



# TRIANGLE

## Test Specification V1.3

(March 2019)



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# 1 Introduction

## 1.1 Purpose

This Test Specification contains the test cases defined by TRIANGLE project to evaluate and verify the performance of mobile applications, mobile devices and IoT devices.

## 1.2 Scope of testing

This Test Specification is applicable to mobile applications, mobile devices and IoT devices.

The test cases included in this test specification are designed to obtain Key Performance Indicators (KPIs) to determine mobile applications, mobile devices and IoT devices performance required to obtain the TRIANGLE mark.

The test cases in this Test Specification are initially defined to be implemented in TRIANGLE testbed.

## 1.3 Definitions and Acronyms

Table 1 – Definitions

State	Description
<i>Application User Flow</i>	The sequence of actions which the user's AUT is expected to perform on the AUT user interface objects in order to execute a test step of this test specification.
<i>AUT Backend Service</i>	Remote endpoint of the AUT service layer
<i>Dummy Battery Fixture</i>	Device designed to replace the usual Host Device battery to facilitate powering the Host device from an external DC source and simulating normal behaviour of the replaced battery
<i>Host Device</i>	Android or iOS device where the AUT is installed in order to test the AUT
<i>Network Scenario</i>	Usage scenario which is defined by a parameterization of the air interface and the core network
<i>Network Scenario</i>	Usage scenario as described in Deliverable D2.2 [1] which is defined by a parameterization of the air interface and the core network
<i>Reference App Backend Service</i>	Remote endpoint of the Reference App service layer
<i>Reference App</i>	Android or iOS App installed in the DUT to measure the DUT performance according to TRIANGLE requirements.
<i>Reference App API</i>	API that lets embedding a reference app implementation on the DUT (e.g., File download in this specification).
<i>Reference App API action</i>	Action to be performed by a reference API that can be invoked through its API
<i>Test System</i>	Integrated system used to measure the AUT's performance against this test specification.
<i>TRIANGLE Testbed</i>	TRIANGLE testing framework. It covers all the software, and the coordination/sequencing that control & connects to the test infrastructure. It is in charge of handling and transforming the end user test requests into actionable steps for the software and hardware components of the testbed.



**Table 2 – Acronyms**

<b>State</b>	<b>Description</b>
<i>AR</i>	Augmented Reality
<i>ARRA</i>	Augmented Reality Reference App
<i>AUT</i>	Application Under Test
<i>CPU</i>	Central Processing Unit
<i>CS</i>	Content Distribution Streaming Services
<i>CSRA</i>	Content distribution Streaming Services Reference App
<i>CV</i>	Connected Vehicles
<i>DUT</i>	Device Under Test
<i>EM</i>	Emergency Services
<i>EMRA</i>	Emergency Services Reference App
<i>GA</i>	Gaming
<i>GARA</i>	Gaming Reference App
<i>GPU</i>	Graphics Processing Unit
<i>HS</i>	High Speed Internet
<i>HSRA</i>	High Speed Internet Reference App
<i>ICS</i>	Implementation Conformance Statement
<i>IXIT</i>	Implementation eXtra Information for Testing
<i>ksp/s</i>	KiloSamples per second (thousands of samples per second)
<i>LS</i>	Live Streaming services
<i>LSRA</i>	Live Streaming Services Reference App
<i>PM</i>	Patient Monitoring
<i>PMRA</i>	Patient Monitoring Reference App
<i>PUT</i>	Product Under Test
<i>SG</i>	Smart Grids
<i>SM</i>	Smart Metering
<i>SN</i>	Social Networking
<i>VR</i>	Virtual Reality
<i>VRRA</i>	Virtual Reality Reference App

## 1.4 References

- [1] D2.2 Formalization of the certification process, requirements and use. Appendix 2: Product characterization.



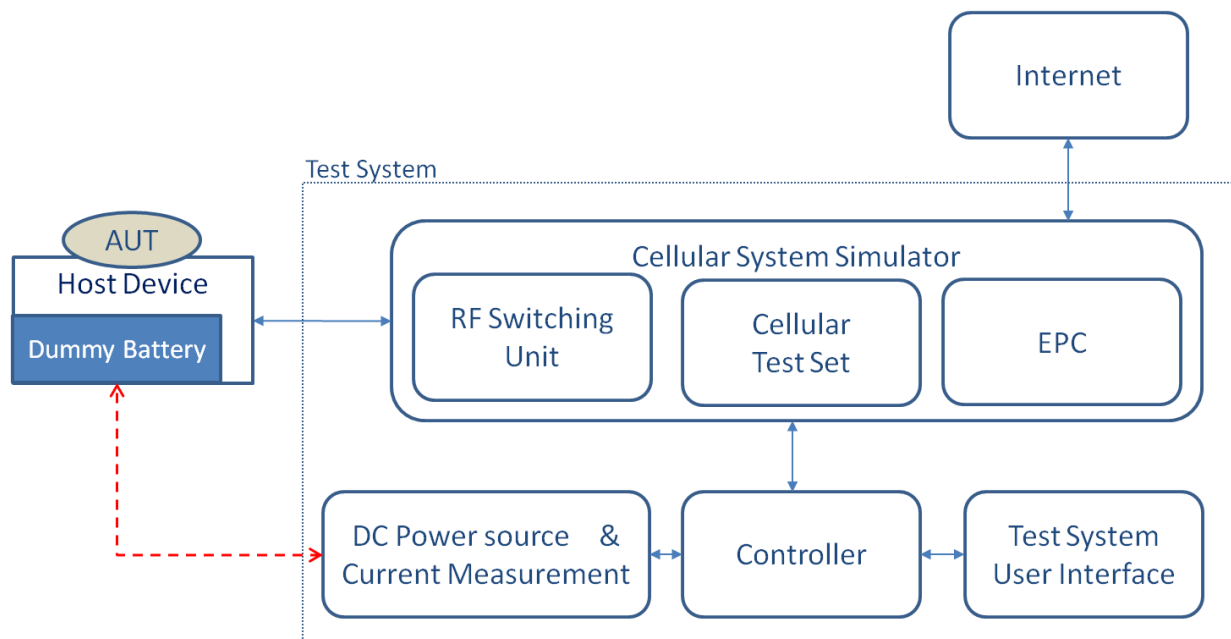
## 2 General Test conditions

Unless otherwise specified in a particular test case, the conditions defined in this section will apply for all test cases.

### 2.1 Test System configuration

#### 2.1.1 Applications

The figure below shows a simplified overview of the testing architecture for testing applications.



**Figure 1 – Test System architecture overview for testing Apps**

The App under test (AUT) is installed in the Host Device. The Host Device is connected to the Test System through a conducted RF connection.

The Host Device is grid powered if feasible. If the Host Device is battery powered, the battery of the Host Device is fully charged.

The Test System is configured to perform the test cases will be one of the bands supported by the Host Device. In case any of the bands listed next is supported by the device it will be selected and in the order defined: 1. FDD4; 2. FDD17; 3. FDD14; 4. FDD25; 5. FDD2; 6. FDD5; 7. FDD7; 8. FDD12; 9. FDD12; 10. FDD30.

The Test System network is initially configured as specified by the latest release of 3GPP TS 36.508.

The Test System shall provide a way to rotate the Host Device according to the 3 space axis, as required by certain VR and AR use cases test cases.

In the case of energy consumption domain, additionally following configuration applies:



The DC Power Source and Current Measurement device provides DC power source to the Host Device and measures the Host Device current consumption.

The DC Power Source will have the following functionalities:

- Configurable output voltage.
- Output Resolution at least 0.01 volt.
- Output voltage range including the nominal voltage of the Host device (+- 5%)
- Remote sensing recommended; for the maintenance of the nominal voltage of the Host Device.
- Enough continuous and peak output current capability to cover Host Device requirements during the measurements.

The Current measurement device will have the following functionalities:

- Measurement resolution: At least 0.1 mA.
- Sampling frequency: No less than 50 ksp/s

The Test System is configured to perform the test cases will be one of the bands supported by

#### **2.1.1.1 Host Device configuration**

The Host Device will be configured as defined below:

- The Host Device is ON and there are no Apps running other than required system apps.
- No antivirus and/or anti-malware App is running.
- Maximum brightness available.
- Maximum screen resolution available.
- No Energy saving or screen saving option is enabled.
- Vibration is enabled if available.
- The Host Device is allowed to use mobile data.
- There is no restriction configuration for data use.
- The Host Device Audio Volume is configured at the middle of the available range.
- The Host Device has been ON for at least three minutes to allow all boot processes to be completed.
- The Host Device screen is configured with screen always ON.

In the case of energy consumption domain, additionally following configuration applies:

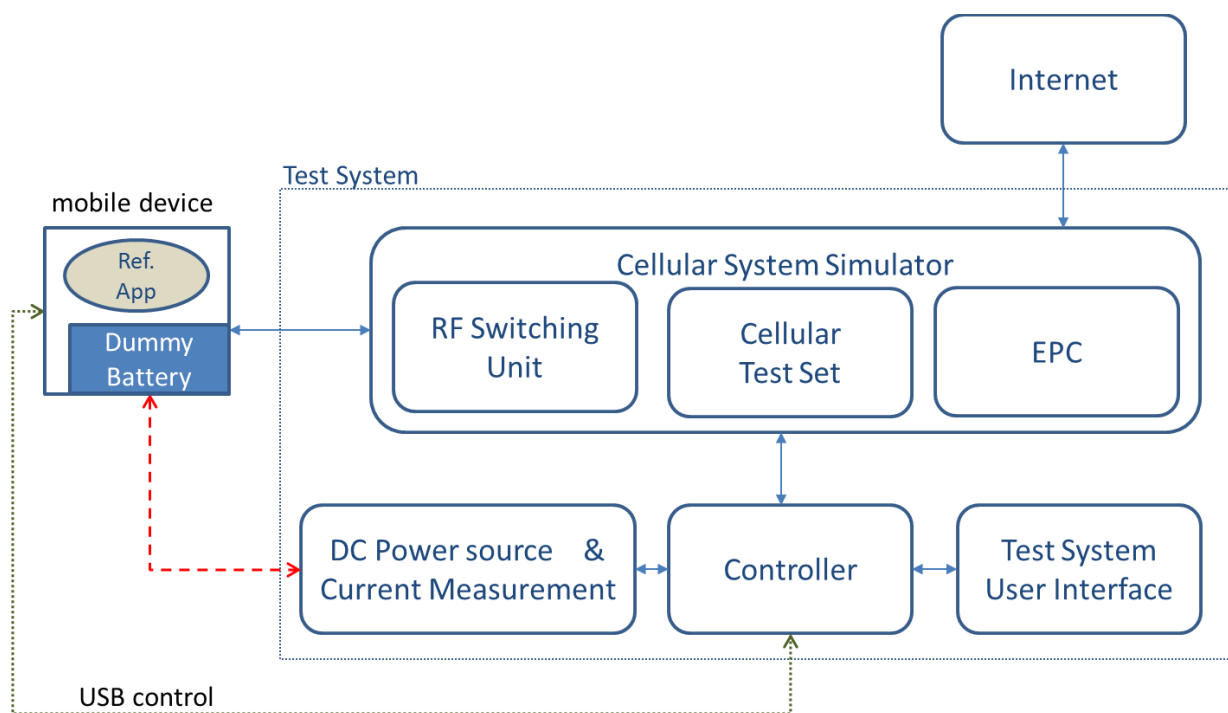
- The Host Device battery is replaced by a dummy battery fixture.
- The dummy battery shall provide a connection between the Host Device battery terminals and the DC power source.



- The dummy battery will provide means to minimize, as far as possible, the resistance, inductance and length of cables required to connect the fixture to the DC power supply.
- The dummy battery may provide source and sense conductors to keep the nominal battery voltage as stable as possible.

### 2.1.2 Mobile Devices

The figure below shows a simplified overview of the testing architecture.



**Figure 2 – Test System architecture overview for testing mobile devices**

The Device Under Test (DUT) is connected to the Test System through a conducted RF connection as shown in the figure above.

The 'DC Power Source and Power Measurement' device provides DC power source to the DUT and measures the DUT power consumption.

The DC Power Source to be used in Energy Consumption test cases will have the following functionalities:

- Configurable output voltage.
- Output Resolution at least 0.01 volt.
- Output voltage range including the nominal voltage of the DUT (+/- 5%)
- Remote sensing recommended; for the maintenance of the nominal voltage of the DUT.



- Enough continuous and peak output current capability to cover the DUT requirements during the measurements.

The Power measurement device will have the following functionalities:

- Measurement resolution: At least 0.1 mA.
- Sampling frequency: No less than 50 ksp/s
- At least, two independent measurement inputs.

The DUT battery is replaced by a dummy battery fixture.

The dummy battery shall provide a connection between the DUT battery terminals and the DC power source.

The dummy battery will provide means to minimize, as far as possible, the resistance, inductance and length of cables required to connect the fixture to the DC power supply.

The dummy battery may provide source and sense conductors to keep the nominal battery voltage as stable as possible.

The DUT is connected to its power source according to the normal operation conditions defined by the DUT's provider.

The Reference Apps applicable for each use case, as defined in [1] Annex C are used to perform the required operations while performing the test cases measurements.

It is recommended to use Reference Apps APIs to ease the test case automation.

The Reference App Backend Service applicable for each use case is accessible from the Test System.

The Test System is configured to perform the test cases will be one of the bands supported by the device. In case any of the bands listed next is supported by the DUT it will be selected and in the order defined: 1. FDD4; 2. FDD17; 3. FDD14; 4. FDD25; 5. FDD2; 6. FDD5; 7. FDD7; 8. FDD12; 9. FDD12; 10. FDD30.

The Test System network is initially configured as specified by the latest release of 3GPP TS 36.508.

The content of the test packets used by the Test System for throughput measurements is random.

Note: It is recommended that the DUT uses always the same frequency band, as it may affect the results obtained.

The Test System network is initially configured as specified by the latest release of 3GPP TS 36.508.

The test environment lighting is set to office conditions with no direct sun light on the DUT.

### **2.1.2.1 DUT configuration**

The DUT will be configured as defined below:

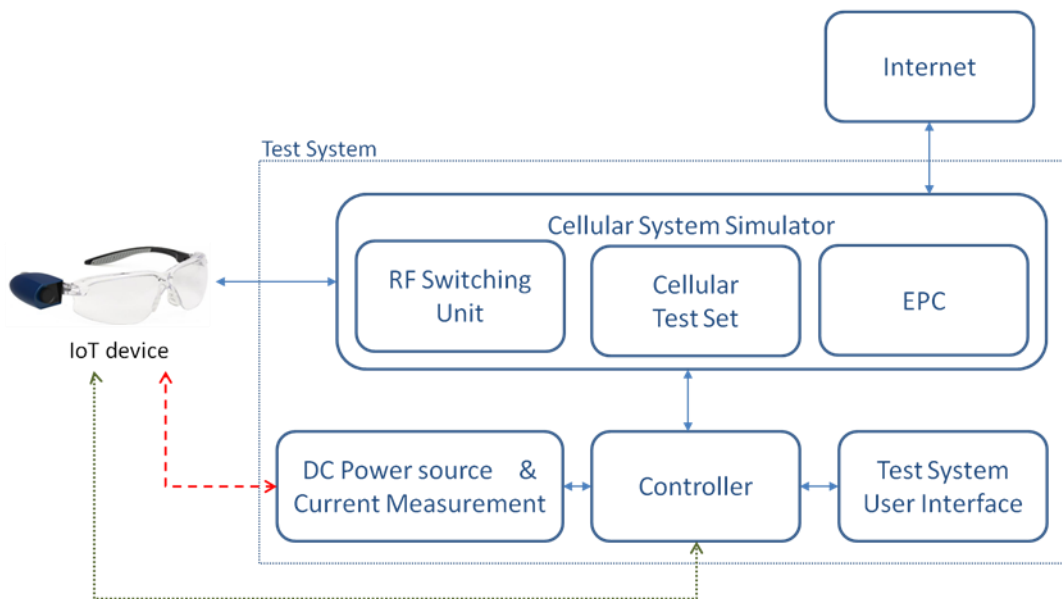
- The DUT is ON
- The only Apps running on the DUT are the apps provided by the manufacturer when the product is obtained commercially (factory configuration) that are started when the mobile device is switched on.



- There is no restriction configuration for data use.
- No antivirus and/or anti-malware App is running.
- Maximum brightness available.
- Maximum screen resolution available.
- No Energy saving or screen saving option is enabled.
- Vibration if available is disabled.
- The DUT is configured to allow the use of mobile data.
- The DUT Audio Volume is configured at the middle of the available range.
- The DUT screen is configured with screen always ON.
- The DUT has been on for at least three minutes to allow all boot processes to be completed.

### 2.1.3 IoT Devices

The figure below shows a simplified overview of the testing architecture.



**Figure 3 – Test System architecture overview for testing IoT devices**

The IoT device is connected to the Test System through a conducted RF connection.

The DC Power Source and Current Measurement device provides DC power source to the IoT Device and measures the IoT Device current consumption.

The DC Power Source will have the following functionalities:

- Configurable output voltage.
- Output Resolution at least 0.01 volt.
- Output voltage range including the nominal voltage of the Host device (+/- 5%)



- Remote sensing recommended; for the maintenance of the nominal voltage of the IUT.
- Enough continuous and peak output current capability to cover IUT requirements during the measurements.

The Current measurement device will have the following functionalities:

- Measurement resolution: At least 0.1 mA.
- Sampling frequency: No less than 50 ksp/s

In the case of battery operated IoT devices, the battery will be replaced by a dummy battery fixture.

The dummy battery shall provide a connection between the IoT Device battery terminals and the DC power source.

The dummy battery will provide means to minimize, as far as possible, the resistance, inductance and length of cables required to connect the fixture to the DC power supply.

The dummy battery may provide source and sense conductors to keep the nominal battery voltage as stable as possible.

In the case of grid operated IoT devices, the IoT device will be connected to the DC power source by the appropriate connector, trying to minimize the resistance, inductance and length of cables required.

The Test System is configured to perform the test cases will be one of the bands supported by the IoT Device. In case any of the bands listed next is supported by the device it will be selected and in the order defined: 1. FDD4; 2. FDD17; 3. FDD14; 4. FDD25; 5. FDD2; 6. FDD5; 7. FDD7; 8. FDD12; 9. FDD12; 10. FDD30.

Note: It is recommended that the IoT Devices always use the same frequency band, as it may affect the results obtained.

The Test System network is initially configured as specified by the latest release of 3GPP TS 36.508.

### **2.1.3.1 IoT device configuration**

The IoT device will be configured according to the standard configuration provided by the supplier in the IoT device user manual.

- If the IoT device has a screen, it will be configured as follows:
  - Maximum brightness available
  - Maximum screen resolution available.
  - No Energy saving or screen saving option is enabled.
- The IoT device is allowed to use mobile data.
- There is no restriction configuration for data use.
- If the IoT device supports audio Volume, it is configured at the middle of the available range.



- The IoT device is ON for at least two minutes to allow all boot processes to be completed.

## 2.2 Network Scenarios Applicability

The test cases will be executed for each of the Network Scenarios applicable for each Use Case as shown in Table 4, and for the case of mobile devices radio performance as shown in table Table 4.

**Table 3 – Mobile devices and Apps Use Case / Network Scenarios Applicability**

Network Scenario	Use Cases								
	CS	LS	SN	HS	VR	AR	PM	ES	GA
Urban-Office	Y		Y	Y	Y	Y		Y	Y
Urban-Pedestrian	Y	Y	Y	Y		Y			Y
Urban-Driving-Normal	Y	Y	Y	Y		Y	Y		Y
Urban-Driving-Traffic jam	Y		Y	Y		Y	Y		Y
Urban-Driving-Emergency driving		Y	Y	Y		Y	Y	Y	
Urban-Internet Café, Busy Hours	Y		Y	Y	Y	Y			Y
Urban-Internet Cafe, Off-Peak	Y		Y	Y	Y	Y			Y
Suburban-Festival	Y	Y	Y	Y		Y		Y	Y
Suburban-Stadium	Y	Y	Y	Y		Y		Y	Y
Suburban-Shopping Mall, Busy Hours	Y		Y	Y		Y		Y	Y
Suburban-Shopping Mall, Off-Peak	Y		Y	Y		Y		Y	Y
High Speed-Relay	Y		Y	Y					Y
High Speed-Direct Passenger Connection	Y		Y	Y					Y

**Table 4 – Network scenarios for Radio Performance test cases**

Network Scenario	Use Case (HS)
<i>Very low coverage</i>	RFP/HS/001
<i>Adjacent Interferer</i>	RFP/HS/002

**Table 5 – IoT Devices Use Case / Network Scenarios Applicability**



<b>SC</b>	<b>Network Scenario</b>	<b>Use Cases</b>				
	<b>Network Scenario</b>	<b>PM</b>	<b>ES</b>	<b>SM</b>	<b>SG</b>	<b>CV</b>
<i>UR-OF</i>	Urban-Office		Y	Y		
<i>UR-PE</i>	Urban-Pedestrian					
<i>UR-DN</i>	Urban-Driving-Normal	Y				Y
<i>UR-DT</i>	Urban-Driving-Traffic jam	Y				Y
<i>UR-DE</i>	Urban-Driving-Emergency driving	Y	Y			Y
<i>UR-IB</i>	Urban-Internet Café, Busy Hours					
<i>UR-IO</i>	Urban-Internet Cafe, Off-Peak					
<i>SU-FE</i>	Suburban-Festival		Y			
<i>SU-ST</i>	Suburban-Stadium		Y			
<i>SU-SB</i>	Suburban-Shopping Mall, Busy Hours		Y			
<i>SU-SO</i>	Suburban-Shopping Mall, Off-Peak		Y			
<i>HS-RE</i>	High Speed-Relay					Y
<i>HS-DP</i>	High Speed-Direct Passenger Connection					Y
<i>IT-WA</i>	Internet of Things-Warehouse			Y		
<i>IT-OS</i>	Internet of Things-Outdoor Sensors			Y	Y	
<i>IT-HS</i>	Internet of Things-Home Sensors	Y		Y	Y	

### 2.3 Number of Test Iterations

In order to obtain statistically relevant measurements out of which the KPIs will be derived (section 8), the test cases will be iterated 100 times, except for the following tests that will be iterated as shown in Table 4.

**Table 6 – Test case Iterations**

<b>Test Case</b>	<b># of Iterations</b>
-	-

### 2.4 Test Case Initial Conditions

#### 2.4.1 Applications

Following initial conditions modes are defined:

#### **AUT-NOT RUNNING**

- The AUT is installed on the Host Device.



- The Host Device is configured as specified in section 2.1.1.1.
- The Test System and the Host Device are connected as shown in Figure 1.
- The AUT Backend Service is accessible from the Test System.
- Test Environment Lightning: Office conditions with no direct sun light on the Host Device.
- The Test System is configured according to the target Network Scenario as defined in D2.2 Appendix 8 (Network scenarios parameterization).
- The Test System has established a data path with the Host Device.

### ***AUT-STARTED***

- The AUT is installed on the Host Device.
- The Host Device is configured as specified in section 2.1.1.1.
- The Test System and the Host Device are connected as shown in Figure 1
- The AUT Backend Service is accessible from the Test System.
- Test Environment Lightning: Office conditions with no direct sun light on the Host Device.
- The Test System is configured according to the target Network Scenario as defined in D2.2 Appendix 8 (Network scenarios parameterization).
- The Test System has established a data path with the Host Device.
- The Test System has cleared the AUT stored data and cache.
- The Test System has opened the AUT.

### **2.4.2 Mobile devices**

Following initial conditions modes are defined:

#### ***DUT-ON***

- The DUT is configured as specified in section 2.1.2.1.
- No reference Apps are installed on the DUT.
- The Test System and the DUT are connected as shown in section 2.1.2; **Error! No se encuentra el origen de la referencia..**
- There is no restriction configuration for data use.
- Test Environment Lightning: Office conditions with no direct sun light on the DUT.
- The Test System has cleared any Reference App stored data and cache.
- The Test System has established a data path with the DUT.

#### ***DUT-READY***

- The DUT is configured as specified in section 2.1.2.1.



- The Reference App (according to the use case to be tested) is installed on the DUT. For common services case (section 3.1) a SNRA is used.

Note: Reference Applications are identified in [1].

- The Reference App Backend Service is accessible from the Test System.
- The Test System and the DUT are connected as shown in section 2.1.2. **Error! No se encuentra el origen de la referencia..**
- The Test System has established a data path with the DUT.
- There is no restriction configuration for data use.
- The Test System is configured according to the target Network Scenario (refer to section 2.2).
- Test Environment Lightning: Office conditions with no direct sun light on the DUT.
- The Test System has cleared any Reference App stored data and cache.

### 2.4.3 IoT devices

Following initial conditions modes are defined:

#### ***IUT-OFF***

- The IUT is OFF.
- The IUT is configured as specified in section 2.1.3.1.
- The Test System and the IUT are connected as shown in figure 1.
- The IUT Backend Service (if existing and required) is accessible from the Test System.
- Test Environment Lightning: Office conditions with no direct sun light on the IUT.
- The Test System is configured according to the target Network Scenario as defined in D2.2 Appendix 8 (Network scenarios parameterization).

#### ***IUT-STARTED***

- The IUT is ON.
- The IUT is configured as specified in section 2.1.3.1.
- The Test System and the IUT are connected as shown in figure 1.
- The IUT Backend Service (if existing and required) is accessible from the Test System.
- Test Environment Lightning: Office conditions with no direct sun light on the IUT.
- The Test System is configured according to the target Network Scenario as defined in D2.2 Appendix 8 (Network scenarios parameterization).
- The Test System has established a data path with the IUT.



## 2.5 Test Case Postamble

Unless stated otherwise in the test case description, the following steps will be executed after the test case steps:

- The System closes the Application (Reference App or AUT).
- The Test System shuts down the data path with the device (Host device or Device Under Test).

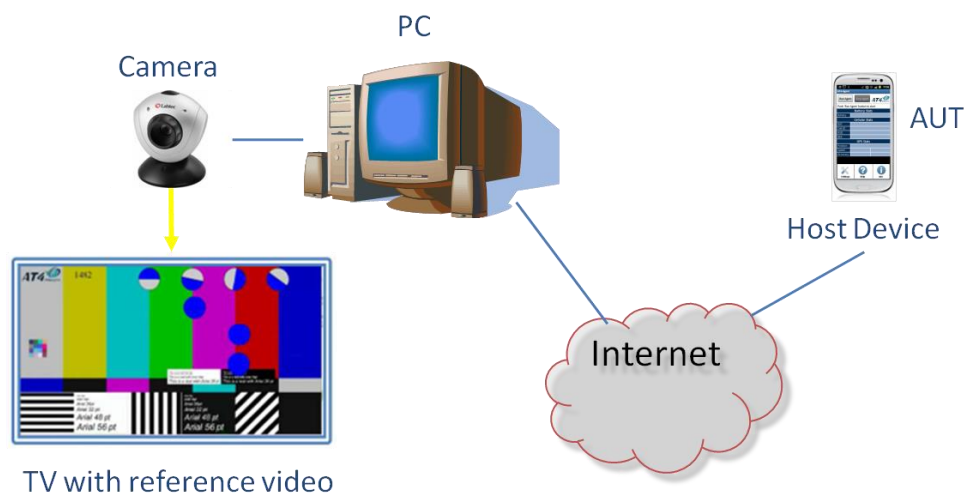
## 2.6 Additional configuration requirements

### 2.6.1 Live Streaming transmission configuration

Some test cases need that a live streaming is generated during test case execution.

If possible, the Test System will avoid the need of using an external camera by replacing the default camera app with a video/image file streamer. This way, a more accurate control over the conditions of what is streamed will be obtained.

If the option of replacing the camera app is not available (e.g. due to limitation of the specific OS), the live streaming will be generated as defined in the figure below:



**Figure 4 – Live streaming transmission configuration**

Personal Computer (or equivalent hardware) connected to an Internet wide band connection.

Camera with video resolution no less than 1080p@30fps connected to the PC.

Live Streaming Services Reference App to stream live videos with operative account valid for live streaming transmission.

The camera will be recording a reference video (RTVP<sub>n</sub>) in a properly illuminated room.

### 2.6.2 Content distribution Streaming Services Reference App

When using Content distribution Streaming Services Reference App following configuration will be used:



- Videos to be played will be configured as following:
  - Quality: Automatic.
  - Speed: Standard.
  - Full Screen.
  - Following videos will be used for video transmission when using YouTube.
  - Content Distribution Reference video 1 (muted):  
<https://www.youtube.com/watch?v=CHO5lrn5u6o>.
  - Content Distribution Reference video 2 (with audio):  
<https://www.youtube.com/watch?v=bBgcsYOPgs8>.

### **2.6.3 Reference elements**

The following reference elements are used in this Test Specification:

- RV1: Reference video 1 (Short duration video):
- RV2: Reference video 2 (Medium duration video):
- RV3: Reference video 3 (Long duration video (at least 30 minutes)):
- RP1: Reference picture 1 (Small size picture):
- RP2: Reference picture 2 (Medium size picture):
- RP3: Reference picture 3 (Large size picture):
- RC1: Reference comment 1: "The rain in Spain stays mainly in the plain."
- RL1: Reference location 1:
- RF1: Reference file 1 (Small size file):
- RF2: Reference file 2 (Medium size file):
- RF3: Reference file 3 (Large size file):
- RF4: Reference file 4 (Large size file):
- RF5: Reference file 5 (Large size file):
- RF6: Reference file 6 (Large size file):
- RVE1: Reference Virtual Experience 1:
- RTVP1: Reference Fixed TV Pattern 1:
- RTVP2: Reference TV Pattern 2 (High definition):



### 3 Management of PUT

During a test case execution, it is required that the Product Under Test perform a set of required actions, so that the corresponding measurements can be obtained. These actions are known as:

- In the case of Apps, the *Application User Flow*;
- In the case of mobile phones, *Reference Apps APIs actions* (the actions to be performed by reference apps are handled by reference APIs) and,
- In the case of IoT devices, the IoT device shall provide an *IoT Device Control Interface* to allow the test case request the IoT device perform such actions

#### 3.1 Applications and mobile devices.

Table 7 contains a list of the common *Application User Flows* and *Reference Apps API actions* to be used by Applications and mobile devices test cases respectively.

**Table 7 –Application User Flows and Reference Apps API actions**

Identifier	Use Case	Application User Flow
1.1	All	Reopen the App <ol style="list-style-type: none"> <li>1. Open the App.</li> <li>2. Perform login step and wait for 5 seconds.</li> <li>3. Close App and wait for 5 seconds</li> <li>4. Open the App (no login required).</li> </ol>
1.2	All	Navigate menu <ol style="list-style-type: none"> <li>1. Open the App.</li> <li>2. Perform login step and wait for 5 seconds.</li> <li>3. Enter all available menu options and views.</li> <li>4. Close the App.</li> </ol>
1.3	All	Login <ol style="list-style-type: none"> <li>1. Perform login step and wait for 5 seconds.</li> </ol>
2.1	CS	Play three reference videos: <ol style="list-style-type: none"> <li>1. Perform login step and wait for 10 seconds.</li> <li>2. Play sequentially the three reference videos: RV1, RV2 and RV3.</li> </ol>
2.2	CS	Play and pause <ol style="list-style-type: none"> <li>1. Perform login step and wait for 10 seconds.</li> <li>2. Start playing RV3 during 10 seconds.</li> <li>3. Pause the reproduction.</li> <li>4. Resume the reproduction after 2 minutes</li> </ol>
2.3	CS	Rewind and Fast Forward



		<ol style="list-style-type: none"> <li>1. Perform login step and wait for 10 seconds.</li> <li>2. Start playing RV3 for 10 seconds.</li> <li>3. Perform fast forward during 2 minutes (select X8 speed if supported by the App (ICSA_CSFastForwardX8), else select the highest speed supported).</li> <li>4. Change to normal play and keep this mode for 10 seconds.</li> <li>5. Perform rewind for 2 minutes (select X8 speed if supported by the App (ICSA_CSRewindX8), else select the highest rewind speed supported),</li> <li>6. Stop the playback.</li> </ol>
2.4	CS	<b>Download a media file</b> <ol style="list-style-type: none"> <li>1. Perform login step and wait for 10 seconds.</li> <li>2. Download RV3.</li> <li>3. Wait until the download is complete.</li> </ol>
2.5	CS	<b>Set background state.</b> <ol style="list-style-type: none"> <li>1. Perform login step and wait for 10 seconds.</li> <li>2. Set the App in background state.</li> <li>3. Wait for 20 minutes</li> <li>4. Set the App in active state</li> </ol>
2.6	CS	<b>Play and Stop</b> <ol style="list-style-type: none"> <li>1. Perform login step and wait for 10 seconds.</li> <li>2. Start playing RV3.</li> <li>3. Stop the reproduction after 1 minute.</li> <li>4. Resume the reproduction after 1 minutes</li> </ol>
2.7	CS	<b>Search and Seek</b> <ol style="list-style-type: none"> <li>1. Perform login step and wait for 10 seconds.</li> <li>2. Search reference file RV3.</li> <li>3. Start playing RV3.</li> <li>4. Seek the player at 15 minutes position.</li> </ol>
2.8	CS	<b>Skip forward and backward</b> <ol style="list-style-type: none"> <li>1. Perform login step and wait for 10 seconds.</li> <li>2. Start playing RV2.</li> <li>3. After 1 minute, skip backward to the beginning of the media file.</li> <li>4. After 20 seconds, skip forward to the next media file (RV3).</li> <li>5. After 5 seconds, skip backward to the previous media file (RV2).</li> </ol>
3.1	LS	<b>Play an live video from a known user</b> <ol style="list-style-type: none"> <li>1. Perform login step and wait for 10 seconds.</li> </ol>



		2. Select to play the live video set up in the test case initial conditions.
3.2	LS	Broadcast live video 1. Perform login step and wait for 10 seconds. 2. Broadcast live video
4.1	SN	Post comments 1. Perform login step and wait for 10 seconds. 2. Post reference comment: RC1. 3. Post reference comment: RC2. 4. Post reference comment: RC3.
4.2	SN	Post pictures 1. Perform login step and wait for 10 seconds. 2. Post sequentially the pictures: RP1, RP2 and RP3 and without any delay between the pictures. 3. Wait until the last picture is completely uploaded.
4.3	SN	Post videos 1. Perform login step and wait for 10 seconds. 2. Post sequentially the pictures: RV1, RV2 and RV3 and without any delay between videos. 3. Wait until the last video is completely uploaded.
4.4	SN	Post live video 1. Perform login step and wait for 10 seconds. 2. Post live video.
4.5	SN	Post location 1. Perform login step and wait for 10 seconds. 2. Post the reference location: RL1.
4.6	SN	Post files 1. Perform login step and wait for 10 seconds. 2. Post sequentially the reference files: RF1, RF2 and RF3. 3. Wait until all the files are completely uploaded.
4.7	SN	Get comment 1. Perform login step and wait for 10 seconds. 2. Get the first available comment.
4.8	SN	Show picture 1. Perform login step and wait for 10 seconds. 2. Get the first available picture.



4.9	SN	Play video <ol style="list-style-type: none"> <li>1. Perform login step and wait for 10 seconds.</li> <li>2. Get the first available video.</li> </ol>
4.10	SN	Play live video <ol style="list-style-type: none"> <li>1. Perform login step and wait for 10 seconds.</li> <li>2. Get reference live video</li> </ol>
4.11	SN	Get location <ol style="list-style-type: none"> <li>1. Perform login step and wait for 10 seconds.</li> <li>2. Post sequentially the reference location: RL1.</li> </ol>
4.12	SN	Get file <ol style="list-style-type: none"> <li>1. Perform login step and wait for 10 seconds.</li> <li>2. Get the first available file.</li> </ol>
4.13	SN	Search objects <ol style="list-style-type: none"> <li>1. Perform login step and wait for 10 seconds.</li> <li>2. Search the most relevant item for which the App has been mainly designed (e.g., contacts, flights, hotels, etc.).</li> </ol>
5.1	HS	Download three files sequentially <ol style="list-style-type: none"> <li>1. Perform login step and wait for 10 seconds.</li> <li>2. Download sequentially the reference files: RF1, RF2 and RF3 and without any delay between them.</li> <li>3. Wait until the last file is completely downloaded.</li> </ol>
5.2	HS	Upload three files sequentially <ol style="list-style-type: none"> <li>1. Perform login step and wait for 10 seconds.</li> <li>2. Upload sequentially the reference files: RF1, RF2 and RF3 and without any delay between them.</li> <li>3. Wait until the last file is completely uploaded.</li> </ol>
5.3	HS	Download several files simultaneously <ol style="list-style-type: none"> <li>1. Perform login step and wait for 10 seconds.</li> <li>2. Download simultaneously the reference files: RF1, RF2, RF3, RF4, RF5 and RF6.</li> <li>3. Wait until the last file is completely downloaded.</li> </ol>
5.4	HS	Upload several files simultaneously <ol style="list-style-type: none"> <li>1. Perform login step and wait for 10 seconds.</li> <li>2. Upload simultaneously the reference files: RF1, RF2, RF3, RF4, RF5 and RF6.</li> <li>3. Wait until the last file is completely uploaded.</li> </ol>
5.5	HS	Download a huge file



		<ol style="list-style-type: none"> <li>1. Perform login step and wait for 5 seconds.</li> <li>2. Download the reference file RF7.</li> <li>3. Wait until the file is completely downloaded.</li> </ol>
5.6	HS	Upload a huge file <ol style="list-style-type: none"> <li>1. Perform login step and wait for 5 seconds.</li> <li>2. Upload the reference file RF7.</li> <li>3. Wait until the last file is completely uploaded.</li> </ol>
5.7	HS	Pause and Resume Download <ol style="list-style-type: none"> <li>1. Perform login step and wait for 10 seconds.</li> <li>2. Start downloading the reference file RF7.</li> <li>3. After 30 seconds, pause the file transfer.</li> <li>4. Wait for 15 seconds and resume the transfer</li> </ol>
5.8	HS	Pause and Resume Upload <ol style="list-style-type: none"> <li>1. Perform login step and wait for 10 seconds.</li> <li>2. Start uploading the reference file RF7.</li> <li>3. After 30 seconds, pause the file transfer.</li> <li>4. Wait for 15 seconds and resume the file upload.</li> </ol>
6.1	VR	Load Virtual Experience <ol style="list-style-type: none"> <li>1. Perform login step and wait for 10 seconds.</li> <li>2. Load reference virtual experience RVE1.</li> <li>3. Load until the virtual experience is completely loaded</li> </ol>
7.1	AR	Load Augmentation layer on physical marker <ol style="list-style-type: none"> <li>1. Perform login step and wait for 10 seconds.</li> <li>2. Start an augmented reality session.</li> <li>3. Aim at a physical marker.</li> </ol>
7.2	AR	Load Augmentation layer at a location <ol style="list-style-type: none"> <li>1. Perform login step and wait for 10 seconds.</li> <li>2. Start an augmented reality session.</li> <li>3. Aim at a specific location.</li> </ol>
10.1	GA	Start session game <ol style="list-style-type: none"> <li>1. Perform login step and wait for 10 seconds.</li> <li>2. Set most common configuration (as required)</li> <li>3. Start session game</li> </ol>
10.2	GA	Short Session game <ol style="list-style-type: none"> <li>1. Perform login step and wait for 10 seconds.</li> </ol>



		<ol style="list-style-type: none"> <li>Set game most common configuration.</li> <li>Start game.</li> <li>Perform standard game session for 2 minutes</li> </ol>
10.3	GA	<b>Large Session game</b> <ol style="list-style-type: none"> <li>Perform login step and wait for 10 seconds.</li> <li>Set game most common configuration.</li> <li>Start game.</li> <li>Perform standard game session for 15 minutes</li> </ol>
10.4	GA	<b>Pause and resume game</b> <ol style="list-style-type: none"> <li>Perform login step and wait for 5 seconds.</li> <li>Set game most common configuration.</li> <li>Start game session.</li> <li>After 2 minutes set the session in pause mode.</li> <li>After 30 seconds, resume the game session.</li> </ol>
10.5	GA	<b>Start saved session game</b> <ol style="list-style-type: none"> <li>Perform login step and wait for 5 seconds.</li> <li>Set game most common configuration.</li> <li>Start game session.</li> <li>After 2 minutes save game session data.</li> </ol> <p>Note: Some Apps may need a longer time to allow saving game session.</p> <ol style="list-style-type: none"> <li>Exit the game session.</li> <li>After 10 seconds restart the saved game session.</li> <li>After 20 seconds, exit the game session.</li> </ol>
10.6	GA	<b>Start two game sessions</b> <ol style="list-style-type: none"> <li>Perform login step and wait for 10 seconds.</li> <li>Set most common configuration (as required).</li> <li>Start a new session game.</li> <li>After 1 minute, exit the game session.</li> <li>Exit the game session and wait for 15 seconds.</li> <li>Start a new session game.</li> <li>After 15 seconds, exit the game session.</li> </ol>

### 3.2 IoT devices

The IUT will provide an *IoT device Control Interface* to allow TRIANGLE testbed perform the following actions on it. IUTs shall implement the actions related to supported ICS.



**Table 8 – Control Interface functionality**

<b>ICS</b>	<b>Action</b>	<b>Description</b>
<i>ICSDI_RecordVideo</i>	Send live video streaming	Transmit a live video streaming
<i>ICSDI_RecordAudio</i>	Send live audio streaming	Transmit a live audio streaming
<i>ICSDI_PlayVideo</i>	Receive live video streaming	Play a live video streaming'
<i>ICSDI_PlayAudio</i>	Receive live audio streaming'	Play a live audio streaming'



## 4 Application Test cases

### 4.1 Application User Experience (AUE)

#### 4.1.1 Common Services

The tests cases in this section apply to all Use Cases.

##### 4.1.1.1 Open the App

**Identifier:** AUE/CO/001

**Title:** Open the App

**Objective:** Verify that the AUT performs the login and logout actions properly.

**Applicability:**

(ICSG\_ProductType = Application) AND ICSA\_Login

**Initial Conditions:**

AUT is in [[AUT-NOT-RUNNING](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 1.1: Reopen the app.
2. The Test System measures the time from initiating the App to starting using the App when login is required and when login is not required.
3. The Test System measures whether the AUT has been unintentionally interrupted or not.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Open Access Time: The time elapsed from initiating the AUT when login is required to starting using the App.
- Re-open Access Time: The time elapsed from initiating the AUT when login is not required to starting using the App.
- Access Operation: Access the application when user intends to use the application to close it.
- Application Cut-Off: Probability that the AUT is interrupted without being done intentionally by the user.

##### 4.1.1.2 Menu Navigation

**Identifier:** AUE/CO/002

**Title:** Menu Navigation

**Objective:** Verify that the AUT does not crash when the user navigates throughout the AUT menu tree.

**Applicability:**



(ICSG\_ProductType = Application) AND ICSA\_Login

**Initial Conditions:**

AUT is in [[AUT-NOT-RUNNING](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 1.2: Navigate menu
2. The Test System measures the time from initiating the App to starting using the App, and whether the AUT could be used or not (as would be intended by a user).
3. The Test System measures whether the AUT has been unintentionally interrupted or not.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Access Time: The time elapsed from initiating the AUT to starting using the App.
- Access Operation: Access the application when user intends to use the application.
- Application Cut-Off: Probability that the AUT is interrupted without being done intentionally by the user.

#### 4.1.2 CS Content Distribution Streaming Services

Note: The following test cases are defined to prevent any device-side content caching which the AUT could implement. However, if the AUT Backend Service also implements a server-side caching (e.g., storing the current playback time for a user), preventing that effect is left to the implementation of the test case.

##### 4.1.2.1 Non Interactive Playback

**Identifier:** AUE/CS/001

**Title:** Non Interactive Playback

**Objective:** Measure the user experience KPIs by the AUT while executing the feature media file playing from the Content Distribution Streaming Services use case.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes CS) AND ICSA\_CSPlay

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 2.1: Play three reference media files.
2. The Test System measures the initial buffering, the number and duration of re-buffering occurrences and the video resolution.

**Postamble:**



- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Time to load first media frame: The time elapsed since the user clicks play button until the media reproduction starts.
- Playback Cut-off: Probability that successfully started stream reproduction is ended by a cause other than the intentional termination by the user.
- Content Stall (s): The elapsed duration of content stalls while playing the content.
- Video resolution: Used video resolution.

#### 4.1.2.2 Play and Pause

**Identifier:** AUE/CS/002

**Title:** Play and Pause

**Objective:** Measure the ability of the AUT to pause and the resume a media file.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes CS) AND ICSA\_CSPause

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 2.2: Play and Pause.
2. The Test System measures whether pause operation was successful or not.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Playback Cut-off: Probability that successfully started stream reproduction is ended by a cause other than the intentional termination by the user.
- Pause Operation: Whether pause operation is successful or not.
- Time to load first media frame (s) after resuming: The time elapsed since the user clicks resume button until the media reproduction starts.

#### 4.1.2.3 Stop and Replay

**Identifier:** AUE/CS/003

**Title:** Stop and replay

**Objective:** Measure the ability of the AUT to stop and the re-play a media file.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes CS)

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 2.6: Stop and Replay.
2. The Test System measures whether stop re-play operations were successful or not.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Time to load first media frame: The time elapsed since the user clicks play button until the media reproduction starts.
- Playback Cut-off: Probability that successfully started stream reproduction is ended by a cause other than the intentional termination by the user.
- Stop Operation: Whether stop operation is successful or not.

#### 4.1.2.4 Search and Seek

**Identifier:** AUE/CS/004

**Title:** Media file Seek

**Objective:** Measure the ability of the AUT to search a media file and seek at any time in the media file.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes CS) AND ICSCA\_CSSearchSeek

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 2.7: Search and Seek.
2. The Test System measures the search time and the time to load the first media frame after the seek operation.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Search Time: The time elapsed since the user clicks search button until the first search result is shown.
- Playback Cut-off: Probability that successfully started stream reproduction is ended by a cause other than the intentional termination by the user.



- Time to load first frame: The time elapsed since the user clicks play button until reproduction resumes after seek operation.
- Search Operation: Whether the search was successful or not

#### 4.1.2.5 Rewind

**Identifier:** AUE/CS/005

**Title:** Rewind

**Objective:** Measure the ability of the AUT to perform rewind and fast forward operations while playing a media file.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes CS) AND ICSCA\_CSReWind

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 2.9: Rewind.
2. The Test System measures the time to load the first media frame after the rewind operation.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Playback cut-off: Probability that successfully started stream reproduction is ended by a cause other than the intentional termination by the user.
- Time to load first media frame: The average of the time elapsed since the user clicks play button until reproduction resumes after rewind operation.
- Rewind operation: Whether rewind operation is successful or not.

#### 4.1.2.6 Playlist Skip Forward and Backward

**Identifier:** AUE/CS/006

**Title:** Playlist Skip Forward and Backward

**Objective:** Measure the ability of the AUT to skip forward and backward through a playlist while playing a media file.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes CS) AND ICSCA\_CSSkipForward AND ICSCA\_CSSkipBackward

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 2.8: Skip Forward and Backward.
2. The Test System measures the time to load the first media frame after the first skip backward operation.
3. The Test System measures the time to load the first media frame after the first skip forward operation.
4. The Test System measures the time to load the first media frame after the second skip backward operation.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Video Playback cut-off: Probability that successfully started stream reproduction is ended by a cause other than the intentional termination by the user.
- Time to load first media frame: The time elapsed since the user clicks play button until reproduction resumes after rewind and fast forward operations.
- Skip Forwards Operation: Measures whether the skip forwards is successful
- Skip Backwards Operation: Measures whether the skip backwards is successful

#### 4.1.2.7 Download content for offline playing

**Identifier:** AUE/CS/007

**Title:** Download content for offline playing

**Objective:** Measure the ability of the AUT to download a media file for offline playing.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes CS) AND ICSA\_CSDownloadMedia

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 2.4: Download a media file.
2. The Test System measures the time to download load the media file.
3. The Test System commands the AUT to delete the media file.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Media Download Operation: Whether the download operation is successful or not.



- File Downloading Time: The time elapsed since the user clicks download button until the media reproduction is ready to be started.

#### 4.1.2.8 Fast Forward

**Identifier:** AUE/CS/008

**Title:** Fast Forward

**Objective:** Measure the ability of the AUT to perform rewind and fast forward operations while playing a media file.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes CS) AND ICSA\_CSFastForward

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 2.10: Fast Forward.
2. The Test System measures the time to load the first media frame after the fast forward operation.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Playback cut-off: Probability that successfully started stream reproduction is ended by a cause other than the intentional termination by the user.
- Time to load first media frame: The average of the time elapsed since the user clicks play button until reproduction resumes after fast forward operation.
- Fast forward operation: Whether fast forward operation is successful or not.

### 4.1.3 Live Streaming Services

#### 4.1.3.1 Play Live Video from User

**Identifier:** AUE/LS/001

**Title:** Play Live Video from User

**Objective:** Measure the user experience KPIs by the AUT while executing the feature live video playing from the Live Streaming Services use case.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes LS)

**Initial Conditions:**



- AUT is in [[AUT STARTED](#)] mode.
- An Internet connected PC transmits live video as defined in section 2.6.1.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 3.1: Playing live video from a known user.
2. The Test System measures the initial buffer, the number of stall occurrences and the video resolution.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Time to load first picture: The time elapsed since the user clicks play button until AUT starts playing the selected broadcast source.
- Broadcasting Reproduction Cut-off: Probability that successfully started broadcast reproduction is ended by a cause other than the intentional termination by the AUT user.
- Content Stall (s): The elapsed duration of content stalls while playing the selected broadcast source.
- Video resolution: Used video resolution.

#### 4.1.3.2 Broadcast Live Video

**Identifier:** AUE/LS/002

**Title:** Broadcast Live Video to User

**Objective:** Measure the capability of broadcasting live content.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes LS)

**Initial Conditions:**

- AUT is in [[AUT STARTED](#)] mode.
- The Host Device camera is focused on a TV displaying reference video RTVP2.

**Steps:**

1. The Test Systems starts playing RTVP2 on the TV.
2. The Test System commands the AUT to replay the Application User Flow 3.2: Broadcast live video.
3. The Test System receives the broadcasted video from the AUT and measures the number of stall occurrences and the video resolution.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**



- Time to load receive first picture: The time elapsed since the user clicks broadcast button until the Test System starts playing the AUT broadcast video.
- Broadcasting Reproduction Cut-off: Probability that successfully started broadcast reproduction is ended by a cause other than the intentional termination by the AUT user.
- Content Stall (s): The elapsed duration of content stalls while broadcasting the content.
- Video resolution: Used video resolution.

#### 4.1.4 Social Networking

##### 4.1.4.1 Picture Posting

**Identifier:** AUE/SN/001

**Title:** Picture Posting

**Objective:** Measure the user experience KPIs by the AUT while executing the feature picture uploading in the Social Networking use case.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes SN) AND ICSA\_SNPstImage

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 4.2: Uploading three reference pictures separately.
2. The Test System measures the time to successfully upload each of the pictures, and whether each upload was successful or not.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Picture Upload Operation: Whether the upload operation is successful or not.
- Picture Upload Time: The time elapsed since the user clicks upload button until the picture is stored in the AUT Backend Service.

##### 4.1.4.2 Video Posting

**Identifier:** AUE/SN/002

**Title:** Video Posting

**Objective:** Measure the user experience KPIs by the AUT while executing the feature video uploading in the Social Networking use case.

**Applicability:**



(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes SN) AND ICSA\_SNPostVideo

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 4.3: Post videos sequentially.
2. The Test System measures the time to successfully upload each of the video clips, and whether each upload was successful or not.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Video Upload Operation: Whether the upload operation is successful or not.
- Video Upload Time: The time elapsed since the user clicks upload button until the video clip is stored in the AUT Backend Service.

#### 4.1.4.3 Comment Posting

**Identifier:** AUE/SN/003

**Title:** Comment Uploading

**Objective:** Measure the user experience KPIs by the AUT while executing the feature comment uploading in the Social Networking use case.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes SN) AND ICSA\_SNPostComment

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 4:1: Uploading three reference comments separately.
2. The Test System measures the time to successfully upload each of the comment, and whether each upload was successful or not.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Comment Upload Operation: Whether the upload operation is successful or not.
- Comment Upload Time: The time elapsed since the user clicks upload button until the comment is stored in the AUT Backend Service.



#### 4.1.4.4 File Posting

**Identifier:** AUE/SN/004

**Title:** File Uploading

**Objective:** Measure the user experience KPIs by the AUT while executing the feature file posting in the Social Networking use case.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes SN) AND ICSA\_SNPostFile.

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 4.6: Post three reference files separately.
2. The Test System measures the time to successfully upload each of the files, and whether each upload was successful or not.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- File Upload Operation: Whether the upload operation is successful or not.
- File Upload Time: The time elapsed since the user clicks upload button until the file is stored in the AUT Backend Service.

#### 4.1.4.5 Show Picture

**Identifier:** AUE/SN/005

**Title:** Show picture

**Objective:** Measure the user experience KPIs by the AUT while executing the feature show picture in the Social Networking use case.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes SN) AND ICSA\_SNGetImage

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 4.8: Show three reference pictures.



2. The Test System measures the time to successfully download and show each of the pictures, and whether each download was successful or not.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Show Picture Operation: Whether the download operation is successful or not.
- Show Picture Time: The time elapsed since the user clicks download button until the picture is shown.



#### 4.1.4.6 Play Video

**Identifier:** AUE/SN/006

**Title:** Play Video

**Objective:** Measure the user experience KPIs by the AUT while executing the feature play video in the Social Networking use case.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes SN) AND ICSA\_SNGetVideo

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 4.9 Play three reference videos.
2. The Test System measures the initial buffer, the number of re-buffering and the content resolution.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Time to load first media frame: The time elapsed since the user clicks play button until the media reproduction starts.
- Playback Cut-off Ratio: Probability that successfully started stream reproduction is ended by a cause other than the intentional termination by the user.
- Content Stalling: The elapsed duration of content stalling while playing the content.
- Video resolution: Used video resolution.

#### 4.1.4.7 File Downloading

**Identifier:** AUE/SN/007

**Title:** File Downloading

**Objective:** Measure the user experience KPIs by the AUT while executing the feature file downloading in the Social Networking use case.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes SN) AND ICSA\_SNGetFile

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 4.12: Downloading three reference files.



2. The Test System measures the time to successfully download each of the files, and whether each download was successful or not.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- File Download Operation: Whether the download operation is successful or not.
- File Download Time: The time elapsed since the user clicks download button until the file is stored in the Host Device.

#### **4.1.4.8 Play Live Video from User**

**Identifier:** AUE/SN/008

**Title:** Play Live Video from User

**Objective:** Measure the user experience KPIs by the AUT while playing a live video from a user.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes SN)

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 4.10: Play live video from a user.
2. The Test System measures the initial buffer, the number of re-buffering and the content resolution.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Time to load first media frame: The time elapsed since the user clicks play button until the media reproduction starts.
- Playback Cut-off: Probability that successfully started stream reproduction is ended by a cause other than the intentional termination by the user.
- Content Stalling: The elapsed duration of content stalling while playing the content.
- Video resolution: Used video resolution.

#### **4.1.4.9 Search Object**

**Identifier:** AUE/SN/009

**Title:** Search Object



**Objective:** Measure the ability of the AUT to search the most relevant item for which the AUT has been mainly designed (e.g., contacts, flights, hotels, etc.).

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes SN)

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 4.13: Search object.
2. The Test System measures the search time.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Search Time: The time elapsed since the user clicks search button until the first search result is shown.
- Search Operation: Whether the search operation is successful or not.

## 4.1.5 High Speed Internet

### 4.1.5.1 Downloading files sequentially

**Identifier:** AUE/HS/001

**Title:** Downloading files sequentially

**Objective:** Measure the user experience KPIs by the AUT while executing the feature file downloading in the High Speed Internet use case.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes HS)

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 5.1: Download three reference files.
2. The Test System measures the time to successfully download each of the files, and whether each download was successful or not.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- File Download Operation: Whether the download operation is successful or not.



- File Download Time: The time elapsed since the user clicks download button until the file is stored in the Host Device.

#### 4.1.5.2 Uploading files sequentially

**Identifier:** AUE/HS/002

**Title:** Uploading files sequentially

**Objective:** Measure the user experience KPIs by the AUT while executing the feature file uploading in the High Speed Internet use case.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes HS)

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 5.2: Upload three reference files.
2. The Test System measures the time to successfully upload each of the files, and whether each upload was successful or not.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- File Upload Operation: Whether the upload operation is successful or not.
- File Upload Time: The time elapsed since the user clicks upload button until the file is stored in the AUT Backend Service.

#### 4.1.5.3 Pause and Resume Download Transfer

**Identifier:** AUE/HS/003

**Title:** Pause and Resume Download Transfer

**Objective:** Measure the ability of the AUT to pause and resume a file download.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes HS)

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 5.7 Pause and Resume one reference media file download.
2. The Test System measures whether the pause operation and the resume operation were successful or not.



**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- File Pause Download Operation: Whether the pause download operation is successful or not.
- File Resume Download Operation: Whether the resume download operation is successful or not.

#### **4.1.5.4 Pause and Resume Upload Transfer**

**Identifier:** *AUE/HS/004*

**Title:** Pause and Resume Upload Transfer

**Objective:** Measure the ability of the AUT to pause and resume a file upload.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes HS)

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 5.8 Pause and Resume one reference media file upload.
2. The Test System measures whether the pause operation and the resume operation were successful or not.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- File Pause Upload Operation: Whether the pause upload operation is successful or not.
- File Resume Upload Operation: Whether the resume upload operation is successful or not.

#### **4.1.6 Virtual Reality**

##### **4.1.6.1 Virtual Experience Loading**

**Identifier:** *AUE/VR/001*

**Title:** Virtual Experience Loading

**Objective:** Measure the ability of the AUT to look around with three degrees of movement freedom from a single observation point.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes VR)

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 6.1 Select a virtual experience.
2. The Test System measures the time to recognize the target object.
3. The Test System spins up the Host Device 30 degrees.
4. The Test System measures the time to recognize the target object.
5. The Test System spins down the Host Device 60 degrees.
6. The Test System measures the time to recognize the target object.
7. The Test System spins up the Host Device 30 degrees and spins left 60 degrees.
8. The Test System measures the time to recognize the target object.
9. The Test System spins right the Host Device 120 degrees.
10. The Test System measures the time to recognize the target object.
11. The Test System spins left 60 degrees.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Time to load the virtual world: Time elapsed from selecting a scenario (world, experience, etc.) to loading the 3D visual context.
- Immersion Cut-off: Probability that successfully started immersion is ended by a cause other than the intentional termination by the user.

#### 4.1.6.2 Virtual Scene Loading

**Identifier:** AUE/VR/002

**Title:** Virtual Scene Loading

**Objective:** Measure the ability of the AUT to move horizontally from the initial observation point under the user control.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes VR)

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 6.1 Select a virtual experience.



2. The Test System waits until the target object is recognized.
3. The Test System spins up the Host Device a random number of degrees between 10 and 50.
4. The Test System waits until the target object is recognized.
5. The Test System commands the AUT to move horizontally (walking speed, 4 km/h) during 20 seconds in order to change the scene.
6. The Test System measures the time to recognize the target object.
7. The Test System spins back the Host Device to the original position.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Time to load the virtual scene: Time elapsed from selecting an scenario (world, experience, etc.) to loading the 3D visual context.
- Immersion Cut-off: Probability that successfully started immersion is ended by a cause other than the intentional termination by the user.
- Video resolution: Used frame resolution.

#### **4.1.7 Augmented Reality**

##### **4.1.7.1 Load Augmentation Layer on Physical Marker**

**Identifier:** AUE/AR/001

**Title:** Load Augmentation Layer on physical marker

**Objective:** Measure the performance of the AUT to render a virtual layer on top of a moving physical marker.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes AR)

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 7.1 Load augmentation layer on a physical marker.
2. The Test System forces the Host Device to aim at a physical maker.
3. The Test System measures the time elapsed by the AUT to display a virtual layer on top of the physical marker.
4. The Test System spins (in any direction) the Host Device 30 degrees, while the physical marker remains in the same position.
5. The Test System measures whether the AUT keeps showing the virtual layer on top of the physical virtual or not.



6. The Test System spins back to the original position.
7. The Test System measures whether the AUT keeps showing the virtual layer on top of the physical marker or not.
8. The Test System commands the AUT to exit augmented reality mode.
9. The Test System measures whether the AUT clears up the virtual layer or not.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Time to load augmentation: Time elapsed from aiming the device at physical marker to displaying the virtual layer on top of it.
- Augmentation Cut-off: Probability that successfully started immersion is ended by a cause other than the intentional termination by the user.
- Clear Augmentation Layer Operation: Whether the clear virtual operation is successful or not.

#### **4.1.7.2 Load Augmentation Layer at Location**

**Identifier:** AUE/AR/002

**Title:** Load Augmentation Layer at specific location

**Objective:** Measure the performance of the AUT to render a virtual layer at a specific location.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes AR)

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 7.2 Load augmentation layer at a specific location.
2. The Test System forces the Host Device to be set at specific position.
3. The Test System measures the time elapsed by the AUT to display a virtual layer at the current location.
4. The Test System commands the AUT to exit augmented reality mode.
5. The Test System measures whether the AUT clears up the virtual layer from the Host Device screen or not.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Time to load augmentation: Time elapsed from setting the Host Device at a specific location to displaying the virtual layer.



- Augmentation Cut-off: Probability that successfully started immersion is ended by a cause other than the intentional termination by the user.
- Clear Augmentation Layer Operation: Whether the clear virtual operation is successful or not.

## 4.1.8 Gaming

### 4.1.8.1 Start new game sessions

**Identifier:** AUE/GA/001

**Title:** Start new game sessions

**Objective:** Measure the ability of the AUT to start new game sessions.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes GA)

**Initial Conditions:**

- AUT is in [[AUT STARTED](#)] mode.
- AUT options are configured to their default values.
- Any AUT screen saving option is disabled.
- AUT resolution is configured to maximum resolution available.
- AUT Music and sound effects are configured to be ON.
- No energy saving option is enabled in the AUT.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 10.6: Start two game sessions.
2. The Test System measures the time to successfully start the game session the first time (including connection to server and loading).
3. The Test System measures the time to successfully start the game a second time.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Time to load the game: The time elapsed since the user clicks play button until the AUT loads the game session and the user can start the interaction with the Host Device for playing.
- Start Game Operation: Whether the game session is successfully loaded or not.
- Time to load the second game: The time elapsed since the user clicks play button until the AUT loads the game session the second time and the user can start the interaction with the Host Device for playing.
- Start Game Operation: Whether the second game session is successfully loaded or not.



#### 4.1.8.2 Long Game session

**Identifier:** AUE/GA/002

**Title:** Long game session

**Objective:** Measure the ability of the AUT to play a game session.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes GA)

**Initial Conditions:**

- AUT is in [[AUT STARTED](#)] mode.
- AUT options are configured to their default values.
- Any AUT screen saving option is disabled.
- AUT resolution is configured to maximum resolution available.
- AUT Music and sound effects are configured to be ON.
- No energy saving option is enabled in the AUT.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 7.3: Play long gaming session. The application user flow must last at least 5 minutes.
2. The Test System measures the number of times and the duration that the game session stalls and the content resolution.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Game Cut-off: Probability that successfully started gaming session ends due to a cause other than the intentional termination by the user.
- Game Content Stall: The elapsed duration of content stalling while executing the gaming session.
- Video resolution: Used video resolution.

#### 4.1.8.3 Pause and Resume

**Identifier:** AUE/GA/003

**Title:** Pause and resume

**Objective:** Measure the ability of the AUT to pause and the resume a game session.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes GA) AND ICSA\_GAPause

**Initial Conditions:**



- AUT is in [[AUT STARTED](#)] mode.
- AUT options are configured to their default values.
- Any AUT screen saving option is disabled.
- AUT resolution is configured to maximum resolution available.
- AUT Music and sound effects are configured to be ON.
- No energy saving option is enabled in the AUT.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 10.4: Pause and resume a game session.
2. The Test System measures whether pause operation and the resume operation were successful or not during step1.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Pause Operation: Whether pause operation is successful or not.
- Resume Operation: Whether resume operation is successful or not.
- Time to load game session after resuming: The time elapsed since the user clicks resume button until the AUT user can resume the interaction with the Host Device for playing.

#### **4.1.8.4 Start saved game session**

**Identifier:** AUE/GA/004

**Title:** Start saved game session

**Objective:** Measure the ability of the AUT to start a saved game session.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes GA) AND ICSA\_GASaveGame

**Initial Conditions:**

- AUT is in [[AUT STARTED](#)] mode.
- AUT options are configured to their default values.
- Any AUT screen saving option is disabled.
- AUT resolution is configured to maximum resolution available.
- AUT Music and sound effects are configured to be ON.
- No energy saving option is enabled in the AUT.

**Steps:**



1. The Test System commands the AUT to replay the Application User Flow 10.5: Saved game session.
2. The Test System measures the time to successfully start the game when starting the saved game version (including connection to server and loading).

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Time to load the game: The time elapsed since the user clicks play button until the AUT loads the saved game session and the user can start the interaction with the Host Device for playing.
- Start Game Operation: Whether the saved game session is successfully loaded or not.



## 4.2 Device Resources Usage (RES)

### 4.2.1 Common test cases

The tests cases in this section apply to all Use Cases.

#### 4.2.1.1 Device ON

**Identifier:** RES/CO/001

**Title:** Device ON

**Objective:** Verify the Host Device resources usage when app is not installed and there is no app installed (other than default apps installed in the host device).

**Applicability:**

(ICSG\_ProductType = Application)

**Initial Conditions:**

AUT is in [[AUT NOT RUNNING](#)] mode.

**Steps:**

1. The Test System measures the Host Device use of resources during 20 minutes.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- **Average Memory usage:** Average amount of memory used during the measurement in MB.
- **Average CPU usage:** Average percentage of CPU used during the measurement.
- **Average GPU usage:** Average percentage of GPU used during the measurement.

#### 4.2.1.2 Open the App

**Identifier:** RES/CO/002

**Title:** Open the App

**Objective:** Measure the AUT usage of the Host Device resources when the AUT is started, and logged in, and then closed and started again.

**Applicability:**

(ICSG\_ProductType = Application) AND ICSA\_Login

**Initial Conditions:**

AUT is in [[AUT NOT RUNNING](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 1.1: Reopen the App.
2. The Test System measures the use of Host Device resources from initiating the App to closing and reopening it again.



**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- **App opening average Memory usage:** Average amount of memory used during the measurement in MB.
- **App opening average CPU usage:** Average percentage of CPU used during the measurement.
- **App opening average GPU usage:** Average percentage of GPU used during the measurement.

#### 4.2.1.3 Background state

**Identifier:** RES/CO/003

**Title:** Background state

**Objective:** Measure the usage of device resources of the AUT when it is in background state.

**Applicability:**

(ICSG\_ProductType = Application)

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 1.3: Login.
2. The Test Systems sets the AUT in background state.
3. The Test System performs the measurements defined below with the AUT in background state.
4. The Test Systems sets the AUT back in active state.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- **Average Memory usage:** Average amount of memory used in background mode for 20 minutes.
- **Average CPU usage:** Average percentage of CPU used in background mode for 20 minutes.

### 4.2.2 CS Content Distribution Streaming Services

#### 4.2.2.1 Non Interactive Playback

**Identifier:** RES/CS/001

**Title:** Non Interactive Playback



**Objective:** Measure the usage of device resources of the AUT when executing the feature media file playing.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes CS)

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 2.1: Play three reference media files.
2. The Test System measures the use of Host Device resources during the reproduction of the three reference videos.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- **Playback average Memory usage:** Average amount of memory used during the measurement in MB.
- **Playback average CPU usage:** Average percentage of CPU used during the measurement.
- **Playback average GPU usage:** Average percentage of GPU used during the measurement.

#### 4.2.2.2 Play and Pause

**Identifier:** RES/CS/002

**Title:** Play and Pause

**Objective:** Measure the usage of device resources of the AUT when a media file is in pause mode.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes CS) AND ICSA\_CSPause.

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 2.2: Play and pause.
2. The Test System measures the use of Host Device resources while the reproduction is in pause mode.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- **Pause average Memory usage:** Average amount of memory used during the measurement in MB.
- **Pause average CPU usage:** Average percentage of CPU used during the measurement.
- **Pause average GPU usage:** Average percentage of GPU used during the measurement.

#### 4.2.2.3 Rewind

**Identifier:** RES/CS/003

**Title:** Rewind

**Objective:** Measure the usage of device resources of the AUT when performing rewind operation while playing a media file.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes CS) AND ICESA\_CSRewind

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 2.9: Rewind.
2. The Test System measures the use of Host Device resources while the AUT is in rewind mode.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- **Rewind average Memory usage:** Average amount of memory used in MB while the reproduction is in rewind mode.
- **Rewind average CPU usage:** Average percentage of CPU used while the reproduction is in rewind mode.
- **Rewind average GPU usage:** Average percentage of GPU used while the reproduction is in rewind mode.

#### 4.2.2.4 Download content for offline playing

**Identifier:** RES/CS/004

**Title:** Download content for offline playing

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes CS) AND ICESA\_CSDownloadMedia

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 2.4: Download a media file.
2. The Test System measures the use of Host Device resources while media file is being downloaded.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- **Downloading content average Memory usage:** Average amount of memory used in MB while thereference file is being downloaded.
- **Downloading content average CPU usage:** Average percentage of CPU used while thereference file is being downloaded.
- **Downloading content average GPU usage:** Average percentage of GPU used while thereference file is being downloaded.

#### 4.2.2.5 Non Interactive Playback with screen off

**Identifier:** RES/CS/005

**Title:** Non Interactive Playback with screen off

**Objective:** Measure the usage of device resources of the AUT while executing the feature media file playing from the Content Distribution Streaming Services use case and the screen is turned off.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes CS)

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

Host Device and/or AUT may need to be configured so it can replay videos with screen off (e.g. Host device configured to send the video reproduction to an external screen)

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 2.1: Play three reference media files.
2. Five seconds after the start of step 1, the Test Systems turns the Host Device screen off and waits for 5 seconds.
3. The Test System measures the usage of device resources of the AUT while the Host Device is with the screen off and the video is being played.

**Postamble:**

- The Test System turns the Host Device screen ON.



- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- **Screen off playback average Memory usage:** Average amount of memory used during the measurement in MB.
- **Screen off playback average CPU usage:** Average percentage of CPU used during the measurement.
- **Screen off playback average GPU usage:** Average percentage of GPU used during the measurement.

#### 4.2.2.6 Fast Forward

**Identifier:** RES/CS/006

**Title:** Fast Forward

**Objective:** Measure the usage of device resources of the AUT when performing Fast Forward operation while playing a media file.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes CS) AND ICSA\_CS FastForward

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 2.10: Fast Forward.
2. The Test System measures the use of Host Device resources while the AUT is in fast forward mode.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- **Fast forward average Memory usage:** Average amount of memory used in MB while the reproduction is in fast forward mode.
- **Fast forward average CPU usage:** Average percentage of CPU used while the reproduction is in fast forward mode.
- **Fast forward average GPU usage:** Average percentage of GPU used while the reproduction is in fast forward mode.

#### 4.2.3 Live Streaming Services

##### 4.2.3.1 Play Live Video from User

**Identifier:** RES/LS/001



**Title:** Play Live Video from User

**Objective:** Measure the usage of device resources of the AUT while executing the feature live video playing from the Live Streaming Services use case.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes LS)

**Initial Conditions:**

- AUT is in [[AUT STARTED](#)] mode.
- A live video is generated as defined in section 2.6.1.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 3.1: Play a live video.
2. The Test System measures the use of Host Device resources during the reproduction of the live video streaming in step 1.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- **Live video from user average Memory usage:** Average amount of memory used during the measurement in MB.
- **Live video from user average CPU usage:** Average percentage of CPU used during the measurement.
- **Live video from user average GPU usage:** Average percentage of GPU used during the measurement.

#### 4.2.3.2 Broadcast Live Video

**Identifier:** RES/LS/002

**Title:** Broadcast Live Video to User

**Objective:** Measure the usage of device resources of the AUT when broadcasting live content.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes LS).

**Initial Conditions:**

- AUT is in [[AUT STARTED](#)] mode.
- The Host Device camera is focused on the fixed TV pattern RTVP1.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 3.2: Broadcast live video.
2. The Test System measures the use of Host Device resources during the reproduction of the live video streaming.



**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- **Live video average Memory usage:** Average amount of memory in MB used during the measurement.
- **Live video average CPU usage:** Average percentage of CPU used during the measurement.
- **Live video average GPU usage:** Average percentage of GPU used during the measurement.

### 4.2.3.3 Broadcast live video with screen off

**Identifier:** AEC/LS/003

**Title:** Broadcast live video with screen off

**Objective:** Measure the usage of device resources of the AUT while executing the feature broadcast a live video from the Live Streaming Services use case when the screen is turned off.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes LS) AND ICSA\_LSBroadcastScreenOff

**Initial Conditions:**

- AUT is in [[AUT STARTED](#)] mode.
- The Host Device camera is focused on the fixed TV pattern RTVP1.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 3.2: Broadcast live video.
2. Five seconds after the start of step 1, the Test Systems turns the Host Device screen off and waits for 5 seconds.
3. The Test System measures the use of Host Device resources after completion of step 2 and during 10 minutes.

**Postamble:**

- The Test System turns the Host Device screen on.
- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- **Screen off live video average Memory usage:** Average amount of memory used during the measurement in MB.
- **Screen off live video average CPU usage:** Average percentage of CPU used during the measurement.



- **Screen off live video average GPU usage:** Average percentage of GPU used during the measurement.

## 4.2.4 Social Networking

### 4.2.4.1 Picture Posting

**Identifier:** RES/SN/001

**Title:** Picture Posting

**Objective:** Measure the usage of device resources of the AUT while executing the feature picture posting in the Social Networking use case.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes SN) AND ICSCA\_SNPostImage

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 4.2: Post pictures.
2. The Test System measures the use of Host Device resources while the pictures are being posted.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- **Post image average Memory usage:** Average amount of memory in MB used during the measurement
- **Post image average CPU usage:** Average percentage of CPU used during the measurement.
- **Post image average GPU usage:** Average percentage of GPU used during the measurement.

### 4.2.4.2 Video Posting

**Identifier:** RES/SN/002

**Title:** Video Uploading

**Objective:** Measure the usage of device resources of the AUT while executing the feature video posting in the Social Networking use case.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes SN) AND ICSCA\_SNPostVideo

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 4.3: Post videos sequentially.
2. The Test System measures the use of Host Device resources while the videos are being posted.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- **Post video average Memory usage:** Average amount of memory in MB used during the measurement
- **Post video average CPU usage:** Average percentage of CPU used during the measurement.
- **Post video average GPU usage:** Average percentage of GPU used during the measurement.

#### 4.2.4.3 File Posting

**Identifier:** RES/SN/003

**Title:** File Posting

**Objective:** Measure the usage of device resources of the AUT while executing the feature file posting in the Social Networking use case.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes SN) AND ICSA\_SNPostFile.

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 4.6: Post three reference files separately.
2. The Test System measures the use of Host Device resources while the files are being posted.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- **Post file average Memory usage:** Average amount of memory in MB used during the measurement



- **Post file average CPU usage:** Average percentage of CPU used during the measurement.
- **Post file average GPU usage:** Average percentage of GPU used during the measurement.

#### 4.2.4.4 Show Picture

**Identifier:** RES/SN/004

**Title:** Show Picture

**Objective:** Measure the usage of device resources of the AUT while executing the feature show picture in the Social Networking use case.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes SN) AND ICOSA\_SNGetImage

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 4.8: Show three reference pictures.
2. The Test System measures the use of Host Device resources while each picture is being downloaded and shown.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- **Show picture average Memory usage:** Average amount of memory in MB used during the measurement
- **Show picture average CPU usage:** Average percentage of CPU used during the measurement.
- **Show picture average GPU usage:** Average percentage of GPU used during the measurement.

#### 4.2.4.5 Play Video

**Identifier:** RES/SN/005

**Title:** Play Video

**Objective:** Measure the usage of device resources of the AUT while executing the feature Play video in the Social Networking use case.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes SN) AND ICOSA\_SNGetVideo

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 4.9 Play three reference videos.
2. The Test System measures the use of Host Device resources while the videos are being played.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- **Play video average Memory usage:** Average amount of memory in MB used during the measurement
- **Play video average CPU usage:** Average percentage of CPU used during the measurement.
- **Play video average GPU usage:** Average percentage of GPU used during the measurement.

## 4.2.5 File Downloading

**Identifier:** RES/SN/006

**Title:** File Downloading

**Objective:** Measure the usage of device resources of the AUT while executing the feature file downloading in the Social Networking use case.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes SN) AND ICSA\_SNGetFile

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 4.12: Downloading three reference files.
2. The Test System measures the use of Host Device resources while the files are being downloaded.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- **Get file average Memory usage:** Average amount of memory in MB used during the measurement
- **Get file average CPU usage:** Average percentage of CPU used during the measurement.



- **Get file average GPU usage:** Average percentage of GPU used during the measurement.

## 4.2.6 High Speed Internet

### 4.2.6.1 Downloading files sequentially

**Identifier:** RES/HS/001

**Title:** Downloading files sequentially

**Objective:** Measure the usage of device resources of the AUT while executing the feature downloading files sequentially in the High Speed Internet use case.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes HS)

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 5.1: Download three reference files.
2. The Test System measures the use of Host Device resources while the files are being downloaded.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- **File download average Memory usage:** Average amount of memory in MB used during the measurement
- **File download average CPU usage:** Average percentage of CPU used during the measurement.
- **File download average GPU usage:** Average percentage of GPU used during the measurement.

### 4.2.6.2 Uploading files sequentially

**Identifier:** RES/HS/002

**Title:** Uploading files sequentially

**Objective:** Measure the usage of device resources of the AUT while executing the feature uploading files sequentially in the High Speed Internet use case.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes HS)

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 5.2: Upload three reference files.
2. The Test System measures the use of Host Device resources while the files are being uploaded.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- **File upload average Memory usage:** Average amount of memory in MB used during the measurement
- **File upload average CPU usage:** Average percentage of CPU used during the measurement.
- **File upload average GPU usage:** Average percentage of GPU used during the measurement.

#### 4.2.6.3 Downloading several files simultaneously

**Identifier:** RES/HS/003

**Title:** Downloading several files simultaneously

**Objective:** Measure the usage of device resources of the AUT while executing the feature downloading several files simultaneously in the High Speed Internet use case.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes HS)

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 5.3: Download several reference files simultaneously.
2. The Test System measures the use of Host Device resources while the files are being downloaded.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- **Average Memory usage:** Average amount of memory in MB used during the measurement
- **Average CPU usage:** Average percentage of CPU used during the measurement.
- **Average GPU usage:** Average percentage of GPU used during the measurement.



#### 4.2.6.4 Uploading several files simultaneously

**Identifier:** RES/HS/004

**Title:** Uploading several files simultaneously

**Objective:** Measure the usage of device resources of the AUT while executing the feature uploading several files simultaneously in the High Speed Internet use case.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes HS)

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 5.4: Upload several reference files simultaneously.
2. The Test System measures the use of Host Device resources while the files are being uploaded.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- **Average Memory usage:** Average amount of memory in MB used during the measurement
- **Average CPU usage:** Average percentage of CPU used during the measurement.
- **Average GPU usage:** Average percentage of GPU used during the measurement.

#### 4.2.6.5 Downloading a file with screen off

**Identifier:** RES/HS/005

**Title:** Downloading a file with screen off

**Objective:** Measure the usage of device resources of the AUT while executing the feature downloading a file in the High Speed Internet use case with the screen off.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes HS)

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 5.5: Download a huge file.
2. Five seconds after the start of step 1, the Test System starts measuring the use of Host Device resources while the file is being downloaded.

**Postamble:**



- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- **Average Memory usage:** Average amount of memory in MB used during the measurement
- **Average CPU usage:** Average percentage of CPU used during the measurement.
- **Average GPU usage:** Average percentage of GPU used during the measurement.

#### 4.2.6.6 Uploading a file with screen off

**Identifier:** RES/HS/006

**Title:** Uploading a file with screen off

**Objective:** Measure the usage of device resources of the AUT while executing the feature uploading a file in the High Speed Internet use case with the screen off.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes HS)

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 5.6: Upload a huge file.
2. Five seconds after the start of step 1, The Test System starts measuring the use of Host Device resources while the file is being uploaded.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- **Average Memory usage:** Average amount of memory in MB used during the measurement
- **Average CPU usage:** Average percentage of CPU used during the measurement.
- **Average GPU usage:** Average percentage of GPU used during the measurement.

#### 4.2.7 Virtual Reality

##### 4.2.7.1 Virtual Experience Loading

**Identifier:** RES/VR/001

**Title:** Virtual Experience Loading

**Objective:** Measure the usage of device resources of the AUT while loading a Virtual experience from a single point.

**Applicability:**



(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes VR)

**Initial Conditions:**

- AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 6.1 Select a virtual experience.
2. The Test System waits until the AUT recognizes the target object
3. The Test System spins up the Host Device 30 degrees, and waits until the AUT recognizes the target object.
4. The Test System spins down the Host Device 60 degrees and waits until the AUT recognizes the target object.
5. The Test System spins up the Host Device 30 degrees and spins left 60 degrees and waits until the AUT recognizes the target object.
6. The Test System spins right the Host Device 120 degrees and waits until the AUT recognizes the target object.
7. The Test System spins left 60 degrees and waits until the AUT recognizes the target object.
8. The Test System measures the use of the Host Device resources from step 1 to step 7.
9. The Test System spins back the Host Device to the original position.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- **Experience loading average Memory usage:** Average amount of memory in MB used during the measurement
- **Experience loading average CPU usage:** Average percentage of CPU used during the measurement.
- **Experience loading average GPU usage:** Average percentage of GPU used during the measurement.

#### 4.2.7.2 Virtual Scene Loading

**Identifier:** RES/VR/002

**Title:** Virtual Scene Loading

**Objective:** Measure the usage of device resources of the AUT while moving horizontally from the initial observation point under the user control.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes VR)

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 6.1 Select a virtual experience.
2. The Test System waits until the target object is recognized.
3. The Test System spins up the Host Device a random number of degrees between 10 and 50.
4. The Test System waits until the target object is recognized.
5. The Test System commands the AUT to move horizontally (walking speed, 4 km/h) during 20 seconds in order to change the scene.
6. The Test System measures use of Host Device resources during step 5 execution.
7. The Test System spins back the Host Device to the original position.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- **Scene loading average Memory usage:** Average amount of memory in MB used during the measurement
- **Scene loading average CPU usage:** Average percentage of CPU used during the measurement.
- **Scene loading average GPU usage:** Average percentage of GPU used during the measurement.



## 4.2.8 Augmented Reality

### 4.2.8.1 Load augmentation layer on a physical marker

**Identifier:** RES/AR/001

**Title:** Load augmentation layer on a physical marker

**Objective:** Measure the usage of device resources of the AUT to render a virtual layer on top of a moving physical marker.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes AR)

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 7.1 Load augmentation layer on a physical marker.
2. The Test System measures the use of Host Device resources until the App displays a virtual layer on top of the physical marker.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- **Average Memory usage:** Average amount of memory in MB used during the measurement
- **Average CPU usage:** Average percentage of CPU used during the measurement.
- **Average GPU usage:** Average percentage of GPU used during the measurement.

### 4.2.8.2 Load Augmentation Layer at Location

**Identifier:** RES/AR/002

**Title:** Load Augmentation Layer at location

**Objective:** Measure the usage of device resources of the AUT to render a virtual layer at an specific location.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes AR)

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 7.2 Load augmentation layer at an specific location.



2. The Test System measures the use of Host Device resources until the App displays a virtual layer at the location specified.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- **Average Memory usage:** Average amount of memory in MB used during the measurement
- **Average CPU usage:** Average percentage of CPU used during the measurement.
- **Average GPU usage:** Average percentage of GPU used during the measurement.

#### 4.2.8.3 Augmented reality session

**Identifier:** RES/AR/003

**Title:** Augmented reality session

**Objective:** Measure the usage of device resources of the AUT when performing an augmented reality session.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes AR)

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 7.1 Load augmentation layer on a physical marker.
2. The Test System spins (in one of the three axis) the Host Device 15 degrees, while the physical marker remains in the same position.
3. The Test Systems wait for 5 seconds
4. The Test System measures the use of Host Device resources in steps 2 and 3, and whether the AUT keeps showing the virtual layer on top of the physical marker.
5. The Test System spins in the same axis the Host Device 30 degrees in the opposite direction, while the physical marker remains in the same position.
6. The Test Systems wait for 5 seconds
7. The Test System measures the use of Host Device resources in steps 5 and 6 and whether the AUT keeps showing the virtual layer on top of the physical virtual.
8. The Test System spins the Host device back to the original position.
9. The Test System spins back to the original position.
10. The Test System repeat steps 2 to 9 in the other two axis.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- **AR session average Memory usage:** Average amount of memory in MB used during the measurement
- **AR session average CPU usage:** Average percentage of CPU used during the measurement.
- **AR session average GPU usage:** Average percentage of GPU used during the measurement.

## 4.2.9 Gaming

### 4.2.9.1 Start Game session

**Identifier:** *RES/GA/001*

**Title:** Start game session

**Objective:** Measure the usage of device resources of the AUT while starting a game session.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes GA)

**Initial Conditions:**

- AUT is in [[AUT STARTED](#)] mode.
- AUT options are configured to their default values.
- Any AUT screen saving option is disabled.
- AUT resolution is configured to maximum resolution available.
- AUT Music and sound effects are configured to be ON.
- No energy saving option is enabled in the AUT.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 10.1: Start game session.
2. The Test System measures the use of Host Device resources while the game session is being started.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).
- **Measurements:**
- **Game session start average Memory usage:** Average amount of memory in MB used during the measurement
- **Game session start average CPU usage:** Average percentage of CPU used during the measurement.
- **Game session start average GPU usage:** Average percentage of GPU used during the measurement.





#### 4.2.9.2 Short Game session

**Identifier:** RES/GA/002

**Title:** Short Game session

**Objective:** Measure the usage of device resources of the AUT while playing a short game session.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes LS)

**Initial Conditions:**

- AUT is in [[AUT STARTED](#)] mode.
- AUT options are configured to their default values.
- Any AUT screen saving option is disabled.
- AUT resolution is configured to maximum resolution available.
- AUT Music and sound effects are configured to be ON.
- No energy saving option is enabled in the AUT.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 7.2: Short game session.
2. The Test System measures the use of Host Device resources while the game session is being played.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- **Short Game session average Memory usage:** Average amount of memory in MB used during the measurement
- **Short Game session average CPU usage:** Average percentage of CPU used during the measurement.
- **Short Game session average GPU usage:** Average percentage of GPU used during the measurement.

#### 4.2.9.3 Long Game session

**Identifier:** RES/GA/003

**Title:** Long Game session

**Objective:** Measure the usage of device resources of the AUT while playing a long game session.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes LS)

**Initial Conditions:**



- AUT is in [[AUT STARTED](#)] mode.
- AUT options are configured to their default values.
- Any AUT screen saving option is disabled.
- AUT resolution is configured to maximum resolution available.
- AUT Music and sound effects are configured to be ON.
- No energy saving option is enabled in the AUT.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 7.3: Long game session.
2. The Test System measures the use of Host Device resources while the game session is being played.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- **Long Game session average Memory usage:** Average amount of memory in MB used during the measurement
- **Long Game session average CPU usage:** Average percentage of CPU used during the measurement.
- **Long Game session average GPU usage:** Average percentage of GPU used during the measurement.

## 4.3 Energy consumption (AEC)

### 4.3.1 Common

The tests cases in this section apply to all Use Cases.

#### 4.3.1.1 Device ON

**Identifier:** AEC/CO/001

**Title:** Device ON

**Objective:** Measure the energy that is consumed by the Host Device when the AUT is not running.

**Applicability:**

(ICSG\_ProductType = Application)

**Initial Conditions:**

AUT is in [[AUT NOT RUNNING](#)] mode.

**Steps:**



2. The Test System measures the current consumption during 20 minutes with the AUT not running and the device switched on.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Current consumption: Record current samples during the measurement time and calculate the following values:
  - Average current consumption.
  - Standard deviation

#### 4.3.1.2 Open the app

**Identifier:** AEC/CO/002

**Title:** Login and log out

**Objective:** Measure the energy that is consumed by the Host Device when the AUT is started, and logged in, and then closed and started again.

**Applicability:**

(ICSG\_ProductType = Application) AND ICESA\_Login

**Initial Conditions:**

AUT is in [\[AUT NOT RUNNING\]](#) mode.

**Steps:**

3. The Test System commands the AUT to replay the Application User Flow 1.1: Reopen the App.
4. The Test System measures the current consumption from initiating the App to closing it and reopening again.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Current consumption: Record current samples during the measurement time and calculate the following values:
  - Average current consumption.
  - Standard deviation

#### 4.3.1.3 Background state

**Identifier:** AEC/CO/003

**Title:** Background state

**Objective:** Measure the energy that is consumed by the AUT when it is in background state.

**Applicability:**

(ICSG\_ProductType = Application)

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

5. The Test System commands the AUT to replay the Application User Flow 1.1: Reopen the App.
6. The Test Systems sets the AUT in background state.
7. The Test System performs the measurements defined below during 20 minutes with the AUT in background state.
8. The Test Systems sets the AUT back in active state.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Current consumption: Record current samples during the measurement time and calculate the following values:
  - Average current consumption.
  - Standard deviation

### 4.3.2 CS Content Distribution Streaming Services

Note: The following test cases are defined to prevent any device-side content caching which the AUT could implement. However, if the AUT Backend Service also implements a server-side caching (e.g., storing the current playback time for an user), preventing that effect is left to the implementation of the test case.

#### 4.3.2.1 Non Interactive Playback

**Identifier:** AEC/CS/001

**Title:** Non Interactive Playback

**Objective:** Measure the energy that is consumed by an AUT while executing the feature media file playing from the Content Distribution Streaming Services use case.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes CS)

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

3. The Test System commands the AUT to replay the Application User Flow 2.1: Play three reference media files.



4. The Test System measures the current consumed during the reproduction of the three reference videos.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Current consumption: Record current samples during the measurement time and calculate the following values:
  - Average current consumption.
  - Standard deviation

#### **4.3.2.2 Play and Pause**

**Identifier:** AEC/CS/002

**Title:** Play and Pause

**Objective:** Measure the energy that is consumed by an AUT when a media file is in pause mode.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes CS) AND ICSCA\_CSPause

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 2.2: Play and pause.
2. The Test System measures the current consumed during the period the reference video is in Pause mode.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Current consumption: Record current samples during the measurement time and calculate the following values:
  - Average current consumption.
  - Standard deviation

#### **4.3.3 Rewind**

**Identifier:** AEC/CS/003

**Title:** Rewind



**Objective:** Measure the energy that is consumed by an AUT when performing rewind operation while playing a media file.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes CS) AND ICOSA\_CSRewind

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 2.9: Rewind.
2. The Test System measures the current consumed while the reproduction of the reference video is in rewind mode.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Current consumption: Record current samples during the measurement time and calculate the following values:
  - Average current consumption.
  - Standard deviation

#### 4.3.4 Download content for offline playing

**Identifier:** AEC/CS/004

**Title:** Download content for offline playing

**Objective:** Measure the energy that is consumed by an AUT when downloading a media file for offline playing.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes CS) AND ICOSA\_CSDownloadMedia

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 2.4: Download a media file.
2. The Test System measures the current consumed while the media file is being downloaded.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**



- Current consumption: Record current samples during the measurement time and calculate the following values:
  - Average current consumption.
  - Standard deviation

#### 4.3.4.1 Non Interactive Playback with screen off

**Identifier:** AEC/CS/005

**Title:** Non Interactive Playback with screen off

**Objective:** Measure the energy that is consumed by an AUT while executing the feature media file playing from the Content Distribution Streaming Services use case and the screen is turned off.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes CS)

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

Host Device and/or AUT may need to be configured so it can replay videos with screen off (e.g. Host device configured to send the video reproduction to an external screen)

**Steps:**

4. The Test System commands the AUT to replay the Application User Flow 2.1: Play three reference media files.
5. Five seconds after the start of step 1, the Test Systems turns the Host Device screen off and waits for 5 seconds.
6. The Test System measures the current consumed while the Host Device is with the screen off and the video is being played.

**Postamble:**

- The Test System turns the Host Device screen ON.
- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Current consumption: Record current samples during the measurement time and calculate the following values:
  - Average current consumption.
  - Standard deviation

#### 4.3.4.2 Fast Forward

**Identifier:** AEC/CS/006

**Title:** Fast Forward



**Objective:** Measure the energy that is consumed by an AUT when performing fast forward operation while playing a media file.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes CS) AND ICSA\_CSFastForward

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 2.10: Fast Forward.
2. The Test System measures the current consumed while the reproduction of the reference video is in Fast Forward mode.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Current consumption: Record current samples during the measurement time and calculate the following values:
  - Average current consumption.
  - Standard deviation

### 4.3.5 Live Streaming Services

#### 4.3.5.1 Play Live Video from User

**Identifier:** AEC/LS/001

**Title:** Play Live Video from User

**Objective:** Measure the energy that is consumed by an AUT while executing the feature live video playing from the Live Streaming Services use case.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes LS)

**Initial Conditions:**

- AUT is in [[AUT STARTED](#)] mode.
- A live video is generated as defined in section 2.6.1.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 3.1: Play a live video.
2. The Test System measures the current consumed during the reproduction of the live video streaming.

**Postamble:**



- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Current consumption: Record current samples during the measurement time and calculate the following values:
  - Average current consumption.
  - Standard deviation.

#### 4.3.5.2 Broadcast Live Video

**Identifier:** AEC/LS/002

**Title:** Broadcast Live Video to User

**Objective:** Measure the energy that is consumed by an AUT when broadcasting live content.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes LS)

**Initial Conditions:**

- AUT is in [[AUT STARTED](#)] mode.
- The test case configuration is as defined in section 2.8.1 (Figure 3), with the Host Device camera focused on the fixed TV pattern RTVP1.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 3.2: Broadcast live video.
2. The Test System measures the current consumed during the reproduction of the live video streaming.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Current consumption: Record current samples during the measurement time and calculate the following values:
  - Average current consumption.
  - Standard deviation.

#### 4.3.5.3 Broadcast live video with screen off

**Identifier:** AEC/LS/003

**Title:** Broadcast live video with screen off

**Objective:** Measure the energy that is consumed by an AUT while executing the feature broadcast a live video from the Live Streaming Services use case when the screen is turned off.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes LS) AND ICSA\_LSBroadcastScreenOff

**Initial Conditions:**

- AUT is in [[AUT STARTED](#)] mode.
- The test case configuration is as defined in section 2.8.1 (Figure 3), with the Host Device camera focused on the fixed TV pattern RTVP1.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 3.2: Broadcast live video.
2. Wait for 10 seconds.
3. The Test Systems turns the Host Device screen off and waits for 5 seconds.
4. The Test System measures the current consumed after completion of step 3 during 10 minutes.

**Postamble:**

- The Test System turns the Host Device screen ON.
- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Current consumption: Record current samples during the measurement time and calculate the following values:
  - Average current consumption.
  - Standard deviation

### 4.3.6 Social Networking

#### 4.3.6.1 Picture Posting

**Identifier:** AEC/SN/001

**Title:** Picture Posting

**Objective:** Measure the energy that is consumed by an AUT while executing the feature picture posting in the Social Networking use case.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes SN) AND ICSA\_SNPostImage

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 4.2: Post pictures.



2. The Test System measures the current consumed while the pictures are being posted.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Current consumption: Record current samples during the measurement time and calculate the following values:
  - Average current consumption.
  - Standard deviation.

#### 4.3.6.2 Video Posting

**Identifier:** AEC/SN/002

**Title:** Video Uploading

**Objective:** Measure the energy that is consumed by an AUT while executing the feature video posting in the Social Networking use case.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes SN) AND ICSCA\_SNPPostVideo

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 4.3: Post videos sequentially.
2. The Test System measures the current consumed while the videos are being posted.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Current consumption: Record current samples during the measurement time and calculate the following values:
  - Average current consumption.
  - Standard deviation.

#### 4.3.6.3 File Posting

**Identifier:** AEC/SN/003

**Title:** File Posting

**Objective:** Measure the energy that is consumed by an AUT while executing the feature file posting in the Social Networking use case.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes SN) AND ICSA\_SNPostFile.

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 4.6: Post three reference files separately.
2. The Test System measures the current consumed while the files are being posted.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Current consumption: Record current samples during the measurement time and calculate the following values:
  - Average current consumption.
  - Standard deviation.

#### 4.3.6.4 Show Picture

**Identifier:** AEC/SN/004

**Title:** Show Picture

**Objective:** Measure the energy that is consumed by an AUT while executing the feature picture downloading in the Social Networking use case.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes SN) AND ICSA\_SNGetImage

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 4.8: Get three reference pictures.
2. The Test System measures the current consumed while the pictures are being downloaded and until the pictures are completely displayed at their final resolution.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Current consumption: Record current samples during the measurement time and calculate the following values:



- Average current consumption.
- Standard deviation.

#### 4.3.6.5 Play Video

**Identifier:** AEC/SN/005

**Title:** Play Video

**Objective:** Measure the energy that is consumed by an AUT while executing the feature play video in the Social Networking use case.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes SN) AND ICSA\_SNGetVideo

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 4.9 Play three reference videos.
2. The Test System measures the current consumed while the videos are being played.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Current consumption: Record current samples during the measurement time and calculate the following values:
  - Average current consumption.
  - Standard deviation.

#### 4.3.6.6 File Downloading

**Identifier:** AEC/SN/006

**Title:** File Downloading

**Objective:** Measure the energy that is consumed by an AUT while executing the feature file downloading in the Social Networking use case.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes SN) AND ICSA\_SNGetFile

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**



1. The Test System commands the AUT to replay the Application User Flow 4.12: Downloading three reference files.
2. The Test System measures the current consumed while the files are being downloaded.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Current consumption: Record current samples during the measurement time and calculate the following values:
  - Average current consumption.
  - Standard deviation.

### 4.3.7 High Speed Internet

#### 4.3.7.1 Downloading files sequentially

**Identifier:** AEC/ HS/001

**Title:** Downloading files sequentially

**Objective:** Measure the energy that is consumed by an AUT while executing the feature downloading files sequentially in the High Speed Internet use case.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes HS)

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 5.1: Download three reference files.
2. The Test System measures the current consumed while the files are being downloaded.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Current consumption: Record current samples during the measurement time and calculate the following values:
  - Average current consumption.
  - Standard deviation.

#### 4.3.7.2 Uploading files sequentially

**Identifier:** AEC/ HS/002

**Title:** Uploading files sequentially



**Objective:** Measure the energy that is consumed by an AUT while executing the feature uploading files sequentially in the High Speed Internet use case.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes HS)

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

3. The Test System commands the AUT to replay the Application User Flow 5.2: Upload three reference files.
4. The Test System measures the current consumed while the files are being uploaded.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Current consumption: Record current samples during the measurement time and calculate the following values:
  - Average current consumption.
  - Standard deviation.

#### 4.3.7.3 Downloading several files simultaneously

**Identifier:** AEC/HS/003

**Title:** Downloading several files simultaneously

**Objective:** Measure the energy that is consumed by an AUT while executing the feature downloading several files simultaneously in the High Speed Internet use case.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes HS)

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 5.3: Download several reference files simultaneously.
2. The Test System measures the current consumed while the files are being downloaded.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Current consumption: Record current samples during the measurement time and calculate the following values:



- Average current consumption.
- Standard deviation.

#### 4.3.7.4 Uploading several files simultaneously

**Identifier:** AEC/HS/004

**Title:** Uploading several files simultaneously

**Objective:** Measure the energy that is consumed by an AUT while executing the feature uploading several files simultaneously in the High Speed Internet use case.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes HS)

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

3. The Test System commands the AUT to replay the Application User Flow 5.4: Upload several reference files simultaneously.
4. The Test System measures the current consumed while the files are being uploaded.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Current consumption: Record current samples during the measurement time and calculate the following values:
  - Average current consumption.
  - Standard deviation.

#### 4.3.7.5 Downloading a file with screen off

**Identifier:** AEC/HS/005

**Title:** Downloading a file with screen off

**Objective:** Measure the energy that is consumed by an AUT while executing the feature downloading a file in the High Speed Internet use case with the screen off.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes HS)

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 5.5: Download a huge file.



2. Five seconds after the start of step 1, The Test System starts measuring the current consumed while the file is being downloaded.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Current consumption: Record current samples during the measurement time and calculate the following values:
  - Average current consumption.
  - Standard deviation.

#### **4.3.7.6 Uploading a file with screen off**

**Identifier:** AEC/ HS/006

**Title:** Uploading a file with screen off

**Objective:** Measure the energy that is consumed by an AUT while executing the feature uploading a file in the High Speed Internet use case with the screen off.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes HS)

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 5.6: Download a huge file.
2. Five seconds after the start of step 1, The Test System start measuring the current consumed while the file is being uploaded.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Current consumption: Record current samples during the measurement time and calculate the following values:
  - Average current consumption.
  - Standard deviation.

### **4.3.8 Virtual Reality**

#### **4.3.8.1 Virtual Experience Loading**

**Identifier:** AEC/VR/001

**Title:** Virtual Experience Loading



**Objective:** Measure the energy that is consumed by an AUT while loading a Virtual experience from a single point.

**Applicability:**

(ICSG\_ProductType = Mobile device) AND (ICSG\_UseCases includes VR)

**Initial Conditions:**

- AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 6.1 Select a virtual experience.
2. The Test System waits until the AUT recognizes the target object
3. The Test System spins up the Host Device 30 degrees, and waits until the AUT recognizes the target object.
4. The Test System spins down the Host Device 60 degrees and waits until the AUT recognizes the target object.
5. The Test System spins up the Host Device 30 degrees and spins left 60 degrees and waits until the AUT recognizes the target object.
6. The Test System spins right the Host Device 120 degrees and waits until the AUT recognizes the target object.
7. The Test System spins left 60 degrees and waits until the AUT recognizes the target object.
8. The Test System measures the current consumed from step 1 to step 7.
9. The Test System spins back the Host Device to the original position.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Current consumption: Record current samples during the measurement time and calculate the following values:
  - Average current consumption.
  - Standard deviation.
- Time to load the virtual experience.

#### 4.3.8.2 Virtual Scene Loading

**Identifier:** AEC/VR/002

**Title:** Virtual Scene Loading

**Objective:** Measure the energy that is consumed by an AUT while moving horizontally from the initial observation point under the user control.

**Applicability:**



(ICSG\_ProductType = Mobile device) AND (ICSG\_UseCases includes VR)

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 6.1 Select a virtual experience.
2. The Test System waits until the target object is recognized.
3. The Test System spins up the Host Device a random number of degrees between 10 and 50.
4. The Test System waits until the target object is recognized.
5. The Test System commands the AUT to move horizontally (walking speed, 4 km/h) during 20 seconds in order to change the scene.
6. The Test System measures the current consumed during step 5 execution.
7. The Test System spins back the Host Device to the original position.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Current consumption: Record current samples during the measurement time and calculate the following values:
  - Average current consumption.
  - Standard deviation.

### 4.3.9 Augmented Reality

#### 4.3.9.1 Load augmentation layer on a physical marker

**Identifier:** AEC/AR/001

**Title:** Load augmentation layer on a physical marker

**Objective:** Measure the energy that is consumed by an AUT to render a virtual layer on top of a moving physical marker.

**Applicability:**

(ICSG\_ProductType = Mobile device) AND (ICSG\_UseCases includes AR)

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 7.1 Load augmentation layer on a physical marker.



2. The Test System measures the current consumed until the App displays a virtual layer on top of the physical marker.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Current consumption: Record current samples during the measurement time and calculate the following values:
  - Average current consumption.
  - Standard deviation.

#### **4.3.9.2 Load Augmentation Layer at Location**

**Identifier:** AEC/AR/002

**Title:** Load Augmentation Layer at location

**Objective:** Measure the energy that is consumed by an AUT to render a virtual layer at an specific location.

**Applicability:**

(ICSG\_ProductType = Mobile device) AND (ICSG\_UseCases includes AR)

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 7.2 Load augmentation layer at an specific location.
2. The Test System measures the current consumed until the App displays a virtual layer at the location specified.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Current consumption: Record current samples during the measurement time and calculate the following values:
  - Average current consumption.
  - Standard deviation.

#### **4.3.9.3 Augmented reality session**

**Identifier:** AEC/AR/003

**Title:** Augmented reality session

**Objective:** Measure the energy that is consumed by an AUT during an augmented reality session.

**Applicability:**

(ICSG\_ProductType = Mobile device) AND (ICSG\_UseCases includes AR)

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 7.1 Load augmentation layer on a physical marker.
2. The Test System spins (in one of the three axis) the Host Device 15 degrees, while the physical marker remains in the same position.
3. The Test Systems wait for 5 seconds
4. The Test System measures the current consumption in steps 2 and 3, and whether the AUT keeps showing the virtual layer on top of the physical marker.
5. The Test System spins in the same axis the Host Device 30 degrees in the opposite direction, while the physical marker remains in the same position.
6. The Test Systems wait for 5 seconds
7. The Test System measures the current consumption in steps 5 and 6 and whether the AUT keeps showing the virtual layer on top of the physical virtual.
8. The Test System spins the Host device back to the original position.
9. The Test System spins back to the original position.
10. The Test System repeat steps 2 to 9 in the other two axis.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Current consumption: Record current samples during the measurement time and calculate the following values:
  - Average current consumption.
  - Standard deviation.

### 4.3.10 Gaming

#### 4.3.10.1 Start Game session

**Identifier:** AEC/GA/001

**Title:** Start game session

**Objective:** Measure the energy that is consumed by an AUT while starting a game session.

**Applicability:**

(ICSG\_ProductType = Mobile device) AND (ICSG\_UseCases includes GA)

**Initial Conditions:**



- AUT is in [[AUT STARTED](#)] mode.
- AUT options are configured to their default values.
- Any AUT screen saving option is disabled.
- AUT resolution is configured to maximum resolution available.
- AUT Music and sound effects are configured to be ON.
- No energy saving option is enabled in the AUT.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 10.1: Start game session.
2. The Test System measures the current consumed while the game session is being started.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Current consumption: Record current samples during the measurement time and calculate the following values:
  - Average current consumption.
  - Standard deviation.

#### **4.3.10.2 Short Game session**

**Identifier:** AEC/GA/002

**Title:** Short Game session

**Objective:** Measure the energy that is consumed by an AUT while playing a short game session.

**Applicability:**

(ICSG\_ProductType = Mobile device) AND (ICSG\_UseCases includes LS)

**Initial Conditions:**

- AUT is in [[AUT STARTED](#)] mode.
- AUT options are configured to their default values.
- Any AUT screen saving option is disabled.
- AUT resolution is configured to maximum resolution available.
- AUT Music and sound effects are configured to be ON.
- No energy saving option is enabled in the AUT.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 7.2: Short game session.



2. The Test System measures the current consumed while the game session is being played.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Current consumption: Record current samples during the measurement time and calculate the following values:
  - Average current consumption.
  - Standard deviation.

### **4.3.10.3 Long Game session**

**Identifier:** AEC/GA/003

**Title:** Long Game session

**Objective:** Measure the energy that is consumed by an AUT while playing a long game session.

**Applicability:**

(ICSG\_ProductType = Mobile device) AND (ICSG\_UseCases includes LS)

**Initial Conditions:**

- AUT is in [[AUT STARTED](#)] mode.
- AUT options are configured to their default values.
- Any AUT screen saving option is disabled.
- AUT resolution is configured to maximum resolution available.
- AUT Music and sound effects are configured to be ON.
- No energy saving option is enabled in the AUT.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 7.3: Long game session.
2. The Test System measures the current consumed while the game session is being played.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Current consumption: Record current samples during the measurement time and calculate the following values:
  - Average current consumption.
  - Standard deviation.



## 4.4 Reliability (REL)

### 4.4.1 Common Services

The tests cases in this section apply to all Use Cases.

#### 4.4.1.1 Open the App

**Identifier:** REL/CO/001

**Title:** Open the App

**Objective:** Measure the reliability KPIs of the AUT when performing the login and logout actions.

**Applicability:**

(ICSG\_ProductType = Application) AND ICSA\_Login

**Initial Conditions:**

AUT is in [[AUT-NOT-RUNNING](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 1.1: Reopen the app.
2. The Test System measures the time from initiating the App to starting using the App when login is required and when login is not required.
3. The Test System measures whether the AUT has been unintentionally interrupted or not.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Open Access Time: The time elapsed from initiating the AUT when login is required to starting using the App.
- Re-open Access Time: The time elapsed from initiating the AUT when login is not required to starting using the App.
- Access Operation: Access the application when user intends to use the application to close it.
- Application Cut-Off: Probability that the AUT is interrupted without being done intentionally by the user.

#### 4.4.1.2 Menu Navigation

**Identifier:** REL/CO/002

**Title:** Menu Navigation

**Objective:** Measure the reliability KPIs of the AUT when the user navigates throughout the AUT menu tree.

**Applicability:**



(ICSG\_ProductType = Application) AND ICSA\_Login

**Initial Conditions:**

AUT is in [[AUT-NOT-RUNNING](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 1.2: Navigate menu
2. The Test System measures the time from initiating the App to starting using the App, and whether the AUT could be used or not (as would be intended by a user).
3. The Test System measures whether the AUT has been unintentionally interrupted or not.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Access Time: The time elapsed from initiating the AUT to starting using the App.
- Access Operation: Access the application when user intends to use the application.
- Application Cut-Off: Probability that the AUT is interrupted without being done intentionally by the user.

#### 4.4.2 CS Content Distribution Streaming Services

Note: The following test cases are defined to prevent any device-side content caching which the AUT could implement. However, if the AUT Backend Service also implements a server-side caching (e.g., storing the current playback time for a user), preventing that effect is left to the implementation of the test case.

##### 4.4.2.1 Non Interactive Playback

**Identifier:** REL/CS/001

**Title:** Non Interactive Playback

**Objective:** Measure the reliability KPIs of the AUT when executing the feature media file playing from the Content Distribution Streaming Services use case.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes CS) AND ICSA\_CSPlay

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 2.1: Play three reference media files.
2. The Test System measures the initial buffering, the number and duration of re-buffering occurrences and the video resolution.

**Postamble:**



- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Time to load first media frame: The time elapsed since the user clicks play button until the media reproduction starts.
- Playback Cut-off: Probability that successfully started stream reproduction is ended by a cause other than the intentional termination by the user.
- Content Stall (s): The elapsed duration of content stalls while playing the content.
- Video resolution: Used video resolution.

#### 4.4.2.2 Play and Pause

**Identifier:** REL/CS/002

**Title:** Play and Pause

**Objective:** Measure the reliability KPIs of the AUT when executing the feature pause and resume a media file.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes CS) AND ICSA\_CSPause

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 2.2: Play and Pause.
2. The Test System measures whether pause operation was successful or not.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Playback Cut-off: Probability that successfully started stream reproduction is ended by a cause other than the intentional termination by the user.
- Pause Operation: Whether pause operation is successful or not.
- Time to load first media frame (s) after resuming: The time elapsed since the user clicks resume button until the media reproduction starts.

#### 4.4.2.3 Stop and Replay

**Identifier:** REL/CS/003

**Title:** Stop and replay

**Objective:** Measure the reliability KPIs of the AUT when executing the feature stop and re-play a media file.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes CS)

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 2.6: Stop and Replay.
2. The Test System measures whether stop re-play operations were successful or not.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Time to load first media frame: The time elapsed since the user clicks play button until the media reproduction starts.
- Playback Cut-off: Probability that successfully started stream reproduction is ended by a cause other than the intentional termination by the user.
- Stop Operation: Whether stop operation is successful or not.

#### 4.4.2.4 Search and Seek

**Identifier:** REL/CS/004

**Title:** Media file Seek

**Objective:** Measure the reliability KPIs of the AUT when executing the feature search a media file and seek at any time in the media file.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes CS) AND ICSA\_CSSearchSeek

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 2.7: Search and Seek.
2. The Test System measures the search time and the time to load the first media frame after the seek operation.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Search Time: The time elapsed since the user clicks search button until the first search result is shown.



- Playback Cut-off: Probability that successfully started stream reproduction is ended by a cause other than the intentional termination by the user.
- Time to load first frame: The time elapsed since the user clicks play button until reproduction resumes after seek operation.
- Search Operation: Whether the search was successful or not

#### 4.4.2.5 Rewind

**Identifier:** REL/CS/005

**Title:** Rewind

**Objective:** Measure the reliability KPIs of the AUT when executing the rewind and fast forward operations while playing a media file.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes CS) AND ICSA\_CSRewind

**Initial Conditions:**

AUT is in [\[AUT STARTED\]](#) mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 2.9: Rewind.
2. The Test System measures the time to load the first media frame after the rewind operation.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Playback cut-off: Probability that successfully started stream reproduction is ended by a cause other than the intentional termination by the user.
- Time to load first media frame: The average of the time elapsed since the user clicks play button until reproduction resumes after rewind operation.
- Rewind operation: Whether rewind operation is successful or not.

#### 4.4.2.6 Playlist Skip Forward and Backward

**Identifier:** REL/CS/006

**Title:** Playlist Skip Forward and Backward

**Objective:** Measure the reliability KPIs of the AUT when executing the features skip forward and backward through a playlist while playing a media file.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes CS) AND ICSA\_CSSkipForward AND ICSA\_CSSkipBackward

**Initial Conditions:**



AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 2.8: Skip Forward and Backward.
2. The Test System measures the time to load the first media frame after the first skip backward operation.
3. The Test System measures the time to load the first media frame after the first skip forward operation.
4. The Test System measures the time to load the first media frame after the second skip backward operation.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Video Playback cut-off: Probability that successfully started stream reproduction is ended by a cause other than the intentional termination by the user.
- Time to load first media frame: The time elapsed since the user clicks play button until reproduction resumes after rewind and fast forward operations.
- Skip Forwards Operation: Measures whether the skip forwards is successful
- Skip Backwards Operation: Measures whether the skip backwards is successful

#### **4.4.2.7 Download content for offline playing**

**Identifier:** REL/CS/007

**Title:** Download content for offline playing

**Objective:** Measure the reliability KPIs of the AUT when executing the feature download a media file for offline playing.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes CS) AND ICSA\_CSDownloadMedia

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 2.4: Download a media file.
2. The Test System measures the time to download load the media file.
3. The Test System commands the AUT to delete the media file.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Media Download Operation: Whether the download operation is successful or not.
- File Downloading Time: The time elapsed since the user clicks download button until the media reproduction is ready to be started.

**4.4.2.8 Fast Forward**

**Identifier:** REL/CS/008

**Title:** Fast Forward

**Objective:** Measure the reliability KPIs of the AUT when executing the rewind and fast forward operations while playing a media file.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes CS) AND ICSA\_CSFastForward

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 2.10: Fast Forward.
2. The Test System measures the time to load the first media frame after the fast forward operation.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Playback cut-off: Probability that successfully started stream reproduction is ended by a cause other than the intentional termination by the user.
- Time to load first media frame: The average of the time elapsed since the user clicks play button until reproduction resumes after fast forward operation.
- Fast forward operation: Whether fast forward operation is successful or not.

**4.4.3 Live Streaming Services****4.4.3.1 Play Live Video from User**

**Identifier:** REL/LS/001

**Title:** Play Live Video from User

**Objective:** Measure the reliability KPIs of the AUT when executing the feature live video playing from the Live Streaming Services use case.

**Applicability:**



(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes LS)

**Initial Conditions:**

- AUT is in [[AUT STARTED](#)] mode.
- An Internet connected PC transmits live video as defined in section 2.6.1; **Error! No se encuentra el origen de la referencia..**

**Steps:**

3. The Test System commands the AUT to replay the Application User Flow 3.1: Playing live video from a known user.
4. The Test System measures the initial buffer, the number of stall occurrences and the video resolution.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Time to load first picture: The time elapsed since the user clicks play button until AUT starts playing the selected broadcast source.
- Broadcasting Reproduction Cut-off: Probability that successfully started broadcast reproduction is ended by a cause other than the intentional termination by the AUT user.
- Content Stall (s): The elapsed duration of content stalls while playing the selected broadcast source.
- Video resolution: Used video resolution.

#### **4.4.3.2 Broadcast Live Video**

**Identifier:** REL/LS/002

**Title:** Broadcast Live Video to User

**Objective:** Measure the reliability KPIs of the AUT when broadcasting live content.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes LS)

**Initial Conditions:**

- AUT is in [[AUT STARTED](#)] mode.
- The Host Device camera is focused on a TV displaying reference video RTVP2.

**Steps:**

1. The Test Systems starts playing RTVP2 on the TV.
2. The Test System commands the AUT to replay the Application User Flow 3.2: Broadcast live video.
3. The Test System receives the broadcasted video from the AUT and measures the number of stall occurrences and the video resolution.

**Postamble:**



- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Time to load receive first picture: The time elapsed since the user clicks broadcast button until the Test System starts playing the AUT broadcast video.
- Broadcasting Reproduction Cut-off: Probability that successfully started broadcast reproduction is ended by a cause other than the intentional termination by the AUT user.
- Content Stall (s): The elapsed duration of content stalls while broadcasting the content.
- Video resolution: Used video resolution.

#### 4.4.4 Social Networking

##### 4.4.4.1 Picture Posting

**Identifier:** REL/SN/001

**Title:** Picture Posting

**Objective:** Measure the reliability KPIs of the AUT when executing the feature picture uploading in the Social Networking use case.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes SN) AND ICSA\_SNPostImage

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 4.2: Uploading three reference pictures separately.
2. The Test System measures the time to successfully upload each of the pictures, and whether each upload was successful or not.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Picture Upload Operation: Whether the upload operation is successful or not.
- Picture Upload Time: The time elapsed since the user clicks upload button until the picture is stored in the AUT Backend Service.

##### 4.4.4.2 Video Posting

**Identifier:** REL/SN/002

**Title:** Video Posting



**Objective:** Measure the reliability KPIs of the AUT when executing the feature video uploading in the Social Networking use case.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes SN) AND ICSA\_SNPostVideo

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 4.3: Post videos sequentially.
2. The Test System measures the time to successfully upload each of the video clips, and whether each upload was successful or not.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Video Upload Operation: Whether the upload operation is successful or not.
- Video Upload Time: The time elapsed since the user clicks upload button until the video clip is stored in the AUT Backend Service.

#### 4.4.4.3 Comment Posting

**Identifier:** REL/SN/003

**Title:** Comment Uploading

**Objective:** Measure the reliability KPIs of the AUT when executing the feature comment uploading in the Social Networking use case.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes SN) AND ICSA\_SNPostComment

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 4:1: Uploading three reference comments separately.
2. The Test System measures the time to successfully upload each of the comment, and whether each upload was successful or not.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**



- Comment Upload Operation: Whether the upload operation is successful or not.
- Comment Upload Time: The time elapsed since the user clicks upload button until the comment is stored in the AUT Backend Service.

#### 4.4.4.4 File Posting

**Identifier:** REL/SN/004

**Title:** File Uploading

**Objective:** Measure the reliability KPIs of the AUT when executing the feature file posting in the Social Networking use case.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes SN) AND ICOSA\_SNPostFile.

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 4.6: Post three reference files separately.
2. The Test System measures the time to successfully upload each of the files, and whether each upload was successful or not.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- File Upload Operation: Whether the upload operation is successful or not.
- File Upload Time: The time elapsed since the user clicks upload button until the file is stored in the AUT Backend Service.

#### 4.4.4.5 Show Picture

**Identifier:** REL/SN/005

**Title:** Show picture

**Objective:** Measure the reliability KPIs of the AUT when executing the feature show picture in the Social Networking use case.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes SN) AND ICOSA\_SNGetImage

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**



1. The Test System commands the AUT to replay the Application User Flow 4.8: Show three reference pictures.
2. The Test System measures the time to successfully download and show each of the pictures, and whether each download was successful or not.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Show Picture Operation: Whether the download operation is successful or not.
- Show Picture Time: The time elapsed since the user clicks download button until the picture is shown.

#### **4.4.4.6 Play Video**

**Identifier:** REL/SN/006

**Title:** Play Video

**Objective:** Measure the reliability KPIs of the AUT when executing the feature play video in the Social Networking use case.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes SN) AND ICSA\_SNGetVideo

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 4.9 Play three reference videos.
2. The Test System measures the initial buffer, the number of re-buffering and the content resolution.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Time to load first media frame: The time elapsed since the user clicks play button until the media reproduction starts.
- Playback Cut-off Ratio: Probability that successfully started stream reproduction is ended by a cause other than the intentional termination by the user.
- Content Stalling: The elapsed duration of content stalling while playing the content.
- Video resolution: Used video resolution.



#### 4.4.5 File Downloading

**Identifier:** REL/SN/007

**Title:** File Downloading

**Objective:** Measure the reliability KPIs of the AUT when executing the feature file downloading in the Social Networking use case.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes SN) AND ICSA\_SNGetFile

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 4.12: Downloading three reference files.
2. The Test System measures the time to successfully download each of the files, and whether each download was successful or not.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- File Download Operation: Whether the download operation is successful or not.
- File Download Time: The time elapsed since the user clicks download button until the file is stored in the Host Device.

##### 4.4.5.1 Play Live Video from User

**Identifier:** REL/SN/008

**Title:** Play Live Video from User

**Objective:** Measure the reliability KPIs of the AUT when playing a live video from a user.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes SN)

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 4.10: Play live video from a user.
2. The Test System measures the initial buffer, the number of re-buffering and the content resolution.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**



- Time to load first media frame: The time elapsed since the user clicks play button until the media reproduction starts.
- Playback Cut-off: Probability that successfully started stream reproduction is ended by a cause other than the intentional termination by the user.
- Content Stalling: The elapsed duration of content stalling while playing the content.
- Video resolution: Used video resolution.

#### 4.4.5.2 Search Object

**Identifier:** REL/SN/009

**Title:** Search Object

**Objective:** Measure the reliability KPIs of the AUT when executing the feature search the most relevant item for which the AUT has been mainly designed (e.g., contacts, flights, hotels, etc.).

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes SN)

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 4.13: Search object.
2. The Test System measures the search time.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Search Time: The time elapsed since the user clicks search button until the first search result is shown.
- Search Operation: Whether the search operation is successful or not.

#### 4.4.6 High Speed Internet

##### 4.4.6.1 Downloading files sequentially

**Identifier:** REL/HS/001

**Title:** Downloading files sequentially

**Objective:** Measure the reliability KPIs of the AUT when executing the feature file downloading in the High Speed Internet use case.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes HS)

**Initial Conditions:**



AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 5.1: Download three reference files.
2. The Test System measures the time to successfully download each of the files, and whether each download was successful or not.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- File Download Operation: Whether the download operation is successful or not.
- File Download Time: The time elapsed since the user clicks download button until the file is stored in the Host Device.

#### 4.4.6.2 Uploading files sequentially

**Identifier:** REL/HS/002

**Title:** Uploading files sequentially

**Objective:** Measure the reliability KPIs of the AUT when executing the feature file uploading in the High Speed Internet use case.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes HS)

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 5.2: Upload three reference files.
2. The Test System measures the time to successfully upload each of the files, and whether each upload was successful or not.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- File Upload Operation: Whether the upload operation is successful or not.
- File Upload Time: The time elapsed since the user clicks upload button until the file is stored in the AUT Backend Service.

#### 4.4.6.3 Pause and Resume Download Transfer

**Identifier:** REL/HS/003



**Title:** Pause and Resume Download Transfer

**Objective:** Measure the reliability KPIs of the AUT when pausing and resuming a file download.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes HS)

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 5.7 Pause and Resume one reference media file download.
2. The Test System measures whether the pause operation and the resume operation were successful or not.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- File Pause Download Operation: Whether the pause download operation is successful or not.
- File Resume Download Operation: Whether the resume download operation is successful or not.

#### 4.4.6.4 Pause and Resume Upload Transfer

**Identifier:** REL/HS/004

**Title:** Pause and Resume Upload Transfer

**Objective:** Measure the reliability KPIs of the AUT when pausing and resuming a file upload.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes HS)

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 5.8 Pause and Resume one reference media file upload.
2. The Test System measures whether the pause operation and the resume operation were successful or not.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- File Pause Upload Operation: Whether the pause upload operation is successful or not.



- File Resume Upload Operation: Whether the resume upload operation is successful or not.

#### 4.4.7 Virtual Reality

##### 4.4.7.1 Virtual Experience Loading

**Identifier:** REL/VR/001

**Title:** Virtual Experience Loading

**Objective:** Measure the reliability KPIs of the AUT when spinning the device host in the three axis with a virtual experience selected.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes VR)

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 6.1 Select a virtual experience.
2. The Test System measures the time to recognize the target object.
3. The Test System spins up the Host Device 30 degrees.
4. The Test System measures the time to recognize the target object.
5. The Test System spins down the Host Device 60 degrees.
6. The Test System measures the time to recognize the target object.
7. The Test System spins up the Host Device 30 degrees and spins left 60 degrees.
8. The Test System measures the time to recognize the target object.
9. The Test System spins right the Host Device 120 degrees.
10. The Test System measures the time to recognize the target object.
11. The Test System spins left 60 degrees.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Immersion Cut-off: Probability that successfully started immersion is ended by a cause other than the intentional termination by the user.

##### 4.4.7.2 Virtual Scene Loading

**Identifier:** REL/VR/002

**Title:** Virtual Scene Loading



**Objective:** Measure the reliability KPIs of the AUT when moving the device host horizontally from the initial observation point under the user control.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes VR)

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 6.1 Select a virtual experience.
2. The Test System waits until the target object is recognized.
3. The Test System spins up the Host Device a random number of degrees between 10 and 50.
4. The Test System waits until the target object is recognized.
5. The Test System commands the AUT to move horizontally (walking speed, 4 km/h) during 20 seconds in order to change the scene.
6. The Test System measures the time to recognize the target object.
7. The Test System spins back the Host Device to the original position.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Time to load the virtual scene: Time elapsed from selecting an scenario (world, experience, etc.) to loading the 3D visual context.
- Immersion Cut-off: Probability that successfully started immersion is ended by a cause other than the intentional termination by the user.
- Video resolution: Used frame resolution.

## 4.4.8 Augmented Reality

### 4.4.8.1 Load Augmentation Layer on Physical Marker

**Identifier:** REL/AR/001

**Title:** Load Augmentation Layer on physical marker

**Objective:** Measure the reliability KPIs of the AUT when rendering a virtual layer on top of a moving physical marker.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes AR)

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 7.1 Load augmentation layer on a physical marker.
2. The Test System forces the Host Device to aim at a physical marker.
3. The Test System measures the time elapsed by the AUT to display a virtual layer on top of the physical marker.
4. The Test System spins (in any direction) the Host Device 30 degrees, while the physical marker remains in the same position.
5. The Test System measures whether the AUT keeps showing the virtual layer on top of the physical virtual or not.
6. The Test System spins back to the original position.
7. The Test System measures whether the AUT keeps showing the virtual layer on top of the physical marker or not.
8. The Test System commands the AUT to exit augmented reality mode.
9. The Test System measures whether the AUT clears up the virtual layer or not.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Time to load augmentation: Time elapsed from aiming the device at physical marker to displaying the virtual layer on top of it.
- Augmentation Cut-off: Probability that successfully started immersion is ended by a cause other than the intentional termination by the user.
- Clear Augmentation Layer Operation: Whether the clear virtual operation is successful or not.

#### 4.4.8.2 Load Augmentation Layer at Location

**Identifier:** REL/AR/002

**Title:** Load Augmentation Layer at specific location

**Objective:** Measure the reliability KPIs of the AUT when rendering a virtual layer at a specific location.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes AR)

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 7.2 Load augmentation layer at a specific location.
2. The Test System forces the Host Device to be set at specific position.



3. The Test System measures the time elapsed by the AUT to display a virtual layer at the current location.
4. The Test System commands the AUT to exit augmented reality mode.
5. The Test System measures whether the AUT clears up the virtual layer from the Host Device screen or not.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Time to load augmentation: Time elapsed from setting the Host Device at a specific location to displaying the virtual layer.
- Augmentation Cut-off: Probability that successfully started immersion is ended by a cause other than the intentional termination by the user.
- Clear Augmentation Layer Operation: Whether the clear virtual operation is successful or not.

## **4.4.9 Gaming**

### **4.4.9.1 Start new game sessions**

**Identifier:** REL/GA/001

**Title:** Start new game sessions

**Objective:** Measure the reliability KPIs of the AUT when starting new game sessions.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes GA)

**Initial Conditions:**

- AUT is in [[AUT STARTED](#)] mode.
- AUT options are configured to their default values.
- Any AUT screen saving option is disabled.
- AUT resolution is configured to maximum resolution available.
- AUT Music and sound effects are configured to be ON.
- No energy saving option is enabled in the AUT.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 10.6: Start two game sessions.
2. The Test System measures the time to successfully start the game session the first time (including connection to server and loading).
3. The Test System measures the time to successfully start the game a second time.

**Postamble:**



- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Time to load the game: The time elapsed since the user clicks play button until the AUT loads the game session and the user can start the interaction with the Host Device for playing.
- Start Game Operation: Whether the game session is successfully loaded or not.
- Time to load the second game: The time elapsed since the user clicks play button until the AUT loads the game session the second time and the user can start the interaction with the Host Device for playing.
- Start Game Operation: Whether the second game session is successfully loaded or not.

#### 4.4.9.2 Long Game session

**Identifier:** REL/GA/002

**Title:** Long game session

**Objective:** Measure the reliability KPIs of the AUT when playing a game session.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes GA)

**Initial Conditions:**

- AUT is in [[AUT STARTED](#)] mode.
- AUT options are configured to their default values.
- Any AUT screen saving option is disabled.
- AUT resolution is configured to maximum resolution available.
- AUT Music and sound effects are configured to be ON.
- No energy saving option is enabled in the AUT.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 7.3: Play long gaming session. The application user flow must last at least 5 minutes.
2. The Test System measures the number of times and the duration that the game session stalls and the content resolution.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Game Cut-off: Probability that successfully started gaming session ends due to a cause other than the intentional termination by the user.
- Game Content Stall: The elapsed duration of content stalling while executing the gaming session.
- Video resolution: Used video resolution.



#### 4.4.9.3 Pause and Resume

**Identifier:** REL/GA/003

**Title:** Pause and resume

**Objective:** Measure the reliability KPIs of the AUT when pausing and resuming a game session.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes GA) AND ICSA\_GAPause

**Initial Conditions:**

- AUT is in [[AUT STARTED](#)] mode.
- AUT options are configured to their default values.
- Any AUT screen saving option is disabled.
- AUT resolution is configured to maximum resolution available.
- AUT Music and sound effects are configured to be ON.
- No energy saving option is enabled in the AUT.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 10.4: Pause and resume a game session.
2. The Test System measures whether pause operation and the resume operation were successful or not during step1.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Pause Operation: Whether pause operation is successful or not.
- Resume Operation: Whether resume operation is successful or not.
- Time to load game session after resuming: The time elapsed since the user clicks resume button until the AUT user can resume the interaction with the Host Device for playing.

#### 4.4.9.4 Start saved game session

**Identifier:** REL/GA/004

**Title:** Start saved game session

**Objective:** Measure the reliability KPIs of the AUT when starting a saved game session.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes GA) AND ICSA\_GASaveGame

**Initial Conditions:**

- AUT is in [[AUT STARTED](#)] mode.
- AUT options are configured to their default values.
- Any AUT screen saving option is disabled.
- AUT resolution is configured to maximum resolution available.
- AUT Music and sound effects are configured to be ON.
- No energy saving option is enabled in the AUT.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 10.5: Saved game session.
2. The Test System measures the time to successfully start the game when starting the saved game version (including connection to server and loading).

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Time to load the game: The time elapsed since the user clicks play button until the AUT loads the saved game session and the user can start the interaction with the Host Device for playing.
- Start Game Operation: Whether the saved game session is successfully loaded or not.

## 4.5 Network Resources Usage (NWR)

### 4.5.1 Common Services

The tests cases in this section apply to all Use Cases.

#### 4.5.1.1 Device ON

**Identifier:** NWR/CO/001

**Title:** Device ON

**Objective:** Measure the use of network resources that are consumed by the Host Device when the AUT is not running.

**Applicability:**

(ICSG\_ProductType = Application)

**Initial Conditions:**

AUT is in [[AUT NOT RUNNING](#)] mode.

**Steps:**

1. The Test System measures the use of network resources during 20 minutes with the AUT not running and the device switched on.



**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- DL IP data usage: Total number of bytes transferred in the DL during the measurement time.
- UL IP data usage: Total number of bytes transferred in the UL during the measurement time.

#### **4.5.1.2 Open the app**

**Identifier:** NWR/CO/002

**Title:** Login and log out

**Objective:** Measure the AUT consumption of network resources when it is started, and logged in, and then closed and started again.

**Applicability:**

(ICSG\_ProductType = Application) AND ICSA\_Login

**Initial Conditions:**

AUT is in [[AUT NOT RUNNING](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 1.1: Reopen the App.
2. The Test System measures the use of network resources from initiating the App to closing and reopening it again.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- DL IP data usage: Total number of bytes transferred in the DL during the measurement time.
- UL IP data usage: Total number of bytes transferred in the UL during the measurement time.

#### **4.5.1.3 Background state**

**Identifier:** NWR/CO/003

**Title:** Background state

**Objective** Measure the AUT consumption of network resources when it is in background state.

**Applicability:**

(ICSG\_ProductType = Application)

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 1.1: Reopen the App.
2. The Test Systems sets the AUT in background state.
3. The Test System measures the use of network resources during 20 minutes with the AUT in background state.
4. The Test Systems sets the AUT back in active state.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- DL IP data usage: Total number of bytes transferred in the DL during the measurement time.
- UL IP data usage: Total number of bytes transferred in the UL during the measurement time.

## 4.5.2 CS Content Distribution Streaming Services

Note: The following test cases are defined to prevent any device-side content caching which the AUT could implement. However, if the AUT Backend Service also implements a server-side caching (e.g., storing the current playback time for a user), preventing that effect is left to the implementation of the test case.

### 4.5.2.1 Non Interactive Playback

**Identifier:** NWR/CS/001

**Title:** Non Interactive Playback

**Objective:** Measure the AUT consumption of network resources while executing the feature media file playing from the Content Distribution Streaming Services use case.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes CS) AND ICSA\_CSPlay

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 2.1: Play three reference media files.
2. The Test System measures the bytes transferred while playing the reference files.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- DL IP data usage: Total number of bytes transferred in the DL during the transmission of the reference media files.
- UL IP data usage: Total number of bytes transferred in the UL during the transmission of the reference media files.

**4.5.2.2 Play and Pause**

**Identifier:** NWR/CS/002

**Title:** Play and Pause

**Objective:** Measure the AUT consumption of network resources when a media file is in pause mode.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes CS) AND ICSA\_CSPause

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 2.2: Play and pause.
2. The Test System measures the bytes transferred during the period the reference video is in Pause mode.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- DL IP data usage: Total number of bytes transferred in the DL during the measurement time.
- UL IP data usage: Total number of bytes transferred in the UL during the measurement time.

**4.5.2.3 Rewind**

**Identifier:** NWR/CS/003

**Title:** Rewind

**Objective:** Measure the AUT consumption of network resources when performing rewind operation while playing a media file.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes CS) AND ICSA\_CSRewind

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 2.9: Rewind.
2. The Test System measures the bytes transferred during the rewind operation.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- DL IP data usage: Total number of bytes transferred in the DL during the measurement time.
- UL IP data usage: Total number of bytes transferred in the UL during the measurement time.

#### 4.5.2.4 Download content for offline playing

**Identifier:** NWR/CS/004

**Title:** Download content for offline playing

**Objective:** Measure the network resources consumed by an AUT when downloading a media file for offline playing.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes CS) AND ICSA\_CSDownloadMedia

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 2.4: Download a media file.
2. The Test System measures the bytes transferred during the period the media file is being downloaded.
3. The Test System commands the AUT to delete the media file.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- DL IP data usage: Total number of bytes transferred in the DL during the measurement time.
- UL IP data usage: Total number of bytes transferred in the UL during the measurement time.

#### 4.5.2.5 Fast Forward

**Identifier:** NWR/CS/005



**Title:** Fast Forward

**Objective:** Measure the network resources consumed by an AUT when performing fast forward operation while playing a media file.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes CS) AND ICSA\_CSFastForward

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 2.10: Fast Forward.
2. The Test System measures the bytes transferred during the fast forward operation.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- DL IP data usage: Total number of bytes transferred in the DL during the measurement time.
- UL IP data usage: Total number of bytes transferred in the UL during the measurement time.

### 4.5.3 Live Streaming Services

#### 4.5.3.1 Play Live Video from User

**Identifier:** NWR/LS/001

**Title:** Play Live Video from User

**Objective:** Measure the AUT consumption of network resources while executing the feature live video playing from the Live Streaming Services use case.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes LS)

**Initial Conditions:**

- AUT is in [[AUT STARTED](#)] mode.
- An Internet connected PC transmits live video as defined in section 2.6.1;**Error! No se encuentra el origen de la referencia..**

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 3.1: Playing live video from a known user.
2. The Test System measures the bytes transferred during the video play operation.

**Postamble:**



- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- DL IP data usage: Total number of bytes transferred in the DL during the measurement time.
- UL IP data usage: Total number of bytes transferred in the UL during the measurement time.

#### **4.5.3.2 Broadcast Live Video**

**Identifier:** NWR/LS/002

**Title:** Broadcast Live Video to User

**Objective:** Measure the AUT consumption of network resources when broadcasting live content.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes LS)

**Initial Conditions:**

- AUT is in [[AUT STARTED](#)] mode.
- The Host Device camera is focused on a TV displaying reference video RTVP2.

**Steps:**

1. The Test Systems starts playing RTVP2 on the TV.
2. The Test System commands the AUT to replay the Application User Flow 3.2: Broadcast live video.
3. The Test System measures the bytes transferred during the live video broadcast operation.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- DL IP data usage: Total number of bytes transferred in the DL during the measurement time.
- UL IP data usage: Total number of bytes transferred in the UL during the measurement time.

#### **4.5.4 Social Networking**

##### **4.5.4.1 Picture Posting**

**Identifier:** NWR/SN/001

**Title:** Picture Posting



**Objective:** Measure the AUT consumption of network resources while executing the feature picture uploading in the Social Networking use case.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes SN) AND ICOSA\_SNPPostImage

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 4.2: Uploading three reference pictures separately.
2. The Test System measures the bytes transferred during the pictures uploading operation.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- DL IP data usage: Total number of bytes transferred in the DL during the measurement time.
- UL IP data usage: Total number of bytes transferred in the UL during the measurement time.

#### 4.5.4.2 Video Posting

**Identifier:** NWR/SN/002

**Title:** Video Posting

**Objective:** Measure the AUT consumption of network resources while executing the feature video uploading in the Social Networking use case.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes SN) AND ICOSA\_SNPPostVideo

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 4.3: Post videos sequentially.
2. The Test System measures the bytes transferred during the videos uploading operation.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**



- DL IP data usage: Total number of bytes transferred in the DL during the measurement time.
- UL IP data usage: Total number of bytes transferred in the UL during the measurement time.

#### 4.5.4.3 Comment Posting

**Identifier:** NWR/SN/003

**Title:** Comment Uploading

**Objective:** Measure the AUT consumption of network resources while executing the feature comment uploading in the Social Networking use case.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes SN) AND ICSA\_SNPostComment

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 4:1: Uploading three reference comments separately.
2. The Test System measures the bytes transferred during the comments uploading operation.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- DL IP data usage: Total number of bytes transferred in the DL during the measurement time.
- UL IP data usage: Total number of bytes transferred in the UL during the measurement time.

#### 4.5.4.4 File Posting

**Identifier:** NWR/SN/004

**Title:** File Uploading

**Objective:** Measure the AUT consumption of network resources while executing the feature file posting in the Social Networking use case.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes SN) AND ICSA\_SNPostFile.

**Initial Conditions:**



AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 4.6: Post three reference files separately.
2. The Test System measures the bytes transferred during the files uploading operation.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- DL IP data usage: Total number of bytes transferred in the DL during the measurement time.
- UL IP data usage: Total number of bytes transferred in the UL during the measurement time.

#### 4.5.4.5 Show Picture

**Identifier:** NWR/SN/005

**Title:** Show picture

**Objective:** Measure the AUT consumption of network resources while executing the feature show picture in the Social Networking use case.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes SN) AND ICSCA\_SNGetImage

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 4.8: Show three reference pictures.
2. The Test System measures the bytes transferred during the pictures downloading operation.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- DL IP data usage: Total number of bytes transferred in the DL during the measurement time.
- UL IP data usage: Total number of bytes transferred in the UL during the measurement time.



#### 4.5.4.6 Play Video

**Identifier:** NWR/SN/006

**Title:** Play Video

**Objective:** Measure the AUT consumption of network resources while executing the feature play video in the Social Networking use case.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes SN) AND ICSA\_SNGetVideo

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 4.9 Play three reference videos.
2. The Test System measures the bytes transferred during the videos playing operation.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- DL IP data usage: Total number of bytes transferred in the DL during the measurement time.
- UL IP data usage: Total number of bytes transferred in the UL during the measurement time.

#### 4.5.4.7 File Downloading

**Identifier:** NWR/SN/007

**Title:** File Downloading

**Objective:** Measure the AUT consumption of network resources while executing the feature file downloading in the Social Networking use case.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes SN) AND ICSA\_SNGetFile

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 4.12: Downloading three reference files.
2. The Test System measures the bytes transferred during the files downloading operation.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- DL IP data usage: Total number of bytes transferred in the DL during the measurement time.
- UL IP data usage: Total number of bytes transferred in the UL during the measurement time.

**4.5.4.8 Play Live Video from User**

**Identifier:** NWR/SN/008

**Title:** Play Live Video from User

**Objective:** Measure the AUT consumption of network resources while playing a live video from a user.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes SN)

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 4.10: Play live video from a user.
2. The Test System measures the bytes transferred during the video playing operation.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- DL IP data usage: Total number of bytes transferred in the DL during the measurement time.
- UL IP data usage: Total number of bytes transferred in the UL during the measurement time.

**4.5.4.9 Search Object**

**Identifier:** NWR/SN/009

**Title:** Search Object

**Objective:** Measure the AUT consumption of network resources while searching the most relevant item for which the AUT has been mainly designed (e.g., contacts, flights, hotels, etc.).

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes SN)

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**



1. The Test System commands the AUT to replay the Application User Flow 4.13: Search object.
2. The Test System measures the bytes transferred during the searching operation.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- DL IP data usage: Total number of bytes transferred in the DL during the measurement time.
- UL IP data usage: Total number of bytes transferred in the UL during the measurement time.

## **4.5.5 High Speed Internet**

### **4.5.5.1 Downloading files sequentially**

**Identifier:** NWR/HS/001

**Title:** Downloading files sequentially

**Objective:** Measure the AUT consumption of network resources while executing the feature file downloading in the High Speed Internet use case.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes HS)

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 5.1: Download three reference files.
2. The Test System measures the bytes transferred during the files downloading operation.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- DL IP data usage: Total number of bytes transferred in the DL during the measurement time.
- UL IP data usage: Total number of bytes transferred in the UL during the measurement time.

### **4.5.5.2 Uploading files sequentially**

**Identifier:** NWR/HS/002

**Title:** Uploading files sequentially



**Objective:** Measure the AUT consumption of network resources while executing the feature file uploading in the High Speed Internet use case.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes HS)

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 5.2: Upload three reference files.
2. The Test System measures the bytes transferred during the files uploading operation.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- DL IP data usage: Total number of bytes transferred in the DL during the measurement time.
- UL IP data usage: Total number of bytes transferred in the UL during the measurement time.

#### 4.5.5.3 Pause and Resume Download Transfer

**Identifier:** NWR/HS/003

**Title:** Pause and Resume Download Transfer

**Objective:** Measure the AUT consumption of network resources when pausing and resuming a file download.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes HS)

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 5.7 Pause and Resume one reference media file download.
2. The Test System measures the bytes transferred between the file-downloading pausing and resuming operations.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- DL IP data usage: Total number of bytes transferred in the DL during the measurement time.



- UL IP data usage: Total number of bytes transferred in the UL during the measurement time.

#### 4.5.5.4 Pause and Resume Upload Transfer

**Identifier:** NWR/HS/004

**Title:** Pause and Resume Upload Transfer

**Objective:** Measure the AUT consumption of network resources when pausing and resuming a file upload.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes HS)

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 5.8 Pause and Resume one reference media file upload.
2. The Test System measures the bytes transferred between the file-uploading pausing and resuming operations.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- DL IP data usage: Total number of bytes transferred in the DL during the measurement time.
- UL IP data usage: Total number of bytes transferred in the UL during the measurement time.

#### 4.5.6 Virtual Reality

##### 4.5.6.1 Virtual Experience Loading

**Identifier:** NWR/VR/001

**Title:** Virtual Experience Loading

**Objective:** Measure the AUT consumption of network resources when looking around with three degrees of movement freedom from a single observation point.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes VR)

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**



1. The Test System commands the AUT to replay the Application User Flow 6.1 Select a virtual experience.
2. The Test System waits until the target object is recognized.
3. The Test System spins up the Host Device 30 degrees.
4. The Test System waits until the target object is recognized.
5. The Test System spins down the Host Device 60 degrees.
6. The Test System waits until the target object is recognized.
7. The Test System spins up the Host Device 30 degrees and spins left 60 degrees.
8. The Test System waits until the target object is recognized.
9. The Test System spins right the Host Device 120 degrees.
10. The Test System waits until the target object is recognized.
11. The Test System spins left 60 degrees.
12. The Test System measures the bytes transferred during the execution of step 1 to step 11.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- DL IP data usage: Total number of bytes transferred in the DL during the measurement time.
- UL IP data usage: Total number of bytes transferred in the UL during the measurement time.

#### 4.5.6.2 Virtual Scene Loading

**Identifier:** NWR/VR/002

**Title:** Virtual Scene Loading

**Objective:** Measure the AUT consumption of network resources when moving horizontally from the initial observation point under the user control.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes VR)

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 6.1 Select a virtual experience.
2. The Test System waits until the target object is recognized.
3. The Test System spins up the Host Device a random number of degrees between 10 and 50.



4. The Test System waits until the target object is recognized.
5. The Test System commands the AUT to move horizontally (walking speed, 4 km/h) during 20 seconds in order to change the scene.
6. The Test System waits until the target object is recognized.
7. The Test System spins back the Host Device to the original position.
8. The Test System measures the bytes transferred during the execution of step 1 to step 6.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- DL IP data usage: Total number of bytes transferred in the DL during the measurement time.
- UL IP data usage: Total number of bytes transferred in the UL during the measurement time.

## **4.5.7 Augmented Reality**

### **4.5.7.1 Load Augmentation Layer on Physical Marker**

**Identifier:** NWR/AR/001

**Title:** Load Augmentation Layer on physical marker

**Objective:** Measure the AUT consumption of network resources when rendering a virtual layer on top of a moving physical marker.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes AR)

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 7.1 Load augmentation layer on a physical marker.
2. The Test System forces the Host Device to aim at a physical marker.
3. The Test System waits until the AUT displays a virtual layer on top of the physical marker.
4. The Test System spins (in any direction) the Host Device 30 degrees, while the physical marker remains in the same position and waits for five seconds.
5. The Test System spins back to the original position and waits for five seconds.
6. The Test System commands the AUT to exit augmented reality mode.
7. The Test System measures the bytes transferred during the execution of step 1 to step 5.



**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- DL IP data usage: Total number of bytes transferred in the DL during the measurement time.
- UL IP data usage: Total number of bytes transferred in the UL during the measurement time.

#### **4.5.7.2 Load Augmentation Layer at Location**

**Identifier:** NWR/AR/002

**Title:** Load Augmentation Layer at specific location

**Objective:** Measure the AUT consumption of network resources when rendering a virtual layer at a specific location.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes AR)

**Initial Conditions:**

AUT is in [[AUT STARTED](#)] mode.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 7.2 Load augmentation layer at a specific location.
2. The Test System forces the Host Device to be set at specific position.
3. The Test System waits until the AUT displays a virtual layer at the current location.
4. The Test System commands the AUT to exit augmented reality mode.
5. The Test System measures the bytes transferred during the execution of step 1 to step 3.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- DL IP data usage: Total number of bytes transferred in the DL during the measurement time.
- UL IP data usage: Total number of bytes transferred in the UL during the measurement time.

### **4.5.8 Gaming**

#### **4.5.8.1 Start new game sessions**

**Identifier:** NWR/GA/001



**Title:** Start new game sessions

**Objective:** Measure the AUT consumption of network resources when starting new game sessions.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes GA)

**Initial Conditions:**

- AUT is in [[AUT STARTED](#)] mode.
- AUT options are configured to their default values.
- Any AUT screen saving option is disabled.
- AUT resolution is configured to maximum resolution available.
- AUT Music and sound effects are configured to be ON.
- No energy saving option is enabled in the AUT.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 10.6: Start two game sessions.
2. The Test System measures the time to successfully start the game session the first time (including connection to server and loading).
3. The Test System measures the time to successfully start the game a second time.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- DL IP data usage: Total number of bytes transferred in the DL during the measurement time.
- UL IP data usage: Total number of bytes transferred in the UL during the measurement time.

#### 4.5.8.2 Long Game session

**Identifier:** NWR/GA/002

**Title:** Long game session

**Objective:** Measure the AUT consumption of network resources when playing a game session.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes GA)

**Initial Conditions:**

- AUT is in [[AUT STARTED](#)] mode.
- AUT options are configured to their default values.
- Any AUT screen saving option is disabled.



- AUT resolution is configured to maximum resolution available.
- AUT Music and sound effects are configured to be ON.
- No energy saving option is enabled in the AUT.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 7.3: Play long gaming session. The application user flow must last at least 5 minutes.
2. The Test System measures the number of times and the duration that the game session stalls and the content resolution.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- DL IP data usage: Total number of bytes transferred in the DL during the measurement time.
- UL IP data usage: Total number of bytes transferred in the UL during the measurement time.

### 4.5.8.3 Pause and Resume

**Identifier:** *NWR/GA/003*

**Title:** Pause and resume

**Objective:** Measure the AUT consumption of network resources when pausing and the resuming a game session.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes GA) AND ICSA\_GAPause

**Initial Conditions:**

- AUT is in [[AUT STARTED](#)] mode.
- AUT options are configured to their default values.
- Any AUT screen saving option is disabled.
- AUT resolution is configured to maximum resolution available.
- AUT Music and sound effects are configured to be ON.
- No energy saving option is enabled in the AUT.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 10.4: Pause and resume a game session.
2. The Test System measures whether pause operation and the resume operation were successful or not during step1.

**Postamble:**



- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- DL IP data usage: Total number of bytes transferred in the DL during the measurement time.
- UL IP data usage: Total number of bytes transferred in the UL during the measurement time.

#### 4.5.8.4 Start saved game session

**Identifier:** *NWR/GA/004*

**Title:** Start saved game session

**Objective:** Measure the AUT consumption of network resources when starting a saved game session.

**Applicability:**

(ICSG\_ProductType = Application) AND (ICSG\_UseCases includes GA) AND ICESA\_GASaveGame

**Initial Conditions:**

- AUT is in [[AUT STARTED](#)] mode.
- AUT options are configured to their default values.
- Any AUT screen saving option is disabled.
- AUT resolution is configured to maximum resolution available.
- AUT Music and sound effects are configured to be ON.
- No energy saving option is enabled in the AUT.

**Steps:**

1. The Test System commands the AUT to replay the Application User Flow 10.5: Saved game session.
2. The Test System measures the time to successfully start the game when starting the saved game version (including connection to server and loading).

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- DL IP data usage: Total number of bytes transferred in the DL during the measurement time.
- UL IP data usage: Total number of bytes transferred in the UL during the measurement time.



## 5 Mobile devices Test cases

### 5.1 Mobile devices User Experience with Reference Apps (DRA)

#### 5.1.1 CS Content Distribution Streaming Services

##### 5.1.1.1 Non Interactive Playback

**Identifier:** *DRA/CS/001*

**Title:** Non Interactive Playback

**Objective:** Measure the user experience KPIs of the CSRA when running on the DUT while executing the feature media file playing from the Content Distribution Streaming Services use case.

**Applicability:**

ICSG\_ProductType = Mobile device

**Initial Conditions:**

- The DUT is in [[DUT-READY](#)] mode.

**Steps:**

1. The Test System calls the Reference App API to execute the action 2.1: Play three reference media files.
2. The Test System measures the initial buffering, the number and duration of re-buffering occurrences and the video resolution.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Time to load first media frame: The time elapsed since the user clicks play button until the media reproduction starts.
- Playback Cut-off: Probability that successfully started stream reproduction is ended by a cause other than the intentional termination by the user.
- Content Stall (s): The elapsed duration of content stalls while playing the content.
- Video resolution: Used video resolution.

##### 5.1.1.2 Play and Pause

**Identifier:** *DRA/CS/002*

**Title:** Play and Pause

**Objective:** Measure the ability of the CSRA when running on the DUT to pause and the resume a media file.

**Applicability:**

(ICSG\_ProductType = Mobile device) AND ICSD\_PlayVideo

**Initial Conditions:**



- The DUT is in [[DUT-READY](#)] mode.

**Steps:**

1. The Test System calls the Reference App API to execute the action 2.2: Play and Pause.
2. The Test System measures whether pause operation was successful or not.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Playback Cut-off: Probability that successfully started stream reproduction is ended by a cause other than the intentional termination by the user.
- Pause Operation: Whether pause operation is successful or not.
- Time to load first media frame (s) after resuming: The time elapsed since the user clicks resume button until the media reproduction starts.

### 5.1.1.3 Stop and Replay

**Identifier:** DRA/CS/003

**Title:** Stop and Replay

**Objective:** Measure the ability the CSRA when running on the DUT to stop and the re-play a media file.

**Applicability:**

(ICSG\_ProductType = Mobile device) AND ICSD\_PlayVideo

**Initial Conditions:**

- The DUT is in [[DUT-READY](#)] mode.

**Steps:**

1. The Test System calls the Reference App API to execute the action 2.6: Stop and Replay.
2. The Test System measures whether stop re-play operations were successful or not.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Time to load first media frame: The time elapsed since the user clicks play button until the media reproduction starts.
- Playback Cut-off: Probability that successfully started stream reproduction is ended by a cause other than the intentional termination by the user.
- Stop Operation: Whether stop operation is successful or not.



#### 5.1.1.4 Search and Seek

**Identifier:** DRA/CS/004

**Title:** Media file Seek

**Objective:** Measure the ability the CSRA when running on the DUT to search a media file and seek at any time in the media file.

**Applicability:**

(ICSG\_ProductType = Mobile device) AND ICSD\_PlayVideo

**Initial Conditions:**

- The DUT is in [[DUT-READY](#)] mode.

**Steps:**

1. The Test System calls the Reference App API to execute the action 2.7: Search and Seek.
2. The Test System measures the search time and the time to load the first media frame after the seek operation.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Search Time: The time elapsed since the user clicks search button until the first search result is shown.
- Playback Cut-off: Probability that successfully started stream reproduction is ended by a cause other than the intentional termination by the user.
- Time to load first frame: The time elapsed since the user clicks play button until reproduction resumes after seek operation.

#### 5.1.1.5 Rewind

**Identifier:** DRA/CS/005

**Title:** Rewind

**Objective:** Measure the ability the CSRA when running on the DUT to perform rewind operation while playing a media file.

**Applicability:**

(ICSG\_ProductType = Mobile device) AND ICSD\_PlayVideo

**Initial Conditions:**

- The DUT is in [[DUT-READY](#)] mode.

**Steps:**

1. The Test System calls the Reference App API to execute the action 2.9: Rewind.
2. The Test System measures the time to load the first media frame after the rewind operation.



**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Playback cut-off: Probability that successfully started stream reproduction is ended by a cause other than the intentional termination by the user.
- Time to load first media frame: The average of the time elapsed since the user clicks play button until reproduction resumes after rewind operation.
- Rewind operation: Whether rewind operation is successful or not.

### **5.1.1.6 Playlist Skip Forward and Backward**

**Identifier:** *DRA/CS/006*

**Title:** Playlist Skip Forward and Backward

**Objective:** Measure the ability the CSRA when running on the DUT to skip forward and backward through a playlist while playing a media file.

**Applicability:**

(ICSG\_ProductType = Mobile device) AND ICSD\_PlayVideo

**Initial Conditions:**

- The DUT is in [[DUT-READY](#)] mode.

**Steps:**

1. The Test System calls the Reference App API to execute the action 2.8: Skip Forward and Backward.
2. The Test System measures the time to load the first media frame after the first skip backward operation.
3. The Test System measures the time to load the first media frame after the first skip forward operation.
4. The Test System measures the time to load the first media frame after the second skip backward operation.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Video Playback cut-off: Probability that successfully started stream reproduction is ended by a cause other than the intentional termination by the user.
- Time to load first media frame: The time elapsed since the user clicks play button until reproduction resumes after rewind and fast forward operations.

### **5.1.1.7 Download content for offline playing**

**Identifier:** *DRA/CS/007*



**Title:** Download content for offline playing

**Objective:** Measure the ability the CSRA when running on the DUT to download a media file for offline playing.

**Applicability:**

ICSG\_ProductType = Mobile device

**Initial Conditions:**

- The DUT is in [[DUT-READY](#)] mode.

**Steps:**

1. The Test System calls the Reference App API to execute the action 2.4: Download a media file.
2. The Test System measures the time to download load the media file.
3. The Test System commands the CSRA to delete the media file.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Media Download Operation: Whether the download operation is successful or not.
- File Downloading Time: The time elapsed since the user clicks download button until the media reproduction is ready to be started.

#### 5.1.1.8 Fast Forward

**Identifier:** DRA/CS/008

**Title:** Fast Forward

**Objective:** Measure the ability the CSRA when running on the DUT to perform fast forward operation while playing a media file.

**Applicability:**

(ICSG\_ProductType = Mobile device) AND ICSD\_PlayVideo

**Initial Conditions:**

- The DUT is in [[DUT-READY](#)] mode.

**Steps:**

1. The Test System calls the Reference App API to execute the action 2.10: Fast Forward.
2. The Test System measures the time to load the first media frame after the fast forward operation.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**



- Playback cut-off: Probability that successfully started stream reproduction is ended by a cause other than the intentional termination by the user.
- Time to load first media frame: The average of the time elapsed since the user clicks play button until reproduction resumes after fast forward operation.
- Fast forward operation: Whether fast forward operation is successful or not.

## 5.1.2 Live Streaming Services

### 5.1.2.1 Play Live Video from User

**Identifier:** *DRA/LS/001*

**Title:** Play Live Video from User

**Objective:** Measure the user experience KPIs of the LSRA when running on the DUT while executing the feature live video playing from the Live Streaming Services use case.

**Applicability:**

(ICSG\_ProductType = Mobile device) AND ICSD\_PlayVideo

**Initial Conditions:**

- The DUT is in [[DUT-READY](#)] mode.
- An Internet connected PC transmits live video as defined in section 2.6.1.

**Steps:**

1. The Test System calls the Reference App API to execute the action 3.1: Playing live video from a known user.
2. The Test System measures the initial buffer, the number of stall occurrences and the video resolution.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Time to load first picture: The time elapsed since the user clicks play button until the LSRA starts playing the selected broadcast source.
- Broadcasting Reproduction Cut-off: Probability that successfully started broadcast reproduction is ended by a cause other than the intentional termination by the LSRA user.
- Content Stall (s): The elapsed duration of content stalls while playing the selected broadcast source.
- Video resolution: Used video resolution.

### 5.1.2.2 Broadcast Live Video

**Identifier:** *DRA/LS/002*

**Title:** Broadcast Live Video to User



**Objective:** Measure the user experience KPIs of the LSRA when running on the DUT while executing the feature broadcasting live video from the Live Streaming Services use case.

**Applicability:**

(ICSG\_ProductType = Mobile device) AND ICSD\_RecordVideo

**Initial Conditions:**

- The DUT is in [[DUT-READY](#)] mode.
- The DUT camera is focused on the fixed TV pattern RTVP1.

**Steps:**

1. The Test System calls the Reference App API to execute the action 3.2: Broadcast live video.
2. The Test System receives the broadcasted video from the LSRA and measures the number of stall occurrences and the video resolution.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Time to load receive first picture: The time elapsed since the user clicks broadcast button until the Test System starts playing the LSRA broadcast video.
- Broadcasting Reproduction Cut-off: Probability that successfully started broadcast reproduction is ended by a cause other than the intentional termination by the LSRA user.
- Content Stall (s): The elapsed duration of content stalls while broadcasting the content.
- Video resolution: Used video resolution.

### 5.1.3 Social Networking

#### 5.1.3.1 Picture Posting

**Identifier:** DRA/SN/001

**Title:** Picture Posting

**Objective:** Measure the user experience KPIs of the SNRA when running on the DUT while executing the feature picture uploading in the Social Networking use case.

**Applicability:**

ICSG\_ProductType = Mobile device

**Initial Conditions:**

- The DUT is in [[DUT-READY](#)] mode.

**Steps:**

1. The Test System calls the Reference App API to execute the action 4.2: Uploading three reference pictures separately.



2. The Test System measures the time to successfully upload each of the pictures, and whether each upload was successful or not.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Picture Upload Operation: Whether the upload operation is successful or not.
- Picture Upload Time: The time elapsed since the user clicks upload button until the picture is stored in the SNRA Backend Service.

### 5.1.3.2 Video Posting

**Identifier:** *DRA/SN/002*

**Title:** Video Posting

**Objective:** Measure the user experience KPIs of the SNRA when running on the DUT while executing the feature video uploading in the Social Networking use case.

**Applicability:**

ICSG\_ProductType = Mobile device

**Initial Conditions:**

- The DUT is in [[DUT-READY](#)] mode.

**Steps:**

1. The Test System calls the Reference App API to execute the action 4.3: Post videos sequentially.
2. The Test System measures the time to successfully upload each of the video clips, and whether each upload was successful or not.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Video Upload Operation: Whether the upload operation is successful or not.
- Video Upload Time: The time elapsed since the user clicks upload button until the video clip is stored in the SNRA Backend Service.

### 5.1.3.3 Comment Posting

**Identifier:** *DRA/SN/003*

**Title:** Comment Uploading

**Objective:** Measure the user experience KPIs of the SNRA when running on the DUT while executing the feature comment uploading in the Social Networking use case.

**Applicability:**



ICSG\_ProductType = Mobile device

**Initial Conditions:**

- The DUT is in [[DUT-READY](#)] mode.

**Steps:**

1. The Test System calls the Reference App API to execute the action 4:1: Post three reference comments separately.
2. The Test System measures the time to successfully upload each of the comment, and whether each post was successful or not.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Comment Upload Operation: Whether the upload operation is successful or not.
- Comment Upload Time: The time elapsed since the user clicks upload button until the comment is stored in the SNRA Backend Service.

#### 5.1.3.4 File Posting

**Identifier:** *DRA/SN/004*

**Title:** File Uploading

**Objective:** Measure the user experience KPIs of the SNRA when running on the DUT while executing the feature file posting in the Social Networking use case.

**Applicability:**

ICSG\_ProductType = Mobile device

**Initial Conditions:**

- The DUT is in [[DUT-READY](#)] mode.

**Steps:**

1. The Test System calls the Reference App API to execute the action 4.6: Post three reference files separately.
2. The Test System measures the time to successfully upload each of the files, and whether each upload was successful or not.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- File Upload Operation: Whether the upload operation is successful or not.
- File Upload Time: The time elapsed since the user clicks upload button until the file is stored in the SNRA Backend Service.



### 5.1.3.5 Show Picture

**Identifier:** DRA/SN/005

**Title:** Show picture

**Objective:** Measure the user experience KPIs of the SNRA when running on the DUT while executing the feature show picture in the Social Networking use case.

**Applicability:**

ICSG\_ProductType = Mobile device

**Initial Conditions:**

- The DUT is in [[DUT-READY](#)] mode.

**Steps:**

1. The Test System calls the Reference App API to execute the action 4.8: Show three reference pictures.
2. The Test System measures the time to successfully download and show each of the pictures, and whether each download was successful or not.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Show Picture Operation: Whether the download operation is successful or not.
- Show Picture Time: The time elapsed since the user clicks download button until the picture is shown.

### 5.1.3.6 Play Video

**Identifier:** DRA/SN/006

**Title:** Play Video

**Objective:** Measure the user experience KPIs of the SNRA when running on the DUT while executing the feature play video in the Social Networking use case.

**Applicability:**

(ICSG\_ProductType = Mobile device) AND ICSD\_PlayVideo

**Initial Conditions:**

- The DUT is in [[DUT-READY](#)] mode.

**Steps:**

1. The Test System calls the Reference App API to execute the action 4.9 Play three reference videos.
2. The Test System measures the initial buffer, the number of re-buffering and the content resolution.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Time to load first media frame: The time elapsed since the user clicks play button until the media reproduction starts.
- Playback Cut-off Ratio: Probability that successfully started stream reproduction is ended by a cause other than the intentional termination by the user.
- Content Stalling: The elapsed duration of content stalling while playing the content.
- Video resolution: Used video resolution.

**5.1.3.7 File Downloading**

**Identifier:** *DRA/SN/007*

**Title:** File Downloading

**Objective:** Measure the user experience KPIs of the SNRA when running on the DUT while executing the feature file downloading in the Social Networking use case.

**Applicability:**

ICSG\_ProductType = Mobile device

**Initial Conditions:**

- The DUT is in [[DUT-READY](#)] mode.

**Steps:**

1. The Test System calls the Reference App API to execute the action 4.12: Downloading three reference files.
2. The Test System measures the time to successfully download each of the files, and whether each download was successful or not.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- File Download Operation: Whether the download operation is successful or not.
- File Download Time: The time elapsed since the user clicks download button until the file is stored in the DUT.

**5.1.3.8 Play Live Video from User**

**Identifier:** *DRA/SN/009*

**Title:** Play Live Video from User

**Objective:** Measure the user experience KPIs of the SNRA when running on the DUT while playing a live video from a user.

**Applicability:**

(ICSG\_ProductType = Mobile device) AND ICSD\_PlayVideo

**Initial Conditions:**

- The DUT is in [[DUT-READY](#)] mode.

**Steps:**

1. The Test System calls the Reference App API to execute the action 4.10: Play live video from a user.
2. The Test System measures the initial buffer, the number of re-buffering and the content resolution.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Time to load first media frame: The time elapsed since the user clicks play button until the media reproduction starts.
- Playback Cut-off: Probability that successfully started stream reproduction is ended by a cause other than the intentional termination by the user.
- Content Stalling: The elapsed duration of content stalling while playing the content.
- Video resolution: Used video resolution.

### 5.1.3.9 Search Object

**Identifier:** *DRA/SN/010*

**Title:** Search Object

**Objective:** Measure the ability of the SNRA when running on the DUT to search the most relevant item for which the Reference App has been mainly designed (e.g., contacts, flights, hotels, etc.).

**Applicability:**

ICSG\_ProductType = Mobile device

**Initial Conditions:**

- The DUT is in [[DUT-READY](#)] mode.

**Steps:**

1. The Test System calls the Reference App API to execute the action 4.13: Search object.
2. The Test System measures the search time.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Search Time: The time elapsed since the user clicks search button until the first search result is shown.
- Search Operation: Whether the search operation is successful or not.



## 5.1.4 High Speed Internet

### 5.1.4.1 Downloading files sequentially

**Identifier:** *DRA/HS/001*

**Title:** Downloading files sequentially

**Objective:** Measure the user experience KPIs of the HSRA when running on the DUT while executing the feature file downloading in the High Speed Internet use case.

**Applicability:**

(ICSG\_ProductType = Mobile device)

**Initial Conditions:**

- The DUT is in [[DUT-READY](#)] mode.

**Steps:**

1. The Test System calls the Reference App API to execute the action 5.1: Download three reference files.
2. The Test System measures the time to successfully download each of the files, and whether each download was successful or not.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- File Download Operation: Whether the download operation is successful or not.
- File Download Time: The time elapsed since the user clicks download button until the file is stored in the DUT.

### 5.1.4.2 Uploading files sequentially

**Identifier:** *DRA/HS/002*

**Title:** Uploading files sequentially

**Objective:** Measure the user experience KPIs of the HSRA when running on the DUT while executing the feature file uploading in the High Speed Internet use case.

**Applicability:**

(ICSG\_ProductType = Mobile device)

**Initial Conditions:**

- The DUT is in [[DUT-READY](#)] mode.

**Steps:**

1. The Test System calls the Reference App API to execute the action 5.2: Upload three reference files.
2. The Test System measures the time to successfully upload each of the files, and whether each upload was successful or not.



**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- File Upload Operation: Whether the upload operation is successful or not.
- File Upload Time: The time elapsed since the user clicks upload button until the file is stored in the HSRA Backend Service.

### 5.1.4.3 Pause and Resume Download Transfer

**Identifier:** *DRA/HS/003*

**Title:** Pause and Resume Download Transfer

**Objective:** Measure the ability of the HSRA when running on the DUT to pause and the resume a file download.

**Applicability:**

(ICSG\_ProductType = Mobile device)

**Initial Conditions:**

- The DUT is in [[DUT-READY](#)] mode.

**Steps:**

1. The Test System calls the Reference App API to execute the action 5.7 Pause and Resume one reference media file download.
2. The Test System measures whether the pause operation and the resume operation were successful or not.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- File Pause Download Operation: Whether the pause download operation is successful or not.
- File Resume Download Operation: Whether the resume download operation is successful or not.

### 5.1.4.4 Pause and Resume Upload Transfer

**Identifier:** *DRA/HS/004*

**Title:** Pause and Resume Upload Transfer

**Objective:** Measure the ability of the HSRA when running on the DUT to pause and the resume a file download.

**Applicability:**

(ICSG\_ProductType = Mobile device)

**Initial Conditions:**

- The DUT is in [[DUT-READY](#)] mode.

**Steps:**

1. The Test System calls the Reference App API to execute the action 5.8 Pause and Resume one reference media file upload.
2. The Test System measures whether the pause operation and the resume operation were successful or not.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- File Pause Upload Operation: Whether the pause upload operation is successful or not.
- File Resume Upload Operation: Whether the resume upload operation is successful or not.

## 5.1.5 Virtual Reality

### 5.1.5.1 Virtual Experience Loading

**Identifier:** *DRA/VR/001*

**Title:** Virtual Experience Loading

**Objective:** Measure the ability of the VRRRA when running on the DUT to look around with the three degrees of freedom from a single observation point.

**Applicability:**

(ICSG\_ProductType = Mobile device) AND ICSD\_VirtualReality

**Initial Conditions:**

- The DUT is in [[DUT-READY](#)] mode.

**Steps:**

1. The Test System calls the Reference App API to execute the action 6.1 Select virtual experience RVE1.
2. The Test System measures the time to recognize the target object.
3. The Test System spins up the DUT 30 degrees.
4. The Test System measures the time to recognize the target object.
5. The Test System spins down the DUT 60 degrees.
6. The Test System measures the time to recognize the target object.
7. The Test System spins up the DUT 30 degrees and spins left 60 degrees.
8. The Test System measures the time to recognize the target object.
9. The Test System spins right the DUT 120 degrees.
10. The Test System measures the time to recognize the target object.



11. The Test System spins left 60 degrees.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Time to load the virtual world: Time elapsed from selecting a scenario (world, experience, etc.) to loading the 3D visual context.
- Immersion Cut-off: Probability that successfully started immersion is ended by a cause other than the intentional termination by the user.

### 5.1.5.2 Virtual Scene Loading

**Identifier:** *DRA/VR/002*

**Title:** Virtual Scene Loading

**Objective:** Measure the ability of the VRRRA when running on the DUT to move horizontally from the initial observation point under the user control.

**Applicability:**

(ICSG\_ProductType = Mobile device) AND ICSD\_VirtualReality

**Initial Conditions:**

- The DUT is in [[DUT-READY](#)] mode.

**Steps:**

1. The Test System calls the Reference App API to execute the action 6.1 Select a virtual experience.
2. The Test System waits until the target object is recognized.
3. The Test System spins up the DUT a random number of degrees between 10 and 50.
4. The Test System waits until the target object is recognized.
5. The Test System commands the VRRRA to move horizontally (walking speed, 4 km/h) during 20 seconds in order to change the scene.
6. The Test System measures the time to recognize the target object.
7. The Test System spins back the DUT to the original position.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Time to load the virtual scene: Time elapsed from selecting a scenario (world, experience, etc.) to loading the 3D visual context.
- Immersion Cut-off: Probability that successfully started immersion is ended by a cause other than the intentional termination by the user.
- Video resolution: Used frame resolution.



## 5.1.6 Augmented Reality

### 5.1.6.1 Load Augmentation Layer on Physical Marker

**Identifier:** DRA/AR/001

**Title:** Load Augmentation Layer on physical marker

**Objective:** Measure the performance of the ARRA when running on the DUT to render a virtual layer on top of a moving physical marker.

**Applicability:**

(ICSG\_ProductType = Mobile device) AND ICSD\_AugmentedReality

**Initial Conditions:**

- The DUT is in [[DUT-READY](#)] mode.

**Steps:**

1. The Test System calls the Reference App API to execute the action 7.1 Load augmentation layer on a physical marker.
2. The Test System forces the DUT to aim at a physical marker.
3. The Test System measures the time elapsed by the ARRA to display a virtual layer on top of the physical marker.
4. The Test System spins (in any direction) the DUT 30 degrees, while the physical marker remains in the same position.
5. The Test System measures whether the ARRA keeps showing the virtual layer on top of the physical virtual or not.
6. The Test System spins back the DUT to the original position.
7. The Test System measures whether the ARRA keeps showing the virtual layer on top of the physical marker or not.
8. The Test System commands the ARRA to exit augmented reality mode.
9. The Test System measures whether the ARRA clears up the virtual layer or not.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Time to load augmentation: Time elapsed from aiming the device at physical marker to displaying the virtual layer on top of it.
- Augmentation Cut-off: Probability that successfully started immersion is ended by a cause other than the intentional termination by the user.
- Clear Augmentation Layer Operation: Whether the clear virtual operation is successful or not.

### 5.1.6.2 Load Augmentation Layer at Location

**Identifier:** DRA/AR/002



**Title:** Load Augmentation Layer at Location

**Objective:** Measure the performance of the ARRA when running on the DUT to render a virtual layer at a specific location.

**Applicability:**

(ICSG\_ProductType = Mobile device) AND ICSD\_AugmentedReality

**Initial Conditions:**

- The DUT is in [[DUT-READY](#)] mode.

**Steps:**

1. The Test System calls the Reference App API to execute the action 7.2 Load augmentation layer at a specific location.
2. The Test System forces the DUT to be set at specific position.
3. The Test System measures the time elapsed by the ARRA to display a virtual layer at the current location.
4. The Test System commands the ARRA to exit augmented reality mode.
5. The Test System measures whether the ARRA clears up the virtual layer from the DUT screen or not.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Time to load augmentation: Time elapsed from setting the DUT at a specific location to displaying the virtual layer.
- Augmentation Cut-off: Probability that successfully started immersion is ended by a cause other than the intentional termination by the user.
- Clear Augmentation Layer Operation: Whether the clear virtual operation is successful or not.

## 5.1.7 Gaming

### 5.1.7.1 Start two new game sessions

**Identifier:** DRA/GA/001

**Title:** Start new game session

**Objective:** Measure the ability of the GARA when running on the DUT to start new game sessions.

**Applicability:**

(ICSG\_ProductType = Mobile device)

**Initial Conditions:**

- The DUT is in [[DUT-READY](#)] mode.
- GARA options are configured to their default values.



- Any GARA screen saving option is disabled.
- GARA resolution is configured to maximum resolution available.
- GARA Music and sound effects are configured to be ON.
- GARA energy saving options are disabled.

**Steps:**

1. The Test System calls the Reference App API to execute the action 10.6: Start two game sessions.
2. The Test System measures the time to successfully start the game the first time (including connection to server and loading).
3. The Test System measures the time to successfully start the game a second time.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Time to load the first game: The time elapsed since the user clicks play button until the GARA loads the first game session and the user can start the interaction with the DUT for playing.
- First Time to load the second game: The time elapsed since the user clicks play button until the GARA loads the second game session and the user can start the interaction with the DUT for playing.
- Start Game Operation: Whether the game sessions are successfully loaded or not.

### 5.1.7.2 Long Game session

**Identifier:** DRA/GA/002

**Title:** LongGame session

**Objective:** Measure the ability of the GARA when running on the DUT to start new game session.

**Applicability:**

(ICSG\_ProductType = Mobile device)

**Initial Conditions:**

- The DUT is in [\[DUT-READY\]](#) mode.
- GARA options are configured to their default values.
- Any GARA screen saving option is disabled.
- GARA resolution is configured to maximum resolution available.
- GARA Music and sound effects are configured to be on.
- No energy saving option is enabled in the GARA.

**Steps:**



1. The Test System calls the Reference App API to execute the action 7.3: Long game session.
2. The Test System measures the number of times and the duration that the game session stalls and the content resolution.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Game Cut-off: Probability that successfully started gaming session is ended by a cause other than the intentional termination by the user.
- Game Content Stall: The elapsed duration of content stalling while executing the gaming session.
- Video resolution: Used video resolution.

### 5.1.7.3 Pause and Resume

**Identifier:** DRA/GA/003

**Title:** Interactive Play and Pause

**Objective:** Measure the ability of the GARA when running on the DUT to pause and the resume a game session.

**Applicability:**

(ICSG\_ProductType = Mobile device)

**Initial Conditions:**

- The DUT is in [[DUT-READY](#)] mode.
- GARA options are configured to their default values.
- Any GARA screen saving option is disabled.
- GARA resolution is configured to maximum resolution available.
- GARA Music and sound effects are configured to be on.
- No energy saving option is enabled in the GARA.

**Steps:**

1. The Test System calls the Reference App API to execute the action 10.4: Pause and resume a game session.
2. The Test System measures whether pause operation and the resume operation were successful or not during step1.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Pause Operation: Whether pause operation is successful or not.



- Resume Operation: Whether pause operation is successful or not.
- Time to load game session after resuming: The time elapsed since the user clicks resume button until the GARA user can resume the interaction with the DUT for playing.

#### 5.1.7.4 Start saved game session

**Identifier:** DRA/GA/004

**Title:** Start saved game session

**Objective:** Measure the ability of the GARA when running on the DUT to start a saved game session.

**Applicability:**

(ICSG\_ProductType = Mobile device)

**Initial Conditions:**

- The DUT is in [[DUT-READY](#)] mode.
- GARA options are configured to their default values.
- Any GARA screen saving option is disabled.
- GARA resolution is configured to maximum resolution available.
- GARA Music and sound effects are configured to be on.
- No energy saving option is enabled in the GARA.

**Steps:**

1. The Test System calls the Reference App API to execute the action 10.5: Saved game session.
2. The Test System measures the time to successfully start the game when starting the saved game version (including connection to server and loading).

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Time to load the game: The time elapsed since the user clicks play button until the GARA loads the saved game session and the user can start the interaction with the DUT for playing.
- Start Game Operation: Whether the saved game session is successfully loaded or not.

## 5.2 Mobile devices Energy Consumption (DEC)

### 5.2.1 Common

The tests cases in this section apply to all Use Cases.



### 5.2.1.1 Device ON

**Identifier:** DEC/CO/001

**Title:** Device ON

**Objective:** Measure the energy that is consumed by the DUT when no App is running on it (other than the Apps that are running when switching on the device with the factory configuration).

**Applicability:**

(ICSG\_ProductType = Mobile device)

**Initial Conditions:**

- DUT is in [\[DUT-ON\]](#) mode.

**Steps:**

1. The Test System measures the current consumption during 20 minutes.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Current consumption: Record current samples during the measurement time and calculate the following values:
  - Average current consumption.
  - Standard deviation

### 5.2.1.2 Device ON with screen OFF

**Identifier:** DEC/CO/002

**Title:** Device ON with screen OFF

**Objective:** Measure the energy that is consumed by the DUT when no App is running on it (other than the Apps that are running when switching on the device with the factory configuration) and the screen of the DUT is OFF.

**Applicability:**

(ICSG\_ProductType = Mobile device)

**Initial Conditions:**

- DUT is in [\[DUT-ON\]](#) mode.

**Steps:**

1. The Test Systems sets the DUT screen OFF.
2. The Test System measures the current consumption during 20 minutes.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**



- Current consumption: Record current samples during the measurement time and calculate the following values:
  - Average current consumption.
  - Standard deviation

### 5.2.1.3 Background state

**Identifier:** DEC/CO/003

**Title:** Background state

**Objective:** Measure the energy that is consumed by the DUT when several reference Apps are in background state.

**Applicability:**

(ICSG\_ProductType = Mobile device)

**Initial Conditions:**

- DUT is in [[DUT-READY](#)] mode.

**Steps:**

1. The Test System calls the Reference App API to execute the action 1.3: Login.
2. The Test Systems sets the CSRA, SNRA, HSRA and VRRM reference Appa in background state.
3. The Test System performs the measurements defined below during 20 minutes with the reference Apps in background state.
4. The Test System sets the reference Apps back in active state.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Current consumption: Record current samples during the measurement time and calculate the following values:
  - Average current consumption.
  - Standard deviation

## 5.2.2 CS Content Distribution Streaming Services

Note: The following test cases are defined to prevent any device-side content caching which the CSRA could implement. However, if the CSRA Backend Service also implements a server-side caching (e.g., storing the current playback time for a user), preventing that effect is left to the implementation of the test case.

### 5.2.2.1 Non Interactive Playback

**Identifier:** DEC/CS/001

**Title:** Non Interactive Playback



**Objective:** Measure the energy that is consumed by a CSRA while executing the feature media file playing from the Content Distribution Streaming Services use case.

**Applicability:**

(ICSG\_ProductType = Mobile device) AND (ICSG\_UseCases includes CS)

**Initial Conditions:**

- DUT is in [[DUT-READY](#)] mode.

**Steps:**

1. The Test System calls the Reference App API to execute the action 2.1: Play three reference media files.
2. The Test System measures the current consumed during the reproduction of the three reference videos.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Current consumption: Record current samples during the measurement time and calculate the following values:
  - Average current consumption.
  - Standard deviation

### 5.2.2.2 Play and Pause

**Identifier:** DEC/CS/002

**Title:** Play and Pause

**Objective:** Measure the energy that is consumed by a CSRA when a media file is in pause mode.

**Applicability:**

(ICSG\_ProductType = Mobile device) AND (ICSG\_UseCases includes CS) AND ICSA\_CSPause

**Initial Conditions:**

- DUT is in [[DUT-READY](#)] mode.

**Steps:**

1. The Test System calls the Reference App API to execute the action 2.2: Play and pause.
2. The Test System measures the current consumed during the period the reference video is in Pause mode.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**



- Current consumption: Record current samples during the measurement time and calculate the following values:
  - Average current consumption.
  - Standard deviation

### 5.2.2.3 Rewind

**Identifier:** DEC/CS/003

**Title:** Rewind

**Objective:** Measure the energy that is consumed by a CSRA when performing rewind operation while playing a media file.

**Applicability:**

(ICSG\_ProductType = Mobile device) AND (ICSG\_UseCases includes CS) AND ICSA\_CSRewind

**Initial Conditions:**

- DUT is in [\[DUT-READY\]](#) mode.

**Steps:**

1. Test System calls the Reference App API to execute the action 2.9: Rewind.
2. The Test System measures the current consumed while the reproduction of the reference video is in rewind mode.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Current consumption: Record current samples during the measurement time and calculate the following values:
  - Average current consumption.
  - Standard deviation

### 5.2.2.4 Download content for offline playing

**Identifier:** DEC/CS/004

**Title:** Download content for offline playing

**Objective:** Measure the energy that is consumed by a CSRA when downloading a media file for offline playing.

**Applicability:**

(ICSG\_ProductType = Mobile device) AND (ICSG\_UseCases includes CS) AND ICSA\_CSDownloadMedia

**Initial Conditions:**



- DUT is in [[DUT-READY](#)] mode.

**Steps:**

1. The Test System calls the Reference App API to execute the action 2.4: Download a media file.
2. The Test System measures the current consumed while the media file is being downloaded.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Current consumption: Record current samples during the measurement time and calculate the following values:
  - Average current consumption.
  - Standard deviation

### 5.2.2.5 Non Interactive Playback with screen off

**Identifier:** DEC/CS/005

**Title:** Non Interactive Playback with screen off

**Objective:** Measure the energy that is consumed by a CSRA while executing the feature media file playing from the Content Distribution Streaming Services use case and the screen is turned off.

**Applicability:**

(ICSG\_ProductType = Mobile device) AND (ICSG\_UseCases includes CS)

**Initial Conditions:**

- DUT is in [[DUT-READY](#)] mode.

DUT and/or CSRA may need to be configured so they can replay videos with screen off (e.g. DUT configured to send the video reproduction to an external screen)

**Steps:**

1. The Test System calls the Reference App API to execute the action 2.1: Play three reference media files.
2. Five seconds after the start of step 1, the Test Systems turns the DUT screen off and waits for 5 seconds.
3. The Test System measures the current consumed while the DUT is with the screen off and the video is being played.

**Postamble:**

- The Test System turns the DUT screen ON.
- Execute the Postamble sequence (see section 2.5).

**Measurements:**



- Current consumption: Record current samples during the measurement time and calculate the following values:
  - Average current consumption.
  - Standard deviation

#### 5.2.2.6 Fast Forward

**Identifier:** DEC/CS/006

**Title:** Fast Forward

**Objective:** Measure the energy that is consumed by a CSRA when performing fast forward operation while playing a media file.

**Applicability:**

(ICSG\_ProductType = Mobile device) AND (ICSG\_UseCases includes CS) AND ICSA\_CSFastForward

**Initial Conditions:**

- DUT is in [[DUT-READY](#)] mode.

**Steps:**

1. The Test System calls the Reference App API to execute the action 2.10: Fast Forward.
2. The Test System measures the current consumed while the reproduction of the reference video is in Fast Forward mode.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Current consumption: Record current samples during the measurement time and calculate the following values:
  - Average current consumption.
  - Standard deviation

### 5.2.3 Live Streaming Services

#### 5.2.3.1 Play Live Video from User

**Identifier:** DEC/LS/001

**Title:** Play Live Video from User

**Objective:** Measure the energy that is consumed by a LSRA while executing the feature live video playing from the Live Streaming Services use case.

**Applicability:**

(ICSG\_ProductType = Mobile device) AND (ICSG\_UseCases includes LS)

**Initial Conditions:**



- DUT is in [[DUT-READY](#)] mode.
- A live video is generated as defined in section 2.6.1.

**Steps:**

1. The Test System calls the Reference App API to execute the action 3.1: Play a live video.
2. The Test System measures the current consumed during the reproduction of the live video streaming.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Current consumption: Record current samples during the measurement time and calculate the following values:
  - Average current consumption.
  - Standard deviation.

### 5.2.3.2 Broadcast Live Video

**Identifier:** DEC/LS/002

**Title:** Broadcast Live Video to User

**Objective:** Measure the energy that is consumed by a LSRA when broadcasting live content.

**Applicability:**

(ICSG\_ProductType = Mobile device) AND (ICSG\_UseCases includes LS)

**Initial Conditions:**

- DUT is in [[DUT-READY](#)] mode.
- The test case configuration is as defined in section 2.8.3 (Figure 3), with the DUT camera focused on the fixed TV pattern RTVP1.

**Steps:**

1. The Test System calls the Reference App API to execute the action 3.2: Broadcast live video.
2. The Test System measures the current consumed during the reproduction of the live video streaming.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Current consumption: Record current samples during the measurement time and calculate the following values:
  - Average current consumption.
  - Standard deviation.



### 5.2.3.3 Broadcast live video with screen off

**Identifier:** DEC/LS/003

**Title:** Broadcast live video with screen off

**Objective:** Measure the energy that is consumed by a LSRA while executing the feature broadcast a live video from the Live Streaming Services use case when the screen is turned off.

**Applicability:**

(ICSG\_ProductType = Mobile device) AND (ICSG\_UseCases includes LS) AND ICSA\_LSBroadcastScreenOff

**Initial Conditions:**

- DUT is in [[DUT-READY](#)] mode.
- The test case configuration is as defined in section 2.8.1 (Figure 3), with the DUT camera focused on the fixed TV pattern RTVP1.

**Steps:**

1. The Test System calls the Reference App API to execute the action 3.2: Broadcast live video.
2. After 10 seconds, the Test Systems turns the DUT screen off.
3. After the DUT screen is off, the Test System measures the current consumed by the DUT during 10 minutes.

**Postamble:**

- The Test System turns the DUT screen ON.
- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Current consumption: Record current samples during the measurement time and calculate the following values:
  - Average current consumption.
  - Standard deviation

## 5.2.4 Social Networking

### 5.2.4.1 Picture Posting

**Identifier:** DEC/SN/001

**Title:** Picture Posting

**Objective:** Measure the energy that is consumed by a SNRA while executing the feature picture posting in the Social Networking use case.

**Applicability:**



(ICSG\_ProductType = Mobile device) AND (ICSG\_UseCases includes SN) AND ICSA\_SNPostImage

**Initial Conditions:**

- DUT is in [\[DUT-READY\]](#) mode.

**Steps:**

1. The Test System calls the Reference App API to execute the action 4.2: Post pictures.
2. The Test System measures the current consumed while the pictures are being posted.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Current consumption: Record current samples during the measurement time and calculate the following values:
  - Average current consumption.
  - Standard deviation.

### 5.2.4.2 Video Posting

**Identifier:** DEC/SN/002

**Title:** Video Uploading

**Objective:** Measure the energy that is consumed by a SNRA while executing the feature video posting in the Social Networking use case.

**Applicability:**

(ICSG\_ProductType = Mobile device) AND (ICSG\_UseCases includes SN) AND ICSA\_SNPostVideo

**Initial Conditions:**

- DUT is in [\[DUT-READY\]](#) mode.

**Steps:**

1. The Test System calls the Reference App API to execute the action 4.3: Post videos sequentially.
2. The Test System measures the current consumed while the videos are being posted.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Current consumption: Record current samples during the measurement time and calculate the following values:
  - Average current consumption.
  - Standard deviation.



#### 5.2.4.3 File Posting

**Identifier:** DEC/SN/003

**Title:** File Posting

**Objective:** Measure the energy that is consumed by a SNRA while executing the feature file posting in the Social Networking use case.

**Applicability:**

(ICSG\_ProductType = Mobile device) AND (ICSG\_UseCases includes SN) AND ICSA\_SNPostFile.

**Initial Conditions:**

- DUT is in [\[DUT-READY\]](#) mode.

**Steps:**

1. The Test System calls the Reference App API to execute the action 4.6: Post three reference files separately.
2. The Test System measures the current consumed while the files are being posted.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Current consumption: Record current samples during the measurement time and calculate the following values:
  - Average current consumption.
  - Standard deviation.

#### 5.2.4.4 Show Picture

**Identifier:** DEC/SN/004

**Title:** Show Picture

**Objective:** Measure the energy that is consumed by a SNRA while executing the feature show picture (downloading) in the Social Networking use case.

**Applicability:**

(ICSG\_ProductType = Mobile device) AND (ICSG\_UseCases includes SN) AND ICSA\_SNGetImage

**Initial Conditions:**

- DUT is in [\[DUT-READY\]](#) mode.

**Steps:**

1. The Test System calls the Reference App API to execute the action 4.8: Get three reference pictures.



2. The Test System measures the current consumed while the pictures are being downloaded and until the pictures are completely displayed at their final resolution.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Current consumption: Record current samples during the measurement time and calculate the following values:
  - Average current consumption.
  - Standard deviation.

#### 5.2.4.5 Play Video

**Identifier:** DEC/SN/005

**Title:** Play Video

**Objective:** Measure the energy that is consumed by a SNRA while executing the feature play video in the Social Networking use case.

**Applicability:**

(ICSG\_ProductType = Mobile device) AND (ICSG\_UseCases includes SN) AND ICSA\_SNGetVideo

**Initial Conditions:**

- DUT is in [[DUT-READY](#)] mode.

**Steps:**

1. The Test System calls the Reference App API to execute the action 4.9 Play three reference videos.
2. The Test System measures the current consumed while the videos are being played.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Current consumption: Record current samples during the measurement time and calculate the following values:
  - Average current consumption.
  - Standard deviation.

#### 5.2.4.6 File Downloading

**Identifier:** DEC/SN/006

**Title:** File Downloading



**Objective:** Measure the energy that is consumed by a SNRA while executing the feature file downloading in the Social Networking use case.

**Applicability:**

(ICSG\_ProductType = Mobile device) AND (ICSG\_UseCases includes SN) AND ICSA\_SNGetFile

**Initial Conditions:**

- DUT is in [[DUT-READY](#)] mode.

**Steps:**

1. The Test System calls the Reference App API to execute the action 4.12: Downloading three reference files.
2. The Test System measures the current consumed while the files are being downloaded.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Current consumption: Record current samples during the measurement time and calculate the following values:
  - Average current consumption.
  - Standard deviation.

## 5.2.5 High Speed Internet

### 5.2.5.1 Downloading files sequentially

**Identifier:** DEC/HS/001

**Title:** Downloading files sequentially

**Objective:** Measure the energy that is consumed by a HSRA while executing the feature downloading files sequentially in the High Speed Internet use case.

**Applicability:**

(ICSG\_ProductType = Mobile device) AND (ICSG\_UseCases includes HS)

**Initial Conditions:**

- DUT is in [[DUT-READY](#)] mode.

**Steps:**

1. The Test System calls the Reference App API to execute the action 5.1: Download three reference files.
2. The Test System measures the current consumed while the files are being downloaded.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**



- Current consumption: Record current samples during the measurement time and calculate the following values:
  - Average current consumption.
  - Standard deviation.

#### 5.2.5.2 Uploading files sequentially

**Identifier:** DEC/ HS/002

**Title:** Uploading files sequentially

**Objective:** Measure the energy that is consumed by a HSRA while executing the feature uploading files sequentially in the High Speed Internet use case.

**Applicability:**

(ICSG\_ProductType = Mobile device) AND (ICSG\_UseCases includes HS)

**Initial Conditions:**

- DUT is in [[DUT-READY](#)] mode.

**Steps:**

1. The Test System calls the Reference App API to execute the action 5.2: Upload three reference files.
2. The Test System measures the current consumed while the files are being uploaded.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Current consumption: Record current samples during the measurement time and calculate the following values:
  - Average current consumption.
  - Standard deviation.

#### 5.2.5.3 Downloading several files simultaneously

**Identifier:** DEC/ HS/003

**Title:** Downloading several files simultaneously

**Objective:** Measure the energy that is consumed by a HSRA while executing the feature downloading several files simultaneously in the High Speed Internet use case.

**Applicability:**

(ICSG\_ProductType = Mobile device) AND (ICSG\_UseCases includes HS)

**Initial Conditions:**

- DUT is in [[DUT-READY](#)] mode.

**Steps:**



1. The Test System calls the Reference App API to execute the action 5.3: Download several reference files simultaneously.
2. The Test System measures the current consumed while the files are being downloaded.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Current consumption: Record current samples during the measurement time and calculate the following values:
  - Average current consumption.
  - Standard deviation.

#### **5.2.5.4 Uploading several files simultaneously**

**Identifier:** *DEC/ HS/004*

**Title:** Uploading several files simultaneously

**Objective:** Measure the energy that is consumed by a HSRA while executing the feature uploading several files simultaneously in the High Speed Internet use case.

**Applicability:**

(ICSG\_ProductType = Mobile device) AND (ICSG\_UseCases includes HS)

**Initial Conditions:**

- DUT is in [[DUT-READY](#)] mode.

**Steps:**

1. The Test System calls the Reference App API to execute the action 5.4: Upload several reference files simultaneously.
2. The Test System measures the current consumed while the files are being uploaded.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Current consumption: Record current samples during the measurement time and calculate the following values:
  - Average current consumption.
  - Standard deviation.

#### **5.2.5.5 Downloading a file with screen off**

**Identifier:** *DEC/ HS/005*

**Title:** Downloading a file with screen off



**Objective:** Measure the energy that is consumed by a HSRA while executing the feature downloading a file in the High Speed Internet use case with the screen off.

**Applicability:**

(ICSG\_ProductType = Mobile device) AND (ICSG\_UseCases includes HS)

**Initial Conditions:**

- DUT is in [[DUT-READY](#)] mode.

**Steps:**

1. The Test System calls the Reference App API to execute the action 5.5: Download a huge file.
2. Five seconds after the start of step 1, The Test System starts measuring the current consumed while the file is being downloaded.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Current consumption: Record current samples during the measurement time and calculate the following values:
  - Average current consumption.
  - Standard deviation.

### 5.2.5.6 Uploading a file with screen off

**Identifier:** DEC/ HS/006

**Title:** Uploading a file with screen off

**Objective:** Measure the energy that is consumed by a HSRA while executing the feature uploading a file in the High Speed Internet use case with the screen off.

**Applicability:**

(ICSG\_ProductType = Mobile device) AND (ICSG\_UseCases includes HS)

**Initial Conditions:**

- DUT is in [[DUT-READY](#)] mode.

**Steps:**

1. The Test System calls the Reference App API to execute the action 5.6: Download a huge file.
2. Five seconds after the start of step 1, The Test System start measuring the current consumed while the file is being uploaded.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**



- Current consumption: Record current samples during the measurement time and calculate the following values:
  - Average current consumption.
  - Standard deviation.

## 5.2.6 Virtual Reality

### 5.2.6.1 Virtual Experience Loading

**Identifier:** DEC/VR/001

**Title:** Virtual Experience Loading

**Objective:** Measure the energy that is consumed by a VRRA while loading a Virtual experience from a single point.

**Applicability:**

(ICSG\_ProductType = Mobile device) AND (ICSG\_UseCases includes VR)

**Initial Conditions:**

- DUT is in [\[DUT-READY\]](#) mode.

**Steps:**

1. The Test System calls the Reference App API to execute the action 6.1 Select a virtual experience.
2. The Test System waits until the reference App recognizes the target object
3. The Test System spins up the DUT 30 degrees, and waits until the reference App recognizes the target object.
4. The Test System spins down the DUT 60 degrees and waits until the reference App recognizes the target object.
5. The Test System spins up the DUT 30 degrees and spins left 60 degrees and waits until the reference App recognizes the target object.
6. The Test System spins right the DUT 120 degrees and waits until the reference App recognizes the target object.
7. The Test System spins left the DUT 60 degrees and waits until the reference App recognizes the target object.
8. The Test System measures the current consumed by the DUT from step 1 to step 7.
9. The Test System spins back the DUT to the original position.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Current consumption: Record current samples during the measurement time and calculate the following values:
  - Average current consumption.



- Standard deviation.
- Time to load the virtual experience.

### 5.2.6.2 Virtual Scene Loading

**Identifier:** DEC/VR/002

**Title:** Virtual Scene Loading

**Objective:** Measure the energy that is consumed by a VRRA while moving horizontally from the initial observation point under the user control.

**Applicability:**

(ICSG\_ProductType = Mobile device) AND (ICSG\_UseCases includes VR)

**Initial Conditions:**

- DUT is in [[DUT-READY](#)] mode.

**Steps:**

1. The Test System calls the Reference App API to execute the action 6.1 Select a virtual experience.
2. The Test System waits until the target object is recognized.
3. The Test System spins up the DUT a random number of degrees between 10 and 50.
4. The Test System waits until the target object is recognized.
5. The Test System commands the reference App to move horizontally (walking speed, 4 km/h) during 20 seconds in order to change the scene.
6. The Test System measures the current consumed by the DUT during step 5 execution.
7. The Test System spins back the DUT to the original position.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Current consumption: Record current samples during the measurement time and calculate the following values:
  - Average current consumption.
  - Standard deviation.

### 5.2.7 Augmented Reality

#### 5.2.7.1 Load augmentation layer on a physical marker

**Identifier:** DEC/AR/001

**Title:** Load augmentation layer on a physical marker



**Objective:** Measure the energy that is consumed by an ARRA to render a virtual layer on top of a moving physical marker.

**Applicability:**

(ICSG\_ProductType = Mobile device) AND (ICSG\_UseCases includes AR)

**Initial Conditions:**

- DUT is in [[DUT-READY](#)] mode.

**Steps:**

1. The Test System calls the Reference App API to execute the action 7.1 Load augmentation layer on a physical marker.
2. The Test System measures the current consumed until the App displays a virtual layer on top of the physical marker.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Current consumption: Record current samples during the measurement time and calculate the following values:
  - Average current consumption.
  - Standard deviation.

### 5.2.7.2 Load Augmentation Layer at Location

**Identifier:** DEC/AR/002

**Title:** Load Augmentation Layer at location

**Objective:** Measure the energy that is consumed by an ARRA to render a virtual layer at a specific location.

**Applicability:**

(ICSG\_ProductType = Mobile device) AND (ICSG\_UseCases includes AR)

**Initial Conditions:**

- DUT is in [[DUT-READY](#)] mode.

**Steps:**

1. The Test System calls the Reference App API to execute the action 7.2 Load augmentation layer at a specific location.
2. The Test System measures the current consumed by the DUT until the App displays a virtual layer at the location specified.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**



- Current consumption: Record current samples during the measurement time and calculate the following values:
  - Average current consumption.
  - Standard deviation.

### 5.2.7.3 Augmented reality session

**Identifier:** DEC/AR/003

**Title:** Augmented reality session

**Objective:** Measure the energy that is consumed by an ARRA during an augmented reality session.

**Applicability:**

(ICSG\_ProductType = Mobile device) AND (ICSG\_UseCases includes AR)

**Initial Conditions:**

- DUT is in [[DUT-READY](#)] mode.

**Steps:**

1. The Test System calls the Reference App API to execute the action 7.1 Load augmentation layer on a physical marker.
2. The Test System spins (in one of the three axis) the DUT 15 degrees, while the physical marker remains in the same position.
3. The Test Systems wait for 5 seconds
4. The Test System measures the current consumption in steps 2 and 3, and whether the reference App keeps showing the virtual layer on top of the physical marker.
5. The Test System spins in the same axis the DUT 30 degrees in the opposite direction, while the physical marker remains in the same position.
6. The Test Systems wait for 5 seconds
7. The Test System measures the current consumption in steps 5 and 6 and whether the reference App keeps showing the virtual layer on top of the physical virtual.
8. The Test System spins the DUT back to the original position.
9. The Test System spins back to the original position.
10. The Test System repeat steps 2 to 9 in the other two axis.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Current consumption: Record current samples during the measurement time and calculate the following values:
  - Average current consumption.
  - Standard deviation.



## 5.2.8 Gaming

### 5.2.8.1 Start Game session

**Identifier:** DEC/GA/001

**Title:** Start game session

**Objective:** Measure the energy that is consumed by a GARA while starting a game session.

**Applicability:**

(ICSG\_ProductType = Mobile device) AND (ICSG\_UseCases includes GA)

**Initial Conditions:**

- DUT is in [\[DUT-READY\]](#) mode.
- Reference App options are configured to their default values.
- Any reference App screen saving option is disabled.
- Reference App resolution is configured to maximum resolution available.
- Reference App Music and sound effects are configured to be ON.
- No energy saving option is enabled in the Reference App.

**Steps:**

1. The Test System calls the Reference App API to execute the action 10.1: Start game session.
2. The Test System measures the current consumed by the DUT while the game session is being started.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Current consumption: Record current samples during the measurement time and calculate the following values:
  - Average current consumption.
  - Standard deviation.

### 5.2.8.2 Short Game session

**Identifier:** DEC/GA/002

**Title:** Short Game session

**Objective:** Measure the energy that is consumed by a GARA while playing a short game session.

**Applicability:**

(ICSG\_ProductType = Mobile device) AND (ICSG\_UseCases includes LS)

**Initial Conditions:**



- DUT is in [[DUT-READY](#)] mode.
- Reference App options are configured to their default values.
- Any reference App screen saving option is disabled.
- Reference App resolution is configured to maximum resolution available.
- Reference App Music and sound effects are configured to be ON.
- No energy saving option is enabled in the reference App.

**Steps:**

1. The Test System calls the Reference App API to execute the action 7.2: Short game session.
2. The Test System measures the current consumed while the game session is being played.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Current consumption: Record current samples during the measurement time and calculate the following values:
  - Average current consumption.
  - Standard deviation.

### 5.2.8.3 Long Game session

**Identifier:** DEC/GA/003

**Title:** Long Game session

**Objective:** Measure the energy that is consumed by a GARA while playing a long game session.

**Applicability:**

(ICSG\_ProductType = Mobile device) AND (ICSG\_UseCases includes LS)

**Initial Conditions:**

- DUT is in [[DUT-READY](#)] mode.
- Reference App options are configured to their default values.
- Any reference App screen saving option is disabled.
- Reference App resolution is configured to maximum resolution available.
- Reference App Music and sound effects are configured to be ON.
- No energy saving option is enabled in the reference App.

**Steps:**

1. The Test System calls the Reference App API to execute the action 7.3: Long game session.



2. The Test System measures the current consumed while the game session is being played.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Current consumption: Record current samples during the measurement time and calculate the following values:
  - Average current consumption.
  - Standard deviation.

## 5.3 Mobile Devices Radio Performance (RFP)

### 5.3.1 High Speed Internet

#### 5.3.1.1 Sensitivity

**Identifier:** RFP/HS/001

**Title:** Sensitivity

**Objective:** Measure the Test System power level received by the DUT at which it is able to provide a defined *target throughput* while executing the feature file downloading in the High Speed Internet use case.

Target throughput is  $\geq 95\%$  of the maximum throughput of the reference measurement channel (Max. Throughput averaged over frame: 1952.8)).

**Applicability:**

(ICSG\_ProductType = Mobile device)

**Initial Conditions:**

- The DUT is in [\[DUT-READY\]](#) mode.
- The Test System is configured in Network Scenario 'Very low coverage' as defined in section 2.2.

**Steps:**

1. The Test System sends a data file to the DUT by the use of the Reference App (e.g. using the Reference App API).
2. The Test System measures the received throughput at the DUT side during a *Throughput Measurement time* of 30 seconds.
3. If the average measured throughput is below *Target Throughput* the test case ends.
4. If the average measured throughput is above  $<1.2 * \text{Target Throughput}>$  the Test System power level is decreased 1 dB.



5. If the average measured throughput is equal or below  $<1.2 * \text{Target Throughput}>$  the Test System power level is decreased 0.2 dB.
6. *The Test System waits for 5 seconds.*
7. *Jump to step 2.*

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Throughput: Measures the average speed of the network connecting while performing the file downloading operation during the measurement time in bits per second.
- Sensitivity level: The maximum power level in dBm at which the DUT is able to receive the Test System Transmission with throughput over *Target Throughput* (i.e. the power level of the Test System in the penultimate measurement).

### 5.3.1.2 Adjacent Channel Selectivity

**Identifier:** RFP/HS/002

**Title:** Adjacent Channel Selectivity.

**Objective:** Measure the power level from an interferer signal received by the DUT at which it is able to provide a defined *target throughput* while executing the feature file downloading in the High Speed Internet use case.

Target throughput is  $\geq 95\%$  of the maximum throughput of the reference measurement channel (Max. Throughput averaged over frame: 1952.8)).

**Applicability:**

(ICSG\_ProductType = Mobile device)

**Initial Conditions:**

- The DUT is in [[DUT-READY](#)] mode.
- The Test System is configured in Network Scenario '*Adjacent interferer*' as defined in section 2.2.

**Steps:**

1. The Test System sends a data file to the DUT by the use of the Reference App (e.g. using the Reference App API).
2. The Test System measures the received throughput at the DUT side during a *Throughput Measurement time* of 30 seconds.
3. If the average measured throughput is below *Target Throughput* the test case ends.
4. If the average measured throughput is equal or above  $<1.2 * \text{Target Throughput}>$  the Test System interferer signal power level is increased 1 dB.
5. If the average measured throughput is equal or below  $<1.2 * \text{Target Throughput}>$  the Test System power interferer signal level is increased 0.2 dB.
6. *The Test System waits for 5 seconds.*



7. Jump to step 2.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Throughput: Measures the average speed of the network connecting while performing the file downloading operation during the measurement time in bits per second.
- AC selectivity level: The maximum power level in dBm configured in the interferer signal at which the DUT is able to receive the Test System Transmission with throughput over *Target Throughput* (i.e, the power level of the Test System in the penultimate measurement).

## 5.4 Mobile devices Data Performance (DDP)

### 5.4.1 Common

The tests cases in this section apply to all Use Cases.

#### 5.4.1.1 Device ON

**Identifier:** DDP/CO/001

**Title:** Device ON

**Objective:** Measure the use of network resources that are consumed by the DUT when no App is running on it (other than the Apps that are running when switching on the device with the factory configuration).

**Applicability:**

(ICSG\_ProductType = Mobile device)

**Initial Conditions:**

- DUT is in [[DUT-ON](#)] mode.

**Steps:**

1. The Test System measures the use of network resources during 20 minutes with no reference App running and the DUT switched on.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- DL IP data usage: Total number of bytes transferred in the DL during the measurement time.
- UL IP data usage: Total number of bytes transferred in the UL during the measurement time.



## 5.4.2 CS Content Distribution Streaming Services

Note: The following test cases are defined to prevent any device-side content caching which the CSRA could implement. However, if the CSRA Backend Service also implements a server-side caching (e.g., storing the current playback time for a user), preventing that effect is left to the implementation of the test case.

### 5.4.2.1 Non Interactive Playback

**Identifier:** DDP/CS/001

**Title:** Non Interactive Playback

**Objective:** Measure the network resources consumed by the DUT using a CSRA to execute the feature media file playing from the Content Distribution Streaming Services use case.

**Applicability:**

(ICSG\_ProductType = Mobile device) AND (ICSG\_UseCases includes CS)

**Initial Conditions:**

- DUT is in [[DUT-READY](#)] mode.

**Steps:**

1. The Test System calls the CSRA API to execute the action 2.1: Play three reference media files.
2. The Test System measures the network resources consumed during the reproduction of the three reference videos.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- DL IP data usage: Total number of bytes transferred in the DL during the measurement time.
- UL IP data usage: Total number of bytes transferred in the UL during the measurement time.

### 5.4.2.2 Play and Pause

**Identifier:** DDP/CS/002

**Title:** Play and Pause

**Objective:** Measure the network resources consumed by the DUT using a CSRA when a media file is in pause mode.

**Applicability:**

(ICSG\_ProductType = Mobile device) AND (ICSG\_UseCases includes CS) AND ICSA\_CSPause

**Initial Conditions:**

- DUT is in [[DUT-READY](#)] mode.

**Steps:**



1. The Test System calls the Reference App API to execute the action 2.2: Play and pause.
2. The Test System measures the network resources consumed during the period the reference video is in Pause mode.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- DL IP data usage: Total number of bytes transferred in the DL during the measurement time.
- UL IP data usage: Total number of bytes transferred in the UL during the measurement time.

### 5.4.2.3 Rewind

**Identifier:** DDP/CS/003

**Title:** Rewind

**Objective:** Measure the network resources consumed by the DUT using a CSRA to execute a rewind operation while playing a media file.

**Applicability:**

(ICSG\_ProductType = Mobile device) AND (ICSG\_UseCases includes CS) AND ICSA\_CSRewind

**Initial Conditions:**

- DUT is in [[DUT-READY](#)] mode.

**Steps:**

1. The Test System calls the Reference App API to execute the action 2.9: Rewind.
2. The Test System measures the network resources consumed while the reproduction of the reference video is in rewind mode.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- DL IP data usage: Total number of bytes transferred in the DL during the measurement time.
- UL IP data usage: Total number of bytes transferred in the UL during the measurement time.

### 5.4.2.4 Download content for offline playing

**Identifier:** DDP/CS/004

**Title:** Download content for offline playing



**Objective:** Measure the network resources consumed by the DUT using a CSRA when downloading a media file for offline playing.

**Applicability:**

(ICSG\_ProductType = Mobile device) AND (ICSG\_UseCases includes CS) AND ICSA\_CSDownloadMedia

**Initial Conditions:**

- DUT is in [[DUT-READY](#)] mode.

**Steps:**

1. The Test System calls the Reference App API to execute the action 2.4: Download a media file.
2. The Test System measures the network resources consumed while the media file is being downloaded.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- DL IP data usage: Total number of bytes transferred in the DL during the measurement time.
- UL IP data usage: Total number of bytes transferred in the UL during the measurement time.

### 5.4.2.5 Fast Forward

**Identifier:** DDP/CS/005

**Title:** Fast Forward

**Objective:** Measure the network resources consumed by the DUT using a CSRA when performing fast forward operation while playing a media file.

**Applicability:**

(ICSG\_ProductType = Mobile device) AND (ICSG\_UseCases includes CS) AND ICSA\_CSFastForward

**Initial Conditions:**

- DUT is in [[DUT-READY](#)] mode.

**Steps:**

1. The Test System calls the Reference App API to execute the action 2.10: Fast Forward.
2. The Test System measures the network resources consumed while the reproduction of the reference video is in Fast Forward mode.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**



- DL IP data usage: Total number of bytes transferred in the DL during the measurement time.
- UL IP data usage: Total number of bytes transferred in the UL during the measurement time.

### 5.4.3 Live Streaming Services

#### 5.4.3.1 Play Live Video from User

**Identifier:** *DDP/LS/001*

**Title:** Play Live Video from User

**Objective:** Measure the network resources consumed by the DUT using a LSRA to execute the feature live video playing from the Live Streaming Services use case with a reference App.

**Applicability:**

(ICSG\_ProductType = Mobile device) AND (ICSG\_UseCases includes LS)

**Initial Conditions:**

- DUT is in [[DUT-READY](#)] mode.
- A live video is generated as defined in section 2.6.1.

**Steps:**

1. The Test System calls the Reference App API to execute the action 3.1: Play a live video.
2. The Test System measures the network resources consumed during the reproduction of the live video streaming.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- DL IP data usage: Total number of bytes transferred in the DL during the measurement time.
- UL IP data usage: Total number of bytes transferred in the UL during the measurement time.

#### 5.4.3.2 Broadcast Live Video

**Identifier:** *DDP/LS/002*

**Title:** Broadcast Live Video to User

**Objective:** Measure the network resources consumed by the DUT using a LSRA to broadcast live content.

**Applicability:**

(ICSG\_ProductType = Mobile device) AND (ICSG\_UseCases includes LS)

**Initial Conditions:**

- DUT is in [[DUT-READY](#)] mode.
- The test case configuration is as defined in section 2.8.3 (Figure 3), with the DUT camera focused on the fixed TV pattern RTVP1.

**Steps:**

1. The Test System calls the Reference App API to execute the action 3.2: Broadcast live video.
2. The Test System measures the network resources consumed during the reproduction of the live video streaming.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- DL IP data usage: Total number of bytes transferred in the DL during the measurement time.
- UL IP data usage: Total number of bytes transferred in the UL during the measurement time.

### 5.4.3.3 Broadcast live video with screen off

**Identifier:** *DDP/LS/003*

**Title:** Broadcast live video with screen off

**Objective:** Measure the network resources consumed by the DUT using a LSRA to execute the feature broadcast a live video from the Live Streaming Services use case when the screen is turned off.

**Applicability:**

(ICSG\_ProductType = Mobile device) AND (ICSG\_UseCases includes LS) AND ICSA\_LSBroadcastScreenOff

**Initial Conditions:**

- DUT is in [[DUT-READY](#)] mode.
- The test case configuration is as defined in section 2.8.3 (Figure 3), with the DUT camera focused on the fixed TV pattern RTVP1.

**Steps:**

1. The Test System calls the Reference App API to execute the action 3.2: Broadcast live video.
2. After 10 seconds, the Test Systems turns the DUT screen off.
3. After the DUT screen is off, the Test System measures the network resources consumed by the DUT during 10 minutes.

**Postamble:**

- The Test System turns the DUT screen ON.



- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- DL IP data usage: Total number of bytes transferred in the DL during the measurement time.
- UL IP data usage: Total number of bytes transferred in the UL during the measurement time.

#### 5.4.4 Social Networking

##### 5.4.4.1 Picture Posting

**Identifier:** *DDP/SN/001*

**Title:** Picture Posting

**Objective:** Measure the network resources consumed by the DUT using a SNRA to execute the feature picture posting in the Social Networking use case.

**Applicability:**

(ICSG\_ProductType = Mobile device) AND (ICSG\_UseCases includes SN) AND ICSA\_SNPostImage

**Initial Conditions:**

- DUT is in [[DUT-READY](#)] mode.

**Steps:**

1. The Test System calls the Reference App API to execute the action 4.2: Post pictures.
2. The Test System measures the network resources consumed while the pictures are being posted.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- DL IP data usage: Total number of bytes transferred in the DL during the measurement time.
- UL IP data usage: Total number of bytes transferred in the UL during the measurement time.

##### 5.4.4.2 Video Posting

**Identifier:** *DDP/SN/002*

**Title:** Video Uploading

**Objective** Measure the network resources consumed by the DUT using a SNRA to execute the feature video posting in the Social Networking use case.

**Applicability:**



(ICSG\_ProductType = Mobile device) AND (ICSG\_UseCases includes SN) AND ICSA\_SNPostVideo

**Initial Conditions:**

- DUT is in [[DUT-READY](#)] mode.

**Steps:**

1. The Test System calls the Reference App API to execute the action 4.3: Post videos sequentially.
2. The Test System measures the network resources consumed while the videos are being posted.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- DL IP data usage: Total number of bytes transferred in the DL during the measurement time.
- UL IP data usage: Total number of bytes transferred in the UL during the measurement time.

### 5.4.4.3 File Posting

**Identifier:** *DDP/SN/003*

**Title:** File Posting

**Objective:** Measure the network resources consumed by the DUT using a SNRA to execute the feature file posting in the Social Networking use case.

**Applicability:**

(ICSG\_ProductType = Mobile device) AND (ICSG\_UseCases includes SN) AND ICSA\_SNPostFile.

**Initial Conditions:**

- DUT is in [[DUT-READY](#)] mode.

**Steps:**

1. The Test System calls the Reference App API to execute the action 4.6: Post three reference files separately.
2. The Test System measures the network resources consumed while the files are being posted.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- DL IP data usage: Total number of bytes transferred in the DL during the measurement time.



- UL IP data usage: Total number of bytes transferred in the UL during the measurement time.

#### 5.4.4.4 Show Picture

**Identifier:** *DDP/SN/004*

**Title:** Show Picture

**Objective:** Measure the network resources consumed by the DUT using a SNRA to execute the feature show picture (downloading) in the Social Networking use case.

**Applicability:**

(ICSG\_ProductType = Mobile device) AND (ICSG\_UseCases includes SN) AND ICSA\_SNGetImage

**Initial Conditions:**

- DUT is in [[DUT-READY](#)] mode.

**Steps:**

1. The Test System calls the Reference App API to execute the action 4.8: Get three reference pictures.
2. The Test System measures the network resources consumed while the pictures are being downloaded and until the pictures are completely displayed at their final resolution.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- DL IP data usage: Total number of bytes transferred in the DL during the measurement time.
- UL IP data usage: Total number of bytes transferred in the UL during the measurement time.

#### 5.4.4.5 Play Video

**Identifier:** *DDP/SN/005*

**Title:** Play Video

**Objective:** Measure the network resources consumed by the DUT using a SNRA to execute the feature play video in the Social Networking use case.

**Applicability:**

(ICSG\_ProductType = Mobile device) AND (ICSG\_UseCases includes SN) AND ICSA\_SNGetVideo

**Initial Conditions:**

- DUT is in [[DUT-READY](#)] mode.

**Steps:**

1. The Test System calls the Reference App API to execute the action 4.9 Play three reference videos.
2. The Test System measures the network resources consumed while the videos are being played.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- DL IP data usage: Total number of bytes transferred in the DL during the measurement time.
- UL IP data usage: Total number of bytes transferred in the UL during the measurement time.

#### 5.4.4.6 File Downloading

**Identifier:** *DDP/SN/006*

**Title:** File Downloading

**Objective** Measure the network resources consumed by the DUT using a SNRA to execute the feature file downloading in the Social Networking use case.

**Applicability:**

(ICSG\_ProductType = Mobile device) AND (ICSG\_UseCases includes SN) AND ICSA\_SNGetFile

**Initial Conditions:**

- DUT is in [[DUT-READY](#)] mode.

**Steps:**

1. The Test System calls the Reference App API to execute the action 4.12: Downloading three reference files.
2. The Test System measures the network resources consumed while the files are being downloaded.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- DL IP data usage: Total number of bytes transferred in the DL during the measurement time.
- UL IP data usage: Total number of bytes transferred in the UL during the measurement time.



## 5.4.5 High Speed Internet

### 5.4.5.1 Downloading files sequentially

**Identifier:** DDP/HS/001

**Title:** Downloading files sequentially

**Objective:** Measure the network resources consumed by the DUT using a HSRA to execute the feature downloading files sequentially in the High Speed Internet use case.

**Applicability:**

(ICSG\_ProductType = Mobile device) AND (ICSG\_UseCases includes HS)

**Initial Conditions:**

- DUT is in [[DUT-READY](#)] mode.

**Steps:**

1. The Test System calls the Reference App API to execute the action 5.1: Download three reference files.
2. The Test System measures the network resources consumed while the files are being downloaded.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- DL IP data usage: Total number of bytes transferred in the DL during the measurement time.
- UL IP data usage: Total number of bytes transferred in the UL during the measurement time.

### 5.4.5.2 Uploading files sequentially

**Identifier:** DDP/ HS/002

**Title:** Uploading files sequentially

**Objective:** Measure the network resources consumed by the DUT using a HSRA to execute the feature uploading files sequentially in the High Speed Internet use case.

**Applicability:**

(ICSG\_ProductType = Mobile device) AND (ICSG\_UseCases includes HS)

**Initial Conditions:**

- DUT is in [[DUT-READY](#)] mode.

**Steps:**

1. The Test System calls the Reference App API to execute the action 5.2: Upload three reference files.
2. The Test System measures the network resources consumed while the files are being uploaded.



**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- DL IP data usage: Total number of bytes transferred in the DL during the measurement time.
- UL IP data usage: Total number of bytes transferred in the UL during the measurement time.

### 5.4.5.3 Downloading several files simultaneously

**Identifier:** *DDP/ HS/003*

**Title:** Downloading several files simultaneously

**Objective:** Measure the network resources consumed by the DUT using a HSRA to execute the feature downloading several files simultaneously in the High Speed Internet use case.

**Applicability:**

(ICSG\_ProductType = Mobile device) AND (ICSG\_UseCases includes HS)

**Initial Conditions:**

- DUT is in [[DUT-READY](#)] mode.

**Steps:**

1. The Test System calls the Reference App API to execute the action 5.3: Download several reference files simultaneously.
2. The Test System measures the network resources consumed while the files are being downloaded.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- DL IP data usage: Total number of bytes transferred in the DL during the measurement time.
- UL IP data usage: Total number of bytes transferred in the UL during the measurement time.

### 5.4.5.4 Uploading several files simultaneously

**Identifier:** *DDP/ HS/004*

**Title:** Uploading several files simultaneously

**Objective:** Measure the network resources consumed by the DUT using a HSRA to execute the feature uploading several files simultaneously in the High Speed Internet use case.

**Applicability:**

(ICSG\_ProductType = Mobile device) AND (ICSG\_UseCases includes HS)

**Initial Conditions:**

- DUT is in [[DUT-READY](#)] mode.

**Steps:**

1. The Test System calls the Reference App API to execute the action 5.4: Upload several reference files simultaneously.
2. The Test System measures the network resources consumed while the files are being uploaded.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- DL IP data usage: Total number of bytes transferred in the DL during the measurement time.
- UL IP data usage: Total number of bytes transferred in the UL during the measurement time.

#### 5.4.5.5 Downloading a file with screen off

**Identifier:** *DDP/HS/005*

**Title:** Downloading a file with screen off

**Objective:** Measure the network resources consumed by the DUT using a HSRA to execute the feature downloading a file in the High Speed Internet use case with the screen off.

**Applicability:**

(ICSG\_ProductType = Mobile device) AND (ICSG\_UseCases includes HS)

**Initial Conditions:**

- DUT is in [[DUT-READY](#)] mode.

**Steps:**

1. The Test System calls the Reference App API to execute the action 5.5: Download a huge file.
2. Five seconds after the start of step 1, The Test System starts measuring the network resources consumed while the file is being downloaded.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- DL IP data usage: Total number of bytes transferred in the DL during the measurement time.
- UL IP data usage: Total number of bytes transferred in the UL during the measurement time.



#### 5.4.5.6 Uploading a file with screen off

**Identifier:** DDP/HS/006

**Title:** Uploading a file with screen off

**Objective:** Measure the network resources consumed by the DUT using a HSRA to execute the feature uploading a file in the High Speed Internet use case with the screen off.

**Applicability:**

(ICSG\_ProductType = Mobile device) AND (ICSG\_UseCases includes HS)

**Initial Conditions:**

- DUT is in [[DUT-READY](#)] mode.

**Steps:**

1. The Test System calls the Reference App API to execute the action 5.6: Download a huge file.
2. Five seconds after the start of step 1, The Test System start measuring the network resources consumed while the file is being uploaded.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- DL IP data usage: Total number of bytes transferred in the DL during the measurement time.
- UL IP data usage: Total number of bytes transferred in the UL during the measurement time.

### 5.4.6 Virtual Reality

#### 5.4.6.1 Virtual Experience Loading

**Identifier:** DDP/VR/001

**Title:** Virtual Experience Loading

**Objective:** Measure the network resources consumed by the DUT using a VRRRA to load a Virtual experience from a single point.

**Applicability:**

(ICSG\_ProductType = Mobile device) AND (ICSG\_UseCases includes VR)

**Initial Conditions:**

- DUT is in [[DUT-READY](#)] mode.

**Steps:**

1. The Test System calls the Reference App API to execute the action 6.1 Select a virtual experience.
2. The Test System waits until the reference App recognizes the target object



3. The Test System spins up the DUT 30 degrees, and waits until the reference App recognizes the target object.
4. The Test System spins down the DUT 60 degrees and waits until the reference App recognizes the target object.
5. The Test System spins up the DUT 30 degrees and spins left 60 degrees and waits until the reference App recognizes the target object.
6. The Test System spins right the DUT 120 degrees and waits until the reference App recognizes the target object.
7. The Test System spins left the DUT 60 degrees and waits until the reference App recognizes the target object.
8. The Test System measures the network resources consumed by the DUT from step 1 to step 7.
9. The Test System spins back the DUT to the original position.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- DL IP data usage: Total number of bytes transferred in the DL during the measurement time.
- UL IP data usage: Total number of bytes transferred in the UL during the measurement time.

### 5.4.6.2 Virtual Scene Loading

**Identifier:** *DDP/VR/002*

**Title:** Virtual Scene Loading

**Objective:** Measure the network resources consumed by the DUT using a HSRA while moving horizontally from the initial observation point under the user control.

.

**Applicability:**

(ICSG\_ProductType = Mobile device) AND (ICSG\_UseCases includes VR)

**Initial Conditions:**

- DUT is in [[DUT-READY](#)] mode.

**Steps:**

1. The Test System calls the Reference App API to execute the action 6.1 Select a virtual experience.
2. The Test System waits until the target object is recognized.
3. The Test System spins up the DUT a random number of degrees between 10 and 50.
4. The Test System waits until the target object is recognized.



5. The Test System commands the reference App to move horizontally (walking speed, 4 km/h) during 20 seconds in order to change the scene.
6. The Test System measures the network resources consumed by the DUT during step 5 execution.
7. The Test System spins back the DUT to the original position.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- DL IP data usage: Total number of bytes transferred in the DL during the measurement time.
- UL IP data usage: Total number of bytes transferred in the UL during the measurement time.

### 5.4.7 Augmented Reality

#### 5.4.7.1 Load augmentation layer on a physical marker

**Identifier:** DDP/AR/001

**Title:** Load augmentation layer on a physical marker

**Objective:** Measure the network resources consumed by the DUT using an ARRA to render a virtual layer on top of a moving physical marker.

**Applicability:**

(ICSG\_ProductType = Mobile device) AND (ICSG\_UseCases includes AR)

**Initial Conditions:**

- DUT is in [[DUT-READY](#)] mode.

**Steps:**

1. The Test System calls the Reference App API to execute the action 7.1 Load augmentation layer on a physical marker.
2. The Test System measures the network resources consumed until the App displays a virtual layer on top of the physical marker.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- DL IP data usage: Total number of bytes transferred in the DL during the measurement time.
- UL IP data usage: Total number of bytes transferred in the UL during the measurement time.



#### 5.4.7.2 Load Augmentation Layer at Location

**Identifier:** DDP/AR/002

**Title:** Load Augmentation Layer at location

**Objective:** Measure the network resources consumed by the DUT using an ARRA to render a virtual layer at a specific location.

**Applicability:**

(ICSG\_ProductType = Mobile device) AND (ICSG\_UseCases includes AR)

**Initial Conditions:**

- DUT is in [[DUT-READY](#)] mode.

**Steps:**

1. The Test System calls the Reference App API to execute the action 7.2 Load augmentation layer at a specific location.
2. The Test System measures the network resources consumed by the DUT until the App displays a virtual layer at the location specified.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- DL IP data usage: Total number of bytes transferred in the DL during the measurement time.
- UL IP data usage: Total number of bytes transferred in the UL during the measurement time.

#### 5.4.7.3 Augmented reality session

**Identifier:** DDP/AR/003

**Title:** Augmented reality session

**Objective:** Measure the network resources consumed by the DUT using an ARRA during an augmented reality session.

**Applicability:**

(ICSG\_ProductType = Mobile device) AND (ICSG\_UseCases includes AR)

**Initial Conditions:**

- DUT is in [[DUT-READY](#)] mode.

**Steps:**

1. The Test System calls the Reference App API to execute the action 7.1 Load augmentation layer on a physical marker.
2. The Test System spins (in one of the three axis) the DUT 15 degrees, while the physical marker remains in the same position.
3. The Test Systems wait for 5 seconds



4. The Test System measures the network resources consumption in steps 2 and 3, and whether the reference App keeps showing the virtual layer on top of the physical marker.
5. The Test System spins in the same axis the DUT 30 degrees in the opposite direction, while the physical marker remains in the same position.
6. The Test Systems wait for 5 seconds
7. The Test System measures the network resources consumption in steps 5 and 6 and whether the reference App keeps showing the virtual layer on top of the physical virtual.
8. The Test System spins the DUT back to the original position.
9. The Test System spins back to the original position.
10. The Test System repeat steps 2 to 9 in the other two axis.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- DL IP data usage: Total number of bytes transferred in the DL during the measurement time.
- UL IP data usage: Total number of bytes transferred in the UL during the measurement time.

## 5.4.8 Gaming

### 5.4.8.1 Start Game session

**Identifier:** *DDP/GA/001*

**Title:** Start game session

**Objective:** Measure the network resources consumed by the DUT using a GARA while starting a game session.

**Applicability:**

(ICSG\_ProductType = Mobile device) AND (ICSG\_UseCases includes GA)

**Initial Conditions:**

- DUT is in [[DUT-READY](#)] mode.
- Reference App options are configured to their default values.
- Any reference App screen saving option is disabled.
- Reference App resolution is configured to maximum resolution available.
- Reference App Music and sound effects are configured to be ON.
- No energy saving option is enabled in the Reference App.

**Steps:**

1. The Test System calls the Reference App API to execute the action 10.1: Start game session.



2. The Test System measures the network resources consumed by the DUT while the game session is being started.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- DL IP data usage: Total number of bytes transferred in the DL during the measurement time.
- UL IP data usage: Total number of bytes transferred in the UL during the measurement time.

#### 5.4.8.2 Short Game session

**Identifier:** *DDP/GA/002*

**Title:** Short Game session

**Objective:** Measure the network resources consumed by the DUT using a GARA while playing a short game session.

**Applicability:**

(ICSG\_ProductType = Mobile device) AND (ICSG\_UseCases includes LS)

**Initial Conditions:**

- DUT is in [[DUT-READY](#)] mode.
- Reference App options are configured to their default values.
- Any reference App screen saving option is disabled.
- Reference App resolution is configured to maximum resolution available.
- Reference App Music and sound effects are configured to be ON.
- No energy saving option is enabled in the reference App.

**Steps:**

1. The Test System calls the Reference App API to execute the action 7.2: Short game session.
2. The Test System measures the network resources consumed while the game session is being played.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- DL IP data usage: Total number of bytes transferred in the DL during the measurement time.
- UL IP data usage: Total number of bytes transferred in the UL during the measurement time.



### 5.4.8.3 Long Game session

**Identifier:** DDP/GA/003

**Title:** Long Game session

**Objective:** Measure the network resources consumed by the DUT using a GARA while playing a long game session.

**Applicability:**

(ICSG\_ProductType = Mobile device) AND (ICSG\_UseCases includes LS)

**Initial Conditions:**

- DUT is in [[DUT-READY](#)] mode.
- Reference App options are configured to their default values.
- Any reference App screen saving option is disabled.
- Reference App resolution is configured to maximum resolution available.
- Reference App Music and sound effects are configured to be ON.
- No energy saving option is enabled in the reference App.

**Steps:**

1. The Test System calls the Reference App API to execute the action 7.3: Long game session.
2. The Test System measures the network resources consumed while the game session is being played.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- DL IP data usage: Total number of bytes transferred in the DL during the measurement time.
- UL IP data usage: Total number of bytes transferred in the UL during the measurement time.



## 6 IoT devices

### 6.1 IoT devices Energy Consumption (IEC)

#### 6.1.1 Common

The tests cases in this section apply to all Use Cases.

##### 6.1.1.1 IUT in idle mode

**Identifier:** IEC/CO/001

**Title:** IUT in idle mode

**Objective:** Measure the energy that is consumed by the IUT when it is in idle mode.

**Applicability:**

(ICSG\_ProductType = IoT device) AND ICSDI\_IdleMode

**Initial Conditions:**

IUT is in [\[IUT STARTED\]](#) mode.

**Steps:**

1. The Test System measures the current consumption during 2 minutes, being the IUT in idle mode.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Current consumption: Record current samples during the measurement time and calculate the following values:
  - Average current consumption.
  - Standard deviation

Item	Description	Status	Support	Mnemonic
1	Support of Playing received video	O		ICSDI_ReceiveVideo
2	Support of Video transmission	O		ICSDI_TransmitVideo
3	Support of Playing Received audio	O		ICSDI_ReceiveAudio
4	Support of Audio transmission	O		ICSDI_TransmitAudio
5	Support of Idle mode	O		ICSDI_IdleMode
6	Support of Audio transmission without Video	C.01		ICSDI_TransmitAudioWithoutVideo



7	Support of Playing received Audio without Video	C.02		ICSDI_ReceiveAudioWithoutVideo
8	Device is connected to a Battery	O		ICSDI_Battery
C.01 IF A.4/4 THEN O ELSE N/A C.02 IF A.4/3 THEN O ELSE N/A				

## 6.1.2 ES Emergency Services

### 6.1.2.1 Send Video streaming

**Identifier:** IEC/ES/001

**Title:** Send Video Streaming

**Objective:** Measure the energy that is consumed by an IUT while executing the feature Send Video Streaming from the Emergency Services use case.

**Applicability:**

(ICSG\_ProductType = IoT device) AND (ICSG\_UseCases includes ES) AND ICSDI\_TransmitVideo

**Initial Conditions:**

IUT is in [\[IUT STARTED\]](#) mode.

**Steps:**

1. The Test System commands the IUT by the Control Interface to perform the feature 'Send live video streaming'.
2. After ten seconds, the Test System measures the current consumed for 2 minutes.
3. The Test System commands the IUT by the Control Interface to perform the feature 'Stop sending stream live video'.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Current consumption: Record current samples during the measurement time and calculate the following values:
  - Average current consumption.
  - Standard deviation

### 6.1.2.2 Send audio streaming

**Identifier:** IEC/ES/002

**Title:** Send Audio Streaming



**Objective:** Measure the energy that is consumed by an IUT while executing the feature Send Audio Streaming from the Emergency Services use case.

**Applicability:**

(ICSG\_ProductType = IoT device) AND (ICSG\_UseCases includes ES) AND ICSDI\_TransmitAudioWithoutVideo

**Initial Conditions:**

IUT is in [\[IUT STARTED\]](#) mode.

**Steps:**

1. The Test System commands the IUT by the Control Interface to perform the feature 'Send live audio streaming.'
2. After ten seconds, the Test System measures the current consumed for 2 minutes.
3. The Test System commands the IUT by the Control Interface to perform the feature 'Stop streaming live audio.'

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Current consumption: Record current samples during the measurement time and calculate the following values:
  - Average current consumption.
  - Standard deviation

### 6.1.2.3 Receive Video streaming

**Identifier:** IEC/ES/003

**Title:** Receive Video Streaming

**Objective:** Measure the energy that is consumed by an IUT while executing the feature Receive Video Streaming from the Emergency Services use case.

**Applicability:**

(ICSG\_ProductType = IoT device) AND (ICSG\_UseCases includes ES) AND ICSDI\_ReceiveVideo

**Initial Conditions:**

IUT is in [\[IUT STARTED\]](#) mode.

**Steps:**

1. The Test System commands the IUT by the Control Interface to perform the feature 'Receive live video streaming'.
2. After ten seconds, the Test System measures the current consumed for 2 minutes.



3. The Test System commands the IUT by the Control Interface to perform the feature 'Stop receiving live video'.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Current consumption: Record current samples during the measurement time and calculate the following values:
  - Average current consumption.
  - Standard deviation

#### **6.1.2.4 Receive Audio streaming**

**Identifier:** IEC/ES/004

**Title:** Receive Audio Streaming

**Objective:** Measure the energy that is consumed by an IUT while executing the feature Receive Audio Streaming from the Emergency Services use case.

**Applicability:**

(ICSG\_ProductType = IoT device) AND (ICSG\_UseCases includes ES) AND ICSDI\_ReceiveAudioWithoutVideo

**Initial Conditions:**

IUT is in [\[IUT STARTED\]](#) mode.

**Steps:**

1. The Test System commands the IUT by the Control Interface to perform the feature 'Receive live audio Streaming'.
2. After ten seconds, the Test System measures the current consumed for 2 minutes.
3. The Test System commands the IUT by the Control Interface to perform the feature 'Stop streaming live audio'.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Current consumption: Record current samples during the measurement time and calculate the following values:
  - Average current consumption.
  - Standard deviation

### **6.2 IoT devices Data Performance (IDP)**



### 6.2.1 Common

The tests cases in this section apply to all Use Cases.

#### 6.2.1.1 IUT in idle mode

**Identifier:** IDP/CO/001

**Title:** IUT in idle mode

**Objective:** Measure the IUT data performance when it is in idle mode.

**Applicability:**

(ICSG\_ProductType = IoT device) AND ICSDI\_IdleMode

**Initial Conditions:**

IUT is in [\[IUT STARTED\]](#) mode.

**Steps:**

1. The Test System measures the data performance of the IUT in Idle mode during 20 minutes (as defined in the measurements section).

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- DL IP data usage: Total number of bytes transferred in the DL during the measurement time.
- UL IP data usage: Total number of bytes transferred in the UL during the measurement time.

### 6.2.2 ES Emergency Services

#### 6.2.2.1 Send Video streaming

**Identifier:** IDP/ES/001

**Title:** Send Video Streaming

**Objective:** Measure the IUT data performance while executing the feature Send Video Streaming from the Emergency Services use case.

**Applicability:**

(ICSG\_ProductType = IoT device) AND (ICSG\_UseCases includes ES) AND ICSDI\_TransmitVideo

**Initial Conditions:**

IUT is in [\[IUT STARTED\]](#) mode.

**Steps:**

1. The Test System commands the IUT by the Control Interface to perform the feature 'Send Stream live video'.



2. After ten seconds, the Test System measures the data performance of the IUT for 2 minutes.
3. The Test System commands the IUT by the Control Interface to perform the feature 'Stop sending stream live video'.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- DL IP data usage: Total number of bytes transferred in the DL during the measurement time.
- UL IP data usage: Total number of bytes transferred in the UL during the measurement time.

### 6.2.2.2 Send Audio streaming

**Identifier:** IDP/ES/002

**Title:** Send Audio Streaming

**Objective:** Measure the IUT data performance while executing the feature Send Audio Streaming from the Emergency Services use case.

**Applicability:**

(ICSG\_ProductType = IoT device) AND (ICSG\_UseCases includes ES) AND ICSDI\_TransmitAudio

**Initial Conditions:**

IUT is in [\[IUT STARTED\]](#) mode.

**Steps:**

1. The Test System commands the IUT by the Control Interface to perform the feature 'Send streaming live audio.'
2. After ten seconds, the Test measures the data performance of the IUT for 2 minutes.
3. The Test System commands the IUT by the Control Interface to perform the feature 'Stop streaming live audio.'

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- DL IP data usage: Total number of bytes transferred in the DL during the measurement time.
- UL IP data usage: Total number of bytes transferred in the UL during the measurement time.



### 6.2.2.3 Receive Video streaming

**Identifier:** IDP/ES/003

**Title:** Receive Video Streaming

**Objective:** Measure the IUT data performance while executing the feature Receive Video Streaming from the Emergency Services use case.

**Applicability:**

(ICSG\_ProductType = IoT device) AND (ICSG\_UseCases includes ES) AND ICSDI\_ReceiveVideo

**Initial Conditions:**

IUT is in [\[IUT STARTED\]](#) mode.

**Steps:**

1. The Test System commands the IUT by the Control Interface to perform the feature 'Receive live video streaming'.
2. After ten seconds, the Test System measures the data performance of the IUT for 2 minutes.
3. The Test System commands the IUT by the Control Interface to perform the feature 'Stop receiving live video'.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- DL IP data usage: Total number of bytes transferred in the DL during the measurement time.
- UL IP data usage: Total number of bytes transferred in the UL during the measurement time.

### 6.2.2.4 Receive Audio streaming

**Identifier:** IDP/ES/004

**Title:** Receive Audio Streaming

**Objective:** Measure the IUT data performance while executing the feature Receive Audio Streaming from the Emergency Services use case.

**Applicability:**

(ICSG\_ProductType = IoT device) AND (ICSG\_UseCases includes ES) AND ICSDI\_ReceiveAudio

**Initial Conditions:**

IUT is in [\[IUT STARTED\]](#) mode.

**Steps:**

1. The Test System commands the IUT by the Control Interface to perform the feature 'Stream live audio'.



2. After ten seconds, the Test System measures the data performance of the IUT for 2 minutes.
3. The Test System commands the IUT by the Control Interface to perform the feature 'Stop streaming live audio'.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- DL IP data usage: Total number of bytes transferred in the DL during the measurement time.
- UL IP data usage: Total number of bytes transferred in the UL during the measurement time.

## **6.3 IoT Devices Reliability (IDR)**

### **6.3.1 Common**

The tests cases in this section apply to all Use Cases.

#### **6.3.1.1 Network Connection**

**Identifier:** IDR/CO/001

**Title:** Network Connection

**Objective:** Measure the IUT reliability KPIs when connecting to the network.

**Applicability:**

(ICSG\_ProductType = IoT device)

**Initial Conditions:**

IUT is in [\[IUT-OFF\]](#) mode.

**Steps:**

1. The IUT is switched ON
2. The Test System establishes a data path with the IUT.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Network connection: Establishment of network connection between the Test System and the IuT.

### **6.3.2 ES Emergency Services**

#### **6.3.2.1 Send video streaming**

**Identifier:** IDR/ES/001



**Title:** Send video streaming

**Objective:** Measure the IUT reliability KPIs while executing the feature Send Video Streaming from the Emergency Services use case.

**Applicability:**

(ICSG\_ProductType = IoT device) AND (ICSG\_UseCases includes ES) AND ICSDI\_TransmitVideo

**Initial Conditions:**

IUT is in [\[IUT STARTED\]](#) mode.

**Steps:**

1. The Test System commands the IUT by the Control Interface to perform the feature 'Send live video streaming'.
2. The Test System measures the number and duration of re-buffering occurrences for 2 minutes.
3. The Test System commands the IUT by the Control Interface to perform the feature 'Stop sending stream live video'.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Stream Availability: Probability that stream transmission starts (it starts being received at the other side).
- Stream Cut-off: Probability that successfully started stream reproduction is ended by a cause other than the intentional termination by the user.
- Video resolution: Used frame resolution.

### 6.3.2.2 Send audio streaming

**Identifier:** IDR/ES/002

**Title:** Send Audio Streaming

**Objective:** Measure the IUT reliability KPIs while executing the feature Send Audio Streaming from the Emergency Services use case.

**Applicability:**

(ICSG\_ProductType = IoT device) AND (ICSG\_UseCases includes ES) AND ICSDI\_TransmitAudio

**Initial Conditions:**

IUT is in [\[IUT STARTED\]](#) mode.

**Steps:**

1. The Test System commands the IUT by the Control Interface to perform the feature 'Send live audio streaming'.



2. The Test System measures the number and duration of re-buffering occurrences for 2 minutes.
3. The Test System commands the IUT by the Control Interface to perform the feature 'Stop streaming live audio'.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Stream Availability: Probability that stream transmission starts (it starts being received at the other side).
- Stream Cut-off: Probability that successfully started audio stream reproduction is ended by a cause other than the intentional termination by the user.

### 6.3.2.3 Receive video streaming

**Identifier:** IDR/ES/003

**Title:** Receive Video Streaming

**Objective:** Measure the IUT reliability KPIs while executing the feature Receive Video Streaming from the Emergency Services use case.

**Applicability:**

(ICSG\_ProductType = IoT device) AND (ICSG\_UseCases includes ES) AND ICSDI\_ReceiveVideo

**Initial Conditions:**

IUT is in [\[IUT STARTED\]](#) mode.

**Steps:**

1. The Test System commands the IUT by the Control Interface to perform the feature 'Receive live video streaming'.
2. The Test System measures the number and duration of re-buffering occurrences for 2 minutes.
3. The Test System commands the IUT by the Control Interface to perform the feature 'Stop receiving live video'.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Stream Availability: Probability that stream reproduction starts at the IoT side.
- Stream Cut-off: Probability that successfully started stream reproduction is ended by a cause other than the intentional termination by the user.
- Video resolution: Used frame resolution.



#### 6.3.2.4 Receive audio streaming

**Identifier:** IDR/ES/004

**Title:** Receive audio streaming

**Objective:** Measure the IUT reliability KPIs while executing the feature Receive Audio Streaming from the Emergency Services use case.

**Applicability:**

(ICSG\_ProductType = IoT device) AND (ICSG\_UseCases includes ES) AND ICSDI\_ReceiveAudio

**Initial Conditions:**

IUT is in [\[IUT STARTED\]](#) mode.

**Steps:**

1. The Test System commands the IUT by the Control Interface to perform the feature 'Receive live audio Streaming'.
2. The Test System measures the number and duration of re-buffering occurrences for 2 minutes.
3. The Test System commands the IUT by the Control Interface to perform the feature 'Stop streaming live audio'.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Stream Availability: Probability that stream reproduction starts at the IoT side.
- Stream Cut-off: Probability that successfully started audio stream reproduction is ended by a cause other than the intentional termination by the user.

#### 6.3.2.5 Power failure when sending video streaming

**Identifier:** IDR/ES/005

**Title:** Power failure when sending video streaming

**Objective:** Measure the IUT reliability KPIs when there is a power failure while executing the feature Send Video Streaming from the Emergency Services use case.

**Applicability:**

(ICSG\_ProductType = IoT device) AND (ICSG\_UseCases includes ES) AND ICSDI\_TransmitVideo AND (NOT ICSDI\_Battery)

**Initial Conditions:**

IUT is in [\[IUT STARTED\]](#) mode.

**Steps:**

1. The Test System commands the IUT by the Control Interface to perform the feature 'Send live video streaming'.



2. After one minute, the Test System stops feeding the IoT devices by setting the DC power source in OFF state.
3. After one minute, the Test System sets the DC power source in ON state again according to the nominal power of the IUT.
4. The Test System commands the IUT by the Control Interface to perform the feature 'Send live video streaming'.
5. The Test System measures the number and duration of re-buffering occurrences for 20minutes.
6. The Test System commands the IUT by the Control Interface to perform the feature 'Stop sending stream live video'.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Stream Availability after power failure: Probability that stream transmission starts (it starts being received at the other side) after the power failure.
- Stream Cut-off: Probability that successfully started stream reproduction after the power failure is ended by a cause other than the intentional termination by the user.
- Video resolution: Used frame resolution.
- Recovery time (s): The elapsed duration since the power source is ON again until the streaming is ongoing again.

### 6.3.2.6 Power failure when sending audio streaming

**Identifier:** IDR/ES/006

**Title:** Power failure when sending audio streaming

**Objective:** Measure the IUT reliability KPIs while executing the feature Send Audio Streaming from the Emergency Services use case.

**Applicability:**

(ICSG\_ProductType = IoT device) AND (ICSG\_UseCases includes ES) AND ICSDI\_TransmitAudio AND (NOT ICSDI\_Battery)

**Initial Conditions:**

IUT is in [\[IUT STARTED\]](#) mode.

**Steps:**

1. The Test System commands the IUT by the Control Interface to perform the feature 'Send live audio streaming'.
2. After one minute, the Test System stops feeding the IoT devices by setting the DC power source in OFF state.
3. After one minute, the Test System sets the DC power source in ON state again according to the nominal power of the IUT.



4. The Test System commands the IUT by the Control Interface to perform the feature 'Send live audio streaming'.
5. The Test System measures the number and duration of re-buffering occurrences for 2 minutes.
6. The Test System commands the IUT by the Control Interface to perform the feature 'Stop streaming live audio'.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Stream Availability: Probability that stream transmission starts (it starts being received at the other side) after the power failure.
- Stream Cut-off: Probability that successfully started audio stream reproduction after the power failure is ended by a cause other than the intentional termination by the user.
- Recovery time (s): The elapsed duration since the power source is ON again until the streaming is ongoing again.

### **6.3.2.7 Power failure when receiving video streaming**

**Identifier:** IDR/ES/007

**Title:** Power failure when receiving video streaming

**Objective:** Measure the IUT reliability KPIs while executing the feature Receive Video Streaming from the Emergency Services use case.

**Applicability:**

(ICSG\_ProductType = IoT device) AND (ICSG\_UseCases includes ES) AND ICSDI\_ReceiveVideo AND (NOT ICSDI\_Battery)

**Initial Conditions:**

IUT is in [\[IUT STARTED\]](#) mode.

**Steps:**

1. The Test System commands the IUT by the Control Interface to perform the feature 'Receive live video streaming'.
2. After one minute, the Test System stops feeding the IoT devices by setting the DC power source in OFF state.
3. After one minute, the Test System sets the DC power source in ON state again according to the nominal power of the IUT.
4. The Test System commands the IUT by the Control Interface to perform the feature 'Receive live video streaming'.
5. The Test System measures the number and duration of re-buffering occurrences for 2 minutes.
6. The Test System commands the IUT by the Control Interface to perform the feature 'Stop receiving live video'.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**

- Stream Availability: Probability that stream reproduction starts at the IoT side after the power failure.
- Stream Cut-off: Probability that successfully started stream reproduction after the power failure is ended by a cause other than the intentional termination by the user.
- Video resolution: Used frame resolution.
- Recovery time (s): The elapsed duration since the power source is ON again until the streaming is ongoing again.

### 6.3.2.8 Power failure when receiving audio streaming

**Identifier:** IDR/ES/008

**Title:** Power failure when receiving audio streaming

**Objective:** Measure the IUT reliability KPIs while executing the feature Receive Audio Streaming from the Emergency Services use case.

**Applicability:**

(ICSG\_ProductType = IoT device) AND (ICSG\_UseCases includes ES) AND ICSDI\_ReceiveAudio AND (NOT ICSDI\_Battery)

**Initial Conditions:**

IUT is in [\[IUT STARTED\]](#) mode.

**Steps:**

1. The Test System commands the IUT by the Control Interface to perform the feature 'Receive live audio Streaming.
2. After one minute, the Test System stops feeding the IoT devices by setting the DC power source in OFF state.
3. After one minute, the Test System sets the DC power source in ON state again according to the nominal power of the IUT.
4. The Test System commands the IUT by the Control Interface to perform the feature 'Receive live audio Streaming.
5. The Test System measures the number and duration of re-buffering occurrences for 2 minutes.
6. The Test System commands the IUT by the Control Interface to perform the feature 'Stop streaming live audio'.

**Postamble:**

- Execute the Postamble sequence (see section 2.5).

**Measurements:**



- Stream Availability: Probability that stream reproduction starts at the IoT side after the power failure.
- Stream Cut-off: Probability that successfully started audio stream reproduction after the power failure is ended by a cause other than the intentional termination by the user.
- Recovery time (s): The elapsed duration since the power source is ON again until the streaming is ongoing again.



## 7 Test cases applicability

The applicability of each individual test is identified in Table C.1.

The applicability of every test is formally expressed by the use of Boolean expressions that are based on parameters (ICS) included in annex A of the present document.

The columns in Table C.1 have the following meaning:

### Test case column

The Test case column indicates the test case number for each test case as described in the Control Panel Service Framework test case specification for which the applicability is identified.

### Description column

The Title column indicates the title of each test case as described in the Control Panel Service Framework test case specification for which the applicability is identified.

### Release column

The Release column indicates the earliest release from which each test case is applicable, except if otherwise stated of an individual test case.

### Status column

The following notations are used for the Status column:

- A applicable - the test is applicable.
- O optional – the capability may be supported or not.
- N/A not applicable – in the given context, the test case is not applicable.
- Ci conditional – the test is applicable ("A") or not ("N/A") depending on the support of other optional or conditional items. "i" is an integer identifying an unique conditional status expression which is defined immediately following the table. For nested conditional expressions, the syntax "IF ... THEN (IF ... THEN ... ELSE...) ELSE ..." is used to avoid ambiguities.

The conditional expressions are added in the last row of the table. These expressions may use ICS as defined in D2.2 Appendix 2. ICS/IXIT. The ICS items will be referred as A.n/m where A.n refers to the table in which the ICS is defined and m refers to the item of the table.

An example of expression interpretation is shown below.

Test case	Test case title	Status
AUE/CS/001	Non Interactive Playback	C01



The status (applicability) of test case 'AUE/CS/001' is defined by condition' C01'

*C01 IF (A.1/1= Application) AND (A.1/3 includes CS) THEN A ELSE N/A*

Where:

C01: Condition to be used in the test cases to define applicability

A.1/1 Value of Item 1 of table A.1 defined in D2.2 Appendix 2. ICS/IXIT In this case, value of ICS 'ICSG\_ProductType' (Table A.1, item 1)

A.1/3 includes CSCS is one of the values of ICS 'ICSG\_UseCases' (table A.1, item 3). (ICSG\_UseCases ICS status is Mn, meaning that several options may be supported.

If the value of the sub-expression (*A.1/1= Application*) is TRUE AND the value of the sub-expression (*A.1/3 includes CS*) is TRUE, the test case status is *Applicable (A)*; In any other case, the status is *Not-applicable (N/A)*.

## 7.1 Application test cases

**Table 9 – Applications User Experience Test cases applicability**

Test case	Test case title	Status
AUE/CO/001	Open the App	CU08
AUE/CO/002	Menu Navigation	CU08
AUE/CS/001	Non Interactive Playback	CU01
AUE/CS/002	Play and Pause	CU020
AUE/CS/003	Stop and Replay	CU01
AUE/CS/004	Search and Seek	CU22
AUE/CS/005	Rewind	CU21
AUE/CS/006	Playlist Skip Forward and Backward	CU23
AUE/CS/007	Download content for offline playing	CU09
AUE/CS/008	Fast Forward	CU24
AUE/LS/001	Play Live Video from User	CU02
AUE/LS/002	Broadcast Live Video	CU02
AUE/SN/001	Picture Posting	CU10
AUE/SN/002	Video Posting	CU11
AUE/SN/003	Comment Posting	CU12
AUE/SN/004	File Posting	CU13



Test case	Test case title	Status
AUE/SN/005	Show Picture	CU14
AUE/SN/006	Play Video	CU15
AUE/SN/007	File Downloading	CU16
AUE/SN/008	Play Live Video from User	CU17
AUE/SN/009	Search Object	CU03
AUE/HS/001	Downloading files sequentially	CU04
AUE/HS/002	Uploading files sequentially	CU04
AUE/HS/003	Pause and Resume Download Transfer	CU04
AUE/HS/004	Pause and Resume Upload Transfer	CU04
AUE/VR/001	Virtual Experience Loading	CU05
AUE/VR/002	Virtual Scene Loading	CU05
AUE/AR/001	Load Augmentation Layer on Physical Marker	CU06
AUE/AR/002	Load Augmentation Layer at Location	CU06
AUE/GA/001	Start new game sessions	CU07
AUE/GA/002	Long game session	CU07
AUE/GA/003	Pause and Resume	CU18
AUE/GA/004	Start saved game session	CU19
CU01	IF (A.1/1 = Application) AND (A.1/3 includes CS) THEN <b>A</b> ELSE <b>N/A</b>	
CU02	IF (A.1/1 = Application) AND (A.1/3 includes LS) THEN <b>A</b> ELSE <b>N/A</b>	
CU03	IF (A.1/1 = Application) AND (A.1/3 includes SN) THEN <b>A</b> ELSE <b>N/A</b>	
CU04	IF (A.1/1 = Application) AND (A.1/3 includes HS) THEN <b>A</b> ELSE <b>N/A</b>	
CU05	IF (A.1/1 = Application) AND (A.1/3 includes VR) THEN <b>A</b> ELSE <b>N/A</b>	
CU06	IF (A.1/1 = Application) AND (A.1/3 includes AR) THEN <b>A</b> ELSE <b>N/A</b>	
CU07	IF (A.1/1 = Application) AND (A.1/3 includes GA) THEN <b>A</b> ELSE <b>N/A</b>	
CU08	IF (A.1/1 = Application) AND A.2/1 THEN <b>A</b> ELSE <b>N/A</b>	
CU09	IF (A.1/1 = Application) AND (A.1/3 includes CS) AND A.2/14 THEN <b>A</b> ELSE <b>N/A</b>	
CU10	IF (A.1/1 = Application) AND (A.1/3 includes SN) AND A.2/17 THEN <b>A</b> ELSE <b>N/A</b>	
CU11	IF (A.1/1 = Application) AND (A.1/3 includes SN) AND A.2/16 THEN <b>A</b> ELSE <b>N/A</b>	
CU12	IF (A.1/1 = Application) AND (A.1/3 includes SN) AND A.2/15 THEN <b>A</b> ELSE <b>N/A</b>	
CU13	IF (A.1/1 = Application) AND (A.1/3 includes SN) AND A.2/19 THEN <b>A</b> ELSE <b>N/A</b>	
CU14	IF (A.1/1 = Application) AND (A.1/3 includes SN) AND A.2/20 THEN <b>A</b> ELSE <b>N/A</b>	
CU15	IF (A.1/1 = Application) AND (A.1/3 includes SN) AND A.2/21 THEN <b>A</b> ELSE <b>N/A</b>	
CU16	IF (A.1/1 = Application) AND (A.1/3 includes SN) AND A.2/17 THEN <b>A</b> ELSE <b>N/A</b>	
CU17	IF (A.1/1 = Application) AND (A.1/3 includes SN) AND A.2/24 THEN <b>A</b> ELSE <b>N/A</b>	
CU18	IF (A.1/1 = Application) AND (A.1/3 includes GA) AND A.2/26 THEN <b>A</b> ELSE <b>N/A</b>	
CU19	IF (A.1/1 = Application) AND (A.1/3 includes GA) AND A.2/25 THEN <b>A</b> ELSE <b>N/A</b>	
CU20	IF (A.1/1 = Application) AND (A.1/3 includes CS) AND A.2/11 THEN <b>A</b> ELSE <b>N/A</b>	
CU21	IF (A.1/1 = Application) AND (A.1/3 includes CS) AND A.2/10 THEN <b>A</b> ELSE <b>N/A</b>	
CU22	IF (A.1/1 = Application) AND (A.1/3 includes CS) AND A.2/27 THEN <b>A</b> ELSE <b>N/A</b>	
CU23	IF (A.1/1 = Application) AND (A.1/3 includes CS) AND A.2/7 AND A.2/9 THEN <b>A</b> ELSE <b>N/A</b>	
CU24	IF (A.1/1 = Application) AND (A.1/3 includes CS) AND A.2/8 THEN <b>A</b> ELSE <b>N/A</b>	
Note: See example below for expression interpretation.		



**Table 10 – Applications Device Resources usage Test cases applicability**

Test case	Description	Status
RES/CO/001	Device ON	A
RES/CO/002	Open the AUT	CD08
RES/CO/003	Background state	CD08
RES/CS/001	Non Interactive Playback	CD01
RES/CS/002	Play and Pause	CD20
RES/CS/003	Rewind	CD21
RES/CS/004	Download content for offline playing	CD09
RES/CS/005	Non interactive Playback with screen off	CD25
RES/CS/006	Fast Forward	CD27
RES/LS/001	Play Live Video from User	CD02
RES/LS/002	Broadcast Live Video	CD02
RES/LS/003	Broadcast Live Video with screen off	CD26
RES/SN/001	Picture Posting	CD10
RES/SN/002	Video Posting	CD11
RES/SN/003	File Posting	CD13
RES/SN/004	Show Picture	CD14
RES/SN/005	Play Video	CD15
RES/SN/006	File Downloading	CD16
RES/HS/001	Downloading files sequentially	CD04
RES/HS/002	Uploading files sequentially	CD04
RES/HS/003	Downloading several files simultaneously	CD04
RES/HS/004	Uploading several files simultaneously	CD04
RES/HS/005	Downloading a file with screen off	CD04
RES/HS/006	Uploading a file with screen off	CD04
RES/VR/001	Virtual Experience Loading	CD05
RES/VR/002	Virtual Scene Loading	CD05
RES/AR/001	Load Augmentation Layer on Physical Marker	CD06
RES/AR/002	Load Augmentation Layer at Location	CD06
RES/AR/003	Augmented reality Session	CD06
RES/GA/001	Start game session	CD07



Test case	Description	Status
RES/GA/002	Short game session	CD07
RES/GA/003	Long game session	CD07
CD01	IF (A.1/1= Application) AND (A.1/3 includes CS) THEN A ELSE N/A	
CD02	IF (A.1/1= Application) AND (A.1/3 includes LS) THEN A ELSE N/A	
CD03	IF (A.1/1= Application) AND (A.1/3 includes SN) THEN A ELSE N/A	
CD04	IF (A.1/1= Application) AND (A.1/3 includes HS) THEN A ELSE N/A	
CD05	IF (A.1/1= Application) AND (A.1/3 includes VR) THEN A ELSE N/A	
CD06	IF (A.1/1= Application) AND (A.1/3 includes AR) THEN A ELSE N/A	
CD07	IF (A.1/1= Application) AND (A.1/3 includes GA) THEN A ELSE N/A	
CD08	IF (A.1/1= Application) AND A.2/1 THEN A ELSE N/A	
CD09	IF (A.1/1= Application) AND (A.1/3 includes CS) AND A.2/14 THEN A ELSE N/A	
CD10	IF (A.1/1= Application) AND (A.1/3 includes SN) AND A.2/17 THEN A ELSE N/A	
CD11	IF (A.1/1= Application) AND (A.1/3 includes SN) AND A.2/16 THEN A ELSE N/A	
CD12	IF (A.1/1= Application) AND (A.1/3 includes SN) AND A.2/15 THEN A ELSE N/A	
CD13	IF (A.1/1= Application) AND (A.1/3 includes SN) AND A.2/19 THEN A ELSE N/A	
CD14	IF (A.1/1= Application) AND (A.1/3 includes SN) AND A.2/20 THEN A ELSE N/A	
CD15	IF (A.1/1= Application) AND (A.1/3 includes SN) AND A.2/21 THEN A ELSE N/A	
CD16	IF (A.1/1= Application) AND (A.1/3 includes SN) AND A.2/17 THEN A ELSE N/A	
CD17	IF (A.1/1= Application) AND (A.1/3 includes SN) AND A.2/24 THEN A ELSE N/A	
CD18	IF (A.1/1= Application) AND (A.1/3 includes GA) AND A.2/26 THEN A ELSE N/A	
CD19	IF (A.1/1= Application) AND (A.1/3 includes GA) AND A.2/25 THEN A ELSE N/A	
CD20	IF (A.1/1= Application) AND (A.1/3 includes CS) AND A.2/11 THEN A ELSE N/A	
CD21	IF (A.1/1= Application) AND (A.1/3 includes CS) AND A.2/10 THEN A ELSE N/A	
CD22	IF (A.1/1= Application) AND (A.1/3 includes CS) AND A.2/27 THEN A ELSE N/A	
CD23	IF (A.1/1= Application) AND (A.1/3 includes CS) AND A.2/7 AND A.2/9 THEN A ELSE N/A	
CD24	IF (A.1/1= Application) AND (A.1/3 includes CS) AND A.2/4 THEN A ELSE N/A	
CD25	IF (A.1/1= Application) AND (A.1/3 includes CS) AND A.2/28 THEN A ELSE N/A	
CD26	IF (A.1/1= Application) AND (A.1/3 includes LS) AND A.2/29 THEN A ELSE N/A	
CD27	IF (A.1/1= Application) AND (A.1/3 includes CS) AND A.2/8 THEN A ELSE N/A	

**Table 11 – Applications Energy consumption Test cases applicability**

Test case	Description	Status
AEC/CO/001	Device ON	A
AEC/CO/002	Open the AUT	CE08
AEC/CO/003	Background state	CE08
AEC/CS/001	Non Interactive Playback	CE01
AEC/CS/002	Play and Pause	CE20
AEC/CS/003	Rewind	CE21
AEC/CS/004	Download content for offline playing	CE09
AEC/CS/005	Non interactive Playback with screen off	CE25
AEC/CS/006	Fast Forward	CE27
AEC/LS/001	Play Live Video from User	CE02
AEC/LS/002	Broadcast Live Video	CE02
AEC/LS/003	Broadcast Live Video with screen off	CE26



Test case	Description	Status
AEC/SN/001	Picture Posting	CE10
AEC/SN/002	Video Posting	CE11
AEC/SN/003	File Posting	CE13
AEC/SN/004	Show Picture	CE14
AEC/SN/005	Play Video	CE15
AEC/SN/006	File Downloading	CE16
AEC/HS/001	Downloading files sequentially	CE04
AEC/HS/002	Uploading files sequentially	CE04
AEC/HS/003	Downloading several files simultaneously	CE04
AEC/HS/004	Uploading several files simultaneously	CE04
AEC/HS/005	Downloading a file with screen off	CE04
AEC/HS/006	Uploading a file with screen off	CE04
AEC/VR/001	Virtual Experience Loading	CE05
AEC/VR/002	Virtual Scene Loading	CE05
AEC/AR/001	Load Augmentation Layer on Physical Marker	CE06
AEC/AR/002	Load Augmentation Layer at Location	CE06
AEC/AR/003	Augmented reality Session	CE06
AEC/GA/001	Start game session	CE07
AEC/GA/002	Short game session	CE07
AEC/GA/003	Long game session	CE07



Test case	Description	Status
CE01	IF (A.1/1= Application) AND (A.1/3 includes CS) THEN A ELSE N/A	
CE02	IF (A.1/1= Application) AND (A.1/3 includes LS) THEN A ELSE N/A	
CE03	IF (A.1/1= Application) AND (A.1/3 includes SN) THEN A ELSE N/A	
CE04	IF (A.1/1= Application) AND (A.1/3 includes HS) THEN A ELSE N/A	
CE05	IF (A.1/1= Application) AND (A.1/3 includes VR) THEN A ELSE N/A	
CE06	IF (A.1/1= Application) AND (A.1/3 includes AR) THEN A ELSE N/A	
CE07	IF (A.1/1= Application) AND (A.1/3 includes GA) THEN A ELSE N/A	
CE08	IF (A.1/1= Application) AND A.2/1 THEN A ELSE N/A	
CE09	IF (A.1/1= Application) AND (A.1/3 includes CS) AND A.2/14 THEN A ELSE N/A	
CE10	IF (A.1/1= Application) AND (A.1/3 includes SN) AND A.2/17 THEN A ELSE N/A	
CE11	IF (A.1/1= Application) AND (A.1/3 includes SN) AND A.2/16 THEN A ELSE N/A	
CE12	IF (A.1/1= Application) AND (A.1/3 includes SN) AND A.2/15 THEN A ELSE N/A	
CE13	IF (A.1/1= Application) AND (A.1/3 includes SN) AND A.2/19 THEN A ELSE N/A	
CE14	IF (A.1/1= Application) AND (A.1/3 includes SN) AND A.2/20 THEN A ELSE N/A	
CE15	IF (A.1/1= Application) AND (A.1/3 includes SN) AND A.2/21 THEN A ELSE N/A	
CE16	IF (A.1/1= Application) AND (A.1/3 includes SN) AND A.2/17 THEN A ELSE N/A	
CE17	IF (A.1/1= Application) AND (A.1/3 includes SN) AND A.2/24 THEN A ELSE N/A	
CE18	IF (A.1/1= Application) AND (A.1/3 includes GA) AND A.2/26 THEN A ELSE N/A	
CE19	IF (A.1/1= Application) AND (A.1/3 includes GA) AND A.2/25 THEN A ELSE N/A	
CE20	IF (A.1/1= Application) AND (A.1/3 includes CS) AND A.2/11 THEN A ELSE N/A	
CE21	IF (A.1/1= Application) AND (A.1/3 includes CS) AND A.2/10 THEN A ELSE N/A	
CE22	IF (A.1/1= Application) AND (A.1/3 includes CS) AND A.2/27 THEN A ELSE N/A	
CE23	IF (A.1/1= Application) AND (A.1/3 includes CS) AND A.2/7 AND A.2/9 THEN A ELSE N/A	
CE24	IF (A.1/1= Application) AND (A.1/3 includes CS) AND A.2/4 THEN A ELSE N/A	
CE25	IF (A.1/1= Application) AND (A.1/3 includes CS) AND A.2/28 THEN A ELSE N/A	
CE26	IF (A.1/1= Application) AND (A.1/3 includes LS) AND A.2/29 THEN A ELSE N/A	
CE27	IF (A.1/1= Application) AND (A.1/3 includes CS) AND A.2/8 THEN A ELSE N/A	

**Table 12 – Applications Reliability Test cases applicability**

Test case	Test case title	Status
REL/CO/001	Open the App	CR08
REL/CO/002	Menu Navigation	CR08
REL/CS/001	Non Interactive Playback	CR01
REL/CS/002	Play and Pause	CR020
REL/CS/003	Stop and Replay	CR01
REL/CS/004	Search and Seek	CR22
REL/CS/005	Rewind	CR21
REL/CS/006	Playlist Skip Forward and Backward	CR23
REL/CS/007	Download content for offline playing	CR09
REL/CS/008	Fast Forward	CR24
REL/LS/001	Play Live Video from User	CR02
REL/LS/002	Broadcast Live Video	CR02
REL/SN/001	Picture Posting	CR10
REL/SN/002	Video Posting	CR11



Test case	Test case title	Status
REL/SN/003	Comment Posting	CR12
REL/SN/004	File Posting	CR13
REL/SN/005	Show Picture	CR14
REL/SN/006	Play Video	CR15
REL/SN/007	File Downloading	CR16
REL/SN/008	Play Live Video from User	CR17
REL/SN/009	Search Object	CR03
REL/HS/001	Downloading files sequentially	CR04
REL/HS/002	Uploading files sequentially	CR04
REL/HS/003	Pause and Resume Download Transfer	CR04
REL/HS/004	Pause and Resume Upload Transfer	CR04
REL/VR/001	Virtual Experience Loading	CR05
REL/VR/002	Virtual Scene Loading	CR05
REL/AR/001	Load Augmentation Layer on Physical Marker	CR06
REL/AR/002	Load Augmentation Layer at Location	CR06
REL/GA/001	Start new game sessions	CR07
REL/GA/002	Long game session	CR07
REL/GA/003	Pause and Resume	CR18
REL/GA/004	Start saved game session	CR19



Test case	Test case title	Status
CR01	IF (A.1/1 = Application) AND (A.1/3 includes CS) THEN A ELSE N/A	
CR02	IF (A.1/1 = Application) AND (A.1/3 includes LS) THEN A ELSE N/A	
CR03	IF (A.1/1 = Application) AND (A.1/3 includes SN) THEN A ELSE N/A	
CR04	IF (A.1/1 = Application) AND (A.1/3 includes HS) THEN A ELSE N/A	
CR05	IF (A.1/1 = Application) AND (A.1/3 includes VR) THEN A ELSE N/A	
CR06	IF (A.1/1 = Application) AND (A.1/3 includes AR) THEN A ELSE N/A	
CR07	IF (A.1/1 = Application) AND (A.1/3 includes GA) THEN A ELSE N/A	
CR08	IF (A.1/1 = Application) AND A.2/1 THEN A ELSE N/A	
CR09	IF (A.1/1 = Application) AND (A.1/3 includes CS) AND A.2/14 THEN A ELSE N/A	
CR10	IF (A.1/1 = Application) AND (A.1/3 includes SN) AND A.2/17 THEN A ELSE N/A	
CR11	IF (A.1/1 = Application) AND (A.1/3 includes SN) AND A.2/16 THEN A ELSE N/A	
CR12	IF (A.1/1 = Application) AND (A.1/3 includes SN) AND A.2/15 THEN A ELSE N/A	
CR13	IF (A.1/1 = Application) AND (A.1/3 includes SN) AND A.2/19 THEN A ELSE N/A	
CR14	IF (A.1/1 = Application) AND (A.1/3 includes SN) AND A.2/20 THEN A ELSE N/A	
CR15	IF (A.1/1 = Application) AND (A.1/3 includes SN) AND A.2/21 THEN A ELSE N/A	
CR16	IF (A.1/1 = Application) AND (A.1/3 includes SN) AND A.2/17 THEN A ELSE N/A	
CR17	IF (A.1/1 = Application) AND (A.1/3 includes SN) AND A.2/24 THEN A ELSE N/A	
CR18	IF (A.1/1 = Application) AND (A.1/3 includes GA) AND A.2/26 THEN A ELSE N/A	
CR19	IF (A.1/1 = Application) AND (A.1/3 includes GA) AND A.2/25 THEN A ELSE N/A	
CR20	IF (A.1/1 = Application) AND (A.1/3 includes CS) AND A.2/11 THEN A ELSE N/A	
CR21	IF (A.1/1 = Application) AND (A.1/3 includes CS) AND A.2/10 THEN A ELSE N/A	
CR22	IF (A.1/1 = Application) AND (A.1/3 includes CS) AND A.2/27 THEN A ELSE N/A	
CR23	IF (A.1/1 = Application) AND (A.1/3 includes CS) AND A.2/7 AND A.2/9 THEN A ELSE N/A	
CR24	IF (A.1/1 = Application) AND (A.1/3 includes CS) AND A.2/8 THEN A ELSE N/A	

Note: See example below for expression interpretation.

**Table 13 – Applications Network Resources Usage Test cases applicability**

Test case	Test case title	Status
NWR/CO/001	Open the App	CN08
NWR/CO/002	Menu Navigation	CN08
NWR/CS/001	Non Interactive Playback	CN01
NWR/CS/002	Play and Pause	CN020
NWR/CS/003	Rewind	CN21
NWR/CS/004	Download content for offline playing	CN09
NWR/CS/005	Fast Forward	CN24
NWR/LS/001	Play Live Video from User	CN02
NWR/LS/002	Broadcast Live Video	CN02
NWR/SN/001	Picture Posting	CN10
NWR/SN/002	Video Posting	CN11
NWR/SN/003	Comment Posting	CN12
NWR/SN/004	File Posting	CN13
NWR/SN/005	Show Picture	CN14
NWR/SN/006	Play Video	CN15
NWR/SN/007	File Downloading	CN16



Test case	Test case title	Status
NWR/SN/008	Play Live Video from User	CN17
NWR/SN/009	Search Object	CN03
NWR/HS/001	Downloading files sequentially	CN04
NWR/HS/002	Uploading files sequentially	CN04
NWR/HS/003	Pause and Resume Download Transfer	CN04
NWR/HS/004	Pause and Resume Upload Transfer	CN04
NWR/VR/001	Virtual Experience Loading	CN05
NWR/VR/002	Virtual Scene Loading	CN05
NWR/AR/001	Load Augmentation Layer on Physical Marker	CN06
NWR/AR/002	Load Augmentation Layer at Location	CN06
NWR/GA/001	Start new game sessions	CN07
NWR/GA/002	Long game session	CN07
NWR/GA/003	Pause and Resume	CN18
NWR/GA/004	Start saved game session	CN19
<p> CN01 IF (A.1/1 = Application) AND (A.1/3 includes CS) THEN <b>A</b> ELSE <b>N/A</b>  CN02 IF (A.1/1 = Application) AND (A.1/3 includes LS) THEN <b>A</b> ELSE <b>N/A</b>  CN03 IF (A.1/1 = Application) AND (A.1/3 includes SN) THEN <b>A</b> ELSE <b>N/A</b>  CN04 IF (A.1/1 = Application) AND (A.1/3 includes HS) THEN <b>A</b> ELSE <b>N/A</b>  CN05 IF (A.1/1 = Application) AND (A.1/3 includes VR) THEN <b>A</b> ELSE <b>N/A</b>  CN06 IF (A.1/1 = Application) AND (A.1/3 includes AR) THEN <b>A</b> ELSE <b>N/A</b>  CN07 IF (A.1/1 = Application) AND (A.1/3 includes GA) THEN <b>A</b> ELSE <b>N/A</b>  CN08 IF (A.1/1 = Application) AND A.2/1 THEN <b>A</b> ELSE <b>N/A</b>  CN09 IF (A.1/1 = Application) AND (A.1/3 includes CS) AND A.2/14 THEN <b>A</b> ELSE <b>N/A</b>  CN10 IF (A.1/1 = Application) AND (A.1/3 includes SN) AND A.2/17 THEN <b>A</b> ELSE <b>N/A</b>  CN11 IF (A.1/1 = Application) AND (A.1/3 includes SN) AND A.2/16 THEN <b>A</b> ELSE <b>N/A</b>  CN12 IF (A.1/1 = Application) AND (A.1/3 includes SN) AND A.2/15 THEN <b>A</b> ELSE <b>N/A</b>  CN13 IF (A.1/1 = Application) AND (A.1/3 includes SN) AND A.2/19 THEN <b>A</b> ELSE <b>N/A</b>  CN14 IF (A.1/1 = Application) AND (A.1/3 includes SN) AND A.2/20 THEN <b>A</b> ELSE <b>N/A</b>  CN15 IF (A.1/1 = Application) AND (A.1/3 includes SN) AND A.2/21 THEN <b>A</b> ELSE <b>N/A</b>  CN16 IF (A.1/1 = Application) AND (A.1/3 includes SN) AND A.2/17 THEN <b>A</b> ELSE <b>N/A</b>  CN17 IF (A.1/1 = Application) AND (A.1/3 includes SN) AND A.2/24 THEN <b>A</b> ELSE <b>N/A</b>  CN18 IF (A.1/1 = Application) AND (A.1/3 includes GA) AND A.2/26 THEN <b>A</b> ELSE <b>N/A</b>  CN19 IF (A.1/1 = Application) AND (A.1/3 includes GA) AND A.2/25 THEN <b>A</b> ELSE <b>N/A</b>  CN20 IF (A.1/1 = Application) AND (A.1/3 includes CS) AND A.2/11 THEN <b>A</b> ELSE <b>N/A</b>  CN21 IF (A.1/1 = Application) AND (A.1/3 includes CS) AND A.2/10 THEN <b>A</b> ELSE <b>N/A</b>  CN22 IF (A.1/1 = Application) AND (A.1/3 includes CS) AND A.2/27 THEN <b>A</b> ELSE <b>N/A</b>  CN23 IF (A.1/1 = Application) AND (A.1/3 includes CS) AND A.2/7 AND A.2/9 THEN <b>A</b> ELSE <b>N/A</b>  CN24 IF (A.1/1 = Application) AND (A.1/3 includes CS) AND A.2/8 THEN <b>A</b> ELSE <b>N/A</b>  Note: See example below for expression interpretation. </p>		



## 7.2 Mobile devices test cases

**Table 14 – Mobile devices User Experience with reference apps Test cases applicability**

Test case	Description	Status
DRA/CO/001	Open the App	A
DRA/CO/002	Menu Navigation	A
DRA/CS/001	Non Interactive Playback	C01
DRA/CS/002	Play and Pause	C01
DRA/CS/003	Stop and Replay	C01
DRA/CS/004	Search and Seek	C01
DRA/CS/005	Rewind	C01
DRA/CS/006	Playlist Skip Forward and Backward	C01
DRA/CS/007	Download content for offline playing	A
DRA/CS/008	Fast Forward	C01
DRA/LS/001	Play Live Video from User	C01
DRA/LS/002	Broadcast Live Video	C02
DRA/SN/001	Picture Posting	A
DRA/SN/002	Video Posting	A
DRA/SN/003	Comment Posting	A
DRA/SN/004	File Posting	A
DRA/SN/005	Show Picture	A
DRA/SN/006	Play Video	C01
DRA/SN/007	File Downloading	A
DRA/SN/008	Play Live Video from User	C01
DRA/SN/009	Search Object	A
DRA/HS/001	Downloading files sequentially	A
DRA/HS/002	Uploading files sequentially	A
DRA/HS/003	Pause and Resume Download Transfer	A
DRA/HS/004	Pause and Resume Upload Transfer	A
DRA/VR/001	Virtual Experience Loading	C03
DRA/VR/002	Virtual Scene Loading	C03
DRA/AR/001	Load Augmentation Layer on Physical Marker	C04



Test case	Description	Status
DRA/AR/002	Load Augmentation Layer at Location	C04
DRA/GA/001	Start new game sessions	A
DRA/GA/002	Long Game session	A
DRA/GA/003	Pause and Resume	A
DRA/GA/004	Start saved game session	A
C01	IF (A.1/1= Mobile Device) AND (A.4/1) THEN A ELSE N/A	
C02	IF (A.1/1= Mobile Device) AND (A.4/2) THEN A ELSE N/A	
C03	IF (A.1/1= Mobile Device) AND (A.4/3) THEN A ELSE N/A	
C04	IF (A.1/1= Mobile Device) AND (A.4/4) THEN A ELSE N/A	

**Table 15 – Mobile devices Energy consumption Test cases applicability**

Test case	Description	Status
DEC/CO/001	Device On	A
DEC/CO/002	Device On with screen OFF	A
DEC/CO/003	Background state	A
DEC/CS/001	Non Interactive Playback	C01
DEC/CS/002	Play and Pause	C01
DEC/CS/003	Rewind	C01
DEC/CS/004	Download content for offline playing	C01
DEC/CS/005	Non interactive Playback with screen off	C01
DEC/CS/006	Fast Forward	C01
DEC/LS/001	Play Live Video from User	C02
DEC/LS/002	Broadcast Live Video	C02
DEC/LS/003	Broadcast Live Video with screen off	C02
DEC/SN/001	Picture Posting	C03
DEC/SN/002	Video Posting	C03
DEC/SN/003	File Posting	C03
DEC/SN/004	Show Picture	C03
DEC/SN/005	Play Video	C03
DEC/SN/006	File Downloading	C03
DEC/HS/001	Downloading files sequentially	C04
DEC/HS/002	Uploading files sequentially	C04
DEC/HS/003	Downloading several files simultaneously	C04
DEC/HS/004	Uploading several files simultaneously	C04



Test case	Description	Status
DEC/HS/005	Downloading a file with screen off	C04
DEC/HS/006	Uploading a file with screen off	C04
DEC/VR/001	Virtual Experience Loading	C05
DEC/VR/002	Virtual Scene Loading	C05
DEC/AR/001	Load Augmentation Layer on Physical Marker	C06
DEC/AR/002	Load Augmentation Layer at Location	C06
DEC/AR/003	Augmented reality Session	C06
DEC/GA/001	Start game session	C07
DEC/GA/002	Short game session	C07
DEC/GA/003	Long game session	C07
C01	IF (A.1/1= Mobile Device) AND (A.1/3 includes CS) AND A.3/1 THEN A ELSE N/A	
C02	IF (A.1/1= Mobile Device) AND (A.1/3 includes LS) AND A.3/2 THEN A ELSE N/A	
C03	IF (A.1/1= Mobile Device) AND (A.1/3 includes SN) THEN A ELSE N/A	
C04	IF (A.1/1= Mobile Device) AND (A.1/3 includes HS) THEN A ELSE N/A	
C05	IF (A.1/1= Mobile Device) AND (A.1/3 includes VR) THEN A ELSE N/A	
C06	IF (A.1/1= Mobile Device) AND (A.1/3 includes AR) THEN A ELSE N/A	
C07	IF (A.1/1= Mobile Device) AND (A.1/3 includes GA) THEN A ELSE N/A	

**Table 16 – Mobile devices Radio Performance Test cases applicability**

Test case	Description	Status
RFP/HS/001	Sensitivity	C01
RFP/HS/002	Adjacent Channel Selectivity	C01
C01	IF (A.1/1= Mobile Device) AND (A.4/1) THEN A ELSE N/A	

**Table 17 – Mobile devices Data Performance Test cases applicability**

Test case	Description	Status
DDP/CO/001	Device On	A
DDP/CS/001	Non Interactive Playback	C01
DDP/CS/002	Play and Pause	C01
DDP/CS/003	Rewind	C01
DDP/CS/004	Download content for offline playing	C01
DDP/CS/005	Fast Forward	C01



Test case	Description	Status
DDP/LS/001	Play Live Video from User	C02
DDP/LS/002	Broadcast Live Video	C02
DDP/LS/003	Broadcast Live Video with screen off	C02
DDP/SN/001	Picture Posting	C03
DDP/SN/002	Video Posting	C03
DDP/SN/003	File Posting	C03
DDP/SN/004	Show Picture	C03
DDP/SN/005	Play Video	C03
DDP/SN/006	File Downloading	C03
DDP/HS/001	Downloading files sequentially	C04
DDP/HS/002	Uploading files sequentially	C04
DDP/HS/003	Downloading several files simultaneously	C04
DDP/HS/004	Uploading several files simultaneously	C04
DDP/HS/005	Downloading a file with screen off	C04
DDP/HS/006	Uploading a file with screen off	C04
DDP/VR/001	Virtual Experience Loading	C05
DDP/VR/002	Virtual Scene Loading	C05
DDP/AR/001	Load Augmentation Layer on Physical Marker	C06
DDP/AR/002	Load Augmentation Layer at Location	C06
DDP/AR/003	Augmented reality Session	C06
DDP/GA/001	Start game session	C07
DDP/GA/002	Short game session	C07
DDP/GA/003	Long game session	C07
C01	IF (A.1/1= Mobile Device) AND (A.1/3 includes CS) AND A.3/1 THEN <b>A</b> ELSE <b>N/A</b>	
C02	IF (A.1/1= Mobile Device) AND (A.1/3 includes LS) AND A.3/2 THEN <b>A</b> ELSE <b>N/A</b>	
C03	IF (A.1/1= Mobile Device) AND (A.1/3 includes SN) THEN <b>A</b> ELSE <b>N/A</b>	
C04	IF (A.1/1= Mobile Device) AND (A.1/3 includes HS) THEN <b>A</b> ELSE <b>N/A</b>	
C05	IF (A.1/1= Mobile Device) AND (A.1/3 includes VR) THEN <b>A</b> ELSE <b>N/A</b>	
C06	IF (A.1/1= Mobile Device) AND (A.1/3 includes AR) THEN <b>A</b> ELSE <b>N/A</b>	
C07	IF (A.1/1= Mobile Device) AND (A.1/3 includes GA) THEN <b>A</b> ELSE <b>N/A</b>	



### 7.3 IoT devices test cases

**Table 18 – IoT devices Energy Consumption Test cases applicability**

Test case	Description	Status
IEC/CO/001	IUT in idle mode	C01
IEC/ES/001	Send video streaming	C02
IEC/ES/002	Send Audio streaming	C03
IEC/ES/003	Receive video streaming	C04
IEC/ES/004	Receive audio streaming	C05
C01	IF (A.1/1= IoT device) AND (A.1/3 includes ES) AND A.4/5 THEN <b>A</b> ELSE <b>N/A</b>	
C02	IF (A.1/1= IoT device) AND (A.1/3 includes ES) AND A.4/2 THEN <b>A</b> ELSE <b>N/A</b>	
C03	IF (A.1/1= IoT device) AND (A.1/3 includes ES) AND A.4/6 THEN <b>A</b> ELSE <b>N/A</b>	
C04	IF (A.1/1= IoT device) AND (A.1/3 includes ES) AND A.4/1 THEN <b>A</b> ELSE <b>N/A</b>	
C05	IF (A.1/1= IoT device) AND (A.1/3 includes ES) AND A.4/7 THEN <b>A</b> ELSE <b>N/A</b>	

**Table 19 – IoT devices Data Performance Test cases applicability**

Test case	Description	Status
IDP/CO/001	IUT in idle mode	C01
IDP/ES/001	Send video streaming	C02
IDP/ES/002	Send Audio streaming	C03
IDP/ES/003	Receive video streaming	C04
IDP/ES/004	Receive audio streaming	C05
C01	IF (A.1/1= IoT device) AND (A.1/3 includes ES) AND A.4/5 THEN <b>A</b> ELSE <b>N/A</b>	
C02	IF (A.1/1= IoT device) AND (A.1/3 includes ES) AND A.4/1 THEN <b>A</b> ELSE <b>N/A</b>	
C03	IF (A.1/1= IoT device) AND (A.1/3 includes ES) AND A.4/6 THEN <b>A</b> ELSE <b>N/A</b>	
C04	IF (A.1/1= IoT device) AND (A.1/3 includes ES) AND A.4/7 THEN <b>A</b> ELSE <b>N/A</b>	
C05	IF (A.1/1= IoT device) AND (A.1/3 includes ES) AND A.4/3 THEN <b>A</b> ELSE <b>N/A</b>	

**Table 20 – IoT devices Reliability Test cases applicability**

Test case	Description	Status
IDR/CO/001	Network connection	C06
IDR/ES/001	Send video streaming	C02
IDR/ES/002	Send Audio streaming	C03



Test case	Description	Status
IDR/ES/003	Receive video streaming	C04
IDR/ES/004	Receive audio streaming	C05
IDR/ES/005	Power failure when sending video streaming	C07
IDR/ES/006	Power failure when sending Audio streaming	C08
IDR/ES/007	Power failure when receiving video streaming	C09
IDR/ES/008	Power failure when receiving audio streaming	C10
C02	IF (A.1/1= IoT device) AND (A.1/3 includes ES) AND A.4/1 THEN <b>A</b> ELSE <b>N/A</b> IF (A.1/1= IoT device) AND (A.1/3 includes ES) AND A.4/6 THEN <b>A</b> ELSE <b>N/A</b> IF (A.1/1= IoT device) AND (A.1/3 includes ES) AND A.4/7 THEN <b>A</b> ELSE <b>N/A</b> IF (A.1/1= IoT device) AND (A.1/3 includes ES) AND A.4/3 THEN <b>A</b> ELSE <b>N/A</b> IF (A.1/1= IoT device) THEN <b>A</b> ELSE <b>N/A</b> IF (A.1/1= IoT device) AND (A.1/3 includes ES) AND A.4/1 AND (NOT A.4/8) THEN <b>A</b> ELSE <b>N/A</b> IF (A.1/1= IoT device) AND (A.1/3 includes ES) AND A.4/6 AND (NOT A.4/8) THEN <b>A</b> ELSE <b>N/A</b> IF (A.1/1= IoT device) AND (A.1/3 includes ES) AND A.4/7 AND (NOT A.4/8) THEN <b>A</b> ELSE <b>N/A</b> IF (A.1/1= IoT device) AND (A.1/3 includes ES) AND A.4/3 AND (NOT A.4/8) THEN <b>A</b> ELSE <b>N/A</b>	
C03		
C04		
C05		
C06		
C07		
C08		
C09		
C10		



## 8 Key Performance Indicators

This chapter summarizes the Key Performance Indicators that will be obtained based on the measurements obtained by the execution of the test cases and each test case repetition.

### 8.1 Application test cases

**Table 21 – Application User Experience (AUE) Key Performance Indicators**

<b>Measurements</b>	<b>Use Cases</b>	<b>Type</b>	<b>Unit</b>	<b>Summarization</b>	<b>KPI</b>
<i>Access Time</i>	All	Unsigned Integer	n/a	Average, Deviation, CDF	App Access Time
<i>Accessibility</i>	All	Boolean	n/a	Ratio	App Accessibility
<i>Availability</i>	All	Boolean	n/a	Ratio	App Availability
<i>Cut-off</i>	CO, CS, LS, SN, VR, AR, GA	Boolean	n/a	Ratio	App Availability
<i>Time to load first media frame</i>	CS, LS SN, GA	Unsigned Integer	s	Average, Deviation, CDF	Content Load Time
<i>Time to load after resuming</i>	CS, LS SN, GA				
<i>Time to load the virtual world</i>	VR				
<i>Time to load the virtual scene</i>	VR				
<i>Time to load augmentation</i>	AR				
<i>Response Time</i>	VR, AR, GA	Unsigned Integer	S	Average, Deviation, CDF	Response Time
<i>Playback</i>	CS, LS, SN	Boolean	n/a	Ratio	Feature Availability
<i>Pause Operation</i>	CS, SN, HS, GA				
<i>Resume Operation</i>	CS, SN, HS, GA				
<i>Stop Operation</i>	CS, LS, SN				
<i>Rewind Operation</i>	CS				
<i>Fast Forward Operation</i>	CS				
<i>Search Operation</i>	CS, LS, SN				
<i>Seek Operation</i>	CS				
<i>Skip Forward Operation</i>	CS				
<i>Skip Backward Operation</i>	CS				



<i>{Picture, Video, Comment, File} Transfer</i>	CS, SN, HS				
<i>Load Augmentation Layer Operation</i>	AR				
<i>Clear Augmentation Layer Operation</i>	AR				
<i>Content Stall</i>	CS, LS, SN, VR, GA	Vector of Unsigned Integer	s	Count, Index (1), CDF	Content Stall
<i>Search Time</i>	CS, LS, SN	Unsigned Integer	s	Average, Deviation, CDF	Content Search Time
<i>{Picture, Video, File} Download Time</i>	CS, SN, HS	Unsigned Integer	s	Average, Deviation, CDF	Content Download Throughput
<i>{Picture, Video, File} Upload Time</i>	CS, SN, HS	Unsigned Integer	s	Average, Deviation, CDF	Content Upload Throughput
<i>Video Resolution</i>	CS, SN, LS, AR, VR, GA	Vector of Nominal	n/a	Mode, CDF	Content Resolution

**Table 22 – Application Device Resource Usage (RES) Key Performance Indicators**

<b>Measurements</b>	<b>Use Cases</b>	<b>Type</b>	<b>Unit</b>	<b>Summarization</b>	<b>KPI</b>
<i>Memory Usage</i>	All	Unsigned Integer	Byte, %	Average, Deviation, CDF	Use of memory
<i>CPU Usage</i>	All	Unsigned Integer	%	Average, Deviation, CDF	Use of CPU
<i>GPU Usage</i>	All	Unsigned Integer	%	Average, Deviation, CDF	Use of GPU

**Table 23 – Application Energy Consumption (AEC) Key Performance Indicators**

<b>Measurements</b>	<b>Use Cases</b>	<b>Type</b>	<b>Unit</b>	<b>Summarization</b>	<b>KPI</b>
<i>Current consumption</i>	All	Unsigned Integer	mA	Average, Deviation, Skewness, Kurtosis	App Consumption

**Table 24 – Application Reliability (REL) Key Performance Indicators**

<b>Measurements</b>	<b>Use Cases</b>	<b>Type</b>	<b>Unit</b>	<b>Summarization</b>	<b>KPI</b>
<i>Accessibility</i>	CO	Boolean	n/a	Ratio	App availability
<i>Cut-off</i>	CO, CS, LS, SN, VR, AR, GA	Boolean	n/a	Ratio	
<i>Accessibility</i>	CO	Boolean	n/a	Ratio	



<i>Cut-off</i>	CO, CS, LS, SN, VR, AR, GA	Boolean	n/a	Ratio	App Autorecovery after fail
<i>Accessibility</i>	CO	Boolean	n/a	Ratio	App Degradation
<i>Cut-off</i>	CO, CS, LS, SN, VR, AR, GA	Boolean	n/a	Ratio	
<i>Availability</i>	All	Boolean	n/a	Ratio	Feature availability
<i>Cut-off</i>	All	Boolean	n/a	Ratio	
<i>Operation</i>	CO, CS, LS, SN, VR, AR, GA	Boolean	n/a	Ratio	
<i>Availability</i>	All	Boolean	n/a	Ratio	Feature Autorecovery after fail
<i>Cut-off</i>	All	Boolean	n/a	Ratio	
<i>Operation</i>	CO, CS, LS, SN, VR, AR, GA	Boolean	n/a	Ratio	
<i>Access Time</i>	CO	Unsigned Integer	s	Average, Deviation, CDF	Feature Degradation
<i>Time to load first media frame</i>	CS, LS SN, GA				
<i>Time to load after resuming</i>	CS, LS SN, GA				
<i>Time to load the virtual world</i>	VR				
<i>Time to load the virtual scene</i>	VR				
<i>Time to load augmentation</i>	AR				
<i>Content Stall</i>	CS, LS, SN, VR, GA	Vector of Unsigned Integer	s	Count, Index (1), CDF	
<i>Search Time</i>	CS, LS, SN	Unsigned Integer	s	Average, Deviation, CDF	
<i>{Picture, Video, File} Download Time</i>	CS, SN, HS	Unsigned Integer	s	Average, Deviation, CDF	
<i>{Picture, Video, File} Upload Time</i>	CS, SN, HS	Unsigned Integer	s	Average, Deviation, CDF	
<i>Video Resolution</i>	CS, SN, LS, AR, VR, GA	Vector of Nominal	n/a	Mode, CDF	

**Table 25 – Application Network Resources Usage (NWR) Key Performance Indicators**

<b>Measurements</b>	<b>Use Cases</b>	<b>Type</b>	<b>Unit</b>	<b>Summarization</b>	<b>KPI</b>
<i>DL IP data usage</i>	All	Unsigned Integer	byte	Average, Deviation, Skewness, Kurtosis	Total DL IP data usage



UL IP data usage

All	Unsigned Integer	byte		Total UL IP data usage
-----	------------------	------	--	------------------------

With:

DL IP data usage: Number of bytes transferred in DL direction.

UL IP data usage: Number of bytes transferred in UL direction.

## 8.2 Mobile devices test cases

**Table 26 – Mobile devices User Experience with reference apps (DRA) KPIs**

<b>Measurements</b>	<b>Use Cases</b>	<b>Type</b>	<b>Unit</b>	<b>Summarization</b>	<b>KPI</b>
<i>Access Time</i>	All	Unsigned Integer	n/a	Average, Deviation, CDF	App Access Time
<i>Accessibility</i>	All	Boolean	n/a	Ratio	App Accessibility
<i>Availability</i>	All	Boolean	n/a	Ratio	App Availability
<i>Cut off</i>	All	Boolean	n/a	Ratio	App Availability
<i>Time to load first media frame</i>	CS, LS SN, GA	Unsigned Integer	s	Average, Deviation, CDF	Content Load Time
<i>Time to load after resuming</i>	CS, LS SN, GA				
<i>Time to load the virtual world</i>	VR				
<i>Time to load the virtual scene</i>	VR				
<i>Time to load augmentation</i>	AR				
<i>Time to load the first game</i>	GA				
<i>Time to load the second game</i>	GA				
<i>Response Time</i>	VR, AR, GA	Unsigned Integer	S	Average, Deviation, CDF	Response Time
<i>Playback</i>	CS, LS, SN	Boolean	n/a	Ratio	Feature Availability
<i>Pause Operation</i>	CS, SN, HS, GA				
<i>Resume Operation</i>	CS, SN, HS, GA				
<i>Stop Operation</i>	CS, LS, SN				
<i>Rewind Operation</i>	CS				
<i>Fast Forward Operation</i>	CS				
<i>Search Operation</i>	CS, LS, SN				
<i>Seek Operation</i>	CS				



<i>Skip Forward Operation</i>	CS				
<i>Skip Backward Operation</i>	CS				
<i>{Picture, Video, Comment, File} Transfer</i>	CS, SN, HS				
<i>Load Augmentation Layer Operation</i>	AR				
<i>Clear Augmentation Layer Operation</i>	AR				
<i>Start Game Operation</i>	GA				
<i>Content Stall</i>	CS, LS, SN, VR, GA	Vector of Unsigned Integer	s	Count, Index (1), CDF	Content Stall
<i>Search Time</i>	CS, LS, SN	Unsigned Integer	s	Average, Deviation, CDF	Content Search Time
<i>{Picture, Video, File} Download Time</i>	CS, SN, HS	Unsigned Integer	s	Average, Deviation, CDF	Content Download Throughput
<i>{Picture, Video, File} Upload Time</i>	CS, SN, HS	Unsigned Integer	s	Average, Deviation, CDF	Content Upload Throughput
<i>Video Resolution</i>	CS, SN, LS, AR, VR, GA	Vector of Nominal	n/a	Mode, CDF	Content Resolution

**Table 27 – Mobile Devices Energy consumption (DEC) Key Performance Indicators**

<b>Measurements</b>	<b>Use Cases</b>	<b>Type</b>	<b>Unit</b>	<b>Summarization</b>	<b>KPI</b>
<i>Current consumption</i>	All	Unsigned Integer	mA	Average, Deviation, Skewness, Kurtosis	App Power Consumption

**Table 28 – Mobile Devices Radio Performance (RFP) Key Performance Indicators**

<b>Measurements</b>	<b>Use Cases</b>	<b>Type</b>	<b>Unit</b>	<b>Summarization</b>	<b>KPI</b>
<i>Sensitivity level</i>	HS	Unsigned float	dBm	Average, Deviation, CDF	Sensitivity
<i>AC Selectivity level</i>	HS	Unsigned float	dBm	Average, Deviation, CDF	Adjacent Channel Selectivity

**Table 29 – Mobile Devices Data Performance (DDP) Key Performance Indicators**

<b>Measurements</b>	<b>Use Cases</b>	<b>Type</b>	<b>Unit</b>	<b>Summarization</b>	<b>KPI</b>
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<i>DL IP data usage</i>	All	Unsigned Integer	byte	Average, Deviation, Skewness, Kurtosis	Total DL IP data usage
<i>UL IP data usage</i>	All	Unsigned Integer	byte		Total UL IP data usage

### 8.3 IoT devices test cases

**Table 30 – IoT devices Energy consumption (IEC) Key Performance Indicators**

<b>Measurements</b>	<b>Use Cases</b>	<b>Type</b>	<b>Unit</b>	<b>Summarization</b>	<b>KPI</b>
<i>Current consumption</i>	All	Unsigned Integer	mA	Average, Deviation, Skewness, Kurtosis	App Consumption

**Table 31 – IoT devices Data Performance (IDP) Key Performance Indicators**

<b>Measurements</b>	<b>Use Cases</b>	<b>Type</b>	<b>Unit</b>	<b>Summarization</b>	<b>KPI</b>
<i>DL IP data usage</i>	All	Unsigned Integer	byte	Average, Deviation, Skewness, Kurtosis	Total DL IP data usage
<i>UL IP data usage</i>	All	Unsigned Integer	byte		Total UL IP data usage

**Table 32 – IoT devices Reliability (IDR) Key Performance Indicators**

<b>Measurements</b>	<b>Use Cases</b>	<b>Type</b>	<b>Unit</b>	<b>Summarization</b>	<b>KPI</b>
<i>Stream Availability</i>	ES	Boolean	n/a	Ratio	Availability
<i>Stream Cutoff</i>	ES	Boolean	n/a	Ratio	
<i>Video Resolution</i>	ES	Vector of Nominal	n/a	Mode, CDF	Content Resolution
<i>Stream Availability after power failure</i>	ES	Boolean	n/a	Ratio	Recovery after fail
<i>Stream Cutoff after power failure</i>	ES	Boolean	n/a	Ratio	
<i>Video Resolution after power failure</i>	ES	Vector of Nominal	n/a	Mode, CDF	
<i>Recovery Time</i>	ES	Unsigned Integer	s	Average, Deviation, CDF	Recovery Time



## 9 ICS

This section lists the ICS items that have been defined in the TRIANGLE Test Specification.

The meaning of the contents of the status tables is stated in section 9.5.

### 9.1 Common

This section shows common ICS items that are applicable to all SUT. ICS items shown in this section may be used by all TRIANGLE Test Specifications (defined in D2.2 Appendices).

**Table A.1. General Information**

<i>Item</i>	<b>Description</b>	<b>Status</b>	<b>Supported values</b>	<b>Support</b>	<b>Mnemonic</b>
1	Type of product	M1	Application, Mobile device, IoT device		ICSG_ProductType
2	Type of IoT device: Grid Powered, Long Lasting battery or Short Lasting battery IoT device)	C01	GP-IoT, LL-IoT, SL-IoT		ICSG_IoTDeviceType
3	Supported use cases: Virtual Reality, Gaming, Augmented Reality, Content Distribution Streaming Services, Live Streaming Services, Social Networking, High Speed Internet, Patient Monitoring, Emergency Services, Smart Metering, Smart Grids and Connected Vehicles	Mn	VR, GA, AR, CS, LS, SN, HS, PM, ES, SM, SG, CV		ICSG_UseCases

*C.01 IF (A.1/1 = IoT device) THEN Mn ELSE N/A*

Note: This table requires values other than Boolean values.

### 9.2 Applications

This section shows ICS items that are applicable only to Applications. ICS items shown in this section may be used by all TRIANGLE Test Specifications.

**Table A.2. Apps supported features** (only applicable if A.1/1 = Application)

<i>Item</i>	<b>Description</b>	<b>Status</b>	<b>Support</b>	<b>Mnemonic</b>
1	<i>Support of Login</i>	O		<i>ICSA_Login</i>
2	<i>Support of logout</i>	C.03		<i>ICSA_Logout</i>
3	<i>Support of open menu</i>	O		<i>ICSA_OpenMenu</i>



4	Support of activate backgroundservice	O		ICSA_Background
5	Support of play content (video/song)	C.01		ICSA_CSPlay
6	Support of re-play content	C.01		ICSA_CSReplay
7	Support of skip forward content	C.02		ICSA_CSSkipForward
8	Support of fast forward content	C.02		ICSA_CSFastForward
9	Support of skip backward content	C.02		ICSA_CSSkipBackward
10	Support of rewind content	C.02		ICSA_CSRewind
11	Support of pause content (video/song)	C.02		ICSA_CSPause
12	Support of X8 speed fast forward content	C.04		ICSA_CSFastForwardX8
13	Support of X8 speed rewind content	C.05		ICSA_CSRewindX8
14	Support of Download content for offline playing	C.02		ICSA_CSDownloadMedia
15	Support of post text	C.06		ICSA_SNPostText
16	Support of post text and image	C.07		ICSA_SNPostImage
17	Support of post text and video	C.07		ICSA_SNPostVideo
18	Support of post text and location	C.07		ICSA_SNPostLocation
19	Support of post file	C.07		ICSA_SNPostFile
20	Support of get image	C.07		ICSA_SNGetImage
21	Support of get video	C.07		ICSA_SNGetVideo
22	Support of get live video	C.07		ICSA_SNGetLiveVideo
23	Support of get location	C.07		ICSA_SNGetLocation
24	Support of get file	C.07		ICSA_SNGetFile
25	Support of save game session	C.09		ICSA_GASave
26	Support of pause game session	C.09		ICSA_GAPause
27	Support of search and seek	C.02		ICSA_CSSearchSeek
28	Support of play content with screen off	C.02		ICSA_CSPlayScreenOff
29	Support of broadcast live video with screen off	C.08		ICSA_LSBroadcastScreenOff



- C.01 IF (A.1/3 INCLUDES CS) THEN M ELSE N/A  
 C.02 IF (A.1/3 INCLUDES CS) THEN O ELSE N/A  
 C.03 IF (A.2/1) THEN M ELSE N/A  
 C.04 IF (A.2/8) THEN O ELSE N/A  
 C.05 IF (A.2/10) THEN O ELSE N/A  
 C.06 IF (A.1/3 INCLUDES SN) THEN M ELSE N/A  
 C.07 IF (A.1/3 INCLUDES SN) THEN O ELSE N/A  
 C.08 IF (A.1/3 INCLUDES LS) THEN O ELSE N/A  
 C.09 IF (A.1/3 INCLUDES GA) THEN O ELSE N/A

Note: Items in this table only can take Boolean 'Yes' or 'No' values (Support column).

### 9.3 Mobile devices

**Table A3. Mobile devices Features** (Only applicable if A.1/1 = Mobile device)

Item	Description	Status	Support	Mnemonic
1	Support of Video Playing	M		ICSDM_PlayVideo
2	Support of Video Recording	O		ICSDM_RecordVideo
3	Support of Virtual Reality	O		ICSDM_VirtualReality
4	Support of Augmented Reality	O		ICSDM_AugmentedReality

Note: Items in this table only can take Boolean 'Yes' or 'No' values (Support column).

### 9.4 IoT devices

**Table A4. IoT devices Features** (Only applicable if A.1/1 = IoT device)

Item	Description	Status	Support	Mnemonic
1	Support of Playing received video	O		ICSDI_ReceiveVideo
2	Support of Video transmission	O		ICSDI_TransmitVideo
3	Support of Playing Received audio	O		ICSDI_PlayAudio
4	Support of Audio transmission	O		ICSDI_RecordAudio
5	Support of Idle mode	O		ICSDI_IdleMode
6	Support of Audio transmission without Video	C.01		ICSDI_RecordAudioWithoutVideo



7	Support of Playing received Audio without Video	C.02		ICSDI_PlayAudioWithoutVideo
8	Device is connected to a Battery	O		ICSDI_Battery
C.01 IF A.4/4 THEN O ELSE N/A C.02 IF A.4/3 THEN O ELSE N/A				

Note: Items in this table only can take Boolean 'Yes' or 'No' values (Support column).

## 9.5 ICS template

This section indicates the ICS proformas to be used by the ICS tables.

The supplier of the device or application implementation shall complete the ICS proformas by filling the 'Support' column.

Two ICS proforma templates are defined depending of the supported values of the 'Support' column.

### 9.5.1 Support column with Boolean values

ICS tables with items that can only take a Boolean value in the 'Support' column will use the following template.

**Table 33 –ICS template for Support column with Boolean values**

Item	Description	Status	Support	Mnemonic
1				
2				
3				
....				

List of conditional expressions

### 9.5.2 Support column with multiple values

ICS tables with items that can take multiple values in the 'Support' column will use the following template.

**Table 34 – ICS template for Support column with multiple values**

Item	Description	Status	Supported values	Support	Mnemonic
1					
2					



3					
....					
<i>List of conditional expressions</i>					

The description of the columns contents for both templates is detailed in the table below.

**Table 35 – ICS Proforma columns**

<b>Column</b>	<b>Description</b>
<i>Item</i>	The item column contains a number which identifies the item in the table.
<i>Description</i>	The item column contains the ICS name
<i>Status</i>	The following notations are used for the status column:
	M            mandatory – the capability is required to be supported.
	M1          mandatory, only 1 option may be supported
	Mn          mandatory, at least one option is supported; many options may be supported.
	O            optional – the capability may be supported or not.
<i>Support</i>	N/A        not applicable – in the given context, it is impossible to use the capability.
	C.i         conditional – the requirement on the capability ("M", "O" or "N/A") depends on the support of other optional or conditional items. "i" is an integer identifying an unique conditional status expression which is defined immediately following the table. For nested conditional expressions, the syntax "IF ... THEN (IF ... THEN ... ELSE...) ELSE ..." shall be used to avoid ambiguities.
	The support column shall be filled in by the supplier of the implementation. The following common notations are used for the support column:
<i>Mnemonic</i>	Y or y            supported by the implementation
	N or n            not supported by the implementation
<i>Supported values</i>	N/A, n/a or -    no answer required (allowed only if the status is N/A, directly or after evaluation of a conditional status)
	The Mnemonic column contains mnemonic identifiers for each item.
	List of supported vales



## 10 IXIT

### 10.1 Applications

This section shows IXIT items that are applicable only to applications

**Table B1. Applications IXIT** (Only applicable if A.1/1 = Application)

<i>Item</i>	<b>Name</b>	<b>Supported values</b>	<b>Mnemonic</b>	<b>Value</b>
1	Operating System	Android, iOS	IXITD_OperatingSystem	

### 10.2 Devices

This section shows IXIT items that are applicable only to devices (mobile devices and IoT devices).

**Table B2. Devices IXIT** (Only applicable if A.1/1 = Mobile device OR A.1/1 = IoT device)

<i>Item</i>	<b>Name</b>	<b>Supported values</b>	<b>Mnemonic</b>	<b>Value</b>
1	Supported cellular technologies	GSM, UMTS, LTE, 5G	IXITD_CellularTechnology	
2	Supported frequency bands	As per TS 36.521-2 Table A.4.3-3	IXITD_Bands	
3	UE Power Class	As per TS 36.521-2 Table A.4.3-3b	IXITD_UEPowerClass	
4	Supported channel bandwidths	As per TS 36.521-2 Table A.4.3-3a	IXITD_Bandwidths	
5	UE Category	As per TS 36.521-2 Table A.4.3-4 and Table A.4.3-4a0	IXITD_UECategory	
6	UE Downlink Category	As per TS 36.521-2 Table A.4.3-4a and Table A.4.3-4aa	IXITD_DLCategory	
7	UE Uplink Category	As per TS 36.521-2 Table A.4.3-4b and Table A.4.3-4ba	IXITD_ULCategory	
8	Nominal working voltage		IXITD_NormalVoltage	

### 10.3 IXIT template

This section indicates the IXIT proforma to be used for the definition of IXIT items..



The table below will be used as IXIT template for the required IXIT tables

**Table 36 –IXIT template**

<b><i>Item</i></b>	<b>Description</b>	<b>Supported values</b>	<b>Mnemonic</b>	<b>Value</b>
1				
2				
3				
.....				



## Annex 1: Version Control

Table 37 – Version Control

<b>Version</b>	<b>Date</b>	<b>Change-log</b>
1.0	2018-11-29	First release
1.1	2018-12-13	Test cases RFP/HS/001 and RFP/HS/002 steps corrected. <i>Corrections across the document</i>
1.2	2018-12-21	IoT devices test cases applicability reworked
1.3	2019-03-27	Minor changes across the document