eCall Plugtests;
Nuneaton, UK;
22 - 24 May 2012

PLUGTESTS™

INTEROP EVENTS

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Contents

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Foreword

Following a decision of the European Parliament, and a request by the European Commission to ETSI, ETSI TC MSG and CEN were tasked with managing the technical specification and creation of open standards for the Pan-European eCall emergency service.

An eCall is an emergency voice call, initiated manually or automatically from a vehicle to a Public Safety Answering Point (PSAP), supplemented by up to 140 bytes of incident related data. The Minimum Set of Data (MSD) has been defined by CEN Technical Committee 278 and includes the GNSS derived location and direction of travel of the vehicle, the Vehicle Identification Number (VIN) and other information to enable the emergency response teams to quickly locate and provide medical and other life saving assistance to the accident victims.

eCall has been designed to operate over any PLMN that supports emergency voice calls, specifically TeleService 12. Should the MSD not be transmitted or received for any reason, or if the PSAP is not equipped with the necessary eCall equipment (eCall modem / server), the accident victims and PSAP operator may still converse using the In-Vehicle System (IVS) audio equipment.

The 3rd Generation Partnership Project (3GPP) has specified the eCall service requirements, data transmission protocols and network signaling aspects for Release 8. The in-band modem used to transfer the MSD from the vehicle to the PSAP, following the establishment of a TS12 emergency voice call, has been specified by 3GPP TSG SA WG 4.

Once an eCall is invoked, initiated manually by the vehicle occupants or automatically as the result of an incident, the eCall call set-up and clear-down procedures (RR, CC, and MM) are automatically controlled by the eCall in-vehicle system (IVS) and its associated network access device (NAD). Once initiated the system requires no MMI intervention and does not permit the user to intervene at any stage during call management. It is important, therefore, that the eCall system works autonomously and reliably when faced with a wide range of probable network access events.

1   Scope

This document forms the guidelines to lead the technical organization of the 1st eCall Plugtests event, in Nuneaton, from 22 to 24 May 2012. This document is intended to be upgraded for future interoperability events.

This document describes:

•   The testbed architecture showing which eCall systems and components are involved and how they are going to interwork

•   The configurations used during test sessions, including the parameter values of the different layers

•   The interoperability test descriptions, which are describing the scenarios, which the participants will follow to perform the tests

2   References

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

Referenced documents which are not found to be publicly available in the expected location might be found at http://docbox.etsi.org/Reference.

NOTE: While any hyperlinks included in this clause were valid at the time of publication ETSI cannot guarantee their long term validity.

2.1   Normative references

The following referenced documents are necessary for the application of the present document.

[1]   ETSI TS 122 101: "Service aspects; service principles"

[2]   ETSI TS 124 008: "Mobile Radio Interface Layer 3 specification; Core Network Protocols; Stage 3"

[3]   ETSI TS 126 267: "eCall Data Transfer; In-band modem solution; Gene description"

[4]   ETSI TS 126 268: "eCall Data Transfer; In-band modem solution; ANSI-C reference code"

[5]   ETSI TS 126 269: "eCall Data Transfer; In-band modem solution; Conformance testing"

[6]   ETSI TR 126 969: "eCall Data Transfer; In-band modem solution; Characterisation Report"

[7]   CEN EN 15722: "Road transport and traffic telematics – eSafety – eCall Minimum Set of Data "

[8]   CEN EN 16062: "Intelligent Transport Systems – eCall – High Level Application Protocols "

[9]   CEN EN 16072: " Intelligent transport systems - eSafety - Pan European eCall - Operating requirements"

[10]   ETSI TS 102 936-1: "eCall Network Access Device (NAD) conformance specification; Part 1 Protocol Test Specification"

[11]   ETSI TS 102 936-2: "eCall Network Access Device (NAD) conformance specification; Part 2 Test Suites"

[12]   ETSI TS 127 007: "AT command set for User Equipment (UE)"

[13]   ETSI TS 131 102: "Characteristics of the Universal Subscriber Identity Module (USIM) application"

[14]   ETSI TS 134 123-1: "User Equipment (UE) conformance specification; Part 1: Protocol conformance specification"

[15]   ETSI TS 134 123-2: "User Equipment (UE) conformance specification; Part 2: Implementation Conformance Statement (ICS) proforma specification"

[16]   ETSI TS 134 123-3: "User Equipment (UE) conformance specification; Part 3: Abstract Test Suites (ATS)"

[17]   ETSI TS 134 108: "Common test environments for User Equipment (UE)"

[18]   ETSI TS 151 010-1: "GSM EDGE Radio Access Network; Mobile Station (MS) conformance specification; Part 1: Conformance specification "

[19]   ETSI TS 151 010-2: "GSM/EDGE Radio Access Network; Mobile Station (MS) conformance specification; Part 2: Protocol Implementation Conformance Statement (PICS) proforma specification "

[20]   ETSI EN 301 908-1: "Base Stations (BS), Repeaters and User Equipment (UE) for IMT-2000 Third-Generation cellular networks; Part 1: Harmonized EN for IMT-2000, introduction and common requirements, covering the essential requirements of article 3.2 of the R&TTE Directive"

[21]   ETSI EN 301 908-2: "Base Stations (BS), Repeaters and User Equipment (UE) for IMT-2000 Third-Generation cellular networks; Part 2: Harmonized EN for IMT-2000, CDMA Direct Spread (UTRA FDD and E-UTRA FDD) (UE) covering the essential requirements of article 3.2 of the R&TTE Directive"

[22]   ETSI EN 301 511: "Harmonized EN for mobile stations in the GSM 900 and GSM 1800 bands covering essential requirements under article 3.2 of the R&TTE directive (1999/5/EC) "

[23]   ETSI EG 202 798 (V1.1.1): "Intelligent Transport Systems (ITS); Testing; Framework for conformance and interoperability testing"

2.2   Informative references

The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area**.**

[i.1]   ISO EN 24978: "Intelligent transport systems - ITS Safety and emergency messages using any available wireless media - Data registry procedures "

[i.2]   ETSI TR 102 937: "Guidelines on applicability of GSM and UMTS mobile station harmonised standards to eCall Network Access Device (NAD)"

[i.3]   ETSI TR 266: "Methods for Testing and Specification (MTS); Test Purpose style guide"

[i.4]   CEN TC 278 WI 00278316 (draft EN): "Intelligent transport systems – eSafety - eCall end to end conformance testing"

3   Definitions and Abbreviations

3.1   For the purposes of the present document, the following definitions apply:

eCall: A manually or automatically initiated emergency call, (TS12) from a vehicle, supplemented with a minimum set of emergency related data (MSD), as defined under the EU Commission's eSafety initiative.

MSD: The Minimum Set of Data forming the data component of an eCall sent from a vehicle to a Public Safety Answering Point or other designated emergency call centre. The MSD has a maximum size of 140 bytes and includes, for example, vehicle identity, location information and time-stamp.

PSAP eCall Modem-server: The PSAP equipment used to receive, validate and acknowledge the MSD sent from an IVS, to manage the voice call transfer to the PSAP operator and to facilitate call-back to the vehicle. The eCall modem-server may also support other functions.

base specification: A specification of a protocol, telecommunication service, interface, abstract syntax, encoding rules, or information object.

implementation: The instance of the reference specification for which conformity to that reference specification is claimed.

reference specification: A standard which provides a base specification, or a set of base specifications, or a profile, or a set of profiles, and for conformance to which the ICS proforma and test specifications are written.

IVS configured for eCall only service (restricted): An eCall capable IVS that is not subscribed to other non-emergency services. The IVS is not permitted to register on a PLMN except for the purpose of making an eCall, or a test/reconfiguration call to a designated non-emergency number, in accordance with TS 122 101 [1]. Following power-up the IVS may perform a PLMN search and maintain a list of available networks upon which to register, when an eCall or test / reconfiguration call is activated. Following an eCall or test / reconfiguration call, the IVS must de-register from the serving network within 12 hours.

IVS configured for eCall and other services (unrestricted): An eCall capable IVS that has valid subscriptions to access other non-emergency services. The IVS may register on a PLMN at anytime and may remain registered on a serving network indefinitely.

3.2   For the purposes of the present document, the following abbreviations apply:

3GPP	Third Generation Partnership Project
CEN	Comité Européen de Normalisation
EC	European Commission
ETSI	European Telecommunication Standards Institute
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
GPRS	General Packet Radio System
GSM	Global System of Mobile telecommunications
HLAP	High Level Application Protocol
ISO	International Standardization Organization
IVS	In Vehicle System (eCall terminal and associated sub-systems in vehicle)
KPI	Key Performance Indicator
MNO	Mobile Network Operator
MSD	Minimum Set of Data
MSISDN	Mobile Subscriber Integrated Services Digital Network Number
NAD	Network Access Device
PLMN	Public Land Mobile Network
PSAP	Public Service Answering Point
SIM	Subscriber Identity Module
TPS	Third Party Service
TMC	Traffic Management Centre
UMTS	Universal Mobile Telecommunication System
VIN	Vehicle Identification Number

4 Conventions

4.1 Interoperability test process

4.1.1 Introduction

The goal of interoperability test is to check that devices resulting from protocol implementations are able to work together and provide the functionalities provided by the protocols. As necessary, one message may be checked during a test, when a successful functional verification may result from an incorrect behaviour for instance. Detailed protocol checks are part of the conformance testing process and are thus avoided during the Interoperability tests.

The test sessions will be mainly executed between 2 devices (IVS and PSAP eCall modem-server) from different vendors.

In addition to the 7 mandatory interoperability tests, 21 other 'optional' tests have been specified, and these may be used to help diagnose basic call set-up problems and high level application protocol (HLAP) timing issues that may be encountered during the interoperability testing phase.

For some of the optional tests it is necessary to use a mobile phone instead of the IVS and in other tests to replace the PSAP eCall modem-server with a telephone – this is further explained in clause 6.

4.1.2 The test description proforma

The test descriptions are provided in proforma tables following the format described in [23] and [i.3]. The following different test events are considered during the test execution:

- A **stimulus** corresponds to an event that enforces an EUT to proceed with a specific protocol action, like sending a message for instance.

- A **verify** consists of verifying that the EUT behaves according to the expected behaviour (for instance the EUT behaviour shows that it receives the expected message).

- A **configure** corresponds to an action to modify the EUT configuration.

- A **check** ensures the receipt of protocol messages on reference points, with valid content. This "check" event type corresponds to the interoperability testing with conformance check method.

See the test description tables applying to the eCall mandatory and optional interoperability testing below.

For the execution of the interoperability test sessions, the following conventions apply:

- Optional (check) tests should be performed using High Level Application Protocol (HLAP) monitor tools (see clause 'Tooling' below) and may be skipped due to time restrictions.

4.2 Tooling

- Message monitoring solutions, including audio recording and event logging, where supported, may be used to facilitate the the resolution of any interoperability and/or performance issues that may be encountered during the eCall Plugtest event.

- All audio and event log files can be consulted by participants for debugging purposes

- Participants may also use their own tool for logging Link Layer and Application Layer messages, and HLAP events e.g. timings.

- A list of the applicable CEN specified eCall HLAP timings can be found in Annex A.

4.2.1   SIM cards issued by innovITS ADVANCE for IVS testing

Testing will be performed over the innovITS ADVANCE GSM network. To access this network SIM cards will be provided with the Private Mobile Network UK mobile code 234-19.

Please note, IVS vendors are requested to manually lock the network setting to 234-19 so as to avoid the device from straying onto a macro network when making an e112 call. This is particularily important when conducting simulated low RSSI tests with reduced network power.

4.3   Test Description naming convention

Table 1: TD naming convention

TD/<root>/<mode><nn>/<gr>		
<root> = root applicability	MAN	Mandatory tests
	OPT	Optional tests
<mode> = mode of operation	PUSH	Push Mode
	PULL	Pull Mode
<nn> = sequential number	01 to 99	Sequential numbers
<gr> = group	IVS	eCall terminal
	PSAP	PSAP eCall modem-server
	EUT	IVS and/or PSAP

4.4   Test Summary – Mandatory Tests

Table 2: Mandatory Tests

1	TD_MAN_PUSH_01_EUT	MSD transmission / reception /acknowledgement
2	TD_MAN_PUSH_02_EUT	Voice communication after receipt of AL-ACK
3	TD_MAN_PUSH_03_EUT	Retransmission of MSD on request from PSAP
4	TD_MAN_PUSH_04_EUT	Voice communication after retransmission of MSD
5	TD_MAN_PUSH_05_EUT	Clear down / PSAP initiated network clear down
6	TD_MAN_PUSH_06_EUT	Clear down / PSAP initiated application layer AL-ACK Clear-down
7	TD_MAN_PUSH_07_EUT	Call Back / PSAP initiated call back to IVS

NOTE: The Mandatory tests verify interoperability between the IVS, PLMN and PSAP

4.5   Test Summary – Optional Tests – PUSH Mode

Table 3: Optional Tests – Push Mode

1	TD_OPT_PUSH_01_IVS	Emergency call set-up with eCall identifier (flag) set to 'Automatically Initiated' in Service Category message
2	TD_OPT_PUSH_02_IVS	Emergency call set-up with eCall identifier (flag) set to 'Manually Initiated' in Service Category message
3	TD_OPT_PUSH_03_IVS	MSD call type indicator set to 'Automatically Initiated'
4	TD_OPT_PUSH_04_IVS	MSD call type indicator set to 'Manually Initiated'
5	TD_OPT_PUSH_05_IVS	MSD call type indicator set to 'Test Call'
6	TD_OPT_PUSH_06_IVS	Duration of Initiation Signal does not exceed 2 seconds from when call is answered
7	TD_OPT_PUSH_07_PSAP	PSAP does not send 'SEND MSD' request if valid Initiation Signal is not received within 2 seconds from answering call
8	TD_OPT_PUSH_08_IVS	Mute IVS audio during MSD transmission and un-mute after application layer acknowledgement
9	TD_OPT_PUSH_09_PSAP	Mute PSAP audio during MSD request / MSD transfer and un-mute after application layer acknowledgement
10	TD_OPT_PUSH_10_IVS	Auto redial following busy / no-answer during call set-up
11	TD_OPT_PUSH_11_IVS	Auto redial if call drops before MSD acknowledged and does not redial if MSD has been acknowledged (LL)
12	TD_OPT_PUSH_12_PSAP	Un-mute PSAP audio when Initiation Signal not received (T4 expired)
13	TD_OPT_PUSH_13_IVS	Un-mute IVS audio when SEND MSD not received (T5 expired)
14	TD_OPT_PUSH_14_IVS	Un-mute IVS audio when AL-ACK not received (T6 expired)
15	TD_OPT_PUSH_15_IVS	Un-mute IVS audio when LL-ACK not received (T7 expired)
16	TD_OPT_PUSH_16_PSAP	Un-mute PSAP audio when MSD not received within (T8 expired)
17	TD_OPT_PUSH_17_IVS	Format of encoded and decoded MSD in accordance with EN 15722
18	TD_OPT_PUSH_18_IVS	IVS configured for eCall 'only' service (restricted)
19	TD_OPT_PUSH_19_IVS	IVS maintains register of recent calls
20	TD_OPT_PUSH_20_PSAP	PSAP handling of more than 1 eCall simultaneously

NOTE: Optional tests verify the behaviour of the IVS and PSAP individually in accordance with the ETSI and CEN specifications and may be used to help identify the cause of interoperability failures.

4.6   Test Summary – Optional Tests – PULL Mode

Table 4: Optional Tests – Pull Mode

01	TD_OPT_PULL_01_PSAP	MSD transmission / reception /acknowledgement (Use of Pull mode is not currently permitted within the EU)

5   Test Bed Architecture

5.1   Overview

The test site architecture comprises a private GSM network and MSC. A SIP (VoIP) trunk from the MSC gateway connects to a SIP – ISDN media gateway providing 8 VoIP channels and 4 x E1 / ISDN (PRI) interfaces.
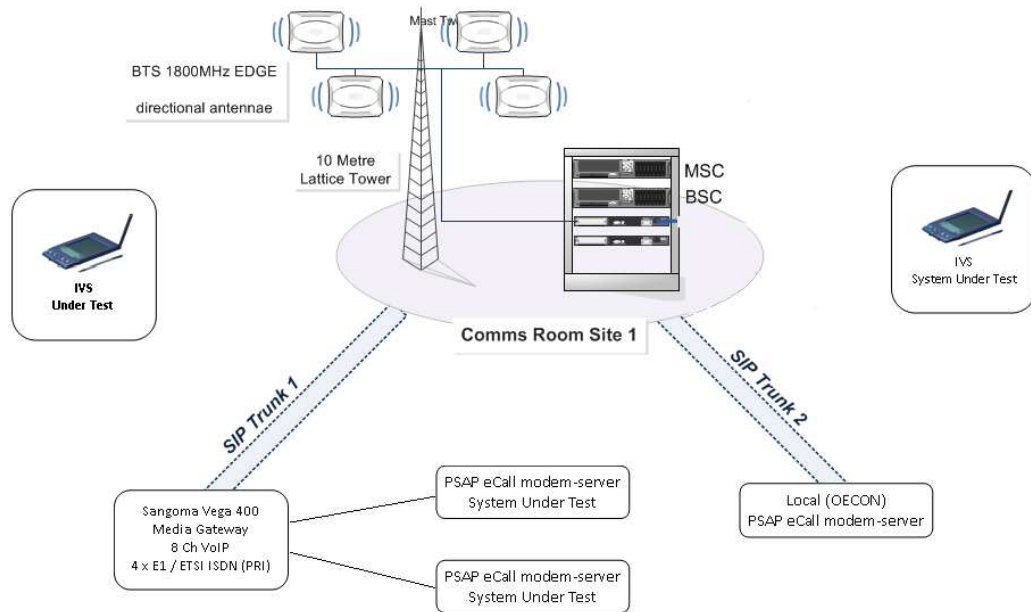
Figure 1: InnovITS ADVANCE simplified test site layout

6   Test Configurations

6.1   Interoperability Testing Configuration

Interoperability tests will be performed using the set-up shown in figure 2 eCall_CFG_01. Ancillary measurement and message logging equipment is not shown but may be used, with the agreement of the participants, to help identify the likely cause of any interoperability test failures that may arise.
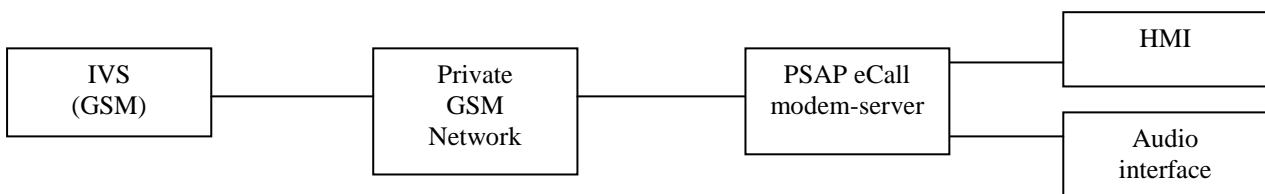
Figure 2: eCall_CFG_01 – Mandatory interoperability testing configuration

6.2   Optional (conformance based) Test Configurations

Optional conformance based testing may be performed using any of the 3 test configurations, specified in each of the optional eCall Scenario test cases, and shown in figures 2, 3 and 4.

eCall_CFG_01	IVS	PLMN	PSAP (Modem-server / HMI / Audio interface)
eCall_CFG_02	IVS	PLMN	TELEPHONE
eCall_CFG_03	MOBILE PHONE	PLMN	PSAP (Modem-server / HMI / Audio interface)

Interoperability test configuration 2 (eCall_CFG_02), a TELEPHONE (only) is used to simulated a PSAP that is either not equipped with a PSAP eCall modem-server or a PSAP eCall modem server that fails to respond to the incoming Initiation Tone from the IVS for any reason.

Figure 3: eCall_CFG_02 – Optional interoperability / diagnostic testing configuration

Interoperability test configuration 3 (eCall_CFG_03), a mobile phone is used instead of an IVS to simulated an emergency call from an IVS, that fails to transmit an eCall Initiation Signal or transmits an invalid Initiation Tone, or from a miss-routed mobile phone originated emergency call. In all such cases the PSAP modem-server must not respond with a request to 'SEND MSD' (START message) but is required, after the specified time, to transfer the emergency call to a PSAP operator , so that 2-way speech can be established.
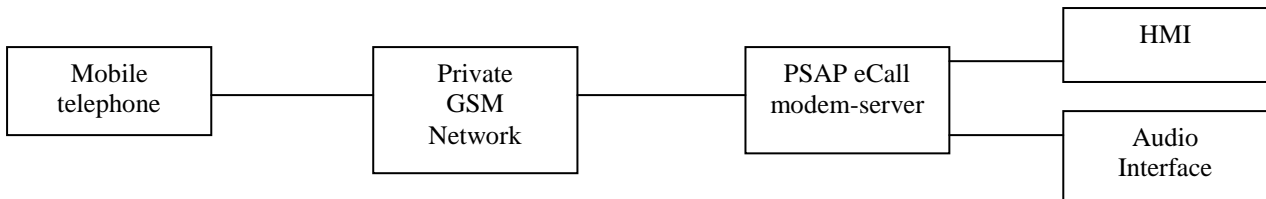
Figure 4: eCall_CFG_03 – Optional interoperability / diagnostic testing configuration

7   eCall Scenarios

7.1   Mandatory Test Cases – PUSH Mode

A basic flow diagram of the Push Mode sequesnce is shown in figure 5.
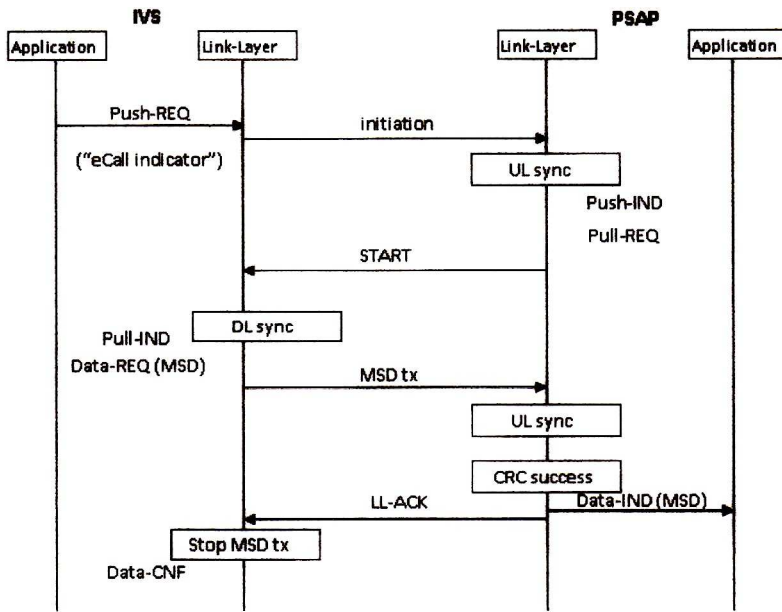
Figure 5: MSD transfer – lower layer – successful case

The application layer acknowledgemnt sequence is shown in figure 6.
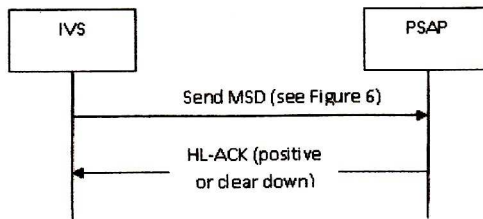
Figure 6: AL-ACK transmission sequence for send MSD case

7.1.1   eCall Push mode: MSD transmission / reception /acknowledgement

Interoperability Test Description			
Identifier:	TD_MAN_PUSH_01_EUT		
Objective:	To verify that an eCall can be established between the IVS and PSAP, that the MSD can be formulated and transmitted to the PSAP without errors, that the PSAP can send and the IVS can receive an acknowledgement that the MSD has been received correctly		
Configuration:	eCall_CFG_01		
References:	[8] EN 16062 Clause 7.4, 7.5 [i.4] CTP 1.1.14.1		
Pre-test conditions:	• Ignition is ON and IVS is in mobile network coverage • MNO and PSAP test points are available • IVS has been programmed with the non-emergency number to be used for test calls • IVS has all the information needed to compile the MSD • PSAP knows the content of the IVS encoded MSD		
Test Sequence:	**Step**	**Type**	**Description**
	1	stimulus	IVS establishes an eCall
	2	verify	PSAP verifies the call is established
	3	verify	PSAP verifies first MSD is received
	4	verify	Verify the MSD is correctly decoded
	5	check	MSD content at PSAP is identical to content transmitted by IVS
	6	verify	PSAP sends acknowledgement
	7	verify	Verify that the IVS has stopped transmitting the MSD

7.1.2   eCall Push mode: Voice communication after receipt of AL-ACK

Interoperability Test Description			
Identifier:	TD_MAN_PUSH_02_EUT		
Objective:	Verify that following transmission of the MSD and receipt of an application layer acknowledgement (AL-ACK) from the PSAP, the IVS and PSAP audio interfaces are reconnected and that 2-way speech is possible between the IVS and PSAP		
Configuration:	eCall_CFG_01		
References:	[8] EN16062 Clause 7.5.1 [i.4] CTP 1.1.14.2, 1.1.15.1		
Pre-test conditions:	• Ignition is ON and IVS is in mobile network coverage • MNO and PSAP test points are available • IVS has been programmed with the non-emergency number to be used for test calls • IVS has all the information needed to compile the MSD		
Test Sequence:	**Step**	**Type**	**Description**
	1	stimulus	IVS establishes an eCall
	2	verify	PSAP verifies the call is established

Interoperability Test Description		
3	verify	PSAP verifies first MSD is received
4	verify	PSAP verifies the MSD is correctly decoded
5	verify	Establishment of voice communication
6	verify	Verify that 2-way speech can be exchanged

7.1.3   eCall Push mode: Retransmission of MSD on request from PSAP

Interoperability Test Description		
Identifier:	TD_MAN_PUSH_03	
Objective:	Verify that the IVS is able to recognise and act upon a request from the PSAP, during an ongoing speech conversation, to send or re-send an updated MSD	
Configuration:	eCall_CFG_01	
References:	[8] EN 16062 Clause 7.6.2 [i.4] CTP 1.1.15.2	
Pre-test conditions:	• Ignition is ON and IVS is in mobile network coverage • MNO and PSAP test points are available • IVS has been programmed with the non-emergency number to be used for test calls • IVS has all the information needed to compile the MSD • Background voice is applied at IVS prior to and during MSD transmission to verify that the IVS can recognise a request from the PSAP to re-send an MSD when a speech call is in progress	

Test Sequence:	**Step**	**Type**	**Description**
	1	stimulus	IVS establishes an eCall
	2	verify	PSAP verifies the call is established
	3	verify	PSAP verifies first MSD is received
	4	verify	PSAP verifies the MSD is correctly decoded (CRC is OK)
	5	verify	Establishment of voice communication
	6	verify	Verify that 2-way speech can be exchanged
	7	stimulus	PSAP pulls a second MSD
	8	verify	Verify the second MSD is received and correctly decoded

7.1.4   eCall Push mode: Speech after retransmission of MSD

Interoperability Test Description	
Identifier:	TD_MAN_PUSH_04
Objective:	Verify that following retransmission of the MSD and receipt of an application layer acknowledgement (AL-ACK) from the PSAP, the IVS and PSAP audio systems are reconnected and that 2-way speech is possible between the IVS and PSAP operator
Configuration:	eCall_CFG_01
References:	[8] EN16062 Clause 7.5.1 [i.4] CTP 1.1.15.2
Pre-test conditions:	• Ignition is ON and IVS is in mobile network coverage • MNO and PSAP test points are available • IVS has been programmed with the non-emergency number to be used for test calls • IVS has all the information needed to compile the MSD

Test Sequence:	Step	Type	Description
	1	stimulus	IVS establishes an eCall
	2	verify	PSAP verifies the call is established
	3	verify	PSAP verifies first MSD is received
	4	verify	PSAP verifies the MSD is correctly decoded (CRC is OK)
	5	verify	Establishment of speech communication
	6	verify	Verify that 2-way speech can be exchanged
	7	stimulus	PSAP pulls a second MSD
	8	verify	Verify this MSD is received and correctly decoded (CRC is OK)
	9	verify	Establishment of 2-way speech communication
	10	verify	Verify that 2-way speech can be exchanged

7.1.5   eCall Push mode: Clear down / PSAP initiated network clear down

Interoperability Test Description	
Identifier:	TD_MAN_PUSH_05
Objective:	Verify that when the PSAP clears down the eCall, the IVS also clears down following receipt of the mobile network clear-down message
Configuration:	eCall_CFG_01
References:	[8] EN16062 Clause 7.5.5 [i.4] CTP 1.1.16.1
Pre-test conditions:	• Ignition is ON and IVS is in mobile network coverage • MNO and PSAP test points are available • IVS has been programmed with the non-emergency number to be used for test calls • IVS has all the information needed to compile the MSD

Test Sequence:	Step	Type	Description

Interoperability Test Description			
	1	stimulus	IVS establishes an eCall
	2	verify	PSAP verifies the call is established
	3	verify	PSAP verifies MSD is received and correctly decoded (CRC is OK)
	4	verify	Establishment of 2-way speech communication for 5 sec
	5	stimulus	PSAP clears down the call / network clear-down
	6	verify	Verify that the IVS clears down following receipt of network clear-down message

7.1.6   eCall Push mode: Clear down / PSAP initiated application layer AL-ACK Clear-down

Interoperability Test Description			
Identifier:	TD_MAN_PUSH_06		
Objective:	Verify that following receipt of an application layer AL-ACK clear-down message from the PSAP, the IVS clears-down		
Configuration:	eCall_CFG_01		
References:	[8] EN16062 Clause 7.5.5 [i.4] CTP 1.1.16.1		
Pre-test conditions:	• Ignition is ON and IVS is in mobile network coverage • MNO and PSAP test points are available • IVS has been programmed with the non-emergency number to be used for test calls • IVS has all the information needed to compile the MSD		
Test Sequence:	**Step**	**Type**	**Description**
	1	stimulus	IVS establishes an eCall
	2	verify	PSAP verifies the call is established
	3	verify	PSAP verifies MSD is received and correctly decoded (CRC is OK)
	4	verify	Establishment of 2-way speech communication for 5 sec
	5	stimulus	PSAP clears down the call /application layer clear down
	6	verify	Verify that the IVS clears down following receipt of application layer AL-ACK clear-down message

7.1.7   eCall Push mode: Call Back / PSAP initiated call back to IVS

Interoperability Test Description	
Identifier:	TD_MAN_PUSH_07
Objective:	To verify that if an eCall has been successfully terminated by the PSAP, then the IVS shall allow a call-back into the vehicle
Configuration:	eCall_CFG_01
References:	[8] EN 16062 Clause 7.10, 7.6.3 [9] EN 16072 Clause 7.13.3 [i.4] CTP 1.1.17.1, 1.1.17.3
Pre-test conditions:	• Ignition is ON and IVS is in mobile network coverage • MNO and PSAP test points are available • IVS has been programmed with the non-emergency number to be used for test calls • IVS has all the information needed to compile the MSD • Background voice is applied prior to and during MSD transmission to verify that the IVS can recognise a request from the PSAP to send or re-send an MSD when a speech call is in progress • PSAP must have received the CLI from the network

Test Sequence:	Step	Type	Description
	1	stimulus	IVS establishes an eCall
	2	verify	PSAP verifies the call is established
	3	verify	PSAP verifies first MSD is received and correctly decoded (CRC is OK)
	4	verify	Verify that 2-way speech can be exchanged for 5 sec
	5	stimulus	PSAP clears down the call / network or application layer clear-down
	6	verify	Verify that IVS has cleared down
	7	stimulus	PSAP establishes a call back (after 30 seconds) using CLI
	8	verify	Verify that 2-way speech can be exchanged
	9	stimulus	PSAP pulls MSD whilst background conversation is in progress
	10	verify	Verify that MSD is received and correctly decoded (CRC is OK)
	11	verify	Verify that 2-way speech can be exchanged
	12	stimulus	PSAP clears down call / network or application layer clear down
	13	verify	Verify that IVS clears down correctly following receipt of network or application layer clear down message

7.2   Optional Test Cases – PUSH Mode

7.2.1   eCall Push mode: Emergency call set-up with eCall identifier (flag) set to 'Automatically Initiated' in Service Category message

Interoperability Test Description	
Identifier:	TD_OPT_PUSH_01_IVS
Objective:	Verify that when activated automatically a TS12 emergency call is established with the correct eCall identifier (flag) routing bit set in the call set-up service category information element
Configuration:	eCall_CFG_01 or eCall_CFG_02
References:	[8] EN 16062 Clause 7.3.6 [i.4] CTP 1.1.7.1
Pre-test conditions:	• Ignition is ON and IVS is in mobile network coverage • MNO and PSAP test points are available • MNO test point is able to recognise and route manually initiated and automatically initiated eCalls to different destination numbers • Private GSM network does not allow received TS12 (emergency service) calls to be routed to an operational PSAP, only to a simulated PSAP test point Note: If a telephone is used at the PSAP test point to verify call routing then steps 3,4 and 5 may be ignored

Test Sequence:	Step	Type	Description
	1	stimulus	IVS establishes an eCall – Automatic trigger event
	2	verify	eCall has been routed to the PSAP test point number designated (by the MNO) for automatically initiated eCalls
	3	verify	PSAP verifies that MSD is received (see pre-test note)
	4	verify	PSAP verifies the MSD is correctly decoded (CRC is OK)
	5	verify	Establishment of voice communication after MSD received
	6	verify	Verify that 2-way speech can be exchanged
	7	stimulus	PSAP clears down call / network clear down or application layer clear-down
	8	verify	Verify that the IVS clears down following receipt of network clear-down or application layer clear-down message

7.2.2   eCall Push mode: Emergency call set-up with eCall identifier (flag) set to 'Manually Initiated' in Service Category message

<table>
<tr><td colspan="2" align="center">Interoperability Test Description</td></tr>
<tr><td>Identifier:</td><td>TD_OPT_PUSH_02_IVS</td></tr>
<tr><td>Objective:</td><td>Verify that when activated manually a TS12 emergency call is established with the correct eCall identifier (flag) routing bit set in the call set-up service category information element</td></tr>
<tr><td>Configuration:</td><td>eCall_CFG_01 or
eCall_CFG_02</td></tr>
<tr><td>References:</td><td>[8] EN 16062 Clause 7.3.6
[i.4] CTP 1.1.8.1</td></tr>
<tr><td colspan="2"></td></tr>
<tr><td>Pre-test conditions:</td><td>

Ignition is ON and IVS is in mobile network coverage
MNO and PSAP test points are available
MNO test point is able to recognise and route manually initiated and automatically initiated eCalls to different destination numbers
Private GSM network does not allow received TS12 (emergency service) calls to be routed to an operational PSAP, only to a simulated PSAP test point

Note: If a telephone is used at the PSAP test point to verify call routing then steps 3,4 and 5 may be ignored
</td></tr>
<tr><td colspan="2"></td></tr>
<tr><td>Test Sequence:</td><td>

<table>
<tr><th>Step</th><th>Type</th><th>Description</th></tr>
<tr><td>1</td><td>stimulus</td><td>IVS establishes an eCall – Manual trigger event</td></tr>
<tr><td>2</td><td>verify</td><td>eCall has been routed to the PSAP test point number designated (by the MNO) for manually initiated eCalls</td></tr>
<tr><td>3</td><td>verify</td><td>PSAP verifies that MSD is received (see pre-test note)</td></tr>
<tr><td>4</td><td>verify</td><td>PSAP verifies the MSD is correctly decoded (CRC is OK)</td></tr>
<tr><td>5</td><td>verify</td><td>Establishment of voice communication after MSD received</td></tr>
<tr><td>6</td><td>verify</td><td>Verify that 2-way speech can be exchanged</td></tr>
<tr><td>7</td><td>stimulus</td><td>PSAP clears down call / network clear down or application layer clear-down</td></tr>
<tr><td>8</td><td>verify</td><td>Verify that the IVS clears down following receipt of network clear-down or application layer clear-down message</td></tr>
</table>

</td></tr>
</table>

7.2.3   eCall Push mode: MSD call type indicator set to 'Automatically Initiated'

Interoperability Test Description			
Identifier:	TD_OPT_PUSH_03_IVS		
Objective:	Verify that the MSD received from the IVS contains the correct eCall initiation indicator		
Configuration:	eCall_CFG_01		
References:	[7] EN 15722 Clause 6.2.2 [i.4] CTP 1.1.11.1		
Pre-test conditions:	• Ignition is ON and IVS is in mobile network coverage • MNO and PSAP test points are available • IVS has all the information needed to compile the MSD and set the MSD call type indicator according to the way that the eCall is initiated • Private GSM network does not allow received TS12 (emergency service) calls to be routed to an operational PSAP, only to a simulated PSAP test point Note: If the eCall is made to a non-emergency number then step 4 should verify that the settings in Block 3 (automaticActivation = true) (testCall = true)		
Test Sequence:	**Step**	**Type**	**Description**
	1	stimulus	IVS establishes an eCall – Automatic trigger event
	2	verify	PSAP verifies that MSD is received
	3	verify	Open the received MSD and verify that Block 3 contains an indication that the eCall was automatically initiated (automaticActivation = true) (testCall = false)
	4	verify	Establishment of voice communication after MSD received
	5	verify	Verify that 2-way speech can be exchanged
	6	stimulus	PSAP clears down call / network clear down or application layer clear-down
	7	verify	Verify that the IVS clears down following receipt of network clear-down or application layer clear-down message

7.2.4   eCall Push mode: MSD call type indicator set to 'Manually Initiated'

Interoperability Test Description			
Identifier:	TD_OPT_PUSH_04_IVS		
Objective:	Verify that the MSD received from the IVS contains the correct eCall initiation indicator		
Configuration:	eCall_CFG_01		
References:	[7] EN 15722 Clause 6.2.2 [i.4] CTP 1.1.12.1		
Pre-test conditions:	• Ignition is ON and IVS is in mobile network coverage • MNO and PSAP test points are available • IVS has all the information needed to compile the MSD and set the MSD call type indicator according to the way that the eCall is initiated • Private GSM network does not allow received TS12 (emergency service) calls to be routed to an operational PSAP, only to a simulated PSAP test point Note: If the eCall is made to a non-emergency number then step 4 should verify that the settings in Block 3 (manualActivation = true) (testCall = true)		
Test Sequence:	**Step**	**Type**	**Description**
	1	stimulus	IVS establishes an eCall – Manual trigger event
	2	verify	PSAP verifies that MSD is received
	3	verify	Open the received MSD and verify that Block 3 contains an indication that the eCall was automatically initiated (manualActivation = true) (testCall = false)
	4	verify	Establishment of voice communication after MSD received
	5	verify	Verify that 2-way speech can be exchanged
	6	stimulus	PSAP clears down call / network clear down or application layer clear-down
	7	verify	Verify that the IVS clears down following receipt of network clear-down or application layer clear-down message

7.2.5   eCall Push mode: MSD call type indicator set to 'Test Call'

Interoperability Test Description			
Identifier:	TD_OPT_PUSH_05_IVS		
Objective:	Verify that the MSD received from the IVS contains the correct test eCall indicator		
Configuration:	eCall_CFG_01		
References:	[7] EN 15722 Clause 6.2.2 [i.4] CTP 1.1.13.1		
Pre-test conditions:	• Ignition is ON and IVS is in mobile network coverage • MNO and PSAP test points are available • IVS has all the information needed to compile the MSD and set the MSD call type indicator according to the way that the eCall is initiated • Private GSM network does not allow received TS12 (emergency service) calls to be routed to an operational PSAP, only to a simulated PSAP test point Note: Test eCalls may only be made to an operational PSAP when specifically authorised by the PSAP and the MSD call type indicator must indicate that the (manually / automatically initiated) eCall is a 'test call'		
Test Sequence:	**Step**	**Type**	**Description**

Interoperability Test Description			
	1	stimulus	IVS establishes an eCall – Manual trigger event
	2	verify	PSAP verifies that MSD is received
	3	verify	Open the received MSD and verify that Block 3 contains an indication that the eCall is a test eCall (testCall = true)
	4	verify	Establishment of voice communication after MSD received
	5	verify	Verify that 2-way speech can be exchanged
	6	stimulus	PSAP clears down call / network clear down or application layer clear-down
	7	verify	Verify that the IVS clears down following receipt of network clear-down or application layer clear-down message

7.2.6   eCall Push mode: Duration of Initiation Signal does not exceed 2 seconds from when call is answered

Interoperability Test Description			
Identifier:	TD_OPT_PUSH_06_IVS		
Objective:	Verify that the eCall Initiation Signal tone does not persist for longer than 2 seconds from when the call is answered		
Configuration:	eCall_CFG_01 or eCall_CFG_02		
References:	[8] EN 16062 Clause 7.4.2 [i.4] CTP 1.1.10.3		
Pre-test conditions:	• Ignition is ON and IVS is in mobile network coverage • MNO and PSAP test points are available • IVS has been programmed with the non-emergency number to be used for test calls • A PSAP simulator or telephone handset may be used to answer the eCall and to verify the duration of the eCall Initiation Signal tone • The IVS can determine when the call has been answered (CONNECT message)		
Test Sequence:	**Step**	**Type**	**Description**
	1	stimulus	IVS initiates an eCall
	2	stimulus	Incoming call to PSAP test point / telephone is answered
	3	stimulus	Monitor incoming audible eCall Initiation signal. Do not send (SEND MSD) response
	4	verify	The audible eCall Initiation signal does not persist for longer than 2 seconds from when the call is answered
	5	verify	Verify that when the Initiation Signal tone ceases that 2-way speech can be exchanged between the IVS and PSAP operator
	6	stimulus	PSAP clears down call / network clear down
	7	verify	Verify that the IVS clears down following receipt of network clear-down message

7.2.7   eCall Push mode: PSAP does not send 'SEND MSD' request if valid Initiation Signal is not received within 2 seconds from answering call

Interoperability Test Description			
Identifier:	TD_OPT_PUSH_07_PSAP		
Objective:	Verify that the PSAP when operating in PUSH mode does not emit any audible signal tones unless a valid Initiation Signal is received within 2 seconds from answering the call		
Configuration:	eCall_CFG_03		
References:	[1] ETSI TS 122 101 Clause A.27 8] EN 16062 Clause 7.4.2, Annex A.1 [i.4] CTP 1.1.10.3		
Pre-test conditions:	• Ignition is ON and IVS is in mobile network coverage • MNO and PSAP test points are available • A line audio monitor is available • Mobile phone is programmed with PSAP test call number		
Test Sequence:	**Step**	**Type**	**Description**
	1	stimulus	A mobile phone initiates a call to the PSAP test call number
	2	stimulus	PSAP answers call
	3	stimulus	Mobile phone / audio monitor listens for any audible signal tones emitted from the PSAP for 5 seconds
	4	verify	Verify that the PSAP does not emit any audible signal tones
	5	verify	Verify that after 2 seconds from when the call is answered that 2-way speech can be exchanged between the IVS and PSAP operator
	6	stimulus	PSAP clears down call / network clear down
	7	verify	Verify that the IVS clears down following receipt of network clear-down message

7.2.8   eCall Push mode: Mute IVS audio during MSD transmission and un-mute after application layer acknowledgement

Interoperability Test Description			
Identifier:	TD_OPT_PUSH_08_IVS		
Objective:	Verify that when an eCall is activated the IVS audio (including entertainment audio) is muted so as not to cause interference to the call whilst the MSD is being transmitted, and is not un-muted before an MSD acknowledgment is received from the PSAP		
Configuration:	eCall_CFG_01		
References:	[8] EN 16062 Clause 7.2.1 [i.4] CTP 1.1.10.3		
Pre-test conditions:	• Ignition is ON and IVS is in mobile network coverage • MNO and PSAP test points are available • IVS has been programmed with the non-emergency number to be used for test calls • Audio channel monitor is available Note: If the IVS supports an entertainment audio muting function then this should be activated when required during this test		
Test Sequence:	**Step**	**Type**	**Description**
	1	stimulus	IVS establishes an eCall – Manual trigger event

Interoperability Test Description			
	2	stimulus	Incoming call to PSAP test point is answered
	3	stimulus	PSAP monitors audio output from the call whilst MSD is being transmitted from the IVS
	4	stimulus	Attempt voice communication with the IVS operator
	5	verify	Verify that voice communication with the IVS operator cannot be established, prior to sending an MSD acknowledgment to the IVS, or after 20 seconds from when the call is first answered.
	6	verify	PSAP verifies that MSD is received and decoded correctly (CRC is OK)
	7	verify	Verify that 2-way speech can be exchanged following application layer acknowledgement
	8	stimulus	PSAP clears down call / network clear down
	9	verify	Verify that the IVS clears down following receipt of network clear-down message

7.2.9   eCall Push mode: Mute PSAP audio during MSD request / MSD transfer and un-mute after application layer acknowledgement

Interoperability Test Description			
Identifier:	TD_OPT_PUSH_09_PSAP		
Objective:	Verify that when an incoming eCall is answered, and when an MSD is requested during an ongoing call, that the PSAP does not cause audio interference to the modem transmissions		
Configuration:	eCall_CFG_01		
References:	[8] EN 16062 Clause 7.2.1 [i.4] CTP 1.1.10.3		
Pre-test conditions:	• Ignition is ON and IVS is in mobile network coverage • MNO and PSAP test points are available • IVS has been programmed with the non-emergency number to be used for test calls • Audio channel monitor is available		
Test Sequence:	**Step**	**Type**	**Description**
	1	stimulus	IVS establishes an eCall – Manual trigger event
	2	stimulus	Incoming call to PSAP test point is answered
	3	stimulus	Monitor audio output from the call whilst MSD is being requested and transmitted from the IVS, and until an application layer acknowledgement is sent to the IVS
	4	stimulus	PSAP operator attempt to establish voice communication with IVS
	5	verify	Verify that the there are no unwanted audio artefacts (e.g. speech) detected whilst monitoring the audio channel
	6	verify	PSAP verifies that MSD is received and decoded correctly (CRC is OK)
	7	verify	Verify that 2-way speech can be exchanged after an application layer acknowledgement
	8	stimulus	PSAP clears down call / network clear down
	9	verify	Verify that the IVS clears down following receipt of network clear-down message

7.2.10 eCall Push mode: Auto redial following busy / no-answer during call set-up

Interoperability Test Description	
Identifier:	TD_MAN_PUSH_10_IVS
Objective:	To verify that if the initial call set-up attempt fails for any reason (busy, congestion, no answer) the IVS makes automatic repeat dialling attempts to establish an emergency call
Configuration:	eCall_CFG_02
References:	[8] EN16062 Clause 7.12.4 [i.4] CTP 1.1.10.2
Pre-test conditions:	• Ignition is ON and IVS is in mobile network coverage • MNO and PSAP test points are available • IVS has been programmed with the non-emergency number to be used for test calls • Audio channel monitor is available • Telephone (only) is used to answer calls and to establish 2-way voice exchange

Test Sequence:	Step	Type	Description
	1	stimulus	PSAP test telephone is off-hook 'busy'
	2	stimulus	IVS initiates an eCall – Manual trigger event
	3	verify	Verify with audio monitor that network returns call failure 'busy' indication to IVS
	4	verify	IVS clears down the call attempt within 2 minutes and makes a repeat dialling attempt automatically
	5	stimulus	PSAP telephone answers 2nd call attempt after 45 seconds
	6	verify	2-way speech can be exchanged within 3 seconds from call being answered
	7	stimulus	PSAP clears down call / network clear down
	8	verify	Verify that IVS has cleared down call
	9	stimulus	IVS initiates an eCall – Manual trigger event
	10	stimulus	PSAP test telephone does not answer call
	11	verify	Verify that with audio monitor that IVS receives 'ring-back tone' and 'no-answer' indication from the network
	12	verify	Verify that IVS clears down the call attempt after > 60 seconds and before < 2 minutes and makes a repeat dialling attempt automatically (without human intervention)
	13	stimulus	PSAP telephone answers 2nd call attempt after 5 seconds
	14	verify	2-way speech can be exchanged within 3 seconds from call being answered
	15	stimulus	PSAP clears down call / network clear down
	16	verify	Verify that IVS has cleared down call

7.2.11 eCall Push mode: Auto redial if call drops before MSD acknowledged and does not redial if MSD has been received and acknowledged (LL)

Interoperability Test Description	
Identifier:	TD_MAN_PUSH_11_IVS
Objective:	To verify that if the call is dropped for any reason before the requested MSD is acknowledged (LL-ACK), other than by the PSAP operator clearing the call down the call (AL-ACK clear-down), the IVS makes an automatic repeat dialling attempt to re-establish the call. The repeat dialling attempt is made within 2 minutes of the previous dropped call. The IVS must not make an repeat attempts if the call drops for any reason after the MSD has been acknowledged (LL-ACK)
Configuration:	eCall_CFG_01
References:	[8] EN16062 Clause 7.12.4 [i.4] CTP 1.1.10.2
Pre-test conditions:	- Ignition is ON and IVS is in mobile network coverage - MNO and PSAP test points are available - IVS has been programmed with the non-emergency number to be used for test calls - The PSAP test point has the capability to drop the call whilst the MSD is being transmitted - Alternatively radio fading may be applied to force the call to drop - IVS has all the information needed to compile the MSD

Test Sequence:	**Step**	**Type**	**Description**
	1	stimulus	IVS establishes an eCall
	2	stimulus	PSAP verifies the call is established
	3	verify	Verify that MSD transmission has started
	4	stimulus	Disconnect call or force call to drop prior to transmission of LL-ACK
	5	verify	Verify that IVS has cleared-down call
	6	verify	Verify that the IVS makes a repeat dialling attempt automatically (without human intervention) to re-establish the connection to the PSAP within 2 minutes of the call dropping
	7	stimulus	PSAP answers call
	8	verify	PSAP verifies the call is established
	9	verify	MSD has been received and acknowledged (LL-ACK)
	10	stimulus	PSAP clears down call / network clear down
	11	verify	Verify that IVS has cleared down call
	16	verify	Verify that IVS does not attempt to make another automatic dialling attempt to the same number

7.2.12   eCall Push mode: Un-mute PSAP audio when Initiation Signal not received within 2 seconds (T4 expired)

Interoperability Test Description			
Identifier:	TD_OPT_PUSH_12_PSAP		
Objective:	Verify that PSAP audio is un-muted and call is routed to an operator within 2 seconds following receipt of answering call, if a valid Initiation Signal is not received and T4 has expired		
Configuration:	eCall_CFG_03		
References:	[8] EN 16062 Clause 7.4.2, 7.12.12 [i.4] CTP 3.1.5.2		
Pre-test conditions:	• Ignition is ON and IVS is in mobile network coverage • MNO and PSAP test points are available • Mobile phone is programmed with PSAP test call number		
Test Sequence:	**Step**	**Type**	**Description**
	1	stimulus	Mobile phone initiates a call to the PSAP test call number
	2	stimulus	PSAP answers call and listens for valid Initiation Signal
	3	verify	Verify that the incoming voice call is routed to the PSAP operator >2 seconds and <3 seconds from the call being answered and un-muted
	4	verify	Verify that 2-way speech can be exchanged between the mobile phone and PSAP operator
	5	stimulus	PSAP clears down call / network clear down

7.2.13   eCall Push mode: Un-mute IVS audio when SEND MSD not received (T5 expired)

Interoperability Test Description			
Identifier:	TD_OPT_PUSH_13_IVS		
Objective:	Verify that the IVS audio is un-muted 2 seconds after call is answered (CONNECT message received), if SEND MSD request was not received and timer T5 has expired		
Configuration:	eCall_CFG_02		
References:	[8] EN 16062 Clause 7.4.4 [i.4] CTP 1.1.15.3		
Pre-test conditions:	• Ignition is ON and IVS is in mobile network coverage • MNO and PSAP test points are available • PSAP test point telephone is used to answer call		
Test Sequence:	**Step**	**Type**	**Description**
	1	stimulus	IVS establishes an eCall
	2	stimulus	PSAP test point telephone answers call and records time

Interoperability Test Description			
	3	stimulus	PSAP listens for eCall Initiation Signal and cessation of tone
	4	verify	Verify that the IVS audio is un-muted after 2 seconds and that 2-way speech can be exchanged between the IVS and PSAP operator
	5	stimulus	PSAP operator clears down call / network clear down
	6	verify	Verify that IVS has cleared down call

7.2.14   eCall Push mode: Un-mute IVS audio when AL-ACK not received (T6 expired)

Interoperability Test Description			
Identifier:	TD_OPT_PUSH_14_IVS		
Objective:	Verify that the IVS audio is un-muted within 5 seconds, following receipt of an LL-ACK, if an AL-ACK is not received and timer T6 has expired		
Configuration:	eCall_CFG_01		
References:	[8] EN16062 Clause 7.5.3 [i.4] CTP1.1.15.4		
Pre-test conditions:	• Ignition is ON and IVS is in mobile network coverage • MNO and PSAP test points are available • IVS has been programmed with the non-emergency number to be used for test calls • IVS has all the information needed to compile the MSD • PSAP must be able to **not** send AL-ACK		
Test Sequence:	**Step**	**Type**	**Description**
	1	stimulus	IVS establishes an eCall
	2	verify	PSAP verifies the call is established
	3	verify	PSAP verifies first MSD is received
	4	verify	PSAP verifies the MSD is correctly decoded
	5	stimulus	PSAP does not send AL-ACK
	6	verify	Verify that the IVS audio is un-muted within 5 seconds, following receipt of an LL-ACK, and that 2-way speech can be exchanged between the IVS and PSAP operator
	7	stimulus	PSAP operator clears down call / network clear down
		verify	Verify that IVS has cleared down call

7.2.15   eCall Push mode: Un-mute IVS audio when LL-ACK not received (T7 expired)

Interoperability Test Description	
Identifier:	TD_OPT_PUSH_15_IVS
Objective:	Verify that the IVS audio is un-muted after 20 seconds, following receipt of the SEND MSD message, if an LL-ACK is not received and timer T7 has expired
Configuration:	eCall_CFG_01
References:	[8] EN16062 Clause 7.5.3 [i.4] CTP 1.1.15.5
Pre-test conditions:	• Ignition is ON and IVS is in mobile network coverage • MNO and PSAP test points are available • IVS has been programmed with the non-emergency number to be used for test calls • IVS has all the information needed to compile the MSD • PSAP must be able to **not** send LL-ACK

Test Sequence:	Step	Type	Description
	1	stimulus	IVS establishes an eCall
	2	verify	PSAP verifies the call is established
	3	verify	PSAP verifies MSD transmission has started
	4	stimulus	PSAP disconnect in-band modem and monitor line with telephone (prevent PSAP modem from sending LL-ACK)
	5	verify	PSAP does not send LL-ACK
	6	verify	Verify that the IVS audio is un-muted after 20 seconds, following receipt of SEND MSD (START) message / start of MSD transmission, and that 2-way speech can be exchanged between the IVS and PSAP operator
	7	stimulus	PSAP operator clears down call / network clear down
		verify	Verify that IVS has cleared down call

7.2.16   eCall Push mode: Un-mute PSAP audio when LL-ACK not sent (T8 expired)

Interoperability Test Description	
Identifier:	TD_OPT_PUSH_16_PSAP
Objective:	Verify that the PSAP audio is un-muted after 20 seconds, from sending the SEND MSD message, if the MSD is not received correctly, an LL-ACK is not sent, and timer T8 has expired
Configuration:	eCall_CFG_01
References:	[8] EN16062 Clause 7.4.4 [i.4] CTP 3.1.7.3
Pre-test conditions:	• Ignition is ON and IVS is in mobile network coverage • MNO and PSAP test points are available • IVS has been programmed with the non-emergency number to be used for test calls • IVS has all the information needed to compile the MSD • PSAP must be able to **<u>not</u>** send LL-ACK

Test Sequence:	Step	Type	Description
	1	stimulus	IVS establishes an eCall
	2	verify	PSAP verifies the call is established
	3	verify	PSAP verifies MSD transmission has started
	4	stimulus	At the PSAP test point apply sufficient attenuation, or distortion to the incoming MSD transmission, to ensure that the MSD is not received error free for at least 25 seconds
	5	verify	PSAP <u>does not</u> send LL-ACK
	6	verify	Verify that the PSAP audio is un-muted 20 seconds after the SEND MSD (START) message was sent , that the call has been routed to the PSAP operator, and that 2-way speech can be exchanged between the PSAP operator and IVS occupants
	7	stimulus	PSAP operator clears down call / network clear down
		verify	Verify that IVS has cleared down call

7.2.17   eCall Push mode: Format of encoded and decoded MSD in accordance with EN 15722

Interoperability Test Description	
Identifier:	TD_OPT_PUSH_16_IVS
Objective:	To verify that the IVS formats the MSD in accordance EN15722 and encodes it correctly, and that the PSAP decodes and displays it correctly
Configuration:	eCall_CFG_01
References:	[8] EN 16062 Clause 7.4, 7.5 [7] EN 15722 [i.4] CTP 1.1.14.1
Pre-test conditions:	• Ignition is ON and IVS is in mobile network coverage • MNO and PSAP test points are available • IVS has been programmed with the non-emergency number to be used for test calls • IVS has all the information needed to compile the MSD • PSAP operator knows the content of the transmitted MSD Note: As an optional extension to this test, if possible, a non-conformant MSD may also be sent to the PSAP modem-server to verify that the PSAP does not send an AL-ACK message to the IVS in response to an incorrectly formatted MSD

Test Sequence:	Step	Type	Description
	1	stimulus	IVS establishes an eCall
	2	verify	PSAP verifies the call is established
	3	verify	PSAP performs CRC check and sends LL-ACK to IVS
	4	verify	IVS stops transmitting MSD
	5	verify	PSAP test point performs automatic format check of MSD data according to EN 15722 and, if compliant, sends an AL-ACK with status set to positive to the IVS (if not compliant then AL-ACK is not sent)
	6	stimulus	Visually inspect format, content, logic and accuracy of MSD when decoded and displayed on screen
	7	verify	Correct decoding and accuracy of received MSD
	8	stimulus	PSAP operator clears down call / network clear down
	9	verify	Verify that IVS has cleared down call

7.2.18   eCall Push mode: IVS configured for eCall 'only' service (restricted)

Interoperability Test Description	
Identifier:	TD_OPT_PUSH_18_IVS
Objective:	To verify that following power-up / ignition ON, an IVS configured for eCall 'only' service, and test / configuration calls, does not attempt to register on any mobile network until an eCall or test/reconfiguration call is initiated.
Configuration:	eCall_CFG_01
References:	[1] TS 122 101 [8] EN 16062 Clause 7.1.4, 7.1.6 [7] TS 102 936-1 [14] TS 134 123-1 [18] TS 151 010-1 [i.4] CTP 1.1.1.2
Pre-test conditions:	• Ignition is OFF and IVS is in mobile network coverage • MNO and PSAP test points are available • IVS has been programmed with the non-emergency number to be used for test calls • The IVS is <u>not</u> registered on any mobile network Note: To avoid generating large amounts of unnecessary (radio) signalling, an IVS configured for emergency service (TS12) and test / reconfiguration service calls to designated numbers, is not permitted to register on any PLMN – except when making an eCall or test / reconfiguration servce call. Following the call, the IVS must remain registered for at least 1 hour (to allow call-back) and must deregister (IMSI detach) from the PLMN within 12 hours

Test Sequence:	Step	Type	Description
	1	stimulus	Switch ON ignition / apply power to the IVS
	2	stimulus	Monitor IVS HMI operational status for 120 seconds
	3	verify	Verify that the IVS is not registered, and doesn't attempt to register, on any mobile network
	4	stimulus	Initiate an eCall
	5	stimulus	Monitor IVS HMI operational status
	6	verify	Verify that the IVS registers on an available PLMN and initiates call set-up
	7	verify	PSAP verifies that call is established, MSD transferred, acknowledged and and that 2-way speech can be exchanged between the IVS and PSAP operator
	8	stimulus	PSAP operator clears down call / network clear down
	9	verify	Verify that IVS has cleared down call
	10	stimulus	Monitor IVS HMI operational status
	11	verify	Verify that the IVS remains registered on the PLMN for a minimum of1 hour and de-registers (IMSI detaches) from the PLMN no later than 12 hours from the end of the preceeding eCall, test / reconfiguration call

7.2.19   eCall Push mode: IVS maintains register of recent calls

Interoperability Test Description	
Identifier:	TD_OPT_PUSH_19_IVS
Objective:	Verify that the IVS registers recent eCalls, stores the fact of the AL-ACK receipt and its timestamp
Configuration:	eCall_CFG_01
References:	[8] EN 16062 Clause 7.5.2 [9] EN16072 [i.4] CTP 1.1.16.3
Pre-test conditions:	• Ignition is ON and IVS is in mobile network coverage • MNO and PSAP test points are available • IVS has been programmed with the non-emergency number to be used for test calls • IVS has all the information needed to compile the MSD Note: It is not specified how the IVS stores the call / MSD transaction information (MSD acknowledgement and timestamp), and this may be implemented in different ways. To verify the content of the record it must be possible to read this information from the IVS during the this optional test

Test Sequence:	Step	Type	Description
	1	stimulus	IVS establishes an eCall
	2	verify	PSAP verifies the call is established
	3	verify	Verify the MSD is correctly received, decoded and displayed
	4	verify	PSAP sends an application layer acknowledgement (AL_ACK)
	5	stimulus	Note time that AL-ACK was sent (when call was automatically transferred to operator)
	6	stimulus	PSAP cleared down call / Application layer AL-ACK clear-down
	7	verify	Verify that IVS has cleared down
	8	stimulus	IVS establish a 2nd eCall
	9	verify	PSAP verifies the call is established
	10	verify	Verify the MSD is correctly received, decoded and displayed
	11	verify	PSAP sends an application layer acknowledgement (AL_ACK)
	12	stimulus	Note time that AL-ACK was sent (when call was automatically transferred to operator)
	13	stimulus	PSAP cleared down call / Application layer AL-ACK clear-down
	14	verify	Verify that IVS has cleared down
	15	stimulus	Read IVS register of recent calls in accordance with manufacturer's instructions
	16	verify	Verify that there is an accurate record of both eCalls having been made, together with correct timestamps and application layer acknowledgements

7.2.20   eCall Push mode: PSAP handling of more than 1 eCall simultaneously

Interoperability Test Description	
Identifier:	TD_OPT_PUSH_20_PSAP
Objective:	Verify that a PSAP (modem-server) system can receive and process more that 1 eCall simultaneously
Configuration:	eCall_CFG_01
References:	[8] EN16062 Clause 7.5.5 [i.4] CTP 1.1.16.1
Pre-test conditions:	• Ignition is ON and IVS is in mobile network coverage • MNO and PSAP test points are available • 2 x IVSs have been programmed with 2 different non-emergency numbers to be used for test calls • PSAP modem-server has the ability to answer and process more than 1 eCall simultaneously

Test Sequence:	Step	Type	Description
	1	stimulus	Both IVSs establishes an eCall to the PSAP (using their allocated numbers)
	2	verify	PSAP verifies the both calls are established
	3	verify	PSAP verifies that both MSDs is correctly received and acknowledged
	4	stimulus	The eCalls are queued for PSAP operator or routed to 2 different operators
	5	stimulus	Both eCalls are answered either in-turn or simultaneously
	6	verify	Establishment of 2-way speech communication between the PSAP operator(s) and the IVS(s), and that the correct MSD information is displayed for each call
	7	stimulus	PSAP operator(s) clears down both calls /application layer clear down
	8	verify	Verify that both IVSs clear down following receipt of application layer AL-ACK clear-down message

7.3   Optional Test Cases – PULL Mode

7.3.1   eCall Pull mode: MSD transmission / reception /acknowledgement (Use of Pull mode is not currently permitted within the EU)

Interoperability Test Description	
Identifier:	TD_OPT_PULL_01_PSAP
Objective:	To verify that (where permitted) an eCall can be established between and IVS and PSAP without the initial exchange and validation of an eCall Initiation Signal
Configuration:	eCall_CFG_01
References:	[3] ETSI TS 126 267 [4] ETSI TS 126 268 [5] ETSI TS 126 269
Pre-test conditions:	• Ignition is ON and IVS is in mobile network coverage • MNO and PSAP test points are available • IVS has been programmed with the non-emergency number to be used for test calls • PSAP modem-server has been configured for PULL Mode i.e. to ignore any incoming calling tones / voice, etc., and, on answering any incoming call, to immediately transmit a SEND MSD (Start) message Note: So as to minimise the chances of a PSAP eCall modem-server causing audible interference to emergency voice calls originating from mobile phones, the use of PULL mode is currently not permitted within the EU. When the eCall 'flag' is supported by all PLMNs 'non-eCall' emergency calls should not be routed to a PSAP modem-server and, subject to regulatory approval, it may be possible for PSAP modem-servers to operate in Pull Mode

Test Sequence:	Step	Type	Description
	1	stimulus	IVS initiates an eCall (with or without sending a valid Initiation Signal
	2	verify	PSAP answers call and immediately transmits SEND MSD (START) message without waiting to validate Initiation Signal
	3	verify	PSAP verifies MSD is received and correctly decoded
	4	verify	PSAP sends acknowledgement
	5	verify	Establishment of 2-way speech communication between IVS and PSAP operator
	6	stimulus	PSAP cleared down call / Application layer AL-ACK clear-down
	7	verify	Verify that IVS has cleared down

Annex A (informative):
eCall High Level Application Protocol timings

The following table of HLAP timings is provided for information only. The full text and applicable requirements may be found CEN specification EN 16062 :2011[8].

Table A.1: eCall High Level Application Protocol (HLAP) timings

Description	Requirement	Value
T1 Manually Initiated eCall (MIeC) false triggering cancellation period	Vehicle occupants may cancel a false triggering of a manually initiated eCall before call set-up.	Specified by manufacturer. NOTE This value may be zero.
T2 IVS Call Clear-down Fallback Timer (CCFT)	If the IVS NAD does not receive a call clear-down indication from the mobile network, or an application layer call clear-down message from the PSAP and the call clear-down timer has reached 60 minutes, the call shall be cleared down.	60 minutes
T3 IVS INITIATION signal duration	The IVS INITIATION signal shall not persist for longer than 2 seconds from when the UE receives notification that the call is first answered.	2 seconds
T4 PSAP wait for INITIATION signal period	If a valid INITIATION message is not received by the PSAP modem within 2 seconds from when the NAD knows that the call has been answered then the call shall be routed to a PSAP operator	2 seconds
T5 IVS wait for SEND MSD period	If the IVS eCall modem, whilst sending the INITIATION message, does not receive or recognise a valid 'SEND MSD' message from the PSAP eCall modem within 2 seconds, from the time that the IVS receives an indication that the PSAP has answered the call, it shall reconnect the IVS loudspeaker and microphone in the vehicle.	2 seconds
T6 IVS wait for AL-ACK period	If an AL-ACK is not received within 5 seconds from receipt of the link layer ACK, the loudspeaker and microphone in the vehicle shall be reconnected to the line in order to enable the call to revert to an E112 voice call.	5 seconds
T7 IVS MSD maximum transmission time	If the IVS does not receive a link layer ACK (LL-ACK) within 20 seconds from the start of MSD transmission, it shall cease transmission and the IVS audio system shall be re-connected.	20 seconds
T8 PSAP MSD maximum reception time	If the PSAP eCall modem does not send a link layer ACK (LL-ACK) within 20 seconds after having sent the 'SEND MSD' message to the IVS eCall modem, it shall route the voice call to a PSAP operator.	20 seconds
T9 IVS NAD minimum network registration period	Following call clear-down by the PSAP the IVS NAD shall remain registered on the serving network and available to receive calls from the PSAP and rescue workers for a <u>minimum</u> period of one hour as defined in EN16072.	1 hour
T10 IVS NAD (eCall only configuration) network De-registration Fallback Timer (DFT)	An IVS NAD configured to make eCalls and test calls only shall, following call clear-down and maximum expiration period of the De-registration Fallback Timer (DFT) 12 hour period, de-register from the serving network.	12 hours

NOTE: Clarification for eCall Plugtest participants - An IVS configured for eCall 'only' service is not permitted to remain registered on a mobile network for longer than 12 hours and may de-register at any time after the required 1 hour minimum network registration (available for call-back) period.

Change History

<table>
<tr><td colspan="3" align="center">**Document history**</td></tr>
<tr><td>0.0.1</td><td>22.03.2012</td><td>First Draft</td></tr>
<tr><td>0.0.2</td><td>26.03.2012</td><td>Editorial clean up</td></tr>
<tr><td>0.0.3</td><td>03.03.2012</td><td>Formulation of mandatory and optional test descriptions</td></tr>
<tr><td>0.0.4</td><td>10.04.2012</td><td>Draft submitted for first Plugtest team review</td></tr>
<tr><td>0.0.5</td><td>11.04.2012</td><td>Test site architecture and test configuration diagrams added – stable draft for agreement</td></tr>
<tr><td>0.0.6</td><td>13.04.2012</td><td>innovITS ADVANCE test site architecture diagram amended and new clause 4.1.2 added</td></tr>
<tr><td>0.0.7</td><td>17.04.2012</td><td>Editorial changes and test 7.2.18 changed to 'IVS configured for eCall 'only' service (restricted)'</td></tr>
<tr><td>0.0.8</td><td>25.04.2012</td><td>Event dates changed on cover and references to 3G network deleted from text and diagrams</td></tr>
<tr><td>0.0.9</td><td>14.05.2012</td><td>Editorial changes</td></tr>
<tr><td>1.0.0</td><td>15.05.2012</td><td>Final version</td></tr>
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