eCall#2 - Testfest;
Essen, Germany;
9-13 September 2013

ETSI

650 Route des Lucioles
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - NAF 742 C
Association à but non lucratif enregistrée à la
Sous-Préfecture de Grasse (06) N° 7803/88

Contents

Intellectual Property Rights

IPRs essential or potentially essential to the present document may have been declared to ETSI. The information pertaining to these essential IPRs, if any, is publicly available for **ETSI members and non-members**, and can be found in ETSI SR 000 314: *"Intellectual Property Rights (IPRs); Essential, or potentially Essential, IPRs notified to ETSI in respect of ETSI standards"*, which is available from the ETSI Secretariat. Latest updates are available on the ETSI Web server (http://webapp.etsi.org/IPR/home.asp).

Pursuant to the ETSI IPR Policy, no investigation, including IPR searches, has been carried out by ETSI. No guarantee can be given as to the existence of other IPRs not referenced in ETSI SR 000 314 (or the updates on the ETSI Web server) which are, or may be, or may become, essential to the present document.

1 Introduction

This document forms the guidelines to lead the technical organization of the 2nd eCall Testfest event, in Essen, from 9 to 13 September 2013.

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

This document is based on a previous release drafted for the previous eCall Plugtests event, held in May 2012 at Nuneaton, UK. Update of this present release is following the update in the eCall base standards, and in particular CEN EN16062 – HLAP. Furthermore a different testbed configuration requires some adaptation of the test descriptions.

2 References

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] Draft CEN EN 15722: "Road transport and traffic telematics – eSafety – eCall Minimum Set of Data " – new release

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

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

[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"

[24] ETSI TS 124 008: "Digital cellular telecommunications system (Phase 2+);Universal Mobile Telecommunications System (UMTS);LTE;Mobile radio interface Layer 3 specification;Core network protocols;Stage 3"

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] Draft CEN TS16454 - "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
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
IVS	In Vehicle System (eCall terminal and associated sub-systems in vehicle)
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
VIN	Vehicle Identification Number

4 Conventions

4.1 Interoperability test process

4.1.1 Principles

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 the current documentation, test decritpion is provided to guide the test process during the test sessions.

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.

In this second eCall interoperability event edition, test systems, including IVS and PSAP simulator will be available. This includes test systems able to simulate the PSAP and the PLMN and therefore to test eCall under real conditions with the eCall flag and the 112 number. Test systems will also provide the conformance as per TS16454 [i.4].

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
		Either PUSH or PULL mode
<nn> = sequential number	01 to 99	Sequential numbers
<gr> = group	IVS	eCall terminal
	PSAP	PSAP eCall modem-server
		IVS or PSAP

4.4 Test Summary

Test scenario with a detailed test description, are provided in this document to provide guidance to the participants and to ensure consistent testing among the different test sessions and participants. The detailed test descriptions are in the clause 7 below. It is recommended to conduct all test cases for all technologies supported by the IVS, e.g. a dual mode GSM and UMTS IVS should conduct all tests with both technologies.

The test scenarios are splitted in 2 groups:

- The mandatory scenarios, which shall be executed during all test sessions, covering the mandatory features of an eCall devices (IVS or PSAP)
- The optional test scenarios, which are provided to do additional testing according to the time left during the test sessions. Theese scenarios are focusing on some details check relating to protocol, like MSD content or timer for instance.

The following test cases are foreseen to be executed during all interoperability test sessions, either with real IVS nad PSAP, but also with testing devices simulating an IVS or a PSAP

Table 2: Mandatory Tests

Nr	Test case ID	Summary	Can be merged with
1	TD_MAN_PUSH_01	MSD transmission / reception /acknowledgement using the PUSH mode	
2	TD_MAN_01	MSD transmission / reception /acknowledgement using the PULL Mode	
3	TD_MAN_02	Voice communication after receipt of AL-ACK	TD_MAN_01
4	TD_MAN_03	Retransmission of MSD on request from PSAP	
5	TD_MAN_04	Voice communication after retransmission of MSD	TD_MAN _03
6	TD_MAN_05	Clear down / PSAP initiated network clear down	
7	TD_MAN_06	Clear down / PSAP initiated application layer AL-ACK Clear-down	
8	TD_MAN_07	Call Back / PSAP initiated call back to IVS	

NOTE: The Mandatory tests verify interoperability between the IVS, PLMN and PSAP. As the employed PLMNs do not yet support the eCall flag, 112 calls cannot be used such that test eCalls with long numbers need to be conducted.

Table 3: Optional Tests

Nr	Test case ID	Summary
1	TD_OPT_01_IVS	Emergency call set-up with eCall identifier (flag) set to 'Automatically Initiated' in Service Category message – **for simulated or private mobile network only**
2	TD_OPT_02_IVS	Emergency call set-up with eCall identifier (flag) set to 'Manually Initiated' in Service Category message – **for simulated or private mobile network only**
3	TD_OPT_03_IVS	MSD call type indicator set to 'Automatically Initiated'
4	TD_OPT_04_IVS	MSD call type indicator set to 'Manually Initiated'
5	TD_OPT_05_IVS	MSD call type indicator set to 'Test Call'
6	TD_OPT_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_08_IVS	Mute IVS audio during MSD transmission and un-mute after application layer acknowledgement
9	TD_OPT_09_PSAP	Mute PSAP audio during MSD request / MSD transfer and un-mute after application layer acknowledgement
10	TD_OPT_10a_IVS	Auto redial following busy during call set-up
11	TD_OPT_10b_IVS	Auto redial following no-answer during call set-up
12	TD_OPT_11_IVS	Auto redial if call drops before MSD acknowledged and does not redial if MSD has been acknowledged (LL)
13	TD_OPT_12_PSAP	Un-mute PSAP audio when Initiation Signal not received (T4 expired)
14	TD_OPT_13_IVS	Un-mute IVS audio when SEND MSD not received (T5 expired)
15	TD_OPT_14_IVS	Un-mute IVS audio when AL-ACK not received (T6 expired)
16	TD_OPT_15_IVS	Un-mute IVS audio when LL-ACK not received (T7 expired)
17	TD_OPT_16_PSAP	Un-mute PSAP audio when MSD not received within (T8 expired)
18	TD_OPT_17_IVS	Format of encoded and decoded MSD in accordance with EN 15722
19	TD_OPT_18_IVS	IVS configured for eCall 'only' service (restricted)
20	TD_OPT_19_IVS	IVS maintains register of recent calls
21	TD_OPT_20_PSAP	PSAP handling of more than 1 eCall simultaneously
22	TD_OPT_21	Check handling of HLAP MSD request when PSAP is using NEC disabling tone.

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.

5 Test Bed Architecture

5.1 Test site layout

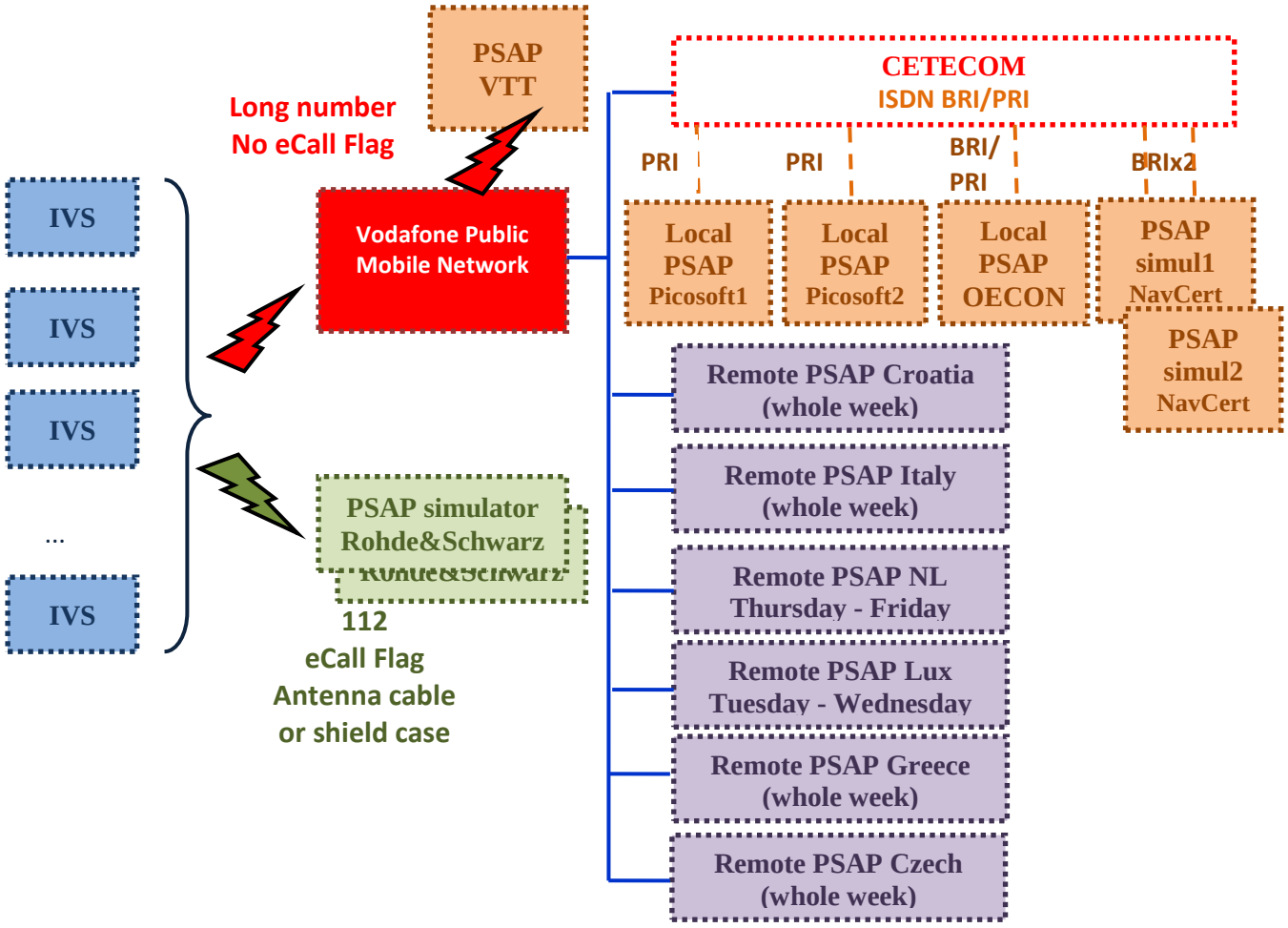

Figure 1: test site layout

5.2 HLAP flow diagram

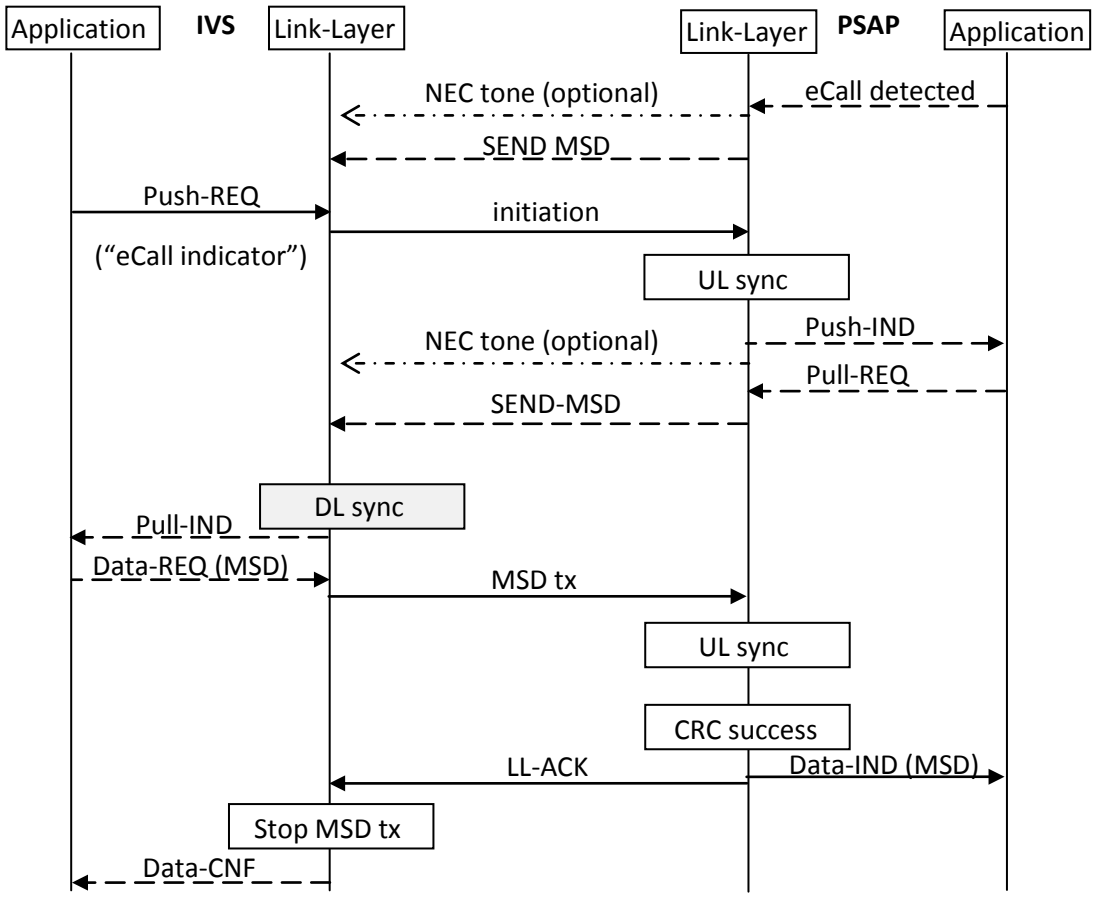

Figure 5: MSD transfer – lower layer – successful case

The application layer acknowledgemnt sequence is shown in figure 6.

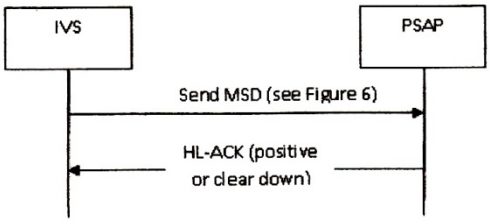

Figure 6: AL-ACK transmission sequence for send MSD case

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.

eCall_CFG_01 IVS PLMN PSAP (Modem-server / HMI / Audio interface)

IVS, PLMN and PSAP can be either real devices or simulators. PSAP simulator are understood to be only simulating the PSAP connected to the public network with ISDN.

With Public PLMN (Vodafone), the eCall flag and

The following figure shows the basic interoperability test configuration. IVS and PSAP can be either real equipments or simulators.

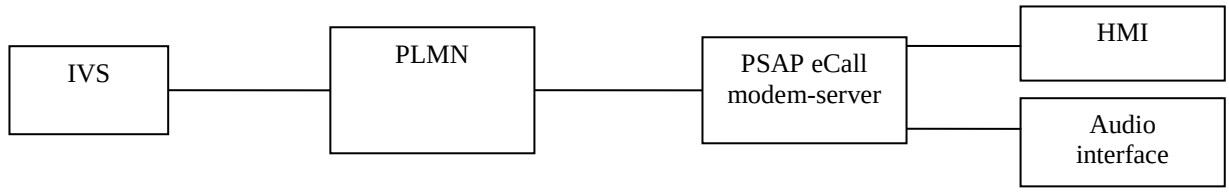

Figure 2: eCall_CFG_01 – IVS and PSAP over PLMN

6.2 Optional Conformance 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_02 IVS PLMN+PSAP simulator

eCall_CFG_03 IVS PLMN TELEPHONE

eCall_CFG_04 MOBILE PHONE PLMN PSAP (Modem-server / HMI / Audio interface)

With the iteroperability test configuration eCall_CFG_02 the IVS is connected to a tster simulating the PSAP and the GSM. Therefore the 112 in combination with the eCall flag (i.e. Service Category IE with bit 6 or 7) can be used, enabling to check that the corresponding feature in the IVS are correctly implemented.

NOTE: **This configuration ns the only one appropriate to carry out test with 112 and eCall flag**.

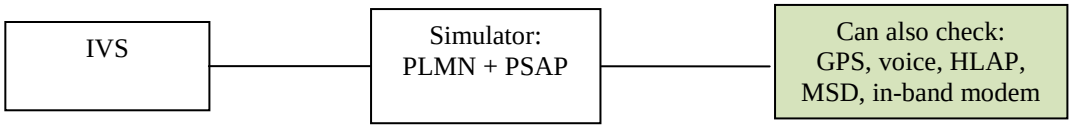

Figure 3: eCall_CFG_02 – PSAP+PLMN simulator

With the iteroperability test configuration eCall_CFG_03, 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.

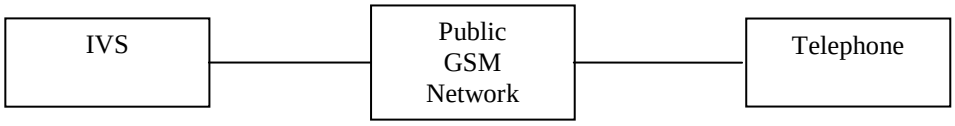

Figure 3: eCall_CFG_03 – Optional interoperability / diagnostic testing configuration

Interoperability test configuration 3 (eCall_CFG_04), 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.

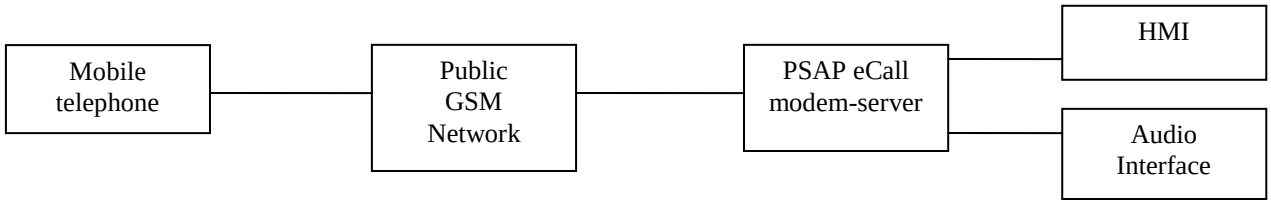

Figure 4: eCall_CFG_04 – Optional interoperability / diagnostic testing configuration

6.3 Test Configuration parameters

6.3.1 Local PSAP long number

PRI:

1 Picosoft1 02054 87 42 01-0

2 Picosoft 2 02054 87 35 48-0

BRI:

1 Navcert1 02054-87 42 145

2 Navcert2 02054-87 45 790

3 OECON 02054 93 94 079

GSM:

1 VTT 0172 207 34 53

6.3.2 Remote PSAP long number

G4S	NPRD	AREU
Greece	Croatia	Italy
+30 210 65 63 619	+385 1 369 86 16	+390332 434570 +390332 434571

RWS	HITEC	Telefonica
The Netherlands	Luxembourg	Czech republic
+31 32 52 52 53	+352 49771 455	+420 271 999 888

7 eCall test scenarios

7.1 Mandatory test scenarios

These test cases shall be executed during all regular interoperability test session implying an IVS and a PSAP. Furthermore these test are also applicable when the IVS or a PSAP is executed by a simulator.

In the initial EN16062 HLAP standard, applied during the 1st eCall interoperability event in 2012, the PUSH mode was mandatory and furthermore the pull mode was not allowed.

However, following several trials, it was showed that the PULL mode could significantly reduce the delay for sending the MSD and thus establishing the voice connection. Therefore **in the 2nd revision of the EN16062, the PULL mode is now mandatory**, and the PUSH is applied only when the PSAP cannot identify that the incoming call is an eCall.

It is recommended to conduct all test cases for all technologies supported by the IVS, e.g. a dual mode GSM and UMTS IVS should conduct all tests with both technologies.

For more details about the new revision of the standard, please refer to annex A and the clause HLAP Flow diagram above.

7.1.1 eCall Push mode: MSD transmission / reception /acknowledgement

Interoperability Test Description			
Identifier:	TD_MAN_PUSH_01		
Objective:	To verify that, when the PSAP does not initiate the mandatory PULL mode process (send the SEND-MSD message upon receipt of the eCall), the IVS initiate the PUSH mode.		
Configuration:	eCall_CFG_01		
References:	[8] EN 16062 Clause 7.4.2		
Pre-test conditions:	• Ignition is ON and IVS is in mobile network coverage • MNO and PSAP test points are available • PSAP is configured not to initiate the PULL mode and therefore not sending the SEND-MSD message on receipt of the eCall • 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	PSAPwaits for the eCall setup and the initiation message and **does not send** the SEND-MSD message
	2	stimulus	IVS establishes an eCall and sends an initiation message within 5s
	3	verify	PSAP transmits SEND MSD (START) message
	4	verify	PSAP verifies first MSD is received
	5	verify	Verify the MSD is correctly decoded
	6	check	MSD content at PSAP is identical to content transmitted by IVS
	7	verify	PSAP sends acknowledgement
	8	verify	Verify that the IVS has stopped transmitting the MSD
NOTE: the PULL mode is now mandatory in the new EN16062 release, so that the PUSH mode is only a fall back procedure, when the PSAP does not send the SEND-MSG soon after having received the eCall.			

7.1.2 eCall Pull mode: MSD transmission / reception /acknowledgement

Interoperability Test Description			
Identifier:	TD_MAN_01		
Objective:	To verify that the PSAP, on receipt of the eCall, sends a SEND-MSG message without waiting for the initiation message from the IVS.		
Configuration:	eCall_CFG_01		
References:	[[8] EN 16062 Clause 7.4.2		
Pre-test conditions:	• Ignition is ON and IVS is in mobile network coverage • MNO and PSAP test points are available • PSAP being configured on the mandatory PULL mode immediately transmit a SEND MSD (Start) message		
Test Sequence:	**Step**	**Type**	**Description**
	1	stimulus	IVS initiates an eCall but does not send the initiation signal soon
	2	verify	PSAP answers call and immediately transmits SEND MSD (START) message without waiting to the valid Initiation Signal
	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
NOTE: the PULL mode is now mandatory in the new EN16062 release.			

7.1.3 Voice communication after receipt of AL-ACK

Interoperability Test Description			
Identifier:	TD_MAN_02		
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 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
	5	verify	Establishment of voice communication
	6	verify	Verify that 2-way speech can be exchanged
NOTE1: the **PULL mode should apply being mandatory** in the new EN16062 release. However the PUSH mode may be applied for testing purpose **NOTE2**: this test case can be combined with 7.1.1 - TD_MAN_01			

7.1.4 Retransmission of MSD on request from PSAP

Interoperability Test Description			
Identifier:	TD_MAN_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 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
NOTE: the **PULL mode should apply being mandatory** in the new EN16062 release. However the PUSH mode may be applied for testing purpose			

7.1.5 Speech after retransmission of MSD

Interoperability Test Description			
Identifier:	TD_MAN_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 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
NOTE1: the **PULL mode should apply being mandatory** in the new EN16062 release. However the PUSH mode may be applied for testing purpose **NOTE2**: : this test case can be combined with 7.1.3 - TD_MAN_03			

7.1.6 Clear down / PSAP initiated network clear down

Interoperability Test Description			
Identifier:	TD_MAN_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 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 / network clear-down
	6	verify	Verify that the IVS clears down following receipt of network clear-down message
NOTE: the **PULL mode should apply being mandatory** in the new EN16062 release. However the PUSH mode may be applied for testing purpose			

7.1.7 Clear down / PSAP initiated application layer AL-ACK Clear-down

Interoperability Test Description			
Identifier:	TD_MAN_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 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
NOTE: the **PULL mode should apply being mandatory** in the new EN16062 release. However the PUSH mode may be applied for testing purpose			

7.1.8 Call Back / PSAP initiated call back to IVS

Interoperability Test Description			
Identifier:	TD_MAN_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 8.13 [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 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 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
NOTE1: the **PULL mode should apply being mandatory** in the new EN16062 release. However the PUSH mode may be applied for testing purpose **NOTE2**: Steps 9 to 13 can be skipped.			

7.2 Optional test scenarios with PLMN+PSAP simulator

The following test scenarios are checking the call setup message provided to the mobile network. As eCall setup parameters shall not be used with Public Network (i.e. eCall flag and 112), the following test scenario are **only applicable with IVS connected to tester being able to simulate the PLMN**.

It is recommended to conduct all test cases for all technologies supported by the IVS, e.g. a dual mode GSM and UMTS IVS should conduct all tests with both technologies.

7.2.1 Emergency call set-up with eCall Flag set to 'Automatically Initiated' in Service Category IE

Interoperability Test Description			
Identifier:	TD_OPT_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_02 **only**		
References:	[8] EN 16062 Clause 7.3.6 – [24] TS 124 008 – clause 10.5.4.33 [i.4] CTP 1.1.7.1		
Pre-test conditions:	• Ignition is ON and IVS is connected to the PLMN simulator • IVS is configured to send eCall on 112 in "automatically initiated" conditions • PSAP+PLMN simulator is ready		
Test Sequence:	**Step**	**Type**	**Description**
	1	stimulus	IVS establishes an automatically generated eCall
	2	verify	112 and eCall flag = "automatically initiated eCall" are checked by the simulator.
	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
NOTE: steps 3 to 7 can be skipped			

7.2.2 Emergency call set-up with eCall Flag set to 'Manually Initiated' in Service Category IE

Interoperability Test Description			
Identifier:	TD_OPT_02_IVS		
Objective:	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		
Configuration:	eCall_CFG_02 **only**		
References:	[8] EN 16062 Clause 7.3.6 – [24] TS 124 008 – clause 10.5.4.33 [i.4] CTP 1.1.8.1		
Pre-test conditions:	• Ignition is ON and IVS is connected to the PLMN simulator • IVS is configured to send eCall on 112 in "manually initiated" conditions • PSAP+PLMN simulator is ready		
Test Sequence:	**Step**	**Type**	**Description**
	1	stimulus	IVS establishes an eCall – Manual trigger event
	2	verify	eCall has been routed to the PSAP test point number designated (by the MNO) for manually 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
NOTE: steps 3 to 7 can be skipped			

7.3 Other optional test scenarios

7.3.1 MSD call type indicator set to 'Automatically Initiated'

Interoperability Test Description			
Identifier:	TD_OPT_03_IVS		
Objective:	Verify that the MSD received from the IVS contains the eCall initiation indicator for an automatic triggered eCall		
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 an automatic triggered eCall		
Test Sequence:	**Step**	**Type**	**Description**
	1	stimulus	IVS establishes an automatic triggered eCall
	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
NOTE: steps 4 to 7 can be skipped			

7.3.2 MSD call type indicator set to 'Manually Initiated'

Interoperability Test Description			
Identifier:	TD_OPT_04_IVS		
Objective:	Verify that the MSD received from the IVS contains the correct eCall initiation indicator for a manually triggered eCall		
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 a manually triggered eCall		
Test Sequence:	**Step**	**Type**	**Description**
	1	stimulus	IVS establishes a manually triggered eCall
	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
NOTE: steps 4 to 7 can be skipped			

7.3.3 MSD call type indicator set to 'Test Call'

Interoperability Test Description			
Identifier:	TD_OPT_05_IVS		
Objective:	Verify that the MSD received from the IVS contains the correct test eCall indicator for a test eCall		
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 a test eCall		
Test Sequence:	**Step**	**Type**	**Description**
	1	stimulus	IVS triggers a test eCall
	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
NOTE: steps 4 to 7 can be skipped			

7.3.4 Duration of Initiation Signal does not exceed 2 seconds from when call is answered

Interoperability Test Description			
Identifier:	TD_OPT_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_03		
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 • A PSAP simulator or telephone handset may be used to answer the eCall and to verify the duration of the eCall Initiation Signal tone		
Test Sequence:	**Step**	**Type**	**Description**
	1	stimulus	IVS initiates an eCall
	2	stimulus	Incoming call to PSAP test point / telephone is answered
	3	stimulus	PSAP 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

7.3.5 PSAP does not send 'SEND MSD' request if valid Initiation Signal is not received within T4 (5 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_01 or eCall_CFG_04		
References:	[1] ETSI TS 122 101 Clause A.27 8] EN 16062 Clause 7.4.2, Annex A.1 – T4 [i.4] CTP 1.1.10.3		
Pre-test conditions:	• Ignition is ON and IVS is in mobile network coverage • IVS is configured for not sending "initiation" or a mobile phone is used instead. • 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	IVS or 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
	4	verify	Verify that the PSAP does not emit any audible signal tones
	5	verify	Verify that after T4 (5 seconds) from when the call is answered that 2-way speech can be exchanged between the IVS and PSAP operator

7.3.6 Mute IVS audio during MSD transmission and un-mute after application layer acknowledgement

Interoperability Test Description			
Identifier:	TD_OPT_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 • 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
	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
	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

7.3.7 Mute PSAP audio during MSD request / MSD transfer and un-mute after application layer acknowledgement

Interoperability Test Description			
Identifier:	TD_OPT_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 • Audio channel monitor is available		
Test Sequence:	**Step**	**Type**	**Description**
	1	stimulus	IVS establishes an eCall
	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

7.3.8 Auto redial following busy during call set-up

Interoperability Test Description			
Identifier:	TD_OPT_10a_IVS		
Objective:	To verify that if the initial call set-up attempt fails for reason: busy, the IVS makes automatic repeat dialling attempts to establish an emergency call		
Configuration:	eCall_CFG_03		
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 • Audio channel monitor is available • A telephone instead of PSAP is used to answer calls and to establish 2-way voice exchange (in order to simulate a busy condition)		
Test Sequence:	**Step**	**Type**	**Description**
	1	stimulus	The test telephone (replacing PSAP) 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 and makes a repeat dialling attempt automatically

7.3.9 Auto redial following no-answer during call set-up

Interoperability Test Description			
Identifier:	TD_OPT_10b_IVS		
Objective:	To verify that if the initial call set-up attempt fails for reason: no answer, the IVS makes automatic repeat dialling attempts to establish an emergency call		
Configuration:	eCall_CFG_03		
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 • Audio channel monitor is available • Telephone (only), instead of PSAP, is used to answer calls and to establish 2-way voice exchange		
Test Sequence:	**Step**	**Type**	**Description**
	1	stimulus	Test telephone (replacing PSAP) does not answer call
	2	verify	Verify that with audio monitor that IVS receives 'ring-back tone' and 'no-answer' indication from the network
	3	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)

7.3.10 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_OPT_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 • 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	PSAP disconnect the call or force call to drop prior to transmission of LL-ACK without sending AL-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 and sends SEND-MSD
	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

7.3.11 Un-mute PSAP audio when Initiation Signal not received within 5 seconds (T4 expired)

Interoperability Test Description			
Identifier:	TD_OPT_12_PSAP		
Objective:	Verify that PSAP audio is un-muted and call is routed to an operator within 5 seconds following receipt of answering call, if a valid Initiation Signal is not received and T4 has expired		
Configuration:	eCall_CFG_04		
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 >5 seconds and <30 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

7.3.12 Un-mute IVS audio when SEND MSD not received (T5 expired)

Interoperability Test Description			
Identifier:	TD_OPT_13_IVS		
Objective:	Verify that the IVS audio is un-muted T5 (5 seconds) after call is answered (CONNECT message received), if SEND MSD request was not received and timer T5 has expired		
Configuration:	eCall_CFG_01 or eCall_CFG_03		
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 • IVS is configured for not sending initiation • PSAP test point telephone is used to answer call or real PSAP configured for not sending SEND-MSD		
Test Sequence:	**Step**	**Type**	**Description**
	1	stimulus	IVS establishes an eCall
	2	stimulus	PSAP test point telephone answers call and records time
	3	stimulus	PSAP listens for eCall Initiation Signal and cessation of tone
	4	verify	Verify that the IVS audio is un-muted after 5 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

7.3.13 Un-mute IVS audio when AL-ACK not received (T6 expired)

Interoperability Test Description			
Identifier:	TD_OPT_14_IVS		
Objective:	Verify that the IVS audio is un-muted within T6 (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 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

7.3.14 Un-mute IVS audio when LL-ACK not received (T7 expired)

Interoperability Test Description			
Identifier:	TD_OPT_15_IVS		
Objective:	Verify that the IVS audio is un-muted after T7 (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 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

7.3.15 Un-mute PSAP audio when LL-ACK not sent (T8 expired)

Interoperability Test Description			
Identifier:	TD_OPT_16_PSAP		
Objective:	Verify that the PSAP audio is un-muted after T8 (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 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	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 does not 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

7.3.16 Format of encoded and decoded MSD in accordance with EN 15722

Interoperability Test Description			
Identifier:	TD_OPT_17_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 all the information needed to compile the MSD • PSAP operator knows the content of the transmitted 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	stimulus	Visually inspect format, content, logic and accuracy of MSD when decoded and displayed on screen

7.3.17 IVS configured for eCall 'only' service (restricted)

Interoperability Test Description			
Identifier:	TD_OPT_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 • The IVS is <u>not</u> registered on any mobile network		
Test Sequence:	**Step**	**Type**	**Description**
	1	stimulus	Switch ON ignition / apply power to the IVS
	2	stimulus	Monitor IVS Mobile Network operational status
	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	verify	Verify that the IVS registers on an available PLMN and initiates call set-up

7.3.18 IVS maintains register of recent calls

Interoperability Test Description			
Identifier:	TD_OPT_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 (note –PSAP is not necessary when eCalls where already executed)		
References:	[8] EN 16062 Clause 7.5.2 [9] EN16072 Clause 8.17.3 [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		
Test Sequence:	**Step**	**Type**	**Description**
	1	stimulus	IVS establishes eCalls (note: this stimulus may be the result of previous test scenario execution)
	2	verify	Verify that there is an accurate record of both eCalls having been made, together with correct timestamps and application layer acknowledgements

7.3.20 PSAP handling of more than 1 eCall simultaneously

Interoperability Test Description			
Identifier:	TD_OPT_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
NOTE: This test scenario can be implicitly checked during the veent, as we expect PSAP to handle test session with more than one IVS.			

7.3.21 eCall Pull mode: MSD transmission following NEC disabling tone

Interoperability Test Description			
Identifier:	TD_OPT_21		
Objective:	To verify that the PSAP, to disable the Network Echo Canceller device, send a NEC disabling tone prior to sending the SEND-MSD message and the IVS is able to proceed the following SEND-MSD request message correctly by sending the MSD.		
Configuration:	eCall_CFG_01		
References:	[[8] EN 16062 Clause 7.4.2		
Pre-test conditions:	• Ignition is ON and IVS is in mobile network coverage • MNO and PSAP test points are available • PSAP is configured to send a NEC disabling tone • PSAP being configured for the mandatory PULL mode to immediately transmit NEC disabling tone followed by SEND MSD (Start) message • This requires TD_MAN_01 to run pass		
Test Sequence:	**Step**	**Type**	**Description**
	1	stimulus	IVS initiates an eCall
	2	verify	PSAP answers call and immediately transmits a NEC disabling tone without waiting for the valid Initiation Signal
	3	verify	PSAP transmits SEND MSD (START) message
	4	verify	PSAP verifies first MSD is received
	5	verify	Verify the MSD is correctly decoded
	6	check	MSD content at PSAP is identical to content transmitted by IVS
	7	verify	PSAP sends acknowledgement
	8	verify	Verify that the IVS has stopped transmitting the MSD
NOTE: the PULL mode is now mandatory in the new EN16062 release.			

Annex A (Normative): changes in the new release of EN16062 – HLAP

The following shows the major changes i the new release of EN16062 – HLAP standard, being the major base standard for the eCall devices. The first event was referring to the published EN16062, in September 2011. Following feedbacks from eCall trials and the first event in 2012, update are now provide in a new release of the standard currently under the drafting process.

7.4.2 Send initiation signal from IVS eCall modem to PSAP

After the eCall has been picked-up by the PSAP telephone system it shall be routed to the PSAP in- band modem. If the PSAP is given an indication that the incoming call is an eCall, then the PSAP modem shall immediately send the "SEND MSD" message to the IVS modem. If there is no indication that the call is an eCall, the PSAP waits for the IVS INITIATION signal before sending the "SEND MSD" message.

- The "INITIATION" message (signal) from the IVS shall persist until the IVS has received a "SEND MSD" message from the PSAP in-band modem
- The "INITIATION" message (signal) from the IVS shall cease
  - When the IVS has received a "SEND MSD" message from the PSAP in-band modem
  - or within 2 s after the IVS has received a signal that the call has been answered (T3 - IVS INITIATION signal duration) (see Annex A)

The IVS *eCall* modem INITIATION signalling procedure shall be in accordance with ETSI TS 126 267 and ETSI TS 126 268.

7.12.13 MSD not received

An *eCall* MSD cannot be received for several reasons including:

- the *eCall* has been routed to a PSAP that is not equipped for the *eCall service*;
- the MSD has not been compiled due to partial IVS equipment failure;
- the MSD as sent by the IVS NAD is or has become corrupted;
- the PSAP has re-requested but not received an error free copy of the MSD;
- the IVS MSD transmission attempt has timed out due e.g. to impaired radio access conditions.

In the event of the above and similar MSD reception failure cases the *eCall* shall continue as a speech only TS12 (112) emergency call.

If any of the following occur the eCall shall continue as a speech only TS12 (112) emergency call and be routed to a PSAP operator:

- The PSAP does not receive an indication that the incoming call is an eCall and does not receive an INITIATION signal within 5 s from answering the call (T4 - PSAP wait for INITIATION signal period) (see Annex A),
- The MSD is not received error free as determined by the link layer CRC within 20 s (T8 - PSAP MSD maximum reception time) (see Annex A) from sending a SEND MSD request, then the *eCall* shall continue as a speech only TS12 (112) emergency call.

If the PSAP has the capability, and the PSAP operator having spoken with *vehicle occupants* determines that emergency call is an *eCall*, then the PSAP may initiate a request to the IVS to re- attempt to send the MSD. If this fails again then the call reverts to a speech only call.

7.5.5 Form of presentation of the AL-ACK

The application layer ACK shall be compressed into 4 bits for transport across the link layer according to the following mapping:

Table 1 — Form of presentation of the AL- ACK

Bit 4: Reserved (currently 0)
Bit 3: Reserved (currently 0)
Bit 2: Status - 0 (Positive ACK), 1 (Clear-down)
Bit 1: Format version – 0/1 of the format version (currently 0)

NOTE: when the IVS receives the AL-ACK with bit 2 set to "1", it clears down the call regardless of the value of bit 1

***Data* field of application layer ACK**	**Bit position of application layer ACK**	**Handling**
Format version	1	1 bit to distinguish between format version 1 and 0
Status	2	0 (Positive ACK); 1 (Clear-down)

Bits 1-4 of Table 1 above are mapped to the DL-Data fields of the in-band modem's higher-layer acknowledgement message information bits [ref. to ETSI 126 267] in the following way.

Bit 4 and Bit 3 of Table 1 are mapped to field DL-Data 1, whereas Bit 2 and Bit 1 of Table 1 are mapped to field DL-Data 2 of the in-band modem's higher-layer acknowledgement message format, according to Tables 2 and 3 below.

Table 2: Mapping of application layer ACK Bit 4 and Bit 3 to Binary Representation in in-band modem higher-layer acknowledgement message

Bit 4	**Bit 3**	**Binary Representation of field DL-Data 1 [26.267]**
0	0	0000
0	1	0001
1	0	0010
1	1	0011

Table 3: Mapping of application layer ACK Bit 2 and Bit 1 to Binary Representation in in-band modem higher-layer acknowledgement message

Bit 2	**Bit 1**	**Binary Representation of field DL-Data 2 [26.267]**
0	0	0000
0	1	0001
1	0	0010
1	1	0011

7.9 eCall clear-down

The PSAP operator may instruct the clear-down of the call at any time after the MSD is received (PSAP modem has sent LL-ACK) or after T8 – PSAP MSD maximum reception time or T4 – PSAP wait for INITIATION signal period is completed.

NOTE The PSAP operator has not had the opportunity to clear-down the call until the MSD has been sent and received, and the call has been forwarded to the PSAP operator.

On receipt of the MSD and/or completion of the telephone conversation with the *vehicle occupants*, the PSAP operator shall clear-down the *eCall*. Depending on the context (see below), the call may be cleared down by either hanging up in the normal way or by sending a clear-down instruction to the IVS.

After the IVS has received the LL-ACK or T5 – IVS wait for SEND MSD period or T7 – IVS MSD maximum transmission time ends, the IVS shall recognise a normal hang-up from the network. Furthermore the IVS shall clear-down the call.

After the PSAP has sent the LL-ACK or T4 – PSAP wait for INITIATION signal period or T8 - PSAP MSD maximum reception time ends and the IVS receives a AL-ACK with status = “clear- down” (see Figure 7 and Table 1), i shall clear-down the call.

NOTE It cannot be guaranteed that an abnormal termination can be recognized as such by the IVS.

The IVS shall not attempt an automatic redial following a *call clear-down* by either of the above two methods.

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 minimum period of T11 (See Annex A) as defined in EN 16072..

The *eCall* only IVS network de-registration fallback timer (DFT) shall be reset following *call clear-down* to control the maximum time that the IVS stays registered on the network (T10 - IVS NAD (*eCall* only configuration) network De-registration Fallback Timer (DFT)) (see Annex A).

Following acceptance of an *eCall* by the PSAP systems, but for which the *eCall* could not be processed (e.g. call was dropped), then the PSAP operator may attempt to call back into the vehicle, but if this is done shall first allow the IVS sufficient time for automatic retries) as described in EN 16072. See Figures 6 and 7.

NOTE 2 The purpose of the DFT is to de-register *eCall* only IVS NADs from the network after a predetermined period.

Following network de-registration the IVS shall go to standby mode and adopt the *eCall* "Inactive

State" in accordance with the *eCall* terminal state machine procedures specified in ETSI TS 124 008.

Annex B (Normative): changes in the HLAP timers

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 min, the call shall be cleared down.	60 min
T3 - IVS INITIATION signal duration	The IVS INITIATION signal shall not persist for longer than 2 s from when the UE receives notification that the call is first answered.	2 s
T4 - PSAP wait for INITIATION signal period	If a valid INITIATION message is not received by the PSAP modem within 5 s from when the NAD knows that the call has been answered then the call shall be routed to a PSAP operator.	**5 s**
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 5 s, 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.	**5 s**
T6 - IVS wait for AL-ACK period	If an AL-ACK is not received within 5 s 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 s
T7 - IVS MSD maximum transmission time	If the IVS does not receive a link layer ACK (LL-ACK) within 20 s from the start of MSD transmission it shall cease transmission and the IVS audio system shall be re-connected.	20 s
T8 - PSAP MSD maximum reception time	If the PSAP eCall modem does not send a link layer ACK (LL-ACK) within 20 s after having sent the "SEND MSD" message to the IVS eCall modem, it shall route the voice call to a PSAP operator.	20 s
T9 - IVS NAD (eCall only configuration) 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 minimum period of one hour as defined in EN 16072.	1 h
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 h period, de-register from the serving network.	12 h
T11 - IVS Callback time limit	An IVS NAD, following call clear-down after an eCall, automatically shall answer a call-back from the PSAP for a period of 12 h after the eCall was first cleared down,.	12 h

History

Document history		
1.0.0	15.05.2012	First release for the eCall#1 event in Nuneaton, UK, May 2012
2.0.0	05.08.2013	Second release for the eCall#2 event in Essen, Germany, September 2013
2.1.0	07.08.2013	Annex A – clause 7.4.2 of EN16062 modified
2.1.1	13.08.2013	corrections
2.21	28.08.2013	TD_MAN_PUSH_01 updated
2.3.1	02.09.2013	Configuration added
2.4.1	03.09.2013	Corrections = NEC test scenario
2.4.2	03.09.2013	TD-OPT-21 description rephrased
2.4.3	09.09.2013	Long number update