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BSI Standards Publication

Intelligent transport systems — ESafety — eCall high level application requirements (HLAP) using GSM/UMTS circuit switched networks

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National foreword

This British Standard is the UK implementation of EN 16062:2015. It supersedes BS EN 16062:2011 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee EPL/278, Intelligent transport systems.

A list of organizations represented on this committee can be obtained on request to its secretary.

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Intelligent transport systems - ESafety - eCall high level application requirements (HLAP) using GSM/UMTS circuit switched networks

Systèmes de transport intelligents - ESafety - Exigences de protocole d'application de haut niveau (HLAP) relatives à l'eCall via des réseaux commutés de circuits GSM/UMTS

Intelligente Transportsysteme - ESicherheit - Allgemeine eCall Anforderungen (HLAP) unter Verwendung von geschalteten GSM/UTMS Netzwerken

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Foreword

This document (EN 16062:2015) has been prepared by Technical Committee CEN/TC 278 “Intelligent transport systems”, the secretariat of which is held by NEN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by October 2015, and conflicting national standards shall be withdrawn at the latest by October 2015.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 16062:2011.

The following changes have been introduced in this revision:

— Improvements in the precision of technical description and update of references;

— 7.4.2 (initiation sequence) has been revised to enable faster connections;

— Timer values have been changed;

— Some Notes have been removed;

— Grammar/presentation has been improved;

— An optional network echo cancellation suppression tone has been added;

— SIM and SIM/USIM have been replaced by USIM throughout for consistency with ETSI *eCall* standards deliverables;

— IVS has been replaced by ‘IVS responsible for the *eCall* system’ for clarity, throughout;

— 7.3.8, 7.4.2, 7.5.4, 7.6.1 reworded for clarity and some rearrangement between 7.5.4 and 7.6.1;

— 7.9 Cleardown clarified;

— Table of timings revised;

— Annex C truncated as CEN/TS 16454 (*eCall* Conformance Tests) now exists.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Introduction

An *eCall* is an emergency call generated either automatically via activation of in-vehicle sensors or manually by the vehicle occupants; when activated, to provide notification and relevant location information to the most appropriate Public Safety Answering Points (PSAP), by means of mobile wireless communications networks and carries a defined standardized minimum set of data, notifying that there has been an incident that requires response from the emergency services and establishes an audio channel between the occupants of the vehicle and the most appropriate PSAP.

EN 15722 specifies a standardized MSD for *eCall*, and EN 16072 specifies pan-European *eCall* operating requirements. (For third party systems, EN 16102 specifies third party services supporting *eCall* operating requirements. See EC Communication on *eCall* Implementation 2009 [COM(2009) 434 final] and Official Journal *eCall* Recommendation C_2011_6269, for more information).

The operating requirements for pan-European *eCall* are made using Public Land Mobile Networks (PLMN) (such as GSM and 3G), as specified in a number of ETSI standards and technical specifications.

In order to provide the *eCall* service across a wireless network, high level application protocols are required as an important essential element to effect this service provision. This European Standard specifies the protocols to put into effect the pan-European *eCall* operating requirements using PLMNs, and also identifies common elements that can be used in the link between third party services supporting *eCall* and PSAPs.

NOTE The term PSAP, which is most widely used in the *eCall* documentation, European Commission documents etc., is used throughout this document and equates to the term emergency call response centre used in the ITS Implementation Directive.

The European Committee for Standardization (CEN) draws attention to the fact that it is claimed that compliance with this European Standard may involve the use of patents concerning *eCall* given in this European Standard.

The patents held may refer to the implementation of *eCall* in general using the specifications in this European Standard, but do not specifically directly refer to specifications of any of the clauses defined herein.

CEN takes no position concerning the evidence, validity and scope of these patent rights.

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1 Scope

In respect of pan-European *eCall* (operating requirements defined in EN 16072), this European Standard defines the high level application protocols, procedures and processes required to provide the *eCall service* using a TS12 emergency call over a mobile communications network.

NOTE 1 The objective of implementing the pan-European in-vehicle emergency call system (*eCall*) is to automate the notification of a traffic accident, wherever in Europe, with the same technical standards and the same quality of services objectives by using a PLMN (such as ETSI prime medium) which supports the European harmonized 112/E112 emergency number (TS12 ETSI/TS 122 003) and to provide a means of manually triggering the notification of an emergency incident.

NOTE 2 HLAP requirements for third party services supporting *eCall* can be found in EN 16102, and have been developed in conjunction with the development of this work item, and is consistent in respect of the interface to the PSAP. This deliverable makes reference to those provisions but does not duplicate them.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 15722:2011, *Intelligent transport systems — eSafety — eCall minimum set of data (MSD)*

EN 16072:2011, *Intelligent transport systems — eSafety — Pan-European eCall operating requirements*

EN 16102:2011, *Intelligent transport systems — eCall — Operating requirements for third party support*

CEN/TS 16454:2013, *Intelligent transport systems — ESafety — ECall end to end conformance testing*

ETSI/TS 122 101, *Universal Mobile Telecommunications System (UMTS); LTE; Service aspects; Service principles (3GPP TS 22.101 [Release 8 or later]*

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 [Release 8 or later]*

ETSI/TS 126 267, *Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); eCall data transfer; In-band modem solution; General description [Release 8 or later]*

ETSI/TS 126 268, *Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); eCall data transfer; In-band modem solution; ANSI-C reference code [Release 8 or later]*

ETSI/TS 126 269, *Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); eCall data transfer; In-band modem solution; Conformance testing [Release 8 or later]*

ETSI/TS 122 003, *Digital cellular communications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); LTE; Circuit Teleservices supported by a Public Land Mobile Network (PLMN) (Teleservice 12/TC12) /E12) [Release 8 or later]*

ETSI/TS 122 011, *Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); LTE; Service accessibility [Release 8 or later]*

ETSI/TS 127 007, *Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); AT command set for user equipment [Release 8 or later]*

ETSI/TS 102 164, *Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); Emergency Location Protocols (version 1.3.1)*

ETSI/TS 151 010-1, *Digital cellular telecommunications system (Phase 2+); Mobile Station (MS) conformance specification; Part 1: Conformance specification (3GPP TS 51.010-1 version 8.1.0) [Release 8 or later]*

ETSI/TS 121 133, *Universal Mobile Telecommunications System (UMTS); 3G Security; Security Threats and Requirements; (3GPP TS 21.133 version 4.1.0) [Release 4 or later]*

ETSI/TS 122 071, *Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); LTE; Location Services (LCS); Service description; Stage 1 [Release 8 or later]*

ISO/IEC 9646 (all parts), *Information technology — Open Systems Interconnection — Conformance testing methodology and framework*

ITU–T:2009, Recommendation G.168 “Digital network echo cancellers”

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
112
single European emergency call number supporting Teleservice 12

[SOURCE: ETSI/TS 122 003]

3.2
call clear-down
termination of call and freeing up of line (usually achieved by hanging up the receiver or pressing ‘end call’ or similar on screen)

3.3
cellular network
wireless communications network consisting of multiple adjacent access points (cells) with the capability of homogeneous transfer of a communications session instance to an adjacent cell without significant interruption to the session

3.4
data
representations of static or dynamic objects in a formalized manner suitable for communication, interpretation, or processing by humans or by machines

3.5
data concept
any of a group of *data* structures (i.e. object class, property, value domain, *data elements,* message, interface dialogue, *association*) referring to abstractions or things in the natural world that can be identified with explicit boundaries and meaning and whose properties and behaviour all follow the same rules

3.6
data element
single unit of information of interest (such as a fact, proposition, observation, etc.) about some (entity) class of interest (e.g. a person, place, process, property, concept, state, event) considered to be indivisible in a particular context

3.7
E112
emergency communications service using the single European emergency call number, 112, which is enhanced with location information of the calling user TS12

3.8
eCall
emergency call generated either automatically via activation of in-vehicle sensors or manually by the *vehicle occupants*; when activated it provides notification and relevant location information to the most appropriate *Public Safety Answering Point*, by means of *mobile wireless communications networks*, carries a defined standardized *minimum set of data* (MSD) notifying that there has been an incident that requires response from the emergency services, and establishes an audio channel between the occupants of the vehicle and the most appropriate *Public Safety Answering Point*

3.9
eCall generator
occupant of a vehicle or equipment within a vehicle that has cause to trigger an *eCall* transaction by automatic or manual means

3.10
eCall identifier
one of two information element bits (flags) included in the emergency call set-up message that may be used by the mobile network to filter and route automatically and manually initiated *eCalls* to a designated PSAP

3.11
eCall service
end-to-end emergency service to connect occupants of an affected vehicle to the most appropriate PSAP via an audio link across a PLMN together with the transfer of a minimum set of data to the PSAP

3.12
eCall transaction
establishment of a mobile wireless communications session across a public wireless communications network and the transmission of a minimum set of data from a vehicle to a public safety answering point and the establishment of an audio channel between the vehicle and the PSAP

3.13
emergency control centre
unit which deals with emergency calls and which has the capacity to consider professionally the need for response, and which has the provision to mobilise the needed resources to deal with the emergency in question

3.14
emergency call response centre
term used in ITS Implementation Directive to mean Public Safety Answering Point (PSAP)

3.15
identifier
any label, symbol or token that names or identifies an entity or a collection of data or the means of designating or referring to a specific instance of a data concept

3.16
in-vehicle equipment
equipment within the vehicle that provides or has access to in-vehicle data required for the minimum set of data and any other data that is to be sent as part of or complementary to the minimum set of data to effect the *eCall* transaction via a public mobile wireless communications network providing a link between the vehicle and a means of enacting the *eCall* service via a public mobile wireless communications network

3.17
in-vehicle equipment provider
provider of *eCall* in-vehicle equipment

Note 1 to entry: The in-vehicle equipment provider can be the vehicle manufacturer or the provider of aftermarket equipment.

3.18
in-vehicle system
in-vehicle equipment together with the means to trigger, manage and effect the *eCall* transaction

3.19
minimum set of data
standardized data concept comprising data elements of relevant vehicle generated data essential for the performance of the *eCall* service

[SOURCE: EN 15722:2011]

3.20
mobile wireless communications network
wireless communications network with homogeneous handover between *network access points*

3.21
mobile wireless communications network device
device providing communications to a *mobile wireless communications network* with homogeneous handover between *network access points*

3.22
most appropriate PSAP
PSAP defined beforehand by responsible authorities to cover emergency calls from a certain area or for emergency calls of a certain type

Note 1 to entry: See also PSAP.

Note 2 to entry: A number of different instantiations of PSAP service are supported within this European Standard. A PSAP can be a Public Authority or a private *service provider* operating on behalf of the responsible authorities.

3.23
network access device (NAD)
see *mobile wireless communications network device*

3.24
network access points
beacon, antenna or similar source of signal propagation and receipt together with equipment to manage communication sessions with users operating within the operating reach of the *network access point* and provide connectivity for the users within the operating reach of the single *access point* to a wider communications network

Note 1 to entry: A network access point may but does not need to provide homogeneous or heterogeneous handover to another network access point.

3.25
public mobile wireless communications network
mobile wireless communications network with access to a public telecommunications network

3.26
Public Safety Answering Point (PSAP)
physical location working on behalf of the national authorities where emergency calls are first received under the responsibility of a public authority or a private organization recognized by the national government

Note 1 to entry: See also most appropriate PSAP.

Note 2 to entry: A number of different instantiations of PSAP service are supported within this European Standard.

3.27
service provider
physical and functional component responsible for providing telematics based services to its subscribers

3.28
vehicle manufacturer
entity which first assembles the vehicle and provides *eCall* equipment as part of its specification and subsequently sells the vehicle directly or via an agent

3.29
vehicle occupant(s)
person(s) inside the vehicle

3.30
wireless communications network
network operating using an air-interface capable of bi-directional transfer of *data* and or voice

Note 1 to entry: There are different types of wireless communications such as PAN, LAN, *cellular network* etc.

4 Symbols and abbreviations

3G	third generation mobile telecommunication system
ACK	ACKnowledgement
AIeC	automatic initiated *eCall*
AT	attention (part of modem instruction to dial as specified in ETSI/TS 127 007)
BS	bearer services
CAN	controller-area network
CRC	cyclic redundancy check
EC	European Commission
ETSI	European Telecommunications Standards Institute
GSM	global system for mobile communications
HLR	home location registry
HPLMN	home public land mobile network
IAM	initial address message
IMSI	international mobile subscriber identity
IVS	in-vehicle system
LAN	local area network

LTE	long term evolution (of 3G UMTS access network)
MIeC	manually initiated *eCall*
MSC	mobile switching centre
MNO	mobile network operator
MSISDN	mobile subscriber ISDN (integrated services digital network)
MSD	minimum set of data (EN 15722)
NAD	network access device (e.g. a GSM or UMTS module)
PAN	personal area network
PLMN	public land mobile network
PSAP	**p**ublic safety answering point
REQ	REQuest
SUT	system under test
TPS	third party service
TPSP	third party service provider
TS (i)	technical specification
TS (ii)	teleservice
TS12	Teleservice 12 ETSI/TS 122 003
Tx	transmit
UMTS	universal mobile telecommunication system
USIM	universal subscriber identity module
VLR	visited location register
WGS	world geodetic system
WGS 84	World Geodetic System; issue 1984 (last revised 2004]

5 Conformance

This European Standard makes no conformance specifications or requirements in respect of TPS *eCall* operating requirements, and conformance requirements in respect of TPS *eCall* can be found in EN 16102.

The first step enabling the interoperability of the pan-European *eCall* system elements is to verify the conformity of each element to the relevant pan-European *eCall* set of standards. In such cases, each element becomes a system under test (SUT) which is tested against a reference conformance test system. Two levels of conformity have to be achieved:

— conformity of the SUT to the network access standards, including support by the network of the *eCall* identifier (flag) in accordance with ETSI/TS 124 008, being used to achieve the routing and end to end transport of information between the IVS responsible for the *eCall* system and the PSAP, and the establishment maintenance and termination of an audio link between both using the 112 emergency number;

— conformity of the SUT to the high level application protocol as specified in this European Standard and conformity to both EN 15722 and EN 16072.

Any test between a given vehicle type and/or communication network and/or PSAP shall be achieved without interference to an operational emergency system, unless by prior arrangement.

The *eCall* system is composed of three distributed main subsystems comprising IVS responsible for the *eCall* system, mobile network and PSAP, corresponding to SUT1, SUT2 and SUT3 respectively. Each SUT shall be tested for conformance using the necessary subsystem simulators, as shown in Figure 1.

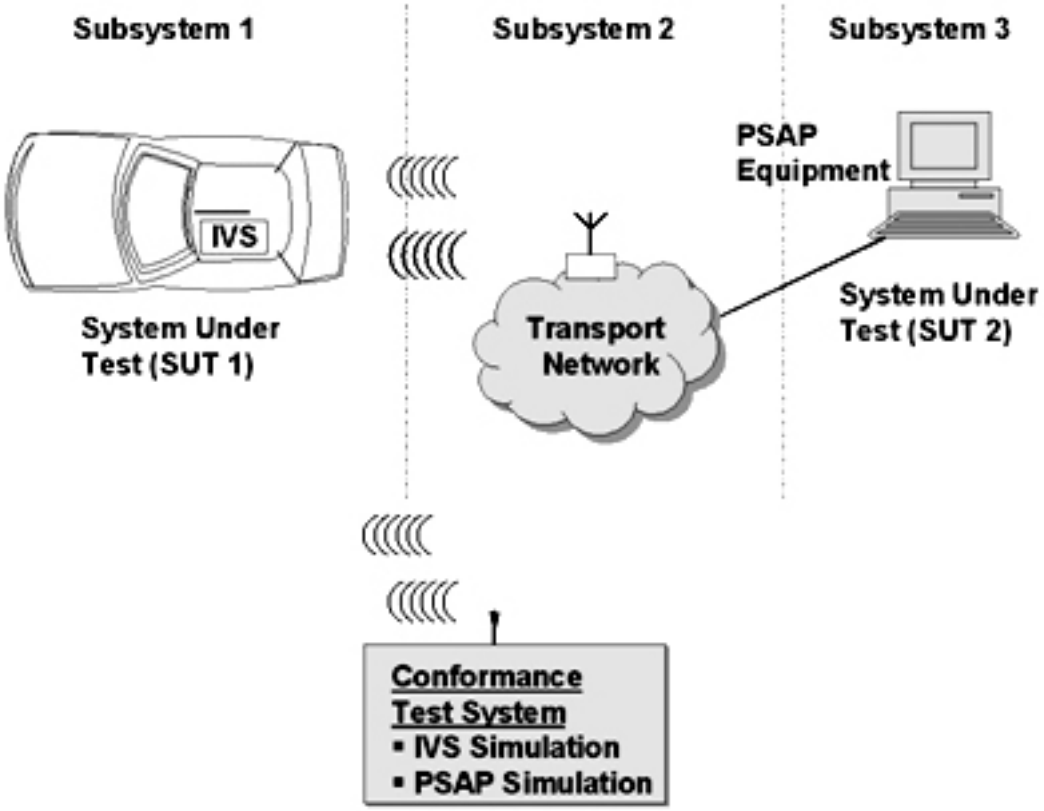

Figure 1 — End-to-End eCall system extended with conformance test system

Clause 11 provides the test and conformance requirements for both the IVS responsible for the *eCall* system and the PSAP equipment. Network support for the *eCall* flag is necessary to ensure correct filtering and optimal routing of *eCalls* to the required PSAP.

Consequently, at the transport network level, the conformance testing shall be simply achieved by verifying that the *eCalls* are correctly routed to relevant PSAPs designated to handle them according to their triggering sources (manual or automatic).

6 General overview of the eCall transaction for Pan European eCall

In the introduction to this European Standard, *eCall* was described as "an emergency call generated either automatically via activation of in-vehicle sensors or manually by the *vehicle occupants* (the *eCall generator*); when activated, it provides notification and relevant location information to the most appropriate *Public Safety Answering Point*, by means of *mobile wireless communications networks* and carries a defined standardized *minimum set of data*, notifying that there has been an incident that requires response from the emergency services and establishes an audio channel between the occupants of the vehicle and the most appropriate *Public Safety Answering Point*.

Pan-European *eCall* effects this service using a Circuit Teleservice supported by a Public Land Mobile Network (PLMN) (Teleservice 12/TS12) ETSI/TS 122 003.

NOTE 1 If the MSD is not sent or received for any reason then the *eCall* continues as a normal 112/E112 emergency call and is afforded the same protection and priority as a Teleservice 12 (ETSI/TS 122 003) emergency voice call. See 7.12.5.

Figure 2 shows an illustrative view of the pan-European *eCall service*, as defined in EN 16072.

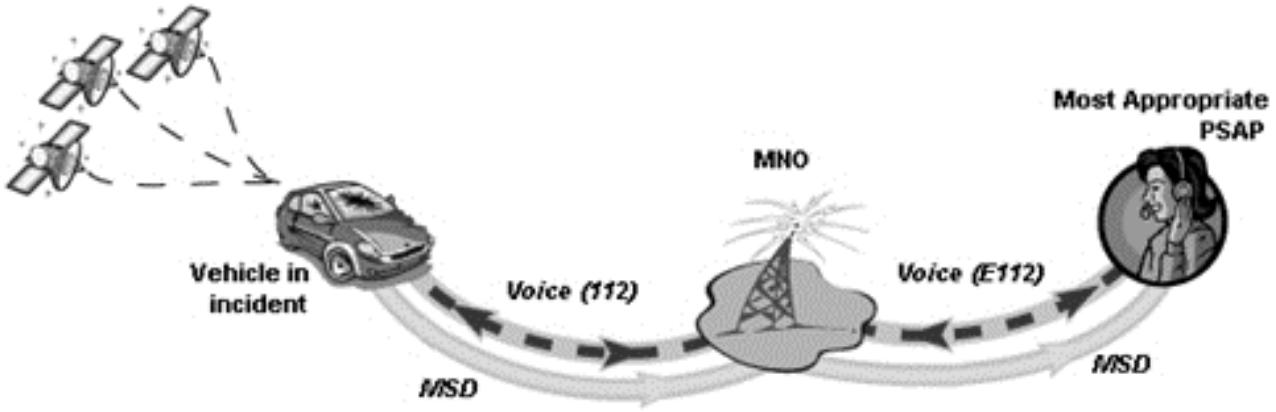

Figure 2 — Relationship of the Pan European eCall process to European Standards

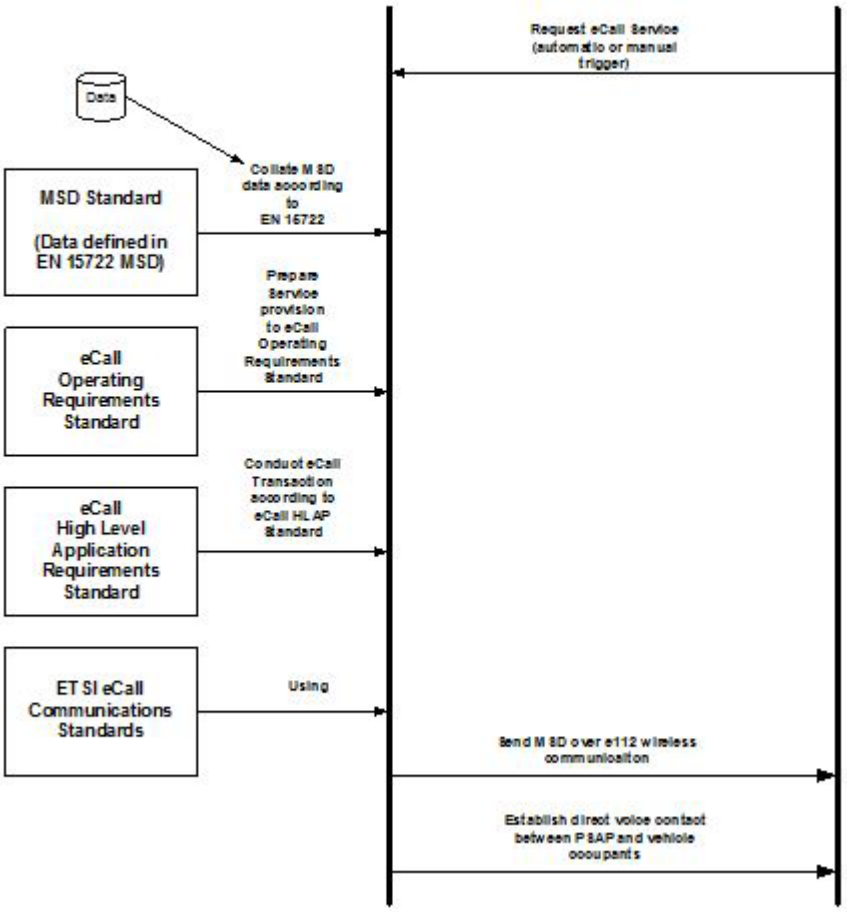

Figure 3 — Relationship of eCall transaction to standards

NOTE 2 For lists of standards referred to in Figure 3, see Clause 2.

After the establishment of an emergency voice call (112/E112) between a vehicle and a *Public Safety Answering Point* (PSAP) the audio equipment comprising the microphone and loudspeaker in the vehicle is disconnected from the line whilst the MSD is transmitted, within the voice band, to the PSAP *data* processing equipment. An indication shall be given to the occupants of the vehicle that an *eCall* is in progress. On completion of the MSD transfer the in-vehicle audio system is reconnected to the line and a voice communication is established between the *vehicle occupants* and a PSAP operator. The incident related information associated with the 112/E112 voice call, contained within the MSD, is made available to the PSAP operator in the manner decided locally.

Following the initial resolution of the incident by the PSAP operator, the PSAP operator may clear-down the call, however, the *in-vehicle system* (IVS responsible for the *eCall* system) remains registered on the mobile network, for the period specified in EN 16072 and Annex A to this document to enable the PSAP or rescue services to re-call the *vehicle occupants*.

The *eCall service* technical requirements, as they apply to the establishment of the TS12 emergency call and the transfer of the in-band *data*, are as specified in ETSI/TS 122 101 and ETSI/TS 124 008. These specifications also describe the use, by the mobile network, of the *eCall* flag *identifier*, needed to ensure the correct filtering and routing of *eCalls* to a designated *eCall* capable PSAP. The *eCall* in-band modem, used to transfer the MSD, is specified in ETSI/TS 126 267 and ETSI/TS 126 268.

Figure 4 provides a general overview of the process of sending an MSD from the IVS responsible for the *eCall* system to the PSAP.

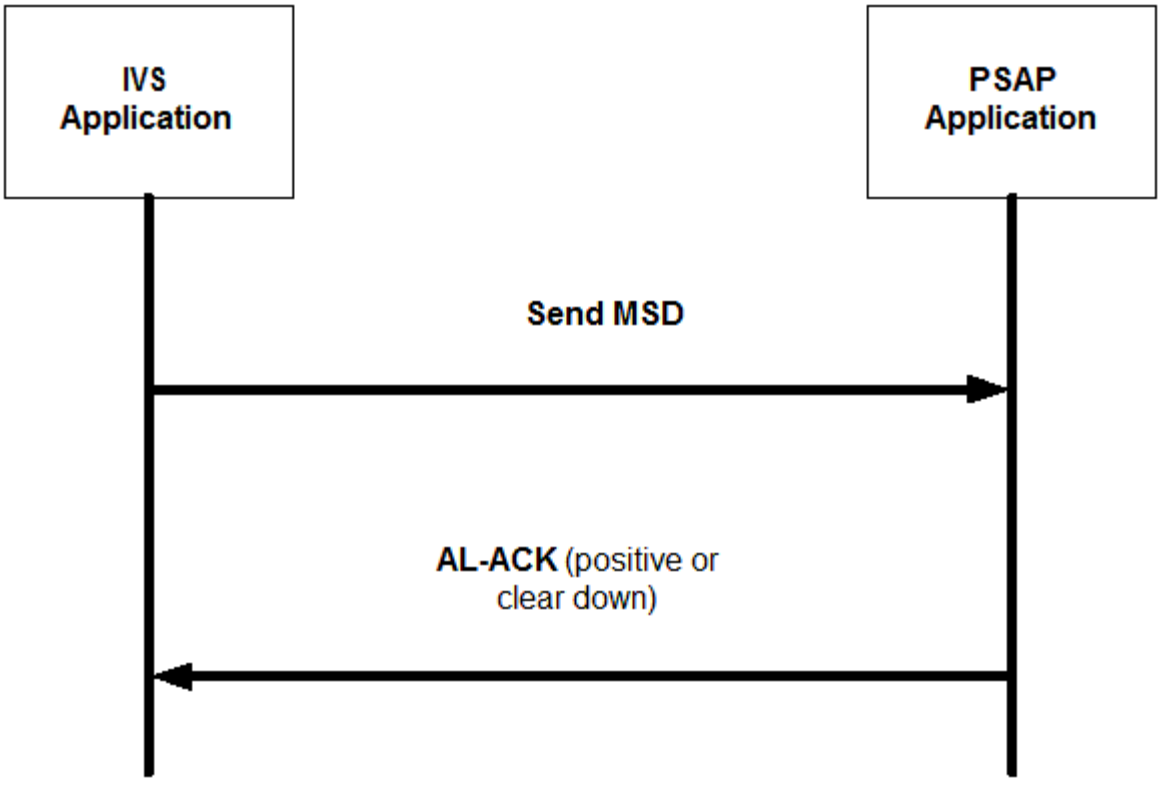

Figure 4 — General overview - MSD sent from IVS to PSAP – successful case

A more detailed explanation of the *eCall transaction* is contained within the following clauses together with specific high-level application requirements.

Under normal circumstances, the stages of the pan-European *eCall transaction* that provide the service can be described as comprising 9 steps:

a) Step 1 – Procedures following power-up and initialisation of the *in-vehicle system*

b) Step 2 – Activation (of system)

c) Step 3 – Call set-up (including identifying call type, make call, network selection and registration, authentication (home location registry), cell localisation (by network), establish audio connection to PSAP modem server)

d) Step 4 – MSD transfer (including disconnect microphone and loudspeaker in vehicle from the line, send network echo canceller disabling tone (optional), send IVS INITIATION signal, synchronize, request MSD, send MSD, error check), and link layer ACK (including stop MSD transmissions)

e) Step 5 – Application layer ACK

f) Step 6 – Establish audio link (including check audio link to vehicle occupants, MSD visualisation, rerouting to another PSAP)

g) Step 7 – Clarification of the overall emergency situation and location

h) Step 8 – Initiate incident resolution and inform *vehicle occupants* verbally that help is coming

i) Step 9 – *Call clear down.*

Procedures also need to be defined by local or national authorities for failure exceptional causes such as:

— PSAP or rescue service call back (voice only) or 'SEND MSD';

— MSD not transmitted correctly;

— false generation of *eCalls*;

— network registration fails;

— call failure;

— network not capable to support *eCall* flag;

— *eCall* routed to a non equipped PSAP;

— PSAP modem failure;

— PSAP network/ICT failure;

— PSAP application failure;

— PSAP operator does not respond;

— MSD not sent;

— MSD not received;

— audio link not established;

— audio link established but subsequently fails;

— re-attempt in case of interrupted call;

— automatic repeat attempts;

— IVS responsible for the *eCall* system NAD does not receive clear-down;

— etc.

Procedures/protocols for other process features need also to be specified, such as:

— termination of manual *eCall* trigger before it has been confirmed by *vehicle occupants*;

— activation/deactivation of *eCall* equipment in the vehicle.

This European Standard provides high level application protocols and procedures to enact the *eCall service* provision in Clause 7. It specifies at "High Level", because it is not the intention to determine how the manufacturers detailed product design is effected, only the steps that need to be effected in order to provide a consistent system in an interoperable open environment.

NOTE 3 Third party support for *eCall* provides the same end service (MSD + audio link between the occupants of the vehicle and the PSAP), but by different means. Transitional arrangements for non-equipped MNOs and PSAPs are also described.

7 Requirements

7.1 Procedures following power-up of the in-vehicle system

7.1.1 General

The IVS responsible for the *eCall* system network access device (NAD) shall conform in all respects to the applicable ETSI specifications and in particular to the requirements specified in ETSI/TS 122 101 and ETSI/TS 124 008 with regard to this initial power-up procedure.

7.1.2 Enabled IVS

The following requirements apply to an IVS responsible for the *eCall* system that has not been disabled for reasons of privacy.

As specified in ETSI/TS 122 101, an *eCall* IVS responsible for the *eCall* system NAD shall have a valid USIM. The USIM enables the provision of the *eCall* service, The USIM can be configured only for *eCall* (in this European Standard referred to as "*eCall* only"), or a combination of *eCall* and commercial service provision.

7.1.3 Enabled PSAP

To be “*eCall* enabled”, a PSAP needs to be equipped with the necessary hardware and a software application that can receive, process and make the MSD contents immediately available to its operators. This can either be a dedicated *eCall* application or integration in the existing PSAP application. An *eCall* enabled PSAP shall conform in all respects to the high-level application protocols as specified herein.

The *eCall* flag makes possible that the *eCalls* are routed to a dedicated number which shall be created. This way, the PSAP can distinguish the *eCalls* from the E112 calls. Figure 5 provides an illustration.

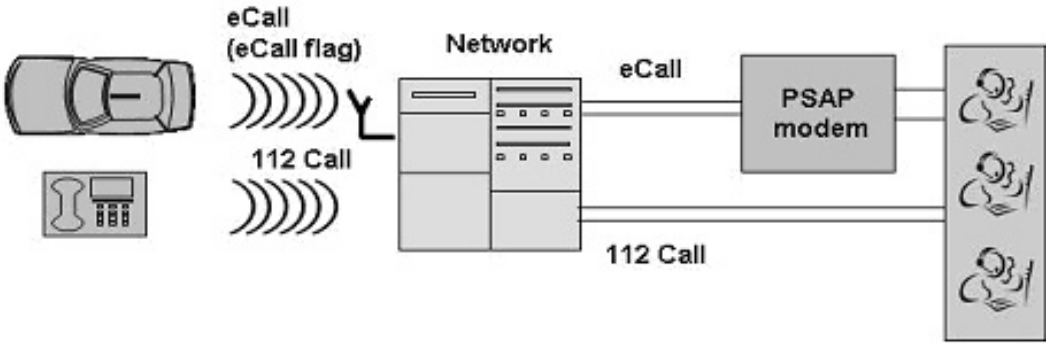

Figure 5 — Use of the eCall flag

The call-handling is to be achieved in line with local/national procedures/regulations, including the regulations on confidentiality.

7.1.4 IVS configured only for eCall

If the IVS responsible for the *eCall* system is configured to make only *eCalls* then, in accordance with ETSI/TS 122 101 (Release 8 or later), the IVS responsible for the *eCall* system NAD shall not systematically perform mobility management procedures, including registration on a PLMN, except when attempting to initiate an *eCall* and during an emergency call, or to initiate a test or reconfiguration of the terminal during a maintenance operation.

NOTE 1 The purpose of this restriction is to avoid network congestion due to large volumes of unnecessary network registration, de-registration and location update signalling from terminals configured only to make *eCalls*.

NOTE 2 Manufacturers need to adopt strategies that do not overload the PLMN by simultaneously testing.

The access and use of test functions are left to the vehicle manufacturers/equipment suppliers to fulfil their conformance testing/interoperability obligations and their own quality control procedures. Implementations, at the manufacturer's discretion, may (but are not obliged to) provide access to the test functions to the occupants of the vehicle.

In accordance with ETSI/TS 122 101 — It shall be possible for the user equipment upon request from the user to initiate a call to an operator designated non-emergency MSISDN for the purpose of accessing test and terminal reconfiguration services.

7.1.5 Self-test

On power up, the IVS responsible for the *eCall* system shall normally perform a self-test without attempting to connect to the network. In the event of a critical system failure, which would result in an inability to execute an *eCall* as described in this European Standard detected during or following the self-test, a warning shall be given to the occupants of the vehicle. The nature of such warning is a feature of product design and is not standardized in this European Standard. It is then the responsibility of the driver/occupant(s) of the vehicle to consider whether the warning is to be followed up. Correct *eCall* functionality cannot be ensured as long as such a critical system failure is present.

7.1.6 Standby mode applicable to IVS configured for eCall only

Following the power-up, an IVS responsible for the *eCall* system configured for "*eCall* only" shall not attempt to register on a PLMN except as permitted in 7.1.4 and 7.2.2. The IVS responsible for the *eCall* system 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.

An IVS responsible for the *eCall* system configured for "*eCall* only" shall periodically scan and maintain a list of available PLMNs, whilst in inactive state, so as to reduce the network selection and registration time in accordance with ETSI/TS 122 011 when the IVS responsible for the *eCall* system needs to initiate an *eCall*.

7.2 Activation

7.2.1 Activation of pan-European eCall

Once the *in-vehicle system* is made aware by the *eCall generator* of a triggering event that fulfils the requirement described in EN 16072, and provided that there is no ongoing *eCall* in progress, the activation sequence shall start. In order to meet the objectives of the provision of the service defined in EN 16072, additional application protocols are required to successfully effect an activation sequence.

The *in-vehicle system* shall:

— if necessary immediately interrupt any ongoing communication using the communication channel required for *eCall*;

— disconnect the in-vehicle microphone from the line;

— disconnect the in-vehicle loudspeaker from the line;

— start the *eCall transaction* at the IVS level;

— except for retrofit *eCall* systems, installed *in-vehicle equipment* shall ensure that the in-vehicle audio equipment is muted for the duration of the *eCall* (as defined in EN 16072);

— alert the *vehicle occupants* of an initiated *eCall* as described in EN 16072.

The aftermarket manufacturers are responsible for their technical solution which may not be able to influence the behaviour of installed *in-vehicle equipment*.

7.2.2 Activation of a test eCall

The *in-vehicle system* shall provide a way to activate a test *eCall*, for example by simulating the *eCall* triggering event, in order to test the IVS.

NOTE Such activation can be made via specific equipment and procedure(s) which may, but does not need to, be accessible to the end user, but for example only by manufacturer authorized facilities or vehicle repair shops (e.g. via a specific request on the CAN interface for line fitted equipment).

Except for tests specifically agreed with a PSAP, the IVS responsible for the *eCall* system shall set the test bit of the MSD according to EN 15722.

For procedures for other tests of system components, refer to Annex C.

Any interoperability test between a given vehicle type and/or communication network and/or PSAP shall be achieved without interference to an operational emergency system, unless by prior arrangement.

7.3 Call set-up

7.3.1 General

On activation of the *eCall* process, either manually by the user or automatically as the result of an incident, the MSD fields are populated or updated in accordance with EN 15722 and an emergency call set-up is initiated by the IVS responsible for the *eCall* system as described in 7.3.6.

Timer T2 - IVS ‘Call Clear-down Fallback Timer’ (CCFT), as specified in Annex A, shall be started.

NOTE The purpose of the *call clear-down* fallback timer is to ensure that the IVS responsible for the *eCall* system NAD clears-down the call correctly if an application layer acknowledgement clear-down instruction (AL-ACK) is not received, or if the IVS responsible for the *eCall* system fails to receive a network clear-down message (i.e. the IVS responsible for the *eCall* system does not recognize the PSAP hang up).

The means by which the *in-vehicle equipment provider* populates and updates the MSD *data* is a matter for product design and outside the scope of this European Standard.

7.3.2 IVS network access device (NAD) already registered on PLMN

If the IVS responsible for the *eCall* system NAD has the necessary capability, and a valid USIM for commercial services, then the IVS responsible for the *eCall* system NAD may already be registered on the home PLMN (HPLMN), or on a visited PLMN (VPLMN) if roaming. In this case the IVS responsible for the *eCall* system NAD shall commence an emergency call set-up in accordance with ETSI/TS 124 008 and include in the TS12 service category request message the "*eCall* flag" as specified in ETSI/TS 122 101 and ETSI/TS 124 008.

7.3.3 eCall in progress

If the IVS responsible for the *eCall* system, during an ongoing automatically or manually triggered *eCall,* receives a new trigger, the ongoing *eCall* shall take priority and shall not be disconnected.

EXAMPLE The driver has called the emergency services because he/she is having a heart attack, and the vehicle then crashes.

Provisions to abandon an *eCall* in progress shall be as specified in EN 16072.

7.3.4 Network selection and registration

Before an *eCall* only IVS responsible for the *eCall* system, as defined in ETSI/TS 122 101, is able to register on a PLMN to make an *eCall*, or to perform a test call to a specified non-emergency number (7.2.2), it shall transition from the *eCall* "Inactive State" as previously described in 7.1.6. The IVS responsible for the *eCall* system NAD shall then perform the network selection and registration procedures, using the highest priority allowed PLMN found during the most recent background scan, as specified in ETSI/TS 122 011.

7.3.5 Authentication of the subscriber

As part of the network registration process, and before call set-up, the identity of the subscriber – international mobile subscriber identity (IMSI) stored on the USIM - is sent to the subscriber’s PLMN home location registry (HLR) for authentication. Should the IMSI authentication fail for any reason then, subject to network operator and national regulatory policies, it may not be possible establish an *eCall*. In this event the IVS responsible for the *eCall* system shall continue to attempt to search and register on another network.

The network registration attempts shall continue until a number of retries or timeout event (specific values are *in-vehicle equipment* manufacturer specific) or available power is exhausted. If network registration fails but networks are present, it shall in any case attempt to make the *eCall*.

NOTE 1 In some countries it is possible to make an emergency call without prior authentication. However, authentication where possible is preferred, to enable call-back.

NOTE 2 During the network registration and authentication process the location of the IVS responsible for the *eCall* system NAD is determined from the identity of the cell on which the NAD is camped and this is stored as a location update in the both the HLR and VLR.

NOTE 3 Because authentication is not performed during a limited service emergency call, the PSAP cannot in some circumstances receive a valid CLI. In this case, it may not be possible for the PSAP operator to call-back the IVS responsible for the *eCall* system.

7.3.6 eCall establishment

To initiate an *eCall* the IVS responsible for the *eCall* system shall initiate a call set-up to the network with a request for a Teleservice 12.

In the call set-up message the IVS responsible for the *eCall* system NAD shall set the "Service Category" information element (IE) in accordance to ETSI/TS 124 008 (Release 8 or later). This is known as the "*eCall* flag". ETSI/TS 122 101 provides a description of the "*eCall* flag" and specifies the mandatory inclusion of the manually initiated *eCall* (MIeC) or automatically initiated *eCall* (AIeC) *identifiers* in the call set-up message. ETSI/TS 122 101 provides a description of the "*eCall* flag" or specifies the mandatory inclusion of the manually initiated *eCall* (MIeC) or automatically initiated *eCall* (AIeC) *identifiers* in the call set-up message.

On receipt of the TS12 emergency call request, the mobile switching centre (MSC) in the network shall route the call to the *most appropriate PSAP*. The MSC shall make use of the "*eCall* flag" in the call set-up message to route the *eCall* to a designated *eCall* capable PSAP.

7.3.7 Cell localisation (by network)

The PLMN shall provide geographic location information of the caller in the same manner as it does for normal 112 (TS12) emergency calls. Service level requirements for the provision of emergency service location information are specified in ETSI/TS 122 071.

NOTE 1 An improvement in accuracy is achieved by the position information contained in the MSD.

NOTE 2 Requirements for accuracy for emergency services are provided in Directive 2002/22 and Directive 2009/136/EC, Universal Service Directive.

7.3.8 Manual termination of eCall by vehicle occupants before trigger confirmation

Abandonment of an *eCall* shall only be allowed in the limited situation described in EN 16072 (within T1).

7.4 MSD transfer

7.4.1 General

Figure 6 provides a *data* flow description of the MSD transfer. A 2.1 kHz tone, in accordance with ITU-T Recommendation G.168, may be used to disable network echo cancellers. If this tone is sent, the tone shall be sent by the PSAP before the “SEND MSD” message.

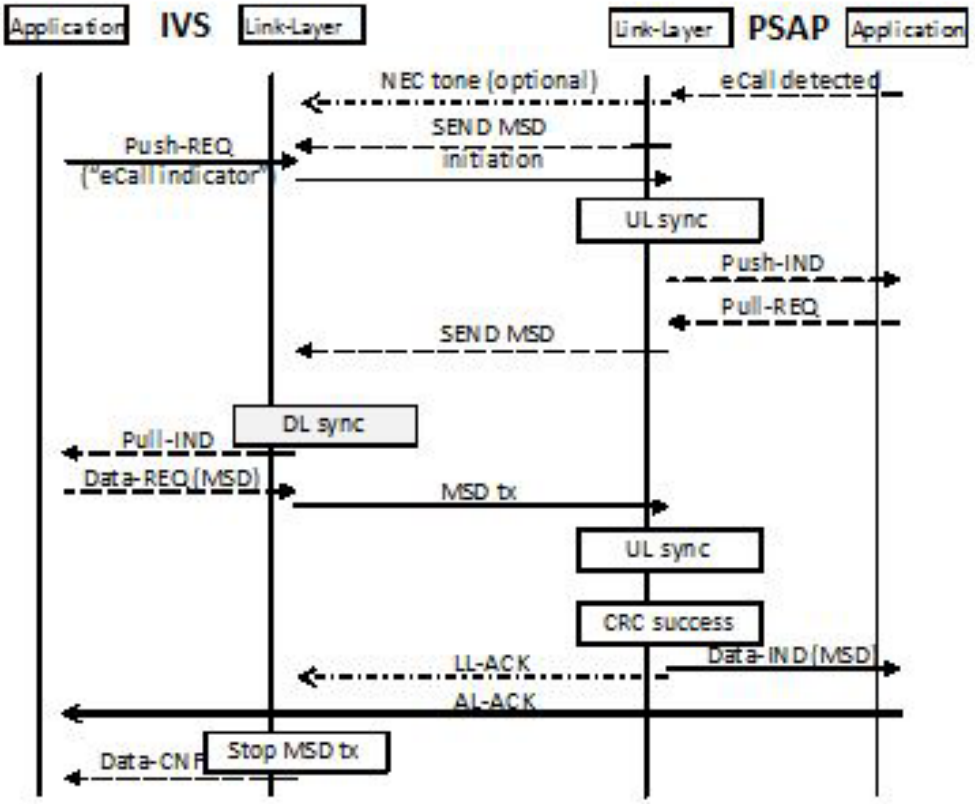

Figure 6 — MSD transfer – lower layer – successful case

NOTE the SEND-MSD message in this document corresponds to the START message in ETSI/TS 126 267.

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; the PSAP modem shall immediately send the “SEND-MSD” message to the IVS responsible for the *eCall* system modem or wait for the INITIATION message (sent by the IVS responsible for the *eCall* system).

NOTE immediately sending the “SEND-MSD” avoids delay and improves the probability of success, but is only appropriate if the PSAP is confident that the call is an *eCall* (as opposed to any other 112 or other type of call).

— The "INITIATION" message (signal) from the IVS responsible for the *eCall* system shall be sent as soon as the IVS responsible for the *eCall* system has received a signal that the call has been answered.

— The "INITIATION" message (signal) from the IVS responsible for the *eCall* system shall persist until either of the following conditions are met:

  — after the IVS responsible for the *eCall* system has received a "SEND MSD" message from the PSAP in-band modem;

— or within T3 - IVS INITIATION signal duration [2 s] (see Annex A) after the IVS responsible for the *eCall* system has received a signal that the call has been answered.

— If the PSAP is waiting for an INITIATION message and a valid "INITIATION" message is not received by the PSAP *eCall* modem within T4- PSAP wait for INITIATION signal period [5 s] from when the call has been answered, then the call shall be routed to a PSAP operator (see Annex A).

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

7.4.3 eCall modem synchronization

Following receipt of either a SEND-MSD message from the PSAP *eCall* modem or a valid INITIATION signal from the IVS responsible for the *eCall* system *eCall* modem, the PSAP and IVS responsible for the *eCall* system modems shall synchronize in accordance with ETSI/TS 126 267 and ETSI/TS 126 268.

7.4.4 Request MSD by PSAP eCall modem to IVS eCall modem

If the PSAP modem has verified the received "INITIATION" message it shall immediately send a "SEND MSD" response to the calling IVS responsible for the *eCall* system, indicating that the MSD is to be transmitted by the IVS responsible for the *eCall* system to the PSAP in accordance with ETSI/TS 126 267.

If the IVS responsible for the *eCall* system *eCall* modem does not receive or recognize a valid "SEND MSD" message from the PSAP *eCall* modem within T5 - IVS wait for SEND MSD period [5 s] (see Annex A) from the time that it receives an indication that the call has been answered, it shall reconnect the IVS loudspeaker and microphone in the vehicle.

If the PSAP *eCall* modem has not received a valid MSD message (and thus does not send a link layer ACK (LL-ACK)) within a maximum of T8 - PSAP MSD maximum reception time [20 s] (see Annex A) after having sent the "SEND MSD" message to the IVS responsible for the *eCall* system *eCall* modem, it shall route the voice call to a PSAP operator.

EXAMPLE The IVS responsible for the *eCall* system also has a synchronized timeout provision. See 7.4.7.

NOTE In the very unlikely event that a link layer ACK (LL-ACK) or an AL-ACK are sent but not received, the PSAP can receive several seconds of MSD transmission noise or silence before the 20 s timer is activated.

7.4.5 Send MSD from vehicle IVS to PSAP eCall modem

The MSD, as defined in EN 15722, shall be sent by the IVS responsible for the *eCall* system *eCall* modem to the PSAP *eCall* modem as defined in ETSI/TS 126 267.

7.4.6 Link layer error check

The PSAP *eCall* modem shall perform a link layer cyclic redundancy check (CRC) as described in ETSI/TS 126 267.

7.4.7 Link layer ACK from PSAP eCall modem to IVS eCall modem

After a successful link layer check, the PSAP *eCall* modem shall send a link layer ACK to the IVS *eCall* modem as described in ETSI/TS 126 267…

NOTE An application layer ACK (AL-ACK) is normally also sent , see 7.5.1

The IVS responsible for the *eCall* system modem shall continue to transmit the MSD for a period not exceeding T7 - IVS MSD maximum transmission time [20 s] or until an acknowledgment is received. If a link layer or application layer acknowledgement is not received within T7 - IVS MSD maximum transmission time

[20 s] (see Annex A) after receipt of the "Send MSD" request, then the IVS responsible for the *eCall* system shall re-connect its loudspeaker and microphone to the line enabling voice communication between the *vehicle occupants* and the PSAP operator.

On receipt of a link layer or application layer acknowledgement from the PSAP *eCall* modem, the IVS responsible for the *eCall* system modem shall stop transmitting/re-transmitting the MSD. If the IVS responsible for the *eCall* system has received a link layer acknowledgement it shall await an application layer acknowledgement (as defined in 7.5), confirming that the PSAP *eCall* application has received the information contained in the MSD.

If the PSAP *eCall* modem does not send a link layer ACK or the application layer an application layer ACK within T8 - PSAP MSD maximum reception time [20 s] (see Annex A) after having starting to send the "SEND MSD" message to the IVS *eCall* modem, it shall route the voice call to a PSAP operator.

7.5 Application layer acknowledgement (AL- ACK)

7.5.1 Following transmission of the MSD to the eCall PSAP application

After successful MSD transfer, the PSAP shall check the MSD content automatically. Immediately after the reception of the MSD by the high level application, the PSAP shall subsequently automatically send the positive AL-ACK to the IVS responsible for the *eCall* system so it can be received within from reception of an LL-ACK T6 – IVS wait for AL-ACK period [5 s].

The format-check shall accept any values allowed according to the range limits of the respective parameters as defined in EN 15722.

When the IVS responsible for the *eCall* system has received the positive AL-ACK it shall connect the IVS loudspeaker and microphone to the line.

If the former check fails, the PSAP shall automatically connect to the PSAP operator within T6 – IVS wait for AL-ACK period [5 s] from sending of the LL-ACK.

The IVS responsible for the *eCall* system shall not attempt to re-send the MSD unless requested by the PSAP.

The PSAP may also subsequently request a new MSD, clear-down the call or route the call to the operator (see below).

NOTE Once the *eCall* initiation message has been sent, the IVS responsible for the *eCall* system modem is always listening for a "SEND MSD" command, regardless of whether the microphone/loudspeaker is connected/disconnected.

7.5.2 PSAP acknowledges the MSD

In order to acknowledge the MSD, the PSAP shall send an AL-ACK as defined in 7.5.4 with status equals positive acknowledgement.

The method by which the AL-ACK is sent is defined below.

The fact of the acknowledgement and its time shall be stored within the IVS responsible for the *eCall* system. The location of such storage shall be an issue of product design.

NOTE 1 In case of automatic sending of the application layer ACK, should the content of the MSD displayed to the PSAP operator not be satisfactory, the operator can subsequently request a new MSD.

NOTE 2 The acknowledgement and its time are stored to provide an audit trail.

7.5.3 No receipt of application layer ACK

If an AL-ACK is not received within T6 - IVS wait for AL-ACK period [5 s] from receipt of the link layer ACK, the speaker and microphone in the vehicle shall be reconnected to the line in order to enable the call to revert to an E112 voice call (see Annex A).

7.5.4 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 responsible for the *eCall* system 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 downlink-data (DL) fields of the in-band modem’s high level 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 high level 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 high level 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 bepresentation in in-band modem high level 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

Figure 7 provides a flow chart for the AL-ACK transmission sequence.

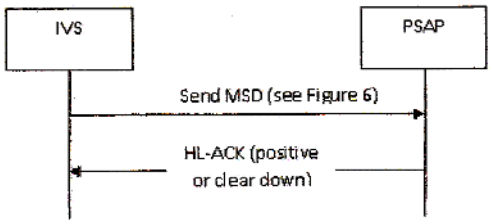

Figure 7 — Flowchart for the AL-ACK transmission sequence

7.6 PSAP request "SEND MSD"

7.6.1 General

The PSAP operator may at any time request that a new MSD is sent.

NOTE This can be, for example because the *data* appears corrupted or inconsistent, or the PSAP operator believes that the *data* can have changed.

The IVS responsible for the *eCall* system shall not attempt to send a new or re-send the MSD unless requested by the PSAP.

7.6.2 Before call clear-down

At any time an *eCall* voice connection is active to the IVS responsible for the *eCall* system, The PSAP application shall have the capability to instruct the PSAP modem to request the IVS responsible for the *eCall* system to send the latest version of the MSD. Figure 8 provides a flow chart for a send/resend request sequence.

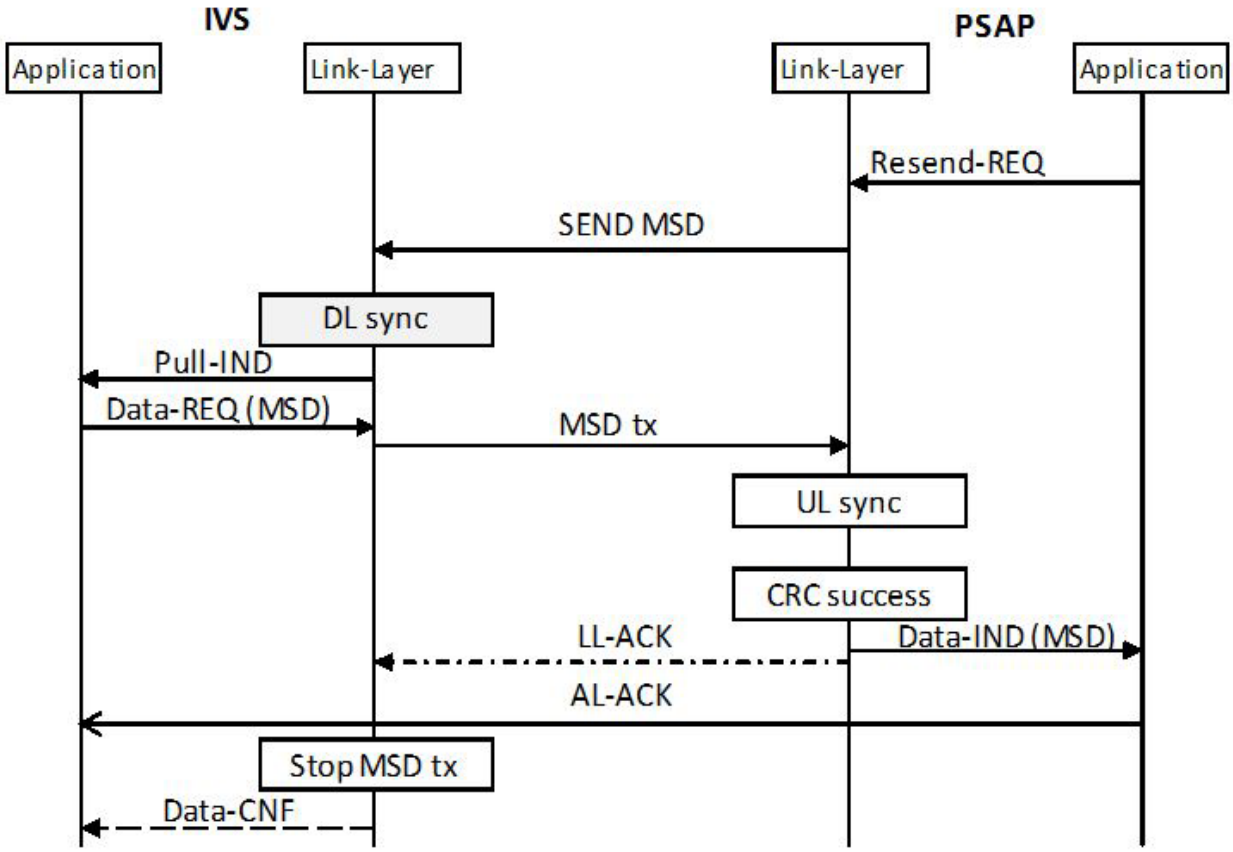

Figure 8 — Request "SEND MSD" – successful case

If the MSD has not been not received correctly, and the PSAP has not previously sent the echo canceller disabling tone prior to previous “SEND MSD” messages, it is recommended that the 2,1 kHz network echo canceller disabling tone may be sent by the PSAP prior to subsequent transmissions.

When the PSAP operator decides during the conversation with the *vehicle occupants* that he/she requires that the latest version of the MSD is sent/re-sent by the IVS responsible for the *eCall* system to the PSAP, the PSAP operator may elect to activate the "send MSD" application user interface of his PSAP *eCall* application.

NOTE When the PSAP operator decides during the conversation with the *vehicle occupants* that he/she requires that the latest version of the MSD is sent/re-sent by the IVS responsible for the *eCall* system to the PSAP, he/she is advised to first inform the occupants of the vehicle that they will hear a short *data* transmission sound and the loudspeaker and microphone may be disconnected from the line during a few seconds to allow the *data* transmission. (This is designed to prevent the victims to panic). How this is achieved is the subject of local procedures.

Since this process may take several seconds, it is advisable to have a progress indicator implemented in the PSAP application. The "Resend-REQ" request is sent by the PSAP *eCall* application to the PSAP *eCall* modem which sends the "SEND MSD" message to the IVS *eCall* modem. When receiving the "SEND MSD" message, the IVS responsible for the *eCall* system shall first disconnect the audio channels in the vehicle from the call and then proceed to the MSD send sequence as described in 7.4. Ideally, a progress indication shall be provided to the *vehicle occupants* to ensure they stay calm.

While transmitting the requested MSD, the IVS responsible for the *eCall* system remains in the existing *eCall* transaction so that the message ID of the further transmitted MSD will be incremented in accordance with EN 15722:2015, 6.2.1, Table 1.

7.6.3 After call clear-down

In the event that the PSAP operator decides that he/she requires that the latest version of the MSD is sent/re-sent by the IVS responsible for the *eCall* system to the PSAP after *call clear-down*, he/she may first attempt to establish a call to the relevant vehicle IVS responsible for the *eCall* system, via an appropriate interface made available to them by the PSAP application.

The PSAP telephone system shall accordingly dial the MSISDN of the IVS responsible for the *eCall* system of the selected vehicle.

It is advisable to implement a progress indicator in the PSAP application.

When receiving an incoming call during the last registration period as determined in EN 16072, the IVS responsible for the *eCall* system shall automatically pick it up and route the audio to the occupants of the vehicle.

If the PSAP wants an update of the MSD the operator is recommended to explain to the occupants of the vehicle what he is about to do before issuing a "SEND MSD" request.

The IVS responsible for the *eCall* system and PSAP shall subsequently follow the sequence as defined in 7.4 and 7.5. Ideally, a progress indication shall be provided to the *vehicle occupants*.

NOTE The IVS responsible for the *eCall* system may alert the *vehicle occupants* about the *eCall* as described in EN 16072.

7.7 PSAP application features

7.7.1 General requirements

In order to be able to claim it can support *eCall*, a PSAP is required to be equipped with a software application that can receive, validate and display the MSD contents to its operator(s). This could either be a special *eCall* application or integrated in the PSAP's interface software.

Each PSAP should be able to decide which *data* it will display to its operators. However, this software/system should at least:

— warn the operator about a new *eCall* arrival;

— show the data included in the MSD in an understandable way as described in 7.7.2;

— warn the operator about the availability of the voice call;

— provide a call-back capability;

— provide a new MSD requirement application user interface;

— provide an ability to clear-down the *eCall*.

NOTE PSAP systems may find it useful to display both the new and old MSD, but this is not a requirement.

7.7.2 MSD display to the PSAP operator

A PSAP can decide in which graphical way the MSD will be displayed to its operators but the *eCall* case page shall show the data included in the MSD in a clear and understandable way.

In respect of interpreting the VIN content of the MSD, the PSAP needs to be equipped with a VIN - decoder or have access to an appropriate VIN decoding facility.

7.7.3 PSAP operator user interface

In order to allow the PSAP operator to establish the audio link as soon as possible ensuring this way the shortest possible processing time, the IVS responsible for the *eCall* system shall never attempt to re-send the MSD unless it has been requested to do so via a "SEND MSD" request.

The user interface shall be displayed in the *eCall* case page to allow the PSAP operator interaction with IVS responsible for the *eCall* system while observing the *eCall* handling process flow. This interface can be designed at the convenience of the PSAP but shall allow at minimum for the event that the MSD is successfully received, the system acknowledges the MSD as described in 7.5, and moves directly to voice contact with the occupants of the vehicle.

It is recommended to implement an MSD history feature allowing toggling between the last 5 MSDs received for a same vehicle in the PSAP *eCall* application.

7.8 Audio link to vehicle occupants

If the caller is able to speak, the call is handled as a normal 112 call.

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 AL-ACK) or after T8 – PSAP MSD maximum reception time or T4 – PSAP wait for INITIATION signal period is completed.

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 responsible for the *eCall* system:

— After the IVS responsible for the *eCall* system has received an LL-ACK or AL-ACK or T5 – IVS wait for SEND MSD period or T7 – IVS MSD maximum transmission time ends, the IVS responsible for the *eCall* system shall recognize a normal hang-up from the network. Furthermore the IVS responsible for the *eCall* system shall clear-down the call.

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

NOTE 1 Following any conversation with the occupants of the vehicle, in order to send a clear down instruction via the in- band modem it will implicitly involve an MSD request and transmission.

NOTE 2 It cannot be guaranteed that an abnormal termination can be recognized as such by the IVS responsible for the *eCall* system.

The IVS responsible for the *eCall* system 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 responsible for the *eCall* system NAD shall remain registered on the serving network and available to receive calls from the PSAP and rescue workers for a minimum period of T9 (See Annex A) as defined in EN 16072.

The *eCall* only IVS responsible for the *eCall* system network de-registration fallback timer (DFT) shall be reset following *call clear-down* to control the maximum time that the IVS responsible for the *eCall* system stays registered on the network (T10 - IVS NAD (*eCall* only configuration) network De-registration Fallback Timer (DFT)) (see Annex A) or loss of power shall have the effect to cause deregistration, (whichever occurs first).

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 responsible for the *eCall* system sufficient time for automatic retries) as described in EN 16072. See Figures 6 and 7.

NOTE 3 The purpose of the DFT is to de-register *eCall* only IVS responsible for the *eCall* system NADs from the network after a predetermined period.

Following network de-registration the IVS responsible for the *eCall* system 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.

7.10 PSAP call back

The PSAP operator shall be able to initiate a call back using the PSAP application system (e.g. call back application user interface) or directly dialling the number using a conventional phone as defined in EN 16072.

NOTE This clause relates to the abilities of the system located at the PSAP. Following an accident there is no guarantee the IVS responsible for the *eCall* system will be in a position to respond.

The sequence shall be that:

a) the operator activates the call back application user interface/dials the number;

b) the telephone system processes the call;

c) for a period of up to T9 following the completion of the *eCall*, the IVS responsible for the *eCall* system shall allow the call-back into the vehicle (as described in EN 16072). The IVS responsible for the *eCall* system shall provide audio and/or visual feedback to the occupants that a call has been successfully established;

d) the operator handles the case;

e) the operator clears down the call as defined in 7.9.

7.11 Rerouting to another PSAP/emergency control centre

Different *eCall* architectures are foreseen and, in some architectures, rerouting to another PSAP or *emergency control centre* may be necessary.

The PSAP who initially receives the *eCall* shall process the data included in the MSD, establish the audio communication and handle the call; if appropriate, the receiving PSAP may reroute the call and MSD data to another PSAP or *emergency control centre* according to procedures determined by the responsible authority. This can be done via data or audio connection, or, preferably, both.

The *eCalls* present the same routing difficulties across borders as any other 112 emergency calls. It can occur that the MSD and the voice call are received by a PSAP which is not responsible for handling this emergency.

Effective rerouting of the emergency data and voice is the responsibility of PSAPs, as determined by the national authority.

7.12 Handling non equipped situations / error cases

7.12.1 MSD not transmitted correctly

If the MSD is not transmitted correctly or is not received correctly by the PSAP, as defined elsewhere in this European Standard, then the call shall, when possible, continue as a normal speech only TS12 (E112) emergency call.

NOTE ETSI specifies a number of "Bearer Services" (BS) and "Tele Services" (TS) in ETSI/TS 122 002 that are characterized by the nature of the services they support and their assigned QoS values. Voice calls are classed as TS11 calls and emergency calls are designated TS12.

7.12.2 Network registration fails

If network registration fails then the procedures in ETSI/TS 122 011 shall be followed. The number of re-attempts is specified in 7.12.5.

If network registration with all alternative present networks fails then the NAD may attempt an *eCall* in limited service state with any available network.

7.12.3 Call failure before the MSD is sent and acknowledged

In the event that the initial *eCall* attempt fails to connect, or the call is dropped for any reason other than by the PSAP operator clearing the call down as specified in 7.9 or T2 (– IVS Call Clear-down Fallback timer) ends, then the IVS responsible for the *eCall* system NAD shall attempt to redial the call.

When a call is "ringing" the IVS responsible for the *eCall* system shall maintain the connection for at least 60 s to allow the PSAP system to answer the call.

In case of a dropped call all redial attempts from the IVS responsible for the *eCall* system shall be completed within two minutes as defined in EN 16072.

NOTE In case of an initial call the maximum connection establishment time may be longer than 2 min and is determined by the *in-vehicle equipment provider*.

Should the MSD not be sent, or is lost and cannot be resent by the IVS responsible for the *eCall* system on request from the PSAP, then the *eCall* shall proceed as a normal speech only TS12 (112) emergency call.

7.12.4 Mobile network not supporting eCall flag or not provided with routing tables

7.12.4.1 General

PLMN’s, and their member states, that cannot support the *eCall* flag cannot claim compliance to the pan-European *eCall* as defined in this European Standard, and therefore the following only describes an interim solution.

If the PLMN does not support the *eCall* flag, the PLMN operator cannot identify the difference between an *eCall* and an TS12 (112) emergency call, and consequently cannot filter *eCalls* from normal TS12 (112) emergency calls, and select the *most appropriate PSAP*.

The PSAP will not be able to identify whether the call being received is an *eCall* or 112/E112 call, and it will not be able to identify if it is an automatic or manual *eCall*, before it is processed.

The PLMN will then process the call as a normal TS12 (112) emergency call which will be handled in one of the two methods described below as defined by national or local regulations:

7.12.4.2 Route both eCalls and 112/E112 voice calls to a PSAP that is equipped to support the eCall service

The infrastructure requirement (capacity of incoming calls in the PSAP in-band modem) has consequently to be oversized to be capable to process all the incoming calls (both *eCall* and 112/E112 calls).

In this circumstance (*eCall* flag not used), as a consequence of the IVS responsible for the *eCall* system Initiation signal procedure all *eCalls* and non *eCalls* (both 112/E112 speech only emergency calls) will be delayed of up to T4 (PSAP wait for INITIATION signal period [up to 5 s)] before 112/E112 voice calls are connected to a human operator.

The *eCall* procedures described in the current specification shall apply.

7.12.4.3 Route both eCalls and 112/E112 voice calls to a PSAP not equipped to support the eCall service.

If the *eCall* is routed to a non *eCall* equipped PSAP it will be answered like a regular TS12 (112) call by the PSAP telephone system which will route it to the first available operator.

The PSAP operator will hear a common *eCall* 1-2 second signalling signal that may be recognized as such and used to differentiate *eCalls* from other emergency calls. The PSAP operator can then choose to transfer the call to an *eCall*-equipped operator to request the MSD, or continue with the voice call.

NOTE Regular 112/E112 calls will be unaffected.

7.12.5 PSAP modem failure

7.12.5.1 Before link layer ACK is sent

As 7.12.4.3.

7.12.5.2 After link layer ACK is sent

The PSAP application shall perform a logical MSD "sense" check and send an AL-ACK to the IVS responsible for the *eCall* system within T6- IVS wait for AL-ACK period [5 s] (see Annex A), and/or route the MSD and voice call without delay to the PSAP operator.

The IVS responsible for the *eCall* system waits for application AL-ACK for a maximum of T6 [5 s] (see Annex A). After this period the loudspeaker and microphone in the car are reconnected to the line.

7.12.5.3 After application ACK is sent

The voice call and the MSD have already been rerouted to an operator, and the MSD content verified and acknowledged.

7.12.6 PSAP network/ICT failure

As 7.12.4.3.

7.12.7 PSAP application failure

Voice is available. As 7.12.4.3.

7.12.8 PSAP operator does not respond

The PSAP shall apply their standard procedure to resolve this situation.

7.12.9 No response if line engaged

If a "line engaged" signal is received, the IVS responsible for the *eCall* system shall re-attempt to make the call as determined in 7.12.5.

7.12.10 MSD not sent

If the IVS responsible for the *eCall* system does not receive a response from the PSAP modem server within T5 – IVS wait for SEND MSD period [5 s] (see Annex A) from the call being answered by the PSAP operator or PSAP *eCall* modem then the IVS responsible for the *eCall* system shall reconnect its loudspeaker and microphone to the line and the call shall continue as a speech only TS12 (112) emergency call.

If the IVS responsible for the *eCall* system is unable to send the MSD error free to the PSAP within T7 - IVS MSD maximum transmission time applies [20 s] (see Annex A) from receiving the SEND MSD message, then the IVS responsible for the *eCall* system shall reconnect its audio communications equipment to the line and the call shall continue as a speech only TS12 (112) emergency call.

NOTE The times are the maximum in exceptional circumstances. Under normal circumstances will be typically less than 6 s.

7.12.11 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 responsible for the *eCall* system equipment failure;

— the MSD as sent by the IVS responsible for the *eCall* system NAD is or has become corrupted;

— the PSAP has re-requested but not received an error free copy of the MSD;

— the IVS responsible for the *eCall* system 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 T4 - PSAP wait for INITIATION signal period [5 s] from answering the call (see Annex A),

— The MSD is not received error free as determined by the link layer CRC within T8 - PSAP MSD maximum reception time [20 s] (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 responsible for the *eCall* system to re- attempt to send the MSD. If this fails again then the call reverts to a speech only call.

7.12.12 Audio link not established

If the initial call attempt to the PSAP does not connect for any reason then the IVS responsible for the *eCall* system shall make automatic repeat attempt in accordance with the procedures described in 7.12.5.

If a satisfactory audio link cannot be established between the PSAP operator and the *vehicle occupants* then this could be for any of the following reasons:

— access network radio conditions cannot sustain a speech call to the PSAP and the network will normally drop such calls. In this event the IVS responsible for the *eCall* system NAD shall initiate the repeat attempt procedure;

— the audio equipment in the vehicle is malfunctioning or has been damaged. The PSAP may still have received the MSD and the MSD application layer acknowledgment may be used to provide a visual indication to the *vehicle occupants* that the PSAP has received the MSD and it is being acted upon;

— the *vehicle occupants* may be incapacitated and unable to respond to the PSAP operator, or may not be in the vehicle. The operator will then have to consider the case based on relevant procedures and the information included in the MSD.

7.12.13 Audio link established but subsequently fails

Should the call drop for any reason other than having been cleared down by PSAP, then the IVS responsible for the *eCall* system shall reattempt to establish a new connection to the PSAP in accordance with 7.3.6 and 7.12.5. If the PSAP has received and acknowledged the MSD and no longer needs to communicate with the *vehicle occupants* then the PSAP operator shall handle the case (e.g. confirm whether this is a new emergency).

When the PSAP initiates the *call clear-down* procedure the IVS responsible for the *eCall* system shall not attempt to automatically re-call the PSAP, but the IVS responsible for the *eCall* system shall allow manually initiated *eCall* attempts at any time.

NOTE If the call drops after the call has been answered and the PSAP has received the MSD, the PSAP operator will also have the CLI and can call- back the vehicle.

7.12.14 Re-attempt in case of interrupted call

See 7.9, 7.1.6, 7.12.5, 7.12.14 and 7.12.16.

7.12.15 Automatic repeat attempts

In the event that the initial *eCall* attempt fails to connect, see 7.12.5.

7.12.16 IVS NAD does not receive call clear-down

If the IVS responsible for the *eCall* system NAD does not receive a *call clear-down* indication from the mobile network, or an application layer clear-down message from the PSAP and the *call clear-down* fall-back timer has reached T2 - IVS *Call Clear-down* Fallback Timer (CCFT) (60 min) (see Annex A).

NOTE Beyond this period the PSAP can call-back the vehicle if continued dialogue is required.

8 Third party services supported eCall (TPS-eCall)

8.1 Overview

The focus of this European Standard is the provision of high level application protocols for pan- European *eCall*. Clause 7 has determined these protocols. As described in Clause 6, the situation for "Third Party

Supported *eCall*" EN 16102 is somewhat different, because the detail of how TPSP operator communicates to/from the vehicle is *service provider* specific. However, the basic service to be received by the PSAP has to remain the same and the *eCall* shall be received by the *most appropriate PSAP* in the same way as pan-European *eCall*. These protocols are defined in EN 16102.

9 Defences against attack (Security provisions)

Security provisions shall be as defined in EN 16072.

10 Quality of service requirements

This European Standard determines the high level application protocols and sequences required to effect the *eCall service*.

The quality of service requirements of "pan-European *eCall*" are specified in relevant clauses of EN 16072, ETSI/TS 122 101, ETSI/TS 124 008, ETSI/TS 126 267, ETSI/TS 126 268, ETSI/TS 126 269 and ETSI/TS 122 003.

NOTE Regulatory requirements are given in Directives 98/34/EC and 99/5/EC.

11 Test and conformance requirements

Test and conformance requirements are determined in CEN/TS 16454.

12 Marking, labelling and packaging

Marking, labelling and packaging shall be in accordance with EN 16072 or EN 16102 as appropriate.

NOTE Regulatory requirements are laid down in Directives 98/34/EC and 99/5/EC.

13 Declaration of patents and intellectual property

No patent or intellectual property have been declared to affect the provisions of this European Standard, other than those described in the Introduction to this Standard and in normatively referenced documents, and attention is drawn to such declarations in the referenced ETSI deliverables.

Annex A
(normative)

Table of timings

The table below contains the timers that are defined for the complete *eCall* transaction until the application layer. For each timer the name, origin, requirements and value are specified. Each timing requirement is described in the following three elements:

START: the start condition and/or moment at which the timing starts its countdown

STOP: the stop condition and/or moment that shall be met for the timing to stop

EXPIRY: the action that should be taken if the STOP condition is not met and the timing expires

Table A.1 — Table of timings

Name ***Origin***	**Description** ***Requirements***	**Value**
T1 *IVS*	**Manually initiated *eCall* (MIeC) false triggering cancellation period** • *START: T1 starts as soon as the eCall is manually activated* • *STOP: T1 stops when Vehicle occupants cancel the manually triggered eCall transaction.* • *EXPIRY: Upon expiry of T1 the IVS-NAD shall start call setup*	See NOTE 1 See NOTE 2
T2 *IVS*	**IVS Call Cleardown Fallback Timer (CCFT)** • *START: T2 starts as soon as the IVS-NAD starts with call setup* • *STOP: T2 stops when the IVS-NAD receives a call clear-down indication from the mobile network or a call clear-down message from the PSAP.* • *EXPIRY: Upon expiry of T2 the IVS-NAD shall clear down the call*	3600 s (1h)
T3 *IVS*	**IVS INITIATION signal duration** • *START: T3 is started as soon as the IVS-NAD starts sending the INITIATION signal* • *STOP: T3 stops when the IVS-NAD receives a SEND MSD signal from the PSAP, at which time the IVS-NAD shall stop sending the INITIATION signal* • *EXPIRY: Upon expiry of T3 the IVS-NAD shall stop sending the INITIATION signal*	2 s
T4 *PSAP*	**PSAP wait for INITIATION signal period** • *START: T4 starts as soon as the PSAP eCall modem has answered the call* • *STOP: T4 stops when the PSAP eCall modem detects an INITIATION signal send by the IVS-* • *EXPIRY: Upon expiry of T4, the PSAP eCall modem shall route the call to a PSAP operator*	5 s
T5 *IVS*	**IVS wait for SEND MSD period** • *START: T5 starts as soon as the IVS-NAD received notification that the call*	5 s

	is first answered • *STOP: T5 stops when the IVS-NAD detects a SEND MSD signal sent by the PSAP* • *EXPIRY: Upon expiry of T5 the IVS-NAD shall reconnect the IVS audio system and terminate eCall specific behaviour (i.e.it shall not proceed with the sending of MSD data) until requested to do otherwise*	
T6 *IVS*	**IVS wait for AL-ACK period** • *START: T6 starts as soon as the IVS-NAD has received LL-ACK* • *STOP:T6 stops when the IVS-NAD receives an AL-ACK message* • *EXPIRY: Upon expiry of T6 the IVS-NAD shall mark the transfer of the MSD as unsuccessful and reconnect the IVS audio system and terminate eCall specific behaviour until requested to do otherwise*	5 s
T7 *IVS*	**IVS MSD maximum transmission time** • *START: T7 starts as soon as the IVS-NAD starts sending the MSD data* • *STOP:T7 stops when the IVS-NAD receives an LL-ACK message* • *EXPIRY: Upon expiry of T7 the IVS-NAD shall mark the transfer of the MSD as unsuccessful and reconnect IVS audio system and terminate eCall specific behaviour until requested to do otherwise*	20 s
T8 *PSAP*	**PSAP MSD maximum reception time** • *START: T8 starts as soon as the PSAP starts sending the SEND MSD signal* • *STOP: T8 stops when the PSAP eCall modem receives a valid MSD (reception being acknowledged by sending an LL-ACK)* • *EXPIRY: Upon expiry of T8, the PSAP eCall modem shall route the call to a PSAP operator*	20 s
T9 *IVS*	**IVS NAD minimum network registration period** • *START: T9 starts as soon as the IVS-NAD clears down a call, or gets notified that a call has been cleared down in accordance with* EN 16072 Clause 7.17.3 • *STOP: T9 is uninterruptable; until T9 expires the IVS-NAD shall remain registered on the serving network, and remain available to receive calls from the PSAP and rescue workers* • *EXPIRY: Upon expiry of T9 the IVS-NAD may deregister from the serving network (see T10)*	3600 s (60 mn)
T10 *IVS*	**IVS NAD network 'Deregistration Fallback Timer' (DFT)** • *START: T10 starts as soon as the IVS-NAD clears down a call, or gets notified that a call has been cleared down* • *STOP: T10 stops if the IVS-NAD receives or makes a new call* • *EXPIRY: Upon expiry of T10 the IVS-NAD shall deregister itself from the serving network*	12 h See NOTE 3

NOTE 1 No normative value, can be chosen by manufacturer, zero ("0", effectively disabling T1) is allowed.

NOTE 2 T1 is not relevant for automatically activated *eCall* transactions.

NOTE 3 Only for '*eCall* only" IVS devices, timer not relevant for IVS NAD devices that remain connected to a network.

Annex B
(informative)

Summary abstracts of normative referenced documents

B.1 Objective

There are many standards and Directives referenced in this European Standard. For ease of use, this informative annex contains the scope statements (or equivalents) of referenced standards and Directives used in this European Standard:

B.2 Summary abstracts

B.2.1 EN 15722, Intelligent transport systems — ESafety — ECall minimum set of data (MSD)

This European Standard specifies the standard data concepts that comprise the minimum set of data to be transferred from a vehicle to a Public Safety Answering Point (PSAP) in the event of a crash or emergency via an *eCall* communication session.

NOTE The communications media protocols and methods for the transmission of the *eCall* message are not specified in this European Standard.

Additional data concepts may also be transferred, and any such data concepts should be registered using a data registry as defined in EN ISO 24978.

B.2.2 EN ISO 24978, Intelligent transport systems — ITS safety and emergency messages using any available wireless media — Data registry procedures (ISO 24978:2009)

A standardized set of protocols, parameters, and a method of management of an updateable "Data Registry" to provide application layers for "ITS Safety messages" via any available wireless media.

B.2.3 WGS84 World Geodetic System 84 (last revised 2004)

The World Geodetic System is a standard for use in cartography, geodesy, and navigation. It comprises a standard coordinate frame for the Earth, a standard spheroid reference surface (the datum or reference ellipsoid) for raw altitude data, and a gravitational equipotential surface (the geoid) that defines the nominal sea level.

The latest revision is WGS 84 (dating from 1984 and last revised in 2004. Earlier schemes included WGS 72, WGS 66, and WGS 60. WGS 84 is the reference coordinate system used by the Global Positioning System.

B.2.4 EN 16072, Intelligent transport systems — eSafety — Pan-European eCall operating requirements

The objective of implementing the pan-European in-vehicle emergency call system (*eCall*) is to automate the notification of a traffic accident, wherever in Europe, with the same technical standards and the same Quality of Services objectives by using the PLMN (such as GSM and 3G) and the European pre-assigned emergency destination address (112), and to provide a means of manually triggering the notification of an incident.

This European Standard specifies the general operating requirements and intrinsic procedures for in- vehicle emergency call (*eCall*) services in order to transfer an emergency message from a vehicle to a Public Safety Answering Point (PSAP) in the event of a crash or emergency, via an *eCall* communication session and to establish an audio channel between the in-vehicle equipment and the PSAP.

Third party *eCall* supportive services, including private in-vehicle emergency services, are outside the scope of this European Standard.

NOTE 1 The communications protocols and methods for the transmission of the *eCall* message are not specified in this European Standard.

NOTE 2 This European Standard determines the operating requirements for an *eCall* service. An important part of the *eCall* service is a minimum set of data (MSD). The operating requirements for the MSD are determined in this European Standard, but the form and data content of the MSD is not defined herein. A common European MSD is determined in EN 15722.

B.2.5 EN 16102, Intelligent transport systems — eSafety — Third party supporting eCall : Operating requirements

The objective of implementing a "Third Party" emergency call is to provide emergency assistance and an automated notification of a traffic accident, using "Third Party Supported" service packages where such services are supported between the vehicle and a third party service provider (TPS) in countries where such services are supported by PSAPs.

The first objective of this "TPS *eCall*" is to transfer an emergency message from a vehicle to a third party service provider (TPSP) in the event of a crash or an emergency situation, and to establish an audio channel between the in-vehicle equipment and the TPSP.

The second objective of this "TPS *eCall*" is, in case of an emergency situation likely to require emergency assistance, for the TPSP to transfer an emergency message including the minimum set of data (MSD) (as defined in EN 16072) from the TPSP to the most appropriate PSAP and to make best efforts to establish a direct voice contact between that PSAP and the occupants of the vehicle if required by the PSAP.

An equipment manufacturer remains free to choose the kind of service supported (e.g. pan-European or TPS *eCall*) provided that it guarantees interoperability in each of the EU-27 and EEA countries which have implemented the pan-European or the TPS *eCall* infrastructure.

This European Standard defines the general operating requirements and intrinsic procedures for an in- vehicle *eCall* via the services of a third party service provider.

This European Standard also provides definition of the service(s) provided to the PSAP and the method and form of service delivery.

An important part of the TPS *eCall* is the minimum set of data (MSD). The operating requirements for the MSD are determined in this European Standard, but the form and data content of the MSD is not specified herein. The common European MSD for *eCall* is determined in EN 16072. Additional data concepts may also be transferred, and it is recommended that any such data concepts be registered using a data registry as defined in EN ISO 24978 to ensure that they can be understood by the recipient.

B.2.6 ETSI/TS 122 101, Universal Mobile Telecommunications System (UMTS); LTE; Service aspects; Service principles (Release 8)

This document specifies network requirements in terms of service-related capabilities for TISPAN NGN. This document places requirements for all TISPAN NGN subsystems.

This document provides generic requirements for services and interoperability in TISPAN NGN in terms of the capabilities for a network or networks. Requirements on service-related subsystems provide sufficient details for architecture, networking requirements and protocols to be specified. Requirements on service independent subsystems are contained within the service-related subsystem requirements.

Specific service requirements may be contained in other documents, as identified in this document, and by other documents referencing this document.

This document does not define services, only capabilities and requirements. This document does not place requirements on terminals or other customer-owned equipment. This document specifies the service-related requirements that are used to determine the network architecture, requirements and control protocols for a network interface to a customer environment.

NOTE This document uses the term "NGN" only in the context of TISPAN.

B.2.7 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

This document specifies the procedures used at the radio interface core network protocols within the 3rd generation mobile telecommunications system and the digital cellular telecommunications system. It specifies the procedures used at the radio interface (Reference Point Um or Uu, see 3GPP TS 24.002 [15] or 3GPP TS 23.002 [127]) for Call Control (CC), Mobility Management (MM), and Session Management (SM).

When the notations for "further study" or "FS" or "FFS" are present in this TS they mean that the indicated text is not a normative portion of this document.

These procedures are defined in terms of messages exchanged over the control channels of the radio interface. The control channels are described in 3GPP TS 44.003 [16] and 3GPP TS 25.301 [128].

The structured functions and procedures of this protocol and the relationship with other layers and entities are described in general terms in 3GPP TS 24.007 [20].

B.2.8 ETSI/TS 126 267, Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); eCall data transfer; In- band modem solution; General description

This document specifies the *eCall* in-band modem, which is used for reliable transmission of the *eCall* minimum set of data (MSD) from an in-vehicle system (IVS responsible for the *eCall* system) to the Public Safety Answering Point (PSAP) via the audio channel of cellular and PSTN networks.

The European Union *eCall* requirements, recommendations and guidelines were developed by eSafety Forum [10] and [11], with important additional work produced by ETSI MSG, GSME, 3GPP, and CEN.

Previous work in 3GPP TR 22.967 [4] "Transfer of Emergency Call Data", examined the issues associated with the transmission of emergency call data from a vehicle to a PSAP. This analysis identified that the preferred option is based on an in-band modem solution.

eCall provides reliable full-duplex data communications between IVS responsible for the *eCall* system and PSAP in addition to emergency voice call (E112) via the cellular network, and can be initiated either automatically or manually. The *eCall* in-band modem uses the same audio channel as used for the emergency voice call. *eCall* allows reliable transmission of MSD alternating with a speech conversation through the existing audio communication paths in cellular mobile phone systems. The expected benefit is that emergency services will be made aware of accidents much more rapidly, will get precise information on location, vehicle type etc. and therefore will be able to reach accident victims faster, with the potential to save many lives annually.

The *eCall* in-band modem solution described here exceeds the *eCall* requirements (see Annex A) by means of a combination of innovations in data modulation scheme, synchronization, forward error correction coding, hybrid ARQ (HARQ) and incremental redundancy transmission.

This document provides a general overview and algorithm description of the *eCall* in-band modems, including IVS responsible for the *eCall* system modem and PSAP modem, to form the complete full-duplex transmission.

The *eCall* in-band modems (IVS and PSAP) are fully specified by this TS together with the C-code reference as provided in 3GPP TS 26.268 [2].

3GPP TS 26.269 [13] deals with the conformance testing for *eCall* modem implementations, and

3GPP TR 26.969 [14] contains a characterization report of the in-band modem.

B.2.9 ETSI/TS 126 268, Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); eCall data transfer; In- band modem solution; ANSI-C reference code

This document contains an electronic copy of the ANSI C code for the *eCall* in-band modem solution for reliable transmission of MSD data from IVS responsible for the *eCall* system to PSAP via the speech channel of cellular networks. The ANSII C code is necessary for a bit exact implementation of the IVS responsible for the *eCall* system modem and PSAP modem described in 3GPP TS 26.267.

B.2.10 Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); eCall data transfer; In-band modem solution; Conformance testing

This Technical Specification (TS) specifies minimum performance requirements, test procedures and digital test sequences to be used for conformance testing of implementations of the *eCall* in-band modem.

The *eCall* in-band modem PSAP and IVS responsible for the *eCall* system transmitters and receivers are specified in TS 26.267. The reference fixed point ANSI-C implementation for the specified *eCall* modem is provided in TS 26.268 [2].

The *eCall* in-band modem is a technology that transmits data reliably over the speech channel of the cellular and PSTN networks. It is specifically designed for transmission of the minimum set of data (MSD) from IVS responsible for the *eCall* system to PSAP for the pan-European *eCall* initiative. For the purpose of the present specification, conformance is determined for the transmission of one single MSD of length 140 bytes. Other applications of the *eCall* in-band modem are out of scope of this document.

B.2.11 Directive 98/34/EC of the European Parliament and of the Council of 22 June 1998 laying down a procedure for the provision of information in the field of technical standards and regulations and Directive 98/48/EC of the European Parliament and of the Council of 20 July 1998 amending Directive 98/34/EC laying down a procedure for the provision of information in the field of technical standards and regulations

Member States shall take all necessary steps to ensure that their standardization bodies:

— communicate information in accordance with Articles 2 and 3;

— publish the draft standards in such a way that comments may also be obtained;

— from parties established in other Member States;

— grant the other bodies referred to in Annex II the right to be involved passively or actively (by sending an observer) in the planned activities;

— do not object to a subject for standardization in their work programme being discussed at European level in accordance with the rules laid down by the European standardization bodies and undertake no action which may prejudice a decision in this regard.

Member States shall refrain in particular from any act of recognition, approval or use by reference to a national standard adopted in breach of Articles 2 and 3 and of paragraph 1 of this Article.

Member States shall immediately communicate to the Commission any draft technical regulation, except where it merely transposes the full text of an international or European Standard, in which case information regarding the relevant standard shall suffice; they shall also let the Commission have a statement of the grounds which make the enactment of such a technical regulation necessary, where these have not already been made clear in the draft.

When Member States adopt a technical regulation, it shall contain a reference to this Directive or shall be accompanied by such reference on the occasion of its official publication. The methods of making such reference shall be laid down by Member States.

B.2.12 Directive 1999/5/EC of the European Parliament and of the Council of 9 March 1999 on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity

This Directive establishes a regulatory framework for the placing on the market, free movement and putting into service in the Community of radio equipment and telecommunications terminal equipment.

Where apparatus as defined in Article 2(a) incorporates, as an integral part, or as an accessory:

a) a medical device within the meaning of Article 1 of Council Directive 93/42/EEC of 14 June 1993 concerning medical devices(1), or

b) an active implantable medical device within the meaning of Article 1 of Council Directive 90/385/EEC of 20 June 1990 on the approximation of the laws of the Member States relating to active implantable medical devices(2), the apparatus shall be governed by this Directive, without prejudice to the application of Directives 93/42/EEC and 90/385/EEC to medical devices and active implantable medical devices, respectively.

Where apparatus constitutes a component or a separate technical unit of a vehicle within the meaning of Council Directive 72/245/EEC(3) relating to the radio interference (electromagnetic compatibility) of vehicles or a component or a separate technical unit of a vehicle within the meaning of Article 1 of Council Directive 92/61/EEC of 30 June 1992 relating to the type-approval of two or three-wheel motor vehicles, the apparatus shall be governed by this Directive without prejudice to the application of Directive 72/245/EEC or of Directive 92/61/EEC respectively.

This Directive shall not apply to equipment listed in its Annex I.

This Directive shall not apply to apparatus exclusively used for activities concerning public security, defence, State security (including the economic well-being of the State in the case of activities pertaining to State security matters) and the activities of the State in the area of criminal law.

B.2.13 ETSI/TS 122 003, Digital cellular communications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); LTE; Circuit Teleservices supported by a Public Land Mobile Network (PLMN) (Teleservice 12/TC12) /E12

This Technical Specification (TS) describes and defines a recommended set of Circuit Teleservices to be supported by a PLMN in connection with other networks as a basis for defining the network capabilities required.

B.2.14 ETSI/TS 122 011, Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); LTE; Service accessibility

The purpose of this TS is to describe the service access procedures as presented to the user. Definitions and procedures are provided in this TS for international roaming, national roaming and regionally provided service. These are mandatory in relation to the technical realization of the Mobile Station (UE).

B.2.15 ETSI/TS 127 007, Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); AT command set for user equipment

This document specifies a profile of AT commands and recommends that this profile be used for controlling Mobile Termination (MT) functions and PLMN (such as GSM and 3G) services from a Terminal Equipment (TE) through Terminal Adaptor (TA). The command prefix +C is reserved for Digital Cellular in ITU T Recommendation V.250 [14].

This document has also the syntax details used to construct these extended PLMN (such as GSM and 3G) commands. Commands from ITU T Recommendation V.250 [14] and existing digital cellular standards (TIA IS 99 [15] and TIA IS 135 [16]) are used whenever applicable. Some of the new commands are defined such way that they can be easily applied to MT of networks other than PLMN (such as GSM and 3G). ITU T T.31 [11] and T.32 [12] fax AT commands may be used for GSM/UMTS fax transmission from TE. GSM/UMTS Short Message Service AT commands are defined in 3GPP TS 27.005 [24]. GPRS AT commands are defined in Clause 10 of this specification.

This document assumes an abstract architecture comprising a TE (e.g. a computer) and a MT interfaced by a TA. The span of control of the defined commands should allow to handle any physical implementation that this abstract architecture may lead to:

— TA, MT and TE as three separate entities;

— TA integrated under the MT cover, and the TE implemented as a separate entity; TA integrated under the TE cover, and the MT implemented as a separate entity; TA and MT integrated under the TE cover as a single entity.

The commands described in this document may be observed on the link between the TE and the TA. However, most of the commands retrieve information about the MT, not about the TA.

Interface between TE and TA is intended to operate over existing serial (ITU T Recommendation V.24) cables, infrared link, and all link types with similar behaviour. For correct operation many of the defined commands require eight bit data and therefore it is recommended that TE TA link is set to eight bits/ byte mode. (For infrared operation implementation refer informative references IrDA. For embedding AT commands and data during on-line data state refer TIA 617/ITU-T V.80.) Interface between TA and MT is dependent on the interface in the MT.

The functional blocks (shown in Figure 1 of the deliverable), using AT commands, shall follow the principles described in the interactions handling framework 3GPP TS 23.227 [63].

B.2.16 ETSI/TS 122 071, Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); LTE; Location Services (LCS); Service description; Stage 1

This document provides the Stage One description of Location Services (LCS). A Stage One description provides an overall service description, primarily from the service subscriber's and user's points of view, but not dealing with the details of the Man Machine Interface (MMI). This TS includes information applicable to network operators, service providers and terminal, base station system, switch, and data base manufacturers.

NOTE Location Services may be considered as a network provided enabling technology consisting of standardized service capabilities which enable the provision of location based applications. These applications may be service provider specific. The description of the numerous and varied possible location applications which are enabled by this technology are outside the scope of this specification. However, clarifying examples of how the functionality being specified may be used to provide specific location services is included in various subclauses of the specification.

This document provides core requirements to an extent sufficient to derive a complete definition of location services at the service level. However, this document also provides additional requirements which may

suggest in a non-normative manner certain ways the system may be implemented to support location services.

LCS can be offered without subscription to basic telecommunication services. LCS is available to the following categories of LCS clients:

— Value Added Services LCS Clients – use LCS to support various value added services. These clients can include UE subscribers as well as non-subscribers to other services;

— PLMN Operator LCS Clients – use LCS to enhance or support certain O&M related tasks, supplementary services, IN related services and bearer services and teleservices.

LCS is applicable to any target UE whether or not the UE supports LCS, but with restrictions on choice of positioning method or notification of a location request to the UE user when LCS or individual positioning methods, respectively, are not supported by the UE.

LCS is being developed in phases with enhancements added in 3GPP releases.

— Emergency Services LCS Clients – use LCS to enhance support for emergency calls from subscribers.

— Lawful Intercept LCS Clients – use LCS to support various legally required or sanctioned services.

B.2.17 ETSI/TS 122 002, Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); Circuit bearer services (BS) supported by a Public Land Mobile Network (PLMN)

This document defines a set of circuit bearer services to be provided to PLMN subscribers by a PLMN itself and in connection with other networks.

This TS should also be used as a reference for defining the corresponding required mobile network capabilities.

B.2.18 ETSI/TS 122 004, Digital cellular telecommunications system (Phase 2+); Universal mobile telecommunications system (UMTS); General on supplementary services

The purpose of this document is to define a recommended set of supplementary services to the Teleservices and Bearer services which will be supported by a PLMN in connection with other networks as a basis for the definition of the network capabilities required.

Supplementary services not covered in 3GPP TS 22.004 cannot be introduced unilaterally in any PLMN if they require modification of the signalling specifications.

Technical realization of supplementary services is described in 3GPP TS 23.011 [19] and 24.010 [21].

B.2.19 Directive 2002/22/EC, Directive of the European Parliament and of the Council on universal service and users' rights relating to electronic communications networks and services (Universal Service Directive)

Within the framework of Directive 2002/21/EC (Framework Directive), this Directive concerns the provision of electronic communications networks and services to end-users. The aim is to ensure the availability throughout the European Union of good quality publicly available services through effective competition and choice and to deal with circumstances in which the needs of end-users are not satisfactorily met by the market.

This Directive establishes the rights of end-users and the corresponding obligations on undertakings providing publicly available electronic communications networks and services. With regard to ensuring provision of universal service within an environment of open and competitive markets, this Directive defines the minimum

set of services of specified quality to which all end-users have access, at an affordable price in the light of specific national conditions, without distorting competition. This Directive also sets out obligations with regard to the provision of certain mandatory services such as the retail provision of leased lines.

B.2.20 ETSI/TS 122 001, Digital cellular telecommunications system (Phase 2+); TSG Services and System Aspects; Principles of circuit telecommunication services supported by a Public Land Mobile Network (PLMN) (Release 8)

This document covers the definition of the circuit telecommunication services supported by a PLMN. The purpose of this document is to provide a method for the characterization and the description of these telecommunication services.

TS 22.101 describes overall service principles of a PLMN.

B.2.21 ETSI/TS 123 018, Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); Basic call handling; Technical realization (Release 8)

This document specifies the technical realization of the handling of calls originated by a PLMN (such as GSM and 3G) mobile subscriber and calls directed to a PLMN mobile subscriber, up to the point where the call is established. Normal release of the call after establishment is also specified. Trunk Originated call is also modelled.

In this document, the term MS is used to denote a UMTS UE or GSM MS, as appropriate.

The handling of DTMF signalling and Off-Air Call set-up (OACSU) are not described in this document. The details of the effects of UMTS or GSM supplementary services on the handling of a call are described in the relevant 3GPP TS 23.07x, 3GPP TS 23.08x and 3GPP TS 23.09x series of specifications.

The specification of the handling of a request from the HLR for subscriber information is not part of basic call handling, but is required for both CAMEL (3GPP TS 23.078 [12]) and optimal routeing (3GPP TS 23.079 [13]).

The use of the Provide Subscriber Information message flow is shown in 3GPP TS 23.078 [12] and

3GPP TS 23.079 [13].

The logical separation of the MSC and VLR (shown in Clauses 4, 5 and 7), and the messages transferred between them (described in Clause 8) are the basis of a model used to define the externally visible behaviour of the MSC/VLR, which is a single physical entity. They do not impose any requirement except the definition of the externally visible behaviour.

If there is any conflict between this document and the corresponding stage 3 specifications (3GPP TS 24.008 [26], 3GPP TS 25.413 [27], 3GPP TS 48.008 [32] and 3GPP TS 29.002 [29]), the stage 3 specification shall prevail.

B.2.22 ETSI/TS 102 164, Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); Emergency location protocols

This document specifies the protocol that is used by the local emergency operator to obtain the location information that is registered on the operator location server, see Figure 1. It endorses and defines a profile of the OMA specification OMA-TS-MLP-V3_2-20051124- C [REF_OMATS_MLP_V32_20051124_C * MERGEFORMAT 1] that are applicable to the emergency location information services.

NOTE The LI Forum has been affiliated and its work subsumed into the OMA; the LIF TS 101 Specification has been succeeded by OMA-TS-MLP-V3_2.

B.2.23 ETSI/TS 151 010, Digital cellular telecommunications system (Phase 2+); Mobile Station (MS) conformance specification; Part 1: Conformance specification (3GPP TS 51.010-1 version 8.1.0)

This document describes the technical characteristics and methods of test for Mobile Stations (MS), for the pan-European digital cellular communications system and Personal Communication Systems (PCS) operating in the 400 MHz, 700 MHz, 810 MHz, 850 MHz, 900 MHz, 1 800 MHz and 1 900 MHz band (GSM 450, GSM 480, GSM 710, GSM 750, T-GSM 810, GSM 850, GSM 900, DCS 1 800 and PCS 1 900), standardized by ETSI Special Mobile Group (SMG).

The present document is valid for MS implemented according to PLMN): GSM Phase2 or Phase2+ R96, or R97, or R98, or R99 or 3GPP Release 4 or 3GPP Release 5 or 3GPP Release 6, 3GPP Release 7 or 3GPP Release 8.

A subset of the tests is referenced in the GSM Common Technical Regulations (CTRs) and is used for regulatory conformance testing according to the EEC procedures for Telecommunications Terminal Equipment (TTE) type approval (EC Directive 91/263/EEC; also known as the "Terminal Directive" or "Second Phase Directive"). The remaining tests can be used to verify conformance with the GSM core technical specifications for those requirements that are not considered "essential" in the sense of the EC Directive 91/263/EEC (Article 4).

The present document covers the minimum characteristics considered necessary in order to provide sufficient performance for mobile equipment and to prevent interference to other services or to other users, and to the PLMNs.

It does not necessarily include all the characteristics which may be required by a user or subscriber, nor does it necessarily represent the optimum performance achievable.

It applies to the public land mobile radio service in the GSM systems named above, using constant envelope modulation and operating on radio frequencies in the frequency bands listed above respectively with a channel separation of 200 kHz and carrying 8 full rate channels or 16 half rate channels per carrier according to the TDMA principle.

The present document is part of the PLMN (such as GSM and 3G) series of technical specifications. The present document neither replaces any of the other GSM technical specifications or GSM related ETSs or ENs, nor is it created to provide full understanding of (or parts of) GSM systems. The present document lists the requirements, and provides the methods of test for testing a MS for conformance to the GSM standard.

For a full description of the system, reference should be made to all the GSM technical specifications or GSM related ETSs or ENs. Clause 2 provides a complete list of the GSM technical specifications, GSM related ETSs, ENs, and ETRs, on which this conformance test specifications is based.

The present document applies to the unit which includes the hardware to establish a connection across the radio interface.

If there is a difference between this conformance document, and any other GSM technical specification or GSM related ETS or EN, or 3GPP TS, then the other GSM technical specification or GSM related ETS or EN or 3GPP TS shall prevail.

B.2.24 ETSI/TS 124 123, Universal Mobile Telecommunications System (UMTS); User Equipment (UE) conformance specification; Part 1: Protocol conformance specification (3GPP TS 34.123-1 version 8.6.0)

This document specifies the protocol conformance testing for the 3rd Generation User Equipment (UE).

This is the first part of a multi-part test specification. The following information can be found in this part:

— the overall test structure;

— the test configurations;

— the conformance requirement and reference to the core specifications;

— the test purposes;

— a brief description of the test procedure, the specific test requirements and short message exchange table.

The following information relevant to testing can be found in accompanying specifications:

— the default setting of the test parameters [10];

— the applicability of each test case [12].

A detailed description of the expected sequence of messages can be found in the 3rd part of this test specification.

The Implementation Conformance Statement (ICS) pro-forma can be found in the 2nd part of the present document.

The present document is valid for UE implemented according to 3GPP Release 1999, 3GPP Release 4 or 3GPP Release 5.

B.2.25 ETSI 121 133, Universal Mobile Telecommunications System (UMTS); 3G Security; Security Threats and Requirements (3GPP TS 21.133 version 4.1.0)

This specification takes notice of the Security Principles and Objectives as set out in [1]. It contains an evaluation of perceived threats to 3GPP and produces subsequently a list of security requirements to address these threats.

As teleservices and applications will not, in general, be standardized, it is difficult to predict their exact nature. Therefore, this specification considers all security threats and aims at listing generic security requirements that shall be applicable irrespective of the actual services offered. The list of threats and requirements may however need to be updated as the 3GPP system evolves.

The threat analysis performed relies to a large extent on previous experiences with 2G systems, in particular GSM, and takes into account known problems from that area.

The security requirements listed in this specification shall be used as input for the choice of security features and the design of the 3GPP security architecture as specified in [3].

The structure of this technical specification is as follows:

— Clause 2 lists the references used in this specification;

— Clause 3 lists the definitions and abbreviations used in this specification;

— Clause 4 contains a reference to the general objectives for 3G security;

— Clause 5 contains an overview of the context in which the security architecture of 3G is designed;

— Clause 6 contains a list of identified security threats to 3G, and gives some results from the threat analyses that have been performed;

— Clause 7 contains an overview of the risk assessment resulting from the threat analyses performed;

— Clause 8 contains the resulting list of security requirements for 3G and indicates how these requirements relate to the threats and the security objectives;

— finally, Annex A gives some more detailed information on threats and risks connected to so called false base station attacks.

B.2.26 Directive 2002/22/EC of The European Parliament and of The Council of 7 March 2002 on universal service and users' rights relating to electronic communications networks and services (Universal Service Directive), amended by Directive 2009/136/EC of the European Parliament and of the Council of 25 November 2009

This Directive addresses universal service obligations and users' rights related to telecommunications in the European Union.

The Universal Service Directive is part of the "Telecoms Package" which, together with four other directives ("framework", "access and interconnection", "authorisation" and "private life and electronic communications"), aims to recast the existing regulatory framework for telecommunications and to make the electronic communications sector more competitive.

"Universal service" means an obligation imposed on one or more operators of electronic communications networks and/or services to provide a minimum set of services to all users, regardless of their geographical location within the national territory, at an affordable price.

Universal service obligations:

Availability of the universal service. The Member States shall ensure that the telecommunications services are made available to all users in their territory, regardless of their geographical location, at a specified quality level and an affordable price.

Directory enquiry services and directories. At least one comprehensive directory which is updated at least once a year shall be available to end-users. Similarly, at least one directory enquiry service shall be available to end-users, including users of public pay telephones.

Public pay telephones. The national regulatory authorities shall be able to impose obligations on undertakings to ensure that public pay telephones are provided to meet the needs of end-users, whether in terms of geographical coverage, the number of telephones, the accessibility of such telephones to disabled users or the quality of services.

Special measures for disabled users. The term "universal" means that the Member States shall ensure that disabled users enjoy a service which meet their needs.

Designation of undertakings. The Member States may designate one or more undertakings to guarantee the provision of universal service. The Member States may also designate different undertakings to provide different elements of universal service and/or to cover different parts of the national territory.

Affordability of tariffs. The Member States shall ensure that consumers with low incomes have access to special tariff arrangements or are given special assistance to enable them to have access to the telephone service and to use it. Furthermore, the Member States may require undertakings which have universal service obligations to comply with price caps or to apply common tariffs, including geographical averaging, throughout the national territory.

Quality of service. The national regulatory authorities shall set performance targets for undertakings with universal service obligations and monitor compliance with these targets by designated undertakings.

Financing of universal service obligations. In order to compensate for the net costs to which the provision of universal service might give rise, compensation mechanisms for operators with universal service obligations may be provided for. This may involve the introduction of a mechanism to compensate from public funds and/or a mechanism to share costs between providers of electronic communications networks and services.

Annex C
(informative)

Test system strategies

C.1 General

Considering that the pan-European *eCall service* is a safety service which will be available for all European vehicle drivers during the life of the vehicle:

— considering that when fully deployed, the number of equipped, in-service' vehicles, can be exceeding several hundred millions in Europe;

— considering that the existence of many original equipment manufacturers and different vehicle models will multiply the number of different solutions for the *eCall* equipment;

a simplified, easily implementable, test strategy is now proposed:

It is assumed that a reference IVS responsible for the *eCall* system simulator and reference PSAP simulator are available and that communication aspects can be tested using ETSI developed test suites.

C.2 Vehicle and PSAP equipment life cycle

Conformance testing has to be achieved for all new vehicle models with *eCall* during the engineering phase. This testing may be achieved under the control of the OEM or its *eCall* equipment supplier. All conformance points and conformance requirements have to be covered during such conformance testing. For this purpose, it is recommended to achieve such conformance tests in an environment as described in C.3 or C.4 below, thereby avoiding disturbing an operational PSAP.

Eventually however, interoperability tests are required to confirm that a new vehicle model is ready to be operating in a pan-European *eCall* environment. Limited tests will at this stage have to be achieved with an operational PSAP with or without using the test bit set to "active" value in the MSD. The test period and modalities have to be planned between PSAP and OEM through a "Private – Public Partnership" agreement.

All other tests if necessary during vehicles manufacturing and when vehicles are in service should be achieved using some OEM or third party test systems (see C.3 below). The tests being achieved and the test system being used are to be under the complete responsibility of OEMs.

Conformance testing is to be achieved for all new PSAP *eCall* equipment during the engineering phase. This testing may be achieved by the PSAP or its *eCall* equipment supplier. All conformance points and conformance requirements have to be covered during such conformance testing. For this purpose, it is recommended to achieve such conformance tests in an environment as described in C.3 or C.4 below.

Interoperability tests are the ultimate goal to verify that new PSAP *eCall* equipment is ready to be operating in a pan-European *eCall* environment. Limited tests have to be achieved with an operational vehicle with or without the test bit set to "active" value in the MSD. The test period and modalities have to be planed between PSAP and OEM through a "Private – Public Partnership" agreement.

All other tests are not necessary as long as the PSAP *eCall* equipment is not upgraded. In case of configuration change management, the PSAP may need to repeat some *eCall* equipment conformance testing or some interoperability test with an operational vehicle.

C.3 Laboratory environment

The creation of a closed testing environment is needed to avoid the overload of tests in real environment.

An IVS responsible for the *eCall* system simulator common for all the *eCall* equipments shall be available for all interested PSAPs. A PSAP reference test system (simulator) needs to be available to the equipment manufacturers and OEMs. These reference test systems have to provide the same features as the real equipment. The scope of the PSAP simulators has to be determined by PSAPs.

Network behaviour (e.g. automatic registration to the best operator, processing of the *eCall* flag) has also to be simulated to avoid sending a live 112/E112 call to the external world.

NOTE 1 For conformance and interoperability testing, a test laboratory needs to be used (see Figure C.1 below), and Directives 98/34/EC, 99/5/EC, and 2002/22/EC.

NOTE 2 OEMs may develop this test laboratory and it is recommended to have it accredited or subcontract the test service to some competent, accredited test laboratories.

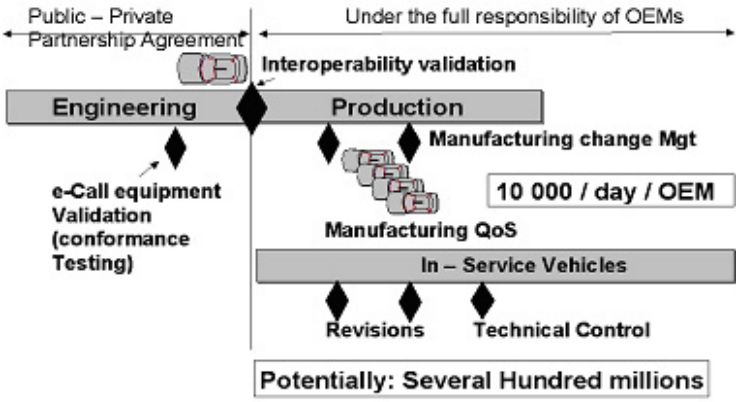

Figure C.1 — Example of equipped test laboratory

C.4 OEM or third party test systems

For tests being necessary during the vehicle or IVS responsible for the *eCall* system development, an OEM or third party test system such as represented in Figure C.2 below can be used.

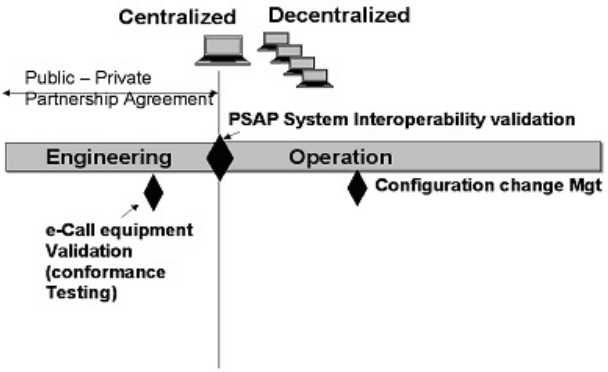

Figure C.2 — OEM or third party test system

For this purpose, it is necessary to call a different number than 112.

NOTE A common number could also be provided for this test purpose.

Bibliography

[1] EN ISO 24978, *Intelligent transport systems - ITS Safety and emergency messages using any available wireless media - Data registry procedures (ISO 24978:2009)*

[2] ETSI/TS 134 123, *Universal Mobile Telecommunications System (UMTS); User Equipment (UE) conformance specification; Part 1: Protocol conformance specification (3GPP TS 34.123-1 version 8.6.0) [Release 8 or later]*

[3] WGS 84, World Geodetic System 84 (The latest revision is WGS 84 dating from 1984 [last revised in 2004])

[4] Directive 91/263/EEC Council Directive of 29 April 1991 on the approximation of the laws of the Member States concerning telecommunications terminal equipment, including the mutual recognition of their conformity (91/263/EEC)

[5] Directive 98/34/EC of the European Parliament and of the Council of 22 June 1998 laying down a procedure for the provision of information in the field of technical standards and regulations

[6] Directive 1999/5/EC of the European Parliament and of the Council of 9 March 1999 on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity

[7] Directive 2002/21/EC of the European Parliament and of the Council of 7 March 2002 on a common regulatory framework for electronic communications networks and services (Framework Directive)

[8] Directive 2002/22/EC of the European Parliament and of the Council of 7 March 2002 on universal service and users' rights relating to electronic communications networks and services (Universal Service Directive)

[9] Directive 2009/136/EC of the European Parliament and of the Council of 25 November 2009 amending Directive 2002/22/EC on universal service and users' rights relating to electronic communications networks and services

[10] ETSI/TS 122 002, *Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); Circuit bearer services (BS) supported by a Public Land Mobile Network (PLMN) [Release 8 or later]*

[11] ETSI/TS 122 004, *Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); General on supplementary services [Release 8 or later]*

[12] ETSI/TS 122 001, *Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); Principles of circuit telecommunication services supported by a Public Land Mobile Network (PLMN) [Release 8 or later]*

[13] ETSI/TS 123 018, *Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); Basic call handling; Technical realization [Release 8 or later]*

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