

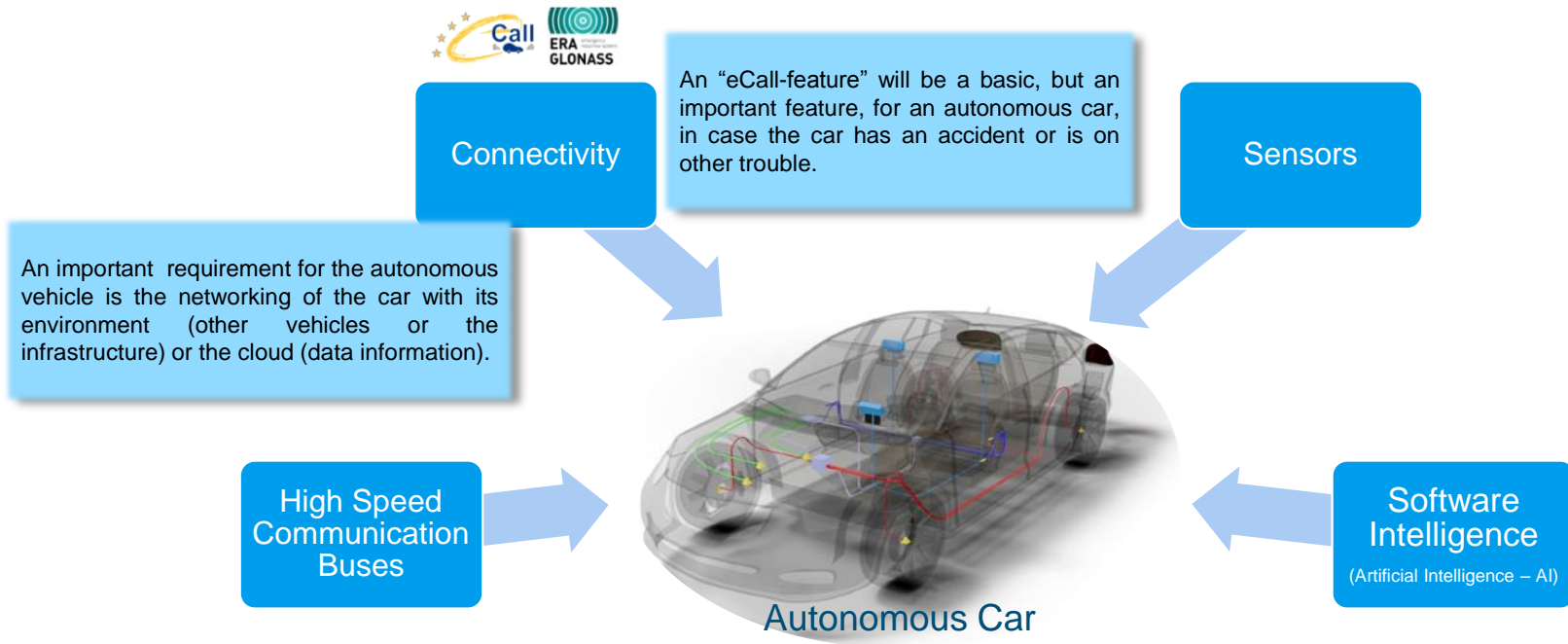
eCall/ERA-GLONASS E2E Conformance Testing

8th June 2017

Rob Short

The autonomous car vs. eCall / ERA-GLONASS

The car will take the control and responsibility from the driver, and controls all tasks and decisions autonomously!



eCall / ERA-GLONASS


Today's emergency call systems for vehicles



Europe

■ eCall



- April 2018
- EU +  EFTA
- Network: GSM
- GNSS: GPS + (GALILEO)
- emergency number 112
- In-band modem
- MSD EN 15722
- Vehicle category
 - M1 and N1 (2018)



Russian Federation

■ ERA-GLONASS



- January 2015
- Russia + Belarus + Kazakhstan
- Network: GSM and UMTS
- GNSS: GLONASS (+ GPS opt.)
- emergency number 112
- In-band modem + SMS
- MSD EN 15722 (+ ext. fields opt.)
- Vehicle category
 - M1 and N1 (2015)
 - M2 and M3 (2016)
 - N1 with weight > 2,500kg
 - N2 and N3 intended for transport of hazardous cargo
 - all others (2017)

EU Vehicle category description

- **M1:** Passenger car
- **N1:** Pick-up, Van
- **M2:** Small Bus
- **M3:** Bus
- **N2:** Commercial Truck
- **N3:** Large Commercial Truck

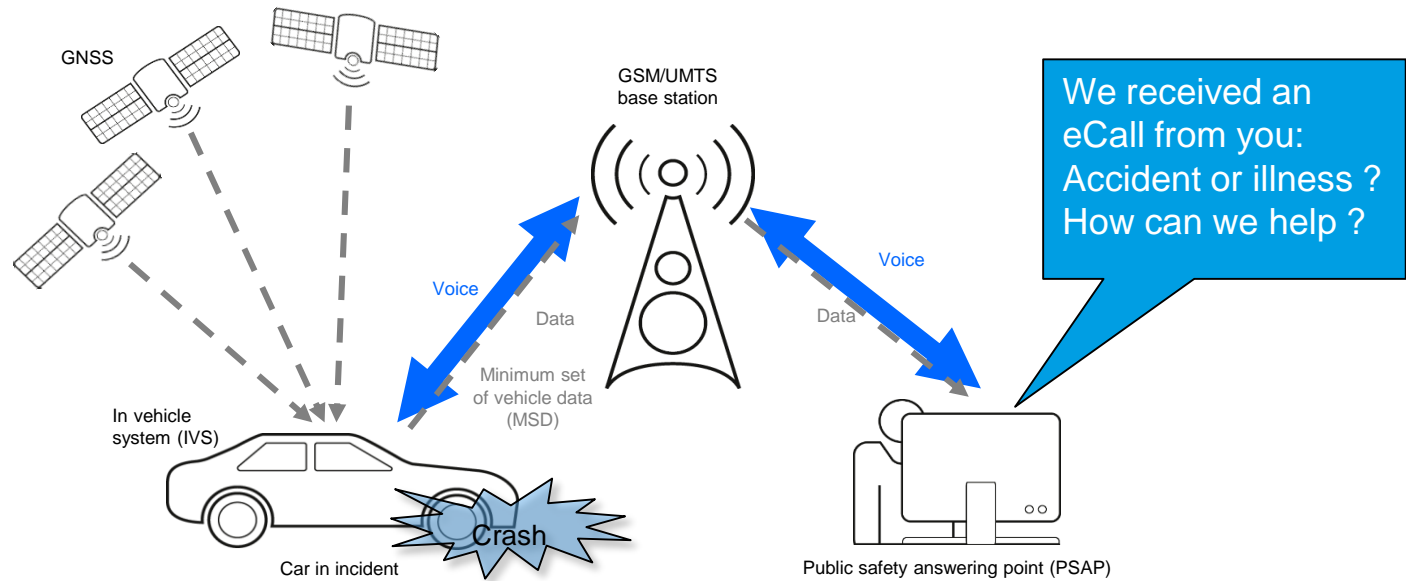
Russian ERA-GLONASS System is harmonized with the EU eCall System.
Basic functions are similar with a view additional features.

eCall / ERA-GLONASS system overview

Today



- A manually or automatically initiated emergency call and a transmission of an MSD from an IVS to PSAP via the voice channel through the cellular network.

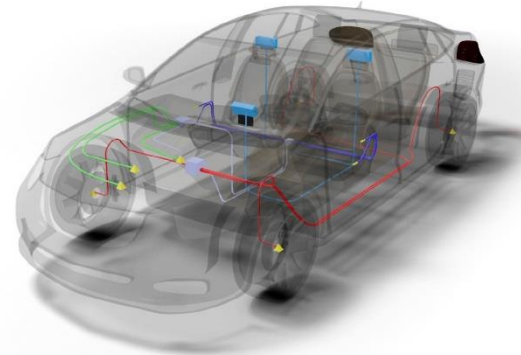
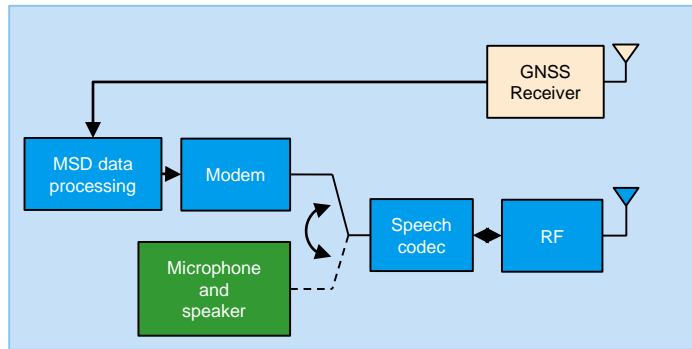


Today's emergency call systems for vehicles

The Key-component

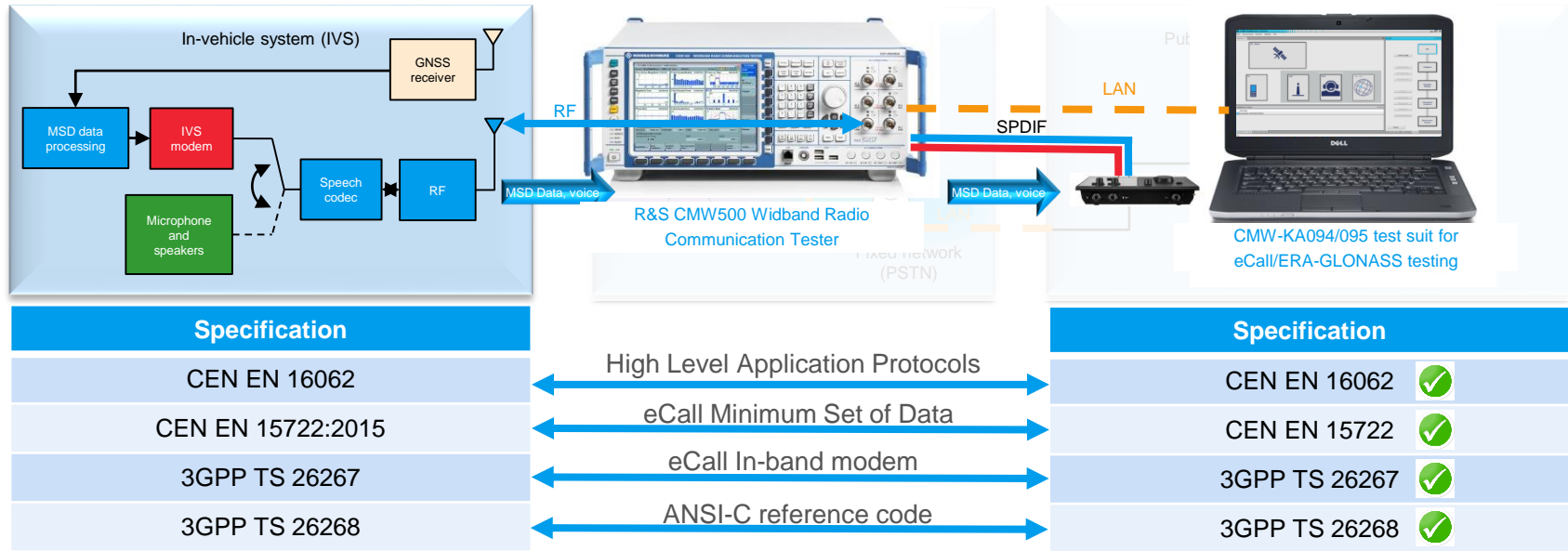


- **IVS:** The **in-vehicle system** is an in-band modem which consists of a modem that operates full-duplex and allows reliable MSD transmission to the PSAP via the voice channel through the cellular network.



The eCall in-band modem uses for data transmission of the MSD the same voice channel as used for the emergency voice calls.

eCall/ERA-GLONASS conformance test setup



← **CEN EN16454*, ETSI TS 103412 and GOST R 55530** **IVS End-End Conformance Tests** Test specifications → ✓

R&S eCall / ERA-GLONASS test setup

R&S CMW500 Communication Tester



R&S®CMW500



Key Features:

- All-in-one test platform for wireless devices
- Supported Technologies:
 - GSM/EGPRS//EDGE Evolution/VAMOS, WCDMA/HSPA/HSPA+, LTE-FDD, LTE-TDD (incl. MIMO), CDMA2000® 1xEV-DO Rev A/B, TD-SCDMA, WLAN and Bluetooth
- Testing of all layers from RF to protocol up to application layer
- Fully integrated IPv4/IPv6 infrastructure for end-to-end application test:
 - File transfer via FTP, Web browsing via HTTP
 - IP stream forwarding to the internet
 - VoLTE - IMS Voice-/Video-Call testing the base for NG eCall service in the future
 - Video streaming
 - And more...

Benefits of using the R&S®CMW500 radio communication tester for eCall/ERA-GLONASS testing:

- Controlled network conditions e.g. country and operator configuration, power levels, speech codecs, etc.
- Reproducible test conditions and results
- Full access to test results and test conditions

R&S eCall / ERA-GLONASS test setup

PSAP emulator CMW-KA094/095



R&S@CMW-KA094/095



Key Features:

- PSAP simulation for eCall (KA094) and ERA-GLONASS (KA095) over GSM and UMTS
PUSH mode, PULL mode without prior hang up, PULL mode with prior hang up, PULL mode without prior, PUSH mode (test if the IVS allows it)
- eCall Flag indication
- Measure MSD transmission time
Time since call establishment, Time since start trigger (from PSAP), Time since sync frame (FoM)
- MSD decoding
according to CEN EN 15722:2015 and GOST R 54620:2011 for every redundancy version
and for every uplink data part
- Optional recording of un-decoded signal from IVS
- Optional audio connection to CMW-Z50 or external audio analyzer
- Details on PUSH and SYNC indications
Timing, Count
- Optional fixed position GPS/GLONASS simulation with SMBV
- ERA-GLONASS SMS Protocol support

Benefits of using the Rohde & Schwarz PSAP simulator

- Controlled environment without influence of network operator
- Reproducible test conditions and results
- Possibility to test real ecall with emergency number 112 ← *high risk in live network*

R&S eCall / ERA-GLONASS test setup

R&S SMBV100A Signal Generator



R&S@CMW-SMBV100A



Key Features:

- Fully fledged GNSS simulator with GPS, Glonass, Galileo, BeiDou and QZSS/SBAS
- Up to 24 satellites can be simulated
- Internal baseband generator supporting 3GPP LTE FDD and TDD, LTE-Advanced, 3GPP FDD/HSPA/HSPA+, GSM/EDGE/EDGE Evolution, TD-SCDMA, WLAN (incl. 802.11p), and all other important digital standards
- Frequency range: 9kHz to 3.2/6GHz
- Level range_ -145dBm to + 18 dBm
- Suitable for GOST R 55534 GNSS testing

Benefits of using the R&S SMBV100A signal generator

- Controlled environment without external influence of live signal
- Reproducible test conditions and results
- Fulfills the requirements for GOST R 55534 GNSS verification

Summary

- **Rohde & Schwarz provides the ideal solution for standard-compliant conformance testing of eCall / ERA-GLONASS modules.**
 - Test if your IVS module comply with eCall / ERA-GLONASS standards
 - Verify the IVS modem is able to trigger an emergency call – automatically and manually
 - Verify MSD data transmission and the voice connection with the PSAP
 - Compare received MSD data with expected values
 - Audio Quality test of voice connection and GNSS receiver testing can be added
 - Logs of ACK/NACKS/Timers allow detailed troubleshooting
- **In line with conformance test specifications for IVS testing:**
 - CEN/TS 16454, GOST R 55530 and ETSI TS 103412
- **CMW500 and SMBV100A are also suitable for**
 - GOST R 55531 audio tests (CMW500 + Audio Analyzer)
 - GOST R 55534 GNSS tests (SMBV100A)
- **The introduced R&S instruments are a save investment also to meet upcoming automotive test requirements e.g. NGeCall (based on LTE and IMS).**
- New EU regulation for eCall testing 2017-79 EU



eCall/ERA-GLONASS E2E Conformance Testing

KA09x GUI Description

9th March 2017

Christian Hof

Application User Interface

The screenshot displays the CMW-KA09x GUI V 3.3.0 interface. The main window is divided into several sections:

- Measurement Statistics Overview:** Contains a "SMBV - GPS - City scenario" panel with a satellite icon, highlighted by a red box and labeled "Satellite configuration SMBV100A".
- Radio Access Network:** Contains four panels: "IVS" (mobile phone icon, blue box, labeled "DUT configuration"), "CMW - GSM" (tower icon, blue box, labeled "Cell configuration CMW500"), "PSAP eCall" (headset icon, green box, labeled "eCall PSAP configuration CMW-KA094/KA095"), and "None" (globe icon).
- Control Panel:** A vertical stack of buttons and status indicators on the right side, including "Initial Config", "Simulation On/Off", "Call IVS", "Stop Calling", "Hangup Call", "Send Start", "Stop Measurement", "Reset", and a status flow from "Idle" to "Configured" to "Simulation Running" to "Data Channel Established" to "Measurement Running".

The bottom status bar shows "Idle" on the left and "Detailed res... ERA-GLONA... Edit City sce... Control" on the right.

Satellite Configuration

The screenshot displays the CMW-KA09x GUI V 3.3.0 interface. The main window is titled "SMBV - GPS - City scenario" and features a satellite icon. A red box highlights this area, with a callout box containing the text "Satellite configuration SMBV100A". A context menu is open over the satellite icon, showing options: "Use GNSS Simulation?" (checked), "Edit SMBV Settings", "Select GNSS Network Simulation" (with a dropdown menu showing "GPS - City scenario"), and "Edit Scenario Settings".

Below the satellite configuration, there is a "Radio Access Network" section with four options: "IVS" (with a mobile phone icon), "CMW - GSM" (with a tower icon), "PSAP ERA-GLONASS" (with a headset icon and a radio button), and "None" (with a globe icon and a radio button).

The bottom section is titled "Message Trace & Results" and includes a table with columns for Time, Protocol, Message, Source, Destination, and Details. Below the table are buttons for "Update configuration" and "Load Defaults".

The status bar at the bottom shows "Idle" on the left and "Detailed results | ERA-GLONASS SMS Commands | Edit SMBV Configuration | Control" on the right.

Satellite Configuration

The screenshot displays the CMW-KA09x GUI V 3.3.0 interface. The main window is titled "SMBV - GPS - City scenario" and features a satellite icon. A context menu is open over this area, listing various simulation scenarios. A red box highlights the "SMBV - GPS - City scenario" area. A white callout box points to the menu with the text "Satellite configuration SMBV100A". Another white callout box points to the menu with the text "Moving scenarios require SMBV-K65 option". The right sidebar shows the "Edit City scenario" panel with a "Location" dropdown menu set to "Munich". The bottom of the interface includes a "Message Trace & Results" section and a "Notification History" section.

CMW-KA09x GUI V 3.3.0

Base Device Setup View Settings Info

Measurement Statistics Overview X

SMBV - GPS - City scenario

Use GNSS Simulation?
Edit SMBV Settings

Select GNSS Network Simulation

GPS - City scenario
GPS - City scenario
GPS - Atlanta scenario
GPS - Atlanta scenario Ind. Pwr.
GPS - Melbourne scenario
GPS - Melbourne scenario Ind. Pwr.
GPS - Melbourne moving scenario
GPS - Melbourne moving scenario Ind. Pwr.
GPS - Santa Cruz scenario Ind. Pwr.
GPS - Santa Cruz moving scenario Ind. Pwr.
GLONASS - City scenario

City scenario

Location

Munich
New York
Sydney
Munich
Moscow
Tokyo
Seoul

Update configuration Load Defaults

Detailed res... ERA-GLONA... Edit City sce... Control

Idle

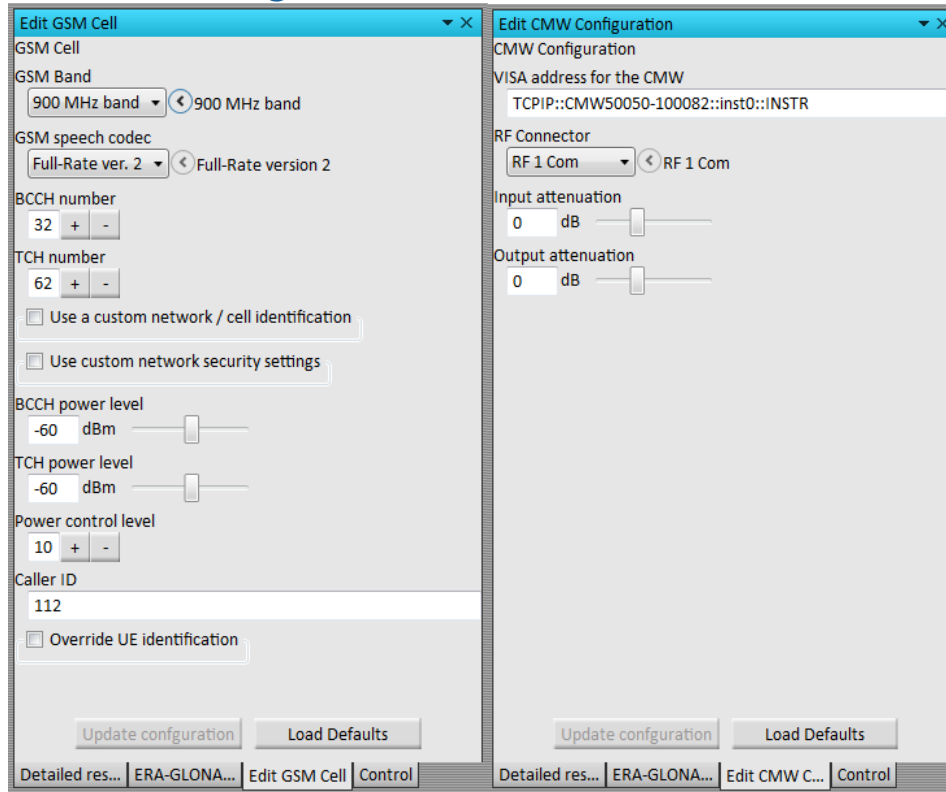
Satellite configuration SMBV100A

Moving scenarios require SMBV-K65 option

Cell Configuration

The screenshot displays the CMW-KA09x GUI V 3.3.0 interface. The main window is titled 'Measurement Statistics Overview' and shows a 'SMBV - GPS - City scenario' with a satellite icon. Below this, there are three panels: 'IVS' (Intelligent Voice Service), 'Radio Access Network' (with 'CMW - GSM', 'PSAP ERA-GLONASS', and 'None' options), and a globe icon. A 'Cell configuration CMW500' callout box is overlaid on the 'Radio Access Network' panel. The right-hand 'Control' panel features a vertical state machine with buttons for 'Initial Config', 'Simulation On', 'Simulation Off', 'Call IVS', 'Stop Calling', 'Hangup Call', 'Send Start', 'Stop Measurement', and 'Reset'. The bottom status bar indicates 'idle'.

Cell Configuration GSM



The transmission quality depends on the selected speech codec. For a first test it is recommended to use a Full Rate ver. 2 (EFR) codec or (if supported by the IVS) a high-quality Adaptive Multi-Rate (AMR) codec.

Cell Configuration UMTS

The image shows two side-by-side configuration windows from a software interface. The left window is titled "Edit WCDMA Cell" and contains the following settings:

- WCDMA Cell**
- WCDMA Band:** Band 1 (2100 MHz)
- WCDMA speech codec:** AMR 12.20k bit/s (Narrow Band Adaptive Multi-Rate with 12.20k bit/s)
- Downlink Channel:** 10563
- Primary Scrambling Code:** 0
- Uplink Scrambling Code:** 0
- Use a custom network / cell identification
- Use custom network security settings
- Overall Output Power:** -56.1 dBm
- Caller ID:** 112
- Buttons: Update configuration, Load Defaults

The right window is titled "Edit CMW Configuration" and contains the following settings:

- CMW Configuration**
- VISA address for the CMW:** TCP/IP::CMW50050-100082::inst0::INSTR
- RF Connector:** RF 1 Com (RF 1 Com)
- Input attenuation:** 0 dB
- Output attenuation:** 0 dB
- Buttons: Update configuration, Load Defaults

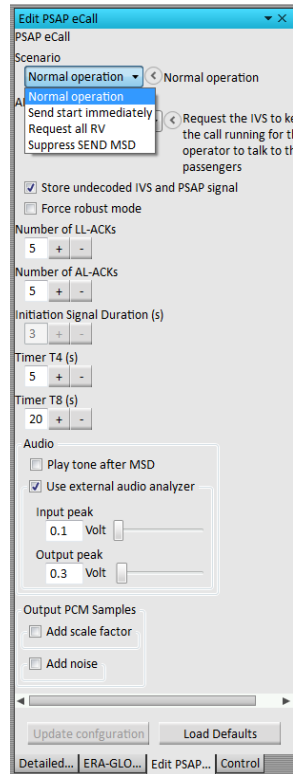
At the bottom of each window, there is a navigation bar with buttons: Detailed res..., ERA-GLONAS..., Edit WCDMA..., Control (left); and Detailed res..., ERA-GLONA..., Edit CMW C..., Control (right).

PSAP Configuration

The screenshot displays the CMW-KA09x GUI V 3.3.0 interface. The main workspace is divided into several sections:

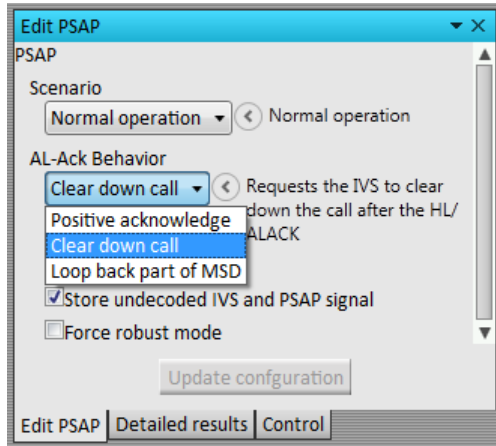
- Measurement Statistics / Overview:** Contains icons for "SMBV - GPS - City scenario", "IVS", and "CMW - GSM". A green box highlights the "CMW - GSM" icon, with a callout box containing the text "CMW-KA094/KA095 eCall PSAP configuration".
- Control Panel:** A vertical flow of buttons and status boxes: "Initial Config", "Idle" (highlighted with a blue border), "Configured", "Simulation On", "Simulation Off", "Simulation Running", "Call IVS", "Stop Calling", "Hangup Call", "Data Channel Established", "Stop Measurement", "Measurement Running", and "Reset".
- Message Trace & Results:** A table with columns for Time, Protocol, Message, Source, Destination, and Details. A context menu is open over the table, showing options: "Simulate PSAP", "Select PSAP Simulation" (with a sub-menu), "Edit PSAP Settings", and "ERA-GLONASS SMS Commands". The sub-menu is open, showing "PSAP eCall" and "PSAP ERA-GLONASS" (selected with a checkmark).
- Notification History / Message Trace & Results / Log:** A bar at the bottom with the status "idle".

PSAP Configuration - Operating Modes



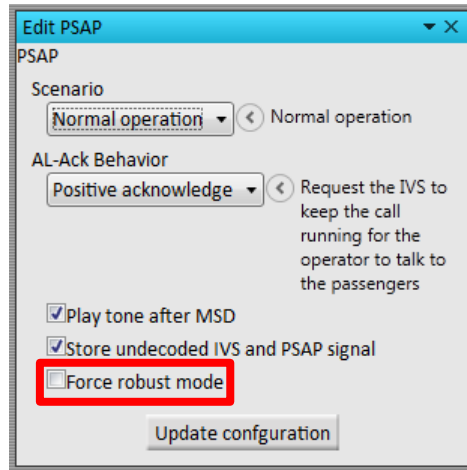
The PSAP emulation provides several operating mode. Different operating mode are required to support specific test cases.

PSAP Configuration - AL-ACK



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)

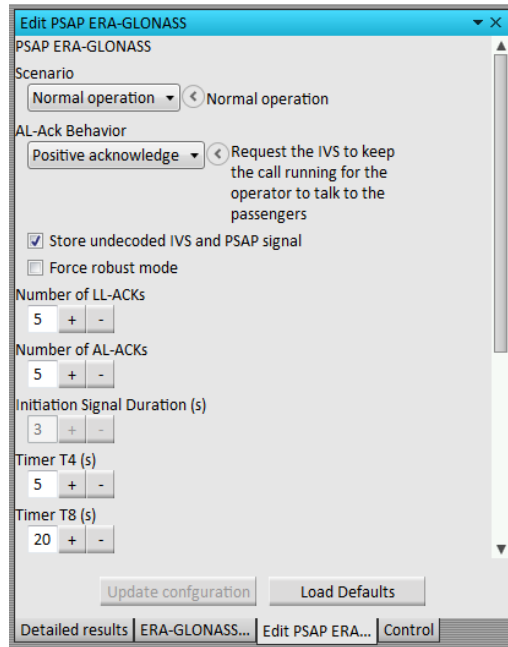
PSAP Configuration - Fast and Robust Mode



The IVS supports two modulation modes, a fast modulation mode and a robust modulation mode.

- Under normal conditions, an MSD transmission is expected to succeed in fast modulation mode.
- The robust modulation mode serves as a fallback solution if a transmission fails in unusually difficult environments.

PSAP Configuration – Additional Parameters

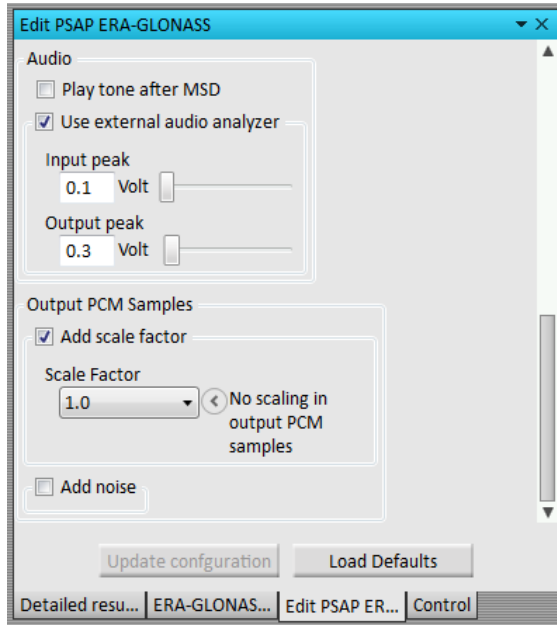


The PSAP provides additional configuration parameter.

- Number of LL-ACKs
- Number of AL-ACKs
- Initiation Signal Duration
- Timer T4
- Timer T8

PSAP Configuration – Additional Parameters

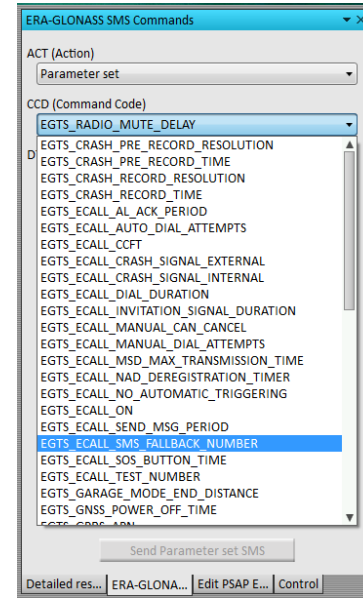
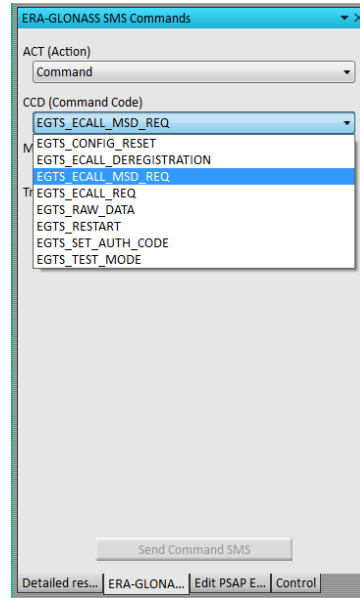
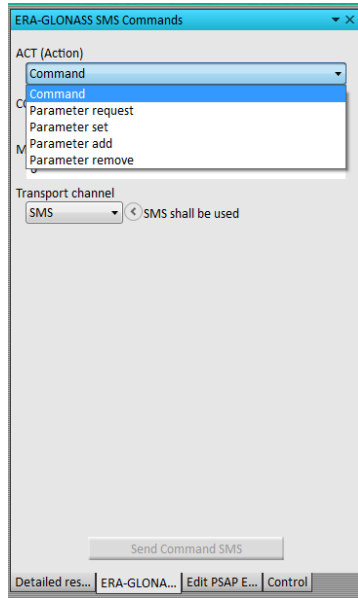
Audio Connection Verification



The PSAP provides additional configuration parameter.

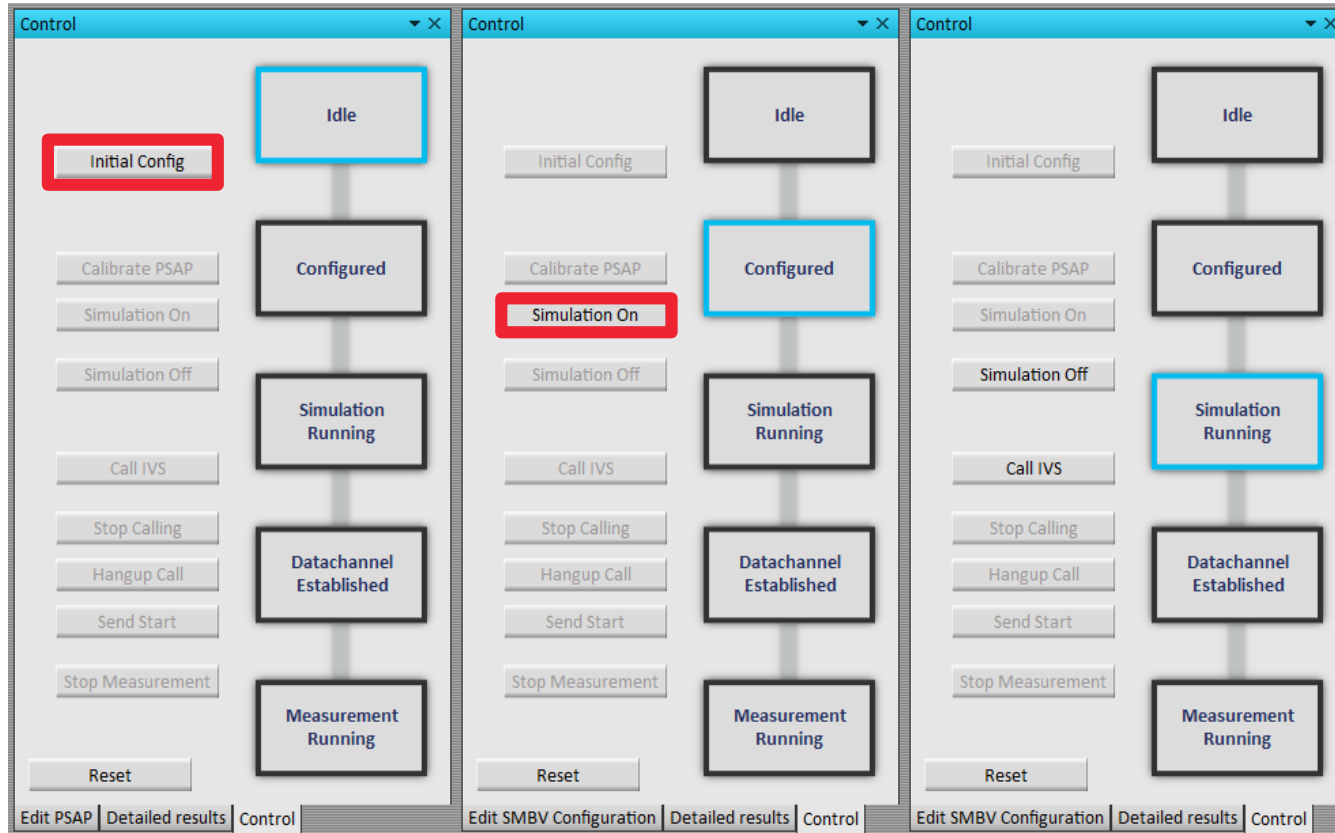
- Use external audio analyzer
- Input peak
- Output peak
- PCM scaling
- Add noise

PSAP Configuration – ERA-GLONASS SMS Commands



The PSAP provides several commands to test ERA-GLONASS SMS protocol.

PSAP State Machine



PSAP Statemachine



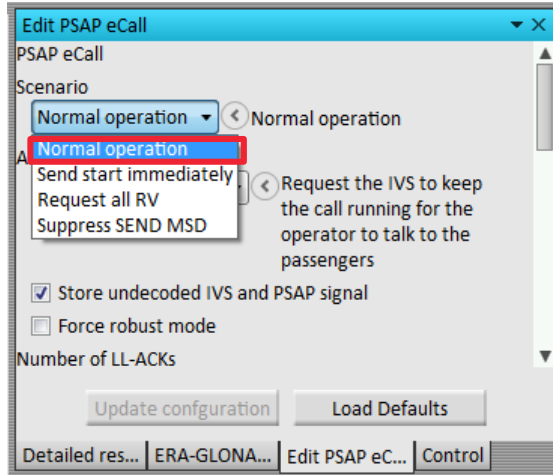
Examples

CTP 1.1.7.1 Set-up TS12 call with eCall identifier (flag) set to 'automatic' – PE eCall IVS

SUT reference	'In-Vehicle System'		
CTP/ PE-IVS/ECI/1.1.7.1	Test for set-up TS12 call with eCall identifier (flag) set to 'automatic'		
SUT test objective	Verify that when activated automatically a TS12 call is established with the correct eCall identifier (flag) routing bit set in the call set-up service category information element		
CTP origin	CEN		
Reference requirement	EN16062 Clause 7.3.6 Paragraph 2		
Initial conditions	Ignition is ON and IVS is in mobile network coverage MNO and PSAP test points are available MNO test point is able to recognise and route manually initiated and automatically initiated eCalls to different destination numbers		
Stimulus and expected behaviour			
Test point	Test point	Tester action	Pass condition
IVS SUT	1	Initiate an eCall automatically in accordance with the manufacturer's instructions	
MNO	2	Check that the IVS NAD sets the "Service Category Request" message information element (IE) to automatically initiated eCall (AleC) in accordance to ETSI TS 122 101 (Release 8 or later).	Optional IE "Service category" was present and set to automatically initiated eCall (AleC)
PSAP test point or MNO test point	3	Verify that the received eCall has been routed to the test point number designated for automatically initiated eCalls	eCall has been routed to the test point number designated in the network for automatically initiated eCalls
			If ALL individual pass conditions listed in this column above have been met THEN CTP PASS ELSE CTP FAIL

Examples

CTP 1.1.7.1 Set-up TS12 call with eCall identifier (flag) set to 'automatic' – PE eCall IVS Configuration



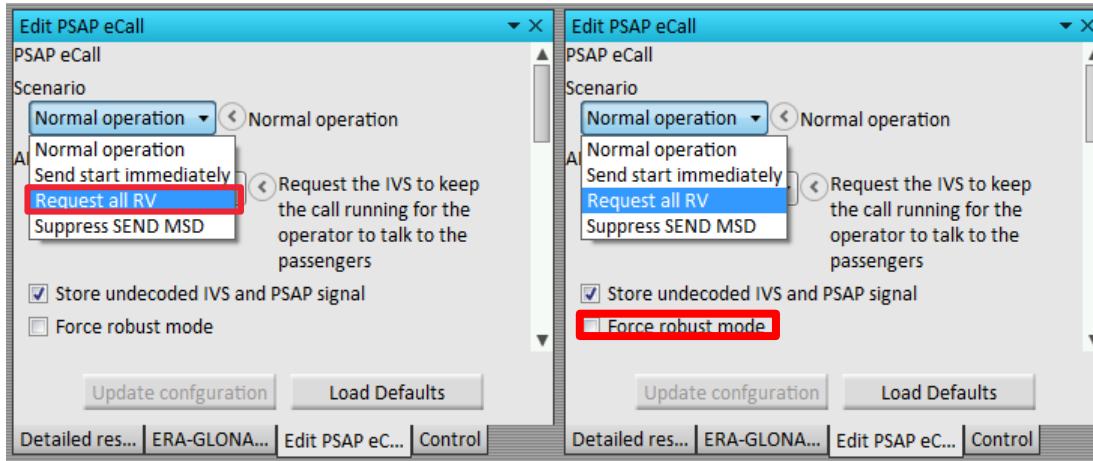
Examples

CTP 1.1.15.5 MSD is transferred continuously until T7 expires and IVS reconnects loudspeaker and microphone on its expiry – PE eCall IVS

SUT reference	'In-Vehicle System'	Stimulus and expected behaviour		
CTP/ PE-IVS/ECP/1.1.15.5	Verify that MSD is transferred continuously until T7 expires and IVS reconnects loudspeaker and microphone on its expiry	Test point	Tester action	Pass condition
SUT test objective	The IVS modem shall continue to transmit the MSD for a period not exceeding 20 seconds If the link layer acknowledgement was not received within 20 seconds after receipt of the "Send MSD" request, then the IVS shall re-connect its loudspeaker and microphone to the line enabling voice communication between the vehicle occupants and the PSAP operator	IVS SUT 1	Initiate an eCall or test eCall in accordance with the manufacturer's instructions	
CTP origin	Original	PSAP test point 2	Answer call. Verify eCall Initiation signal Send 'SEND MSD' message Start timer T8 (PSAP MSD maximum reception time, 20 seconds)	
Reference requirement	EN 16062 Clause 7.4.7	IVS SUT 3	SEND MSD' message received Start sending MSD Start timer T7 (IVS MSD maximum transmission time, 20 seconds)	
Initial conditions	Ignition is ON and IVS is in mobile network coverage MNO and PSAP test points are available IVS has been programmed with the non-emergency number to be used for test calls	PSAP test point 4	Wait until T8 expires Do not send positive LL-ACK Route call to PSAP test point operator microphone and speaker	Continuous MSD transmission from IVS until T8 expires
		IVS SUT 6	Continue sending MSD until T7 expires	
		IVS SUT 7	Timer T7 expired. Verify that the IVS loudspeaker and microphone are reconnected 20 seconds after 'SEND MSD' request received	IVS loudspeaker and microphone were reconnected 20 seconds after SEND MSD request received
		IVS SUT PSAP test point 8	Confirm that the audio/voice line has been reconnected and the IVS loudspeakers and microphone are working correctly	2-way speech was possible between the IVS and PSAP test point If ALL individual pass conditions listed in this column above have been met THEN CTP PASS ELSE CTP FAIL

Examples

CTP 1.1.15.5 MSD is transferred continuously until T7 expires and IVS reconnects
loudspeaker and microphone on its expiry – PE eCall IVS
Configuration



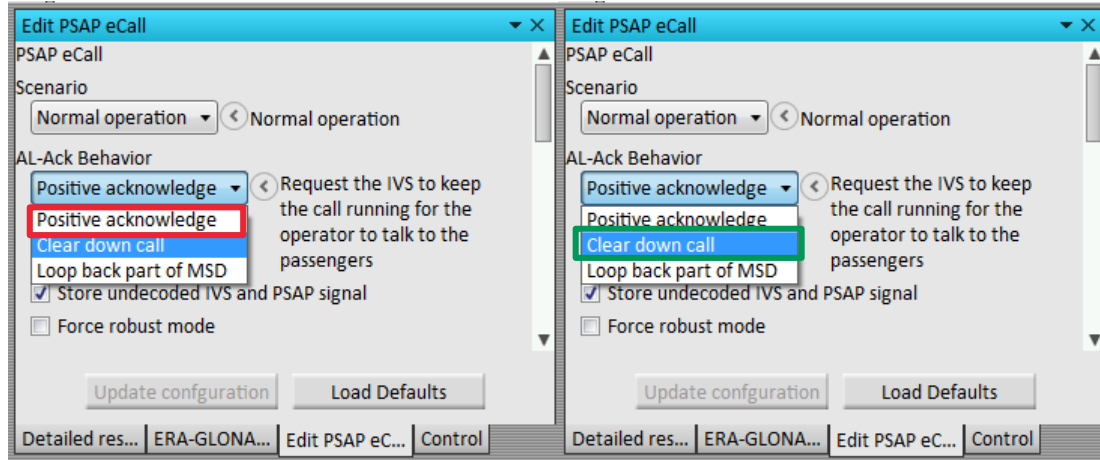
Examples

CTP 1.1.16.1 Clear down call automatically – PE eCall IVS

SUT reference	'In-Vehicle System'	
CTP/ PE-IVS/CLR/1.1.16.1	Test for Clear-down call automatically	
SUT test objective	Verify that when the PSAP clears down the eCall, or sends an application layer clear down message to the IVS, that the IVS clears down the call	
CTP origin	CEN	
Reference requirement	EN16062 Clause 7.5.5	
Initial conditions	Ignition is ON and IVS is in mobile network coverage MNO and PSAP test points are available IVS has been programmed with the non-emergency number to be used for test calls	
Stimulus and expected behaviour		
Test point	Tester action	Pass condition
IVS SUT	1 Initiate an eCall or test eCall in accordance with the manufacturer's instructions	
IVS SUT	2 PSAP clears down call normally. Verify that the IVS also clears down	IVS cleared down the call following receipt of a clear down message from the network
IVS SUT	3 Initiate an eCall or test eCall in accordance with the manufacturer's instructions	
IVS SUT	4 PSAP sends AL ACK CLEAR DOWN message. Verify that the IVS clears down	IVS cleared down the call following receipt of an AL ACK CLEAR DOWN message from the PSAP If ALL individual pass conditions listed in this column above have been met THEN CTP PASS ELSE CTP FAIL

Examples

CTP 1.1.16.1 Clear down call automatically – PE eCall IVS Configuration



Results - Dialed Number and Service Category

CMW-KA09x GUI V 2.0.0

Base Device Setup View Settings Info

Overview

GPS - City scenario

IVS
Call est.

Radio Access Network

GSM
Call est.

PSAP
Ready for eCall

GSM RRLP LBSS

Detailed results

Information about the current call
Timestamp: 2014.02.28 - 14:55:49.5

Field overview:

Name	Content
Dialed number	"00302106563619"
Emergency call	False
Manual eCall	False
Automated eCall	False
Measurement ID	2

Results overview

Time	Result Type	Info
14:53:18.5	GSM results	Dialed number ""00302106563619""
14:53:22.6	Raw MSD	Redundancy Version = 0 - 0x01 0x00 0x05 0x05 0xD6 0xCA 0x82 0x08 0x04 0x08 ...
14:53:22.6	Decoded MSD message	Redundancy version 0 of MSD according to EN 15722 2011, decoded successfully
14:55:49.5	GSM results	Dialed number ""00302106563619""
14:55:53.6	Raw MSD	Redundancy Version = 0 - 0x01 0x00 0x05 0x05 0xD6 0xCA 0x82 0x08 0x04 0x08 ...
14:55:53.6	Decoded MSD message	Redundancy version 0 of MSD according to EN 15722 2011, decoded successfully
14:58:48.7	Raw MSD	Redundancy Version = 0 - 0x01 0x00 0x05 0x05 0xD6 0xCA 0x82 0x08 0x04 0x08 ...
14:58:48.7	Decoded MSD message	Redundancy version 0 of MSD according to EN 15722 2011, decoded successfully

Notification History Results overview Message Trace Log

Edit PSAP Detailed results Control

Data channel is established

Results - RAW MSD Transmission

CMW-KA09x GUI V 3.3.0

Base Device Setup View Settings Info

Measurement Statistics Overview X

Simulation disabled

Radio Access Network

IVS Call est.

CMW - GSM Call est.

PSAP ERA-GLONASS Ready for eCall

None

Message Trace & Results

Time	Protocol	Message	Source	Destr	Details - Filter by details
13:45:40.8		GSM results			Dialed number '0'
13:45:41.7	eCall	PUSH message	UE/IVS	PSAP	Push message counter: 1
13:45:41.7	eCall	PUSH message	UE/IVS	PSAP	Push message counter: 2
13:45:41.7	eCall	START message	PSAP	UE/IVS	No further info available
13:45:44.9		Raw MSD voice			Redundancy Version = 0 - 0x02 0x44 0x05 0x01 0xD6 0xC4 0x82 0x08 0x04 0x08 ...
13:45:44.9		Decoded ERA-GLONASS			Decoded MSD successful + Unknown additional data with oid '1.0.14817.106.2.1'
13:45:45.0	eCall	MSD message	UE/IVS	PSAP	RV 0 FAST modulation

Notification History Message Trace & Results Log

Data channel is established

Detailed results

The raw, undecoded MSD as received by the PSAP via the voice channel
Timestamp: 2016.02.02 - 13:45:44.9

Field overview:

Name	Content	Unit
msd	Byte[140]	
Modulation type	Fast	
Uplink data part	3	
Redundancy version	0	
Description	'Raw MSD data OK'	
Time since start	3,21	seconds
Time since call established	4,2	seconds
MSD Transmission Time	1,477	seconds
Measurement ID	1002	

Raw MSD content:

Position [Byte]	Hex [MSB first]	Binary [MSB first]
0	02	00000010
1	44	01000100
2	05	00000101
3	01	00000001
4	D6	11010110
5	CA	11001010
6	82	10000010
7	08	00001000
8	04	00000100
9	08	00001000
10	52	01010010
11	96	10010110
12	00	00000000
13	00	00000000
14	06	00000110
15	04	00000100
16	44	01000100
17	10	00010000
18	00	00000000
19	00	00000000
20	01	00000001
21	27	00100111
22	02	11111111

Detailed results ERA-GLONASS SMS Commands Edit PSAP ERA-GLONASS Control

Results - Decoded MSD

CMW-KA09x GUI V 3.3.0

Base Device Setup View Settings Info

Measurement Statistics Overview X

Simulation disabled

Radio Access Network

IVS Call est.

CMW - GSM Call est.

PSAP ERA-GLONASS Ready for eCall

None

Message Trace & Results

Time	Protocol	Message	Source	Destri	Details - Filter by details
13:45:40.8		GSM results			Dialed number '0'
13:45:41.7	eCall	PUSH message	UE/IVS	PSAP	Push message counter: 1
13:45:41.7	eCall	PUSH message	UE/IVS	PSAP	Push message counter: 2
13:45:41.7	eCall	START message	PSAP	UE/IVS	No further info available
13:45:44.9		Raw MSD Voice			Redundancy Version = 0 - 0x02 0x44 0x05 0x01 0x06 0xCA 0x82 0x08 0x04 0x08 ...
13:45:44.9		Decoded MSD	ERA-GLONASS		Decoded MSD successful + Unknown additional data with oid '1.0.14817.106.2.1'
13:45:45.0	eCall	MSD message	UE/IVS	PSAP	RV 0 FAST modulation

Notification History Message Trace & Results Log

Data channel is established

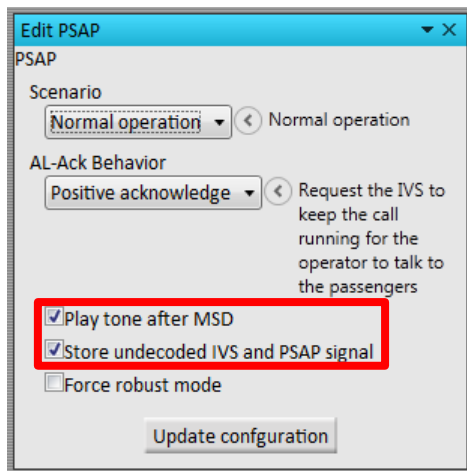
Detailed results

Decoded MSD message according to GOST R 54620 2011 Revision 1 data
Timestamp: 2016.02.02 - 13:45:44.9

- MSD (ECallMessage)
 - ID = 2
 - Minimum Set Of Data (MSDMessage)
 - MSD structure
 - Message identifier = 1
 - Control
 - Automatic activation = False
 - Test call = True
 - Position can be trusted = False
 - Vehicle type = Passenger vehicle class M1
 - VIN
 - World Manufacturer Index = 'WUA'
 - Vehicle Type Descriptor = 'ZZZ425'
 - Modelyear = 'A'
 - Plant code and sequential number = 'N000614'
 - Vehicle propulsion storage type
 - Gasoline tank present = True
 - Diesel tank present = False
 - Compressed natural gas = False
 - Liquid propane gas = False
 - Electric energy storage = False
 - Hydrogen storage = False
 - Timestamp = 18 [Seconds since midnight 01.01.1970 UTC]
 - Vehicle location
 - Latitude = -1 [milli-arc-seconds]
 - Longitude = -1 [milli-arc-seconds]
 - Vehicle direction = 255 [2°]
 - Recent vehicle location 1 (optional / not present)
 - Recent vehicle location 2 (optional / not present)
 - Number of passengers = 4
 - Optional Additional Data (AdditionalData)
 - Object Identifier = int32[6] - [0x00000000, 0x000039E1, ...]
 - Data = byte[8] - [0x01, 0x23, 0x45, ...]
 - Additional Data (DecodedMsdAdditionalDataUnknown)
 - Decoding Information = 'Unknown additional data with oid '1.0.14817.106.2.1''
 - Decoding Status = Failed
 - Decoding Information = 'Redundancy version 0 of MSD according to GOST R 54620 V2011 R1, deco'
 - Decoding Status = Successful
 - Measurement ID = 1002

Detailed results ERA-GLONASS SMS Commands Edit PSAP ERA-GLONASS Control

PSAP Configuration - Offline Signal Analysis



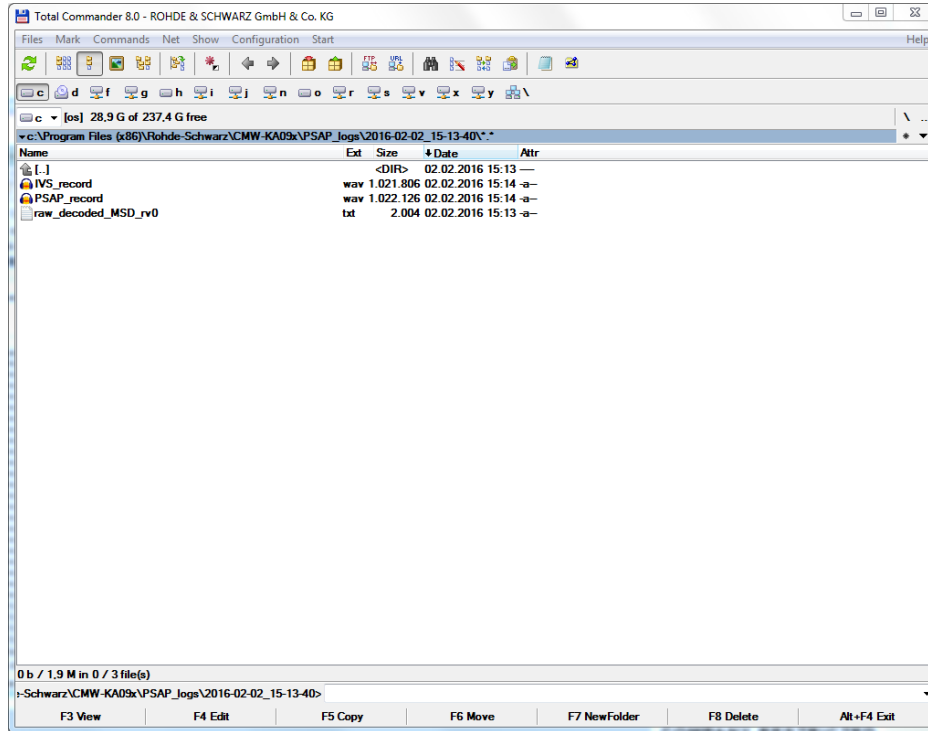
The IVS supports two modulation modes, a fast modulation mode and a robust modulation mode.

- Under normal conditions, an MSD transmission is expected to succeed in fast modulation mode.
- The robust modulation mode serves as a fallback solution if a transmission fails in unusually difficult environments.

- The modulation modes merely differ by symbol duration, i.e., the length of the modulation frames, which is 2 ms for the fast modulation mode and 4 ms for the robust modulation mode.

PSAP - Offline Signal Analysis

Wav-File recording



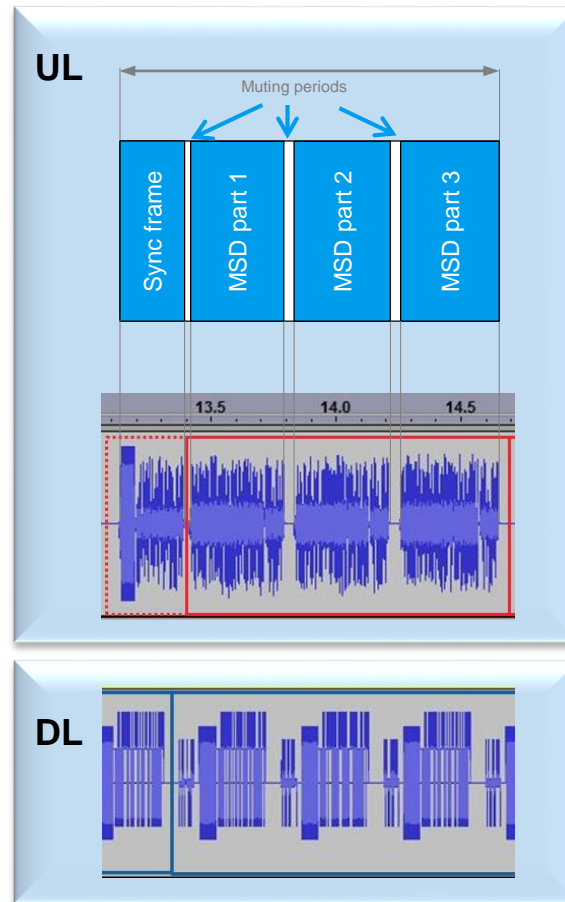
MSD transmission

UL transmission frame and DL feedback

■ UL: Minimum Set of Data (MSD):

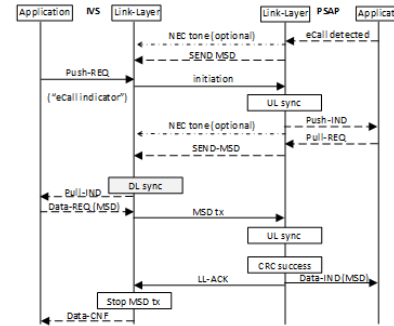
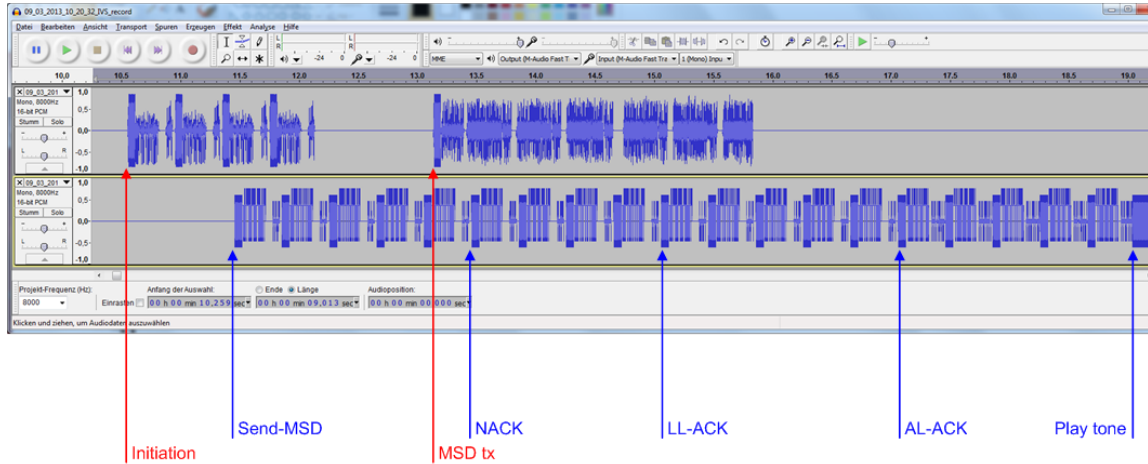
- The IVS transmitter modulates the MSD data to generate signals suitable for transmission over the in-band voice channel to the PSAP
- The MSD is represented by a field of 140 bytes, protected by a 28 bit CRC code (prior to HARQ FEC encoding).
- 1 MSD contains 3 data parts and 4 muting periods in-between + preceding synchronization frame
- requirement: < 4 seconds MSD transmission time

■ DL message contains NACK if CRC failed etc. (check length of signal)

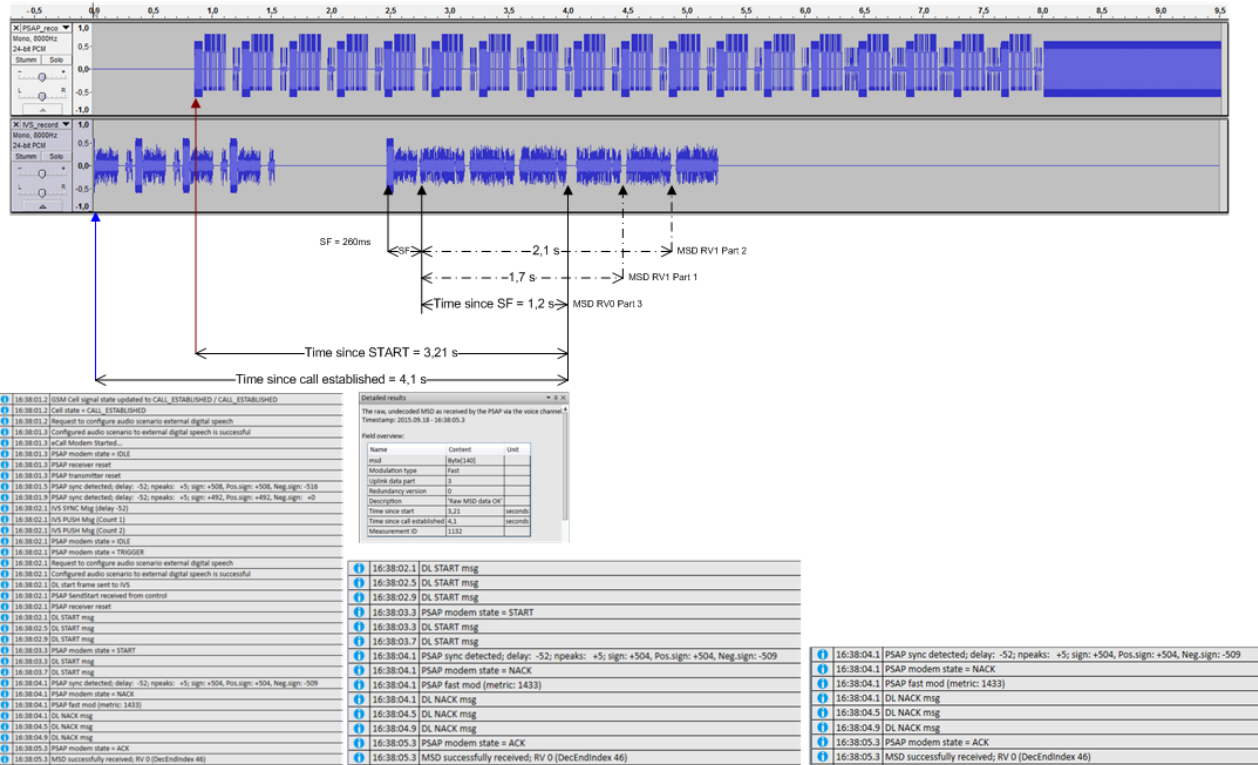


NACK = Non-Acknowledgement, CRC = Cyclic redundancy check, DL = downlink, UL = uplink

MSD transmission



MSD transmission

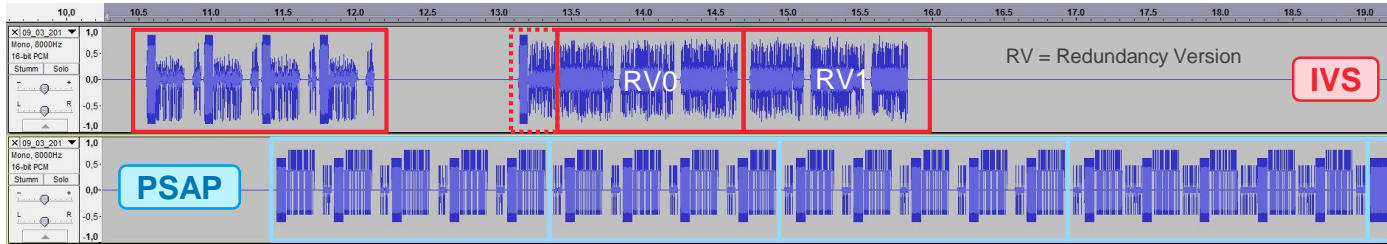


Picture 1: Time since Call Established

Picture 2: Time since START

Picture 3: Time since SF

MSD transfer sequence (HLAP flow diagram)



eCall signaling procedure:

Initiation: In the event of an accident, IVS establishes an automatic 112 voice call => continuous start messages are sent (max. 5x)

Send-MSD: PSAP receives emergency call and triggers MSD transmission (PULL mode mandatory), continuously sends start until it detects the first incoming sync frame

MSD-tx: IVS sends sync frame (dotted) after 3 successfully decoded START messages, MSD RV0 in 3 blocks (fast mode), then MSD RV1 (since IVS receives first NACK, but discontinued after receiving LL-ACK)

NACK: PSAP detects uplink sync and continuously transmits NACK

LL-ACK: PSAP tries to decode MSD after complete reception of RV0, and after each data part of subsequent RVs

AL-ACK: Upon CRC success, PSAP sends 3 ACK messages and then stops transmission => voice channel is un-muted

Play tone: To test the voice channel in the R&S PSAP implementation a 1kHz sine tone is played

