EFFICIENT 4G AND 5G NEXT GENERATION eCall VERIFICATION

End-to-end conformance testing of 4G and 5G next generation eCall (NG eCall) modules under controlled network conditions

NG eCall end-to-end conformance test setup with the R&S®CMX500 radio communication tester, the R&S®SMBV100B vector signal generator (as GNSS simulator) and the R&S®CMX-KA098 comprehensive eCall verification software

Your task

eCall is an automotive system that automatically dials the European emergency number 112 in the event of a serious accident. Currently, eCall systems use 2G GSM or 3G UMTS networks, but these will be replaced by 4G LTE and 5G NR networks in Europe in the coming years. This change will also affect the 112 emergency call, which will be replaced by an IP multimedia subsystem (IMS) emergency call using the IMS as an enabler.

To ensure the proper functioning and compliance of NG eCall systems in their vehicles, car manufacturers must adhere to regulations and standards from organizations such as CEN, ETSI, UN and Euro NCAP. Compliance with the technical specification CEN/TS 17240 for NG eCall systems is required, which includes testing for correct transmission of the minimum set of data (MSD), location accuracy and uninterrupted voice communications during emergency calls.

Manufacturers must take a comprehensive approach early in the development and integration of NG eCall into vehicles to ensure compliance with all relevant regulations and standards. Testing NG eCall system conformance and preparing vehicles for the future through field testing in real-world mobile network and satellite environments alone can be time-consuming, costly and challenging. This is especially true for testing related to IMS, which is part of the core network, as test results can be hard to obtain and may not be reproducible in such an environment. Certified testing solutions can help avoid delays and increased costs by thoroughly testing all aspects of the system to ensure its reliability, safety and effectiveness in a reproducible test environment. These test solutions can confirm that the NG eCall module meets the required regulations.

Rohde & Schwarz solution

Rohde & Schwarz provides a testing system for NG eCall modules. This system is built on the:
▶ R&S®CMX500 radio communication tester
▶ R&S®SMBV100B vector signal generator (as GNSS simulator)
▶ R&S®CMX-KA098 comprehensive eCall verification software

The R&S®CMX-KA098 software emulates an NG eCall-capable public safety answering point (PSAP) and controls the R&S®CMX500, which simulates a 4G LTE or 5G NR cellular network, including the necessary IMS infrastructure.

This setup can be fully managed in your lab to verify whether the eCall in-vehicle system (IVS) can:
▶ Trigger an NG eCall over 4G or 5G
▶ Choose the correct network
▶ Obtain its GNSS position
▶ Send accurate MSD including GNSS position
▶ Establish a voice connection via voice over LTE (VoLTE) or voice over NR (VoNR) to the PSAP

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Make ideas real

The received MSD data is available in both raw and decoded formats, showing all transmitted values, including mandatory fields like position information. Because this testing takes place in a simulated environment, independent of the real-world mobile network, true 112 calls can be placed without risk.

The R&S®SMBV100B can function as a GNSS signal generator, allowing for position accuracy measurements based on the IVS's MSD. It also offers precise GNSS receiver performance testing.

To simplify NG eCall tests, you can use the R&S®CMWrun sequencer software tool, which provides ready-to-use test sequences for end-to-end conformance testing according to relevant standards.

▶ The R&S®CMX-KF671B option tests NG eCall conformity against the CEN/TS 17240 standard
▶ The R&S®SMBV-KT361 package automates GNSS receiver testing with the R&S®CMWrun

The user-friendly interface lets you select and combine required test sequences, and the software automatically sets up test instruments and the PSAP remotely. It runs the selected tests and produces a complete test report with pass/fail indications for each test case.

To achieve optimal eCall voice quality, car manufacturers can enhance their test system with the HEAD acoustics labCORE modular hardware platform for tests of voice and audio quality. The R&S®CMX500 simulates a controllable 4G or 5G mobile network, and together with the HEAD acoustics labCORE and ACQUA software, it enables high-precision speech quality analysis. Using ACQUA measurement and analysis software, you can measure audio delay
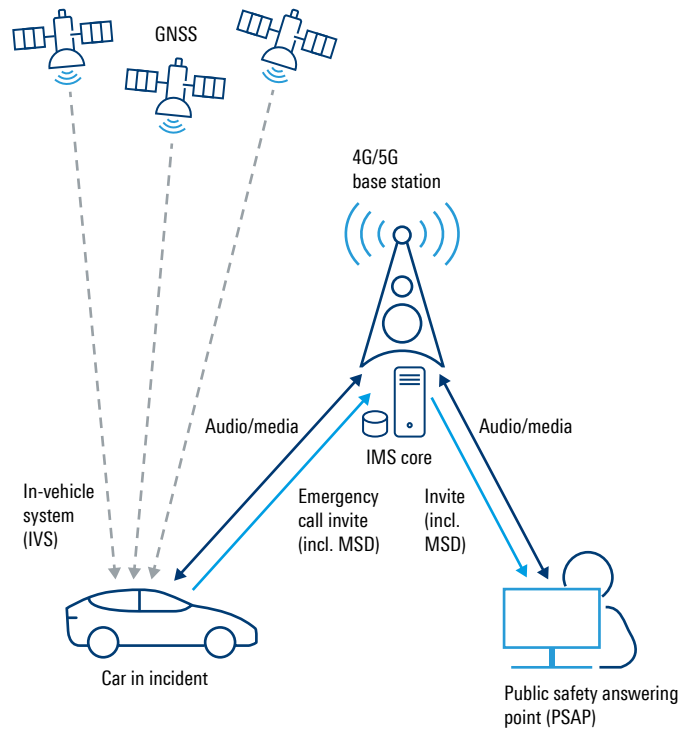
Basic setup for verification of next generation eCall functionality in an IVS

eCall speech quality test setup

and voice quality, ensuring dependable communication and the best possible voice quality for eCall and other voice applications in vehicles during emergencies.

Summary
The test system based on the R&S®CMX500 radio communication tester and the R&S®SMBV100B GNSS simulator allows for independent testing of NG eCall modules, including GNSS performance measurements and automated conformance tests. The R&S®CMWrun sequencer software tool simplifies NG eCall tests with ready-to-use test sequences and a complete test report. For optimal eCall voice quality, car manufacturers can expand their test system to include the HEAD acoustics labCORE for high-precision speech quality analysis. This process ensures reliable communications and the best possible voice quality for eCall and other voice applications in vehicles during emergencies.

These test solutions can confirm that the NG eCall module meets the required regulations.

See also
www.rohde-schwarz.com/product/cmw-ka09x

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