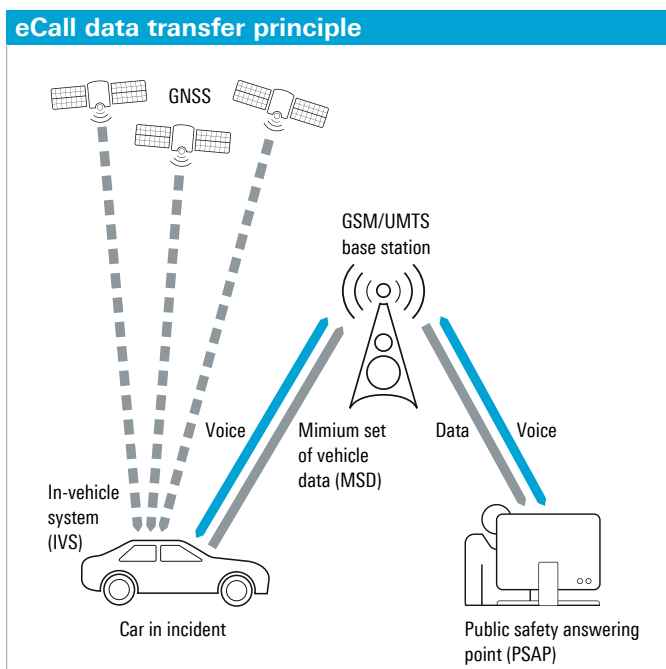# Test your eCall in-vehicle system modules reliably

The R&S®CMW500 and R&S®SMBV100A are the ideal team for testing your eCall system's cellular modem and GNSS receiver in a lab environment.

In case of an accident, the eCall system establishes a full-duplex data communications link between the in-vehicle system (IVS) and the local public safety answering point (PSAP) via the cellular network. The IVS transfers a standardized minimum set of data (MSD) containing information such as the number of passengers, the timestamp and the GNSS coordinates of the accident. Additionally, a voice connection is established, as the car occupant might be able to speak.

eCall in-vehicle systems consist of several components including a dedicated cellular communications module with antenna (such as for GSM or UMTS) for sending the emergency call, a GNSS receiver for determining the accident location, crash sensors for detecting the accident, a microphone and loudspeaker for voice communications, an emergency power supply, and a pushbutton for manual activation of eCall.

As a safety system, eCall demands high reliability, and correct MSD data transmission must be ensured. This is particularly critical in cellular networks optimized for voice transmissions such as GSM. Testing eCall system components or overall system performance in a real-life mobile network and satellite environment can easily become time-consuming and costly. For example, testing the eCall flag in a real-life environment implies great effort because the flag alerts the PSAP. As environmental conditions might change, test results are also hardly reproducible.

eCall data transfer principle

Your task

The European Union aims to have intelligent telematics-based vehicle safety systems in place throughout the EU by 2015 to speed up emergency response times in order to save human lives. eCall (emergency call) is an electronic safety system for cars that automatically calls 112 for local emergency medical services in the event of a serious road accident. Manual activation is also possible.

T&M solution

Rohde & Schwarz offers a compact solution for reliable and reproducible end-to-end conformance tests of eCall modules in line with CEN/TS 16454:2012. The R&S®CMW-KA094 eCall application software simulates a PSAP and remotely controls the R&S®CMW500 wideband radio communication tester to emulate a cellular network in the lab. The test software also controls the R&S®SMBV100A vector signal generator, which provides GNSS coordinates required by the IVS to compile the MSD. This setup makes it possible, for example, to test if the IVS modem is able to trigger an eCall, send the correct MSD data and establish a voice connection with the PSAP.

ROHDE & SCHWARZ

Controlled by R&S®CMW-KA094, the R&S®CMW500 verifies if the IVS is in line with the eCall standards. This includes for example the test of PUSH mode, PULL mode, MSD transmission time, MSD decoding and recording of undecoded IVS audio signals.

In addition to conforming to the eCall specification, the GNSS receiver performance of an IVS module is important in terms of accuracy and for determining correct coordinates even under weak signal conditions. Being a full-fledged satellite simulator for GNSS, the R&S®SMBV100A is also the ideal instrument for testing the capabilities of GNSS receivers.

The R&S®SMBV100A can simulate a wide variety of scenarios, from simple setups with individual, static satellites all the way to flexible scenarios generated in realtime with up to 24 dynamic GPS (C/A and P code), Glonass and Galileo satellites. Only a few keystrokes are needed to generate even complex scenarios, unlimited in time with on-the-fly exchange of satellites, including hybrid GPS, Glonass and Galileo constellations.
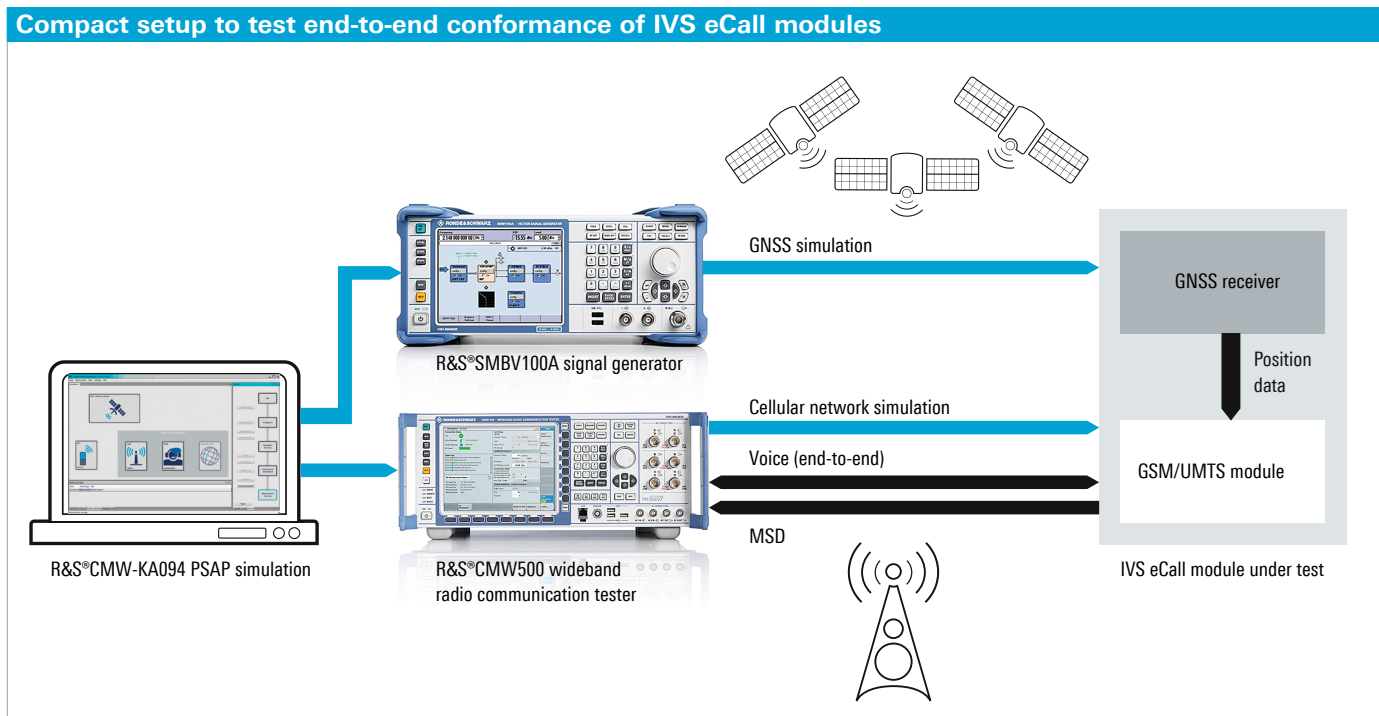
Users can load an almanac or RINEX file to get the up-to-date satellite orbits. Both stationary geographic positions and moving scenarios that simulate the movement of the receiver, i.e. a car, along any user-defined route are possible.

In addition, the R&S®SMBV100A is also able to simulate realistic transmission conditions through the use of multipath signal generation, by modeling atmospheric effects, or by automatically simulating signal obstruction caused by buildings or other obstacles. Simulation of different geographic positions and real-life environmental conditions is important for testing if the GNSS receiver will be able to determine the correct GNSS coordinates with the required accuracy in the field. Furthermore, the signal strength of individual satellites can be controlled interactively to simulate conditions of restricted satellite visibility as can occur in (urban) canyons or forests, where accidents are likely to happen.

The computer-based R&S®CMW-KA094 eCall test software in combination with the R&S®CMW500 and R&S®SMBV100A is the ideal solution for standard-compliant conformance testing of your IVS modules. Moreover, the unrivaled satellite simulation capabilities of the R&S®SMBV100A also allow detailed testing of GNSS receiver performance. The instruments are a future-ready investment and can be upgraded to meet upcoming test requirements.

See also:
www.rohde-schwarz.com/product/SMBV100A
www.rohde-schwarz.com/product/CMW500_overview

Compact setup to test end-to-end conformance of IVS eCall modules

R&S®SMBV100A signal generator

R&S®CMW-KA094 PSAP simulation

R&S®CMW500 wideband radio communication tester

GNSS simulation

Cellular network simulation

Voice (end-to-end)

MSD

GNSS receiver

Position data

GSM/UMTS module

IVS eCall module under test