Cellular V2X end-to-end application layer test

Verification of safety-critical scenarios in the lab

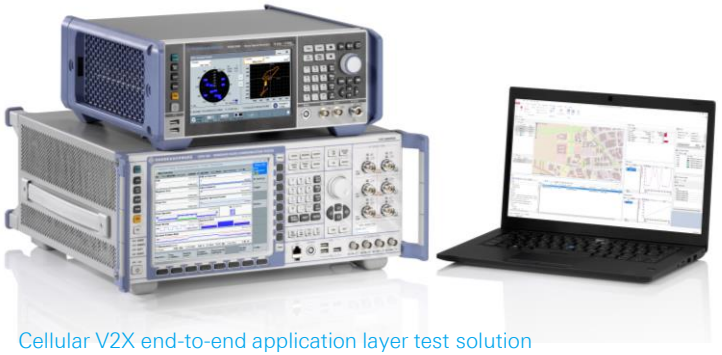
Challenge

- The automotive industry is evolving towards connected and autonomous vehicles that offer many benefits by equipping vehicles with 3GPP Release 14 C-V2X ECUs
- Simulate reliable, repeatable and easy to verify safety-critical end-to-end V2X scenarios in a lab environment
- Test the complete stack, 3GPP radio access layers for C-V2X mode 4, region-specific ITS protocol layers (EU and US) and the ITS application message sets
- Have a test system with multiple options for automotive bus connectivity such as CAN, LIN, MOST, FlexRay and automotive Ethernet to analyze or stimulate the ECU within an entire system from your desk

Solution

- Combined setup consisting of the R&S®CMW500 LTE network simulator, the R&S®SMBV100A/B GNSS simulator and Vector CANoe .Car2x to develop and test C-V2X based communication applications.
- Configure and run traffic scenarios to comprehensively test your C-V2X application from the 3GPP radio access layer for C-V2X mode 4 up to the application layer of C-V2X ECUs.
- The test station can emulating a large number of vehicles in real life scenarios such as road intersections and congestion on a freeway, allowing the user to verify their C-V2X application or to stress test the DUT.

Your benefit	Features
Tests are 100 % reproducible	The solution can be used to emulate **real life scenarios in a lab environment** and makes sure that scenarios are **fully reproducible**, which makes the solution ideal for validating safety-critical V2X scenarios in the lab.
Tests cover all layers	The **R&S®CMW500** in combination with the **R&S®SMBV** and **Vector CANoe** software gives the user the flexibility to test all layers of C-V2X ECUs.
Support of all common automotive bus connectivity	The test solution allows bus connectivity via CAN, LIN, MOST, FlexRay, automotive Ethernet, etc. to analyze or stimulate the ECU remotely.
Extendable	The range of tests can be easily expanded by adding software options to the setup for performance protocol tests, GCF protocol conformance tests and RF measurements.

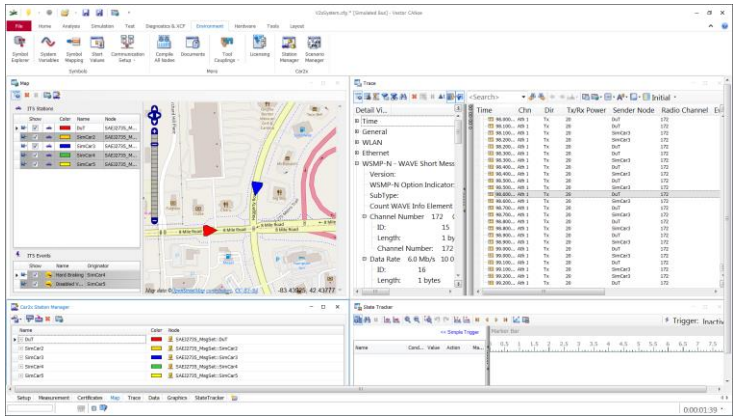


Cellular V2X end-to-end application layer test solution

Testing of specific use cases such as:

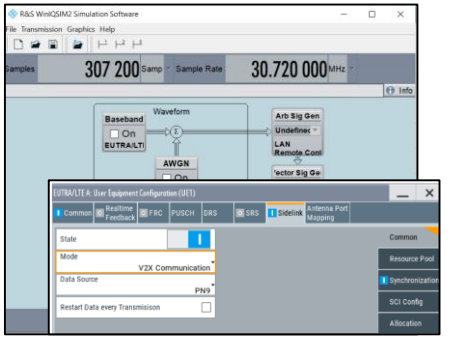
- Emergency electronic brake light (EEBL)
- Left turn assist (LTA)
- Intersection movement assist (IMA)
- Congested highway with multiple simulated cars

Vector CANoe .Car2x



Vector CANoe .Car2x, a comprehensive software tool for simulating, developing and testing V2X based communication applications

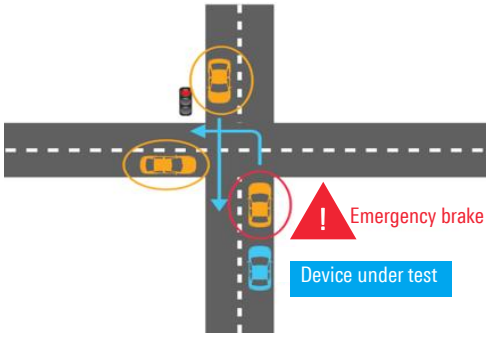
C-V2X RF measurements and waveform creation



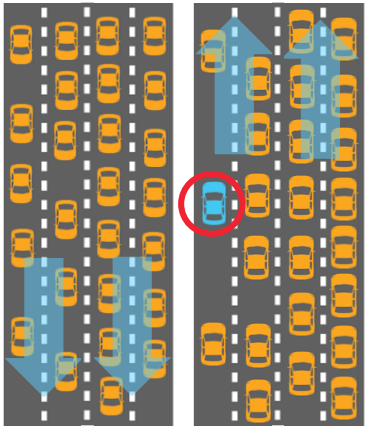
- The R&S®CMW500 provides specific TX measurements for C-V2X and can assess the performance of a C-V2X RF transmitter with the R&S®CMW-KM570 option
- R&S®WinIQSIM2™ with the R&S®CMW-KW570 and R&S®CMW-KW500 options allow user-defined C-V2X waveforms to be created for RX receiver tests
- R&S®CMW-KV1xxA option enables RX test of specific C-V2X chipsets with predefined waveforms

Test scenario examples:

Emergency electronic brake light (EEBL)



Congested highway (performance test)



The device under test (DUT) is verified in a scenario with multiple simulated cars and receives an emergency electronic brake light warning message or is tested in a congestion scenario

Other C-V2X test solutions offered by Rohde & Schwarz

R&S®CMW100 K06

R&S®CMW100 K06
- C-V2X and 5G NR sub 6 GHz production testing

R&S®SMBV

R&S®CMW500 and R&S®SMBV100B protocol test solution
- Data transmission and data reception test cases
- Performance test cases with various fading profiles
- GCF validated protocol conformance test cases

▷ For more information, visit
www.rohde-schwarz.com/_234250.html
www.vector.com/canoe_car2x/

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