

Automotive performance testing with R&S®CMWcards

R&S®CMWcards is an intuitive and user-friendly software application that makes mobility verification easier than ever.



Your task

A telematic control unit (TCU) is an embedded system that enables vehicle tracking. It is quickly becoming a crucial part of vehicle architectures. A TCU includes technology for positioning, mobile communications (including 2G, 3G, LTE or 5G), non-cellular technology (e.g. Bluetooth®, WLAN) and other processing capabilities.

A reliable mobile communications connection is essential for excellent user experience even under very challenging radiochannel propagation conditions and stressful application scenarios.

A scenario such as the TCU being in a deep fade, for example, can result in a temporary failure of communications due to the severe drop in the channel's signal-to-noise ratio.

Take the example of a car performing a firmware update while moving in an urban area where the device receives a distorted signal. Due to multipath fading, Doppler effects, etc., the procedure will immediately suffer from degraded data service. This leads directly to a poor user experience.

Utilizing multiple radio technologies in the vehicle's TCU means a high probability of interference. LTE, Bluetooth® and WLAN can simultaneously operate in the 2.4 GHz band. It is an important topic of coexistence to ensure that these radio modules do not interfere with each other.

To mitigate the fading effect, you need to increase the radio coexistence capability and improve the TCU performance. Extensive tests must be conducted during the product design phase to ensure proper device performance, which is achievable only with a good hardware design that includes the RF frontend, an error resilient receiver as well as modern and robust digital signal processing implementations.

Rohde & Schwarz solution

R&S®CMWcards is a graphic test script creation tool that runs on the R&S®CMW500 wideband radio communication tester and requires no prior programming knowledge. You can create various signaling test scripts by simply setting up a hand of cards. In combination with a configurable radio propagation channel with different fading profiles, the test scripts can be used to benchmark the performance of your device. Each card consists of a predefined protocol procedure, yet offers the flexibility to allow the user to adjust the signaling parameters. The built-in error check functionality of each card ensures the conformity of the signaling flows.

R&S®CMWcards provides a repeatable and deterministic test environment in which test scenarios can easily be combined.

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Application

The example test script below shows how to verify the impact of fading on the device during connected mode mobility. The entire test script is as follows:

- Set up two LTE cells (LTE cells setup macro card), activate the cells (activate LTE cells macro card) and configure the cell power (configure cell power macro card) so that the power of cell 1 is higher than that of cell 2
- DUT starts and performs registration on the LTE cell registration card
- Perform RRC connection reconfiguration procedure to update the DUT with the throughput setting of the active cell 1
- Start data transmission verification using lperf (start IP data service card)
- Activate fading channel (activate fading card) with configurable fading profiles and verify the impact on the data throughput due to fading

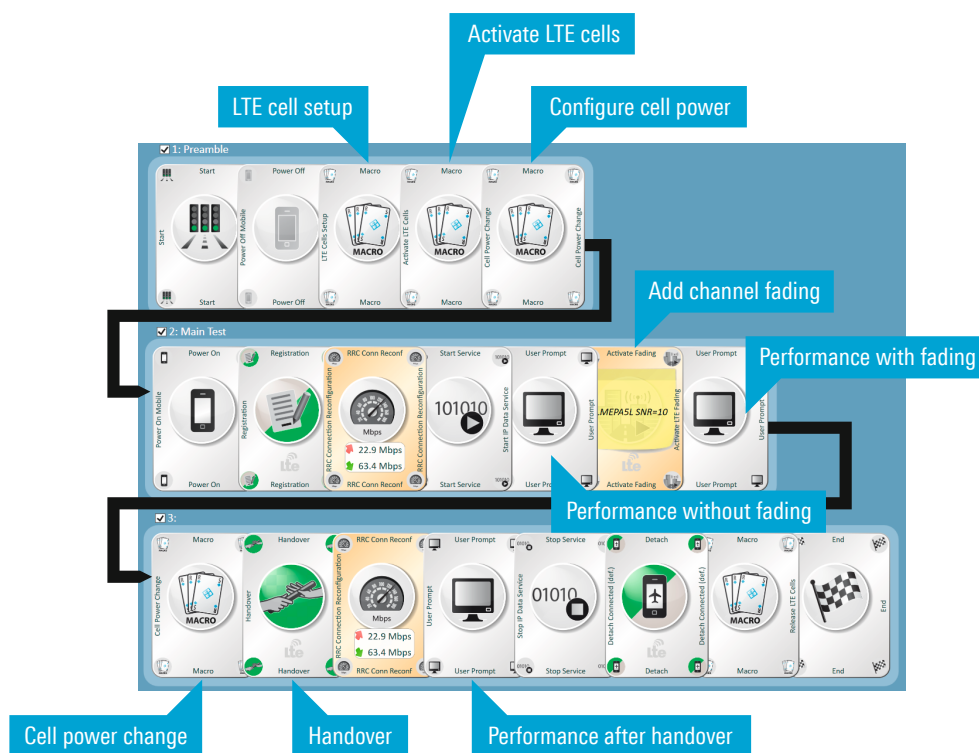
- Increase the power level of cell 2 and decrease the power of cell 1 (cell power change macro card)
- Handover from LTE cell 1 to cell 2
- Perform RRC connection reconfiguration procedure to update the DUT with the throughput setting of the active cell 1
- Stop data transmission verification (stop IP data service card)
- DUT detaches and script releases the LTE cells

R&S®CMWcards is an easy-to-use software application that helps you benchmark your product performance by generating a variety of test scripts in conjunction with challenging radiochannel conditions.

See also

<https://www.rohde-schwarz.com/CMWcards>

Example test script: data throughput impacted by channel fading



Designation	Type	Order No.
R&S®CMWcards framework	R&S®CMW-KP091	1211.0540.02
R&S®CMWcards	R&S®CMW-KT022	1207.9301.02
R&S®CMWcards advanced extension	R&S®CMW-KT026	1209.1750.02

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