

R&S®CMPQ COMPACT SOLUTION FOR 5G mmWAVE RF TESTING

Making 5G mmWave OTA testing as
reliable and efficient as sub6 testing



Product Brochure
Version 01.00

ROHDE & SCHWARZ

Make ideas real



5G ONE-BOX SOLUTIONS FROM ROHDE & SCHWARZ

The challenges associated with 5G NR require high flexibility, end-to-end package solutions and reliable measurement methods. As a long-term partner of the mobile communications industry, Rohde & Schwarz offers a comprehensive portfolio of innovative 5G NR test solutions.

For most mobile network operators, fifth generation (5G) mobile communications will initially be an additional data service for transmission rates up to 20 Gbit/s. To allow developers to test their mobile devices in 5G NR non-standalone mode in line with 3GPP specifications, the test solution must work seamlessly in both LTE and 5G NR networks.

5G non-signaling solutions

For 5G NR FR2 testing (mmWave), Rohde & Schwarz offers the R&S®CMPO. The R&S®CMPO is a compact solution based on the R&S®CMP200 radio communication tester in combination with the R&S®CMPHEAD30 remote radio head (RRH) and the R&S®CMQ200 shielding cube. The instruments are matched to each other. Together they form an easy-to-use, cutting-edge test solution with a wide

variety of combination options. The FR1 sub6 solution consists of the well-known R&S®CMW100 communications manufacturing test set and corresponding measurement software.

5G signaling solutions

The R&S®CMX500 radio communication tester adds 5G NR signaling tests to existing LTE test and measurement solutions. Users who already have an R&S®CMW500 or R&S®CMWflexx test system for LTE measurements can continue using it and simply add an R&S®CMX500 as an extension box to perform 5G NR signaling tests. This allows them to test 5G NR use cases in non-standalone (NSA) mode in FR1 and FR2 in accordance with Option 3. For pure 5G NR test environments in FR2, all that is needed is an R&S®CMX500 radio communication tester.

Rohde & Schwarz radio communication tester portfolio

Non-signaling
(RF analyzer and generator)

Signaling
(network emulation)

LTE Advanced (plus legacy) | 5G NR sub6



R&S®CMW100



R&S®CMW minimum setup



R&S®CMX500



R&S®CMXHEAD30

5G NR mmWave (plus IF)

R&S®CMPO

Compact solution for 5G mmWave RF testing



R&S®CMQ200



R&S®CMP200



R&S®CMPHEAD30

ONE-PLATFORM STRATEGY

Just like the R&S®CMW platform for LTE, Rohde & Schwarz is sticking to the proven one-platform strategy for 5G NR. The R&S®CMP200 and R&S®CMX500 are based on this strategy.

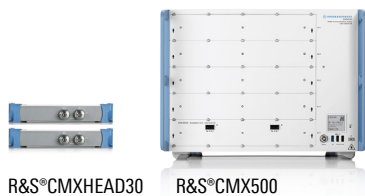
The principle of the one-platform strategy is to use the same technology, comparable hardware and the same software in all test solutions. This makes the test results comparable. The different test configurations (signaling/non-signaling) must deliver reproducibility and validated test results. Rohde & Schwarz fulfills this requirement.

Due to the higher frequencies, 5G requires complex test setups. But R&S®CMPQ users do not have to be concerned with this complexity. Rohde & Schwarz makes 5G mmWave OTA testing as reliable and efficient as sub6 testing.

The test results must provide conclusive information about the characteristics of the DUTs without – figuratively speaking – also testing the test solution. Rohde & Schwarz systems deliver accurate and consistently reproducible test results.

One-platform strategy

Signaling: sub6 + IF + mmWave



5G
FR 1/2

Technology reuse

- Same test concept
- Result traceability
- Synergy effects

Non-signaling: IF + mmWave



5G
FR 2



Identical
measurements



R&S®CMPQ – THE COMPACT SOLUTION FOR 5G mmWAVE RF TESTING IN PRODUCTION

5G devices operating in the mmWave range (FR2) require over-the-air (OTA) testing approaches since it is not possible to use RF connectors. The Rohde & Schwarz solution is the R&S®CMPQ.

To meet the measurement challenges of 5G device testing in the mmWave (mmW) frequency spectrum Rohde & Schwarz offers the R&S®CMPQ, a fully integrated solution from a single supplier. The R&S®CMPQ consists of the R&S®CMP200 radio communication tester, the R&S®CMPHEAD30 remote radio head and the R&S®CMQ200 shielding cube. The R&S®CMPQ provides accurate and reliable measurement results under radiated conditions.

The system concept of the R&S®CMPQ is completely flexible. The user can configure the individual devices and the system constellation independently of each other to create customized solutions for individual requirements.

The R&S®CMPQ is ideal for use in all phases of the product life cycle – from development to validation and quality assurance to production. The system is optimized for production applications. It is ultrafast, robust, reliable, cost efficient and flexible.

Validation of DUTs needs to be done in an OTA environment. All system components have to be matched exactly to get a reliable and efficient test setup. Rohde & Schwarz manufactures all system components, including the antennas, cables, feedthroughs, power sensors, remote radio head and non-signaling tester. This ensures optimal system parameters.

The R&S®CMPQ consists of the R&S®CMP200 radio communication tester, the R&S®CMPHEAD30 remote radio head and the R&S®CMQ200 shielding cube.



The split concept is a key feature of the one-box tester. The R&S®CMP200 can generate and analyze IF frequencies from 6 GHz to 20 GHz directly at the output. In higher frequency ranges, R&S®CMPHEAD30 seamlessly takes over this function.

The R&S®CMPO is a future-proof investment. Rohde&Schwarz continually enhances the R&S®CMPO solution with new hardware and software to meet present and future requirements and specifications.

System software

R&S®CMsquares

The Rohde&Schwarz system software has a new dashboard style with access to all types of applications. This unique user interface is controlled via a web GUI. All new 5G radio communication testers from Rohde&Schwarz are controlled via a standardized GUI for a unified user experience. The integrated sequencer simplifies setups for production tests.

General purpose (GPRF) generator

The ARB generator function allows users to play pre-defined waveforms and CW signals. Any 5G NR FR2 signals can easily be generated.



Web based GUI

General purpose (GPRF) TX measurements

A generic set of RF measurements, such as frequency selective power, FFT spectrum analyzer, I/Q versus slot, I/Q recorder and power measurement with R&S®NRPM module.

5G NR FR2 TX measurements

Multi-evaluation measurement covers the full set of 5G NR FR2 measurements required by 3GPP, e.g. EVM, frequency error, equalizer spectrum flatness, in-band emission, spectrum ACLR and spectrum emission mask.

Key features

- 1 Reliable system parameters and responsibility**
One partner who takes responsibility for the entire solution
- 2 Scalable**
For different use cases and production lot sizes
- 3 Fully integrated solution**
Split concept with IF tester, mmWave remote radio head and shielding cube
- 4 One-platform strategy**
Use of the same technology for signaling and non-signaling setups
- 5 Unique calibration concept**
For parameter testing in all stages of device assembly
- 6 Outstanding RF performance**
Optimized link budget, technology optimized for OTA
- 7 Functional testing**
Measurement under direct far-field (DFF) conditions
- 8 Robust**
Robust mechanical design proven in many years of production use
- 9 Multi-DUT/parallel testing**
Same feature set available as for R&S®CMW100 (production reference for 4G)
- 10 Beamforming testing**
With R&S®NRPM sensor modules
- 11 Advanced measurement methods**
Technologies for performance optimization on production lines

R&S®CMP200 RADIO COMMUNICATION TESTER AND R&S®CMPHEAD30 REMOTE RADIO HEAD

The non-signaling solution for 5G mmWave RF parametric testing

The R&S®CMP200 is an IF tester that combines vector signal analyzer and ARB based generator functionality. The compact integrated solution can be customized with up to three R&S®CMPHEAD30 remote radio heads (RRH), for up/downconverting signals to 5G FR2 frequencies.

Key facts of the R&S®CMP200

- ▶ Ultrafast measurement speed
- ▶ Parallel testing of multiple DUTs
- ▶ IF range from 6 GHz to 20 GHz
- ▶ Fully automated path correction concept

The separate one-box tester and the R&S®CMPHEAD30 RRH concept allow short RF cable lengths for an optimal link budget in radiated test environments. This approach enables testing of fully assembled FR2 devices and RFICs with both IF and mmWave RF interfaces. The multi-band R&S®CMPHEAD30 covers all important FR2 bands.

Key facts of the R&S®CMPHEAD30

- ▶ Up/downconverter for IF ↔ mmWave
- ▶ Integrated mmWave RF switch matrix provides two mmWave RF paths
- ▶ Compact size of 250 mm × 190 mm × 30 mm
- ▶ Connection of up to two mmWave single-polarized antennas
- ▶ Frequency range from 24.25 GHz to 31.80 GHz and from 37.00 GHz to 43.50 GHz

R&S®CMP200 with R&S®CMPHEAD30 on top



R&S®CMQ200 SHIELDING CUBE

The compact shielding solution for 5G mmWave RF parametric testing

The R&S®CMQ200 is a compact and fully integrated solution to cover most 5G devices in various applications. The drawer concept enables fully automated handling in manufacturing environments. The robust mechanical design ensures millions of test cycles for reliable mass production environments. The flexible cube design covers applications for smart devices, CPEs, RFIC and prototypes. R&S®CMQ200 is ready for 5G and other technologies in the frequency range from 20 GHz to 77 GHz.

Key facts of the R&S®CMQ200

- ▶ Ready for 5G and other technologies
- ▶ Reduced floor space: fits into 19" racks
- ▶ Cost-efficient for large production lot sizes: layouts with simplified geometry
- ▶ Specially designed compact antennas available
- ▶ Antennas with special mounts and swivel heads cover all positions of DUT antenna arrays
- ▶ Power sensors with CW source available



R&S®CMQ200 with open drawer

Service that adds value

- ▶ Worldwide
- ▶ Local und personalized
- ▶ Customized and flexibel
- ▶ Uncompromising quality
- ▶ Long-term dependability

Rohde & Schwarz

The Rohde & Schwarz electronics group offers innovative solutions in the following business fields: test and measurement, broadcast and media, secure communications, cybersecurity, monitoring and network testing. Founded more than 80 years ago, the independent company which is headquartered in Munich, Germany, has an extensive sales and service network with locations in more than 70 countries.

www.rohde-schwarz.com

Sustainable product design

- ▶ Environmental compatibility and eco-footprint
- ▶ Energy efficiency and low emissions
- ▶ Longevity and optimized total cost of ownership

Certified Quality Management

ISO 9001

Certified Environmental Management

ISO 14001

Rohde & Schwarz training

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