

## Universal Radio Communication Tester R&amp;S CMU300

## Fast transmitter and receiver measurements on WCDMA base stations



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FIG 1 The R&S CMU300 is an all-in-one solution for testing WCDMA base stations.

**The R&S CMU 300 (FIG 1) now provides transmitter and receiver measurements in one instrument, not only for the GSM mobile radio standard but for WCDMA as well.**

**The new option R&S CMU-K75 for measurements on 3GPP base station transmitters complements the existing**

**WCDMA generator for tests on 3GPP base station receivers (option R&S CMU-K76 [1]).**

### Universal solution for tests on WCDMA base stations

The newly developed transmitter measurements are based on the 3GPP test specification TS25.141 (FDD) and cover all important RF tests in production, development and network support. In implementing the solution, special emphasis was placed on high measurement accuracy and measurement speed.

### The new measurements in detail

For the different measurements, the 3GPP test specification TS25.141 [2] prescribes specific test models aimed at simulating a particular channel utilization. The R&S CMU 300 supports all these test models. The use of other user-configurable channel tables is also planned.

Basically any desired test models can be selected for all measurements. For example, channel model 1.64, which contains 64 active dedicated channels (DCH), can be used for modulation measurements, although it was primarily designed for spectrum measurements.

### Code domain power (CDP)

Precise power control on the uplink and downlink is essential in CDMA systems. The CDP measurement analyzes power distribution across the individual code channels by recording and evaluating one complete WCDMA frame per measurement. The screen is divided into three sections to handle the complex signal structure (FIG 2).

The top section shows the CDP of all codes. Active code channels are highlighted in colour and combined to form a bar whose width depends on the spreading factor.

### New features at a glance

- ◆ Provision of all uplink reference channels from 12.2 kbit/s to 2048 kbit/s
- ◆ Signal generation in realtime with a test data length of up to PRBS 16 for continuous receiver measurements
- ◆ Virtually realtime response to changing RF parameters
- ◆ Comprehensive and very fast power, modulation and spectrum measurements (CDP: on average only 0.3 s per measurement)
- ◆ Convenient and clearly arranged user interface
- ◆ Compact tester with GSM / EDGE / GPRS and WCDMA standards in one instrument

- In the center section, the CDP of a selected code is displayed versus time. Since the individual code channels may be time-delayed with respect to the frame start, the center diagram contains two time scales. The common pilot chan-

nel (CPICH) is used as a reference for the different measurement results because it is not time-delayed (displayed on the first scale). A second scale refers to the selected code channel.

The bottom section displays general modulation parameters as scalar values referring to the selected CPICH slot.

### Code domain error power (CDEP)

The CDEP is an analysis of the error signal in the code domain, i.e. the projection of the error power onto the individual code channels. As with the CDP, the screen is divided into three sections (FIG 3). The CDEP is to be measured across a CPICH slot with a defined spreading factor. The display is thus much simpler than for CDP. The top diagram displays the CDEP across all codes in the selected CPICH slot.

In the center diagram, the peak code domain error power (PCDEP) is displayed for all 15 frame slots. Here too, comprehensive means for analysis are available. For example, if the PCDEP is particularly

high in one slot, the CDEP over all codes can be viewed by selecting this slot, and thus the code channel with the maximum error can be detected.

### Error vector magnitude (EVM)

EVM in the time domain corresponds to CDEP in the code domain. The EVM is the difference between the ideal reference signal and the processed test signal. In contrast to the CDEP, the error is evaluated at the chip level, so that errors are shown in the time domain on the basis of the chip offset from the selected CPICH slot. Analysis is again frame-based; therefore all RMS values of the individual slots are also displayed versus time (FIG 4).

### Occupied bandwidth (OBW) and adjacent channel leakage ratio (ACLR)

With the OBW and ACLR measurements, the R&S CMU 300 provides two inband spectrum measurements that are of great importance for assessing WCDMA transmitters (FIG 5). A high dynamic ACLR for even higher requirements will soon be available as an option.

FIG 2 Measurement of code domain power with test model 3.32.

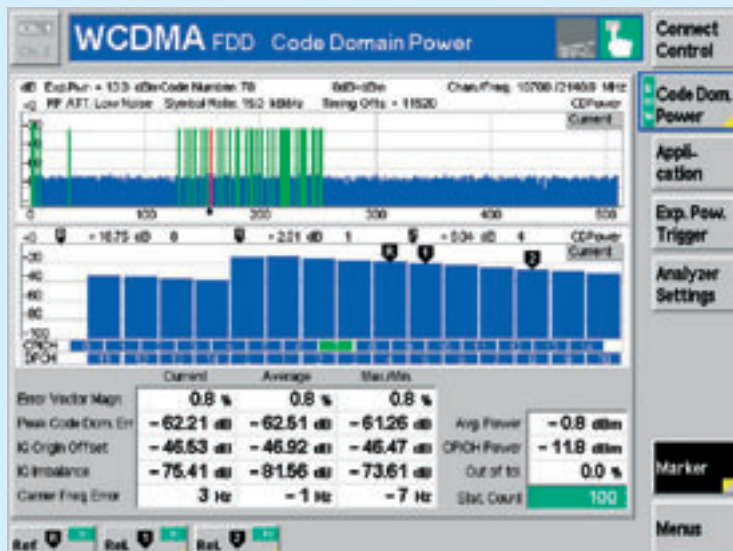
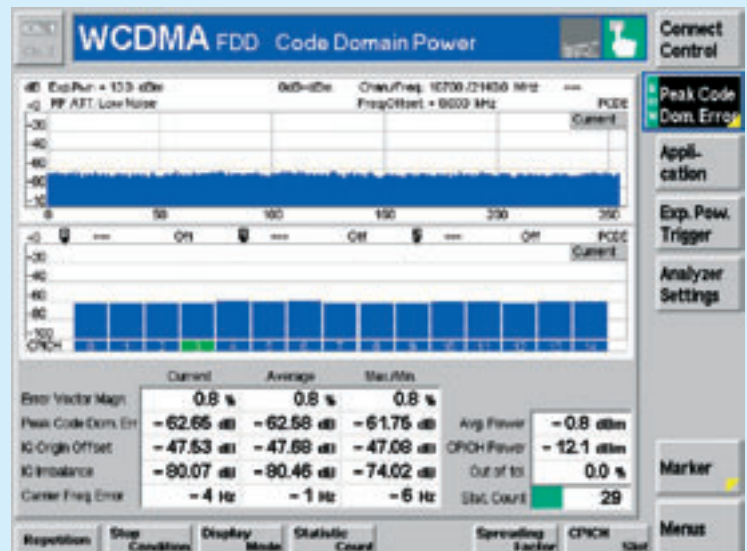


FIG 3 Measurement of code domain error power with test model 3.32.



Option	Designation	Functions
R&S CMU-K75	Software option WCDMA TX test (3GPP/FDD/DL)	Software for transmitter measurements on 3GPP FDD base stations
R&S CMU-U75	Upgrade kit Meas. DSP module for WCDMA	Universal hardware for transmitter measurements on WCDMA base stations
R&S CMU-B76	Hardware option Layer-1 board for WCDMA	Universal hardware for receiver measurements on WCDMA base stations
R&S CMU-K76	Software option WCDMA generator (3GPP/FDD/UL)	Software for receiver measurements on 3GPP base stations
R&S CMU-U76	Upgrade kit Layer-1 board for WCDMA	Contains: WCDMA layer-1 board B76 and power supply SN 250

WCDMA options for the R&S CMU 300.

### Comprehensive high-speed-transmitter measurements

With these measurements, some of which are very complex, the R&S CMU 300 again proves its high measurement speed. For example, the CDP measurement with channel model 3.32 takes only about 0.3 s/frame, even without an additional external frame trigger. Moreover, special IEC/IEEE-bus commands are planned for optimal remote-control performance.

### Summary

The newly added transmitter measurements round out the R&S CMU 300 as an all-in-one solution for testing WCDMA base stations. The radio tester is thus able to conduct all important tests on 2G (GSM), 2.5G (EDGE, GPRS, EGPRS) and 3G (WCDMA) base stations.

The development of further features such as the extension of generator functionality by BER/BLER verification (implementation of bit errors) is already

More information and data sheet at [www.rohde-schwarz.com](http://www.rohde-schwarz.com)  
(search term: CMU 300)



Technical information on WCDMA generator

#### REFERENCES

- [1] R&S CMU 300: WCDMA generator for tests on 3GPP base station receivers. News from Rohde & Schwarz (2002) No. 176, pp. 17–20.
- [2] 3GPP specifications: [www.3gpp.com](http://www.3gpp.com)

underway. With its compact design, easy handling and extremely high measurement speed, the R&S CMU 300 will maintain its role in development, production and network support also in the future. The WCDMA options can be easily added to GSM/EDGE instruments.

Anne Stephan; Rolf Lorenzen

FIG 4 Measurement of error vector magnitude.

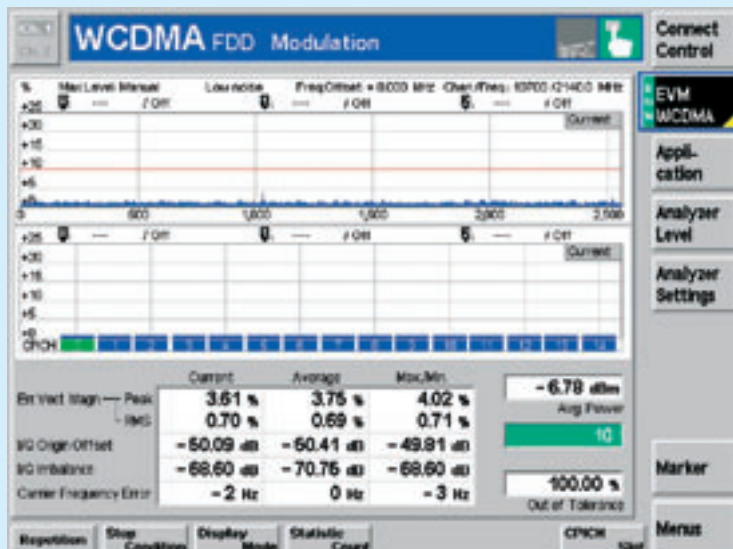


FIG 5 Measurement of adjacent channel leakage ratio.

