Universal Radio Communication Tester CMU 300

RF tests on base stations – comprehensive, fast and accurate

Photo 43 641/1N

FIG 1 CMU 300, specialist for base stations

15 months after the successful launch of Universal Radio Communication Tester CMU 200 [*], and set up on the same platform, Rohde & Schwarz presents Base Station Tester CMU 300 (FIG 1). This model was specially developed to meet the more stringent demands involved in RF parameter measurements on base stations.

Based on proven platform

Created from the same platform as CMU 200, CMU 300 offers all the highlights of this modern tester generation: maximum measurement accuracy and speed combined with extremely high reliability and repeatability. The new instrument from Rohde & Schwarz is tailor-made for tests on base stations in development, production, installation and service. The unit is intended for testing the U_M air interface of base stations and follows GSM specification 11.21 (ETSI TS 101087).

CMU 300 keeps pace with the evolution of modern digital mobile radio, supporting GSM (2G) and EDGE (2.5G), and an extension is planned to add 3G functionality.

Compact, top-performance tester

In bit-error-rate measurements, the capability of CMU 300 to generate and decode signals for different channels in realtime is of particular importance. This is the key prerequisite for automatic measurement of limit sensitivity, or for signalling at higher layers, e. g. to simulate the functions of mobile stations.

Another strong point of CMU 300 is its flexible adaptation to entirely different test environments. From the pseudo-random noise generator to the DUT to BER analysis, it supports a variety of test paths. For example, the test signal may be taken via various loops within the base transceiver station (BTS) – with or without channel coding – or via the A_{bis} interface. Plus, CMU 300 itself can act as an RF loop, likewise with and without channel coding (FIG 2).

In contrast to mobile radio tests, where a tester can control DUTs entirely via the RF interface, base stations need to be driven by an external controller. Like in a real network, this is done by a base station controller (BSC) via the A_{bis} interface or, when a PC is used, a base-station-specific interface. The external controller activates the RF channels to be tested in the BTS.

The base station is linked via its antenna or test connectors to the powerful front-end of CMU 300. The tester incorporates an RF switching matrix with four user-configurable inputs and outputs for optimum matching to the RF test environment. Two of the inputs / outputs are duplex-capable. The first (RF 1) is intended for connection to a high-power base station of max. +47 dBm output power, the second (RF 2) for micro base stations of max. +33 dBm output. CMU 300 additionally features a highly sensitive input (RF 4 IN) and a high-level output (RF 3 OUT).

Two operating modes

The instrument supports two operating modes. Non-signalling mode is particularly suitable for testing GSM RF boards/modules with little or no signalling activity. As soon as a GSM RF signal appears at the tester input, the transmitter parameters are measured. A GSM generator for stimulating the DUT is available too.

More important is signalling mode, however, because here the tester operates synchronously with the BTS, i. e. synchronized with the TDMA frame structure – vital for receiver bit-error-rate measurement. Transmitter parameters can also be tested separately for each timeslot. This function is necessary for testing base stations that support both GSM and EDGE.

The instrument can be synchronized to the base station in the following ways:

- If the BTS has a multiframe clock output, the signal can be used to trigger CMU 300. This requires an additional trigger line.
- If only the RF connection is used, the tester can synchronize to the C0 carrier of the base station, just like a mobile phone. This simplifies the test setup. However, a C0 carrier must be activated in the BTS before measuring the useful channel.

Tailor-made with options

CMU 300 already offers signal generator and spectrum analyzer functionality in its basic version. It is turned into a radiocommunication tester (transmitter and receiver measurements for GMSK modulation) by adding hardware option CMU-B 21 (signalling unit) and one of the five GSM software options (CMU-K 30 through CMU-K 34). In this way all GPRS channel coders are available as an essential feature in CMU 300.

The named GSM functionalities can be extended to EDGE (transmitter and receiver measurements for 3/4 π 8PSK modulation) by software option CMU-K41, which also adds EGPRS channel coders (FIGs 3 and 4).

FIG 2 For bit-error-rate measurements, a bit sequence can be selected from a list, or CMU 300 itself can be used as an RF loop if the DUT sends the data stream

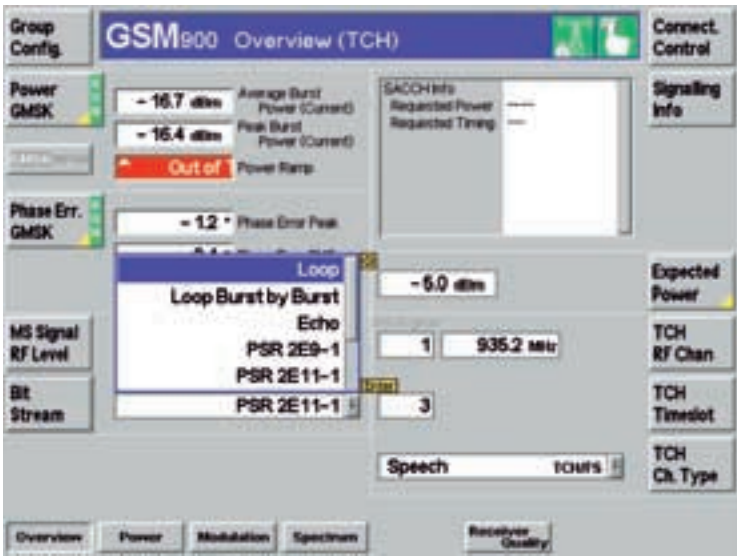
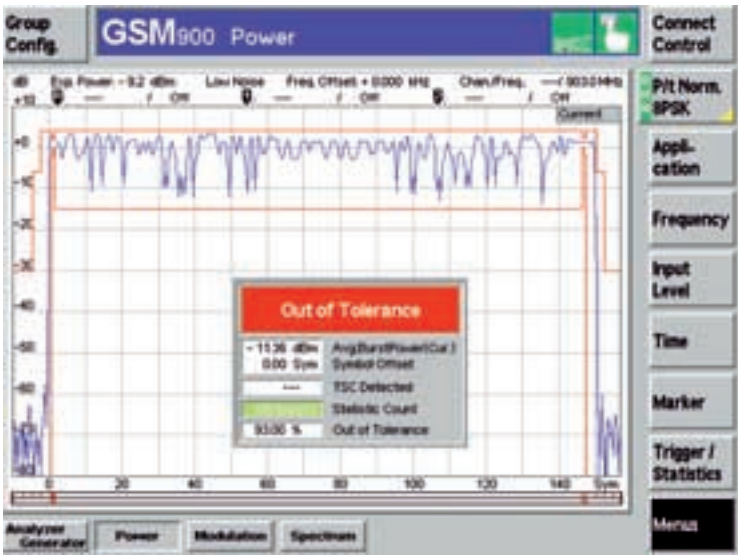


FIG 3 Power-versus-time measurement of an 8 PSK-modulated burst showing the high crest factor typical of EDGE signals



Software option CMU-K39 allows link setup using MOC/MTC (mobile originated/terminated call) standard signalling. This is necessary when you want to test the signalling software of the base station, too, and receive its measurement reports or measure in hopping mode. Software options CMU-K39 and CMU-K41 produce the functionality in each case for all installed GSM options.

Available hardware options include a highly accurate, oven-controlled crystal (CMU-B12) and an A_{bis} board (CMU-B71). The latter is needed for BER tests where the bit pattern sent by CMU300 cannot be returned via an internal loop of the BTS. The bit pattern is in this case returned to CMU300 via the A_{bis} interface between the BTS and BSC.

The tester is equipped as standard with two PCMCIA slots, but can also be supplied with a disk drive (CMU-U61).

CMU300 – a future-proof investment

CMU300 is a universal RF tester for all aspects of base station tests. It features unmatched speed thanks to the use of Probe DSP™ technology, innovative measurement algorithms and parallel test capability. The extremely high measurement accuracy and repeatability are the result of an optimized frontend coupled with sophisticated measured-value correction software that, in the event of variation of frequency, level range or board temperature, performs realtime compensation across the entire frequency and dynamic range. This is supported by three independent cooling circuits that keep instrument temperature at a constant low even in extreme operating environments. The concept of the tester ensures simple implementation of solutions for future measurement needs. For example, processor power can be boosted by pluggable DSP modules. All this shows that CMU300 is a reliable and future-proof investment.

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FIG 4
List of traffic channel types including GPRS and EGPRS channel coders

More information and data sheet at www.rohde-schwarz.com or enter 170/01 on reader service card

REFERENCES
[*] CMU200: On the fast lane into the mobile radio future. News from Rohde&Schwarz (1999) No. 165, pp 4–7