R&S®CMU 200 Universal Radio Communication Tester

Ample new functionality for measurements on GSM mobile phones

With the latest software version, the R&S®CMU 200 universal radio communication tester offers an extensive range of new functions that help to cut manufacturing times on the production floor and to test and verify the latest developments in mobile radio in the lab.

I/Q-versus-slot measurement

Using the I/Q-versus-slot measurement, for example, the characteristic of a mobile phone's output stage can be determined very quickly. From this characteristic, a precorrection characteristic for the mobile phone is generated. In practice it may be useful to repeat the measurement several times to calculate an average precorrection characteristic. This previously required restarting the measurement several times both on the mobile phone and the tester. To reduce test times, the R&S®CMU 200 now makes it possible to carry out this measurement in several steps with only one start being required. On completion of each step, the tester waits until the trigger condition for the next step is fulfilled. A complete measurement sequence can thus be run on the mobile phone several times, yielding all results required to form an average (FIG 1) while the measurement has to be started only once.

BLER and uplink TBF

BLER measurements are very time-consuming for reasons inherent in the procedure. The R&S®CMU 200 therefore provides a new connection mode for packet data links that allows BLER and transmitter measurements to be performed simultaneously on the mobile phone, thus reducing measurement time.

Power-versus-time measurement

The R&S®CMU 200 features an intelligent and flexible power-versus-time measurement capable of analyzing up to four GSM timeslots simultaneously. In addition to the standard filter bandwidths of 500 kHz (GMSK) and 600 kHz (EDGE), a bandwidth of 1 MHz can now be set. Even very fine peaks in the RF signal power characteristic of a mobile phone can thus be detected and displayed.

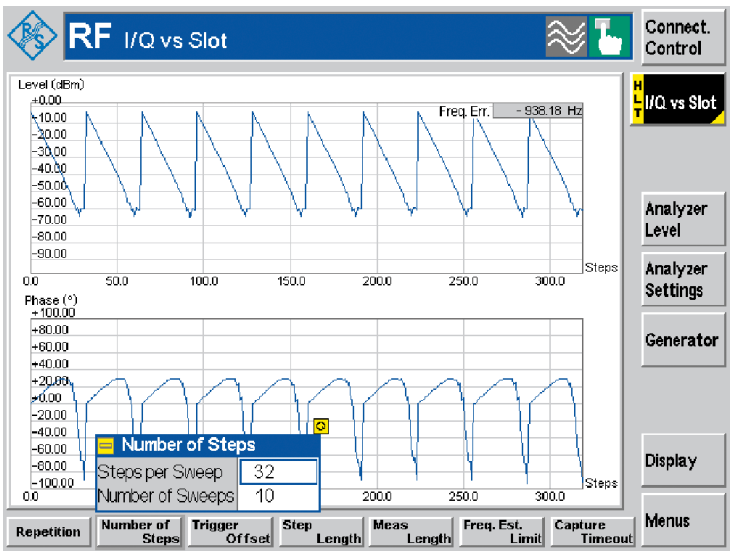

FIG 1
In the I/Q-versus-slot measurement, several test sequences can be executed as submeasurements in a single test run. The number of submeasurements and the test points for each submeasurement can be defined by the user. After each submeasurement, the tester waits until the trigger condition for the next submeasurement is fulfilled. On completion of the test run, all results are displayed in a straightforward manner.

Synchronization of several R&S®CMU 200 testers

For R&D and quality assurance applications, it is sometimes necessary to offer the mobile phone several GSM cells that must be time-synchronized. This can easily be implemented with the R&S®CMU 200. One R&S®CMU 200 acts as a master, the others as slaves. The master outputs a defined trigger signal at a user-defined frame number during the GSM signaling. The trigger signal time-synchronizes all R&S®CMU 200 units in the network (FIG 2). For each slave, a separate signaling offset rel-

ative to the master can be defined. The offset can be set via the parameters "Frame Number", "Slot" and "1/4 Symb. Offset" in a range of over two million frames with a resolution of ¼ symbol. And the R&S®CMU 200 offers even further convenient functions. Its timing can be modified by introducing a defined drift, i. e. the timing can be shifted by ¼ symbol for a user-definable frame division (FIG 4).

Repeated FACCH/SACCH

The standardization bodies have defined new signaling modes. In the "Repeated FACCH" mode, each FACCH block is transmitted twice in the downlink. By retransmitting the block immediately, transmission errors in signaling can be reduced (FIG 3). If a mobile phone cannot decode the first FACCH block error-free, it attempts to decode the retransmitted block. If this also fails, the mobile phone attempts to retrieve the information error-free from the two errored blocks. By using the combined information of two errored blocks, signaling stability can be increased.

The same principle is employed in the "Repeated SACCH" mode, with the difference that SACCH blocks are retransmitted only on request. Whereas "Repeated FACCH" is used only in the downlink, "Repeated SACCH" is used in the uplink and the downlink.

The R&S®CMU 200 supports both signaling modes. The tester not only adapts the signaling procedure to the type of mobile phone under test, but also the FACCH FER measurement, taking into account the different responses of the various types of phones, depending on whether or not they support the "Repeated FACCH" mode.

To determine how many times a mobile phone has requested retransmission of a SACCH block, the R&S®CMU 200 provides the "Repeated DL SACCH" measurement (FIG 5).

Enhanced power control (EPC)

The standardization bodies have defined a new signaling mode also for the power control of mobile phones. The previous control mechanism via the SACCH allowed the mobile phone power to be varied every 480 ms. Using the new EPC mode, the power can be varied every 120 ms. The enhanced power control mode is currently being implemented in the development labs of the mobile phone manufacturers. The R&S®CMU 200 supports tests of the new power control mode even today.

Summary

The functions described here are only a few of the enhancements offered by the new software of the R&S®CMU 200. Many more new functions such as the two speech codecs (GSM-8PSK-AMR and WB-AMR, page 19) and the CMR performance measurement will be available after the update. The R&S®CMU 200 is keeping pace with the rapid development of mobile radio, supporting applications in all areas, whether production, development, or quality assurance.

Rudolf Schindlmeier

The R&S®CMU 200 is keeping pace with the rapid development of mobile radio, offering an extensive range of new functions that are described in this issue:

- **Page 10** The new version of the R&S®CMUgo software increases throughput in service.
- **Page 14** With firmware version 4.20, the R&S®CMU 200 can request the mobile phone to send the reception quality of neighboring cells of other mobile radio networks now also in the GSM standard and evaluate the information returned.
- **Page 16** With a new signaling option, the R&S®CMU 200 covers all test scenarios relevant in the development and production of 1xEV-DO access terminals.
- **Page 19** The R&S®CMU 200 – the trailblazer when it comes to voice functionality – expands its position with two new voice codecs.
- **Page 22** The R&S®CMU 200 now also supports discontinuous transmission (DTX) in the downlink, as well as the important "performance of bad frame indication" (BFI) test case.
- **Page 24** Two new options expand the functionality of the R&S®CMU 200, adding capability to test WCDMA-HSDPA data applications.

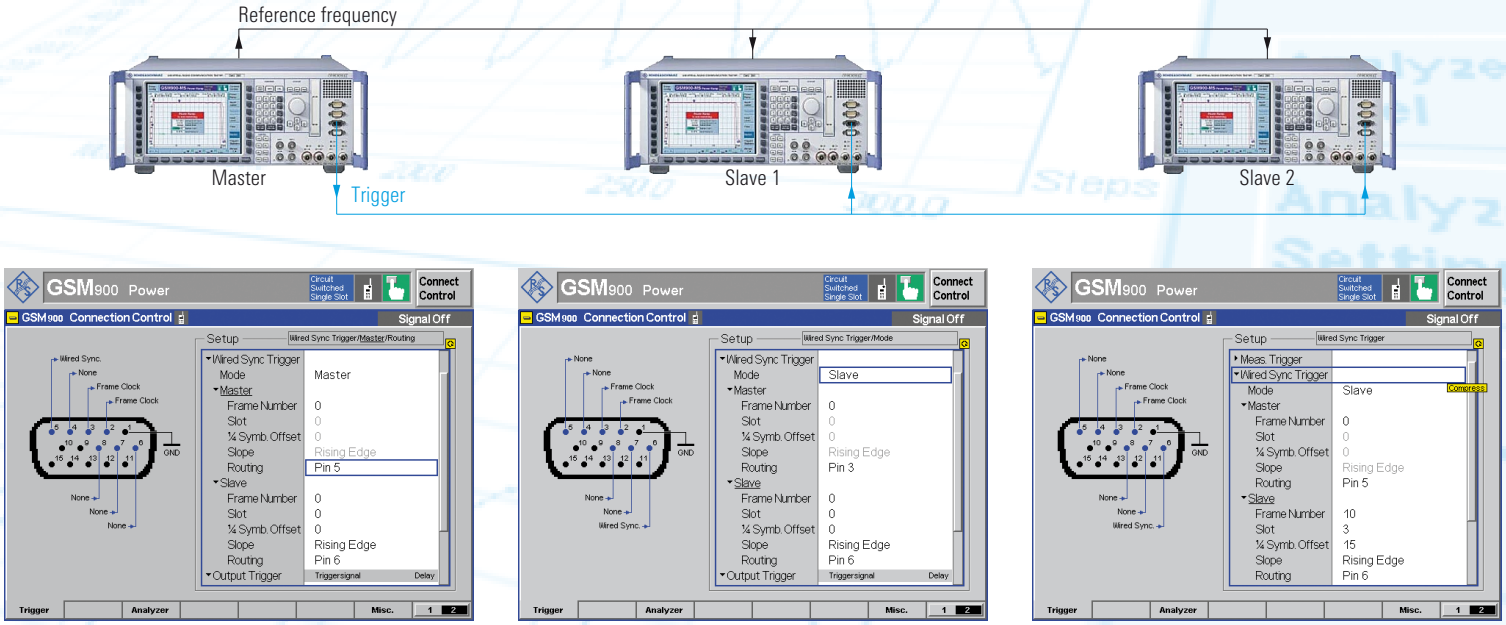

FIG 2 Several R&S®CMU 200 units can be connected to form a network of time-synchronous GSM cells. For each R&S®CMU 200, a separate timing offset can be defined.

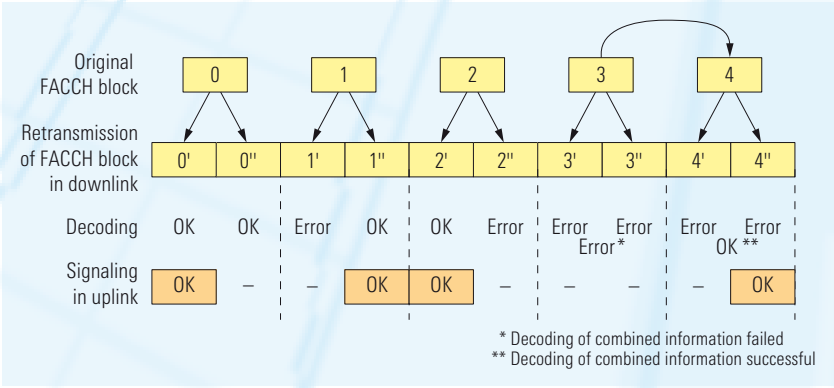

FIG 3
Immediate retransmission of the FACCH block reduces transmission errors in signaling. If neither of the two blocks can be decoded correctly, the mobile phone attempts to retrieve the message error-free from the combined information of the two errored FACCH blocks.

FIG 4 The R&S®CMU 200 timing can be shifted by introducing a defined drift of ¼ symbol for a definable frame division. The timing offset can be used to test a mobile phone's ability to stay synchronized.

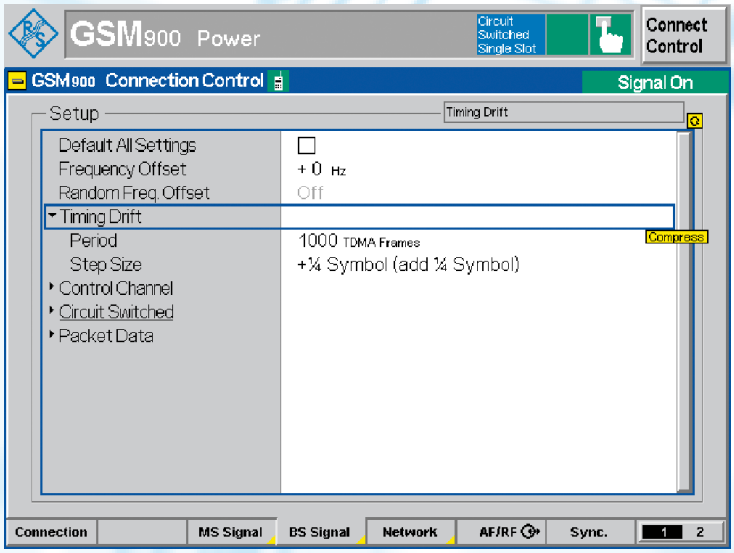

FIG 5 In the "Repeated SACCH" mode, signaling blocks are retransmitted only on request. The "Repeated DL SACCH" measurement determines the number of retransmission requests issued by the mobile phone for a specific downlink level.