Universal Radio Communication Tester R&S®CMU 200

Unprecedented speed in mobile phone production testing

During production, the transmit and receive levels (RSSI = receiver signal strength indicator) of GSM phones are aligned throughout the entire frequency range. Previous alignment procedures took several tens of seconds – depending on the number of frequency/level combinations to be measured. The R&S®CMU-K47 software option (Smart Alignment@GSM-MS) makes intelligent use of the GSM frame/slot structure and performs alignment in just 0.25 seconds – at a maximum of 50 frequencies and seven levels per frequency.

Previous alignment strategies were relatively slow

Conventional procedures for TX calibration set each frequency/level combination separately on the phone, and the tester measures the actual transmit level at each frequency. In the case of RX calibration, each frequency/level combination is separately set on the tester, and the phone logs the levels received. The results obtained by the tester and by the phone yield correction values that are stored in the phone.

The power versus slot measurement of the R&S®CMU 200 speeds up calibration. It accelerates TX calibration by a factor of 8 (= number of timeslots per frame). The phone must be able, however, to transmit at different levels in each of the eight timeslots of a frame.

Smart Alignment ensures high speed

The new Smart Alignment@GSM-MS option makes calibration very fast. Now that state-of-the-art GSM phones have multislot capability, this feature can be used to significantly speed up calibration owing to the fact that the mobile phones are able to perform the following:

- Output a different level in every timeslot of a frame
- Evaluate the level of every timeslot of a frame
- Identify the channel structure of every timeslot of a frame

This means that basically every timeslot of a frame can be used for a calibration step.

The frequency is set in line with the frame grid. Since the settling time of the synthesizer corrupts the measurement result, one timeslot (577 µs) per frame is used for settling instead of calibration. Smart Alignment uses timeslot 7 for settling; timeslots 0 to 6 are available for calibration.

RX calibration

FIGs 1 and 2 show the typical transmit signal characteristic of the R&S®CMU 200 and the related configuration. A frequency correction channel (FCH) is transmitted in the first timeslot of the first frame; the phone detects the FCH and uses it for frequency synchronization. The remaining timeslots are filled with dummy bursts. A positive side effect is that the synchronized frequency can also be used for calibrating the VCO in the phone.

Synchronization channels (SCHs) with user-configurable levels are transmitted in the other frames. SCHs have a longer training sequence and thus make time synchronization easier for the phone. The phone itself is the measuring instrument as it provides the results that are required in order to determine the correction values for the receive level.

The number of selected frequencies determines the cycle time of the transmit sequence. The maximum cycle time is 230 ms (= 50 frame periods).

TX calibration

FIGs 3 and 4 show the typical transmit signal characteristic of the phone and the TX calibration configuration. After the start of the measurement, the first timeslot of the first frame triggers the measurement sequence, which

More information and data sheet at www.rohde-schwarz.com (search term: CMU200)

then runs automatically until it is completed. It is subsequently possible to fetch all results and determine the correction values for the transmit levels of the phone. Here, too, the number of selected frequencies determines the measurement time, which is again max. 230 ms.

Combined TX/RX calibration

In the case of GSM, the uplink and downlink frequency ranges are separated by duplex spacing and are, therefore, not allowed to overlap. This means that receiver and transmitter can be calibrated simultaneously. This reduces the process time by half so that a phone can be calibrated in just 0.25 s.

Summary

The R&S®CMU-K47 option enables the Universal Radio Communication Tester R&S®CMU 200 to benefit from the advantages of the GSM standard and of modern GSM phones. With this option, the alignment of a GSM mobile phone in production – which is a significant part of total test time – can be performed at unprecedented speed.

Dieter Tiroch

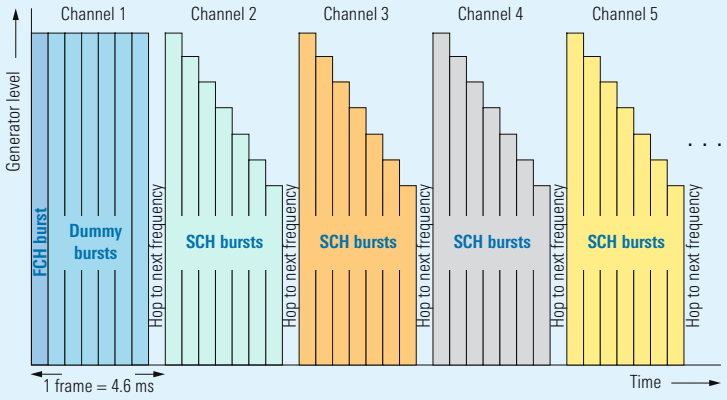

FIG 1 RX calibration: typical time characteristic of the R&S®CMU 200 transmit signal.

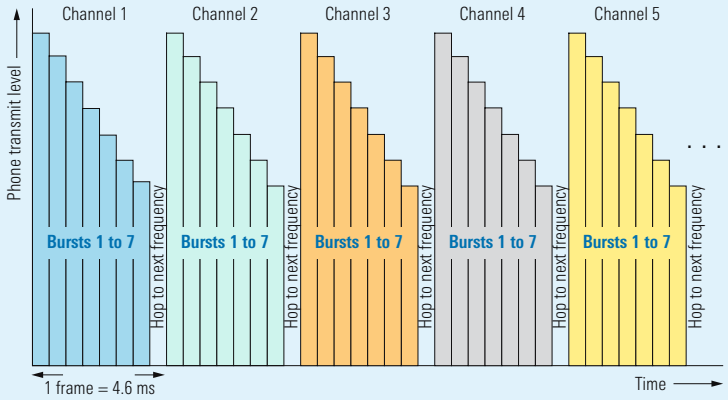

FIG 3 TX calibration: typical time characteristic of the mobile phone transmit signal.

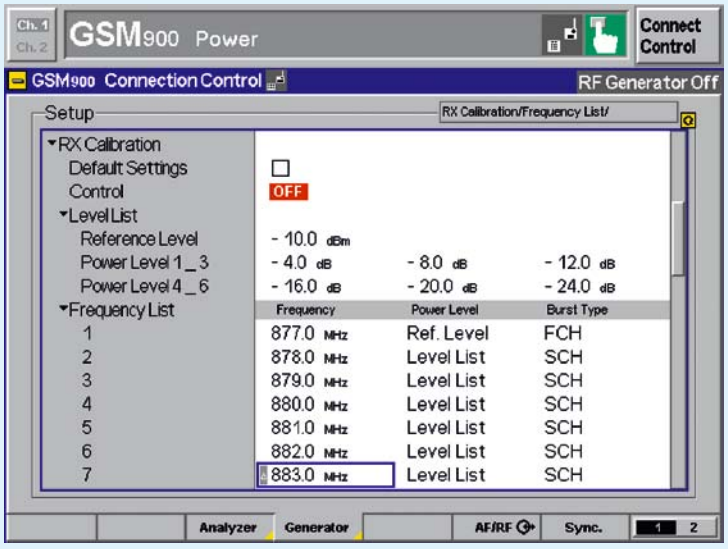

FIG 2 RX calibration: configuration of the R&S®CMU 200 transmit sequence.

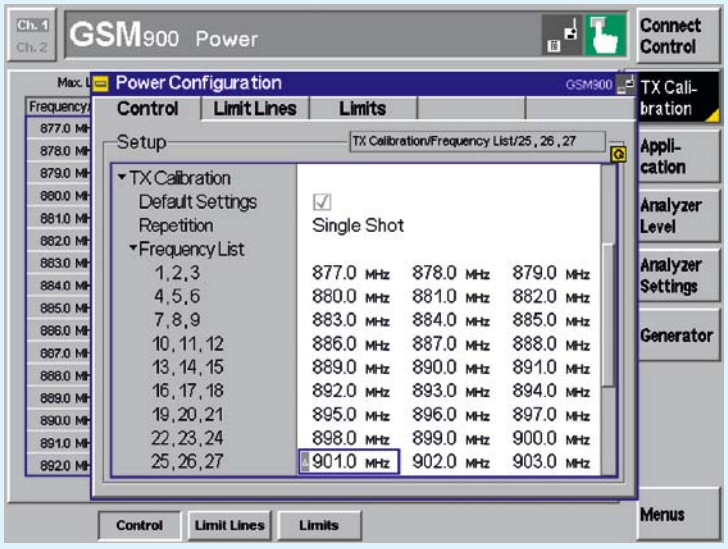

FIG 4 TX calibration: configuration of the R&S®CMU 200 receive sequence.