High measurement speed and flexibility

Since the R&S CMU 200 was also designed for production-related applications, Rohde & Schwarz paid particular attention to high measurement speed and accuracy right from the start of the tester development. Users involved in the hardware or software development of a WCDMA telephone can generate a large number of test setups by means of the flexible parameterization of the measurement and signalling functions. Right now, with UMTS still on its marks, users benefit from the joint platform components of the Protocol Tester R&S CRTU-W and the R&S CMU 200. The protocol tester is thus able to integrate possible changes in the 3GPP standard into the signalling unit of the radio tester, keeping time delay to a minimum.

If the R&S CMU 200 is fitted with the optional IQ/IF Interface R&S CMU-B17 [3], it is possible to couple or decouple directly at the baseband or in the IF of the DUTs, enabling the testing of pure baseband or RF module characteristics.

Summary

The R&S CMU 200 as a multimode tester is able to test in a single test sequence DUTs that can contain modules for WCDMA, GSM and *Bluetooth*. Since practical UMTS applications are still in their infancy, other versatile test functions, also between the different cellular standards, will be developed on this basis.

Pirmin Seebacher

REFERENCES R&S CMU 200

[1] First WCDMA measurement functions. News from Rohde & Schwarz (2001) No. 171, pp 13–15

[2] WCDMA generator for fast testing of 3G mobile radios. News from Rohde & Schwarz (2002) No. 173, pp 9–11

[3] Optional IQ and IF interfaces for new applications. News from Rohde & Schwarz (2002) No. 175, pp 12–14

The seemingly inconspicuous functions of a mobile radio tester are often the ones that contribute to a productivity increase in production. This also applies to the user-specific correction of frequency response and level response in the R&S CMU 200, which offers quite a few advantages in mobile phone production.

Universal Radio Communication Tester R&S CMU 200

User-specific correction of frequency response and level response

Why such a correction?

You may ask yourself why a user-specific correction of frequency response and level response is required if a professional mobile tester can reliably be expected to perform precise measurements across the entire frequency range. At first glance, this is, of course, true. However, once the instrument is integrated into a test system in a production line, the situation is different. The total measurement error includes not only inaccuracies of the radio tester, but also errors in the test setup such as the frequency response of cabling and any power divider that may be used. To compensate for these wiring losses, "external attenuation" may be entered in the mobile radio testers, often also separately for several frequency bands. Even so, this type of correction is frequently insufficient, e.g. when using an antenna coupler for coupling the DUT, since notable level changes in these instruments can often be detected even across individual radio channels.

Such frequency responses are usually measured and stored as correction

User-specific correction of frequency response and level response: a snap with the R&S CMU 200

The user-specific correction of frequency response and level response of the Universal Radio Communication Tester R&S CMU 200 is designed to be versatile (FIG 1, 2). Separate correction tables can be compiled for each RF input and RF output. The user is free to decide on the number of frequency and level points to be set up. The tester linearly interpolates the level correction to be used between the frequency points. The correction tables (FIG 3) are easy to compile on any PC by means of a normal text editor, or automatically by a measurement program, and are then loaded into the mobile radio tester via the IEC/IEEE bus, RS-232-C interface or PCMCIA card, where they can be activated or deactivated at any time.

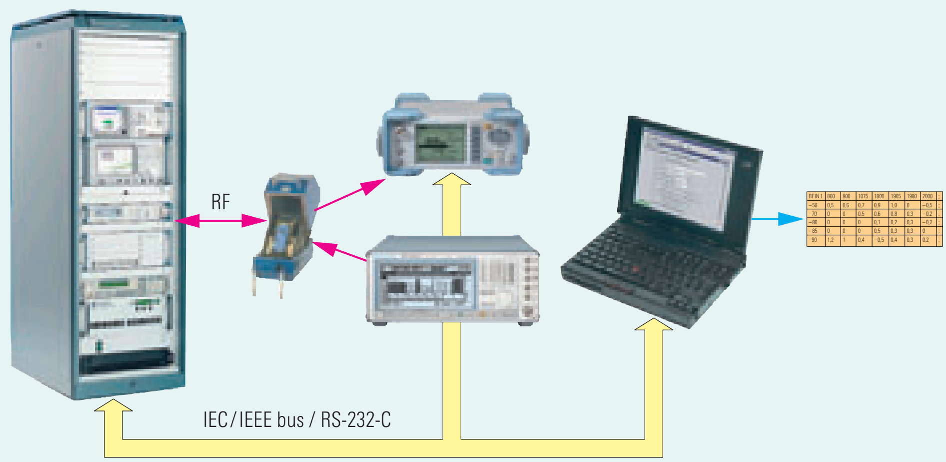

FIG 1
Instead of the DUT, a power meter or a signal generator is connected to determine the correction values, and the required correction points are measured. A correction table is then compiled from the measurement results. A separate table can be generated for each RF input and output on the R&S CMU 200.

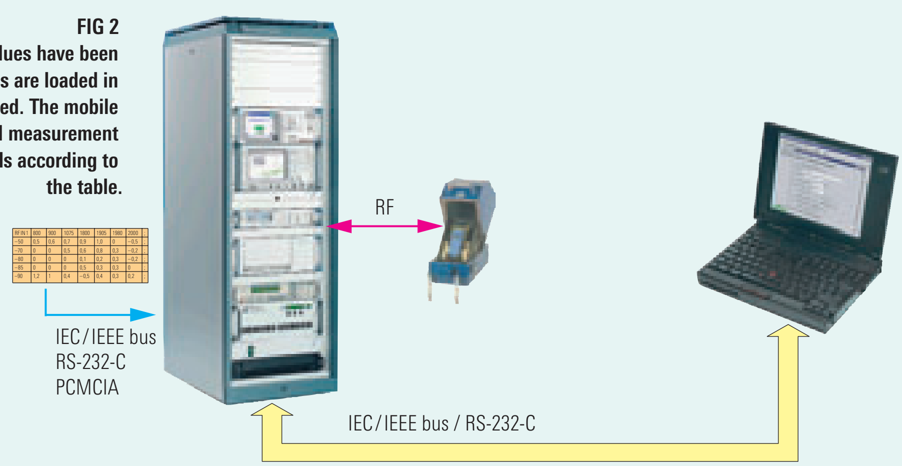

FIG 2
Once the correction values have been recorded, the correction tables are loaded in the R&S CMU 200 and activated. The mobile radio tester now corrects all measurement results and all transmit levels according to the table.

RF IN 1	800	900	1075	1800	1905	1980	2000	;
–50	0.5	0.6	0.7	0.9	1.0	0	–0.5	;
–70	0	0	0.5	0.6	0.8	0.3	–0.2	;
–80	0	0	0	0.1	0.2	0.3	–0.2	;
–85	0	0	0	0.5	0.3	0.3	0	;
–90	1.2	1	0.4	–0.5	0.4	0.3	0.2	;

FIG 3
The first column in the correction table designates the RF input or output that is to be corrected. The frequency points are on the horizontal axis, the level points on the vertical axis. The other table entries are the correction values. A semicolon indicates the end of a table line. During operation, the correction value is linearly interpolated between the individual frequency points; there is no interpolation between the level points. The frequency and level points are user-definable. A correction table can contain a total of 120 values.

values in a database outside the radio tester. During the subsequent measurement, the test program (i.e. not the tester) corrects the obtained results by means of the correction values. However, such methods do not use the capabilities of modern mobile radio testers, which provide not only numerical measurement values, but are also able to evaluate the measurement results by using the limit values and tolerance schemes specified by the standardization bodies.

For example, the R&S CMU 200 fully automatically checks a GSM burst within only a few milliseconds by using the power ramp tolerance mask defined in the specifications, and outputs the measurement result as PASS or FAIL information. For this rather complex measurement, the R&S CMU 200 first evaluates the data content of the burst which determines the time position of the tolerance mask across the burst. It then determines the average transmit power in the burst across the useful part and the modulation (GMSK or 8PSK). Based on these two measurement results, it decides on the suitable tolerance mask and positions it correctly across the burst. It must then clip the tolerance mask at a specific absolute level. Only now can the R&S CMU 200 determine if the measured burst fully complies with the tolerance mask.

Still, the results thus obtained can only be used if the level measured by the tester is identical with the actual level, i.e. if the attenuation errors of the entire test system in the R&S CMU 200 are known as well. This clearly shows the shortcomings of a subsequent correction of the measured value in the test program: The capabilities of the tester to make PASS / FAIL decisions in a split second cannot be used; the external measurement program must perform them, which is very time-consuming. If, however, the frequency response and level response of the test setup are taken into account in the mobile radio tester, its automatic PASS / FAIL decisions are also correct and can be used in the measurement program.

Improved measurement accuracy

Every T & M device must be calibrated periodically because this is the only way to continuously ensure the measurement accuracy specified in the data sheet. The data sheets therefore usually mention a prescribed calibration interval. If users want to improve the measurement accuracy within the calibration interval, they can check the measurement accuracy in between these comprehensive calibration actions, store the determined correction values in a database and have them automatically considered at a later time in the measurement results. But the above remarks about the shortcomings of calculating the results in the external measurement program apply also in this case. Plus, there is the obligatory administrative effort. The measurement program must determine the serial number of the tester and use it to search for the corresponding correction values in the database. The effort is particularly high if you do not want to control the tester via a program, but manually: there is no alternative to correcting each displayed measured value by using a pocket calculator.

The user-specific correction of frequency response and level response in the tester helps to easily circumvent all of the above problems: Simply store the determined correction values in the test setup, which will then consider them automatically.

Setup times are reduced

The user-specific correction of frequency and level response also reduces setup times, for example if you regularly measure all mobile radio testers available in a specific production on a reference measurement system and then store the correction values thus determined in the mobile radio tester. If a production system has to be modified (e.g. if a mobile radio tester needs recalibration at the end of a calibration interval), the mobile radio testers can be exchanged at random. The production system is immediately ready for use without requiring complex measurements since every mobile radio tester already comes with the required correction values.

Summary

It is not necessarily the big features that ensure innovation in a mobile radio tester. The sum of numerous small characteristics can just as easily make it a top-ranking mobile radio tester. This may be part of the secret behind the huge success of the Universal Radio Communication Tester R&S CMU 200, which has advanced to one of the most innovative products in mobile radio measurement.

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More information and data sheet at www.rohde-schwarz.com (search term: CMU 200)