

Measuring EMC on mobile phones

With increasing demand for digital telecommunications, especially in the private sector, EMC requirements placed on terminal equipment (mobile phones and base stations) are gaining more and more importance. Rohde & Schwarz offers test systems for measuring the electromagnetic compatibility of mobile radio equipment of this type in line with most of the current European standards (GSM, DCS, DECT, NMP).

possible effects on analog circuits are examined, used to pick up or generate voice signals for instance (FIG 1). Measurements are performed in both directions, from the telephone to the base station (uplink) and from the base station to the telephone (downlink).

With GSM mobile phones the quality of the digital link is determined by evaluating RXQUAL. This is a parameter

and 80% AM has no noticeable effect for the user on analog circuits, the level of the demodulated audio signal sent by the mobile to the base station (uplink) is measured by a communications tester. FIG 2 shows a typical result. In the direction base station → telephone the sound pressure level produced by the mobile at the earphone (downlink) is measured with a sensitive test microphone.

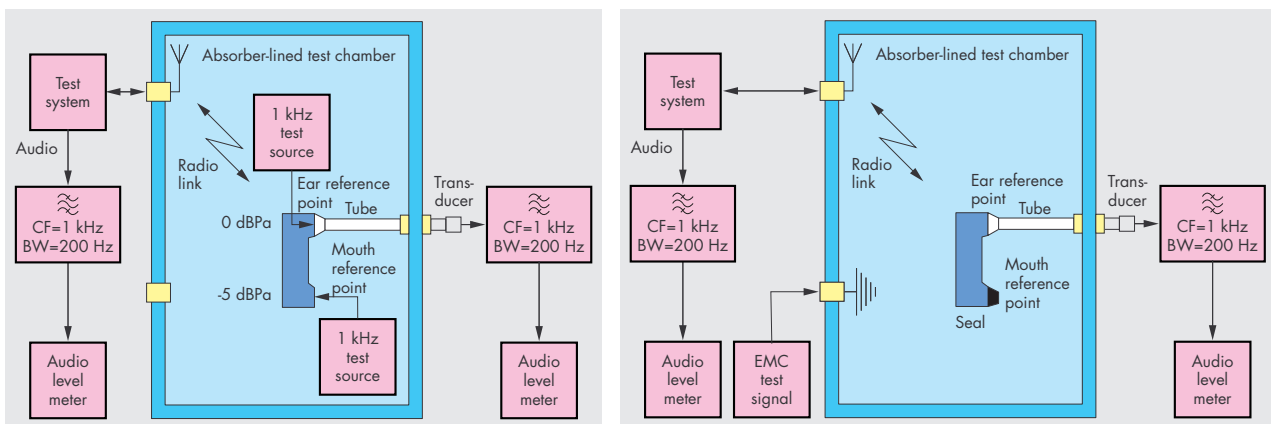


FIG 1 EMC measurements on mobile phones (EUT dark blue); left: reference measurement, right: EUT measurement

EMC measurements on mobile phones are based on the standards issued by ETSI (European Telecommunications Standard Institute), particularly ETS 300 342, parts 1 and 2 (GSM and DCS), and ETS 300 329 (DECT). These are product standards, taking into consideration the specific characteristics of EUTs. While there are no substantial differences in the measurement of interfering emissions of mobile phones to that of other electronic equipment, new techniques have been developed in the field of electromagnetic susceptibility (EMS) for monitoring parameters defined to assess the behaviour of EUTs.

On the one hand the quality of the digital link between base station and telephone is monitored, on the other

measured by the GSM phone itself and signalled to the base station within the protocol frame. So a base station must be integrated in the EMC test system to produce the parameter for evaluation at each frequency of the RFI signal. The base-station function can be implemented with Digital Radio-communication Tester CMD for instance [1]. The communication quality of DECT telephones is determined by evaluating bit error rate. For this purpose the phone is operated in loopback mode, ie test data emitted by the base station are sent back by the phone and the two data streams are then compared in the base station.

To ensure that an interfering electromagnetic field modulated with 1 kHz

In both cases only the noise level is measured, ie no audio signal is present. The measured level is referred to a reference level determined in a separate measurement prior to the actual EMC test. The noise measured in the presence of an RFI signal should be at least 35 dB below the reference. The reference for the uplink is determined by applying an acoustic level of -5 dBPa at the EUT's mouth reference point and for the downlink by applying 0 dBPa to the test microphone. The reference levels are produced with the aid of an artificial mouth driven by a 1 kHz generator.

Rohde & Schwarz EMS test systems are operated with **System Software EMS-K1** [2]. Measurements on mobile

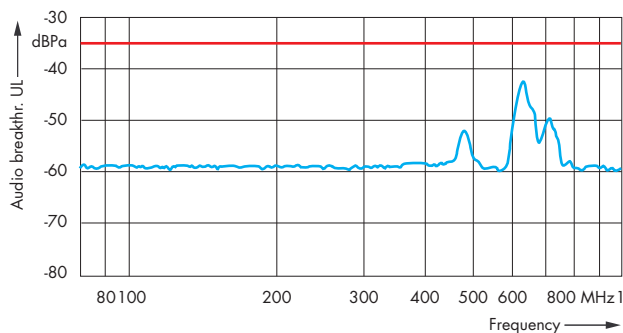


FIG 2
Typical curve
measured for uplink
audio level of
DECT base station

phones are supported by special scripts and device drivers, designed to meet all requirements:

- User support by onscreen guidance for necessary hardware setup modifications.
- Determination of reference level and consideration of measured values in EUT tests.
- Automatic, broadband/narrowband evaluation to standard for a nogo result of the EUT.

- Control of Rohde & Schwarz testers (CMD, CMS, CMTA) in line with various digital standards. In this case call setup and evaluation of respective parameters (RXQUAL, demodulated AF level) can be software-controlled.

The described test system from Rohde & Schwarz is a turnkey solution enabling manufacturers of mobile telephones and EMC service providers to evaluate

EMC characteristics of mobile phones in line with standards. With measurement routines integrated in System Software EMS-K1, precompliance measurements can also be performed during development beyond those prescribed by the standards .

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REFERENCES

- [1] Mittermaier, W.: New measurement functions for Radiocommunication Tester CMD55. In this edition, p 34
- [2] Göpel, K.-D.: System Software EMS-K1 under Windows – Automatic measurement of electromagnetic susceptibility. News from Rohde & Schwarz (1995) No. 148, pp 12–15

Reader service card 157/08

DVB – coverage measurements, program monitoring and production testing

Introduction of digital TV to various DVB standards (satellite, cable and terrestrial transmission [1]) is fast gaining

ground. DVB broadcasts have already commenced in many countries all over the world. The advantages of digital

transmission – frequency economy, integration of multimedia data services, adaptation of modulation to transmission link – are pointers to the rapid development of this market. Rohde & Schwarz has been offering instruments and systems for measurements on transmission links for quite some time. It has now extended the line of equipment to coverage measurements, program monitoring and production tests (FIG 1).

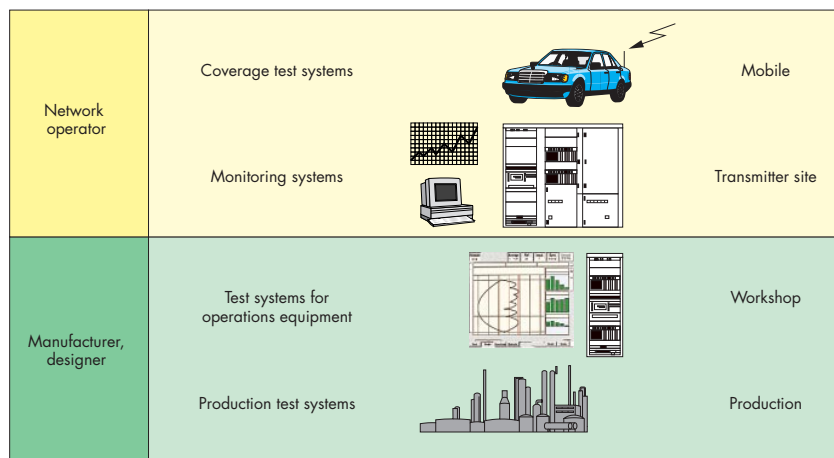


FIG 1 Main applications of DVB test systems