The European mobile radio standard GSM is conquering the globe, and the US market is an integral part of this development. Like in Europe, type certification for mobile stations to PCS1900 has become obligatory since the middle of this year. Rohde & Schwarz is the only company to offer the required test equipment: PCS1900 System Simulator TS8915.

In the US, the PCS1900 standard is currently being drawn up within GSM N.A. (GSM North America) as a derivative of the European GSM standard phase 2 (in future also called GSM1900). PCS1900 stands for Personal Communications System in the 1900 MHz band. Rohde & Schwarz has responded to this development in good time by providing the corresponding test equipment [1; 2]. PCS1900 System Simulator TS8915 provides more than 200 test cases for type certification of US mobile phones to PCS1900 standard.

On the way towards PCS1900 type certification

In line with CTIA (Cellular Telecommunications Industry Association), the Permanent Reference Document PRD NATWG.03 [4] defines the procedure of GSM N.A. type certification for PCS1900 mobile stations. PCS1900 System Simulator TS8915 and Test Set CRTC02 from Rohde & Schwarz are cited in this document exclusively as reference platforms for type certification. This certification is based on the GSM specifications including the corresponding modifications for the North American standard. These modifications are defined and maintained by the GSM N.A. network operators.

The test specification is documented in GTS (Global Telecommunications Standard) recommendation PCS11.10-1, derived from GSM 11.10-1 specification. Rohde & Schwarz was involved at a very early stage in the creation of this test specification initiated by the German test house and service enterprise CETECOM [5] and implemented the test cases on PCS1900 System Simulator TS8915 and Test Set CRTC02. Thus, within six months, more than 200 test cases could be implemented and validated in due time for the official start on 1 June 1997. The test implementations were again validated by CETECOM in close cooperation with the development engineers from Rohde & Schwarz.
After an initial phase of 18 months other independent test labs can be accredited by GSM N.A. for PCS1900 mobile station certification. During this phase, cooperation with other test houses is possible. The PCS1900 Type Certification Review Board (PTCRB) defines the required test cases. Currently, the list contains 315 tests that will be available by autumn this year. FIG 2 gives an overview of the PCS1900 type certification process.

Differences between European GSM and GSM N.A.

Type certification of PCS1900 mobile stations using the PCS1900 system simulator is via the air interface, i.e. via the radio channel between the mobile and base station (simulated by the system simulator). Corresponding modifications by CTIA or GSM N.A. had to be considered for the test equipment. First of all, PCS1900-specific frequencies have to be adhered to. TABLE 1 gives an overview of all the frequency bands currently occupied in the digital mobile radio world according to GSM standard (channel spacing 200 kHz).

Moreover, three power classes have been defined. TABLE 2 compares the current standards. The PCS1900 system simulator considers these parameters by a corresponding configuration of the RF switching matrix [6]. Thus, the complete frequency and level range can be tested. Further modifications have been introduced to the network management. The GSM standard defines the location area identifier for determining the position of a base station by three parameters: MCC (mobile country code), MNC (mobile network code) and LAC (location area code). MNC is the network indicator. A mobile station in Germany (MCC 262), for example, recognizes from the MNC whether it is in D1 (MNC 01), D2 (MNC 02) or in E1 network (MNC 03). Because of the 2-digit BCD coding of MNC the number of network operators in the GSM standard is limited to 99. This parameter was extended to a value allowing to identify 999 (!) network operators in the North American PCS1900 world. All this is taken into account by the corresponding signaling software. Another innovation is the enhanced full rate vocoder (EFR) which can also be supported by PCS1900 Simulator TS8915.

Test system configuration

The PCS1900 system simulator comprises three CRT/TC02 units allowing simultaneous simulation of up to six mobile radio cells (base stations). Moreover, Signal Generators SME02 and SMP02 provide the necessary spurious signals as required for selectivity measurements. A fading simulator in the PCS band ensures a realistic simulation of the mobile radio channel by exactly simulating standardized fading profiles. Spectrum Analyzer FSM allows frequency-selective measurements of the stimulating end of the DUT – e.g. for spectral analysis of the transmit signal of the mobile station – as well as the frequency-selective analysis of spurious emissions. Dual-Channel Power Meter NRVD can carry out high-precision level measurements due to the fully automatic RF path compensation by the system itself. All relevant RF signals are applied to the DUT via a complex RF switching matrix. The required accuracies for the RF parameters of the test signal are thus ensured for type testing. As an option TS8915 can also comprise audio test equipment so that this type of testing is also possible.
The test requirements of PCS1900 11.10-1 include the same test ranges as those known from GSM or DCS1800 type testing. It is noteworthy that the system simulator – due to its flexible concept – is not only suitable for PCS1900 type certification but also for type testing of DCS1800 mobile stations. Corresponding test cases are also available in the GSM band and so TS8915 is optimally prepared for final GSM type-approval testing. These characteristics make the simulator fit for providing multiband test cases without elaborate modifications being required: this means a single system suitable for all possible applications in the GSM world.

Heinz Mellein

REFERENCES

Condensed data of PCS1900 System Simulator TS8915
Frequency range (useful band)
Uplink 1850 to 1910 MHz
Downlink 1930 to 1990 MHz
Modulation GMSK
Power (uplink) 1 mW to 4 W

Reader service card 156/02

Electromagnetic compatibility

by Joachim Nedtwig and Martin Lutz (editors).
The handbook “Electromagnetic Compatibility” published by the German WEKA Fachverlag in Augsburg in the form of a loose-leaf edition was printed for the first time in February 1996, when it comprised around 700 pages. It has since then been updated by six supplements and is now available as a 1200-page edition including a CD-ROM. It is available from WEKA Fachverlag für technische Führungskräfte GmbH, Morellstrasse 33, 86159 Augsburg, Germany; price: 298.— DM (only in German).

With the help of 30 experts, each contributing their specialized knowledge on EMC, the editors have created a publication covering all aspects of electromagnetic compatibility for engineers and technicians. Volume 1 of the compendium, which by now consists of two volumes, deals with the relevant EC directives, the implementation of EMC Directive 89/336/EEC in the form of the German EMC law and its implications as well as with the EMC standards. It also lists the standards for the protection of personnel and the low-voltage directive. In the last chapter of volume 1 the physical principles of EMC are described and interference source, coupling and interference sink explained.

Volume 2 deals with the electronic and mechanical development of equipment from the viewpoint of EMC and provides an insight into EMC in motor vehicles and the interrelation of EMC and lightning protection in aircraft. One chapter is dedicated to the legal consequences of the EMC law, two further sections are provided for measurement and test procedures according to EMI and EMS standards. The contribution on electromagnetic interference measurements was made at Rohde & Schwarz by Dipl.-Ing. Karl-Otto Müller, who over the past 20 years has been in charge of the development of R&S EMI test receivers, which are in use all over the world.

The handbook is rounded off by a section dealing with a cost and economic analysis of EMC testers. This section may help those who have to decide between buying their own tester or having measurements performed at a test house. A list with the addresses of companies offering EMC services in the German-speaking countries and the relevant bodies and authorities is also provided.

The handbook offers a wealth of information that has not been compiled in such a comprehensive way before. The expected penetration of electric and electronic products into all spheres of life will make further EMC standards and legislation necessary. The handbook is published as a loose-leaf edition and will be regularly supplemented (partly also on CD-ROM), so it will be possible to keep the compendium up to date at all times.

AS