Universal Radio Communication Tester R&S®CMU 200

Versatile application tests in (E)GPRS mobile radio

A new software option for the R&S®CMU 200 allows you to test applications for 2.5G mobile phones. For example, you can now test the transmission or reception of multimedia message services (MMS), Internet browsing or video streaming within a simulated (E)GPRS network environment. In addition to measuring the known RF parameters of power, spectrum or modulation, you can now also perform such tasks as displaying data throughput or analyzing protocols.

New value-added services …

At the beginning of the mobile radio era, users were satisfied if they could simply make phone calls from virtually anywhere. Today, they enjoy a much wider range of communications services. By using state-of-the-art mobile phones fitted with a large color display and an integrated digital camera, they exchange photos and video sequences, browse the Internet or load videos. The push-to-talk voice service is becoming increasingly popular; based on the voice over IP data service, it provides a group of people with inexpensive voice communications in walkie-talkie mode.

Modern generations of mobile radio provide the necessary technical prerequisites for all these services. Yet they also present new challenges to manufacturers of T&M equipment. While it used to be sufficient to test the characteristics of the transmitter or receiver of a mobile phone, additional tests are now required to ensure smooth operation of the highly diverse applications. The R&S®CMU 200 has proven to be outstanding for this purpose. Due to its flexible platform concept, it effortlessly keeps pace with changes in mobile radio and ideally meets new requirements in application tests.

… require a number of tests

The tests required for available applications are just as varied as the applications themselves. The currently available applications can be differentiated by any number of factors, e.g. realtime requirements, error control, or point-to-point, point-to-multipoint or broadcast

communications. The Internet protocol (IP) – which ensures data exchange across network boundaries – provides a common basis and means of accessing most applications. Together with the Internet, it has conquered the world and evolved into the international standard in data communications. Also in radiocommunications, these applications are usually implemented according to the client-server principle, where, for example, an Internet server provides the desired application on the mobile phones of a number of clients on demand.

To use several IP-based applications in mobile radio, additional signaling routines are required. For example, when transmitting an MMS via a GPRS or EGPRS(EDGE) mobile phone, the MMS center informs the receiver via the short message service (SMS) that a message has been sent and asks the receiver to retrieve it.

The range of possible application tests includes simple Go/NoGo tests, performance analyses, evaluations of the interaction between different applications running simultaneously on a mobile phone through to the testing of the interoperability between two mobile phones. To test applications on a mobile phone, the R&S®CMU 200 simulates a radio network; external computers connected to the radio tester provide the required servers (FIG 1). Yet another challenge is the detailed examination of protocol and signaling procedures (enablers) that are often necessary at the start and which usually require the use of protocol testers such as the R&S®CRTU-G [1]. Since the R&S®CMU 200 and the R&S®CRTU-G
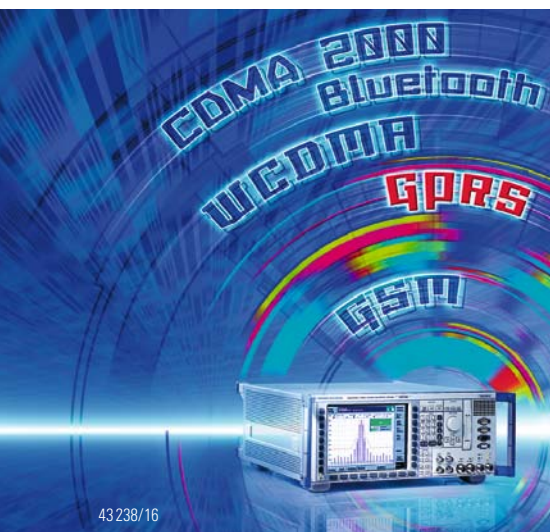

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share a common platform, the data that is obtained can be exchanged between them and analyzed further.

(E)GPRS application tests with the R&S®CMU 200

Owing to significant protocol stack extensions, the R&S®CMU 200 now also allows you to test applications via GPRS and EGPRS(EDGE) mobile phones simply by activating a new software option. In addition to the application test for CDMA2000® [2], this is yet another standard ideally supported by the R&S®CMU 200, proving its flexible, future-proof concept. The new software option makes it possible to test almost any IP-based applications in packet-oriented mode via an IP gateway. You can simply test proper functioning, but also check whether different applications that are simultaneously activated on a mobile phone run smoothly. GPRS and EGPRS, the offshoots of the GSM standard, achieve data transmission rates of up to 171.2 kbit/s and 473.6 kbit/s respectively, thus allowing a multitude of applications to be carried out, some of them even with realtime requirements. In addition to displaying the current data throughput of the IP packets exchanged between mobile phone and server (FIG 2), the R&S®CMU 200 also records various transmission protocols (FIG 3). Design engineers are thus able to thoroughly analyze not only the IP protocol, but also a number of other radio-specific protocols such as radio link control (RLC) or medium access control (MAC). Regardless of these activities, it is still possible to measure and analyze the RF signals transmitted by GPRS or EGPRS mobile phones on the R&S®CMU 200 with respect to power, spectrum or modulation (FIG 4). Unlike the previous transmitter test, the measurement is now performed as part of the application data transmission and no longer on the basis of pseudo-random binary sequences
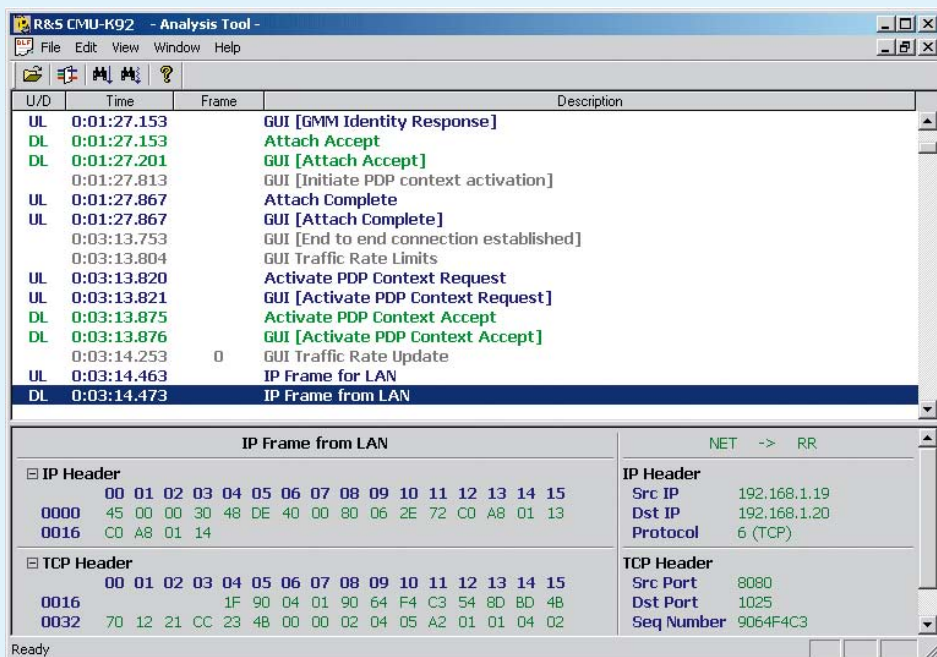

FIG 1
Simulation of a radio network by means of the R&S®CMU 200. PCs connected via Ethernet to the radio tester provide one or more servers.

Ethernet

RF connection
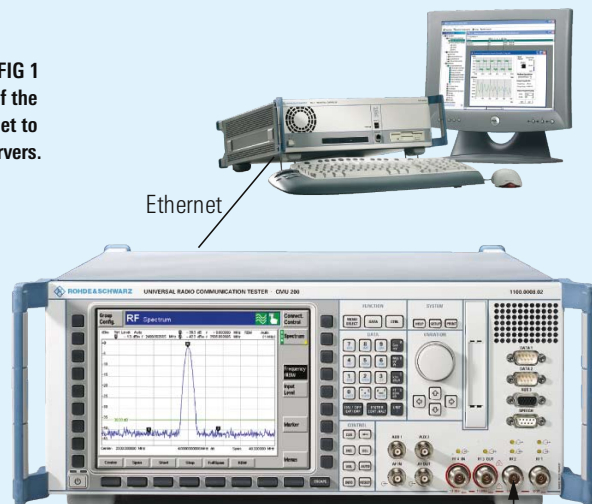
FIG 2
Throughput of the IP data packets exchanged between mobile phone and server.
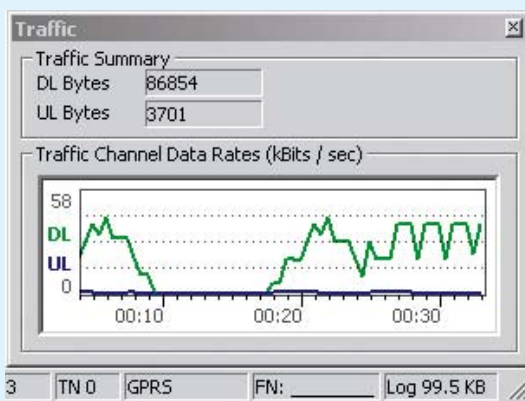
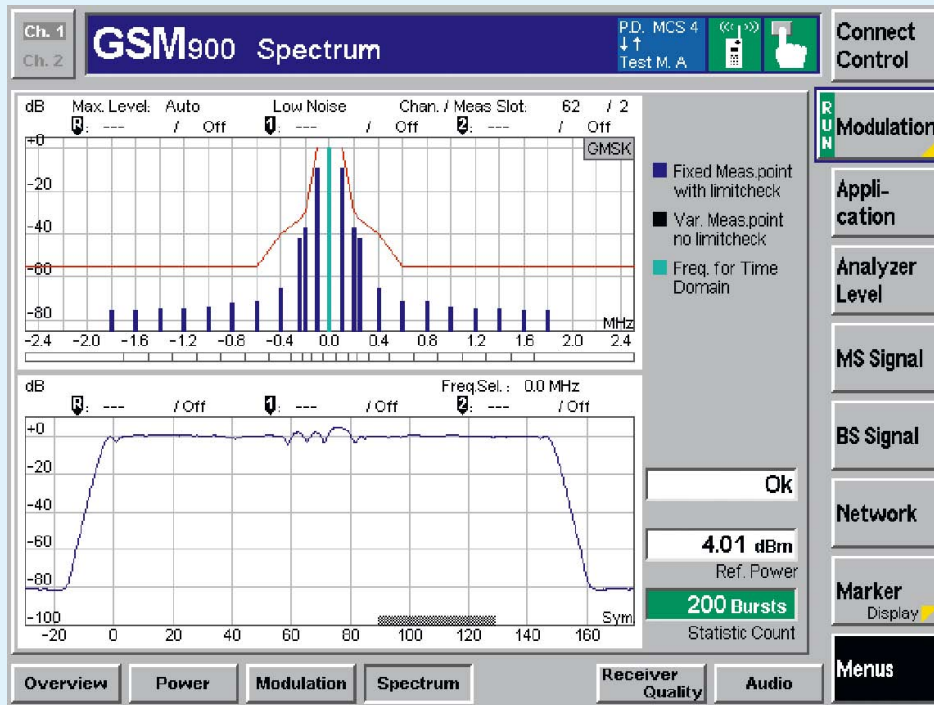FIG 3   The R&S®CMU 200 also records different transmission protocols.

FIG 4   During the application test, the R&S®CMU 200 can also measure the RF signals transmitted by GPRS or EGPRS mobile phones with regard to power, spectrum or modulation. This figure shows an example of the 'due to modulation' spectrum measurement of a mobile phone transmitter.

FIG 5   Test setup for data end-to-end tests, for example for testing the exchange of an MMS message between two mobile phones.

(PRBS). If two R&S®CMU 200 testers are available, the application tests can be expanded to accommodate data end-to-end tests, for example for checking the exchange of an MMS message between two mobile phones (FIG 5). If only one R&S®CMU 200 is available, the transmission and slightly delayed reception of an MMS message with one mobile phone can also be implemented using the loop-back setting in the MMSC.

Powerful aid in the development lab

The new software option R&S®CMU-K92 for the R&S®CMU 200 for the first time allows application design engineers to test their work in the lab on mobile phones in a simulated radio network. In this case, the main focus is on proving that the application runs smoothly on the mobile phone under normal operating and radio conditions. For these applications, which can be divided into mobile-originated and mobile-terminated applications, this represents the first realistic test after completion of the simulation tests on the development computer. When testing mobile-originated applications, data communication is initiated on the mobile phone, for example by calling up an integrated browser with subsequent access to the data of a web server connected via the Ethernet interface of the R&S®CMU 200. An example of a test of a mobile-terminated application is an SMS transmission, either from a computer connected to the tester or directly from the tester to the mobile phone.

Using this new option, mobile phone designers are now able to analyze the RF parameters of the mobile phone transmitter while the applications are running. Power consumption, feasible data rates at different signal levels or, for example, the behavior under fading conditions can thus be thoroughly examined.

In addition, network operators that perform these application tests to check new mobile phones before approving them for their networks can use this option to ensure smooth network operation.

Future prospects

Application tests are becoming more and more important in mobile radio. Rohde & Schwarz is meeting this trend by continuously developing new solutions in this field. The licensing authorities have responded to changes in the way mobile communications are used: By developing test scenarios with exact specifications, they are defining appropriate tests at the application level that will ensure that mobile radio networks will also operate smoothly in the future.

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REFERENCES
[1] Protocol Tester R&S®CRTU-G: Reducing test time through automation. News from Rohde & Schwarz (2004) No. 182, pp 16–17
[2] Universal Radio Communication Tester R&S®CMU 200: Testing CDMA2000® data applications. News from Rohde & Schwarz (2004) No. 182, pp 11–13

Universal Radio Communication Tester R&S®CMU 200

Convenience and flexibility – the key to successful mobile radio testers

Modern mobile radio systems sparkle with continuously new innovations, placing ever more complex development and production demands on mobile phone manufacturers. To meet such challenging tasks, you need a mobile radio tester that can keep pace with the rapid rate of innovation without compromising on operating convenience.

Automatic timeslot configuration

The expansion of the GSM standard to packet data services (GPRS and EGPRS) considerably increased the complexity of mobile radio systems. To meet this challenge, a tester must cover all relevant scenarios. Especially when you use testers in development, you must be able to set a large number of parameters to your specific requirements. However, this may present very difficult problems, for example if you want to determine which of the numerous parameters must be set and how to set them in order for the tester to generate the expected scenario. Therefore a state-of-the-art mobile radio tester must take a new approach in

operation. The Universal Radio Communication Tester R&S®CMU 200 previously came with a configurator for the GSM system that automatically selected the optimum timeslot configuration in accordance with the mobile phone's capabilities and the desired type of connection [*]. This timeslot configurator has now been expanded by an automatic measurement configurator and a wizard. ▶