Enhanced *Bluetooth*™ measurements

The R&S CMU 200 is the only tester on the market that offers *Bluetooth* and all important mobile radio standards in a single instrument. Over the past two years, it has excelled worldwide in the research, development and production of *Bluetooth* products. Software version 3.08 significantly enhanced the *Bluetoot*h functionality.

The innovations in detail

Link setup in normal mode (without test mode)

The previous software versions only allowed link setup that was immediately followed by activation of the *Bluetooth* test mode. This is still possible with the "connect test mode" key. But the new software also enables the setup of a *Bluetooth* asynchronous connection-less (ACL) link without test mode activation. This mode permits the measurement of the power and frequency accuracy of every DUT, regardless whether the DUT has been locally enabled for the test mode. If a normal ACL link is used, the R&S CMU 200 can switch the DUT to audio, hold and sniff mode.

Audio mode

In audio mode, the R&S CMU 200 sets up a synchronous link to the DUT. All instruments supplied to date come with integrated hardware for the *Bluetooth* audio codec so that audio functionality can now be retrofitted free of charge via a simple software update. External audio generators and analyzers can be connected by means of one analog input and output each. However, the R&S CMU-B41 audio option is a much more convenient alternative since it effortlessly enables basic audio measurements on *Bluetooth* DUTs by means of the *Bluetooth* audio codec (FIG 1 and 2).

Hold and sniff mode

Power consumption of a *Bluetooth* chipset is considerably reduced in these two modes, making them particularly important in all battery-powered *Bluetooth* devices. The R&S CMU 200 can switch the DUT to both modes, thus allowing the reduced power consumption to be checked by means of external test equipment.

Power control

In this mode, the mobile radio tester can send the link manager protocol (LMP) commands for power up and power down to the DUT. The user has two keys for manual power control. After each keystroke, the R&S CMU 200 displays in a measurement window the difference level as compared to each previous power level. In compliance with the *Bluetooth* specification, all difference values must be in the 2 dB to 8 dB range. When the maximum or minimum power level has been reached, the DUT sends
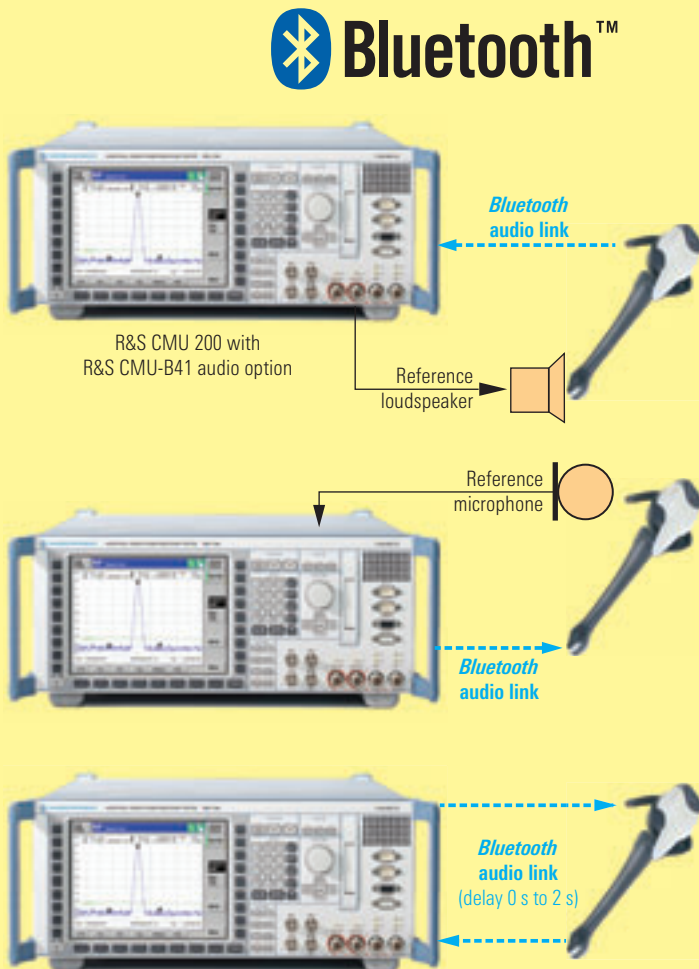

R&S CMU 200 with
R&S CMU-B41 audio option

Bluetooth audio link

Reference loudspeaker

Reference microphone

Bluetooth audio link

Bluetooth audio link
(delay 0 s to 2 s)

FIG 1
Measurement of the audio characteristics of a *Bluetooth* headset (microphone and earphone) by using the R&S CMU-B41 audio option.

FIG 2
Function test of a *Bluetooth* headset by means of the echo test.

▶ a message which is displayed by the R&S CMU 200 (FIG 3).

Enhanced modulation measurements

In compliance with the *Bluetooth* RF test specification, a minimum of 99.9% of all measured bits must have a frequency deviation of at least 115 kHz. The R&S CMU 200 displays the measurement result in an additional window in the modulation display.

Channel display in frequency-hopping mode

If "on limit failure" is set as a stop condition in frequency-hopping measurements, the R&S CMU 200 automatically stops the measurement at the RF channel where one of the measured values exceeds the settable limit values, and displays the channel number.

Dirty transmitter parameters

The *Bluetooth* RF test specification stipulates a "dirty transmitter" for measuring the receiver sensitivity; its two major parameters, modulation index and frequency accuracy, can be continuously adjusted on the R&S CMU 200, and set in any combinations. Even during link setup (inquiry, connect), the R&S CMU 200 uses the dirty transmitter settings, thus enabling a wide variety of tests that exceed the test specifications requirements by far.

Control commands to the DUT

The R&S CMU 200 can send user-specific control commands in the form of any bytes via the ACL link to the DUT. This application, which comes in useful in production, allows the control of specific functions of the DUT via the RF interface, e.g. switching a headset LED on and off.

Complementary software

R&S CMUGo

Windows™ Software R&S CMUGo is available free of charge and allows easy configuration of test sequences to remote-control the R&S CMU 200. A wide variety of modules (DLLs) are available for *Bluetooth*, supporting measurements in compliance with the *Bluetooth* RF test specification for example. The software also offers automatic measurement of all available parameters on all 79 *Bluetooth* channels. It generates graphics that show the measurement results for all channels. Thus, the user can see at a glance if the DUT exhibits homogeneous behaviour across the entire frequency range. R&S CMUGo is also very convenient for users who want to create user-specific remote-control scripts, since all remote-control commands used by the software can be easily copied to other applications.

R&S DUT Control

The R&S CMU 200 can switch a DUT to test mode only if it is locally enabled for this test mode. Previously, each DUT required specific software which could be easy or not so easy to operate. Rohde & Schwarz now provides all users of the R&S CMU 200 free of charge with the Windows™ Application R&S DUT Control which very easily controls a DUT via its standardized host controller interface (HCI).

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

FIG 3
Power control of the *Bluetooth* DUT by using the up and down keys. The R&S CMU 200 displays the difference level as compared to each previous power level in a separate measurement window.