R&S®CMU 200 Universal Radio Communication Tester

HSUPA data applications

In addition to the established WCDMA Release 99 and HSDPA transmission standards, the R&S®CMU 200 now offers capability to perform HSUPA end-to-end data tests. It is thus able to handle the latest expansion of the WCDMA standard, allowing mobile user equipment to be tested in a realistic scenario at an early stage of development.

What is HSUPA

HSUPA (high-speed uplink packet access) is an advancement of the WCDMA standard. It is included in Release 6 and optimized for packet-switched uplink transmission. A significant enhancement is the rapid allocation of uplink resources to mobile equipment by means of a grant value defining the power at which a mobile may send in the uplink. The base station signals the grant value via the E-AGCH and E-RGCH channels (enhanced absolute / enhanced relative grant channel). Moreover, an H-ARQ profile for rapid retransmission of errored data blocks is used. The H-ARQ profile is signaled via the E-HICH channel (enhanced H-ARQ indication channel). The transmission time intervals (TTIs) of data blocks can optionally be reduced from 10 ms to 2 ms in order to decrease the delay and increase the data rate. In the uplink, data is transported on one or several E-DPDCHs (enhanced dedicated physical data channels). A new control channel – E-DPCCH (enhanced dedicated physical control channel) – is also provided. For more information refer to [2].

End-to-end data tests – now also for HSUPA

The test setup and procedure for HSUPA end-to-end data connections (see box below) is the same as for WCDMA / HSDPA tests [1]. The device under test (DUT) is connected to the R&S®CMU 200 and initiates a packet-switched call setup. The radio tester establishes the call with the preset parameters. On the R&S®CMU 200 graphical user interface, you can select HSUPA for packet data transmission in the uplink. Downlink transmission can take place on a WCDMA Release 99 channel or an HSDPA channel – in other words, HSPA transmission (i. e. simultaneous HSDPA and HSUPA transmission) is possible. When the call has been set up successfully, a data application can be run. For example, files can be uploaded and downloaded between the tester and the DUT using the FTP server in the R&S®CMU 200. For other applications, e. g. video streaming, an external PC can be connected to the R&S®CMU 200 via Ethernet, and an end-to-end data connection can be set up between the DUT and the PC for any IP-based application.

Measurement functions for HSUPA

During an end-to-end data connection, the enhanced measurement functions of the R&S®CMU 200 can be used to analyze the signal sent by the DUT. For example, the various code domain power measurement functions detect the new E-DPCCH and E-DPDCH HSUPA channels and measure their gain factors (FIG 1). This measurement reveals whether the DUT transmits on the various channels with the correct gain factors. Similarly, all the known power, modulation, and spectrum measurements can also be used for testing the HSUPA uplink signal. The RLC BLER measurement is particularly suitable for end-to-end data connections. It displays the data throughput versus time at the RLC layer. The RLC BLER measurement in FIG 2 shows a UDP streaming application running in the uplink while an FTP data transfer is performed in parallel. The figure shows that the throughput of the streaming application varies about 1.2 Mbit/s, while data throughput of the FTP transmission is constantly high at nearly 2 Mbit/s. With the TTI value set to 10 ms, this is the maximum achievable throughput.

Comprehensive configuration options

The R&S®CMU 200 user interface allows a large number of parameters to be set for the HSUPA connection, both for the downlink signaling channels generated by the tester and the HSUPA uplink signal sent by the DUT. A key parameter is the TTI mode. The R&S®CMU 200 offers both the standard TTI value of 10 ms and the new value of 2 ms.

The grant values to be signaled to the DUT via the E-AGCH and E-RGCH channels (see box) can be defined. Constant values or user-defined patterns can be sent either once or continuously. Using the relevant R&S®CMU 200 measurement functions, the DUT's response to signaled grant values can be tested directly. The RLC BLER measurement, for example, reveals immediately whether a DUT reduces the data rate when a lower grant value is signaled. For the E-HICH, the R&S®CMU 200 can also send predefined patterns of retransmission requests.

The parameters defining the HSUPA uplink signal (FIG 3) are communicated to the DUT during call setup. These parameters include, for example, the gain factors for the uplink signal. They are set directly for the E-DPCCH channel and via reference E-TFCIs for the E-DPDCH channel. Moreover, the maximum number of retransmissions for the H-ARQ and further HSUPA-specific parameters can be set and the response of the DUT tested.

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FIG 1
Code domain power measurement during an HSUPA end-to-end data connection. The R&S®CMU 200 detects a DPCCH (Rel. 99) as well as an HSUPA E-DPCCH and two HSUPA E-DPDCH channels, and displays the measured relative powers.

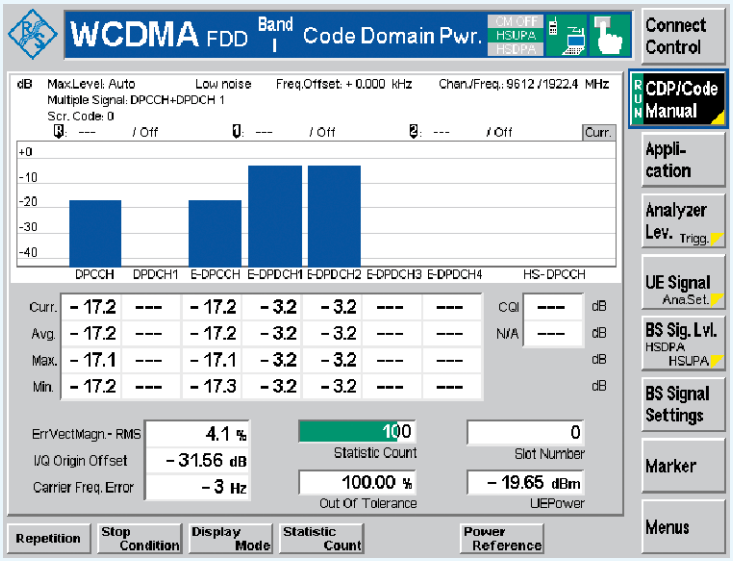


FIG 2
RLC BLER measurement during an HSUPA end-to-end data connection with two parallel data applications in the uplink: While a streaming application is running, a file is uploaded via FTP.

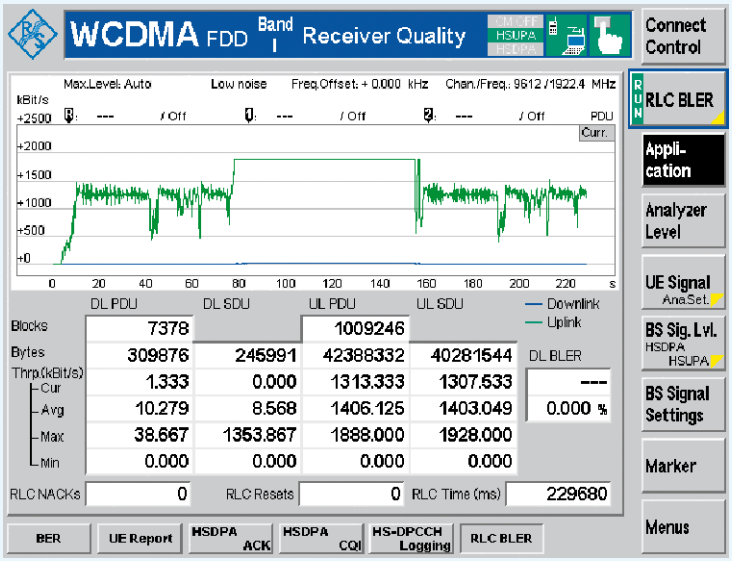
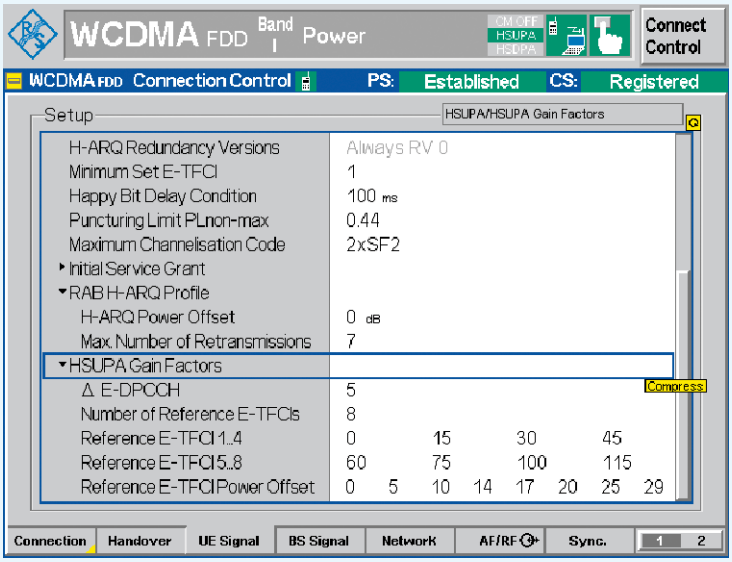


FIG 3
HSUPA uplink signal configuration on the R&S®CMU 200 user interface. The parameters are signaled to the DUT during call setup.



More information and data sheet at www.rohde-schwarz.com (search term: CMU200)

REFERENCES

[1] R&S®CMU 200 Universal Radio Communication Tester: WCDMA/ HSDPA data applications. News from Rohde & Schwarz (2006) No. 191, pp 24–25

[2] R&S®CRTU-W Protocol Tester: HSUPA: Increased uplink resources – thoroughly tested. News from Rohde & Schwarz (2006) No. 191, pp 4–6