Optimize your HSPA+ design
Application

Simultaneous DL throughput verification and
UL transmission testing with the R&S®CMW500

The R&S®CMW500 radio communication tester supports all steps of HSPA+
terminal development – from functional test to application test.
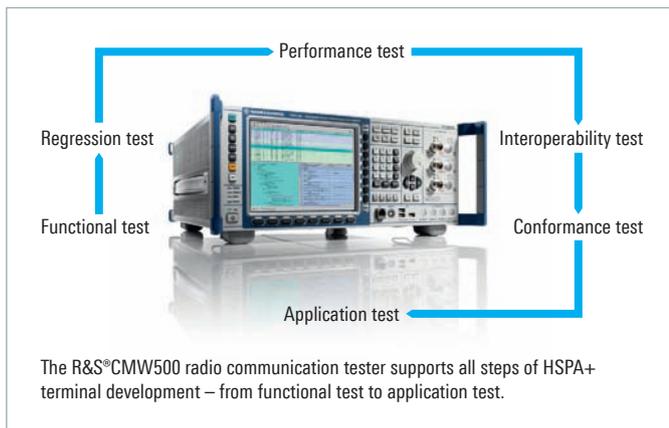
Your task

3GPP Release 7 specifies 64QAM modulation in down-
link in combination with protocol (Layer 2) enhancements
featuring downlink data rates exceeding 21 Mbit/s. The
implementation of these two features in a mobile terminal
places higher requirements on the design. The maximum
possible throughput needs to be achieved while the pro-
tocol stack is running according to 3GPP specifications. In
the protocol test environment, test scenarios are created to
compose and analyze messages and to run test suites in
an automated manner, for example for regression testing.

The resulting data throughput of a mobile terminal design
is measured in an end-to-end (E2E) environment. This en-
ables you to determine the maximally achievable data rate
on the IP layer by running a specific service of interest, for
example streaming a video file. Furthermore, mobile ter-
minal designers need to verify that basic RF uplink charac-
teristics such as output power, EVM, occupied bandwidth,
etc., are within the 3GPP specification limits, although the
64QAM and Layer 2 enhancement features do not directly
affect the UL transmission of the device under test (DUT).

An overall test that includes an HSPA+ data call in the pro-
tocol test environment, E2E throughput testing and RF up-
link measurements is necessary in order to enhance your
HSPA+ design to the maximum. And ideally, a single testing
device should be able to measure all of them.

T&M solution

The R&S®CMW500 radio communication tester is a unique
multi-purpose tester. It provides designers of UE proto-
col stacks with a 3GPP specification-compliant reference
implementation of the air interface. The comprehensive
functions of the programming interfaces and the highly
detailed representation in the analysis tools enable quick
detection of discrepancies in the DUT protocol stack.

Example scenarios are available for the specific testing of
64QAM modulation in combination with Layer 2 enhance-
ments. The R&S®CMW500 generates internal arbitrary data
after setting up the appropriate 64QAM radio bearer with
the DUT. When running the test case the throughput is eval-
uated simply by starting the RLC throughput monitor. By
using the logging capabilities of the R&S®CMW500 and its
message analyzer, a detailed investigation of the message
flow is possible, for example to detect the loss of perfor-
mance due to incorrect behavior and also protocol errors.

In order to identify the E2E capabilities of the design, an
alternative test scenario from the available example sce-
nario set is used. Again, a 64QAM radio bearer is setup,
but without internal data provision. The IP data has to be
generated by a suitable application, e.g. by using a media
player with an appropriate IP address configuration. The
throughput performance is accessible on the RLC layer
using the RLC throughput monitor and/or on the IP layer
using an arbitrary bitmeter application.

The R&S®CMW500 is equipped with powerful hardware and provides a very modular software concept. Two different software options can be used on the same hardware, enabling test engineers to run RF measurements parallel to an medium-level API (MLAPI) test scenario that was started in the protocol environment.

The RF measurements are provided in multi-evaluation mode. An overview screen provides all measured results and scalar values for the essential measurements including UE power, error vector magnitude (EVM), root mean square (RMS) power, carrier frequency error and occupied bandwidth (OBW). Since only one set of measured data is used, the individual results relate to each other, which makes troubleshooting and debugging easier. The overview display in multi-evaluation mode can be adapted to the individual testing needs. After reviewing all results to obtain an overview, the test engineer may want to concentrate, for example, on two specific measurements for a detailed analysis.

The R&S®CMW500 is your ideal choice for overall HSPA+ testing, providing comparable and detailed results from design through to production, fulfilling all test needs. Future implementations will reflect the latest 3GPP enhancements, including LTE.

See also: www.rohde-schwarz.com/technology/HSPA

Test setup for parallel measurement of all relevant parameters with the R&S®CMW500
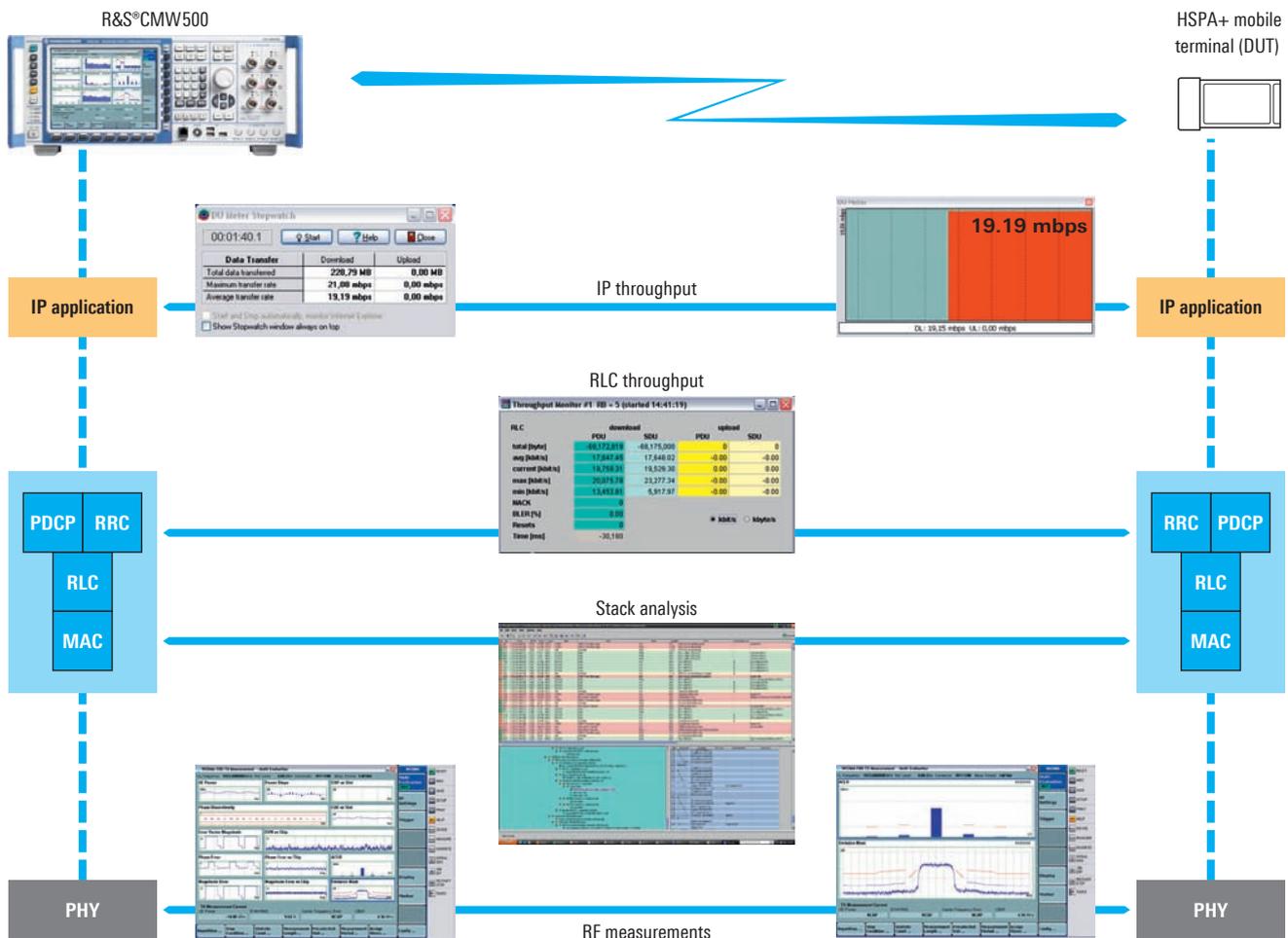
Parallel measurement of all relevant parameters with the R&S®CMW500: The throughput monitor provides performance on the RLC layer while, additionally, bitmeter applications provide E2E performance on the IP layer. Parallel uplink RF measurements can be started in addition.