

## 3G Virtual Protocol Test System R&S CRTU-VT

### Protocol testing with a PC

#### Software tools

- ◆ Integrated TTCN development environment with TTCN editor and compiler
- ◆ Simple configuration and execution of individual test cases and complete test sequences
- ◆ Powerful software tools for analysis of protocol procedures
- ◆ Identical software tools for the Virtual Protocol Testers R&S CRTU-VT and R&S CRTU-W
- ◆ Upgrade to Protocol Tester R&S CRTU-W

#### 3GPP test cases

- ◆ Verified 3GPP TTCN signalling conformance test cases for testing MAC, RLC, RRC and NAS to 34.123-3
- ◆ Automatic generation of 3GPP executable test cases
- ◆ Support of GCF test case packages 1 to 4
- ◆ Scheduling of individual test case packages in line with GCF prioritization

#### Applications

- ◆ Virtual testing of 3G UE protocol stack implementations
  - Higher layer non access stratum test cases
  - Access stratum test cases RRC, RLC, MAC
- ◆ Regression tests
- ◆ Application tests



**ROHDE & SCHWARZ**

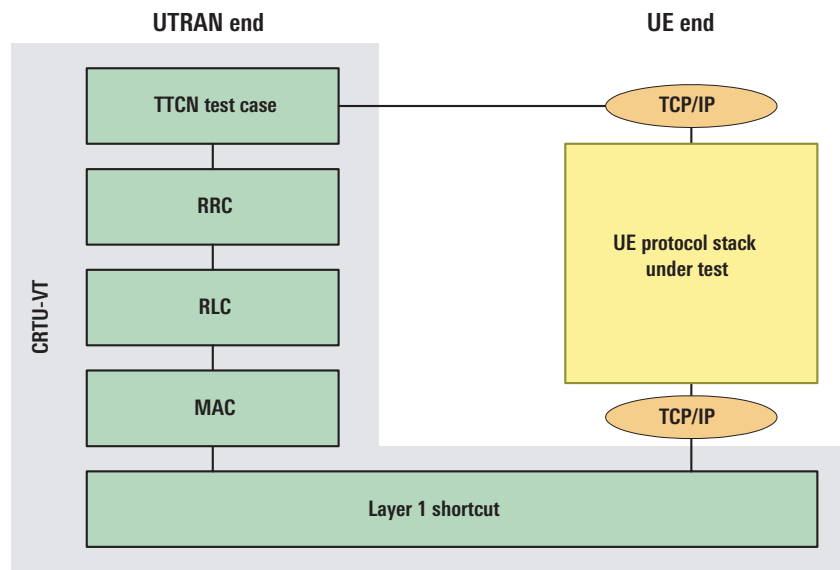
# 3G Virtual Protocol Test System R&S CRTU-VT

The 3G Virtual Protocol Test System R&S CRTU-VT combines a complete TTCN (tree and tabular combined notation) software development environment with verified 3GPP signalling test cases and powerful analysis tools for testing 3G UE protocol stacks. It ideally complements the 3G Protocol Tester R&S CRTU-W and permits early and comprehensive testing of signalling procedures in 3G networks, regression testing of UE protocol stack implementations and the high-level application tests of new 3G services.

## Software components

The R&S CRTU-VT comprises the following software components:

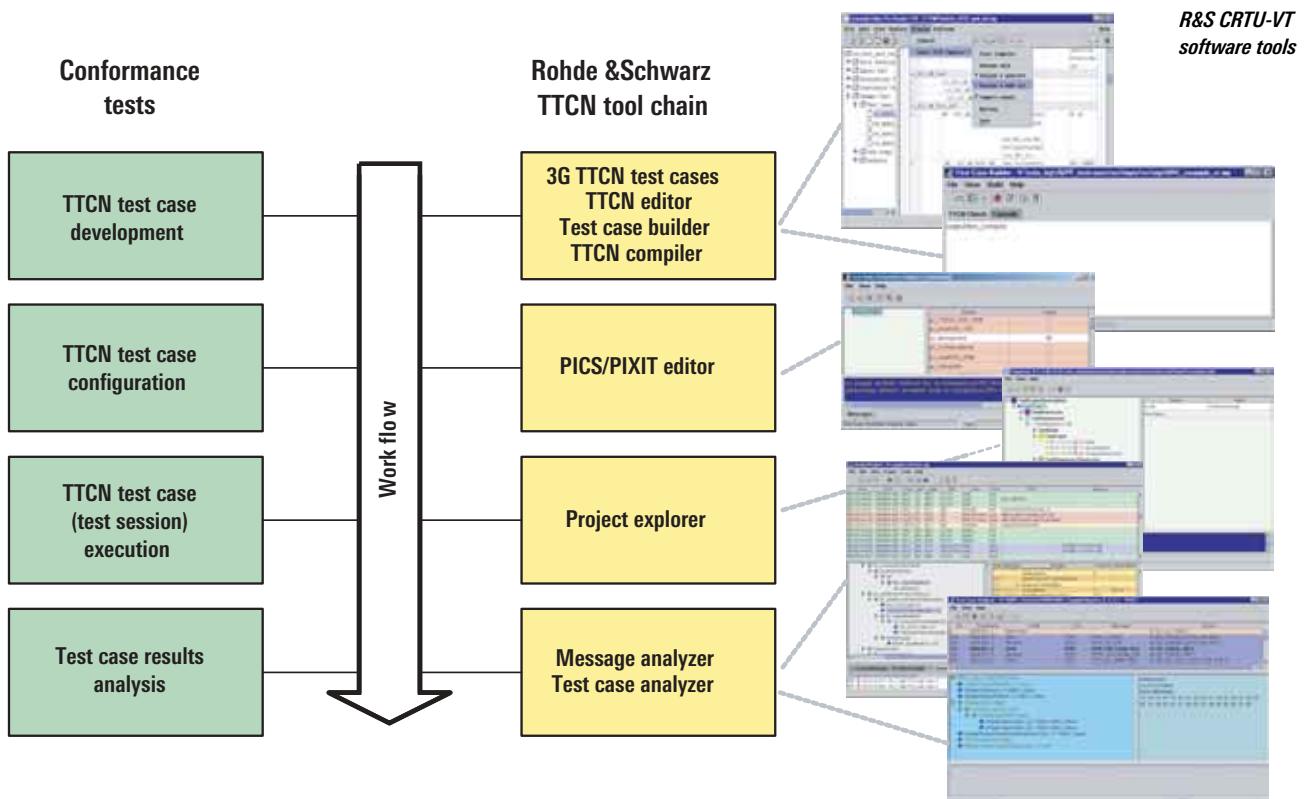
- ◆ Integrated TTCN development environment with graphics editor, test case builder and compiler for creating new 3GPP TTCN test cases and for modifying the test cases supplied
- ◆ Standard Rohde&Schwarz reference implementation of UTRAN protocol stacks in line with 3G specifications including simulation of layer 1



## System architecture

- ◆ Powerful software tools for configuration and execution of signalling test cases and for detailed analysis of test results using the generated log files
- ◆ Signalling conformance test cases in TTCN according to 34.123-3

The 3G Virtual Protocol Test System R&S CRTU-VT comprises everything required for an early conformance test of 3G UE protocol stacks prior to integration into the physical layer.



## Upgrade to R&S CRTU-W

The software of the virtual tester is identical with that of the Protocol Tester R&S CRTU-W. An upgrade from the R&S CRTU-VT to the R&S CRTU-W can also be supplied.

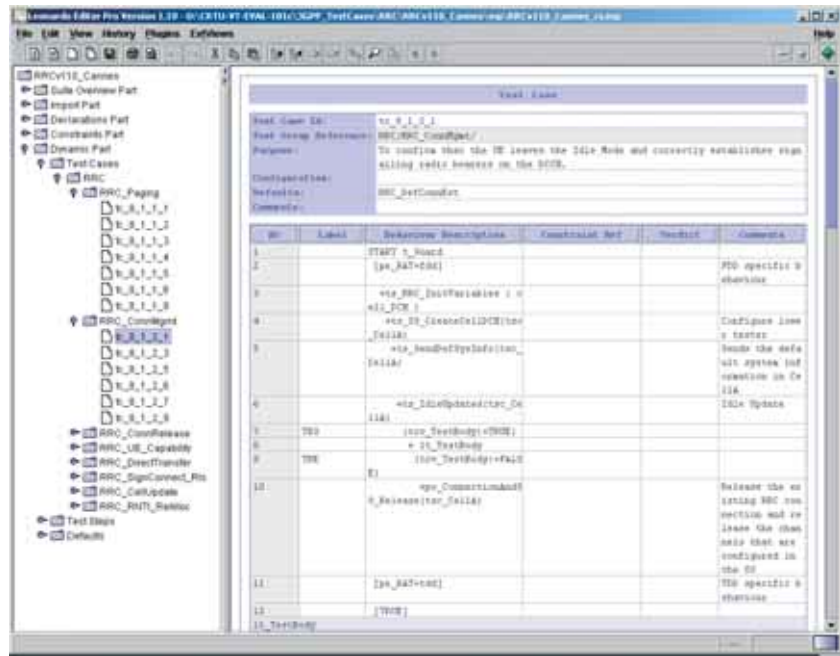
## Simple installation

The R&S CRTU-VT is a pure software product on a CD-ROM which can be run under Windows 2000 on any modern PC. A convenient installation program installs all required software components on the target computer.

The R&S CRTU-VT tools and test cases are licensed and hardlock-protected.

## Soft timer for reducing the test time

The execution speed of the signalling tests can be varied within wide ranges by means of the soft timer. For instance, a test case may be run 100 times faster than in reality for regression tests, but can also be slowed down or even stopped for troubleshooting in the UE protocol stack.



TTCN editor Leonardo Pro

## System architecture

Different test cases are available for different protocol procedures such as connection setup, paging or call setup.

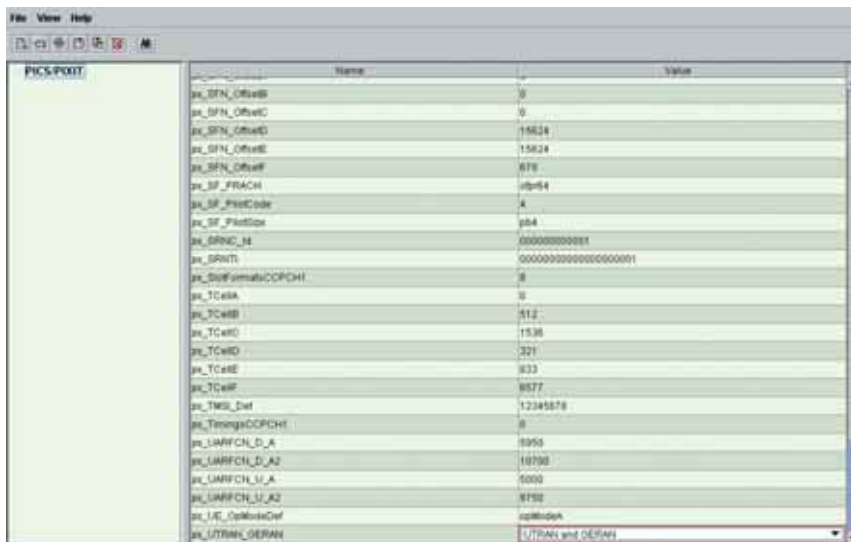
The appropriate TTCN test case and the UTRAN protocol stack simulate the 3G network. The responses of the UE protocol stack to be tested are recorded by the R&S CRTU-VT, compared to the protocol behaviour defined by the 3G specifications and checked for conformance.

## TTCN editor Leonardo Pro

The user-friendly and powerful TTCN editor Leonardo Pro is provided for generating and modifying TTCN test cases. This editor has been completely integrated in the TTCN development environment by Rohde&Schwarz and permits direct display of protocol errors in the TTCN source text, for example. This considerably reduces turn-around times in test case development.

## TTCN compiler

The TTCN compiler translates the 3G TTCN test suites into the automatically generated C code. The C code is then linked to the individual test cases by means of Rohde&Schwarz-specific 3G libraries. The TTCN compiler simplifies test case development by a comprehensive syntax check. The ASN.1 BER/PER encoding of messages, which is important for 3G protocols, is fully supported.



PICS/PIXIT editor

The test case builder, a graphical front-end developed by Rohde&Schwarz, controls the make/build process of the compiler and makes generation of 3G test cases very convenient.

### PICS/PIXIT editor

The graphical PICS/PIXIT editor simplifies generation and editing of PICS/PIXIT parameters required for test case configuration at run time. The previously time-consuming and error-prone entry of PICS/PIXIT parameters is considerably simplified through the use of selection lists for ENUM values, automatic range checks and tool tips containing online help.

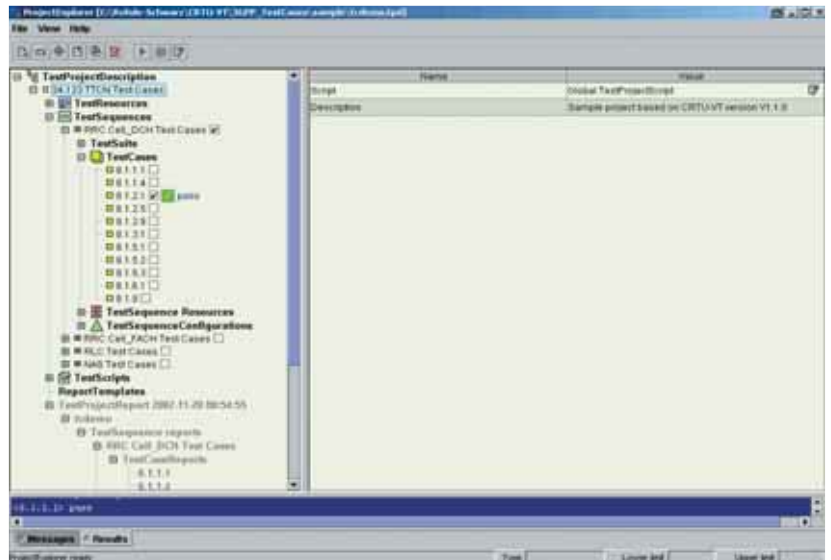
### Project explorer

The project explorer is responsible for test case execution. With this tool, test cases are easily combined to form complete test sessions and the UTRAN protocol stack is correctly configured. During execution, the current status of individual test cases can be followed on the project explorer and after completion of the test case, the verdict, i.e. the obtained result, is displayed.

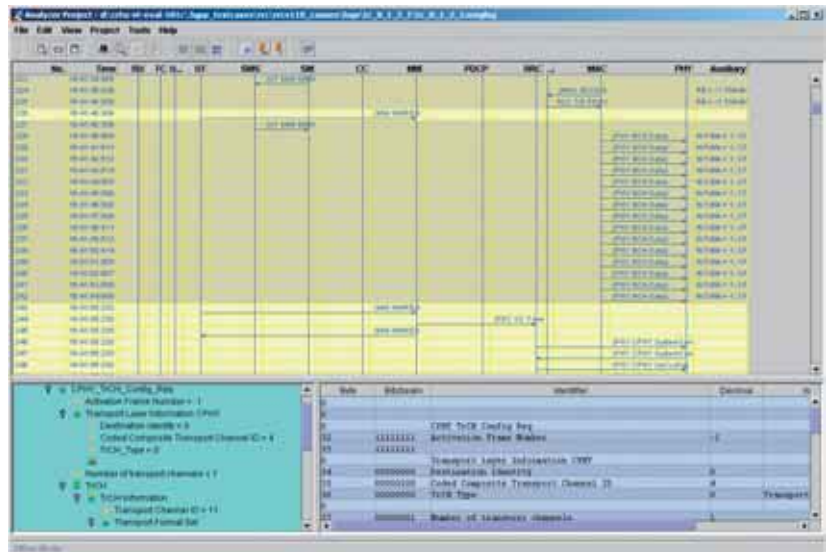
### Message analyzer

The message analyzer is the most powerful tool of the R&S CRTU-VT applications.

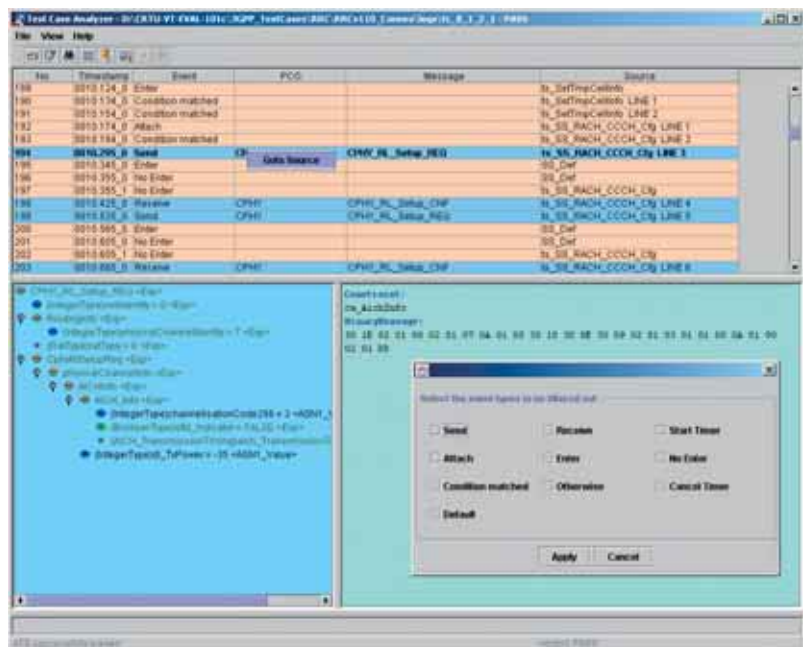
During test case execution, all protocol messages exchanged between the R&S CRTU-VT and the protocol stack under test as well as the information flow within the R&S UTRAN protocol stack are recorded. The user-friendly and powerful message analyzer permits detailed analysis of the recorded signalling sequences. The messages are automatically decoded and displayed either in tabulated form or as a graphical message sequence chart (MSC). The message structure is presented down to bit level. Powerful functions such as filtering and searching message elements, colour-coding of message types and a parent-child view illustrating the relationship between messages support the analysis of complex 3G signalling sequences.



Project explorer



Message analyzer (MSC View)



Test case analyzer

## Test case analyzer

The test case analyzer, which complements the message analyzer, displays the automatically generated trace files of the TTCN test cases. It displays the messages to and from the test case PCOs (points of control and observation), the timer configuration and constraint matching in tabular form. Hyperlinks allow direct access to the TTCN source text. The test case analyzer and the message analyzer have a similar look and feel and use a similar operating concept.

## R&S CRTU-VT TTCN test case packages

### 3GPP signalling conformance test cases

The 3G mobile radio standard defines the protocol procedures for the radio access network and the associated signalling conformance tests (3GPP specifications TS 34.108, TS 34.123). These test cases are binding worldwide for 3G network operators and manufacturers of mobile radio equipment.

TS 34.123-3, which is based on the valid baseline, presently provides more than 650 test cases in TTCN. These tests cover all protocol layers from layer 2 of the 3G radio access network (RAN) up to the higher layers 3 and 4 in the non access stratum. Circuit-switched and packet-switched services are tested in the same way.

### GCF test case priorities

The Global Certification Forum (GCF) selected 379 TTCN test cases (dated 11/02) for certification of the first 3G UEs. These test cases are prioritized by the GCF and will be ported to the valid baseline every six months, starting with the 104 most important GCF package 1 test cases.

## Rohde&Schwarz TTCN test case packages

Rohde&Schwarz played a key role in the specification of test cases for TS 34.123-1, TTCN implementation in TS 34.123-3 and ETSI/MCC160 (at ETSI in France) and the subsequent verification on the Protocol Testers R&S CRTU-VT and R&S CRTU-W.

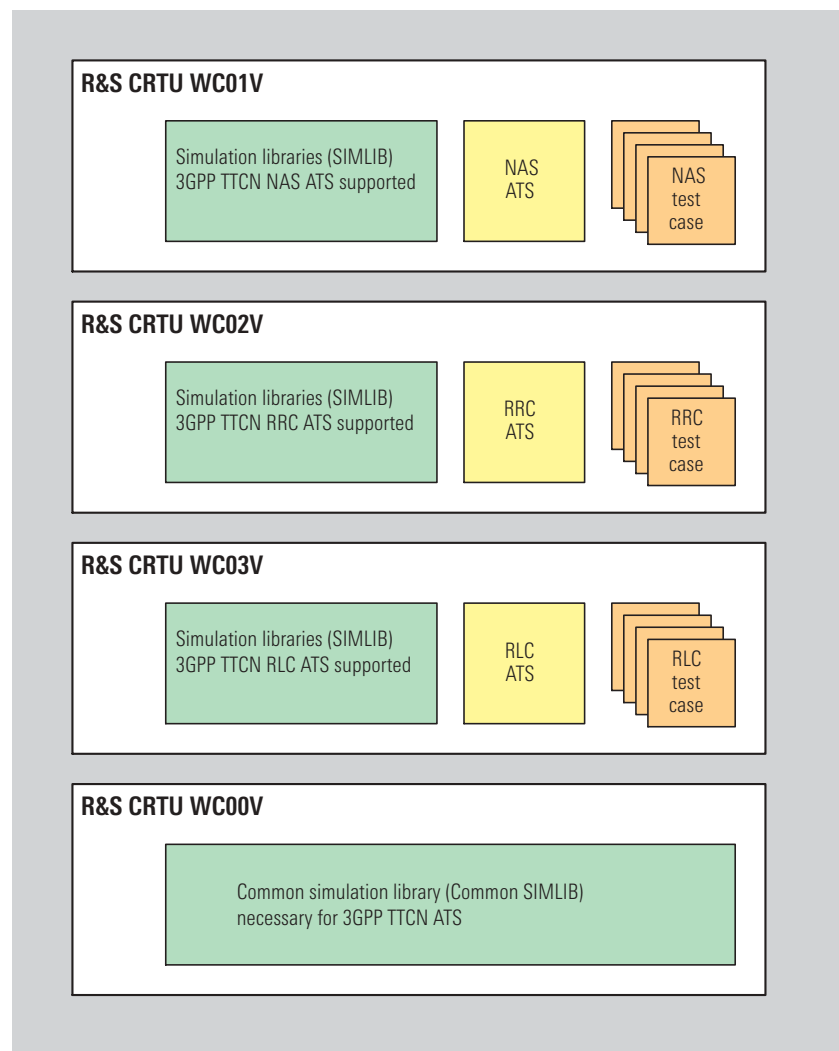
The results achieved by the committees in many years of successful work and in cooperation with ETSI/MCC160 are available in the form of verified TTCN test case packages.

Each Rohde&Schwarz test case package contains verified 3GPP TTCN test cases, the order of supply depending on GCF priorities.

To ensure that the test cases are of top quality and without errors, they were verified by Rohde&Schwarz against independent UE protocol stack implementations. Errors in the 3GPP test cases are eliminated by Rohde&Schwarz and reported to ETSI/MCC160 by means of a change request. Rohde&Schwarz customers with a technical support contract will receive the verification results in advance.

Each Rohde&Schwarz test case package comprises:

- ◆ Abstract test suite (ATS)
- ◆ Simulation libraries for generating executable test cases
- ◆ The executable test cases



*Test case packages*

## Support and training

Rohde&Schwarz offers comprehensive support contracts for the R&S CRTU-VT and a number of training seminars.

### Support contracts

The R&S CRTU-VT support contracts include regular updates of the protocol stack and of the TTCN development and analysis tools.

Technical support is provided for the TTCN test case packages, including support by e-mail or telephone.

Technical support also includes direct access to Rohde & Schwarz verification results before they are implemented by ETSI/MCC160 in the official 3GPP TTCN test case packages.

Debugged ETSI TTCN test cases are thus available to customers for testing at the earliest possible time.



### Seminars

To shorten the learning curve for the 3GPP TTCN test case packages and to facilitate efficient use of the R&S CRTU-VT, Rohde&Schwarz offers the following seminars:

- ◆ WCDMA fundamentals
- ◆ TTCN fundamentals
- ◆ R&S CRTU-VT tools
- ◆ TTCN test case development with the R&S CRTU-VT

- ◆ Linking the UE protocol stacks to the R&S CRTU-VT
- ◆ Conformance test with 3GPP TTCN test case: in-depth training on R&S CRTU-VT tools, with emphasis on test case analysis

The duration and content of seminars will be defined in cooperation with the customer.

## Specifications

Hardware	Minimum requirements
CPU	Pentium III, 800 MHz class
Memory	256 Mbyte RAM 512 Mbyte additional swap space
Required hard disk memory	1 Gbyte
CD-ROM drive	>16 x
Graphics card	1024 x 768 XGA resolution
Interfaces	
Entry	keyboard, mouse
Network adapter	standard 10/100 Mbit network adapter
I/O ports	Centronics parallel or USB connector for hard-lock dongle
Software	Minimum requirements
Network	TCP/IP network driver installed
Operating system	Windows 2000

Certified Quality System  
**ISO 9001**  
DQS REG. NO 1954

Certified Environmental System  
**ISO 14001**  
REG. NO 1954



## Ordering information

Designation	Type	Order number
Virtual test environment for WCDMA FDD protocol tests of mobile terminals, including the following options (except upgrade to R&S CRTU-W and support contracts)	R&S CRTU-VT	1139.7190.02

### Options

Designation	Type	Order number
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#### WCDMA operational software

Virtual testing WCDMA FDD operational software for UE test to UTRAN protocol stack reference implementation MAC, RLC, layer 1 shortcut; layer 1 shortcut at transport channel level; upper tester, PHY and CPHY interface API (TCP/IP); Rohde&Schwarz project explorer, Rohde&Schwarz message analyzer, Rohde&Schwarz PICS/PIXIT editor; C/C++ compiler, Microsoft Visual C/C++, version 6.0	R&SCRTUW001V	1139.6007.02
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#### TTCN and analysis tools

TTCN editor/analyzer, TTCN editor Leonardo Pro from Da Vinci Systems, Rohde&Schwarz TTCN analyzer	R&S CRTUWT03	1139.5530.02
TTCN compiler from Danet GmbH, supports all 3GPP TTCN ATS in line with TS 34.123-3	R&S CRTUWT04	1139.5600.02

#### Test case packages

Common test case TTCN library in line with TS 34.123	R&S CRTUWC00V <sup>1)</sup>	1139.9606.02
NAS test case TTCN library in line with 3GPP TS 34.123-3	R&S CRTUWC01V <sup>2)</sup>	1139.6207.0x
RRC test case TTCN library in line with 3GPP TS 34.123-3	R&S CRTUWC02V <sup>2)</sup>	1139.6307.0x
RLC test case TTCN library in line with 3GPP TS 34.123-3	R&S CRTUWC03V <sup>2)</sup>	11239.6407.0x

Note: The packages R&S CRTUWC01/02/03V cover > 80% of GCF test case package 1. More test case packages for GCF packages 2 to 4 are planned and not included in the R&S CRTU-VT.

<sup>1)</sup> Required for R&S CRTUWC0xV.

<sup>2)</sup> R&S CRTUWC00V required.

## Upgrade to R&S CRTU-W

Designation	Type	Order number
Upgrade to R&S CRTU-W	R&S CRTUU02	1140.1405.02

## Support

Designation	Type	Order number
1 year technical support for the WCDMA operational software	R&S CRTUWS01	1139.6707.02
1 year technical support for TTCN tools and test cases	R&S CRTUWS02	1139.6807.02



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