ROHDE&SCHWARZ

Technical Information

ROMES Software Option

UMTS Interference Analyzer

TS5K50C

Material-No. 1063.0579.02

Benefits

- Extremely fast and accurate measurement in UMTS Networks, Indoor and Outdoor
- Runs on any high-class PC or Notebook
- Automatic Scrambling Code Detection and Analysis with 2500 Rake Receivers
- Full Spectrum Analyzer Function
- Integral Part of ROMES Network Optimization Software Platform

Features

- High-End Test Receiver ESPI (or Spectrum Analyzer FSP) as RF Front End
- GPS System integrated, uses GIS Data
- -117 dBm sensitivity (-130 dBm in High Resolution Mode)
- 20 Full Measurements per Second

General

In a UMTS Mobile Radio Network, it is essential to achieve accurate information about the receiving conditions of a mobile unit at any place and any time. The first step (before the availability of reasonable test mobile stations TMS) is to implement a mobile unit to measure and identify all Node-B signals in the air.

According to UMTS/3GPP specification, numerous Node-B share one channel. Ideally, the total power of the serving cell is more than 20 dB higher than all other neighbors. In reality, this is impossible for a functioning network, and optimization work requires then the knowledge of all base stations that exceed this threshold of 20 dB distance.

Thus, every UMTS network operator needs a powerful instrument for "UMTS Interference Analysis" in his network.

Rohde & Schwarz Solution

R&S has developed this instrument to achieve highest quality and customer satisfaction. The minimum necessary components are:

- ESPI Test Receiver & Spectrum Analyzer
- ROMES Network Optimization Software with UMTS Interference Analyzer Module
- GPS with PPS-Pulse and/or Synchronization Unit for Triggering
- Powerful PC or Notebook

Figure 1: Notebook with UMTS Interference Analyzer

The principle behind this analyzer is different to that of all other currently available products. Ordinary PN Scanners use the standard technology of mobile telephones with means of regular rake receivers. To fulfil the real requirements for interference analysis in UMTS, R&S has replaced this principle by the development of "Dynamic Rake Receivers". These Dynamic Rake Receivers are capable of tracing up to 5000 different signal propagation paths leading to max. 2500 Node-B's simultaneously, where static rake receivers allow only the tracing of 4 or 8 paths.

With this technology, the UMTS Interference Analyzer can synchronize on UMTS base stations with inexperienced speed, accuracy and dynamic range. Future development will include a 3GPP telephone (commercial and with trace function, when available) to add smart control to the Interference Analyzer.

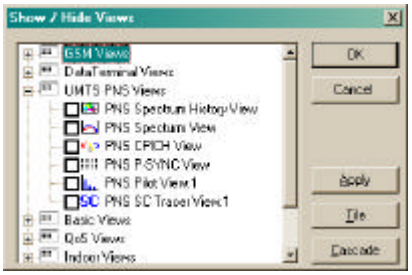
The UMTS Interference Analyzer is part of an extensive software platform named ROMES, which supports the simultaneous measurement and analysis within different wireless network technologies. All measurement data will be stored together with positioning and timing information, for later replay or detailed analysis & processing.

The Receivers FSP and ESPI can be used in the ROHDE & SCHWARZ network optimization system TS9955. They fit mechanically in a 19” rack and need five height units.

Information & Parameter Displays

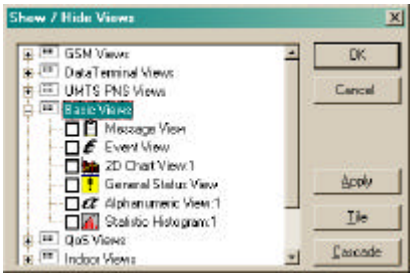
All necessary information for the UMTS Interference Analyzer will be displayed either graphically or in numeric / text values. These comprise (among many others for different tasks in Network Optimization):

Display Windows UMTS:



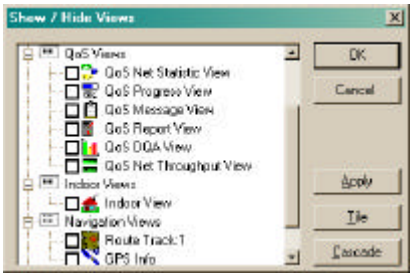
- Spectrum History View
- Spectrum View
- CPICH View
- P-SYNC View
- Pilot View (Multiple)
- Scrambling Code Tracer View (Multiple)

Display Windows General:



- Message View
- Event View
- 2D Chart View (Multiple)
- General Status View
- Alphanumeric View (Multiple)
- Statistics View (Multiple)

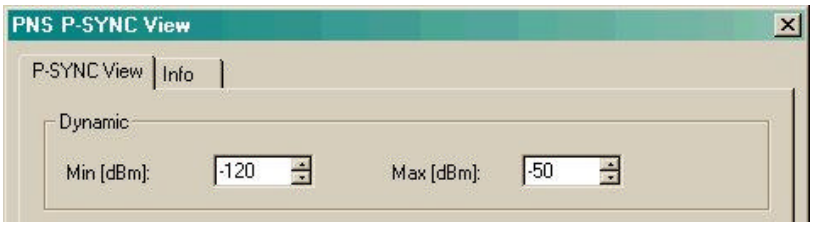
Display Windows Network Optimization:



- QoS Net Statistic View
- QoS Progress View
- QoS Message View
- QoS Report View
- QoS DQA View
- QoS Net Throughput View
- Indoor View for Real-Time Indoor Map Display
- Route Track with GIS Info for Real-Time Map Display (Multiple)
- GPS Info

To make the underlying algorithm as transparent as possible the ROMES Displays offer a view into the different steps of the measurement process.

- **P-SYNC View:**



To synchronize to the UMTS network it is necessary to find all P-SYNCH channels in the air. The result of this step is displayed in the *P-SYNC* View (Figure 2). Is shall be noted here that only peaks that represent original Node-B-Signals are taken into this evaluation, not peaks produced by so-called “accidential correlation”. This enhances speed and accuracy of the subsequent measurements.

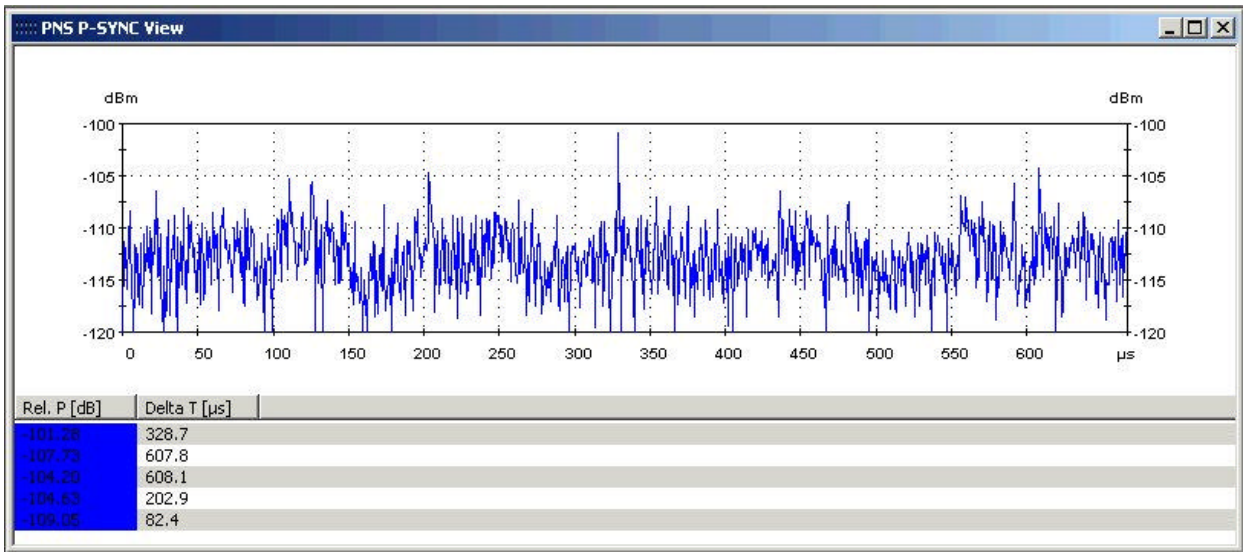


Figure 2: P-SYNC View (with Configuration)

- **CPICH View:**

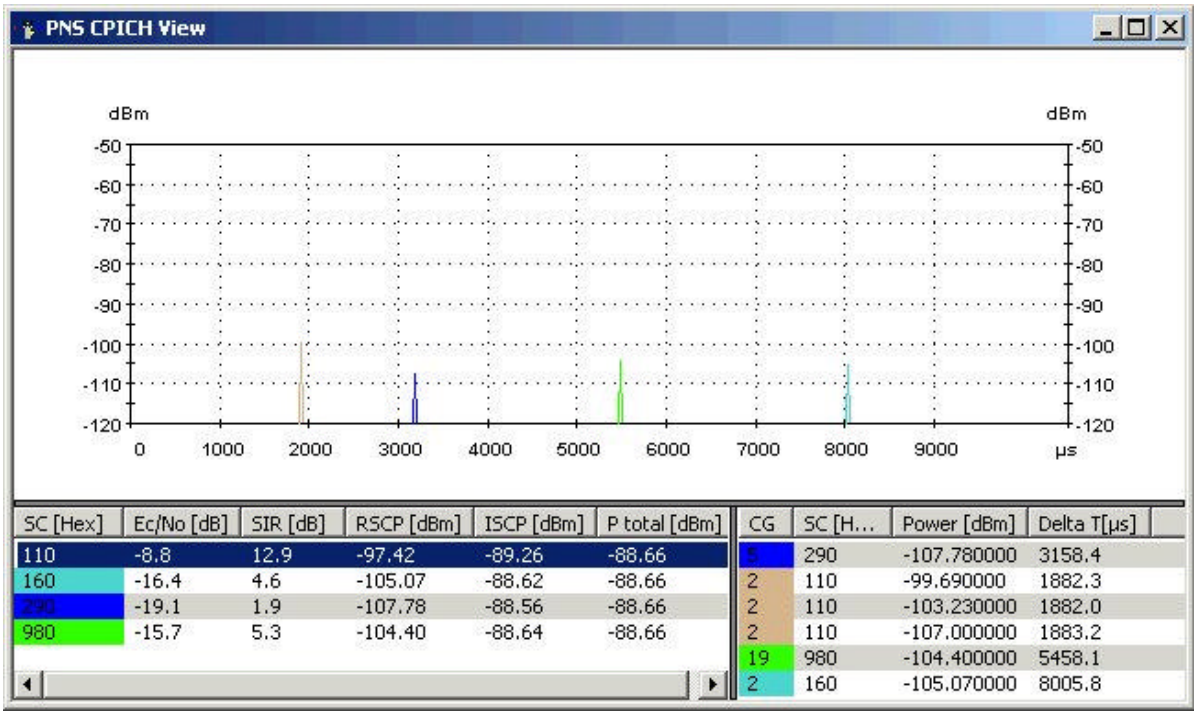


Figure 3: CPICH View

CPICH RSCP = Received Signal Code Power, the received power on one code measured on the pilot bits of the Primary CPICH
Range: -115 .... -25 dBm, resolution 1 dB

ISCP = Interference Signal Code Power, the interference on the received signal measured on the pilot bits. Only the non-orthogonal part of the interference is included in the measurement.

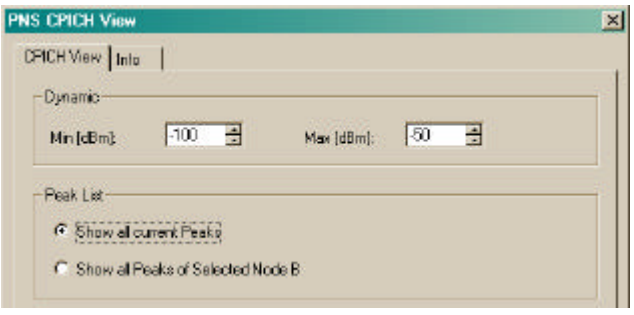
UTRA carrier RSSI = Received Signal Strength Indicator, the wide band received power within the relevant channel bandwidth. Measurement is performed on the UTRAN downlink carrier.
Range: -94.....-32 dBm, resolution 1 dB.

CPICH Ec/Eo (Io) = The received energy per chip divided by the power density in the band. The Ec/Eo is identical to RSCP/RSSI. Measurement is performed on the Primary CPICH.

SIR = Signal to Interference Ratio, RSCP/ISCP

SC = Scrambling Code (512 SC Codes, 0 - 8176)

CG = Code Group. 0 - 63 (CG0 = SC0,16,32...128)



The identified peaks are used for further investigation of the received Node-B's. Using the S-SYNCH channel the Code Groups of the received Node-B's can be found. Once the Code Group is known, the P-CPICH gives the information about the transmitted Scrambling Code. The result of the correlation with the CPICH is displayed in the *CPICH View* (Figure 3). For each found Scrambling Code the view has an entry on its left table. Each Scrambling Code refers to a Node-B. Beside the total power of the signal, for each Node-B, E_c/I_0, SIR, RSCP, ISCP are calculated.For each entry in the left table the right table shows the peaks coming with the corresponding Scrambling Code (SC). The peaks' power and relative arrival time give the important information about reflections and/or interference.

SC (Scrambling Code) Trace View:

To trace the coverage of a specific Scrambling Code the *SC Trace View* is implemented. This display shows all peaks referring to one Scrambling Code. The strongest peak is on a fixed location on the x-axis (time). Beside this strongest carrier, all reflections and interferes are shown (Figure 4).

It is possible to open mulptiple Scrambling Code Trace Views, as many as are necessary for a measurement tour.

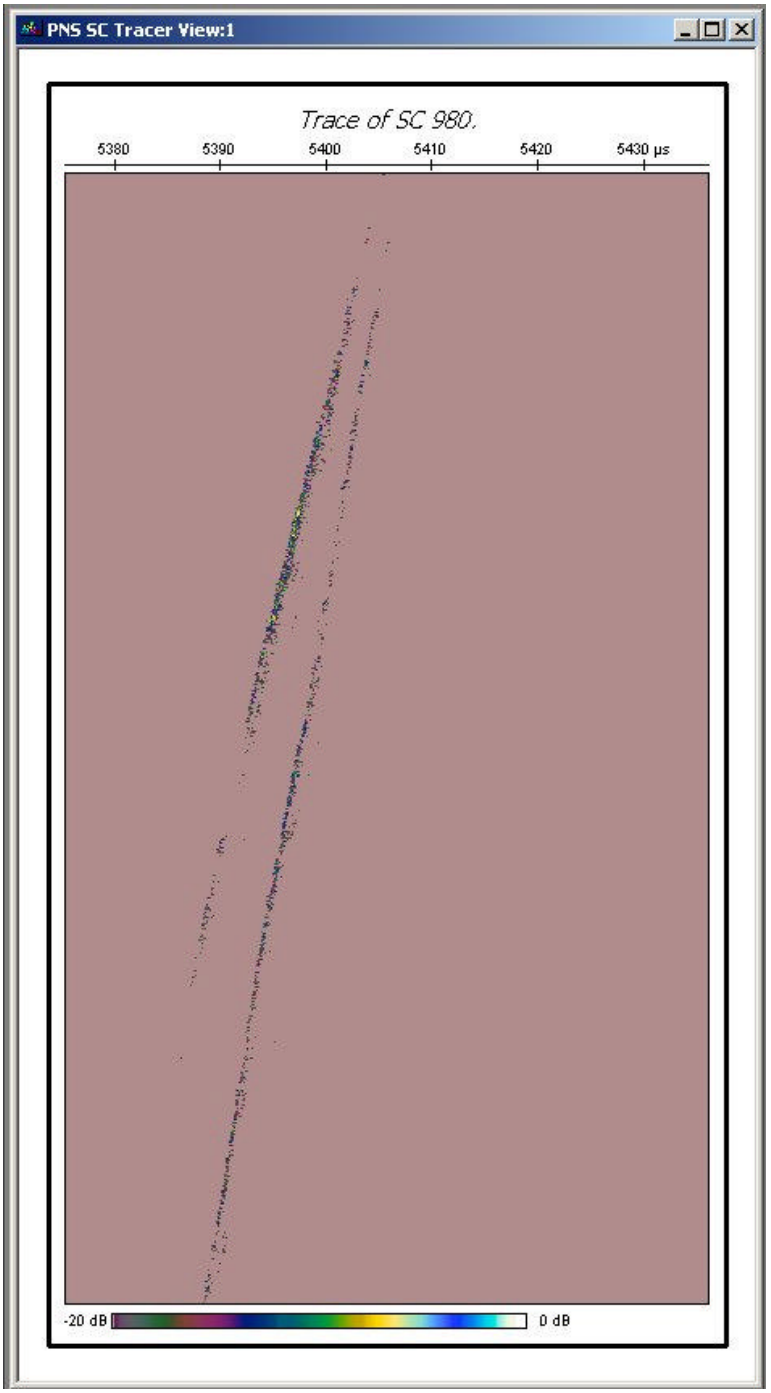


Figure 4: Scrambling Code Tracer View

Spectrum View:

The spectrum of the measured channels will be displayed on a 2D Chart in the *Spectrum View* (Figure 5), covering the full bandwith of 5 MHz. The level distribution in the channel is displayed with three evelopes, upper is max., medium is average and lower line is min.

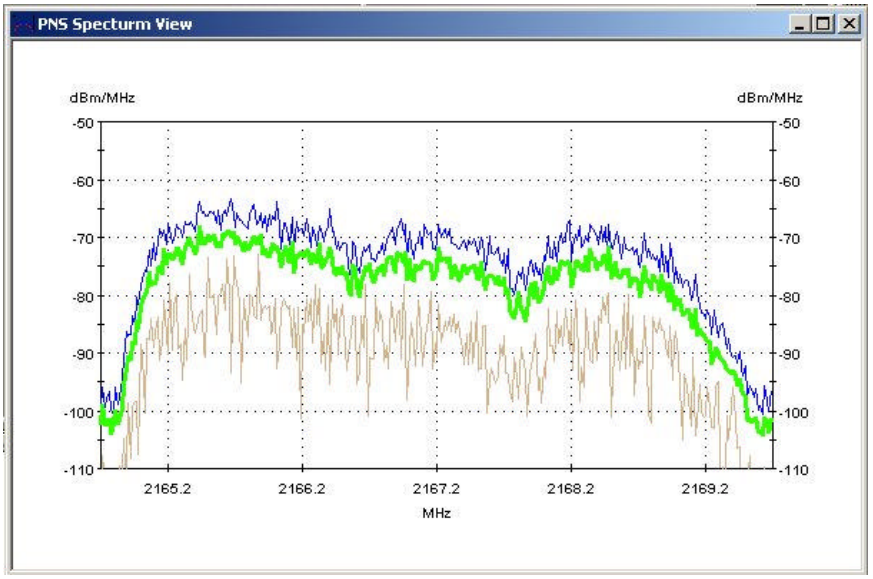


Figure 5: Spectrum View

Spectrum History View:

For even better analysis, the *Spectrum History View* (Figure 6) is available. It does not only show the current spectrum. In a colored waterfall diagram the spectrum development during the drive test can be observed easily.

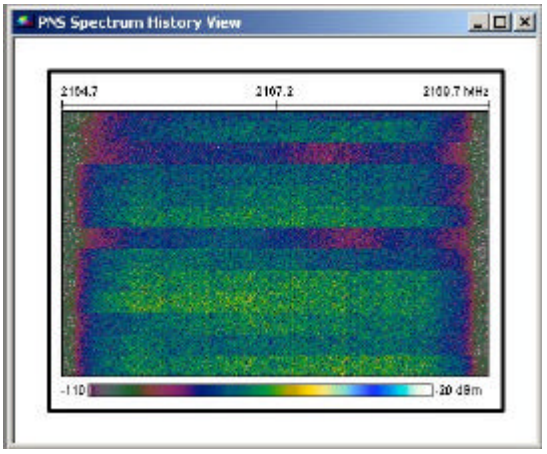


Figure 6: Spectrum History View

Pilot View:

The *Pilot View* (Figure 7) gives an picture of all found pilots at the measurement point, together with a certain history that keeps measured pilots for some time. The view has two display modes. The Min-Max-Average-Current Mode show the minimal, the maximal the average and the current value of the RSCP of the Scrambling Code.

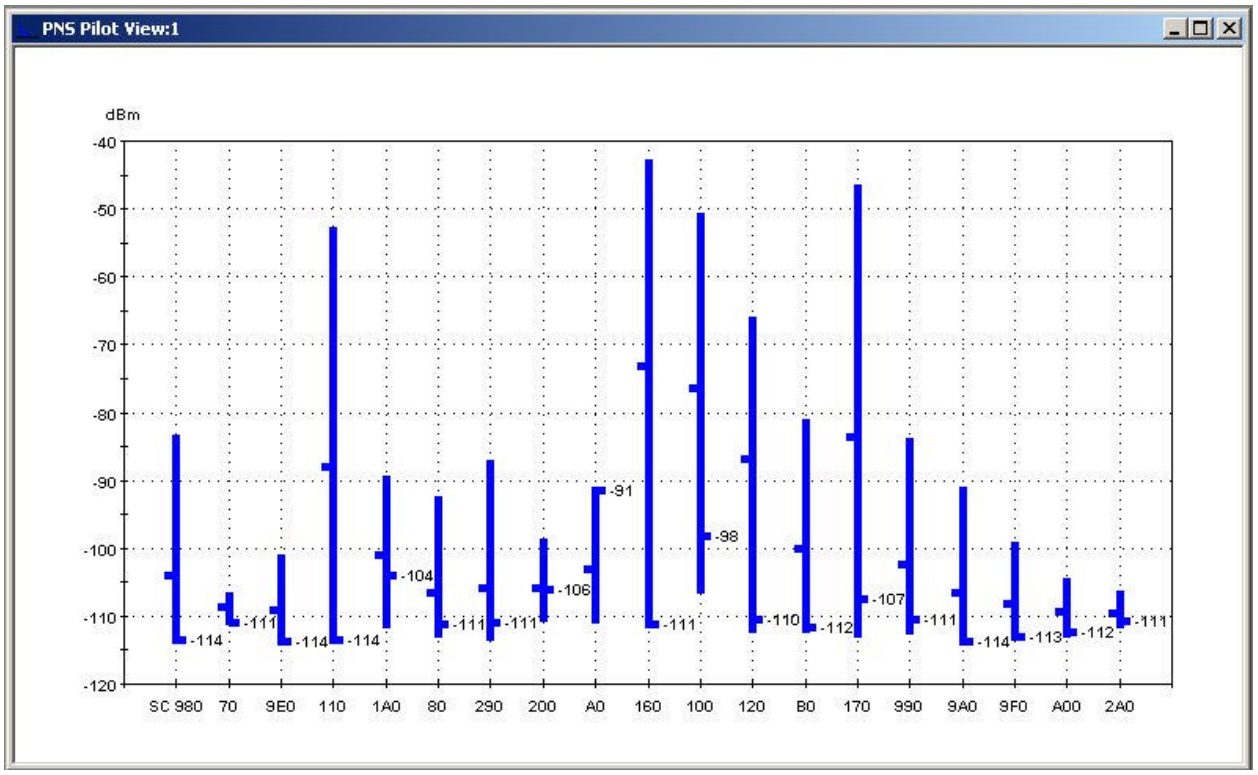


Figure 7: Pilot View (Min, Max, Current)

The Bar Mode shows the RSCP in the well known standard display. It is possible to open mulptiple Scrambling Code Trace Views, as many as are necessary for a measurement tour.

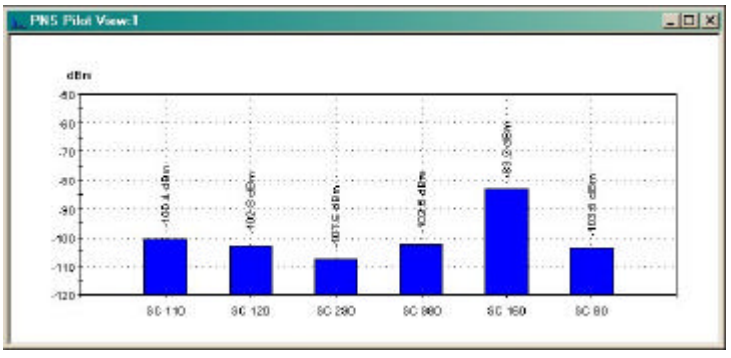
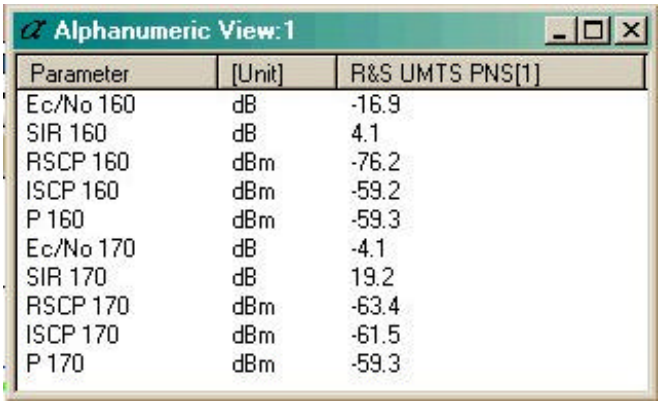


Figure 8: Pilot View (Min, Max, Current)

Standard Views:

Additionally to the special UMTS PN Scanner Views the measured data (E_c/I_0, SIR, RSCP, ISCP and Power) can be displayed in the ROMES Standard View like *Alphanumeric View*, the *2D Chart View* and on the *Route Track View.*



Parameter	[Unit]	R&S UMTS PNS[1]
Ec/No 160	dB	-16.9
SIR 160	dB	4.1
RSCP 160	dBm	-76.2
ISCP 160	dBm	-59.2
P 160	dBm	-59.3
Ec/No 170	dB	-4.1
SIR 170	dB	19.2
RSCP 170	dBm	-63.4
ISCP 170	dBm	-61.5
P 170	dBm	-59.3

Figure 9: Alphanumeric View

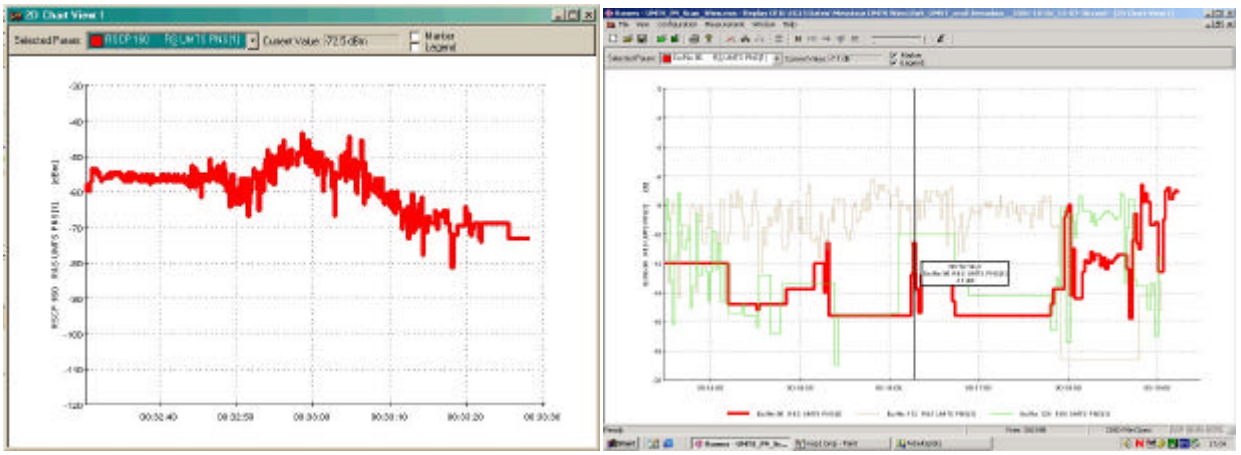


Figure 10: 2D Chart View for RSCP and Ec/No (Io) e.g.

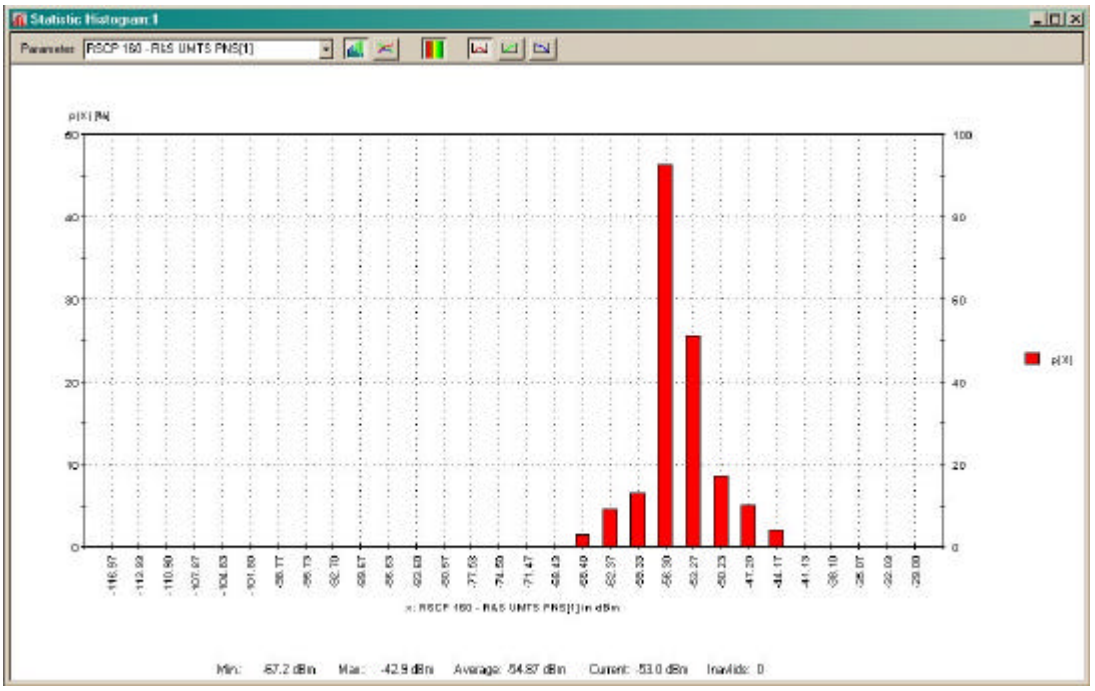


Figure 11: Statistic Histrogram View for RSCP (e.g.)

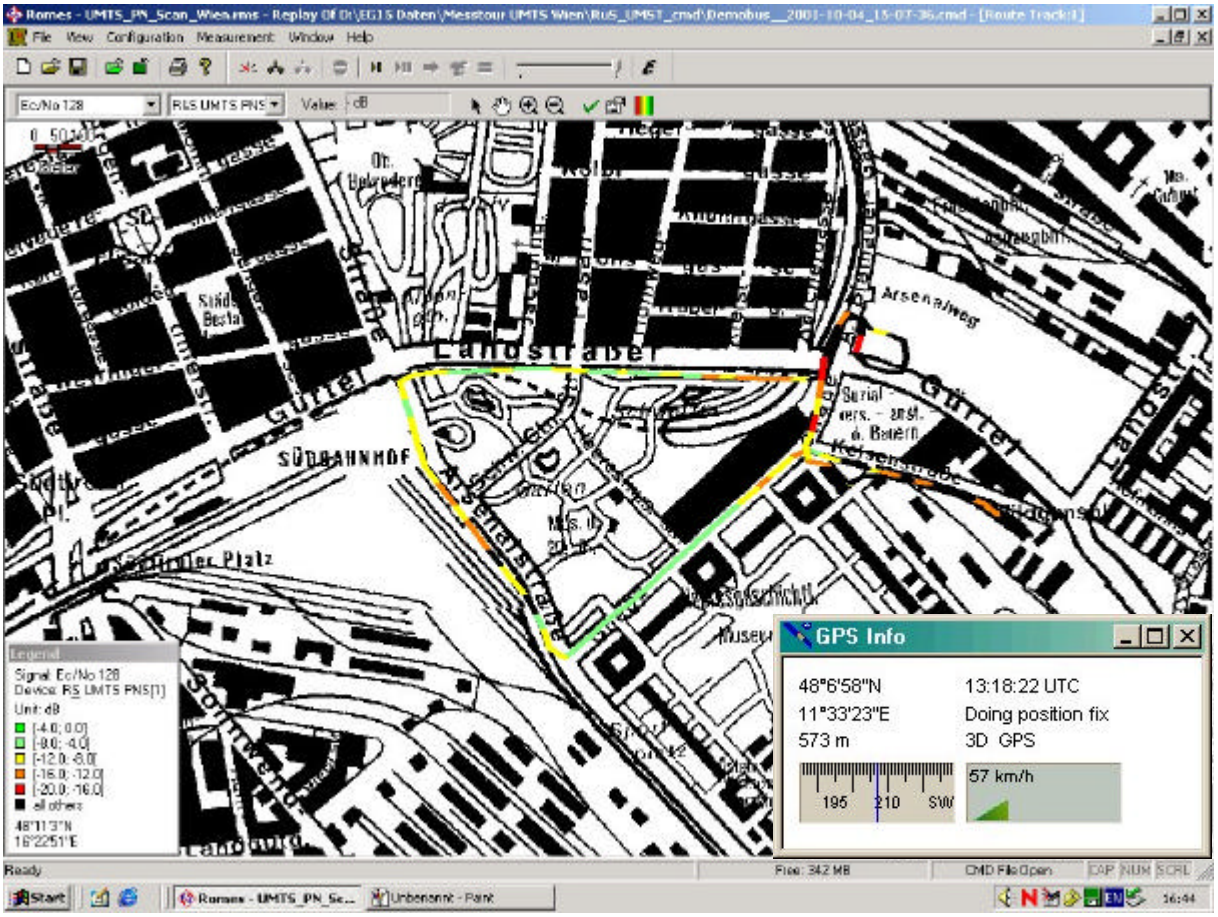


Figure 12: Route Track View with GPS Info

The Software User Interface

The Modular Concept

Romes 3 is based on a modular system concept, allowing any type of data to be collected and analyzed. Any sensor (e.g. test receiver, test mobile or GPS receiver) capable of result transfer to a PC or Laptop can be used. This opens a wide range of use, from measurements in mobile radio to almost any kind of exotic application. The modular concept enables the implementation of very small systems and high performance systems alike. And it makes the software future proof, as it can easily be extended to accommodate upcoming technologies.

The PN Scanner is embedded in the modular Software Romes 3. It consists of a dedicated driver which has to be installed in the Basic Romes 3 Software (see Data Sheet Romes 3, PD 0757.6679.21).

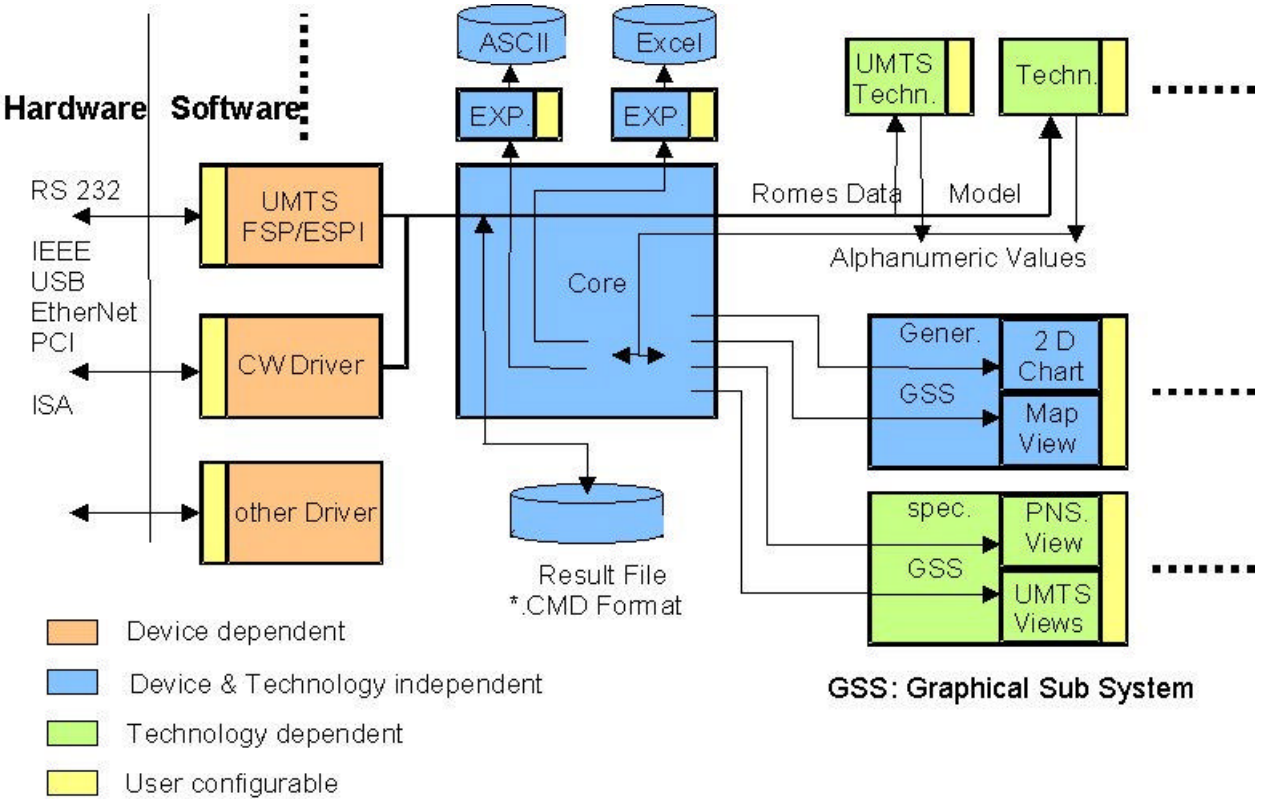


Figure 13: Modular Software Comcept of Romes3 for UMTS

A core unit is acting as a shunting station. It transfers the data from the external hardware via the driver to the result file and to the displays. In general two different display types are supported, one is the general view e.g. 2 D-chart, alpha or map view, the other is the technical specific view, e.g. GSM measurement report, PN-Scan view etc.
In addition postprocessing of all data with an external tool e.g. Excel is possible. A comfortable, freely definable export function and a lot of specific exports are also available. Upgrading to new hardware is easy. Only a new driver has to be installed by the user.

UMTS Receiver Settings

The Receiver Settings (Test Receiver ESPI or Spectrum Analyzer FSP) require the mere setting of

- Type of Receiver
- Type of Connection
- Channels / Frequencies for the measurement
- Attenuation & Amplifier
- Real or Simulated Measurement

All other parameters are set automatically:

- Minimal measurement interval in slots
- Number of used slots
- Number of rakes
- Total Dynamic
- Maximal Peak Dynamic
- Total Dynamic for Code
- Maximal Peak Dynamic for Code
- Sample Distance for Spectrum
- Number of Samples for Spectrum
- Overlap of Samples for Spectrum

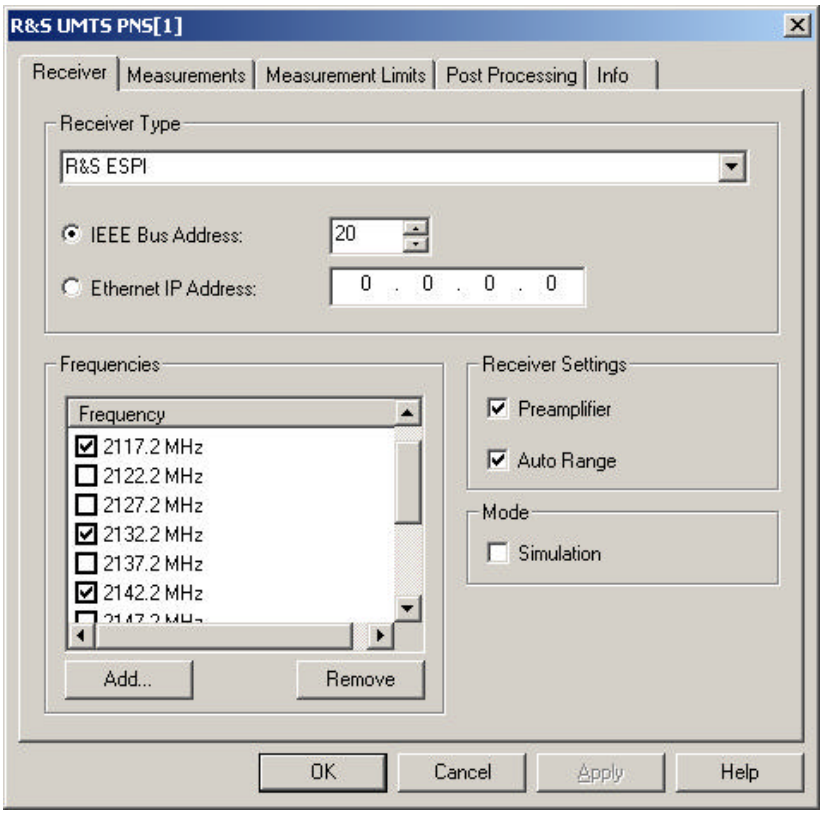


Figure 14: UMTS Receiver Settings for ESPI or FSP

System Hardware Configuration Types

Two Applications in One
PN Scanner + CW Measurements with one System

General

The PN Scanner can be configured in four different packages. Configuration Fig.1 to 3 is designed as a cost effective and very light laptop version. Alternatively high performance solutions Fig. 4 and Fig. 5 with dead reckoning navigation and distance trigger for signal strength measurements are also available.

Laptop Configurations for PN Scanning (see Fig. 15)

Laptops are very cost effective control unit for drive test equipment. The design consists of separate items and is installed with magnet mount antennas in various vehicles.

Minimum Configuration:

* **Laptop** (800 MHz, 256 MB RAM, 10 GB HD)
  equipped with PCMCIA IEEE-Bus Interface or
  LAN Interface (recommended)
* **FSP** (Spectrum Analyzer)
  or **ESPI** (Test Receiver)
* **GPS System** (e.g. Garmin Mouse)
* **Measurement Software** Romes 3 incl. PN-Scanner-Option

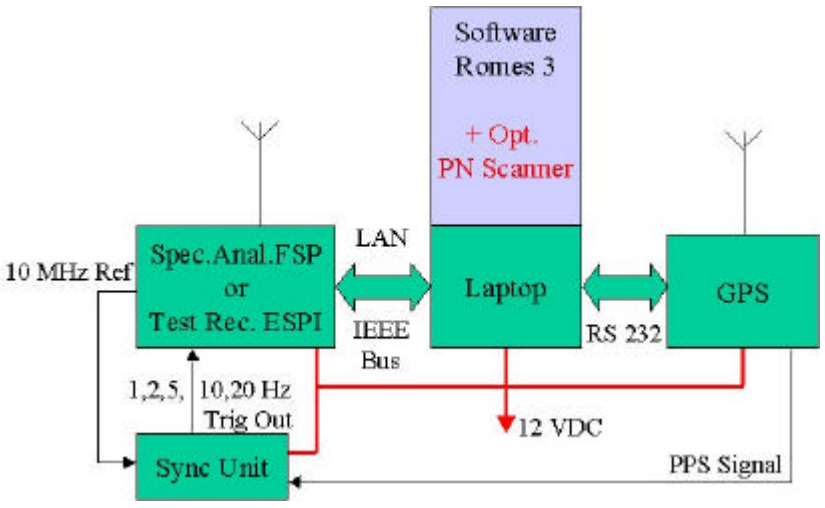


Figure 15: Laptop Configuration for PN Scanning

Laptop Configuration for CW Measurements (see Fig. 16)

In this application the laptop is used for the control of CW (signal strength measurements). For that kind of tests a preselection is needed, which is not included in the Spectrum Analyzer FSP. The Test Receiver ESPI, which has a preselector option is the ideal instrument for this application. It is internally triggered and is extremely fast . The max. test speed is approx. 1000 measurement cycles per sec. (peak detection, one frequency).

Minimum Configuration:

* *Laptop* ***(800 MHz, 256 MB RAM, 10 GB HD) equipped with PCMCIA IEEE-Bus Interface or LAN Interface***
* ***ESPI (Test Receiver) with Preselector***
* *GPS System* ***(e.g. Garmin Mouse)***
* *Measurement Software* ***Romes 3 incl. PN-Scanner-Option***

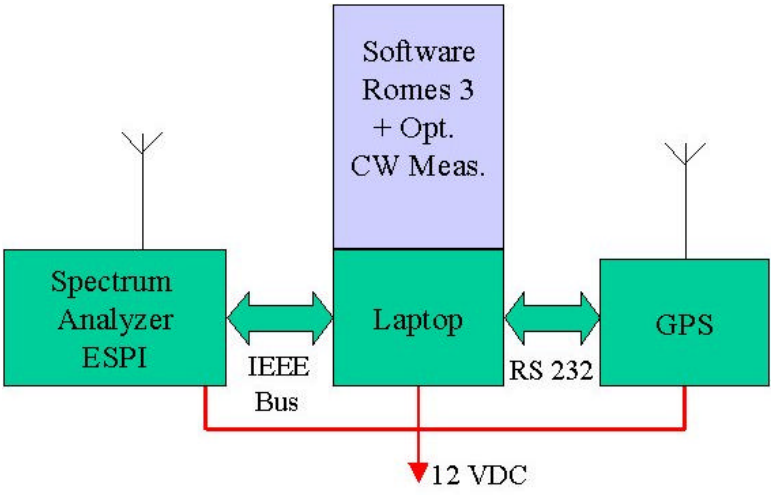


Figure 16: Laptop Configuration for CW Measurement

Laptop Configuration for CW and PN-Scan Measurements **(see Fig. 17)**

Fig. 15 configuration is a combination of Fig. 13 and Fig. 14.applications. The system covers the PN Scan and the CW application.

Configuration:

* **Laptop** (800 MHz, 256 MB RAM, 10 GB HD) equipped with PCMCIA IEEE-Bus Interface or LAN Interface (recommended)
* **ESPI** (Test Receiver)
* **GPS System** (e.g. Garmin Mouse)
* **Measurement Software** Romes 3 incl. PN-Scanner-Option and CW Measurement

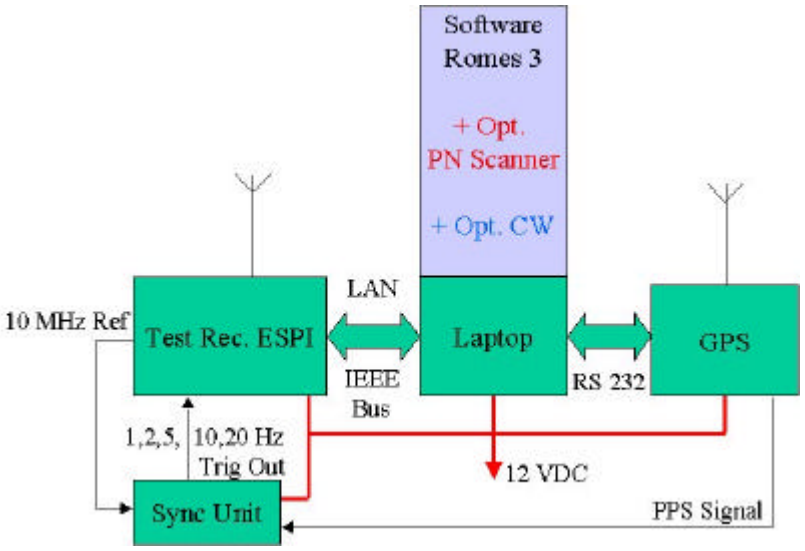


Figure 17: Laptop Configuration for CW and PN Scanner

Process Controller Configuration for PN Scanning (see Fig. 18)

The high performance Process Controller (two CPU's in parallel mode) improves the performance of the laptop version. In addition it is designed for upgrades (e.g. Interference Measuring System) for GSM. System parts are integrated into a 19" rack. The system is bigger than the laptop version, but it is extremely reliable. Due to its bulk it is designed for fix installation into special test vehicles with fix mounted antennas.

***Configuration*:**

* **Process Controller TSPC2**
  equipped with Network Interface
* **External LCD 15,1" Display**
* **FSP** (Spectrum Analyzer)
  or **ESPI** (Test Receiver)
* **Inertial GPS Navigation System**
* **Power supply control unit**
* **Measurement Software Romes 3** incl. PN-Scanner-Option

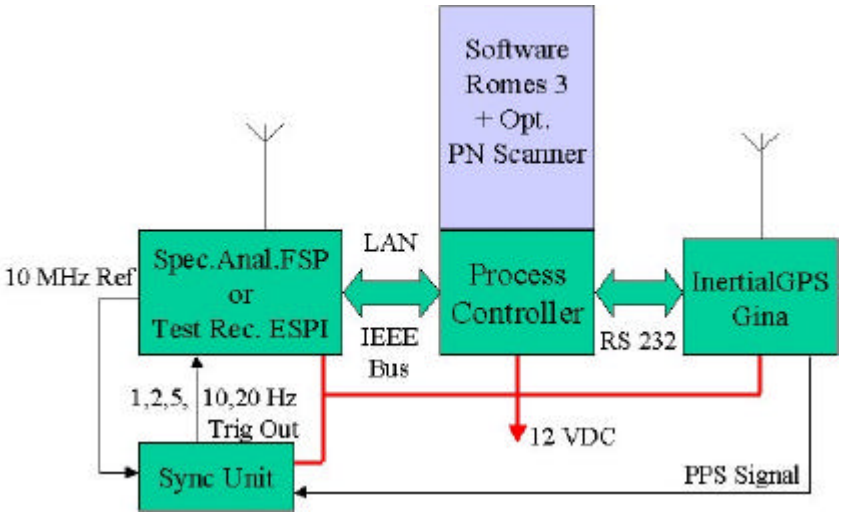


Figure 18: ProcessController Configuration for PN Scanner

High Performance System for PN Scan and CW Measurement (see Fig. 19)

In the CW measurement mode the signal strength can be measured very fast and very precisely with the Test Receiver ESPI. Only ESPI, which has an integrated preselection can be used for CW measurements. The maximum rate is approx. 2000 measurements per second. Depending on the selected IF filter band width the test speed has to be reduced. Complete frequency or channel lists can be defined for parallel measurements of different signals. The application is not restricted to special frequency bands (e.g. UMTS, GSM, IS95, ETACS...). The user is free to select all available frequencies of the test receiver. In the setup of the software measurements according to the Lee Criterion or distance trigger can be selected.

Configuration:

* **System Process Controller** TSPC2
  equipped with Network Interface
* **External LCD 15,1" Display**
* **ESPI** (Test Receiver)
* **Inertial GPS Navigation System** with distance
  trigger unit and external distance pulse
  generator.
* **Power supply control unit**
* **Measurement Software Romes 3** incl. PN-
  Scanner and CW Option

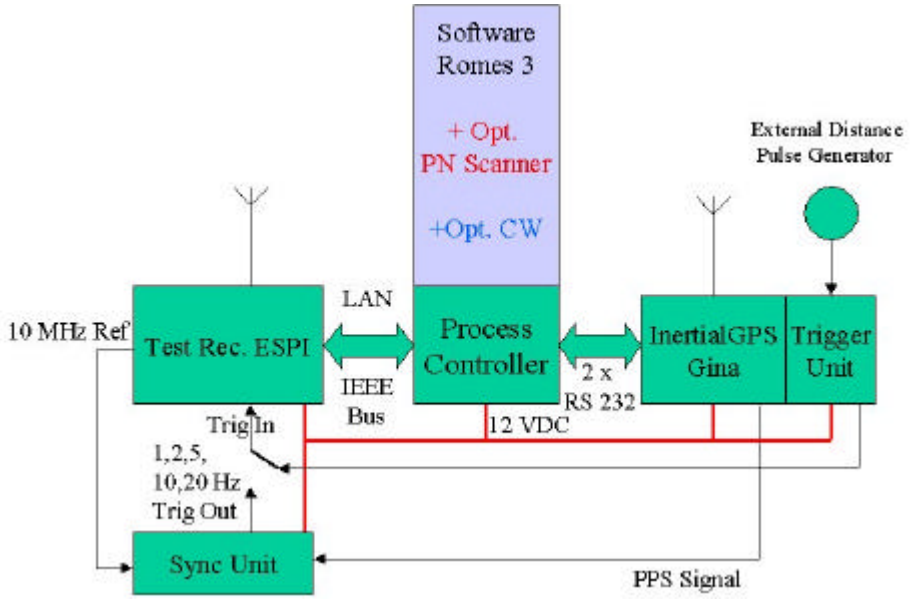


Figure 19: ProcessController Configuration for PN Scanner and CW Measurement

Hardware for UMTS PN Scanner and CW Signal Strength Measurements

- **Five different system configurations for UMTS Application are possible**

Laptop Versions for UMTS PN Scanner and CW Application

Configuration 1: Only PN Scanner
Spectrum Analyzer FSP or Test Receiver ESPI can be used

Configuration 2: Only CW Signal Strength
Test Receiver ESPI has to be used

Configuration 3: PN Scanner and CW Signal Strength
Test Receiver ESPI has to be used

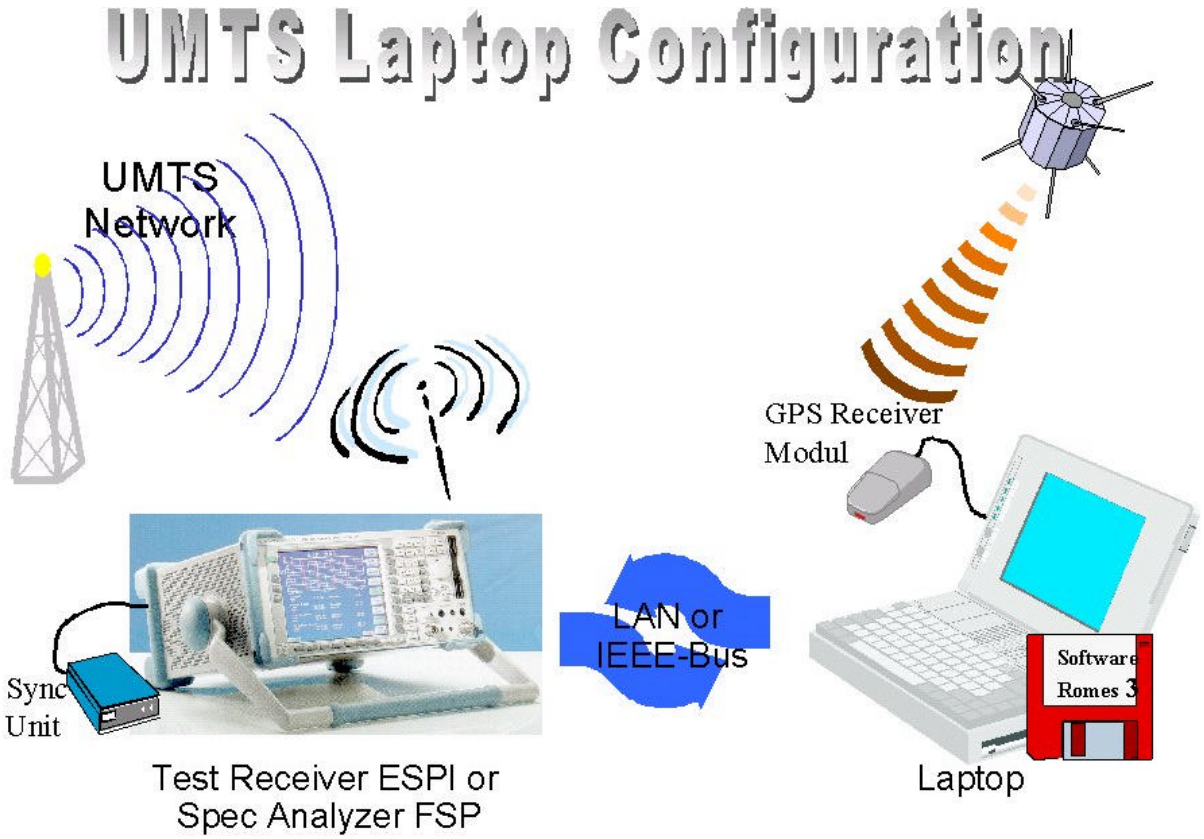


Figure 20: Laptop Version of PN Scanner

Item List for Laptop Versions.

Laptop

TS951PC	1070.5872.10	Intel Mobile Pentium III-M 866 MHz ; 14.1" XGA TFT Display; 128 MB PC133 SDRAM; 10 GB EIDE HDD; 512 KB L2 Cache; ATI Mobility Radeon 4x AGP; 2D/3D Graphics Accelerator with 16 MB SDRAM; 10/100 Ethernet Network integrated; Lithium-Ionen Accu with 59 Wh Capacity; Touchpad and Trackpoint; 3,5" Diskette Drive (modular) 24 x EIDE CD ROM Modular Bay; Additional Lithium Ion Accu 59 Wh; Integrated Wireless LAN Antenna; Carrying Bag and Belt; MS Windows 2000 Professional English;
TS-IEC	1042.0970.02	NATIONAL INSTRUMENTS IEC625/IEEE-488 PCMCIAtype II card NI-488.2 for Windows 2000/9x Low power draw for battery-powered applications For Device Control in Coverage Meas. Systems ***needed if no LAN (FSP-B16) is available***

GPS System

TS95GPS	1090.8348.02	GPS NAVIGATION SYSTEM GARMIN GPS 35 LVS PC, 12-Channel Receiver with 3 Meter Cable, 9-Pin Sub-D-Connector and 40 cm Cable to PS2-Connector for DC Power Supply 3,6V-6V from Mouse Connector
TS5K90A	1143.8281.02	"NMEA-0183" SW DRIVER FOR GPS RECEIVER; REQUIRES NMEA-0183 GPS on COM PORT; SINGLE USER LICENCE;

Test Receiver FSP/ESPI

ESPI3	1142.8007.03	EMI TEST RECEIVER 9 KHZ TO 3 GHZ *** FSP can replace ESPI for PN Scan only, FSP no CW use***
ESPI-B2	1129.7498.02	OPTION: PRESELECTOR FOR ESPI (FACTORY INSTALLATION) ***only for ESPI***
FSP-B16	1129.8042.02	LAN INTERFACE 10/100 BASE T FOR FSP/ESPI INCLUDING DRIVER SOFTWARE. ***alternativ IEEE Bus can be used, slower data rate***
FSP-B4	1129.6740.02	OCXO 10MHZ FOR FSP/ESPI ***mandatory***
TS-HW	1042.5771.02	12 V DC POWER SUPPLY 12 VDC POWER SUPPLY FOR FSP/ESPI ***recommended for car application***
DCV-2	0240.2193.09	DOCUMENTATION OF CALIBRATION VALUES. ***recommended as a reference***
TS-SWI	1014.2407.02	TRIGGER SOFTWARE FOR COVERAGE MEASUREMENTS WITH ESPI3 ***mandatory for CW***

TS5K10E	1143.8198.02		CW "ESPI" DRIVER; TIME or DISTANCE TRIGGERED; RAW DATA; "LEE"-CRITERIA; AVERAGE DATA;SINGLE USER LICENCE; USES TRIGGER BOX TS-TRIG FOR EXTERNAL TIME/DISTANCE TRIGGER; ALTERNATIVELY INTERNAL TIME TRIGGER; ***not needed for PN Scan only***
TS-PNSY	1114.4817.00		SYNCHRONIZATION UNIT FOR UMTS PN SCANNER DRIVER TS5K50C; 10 MHZ REF. INPUT, PPS INPUT (EXT. GPS), 1/2/5/10/20 HZ TRIGGER OUTPUT; PS/2 Port Power Supply 5V DC; ***mandatory for synchronized measurements***
TS5K50C	1063.0579.02		ROMES 3 UMTS PN SCANNER SOFTWARE DRIVER FOR UMTS QUALITY TESTS WITH FSP/ESPI; SINGLE USER LICENCE;
Software Romes 3			
TS5K00	1143.7991.02	ROMES 3	BASIC MEASUREMENT SW FREE CONFIGURABLE MMI, DATA HANDLING, ALPHANUMERIC VIEW; 2D GRAPH; REPLAY MODE; ROUTE TRACKING AND MAP OVERLAY (INCL. "MAP-X"-LICENCE) DATA BASE HANDLING; *.MES EXPORT; SINGLE USER LICENCE; ENGLISH MANUAL ON CD; *** For Operating Systems W95/98/2000 *** ** REQUIRES HARDLOCK TS-LOCK ***
TS5K02	1143.8000.03		EXPORT TO "ASCII" (DATA FORMAT *.ASC); EXPORT OF GSM DATA TO META FORMAT *.SRS (FOR "MSI PLANET" AND "SIEMENS TORNADO"); EXPORT TO "NOKIA NSP/X" (DATA FORMAT *.NT3); EXPORT TO "ASCII PROTOCOL FORMAT" (DATA FORMAT *.PRO, CW DATA FOR IMPORT TO "MSI PLANET" AND "SIEMENS TORNADO"); EXPORT OF ROUTE TRACK DATA TO MAPINFO FORMAT (*.MIF); SOFTWARE EXTENSION FOR ROMES 3 ***recommended for data postprocessing with other tools***
TS-LOCK	1090.1143.04		DONGLE (HARDLOCK) FOR USB PORT TO BE USED WITH CMS SYSTEM SOFTWARE NCL. BURNING OF ROMES/ROSEVAL/TS53-K1 LICENCE ONLY FOR WINDOWS 98/ME/2000 ***USB and PCMCIA Dongles on request***

Options:

Evaluation Software Roseval

TS54-K1	1117.5495.02	EVALUATION SOFTWARE ROSEVAL FOR COVERAGE FOR MEAS. SW ROMES 3; SERVES FOR CW, GSM, ETACS, DAB, DVB, CDMA (IS95) MEASUREMENTS; ENGLISH MANUAL ON CD; REQUIRES "MAPINFO 6.5" or "TS-MAPINF 1070.5850.02" WITH HARDLOCK; REQUIRES SEPARATE HARDLOCK TS-LOCK;
TS-LOCK	1090.1143.02	DONGLE (HARDLOCK) FOR PARALLEL PORT LPT INCL. BURNING OF ROMES/ROSEVAL/TS53-K1 LICENCE TO BE USED WITH CMS SYSTEM SOFTWARE ONLY FOR WINDOWS 95/98/ME/NT/2000
TS-MAPI	1070.5850.02	MapInfo Professional Version 6.5 English For Microsoft Windows 2000, 98, 95 and Windows NT4 Certified for MS Windows 2000 Includes a built-in geocoder, 540 MB of data and a collection of pre-designed maps; includes Hardlock on Parallel Port ***needed if not available at customer side***

Training

TR164-1	0844.2987.18	1 DAY TRAINING; MAX. 5 PERSONS, IN MUNICH WITHOUT ACCOMODATION / TRAVEL COST

High Performance System for UMTS PN Scanner and CW Application

Configuration 4: PN Scanner only
Spectrum Analyzer FSP or Test Receiver ESPI can be used

Configuration 5: PN Scanner and CW Signal Strength
Test Receiver ESPI has to be used!.
In this configuration the Sync Unit or the Trigger Unit have to be used alternatively by switching the "Trig In" of the Test Receiver.

All Items are integrated in a 19" rack and installed into a test vehicle.

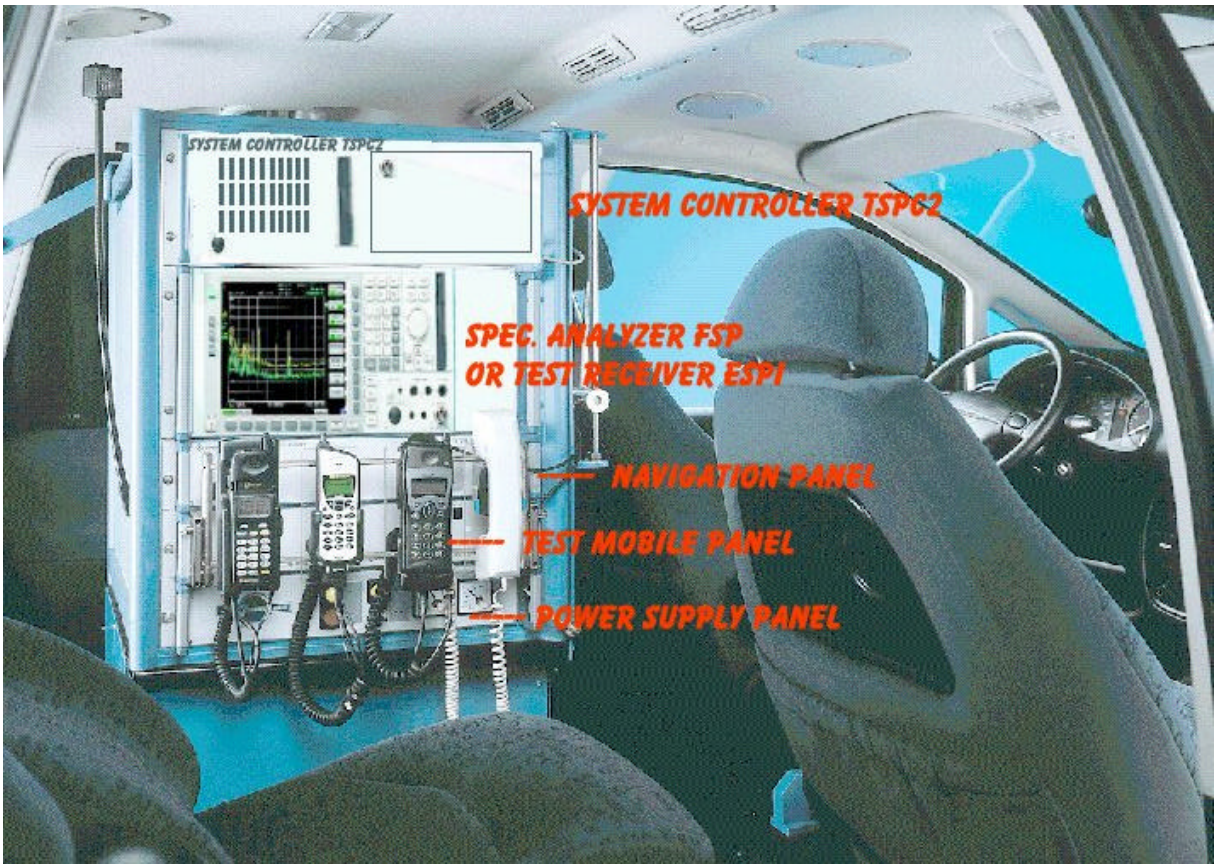


Figure 21: System Controller Configuration for PN Scanner

Test Vehicle installations

Figure 22: Test Vehicle Nissan Patrol (4 wheel Drive)

Figure 23: Test Vehicle VW Sharan

System Items for UMTS High Performance System:

System Controller, LCD-Display and Interfaces

TSPC2	4049.9571.00	SYSTEM PROCESS CONTROLLER FOR MOBILE USE IN NETWORK OPTIMIZATION 19" RACK MOUNT; 4HU; RUGGEDIZED; DC Power Supply 8 - 16 VDC; DOUBLE INTEL PENTIUM III 800 MHZ; SCSI Adapater Adaptec Ultra 29160N; 512 MB RAM; 18 GB HDD SCSI; 3,5 " FD; 2 x SERIAL + 1 X PARALLEL INTERFACE; DVD - ROM and CD READ/WRITE; WINDOWS 2000 PROFESSIONAL ENGL.; *** Includes: *** Hardware Integration, Driver Configuration, Software Installation, System Test, Bootable Image of Harddisk on CD
TS-KEYB	1061.8943.02	KEYBOARD FOR TSPC2; INTEGRATED 16 MM TRACKBALL US CHARACTERS 1 x keyboard generic / 6 PIN mini-DIN (PS/2 Style) female, 1 x mouse generic / 6 PIN mini-DIN (PS/2 Style) female Layout Style: QWERTY Number of Keys: 83 Height: 2.0cm, Width: 37.0cm, Depth: 13.8cm, Weight: 1.0lbs
TS-IEC	1042.1276.02	High-performance GPIB Interface for PCI NI-488.2 for Windows 2000/9x, Onboard bus master DMA Controller Transfer rates over 1.5 Mbytes/s using IEEE 488.1 handshake; For Device Control in Coverage Measurement Systems
TS95SER	1029.5871.02	8 COM RS 232 INTERFACE PCI Board DSM 96M0144; 8 x Serial (16C950), IRQ-Sharing, 128 Byte Buffer With Cable 8 x DB 9 Plugs *** For TSPC2 Controller ***
TS95NET	1029.7997.02	NETWORK ADAPTER (PCI) 3COM 3C905B-TX-NM PCI 32-bit, 10/100 Mbps, RJ45 Driver for Windows 95 / 98 / NT / ME / 2000 Auto-Negotiation Full-Duplex
TS-LCD1	1064.5800.02	LCD-COLOUR MONITOR; 15,1" TFT-DISPLAY 1024 X 768 PXL; 230 VAC, 12 VDC, 33 W

Basic System Components for Rack Mount

TS955RA	1053.5590.02	STABLE 19" RACK FOR TS9955 (15 HU) FOR TS9955 MOBILE APPLICATION; Mandatory for TS9955 Turn-Key System;
TS955KS	1042.9631.02	MEASUREMENT CABLE SET FOR TS9955; Mandatory for TS9955 Turn-Key System;
TS955HI	1053.5603.02	HW- INTEGRATION INTO RACK FOR TS9955 Mandatory for Turn-Key System

TS95AC1	1042.0570.02	1 DAY ACCEPTANCE TEST IN MUNICH FOR COVERAGE MEASUREMENT SYSTEMS WITHOUT ACCOMODATION / TRAVEL COST LANGUAGE: ENGLISH *** Upon Request, To Be Defined ***
TS955DC	1042.9590.02	DOCUMENTATION FOR TS9955 ENGLISH MANUALS Includes TS9955 Service Manuals and Block Diagrams
GPS System		
TS95SP3	1148.0508.02	SYSTEM PANEL HOUSING or Coverage Measurement Systems 19" RACK UNIT, 2 HU, 12 V DC Power Supply; Possible Options: TS-GINA; TS-TRIG; *** Mandatory for Turn-Key Systems ***
TS-GINA	1061.8814.03	GPS NAVIGATOR WITH INERTIAL NAVIGATION SYSTEM INCL. 12 CH. GPS-RECEIVER, INERTIAL SYSTEM, CABLE, ANTENNA INCL. INTEGRATION INTO NAVIGATION SYSTEM PANEL
TS5K90A	1143.8281.02	"NMEA-0183" SW DRIVER FOR GPS RECEIVER; REQUIRES NMEA-0183 GPS on COM PORT; SINGLE USER LICENCE;
TS-TRIG	1148.1104.02	TRIGGER BOX FOR INTERNAL ELECTRONIC PULSES; TIME OR DISTANCE TRIGGER MODE (REQUIRES DISTANCE PULSES) FOR INTEGRATION INTO TS95SP3
TS995D1	1059.1951.02	PEISELER PULSE GENERATOR FOR WHEEL MOUNT; requires Peiseler Ground Plate, depending on Type of Car; ***only needed if no internal pulses are available***
TS995D3	1059.1951.03	PEISELER PULSE GENERATOR FOR INTERNAL MECHANICAL MOUNT ON SPEEDOMETER Requires Splitting of Mechanical Speedometer Shaft; ***only needed if no internal pulses are available***
Test Receiver FSP/ESPI		
ESPI3	1142.8007.03	EMI TEST RECEIVER 9 KHZ TO 3 GHZ *** FSP can replace ESPI for PN Scan only, no CW use***
ESPI-B2	1129.7498.02	OPTION: PRESELECTOR FOR ESPI (FACTORY INSTALLATION) ***only for ESPI***

FSP-B16	1129.8042.02	LAN INTERFACE 10/100 BASE T FOR FSP/ESPI INCLUDING DRIVER SOFTWARE. ***alternativ IEEE Bus can be used, slower data rate***
FSP-B4	1129.6740.02	OCXO 10MHZ FOR FSP/ESPI ***mandatory***
ZZA-478	1096.3248.00	19"-ADAPTER, 4HU, 7/8 FOR BW2000 CABINETS ***mandatory***
TS-HW	1042.5771.02	12 V DC POWER SUPPLY 12 VDC POWER SUPPLY FOR FSP/ESPI ***recommended for car application***
DCV-2	0240.2193.09	DOCUMENTATION OF CALIBRATION VALUES. ***recommended as a reference***
TS-SWI	1014.2407.02	TRIGGER SOFTWARE FOR COVERAGE MEASUREMENTS WITH ESPI3 ***mandatory for CW***
TS5K10E	1143.8198.02	CW "ESPI" DRIVER; TIME or DISTANCE TRIGGERED; RAW DATA; "LEE"-CRITERIA; AVERAGE DATA SINGLE USER LICENCE; USES TRIGGER BOX TS-TRIG FOR EXTERNAL TIME/DISTANCE TRIGGER; ALTERNATIVELY INTERNAL TIME TRIGGER; ***not needed for PN Scan only***
TS-PNSY	1114.4817.00	SYNCHRONIZATION UNIT FOR UMTS PN SCANNER DRIVER TS5K50C; 10 MHZ REF. INPUT, PPS INPUT (EXT. GPS), 1/2/5/10/20 HZ TRIGGER OUTPUT; PS/2 Port Power Supply 5V DC; ***mandatory for synchronized measurements***
TS5K50C	1063.0579.02	ROMES 3 UMTS PN SCANNER SOFTWARE DRIVER FOR UMTS QUALITY TESTS WITH FSP/ESPI; SINGLE USER LICENCE;
Software Romes 3		
TS5K00	1143.7991.02	ROMES 3 BASIC MEASUREMENT SW FREE CONFIGURABLE MMI, DATA HANDLING, ALPHANUMERIC VIEW; 2D GRAPH; REPLAY MODE; ROUTE TRACKING AND MAP OVERLAY (INCL. "MAP-X"-LICENCE) DATA BASE HANDLING; *.MES EXPORT; SINGLE USER LICENCE; ENGLISH MANUAL ON CD; *** For Operating Systems W95/98/2000 *** *** REQUIRES HARDLOCK TS-LOCK ***

TS5K02	1143.8000.03	EXPORT TO "ASCII" (DATA FORMAT *.ASC); EXPORT OF GSM DATA TO META FORMAT *.SRS (FOR "MSI PLANET" AND "SIEMENS TORNADO"); EXPORT TO "NOKIA NSP/X" (DATA FORMAT *.NT3); EXPORT TO "ASCII PROTOCOL FORMAT" (DATA FORMAT *.PRO, CW DATA FOR IMPORT TO "MSI PLANET" AND "SIEMENS TORNADO"); EXPORT OF ROUTE TRACK DATA TO MAPINFO FORMAT (*.MIF); SOFTWARE EXTENSION FOR ROMES 3 ***recommended for data post processing with other tools***
TS-LOCK	1090.1143.02	DONGLE (HARDLOCK) FOR PARALLEL PORT LPT INCL. BURNING OF ROMES/ROSEVAL/TS53-K1 LICENCE TO BE USED WITH CMS SYSTEM SOFTWARE ONLY FOR WINDOWS 95/98/ME/NT/2000

Options:

Evaluation Software Roseval

TS54-K1	1117.5495.02	EVALUATION SOFTWARE ROSEVAL FOR COVERAGE FOR MEAS. SW ROMES 3; SERVES FOR CW, GSM, ETACS, DAB, DVB, CDMA (IS95) MEASUREMENTS; ENGLISH MANUAL ON CD; REQUIRES "MAPINFO 6.5" or "TS-MAPINF 1070.5850.02"WITH HARDLOCK; REQUIRES SEPARATE HARDLOCK TS-LOCK;
TS-MAPI	1070.5850.02	MapInfo Professional Version 6.5 English For Microsoft Windows 2000, 98, 95 and Windows NT4 Certified for MS Windows 2000 Includes a built-in geocoder, 540 MB of data and a collection of pre-designed maps; Includes Hardlock on Parallel Port ***needed if not available at customer side***

Training

TR164-1	0844.2987.18	1 DAY TRAINING; MAX. 5 PERSONS, IN MUNICH WITHOUT ACCOMODATION / TRAVEL COST

Technical Data

RF Frontend:

- Frequency Range: 9 kHz – 3 GHz (7 GHz with ESPI7)
- Input Impedance: 50 Ω (N-Type Connector)
- Frequency Resolution: 0.1 Hz
- Frequency Accuracy: ± 0.01 ppm with OCXO FSP-B4
- OCXO Aging: ± 0.1 ppm
- IF Bandwidth: 10 Hz ... 10 MHz (Steps 10, 3)
  Multiple Special Filters from 100 Hz to 8 MHz, specifically DAB/DVB, CDMAOne, Tetra, IS136, W-CDMA
- RF Input Range: -150 dBm ... + 30 dBm (in UMTS Band)
- Level Accuracy: -
- Noise Figure: -
- 1 dB Compression Point: -
- Adjacent Channel Desentization: -
- Adjacent Channel Rejection: -
- IP3 > 2 dBm, typ. 5 dBm

UMTS Interference Analyzer:

- Sampling Rate: 1/2/5/10/20 Hz
- Number of Rake Receivers: 5000
- Power Measurement: -117 ... -10 dBm (Fast UMTS Mode)
  -130 ... 0 dBm (Enhanced UMTS Mode)
- Base Station Measurement: up to 2500 Base Stations (Node-B) simultaneously
- Spectrum Monitor Function: 5 MHz, Resolution Bandwidth 1 kHz
- Display: up to 1600 x 1200, depending on Type of Monitor

Parameter Display:

UMTS:
- Spectrum View, Spectrum History View, CPICH View, P-SYNC View
- Scrambling Code Tracer View (Multiple), Pilot View (Multiple)

General:
- Event View, 2D Chart View (Multiple), General Status View
- Alphanumeric View (Multiple), Statistics View (Multiple)
- Route Track with GIS Info for Real-Time Map Display (Multiple), GPS Info
- Indoor View for Real-Time Indoor Map Display

Measured Parameters:

General:
- RSSI of received channel

P-SYNC:
- Graphical Display of Correlation Result
- Relative Power of detected peaks (in dB)
- Time Delay of detected peaks (in µs)

P-CPICH:
- Code Group
- Scrambling Code (up to 512, Hexadecimal)

- Total Power of CPICH (in dBm)
- Parameters for every Scrambling Code:

Result	Description	Specification
E_c/I_0	The received energy per chip divided by the power density in the band	TS 25.215; 5.1.6
SIR	Signal to Interference Ratio	TS 25.215; 5.1.3
RSCP	Received Signal Code Power	TS 25.215; 5.1.3
ISCP	Interference Signal Code Power	TS 25.215; 5.1.3

Table 1: Measured Parameters of CPICH per Scrambling Code

- Parameters per identified peak for every Scrambling Code:

Result	Description	Specification
Power	Power of Identified Peak	-
Time	• Relative Time of Arrival • Absolute Timing against GPS Clock	-

Table 2: Measured Parameters of CPICH per Identified Peak per Scrambling Code

Code Channel Power:
- Code Channel
- Power of Code Channels
- Spreading Factor

Spectrum:
- Spectrum of channel
- Spectrum History of channel

Sampling Rates:

The Sampling Rates depend on three aspects:

- Required Measurements
- Number of Node-B's and reflections in the air PC
- Performance of the Controller

The following table represents typical update rates on a Pentium IV 2 GHz System. The calculations were done with Version 3.20 and 2 UMTS Slots.

Spectrum			✓
P-SYNC		✓	✓
P-CPICH	✓	✓	✓
Peaks	✓	✓	✓
# Node-B's	30	30	30

Update [s]	**0,05**	**0,1**	**0,2**

Table 3: Typical Sampling Rates

Dynamic Ranges:

C-PICH's are analyzed successfully up to the following values:

E_c/I_0	-20 dB
RSCP	- 117 dBm

Table 4: Dynamic Range

Note: See also data Sheet of “Test Receiver ESPI” (PD 757.6540.11) for further technical information