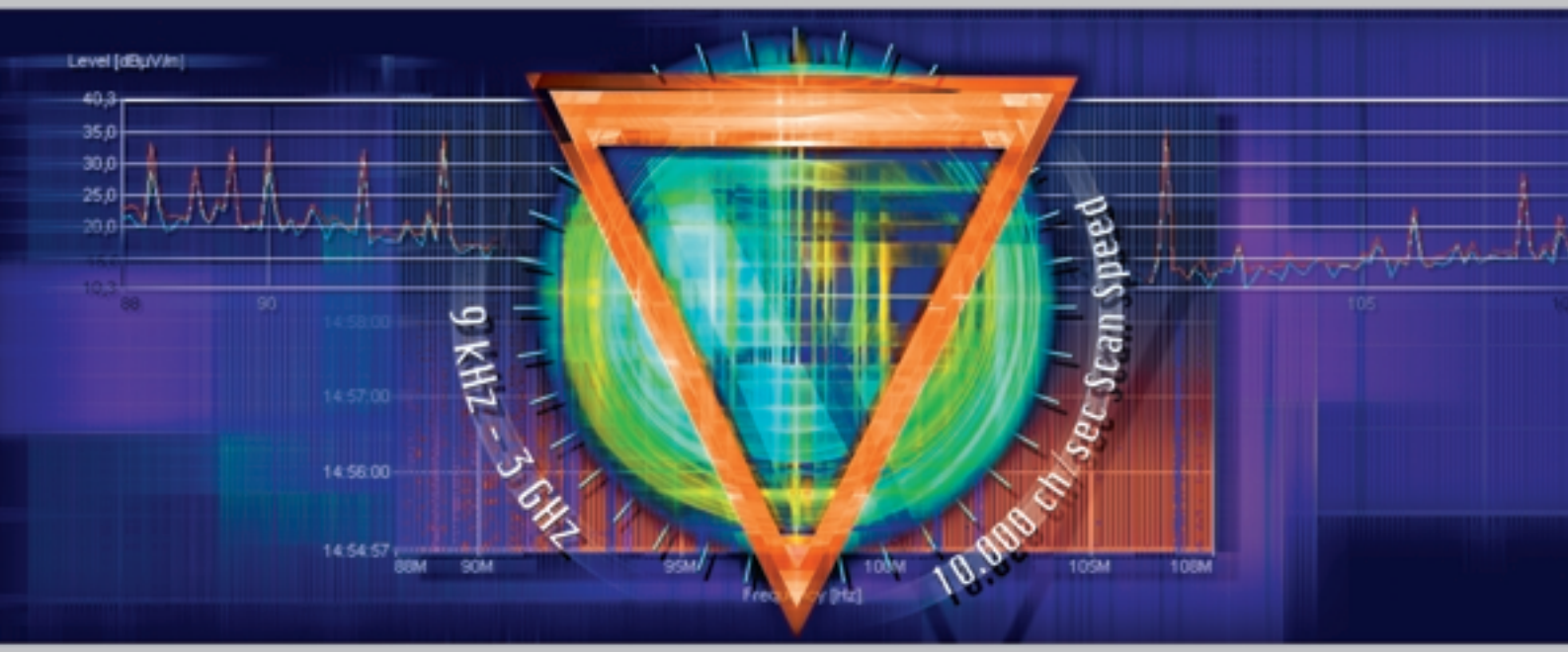
News from Rohde & Schwarz



ITU-conformant monitoring receiver

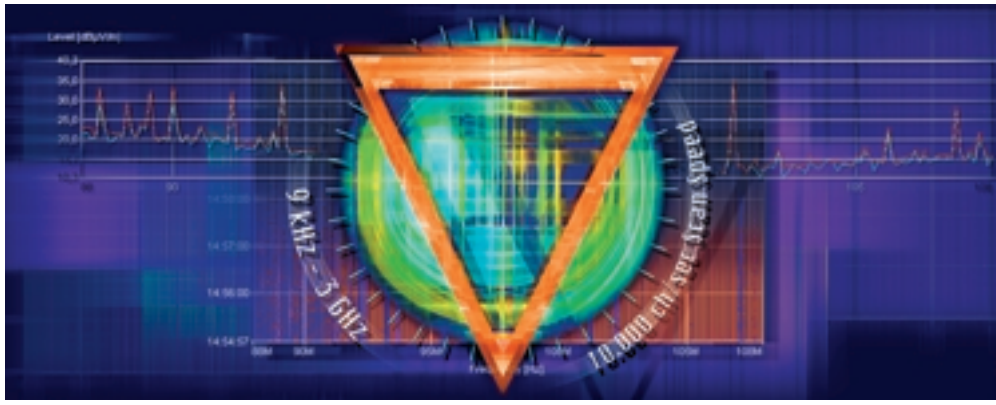
Software for
spectrum monitoring systems

Recording, processing and replaying
MPEG2 transport streams

2000/II
167

ROHDE&SCHWARZ

Number 167 2000/II Volume 40



Radiomonitoring over wide frequency ranges at high scan rates
The new Monitoring Receiver ESMB handles the frequency range from 9 kHz to 3 GHz and has excellent electrical characteristics and comprehensive functions – all that combined in an incredibly compact instrument (page 4).

Photo 43565

Articles

Software

Application notes

Application notes

Panorama

Regular features

Universal Radio Communication Tester CMU200 was presented in No. 165. This new tester is future-proof thanks to its high measurement speed and modular concept. The article on page 24 describes fast GSM power measurements with CMU200. The tester's versatile selftest capabilities are detailed on page 26 of this issue.

Photo 43238/7

Imprint

Published by ROHDE&SCHWARZ GmbH&Co. KG · Muehldorfstrasse 15 · 81671 Munich · Support Center: Tel. (+49) 01805124242 · E-mail: customersupport@rohde-schwarz.com · Fax (+4989) 4129-3777 Editor and layout: Ludwig Drexl, Redaktion – Technik (German) · English translation: Dept. 5CL4 · Photos: Stefan Huber · Circulation 90000 six times a year · ISSN 0028-9108 · Supply free of charge through your nearest Rohde&Schwarz representative · Printed in Germany by peschke druck, Munich · Reproduction of extracts permitted if source is stated and copy sent to Rohde&Schwarz Munich.

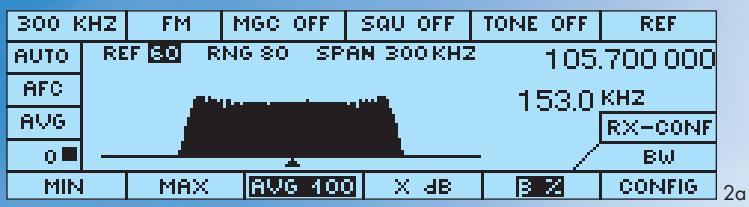
FIG 1 A strong duo: new Monitoring Receiver ESMB (top) and Digital Direction Finder DDF190. The two extremely compact and powerful instruments perform practically all tasks in signal detection, monitoring and measurement

Photo 43456/1

ITU-conformant Monitoring Receiver ESMB

Incredibly compact – and high-end into the bargain

There was a time when ITU-conformant test receivers were by no means lightweight and their high power consumption was an additional drawback in many an application. Not so the new Monitoring Receiver ESMB (FIG 1): a wide frequency range from 9 kHz to 3 GHz, excellent electrical characteristics, comprehensive functions – all combined in an incredibly compact and lightweight instrument – make it ideal for mobile and stationary use. It is intended as a monitoring receiver for all tasks in compliance with ITU recommendations and for use in the entire field of radiomonitoring.



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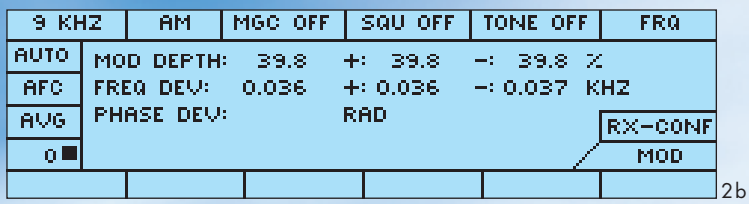

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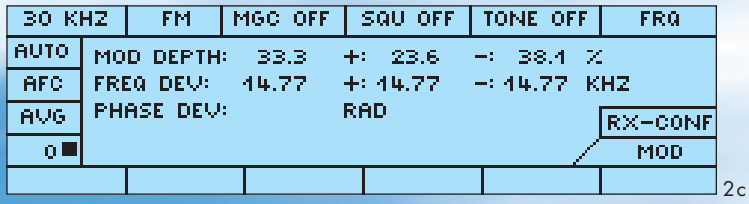

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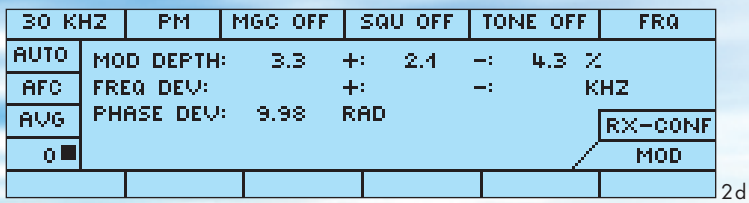
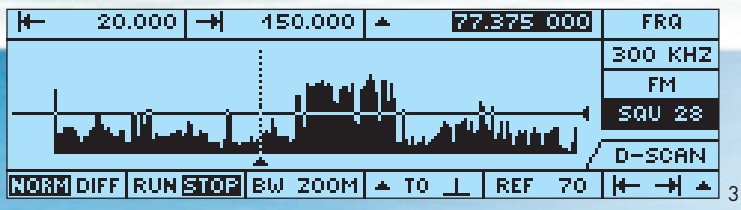


2d



3

FIGs 2a to 2d
All measurements in line with ITU recommendations.
2a: bandwidth;
2b to 2d: modulation

FIG 3
RF panoramic display with DIGI Scan option

ITU-conformant measurements

ESMB can perform all measurements in line with ITU recommendations, such as frequency and frequency offset, field strength, modulation parameters, bandwidth and frequency occupancy (with PC) (FIGs 2a to 2d). For bandwidth measurement both XdB and the more universal β% method can be adopted. A special benefit is that parameters can be measured simultaneously, so time requirements are cut to a minimum. The time needed for this kind of procedure can otherwise be quite bothersome when a whole series of measurements has to be carried out.

Before it actually starts to measure signals, important functions in ESMB support their detection, acquisition, assessment and classification. These include special features like frequency scan, memory scan, IF panorama or RF spectrum with the DIGI Scan option (FIG 3), the latter often being the only means of detecting signals. This option features scan rates up to 800 MHz/s, in other words about 10000 channels/s with 150 kHz bandwidth.

Lean digital

ESMB uses highly advanced digital signal processing. Digital technology is not only employed for the measurements mentioned above but for the entire IF processing. Such a large vari-

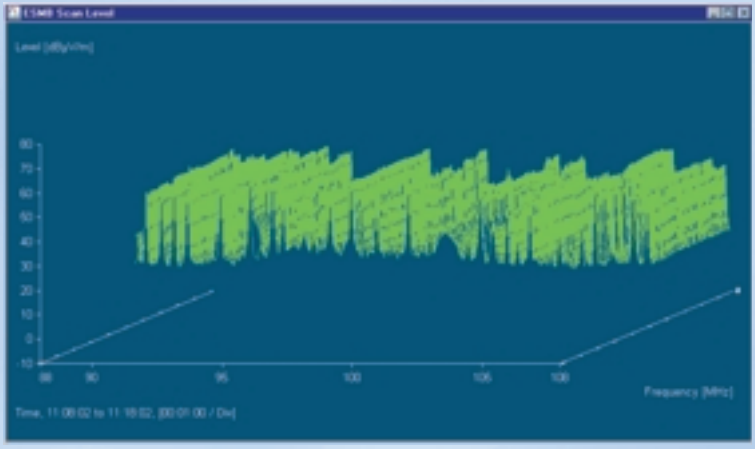


FIG 5
Scan with 3D waterfall display

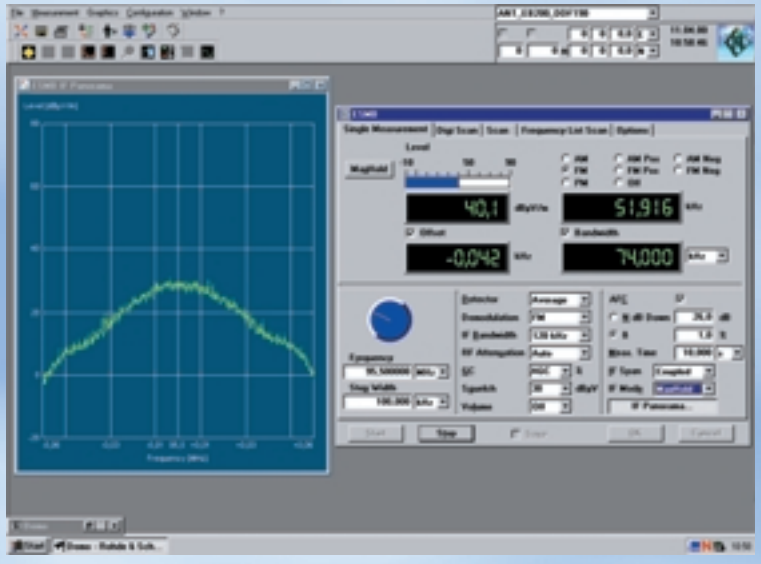


FIG 6
Modulation and bandwidth measurement with panoramic display

ety of functions would never have been possible on an analog basis because of the forbidding space requirements. ESMB has 18 IF filters from 150 Hz to 300 kHz for demodulation and a variety of other filters up to 1 MHz for measuring level, offset and bandwidth with the aid of an IF panorama. Providing Average, Min Hold and Max Hold functions as well as selectable display range, the panorama is an indispensable tool in signal assessment. The IF panorama is not an option by the way, it is fully integrated into the basic unit, since it is needed whenever you want to measure bandwidth.

AM, FM, CW, LSB, USB, ISB, PM and IQ demodulators are fitted as standard. The digital concept – all IF functions being "merely" computed – allows subsequent upgrading by loading new software. This also applies to filters and other functions of course, should adaptation become necessary due to changes in specifications or measurement methods.

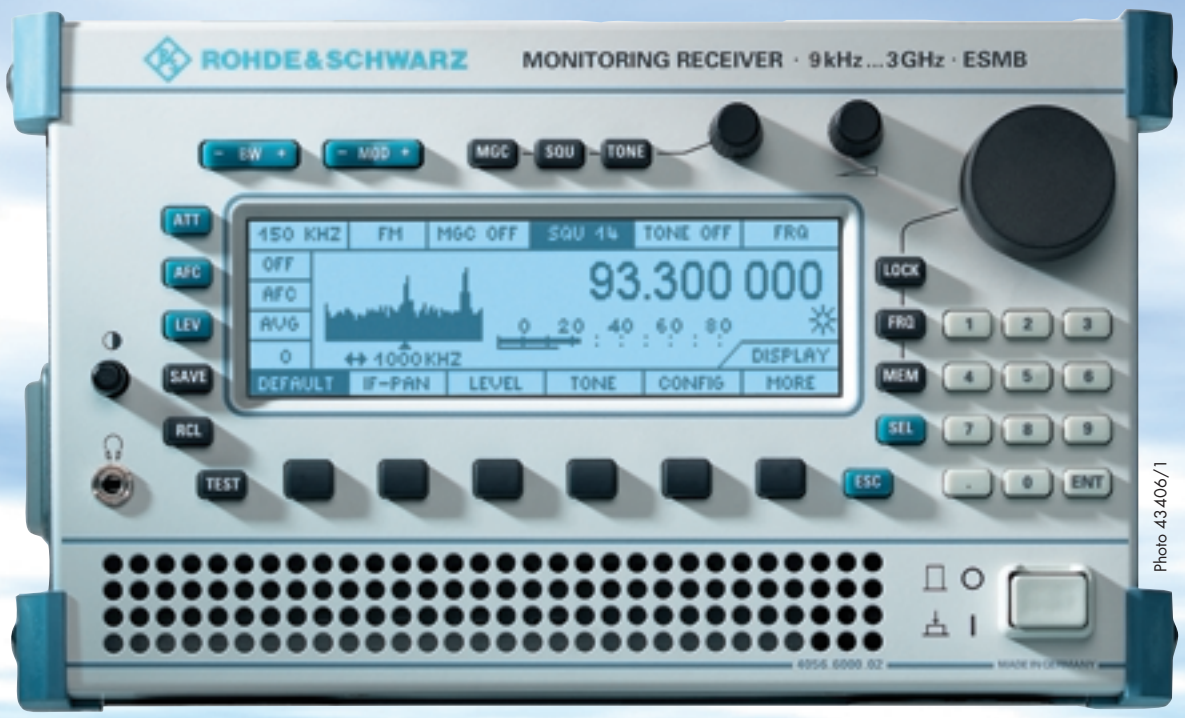


FIG 4
As a stand-alone ESMB is able to perform all monitoring and measurement tasks

Photo 43406/1

Designed for mobile use

Low weight and compact dimensions mean that ESMB can easily be used in a large variety of applications. In a stand-alone role it is able to perform all monitoring and measurement tasks without PC support (FIG 4). The clear-cut front panel makes for ease of operation, allowing the user to familiarize with a minimum of effort without time-consuming study of a manual. The proven operating philosophy of Miniport Receiver EB 200 [1] was largely adopted here, an extra benefit because the two instruments are often used together. Easily understood menus allow simple adaptation of ESMB to different tasks, reducing operator error to a minimum.

Used in a mobile role, not only ESMB's compact size but also its low power consumption is a special benefit, particularly for the vehicle's battery.

Communicative within a system

Controlled from a PC on its modern Ethernet interface, ESMB demonstrates all its functionality. Rohde&Schwarz offers Measurement Software ArgusMon [2] for this purpose (see also page 18). With the aid of this software, all functions can be controlled, results quickly and clearly displayed and, if wished, data recorded, the volume only being limited by the capacity of the storage medium. Despite its versatility, ArgusMon is quite simple to handle. The user interfaces shown in FIGs 5 and 6 are only a fraction of the many possibilities.

An RS-232-C interface can optionally be fitted instead of the Ethernet interface. This interface is sufficient for simple remote-control applications without exacting speed requirements.

Use of ESMB in conjunction with Digital Direction Finder DDF 190 from Rohde&Schwarz [3, 4] produces a small-scale system that is almost unparalleled in terms of functionality and compactness, and that is able to perform practically all tasks in signal detection, monitoring and measurement (FIG 1). Suitable Argus drivers are of course available for combination with DF equipment. Thanks to its modern interfaces and standardized command syntax, ESMB is easily integrated into large monitoring systems. Use in unattended measurement stations is no problem either, since all results including the data for spectrum display are available at the interface.

Premium in reliability and serviceability

The low power consumption and the well-devised thermal concept ensure high reliability even where space is at a premium. Should any fault occur, the intelligent test concept (BITE) is a valuable aid in troubleshooting. Out-of-tolerance conditions are signalled acoustically and optically and the defective module is immediately identified. Replacement is quite straightforward, reducing downtime to a minimum.

Designed for the future

Simple downloading of new software and additional free slots for hardware extensions provide sufficient reserve capacity for subsequent upgrades. With its future-oriented technology, ESMB gives the user a tool that can always be kept right up to the state of the art.

Christian Gottlob

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Condensed data of ESMB

Frequency range	9 kHz to 3 GHz
Measurement functions	frequency, offset, field strength, modulation parameters, bandwidth, frequency occupancy with PC
Demodulation	AM, FM, CW, LSB, USB, ISB, PM, IQ
Filters	18 (150 Hz to 300 kHz), shape factor <2:1; and 3 (200 kHz, 500 kHz, 1 MHz), not for demodulation
Scan functions	frequency scan, memory scan, RF spectrum DIGI Scan (option)
Interfaces	Ethernet 10BaseT or RS-232-C (option)
Power consumption	<40 W
Weight	8 kg
Dimensions (W x H x D)	227 mm x 153 mm x 474 mm

Reader service card 167/01

DTV Recorder Generator DVRG

Recording, processing and replaying MPEG2 transport streams

From the very beginning of digital television, Rohde&Schwarz has demonstrated its competence in terms of MPEG2 with MPEG2 Generator DVG and MPEG2 Measurement Decoder DVMD [1; 2]. This instrument duo with its unparalleled features is today found virtually wherever MPEG2 transport streams appear and have to be processed. Now a new member has been added to the family – the DVRG generator platform (FIG 1). This unit is quite unique, generating the entire spectrum of digital TV signals while occupying minimum space. In addition to recording and replaying MPEG2 transport streams, DVRG can optionally process uncompressed SDI video streams of 270 Mbit/s. Additional software packages open up a wide range of applications.

Newcomer with many special features

DVRG offers outstanding characteristics right in its basic version. Featuring compact design of only two height units, DVRG offers up to 36 Gbytes of storage capacity for recording and replaying MPEG2 transport streams.

The supplied transport-stream library contains predefined signals for many applications and test cases. This library, familiar from DVG and much appreciated

FIG 1 Only two units in height yet easy to operate via the front panel: DTV Recorder Generator DVRG

Photo 43401/3

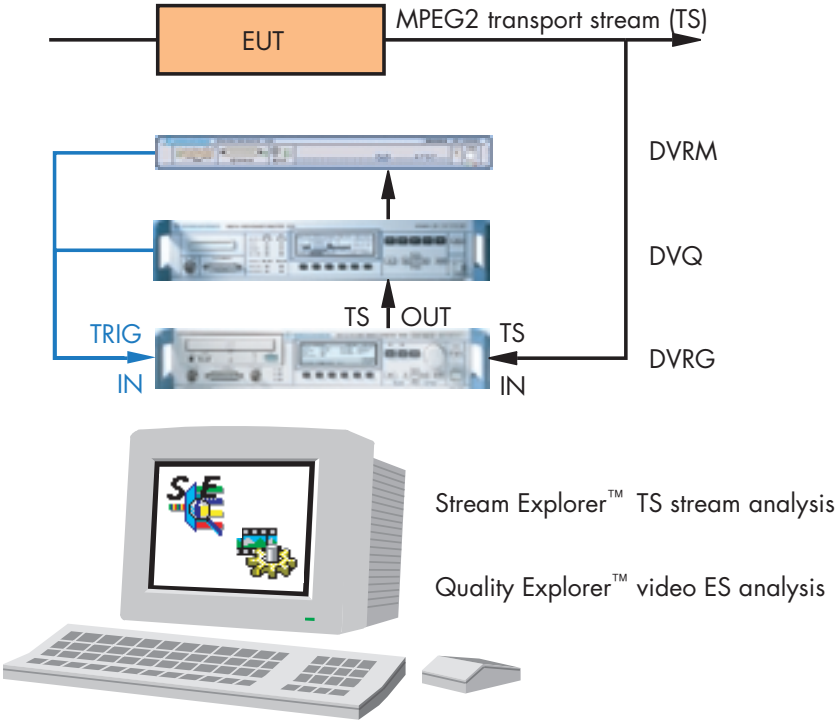

FIG 2 Compact test station for error analysis

by users, is continuously expanded by Rohde&Schwarz to match new requirements and developments in the TV industry. An integrated CD-ROM drive makes it easy to download signals. And an optional CD burner is available for archiving recorded streams.

A trigger input simplifies the selective recording of video streams. Transport streams can be recorded before, after or right at the time of an event, so that even rare errors or events can be reliably documented and analyzed (FIG 2).

Beside these characteristics, DVRG is also compatible with the widely used MPEG2 Generator DVG from Rohde&Schwarz. This makes for good economics, because all signals generated for DVG can be transferred to DVRG unmodified. Conversely, sequences generated by DVRG can be downloaded to DVG and replayed there.

Another strong point of DVRG shows in continuous operation. Free RAM capacity is automatically used for signal output. This means that shorter image sequences can be output without requiring any hard disk capacity.

Robust operating system and comprehensive software packages

The Windows Embedded NT™ operating system is the powerful motor in DVRG. This robust version of the Windows NT™ 4.0 operating system known from the PC world also allows the unit to be powered off in ongoing operation. This does away with tedious shutdown, an aspect that will be appreciated by many users. The main advantage however is that reliable booting is ensured even after a power failure – an important feature especially in production.

Connecting a keyboard, mouse and monitor turns DVRG into a Windows NT™ workstation, for which extensive software packages are available for generating, processing and analyzing transport streams in the unit (FIG 3). The Stream Combiner™ software [3] allows fast and simple modification and recombination of transport streams. This software too comes with a large library of elementary streams into which elements of recorded sequences can also be integrated. The coding of recorded transport streams can be analyzed and displayed in detail with the elementary stream analyzer of the Quality Analyzer software package [4].

Applications here, there and everywhere

Video server

Absolutely new in an MPEG2 generator is the optional ITU 601 interface. This enables recording and replaying of uncompressed video signals, turning DVRG into one of the most compact video servers on the market. DVRG is thus an ideal signal source for testing encoders and decoders.

Development

With its versatile capabilities, DVRG is an ideal tool in the development of digital TV equipment of every kind, for example encoders, multiplexers, modulators, receivers, set-top boxes. In the simplest case, one of the many predefined test signals available in DVRG can be used. If transport streams with specific contents are needed, these can be obtained either by recording other sources or by freely configuring the recorded elementary streams of optional Stream Combiner™ software DVG-B1 [3]. For special-purpose tests, defined error states can also be produced in this way.

Production

Test signals already generated at the development stage can be re-used in the production of the equipment in question. Compatibility with DVG – the MPEG2 generator most widely used –

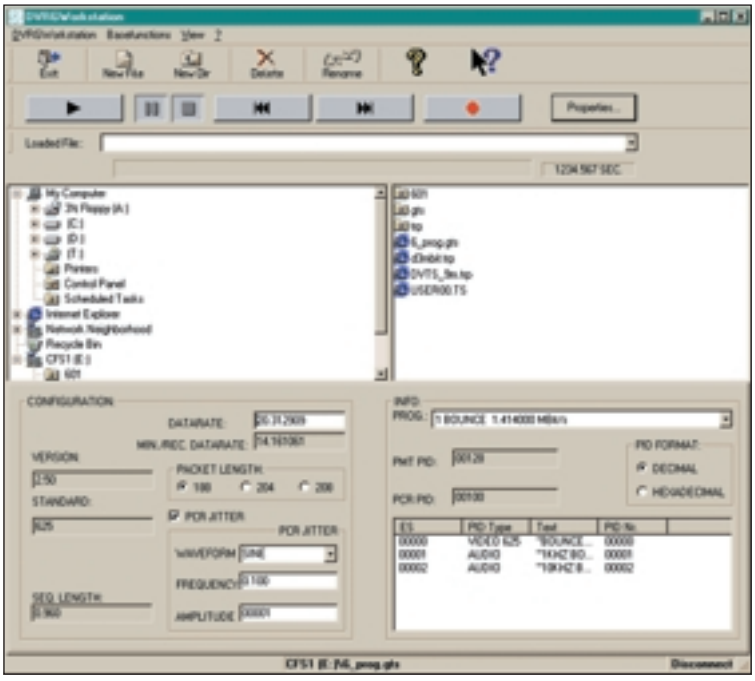

FIG 3
Windows™ user interface for operating DVRG as workstation

makes it possible to replay signals on both units.

In addition to the low-wear operation of DVRG, which makes it ideal for continuous service, its sturdy design also makes it an interesting proposition for a production environment. A standard 19-inch enclosure and Ethernet interface (100BaseT) simplify integration of DVRG into test systems.

If an EUT outputs MPEG2 transport streams or SDI video streams, these can be recorded by DVRG for test or quality-assurance purposes and subsequently analyzed offline with other tools such as MPEG2 Measurement Decoder DVMD or Digital Video Quality Analyzer DVQ [4].

Monitoring

DVRG is suitable also in monitoring applications. Triggered recording allows in-depth analysis of error states that occur only rarely. The trigger signal is supplied by MPEG2 Realtime Monitor DVRM [5] or by DVQ for example (FIG 2). DVRG can be set to start recording some time before the trigger event so that the cause of an error state can easily be traced. In a workstation configuration, the Stream Explorer and Quality Explorer software options can be installed on these units to produce a complete, compact test station.

Compact, powerful and extremely flexible – these properties make DVRG a highly versatile MPEG2 test device.

Werner Rohde; Alexander Wörner

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[4] Wörner, Alexander: Digital Video Quality Analyzer DVG – Getting the picture on picture quality. News from Rohde&Schwarz (1999) No. 163, pp 4–7

[5] Fischbacher, Michael: MPEG2 Realtime Monitor DVRM – Digital broadcast networks: operation secured. News from Rohde&Schwarz (1999) No. 165, pp 14–15

Condensed data of DVRG

Signal inputs and outputs	DVB TS ASI (active loop-through input) DVB TS SPI/LVDS ISDI (ITU 601/SMPTE 259E)
Transport stream	to ISO/IEC 1-13818
Packet lengths	ATSC: 188/208 bytes (selectable) DVB: 188/204 bytes (selectable)
Sequence length	endless or limited by hard disk size
Signal set	transport-stream library with approx. 80 sequences
Data memory	18 Gbytes or 2 x 18 Gbytes
Operating system	Microsoft Windows Embedded NT™
Remote-control interfaces	Ethernet 100BaseT, RS-232-C

Reader service card 167/02

ATSC Test Receiver EFA

All measurement functions for North-American digital TV standard

Following North America's decision in favour of ATSC/VSB (Advanced Television Systems Committee) for digital TV broadcasting, Rohde & Schwarz started to develop the necessary instrumentation and transmitters (see overview on page 13). After the successful launch of test receivers for analog TV signals and European digital TV standards, a new member for ATSC has now joined the EFA family. Compact in design and with extensive automatic test functionality, this receiver (FIG 1) is ideal for applications in the development and production of transmitter modulators as well as acceptance testing of large transmitter systems and monitoring the quality of digital TV signals.

FIG 1 ATSC Test Receiver EFA joins EFA instrument family, adding measurements in digital TV systems to North-American ATSC/VSB standard

Photo 43482/1

Full ATSC coverage by 2002

Key features of the North-American digital TV standard are the use of MPEG2 (Moving Pictures Experts Group) to compress video and audio signals, and 8VSB modulation (see box, pp 12–13).

A decisive factor for fast, nationwide introduction of digital TV in the United States was the allocation of additional 6 MHz channels for the parallel transmission of digital TV programs by all the approximately 1600 broadcast stations. This made it possible to operate simultaneously on digital and analog channels during the transition period.

Another milestone was the definition of a tight time frame by the legislation, compelling stations to start broadcasting digital TV signals in good time. The first digital programs were transmitted on schedule in November 1998. To date (May 2000) some 120 stations are on air with digital programs, providing coverage for about 60% of the US-American population. By late 2002 all commercial TV stations are to follow. It is planned to shut down all analog channels by the end of 2006.

EFA – characteristics

ATSC Test Receiver EFA, fully compatible with the ATSC Doc. A/53 standard, receives, demodulates, decodes and analyzes VSB (vestigial sideband) signals. All major parameters for demodulating the receive signal can be selected automatically or manually:

- 8VSB modulation,
- trellis decoder (code rate 2/3),
- variable symbol rate for special modulator tests and lab analysis,
- Reed-Solomon error correction 207/187/10,
- filter bandwidth 6 MHz, optionally 2 MHz and 8 MHz.

The operating principle of the new receiver is largely identical with that of the other receivers of the EFA family [*] except for standard-specific functions.

Singular versatility

The new test receiver features a multitude of innovative measurement functions right from the basic version, allowing comprehensive, in-depth signal analysis. In addition to measurement of general parameters such as bit error ratio (BER) (FIG 2), more thorough analysis includes:

- I/Q constellation diagrams with selectable number of symbols to be represented,
- eye aperture and modulation error (MER/EVM) versus time,

- calculation of transmission parameters like pilot carrier,
- amplitude spectrum of user channel,
- linearity analysis from histogram of amplitude distribution,
- complex channel transmission function,
- received echo signals (ghost pattern).

Any failures and degradations are visible straight away from the constellation diagram (FIG 3). Effects of interest can be located more precisely by varying the number of symbols represented. A particularly effective method here is presentation of eye aperture as a function of time. Eye apertures plus decision thresholds are displayed on a largely user-selectable scale revealing, for example, periodic transmission errors or individual interferers at a glance and allowing immediate identification. Trend analyses, too, are possible with this method.

The integrated spectral analysis function enables simple examination of the signal type and its spectrum. You can see immediately, for example, whether there is a marked frequency offset, or if the pilot-carrier level matches the specification (FIG 4). An optional filter with 8 MHz channel bandwidth covers spectral components outside the 6 MHz user channel while effectively suppressing more distant components.

Realtime signal analysis

The powerful digital signal processing of EFA provides fast and in-depth analysis of 8VSB signals (FIG 5). Analysis is simultaneous with and independent of demodulation and decoding, so the MPEG transport stream is permanently available for vision and sound reproduction. Thanks to this realtime analysis capability, the large number of measured values necessary for the complex calculation and display processes are produced fast for subsequent mathematical-statistical processing. Because of its rapid data acquisition, the test receiver is an ideal choice not only in R&D but also in production monitoring, where high measurement speed is called for.

EFA-ATSC as monitoring receiver

Monitoring receivers permanently monitor the major parameters of broadcast signals directly at the transmitting station (FIG 6). EFA-ATSC is tailor-made for this application. Six parameters with separately selectable alarm thresholds can be configured for monitoring. Particularly worth emphasizing is BER monitoring ahead of and after the various error-protection blocks, allowing early detection of any problems. Detected transmission errors are saved in the test receiver together with the date and time in error reports comprising up to 1000 entries. In addition, it triggers an acoustic alarm.

Use as relay receiver

For this special application, EFA is simply optimized for reception at a keystroke. This allows reception even under adverse operating conditions. The user is also able to configure the bandwidths of the main amplitude- and phase-control loops.

Christoph Balz;
Mathias Leutiger; Ernst Polz

Further articles on Test Receivers EFA on pages 32 and 37 of this issue.

8VSB – ATSC modulation for terrestrial broadcasting of digital TV signals

The ATSC standard employs 8VSB (8-level trellis-coded vestigial sideband) discrete amplitude modulation. Here the incoming data stream at the transmitter is applied to a data randomizer, Reed-Solomon encoder and data interleaver, divided into packets of two bits and, because of the 2/3 code rate, coded to produce data packets of three bits in a Viterbi convolutional encoder (trellis encoder). Each group of three bits (symbol) represents a

Captions to FIGs 2 through 6

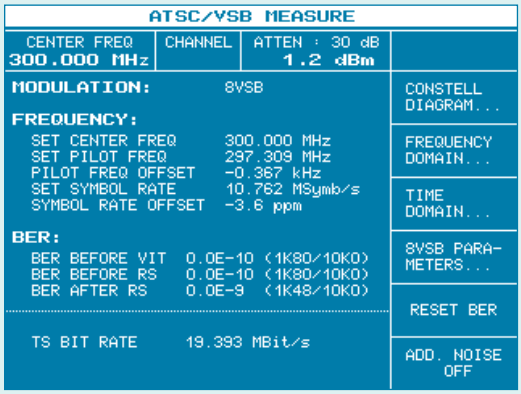
FIG 2 Measurement menu: all important data visible at a glance

FIG 3 Constellation diagram, here representing 10000 symbols

FIG 4 Spectral analysis of 8VSB signal by means of FFT

FIG 5 Display of calculated 8VSB transmission parameters in corresponding measurement menu

FIG 6 Simultaneous analysis/measurement of key parameters – ideal for monitoring tasks



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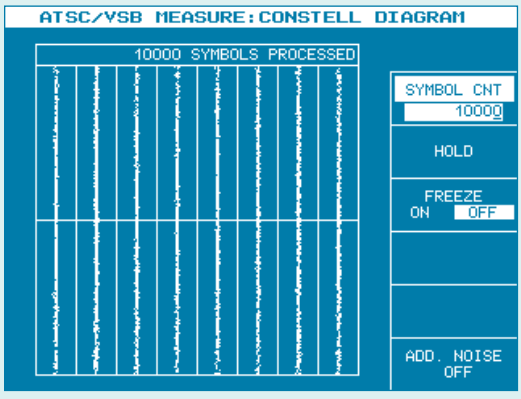

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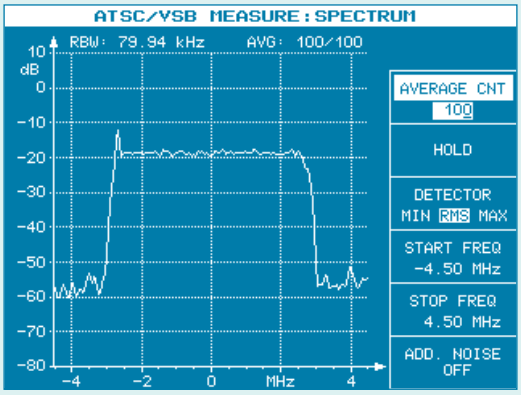
specific amplitude level (eight levels). Synchronization data (segment sync, field sync) are added to the coded signal for data recovery in the receiver (error correction, channel equalizer). For carrier recovery in the receiver, the unmodulated carrier is added to the 8VSB signal as a pilot. To make the most efficient use of the available bandwidth, only one sideband of the AM-modulated signal is transmitted (vestigial-sideband suppression). Prior to emission, the modulated signal is shaped by a root-cosine rolloff filter (r = 0.115).



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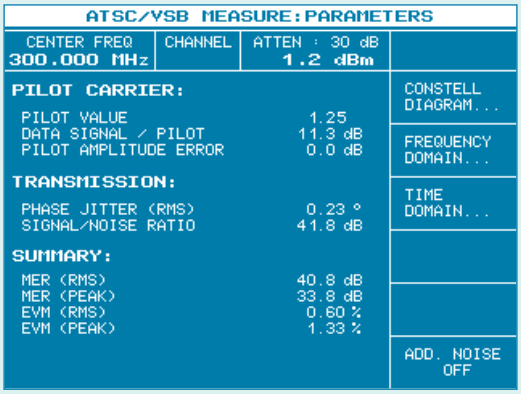

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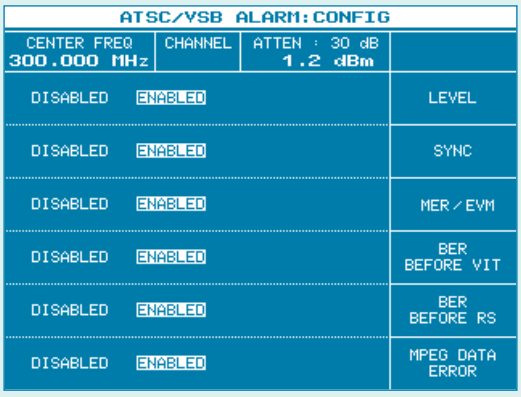

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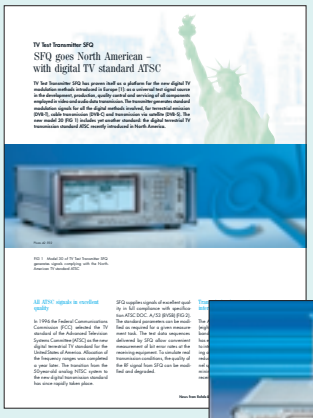
Everything for ATSC from Rohde&Schwarz



TV Test Transmitter SFQ (News 166)

UHF Transmitter Family NH/NV7000 (News 165)

MPEG2 Realtime Monitor DVRM (News 165)

MPEG2 signal generators and analyzers (News 164)

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Condensed data of EFA-ATSC

Frequency range	model 50: 48 MHz to 862 MHz model 53: 43 MHz to 1000 MHz model 53 with option EFA-B3: 5 MHz to 1000 MHz
Input level range	model 50: –77 dBm to +10 dBm model 53: –47 dBm to +14 dBm model 53 with option EFA-B3: –77 dBm to +14 dBm
Bandwidths	6/8/2 MHz
Modulation	8VSB
Symbol rate	2 to 11 Msymbol/s
Equalizer	auto/freeze/off
BER analysis	ahead of and after Reed-Solomon decoder, ahead of Viterbi decoder
Measurement functions	level, BER, MER, EVM, SNR, pilot-carrier level, pilot-carrier frequency, symbol rate
Graphical displays	I/Q constellation, amplitude spectrum, echo signals (ghost pattern), complex channel transmission function, amplitude distribution, eye pattern, history
Output signals	SMPTE 310, MPEG-TS: SPI, ASI
Options	RF preselection (EFA-B3), SAW filter 8 MHz/2 MHz (EFA-B13/-B14)

Reader service card 167/03

Photo 43475/1

FIG 1 Flexible platform for GPRS test scenarios: Digital Radiocommunication Test Set CRTx and Industrial Controller PSM

Digital Radiocommunication Test Set CRTx

Flexible test platform for general packet radio service (GPRS)

General packet radio service (GPRS) is the new service of GSM standard Phase2+ for packet-oriented data transmission. Compared with existing, line-oriented GSM data services such as high-speed circuit-switched data (HSCSD) [1], GPRS allows better adaptation to data networks like the Internet and more efficient use of available radio resources while offering the same data transfer rates. Radiocommunication Test Set CRTx is ready to go for this new data service and, with its flexible test facilities, provides an excellent platform for GPRS test scenarios.

The arrival of GPRS has added multiple complexity to the GSM standard, especially with regard to the protocol stack. This places stringent demands on the performance and flexibility of a GPRS test platform, which CRTx meets by hardware and software extensions.

To meet elevated performance requirements, CRTx is supported by Industrial Controller PSM (FIG 1). The two units communicate on a standard Ethernet link. The more time-critical, lower protocol layers (physical layer and RLC/MAC) run on CRTx, the higher layers (LLC and SNDCP) on PSM (FIG 2). The system as a whole is operated from PSM using the Windows NT™ operating system.

GPRS test applications are programmed via a powerful API, which allows each protocol layer to be checked. In addition, a reference implementation of the complete GPRS protocol stack is available for testing GPRS-

based applications. RF measurements like block error rate (BLER) are implemented too. As regards multislot operation, CRTx supports a maximum of four timeslots uplink and downlink (4+4).

The system is consequently suitable both for applications in the development of GPRS systems and conformance testing of mobile-radio stations.

PSM must be equipped with option B10, comprising the Windows NT™ operating system, a second network card and an Ethernet cable for connection to CRTx. CRTx, in turn, must be fitted with option CRT-B3 (network card) for connection to PSM.

Phase2+ Operational Software CR02P2P provides full circuit-switched functionality for GSM Phase2+. Part of the software package is installed on CRTx and part on PSM.

Software option CRGPRS1 incorporates functionality for the GPRS physical layer and RLC/MAC layer in the unacknowledged mode. Software option CRGPRS2 adds acknowledged mode to the RLC/MAC layer, provided that software option CRGPRS1 is installed.

Software option CRGPRS3 comprises the higher protocol layers LLC and SNDCP. It is installed on PSM and requires one of the options CRGPRS1 or CRGPRS2 integrated in CRTx.

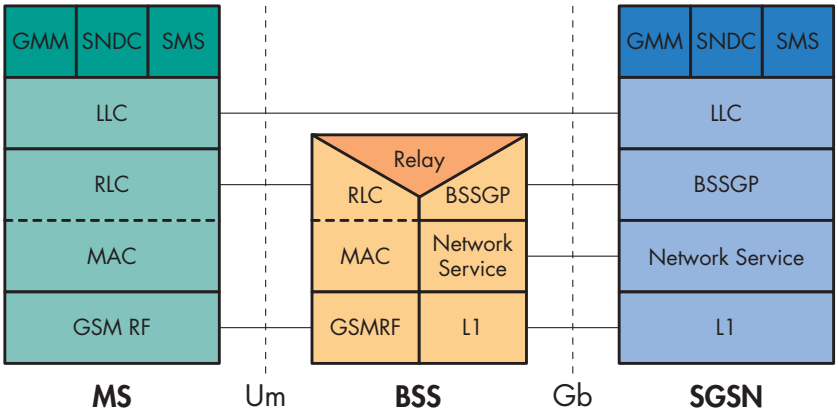
Several packages CRTKGxx are also available, containing GPRS test cases implemented according to ETSI specification GSM11.10-1.

Patrick Kolligs

Reader service card 167/04

REFERENCES
[1] Segerer, Franz: HSCSD test software for GSM Phase2+ – Measurement software and test cases for new, fast GSM data services. News from Rohde&Schwarz (1999) No. 163, pp 28–29
[2] GSM 04.64, version 6.7.0, release 1997 (ETSI TS 101 351)

FIG 2 Structure of GPRS protocol stack [2]



General packet radio service (GPRS)

GPRS is a third-generation data service set up on mobile-radio networks of the second generation (GSM). Data transmission is packet-switched, not circuit-switched like in HSCSD for example. This enables better adaptation to existing data networks, such as the Internet and its associated services (WWW, e-mail, etc).

The short packets comprise a maximum of 1500 octets. Through channel trunking (multislot) of up to eight timeslots, a maximum data rate of 115.2 kbit/s is achieved in full-duplex mode same as with HSCSD. Since some applications require a defined, continuous data rate, the user can select between different service classes (QoS: quality of service), for which network operators guarantee the appropriate data throughput. After registration, a permanent virtual link exists round the clock, which also allows faster access to the data network.

The major advantage from the point of view of network operators is the more efficient use of available radio resources. With GPRS, this is achieved chiefly by making use of radio resources only during data transmission. Timeslots in uplink and downlink can also be split dynamically among several subscribers.

The chief advantage of GPRS where users are concerned is the low cost compared with former circuit-switched transmission since only the actual data volume transmitted, not the online time, is charged. Simultaneous data and voice communication is possible too.

GPRS-based applications can be divided into two classes: point-to-point (eg home banking, travel booking) and point-to-multipoint (eg news, traffic information).

The first mobiles supporting GPRS are expected to become available late this year.

GH 127 AllAudio

Digital recording, distribution and management of audio signals in radiomonitoring systems

GH 127 AllAudio is PC-based software for simultaneous digital recording of audio signals from up to 16 channels and their distribution via networks. An integrated database for data backup and an export function support management of recordings. An optional intercom makes for easy teamwork.

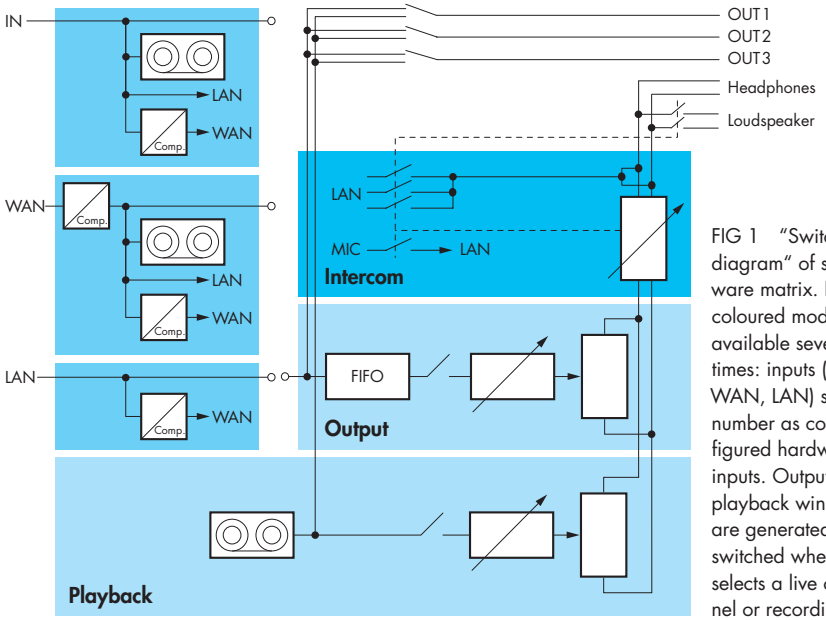


FIG 1 "Switching diagram" of software matrix. Each coloured module is available several times: inputs (IN, WAN, LAN) same number as configured hardware inputs. Outputs or playback windows are generated and switched when user selects a live channel or recording

GH 127 AllAudio at a glance

- Flexible local audio signal distribution by software configuration of up to 16 channels
- LAN distribution to any number of workstations by multicast technology
- Speech transmission in WAN by compression from data rates of 9600 baud per channel
- Local recording of all channels for optimum use of resources; central archiving possible
- Integrated database, report function and data backup for management of recordings
- Optional intercom with automatic muting of audio sources, group call, etc

Advantages through digitization

Conventional radiomonitoring systems use different analog components to process audio signals such as:

- switching matrixes,
- recorders,
- distributors, splitters, amplifiers,
- multiplexers,
- intercom.

All these components can be implemented much more flexibly and cost-efficiently on a PC by software. GH 127 AllAudio digitizes all audio signal sources via multichannel sound cards and can distribute, record, play back and store digitized signals. Possible sources are the audio outputs of receivers, microphones or IF outputs up to a center frequency of 12.5 kHz (like VLF-HF Receiver EK 896) or digital audio signals, eg from Digital Monitoring Direction Finder DDF 0x M from Rohde&Schwarz.

GH 127 AllAudio is ideal for all systems in which automatic audio signal recording and distribution as well as communication via intercom are to be integrated. Radiomonitoring and spectrum management are typical fields of application.

GH 127 AllAudio in detail

Flexible signal distribution

Audio signals are distributed by switchover or mixing the input channels by software (FIGs 1 and 2). A data buffer with 60 s capacity is available for each channel. The user can play passages again by positioning the mouse appropriately. Output is on headphones or simultaneously by loudspeaker. In addition, signals can be switched exclusively to up to three further outputs for more detailed analysis.

The available LAN or WAN serves for distributing the signals between stations. Advanced multicast technology like that in Internet radio is used. In this way, signals of interest can be analyzed simultaneously at all workstations. There is no need for multiplexers or complex cabling.

Signals can be compressed for transmission via a WAN (router, modems), so speech signals are transmitted at data rates from 9600 baud per channel.

Optional communication via intercom

Through the optional intercom an operator can report the frequency of a detected signal he cannot process to a colleague for example (or to several colleagues by a group call). Teamwork thus becomes much simpler.

Virtually any capacity

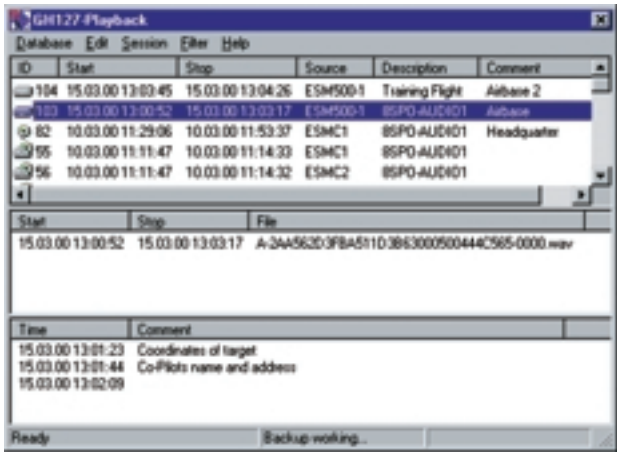
Signal recording is on the local PC. The capacity of modern hard disks allows continuous recording over several days or even weeks. Audio squelch control and data compression contribute to long recording times without a user having to intervene.

Integrated database

Recordings are administered in an integrated database (FIG 3). The system automatically registers data such as recording time, channel and station name. Users can identify important passages in a recording by bookmarks – comments which are stored together with their entry time.

Database and recordings can be backed up on tape and restored.

FIG 3 Recording database: selected recording sessions consist of several files in WAV format. Some positions of recording session are characterized by bookmarks. Session is played when clicked at corresponding position



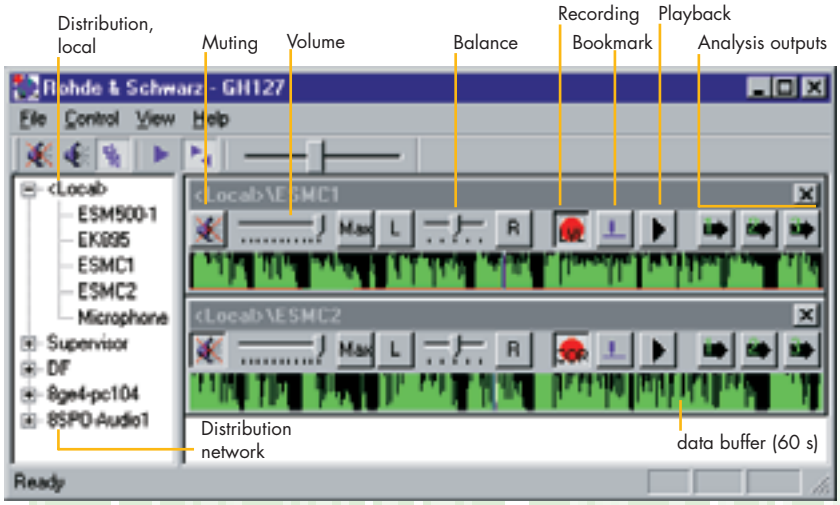
Backup may delete recordings while management information in the database is maintained on the PC. The user can thus see all recordings. When accessing archived recordings he is told on which tape to find them.

In touch by remote control

Several remote-control possibilities are integrated:

- stations with GH127 can remotely control other workstations with GH127 to start or stop recordings,
- monitoring software (eg Rohde&Schwarz RAMON or ARGUS – see page 18 of this issue) can activate audio output of a receiver, control the volume, etc,
- switching statuses of outputs can be queried so that results of analyses can be assigned correctly,
- recording of each channel can be controlled by software, and information like time, file name, etc is exported to a controlling application for management in a common database.

FIG 2 Audio distribution – 2 channels switched for listening



Easy to get into

The simple and self-explanatory user interface (Windows NT™), configurable user groups with different rights and automatic control of input level are features that make a change from conventional analog technology or operation for inexperienced users a lot easier. And integrated data administration allows experienced users to manage their recordings much better than before.

GH127 AllAudio can be supplied in different configurations, eg as software with sound cards for use on PCs or as a completely remote-controllable digital recorder.

Johannes Meidert

Reader service card 167/05

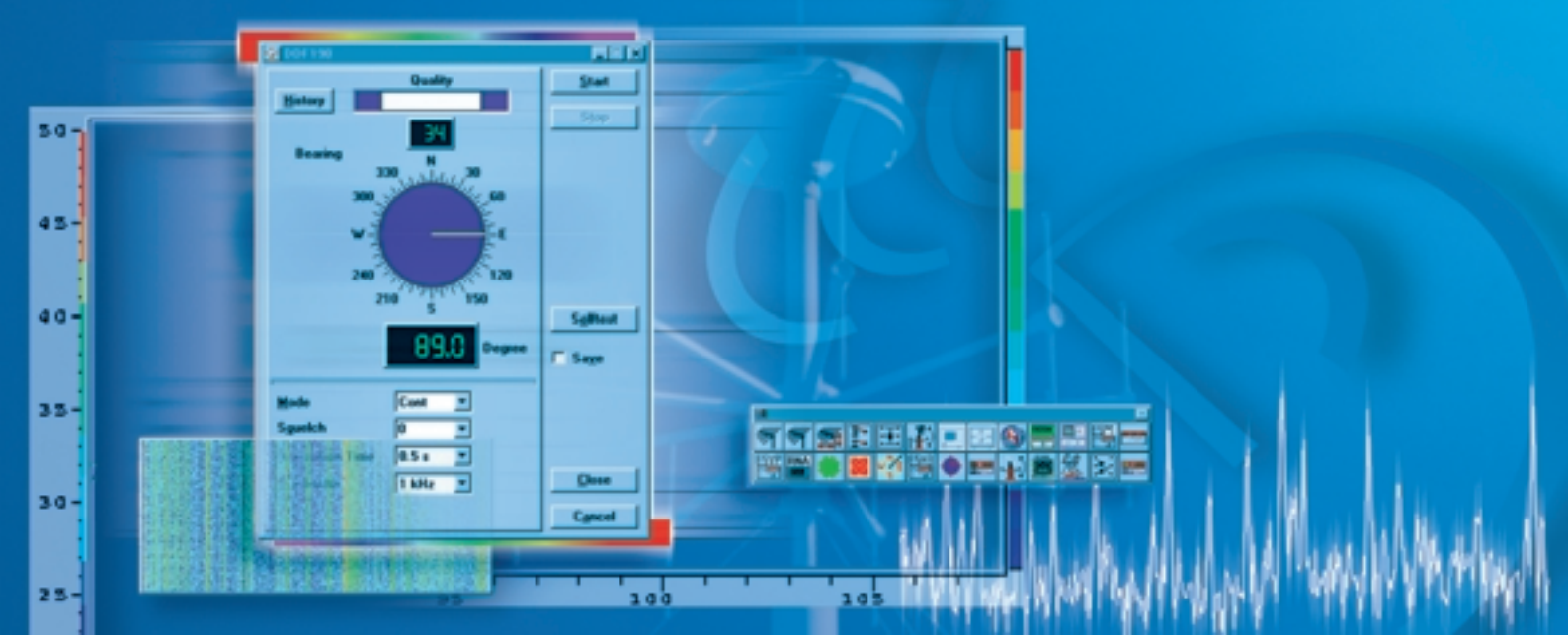


Photo 43336

Spectrum Monitoring Software ARGUS 4.0

New software generation for spectrum monitoring systems

Spectrum Monitoring System ARGUS-IT (formerly SMSI plus TS9965) [1; 2] is equipped with different software packages for complex radiomonitoring tasks. ArgusMon and ArgusEval, now available in upgraded versions, form the core of the software.

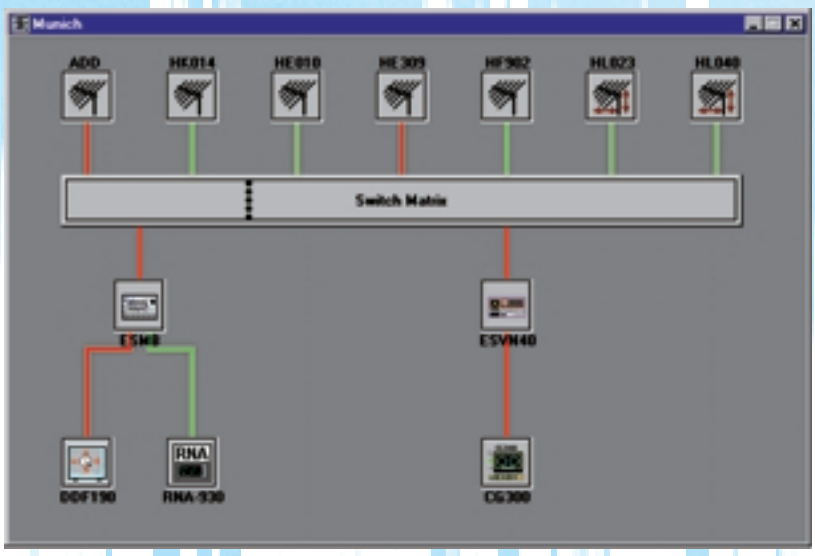
Tried and tested but still improved

Measurement Software ArgusMon provides very different means of measuring electromagnetic emission in various modes according to ITU recommendations. It can be scaled by using modular components: controlling a single device (see [3] and page 5, Monitoring Receiver ESMB) is as easy as operating several unattended stations.

Evaluation Software ArgusEval allows comprehensive statistical analysis of measurement results according to ITU recommendations. In addition, measured results, the associated definitions and statistical evaluations can all be documented.

Both software packages are now available in version 4.0. They come with improved user-friendliness, even better oriented on the tasks of radiomonitoring. Plus, the latest ITU recommendations are also considered. The most important modifications compared to version 3.6 are described in what follows.

FIG 1 System visualizer in ArgusMon produces schematic of complete radiomonitoring stations



The most important modifications

System visualizer

The new system visualizer in ArgusMon produces the schematic of a selected radiomonitoring station: antennas, receivers, analyzers, decoders and recording equipment with all their connections are shown in graphical representation (FIG 1). The required connections between antennas and receivers can be selected and switched by mouse click. A second mouse click on a device icon opens the interface from which the user can control the device and measure with it.

Interactive measurement mode

The revised interactive measurement mode (IMM) and the bearing measurement mode (BMM) now ensure direct access to device settings. This does away with bothersome setting through range configuration menus. In addition to spectrum and signal analysis, the interactive measurement mode now also offers antenna analysis for fast omnidirectional, height and elevation measurements (FIG 2).

Intermodulation analysis

Intermodulation analysis is now integrated into IMM. The original frequencies can be found much faster since the number of possible frequencies and the maximum order can be limited during calculation and the results displayed according to probability. Editing the list of possible original frequencies was also extended and simplified.

Spectrum mode

In the spectrum mode of IMM it is now possible to define alarm conditions. If they are exceeded for example, signal analysis of the particular frequency can be started.

Bearing measurement mode

In the bearing measurement mode (FIG 3) it is possible to calculate and store radiolocation results. This requires the use of at least two direction finders. Locations can also be performed by the automatic measurement mode or the interactive measurement mode and the results can be stored.

Automatic measurement mode

In the automatic measurement mode (FIG 4) scans of transmitter lists can be performed. Transmitter lists can also be extracted from databases for example. Since the location of a transmitter is often known, ArgusMon can align rotatable antennas towards the transmitter and then measure.

Practice-proven user manual

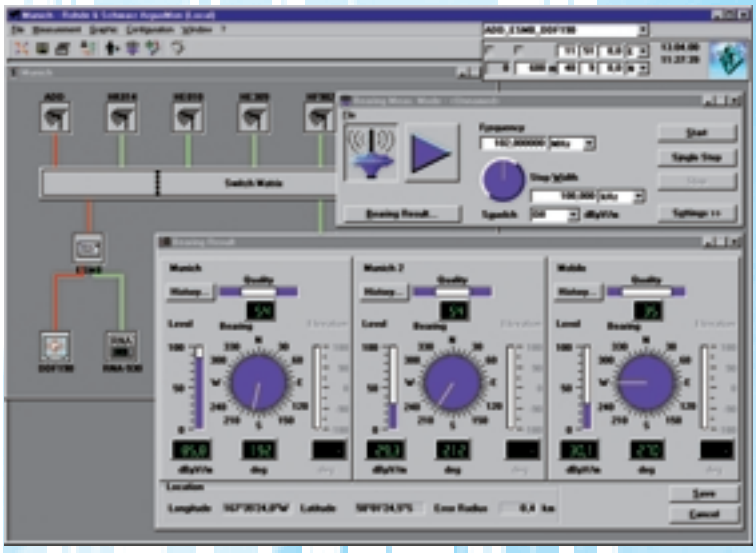
The new user manual was developed in close cooperation with experienced customers. It explains step by step the commonest, typical measurement tasks in radiomonitoring and how to solve them with the ARGUS software packages.

Further improvements in brief

- Level cannot only be measured in dBµV and dBµV/m but now in all other common units
- A new graphical window shows frequency-band occupancy during a measurement in realtime (FIG 5)
- An auxiliary icon bar shows the current location and alignment of the test vehicle at a glance if a GPS receiver and compass are connected

FIG 2 Antenna analysis in interactive measurement mode

FIG 3 Bearing measurement mode



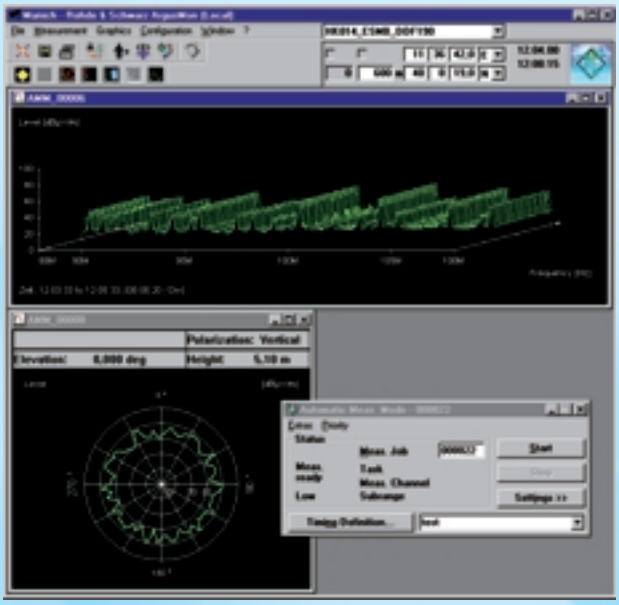


FIG 4
Automatic measurement mode

- The newly developed data navigator in ArgusMon and ArgusEval allows extremely fast access to definition files and measured results
- The time stamp in the measured results now also indicates milliseconds to accommodate modern receivers
- The speed of graphics presentation is as much as ten times faster
- ArgusEval contains new statistics for frequency-band occupancy according to a planned ITU recommendation (FIG 6). All statistics can be generated faster because the measured results can be used direct. Generating the channels is no longer necessary

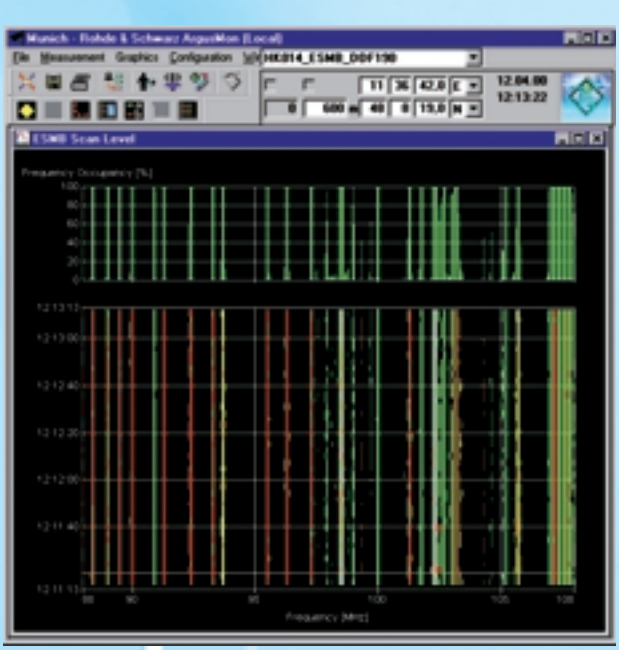


FIG 5
Frequency-band occupancy can be visualized in real-time during measurement

A big step ahead

Many improvements and additions in the new version make the software packages even easier to operate for faster turnaround. The self-explanatory user interface increases productivity decisively and takes stress off the operator in performing the various and complex measurements

Jörg Pfitzner

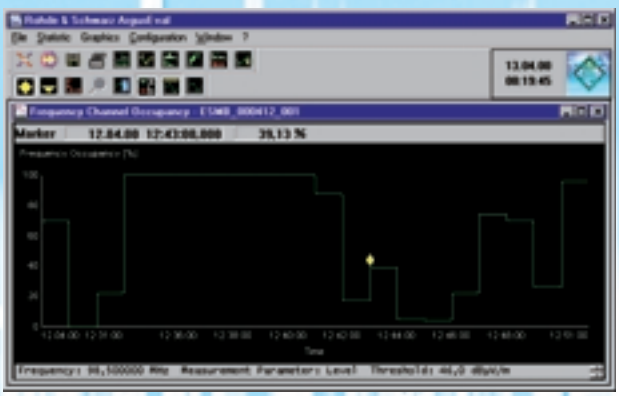


FIG 6
Frequency-channel statistics in ArgusEval

Reader service card 167/06

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[1] Seidl, Wolf: Spectrum monitoring the ITU way. News from Rohde&Schwarz (1997) No. 153, pp 26–27
[2] Pfitzner, Jörg: Radiomonitoring System TS9965 – Complete coverage up to 18 GHz. News from Rohde&Schwarz (1994) No. 146, pp 22–25
[3] Fokken, Theodor: Mini-receivers – Remote control lends weight to network role. News from Rohde&Schwarz (1999) No. 165, pp 6–17

Electronic spare-parts catalog

Short clicking is better than long leafing

People in spare-parts logistics and field service are often under considerable pressure, especially when their customers' expensive machinery or systems are shut down due to a defect. A large number of different models, versions and variants as well as a constantly changing product range aggravate this situation, and often result in the wrong thing being ordered. One solution to this problem is electronic spare-parts catalogs (SPCs), with integrated search engines to speed up the tracing of the right spare part. They reduce the effort involved in updating spare-parts documentation, simplify the ordering process, and lots more.

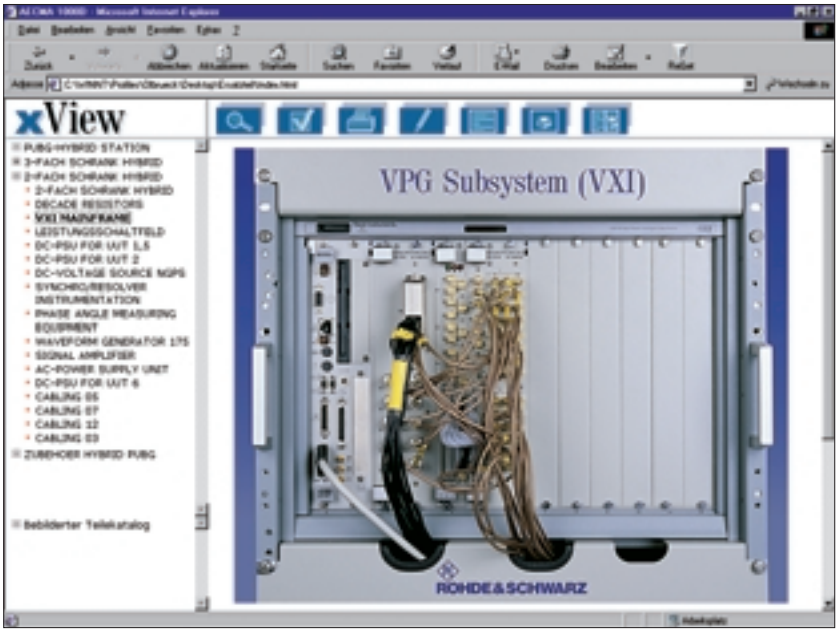


FIG 1 Hierarchical structure of complex units and systems helps to fid spare parts fast

What is an SPC?

Based on techniques proven on the Internet, the service center for technical documentation of the Rohde&Schwarz Cologne Plant [1] develops electronic spare-parts catalogs that make logistics a lot easier. Searching through lists as well as order operations become much more convenient. Thanks to the techniques used, later integration into complex electronic documentation systems [2] is possible. A free Internet browser, available on practically every PC, is used as display software.

In an SPC, parts lists and graphics such as exploded-view drawings are combined electronically. Parts lists stored in ASCII format can be integrated as simply as graphical presentations and photographs.

Systematic structure for fast searching

An SPC has a user-friendly hierarchy, like the corresponding hardware structure resulting from design or integration (FIG 1). Individual startup pages, lists of contents, product groups or equipment family overviews help you to quickly get where you want. You familiarize quickly and intuitively with a unit or system.

Electronic SPCs reduce the documentation carried by someone in the field service to a single CD-ROM. Even electronic SPCs cannot always be up-to-date, which is where an amendments service helps, providing the latest information and changes via diskette, CD-ROM or straight from the Internet for daily actuality.

SPC functions

Presentation and navigation in Internet browser

Use of standard software (eg Microsoft Internet Explorer™) simplifies intuitive working, because you find the familiar Microsoft Windows™ environment. An SPC makes use of the standard functions (forward and backward navigation, bookmarking by favourites, etc), and other functions can be added by Java scripts. Very many configurations are possible, so a customer's own corporate identity can be created. Further functions or links to other applications are easily integrated.

Sophisticated search functions

Searching for individual parts is extremely simple. This can be done by selection from graphical presentations and through designations or part numbers (FIG 2). Full-text search is also possible (FIG 3).

Automatic contents generation

Ordering and logistics information as well as graphics are, for the most part, automatically imported from existing databases or CAD systems. Operating an amendments service will generally require very little manual effort.

Integrated ordering system

An ordering process is initiated for the particular spare parts or products through the ordering system. Coupling to the manufacturer's goods management system is possible via an Internet link.

Notepad and printer functions

The producer and user can file a separate note for each spare part via the notepad function. So feedback can be obtained from the field on an online link.

Graphical views in CGM format can be printed out by the integrated viewer. Parts lists can be printed straight from the browser.

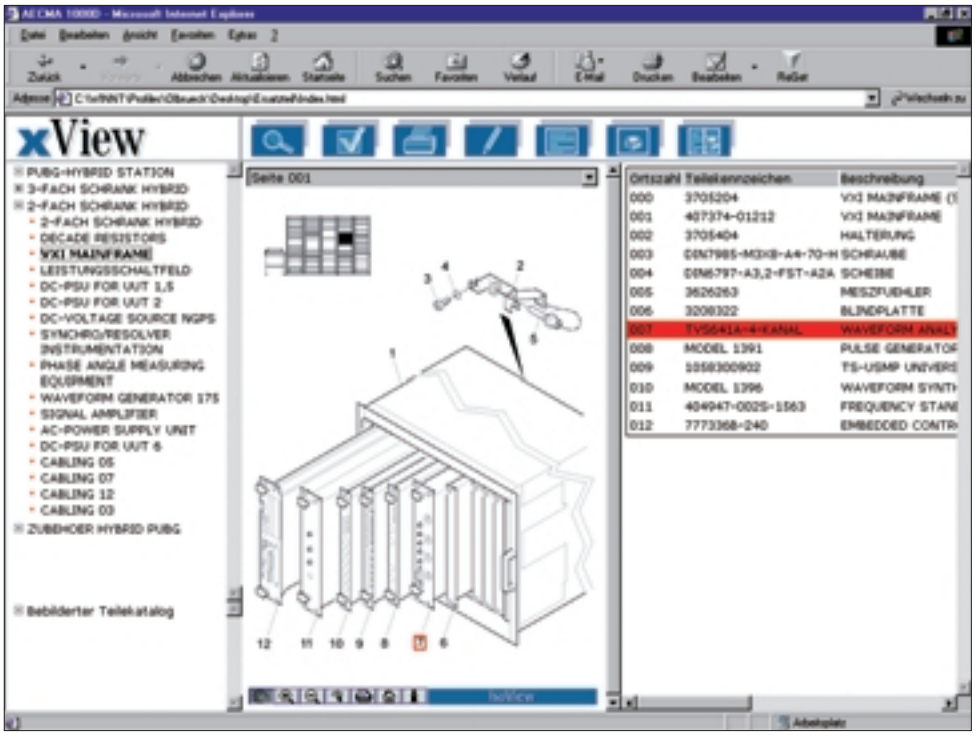


FIG 2 User-friendly combination of picture and text information

SPC – ideal for experienced service providers

The functions outlined here are just examples, and can be expanded in a whole variety of ways. The service center for technical documentation at the Rohde&Schwarz Cologne Plant assists users in devising tailor-made concepts for the implementation of electronic documentation and cataloging of spare parts.

Heinz-Peter Olbrück;
Jörg Zorenböhmer

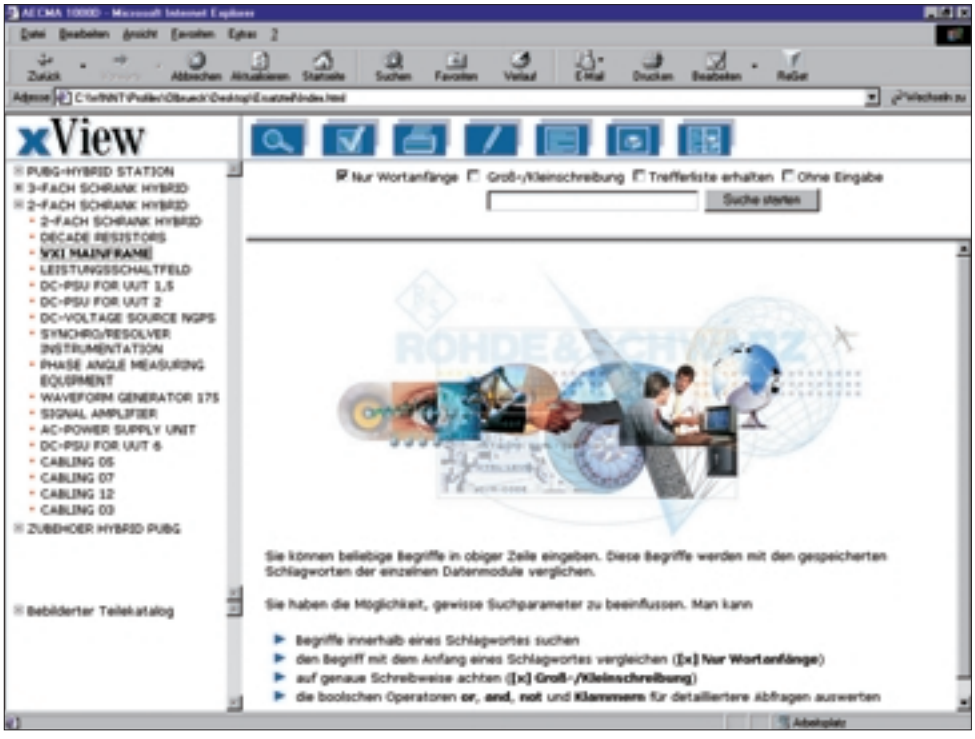


FIG 3 Wide range of functions in familiar software environment, eg full-text research in Microsoft™ Internet Explorer

REFERENCES

[1] Zorenböhmer, Jörg: Technical documentation by high-tech methods. News from Rohde&Schwarz (1999) No. 162, pp 16–17

[2] Olbrück, Heinz-Peter: Database-supported information management. News from Rohde&Schwarz (2000) No. 166, pp 20–21

Reader service card 167/07

Noise Measurement Software FS-K3

Noise test system with FSE, FSIQ or FSP analyzers

The noise figure and the gain of a DUT can be measured highly accurately with the new Noise Measurement Software FS-K3 and a signal or spectrum analyzer of the FSE, FSIQ or FSP family. The result is a noise test system that is substantially superior to a conventional test setup.

High-grade noise test systems

Spectrum Analyzers FSE and FSP and Signal Analyzers FSIQ from Rohde & Schwarz featuring high sensitivity and level accuracy are – together with switchable and calibrated noise sources – ideal for performing automatic measurements of noise figure and gain. Noise Measurement Software FS-K3 invests these high-grade analyzers with characteristics that are otherwise only obtainable in special-purpose noise test systems. The following parameters can be measured:

- noise figure in dB,
- noise temperature in Kelvin,
- gain in dB.

The software runs on a commercial PC with the Microsoft Windows™ 3.1/95/98/NT operating systems. An IEEE/IEC-625-1 interface is required for measurement. In the case of analyzers including the controller function (FSE-B15) or FSIQ, the application can run in the particular unit without the need for a PC.

Settings for the measurements are performed via the software and can be stored on a data medium. Results can be exported in the form of WMF, DAT or TXT files for further processing by other programs.

Users who already have the predecessor version FSE-K3 will receive a free upgrade and can take advantage of the extended functionality.

Noise figure and gain of mixers

A frequent problem when measuring the noise figure and gain of mixers is that the broadband noise of commercial noise sources is not only converted into the IF at the required input frequency but also at the image frequency. The noise power, additionally converted at the image frequency, causes a measurement error that can vary by proportion.

One way of avoiding this error is to use a filter with which the input noise at the image frequency is strongly suppressed and only the noise component at the desired receive frequency is considered. But often, suitable filters will not be available and first have to be provided. That is why this solution is too time-consuming and inflexible for use in labs.

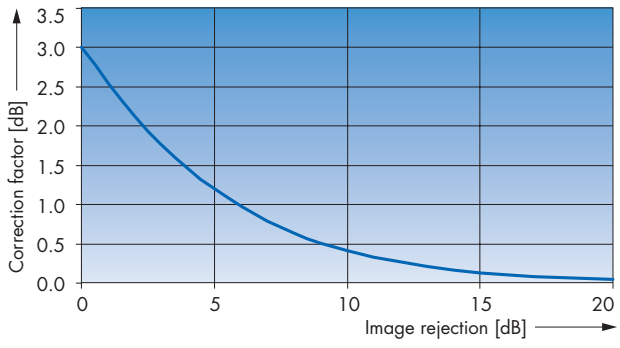
FS-K3 offers a way around this problem. The difference between receive and image frequency in the conversion losses of a mixer can be entered in the software. A correction factor for the measured noise figure or gain is then calculated as a function of this difference, which will be called image rejection. The FIG illustrates the relationship between the correction factor and image rejection.

To obtain the equivalent noise figure for a sideband, the correction factor for the given suppression has to be added to the measured value. For gain you proceed in a similar way, but subtract the correction factor from the measured value. The suppression can be determined by measuring the conversion loss of the DUT at the receive and image frequency, eg with Network Analyzer ZVR.

Robert Obertreis

Reader service card 167/08

Correction factor for noise figure and gain at image frequency



Universal Radio Communication Tester CMU200

GSM power measurement – versatile, fast and accurate

Measurement speed and accuracy – these are the key criteria in production because they determine test times and thus throughput. Universal Radio Communication Tester CMU200 [*] (FIG 1) optimizes the two parameters for each application. How this rapid tester helps you to cut down on measurement times is demonstrated here by the example of power measurements on GSM mobiles.

Photo 43238/10

FIG 1 Universal Radio Communication Tester CMU200 optimally matches measurement requirements in GSM mobile-phone production

Optimized in every case

GSM specifications state how much power a mobile may emit as a function of power control level (PCL), together with the time characteristic a mobile must comply with (FIG 2). The latter again depends on PCL. CMU200 performs all the measurements required for this – fast and extremely accurately.

Power versus frequency

CMU200 allows GSM-conformant measurement of the power characteristic in all frequency bands:

- GSM400 with option CMU-K20
- GSM900 with option CMU-K21
- GSM1800 with option CMU-K22
- GSM1900 with option CMU-K23

CMU200 records several bursts (1 to 2000) of a mobile and from these finds the minimum, maximum and average power characteristic. In manual operation, detailed analysis is simplified by a zoom function, markers and auxiliary lines. To allow immediate verification of compliance with GSM specifications, the tester automatically positions the power versus time template over the measured burst and detects and marks violations of limits and specifications (FIG 2). The template is automatically adapted to the particular power control level. The user can define template and tolerance limits to match mobile-specific requirements. In short, with CMU200 you can check at a glance whether the power characteristic of a mobile is go or nogo.

The pass/fail indicators are available also in remote control. So, on the remote-control computer, you can determine immediately, without elaborate analysis, whether or not a mobile conforms to GSM specifications. Plus, you

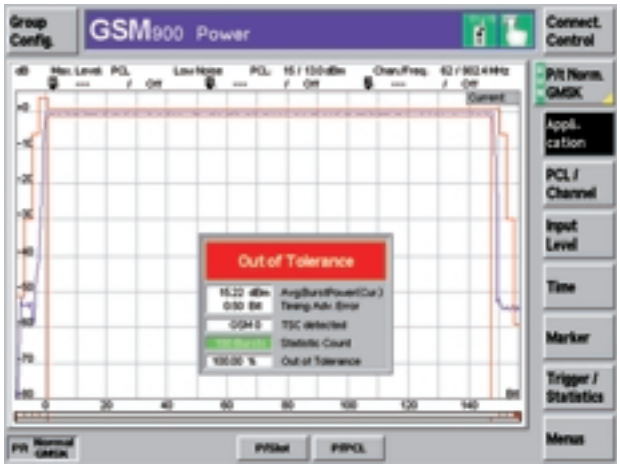


FIG 2 CMU200 automatically positions power versus time template over measured power characteristic and checks compliance with specified values. Tolerance violations are marked by fail indicators and measured values highlighted in red

can read out the complete power characteristic – minimum, maximum and average – or selected parts of it. In the latter case, CMU200 also detects the minimum, maximum and average power values of the selected part. This special feature allows time-optimized recording of especially critical parts of the power characteristic and makes it very easy to trace power ripple of the useful part.

In the production of GSM mobile phones, peak power measurement is sufficient in many cases. It allows, for example, very fast adjustment of a mobile, followed only by a compliance check of the power versus time template. CMU200 comprises power meters of different bandwidths to perform such peak power measurements.

Power versus slot

But this is by no means all this fast new tester has to offer. Another important measurement is power versus slot (FIG 3), which is of interest in particular in testing multislot mobile phones. Here CMU200 measures the average power of eight successive timeslots in realtime. It is not possible to carry out GSM-conformant power measurement and template verification in such a short time, so the tester only evaluates part of the power ramp and from this calculates the average power. The training sequence is not determined in this measurement, nor is the power versus time template checked. Experience has shown, however, that results obtained in this way are usually sufficient in GSM mobile-phone production.

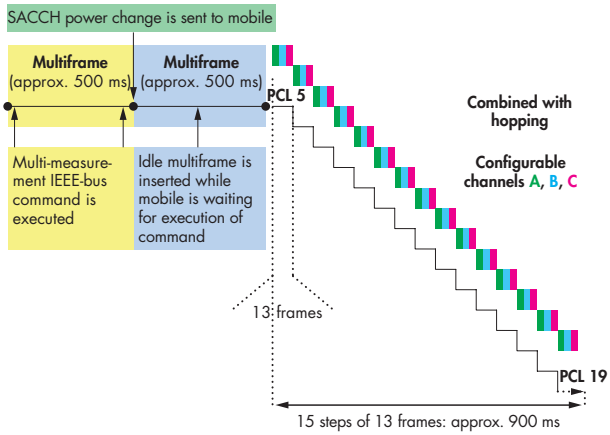
Power versus PCL

When measuring power versus PCL, CMU200 shows unbeatable performance, ie time economies. In no more than two or three seconds, it determines the power of a mobile phone at all power control levels on three different GSM channels. Using conventional methods (channel and power change followed by measurement of power versus time), this would take more than 30 seconds. Hopping in frequency, CMU200 changes power from the highest through to the lowest PCL (FIG 4) and detects the power in realtime by the same method as in measurement of power versus slot. The power measured on three different channels is output in table form for each PCL (FIG 5). In doing this, the tester automatically takes into account the PCLs supported by the mobile.

CMU200 also incorporates sophisticated selftest functions, which are described on the next two pages.

Rudolf Schindlmeier

FIG 4 Hopping in frequency, CMU200 changes power from highest through to lowest power control level (PCL). All PCLs are measured in one go



LITERATUR

[*] Mittermaier, Werner; Schmitz, Walter: Universal Radio Communication Tester CMU200 – On the fast lane into the mobile radio future. News from Rohde&Schwarz (1999) No. 165, pp 4–7

Reader service card 167/09

FIG 3 Power versus slot measurement determines power in all eight timeslots of a frame – an interesting function for multislot mobiles

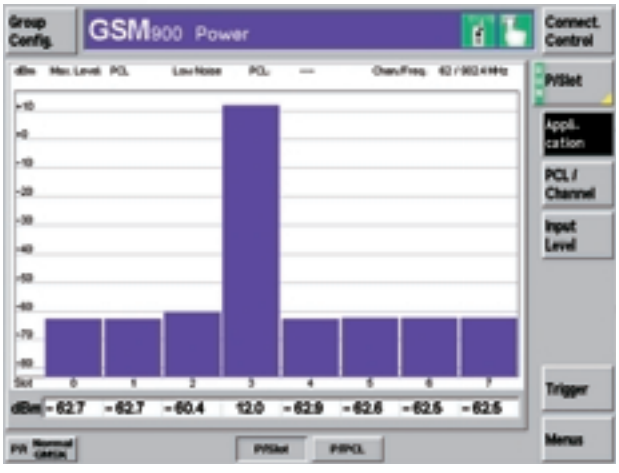
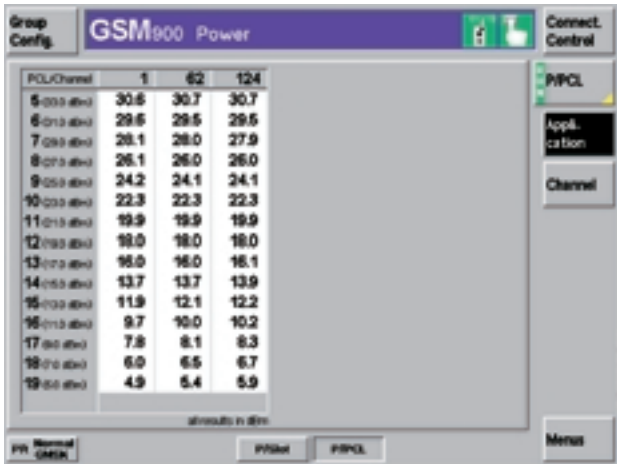


FIG 5 CMU200 measures power through all PCLs of mobile on three different GSM channels in just two or three seconds



Digital Radio Communication Tester CMU200

Selftesting CMU200

Modern measuring instruments are not only expected to be fast and accurate, the user also wants high reliability and above all long calibration intervals. Should any repair ever become necessary, accurate fault diagnosis helps to keep servicing times to a minimum and makes for increased instrument availability. Universal Radio Communication Tester CMU200 consequently integrates elaborate selftest facilities allowing fast checking of its basic functions.

Extensive selftests as early as production

CMU200 selftest functions are extensively used during its production. The first selftest is carried out after assembly and interconnection of all the unit's modules. In this way possible faults are detected before the instrument is subjected to a five-day burn-in at temperatures varying between 5 °C and 45 °C. During this time a continuous selftest is run in CMU200. Any faults detected are logged in a file. This reveals both non-recurrent faults and those appearing at certain temperatures. Such a procedure detects faults at the earliest possible stage, so that only good units are subjected to further checks and final testing, thus considerably reducing measurement time and costs.

An extra benefit for the user

CMU200 selftest functions offer the user a convenient way of checking basic instrument functions and thus reliably excluding faults. This is important, for example, in the production of mobiles, where the user needs to be sure that his measuring equipment is operating properly.

At Rohde&Schwarz service centers, the selftest functions are used in incoming inspection of instruments returned. The tests supply detailed information about faulty modules, which enables fast repair, ie replacement. Customers benefit from short repair times because their instruments are soon available for use again.

Menu-guided test runs

The selftest menu is called with the MENU SELECT key on the CMU200 front panel (examples are shown in FIGs 1 to 3). Then you select the BASE/Maintenance function group with the spinwheel and confirm with ENTER. The selftest menu (Maintenance/Dyn. Test) opens and you can choose the particular test with the spinwheel after pressing the SELECT softkey.

Detailed report

The selected selftest is started by pressing TEST and confirming with ON. You can cancel a selftest at any time by pressing OFF. At the end of the selftest, a report is displayed in which you can scroll up and down with the spinwheel after pressing the REPORT softkey. Any fault that may have occurred is thus easily located and remedied fast by replacing the module concerned. Normally, of course, no faults will be detected in the selftest, showing that your CMU200 is working perfectly – this is ensured alone by early diagnosis in production.

Roland Mahr

To find out just how fast CMU200 can measure the power of GSM mobiles, look at pages 24–25

Reader service card 167/10

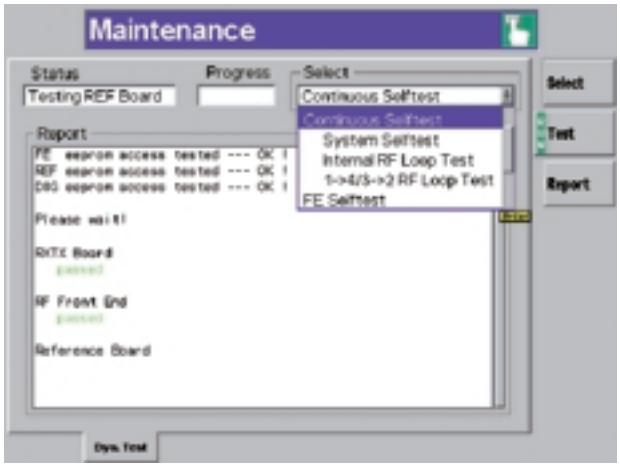


FIG 1
Example: selection of selftest function

CMU200 selftest

Module tests

(Any tolerance violations are marked in red)

FE Selftest RF FRONTEND. Output of defined supply voltages and logic switching voltages, limit values and current measured value for each voltage.

REF Selftest REFERENCE BOARD. Output of defined tuning and amplitude voltages of PLLs at different frequencies, output of supply voltages and module temperature, limit values and current measured value for each voltage.

DIG Selftest DIGITAL BOARD. Output of defined supply voltages and frequency-proportional voltages of clock signals, limit values and current measured value for each voltage.

RXTX1 Selftest RXTX BOARD1. Output of defined supply voltages, tuning and amplitude voltages of PLLs of oscillators, tuning voltages of harmonic filters, module temperatures, limit values and current measured value for each voltage.

Combined tests

System Selftest All modules are tested once in consecutive order. Test results (PASSED or FAILED) and the fault in question are indicated.

Internal RF LOOP Selftest The frequencies and levels of the RF path are tested once at connectors RF1 and RF2 using the TX generator and the selective RX power meter with internal RF coupling. All frequencies and levels are output and any limit violations marked in red.

Continuous Selftest Continuous test of system selftest and internal RF LOOP selftest. This test was developed specially for the burn-in cycle and is also very helpful in finding faults occurring rarely or sporadically.

Test results (PASSED or FAILED) and the fault in question are indicated. Any faults found are logged in a specially created file (CST.ERR) together with the date and time.

1–>4/3–>2 RF LOOP The frequencies and levels of the RF path are tested once at connectors RF1–>RF4IN and RF3OUT–>RF2 via special external N coax cables (included in CMU Service Kit CMU-Z3) using the TX generator and the selective RX power meter.

FIG 2 Example: REF selftest

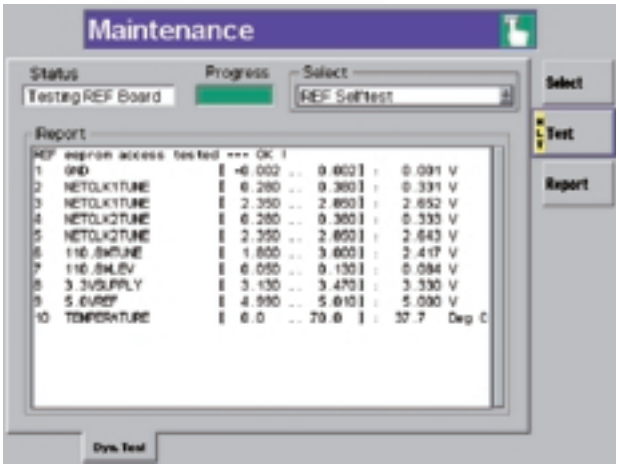
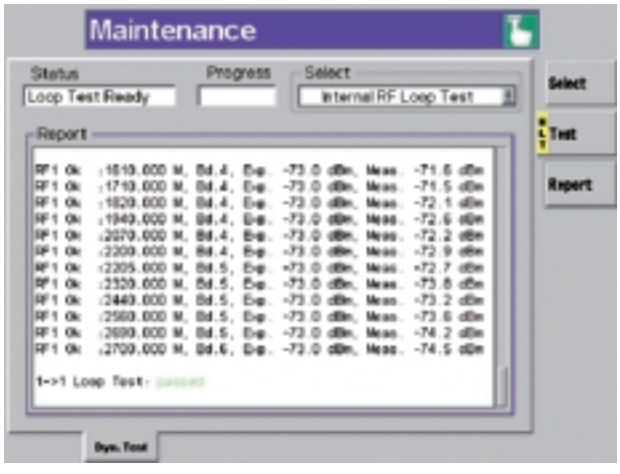


FIG 3 Example: internal RF loop test



Software for mobile-radio conformance test systems

Convenient parameter sets instead of time-consuming, low-level programming

Conformance test systems from Rohde&Schwarz for mobile radio support all major standards such as GSM900/1800/1900, DECT, TETRA, W-CDMA and Bluetooth. Hundreds of test cases based on the particular regulations have already been implemented. But the low-level interface used for programming is much too time-consuming for users wanting to modify test cases or design their own. To allow users to concentrate on their tasks, Rohde&Schwarz developed test types described by parameter sets that very much simplify complex procedures.

Why complicated …

Conventional development of test cases involves exact coding of the test regulation, creating a program that is no longer changed once validated. Modern high-level languages (eg C), which are very flexible and thus suitable for all cases, are used for programming. But for users who want to modify supplied tests or create their own, these low-level interfaces are relatively complicated and time-consuming. So there is big demand for further functionalities beyond validated test cases, because many users want to:

- vary test routines without any problems,
- perform qualitative tests in an early development phase of the DUTs,
- analyze test results with powerful tools,
- make optimum use of expensive hardware.

Such requirements can only be met by high-performance test systems that provide the measurement competence in optimum and transparent form and flexibly cover the range between one-button testers and very versatile test systems.

… if there is a simpler way

The Rohde&Schwarz solution to these requirements takes the form of abstract, complete test types matched to mobile-radio needs. The user can vary these test types in any way imaginable thanks to their transparent parameters. One parameter set describes a test case that can be completely executed (FIG 1).

The following test types are currently available depending on the test-system family: transceiver, transmitter, receiver, complex time and special DUT reporting measurements. They are defined after abstraction of all test cases to be implemented (possibly for all mobile-radio standards) with the aim of obtaining an optimum between the total number of test types and the number of parameters to be configured (and displayed). Such a test type is characterized by:

- the mobile-radio network to be configured (eg characteristics of the useful channel),
- test conditions (regarding DUT/environment),
- its dynamic behaviour (special test sequence),
- the measurement technique (how the measurement is conducted),
- processing and display of results.

Example: transmitter measurements

The test type "transmitter measurements" determines the transmitter quality of the DUT. It defines the network and environmental conditions. Especially interesting is the response of the DUT as a function of:

- transmit level and frequency,
- receive level,
- interfering signals,
- supply voltage,
- temperature and vibration,
- position during antenna measurements.

By combining different parameters, special features of the DUT can be tested or a series of measurements carried out to find associations that may reveal design problems. The convenient graphical user interface supports the user in the creation of test cases (FIG 2).

The transmitter measurements test type given as an example (FIG 3) determines:

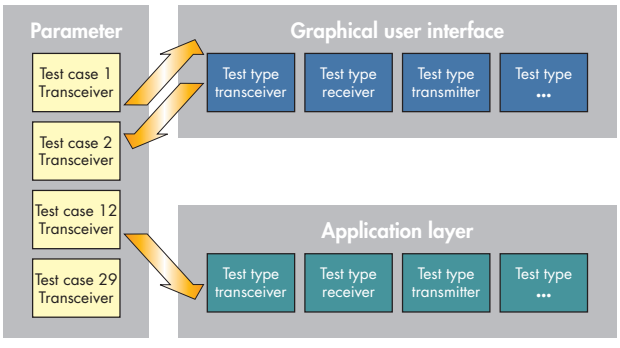


FIG 1
Parameter set describes complete executable test case

- phase and frequency errors,
- power as a function of time (for mobile-radio standards with TDMA),
- modulation parameters (future).

For result analysis, it displays the following (FIG 4):

- phase and frequency error as maximum and average value,
- average power of transmit signal,
- burst form.

Users can freely select the above-mentioned parameters. They can use conformance tests already supplied by Rohde&Schwarz (normally sampling tests and thus a small subset of the complete test range) and modify a copy of them. Creating new test cases within the given test types is also very simple. Preset defaults help and support the user in the first steps.

This powerful open interface places high demands on the system software, since it must be able to offer functions (measurement, stimulus and compensation methods) to handle this variety of functionalities and implement them correctly for the complex test system. This is a real challenge but Rohde&Schwarz is backed up by many years of experience in all fields of mobile-radio measurements.

Application software is supplied together with the test cases and combines high-grade measuring instruments for a variety of uses. Users can fully concentrate on the measurement task itself and the optimization of DUTs – from development through to conformance testing.

Detlef Wiese

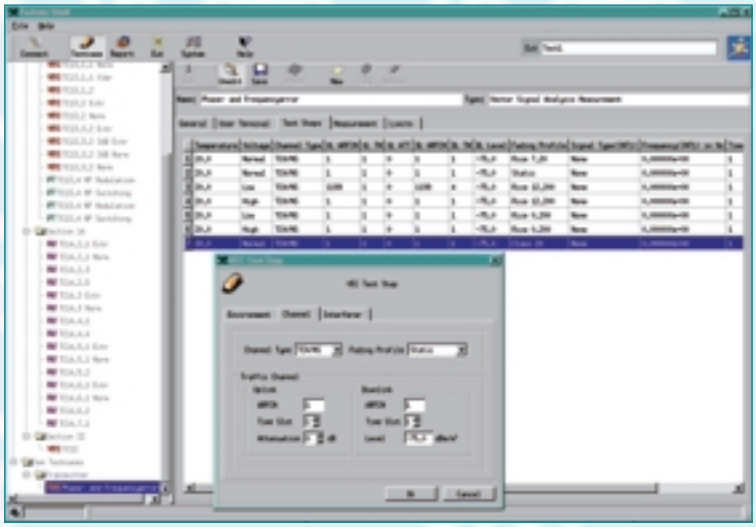


FIG 2
Convenient graphical user interface: list of all test steps to be performed with editor in foreground

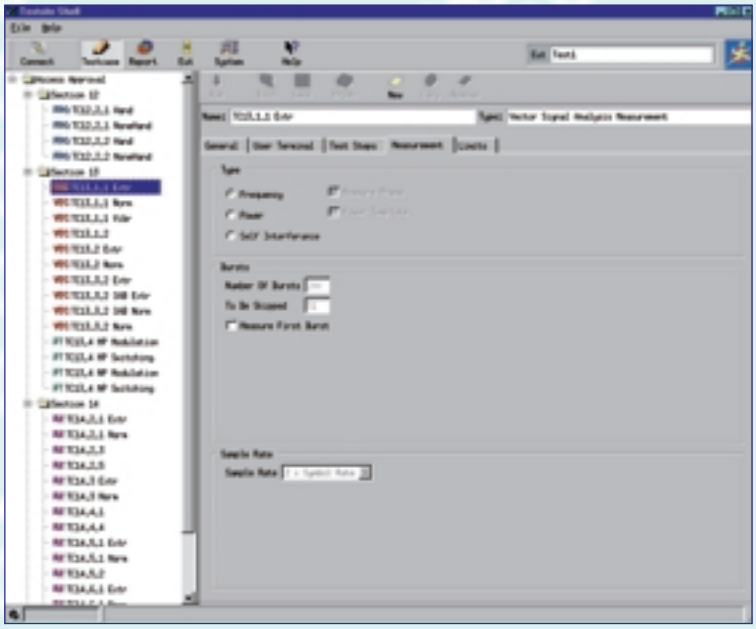


FIG 3
Example of RF test type for transmitter measurement

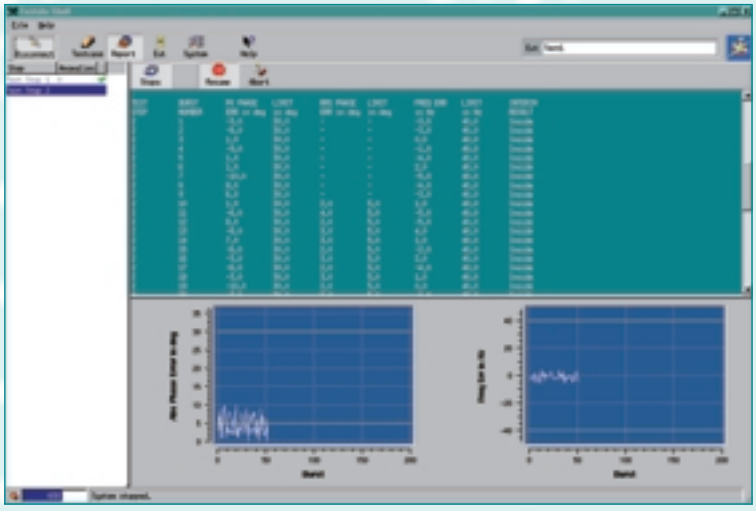


FIG 4
Overview of test results for successful analysis

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TV Test Transmitter SFQ

Bit-error-rate measurement on set-top boxes

Bit error rate (BER) can be measured at different points on set-top boxes for digital television. A BER instrument must be able to accept and evaluate data in serial or parallel form or as the payload of an MPEG2 transport stream. This is no problem with TV Test Transmitter SFQ (FIG 1) and its BER measurement option: while the necessary signals are generated at the right places in the signal flow, BER is measured at the same time. Together with an optional noise generator and fading simulator, SFQ is also able to simulate the interference occurring in real-life transmissions in a reproducible way.

Photo 42592/2

FIG 1 TV Test Transmitter SFQ produces highly precise, standard test signals that can be varied and generated with predefined errors to determine the performance of products at their operating limits

No need for special transmission testers

Reproducible measurement of BER under defined conditions is an informative and important measurement when you want to assess the quality of digital transmission methods and the components involved. TV Test Transmitter SFQ [*] features comprehensive BER capability: it evaluates data from receivers, set-top boxes or demodulator chips in serial form as data and clock, or in parallel form as a PRBS sequence, or as the payload of an MPEG2 transport stream. No extra digital transmission tester is necessary. Signal generation and evaluation can be fully remote-controlled.

Quasi errorfree

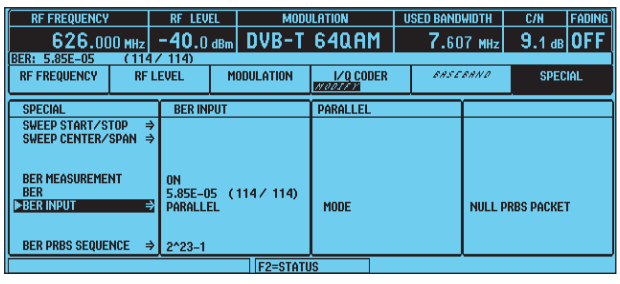
In digital television to DVB specifications, measurement of the quasi errorfree (QEF) point at a defined receive level has proven to be especially important. QEF means a BER of 2×10^{-4} before the Reed-Solomon decoder. White Gaussian noise is added to the useful signal and BER is measured before the Reed-Solomon decoder at different noise levels (C/N settings). The deviation of the measured from the theoretical curve is then determined at the QEF point to obtain the equivalent noise degradation (END), which is an important receiver parameter.

What was previously only possible with a special configuration is now done by SFQ quite simply: BER measured direct in an MPEG2 transport stream. For this purpose SFQ provides a NULL PRBS PACKET signal before the FEC (forward error correction) in the coder in which a pseudo-random bit sequence (PRBS) is packeted as the payload in an MPEG2 transport stream.

Example: set-top box

The set-top box demodulates and decodes the RF signal generated by

FIG 3
Permanent display of measured BER



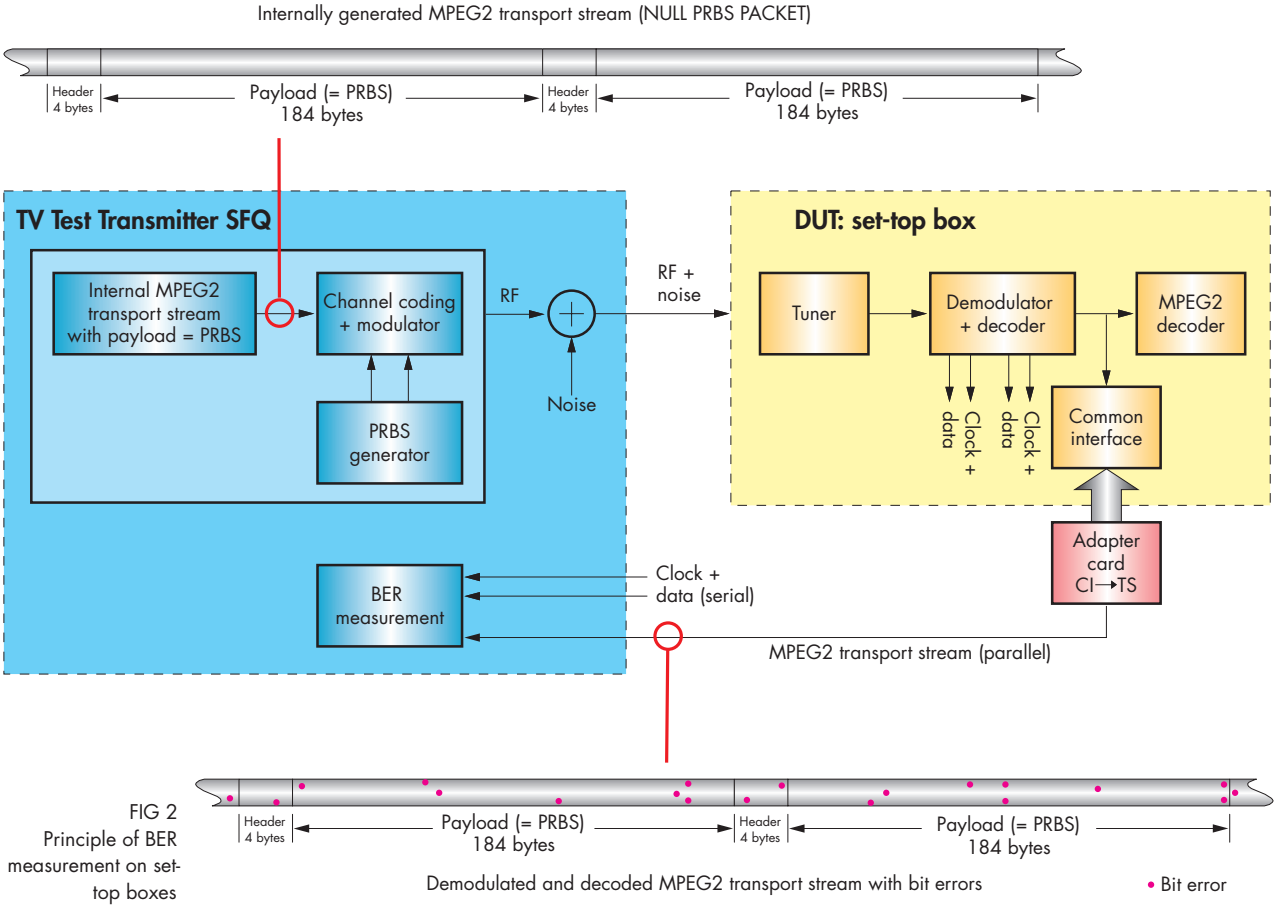


FIG 2
Principle of BER measurement on set-top boxes

SFQ (FIG 2). The received MPEG2 transport stream is available at its common interface. An adapter card is available as a recommended extra for this standard interface so that the MPEG2 transport stream can be output, converted in level and the signal then applied to the parallel input (TS PARALLEL AUX) of SFQ. For BER measurement, SFQ eliminates the header from the MPEG2 transport stream and evaluates bit errors in the payload.

The BER measurement hardware is accommodated in the DVB-T module of SFQ. The BER measurement software option is independent of this module, however, and works with transport streams of any modulation format. The bit error rate currently being measured is shown in a line of the display (FIG 3). The user can thus vary the C/N ratio and see the measured bit error rate at the same time.

Franz-Josef Zimmermann

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[*] Kretschmer, Erhard; Zimmermann, Franz-Josef: Digital test signals for the television future. News from Rohde&Schwarz (1997) No. 153, pp 14–16

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DVB-T Test Receiver EFA-T

Innovative measurement functions for terrestrial digital TV

DVB-T Test Receiver EFA-T (FIG 1) features a multitude of measurement functions for the complex characteristics of OFDM signals, thus helping to locate transmission channel problems. Some of these innovative methods are already described in detail in [1]. A number of new features now allow classification and analysis of DVB-T signal quality.

FIG 1 DVB-T Test Receiver EFA-T – now with enhanced functionality for terrestrial digital TV

OFDM modulation

DVB-T employs OFDM (orthogonal frequency-division multiplex) modulation in accordance with standard ETS300744 [2]. Depending on the transmission mode, 1705 or 6817 mutually orthogonal carriers are sent simultaneously in a transmission channel (6 MHz, 7 MHz or 8 MHz bandwidth). Each single carrier is 4QAM, 16QAM or 64QAM modulated. At exactly defined intervals, individual carriers, called pilots, are emitted unmodulated with 0° or 180° phase angle, depending on the carrier number, and at power boosted by a factor of 16/9. These pilots allow direct assessment of the quality of the transmission channel (linear distortion).

Linear distortion

EFA-T calculates the theoretical, expected phase values of the pilots. At the same time, the actual phase values and amplitudes of the received pilots are determined. The quotients of the theoretical to actual values are a measure of linear distortion in a transmission channel at a specific frequency. All values of the pilots together give the channel transmission function. The special point about this method is that all calculations are complex (ie with real and imaginary components), yielding complex results. So EFA-T outputs not only the amplitude response of a transmission channel but also its phase response. The frequency axis is freely selectable, and the amplitude/phase axis automatically adjusts to the range of values obtained (FIG 2). Group delay can now be determined by means of a simple conversion function of EFA-T.

Polar plot in complex plane

The conditions prevailing in a transmission channel can be assessed at a glance by representing the complex values of pilots in the complex plane. While this representation is not referenced to frequency, it offers straightforward phase and amplitude information in a single diagram (FIG 3).

Channel impulse response

The channel transmission function and the channel impulse response are linked to each other via the Fourier transform. EFA-T performs an inverse Fourier transform (IFFT) to determine the channel impulse response, whose main signal (at t = 0) and echoes are graphically displayed (FIG 4). This measurement is performed with very high precision, so the zoom function of the receiver is particularly valuable in this case, allowing highly detailed presentation of results.

This measurement is used on the one hand to show the channel impulse response, caused for example by reflections from buildings, mountains and other obstacles. But it also serves for monitoring synchronization in single-frequency networks (SFNs). The SFN technique allows network operators

to operate all transmitters at the same frequency for broadcasting a DVB-T signal from several sites. This requires highly precise time synchronization of the different transmitters however. To verify synchronization, EFA-T can present channel impulse response as a function of both time and distance (conversion to kilometers or miles).

Amplitude distribution of nonlinear distortions

DVB-T signals displayed on an oscilloscope cannot be distinguished from Gaussian noise. These signals are known for their very high crest factor. Monitoring the amplitude distribution of these signals is particularly important for the transmitter operator for two reasons, which should be carefully weighed up against each other. On the one hand, (nonlinear) limitation of the transmitted signals increases spurious emissions because of intermodulation between the OFDM carriers, so adjacent TV channels may be affected. For this reason, a high crest factor of the transmitted signal is aimed at. On the other hand, too high a crest factor in conjunction with effective use of the available transmitter power can considerably reduce the lifetime of transmitter output stages. For this reason, precisely specified limitation is chosen, ie reduced crest factor.

FIG 5 illustrates the amplitude distribution of a DVB-T transmitter, showing the relative frequency of the amplitudes in a 1 dB amplitude window. The rms value of the transmitted signal is used as the basis to which all other values are referred. Noteworthy is the very high inherent crest factor of more than 15 dB of EFA-T, which offers a comfortable margin for this type of measurement.

Since the theoretical amplitude distribution characteristic can be exactly calculated with DVB-T, it is included in the diagram (dotted lines above columns).

FIG 2 Linear distortion in transmission channel (here due to strong fading), top: amplitude frequency response, bottom: phase frequency response; frequency axis marked with carrier number k of OFDM signal

FIG 3 Linear distortion as polar plot; real component represented along long diagonal, imaginary component along short diagonal

FIG 4 Channel impulse response; useful signal at t = 0; post-echo with –10 dB at t = 100 µs; pre-echo with –15 dB at t = –50 µs. Signal is generated by DVB-T Test Transmitter SFQ fitted with fading simulator option

FIG 5 Amplitude distribution of DVB-T transmitter. Theoretical (ideal) distribution is shown by dotted lines. Limiting effect of power amplifier is clearly discernible (red arrows)

You can see at a glance if and how the signal is limited in amplitude.

Summary: reference class

EFA-T offers further functions not described here, such as spectrum analysis (FFT) and history. So it is no wonder that the test receiver has rapidly become a reference in the class of realtime instruments. All functions and graphical displays are of course available also via the remote-control interface. Great ease of operation and extremely fast measurement cycles round off the comprehensive and innovative functionality of EFA-T.

Christoph Balz

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[1] Balz, Christoph; Leutiger, Mathias: DVB-T Test Receiver EFA-T – The test reference: now for terrestrial digital TV too. News from Rohde&Schwarz (1999) No. 164, pp 4–7

[2] Digital systems for television, sound and data services. Framing structure, channel coding and modulation for digital terrestrial television. ETS300744, European Telecommunications Standards Institute, ETSI

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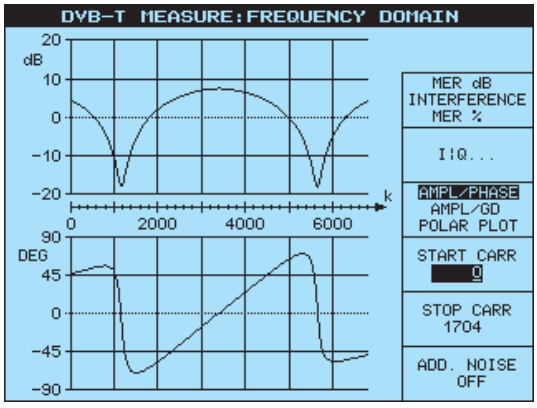

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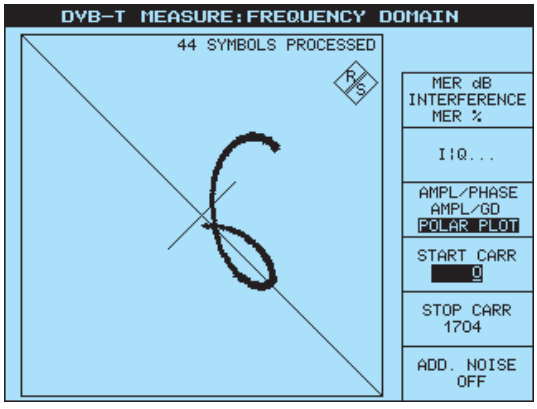

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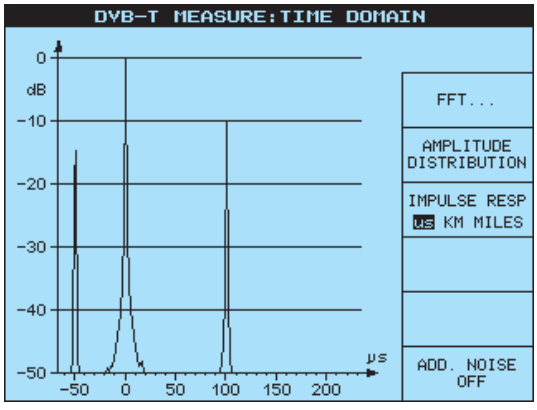

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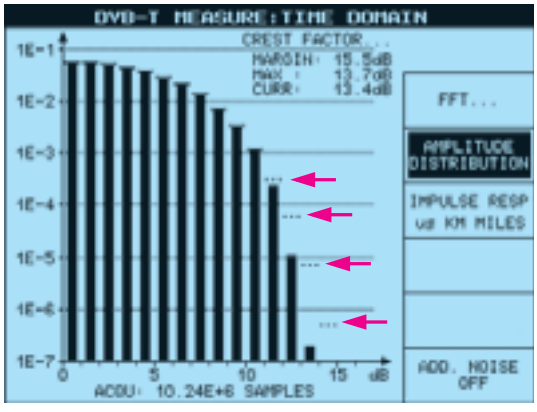

64 kbit modem for multifunctional mobile radios

Software enhancement of functions for future requirements

The newly developed radio equipment families from Rohde&Schwarz, eg Series 4400 [1], are set up with hardware and software modules on a uniform platform. This principle ensures across-the-board use and radio-system standardization with all the accompanying potential for low cost of ownership. The universal platform can be adapted to future requirements by software and hardware extensions to the basic unit, eg with the 64 kbit high-performance modem for radio data transmission with high bandwidth efficiency.

Modem implemented by software

The new 64 kbit modem is entirely implemented as software on one of the digital signal processors of the radio. This allows future extensions or matching to special applications through a simple software upgrade. The new method makes considerably better use of scarce frequency bands than conventional solutions. Encryption of communication is just as straightforward as changing to other communications standards, eg from ISDN through TCP/IP LAN links to mobile-radio networks.

The new modem has vast potential: stills, video sequences and fast database queries are now also possible during mobile use. That makes it a must for the military as well as government authorities and organizations with security missions such as police forces, fire fighters and border patrols. In addition, it is ideal for mobile data-acquisition and information systems, portable control units as well as remote access applications. The box below illustrates how the modem meets the special requirements encountered in mobile use.

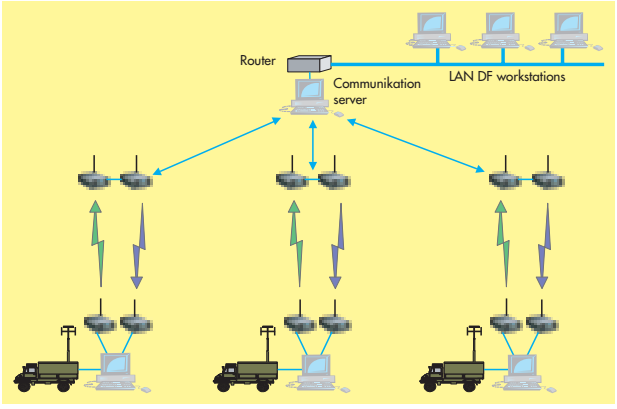

FIG 1
Radio data by software modem shows how: flexible DF networks with data rates of 64 kbit/s for bearing and control data

Mobile radio data must meet special requirements

In contrast to fixed transmit and receive equipment, radio data units for mobile use face additional requirements. Fading is a general problem in mobile radio. It can be time- and frequency-selective; multipath fading in particular causes problems when transmitting data via mobile-radio links.

The new data modem offers significant advantages by using OFDM (orthogonal frequency-diversity modulation). Here the data stream is split into parallel bit streams and spread over several carriers in the baseband. In addition to the modulated carriers, pilot tones (sinusoidal) are integrated in the spectrum for channel estimation and synchronization.

To enable the baseband signal with up to 24 kHz bandwidth to be transmitted in standardized frequency grids (eg 25 kHz), linear conversion to the channel frequency is performed by modulation similar to SSB. Since the data rate is split up among a large number of carriers, symbol duration can be selected large enough to minimize fading effects and intersymbol interference.

To make communication resistant to interference, the various QAM (quadrature amplitude modulation, $q \leq 64$) signal states are trellis-coded. Trellis-coded modulation (TCM) is a combination of encoding and modulation technique that yields an improvement (coding gain and shaping gain) of almost 6 dB compared to equivalent QAM without trellis coding.

Radio DF networks are a good example of remote-controlled applications. A central communication server that processes the data is connected to detached direction finders via radio modems (FIG 1) that can transmit remote-control information plus IF spectra or audio signals thanks to their high data rate.

Use of the radio modem in conjunction with broadband data transmission media such as satellites or DAB transmitters opens up completely new prospects. DAB, originally developed for digital radio, is basically suitable for transmitting data of any kind (FIG 2). Interactive multimedia applications using DAB have asymmetrical throughput. So a query for data on the Internet can use the narrowband path, whereas the usually vast amount of data is returned through the broadband medium. This guarantees the extremely efficient utilization of the available resources.

Ulrich Otto

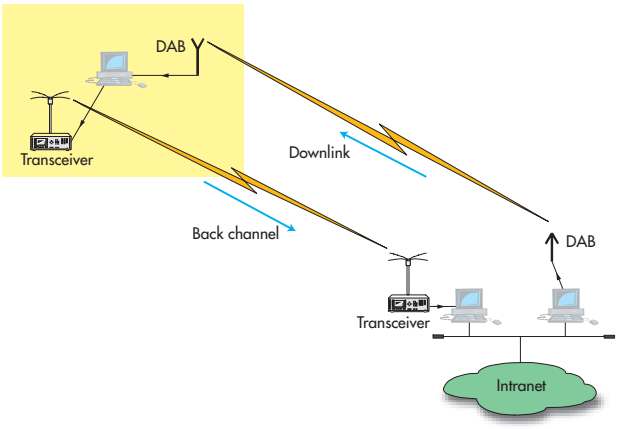

FIG 2
The Rohde&Schwarz product range offers all components for point-to-point communication from a single source: various radio equipment families, DAB and DVB transmitters and IT product PostMan [2]

Reader service card 167/14

REFERENCES
[1] Fraebel, Michael; Vielhuber, Robert: Software-based radios for professional use. News from Rohde&Schwarz (2000) No. 166, pp 8–9
[2] Kneidel, Thomas: When the PostMan rings on Internet. News from Rohde&Schwarz (1997) No. 153, pp 28–29

Workshop on CD-ROM: Miniport Receiver EB 200

A new English/German training CD-ROM* from Rohde&Schwarz presents an extensive and versatile, virtual workshop for familiarizing with operation and functionality of Miniport Receiver EB 200.

Following an interesting lead-in animation – you see EB 200 emerge step by step from the drawing board to become the finished receiver – the main menu offers you a wide choice of subjects. First time round though, you should work from the top down. The *Tutorial* tells you all about startup, reception, direct functions and frequency plus memory scan. Here you can learn how to handle the device just like in conventional training. Under the next menu item *Operation*, you can try out what you know – virtually – on the receiver, which is simulated with all its functions. *Test* finds out what you know about EB 200 and what you can do with it. The results tell you how good you are and what you may need to repeat to get better. Click on *Documentation* and you can read the data sheet, specifications and manual, a presentation of all information relating to EB 200 and a profile of Rohde&Schwarz.

This virtual workshop offers both users of Miniport Receiver EB 200 and those interested in it a simple way of finding out how to operate the device or make even better use of it.

Stefan Böttinger

* Obtainable free of charge from your Rohde&Schwarz representative

Vector Network Analyzer ZVM (10 MHz to 20 GHz) has the top-class features of the ZVx models and extends their frequency range to 20 GHz; options and extras as for the other ZVx models.

Data sheet PD 757.5543.21 enter 167/15

Baseband Fading Simulator ABFS generates signals for universal mobile-radio measurement applications (I/Q); 2 fading channels, 12 paths (optional: 4 or 24); noise generators (optional) for output and second output.

Data sheet PD 757.5466.21 enter 167/16

Modulation Generator AMIQ, Simulation Software WinIQSIM The data sheet contains specifications relating to W-CDMA 3 GPP (FDD) and describes the optional digital I/Q output as well as the AMIQ03 and AMIQ04 models (the latter: 16 Msample).

Data sheet PD 757.5314.21 enter 167/17

Signal Analyzer FSIQ 20 Hz to 40 GHz for the latest FSIQ model; this model and the options 1 dB attenuator, Ethernet interface with RJ-45 connector and exchangeable hard disk (or two) have been taken into account in the revised data sheet.

Data sheet PD 757.4160.22 enter 167/18

Signal Generator SML01 (9 kHz to 1.1 GHz, resolution 0.1 Hz) offers all the properties of a universal signal source: setting time <10 ms, level –140 dBm to +13 dBm (+19 dBm overrange, error typ. <+0.5 dB), SSB phase noise typ. –128 dBc(Hz), AM, FM/φM, pulse; digital sweeps, electronic attenuator; options: pulse modulator (with generator) and reference oscillator.

Data sheet PD 757.5550.21 enter 167/19

DECT Signalling Test Unit PTW 15 can be used for mobile and stationary coverage measurements (installation, test), network control, software and hardware development as well as audio tests.

Data sheet PD 757.5020.21 enter 167/20

Compact Coverage Measurement System TS55-C3 Flexible field-strength measurement system for stationary and mobile applications (software ROMES) in public GSM networks, GSM-R (railway) and E-GSM (extended); optional GPS navigation and signalling measurement.

Data sheet PD 757.4247.21 enter 167/21

Emission Test System TS9976 (0.15 MHz to 18 GHz) for standard-conformant interference and spurious measurements on wireless communication equipment in EMC and conformance testing; for use up to 40 GHz.

Data sheet PD 757.5495.21 enter 167/22

EMS Test System TS9980 The 6-page data sheet provides more information, specifications and illustrations.

Data sheet PD 757.1525.22 enter 167/23

Vector Signal Generator SMIQ (300 kHz to 6.4 GHz) comes with new options; BER measurement and digital standard W-CDMA acc. to 3GPP (FDD) have been added.

Data sheet
PD 757.2438.24 +
PD 757.4582.22 enter 167/24

Antenna Impedance Converter EZ-12 (120 kHz to 30 (120) MHz) has been redesigned and is calibrated to the future CISPR25 standard; remote-controllable AM/FM switchover.

Data sheet PD 757.5289.21 enter 167/25

Precision Halfwave Dipoles HZ-12, HZ-13 (30 MHz to 1000 MHz) The specifications of the antennas have been extended.

Data sheet PD 757.0387.22 enter 167/26

Web over DVB™ is an interactive Internet service for sending, controlling, managing and accessing Internet data; transmission in the MPEG2 data stream (IP format), call-up on PC via standard browser.

Data sheet PD 757.5237.21 enter 167/27

DTV IP Inserters DIP001 and DIP010 enable the insertion of Internet/Intranet data for standard-independent transmission in the MPEG2 data stream; DIP001 requires an external PC, DIP010 has an incorporated PC.

Data sheet PD 757.5637.21 enter 167/28

MPEG2 Realtime Monitor DVRM can handle 26 DVB or (as an option) 19 ATSC measurements at the same time; remote control only, messages via LEDs, relay contacts and interface; result documentation, for example, available as an option.

Data sheet PD 757.5566.21 enter 167/29

DAB Multiplexer DM001 The STI interface and other changes are described in the new edition of the data sheet.

Data sheet PD 757.2580.23 enter 167/30

TV Test Transmitter SFQ (0.3 MHz to 3.3 GHz) is provided with a new option for BER measurements for the DVB-T test transmitter models.

Data sheet PD 757.3334.26 enter 167/31

Digital Direction Finder DDF190 (0.5 MHz to 3 GHz) The new ADD119 antenna (0.5 MHz to 30 MHz) plus firmware version ≥2 enables direction finding in the HF range (error 2°); all the antennas can be operated simultaneously.

Data sheet PD 757.1460.24 enter 167/32

Microwave Directional Antenna AC008 (1 GHz to 26.5 GHz) The extended frequency range of the HL025 feed made a new edition of this data sheet necessary.

Data sheet PD 756.5633.23 enter 167/33

Series200 Single-Channel Communication System (118 MHz to 144 MHz, 225 MHz to 400 MHz) Many specifications were outdated due to ongoing technical development.

Data sheet PD 757.0241.25 enter 167/34

D-Channel Filter ISDNwall A model with S_0 interface for connecting several instruments is offered by **Rohde&Schwarz SIT GmbH**.

Data sheet PD 757.3770.23 enter 167/35

Rohde&Schwarz electronic workshops "Your way to independence in maintenance and repair" is presented by **R&S Cologne Plant** in this brochure: customized stationary, semi-mobile and mobile test shops especially for applications without standard solutions.

Info PD 757.5508.21 enter 167/36

New application notes

Bit error ratio BER in DVB as a function of S/N

Appl. 7BM03_1E enter 167/37

Program for frequency response measurements FreRes

Appl. 1MA09_4E enter 167/38

Calibrating the CMD output level for BER

Appl. 1MA24_0E enter 167/39

W-CDMA signal generator solutions by Rohde&Schwarz

Appl. 1GP39_0E enter 167/40

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Photos: author

Top: the "star", the new ATSC Test Receiver EFA;
left: Michael Vondermassen, Head of the Broadcasting Division, receiving the Star Award

Star Award for ATSC Test Receiver EFA

***TV Technology*, the world's major and most read magazine focusing on the broadcast industry, presented its Star Award in the category for measurement technology to the new ATSC Test Receiver EFA from Rohde&Schwarz at the NAB 2000 show (page 38).**

The test receiver won the prize for its innovative concept and modern technology. EFA can simultaneously receive, analyze and demodulate 8 VSB-modulated picture data (the transmission standard adopted for digital television in North America). The Star Award is presented just once a year to the most innovative products exhibited at the NAB show in Las Vegas. Articles in this issue on ATSC-EFA (page 11) and EFA-T (page 32).

Stefan Böttinger

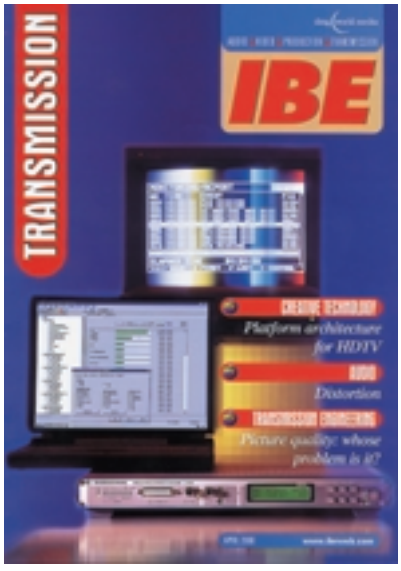
Into the Bluetooth era – with Rohde&Schwarz

***MOBILE europe*, a European journal for wireless communication, decorated the cover of its March issue with the Bluetooth image motif from Rohde&Schwarz. Inside the magazine reported on the new Bluetooth test system:**

"In TS 8960 Rohde&Schwarz is launching the world's first test system for Bluetooth equipment and components. This system, right in tune with the current Bluetooth core specifications 1.0 and RF test specifications 0.7, can be used for both conformity tests and measurements in the development phase or in quality assurance. All necessary Bluetooth test cases are ready set, but their parameters can be modified and adapted as wished. …TS 8960 is available straight away, making it the first and only Bluetooth test system obtainable on the world market."

Instrumentation for digital TV

The front spread of the April edition of the European broadcasting magazine *IBE* was taken up by measurement solutions for DTV from Rohde&Schwarz. An article inside the journal described the use of this instrumentation in terrestrial digital TV networks:



"… Digital broadcasting of TV signals by MPEG 2 is on the increase. In addition to transmission media like satellite and cable, terrestrial broadcasting networks are in the process of being set up in many countries or are planned for the near future. Rohde&Schwarz offers numerous solutions for these requirements."

NAB – Rohde&Schwarz with allround assortment

At the world's biggest show for broadcast technology, the NAB, which was staged in Las Vegas from 10 through 14 April, Rohde&Schwarz presented its entire range of transmission and measurement equipment. The effort was worth it: the large number of visitors to the stand and numerous contacts proved how much interest there is in the company and what it has to offer. The focus at the show was on new generations of test equipment for digital technologies and on medium-power transmitters. The compact, air-cooled transmitters of the NH/NV7000 family with LDMOS transistors and integrated analog or OFDM (8VSB) coder are designed for digital television from 100 W to 800 W and analog television in the range 250 W to 2 kW. They allow precise and efficient coverage even of small areas. The exciter is modular, meaning that the transmitters can be reconfigured from analog to digital TV (DVB-T, ATSC) by simply replacing the encoder module.

Among the highlights was the ATSC Test Receiver EFA, the world's first realtime TV test receiver for digital TV (see pages 11 and 37). With the new MPEG2 Recorder/Generator DVRG, transport streams to ATSC and DVB can be recorded, decoded, newly multiplexed and generated. The new TV Test Transmitter SFQ produces RF signals for ATSC, the North-American terrestrial digital TV standard.

In addition to its own showing, Rohde&Schwarz was also represented on the stand of its US partner Acrodyne. The teaming up of the two transmitter producers has been well received in the USA and already resulted in initial joint projects and contracts.

In the words of a seasoned sales engineer who really knows the show: "The best NAB ever!"

Stefan Böttinger

German Navy successfully trials PostMan

As part of a series of shortwave trials called "PC-Net", the German Navy used the PostMan communication software from Rohde&Schwarz for the first time early in 2000. With the aid of PostMan it was possible to set up a wireless TCP/IP link between a submarine and a land-based LAN on shortwave. The radio link enabled an exchange of e-mails using COTS (commercial off-the-shelf) e-mail programs. PostMan will also implement other TCP/IP applications by radio, as was demonstrated by an intranet access with standard browsers.

Thomas Kneidel

Competent on-the-spot service in Asia

In the capital-goods sector in particular, customer satisfaction depends very much on being able to offer fast and first-class service. For this reason Rohde&Schwarz is implementing an expanded, multistage concept with its Asian representatives in the 1999/2000 business year that will upgrade the service support centers in the various countries to meet the bigger demands of the market for calibration, repair and spare-part logistics. Categorization will also provide customers with a clearer profile of the individual support centers.

This means auditing Rohde&Schwarz's Asian support centers and organizing them into performance categories according to training, equipment inventory, service processes and profiles. The categories range from basic support (First Line Bronze) through standard service (First Line Silver) to above-average service and support (First Line Gold). Appropriate upgrading will be undertaken to achieve the right performance category at the right place.

The support for large regions has been decentralized and assigned to an area support center (Second Line Service), which handles direct most of the service previously managed from Munich, thus presenting greater on-the-spot presence. The demands made on such an area support center are very high, in both technical and logistic terms. The Rohde&Schwarz Support Center Asia (SCA) sited in Singapore satisfied all the requirements and was recently named the first official area support center (photo). Others are currently being set up in both Asia and Latin America.

Hans-Joachim Mann

▽

The SCA team of the area support center for Southeast Asia

Photo: author

Spectrum Monitoring System ARGUS-IT on the roof of the world in Bhutan

A Spectrum Monitoring System ARGUS-IT from Rohde&Schwarz was recently commissioned in Bhutan, a country in the eastern Himalayas. It was contracted by the Ministry of Communication and consists of a station in the capital Thimphu plus an all-terrain test vehicle (photo). In Bhutan the focus is on coordinating the many medium-wave transmitters in the country itself and in the neighbouring countries China and India to prevent mutual interference. At the official handover, Bhutan's Deputy Minister of Communication, Dasho Leki Dorji, was very satisfied with the performance of ARGUS-IT.

Jörg Pfitzner

(Software for ARGUS-IT, see page 18 in this issue)

Photo: author

Spectrum monitoring on the highest passes of Bhutan (Pele La at 3400 m altitude)

GSM test equipment for Italy's telecommunications ministry

The ISCTI (Istituto Superiore delle Communicazioni e delle Tecnologie dell'Informazione), which is part of the Italian telecommunications ministry, awarded Rohde&Schwarz an order to supply a GSM System Simulator TS8916B with extensive accessories for a test center in Rome for the certification of GSM mobile telephones. The TS8916B system is the state of the art in GSM conformance testing and is used by virtually all producers and test houses worldwide. It comprises a total of nine physical RF channels and extra RF instrumentation for measuring fading effects or wideband interference.

Many years of experience in all sectors of mobile radio and especially in certification testing have made Rohde&Schwarz the world's market leader. The ISCTI, which is responsible for certificating digital communications equipment in Italy, intends to set up a GSM test center by mid-2000 that covers the broad spectrum from protocol and RF tests through to acoustic and EMC tests plus environmental simulation.

Safeguard against attacks from the Internett

In the new version of the BSI tool "Secure UNIX Administration", Rohde&Schwarz is offering software with which UNIX systems can be tested for gaps in their security. The software performs security checks automatically or manually, produces suggestions for correcting weaknesses in security, and even supports the system administrator in eliminating detected sources of danger. In the catalog of measures of the "Safe Internet" task force, recently published by Germany's ministry of the interior, the BSI tool from Rohde&Schwarz is recommended as being especially suitable for protecting IT systems against denial of service on the Internet.

Stefan Böttinger

Visit us on Internet at www.rohde-schwarz.com

ROHDE&SCHWARZ

ROHDE & SCHWARZ GmbH & Co. KG · Muehldorfstrasse 15 · 81671 Munich, Germany · P.O.B. 80 14 69 · 81614 Munich
Support Center: Tel. (+49) 018 05 12 42 42 · E-Mail: customersupport@rohde-schwarz.com · Fax (+49 89) 41 29-37 77

News from Rohde & Schwarz 167 (2000/II) · PD 757.5350.21 · B42622