



SCHWARZBECK MESS-ELEKTRONIK

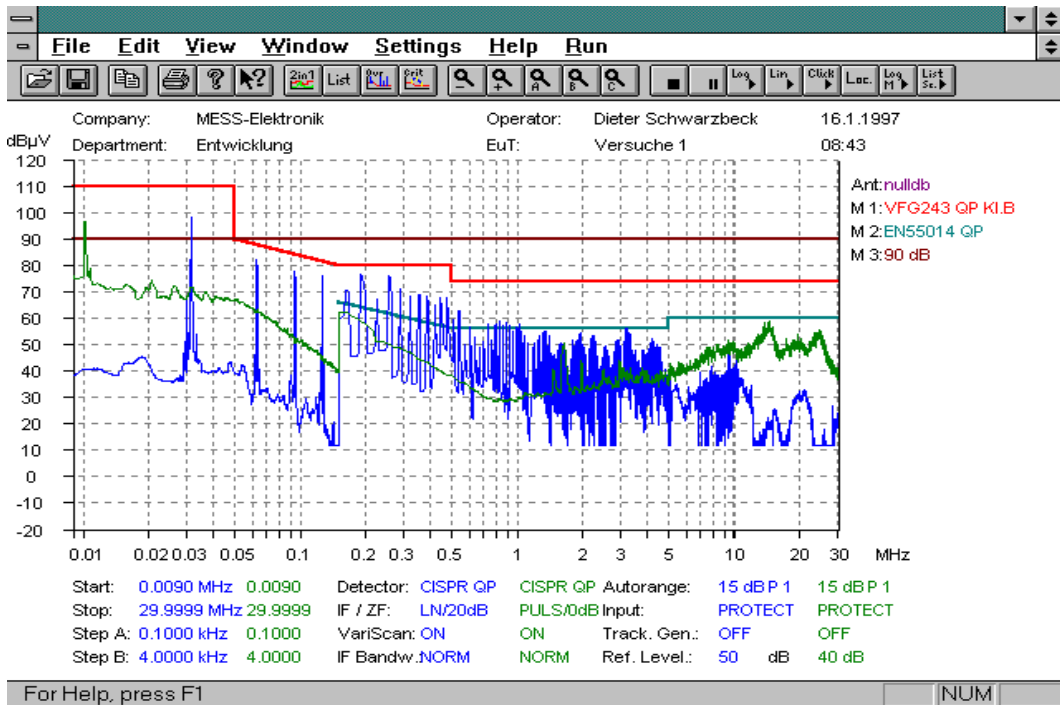
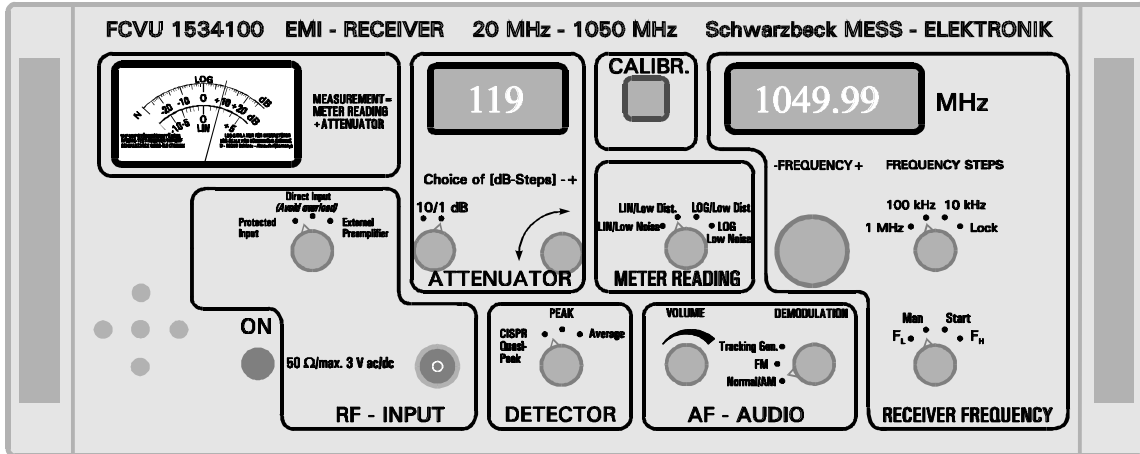
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DESCRIPTION, DATA SHEET

20 MHz - 1050 MHz

Interference Measuring Receiver

FCVU 1534



- ◆ Frequency range 20 MHz-1050 MHz
- ◆ Field-strength-measurement with antennas.
- ◆ Measurement of interference power with clamps.
- ◆ Measurement of conducted voltage with automotive L.I.S.N.s
- ◆ Integrated Power attenuator for receiver protection.
- ◆ Optional external Preamplifier for best sensitivity.
- ◆ Optional high level tracking generator is ideal to measure filter attenuation and to drive power amplifiers.
- ◆ Manual operation, semi-automatic operation with xy-recorder and PC-control via IEEE-488 using the Schwarzbeck software Messbase.
- ◆ Fast 100% CISPR-Quasi-peak-measurement with VARISCAN.

For many decades, most of the interference measuring receivers were used in laboratories. They were operated manually using their front panel.

This type of operation including front panel control will still be there in the future, but PC-control gives value added measurement because of increased speed and better documentation.

The unique r. f. and analogue circuits of the FCVU 1534 give precise measurement with or without PC-control. The receiver comes complete for EMI-measurement, but can be equipped with useful options.

Characteristics of the FCVU 1534

Unique R.F.-circuitry

- ◆ Attenuator with coaxial relays uses resistive π -attenuators with 1-dB-steps. Total resistive attenuation is 89 dB.
- ◆ Switchable 10 dB High Power Attenuator for receiver protection.

- ◆ 7 selective preamplifiers with 28 tuned circuits for best large signal handling capability combined with low noise.
- ◆ Build in 100 Hz Pulse standard similar to IGU 2912 for calibration. Error is compensated by a EPROM list.
- ◆ Low noise, low distortion GaAs-MMIC preamplifier (Option) can be used directly at the antenna eliminating cable loss. The standard coaxial cable is used for remote power supply and remote control.
- ◆ Integrated (optional) tracking generator with $120 \text{ dB}\mu\text{V} (1 \text{ V}) / 50 \Omega$ for measurement of filter attenuation, site attenuation with antennas and drive of power amplifiers acc. to **IEC 801**. (External optional modulator)

High precision measurement

- ◆ Meter with 2 large scales.
Linear voltage scale with 1-dB-scaling for the amplitude range
-10 dB / 0 dB centre of meter / +6 dB
according to EN 55014 C.2.1.
plus Logarithmic overview
-25 dB / 0 dB centre of meter / +25 dB
- ◆ 12 Bit A/D-converter

Easy to use

- ◆ Functional areas of controls and displays.
- ◆ Small size, moderate weight, rugged Aluminium cabinet
- ◆ Low heat dissipation
- ◆ Due to effective shielding no problems even when used in the shielding room.

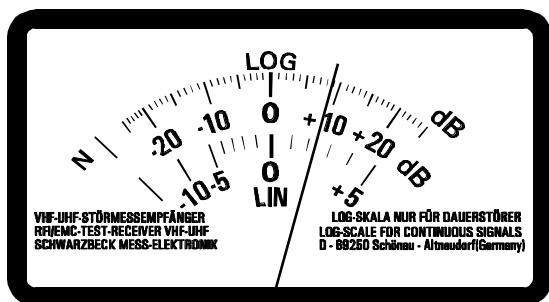
Modes of operation

The FCVU 1534 covers the following modes:

- ◆ Manual operation with manual frequency tuning and reading the measurement from the meter.
- ◆ Semi-automatic operation using an xy-recorder for the reading.
- ◆ PC-controlled operation via IEEE-Bus with Schwarzbeck Software Messbase.

Manual operation

As no other this mode of operation gives direct access to the receiver without any collision with PC or software. Especially in the measuring field outside of a shielding room, broadcast signals can be identified using the demodulator/loudspeaker. Both AM and FM signals can be monitored. Reading can be seen clearly on the meter which gives perfect reading from narrow band signals down to single click.



- The meter uses the classic 0 dB centre of meter scaling to measure safe without interpretation.
- The linear scale gives true linear voltage reading avoiding problems with slow pulses.
- For any interference signal from continuous distortion to single click 0 dB centre of instrument is free of overload problems. For overview a 50 dB logarithmic scaling can be used.

Semi-automatic operation

Spectrum can be recorded when the receiver is used in the scan mode together with an xy-recorder. The time consumption is reduced substantially, because VARISCAN adjusts scan speed to the signals ahead.

So the spectrum can be scanned directly in CISPR-Quasi-peak avoiding Peak-measurement.

The xy-recorder can be used in manual tuning mode as well. The xy-recorder then follows the manual frequency tuning on the encoder.

Doing so, it is very easy to stop on critical frequencies to find the maximum signal strength, which will be kept by the xy-recorder.

PC-controlled mode

Using a standard PC, a IEEE-card and the Schwarzbeck software Messbase together with the FCVU 1534 gives PC-controlled measurement. Modern PCs offer high speed and high capacity hard disks which improves considerably storage and documentation of measurement.

Primary goal of development was safe measurement of the complete range of interference signals keeping the high standard of manual measurement.

This means that there must be no trade off considering even slow pulses.

The completely new approach using the fourth demodulator included in VARISCAN gives fast Quasi-peak-measurement without using the Peak detector, which shows a very different behaviour. VARISCAN analyses the signal ahead before it is really measured.

Practical spectrum often shows amplitude jitter which could be subject to misinterpretations using the Peak detector to decide which signal has to be re-measured in CISPR or not.

The second step towards safe measurement is controlling the receiver by the limits given in the standards. Basically AUTORANGE can catch any signal, but there are restrictions when slow pulses occur.

The way out of the problem is to guide the receiver along the limits in such a way, that it is centred in the middle between noise and overload. Even antenna factors are included in this strategy.

SCHWARZBECK MESS - ELEKTRONIK

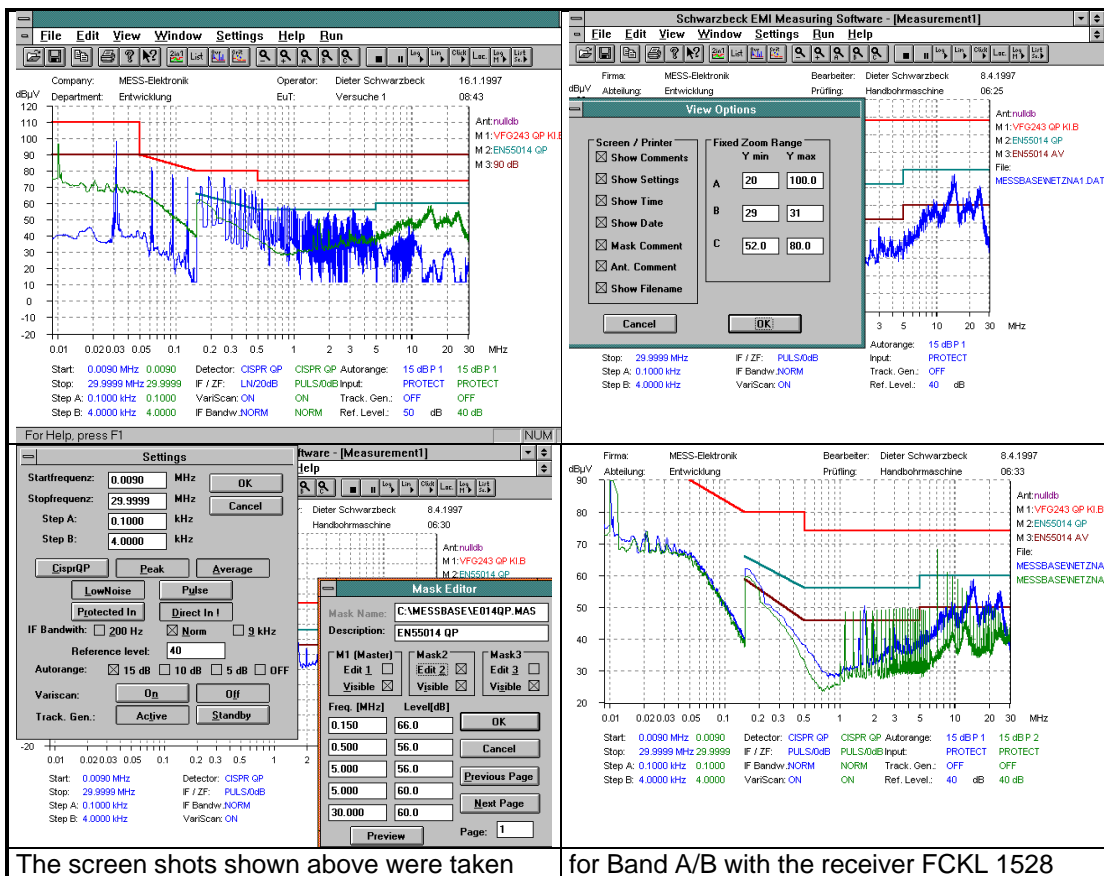
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Messbase-Software for Emission-tests under MS-WINDOWS 95/98/NT/2000/XP

- Easy to learn and to use
- Fast & Reliable with Variscan and Autorange
- High security against overload using mask-guidance
- User editable limits and antenna factors guarantee high flexibility
- Interactive final measurements with automatic test report generation
- Automatic creation and scan of frequency lists
- Free scalable prints
- User definable creation of test reports
- Convenient graphic features and data transfer to other Windows applications
- Marker with integrated final measurement capability
- Subranges reduce measuring time and provide data reduction
- Remote control for LISN or coaxial switching unit included
- Additional IEEE 488-devices can be integrated on request
- Attenuation measurements > 100 dB for site performance checks or insertion loss of filters
- Comparison of two measured diagrams and up to 3 masks simultaneously
- Accelerator keys for frequently used functions speed up operation
- Click measurement with 10 samples per second
- Context sensitive Online Help
- Macros performing up to 32 time-consuming measurements
- Find the Maximum Envelope out of a set of measurements

Hardware - Requirements:

IBM-compatible PC with 80386 and math. Coprocessor 80387 or better, 4 MByte RAM, VGA-Graphics, min. 10 MByte free space on hard disk, 3.5" floppy disk drive, INES IEEE 488 16-bit interface card. PCMCIA-card also available for portable Computers.



The screen shots shown above were taken

for Band A/B with the receiver FCKL 1528

FCVU 1534 Technical data

Frequency range	20 MHz - 1050 MHz
Frequency tuning with encoder wheel	10 kHz, 100 kHz, 1 MHz
Display	6 digits LED
Software	Start- and Stop frequency random, random steps > 10 kHz, automatic scanning with graphic.
Frequency error	$1 \cdot 10^{-5} \pm 10$ kHz
R.F-Input	N-connector, 50 Ω
SWR	<1,2 for attenuator >10 dB <2 for attenuator 0 dB
Oscillator voltage on R.F. Input	<30 dBpW for attenuator 0 dB, <20 dBpW for 10 dB power attenuator.

R.F-amplifier frequency ranges

7 amplifiers with tracking band-filters at in- and output

1	20 MHz - 50 MHz
2	50 MHz - 100 MHz
3	100 MHz - 200 MHz
4	200 MHz - 400 MHz
5	400 MHz - 600 MHz
6	600 MHz - 800 MHz
7	800 MHz - 1050 MHz

Calibration

Pulse standard for CISPR-Standard pulses 100 Hz	
Voltage nom.	30 dB μ V (100 Hz)

Maximum Input level (w.o. ext. preamplifier.)

R.F.-attenuation 0 dB (D. C.- isolation)	
D.C. voltage	15 V
Sine wave R.F. voltage	130 dB μ V (3,16 V)
R.F.-attenuation 10 dB (D. C.-isolation)	
Spectrum pulse density	96 dB μ V/MHz (<0,5 ns)

R.F.-attenuation 10 dB power attenuator	
D.C.-voltage	15 V
Sine wave R.F.-voltage	137 dB μ V (1 W)

Spurious, Large Signal Handling Capability

Image frequency atten.	>65 dB/typ. 90 dB
I.F.-isolation	>70 dB/typ. 90 dB
Third order Intercept d3 standard setup	>17 dBm

R.F.-feed through

(1 dB error, w.o. receiver frequ.)	10 V/m
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I.F.-frequencies

1. I.F. ranges 1-4	300 MHz
1. I.F. ranges 5-7	500 MHz
2. I.F.	82,72 MHz
3. I.F.	10,72 MHz
4. I.F.	2,03 MHz

I.F.-Standard filter bandwidths acc. to CISPR 120 kHz (-6 dB)

Noise indication

Average (120 kHz)	-5 dB μ V (typ. -7 dB μ V)
Peak (120 kHz) typ.	+1 dB μ V
CISPR Quasipeak	typ. -4 dB μ V

Noise indication

	with ext. preamplifier
Average (120 kHz)	typ -11 dB μ V
Peak (120 kHz) typ.	-5 dB μ V
CISPR Quasipeak	typ. -10 dB μ V
Pulse compression	1 dB at 30 dB μ V, 100 Hz CISPR Standard pulse

Range for voltage measurement

Lower limit for <1 dB noise error	
Average (120 kHz)	-1 dB μ V
Peak (120 kHz)	+15 dB μ V
CISPR Quasipeak	
Standard pulse 100 Hz	<4 dB μ V

	with ext. preamplifier.
Average (120 kHz)	-7 dB μ V
Peak (120 kHz)	+8 dB μ V
CISPR Quasipeak	
Standard pulse 100 Hz	< -2 dB μ V

Upper limit	137 dB μ V (3,16 V)
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	with ext. preamplifier.
	116 dB μ V sine wave.

Spurious	equiv. < -3 dB μ V typ.: None
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Level indication

Digital	3 digit LED display for reference level
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Analogue	Meter with 0 dB centre of instrument. Voltage linear scale with dB scaling w.o. logarithmic converter.
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	Logarithmic scale with -25 dB / 0 dB / +25 dB (low noise).
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Recording with XY-recorder
 Y-axis within dynamic range of demodulator linear or logarithmic acc. to meter scale.

X-axis via EPROM list and D/A-converter derived from receiver frequency Prefabricated measurement diagrams ready to use.

Detectors Average, Peak, Quasipeak (CISPR)

Error analogue, digital
 < 1 dB (0 dB centre of meter, limit)

Demodulation AM, FM

Inputs, outputs

Analogue

Recorder outputs Y-axis, amplitude 0 dB centre of meter corresponds to 0,5 V

linear

logarithmic, $R_i < 10 \text{ k}\Omega$
 X-axis, frequency, 30 MHz at 0 V, 1000 MHz at 1,000 V Pen Down $R_i < 2 \text{ k}\Omega$

Measuring outputs Active demodulator (Envelope of I.F.) 0 dB centre of meter corresponds to. 15 mV, $R_i > 10 \text{ k}\Omega$

Pulse weighted output see Y-axis xy-recorder

I.F.-output optional

Supply voltage for auxiliaries +12 V / 100 mA -12 V / 50 mA

Control and supply

of optional external preamplifier build in 5 V / 100 mA on centre of R.F.-input N-connector (fuse on rear panel)

Digital IEEE-Bus connector 24 socket

Options

Tracking generator (optional, build in)
 Frequency range 30 MHz-1000 MHz
 Frequency steps Same as receiver
 Output voltage 120 dB μ V (1 V) / 50 Ω
 Control Rotary switch on front, panel, software

Preamplifier (optional, separately)
 Frequency range 20 MHz-1050 MHz nom.
 Amplification 10 dB typ.
 Pulse compression 1 dB at 30 dB μ V CISPR-Standard pulse 100 Hz

Connectors N-socket, N-pin
 Control Switching amplifier ON/OFF via coaxial cable from front panel switch or software

Power supply Remote supply via coaxial cable.

Dimension (w.o. connectors) 50 mm x 30 mm x 30 mm

Option 19" build in capability

General

Nominal temperature range 0°C to 50°C
 Storage temperature range -20°C to +70°C
 Cooling Temperature controlled, low noise cooling fan

EMI acc. to VDE 0876, 1a
 Shock, Vibration acc. to DIN IEC 68-2-27/29

Power supply 110,130,220,240 V +-10%
 50 , 60 Hz 80 W
 12V DC optional

Cabinet

B x H x T 447 mm x 180 mm x 460 mm
 approx. 17 kg

Standard accessories

Mains cable,
 Operation manual

Recommended accessories

A) Measuring conducted voltage with manual or software control.

with automotive L.I.S.N.
up to 300 MHz NNBM 8126 b

50 Ω / 4 x 25 A
up to 300 MHz UNN 8122

B) Interference power

Absorbing clamp
30 MHz-1000 MHz MDS 21

Absorbing clamp
to 2 GHz MDS 22

C) Radiated field strength with antennas

Biconic elements
30-300 MHz BBA 9106

Holder for above elements VHA 9103

Holder with balun
50/200 Ω VHBA 9123

Holder with balun
50/200 Ω extr. symm. VHBB 9124

Biconic antenna
200-100 MHz UBA 9116

Log. Per. Antennas

VHF-UHF Log.-Per. Ant.
75 (50)-1500 MHz VULP 9118 E

VHF-UHF Log.-Per. Ant.
95 (80)-1500 MHz VULP 9118 D

VHF-UHF Log.-Per. Ant.
140-1100 MHz VULP 9118 C

VHF-UHF Log.-Per. Ant.
170-1100 MHz VULP 9118 B

VHF-UHF Log.-Per. Ant.
200-1100 MHz VULP 9118 A

Log.-Per. Ant.
300-1000 MHz UHALP 9108 A

Logbicon Super-
Broad band-Combinations VULB 9160
VULB 9165

$\lambda/2$ Dipole antennas with telescopes

VHF-Dipole with
Telescopes VHA 9103

UHF-Dipole with
Telescopes UHA 9105

Precession-Dipoles

VHF Precision-Dipole
30 MHz-300 MHz VHAP

UHF Precision-Dipole
300 MHz-1000 MHz UHAP

Cable

Calibrated coaxial cable
Length 10 m AK 9513

Mast

Complete mast, can
be disassembled for,
easy transportation,
4 m high AM 9104

Small antenna mast AM 9144

D) Others

Transformers, Transducers, Modulators

Symmetric/ Unsymmetric transformer
105 Ω SYM 9223

Current converter
10 kHz-200 MHz SW 9602

Modulator UVM 7002 30 MHz-1 GHz for modulated R.F. acc. to IEC 801

Near field probes FS-SET 7100, magnetic, electric, separator, power supply, Box.

FCKL 1528 is the corresponding EMI receiver for the frequency range 9 kHz-30 MHz. It is especially designed for EMI-requirements in this frequency range. A built-in power attenuator protects the receiver especially in combination with high power L.I.S.N.s.. The optional tracking generator delivers 1 V/50 Ω . It can be used for filter measurement with extremely high dynamic range or to drive power amplifiers.

The receivers are similar in manual and PC controlled operation.

A multitude of L.I.S.N.s, probes, field strength adapters and other accessories makes this receiver a versatile tool for EMI-measurement.

This is only a part of our EMI-program. Please ask for more information.

Equipment may be subject to modification without any notice. Specifications without tolerance should be considered as order of magnitude.