Product brochure

Version 01.00

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TV Analyzer R&S®FSH3-TV

The universal combined TV and spectrum analyzer from 100 kHz to 3 GHz

- Measurement functions for analog and digital TV signals
- Full-fledged spectrum analyzer
- Combined video/ASI output
- Compact and robust housing
- Up to four hours operating time on battery power
- Wide selection of accessories for diverse measurement tasks
- Preselector option with 75 Ω RF input

ROHDE&SCHWARZ

General

The TV Analyzer R&S®FSH3-TV combines the functions and features of a complete spectrum analyzer with those of a TV test receiver in a single measurement instrument.

It can be taken wherever needed and is ideal for technicians who perform measurements on site – for example, during new installations or maintenance and repair work on components of TV cable networks and transmitters.

Robust and portable

The instrument's compact housing is designed for portable use. Its robust edge protection and RF connector covers safeguard the R&S®FSH3-TV against mechanical and weather-related conditions.

The R&S®FSH3-TV weighs only 2.8 kg. It has a sturdy carrying handle that also makes reading the display easy when the instrument is placed on a flat surface. In addition, an integrated stand allows the R&S®FSH3-TV to be positioned to the optimum angle for reading results.

The powerful, built-in NiMH battery can power the instrument for up to four hours, thus providing reliable operation even at remote locations.

Convenient operation

The R&S®FSH3-TV is operated by means of convenient menus and softkeys. Frequently used functions can be selected directly. In addition, a rotary knob allows quick and easy variation of entry values and the selection of items from menus.

Measured values and menus are shown on a backlit color liquid crystal display. The display remains legible even under difficult lighting conditions (daylight).

Well-equipped

The TV Analyzer R&S®FSH3-TV comes equipped with a TV board, a preamplifier and a tracking generator.

The TV board permits measurements of analog TV signals and their demodulation. The demodulated video signal, which is made available at an output that can be used either as a CCVS (analog TV) or as a TS-ASI (digital TV) output, can be routed to an external monitor or an MPEG decoder. The supplied headphones can be used to listen to the sound of the analog TV signal.

Optional accessories

Numerous accessories that add a wide variety of capabilities to the R&S®FSH3-TV are available, e.g. options for performing distance-to-fault measurements and measurements on digital TV signals (Table 1).

If the vector transmission measurement option is added to the standard tracking generator, the R&S®FSH3-TV can also be used in development and service.

Data in brief

Spectrum analyzer	
Frequency range	100 kHz to 3 GHz
Resolution bandwidths	100 Hz to 1 MHz
Video bandwidths	10 Hz to 1 MHz
Displayed average noise level (DANL)	typ. –135 dBm (100 Hz)
TOI	typ. 13 dBm
SSB phase noise	<–100 dBc (1 Hz) at 100 kHz from carrier
Sweep at span = 0 Hz	100 µs to 100 s
Detectors	sample, max/min peak, auto peak, RMS
Level measurement uncertainty	<1.5 dB, typ. 0.5 dB
Reference level	–80 dBm bis +20 dBm
Digital TV receiver (option R&S®FSHTV-K21 for QAM, R&S®FSHTV-K22 for 8VSB)	
Modulation methods	4QAM, 16QAM, 32QAM, 64QAM, 128QAM, 256QAM, 8VSB
Bandwidths, depending on standard	6 MHz, 7 MHz and 8 MHz
Symbol rate by QAM / ATSC	2 MHz to 6.999 MHz/10.762238 MHz
Inherent MER (equalizer ON)	>35 dB
Analog TV receiver	
Standards	B, G, H, D, K, I, L, M, N,
Sound standards	IRT-A2, NICAM, BTSC, EIA-J
Video bandwidths	depending on standard
Inherent S/N video, weighted in accordance with CCIR Rec. 567	>50 dB
General data	
Dimensions	170 mm × 120 mm × 270 mm
Weight	2.8 kg

R&S®FSH3-TV with VSWR Bridge and Power Divider R&S®FSH-Z2

R&S®FSH3-TV with Active Directional Antenna R&S®HE200

Made for TV

The TV Analyzer R&S®FSH3-TV offers the same scope of functions as any spectrum analyzer from the R&S®FSH family of Rohde & Schwarz instruments.

However, additional settings and options have been added that are specially designed for measurements needed by TV cable operators and transmitter network operators.

The main expansion is the TV board integrated in the base unit. This board provides additional capabilities for analyzing and demodulating analog and digital TV signals. Table 1 provides a summary of the available TV standards.

The R&S®FSH3-TV comes equipped with a female N connector (50 Ω) for the RF input. To ensure that the correct characteristic impedance is achieved when the R&S®FSH3-TV is connected to cable network components or, for example, to TV antenna systems with 75 Ω impedance, the R&S®RAZ and R&S®FSH-Z38 50 Ω/75 Ω matching pads are offered as options.

	TV Standard
R&S®FSH3-TV (base unit)	B, G, H, D/K, N, I, L M/NTSC, M/PAL
R&S®FSHTV-K21 (option)	DVB-C (J.83/A/C) J.83/B
R&S®FSHTV-K22 (option)	ATSC/8VSB

Table 1: TV standards for the R&S®FSH3-TV

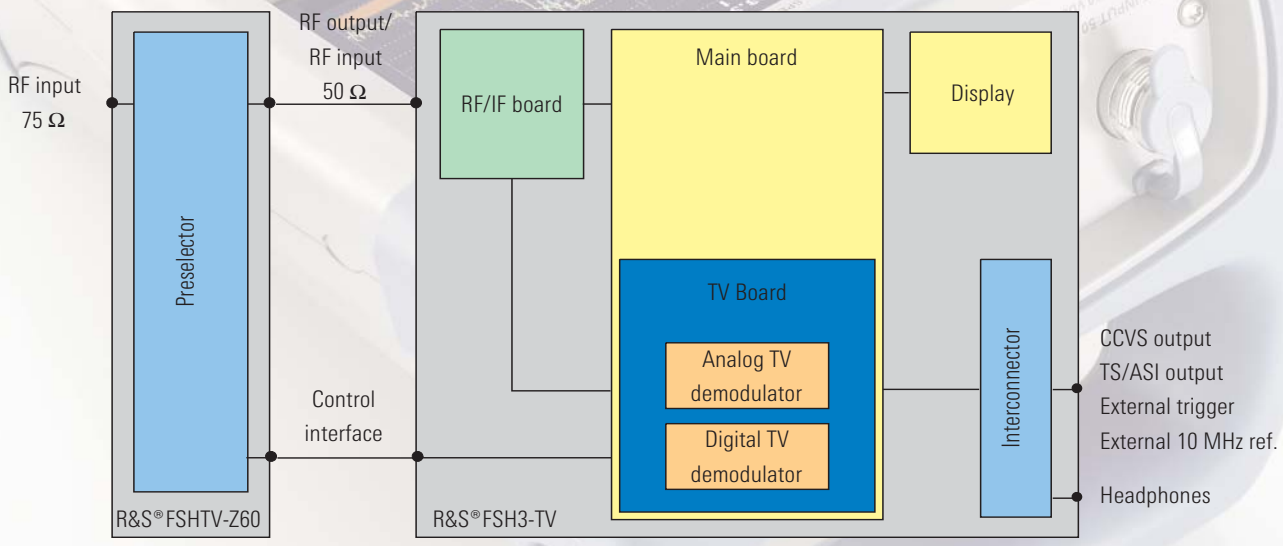
If the R&S®FSH3-TV is intended for frequent use in cable networks, the new Preselector R&S®FSHTV-Z60 is recommended.

This option, which is connected ahead of the broadband RF input of the R&S®FSH3-TV, improves the usable dynamic range particularly in the case of densely occupied cable systems.

The preselector option is simply screwed onto the RF input of the R&S®FSH3-TV and connected to the base unit with a control cable. The power for the option is also supplied via the control cable.

The RF input of the preselector option is a 75 Ω female F connector. If the F connector becomes damaged, it can easily be replaced and the R&S®FSH3-TV can be used again immediately.

Preselector R&S®FSHTV-Z60



Block diagram of the R&S®FSH3-TV with the R&S®FSHTV-Z60

Many tasks, one solution

In addition to its numerous built-in functions, the R&S®®FSH3-TV also offers a wide range of options and separate accessories that allow it to be customized to the application at hand. This means that a full scope of configurations is possible – from a special-purpose instrument up to a do-it-all solution.

Table 2 provides a list of applications and the configuration needed.

	Application					Software option				Hardware option			
Function/equipment	**Measurements in cable network**	**Measurements on transmitter**	**Coverage measurements**	**Lab and service**	**Included as standard in R&S®FSH3-TV base unit**	**Vector Transmission and Reflection Measurements R&S®FSH-K2**	**Receiver Mode R&S®FSH-K3**	**DVB-C/J.83/A/B/C (OAM) Firmware R&S®FSHTV-K21**	**ATSC/8VSB Firmware R&S®FSHTV-K22**	**Distance-to-Fault Measurement R&S®FSH-B1**	**Preselector R&S®FSHTV-Z60**	**VSWR Bridge and Power Divider R&S®FSH-Z2**	**Directional Power Sensor R&S®FSH-Z14/R&S®FSH-Z44**
Channel tables	●	●	●		✓								
Measurements – analog TV	●	●	●	●	✓								
Demodulation – analog TV	●	●	●	●	✓								
Scope function (video line analysis)	●	●	●	●	✓								
Modulation parameters – analog TV	●	●		●	✓								
Measurements – DVB-C (J.83/A/C), J.83/B	●			●				●					
Demodulation – DVB-C (J.83/A/C), J.83/B	●			●				●					
Measurements – ATSC/8VSB		●	●	●					●				
Demodulation – ATSC/8VSB		●	●	●					●				
Defined settings	●	●	●	●	✓								
Channel power	●			●	✓								
C/N measurement	●			●	✓								
CSO, CTB, HUM	●			●	✓								
Shoulder attenuation		●		●	✓								
Power measurements		●		●									●
Zero span, trigger	●				✓								
Field-strength measurements			●		✓								
EMC precompliance	●			●			●						
Scan mode	●		●				●						
Scalar transmission measurements				●	✓								
Scalar reflection measurements (VSWR)		●		●								●	
Vector transmission measurements		●		●		●							
Vector reflection measurements (VSWR)		●		●		●						●	
Measurements on cables	●	●								●		●	
Cable loss measurements		●		●		●							
Preamplifier			●		✓								
Preselector	●		●								●		
Tracking generator	●	●		●	✓								
R&S®FSH View	●	●	●	●	✓								

Table 2: Hardware and software options for various applications

Channel tables

If preferred, the R&S®FSH3-TV can be tuned by channel numbers rather than by entering the frequency. The channel tables can be defined either by means of Control Software R&S®FSH View or directly on the R&S®FSH3-TV by entering the first channel number, the associated frequency, the number of channels and the channel spacing. Predefined channel tables for a number of countries are supplied together with the R&S®FSH3-TV. Users can customize them as needed.

Modulation parameters – analog

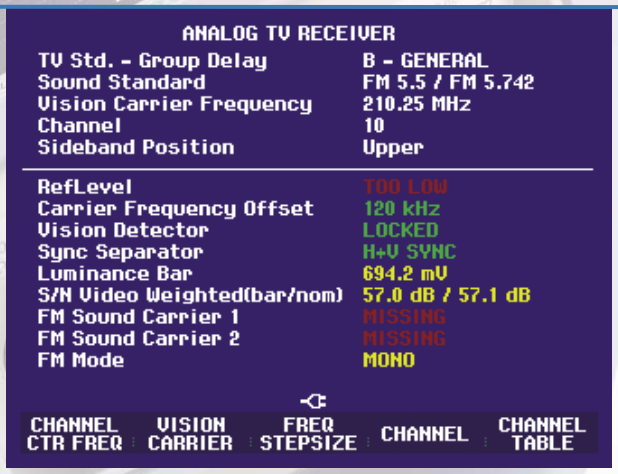
Analog modulation parameters – listed in Table 3 – are measured in the assigned video lines. Depending on the TV standard selected, the R&S®FSH3-TV places the measurement items in the video line in accordance with the CCIR, FCC or NTC7 standards. The test results are updated once for each sweep and displayed in a result window that can be superimposed on the screen.

Modulation parameters	
Vision carrier peak power	Residual picture carrier
Modulation depth	Bar amplitude

Table 3: Modulation parameters measured by the R&S®FSH3-TV

TV receiver – analog

The R&S®FSH3-TV evaluates analog TV signals by using either the TV receiver mode (with demodulation) or TV analyzer mode (without demodulation). In the TV receiver mode, the states of the vision and sound carriers and the mode of the NICAM or BTSC decoder are displayed after the TV standard, group delay, channel or receive frequency have been selected. The R&S®FSH3-TV display automatically adapts to the TV standard selected.
In the TV receiver mode, the demodulated video signal for display on a TV monitor is provided at the combined BNC output. Users can listen to the demodulated sound by using the headphones supplied.

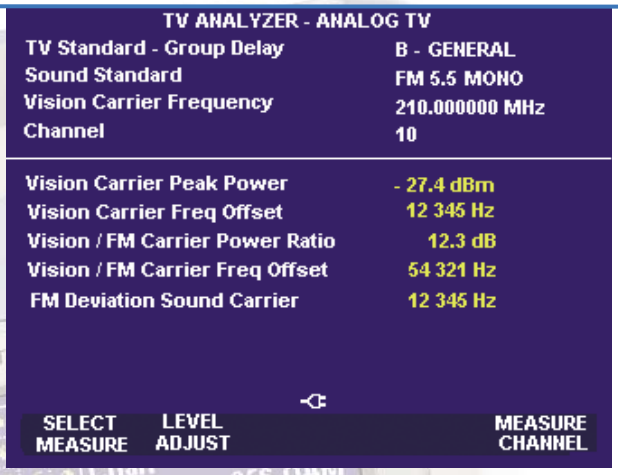


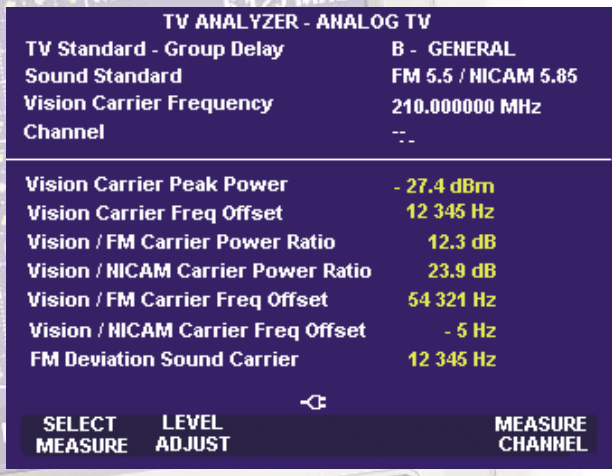
TV analyzer – analog

In the TV analyzer mode, the vision and sound carriers are analyzed without demodulation. Table 4 shows the measurements for each standard.

Sound transmission standards Test parameters	Mono sound FM sound carrier	Dual sound FM sound carrier	FM sound and NICAM carrier	AM sound and NICAM carrier	Mono sound AM sound carrier
Vision carrier peak power	●	●	●	●	●
Vision carrier frequency offset	●	●	●	●	●
Vision/FM carrier power ratio	●		●		
Vision/FM carrier frequency offset	●		●		
FM deviation sound carrier	●		●		
Vision/FM carrier 1 power ratio		●			
Vision/FM carrier 2 power ratio		●			
Vision/FM carrier 1 frequency offset		●			
Vision/FM carrier 2 frequency offset		●			
FM deviation sound carrier 1		●			
FM deviation sound carrier 2		●			
Vision/NICAM carrier power ratio			●	●	
Vision/NICAM carrier frequency offset			●	●	
Vision/AM sound carrier power ratio				●	●
Vision/AM sound carrier frequency offset				●	●

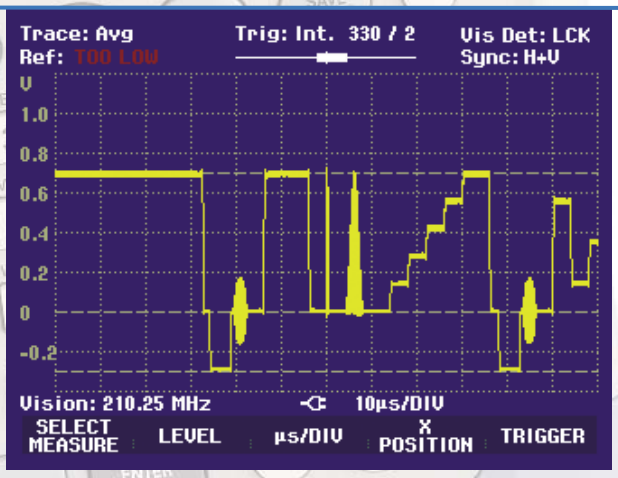
Table 4: Standard-dependent measurements





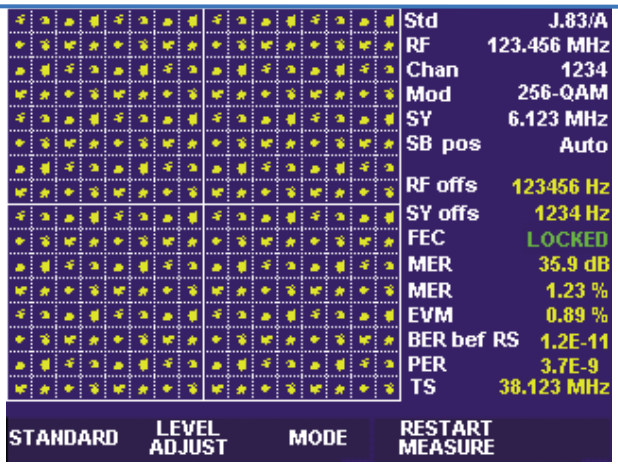
Video scope function (video line analysis)

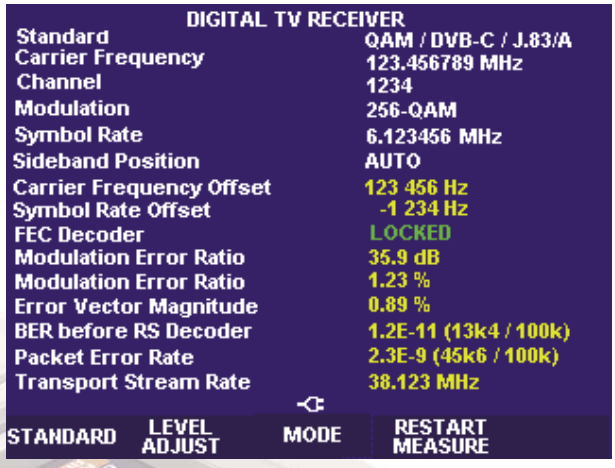
A special feature of the R&S®FSH3-TV is a video line trigger. After a line number is selected, the complete video line is output on the measurement screen. If only a small section of a video line is examined (zoom function), a section display at the upper edge of the screen can be used for orientation.



TV receiver for DVB-C and J.83/B

The R&S®FSHTV-K21 option enables the R&S®FSH3-TV to perform measurements on digital, QAM-modulated TV signals in accordance with the DVB-C (J.83/A/C) and J.83/B standards. The R&S®FSH3-TV displays the main operating parameters of the selected DTV channel together with measured parameters such as MER, EVM or BER on just one screen. The DTV signal can be analyzed further by switching to the display of the constellation diagram. The parameters and measurement results are displayed along with the constellation diagram. This gives the user a quick look at the quality of the signal. The demodulated DTV signal is made available for further processing at the combined BNC output, which functions as a TS-ASI output in this case. Thus, an MPEG-2 transport stream analyzer such as the R&S®DVM400 from Rohde&Schwarz can be connected for in-depth measurements.





TV receiver for ATSC/8VSB

The R&S®FSHTV-K22 option enables the R&S®FSH3-TV to perform measurements on digital TV signals in accordance with the US ATSC/8VSB standard. The R&S®FSH3-TV displays the main operating parameters of the selected DTV channel together with measured parameters such as EVM, MER or BER on just one screen. The DTV signal can be analyzed further by switching to the display of the constellation diagram. The parameters and measurement results are displayed along with the constellation diagram. The demodulated DTV signal is made available for further processing at the combined BNC output, which functions as a TS-ASI output in this case.

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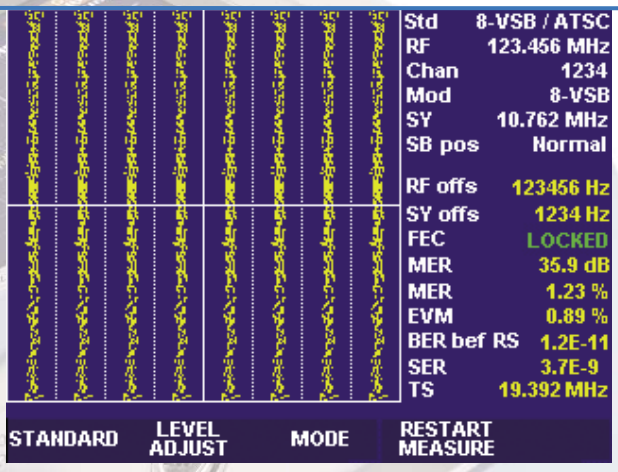
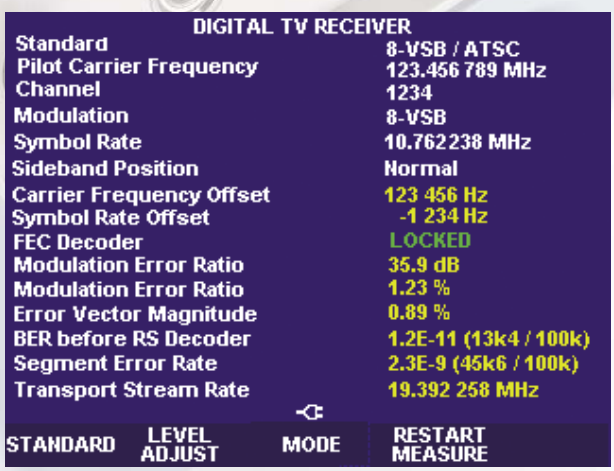


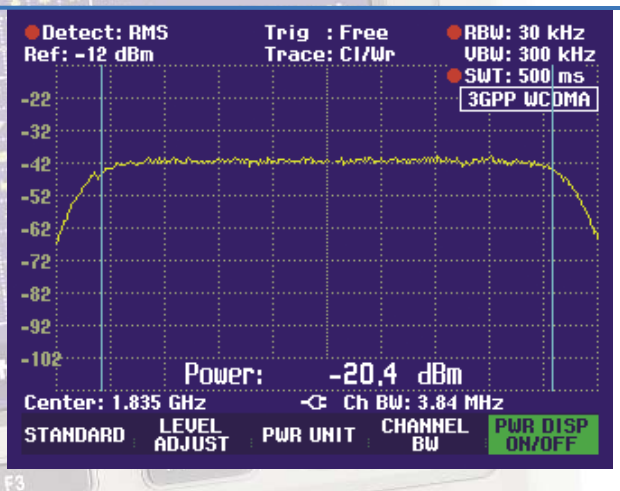


Memory for measurement results and settings

The R&S®FSH3-TV has a memory for up to 100 measurement results and settings. The stored results can be transferred to a PC via the USB interface on the R&S®FSH3-TV and further processed with Control Software R&S®FSH View. Stored results together with their associated settings can be retrieved and activated by using RECALL. Thus, measurements can be repeated with the same settings at any time. This function is particularly useful in service since it allows service technicians to always perform the same TV measurements.

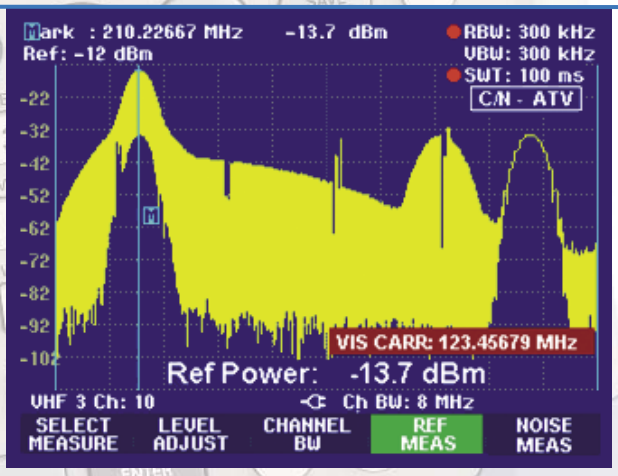
Channel-power measurements

The R&S®FSH3-TV determines the power of a definable transmission channel by means of the channel-power measurement function. A channel-power measurement for digital TV and mobile radio standards is performed at a keystroke with all correct instrument settings.



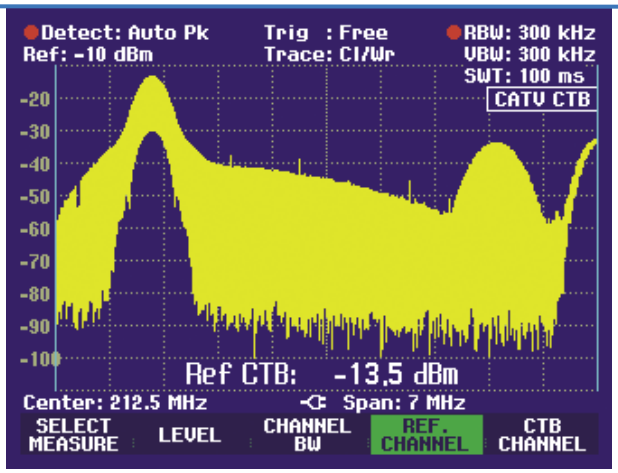
Carrier/noise ratio (C/N)

The R&S®FSH3-TV offers a measurement for determining the ratio of carrier power to noise power. The R&S®FSH3-TV performs the measurement in two steps. First, it measures the carrier power of a transmission channel (or the user determines a reference power which is then used to calculate the C/N ratio). Second, the R&S®FSH3-TV measures the noise power of an unoccupied transmission channel and calculates the ratio of carrier power to noise power.



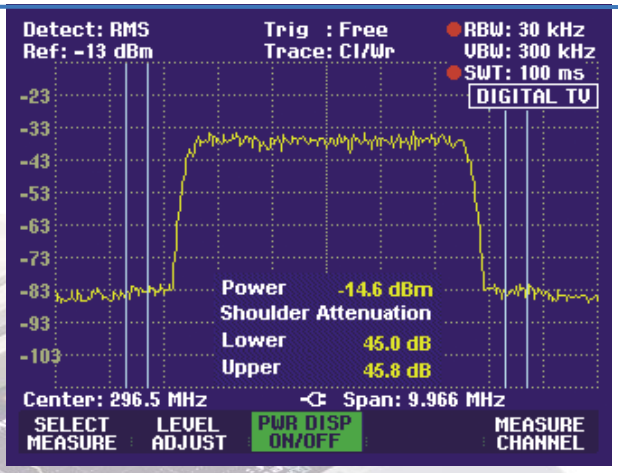
CSO, CTB, HUM (CATV measurements)

The quality of the components used in TV cable network (for example, line amplifiers or signal distributors) is largely characterized by three measurement parameters: CSO (composite second order), CTB (composite triple beat) and HUM. The R&S®FSH3-TV measures the second-order (CSO) and third-order (CTB) noise products in the useful channel – like in the C/N measurement – by referencing them to a specific channel or level defined by the user. In addition to the noise products mentioned above, hum voltages from power supplies with poor noise suppression may cause noticeable interference in the analog TV signal. The R&S®FSH3-TV displays the HUM value to indicate this type of interference.



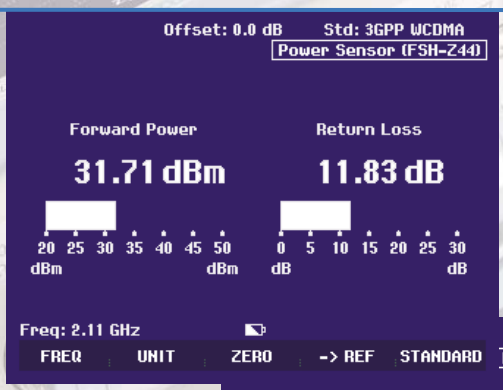
Shoulder attenuation

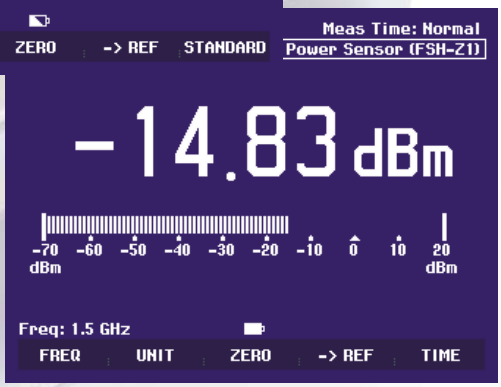
In digital TV, it is extremely important to adhere to the specified shoulder attenuation values in order to keep the effect on adjacent channels under control. The R&S®FSH3-TV measures the upper and lower shoulder attenuation – in accordance with ETSI TR 101 290 or FCC – at a modulator or at the output of a transmitter.



Power measurements

The Directional Power Sensors R&S®FSH-Z14 and R&S®FSH-Z44 turn the R&S®FSH3-TV into a full-fledged directional power meter with a range of 25 MHz to 1 GHz and 200 MHz to 4 GHz, respectively. This added functionality enables the R&S®FSH3-TV to simultaneously measure output power and matching of transmitter system antennas under operating conditions. The power sensors measure power up to 120 W and normally eliminate the need for any extra attenuators. They are compatible with the common standards GSM/EDGE, 3GPP WCDMA, cdmaOne, CDMA2000®1x, DVB-T and DAB. For high-precision power measurements, the Power Sensor R&S®FSH-Z1 for frequencies up to 8 GHz and the Power Sensor R&S®FSH-Z18 for frequencies up to 18 GHz are available. As with thermal sensors, the true RMS value of the measured signal is obtained over the entire measurement range of –67 dBm to +23 dBm irrespective of the signal waveform. This prevents any additional measurement errors, particularly with modulated signals.





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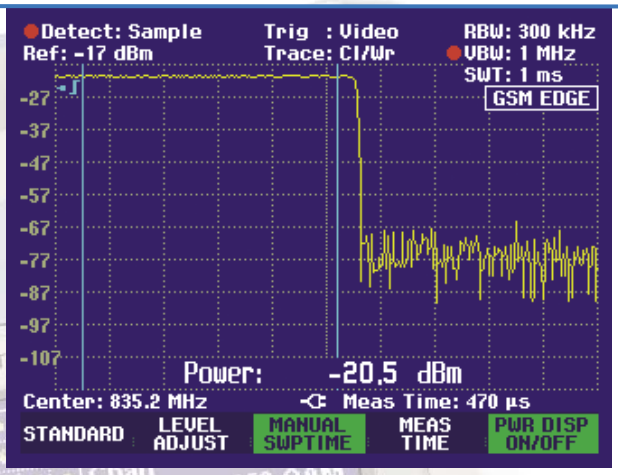
Triggering, zero span, TDMA power measurements

The R&S®FSH3-TV has several triggering capabilities. For example, the R&S®FSH3-TV can respond to the rising or falling edge of an external event via its trigger input. In the zero span mode, it has a video trigger that is very useful for detecting interference or sporadic signals such as those that occur in reverse channels of cable networks. A trigger delay can be set for all trigger variants. By applying the zero span mode and triggering, the R&S®FSH3-TV can also measure the power of TDMA signals within a defined time range.

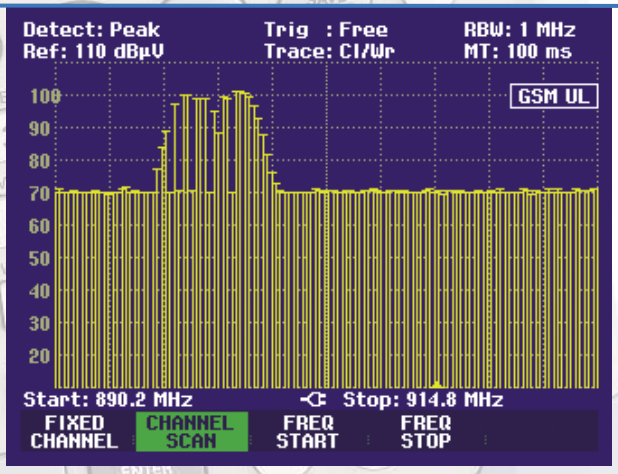


Field-strength measurements

When measuring electric field strength, the R&S®FSH3-TV takes into account the specific antenna factors of the connected antenna. Field strength is displayed directly in dBµV/m. In addition, frequency-dependent loss or gain of, for example, a cable or amplifier can be corrected. For quick and easy result analysis, the R&S®FSH3-TV offers two user-definable limit lines with automatic limit monitoring. Antenna factors are included as standard for the most common test antennas from Rohde&Schwarz.

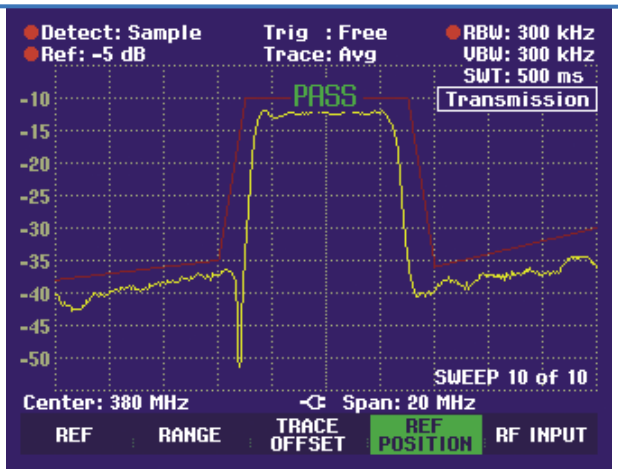
Receiver mode/scan mode

When equipped with the R&S®FSH-K3 option, the R&S®FSH3-TV can be operated as a receiver for monitoring and precompliance EMC applications. Measurements are performed at a predefined frequency with a user-selectable measurement time. In the scan mode, the R&S®FSH3-TV sequentially measures each level at various frequencies defined in a channel table. In addition to the TV channel tables, tables for several mobile radio standards are also predefined. In addition, the CISPR bandwidths 200 Hz, 9 kHz, 120 kHz and 1 MHz are available for EMI emission measurements. The R&S®FSH3-TV offers peak, average, RMS and quasi-peak detectors. When operated together with a suitable directional antenna, the R&S®FSH3-TV can thus be used to detect electromagnetic leaks in cable networks or antenna systems.



Scalar transmission and reflection measurements

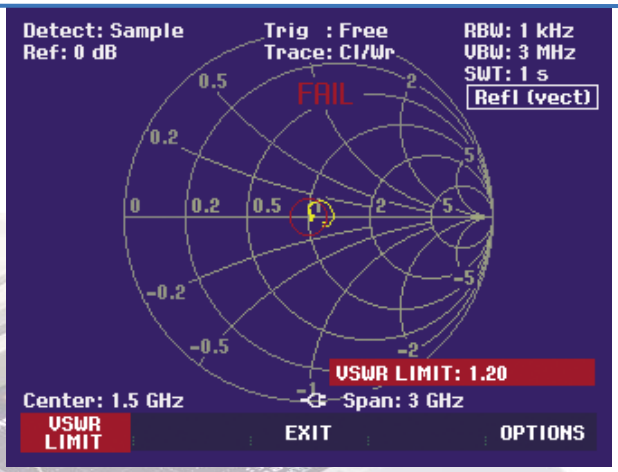
With its built-in tracking generator, the R&S®FSH3-TV rapidly determines the transmission characteristics of cables, filters, and amplifiers in development and service with a minimum of effort. When the VSWR Bridge R&S®FSH-Z2 (10 MHz to 3 GHz) is installed, the R&S®FSH3-TV can also measure the matching (return loss or VSWR) of an antenna, for example. The bridge is screwed directly onto the R&S®FSH3-TV's RF input and tracking generator output. No cumbersome, extra cabling is involved.



Vector transmission and reflection measurements

Compared to scalar measurements, the R&S®FSH-K2 option significantly increases measurement accuracy and dynamic range for vector transmission and reflection measurements. This is possible because the receive signal is analyzed with respect to magnitude and phase. After calibration, complex correction of the system errors can be performed by the R&S®FSH3-TV.

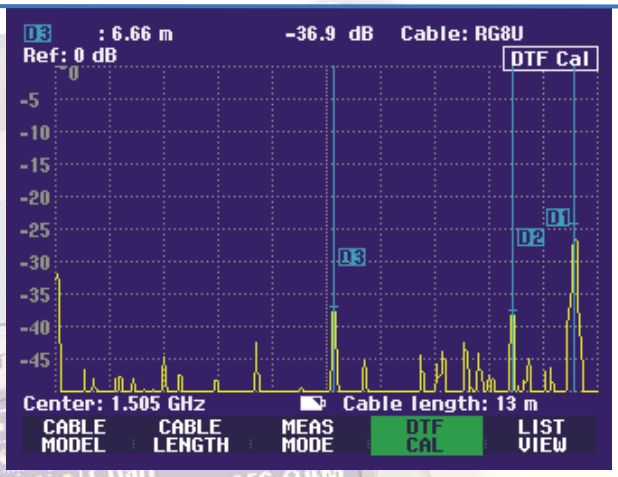
To allow detailed analysis of the matching of an antenna, for example, the magnitude and phase are displayed in a Smith chart. A user-definable limit line comes in handy when evaluating the results.



Measurements on cables (distance-to-fault)

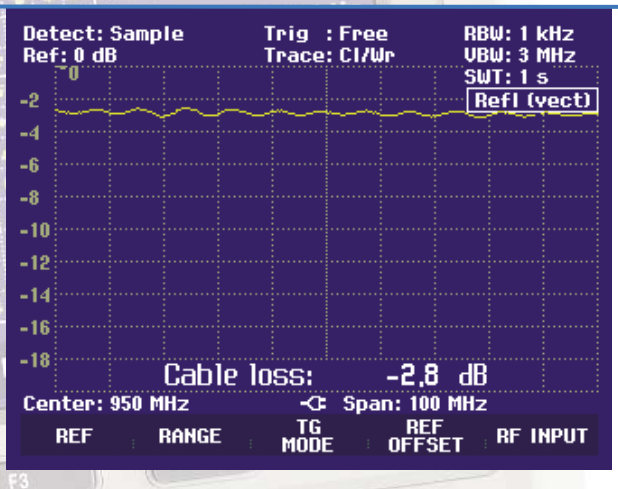
Service technicians frequently need to locate connection faults or damaged cables in TV cable networks. The R&S®FSH-B1 (Distance-to-Fault Measurement) and R&S®FSH-Z2 (VSWR Bridge) options enable the R&S®FSH3-TV to determine the distance to a possible fault quickly and accurately. This provides an immediate overview of the state of the device under test (return loss and distance; see figure).

The marker-zoom function allows detailed analysis of faults with a resolution of up to 1024 pixels.



One-port cable loss measurements

The R&S®FSH3-TV with its built-in tracking generator and the optional VSWR Bridge R&S®FSH-Z2 can determine the cable loss of previously installed long cables without much effort. One end of the cable is connected to the VSWR bridge, and the other is terminated with a short circuit or simply left open. The calculated cable loss represents the average value within the displayed frequency range. The loss at specific frequencies is determined via markers. The one-port cable loss measurement is only available with the R&S®FSH-K2 option.



Control Software R&S®FSH View

The powerful Control Software R&S®FSH View is included as standard with every TV Analyzer R&S®FSH3-TV. Installation and setup are easy. Simply install the software on a PC and then connect the PC with the R&S®FSH3-TV using the supplied USB cable. The software is now ready to run.

R&S®FSH View is a convenient tool for recording measurements and quickly configuring the R&S®FSH3-TV. For example, new channel tables, antenna factors, limit lines or cable data for distance-to-fault measurements can simply be transferred to the R&S®FSH3-TV, or measurements stored in the R&S®FSH3-TV can be viewed and saved on the PC.

Features

- Runs under Windows 98/ME/NT/2000/XP
- Quick and simple transfer of measurement data from the R&S®FSH3-TV to a PC and vice versa
- Data export in ASCII or MS Excel formats
- Printout of all relevant data via Windows (screenshot of the R&S®FSH3-TV display for documentation)
- Storage of graphics data in standard formats (.bmp, .pcx, .png, .wmf)
- Permanent and continuous transfer of sweeps to the PC; facilities for subsequent analysis (markers, zoom, etc)
- Storage space for traces and measurement data as well as for comparisons of current and previous measurements (available space is limited only by the size of the hard disk of the controlling PC)
- Automatic storage of measurement results at selectable intervals
- Generation of cable data with a built-in cable editor; downloading to the R&S®FSH3-TV for distance-to-fault measurements (R&S®FSH-B1)
- Editor for generating limit lines, antenna correction factors and correction factors for external attenuators or amplifiers
- Generation of channel tables and downloading to the R&S®FSH3-TV for the receiver mode (R&S®FSH-K3)
- Macro function for Microsoft Winword for fast and convenient documentation of results
- Connection between PC and R&S®FSH3-TV via an electrically isolated USB optical interface

Ordering information for the R&S®FSH3-TV

Designation	Type	Order No.
TV Analyzer	R&S®FSH3-TV	2111.7005.63

Options

Designation	Type	Order No.
DVB-C/J.83/A/B/C (QAM) Firmware	R&S®FSHTV-K21	2111.7211.02
ATSC/8VSB Firmware	R&S®FSHTV-K22	2111.7228.02

Recommended extras

Designation	Type	Order No.
Preselector	R&S®FSHTV-Z60	2111.7105.02
Spare F Adapter, female/female	R&S®FSHTV-Z61	2111.7111.02
Accessories supplied: external power supply, battery pack (integrated), USB optical cable, headphones, quick start manual, CD-ROM with Control Software R&S®FSH View and documentation		

Ordering information for R&S®FSH accessories

Designation	Type	Order No.
Distance-to-Fault Measurement (includes 1 m cable, R&S®FSH-Z2 required)	R&S®FSH-B1	1145.5750.02
Remote Control via USB (for spectrum analyzer functions only)	R&S®FSH-K1	1157.3458.02
Vector Transmission and Reflection Measurements	R&S®FSH-K2	1157.3387.02
Receiver Mode	R&S®FSH-K3	1157.3429.02

Recommended extras

Designation	Type	Order No.
Power Sensor 10 MHz to 8 GHz	R&S®FSH-Z1	1155.4505.02
VSWR Bridge and Power Divider, 10 MHz to 3 GHz (contains short, open and load for calibration)	R&S®FSH-Z2	1145.5767.02
Directional Power Sensor, 25 MHz to 1 GHz	R&S®FSH-Z14	1120.6001.02
Power Sensor, 10 MHz to 18 GHz	R&S®FSH-Z18	1165.1909.02
Directional Power Sensor, 200 MHz to 4 GHz	R&S®FSH-Z44	1165.2305.02
Matching Pad 50/75 Ω 0 Hz to 2700 MHz	R&S®RAZ	0358.5714.02
Spare RF Cable (1 m), male and female N connectors for R&S®FSH-B1	R&S®FSH-Z20	1145.5867.02
12 V Car Adapter	R&S®FSH-Z21	1300.7579.02
Serial/Parallel Converter	R&S®FSH-Z22	1145.5880.02
Carrying Bag	R&S®FSH-Z25	1145.5896.02
Transit Case	R&S®FSH-Z26	1300.7627.02
Combined Short/Open and 50 Ω Load for VSWR and DTF calibration	R&S®FSH-Z29	1300.7504.02
Spare Short/Open Calibration Standard for R&S®FSH-Z2 for VSWR calibration	R&S®FSH-Z30	1145.5773.02
Spare 50 Ω Load for R&S®FSH-Z2 for VSWR and DTF calibration	R&S®FSH-Z31	1145.5780.02
Spare Battery Pack	R&S®FSH-Z32	1145.5796.02
Spare AC Power Supply	R&S®FSH-Z33	1145.5796.02
Spare RS-232-C Optical Cable	R&S®FSH-Z34	1145.5815.02
Spare CD-ROM with Control Software R&S®FSH View and documentation	R&S®FSH-Z35	1145.5821.02
Spare Headphones	R&S®FSH-Z36	1145.5838.02
Spare USB Optical Cable	R&S®FSH-Z37	1300.7733.02
Matching Pad 50/75 Ω, 0 Hz to 1000 MHz	R&S®FSH-Z38	1300.7740.02

For specifications, see PD 0758.2648.21
and www.rohde-schwarz.com
(search term: FSH, FSH3-TV)

Certified Quality System
ISO 9001
DQS REG. NO 1954 QM

Certified Environmental System
ISO 14001
DQS REG. NO 1954 UM

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