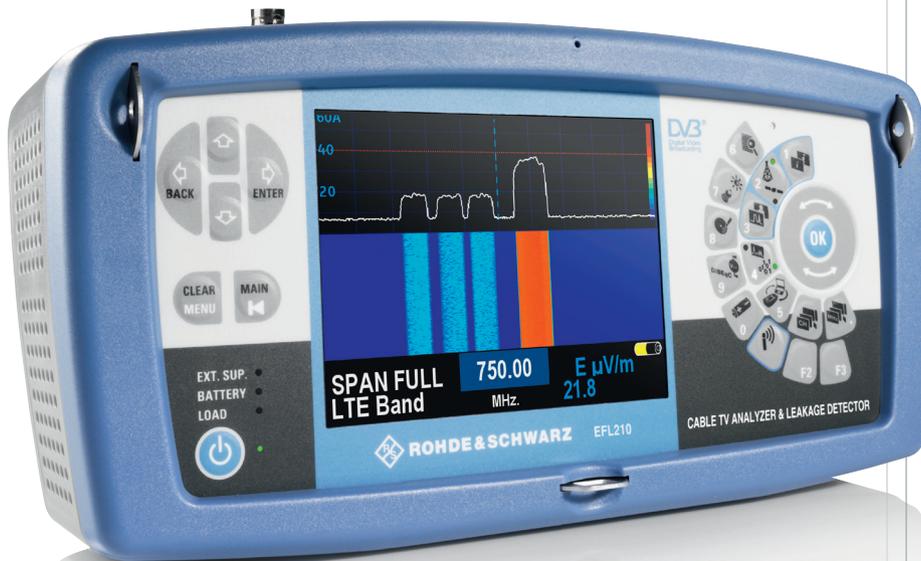


R&S® EFL110/EFL210 Cable TV Analyzer and Leakage Detector

Detecting interference in cable TV and LTE networks



R&S®EFL110/ R&S®EFL210 Cable TV Analyzer and Leakage Detector At a glance

The R&S®EFL110/EFL210 cable TV analyzer and leakage detector is a handy, portable instrument for detecting radiated emissions. It is rugged, easy to operate and has been optimized for use in the field.

Thanks to its sensitive receiver and straightforward graphical display, the R&S®EFL110/210 can detect even weak and sporadic interference. Specially for troubleshooting US cable TV networks, the R&S®EFL210 has been equipped with a test receiver that supports the J.83/B and NTSC cable TV standards.

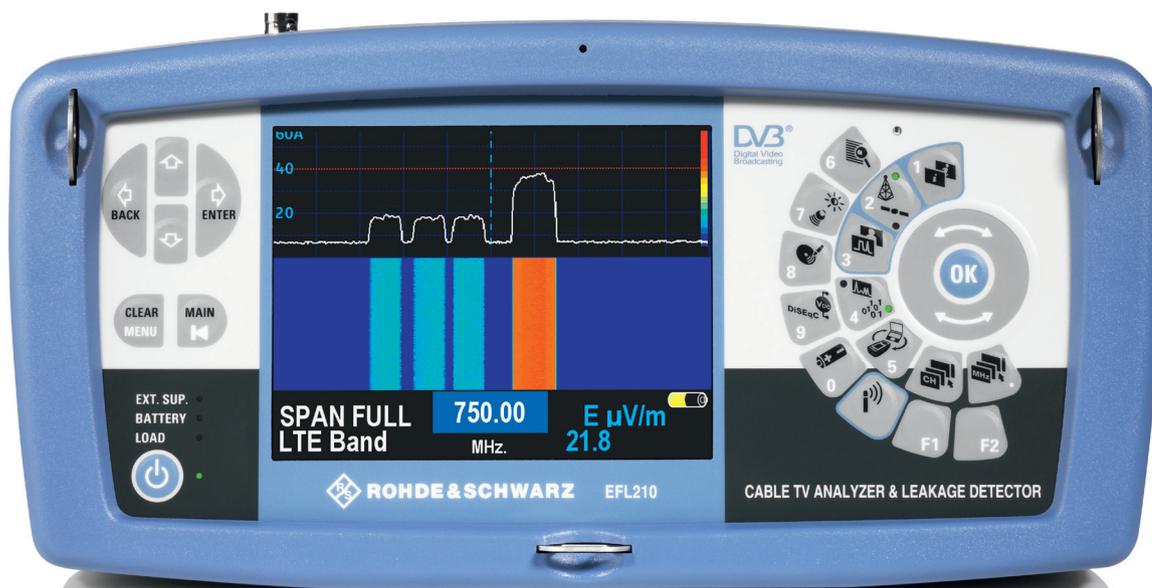
The R&S®EFL110/210 receiver offers unprecedented sensitivity in its class and can be used to verify compliance with the strict limits defined by the US FCC regulatory authority. The R&S®EFL110/210 can be operated as a spectrum analyzer and as an FFT analyzer. The spectrogram display of measurement results makes it possible to detect even sporadic interference and simplifies working with a directional antenna. A directional antenna suitable for the UHF and VHF band is available as an accessory.

Field measurements must be fast and simple. The R&S®EFL110/210 helps in many ways: Its clear-cut, ergonomic keypad allows intuitive operation. Preinstalled channel tables save valuable time when entering parameters. The supplied R&S®EFL-Suite software transfers measurement results saved in log files to a PC.

The R&S®EFL110/EFL210 has been optimized for mobile use. It is compact, lightweight and robust, and its lithium-ion battery supplies power for more than four hours of operation. The instrument and its wide range of accessories come in a carrying bag.

Key facts

- Frequency range from 5 MHz to 2500 MHz
- Minimum detectable signal level 11 uV/m in E-UTRA bands 12, 13, 14 and 17
- Minimum detectable signal level 19 uV/m in aeronautical radio band from 108 MHz to 139 MHz
- Battery operation > 4 h



R&S®EFL110/ R&S®EFL210 Cable TV Analyzer and Leakage Detector

Benefits and key features

Detection and localization of radiated emissions from cable TV networks

- ▮ High sensitivity for detecting weak interference sources
- ▮ FFT signal analysis with spectrogram display
- ▮ Dualband VHF/UHF directional antenna for locating interference sources

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Extensive measurement functions for digital and analog cable TV signals

- ▮ Test receiver for digital and analog cable TV
 - MER, BER and constellation diagram
 - Videoscope function for analog TV
- ▮ MPEG decoding and video display
 - MPEG-2 and MPEG-4
 - SD and HD
- ▮ Spectrum measurements with zoom function and Combo mode
 - Spectrum analysis up to 2500 MHz
 - Spectrum, measurement results and video at a glance

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Leakage detection in cable TV networks

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Model overview

	Interference detection		Test receiver for cable TV	
	FFT analyzer	Spectrogram display	Analog	J.83/B
R&S®EFL110	•	•	–	–
R&S®EFL210	•	•	•	•

Detection and localization of radiated emissions from cable TV networks

High sensitivity for detecting weak interference sources

Even low-level interference sources can considerably affect the operation of wireless communications networks. Interference with security-relevant services is particularly problematic. The FCC has therefore defined strict limits for radiated emissions in the VHF aeronautical radio band. Limits for the UHF band have recently been introduced to prevent interference between cable TV and LTE networks. A sensitive test receiver is necessary to verify compliance with these limits. The R&S®EFL110/210 has been optimized specifically for this task. Equipped with the appropriate antenna, the R&S®EFL110/210 can reliably detect radiated emissions that violate these limits, even from a distance.

FFT signal analysis with spectrogram display

Fast recording and on-screen representation of measurement results are the key to reliably detecting radiated emissions and sporadic interference. Narrowband sweep spectrum analyzers are too slow. FFT analysis is the right method for this task.

In addition to a spectrum analyzer, the R&S®EFL110/210 offers an FFT analyzer with an FFT bandwidth of 20 MHz. With a measurement range of up to 100 MHz, the FFT analyzer can measure the entire LTE frequency band simultaneously. The currently measured spectrum is displayed at the top of the screen. The lower part of the screen contains a spectrogram display in which even sporadic effects are visually captured, making it easy to locate the source of interference. The autorange function is especially useful as it optimally adapts the spectrogram's color coding to the currently measured level range.

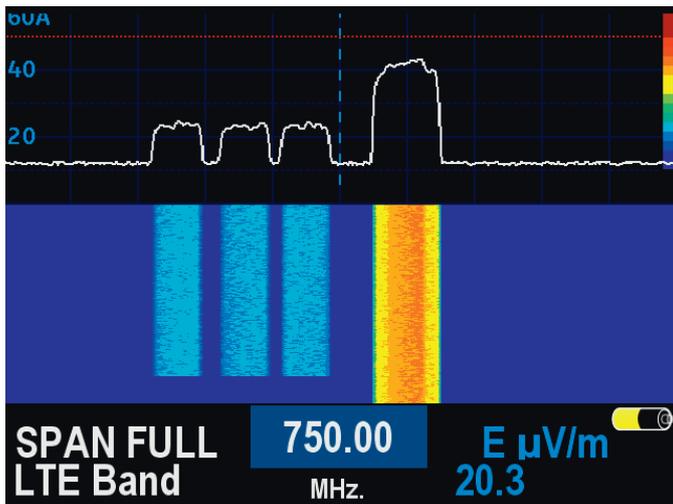
Dualband VHF/UHF directional antenna for locating interference sources

Simply detecting radiated emissions is not enough; it is also necessary to locate their source. This can be achieved using a directional antenna. Rohde&Schwarz offers the R&S®EFL-Z100 VHF/UHF directional antenna as an accessory. The antenna has been optimized for measurements in the aeronautical radio band and the 700 MHz band. In the UHF band, the R&S®EFL-Z100 operates as an active antenna. The two VHF dipoles can be removed. The K factor of the R&S®EFL-Z100 is preinstalled in the R&S®EFL110/210. The R&S®EFL110/210 permits users to enter their own K factors and use any suitable antenna.

R&S®EFL-Z100 VHF/UHF directional antenna.

Frequency range	Field strength limits of radiated emissions in line with FCC 47 C.F.R.
$f \leq 54$ MHz	15 μ V/m at a distance of 30 m
54 MHz < $f \leq 216$ MHz, includes the 108 MHz to 139 MHz aeronautical radio band	20 μ V/m at a distance of 3 m
$f > 216$ MHz, includes the 700 MHz to 800 MHz LTE band	15 μ V/m at a distance of 30 m

FFT signal analysis with spectrogram display.



Extensive measurement functions for digital and analog cable TV signals

Test receiver for digital and analog cable TV

The R&S®EFL210 analyzes digital QAM TV signals for J.83/B. It measures level, C/N, MER, and BER before and after Reed-Solomon, and outputs a user-defined quality indicator for each parameter. This provides users with a quick overview of signal quality. The constellation diagram allows a detailed analysis. To capture and record the signal quality over an extended period of time, the R&S®EFL210 test receiver is equipped with a counter that continuously counts uncorrected data packets and sync loss events. For analyzing analog TV signals, the R&S®EFL210 features a videoscope function, level, V/A and C/N measurements, as well as video and audio output for NTSC, PAL and SECAM. The R&S®EFL210 measures the level of FM sound broadcast signals and demodulates the audio signal.

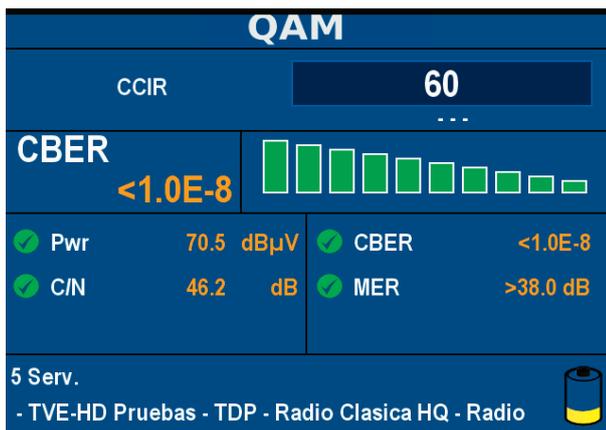
MPEG decoding and video display

The simplest and fastest way to test the quality of a TV signal is to subjectively evaluate the audio and video content. The R&S®EFL210 outputs crystal clear SD and HD videos on its 5.7" TFT color display. It decodes MPEG-2 and MPEG-4, and processes all HD formats up to 1080p. Audio is output via the test receiver's built-in loudspeaker. To test digital baseband signals, the R&S®EFL210 displays NID, PID, SID, service names and service profiles and measures video and audio bit rates.

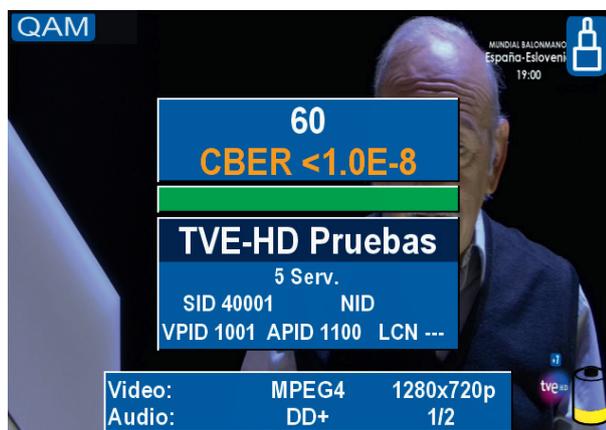
Spectrum measurements with zoom function and Combo mode

The R&S®EFL110/210 includes a spectrum analyzer for the frequency range from 5 MHz to 2500 MHz. The zoom function can be used to expand a subrange of the measured spectrum and to display it in a second trace. In cable TV applications, for example, this makes it possible to display the entire received spectrum with all channels and to simultaneously measure the spectrum of an individual channel in detail. The unique Combo mode simultaneously displays the three operating modes (TV signal analysis, spectrum analysis and video output), allowing the user to see all important information at a glance.

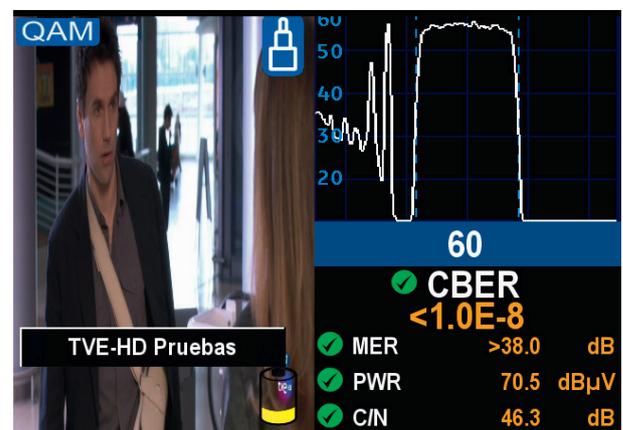
Digital TV analyzer.



Video display with service information and bit rates.



Combo mode display.



Leakage detection in cable TV networks

Since the digitization of terrestrial TV, many countries have discontinued TV broadcasting in the UHF range. The freed-up frequencies are now available as digital dividend for other services such as LTE. Since cable TV continues to use the UHF band, leakage in cable TV networks will become the most frequent cause of interference in LTE networks. The R&S®EFL110/210 is the ideal tool for detecting this leakage.

The R&S®EFL110/210 can be carried using a shoulder and waist strap so that users have both hands free for working with the antenna. When the directional antenna points at an interference source, the R&S®EFL110/210 immediately registers an increase in level. The measured value is visible for a while in the spectrogram display, allowing users to see radiated emissions that were only briefly indicated by the antenna. Using the spectrogram, users can move the antenna back until the interference is visible again and the antenna points to the source (see figure below). Users follow the antenna movement with their eyes, and the R&S®EFL110/210 supports them by generating an acoustic signal. The pitch of the tone is proportional to the measured field strength.

Once the source of interference is detected and corrected, the R&S®EFL210 TV test receiver can be used for a final test of the TV signal quality.

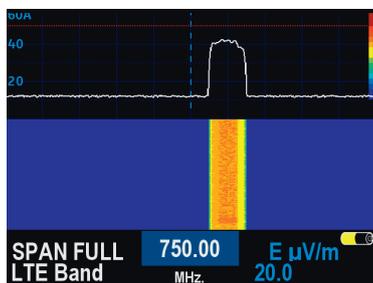
The R&S®EFL110/210 is small, lightweight and robust and has been optimized for outdoor use. Its 5.7" display adapts itself to the ambient brightness and is always clearly visible. A special daylight mode makes it possible to read the display even in bright sunlight.

Leakage detection with the R&S®EFL110/210 and the R&S®EFL-Z100.



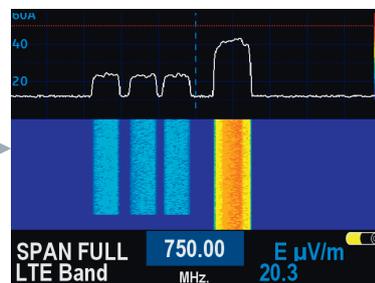
Locating the source of interference

Nothing found



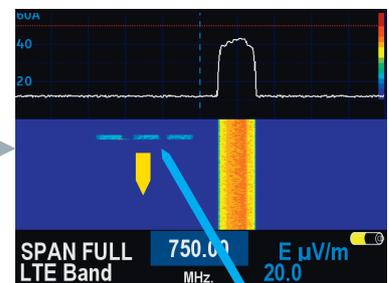
Move
antenna

Antenna pointing at the leak



Move
antenna

You have passed the leak!



Move the antenna back

Previously detected interference slowly moving down the waterfall.

Specifications in brief

Specifications in brief		
FFT analyzer		
Frequency bands	FM radio band	80 MHz to 108 MHz
	aeronautical radio band ¹⁾	108 MHz to 139 MHz
	VHF/UHF band	139 MHz to 700 MHz
	700 MHz LTE band ¹⁾	700 MHz to 800 MHz
	GSM band	800 MHz to 950 MHz
	WiFi band	2400 MHz to 2500 MHz
Minimum detectable signal with R&S®EFL-Z100		
In the aeronautical radio band	RBW 18 kHz, 10 MHz span	19 µV/m
In the 700 MHz LTE band	RBW 18 kHz, 10 MHz span	11 µV/m
FFT analysis	maximum span	100 MHz
	FFT bandwidth	20 MHz
	marker functions	peak search, peak to center, delta
Graphical display	split screen	FFT spectrum and waterfall
Acoustic signal	built-in loudspeaker	pitch of tone proportional to measured field strength
Spectrum analyzer		
Frequency range		5 MHz to 2500 MHz
Span		100 kHz to 2500 MHz
Bandwidth	resolution bandwidth	300 Hz to 6.4 MHz
	video bandwidth	100 Hz to 1 MHz
Level	maximum level	22 dBm
	setting range	-105 dBm to +20 dBm
Sensitivity	RBW 800 kHz, 100 MHz span	≤ -88 dBm
	RBW 36 kHz, 5 MHz span	≤ -100 dBm
Trace function	2 traces	max. hold, min. hold
Markers	3 markers	peak, search, delta
TV test receiver (only R&S®EFL210)		
Measurement functions	digital: J.83/B	level, C/N, MER, BER, constellation, MPEG, video and audio output
	analog: NTSC, PAL, SECAM	videoscope, level, V/A, C/N, video and audio output
General		
Temperature range	operating	0°C to +40°C
	permissible	-10°C to +45°C
Dimensions	W x H x D	302 mm x 148 mm x 120 mm (11.89 in x 5.83 in x 4.72 in)
Weight	with battery	2.48 kg (5.47 lb)

¹⁾ The instrument is optimized for maximum sensitivity in the aeronautical band and in the 700 MHz LTE band.

Ordering information

Designation	Type	Order No.
Base unit²⁾		
Cable TV Leakage Detector	R&S®EFL110	2116.8968.02
Cable TV Analyzer and Leakage Detector	R&S®EFL210	2116.8974.02
External accessories		
VHF/UHF Directional Antenna	R&S®EFL-Z100	2116.9158.02
Rain Cover	R&S®EFL-Z1	2116.9087.00

²⁾ Including carrying bag, two carrying straps, rechargeable battery, power cable, battery charger, 12 V car adapter, RF adapter set, SD card, USB cable, software and operating manual on CD.

Service you can rely on

- | Worldwide
- | Local and personalized
- | Customized and flexible
- | Uncompromising quality
- | Long-term dependability

About Rohde & Schwarz

Rohde & Schwarz is an independent group of companies specializing in electronics. It is a leading supplier of solutions in the fields of test and measurement, broadcasting, radiomonitoring and radiolocation, as well as secure communications. Established more than 75 years ago, Rohde & Schwarz has a global presence and a dedicated service network in over 70 countries. Company headquarters are in Munich, Germany.

Environmental commitment

- | Energy-efficient products
- | Continuous improvement in environmental sustainability
- | ISO 14001-certified environmental management system

Certified Quality System
ISO 9001

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