20 MHz demodulation bandwidth for level measurement

The R&S®EB500 offers level measurement of signals with 20 MHz bandwidth.

Your task

For wideband signals, which often have bandwidths larger than 10 MHz, it is critical to have sufficient demodulation bandwidth to obtain accurate level measurements.

A regulator frequently needs to monitor the signal transmitted by mobile operators, broadcasting and other communications providers to check that they are transmitting within the effective radiating power (ERP) limit and frequency range. If the transmitted power level exceeds the permitted threshold, it might interfere with other wireless communications devices which can be disruptive and annoying. It is also common for a service or broadcasting provider to self-monitor the transmitted signal for coverage optimization.

Monitoring solution

The compact R&S®EB500 monitoring receiver with excellent RF parameters is equipped with various useful functions to aid users in their daily monitoring tasks. To accurately measure RF level, an appropriate measurement detector (e.g. peak detector, RMS detector, average detector and fast detector) and the measurement bandwidth are essential. For direct level measurements on modulated signals, the measurement bandwidth has to be at least as wide as the occupied signal bandwidth. The R&S®EB500 has four different measurement detectors to interpret or weight the RF level. It uses demodulation bandwidth as the widest available measurement bandwidth for level reading.

The monitoring receiver has 34 IF filters where the demodulation bandwidth ranges from 100 Hz to 20 MHz. It supports the necessary measurement bandwidth for all of the common radio systems listed in ITU Handbook, edition 2010, table 4.3-1.

Necessary measurement bandwidths (source: ITU Handbook, edition 2010, table 4.3-1)

System	Necessary measurement bandwidth	Remarks
AM double sideband	9 or 10 kHz	Narrowband (voice) transmissions
AM single sideband	2.4 kHz	Narrowband (voice) transmissions
FM narrowband with a channel spacing of: 12.5 kHz 20 or 25 kHz	 7.5 kHz 12 kHz	
FM sound broadcasting	120 kHz	Maximum occupied bandwidth is 180 kHz, but nearly all of the energy lies within 120 kHz
T-DAB, T-DMB	1.5 MHz	
Analogue TV	120 kHz	Although occupied bandwidth is higher, nearly all energy is in the vision carrier for which 120 kHz is sufficient
Digital terrestrial TV	6, 7 or 8 MHz	Equal to the channel bandwidth used
TETRA	30 kHz	
GSM	300 kHz	Although common channel spacing is 200 kHz, the occupied bandwidth of GSM signals is higher
UMTS	4 MHz	
WiMAX, LTE	3, 5, 10 or 20 MHz	Depending on system configuration (equal to maximum emission bandwidth)

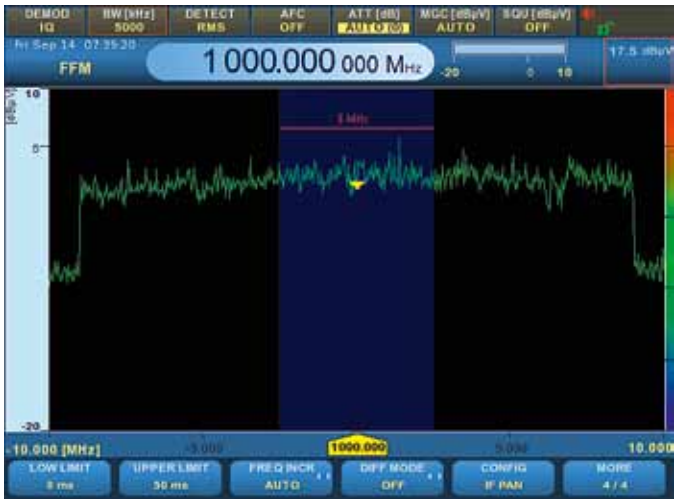
Applications

DVB-T2: broadcasting example

DVB-T2 is the second-generation digital terrestrial television standard. A typical DVB-T2 channel bandwidth is 8 MHz. To make it suitable for professional use, for example for transmission between radio cameras and mobile studios, a 10 MHz option is included. To effectively measure the signal level, the monitoring receiver has to set the demodulation bandwidth to at least 8 MHz or 10 MHz respectively to achieve an accurate level reading. The broadcasting provider then monitors an end-user received signal at some distance from the transmitter and simultaneously monitors interference.

LTE: mobile communications example

The latest mobile technology, LTE, can be deployed in spectrums with bandwidths as wide as 20 MHz. In RSSI (received signal strength indicator) measurements, the RF power is effectively distributed over the entire measurement bandwidth. Using the R&S®EB500, the RSSI can be easily determined. In the test setup, a signal generator (e.g. R&S®SMU200A) is connected to the R&S®EB500, simulating LTE modulated signal at 1 GHz with power level at 23.0 dBµV. As can be seen below, where the demodulation bandwidth is set to 5 MHz, the measured RSSI is 17.5 dBµV. With the demodulation bandwidth set equivalent to the spectrum bandwidth, the measured RSSI (22.8 dBµV) is more accurate (cable loss considered).



R&S®EB500 – capturing LTE signal with 5 MHz demodulation bandwidth.

R&S®EB500 – capturing LTE signal with 20 MHz demodulation bandwidth.

Specifications		
Frequency range	base unit	20 MHz to 3.6 GHz
	with R&S®EB500-HF option	9 kHz to 3.6 GHz
	with R&S®EB500-FE option	20 MHz to 6 GHz
Level measurement		
Signal level		–30 dBµV to 120 dBµV, resolution 0.1 dB
Level accuracy		max. +3 dB, typ. +1 dB
Level detector		avg, peak, fast, RMS
IF bandwidths		
Bandwidth	demodulation, level and offset measurements (3 dB bandwidth), 34 filters	100/150/300/600 Hz, 1/1.5/2.1/2.4/2.7/3.1/4/4.8/6/9/12/15/30/50/120/150/250/300/500/800 kHz, 1/1.25/1.5/2/5/8/10/12.5/15/20 MHz

Designation	Type	Order No.
Monitoring Receiver, with control front panel	R&S®EB500	4072.5004.03
Monitoring Receiver, without control front panel	R&S®EB500	4072.5004.02

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