

Descripton

The new Full-Compliance ERX-6 EMI test receiver from Frankonia is suitable for mobile use as well as for use in systems. The ERX-6 offers a very high measuring speed so that e.g. the measurement is reduced from hours to seconds with the Quasipeak detector for emission measurements. By default, the ERX-6 is equipped with hardware that significantly accelerates the measurement according to the standards CISPR 16-1-1 Ed 3.1 and MIL461G (FFT-based measuring instrument). For standards that do not provide acceleration using the FFT-based measuring instrument, the ERX-6 has a classic stepped scan mode. In addition, it is possible to perform measurements at individual frequency points, as described e.g. at the final maximization. In conjunction with the PROVE-EMC software, the receiver can significantly improve the measurement quality and reduce the test times in conjunction with the antenna mast and turntable. Due to the excellent noise floor of <-12 dBuV (band C / D) or -3 dBuV (band E) even difficult measuring tasks can be solved, without the need for an external preamplifier. The functional scope is rounded off by a very fast spectrum analyzer as well as a high-resolution scope function.



Why FFT?

- » EMI testing is time consuming
- » Complex devices show a lot of different operation modes
- » Introduction of FFT-based measuring instruments in CISPR 16-1-1 in 2010
- » Introduction of new measurement strategies in CISPR 16-2-X in 2010
- » FFT-based measuring instruments are also validly in further standards e.g. MIL-STD 461 and ETSI standards

Frequency Range

ERX-6	Spectral purity
10 Hz - 6 GHz	<ul style="list-style-type: none"> - SSB phase noise frequency = 500 MHz, carrier offset - 100 Hz < -100 dBc (1 Hz) - 1 kHz < -107 dBc (1 Hz) - 10 kHz < -101 dBc (1 Hz) - 100 kHz < -126 dBc (1 Hz) - 1 MHz < -146 dBc (1 Hz) - 10 MHz < -150 dBc (1 Hz) (nom.) - Residual FM frequency = 500 MHz, RBW = 1 kHz, Sweep time = 100 ms < 3 Hz (nom.)
Operating modes	Reference Oscillator:
<ul style="list-style-type: none"> - EMI receiver (superheterodyne) - EMI receiver (FFT-based measuring instrument) - Spectrum analyzer - Oscilloscope (up to 1 GHz) 	<ul style="list-style-type: none"> - Reference oscillator OCXO Aging $< +/- 3.5$ ppm / 15 years Temperature drift (0 – 60° C) $< +/- 1 \times 10e-8$ SSB phase noise (1 Hz BW): 1 Hz -95 dBc/Hz (12.8 MHz) 10 Hz -120 dBc/Hz 100 Hz -140 dBc/Hz 1 kHz -145 dBc/Hz - Frequency resolution 0.01 Hz

EMI Receiver

Frequency readout (Analyzer mode)

- Marker resolution 0.5 Hz
- Uncertainty $\pm(\text{marker frequency} \times \text{reference accuracy} + 10\% \times \text{resolution bandwidth} + \frac{1}{2}(\text{span}/(\text{sweep points} - 1)) + 0.5 \text{ Hz})$
- Spectrum analyzer 1 to 8 000 000 (64 bit operation system)
- EMI measurement 1 to 8 000 000 (64 bit operation system)
- Marker tuning frequency step size marker step size = sweep points span/(sweep points - 1)
- Marker step size = standard span/(default sweep points - 1)
- Frequency counter resolution 0.001 Hz
- Count accuracy $\pm(\text{frequency} \times \text{reference accuracy} + \frac{1}{2}(\text{last digit}))$
- Display range for frequency axis 0 Hz, 10 Hz to max. frequency
- Resolution 0.1 Hz
- Max. span deviation $\pm 0.1\%$

Receiver scan

- Scan scan with max. 100 subranges with different settings
- Scan modes normal scan, FFT-based measuring instrument according to CISPR 16-1-1
- Measurement time superhet scan, per frequency 1 μs to >100 s
- Measurement time FFT-based measuring instrument, per frequency 1 μs to >100 s
- Number of trace points up to 8 000 000
- Frequency step size normal scan min. 1 Hz
- Frequency step size FFT-based measuring instrument min. 1 Hz

EMI Receiver FFT-based Measuring Instrument

Frequency segment processed in parallel

- RBW = 10 Hz 0.08 MHz
- RBW = 100 Hz 0.8 MHz
- RBW = 200 Hz 1.6 MHz
- RBW = 1 kHz 8.1 MHz
- RBW = 9 kHz 81 MHz
- RBW = 10 kHz 81 MHz
- RBW = 120 kHz 162.5 MHz
- RBW = 100 kHz 162.5 MHz
- RBW = 1 MHz 162.5 MHz

Scanning Speed (Receiver Mode) typ.:

- Band A, Quasi-peak, dwell time 1 s : 3 s
- Band B, Quasi-peak, dwell time 1 s : 3 s
- Band C/D Quasi-peak, dwell time 1 s : 50 s
- Band E (1 GHz – 6 GHz), dwell time 100 ms: 3,5 s

FFT-Overlapping Factor

- according to CISPR 16-1-1 and CISPR 16-3
- Overlapping factor typ > 95%

FFT-based measuring instrument according to CISPR 16-1-1, MIL461 and other EMC standards. Sometimes called time-domain scan.

Preselection and Preamplifier Structure

- Multiple paths with fixed filters

Analog Preselection

- 10 Hz – 9 kHz
- 9 kHz – 150 kHz
- 150 kHz – 30 MHz
- 30 MHz – 325 MHz
- 325 MHz – 1 GHz
- 1 GHz – 3 GHz
- 3 GHz – 6 GHz

Preamplifier	Digital Preselection
<ul style="list-style-type: none"> - Located between preselection and ADC & mixer - Individual pre-amps for different frequency ranges - Gain: Typ. 20 dB, full overrange detection and auto attenuation - Noise figure: Typ 3.5 dB - Frequency range: 10 Hz - 6 GHz 	<ul style="list-style-type: none"> - 0 MHz – 162.5 MHz - 162.5 MHz – 325 MHz - 325 MHz - 487.50 MHz - 487.50 MHz - 650 MHz - 650 MHz - 812.50 MHz - 812.50 MHz – 975 MHz - 975 MHz – 1 GHz
Low Noise Amplifier	
<ul style="list-style-type: none"> - 30MHz - 6 GHz, Noise Figure < 4dB 	
Spectrum Analyzer	
Spectrum Analyzer	IF Bandwidths
<ul style="list-style-type: none"> - Sweep time range span = 0 Hz, 1 μs to 16000 s - Span \geq 10 Hz, swept 1 us to 16000 s - Span \geq 10 Hz, FFT based measuring instrument 1 μs to 16000 s - Sweep time accuracy span = 0 Hz \pm0.1 % (nom.) - Span \geq 10 Hz, swept \pm1 % (nom.) 	<ul style="list-style-type: none"> - 3dB bandwidth: 1 Hz – 30 MHz - 1, 2, 3, 5 steps - Small step size (145 steps) for channel measurments - 6dB bandwidths CISPR: 200 Hz, 9 kHz, 120 kHz, 1 MHz - 6dB bandwidths MIL/DO: 10 Hz, 100 Hz, 1 kHz, 100 kHz, 1 MHz
Video filter	Detectors (Video filter off / 3 RBW)
<ul style="list-style-type: none"> - Relative IF bandwidth: - 1, 1/2, 1/5, 1/10, 1/20, 1/50, 1/100, 1/1000, 1/10000, 1/ 100000 - Detectors: MaxPeak, MinPeak, Sample 	<ul style="list-style-type: none"> - Maxpeak, Average, RMS - Dynamic requirements according to CISPR 16-1-1 (Peak, AVG)
Level	Intermodulation
<ul style="list-style-type: none"> - Display range displayed noise floor up to +30 dBm - Maximum DC input level, pulse 6 V (0dB Att) - RF-CW signal 120 dBμV (13 dBm) 	<ul style="list-style-type: none"> - 1dB Compression Point of Mixer f < 1 GHz f > 1 GHz - Third order Intercept Point (TOI) 10 Hz – 6 GHz Typ. > 20dBm - Second Harmonic Intercept Point (SHI) 10 Hz – 6 GHz Typ. > 55dBm
Displayed Average Noise Level RF attenuation 0dB, normalized to 1 Hz RBW, mean marker (typ.)	
<ul style="list-style-type: none"> - 9 kHz – 150 kHz: - 130 dBm - 150 kHz – 1 MHz: - 154 dBm - 1 MHz – 30 MHz: - 161 dBm - 30 MHz – 1000 MHz: - 163 dBm (LNA off) - 169 dBm (LNA on) - 1000 MHz – 6 GHz: - 164 dmb (LNA off) - 170 dBm (LNA on) 	

Noise Indication

RF attenuation 0dB, RBW according to CISPR 16-1-1, mean marker (typ.)

- 9 kHz – 150 kHz: < 0 dBuV
- 150 kHz – 1 MHz: < -5 dBuV
- 1 MHz – 30 MHz: < -18 dBuV
- 30 MHz – 1000 MHz: < -6 dBuV (LNA off)
< -12 dBuV (LNA on)
- 1000 MHz – 6 GHz: < 4 dBuV (LNA off)
< -3 dBuV (LNA on)

Level Measurement Uncertainty

CISPR Indication Range

- 6 dB margin to noise floor over complete amplitude range according to CISPR 16-1-1 Ed. 3.1
- Quasi-peak indication according to CISPR 16-1-1: All pulse repetition frequencies
- Peak, Average, CISPR-AVG indication according to CISPR 16-1-1 in all modes
- CISPR-RMS indication according to CISPR 16-1-1
- Maximum deviation for sinusoidal signals according to CISPR 16-1-1: 2dB (9 kHz – 6 GHz)

Absolute level uncertainty

- Signal level : 40 – 60 dBuV (15 MHz) < 0.3 dB ($\sigma = 0.1$)
- Frequency response (9 kHz – 6 GHz) < 0.5 dB ($\sigma = 0.15$)
- Attenuator switching uncertainty (15 MHz) < 0.2 dB ($\sigma = 0.15$)
- Total measurement uncertainty CW signal, S/N > 20 dB 95 % confidence level: 0.5 dB

Spurious Response

- Residual spurious response RF attenuation = 0 dB
- $f \leq 1$ MHz < -107 dBm
- $f \leq 1$ MHz < -117 dBm
- $f > 1$ MHz < -112 dBm
- Image frequency < -80 dBc (nom.)

Time Domain Analysis (RF)

- 1 GHz bandwidth
- 2.6 GS/s sampling rate
- Acquisition memory: 32000 samples
- Trigger edge, post- and pre-trigger function, Amplitude trigger

Attenuator

- 0 - 50 dB
- 10 dB steps

General Data

Input Ports (RF Input)

- N type connector, 50 Ohm
- 0 dB attenuator: VSWR < 2.0 (9 kHz - 1 GHz)
- 10 dB attenuator: VSWR < 3.0 (1 GHz - 6 GHz)

Remote Control

- Remote control command set according to SCPI standard

PC

- Mobile Dual Core processor, 4 GByte RAM, >35 GByte Solid State Disc
- Operation system: Windows® 7, 64Bit

Power Supply

- +11 V .. +14 V DC, 230 V +/-20 % 50 Hz or 110 V +/- 10% 60 Hz
- Max. power consumption approx. 60 W

Interfaces

- Ethernet/LAN, USB, VGA, HDMI, Audio

Display, User Interface

- Resolution 800 x 600 Pixel, 8,4", TrueColor (16.78 Mio. colors), Touchscreen

Weight

- approx. 8 kg