

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

### 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  $\mu\text{s}$  to >100 s
- Measurement time FFT-based measuring instrument, per frequency 1  $\mu\text{s}$  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

<b>Preamplifier</b>	<b>Digital Preselection</b>
<ul style="list-style-type: none"> <li>- Located between preselection and ADC &amp; mixer</li> <li>- Individual pre-amps for different frequency ranges</li> <li>- Gain: Typ. 20 dB, full overrange detection and auto attenuation</li> <li>- Noise figure: Typ 3.5 dB</li> <li>- Frequency range: 10 Hz - 6 GHz</li> </ul>	<ul style="list-style-type: none"> <li>- 0 MHz – 162.5 MHz</li> <li>- 162.5 MHz – 325 MHz</li> <li>- 325 MHz - 487.50 MHz</li> <li>- 487.50 MHz - 650 MHz</li> <li>- 650 MHz - 812.50 MHz</li> <li>- 812.50 MHz – 975 MHz</li> <li>- 975 MHz – 1 GHz</li> </ul>
<b>Low Noise Amplifier</b>	
<ul style="list-style-type: none"> <li>- 30MHz - 6 GHz, Noise Figure &lt; 4dB</li> </ul>	
<b>Spectrum Analyzer</b>	
<b>Spectrum Analyzer</b>	<b>IF Bandwidths</b>
<ul style="list-style-type: none"> <li>- Sweep time range span = 0 Hz, 1 <math>\mu</math>s to 16000 s</li> <li>- Span <math>\geq</math> 10 Hz, swept 1 us to 16000 s</li> <li>- Span <math>\geq</math> 10 Hz, FFT based measuring instrument 1 <math>\mu</math>s to 16000 s</li> <li>- Sweep time accuracy span = 0 Hz <math>\pm</math>0.1 % (nom.)</li> <li>- Span <math>\geq</math> 10 Hz, swept <math>\pm</math>1 % (nom.)</li> </ul>	<ul style="list-style-type: none"> <li>- 3dB bandwidth: 1 Hz – 30 MHz</li> <li>- 1, 2, 3, 5 steps</li> <li>- Small step size (145 steps) for channel measurments</li> <li>- 6dB bandwidths CISPR: 200 Hz, 9 kHz, 120 kHz, 1 MHz</li> <li>- 6dB bandwidths MIL/DO: 10 Hz, 100 Hz, 1 kHz, 100 kHz, 1 MHz</li> </ul>
<b>Video filter</b>	<b>Detectors (Video filter off / 3 RBW)</b>
<ul style="list-style-type: none"> <li>- Relative IF bandwidth:</li> <li>- 1, 1/2, 1/5, 1/10, 1/20, 1/50, 1/100, 1/1000, 1/10000, 1/ 100000</li> <li>- Detectors: MaxPeak, MinPeak, Sample</li> </ul>	<ul style="list-style-type: none"> <li>- Maxpeak, Average, RMS</li> <li>- Dynamic requirements according to CISPR 16-1-1 (Peak, AVG)</li> </ul>
<b>Level</b>	<b>Intermodulation</b>
<ul style="list-style-type: none"> <li>- Display range displayed noise floor up to +30 dBm</li> <li>- Maximum DC input level, pulse 6 V ( 0dB Att)</li> <li>- RF-CW signal 120 dBV</li> </ul>	<ul style="list-style-type: none"> <li>- 1dB Compression Point of Mixer</li> <li>  f &lt; 1 GHz</li> <li>  f &gt; 1 GHz</li> <li>- Third order Intercept Point (TOI)</li> <li>  10 Hz – 6 GHz Typ. &gt; 20dBm</li> <li>- Second Harmonic Intercept Point (SHI)</li> <li>  10 Hz – 6 GHz Typ. &gt; 55dBm</li> </ul>
<b>Displayed Average Noise Level RF attenuation 0dB, normalized to 1 Hz RBW, mean marker (typ.)</b>	
<ul style="list-style-type: none"> <li>- 9 kHz – 150 kHz: - 130 dBm</li> <li>- 150 kHz – 1 MHz: - 154 dBm</li> <li>- 1 MHz – 30 MHz: - 161 dBm</li> <li>- 30 MHz – 1000 MHz: - 163 dBm (LNA off)</li> <li>                                  -169 dBm (LNA on)</li> <li>- 1000 MHz – 6 GHz: -164 dmb (LNA off)</li> <li>                                  -170 dBm (LNA on)</li> </ul>	

### 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