The TDEMI 1G was the first instrument commercially available providing totally novel methods and leading-edge technology enabling fully gapless real-time measurements. It was the result of several years of research and development to make the instrument suitable and usable for daily EMC testing at the customer’s site. It enables conducted emission measurements, radiated emission measurements as well as the measurement of disturbance power in the frequency range from 9 kHz to 1 GHz. The measurement system can be used for preinvestigations as well as measurements for certification according to CISPR/EN standards.

The TDEMI 1G allows the user to carry out EMI measurements in so far unknown measurement speed. By an ultra high-speed floating-point ADC unit and real-time signal processing the TDEMI system is by a factor of 4000 faster than traditional EMI receivers.

In contrast to a traditional superheterodyne receiver that performs the scan by a sequential measurements at several thousand frequencies the TDEMI Measurements System uses a baseband bandwidth of 1 GHz. The signal is digitized and the spectrum is calculated by the short-time Fast Fourier Transform (STFFT) which corresponds to a bank of IF filters. By this way the total test time is reduced by orders of magnitude. The total test time for a single measurement in the full frequency range up to 1 GHz in the quasi-peak detector mode is less than two minutes while the measurement is performed at all frequencies.

By a multi-resolution ultra high-speed analog-to-digital converter system the required dynamic range for pulses according to CISPR 16-1-1 is achieved. An autorange attenuator and optional features like preselection band A and band B enhance the dynamic range up to 140 dB. An automated measurement, generation of test reports for conducted and radiated measurements and also for the measurement of disturbance power is performed by the measurement software of the TDEMI or as well as by an external automation software. The automated evaluation and documentation according to CISPR 16-2-1 and CISPR 16-2-2 is done by a report generator. The instrument can be operated via a touchscreen or remotely via TCP/IP.

Fig. 23 – Measurement of ambient noise in the frequency range from 30 MHz to 1 GHz.
### TDEMI 1G Specifications

#### FREQUENCY RANGE
150 kHz – 1 GHz, 9 kHz – 1 GHz (with Option LF - UG1G)

#### REFERENCE (OCXO)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aging</td>
<td>&lt; ± 3.5 ppm / 15 years</td>
</tr>
<tr>
<td>Temperature Drift (0...60°C)</td>
<td>± 1 x 10e-8</td>
</tr>
<tr>
<td>SSB Phase Noise (1 Hz BW)</td>
<td>1 Hz</td>
</tr>
<tr>
<td>(typ. @ 12.8 MHz)</td>
<td>-95 dBc/Hz</td>
</tr>
<tr>
<td></td>
<td>10 Hz</td>
</tr>
<tr>
<td></td>
<td>-120 dBc/Hz</td>
</tr>
<tr>
<td></td>
<td>100 Hz</td>
</tr>
<tr>
<td></td>
<td>-140 dBc/Hz</td>
</tr>
<tr>
<td></td>
<td>1 kHz</td>
</tr>
<tr>
<td></td>
<td>-145 dBc/Hz</td>
</tr>
</tbody>
</table>

#### RECEIVER MODE (CISPR Standard)

- **IF Bandwidth 200 kHz Band A**
  - IF Filter: Gaussian Shaped Filter, Specifications according to CISPR 16-1-1, Bandwidth Deviation < 10 %
  - Detector Modes: Peak, Quasi-Peak, Average, RMS, CISPR-AV
  - Displayed Average Noise Level (Input Level < 65 dBμV Sinus): < -15 dBμV (typ. -19 dBμV)
  - Measurement at 1024 Frequencies in parallel
  - Frequency Step < 800 Hz

- **IF Bandwidth 9 kHz**
  - IF Filter: Gaussian Shaped Filter, Specifications according to CISPR 16-1-1, Bandwidth Deviation < 10 %
  - Detector Modes: Peak, Quasi-Peak, Average, RMS, CISPR-AV
  - Displayed Average Noise Level (Input Level < 65 dBμV Sinus): < -15 dBμV (typ. -15 dBμV)
  - Measurement at 4096 Frequencies in parallel

- **IF Bandwidth 120 kHz**
  - IF Filter: Gaussian Shaped Filter, Specifications according to CISPR 16-1-1, Bandwidth Deviation < 10 %
  - Detector Modes: Peak, Quasi-Peak, Average, RMS, CISPR-AV
  - Displayed Average Noise Level (Input Level < 65 dBμV Sinus): < -6 dBμV (typ. -6 dBμV)
  - Measurement at 1024 Frequencies in parallel
  - Frequency Step < 800 Hz

- **IF Bandwidth 1 MHz**
  - IF Filter: Gaussian Shaped Filter, Specifications according to CISPR 16-1-1, Bandwidth Deviation < 10 %
  - Detector Modes: Peak, Quasi-Peak, Average, RMS, CISPR-AV
  - Displayed Average Noise Level (Input Level < 65 dBμV Sinus): < 0 dBμV (typ. -3 dBμV)
  - Frequency Step < 100 Hz

#### WEIGHTED AVERAGE TIME-SPECTRUM PROGRAM

<table>
<thead>
<tr>
<th>Time-domain</th>
<th>Frequency</th>
<th>Frequency Step Interpolation</th>
<th>Frequency Span</th>
<th>Minimum Time Step</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fully gapless</td>
<td>158 kHz for 120 kHz</td>
<td>1.2 MHz for 1 MHz</td>
<td>&gt; 150 MHz</td>
<td>50 ms</td>
</tr>
<tr>
<td></td>
<td>40 kHz for 120 kHz</td>
<td>300 kHz for 1 MHz</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### TIME-DOMAIN ANALYSIS (RF)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bandwidth</td>
<td>1 GHz</td>
</tr>
<tr>
<td>Sampling Rate</td>
<td>2.6 GS/s</td>
</tr>
<tr>
<td>Acquisition Memory</td>
<td>32000 Samples</td>
</tr>
</tbody>
</table>

#### ABSOLUTE MAXIMUM RATINGS (ATTENUATION 0 dB)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum DC Input Level, Pulse</td>
<td>6 V</td>
</tr>
<tr>
<td>RF-CW Signal</td>
<td>120 dBμV</td>
</tr>
</tbody>
</table>

#### ATTENUATOR
0 – 70 dB, 10 dB Steps, Auto Attenuation
max. Input Power for Attenuation > 15 dB: 1 W CW

#### INTEMODULATION, NONLINEARITIES

- **CW Signals**: Two tone
  - < -40 dB (typ. -53 dB)
  - Harmonics (> 40 dBμV, > 1 MHz)
  - < -40 dB (typ. -50 dB)
  - Inherent Reception Points: < -40 dB (typ. -50 dB)
  - Total Dynamic Range (120 kHz IF Bandwidth) > 140 dB

#### INHERENT RECEPTION POINTS (ATTENUATION 0 dB)

- Inherent Reception Point 1/4 ADC Sampling Rate:
  - << 5 dBμV (using Multi-sampling < -15 dBμV)
  - << 25 dBμV (using Multi-sampling < -15 dBμV)

#### MEASUREMENT (1 MHz)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 µs – 60 s (Average, RMS)</td>
<td></td>
</tr>
<tr>
<td>1 µs – infinite (Peak, Quasi-Peak, CISPR-Average, CISPR-RMS-AV (Option))</td>
<td></td>
</tr>
</tbody>
</table>

#### MEASUREMENT ACCURACY

- Sinusoidal Signals (9 kHz – 1 GHz) ± 1 dB
- Pulses according to CISPR 16-1-1

#### RF INPUT

- 50 Ohm
- VSWR < 2.0 (typ. 1.3)
- VSWR < 1.2 typ., with 10 dB Attenuation

#### REMOTE CONTROL, INTERFACES

- Remote control command set according to SCPI Standard
- Ethernet/LAN, USB, RS232, GPIB (Option GPIB-UG), PS/2, VGA, HDMI, Audio

#### DISPLAY, USER INTERFACE

- Resolution 800 x 600 pixels, 8.4”, True Color (16.78 Mio. colors)
- Touchscreen

#### PC

- Intel Core i, 2 GB RAM, 120 GB Hard Disk or higher
- Operating system: Windows XP or Windows 7

#### POWER SUPPLY

- 230 V +/-20%, 50 Hz or 110 V +/-10%, 60 Hz

#### WEIGHT

- ca. 20 kg

#### MAIN OPTIONS

- AT - UG1G: Attenuator 0 – 75 dB, 5 dB Steps, low Noise Figure
- LF - UG1G: Frequency Extension down to 9 kHz (9 kHz – 150 kHz), IF Bandwidth 200 Hz, Quasi-Peak Band A
- PRE - UG: Preselection Band A
- MIL/DO - UG: Frequency Extension down to 10 Hz, IF Bandwidths 10 Hz, 100 Hz, 1 kHz, 10 kHz, 100 kHz, 1 MHz
- LSN - UG: Controller for Measuring Accessories (TTL, SV)
- LSN Cable - UG: Customized Control Cabel for Accessories, e.g. LSN
- TG - UG: Carrying Handle
- PC - UG: Powerful multicore processor (Intel Core i or comparable) for advanced computing power, doubled hard disk capacity, doubled RAM size
- KB - UG: Compact Keyboard incl. Touchpad
- RG - UG: Report Generator
- CAL - UG: Manufacturer Calibration with Certificate
- CALD - UG: DAKks Calibration with Certificate
- CLICK - UG: Click Rate Analyzer, fully integrated
- SLIDE - UG: Software for Disturbance Power Measurements