TDEMI® M & M+

TDEMI® Mobile & TDEMI® Mobile+
Emission measurements everytime everywhere.

GAUSS

Special Features

- 16000x Faster & Safer Pre-certification
- 225 MHz Real-time Bandwidth
- Ultra Compact Design
- 12 V Supply & Battery Pack
- Real-time Spectrum Analyzer
- Upgradeable to Full Compliance

Content

TDEMI® Mobile M & M+

- **Pre-certification testing 16,000x faster than by conventional EMI receivers**
- **+12 V supply and battery pack operation for mobile and on-board testing**
- **112/225 MHz fully gapless real-time analysis bandwidth**
- **Spectrum analyzer and real-time spectrum analyzer**

The new TDEMI® M & M+ measurement systems are setting the new benchmark for pre-certifications, outdoor applications or EMC measurements on-board of cars or other vehicles. While the TDEMI® M can be operated via the USB interface by any Windows® operated laptop or tablet computer, the TDEMI® M+ comes with an embedded PC with a 64 bit operating system and a touchscreen interface for convenient and easy-to-use operation.

The instruments of the TDEMI® M & M+ receiver series are available for the frequency ranges up to 1 GHz, 3 GHz, 6 GHz, and 7 GHz starting at the lower end frequency at 9 kHz each. Additionally these blazing fast measurements can be carried out even starting from 10 Hz optionally (Option MIL/DO-UG). The TDEMI® M & M+ receivers have been optimized for low power consumption and high performance at the same time. With only 60 Watts of power consumption these receiver series still provides a fully gapless real-time bandwidth of up to 225 MHz (Option RTEMI225-UG). The TDEMI® M & M+ can be supplied either by 12 Volts or 110 - 240 Volts or by a battery pack respectively. This flexibility enables to perform on-board testings in vehicles or aircrafts.

The TDEMI® M & M+ series have been designed for the usage for pre-certifications as well as final certifications. The basic instruments fulfill the CISPR 16-1-1 Ed 3.1 and later editions for pulse repetition frequencies down to 10 Hz. With the available options COM-UG, COM2-UG and PRLNA-UG the instrument can be enhanced any time later to even fulfill the isolated impulse test of CISPR 16-1-1 also which is required for full compliance testing of some devices.

The vast variety of functionalities includes a real-time spectrum analyzer up to 225 MHz (Option RTSPA225-UG) real-time analysis bandwidth. Special hardware based on the patented TDEMI® Technology of GAUSS INSTRUMENTS® allow to process real-time bands of up to 225 MHz (Option RTEMI225-UG) fully gapless as required by CISPR 16-1-1. This tough requirement of a probability of intercept of about 300 ps make the TDEMI® M & M+ also a perfect analysis tool to detect, measure and investigate very short or intermittent events.

For EMI testings the TDEMI® M & M+ brings an extremely fast scanning speed. Pre- and full compliance measurements can be carried out by a factor of 16,000 times faster than other solutions. For measurements using the quasi-peak detector the duration of a scan in the range from 30 MHz – 1 GHz is reduced from hours down to 8 seconds, making the TDEMI® M & M+ the absolutely fastest receiver for pre-certifications as well as for full compliance testing in a compact format available on the market. But blazing speed is not the only absolutely unparalleled feature mak-

ing the TDEMI® M & M+ unrivaled. Some more of the outstanding features are e. g. the possibility to run 100 scans, to load an unlimited number of limit lines and transducers, and creating tables with an unlimited number of markers. These features greatly help to make your testing much more efficient and the final test report is generated automatically (Option RG-UG) and you're completely done within just seconds.

For spectrum analysis and real-time spectrum analysis (Option RTSPA*-UG) the TDEMI® M & M+ receivers are setting a new benchmark in their class. The TDEMI® M & M+ provide an excellent noise floor, excellent phase noise (Option OCXO-UG) as well as the recording of spectrograms and visualization as 2D and 3D images.

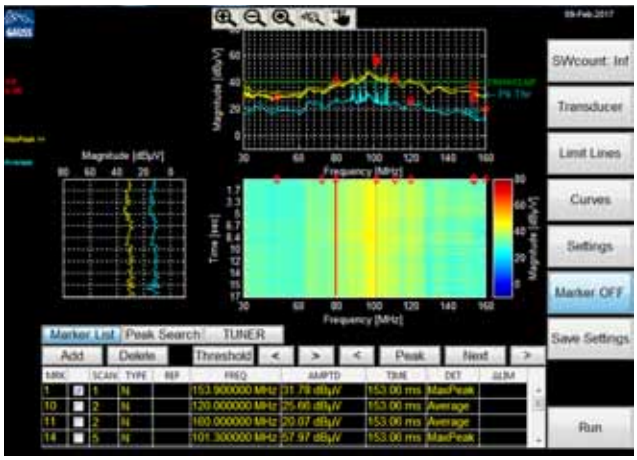

Fig. 1 – **Real-time measurement of spectrogram - two detectors in parallel, time-domain signal and table of markers.**

The fully gapless real-time analysis bandwidth of 225 MHz (Option RTEMI225-UG) of the weighted spectrogram mode makes the TDEMI® M & M+ series leading-edge in the instrumentation market for pre-certification and provides a perfect tool for real-time EMC debugging during your product development and pre-certification testing. It supports the user in detecting, localizing, observing and analyzing emissions as well as in troubleshooting and optimizing circuits, components, sub-systems and/or entire systems. An AM/FM audio-demodulator (Option DM-UG) is very useful e. g. at an open area test site (OATS) for analyzing the ambient noise.

With the TDEMI® M & M+ series your EMC testing according to CISPR, MIL461 DO160 and ETSI standards or any related standards is tremendously accelerated. At the same time highly reliable and reproducible test results with reduced measurement uncertainty ensure a very good correlation with your external certification lab. By not missing any disturbance or emission, e. g. intermittent or even single events you can be sure to pass the final certification also. This saves the additional costs of repeating certification tests and makes the TDEMI® M & M+ the most cost effective solution for your product development and pre-certification process.

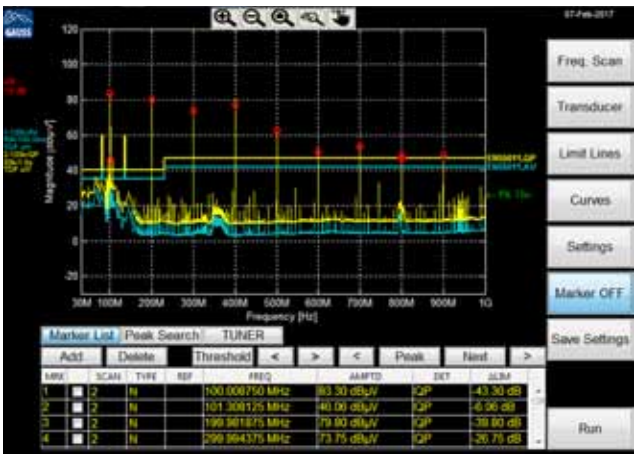

Fig. 2 – **Receiver measurement with table of markers shown, measurement of a comb generator within ambient noise.**

The TDEMI® M & M+ are an absolutely excellent investment for today and for the future. During a first step the TDEMI® M or TDEMI® M+ can be configured as a pre-certification system. When full compliance requirements are showing up e. g. for conducted emissions the instrument can be upgraded for the frequency range (9 kHz – 30 MHz) for full compliance (Option COM-UG). In addition an upgrade for full compliance testing over the complete frequency range is available also (Option COM2-UG, PRLNA-UG). Upgrading of the frequency range or with real-time spectrum analyzer (Option RTSPA*-UG) mode is possible also. With the EMI 64k software suite conducted emission measurements, measurements with the CDNE and disturbance power measurements can be fully automated. For radiated EMI testing in a full anechoic room (FAR), open area test sites (OATS) or in a semi anechoic chamber (SAC) automation routines and drivers for turntable and antenna masts are available. The EMI testing with the GTEM cell can be also fully automated including the generation of the final report.

TDEMI® M

The new TDEMI® M is the perfect super compact solution in combination with a tablet computer, laptop or personal computer (PC). The TDEMI® M is connected just via the USB interface. While the TDEMI® M internally runs FPGAs with a computation power of about 40 state-of-the-art PCs for real-time processing, the final measurement results are transferred via the USB to the external PC or laptop. This concept allows to have fully gapless processing independent from the setup's configuration on the desk, workbench - or where ever.

For outdoor measurements a laptop or tablet computer is a good choice to interface and operate the TDEMI® M, as it provides the maximum flexibility. All basically required functions like limit lines, transducers and report generation and more are available. The software can be installed on several laptops for personalization as well as for data security. All measurement setups, measurement data and measurement results can be stored on the laptop of course. The TDEMI® M does not store internally any of these information, which makes it the perfect tool for multiple users using the instrument applying or creating confidential data.

In a lab e. g. the combination of the 64 bit software with huge memory addressing capabilities as well as a powerful PC allow to process huge measurement data, e. g. the recording of the emissions over several hours or the analysis of discontinuous disturbance (Option CLICK-UG). On the same PC the EMI 64k Automation Software Suite can be installed to fully automate all your EMI testings. Turntable and antenna masts as well as many other equipment can be controlled by it. The TDEMI® M enables you to perform your measurement directly with the final detector, e. g. quasi-peak at several angular positions. Such a procedure is much more reliable than using pre-scanning procedures using the peak detector. But of course also the traditional pre- and final scan method is supported by the software. With the option RF1/RF2 (Option RF1/RF2-UG) in addition to a high sensitivity port also a protected input port for conducted emission measurements is provided. The optional tracking generator (Option MG-UG), which is available over the complete frequency range, allows to perform transmission measurements of cables or filters. An optional battery pack (Option BAT-UG) allows a completely independent operation up to three hours.

TDEMI® M+

The new TDEMI® M+ is the perfect solution as stand-alone instrument. The embedded PC as well as a touchscreen interface makes the instrument the perfect tool for fast and demanding pre-certification measurements.

The very easy-to-use software interface can be operated right by the touchscreen like a smartphone and allows you to work fast and highly efficient - either in the lab or outdoor. In order to process huge data amounts the internal PC, the operating system, and the measurement software itself are all full 64 bit architectures.
For data transfer the PC has several USB interfaces and Gigabit Ethernet as well. Furthermore the instrument can be powered by a battery pack (Option BAT-UG) making it even more flexible and easy to carry it without any need of an external power supply.

The TDEMI® M+ is designed ruggedized for outdoor usage. Only milled housings are used for the all RF as well as digital high-speed modules, to provide the best reliability and temperature stability available on the market. In order to withstand shock and vibrations the PC is by default equipped with a solid state disc.

When it is used in combination with the EMI 64k Software the TDEMI® M+ can be remotely controlled as per SCPI standard command set via the Gigabit Ethernet interface. Such a setup is not limited to pre-certification but is also extendable to a fully automated test environment for full compliance testing (Option COM-UG and COM2-UG as well as option PRLNA-UG) according to the CISPR standards. In such a fully automated test environment using the EMI 64k the blazing speed of the instrument is fully supported also. This absolutely unrivaled speed is not only limited to fast quasi-peak measurements within seconds but also for angular characterizations using peak and average detector in the spectrogram mode. For the measurements according to ETSI standards the spectrum analyzer as well as the real-time spectrum analyzer (Option RTSPA*-UG) can be used in addition.

Specification TDEMI® M & M+

Frequency Range

TDEMI® M1 / M1+	9 kHz - 1 GHz
TDEMI® M3 /M3+	9 kHz - 3 GHz
TDEMI® M6 / M6+	9 kHz - 6 GHz
TDEMI® M7 / M7+	9 kHz - 7 GHz
extendable	down to 10 Hz - 9 kHz, Option MIL/DO-UG

Reference Oscillator (Option OCXO-UG)	› Aging < +/- 3.5 ppm / 15 years › Temperature drift (0 – 60° C) < +/- 1 x 10e-8 SSB phase noise (1 Hz BW): 1 Hz -95 dBc/Hz 10 Hz -120 dBc/Hz 100 Hz -140 dBc/Hz 1 kHz -145 dBc/Hz › Long-term frequency stability < 0.5 x 10^{-8} / year › Temperature drift < 0.5 x 10^{-8} (0–50 °C) › Initial calibration accuracy < 1 x 10^{-8}

Spectral purity	› SSB phase noise frequency = 1 GHz, carrier offset › 100 Hz < –100 dBc (1 Hz) › 1 kHz < –126 dBc (1 Hz) › 10 kHz < –133 dBc (1 Hz) › 100 kHz < –135 dBc (1 Hz) › 1 MHz < –146 dBc (1 Hz) › 10 MHz < –150 dBc (1 Hz) (nom.) › Residual FM frequency = 1 GHz, RBW = 1 kHz, Sweep time = 100 ms < 5 Hz (nom.)

Operating modes	› EMI receiver (superheterodyne) › EMI receiver (FFT-based measuring instrument) › Spectrum analyzer › Real-time EMI receiver (spectrogram) (Option RTEMI*-UG) › Real-time spectrum analyzer (HyperOverlapping) (Option RTSPA*-UG)

EMI Receiver
(CISPR 16-1-1, ANSI C63.2, MIL461, DO-160)
Traditional stepped scan

Frequency readout (Analyzer mode)	› Marker resolution 0.005 Hz › Uncertainty ±(marker frequency × reference accuracy + 10 % × resolution bandwidth + ½ (span/(sweep points – 1)) + 0.5 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 ±(frequency × reference accuracy + ½ (last digit)) › Display range for frequency axis 0 Hz, 10 Hz to max. frequency › Resolution 0.01 Hz › Max. span deviation ±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 › Frequency step size normal scan min. 1 Hz › Frequency step size FFT-based measuring instrument min. 1 Hz

EMI Receiver FFT-based Measuring Instrument

(CISPR 16-1-1, ANSI C63.2, MIL461, DO160)
HyperOverlapping Technology

Frequency segment processed in parallel	› RBW = 10 Hz 0.06 MHz (Option MIL/DO-UG) › RBW = 100 Hz 0.6 MHz (Option MIL/DO-UG) › RBW = 200 Hz 1.1 MHz › RBW = 1 kHz 5.7 MHz (Option MIL/DO-UG) › RBW = 9 kHz 57 MHz › RBW = 10 kHz 57 MHz (Option MIL/DO-UG) › RBW = 120 kHz 225 MHz › RBW = 100 kHz 225 MHz (Option MIL/DO-UG) › RBW = 1 MHz 225 MHz (Option MIL/DO-UG) › RBW = 8 MHz 225 MHz (Option MIL/DO-UG) › RBW = 10 MHz 225 MHz (Option MIL/DO-UG)
Scanning Speed (Receiver Mode typ.)	› Band A (9 kHz - 150 kHz), Quasi-Peak, dwell time 1 s : 1.5 s › Band B (150 kHz - 30 MHz) 9 kHz peak detector, dwell time 100 ms: 0.1 s › Band B (150 kHz - 30 MHz), Quasi-Peak, dwell time 1 s: 1.5 s › Band C/D (30 MHz - 1 GHz) 120 kHz, peak detector, dwell time 10 ms: < 100 ms › Band C/D (30 MHz - 1 GHz) 9 kHz, peak detector, dwell time 10 ms: < 100 ms › Band C/D (30 MHz - 1 GHz), Quasi-Peak, dwell time 1 s: 8 s (Option RTEMI225-UG) › Band E (1 GHz – 6 GHz), dwell time 1 ms: 100 ms
Measurement Speed	› Measurement and Update Rate Receiver Mode & Storage 40960 Frequency Points 1ms (40960000 Points / s) (meas.)
FFT-Overlapping Factor	› according to CISPR 16-1-1 and CISPR 16-3 › Overlapping factor typ > 95% [1] › HyperOverlapping > 99.9% [1]

1 FFT-based measuring instrument according to CISPR 16-1-1, MIL461 and other EMC standards. An improved version of time-domain scan.

Real-time EMI Receiver (Spectrogram) (Option RTEMI112-UG, RTEMI225-UG)

(CISPR 16-1-1, ANSI C63.2, MIL461, DO-160)

	› Real-time bandwidth 112 MHz (Option RTEMI112-UG) › Real-time bandwidth 225 MHz (Option RTEMI225-UG) › Peak, Quasi-Peak, Average, CISPR-Average, and RMS detector › Time-domain fully gapless › Frequency Step: Half of Bandwidth › Minimum resolution 5 ms (depending on number of points) › Zoom & Pan to Select Frequency band of interest › POI 300ps › HyperOverlapping Technology
Display and Analysis Functions	› Spectrogram (2D & 3D), 16.78 m. colors › Time-domain, Frequency Domain (Marker selectable) › Delta-Marker in Time- and Frequency Domain › Save and Load Measurements, Visualization, Post-processing and Evaluation

Preselection and Preamplifier

Structure	› Multiple paths with fixed filters › Multiple paths for different amplitude ranges
Digital Preselection	› 0 MHz – 225 MHz › 225 MHz – 450 MHz › 450 MHz – 675 MHz › 675 MHz – 900 MHz › 900 MHz – 1 GHz › Above 1 GHz in 225 MHz steps

Spectrum Analyzer
(CISPR 16-1-1, ANSI C63.2, MIL-461, DO-160)

Spectrum Analyzer	› Sweep time range span = 0 Hz, 1 µs to 16000 s › Span ≥ 10 Hz, swept 1 us to 16000 s › Span ≥ 10 Hz, FFT based measuring instrument 1 µs to 16000 s › Sweep time accuracy span = 0 Hz ±0.1 % (nom.) › Span ≥ 10 Hz, swept ±1 % (nom.)
IF Bandwidths	› 3dB bandwidth: 1 Hz – 60 MHz › 1, 2, 3, 5 steps › Small step size (150 steps) for channel measurements › EMI Filters: 6dB bandwidths CISPR: 200 Hz, 9 kHz, 120 kHz, 1 MHz 6dB bandwidths MIL/DO: 1 Hz, 10 Hz, 100 Hz, 1 kHz, 10 kHz, 100 kHz, 1 MHz
Video filter	› 0.1 Hz - 10 MHz + 3*RBW/OFF › 1, 2, 3, 5 steps › Detectors: MaxPeak, MinPeak, Sample
Detectors (Video filter off)	› Maxpeak, Average, RMS › Dynamic requirements according to CISPR 16-1-1 (Peak, AVG)

Real-time Spectrum Analyzer (Option RTSPA*-UG)
(CISPR 16-1-1, ANSI C63.2, MIL-461, DO-160)

Analysis Settings	› Automatic selection of the settings › STFFT Resolution: > 32,000 › Real-time analysis bandwidth 225 MHz › Time-domain fully gapless › Frequency step: Half of bandwidth › Zoom & Pan to select frequency band of interest › Analysis of history › Detectable signal duration (SNR>60 dB) 300 ps › Signal duration for 100% POI 300 ps › HyperOverlapping Technology
Display and Analysis Functions	› Spectrogram (2D & 3D), 16.78 m. colors › Time-domain, Frequency Domain (Marker selectable) › Delta-Marker in Time- and Frequency Domain › Save and Load measurements › Real-time Spectrum › Persistence Spectrum › Real-time Spectrogram › Power vs. time › Power vs. waterfall
IF Bandwidth	› 3dB bandwidth: 1 Hz – 60 MHz › 1, 2, 3, 5 steps › Small step size (150 steps) for channel measurements › EMI Filters: 6dB bandwidths CISPR: 200 Hz, 9 kHz, 120 kHz, 1 MHz 6dB bandwidths: 1 Hz, 10 Hz, 100 Hz, 1 kHz, 100 kHz, 1 MHz, 8 MHz, 10 MHz
Video filter	› 0.1 Hz - 10 MHz + 3*RBW/OFF › 1, 2, 3, 5 steps › Detectors: MaxPeak, MinPeak, Sample
Detectors (Video filter off)	› Maxpeak, Average, RMS › Dynamic requirements according to CISPR 16-1-1 (Peak, AVG)
Measurement Speed	› Measurement and Update Rate Analyzer Mode & Storage 32000 Frequency Points 1ms (32000 000 Points / s) (meas.)
Noise Floor (Analyzer Mode) without Option ULNA-UG	› Preselection (in front of preamp) active, Average Detector, typ. › 1 Hz – 10 Hz < - 80 dBm/Hz › 10 Hz – 100 Hz < -117 dBm/Hz › 100 Hz – 1 kHz < -127 dBm/Hz › 1 kHz – 9 kHz < -137 dBm/Hz › 9 kHz – 150 kHz < -150 dBm/Hz › 1 MHz – 30 MHz < -162 dBm/Hz › 30 MHz – 1 GHz < -166 dBm/Hz › 1 GHz – 1.1 GHz < -163 dBm/Hz › 1.1 GHz – 6 GHz < -165 dBm/Hz › 6 GHz – 7 GHz < -157 dBm/Hz
Noise Floor (Analyzer Mode) with Option ULNA-UG	› ULNA-UG on, Preselection on/off, Average Detector, typ. › 100 Hz – 1 kHz < -127 dBm/Hz › 1 kHz – 9 kHz < -137 dBm/Hz › 9 kHz – 150 kHz < -150 dBm/Hz › 1 MHz – 30 MHz < -162 dBm/Hz › 30 MHz – 1 GHz < -166 dBm/Hz › 1 GHz – 1.1 GHz < -163 dBm/Hz › 1.1 GHz – 6 GHz < -165 dBm/Hz › 6 GHz – 7 GHz < -157 dBm/Hz

Preselection (Option PRLNA-UG)

TDEMI® M1 / M1+	1 Hz – 9 kHz	
	9 kHz – 150 kHz	
	150 kHz – 30 MHz	
	30 MHz – 225 MHz	
	225 MHz – 450 MHz	
	450 MHz – 675 MHz	
	675 MHz – 900 MHz	
	900 MHz – 1 GHz	
TDEMI® M3 / M3+	1 Hz – 9 kHz	
	9 kHz – 150 kHz	
	150 kHz – 30 MHz	
	30 MHz – 225 MHz	
	225 MHz – 450 MHz	
	450 MHz – 675 MHz	
	675 MHz – 900 MHz	
	900 MHz – 1 GHz	
	1 GHz – 3 GHz	(8 Filter)
TDEMI® M6 / M6+	1 Hz – 9 kHz	
	9 kHz – 150 kHz	
	150 kHz – 30 MHz	
	30 MHz – 225 MHz	
	225 MHz – 450 MHz	
	450 MHz – 675 MHz	
	675 MHz – 900 MHz	
	900 MHz – 1 GHz	
	1 GHz – 3 GHz	(8 Filter)
	3 GHz – 6 GHz	(12 Filter)
TDEMI® M7 / M7+	1 Hz – 9 kHz	
	9 kHz – 150 kHz	
	150 kHz – 30 MHz	
	30 MHz – 225 MHz	
	225 MHz – 450 MHz	
	450 MHz – 675 MHz	
	675 MHz – 900 MHz	
	900 MHz – 1 GHz	
	1 GHz – 3 GHz	(8 Filter)
	3 GHz – 6 GHz	(12 Filter)
	6 GHz –7 GHz	

Low Noise Preamplifier (Option ULNA-UG)

TDEMI® M1 / M1+	› switchable on/off (> 30 MHz)	
	› 1 kHz – 1 GHz	(Gain 20 dB, NF typ. 2.0 dB)
TDEMI® M3 / M3+	› switchable on/off (> 30 MHz)	
	› 1 kHz – 1 GHz	(Gain 20 dB, NF typ. 2.0 dB)
	› 1 GHz – 3 GHz	(Gain 20 dB, NF typ. 2.0 dB)
TDEMI® M6 / M6+	› switchable on/off (> 30 MHz)	
	› 1 kHz – 1 GHz	(Gain 20 dB, NF typ. 2.0 dB)
	› 1 GHz – 6 GHz	(Gain 20 dB, NF typ. 2.0 dB)
TDEMI® M7 / M7+	› switchable on/off (> 30 MHz)	
	› 1 kHz – 1 GHz	(Gain 20 dB, NF typ. 2.0 dB)
	› 1 GHz – 6 GHz	(Gain 20 dB, NF typ. 2.0 dB)
	› 6 GHz – 7 GHz	(Gain 20 dB, NF typ. 2.0 dB)

Noise Floor (Receiver Mode) with Option ULNA-UG

Preselection (in front of preamp) active, Average Detector, typical

TDEMI® M1 / M1+	› 100 Hz – 1 kHz (10 Hz IF):	< -10 dBuV
	› 1 kHz – 9 kHz (10 Hz IF):	< -20 dBuV
	› 9 kHz – 150 kHz (200 Hz IF):	< -20 dBµV
	› 1 MHz – 30 MHz (9kHz IF):	< -16 dBµV
	› 30 MHz – 1 GHz (120 kHz IF):	< -10 dBµV
TDEMI® M3 / M3+	› 100 Hz – 1 kHz (10 Hz IF):	< -10 dBuV
	› 1 kHz – 9 kHz (10 Hz IF):	< -20 dBuV
	› 9 kHz – 150 kHz (200 Hz IF):	< -20 dBµV
	› 1 MHz – 30 MHz (9kHz IF):	< -16 dBµV
	› 30 MHz – 1 GHz (120 kHz IF):	< -10 dBµV
	› 1 GHz – 3 GHz (1 MHz IF):	< 0 dBuV
TDEMI® M6 / M6+	› 100 Hz – 1 kHz (10 Hz IF):	< -10 dBuV
	› 1 kHz – 9 kHz (10 Hz IF):	< -20 dBuV
	› 9 kHz – 150 kHz (200 Hz IF):	< -20 dBµV
	› 1 MHz – 30 MHz (9kHz IF):	< -16 dBµV
	› 30 MHz – 1 GHz (120 kHz IF):	< -10 dBµV
	› 1 GHz – 6 GHz (1 MHz IF):	< 0 dBuV
TDEMI® M7 / M7+	› 100 Hz – 1 kHz (10 Hz IF):	< -10 dBuV
	› 1 kHz – 9 kHz (10 Hz IF):	< -20 dBuV
	› 9 kHz – 150 kHz (200 Hz IF):	< -20 dBµV
	› 1 MHz – 30 MHz (9kHz IF):	< -16 dBµV
	› 30 MHz – 1 GHz (120 kHz IF):	< -10 dBµV
	› 1 GHz – 6 GHz (1 MHz IF):	< 0 dBuV
	› 6 GHz – 7 GHz (1 MHz IF):	< 3 dBuV

Level

› Display range displayed noise floor up to +30 dBm
› Maximum DC input level, pulse 6 V (0dB Att)
› RF-CW signal 120 dBµV

Display Accuracy

› Measurement Uncertainty: < 0.5 dB (100 MHz) typ. 0.15 dB
› Resolution: 0.01 dB
› f < 1 GHz: +/- 1 dB
› 1 GHz < f < 7 GHz: +/- 1.5 dB
› Pulse Indication according to CISPR 16-1-1

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: Pulse repetition frequency > 10 Hz
› Quasi-peak indication according to CISPR 16-1-1: All pulse repetition frequencies (Option COM-UG) (9 kHz – 30 MHz) & (300 MHz – 7 GHz) Pulse repetition frequency > 10 Hz (30 MHz – 300 MHz)
› Quasi-peak indication according to CISPR 16-1-1: All pulse repetition frequencies (COM2-UG, PRLNA-UG) (9 kHz – 7 GHz)
› Peak, Average, CISPR-AVG indication according to CISPR 16-1-1 in all modes
› CISPR-RMS indication according to CISPR 16-1-1 (Option COM2-UG, PRLNA-UG, CRMS-UG)
› Maximum deviation for sinusoidal signals according to CISPR 16-1-1: 2dB (9 kHz – 7 GHz)

Absolute level uncertainty

› Signal level : 40 – 60 dBuV (15 MHz) < 0.3 dB (σ = 0.1)
› Attenuator switching uncertainty (15 MHz) < 0.2 dB (σ = 0.15)

Frequency response

› Attenuation: all states including 0dB
Preamplifier: On/Off, PRELNA: Off
1 Hz – 1 GHz < 0.5 dB (σ = 0.15dB)
1 GHz – 7 GHz < 1.5 dB (σ = 0.50dB)

› Attenuation: all states including 0dB
Pre amplifier: On/Off, PRELNA: On
1 Hz – 30 MHz < 0.5 dB (σ = 0.15dB)
30 MHz – 1 GHz < 1.2 dB (σ = 0.40dB)
1 GHz – 7 GHz < 1.5 dB (σ = 0.50dB)

Additional uncertainties

› Uncertainty of reference level setting: 0 dB
› Uncertainty between Superheterodyne Mode and FFT-based Mode: 0 dB
› Bandwidth Switching Uncertainty Typ: < 0.1dB

Nonlinearity of displayed level

› Logarithmic level display
S/N > 16 dB, 0 dB ≤ level ≤ –70 dB < 0.1 dB (σ = 0.04 dB)
S/N > 16 dB, –70 dB < level ≤ –90 dB < 0.2 dB (σ = 0.08 dB)

Total Measurement Uncertainty S/N > 20dB (95 % confidence level)

› Pre amplifier: On/Off, PRLNA: Off
1 Hz – 1 GHz < 0.3 dB
1 GHz – 7 GHz < 0.7 dB

› Attenuation: all states including 0dB
Preamplifier: On/Off, PRLNA: On
1 Hz – 30 MHz < 0.3 dB
30 MHz – 1 MHz < 0.6 dB
1 GHz – 7 GHz < 0.7 dB

Spurious Response

› Residual spurious response RF attenuation = 0 dB, Preamp on
› f ≤ 1 MHz < –107 dBm
› f ≤ 1 MHz < –117 dBm
› f > 1 MHz < –112 dBm
› f > 1 GHz < –120 dBm (multisampling)
› Image frequency < -80 dBc (nom.)
› Suppression of 2x2 Mixing Product (< -70 dBc, multisampling)

Measurement time

› 1 µs – 60 s (Average, RMS)
› 1 µs – infinite (Peak, Quasi-Peak, CISPR-Average, CISPR-RMS-Average)

Attenuator

› Mechanical: 0 – 50 dB, 10 dB Steps
› Autorange Function
› Protection during Start-up: 10 dB
› Protection in Off-State: Set to the max. Att.

RF Input

› N Standard Connector 50 Ohm
› 0 dB Attenuator:
VSWR: < 1.8 (f< 1 GHz), typ. 1.2
VSWR: < 2.5 (f>1 GHz), typ. 2.0
› 10 dB Attenuator:
VSWR: < 1.2 (f< 1 GHz), typ. 1.1
VSWR: < 2.0 (f>1 GHz), typ. 1.8

Maximum input level (RF1)

› 0 dB Attenuator
122 dBµV
6V Pulses
› 10 dB Attenuator
132 dBµV
18V Pulses

Maximum input level (RF2) (Option RF1/RF2-UG) (only for TDEMI® M)

› 0 dB Attenuator
132 dBµV
18V Pulses

Marker and Evaluation (Receiver Mode)	› Marker Functions : Marker, Delta, Peak Left, Peak Right, Left, Right, Marker › to Trace, . . . › Save and Load Measurements › Report Generator (Option RG-UG) for automated Evaluation against Limit Lines, incl. Subranges

Intermodulation	› 1dB Compression Point of Mixer f ≤ 1 GHz 15 dBm (Digital IQ mixer) f > 1 GHz 10 dBm (First mixer) › Third order Intercept Point (TOI) 10 Hz – 1 GHz Typ. > 25 dBm 1 GHz – 7 GHz Typ. > 20 dBm › Second Harmonic Intercept Point (SHI) 10 Hz – 7 GHz Typ. > 15 dBm (Preamp ON)

Dynamic, Nonlinearities	› Preamp active, Preselection active/inactive, Attenuator: 0 dB › Image Frequency Rejection: typ. 70 dBc (100dBc Multisampling) › IF Rejection: 80 dBc, (100dBc Multisampling) › Display Level Range: Noise floor – 120 dBµV (13dBm) › Suppression of harmonic components (Option PRLNA-UG) 20 MHz - 7 GHz Mixer Level - 10 dBm: < - 80 dBc › Suppression of non-harmonic components f > 1 MHz: < - 80 dBc

Trigger function	› Real-time spectrum analyzer mode: Frequency mask trigger, post & pretrigger › Real-time EMI receiver mode: Frequency mask trigger, post & pretrigger

Demodulation (Receiver Mode) (Option DM-UG)	› Amplitude Modulation (AM) › Frequency Modulation (FM) › "Tune to Marker" Function

Tracking generator (Option MG-UG) (only for TDEMI® M)	› MG-UG6G: 9 kHz – 7 GHz › MG-UG XE: Control of external signal generator › Synchronous stepped scanning › Normalization for transducer factor (export function)

Temperature range / EMC	› 15° - 40° C (min.) › Emissions according to DIN EN 55011 › Immunity according to DIN EN 61000-6-2 (10V/m) › Inputs matched › Mains harmonics according to EN61000-3-2

Mechanical stress	› sinusoidal vibration:	5 Hz to 150 Hz, max. 1.8 g, 0.5 g from 55 Hz to 150 Hz, in line with EN 60068-2-6
	› random vibration:	10 Hz to 100 Hz, acceleration 1g (RMS)
	› shock:	40 g shock spectrum, in line with MIL-PRF-28800F, class 3

Specification TDEMI® M & M+

TDEMI® M	
Remote Control	› via external PC › Remote control command set according to SCPI standard
System Requirements (Laptop, Tablet Computer, or Desktop PC)	› Mobile Dual Core processor › 4 GB RAM, DDR2 (667 MHz) or higher › Hard disc: > 20 GB › Display: High color, 800 x 600 pixel or higher resolution › Interface: USB 2.0 or higher › Operating system: Windows® 7, 64 Bit or Windows® 10 , 64 Bit
Power Supply	› +11 V .. +14 V DC, 230 V +/-20 % 50 Hz or 110 V +/- 10% 60 Hz › Max. power consumption approx. 50 W
Weight	› approx. 6 kg

TDEMI® M+	
Remote Control	› Remote control command set according to SCPI standard
Interfaces	› Ethernet/LAN, USB, GPIB (Option GPIB-UG), HDMI (Display port), Audio
Display, User Interface	› Resolution 800 x 600 Pixel, 8,4", TrueColor (16.78 Mio. colors), Touchscreen with Option PC-UG_M+ › Enhanced multi-touch display
PC	› Mobile Dual Core processor, 4 GByte RAM, >35 GByte Solid State Disc › Operation system: Windows® 7, 64Bit with Option PC-UG_M+ › Multicore processor, 16 GByte RAM, >128 GByte Solid State Disc › Operation system: Windows® 10, 64Bit
Power Supply	› +11 V .. +14 V DC, 230 V +/-20 % 50 Hz or 110 V +/- 10% 60 Hz › Max. power consumption approx. 65 W
Weight	› approx. 7 kg

Main Options

MIL/DO-UG	› Frequency extension down to 10 Hz, IF bandwidths 10 Hz, 100 Hz, 1 kHz, 10 kHz, 100 kHz, 1 MHz	F, Z
OCXO-UG	› Highly stable oven controlled reference oscillator	F, Z
ULNA-UG	› Ultra Low Noise Amplifier, additionally integrated for ultra low noise floor	F, Z
DM-UG	› AM/FM demodulator	F, Z
COM-UG	› Full compliance in band A and B according to CISPR 16-1-1	F, Z
COM2-UG	› Full compliance in band C, D & E according to CISPR 16-1-1 (Requirement: Option PRLNA-UG)	F, Z
PRLNA-UG	› Preselection Low Noise Amplifier System	F, Z
RTEMI112-UG	› Real-time EMI Receiver (112 MHz Real-time Bandwidth)	F, Z
RTEMI225-UG	› Real-time EMI Receiver (225 MHz Real-time Bandwidth)	F, Z
RTSPA112-UG	› Real-time Spectrum Analyzer (112 MHz Real-time Bandwidth)	F, Z
RTSPA225-UG	› Real-time Spectrum Analyzer (225 MHz Real-time Bandwidth)	F, Z
CRMS-UG	› CISPR-RMS-AVG detector	S
LISN-UG	› Controller for measuring accessories, TTL signals (+5V), e.g. for automated control of LISN	F, Z
LISNCable-UG	› Customized cable for auxiliary measurement equipment, e.g. LISN or triple loop antenna	H
RG-UG	› Report generator including analysis of subranges	S
MG-UG	› Tracking generator (Only available for TDEMI® M)	F, Z
MX-UG	› External Mixer Hardware Interface (Requirement: Option MG-UG) (Only available for TDEMI® M)	F, Z
KB-UG	› Compact keyboard incl. touchpad	H
TC-UG	› Transport and storage case for TDEMI® M&M+	H
BAT-UG	› Battery pack, rechargeable, ca. 3 hours runtime	Z
EMI64k	› Automation software suite	S
CLICK-UG	› Click rate analyzer, measurement of 4 frequencies in parallel	S
RF1/RF2-UG	› RF1: Input for max. sensitivity, RF2: Protected input (Only available for TDEMI® M)	F, Z
CAL-UG	› Calibration by the manufacturer according to ISO17025, incl. certificate and documentation of values	24 Months
CALD-UG	› Accredited Calibration according to DAkkS (ILAC) / ISO 17025, incl. certificate and documentation of values	24 Months
	additional customized options are possible upon request	M

F: Upgradeable, integration at manufacturer site necessary
Z: Additional costs for exchange
H: Delivery of hardware
S: Software installation
M: e-mail request to info@tdemi.com

Calibration interval: 24 Months (given only due to the request of customer)

FULL & PRE COMPLIANCE

GAUSS INSTRUMENTS®
TDEMI® TECHNOLOGY

ULTRA Series

FULL COMPLIANCE
TDEMI® EMI Receiver

12V Power Supply & Battery Pack

SPECIAL FEATURES
› Multi GHz Real-time Spectrum Analyzer
› Ultrafast Spectrum Analyzer Scanning
› Ultrafast Receiver Scanning
› Ultrafast Superhet Mode

INFO
[ULTRA]

Multi GHz — Real-Time Scanning [ULTRA Series]

685 / 342.5 MHz — Real-Time Bandwidth [ULTRA Series]

DC - 6/18/26.5/40 GHz — Frequency Ranges [ULTRA Series]

X & G Series

FULL COMPLIANCE
TDEMI® EMI Receiver

SPECIAL FEATURES
› Real-time Spectrum Analyzer
› Oscilloscope
› Signal Analyzer

Multi GHz — Real-Time Scanning [X Series]

645 MHz — Real-Time Bandwidth [X Series]

325 / 162.5 GHz — Real-Time Bandwidth [X Series]

225 / 112 MHz — Real-Time Bandwidth [G Series]

INFO
[X] eXtreme

DC - 1/3/6/18/26.5/40 GHz — Frequency Ranges [X Series]

INFO
[G] Standard

1 Hz - 1/3/6/9/18/26.5/40/44 GHz — Frequency Ranges [G Series]

M & M+ Series

PRE COMPLIANCE
TDEMI® EMI Receiver

Upgradeable to Full Compliance

SPECIAL FEATURES
› Real-time Spectrum Analyzer
› 12V Power Supply & Battery Pack

INFO
[M] Mobile
[M+] Mobile Plus

225 / 112 MHz — Real-Time Bandwidth [M & M+ Series]

10 Hz - 1/3/6/7 GHz — Frequency Ranges [M & M+ Series]

ABOUT

GAUSS INSTRUMENTS®
TDEMI® TECHNOLOGY

Established in the year 2007, the company GAUSS INSTRUMENTS is manufacturer of highest performance EMC test equipment and provides advanced EMI test solutions pushing your product development and testing capabilities ahead, and speeding up your time to market cycles. With GAUSS putting the turbo in EMC since 2007, product certifications as well as pre-certification tasks have become as simple as they had never been before. Across all over the world we provide our unrivaled products, advanced test solutions, and services – together with a local service partner of our worldwide network of highly qualified and dedicated team and partners.

GAUSS INSTRUMENTS traces its technical roots to basic research on short time Fourier analysis and synthesis begun in the 70's. In the early 2000's the founders of GAUSS INSTRUMENTS invented a measurement technology combining time-domain and FFT based techniques and superheterodyne technology in a massively parallel topology - the so called TDEMI® Technology which has become the new state-of-the-art in the world of EMI testing in the meanwhile. TDEMI® Technology is a registered brand and patented technology of GAUSS INSTRUMENTS. It is provided to you only by GAUSS or its' official certified local partners. Joint research projects were performed in the field of time-domain measurements of electromagnetic interferences (EMI) together with well-respected research institutes and universities. Official metrology labs, testing and certification institutes, as well as leading automotive OEMs and many other blue chip companies selected GAUSS as innovative cooperation partner and reliable solution provider for their demanding test requirements during market certification as well as product development but also research investigations. Over the past two decades about 100 publications, transaction papers, white papers and journal articles were published on selected topics of time-domain EMI measurements and EMC testing as well as intelligent methods for automated testing. As inventor of the TDEMI® Measurement Systems which use ultra high-speed analog-to-digital converters and pretty much advanced real-time digital signal processing methods we enable ultra fast tests and measurements for electromagnetic compliance that fulfill the increasing demands for measurements of today's ever increasing density and complexity of electronic equipment and systems.

And our innovation continues - combining our deep knowledge of real-time digital signal processing, millimeter, and microwave technologies to develop receiver and analyzer solutions combining and blurring the lines between previously discrete test instruments while delivering speeds and analysis capabilities several orders of magnitude greater than any other measurement equipment available. Combining both the advantages of the 'old' analog and the 'new' digital world we keep your testing up-to-date and beyond - pushing it to the next level and ready prepared for the future coming.

Today GAUSS offers a wide range of solutions from DC to 40 GHz for all kind of test requirements in the world of emission testing - full compliance solutions as well as pre-certification solution or even customized solution perfectly fitting to your specific requirements pushing your testing capabilities ahead. We provide customized signal processing solutions based on our well-proven hardware and DSP platforms, as well as unique software solutions. With a strong knowledge in real-time and digital technology, millimeterwave and microwave technology we develop systems that are absolutely outstanding in the field of test and measurement. E. g. the fastest real-time FFT based measuring instruments on the planet with a full compliance real-time analysis bandwidth of 645 MHz as well as classical superheterodyne technology to name a few only of our outstanding and outperforming features for full compliance testing and signal analysis.

It is our true passion to develop and to produce highest quality and highest performance instruments made in Germany. With leading-edge technology we're fulfilling all the today's requirements of complex measurement tasks and beyond. Our dedicated goal and ultimate passion is to provide our customers with all the additional benefits and full competitive advantages of accelerated testing, the optimum measurement procedures, unrivaled measurement speed and accuracy - all together at the same time. Empowered by our leading test solutions and patented TDEMI® Technology, we're boosting the capabilities of today's product development and significantly speeding up the time to market of your products. Thus, your product certification as well as pre-certification challenges become just a walk-over now!

Feel the experience and make your life easy!

Driven by our ultimate mission: **Smarter testing for a smarter world.**

Imprint

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REAL-TIME BANDWIDTH

162.5 MHz

SINCE 2007

REAL-TIME BANDWIDTH

325 MHz

SINCE 2013

REAL-TIME BANDWIDTH

645 MHz

SINCE 2016

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