TDEMI® X

TDEMI® X – 64 000 TIMES FASTER THAN CONVENTIONAL EMI RECEIVERS

MAIN FEATURES

Receiver	APD Function and Histogram	Real-time Spectrogram	Spectrum Analyzer	Real-time Spectrum Analyzer	Oscilloscope

Content

At a Glance

TDEMI® X

› **64 000 times faster than conventional instruments**

› **100 dB dynamic range (@ 0dB Att.)**

› **multifunctional and upgradeable**

› **conventional and FFT-based leading-edge technology**

› **lowest noise floor**

› **additional integrated preselection (Option)**

The novel product line TDEMI® eXtreme (short form: TDEMI® X) is the latest and most advanced level of full digital measurement equipment for emission testing on the fast lane. It is based on the unrivaled and well approved technology of GAUSS INSTRUMENTS.

By the use of the leading-edge analog-to-digital converters with the best ratio of signal to noise power density available on the market, most modern high-speed FPGAs with a calculation power of about 250 state-of-the-art PCs and in-house designed high performance microwave circuits highest measurement accuracy and highest measurement speed is achieved over the entire frequency range starting from DC up to 40 GHz.

The new TDEMI® eXtreme is easily upgradeable in its frequency range by different extensions which can be integrated into the instrument subsequently.

The frequency ranges are 1 GHz, 3 GHz, 6 GHz, 18 GHz, 26.5 GHz or 40 GHz respectively. The frequency ranges of the instruments start at 9 kHz by standard configuration and can be extended down to 10 Hz by the optional Option MIL/DO-UG. A large variety of configurable options make the TDEMI® X to the customized solution perfect fitting to your application according to all civil standards (e. g. CISPR, EN, FCC, or ANSI), military (MIL-461) as well as avionic standards (DO-160). The TDEMI® X measurement system offers in its standard configuration a fully integrated spectrum analyzer mode and also a real-time spectrum analyzer mode. An overview of the available options is given on the page following to the detailed technical specification. Furthermore we offer a customized adaption to your specific application and needs upon request.

The option DC-UG is extending the frequency range even down to DC. The new and highest performance product line TDEMI® X can be used in a vast range of applications due to its spectrum analyzer mode and real-time spectrum analyzer and can be used also for measurements according to telecommunication standards such as ETSI standards e.g. or for general analysis of signals - and all this can be done fully in real-time with an absolutely unique instantaneous bandwidth of 325 MHz and even up to 645 MHz as well as an unrivaled measurement speed and dynamic range of 100 dB (without attenuator) or even up to 170 dB with attenuator.

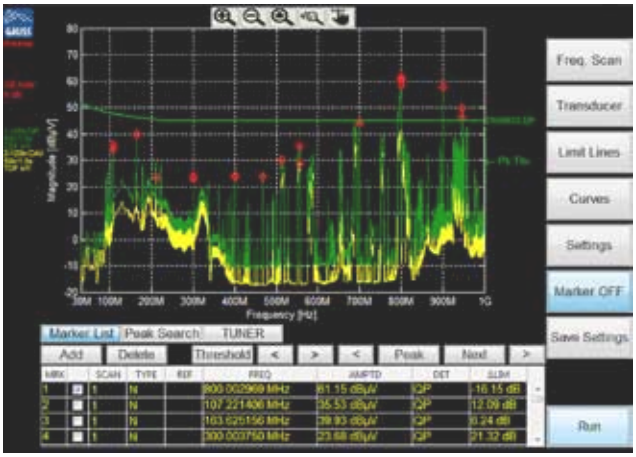

Fig. 1 – **Measurement of a comb generator and ambient signals, Quasi-peak and CISPR -Average detectors applied in parallel.**

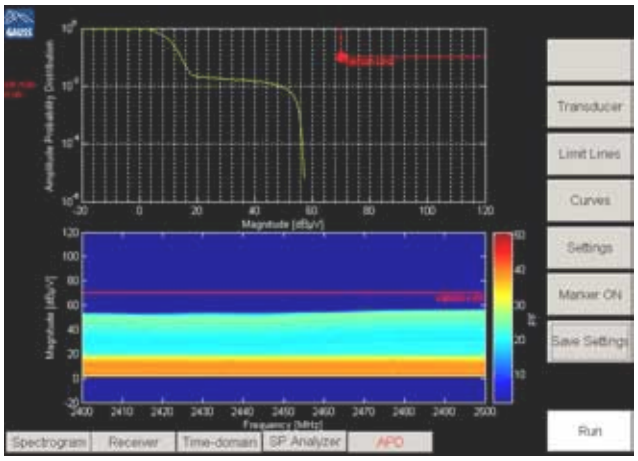

Fig. 2 – **Measurement of APD and histogram and fully automated evaluation against limit lines.**

Receiver Mode

The TDEMI® eXtreme provides a traditional superhet mode for sure, which is implemented fully digital in the frequency range up to 1 GHz. Above 1 GHz there is an ultra broadband down-conversion to the digital IF level, with an FFT bandwidth of 325 MHz. The instruments can be configured with an AM/FM demodulator and output to headphones (Option DM-UG).

Moreover the receiver mode of the TDEMI® X provides a fully CISPR 16-1-1 compliant Shortterm-FFT (STFFT) implementation, which speeds up your EMC measurements by a factor up to 32000. Thus scan times - and with it overall testing times - can be realized now which are much shorter and setting new standards in product certification. For example a full scan with quasi-peak detector in the range from 30 MHz to 1 GHz is carried out in less than 10 seconds.

So it is possible to measure and characterize fluctuating disturbances and equipment under test changing between different operation modes very easily and much more precise and reliable. An excellent noise floor makes the TDEMI® X perfect suited for radiated, conducted as well as measurements with absorbing clamp or CDN.

APD Function and Histogram

The measurement systems of the TDEMI® eXtreme series can be equipped with a measuring mode for the amplitude probability distribution (APD) and with a colored histogram display by the option APD-UG.

The APD measuring function for example is used for testing of ISM (industrial, scientific, medical) equipment. Especially for such measurements like APD function the vast advantages of the most modern technology of the TDEMI® X become aware, when a highly parallel measurement and calculation is saving a huge amount in time and money.

Moreover the histogram function, by its color depth of 16.78 million, enables the user to analyse and distinguish intermittent narrow- and broadband disturbances as well as to detect masked signals very easily.

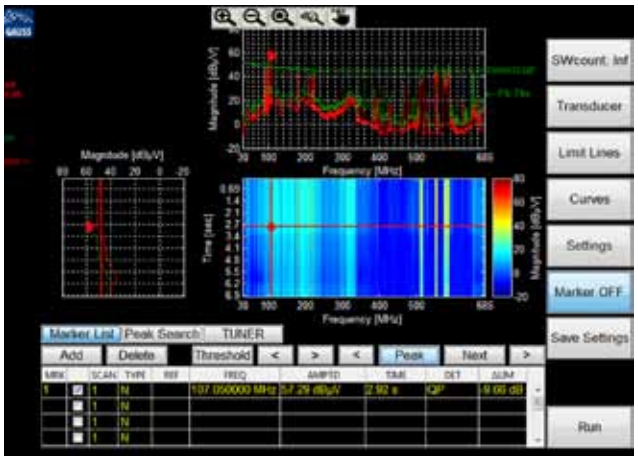

Fig. 3 – **Parallel measurement of Quasi-Peak and Average with 645 MHz real-time bandwidth.**

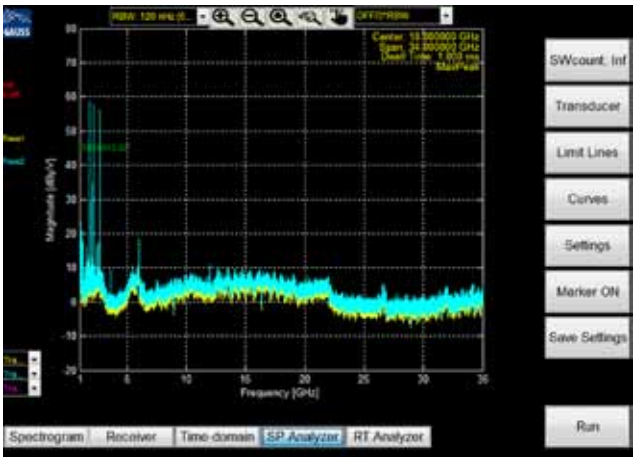

Fig. 4 – **Measurement of Ambient Noise between 1 GHz and 35 GHz.**

Real-time Spectrogram Mode

The real-time spectrogram mode of the TDEMI® eXtreme is absolutely unique in its performance and unique particularly because of the full conformance with the standards CISPR 16-1-1, ANSI C63.2, MIL-461, and DO-160 respectively. The real-time spectrogram offers the perfect combination of full compliance and analysis capabilities in fully gapless real-time, observing what is going on there in your circuitry, component, device or equipment under test.

The remote control commands according to SCPI standard enables the use in a fully automated lab and certification environment. Evaluation capabilities, e. g. several markers, display in 2D or 3D allow to analyse disturbances and evaluate them regarding to conformity. The measurement is carried out over a frequency range of 162.5 MHz, 325 MHz (Option QCDSP-UG) or even up to 645 MHz (Option 645M-UG) in real-time. Up to 16000 frequency points are measured in parallel.

Spectrum Analyzer

Also in spectrum analyzer mode the TDEMI® X is equipped with a traditional superhet mode. It is implemented digital and provides 145 IF bandwidths beginning from 1 Hz going up to 30 MHz in 1, 2, 3, 5 steps as well as small sized steps in between.

By the innovative multi-channel technology the measurement speed is increased by a factor up to 64000. It corresponds to a Shortterm-FFT based set of 64000 full digital superheterodyne receivers. In conjunction with the parallel implementation of video filters and detectors all measurements according to standards are sped up by the factor 64000 and the user is enabled to analyse non-stationary phenomenons much more precisely and reliable.

Due to the available 6 dB bandwidths and the full compliance to CISPR 16-1-1 as well as ANSI C63.2, in particular e.g. the very essential requirement regarding the dynamic range for pulses, the TDEMI® X can be applied for pre- and final measurements with peak and average detector. Also it is in full conformance with ANSI C63.4, MIL-461 and DO-160. A large number of additional functionalities allow the use in a wide range of applications for the analysis of analog and digital communication signals.

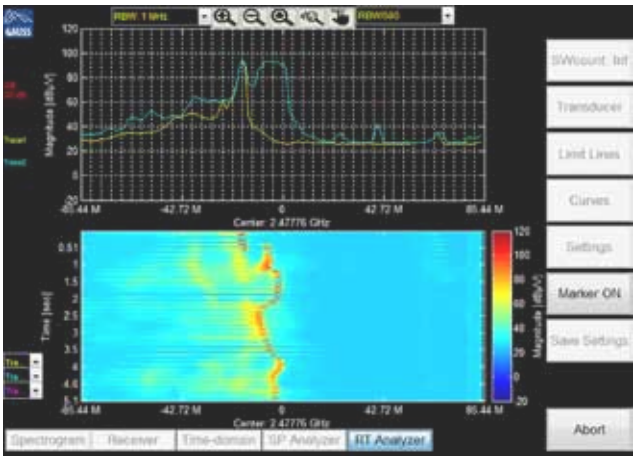

Fig. 5 – **Measurement of a Magnetron pulsed and drifting electromagnetic emission.**

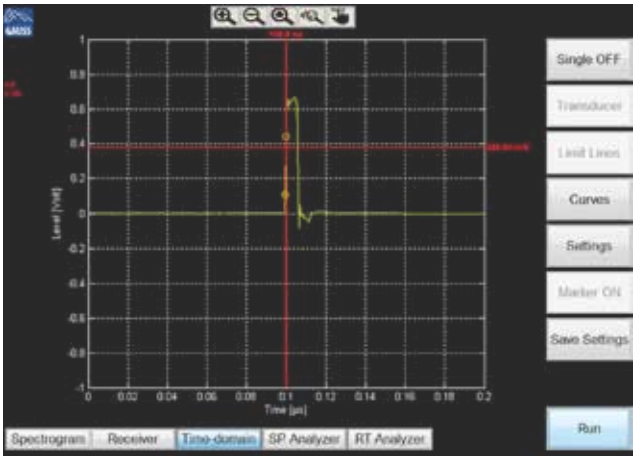

Fig. 6 – **Time-domain measurement of a pulse with a resolution of 16 bit. Red lines show the trigger levels in time and amplitude respectively.**

Real-time Spectrum Analyzer

The real-time spectrum analyzer mode comes along with a real-time bandwidth of 162.5 MHz in the standard configuration of the TDEMI® X instruments and can be extended to 325 MHz real-time bandwidth by the option QCDSP-UG which is absolutely unique in the test and instrumentation market.

The real-time spectrum analyzer mode provides all bandwidths and settings already known from spectrum analyzer mode and also provides the full dynamic for pulses required by CISPR 16-1-1.

This operation mode of the TDEMI® X series combines all advantages of conventional superhet analyzers with the advanced evaluation capabilities and vast advantages of the real-time capabilities based on the leading-edge technology provided by GAUSS INSTRUMENTS. The unrivaled real-time bandwidth of 325 MHz opens up absolutely new possibilities regarding the analysis, characterization and observation of all kinds of signals.

Time-domain Mode

The time-domain mode of the TDEMI® eXtreme provides a real-time bandwidth of 1 GHz and enables a broadband acquisition of signals with highest resolution in its class at the same time. Digitally implemented hardware triggering combined with an extremely high dynamic range allow triggering on CISPR 16-1-1 pulses and display with a unique precision of 16 bit.

By the easy and intuitive user interface and control via touchscreen, the operator can set and vary trigger levels for example directly with a touch on the screen of the instrument.

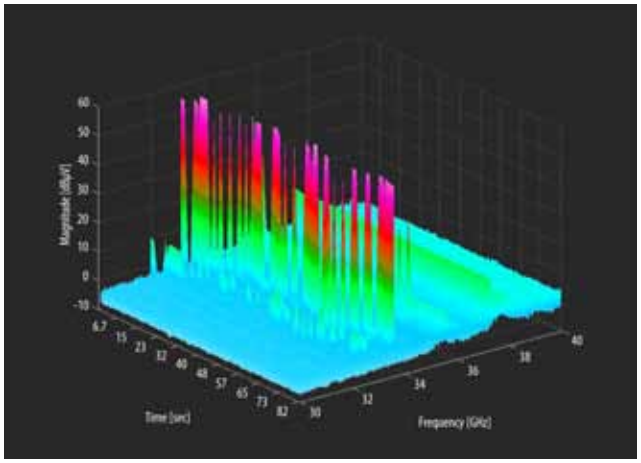

Fig. 7 – **Real-time measurement of a GHz frequency hopping signal.**

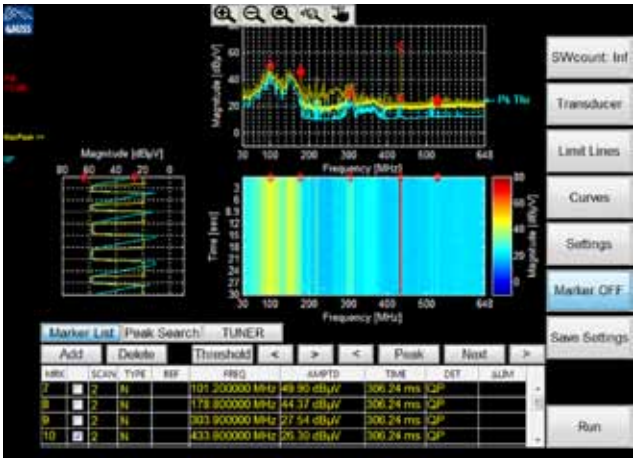

Fig. 8 –**Screenshot of 645 MHz Real-time Measurement (Peak and Quasi-peak parallel).**

Multi GHz Real-time Scanning

GAUSS INSTRUMENTS introduced a novel Multi-GHz real-time scanning feature for the TDEMI® eXtreme receiver series providing a several Gigahertz real-time bandwidth.

By the newly designed very powerful hardware module, measurements across several Gigahertz can be performed in the real-time spectrum analyzer mode. E.g. in the frequency range from 1 GHz to 40 GHz all frequency points can be directly measured with a very high resolution in time and the result can be maximized instantaneously.

Over the entire frequency range the results are displayed in real-time. Thus the final maximization can be performed at all frequencies in just one step. The detectors peak, average, and RMS are available in this mode. Further the video bandwidths, which are required according to the standards, can be applied.

Of course all the measurements according to CISPR, ANSI C63.4, FCC Part 15, MIL 461, DO 160 as well as many other national and international standards are fully covered.

645 MHz Real-time Bandwidth

Measurements of radiated emissions in the frequency range up to 1 GHz are very time consuming as according to CISPR and FCC Standards the measurements have to be performed at several antenna heights and all angular positions of the device under test.

Using the TDEMI® X of GAUSS INSTRUMENTS with a real-time analysis bandwidth of 645 MHz and fully gapless evaluation and visualizing (Option QCDSP-UG, 645M-UG) the final maximization can be performed at all frequencies simultaneously.

The worldwide unique feature of the fully gapless real-time spectrogram mode combines all advantages of the single frequency mode of a traditional receiver with the possibility to carry out the measurement at all frequencies simultaneously. Two detectors are applied simultaneously, thus CISPR-Average and Quasi-peak detectors can be measured simultaneously in real-time and stored and visualized in real-time. Fully gapless processing and evaluation of all frequencies is given, which is a mandatory requirement of CISPR 16-1-1 Ed. 3.

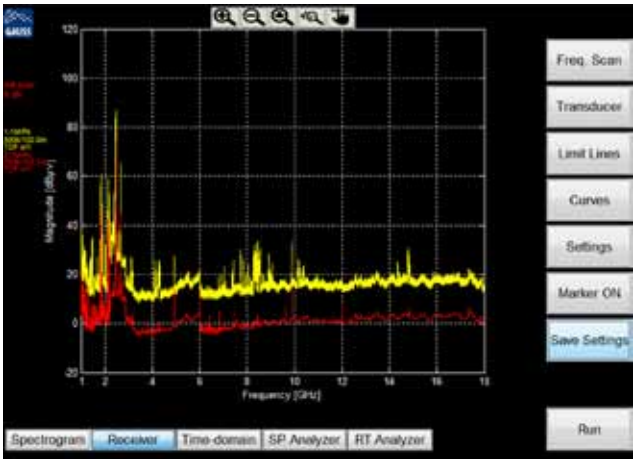

Fig. 9 – **Measurement of Harmonics of Magnetron and Ambient noise up to 18 GHz.**

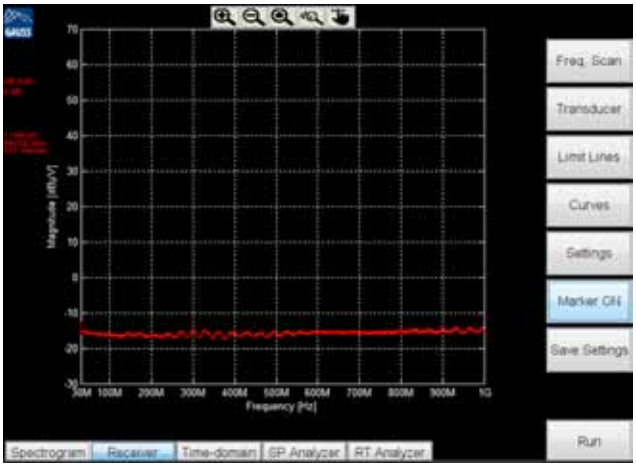

Fig. 10 – **Noise floor up to 1 GHz of the TDEMI® X with option ULNA-UG1G.**

Preselection Low Noise Amplifier System

The TDEMI® X contains a combination of a preselection, ultra high linear input stage, and high resolution ADCs to achieve a maximum performance e.g. for pulses and pulse modulated carriers that supersedes prior art technology.

By this technology during all operating modes optimum image rejection, and full CISPR 16-1-1 compliance is ensured, of course.

For the measurement of transmitting devices, e.g. below 1 GHz, it is often necessary to measure harmonics of these devices with a performance up to 90 dBc. The optional Preselection Low Noise Amplifier System (PRLNA-UG) allows suppressing the fundamentals while the harmonics are measured. The option can be activated during measurements in receiver mode. While the preselection is active an instantaneous real-time bandwidth of 162.5 MHz is available. Additional auxiliary equipment, such as external notch filters are not needed anymore during the measurement of such devices.

Lowest noise floor

The world's fastest EMI receivers –the TDEMI® eXtreme series (TDEMI® X) of GAUSS INSTRUMENTS covering the frequency range from DC – 40 GHz and providing unique features as 645 MHz CISPR compliant real-time bandwidth, Multi-GHz Real-time Scanning and the lowest displayed average noise level at 40 GHz can be equipped also with additional ultra-low noise pre-amplifiers for the frequency range 30 MHz – 1 GHz, 3GHz, 6 GHz, 18 GHz, 26.5 GHz and 40 GHz.

This novel preamp provides lowest noise figure and highest dynamic range - both at the same time. High linearity and lowest displayed inherent noise is achieved by a patented technology using pre-amps with low noise figure, pre-selectors and a special circuit monitoring the linearity reserve of the pre-amp.

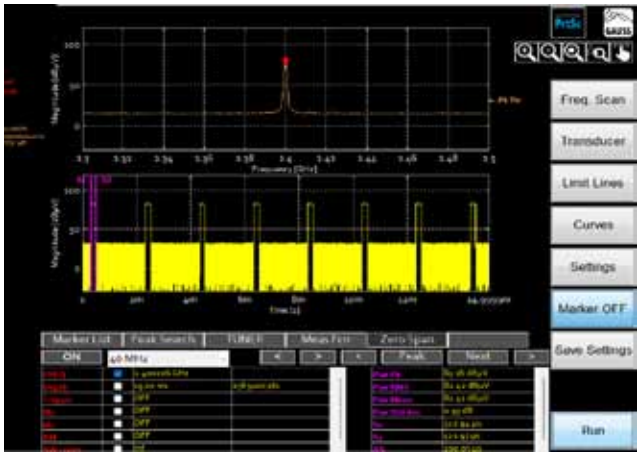

Fig. 11 – **Measurement of Pulse Train of Signal at 2.4 GHz with 40 MHz Resolution Bandwidth.**

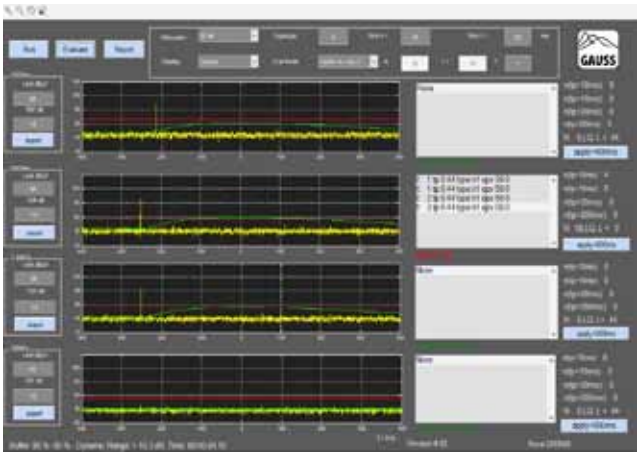

Fig. 12 – **Measurement with Click Rate Analyzer according to CISPR 14.**

200 MHz IQ Analysis

The IQ mode (Option IQ-UG) is available as additional option for the TDEMI® X and can be ordered in several selections either up to 40 MHz or with Option LRBW-UG up to 200 MHz.

The TDEMI® X is equipped with a large memory of 2x8 Megasamples first level memory and 8 GByte second level memory to store and process the I/Q data for vector signal analysis. Typical applications are the pulse power train measurements for WIFI and Bluetooth. The Option LRBW-UG offers the large Resolution Bandwidth which are needed for measurement of UWB Signals. For even more advanced signal analysis applications, e.g. of radar signals or correlation measurements, the large I/Q data can be postprocessed also by additional signal processing algorithms.

The largest IQ bandwidth of up to 200 MHz is available up to 40 GHz with activated preselection. In contrast to traditional receivers that are based on spectrum analyzers, thus with the TDEMI® X always full image rejection is guaranteed and high dynamic range provided without any need to turn off the preselection during wide IF bandwidth operation.

Click Rate Analyzer

The optional available click rate analyzer expands the existing TDEMI® Measurement System to a fully integrated click rate analyzer. So the combination of a receiver, as the TDEMI®, according to CISPR 16-1-1, a click rate analyzer and advanced evaluation methods, as the spectrogram mode, is available in a single box solution. The click rate measurement is performed at all four frequencies in parallel. Hereby, the total testing time is reduced significantly compared to sequential measurements performed by a conventional heterodyne receivers. By using the same digital data base of the TDEMI® System as in its receiver mode the calibration of the click rate analyzer is covered automatically by the standard calibration of the TDEMI® System. The click rate analysis is operated by an own graphical user interface. The software measures and displays the current signal at all four frequencies in parallel as peak and quasi-peak value each. Both detector values are fully stored and evaluated. After finishing testing every single disturbance can be selected from a list and the response of the IF signal and the quasi-peak value can be displayed and a test report can be automatically created, so there is no need anymore to repeat a measurement for a certain click or time.

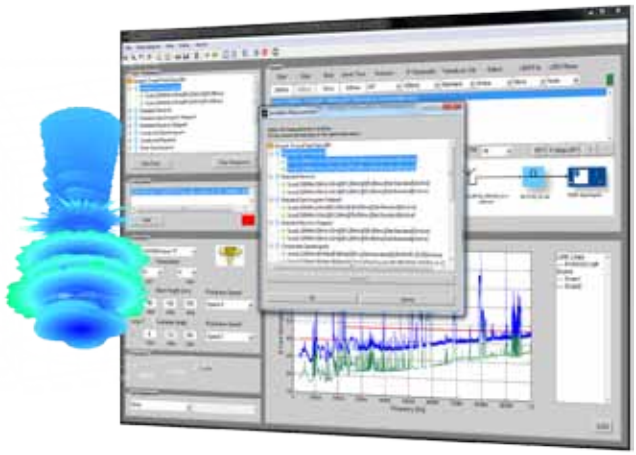

Fig. 13 – **Screenshot EMI 64k Software Suite.**

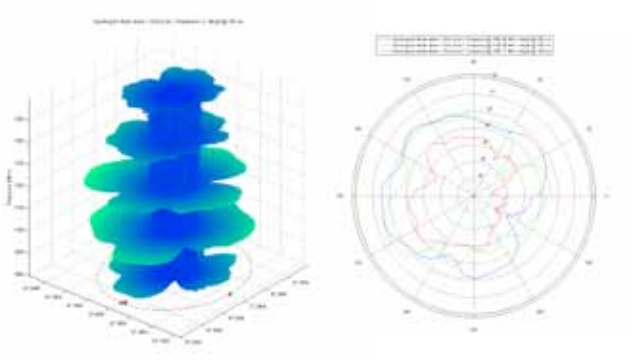

Fig. 14 – **Screenshot EMI 64k Software Suite - radiation pattern in 2D and 3D.**

EMI 64k Automation Software Suite

The EMI 64k automation software suite of GAUSS INSTRUMENTS, allows to embed your TDEMI® and TDEMI® X EMI Receiver in a fully automated test environment. A full automation of EMI testing according to all commercial and military standards is available with this software suite. Using the capabilities of the TDEMI® X with a fully gapless processing and full Quasi-peak detection the EMI 64k is the only software that provides a full automation even under conditions of sporadic interferences or drifting emissions. This unique technology avoids manual searching of peaks and improves the overall test quality. In addition the complete radiation pattern is measured at all frequencies with Quasi-peak detector.

The EMI 64k provides traditional measurement procedures like pre-scanning and final maximization at individual frequencies as well as full automated EMI testing using the full benefits of a huge real-time bandwidth of 645 MHz with Quasi-peak and Average detector to get the spectrum at all angular positions and heights. The method of data reduction and fully automated maximization using the real-time spectrogram mode can be combined for extremely fast and accurate testing.

The EMI 64k software supports conducted emissions, measurement of disturbance power, radiated emission measurements in a full anechoic room or at an open area test site as well as in a semi anechoic chamber. For all these typical test setups the EMI testing is fully automated. Also measurements with your GTEM cell, which is a very effective approach to test small devices, are possible with the EMI 64k software to speed up the measurement using the Quasi-peak detector for a scan with a scan time between 3s (TDEMI® X) and 64 s (TDEMI® M). The measurement is carried out at all 3 axis and the calculation of an OATS equivalent result is performed.

The EMI 64k automation software is available for all TDEMI® product families and can be hosted on your TDEMI® System or from a separate work station via an external PC or Laptop.

The EMI 64k is a bundle of packages that can be configured according to the customer requirements. The great advantage is the following: You only pay for the features that you need and you can upgrade anytime later with additional features that you need for future tests.

TDEMI® X Specifications

Frequency Range	
TDEMI® X1	› 9 kHz - 1 GHz
TDEMI® X3	› 9 kHz - 3 GHz
TDEMI® X6	› 9 kHz - 6 GHz
TDEMI® X18	› 9 kHz - 18 GHz
TDEMI® X26	› 9 kHz - 26.5 GHz
TDEMI® X40	› 9 kHz - 40 GHz
extendable	down to 10 Hz - 9 kHz, with Option MIL/DO-UG
extendable	down to DC, with Option DC-UG
Reference Oscillator (OCXO)	› Aging < +/- 3.5 ppm / 15 years › Temperature drift (0 – 60° C) < +/- 1 x 10e-8 SSB phase noise (1 Hz BW): 1 Hz -90 dBc/Hz 10 Hz -120 dBc/Hz 100 Hz -135 dBc/Hz 1 kHz -145 dBc/Hz
Receiver Mode	› Analog and Digital Superheterodyne Receiver › STFFT-based Receiver Mode (Multichannel Mode) › Trace Point > 8.000.000

Receiver Mode (CISPR 16-1-1, ANSI C63.2)	
IF Bandwidth 200 Hz	› IF Filter: Gaussian Shaped Filter, Specification according to CISPR 16-1-1, Bandwidth Deviation < 10% › Peak, Average, CISPR-Average, Quasi-Peak, RMS, CISPR-RMS-AVG Detector (Option CRMS-UG) › Measurement at > 1400 Frequencies in parallel, >2400 Frequencies in parallel (with Option QCDSP-UG) › Frequency Step < 100 Hz
IF Bandwidth 9 kHz	› IF Filter: Gaussian Shaped Filter, Specification according to CISPR 16-1-1, Bandwidth Deviation < 10% › Peak, Average, CISPR-Average, Quasi-Peak, RMS, CISPR-RMS-AVG Detector (Option CRMS-UG) › Measurement at 8192 Frequencies in parallel, 16384 Frequencies in parallel (with Option QCDSP-UG) › Frequency Step < 400 Hz
IF Bandwidth 120 kHz	› IF Filter: Gaussian Shaped Filter, Specification according to CISPR 16-1-1, Bandwidth Deviation < 10% › Peak, Average, CISPR-Average, Quasi-Peak, RMS, CISPR-RMS-AVG Detector (Option CRMS-UG) › Measurement at 2048 Frequencies in parallel 4096 Frequencies in parallel (with Option QCDSP-UG) › Frequency Step < 400 Hz
IF Bandwidth 1 MHz	› IF Filter: Gaussian Shaped Filter, Specification according to CISPR 16-1-1, Bandwidth Deviation < 10% › Peak, Average, CISPR-Average, RMS, CISPR-RMS-AVG Detector (Option CRMS-UG) › Measurement at 256 Frequencies in parallel, 512 Frequencies in parallel (with Option QCDSP-UG) › Frequency Step < 800 Hz

Noise Floor (Receiver Mode) without Option PRLNA-UG
Preselection (in front of preamp) active, Average Detector, typical

TDEMI® X1	› 9 kHz – 150 kHz (200 Hz IF):	< -20 dBµV
	› 1 MHz – 30 MHz (9kHz IF):	< -15 dBµV
	› 30 MHz – 1 GHz (120 kHz IF):	< -8 dBµV
TDEMI® X3	› 9 kHz – 150 kHz (200 Hz IF):	< -20 dBµV
	› 1 MHz – 30 MHz (9kHz IF):	< -15 dBµV
	› 30 MHz – 1 GHz (120 kHz IF):	< -8 dBµV
	› 1 GHz – 1.1 GHz (1 MHz IF):	< 1 dBuV
	› 1.1 GHz – 3 GHz (1 MHz IF):	< 2 dBuV
TDEMI® X6	› 9 kHz – 150 kHz (200 Hz IF):	< -20 dBµV
	› 1 MHz – 30 MHz (9kHz IF):	< -15 dBµV
	› 30 MHz – 1 GHz (120 kHz IF):	< -8 dBµV
	› 1 GHz – 1.1 GHz (1 MHz IF):	< 1 dBuV
	› 1.1 GHz – 6 GHz (1 MHz IF):	< 2 dBuV
TDEMI® X18	› 9 kHz – 150 kHz (200 Hz IF):	< -20 dBµV
	› 1 MHz – 30 MHz (9kHz IF):	< -15 dBµV
	› 30 MHz – 1 GHz (120 kHz IF):	< -8 dBµV
	› 1 GHz – 1.1 GHz (1 MHz IF):	< 1 dBuV
	› 1.1 GHz – 6 GHz (1 MHz IF):	< 2 dBuV
	› 6 GHz – 9 GHz (1 MHz IF):	< 10 dBuV
	› 9 GHz – 13 GHz (1 MHz IF):	< 10 dBuV
	› 13 GHz – 18 GHz (1 MHz IF):	< 15 dBuV
TDEMI® X26	› 9 kHz – 150 kHz (200 Hz IF):	< -20 dBµV
	› 1 MHz – 30 MHz (9kHz IF):	< -15 dBµV
	› 30 MHz – 1 GHz (120 kHz IF):	< -8 dBµV
	› 1 GHz – 1.1 GHz (1 MHz IF):	< 1 dBuV
	› 1.1 GHz – 6 GHz (1 MHz IF):	< 2 dBuV
	› 6 GHz – 9 GHz (1 MHz IF):	< 10 dBuV
	› 9 GHz – 13 GHz (1 MHz IF):	< 10 dBuV
	› 13 GHz – 18 GHz (1 MHz IF):	< 15 dBuV
	› 18 GHz – 26.5 GHz (1 MHz IF):	< 10 dBuV
TDEMI® X40	› 9 kHz – 150 kHz (200 Hz IF):	< -20 dBµV
	› 1 MHz – 30 MHz (9kHz IF):	< -15 dBµV
	› 30 MHz – 1 GHz (120 kHz IF):	< -8 dBµV
	› 1 GHz – 1.1 GHz (1 MHz IF):	< 1 dBuV
	› 1.1 GHz – 6 GHz (1 MHz IF):	< 2 dBuV
	› 6 GHz – 9 GHz (1 MHz IF):	< 10 dBuV
	› 9 GHz – 13 GHz (1 MHz IF):	< 10 dBuV
	› 13 GHz – 18 GHz (1 MHz IF):	< 15 dBuV
	› 18 GHz – 26.5 GHz (1 MHz IF):	< 10 dBuV
	› 26.5 GHz – 33 GHz (1 MHz IF):	< 18 dBuV
	› 33 GHz – 40 GHz (1 MHz IF):	< 20 dBuV

Noise Floor (Receiver Mode) with Option PRLNA-UG
Preselection (in front of preamp) active, Average Detector, typical

		Option ULNA-UG	off	on
TDEMI® X1	› 10 Hz – 100 Hz (10 Hz IF):		< 0 dBuV	< 0 dBuV
	› 100 Hz – 1 kHz (10 Hz IF):		< -10 dBuV	< -10 dBuV
	› 1 kHz – 9 kHz (10 Hz IF):		< -20 dBuV	< -20 dBuV
	› 9 kHz – 150 kHz (200 Hz IF):		< -20 dBµV	< -20 dBµV
	› 1 MHz – 30 MHz (9kHz IF):		< -15 dBµV	< -15 dBµV
	› 30 MHz – 1 GHz (120 kHz IF):		< -8 dBµV	< -15 dBµV
TDEMI® X3	› 10 Hz – 100 Hz (10 Hz IF):		< 0 dBuV	< 0 dBuV
	› 100 Hz – 1 kHz (10 Hz IF):		< -10 dBuV	< -10 dBuV
	› 1 kHz – 9 kHz (10 Hz IF):		< -20 dBuV	< -20 dBuV
	› 9 kHz – 150 kHz (200 Hz IF):		< -20 dBµV	< -20 dBµV
	› 1 MHz – 30 MHz (9kHz IF):		< -15 dBµV	< -15 dBµV
	› 30 MHz – 1 GHz (120 kHz IF):		< -8 dBµV	< -15 dBµV
	› 1 GHz – 1.1 GHz (1 MHz IF):		< 1 dBuV	< - 4 dBuV
	› 1.1 GHz – 3 GHz (1 MHz IF):		< 2 dBuV	< - 4 dBuV
TDEMI® X6	› 10 Hz – 100 Hz (10 Hz IF):		< 0 dBuV	< 0 dBuV
	› 100 Hz – 1 kHz (10 Hz IF):		< -10 dBuV	< -10 dBuV
	› 1 kHz – 9 kHz (10 Hz IF):		< -20 dBuV	< -20 dBuV
	› 9 kHz – 150 kHz (200 Hz IF):		< -20 dBµV	< -20 dBµV
	› 1 MHz – 30 MHz (9kHz IF):		< -15 dBµV	< -15 dBµV
	› 30 MHz – 1 GHz (120 kHz IF):		< -8 dBµV	< -15 dBµV
	› 1 GHz – 1.1 GHz (1 MHz IF):		< 1 dBuV	< - 4 dBuV
	› 1.1 GHz – 6 GHz (1 MHz IF):		< 2 dBuV	< - 4 dBuV
TDEMI® X18	› 10 Hz – 100 Hz (10 Hz IF):		< 0 dBuV	< 0 dBuV
	› 100 Hz – 1 kHz (10 Hz IF):		< -10 dBuV	< -10 dBuV
	› 1 kHz – 9 kHz (10 Hz IF):		< -20 dBuV	< -20 dBuV
	› 9 kHz – 150 kHz (200 Hz IF):		< -20 dBµV	< -20 dBµV
	› 1 MHz – 30 MHz (9kHz IF):		< -15 dBµV	< -15 dBµV
	› 30 MHz – 1 GHz (120 kHz IF):		< -8 dBµV	< -15 dBµV
	› 1 GHz – 1.1 GHz (1 MHz IF):		< 1 dBuV	< - 4 dBuV
	› 1.1 GHz – 6 GHz (1 MHz IF):		< 2 dBuV	< - 4 dBuV
	› 6 GHz – 9 GHz (1 MHz IF):		< 3 dBuV	< - 4 dBuV
	› 9 GHz – 13 GHz (1 MHz IF):		< 3 dBuV	< - 4 dBuV
	› 13 GHz – 18 GHz (1 MHz IF):		< 3 dBuV	< - 4 dBuV
TDEMI® X26	› 10 Hz – 100 Hz (10 Hz IF):		< 0 dBuV	< 0 dBuV
	› 100 Hz – 1 kHz (10 Hz IF):		< -10 dBuV	< -10 dBuV
	› 1 kHz – 9 kHz (10 Hz IF):		< -20 dBuV	< -20 dBuV
	› 9 kHz – 150 kHz (200 Hz IF):		< -20 dBµV	< -20 dBµV
	› 1 MHz – 30 MHz (9kHz IF):		< -15 dBµV	< -15 dBµV
	› 30 MHz – 1 GHz (120 kHz IF):		< -8 dBµV	< -15 dBµV
	› 1 GHz – 1.1 GHz (1 MHz IF):		< 1 dBuV	< - 4 dBuV
	› 1.1 GHz – 6 GHz (1 MHz IF):		< 2 dBuV	< - 4 dBuV
	› 6 GHz – 9 GHz (1 MHz IF):		< 3 dBuV	< - 4 dBuV
	› 9 GHz – 13 GHz (1 MHz IF):		< 3 dBuV	< - 4 dBuV
	› 13 GHz – 18 GHz (1 MHz IF):		< 3 dBuV	< - 4 dBuV
	› 18 GHz – 26.5 GHz (1 MHz IF):		< 5 dBuV	< 3 dBuV
TDEMI® X40	› 10 Hz – 100 Hz (10 Hz IF):		< 0 dBuV	< 0 dBuV
	› 100 Hz – 1 kHz (10 Hz IF):		< -10 dBuV	< -10 dBuV
	› 1 kHz – 9 kHz (10 Hz IF):		< -20 dBuV	< -20 dBuV
	› 9 kHz – 150 kHz (200 Hz IF):		< -20 dBµV	< -20 dBµV
	› 1 MHz – 30 MHz (9kHz IF):		< -15 dBµV	< -15 dBµV
	› 30 MHz – 1 GHz (120 kHz IF):		< -8 dBµV	< -15 dBµV
	› 1 GHz – 1.1 GHz (1 MHz IF):		< 1 dBuV	< - 4 dBuV
	› 1.1 GHz – 6 GHz (1 MHz IF):		< 2 dBuV	< - 4 dBuV
	› 6 GHz – 9 GHz (1 MHz IF):		< 3 dBuV	< - 4 dBuV
	› 9 GHz – 13 GHz (1 MHz IF):		< 3 dBuV	< - 4 dBuV
	› 13 GHz – 18 GHz (1 MHz IF):		< 3 dBuV	< - 4 dBuV
	› 18 GHz – 26.5 GHz (1 MHz IF):		< 5 dBuV	< 3 dBuV
	› 26.5 GHz – 33 GHz (1 MHz IF):		< 5 dBuV	< 5 dBuV
	› 33 GHz – 40 GHz (1 MHz IF):		< 5 dBuV	< 5 dBuV

Receiver Mode (MIL-461, DO-160, ANSI C63.2) with Option MIL/DO-UG

IF Bandwidth 1 Hz	› IF Filter: Gaussian Shaped › Bandwidth Deviation < 10% › Peak, Average, RMS Detector
IF Bandwidth 10 Hz	› IF Filter: Gaussian Shaped › Bandwidth Deviation < 10% › Peak, Average, RMS Detector
IF Bandwidth 100 Hz	› IF Filter: Gaussian Shaped › Bandwidth Deviation < 10% › Peak, Average, RMS Detector
IF Bandwidth 1 kHz	› IF Filter: Gaussian Shaped › Bandwidth Deviation < 10% › Peak, Average, RMS Detector
IF Bandwidth 10 kHz	› IF Filter: Gaussian Shaped › Bandwidth Deviation < 10% › Peak, Average, RMS Detector
IF Bandwidth 100 kHz	› IF Filter: Gaussian Shaped › Bandwidth Deviation < 10% › Peak, Average, RMS Detector
IF Bandwidth 1 MHz	› IF Filter: Gaussian Shaped › Bandwidth Deviation < 10% › Peak, Average, RMS Detector
Attenuator	› Mechanical: 0 – 70 dB, 10 dB Steps; or 0 – 75 dB, 5 dB Steps › Electronical: 5 dB Steps › Autorange Function › Protection during Start-up: 10 dB › Protection in Off-State: Set to the max. Att.
Spectral purity	› 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.)

TDEMI® X Specifications

Preselection without Option PRLNA-UG

TDEMI® X1	High-pass Filter 150 kHz 150 kHz – 30 MHz 30 MHz – 300 MHz 30 MHz – 1 GHz
TDEMI® X3	High-pass Filter 150 kHz 150 kHz – 30 MHz 30 MHz – 300 MHz 30 MHz – 1.15 GHz 1.15 GHz – 3 GHz
TDEMI® X6	High-pass Filter 150 kHz 150 kHz – 30 MHz 30 MHz – 300 MHz 30 MHz – 1.15 GHz 1.15 GHz – 3 GHz 3 GHz – 6 GHz
TDEMI® X18	High-pass Filter 150 kHz 150 kHz – 30 MHz 30 MHz – 300 MHz 30 MHz – 1.15 GHz 1.15 GHz – 3 GHz 3 GHz – 6 GHz 6 GHz – 9 GHz 9 GHz – 13 GHz 13 GHz – 15 GHz 15 GHz – 18 GHz
TDEMI® X26	High-pass Filter 150 kHz 150 kHz – 30 MHz 30 MHz – 300 MHz 30 MHz – 1.15 GHz 1.15 GHz – 3 GHz 3 GHz – 6 GHz 6 GHz – 9 GHz 9 GHz – 13 GHz 13 GHz – 15 GHz 15 GHz – 18 GHz 18 GHz – 22 GHz 22 GHz – 26.5 GHz
TDEMI® X40	High-pass Filter 150 kHz 150 kHz – 30 MHz 30 MHz – 300 MHz 30 MHz – 1.15 GHz 1.15 GHz – 3 GHz 3 GHz – 6 GHz 6 GHz – 9 GHz 9 GHz – 13 GHz 13 GHz – 15 GHz 15 GHz – 18 GHz 18 GHz – 22 GHz 22 GHz – 26.5 GHz 26.5 GHz – 29.2 GHz 29.2 GHz – 33 GHz 33 GHz – 40 GHz

Preselection with Option PRLNA-UG

TDEMI® X1	DC – 9 kHz 9 kHz – 150 kHz 150 kHz – 30 MHz 30 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
TDEMI® X3	DC – 9 kHz 9 kHz – 150 kHz 150 kHz – 30 MHz 30 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 1 GHz – 3 GHz
TDEMI® X6	DC – 9 kHz 9 kHz – 150 kHz 150 kHz – 30 MHz 30 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 1 GHz – 3 GHz 3 GHz – 6 GHz
TDEMI® X18	DC – 9 kHz 9 kHz – 150 kHz 150 kHz – 30 MHz 30 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 1 GHz – 3 GHz 3 GHz – 6 GHz 6 GHz – 9 GHz 9 GHz – 13 GHz 13 GHz – 15 GHz 15 GHz – 18 GHz

TDEMI® X26	DC – 9 kHz 9 kHz – 150 kHz 150 kHz – 30 MHz 30 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 1 GHz – 3 GHz 3 GHz – 6 GHz 6 GHz – 9 GHz 9 GHz – 13 GHz 13 GHz – 15 GHz 15 GHz – 18 GHz 18 GHz – 22 GHz 22 GHz – 26.5 GHz
TDEMI® X40	DC – 9 kHz 9 kHz – 150 kHz 150 kHz – 30 MHz 30 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 1 GHz – 3 GHz 3 GHz – 6 GHz 6 GHz – 9 GHz 9 GHz – 13 GHz 13 GHz – 15 GHz 15 GHz – 18 GHz 18 GHz – 22 GHz 22 GHz – 26.5 GHz 26.5 GHz – 29.2 GHz 29.2 GHz – 33 GHz 33 GHz – 40 GHz

Low Noise Preamplifier without Option PRLNA-UG

TDEMI® X1	› Fixed between Preselection and ADC › 150 kHz – 1.15 GHz (Gain 20 dB, NF typ. 2.5 dB)
TDEMI® X3	› Fixed between Preselection and Mixer, ADC respectively › 150 kHz – 1.15 GHz (Gain 20 dB, NF typ. 2.5 dB) › 1.15 GHz – 3 GHz (Gain 20 dB, NF typ. 2.0 dB)
TDEMI® X6	› Fixed between Preselection and Mixer, ADC respectively › 150 kHz – 1.15 GHz (Gain 20 dB, NF typ. 2.5 dB) › 1.15 GHz – 6 GHz (Gain 20 dB, NF typ. 2.0 dB)
TDEMI® X18	› Fixed between Preselection and Mixer, ADC respectively › 150 kHz – 1.15 GHz (Gain 20 dB, NF typ. 2.5 dB) › 1.15 GHz – 6 GHz (Gain 20 dB, NF typ. 2.0 dB) › 6 GHz – 9 GHz (Gain 17 dB, NF typ. 1.6 dB) › 9 GHz – 13 GHz (Gain 21 dB, NF typ. 1.8 dB) › 13 GHz – 18 GHz (Gain 19 dB, NF typ. 2.2 dB)
TDEMI® X26	› Fixed between Preselection and Mixer, ADC respectively › 150 kHz – 1.15 GHz (Gain 20 dB, NF typ. 2.5 dB) › 1.15 GHz – 6 GHz (Gain 20 dB, NF typ. 2.0 dB) › 6 GHz – 9 GHz (Gain 17 dB, NF typ. 1.6 dB) › 9 GHz – 13 GHz (Gain 21 dB, NF typ. 1.8 dB) › 13 GHz – 18 GHz (Gain 19 dB, NF typ. 2.2 dB) › 18 GHz – 26.5 GHz (Gain 22 dB, NF typ. 2.0 dB)
TDEMI® X40	› Fixed between Preselection and Mixer, ADC respectively › 150 kHz – 1.15 GHz (Gain 20 dB, NF typ. 2.5 dB) › 1.15 GHz – 6 GHz (Gain 20 dB, NF typ. 2.0 dB) › 6 GHz – 9 GHz (Gain 17 dB, NF typ. 1.6 dB) › 9 GHz – 13 GHz (Gain 21 dB, NF typ. 1.8 dB) › 13 GHz – 18 GHz (Gain 19 dB, NF typ. 2.2 dB) › 18 GHz – 26.5 GHz (Gain 22 dB, NF typ. 2.0 dB) › 26.5 GHz – 33 GHz (Gain 22 dB, NF typ. 2.0 dB) › 33 GHz – 40 GHz (Gain 17 dB, NF typ. 2.1 dB)

TDEMI® X Specifications

Low Noise Preamplifier with Option PRLNA-UG

TDEMI® X1	› switchable on/off › 150 kHz – 1.15 GHz (Gain 20 dB, NF typ. 2.0 dB)
TDEMI® X3	› switchable on/off › 150 kHz – 1.15 GHz (Gain 20 dB, NF typ. 2.0 dB) › 1.15 GHz – 3 GHz (Gain 20 dB, NF typ. 2.0 dB)
TDEMI® X6	› switchable on/off › 150 kHz – 1.15 GHz (Gain 20 dB, NF typ. 2.0 dB) › 1.15 GHz – 6 GHz (Gain 20 dB, NF typ. 2.0 dB)
TDEMI® X18	› switchable on/off › 150 kHz – 1.15 GHz (Gain 20 dB, NF typ. 2.0 dB) › 1.15 GHz – 6 GHz (Gain 20 dB, NF typ. 2.0 dB) › 6 GHz – 9 GHz (Gain 20 dB, NF typ. 2.0 dB) › 9 GHz – 13 GHz (Gain 20 dB, NF typ. 2.0 dB) › 13 GHz – 18 GHz (Gain 20 dB, NF typ. 2.0 dB)
TDEMI® X26	› switchable on/off › 150 kHz – 1.15 GHz (Gain 20 dB, NF typ. 2.0 dB) › 1.15 GHz – 6 GHz (Gain 20 dB, NF typ. 2.0 dB) › 6 GHz – 9 GHz (Gain 20 dB, NF typ. 2.0 dB) › 9 GHz – 13 GHz (Gain 20 dB, NF typ. 2.0 dB) › 13 GHz – 18 GHz (Gain 20 dB, NF typ. 2.0 dB) › 18 GHz – 26.5 GHz (Gain 20 dB, NF typ. 2.0 dB)
TDEMI® X40	› switchable on/off › 150 kHz – 1.15 GHz (Gain 20 dB, NF typ. 2.0 dB) › 1.15 GHz – 6 GHz (Gain 20 dB, NF typ. 2.0 dB) › 6 GHz – 9 GHz (Gain 20 dB, NF typ. 2.0 dB) › 9 GHz – 13 GHz (Gain 20 dB, NF typ. 2.0 dB) › 13 GHz – 18 GHz (Gain 20 dB, NF typ. 2.0 dB) › 18 GHz – 26.5 GHz (Gain 20 dB, NF typ. 2.0 dB) › 26.5 GHz – 33 GHz (Gain 20 dB, NF typ. 2.0 dB) › 33 GHz – 40 GHz (Gain 20 dB, NF typ. 2.0 dB)

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
Dynamic, Nonlinearities	› Preamp active, Preselection active/inactive, Attenuator: 0 dB › Image Frequency Rejection: typ. 70 dBc (100dBc Multisampling) › IF Rejection: 70 dBc, (100dBc Multisampling) › Display Level Range: Noise floor – 120 dBµV (13dBm) › split into 2 Measurement Ranges › Automatical Switching between Measurement Ranges 1) Noise floor – 90 dBµV 2) 90 dBµV – 120 dBµV (f < 1 GHz) › P1dB@1 GHz: > 120 dBµV , P1dB Mixer 5 dBm › IP3: > 142 dBµV (typ. 155 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 < 18 GHz: +/- 1.5 dB 18 GHz < f < 40 GHz: +/- 2 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 › 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: 1dB (9 kHz – 1 GHz) 2dB (1 GHz – 40 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 Preamplifer: On/Off, PRLNA: Off DC – 1 GHz < 0.5 dB (σ = 0.15dB) 1 GHz – 18 GHz < 1.5 dB (σ = 0.50dB) 8 GHz – 40 GHz < 2 dB (σ = 0.67dB) › Attenuation: all states including 0dB Preamplifer: On/Off, PRLNA: On DC – 30 MHz < 0.5 dB (σ = 0.15dB) 30 MHz – 1 MHz < 1.2 dB (σ = 0.40dB) 1 GHz – 18 GHz < 1.5 dB (σ = 0.50dB) 18 GHz – 40 GHz < 2 dB (σ = 0.67dB)
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)	› Preamplifer: On/Off, PRLNA: Off DC – 1 GHz < 0.3 dB 1 GHz – 18 GHz < 0.7 dB 18 GHz – 40 GHz < 1.5 dB › Attenuation: all states including 0dB Preamplifer: On/Off, PRLNA: On DC – 30 MHz < 0.3 dB 30 MHz – 1 MHz < 0.6 dB 1 GHz – 18 GHz < 0.7 dB 18 GHz – 40 GHz < 1.5 dB
Measurement time	› 1 µs – 60 s (Average, RMS) › 1 µs – infinite (Peak, Quasi-Peak, CISPR-Average, CISPR-RMS-Average)

Maximum input level (RF1)	› 0 dB Attenuator 122 dBµV 6V Pulses › 10 dB Attenuator 132 dBµV 18V Pulses
Maximum input level (RF2)	› 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
Demodulation (Receiver Mode) (Option DM-UG)	› Amplitude Modulation (AM) › Frequency Modulation (FM) › "Tune to Marker" Function
Analog-Digital-Converter System	› Number of bit per A/D Converter: 12 › Sampling rate: 2.6 GS/s › Number of Analog-Digital-Converter (multiresolution): 2 › Full number of bit (real-time bandwidth 162.5 MHz): 22 › P1dB (ADC1) typ.: 13 dBm (without preamp) › P1dB (ADC2) typ.: 40 dBm Peak (pulses)
EMI Receiver FFT-based Measuring Instrument [1]	› Frequency segment processed in parallel 162.5 MHz › Frequency segment processed in parallel 325 MHz (with Option QCDSP-UG)
Scanning Speed (Receiver Mode typ.)	› Band A, Quasi-Peak, dwell time 1 s : 3 s › Band A, Quasi-Peak, dwell time 1 s : 1.5 s (QCDSP-UG) › Band B (150 kHz - 30 MHz) 9 kHz peak detector, dwell time 100 ms: 0.1 s › Band B, Quasi-Peak, dwell time 1 s: 3 s › Band B, Quasi-Peak, dwell time 1 s: 1.5 s (QCDSP-UG) › Band C/D (30 MHz - 1 GHz) 120 kHz, peak detector, dwell time 10 ms: < 1 s › Band C/D (30 MHz - 1 GHz) 9 kHz, peak detector, dwell time 10 ms: < 2 s › Band C/D Quasi-Peak, dwell time 1 s: 20 s › Band C/D Quasi-Peak, dwell time 1 s: 10 s (QCDSP-UG) › Band E (1 GHz – 6 GHz), dwell time 100 ms: 4 s › Band E (1 GHz – 6 GHz), dwell time100 ms: 2 s (QCDSP-UG)

Weighted real-time Spectrogram (Receiver Mode)

Acc. to CISPR 16-1-1, ANSI C63.2, MIL-461, DO-160	› Real-time bandwidth 162.5 MHz › Peak, Quasi-Peak, Average, CISPR-Average, and RMS detector › Time-domain fully gapless › Frequency Step: Half of Bandwidth › Minimum resolution in time 5 ms (depending on number of points) › Zoom & Pan to Select Frequency band of interest

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

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
Time-domain Analysis (RF) - Oscilloscope	› Bandwidth 1 GHz › Sampling rate 2.6 GS/s › 16 Bit resolution › 32000 Samples › Trigger, Post- and Pre- Trigger function, Amplitude Trigger
Tracking generator (Option MG-UG)	› MG-UG1G: 9 kHz – 1 GHz › MG-UG3G: 9 kHz – 3 GHz › MG-UG6G: 9 kHz – 6 GHz › MG-UG20G: 9 kHz – 20 GHz › MG-UG40G: 9 kHz – 40 GHz › MG-UG XE: Control of external signal generator › Synchronous and fast sweeped › Normalization for Transducer Factors (export function)
Remote control / Interfaces	› Ethernet/LAN (1 GBit and 100 MBit) › Remote Control Command Set according to SCPI Standard › USB 2.0, RS232, PS/2, Audio out for AM/FM Demodulation, VGA, HDMI › GPIB (with Option GPIB-UG)
Display / User Interface	› Resolution 800 x 600 Pixel, 8.4", True Color (16,78 m. colors) › Touchscreen
Power Supply	› 230 V +/-20% 50 Hz, 110 V+/-10% 60 Hz › Power consumption (typ.): 120 W to 150 W
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
Weight (ca.)	› TDEMI® X1: 15 kg › TDEMI® X3: 18 kg › TDEMI® X6: 18 kg › TDEMI® X18: 20 kg › TDEMI® X26: 20 kg › TDEMI® X40: 25 kg

TDEMI® X Specifications

Spectrum Analyzer

IF Bandwidths	› 3 dB Bandwidth: 1 Hz – 30 MHz › 1, 2, 3, 5 Steps › Small Step Size (145 Steps) for Channel Measurements › 6 dB Bandwidths CISPR, ANSI: 200 Hz, 9 kHz, 120 kHz, 1 MHz › 6 dB Bandwidths MIL/DO, ANSI: 10 Hz, 100 Hz, 1 kHz, 10 kHz, 100 kHz, 1 MHz › 3dB bandwidths: 20 MHz, 40 MHz (Option IQ-UG), 50 MHz, 80 MHz, 100 MHz, 160 MHz (Option IQ-UG + LRBW-UG) [1] › Channel Filter: 60 kHz, 100 kHz, 200 kHz, 500 kHz, 1 MHz, 2 MHz, 4 MHz, 8 MHz, 15 MHz, 30 MHz (Option IQ-UG), 50 MHz, 100 MHz, 200 MHz (Option IQ-UG+LRBW-UG) [1]
Video Filter	› 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
Detector (Video Filter off)	› Maxpeak, Average, RMS › Dynamic Requirements according to CISPR 16-1-1 (Peak, AVG)
Sweep time	› Traditional Mode: 10 µs – 1000 s › Multi-Channel Mode: 10 µs – 1000 s › Definition via dwell time: 10 µs – 150 s › Autoset Function
Typical sweep time for Scanning	› 30 MHz – 1 GHz: 40 ms (dwell time 2 ms) (120 kHz) › 1 GHz – 6 GHz: 1s (dwell time 0.5ms) (1 MHz) › 30 GHz – 40 GHz: 1s (dwell time 0.1ms) (1 MHz) › 30 GHz – 40 GHz: 3s (dwell time 0.1ms) (120 kHz)
Multi-Channel Mode	› Speeding up the Measurement by: Factor 32768, Factor 65536 (Option QCDSP-UG) › Number of Points measured in parallel: 32768, 65536 (Option QCDSP-UG) › Reduction of Dead time: Factor 32768, Factor 65536 (Option QCDSP-UG) › Real-time Analysis and Evaluation Bandwidth: 162.5 MHz, 325 MHz (Option QCDSP-UG)
Display and analysis Functions	› Measurements against Masks and Limit Lines › Parameters as carrier to noise ratio, occupied bandwidth, spurious emission, APD, CCDF › Pulse Train Measurement › Analysis of IQ Data (Option IQ-UG) › Trace Points 8.000.000 › Bandwidth > 200 MHz (Option LRBW-UG) [2]

1 Signal analysis available without option LRBW-UG_E only up to 30 GHz

2 up to 30 GHz; with option LRBW-UG_E up to 40 GHz (Dual-use export controlled)

Real-time Spectrum Analyzer

Analysis Settings	› Automatic Selection of the Settings › STFFT Resolution: 32768 Points › STFFT Resolution: 65536 Points (Option QCDSP-UG) › Real-time Analysis Bandwidth 162.5 MHz › Real-time Analysis Bandwidth 325 MHz (Option QCDSP-UG) › Time-domain fully gapless › Frequency Step: Half of Bandwidth › Minimum resolution in time 5 ms (depending on number of points) › Zoom & Pan to Select Frequency band of interest › Analysis of History
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
IF Bandwidths	› 3 dB Bandwidth: 1 Hz – 30 MHz › 1, 2, 3, 5 Steps › Small Step Size (145 Steps) for Channel Measurements › 6 dB Bandwidths CISPR, ANSI: 200 Hz, 9kHz, 120 kHz, 1 MHz › 6 dB Bandwidths MIL/DO, ANSI: 10 Hz, 100 Hz, 1 kHz, 10 kHz, 100 kHz, 1 MHz
Video Filter	› 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
Detector (Video Filter off)	› Maxpeak, Average, RMS › Dynamic Requirements according to CISPR 16-1-1 (Peak, AVG)
Noise Floor (Analyzer Mode) without Option PRLNA-UG	› Preselection (in front of preamp) active, Average Detector › 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 – 9 GHz < -157 dBm/Hz › 9 GHz – 13 GHz < -157 dBm/Hz › 13 GHz – 18 GHz < -152 dBm/Hz › 18 GHz – 26.5 GHz < -147 dBm/Hz › 26.5 GHz – 33 GHz < -149 dBm/Hz › 33 GHz – 40 GHz < -147 dBm/Hz
Noise Floor (Analyzer Mode) with Option PRLNA-UG	› LNA on, Preselection on/off, Average Detector › 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 – 9 GHz < -165 dBm/Hz › 9 GHz – 13 GHz < -165 dBm/Hz › 13 GHz – 18 GHz < -160 dBm/Hz › 18 GHz – 26.5 GHz < -160 dBm/Hz › 26.5 GHz – 33 GHz < -160 dBm/Hz › 33 GHz – 40 GHz < -160 dBm/Hz

TDEMI® X Options

Main Options

DC-UG	› Frequency range extension down to DC	F, Z
MIL/DO-UG	› Start frequency 10 Hz, decade bandwidths: 10 Hz, 100 Hz, 1kHz, 10 kHz, 100 kHz, 1 MHz	F, Z
QCDSP-UG	› Enhanced DSP Unit, boosting system calculation power, Increase of measurement speed for receiver and spectrum analyzer, Extension of real-time analysis bandwidth to 325 MHz.	F, Z
645M-UG	› Real-time Bandwidth 645 MHz, Quasi-Peak and CISPR-AVG parallel in real-time spectrogram mode More increase of measurement speed (Requirement: Option QCDSP-UG)	F, Z
UFSPA-UG	› Multi GHz Real-Time Scanning Module for Real-Time Spectrum Analyzer Hardware and Software for ultra fast scanning in Spectrum Analyzer Mode	F, Z
ULNA-UG	› Ultra Low Noise Amplifier, additionally integrated for ultra low noise floor	F, Z
PRLNA-UG	› Preselection Low Noise Amplifier System	
MG-UG	› Tracking generator	F, Z
MX-UG	› External Mixer Hardware Interface (Requirement: Option MG-UG)	F, Z
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
KB-UG	› Compact keyboard incl. touchpad	H
TT-UG	› Transport trolley for TDEMI	H
DM-UG	› AM/FM demodulator	S
IQ-UG	› IQ data analysis	F, Z
LRBW-UG	› Further Resolution Bandwidths up to 200 MHz (requires IQ-UG) up to 30 GHz	F, Z
LRBW-UG_E	› Further Resolution Bandwidths up to 200 MHz (requires IQ-UG) up to 40 GHz (Dual-use export controlled)	F, Z
RG-UG	› Report generator including analysis of subranges	S
CRMS-UG	› CISPR-RMS-AVG detector	S
APD-UG	› APD measuring function according to CISPR 16-1-1, processing of frequencies in parallel in real-time	F, Z
CLICK-UG	› Click rate analyzer, measurement of 4 frequencies in parallel	S
EMI64k	› Automation Software Suite	S
CAL-UG	› Calibration by the manufacturer according to ISO17025, incl. certificate and documentation of values	24 Months
CALD-UG	› DAkkS Calibration by accredited lab according to DAkkS, incl. certificate and documentation of values	24 Months

F: Upgradeable, integration at manufacturer site necessary; Z: Additional costs for exchange; H: Delivery of hardware; S: Software installation

Recommended Calibration interval: 24 Months

FULL & PRE COMPLIANCE

GAUSS INSTRUMENTS®
TDEMI® TECHNOLOGY

FULL COMPLIANCE
TDEMI® EMI Receiver

Ultimate & ULTRA Series

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 [Ultimate & ULTRA]

1000 MHz — Real-Time Bandwidth [Ultimate]

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

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

up to 44 GHz — Frequency Ranges [Ultimate Series]

FULL COMPLIANCE
TDEMI® EMI Receiver

X & G Series

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

INFO
[X] eXtreme

INFO
[G] Standard

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]

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

1 Hz -1/3/6/9/18/26.5/30/40/44 GHz — Frequency Ranges [G Series]

PRE COMPLIANCE
TDEMI® EMI Receiver

M & M+ Series

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

Specifications subject to be changed without notice.
Technically conditioned color divergences are possible.

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QP REAL-TIME BANDWIDTH

162.5 MHz

SINCE 2007

QP REAL-TIME BANDWIDTH

325 MHz

SINCE 2013

QP REAL-TIME BANDWIDTH

645 MHz

SINCE 2016

ULTRA-FAST RECEIVER SCANNING

40 GHz

SINCE 2018

@ TDEMI ULTRA

QP REAL-TIME BANDWIDTH

1000 MHz

SINCE 2023

@ TDEMI Ultimate

REAL-TIME MEASUREMENTS

44 GHz

SINCE 2023

@ TDEMI Ultimate

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