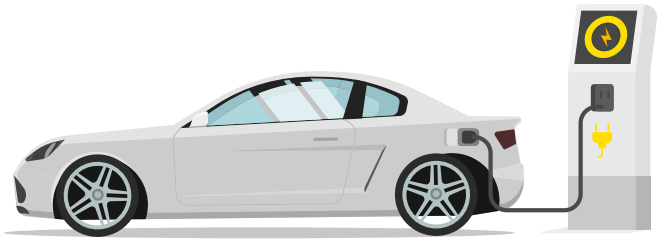
MESSTECHNIK

GRID IMPEDANCE ANALYZER

150 kHz / 450 kHz

Power Quality

Grid Impedance



Resonance Detection

Series resonances -> High Harmonic Voltages
Parallel resonances -> High Harmonic Currents

Power Line Comm. (PLC)

Troubleshooting (e.g. Detection of signal loss)
for CENELEC A,B,C,D / FCC / ARIB / EPRI

Grid Codes

Assessment of harmonic emission limits according to national grid codes (DACH-CZ, TOR, TAR, etc.)

Mobile Operation

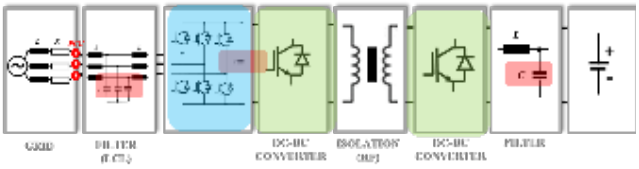
Battery powered by PQA8000H for up to 4 hours
Perfect for long- and short term measurement

www.neo-messtechnik.com

Applications

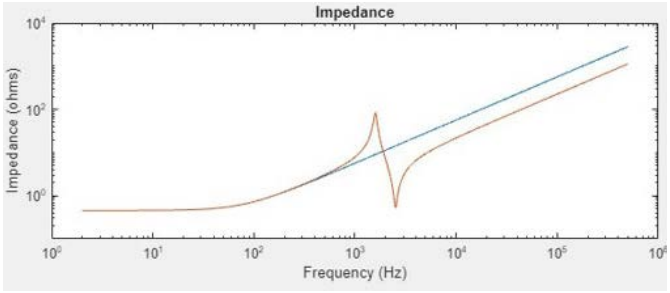
Use Case 1: Resonance Detection & Grid Codes

The high penetration of distributed generation and modern electrical devices based on active power electronics are causing significant changes in the higher frequency grid impedance. The additional inductances and capacitances (LCL filter, DC link etc.) causes multiple parallel and series resonances. Effects are high harmonic currents, high harmonic voltages, overheating of devices, noise, additional losses or malfunction of equipment or malfunction of digital communication.



Grid codes (for example DACH-CZ, TOR, TAR) first time allow the consideration of resonance factors for the determination of harmonic emission limits for each individual harmonic.

- *Definition of Harmonic Emission limits considering resonance factors*
- *Optimization of inverter control (Wind, PV, Motor etc.), filter (EMC) and reactive power control*



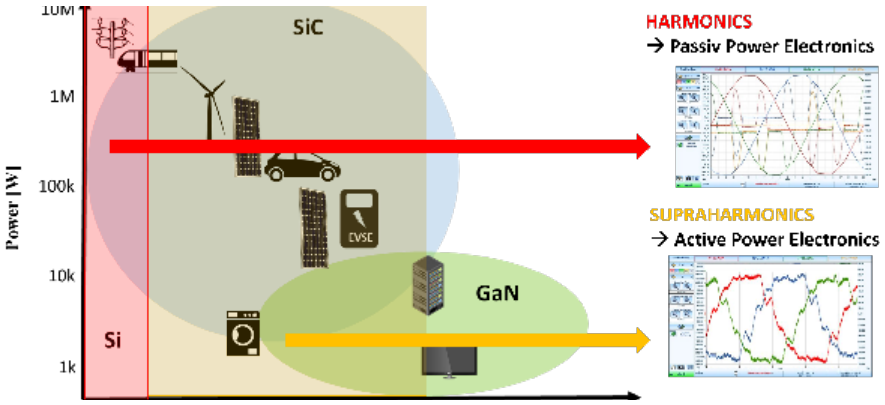
Picture 1: Example of connecting a V2G charging station
(Source Grasel 2023 The impact of V2G charger to the frequency dependent grid impedance CIRED Rom)
Reference Grid *V2G charger connected*

Picture 1 shows how resonance points appear while connecting a V2G charging station. Note: Even if the charging station is not in operation, resonance points are caused due to the LCL input filter.

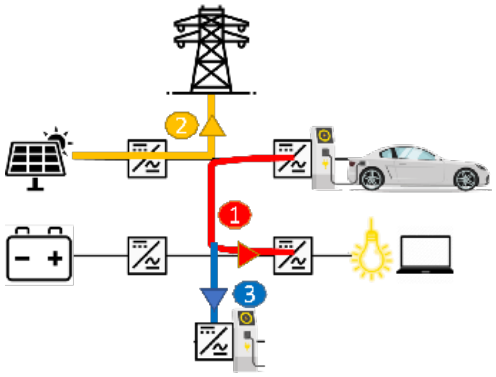
Use Case 2: Supraharmonic Propagation

Supraharmonic emissions in the range of 10 kHz to 500 kHz due to active power electronics such as Photovoltaics, Electric vehicle chargers, Wind power, heatpump and others

Propagation of Supraharmonics Examples
Case 1) within a customer facility
Case 2) to transformer station (e.g. up to 16 km)
Case 3) to non-active electric vehicle charging station



Picture 3: Supraharmonic emissions of active power electronics (Source: Grasel 2021)



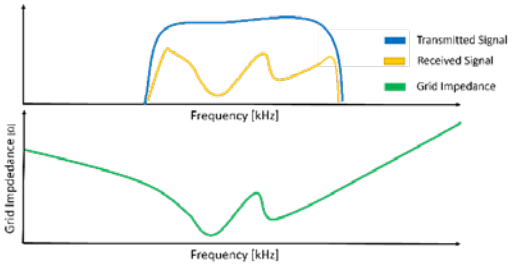
Picture 4: Exemplary Propagation of Supraharmonic Emissions

Use Case 3: Power Line Communication (PLC)

Power Line Communication (PLC) is widely used for Smart Metering applications in a frequency range from 10 kHz to 450 kHz (CENELEC A, B, C, D, FCC, ARIB). Existing power cables are used for communciation purposes but represent a "harsh" medium. Communciation failures are resulting due to:

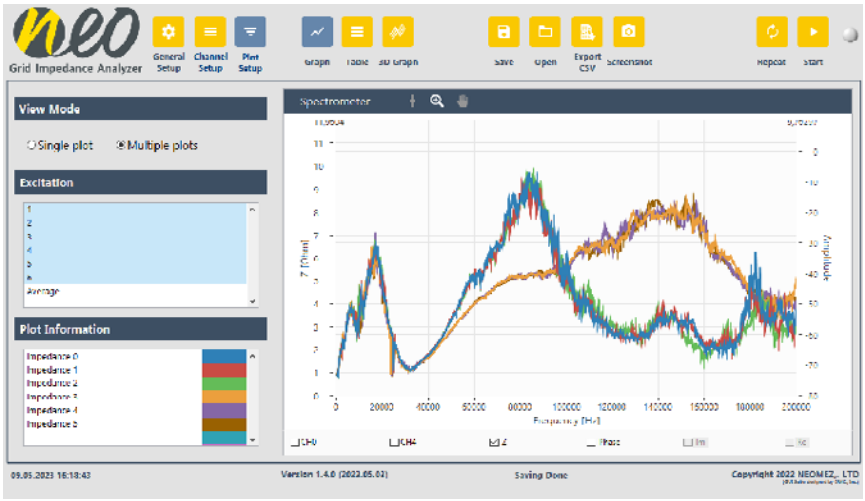
- Increasing Supraharmonic emissions causing a Noise floor
- Series Resonances (e.g. LCL input filter of other devices) representing a low-impedance path for intentional emissions
- Attenuation between transmitter and receiver

Picture 2 shows the relation between transmitted signal and grid impedance



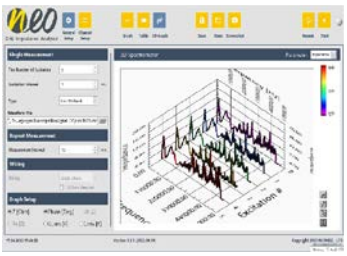
Picture 2: Relation of PLC transmission losses and higher frequency grid impedance

HARD- & SOFTWARE



Zeit- und frequenzabhängige Charakterisierung der Netzimpedanz (Netzimpedanz) des elektrischen Niederspannungsnetzes

Table View



3D Chart

Specifications	
Measurement Range	230 V / 400 V / (Option 690 V)
Safety Category	CAT IV 300V (Option 600V)
Frequency Range	up to 150 kHz (Option 450 kHz)
Nominal Frequency	50 Hz / 60 Hz / 16.7 Hz
Resolution	18 bit
Signal-to-Noise Ratio (SNR)	>100 dB
Measurement time	400ms per Excitation
Max. Current	5A rms
Wiring	L-N / L-L (Option: 3-Phase)
Battery	4 hours (powered by PQA8000H)
Export	CSV, RAW, JPG
Weight	2 kg
Dimensions (LxBxH)	265 x 255 x 125 mm

- **COMPACT DESIGN**
- **MOBILE OPERATION**
- **HIGH ACCURACY**
- **FAST MEASUREMENT**

Grid Impedance

Power Quality

PERFECT EXTENSION FOR PQA8000H

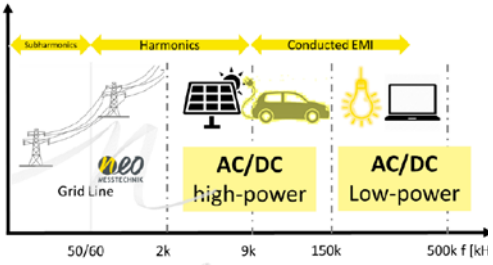
GIA1

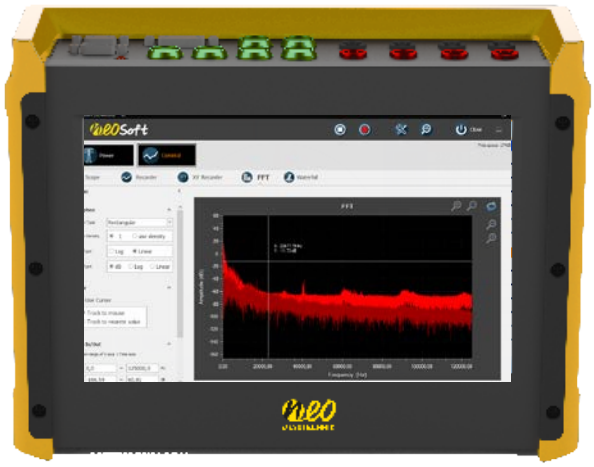
PQA8000H

Power Quality
Class A++

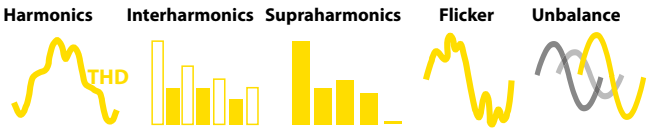
PQA8000H - DC to 500 kHz for voltage and current

- Harmonics / Interharmonics / THD / TDD
- Subharmonics / DC
- Supraharmonics 2 -9 kHz (IEC61000-4-7)
- Supraharmonics 8 - 500 kHz (IEC61000-4-30)
- Raw FFT and PLC Digital Data Stream
- Grid Impedance up to 500 kHz



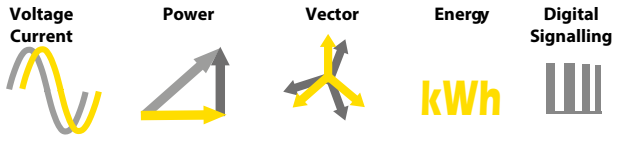


POWER QUALITY

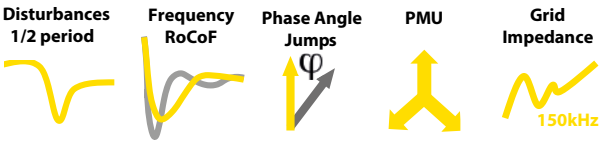


WAVEFORM & TRANSIENTS

POWER



DISTURBANCES AND SYSTEM DYNAMICS



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