

# High Frequency Power Quality

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## A challenge for the future low-voltage network

### Synthesis

Due to the increasing number of devices with intelligent power electronics on the network, combined with an increasing use of the low-voltage network as a communication medium, the coexistence of both systems will become a major problem in the future. Given the increasing application of both, the first problems already appear in practical installations. Power electronic converters, which are present in almost all electrical appliances, switch on frequencies between 2 kHz and 500 kHz. Narrow band Power Line Communication (PLC), both for control, metering and data communication with limited bandwidth, takes place in the 3 kHz to 148.5 kHz range.

Studies on low-frequency harmonics (up to 2 kHz) are widespread. However, SMPS and grid-connected inverters not only provide for the injection of harmonics but also for emissions at higher frequencies (switching harmonics from 2 kHz to 150 kHz and higher). In addition, both types of devices contain capacitors that form a low-impedant path at higher frequencies. This is a problem with the transmission of CAB signals (Central Remote Control) and PLC signals (power line communication) as the signals are "absorbed" as it were.

Another major problem is the fact that devices interfere with each other in their operation. These are caused by interference between devices, but also by interactions between devices and, for example, the time variant of the electricity grid itself. To avoid problems, work is currently underway on both emission and immunity standards in the 2 kHz - 150 kHz range.

The following questions were answered within the project:

- When do such problems occur?
- What is the probability that the problem will occur
- What are the consequences?
- Which solutions are available and which are needed in the long term?