Considerations and Measurements of Noise for the Industrial Link Segment

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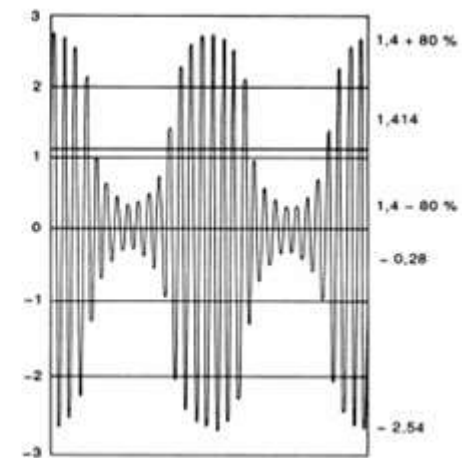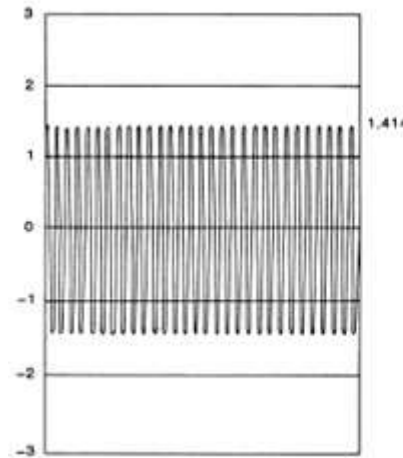
Motivation

- 10SPE Link Segment Model established

- SNR model needs the „N"

- There are standards related to noise in different environments:
  - EMC testing with levels for several environments (IEC 61000 / CISPR and many product standards)
  - MICE classification

- The standards do not link to the actual noise levels on the line (between the two wires)
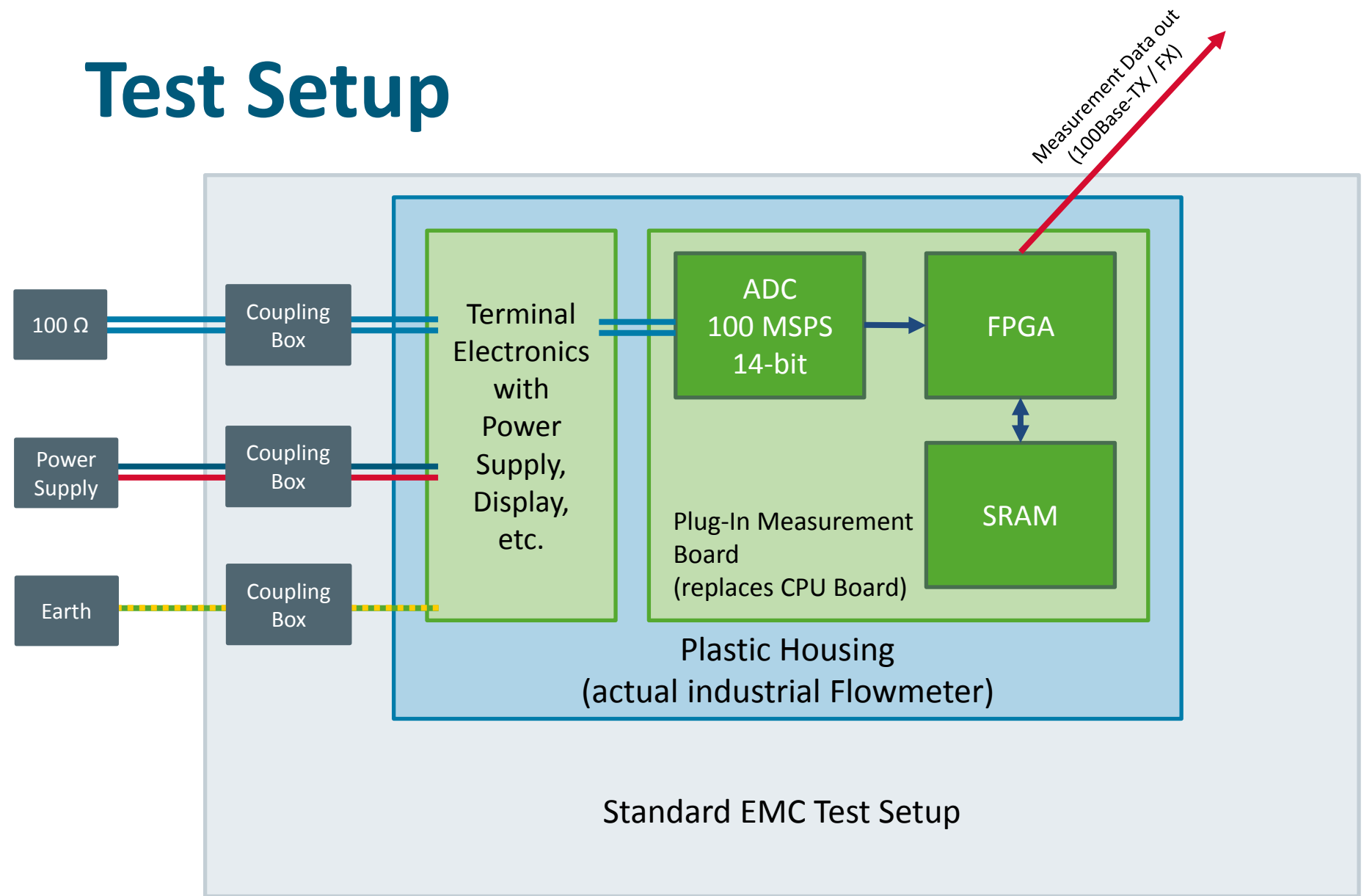
Goal for the measurements

- Get a link between testing levels and actual differential levels between the lines

- Measure the voltage under actual EMC-conditions in an real industrial device

- The measured levels are not universal for **every** device, but they give a rough estimation on the noise to be expected
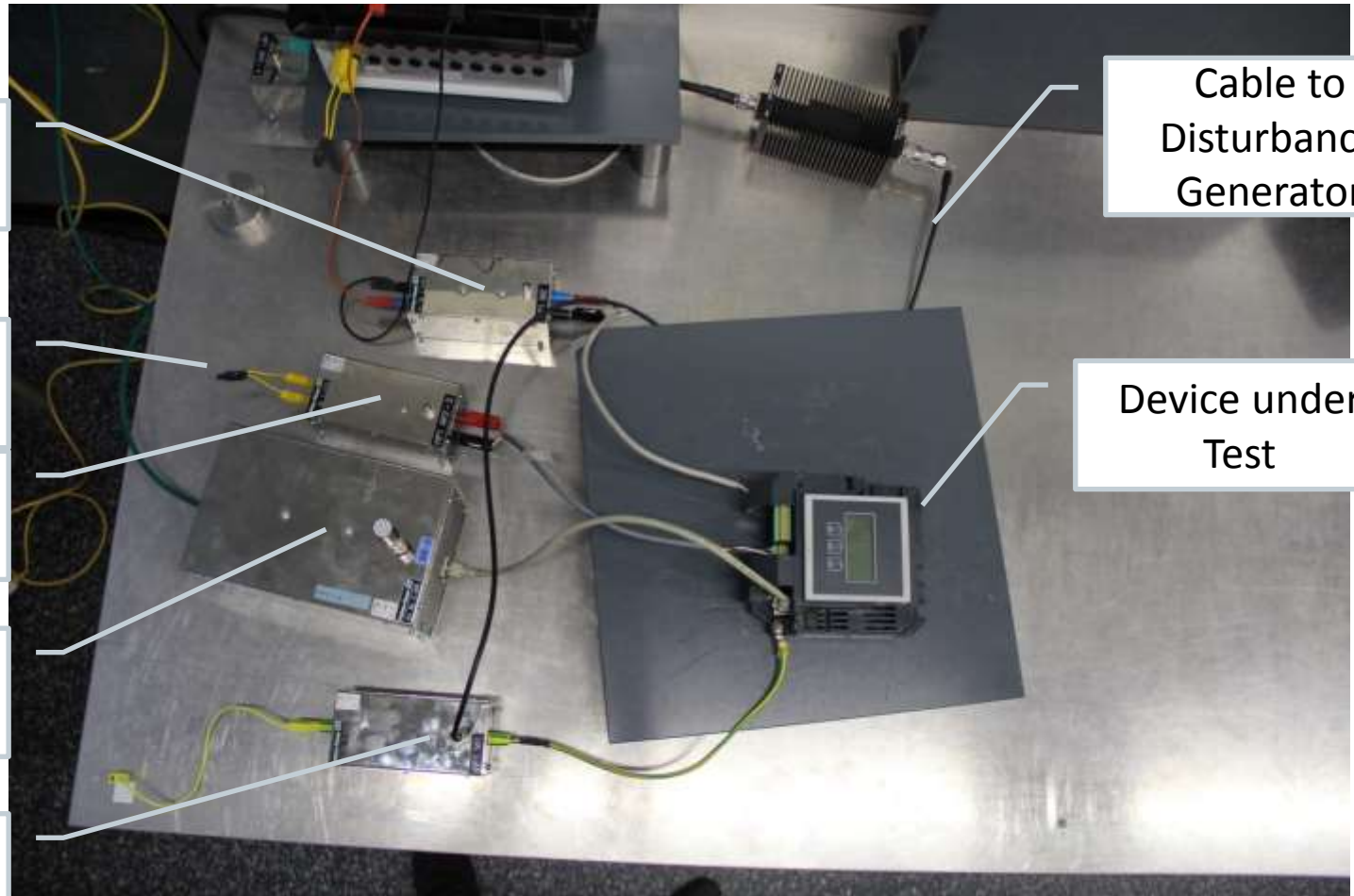
Conducted radio-frequency interference

- Conducted radio-frequency interference
  - Setup acc. to IEC 61000-4-6
  - Frequency range 10kHz to 80MHz
  - AM with 1kHz, modulation 80% of the test level

Test Setup

100 Ω

Coupling Box

Power Supply

Coupling Box

Earth

Coupling Box

Terminal Electronics with Power Supply, Display, etc.

ADC 100 MSPS 14-bit

FPGA

SRAM

Plug-In Measurement Board (replaces CPU Board)

Measurement Data out (100Base-TX / FX)

Plastic Housing (actual industrial Flowmeter)

Standard EMC Test Setup

Test Setup – RF Immunity
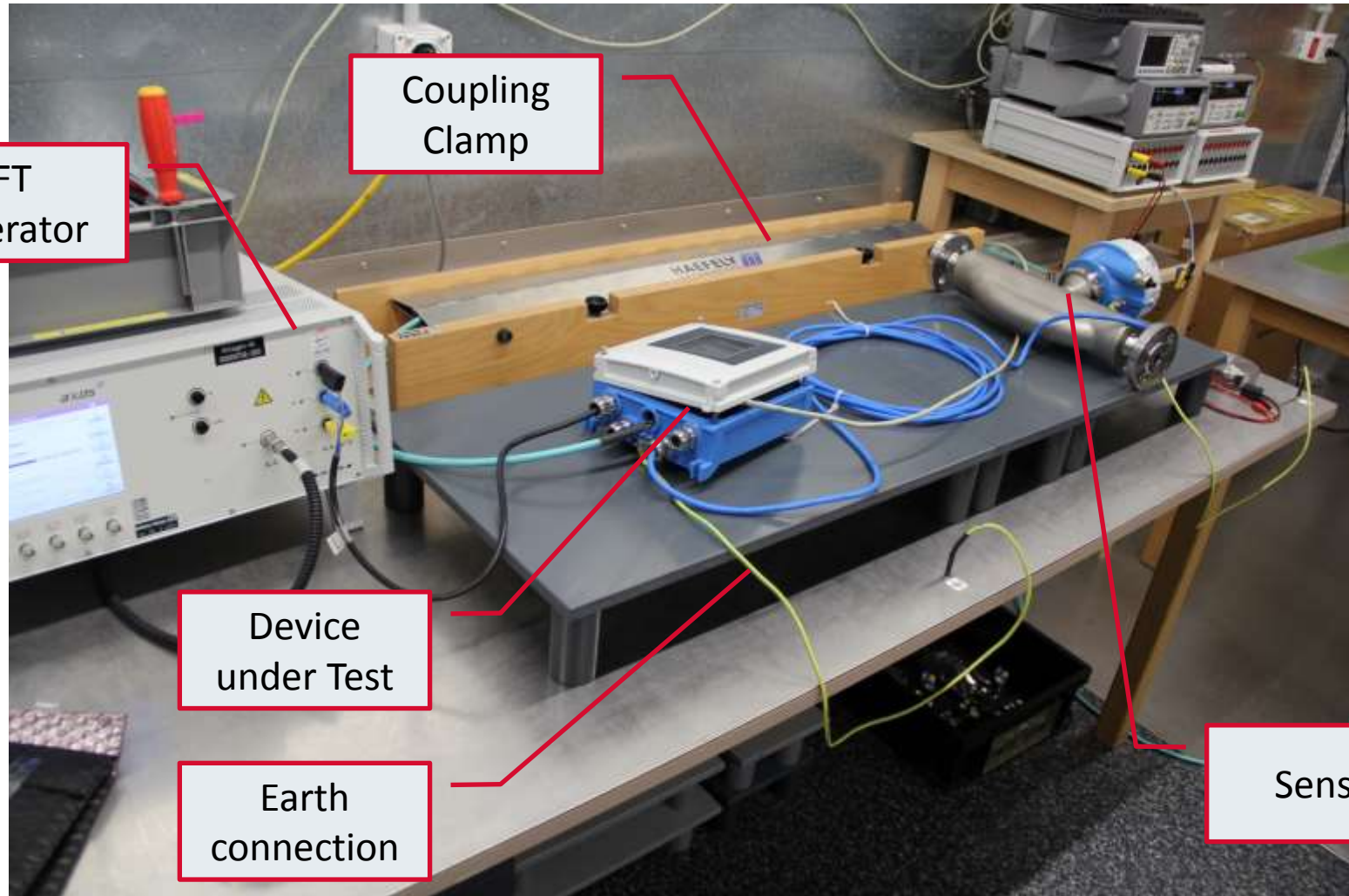

Power Supply

100 Ω

Future 10SPE

100Base-TX

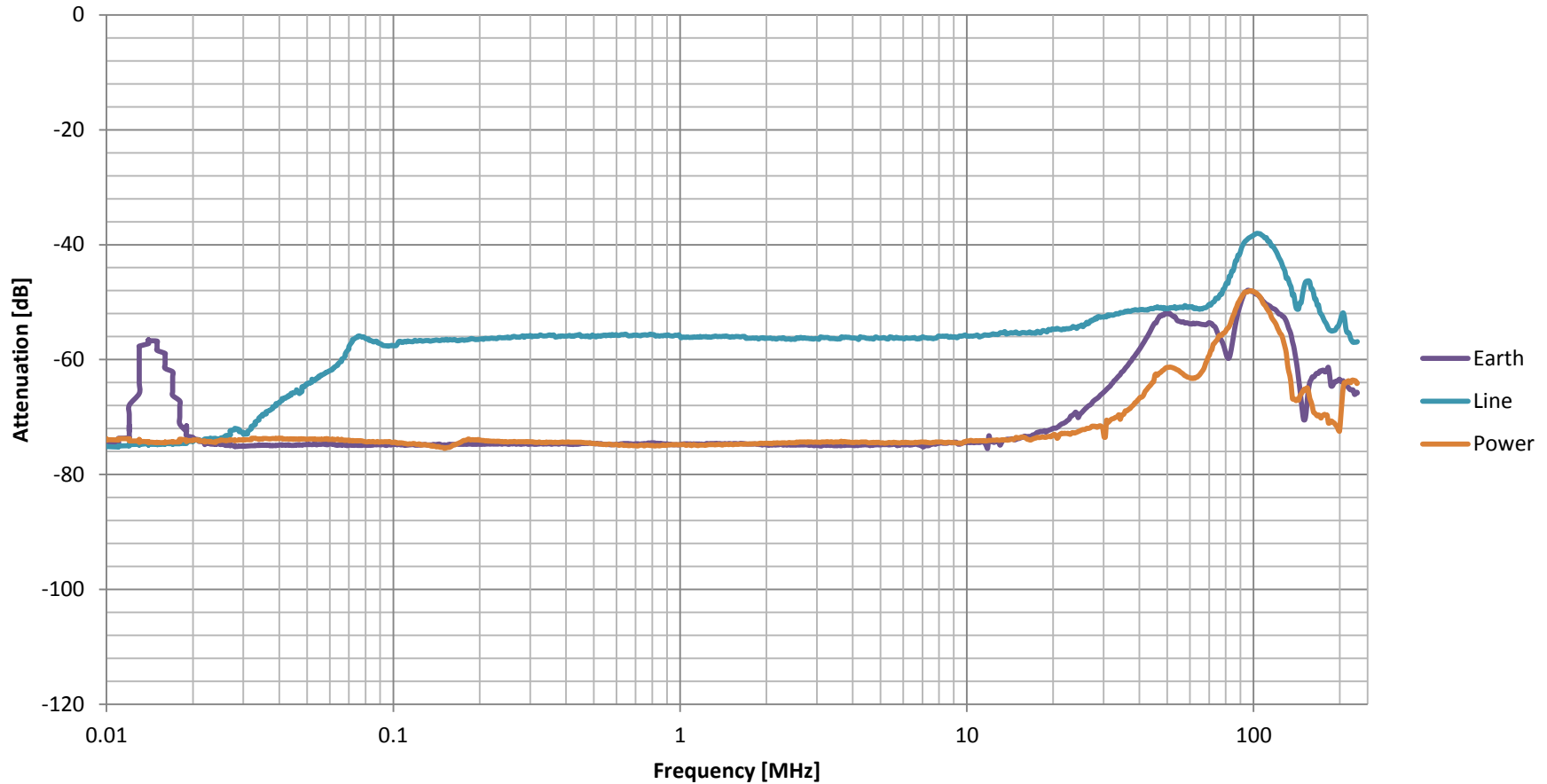Earth

Cable to Disturbance Generator

Device under Test
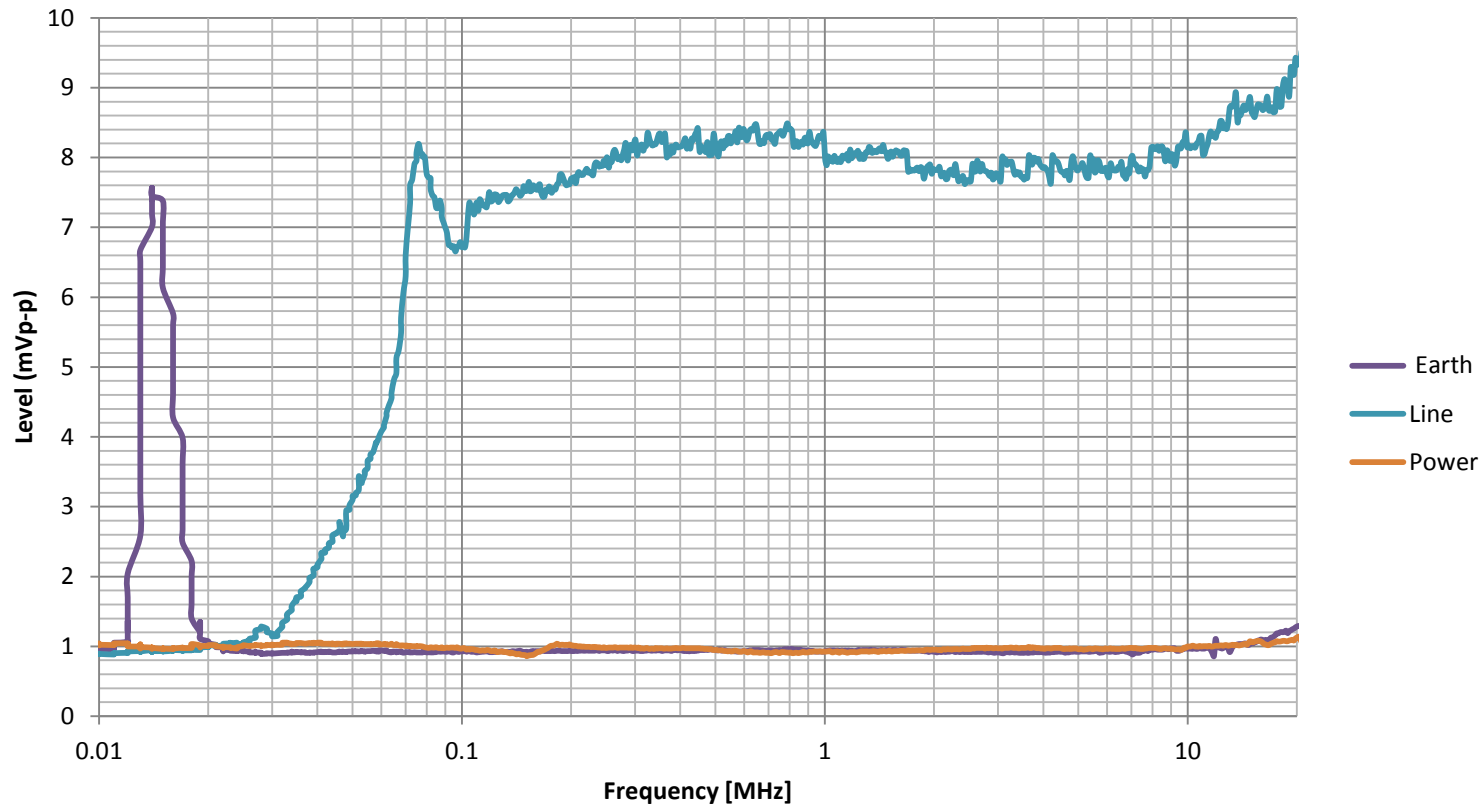
Test Setup – EFT

Test Results – RF Immunity
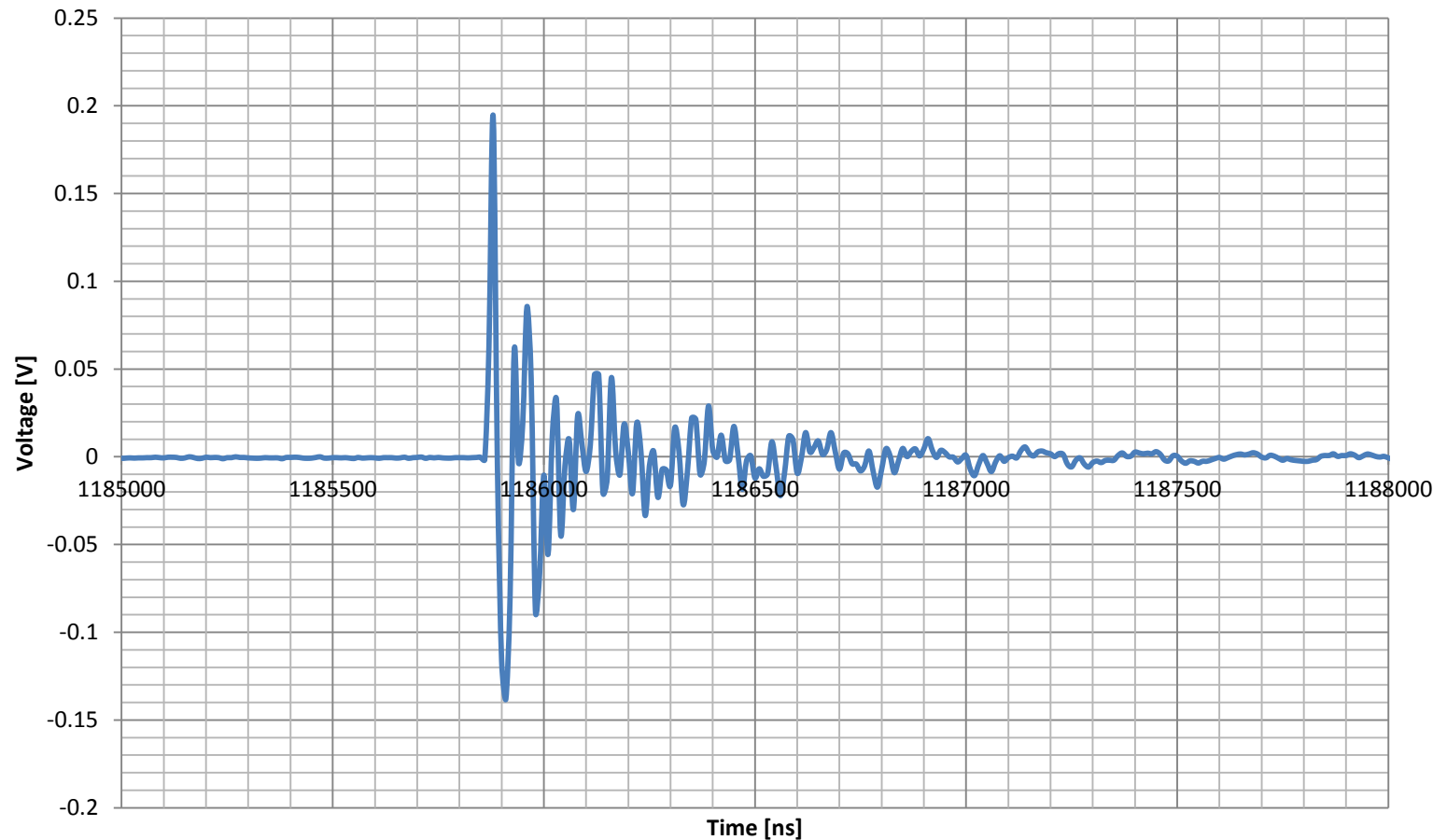

Conducted Immunity Transfer Ratio

Test Results – RF Immunity

Conducted Immunity Differential Voltage at 10V Test Voltage

Test Results – EFT

Burst waveform on dataline at 1kV test voltage

Conclusion

- RF-noise can be kept under 10mVpp
  - No issues when used with the proposed modulation levels

- EFT can go up to 200mV
  - Might be hard to handle
  - Retries?

- This is a test with a single device, so not universal!

Further work

- Other EMC-Testing
- Using the future sample rate of the system and a matching low-pass filter
- Test different shielding options
- Test with a common mode choke

Thank You