EMI DEBUGGING USING OSCILLOSCOPES

Dr. Gabriel Rojas
Application Engineer Power Electronics

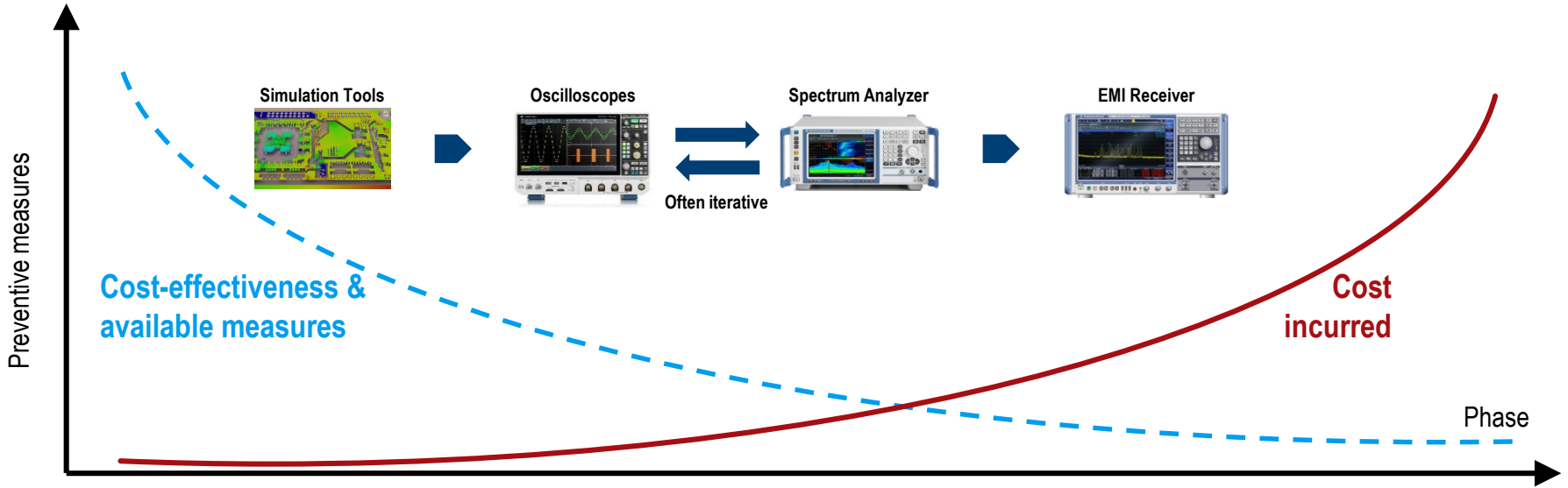
ROHDE&SCHWARZ
Make ideas real

Simulation

Pre-compliance

Debugging

Compliance



R&D

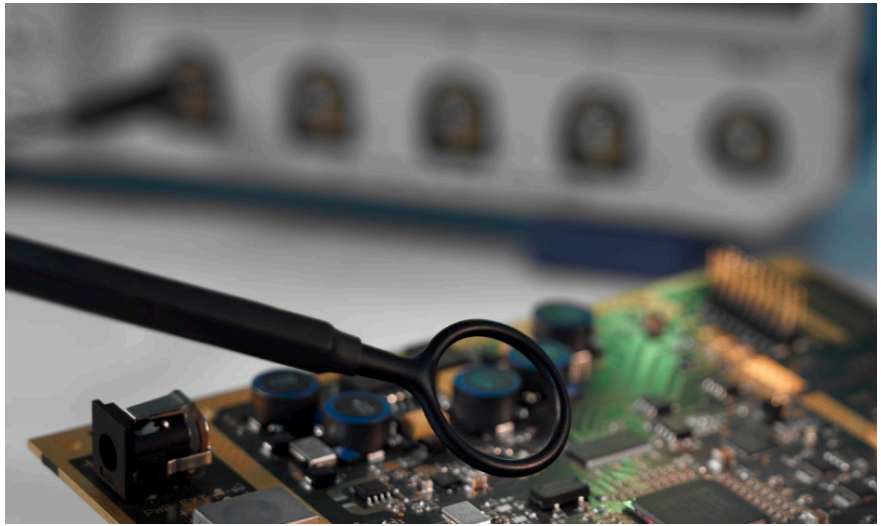
Prototype

Pre-Production

Manufacturing

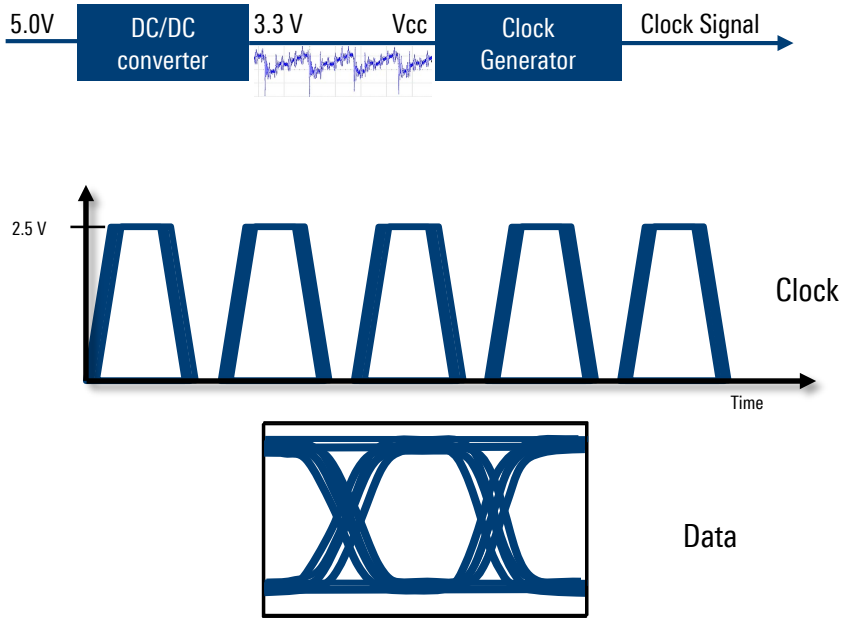
Design

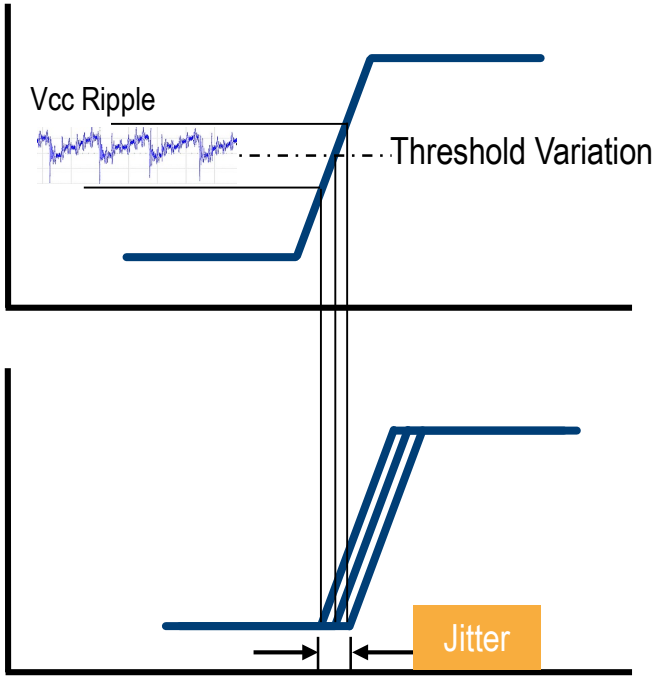
PREVENTION IS BETTER THAN CURE



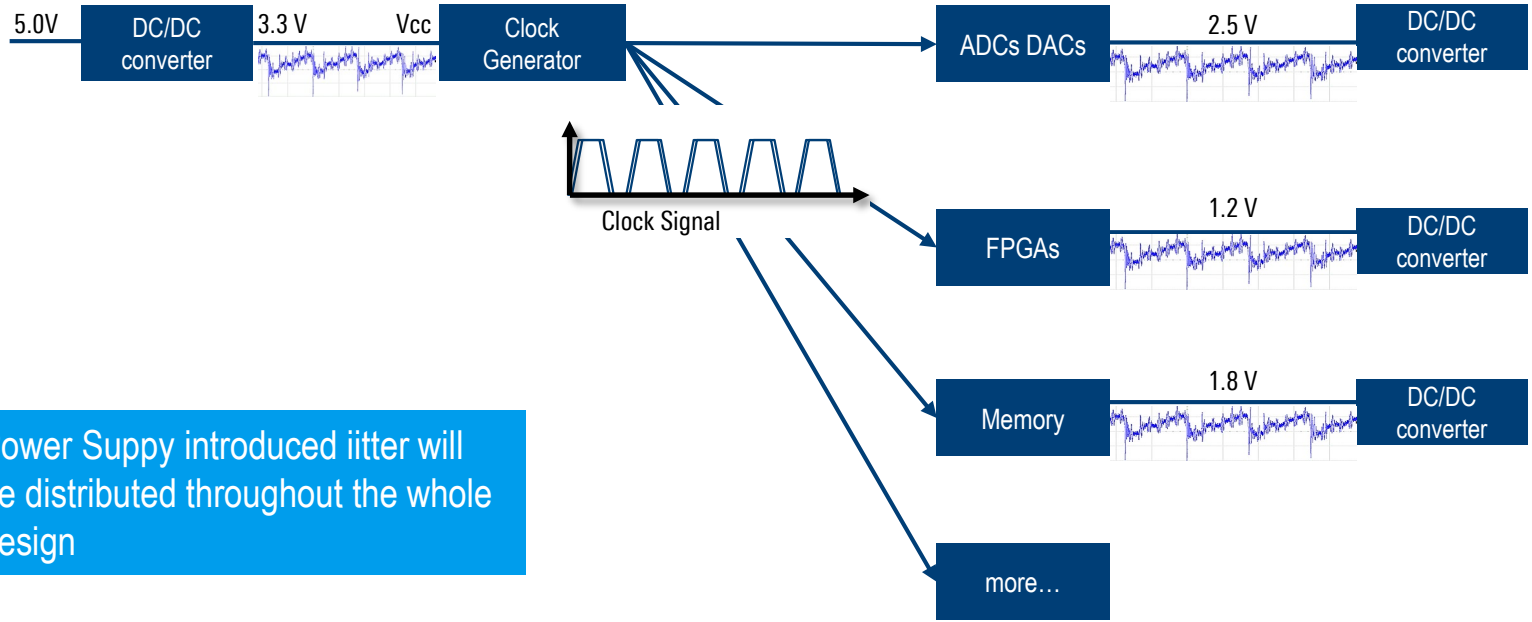
Similar to medical check-up for preventive health care, we diagnose early on circuit to avoid future issues

WHY EMI ON POWER CIRCUIT MATTERS?
DEGRADING AND INFLUENCE ON SIGNAL INTEGRITY



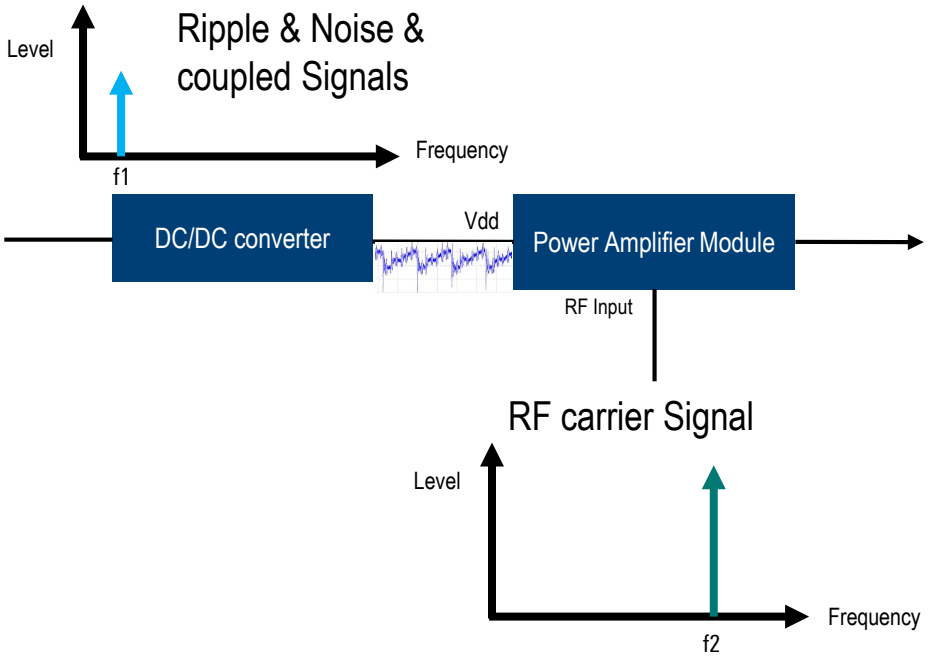


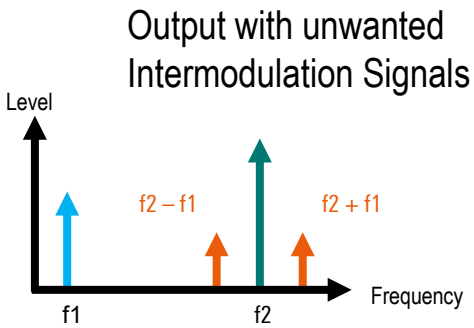
WHY EMI ON POWER CIRCUIT MATTERS?
DEGRADING AND INFLUENCE ON SIGNAL INTEGRITY



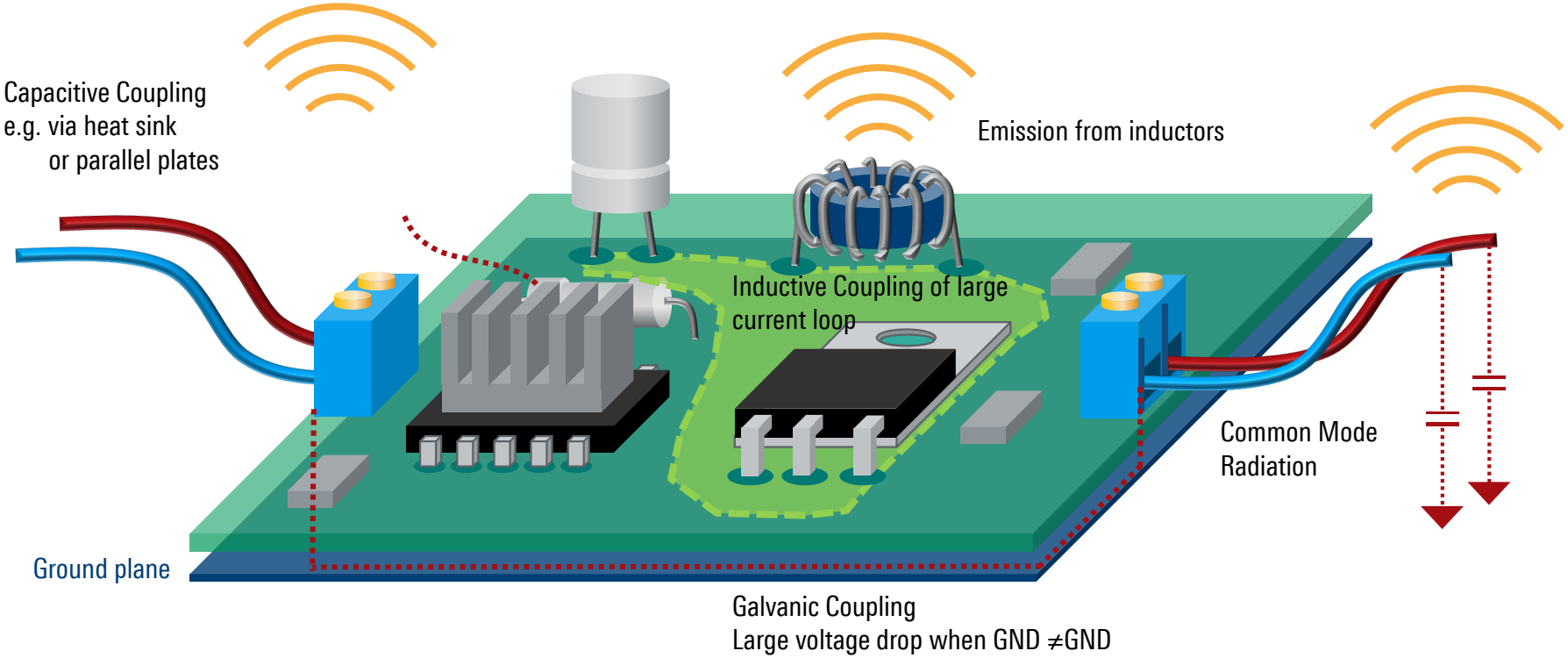
Power Suppy introduced iitter will be distributed throughout the whole design

WHY EMI ON POWER CIRCUIT MATTERS?
POWER INTEGRITY INFLUENCES RF SIGNAL INTEGRITY

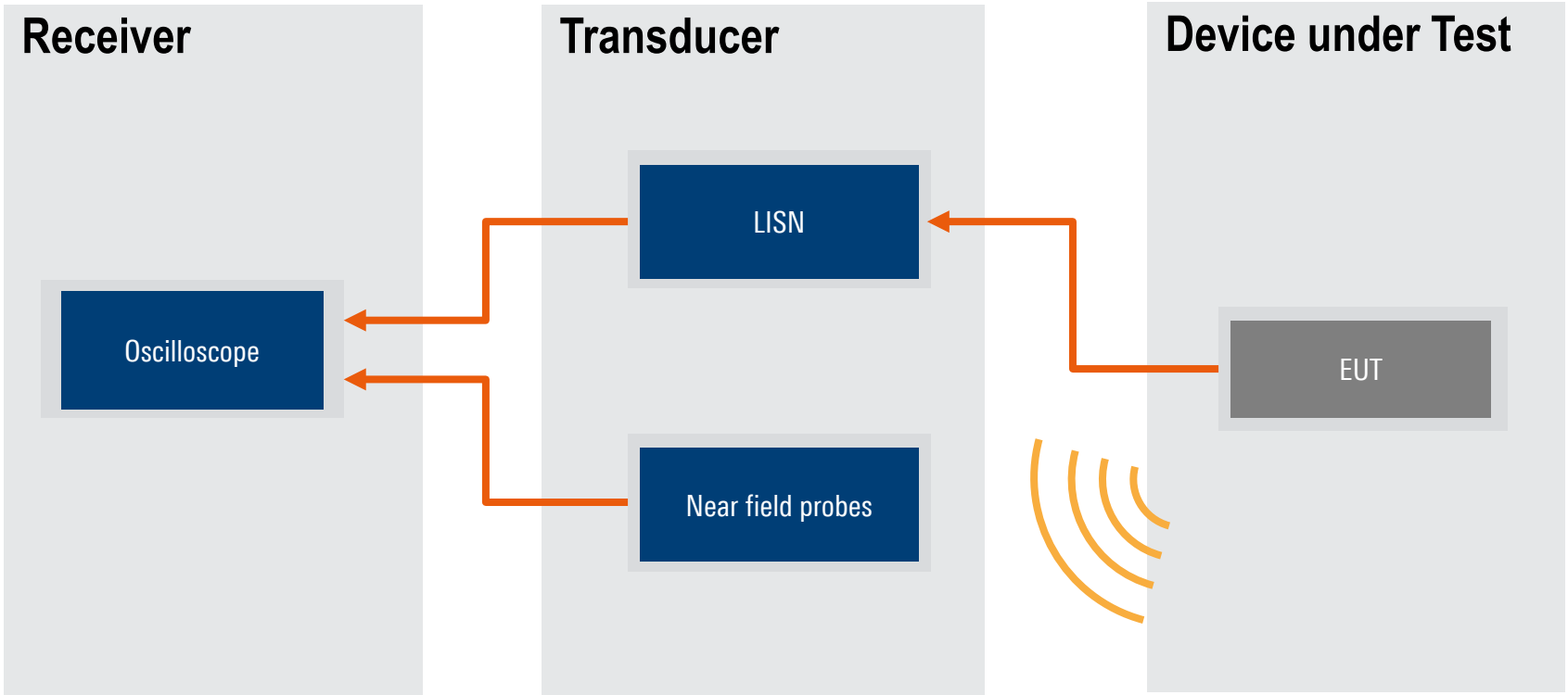




ELECTRO-MAGNETIC EMISSION (EME) SOURCES



SYSTEM CONFIGURATION
EMI DEBUGGING



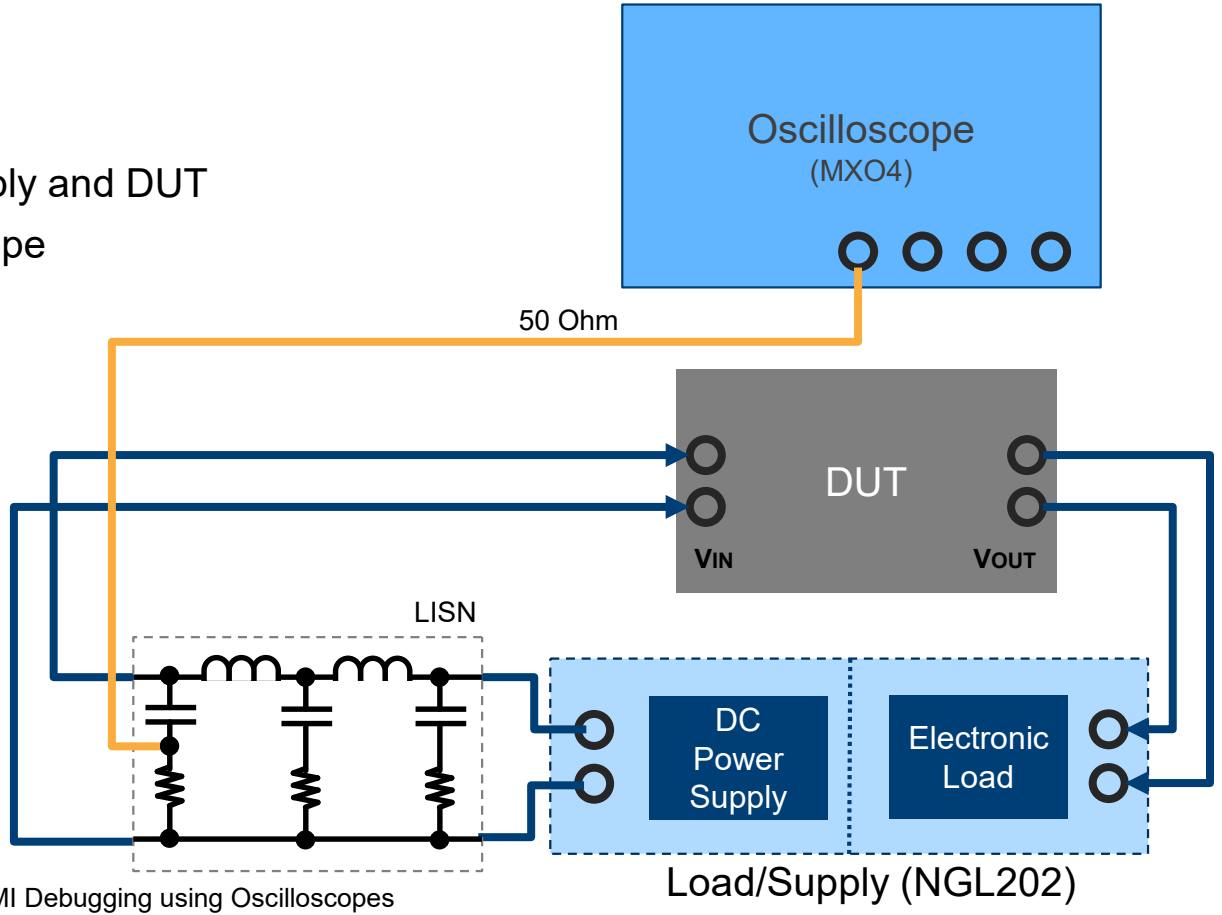
HOW TO MEASURE CONDUCTED EMISSIONS

Oscilloscope (MXO4)

- 50 Ohm connection to LISN
- Connect LISN between supply and DUT
- Use Spectrum on Oscilloscope

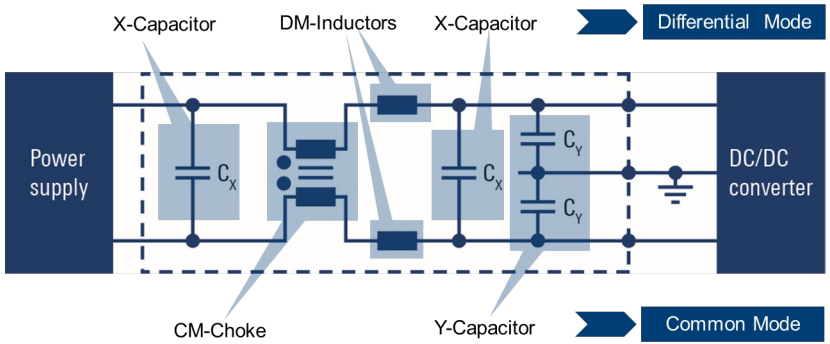
Electronic Load (NGL202)

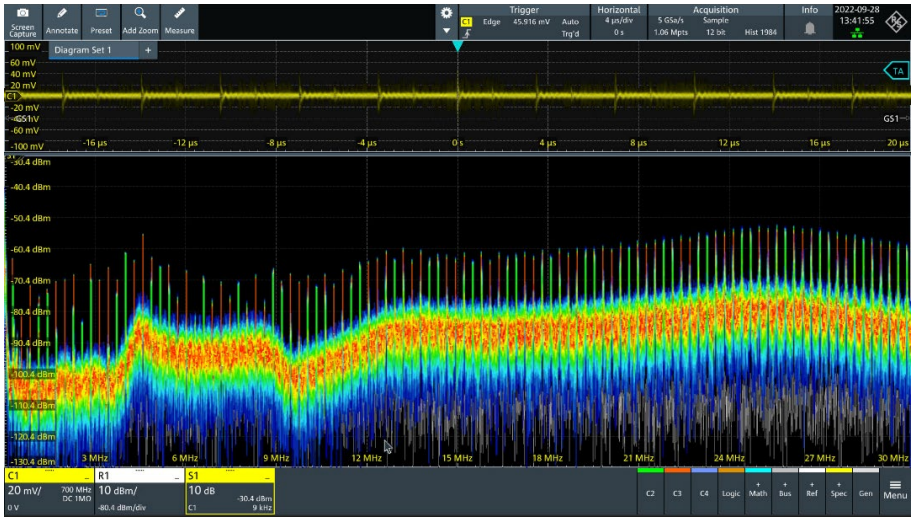
- Constant Resistance



HOW TO MEASURE CONDUCTED EMISSIONS

- The Spectrum option of the oscilloscope is configured in a way that it shows the conducted emissions up to 30 MHz
- A reference to the noise floor should be added
- Identify problems and design your input filter



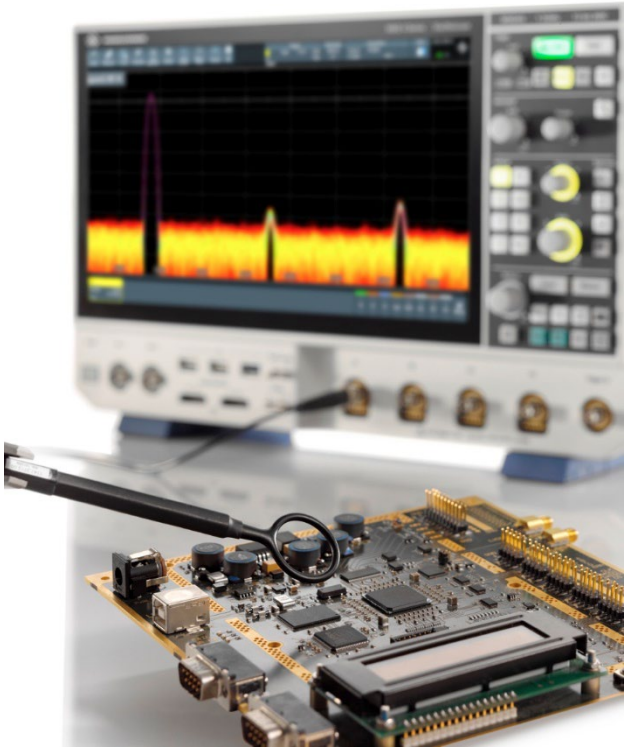


RADIATED EMISSIONS
NEAR FIELD PROBES

- Identify and mitigate the sources of emissions
- Correlate the EME sources with the signals measured in the DUT.
- Debugging before or after pre-compliance.

- It is important to perform a reference measurement
- Know the DUT:

Source	Frequency
Clock frequency	e.g. 25 MHz + Multiples
Ethernet PHY	e.g. 125 MHz + Multiples
Voltage converter / power adapter	broadband
…	



DEMO