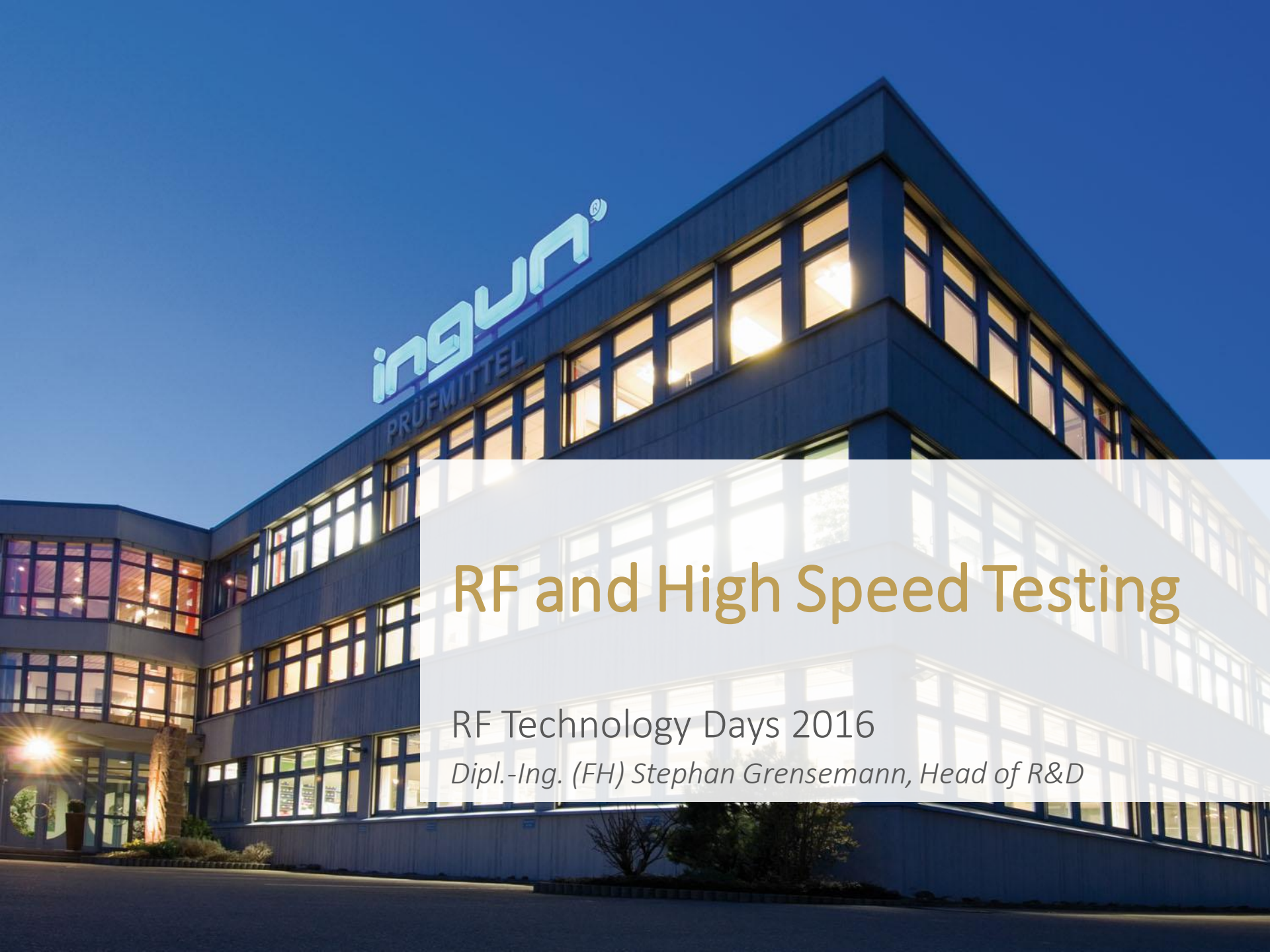


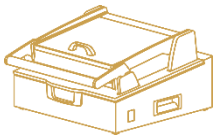
RF and High Speed Testing

RF Technology Days 2016

Dipl.-Ing. (FH) Stephan Grensemann, Head of R&D

Content

Company



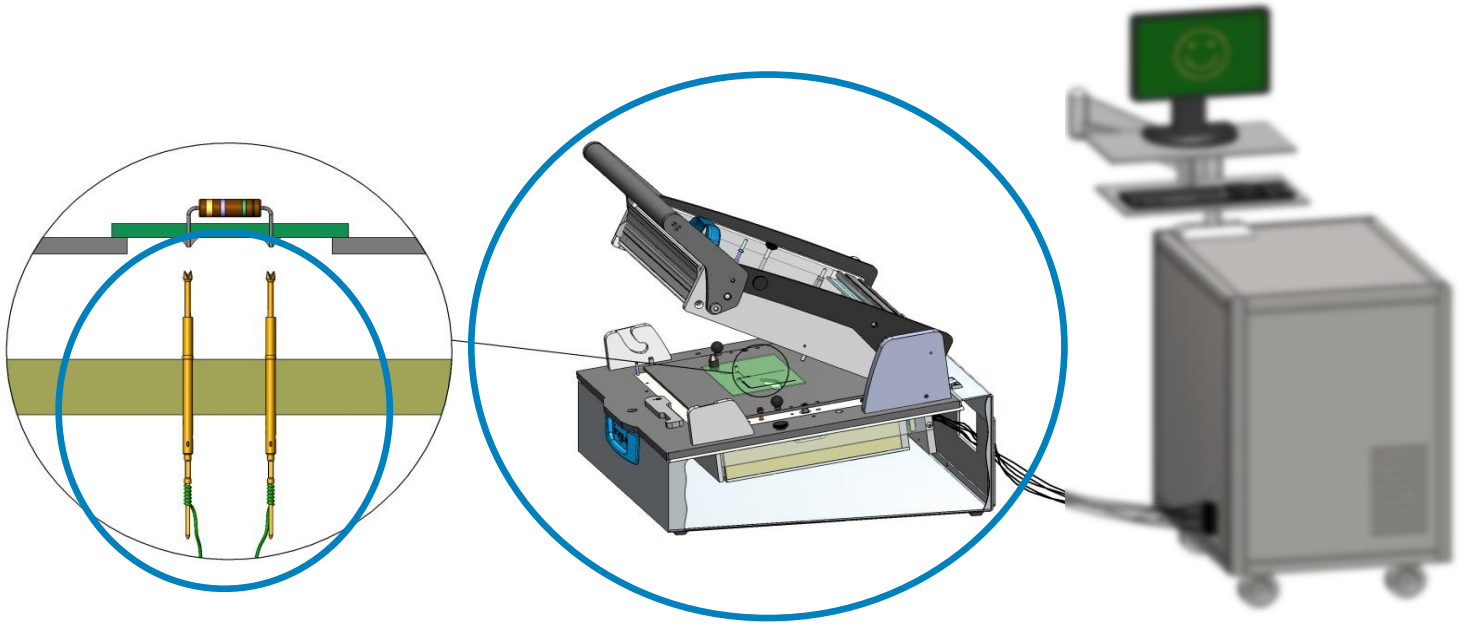
What can be tested, and how?
Different types of test points
Device-under-test
specification
Complete set-up

Mobile network testing
Test solutions
Antenna feed testing
Future Technologies

Conclusion

Welcome to INGUN

No. 1 Manufacturer of Testing Equipment



Test Probes – Connection between PCB and test fixture

Test Fixture – Connection between test probe and test system

Test system

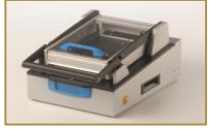
One-stop Custom-made Test Solutions

Eight test areas:

Test Probes

Quality through Precision

Test Fixtures

In-Circuit / Functional	Radio-frequency / Coax	Cable / Connector contacting	High current	Battery / Transfer contacts	Test fixtures WITHOUT customising	Accessories	Test fixtures WITH customising
							

Various industries using electronics production

What is Challenging in RF and High Speed Testing?

Main issues:

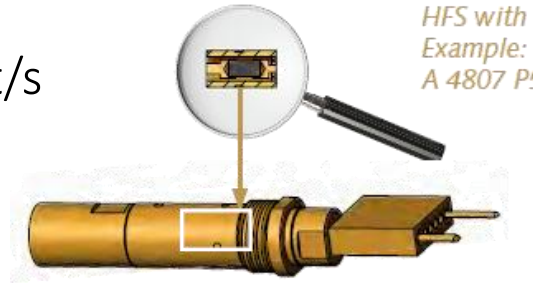
- For mass production testing, automated test solutions are required
- Rising frequencies and data rates requires more accurate mechanics
- High-density packaging on electronical boards means less space for test points

What can be tested, and how?

What can be tested, and how?

Large assortment of RF probes up to 20 GHz - unrivaled range

- PCB contacting in grids up to 0.5 mm (= 20 Mil)
- RF probes for all standard connectors from “A” like AMC to “X” like X.FL
- Automotive connectors, such as FAKRA, HSD, etc.
- High return loss with low insertion loss
- Integrated technologies, such as filters and attenuators
- Digital test solution, e.g., USB up to 5 GBit/s



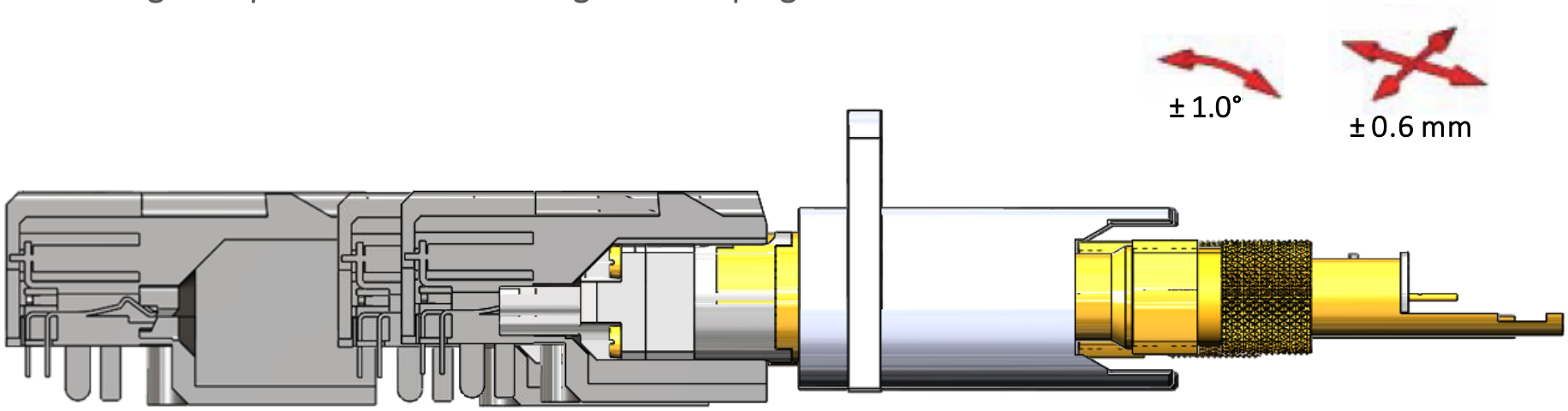
HFS with integrated filter
Example: HFS-440 007 051
A 4807 P5-AS 4M

What can be tested, and how?

Contacting standard connectors

What can be tested, and how?

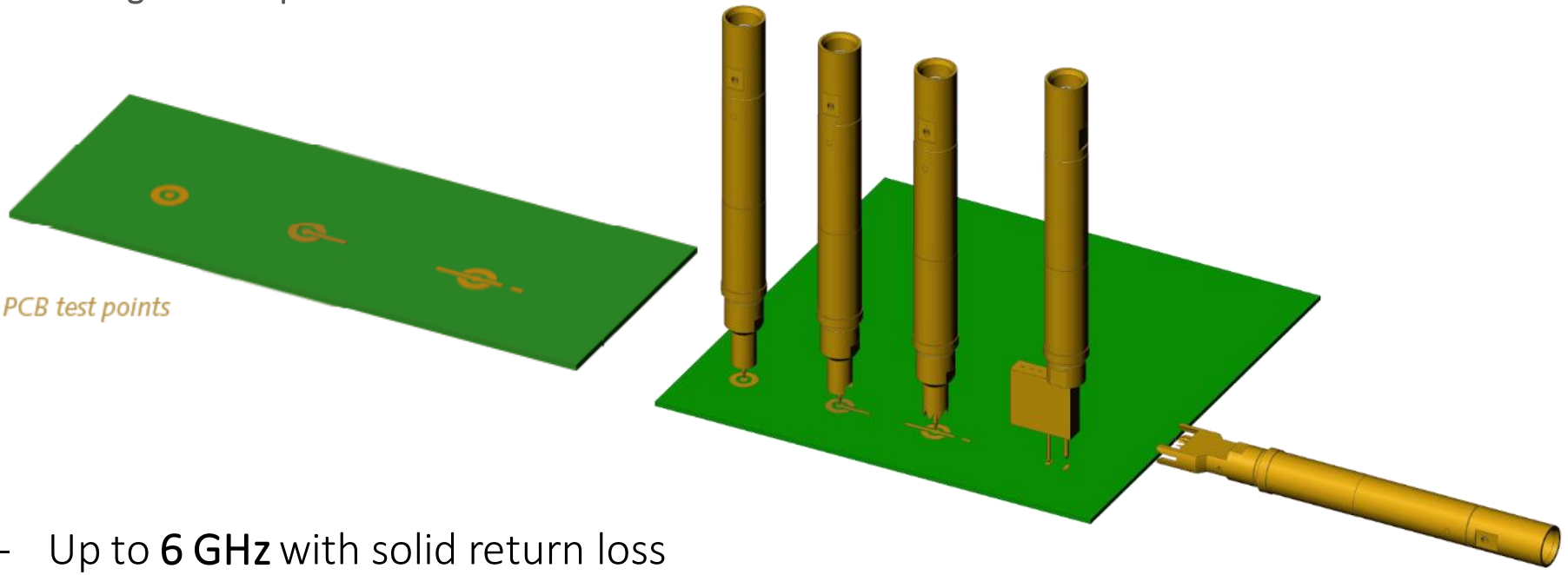
Contacting example: HFS-821 contacting USB mini plug



1. ‘Floating’ test probe is aligned in the connector
2. Contact is made
3. Decompress the complete unit to achieve stable, reliable contact

What can be tested, and how?

Contacting PCB test points



– Up to **6 GHz** with solid return loss

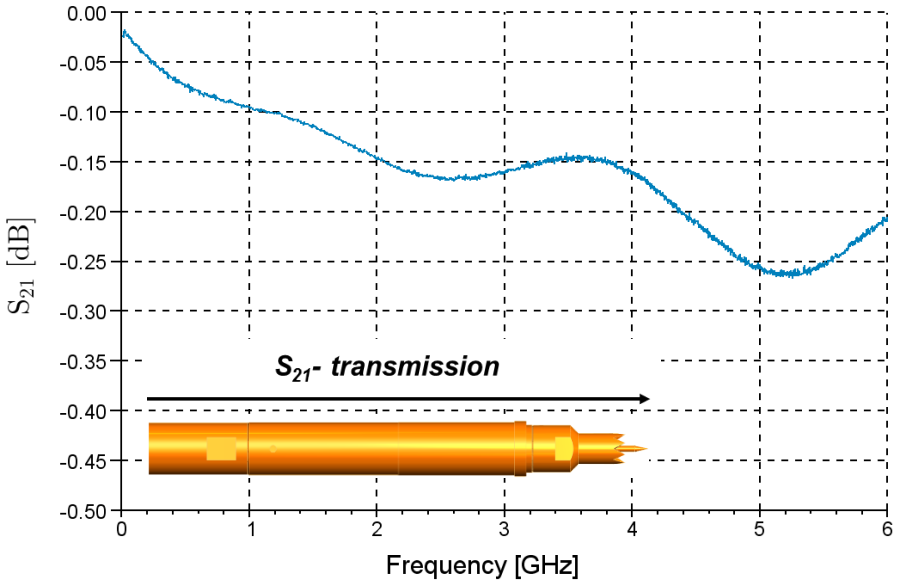
– Test solutions with integrated attenuator is available to achieve better return loss

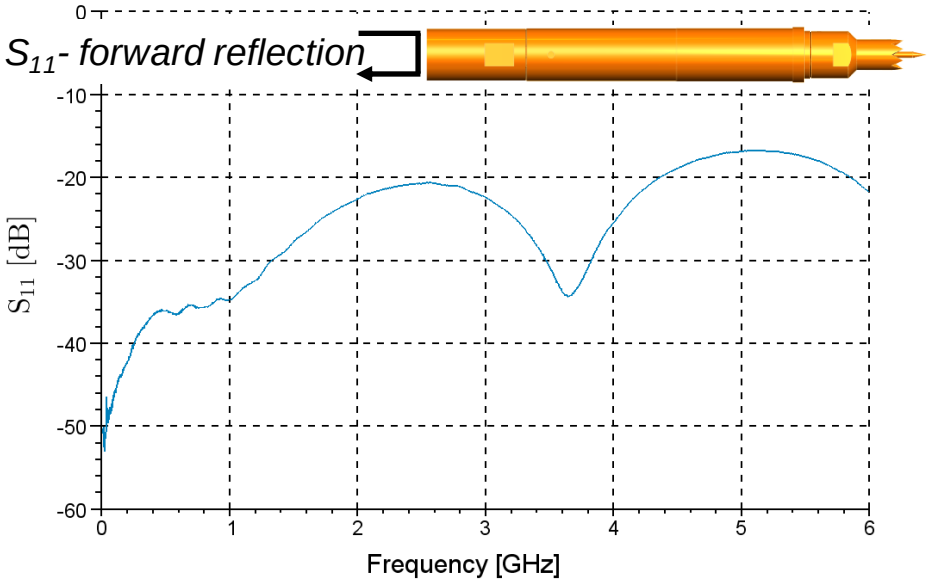
What can be tested, and how?

Device-under-test specification

Analog specification:

– VNA (scattering parameters e.g. S_{11} and S_{21})





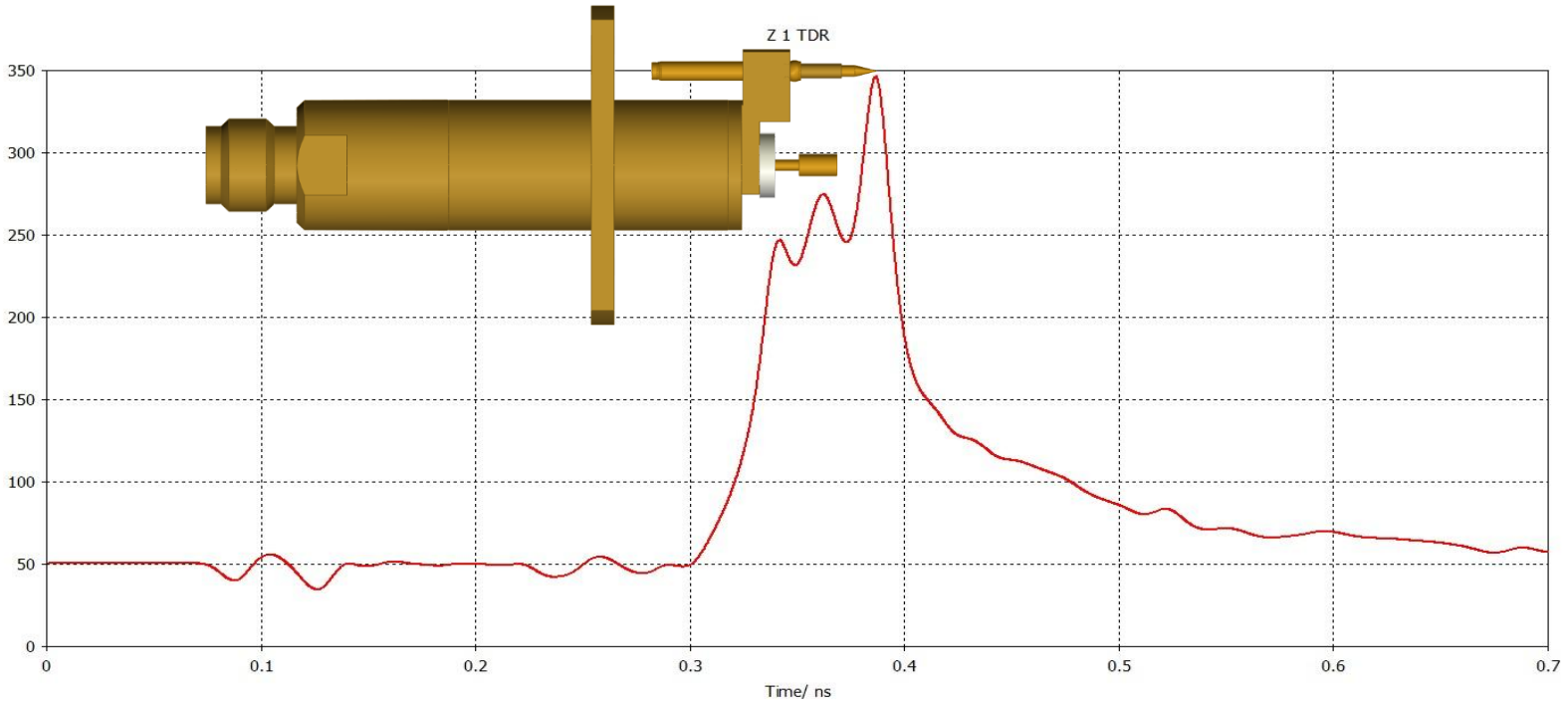
– Spectrum analyser (amplitude vs. frequency)

– Power meter (amplitude)

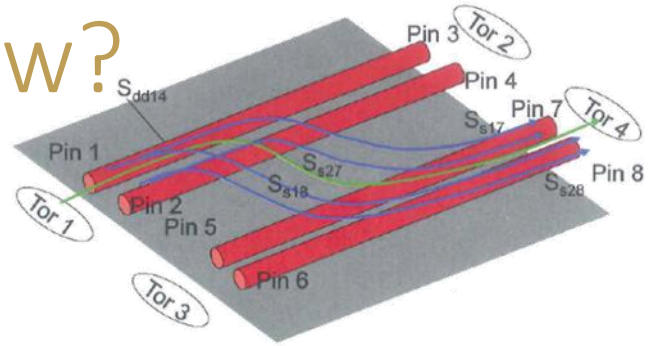
What can be tested, and how?

Device-under-test specification

Oscilloscope (amplitude and phase) ⟶ Time Domain Reflectometry (TDR)



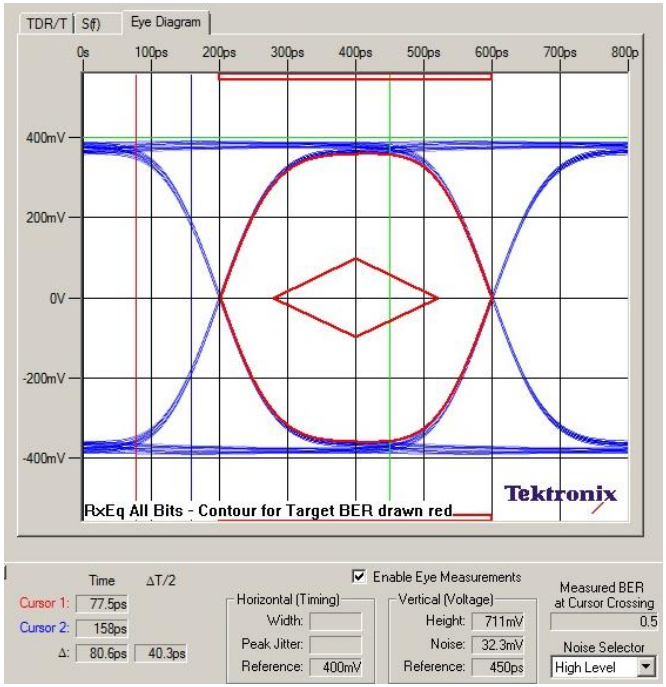
What can be tested, and how?

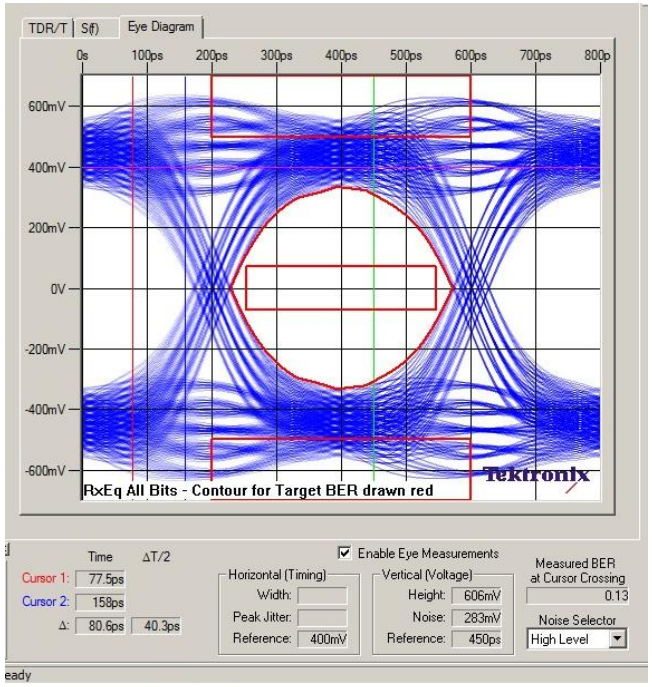


Device-under-test specification

Digital specification:

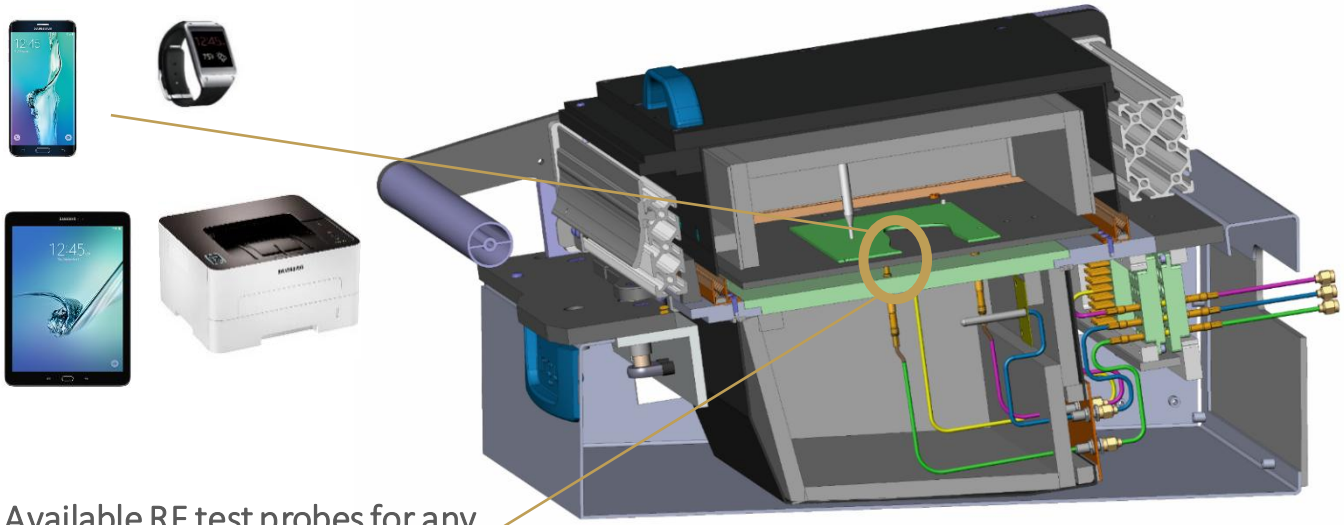
– MOI specifies e.g. impedance, propagation delay, skew, attenuation, NEXT, FEXT
– Eye diagram tests carry information about jitter and amplitude





What can be tested, and how?

Complete set-up of RF testing equipment

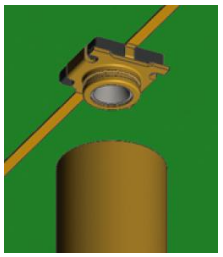


Test system
(consisting e.g. network analyzer)

RF test fixture for device-under-test (DUT)
e.g. PCB used in Smartphones, SmartWatches, tablets

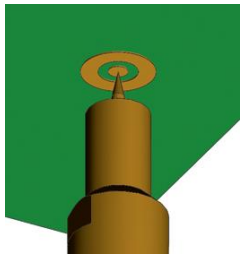
Available RF test probes for any PCB test points, such as:

Switch connector



Plug connector

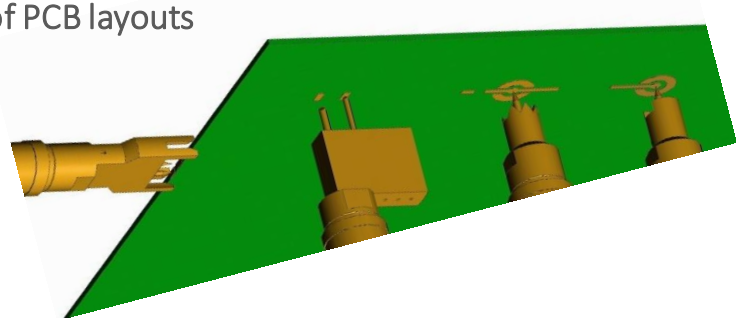
PCB coax closed



All kind of PCB layouts

signal – ground structure

PCB coax open



Mobile Network Testing

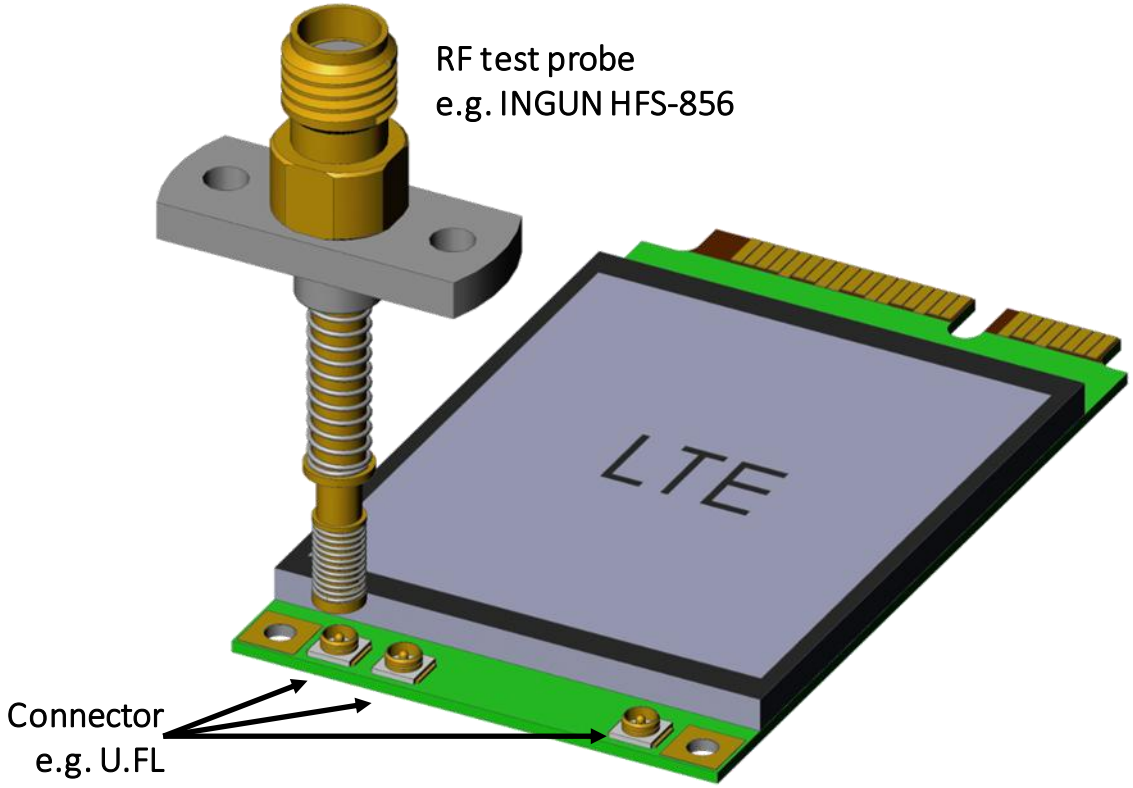
Mobile Network Testing

Using wireless or RF communication features for all industry standards, connectors, switches and customized test points

Mobile Network Testing

Using antenna connector as test point

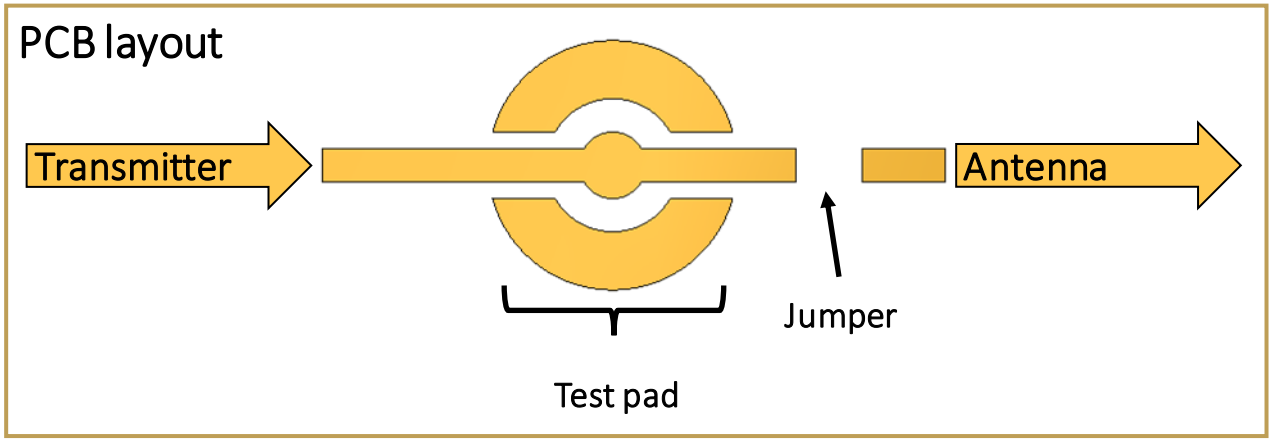
1. Case: Antenna can be connected after testing

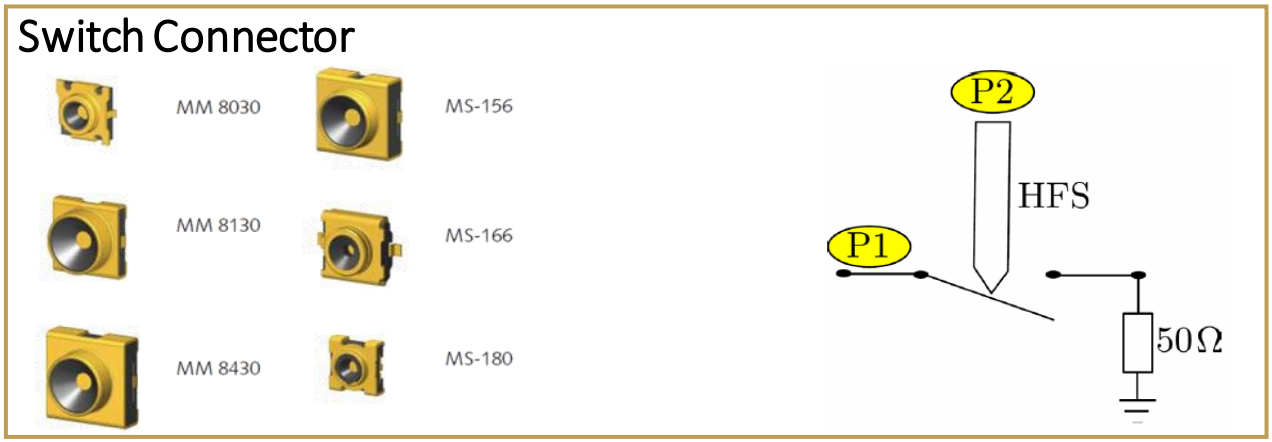


Mobile Network Testing

PCB layout vs. switch connector

2. Case: Using e.g., ship antennas on Printed Circuit Boards (PCBs)

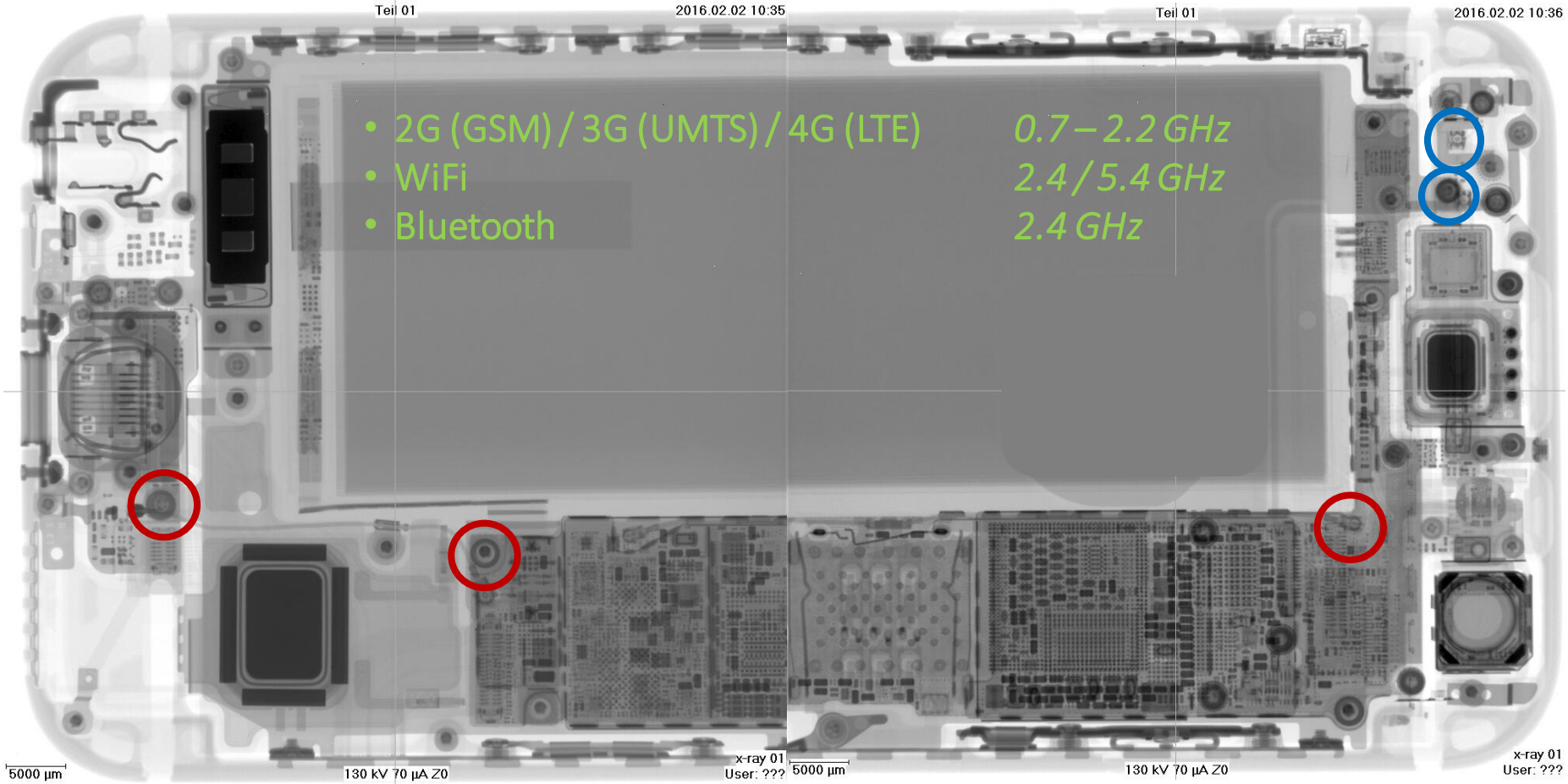




Mobile Network Testing

sub-miniature connector
switch connector

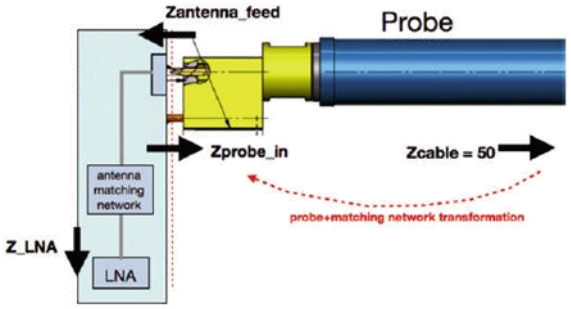
Mobile phone example



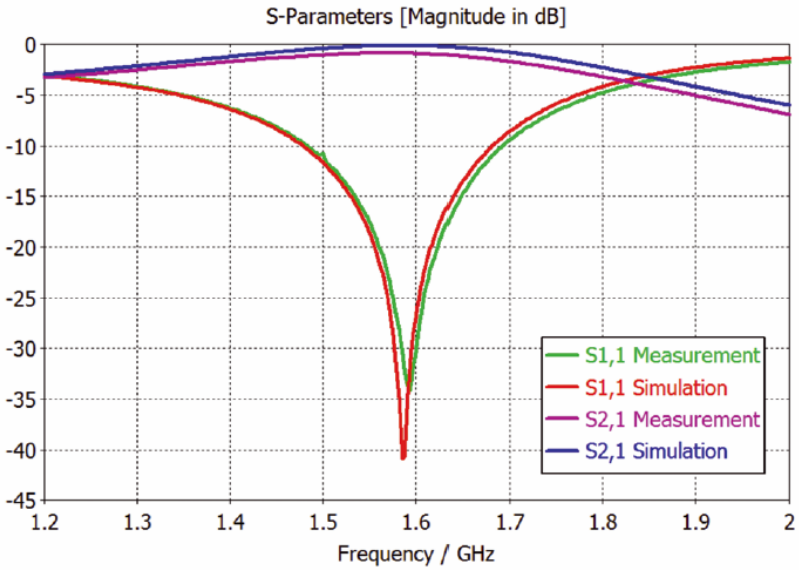
Mobile Network Testing

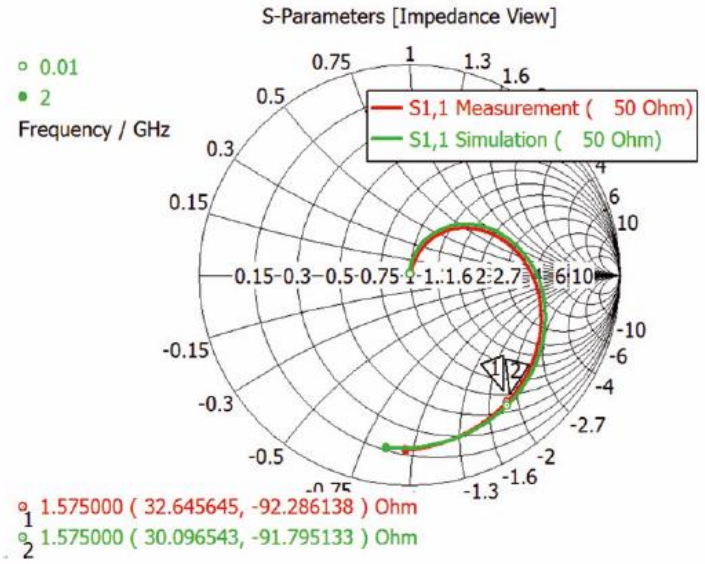
Impedance-matching probe for antenna feed testing

RF test probe with narrow band matching network



Example for the use of a RF test probe with narrow band matching network





Comparision of simulation and measurement: The transformation shown in the Smith chart

Mobile Network Testing

Future Technologies

What's coming next?

60 GHz

Conclusion

- A great assortment of different RF test probes are already available
- RF and digital signals can be measured
- Developers of electronical test boards always struggle with test points. Please challenge us!
- For future technologies, such as 5G or high-speed digital testing, please don't miss the **electronica 2016** tradeshow in Munich!

Thank you for your attention

Need more advice?
Don’t hesitate to contact us.

INGUN Prüfmittelbau GmbH
Max-Stromeyer-Straße 162
78467 Konstanz
Germany
info@ingun.com
www.ingun.com