EMI troubleshooting and debugging

Learn how to see your circuits

An experience including experiments

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Organized by:

ROHDE&SCHWARZ
Make ideas real

Nov 2021

EMI/EMC/SI Design and Troubleshooting

Two exciting days: ... for EMI/EMC!

DAY 1: 9th November

9:30 to 12:00 (CET) – Roots of EMI (Part 1)
> Challenges and Early Review of Your Design! (Presented by Arturo Mediano, University of Zaragoza - 45min)
> EMC Testing from First-Level Debugging to the Compliance Stage (Presented by Christian Reimer, R&S - 45min)
> Practical and Early Testing Showcases (Presented by Jan Spindler, MPS - 45min)

Register Now

13:00 to 16:30 (CET) – Roots of EMI (Part 2)
> EMI Troubleshooting and Debugging (Presented by Arturo Mediano, University of Zaragoza - 1h)
> DC/DC Conversion Workshop – DUT Troubleshooting (Presented by Jens Hedrich, MPS - 1h)
> Pre-Compliance Set-Up (Presented by Alexander Küllmer, R&S - 1h)

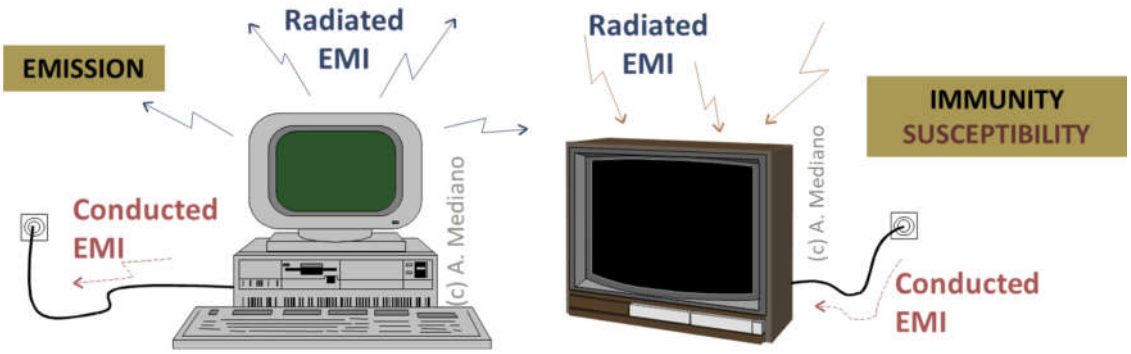
Register Now

DAY 2: 10th November

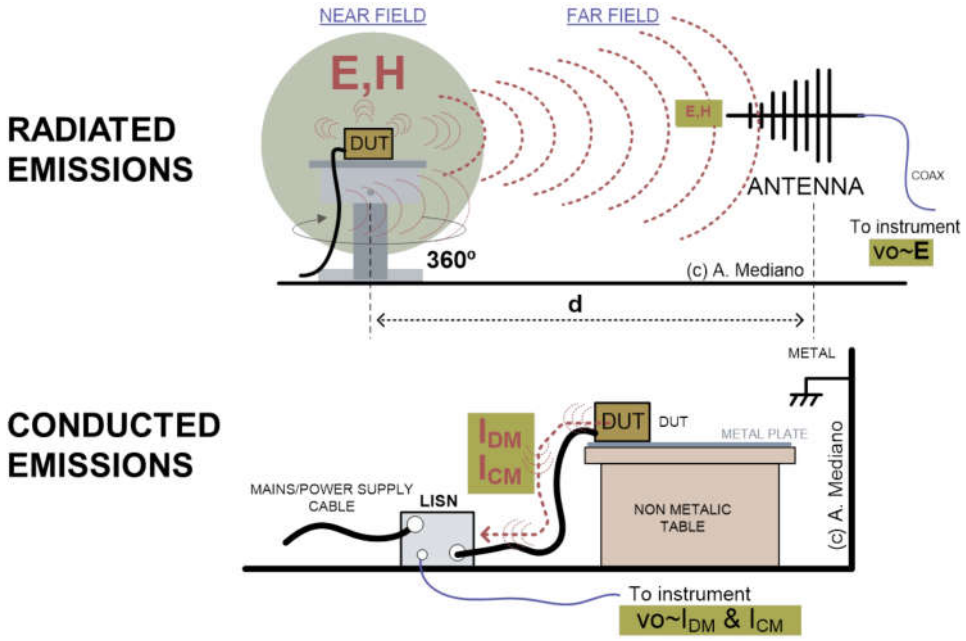
8:30 to 12:00 (CET) – Power Applications
> Filter Design Hints and Tricks (Presented by Arturo Mediano, University of Zaragoza - 45min)
> Stability in Converters: Control Loop & Load Step Design (Presented by Christian Kueck, MPS - 45min)
> Power Integrity Can Cause EMI Challenges (Presented by Arturo Mediano, University of Zaragoza - 45min)
> Mythbusting EMC Techniques in Power Converter Design (Presented by Francesc Estragues, MPS - 45min)

EMI/EMC: classification

Radiated and conducted **emissions/immunity**

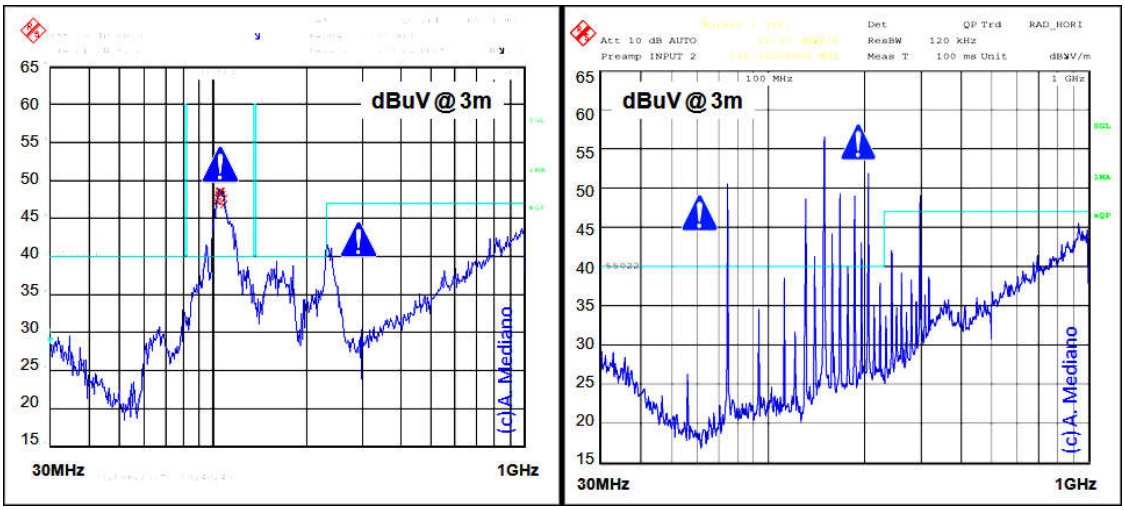


EMI/EMC: tests



EMI/EMC/SI Design and Troubleshooting

Introduction: example failures



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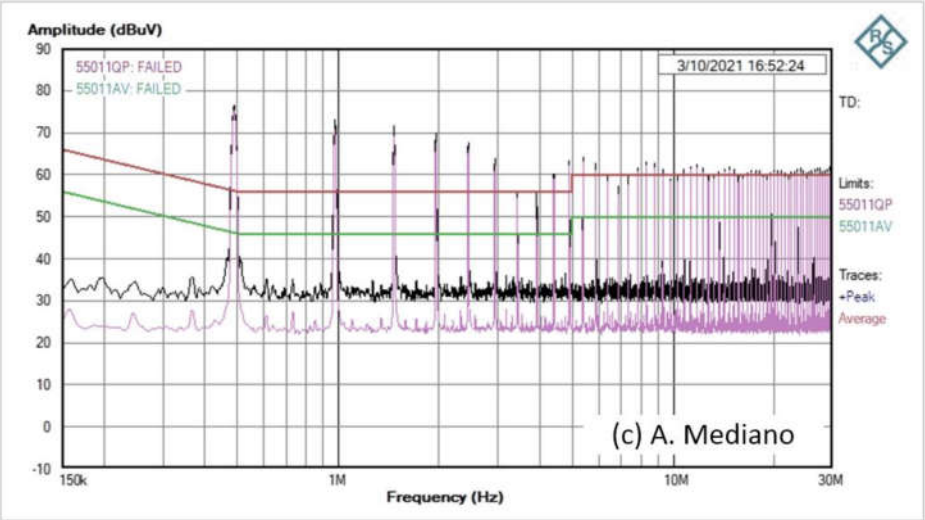
Problem: failing in conducted emissions.



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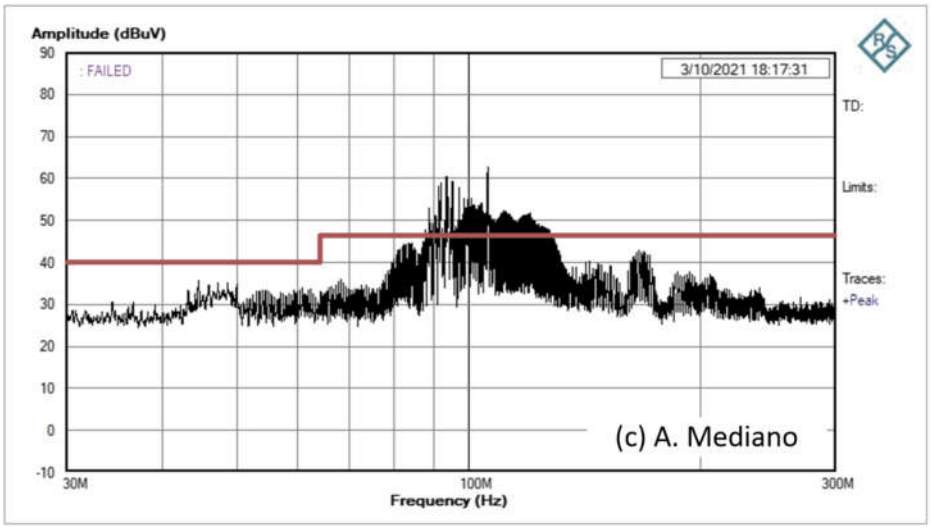
Problem: failing in radiated emissions.



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Testing: instrumentation

www.incompliancemag.com

EMI Debugging: if you can see it you can fix it by Arturo Mediano.

SCOPE with FFT
Picture R&S RTO6

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Testing: instrumentation

R&S **Scope**

R&S **HL562E** antenna

R&S **ESH3-Z2**
pulse limiter

R&S **ENV216** LISN

R&S **HM6050-2**
LISN

R&S **RT-ZP10**
Voltage probe

R&S **EZ – 17**
Current Probe

R&S **HZ – 15**
Near Field Probe

R&S **HZ-16**
Preamplifier

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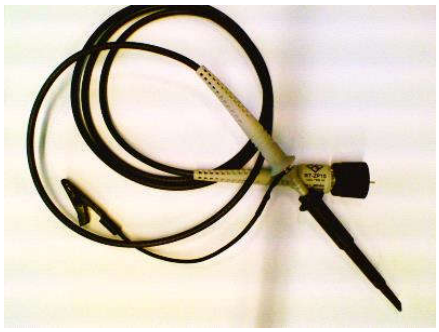
Testing: R&S RT-ZP10



Electrical Specifications

Attenuation Ratio (1)	10:1	± 2 % at DC
Voltage Coefficient	0.0025 %/V	(typical)
System Bandwidth (1)	500 MHz	(-3 dB)
Probe Risetime (1)	700 ps	(10 % - 90 %) (typical)
Input Resistance (System)	10 MΩ	± 1 %
Input Capacitance (System)	9.5 pF	(typical)
Compensation Range	5 pF - 20 pF	(typical)
Input Coupling of the Measuring Instrument	1 MΩ AC / DC	

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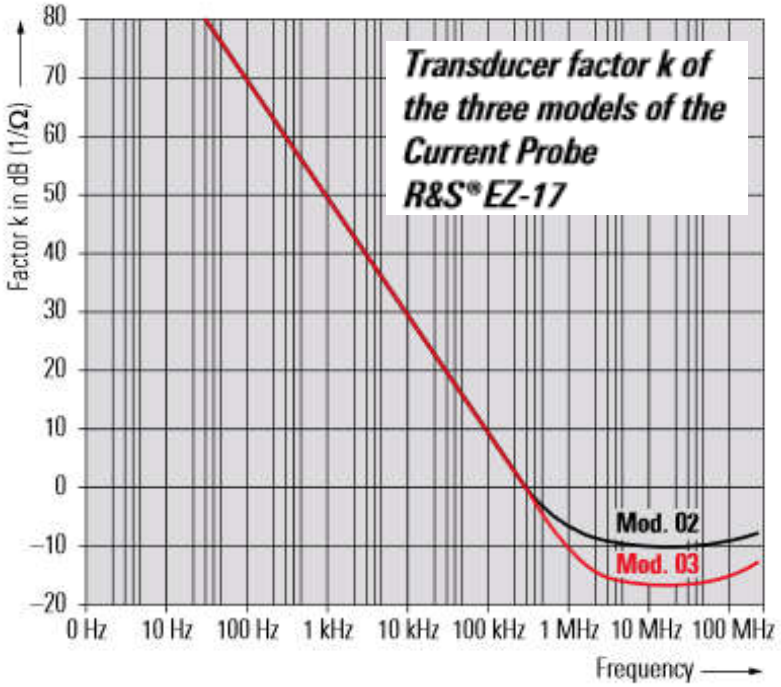
Testing: R&S EZ-17

R&S **EZ – 17**
Current Probe
50Hz - 200MHz



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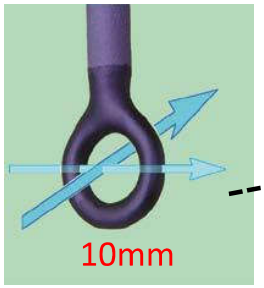
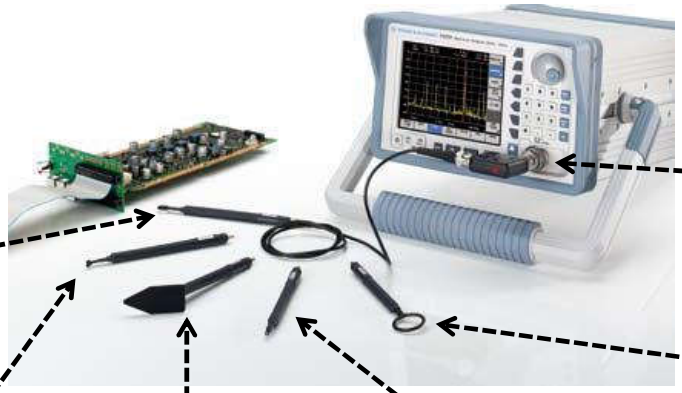
Testing: R&S HZ-15 Near field probes

H probe RS H 50-1

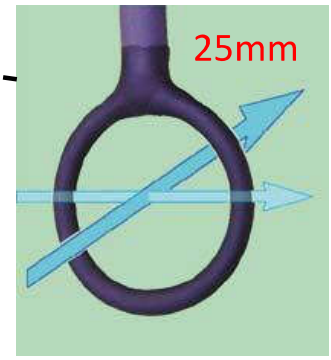




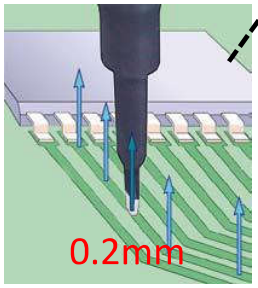
SCOPE OR
SPECTRUM ANALYZER

Preamp HZ-16

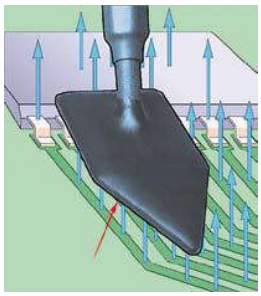
H probe RS H 400-1



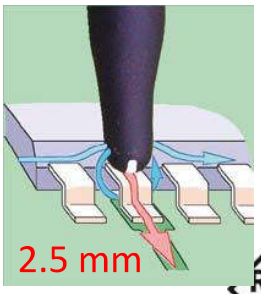
E probe RS E 10



E probe RS E 02



H probe RS H 2.5-2



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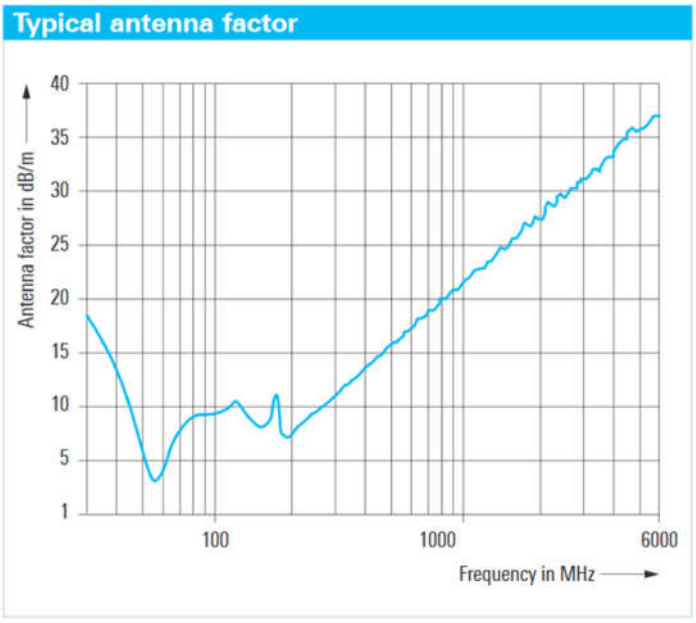
Testing: R&S HL562E ULTRALOG

30 MHz to 6 GHz



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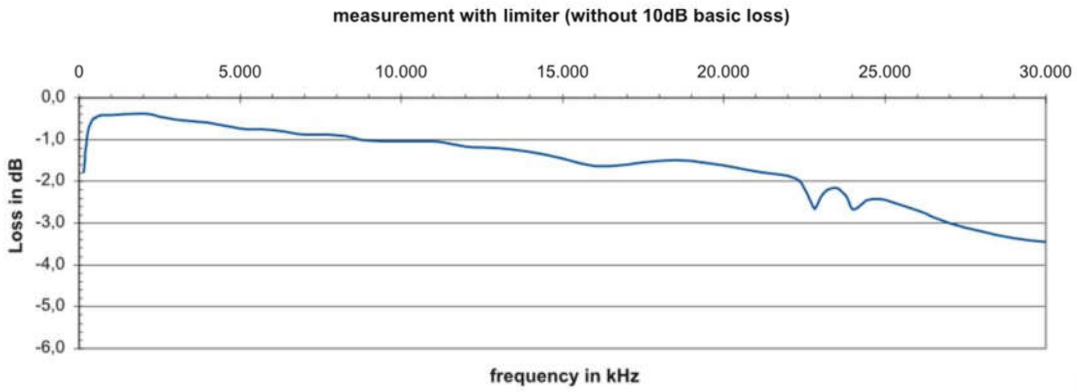
Testing: R&S HM6050-2 LISN

10kHz-30MHz

Line Impedance Stabilization Network HM6050-2	
All data valid at 23 °C after 30 minutes warm-up.	
Frequency Range:	10 kHz to 30 MHz
Impedance Characteristics:	Z = 50Ω || (50 µH + 5Ω), Error <20% under terms of VDE 876T1
Max. Current:	16A
Line Voltage/Frequency:	230V/50…60Hz, CAT II
Artificial Hand:	220pF + 511Ω
PE (selectable):	50µH || 50Ω



THANK YOU!

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