EMSCAN
real-time results

EMC/EMI Testing in Less Than One Second Using Very-Near-Field Techniques

Agenda

- Introduction to Very-Near-Field
- Very-Near-Field Implementation
- Very Near-Field Benefits
- Far-Field Prediction
- Other Applications
- Conclusion

Introduction to EMSCAN

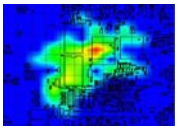
World Leading Developer of **Fast** Magnetic Very-Near-Field Measurement Applications

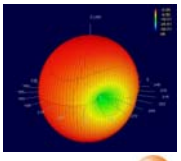
Real-Time Visual Test Solutions for Antenna and PCB Designers and Verification Engineers

Pre-Compliance Not Compliance

Products

- EMxpert
  - EMC/EMI diagnostic tool enabling designers to rapidly diagnose and solve EM problems in a single design cycle in their own lab environment
- RFxpert
  - APM tool enabling engineers to quickly evaluate and optimize their designs with real-time antenna performance characterization at their desk



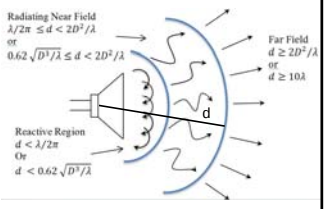


Introduction to Very-Near-Field

Far-Field / Near-Field / Very-Near-Field

What is Very-Near-Field?

- What we call the very-near-field is the reactive region
- Interaction with device under test is unavoidable
- These are rules of thumb only



Far-Field Measurements cont.

- Controlled environment
- Anechoic or semi-anechoic chamber
- High capital and operating expenses
- Queues often form to get time in chamber

Image: www.geotig.com

Very-Near-Field Measurements

- Origin of all emissions
- Insight into root causes
- Best applied at board level
- Extrapolate far-field from very-near-field

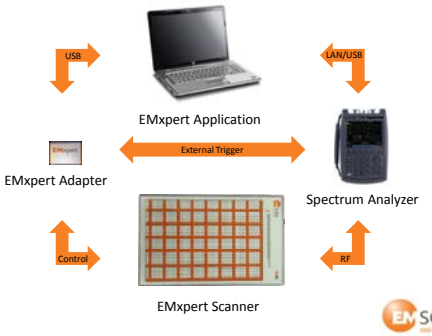
Very-Near-Field Implementation

A Better Solution

Powerful Scanner

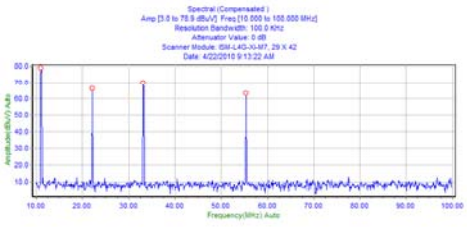
- 1218 probes in a 29 x 42 array
- Magnetic field loop probes
  - Sensitive down to -135 dBm
  - Inefficient for EMI isolation
  - Broadband
    - 50 kHz to 4 GHz
    - 150 kHz to 8 GHz
- 3.75 mm to 0.12 mm resolution
- Scan area 21.8cm x 31.6cm
- Isolated case for safe testing
- Real-time measurements (<1 sec)

System Configuration



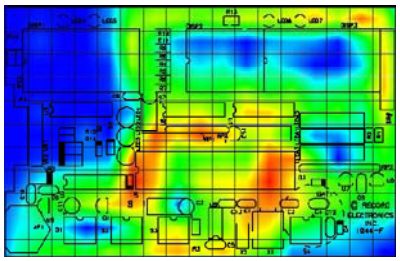
Spectral Scan

- Identify the frequencies of emission



Spatial Scan

- Visualize where the emissions are coming from



A Real Time Scanner

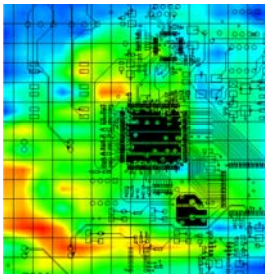
Demonstration

A Real Time Scanner

Benefits of Very-Near-Field Testing

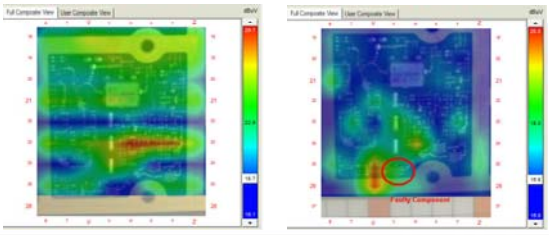
Real-Time

- Changes in real-time
- Intermittent events
- Functional testing
- Different operating modes
- Firmware modifications



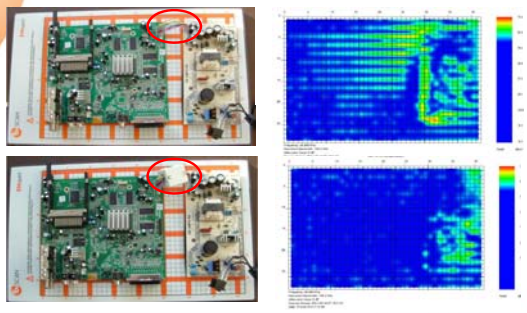
A/B Comparison

- Obsolescence management
- Production unit versus gold standard
- Fault diagnosis



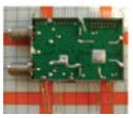
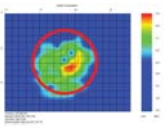
Effectiveness of Filters

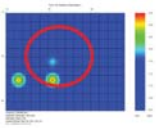
- Immediate feedback means trial and error can be used



Testing Shielding or Absorbers

- Look for leakage points or introduction of new radiation mechanisms
- Test uniformity and effectiveness

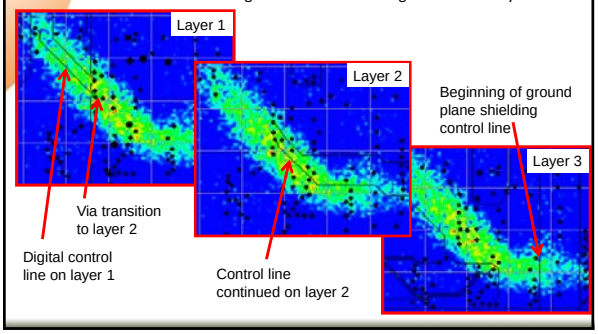





SCAN

High Resolution Scanner - ERX+

- Hybrid mechanical array solution can measure with 0.12mm resolution
- Able to follow the signal on the traces as it goes between layers.



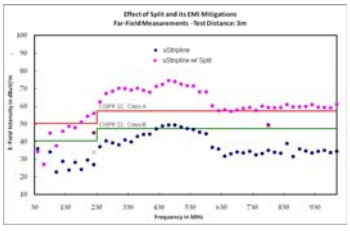
Pre-Compliance Testing

What about Far-Field?

Correlation between VNF and FF

Case Study

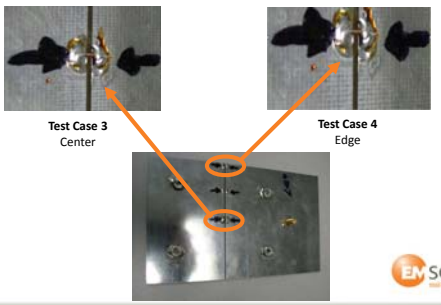
- PCBs containing split planes on ground plane fail EMI requirements more often than those without



Measured at DVT Solutions in Calgary, Canada

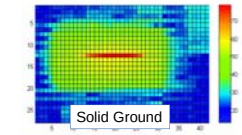
Cases 3 to 4: Shorting Jumper

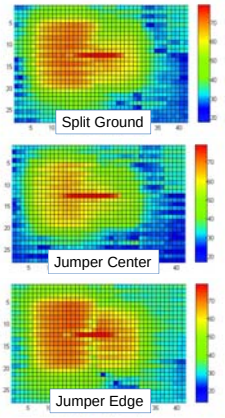
- Splits in ground are repaired with different grounding points or with capacitive connection



Shorting Jumper

- Split ground effect is easy to visualize
- Mitigation can be guided without chamber measurements

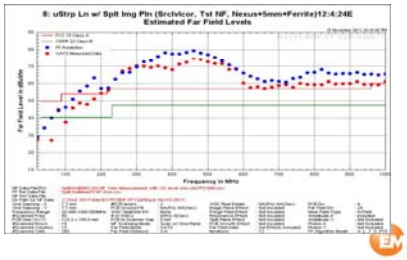




Predictive Application

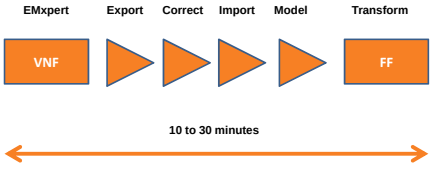
Far-Field Prediction

- Software to predict Open Area Test Site (OATS) or free space radiated EMI of PCB



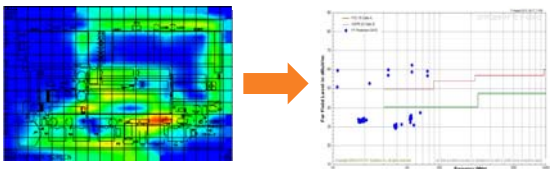
Methodology

- Measure very-near-field emissions and apply a model based prediction algorithm to them
- Some user expertise is still needed



Far-Field Prediction

- World's fastest pre-compliance
  - FCC/ANSI, CISPR and user-defined limit lines

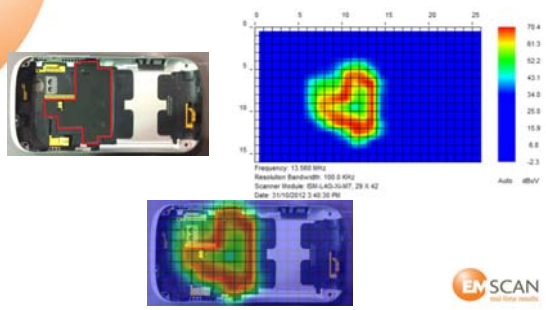


Other Applications

Beyond EMC

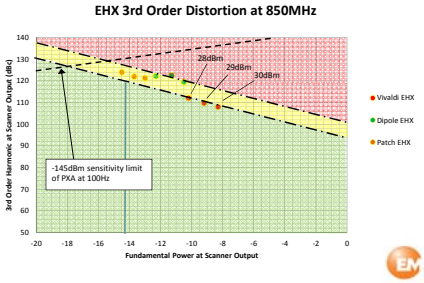
NFC Antennas

- Measure the field strength at specific distances



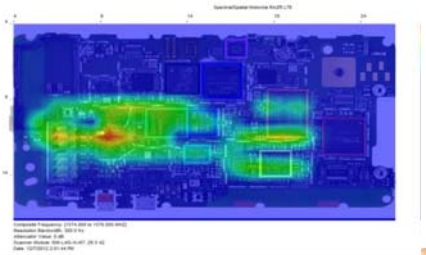
Distortion and PIM Testing

- Scanner linearity can be better than -120dBc



Measure Self-Interference (Desense)

- Sensitivity of the system can detect emissions from a conducted power as low as -135dBm



Noise generated at 1575.039 MHz while camera is active harms GPS performance

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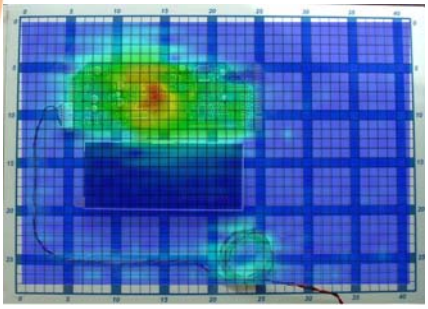
Conclusion

Very-Near-Field = Magic Goggles



Very-Near-Field Pros and Cons

- Strengths
  - Continuous peak hold scan for spurious events
  - Real-time view of emission sources and currents
  - Fast pre-compliance regulatory data
- Limitations
  - PCB diagnostic not product compliance
  - DUT no bigger than scanner for pre-compliance
    - Any size for diagnostic
  - Mezzanine PCB might need disassembly for testing

Exciting Value Proposition

Substantially **Reduce** Project Development Costs
Dramatically **Increase** Designer Productivity
Significantly **Accelerate** Time-to-Market

1 Hour in a Chamber or **1 Second** with a Scanner?

Thank You

www.emscan.com
info@emscan.com