



EMxpert

High-Speed High-Frequency High-Resolution EMC Testing



Very-near-field magnetic measurements expert since 1989

Unique patented products for RF/MW and EMC/EMI

- Far-field = pattern is not changing with the distance
- Near-field = anything not in the far-field
- Stay out of the reactive region? Not EMSCAN!
 - Very-near-field

Radiating Near Field

$$\lambda/2\pi \leq d < 2D^2/\lambda$$

or

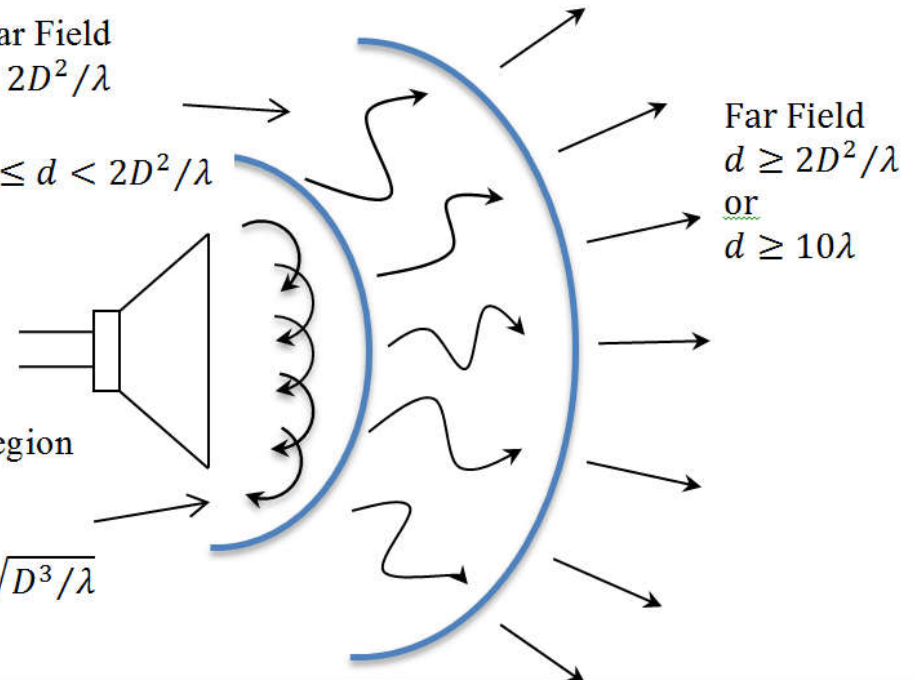
$$0.62 \sqrt{D^3/\lambda} \leq d < 2D^2/\lambda$$

Reactive Region

$$d < \lambda/2\pi$$

Or

$$d < 0.62 \sqrt{D^3/\lambda}$$



Introduction

World Leading Developer of Visual **Real-Time**
EM and RF **Pre-Compliance** Test Solutions

Antenna and PCB **Designers**

Product Integration and Verification **Engineers**

Diagnostic Tool

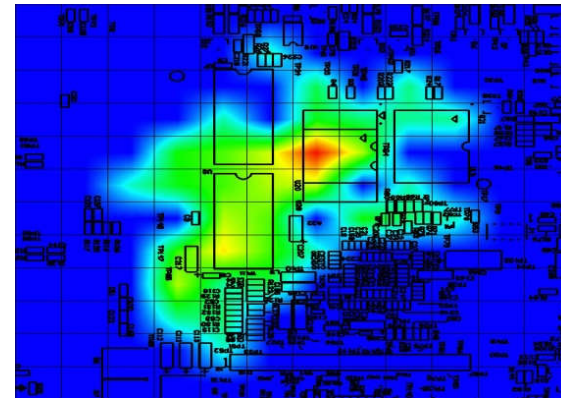
Manufacturing Quality Control



Chamber on your Desktop

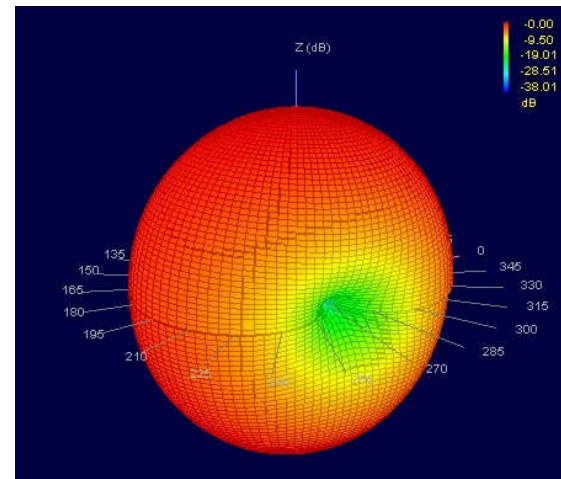
- **EMxpert**

- EMC diagnostic tool to rapidly diagnose and solve EMC/EMI problems with real-time PCB emission analysis



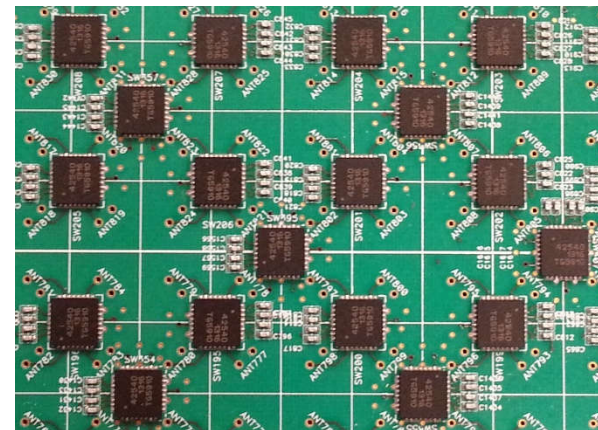
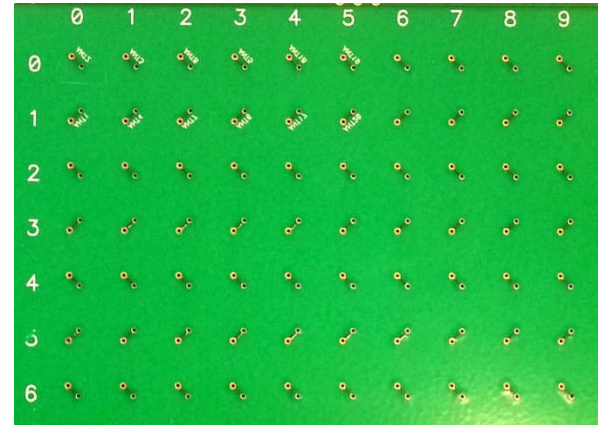
- **RFxpert**

- APM tool enabling to quickly evaluate performance and optimize designs with real-time antenna performance characterization



Scanning Array of Probes

- **1218 probes in a 29 x 42 array**
 - Switched
- **Magnetic field loop probes**
 - Sensitive down to -135 dBm
 - Inefficient for EMI isolation
 - Broadband
- **7.5 mm to 0.06 mm resolution**
- **Scan area 21.8 cm x 31.6 cm**
- **Sub-second spatial measurements**



Value Proposition

Significantly **Accelerate** Time-to-Market

Dramatically **Increase** Designer Productivity

Substantially **Reduce** Project Development Costs

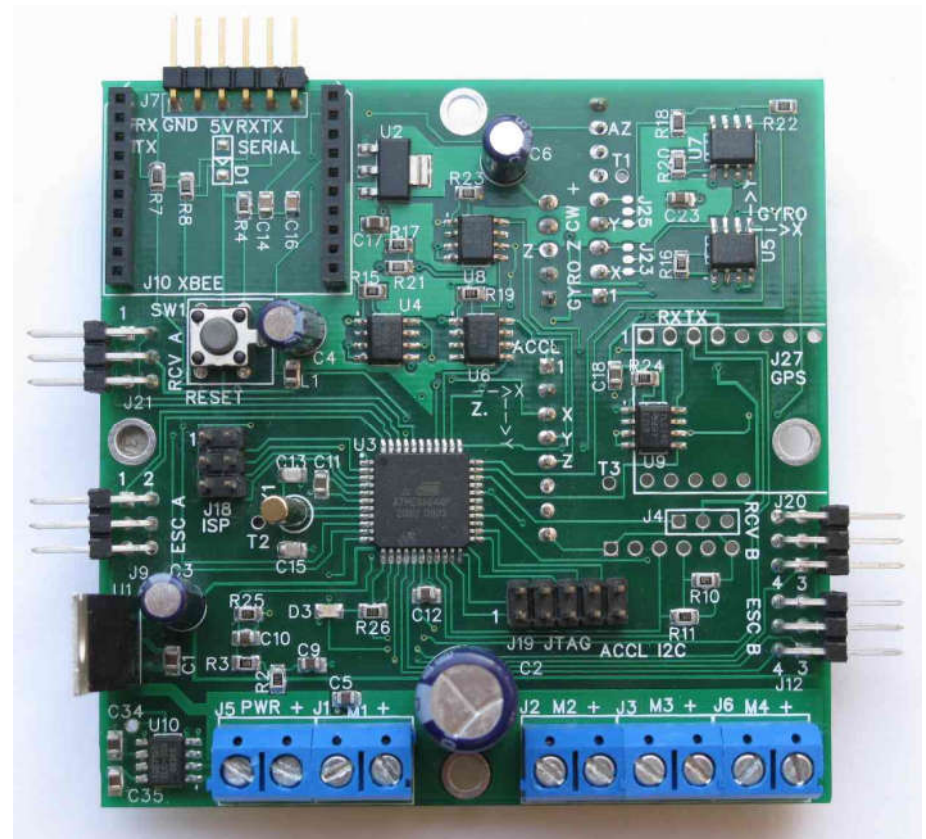
1 Hour in a Chamber or 1 Second with EMSCAN?

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Overview

PCB Radiated EMC/EMI/EMS Issues

- EMC prevention an afterthought
- Little interest in EMC
- EMC as a black art



**Every EMI (electromagnetic interference) problem
ultimately starts or ends at an electronic circuit**

Daryl Gerke and Bill Kimmel
IN COMPLIANCE MAGAZINE JULY 2013



Existing Solutions

● Chambers

- Slow testing
 - Compliance
- High CAPEX (in-house)
 - Real-estate
 - Qualified technicians
- High OPEX (third party)



● Probes

- Slow testing
 - Resolution nm



The Better Solution: EMxpert

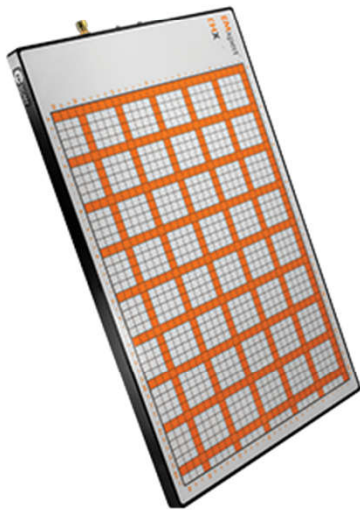
Directly addresses the challenges

- **Fast measurements**
 - Continuous “real-time”
 - Single spatial scan in seconds
- **Compact tabletop instrument**
- **Cost effective solution**



EMxpert Family

EMxpert™



EHX™



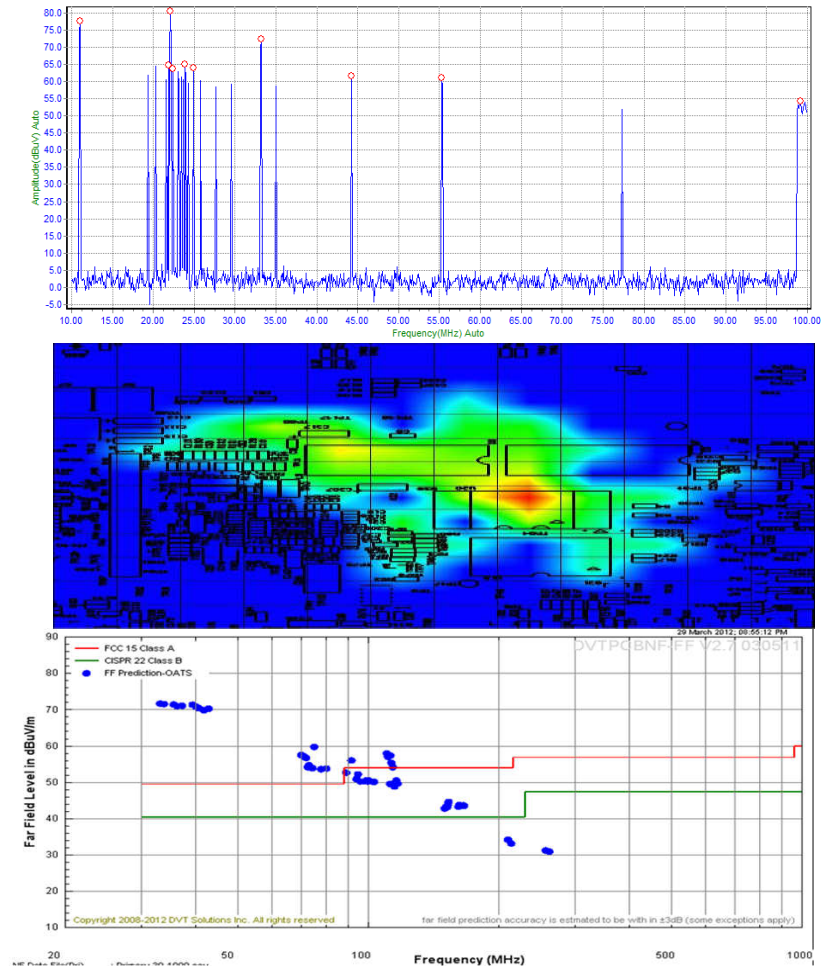
EHX+™



ERX+™

Functionality

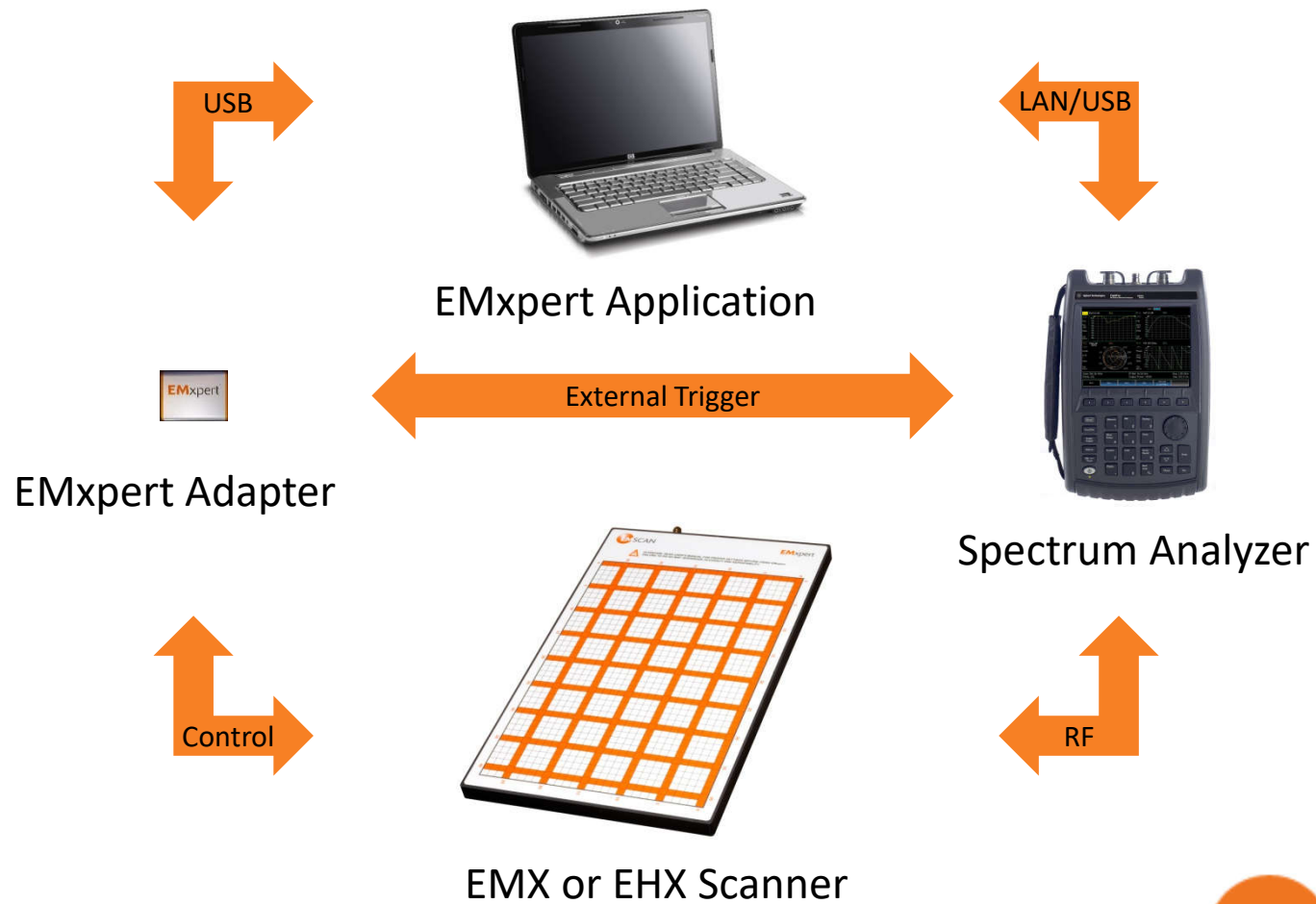
- **Spectral scan**
 - Problem frequencies
 - Frequency from 150 kHz to 8 GHz
- **Real-time very-near-field spatial scan**
 - Sources of radiated emissions
 - Resolution from 3.75 mm to 0.06 mm
- **Far-Field prediction**
 - Pre-compliance regulatory data
- **Compare and overlay functions**
- **Automated report generator**



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Technical Specifications

EMX & EHX Configuration



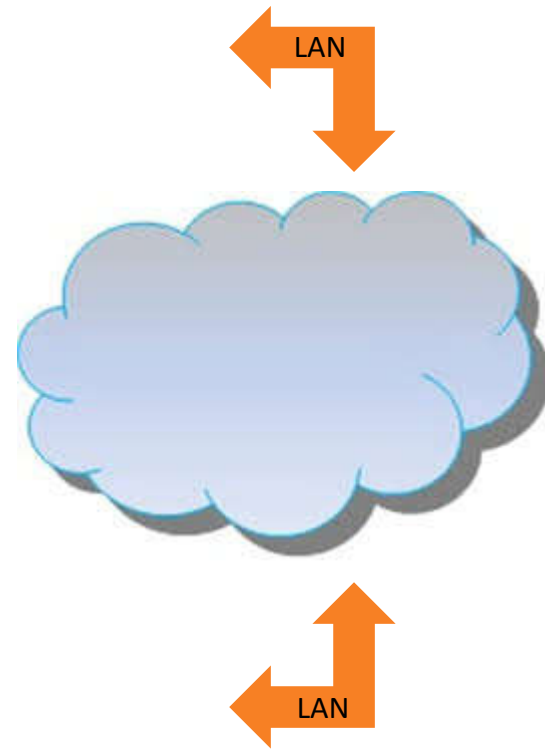
EHX+ and ERX+ Configuration



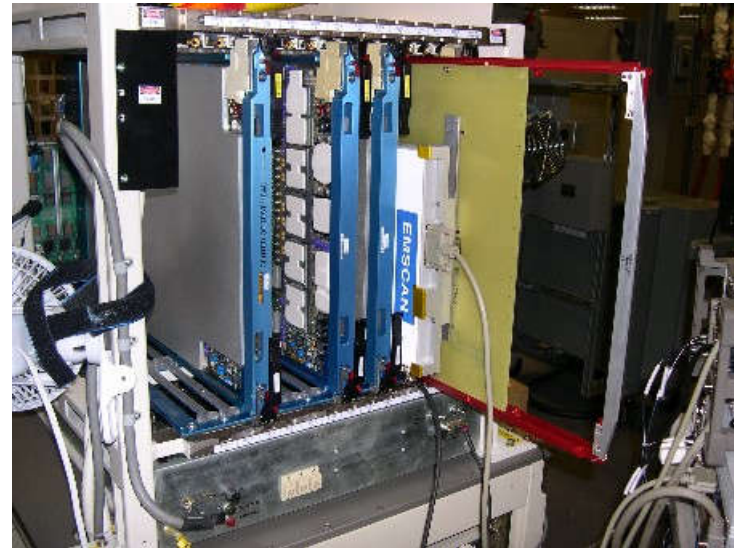
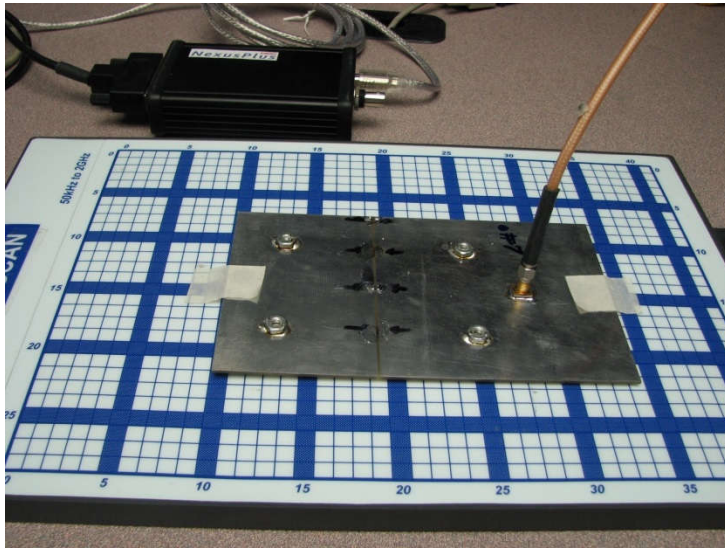
EMxpert Application



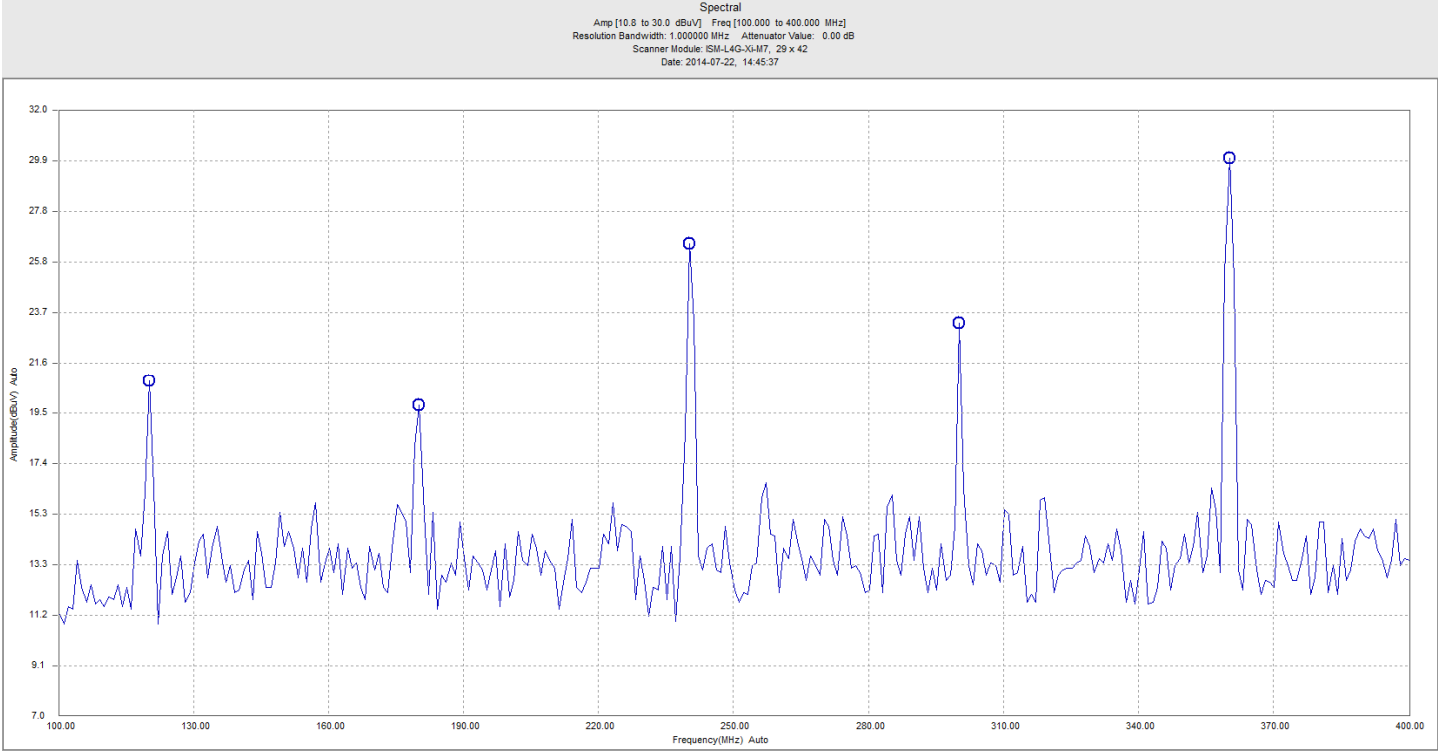
EHX+ or ERX+



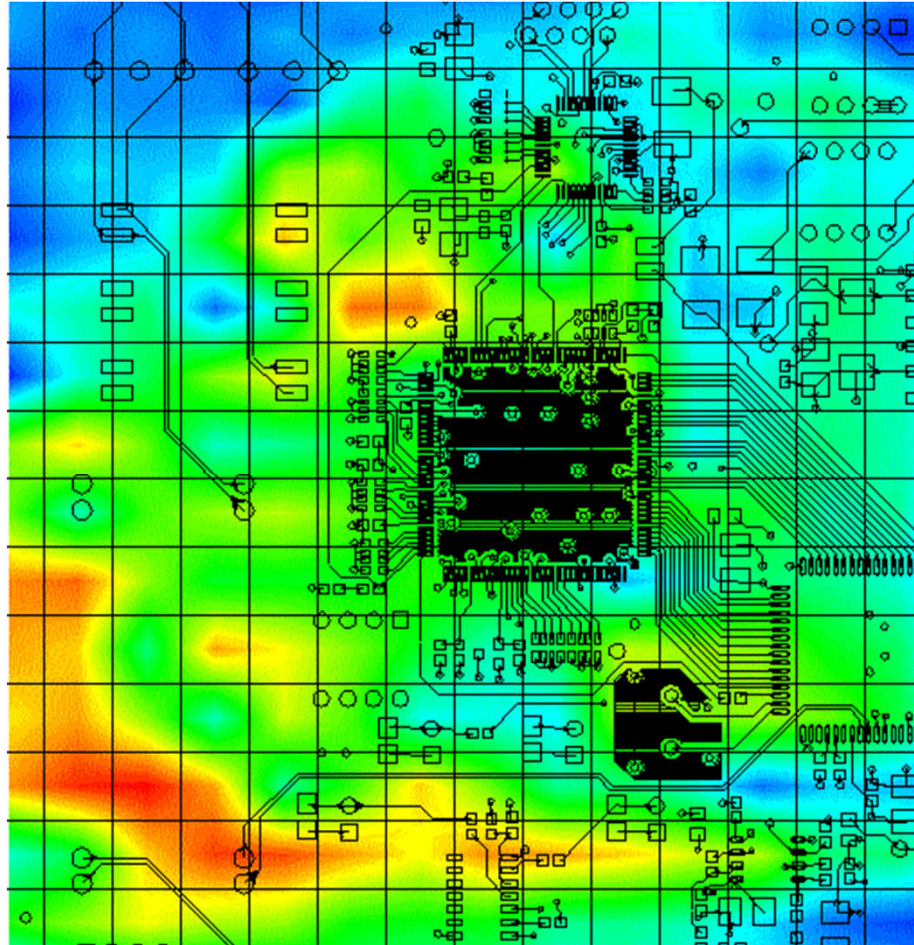
Modes of Operation



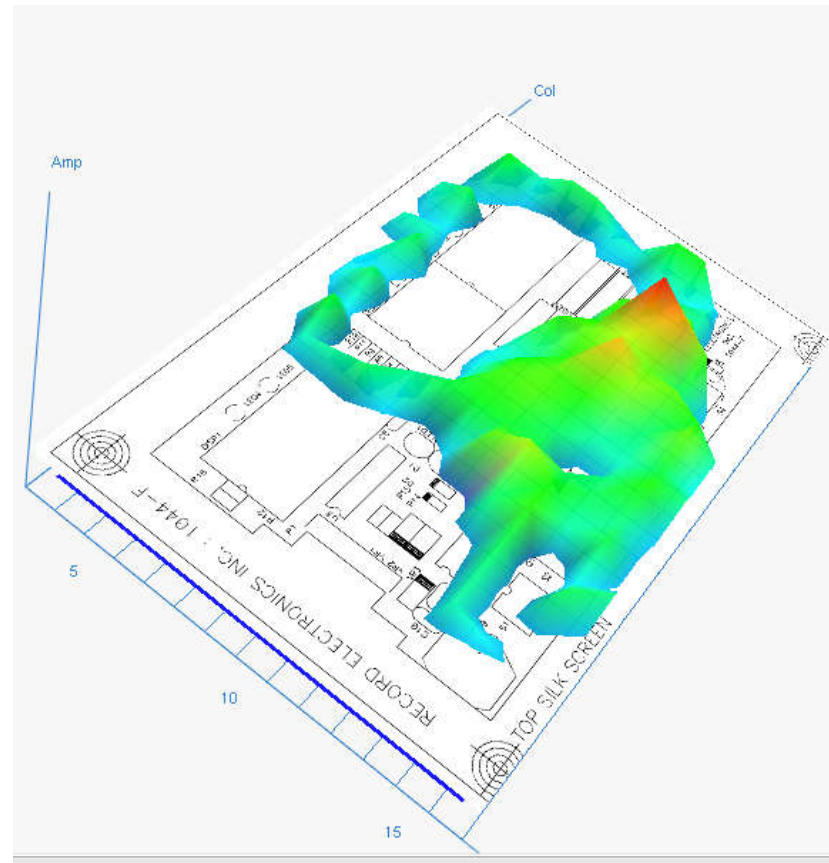
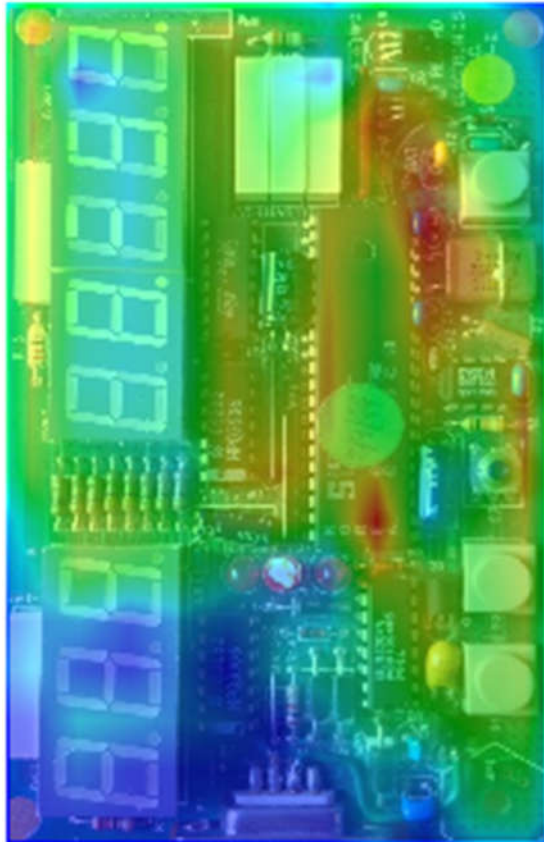
Spectral Scan: Scanner



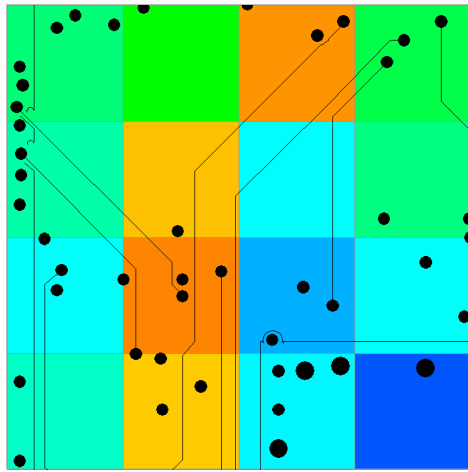
L1 Spatial Scan: Real-Time Scanner



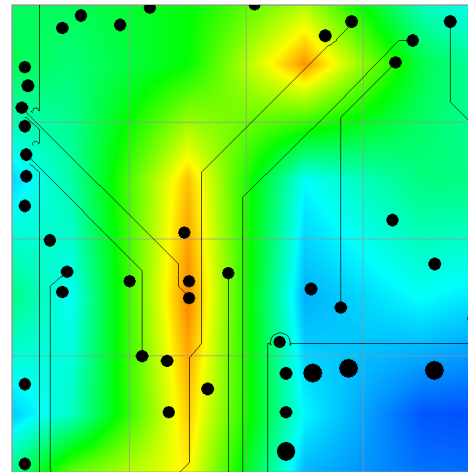
L1 Scan: Single-Frequency



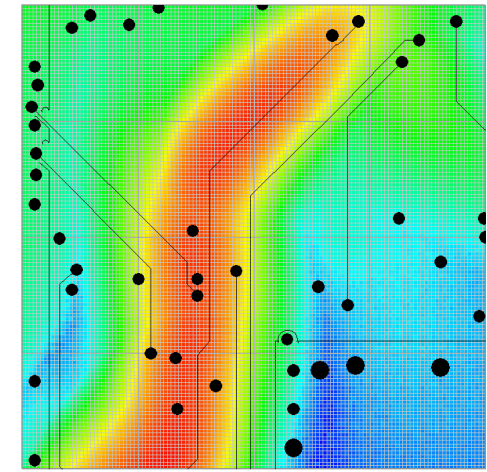
L2-L8 Spatial Scan: Post Capture High Res.



L1



L2 to L8

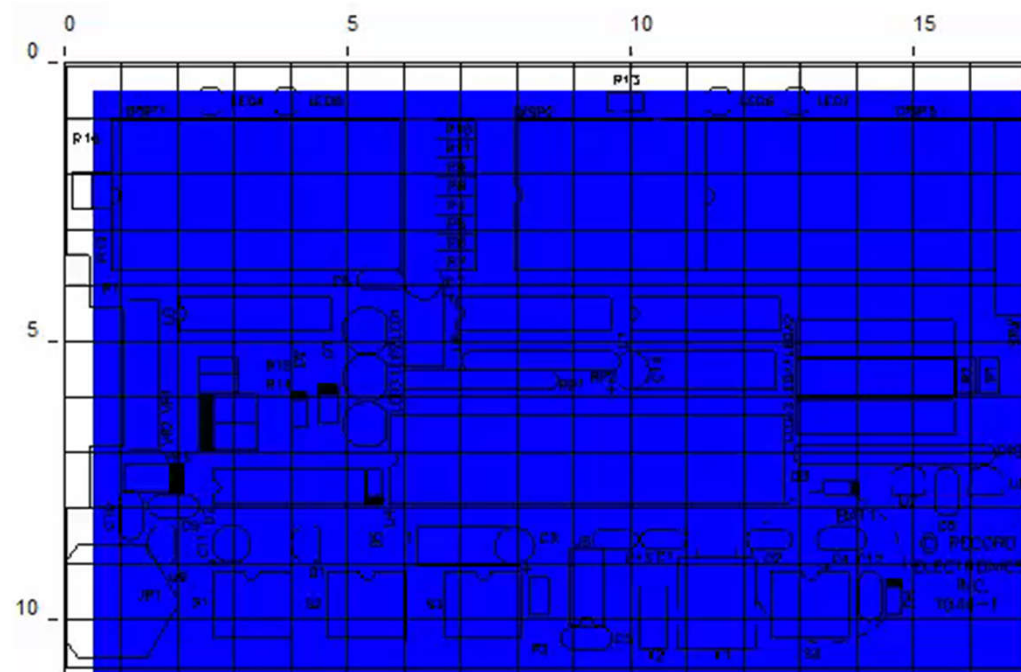


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Applications

Real-Time PCB Analysis

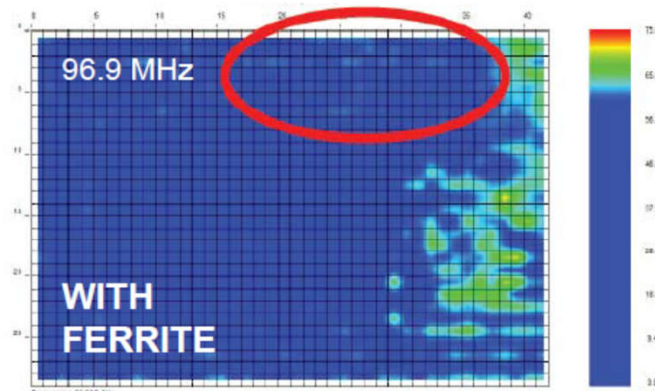
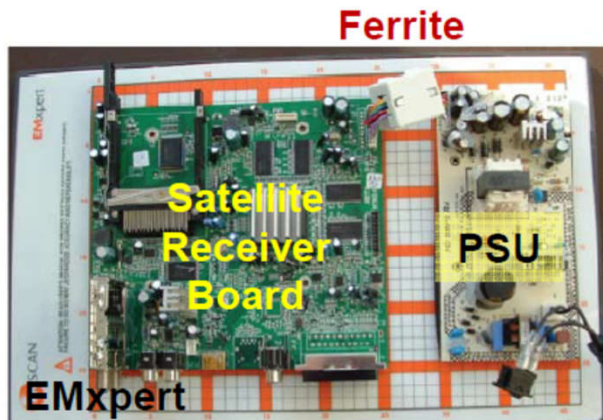
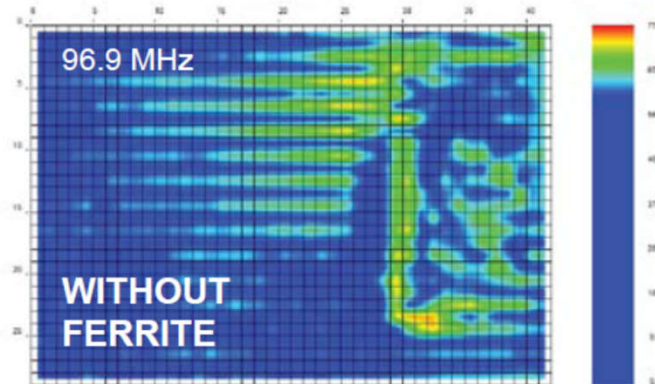
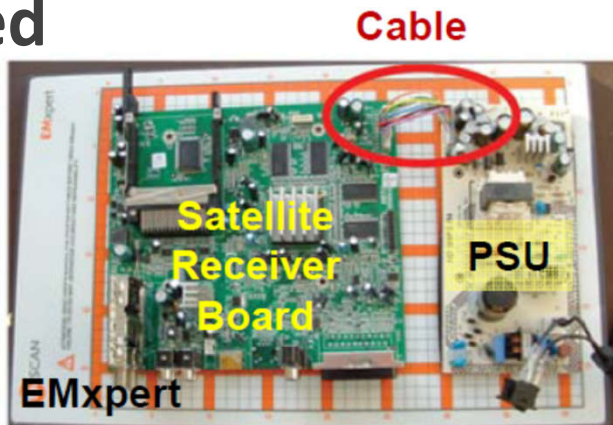
- **Intermittent peaks**
 - Source
 - Path
 - Distribution
- **Functional mode**
 - Highest emission



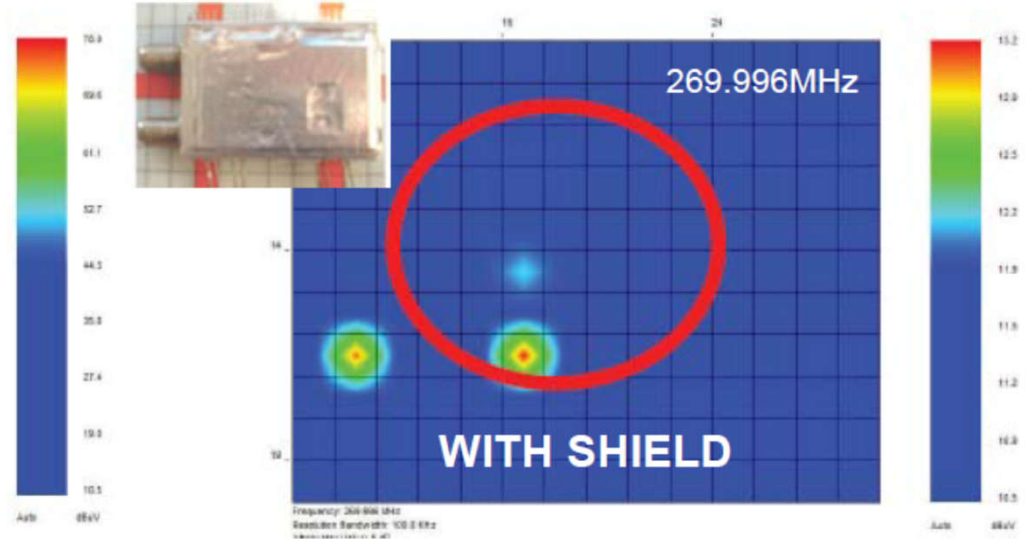
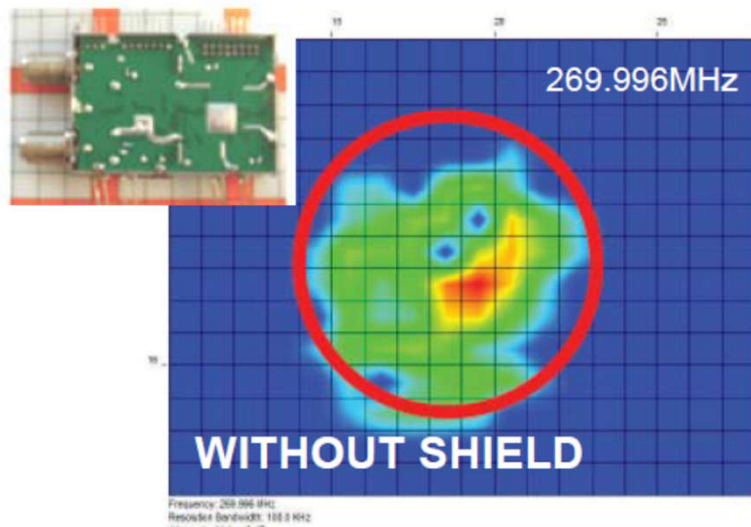
Frequency: 11.060 MHz
Resolution Bandwidth: 100.0 KHz
Attenuator Value: 0 dB
Scanner Module: ISM-8G-V8, 29 X 42
Date: 17/03/14 3:40:43 PM

Effectiveness of Filters

- Immediate feedback means trial and error can be used



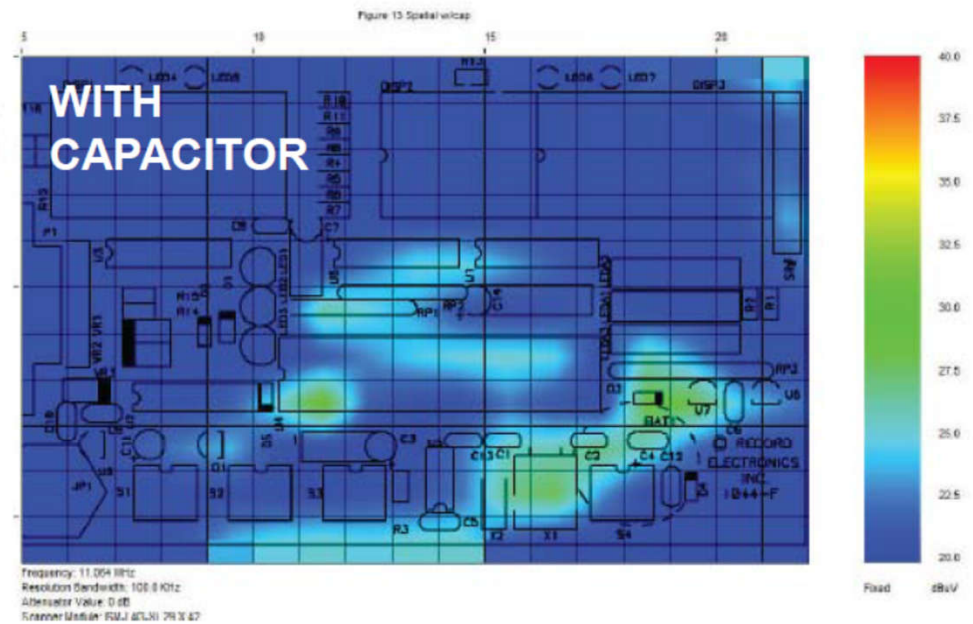
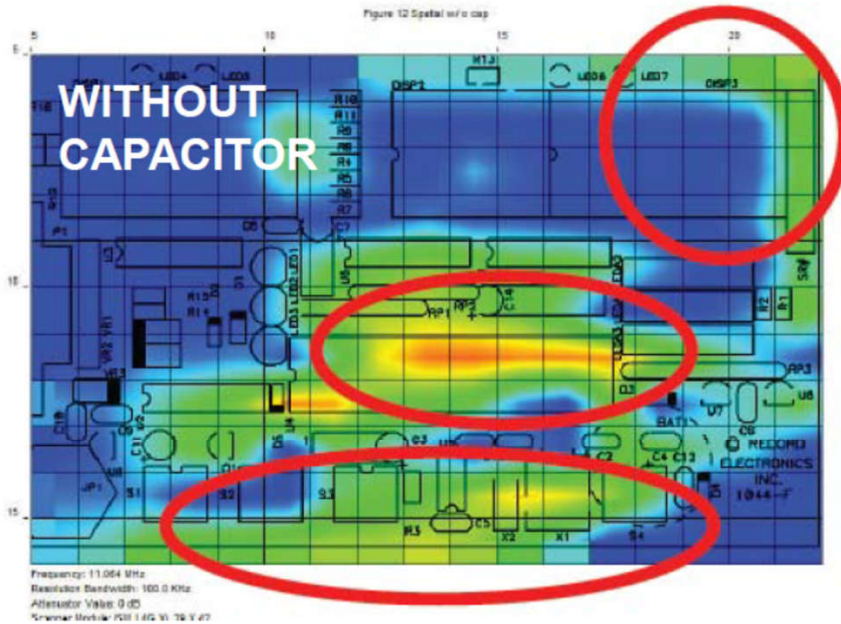
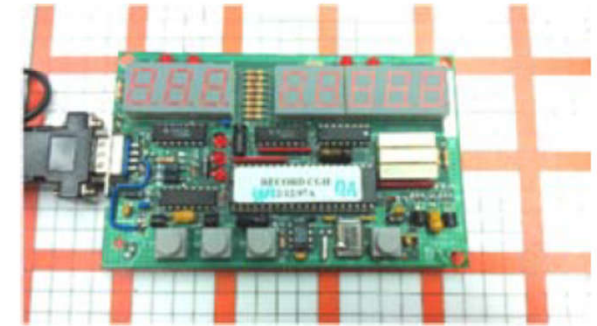
Effectiveness of Shielding



Effectiveness of Filters

Decoupling capacitor effect

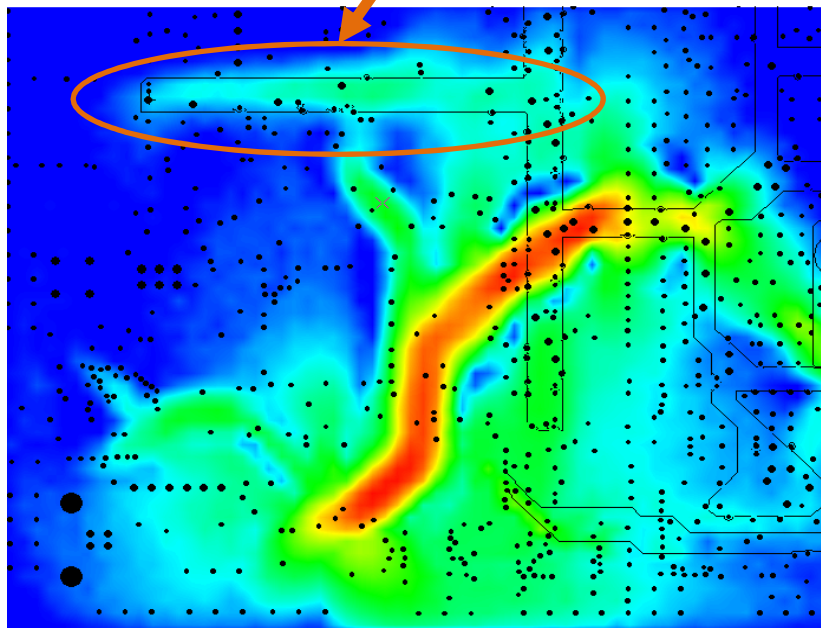
11.064 MHz



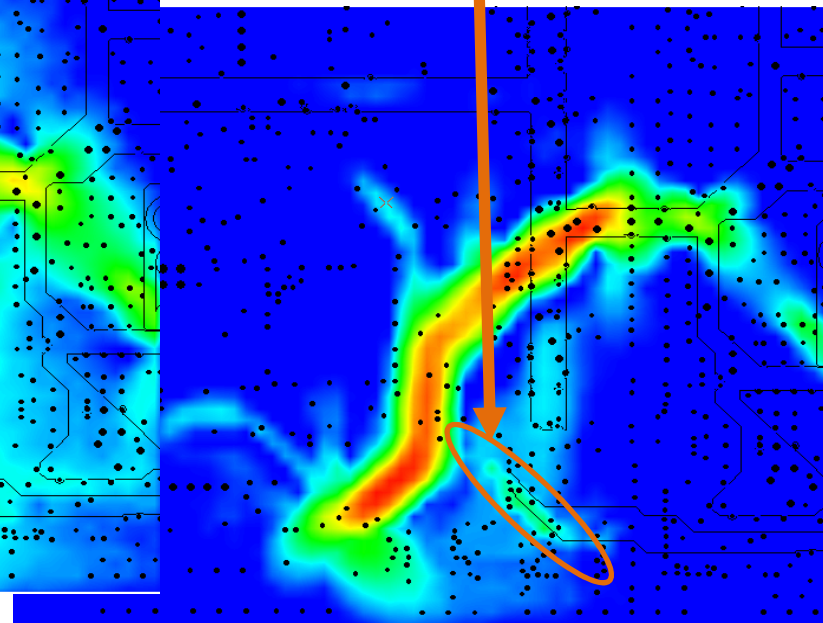
In-Depth PCB Analysis

- Jump around by frequency or location to follow signals
- Load new PCB layers to correlate to features

Energy coupled onto power plane



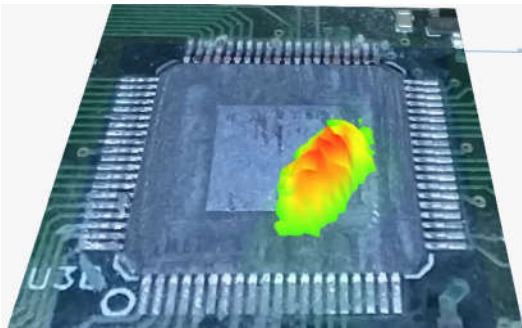
Energy coupled onto control line



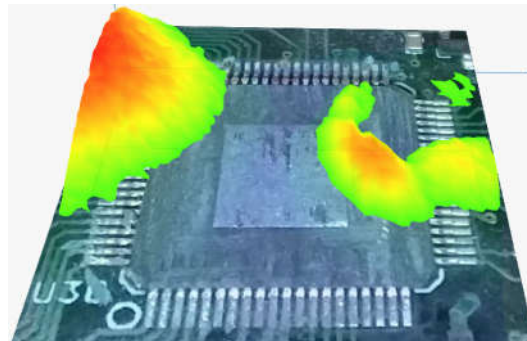
IC Analysis

- Small PIC with die exposed
- About 2 minutes per scan

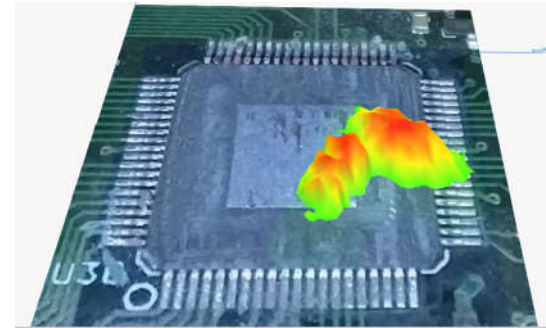
100 MH



120MHz

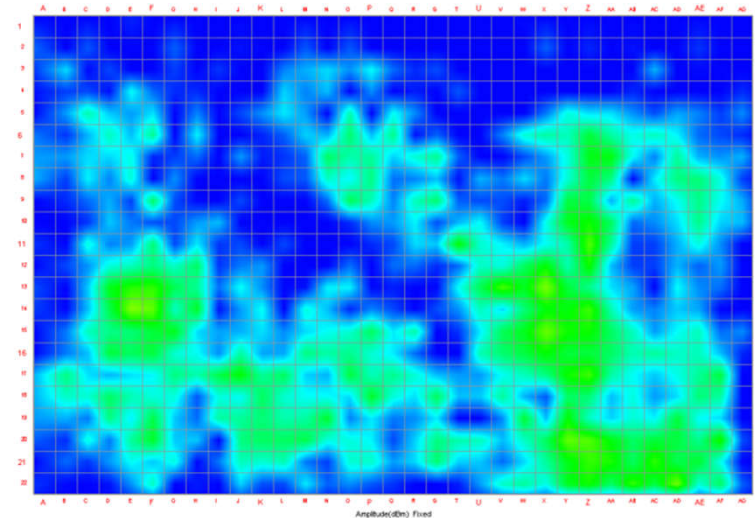
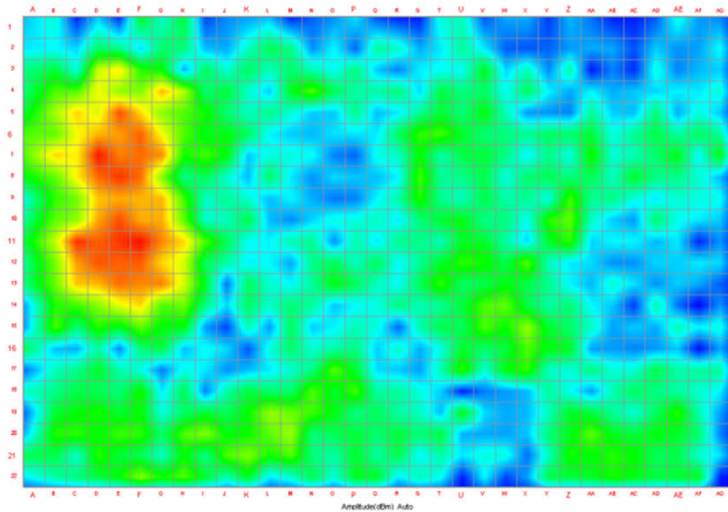


130MHz



A/B Comparison

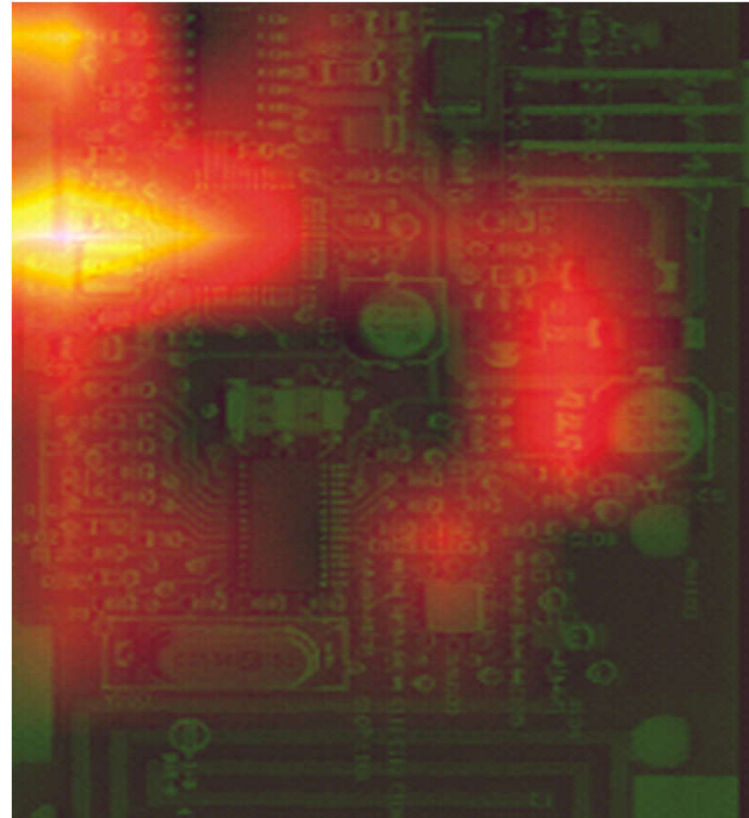
- **Obsolescence management**



- **Production unit versus gold standard**

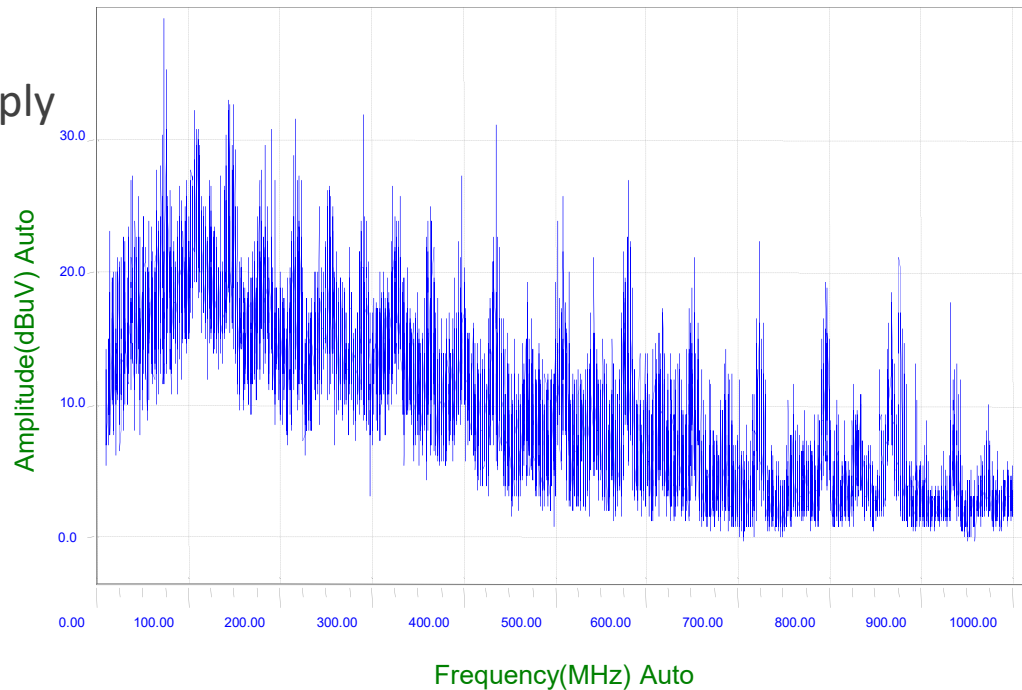
Common Mode

- How signals couple onto connectors creating common mode problems



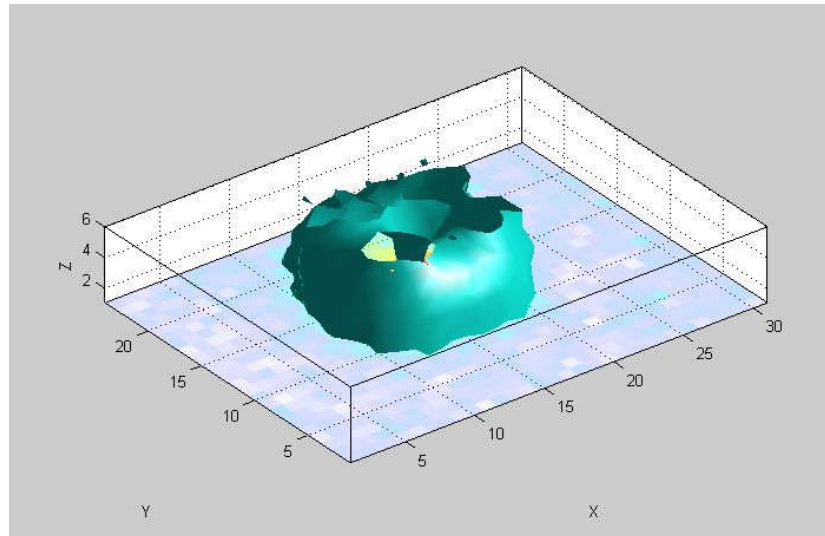
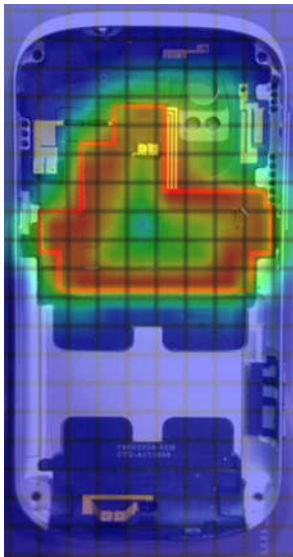
Broadband Emissions

- **Broadband emissions**
 - Switching mode power supply



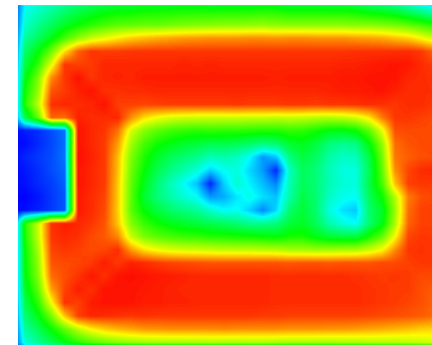
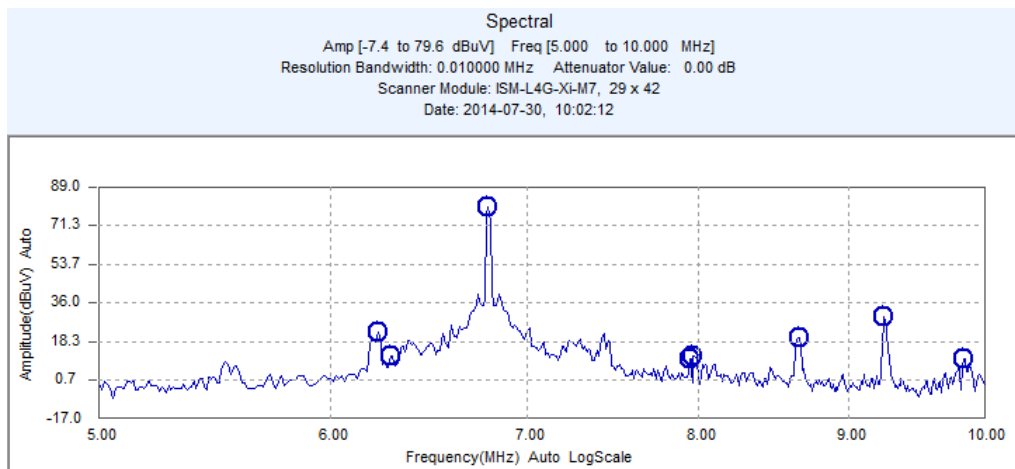
Non-EMC Applications

- **NFC/RFID**
 - 13.56 MHz



Non-EMC Applications

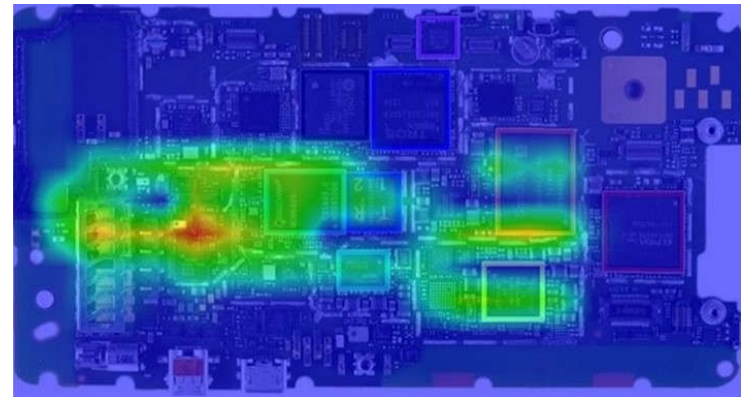
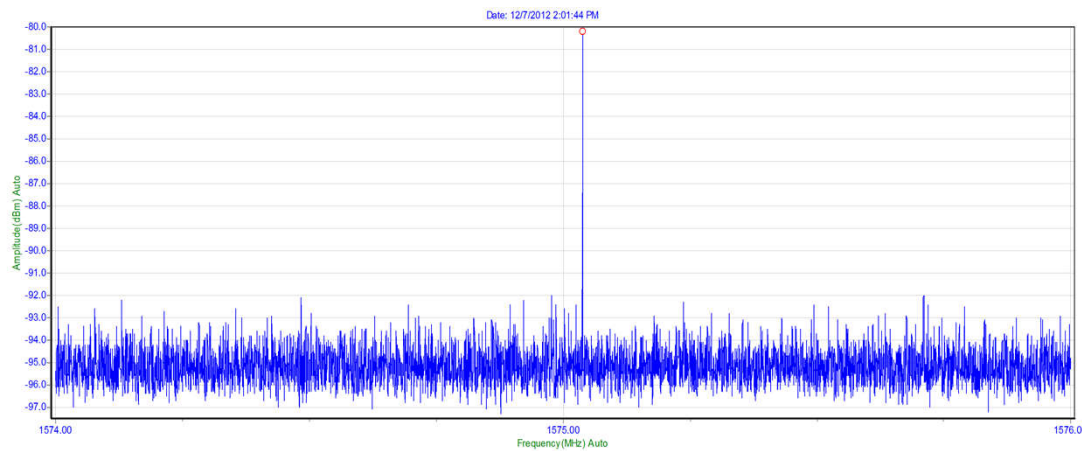
- **Wireless charging**
 - A4WP 6.78 MHz
 - PMA's 277-357 kHz
 - Qi's 100-205 kHz



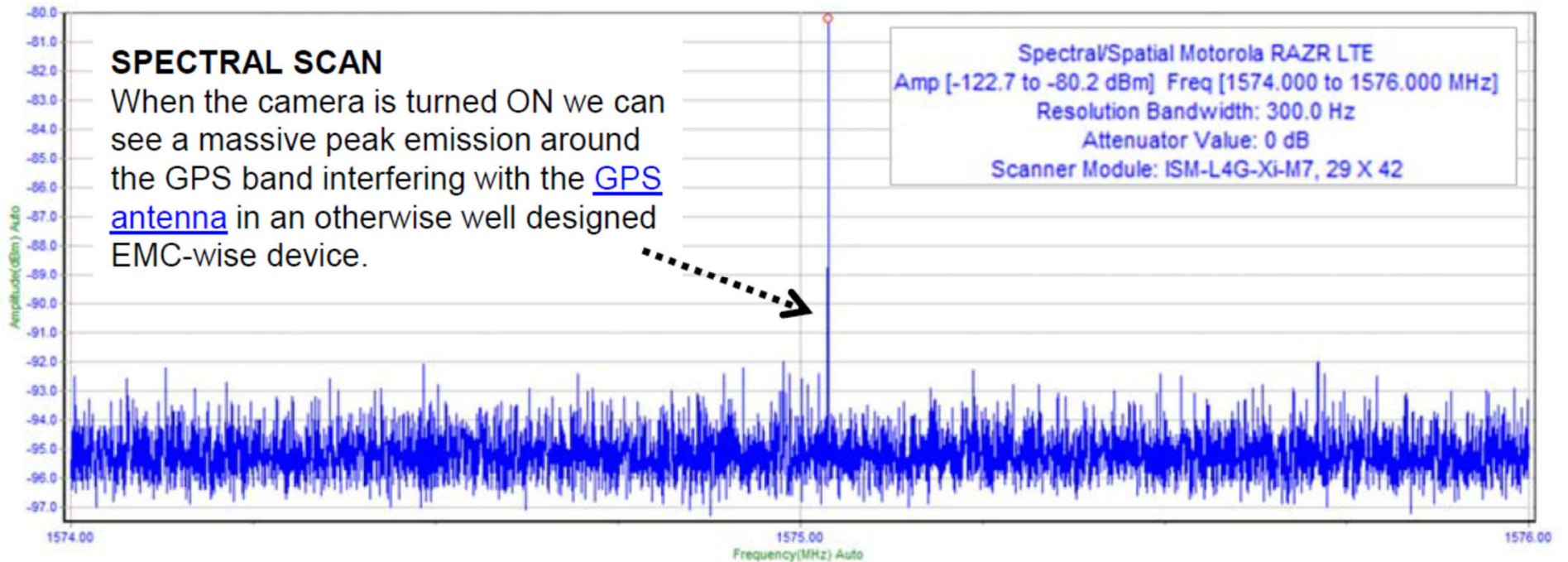
Non-EMC Applications

- **Coexistence**

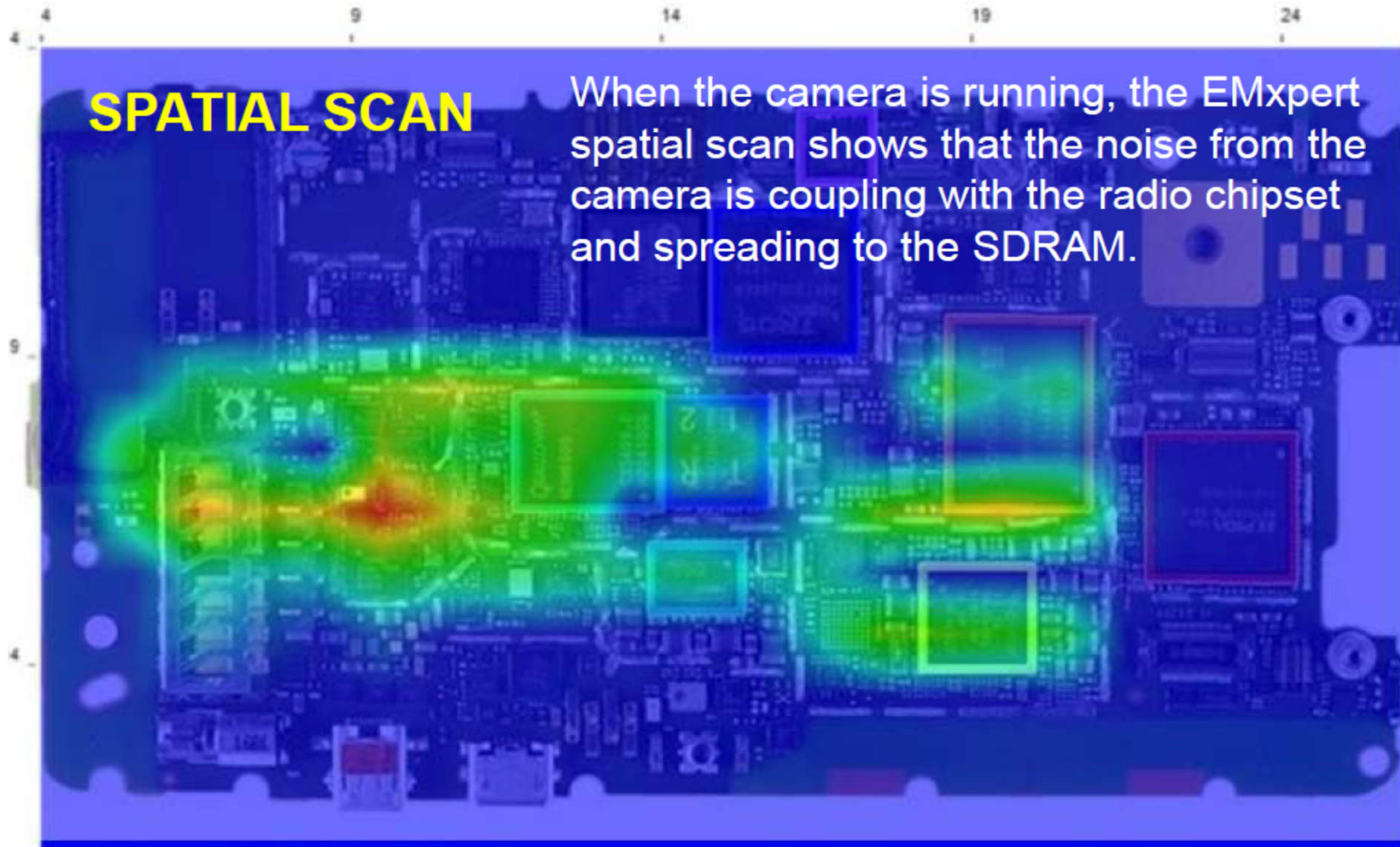
- PIM 1st to 3rd harmonic 120 dBc
- Self-interference



Desense

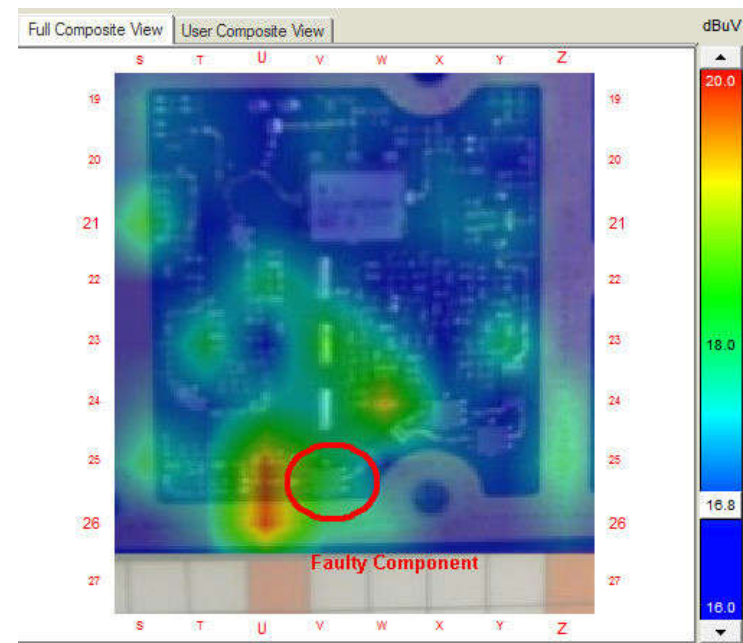
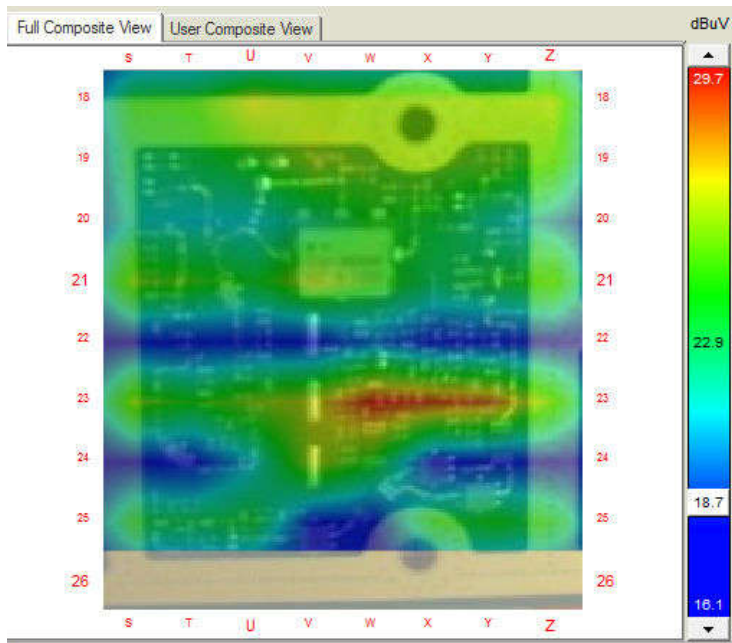


Desense



Composite frequency: 1574-1576MHz · Resolution BW: 300Hz and Attenuator: 0dB

Fault diagnosis



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Conclusion

Advantages

- “**Real-time**” view of emission sources and distribution
- Continuous peak hold scan for **spurious events**
- World’s fastest high-resolution testing
- World’s fastest pre-compliance data
- Low acquisition cost

Benefits

- **Improved TTM and R&D productivity**
 - Test time reduction > 100 x
 - Rapid design iteration, prototyping & optimization
- **Reduced chamber costs**
 - Delayed investment in new chambers
 - Third party test expenses
- **Cost effective preparation to compliance**

Some Customers

3M

ABB



BOSCH



CURTIS

DENSO

EATON



GARMIN™



Google



HARRIS®

HITACHI
Inspire the Next

Honeywell



JAVAD



Microsoft



MOTOROLA SOLUTIONS



Panasonic

PHILIPS

Healthcare

Rockwell
Collins



THALES



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