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Agilent’s EMI Receiver:
- An Historical Perspective
Objectives

- Historical Perspective
- How technical improvements affect throughput
- Technical Point: Bucketization and Pixelation
Legacy Agilent Solutions

HP 8571/72/73/74
Introduced - 1983

- Based on 8566/68
  - First Microprocessor Controlled Spectrum Analyzer
  - Lock and Roll
    - 10 MHz Synthesized Sweeps
    - 2% Span Accuracy
  - Amplitude Accuracy Top Division for Log Display
    - Log Amplifier doesn’t respond correctly to CISPR pulse measurement
    - Need Linear Scale for all final measurements
- 1001 Data Points
- 10 dB Step Size Attenuator
- Added Preselector
  - Required Extensive Calibration
  - Comb Generator for Calibration
- Added CISPR Detectors and Bandwidths
Legacy Agilent Solutions

- Based on 859x
  - Low Cost SA from late 1980s
    - User driven automated alignment
  - Lock and Roll
    - 10 MHz Synthesized Sweeps
    - 2% Span Accuracy
  - Amplitude Accuracy Top Three Divisions for Log Display
    - Log Amplifier doesn’t respond correctly to CISPR pulse measurement
    - Need Linear Scale for all final measurements
- 401 Data Points
- 10 dB Step Size Attenuator
- Built in CISPR detectors and bandwidths
- Optional Tracking Generator

- Added Preselector
  - Required calibration
  - Comb Generator for calibration

8542/46A Introduced - 1994
Agilent PSA Based EMI Measurement Receiver

• Based on PSA
  – Designed for Telecom - 1999
  – Fully Synthesized Sweeps
    • Typical span accuracy 0.02%
  – All Linear Digital IF
    • Log amplitude is a numeric exercise
    • Amplitude accuracy anywhere on screen in either LIN or LOG scale
  – 30 dB more dynamic range than 8566
  – 101 to 8192 Data Points
  – 2 dB Step Size Attenuator
• Added CISPR &MIL Std detectors and bandwidths 2005
• Preselector Added in 2007
  – Family of Sources for User Alignment
    • Leveled Source
      – Source Control
      – EMI Toolset (Cable Losses, Volumetric Site Attenuation)
    • No Comb Generator
PSA Series Standard Features since June 2005

CISPR Defined Detectors and Resolution Bandwidths
• Peak, Quasi-Peak and Average detectors
• 200 Hz, 9 kHz and 120 kHz -6 dB bandwidths
• 1 MHz bandwidth

MIL-STD Resolution Bandwidths
• 10, 100 Hz, 1, 10, 100 kHz, 1 MHz -6 dB bandwidths
PSA Series Standard Features since June 2005

Limit lines
• Standards based limit lines downloadable from www.agilent.com/find/emc
• Set pass/fail curves for spur searches, max output power and more
• 2 sets of limit lines, with margins, dynamic around center frequency and level

Amplitude correction
• 4 sets of AmpCor available (Cable, Antenna, Other, User)
• 200 points per set available
• Programmable freq. vs. amp. curve to calibrate whole system
America’s Market Speaks

• Customers drive Agilent to leverage PSA as EMI solution (2004)
  – Recognized its technical advantages would benefit test time
    • Requested quasi-peak detector at a minimum
  – Required replacement for legacy HP equipment
  – Believed spectrum analyzer superior to receiver mode
• Agilent responds with EMI package (2005)
  – EMI peak, quasi-peak, average detectors (automatic resolution bandwidths)
  – Limit lines and transducer factors
• Customer response (2005)
  – Early adopters see 30% improvement in throughput
    • Customized software
• Agilent gets religion! (2005)
  – Preselector developed for full CISPR16-1-1 compliance
• Customers response (2007)
  – The WORD is out in close-knit community pressing Agilent for immediate solution
  – Unprecedented request for VIP demonstrations
The challenge of measuring Radiated Emissions

*Radiated Emissions are difficult because of multiple dimensions!*

1. Azimuth (angle)
2. Antenna Height
3. Field Strength
4. Frequency
5. Time

- 41.2563MHz
- 218.120MHz
- 1500.260MHz

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**Typical EMC Task Flow**

<table>
<thead>
<tr>
<th>Percent of test time:</th>
<th>Task Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>5%</td>
<td><strong>Test Preparation</strong></td>
</tr>
<tr>
<td>10%</td>
<td><strong>Initial Scan</strong></td>
</tr>
<tr>
<td>5%</td>
<td><strong>Frequency Filter</strong></td>
</tr>
<tr>
<td>25%</td>
<td><strong>Spatially Maximize</strong></td>
</tr>
<tr>
<td>50%</td>
<td><strong>Troubleshoot</strong></td>
</tr>
<tr>
<td>5%</td>
<td><strong>Audit</strong></td>
</tr>
<tr>
<td>Plus ½ day</td>
<td><strong>Report</strong></td>
</tr>
</tbody>
</table>

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Bucketization and Pixelation

**Bucketization**: Hardware limitation of the number of data points collected.
- If DP = 10 then signal appears @ ~ 250 MHz
- Goal: Each DP = 1/3 IF

**Pixelation**: Display limitation whereby the number of data points cannot be displayed.
- **PSA**: VGA display.
  - 640 pixels – menu
  - ~550 pixels

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Digital Power Analyzer

- **Points**: 8192
- **Gain**: 10 dB
- **Input**: 70.99 dB
- **FFT**: 4 dB
- **Sweep Time**: 78.09 ms
- **Auto**: Man
- **Sweep**: Single / Continuously
- **Gates**: On / Off
- **Gate Setup**: Points 8192

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Customer Testimonial

“The PSA is like having eight 8566B spectrum analyzers in one.”

Senior EMI Test Engineer

For the same amount of data acquisition:
• 8566B takes 8 scans
• PSA takes 1 scan
Pixelation Solution

Synchronized Zoom Trace (SZT)
Sales Tools and Information Sources

To Learn More . . .

www.agilent.com/find/emc
www.agilent.com/find/N9039A