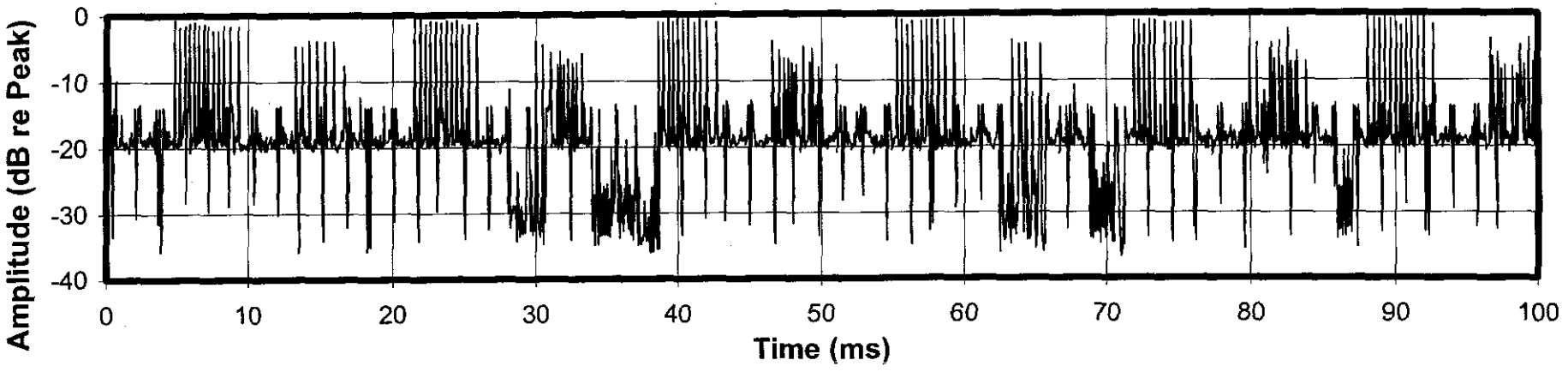
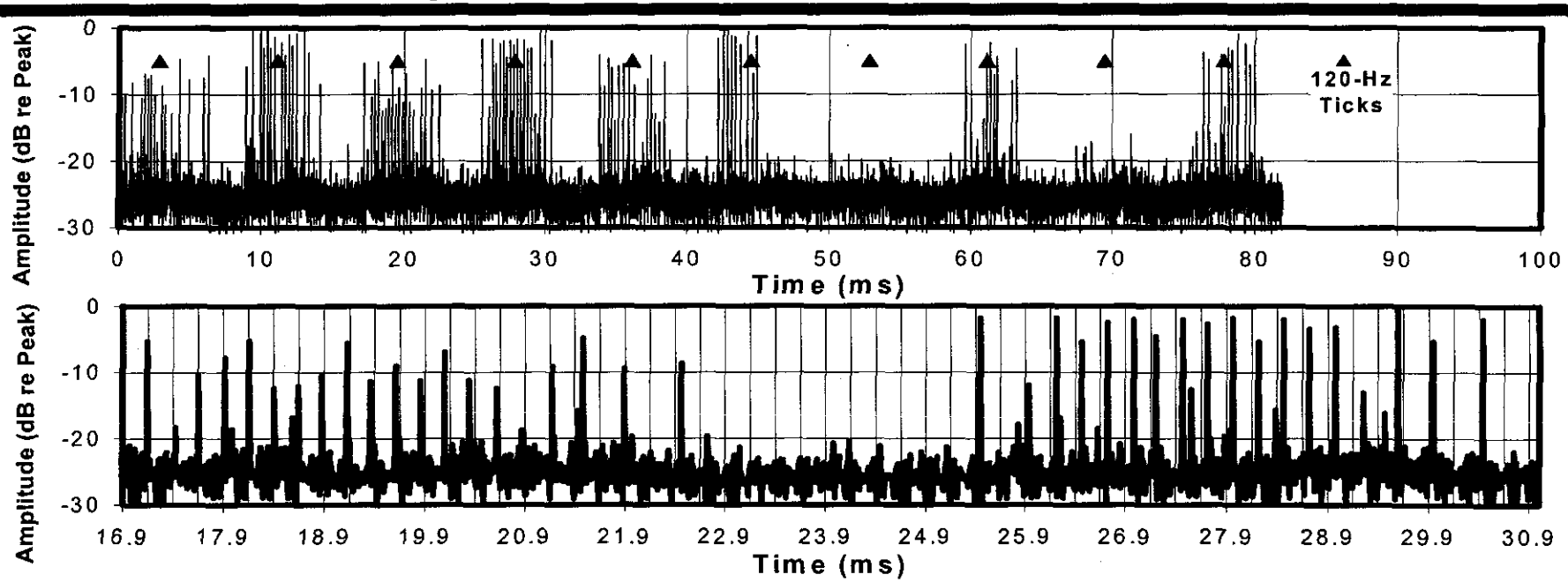
Temporal Measurements: DUT 2, Site 2a



- **Impulse noise exceeds signal level by ~ 15 dB (peak)**
- **Desired PLC signal conditions achieved**
  - Requirement for >20 Hz rep-rate achieved
  - Percentage of 61-μs temporal bins containing BPL signals = 77% (single 0.5-second trace, with signal presence defined by threshold 22 dB below max impulse peak)
- **Measurement Setup**
  - Test Config. 2
  - Analyzer settings
    - RBW=3 MHz, VBW=3 MHz
    - Center frequency 42.7 MHz (set to encompass broadband spectral peak)
    - 8192-point sweep with duration 0.5 seconds (61 μsec bin width)

Site 2b—Impulse Noise Measurement (BPL coms terminated)



- **Impulse noise source not identified**
  - High level when measured at Site 2a (25-m downline from DUT), with coms terminated, and outside BPL operating band suggested DUT was not the source
- **Characteristics**
  - 120-Hz burst rate
  - 4.0 kHz pulse rate within a burst
  - 1.3% of 10-μs temporal bins contain impulse signals **(82 ms trace, based on threshold 15 dB below max impulse peak)**
- **Measurement Setup**
  - Test Config. 1, less the bandpass filter
  - Analyzer settings
    - RBW=3 MHz, VBW=3 MHz, Center frequency 50 MHz (set to encompass broadband spectral peak)
    - 8192-point sweep with duration 81.9 ms (10 μsec bin width)

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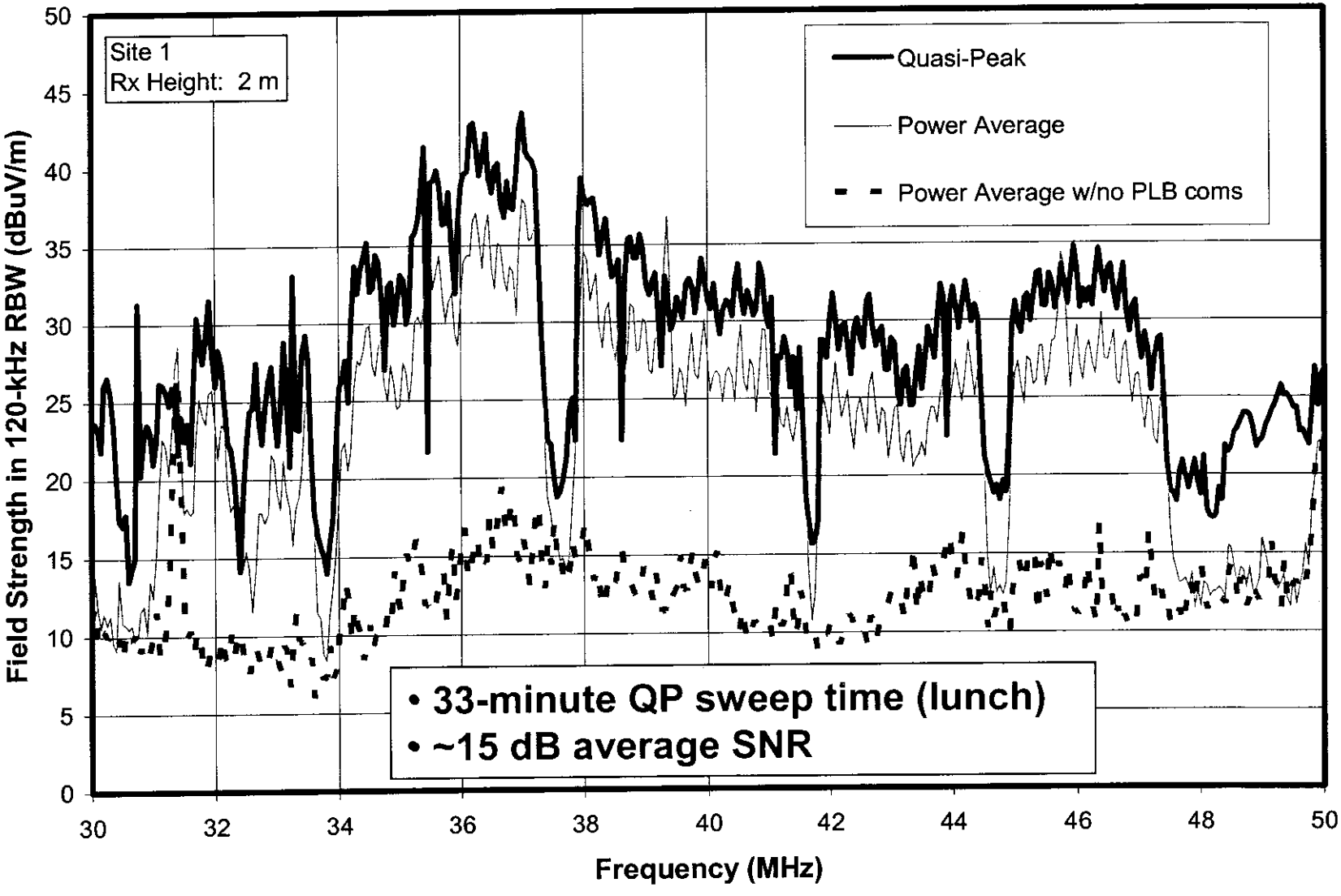
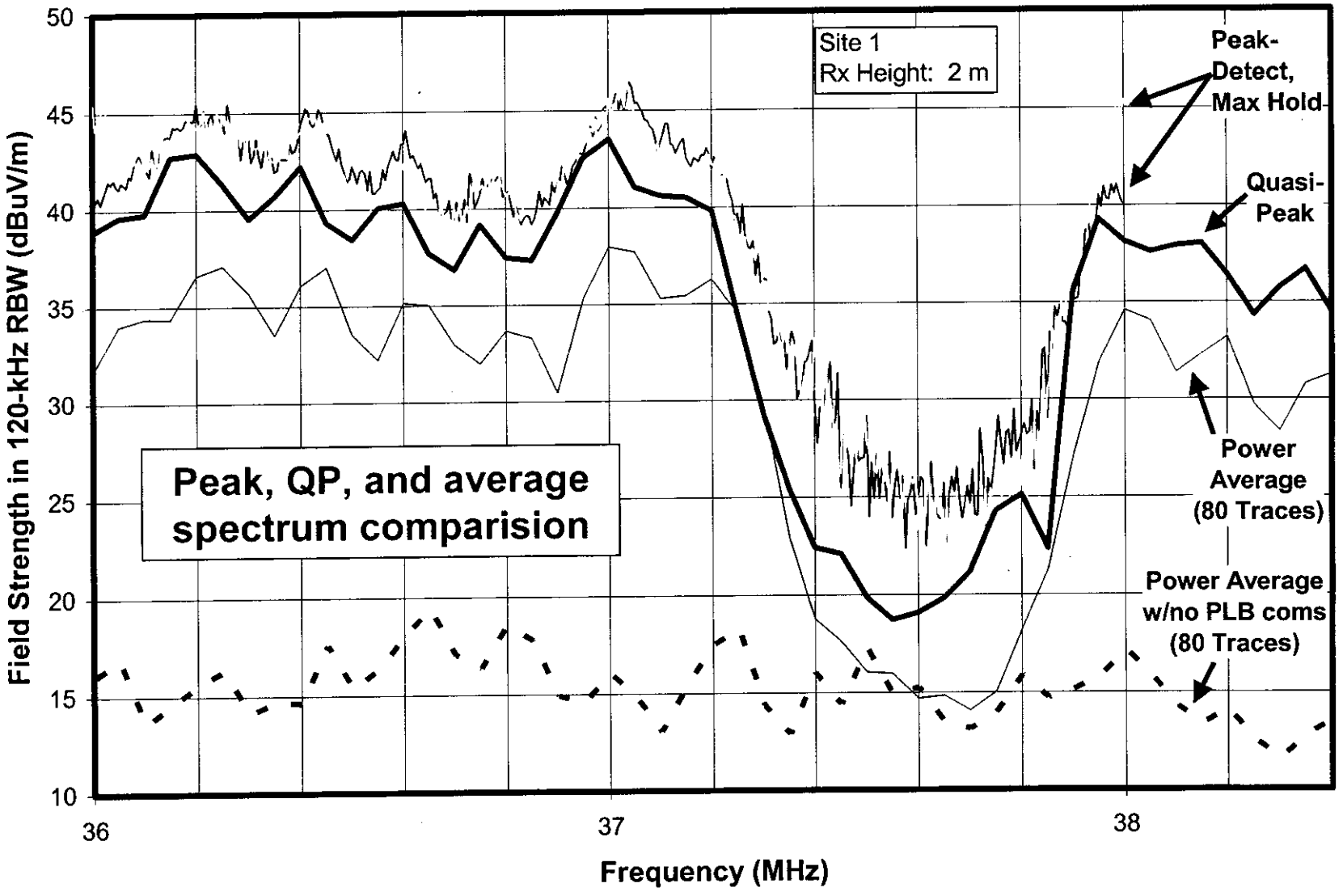
Site-1 Spectra

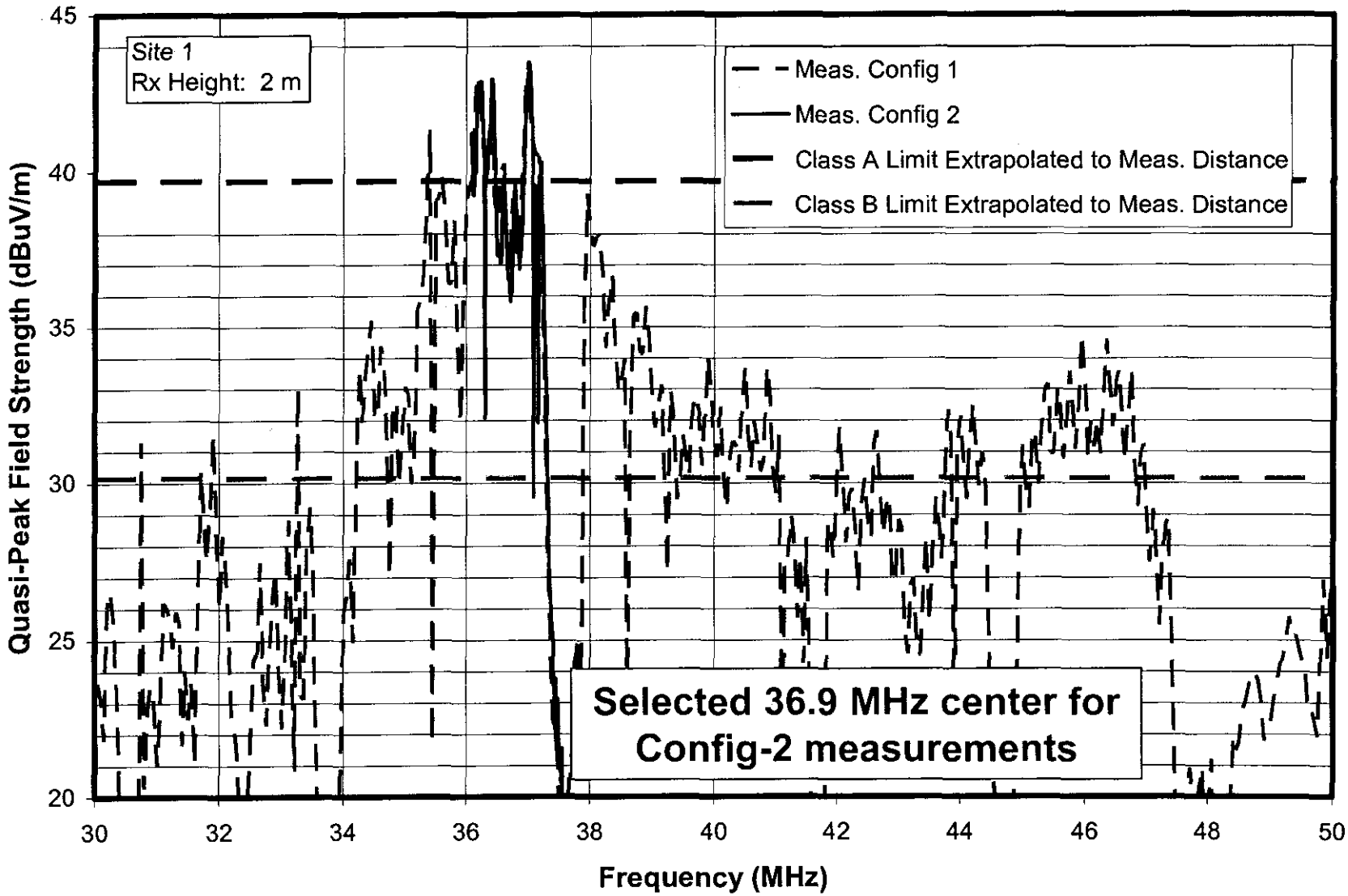
Site 1—Full-Band Quasi-Peak and Average Spectra



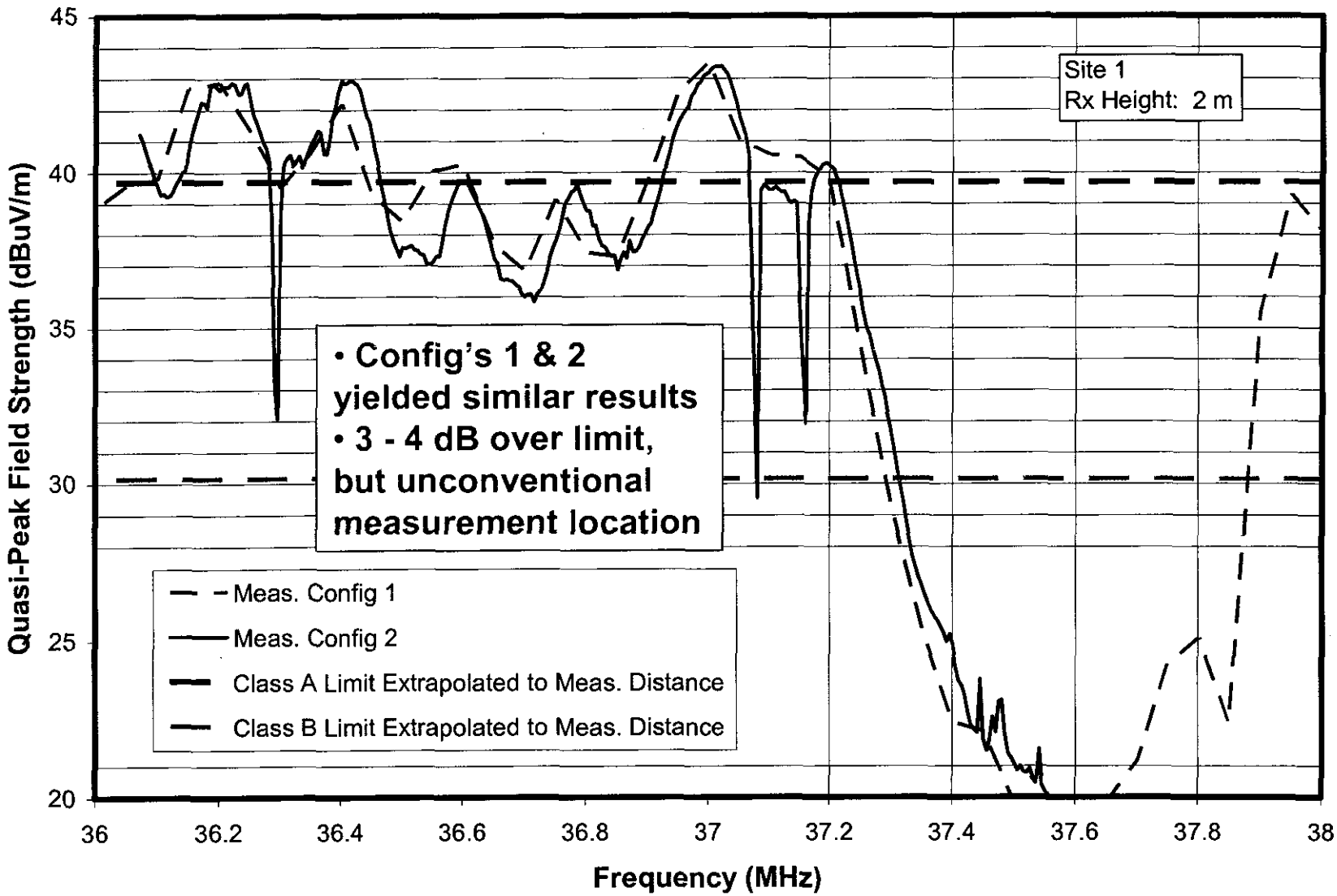
Site 1—Expanded Spectrum Comparison



Site 1—Full-Band Quasi Peak Spectra and Limits



Site 1—Expanded Quasi Peak Spectra and Limits



Site-2 Spectra

Site 2a—Three Max-Hold Spectra

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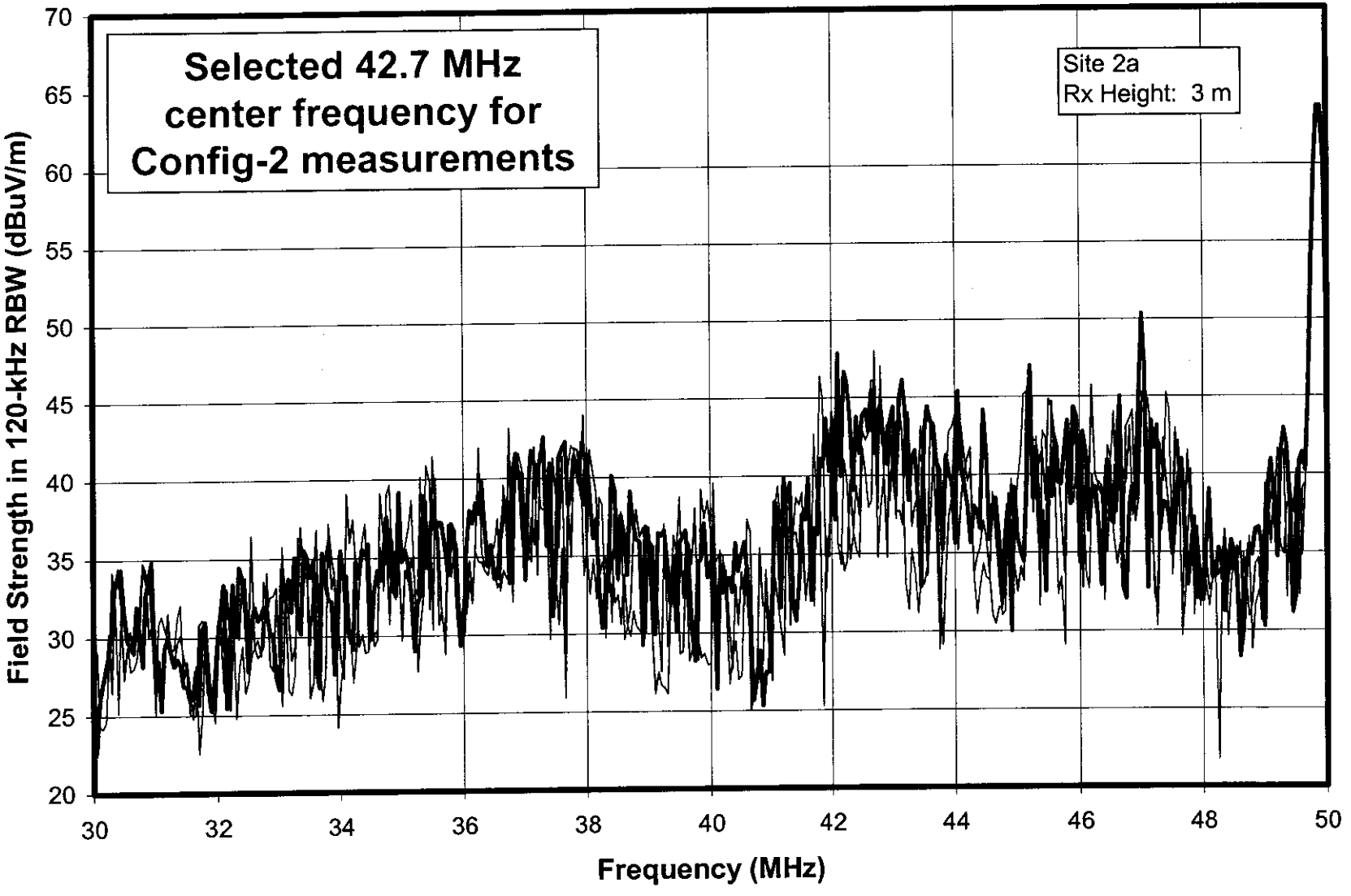
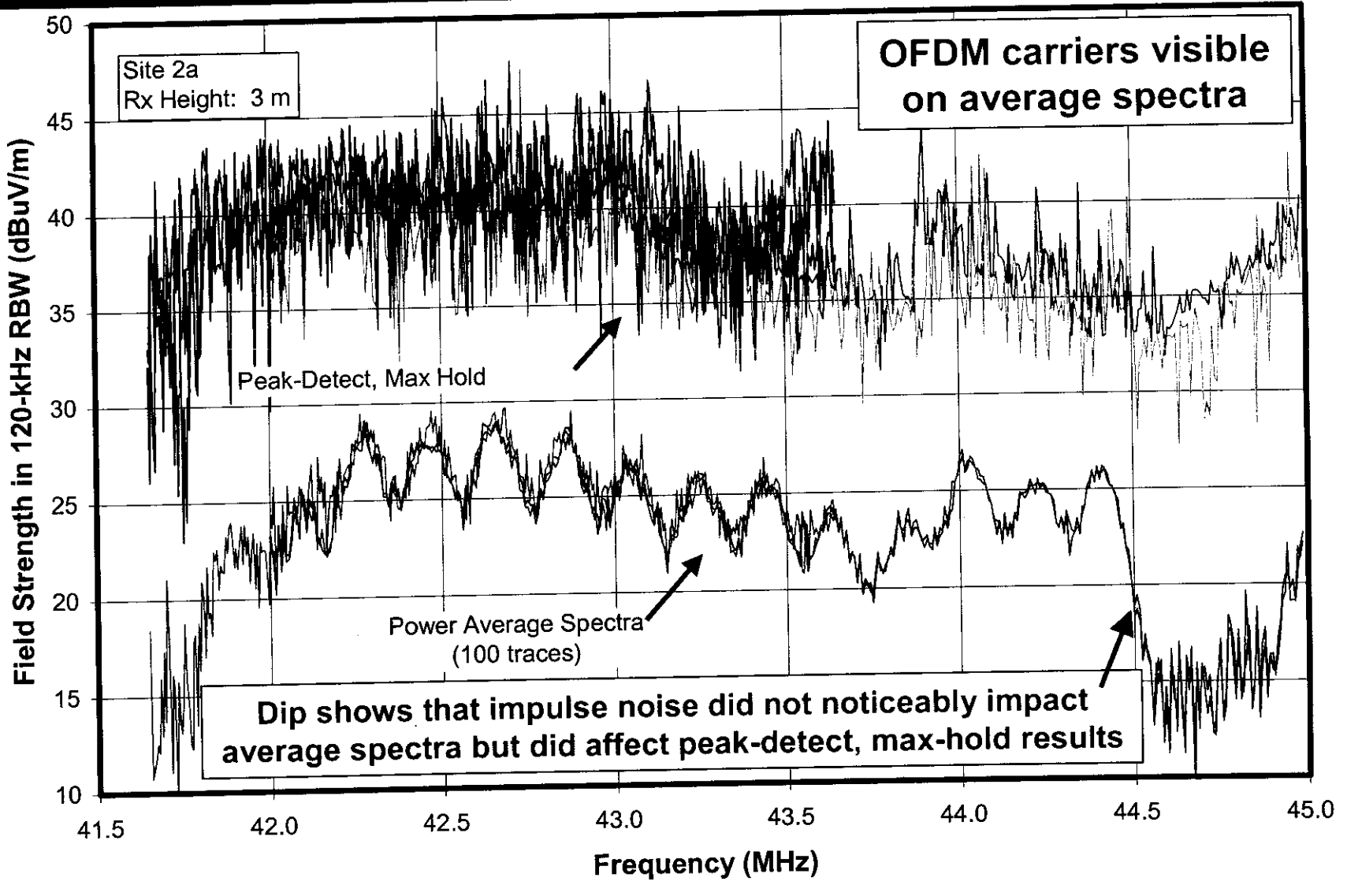
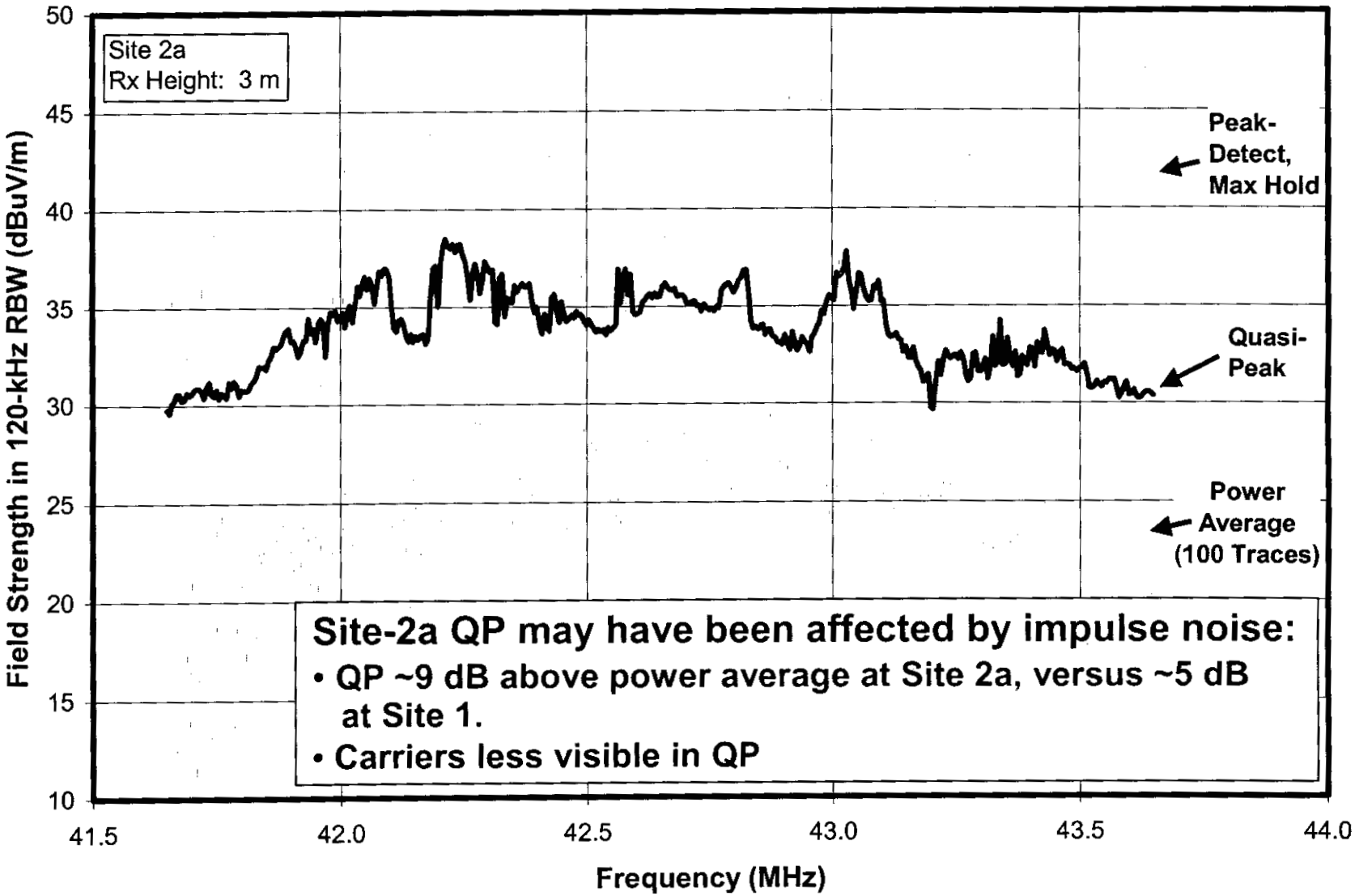


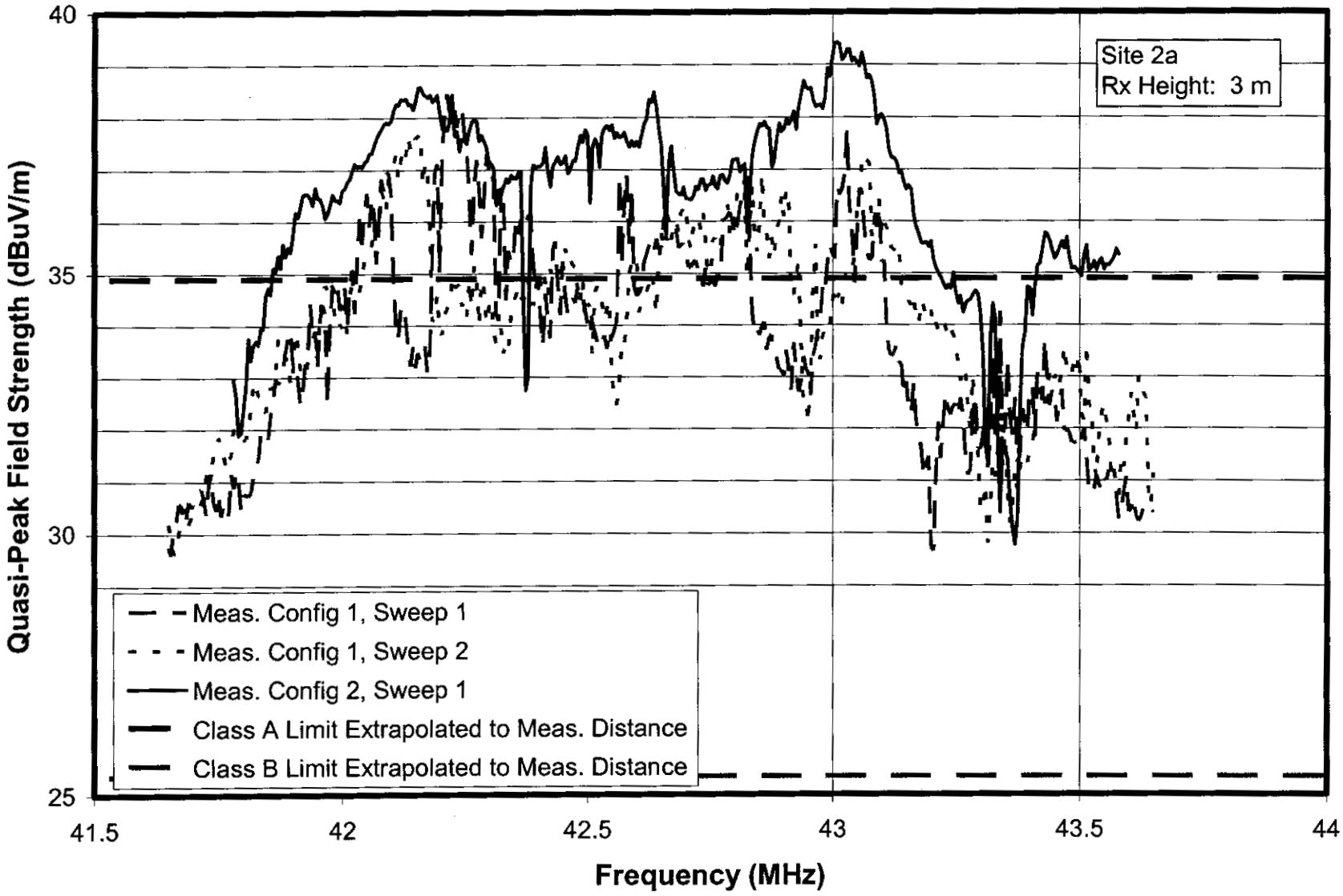
Site 2a—Expanded Max-Hold and Average Spectra



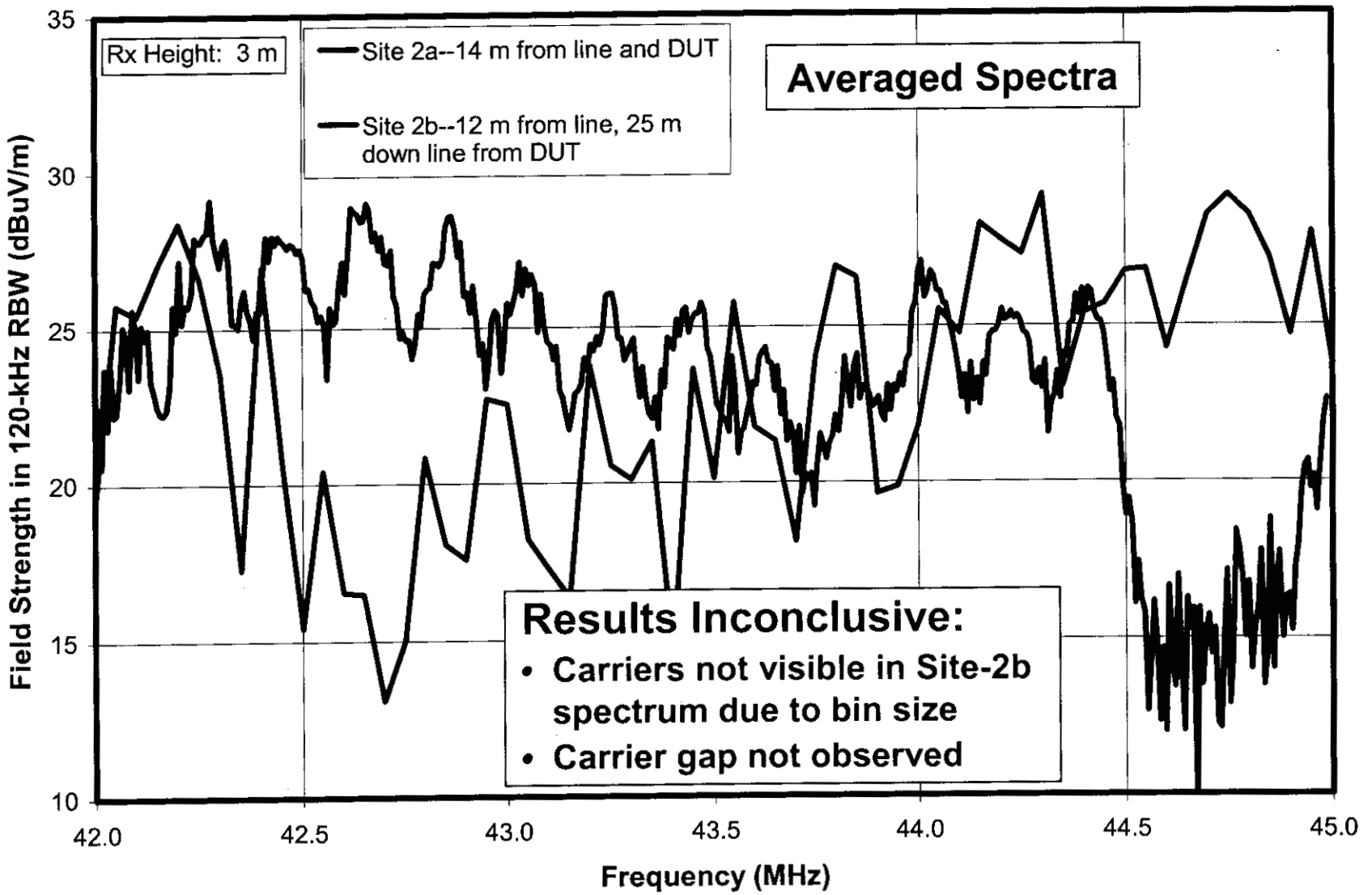
Site 2a—Comparison of Max-Hold, Quasi-Peak, and Average Spectra



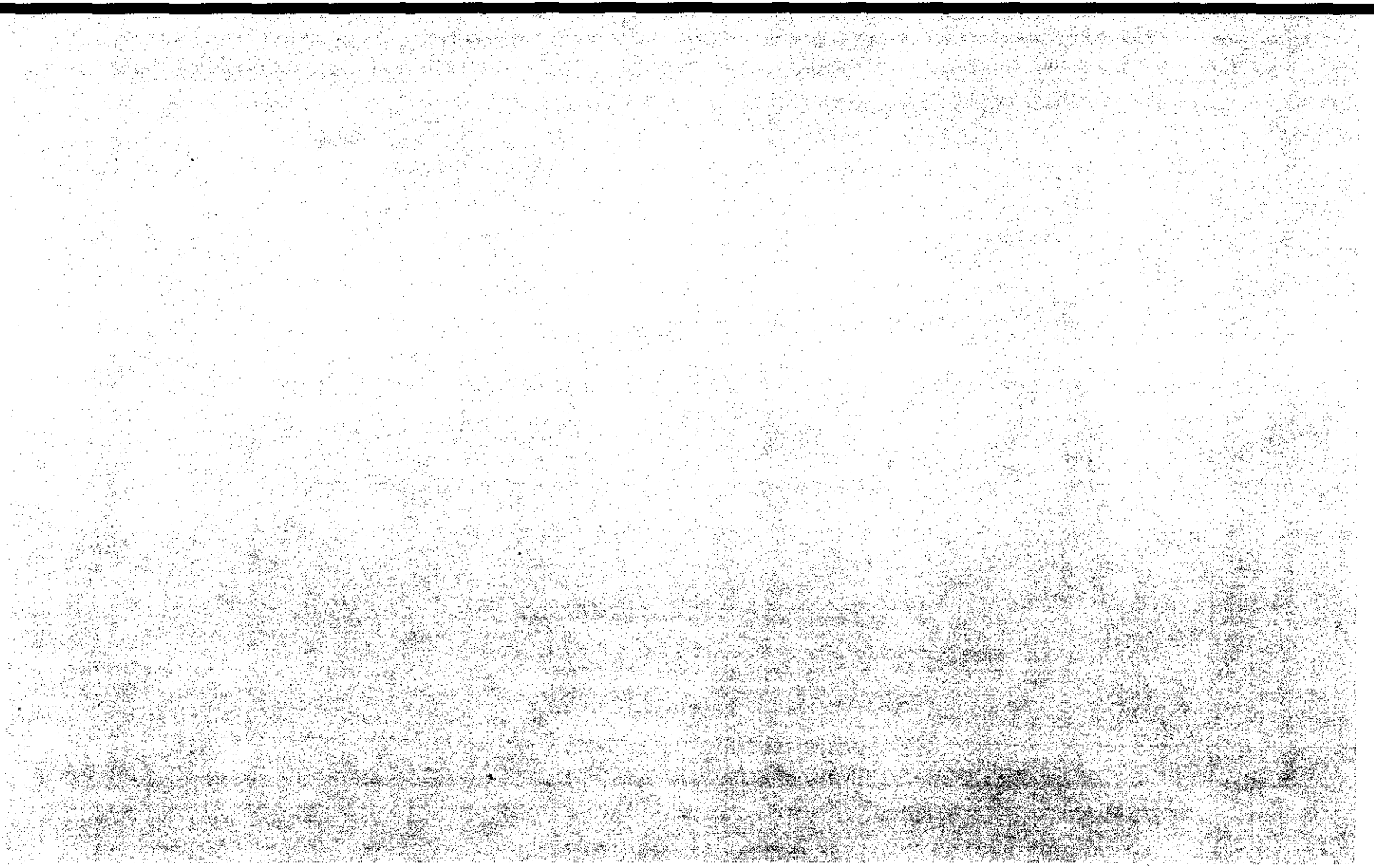
Site 2a—Three Quasi-Peak Spectrum Measurements



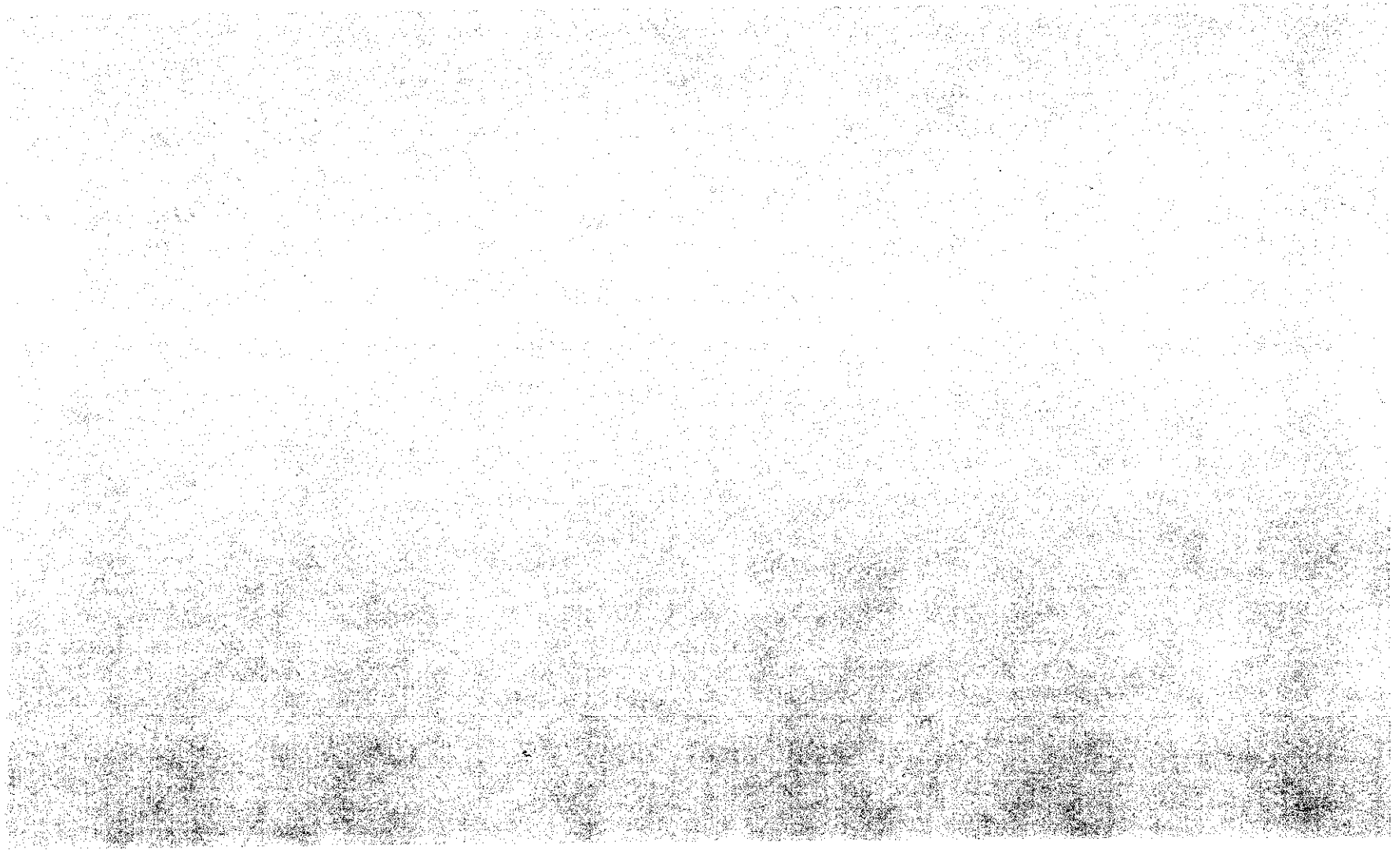
Effect of Distance Down Line



Conclusions



Recommended Future FCC Tests
(To understand technology)



BPL Summary
After Briarcliff Manor, NY Test

To OET
September 8, 2004
Steve Martin & Andy Leimer – FCC Laboratory

On site support provided by Ambient during emission testing

Briarcliff Manor BPL Test Results

FCC Laboratory wrt Interference Complaint in Notched Amateur Band

- Tested one device
- Compliant w/emission limits within measurement uncertainty
- Notch performed poorly
  - Vendor forgot to notch device 0.7 miles away
  - Vendor admitted bug in notching & plans a fix

Frequency Allocations and Briarcliff Manor BPL Bands

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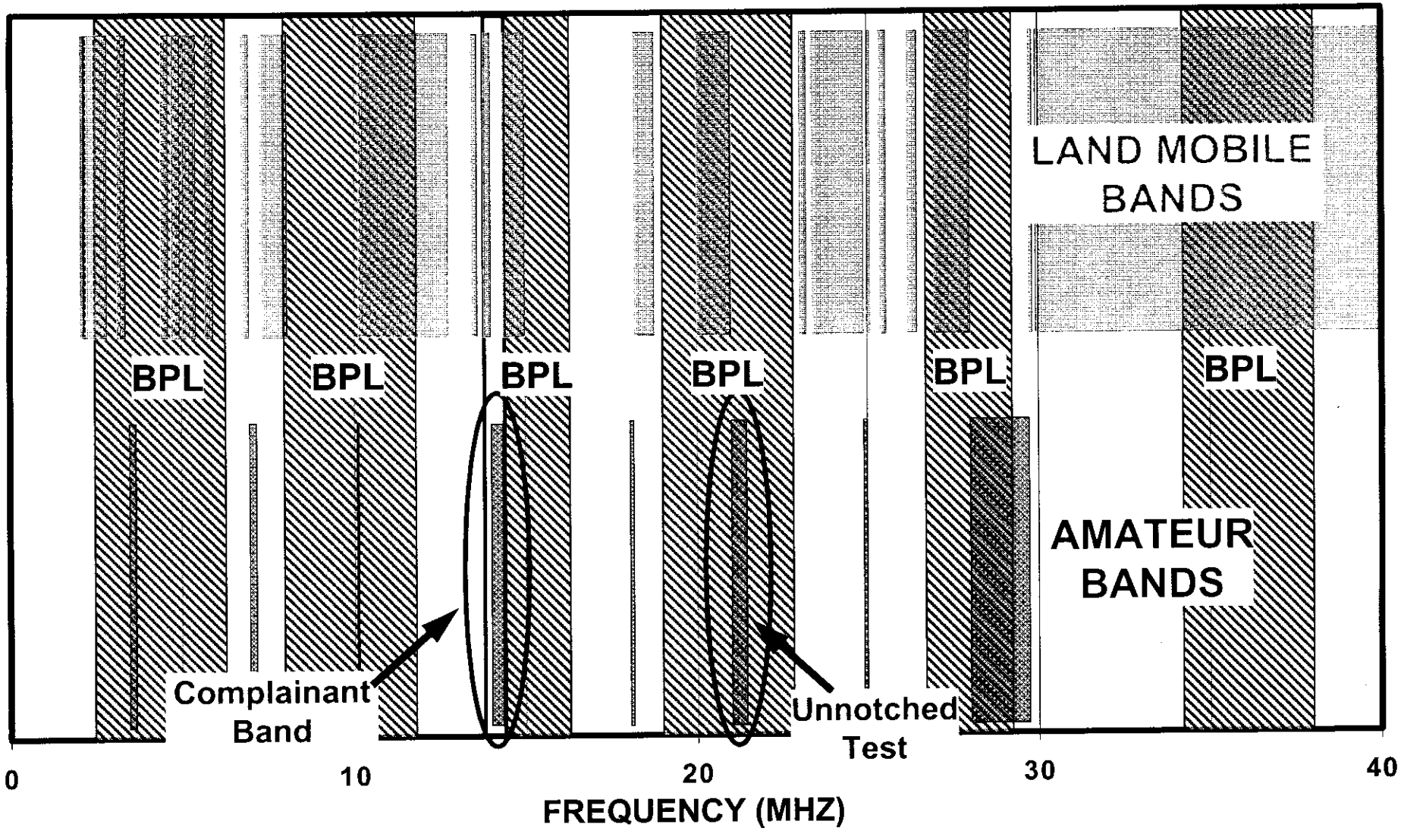

Interference to Mobile Radio in Un-Notched Bands

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Van and HF Amateur Antenna

Power line height – 10.6 m
Antenna center height – 3 m

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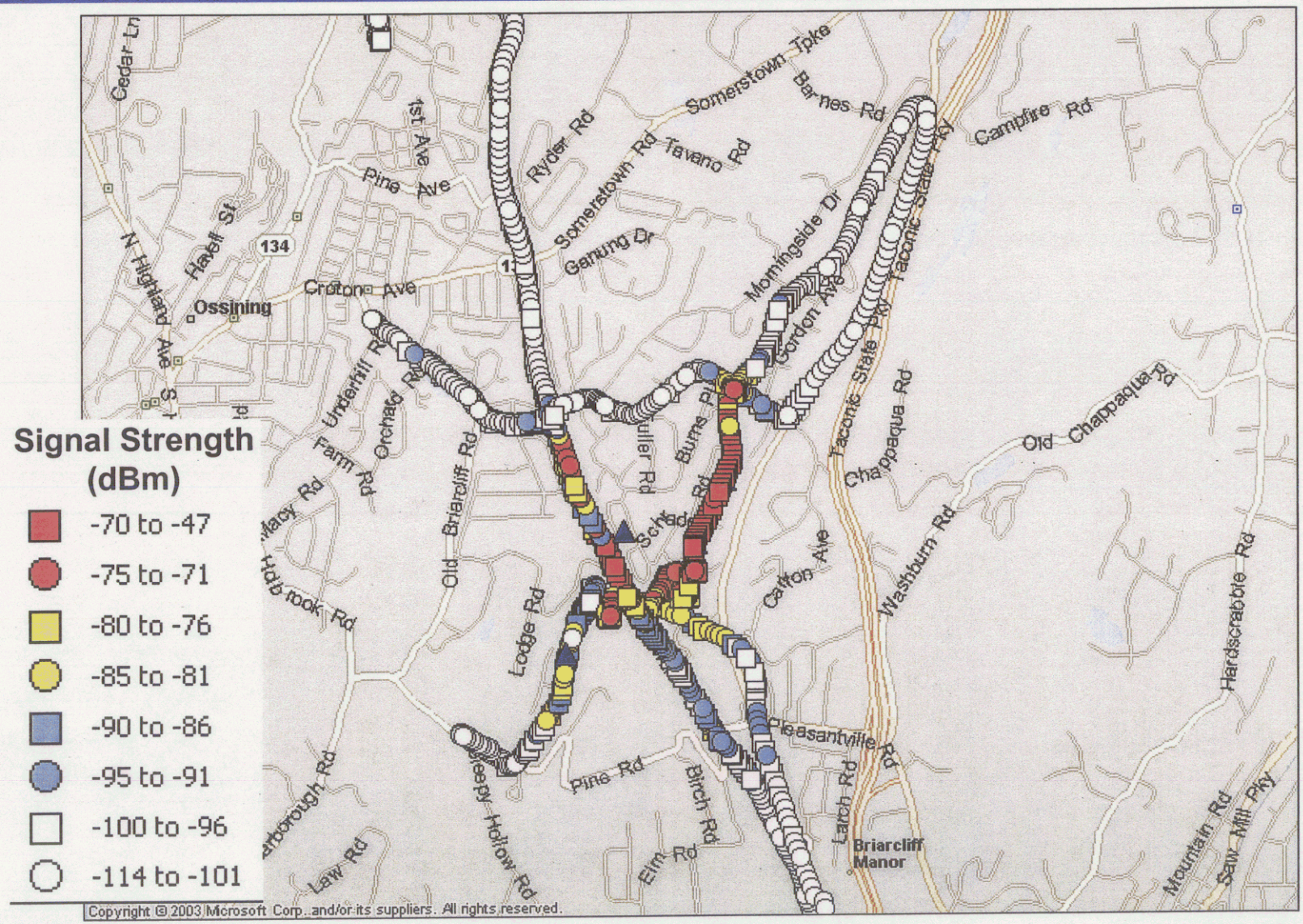
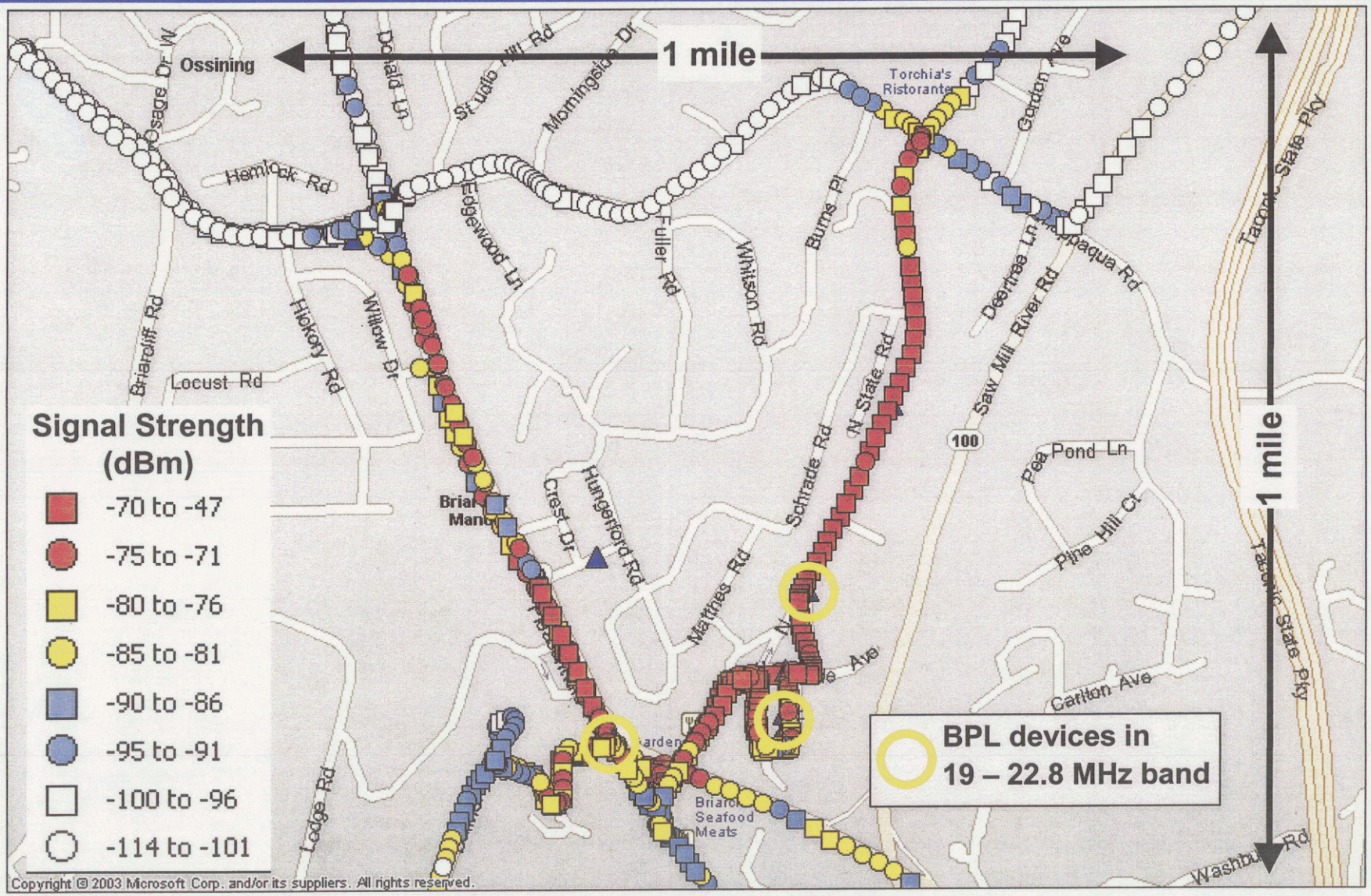
Briarcliff Manor Signal Strength Map at 21.2 MHz
(Unnotched Amateur Band)



Briarcliff Manor Signal Strength Map at 21.2 MHz
(Unnotched Amateur Band)

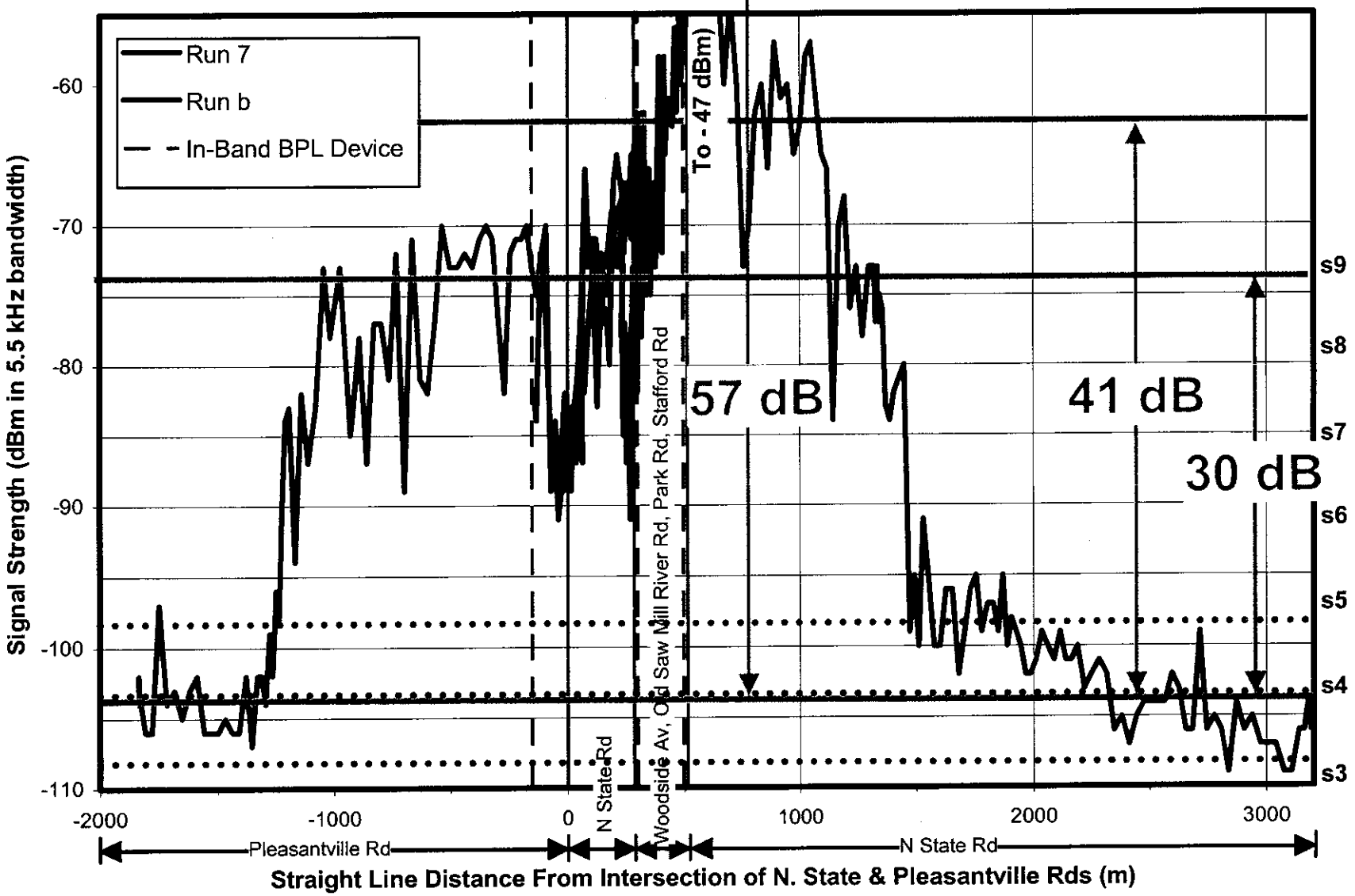
FCC Laboratory



Briarcliff Manor Received Levels at 21.2 MHz

(Unnotched Amateur Band)

FCC Laboratory



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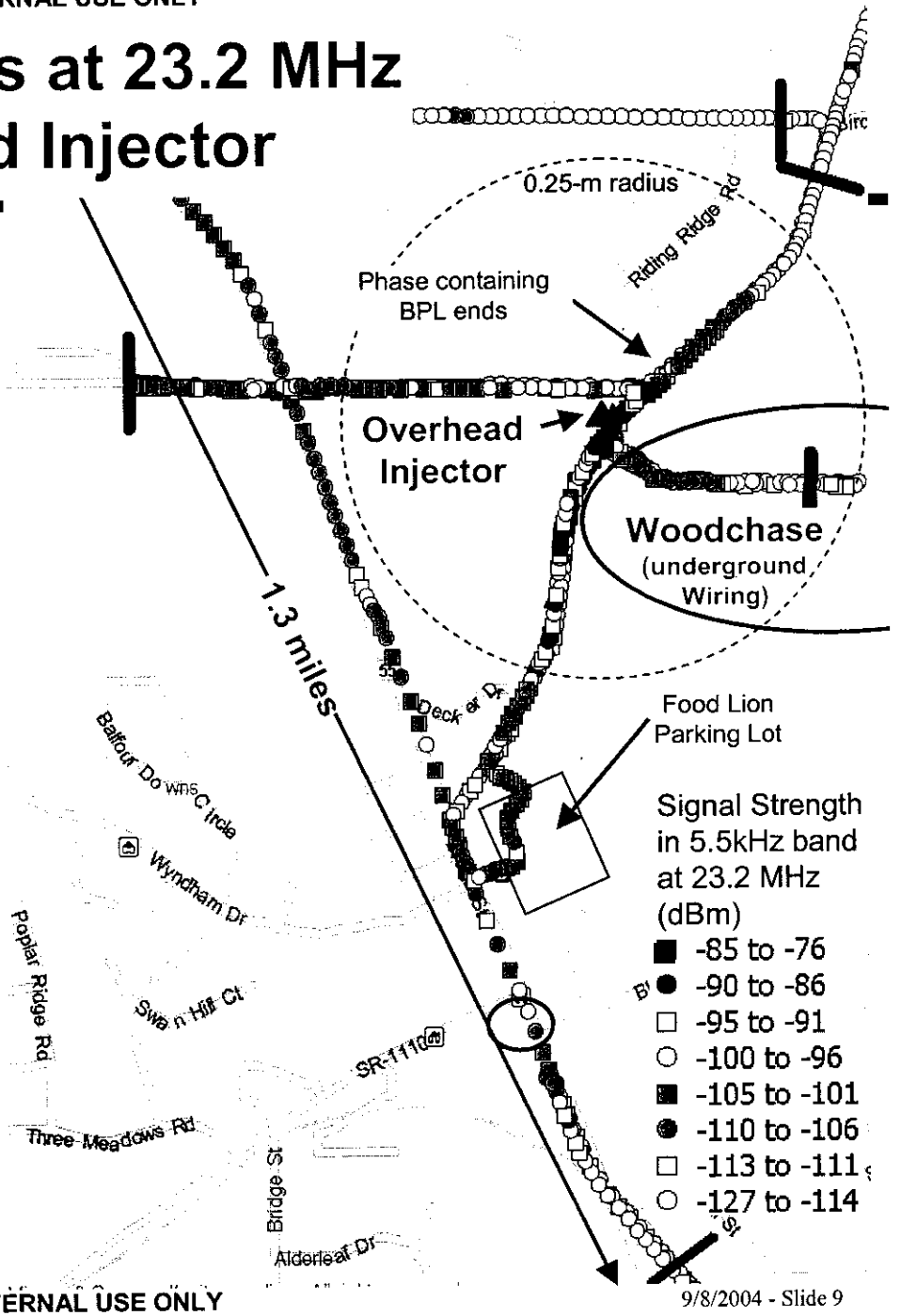
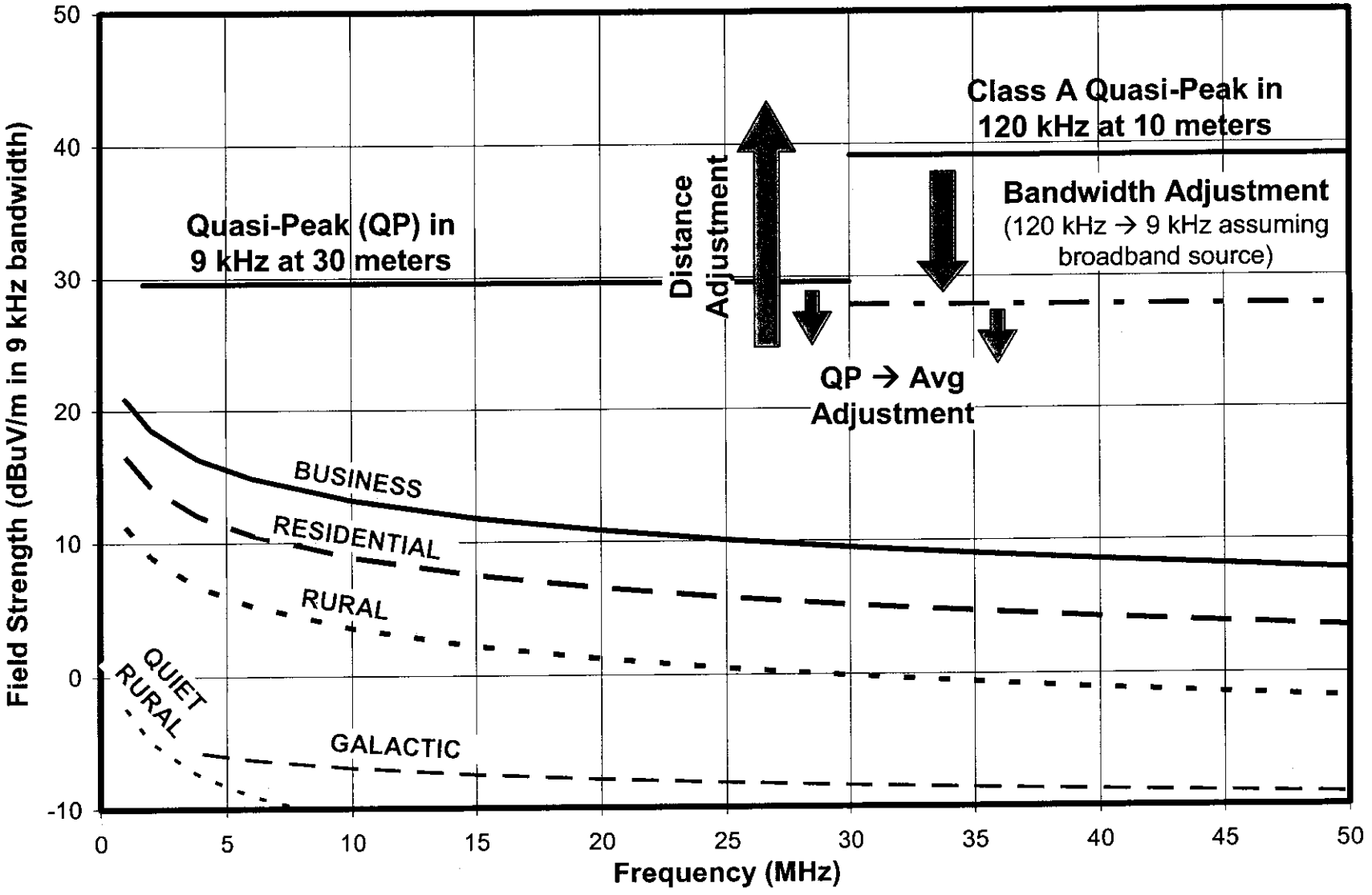
Raleigh Received Levels at 23.2 MHz From One Overhead Injector

FCC Laboratory

- **Noise floor measurement prevented by inefficient antenna**
  - Designed for 27-MHz
- **Yellow levels** (0.6 mi of James Slaughter Rd & Old Powell Rd)
  - 14 to 23 dB above measurement floor
  - ~27 – 36 dB above probable ambient noise floor
- **Red levels**
  - 24 to 38 dB above measurement floor
  - ~37 to 51 dB above probable ambient noise floor

s-0 level observed on s-meter during much of test, is ~13 dB below floor of digital output indicator (-114 dBm)



Part 15 Emission Limits and ITU Noise Curves