

WTC DTV Antenna Work and RF Safety Considerations

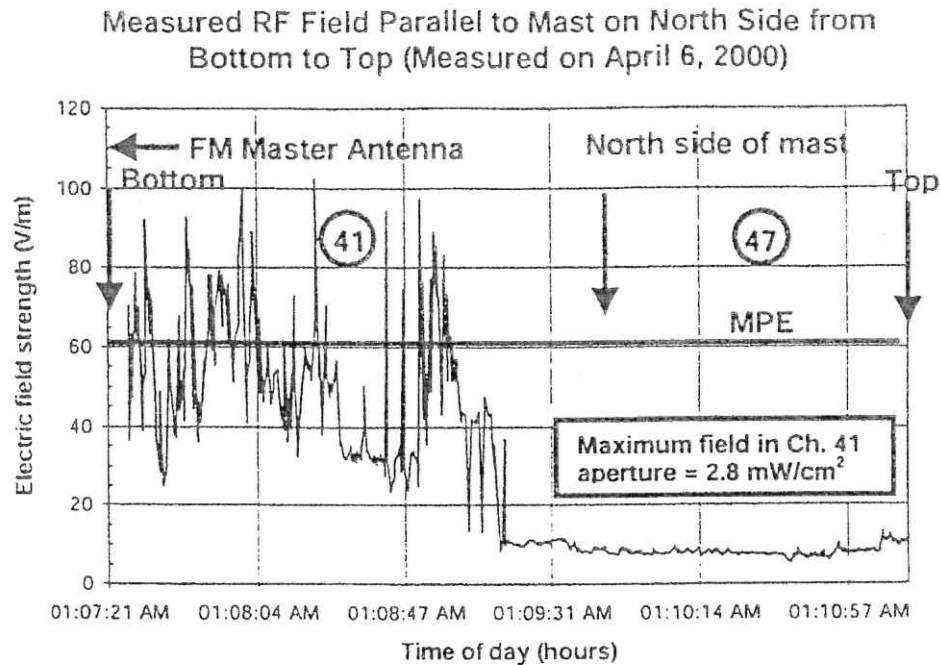


Figure 10. Electric field strength measured parallel to antenna mast on April 6, 2000, with normal broadcast operations, except with channel 47 off, with all FM stations on and probe moving up on north side of mast.

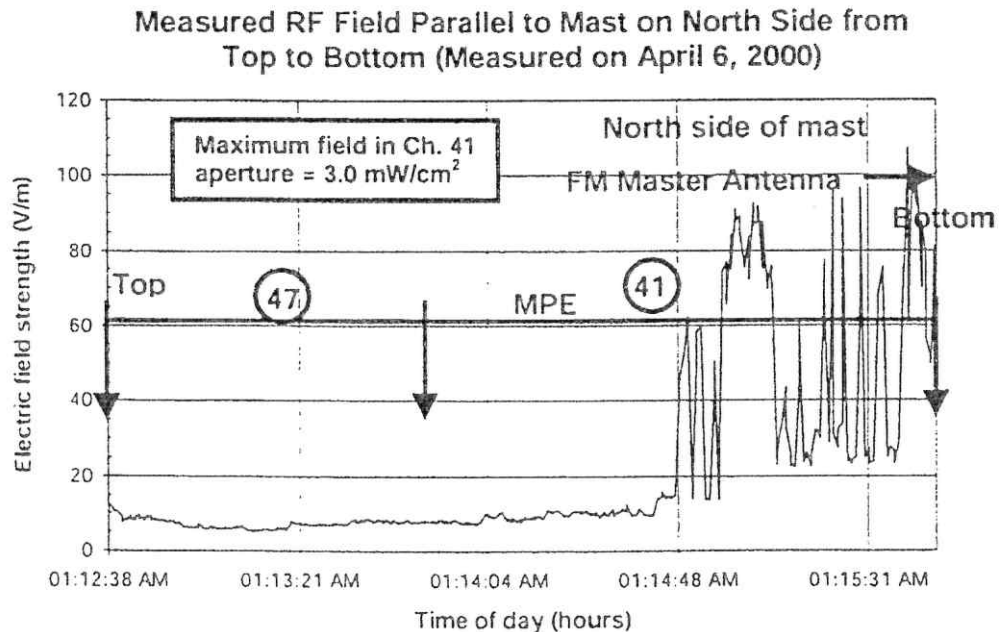


Figure 11. Electric field strength measured parallel to antenna mast on April 6, 2000, with normal broadcast operations, except with channel 47 off, with all FM stations on and probe moving down on north side of mast.

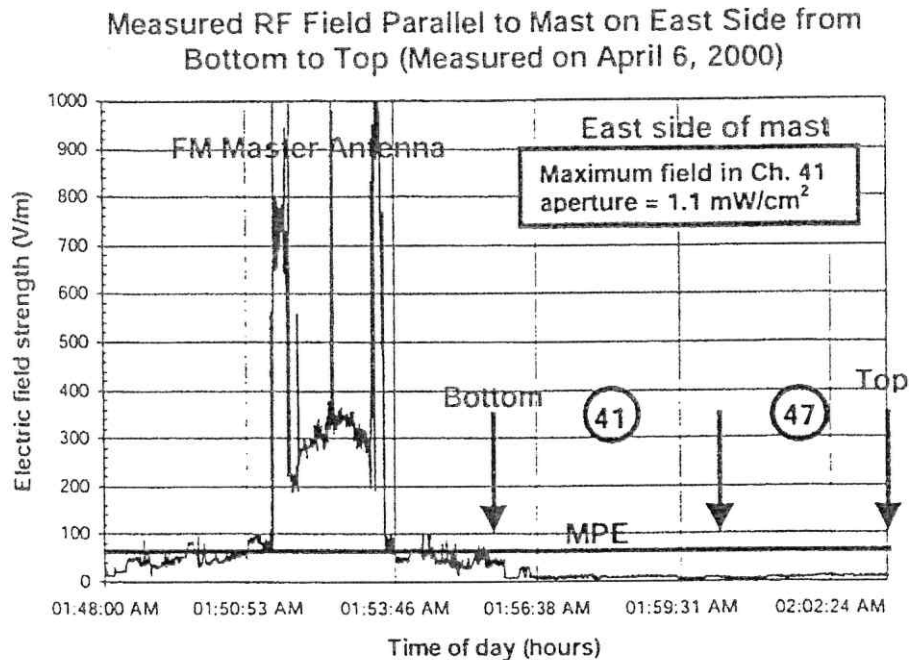


Figure 12. Electric field strength measured parallel to antenna mast on April 6, 2000, with normal broadcast operations, except with channel 47 off, with all FM stations on and probe moving up on east side of mast.

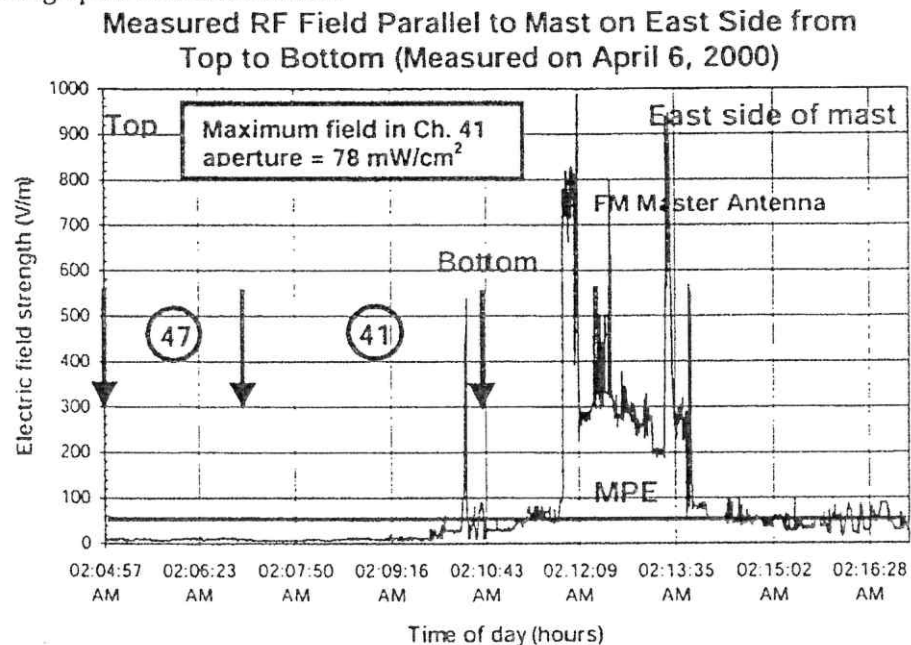


Figure 13. Electric field strength measured parallel to antenna mast on April 6, 2000, with normal broadcast operations, except with channel 47 off, with all FM stations on and probe moving down on east side of mast.

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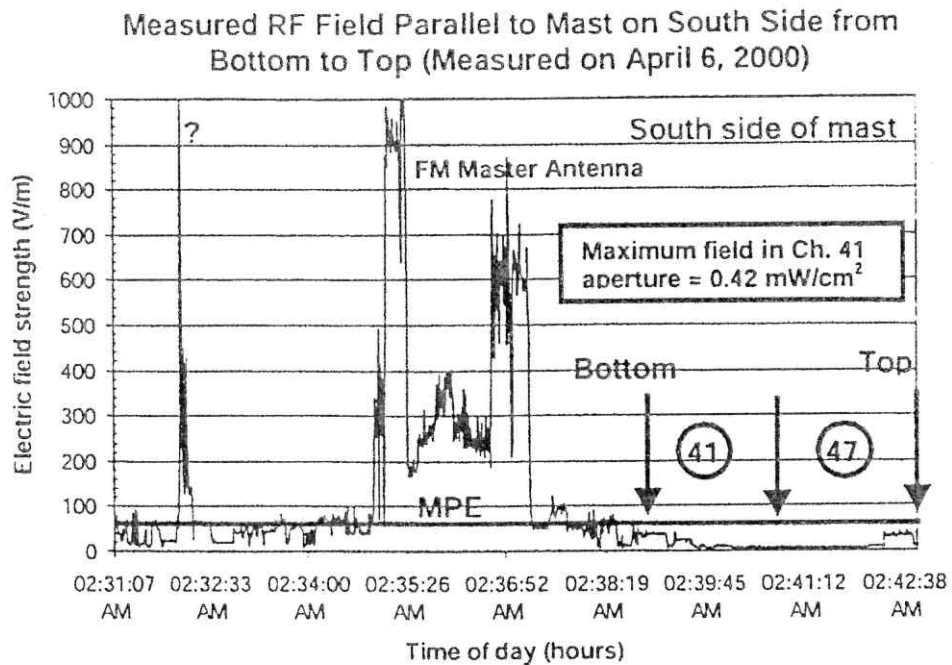


Figure 14. Electric field strength measured parallel to antenna mast on April 6, 2000, with normal broadcast operations, except for channel 47, with all FM stations on and probe moving up on south side of mast.

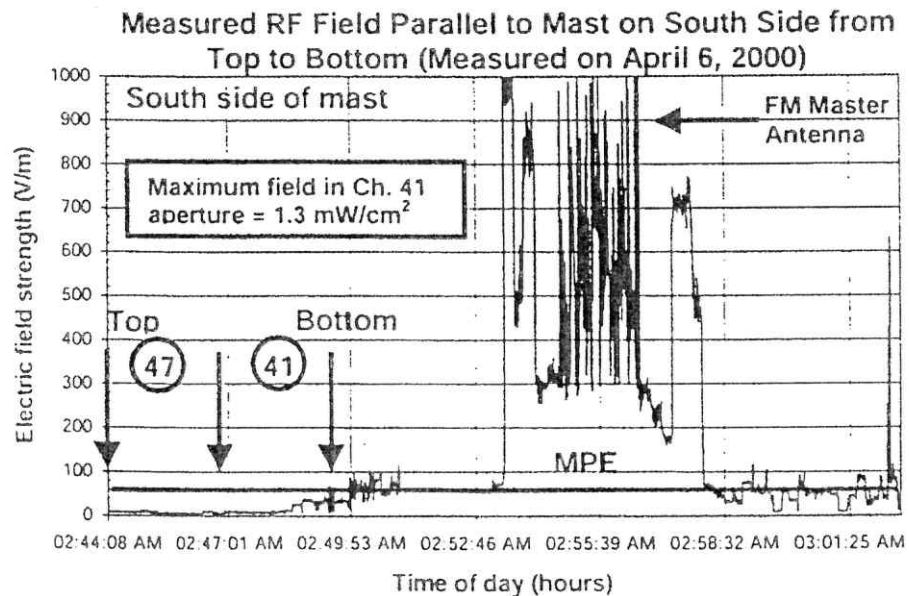


Figure 15. Electric field strength measured parallel to antenna mast on April 6, 2000, with normal broadcast operations, except for channel 47, with all FM stations on and probe moving down on south side of mast.

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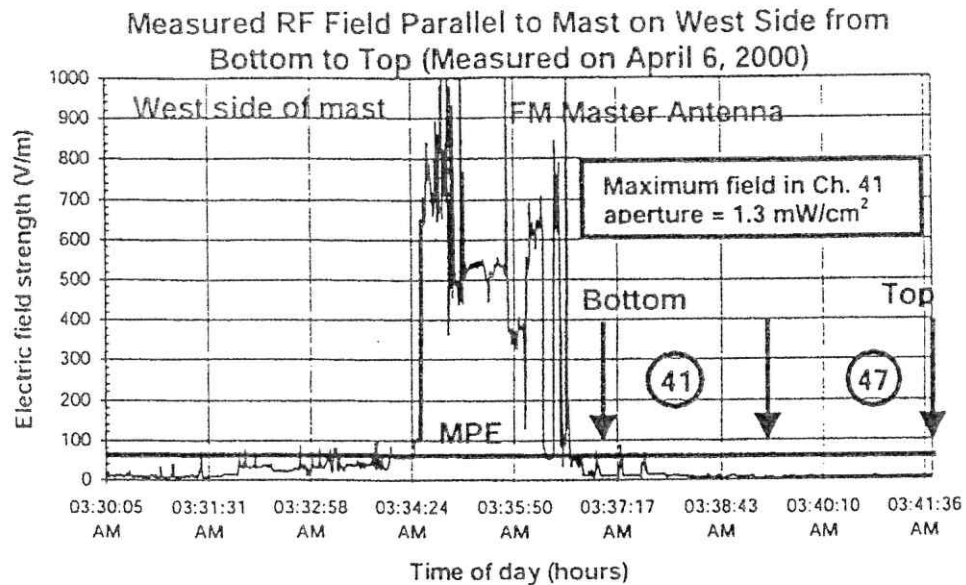


Figure 16. Electric field strength measured parallel to antenna mast on April 6, 2000, with normal broadcast operations, except for channel 47, with all FM stations on and probe moving up on west side of mast.

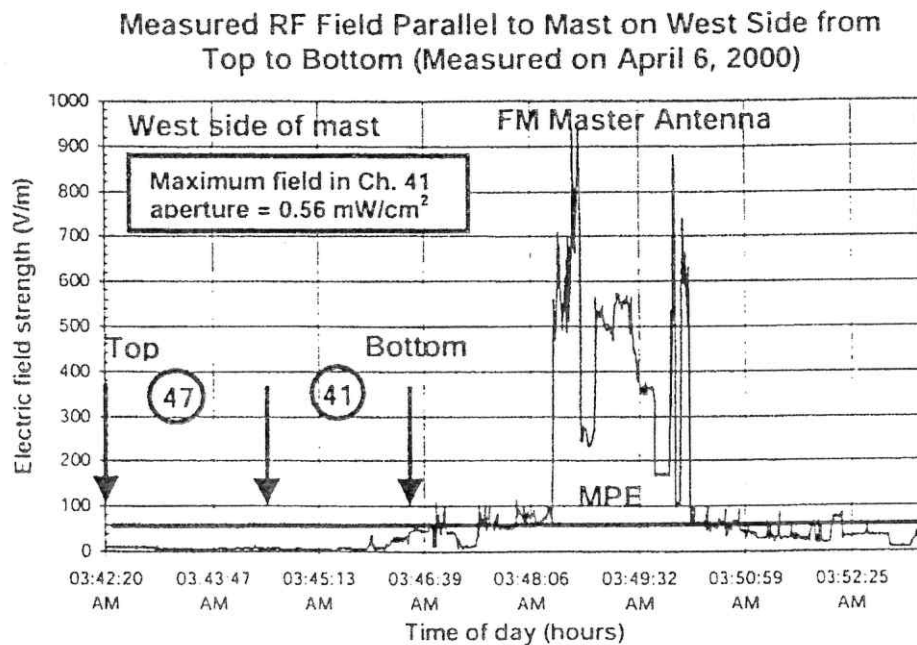


Figure 17. Electric field strength measured parallel to antenna mast on April 6, 2000, with normal broadcast operations, except for channel 47, with all FM stations on and probe moving down on south side of mast.

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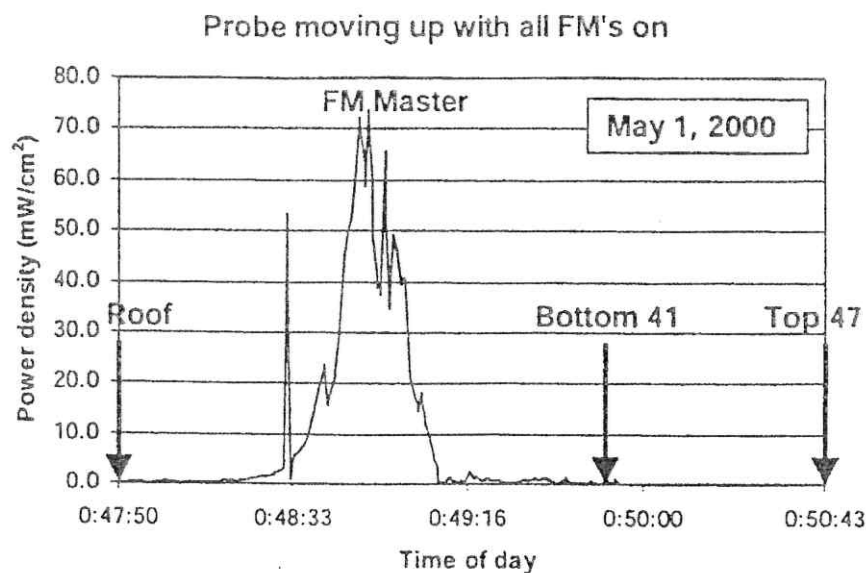


Figure 18. Plane wave equivalent power density measured parallel to antenna mast on May 1, 2000, with normal broadcast operations and all FM stations on and probe moving up.

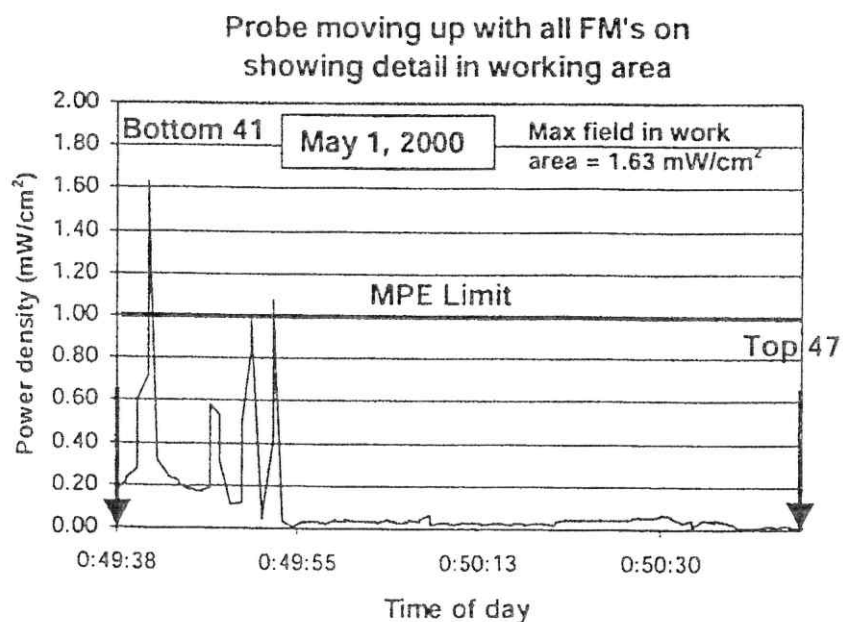


Figure 19. Plane wave equivalent power density measured parallel to antenna mast on May 1, 2000, with normal broadcast operations and all FM stations on and probe moving down.

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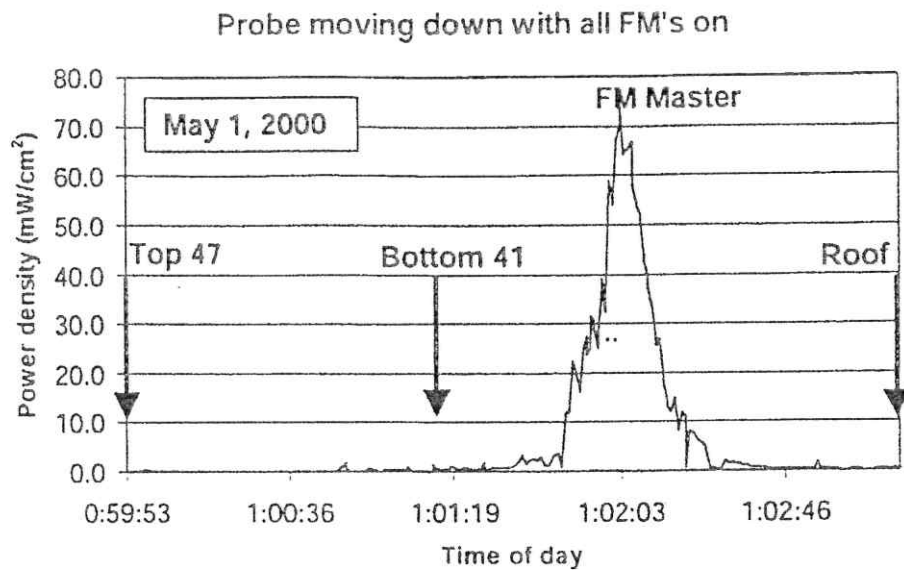


Figure 20. Plane wave equivalent power density measured parallel to antenna mast on May 1, 2000, with normal broadcast operations and all FM stations on and probe moving down.

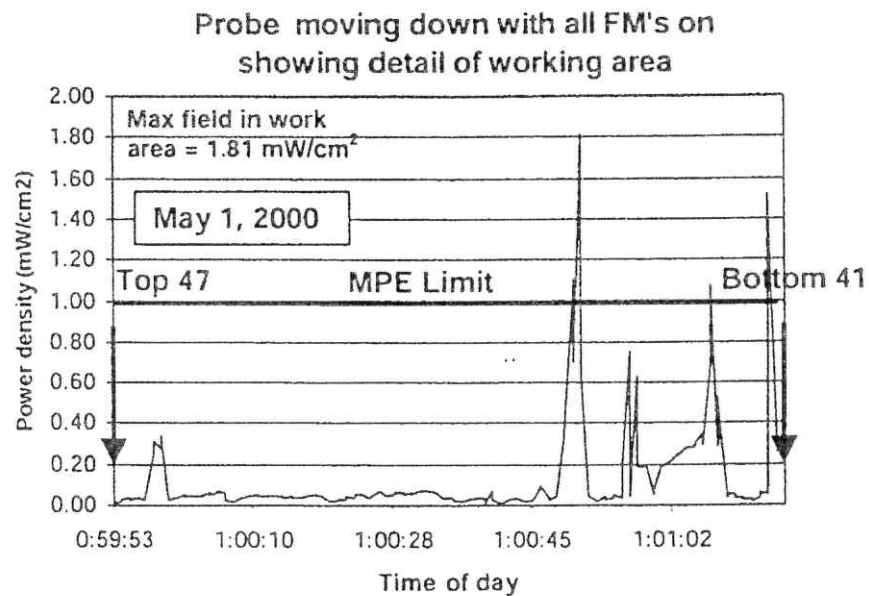


Figure 21. Plane wave equivalent power density measured parallel to antenna mast on May 1, 2000, with normal broadcast operations and all FM stations on and probe moving up.

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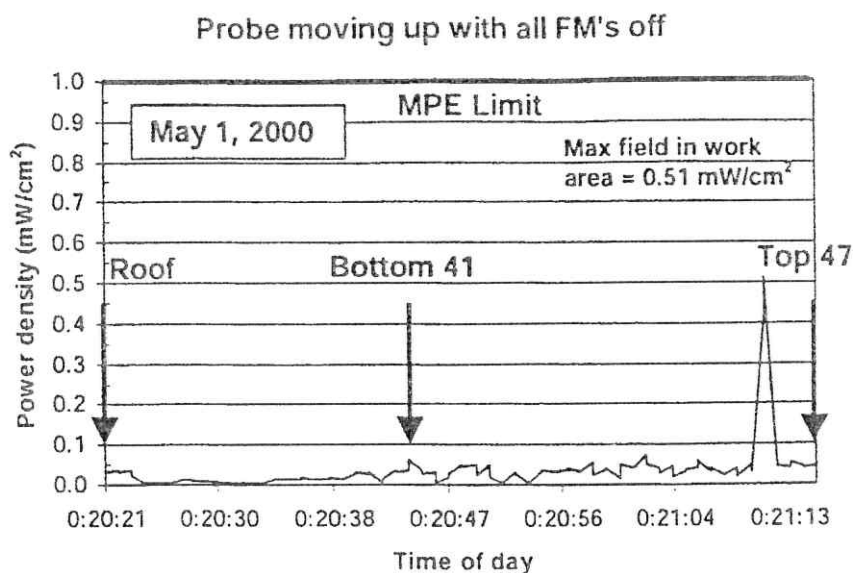


Figure 22. Plane wave equivalent power density measured parallel to antenna mast on May 1, 2000, with normal broadcast operations but with all FM stations off and probe moving up.

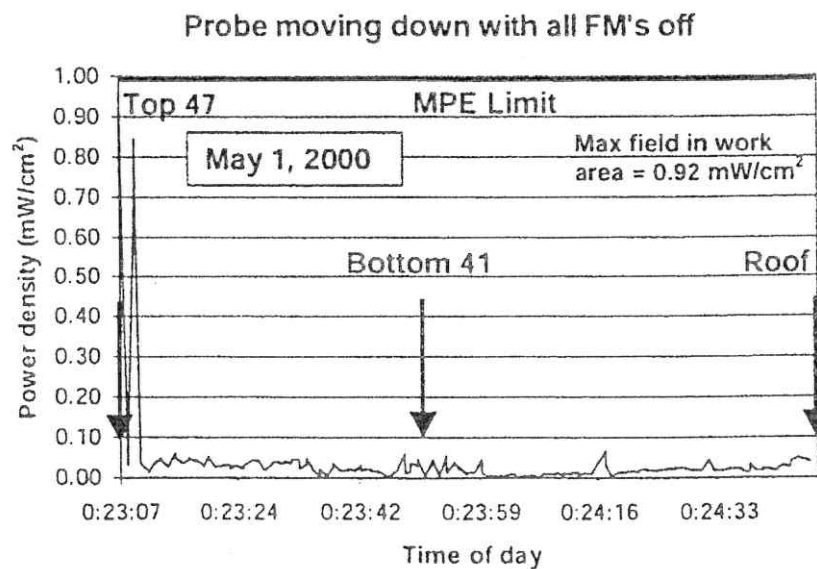


Figure 23. Plane wave equivalent power density measured parallel to antenna mast on May 1, 2000, with normal broadcast operations but with all FM stations off and probe moving down.

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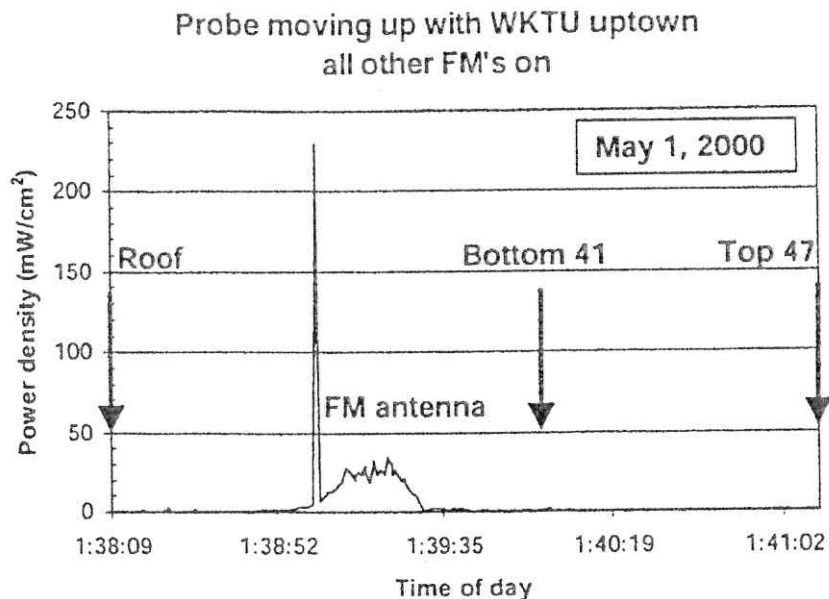


Figure 24. Plane wave equivalent power density measured parallel to antenna mast on May 1, 2000, with normal broadcast operations but with WKTU operating from uptown site and probe moving up.

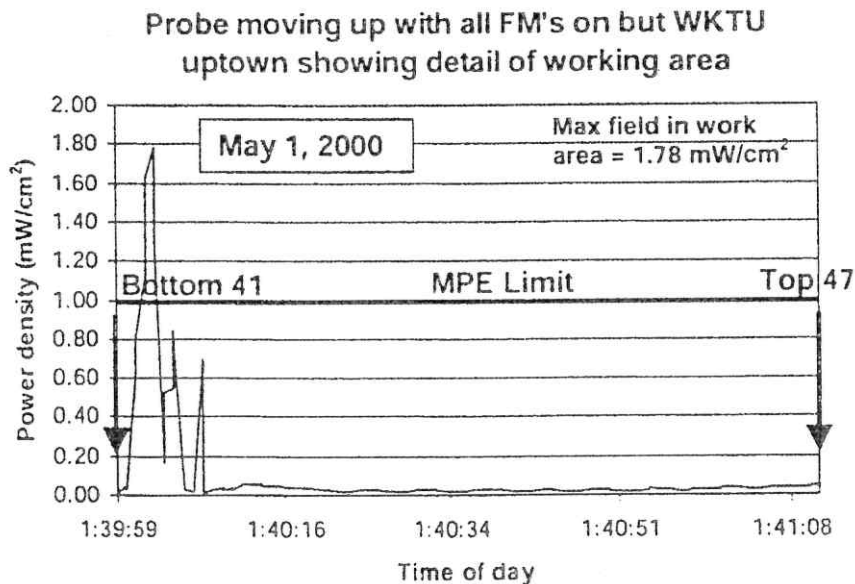


Figure 25. Plane wave equivalent power density measured parallel to antenna mast on May 1, 2000, with normal broadcast operations but with WKTU operating from uptown site and probe moving up showing detail of the working area.

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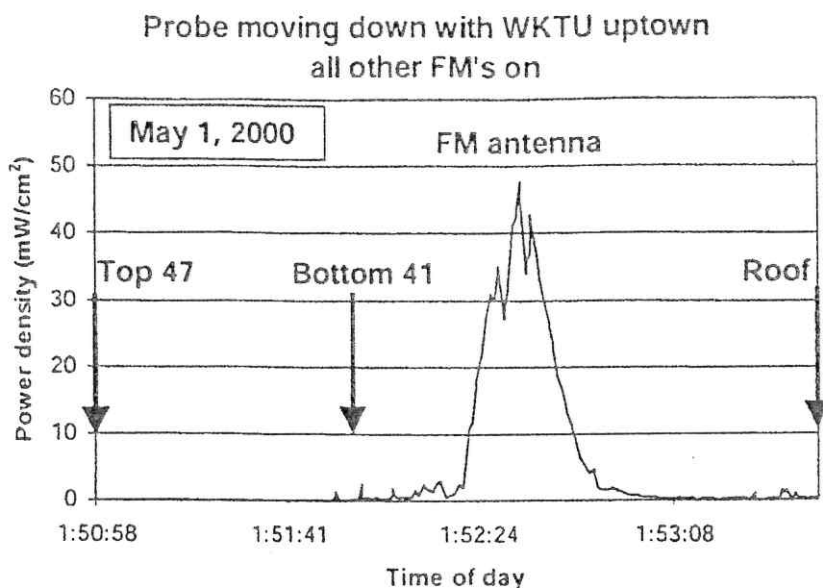


Figure 26. Plane wave equivalent power density measured parallel to antenna mast on May 1, 2000, with normal broadcast operations but with WKTU operating from uptown site and probe moving down.

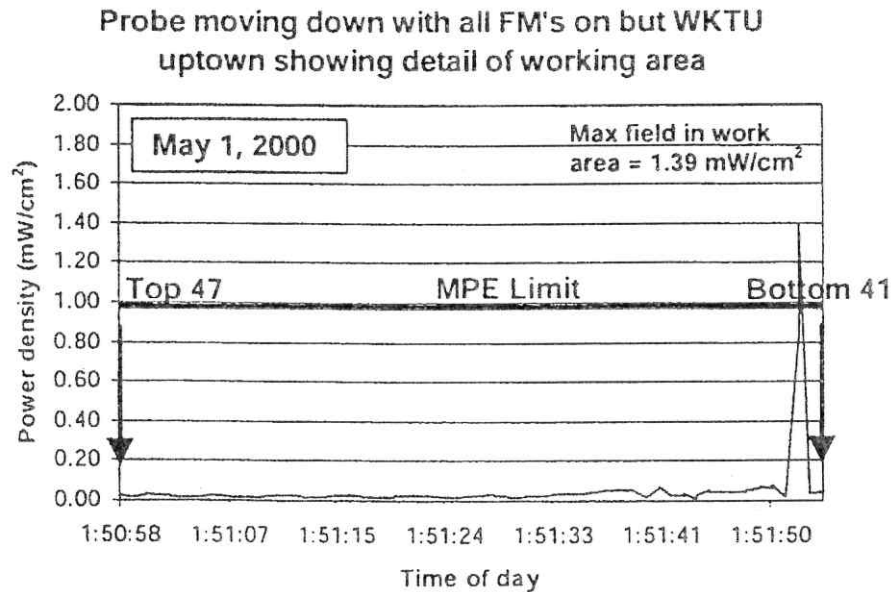


Figure 27. Plane wave equivalent power density measured parallel to antenna mast on May 1, 2000, with normal broadcast operations but with WKTU operating from uptown site and probe moving down showing detail of working area.

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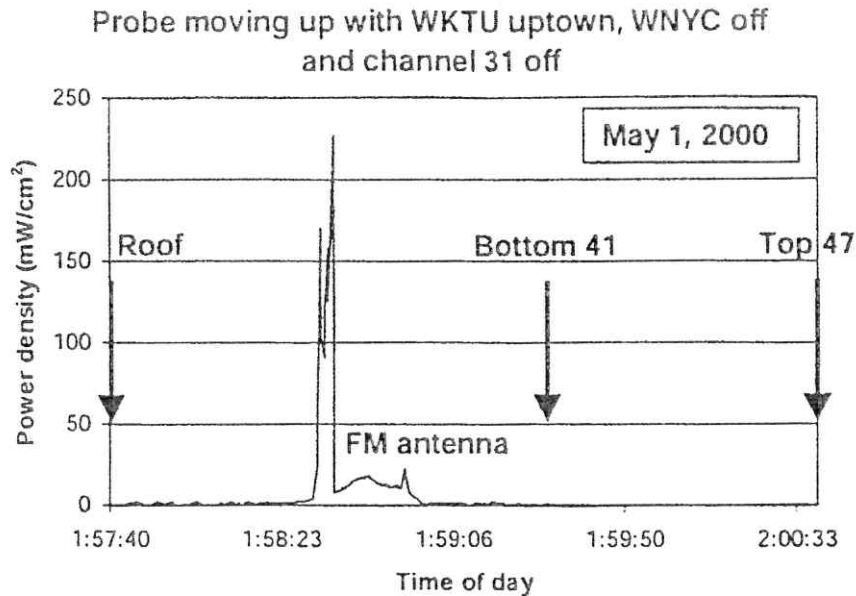


Figure 28. Plane wave equivalent power density measured parallel to antenna mast on May 1, 2000, with normal broadcast operations but with WKTU operating from uptown site, WNYC off and probe moving up.

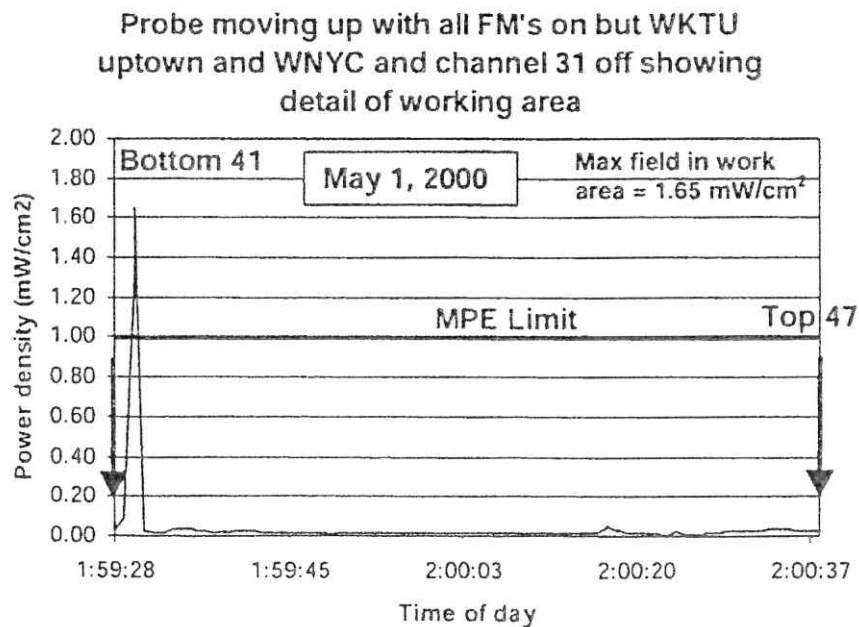


Figure 29. Plane wave equivalent power density measured parallel to antenna mast on May 1, 2000, with normal broadcast operations but with WKTU operating from uptown site, WNYC off and probe moving up showing detail of working area.

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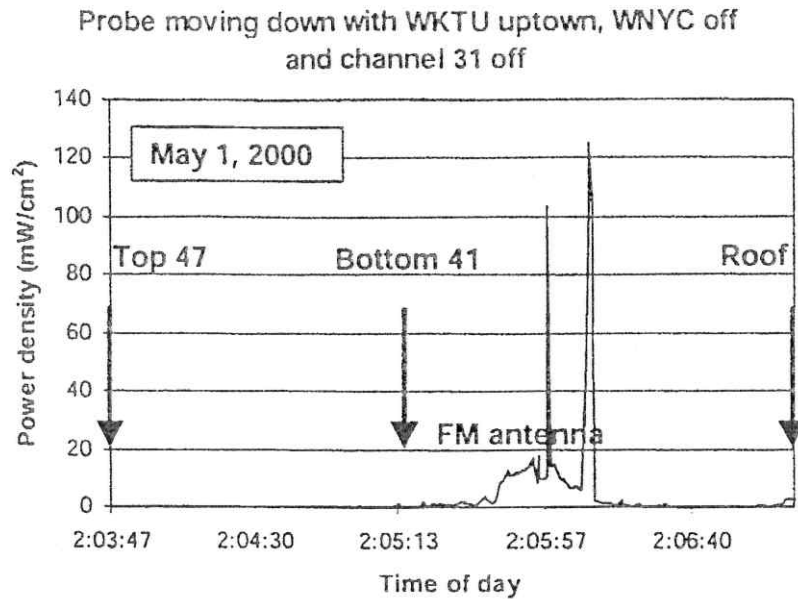


Figure 30. Plane wave equivalent power density measured parallel to antenna mast on May 1, 2000, with normal broadcast operations but with WKTU operating from uptown site, WNYC off and probe moving down.

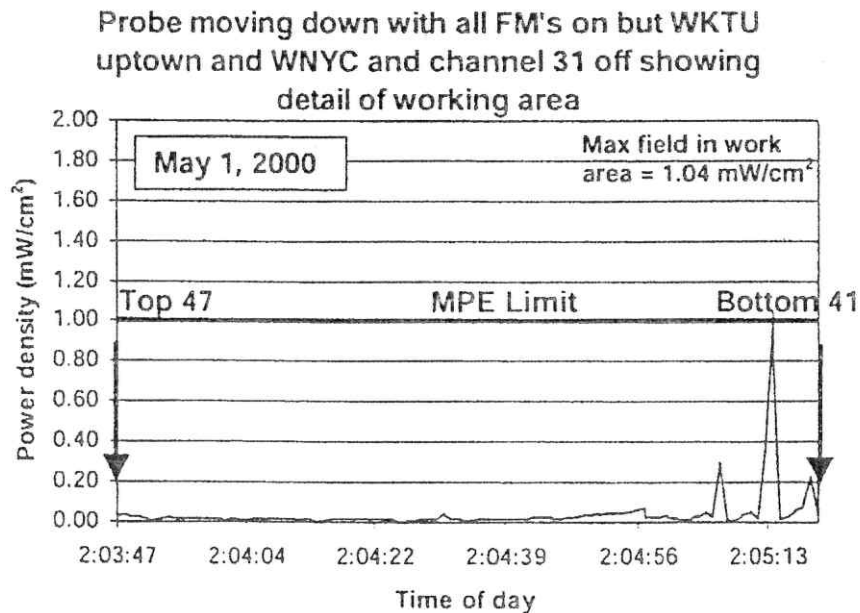


Figure 31. Plane wave equivalent power density measured parallel to antenna mast on May 1, 2000, with normal broadcast operations but with WKTU operating from uptown site, WNYC off and probe moving down showing detail of working area.

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APPENDIX A - LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE) Adopted by the Federal Communications Commission (Reference = Table 1. Title 47 CFR)

(A) Limits for Occupational/Controlled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm ²)	Averaging Time E ² , H ² or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842/f	4.89/f	(900/f ²)*	6
30-300	61.4	0.163	1.0	6
300-1500	--	--	f/300	6
1500-100,000	--	--	5	6

(B) Limits for General Population/Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm ²)	Averaging Time E ² , H ² or S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f ²)*	30
30-300	27.5	0.073	0.2	30
300-1500	--	--	f/1500	30
1500-100,000	--	--	1.0	30

f = frequency in MHz

*Plane-wave equivalent power density

NOTE 1: *Occupational/controlled* limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

NOTE 2: *General population/uncontrolled* exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

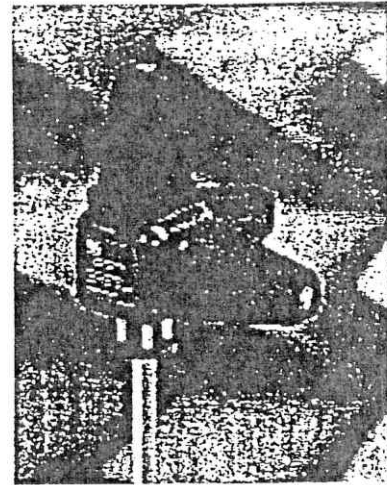
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Appendix B: HI-6005 Electric Field Probe

New Technology Solving EMF Problems

The new HI-6005 Electric Field Probe embodies the latest innovations in isotropic sensor design and low noise, miniaturized electronics.

The HI-6005 is a fully intelligent sensor enabling fast and accurate EMF measurements with industry-leading performance specifications. Optical coupling to a variety of readout options makes this new probe ideally suited for a wide range of field monitoring applications.



Specifications

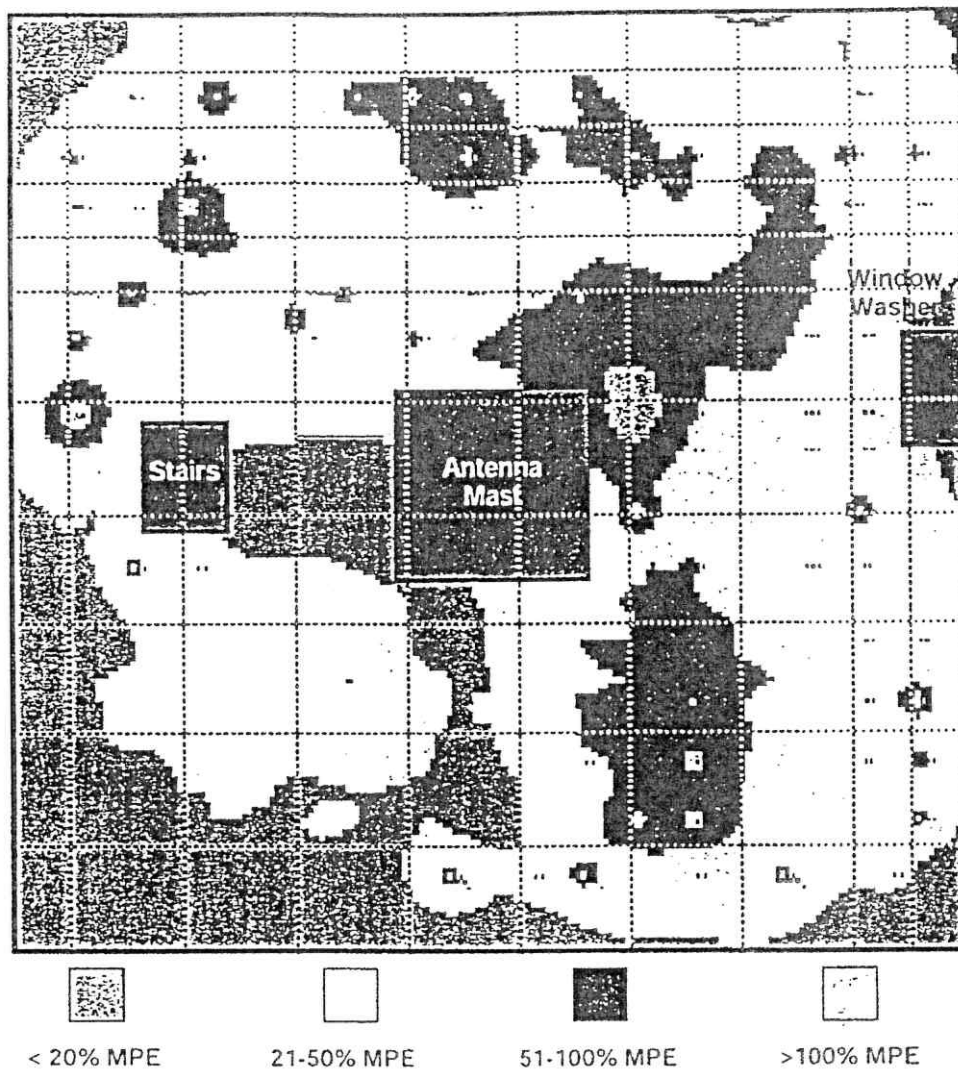
Sensor Type	Electric Field
Detection	Isotropic (X, Y and Z Axis Readings)
Dynamic Range	0.5 – 800 V/m (>64 dB, Single Range)
Resolution	0.01 V/m
Readout Units	V/m, V ² /m ² , mW/cm ²
Frequency Response	100 kHz – 5 GHz
Accuracy	± 1 dB from 26 MHz – 2 GHz ± 0.5 dB at Calibration Frequencies
Isotropic Deviation	± 0.5 dB
Linearity	± 0.5 dB
Probe Response Time	5 µsec (typical)
Overload Withstand	>1500 V/m Continuous Field
Physical Interface	Duplex Optical Fiber (200 micron multimode) FSMA Connectors
Operating Range	10°C to 40°C 5% to 95% Relative Humidity, Non-Condensing
Operating Time	10 Hours Continuous Use
Battery	Rechargeable NiMH
Battery Charger	100-240 VAC Universal Input 2 Hour Charge Time from Fully-Depleted Battery
Dimensions	32mm x 32mm x 32mm Cubical Housing 43mm Sensor Protection Caps
Mounting	¼-20 UNC Internal Thread
Weight	80g

Holaday Industries, Inc.
14825 Martin Drive
Eden Prairie, Minnesota, 55344
Telephone: 952-934-4920
Facsimile: 952-934-3604
E-mail: sales@holadayinc.com
Internet: www.holadayinc.com

Holaday Industries, UK
Shieling House, Invincible Road
Farnborough, Hants, UK GU14 7QU
Tel/Fax: (44) 1252 540955
E-mail: sales-eu@holadayinc.com

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Appendix C: Colorized WTC North Tower Roof Map of RF Fields



A 1999 reevaluation of RF fields from measured ambient fields of normal broadcasting operations with calculated contribution of all wireless telecommunications antennas (see footnote on page 10). Maximum field is 299.6% MPE.

1999 Statistical summary of RF Fields on WTC roof		
Percent occupational MPE range (%)	Roof area in this range (ft ²)	Percent of roof area in this range (%)
0-20	5490	20.18
21-50	17508	64.36
51-100	4012	14.75
>100	195	0.72

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Appendix D: Example RF Safety Log Book For WTC DTV Antenna Project

Date: _____

Personnel working aloft:

- | | |
|----------|---------------------------------------|
| 1. _____ | Personal monitor: Yes _____ No: _____ |
| 2. _____ | Personal monitor: Yes _____ No: _____ |
| 3. _____ | Personal monitor: Yes _____ No: _____ |
| 4. _____ | Personal monitor: Yes _____ No: _____ |

Clearing of work area:

1. Who did it: _____
2. Time completed: _____
3. All points less than threshold? _____ Yes _____ No
4. Description: _____
5. If no, what was done to correct issue?

Confirmation that channel 47 is off or on temporary antenna:

1. Name of person: _____ Phone: _____
2. Time this was done: _____

Confirmation that all auxiliary antennas are locked out:

1. Name of person: _____ Phone: _____
2. Time this was done: _____

Confirmation that channel 31 and 2 not operating from mast, if needed:

1. Name of person: _____ Phone: _____
2. Time this was done: _____
3. Time stations returned to normal operation from mast: _____

High-field incident(s) observed during work session: Yes _____ No _____

1. When: _____
2. Who noted them: _____
3. What was done to correct issue(s):

Time last man aloft during work session back on roof: _____

Stations returned to normal operations:

1. Person confirming return to normal operation on mast: _____
2. Phone: _____
3. Time stations back on mast: _____

Notes: _____

