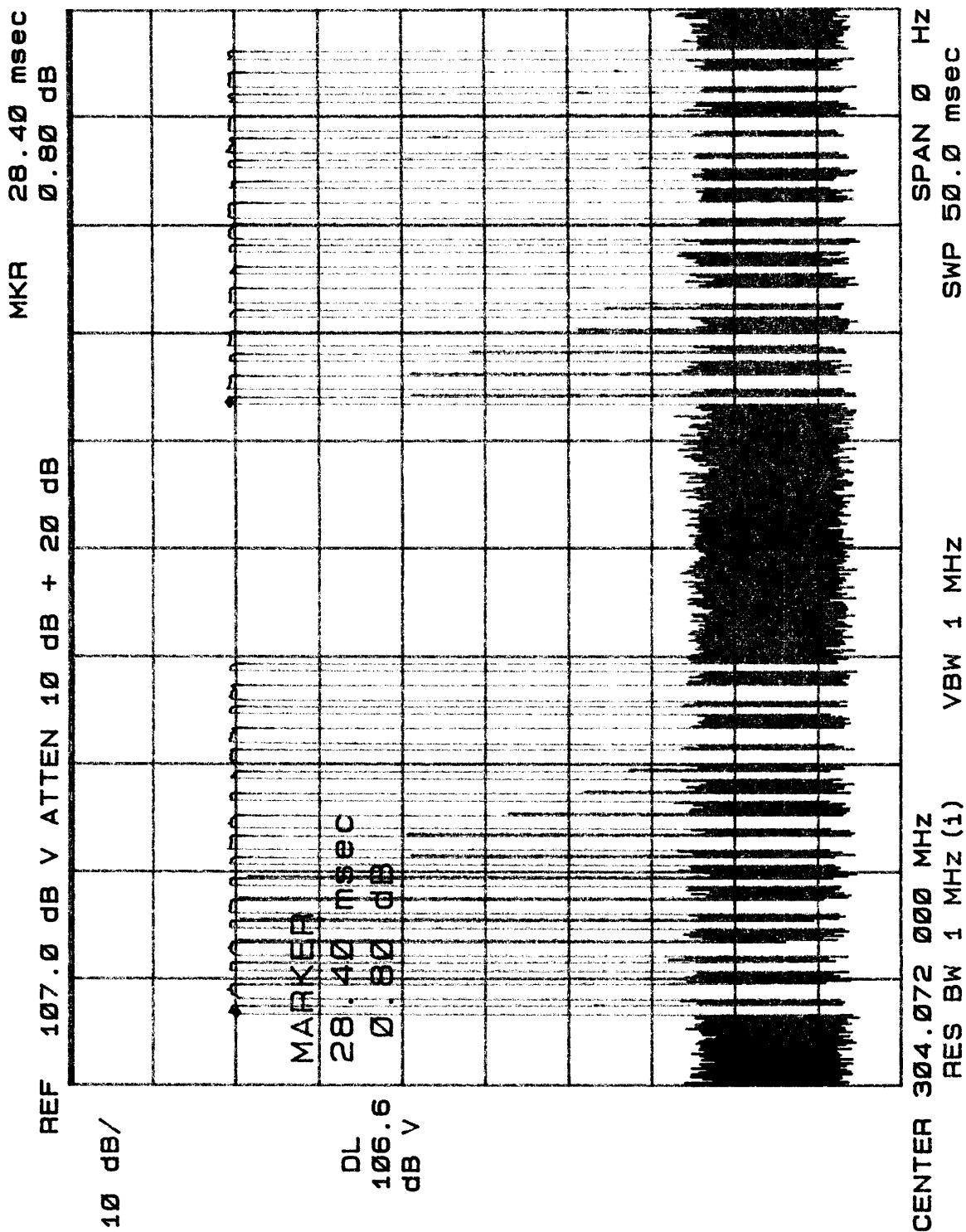


Test 2, Item Total Period - Peak Plot (Amplitude in dBuV/m):

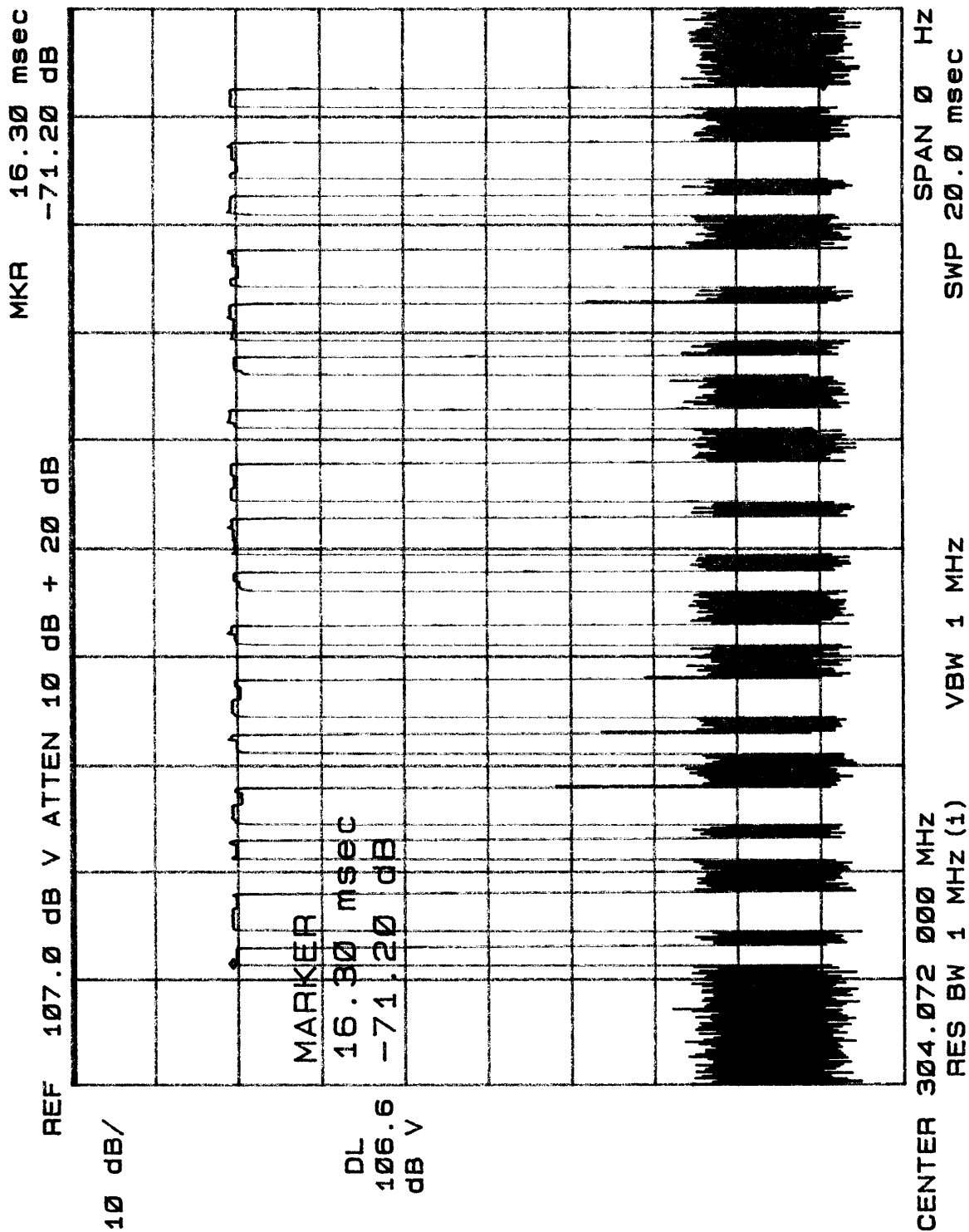
Radiated Disturbance Emissions - Peak-to-Average Ratio



REV.

Test 2, Item Bursts Detail - Peak Plot (Amplitude in dBuV/m):

Radiated Disturbance Emissions - Peak-to-Average Ratio



Test 3: Radiated Disturbance Emissions - 9 kHz to 30 MHz

Test Requirement: 47 CFR Part 15, Subpart C

Test Specification: 47 CFR Part 15, Subpart C, Section 15.209

Test Procedure:

All testing was performed in UL's 10 meter semi-anechoic chamber. The chamber meets the FCC's site attenuation criteria for use as an alternative measurement site. The EUT was tested per ANSI C63.4:1992 test method placed on a non-conductive 1m x 1.5m table 80 cm above the ground plane. The receive antenna used was a loop antenna mounted on an antenna mast. The turntable was rotated from 0° to 360° to determine the worst-case emissions angle for each frequency. The antenna mast was raised and lowered between 1 and 4 meters above the ground plane to determine the worst-case height.

The loop antenna was positioned in each of the three orthogonal axes (X, Y, and Z) and peak scans were taken for each test configuration. The peak field strength was recorded. Average field strength was calculated using the peak-to-average ratio documented elsewhere in this report.

All measurements were made at a 3 meter distance in an attempt to identify any emission produced by the EUT. A 40 dB/decade adjustment was made to the signal for measurements below 30 MHz per FCC Section 15.31(f)(2). Magnetic Field to electric field conversion is made assuming the impedance of free space of 377Ω (or 51.5 dBΩ).

Radiated Disturbance Limits - General Requirements Section 15.209

Frequency Range MHz	Field Strength Limit μV/m	Field Strength Limit dBμV/m	Measurement Distance (m)
0.009 to 0.490	2400/F (kHz)	20*log(2400/F(kHz))	300
0.490 to 1.705	24,000/F (kHz)	20*log(24,000/F(kHz))	30
1.705 to 30	30	29.5	30

Limits adjusted to 3 meter measurement distance and converted to magnetic field

Frequency Range MHz	Field Strength Limit μV/m	Field Strength Limit dBμV/m	Field Strength Limit (magnetic) dBμA/m	Limit Range dBμA/m
0.009 to 0.490	2400/F (kHz) * 10 ⁴	20*log(24,000,000/F(kHz))	20*log(2400/F(kHz))+28.5	77 to 42.3
0.490 to 1.705	24,000/F (kHz) * 100	20*log(2,400,000/F(kHz))	20*log(24,000/F(kHz))-11.5	22.3 to 11.4
1.705 to 30	30 * 100	69.5	18	18

Test Deviations:

None

Test Setup: Only the following ports were tested. See EUT Information for details.

Test Item	Port #	Port Name	EUT Operation Mode	EUT Configuration	Power Interface
A	0	Enclosure	1	1	1

Test 3 - Results: Radiated Disturbance Emissions - 9 kHz to 30 MHz

Test Results Summary:

Test Item	Test Location	Humidity (%)	Temperature (°C)	Pressure (kPa)	Pass/Fail (P/F)	Date Completed	Comment #
A	A	34.0	24.0	101.5	P	2/18/02	

The EUT was considered to **Pass** the Requirements.

Comments:

Comment #	Description

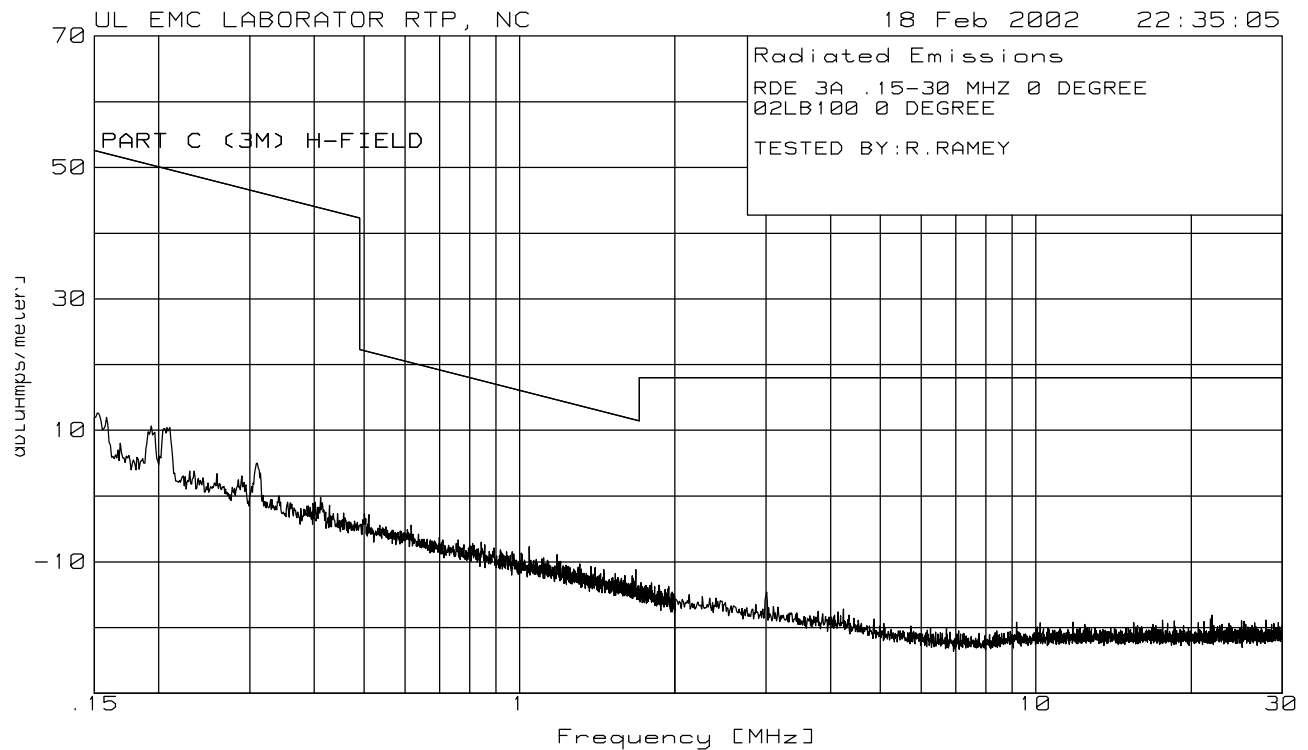
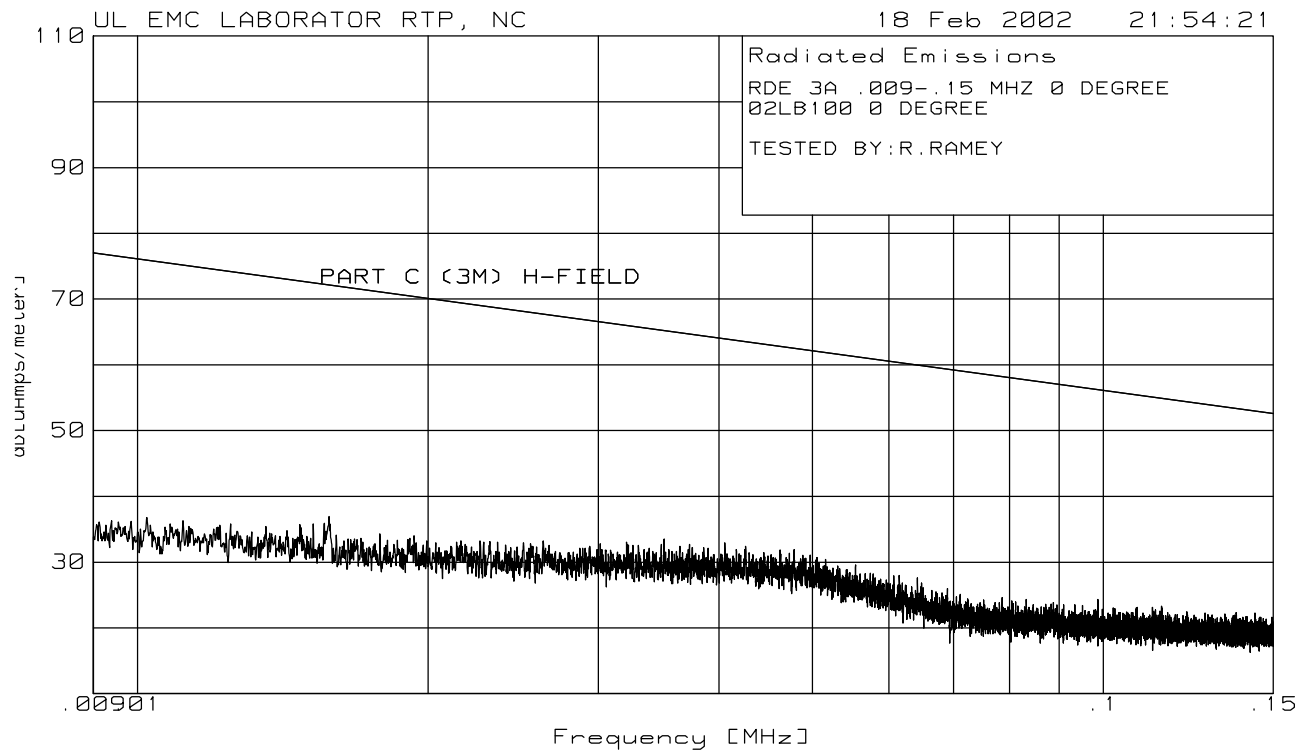
Test 3 - Test Equipment Used: Radiated Disturbance Emissions - 9 kHz to 30 MHz

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
AT0036	100kHz to 30MHz Loop Antenna	Electro-Metrics	EM-6872	12/5/01	12/31/02
AT0037	30Hz to 1MHz Loop Antenna	Electro-Metrics	EM-6971	12/15/01	12/31/02
ATA026	20 ft Cable, BNC - N	UL	RG-223	4/27/01	4/30/02
ATA095	6 ft, N male - N male	Micro-Coax	Coaxial Cable	4/26/01	4/30/02
ATA096	50 ft, N male - N male	Micro-Coax	Coaxial Cable	4/26/01	4/30/02
HI0034	Environmental Indicator	Cole-Palmer	99760-00	10/1/01	10/31/02
SAR001	Spectrum Analyzer / Receiver	Hewlett-Packard	8572A	12/3/01	12/31/02

The above equipment has been calibrated and is within the manufacturer's published limit of error. Calibration is traceable to the National Institute of Standards & Technology(NIST) and conforms to ANSI/NCSL Z540-1-1994.

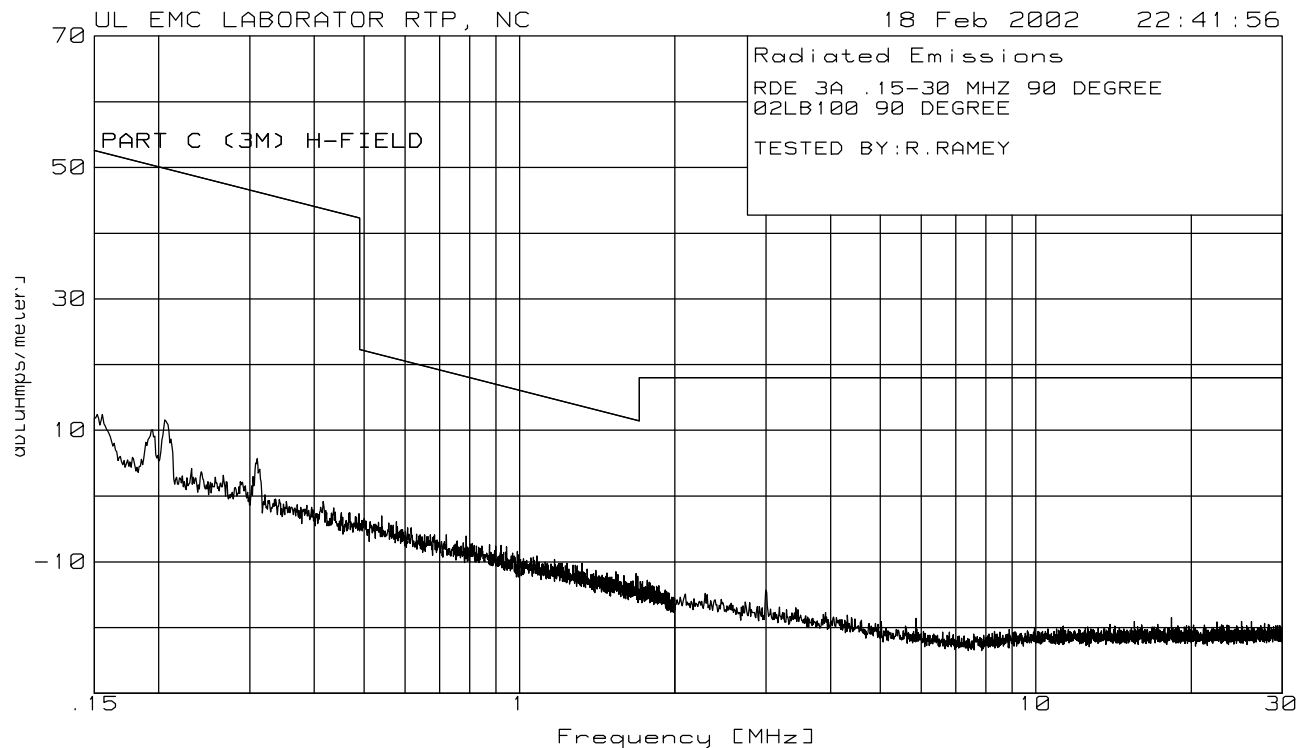
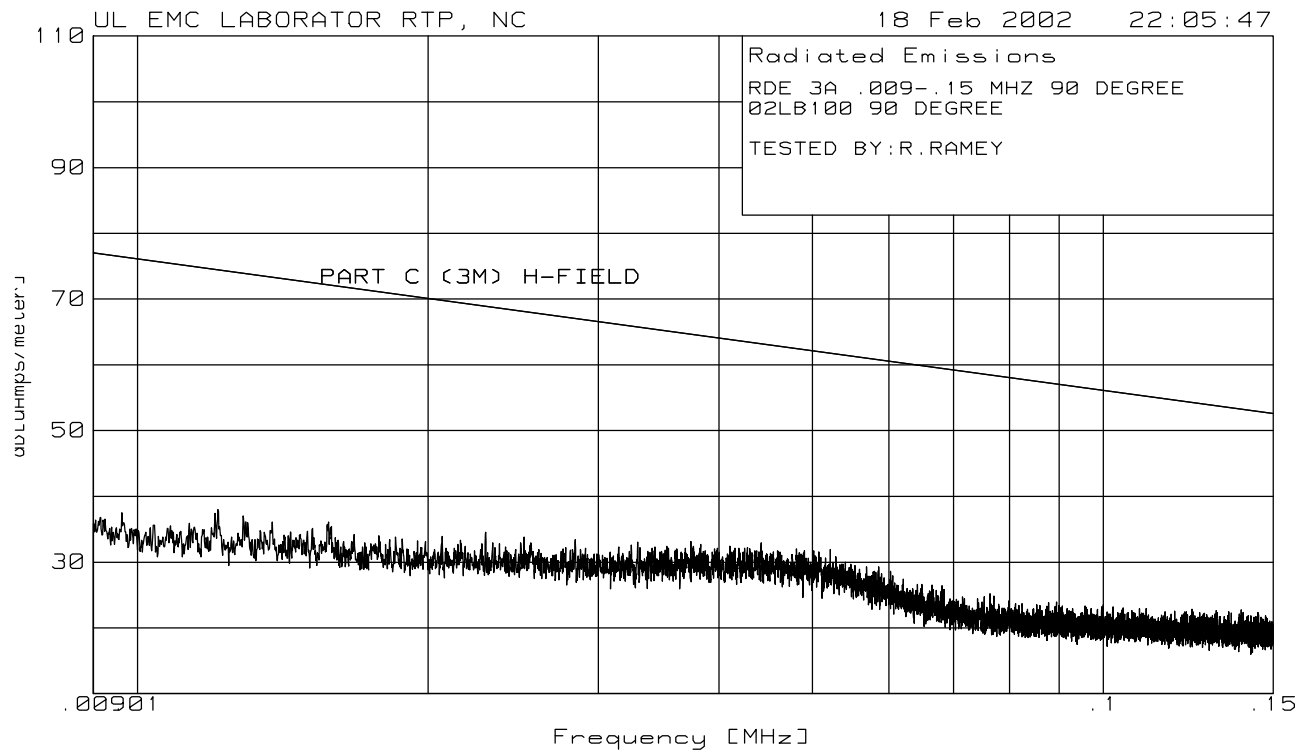
Test 3, Item A (Transmitter Active) - Peak Plot (Amplitude in dBuV/m):

Radiated Disturbance Emissions - 9 kHz to 30 MHz



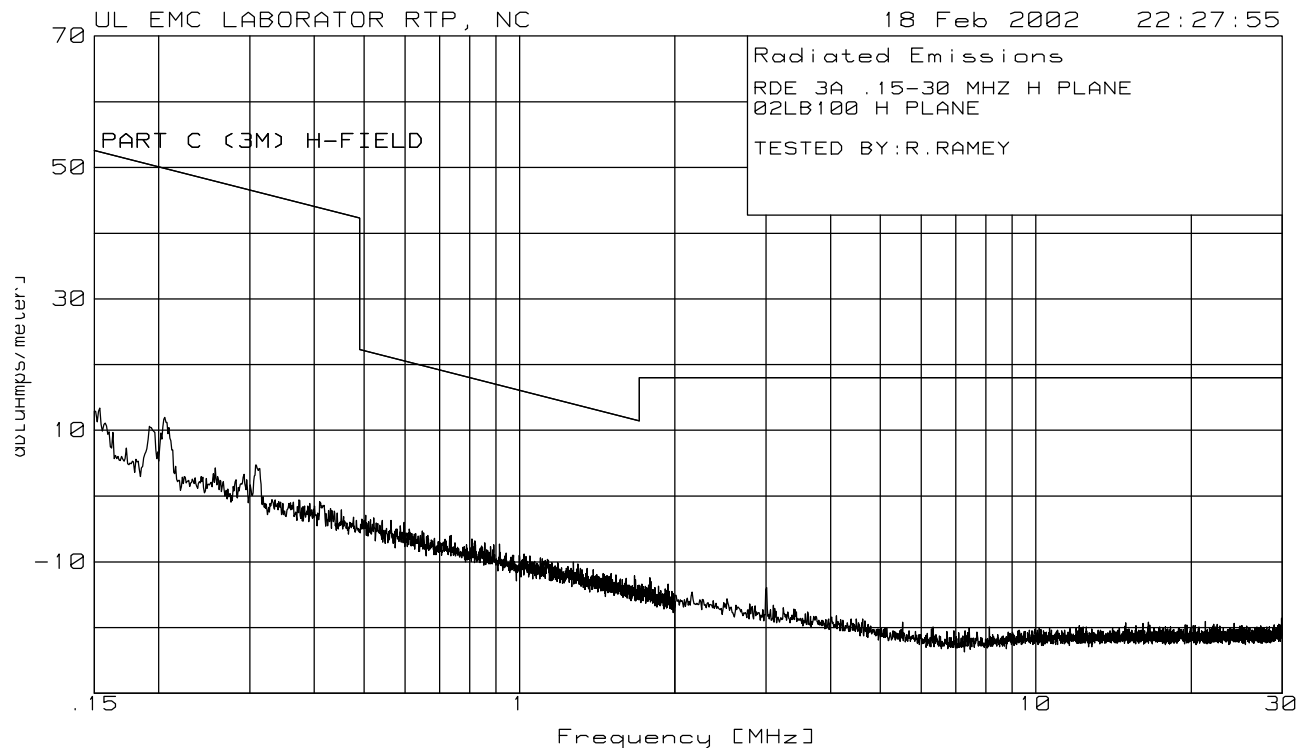
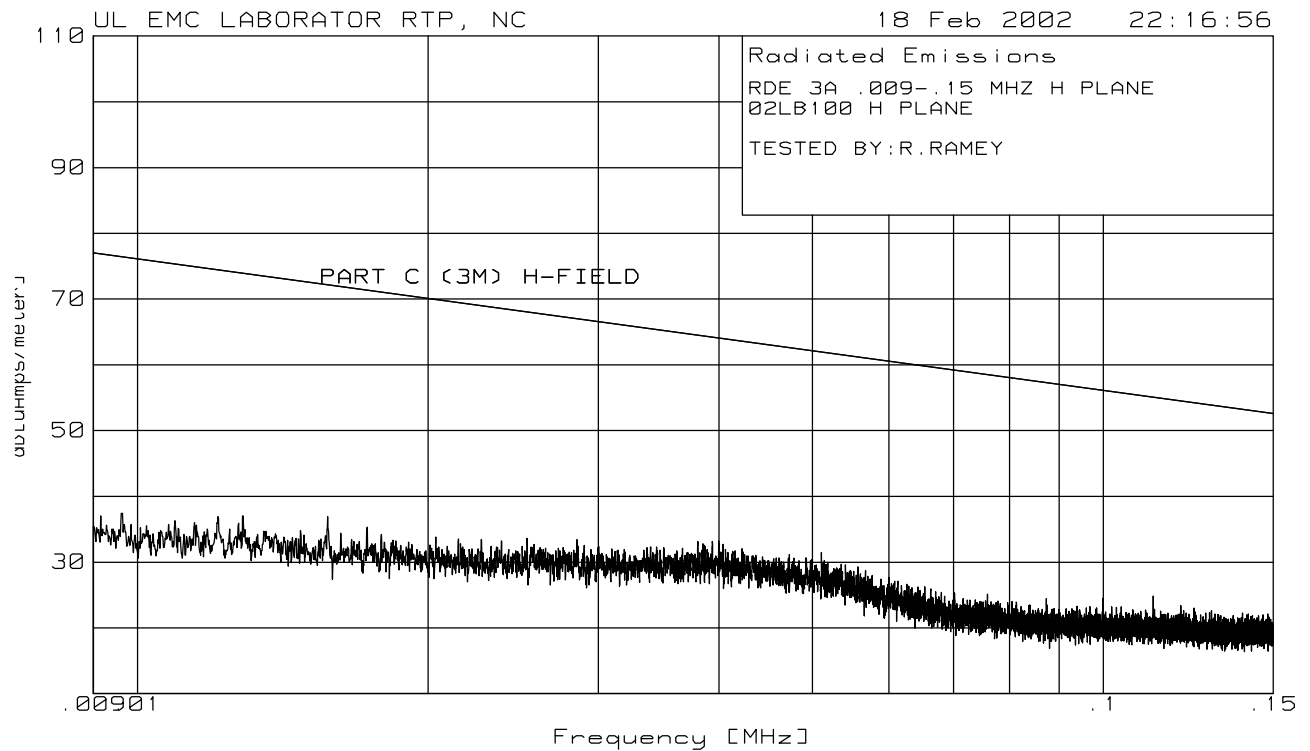
Test 3, Item A (Transmitter Active) - Peak Plot (Amplitude in dBuV/m):

Radiated Disturbance Emissions - 9 kHz to 30 MHz



Test 3, Item A (Transmitter Active) - Peak Plot (Amplitude in dBuV/m):

Radiated Disturbance Emissions - 9 kHz to 30 MHz



Radiated Disturbance Emissions - 9 kHz to 30 MHz

[illegible]

Notes: * P = Peak, Q = Quasi-Peak, A = Average.

** The Specified Limit is for the type measurement indicated. When Peak data is indicated, the tightest limit applicable is indicated.

*** # = See Comment Number Under This Test's Comments Section.

Sample Calculation: Corrected Value = Measured Value + Equipment Correction

Equipment Correction = Antenna Factor (dB/m) + Cable Loss (dB) - Amplifier Gain (dB, if used)

Test 3, Item A (Transmitter Ready) - Discrete Data:

Radiated Disturbance Emissions - 9 kHz to 30 MHz

Test Item (A-Z)	Detector Type* (P/Q/A)	Antenna Polarity (0/90/Z)	Antenna Distance (m)	Measured Frequency (MHz)	Measured Value (dBμV)	Equipment Correction (dB/m)	Corrected Value (dBμV/m)	Specified Limit** (dBμV/m)	Spec Margin (dB)	See Comment (#) ***
A	P	90	3	0.0096	23.1	14.4	37.5	76.4	-38.9	
A	P	90	3	0.0121	24.6	13.4	38.0	74.4	-36.4	
A	P	90	3	0.0129	23.9	13.1	37.0	73.9	-36.9	
A	P	90	3	0.0158	23.8	12.3	36.1	72.1	-36.0	
A	P	90	3	0.0229	24.0	10.5	34.5	68.9	-34.4	
A	P	90	3	0.0251	23.7	10.1	33.8	68.1	-34.3	
A	P	90	3	0.0284	23.9	9.5	33.4	67.0	-33.6	
A	P	90	3	0.0374	24.8	8.3	33.1	64.6	-31.5	
A	P	90	3	0.0501	25.3	6.4	31.7	62.1	-30.4	
A	P	90	3	0.1258	18.4	3.9	22.3	54.1	-31.8	
A	P	90	3	0.1523	1.6	11.0	12.6	52.4	-39.8	
A	P	90	3	0.1583	1.3	10.7	12.0	52.1	-40.1	
A	P	90	3	0.1935	2.4	8.3	10.7	50.4	-39.7	
A	P	90	3	0.2101	2.8	7.6	10.4	49.7	-39.3	
A	P	90	3	0.2896	-1.9	5.0	3.1	46.9	-43.8	
A	P	90	3	0.3100	0.5	4.5	5.0	46.3	-41.3	
A	P	90	3	0.4116	-2.3	2.1	-0.2	43.8	-44.0	
A	P	90	3	1.0431	-2.1	-5.6	-7.7	15.7	-23.4	
A	P	90	3	3.0073	-1.3	-13.3	-14.6	18.0	-32.6	
A	P	90	3	5.0780	-3.2	-16.2	-19.4	18.0	-37.4	
A	P	90	3	9.1819	-1.9	-17.3	-19.2	18.0	-37.2	
A	P	90	3	21.9694	-1.4	-16.7	-18.1	18.0	-36.1	

Notes: * P = Peak, Q = Quasi-Peak, A = Average.

** The Specified Limit is for the type measurement indicated. When Peak data is indicated, the tightest limit applicable is indicated.

*** # = See Comment Number Under This Test's Comments Section.

Sample Calculation: Corrected Value = Measured Value + Equipment Correction

Equipment Correction = Antenna Factor (dB/m) + Cable Loss (dB) - Amplifier Gain (dB, if used)

Radiated Disturbance Emissions - 9 kHz to 30 MHz

[illegible]

Notes: * P = Peak, Q = Quasi-Peak, A = Average.

** The Specified Limit is for the type measurement indicated. When Peak data is indicated, the tightest limit applicable is indicated.

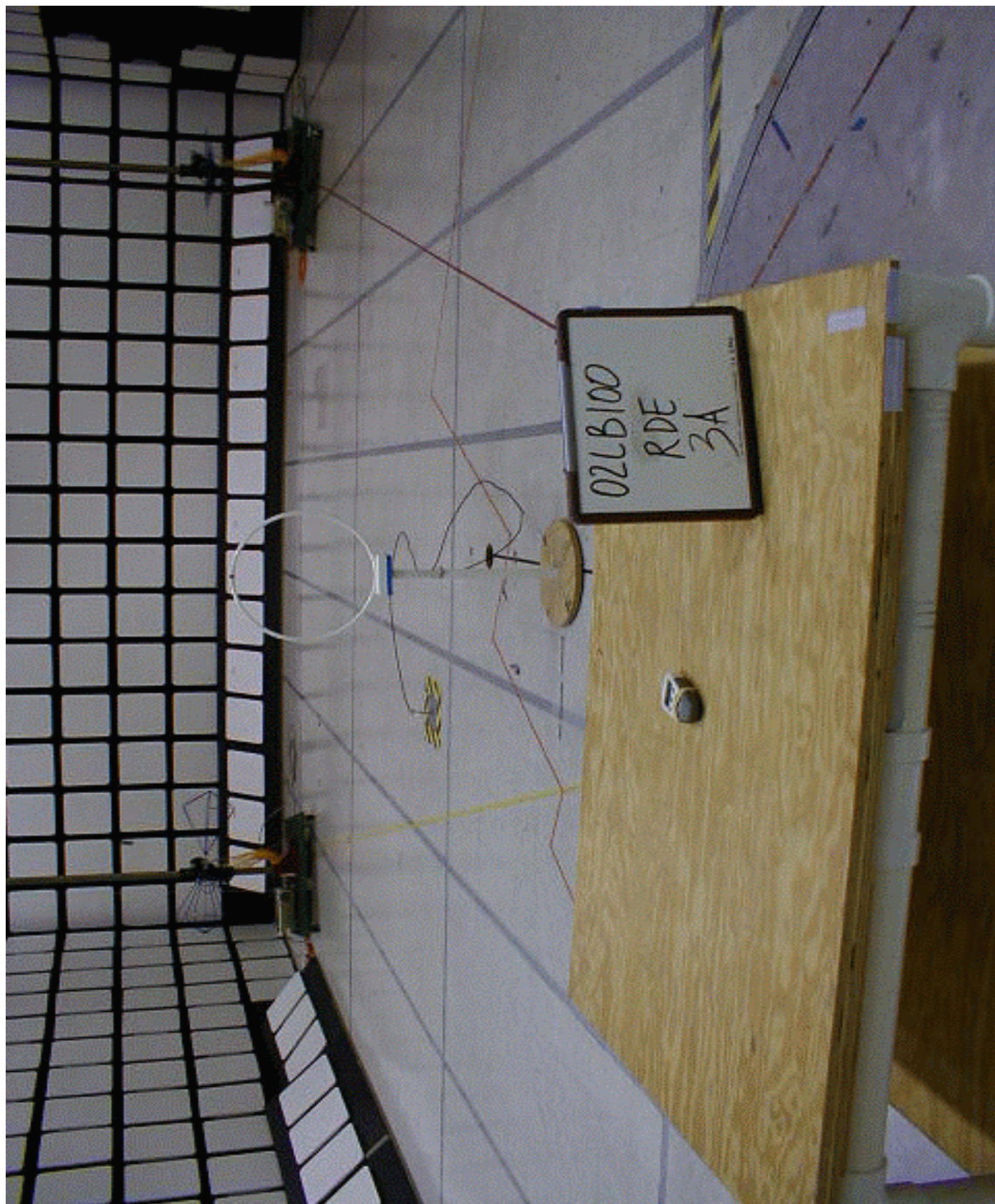
*** # = See Comment Number Under This Test's Comments Section.

Sample Calculation: Corrected Value = Measured Value + Equipment Correction

Equipment Correction = Antenna Factor (dB/m) + Cable Loss (dB) - Amplifier Gain (dB, if used)

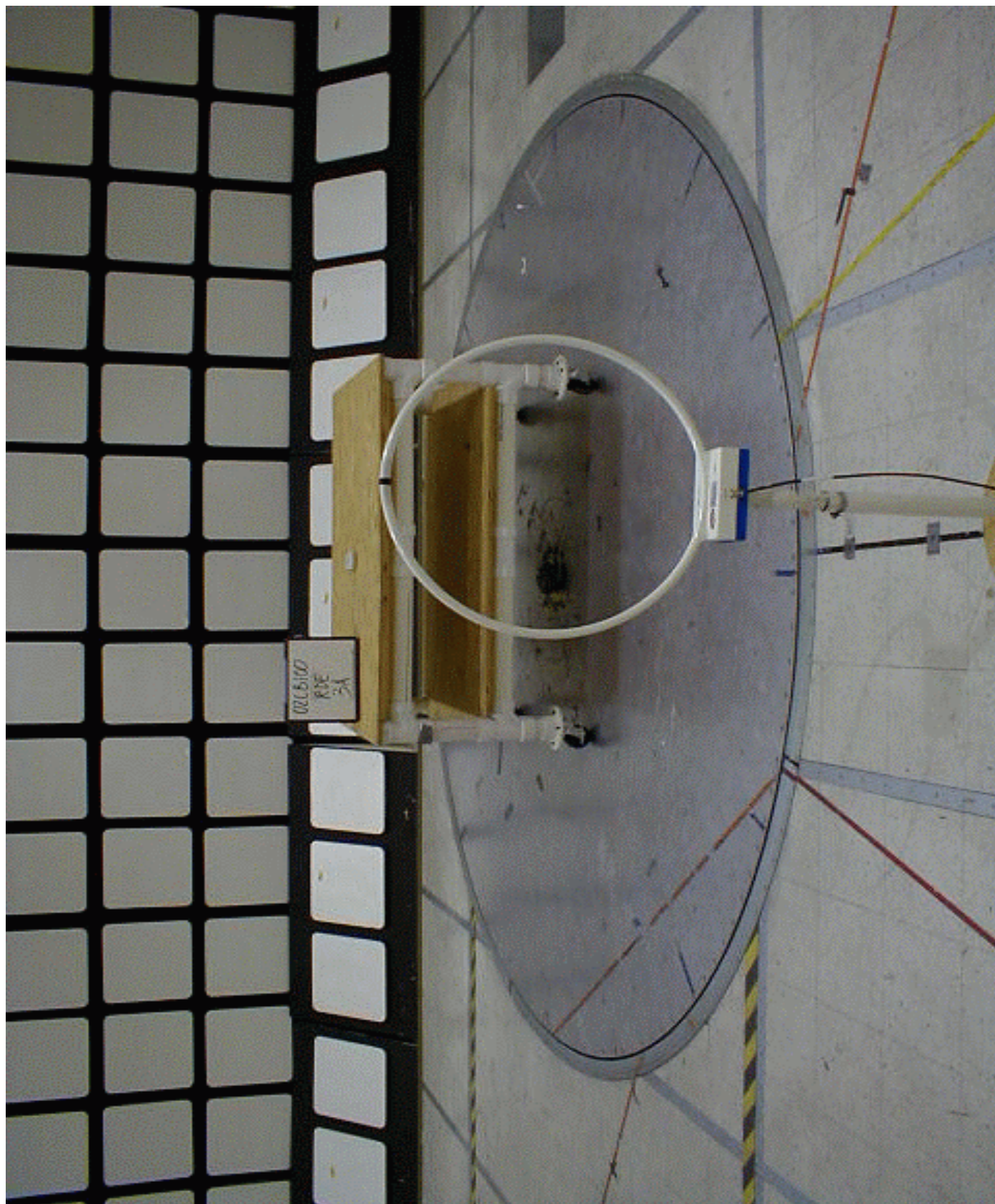
Test 3, Item A - Test Set-Up Photo - Maximum Emissions Configuration:

Radiated Disturbance Emissions - 9 kHz to 30 MHz



Test 3, Item A - Test Set-Up Photo - Maximum Emissions Configuration:

Radiated Disturbance Emissions - 9 kHz to 30 MHz



Test 4: Radiated Disturbance Emissions - 30 MHz to 1000 MHz

Test Requirement: 47 CFR Part 15, Subpart C

Test Specification: 47 CFR Part 15, Subpart C, Section 15.209 and 15.231

Test Procedure:

The test was performed in accordance with the Test Requirement and Specification and configured as noted in the Test Setup. The EUT was placed inside the anechoic chamber with a fresh battery installed. A peak measurement was first made by scanning the entire test frequency range and maximizing the EUT emissions by rotating the EUT and raising the antenna height from 1 to 4 meters above the ground reference plane. Then, a measurement was taken for all peak emissions to verify each were below the Test Limits.

Radiated Disturbance Limits for Manually Operated Transmitters - Section 15.231
at a measurement distance of 3 meters

Fundamental Frequency (MHz)	Field Strength of Fundamental ($\mu\text{V/m}$) (dB $\mu\text{V/m}$)		Field Strength of Spurious ($\mu\text{V/m}$) (dB $\mu\text{V/m}$)	
40.66 to 40.70	2250	67.04	225	47.04
70 to 130	1250	61.94	125	41.94
130 to 174	1250 to 3750	61.94 to 71.48	125 to 375	41.94 to 51.48
174 to 260	3750	71.48	375	51.48
260 to 470	3750 to 12,500	71.48 to 81.93	375 to 1250	51.48 to 61.93
above 470	12,500	81.93	1250	61.93

** Linear Interpolations

Test Clarifications (Specific Limits for this transmit frequency):

At fundamental frequency, 304 MHz, Average field strength limit = 5583.3 $\mu\text{V/m}$ (74.9 dB $\mu\text{V/m}$).

Harmonic field strength limit = 558.3 $\mu\text{V/m}$ (54.9 dB $\mu\text{V/m}$).

Per 15.35(b) peak limit is 20 dB above average limit for each frequency.

Test Deviations:

None

Test Setup: Only the following ports were tested. See EUT Information for details.

Test Item	Port #	Port Name	EUT Operation Mode	EUT Configuration	Power Interface
A	0	Enclosure	1 (Transmitter Active)	1	1
B	0	Enclosure	2 (Not Transmitting)	1	1

Test 4 - Results: Radiated Disturbance Emissions - 30 MHz to 1000 MHz

Test Results Summary:

Test Item	Test Location	Humidity (%)	Temperature (°C)	Pressure (kPa)	Pass/Fail (P/F)	Date Completed	Comment #
A	A	44.0	23.0	100.1	P	3/11/02	1 - 3
B	A	44.0	23.0	100.1	P	3/11/02	1 - 3

The EUT was considered to **Pass** the Requirements.

Comments:

Comment #	Description
1	Average emissions were calculated using peak-to-average ratio of 9.4 dB determined in Test 2.
2	See Test 5 for setup photo.
3	30 to 200 MHz measured on 3/22/02

Test 4 - Test Equipment Used: Radiated Disturbance Emissions - 30 MHz to 1000 MHz

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
AT0021	Biconical Antenna, 20 to 300 MHz	Chase	VBA6106A	6/11/01	6/30/02
AT0022	Log Periodic Antenna, 200 to 1000 MHz	Chase	UPA6109	6/11/01	6/30/02
ATA084	Attenuator 6 dB, 2 GHz	Pasternack	PE7002-6	4/26/01	4/30/02
ATA085	Attenuator 6 dB, 2 GHz	Pasternack	PE7002-6	4/24/01	4/30/02
ATA095	6 ft, N male - N male	Micro-Coax	Coaxial Cable	4/26/01	4/30/02
ATA108	10m, N male - N male	UL	RG214	8/23/01	8/31/02
ATA110	RF Amplifier 1-1000 MHz	Miteq	AM-3A-000110-N	4/24/01	4/30/02
ATA112	RF Amplifier 1-1000 MHz	Miteq	AM-4A-000110-7687	3/30/01	3/31/02
ATA118	10m, N male - N male Ferrite Cable	EMC eupen	RG 214, Ferrite Cable	4/26/01	4/30/02
ATA124	RF Amplifier 1-1000 MHz	Miteq	AM-3A-000110-N(M-F)	6/26/01	6/30/02
SAR001	Spectrum Analyzer / Receiver	Hewlett-Packard	8572A	12/3/01	12/31/02
HI0034	Environmental Indicator	Cole-Palmer	99760-00	10/1/01	10/31/02

The above equipment has been calibrated and is within the manufacturer's published limit of error. Calibration is traceable to the National Institute of Standards & Technology(NIST) and conforms to ANSI/NC SL Z540-1-1994.