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EMC Test Report

Company:	Senior Technologies A Division of Stanley Security Solutions 1620 N. 20th Circle Lincoln, NE 68503
Contact:	Randy Nuss
Product:	WanderGuard Universal Tester Model 18029
FCC ID:	LA5IDUT001
Test Report No:	R110905-07B
APPROVED BY:	Doug Kramer Senior Test Engineer
DATE:	2 February 2006
Total Pages:	27

ACCREDITED
Certificate Number 1953-01

1.0 Summary of test results

1.1 Test Results

Based on the data collected with the unit as configured.

Test	Test Specification	Results
CFR 47, FCC Part 15.203	Part 15.203	Complies
47 CFR Part 15.207	Conducted Emissions	N/A
47 CFR Part 15.209	Radiated Emissions	Complies

1.2 Test Methods

1.2.1 Conducted Emissions

The EUT was powered by an internal battery. There was no connection to the AC mains supply network, nor is it an option, the user manual instructs the owner to dispose of the EUT when the battery is low on charge.

1.2.2 Radiated Emissions

Compliance to 47 CFR Part 15.209 was tested in accordance with the methods of ANSI/IEEE C63.4, 2003 and the FCC required technique for measurements under 30MHz. Several configurations were examined and the results presented represent a worst-case scenario. The EUT was placed on a wooden table approximately 80cm high and centered on a 4m diameter turntable. The table was rotated to find the angles of maximum emissions and the antenna was moved from 1m to 4m in both vertical and horizontal positions. All measurements were taken at a distance of 3meters or closer when specified in the report. The X, Y and Z axis of the EUT were examined for the worst case emissions. The loop orientation relative to the product was also positioned in order to maximize the emissions.

2.0 Description

2.1 Equipment under test

The equipment under test was a WanderGuard universal tester Model 18029, from Senior Technologies, a division of Stanley Security Solutions. The EUT sends out a test signal to WanderGuard door monitors to detect if they are operational, as well as receives signals from WanderGuard bracelets to detect if they are operational. The EUT transmits at 508kHz.

2.1.1 Identification: WanderGuard Universal Tester Model 18029

2.1.2 EUT received date: 9 January 06

2.1.3 EUT tested dates: 9, 10 January 06

2.1.4 Manufacturer: Stanley Senior Technologies

2.1.5 Serial number: FCC1

2.2 Laboratory description

All testing was performed at the NCEE Lincoln facility, which is a FCC (100875) and Industry Canada (4294) registered lab. Laboratory environmental conditions varied slightly throughout the tests:

Relative humidity of 45 ± 4%

Temperature of 20 ± 3° Celsius

2.3 Special equipment or setup

The EUT was set to continuously transmit the test signal. The EUT contains no connection to the AC mains supply network or any auxiliary equipment.

3.0 Test equipment used

Serial #	*Manufacturer*	*Model*	*Description*	*Last cal.*
1647	EMCO	3142B	Biconilog antenna	10-Mar-05
6515	EMCO	6515	Loop antenna	05-Jan-06
100037	Rohde & Schwarz	ESIB26	EMI Test Receiver	10-Aug-05
2575	Rohde & Schwarz	ES-K1	Software v1.60	N/A

4.0 Detailed Results

Radiated emissions measurements were made by first using a spectrum analyzer getting a rough signal spectrum, any points were then measured using a CISPR 16 compliant receiver with the following bandwidth setting:

490kHz – 30MHz: 9kHz IF bandwidth, 5kHz steps
30MHz - 1 GHz: 120 kHz IF bandwidth, 60kHz steps

4.1 Unique connector for antenna

The antenna is inside of the EUT and is permanently attached to the EUT as shown in Figure 14.

4.2 Part 15.207 Conducted Emissions

Conducted Emissions testing was not applicable to this product.

4.3 Part 15.209 Radiated Emissions (intentional)

The EUT was found to comply with the published limits for Class 'B' digital devices. The EUT was tested at 3m. See figure 1 for test setup, this orientation provided the maximum emissions. Radiated emissions measurements of the EUT running in both transmit and receive modes from 490kHz to 1GHz can be found in Appendix B. Table 1 contains the tabular data from these plots. The peak levels of the transmitter were not above the ambient limits for an intentional radiator. Figures 7 through 11 show screen captures of the maximized fundamental transmission frequency at various distances from the antenna (1m, 1.5m, 2m and 3m, as well as 1m in receive mode). This shows that the EUT is indistinguishable from the general ambient noise at distances greater than 2m from the antenna.

The limit line as shown in Figures 5 and 6 is NOT correct; the correct limits are shown in Tables 1 and 2.

The fundamental frequency of 0.508MHz had a maximum reading of 64dBµV/m at 1m distance, the uncorrected reading can be seen in Figure 7. The 15.209 limit at this frequency and distance is 92.6 dBµV/m, for a margin of 28.6dB.
Figures 12 and 13 show the bandwidth of the fundamental and the absence of the fundamental in the 505kHz restricted band.

Appendix A: Test Photos

Figure 1 - Radiated Emissions Test Setup

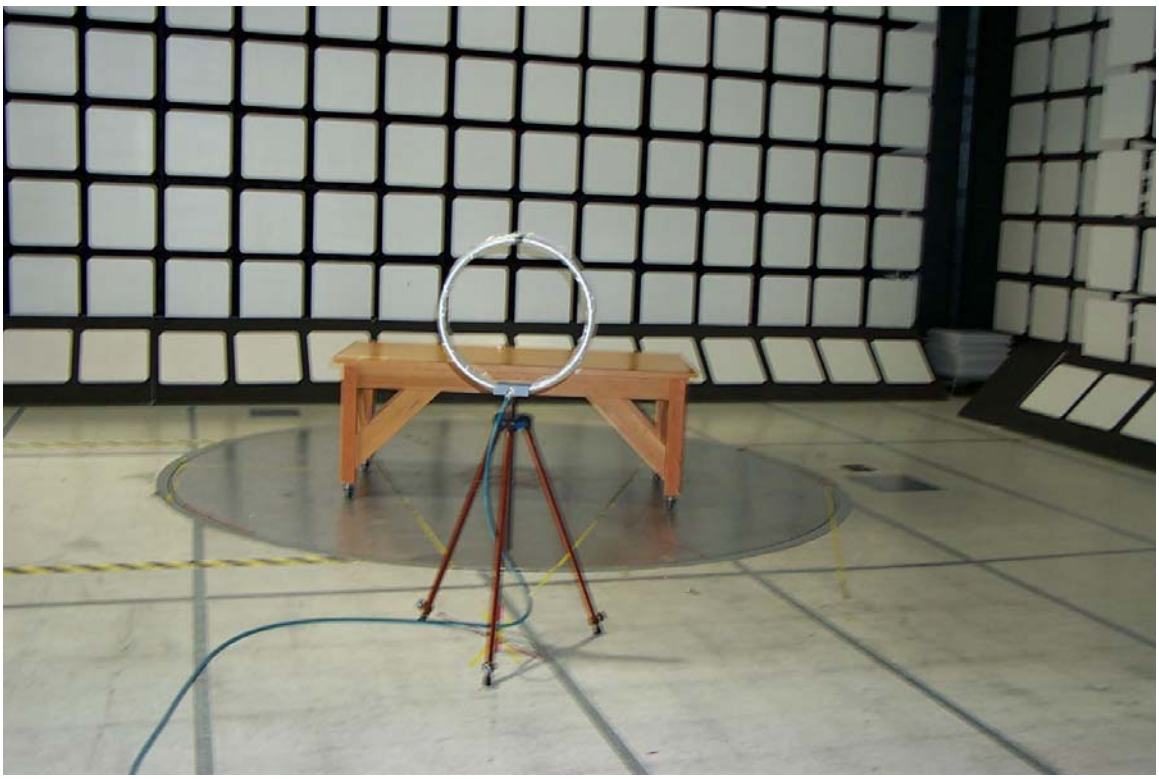

Figure 2 - Test setup, loop antenna at 3m test distance

Appendix B: Emissions Plots

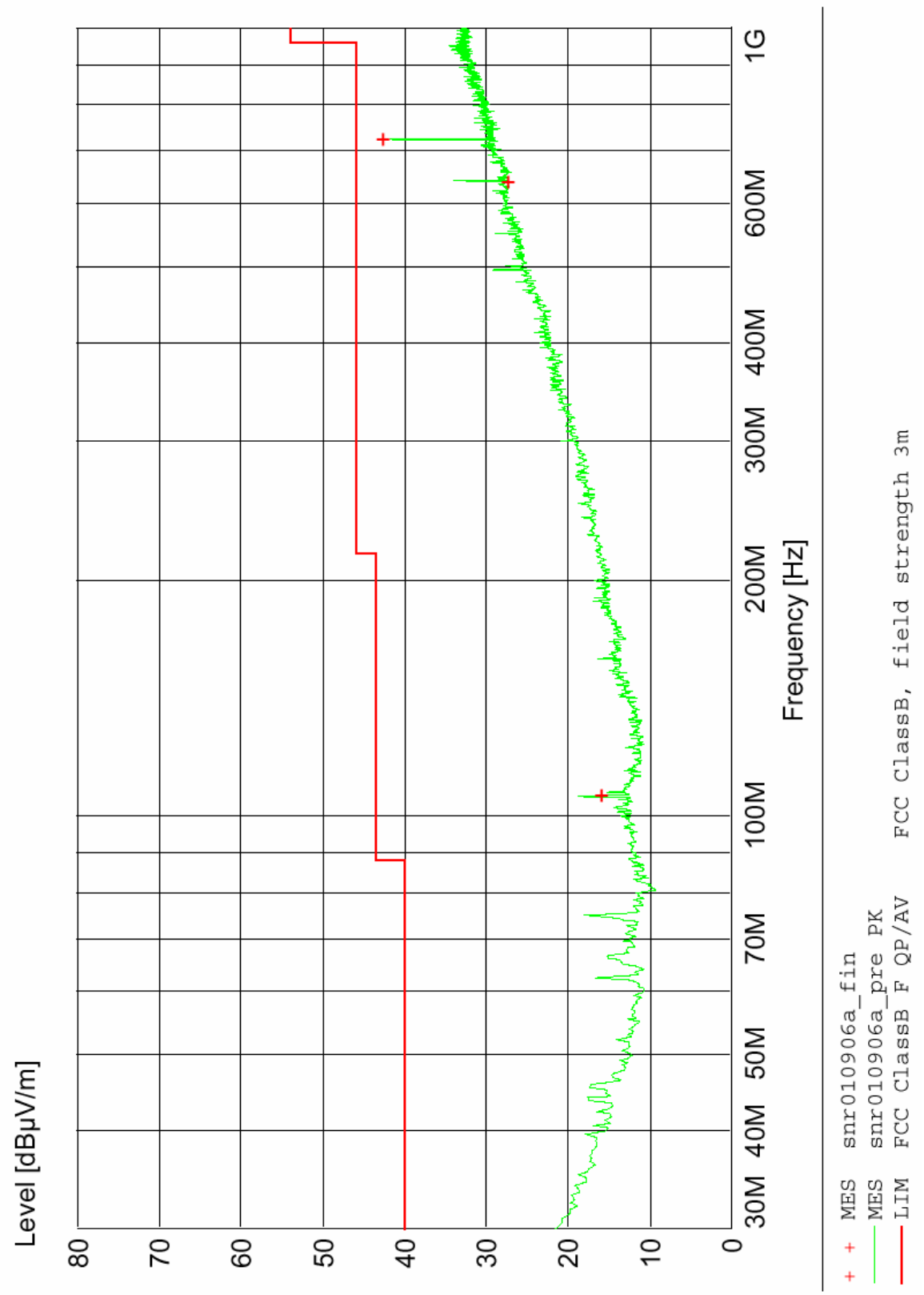

Figure 3 - Radiated Emissions Plot, 30MHz – 1GHz, Transmit ON

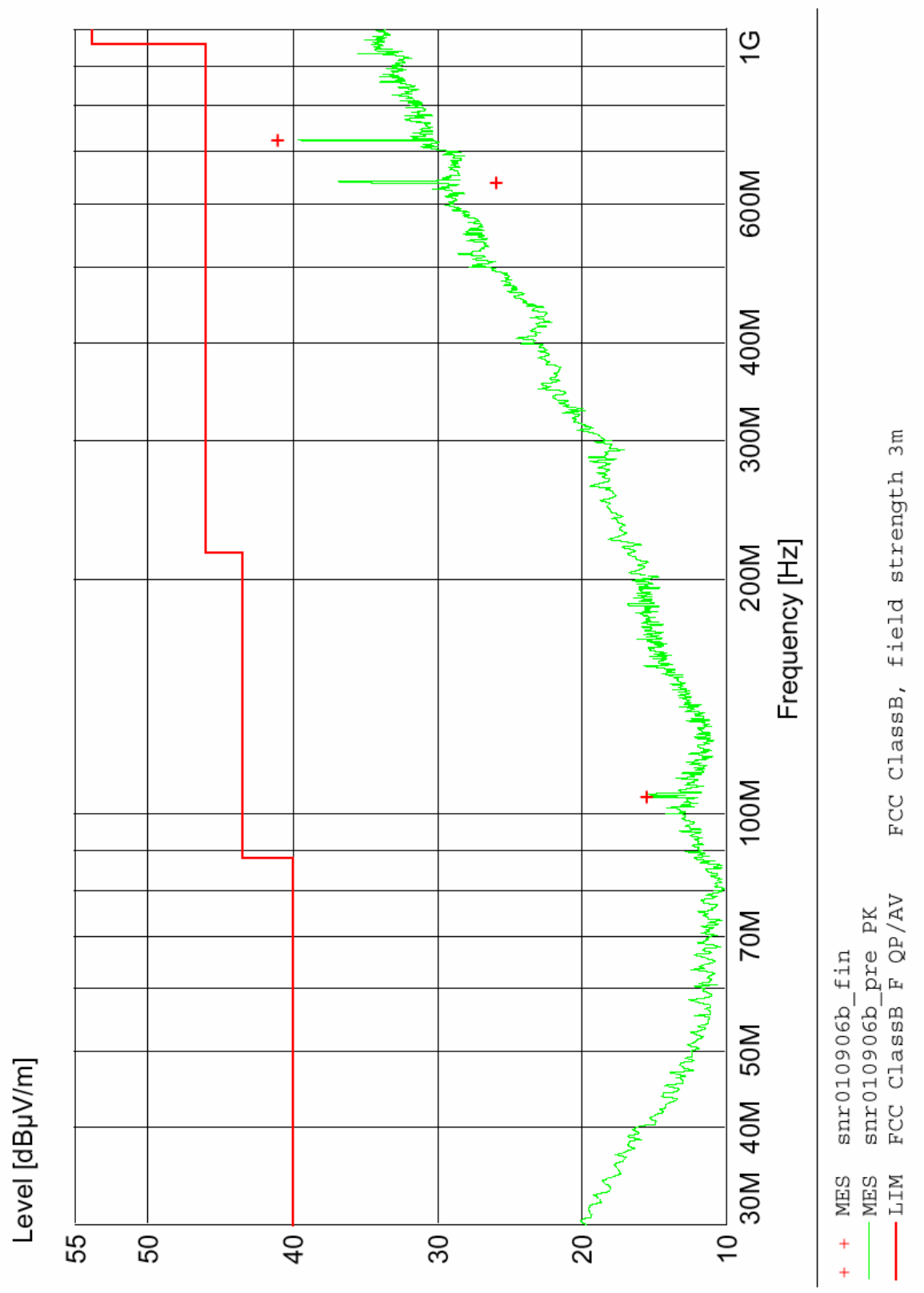

Figure 4 - Radiated Emissions Plot, 30MHz – 1GHz, Receive ON, Tx OFF

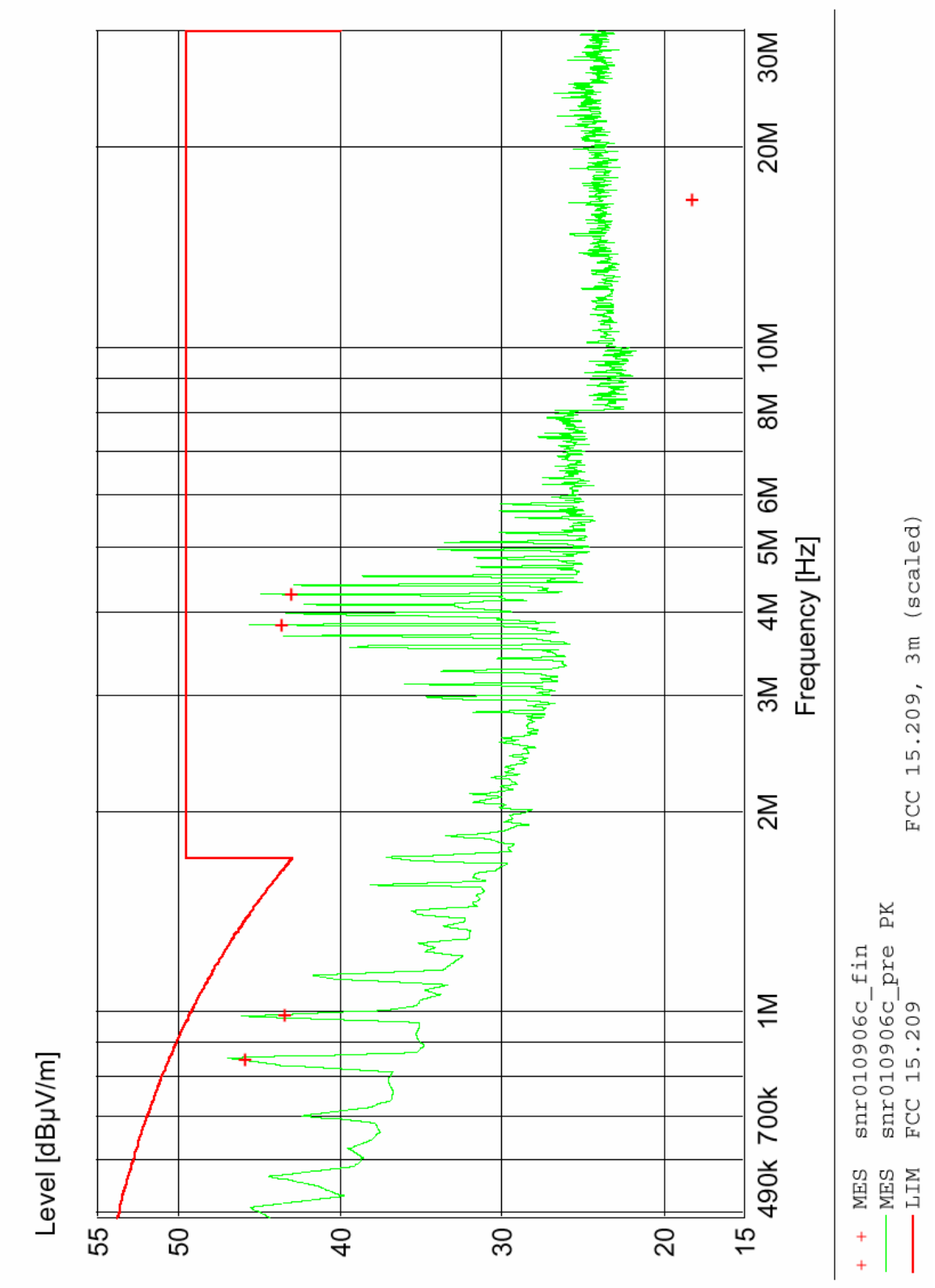

Figure 5 - Radiated Emissions Plot, 490kHz – 30MHz, Transmit ON, 3m measurement distance

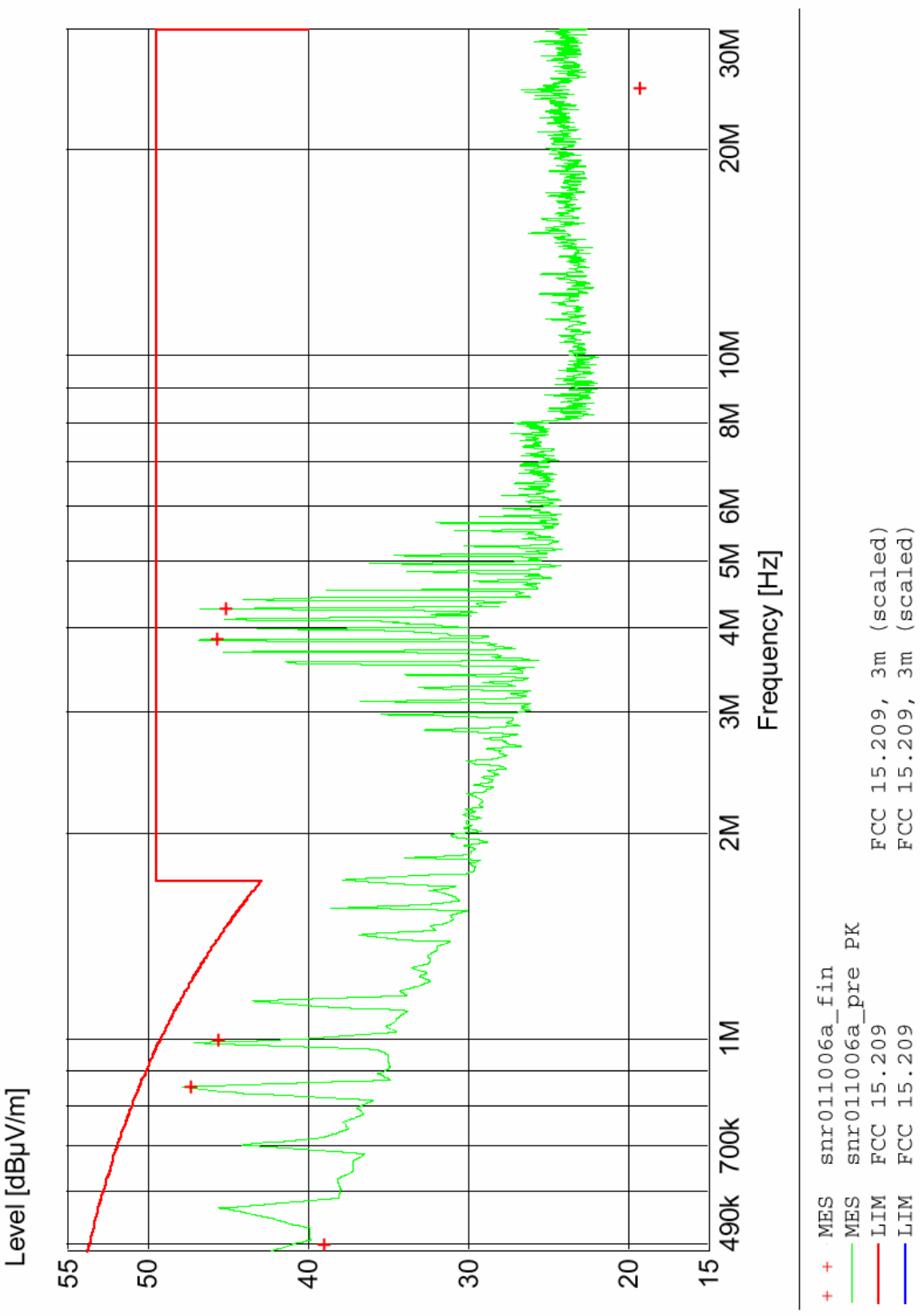

Figure 6 - Radiated Emissions Plot, 490kHz - 30MHz, Receive ON, Tx OFF, 3m distance

Table 1

Radiated Emissions Quasi-Peak Data, Transmit On (Figures 3 and 5), 3m distance

Frequency	Level	Limit	Margin	Height	Angle	Pol.
MHz	dBµV/m	dBµV/m	dB	cm	deg	
0.850000	45.90	69.0	23.1	100.0	320	N/A
0.990000	43.48	67.7	24.22	100.0	235	N/A
3.825000	43.65	69.5	25.85	100.0	103	N/A
4.255000	43.04	69.5	26.46	100.0	313	N/A
16.665000	18.28	69.5	51.22	100.0	156	N/A
106.260000	15.98	43.5	27.5	123.0	57	VERT
639.240000	27.32	46.0	18.7	400.0	337	VERT
723.240000	42.65	46.0	3.4	150.0	164	VERT

Table 2

Radiated Emissions Quasi-Peak Data, Receive On (Figures 4 and 6), 3m distance

Frequency	Level	Limit	Margin	Height	Angle	Pol.
MHz	dBµV/m	dBµV/m	dB	cm	deg	
0.500000	38.98	73.5	34.52	100.0	18	N/A
0.850000	47.27	69.0	21.73	100.0	359	N/A
0.995000	45.56	67.6	22.04	100.0	206	N/A
3.830000	45.66	69.5	23.84	100.0	314	N/A
4.255000	45.06	69.5	24.44	100.0	66	N/A
24.500000	19.24	69.5	50.26	100.0	126	N/A
105.300000	15.54	43.5	28.0	119.0	86	VERT
639.240000	25.87	46.0	20.1	400.0	125	VERT
723.240000	41.02	46.0	5.0	100.0	263	VERT

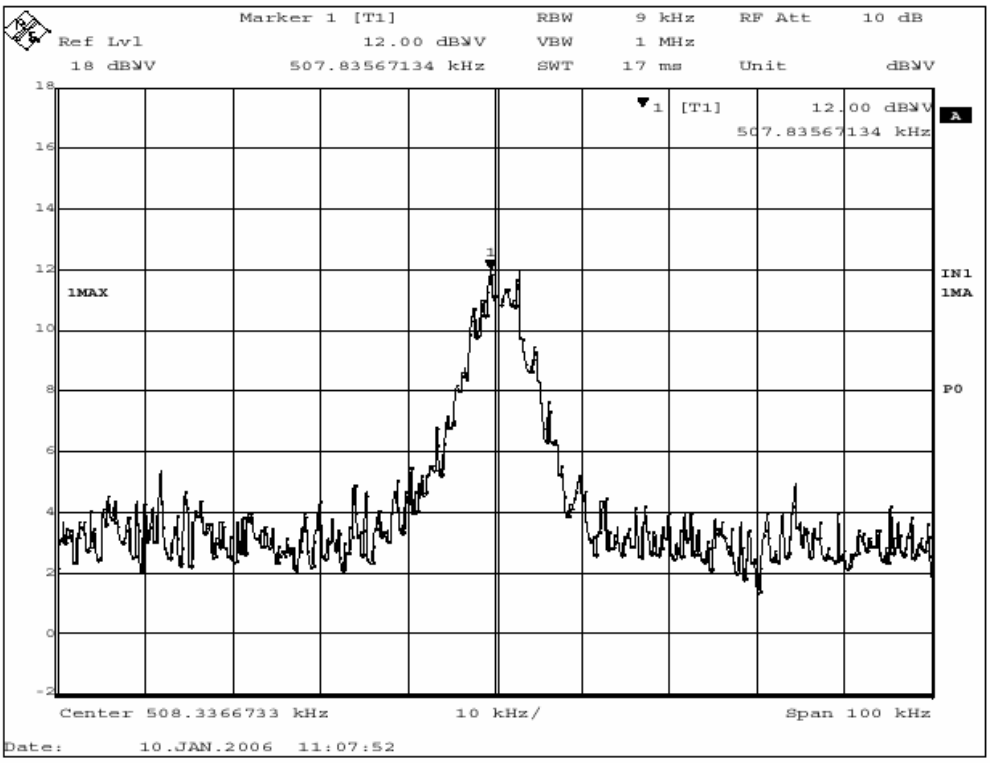

Figure 7 - Transmit ON, 1m Measurement Distance, uncorrected

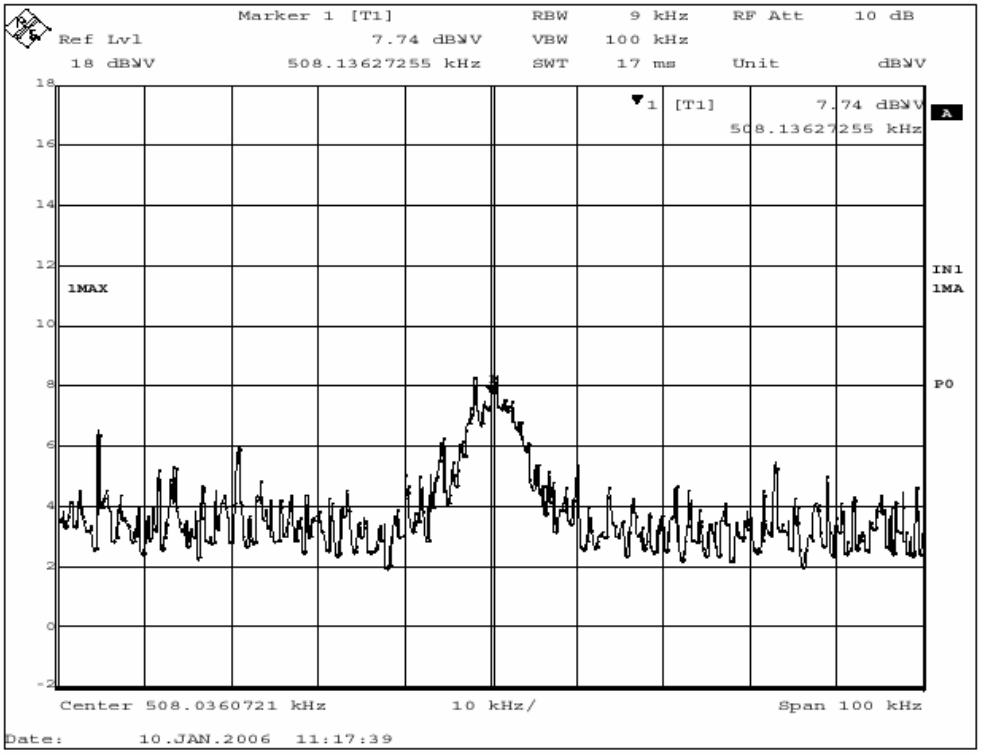

Figure 8 - Transmit ON, 1.5m Measurement Distance, uncorrected

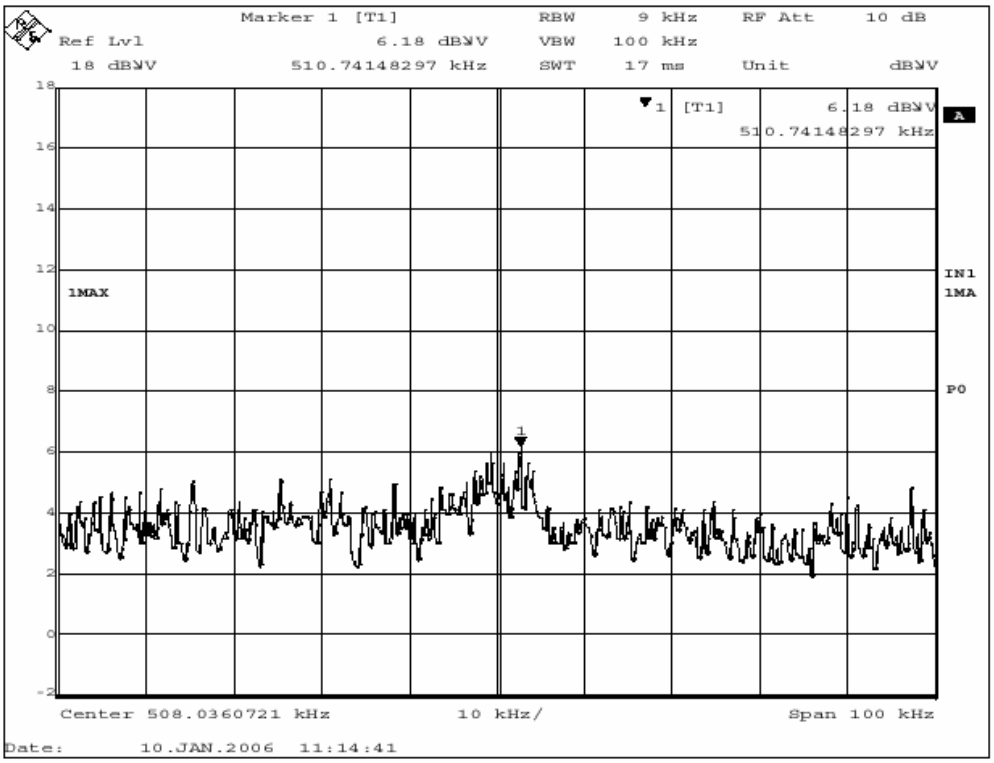

Figure 9 - Transmit ON, 2m Measurement Distance, uncorrected

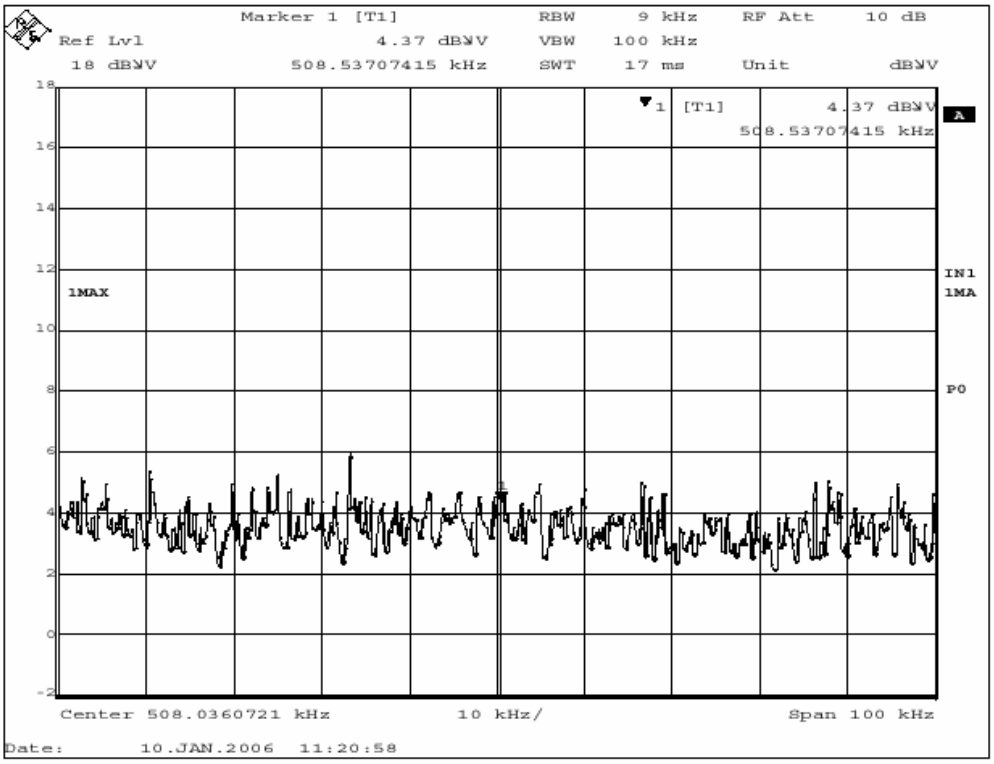

Figure 10 - Transmit ON, 3m Measurement Distance, uncorrected

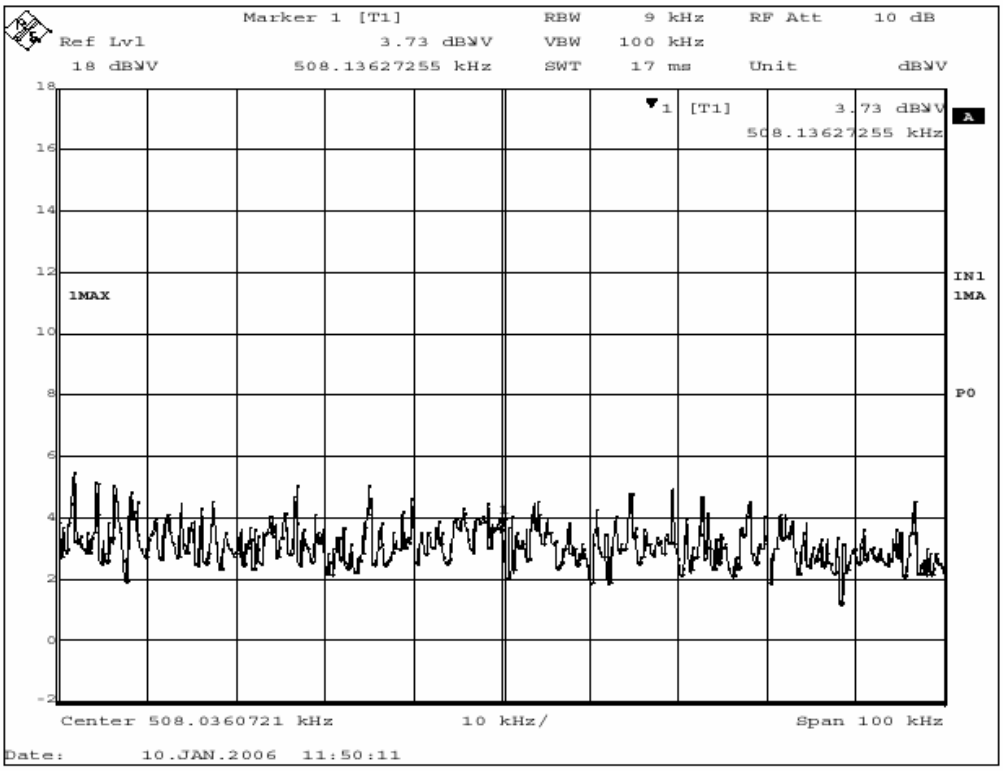

Figure 11 - Receive ON, Tx OFF, 1m Measurement Distance, uncorrected

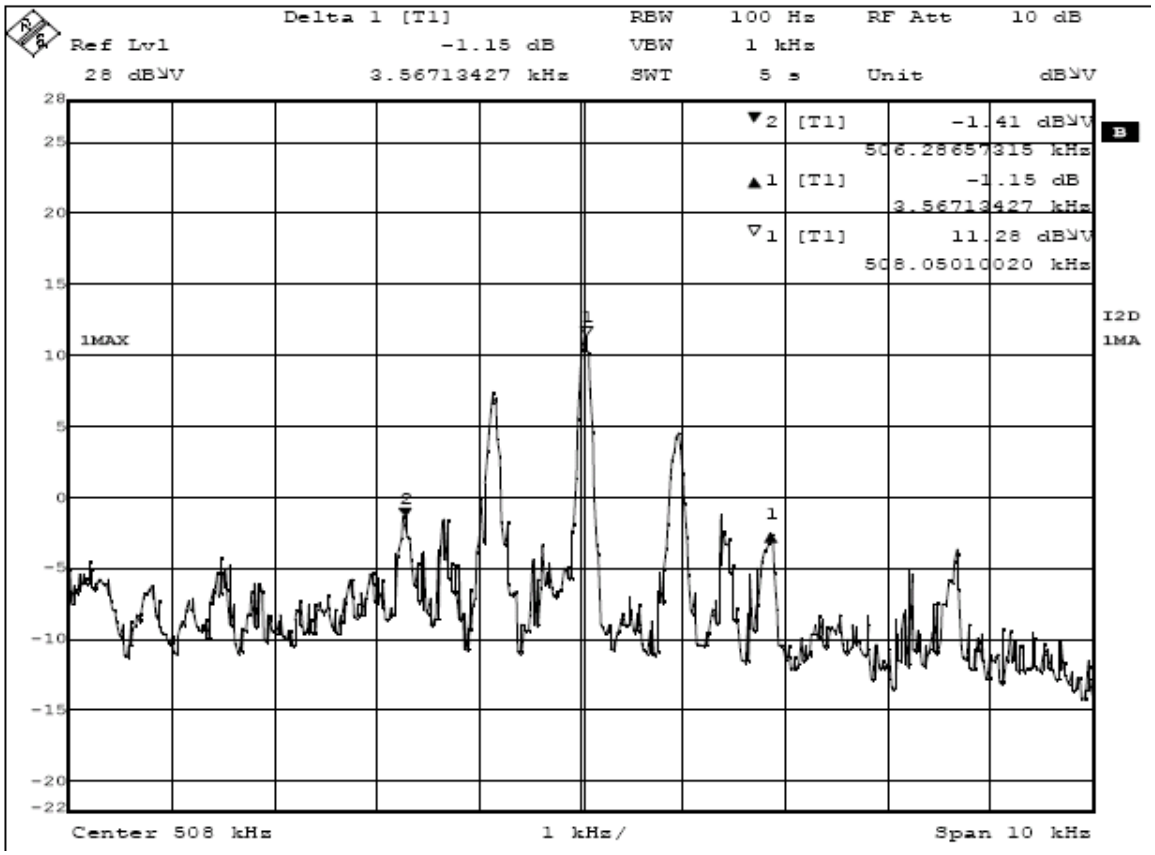

Figure 12 Tx ON, 100Hz RBW, 80cm distance

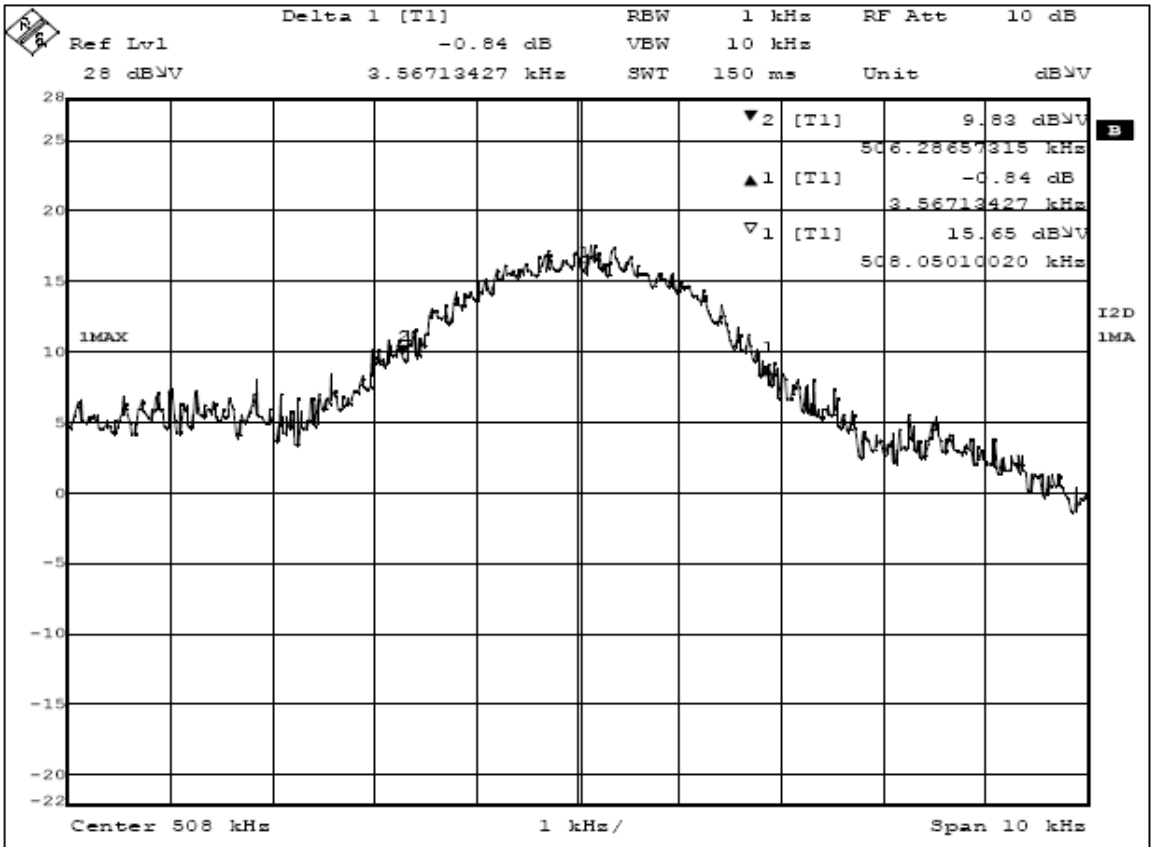

Figure 13 Tx ON, 1kHz RBW, 80cm distance

Appendix C: Sample Calculation

Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:
FS = RA + AF – (-CF + AG) + AV

where FS = Field Strength

RA = Receiver Amplitude

AF = Antenna Factor

CF = Cable Attenuation Factor

AG = Amplifier Gain

AV = Averaging Factor (if applicable)

Assume a receiver reading of 55 dBμV is obtained. The Antenna Factor of 12 and a Cable Factor of 1.1 is added. The Amplifier Gain of 20 dB is subtracted, giving a field strength of 48.1 dBμV/m.

FS = 55 + 12 – (-1.1 + 20) + 0 = 48.1 dBμV/m

The 48.1 dBμV/m value can be mathematically converted to its corresponding level in μV/m.

Level in μV/m = Common Antilogarithm [(48.1 dBμV/m)/20]= 254.1 μV/m

AV is calculated by the taking the 20*log(T_{on}/100) where T_{on} is the maximum transmission time in any 100ms window.

Is this case, T_{on} is less than 50mSec for a 100mSec window. An average correction factor of 6dB was applied where noted.

Appendix D: EUT Photos

Figure 14 - Outside View of EUT, Front

Figure 15 - Outside View of EUT, Back

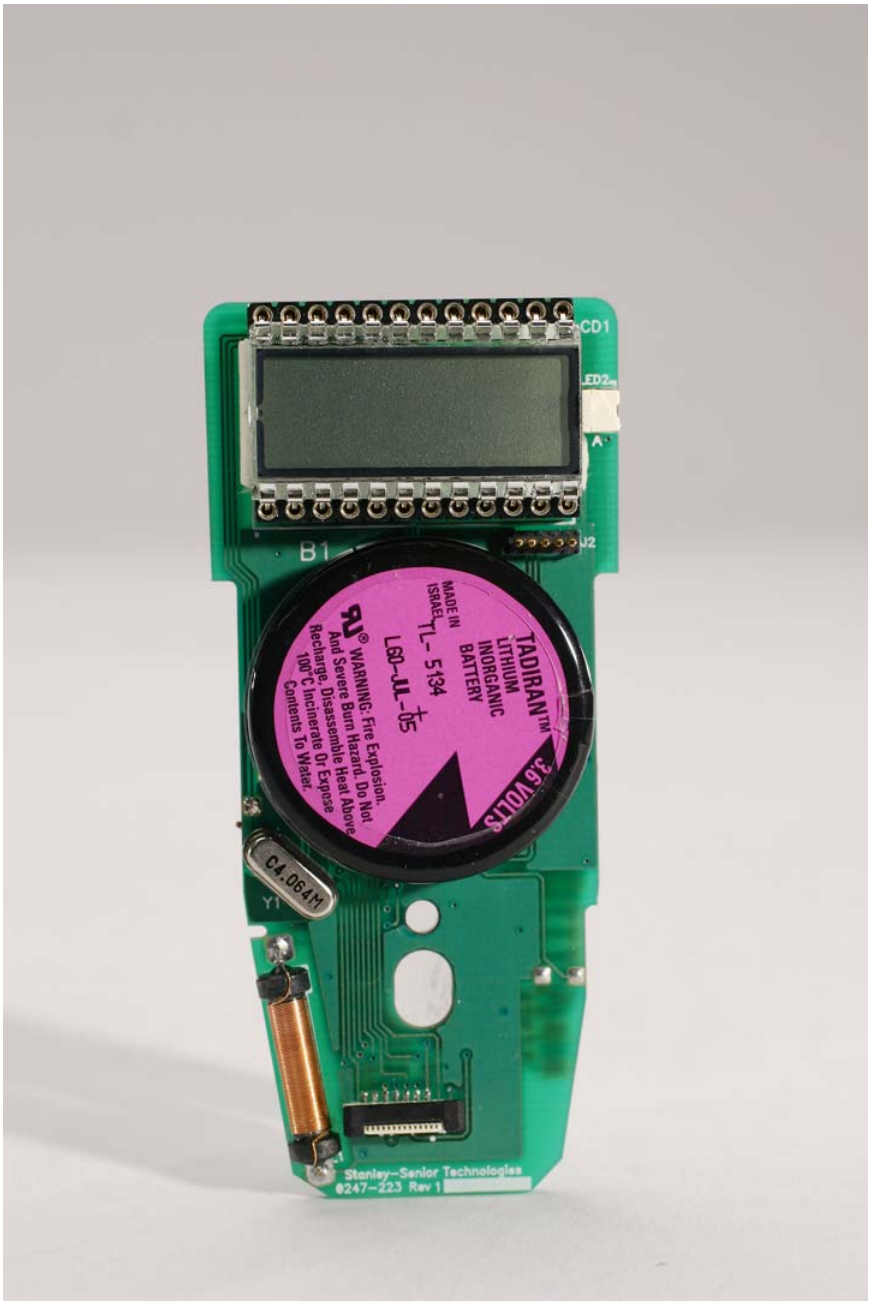

Figure 16 - Internal View of Front Side of EUT

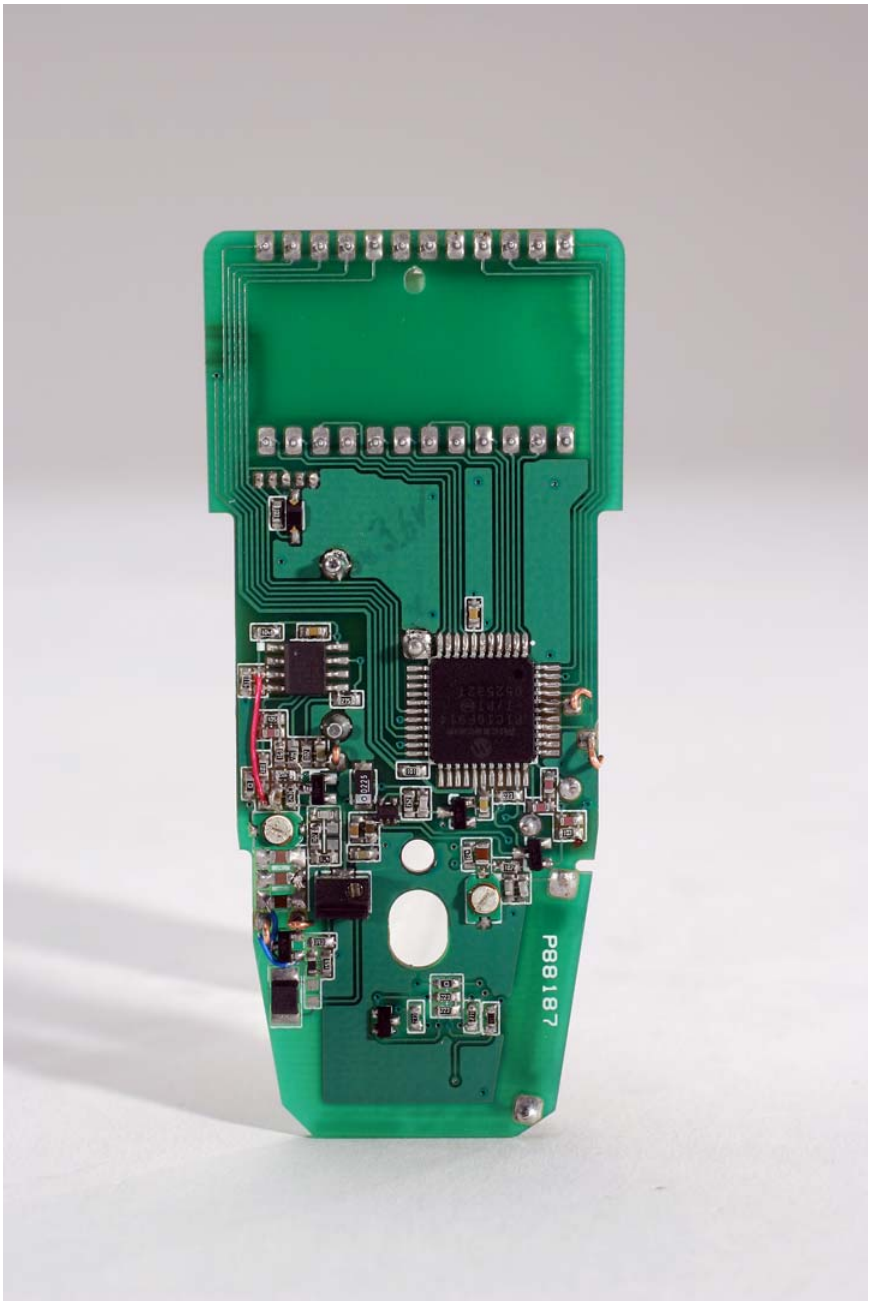

Figure 17 - Internal View of Back Side of EUT

Appendix E: Table of Figures

Figure **Page Number**