



## **MetroTel Corporation of Minnesota**

Application  
For Certification  
**MT-9100T Transmitter**

**FCC ID: RWB-MT9100T**

February, 2004



**Intertek ETL SEMKO**  
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## **1.0 GENERAL DESCRIPTION**

### **1.1 Related Submittals Grants**

This is single application of the *MetroTel MT-9100T Transmitter* for Certification under FCC Part 15, Subpart C.

There are no other simultaneous applications.

The Receiver portion will be verified under Declaration of Conformity.

### **1.2 Product Description**

*MT-9100T Transmitter* operates at 916.48MHz. The *MT-9100T Transmitter* intended to be installed with propane gas tank and using the device sensor checks the gas level. The intended use of the *MT-9100T Transmitter* is to generate and transmit a RF signal to control Base Unit (Receiver). The *MT-9100T Transmitter* powered from two 3.6V internal lithium batteries.

#### Antenna Description:

Non-detachable from the PCB  $\frac{1}{4}$  wavelength monopole antenna.

Sample Submitted: February 19, 2004  
Test Work Started: February 19, 2004  
Test Work Completed: February 20, 2004

### **1.3 Test Methodology**

Emission measurements were performed according to the procedures in ANSI C63.4-2000. All field strength radiated emissions measurements were performed in the semi-anechoic chamber, and for each scan, the procedure for maximizing emissions in Appendices D and E were followed. All field strength radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the "Justification Section" of this Application.

### **1.4 Test Facility**

The test site facility used to collect the radiated and conducted measurement data is located at 7250 Hudson Blvd., Suite 100, Oakdale, Minnesota. This test facility has been fully described in a report dated on March 2003 submitted to FCC. Please reference the site registration number: 90706, dated April 18, 2003.

**2.0 SYSTEM TEST CONFIGURATION**

**2.1 Justification**

For simplicity of testing, the transmitter was wired to transmit continuously.

**2.2 EUT Exercising Software**

N/A

**2.3 Special Accessories**

There are no special accessories necessary for compliance of these products.

**2.4 Equipment Modification**

No modifications were installed during the testing.

**2.5 Support Equipment List and Description**

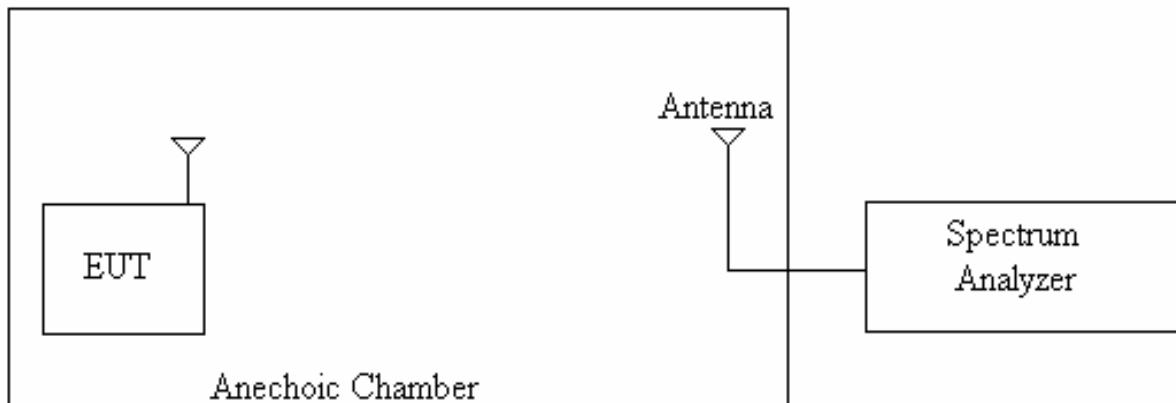
N/A

## 2.6 Test Configuration Block Diagrams

The EUT was setup as tabletop equipment.

The EUT was powered from two 3.6V internal lithium batteries.

### Field Strength Measurements



### 3.0 TEST RESULTS

Data is included for the worst case configuration (the configuration which resulted in the highest emission levels). A sample calculation, configuration photographs, data tables and graphical representations of the emissions are included.

The EUT is intended for operation under the requirements of Part 15 Subpart C. Specific test requirements include the following:

47 CFR 15.249(a)(b)	Field Strength of Fundamental
47 CFR 15.249(a)(b), 15.205	Field Strength of Harmonics
47 CFR 15.249(c), 15.209	Out of Band Spurious Emissions
RSS 210 6.2.2(m2)	Occupied Bandwidth

Note: A Conducted emissions testing was not performed as battery powered equipment.

### **3.1 Field Strength of Fundamental and Harmonics Emissions, FCC 15.249(a)(b), 15.205**

Field Strength of Fundamental and Harmonics Emissions measurements were made with Fundamental frequency at 916.48MHz. The Harmonics emissions were tested up to 10<sup>th</sup> harmonic.

The EUT complies with the Standard requirements for Fundamental and Harmonics Emissions with minimum margin 0.2dB for Fundamental Emissions and 23.7dB for Harmonic Emissions.

The Table 3-1-1 shows the Field Strength of Fundamental Radiation and Harmonics Emissions. The Graphs 3-1-1 and 3-1-2 show the Field Strength of Fundamental Radiation, Harmonics and Spurious Emissions from 30MHz to 5GHz.

No emissions above ambient was found at 5<sup>th</sup> and above harmonics.

**Note:** Emission level shown on the Graphs includes the Antenna and Cable correction factors and Pre-amplifier gain.

**Radiated Emissions at Fundamental and Harmonics**
**Date:** 02-19-2004

**Company:** MetroTel Corporation of Minnesota

**Model:** MT-9100T, Transmitter

**Test Engineer:** Norman Shpilsher

**Special Info:**
**Standard:** FCC Part 15.249

**Test Site:** 3m Anechoic Chamber, 3m measurement distance

**Note:** The table shows the worst case radiated emissions

Measurements were taken using a CISPR Quasi-peak detector in frequency range below 1GHz with RBW 100kHz and Peak detector in frequency range above 1GHz with RBW 1MHz

Correction Factor includes Antenna Factor, Cable Loss and Amplifier Gain (above 1GHz)

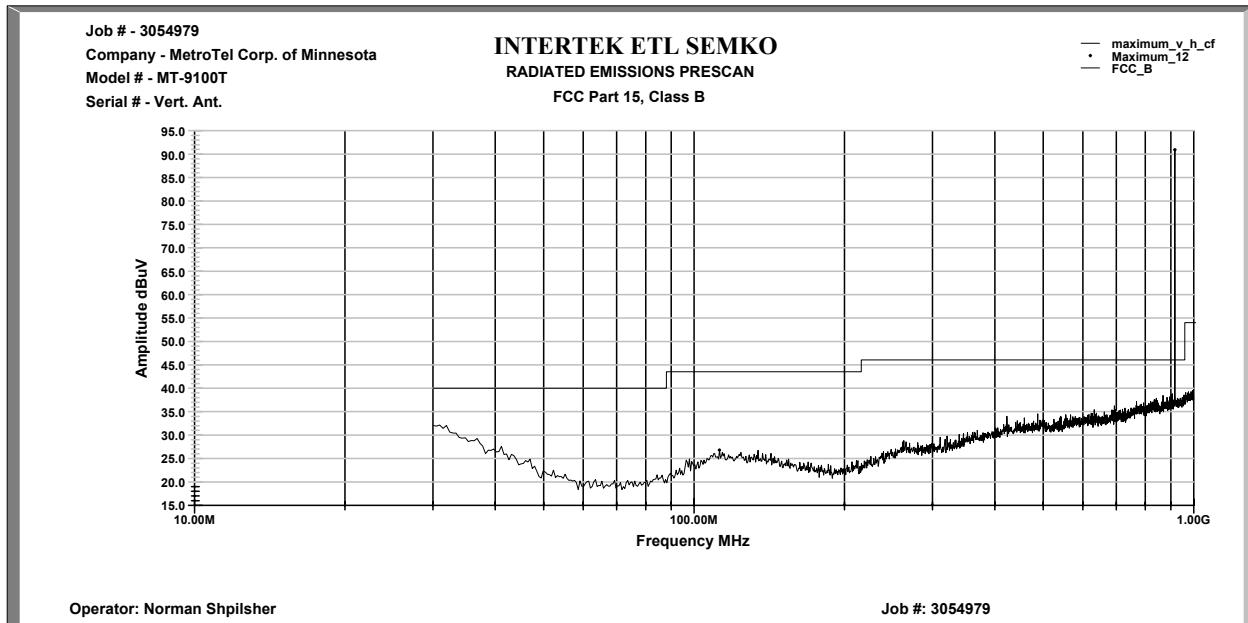
**Table # 3-1-1**

Frequency MHz	Antenna Polarity	Corr. Factor dB1/m	Reading dB $\mu$ V	Total Reading dB $\mu$ V/m	Limit dB $\mu$ V/m	Margin dB	Comments
916.49	V	25.2	68.6	93.8	94.0	-0.2	Fund.
916.49	H	25.2	60.4	85.6	94.0	-8.4	Fund.
1833.69	V	-3.1	51.8	48.7	74.0	-25.3	2nd harm.
1833.69	V	-3.1	48.4	45.3	74.0	-28.7	2nd harm.
2750.54	V	1.0	49.3	50.3	74.0	-23.7	3rd harm.
2750.54	V	1.0	45.6	46.6	74.0	-27.4	3rd harm.
3667.38	V	5.1	38.9	44.0	74.0	-30.0	4th harm.
3667.38	V	5.1	39.2	44.3	74.0	-29.7	4th harm.

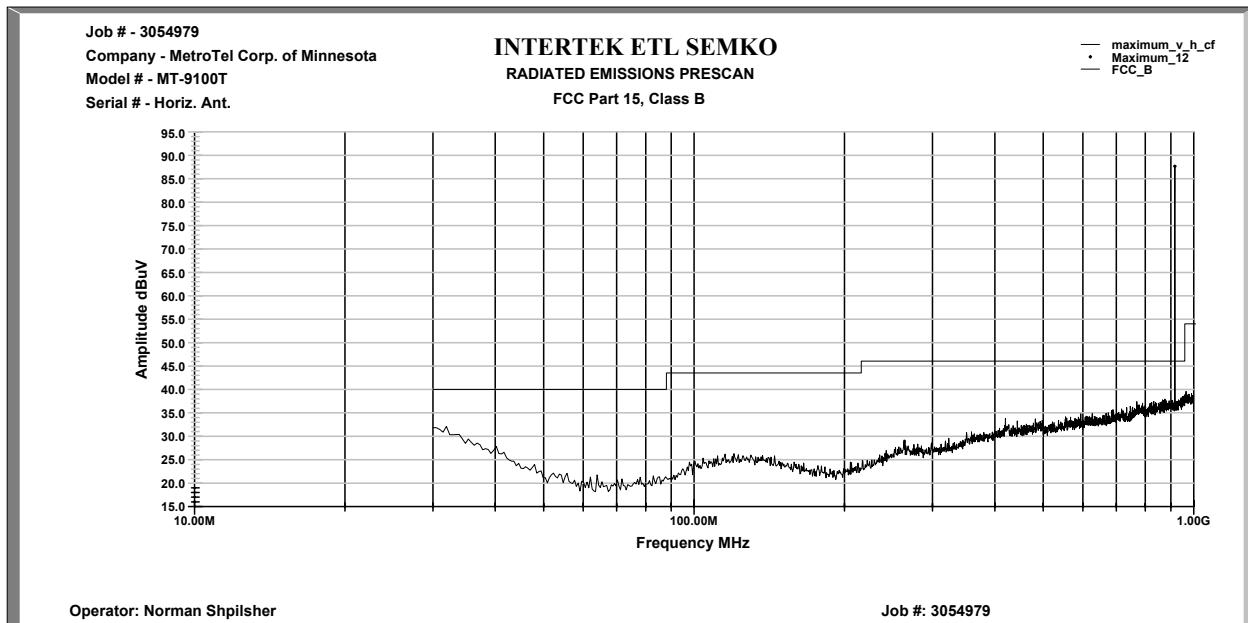
**Comments:** No emissions above ambient was found at 5th and above harmonics

**Graph #3-1-1**  
**Radiated Emissions from 30MHz to 1GHz**

**Vertical Antenna Polarization**

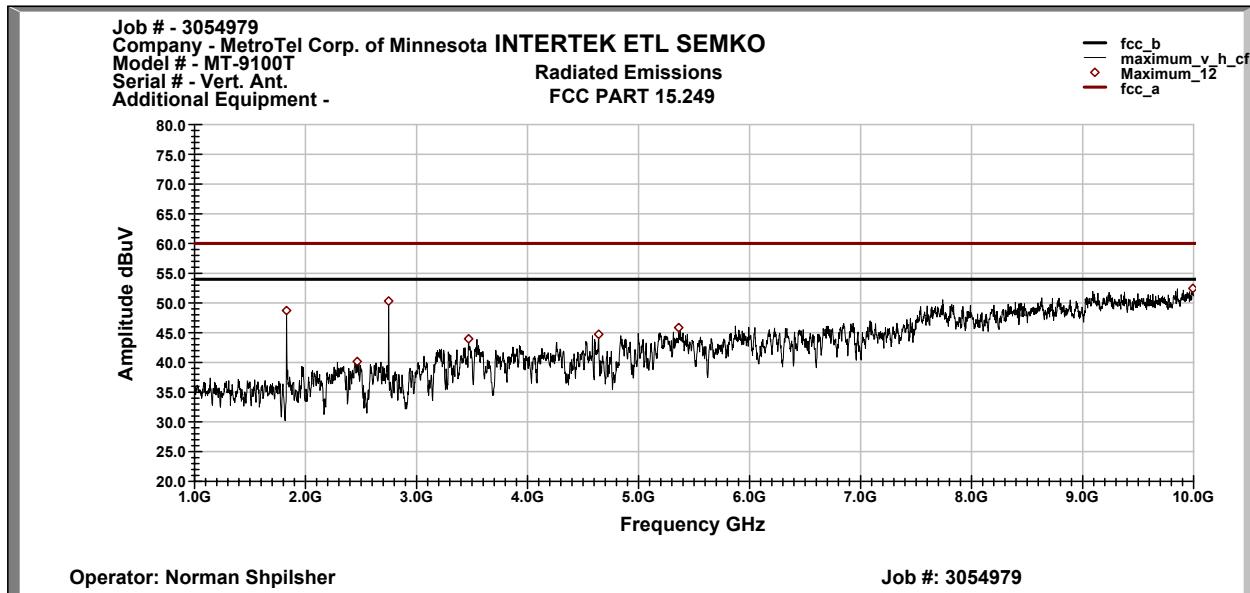


**Horizontal Antenna Polarization**

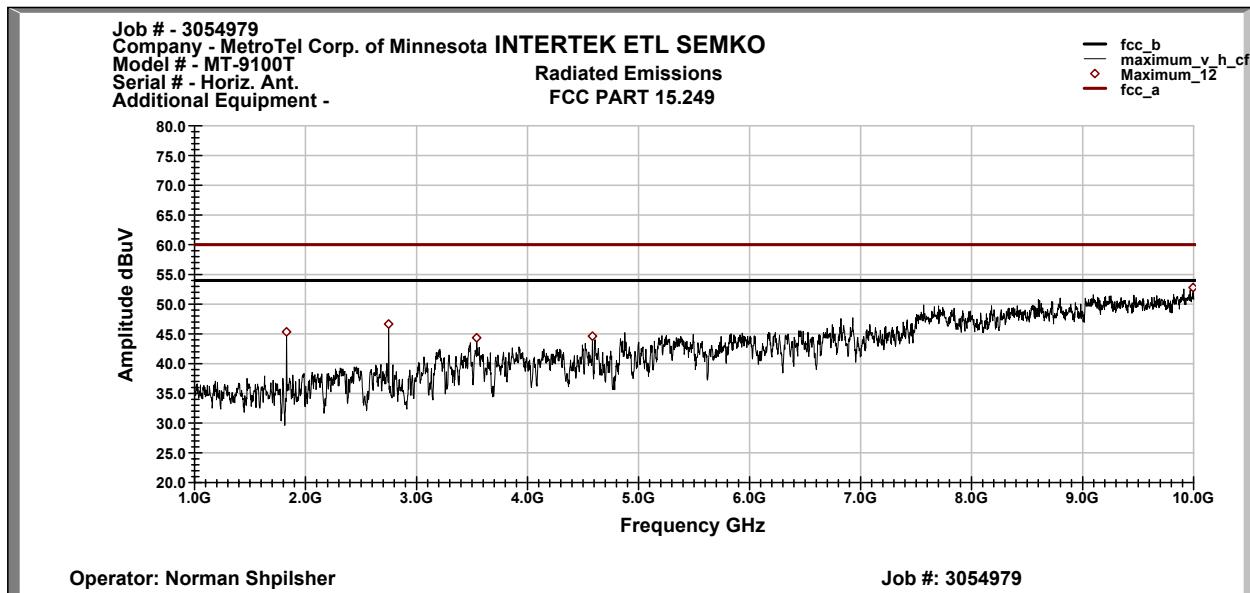


**Graph #3-1-2**  
**Radiated Emissions from 1GHz to 5GHz**

**Vertical Antenna Polarization**



**Horizontal Antenna Polarization**



**3.2 Out of Band Spurious Emissions, FCC 15.249(c), 15.209**

Out-of-band measurements were made for frequencies:  
902MHz  
928MHz.

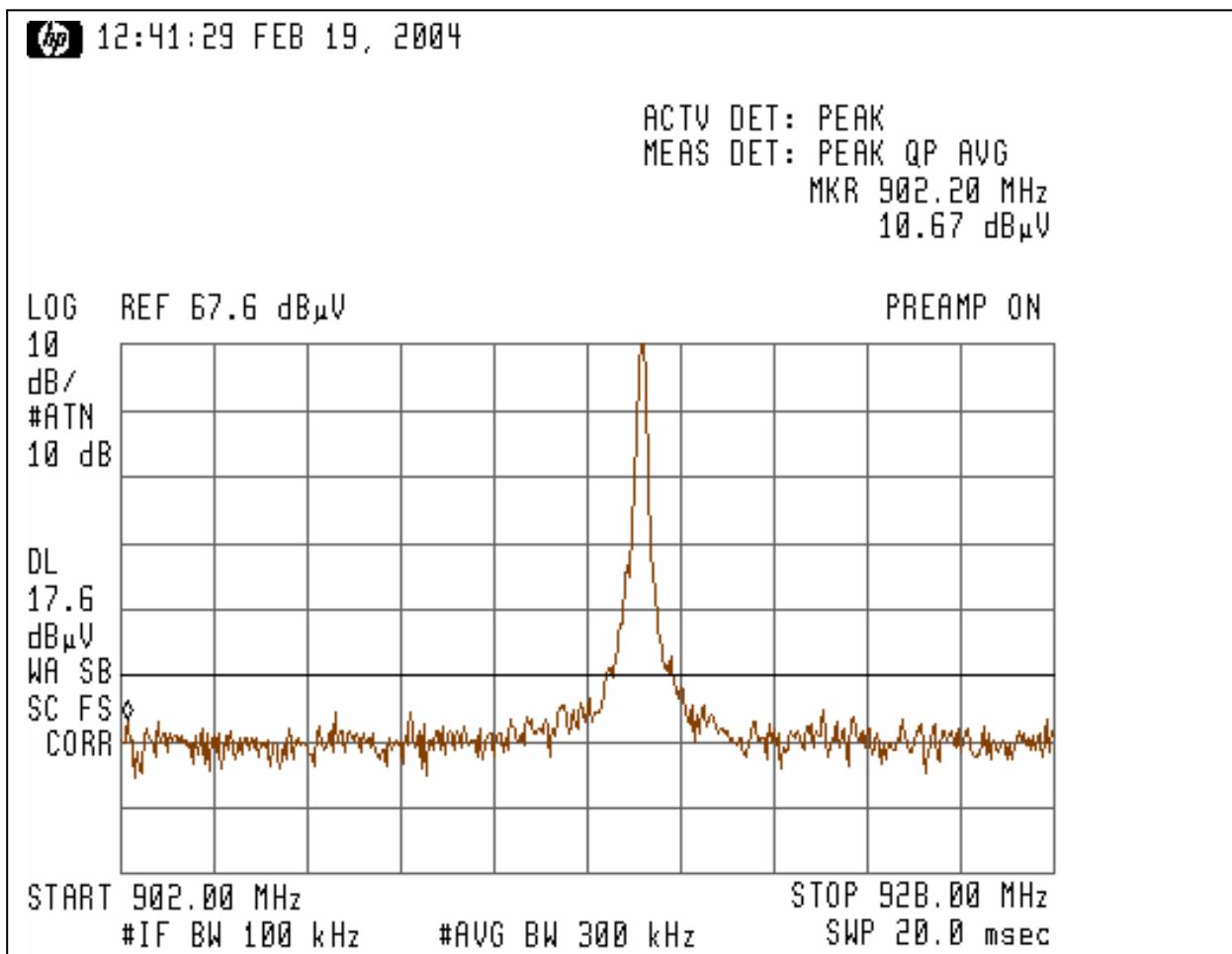
Output frequencies of the EUT was 916.48MHz

The EUT complies with the Standard requirements Out of Band Spurious Emissions for Section 15.209 as well as for Section 15.249(c).

The Graph 3-2-1 show the Out of Band Spurious Emissions.

**Note:** Emission level shown in the Graphs does not include the Antenna and Cable correction factors.

Graph # 3-2-1  
Out of Band Spurious Emissions



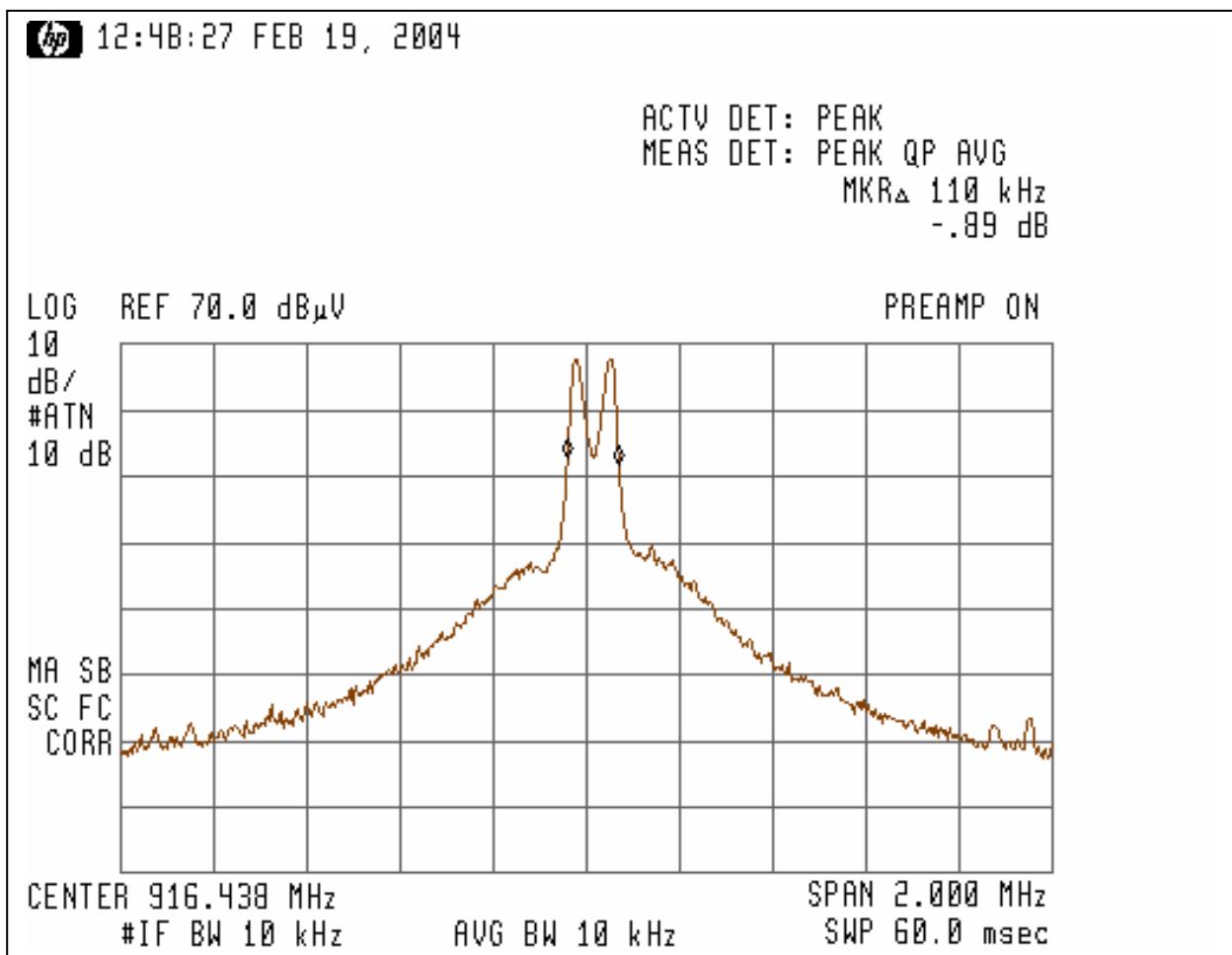
### 3.3 RSS 210 6.2.2(m2) Occupied Bandwidth

Occupied Bandwidth was measured at 99% output power and 20dB attenuation.  
Measured 99% Occupied Bandwidth is 110kHz; measured 20dB Occupied Bandwidth is 125kHz.

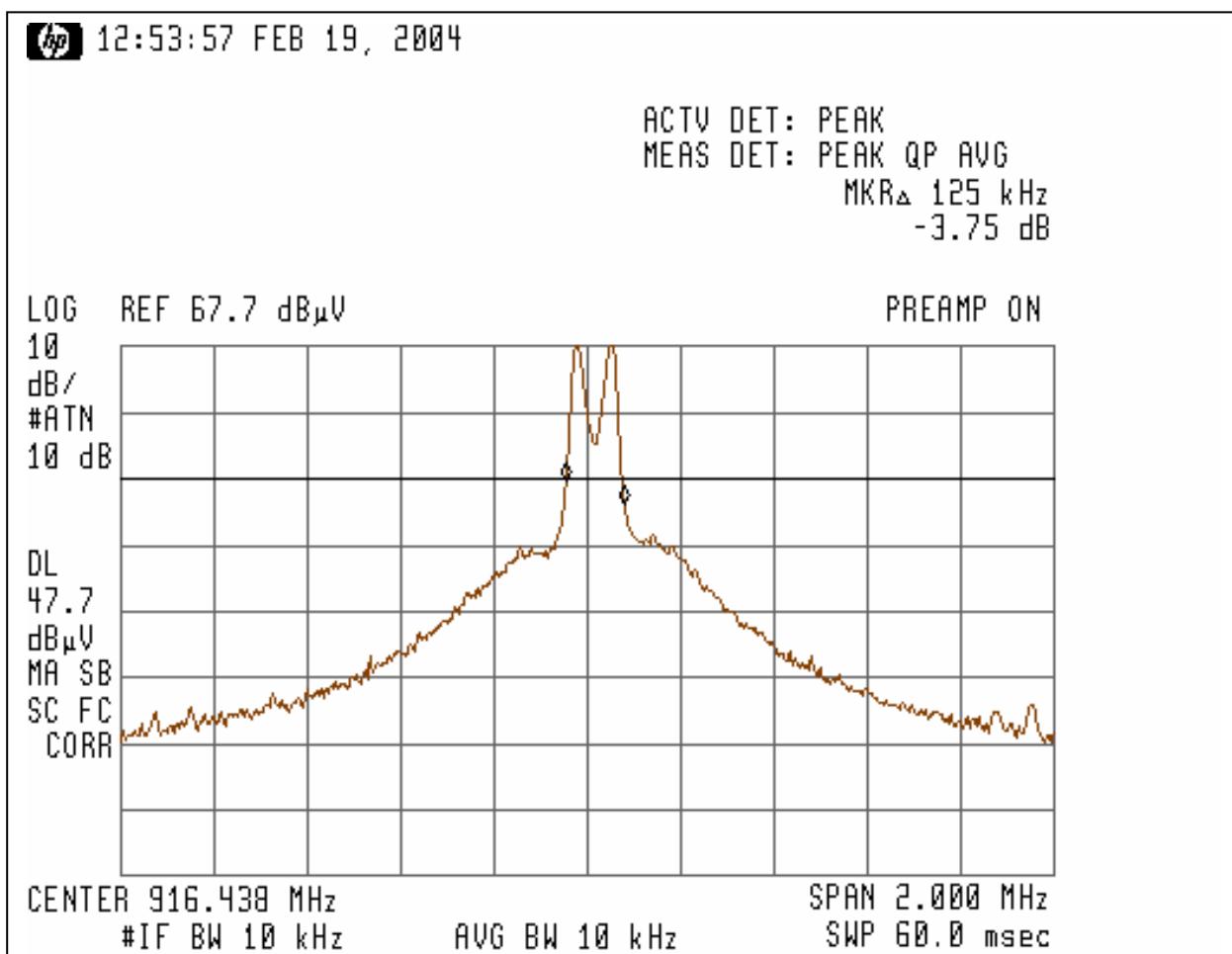
The Graphs 3-3-1 and 3-3-2 show the Occupied Bandwidth.

**Note:** Emission level shown in the Graphs does not include the Antenna and Cable correction factors.

**Graph # 3-3-1**  
**99% Occupied Bandwidth**



Graph # 3-3-2  
20dB Occupied Bandwidth



### 3.4 Test Procedure

#### Field Strength Measurements

The EUT was placed on a non-conductive table 0.8m above the ground plane inside the Anechoic Chamber. The table was centered on a motorized turntable, which allows 360-degree rotation. The measurement antenna was positioned at 3m distance. The Bicono-Log antenna was used in frequency range from 30MHz to 1GHz, and the Horn antenna was used in frequency range above 1GHz. The radiated emissions were maximized by rotating the EUT, by changing antenna polarization, and by changing antenna height from 1 to 4m. Method of the direct Field Strength Calculation is shown in Section 3.6.

### 3.5 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 emissions reading on the EMI Receiver.

The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CF - AG$$

Where: FS = Field Strength in dB( $\mu$ V/m)

RA = Receiver Amplitude in dB( $\mu$ V)

CF = Cable Attenuation Factor in dB

AF = Antenna Factor in dB( $m^{-1}$ )

AG = Amplifier Gain in dBi

Assume a receiver reading of 48.1 dB( $\mu$ V) is obtained. The antenna factor of 7.4 dB( $m^{-1}$ ) and cable factor of 1.6 dB is added and amplifier gain of 16.0 dBi is subtracted giving field strength of 41.1 dB( $\mu$ V/m).

$$RA = 48.1 \text{ dB}(\mu\text{V})$$

$$AF = 7.4 \text{ dB}(m^{-1})$$

$$CF = 1.6 \text{ dB}$$

$$AG = 16.0 \text{ dBi}$$

$$FS = RF + AF + CF - AG$$

$$FS = 48.1 + 7.4 + 1.6 - 16.0$$

$$FS = 41.1 \text{ dB}(\mu\text{V/m})$$

In the tables the Cable correction factors are included to the Antenna Factors.

Tested by:

Norman Shpilsher  
Sr. EMC Engineer  
Intertek ETL SEMKO

Signature



Date: February 20, 2004

## 4.0 TEST EQUIPMENT

### Receivers/Spectrum Analyzers and Test Software

DESCRIPTION	SERIAL NO.	LAST CAL	CAL DUE	USED
HP85462A Receiver RF Section	3325A00106	08/03	08/04	X
HP85460A RF Filter Section	3330A00109	08/03	08/04	X
HP85462A Receiver RF Section	3549A00306	01/04	01/05	
HP85460A RF Filter Section	3448A00276	01/04	01/05	
Advantest Spectrum Analyzer R3271A	55050084	06/03	06/04	X
TILE! Instrument Control System	ver. 3.2 W	N/A	N/A	

### Antennas

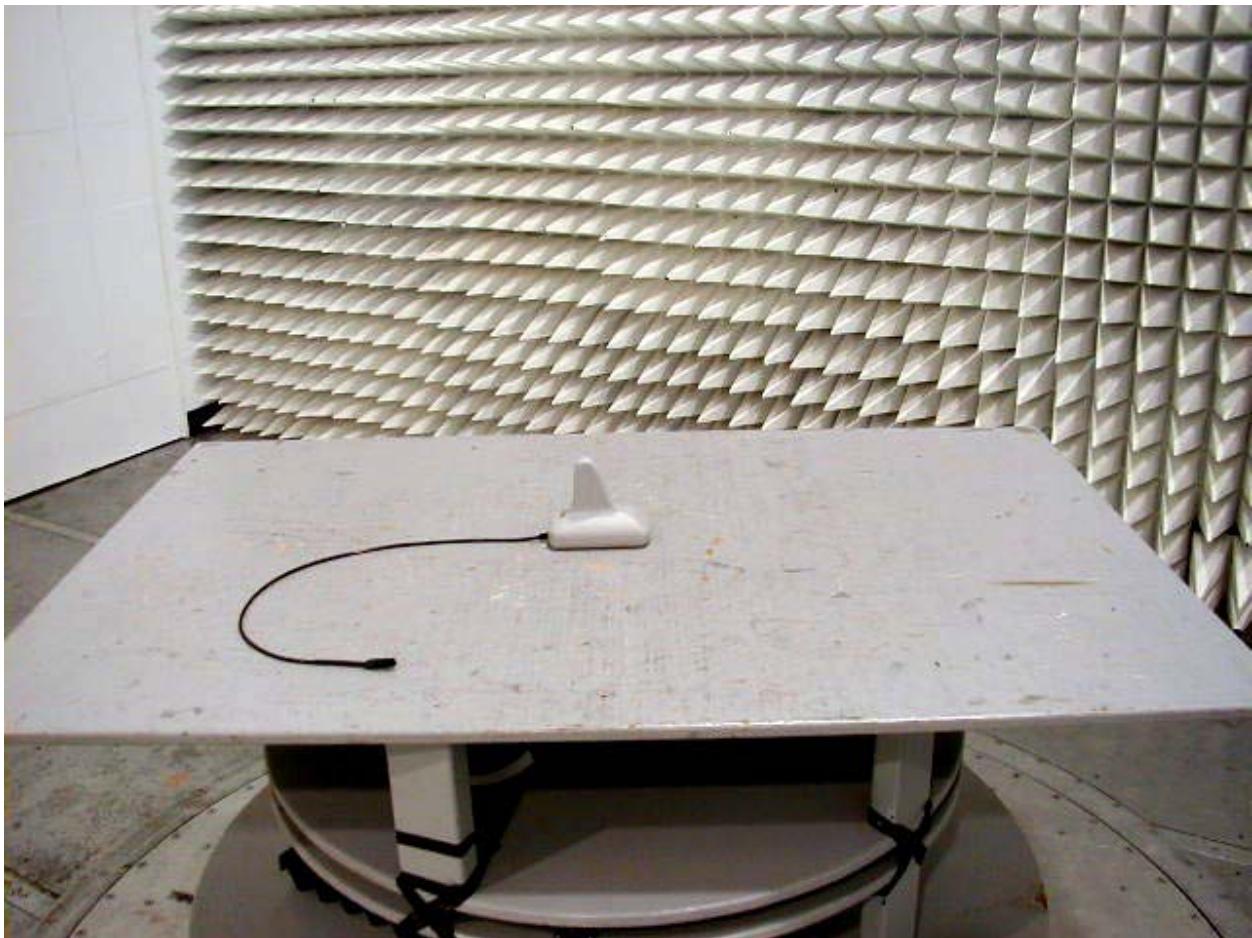
DESCRIPTION	SERIAL NO.	LAST CAL	CAL DUE	USED
Schaffner-Chase Bicono-Log Antenna	2468	01/04	01/05	X
Schaffner-Chase Bicono-Log Antenna	2630	06/03	06/04	
EMCO Horn Antenna 3115	9507-4513	12/03	12/04	
EMCO Horn Antenna 3115	6579	01/04	01/05	X

### Artificial Mains Networks/Absorbing Clamps

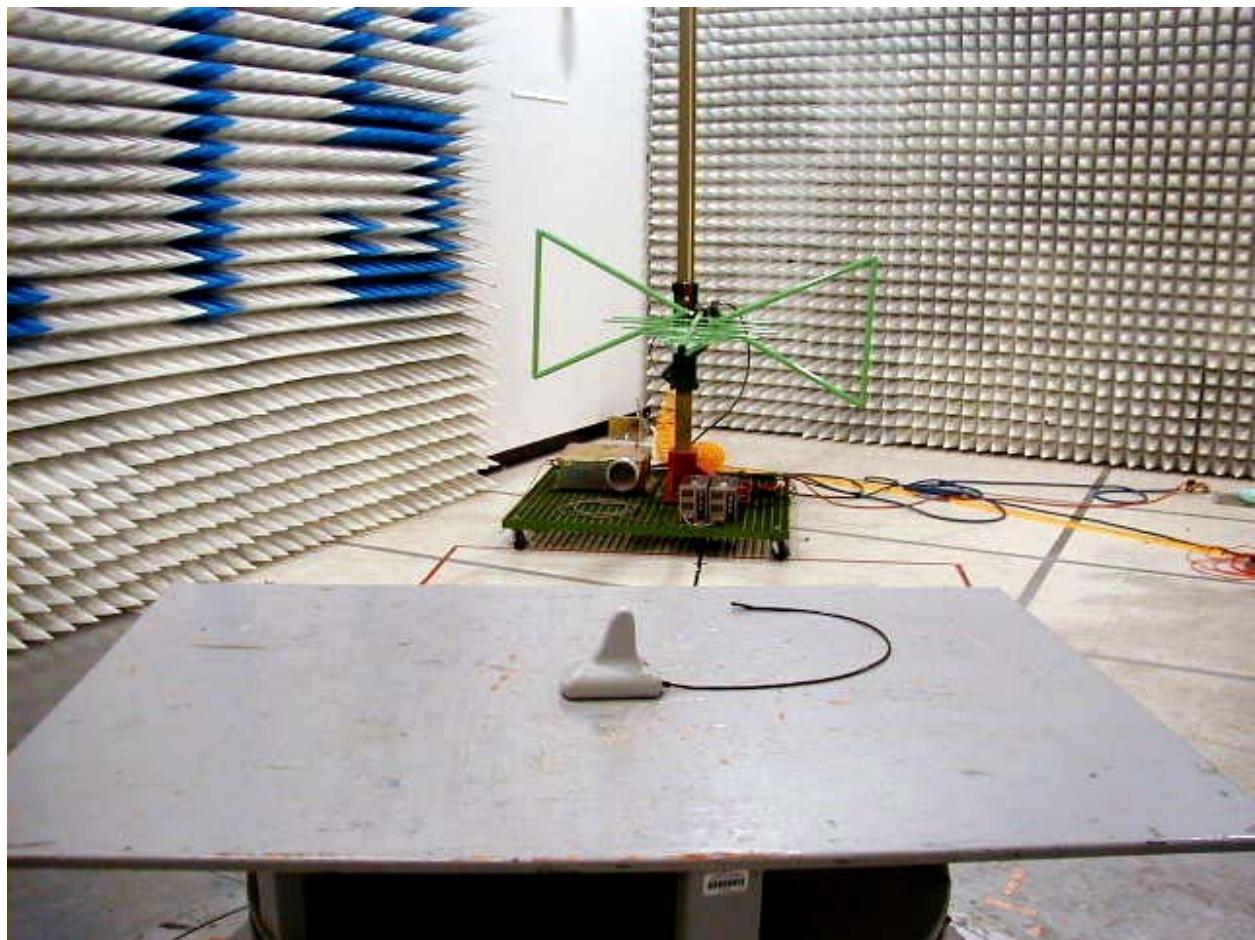
DESCRIPTION	SERIAL NO.	LAST CAL	CAL DUE	USED
FCC LISN-2	316	01/03	01/04	
FCC-LISN-50-25-2	2014	06/03	06/04	

**EXHIBIT 1**

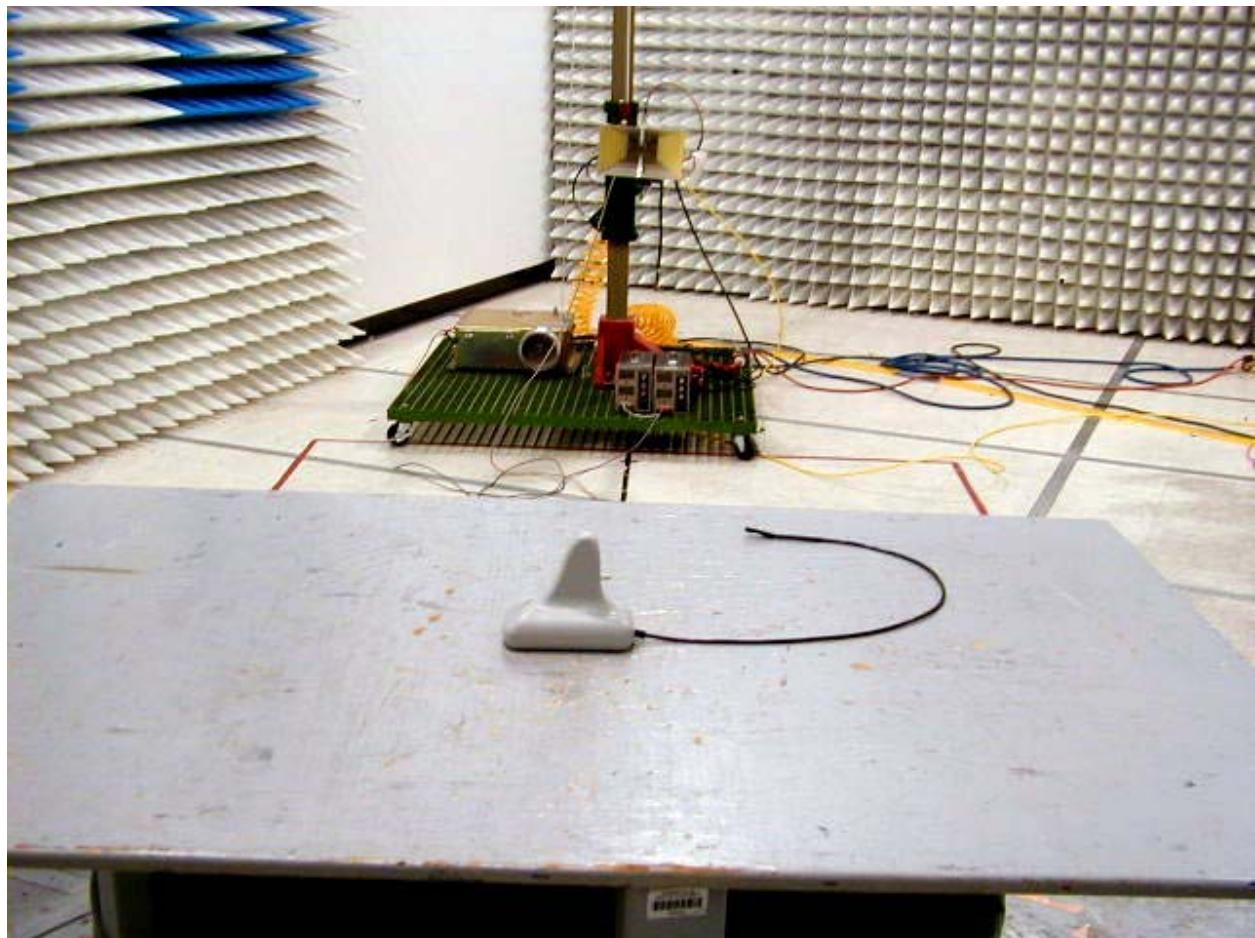
**RADIATED EMISSIONS  
CONFIGURATION PHOTOS**



Radiated Emissions Test Configuration



Radiated Emissions Test Configuration



Radiated Emissions Test Configuration