# ENGINEERING TEST REPORT

## MESDUO
## Model No.: MES250/2

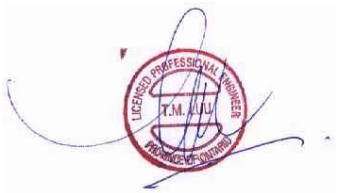
**FCC ID: OA4MES250**

*Applicant:* **Safeguards Technology, LLC.**
*75 Atlantic Street*
*Hackensack, New Jersey*
*USA, 07601-4132*

***In Accordance With***

**FEDERAL COMMUNICATIONS COMMISSION (FCC)**
**PART 15, SUBPART C, SEC. 15.245**
**Field Disturbance Sensors**
**Operating in the frequency band 10500 - 10550 MHz**

**UltraTech's File No.: SFGT-001FCC245**

| | |
|---|---|
| This Test report is Issued under the Authority of<br>Tri M. Luu, Professional Engineer,<br>Vice President of Engineering<br>UltraTech Group of Labs<br><br>Date: February 24, 2009 |  |
| Report Prepared by: Santhosh Fernandez<br><br>Issued Date: February 24, 2009 | Tested by: Mr. Wei Wu and Satish Patel, EMI/RFI Technicians<br><br>Test Dates: August 13, November 24 and December 1, 2008 |

- *The results in this Test Report apply only to the sample(s) tested, and the sample tested is randomly selected.*
- *This report must not be used by the client to claim product endorsement by NVLAP or any agency of the US Government.*


**UltraTech**

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- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

# EXHIBIT 1. INTRODUCTION

## 1.1. SCOPE

| | |
|---|---|
| **Reference:** | FCC Part 15, Subpart C, Section 15.245 |
| **Title** | Telecommunication - Code of Federal Regulations, CFR 47, Part 15 |
| **Purpose of Test:** | To gain FCC Certification Authorization for Low Power Transmitters operating in the Frequency Band 10500-10550 MHz . |
| **Test Procedures** | Both conducted and radiated emissions measurements were conducted in accordance with American National Standards Institute ANSI C63.4 - American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz. |
| **Environmental Classification:** | • Commercial, industrial or business environment |

## 1.2. RELATED SUBMITAL(S)/GRANT(S)

None

## 1.3. NORMATIVE REFERENCES

| | | |
|---|---|---|
| FCC CFR Parts 0-19 | 2008 | Code of Federal Regulations – Telecommunication |
| ANSI C63.4 | 2003 | American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz |
| CISPR 22<br><br>EN 55022 | 2008-09, Edition 6.0<br>2006 | Information Technology Equipment - Radio Disturbance Characteristics - Limits and Methods of Measurement |
| CISPR 16-1-1<br>+A1<br>+A2 | 2006<br>2006<br>2007 | Specification for radio disturbance and immunity measuring apparatus and methods.<br>Part 1-1: Measuring Apparatus |
| CISPR 16-1-2<br>+A1: 2004<br>+A2: 2006 | 2003 | Specification for radio disturbance and immunity measuring apparatus and methods.<br>Part 1-2: Conducted disturbances |

# EXHIBIT 2. PERFORMANCE ASSESSMENT

## 2.1. CLIENT INFORMATION

| **APPLICANT**: | |
|---|---|
| **Name:** | Safeguards Technology, LLC. |
| **Address:** | 75 Atlantic Street<br>Hackensack, New Jersey<br>USA, 07601 |
| **Contact Person:** | Mr. Haim Perry<br>Phone #:201-488-1022<br>Fax #: 20-488-1244<br>Email Address: haimperry@safeguards.com |

| **MANUFACTURER:** | |
|---|---|
| **Name:** | SICURIT ALARMITALIA SPA |
| **Address:** | VIA GADAMES 91<br>MILAN<br>ITALY, 20151 |
| **Contact Person:** | SEBASTIANO VENTO<br>Phone #: 0039 02 380701<br>Fax #: 0039 02 3088067<br>Email Address: EXPORT@SICURIT.IT |

## 2.2. EQUIPMENT UNDER TEST (EUT) INFORMATION

The following information (with the exception of the Date of Receipt) has been supplied by the applicant.

| | |
|---|---|
| **Brand Name** | SICURIT |
| **Product Name** | MESDUO |
| **Model Name or Number** | MES250/2 |
| **Serial Number** | Test Sample |
| **Type of Equipment** | Field Disturbance Sensor |
| **Input Power Supply Type** | 13.8Vdc |
| **Primary User Functions of EUT:** | Dual microwave barrier to detect presence of bodies moving inside an area between transmit and receive units of this device. |

## 2.3. EUT'S TECHNICAL SPECIFICATIONS

| TRANSMITTER | |
|---|---|
| **Equipment Type:** | Fixed |
| **Intended Operating Environment:** | Commercial, light industry & heavy industry |
| **Power Supply Requirement:** | 13.8Vdc |
| **RF Output Power Rating:** | 127.97 dBuV/m Peak @3m |
| **Operating Frequency Range:** | 10525.5-10529.5 MHz |
| **RF Output Impedance:** | 50 Ohms |
| **Channel Spacing:** | N/A |
| **Duty Cycle:** | 50.7% |
| **20 dB Bandwidth:** | 1.423MHz |
| **Modulation Type:** | On-Off Keying (Pulse Keying 50%) |
| **Antenna Connector Type:** | • Integral |
| **Antenna Description:** | Manufacturer: ALTEC SRL<br>Type: Parabolic<br>Model:20CATXC0009<br>Frequency Range: 10.500 – 10.600 GHz<br>In/Out Impedance: 50 Ohms<br>Gain: 24dBi |

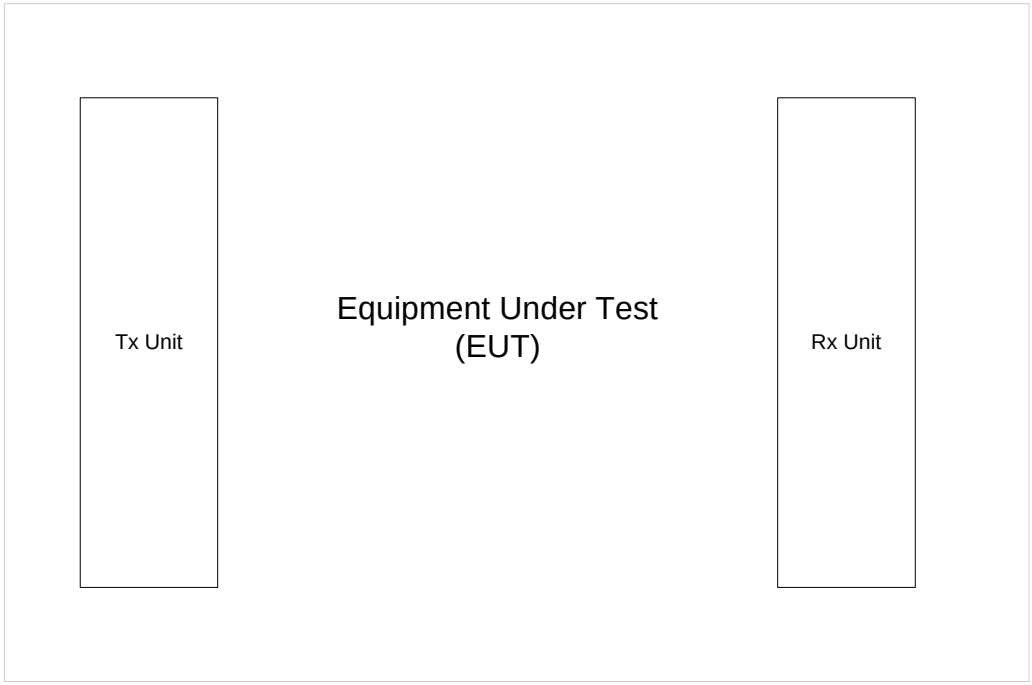
## 2.4. LIST OF EUT'S PORTS

None

## 2.5. ANCILLARY EQUIPMENT

None

## 2.6. GENERAL TEST SETUP






- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

# EXHIBIT 3. EUT OPERATING CONDITIONS AND CONFIGURATIONS DURING TESTS

## 3.1. CLIMATE TEST CONDITIONS

The climate conditions of the test environment are as follows:

| | |
|---|---|
| Temperature: | 21°C |
| Humidity: | 51% |
| Pressure: | 102 kPa |
| Power input source: | 13.8Vdc |

## 3.2. OPERATIONAL TEST CONDITIONS & ARRANGEMENT FOR TESTS

| | |
|---|---|
| **Operating Modes:** | EUT was configured and operated in the normal mode to transmit. |
| **Special Test Software:** | None |
| **Special Hardware Used:** | None |
| **Transmitter Test Antenna:** | The EUT is tested with the antenna fitted in a manner typical of normal intended use as integral antenna equipment. |

| **Transmitter Test Signals:** | |
|---|---|
| **Frequencies:**<br>▪ 10500 - 10550 MHz band: | Lowest, middle and highest channel frequencies tested:<br>10525.5,10527.3 and 10529.5 MHz |
| **Transmitter Wanted Output Test Signals:**<br>▪ RF Power Output (measured maximum output power):<br>▪ Normal Test Modulation<br>▪ Modulating signal source: | <br>▪ 127.97 dBuV/m Peak @3m<br>▪ On-Off Keying (Pulse Keying 50%)<br>▪ Internal |

Note: The EUT was tested with 3 different antennas to obtain the above three frequencies.

# EXHIBIT 4. SUMMARY OF TEST RESULTS

## 4.1. LOCATION OF TESTS

All of the measurements described in this report were performed at Ultratech Group of Labs located in the city of Oakville, Province of Ontario, Canada.

- AC Powerline Conducted Emissions were performed in UltraTech's shielded room, 16'(L) by 12'(W) by 12'(H).

- Radiated Emissions were performed at the Ultratech's 3-10 TDK Semi-Anechoic Chamber situated in the Town of Oakville, province of Ontario. This test site been calibrated in accordance with ANSI C63.4, and found to be in compliance with the requirements of Sec. 2.948 of the FCC Rules. The descriptions and site measurement data of the Oakville 3-10 TDK Semi-Anechoic Chamber has been filed with FCC office (FCC File No.: 31040/SIT 1300B3) and Industry Canada office (Industry Canada File No.: IC2049A-3, Expiry Date: May 17, 2009).

## 4.2. APPLICABILITY & SUMMARY OF EMC EMISSION TEST RESULTS

| FCC PARAGRAPH. | TEST REQUIREMENTS | COMPLIANCE (YES/NO) |
|---|---|---|
| 15.203 | Antenna Requirement | Yes. Permanently attached parabolic antenna. |
| 15.207(a) | Power Line Conducted Emissions Measurements (Transmit & Receive) | Yes |
| 15.245 (b) | Radiated Emissions, Fundamental | Yes |
| 15.245 (b) (1) | Radiated Emissions, Harmonics | Yes |
| 15.245 (b) (3) & 15.209 | Radiated Emissions, Outside specified band 30 MHz to 53 GHz | Yes |
| The digital circuit portion of the EUT has been tested and verified to comply with FCC Part 15, Subpart B, Class B Digital Devices. The engineering test report can be provided upon FCC requests. | | |

## 4.3. MODIFICATIONS INCORPORATED IN THE EUT FOR COMPLIANCE PURPOSES

None



- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

# EXHIBIT 5. MEASUREMENTS, EXAMINATIONS & TEST DATA FOR EMC EMISSIONS

## 5.1. TEST PROCEDURES

This section contains test results only. Details of test methods and procedures can be found in ANSI C63.4 and ULTR-P001-2004.

## 5.2. MEASUREMENT UNCERTAINTIES

The measurement uncertainties stated were calculated in accordance with requirements of UKAS Document LAB 34 with a confidence level of 95%. Please refer to Exhibit 6 for Measurement Uncertainties.

## 5.3. MEASUREMENT EQUIPMENT USED:

The measurement equipment used complied with the requirements of the Standards referenced in the Methods & Procedures ANSI C63.4 and CISPR 16-1.

# 5.4. POWERLINE CONDUCTED EMISSIONS @ FCC PART 15, SUBPARTS B & C, PARA.15.107(A) & 15.207

## 5.4.1. Limits

The equipment shall meet the limits of the following table:

| | CLASS B LIMITS | | |
|---|---|---|---|
| **Test Frequency Range (MHz)** | **Quasi-Peak (dBµV)** | **Average* (dBµV)** | **Measuring Bandwidth** |
| 0.15 to 0.5 | 66 to 56* | 56 to 46* | RBW = 9 kHz<br>VBW ≥ 9 kHz for QP<br>VBW = 1 Hz for Average |
| 0.5 to 5 | 56 | 46 | RBW = 9 kHz<br>VBW ≥ 9 kHz for QP<br>VBW = 1 Hz for Average |
| 5 to 30 | 60 | 50 | RBW = 9 kHz<br>VBW ≥ 9 kHz for QP<br>VBW = 1 Hz for Average |

* Decreasing linearly with logarithm of frequency

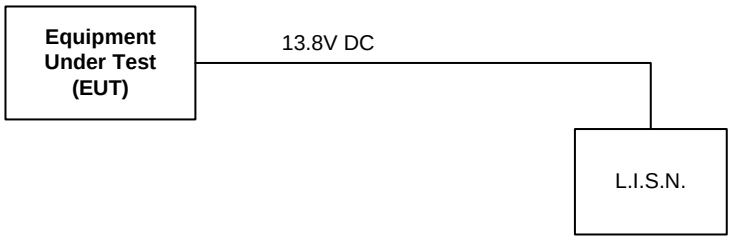
## 5.4.2. Method of Measurements

Refer to Ultratech Test Procedures, File # ULTR P001-2004 and ANSI C63.4 for measurement methods

## 5.4.3. Test Equipment List

| **Test Instruments** | **Manufacturer** | **Model No.** | **Serial No.** | **Frequency Range** |
|---|---|---|---|---|
| EMI Receiver System/Spectrum Analyzer with built-in Amplifier | Hewlett Packard | HP 8546A | 3520A00248 | 9KHz-5.6GHz, 50 Ohms |
| Transient Limiter | Hewlett Packard | 11947A | 310701998 | 9 kHz – 200 MHz<br>10 dB attenuation |
| L.I.S.N. | EMCO | 3825/2 | 89071531 | 9 kHz – 200 MHz<br>50 Ohms / 50 µH |
| 12'x16'x12' RF Shielded Chamber | RF Shielding | … | .. | … |

## 5.4.4. Test Arrangement





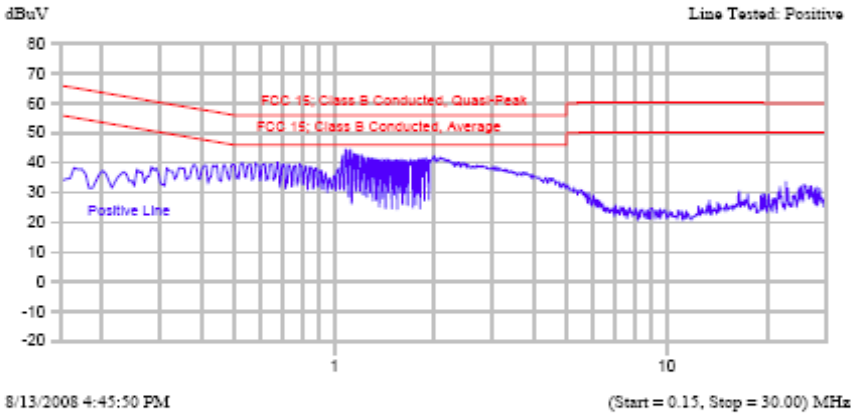

- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

## 5.4.5. Test Data

### *5.4.5.1. Power line Conducted Emissions, Transmit Unit- Positive Line*

Description: Supply Voltage:13.8VDC
Transmmiter Only
Setup Name: FCC 15 Class B
Customer Name: Safeguard Technology Llc
Project Number: SFGT-001Q
Operator Name: Satish
EUT Name: Field Disturbance Sensor

Current Graph



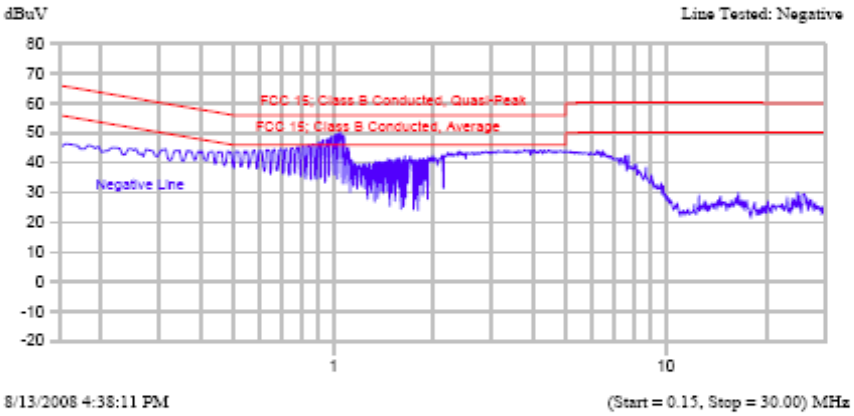

Current List

| Frequency MHz | Peak dBuV | QP dBuV | Delta QP-QP Limit dB | Avg dBuV | Delta Avg-Avg Limit dB | Trace Name |
|---|---|---|---|---|---|---|
| 0.666 | 40.5 | 37.0 | -19.0 | 23.7 | -22.3 | Positive Line |
| 1.095 | 45.1 | 42.2 | -13.8 | 26.3 | -19.7 | Positive Line |
| 1.092 | 45.0 | 42.2 | -13.8 | 26.4 | -19.6 | Positive Line |
| 1.097 | 45.2 | 42.2 | -13.8 | 26.4 | -19.6 | Positive Line |
| 1.135 | 44.5 | 41.5 | -14.5 | 26.1 | -19.9 | Positive Line |
| 1.994 | 41.9 | 38.5 | -17.5 | 25.1 | -20.9 | Positive Line |
| 22.793 | 34.9 | 25.0 | -35.0 | 16.2 | -33.8 | Positive Line |

### *5.4.5.2. Power line Conducted Emissions, Transmit Unit- Negative Line*

Description: Supply Voltage:13.8VDC
Transmmiter Only
Setup Name: FCC 15 Class B
Customer Name: Safeguard Technology Llc
Project Number: SFGT-001Q
Operator Name: Satish
EUT Name: Field Disturbance Sensor

Current Graph



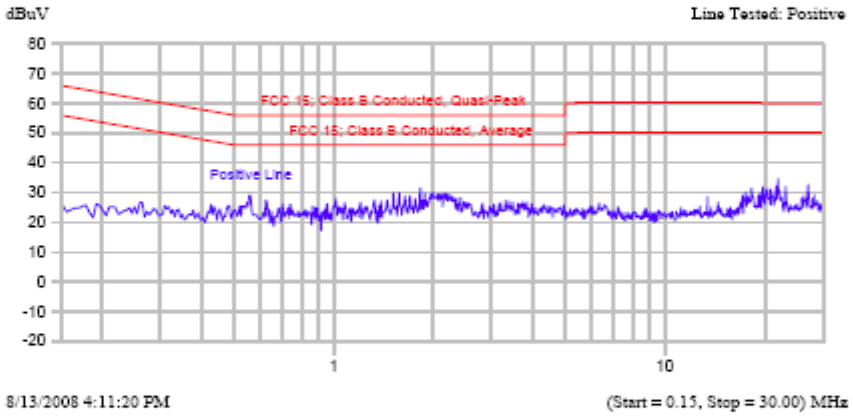

Current List

| Frequency MHz | Peak dBuV | QP dBuV | Delta QP-QP Limit dB | Avg dBuV | Delta Avg-Avg Limit dB | Trace Name |
|---|---|---|---|---|---|---|
| 0.552 | 44.6 | 41.7 | -14.3 | 28.1 | -17.9 | Negative Line |
| 0.761 | 45.5 | 42.8 | -13.2 | 27.6 | -18.4 | Negative Line |
| 1.053 | 50.7 | 47.8 | -8.2 | 31.1 | -14.9 | Negative Line |
| 1.056 | 50.2 | 47.7 | -8.3 | 30.8 | -15.2 | Negative Line |
| 1.060 | 50.2 | 47.5 | -8.5 | 30.7 | -15.3 | Negative Line |
| 1.084 | 47.8 | 45.2 | -10.8 | 29.0 | -17.0 | Negative Line |
| 2.429 | 43.8 | 40.7 | -15.3 | 25.3 | -20.7 | Negative Line |
| 6.047 | 43.3 | 40.3 | -19.7 | 25.0 | -25.0 | Negative Line |

### *5.4.5.3. Power line Conducted Emissions, Receive Unit- Positive Line*

Description: Supply Voltage:13.8VDC
Receiver Only
Setup Name: FCC 15 Class B
Customer Name: Safeguard Technology Llc
Project Number: SFGT-001Q
Operator Name: Satish
EUT Name: Field Disturbance Sensor

Current Graph



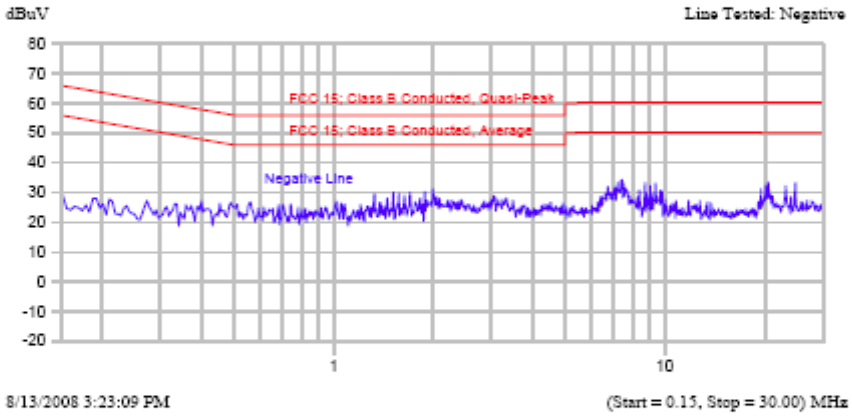

Current List

| Frequency MHz | Peak dBuV | QP dBuV | Delta QP-QP Limit dB | Avg dBuV | Delta Avg-Avg Limit dB | Trace Name |
|---|---|---|---|---|---|---|
| 1.811 | 31.9 | 28.9 | -27.1 | 26.1 | -19.9 | Positive Line |
| 18.244 | 34.4 | 29.5 | -30.5 | 23.9 | -26.1 | Positive Line |
| 21.936 | 35.1 | 32.9 | -27.1 | 24.9 | -25.1 | Positive Line |
| 27.035 | 26.6 | 22.1 | -37.9 | 11.4 | -38.6 | Positive Line |

### *5.4.5.4. Power line Conducted Emissions, Receive Unit- Negative Line*

Description: Supply Voltage:13.8 V DC
Configuration: Receiver Only
Setup Name: FCC 15 Class B
Customer Name: Safeguards Technology Llc
Project Number: SFGT-001Q
Operator Name: Satish
EUT Name: Field Disturbance Sensor

Current Graph




Current List

| Frequency MHz | Peak dBuV | QP dBuV | Delta QP-QP Limit dB | Avg dBuV | Delta Avg-Avg Limit dB | Trace Name |
|---|---|---|---|---|---|---|
| 1.997 | 31.7 | 27.8 | -28.2 | 23.8 | -22.2 | Negative Line |
| 7.373 | 37.2 | 34.4 | -25.6 | 28.7 | -21.3 | Negative Line |
| 8.694 | 35.1 | 33.0 | -27.0 | 32.3 | -17.7 | Negative Line |
| 9.029 | 29.5 | 24.2 | -35.8 | 19.1 | -30.9 | Negative Line |
| 9.353 | 34.0 | 31.9 | -28.1 | 29.7 | -20.3 | Negative Line |
| 20.466 | 36.4 | 34.4 | -25.6 | 31.1 | -18.9 | Negative Line |
| 23.128 | 35.5 | 31.9 | -28.1 | 26.0 | -24.0 | Negative Line |
| 24.763 | 34.5 | 31.4 | -28.6 | 27.4 | -22.6 | Negative Line |

## 5.5. 20 DB BANDWIDTH @ FCC 15.215(C)

### 5.5.1. Limits

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§ 15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

### 5.5.2. Method of Measurements

Refer to ANSI C63.4

### 5.5.3. Test Equipment List

| Test Instruments | Manufacturer | Model No. | Serial No. | Frequency Range |
|---|---|---|---|---|
| Spectrum Analyzer/ EMI Receiver | Rohde & Schawrz | FSEK20/B4/B21 | 834157/005 | 9 kHz – 40 GHz with external mixer |
| Horn Antenna | EMCO | 3155 | 9701-5061 | 1 GHz – 18 GHz |

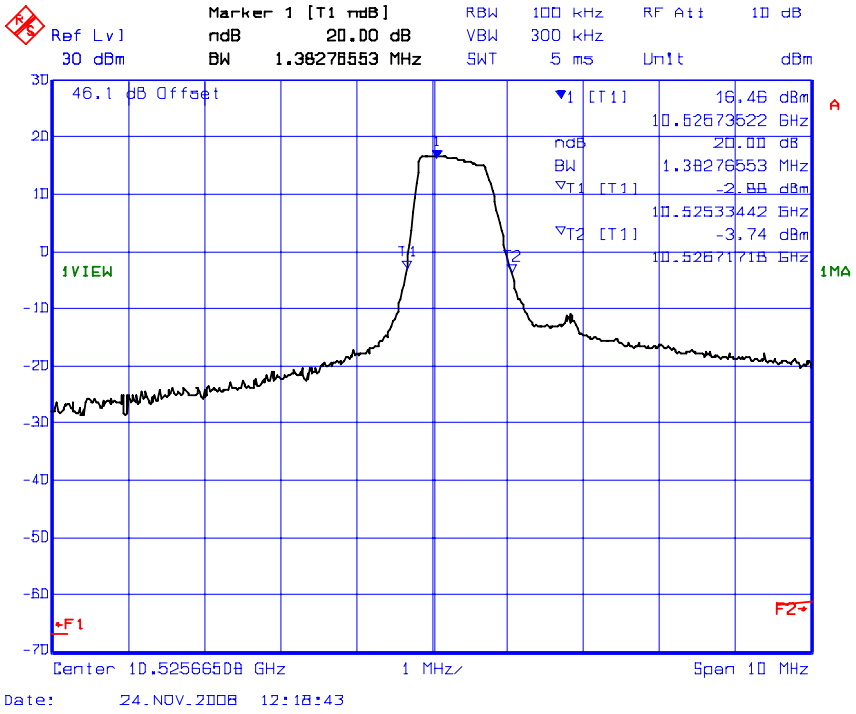
### 5.5.4. Test Data

| CHANNEL FREQUENCY (MHz) | 20dB Bandwidth (MHz) |
|---|---|
| 10525.67 | 1.3828 |
| 10527.51 | 1.4028 |
| 10529.47 | 1.4228 |

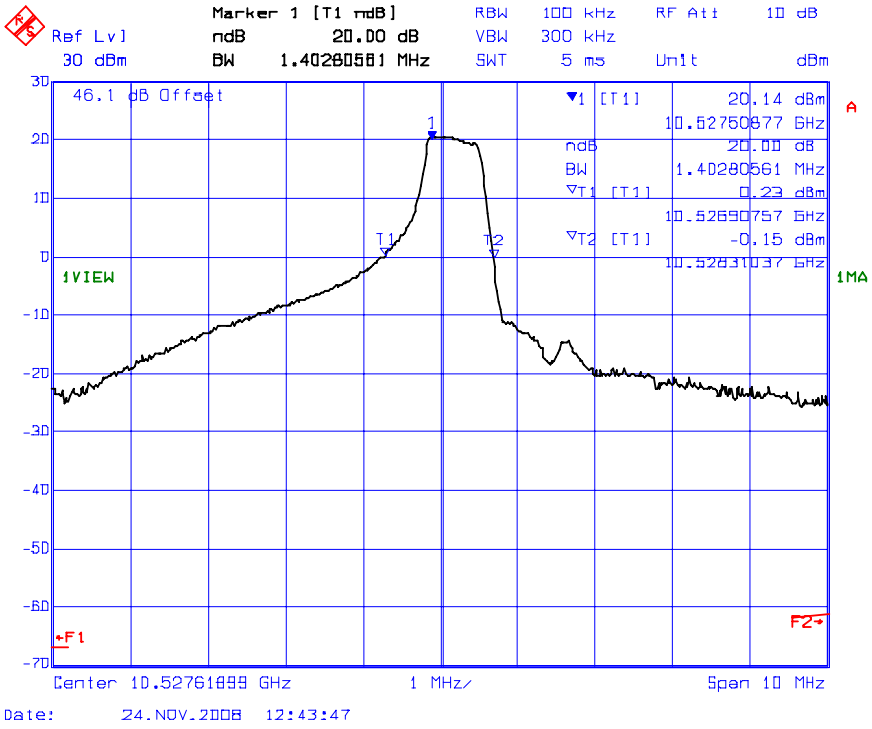
Please refer to Plots # 1to 3 for Measurements data

### 5.5.5. Test Arrangement

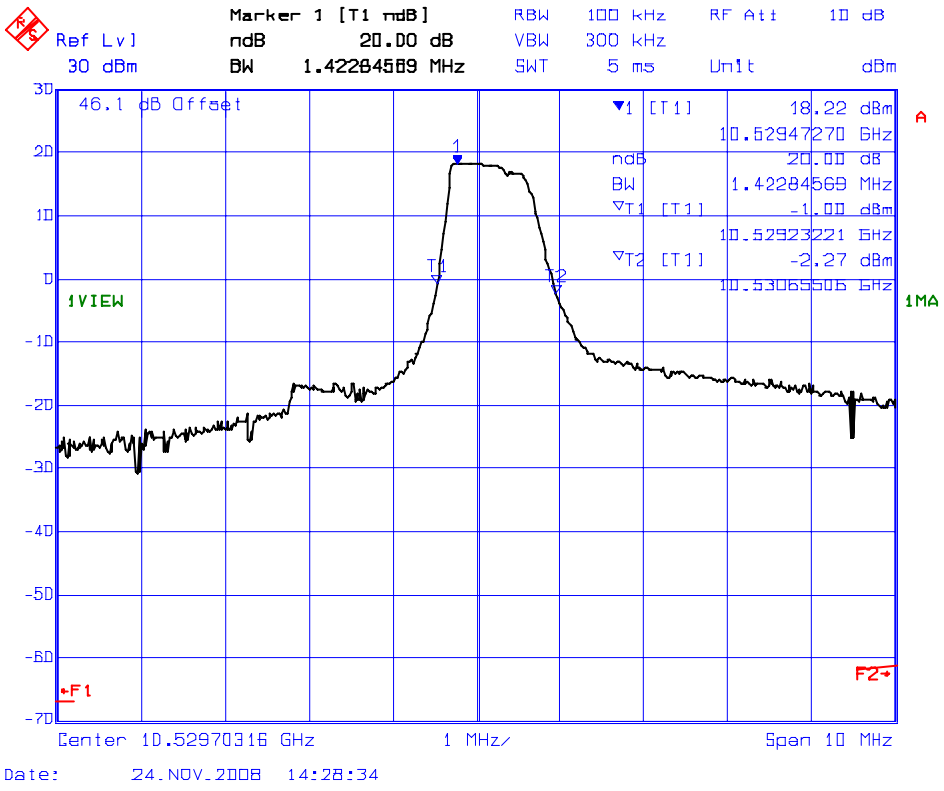
### *5.5.5.1. Plot#1 - Antenna #1 Configuration: 20dB Bandwidth*



### *5.5.5.2. Plot#2 - Antenna #2 Configuration: 20dB Bandwidth*



### *5.5.5.3. Plot#3 - Antenna #3 Configuration: 20dB Bandwidth*






- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

# 5.6. RADIATED EMISSIONS, FUNDAMENTAL AND HARMONICS @ 15.245 (B)

## 5.6.1. Limits

The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

| Fundamental Frequency (MHz) | Field Strength of Fundamental @ 3m | | Field Strength of Harmonics @ 3m | |
|---|---|---|---|---|
| | (millivolts/meter) | (dBµV/m) | (millivolts/meter) | (dBµV/m) |
| 10500 - 10550 | 2500 | 127.96 | 25.0 | 87.95 |

Regardless of the limits shown in the above table, harmonic emissions in the restricted bands below 17.7 GHz, as specified in § 15.205, shall not exceed the field strength limits shown in § 15.209. Harmonic emissions in the **restricted bands at and above 17.7 GHz** shall not exceed the following field strength limits:
(i) For the second and third harmonics of field disturbance sensors operating in the 24075-24175 MHz band and for other field disturbance sensors designed for use only within a building or to open building doors, 25.0 mV/m @ 3m.
(ii) For all other field disturbance sensors, **7.5 mV/m (77.5 dBµV/m) @ 3m**.

## 5.6.2. Method of Measurements

Refer to ANSI C63.4

## 5.6.3. Test Equipment List

| Test Instruments | Manufacturer | Model No. | Serial No. | Frequency Range |
|---|---|---|---|---|
| Spectrum Analyzer/ EMI Receiver | Rohde & Schawrz | FSEK20/B4/B21 | 834157/005 | 9 kHz – 40 GHz with external mixer |
| Microwave Amplifier | Hewlett Packard | HP 83017A | | 1 GHz to 26.5 GHz |
| Microwave Amplifier | Spacek Labs | SLKKa-30-6 | 6A10 | 18-40GHz |
| Biconilog Antenna | EMCO | 3143 | 1029 | 20 MHz to 2 GHz |
| Horn Antenna | ETS | 3115 | 5955 | 1 GHz – 18 GHz |
| Horn Antenna | EMCO | 3160-09 | 1007 | 18 GHz – 26.5 GHz |
| Horn Antenna | EMCO | 3160-10 | 1001 | 26.5 GHz – 40 GHz |
| Horn Antenna & Mixer | OML | WR-19 | U30625-1 | 40 –60 GHz |
| Co-axial cable (4m) | Micro-Coax | P/N: MKR250-A-0-1574-200200 | 210275-001 | DC-40GHz |

## 5.6.4. Test Arrangement




- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

### 5.6.5. Test Data

**Fundamental and Harmonics of Antenna #1**

| Frequency (MHz) | RF Peak Level (dBµV/m) | Duty Cycle (%) | RF Avg Level (dBµV/m) | Antenna Plane (H/V) | Limit@ 3m 15.245 (dBµV/m) | Margin (dB) | Pass/ Fail |
|---|---|---|---|---|---|---|---|
| 10525.541 | 127.97 | 50.7 | 122.07 | V | 127.96 | -5.9 | Pass |
| 10525.541 | 107.54 | 50.7 | 101.64 | H | 127.96 | -26.3 | Pass |
| 21051.480 | 76.38 | 50.7 | 70.48 | V | 77.5 | -7.0 | Pass |
| 21051.480 | 73.87 | 50.7 | 67.97 | H | 77.5 | -9.5 | Pass |
| 31577.907 | 75.65 | 50.7 | 69.75 | V | 77.5 | -7.8 | Pass |
| 31577.907 | 73.52 | 50.7 | 67.62 | H | 77.5 | -9.9 | Pass |

**Fundamental and Harmonics of Antenna #2**

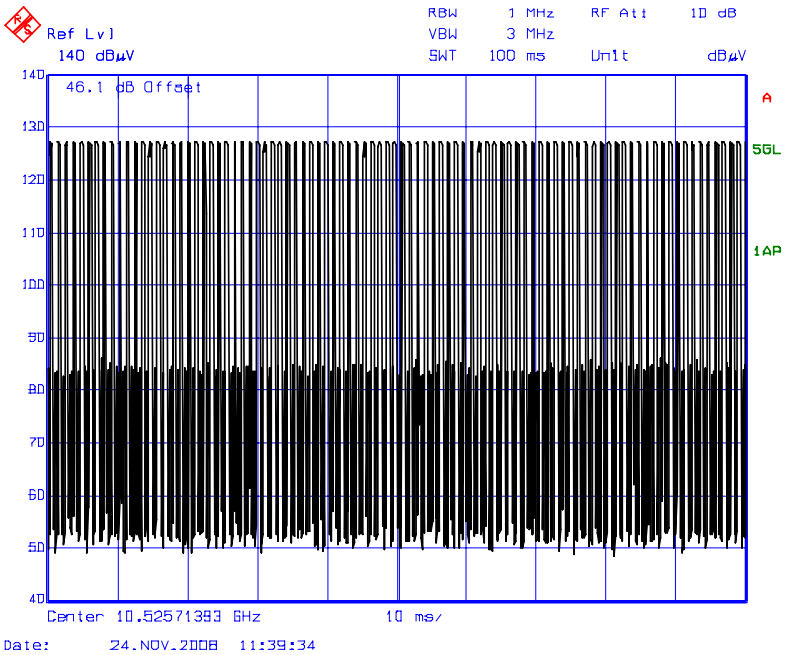
| Frequency (MHz) | RF Peak Level (dBµV/m) | Duty Cycle (%) | RF Avg Level (dBµV/m) | Antenna Plane (H/V) | Limit@ 3m 15.245 (dBµV/m) | Margin (dB) | Pass/ Fail |
|---|---|---|---|---|---|---|---|
| 10527.270 | 126.57 | 50.7 | 120.67 | V | 127.96 | -7.3 | Pass |
| 10527.270 | 108.10 | 50.7 | 102.20 | H | 127.96 | -25.8 | Pass |
| 21055.674 | 77.86 | 50.7 | 71.96 | V | 77.5 | -5.5 | Pass |
| 21055.674 | 74.78 | 50.7 | 68.88 | H | 77.5 | -8.6 | Pass |
| 31587.380 | 79.68 | 50.7 | 73.78 | V | 77.5 | -3.7 | Pass |
| 31587.380 | 79.16 | 50.7 | 73.26 | H | 77.5 | -4.2 | Pass |

**Fundamental and Harmonics of Antenna #3**

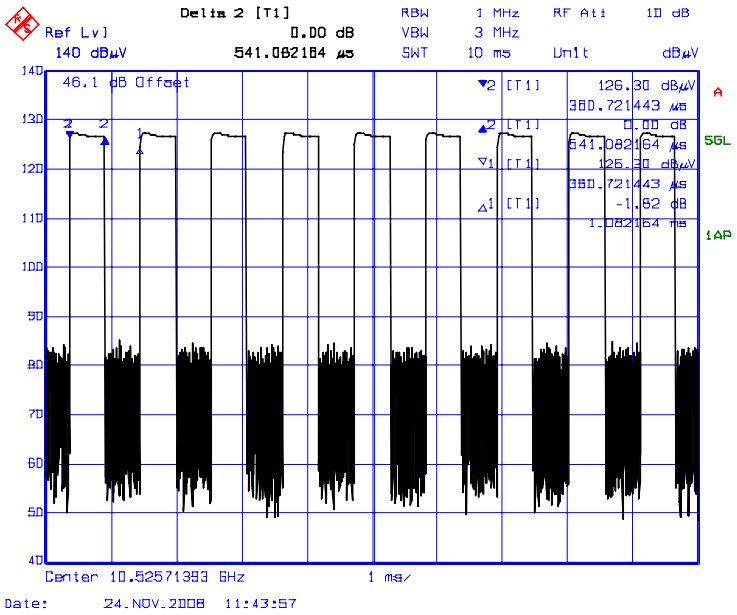
| Frequency (MHz) | RF Peak Level (dBµV/m) | Duty Cycle (%) | RF Avg Level (dBµV/m) | Antenna Plane (H/V) | Limit@ 3m 15.245 (dBµV/m) | Margin (dB) | Pass/ Fail |
|---|---|---|---|---|---|---|---|
| 10529.509 | 126.24 | 50.7 | 120.34 | V | 127.96 | -7.6 | Pass |
| 10529.509 | 106.07 | 50.7 | 100.17 | H | 127.96 | -27.8 | Pass |
| 21059.431 | 73.76 | 50.7 | 67.86 | V | 77.5 | -9.6 | Pass |
| 21059.431 | 74.72 | 50.7 | 68.82 | H | 77.5 | -8.7 | Pass |
| 31590.603 | 71.57 | 50.7 | 65.67 | V | 77.5 | -11.8 | Pass |
| 31590.603 | 71.71 | 50.7 | 65.81 | H | 77.5 | -11.7 | Pass |

## 5.6.6. Duty Cycle Analysis

### *5.6.6.1. 100ms time Plot*



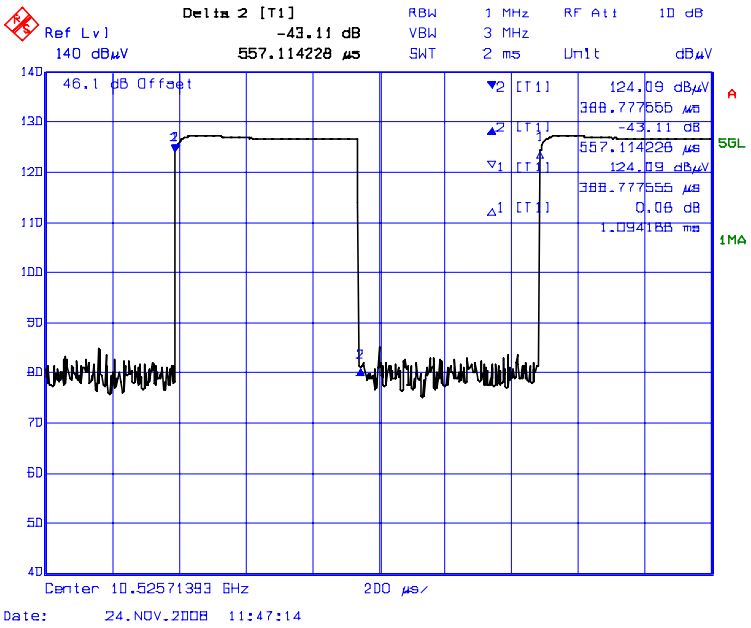

### *5.6.6.2. 10ms time Plot*






- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

### *5.6.6.3. Tx on time Plot*




### *5.6.6.4. Calculation*

Tx on= 91x0.557114228= 50.697ms
Duty cycle=Txon/(Txon+Txoff)= 50.697/100= 0.50697
Duty cycle factor = 20log(0.50697)=-5.9dB

## 5.7. RADIATED EMISSIONS, OUTSIDE SPECIFIED FREQUENCY BAND @ 15.245 (B)(3) AND 15.209

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in Section 15.209, whichever is the lesser attenuation.

### 5.7.1. Method of Measurements

Refer to Ultratech Test Procedures, File # ULTR P001-2004 and ANSI C63.4 for measurement methods

The following measurement procedures were also applied:

- For 30 MHz $\leq$ frequencies $\leq$ 1 GHz: RBW = 100 KHz, VBW $\geq$ 100 KHz, SWEEP=AUTO.
- For frequencies $\geq$ 1 GHz: RBW = 1 MHz, VBW = 1 MHz .
- If the emission is pulsed, modified the unit for continuous operation, then use the settings above for measurements, then correct the reading by subtracting the peak-average correction factor derived from the appropriate duty cycle calculation. See Section 15.35(b) and (c).

### 5.7.2. Test Equipment List

| Test Instruments | Manufacturer | Model No. | Serial No. | Frequency Range |
|---|---|---|---|---|
| Spectrum Analyzer/ EMI Receiver | Rohde & Schawrz | FSEK20/B4/B21 | 834157/005 | 9 kHz – 40 GHz with external mixer |
| Microwave Amplifier | Hewlett Packard | HP 83017A | | 1 GHz to 26.5 GHz |
| Microwave Amplifier | Spacek Labs | SLKKa-30-6 | 6A10 | 18-40GHz |
| Biconilog Antenna | EMCO | 3143 | 1029 | 20 MHz to 2 GHz |
| Horn Antenna | ETS | 3115 | 5955 | 1 GHz – 18 GHz |
| Horn Antenna | EMCO | 3160-09 | 1007 | 18 GHz – 26.5 GHz |
| Horn Antenna | EMCO | 3160-10 | 1001 | 26.5 GHz – 40 GHz |
| Horn Antenna & Mixer | OML | WR-19 | U30625-1 | 40 –60 GHz |
| Co-axial cable (4m) | Micro-Coax | P/N: MKR250-A-0-1574-200200 | 210275-001 | DC-40GHz |

### 5.7.3. Test Arrangement




- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

### 5.7.4. Test Data

The emissions were scanned from 30MHz to 53 GHz and all emissions within 20dB below the limits.

| Frequency (MHz) | RF Level (dBµV/m) | Detector Used (Peak/QP/Avg) | Antenna Plane (H/V) | 3m Limit (dBµV/m) | Margin (dB) | Pass/ Fail |
|---|---|---|---|---|---|---|
| 50.0 | 34.36 | Peak | V | 40.0 | -5.6 | Pass |
| 50.0 | 23.38 | Peak | H | 40.0 | -16.6 | Pass |
| 57.5 | 28.13 | Peak | V | 40.0 | -11.9 | Pass |
| 99.5 | 23.86 | Peak | V | 43.5 | -19.6 | Pass |
| 99.5 | 22.39 | Peak | H | 43.5 | -21.1 | Pass |
| 117.9 | 32.43 | Peak | H | 43.5 | -11.1 | Pass |
| 133.7 | 25.32 | Peak | V | 43.5 | -18.2 | Pass |
| 149.2 | 25.58 | Peak | V | 43.5 | -17.9 | Pass |
| 423.7 | 28.96 | Peak | V | 46.0 | -17.0 | Pass |
| 423.7 | 36.07 | Peak | H | 46.0 | -9.9 | Pass |
| 520.5 | 28.82 | Peak | V | 46.0 | -17.2 | Pass |
| 520.5 | 31.76 | Peak | H | 46.0 | -14.2 | Pass |
| 620.0 | 31.75 | Peak | V | 46.0 | -14.3 | Pass |
| 620.0 | 41.21 | Peak | H | 46.0 | -4.8 | Pass |
| 621.2 | 32.66 | Peak | V | 46.0 | -13.3 | Pass |
| 623.1 | 34.56 | Peak | V | 46.0 | -11.4 | Pass |
| 623.1 | 38.79 | Peak | H | 46.0 | -7.2 | Pass |
| 648.6 | 31.65 | Peak | V | 46.0 | -14.4 | Pass |
| 671.6 | 31.77 | Peak | V | 46.0 | -14.2 | Pass |
| 671.6 | 32.90 | Peak | H | 46.0 | -13.1 | Pass |
| 672.9 | 37.52 | Peak | V | 46.0 | -8.5 | Pass |
| 672.9 | 39.92 | Peak | H | 46.0 | -6.1 | Pass |
| 769.9 | 33.47 | Peak | V | 46.0 | -12.5 | Pass |
| 769.9 | 32.16 | Peak | H | 46.0 | -13.8 | Pass |
| 822.1 | 31.77 | Peak | V | 46.0 | -14.2 | Pass |
| 822.1 | 39.35 | Peak | H | 46.0 | -6.7 | Pass |
| 871.9 | 35.98 | Peak | V | 46.0 | -10.0 | Pass |
| 871.9 | 34.28 | Peak | H | 46.0 | -11.7 | Pass |
| 919.0 | 33.35 | Peak | V | 46.0 | -12.7 | Pass |
| 919.0 | 35.07 | Peak | H | 46.0 | -10.9 | Pass |
| 968.8 | 35.78 | Peak | V | 54.0 | -18.2 | Pass |
| 968.8 | 38.22 | Peak | H | 54.0 | -15.8 | Pass |
| 1019.0 | 44.07 | Peak | H | 54.0 | -9.9 | Pass |
| 1119.0 | 46.42 | Peak | V | 54.0 | -7.6 | Pass |
| 1119.0 | 41.74 | Peak | H | 54.0 | -12.3 | Pass |
| 1271.0 | 48.08 | Peak | V | 54.0 | -5.9 | Pass |
| 1271.0 | 43.22 | Peak | H | 54.0 | -10.8 | Pass |
| 1318.0 | 48.11 | Peak | V | 54.0 | -5.9 | Pass |
| 1318.0 | 47.45 | Peak | H | 54.0 | -6.6 | Pass |
| 1366.0 | 49.61 | Peak | V | 54.0 | -4.4 | Pass |
| 1366.0 | 46.89 | Peak | H | 54.0 | -7.1 | Pass |

Continued …



- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

| Frequency (MHz) | RF Level (dBµV/m) | Detector Used (Peak/QP/Avg) | Antenna Plane (H/V) | 3m Limit (dBµV/m) | Margin (dB) | Pass/ Fail |
|---|---|---|---|---|---|---|
| 1418.0 | 48.14 | Peak | V | 54.0 | -5.9 | Pass |
| 1418.0 | 47.45 | Peak | H | 54.0 | -6.6 | Pass |
| 1442.0 | 46.83 | Peak | V | 54.0 | -7.2 | Pass |
| 1442.0 | 41.13 | Peak | H | 54.0 | -12.9 | Pass |
| 1570.0 | 47.95 | Peak | V | 54.0 | -6.1 | Pass |
| 1570.0 | 43.23 | Peak | H | 54.0 | -10.8 | Pass |
| 1618.0 | 48.71 | Peak | V | 54.0 | -5.3 | Pass |
| 1618.0 | 45.20 | Peak | H | 54.0 | -8.8 | Pass |
| 1765.0 | 47.13 | Peak | V | 54.0 | -6.9 | Pass |
| 1765.0 | 40.96 | Peak | H | 54.0 | -13.0 | Pass |
| 1808.0 | 42.75 | Peak | H | 54.0 | -11.3 | Pass |
| 1869.0 | 43.59 | Peak | H | 54.0 | -10.4 | Pass |

# EXHIBIT 6. MEASUREMENT UNCERTAINTY

The measurement uncertainties stated were calculated in accordance with the requirements of NIST Technical Note 1297 and LAB 34

## 6.1. LINE CONDUCTED EMISSION MEASUREMENT UNCERTAINTY

| CONTRIBUTION (Line Conducted) | PROBABILITY DISTRIBUTION | UNCERTAINTY (dB) | |
|---|---|---|---|
| | | 9-150 kHz | 0.15-30 MHz |
| EMI Receiver specification | Rectangular | ±1.5 | ±1.5 |
| LISN coupling specification | Rectangular | ±1.5 | ±1.5 |
| Cable and Input Transient Limiter calibration | Normal (k=2) | ±0.3 | ±0.5 |
| Mismatch: Receiver VRC $\Gamma_1$ = 0.03<br>LISN VRC $\Gamma_R$ = 0.8(9 kHz) 0.2 (30 MHz)<br>Uncertainty limits 20Log(1±$\Gamma_1\Gamma_R$) | U-Shaped | ±0.2 | ±0.3 |
| System repeatability | Std. deviation | ±0.2 | ±0.05 |
| Repeatability of EUT | -- | -- | -- |
| Combined standard uncertainty | Normal | ±1.25 | ±1.30 |
| Expanded uncertainty U | Normal (k=2) | ±2.50 | ±2.60 |

Sample Calculation for Measurement Accuracy in 450 kHz to 30 MHz Band:

$u_c(y) = \sqrt{\sum_{I=1}^{m} u_i^2(y)} = \pm \sqrt{(1.5^2 + 1.5^2)/3 + (0.5/2)^2 + (0.05/2)^2 + 0.35^2} = \pm 1.30$ dB

$U = 2u_c(y) = \pm 2.6$ dB



- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

## 6.2. RADIATED EMISSION MEASUREMENT UNCERTAINTY

| CONTRIBUTION (Radiated Emissions) | PROBABILITY DISTRIBUTION | UNCERTAINTY (± dB) | |
|---|---|---|---|
| | | 3 m | 10 m |
| Antenna Factor Calibration | Normal (k=2) | ±1.0 | ±1.0 |
| Cable Loss Calibration | Normal (k=2) | ±0.3 | ±0.5 |
| EMI Receiver specification | Rectangular | ±1.5 | ±1.5 |
| Antenna Directivity | Rectangular | +0.5 | +0.5 |
| Antenna factor variation with height | Rectangular | ±2.0 | ±0.5 |
| Antenna phase center variation | Rectangular | 0.0 | ±0.2 |
| Antenna factor frequency interpolation | Rectangular | ±0.25 | ±0.25 |
| Measurement distance variation | Rectangular | ±0.6 | ±0.4 |
| Site imperfections | Rectangular | ±2.0 | ±2.0 |
| Mismatch: Receiver VRC $\Gamma_1 = 0.2$<br>Antenna VRC $\Gamma_R = 0.67$(Bi) 0.3 (Lp)<br>Uncertainty limits $20\text{Log}(1\pm\Gamma_1\Gamma_R)$ | U-Shaped | +1.1<br><br>-1.25 | ±0.5 |
| System repeatability | Std. Deviation | ±0.5 | ±0.5 |
| Repeatability of EUT | | - | - |
| Combined standard uncertainty | Normal | +2.19 / -2.21 | +1.74 / -1.72 |
| Expanded uncertainty U | Normal (k=2) | +4.38 / -4.42 | +3.48 / -3.44 |

Calculation for maximum uncertainty when 3m biconical antenna including a factor of k=2 is used:

$U = 2u_c(y) = 2x(+2.19) = +4.38$ dB And $U = 2u_c(y) = 2x(-2.21) = -4.42$ dB



- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*