## EXHIBIT E: REPORT OF MEASUREMENTS [2.1033(B6)]

# Abbreviated Test Report for FCC ID: FBRKGEN2-EI

# FCC Part 2.1031, Part 15 Subpart C(15.247)

**Report #0600900KF**
**Issued 04/30/06**

# FREQUENCY HOPPING TRANSCEIVER
# MODEL KGEN2EI

Prepared for:

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Final Test Date: April 25, 2006

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## Statements Concerning this Report

**NVLAP Accreditation: NVLAP Lab Code 200129-0**
The scope of AHD accreditation is the conducted emissions, radiated emissions test methods of:

IEC/CISPR 22: Limits and methods measurement of radio disturbance characteristics of information technology equipment.
FCC Method – 47 CFT Part 15 – Digital Devices.
AS/NZS 3548: Electromagnetic Interference – Limits and Methods of Measurement of Information Technology Equipment.
IEC61000-4-2 and Amend.1: ElectroStatic Discharge Immunity
IEC61000-4-5: Surge Immunity

**Test Data:**
This test report contains data included in the scope of the NVLAP accreditation.

**Subcontracted Testing:**
This report contains data recorded at the University of Michigan Radiation Laboratory. The University of Michigan test facility is located at 8501 Beck Road, Belleville, Michigan 48111. This test facility has been fully described and accepted by the FCC and Industry Canada. This facility was utilized to measure emissions occurring at frequencies greater than 6GHz.

**Test Traceability:**
The calibration of all measuring and test equipment and the measured data using this equipment are traceable to the National Institute for Standards and Technology (NIST).

**Limitations on results:**
The test results contained in this report relate only to the Item(s) tested. Any electrical or mechanical modification made to the test item subsequent to the test date shall invalidate the data presented in this report. Any electrical or mechanical modification made to the test item subsequent to this test date shall require an evaluation to verify continued compliance.

**Limitations on copying:**
This report shall not be reproduced, except in full, without the written approval of AHD.

**Limitations of the report:**
This report shall not be used to claim product endorsement by NVLAP, FCC, or any agency of the US Government.

**Statement of Test Results Uncertainty:** Following the guidelines of NAMAS publication NIS81 and NIST Technical Note 1297, the Measurement Uncertainty at a 95% confidence level is determined to be: ± 1.4 dB

# EXHIBIT 1: STATEMENTS OF ATTESTATION

## Statement Attesting to the Accuracy of the Data

The measurements declared in this report were made in accordance with the procedures indicated and the energy levels emitted by this equipment were found to be within the limits applicable.

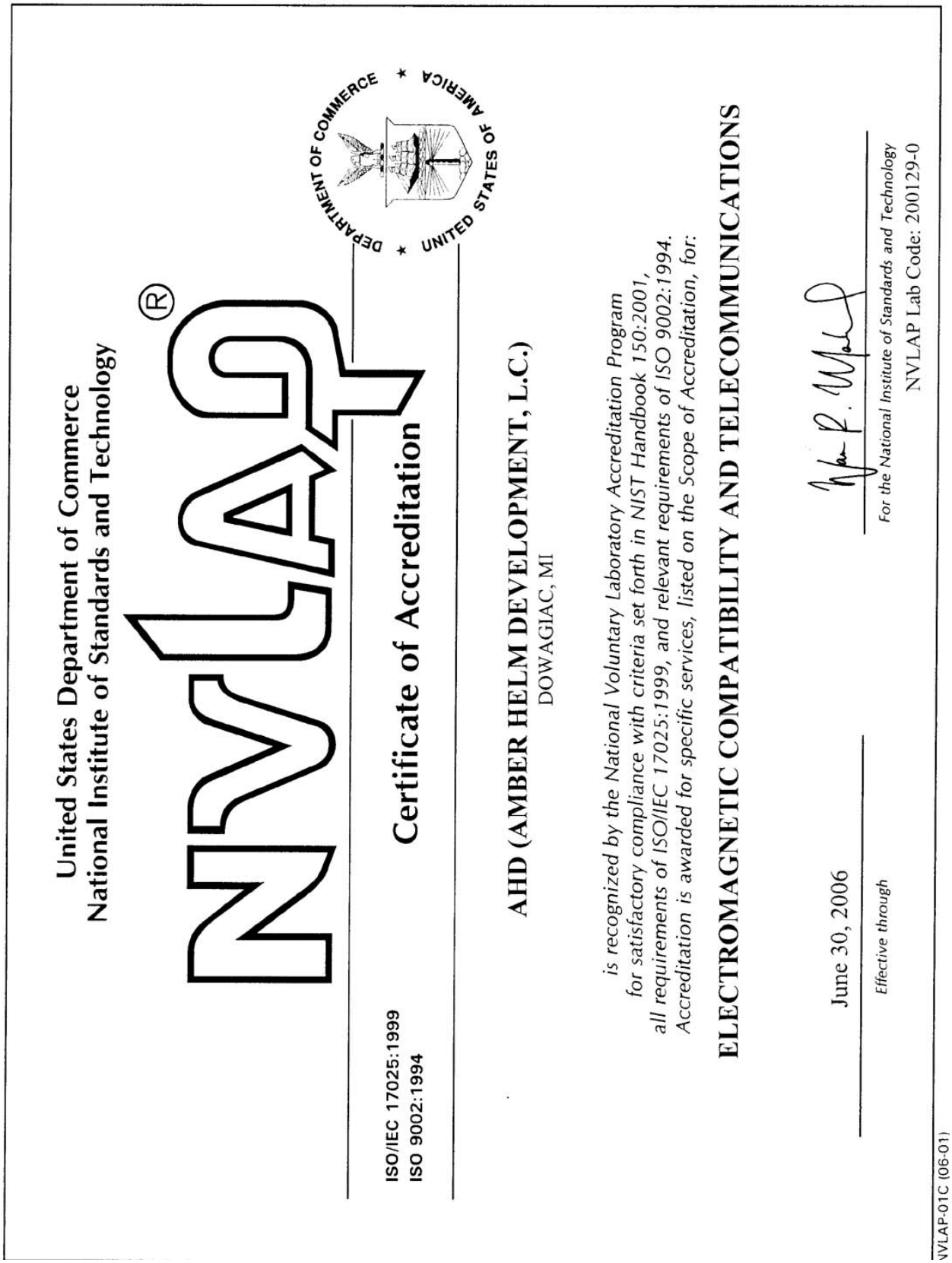
The technical test data reported herein was performed or supervised by a NARTE Certified Engineer at a NVLAP accredited facility who attests to the accuracy of the data presented and whose signature appears below.

On the basis of the measurements made, the equipment tested is capable of operation in compliance with the requirements of Part 15 of the FCC Rules under normal use and maintenance.

signed Gordon L. Helm

Gordon L. Helm, NCE
Technical Lab. Mgr., AHD

## NVLAP Accreditation



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DEPARTMENT OF COMMERCE * UNITED STATES OF AMERICA

Certificate of Accreditation

ISO/IEC 17025:1999
ISO 9002:1994

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DOWAGIAC, MI

*is recognized by the National Voluntary Laboratory Accreditation Program for satisfactory compliance with criteria set forth in NIST Handbook 150:2001, all requirements of ISO/IEC 17025:1999, and relevant requirements of ISO 9002:1994. Accreditation is awarded for specific services, listed on the Scope of Accreditation, for:*

ELECTROMAGNETIC COMPATIBILITY AND TELECOMMUNICATIONS

June 30, 2006
*Effective through*

*For the National Institute of Standards and Technology*
NVLAP Lab Code: 200129-0

NVLAP-01C (06-01)

## Manufacturer/Applicant [2.1033(b1)]

The manufacturer and applicant:

FLEETWOOD GROUP Inc.
P.O. Box 1259
Holland, Michigan 49422-1259

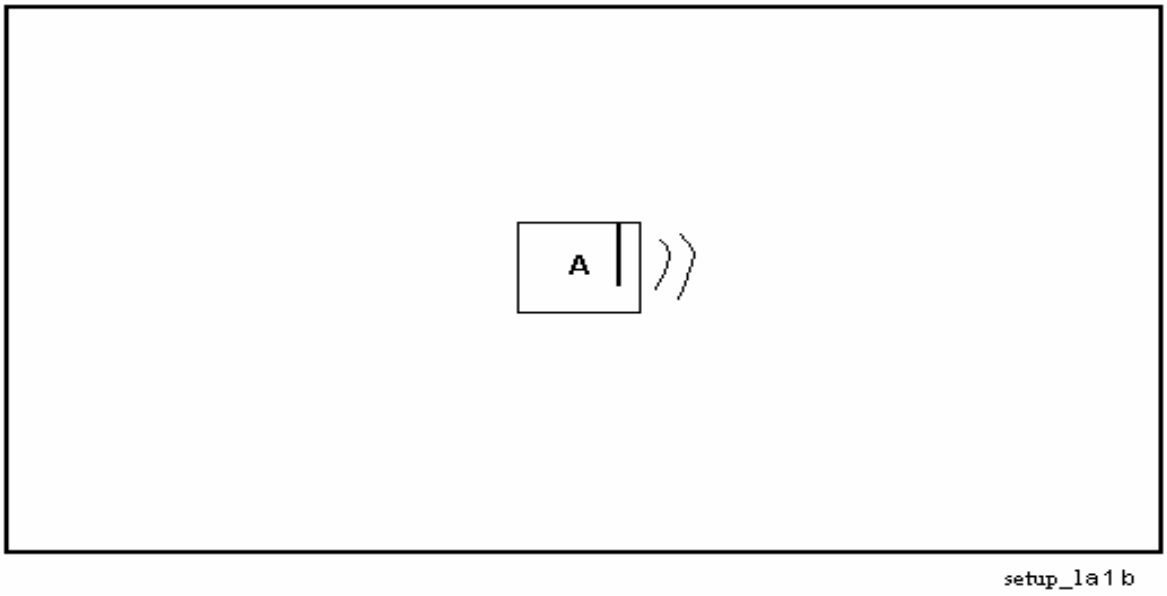
## Tested Configuration /Setup: [2.1033(b8)]

### Support Equipment & Cabling

| Setup Diagram Legend | Description | Model | Serial No. / Part No. | EMC Consideration |
|---|---|---|---|---|
| A | [EUT] Gen2 Keypad Transceiver | [Fleetwood Group] KGEN2EI | preproduction | FCC ID: FBRKGEN2-EI |
| | | | | |

### Setup Diagram

Note: Setup photographs are located in Attached Electronic File, Exhibit E.




BASIC EUT SETUP
(Legend designation is above)

## Summary of Results:

1. This test series evaluated the Equipment Under Test to FCC Part 15, SubPart C.
2. The system tested is compliant to the requirement of CFR 47, FCC Part 15, SubPart C for Frequency Hopping operation in the 2400-2483.5MHz frequency band, ( Part 15.247 ).
3. The equipment under test was received on January 5, 2006 and this test series commenced through April 22, 2006.
4. This model is electrically the similar to previously tested using FCC ID: FBRCRS5200-M. This model differs in the housing shape/color and the indicator LED's are replaced by a LCD display.
5. The product is powered using two AA 1.5vdc batteries. There was no power line conducted evaluation.
6. This submittal presents a complete new set of measurements as evidence of compliance
7. The occupied bandwidth was greatest while observing 2438MHz. Using 30kHz RBW, the 99% bandwidth measured 810kHz.
8. The Band Edge measurements: All spurious below the lower band edge of 2400MHz and above the upper band edge of 2483.5MHz are greater than 20dB below the level of the fundamental carrier.
9. The output level of the fundamental was measured for 2401MHz, 2438MHz, and 2475MHz. The evaluation showed the emission nearest the limit occurred at approximately 2475MHz. The EUT was positioned on the 'end' and the receive antenna oriented in the vertical polarization. This signal was measured with a peak detection and the calculated EIRP was determined to be **26.2dB** below the peak power limit of 1 Watt.
10. The suspects frequencies for spurious emissions and RX LO harmonics were determined in a shielded enclosure. All suspects below 1GHz were determined to be below the background noise at the open area test site. The suspect frequency nearest the limit was 5602MHz. This level was measured to be **13.0dB** below the limit of 56dBuV/m.

### Changes made to achieve compliance

1. None

## Standards Applied to Test: [2.1033(b6)]

ANSI C63.4 - 2001
CFR47 FCC Part 2, Part 15, SubPart C, 15.247 Intentional Radiator; SubPart B, Digital Device
AHD test procedures TP0101-01, TP0102-01

## Test Methodology: [2.1033(b6)]

This abbreviated test plan evaluated the spurious/digital emissions of the product and evaluated the fundamental power output as a field strength at 3 meters and with the output directly connected to the analyzer.

The system was placed at the center of the table 80cm above the ground plane pursuant to ANSI C63.4 for stand-alone equipment. The setup pictures in this report indicate the configurations of testing for this product.

This product contains a Nordic 2.4GHZ RF chip. The antenna is a foil trace on the circuit board. The antenna can not be adjusted by the user.

Most of the evaluations in transmit mode were performed with the frequency hopping function disabled. In this mode the EUT was setup up to transmit continuously with modulation. The measurements of the fundamental were recorded with Peak detection and the results peak power limit of section 15.247.

Line conducted emission testing was not performed on this product. The product is powered from two AA 1.5Volt batteries only. The batteries were replaced during the course of testing to maintain battery ‘freshness’.

### Radiated

The system was placed upon a 1 x 1.5 meter non-metallic table 80cm above the open field site ground plane in the prescribed setup per ANSI C63.4.

The table sits upon a remote controlled turntable. The receiving antenna, located at the appropriate standards distance of 3 or 10 meters from the table center, is also remote controlled.

The principle settings of the EMI Receiver for radiated testing include:

| | | |
|---|---|---|
| IF Bandwidth: | 120kHz | for frequencies less than 1GHz. |
| | 1 MHz | for frequencies greater than 1GHz. |
| Detector Function: | Peak Mode for transmitter fundamental. | |
| | Quasi-Peak for emissions < 1000MHz | |
| | Average for emissions > 1000MHz | |
| Occupied Bandwidth settings: | | |
| | RBW: 10kHz | |
| | VBW: 30kHz | |

At frequencies up to 1000MHz a BiconiLog broadband antenna was used for measurements. At frequencies above 1000MHz a double-ridge Horn broadband antenna was used for measurements.

During the transmitter evaluation the EUT was transmitting continuously.

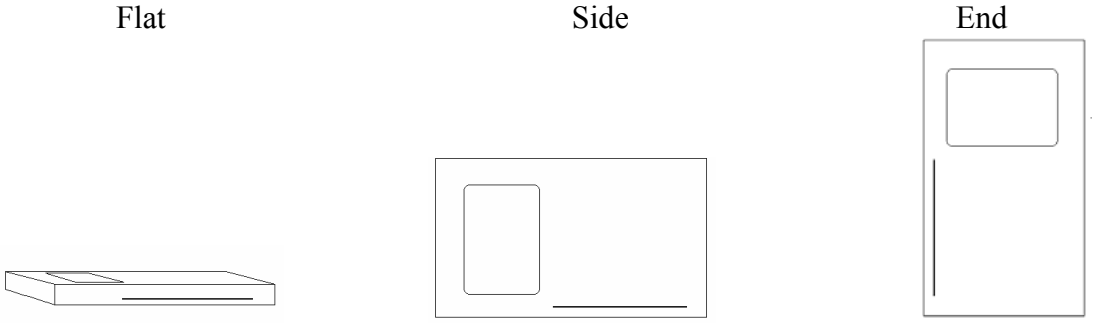
The turntable was rotated 360 degrees and the receiving antenna height varied from 1 to 4 meters to search out the highest emissions.

The final measurements were made at the lowest transmit frequency (2401MHz), a mid band frequency (2438MHz), and the highest transmit frequency (2475MHz) pursuant to the requirements of 47CFR 15.31(m). At each frequency the EUT was placed in three orthogonal positions (designated as flat, side, and end). Measurements were recorded with the receive antenna in vertical and horizontal positions.

The unit was evaluated up to the tenth harmonic of the transmit fundamental and up to 5GHz for other spurious signals.

The orthogonal positions of EUT are:

Flat Side End



## FORMULAS AND SAMPLE CALCULATIONS:

THE HP8546A EMI Receiver has stored in memory the antenna and coax correction factors used in this test. The resultant Field Strength (FS) in dBuV/m presented by the HP8546A is the summation in decibels (dB) of the Received Level (RF), the Antenna Correction Factor (AF), and the Cable Loss Factor (CF).

Formula 1: Field Strength FS(dBuV/m) = RF(dBuV) + AF(dB/m) +CF(dB)

With the EUT transmitting the resultant Field Strength measurement is recorded using the peak hold detector of the HP8546A.

Formula 2: Equivalent Isotropic Radiated Power $PG = \frac{(E*d)^2}{30}$

E = 10^(FS(dBuV/m)/ 20 ) / 1000000
d = 3 meter

Where applicable, the recorded level is further corrected, by calculation, using a duty cycle correction factor. The duty cycle factor is determined by:

Formula 3: Duty Cycle factor DC factor (dB) = 20*LOG(dwell time / 100mSec).

When the dwell time is determined to be less than 10mSec, the duty cycle factor to apply is determined to be 20dB. [ duty cycle factor(dB) = 20*Log(0.1) = -20.0 dB ]

Where it was necessary to move the EUT to 1 meter distance to take measurements a 'dB' factor which adjusts for this distance variance is used before comparing the emission level to the FCC limits. This factor is determined by the following formula.

Formula 4: Distance factor(dB) = 20*Log(3meter/1meter) = 20*Log(3) = 9.54dB.

## Emission Designation [TRC-43]

The emission designation applicable to this product is 810KF1D.

The "810K" is the highest measured occupied bandwidth of the device.
"F" designates the frequency modulation.
"1" designates the modulation as single channel digital information.
"D" designates the modulation as data transmission.

## Test Data [2.1033(b6)]

### Antenna Characteristics [15.203, 15.204]

The radiating element 'antenna' is a foil trace on the printed circuit board. The user can not adjust nor replace the trace antenna.

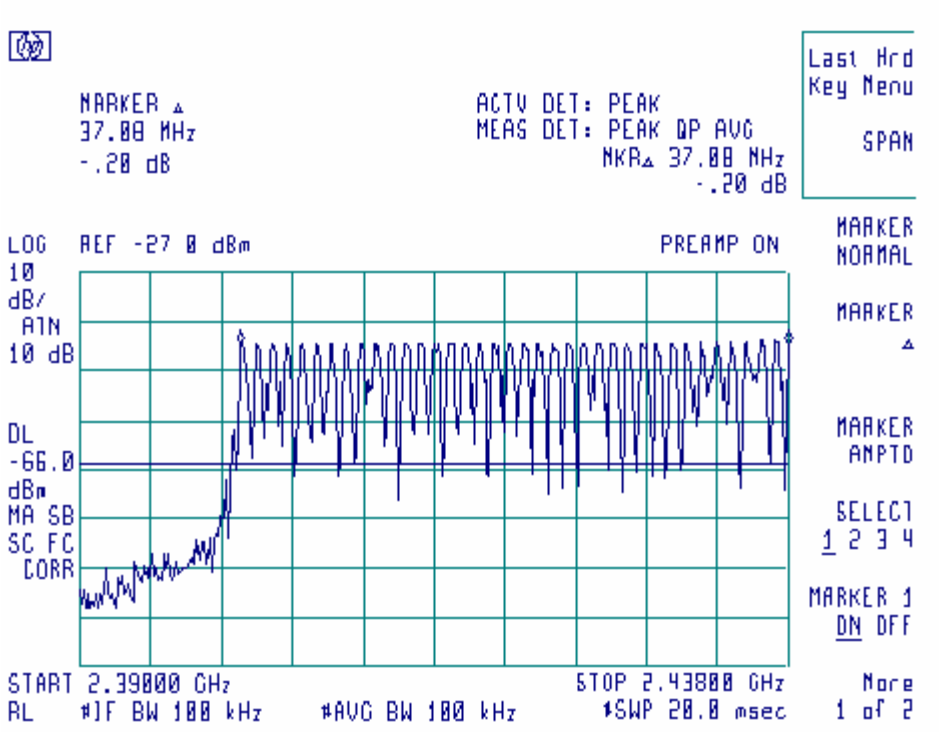
### Modulation Characteristics

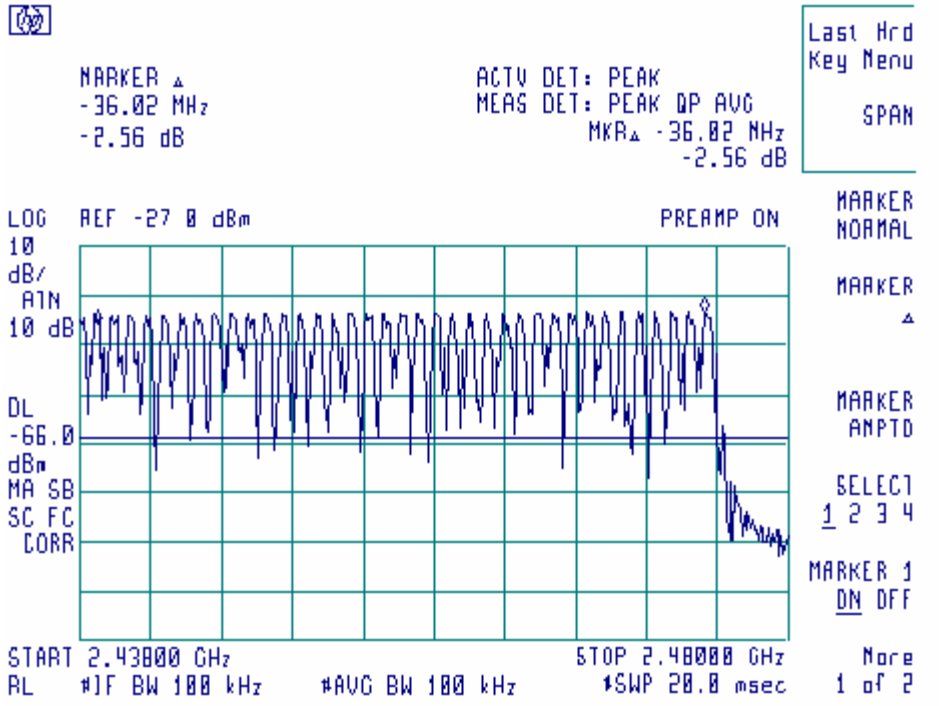
The transmitter is FSK modulated.
Modulation. F1 represents the bit "1", F2 represents the bit "0". F1 and F2 are separated by approximately 300kHz. Data rate is 256KB/sec

### Frequency Hopping Characteristics

#### Number of Hopping Frequencies [15.247a1i; 6.2.2o]

Seventy Five (75) frequencies from 2401MHz through 2475MHz are available for the keypad transceiver to utilize. The base initiates the communications to the associated keypad units. Refer to 'file GEN2_TechDesc.pdf' for a detailed operational description.




Plot scan of the FHSS profile. Seventy five transmitted frequencies can be discerned.

**Occupied bandwidth [15.247a1i; 6.2.2o]**

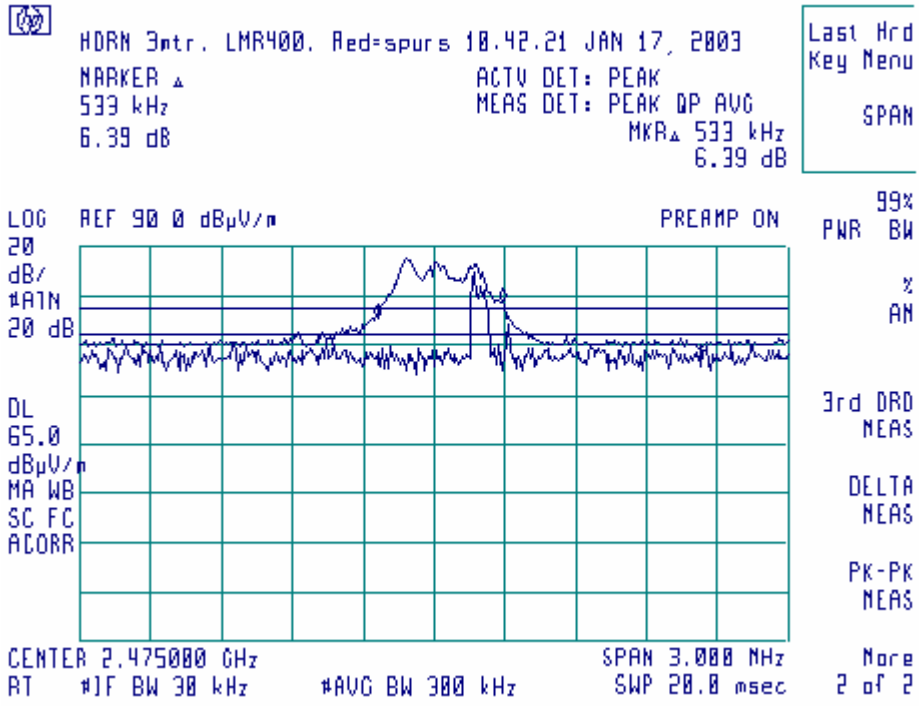
The occupied bandwidth was measured initially with the unit hopping function disabled. The transmitter is FSK modulated.

Two methods were used to determine occupied bandwidth; 20dB method and 99% method. The 99% method is reported here. The measurement procedure of both methods are described in the paper "A Discussion on the Measurement of Occupied Bandwidth" authored by Brian Kasper.

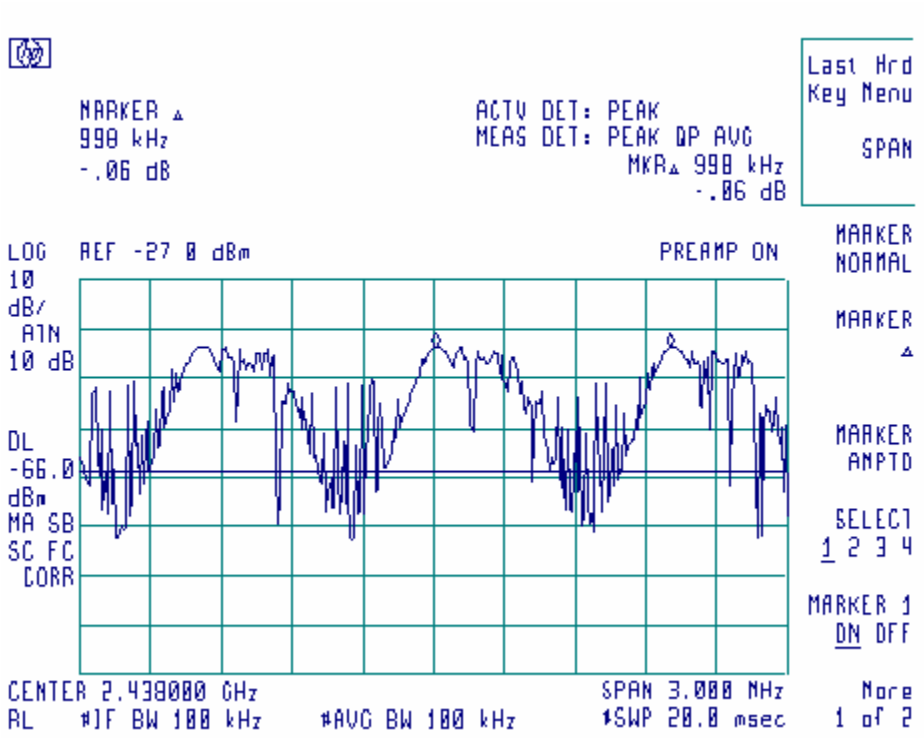
The 99% method utilized a routine which had been programmed into the HP8546A EMI Receiver by the manufacturer.

| Fundamental (MHz) | Measured 99% Bandwidth 30kHzRBW | LIMIT RSS-210(a3) |
|---|---|---|
| 2401 | 730 kHz | 1000 kHz |
| 2437 | 810 kHz | 1000 kHz |
| 2475 | 533 kHz | 1000 kHz |

<u>This chart shows greatest measured bandwidth signal.</u>

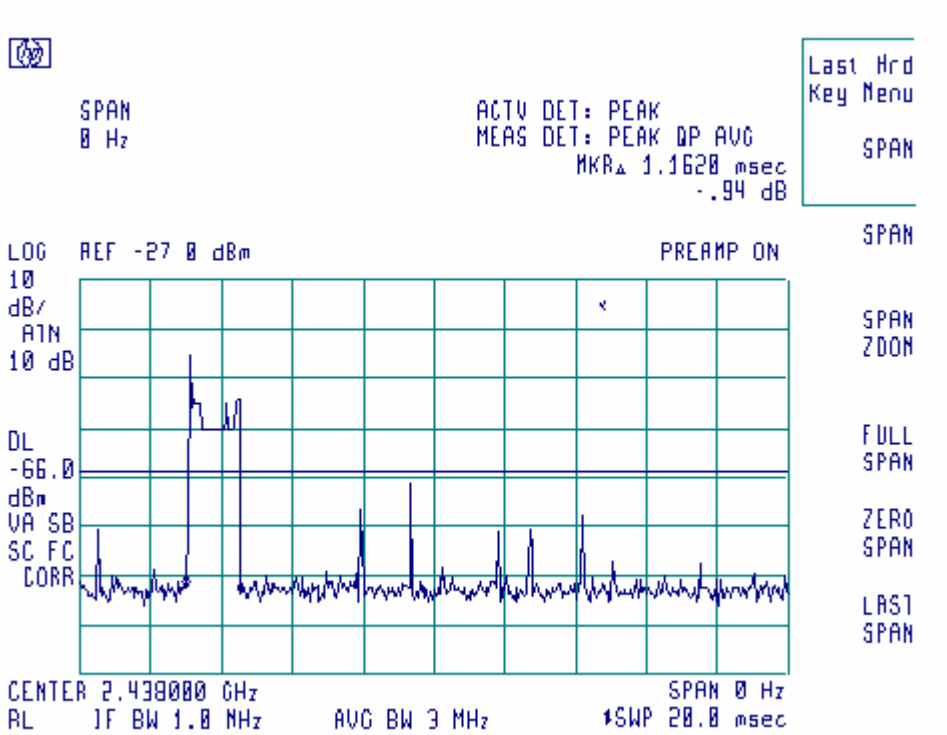


### Carrier Frequency Separation [15.247a1; 6.2.2o]




Each Hopping channel is separated by 1000kHz. This is greater than the minimum requirement of 25kHz or 20dB bandwidth.

### Carrier Frequency Dwell Time [15.247a1i]



The Dwell Time of each hopping frequency is 1.2mSec. Refer to Exhibit B 'operational description' for a table showing dwell times of the system operations.

### Relative Emission Level vs. Supply Voltage [15.31(e)]

The relative emission level as the supply voltage varied is presented in the charts below.
The voltage is varied to at least 85% to 115% of nominal supply voltage.
The unit is powered by two 1.5vdc alkaline batteries (3vdc). A variable DC power supply was used with the EUT for this test.

| TX OUTPUT vs Voltage LEVEL 2437MHz modulated | |
|---|---|
| Volt In | TX OutPut Pk dBm |
| 2.40 | -0.8 |
| **2.50** | **-0.8** |
| **2.60** | **-0.8** |
| **2.70** | **-0.8** |
| **2.80** | **-0.8** |
| **2.90** | **-0.8** |
| **3.00** | **-0.8** |
| **3.10** | **-0.8** |
| **3.20** | **-0.8** |
| **3.30** | **-0.8** |
| **3.40** | **-0.8** |
| **3.50** | **-0.8** |
| 3.60 | -0.8 |
| | |

**Restricted Bands: [15.205]**

The following frequency bands are restricted. Only spurious emissions are permitted at levels limited by 15.209:

| MHz | MHz | MHz | GHz |
|---|---|---|---|
| 0.090-0.110 | 16.42-16.423 | 399.9-410 | 4.5-5.25 |
| 0.490-0.510 | 16.69475-16.69525 | 608-614 | 5.35-5.46 |
| 2.1735-2.1905 | 16.80425-16.80475 | 960-1240 | 7.25-7.75 |
| 4.125-4.128 | 25.5-25.67 | 1300-1427 | 8.025-8.5 |
| 4.17725-4.17775 | 37.5-38.25 | 1435-1626.5 | 9.0-9.2 |
| 4.20725-4.20775 | 73-74.6 | 1645.5-1646.5 | 9.3-9.5 |
| 6.215-6.218 | 74.8-75.2 | 1660-1710 | 10.6-12.7 |
| 6.26775-6.26825 | 108-121.94 | 1718.8-1722.2 | 13.25-13.4 |
| 6.31175-6.31225 | 123-138 | 2200-2300 | 14.47-14.5 |
| 8.291-8.294 | 149.9-150.05 | 2310-2390 | 15.35-16.2 |
| 8.362-8.366 | 156.52475-156.52525 | 2483.5-2500 | 17.7-21.4 |
| 8.37625-8.38675 | 156.7-156.9 | 2655-2900 | 22.01-23.12 |
| 8.41425-8.41475 | 162.0125-167.17 | 3260-3267 | 23.6-24.0 |
| 12.29-12.293 | 167.72-173.2 | 3332-3339 | 31.2-31.8 |
| 12.51975-12.52025 | 240-285 | 3345.8-3358 | 36.43-36.5 |
| 12.57675-12.57725 | 322-335.4 | 3600-4400 | Above 38.6 |
| 13.36-13.41 | | | |

**LIMIT @ 3meter: [15.209(a)]**

| | | |
|---|---|---|
| 30-88MHz | 100uV/m | 40dBuV/m |
| 88-216MHz | 150uV/m | 43.5dBuV/m |
| 216-960MHz | 200uV/m | 46dBuV/m |
| above 960MHz | 500uV/m | 54dBuV/m |

The spurious emissions observed in the restricted bands did not exceed the allowed limits for the restricted bands.

## Radiated Field Strength / Output Power Measurements: [15.209, 15.247(b,c)]

### Field Strength Measurements : [15.247, 15.209, RSS-210.6.1.1, 6.5, 6.2.2]]

MEASUREMENT PROCEDURE:
Direct Connect Measurements at antenna output.

Transmit Mode. Fundamental

| Frequency<br>MHz | Module #2 Direct Connect PEAK Measurement<br>dBm | FCC Limit 15.247b<br>=1 Watt | **Margin**<br>**dB** |
|---|---|---|---|
| 2401 | -1.1 | 30dBm | **31.1** |
| 2437 | -0.8 | 30dBm | **30.8** |
| 2475 | -1.2 | 30dBm | **31.2** |

### Field Strength Measurements of Fundamental & harmonics [15.247(a), 15.209]

MEASUREMENT PROCEDURE:
1. The EUT was measured at three test frequencies.
2. The receiving antenna and EUT were placed in the orientation determined in earlier testing (re: Exhibit G).

Transmit Mode. Fundamental

| Frequency<br>MHz | Corrected PEAK Measurement<br>dBuV/m | Included Cable+Antenna Factors<br>dB+dB/m | Turntable Azimuth<br>deg | Antenna Height<br>Mtr | Calculated EIRP<br>mWatt | FCC Limit 15.247b<br>mWatt | **Margin**<br>**dB** | EUT position | Ant Pol. |
|---|---|---|---|---|---|---|---|---|---|
| 2401 | 96.3 | 35.39 | 80 | 1.0 | 1.28 | 1000 | **28.9** | end | V |
| 2438 | 98.2 | 35.61 | 80 | 1.0 | 1.98 | 1000 | **27** | end | V |
| 2475 | 98.8 | 35.83 | 80 | 1.0 | 2.28 | 1000 | **26.2** | end | V |

The measurements of the 2nd through 10th transmitter harmonics were taken at the UM Radiation Lab facility.
Transmit Mode. Fundamental harmonics

**Table 5.1 Highest Emissions Measured**

| Radiated Emissions | | | | | | | | | | FCC/IC |
|---|---|---|---|---|---|---|---|---|---|---|
| # | Freq. MHz | Ant. Used | Ant. Pol. | Pr. (Pk) dBm | Ka dB/m | Kg dB | E3 dBµV/m | E3lim(Pk) dBµV/m | Pass dB | Comments |
| 1 | 2401.0 | | | | | | | | | Low channel |
| 2 | 2438.0 | | | | | | | | | Mid channel |
| 3 | 2475.0 | | | | | | | | | High channel |
| 4 | | | | | | | | | | |
| 5 | 2390.0 | Horn S | H/V | | 21.5 | - 0.6 | - | 74.0 | | Low |
| 6 | 2390.0 | Horn S | H/V | | 21.5 | - 0.6 | - | 74.0 | | Mid |
| 7 | 2390.0 | Horn S | H/V | | 21.5 | - 0.6 | - | 74.0 | | High |
| 8 | 2483.5 | Horn S | H/V | | 21.5 | - 0.6 | - | 74.0 | | Low |
| 9 | 2483.5 | Horn S | H/V | | 21.5 | - 0.6 | - | 74.0 | | Mid |
| 10 | 2483.5 | Horn S | H/V | | 21.5 | - 0.6 | - | 74.0 | | High |
| 11 | 4802.0 | Horn C | H/V | -30.9 | 25.5 | 37.0 | 64.6 | 74.0 | 9.4 | Low |
| 12 | 4876.0 | Horn C | H/V | -32.1 | 25.5 | 37.0 | 63.4 | 74.0 | 10.6 | Mid |
| 13 | 4950.0 | Horn C | H/V | -30.4 | 25.5 | 37.0 | 65.1 | 74.0 | 8.9 | High |
| 14 | 7203.0 | Horn XN | H/V | -35.0 | 25.5 | 36.0 | 61.5 | N/A | - | Low |
| 15 | 7314.0 | Horn XN | H/V | -33.5 | 25.5 | 36.0 | 63.0 | 74.0 | 11.0 | Mid |
| 16 | 7425.0 | Horn XN | H/V | -29.5 | 25.5 | 36.0 | 67.0 | 74.0 | 7.0 | High |
| 17 | 9604.0 | Horn X | H/V | -46.0 | 25.5 | 34.0 | 52.5 | N/A | - | Low |
| 18 | 9752.0 | Horn X | H/V | -44.1 | 25.5 | 34.0 | 54.4 | N/A | - | Mid |
| 19 | 9900.0 | Horn X | H/V | -42.2 | 25.5 | 34.0 | 56.3 | N/A | - | High |
| 20 | 12005.0 | Horn X | H/V | -48.9 | 25.5 | 34.0 | 49.6 | 74.0 | 24.4 | Low, noise |
| 21 | 12190.0 | Horn X | H/V | -51.6 | 25.5 | 34.0 | 46.9 | 74.0 | 27.1 | Mid, noise |
| 22 | 12375.0 | Horn X | H/V | -51.7 | 25.5 | 34.0 | 46.8 | 74.0 | 27.2 | High, noise |
| 23 | 14406.0 | Horn Ku | H/V | -55.2 | 25.5 | 17.3 | 60.0 | N/A | - | Low, noise |
| 24 | 14628.0 | Horn Ku | H/V | -55.6 | 25.5 | 17.3 | 59.6 | N/A | - | Mid, noise |
| 25 | 14850.0 | Horn Ku | H/V | -55.1 | 25.5 | 17.3 | 60.1 | N/A | - | High, noise |
| 26 | 16807.0 | Horn Ku | H/V | -56.3 | 32.3 | 34.0 | 49.1 | N/A | - | Low, noise |
| 27 | 17066.0 | Horn Ku | H/V | -54.0 | 32.3 | 34.0 | 51.3 | N/A | - | Mid, noise |
| 28 | 17325.0 | Horn Ku | H/V | -55.4 | 32.3 | 34.0 | 49.9 | N/A | - | High, noise |
| 29 | 19208.0 | Horn K | H/V | -56.5 | 32.3 | 32.0 | 50.8 | 74.0 | 23.2 | Low, noise |
| 30 | 19504.0 | Horn K | H/V | -51.4 | 32.3 | 32.0 | 55.9 | 74.0 | 18.1 | Mid, noise |
| 31 | 19800.0 | Horn K | H/V | -50.6 | 32.3 | 32.0 | 56.7 | 74.0 | 17.3 | High, noise |
| 32 | 21609.0 | Horn K | H/V | -50.0 | 32.3 | 32.0 | 57.3 | N/A | - | Low, noise |
| 33 | 21942.0 | Horn K | H/V | -49.2 | 32.3 | 32.0 | 58.1 | N/A | - | Mid, noise |
| 34 | 22275.0 | Horn K | H/V | -48.8 | 32.3 | 32.0 | 58.5 | 74.0 | 15.5 | High, noise |
| 35 | 24010.0 | Horn Ka | H/V | -48.7 | 32.3 | 32.0 | 58.6 | N/A | - | Low, noise |
| 36 | 24380.0 | Horn Ka | H/V | -47.8 | 32.3 | 32.0 | 59.5 | N/A | - | Mid, noise |
| 37 | 24750.0 | Horn Ka | H/V | -48.2 | 32.3 | 32.0 | 59.1 | N/A | - | High, noise |
| 38 | | | | | | | | | | |
| 39 | * Pk: measured with 1 MHz RBW and 3 MHz VBW | | | | | | | | | |
| 40 | | | | | | | | | | |
| 41 | | | | | | | | | | |
| 42 | | | | | | | | | | |

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**Table 5.1 Highest Emissions Measured**

| Radiated Emissions | | | | | | | | | | FCC/IC |
|---|---|---|---|---|---|---|---|---|---|---|
| # | Freq. MHz | Ant. Used | Ant. Pol. | Pr. (avg) dBm | Ka dB/m | Kg dB | E3 dBµV/m | E3lim dBµV/m | Pass dB | Comments |
| 1 | 2401.0 | | | | | | | | | Low channel |
| 2 | 2438.0 | | | | | | | | | Mid channel |
| 3 | 2475.0 | | | | | | | | | High channel |
| 4 | | | | | | | | | | |
| 5 | 2390.0 | Horn S | H/V | | 21.5 | - 0.6 | - | 54.0 | | Low |
| 6 | 2390.0 | Horn S | H/V | | 21.5 | - 0.6 | - | 54.0 | | Mid |
| 7 | 2390.0 | Horn S | H/V | | 21.5 | - 0.6 | - | 54.0 | | High |
| 8 | 2483.5 | Horn S | H/V | | 21.5 | - 0.6 | - | 54.0 | | Low |
| 9 | 2483.5 | Horn S | H/V | | 21.5 | - 0.6 | - | 54.0 | | Mid |
| 10 | 2483.5 | Horn S | H/V | | 21.5 | - 0.6 | - | 54.0 | | High |
| 11 | 4802.0 | Horn C | H/V | -49.5 | 25.5 | 37.0 | 46.0 | 54.0 | 8.0 | Low |
| 12 | 4876.0 | Horn C | H/V | -49.6 | 25.5 | 37.0 | 45.9 | 54.0 | 8.1 | Mid |
| 13 | 4950.0 | Horn C | H/V | -48.3 | 25.5 | 37.0 | 47.2 | 54.0 | 6.8 | High |
| 14 | 7203.0 | Horn XN | H/V | -60.3 | 25.5 | 36.0 | 36.2 | N/A | - | Low |
| 15 | 7314.0 | Horn XN | H/V | -51.7 | 25.5 | 36.0 | 44.8 | 54.0 | 9.2 | Mid |
| 16 | 7425.0 | Horn XN | H/V | -47.0 | 25.5 | 36.0 | 49.5 | 54.0 | 4.5 | High |
| 17 | 9604.0 | Horn X | H/V | -57.7 | 25.5 | 34.0 | 40.8 | N/A | - | Low |
| 18 | 9752.0 | Horn X | H/V | -57.5 | 25.5 | 34.0 | 41.0 | N/A | - | Mid |
| 19 | 9900.0 | Horn X | H/V | -53.9 | 25.5 | 34.0 | 44.6 | N/A | - | High |
| 20 | 12005.0 | Horn X | H/V | -60.8 | 25.5 | 34.0 | 37.7 | 54.0 | 16.3 | Low, noise |
| 21 | 12190.0 | Horn X | H/V | -62.8 | 25.5 | 34.0 | 35.7 | 54.0 | 18.3 | Mid, noise |
| 22 | 12375.0 | Horn X | H/V | -63.9 | 25.5 | 34.0 | 34.6 | 54.0 | 19.4 | High, noise |
| 23 | 14406.0 | Horn Ku | H/V | -65.9 | 25.5 | 17.3 | 49.3 | N/A | - | Low, noise |
| 24 | 14628.0 | Horn Ku | H/V | -66.0 | 25.5 | 17.3 | 49.2 | N/A | - | Mid, noise |
| 25 | 14850.0 | Horn Ku | H/V | -65.5 | 25.5 | 17.3 | 49.7 | N/A | - | High, noise |
| 26 | 16807.0 | Horn Ku | H/V | -66.0 | 32.3 | 34.0 | 39.3 | N/A | - | Low, noise |
| 27 | 17066.0 | Horn Ku | H/V | -66.1 | 32.3 | 34.0 | 39.2 | N/A | - | Mid, noise |
| 28 | 17325.0 | Horn Ku | H/V | -65.5 | 32.3 | 34.0 | 39.8 | N/A | - | High, noise |
| 29 | 19208.0 | Horn K | H/V | -64.4 | 32.3 | 32.0 | 42.9 | 54.0 | 11.1 | Low, noise |
| 30 | 19504.0 | Horn K | H/V | -61.1 | 32.3 | 32.0 | 46.2 | 54.0 | 7.8 | Mid, noise |
| 31 | 19800.0 | Horn K | H/V | -60.8 | 32.3 | 32.0 | 46.5 | 54.0 | 7.5 | High, noise |
| 32 | 21609.0 | Horn K | H/V | -59.7 | 32.3 | 32.0 | 47.6 | N/A | - | Low, noise |
| 33 | 21942.0 | Horn K | H/V | -58.7 | 32.3 | 32.0 | 48.6 | N/A | - | Mid, noise |
| 34 | 22275.0 | Horn K | H/V | -59.7 | 32.3 | 32.0 | 47.6 | 54.0 | 6.4 | High, noise |
| 35 | 24010.0 | Horn Ka | H/V | -56.0 | 32.3 | 32.0 | 51.3 | N/A | - | Low, noise |
| 36 | 24380.0 | Horn Ka | H/V | -57.3 | 32.3 | 32.0 | 50.0 | N/A | - | Mid, noise |
| 37 | 24750.0 | Horn Ka | H/V | -56.1 | 32.3 | 32.0 | 51.2 | N/A | - | High, noise |
| 38 | | | | | | | | | | |
| 39 | * Ave: measured with 1 MHz RBW and 100 Hz VBW | | | | | | | | | |
| 40 | | | | | | | | | | |
| 41 | | | | | | | | | | |
| 42 | | | | | | | | | | |

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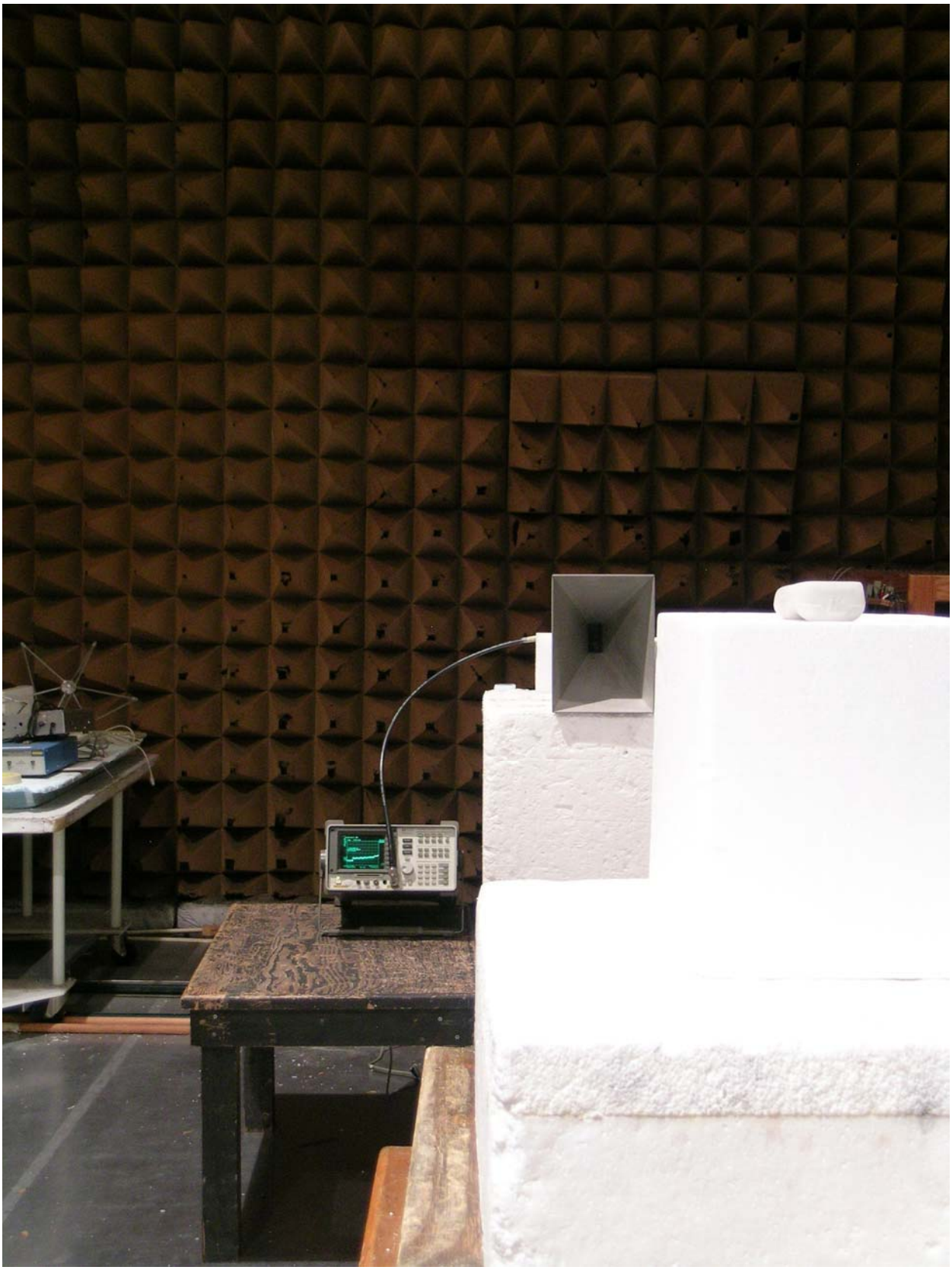
**Radiated Field Strength Measurement Setup Site 2:**



**Field Strength Measurements of Local Oscillator & Harmonics:**

Receive Mode. Local Oscillator

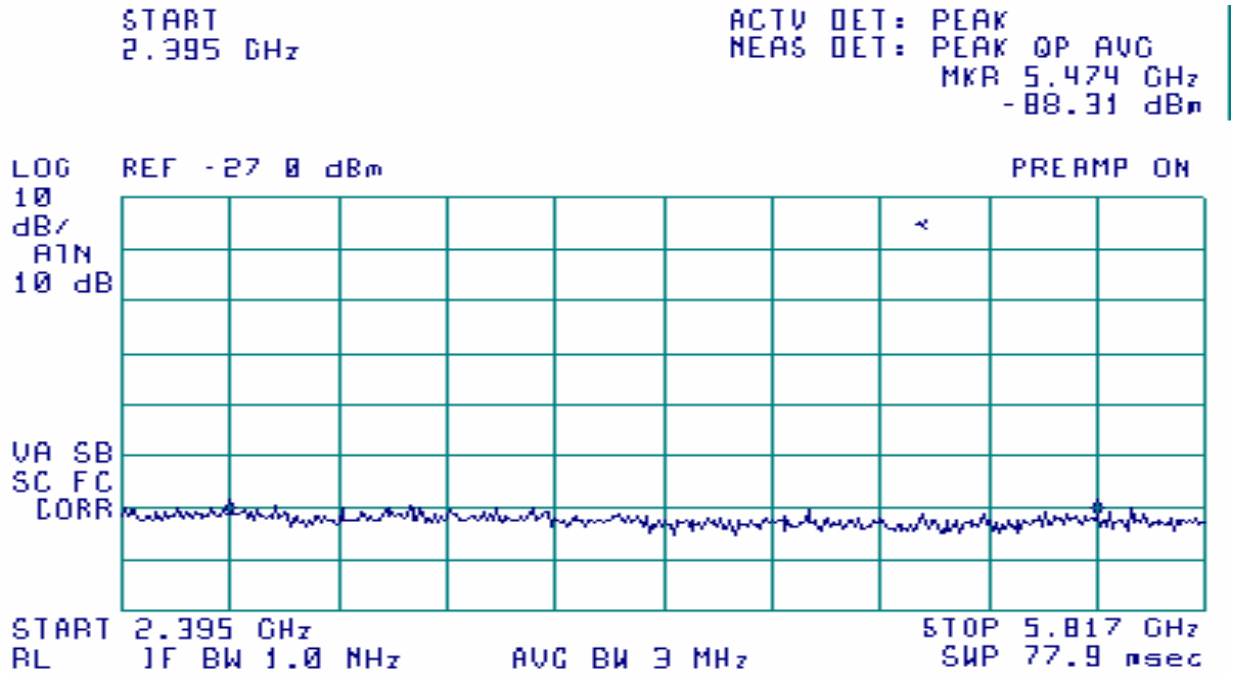
The injected LO for superheterodyne operation is 300MHz above the operating frequency.

The levels of the RF emissions of the local oscillator and harmonics were below the background noise floor of the measurement system. No emissions were detected at a distance of 1 meter from the EUT. No emissions were detected when the unit was directly connected to a spectrum analyzer.

MEASUREMENT PROCEDURE:

1. The EUT output was directly connected to the spectrum analyzer.
2. The spectrum analyzer bandwidth settings are 100kHz RBW, 300kHz VBW.
3. The spectrum is observed for emissions.

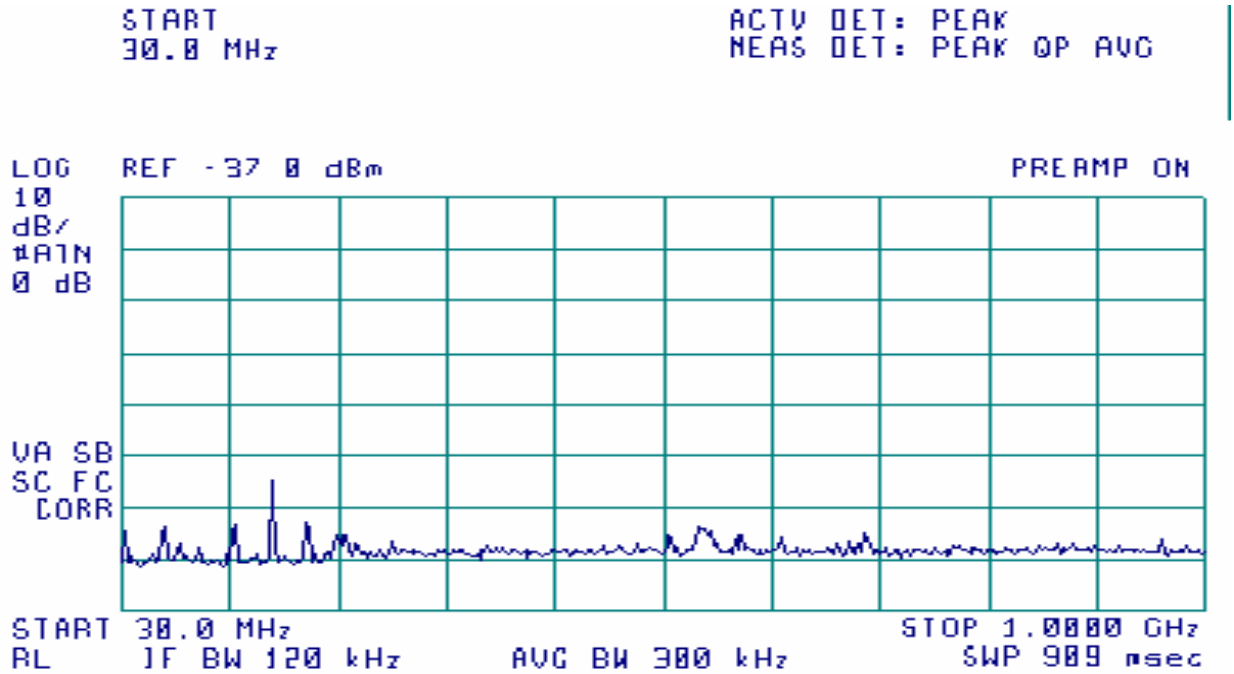
At 2437MHzMHz, the L.O. frequency is approximately 2737MHz.




Direct connect scan. Markers 1 and 2 are one division in from the left and right respectively. Marker 1 is at the LO frequency of 2737MHz. Marker 2 is at the first harmonics frequency of 5475MHz.

**Spurious Emissions: [15.247c]**

A scan of the KGEN2EI was made in a shielded room to study the emission profile of the EUT. These scans indicate spurious emissions from the unit other than the fundamental and its associated harmonics. These suspect signals were measured at the 3-meter open area test site.




**Band Edges [15.247(c); 6.2.2o]**

The emissions outside the 2400-2483.5MHz band are to be either 20dB below the level of the fundamental or the limits of section 15.209.

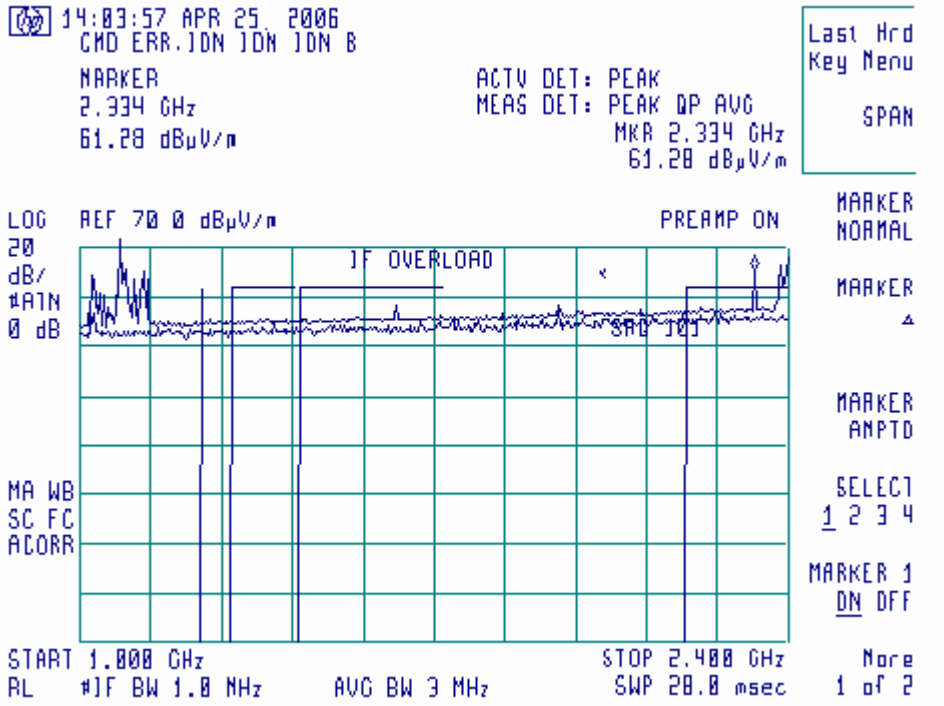
MEASUREMENT PROCEDURE:

1. The EUT output optimized for measurement by the EMI receiver.
2. The spectrum analyzer bandwidth settings are >100kHz RBW.
3. The peak of the fundamental is determined.
4. A display line is set on the spectrum analyzer 20dB below the fundamental level.
5. The remainder of the spectrum is observed for any emissions that are greater than the 20dBc display line.

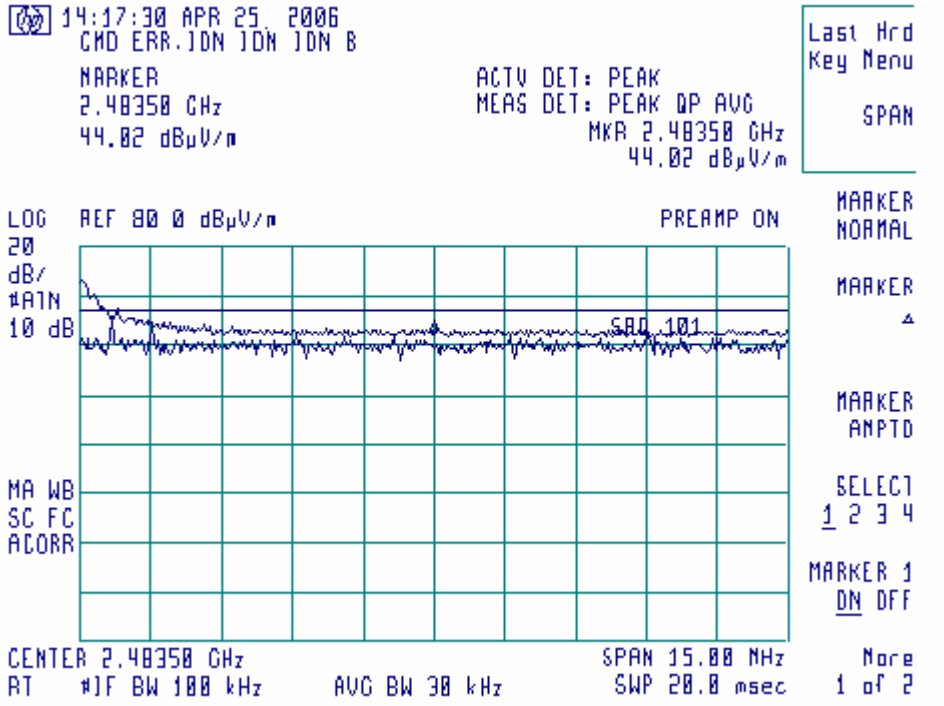
Using >100kHz resolution bandwidth, the spurious emissions outside the 2400-2483.5MHz band that is produced by the intentional radiator are greater than 20dB below the level of the fundamental frequency.

The plots on the following pages show the spectrum pattern of the EUT emissions.

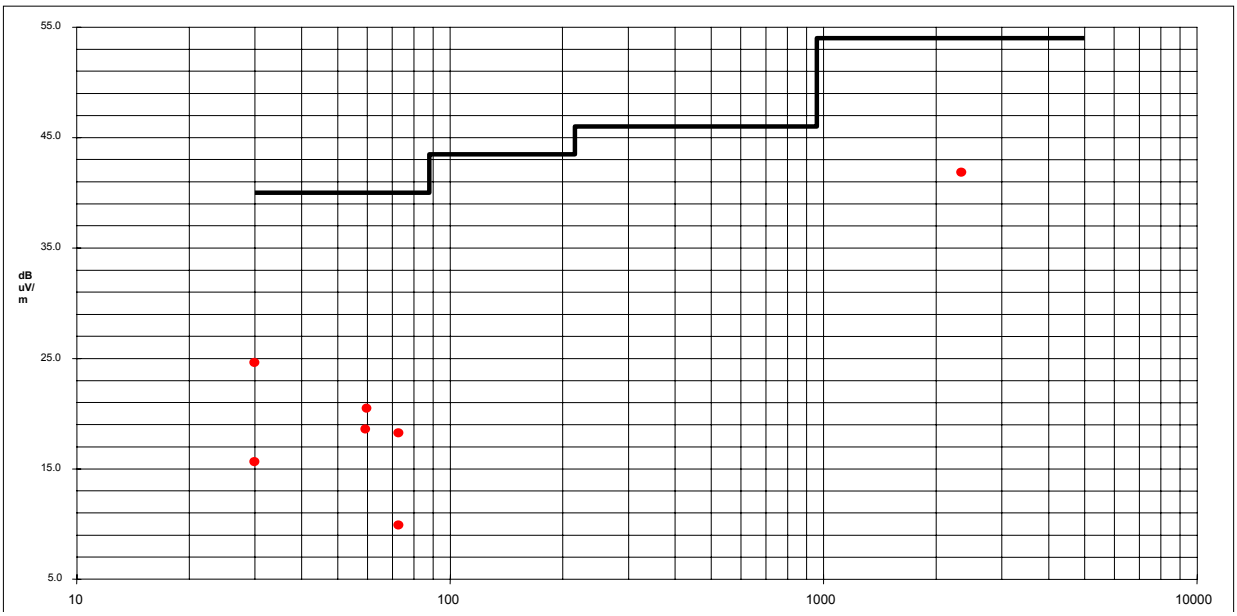
Transmitting Lower Band Edge:




Transmitting Upper Band Edge:



## Other Spurious emissions




Tabulated Quasi-Peak Measurements.

| Frequency MHz | Corrected Measurement dBuV/m | Duty Cycle factor dB | Included Cable+Antenna Factors dB+dB/m | Turntable Azimuth deg | Antenna Height Mtr | Polarity | FCC Limit dBuV/m | **Margin dB** |
|---|---|---|---|---|---|---|---|---|
| 30.0 | ** 15.54QP | -- | 19.18 | - | 1.0 | H | 40.00 | **24.83** |
| 59.7 | ** 18.70QP | -- | 8.61 | - | 1.0 | H | 40.00 | **31.39** |
| 71.6 | ** 10.3QP | -- | 7.46 | - | 1.0 | H | 40.00 | **39.70** |
| #2334 | 61.28peak | 20 | 35.00 | 0 | 1.0 | V | 54.00 | **12.72** |
| 30.0 | **24.81QP | -- | 19.18 | - | 1.0 | V | 40.00 | **15.19** |
| 59.9 | **20.65QP | -- | 8.58 | - | 1.0 | V | 40.00 | **19.35** |
| 71.9 | **18.45 QP | -- | 7.43 | - | 1.0 | V | 40.00 | **21.65** |

The frequencies for measurements were determined by the suspect list generated from the prescan of 30MHz through 2.9GHz.
**The measured levels represent the background floor noise of the measurement system.
#These emissions have a pulse width of 0.15mSec and a repetition rate of 20.5mSec, the 20dB factor applies.

**Table 5.1 Highest Emissions Measured**

| Radiated Emissions | | | | | | | | | | FCC/IC |
|---|---|---|---|---|---|---|---|---|---|---|
| # | Freq. MHz | Ant. Used | Ant. Pol. | Pr. dBm | Ka dB/m | Kg dB | E3 dBµV/m | E3lim dBµV/m | Pass dB | Comments |
| 1 | **RX Spurious (Average)** | | | | | | | | | |
| 2 | 4830.0 | Horn C | H/V | -66.4 | 25.5 | 37.0 | 29.1 | 54.0 | 24.9 | Low |
| 3 | 4854.0 | Horn C | H/V | -67.2 | 25.5 | 37.0 | 28.3 | 54.0 | 25.7 | Mid |
| 4 | 4901.0 | Horn C | H/V | -65.2 | 25.5 | 37.0 | 30.3 | 54.0 | 23.7 | High |
| 5 | 5520.0 | Horn C | H/V | -60.1 | 25.5 | 37.0 | 35.4 | 54.0 | 18.6 | Low |
| 6 | 5547.0 | Horn C | H/V | -58.6 | 25.5 | 37.0 | 36.9 | 54.0 | 17.1 | Mid |
| 7 | 5602.0 | Horn C | H/V | -59.2 | 25.5 | 37.0 | 36.3 | 54.0 | 17.7 | High |
| 8 | 6241.0 | Horn XN | H/V | -59.4 | 25.5 | 36.0 | 37.1 | 54.0 | 16.9 | max all, noise |
| 9 | 6935.0 | Horn XN | H/V | -58.2 | 25.5 | 36.0 | 38.3 | 54.0 | 15.7 | max all, noise |
| 10 | 7630.0 | Horn XN | H/V | -58.1 | 25.5 | 36.0 | 38.4 | 54.0 | 15.6 | max all, noise |
| 11 | 8250.0 | Horn X | H/V | -55.3 | 25.5 | 34.0 | 43.2 | 54.0 | 10.8 | max all, noise |
| 12 | 8940.0 | Horn X | H/V | -54.9 | 25.5 | 34.0 | 43.6 | 54.0 | 10.4 | max all, noise |
| 13 | 9630.0 | Horn X | H/V | -56.9 | 25.5 | 34.0 | 41.6 | 54.0 | 12.4 | max all, noise |
| 14 | | | | | | | | | | |
| 15 | | | | | | | | | | |
| 16 | | | | | | | | | | |
| 17 | | | | | | | | | | |
| 18 | | | | | | | | | | |
| 19 | | | | | | | | | | |
| 20 | | | | | | | | | | |
| 21 | | | | | | | | | | |
| 22 | | | | | | | | | | |
| 23 | | | | | | | | | | |
| 24 | | | | | | | | | | |
| 25 | | | | | | | | | | |
| 26 | **RX Spurious (Peak)** | | | | | | | | | |
| 27 | 4830.0 | Horn C | H/V | -54.6 | 25.5 | 37.0 | 40.9 | 54.0 | 13.1 | Low |
| 28 | 5602.0 | Horn C | H/V | -54.5 | 25.5 | 37.0 | 41.0 | 54.0 | 13.0 | High |
| 29 | 6241.0 | Horn XN | H/V | -70.7 | 25.5 | 36.0 | 25.8 | 54.0 | 28.2 | max all, noise |
| 30 | 6935.0 | Horn XN | H/V | -70.9 | 25.5 | 36.0 | 25.6 | 54.0 | 28.4 | max all, noise |
| 31 | 7630.0 | Horn XN | H/V | -68.4 | 25.5 | 36.0 | 28.1 | 54.0 | 25.9 | max all, noise |
| 32 | 8250.0 | Horn X | H/V | -65.4 | 25.5 | 34.0 | 33.1 | 54.0 | 20.9 | max all, noise |
| 33 | | | | | | | | | | |
| 34 | | | | | | | | | | |
| 35 | | | | | | | | | | |
| 36 | | | | | | | | | | |
| 37 | | | | | | | | | | |
| 38 | | | | | | | | | | |
| 39 | * Ave: measured with 1MHz RBW and 100 Hz VBW | | | | | | | | | |
| 40 | * Pk: measured with 1MHz RBW and 3 MHz VBW | | | | | | | | | |
| 41 | | | | | | | | | | |
| 42 | | | | | | | | | | |

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# EXHIBIT 3: MEASUREMENT FACILITIES & EQUIPMENT

## Test Site:

## Measurement/Test Site Facility & Equipment

### Test Site [2.948, 2.1033(b6)]

**SITE 1.**

The AHD test facility is centered on 9 acres of rural property near Sister Lakes, Michigan. The mailing address is 92723 M-152, Dowagiac, Michigan 49047. This test facility is NVLAP accredited (LabCode 200129-0). It has been fully described in a report filed with the FCC (No.90413) and Industry Canada (file:IC3161).

### Measurement Equipment Used [2.947(d), 15.31(b)]

**SITE 1.**

| Equipment | Model | S/N | Last Cal Date | Calibration Interval |
|---|---|---|---|---|
| HP EMI Receiver system | HP 8546A | | | |
| RF Filter Section | HP-85460A | 3448A00283 | 18-Aug-05 | 12 months |
| RF Receiver Section | HP-85462A | 3625A00342 | 18-Aug-05 | 12 months |
| EMCO BiconiLog Antenna | 3142 | 1077 | 12-Aug-05 | 12 months |
| Solar LISN | 8012-50-R-24-BNC | 962137 | 25-Aug-05 | 12 months |
| Solar LISN | 8012-50-R-24-BNC | 962138 | 25-Aug-05 | 12 months |
| (LCI) Double shielded 50ohm Coax | RG58/U | C010609 | 18-Feb-06 | 12 months |
| (3-M) LMR-400 Ultra Flex | LMR400 | 9812-11 | 05-Nov-05 | 6 months |
| Double Ridged Horn | ONO91202-2 | A00329 | calibration by design & physical inspection. | |

**SITE 2.**

The University of Michigan test facility is located at 8501 Beck Road, Belleville, Michigan 48111. This test facility has been fully described and accepted by the FCC and Industry Canada. This facility was utilized to measure emissions occurring at frequencies greater than 2.9 GHz.

**SITE 2.**

| Equipment | Model | S/N | Last Cal Date | Calibration Interval |
|---|---|---|---|---|
| C-Band Std. Gain Horn | UM NRL design | | calibration by design & physical inspection. | |
| XN-Band Std. Gain Horn | UM NRL design | | calibration by design & physical inspection. | |
| X-Band Std. Gain Horn | SA 12-8.2 | 730 | calibration by design & physical inspection. | |
| K-band horn (18-26.5 GHz) FXR, Inc. | K638KF | | calibration by design & physical inspection. | |
| Avantek RF amplifier | AFT-12665 | | Jul-05 | 12 months |
| 3ft LowLoss coax | RG142 | - | with Avantek amp | |
| Spectrum Analyzer 26GHz | HP 8593E | 3412A01131 | Jul-05 | 12 months |

### Measurement Environment

The tests were performed with the equipment under test, and measurement equipment inside the all-weather enclosure. Ambient temperature was 22deg.C., the relative humidity 35%.