ENGINEERING TEST REPORT

Wireless POS Terminal Base
Model No.: NBS5030B001

FCC ID: O3JNBS5030

Applicant:

NBS Payment Solutions
703 Evans Ave., Suite 400
Toronto, Ontario
Canada, M9C 5E9

In Accordance With

FEDERAL COMMUNICATIONS COMMISSION (FCC)
PART 15, SUBPART C, SECTION 15.247
Frequency Hopping (Bluetooth)
Operating in the Frequency Band 2402-2480 MHz

UltraTech's File No.: MIS-068F15C247_B

This Test report is Issued under the Authority of Tri M. Luu, Professional Engineer, Vice President of Engineering UltraTech Group of Labs Date: October 25, 2007	
Report Prepared by: JaeWook Choi Issued Date: October 25, 2007	Tested by: Hung Trinh, RFI Technologist Test Dates: September 30, 2007 & October 17, 2007

- *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.*

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EXHIBIT 1 INTRODUCTION

1.1 SCOPE

Reference:	Part 15, Subpart C, Section 15.247
Title:	Telecommunication - Code of Federal Regulations, CFR 47, Part 15
Purpose of Test:	To gain FCC Equipment Authorization for Frequency Hopping (Bluetooth) Operating in the Frequency Band 2402-2480 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, light industry & heavy industry

1.2 RELATED SUBMITTAL(S)/GRANT(S)

None.

1.3 NORMATIVE REFERENCES

Publication	Year	Title
FCC 47CFR Parts 0-19	2005	Code of Federal Regulations, Title 47 – 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 +A1 EN 55022	2003-04-10 2004-10-14 2003	Limits and Methods of Measurements of Radio Disturbance Characteristics of Information Technology Equipment
CISPR 16-1-1	2003	Specification for radio disturbance and immunity measuring apparatus and methods. Part 1-1: Measuring Apparatus
CISPR 16-2-1	2003	Specification for radio disturbance and immunity measuring apparatus and methods. Part 2-1: Conducted disturbance measurement
CISPR 16-2-3	2003	Specification for radio disturbance and immunity measuring apparatus and methods. Part 2-3: Radiated disturbance measurement
FCC Public Notice DA 00-705	2000	Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems
KDB Publication No. 558074	2005	Guidance on Measurements for Digital Transmission Systems (47 CFR 15.247)

EXHIBIT 2 PERFORMANCE ASSESSMENT

2.1 CLIENT INFORMATION

APPLICANT:	
Name:	NBS Payment Solutions
Address:	703 Evans Ave., Suite 400 Toronto, ON Canada, M9C 5E9
Contact Person:	Mr. Dragoslav Jovanovic Phone #: 416-621-7410 Fax #: 416-621-2450 Email Address: djovanovic@nbsps.com

MANUFACTURER:	
Name:	SAGEM Monetel
Address:	1, Rue Claude Chappe – BP346 Guilherand-Granges France, 07503
Contact Person:	Clement Lormeau, Customer Service Phone #: +33.4.75.81.40.47 Fax #: +33.4.75.81.41.57 Email Address: clement.lormeau@sagem.com

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:	NBS Payment Solutions
Product Name:	Wireless POS Terminal Base
Model Name or Number:	NBS5030B001
Serial Number:	06108PT40011308
Type of Equipment:	Bluetooth (FHSS)
Input Power Supply Type:	AC/DC Adapter 5V DC / 1A
Primary User Functions of EUT:	Financial Transactions

2.3 EUT'S TECHNICAL SPECIFICATIONS

TRANSMITTER	
Equipment Type:	Mobile
Intended Operating Environment:	Commercial, light industry & heavy industry
Power Supply Requirement:	3.3 VDC
RF Output Power Rating:	0.0478 W conducted (18.79 dBm EIRP in 1MHz)
Operating Frequency Range:	2402-2480 MHz
RF Output Impedance:	50 Ω
Channel Spacing:	1 MHz
Duty Cycle:	100%
Modulation Type:	Bluetooth (FHSS)
Antenna Connector Type:	Chip Antenna (internal)
Antenna Description:	Manufacturer: TAIYO YUDEN Type: Bluetooth Model No.: AH 104F2450S1 Frequency Range: 2.4 – 2.5 GHz Gain: 2 dBi (peak)

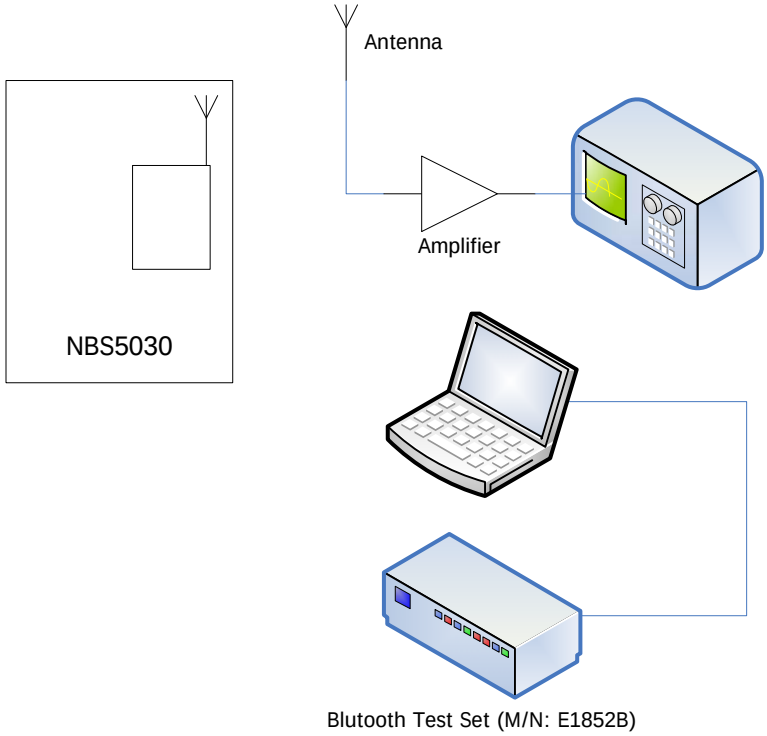
2.4 LIST OF EUT'S PORTS

Port Number	EUT's Port Description	Number of Identical Ports	Connector Type	Cable Type (Shielded/Non-shielded)
1	USB port	1	USB Type B	Shielded
2	External Power Supply	1	Male Plug	Shielded
3	Phone Jack Plug (COM1)	1	RJ-9 4 pin	Non-shielded
4	LAN port	1	RJ-45 8 pin	Non-shielded
5	Phone Jack Plug (COM0)	1	RJ-11 6 pin	Non-shielded

2.5 ANCILLARY EQUIPMENT

	Description	Manufacturer	Model Number	Serial Number
1	Bluetooth Test Set	Agilent	E1852B	DK42050131
2	Laptop	Toshiba	160SCDS/43	1027387CU

2.6 TEST SETUP BLOCK DIAGRAM



Blutooth Test Set (M/N: E1852B)

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 OPERATIONAL TEST CONDITIONS & ARRANGEMENT FOR TESTS

Operating Modes:	▪ Each of lowest, middle and highest channel frequencies transmits continuously for emissions measurements. ▪ The EUT operates in frequency hopping mode and direct sequence or digital modulation mode.
Special Test Software:	Special software is provided by the applicant to put the EUT into the test mode and Bluetooth test set was used to select and operate the EUT at each channel frequency continuously and mode of operation such as frequency hopping and direct sequence or digital modulation for testing purpose.
Special Hardware Used:	N/A
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	
Frequency Band(s):	2402 - 2480 MHz
Frequency(ies) Tested: (Near lowest, near middle & near highest frequencies in the frequency range of operation.)	2402, 2441 & 2480 MHz.
RF Power Output:	0.0478 W conducted (18.79 dBm EIRP in 1MHz)
Normal Test Modulation:	Bluetooth (FHSS)
Modulating Signal Source:	Internal

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 Power Line Conducted Emissions were performed in UltraTech's shielded room, 24'(L) by 16'(W) by 8'(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). Last Date of Site Calibration: May 17, 2007.

4.2 APPLICABILITY & SUMMARY OF EMC EMISSION TEST RESULTS

FCC Section(s)	Test Requirements	Compliance (Yes/No)
15.107(a) /15.207(a)	AC Power Conducted Emissions	Yes (Note 1)
15.109(a)	Class B Radiated Emissions	Yes (Note 1)
15.247(a)(1)	Channel Separation & 20dB Bandwidth	Yes
15.247(a)(1)(iii)	Number of Hopping Channel & Average Time of Occupancy	Yes
15.247(b)(1)	Peak Output Power	Yes
15.247(d), 15.209 & 15.205	Radiated Spurious Emissions	Yes
15.247(d)	Conducted Spurious Emissions	N/A(Note 2)
15.247(i), 1.1310 & 2.1091	RF Exposure	Yes

Notes:

(1) A separate engineering test report for compliance with FCC Part 15, Subpart B – Class B Unintentional Radiators will be provided upon request.
(2) Antenna is soldered on the PCB board thus can not be removed.

4.3 MODIFICATIONS INCORPORATED IN THE EUT FOR COMPLIANCE PURPOSES

None.

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; KDB Publication No. 558074: Guidance on Measurements for Digital Transmission Systems (47 CFR 15.247); FCC Public Notice DA 00-705: Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems.

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 COMPLIANCE WITH FCC PART 15 – GENERAL TECHNICAL REQUIREMENTS

FCC Section	FCC Rules	
15.203	Described how the EUT complies with the requirement that either its antenna is permanently attached, or that it employs a unique antenna connector, for every antenna proposed for use with the EUT. The exception is in those cases where EUT must be professionally installed. In order to demonstrate that professional installation is required, the following 3 points must be addressed: • The application (or intended use) of the EUT • The installation requirements of the EUT • The method by which the EUT will be marketed	The integral antenna is permanently mounted on the printed circuit board and located inside the enclosure
15.204	Provided the information for every antenna proposed for use with the EUT: (a) type (e.g. Yagi, patch, grid, dish, etc…), (b) manufacturer and model number (c) gain with reference to an isotropic radiator	Manufacturer: TAIYO YUDEN Co., LTD Type: 2.4GHz Multilayer Antenna Model No.: AH 104F2450S1 Frequency Range: 2.4 – 2.5 GHz Gain: > 0 dBi

5.5 CHANNEL SEPARATION & 20 DB BANDWIDTH [§15.247(a)(1)]

5.5.1. Limits

- **§15.247(a)(1):** Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

5.5.2. Method of Measurements

Refer to FCC Public Notice DA 00-705, KDB Publication No. 558074 and ANSI C63.4 for measurement methods.

5.5.3. Test Arrangement

See Section 2.6 of this test report.

5.5.4. Test Equipment List

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range
Spectrum Analyzer/ EMI Receiver	Rohde & Schwarz	FSEK30	100077	20 Hz – 40 GHz
Amplifier	Hewlett Packard	8449B	3008A00769	1 GHz – 26.5 GHz
Horn Antenna	EMCO	3155	9701-5061	1 GHz – 18 GHz
Biconilog Antenna	EMCO	3143	1029	20 MHz – 2 GHz

5.5.5. Test Data

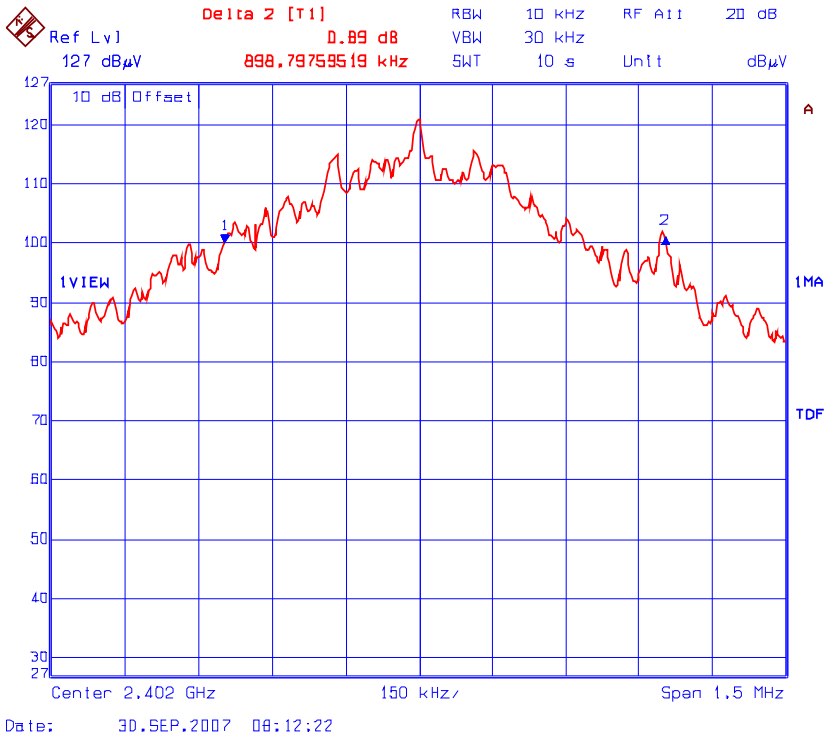
Note: Bandwidth measurements were done using the built-in auto function of the analyzer.

5.5.5.1. For Frequency Hopping Spread Spectrum Mode

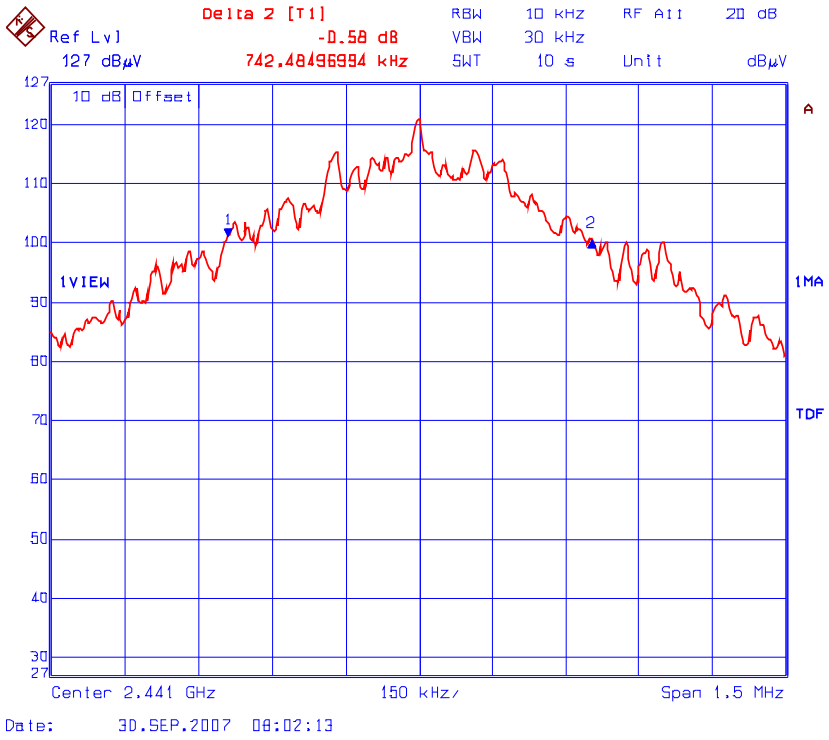
Frequency (MHz)	20 dB Bandwidth (kHz)
2402	898.80
2441	742.48
2480	1000.70

See the following plots for detailed measurements.

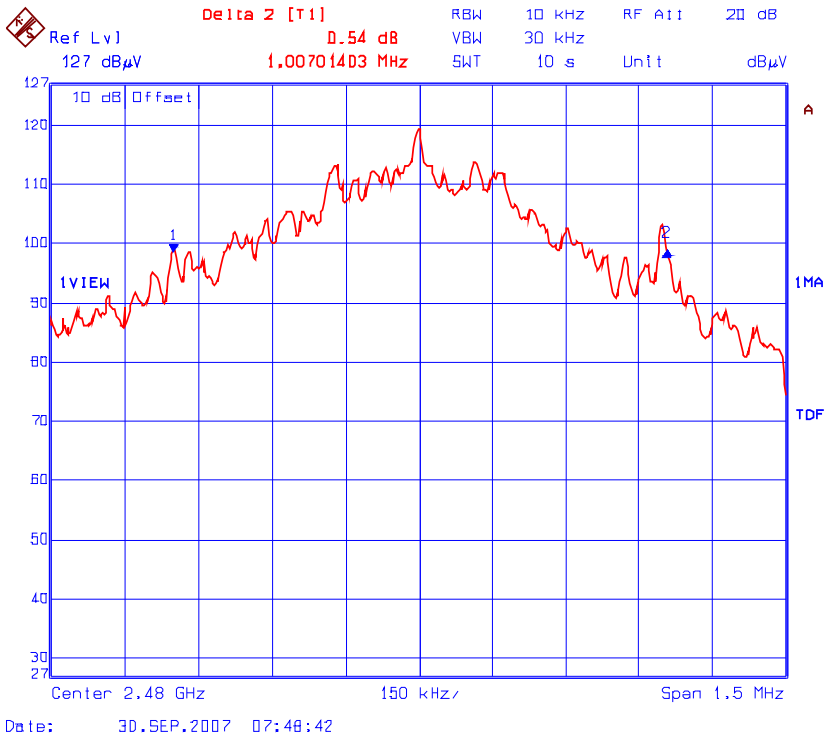
Plot 5.5.5.1.1.: 20 dB Bandwidth
2402 MHz, Packet Type: DH1, Random Modulation: SPSR (Static Pseudo)



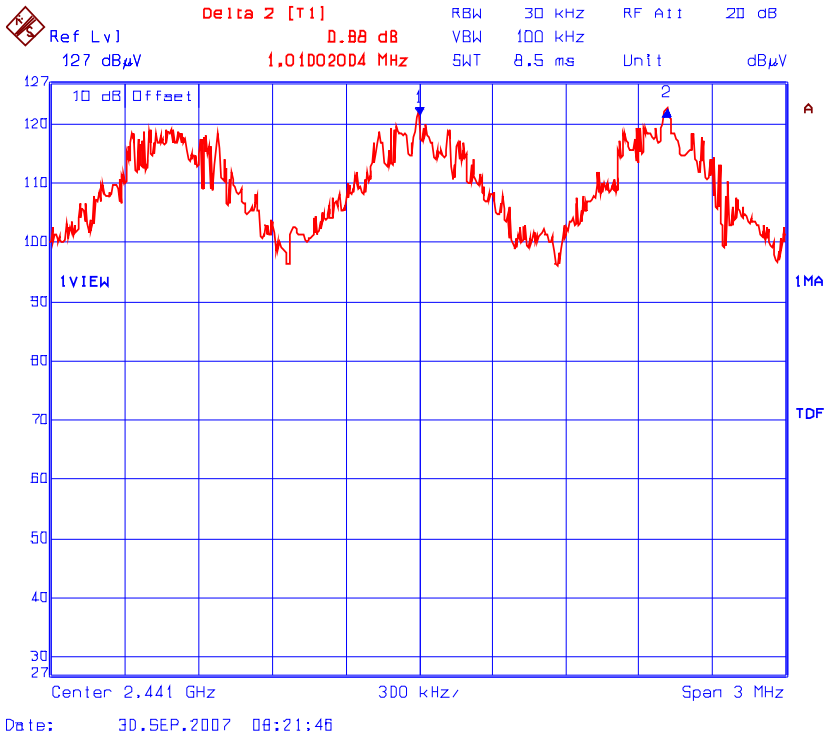
Plot 5.5.5.1.2.: 20 dB Bandwidth
2441 MHz, Packet Type: DH1, Random Modulation: SPSR (Static Pseudo)



Plot 5.5.5.1.3.: 20 dB Bandwidth
2480 MHz, Packet Type: DH1, Random Modulation: SPSR (Static Pseudo)



Plot 5.5.5.1.4.: Channel Separation
Packet Type: DH1, Random Modulation: SPSR (Static Pseudo), Hopping mode



5.6 NUMBER OF HOPPING CHANNEL & AVERAGE TIME OF OCCUPANCY [§ 15.247(a)(1)(iii)]

5.6.1. Limits

- **FCC 15.247(a)(1)(iii):** Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

5.6.2. Method of Measurements

Refer to FCC Public Notice DA 00-705, KDB Publication No. 558074 and ANSI C63.4 for measurement methods.

5.6.3. Test Arrangement

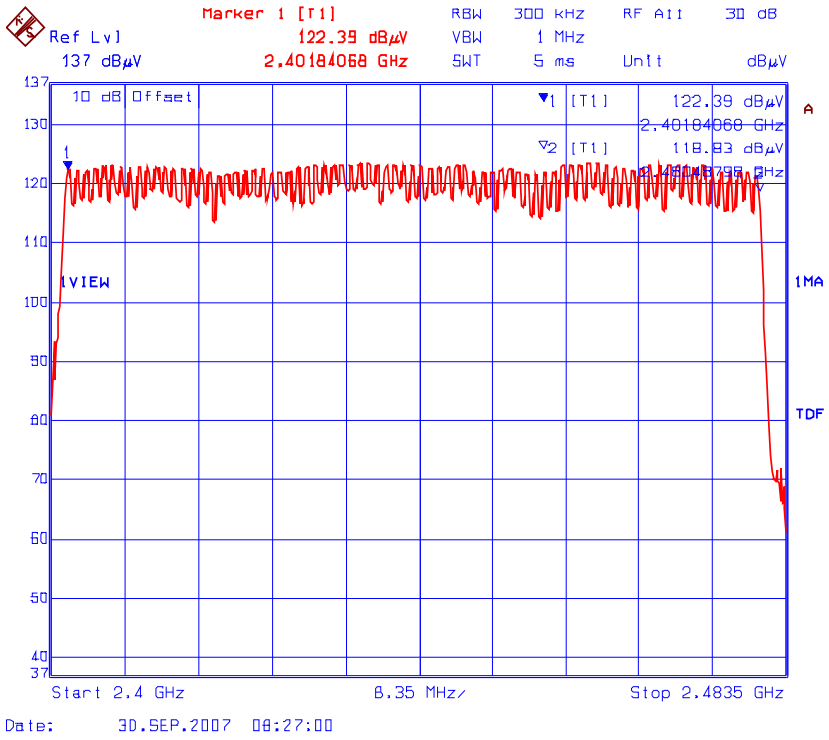
See Section 2.6 of this test report.

5.6.4. Test Equipment List

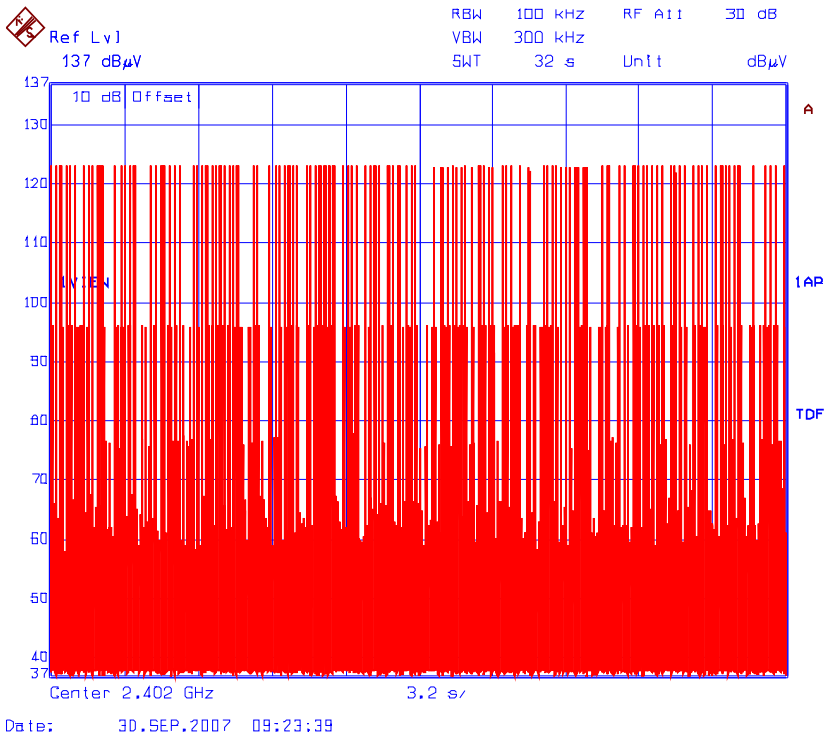
Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range
Spectrum Analyzer/ EMI Receiver	Rohde & Schwarz	FSEK30	100077	20 Hz – 40 GHz
Amplifier	Hewlett Packard	8449B	3008A00769	1 GHz – 26.5 GHz
Horn Antenna	EMCO	3155	9701-5061	1 GHz – 18 GHz
Biconilog Antenna	EMCO	3143	1029	20 MHz – 2 GHz

5.6.5. Test Data

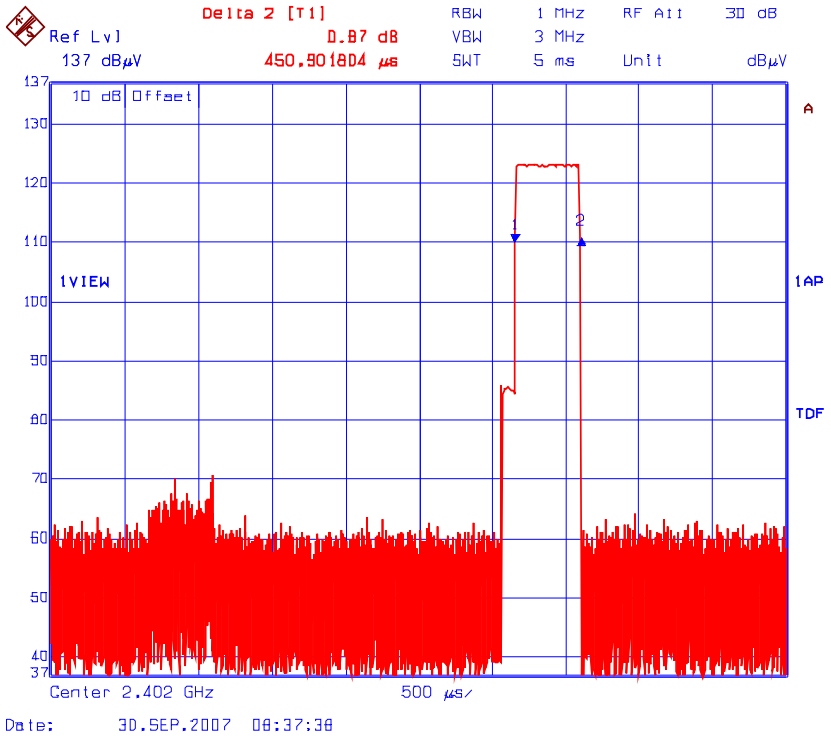
Plot 5.6.5.1.: Number of hopping channel
Packet Type: DH1, Random Modulation: SPSR (Static Pseudo), Hopping mode - 79 channels



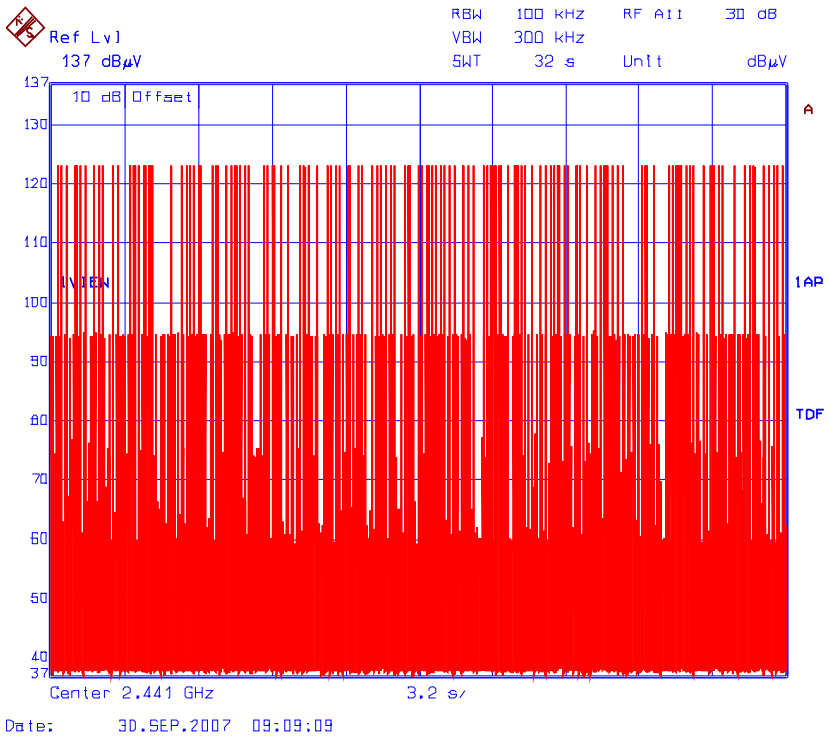
Plot 5.6.5.2.: Time of Occupancy at 2402 MHz #1
Packet Type: DH1, Random Modulation: SPSR (Static Pseudo)
115 * 450.90us= 51.85ms < 400ms within 31.6s (0.4s * 79)



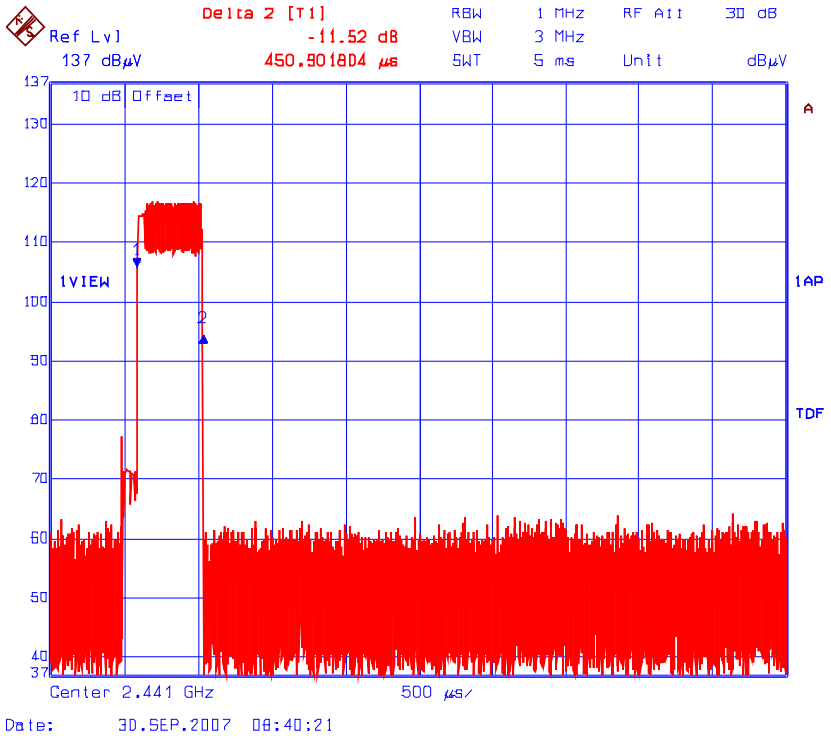
Plot 5.6.5.3.: Time of Occupancy at 2402 MHz #2
Packet Type: DH1, Random Modulation: SPSR (Static Pseudo)



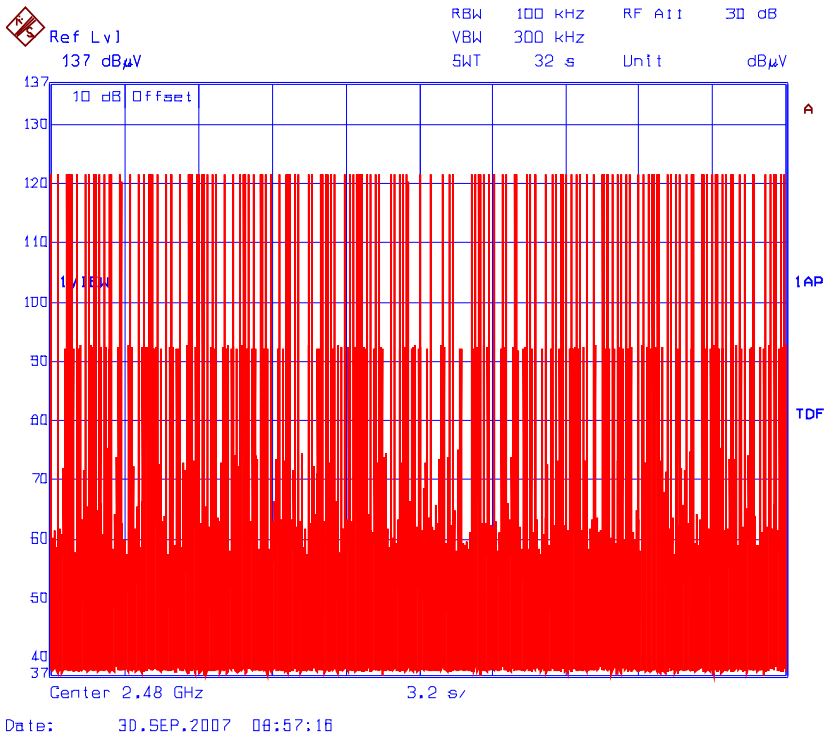
Plot 5.6.5.4.: Time of Occupancy at 2441Hz #1
Packet Type: DH1, Random Modulation: SPSR (Static Pseudo)
115 * 450.90us= 51.85ms < 400ms within 31.6s (0.4s * 79)



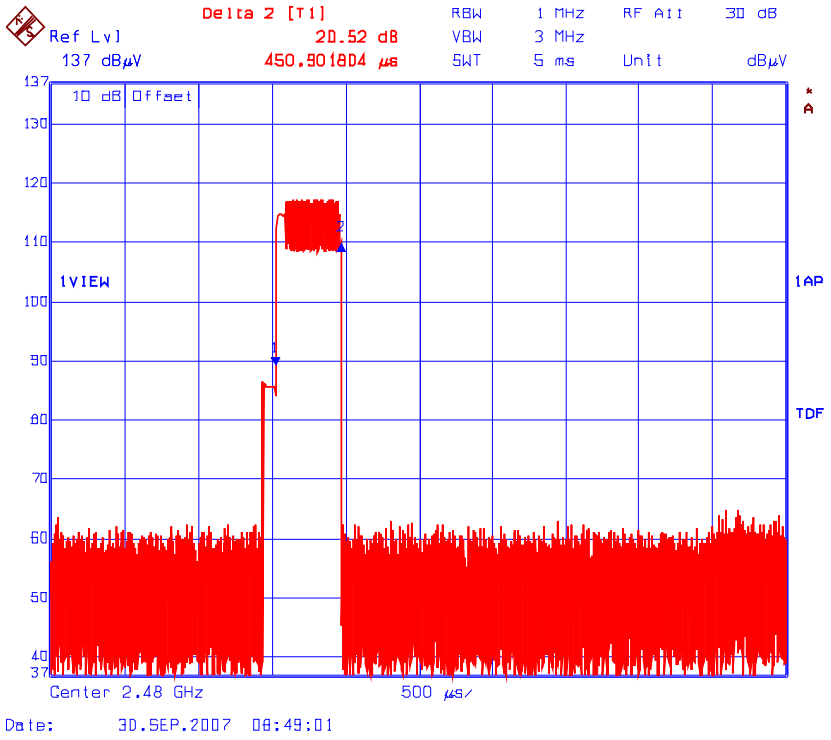
Plot 5.6.5.5.: Time of Occupancy at 2441Hz #2
Packet Type: DH1, Random Modulation: SPSR (Static Pseudo)



Plot 5.6.5.6.: Time of Occupancy at 2480 MHz #1
Packet Type: DH1, Random Modulation: SPSR (Static Pseudo)
115 * 450.90us= 51.85ms < 400ms within 31.6s (0.4s * 79)



Plot 5.6.5.7.: Time of Occupancy at 2480 MHz #2
Packet Type: DH1, Random Modulation: SPSR (Static Pseudo)



5.7 PEAK OUTPUT POWER [§§ 15.247(b)(1)]

5.7.1. Limits

- **FCC 15.247(b)(1):** For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

5.7.2. Method of Measurements

Refer to FCC Public Notice DA 00-705, KDB Publication No. 558074 and ANSI C63.4 for measurement methods.

5.7.3. Test Arrangement

See Section 2.6 of this test report.

5.7.4. Test Equipment List

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range
Spectrum Analyzer/ EMI Receiver	Rohde & Schwarz	FSEK30	100077	20 Hz – 40 GHz
Amplifier	Hewlett Packard	8449B	3008A00769	1 GHz – 26.5 GHz
Horn Antenna	EMCO	3155	9701-5061	1 GHz – 18 GHz
Biconilog Antenna	EMCO	3143	1029	20 MHz – 2 GHz

5.7.5. Test Data

Frequency (MHz)	E-Field in 1 MHz @ 3m (dBuV/m)	Antenna Polarization (V/H)	Power from Signal Gen. (dBm)	Subs. Ant. Horn Gain (dBi)	Measured Peak EIRP in 1MHz (dBm)	EIRP Limit (dBm)	Margin (dB)
2402	116.99	V	10.89	7.9	18.79	30	-11.21
	113.77	H	7.26	7.9	15.16	30	-14.84
2441	116.25	V	9.42	8.3	17.72	30	-12.28
	112.32	H	5.16	8.3	13.46	30	-16.54
2408	116.11	V	7.35	8.4	16.75	30	-13.25
	111.34	H	4.06	8.4	12.46	30	-17.54

* Peak power is calculated using the following equation:

$$P = \frac{(E \times D)^2}{30 \times G}$$

Where: E – The measured maximum field strength in V/m
G – The numeric gain of the transmitting antenna over an isotropic radiator
D – The distance in meters form which the field strength was measured
P – The power in watts

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

5.8 RADIATED SPURIOUS EMISSIONS @ 3 METERS [§ 15.209 & § 15.247(d)]

5.8.1. Limits

- **FCC 15.247(d):** In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required.

- **FCC 15.209:** In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

47 CFR 15.205(a) - Restricted Bands of Operation

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
[1]0.495 - 0.505	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	2690 - 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	(2)
13.36 - 13.41			

[1] Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.
[2] Above 38.6

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

47 CFR 15.209(a) - Radiated emission limits, general requirements

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30	30
30 - 88	100 **	3
88 - 216	150 **	3
216 - 960	200 **	3
Above 960	500	3
** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.		

5.8.2. Method of Measurements

Refer to Ultratech Test Procedures, Files # ULTR P002-2004 or ULTR P003-2004 and ANSI C63.4 for measurement methods

5.8.3. Test Arrangement

Refer to Section 2.6 of this test report for test setup.

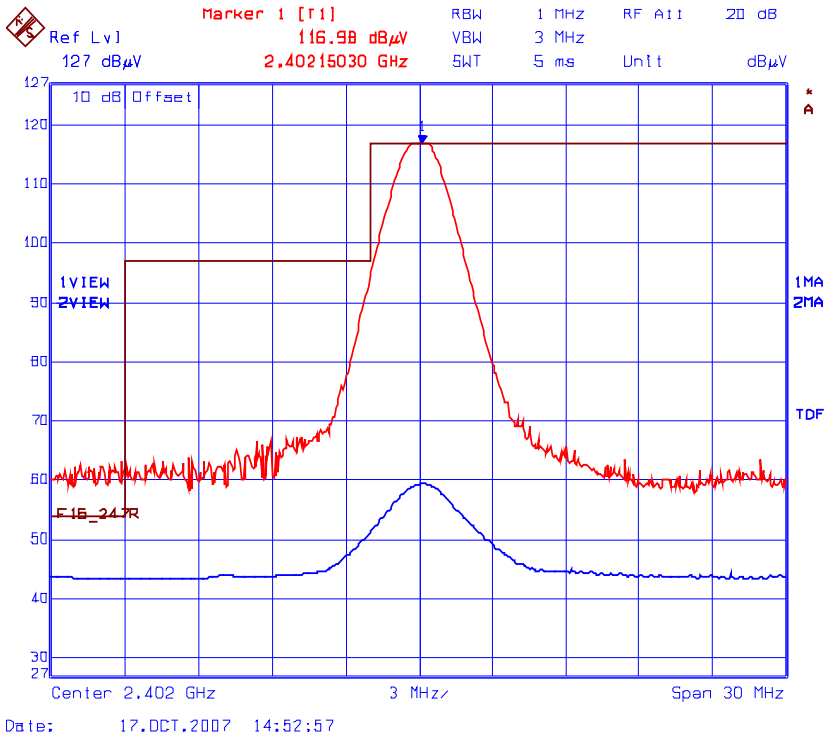
5.8.4. Test Equipment List

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range
Spectrum Analyzer/ EMI Receiver	Rohde & Schwarz	FSEK30	100077	20 Hz – 40 GHz
Amplifier	Hewlett Packard	8449B	3008A00769	1 GHz – 26.5 GHz
Horn Antenna	EMCO	3155	9701-5061	1 GHz – 18 GHz
Biconilog Antenna	EMCO	3143	1029	20 MHz – 2 GHz

5.8.5. Test Data

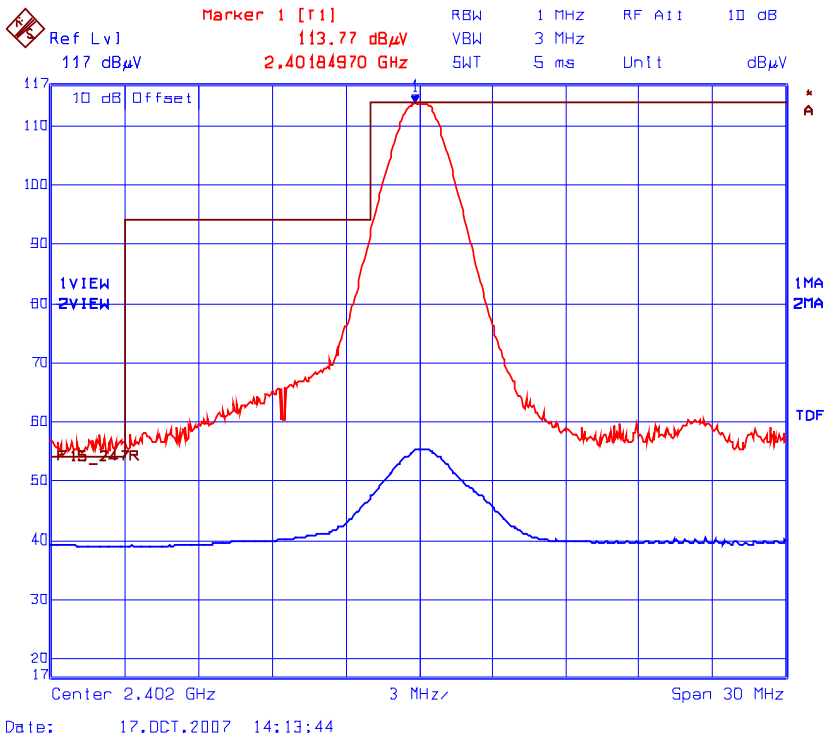
5.8.5.1. Band-edge Radiated Emissions

Plot 5.8.5.1.1.: Band-Edge Radiated Emissions @ 3 meters
2402MHz, Lower Band-Edge Radiated Emissions Vertical Polarization, Continuous
Packet Type: DH1, Random Modulation: SPSR (Static Pseudo), EUT lay flat
Trace 1: RBW= 1MHz, VBW= 3MHz (Peak)
Trace 2: RBW= 1MHz, VBW= 10Hz (Average)

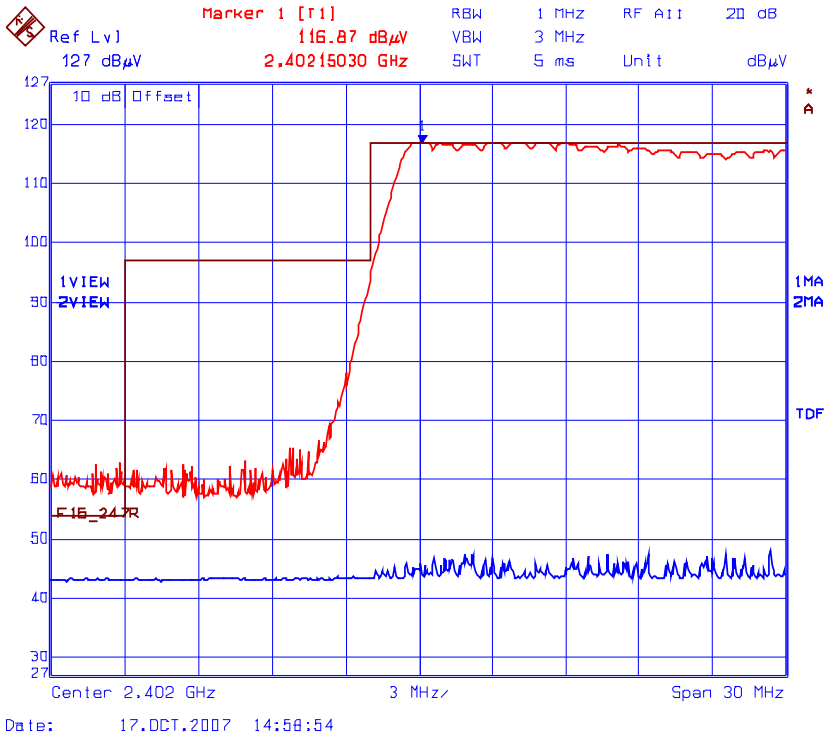


All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)

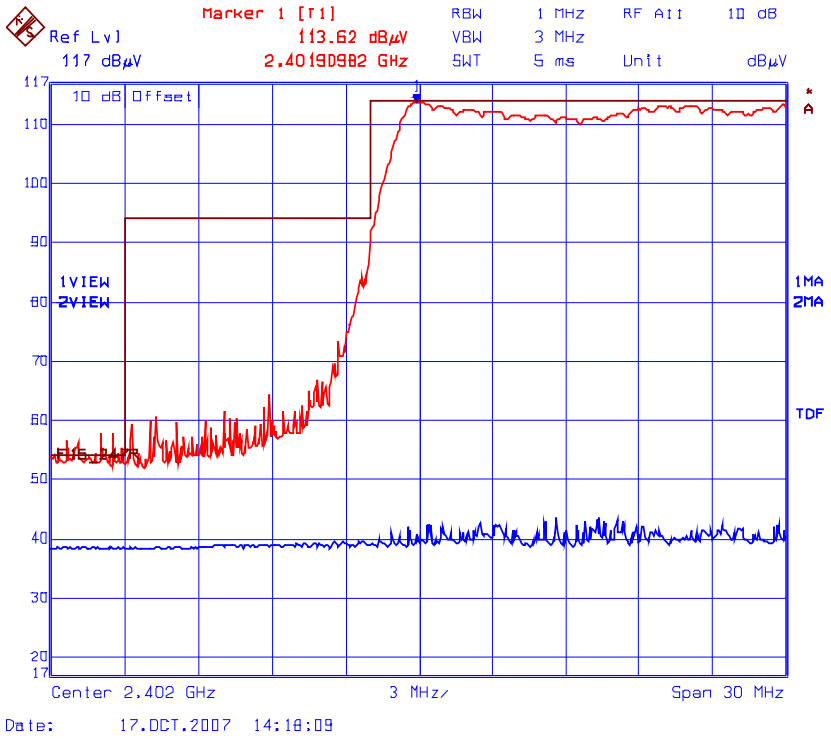
Plot 5.8.5.1.2.: Band-Edge Radiated Emissions @ 3 meters
2402MHz, Lower Band-Edge Radiated Emissions Horizontal Polarization, Continuous
Packet Type: DH1, Random Modulation: SPSR (Static Pseudo), EUT Left side down
Trace 1: RBW= 1MHz, VBW= 3MHz (Peak)
Trace 2: RBW= 1MHz, VBW= 10Hz (Average)



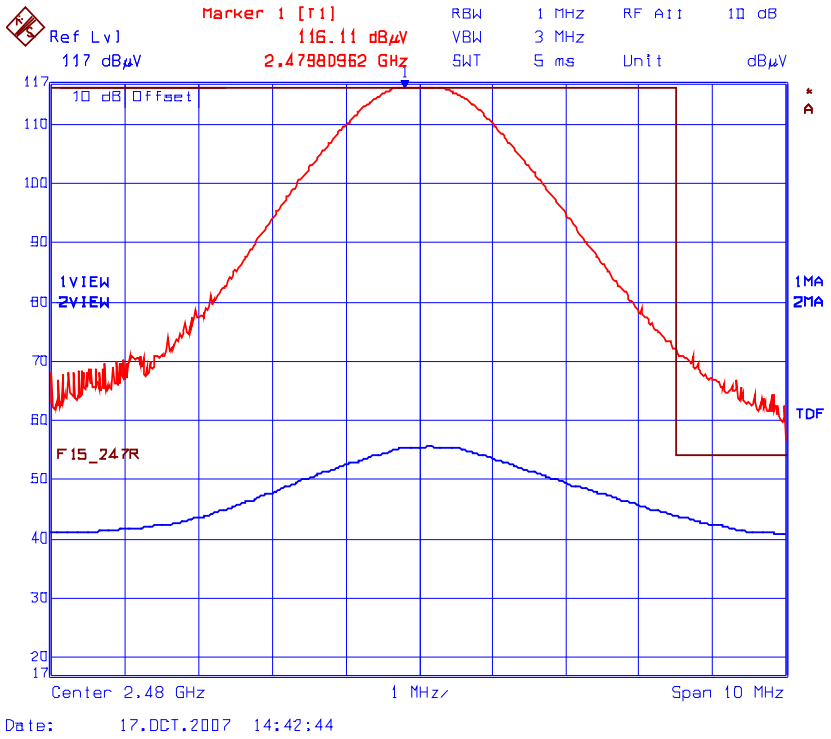
Plot 5.8.5.1.3.: Band-Edge Radiated Emissions @ 3 meters,
2402MHz, Lower Band-Edge Radiated Emissions Vertical Polarization, Hopping
Packet Type: DH1, Random Modulation: SPSR (Static Pseudo), EUT lay flat
Trace 1: RBW= 1MHz, VBW= 3MHz (Peak)
Trace 2: RBW= 1MHz, VBW= 10Hz (Average)



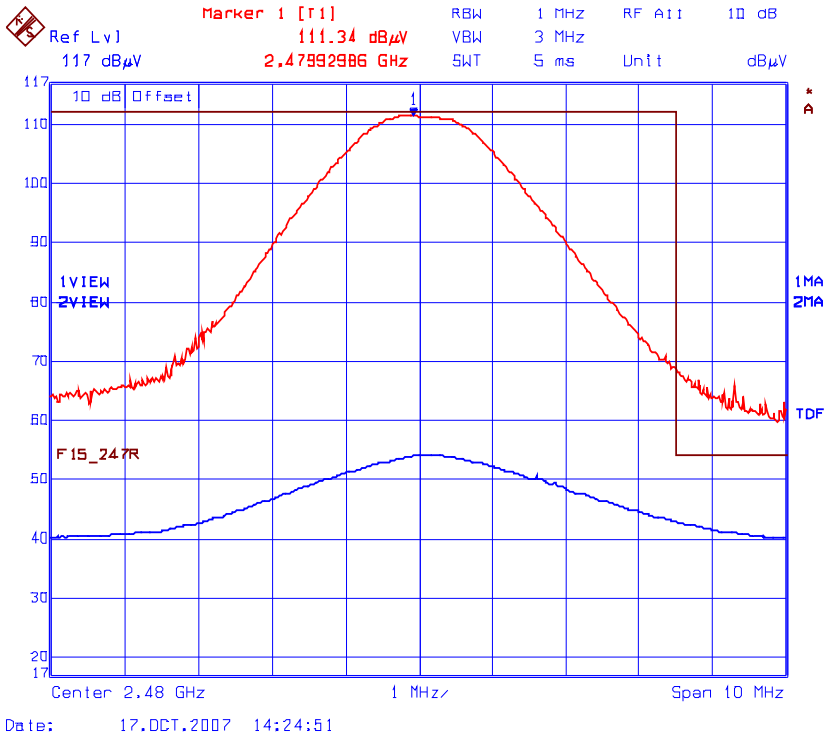
Plot 5.8.5.1.4.: Band-Edge Radiated Emissions @ 3 meters
2402MHz, Lower Band-Edge Radiated Emissions Horizontal Polarization, Hopping
Packet Type: DH1, Random Modulation: SPSR (Static Pseudo), EUT Right side down
Trace 1: RBW= 1MHz, VBW= 3MHz (Peak)
Trace 2: RBW= 1MHz, VBW= 10Hz (Average)



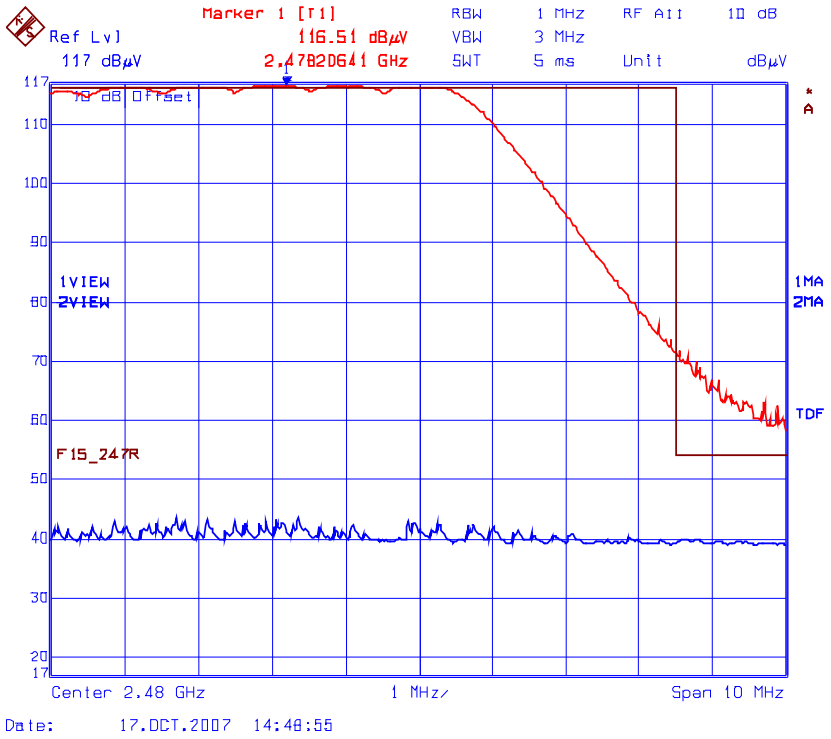
Plot 5.8.5.1.5.: Band-Edge Radiated Emissions @ 3 meters
2480MHz, Upper Band-Edge Radiated Emissions Vertical Polarization, Continuous
Packet Type: DH1, Random Modulation: SPSR (Static Pseudo), EUT lay flat
Trace 1: RBW= 1MHz, VBW= 3MHz (Peak)
Trace 2: RBW= 1MHz, VBW= 10Hz (Average)



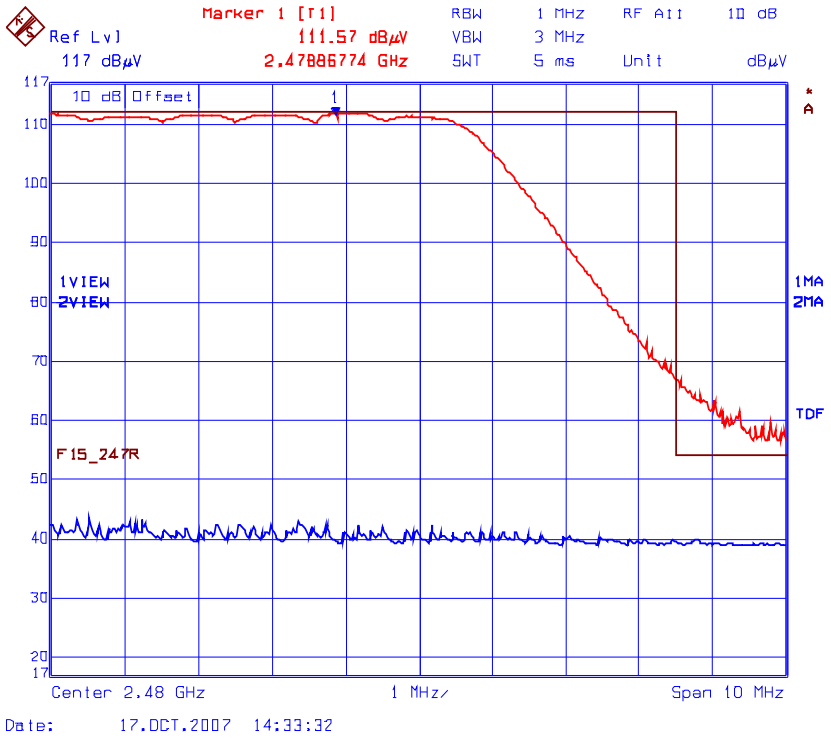
Plot 5.8.5.1.6.: Band-Edge Radiated Emissions @ 3 meters
2480MHz, Upper Band-Edge Radiated Emissions Horizontal Polarization, Continuous
Packet Type: DH1, Random Modulation: SPSR (Static Pseudo), EUT Left side down
Trace 1: RBW= 1MHz, VBW= 3MHz (Peak)
Trace 2: RBW= 1MHz, VBW= 10Hz (Average)



Plot 5.8.5.1.7.: Band-Edge Radiated Emissions @ 3 meters
2480MHz, Upper Band-Edge Radiated Emissions Vertical Polarization, Hopping
Packet Type: DH1, Random Modulation: SPSR (Static Pseudo), EUT lay flat
Trace 1: RBW= 1MHz, VBW= 3MHz (Peak)
Trace 2: RBW= 1MHz, VBW= 10Hz (Average)



Plot 5.8.5.1.8.: Band-Edge Radiated Emissions @ 3 meters
2480MHz, Upper Band-Edge Radiated Emissions Horizontal Polarization, Hopping
Packet Type: DH1, Random Modulation: SPSR (Static Pseudo), EUT Left side down
Trace 1: RBW= 1MHz, VBW= 3MHz (Peak)
Trace 2: RBW= 1MHz, VBW= 10Hz (Average)



5.8.5.2. Transmitter Radiated Spurious Emissions

The emissions were scanned from 30 MHz to 25 GHz; all signals within 20 dB below the permissible limit were recorded in the table below.

Frequency (MHz)	RF Peak Level (dBµV/m)	RF Avg Level (dBµV/m)	Antenna Plane (H/V)	Limit 15.209 (dBµV/m)	Limit 15.247 (dBµV/m)	Margin (dB)	Pass/ Fail
Fundamental Frequency: 2402 MHz							
2402	116.99	-	V	-	-	-	-
2402	113.77	-	H	-	-	-	-
4804	62.13	37.97	V	54.0	96.99	-16.03	Pass*
4804	60.03	37.45	H	54.0	96.99	-16.55	Pass*
7206	72.71	40.90	V	54.0	96.99	-56.06	Pass
7206	74.36	42.45	H	54.0	96.99	-54.54	Pass
9608	63.54	41.95	V	54.0	96.99	-55.04	Pass
9608	63.58	41.27	H	54.0	96.99	-55.72	Pass
Fundamental Frequency: 2441 MHz							
2441	116.25	-	V	-	-	-	-
2441	112.32	-	H	-	-	-	-
4882	62.49	37.87	V	54.0	96.25	-16.13	Pass*
4882	62.56	37.94	H	54.0	96.25	-16.06	Pass*
7323	69.97	40.63	V	54.0	96.25	-13.37	Pass*
7323	72.41	40.98	H	54.0	96.25	-13.02	Pass*
9764	62.09	42.76	V	54.0	96.25	-53.49	Pass
9764	61.00	42.60	H	54.0	96.25	-53.65	Pass
Fundamental Frequency: 2480 MHz							
2480	116.11	-	V	-	-	-	-
2480	111.34	-	H	-	-	-	-
4960	71.29	39.78	V	54.0	96.11	-14.22	Pass*
4960	68.72	39.25	H	54.0	96.11	-14.75	Pass*
7440	71.69	41.45	V	54.0	96.11	-12.55	Pass*
7440	72.96	41.70	H	54.0	96.11	-12.30	Pass*
9920	61.38	42.81	V	54.0	96.11	-53.30	Pass
9920	63.83	43.41	H	54.0	96.11	-52.70	Pass

* Emission in restricted bands.

5.9 RF Exposure Requirement [§ 15.247 (i), 1.1310 & 2.1091]

5.9.1. Limits

- **§ 15.247(i):** Systems operating under provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines. See 1.1307(b)(1).
- **§ 1.1310:**- The criteria listed in the following table shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in 1.1307(b).

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3–3.0	614	1.63	*(100)	6
3.0–30	1842/f	4.89/f	*(900/f^2)	6
30–300	61.4	0.163	1.0	6
300–1500			f/300	6
1500–100,000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*(180/f^2)	30
30–300	27.5	0.073	0.2	30
300–1500			f/1500	30
1500–100,000			1.0	30

f = frequency in MHz
* = Plane-wave equivalent power density

NOTE 1 TO TABLE 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

NOTE 2 TO TABLE 1: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

5.9.2. Method of Measurements

Refer to Sections 1.1310, 2.1091 and Public Notice DA 00-705 (March 30, 2000)

Spread spectrum transmitters operating under section 15.247 are categorically from routine environmental evaluation to demonstrating RF exposure compliance with respect to MPE and/or SAR limits. These devices are not exempted from compliance (As indicated in Section 15.247(b)(4), these transmitters are required to operate in a manner that ensures that exposure to public users and nearby persons) does not exceed the Commission's RF exposure guidelines (see Section 1.1307 and 2.1093). Unless a device operates at substantially low power levels, with a low gain antenna(s), supporting information is generally needed to establish the various potential operating configurations and exposure conditions of a transmitter and its antenna(s) in order to determine compliance with the RF exposure guidelines.

In order to demonstrate compliance with MPE requirements (see Section 2.1091), the following information is typically needed:

(1) Calculation that estimates the minimum separation distance (20 cm or more) between an antenna and persons required to satisfy power density limits defined for free space.
(2) Antenna installation and device operating instructions for installers (professional/unskilled users), and the parties responsible for ensuring compliance with the RF exposure requirement

(3) Any caution statements and/or warning labels that are necessary in order to comply with the exposure limits
(4) Any other RF exposure related issues that may affect MPE compliance

Calculation Method of RF Safety Distance:

$$S = \frac{P \cdot G}{4 \cdot \pi \cdot r^2} = \frac{EIRP}{4 \cdot \pi \cdot r^2}$$

Where: P: power input to the antenna in mW
EIRP: Equivalent (effective) isotropic radiated power
S: power density mW/cm^2
G: numeric gain of antenna relative to isotropic radiator
r: distance to centre of radiation in cm

For portable transmitters (see Section 2.1093), or devices designed to operate next to a person's body, compliance is determined with respect to the SAR limit (define in the body tissues) for near-field exposure conditions. If the maximum average output power, operating condition configurations and exposure conditions are comparable to those of existing cellular and PCS phones, SAR evaluation may be required in order to determine if such a device complies with SAR limit. When SAR evaluation data is not available, and the additional supporting information cannot assure compliance, the Commission may request that an SAR evaluation be performed, as provided for in Section 1.1307(d)

5.9.3. Test Arrangement

Refer to Section 2.6 of this test report for test setup.

5.9.4. Test Equipment List

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range
Spectrum Analyzer/ EMI Receiver	Rohde & Schwarz	FSEK30	100077	20 Hz – 40 GHz
Amplifier	Hewlett Packard	8449B	3008A00769	1 GHz – 26.5 GHz
Horn Antenna	EMCO	3155	9701-5061	1 GHz – 18 GHz
Biconilog Antenna	EMCO	3143	1029	20 MHz – 2 GHz

5.9.5. Test Data

Evaluation of RF Exposure Compliance Requirements	
RF Exposure Requirements	**Compliance with FCC Rules**
Minimum calculated separation distance between antenna and persons required: ***2.45 cm**	Manufacturer' instruction for separation distance between antenna and persons required: **20 cm.**
Antenna installation and device operating instructions for installers (professional/unskilled users), and the parties responsible for ensuring compliance with the RF exposure requirement	Antenna installation and device operating instructions shall be provided to installers to maintain and ensure compliance with RF exposure requirements.
Caution statements and/or warning labels that are necessary in order to comply with the exposure limits	Refer to User's Manual for RF Exposure Information.
Any other RF exposure related issues that may affect MPE compliance	None.

*The minimum separation distance between the antenna and bodies of users are calculated using the following formula:

RF EXPOSURE DISTANCE LIMITS

$$r = \sqrt{\frac{P \cdot G}{4 \cdot \pi \cdot S}} = \sqrt{\frac{EIRP}{4 \cdot \pi \cdot S}}$$

(S_{Limit}) = 1.0 mW/cm^2

(Maximum EIRP Measured) =18.79 dBm ≈ $10^{1.879}$ = 75.68 mW

(Minimum Safe Distance, r) = $\sqrt{\frac{EIRP}{4 \cdot \pi \cdot S}} = \sqrt{\frac{75.68}{4 \cdot \pi \cdot 1.0}} \approx 2.45cm$

EXHIBIT 6 MEASUREMENT UNCERTAINTY

The measurement uncertainties stated were calculated in accordance with the requirements of NIST Technical Note 1297 and NIS 81 (1994)

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 Γ_1 = 0.03 LISN VRC Γ_R = 0.8(9 kHz) 0.2 (30 MHz) 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 Γ_1 = 0.2 Antenna VRC Γ_R = 0.67(Bi) 0.3 (Lp) Uncertainty limits 20Log(1±$\Gamma_1\Gamma_R$)	U-Shaped	+1.1 -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