ENGINEERING TEST REPORT

Vehicle Mount Computer
Model No.: 8530G2

FCC ID: GM38530G2

Applicant:

Psion Teklogix Inc.
2100 Meadowvale Blvd.
Toronto, Ontario
Canada, L5N 7J9

In Accordance With

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

UltraTech's File No.: TEK-535F15C247

This Test report is Issued under the Authority of Tri M. Luu, Professional Engineer, Vice President of Engineering UltraTech Group of Labs Date: June 6, 2006	
Report Prepared by: Dharmajit Solanki Issued Date: June 6, 2006	Tested by: Hung Trinh, RFI Technologist Test Dates: April 11 – May 1, 2006

- *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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ANSI	FC	VCI	Canada	NVLAP	BSMI
0685	31040/SIT	C-1376	46390-2049	200093-0	SL2-IN-E-1119R

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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 and Digital Modulation Systems (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:	• Residential • Light-industry, Commercial • 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:	Psion Teklogix Inc.
Address:	2100 Meadowvale Blvd. Mississauga, ON Canada, L5N 7J9
Contact Person:	Mr. Sada Dharwarkar Phone #: 905-812-6200 (3358) Fax #: 905-812-6301 Email Address: Sada.Dharwarkar@psionteklogix.com

MANUFACTURER:	
Name:	Psion Teklogix Inc.
Address:	2100 Meadowvale Blvd. Mississauga, ON Canada, L5N 7J9
Contact Person:	Mr. Sada Dharwarkar Phone #: 905-812-6200 (3358) Fax #: 905-812-6301 Email Address: Sada.Dharwarkar@psionteklogix.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:	Psion Teklogix Inc.
Product Name:	Vehicle Mount Computer
Model Name or Number:	8530G2
Serial Number:	VA5026094972
Type of Equipment:	Radio Equipment (Multiple Transmitter)
Power Supply Type:	Vehicle Battery 13.8 V DC or PHIHONG Switching Power Supply, 18V DC, 3.3A
Primary User Functions of EUT:	Vehicle Mount RF real time data collection computer used in supply chain and inventory management solutions.

2.3. EUT'S TECHNICAL SPECIFICATIONS

HARDWARE	
MANUFACTURER	Psion Teklogix Inc.
PRODUCT	8530 G2 Bluetooth + RA2040 + RA1001
TEKLOGIX MODEL NUMBER	8530G2
SERIAL NUMBER	VA5026094972
MLB PART NUMBER	VA1EP5460400
DISPLAY	RoHS
EQUIPMENT TYPE	MOBILE
INTENDED OPERATING ENVIRONMENT	Commercial, Industrial, or Business
MISCELANEOUS HARDWARE	
MANUFACTURER	PHIHONG
PRODUCT	SWITCHING POWER SUPPLY
MODEL NUMBER	PSA65U-180 (RoHS)
SERIAL NUMBER	P60600791A7
TEKLOGIX PART NUMBER	N/A

SOFTWARE	
SOFTWARE VERSION	Microsoft
APPLICATION VERSION	Windows XP
CLOCK SPEED	520 MHz
DUTY CYCLE	25%

RADIO 1	
LOCATION	Main Logic Board
MANUFACTURER:	Murata
PRODUCT	2.4 GHz FHSS Bluetooth Radio Chip Set
PART NUMBER	LBMA2U2BL2-092
TEKLOGIX MODEL NUMBER	N/A
SERIAL NUMBER	N/A
FCC ID	N/A
POWER	4 mW EIRP
FREQUENCY RANGE	2.402 to 2.480 GHz
DATA RATES	57.6 – 723.2 kbps
CHANNELS	79
INTERNAL/EXTRENAL ANTENNA	Internal
RF CABLE TYPE	None
ANTENNA TYPE + GAIN	Chip, 2.0 dBi
TEKLOGIX PART NUMBER	N/A

RADIO 2	
MANUFACTURER	Askey
PRODUCT	802.11b/g DSSS or OFDM
TEKLOGIX MODEL NUMBER	RA2040
TEKLOGIX PART NUMBER	N/A
SERIAL NUMBER	1001933-002
FCC ID NUMBER	GM3RA2040
OUTPUT POWER	15 dBm + - 1.5dBm
OPERATING FREQUENCY RANGE	2.4-2.5GHz
DATA RATES	11MBps
CHANNELS	11 (FCC)
OPERATING VOLTAGE	DC 3.3V
REF. OSC. FREQUENCIES	32 MHz
ANTENNA	MOBILE MARK IMAG5-2400
GAIN	3 dBi
ANTENNA CONNECTOR TYPE	Reverse Polarity SMA

RADIO 3	
MANUFACTURER	Psion Teklogix Inc.
PRODUCT	NB UHF
TEKLOGIX MODEL NUMBER	RA1001
TEKLOGIX PART NUMBER	1001411-1
SERIAL NUMBER	RA1SP6100020
OUTPUT POWER (WATTS)	1 W
OPERATING FREQUENCY RANGE	435-451 MHz
DATA RATES	9600
CHANNELS	20
OPERATING VOLTAGE	5 VDC 1.5A
REF. OSC. FREQUENCIES	32 MHz
ANTENNA	¼ Wave
GAIN	0 dBi
ANTENNA CONNECTOR TYPE	SMA

2.4. LIST OF EUT'S PORTS

LIST OF EUT PORTS				
INTERFACE PORT NAME	**PORT/CABLE TYPE**	**CABLE LENGTH**	**SHEILDED? YES/NO**	**TERMINATED? YES/NO**
Serial Port	DB-9	5'	NO	YES
Auxiliary Port Host/Device Interface	HDB-26 Pin F	5'	YES	YES
Key Board	DB-26 Pin Male	2 Meter	YES	YES
Scanner	JB5	9'	NO	YES
Mouse	USB	5'	NO	YES
Antenna 1	SMA Rev. Polarity (802.11b/g)	9'	YES	YES
Antenna 2	SMA Polarity (Narrow Band)	9'	YES	YES
Power Port	AMP CPC	1.5'	NO	YES

2.5. ANCILLARY EQUIPMENT

The EUT was tested while connected to the following representative configuration of ancillary equipment necessary to exercise the ports during tests:

Ancillary Equipment # 1	
Description:	Scanner Symbol
Brand name:	Psion Teklogix
Model Name:	LS3408-ER20005
Serial Number:	ALP76579
Connected to EUT's Port:	Tether

Ancillary Equipment # 2	
Description:	Switching Power Supply
Brand name:	PHIHONG
Model Name:	PSA65U-180
Serial Number:	P60600791A7
Connected to EUT's Port:	AMP CPC

Ancillary Equipment # 3	
Description:	Mouse
Brand name:	Pilot Optical Mouse
Model Name:	72127
Serial Number:	C0509000335
Connected to EUT's Port:	Auxiliary

2.6. TEST SETUP BLOCK DIAGRAM

BLOCK DIAGRAM OF TEST SETUP

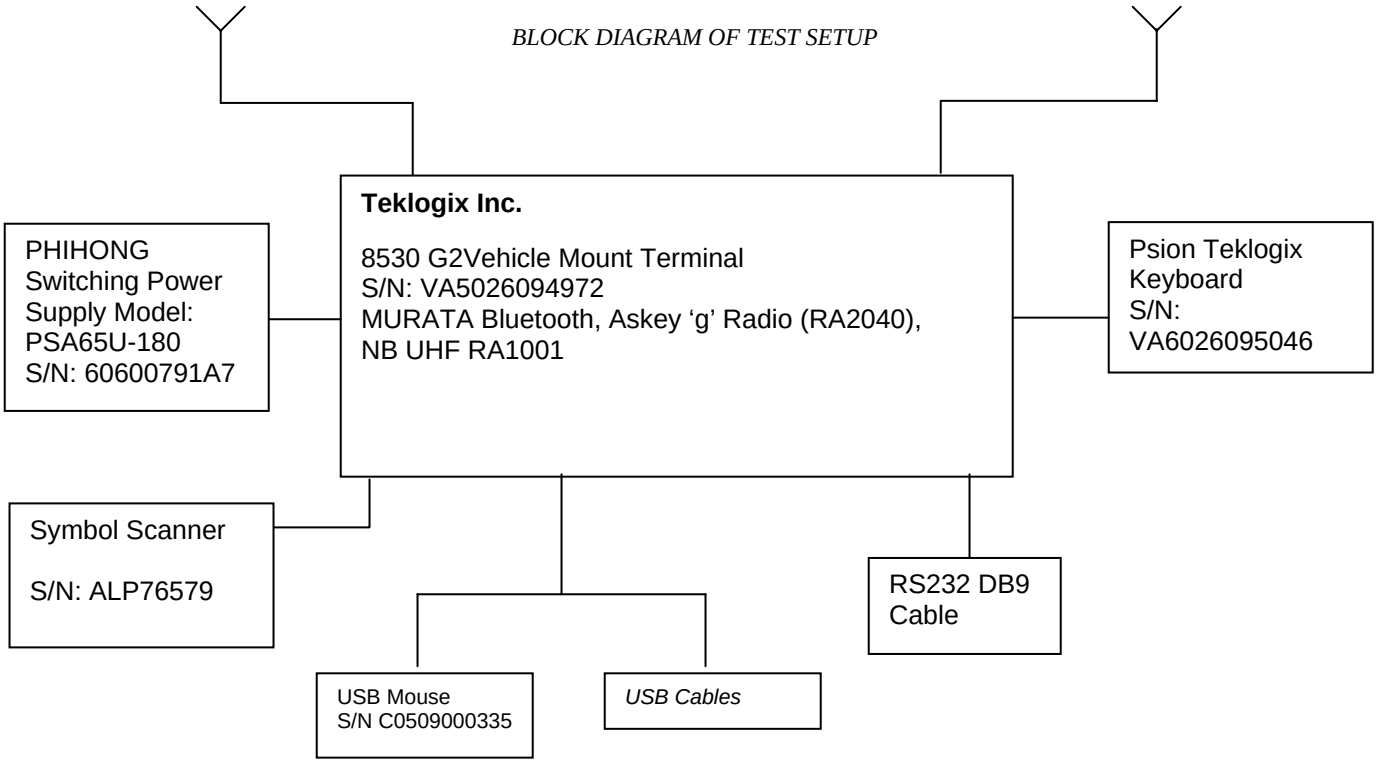


EXHIBIT 3. EUT OPERATING CONDITIONS AND CONFIGURATIONS DURING TESTS

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:	PHIHONG Switching Power Supply, 18V DC, 3.3A

3.2. 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 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:	4 mW EIRP
Normal Test Modulation:	Bluetooth
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.

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.: IC2049-1). Last Date of Site Calibration: June 20, 2005.

4.2. APPLICABILITY & SUMMARY OF EMC EMISSION TEST RESULTS

FCC Section(s)	Test Requirements	Compliance (Yes/No)
15. 207	AC Power Conducted Emissions	Yes (Note 1)
15.247(a)(1)&(2)	20dB & 6 dB Bandwidth	Yes
15.247(b)(1) & (3)	Peak Output Power	Yes
15.247(b)(5), 15.247(e)(i) & 1.1307(b)(1)	RF Exposure	Yes (Note 2)
15.247(d), 15.209 & 15.205	Spurious Radiated Emissions	Yes
15.247(e)&(f)	Power Spectral Density	Yes
15.247(f)	Average Time of Occupancy	Yes
15.109	Class B Radiated Emissions	Yes (Note 1)

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) The SAR tests and RF Exposure requirements is exempted, the device operates at substantially low output power level (4 mW), with a low gain antenna (2 dBi).

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: Murata Type: Chip Part No.: LBMA2U2BL2-092 Frequency Range: 2.402 – 2.480 GHz Gain: 2.0 dBi

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

5.5. 6 dB & 20 dB Bandwidth [§15.247(a)(1)&(2)]

5.5.1. Limit

- For Frequency Hopping System, minimum of 25 kHz.
- For a Digital Modulation System, the 6 dB bandwidth shall be at least 500 KHz.

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	FSEK20/B4/B21	834157/005	9 kHz – 40 GHz with external mixer
Horn Antenna	EMCO	3155	9701-5061	1 GHz – 18 GHz

5.5.5. Test Data

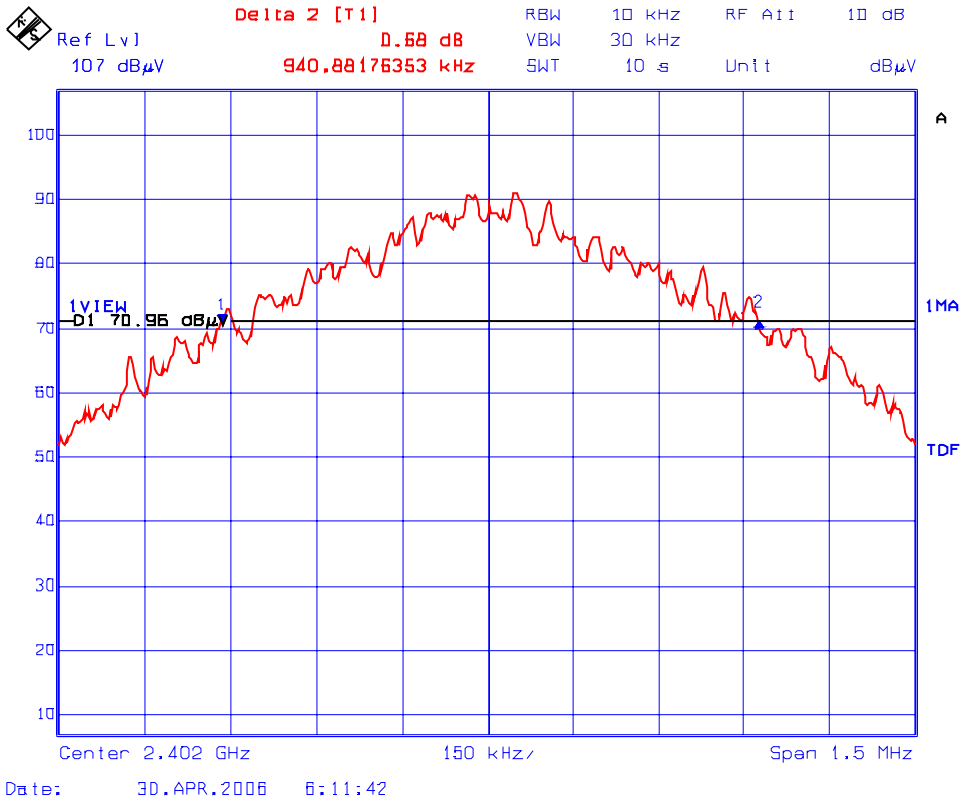
5.5.5.1. For Frequency Hopping Spread Spectrum Mode

Frequency (MHz)	20 dB Bandwidth (MHz)
2402	0.941
2441	0.944
2480	0.947

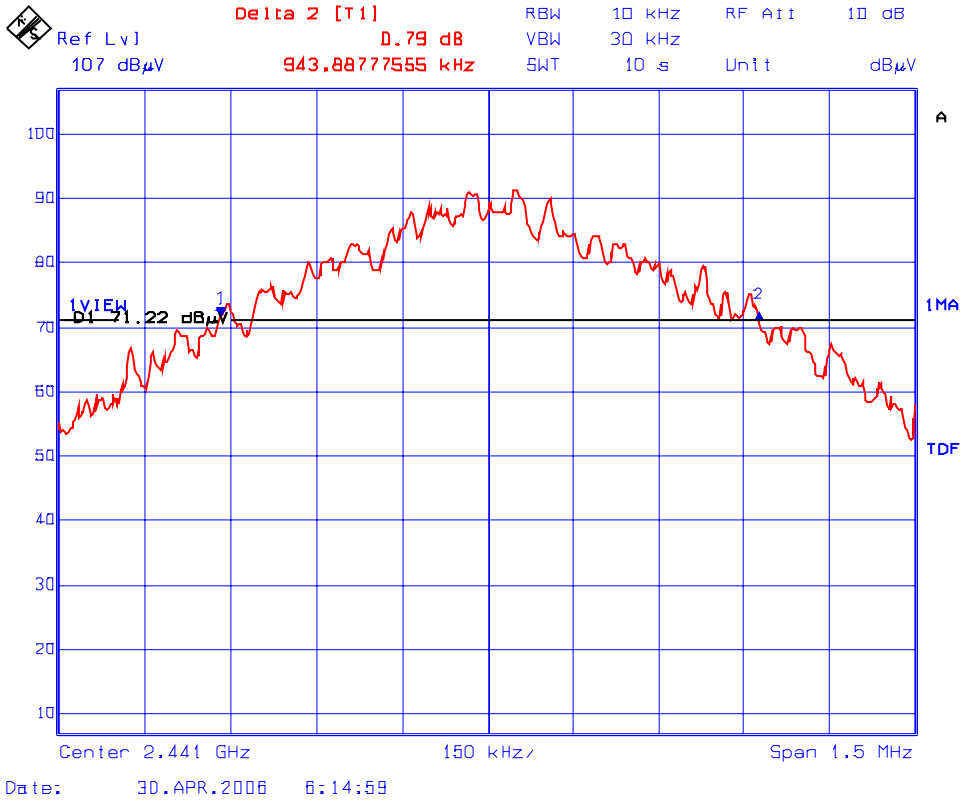
See the following plots for detailed measurements.

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

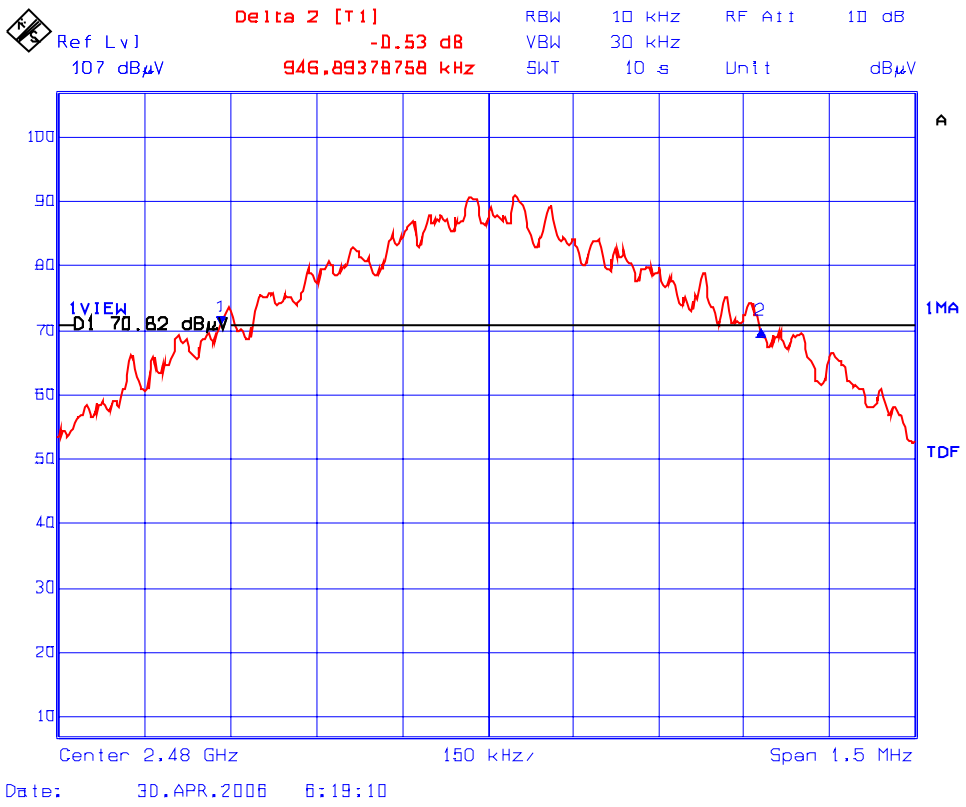
Plot 5.5.5.1.1:
20 dB Bandwidth
Test Frequency: 2402 MHz



Plot 5.5.5.1.2:
20 dB Bandwidth
Test Frequency: 2441 MHz



Plot 5.5.5.1.3:
20 dB Bandwidth
Test Frequency: 2480 MHz

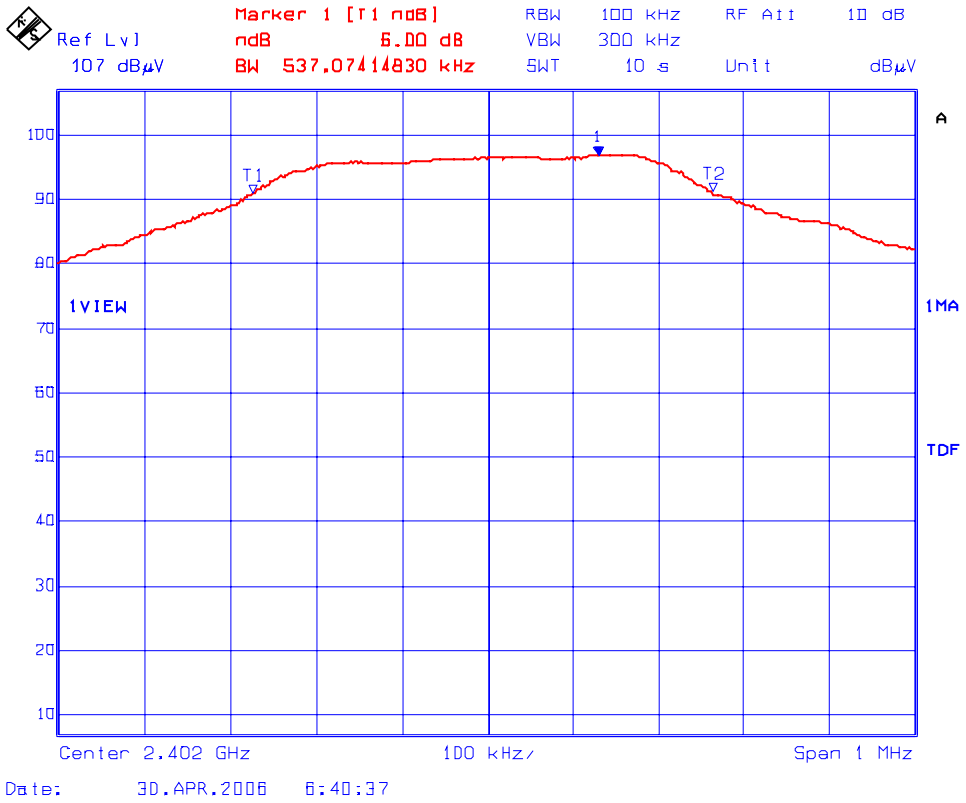


5.5.5.2. For Digital Modulation System

Frequency (MHz)	6 dB Bandwidth (MHz)
2402	0.537
2441	0.545
2480	0.551

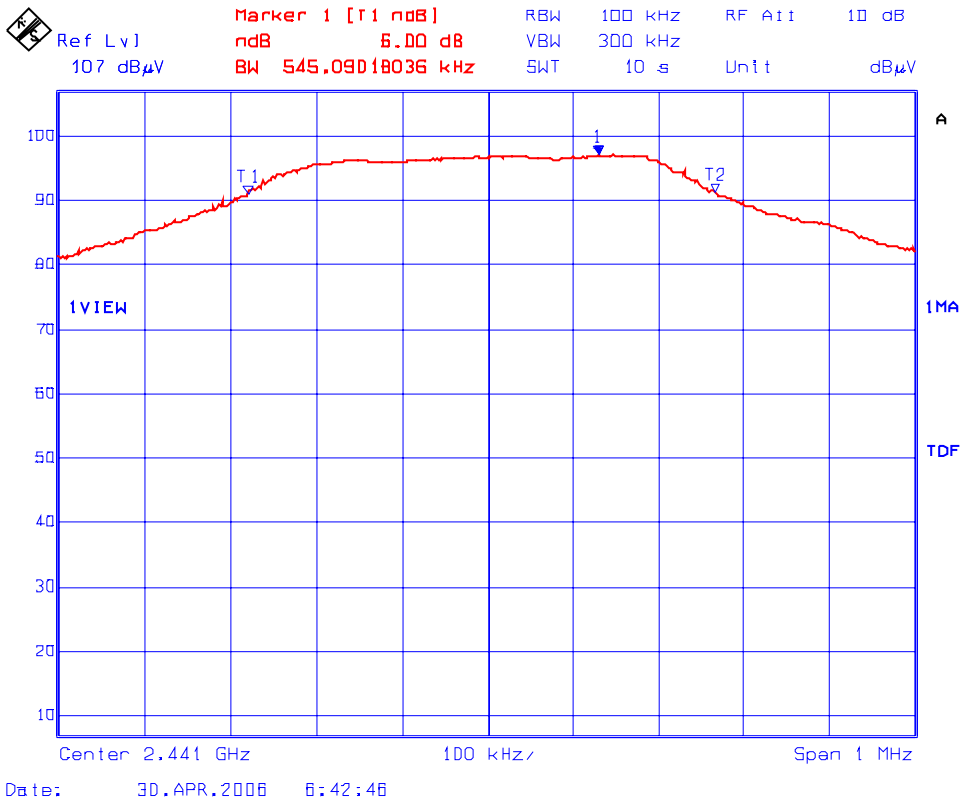
See the following plots for detailed measurements.

Plot 5.5.5.2.1:
6 dB Bandwidth
Test Frequency: 2402 MHz

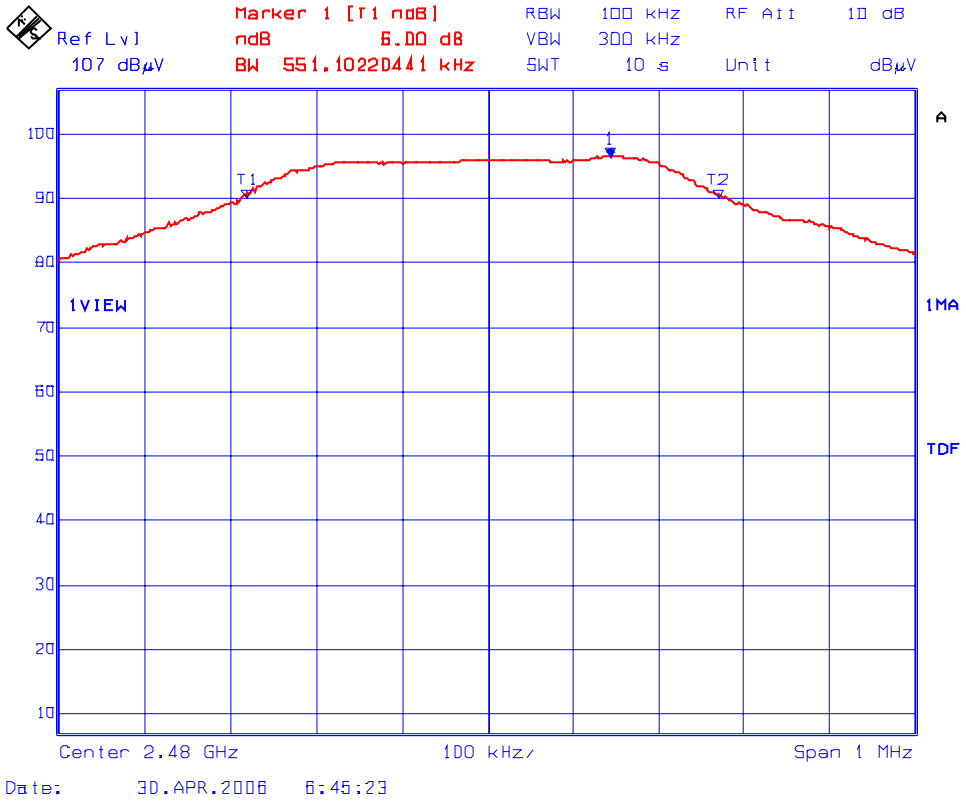


All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)

Plot 5.5.5.2.2:
6 dB Bandwidth
Test Frequency: 2441 MHz



Plot 5.5.5.2.3:
6 dB Bandwidth
Test Frequency: 2480 MHz



5.6. PEAK OUTPUT POWER [§§ 15.247(b)(1)&(3)]

5.6.1. Limit

- **FCC 15.247(b)(1):** Maximum peak output power of the transmitter shall not exceed 1 Watt.
- **FCC 15.247(b)(4(i):** If the device is not for fixed point to point radio, the antenna of directional gain greater than 6 dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

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 Equipment List

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

5.6.4. Test Data

Frequency (MHz)	E-Field in 1 MHz @ 3m (dBuV/m)	Antenna Polarization (V/H)	*Calculated Peak Power (Watt)
2402	97.76	V	0.00089
2402	97.97	H	0.00094
2441	95.54	V	0.00054
2441	97.13	H	0.00077
2480	94.88	V	0.00046
2480	97.08	H	0.00076

*Peak power is calculated using the following equation:

P = (E x D) squared / (30 x 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)

5.7. SPURIOUS RADIATED EMISSIONS @ 3 METERS [§ 15.247(d)]

5.7.1. Limit

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. 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

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.

5.7.2. Method of Measurements

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

5.7.3. Test Arrangement

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

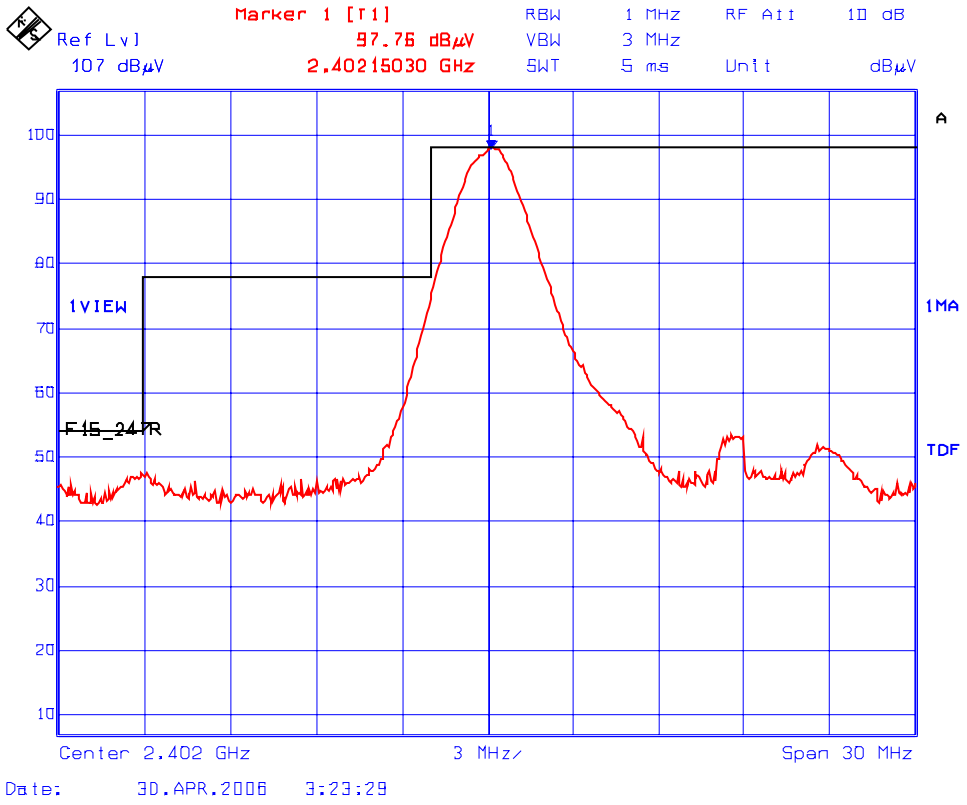
5.7.4. Test Equipment List

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range
Spectrum Analyzer/ EMI Receiver	Rohde & Schwarz	FSEK20/B4/B21	834157/005	9 kHz – 40 GHz with external mixer
Microwave Amplifier	Hewlett Packard	HP 83017A		1 GHz to 26.5 GHz
Biconilog Antenna	EMCO	3143	1029	20 MHz to 2 GHz
Horn Antenna	EMCO	3155	9701-5061	1 GHz – 18 GHz
Horn Antenna	EMCO	3160-09	..	18 GHz – 26.5 GHz
Horn Antenna	EMCO	3160-10	..	26.5 GHz – 40 GHz
Mixer	Tektronix	118-0098-00	..	18 GHz – 26.5 GHz
Mixer	Tektronix	119-0098-00	..	26.5 GHz – 40 GHz

5.7.5. Test Data

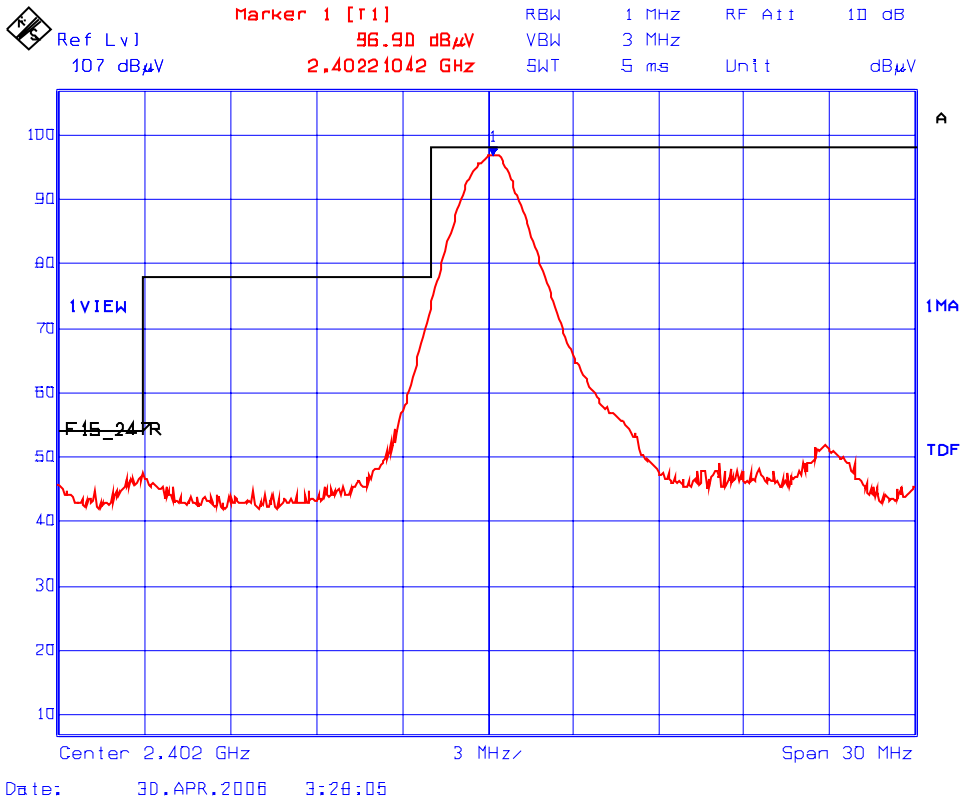
5.7.5.1. Band-edge Radiated Emissions

Plot 5.7.5.1.1
Band-Edge Radiated Emissions @ 3 meters, Vertical Polarization
Low End of Frequency Band, Continuous Mode



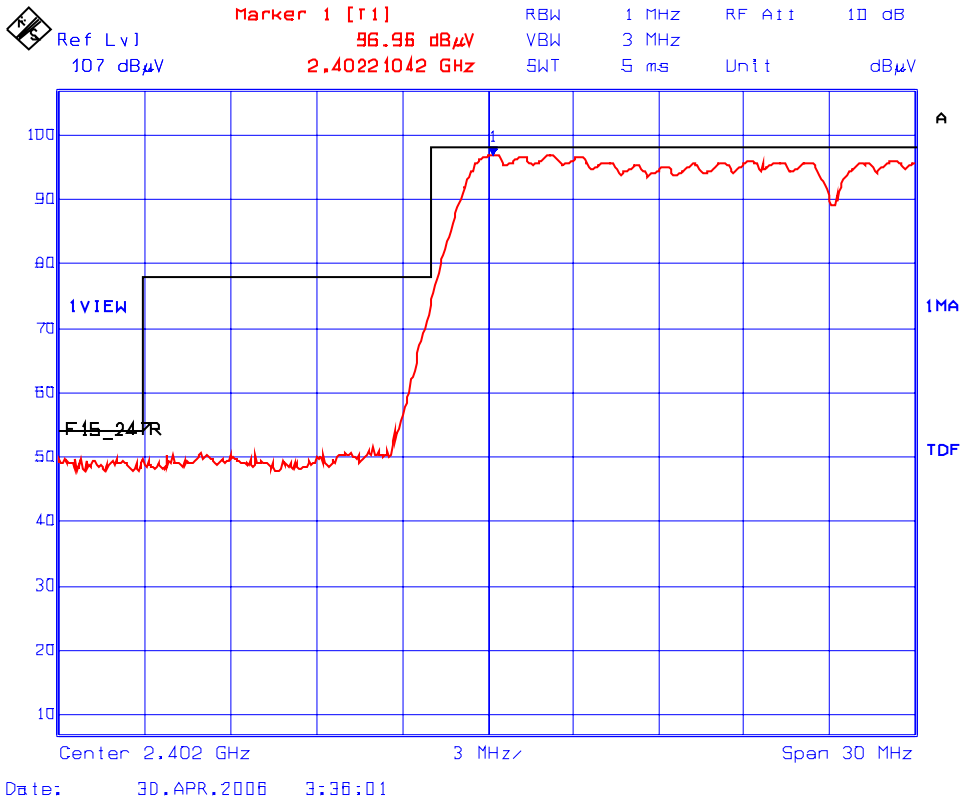
All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)

Plot 5.7.5.1.2
Band-Edge Radiated Emissions @ 3 meters, Horizontal Polarization
Low End of Frequency Band, Continuous Mode

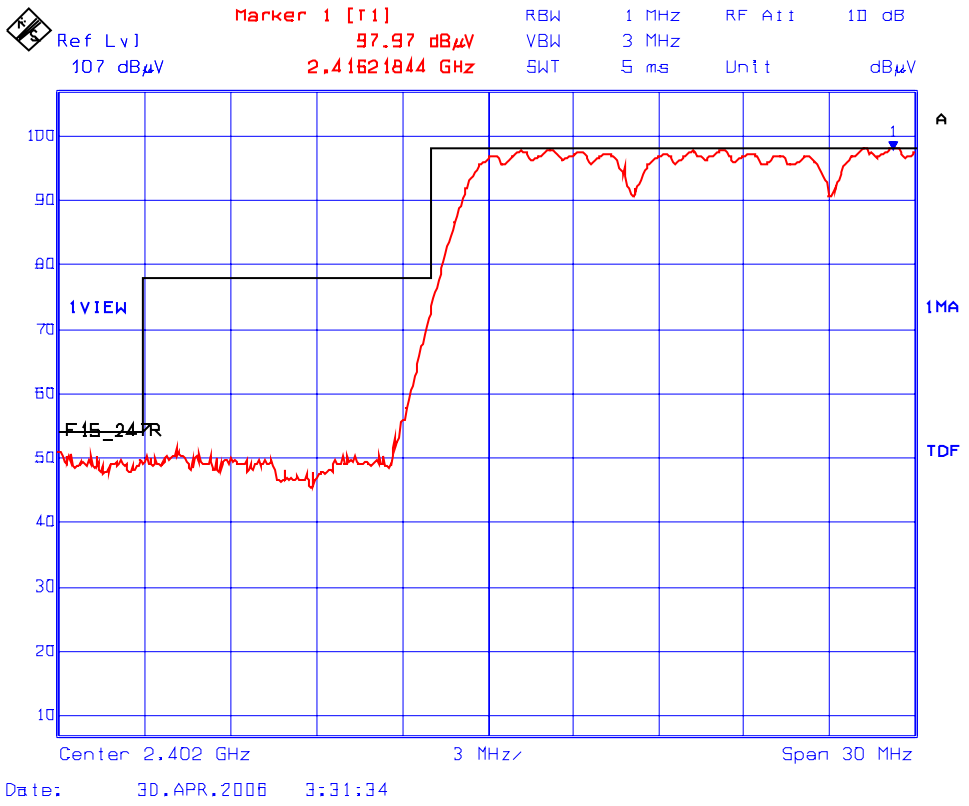


All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)

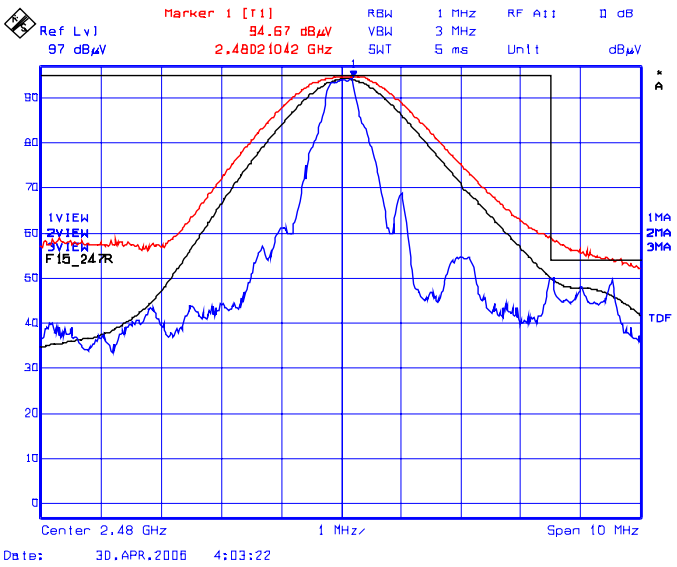
Plot 5.7.5.1.3
Band-Edge Radiated Emissions @ 3 meters, Vertical Polarization
Low End of Frequency Band - Frequency Hopping Enabled



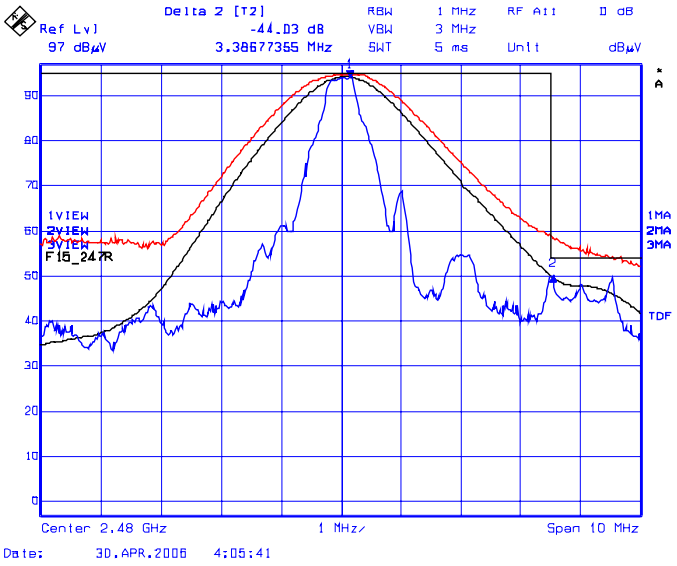
Plot 5.7.5.1.4
Band-Edge Radiated Emissions @ 3 meters, Horizontal Polarization
Low End of Frequency Band - Frequency Hopping Enabled



Plot 5.7.5.1.5
Band-Edge Radiated Emissions @ 3 meters, Vertical Polarization, Upper End of Frequency Band

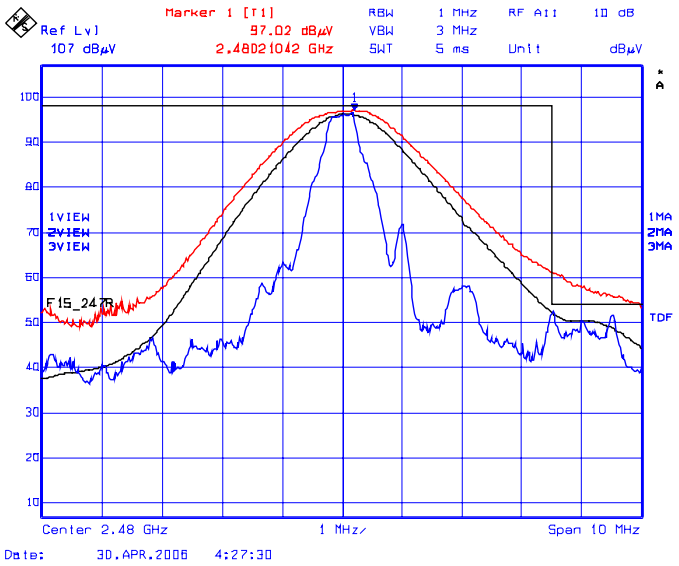


Plot 5.7.5.1.6
Band-Edge Radiated Emissions @ 3 meters, Vertical Polarization, Upper End of Frequency Band

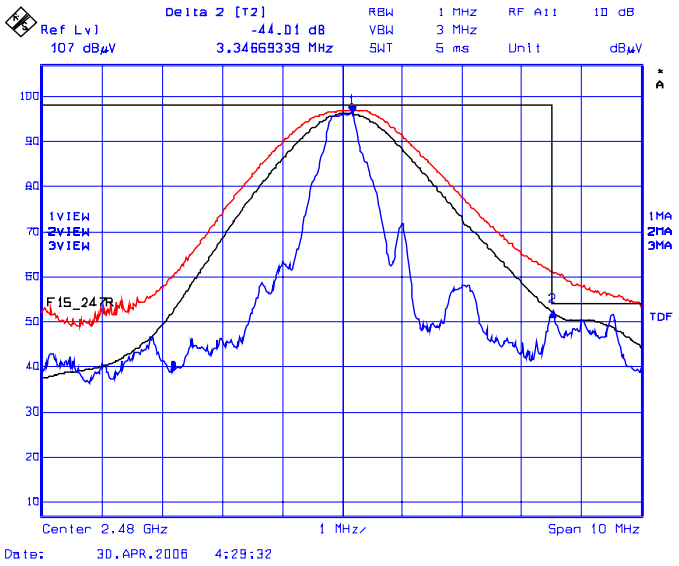


Trace 1 _: RBW = 1 MHz, VBW = 3 MHz
Trace 2 _: RBW = 100 kHz, VBW = 300 kHz, Delta (Peak to Band-Edge): 44.03 dB
Trace 3 _: RBW = 1 MHz, VBW = 10 Hz
Band-Edge Level at 2484 MHz: 94.67 dBuV/m – 44.03 dB= **50.64 dBuV/m**

Plot 5.7.5.1.7
Band-Edge Radiated Emissions @ 3 meters, Horizontal Polarization, Upper End of Frequency Band

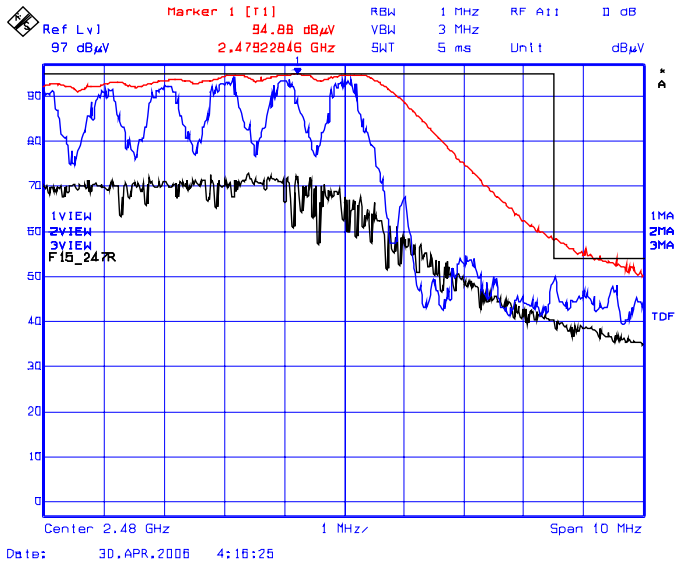


Plot 5.7.5.1.8
Band-Edge Radiated Emissions @ 3 meters, Horizontal Polarization, Upper End of Frequency Band

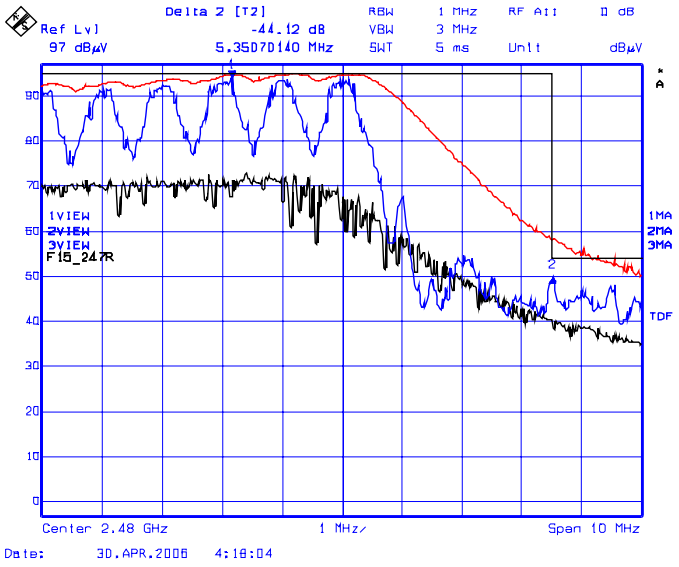


Trace 1 _: RBW = 1 MHz, VBW = 3 MHz
Trace 2 _: RBW = 100 kHz, VBW = 300 kHz, Delta (Peak to Band-Edge): 44.01dB
Trace 3 _: RBW = 1 MHz, VBW = 10 Hz
Band-Edge Level at 2483.5 MHz: 97.02 dBuV/m – 44.01 dB= **53.01 dBuV/m**

Plot 5.7.5.1.9
Band-Edge Radiated Emissions @ 3 meters, Vertical Polarization
Upper End of Frequency Band, Frequency Hopping Enabled

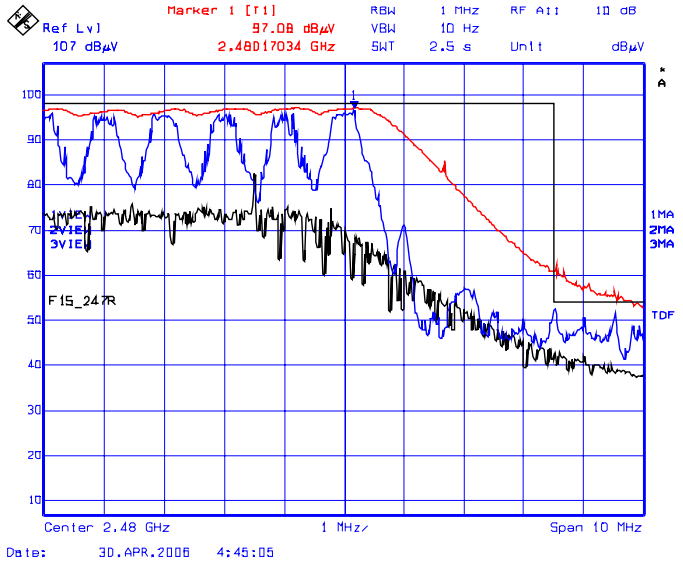


Plot 5.7.5.1.10
Band-Edge Radiated Emissions @ 3 meters, Vertical Polarization
Upper End of Frequency Band (2480 MHz), Frequency Hopping Enabled

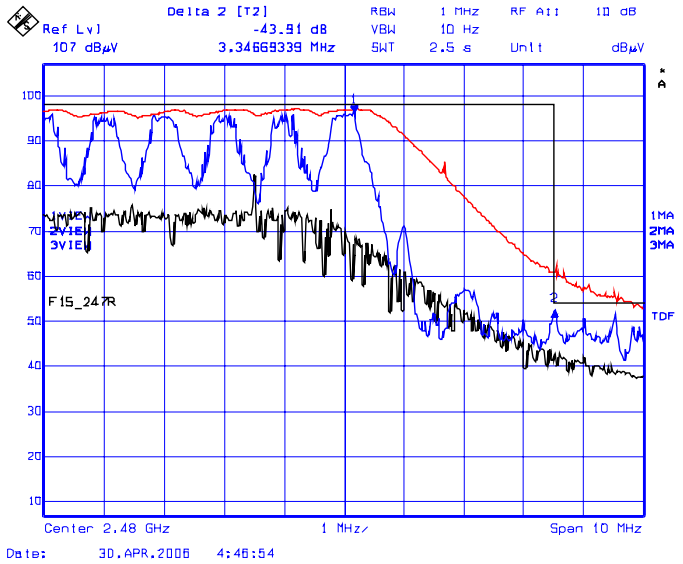


Trace 1 _: RBW = 1 MHz, VBW = 3 MHz
Trace 2 _: RBW = 100 kHz, VBW = 300 kHz, Delta (Peak to Band-Edge): 44.12 dB
Trace 3 _: RBW = 1 MHz, VBW = 10 Hz
Band-Edge Level at 2484 MHz: 94.88 dBuV/m – 44.12 dB= **50.76 dBuV/m**

Plot 5.7.5.1.11
Band-Edge Radiated Emissions @ 3 meters, Horizontal Polarization
Upper End of Frequency Band, Frequency Hopping Enabled



Plot 5.7.5.1.12
Band-Edge Radiated Emissions @ 3 meters, Horizontal Polarization
Upper End of Frequency Band (2480 MHz), Frequency Hopping Enabled



Trace 1 _: RBW = 1 MHz, VBW = 3 MHz
Trace 2 _: RBW = 100 kHz, VBW = 300 kHz, Delta (Peak to Band-Edge): 43.91 dB
Trace 3 _: RBW = 1 MHz, VBW = 10 Hz
Band-Edge Level at 2484 MHz: 97.08 dBuV/m – 43.91 dB= 53.17 dBuV/m

5.7.5.2. Transmitter Radiated Spurious Emissions

The emissions were scanned from 30 MHz to 25 GHz; and No Spurious emissions found within the 20 dB below the limits.

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	97.76	-	V	-	-	-	-
2402	97.97	-	H	-	-	-	-
Fundamental Frequency: 2441 MHz							
2441	95.54	-	V	-	-	-	-
2441	97.13	-	H	-	-	-	-
Fundamental Frequency: 2480 MHz							
2480	94.88	-	V	-	-	-	-
2480	97.08	-	H	-	-	-	-

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

5.8. POWER SPECTRAL DENSITY [§ 15.247(e) & (f)]

5.8.1. Limit

For a digitally modulated system, the power spectral density conducted from the intentional radiator to the antenna shall not be grater than 8 dBm in any 3 KHz bandwidth within this band during any time interval of continuous transmission.

5.8.2. Method of Measurements

KDB Publication No. 558074: Guidance on Measurements for Digital Transmission Systems (47 CFR 15.247), using Alternative Test Procedures.

5.8.3. Test Equipment List

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

5.8.4. Test Data

Frequency (MHz)	Peak E-Field in 3 kHz BW @ 3m (dBµV/m)	Tx Ant. Gain (dBi)	*Calculated SPD (dBm)	Limit dBm)	Margin (dBm)
2402	85.71	2.0	-11.5	+8.0	-19.5
2441	85.56	2.0	-11.7	+8.0	-19.7
2480	85.32	2.0	-11.9	+8.0	-19.9

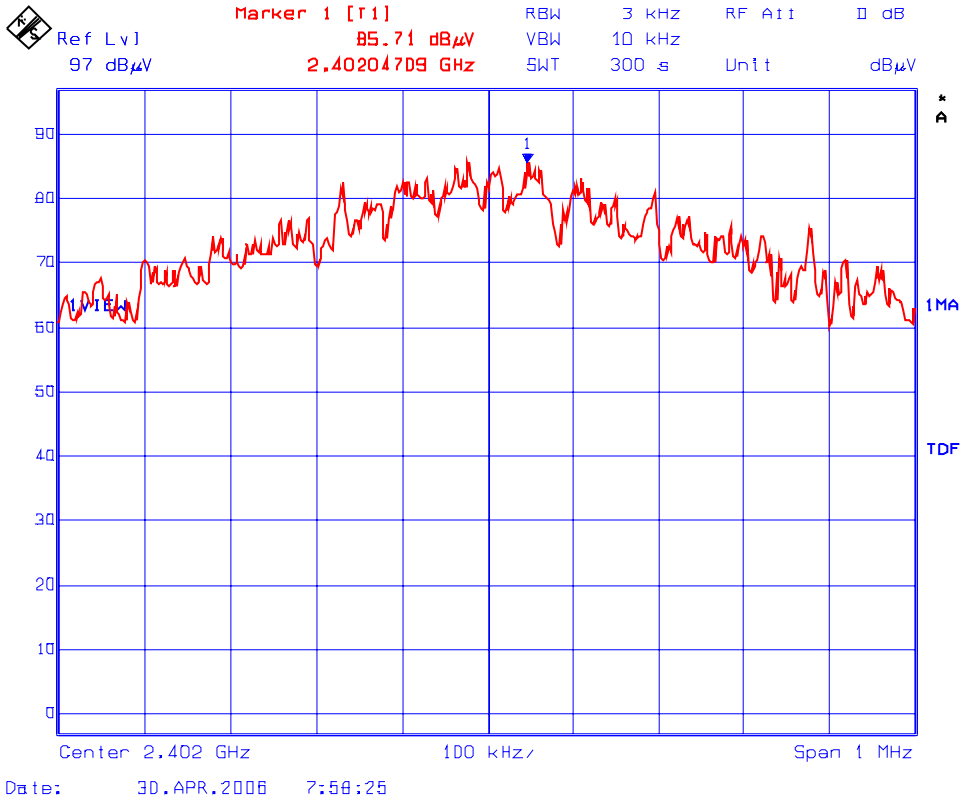
*SPD is calculated using the following equation:

P = (E x D) squared / (30 x G)

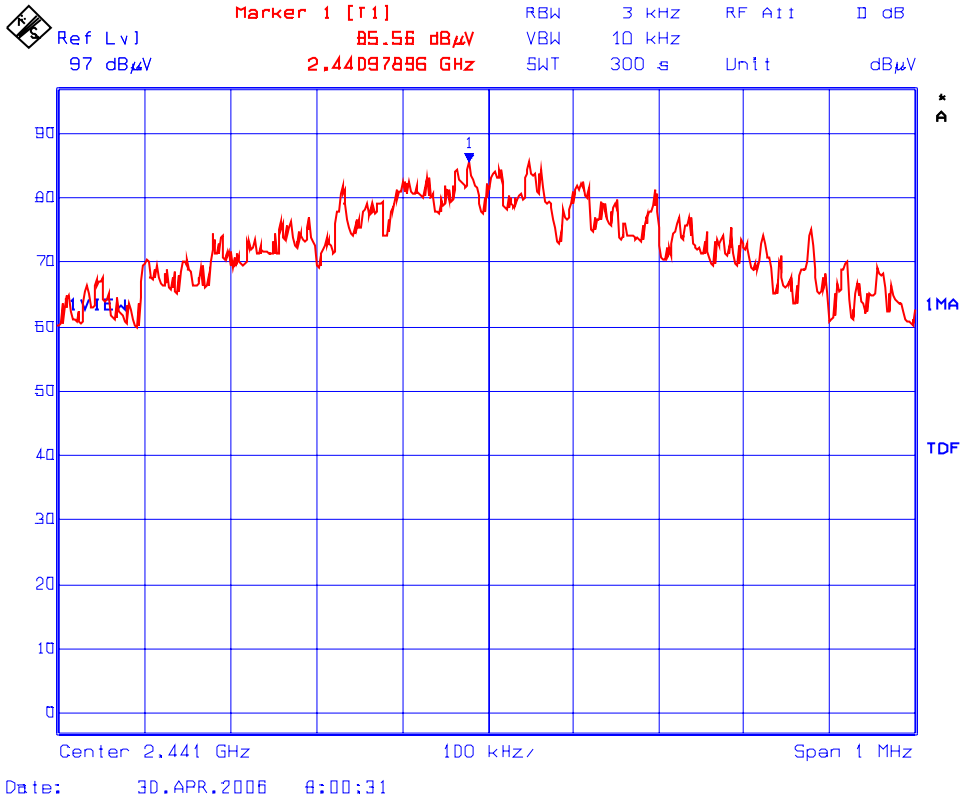
Where: E = the measured maximum field strength in V/m
G = the numeric gain of the transmitting antenna over an isotropic radiator.
D = the distance in meters form which the field strength was measured.
P = the power in watts

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

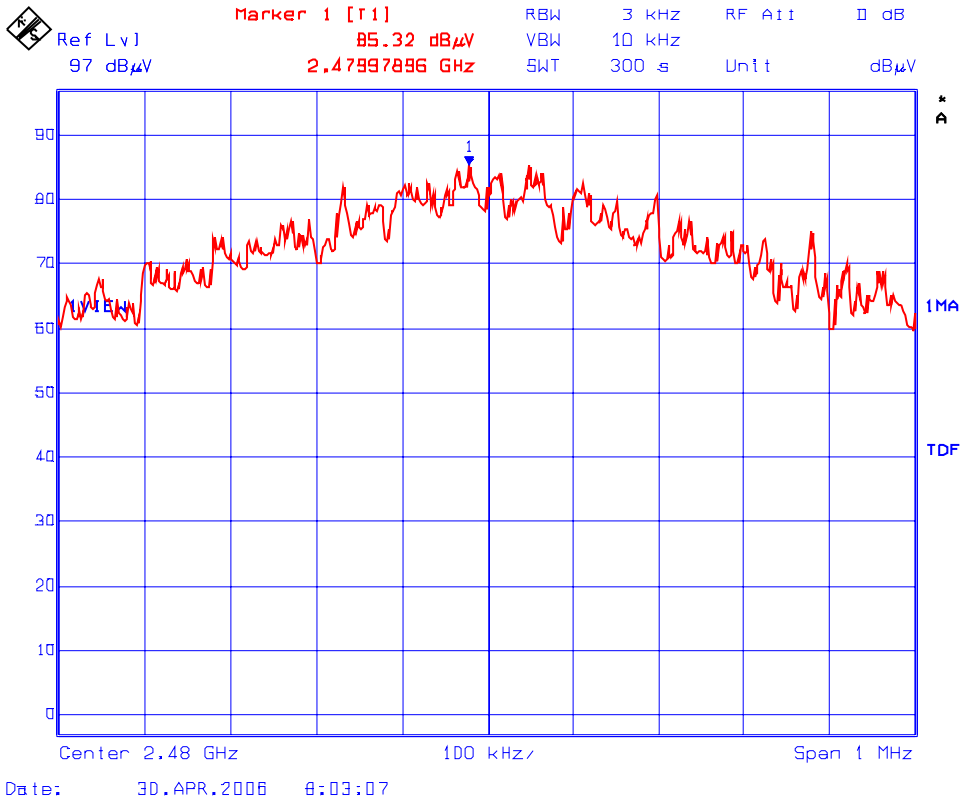
Plot 5.8.4.1:
Power Spectral Density
Test Frequency: 2402 MHz



Plot 5.8.4.2:
Power Spectral Density
Test Frequency: 2441 MHz



Plot 5.8.4.3:
Power Spectral Density
Test Frequency: 2480 MHz



5.9. AVERAGE TIME OF OCCUPANCY [§ 15.247(f)]

5.9.1. Limit

The frequency hopping operation of the hybrid system, with the direct sequence or digital modulation operation turned off shall have an average time of occupancy on any frequency not to exceed 0.4 seconds with in a time period in seconds equal to the number of hopping frequencies employed multiplied by 0.4.

5.9.2. Method of Measurements

Refer to FCC DA-00-705 and ANSI C63.4 for measurement methods.

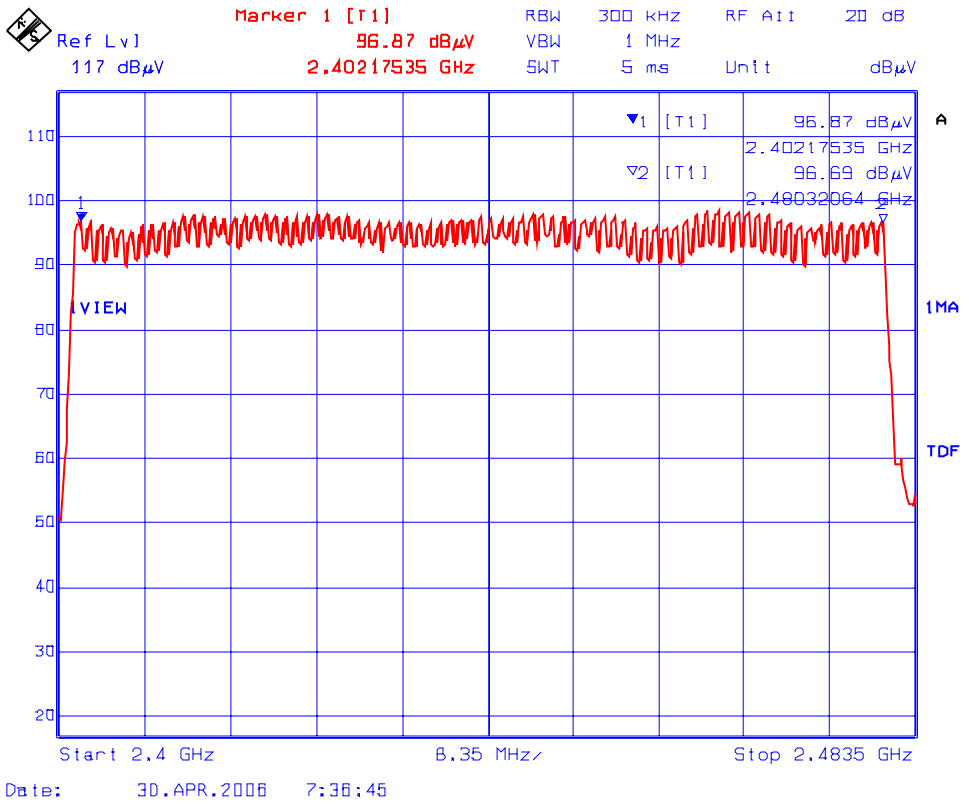
5.9.3. Test Equipment List

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

5.9.4. Test Data

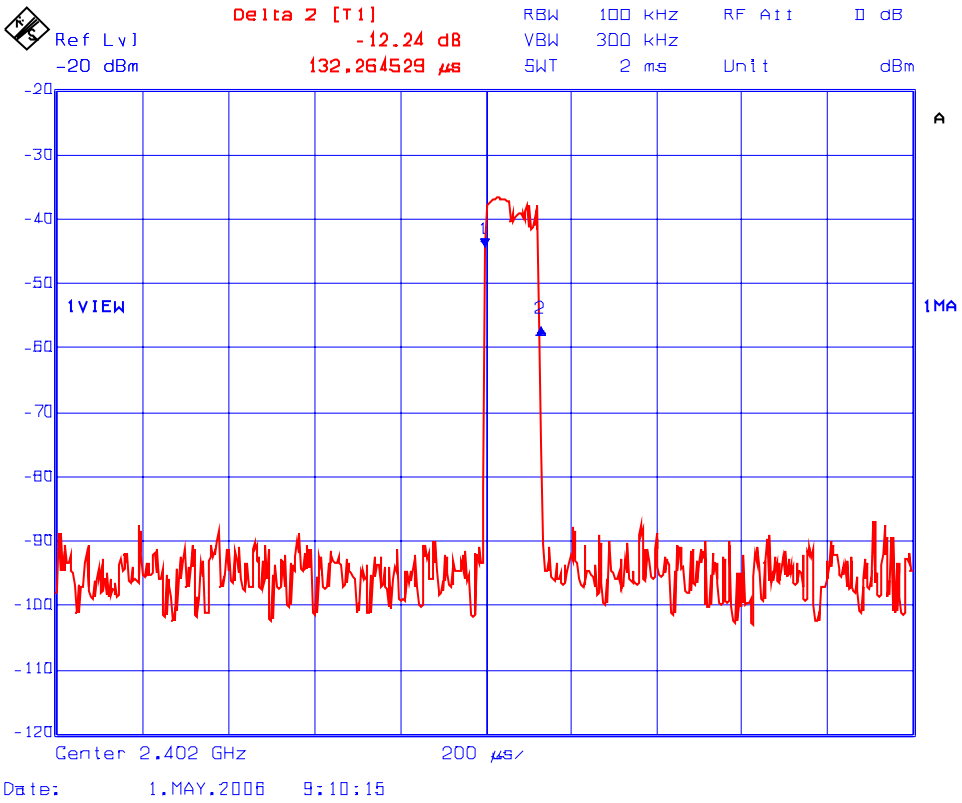
See the following plots for measurement details.

Plot 5.9.4.1:
Number of Hopping Frequencies
79 channels



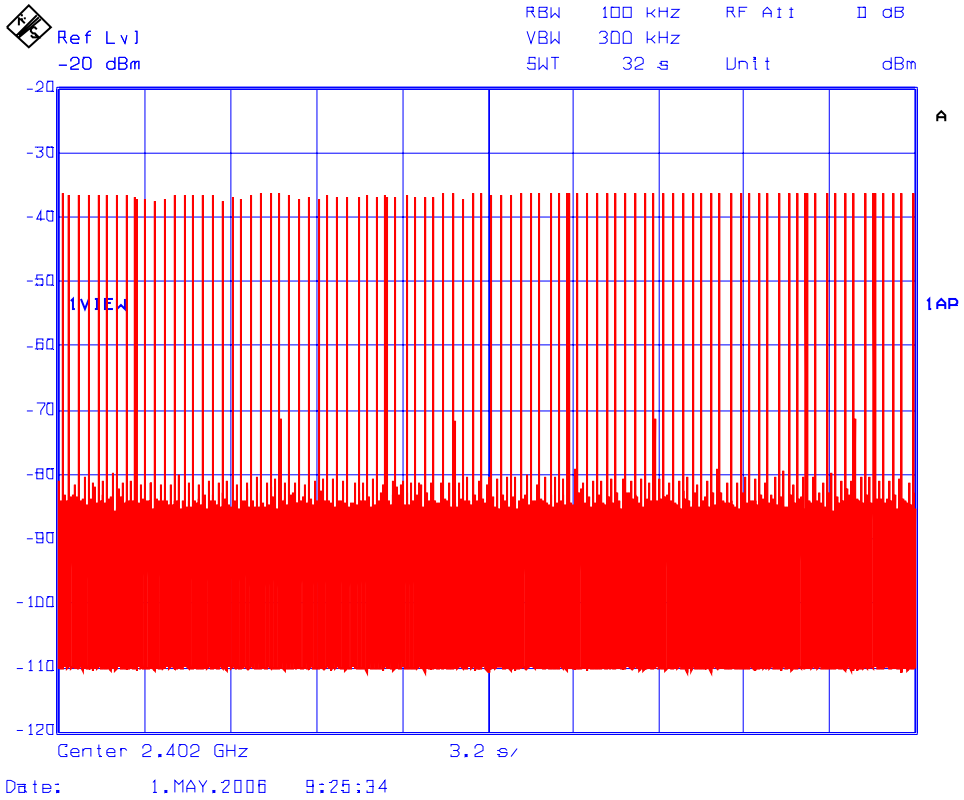
All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)

Plot 5.9.4.2:
Time of Occupancy
Test Frequency: 2402 MHz



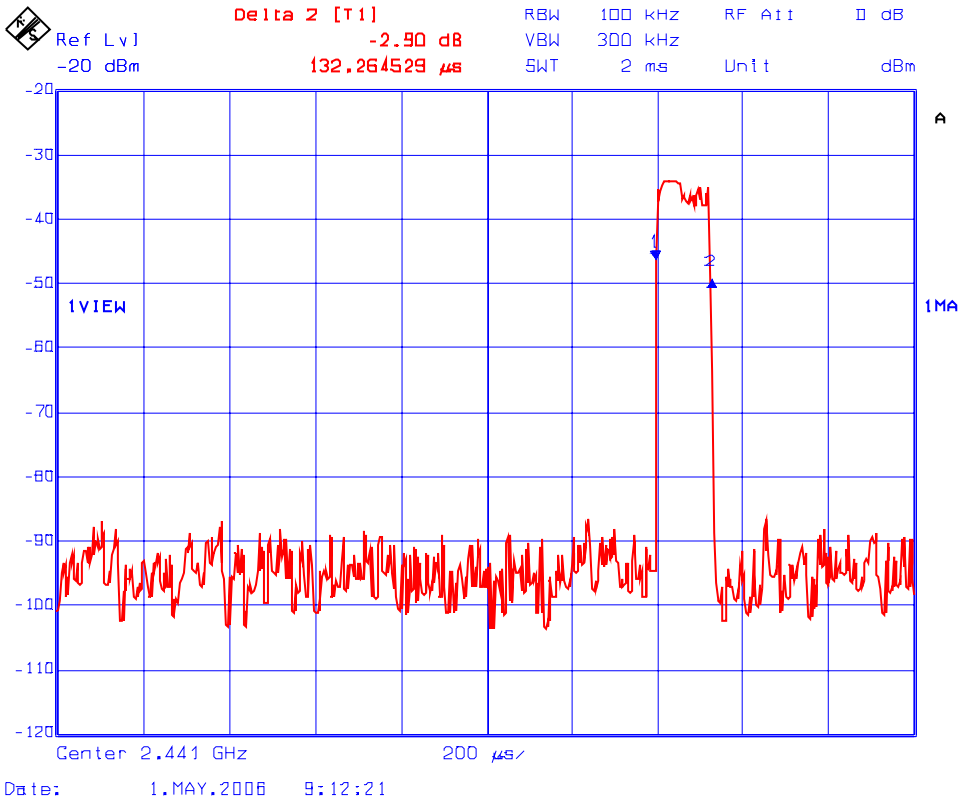
Dwell Time @ 2402 MHz = 132.264529 µs

Plot 5.9.4.3:
Time of Occupancy
Test Frequency: 2402 MHz



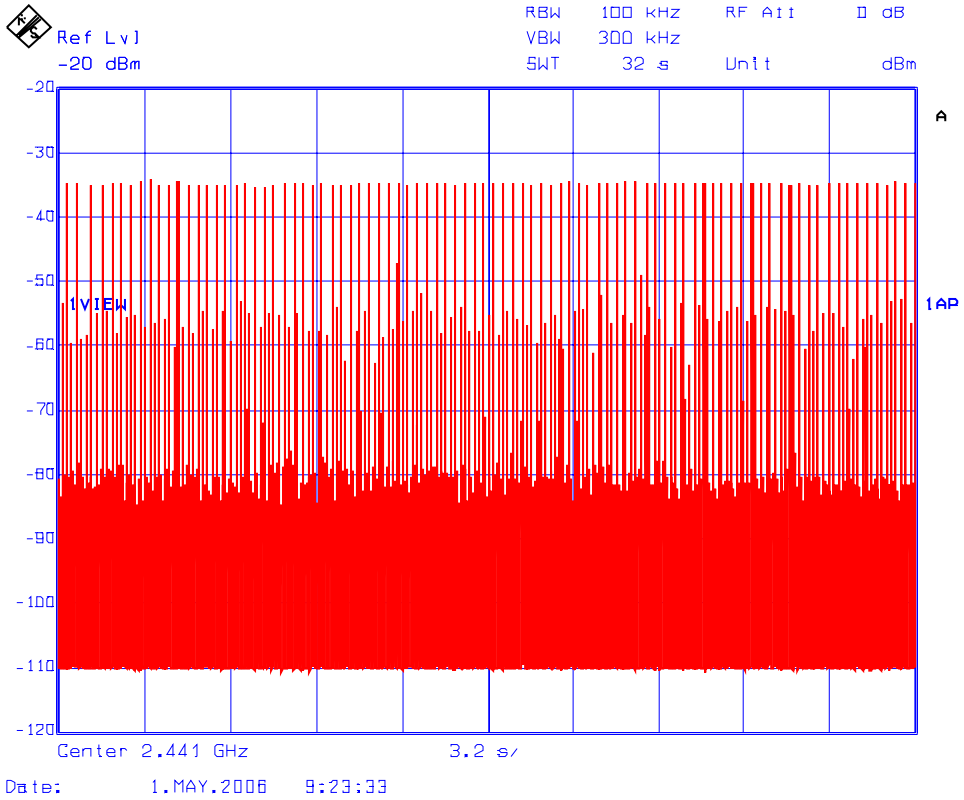
Average time of occupancy in 31.6 s = (Dwell Time @ 2402 MHz) x (number of hops in 31.6 s)
= 132.264529 µs x 90
= 11.90 ms

Plot 5.9.4.4:
Time of Occupancy
Test Frequency: 2441 MHz



Dwell Time @ 2441 MHz = 132.264529 µs

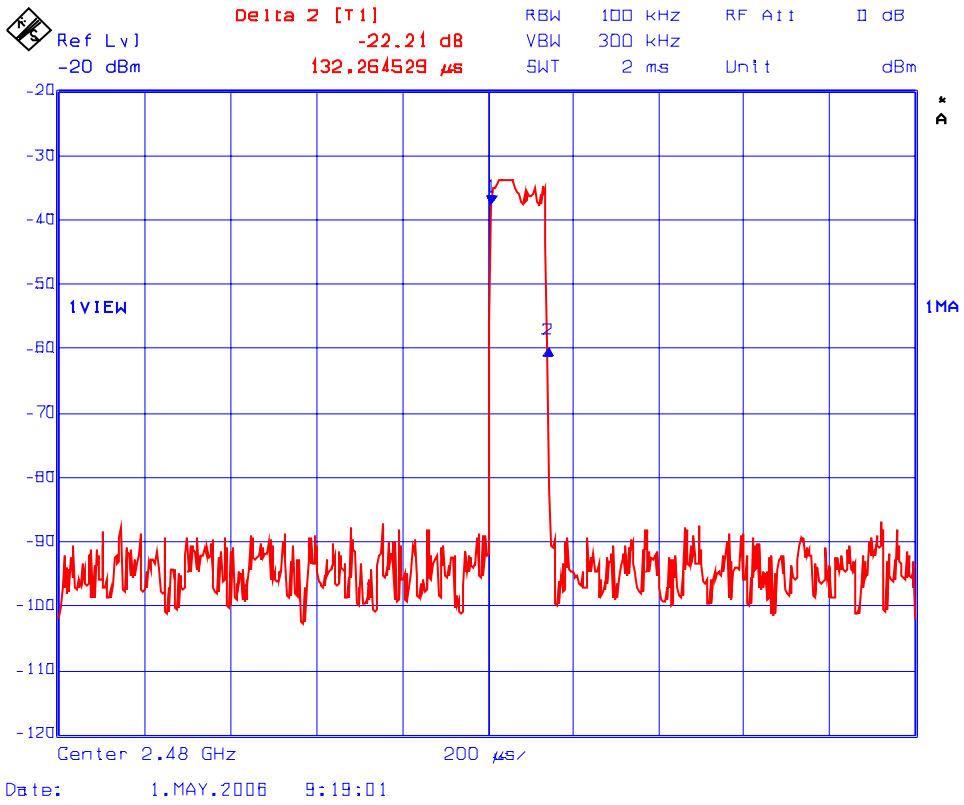
Plot 5.9.4.5:
Time of Occupancy
Test Frequency: 2441 MHz



Average time of occupancy in 31.6 s = (Dwell Time @ 2441 MHz) x (number of hops in 31.6 s)
= 132.264529 µs x 90
= 11.90 ms

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

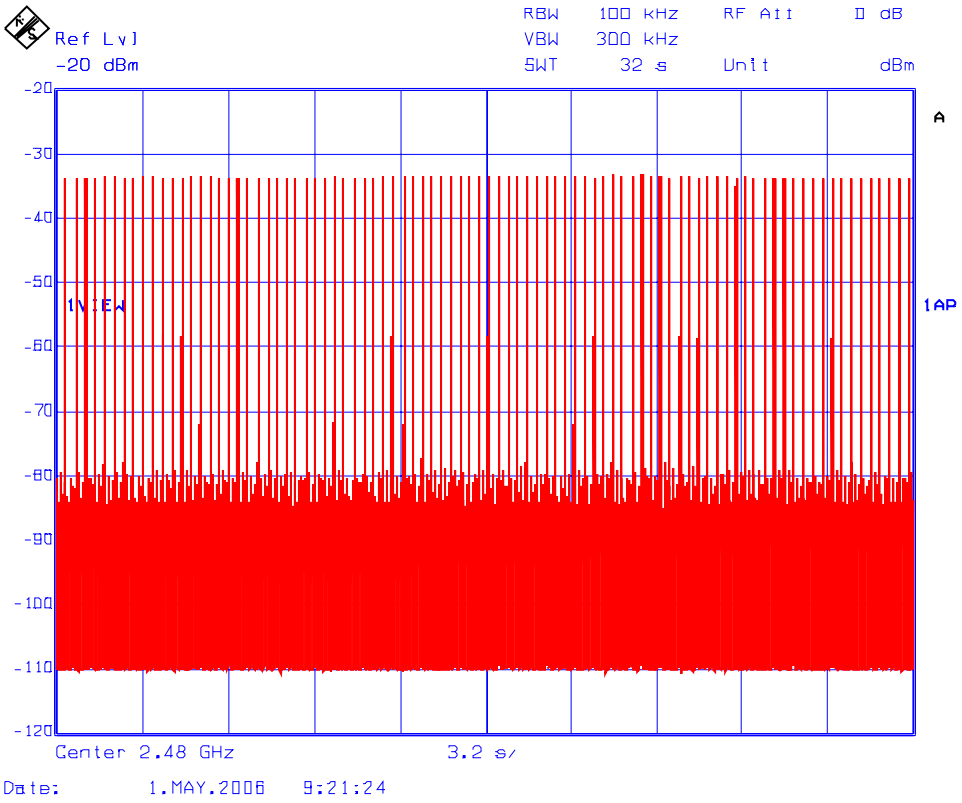
Plot 5.9.4.6:
Time of Occupancy
Test Frequency: 2480 MHz



Dwell Time @ 2480 MHz = 132.264529 µs

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

Plot 5.9.4.7:
Time of Occupancy
Test Frequency: 2480 MHz



Average time of occupancy in 31.6 s = (Dwell Time @ 2480 MHz) x (number of hops in 31.6 s)
= 132.264529 µs x 90
= 11.90 ms

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

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