Electromagnetic Compatibility Test Report

Tests Performed on a Freedom Innovations

2.4 GHz FHSS Wireless Link for

a Microprocessor Controlled Prosthetic Knee, Model AMPCK001

Radiometrics Document RP-5902

ACCREDITED
Certification # 1495.01

Product Detail:
FCC ID: **UPBAMPCK**
IC ID: 6745A-AMPCK001
Equipment type: FHSS Transmitter

Test Standards:
US CFR Title 47, Chapter I, FCC Part 15 Subpart C
FCC Part 15 CFR Title 47: 2006
Industry Canada RSS-210, Issue 6 as required for Category I Equipment

This report concerns: Original Grant for Certification
FCC Part 15.247

Tests Performed For:	*Test Facility:*
Freedom Innovations 7 Studebaker Irvine, CA 92618	**Radiometrics Midwest Corporation** 12 East Devonwood Romeoville, IL 60446

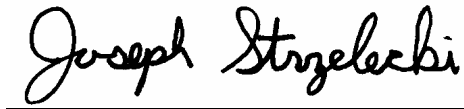
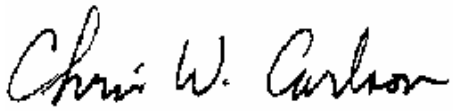
Test Date(s): (Month-Day-Year)
September 20 thru 26

Document RP-5902 Revisions:

Rev.	Issue Date	Affected Pages	Revised By
0	October 16, 2006		

Table of Contents

1 ADMINISTRATIVE DATA

Equipment Under Test: A Freedom Innovations, Microprocessor Controlled Prosthetic Knee Model: AMPCK001 Serial Number: none This will be referred to as the EUT in this Report	
Date EUT Received at Radiometrics: (Month-Day-Year) September 19, 2006	*Test Date(s): (Month-Day-Year)* September 20 thru 26
Test Report Written By: Joseph Strzelecki Senior EMC Engineer	*Test Witnessed By:* The test was not witnessed by personnel from Freedom Innovations
Radiometrics' Personnel Responsible for Test:  Joseph Strzelecki Senior EMC Engineer NARTE EMC-000877-NE	*Test Report Approved By*  Chris W. Carlson Director of Engineering NARTE EMC-000921-NE

2 TEST SUMMARY AND RESULTS

The EUT (Equipment Under Test) is a Microprocessor Controlled Prosthetic Knee, Model AMPCK001, manufactured by Freedom Innovations. The detailed test results are presented in a separate section. The following is a summary of the test results.

Emissions Tests Results

Environmental Phenomena	Frequency Range	Basic Standard	Test Result
RF Radiated Emissions	30-25000 MHz	RSS-210 & FCC Part 15	Pass
Occupied Bandwidth Test	Fundamental Freq.	RSS-210 & FCC Part 15	Pass

Spread Spectrum Transmitter Requirements

Environmental Phenomena	Frequency Range	FCC Section	RSS-210 Section	Test Result
Carrier Frequency Separation	2400 to 2483 MHz	15.247 a	A8.1 (2)	Pass
Number of Hopping Frequencies	2400 to 2483 MHz	15.247 a	A8.1 (2)	Pass
Time of Occupancy (Dwell Time)	2400 to 2483 MHz	15.247 a	A8.1 (4)	Pass
20 dB Bandwidth Test;	2400 to 2483 MHz	15.247 a	A8.1 (1)	Pass
Peak Output Power	2400 to 2483 MHz	15.247 b	A8.4 (2)	Pass
Band-edge Compliance of RF Conducted Emissions	2400 to 2483 MHz	15.247 d	A8.5	Pass
Spurious Radiated Emissions	30 MHz to 25 GHz	15.247 d	A8.5	Pass

2.1 RF Exposure Compliance Requirements

The power output is 28 mW. The EUT meets the FCC requirement for RF exposure. Since the EUT is less than 200 mW, it is exempt from RSS-102. There are no power level adjustments and the antenna is permanently attached. The detailed calculations for RF Exposure are presented in a separate document.

3 EQUIPMENT UNDER TEST (EUT) DETAILS

3.1 EUT Description

The EUT is a Wireless Link for a Microprocessor Controlled Prosthetic Knee, Model AMPCK001, manufactured by Freedom Innovations. The EUT was in good working condition during the tests, with no known defects. The EUT operates from 2402 to 2480 MHz with 79 Channels.

3.1.1 FCC Section 15.203 & RSS-GEN Antenna Requirements

The antenna is permanently attached to the PCB. The antenna is internal to the EUT and it is not readily available to be modified by the end user. Therefore it meets the 15.203 Requirement.

3.2 Related Submittals

Freedom Innovations is not submitting any other products simultaneously for equipment authorization related to the EUT.

4 TESTED SYSTEM DETAILS

4.1 Tested System Configuration

The system was configured for testing in a typical fashion. The EUT was placed on an 80-cm high, nonconductive test stand. The testing was performed in conditions as close as possible to installed conditions. Wiring was consistent with manufacturer's recommendations.

The EUT was tested as a stand-alone device.

Power was supplied with a new battery.

The identification for all equipment, plus descriptions of all cables used in the tested system, are:

Tested System Configuration List

Item	Description	Type*	Manufacturer	Model Number	Serial Number
1	Microprocessor Controlled Prosthetic Knee	E	Freedom Innovations	AMPCK001	None
2	Notebook PC	H	Dell	PP01L	TW04E641-12800-1A9-5632
3	Bluetooth USB Adaptor	S	Belkin	F8T001	00A3A58BF5A
4	BlueWave Development	S	BlueWAVE	IO135-01	None

* Type: E = EUT, P = Peripheral, S = Support Equipment; H = Host Computer

4.2 Special Accessories

No special accessories were used during the tests in order to achieve compliance.

4.3 Equipment Modifications

No modifications were made to the EUT at Radiometrics' test facility in order to comply with the standards listed in this report.

5 TEST SPECIFICATIONS AND RELATED DOCUMENTS

Document	Date	Title
FCC CFR Title 47	2006	Code of Federal Regulations Title 47, Chapter 1, Federal Communications Commission, Part 15 - Radio Frequency Devices
ANSI C63.4-2003	2003	Methods of Measurement of Radio Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
IC RSS-210 Issue 6	2005	Low Power Licence-Exempt Radiocommunication Devices (All Frequency Bands) Category I Equipment
IC RSS-212 Issue 1	1999	Test Methods For Radio Equipment
IC RSS-Gen Issue 1	2005	General Requirements and Information for the Certification of Radiocommunication Equipment (RSS-Gen)
FCC DA 00-705	2000	Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems

The test procedures used are in accordance with the FCC DA 00-705, Industry Canada RSS-212 and ANSI document C63.4-2003, "Methods of Measurement of Radio Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz". The specific procedures are described herein. Radiated testing was performed at an antenna to EUT distance of 3 meters. The antenna was raised and lowered from 1 to 4 meters.

6 RADIOMETRICS' TEST FACILITIES

The results of these tests were obtained at Radiometrics Midwest Corp. in Romeoville, Illinois, USA. Radiometrics is accredited by A2LA (American Association for Laboratory Accreditation) to conform to ISO/IEC 17025: 1999 "General Requirements for the Competence of Calibration and Testing Laboratories". Radiometrics' Lab Code is 121191 and Certification Number is 1495.01. Radiometrics' scope of accreditation includes all of the test methods listed herein. A copy of the accreditation can be accessed on our web site (www.radiomet.com). Radiometrics accreditation status can be verified at A2LA's web site (www.a2la2.org).

The following is a list of shielded enclosures located in Romeoville, Illinois:

Chamber A: Is an anechoic chamber that measures 24' L X 12' W X 12' H. The walls and ceiling are fully lined with ferrite absorber tiles. The floor has a 10' x 10' section of ferrite absorber tiles located in the center. Panashield of Rowayton, Connecticut manufactured the chamber. The enclosure is NAMAS certified.

Chamber B: Is a shielded enclosure that measures 24' L X 12' W X 8' H. Erik A. Lindgren & Associates of Chicago, Illinois manufactured the enclosure.

Chamber C: Is a shielded enclosure that measures 20' L X 10' W X 8' H. Lindgren RF Enclosures Inc. of Addison, Illinois manufactured the enclosure.

Chamber D: Is a fully anechoic chamber that measures 22' L X 10' W X 10' H. The walls, ceiling and floor are fully lined with ferrite absorber tiles. Braden Shielding Systems of Tulsa, Oklahoma manufactured the chamber.

Chamber E: Is a custom made anechoic chamber that measures 52' L X 30' W X 18' H. The walls and ceiling are fully lined with RF absorber. Pro-shield of Collinsville, Oklahoma manufactured the chamber.

Test Station F: Is an area that measures 10' D X 12' W X 10' H. The floor and back wall are metal shielded. This area is used for conducted emissions measurements.

A separate ten-foot long, brass plated, steel ground rod attached via a 6 inch copper braid grounds each of the above chambers. Each enclosure is also equipped with low-pass power line filters.

Open Area Test Site (OATS): Is located on 8625 Helmar Road in Newark, Illinois, USA and measures 56' L X 24' W X 17' H. The entire open field test site has a metal ground screen. The FCC has accepted these sites as test site number US1065. The FCC test site Registration Number is 732175. Details of the site characteristics are on file with the Industry Canada as file number IC3124.

A complete list of the test equipment is provided herein. The calibration due dates are indicated on the equipment list. The equipment is calibrated in accordance to ANSI/NCSL Z540-1 with traceability to the National Institute of Standards and Technology (NIST).

7 DEVIATIONS AND EXCLUSIONS FROM THE TEST SPECIFICATIONS

There were no deviations or exclusions from the test specifications.

8 CERTIFICATION

Radiometrics Midwest Corporation certifies that the data contained herein was taken under conditions that meet or exceed the requirements of the test specification. The results relate only to the EUT listed herein. Any modifications made to the EUT subsequent to the indicated test date will invalidate the data and void this certification.

9 TEST EQUIPMENT TABLE

RMC ID	Manufacturer	Description	Model No.	Serial No.	Frequency Range	Cal Period	Cal Date
AMP-05	RMC/Celeritek	Pre-amplifier	MW110G	1001	1.0-12GHz	12 Mo.	12/22/05
AMP-20	Avantek	Pre-amplifier	SF8-0652	15221	8-18GHz	12 Mo	12/22/05
AMP-22	Anritsu	Pre-amplifier	MH648A	M23969	0.1-1200MHz	12 Mo.	12/21/05
ANT-13	EMCO	Horn Antenna	3115	2502	1.0-18GHz	24 Mo.	10/13/04
ANT-44	Impossible Machine	Super Log Antenna	SL-20M2G	1002	20-2000MHz	24 Mo.	12/12/05
HPF-02	Microwave Cir.	High Pass Filter	H2G09G02	HPF-2	1.5-11 GHz	24 Mo.	12/31/03
HPF-03	Mini-Circuits	High Pass Filter	VHP-39	HPF-03	3-10 GHz	12 Mo.	02/08/06
AMP-29	HP / Agilent	Amplifier	11975A	2304A00158	2-8 GHz	12 Mo.	08/18/06
MXR-01	H P	Harmonic Mixer	11970K	3003A02243	18.6-26.5GHz	12 Mo.	08/18/06
ANT-48	RMC	Std Gain Horn	HW2020	1001	18-26 GHz	12 Mo.	08/18/06

RMC ID	Manufacturer	Description	Model No.	Serial No.	Frequency Range	Cal Period	Cal Date
PRE-01	Hewlett Packard	Preselector	85685A	2510A00143	20 Hz-2GHz	N/A	07/05/06
REC-03	Anritsu	Spectrum Analyzer	MS2601B	MT94589	0.01-2200MHz	12 Mo.	12/07/05
REC-08	Hewlett Packard	Spectrum Analyzer	8566B	2648A13481 2209A01436	30Hz-22GHz	12 Mo.	07/05/06
THM-01	Extech Inst.	Temp/Humid Meter	4465CF	001106557	N/A	24 Mo.	03/31/06

Note: All calibrated equipment is subject to periodic checks.

10 TEST SECTIONS

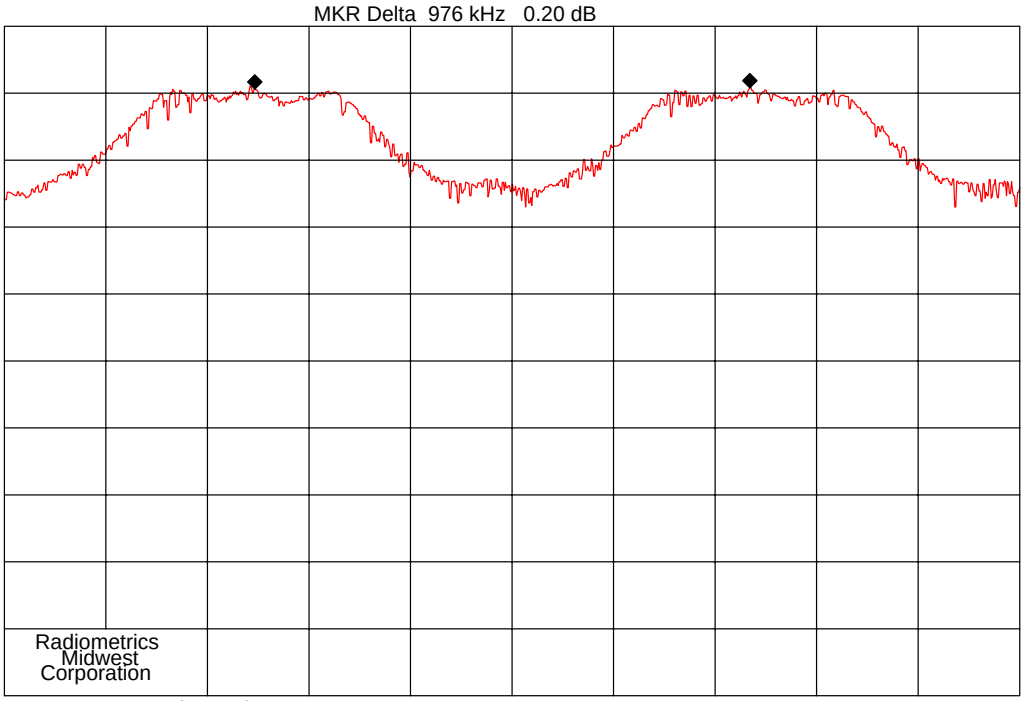
10.1 AC Conducted Emissions; Section 15.207

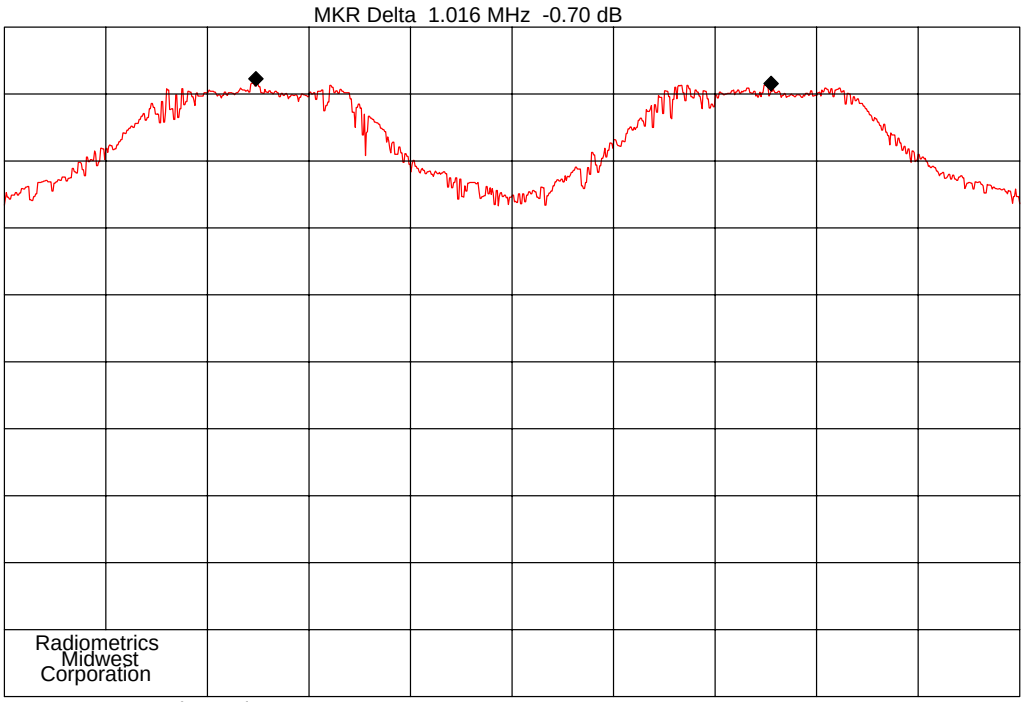
Since the EUT is battery powered, Conducted Emissions tests were not performed.

10.2 Carrier Frequency Separation

The EUT has its hopping function enabled. The spectrum analyzer was set to the MAX HOLD mode to read peak emissions. The sweep was set to AUTO. The trace was allowed to stabilize. The marker-delta function was used to determine the separation between the peaks of the adjacent channels.

The channel separation is 1 MHz. The minimum separation required is 0.66 MHz since the power is less than 0.125 Watts.

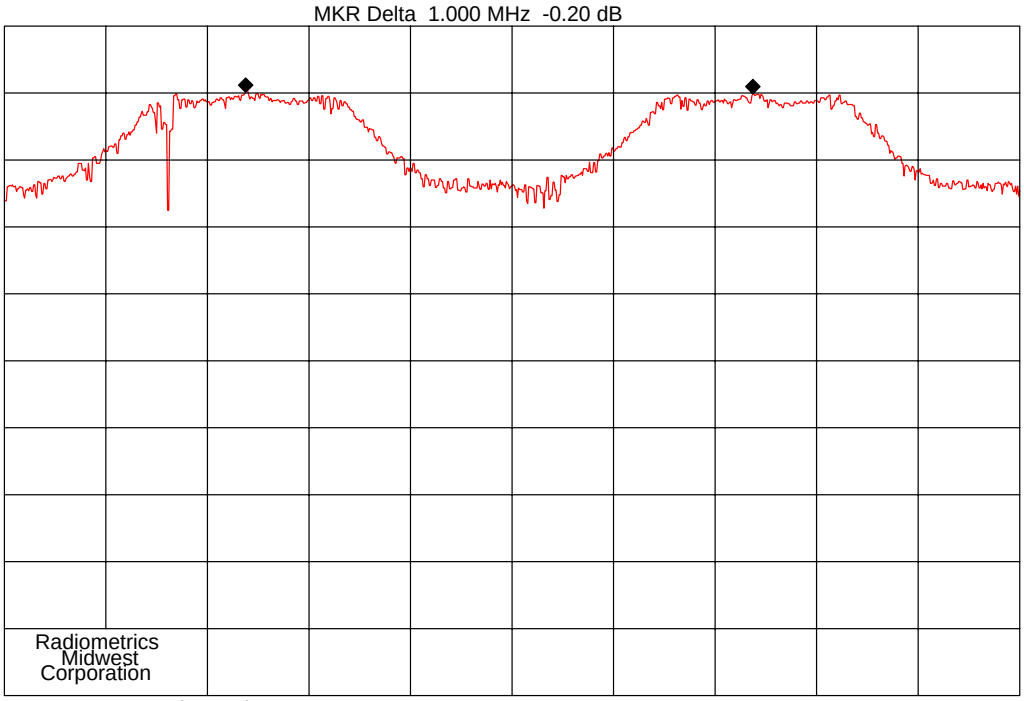




COMPANY : Freedom Science
CENTER 2.440 50 GHz
RES BW 100 kHz
10 dB/
NOTES : Carrier Freq. Separation, Mid Channel

ITEM : Knee
REF -4.4 dBm
VBW 300 kHz
TIME : 14:23

DATE : 09-26-2006
SPAN 2.00 MHz
ATTEN 10 dB
SWP 20.0 msec
cfs-2



COMPANY : Freedom Science
CENTER 2.479 50 GHz
RES BW 100 kHz
10 dB/
NOTES : Carrier Freq. Separation, High Channel

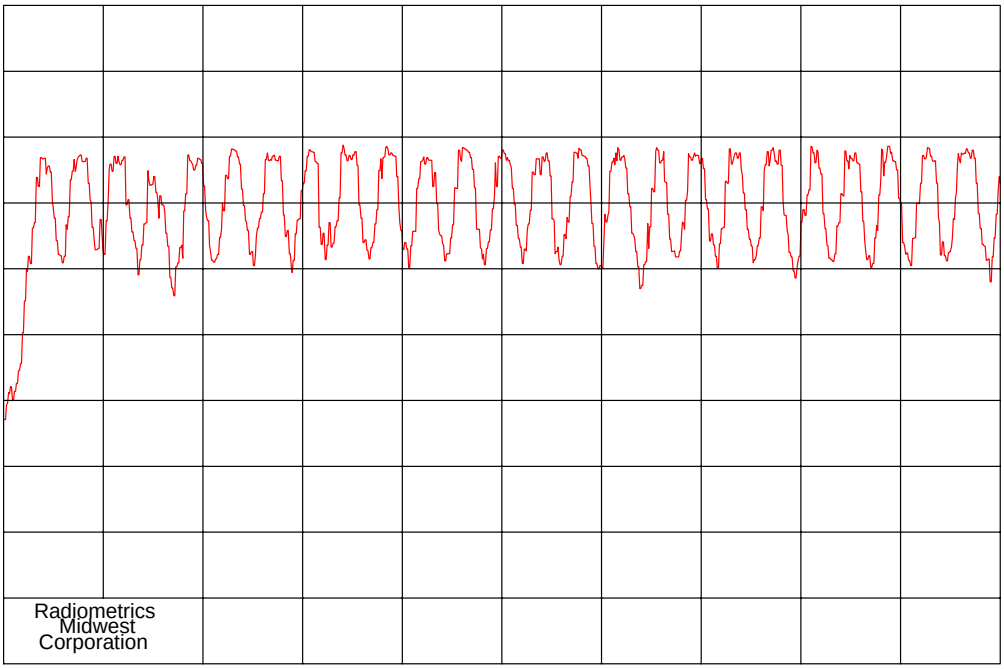
ITEM : Knee
REF -4.4 dBm
VBW 300 kHz
TIME : 14:21

DATE : 09-26-2006
SPAN 2.00 MHz
ATTEN 10 dB
SWP 20.0 msec
cfs-3

10.3 Number of Hopping Frequencies

The EUT has its hopping function enabled. The spectrum analyzer was set to the MAX HOLD mode to read peak emissions. The sweep was set to AUTO. The trace was allowed to stabilize.

As Can be seen, 25 + 27 + 27 = 79 Channels are shown. This exceeds the minimun number of channels required. The minimum number required is 15.

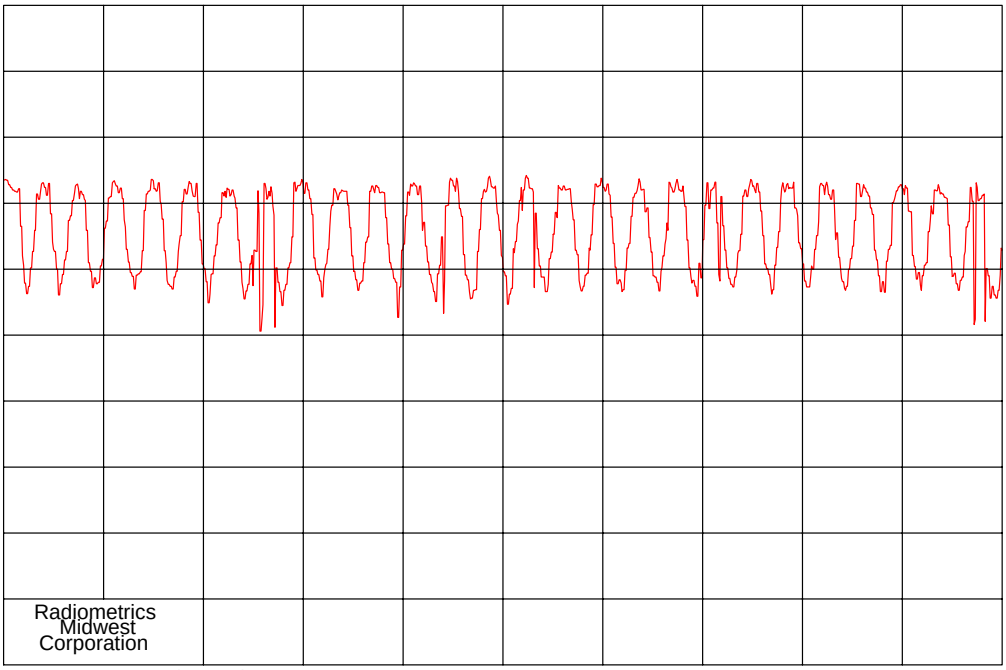


COMPANY : Freedom Science
START 2.401 0 GHz
RES BW 100 kHz
10 dB/
NOTES : Number of Hopping Frequencies, Band 1

ITEM : Knee
REF -10.0 dBm
VBW 300 kHz
TIME : 16:00

DATE : 09-25-2006
STOP 2.427 0 GHz
ATTEN 0 dB
SWP 20.0 msec
nfh-1

25 Channels shown

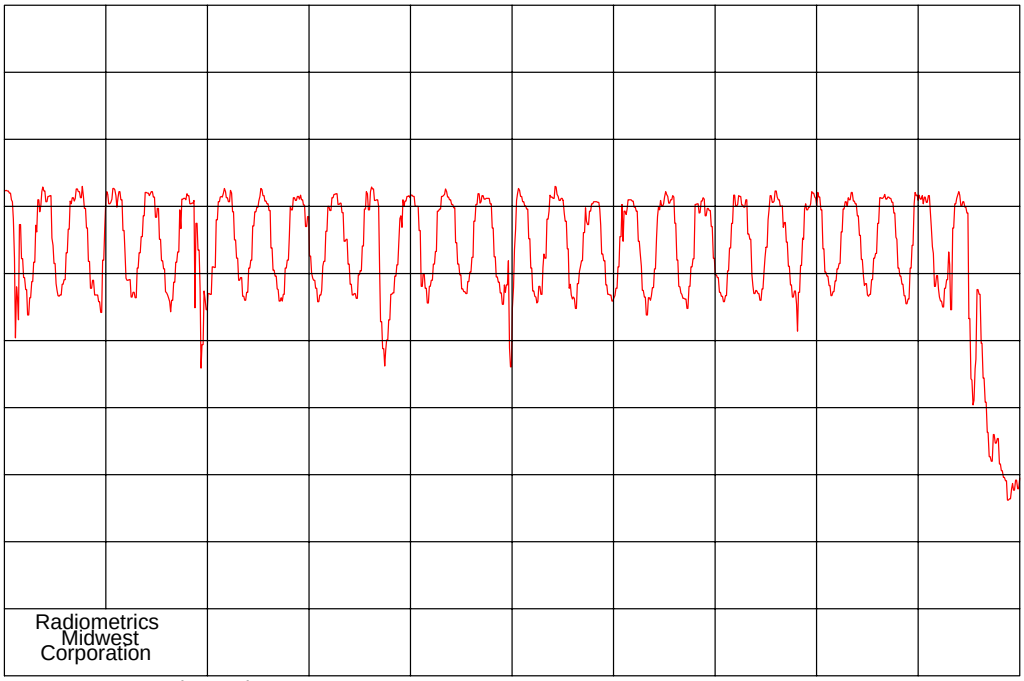


COMPANY : Freedom Science
START 2.427 0 GHz
RES BW 100 kHz
10 dB/
NOTES : Number of Hopping Frequencies, Band 2

ITEM : Knee
REF -10.0 dBm
VBW 300 kHz
TIME : 16:06

DATE : 09-25-2006
STOP 2.454 0 GHz
ATTEN 0 dB
SWP 20.0 msec
nfh-2

27 Channels Shown



COMPANY : Freedom Science
START 2.454 0 GHz
RES BW 100 kHz
10 dB/
NOTES : Number of Hopping Frequencies, Band 3

ITEM : Knee
REF -10.0 dBm
VBW 300 kHz
TIME : 16:10

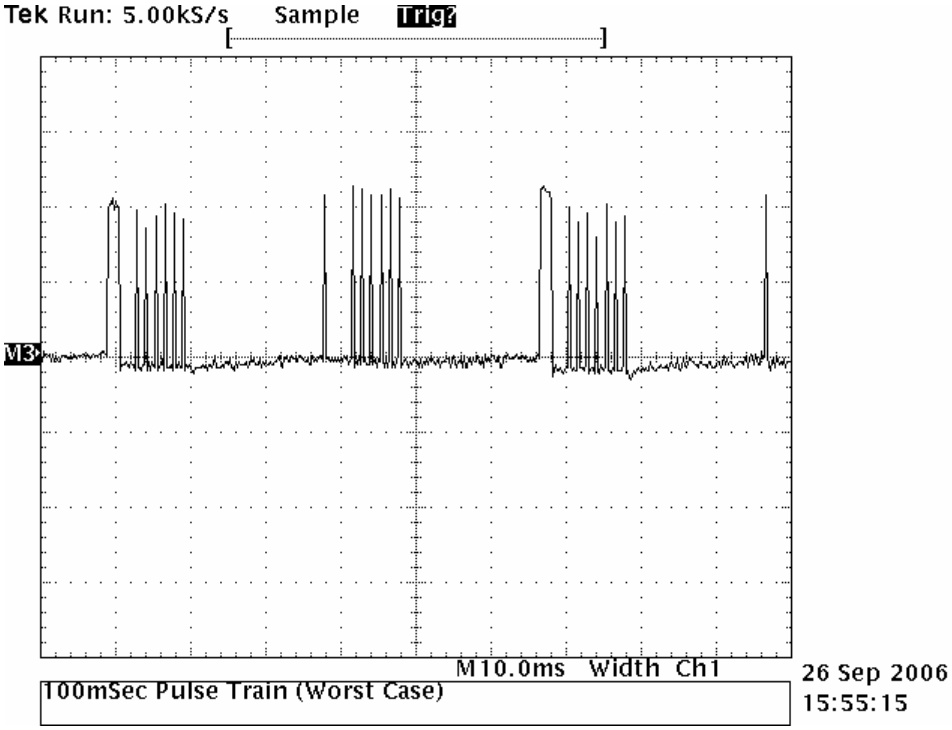
DATE : 09-25-2006
STOP 2.482 0 GHz
ATTEN 0 dB
SWP 20.0 msec
nfh-3

27 Channels Shown

10.4 Time of Occupancy (Dwell Time)

The EUT has its hopping function enabled. The Peak to average factor is calculated by the highest duty cycle in percent over any 100mS transmission. The factor in dB is 20 * Log(Duty cycle/100).

A scope was used with a crystal detector to show the individual pulses. The traces were performed at the highest data rate.



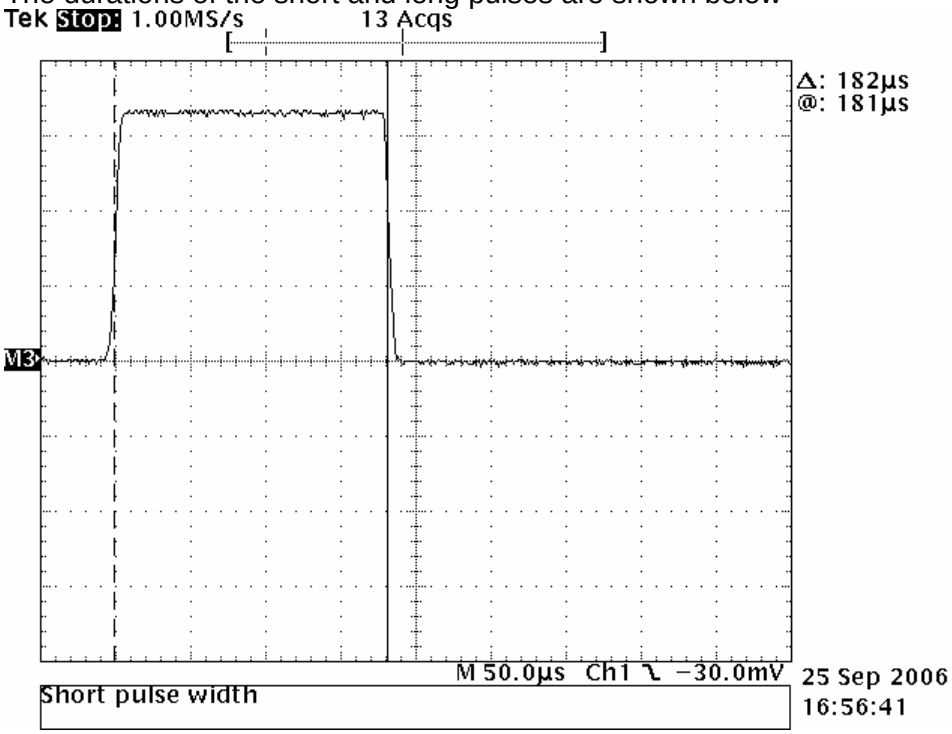
This trace shows the number of pulses in within a 100 mSec window with the highest duty cycle and the greatest number of long pulses.

Within this window, there are two pulses that are 1.36 mS and 21 pulses that are 180 uS in duration. As seen below this corresponds to a 7.1 mSec on time during 100 mSec.

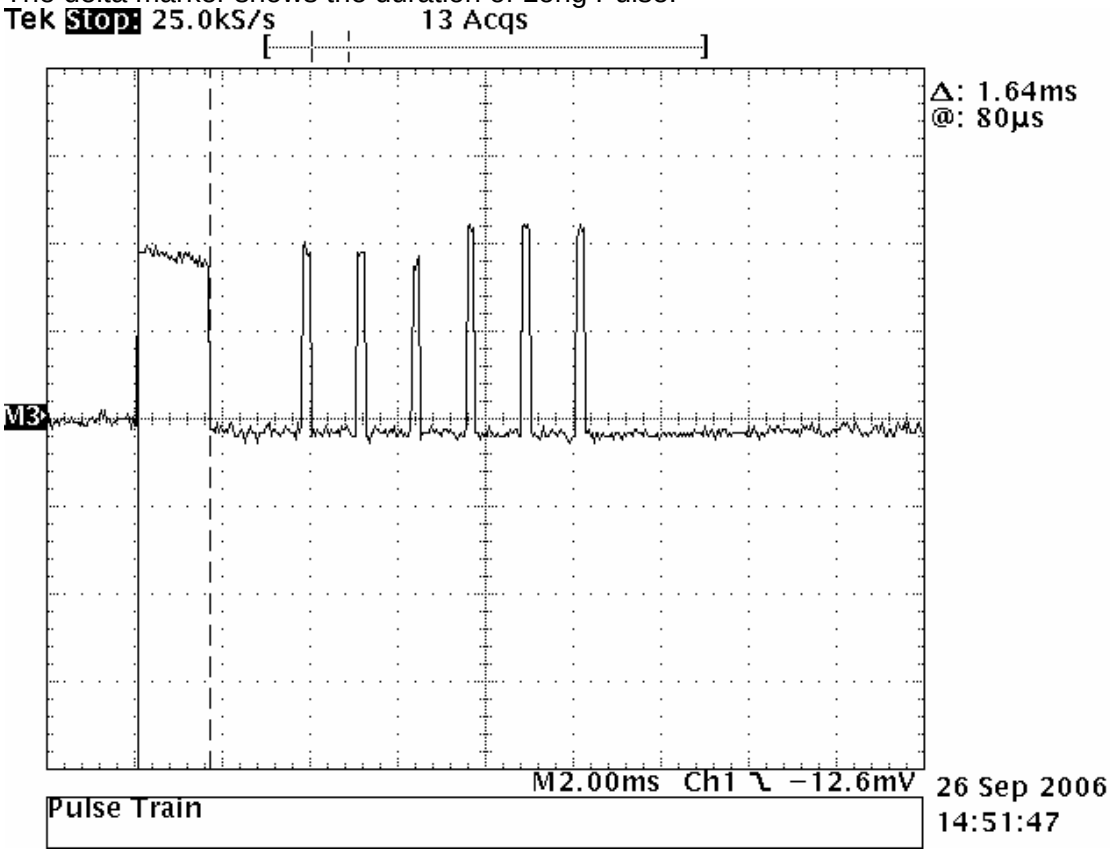
mS	# of pulses	Total
1.64	2	3.28
0.182	21	3.82
	Total On time/100mSec	7.10

20 Log*(6.46mSec/100mSec) = -22.97 dB Peak to average Correction factor.

The durations of the short and long pulses are shown below



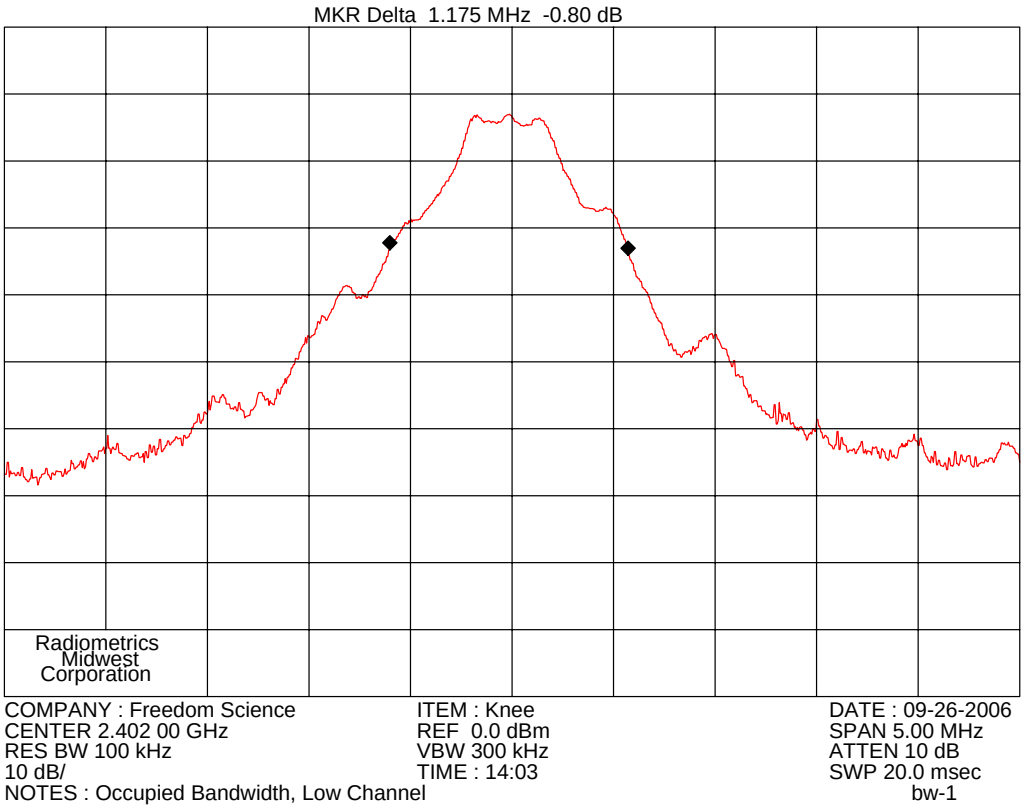
The delta marker shows the duration of Long Pulse.

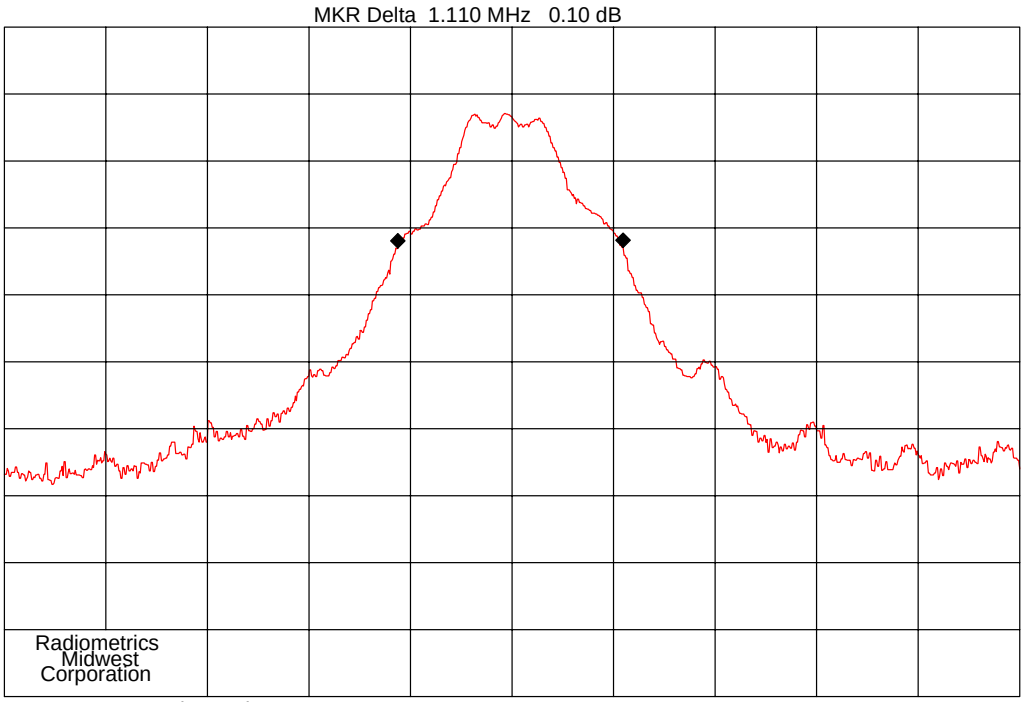


10.5 Occupied Bandwidth (20 dB)

The spectrum analyzer was set to the MAX HOLD mode to record the worst case of the modulation. The EUT was transmitting at its maximum data rate. The trace was allowed to stabilize.

The marker-to-peak function was set to the peak of the emission. Then the marker-delta function was used to measure 20 dB down one side of the emission. The marker-delta function was reset and then moved to the other side of the emission, until it is (as close as possible to) even with the reference marker level. The marker-delta reading at this point is the 20 dB bandwidth of the emission.

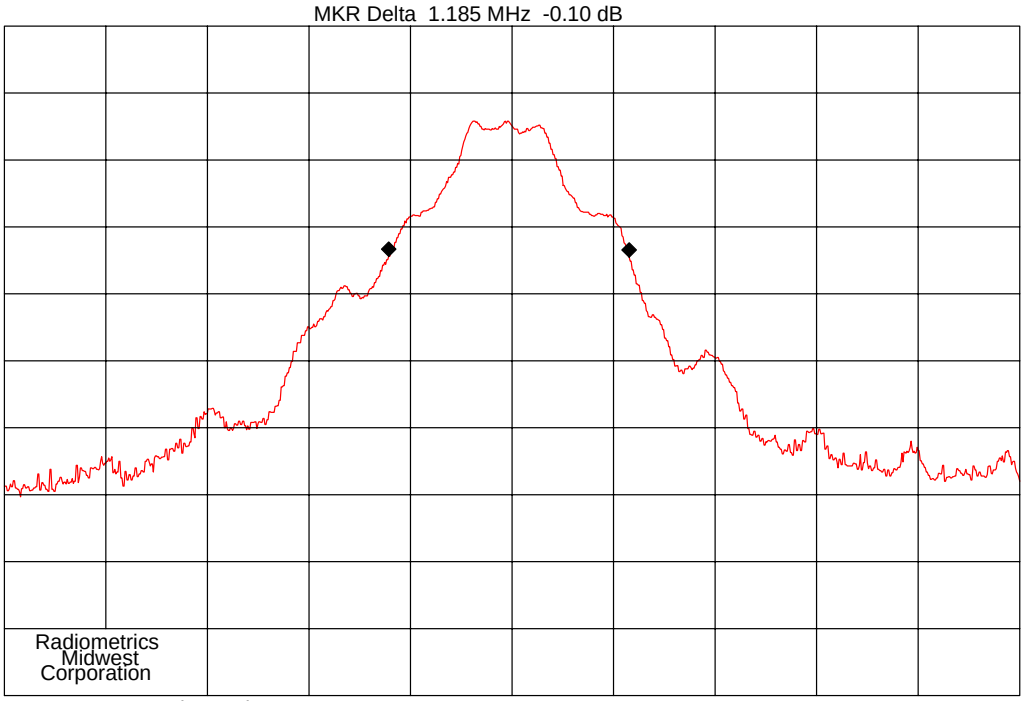




COMPANY : Freedom Science
CENTER 2.441 00 GHz
RES BW 100 kHz
10 dB/
NOTES : Occupied Bandwidth, Mid Channel

ITEM : Knee
REF 0.0 dBm
VBW 300 kHz
TIME : 14:00

DATE : 09-26-2006
SPAN 5.00 MHz
ATTEN 10 dB
SWP 20.0 msec
bw-2

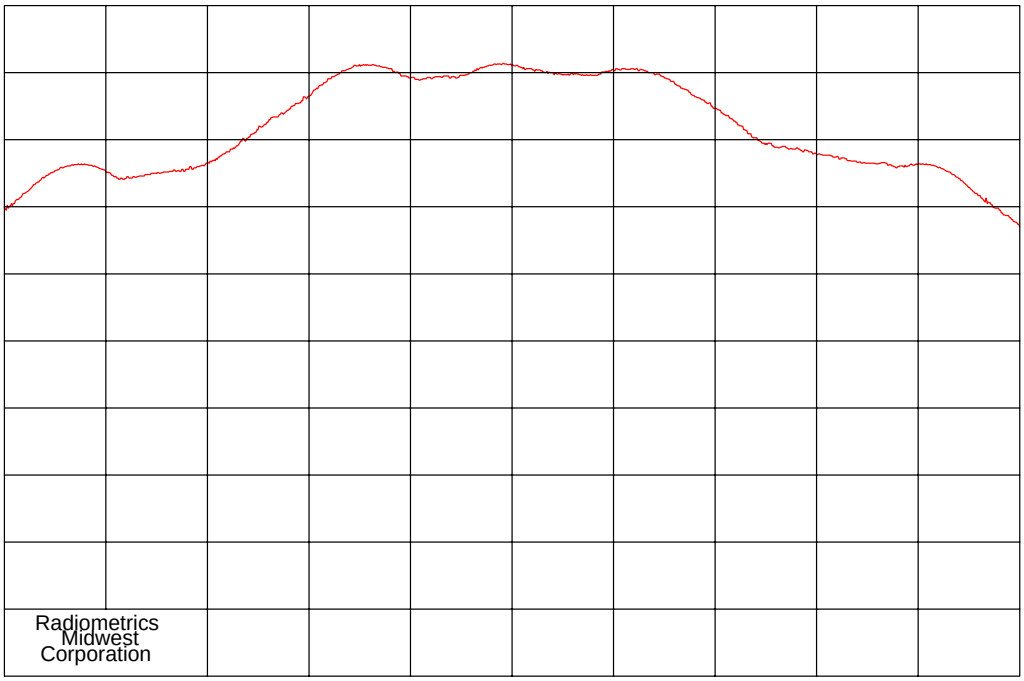


COMPANY : Freedom Science
CENTER 2.480 00 GHz
RES BW 100 kHz
10 dB/
NOTES : Occupied Bandwidth, High Channel

ITEM : Knee
REF 0.0 dBm
VBW 300 kHz
TIME : 14:05

DATE : 09-26-2006
SPAN 5.00 MHz
ATTEN 10 dB
SWP 20.0 msec
bw-3

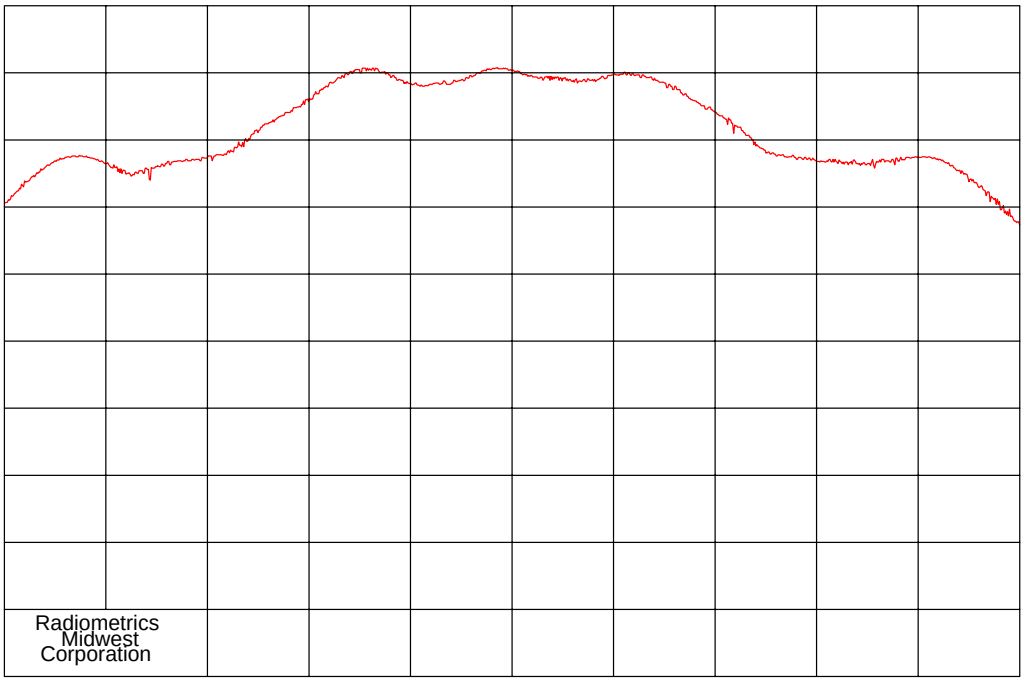
The following shows the 20 dB bandwidth as required by Industry Canada.



COMPANY : Freedom Science
CENTER 2.441 00 GHz
RES BW 100 kHz
10 dB/
NOTES : Occupied Bandwidth, Mid Channel

ITEM : Knee
REF -4.4 dBm
VBW 300 kHz
TIME : 14:12

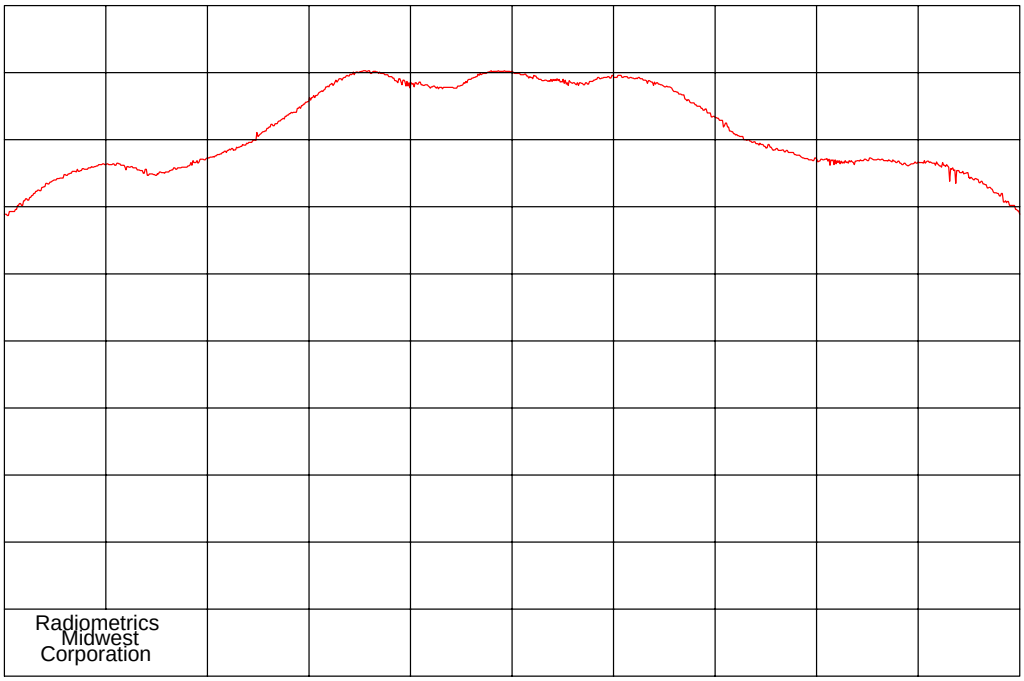
DATE : 09-26-2006
SPAN 1.20 MHz
ATTEN 10 dB
SWP 20.0 msec
bw-2c



COMPANY : Freedom Science
CENTER 2.402 00 GHz
RES BW 100 kHz
10 dB/
NOTES : Occupied Bandwidth, Low Channel

ITEM : Knee
REF -4.4 dBm
VBW 300 kHz
TIME : 14:13

DATE : 09-26-2006
SPAN 1.20 MHz
ATTEN 10 dB
SWP 20.0 msec
bw-1c



The system RF bandwidth as defined by RSS-210 is 1.185 * 79 = 93.615 MHz.

10.6 Peak Output Power

Since antenna conducted tests cannot be performed on the EUT, radiated tests were performed to show compliance with this requirement. The FCC procedures from power output option 1 were used.

The transmitter's peak power was calculated using the following equation:

P = (E x d)^2 / (30 x G)

Where: E = the measured maximum peak field strength in V/m.
G = The numeric gain of the transmitting antenna over an isotropic radiator.
d = Distance in meters from which the field strength was measured. (3 meters)
P = The EUT power in watts

The field strength was measured using the procedures described in section 10.9, with the exception of the resolution and video bandwidths. The spectrum analyzer was set to the following settings:

Span = 3 MHz ; RBW = 3 MHz (> the 20 dB bandwidth of the emission being measured)
VBW = 3 MHz; Sweep = auto; Detector function = peak; Trace = max hold

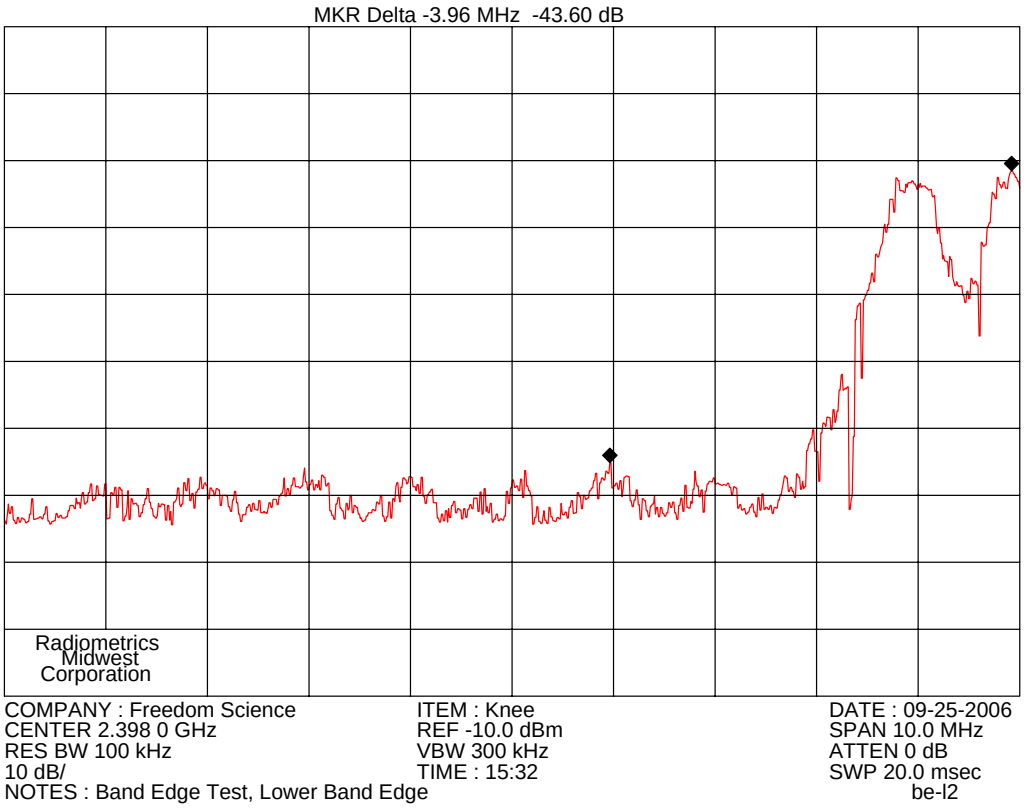
Since the gain of the antenna is always less than 6dB, the limit is not reduced.

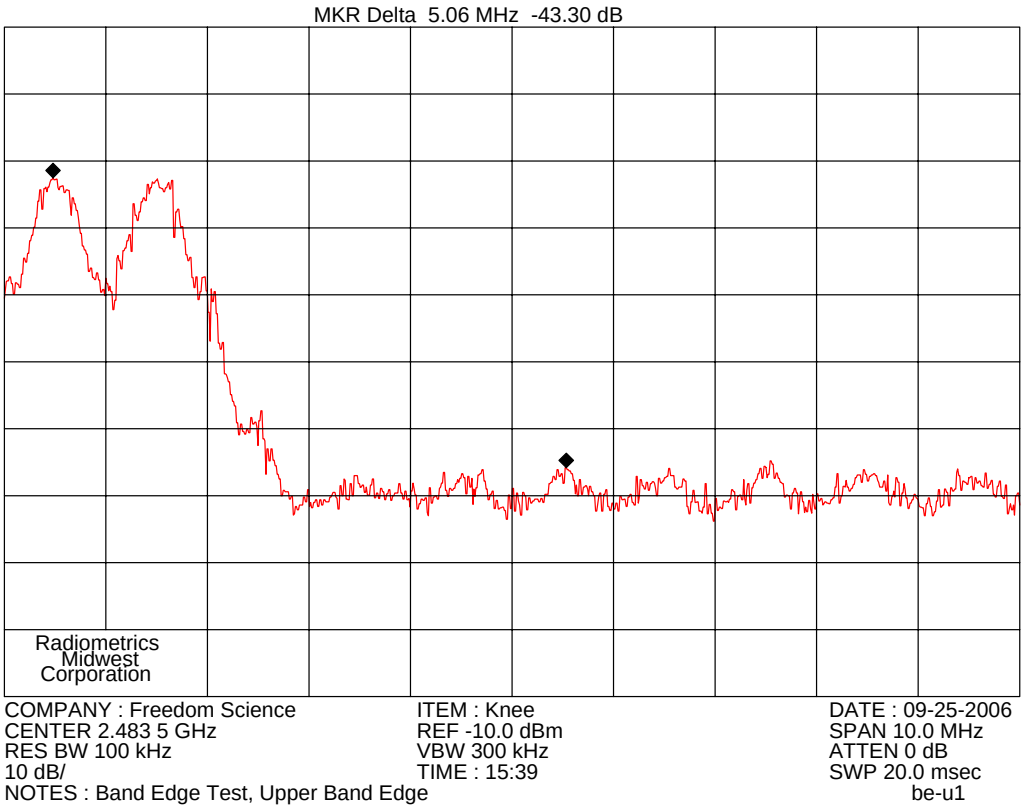
Freq	Peak Field Strength		Ant gain	Test Distance	Output power from EUT		Limit
MHz	dBuV/m	V/m	Numeric	Meters	Watts	dBm	dBm
2402	106.8	0.219	1	3	0.0144	11.6	30
2441	109.0	0.281	1	3	0.0238	13.8	30
2480	109.7	0.305	1	3	0.0280	14.5	30

Overall Test result: Pass by 15.5 dB

10.7 Band-edge Compliance of RF Conducted Emissions

The spectrum analyzer was set to the MAX HOLD mode to record the worst case of the modulation at the band-edge, with the EUT set to the lowest frequency. The trace was allowed to stabilize.





Overall Test result: Pass by 23.3 dB

10.8 Spurious Radiated Emissions

Radiated emission measurements in the Restricted bands were performed with linearly polarized broadband antennas. The results obtained with these antennas can be correlated with results obtained with a tuned dipole antenna. Below 1 GHz, when a radiated emission is detected approaching the specification limit, the measurement of the emission is repeated using a tuned dipole antenna with a Roberts Balun. Since preamplifiers are used, a 10 dB linearity check is performed prior to start of testing in order to determine if an overload condition exists. Measurements were performed using two antenna polarizations, (vertical and horizontal). The worst case emissions were recorded. The out of band emissions and the ambient emissions were below the level of input overload (72 dBuV).

From 30 to 1000 MHz, an Anritsu spectrum analyzer was used. For tests from 1 to 25 GHz, an HP 8566 spectrum analyzer was used. For tests from 1 to 10 GHz, a high pass filter was used to reduce the fundamental emission. A harmonic mixer was used from 18 to 25 GHz. Figure 4 herein lists the details of the test equipment used during radiated emissions tests.

Final radiated emissions measurements were performed in an anechoic chamber at a test distance of 3 meters. The entire frequency range from 30 to MHz was slowly scanned and the emissions in the restricted frequency bands were recorded. Measurements were performed using the peak detector function. The detected emission levels were maximized by rotating the EUT, adjusting the positions of all cables, and by scanning the measurement antenna from 1 to 4 meters above the ground. All other tests are performed at 12 East Devonwood Ave. Romeoville, Illinois EMI test lab.

The EUT was rotated through three orthogonal axis as per 13.1.4.1 of ANSI C63.4 during the prescans and during final radiated tests.

10.8.1 Radiated Emissions Field Strength Sample Calculation

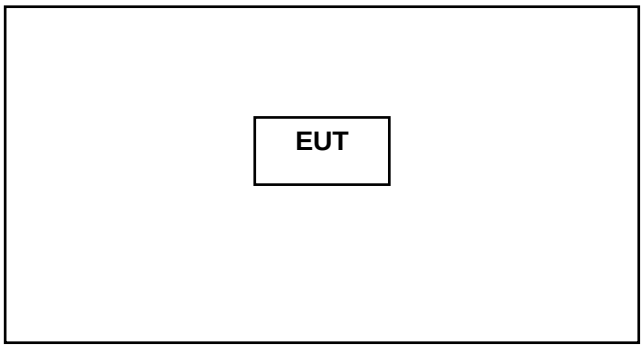
The field strength is calculated by adding the Antenna Factor and Cable Loss, and by subtracting the Amplifier Gain from the measured reading. The basic equation is as follows:

FS = RA + AF + CF – AG +HPF + PKA

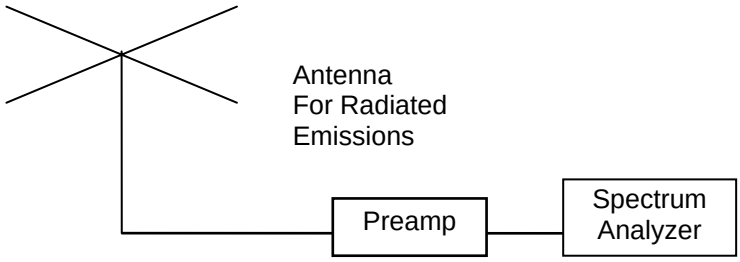
Where: FS = Field Strength
RA = Receiver Amplitude
AF = Antenna Factor
CF = Cable Attenuation Factor
AG = Amplifier Gain
HPF = High pass Filter Loss
PKA = Peak to Average Factor (This is used only for Average measurements)

The Peak to average factor is used when average measurements are required. It is calculated by the highest duty cycle in percent over any 100mS transmission. The factor in dB is 20 * Log(Duty cycle/100).

Figure 1. Drawing of Radiated Emissions Setup



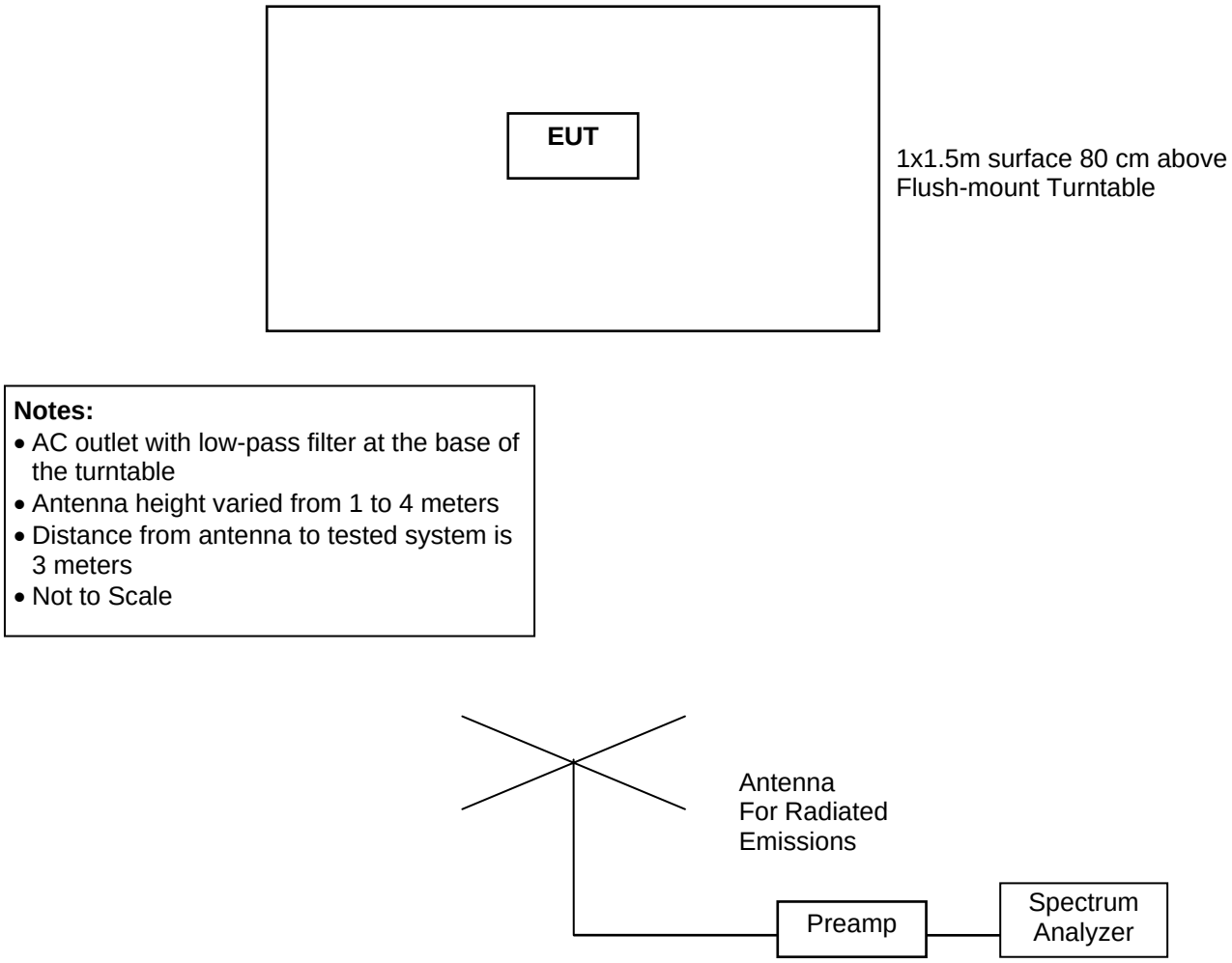
Notes:
- AC outlet with low-pass filter at the base of the turntable
- Antenna height varied from 1 to 4 meters
- Distance from antenna to tested system is 3 meters
- Not to Scale



Frequency Range	Receive Antenna	Amplifier	Spectrum Analyzer	High Pass Filter
30 to 1000 MHz	ANT-44	None	REC-03	None*
1 to 10 GHz	ANT-13	AMP-05	REC-01	HPF-03
10 to 18 GHz	ANT-13	AMP-20	REC-01	None*
18 to 25 GHz	ANT-48	AMP-29	REC-08; MXR-01	None*

* A high pass filter was not needed since the fundamental frequency was outside of the amplifiers pass band.

Figure 2. Drawing of Radiated Emissions Setup



10.8.2 Spurious Radiated Emissions Test Results (Restricted Band)

Emissions Below 1 GHz including non-restricted bands

The following spectrum analyzer settings were used .

Span = wide enough to fully capture the emission being measured
RBW = 120 kHz
VBW ≥ RBW
Sweep = auto

Manufacturer	Freedom Innovations	Specification	FCC Part 15 Subpart C & RSS-210
Model	AMPCK001	Test Date	09/21/2006
Serial Number	none	Test Distance	3 Meters
Abbreviations	Pol = Antenna Polarization; V = Vertical; H = Horizontal; P = peak; Q = QP		
Notes	Corr. Factors = Cable Loss – Preamp Gain – Duty Cycle Factor + HP Filter Loss		

Freq. MHz	Meter Reading dBuV	Antenna Factor dB	Antenna Pol/ Type	Corr. Factors dB	Field Strength dBuV/m EUT	Field Strength dBuV/m Limit	Margin Under Limit dB
52.0	25.8 P	14.6	H/44	-27.3	13.1	40.0	26.9
155.5	26.4 P	9.8	H/44	-26.1	10.1	43.5	33.4
262.9	25.8 P	13.0	H/44	-25.2	13.6	46.0	32.4
891.6	25.2 P	22.1	H/44	-20.8	26.5	46.0	19.5
997.9	26.0 P	22.9	H/44	-19.5	29.4	54.0	24.6
1100.7	27.0 P	23.6	H/44	-18.6	32.0	54.0	22.0
50.9	24.8 P	13.7	V/44	-27.3	11.1	40.0	28.9
136.3	24.5 P	13.0	V/44	-26.2	11.2	43.5	32.3
238.8	26.0 P	12.8	V/44	-25.3	13.4	46.0	32.6

There were no other emissions detected below 1 GHz.
Judgment: Passed by 19.5 dB

Emissions above 1 GHz

Span = wide enough to fully capture the emission being measured
RBW = 1 MHz for f ≥ 1 GHz
VBW ≥ RBW
Sweep = auto
Detector function = peak
Trace = max hold

Since the emission is pulsed, the unit was modified for continuous operation. The average reading was determined by taking the peak reading and subtracting the peak-average correction factor, derived from the appropriate duty cycle calculation from FCC Section 15.35(b) and (c). See Section 10.4 herein.

Note that each row shows the peak and average data.

hrm #	Tx Freq	Ant. Pol.	Analyzer RDG dBuV		Corr. Fact. dB	EUT Emission Freq MHz	Field Strength (dBuV/m)				Margin Under Limit dB
			Peak	Average			Peak Total	Ave Total	Peak Limit	Ave Limit	
be	2402	V	52.9	29.9	9.9	2390	62.8	39.8	74	54	11.2
be	2402	H	51.7	28.7	9.9	2390	61.6	38.6	74	54	12.4
2	2402	V	52.7	29.7	12.7	4804	65.4	42.4	74	54	8.6
2	2402	H	57.9	34.9	12.7	4804	70.6	47.6	74	54	3.4
3	2402	V	41.6	18.6	18.5	7206	60.1	37.1	74	54	13.9
3	2402	H	42.1	19.1	18.5	7206	60.6	37.6	74	54	13.4
4	2402	V	35.1	12.1	17.7	9608	52.8	29.8	74	54	21.2
4	2402	H	34.7	11.7	17.7	9608	52.4	29.4	74	54	21.6
2	2441	V	51.9	28.9	12.7	4882	64.6	41.6	74	54	9.4
2	2441	H	55.1	32.1	12.7	4882	67.8	44.8	74	54	6.2
3	2441	V	43.4	20.4	18.8	7323	62.2	39.2	74	54	11.8
3	2441	H	42.6	19.6	18.8	7323	61.4	38.4	74	54	12.6
4	2441	V	35.3	12.3	17.8	9764	53.1	30.1	74	54	20.9
4	2441	H	34.8	11.8	17.8	9764	52.6	29.6	74	54	21.4
be	2480	V	56.5	33.5	10.9	2483.5	67.4	44.4	74	54	6.6
be	2480	H	53.1	30.1	10.9	2483.5	64.0	41.0	74	54	10
2	2480	V	56.6	33.6	13.2	4960	69.8	46.8	74	54	4.2
2	2480	H	57.0	34.0	13.2	4960	70.2	47.2	74	54	3.8
3	2480	V	41.3	18.3	20	7440	61.3	38.3	74	54	12.7
3	2480	H	40.2	17.2	20	7440	60.2	37.2	74	54	13.8
4	2480	V	35.2	12.2	17.6	9920	52.8	29.8	74	54	21.2
4	2480	H	35.6	12.6	17.6	9920	53.2	30.2	74	54	20.8

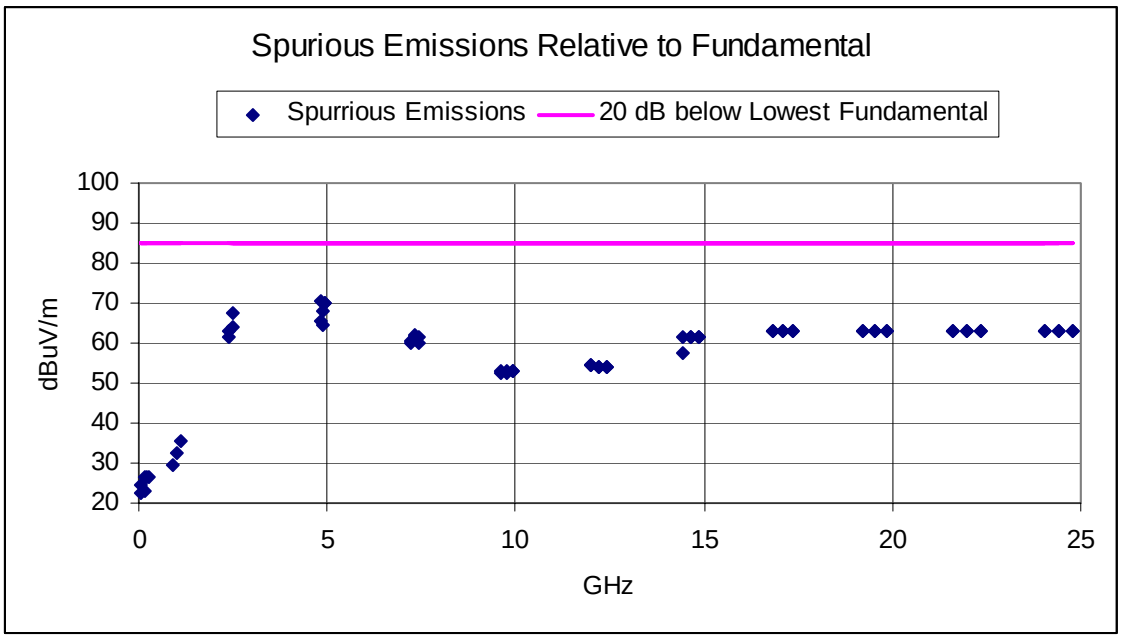
Notes: 1. hrm = Harmonic; BE = Band Edge emissions; V = Vertical; H = Horizontal
2. The margin (last column) is the worst case margin under the limits.
3. Corr. Factors = Cable Loss – Preamp Gain + Antenna Factor + High pass Filter
4. No other radiated emissions were detected in the restricted bands, above 1 GHz.

Judgment: Passed by 3.4 dB

10.9 Spurious RF Conducted Emissions

Since antenna conducted tests cannot be performed on the EUT, radiated tests were performed to show compliance with this requirement.

The EUT was tested in continous mode and peak readings were made from the lowest frequency generated in the EUT up through the 10th harmonic. The limit is 20 dB lower than the peak of the fundamental. For each polarization and fundamental frequency, there is a separate limit. The data is shown graphically and in tabular form.



The Limit is 20 dB Below Lowest Fundamental.

hrm #	Tx Freq	Ant. Pol.	Peak Analyzer RDG dBuV	Corr. Fact. dB	EUT Emission Freq MHz	Field Strength (dBuV/m)		Margin Under Limit dB
						Total	Limit	
1	2402	V	96.9	9.9	2.402	106.8	N/A	N/A
1	2402	H	95.1	9.9	2.402	105.0	N/A	N/A
be	2402	V	52.9	9.9	2.39	62.8	85	22.2
be	2402	H	51.7	9.9	2.39	61.6	85	23.4
2	2402	V	52.7	12.7	4.804	65.4	85	19.6
2	2402	H	57.9	12.7	4.804	70.6	85	14.4
3	2402	V	41.6	18.5	7.206	60.1	85	24.9
3	2402	H	42.1	18.5	7.206	60.6	85	24.4
4	2402	V	35.1	17.7	9.608	52.8	85	32.2
4	2402	H	34.7	17.7	9.608	52.4	85	32.6
5	2402	V	34.0	20.3	12.01	54.3	85	30.7
5	2402	H	34.0	20.3	12.01	54.3	85	30.7
6	2402	V	34.0	23.4	14.412	57.4	85	27.6
6	2402	H	38.0	23.4	14.412	61.4	85	23.6
7	2402	V	38.0	24.9	16.814	62.9	85	22.1

hrm #	Tx Freq	Ant. Pol.	Peak Analyzer RDG dBuV	Corr. Fact. dB	EUT Emission Freq MHz	Field Strength (dBuV/m)		Margin Under Limit dB
						Total	Limit	
7	2402	H	38.0	24.9	16.814	62.9	85	22.1
8	2402	V	38.0	24.9	19.216	62.9	85	22.1
8	2402	H	38.0	24.9	19.216	62.9	85	22.1
9	2402	V	38.0	24.9	21.618	62.9	85	22.1
9	2402	H	38.0	24.9	21.618	62.9	85	22.1
10	2402	V	38.0	24.9	24.02	62.9	85	22.1
10	2402	H	38.0	24.9	24.02	62.9	85	22.1
1	2441	V	98.4	10.6	2.441	109.0	N/A	N/A
1	2441	H	96.5	10.6	2.441	107.1	N/A	N/A
2	2441	V	51.9	12.7	4.882	64.6	85	20.4
2	2441	H	55.1	12.7	4.882	67.8	85	17.2
3	2441	V	43.4	18.8	7.323	62.2	85	22.8
3	2441	H	42.6	18.8	7.323	61.4	85	23.6
4	2441	V	35.3	17.8	9.764	53.1	85	31.9
4	2441	H	34.8	17.8	9.764	52.6	85	32.4
5	2441	V	34.0	20.1	12.205	54.1	85	30.9
5	2441	H	34.0	20.1	12.205	54.1	85	30.9
6	2441	V	38.0	23.5	14.646	61.5	85	23.5
6	2441	H	38.0	23.5	14.646	61.5	85	23.5
7	2441	V	38.0	24.9	17.087	62.9	85	22.1
7	2441	H	38.0	24.9	17.087	62.9	85	22.1
8	2441	V	38.0	24.9	19.528	62.9	85	22.1
8	2441	H	38.0	24.9	19.528	62.9	85	22.1
9	2441	V	38.0	24.9	21.969	62.9	85	22.1
9	2441	H	38.0	24.9	21.969	62.9	85	22.1
10	2441	V	38.0	24.9	24.41	62.9	85	22.1
10	2441	H	38.0	24.9	24.41	62.9	85	22.1
1	2480	V	98.8	10.9	2.48	109.7	N/A	N/A
1	2480	H	97.5	10.9	2.48	108.4	N/A	N/A
be	2480	V	56.5	10.9	2.4835	67.4	85	17.6
be	2480	H	53.1	10.9	2.4835	64.0	85	21.0
2	2480	V	56.6	13.2	4.96	69.8	85	15.2
2	2480	H	57.0	13.2	4.96	70.2	85	14.8
3	2480	V	41.3	20	7.44	61.3	85	23.7
3	2480	H	40.2	20	7.44	60.2	85	24.8
4	2480	V	35.2	17.6	9.92	52.8	85	32.2
4	2480	H	35.6	17.6	9.92	53.2	85	31.8
5	2480	V	34.0	19.8	12.4	53.8	85	31.2
5	2480	H	34.0	19.8	12.4	53.8	85	31.2
6	2480	V	38.0	23.7	14.88	61.7	85	23.3
6	2480	H	38.0	23.7	14.88	61.7	85	23.3
7	2480	V	38.0	24.9	17.36	62.9	85	22.1
7	2480	H	38.0	24.9	17.36	62.9	85	22.1
8	2480	V	38.0	24.9	19.84	62.9	85	22.1
8	2480	H	38.0	24.9	19.84	62.9	85	22.1
9	2480	V	38.0	24.9	22.32	62.9	85	22.1

hrm #	Tx Freq	Ant. Pol.	Peak Analyzer RDG dBuV	Corr. Fact. dB	EUT Emission Freq MHz	Field Strength (dBuV/m)		Margin Under Limit dB
						Total	Limit	
9	2480	H	38.0	24.9	22.32	62.9	85	22.1
10	2480	V	38.0	24.9	24.8	62.9	85	22.1
10	2480	H	38.0	24.9	24.8	62.9	85	22.1
N/A	2441	H	25.8	-1.5	0.052	24.3	85	60.7
N/A	2441	H	26.4	0.3	0.156	26.7	85	58.3
N/A	2441	H	25.8	0.6	0.263	26.4	85	58.6
N/A	2441	H	25.2	4.4	0.892	29.6	85	55.4
N/A	2441	H	26	6.5	0.998	32.5	85	52.5
N/A	2441	H	27	8.4	1.101	35.4	85	49.6
N/A	2441	V	24.8	-2.5	0.051	22.3	85	62.7
N/A	2441	V	24.5	-1.7	0.136	22.8	85	62.2
N/A	2441	V	26	0.7	0.239	26.7	85	58.3

Notes: 1. hrm = Harmonic; BE = Band Edge emissions; V = Vertical; H = Horizontal
2. The margin (last column) is the worst case margin under the limits.
3. Corr. Factors = Cable Loss – Preamp Gain + Antenna Factor + High pass Filter
4. No other radiated emissions were detected in the restricted bands, above 1 GHz.

Judgment: Passed by 14.4 dB