



## TEST REPORT

Report Number: 100455091ATL-005

September 28, 2011

**Product Name: Sirius XM Lynx Portable Radio**

**Product Model Number: SXi1**

Standard: FCC Part 15, Subpart C, Intentional Radiators (15.247)

Tested by:  
Intertek Testing Services NA Inc.  
1950 Evergreen Blvd., Suite 100  
Duluth, GA 30096

Client:  
SIRIUS XM Radio Inc  
1500 Eckington PL NE  
Washington, DC 20002  
Contact: Beejay Jolayemi  
Phone: 202.680.4288  
Fax: 202.380.4091

Report prepared by:

Richard Bianco  
EMC Team Leader

Report reviewed by:

Jeremy O. Pickens  
Department Manager - EMC

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## 1.0 Introduction and Conclusion

The tests indicated in section 2.0 were performed on the product constructed as described in section 3.0. The remaining test sections are the verbatim text from the actual data sheets used during the investigation. These test sections include the test name, the specified test Method, a list of the actual Test Equipment Used, documentation Photos, Results and raw Data. No additions, deviations, or exclusions have been made from the standard(s) unless specifically noted.

Based on the results of our investigation, we have concluded the product tested complies with the testing indicated below. The results obtained in this test report pertain only to the item(s) tested. Refer to the Test Summary for the specific details.

## 2.0 Test Summary

Section	Test Full Name	Test Date	Result
3.0	Description of Equipment Under Test		
4.0	System setup including cable interconnection details, support equipment and simplified block diagram.		
5.0	Transmitter Information for equipment operating under Parts 11, 15 and 18 of the rules (Transmitter Info -		PASS
6.0	§ 15.247 Occupied Bandwidth		PASS
7.0	§ 15.247(e) Power Spectral Density		PASS
8.0	§ 15.247(b)(3) Conducted Power		PASS
9.0	§ 15.247(d) Conducted Spurious Emissions		PASS
10.0	§ 15.247(d) Radiated Spurious Emissions		PASS
11.0	Test Equipment List		
12.0	Revision History		

### 3.0 Description of Equipment Under Test

Equipment Under Test			
Description	Manufacturer	Model Number	Serial Number
Satellite Radio	SIRIUS XM Satellite Radio	SXi1	NA

EUT receive date:	July 11, 2011
EUT receive condition:	Good

Description of EUT provided by Client:

Sirius XM Lynx Hardware Features

- Revolutionary SiriusXM *PowerConnect*™ FM Transmitter works through your vehicle's radio\* with easy Do-It-Yourself Installation. The color-coded Vehicle Dock makes it simple to connect.
- Customize your display by choosing the backlight color theme that matches your mood or vehicle dash lights.
- Personalize your radio by choosing the trim ring that reflects your taste or complements your vehicle interior.
- View artist name, song title, and channel information on the large color display.
- Browse programs, artists, and songs playing on other channels without having to change the channel.
- One-Touch Jump™ to traffic and weather of the 20 most congested cities, or to the previous channel to which you were listening.
- Save and enjoy fast access to your favorite channels.
- Lock and unlock channels with easy-to-use parental controls.
- Complete *PowerConnect* Vehicle Kit included.
- Universal docking capability - add accessories for your home, office, additional vehicles or even outdoors.
- Connectivity could be achieved via Satellite, WiFi, Bluetooth & USB.

Description of EUT exercising:

The EUT was powered with a 12Vdc battery supplied to the dock. The satellite signal was amplified and retransmitted into the emissions chamber to the radio under test. The radio then transmitted the music on the FM channel being investigated. The channels tested were 88.1, 96.9, and 107.9MHz.

Mode of Operation	Frequency Range (MHz)	Number of Channels	Channel Separation (kHz)
Bluetooth	2400-2483.5	NA	NA

Applicant Information:

XM Radio Inc.  
1500 Eckington PI, NE  
Washington, DC 20002

Manufacturer Information:

WNC (Kunshan) Corp.  
NO. 88 Central Avenue, Area B, Kunshan Export Processing Zone  
Kunshan City, Jiangsu, China

**4.0 System setup including cable interconnection details, support equipment and simplified block diagram. (System Setup)**

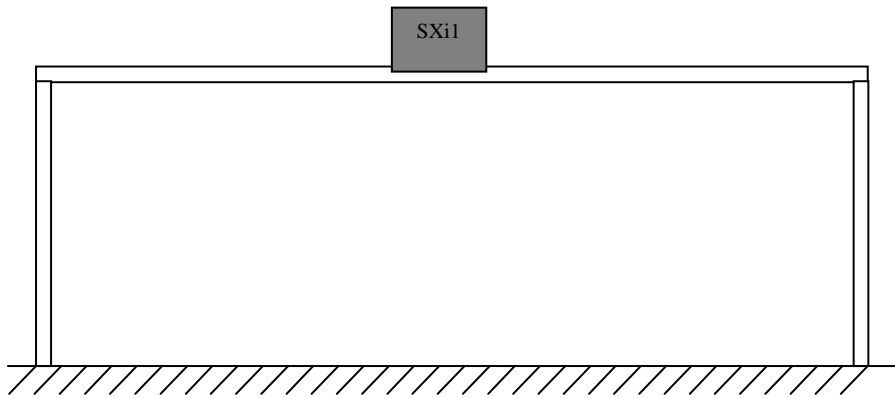
**Method:**

Record the details of EUT cabling, document the support equipment, and show the interconnections in a block diagram.

Support Equipment			
Description	Manufacturer	Model Number	Serial Number
No support equipment required			

**4.0 System setup including cable interconnection details, support equipment and simplified block diagram. (System Setup)**

**Configuration Diagram – Test Setup**



**5.0 Transmitter Information for equipment operating under Parts 11, 15 and 18 of the rules (Transmitter Info - Unlicensed)**

FCC Rule Part			
2.1033(b)(1)	<b>Applicant</b>	Company Name:	Sirius XM Satellite Radio, Inc.
		Address:	3161 S.W. 10th Street, Deerfield Beach, FL 33442
		Phone:	202-680-4288
		Contact Name:	Beejay Jolayemi
	<b>Manufacturer</b>	Company Name:	Same
		Address:	Same
		Phone:	Same
2.1033(b)(2)	<b>Equipment</b>	FCC ID:	RS2SXI1
		EUT Model Number:	SXi1
		EUT Serial Number:	NA
2.1033(b)(3)	User Manual	Attach as separate exhibit.	
2.1033(b)(4)	Brief description of circuit functions	Attach as separate exhibit.	
2.1033(b)(5)	Block diagram showing frequency of oscillators	Attach as separate exhibit.	
2.1033(b)(6)	Test report	Incorporated with this document	
2.1033(b)(7)	Internal and external photographs	Attach as separate exhibit.	
2.1033(b)(8)	Peripheral Equipment	Can be used?	N/A
		Comercially available?	N/A
2.1033(b)(9)	Transition rules apply?	No	
2.1033(b)(10)	Scanning receiver?	No	
2.1033(b)(11)	Transmitter in 59-64 GHz band?	No	
2.1033(b)(12)	Software defined radio?	No	

### 6.0 15.247 Occupied Bandwidth

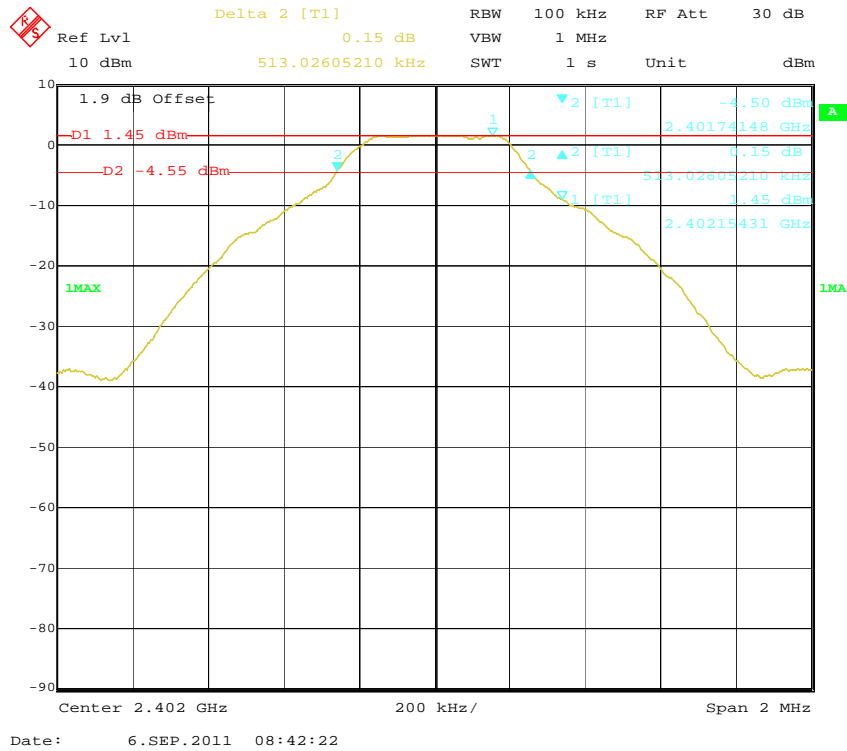
#### Method:

Test Requirement: Emissions from the intentional radiator shall be greater than a band 500 kHz wide centered on the operating frequency. The 500 kHz band shall lie wholly within the frequency range of 2400-2483.5 MHz.

Test Procedure: FCC's KDB Publication 558074, "Measurement of Digital Transmission Systems Operating under Section 15.247" March 23, 2005

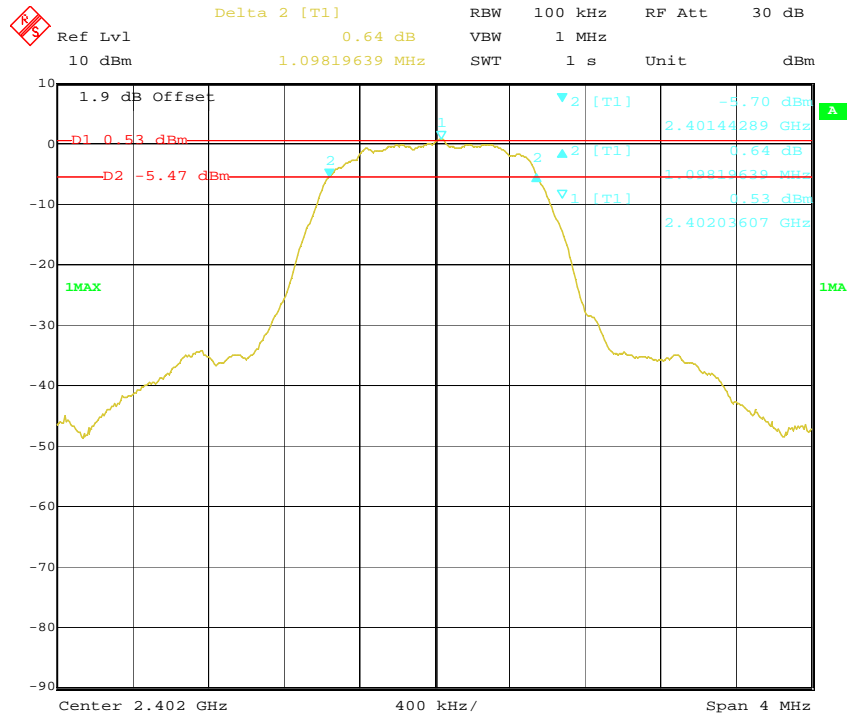
Results: The sample tested was found to Comply

#### Low Channel Bandwidth – 513.026kHz



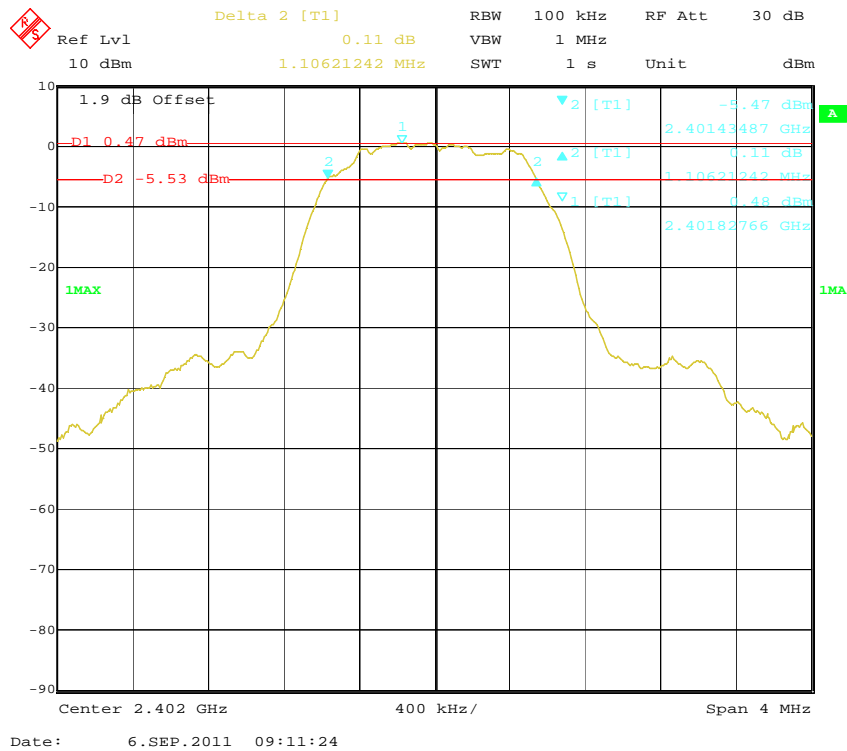
#### Channel 2402MHz - GFSK

Low Channel Bandwidth – 1.098MHz



Channel 2402MHz – Pi/4 DQPSK

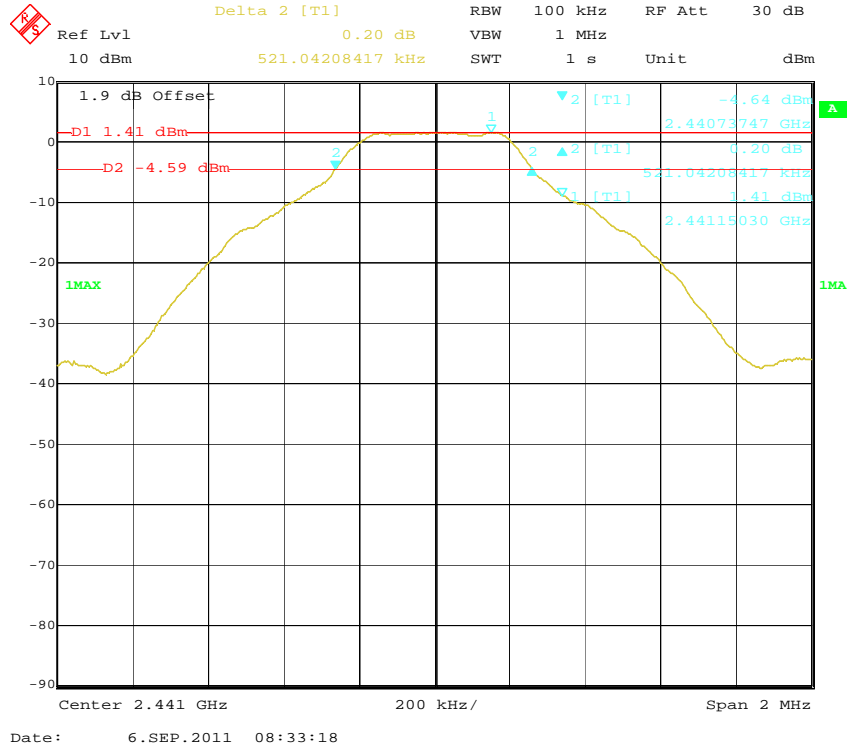
Low Channel Bandwidth – 1.106MHz



Channel 2402MHz – 8DPSK

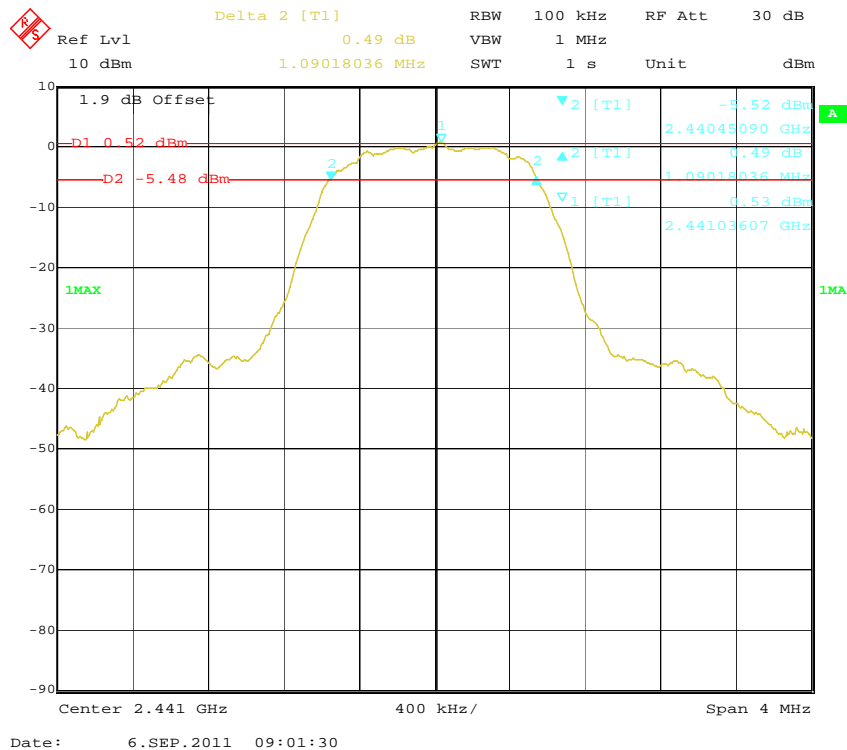


Middle Channel Bandwidth – 521.042kHz



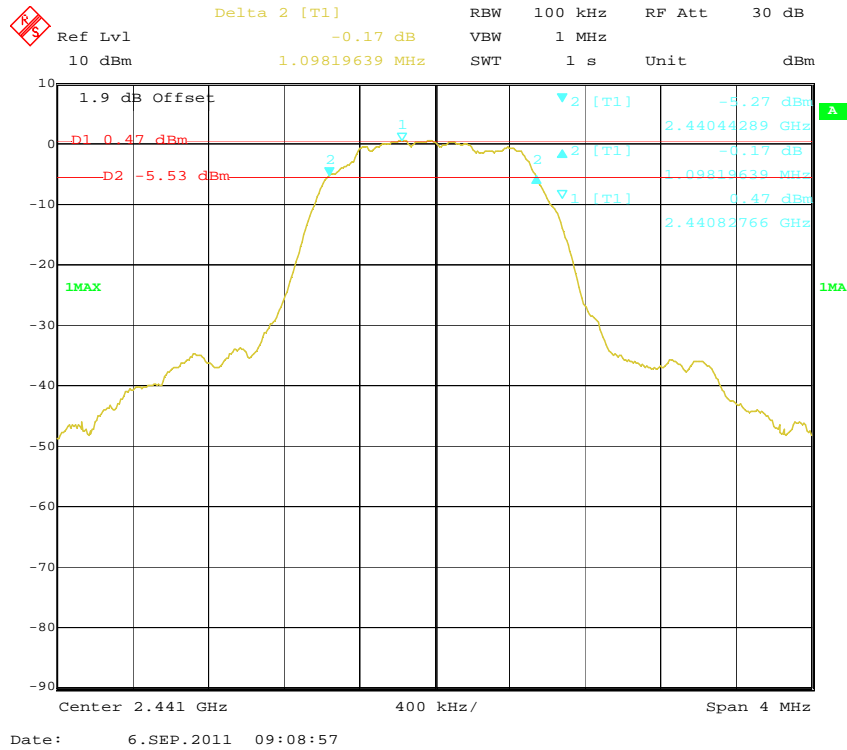
Channel 2441MHz – GFSK

Middle Channel Bandwidth – 1.090MHz



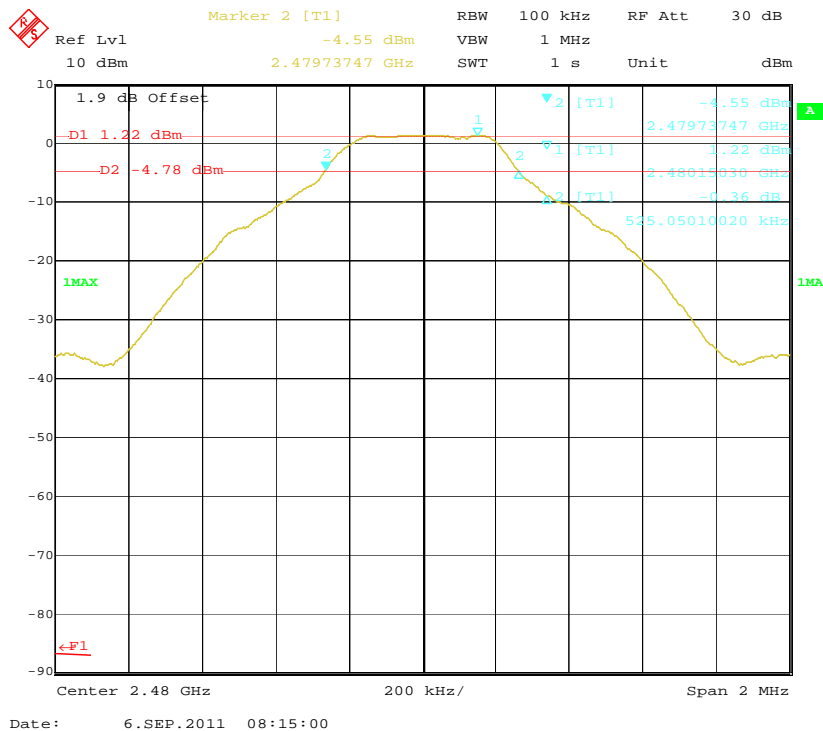
Channel 2441MHz – Pi/4 DQPSK

### Middle Channel Bandwidth – 1.098MHz



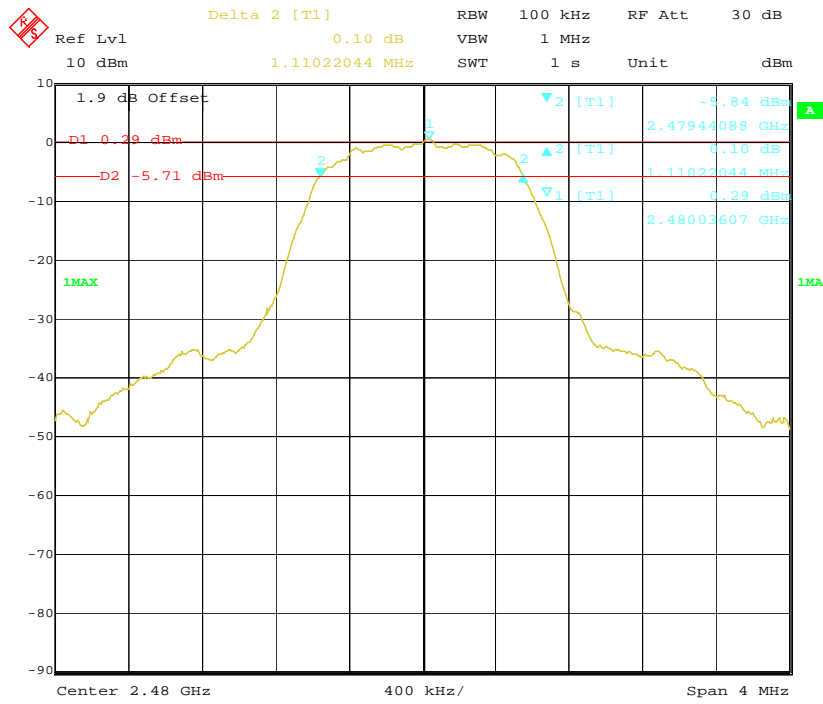
### Channel 2441MHz – 8DPSK

### High Channel Bandwidth – 525.050kHz



### Channel 2480MHz – GFSK

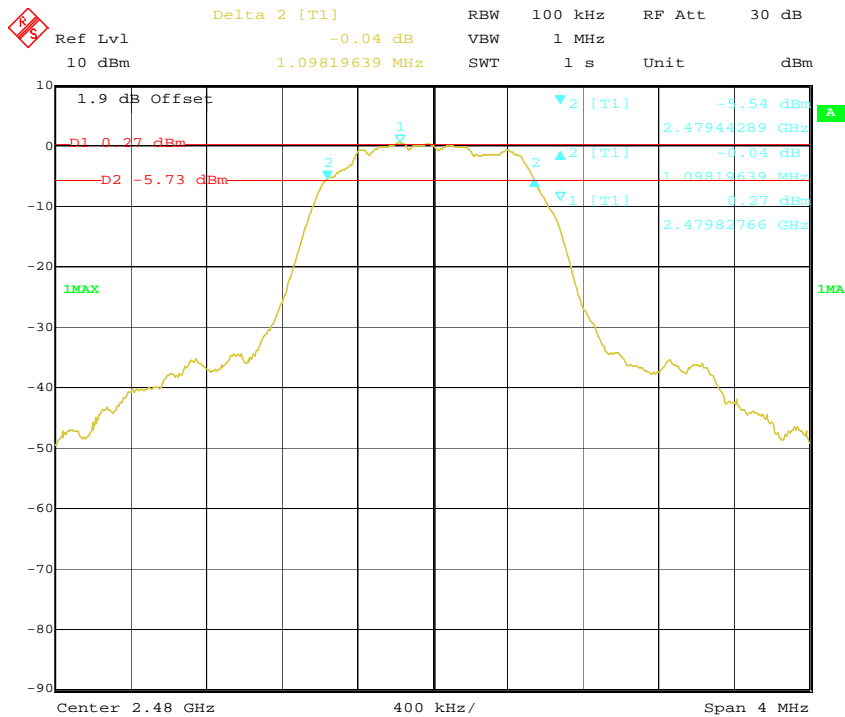
### High Channel Bandwidth – 1.110MHz



Date: 6.SEP.2011 08:59:07

### Channel 2480MHz – Pi/4 DQPSK

### High Channel Bandwidth – 1.098MHz



Date: 6.SEP.2011 09:06:57

### Channel 2480MHz – 8DPSK

## **7.0 15.247(e) Power Spectral Density**

### **Method:**

Equipment setup for conducted disturbance tests shall follow the guidelines of ANSI C63.4.

FCC's KDB Publication 558074, "Measurement of Digital Transmission Systems Operating under Section 15.247" March 23, 2005

Connect the antenna port of the EUT to the input of a spectrum analyzer. Input an offset into the analyzer amplitude to account for the associated cable loss.

Set the span to cover the entire emission bandwidth. With a bandwidth of 100kHz or greater, set the marker to the peak emission and move that frequency to the center of the display. Set the analyzer resolution and video bandwidths to 3kHz and turn on the max hold function. Set the frequency span was set to 300kHz around the highest amplitude occurring in the peak emission envelope. The total sweep time was calculated as follows:

Sweep time (Sec.) = (Fstop - Fstart)/Resolution Bandwidth

Example:

Sweep time (Sec) = 300kHz / 3kHz

Sweep time (Sec) = 100 Seconds

Perform a peak search on the resultant trace. Record the amplitude of that peak as the maximum power density in dBm. Measure the power density for all data rates and modulation modes on the middle channel.

For the high and low channels, measure the power density at the data rate and modulation mode that resulted in the highest and lowest conducted power for that channel.

### **TEST SITE**

The test site for conducted emissions is located at 1950 Evergreen Blvd, Suite 100, Duluth, Georgia 30096. The VCCI Registration Number for this site is C-2818.

### **MEASUREMENT UNCERTAINTY**

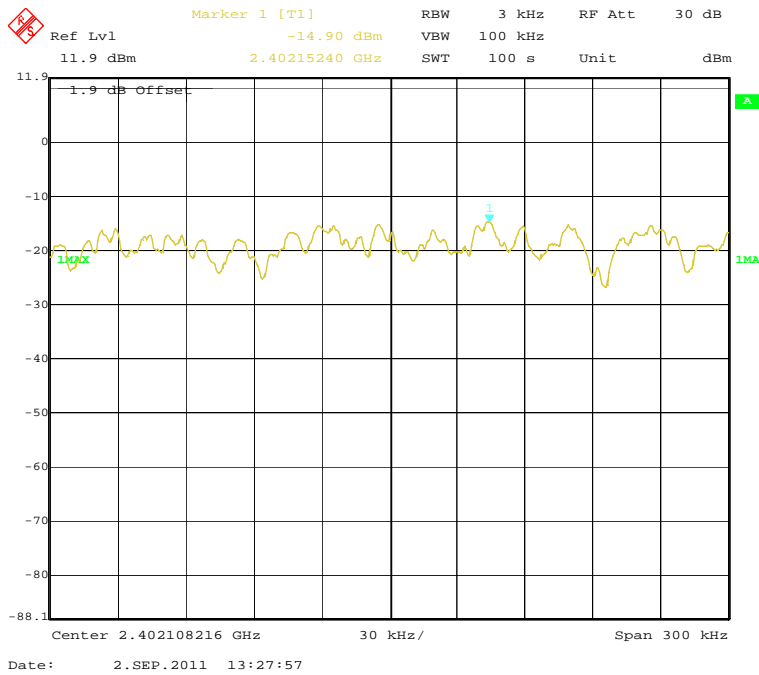
Compliance of the product is based on the measured value. However, the measurement uncertainty is included for informational purposes. The values given are the measurement uncertainty values with an expanded uncertainty of k=2.

150 kHz to 30 MHz: +/- 2.8 dB

**Results: The sample tested was found to Comply.**

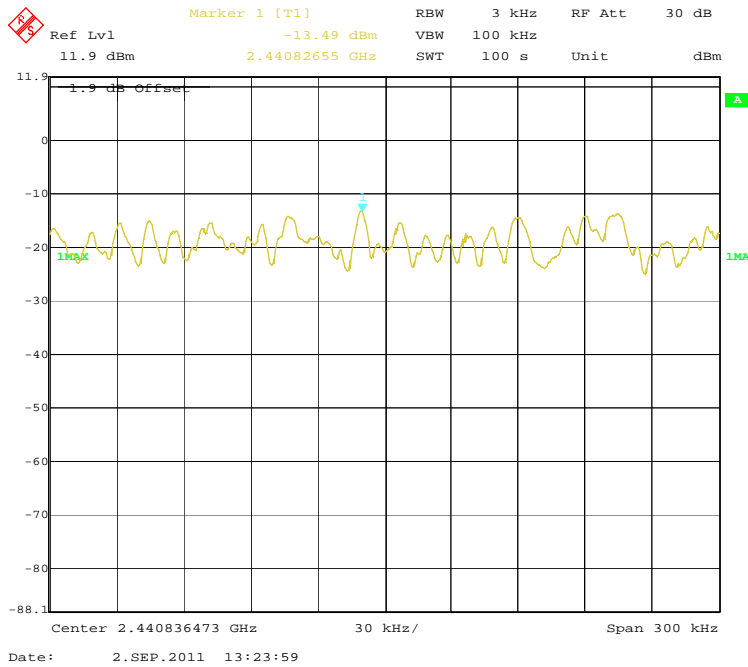
### 7.0 15.247(e) Power Spectral Density

#### Low Channel Power Spectral Density – (-14.9dBm)



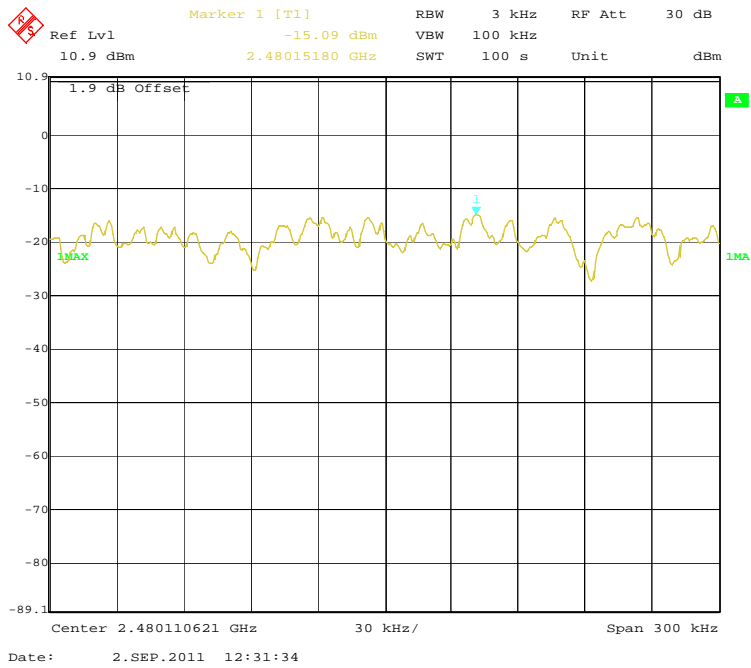
#### Channel 2402MHz – 8DPSK

#### Middle Channel Power Spectral Density – (-13.49dBm)



#### Channel 2441MHz – 8DPSK

### High Channel Power Spectral Density – (-15.09dBm)



### Channel 2480MHz – 8DPSK

**7.0 15.247(e) Power Spectral Density****Tabular Data:**

Channel	PSD dBm	Limit dBm	Margin	Results
Blue tooth 8DPSK – Low Channel (2402)	-15.01	8	23.01	Pass
Blue tooth 8DPSK – Mid Channel (2441)	-13.49	8	21.49	Pass
Blue tooth 8DPSK – High Channel (2480)	-15.09	8	23.09	Pass

## **8.0 15.247(b)(3) Conducted Peak Power**

### **Method:**

The maximum peak conducted output power of the intentional radiator shall not exceed the following: For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt.

FCC's KDB Publication 558074, "Measurement of Digital Transmission Systems Operating under Section 15.247" March 23, 2005

As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level.

If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

Equipment setup for radiated disturbance tests shall follow the guidelines of ANSI C63.4.

### **TEST SITE**

The test site for radiated emissions is located at 1950 Evergreen Blvd, Suite 100, Duluth, Georgia 30096. It is a 10 meter semi-anechoic chamber manufactured by Panashield. Embedded in the floor is a 3 meter diameter turntable.

A2LA: 1455.01

IC: 2077-1

VCCI Registration Number: R-2570

### **MEASUREMENT UNCERTAINTY**

Compliance of the product is based on the measured value. However, the measurement uncertainty is included for informational purposes. The values given are the measurement uncertainty values with an expanded uncertainty of  $k=2$ .

30 MHz to 1000 MHz at 3 meters: +/- 3.9 dB

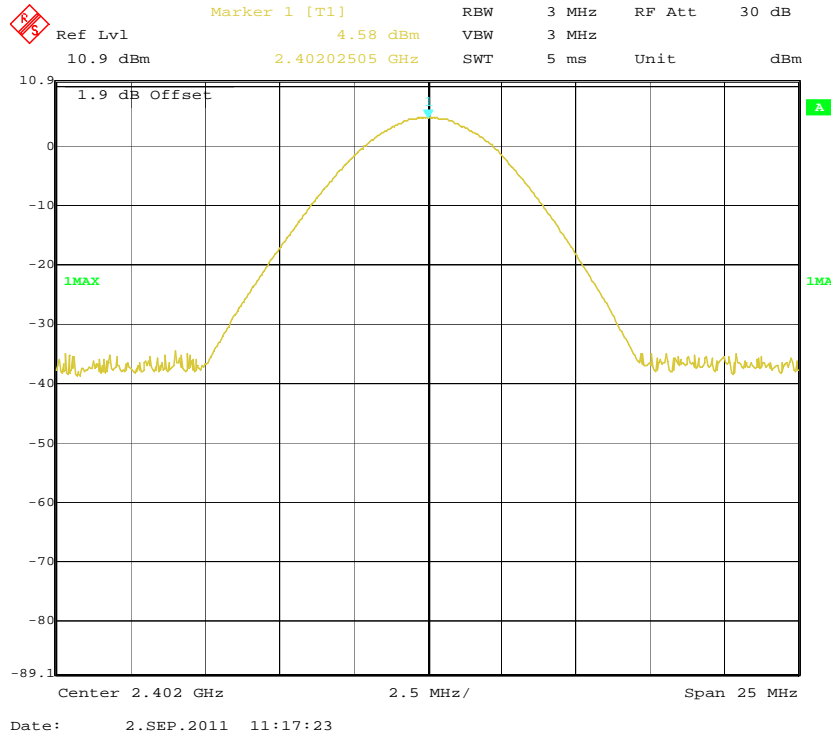
30 MHz to 1000 MHz at 10 meters: +/- 3.6 dB

1 GHz to 18 GHz at 3 meters: +/- 4.2 dB



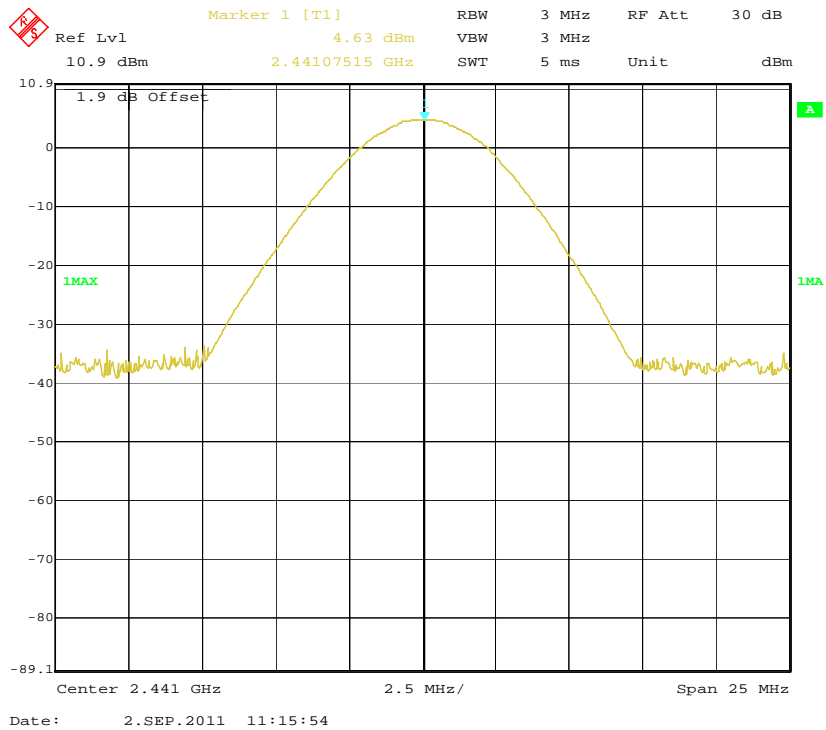
### 8.0 15.247(b)(3) Conducted Peak Power

#### Low Channel Peak Power – (4.58dBm)



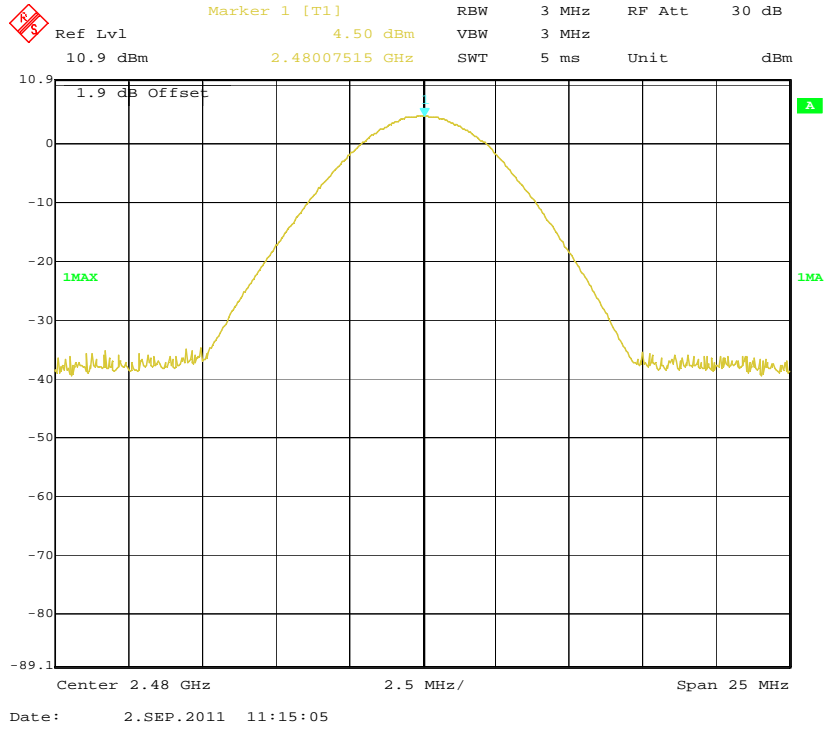
#### Channel 2402MHz – 8DPSK

#### Middle Channel Peak Power – (4.63dBm)



#### Channel 2441MHz – 8DPSK

### High Channel Peak Power – (4.50dBm)



### Channel 2480MHz – 8DPSK

**8.0 15.247(b)(3) Conducted Peak Power**

**Tabular Data:**

Channel	Power dBm	Limit (dBm)	Margin	Results
Blue tooth 8DPSK – Low Channel (2402)	4.58	30	25.42	Pass
Blue tooth 8DPSK – Mid Channel (2441)	4.63	30	25.37	Pass
Blue tooth 8DPSK – High Channel (2480)	4.5	30	25.5	Pass

## **9.0 15.247(d) Conducted Spurious Emissions**

### **Method:**

Equipment setup for conducted disturbance tests shall follow the guidelines of ANSI C63.4.

FCC's KDB Publication 558074, "Measurement of Digital Transmission Systems Operating under Section 15.247" March 23, 2005

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the radio frequency power that is produced 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 section A8.4(4), the attenuation required shall be 30 dB instead of 20 dB.

### **TEST SITE**

The test site for conducted emissions is located at 1950 Evergreen Blvd, Suite 100, Duluth, Georgia 30096. The VCCI Registration Number for this site is C-2818.

### **MEASUREMENT UNCERTAINTY**

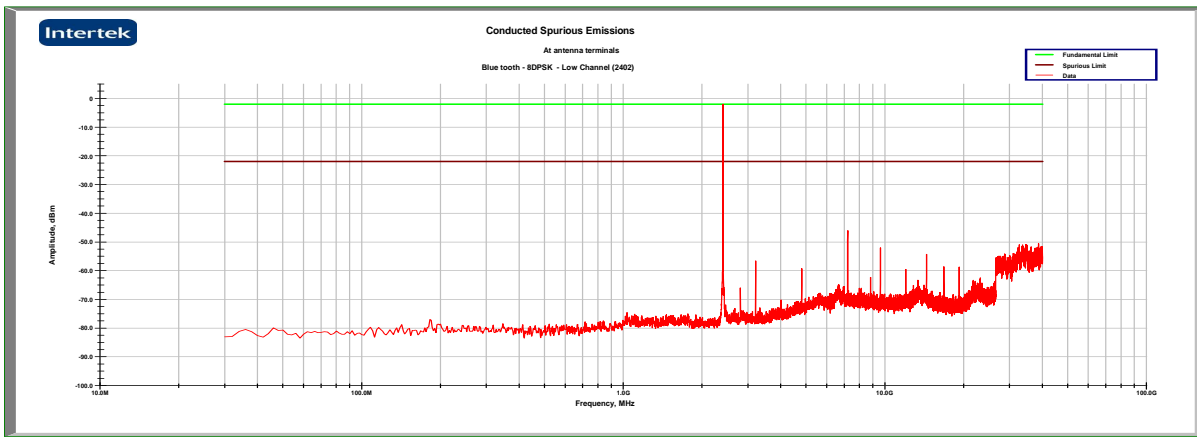
Compliance of the product is based on the measured value. However, the measurement uncertainty is included for informational purposes. The values given are the measurement uncertainty values with an expanded uncertainty of k=2.

150 kHz to 30 MHz: +/- 2.8 dB

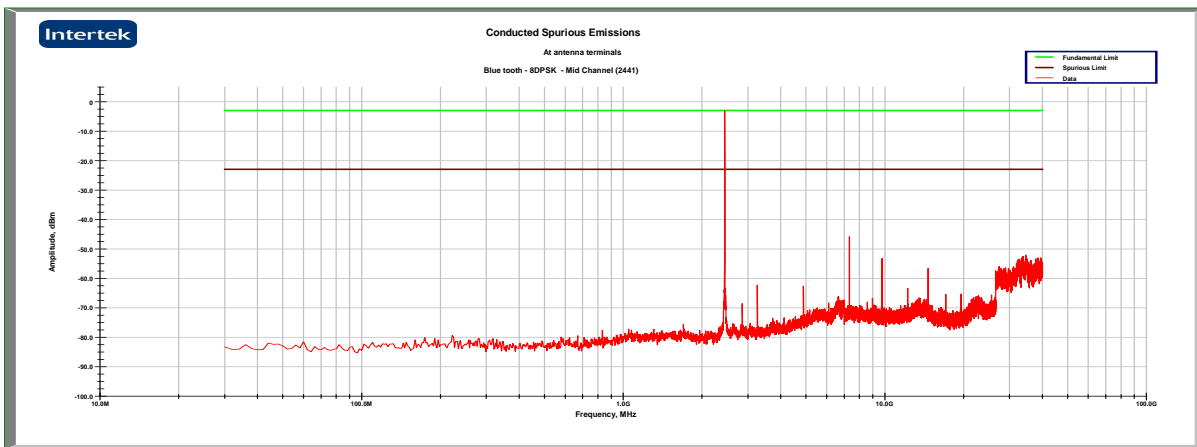
**Results: The sample tested was found to Comply.**

### 9.0 15.247(d) Conducted Spurious Emissions

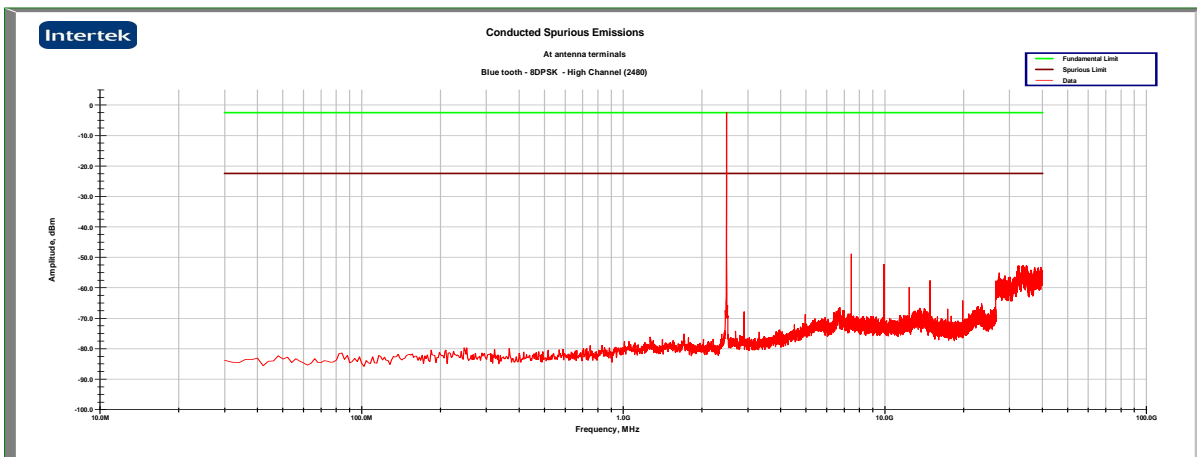
Low Channel – 8DPSK



Middle Channel – 8DPSK



High Channel – 8DPSK



## 10.0 15.247(d) Radiated Spurious Emissions

### Method:

Measurements in the frequency range of 30 MHz to 40000 MHz shall be performed with a quasi-peak detector instrument that meets the requirements of Section One of CISPR 16. Above 1000 MHz, a peak detector shall be used. Peak values converted to average by applying the duty cycle correction factor, when applicable. When an average detector is used, it shall meet the requirements of Section One of CISPR 16. The measuring antenna shall correlate to a balanced dipole.

#### Bandwidths:

30 MHz to 1000 MHz: 120 kHz RBW and 1 MHz VBW

Above 1000 MHz: 1 MHz RBW and 3 MHz VBW

Measurements of the radiated field are made with the antenna located at a distance of 3 or 10 meters from the EUT. The limit applied to the measurement shall be appropriate for the test distance. The test distance shall be indicated in the results section.

The EUT shall be arranged and connected with cables terminated in accordance with the product specification.

Exploratory tests should be carried out while varying the cable positions to determine the maximum or near-maximum emission level. During manipulation, cables shall not be placed under or on top of the system test components unless such placement is required by the inherent equipment design.

The antenna shall be adjusted between 1m and 4m in height above the ground plane for maximum meter reading at each test frequency.

The antenna-to-EUT azimuth shall be varied during the measurement to find the maximum field-strength readings.

The antenna-to-EUT polarization (horizontal and vertical) shall be varied during the measurements to find the maximum field-strength readings.

If the EUT is intended for tabletop use, it shall be placed on a table whose top is 0.8m above the ground plane. The table shall be constructed of non-conductive materials. Its dimensions are at least 1m by 1.5m, but may be extended for larger EUT.

If EUT is floor standing, the EUT was placed on a horizontal metal ground plane and isolated from the ground plane by up to 12 mm of insulating material.

Equipment setup for radiated disturbance tests shall follow the guidelines of ANSI C63.4.

### TEST SITE

The test site for radiated emissions is located at 1950 Evergreen Blvd, Suite 100, Duluth, Georgia 30096. It is a 10 meter semi-anechoic chamber manufactured by Panashield. Embedded in the floor is a 3 meter diameter turntable.

A2LA: 1455.01

IC: 2077-1

VCCI Registration Number: R-2570

### MEASUREMENT UNCERTAINTY

Compliance of the product is based on the measured value. However, the measurement uncertainty is included for informational purposes. The values given are the measurement uncertainty values with an expanded uncertainty of  $k=2$ .

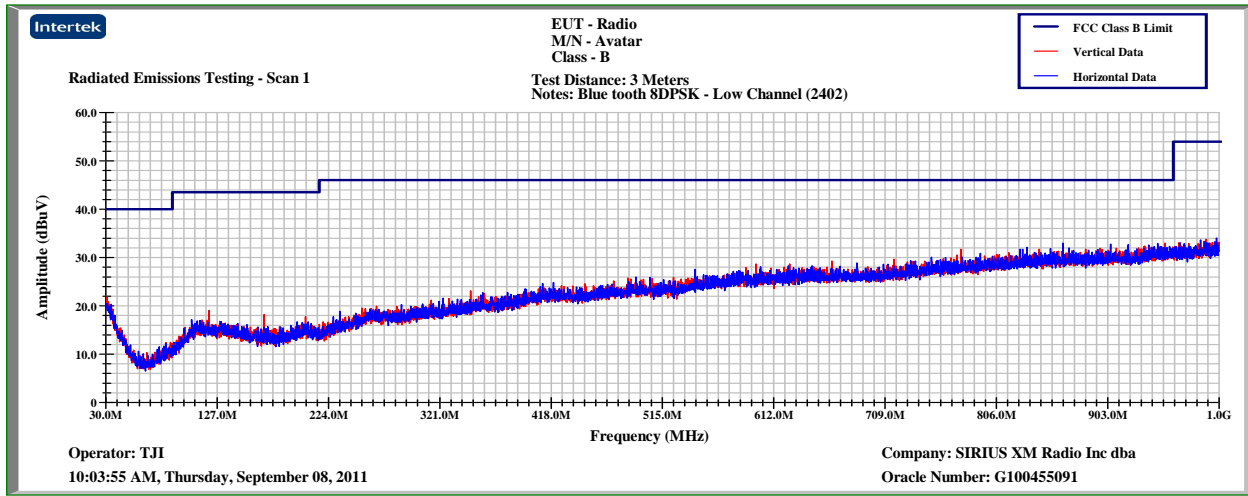
30 MHz to 1000 MHz at 3 meters: +/- 3.9 dB

30 MHz to 1000 MHz at 10 meters: +/- 3.6 dB

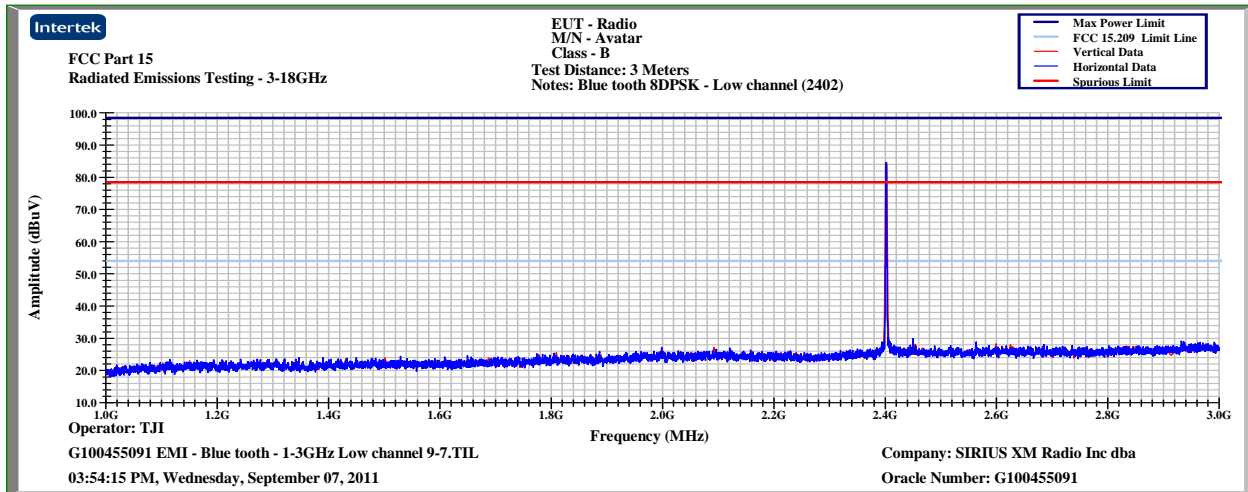
1 GHz to 18 GHz at 3 meters: +/- 4.2 dB

### 10.0 15.247(d) Radiated Spurious Emissions

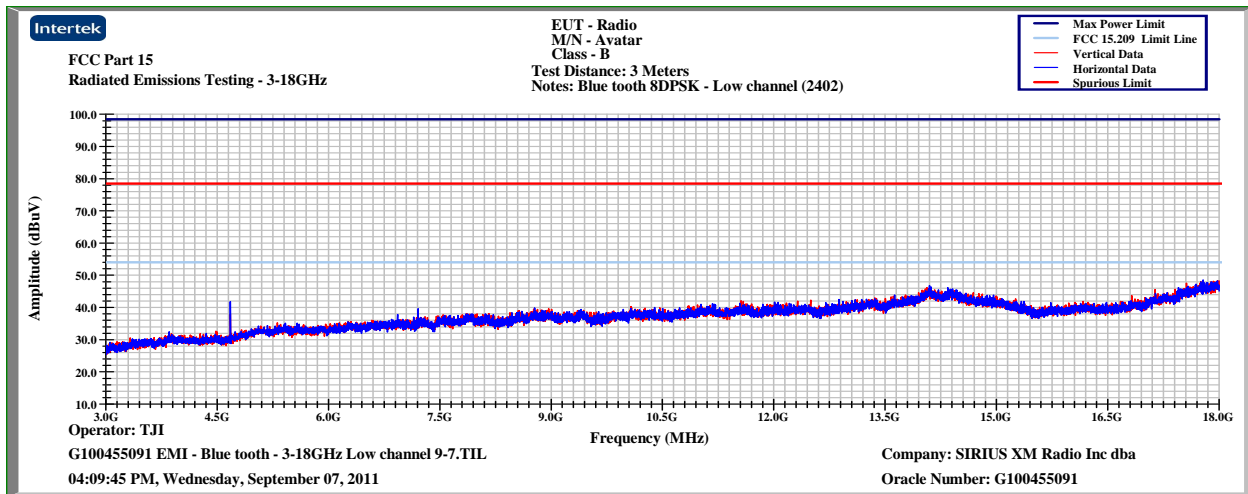
Peak Plot – 30MHz-1000MHz – 8DPSK



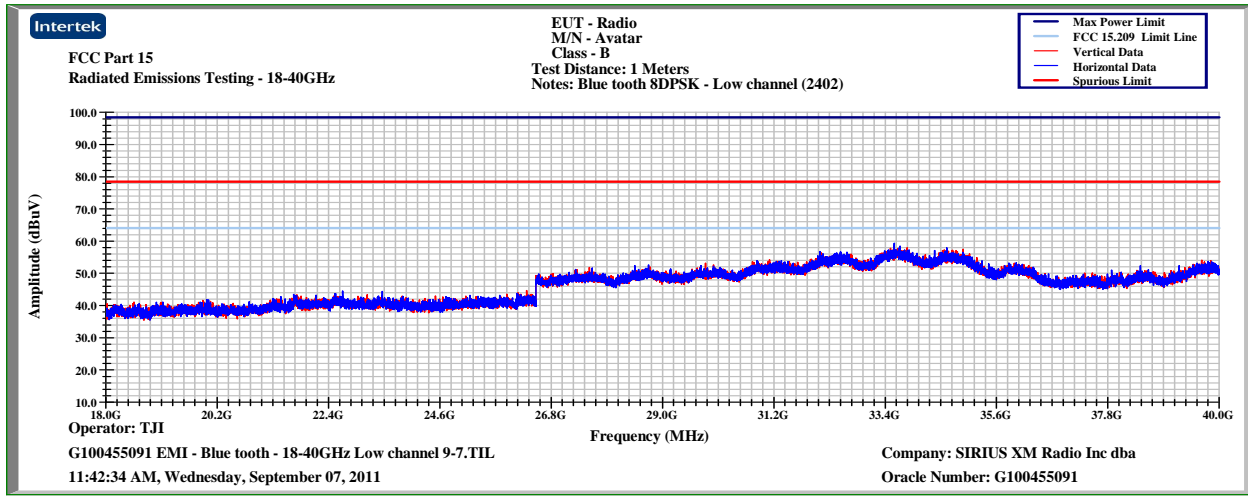
Peak Plot – 1000MHz-3000MHz – 8DPSK



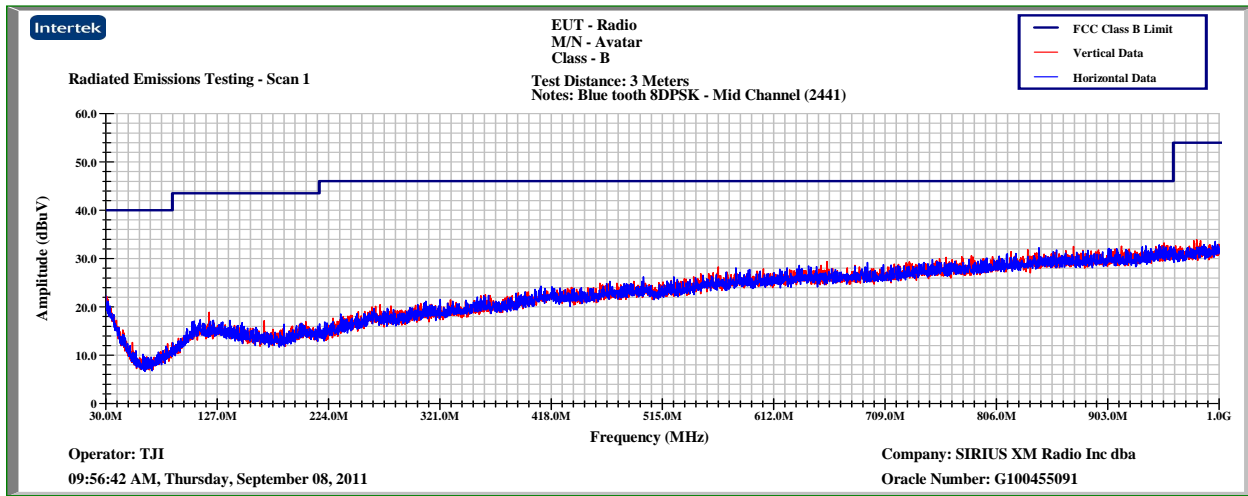
Peak Plot – 3000MHz-18000MHz – 8DPSK



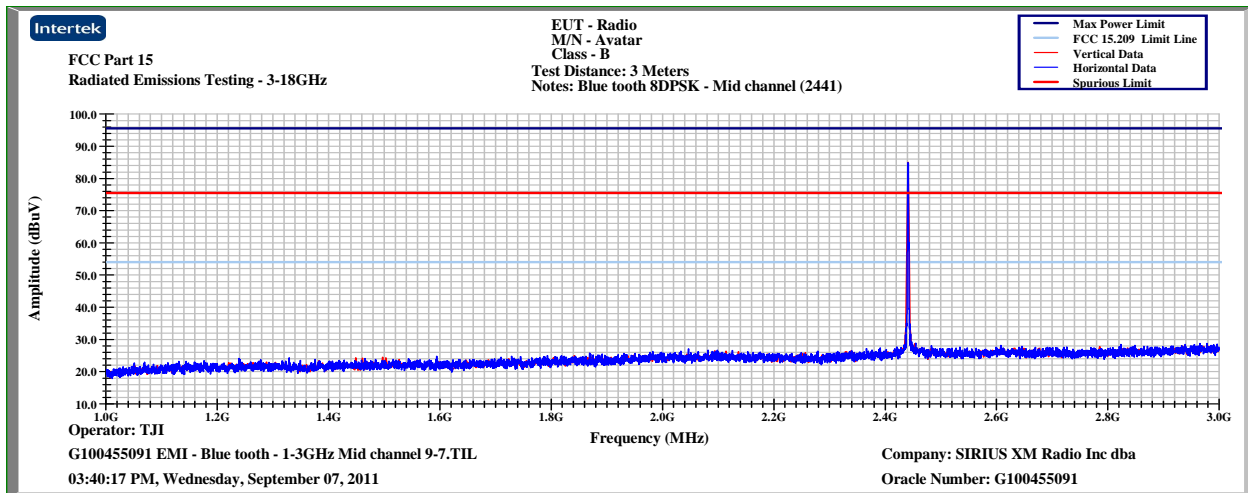
Peak Plot – 18000MHz-40000MHz – 8DPSK



Peak Plot – 30MHz-1000MHz – 8DPSK

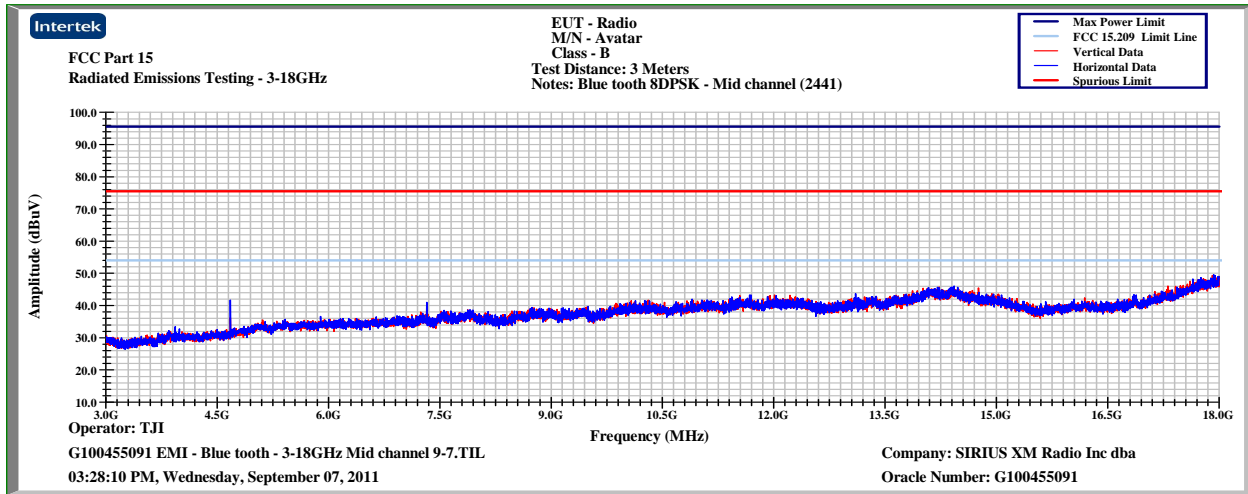


Peak Plot – 1000MHz-3000MHz – 8DPSK

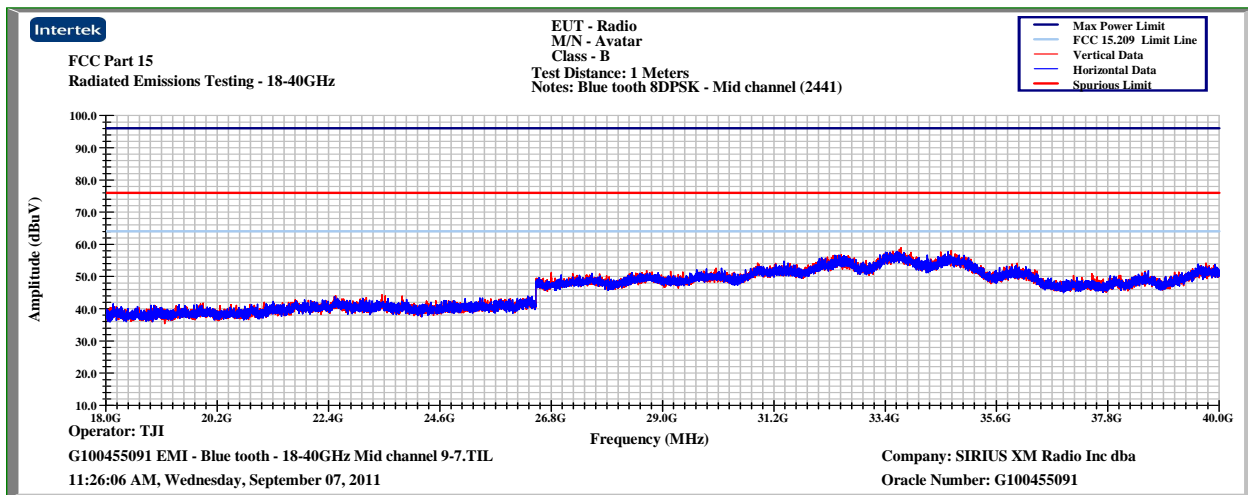




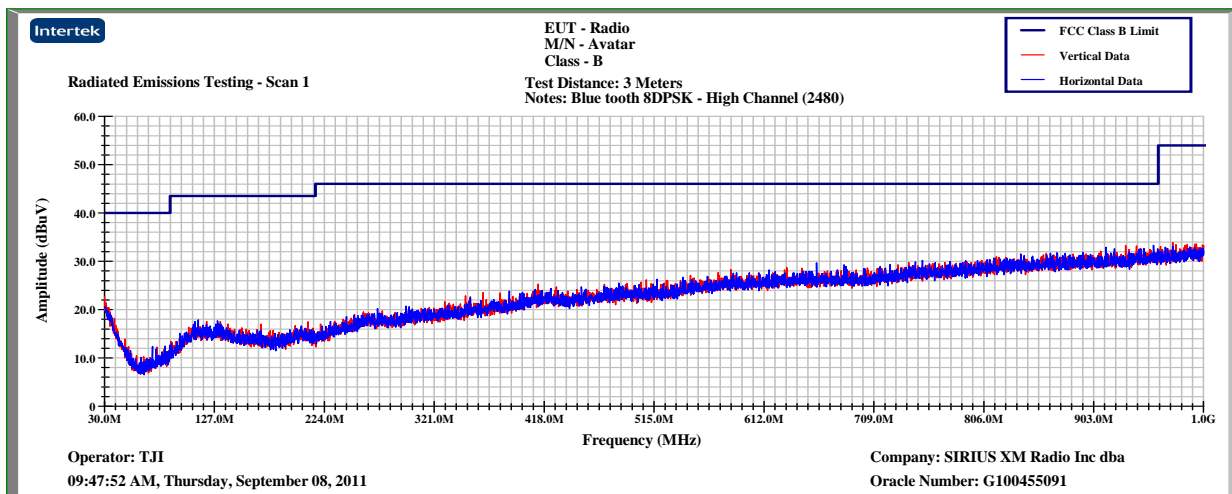
Peak Plot – 3000MHz-18000MHz – 8DPSK



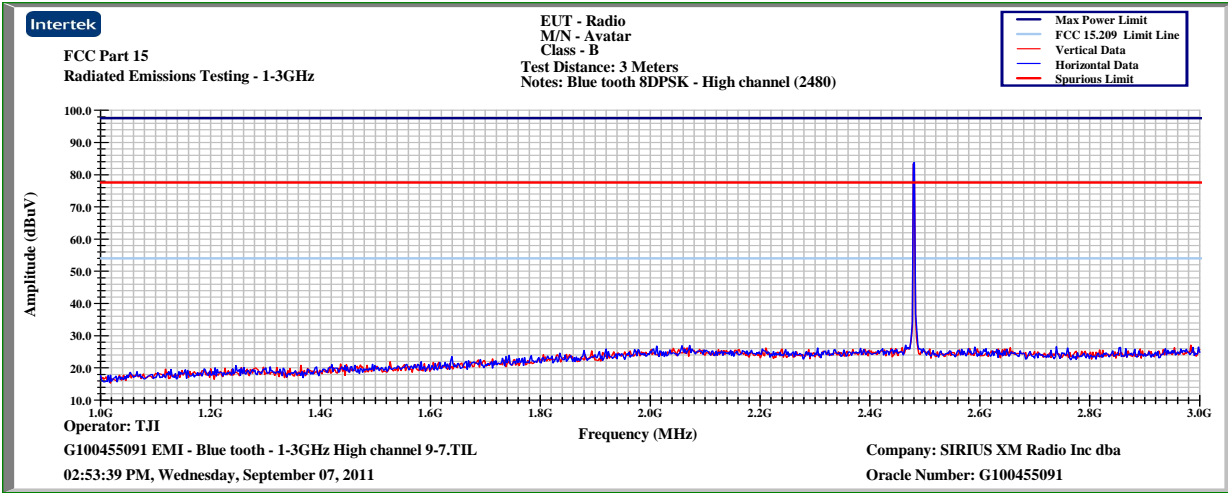
Peak Plot – 18000MHz-40000MHz – 8DPSK



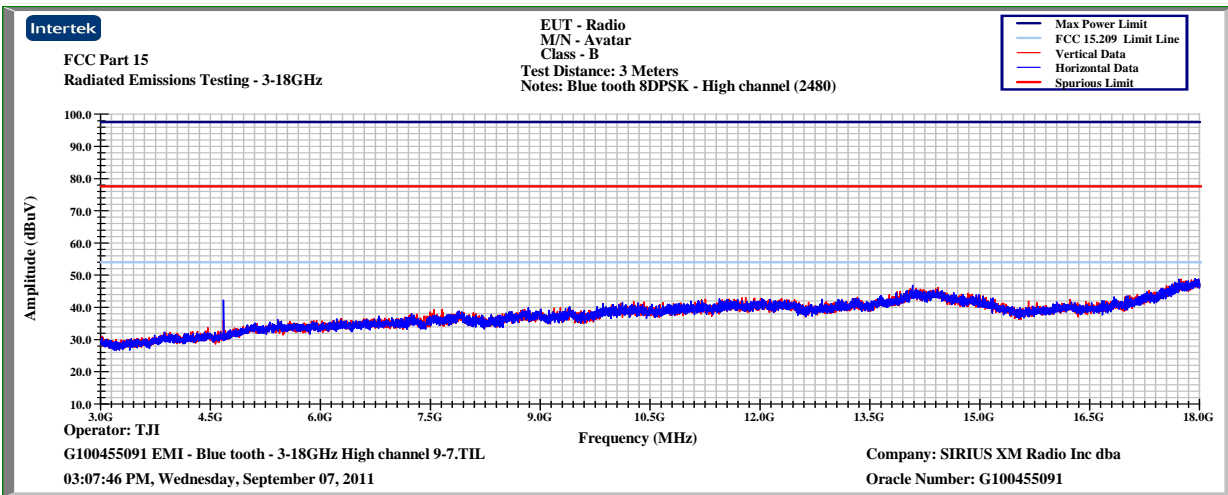
Peak Plot – 30MHz-1000MHz – 8DPSK



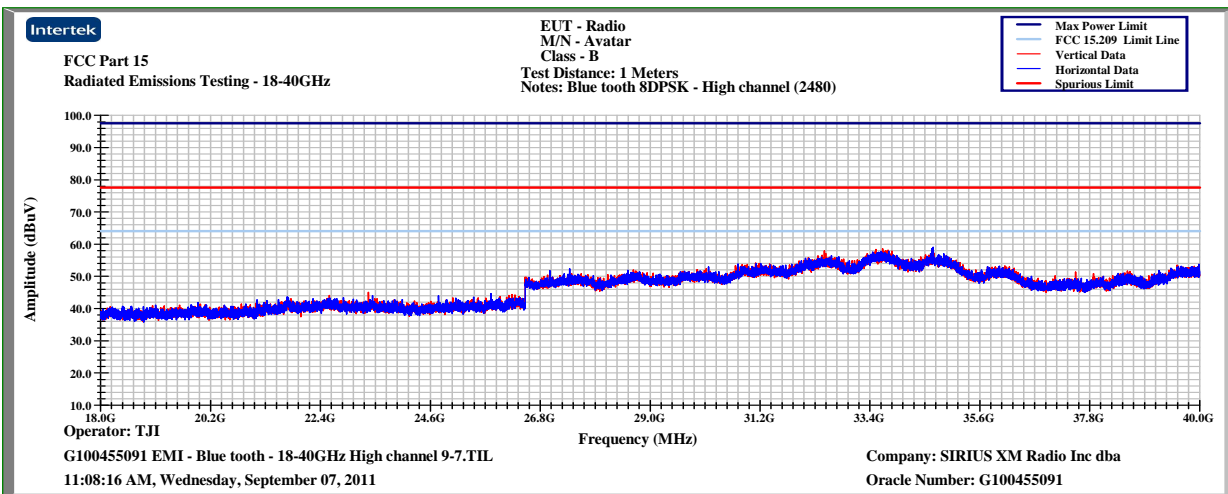
Peak Plot – 1000MHz-3000MHz – 8DPSK



Peak Plot – 3000MHz-18000MHz – 8DPSK



Peak Plot – 18000MHz-40000MHz – 8DPSK



Note: Peaks above the limit between 2.2 and 2.5GHz are signals transmitted into the chamber with the satellite signal and are not related to the DUT.

## 10.0 15.247(d) Radiated Spurious Emissions

Tabular Data

Frequency Range (MHz): Fundamental

Test Distance (m): 3

Input power: 3.7VDC battery

Limit: FCC Part 15.247

Modifications for compliance (y/n): n

A	B	C	D	E	F	G	H	I	J
Ant. Pol. (V/H)	Frequency MHz	Reading dB(uV)	Antenna Factor dB(1/m)	Cable Loss dB	Pre-amp Factor dB	Net dB(uV/m)	Limit dB(uV/m)	Margin dB	Detectors / Bandwidths Det/RBW/VBW
<b>Blue tooth 8DPSK - Low Channel (2402)</b>									
v	2401.813	84.9	28.3	10.2	33.1	90.3	125.0	-34.7	Pk/100k/300k
h	2401.813	87.5	28.4	10.2	33.1	93.0	125.0	-32.0	Pk/100k/300k
v	2401.813	90.3	28.3	10.2	33.1	95.7	125.0	-29.3	Pk/100k/300k
h	2401.813	83.5	28.4	10.2	33.1	89.0	125.0	-36.0	Pk/100k/300k
v	2401.813	93.0	28.3	10.2	33.1	98.4	125.0	-26.6	Pk/100k/300k
h	2401.813	86.4	28.4	10.2	33.1	91.9	125.0	-33.1	Pk/100k/300k
<b>Blue tooth 8DPSK - Mid Channel (2441)</b>									
v	2440.825	85.8	28.5	10.3	33.1	91.5	125.0	-33.5	Pk/100k/300k
h	2440.813	87.7	28.5	10.3	33.1	93.4	125.0	-31.6	Pk/100k/300k
v	2440.825	90.3	28.5	10.3	33.1	96.0	125.0	-29.0	Pk/100k/300k
h	2440.825	83.4	28.5	10.3	33.1	89.1	125.0	-35.9	Pk/100k/300k
v	2440.825	89.8	28.5	10.3	33.1	95.5	125.0	-29.5	Pk/100k/300k
h	2440.825	87.6	28.5	10.3	33.1	93.3	125.0	-31.7	Pk/100k/300k
<b>Blue tooth 8DPSK - High Channel (2480)</b>									
v	2479.963	86.2	28.6	10.4	33.1	92.1	125.0	-32.9	Pk/100k/300k
h	2479.963	88.6	28.6	10.4	33.1	94.5	125.0	-30.5	Pk/100k/300k
v	2479.963	91.6	28.6	10.4	33.1	97.5	125.0	-27.5	Pk/100k/300k
h	2479.963	85.0	28.6	10.4	33.1	90.9	125.0	-34.1	Pk/100k/300k
v	2479.963	91.6	28.6	10.4	33.1	97.5	125.0	-27.5	Pk/100k/300k
h	2479.963	87.9	28.6	10.4	33.1	93.8	125.0	-31.2	Pk/100k/300k
<b>Calculations</b>		G=C+D+E-F			I=G-H				

**11.0 Test Equipment List**

Description	Manufacturer	Model	Serial Number	Cal Due
Bilog Antenna	Chase	CBL6112A	2622	10/13/2011
Cable E205	Megaphase	TM18 NKNK 118	9053201 003	05/12/2012
Cable E206	Megaphase	TM18 NKNK 118	9053201 004	05/12/2012
Cable MP3	Megaphase	G919-NKNK-394	MP3	05/12/2012
Cable ST-3	Storm Products Co.	PR90-195-7MTR	09-07-601	08/19/2012
Cable E401	Megaphase	TR40	E401	07/07/2012
Cable E402	Megaphase	TR40	E402	07/07/2012
Cable E403	Megaphase	TR40	E403	07/07/2012
Cable TT4	Andrews	TT4	TT4	05/24/2012
EMI Receiver	Hewlett Packard	8546A	213109	10/26/2011
EMI Receiver RF Preselector	Hewlett Packard	85460A	213108	10/26/2011
Horn Antenna (1-18GHz)	EMCO	3115	9208-3919	05/07/2012
Horn Antenna (18-40GHz)	EMCO	3116	9310-2222	07/07/2012
LISN	Fischer	FCC-LISN-50-50-M	2019	11/12/2011
Preamplifier, 10 MHz to 2000 MHz	Mini-Circuits	ZKL-2	D052005	08/16/2012
Preamplifier (1-18GHz)	Miteq	AMF-4D-001180-24-10P	1020106	10/04/2011
Preamplifier (18-40GHz)	Miteq	JS4	965178	07/06/2012
Preamplifier (18-40GHz)	Miteq	JS4	818197	07/06/2012
Spectrum Analyzer	Rohde & Schwartz	FSEK30	100253	10/22/2011

## 12.0 Revision History

Revision Level	Date	Report Number	Notes
Original issue	August 25, 2011	100455091ATL-005	--
1	August 30, 2011	100455091ATL-005	Page 15 – Added PSD measurement table Page 19 – Added Conducted Power measurement table
2	September 09, 2011	100455091ATL-005	Pages 7-28 – Output power measured using correct power setting Pages 29-31 – Included Restricted Band measurements.
3	September 26, 2011	100455091ATL-005	Page 6 – Changed FCC ID to RS2SX1 Page 30 – Corrected edgeband measurements
4	September 28, 2011	100455091ATL-005	Page 30 – Removed edgeband measurements