



Compliance Testing, LLC

Previously Flom Test Lab

EMI, EMC, RF Testing Experts Since 1963

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Test Report

Prepared for: Roving Networks, Inc

Model: RN-42

Description: Bluetooth Device Modular

FCC ID: T9J-RN42

IC ID: 6514A-RN42

To

FCC Part 15.247 FHSS

Date of Issue: November 2, 2011

On the behalf of the applicant:

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Attention of:

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Project No: p11a0005

Greg Corbin
Project Test Engineer

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Test Report Revision History

Revision	Date	Revised By	Reason for Revision
1.0	November 2, 2011	Greg Corbin	Original Document



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ILAC / A2LA

Compliance Testing, LLC, has been accredited in accordance with the recognized International Standard ISO/IEC 17025:2005. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer joint ISO-ILAC-IAF Communiqué dated January 2009)

The tests results contained within this test report all fall within our scope of accreditation, unless noted below.

Please refer to <http://www.compliancetesting.com/labscope.html> for current scope of accreditation.

Testing Certificate Number: **2152.01**



FCC OATS Reg, #933597

IC Reg. #2044A-1

Non-accredited tests contained in this report:

N/A



The applicant has been cautioned as to the following

15.21 - Information to User

The user's manual or instruction manual for an intentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

15.27(a) - Special Accessories

Equipment marketed to a consumer must be capable of complying with the necessary regulations in the configuration in which the equipment is marketed. Where special accessories, such as shielded cables and/or special connectors are required to enable an unintentional or intentional radiator to comply with the emission limits in this part, the equipment must be marketed with, i.e. shipped and sold with, those special accessories. However, in lieu of shipping or packaging the special accessories with the unintentional or intentional radiator, the responsible party may employ other methods of ensuring that the special accessories are provided to the consumer, without an additional charge.

Information detailing any alternative method used to supply the special accessories for a grant of equipment authorization or retained in the verification records, as appropriate. The party responsible for the equipment, as detailed in 2.909 of this chapter, shall ensure that these special accessories are provided with the equipment. The instruction manual for such devices shall include appropriate instructions on the first page of text concerned with the installation of the device that these special accessories must be used with the device. It is the responsibility of the user to use the needed special accessories supplied with the equipment.



Standard Test Conditions and Engineering Practices

All tests and measurement data shown were performed in accordance with FCC Rules and Regulations, Volume II; Part 2 and the following individual Parts: 15.247 Operation within bands 902-928, 2400-2483.5, 5725-5850 MHz

Except as noted herein, the following conditions and procedures were observed during the testing:

In accordance with ANSI C63.4-2009, ANSI C63.10-2009, FCC DA 00-705, and unless otherwise indicated in the specific measurement results, the ambient temperature of the actual EUT was maintained within the range of 10 to 40C (50 to 104F) unless the particular equipment requirements specify testing over a different temperature range. Also, unless otherwise indicated, the humidity levels were in the range of 10% to 90% relative humidity.

Environmental Conditions		
Temperature Deg C	Humidity %	Pressure mbar
24.2 - 26	12.1 – 29.8	964.7 – 976.3

Measurement results, unless otherwise noted, are worst case measurements.



EUT Description

Model: Sphero

Description: Robotic Ball Controlled from a Smartphone

S/N: FCC test sample

Additional Information:

This is a C2PC to a pre-certified Bluetooth Module, Model: RN-42 (FCC ID: T9J-RN42, IC ID: 6514A-RN42) installed in the Robotic Ball Controlled from a Smartphone.

The manufacturer changed the antenna type and this report is for radiated tests to show the EUT is still compliant to the specification.

The Antenna gain is 2.43 dBi.

EUT Operation during Tests

The EUT was tuned to the low, mid, and high channels using a test software program called BlueTest3. The test mode "TXDATA1" was selected with the following parameters:

Frequency = 2402, 2441, 2480 MHz as required.

Power = 255/32 was used as the maximum power setting per the manufacturer's instructions.

15.203: Antenna Requirement:

- The antenna is permanently attached to the EUT
- The antenna uses a unique coupling
- The EUT must be professionally installed
- The antenna requirement does not apply

Accessories:

Qty	Desc	Mfg	Model	S/N
1	Laptop PC with BlueTest3 test software installed	IBM	ThinkPad	N/A
1	AC Adapter for Laptop PC	Lenovo	P/N: 92P1213	N/A
1	USB – SPI converter	CSR	USB - SPI	N/A
1	Programming interface board	CSR	N/A	N/A
1	Charger Cradle	Orbotix	Sphero	N/A
1	Power Supply with ferrite on cable, for charger cradle	Shenzhen Yingyuan Electronics Co	SAW 1200500	N/A

Cables:

Qty	Desc	Length (M)	Shielding Y/N	Shielded Hood Y/N	Ferrite Y/N
1	Ethernet	1	Y	N	N
1	USB	1	Y	N	N

Modifications: None



Test Results Summary

Specification	Test Name	Pass, Fail, N/A	Comments
15.247(b)	Peak Output Power	Pass	
15.247(d)	Conducted Spurious Emissions	N/A	C2PC to a pre-certified module for change in antenna
15.247(d), 15.209(a), 15.205	Radiated Spurious Emissions	Pass	
15.247(d), 15.209(a), 15.205	Emissions At Band Edges	Pass	
15.247(a)	Occupied Bandwidth	N/A	C2PC to a pre-certified module for change in antenna
15.247(a)	Dwell Time	N/A	C2PC to a pre-certified module for change in antenna
15.247(a)	Number of Hopping Channels	N/A	C2PC to a pre-certified module for change in antenna
15.207	A/C Powerline Conducted Emissions	N/A	C2PC to a pre-certified module for change in antenna
RSS-GEN 6(b)	Receiver Spurious Emissions	N/A	C2PC to a pre-certified module for change in antenna



Peak Output Power

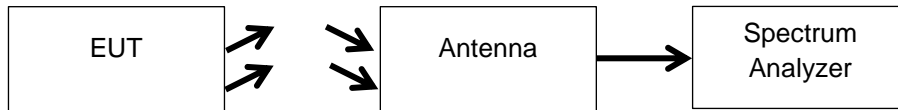
Name of Test: Peak Output Power
Specification: 15.247(b)
Test Equipment Utilized: i00103, i00331

Engineer: Greg Corbin
Test Date: 10/28/2011

Test Procedure

The Radiated Output Power was measured on an OATS to show that the EUT still complies with the Output Power limit with the new antenna.
The antenna and cable correction factors were input into the spectrum analyzer as an offset to before recording measurements
RBW = 1 MHz
VBW = 3 MHz

Test Setup



Transmitter Peak Output Power

Tuned Frequency (MHz)	Recorded Measurement (W)	Specification Limit (W)	Result
2402	0.0000671	1	Pass
2441	0.0000736	1	Pass
2480	0.0000533	1	Pass



Radiated Spurious Emissions

Name of Test: Radiated Spurious Emissions
Specification: 15.247(d), 15.209(a), 15.205 **Engineer:** Greg Corbin
Test Equipment Utilized: i00028, i00103, i00177, i00267, i00331 **Test Date:** 11/2/2011

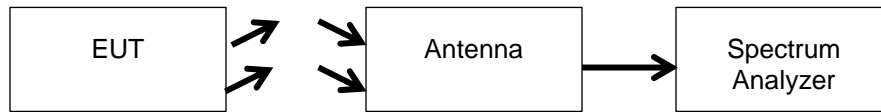
Test Procedure
Radiated Spurious Emissions: 30 – 1000 MHz

The EUT was tested in an Open Area Test Site (OATS) set 3m from the receiving antenna. A spectrum analyzer was used to verify that the EUT met the requirements for Radiated Emissions. The EUT was tested by rotating it 360° with the antennas in both the vertical and horizontal orientation and was raised from 1 to 4 meters to ensure the TX signal levels were maximized. All emissions from 30 MHz to 1 GHz were examined.

Measured Level includes antenna and receiver cable correction factors.
Correction factors were input into the spectrum analyzer before recording “Measured Level”.

RBW = 100 KHz
VBW = 300 KHz
Detector – Quasi Peak

Test Setup



Radiated Spurious Emissions Test Data: 30 MHz – 1000 MHz

Emission Frequency (MHz)	Measured Value (dBuV/m)	Correction Factor (dB)	Corrected Value (dBuV/m)	Limit (dBuV/m)	Margin (dB)
43.261	23.460	13.025	36.485	40.000	-3.515
47.627	20.120	10.668	30.788	40.000	-9.212
178.945	15.500	10.582	26.082	43.500	-17.418
325.020	8.880	16.095	24.975	46.000	-21.025
653.967	5.520	22.550	28.070	46.000	-17.930
934.989	7.000	27.128	34.128	46.000	-11.872



Test Procedure for Radiated Spurious Emissions above 1 GHz

The EUT was tested on an OATS, set 3m from the receiving antenna. A spectrum analyzer was used to verify that the EUT met the requirements for Radiated Spurious Emissions. The antenna and cable correction factors were summed with the amplifier gain and input into the spectrum analyzer as an offset to ensure accurate readings. A high pass filter was used to ensure the fundamental signal did not overdrive the front end of the spectrum analyzer. The spectrum for each tuned frequency was examined to the 10th harmonic.

Detector = Peak, RBW = 1 MHz, VBW = 3 MHz

The Peak spurious emission was recorded and the Average value was calculated by adding the duty cycle correction factor (DCCF) to the peak value per C63.10:2009, section 7.5.

$$DCCF (dB) = 20\text{LOG}(T1/T2 \text{ or } 100 \text{ ms})$$

T1 = total "on time" for one pulse train (or 100 ms).

T2 = period of the pulse train or 100 ms if the pulse train length is greater than 100 ms

Per the manufacturer:

T1 = 1.95 mS

T2 = 120 mS , (use 100 mS for DCCF calculation))

$$DCCF (dB) = 20\text{LOG}(1.95/100)$$

$$DCCF (dB) = -34.2 \text{ dB}$$

Test Setup



Radiated Spurious Emissions

Tuned Freq (MHz)	Emission Freq (MHz)	Peak Monitored Level (dBuV/m)	Peak Limit (dBuV/m)	Duty Cycle Correction Factor (dB)	Average Calculated Level (dBuV)	Average Limit (dBuV/m)	Result
2402	4804	60.0	74.0	-34.2	25.8	54.0	Pass
2402	7206	57.3	74.0	-34.2	23.1	54.0	Pass
2441	4882.3	61.6	74.0	-34.2	27.4	54.0	Pass
2441	7322.9	61.2	74.0	-34.2	27.0	54.0	Pass
2480	4959.6	64.2	74.0	-34.2	30.0	54.0	Pass
2480	7440	59.4	74.0	-34.2	25.2	54.0	Pass

No other emissions were detectable. All emissions were greater than -20 dBc.



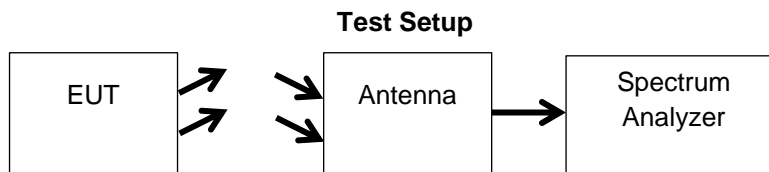
Emissions at Band Edges

Name of Test: Emissions at Band Edges
Specification: 15.247(d), 15.209(a), 15.205
Test Equipment Utilized: i00028, i00103, i00331, i00385

Engineer: Greg Corbin
Test Date: 11/2/2011

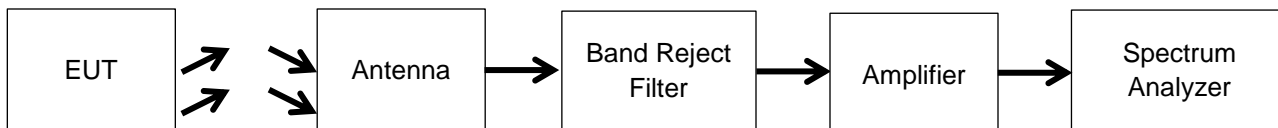
Test Procedure

The EUT was tested in a semi-anechoic chamber set for 3m from the receiving transducer. A spectrum analyzer was used to verify that the EUT met the requirements for band edge with both peak and average measurements. The cable and transducer correction factors were input into the analyzer as a reference level offset to ensure accurate reading were obtained.



Band Edge Emissions Summary

Tuned Frequency (MHz)	Measured Data (dBc)	Detector	Limit (dBc)	Result
2402	35.6	Peak	-20	Pass
2480	32.3	Peak	-20	Pass

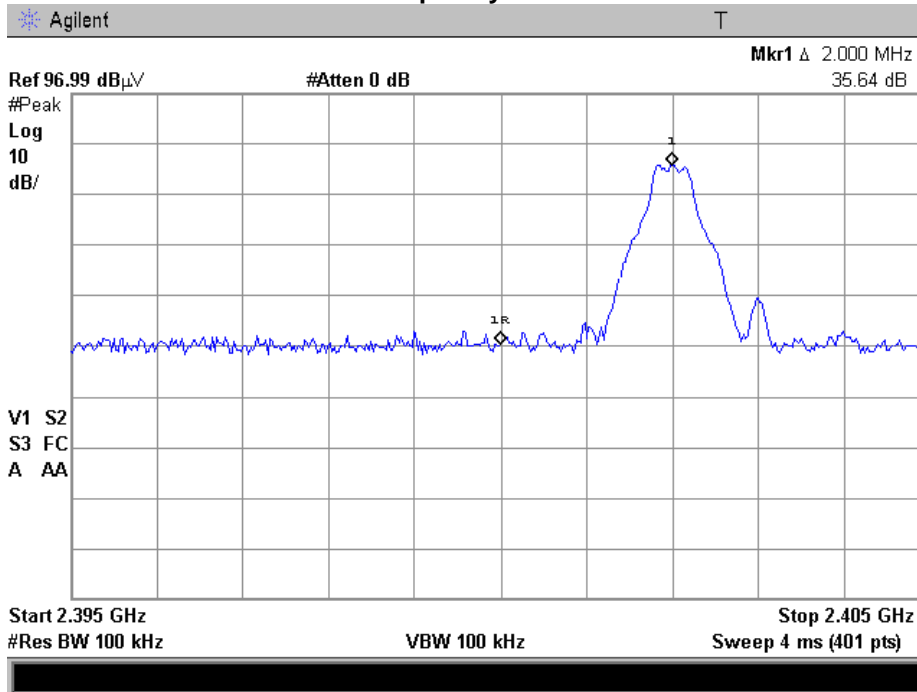


Restricted Band Emissions Summary

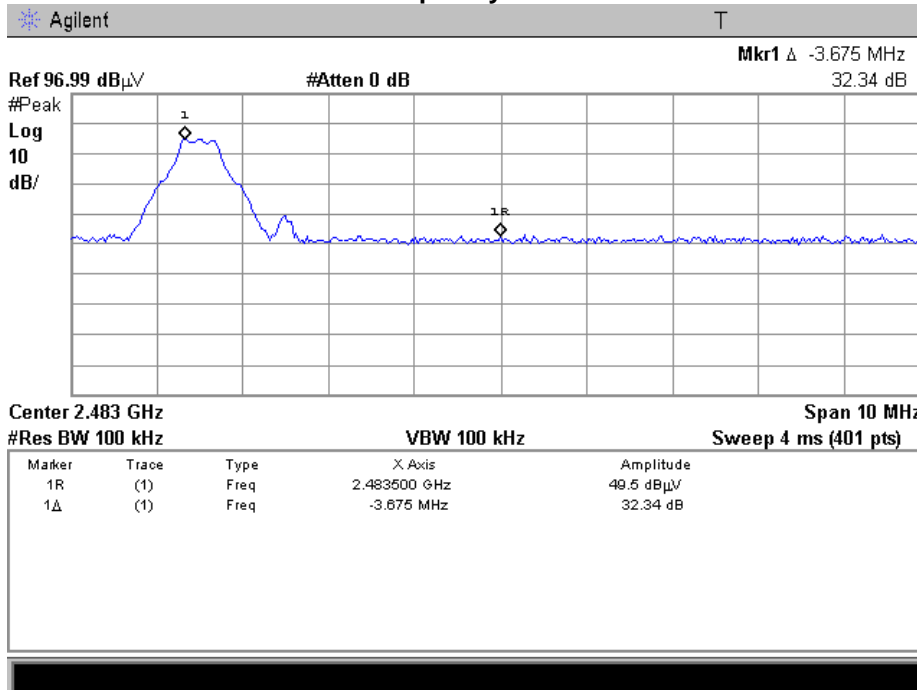
Restricted Band (MHz)	Tuned Frequency (MHz)	Emission Frequency (MHz)	Measured Data (dBuV/m)	Detector	Limit (dBuV/m)	Result
2300 – 2390	2402	2337.5	53.4	Peak	74	Pass
2300 – 2390	2402	2337.2	51.8	Average	54	Pass
2483.5 - 2500	2480	2484.3	49.9	Peak	74	Pass
2483.5 - 2500	2480	2484.5	47.8	Average	54	Pass



Band Edge 2400 MHz
Tuned Frequency = 2405 MHz

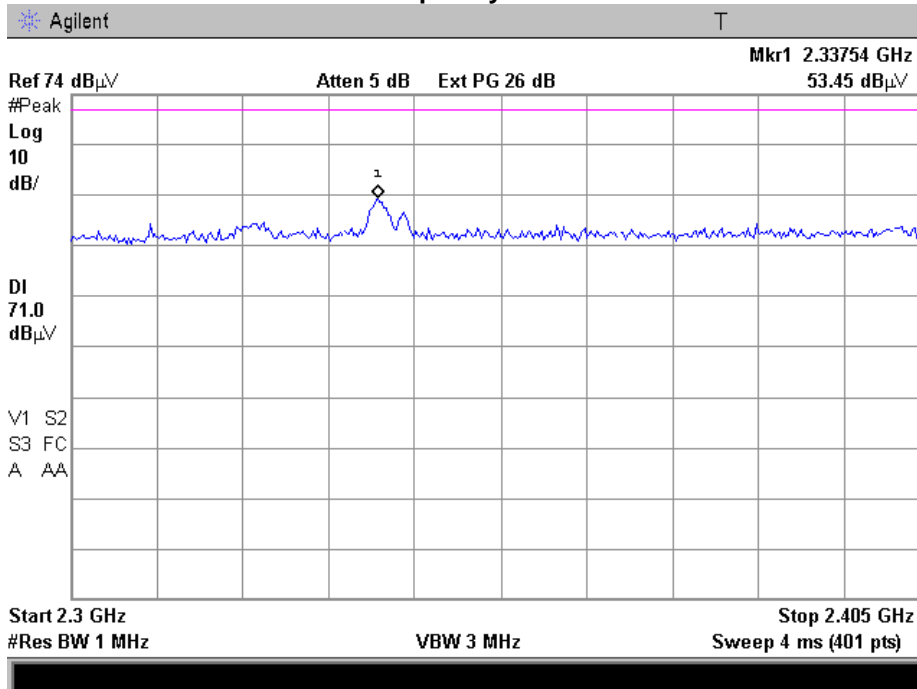


Band Edge 2483.5 MHz
Tuned Frequency = 2480 MHz

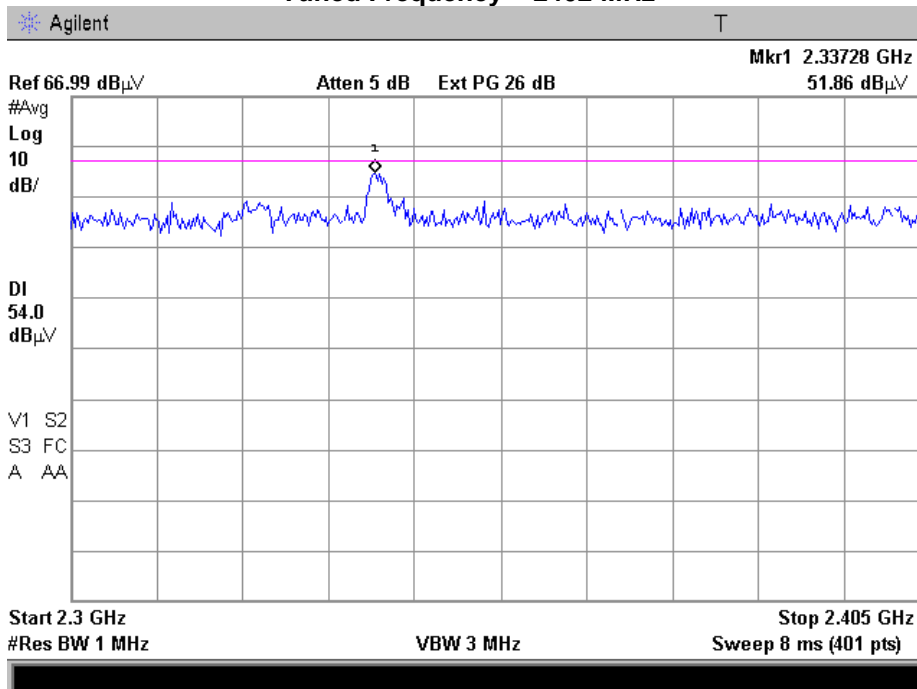




Restricted Band 2300 – 2390 MHz – Peak Tuned Frequency = 2402 MHz

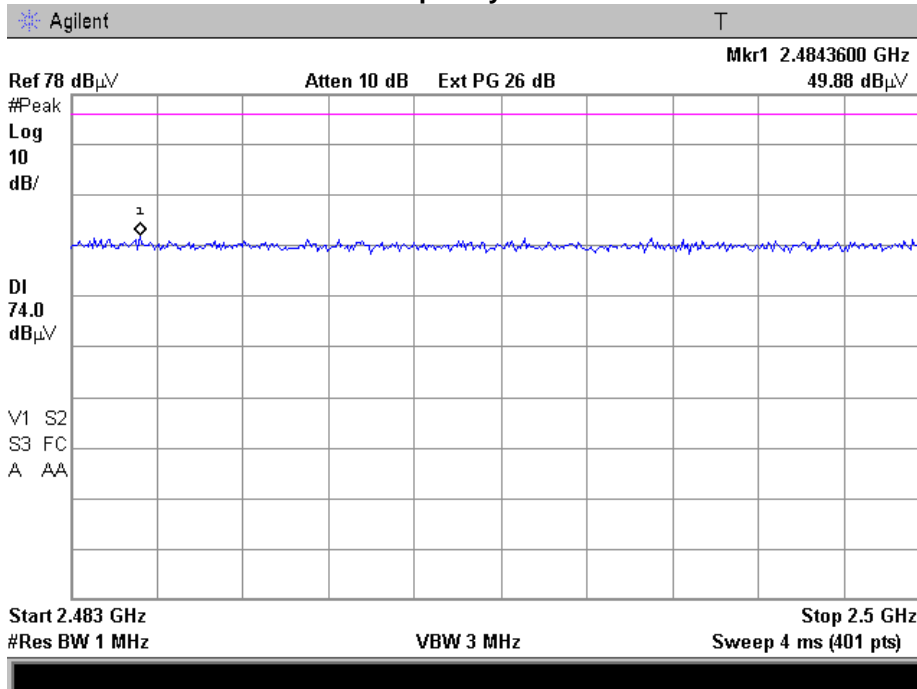


Restricted Band 2300 – 2390 MHz – Average Tuned Frequency = 2402 MHz

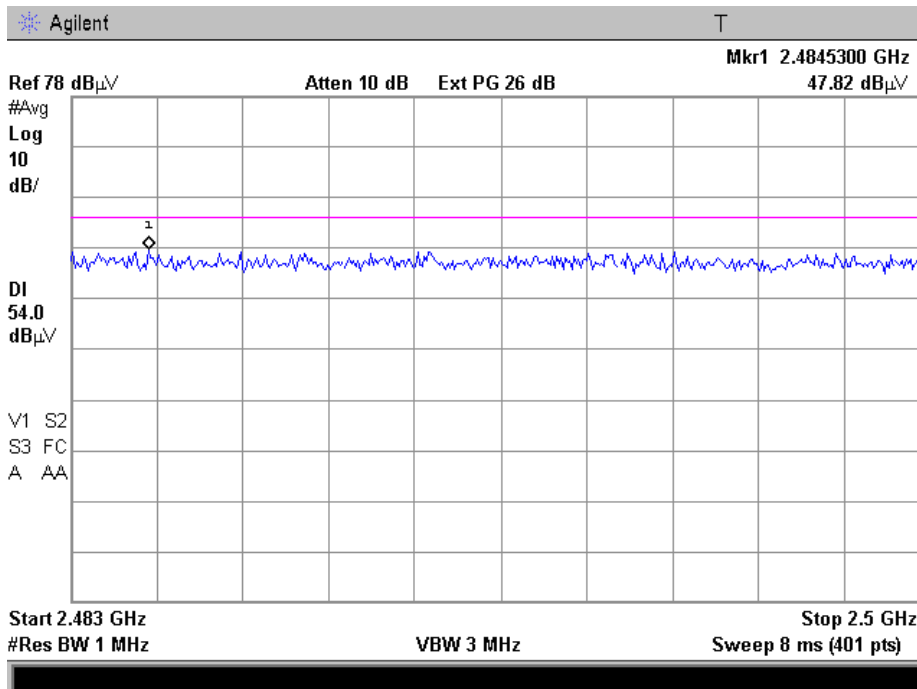




Restricted Band 2483.5 – 2500 MHz – Peak Tuned Frequency = 2480 MHz



Restricted Band 2483.5 – 2500 MHz – Average Tuned Frequency = 2480 MHz





Test Equipment Utilized

Description	Manufacturer	Model Number	CT Asset #	Last Cal Date	Cal Due Date
Preamplifier	HP	8449A	i00028	9/14/2011	9/14/2012
Horn Antenna	EMCO	3115	i00103	11/5/10	11/5/12
High Pass Filter	Trilithic	4HX3400-3-XX	i00177	Verified on: 11/2/2011	
Bi-Log Antenna	Schaffner	CBL611C	i00267	11/21/09	11/21/11
Humidity / Temp Meter	Newport	IBTHX-W-5	i00282	11/11/10	11/11/11
Spectrum Analyzer	Agilent	E4407B	i00331	5/24/11	5/24/12
Humidity / Temp Meter	Control Company	4189CC	i00355	1/26/11	1/26/12
Band Reject Filter	Wainwright	WRCTF2402/2480	i00385	Verified on: 11.2.2011	

In addition to the above listed equipment standard RF connectors and cables were utilized in the testing of the described equipment. Prior to testing these components were tested to verify proper operation.

END OF TEST REPORT