



Compliance Testing, LLC

Previously Flom Test Lab

EMI, EMC, RF Testing Experts Since 1963

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Test Report

Prepared for: Kenwood USA Corporation

Model: NX-5400-K2, NX-5400-K3, NX-5400-F2, NX-5400-F3

Description: 700/800MHz P25 TRANSCEIVER with Bluetooth

To

FCC Part 15.247 FHSS

Date of Issue: June 27, 2014

On the behalf of the applicant:

Kenwood USA Corporation
Communications Division
3970 Johns Creek Court
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Attention of:

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Project No: p1460001

Alex Macon
Project Test Engineer

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Test Report Revision History

Revision	Date	Revised By	Reason for Revision
1.0	June 12, 2014	Alex Macon	Original Document
2.0	June 27, 2014	Alex Macon	Additional dwell time plots of been added to the test section



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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 in the table below.

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

Testing Certificate Number: **2152.01**



FCC Site Reg. #349717

IC Site Reg. #2044A-2

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 MHz, 2400-2483.5 MHz, and 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 (°C)	Humidity (%)	Pressure (mbar)
24.6 – 26.4	22.4 – 27.9	959.5 – 968.2

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

EUT Description

Model: NX-5400-K2, NX-5400-K3, NX-5400-F2, NX-5400-F3

Description: 700/800MHz P25 TRANSCEIVER with Bluetooth

Additional Information: The EUT is a push to talk occupational radio

EUT Operation during Tests

The EUT was in a normal operating condition for testing. Both a radiated and conducted sample was provided.

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



Test Results Summary

Specification	Test Name	Pass, Fail, N/A	Comments
15.247(b)	Peak Output Power	Pass	
15.247(d)	Conducted Spurious Emissions	Pass	
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	Pass	
15.247(a)	Dwell Time	Pass	
15.247(a)	Number of Hopping Channels	Pass	
15.207	A/C Powerline Conducted Emissions	Pass	



Accessories:

Qty	Description	Mfg	Model	S/N
1	Charger	Kenwood	KSC-Y32	7
1	Switch mode power supply	HDP	DYS404-150200W	N/A

Cables: None

Qty	Description	Length (M)	Shielding Y/N	Shielded Hood Y/N	Ferrite Y/N
1	AC Cord	<3m	N	N	Y

Modifications: None



Peak Output Power

Name of Test:

Peak Output Power

Engineer: Alex Macon

Test Equipment Utilized:

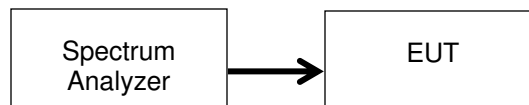
i00379

Test Date: 6/6/14

Test Procedure

The EUT was connected directly to the input of a Spectrum Analyzer. The peak readings were taken and the result was then compared to the limit.

Test Setup



Transmitter Peak Output Power

Tuned Frequency (MHz)	Recorded Measurement (mW)	Specification Limit (W)	Result
2402	1.46	1	Pass
2441	1.42	1	Pass
2480	1.40	1	Pass



Conducted Spurious Emissions

Name of Test: Conducted Spurious Emissions
Test Equipment Utilized: i00377, i00379

Engineer: Alex Macon

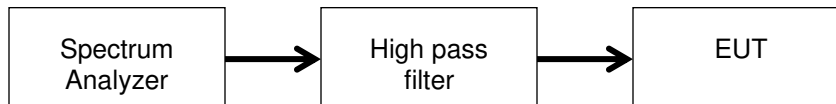
Test Date: 6/6/14

Test Procedure

The EUT was connected directly to a spectrum analyzer to verify that the EUT met the requirements for spurious emissions. The frequency range from 30 MHz to the 10th harmonic of the fundamental transmitter was observed. Only detectable spurious emissions were recorded and plotted.

Only the worst case is recorded in the Conducted Spurious Emissions Summary Test Table.

Test Setup

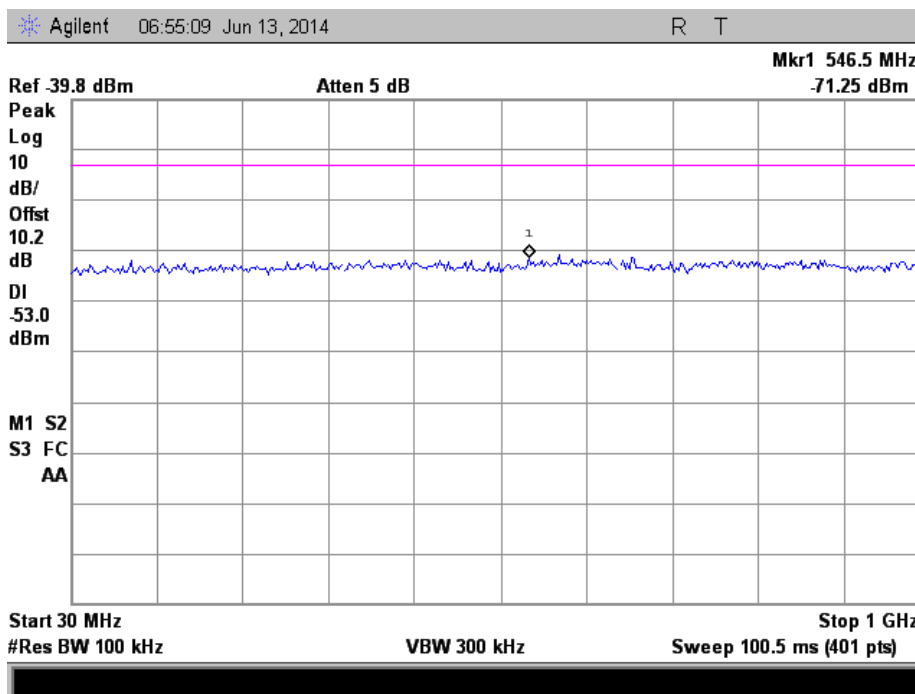


Conducted Spurious Emissions Summary Test Table

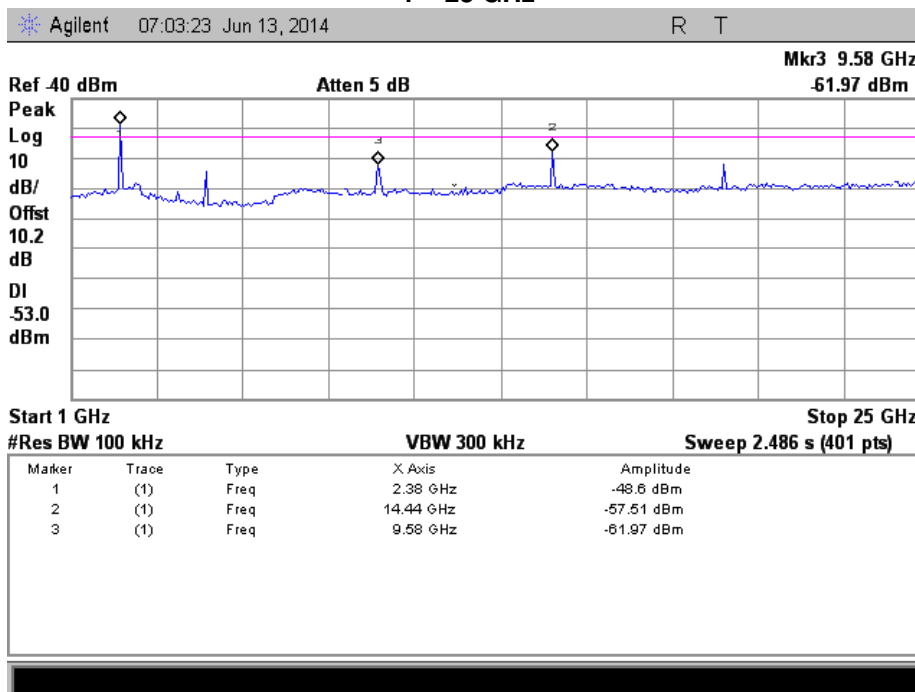
Tuned Frequency (MHz)	Emission Frequency (GHz)	Recorded Measurement (dBm)	Result
2402	14.44	-57.51	Pass
2441	9.76	-57.57	Pass
2480	9.94	-55.83	Pass



Conducted Spurious Emissions 2402 MHz

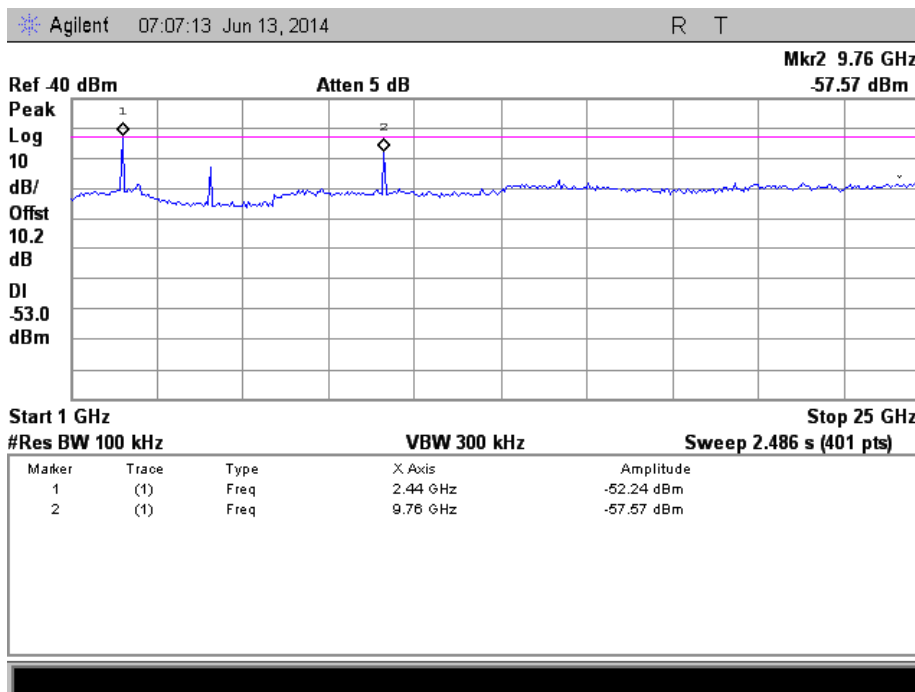
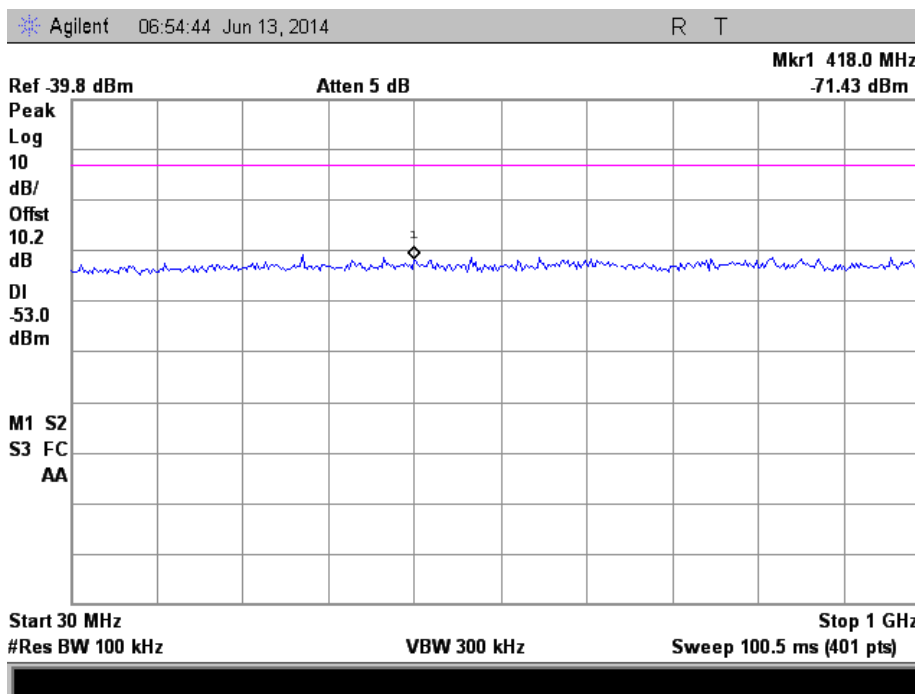


1 – 25 GHz



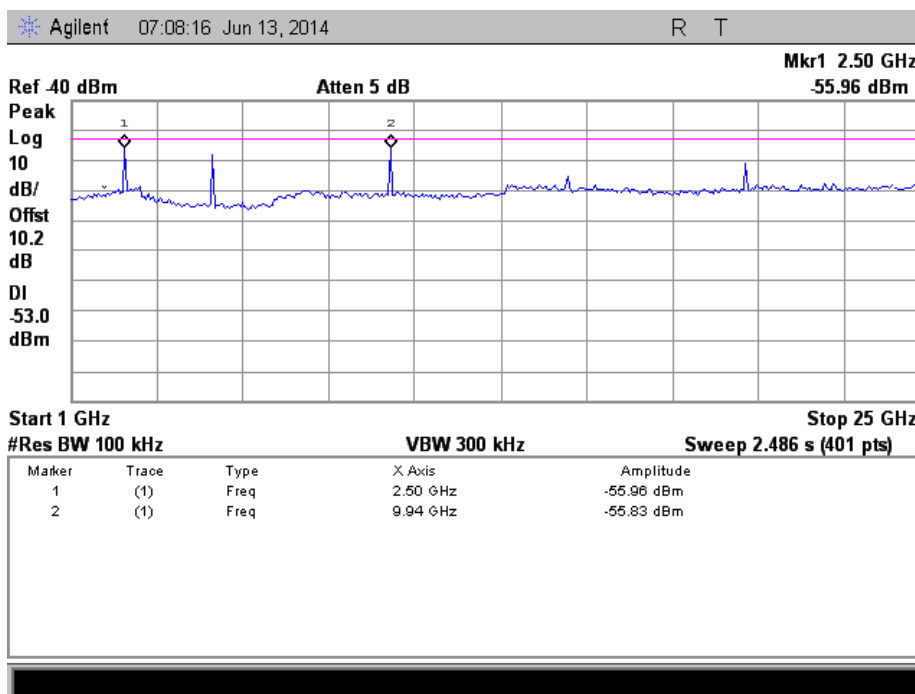
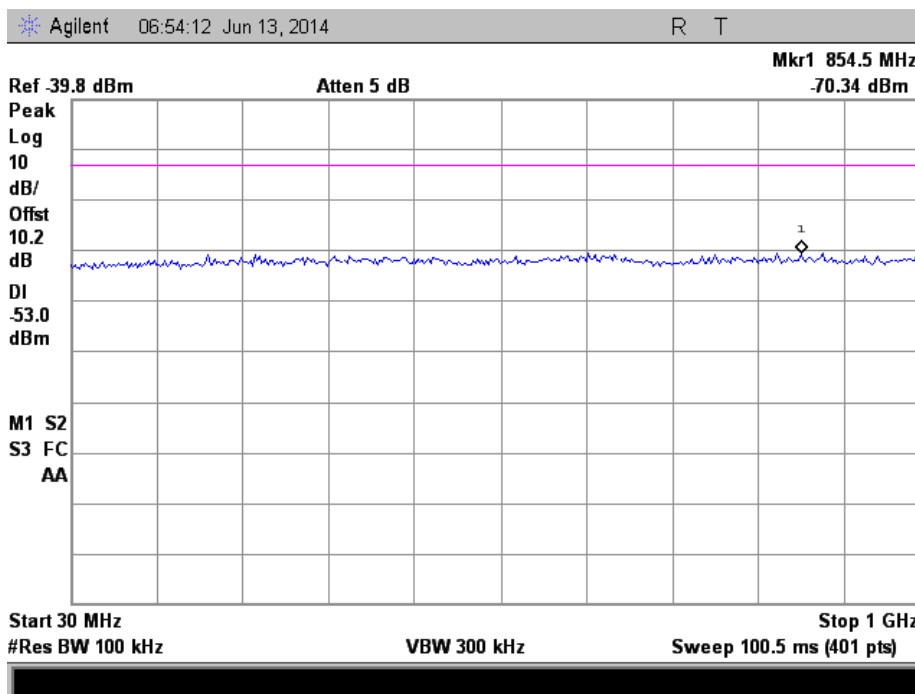


Conducted Spurious Emissions 2441 MHz





Conducted Spurious Emissions 2480 MHz





Radiated Spurious Emissions

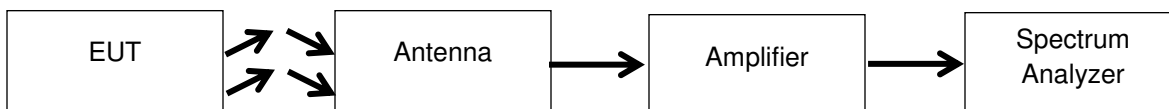
Name of Test: Radiated Spurious Emissions
Test Equipment Utilized: i00271, i00379, i00428

Engineer: Alex Macon
Test Date: 6/11/14

Test Procedure

The EUT was tested in a semi-anechoic chamber 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 entered into the spectrum analyzer as an offset to ensure accurate readings. The spectrum for each tuned frequency was examined to the 10th harmonic. Measurements from 30 MHz to 1 GHz were performed but no emissions generated by the intentional radiators were detected.

Test Setup



Detector Settings	RBW	VBW
Peak	1 MHz	3 MHz
Average	1 MHz	3 MHz

Radiated Spurious Emissions

Tuned Frequency (MHz)	Emission Frequency (MHz)	Peak Monitored Level (dBuV/m)	Peak Limit (dBuV/m)
2402	4804	40.0	74.0
2402	4050	39.3	74.0
2402	12010	47.8	74.0
2441	4882	38.9	74.0
2441	7321	42.7	74.0
2441	12206	47.6	74.0
2480	4960	39.5	74.0
2480	7439	43.9	74.0
2480	12399	48.2	74.0

All peak emissions were under the average limit of 54 dBuV/m
No other emissions were detectable. All emissions were lower than -20 dBc



Emissions at Band Edges

Name of Test:

Emissions at Band Edges

Engineer: Alex Macon

Test Equipment Utilized:

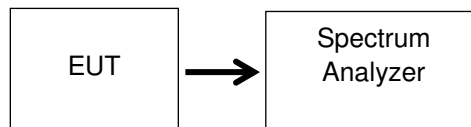
i00379

Test Date: 6/6/14

Test Procedure

The EUT was connected directly to a spectrum analyzer which was used to verify that the EUT met the requirements for band edge measurements. The cable and attenuator correction factors were input into the analyzer as a reference level offset to ensure accurate readings.

Test Setup



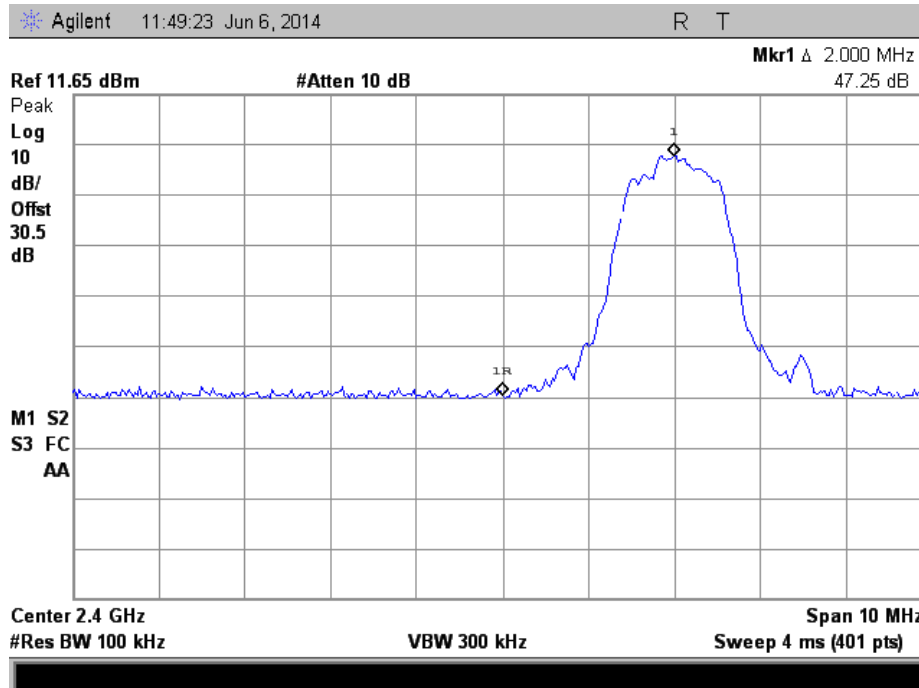
Band Edge Emissions Summary

Tuned Frequency (MHz)	Emission Frequency (MHz)	Monitored Level (dBc)	Detector	Limit (dBc)	Result
2402	2400	-47.25	Peak	-20	Pass
2480	2483.5	-47.6	Peak	-20	Pass

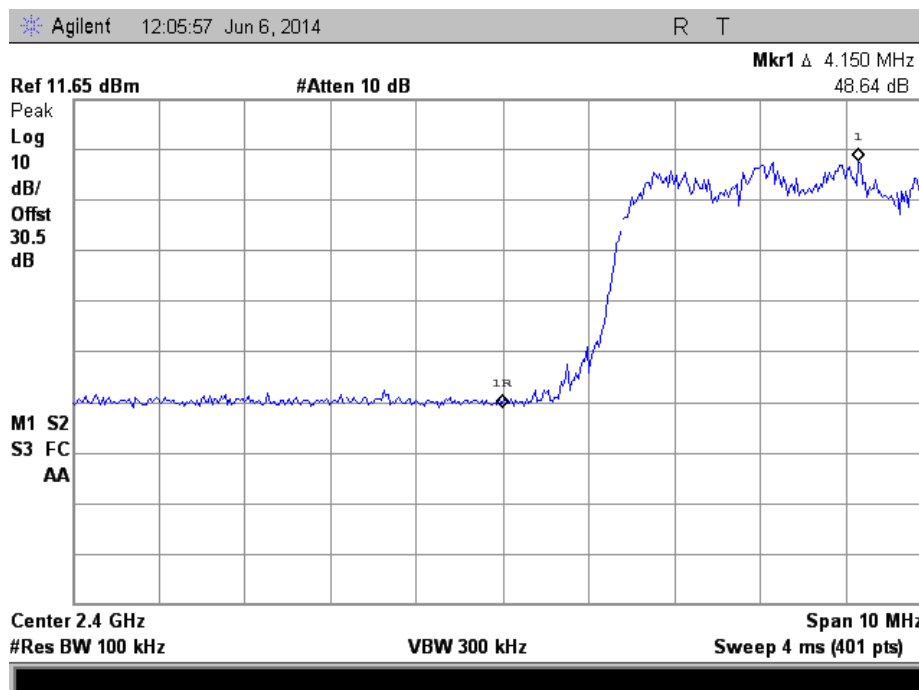


Band Edge 2400 MHz

Non-Hopping



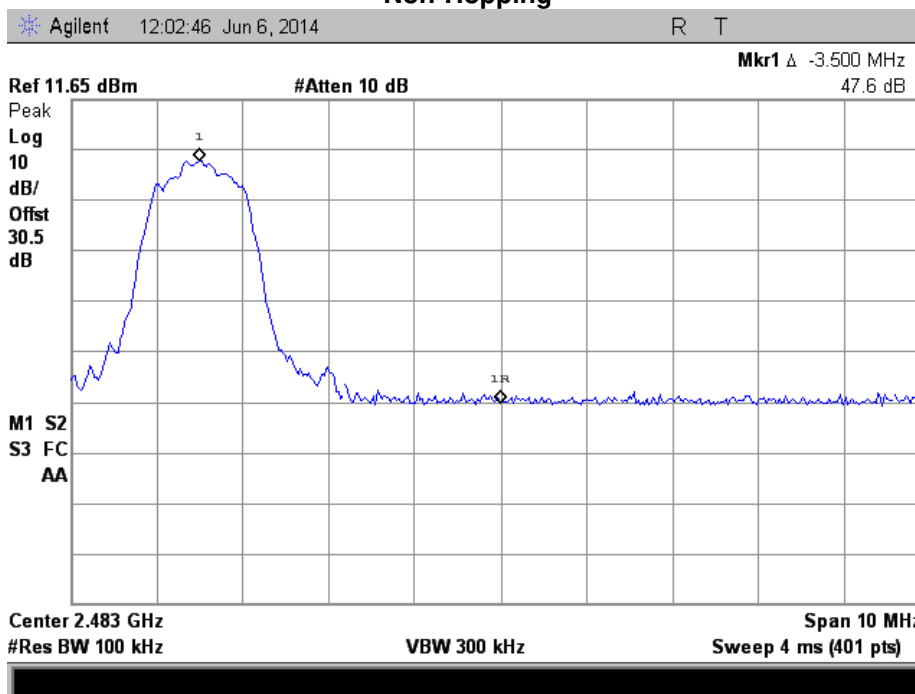
Hopping



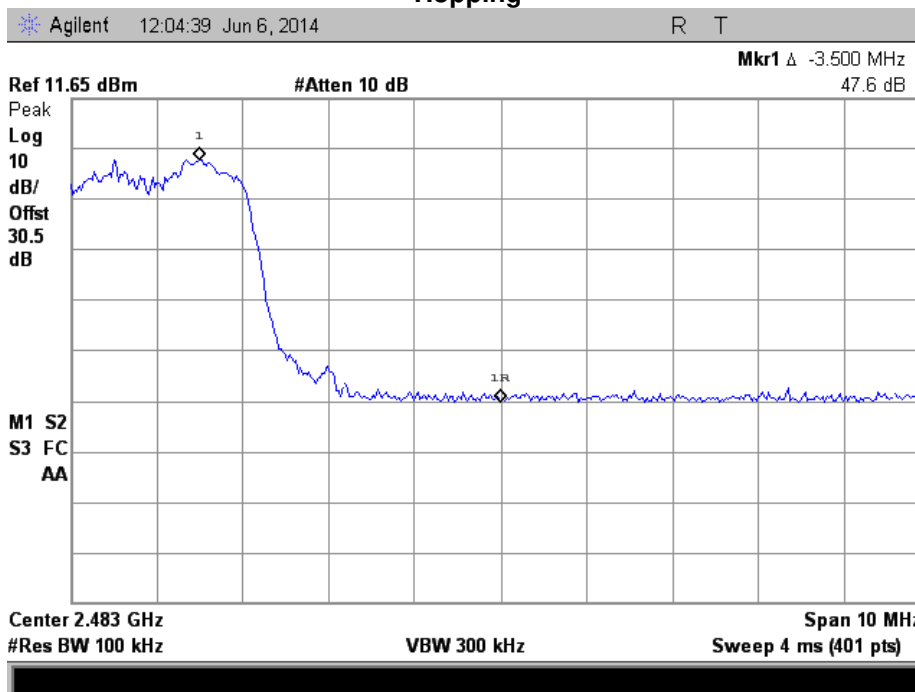


Band Edge 2483.5 MHz

Non-Hopping



Hopping





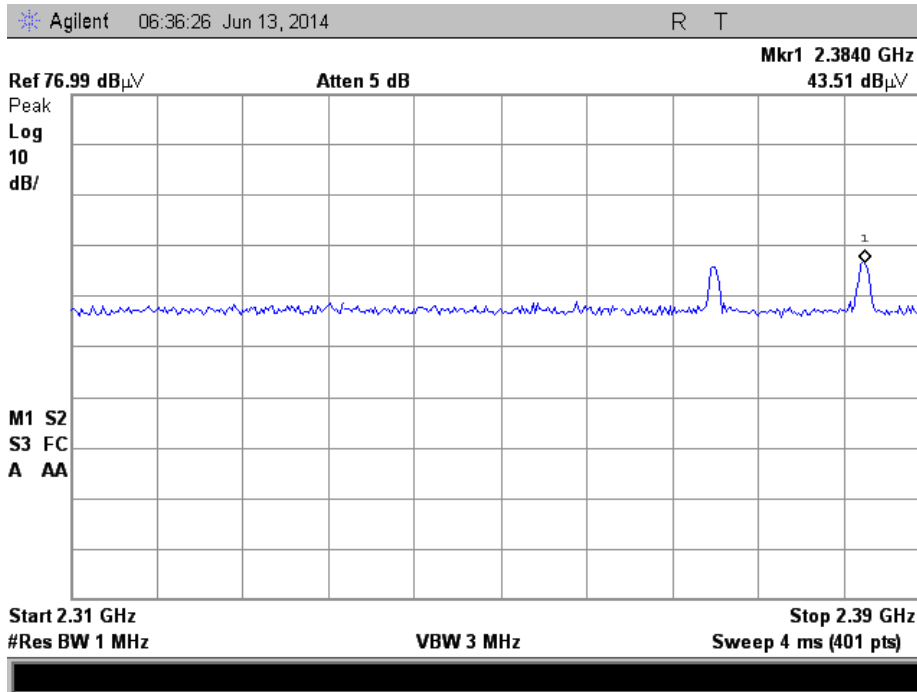
Restricted Band Emissions Summary

Tuned Frequency (MHz)	Emission Frequency (MHz)	Peak Monitored Level (dBuV/m)	Peak Limit (dBuV/m)	Average Monitored Level (dBuV/m)	Average Limit (dBuV/m)	Result
2402	2384	43.51	74.0	42.72	54.0	Pass
2480	2490	37.16	74.0	34.58	54.0	Pass

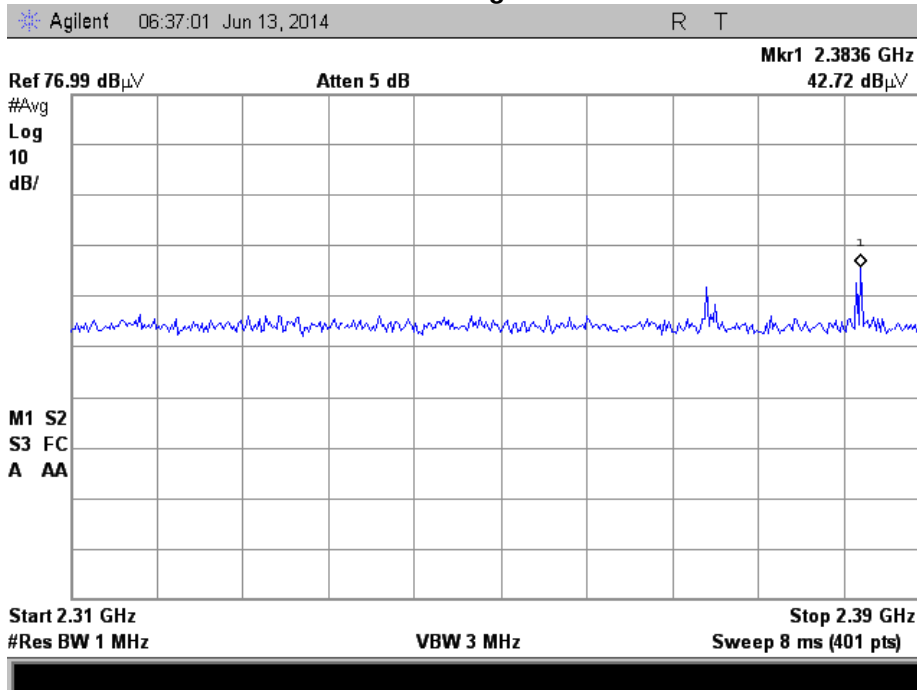


Restricted Band 2390 MHz

Peak



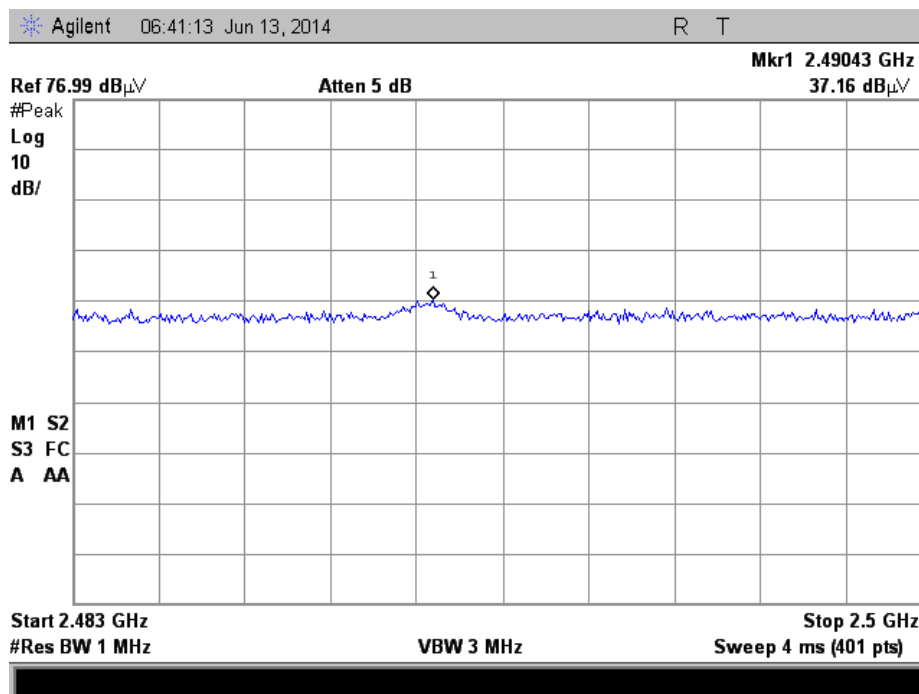
Average



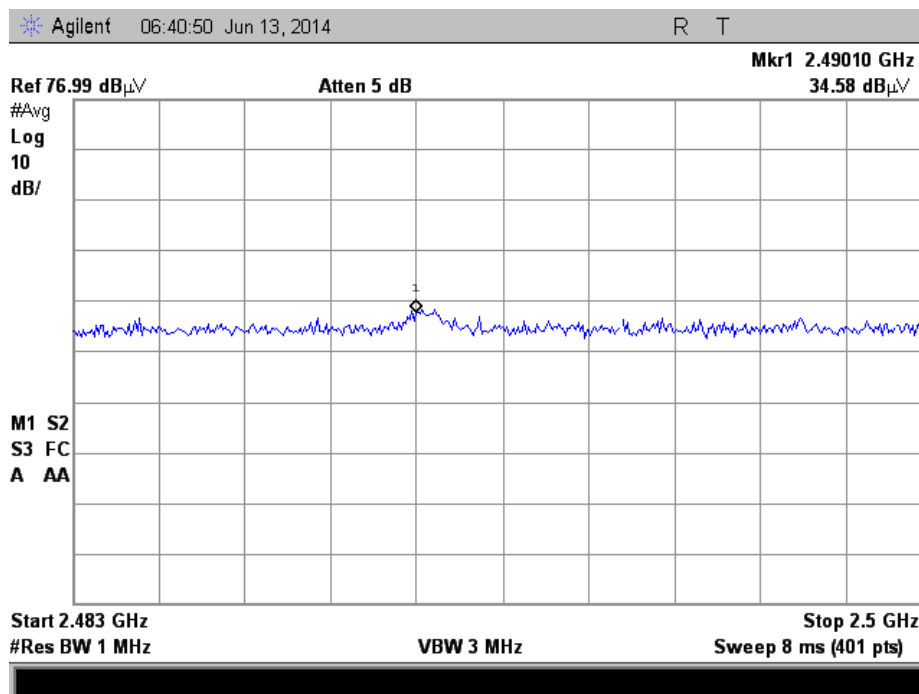


Restricted Band 2483.5 MHz

Peak



Average





Occupied Bandwidth

Name of Test:

Occupied Bandwidth

Engineer: Alex Macon

Test Equipment Utilized:

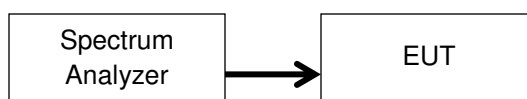
i00379

Test Date: 6/13/14

Test Procedure

The EUT was connected directly to a spectrum analyzer. The Span was set wide enough to capture the entire transmitting spectrum and the resolution bandwidth was set to at least 1% of the span. The analyzer was set to max hold and when the entire spectrum was captured, the 20dB and 99% bandwidths were measured to verify that the bandwidth met the specification.

Test Setup



20 dB Bandwidth Summary

Frequency (MHz)	Recorded Measurement (MHz)	Specification Limit	Result
2402	1.15	N/A	Pass
2441	1.10	N/A	Pass
2480	1.10	N/A	Pass

99% Bandwidth Summary

Frequency (MHz)	Recorded Measurement (MHz)	Result
2402	1.21	Pass
2441	1.20	Pass
2480	1.20	Pass



Dwell Time

Name of Test:

Dwell Time

Engineer: Alex Macon

Test Equipment Utilized:

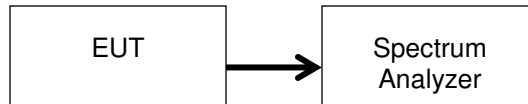
i00379

Test Date: 6/6/14

Test Procedure

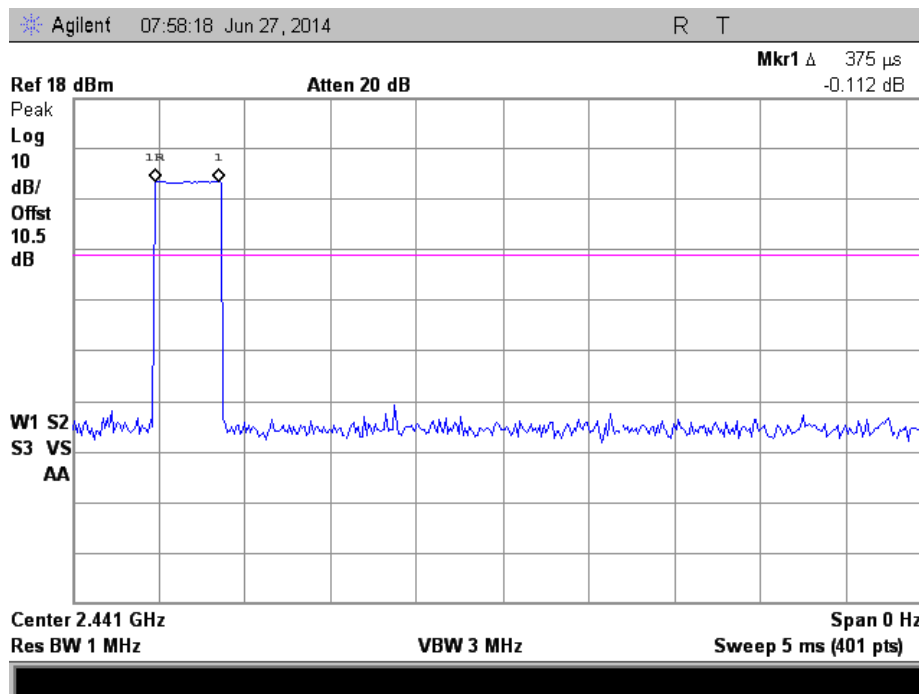
The EUT was connected directly to a spectrum analyzer. The EUT was set to hopping mode with the spectrum analyzer set to a 0 Hz span. A single transmission was captured and the dwell time was recorded.

Test Setup



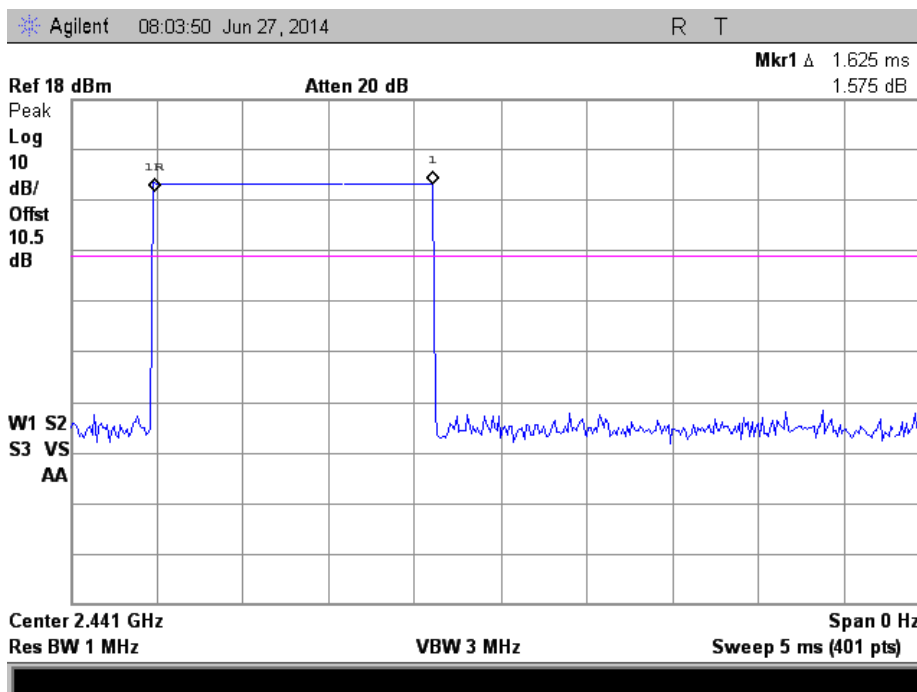
Dwell Time

DH1

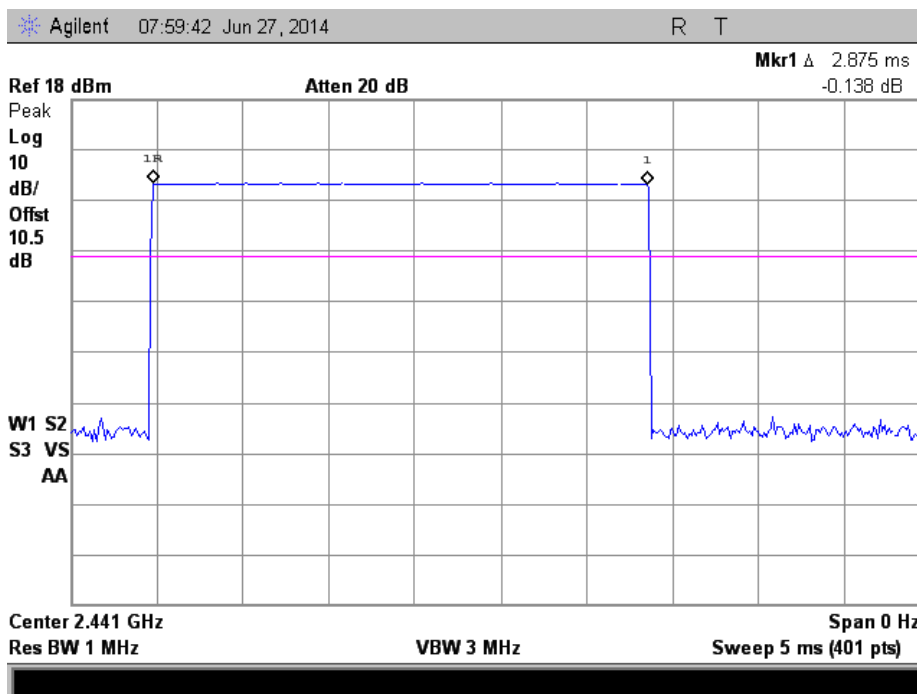




DH3

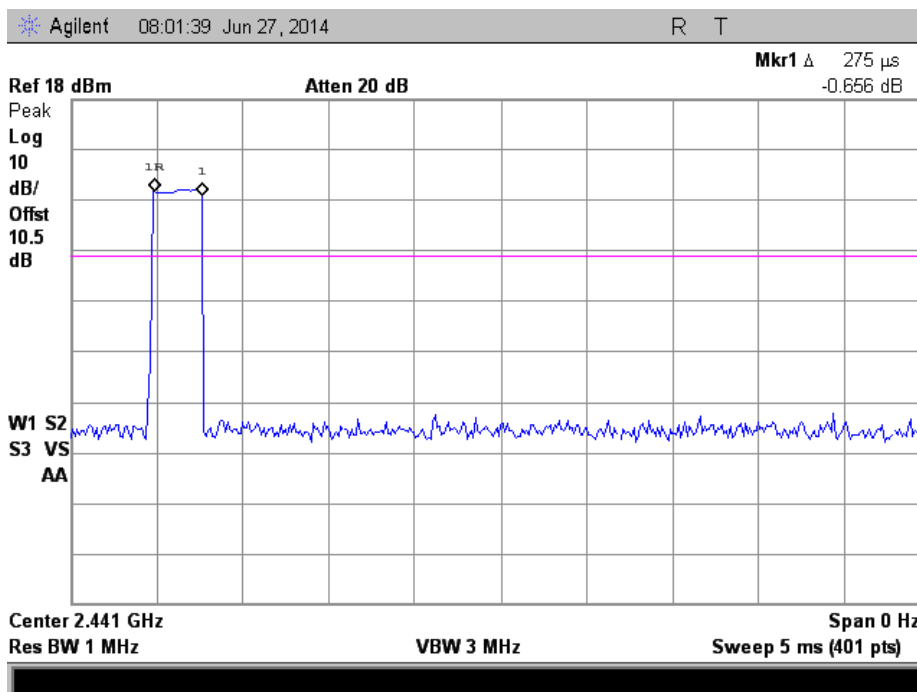


DH5

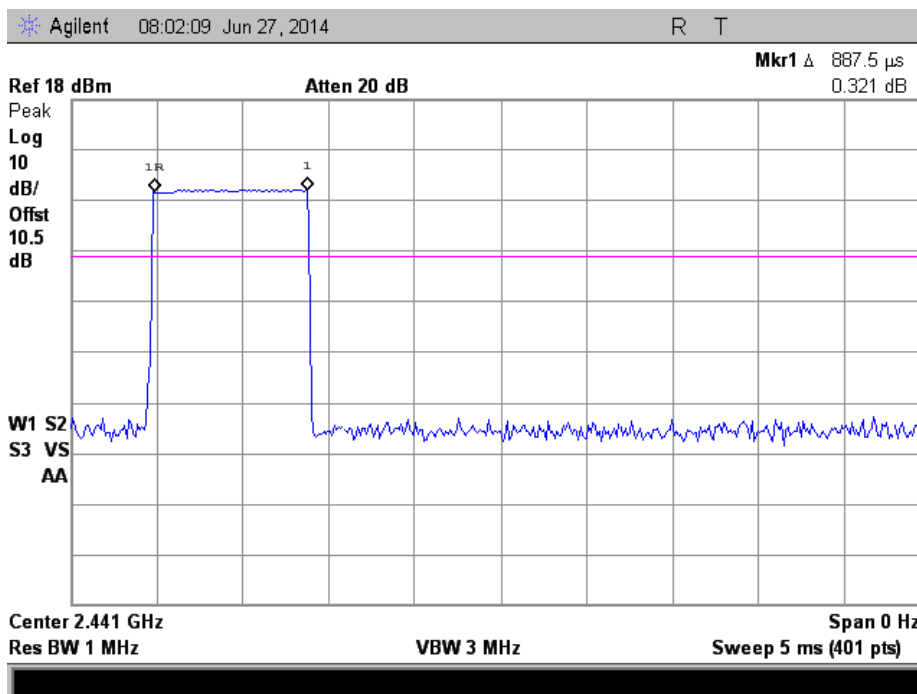




2DH1

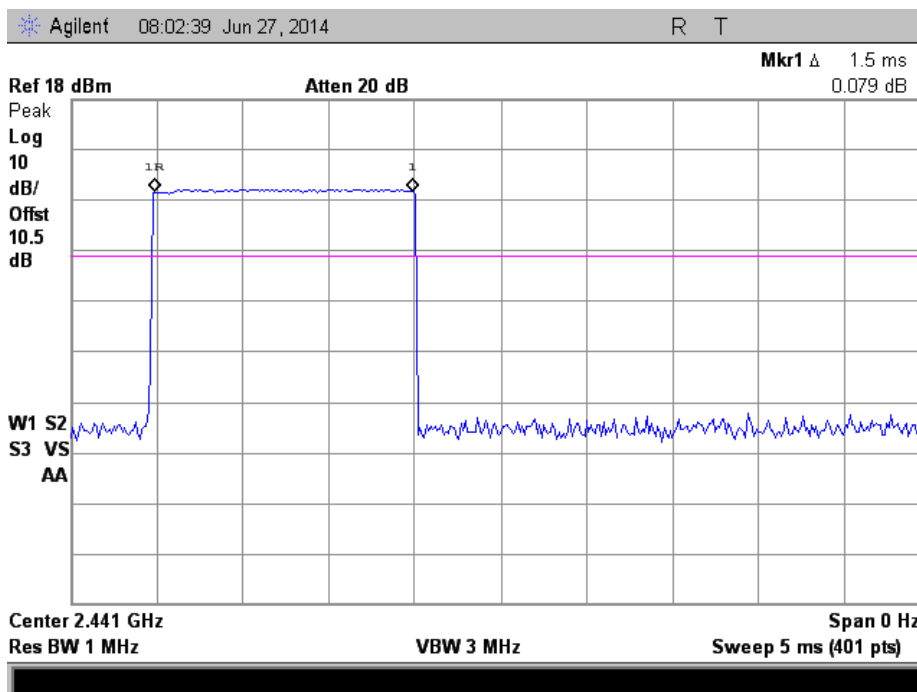


2DH3

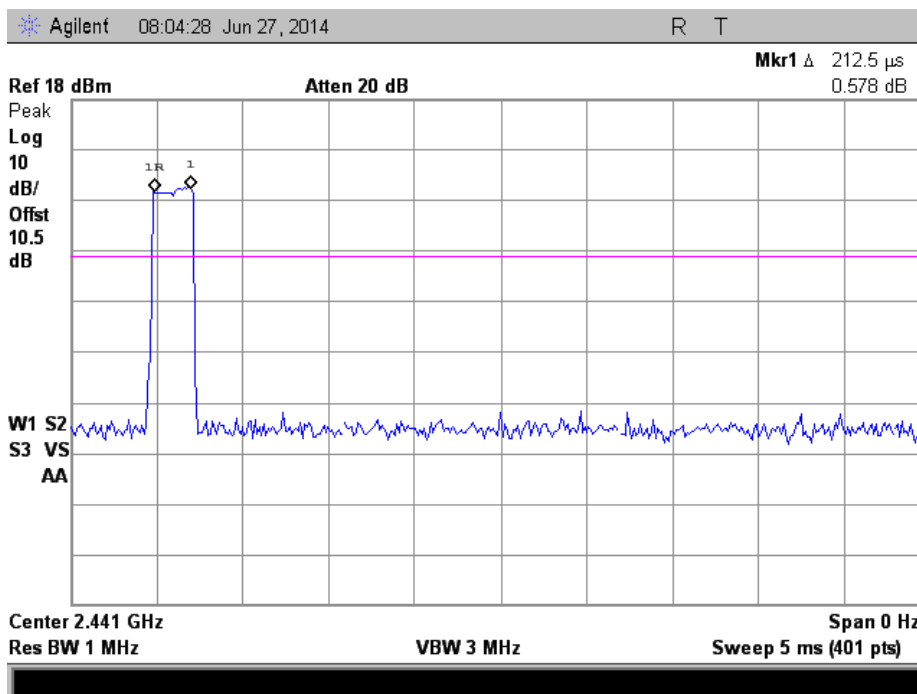




2DH5

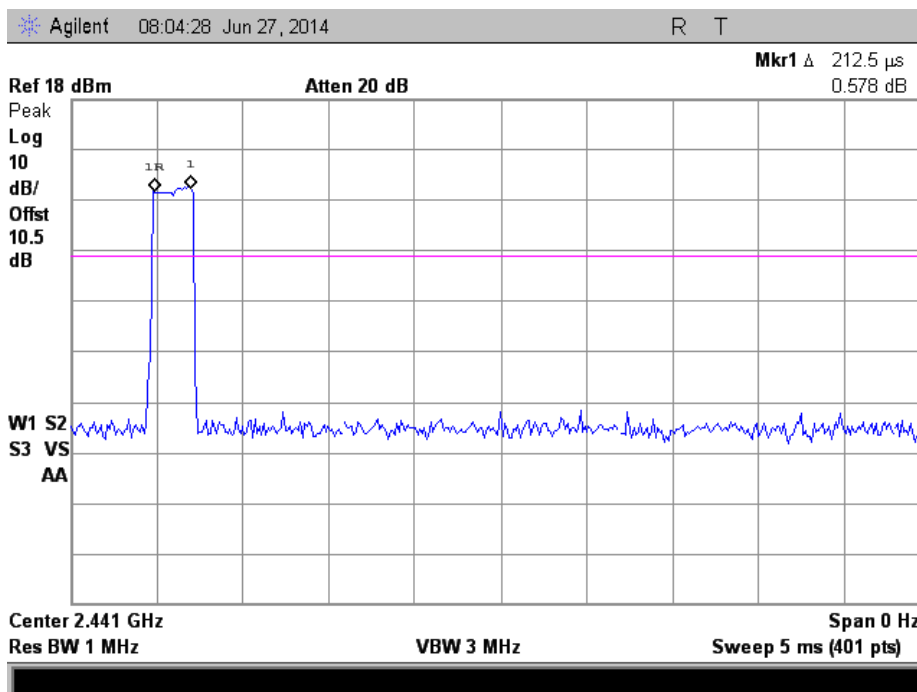


3DH1

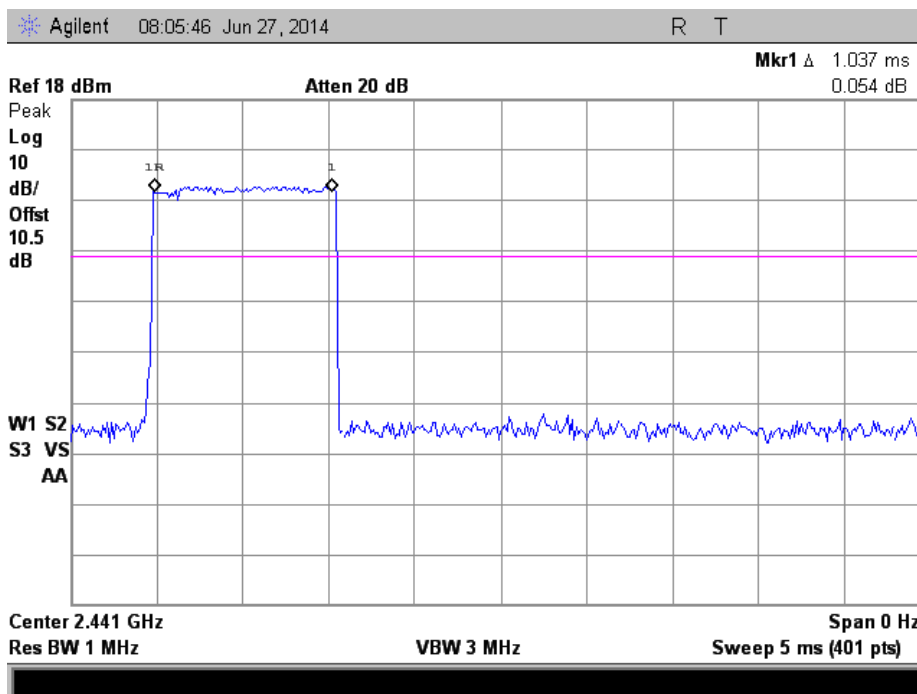




3DH3



3DH5





Number of Hopping Channels

Name of Test:

Number of Hopping Channels

Engineer: Alex Macon

Test Equipment Utilized:

i00379

Test Date: 6/6/14

Test Procedure

The EUT was connected directly to a spectrum analyzer. The Span was set to the specified band end points. The EUT was then set to operate in hopping mode. The MAX HOLD function of the spectrum analyzer was utilized to verify the number of hopping channels.

Total channel count - 79

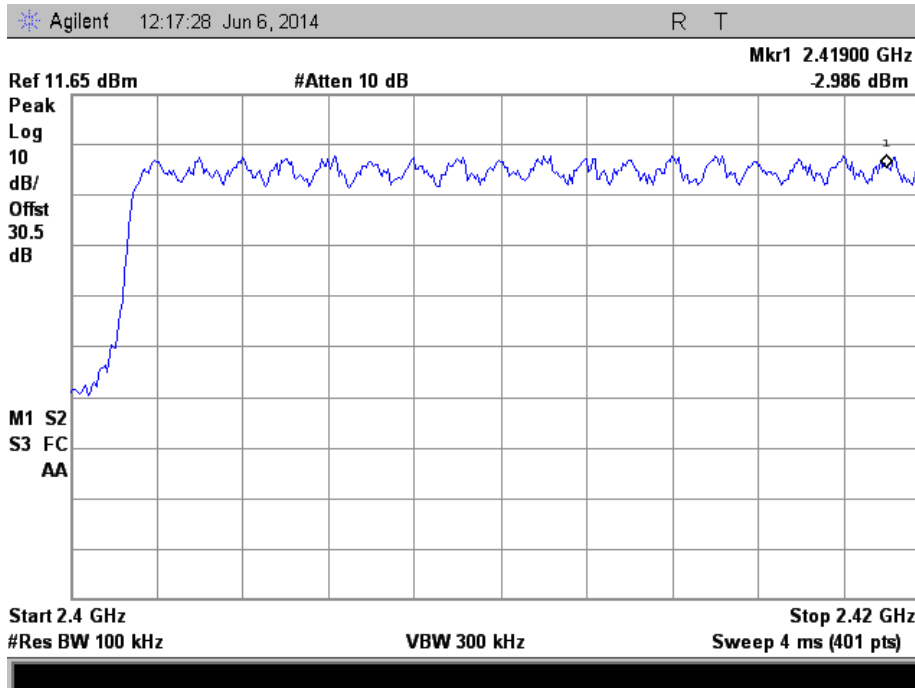
Test Setup



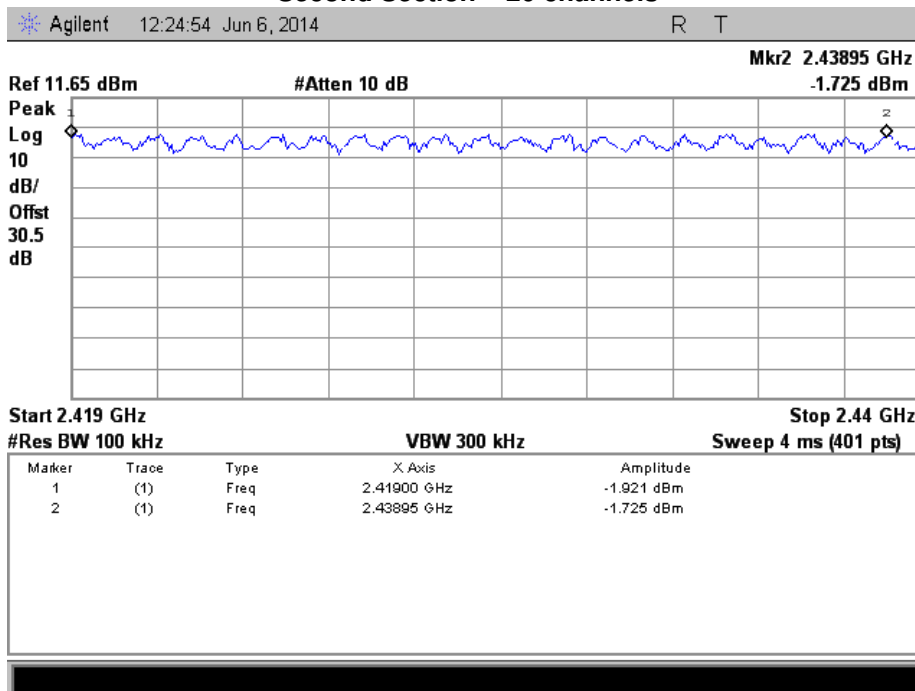


Number of Hopping Channels

First Section – 18 channels

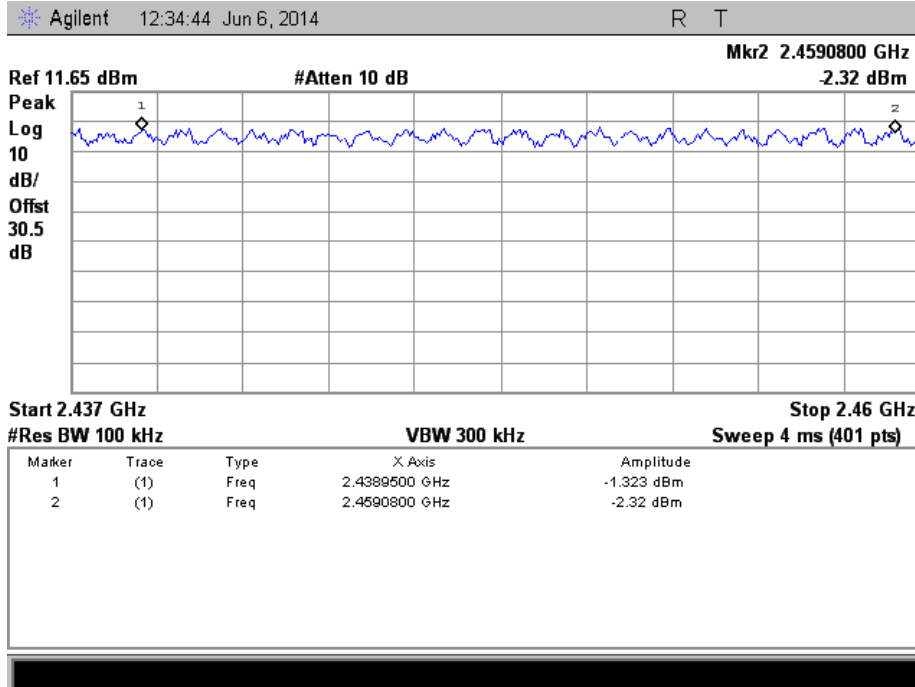


Second Section – 20 channels

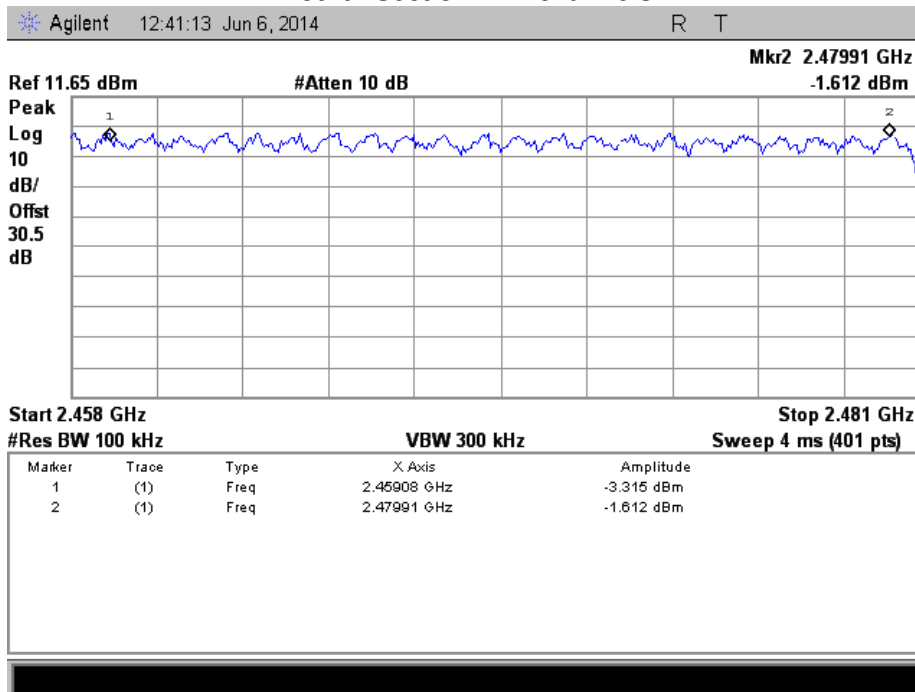




Third Section – 20 channels



Fourth Section – 21 channels





Channel Spacing

Name of Test:

Channel Spacing

Engineer: Alex Macon

Test Equipment Utilized:

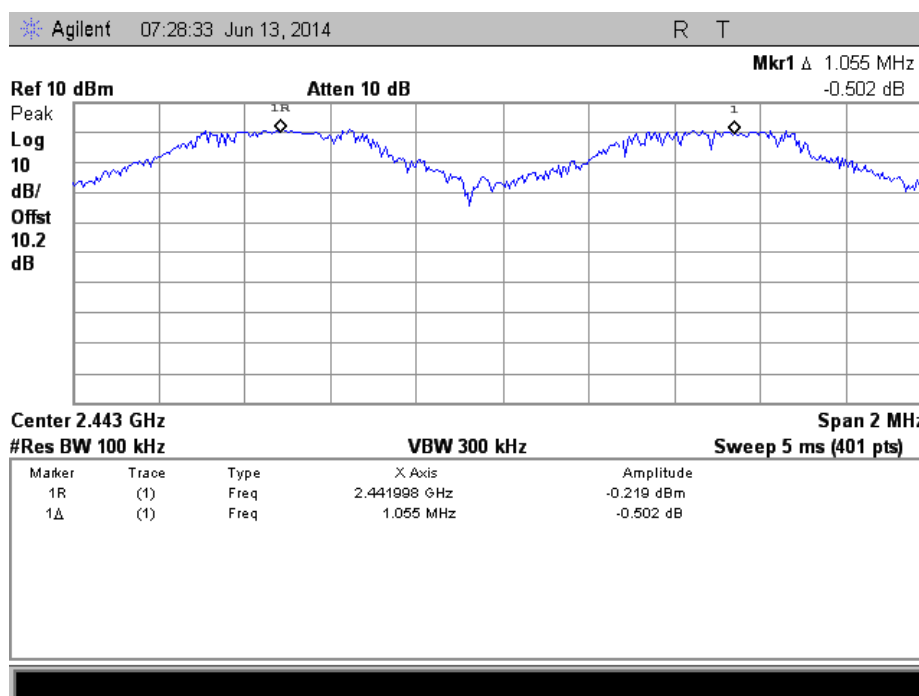
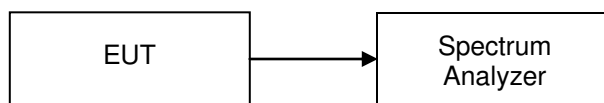
i00379

Test Date: 6/6/14

Test Procedure

The EUT was connected directly to a spectrum analyzer and the channel spacing was measured.

Test Setup





A/C Powerline Conducted Emissions

Name of Test:

A/C Powerline Conducted Emissions

Engineer: Alex Macon

Test Equipment Utilized:

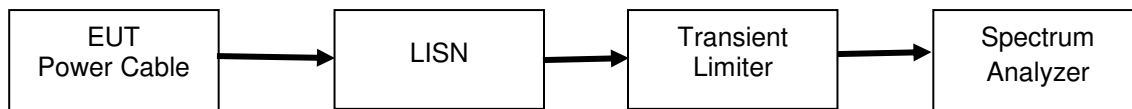
i00033, i00123, i00270, i00362

Test Date: 6/3/14

Test Procedure

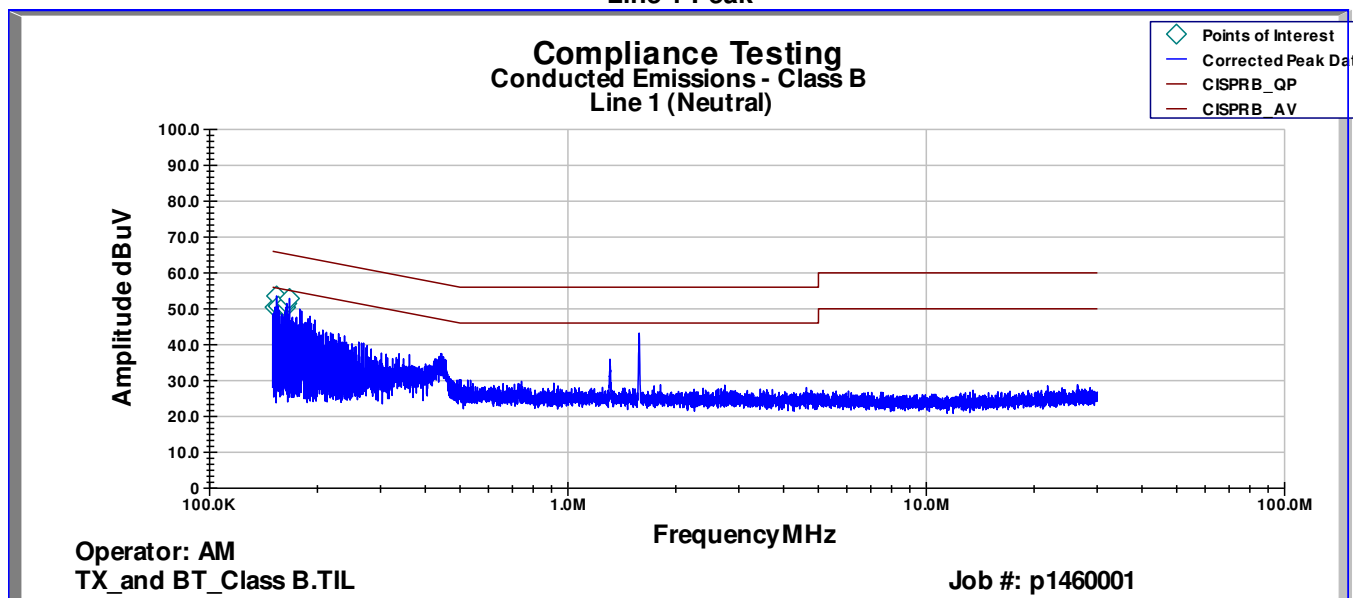
The EUT power cable was connected to a LISN and the monitored output of the LISN was connected to a transient limiter, which then connected directly to a spectrum analyzer. The conducted emissions from 150 kHz to 30 MHz were measured and compared to the specification limits.

Test Setup

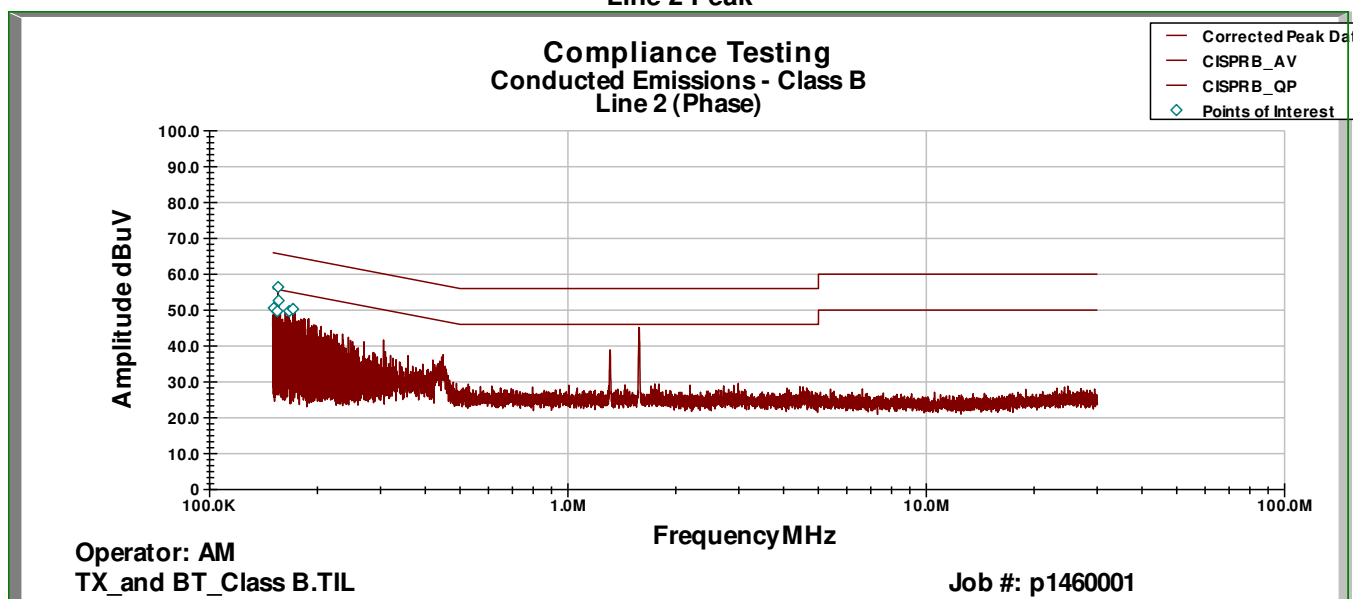




Line 1 Peak



Line 2 Peak



All peak readings are below the quasi peak and average limits, therefore no tabular data was recorded.

The signals at 1.38MHz and 1.57 MHz are ambient test signals and not part of the EUT.



Test Equipment Utilized

Description	Manufacturer	Model #	CT Asset #	Last Cal Date	Cal Due Date
EMI Receiver	HP	8546A	i00033	2/24/14	2/24/15
Function Generator	HP	33120A	i00118	Verified on: 6/6/14	
Transient Limiter	Com Power	LIT-930	i00123	Verified on: 6/3/14	
LISN	FCC	FCC-LISN-50-32-2-01	i00270	10/5/12	10/5/14
Horn Antenna, Amplified	ARA	DRG-118/A	i00271	5/8/14	5/8/15
Humidity / Temp Meter	Newport	IBTHX-W-5	i00282	3/24/14	3/24/15
Voltmeter	Fluke	75III	i00320	3/24/14	3/24/15
Spectrum Analyzer	Agilent	E4407B	i00331	4/23/13	4/23/14
Spectrum Analyzer	Tektronix	RSA3308A	i00345	3/18/14	3/18/15
Bi-Log Antenna	Schaffner	CBL 6111D	i00349	10/8/13	10/8/15
AC Power Source	Behlman	BL 6000	i00362	Verified on:6/3/14	
High Pass Filter	Trilithic	4HX3400-3-XX	i00377	Verified on:6/10/14	
EMI Analyzer	Agilent	E7405A	i00379	1/14/14	1/14/15
Thermo Hygrometer	Omega	RH81	i00408	4/15/13	4/15/15
3 Meter Semi-Anechoic Chamber	Panashield	3 Meter Semi-Anechoic Chamber	i00428	11/26/13	11/26/15

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