Test Report # 317328 B

Equipment Under Test:	Leviton 0XB1803 ZigBee/Bluetooth LE PCA Transceiver Module, MGx
Test Date(s):	11/10/17 – 12/3/19
Prepared for:	Dmitriy Moskovkin Leviton Manufacturing Co., Inc. Energy Management, Controls and Automation (EMC&A) 20497 SW Teton Avenue Tualatin, OR 97062

Report Issued by: Shane Dock, EMC Engineer

Signature:

Date: 12/5/2019

Report Reviewed by: Adam Alger, Quality Manager

Signature:

Date: 04/11/2019

Report Constructed by: Shane Dock, EMC Engineer

Signature:

Date: 1/9/2019

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Laird Technologies Test Services in Review

The Laird Technologies, Inc. laboratory located at W66 N220 Commerce Court Cedarburg, Wisconsin, 53012 USA is recognized through the following organizations:

A2LA – American Association for Laboratory Accreditation

Accreditation based on ISO/IEC 17025:2017 with Electrical (EMC) Scope

A2LA Certificate Number: 1255.01

Scope of accreditation includes all test methods listed herein unless otherwise noted

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Federal Communications Commission (FCC) – USA

Accredited Test Firm Registration Number: 953492

Recognition of two 3 meter Semi-Anechoic Chambers

Government of Canada

Innovation, Science and Economic Development Canada

Accredited U.S. Identification Number: US0218

Recognition of two 3 meter Semi-Anechoic Chambers

1 Test Report Summary

During **11/10/17 – 12/3/19** the Equipment Under Test (EUT), **Leviton 0XB1803 ZigBee/Bluetooth LE PCA Transceiver Module, MGx**, as provided by **Leviton Manufacturing Co., Inc.** was tested to the following requirements:

Requirement	Description	Specification	Method	Result
FCC: 15.247 (a)(2) IC: RSS-247 5.2 (1)	Digital Modulation System 6 dB bandwidth	500 kHz	ANSI C63.10	Pass
FCC: 2.1049 IC: RSS-GEN 6.7	Occupied Bandwidth	Reported	ANSI C63.10	Pass
FCC: 15.247 (b)(3) IC: RSS-247 5.4 (d)	Maximum Conducted Output Power	30 dBm	ANSI C63.10	Pass
FCC: 15.247 (e) IC: RSS-247 5.2 (b)	Digital Modulation System Power Spectral Density	8 dBm / 3 kHz	ANSI C63.10	Pass
FCC: 15.247 (d) IC: RSS-247 5.5	RF Spurious Emissions at the Transmitter Antenna Terminal	20 dBc	ANSI C63.10	Pass
FCC: 15.247 (d) IC: RSS-GEN 8.10	Spurious Radiated Emissions in Restricted Bands	FCC 15.209 RSS-GEN 8.9	ANSI C63.10	Pass
FCC: 2.1055 (d) IC: RSS-GEN 6.11	Frequency Stability	Reported	ANSI C63.10	Pass
FCC: 15.207 IC: RSS-GEN 8.8	AC Power Line Conducted Emissions	0.150-30 MHz	ANSI C63.10	Pass

Notice:

The results relate only to the item tested and described in this report. Any modifications made to the equipment under test after the specified test date(s) may invalidate the data herein.

If the resulting measurement margin is seen to be within the uncertainty value, as listed in this report, the possibility exists that this unit may not meet the required limit specification if subsequently tested.

2 CLIENT INFORMATION

Company Name	Leviton Manufacturing Co., Inc.
Contact Person	Dmitriy Moskovkin
Address	20497 SW Teton Avenue Tualatin, OR 97062

2.1 Equipment Under Test (EUT) Information

The following information has been supplied by the client

Product Name	Name: Leviton 0XB1803 ZigBee/Bluetooth LE PCA Transceiver Module, MGx
Model Number	0XB1803 Module, Bluetooth LE protocol
Serial Number	Engineering Sample
FCC/IC ID	FCC: QGH-ZBMG IC: 2473A-ZBMG

2.2 Product Description

Zigbee and Bluetooth low energy module using B1803 PCA and Silicon Labs EFR series MG1, MG12, or MG13

2.3 Modifications Incorporated for Compliance

None noted at time of test

2.4 Deviations and Exclusions from Test Specifications

None noted at time of test

2.5 Additional Information

AC Adapter used to power Board with 5 VDC. EUT programmed via Laptop and WSTK Board using Gecko SDK Suite V1.1.1 and Adapter firmware version 1v0p3b664. The MG12 module was tested in its entirety with some radiated spotchecks for the MG1 and MG13, as the MG1 and MG13 modules feature an identical layout on the PCB. The MG12 module was also tested in a minimum power configuration to cover the lowest possible power setting among configurations.

2.6 Test Configurations

Power Profile 1 was tested for Radiated Emissions. Each profile was tested for Conducted Output power, while profile 3 was also tested for bandwidth and PSD.

2.7 Power Profiles

Refer to Section 5 for Measured Output Power Levels. The Channels tested represent the Low, Mid, and High channels of all full power channels, plus any reduced power channels.

Power Profile	Part Numbers Represented	2402 MHz Power Setting (dBm)	2440 MHz Power Setting (dBm)	2478 MHz Power Setting (dBm)	2480 MHz Power Setting (dBm)
1	0XB18031003CC01 0XB18032233CC11 0XB18032223CC15 0XB18033113CC19	20	20	20	17
2	0XB18031002CC03	17	17	17	17
3	0XB18032231CC13 0XB18032221CC17 0XB18033111CC21	10	10	10	10

3 REFERENCES

Publication	Edition	Date
CFR 47 Part 15	-	2019
ANSI C63.10	-	2013
RSS-247	2	2017
RSS GEN	5	2018

4 UNCERTAINTY SUMMARY

Using the guidance of the following publications the calculated measurement uncertainty represents an expanded uncertainty expressed at approximately the 95 % confidence level, using a coverage factor of k = 2.

References	Version / Date
CISPR 16-4-1	Ed. 2 (2009-02)
CISPR 16-4-2	Ed. 2 (2011-06)
CISPR 32	Ed. 1 (2012-01)
ANSI C63.23	2012
A2LA P103	February 4, 2016
A2LA P103c	August 10, 2015
ETSI TR 100-028	V1.3.1 (2001-03)

Measurement Type	Configuration	Uncertainty ±
Radiated Emissions	Biconical Antenna	5.0 dB
Radiated Emissions	Log Periodic Antenna	5.3 dB
Radiated Emissions	Horn Antenna	4.7 dB
AC Line Conducted Emissions	Artificial Mains Network	3.4 dB
Telecom Conducted Emissions	Asymmetric Artificial Network	4.9 dB
Disturbance Power Emissions	Absorbing Clamp	4.1 dB
Radiated Immunity	3 Volts/meter	2.2 dB
Conducted Immunity	CDN/EM/BCI	2.4/3.5/3.4 dB
EFT Burst/Surge	Peak pulse voltage	164 volts
ESD Immunity	15 kV level	1377 Volts

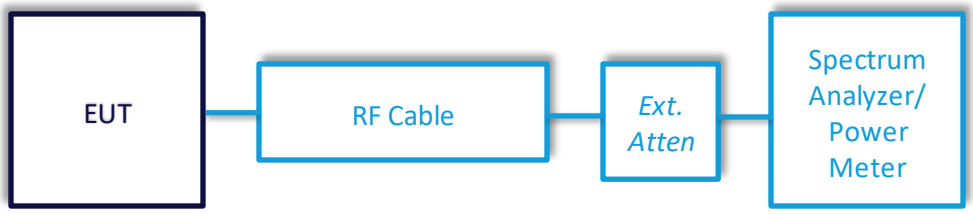
Parameter	ETSI U.C. ±	U.C. ±
Radio Frequency, from F0	$1x10^{-7}$	$0.55x10^{-7}$
Occupied Channel Bandwidth	5 %	2 %
RF conducted Power (Power Meter)	1.5 dB	1.2 dB
RF conducted emissions (Spectrum Analyzer)	3.0 dB	1.7 dB
All emissions, radiated	6.0 dB	5.3 dB
Temperature	1° C	0.65° C
Humidity	5 %	2.9 %
Supply voltages	3 %	1 %

5 TEST DATA

5.1 Antenna Port Conducted Emissions

Description of Measurement	The direct measurement of emissions at the antenna port of the EUT is achieved by use of a RF connection to a spectrum analyzer or power meter. The cable and attenuator factors are loaded into the analyzer or power meter allowing for direct measurement readings without the need for further corrections.
Example Calculations	Measurement (dBm) + Cable factor (dB) + External Attenuator (dB) = Corrected Reading (dBm) Margin (dB) = Limit (dBm) – Corrected Reading (dBm)

Block Diagram



5.1.1 Antenna Port Conducted Emissions

Operator	Coty Hammerer, Shane Dock
Test Date	11/16/17, 7/18/19, 12/3/19
Location	Conducted RF Area
Temp. / R.H.	70 degrees F / 44% RH
Requirement	FCC 15.247 (a)(2), b(3), (e), (d), and Part 2.1055 (d) IC: RSS-247 5.2 (a), 5.4 (d), 5.2 (b), 5.5, and RSS-GEN 6.1
Method	ANSI C63.10 Sections 6.9, 11.9.1.1, 11.10.2, 11.11, and Section 6.8

Limits:

Minimum 6 dB BW (MHz)
0.5

Maximum Conducted Output Power (dBm)	Maximum Conducted Output Power (watts)
30	1

Power Spectral Density (dBm/ 3 kHz)
8

Spurious Emissions Limit (dBc from Reference Point)
20

Test Parameters

Frequency	2402, 2440, 2478, and 2480 MHz
Settings	VBW and RBW set per requirements of each procedure (see plots). Peak detector used.
Settings	Peak measurement methods used for conducted output power and PSD measurements.
Note	Frequency Stability testing performed at +/- 10% of nominal voltage.
Conducted Tx Spurious Note	All emissions were found to be more than 20 dB below the limit.

Instrumentation

Laird
Smart Technology. Delivered.

Date : 30-Oct-2017 Test : Conducted RF Measurements Job : C-2856

PE : Sha ne Dock Customer : Leviton LES Quote : 317328

No.	Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due Date	Equipment Status
1	EE 960087	44GHz EXA Spectrum Analyzer	Agilent	N9010A	MY53400296	12/22/2016	12/22/2017	Active Calibration
2	AA 960160	UTiFLEX Cable	Micro-Coax	UFC142A-0-0720-20(	218652-001	11/15/2017	11/12/2018	Active Verification

2019 testing

Laird
Smart Technology. Delivered.

Date : 30-Oct-2017 Test : Conducted RF Measurements Job : C-2856

PE : Sha ne Dock Customer : Leviton LES Quote : 317328

No.	Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due Date	Equipment Status
1	EE 960087	Analyzer - Spectrum	Agilent	N9010A	MY53400296	4/24/2019	4/24/2020	Active Calibration
2	AA 960144	Cable	Gore	EKD01D010720	5800373	11/12/2018	12/12/2019	Active Verification
3	AA 960172	Cable	A.H. Systems, Inc	SAC-26G-1	387	6/4/2018	6/4/2020	Active Verification

Table

Bandwidth

Channel	2402 MHz	2440 MHz	2478 MHz	2480 MHz
Power Setting	20	20	20	17
6 dB Bandwidth (kHz)	715.9	713.0	710.2	706.5
99% Bandwidth (MHz)	1.04	1.04	1.05	1.05

Channel	2402 MHz	2440 MHz	2480 MHz
Power Setting	10	10	10
6 dB Bandwidth (kHz)	723.4	714.4	718.4

Measured Conducted Output Power Values below are in dBm.

Power Profile	2402 MHz	2440 MHz	2478 MHz	2480 MHz
1 – Power Setting	20	20	20	17
1 – Measured Output Power	19.0	18.9	13.9	15.9
2 – Power Setting	17	17	-	17
2 – Measured Output Power	16.6	16.5	-	15.9
3 – Power Setting	10	10	-	10
3 – Measured Output Power	7.7	7.3	-	6.7

PSD

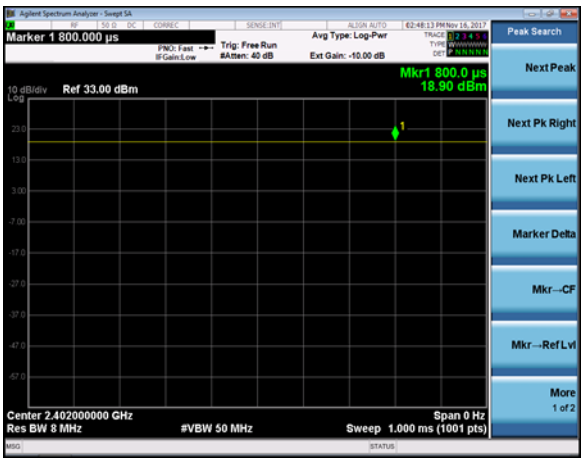
Channel	2402 MHz	2440 MHz	2478 MHz	2480 MHz
Power Setting	20	20	20	17
PSD (dBm)	4.6	4.8	9.8	7.7

Channel	2402 MHz	2440 MHz	2480 MHz
Power Setting	10	10	10
PSD (dBm)	6.841	6.504	5.913

Channel	2.97VDC	3.3VDC	3.63VDC	Freq Deviation
2402 MHz	2401890038	2401890657	2401889947	710.6
2440 MHz	2439887396	2439887522	2439887382	140.8
2478 MHz	2477884888	2477884920	2477884828	91.4
2480 MHz	2479885108	2479884817	2479884018	1089.8

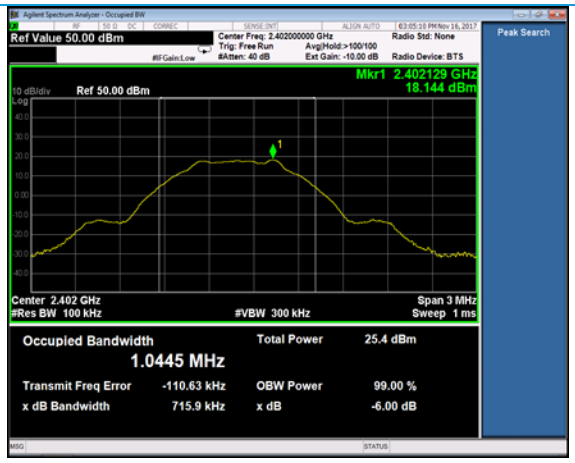
Note: Values above are in Hz.

Plots

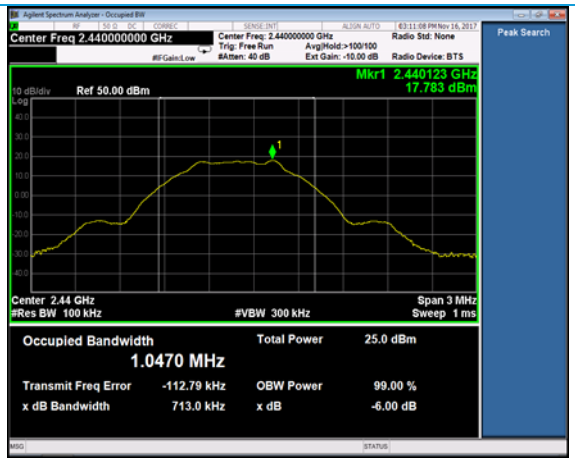


Duty Cycle (100%)

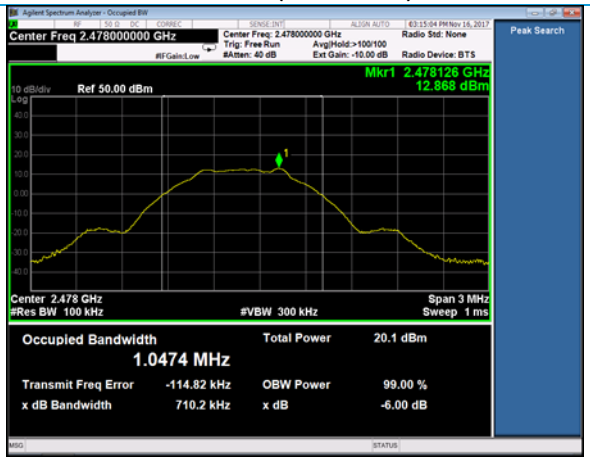
Bandwidth – Profile 1



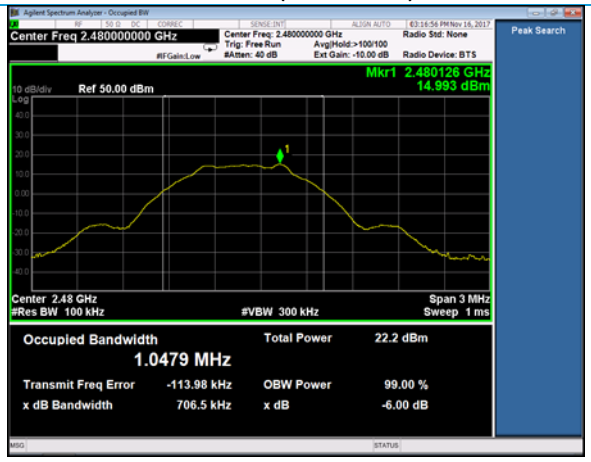
DTS BW (2402 MHz)



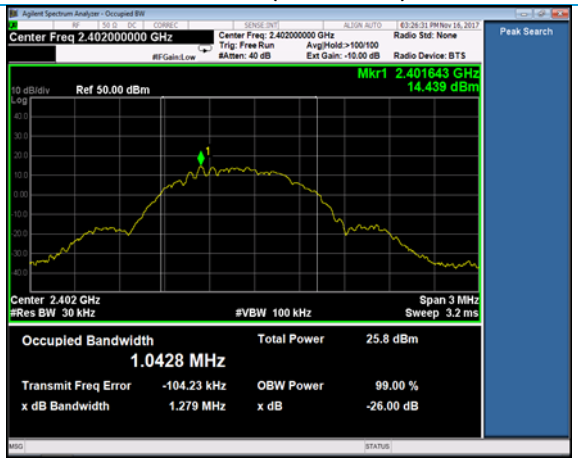
DTS BW (2440 MHz)



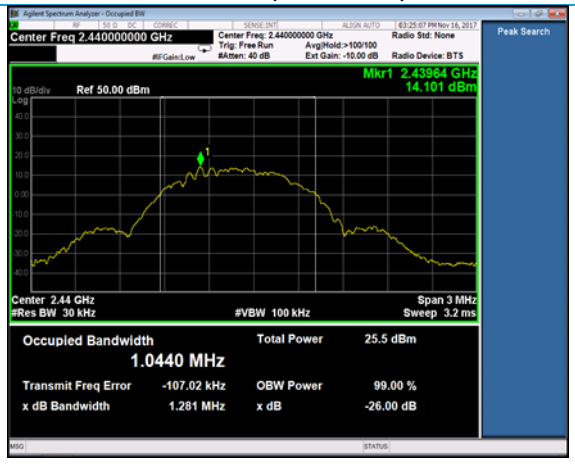
DTS BW (2478 MHz)



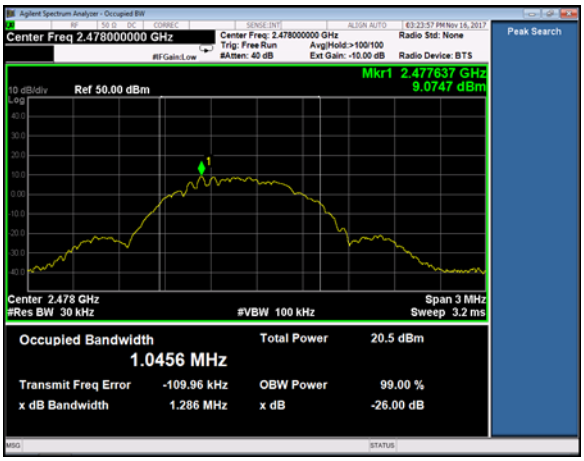
DTS BW (2480 MHz)



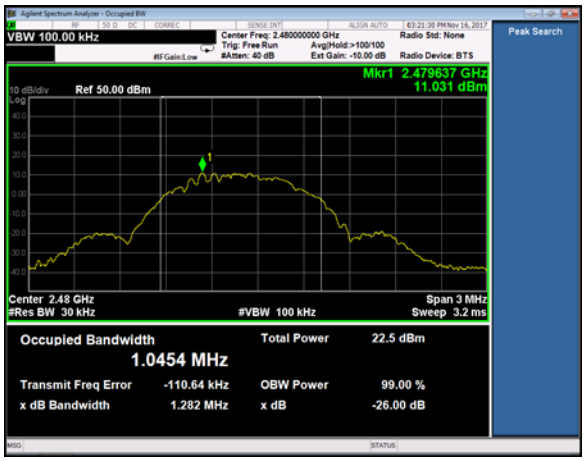
99% BW (2402 MHz)



99% BW (2440 MHz)

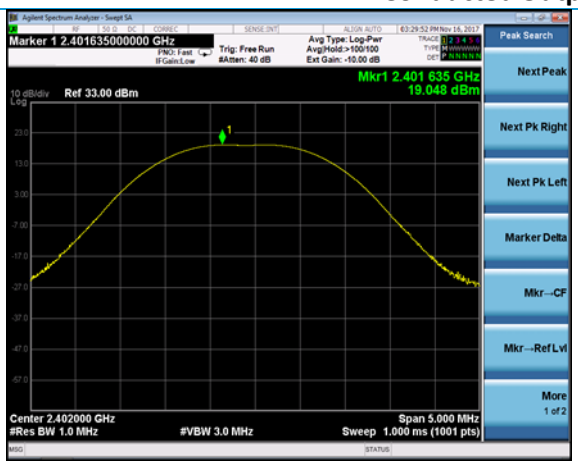


99% BW (2478 MHz)

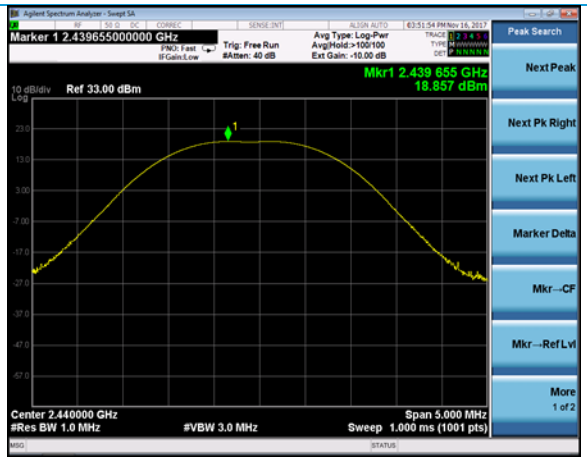


99% BW (2480 MHz)

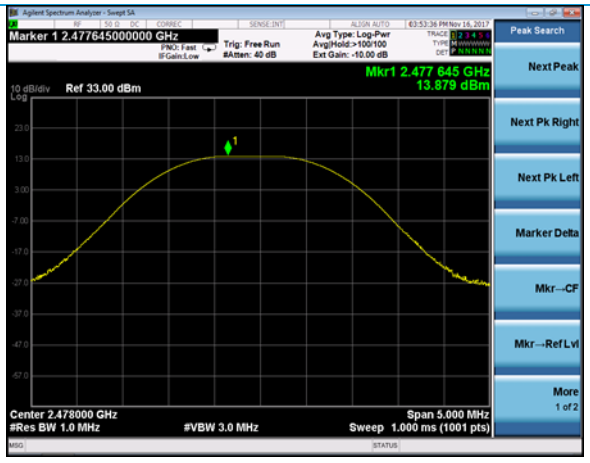
Conducted Output Power – Profile 1



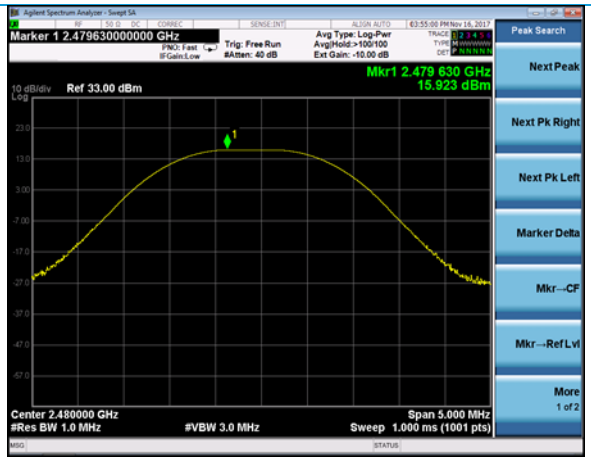
2402 MHz



2440 MHz

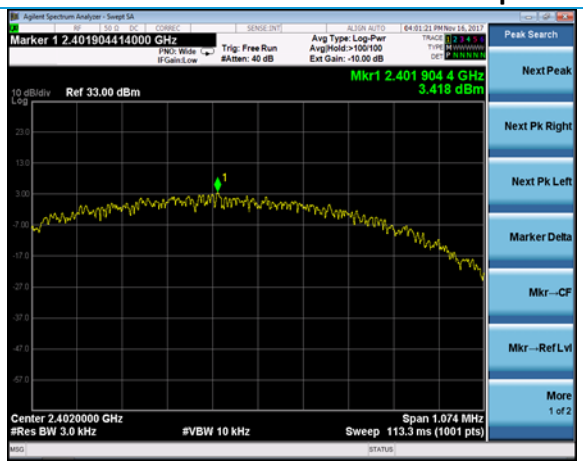


2478 MHz

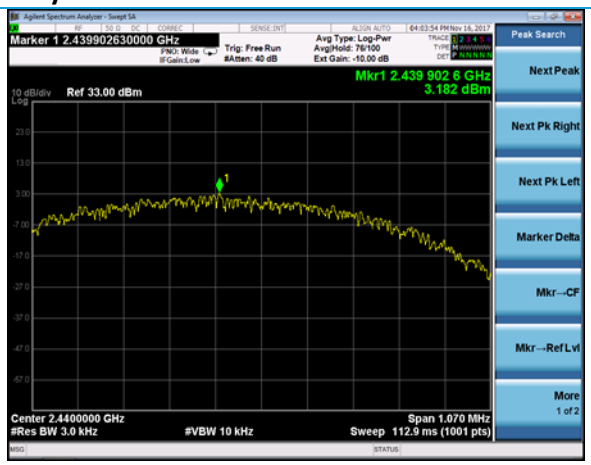


2480 MHz

Power Spectral Density – Profile 1

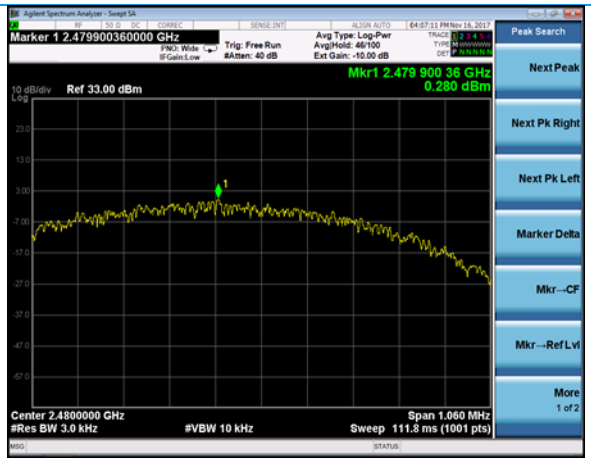


2402 MHz



2440 MHz

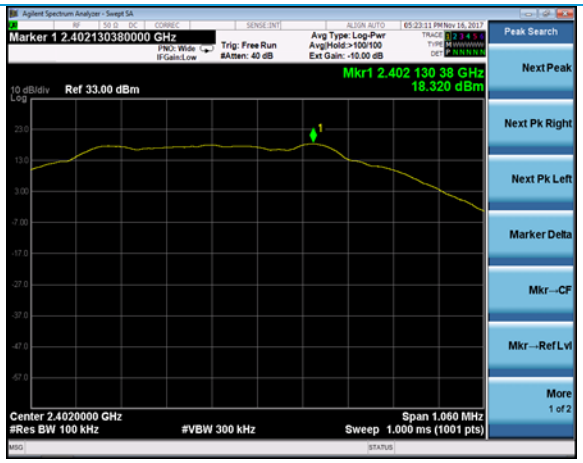
2478 MHz



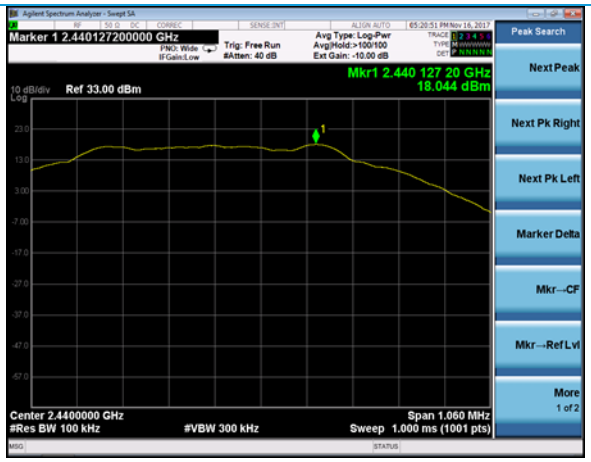
2480 MHz

Conducted Tx Spurious Measurements – Profile 1

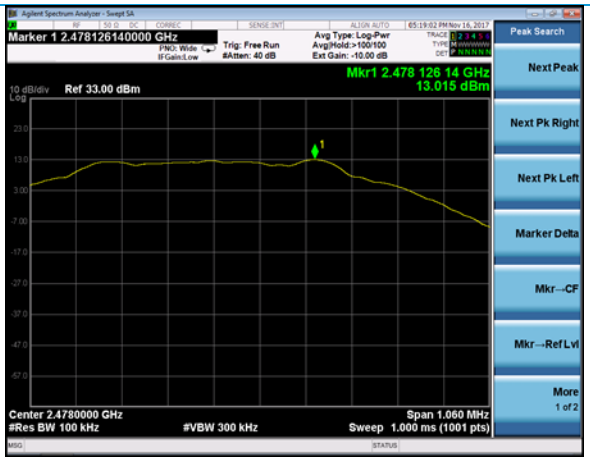
Reference Limits



2402 MHz Channel



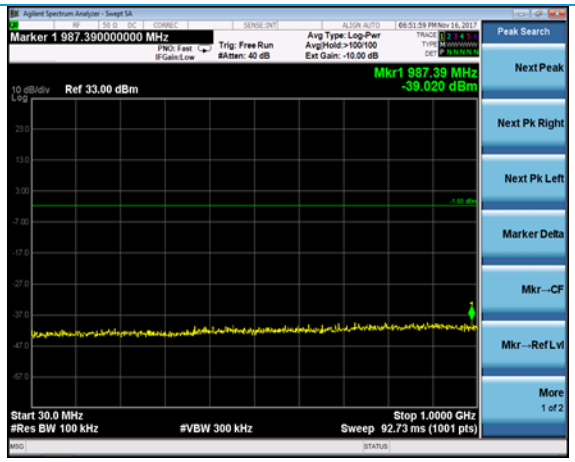
2440 MHz Channel



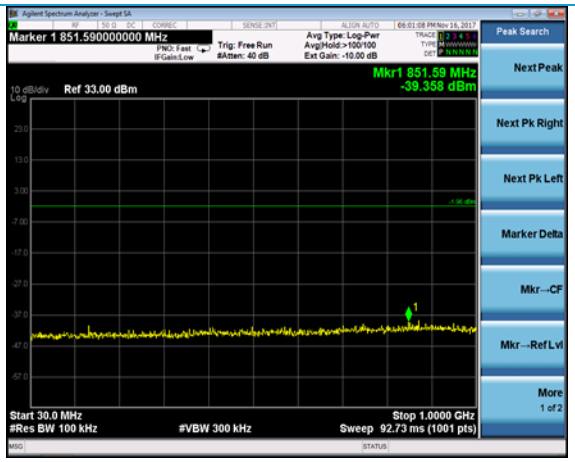
2478 MHz Channel

2480 MHz Channel

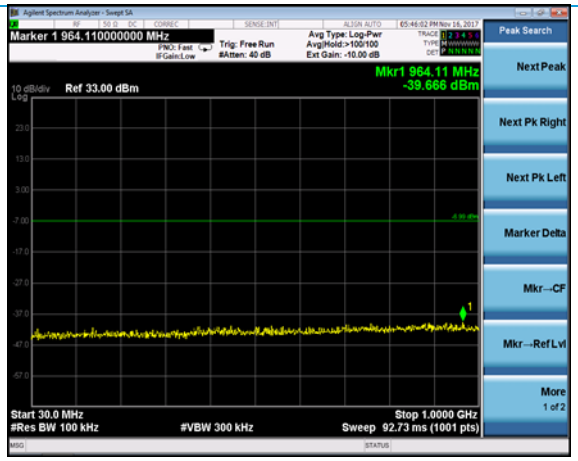
30-1000 MHz



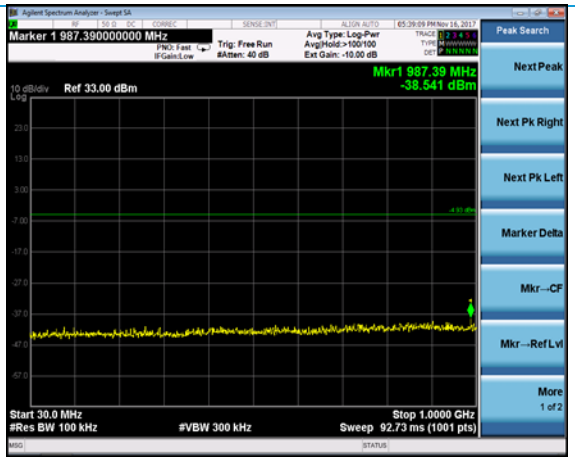
2402 MHz Channel



2440 MHz Channel

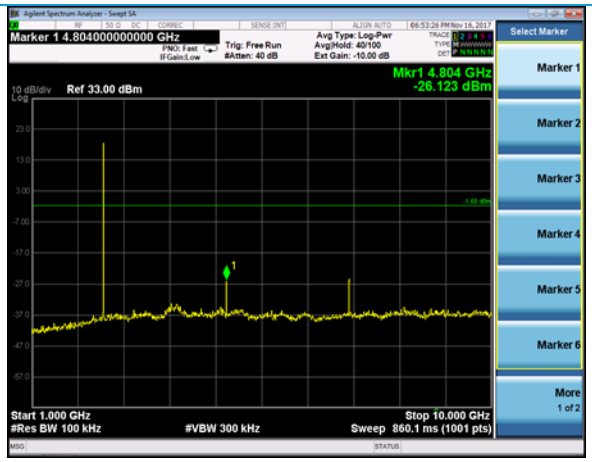


2478 MHz Channel

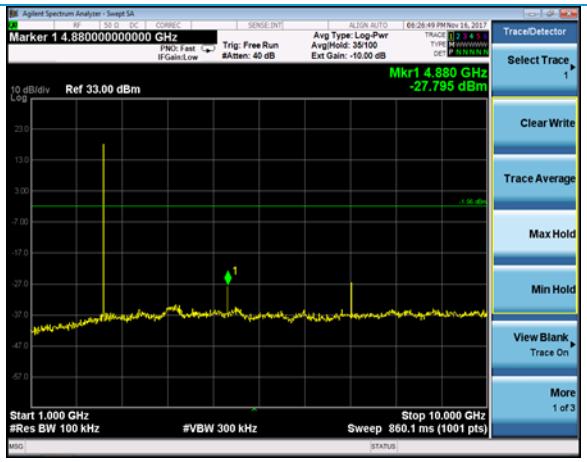


2480 MHz Channel

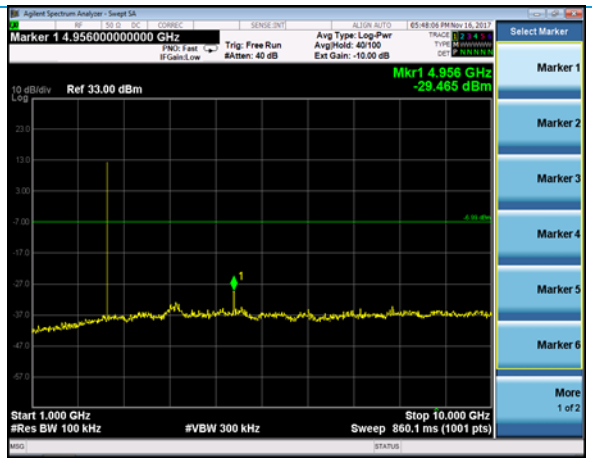
1000-10000 MHz



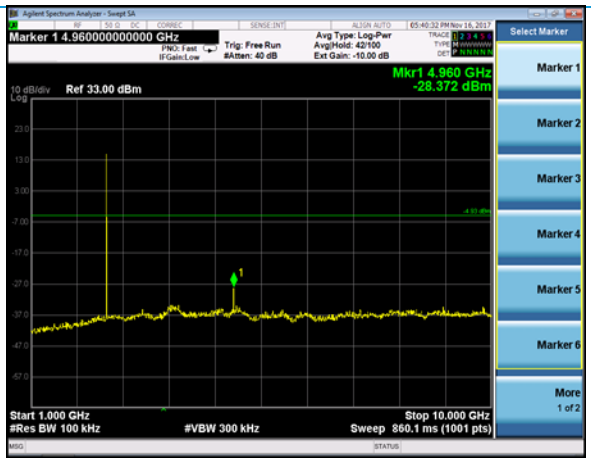
2402 MHz Channel



2440 MHz Channel



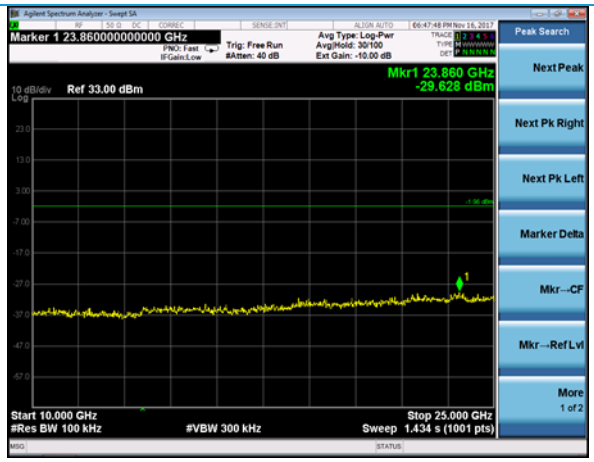
2478 MHz Channel



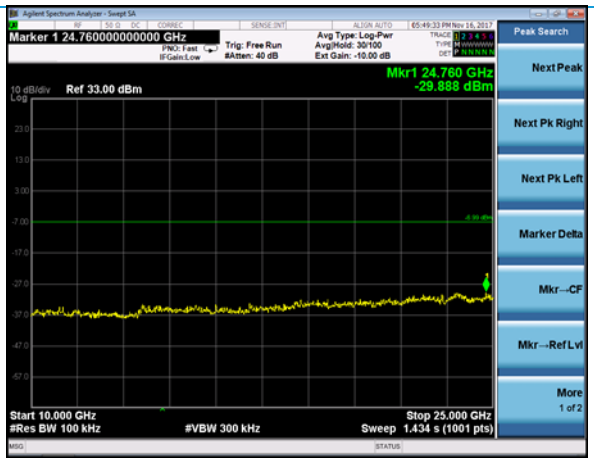
2480 MHz Channel

10000-25000 MHz

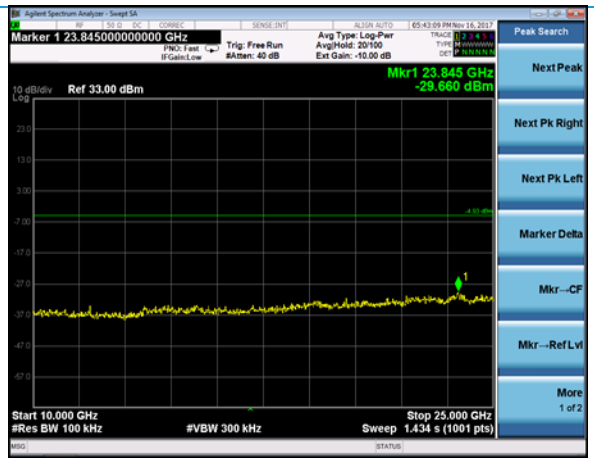
2402 MHz Channel



2440 MHz Channel

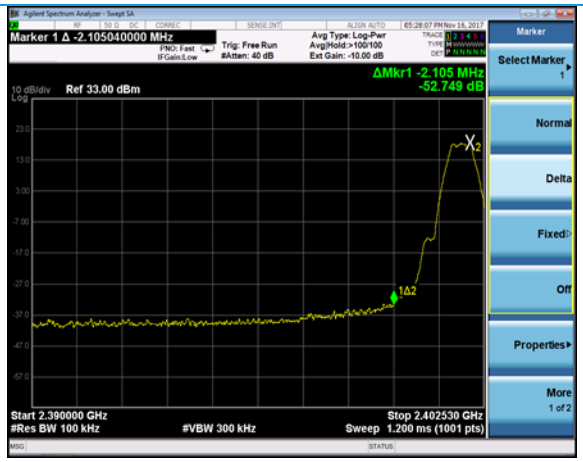


2478 MHz Channel

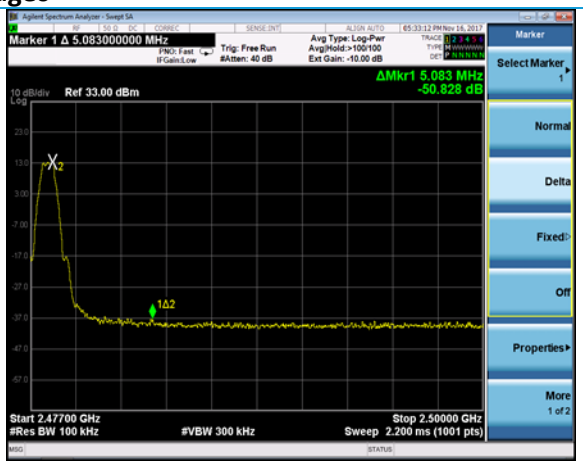


2480 MHz Channel

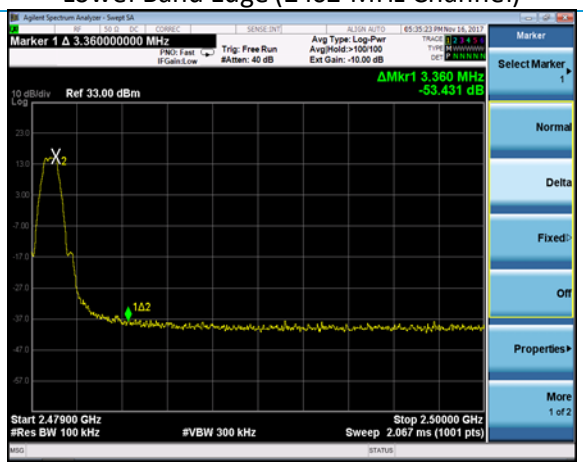
Band Edges



Lower Band Edge (2402 MHz Channel)



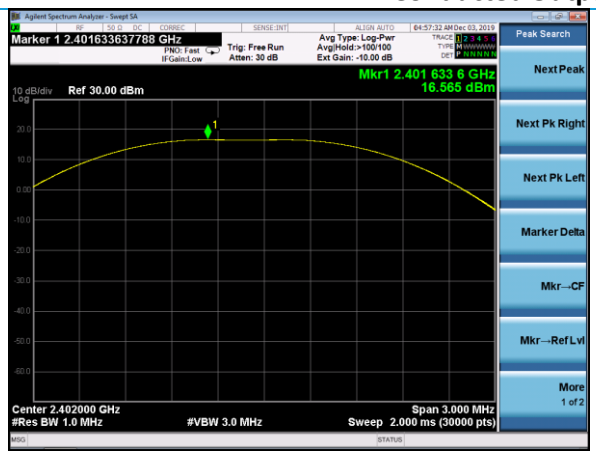
Upper Band Edge (2478 MHz Channel)



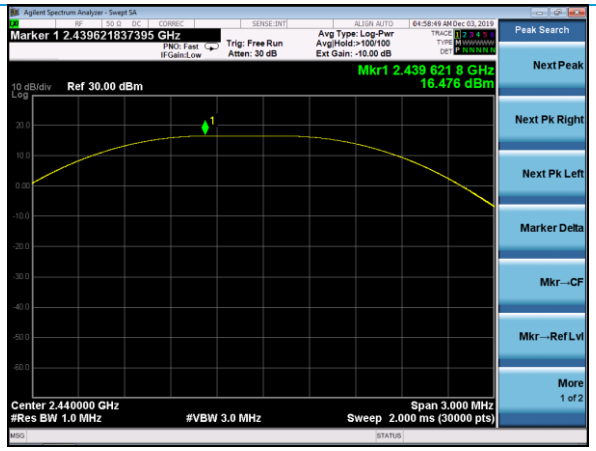
Upper Band Edge (2480 MHz Channel)

Power Profile 2 – Conducted Test Data

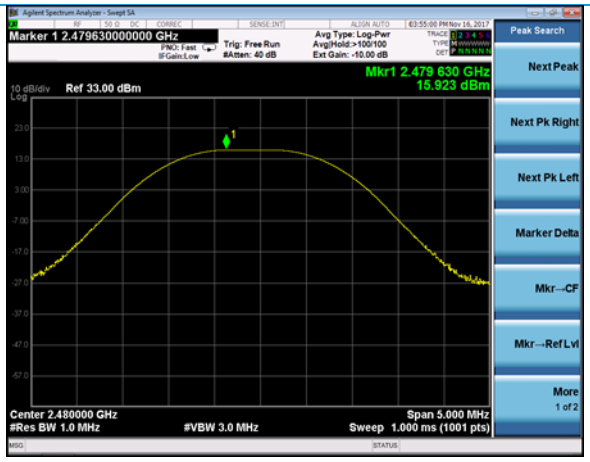
Conducted Output Power – Profile 2



2402 MHz



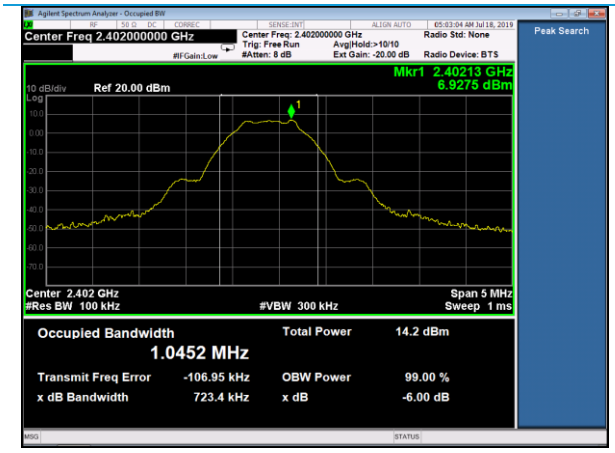
2440 MHz



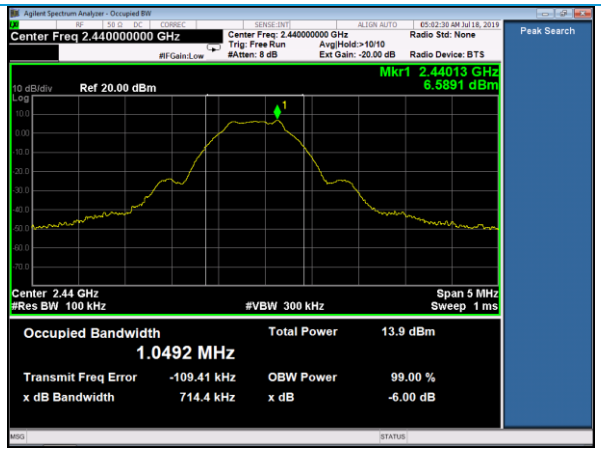
2480 MHz

Power Profile 3 - Conducted Test Data

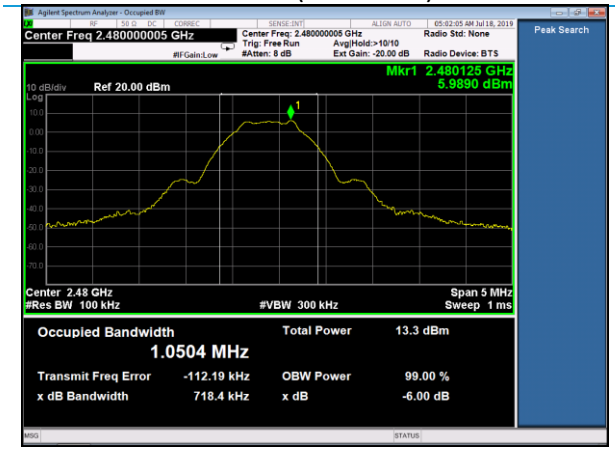
Bandwidth – Profile 3



DTS BW (2402 MHz)

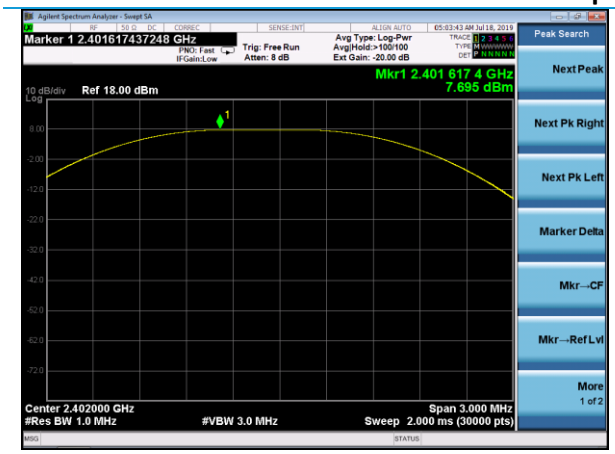


DTS BW (2440 MHz)

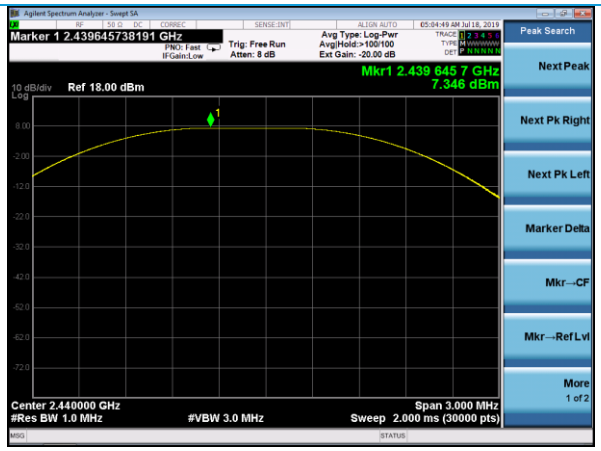


DTS BW (2480 MHz)

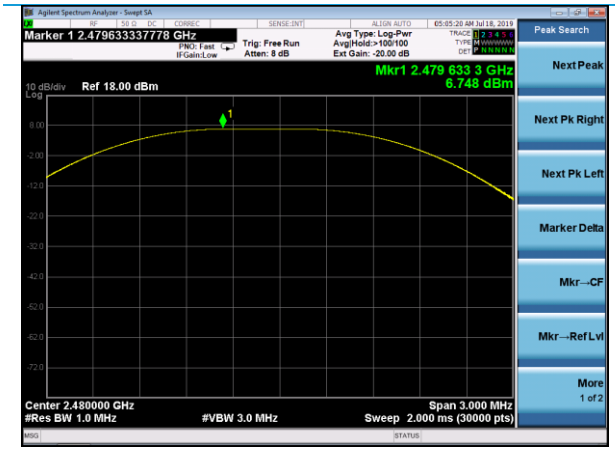
Conducted Output Power – Profile 3



2402 MHz

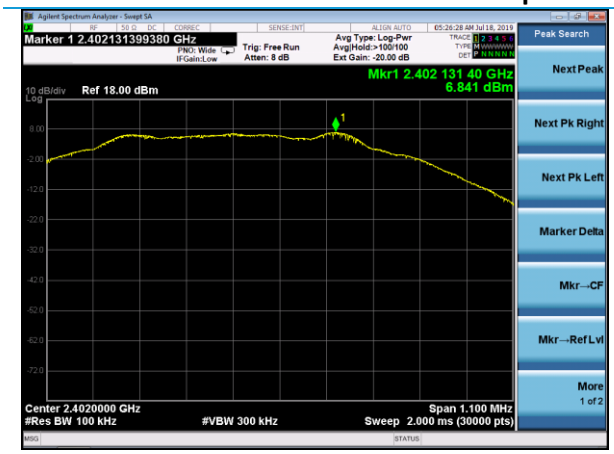


2440 MHz



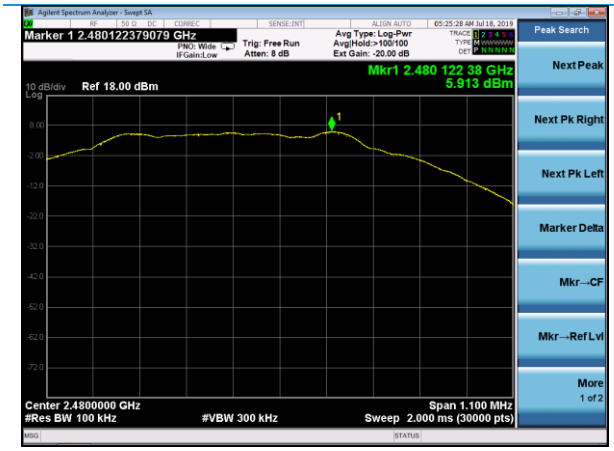
2480 MHz

Power Spectral Density – Profile 3



2402 MHz

2440 MHz



2480 MHz

-

Conducted Tx Spurious Measurements – Profile 3

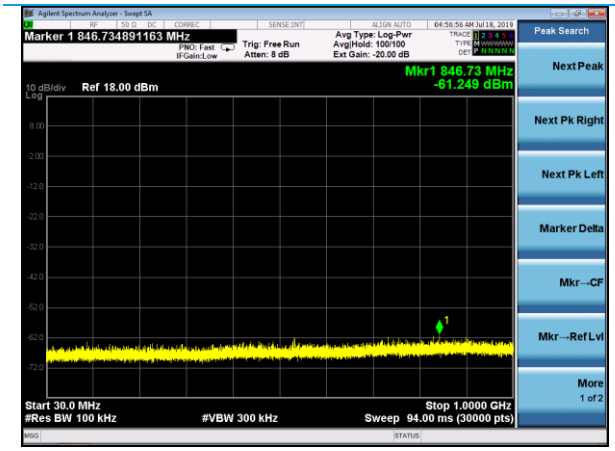
Reference Limits

2402 MHz Channel

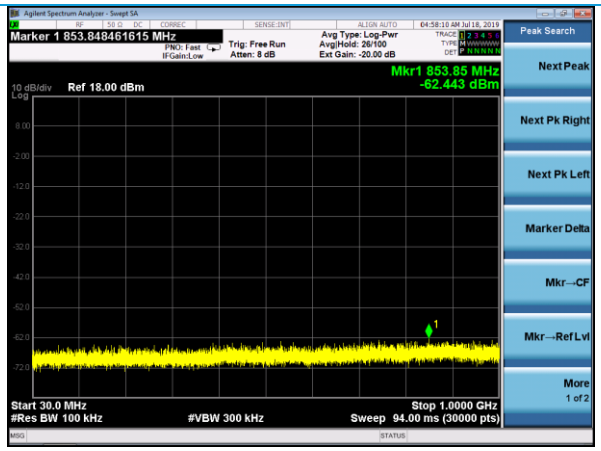
2440 MHz Channel

2480 MHz Channel

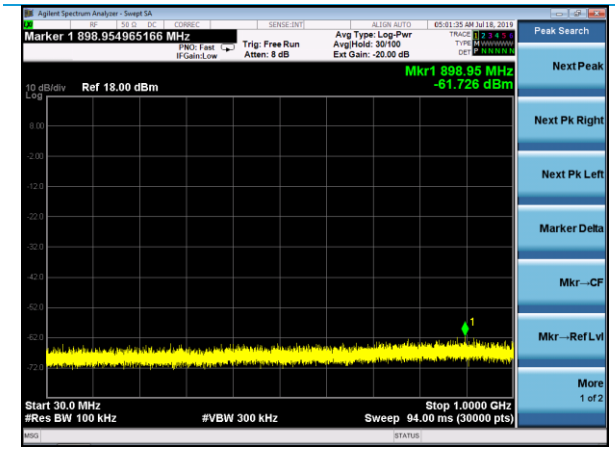
30-1000 MHz



2402 MHz Channel

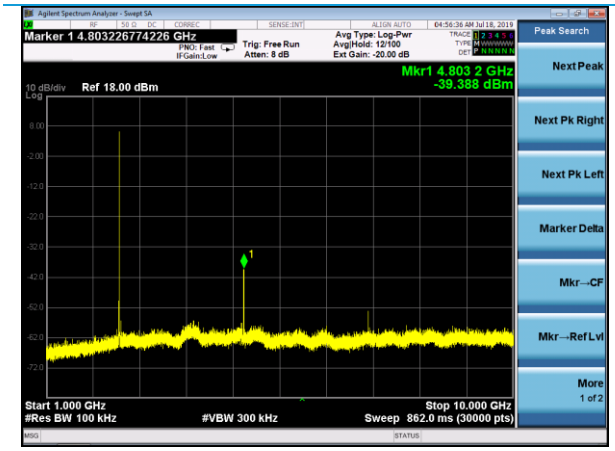


2440 MHz Channel

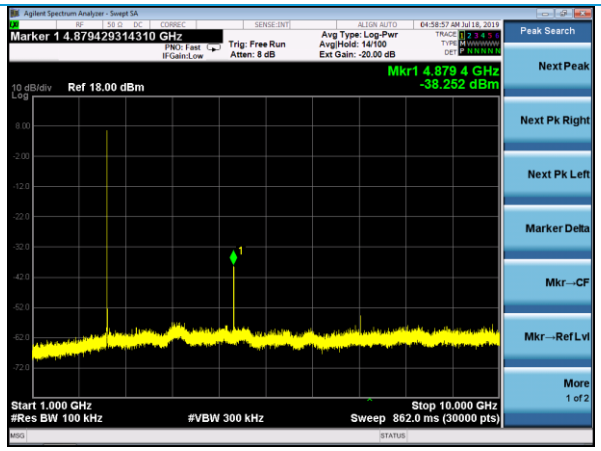


2480 MHz Channel

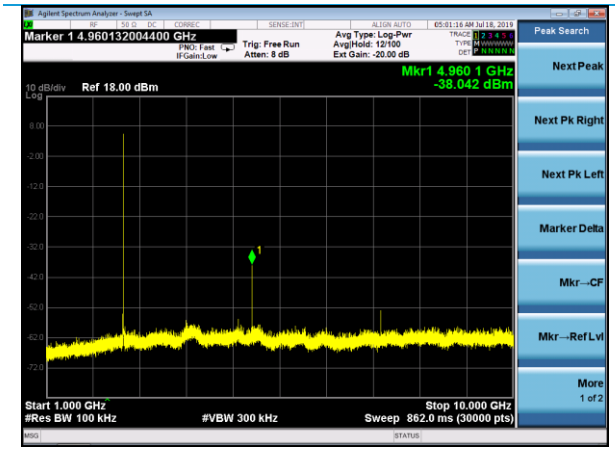
1000-10000 MHz



2402 MHz Channel

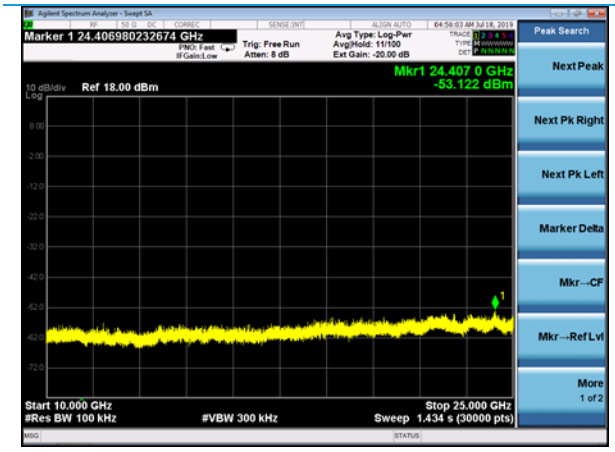


2440 MHz Channel

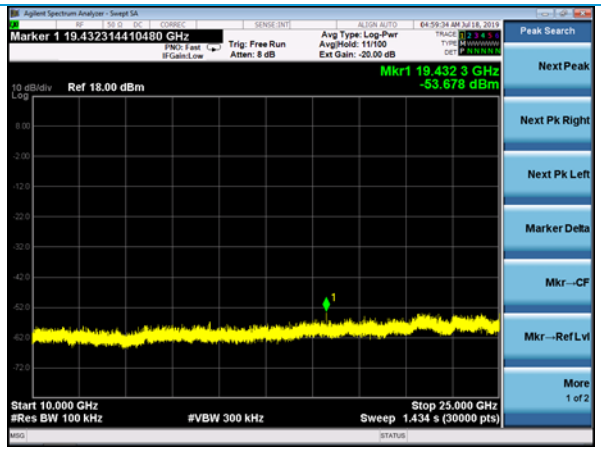


2480 MHz Channel

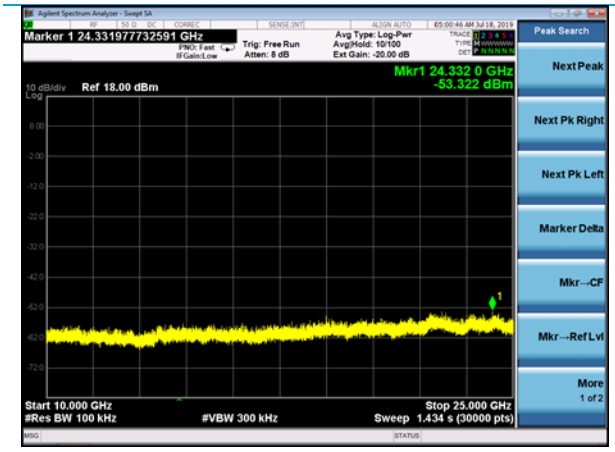
10000-25000 MHz



2402 MHz Channel

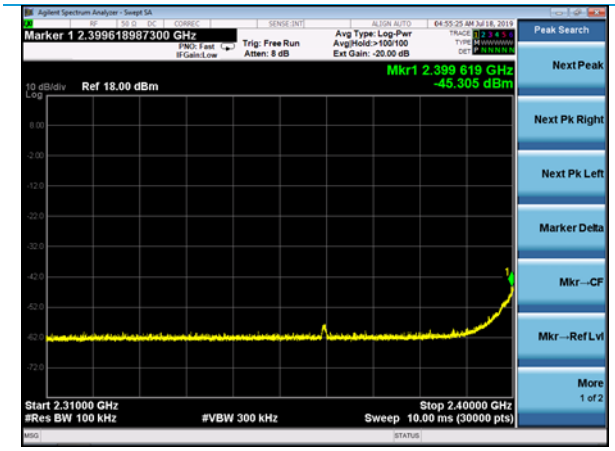


2440 MHz Channel

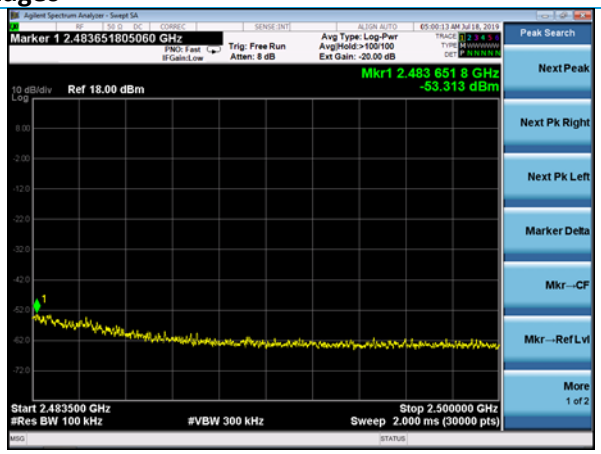


2480 MHz Channel

Band Edges



Lower Band Edge (2402 MHz Channel)

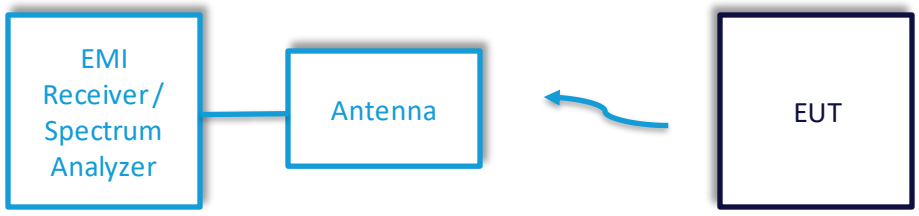


Upper Band Edge (2480 MHz Channel)

5.2 Radiated Emissions

Description of Measurement	The frequency spectrum is investigated for intentional and / or unintentional signals emanating from the EUT by use of a standardized test site and measurement antenna. The antenna, cable, pre-amp, and other necessary measurement system correction factors are loaded onto the EMI receiver / spectrum analyzer when the measurements are performed allowing the data to be gathered and reported as corrected values. The maximum emissions from the EUT are determined by turn-table azimuth rotation (360°) and scanning of the measurement antenna. Maximized levels are noted at degree values of azimuth, measurement antenna height, and measurement antenna polarity.
Example Calculations	Measurement (dBµV) + Cable factor (dB) + Other (dB) + Antenna Factor (dB/m) = Corrected Reading (dBµV/m) Margin (dB) = Limit (dBµV/m) - Corrected Reading (dBµV/m) Example at 4000 MHz: Reading = 40 dBµV + 3.4 dB + 0.9 dB + 6.5 dB/m = 50.8 dBµV/m Average Limit = 20 log (500) = 54 dBµV/m Margin = 54 dBµV/m - 50.8 dBµV/m = 3.2 dB

Block Diagram



5.2.1 Radiated Emissions

Operator	Coty Hammerer
Test Date	11/10/17 – 7/24/19
Location	Chamber 5
Temp. / R.H.	70-74 degrees F/ 30-42% RH
Requirement	FCC: 15.247 (d) IC: RSS-GEN 8.10
Method	ANSI C63.10 Sections 6.5 and 6.6

Limits:

	30-88 MHz	88-216 MHz	216 – 960 MHz	960+ MHz
Field Strength (µV/m)	100	150	200	500
Field Strength (dBµV/m)	40.0	43.5	46.0	54.0

Test Parameters

Frequency	30-25000 MHz
Distance	3m
Settings	Unit tested at Low, Mid, High Channels
Settings	RBW = 120kHz, VBW 1.2 MHz (<1 GHz) RBW = 1 MHz, VBW = 3 MHZ (>1 GHz) 10 Hz VBW used for average measurements
Notes	Measurements taken in restricted bands. For measurements above 1 GHz, antenna used with a tilt gear to keep EUT within the cone of radiation. Absorbers were also added to the floor of the chamber while measuring emissions above 1 GHz. Emissions under 1 GHz are not a function of the EUT.
Example Calculation	Limit (dBµV/m) = 20* Log[Limit (µV/m)] 40 = 20* log (100) Raw Data + Antenna Factor + Cable Factor = Reported Data 19.77 dBµV + 12.50 dB/m + 0.93 dB = 38.80 dBµV/m

Instrumentation

Date : 30-Oct-2017 Test : Spurious Emissions Job : C-2856

PE : Shane Dock Customer : Leviton LES Quote : 317328

No.	Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due Date	Equipment Status
1	AA 960078	Log Periodic Antenna	EMCO	93146	9701-4855	3/31/2016	3/31/2017	Active Calibration
2	AA 960128	Biconical Antenna	ETS Lindgren	3110B	00062899	3/21/2016	3/21/2017	Active Calibration
3	AA 960081	Double Ridge Horn Antenna	EMCO	3115	6907	3/7/2016	3/7/2017	Active Calibration
4	EE 960085	N9038A MXE 26.5GHz Receiver	Agilent	N9038A	MY51210148	5/12/2016	5/12/2017	Active Calibration
5	EE 960088	8GHz MXE Spectrum Analyzer	Agilent	N9038A	MY51210138	2/24/2016	2/23/2017	Active Calibration
6	EE 960087	44GHz EXA Spectrum Analyzer	Agilent	N9010A	MY53400296	12/22/2016	12/22/2017	Active Calibration
7	AA 960176	Cable - low loss 6m	A.H. Systems, Inc	SAC-26G-6	395	12/5/2016	12/5/2017	Active Verification
8	AA 960174	Small Horn Antenna 18-40 GHz	ETS-Lindgren	3116C-PA	00206880	4/23/2016	4/23/2017	Active Calibration
9	AA 960154	2.4GHz High Pass Filter	KWM	HPF-L-14186	7272-02	7/25/2016	7/25/2017	Active Calibration
10	AA 960153	2.4GHz High Pass Filter	KWM	HPF-L-14186	7272-04	4/29/2016	4/29/2017	Active Calibration
11	EE 960096	0.8 - 21GHz LNA	Mini-Circuits	ZVA-213X-S+	40201429	3/7/2016	3/7/2017	Active Calibration

2019 Testing

Date : 30-Oct-2017 Test : Radiated Emissions Job : C-2856

PE : Shane Dock Customer : Leviton LES Quote : 317328

No.	Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due Date	Equipment Status
1	AA 960081	Antenna - Double Ridge Horn	EMCO	3115	6907	4/16/2018	4/16/2020	Active Calibration
2	EE 960085	Analyzer - EMI Receiver	Agilent	N9038A	MY51210148	4/24/2019	4/24/2020	Active Calibration
3	AA 960174	Antenna - Small Horn	ETS Lindgren	3116C-PA	00206880	5/15/2018	5/15/2020	Active Calibration
4	EE 960096	Antenna - Low Noise Amplifier	Mini-Circuits	ZVA-213X-S+	40201429	4/16/2018	4/16/2020	Active Calibration
5	AA 960153	Filter - High Pass 2.4 GHz	KWM	HPF-L-14186	7272-04	4/22/2019	4/22/2020	Active Calibration

Tables – MG12

Band Edge

Peak Frequency (MHz)	Peak Reading (dBµV/m)	Peak Limit (dBµV/m)	Peak Margin (dB)	Avg Frequency (MHz)	Avg Reading (dBµV/m)	Avg Limit (dBµV/m)	Avg Margin (dB)
2364.24	55.0	74.0	19.0	2363.52	43.1	54.0	10.9
2483.65	64.3	74.0	9.7	2483.50	53.7	54.0	0.3
2483.60	59.9	74.0	14.1	2483.50	48.9	54.0	5.1

Harmonics

Frequency (MHz)	Height (cm)	Azimuth (degree)	Peak Reading (dBµV/m)	Avg Reading (dBµV/m)	Avg Limit (dBµV/m)	Margin (dB)	Antenna Polarity	EUT orientation
4804	2.91	97.5	49.5	43.7	54.0	10.3	Vertical	Vertical
4880	1.41	196.5	47.7	42.0	54.0	12.0	Horizontal	Flat
7320	1.71	354	52.9	45.7	54.0	8.3	Horizontal	Side
4956	2.74	87	44.9	38.1	54.0	15.9	Vertical	Vertical
7434	1.32	355	46.0	36.8	54.0	17.2	Horizontal	Side

Table – MG13, MG1

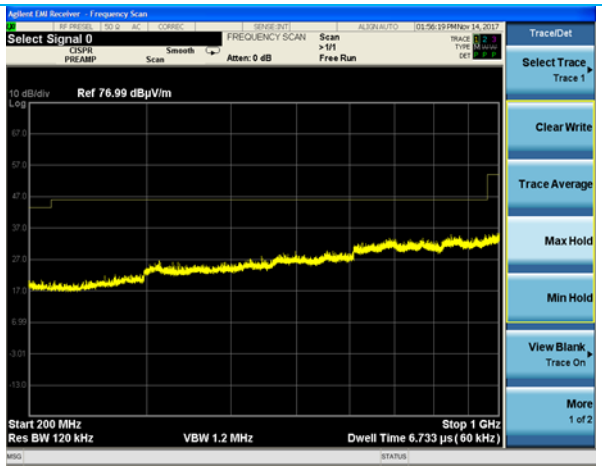
Frequency (MHz)	Height (cm)	Azimuth (degree)	Peak Reading (dBµV/m)	Avg Reading (dBµV/m)	Avg Limit (dBµV/m)	Margin (dB)	Antenna Polarity	EUT orientation	Unit
7320.0	143.0	337.1	56.6	48.2	54.0	5.8	H	V	MG1
7320.0	143.0	0.0	57.6	49.4	54.0	4.6	V	V	MG1
7320.0	199.0	331.9	58.5	50.5	54.0	3.5	H	S	MG1
7320.0	112.0	306.1	53.4	43.4	54.0	10.6	V	S	MG1
7320.0	188.0	0.0	58.9	52.7	54.0	1.3	H	S	MG13
7433.0	150.0	0.0	52.6	41.4	54.0	12.6	H	S	MG13

Tables – MG12 Minimum Power Configuration

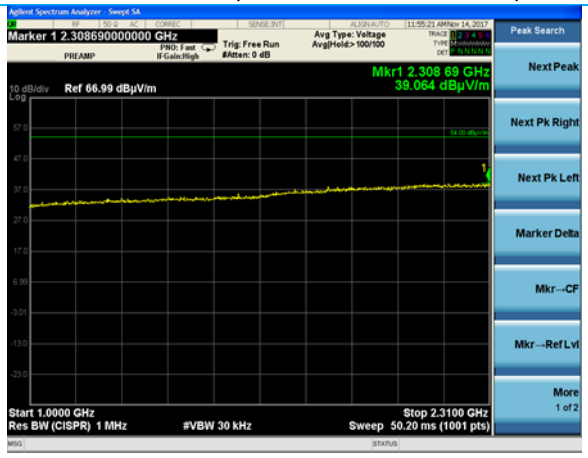
Frequency (GHz)	Antenna Polarity	EUT Orient.	Height (cm)	Azimuth (degree)	Average Measurement (dBµV/m)	Average Limit (dBµV/m)	Average Margin (dB)	Peak Measurement (dBµV/m)	Peak Limit (dBµV/m)	Peak Margin (dB)	Notes
4.960	Vertical	Vertical	187	110	33.1	54.0	20.9	41.8	74.0	32.2	High Channel
4.960	Horizontal	Vertical	215	55	33.5	54.0	20.5	42.1	74.0	31.9	High Channel
4.960	Horizontal	Horiz.	152	59	34.5	54.0	19.5	42.7	74.0	31.3	High Channel
4.960	Vertical	Horiz.	203	25	31.8	54.0	22.2	41.3	74.0	32.7	High Channel
4.960	Vertical	Flat	130	325	34.0	54.0	20.0	43.2	74.0	30.8	High Channel
4.960	Horizontal	Flat	104	306	34.8	54.0	19.2	43.2	74.0	30.8	High Channel
4.804	Horizontal	Flat	104	306	35.4	54.0	18.6	44.3	74.0	29.7	Low Channel
4.880	Horizontal	Flat	107	295	35.5	54.0	18.5	43.7	74.0	30.3	Mid Channel

Plots (Worst-Case Shown, with Polarization) – MG12

30 – 200 MHz (Horizontal Polarization)

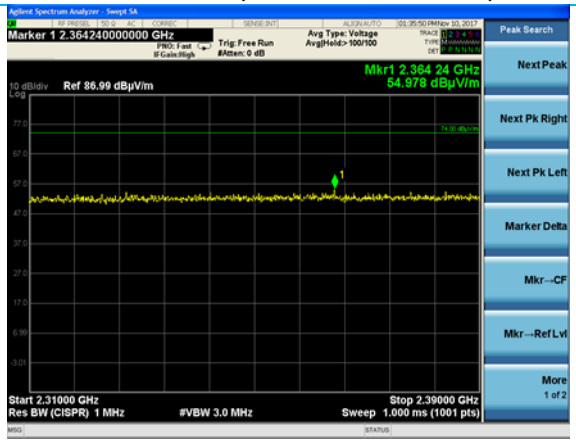


200 – 1000 MHz (Vertical Polarization)

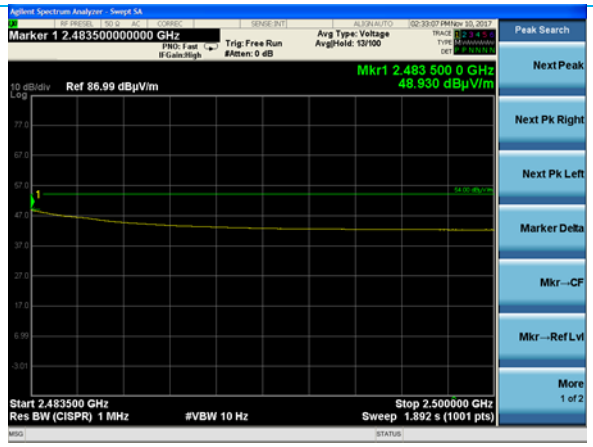


1 – 2.31 GHz (Vertical Polarization)

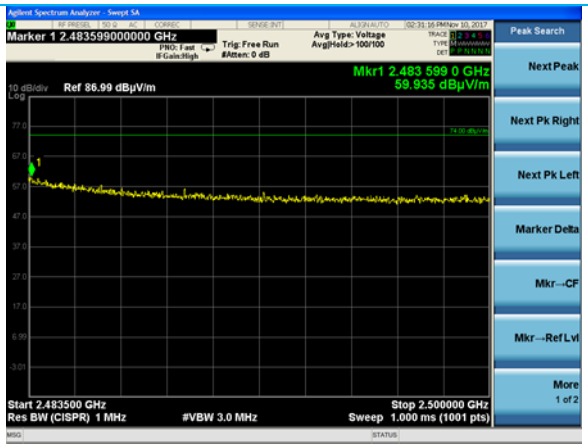
Lower Band Edge (Average)



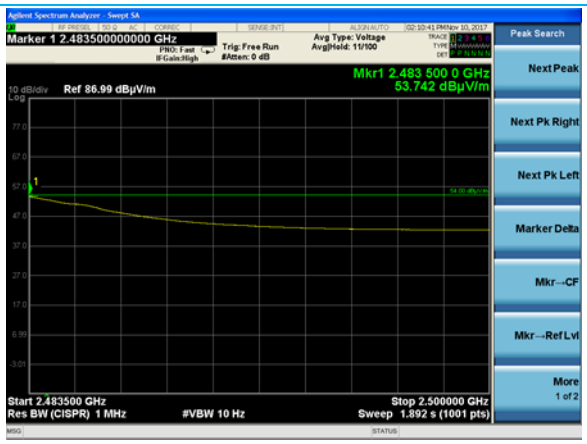
Lower Band Edge (Peak)



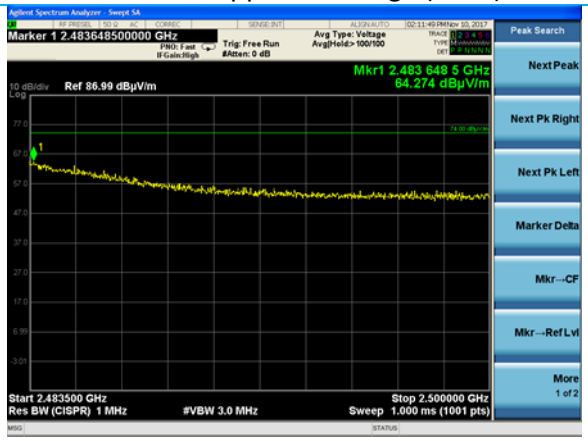
2478 MHz Upper Band Edge (Average)



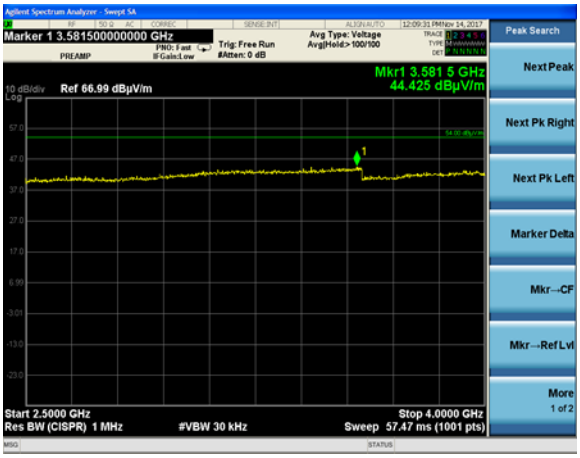
2478 MHz Upper Band Edge (Peak)



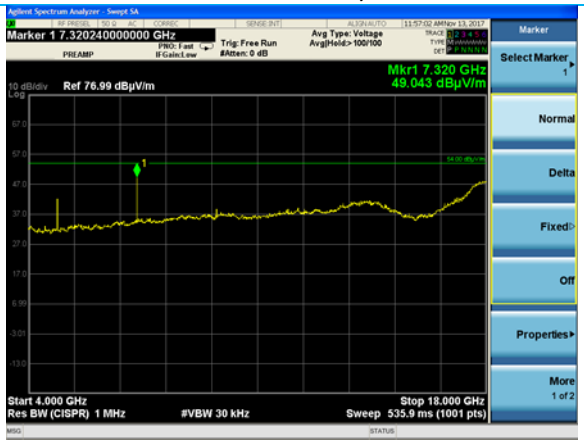
2480 MHz Upper Band Edge (Average)



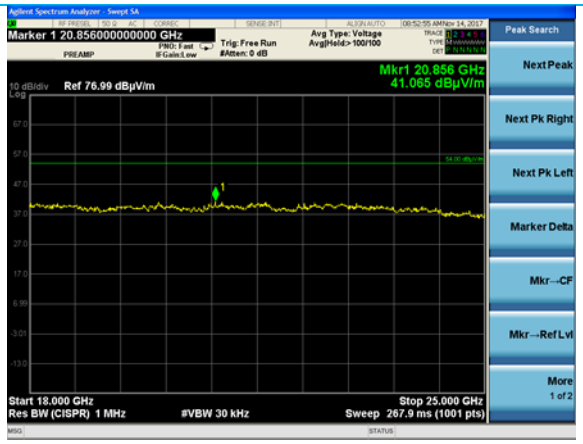
2480 MHz Upper Band Edge (Peak) (Horizontal Polarization)



2.5 – 4 GHz (Vertical Polarization)

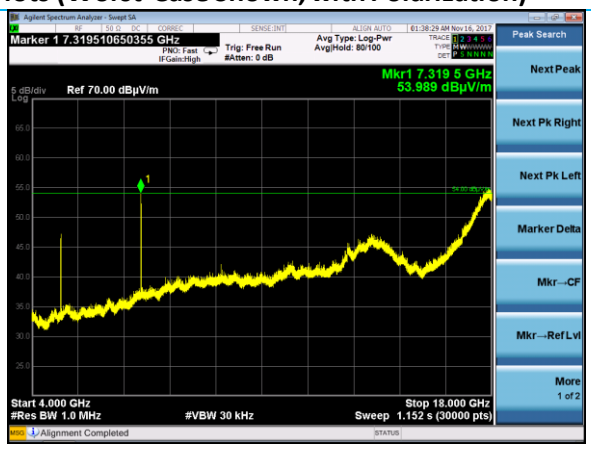


4 – 18 GHz (Horizontal Polarization)



18 – 25 GHz (Horizontal Polarization)

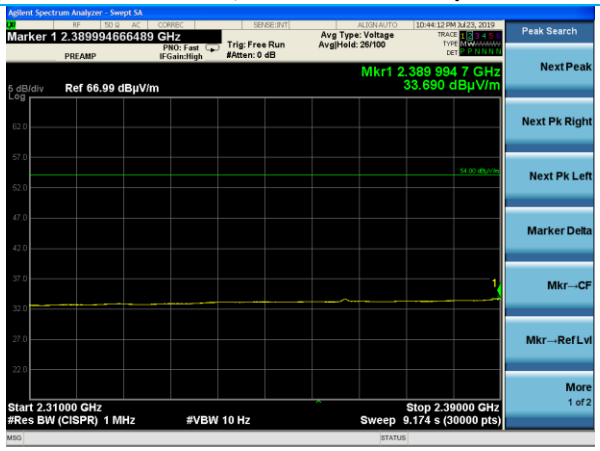
Plots (Worst-Case Shown, with Polarization)



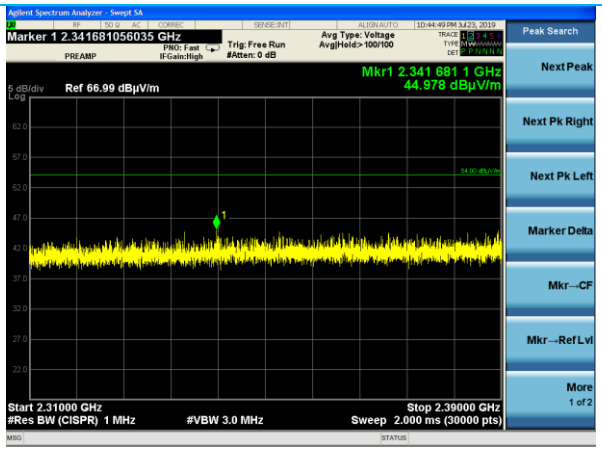
MG13 4 – 18 GHz (Horizontal Polarization)

MG1 4 – 18 GHz (Horizontal Polarization)

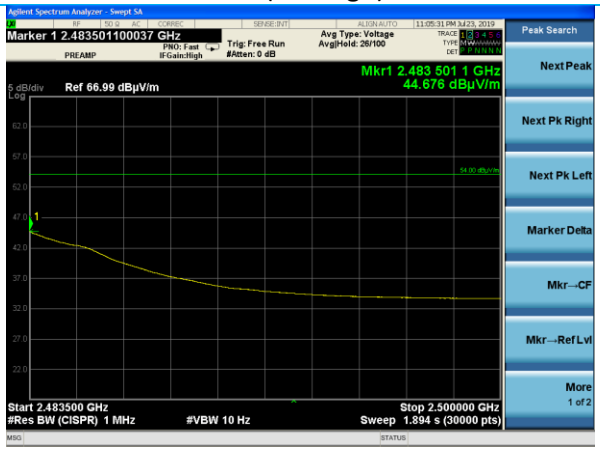
MG12 Minimum Power Configuration Plots (Worst-Case Shown, with Polarization)



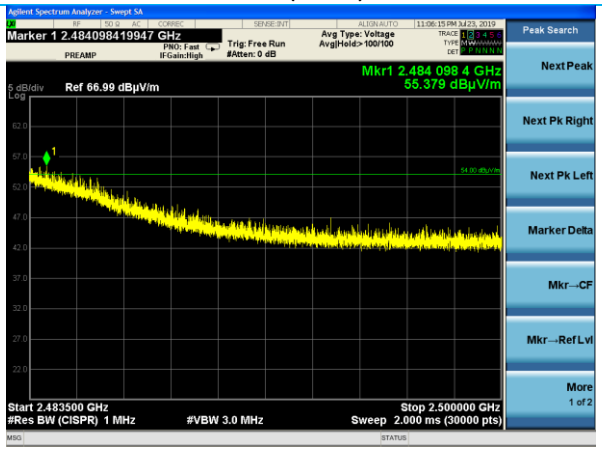
LBE (Average)



LBE (Peak)

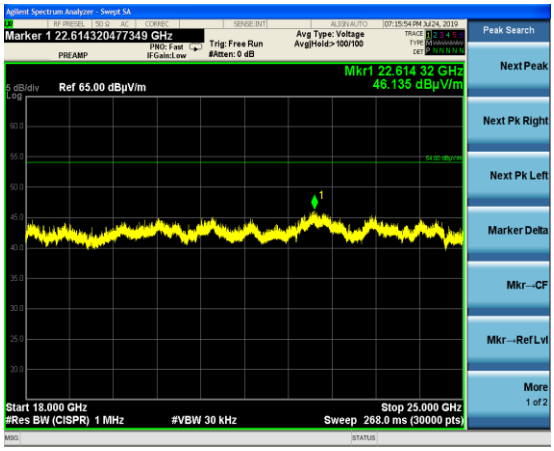


UBE (Average)



UBE (Peak)

4-18 GHz (Horizontal Polarization)

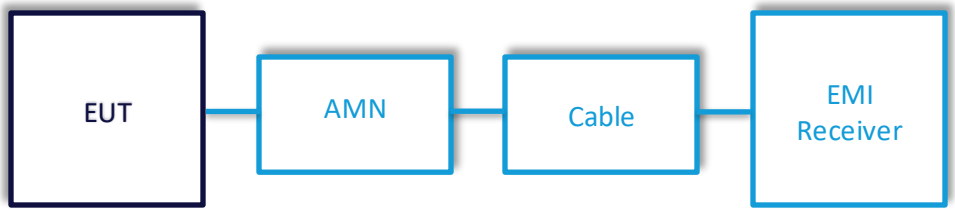


18-25 GHz (Horizontal Polarization)

5.3 AC Mains Conducted Emissions

Description of Measurement	A line impedance stabilization network (LISN) or artificial mains network (AMN) allows the emissions of the power supply conductors to be measured while isolating the EUT from the supply mains. The AMN, cable, and other necessary measurement system correction factors are loaded onto the EMI receiver when the measurements are performed. The data is gathered and reported as the corrected values. Maximum emissions are determined with a peak max hold trace then measurements at a selection of the highest points are made with quasi-peak and average detectors. Results are recorded and compared to limit for each line. (e.g. line and neutral)
Example Calculations	Measurement (dBµV) + Cable factor (dB) + Other (dB) = Corrected Reading (dBµV) Margin (dB) = Limit (dBµV) - Corrected Reading (dBµV)

Block Diagram



5.3.1 AC Mains Conducted Emissions

Operator	Coty Hammerer
Test Date	11/17/2017
Location	Conducted Bench Area
Temp. / R.H.	70 F/ 44%
Requirement	FCC 15.207
Method	ANSI C63.10 Section 6.2

Limits: Class B

Frequency Range (MHz)	Quasi-Peak (dBµV)	Average (dBµV)
0.15 – 0.5	66 to 56	56 to 46
0.5 – 5.0	56	46
5.0 – 30.0	60	50

Test Parameters

Frequency	150kHz - 30 MHz
Detectors	Quasi-Peak, Average
Distance	40 cm from Vertical Ground Plane, 80 cm above Horizontal Ground Plane and any other conductive material
Settings	RBW=9kHz, VBW=90kHz
EUT	120VAC/60 Hz
Notes	EUT tested in Tx mode on Low Channel (Worst-Case)

Instrumentation

Laird
Smart Technology. Delivered.

Date : 30-Oct-2017 Test : Conducted AC Mains Job : C-2856

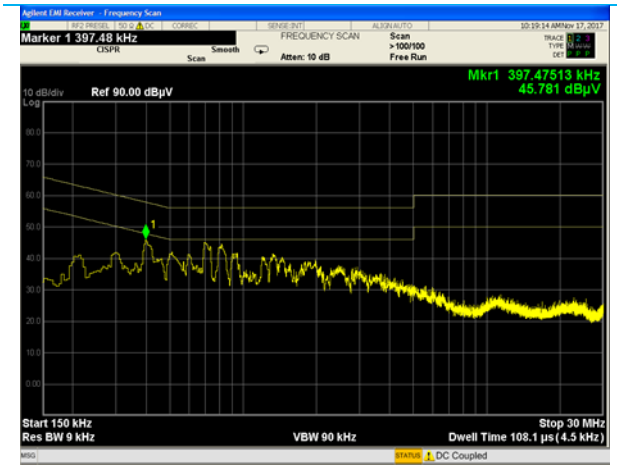
PE : Shane Dock Customer : Leviton LES Quote : 317328

No.	Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due Date	Equipment Status
1	EE 960088	8GHz MXE Spectrum Analyzer	Agilent	N9038A	MY51210138	2/24/2016	2/23/2017	Active Calibration
2	EE 960085	N9038A MXE 26.5GHz Receiver	Agilent	N9038A	MY51210148	5/12/2016	5/12/2017	Active Calibration
3	EE 960162	LISN - 15A	COM-POWER	LI-215A	191969	8/15/2016	8/15/2017	Active Calibration

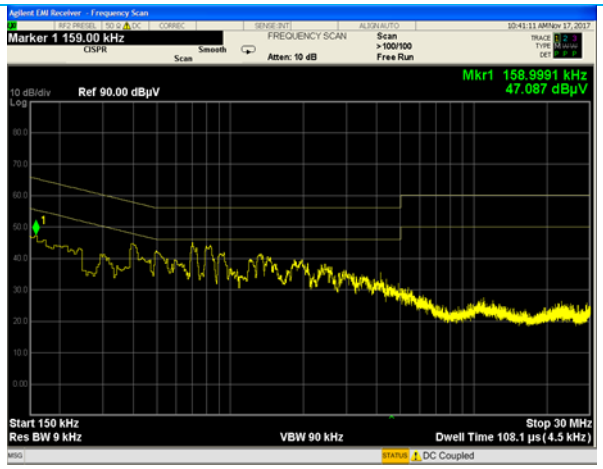
Table

Line	Frequency (MHz)	Q-Peak Reading (dBµV)	Q-Peak Limit (dBµV)	Quasi-Peak Margin (dB)	Average Reading (dBµV)	Average Limit (dBµV)	Average Margin (dB)
2	0.397	42.6	57.9	15.3	33.3	47.9	14.6
2	0.694	40.8	56.0	15.2	28.4	46.0	17.6
2	0.811	40.6	56.0	15.4	29.8	46.0	16.2
1	0.159	42.2	65.5	23.3	32.4	55.5	23.1
1	0.397	42.3	57.9	15.6	32.9	47.9	15.0
1	0.699	41.4	56.0	14.6	29.9	46.0	16.1

Plots



Line 1



Line 2

6 Revision History

Version	Date	Notes	Person
V0	1/9/19	First Draft	Shane Dock
V1	2/25/19	Updated Draft	Shane Dock
V2	4/10/19	Further revision	Shane Dock
V3	5/2/19	Final Draft	Shane Dock
V4	8/1/2019	Added Low Power Data	Shane Dock
V5	11/4/2019	Updated for TCB Responses	Shane Dock
V6	12/3/2019	Added Power Profiles	Shane Dock
V7	12/5/2019	Updated Power Profiles	Shane Dock

END OF REPORT