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02/18/2021

Lutron Electronics Co., Inc.
7200 Suter Road
Coopersburg, PA 18036

Dear Andrew Vaughn,

Enclosed is the EMC Wireless test report for compliance testing of the Lutron Electronics Co., Inc., Darter Keypad as tested to the requirements of Title 47 of the CFR, Ch. 1 (10-1-06 ed.), Part 15 Subpart C for Intentional Radiators.

Thank you for using the services of Eurofins E&E North America. If you have any questions regarding these results or if Eurofins can be of further service to you, please feel free to contact me.

Sincerely yours,
EUROFINS E&E NORTH AMERICA

Joel Huna
Documentation Department

Reference: (\Lutron Electronics Co., Inc.\WIR110653A-FCC247 Rev. 3)

Electromagnetic Compatibility Criteria
Test Report

for the

Lutron Electronics Co., Inc.
Darter Keypad

Tested under
the FCC Certification Rules
contained in
15.247 Subpart C for Intentional Radiators

Report: WIR110653A-FCC247 Rev. 3

02/18/2021

Prepared For:

Lutron Electronics Co., Inc.
7200 Suter Road
Coopersburg, PA 18036

Prepared By:
Eurofins E&E North America
914 West Patapsco Avenue, Baltimore, MD 21230

Electromagnetic Compatibility Criteria
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the FCC Certification Rules
contained in
15.247 Subpart C for Intentional Radiators

Deepak Giri, Project Engineer
Electromagnetic Compatibility Lab

Joel Huna
Documentation Department

Engineering Statement: The measurements shown in this report were made in accordance with the procedures indicated, and the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them. It is further stated that upon the basis of the measurements made, the equipment tested is capable of operation in accordance with the requirements of the FCC Rules Part 15.247 under normal use and maintenance.

Steve Pitta,
Manager, Electromagnetic Compatibility Lab

Report Status Sheet

Revision	Report Date	Reason for Revision
∅	01/22/2021	Initial Issue.
1	01/29/2021	Customer Comments.
2	02/05/2021	Updates per TCB Comments
3	02/18/2021	Updated MPE Calculation

Table of Contents

I. Executive Summary 1
A. Purpose of Test 2
B. Executive Summary 2
II. Equipment Configuration 3
A. Overview 4
B. References 5
C. Test Site 5
D. Measurement Uncertainty 5
E. Description of Test Sample 6
F. Equipment Configuration 6
G. Support Equipment 6
H. Ports and Cabling Information 7
I. Mode of Operation 7
J. Method of Monitoring EUT Operation 7
K. Modifications 7
a) Modifications to EUT 7
b) Modifications to Test Standard 7
L. Disposition of EUT 7
III. Electromagnetic Compatibility Criteria for Intentional Radiators 8
§ 15.203 Antenna Requirement 9
§ 15.207(a) Conducted Emissions Limits 10
§ 15.247(a)(a) 6 dB and 99% Bandwidth 15
§ 15.247(b) Peak Power Output 21
§ 15.247(d) Radiated Spurious Emissions Requirements and Band Edge 27
§ 15.247(c) Spurious Emissions in Non-restricted Bands 43
§ 15.247(e) Peak Power Spectral Density 49
§ 15.247(i) Maximum Permissible Exposure 52
IV. Test Equipment 53
V. Certification & User's Manual Information 55
A. Certification Information 56
B. Label and User's Manual Information 60

List of Tables

Table 1. Executive Summary of EMC Part 15.247 ComplianceTesting 2
Table 2. EUT Summary Table 4
Table 3. References 5
Table 4. Uncertainty Calculations Summary 5
Table 5. Equipment Configuration 6
Table 6. Support Equipment 6
Table 7. Ports and Cabling Information 7
Table 8. Antenna List 9
Table 9. Conducted Limits for Intentional Radiators from FCC Part 15 § 15.207(a) 10
Table 10. Conducted Emissions, 15.207(a), 1 Mbps, Phase Line, Test Results 11
Table 11. Conducted Emissions, 15.207(a), 1 Mbps, Neutral Line, Test Results 12
Table 12: Conducted Emissions, 2 Mbps, Phase, Test Results 13
Table 13: Conducted Emissions, 2 Mbps, Neutral, Test Results 14
Table 14. 6 dB Occupied Bandwidth, 1 Mbps, Test Results 16
Table 15: 6 dB Occupied Bandwidth, 2 Mbps, Test Results 16
Table 16. Output Power Requirements from §15.247(b) 21
Table 17: Duty Cycle Calculation, BLE 1 Mbps 21
Table 18: Duty Cycle Calculation, BLE 2 Mbps 21
Table 19. Peak Power Output, 1 Mbps, Test Results 24
Table 20: Peak Power Output, 2 Mbps, Test Results 24
Table 21. Restricted Bands of Operation 27
Table 22. Radiated Emissions Limits Calculated from FCC Part 15, § 15.209 (a) 28
Table 23. Peak Power Spectral Density, 1 Mbps, Test Results 49
Table 24: Peak Power Spectral Density, 2 Mbps, Test Results 49
Table 25. Test Equipment List 54

List of Figures

Figure 1. Block Diagram of Test Configuration 6
Figure 2: Conducted Emissions, 15.207(a), 1 Mbps, Phase Line 11
Figure 3: Conducted Emissions, 15.207(a), 1 Mbps, Neutral Line 12
Figure 4: Conducted Emissions, 2 Mbps, Phase Plot 13
Figure 5: Conducted Emissions, 2 Mbps, Neutral Plot 14
Figure 7. Block Diagram, Occupied Bandwidth Test Setup 15
Figure 8: Occupied Bandwidth, BLE Low Channel 1 Mbps 6db DTS Bandwidth 17
Figure 9: Occupied Bandwidth, BLE Mid Channel 1 Mbps 6db DTS Bandwidth 17
Figure 10: Occupied Bandwidth, BLE High Channel 1 Mbps 6db DTS Bandwidth 18
Figure 11: 6db DTS Bandwidth BLE Low Channel 2 Mbps 19
Figure 12: 6db DTS Bandwidth BLE Mid Channel 2 Mbps 19
Figure 13: 6db DTS Bandwidth BLE High Channel 2 Mbps 20
Figure 14: Duty Cycle BLE 1 Mbps Low Channel 22
Figure 15: Duty Cycle BLE 1 Mbps Mid Channel 22
Figure 16: Duty Cycle BLE 1 Mbps High Channel 22
Figure 17: Duty Cycle BLE 2 Mbps Low Channel 23
Figure 18: Duty Cycle BLE 2 Mbps Mid Channel 23
Figure 19: Duty Cycle BLE 2 Mbps High Channel 23
Figure 20: Maximum Peak Conducted Output Power BLE Low Channel 1 Mbps 25

Figure 21: Maximum Peak Conducted Output Power BLE Mid Channel 1 Mbps 25
Figure 22: Maximum Peak Conducted Output Power BLE High Channel 1 Mbps 25
Figure 23: Maximum Peak Conducted Output Power BLE Low Channel 2 Mbps 26
Figure 24: Maximum Peak Conducted Output Power BLE Mid Channel 2 Mbps 26
Figure 25: Maximum Peak Conducted Output Power BLE High Channel 2 Mbps 26
Figure 26: Radiated Spurious Emission. BLE 1 Mbps Low Channel 30MHz-1GHz 29
Figure 27: Radiated Emission Average. BLE 1 Mbps Low Channel 1GHz-18GHz 29
Figure 28: Radiated Emission Peak. BLE 1 Mbps Low Channel 1GHz-18GHz 29
Figure 29: Radiated Emission Average. BLE 1 Mbps Low Channel 18GHz-25GHz 30
Figure 30: Radiated Emission Peak. BLE 1 Mbps Low Channel 18GHz-25GHz 30
Figure 31: Radiated Spurious Emission. BLE 1 Mbps Mid Channel 30MHz-1GHz 30
Figure 32: Radiated Emission Average. BLE 1 Mbps Mid Channel 1GHz-18GHz 31
Figure 33: Radiated Emission Peak. BLE 1 Mbps Mid Channel 1GHz-18GHz 31
Figure 34: Radiated Emission Average. BLE 1 Mbps Mid Channel 18GHz-25GHz 31
Figure 35: Radiated Emission Peak. BLE 1 Mbps Mid Channel 18GHz-25GHz 32
Figure 36: Radiated Spurious Emission. BLE 1 Mbps High Channel 30MHz-1GHz 32
Figure 37: Radiated Emission Average. BLE 1 Mbps High Channel 1GHz-18GHz 32
Figure 38: Radiated Emission Peak. BLE 1 Mbps High Channel 1GHz-18GHz 33
Figure 39: Radiated Emission Average. BLE 1 Mbps High Channel 18GHz-25GHz 33
Figure 40: Radiated Emission Peak. BLE 1 Mbps High Channel 18GHz-25GHz 33
Figure 41: Radiated Spurious Emission. BLE 2 Mbps Low Channel 30MHz-1GHz 34
Figure 42: Radiated Emission Average. BLE 2 Mbps Low Channel 1GHz-18GHz 34
Figure 43: Radiated Emission Peak. BLE 2 Mbps Low Channel 1GHz-18GHz 34
Figure 44: Radiated Emission Average. BLE 2 Mbps Low Channel 18GHz-25GHz 35
Figure 45: Radiated Emission Peak. BLE 2 Mbps Low Channel 18GHz-25GHz 35
Figure 46: Radiated Spurious Emission. BLE 2 Mbps Mid Channel 30MHz-1GHz 35
Figure 47: Radiated Emission Average. BLE 2 Mbps Mid Channel 1GHz-18GHz 36
Figure 48: Radiated Emission Peak. BLE 2 Mbps Mid Channel 1GHz-18GHz 36
Figure 49: Radiated Emission Average. BLE 2 Mbps Mid Channel 18GHz-25GHz 36
Figure 50: Radiated Emission Peak. BLE 2 Mbps Mid Channel 18GHz-25GHz 37
Figure 51: Radiated Spurious Emission. BLE 2 Mbps High Channel 30MHz-1GHz 37
Figure 52: Radiated Emission Average. BLE 2 Mbps High Channel 1GHz-18GHz 37
Figure 53: Radiated Emission Peak. BLE 2 Mbps High Channel 1GHz-18GHz 38
Figure 54: Radiated Emission Average. BLE 2 Mbps High Channel 18GHz-25GHz 38
Figure 55: Radiated Emission Peak. BLE 2 Mbps High Channel 18GHz-25GHz 38
Figure 56: Restricted Band Edge Average. BLE 1 Mbps Low Channel 39
Figure 57: Restricted Band Edge Average. BLE 1 Mbps High Channel 39
Figure 58: Restricted Band Edge Peak. BLE 1 Mbps Low Channel 40
Figure 59: Restricted Band Edge Peak. BLE 1 Mbps High Channel 40
Figure 60: Restricted Band Edge Average. BLE 2 Mbps Low Channel 41
Figure 61: Restricted Band Edge Peak. BLE 2 Mbps Low Channel 41
Figure 62: Restricted Band Edge Average. BLE 2 Mbps High Channel 41
Figure 63: Restricted Band Edge Peak. BLE 2 Mbps High Channel 42
Figure 64: Conducted Spurious Emission Reference Level BLE 1 Mbps High Channel 44
Figure 65: Conducted Spurious Emission Band Edge BLE 1 Mbps High Channel 44
Figure 66: Conducted Spurious Emission BLE 1 Mbps High Channel 30MHz - 25GHz 44
Figure 67: Conducted Spurious Emission BLE 1 Mbps Low Channel 30MHz - 25GHz 45
Figure 68: Conducted Spurious Emission Reference Level BLE 1 Mbps Mid Channel 45
Figure 69: Conducted Spurious Emission BLE 1 Mbps Mid Channel 30MHz - 25GHz 45
Figure 70: Conducted Spurious Emission Reference Level BLE 2 Mbps Low Channel 46
Figure 71: Conducted Spurious Emission Band Edge BLE 2 Mbps Low Channel 46

Figure 72: Conducted Spurious Emission BLE 2 Mbps Low Channel 30MHz - 25GHz 46
Figure 73: Conducted Spurious Emission BLE 2 Mbps Mid Channel 30MHz - 25GHz 47
Figure 74: Conducted Spurious Emission Reference Level BLE 2 Mbps High Channel 47
Figure 75: Conducted Spurious Emission Band Edge BLE 2 Mbps High Channel 47
Figure 76: Conducted Spurious Emission BLE 2 Mbps High Channel 30MHz - 25GHz 48
Figure 77: Power Spectral Density BLE 1 Mbps Low Channel Peak 50
Figure 78: Peak Power Spectral Density BLE 1 Mbps Mid Channel 50
Figure 79: Peak Power Spectral Density BLE 1 Mbps High Channel 50
Figure 80: Peak Power Spectral Density BLE 2 Mbps Low Channel 51
Figure 81: Peak Power Spectral Density BLE 2 Mbps Mid Channel 51
Figure 82: Peak Power Spectral Density BLE 2 Mbps High Channel 51

List of Terms and Abbreviations

AC	**A**lternating **C**urrent
ACF	**A**ntenna **C**orrection **F**actor
Cal	**Cal**ibration
d	**M**easurement **D**istance
dB	**D**eci**b**els
dBµA	**D**eci**b**els above one **micro**amp
dBµV	**D**eci**b**els above one **micro**volt
dBµA/m	**D**eci**b**els above one **micro**amp **per m**eter
dBµV/m	**D**eci**b**els above one **micro**volt **per m**eter
DC	**D**irect **C**urrent
E	**E**lectric Field
DSL	**D**igital **S**ubscriber **L**ine
ESD	**E**lectro**s**tatic **D**ischarge
EUT	**E**quipment **U**nder **T**est
f	**F**requency
FCC	**F**ederal **C**ommunications **C**ommission
GRP	**G**round **R**eference **P**lane
H	Magnetic Field
HCP	**H**orizontal **C**oupling **P**lane
Hz	**H**er**z**
IEC	**I**nternational **E**lectrotechnical **C**ommission
kHz	**k**ilo**h**er**z**
kPa	**k**ilo**pa**scal
kV	**k**ilo**v**olt
LISN	**L**ine **I**mpedance **S**tabilization **N**etwork
MHz	**M**ega**h**ertz
µH	**microh**enry
µ	**microf**arad
µs	**micros**econds
NEBS	**N**etwork **E**quipment-**B**uilding **S**ystem
PRF	**P**ulse **R**epetition **F**requency
RF	**R**adio **F**requency
RMS	**R**oot-**M**ean-**S**quare
TWT	**T**raveling **W**ave **T**ube
V/m	**V**olts **per m**eter
VCP	**V**ertical **C**oupling **P**lane

I. Executive Summary

A. Purpose of Test

An EMC evaluation was performed to determine compliance of the Lutron Electronics Co., Inc. Darter Keypad, with the requirements of Part 15, §15.247. All references are to the most current version of Title 47 of the Code of Federal Regulations in effect. In accordance with §2.1033, the following data is presented in support of the Certification of the Darter Keypad. Lutron Electronics Co., Inc. should retain a copy of this document which should be kept on file for at least two years after the manufacturing of the Darter Keypad, has been **permanently** discontinued.

B. Executive Summary

The following tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15, §15.247, in accordance with Lutron Electronics Co., Inc., purchase order number 5231500. All tests were conducted using measurement procedure ANSI C63.10 2013.

FCC Reference 47 CFR Part 15.247:2005	Description	Compliance
Title 47 of the CFR, Part 15 §15.203	Antenna Requirement	Compliant
Title 47 of the CFR, Part 15 §15.207(a)	Conducted Emission Limits	Compliant
Title 47 of the CFR, Part 15 §15.247(a)(2)	6dB Occupied Bandwidth	Compliant
Title 47 of the CFR, Part 15 §15.247(b)	Peak Power Output	Compliant
Title 47 of the CFR, Part 15 §15.247(d)	Spurious Emissions in Non-restricted Bands	Compliant
Title 47 of the CFR, Part 15 §15.247(d); §15.209; §15.205	Radiated Spurious Emissions Requirements	Compliant
Title 47 of the CFR, Part 15; §15.247(e)	Peak Power Spectral Density	Compliant
Title 47 of the CFR, Part 15 §15.247(i)	Maximum Permissible Exposure (MPE)	Compliant

Table 1. Executive Summary of EMC Part 15.247 ComplianceTesting

Eurofins MET Laboratories Inc. (Eurofins E&E North America) is part of the Eurofins Electrical & Electronics (E&E) global compliance network.

II. Equipment Configuration

A. Overview

Eurofins E&E North America was contracted by Lutron Electronics Co., Inc. to perform testing on the Darter Keypad, under Lutron Electronics Co., Inc.'s purchase order number 5231500.

This document describes the test setups, test methods, required test equipment, and the test limit criteria used to perform compliance testing of the Lutron Electronics Co., Inc., Darter Keypad.

The results obtained relate only to the item(s) tested.

Model(s) Tested:	Darter Keypad	
Model(s) Covered:	Darter Keypad	
EUT Specifications:	Primary Power: 120 - 277 VAC	
	FCC ID: JPZ0136	
	Type of Modulations:	GFSK
	Equipment Code:	DTS
	Peak RF Output Power:	17.73 dBm conducted
	EUT Frequency Ranges:	2402 - 2480 MHz
Analysis:	The results obtained relate only to the item(s) tested.	
Environmental Test Conditions:	Temperature: 15-35º C	
	Relative Humidity: 30-60%	
	Barometric Pressure: 860-1060 mbar	
Evaluated by:	Deepak Giri	
Report Date(s):	02/18/2021	

Table 2. EUT Summary Table

B. References

CFR 47, Part 15, Subpart C	Federal Communication Commission, Code of Federal Regulations, Title 47, Part 15: General Rules and Regulations, Allocation, Assignment, and Use of Radio Frequencies
ANSI C63.4:2014	Methods and Measurements of Radio-Noise Emissions from Low-Voltage Electrical And Electronic Equipment in the Range of 9 kHz to 40 GHz
ISO/IEC 17025:2017	General Requirements for the Competence of Testing and Calibration Laboratories
ANSI C63.10-2013	American National Standard for Testing Unlicensed Wireless Devices
KDB 558074 v05r02	Guidance For Performing Compliance Measurements On Digital Transmission Systems (DTS) Operating Under Section 15.247

Table 3. References

C. Test Site

All testing was performed at Eurofins E&E North America, 914 West Patapsco Avenue, Baltimore, MD 21230. All equipment used in making physical determinations is accurate and bears recent traceability to the National Institute of Standards and Technology.

Radiated Emissions measurements were performed in a 3 meter semi-anechoic chamber (equivalent to an Open Area Test Site). In accordance with §2.948(a)(3), a complete site description is contained at MET Laboratories.

Eurofins MET Laboratories Inc. (Eurofins E&E North America) is part of the Eurofins Electrical & Electronics (E&E) global compliance network.

D. Measurement Uncertainty

Test Method	Typical Expanded Uncertainty	K	Confidence Level
RF Frequencies	±4.52 Hz	2	95%
RF Power Conducted Emissions	±2.32 dB	2	95%
RF Power Conducted Spurious Emissions	±2.25 dB	2	95%
RF Power Radiated Emissions	±3.01 dB	2	95%
Conducted Emission Voltage	±2.03 dB	2	95%

Table 4. Uncertainty Calculations Summary

E. Description of Test Sample

The Lutron Electronics Co., Inc. Darter Keypad, Equipment Under Test (EUT), is Wireless remote keypad for installation into a standard WD wallbox and powered at 120-277V. Device does not have a load but provides wireless signals to a Lutron lighting control system.

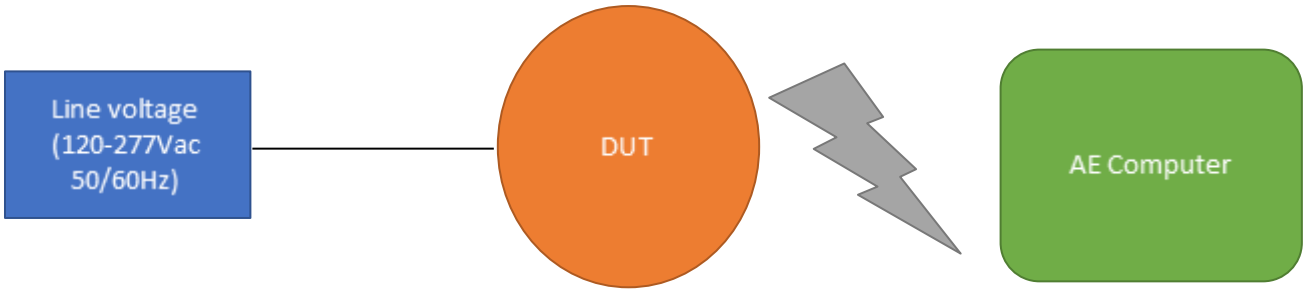

Figure 1. Block Diagram of Test Configuration

F. Equipment Configuration

The EUT was set up as outlined in Figure 1, Block Diagram of Test Setup. All cards, racks, etc., incorporated as part of the EUT is included in the following list.

Ref. ID	Slot #	Name / Description	Model Number	Part Number (White / Light Almond)	Serial Number	Rev. #
Conducted		Wireless Keypad	AZ03146	N/A	N/A	
Radiated		Wireless Keypad	AZ03146	N/A	N/A	

Table 5. Equipment Configuration

G. Support Equipment

Support equipment necessary for the operation and testing of the EUT is included in the following list.

Ref. ID	Name / Description	Manufacturer	Model Number	*Customer Supplied Calibration Data
Computer	2.4G Dongle	NCD Communications		N/A
Test Software	Dart KP_FCC_2.ptp	N/A	N/A	N/A
The 'Customer Supplied Calibration Data' column will be marked as either not applicable, not available, or will contain the calibration date supplied by the customer.				

Table 6. Support Equipment

H. Ports and Cabling Information

Ref. ID	Port name on EUT	Cable Description or reason for no cable	Qty	Length as tested (m)	Max Length (m)	Shielded? (Y/N)	Termination Box ID & Port Name
	Power	Romex 18AWG min	1	1	N/A	No	Black-Hot, Silver-Neutral, Green-Ground

Table 7. Ports and Cabling Information

I. Mode of Operation

Stand by mode, awaiting an RF signal Transmitting

J. Method of Monitoring EUT Operation

LED indicator change to a brighter level to indicate the active scene.

K. Modifications

a) Modifications to EUT

No modifications were made to the EUT.

b) Modifications to Test Standard

No modifications were made to the test standard.

L. Disposition of EUT

The test sample including all support equipment submitted to the Electro-Magnetic Compatibility Lab for testing was returned to Lutron Electronics Co., Inc. upon completion of testing.

III. Electromagnetic Compatibility Criteria for Intentional Radiators

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.203 Antenna Requirement

Test Requirement: **§ 15.203:** An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

The structure and application of the EUT were analyzed to determine compliance with Section 15.203 of the Rules. Section 15.203 states that the subject device must meet at least one of the following criteria:

a.) Antenna must be permanently attached to the unit.

b.) Antenna must use a unique type of connector to attach to the EUT.

c.) Unit must be professionally installed. Installer shall be responsible for verifying that the correct antenna is employed with the unit.

Results: The EUT as tested is compliant the criteria of §15.203. Antenna is permanently attached and hence is compliant as per 15.203.

Test Engineer(s): Deepak Giri

Test Date(s): 12/30/2020

Antenna Type	Antenna Gain (dBi)	Manufacturer	Compliant by
Monopole	-1	N/A	Permanently attached

Table 8. Antenna List

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.207(a) Conducted Emissions Limits

Test Requirement(s): **§ 15.207 (a):** For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30MHz, shall not exceed the limits in the following table, as measured using a 50 μH/50 Ω line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency range (MHz)	§ 15.207(a), Conducted Limit (dBμV)	
	Quasi-Peak	Average
* 0.15- 0.5	66 - 56	56 - 46
0.5 - 5	56	46
5 - 30	60	50

Table 9. Conducted Limits for Intentional Radiators from FCC Part 15 § 15.207(a)

Test Procedure: The EUT was placed on a 0.8 m-high wooden table inside a screen room. The EUT was situated such that the back of the EUT was 0.4 m from one wall of the vertical ground plane, and the remaining sides of the EUT were no closer than 0.8 m from any other conductive surface. The EUT was powered from a 50 Ω/50 μH Line Impedance Stabilization Network (LISN). The EMC receiver scanned the frequency range from 150 kHz to 30 MHz. Conducted Emissions measurements were made in accordance with *ANSI C63.10-2013*. The measurements were performed over the frequency range of 0.15 MHz to 30 MHz using a 50 Ω/50 μH LISN as the input transducer to receiver. For the purpose of this testing, the transmitter was turned ON. Scans were performed with the transmitter ON.

Test Results: The EUT was compliant with this requirement. EUT was tested using 120VAC 60Hz power source.

Test Engineer(s): Deepak Giri

Test Date(s): 12/30/2020

15.207(a) Conducted Emissions Test Results

Line Under Test:		Phase												
Frequency (MHz)	Uncorrected Meter Reading (dBuV) QP	Cable Loss (dB)	External Attenuation (dB)	Corrected Measurement (dBuV) QP	Limit (dBuV) QP	Pass/Fail QP	Margin (dB) QP	Uncorrected Meter Reading (dBuV) Avg.	Cable Loss (dB)	External Attenuation (dB)	Corrected Measurement (dBuV) AVG	Limit (dBuV) AVG	Pass/Fail AVG	Margin (dB) AVG
0.175	33.69	0	10	43.69	64.72	PASS	-21.03	19.68	0	10	29.68	54.72	PASS	-25.04
0.262	36.52	0	10	46.52	61.37	PASS	-14.85	20.56	0	10	30.56	51.37	PASS	-20.81
0.3275	36.09	0	10	46.09	59.51	PASS	-13.42	20.78	0	10	30.78	49.51	PASS	-18.73
0.4095	35.18	0	10	45.18	57.66	PASS	-12.48	20.22	0	10	30.22	47.66	PASS	-17.44
0.661	29.72	0	10	39.72	56	PASS	-16.28	15.39	0	10	25.39	46	PASS	-20.61
1.073	27.11	0	10	37.11	56	PASS	-18.89	13.03	0	10	23.03	46	PASS	-22.97

Table 10. Conducted Emissions, 15.207(a), 1 Mbps, Phase Line, Test Results

Note 1: * - At this frequency, the measured electric-field strength exhibits a margin of compliance that is less than 3 dB below the specification limit. We recommend that every emission measured, have at least a 3 dB margin to allow for deviations in the emission characteristics that may occur during the production process.

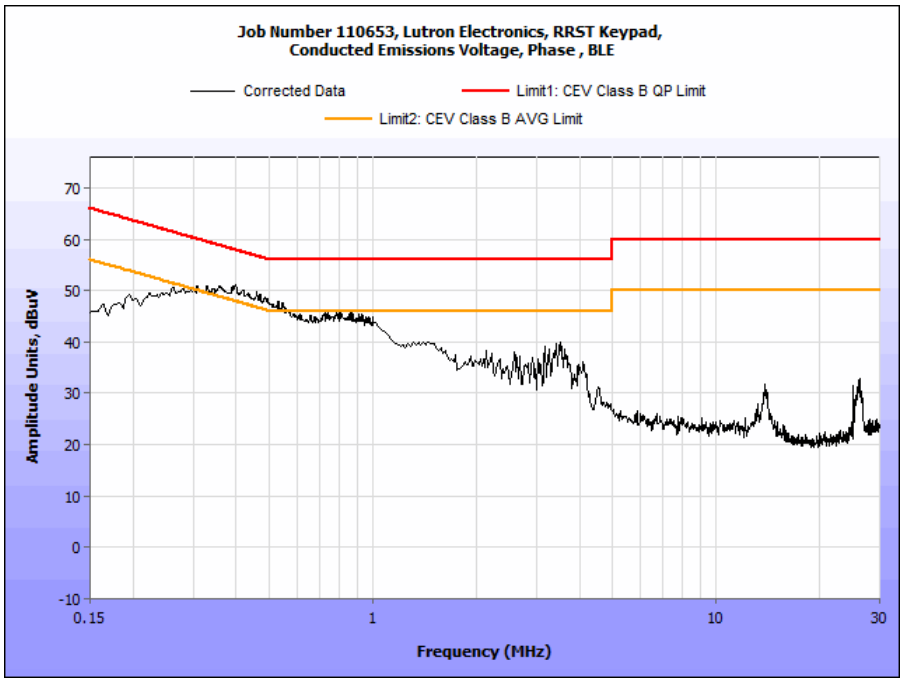

Figure 2: Conducted Emissions, 15.207(a), 1 Mbps, Phase Line

15.207(a) Conducted Emissions Test Results

Line Under Test:		Neutral												
Frequency (MHz)	Uncorrected Meter Reading (dBuV) QP	Cable Loss (dB)	External Attenuation (dB)	Corrected Measurement (dBuV) QP	Limit (dBuV) QP	Pass/Fail QP	Margin (dB) QP	Uncorrected Meter Reading (dBuV) Avg.	Cable Loss (dB)	External Attenuation (dB)	Corrected Measurement (dBuV) AVG	Limit (dBuV) AVG	Pass/Fail AVG	Margin (dB) AVG
0.1972	29.49	0	10	39.49	63.73	PASS	-24.24	8.99	0	10	18.99	53.73	PASS	-34.74
0.2915	31.88	0	10	41.88	60.48	PASS	-18.6	9.97	0	10	19.97	50.48	PASS	-30.51
0.3702	32.77	0	10	42.77	58.5	PASS	-15.73	10.2	0	10	20.2	48.5	PASS	-28.3
0.4125	32.25	0	10	42.25	57.6	PASS	-15.35	10.12	0	10	20.12	47.6	PASS	-27.48
0.697	27.61	0	10	37.61	56	PASS	-18.39	6.83	0	10	16.83	46	PASS	-29.17
1.653	21.64	0	10	31.64	56	PASS	-24.36	5.16	0	10	15.16	46	PASS	-30.84

Table 11. Conducted Emissions, 15.207(a), 1 Mbps, Neutral Line, Test Results

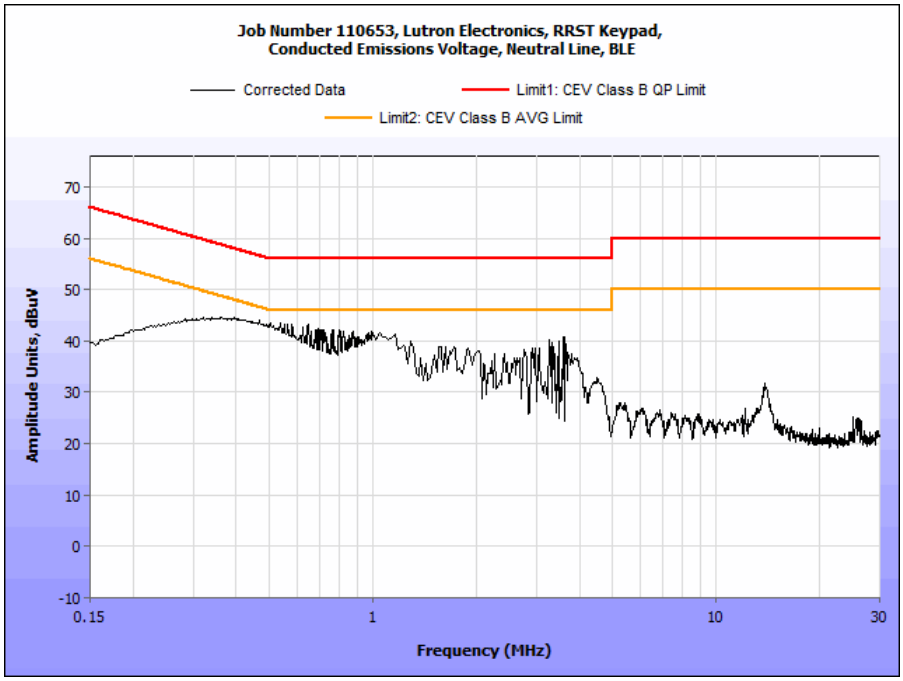

Figure 3: Conducted Emissions, 15.207(a), 1 Mbps, Neutral Line

Line Under Test:		Phase												
Frequency (MHz)	Uncorrected Meter Reading (dBuV) QP	Cable Loss (dB)	External Attenuation (dB)	Corrected Measurement (dBuV) QP	Limit (dBuV) QP	Pass/Fail QP	Margin (dB) QP	Uncorrected Meter Reading (dBuV) Avg.	Cable Loss (dB)	External Attenuation (dB)	Corrected Measurement (dBuV) AVG	Limit (dBuV) AVG	Pass/Fail AVG	Margin (dB) AVG
0.158	34.66	0	10	44.66	65.57	PASS	-20.91	21.44	0	10	31.44	55.57	PASS	-24.13
0.257	35.71	0	10	45.71	61.53	PASS	-15.82	22.45	0	10	32.45	51.53	PASS	-19.08
0.375	38.79	0	10	48.79	58.39	PASS	-9.6	21.46	0	10	31.46	48.39	PASS	-16.93
0.481	36.77	0	10	46.77	56.32	PASS	-9.55	22.63	0	10	32.63	46.32	PASS	-13.69
0.623	32.14	0	10	42.14	56	PASS	-13.86	17.32	0	10	27.32	46	PASS	-18.68
1.121	29.45	0	10	39.45	56	PASS	-16.55	15.62	0	10	25.62	46	PASS	-20.38

Table 12: Conducted Emissions, 2 Mbps, Phase, Test Results

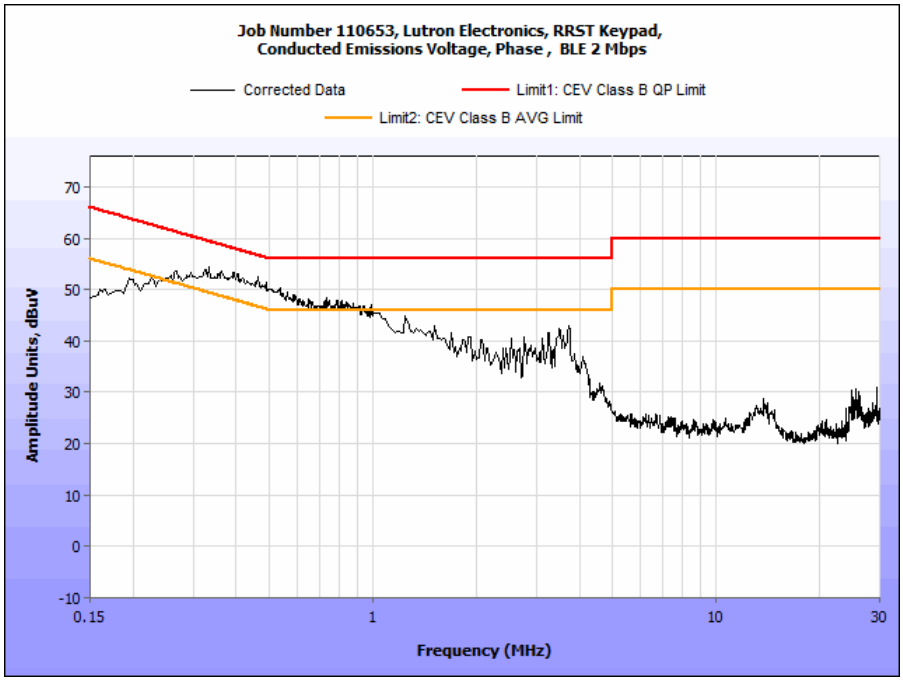

Figure 4: Conducted Emissions, 2 Mbps, Phase Plot

Line Under Test:	Neutral													
Frequency (MHz)	Uncorrected Meter Reading (dBuV) QP	Cable Loss (dB)	External Attenuation (dB)	Corrected Measurement (dBuV) QP	Limit (dBuV) QP	Pass/Fail QP	Margin (dB) QP	Uncorrected Meter Reading (dBuV) Avg.	Cable Loss (dB)	External Attenuation (dB)	Corrected Measurement (dBuV) AVG	Limit (dBuV) AVG	Pass/Fail AVG	Margin (dB) AVG
0.188	30.14	0	10	40.14	64.12	PASS	-23.98	9.44	0	10	19.44	54.12	PASS	-34.68
0.265	32.21	0	10	42.21	61.27	PASS	-19.06	10.71	0	10	20.71	51.27	PASS	-30.56
0.362	34.88	0	10	44.88	58.68	PASS	-13.8	11.51	0	10	21.51	48.68	PASS	-27.17
0.435	33.12	0	10	43.12	57.16	PASS	-14.04	11.46	0	10	21.46	47.16	PASS	-25.7
0.667	28.32	0	10	38.32	56	PASS	-17.68	9.51	0	10	19.51	46	PASS	-26.49
1.532	20.41	0	10	30.41	56	PASS	-25.59	9.23	0	10	19.23	46	PASS	-26.77

Table 13: Conducted Emissions, 2 Mbps, Neutral, Test Results

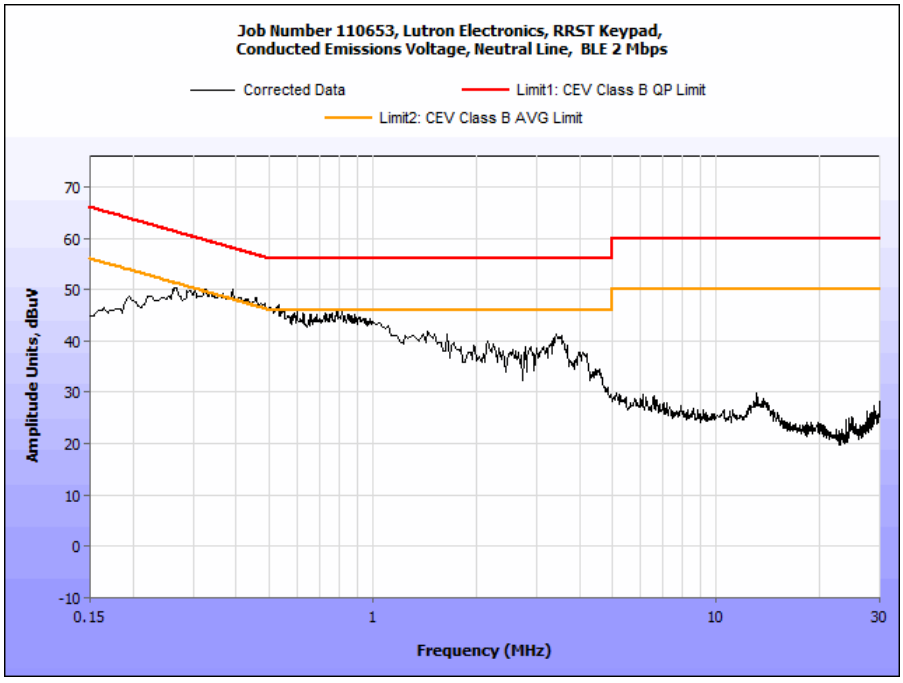

Figure 5: Conducted Emissions, 2 Mbps, Neutral Plot

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.247(a)(2) 6 dB Bandwidth

Test Requirements: **§ 15.247(a)(2):** Operation under the provisions of this section is limited to frequency hopping and digitally modulated intentional radiators that comply with the following provisions:

For systems using digital modulation techniques, the EUT may operate in the 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz bands. The minimum 6dB bandwidth shall be at least 500 kHz.

Test Procedure: The transmitter was on and transmitting at the highest output power. The bandwidth of the fundamental frequency was measured with the spectrum analyzer using a RBW = 100kHz, VBW = 3*RBW. The 6 dB Bandwidth was measured and recorded following procedure stated in 11.8.1 of ANSI C63.10 2013. The measurements were performed on the low, mid and high channels.

Test Results The EUT was compliant with § 15.247 (a)(2).

The 6 dB Bandwidth was determined from the plots on the following pages.

Test Engineer(s): Deepak Giri

Test Date(s): 12/30/2020

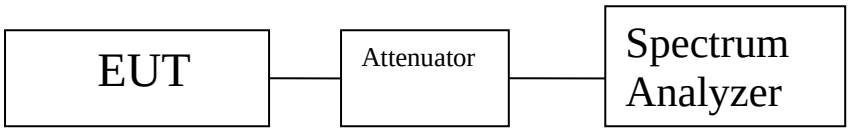

Figure 6. Block Diagram, Occupied Bandwidth Test Setup

Occupied Bandwidth Test Results

Frequency (MHz)	Mode	6dB Bandwidth Measured (KHz)	Limit (KHz)
2402	BLE 1Mbps	712.94	≥500
2442		710.08	≥500
2480		705.16	≥500

Table 14. 6 dB Occupied Bandwidth, 1 Mbps, Test Results

Frequency (MHz)	Mode	6dB Bandwidth Measured (KHz)	Limit (KHz)
2402	BLE 2Mbps	1379	≥500
2442		1377	≥500
2480		1373	≥500

Table 15: 6 dB Occupied Bandwidth, 2 Mbps, Test Results

6 dB Occupied Bandwidth Test Results

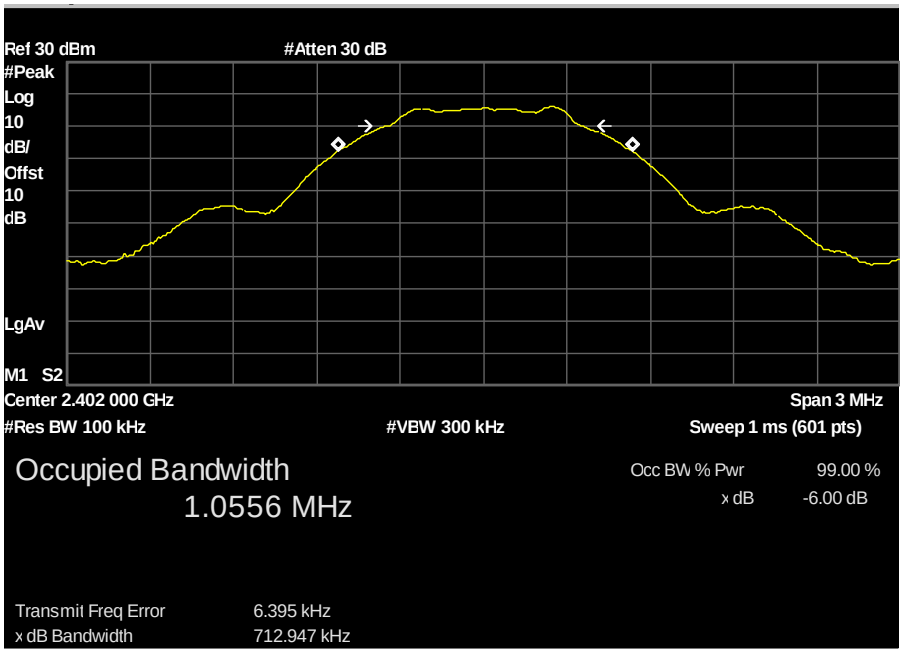

Figure 7: Occupied Bandwidth, BLE Low Channel 1 Mbps 6db DTS Bandwidth

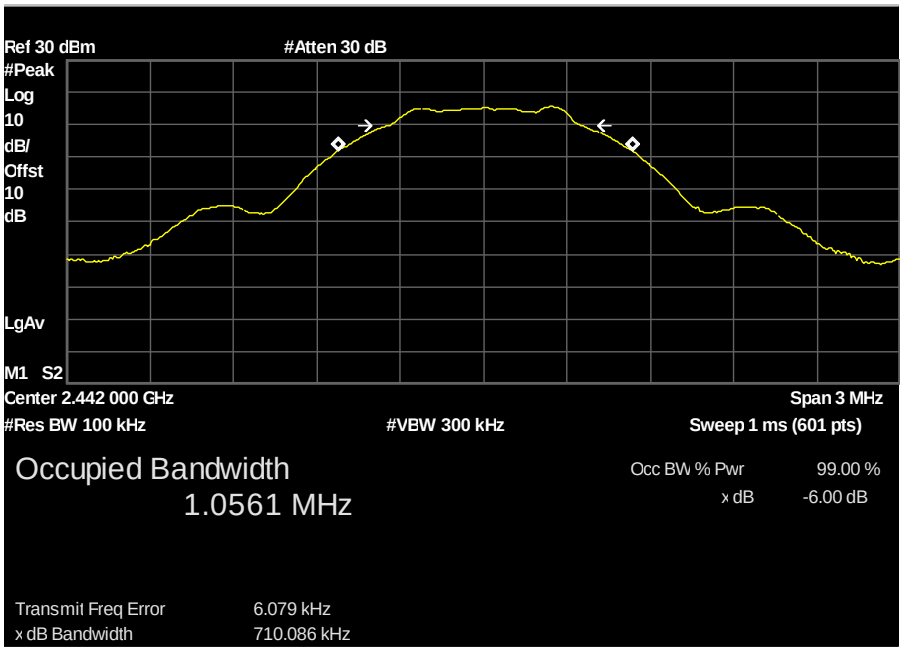

Figure 8: Occupied Bandwidth, BLE Mid Channel 1 Mbps 6db DTS Bandwidth

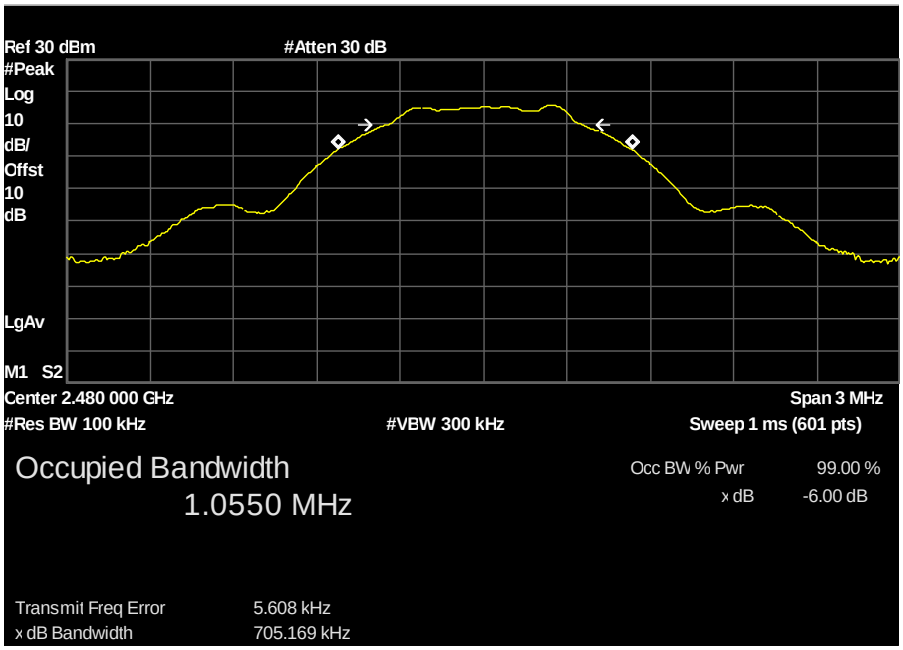

Figure 9: Occupied Bandwidth, BLE High Channel 1 Mbps 6db DTS Bandwidth

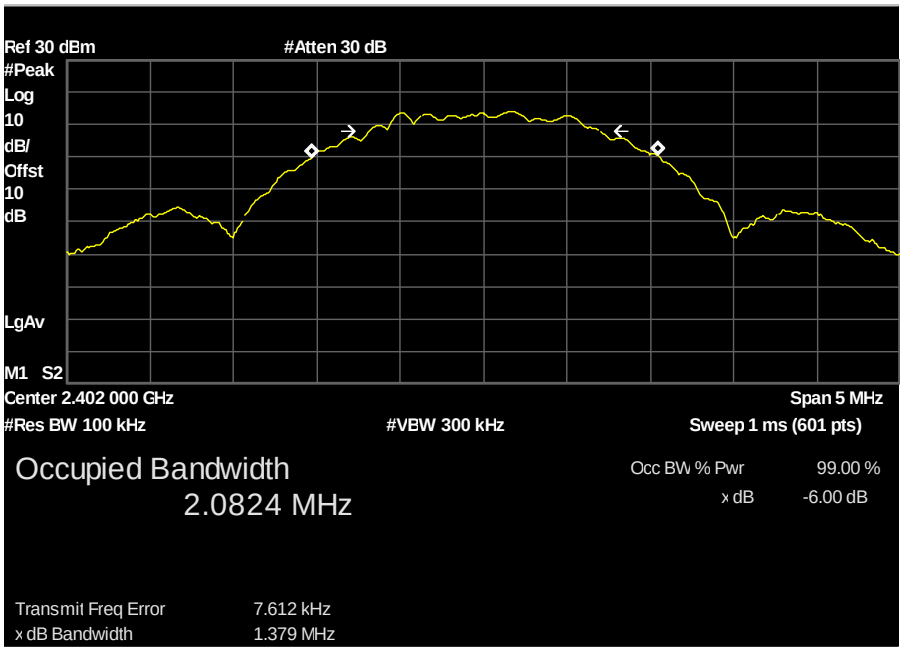

Figure 10: 6db DTS Bandwidth BLE Low Channel 2 Mbps

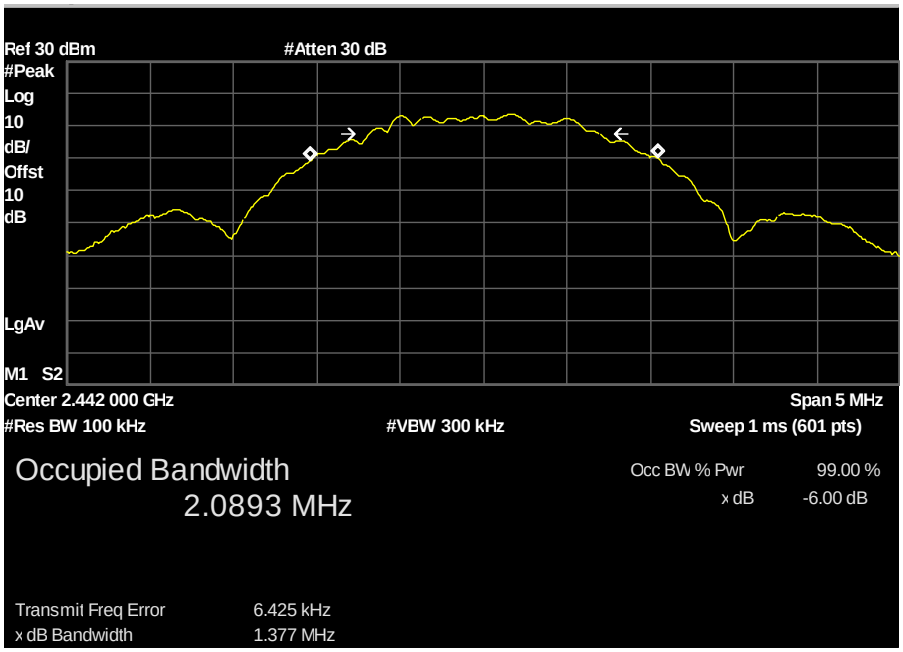

Figure 11: 6db DTS Bandwidth BLE Mid Channel 2 Mbps

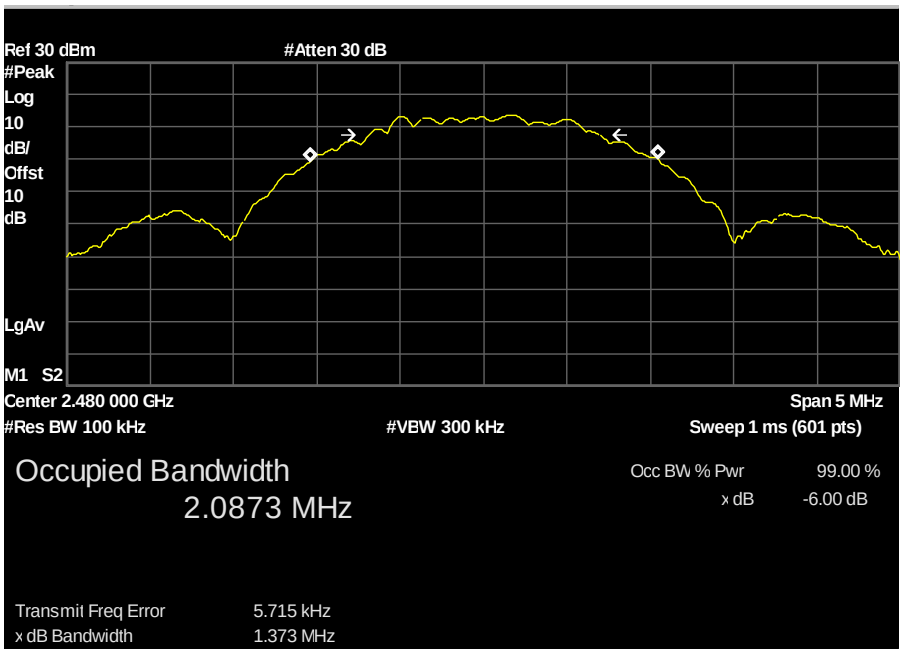

Figure 12: 6db DTS Bandwidth BLE High Channel 2 Mbps

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.247(b) Peak Power Output

Test Requirements: **§15.247(b):** The maximum peak output power of the intentional radiator shall not exceed the following:

Digital Transmission Systems (MHz)	Output Limit (Watts)
2400–2483.5	1.000

Table 16. Output Power Requirements from §15.247(b)

§15.247(c): if transmitting antennas of directional gain greater than 6 dBi are used the peak output power from the intentional radiator shall be reduced below the stated values in the 9, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Test Procedure: The EUT was measured at the low, mid and high channels of each band at the maximum power level. Test was performed following the procedure defined in 11.9.1.1 of ANSI C63.10 2013.

Test Results: The EUT was compliant with the Peak Power Output limits of **§15.247(b)**. Test software Dart KP_FCC_2.ptp was used. Power control was at maximum power level pre-set by manufacturer.

Test Engineer(s): Deepak Giri

Test Date(s): 12/30/2020

Frequency (MHz)	Mode	ON Time (ms)	OFF Time (ms)	Period (ms)	Duty Cycle (%)	Correction Factor (dB)
2402	BLE 1Mbps	100	0	100	100	0.00
2442		100	0	100	100	0.00
2480		100	0	100	100	0.00

Table 17: Duty Cycle Calculation, BLE 1 Mbps

Frequency (MHz)	Mode	ON Time (ms)	OFF Time (ms)	Period (ms)	Duty Cycle (%)	Correction Factor (dB)
2402	BLE 2Mbps	100	0	100	100	0.00
2442		100	0	100	100	0.00
2480		100	0	100	100	0.00

Table 18: Duty Cycle Calculation, BLE 2 Mbps

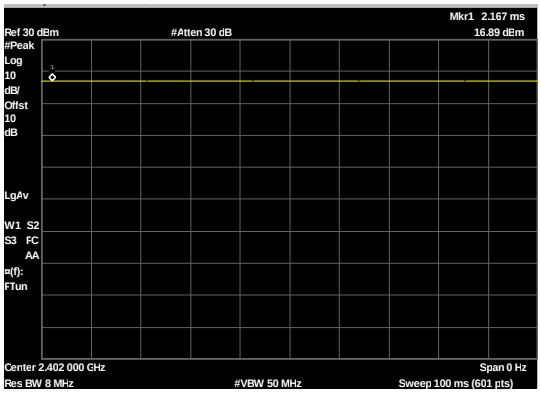

Figure 13: Duty Cycle BLE 1 Mbps Low Channel

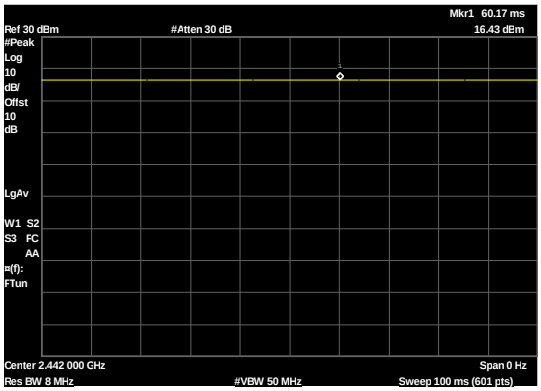

Figure 14: Duty Cycle BLE 1 Mbps Mid Channel

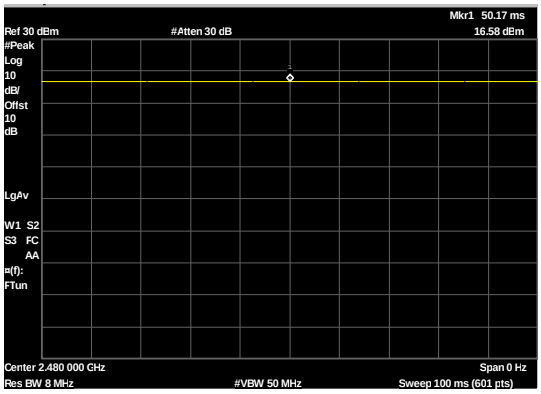

Figure 15: Duty Cycle BLE 1 Mbps High Channel

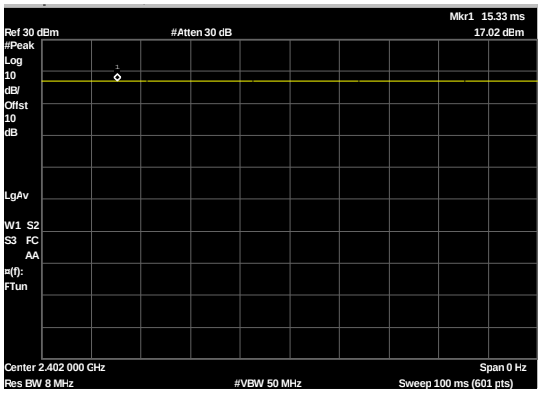

Figure 16: Duty Cycle BLE 2 Mbps Low Channel

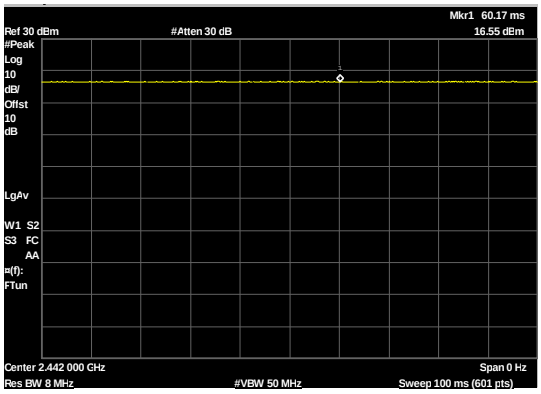

Figure 17: Duty Cycle BLE 2 Mbps Mid Channel

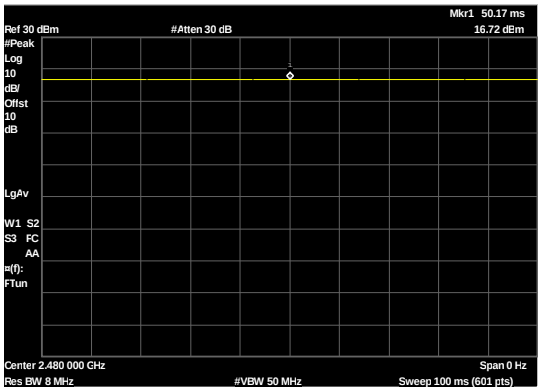

Figure 18: Duty Cycle BLE 2 Mbps High Channel

Peak Power Output Test Results

Frequency (MHz)	Mode	Peak Conducted Power measured (dBm)	Conducted Power limit (dBm)	Margin	Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Margin
2402	BLE	17.64	30	-12.36	-1	16.74	36	-19.26
2442		17.20	30	-12.80	-1	16.20	36	-19.80
2480		17.35	30	-12.65	-1	16.35	36	-19.65

Table 19. Peak Power Output, 1 Mbps, Test Results

Frequency (MHz)	Mode	Peak Conducted Power measured (dBm)	Conducted Power limit (dBm)	Margin	Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Margin
2402	BLE	17.73	30	-12.27	-1	16.73	36	-19.27
2442		17.3	30	-12.7	-1	16.3	36	-19.7
2480		17.41	30	-12.59	-1	16.41	36	-19.59

Table 20: Peak Power Output, 2 Mbps, Test Results

Peak Power Output Test Results

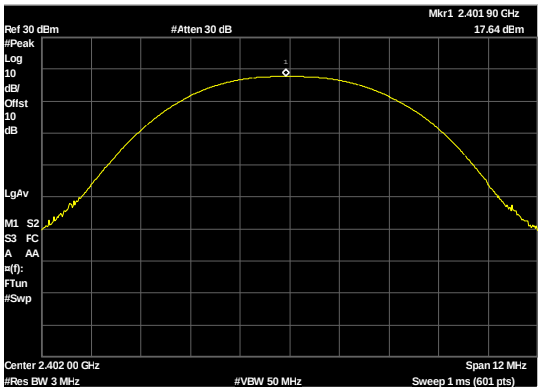

Figure 19: Maximum Peak Conducted Output Power BLE Low Channel 1 Mbps

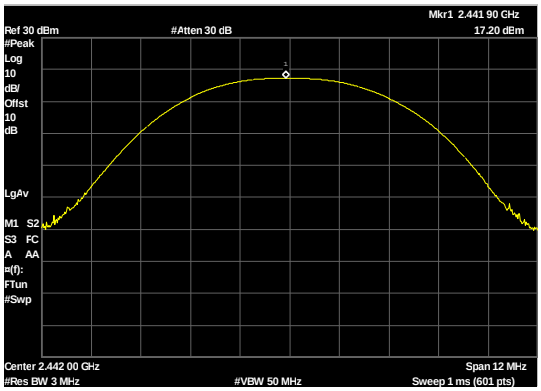

Figure 20: Maximum Peak Conducted Output Power BLE Mid Channel 1 Mbps

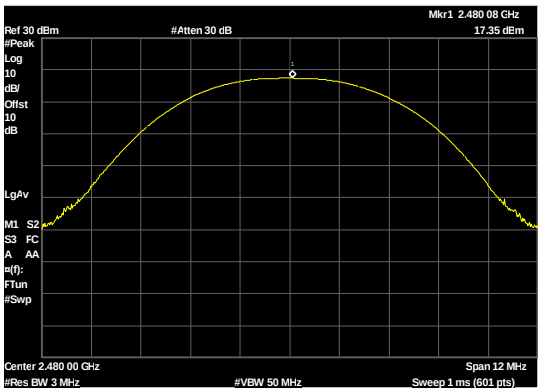

Figure 21: Maximum Peak Conducted Output Power BLE High Channel 1 Mbps

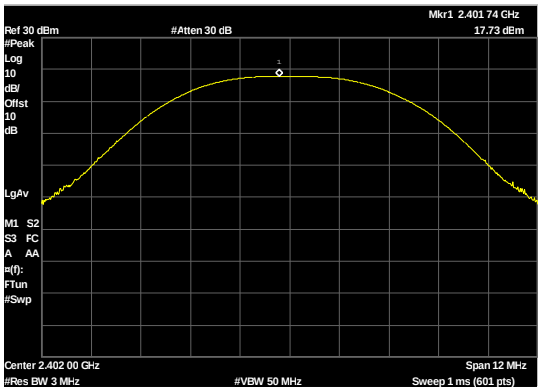

Figure 22: Maximum Peak Conducted Output Power BLE Low Channel 2 Mbps

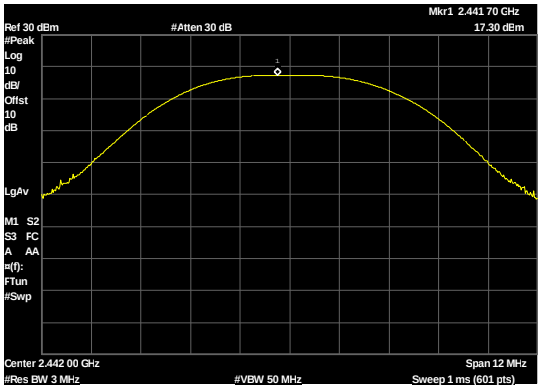

Figure 23: Maximum Peak Conducted Output Power BLE Mid Channel 2 Mbps

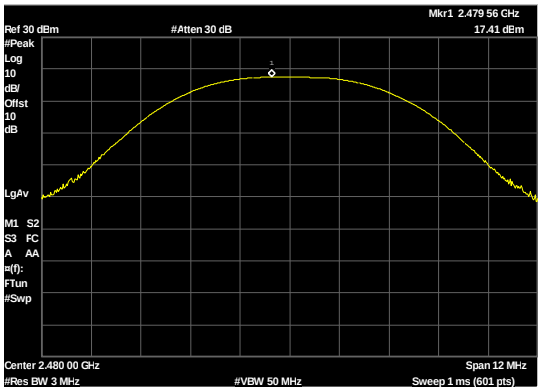

Figure 24: Maximum Peak Conducted Output Power BLE High Channel 2 Mbps

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.209 Radiated Spurious Emissions Requirements and Band Edge

Test Requirements: **§15.247(d); §15.205:** Emissions outside the frequency band.

§15.205(a): Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090–0.110----------	16.42–16.423	399.9–410	4.5–5.15
[1] 0.495–0.505----------	16.69475–16.69525	608–614	5.35–5.46
2.1735–2.1905----------	16.80425–16.80475	960–1240	7.25–7.75
4.125–4.128----------	25.5–25.67	1300–1427	8.025–8.5
4.17725–4.17775----------	37.5–38.25	1435–1626.5	9.0–9.2
4.20725–4.20775----------	73–74.6	1645.5–1646.5	9.3–9.5
6.215–6.218----------	74.8–75.2	1660–1710	10.6–12.7
6.26775–6.26825----------	108–121.94	1718.8–1722.2	13.25–13.4
6.31175–6.31225----------	123–138	2200–2300	14.47–14.5
8.291–8.294----------	149.9–150.05	2310–2390	15.35–16.2
8.362–8.366----------	156.52475–156.52525	2483.5–2500	17.7–21.4
8.37625–8.38675----------	156.7–156.9	2655–2900	22.01–23.12
8.41425–8.41475----------	162.0125–167.17	3260–3267	23.6–24.0
12.29–12.293----------	167.72–173.2	3332–3339	31.2–31.8
12.51975–12.52025----------	240–285	3345.8–3358 36.	43–36.5
12.57675–12.57725----------	322–335.4	3600–4400	([2])

Table 21. Restricted Bands of Operation

[1] Until February 1, 1999, this restricted band shall be 0.490 – 0.510 MHz.
[2] Above 38.6

Test Requirement(s): **§ 15.209 (a):** Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in Table 22.

Frequency (MHz)	§ 15.209(a),Radiated Emission Limits (dBµV) @ 3m
30 - 88	40.00
88 - 216	43.50
216 - 960	46.00
Above 960	54.00

Table 22. Radiated Emissions Limits Calculated from FCC Part 15, § 15.209 (a)

Test Procedures: The transmitter was turned on. Measurements were performed of the low, mid and high Channels. The EUT was rotated orthogonally through all three axes. Measurements were made with both horizontal and vertical polarization of receiving antenna. Plots shown are corrected for both antenna correction factor and distance and compared to a 3 m limit. Procedure defined in 6.3, 6.5 and 6.6 of ANSI C63.10 2013 were used. Only noise floor was measured above 18 GHz.

Test Results: The EUT was compliant with the Radiated Spurious Emission limits of **§ 15.247(d) and § 15.209**. From 30MHz-1GHz emissions were measured without pre-amp. From 1GHz-18GHz emissions were measured using high pass filter, 2.4GHz band notch filter and pre-amp. From 18Ghz-25GHz emissions were measured using only pre-amp. In all frequency ranges tested, emissions close to limit line were re-evaluated under narrow span, applicable detectors and bandwidth. Plots shown are cumulative outcome of receiving antenna polarizations and EUT's emissions along 3 orthogonal axes.

Test Engineer(s): Deepak Giri

Test Date(s): 12/30/2020

Radiated Spurious Emissions, Test Results

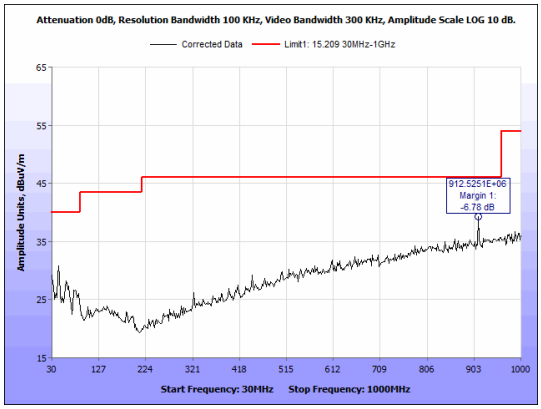

Figure 25: Radiated Spurious Emission. BLE 1 Mbps Low Channel 30MHz-1GHz

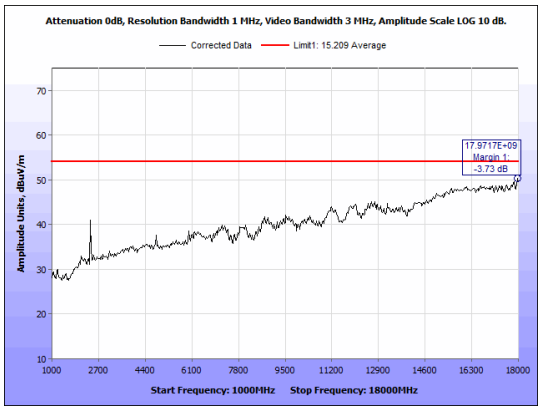

Figure 26: Radiated Emission Average. BLE 1 Mbps Low Channel 1GHz-18GHz

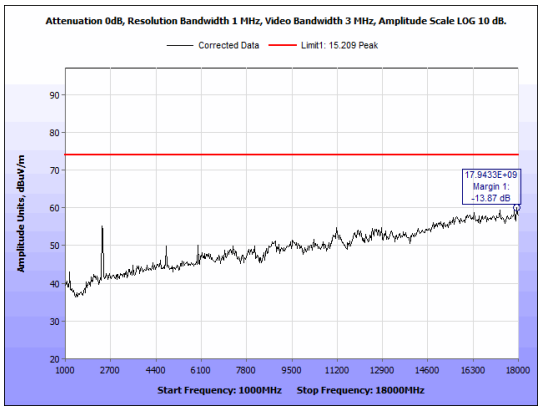

Figure 27: Radiated Emission Peak. BLE 1 Mbps Low Channel 1GHz-18GHz

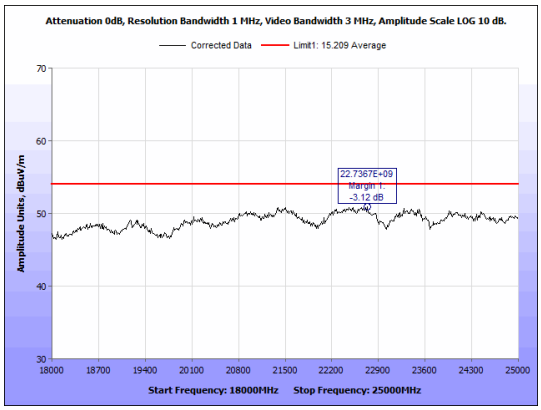

Figure 28: Radiated Emission Average. BLE 1 Mbps Low Channel 18GHz-25GHz

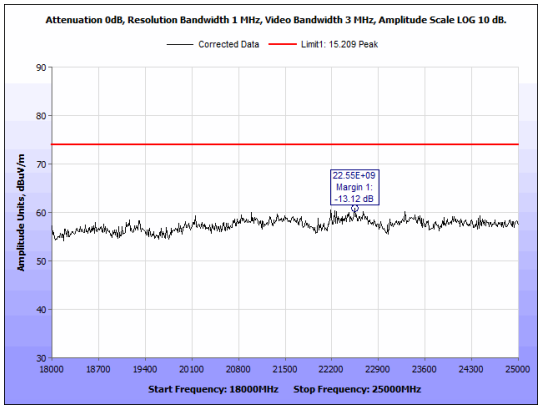

Figure 29: Radiated Emission Peak. BLE 1 Mbps Low Channel 18GHz-25GHz

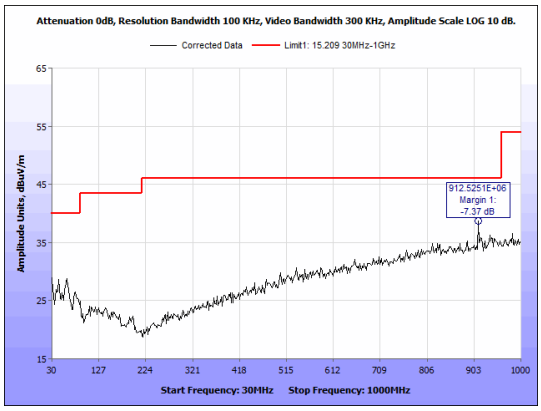

Figure 30: Radiated Spurious Emission. BLE 1 Mbps Mid Channel 30MHz-1GHz

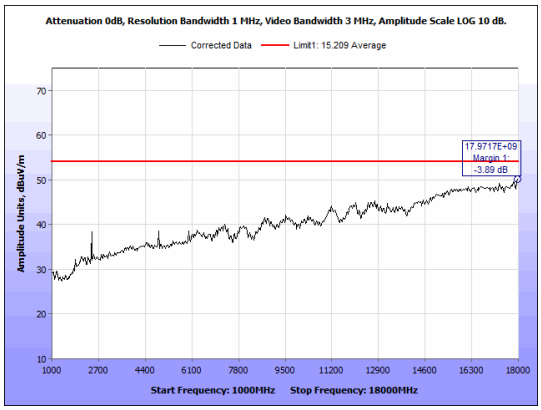

Figure 31: Radiated Emission Average. BLE 1 Mbps Mid Channel 1GHz-18GHz

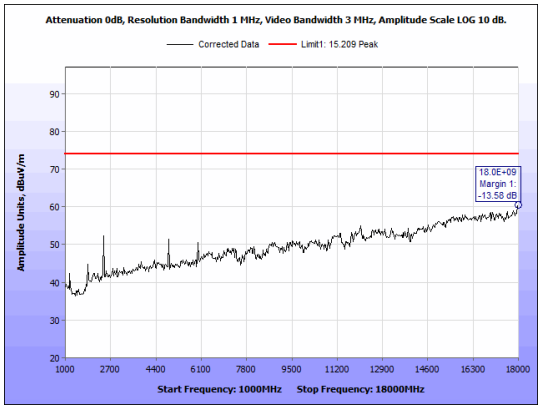

Figure 32: Radiated Emission Peak. BLE 1 Mbps Mid Channel 1GHz-18GHz

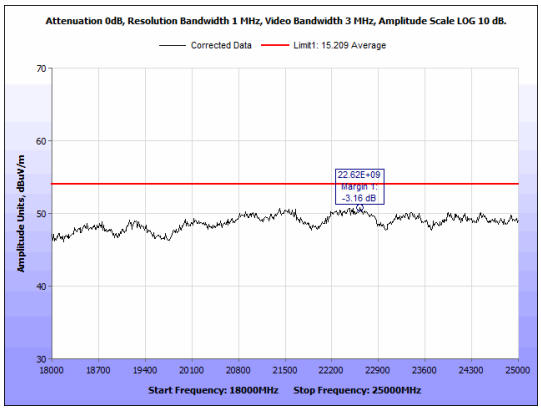

Figure 33: Radiated Emission Average. BLE 1 Mbps Mid Channel 18GHz-25GHz

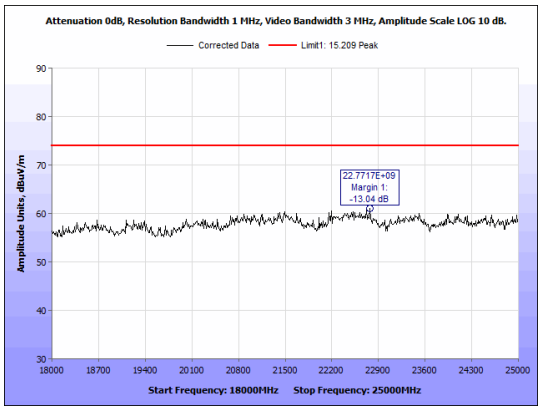

Figure 34: Radiated Emission Peak. BLE 1 Mbps Mid Channel 18GHz-25GHz

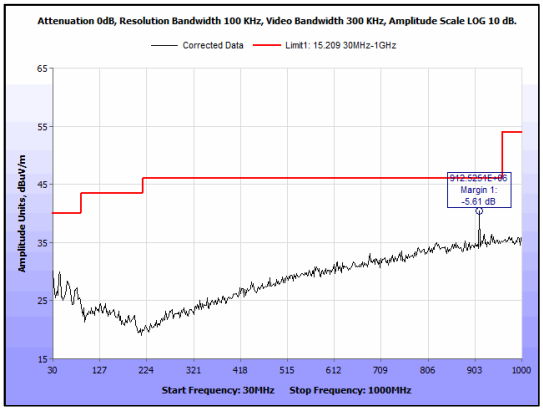

Figure 35: Radiated Spurious Emission. BLE 1 Mbps High Channel 30MHz-1GHz

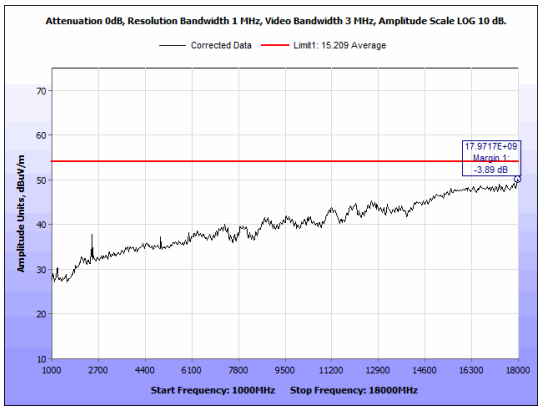

Figure 36: Radiated Emission Average. BLE 1 Mbps High Channel 1GHz-18GHz

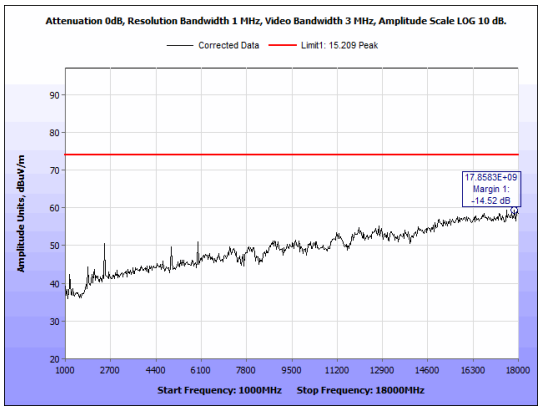

Figure 37: Radiated Emission Peak. BLE 1 Mbps High Channel 1GHz-18GHz

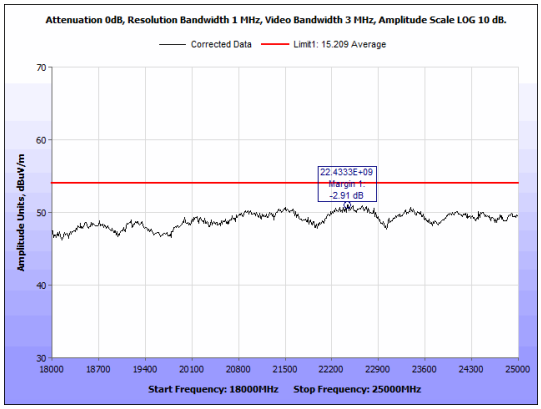

Figure 38: Radiated Emission Average. BLE 1 Mbps High Channel 18GHz-25GHz

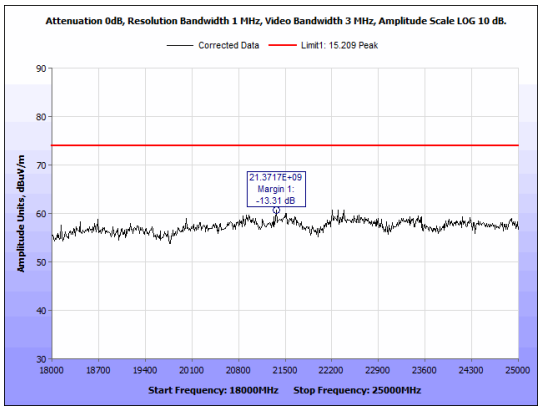

Figure 39: Radiated Emission Peak. BLE 1 Mbps High Channel 18GHz-25GHz

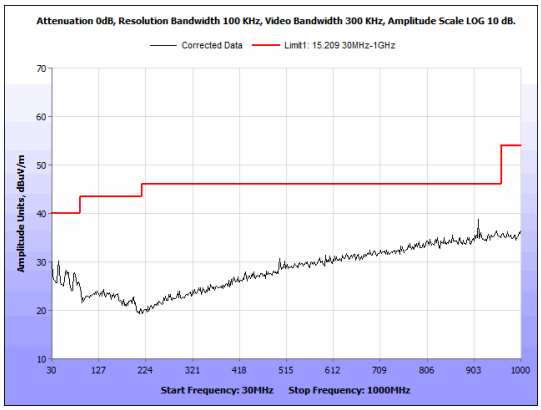

Figure 40: Radiated Spurious Emission. BLE 2 Mbps Low Channel 30MHz-1GHz

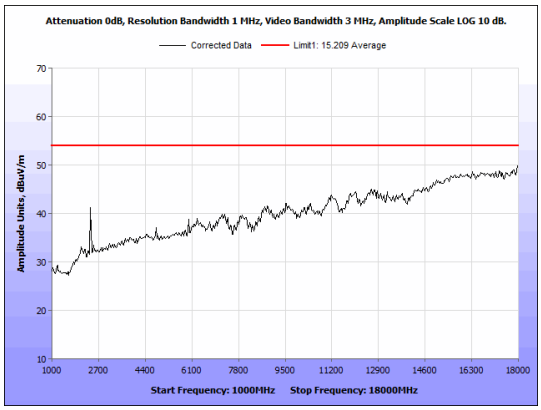

Figure 41: Radiated Emission Average. BLE 2 Mbps Low Channel 1GHz-18GHz

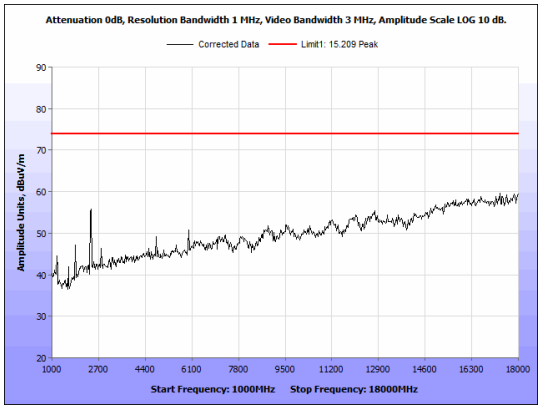

Figure 42: Radiated Emission Peak. BLE 2 Mbps Low Channel 1GHz-18GHz

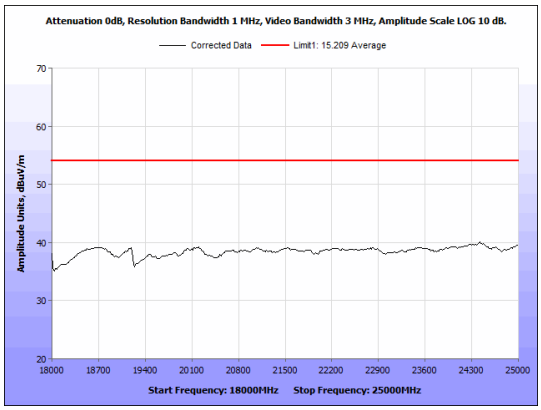

Figure 43: Radiated Emission Average. BLE 2 Mbps Low Channel 18GHz-25GHz

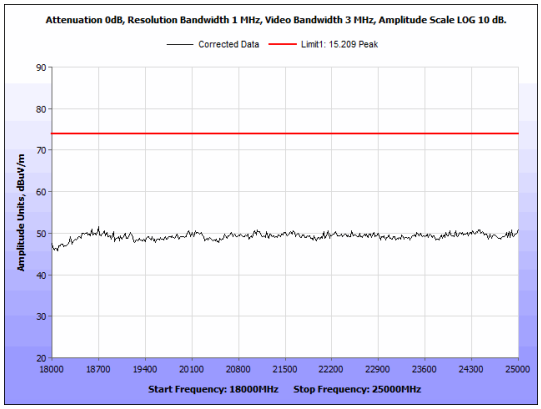

Figure 44: Radiated Emission Peak. BLE 2 Mbps Low Channel 18GHz-25GHz

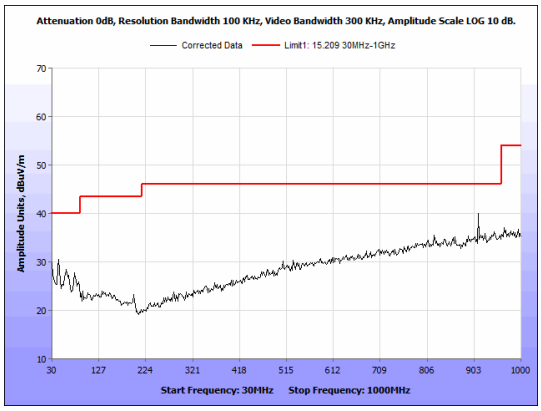

Figure 45: Radiated Spurious Emission. BLE 2 Mbps Mid Channel 30MHz-1GHz

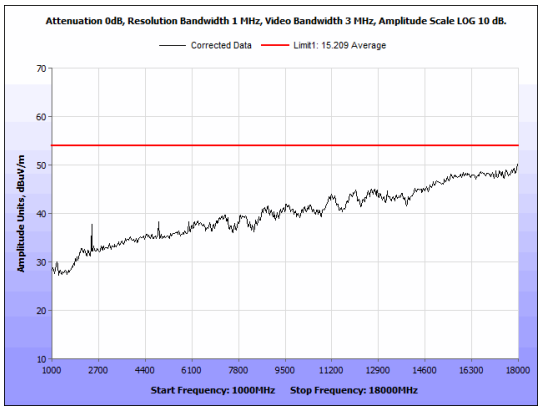

Figure 46: Radiated Emission Average. BLE 2 Mbps Mid Channel 1GHz-18GHz

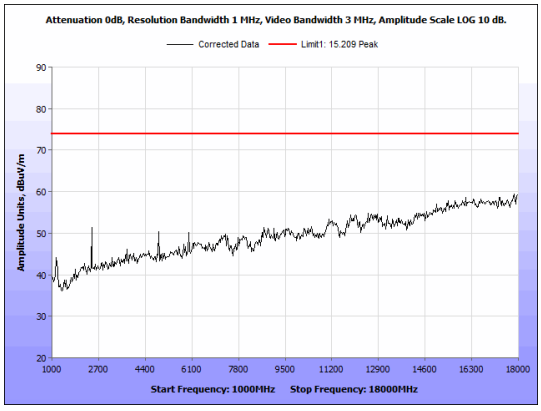

Figure 47: Radiated Emission Peak. BLE 2 Mbps Mid Channel 1GHz-18GHz

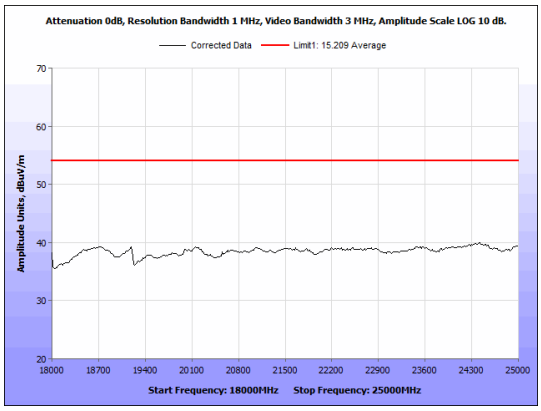

Figure 48: Radiated Emission Average. BLE 2 Mbps Mid Channel 18GHz-25GHz

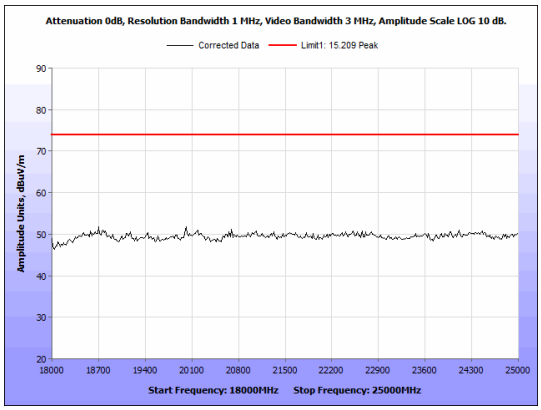

Figure 49: Radiated Emission Peak. BLE 2 Mbps Mid Channel 18GHz-25GHz

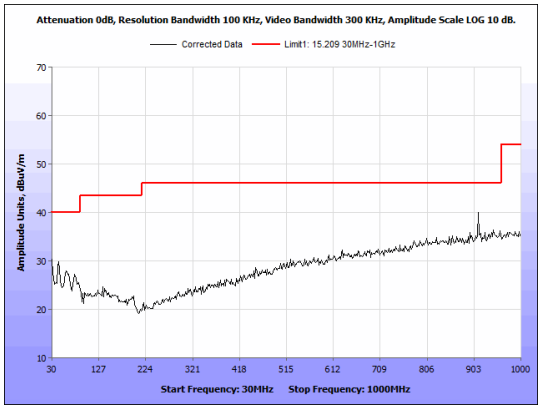

Figure 50: Radiated Spurious Emission. BLE 2 Mbps High Channel 30MHz-1GHz

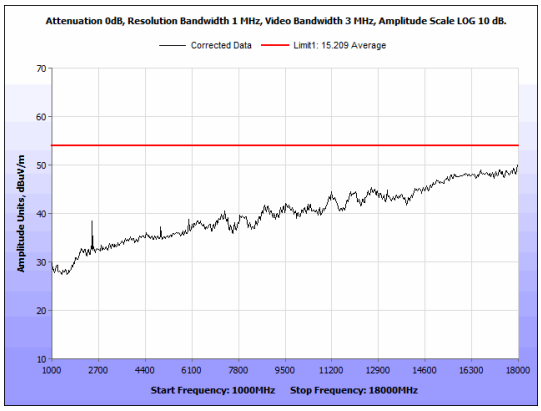

Figure 51: Radiated Emission Average. BLE 2 Mbps High Channel 1GHz-18GHz

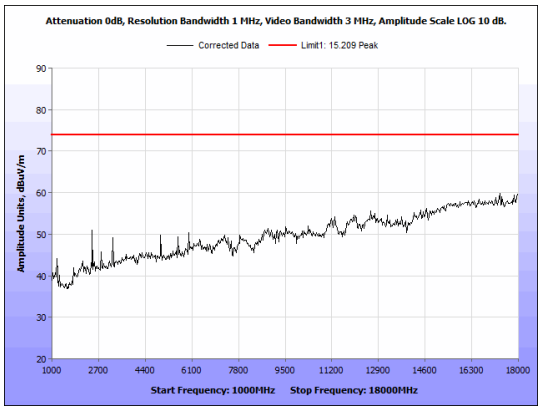

Figure 52: Radiated Emission Peak. BLE 2 Mbps High Channel 1GHz-18GHz

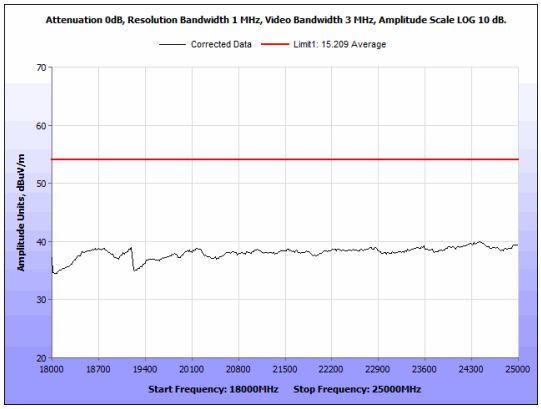

Figure 53: Radiated Emission Average. BLE 2 Mbps High Channel 18GHz-25GHz

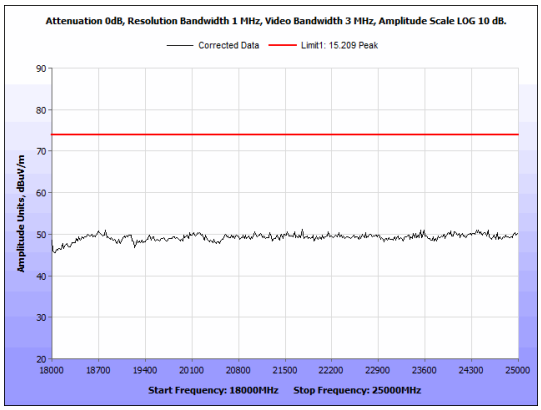

Figure 54: Radiated Emission Peak. BLE 2 Mbps High Channel 18GHz-25GHz

Radiated Band Edge Measurements

Test Procedures: The transmitter was turned on. Measurements were performed of the low and high Channels. The EUT was rotated orthogonally through all three axes. Plots shown are corrected for both antenna correction factor and distance and compared to a 3 m limit. Procedure defined in 6.3, 6.5 and 6.6 of ANSI C63.10 2013 were used. Band edge was measured using procedure defined in 6.10.5.2 of ANSI C63.10 2013. Plots shown are cumulative outcome of receiving antenna polarizations and EUT's emissions along 3 orthogonal axes.

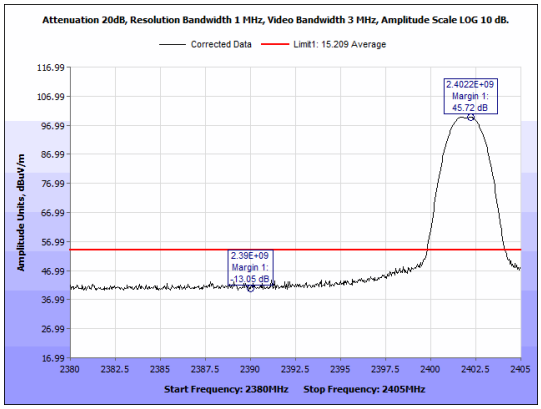

Figure 55: Restricted Band Edge Average. BLE 1 Mbps Low Channel

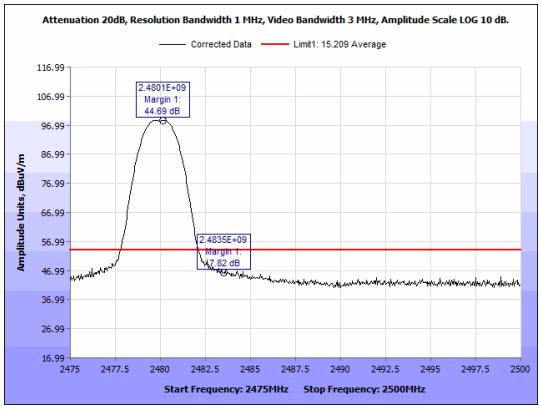

Figure 56: Restricted Band Edge Average. BLE 1 Mbps High Channel

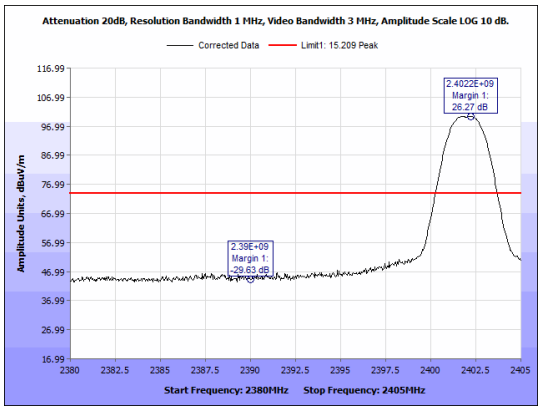

Figure 57: Restricted Band Edge Peak. BLE 1 Mbps Low Channel

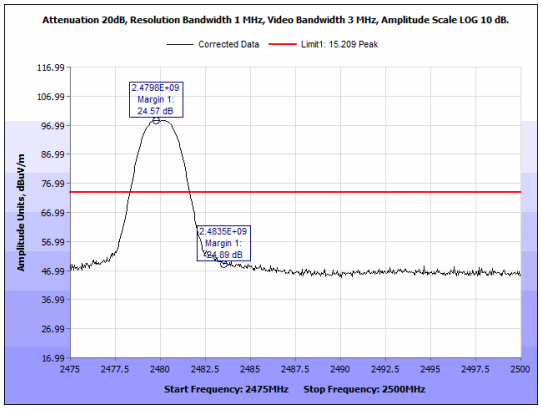

Figure 58: Restricted Band Edge Peak. BLE 1 Mbps High Channel

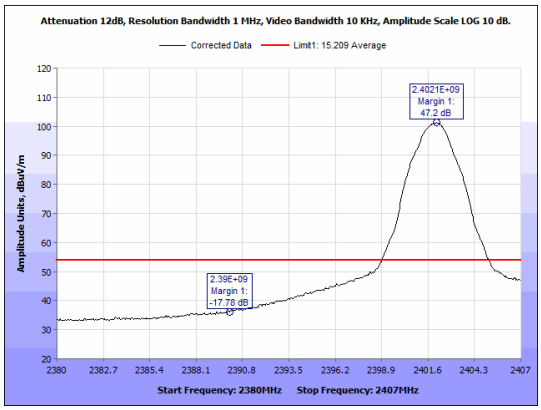

Figure 59: Restricted Band Edge Average. BLE 2 Mbps Low Channel

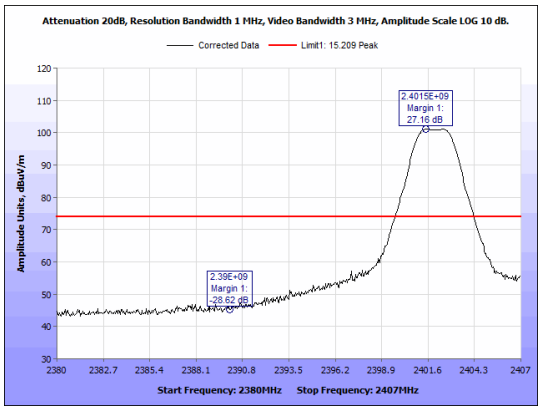

Figure 60: Restricted Band Edge Peak. BLE 2 Mbps Low Channel

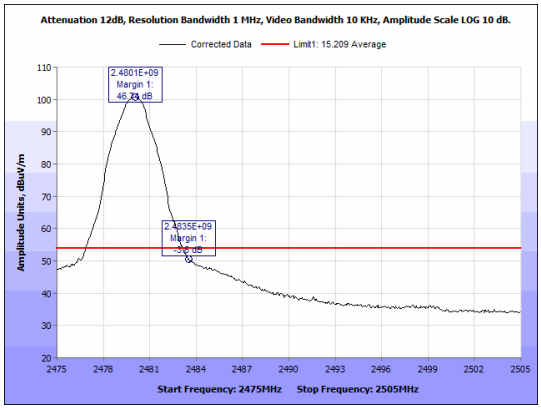

Figure 61: Restricted Band Edge Average. BLE 2 Mbps High Channel

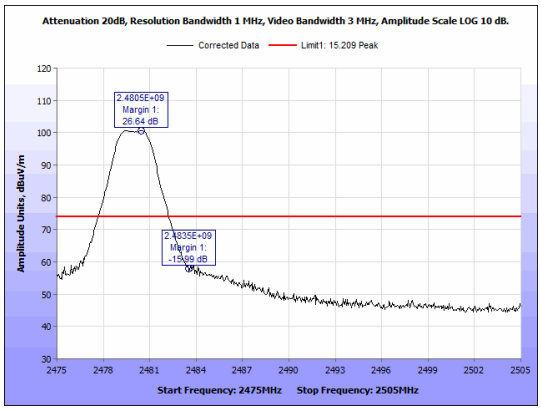

Figure 62: Restricted Band Edge Peak. BLE 2 Mbps High Channel

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.247(d) Spurious Emissions in Non-restricted Bands

Test Requirement: **15.247(d)** In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator 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 paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

Test Procedure: Measurement were performed using the procedure defined in 11.11.2 of ANSI C63.10 2013 to measure the reference level. 11.11.3 of ASNI C63.10 2013 was used to measure the spurious emission in the non- restricted band. Since Peak conducted output power and Peak power spectral density were measured, the reference level was set to 20dB below the peak emission. Low, mid and high channel were used for testing.

Test Results: The EUT was compliant with the Spurious Emission limits of **§15.247(d)**. Conducted test set up was used.

Test Engineer(s): Deepak Giri

Test Date(s): 12/30/2020

Spurious Emissions in Non-restricted Bands, Test Results

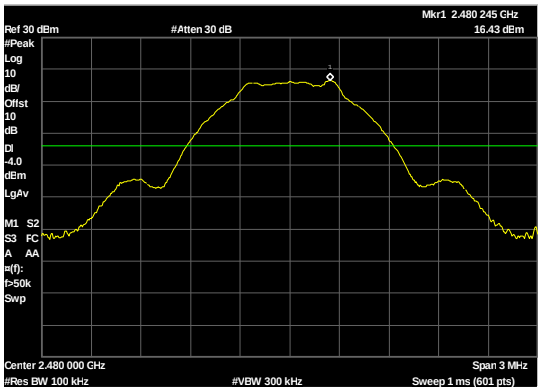

Figure 63: Conducted Spurious Emission Reference Level BLE 1 Mbps High Channel

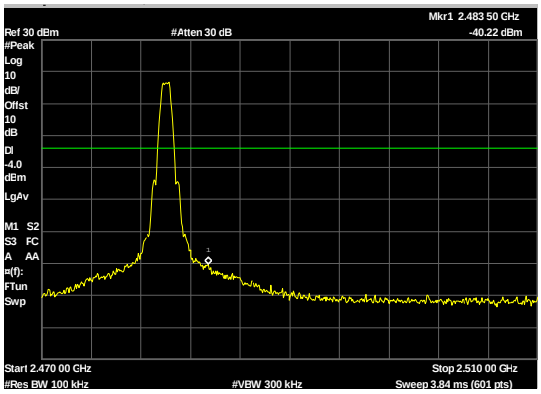

Figure 64: Conducted Spurious Emission Band Edge BLE 1 Mbps High Channel

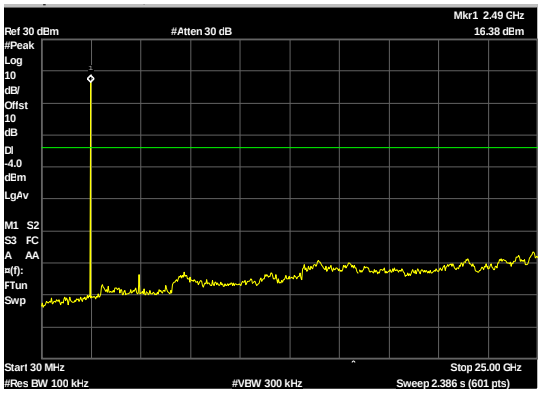

Figure 65: Conducted Spurious Emission BLE 1 Mbps High Channel 30MHz - 25GHz

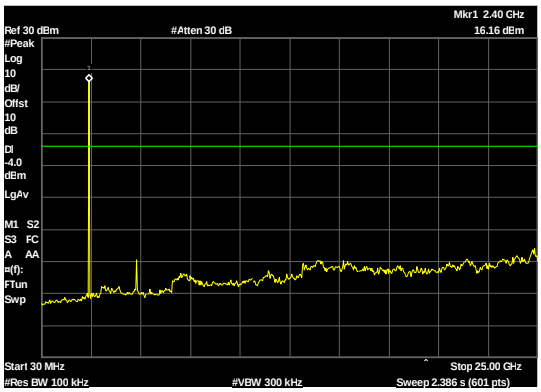

Figure 66: Conducted Spurious Emission BLE 1 Mbps Low Channel 30MHz - 25GHz

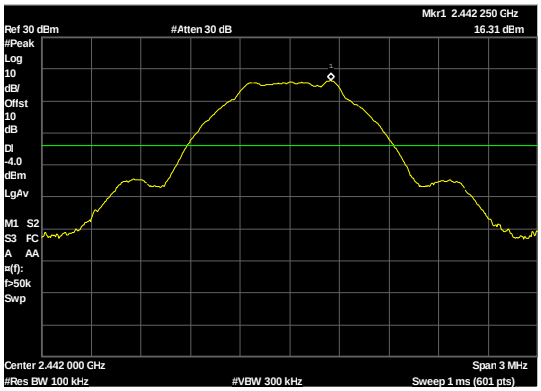

Figure 67: Conducted Spurious Emission Reference Level BLE 1 Mbps Mid Channel

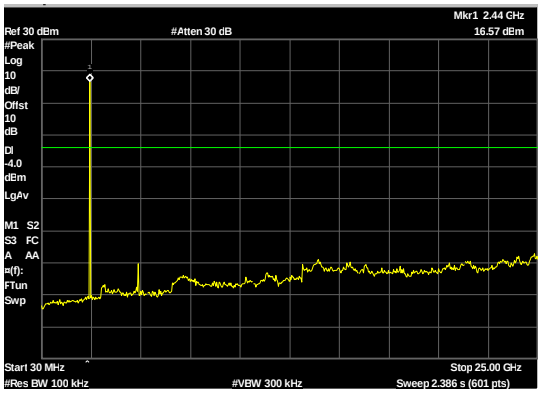

Figure 68: Conducted Spurious Emission BLE 1 Mbps Mid Channel 30MHz - 25GHz

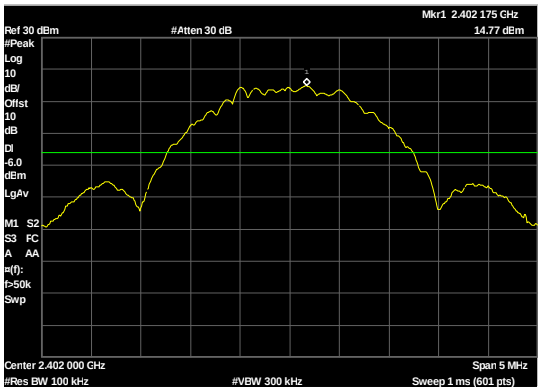

Figure 69: Conducted Spurious Emission Reference Level BLE 2 Mbps Low Channel

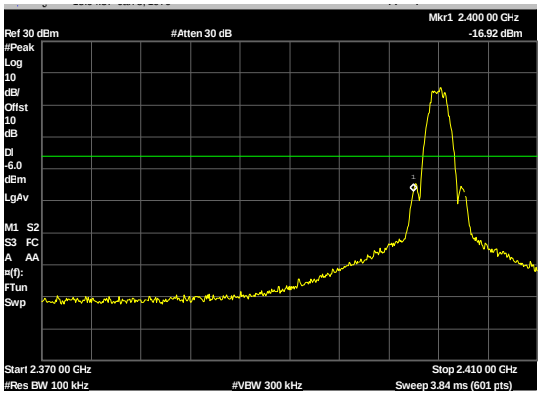

Figure 70: Conducted Spurious Emission Band Edge BLE 2 Mbps Low Channel

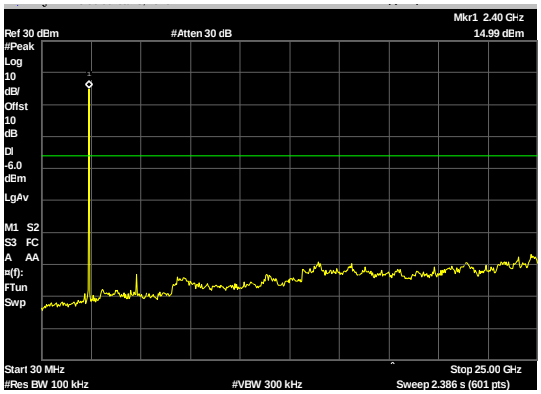

Figure 71: Conducted Spurious Emission BLE 2 Mbps Low Channel 30MHz - 25GHz

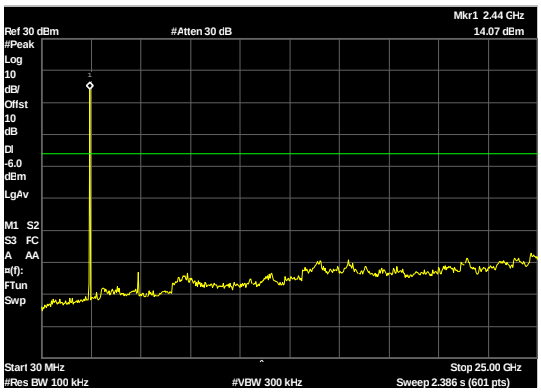

Figure 72: Conducted Spurious Emission BLE 2 Mbps Mid Channel 30MHz - 25GHz

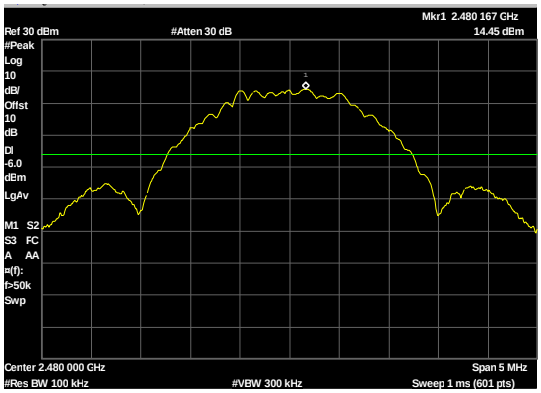

Figure 73: Conducted Spurious Emission Reference Level BLE 2 Mbps High Channel

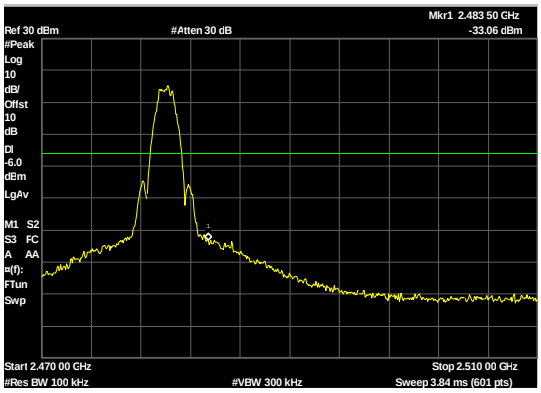

Figure 74: Conducted Spurious Emission Band Edge BLE 2 Mbps High Channel

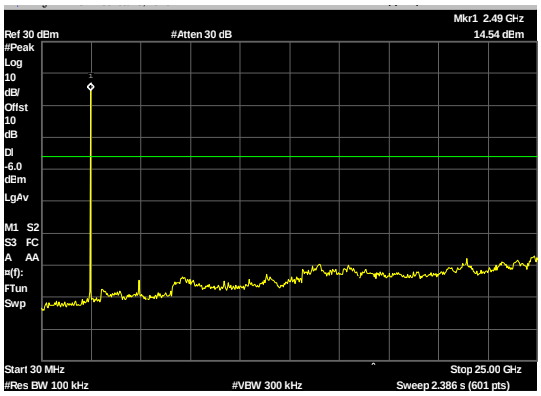

Figure 75: Conducted Spurious Emission BLE 2 Mbps High Channel 30MHz - 25GHz

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.247(e) Peak Power Spectral Density

Test Requirements: **§15.247(e):** For digitally modulated systems, the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3 kHz band during any time interval of continuous transmission.

Test Procedure: Test method specified in 11.10.2 to measure Peak power spectral density was used to perform the measurement since Peak conducted output power measurement method was used to measure the conducted power. Measurement were performed on low, mid and high channel.

Test Results: The EUT was compliant with the peak power spectral density limits of **§ 15.247 (e)**

The peak power spectral density was determined from plots on the following page(s).

Test Engineer: Deepak Giri

Test Date: 12/30/2020

Peak Power Spectral Density Test Results

Frequency (MHz)	Mode	Peak PSD measured (dBm)	PSD limit (dBm)	Margin
2402	BLE 1Mbps	2.06	8	-5.94
2442		1.66	8	-6.34
2480		1.80	8	-6.80

Table 23. Peak Power Spectral Density, 1 Mbps, Test Results

Frequency (MHz)	Mode	Peak PSD measured (dBm)	PSD limit (dBm)	Margin
2402	BLE 2Mbps	-1.99	8	-9.99
2442		-2.39	8	-10.39
2480		-2.37	8	-10.37

Table 24: Peak Power Spectral Density, 2 Mbps, Test Results

Peak Power Spectral Density

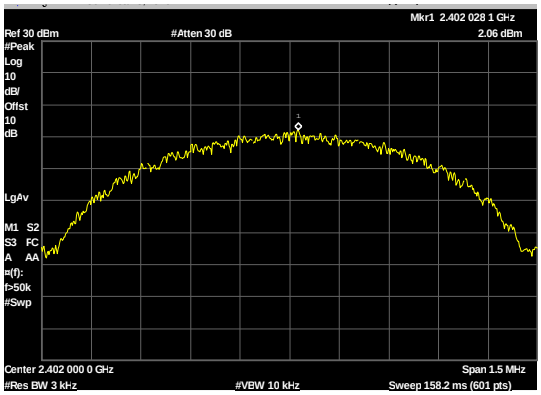

Figure 76: Power Spectral Density BLE 1 Mbps Low Channel Peak

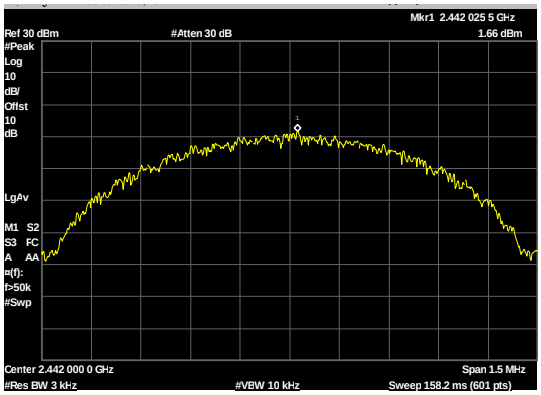

Figure 77: Peak Power Spectral Density BLE 1 Mbps Mid Channel

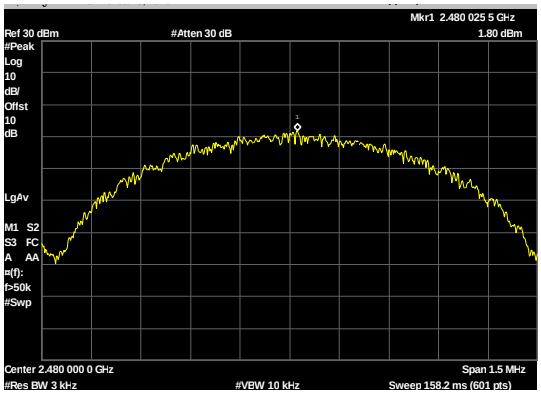

Figure 78: Peak Power Spectral Density BLE 1 Mbps High Channel

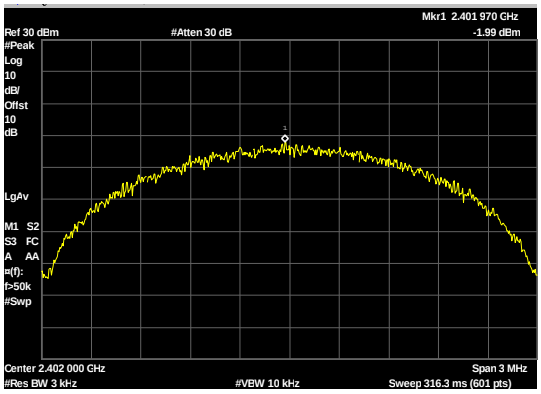

Figure 79: Peak Power Spectral Density BLE 2 Mbps Low Channel

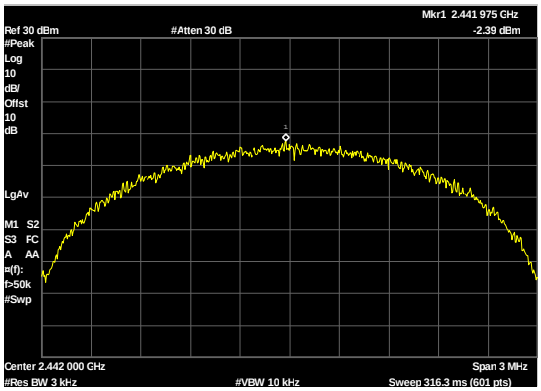

Figure 80: Peak Power Spectral Density BLE 2 Mbps Mid Channel

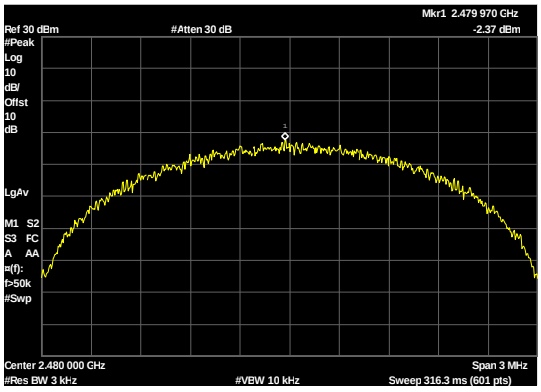

Figure 81: Peak Power Spectral Density BLE 2 Mbps High Channel

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.247(i) Maximum Permissible Exposure

RF Exposure Requirements: **§1.1307(b)(1) and §1.1307(b)(2):** Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines.

RF Radiation Exposure Limit: **§1.1310:** As specified in this section, the Maximum Permissible Exposure (MPE) Limit shall be used to evaluate the environmental impact of human exposure to radiofrequency (RF) radiation as specified in Sec. 1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of Sec. 2.1093 of this chapter.

MPE Limit: EUT's operating frequencies @ 2400-2483.5 MHz; **Limit for Uncontrolled exposure: 1 mW/cm^2 or 10 W/m^2**

Equation from page 18 of OET 65, Edition 97-01

$$S = PG / 4\pi R^2 \quad \text{or} \quad R = \sqrt{(PG / 4\pi S)}$$

where, S = Power Density (mW/cm^2)
P = Power Input to antenna (mW)
G = Antenna Gain (numeric value)
R = Distance (cm)

Test Results:

FCC									
Frequency (MHz)	**Con. Pwr. (dBm)**	**Con. Pwr. (mW)**	**Ant. Gain (dBi)**	**Ant. Gain numeric**	**Pwr. Density (mW/cm^2)**	**Limit (mW/cm^2)**	**Margin**	**Distance (cm)**	**Result**
2402	19.5	89.125	-1	0.794	0.01408	1	0.98592	20	Pass

Worst-case manufacturing power including tolerance.

The safe distance where Power Density is less than the MPE Limit listed above was found to be 20 cm. Tolerance is 1dBm.

IV. Test Equipment

Test Equipment

Calibrated test equipment utilized during testing was maintained in a current state of calibration per the requirements of ISO/IEC 17025:2005.

MET Asset #	Equipment	Manufacturer	Model	Last Cal Date	Cal Due Date
1T4771	PSA Spectrum Analyzer	Agilent Technologies	E4446A	02/26/2020	08/26/2021
1T4757	Antenna; Horn	ETS-Lindgren	3117	06/29/2020	12/29/2021
1T8743	Preamplifier	A.H. Systems, Inc.	PAM-0118P	Func Verify	
1T4612	Spectrum Analyzer	Agilent Technologies	E4407B	03/04/2020	09/04/2021
1T4875	LISN	Com-Power	LI-150A	11/12/2019	05/12/2021
1T4795	LISN	Com-Power	LI-150A	11/11/2019	05/11/2021
1T4409	EMI Receiver	Rohde & Schwarz	ESIB7	01/04/2019	01/04/2021
1T4771	PSA Spectrum Analyzer	Agilent Technologies	E4446A	02/26/2020	08/26/2021
1T4681	Spectrum Analyzer	Agilent Technologies	E4448A	04/07/2020	04/07/2021
1T4757	Antenna; Horn	ETS-Lindgren	3117	06/29/2020	12/29/2021
1A1161	DRG Horn Antenna	ETS Lindgren	3116C-PA	06/03/2020	06/03/2022
1T4751	Antenna - Bilog	Sunol Sciences	JB6	05/02/2019	01/02/2021
1T8743	Preamplifier	A.H. Systems, Inc.	PAM-0118P	Func Verify	

Table 25. Test Equipment List

Note: Functionally tested equipment is verified using calibrated instrumentation at the time of testing.

V. Certification & User's Manual Information

Certification & User's Manual Information

A. Certification Information

The following is extracted from Title 47 of the Code of Federal Regulations, Part 2, Subpart I — Marketing of Radio frequency devices:

§ 2.801 Radio-frequency device defined.

As used in this part, a radio-frequency device is any device which in its operation is capable of Emitting radio-frequency energy by radiation, conduction, or other means. Radio- frequency devices include, but are not limited to:

(a) The various types of radio communication transmitting devices described throughout this chapter.

(b) The incidental, unintentional and intentional radiators defined in Part 15 of this chapter.

(c) The industrial, scientific, and medical equipment described in Part 18 of this chapter.

(d) Any part or component thereof which in use emits radio-frequency energy by radiation, conduction, or other means.

§ 2.803 Marketing of radio frequency devices prior to equipment authorization.

(a) Except as provided elsewhere in this chapter, no person shall sell or lease, or offer for sale or lease (including advertising for sale or lease), or import, ship or distribute for the purpose of selling or leasing or offering for sale or lease, any radio frequency device unless:

(1) In the case of a device subject to certification, such device has been authorized by the Commission in accordance with the rules in this chapter and is properly identified and labeled as required by §2.925 and other relevant sections in this chapter; or

(2) In the case of a device that is not required to have a grant of equipment authorization issued by the Commission, but which must comply with the specified technical standards prior to use, such device also complies with all applicable administrative (including verification of the equipment or authorization under a Declaration of Conformity, where required), technical, labeling and identification requirements specified in this chapter.

(d) Notwithstanding the provisions of paragraph (a) of this section, the offer for sale solely to business, commercial, industrial, scientific or medical users (but not an offer for sale to other parties or to end users located in a residential environment) of a radio frequency device that is in the conceptual, developmental, design or pre-production stage is permitted prior to equipment authorization or, for devices not subject to the equipment authorization requirements, prior to a determination of compliance with the applicable technical requirements *provided* that the prospective buyer is advised in writing at the time of the offer for sale that the equipment is subject to the FCC rules and that the equipment will comply with the appropriate rules before delivery to the buyer or to centers of distribution.

(e)(1) Notwithstanding the provisions of paragraph (a) of this section, prior to equipment authorization or determination of compliance with the applicable technical requirements any radio frequency device may be operated, but not marketed, for the following purposes and under the following conditions:

(i) Compliance testing;

(ii) Demonstrations at a trade show provided the notice contained in paragraph (c) of this section is displayed in a conspicuous location on, or immediately adjacent to, the device;

(iii) Demonstrations at an exhibition conducted at a business, commercial, industrial, scientific or medical location, but excluding locations in a residential environment, provided the notice contained in paragraphs (c) or (d) of this section, as appropriate, is displayed in a conspicuous location on, or immediately adjacent to, the device;

(iv) Evaluation of product performance and determination of customer acceptability, provided such operation takes place at the manufacturer's facilities during developmental, design or pre-production states; or

(v) Evaluation of product performance and determination of customer acceptability where customer acceptability of a radio frequency device cannot be determined at the manufacturer's facilities because of size or unique capability of the device, provided the device is operated at a business, commercial, industrial, scientific or medical user's site, but not at a residential site, during the development, design or pre-production stages.

(e)(2) For the purpose of paragraphs (e)(1)(iv) and (e)(1)(v) of this section, the term *manufacturer's facilities* includes the facilities of the party responsible for compliance with the regulations and the manufacturer's premises, as well as the facilities of other entities working under the authorization of the responsible party in connection with the development and manufacture, but not the marketing, of the equipment.

(f) For radio frequency devices subject to verification and sold solely to business, commercial, industrial, scientific and medical users (excluding products sold to other parties or for operation in a residential environment), parties responsible for verification of the devices shall have the option of ensuring compliance with the applicable technical specifications of this chapter at each end user's location after installation, provided that the purchase or lease agreement includes a proviso that such a determination of compliance be made and is the responsibility of the party responsible for verification of the equipment.

Certification & User's Manual Information

The following is extracted from Title 47 of the Code of Federal Regulations, Part 2, Subpart J — Equipment Authorization Procedures:

§ 2.901 Basis and Purpose

(a) In order to carry out its responsibilities under the Communications Act and the various treaties and international regulations, and in order to promote efficient use of the radio spectrum, the Commission has developed technical standards for radio frequency equipment and parts or components thereof. The technical standards applicable to individual types of equipment are found in that part of the rules governing the service wherein the equipment is to be operated.[1] *In addition to the technical standards provided, the rules governing the service may require that such equipment be verified by the manufacturer or importer*, be authorized under a Declaration of Conformity, or receive an equipment authorization from the Commission by one of the following procedures: certification or registration.

(b) The following sections describe the verification procedure, the procedure for a Declaration of Conformity, and the procedures to be followed in obtaining certification from the Commission and the conditions attendant to such a grant.

§ 2.907 Certification.

(a) Certification is an equipment authorization issued by the Commission, based on representation and test data submitted by the applicant.

(b) Certification attaches to all units subsequently marketed by the grantee which are identical (see Section 2.908) to the sample tested except for permissive changes or other variations authorized by the Commission pursuant to Section 2.1043.

[1] In this case, the equipment is subject to the rules of Part 15. More specifically, the equipment falls under Subpart B (of Part 15), which deals with unintentional radiators.

Certification & User's Manual Information

§ 2.948 Description of measurement facilities.

(a) Each party making measurements of equipment that is subject to an equipment authorization under Part 15 or Part 18 of this chapter, regardless of whether the measurements are filed with the Commission or kept on file by the party responsible for compliance of equipment marketed within the U.S. or its possessions, shall compile a description of the measurement facilities employed.

(1) If the measured equipment is subject to the verification procedure, the description of the measurement facilities shall be retained by the party responsible for verification of the equipment.

(i) If the equipment is verified through measurements performed by an independent laboratory, it is acceptable for the party responsible for verification of the equipment to rely upon the description of the measurement facilities retained by or placed on file with the Commission by that laboratory. In this situation, the party responsible for the verification of the equipment is not required to retain a duplicate copy of the description of the measurement facilities.

(ii) If the equipment is verified based on measurements performed at the installation site of the equipment, no specific site calibration data is required. It is acceptable to retain the description of the measurement facilities at the site at which the measurements were performed.

(2) If the equipment is to be authorized by the Commission under the certification procedure, the description of the measurement facilities shall be filed with the Commission's Laboratory in Columbia, Maryland. The data describing the measurement facilities need only be filed once but must be updated as changes are made to the measurement facilities or as otherwise described in this section. At least every three years, the organization responsible for filing the data with the Commission shall certify that the data on file is current.

Certification & User's Manual Information

1. Label and User's Manual Information

The following is extracted from Title 47 of the Code of Federal Regulations, Part 15, Subpart A — General:

§ 15.19 Labeling requirements.

(a) In addition to the requirements in Part 2 of this chapter, a device subject to certification or verification shall be labeled as follows:

(1) Receivers associated with the operation of a licensed radio service, e.g., FM broadcast under Part 73 of this chapter, land mobile operation under Part 90, etc., shall bear the following statement in a conspicuous location on the device:

This device complies with Part 15 of the FCC Rules. Operation is subject to the condition that this device does not cause harmful interference.

(2) A stand-alone cable input selector switch, shall bear the following statement in a conspicuous location on the device:

This device is verified to comply with Part 15 of the FCC Rules for use with cable television service.

(3) All other devices shall bear the following statement in a conspicuous location on the device:

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

(4) Where a device is constructed in two or more sections connected by wires and marketed together, the statement specified under paragraph (a) of this section is required to be affixed only to the main control unit.

(5) When the device is so small or for such use that it is not practicable to place the statement specified under paragraph (a) of this section on it, the information required by this paragraph shall be placed in a prominent location in the instruction manual or pamphlet supplied to the user or, alternatively, shall be placed on the container in which the device is marketed. However, the FCC identifier or the unique identifier, as appropriate, must be displayed on the device.

§ 15.21 Information to user.

The user's manual or instruction manual for an intentional or unintentional 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.

Verification & User's Manual Information

The following is extracted from Title 47 of the Code of Federal Regulations, Part 15, Subpart B — Unintentional Radiators:

§ 15.105 Information to the user.

(a) For a Class A digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual:

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at own expense.

(b) For a Class B digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual:

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a residential environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

– Reorient or relocate the receiving antenna.

– Increase the separation between the equipment and receiver.

– Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

– Consult the dealer or an experienced radio/TV technician for help.

End of Report

