HEADQUARTERS: 914 WEST PATAPSCO AVENUE • BALTIMORE, MARYLAND 21230 • PHONE (410) 354-3300 • FAX (410) 354-3313

07/20/2020

S&C Electric Company
6001 North Ridge Blvd.
Chicago, IL 60626

Dear Rohit Sharma,

Enclosed is the Wireless test report for compliance testing of the S&C Electric Company, S&C Wi-Fi/GPS Module 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: (\S&C Electric Company\WIR107750-FCC247)

Electromagnetic Compatibility Criteria
Test Report

for the

S&C Electric Company
S&C Wi-Fi/GPS Module

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

Report: WIR107750-FCC247

07/20/2020

Prepared For:

S&C Electric Company
6001 North Ridge Blvd.
Chicago, IL 60626

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

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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
∅	07/20/2020	Initial Issue.

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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
µ**s**	**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 S&C Electric Company S&C Wi-Fi/GPS Module, 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 S&C Wi-Fi/GPS Module. S&C Electric Company should retain a copy of this document which should be kept on file for at least two years after the manufacturing of the S&C Wi-Fi/GPS Module, 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 S&C Electric Company, purchase order number 1020221. 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(c)	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 S&C Electric Company to perform testing on the S&C Wi-Fi/GPS Module, under S&C Electric Company's purchase order number 1020221.

This document describes the test setups, test methods, required test equipment, and the test limit criteria used to perform compliance testing of the S&C Electric Company, S&C Wi-Fi/GPS Module.

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

Model(s) Tested:	S&C Wi-Fi/GPS Module	
Model(s) Covered:	S&C Wi-Fi/GPS Module	
EUT Specifications:	Primary Power: 12 VDC	
	FCC ID: U3D-WIFIGPS	
	Type of Modulations:	OFDM
	Equipment Code:	DTS
	Peak RF Output Power:	12.75 dBm conducted
	EUT Frequency Ranges:	2412 - 2462 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):	07/20/2020	

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

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

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 Eurofins E&E North America.

D. Measurement Uncertainty

Test Method	Typical Expanded Uncertainty (dB)	K	Confidence Level
Radiated Emissions, (30 MHz – 1 GHz)	±3.45	2	95%
Radiated Emissions, (1 - 6 GHz)	±6.29	2	95%
Conducted Emission	±3.8	2	95%
CEV Telecom Port	±2.8	2	95%

Table 4. Uncertainty Calculations Summary

E. Description of Test Sample

The S&C Electric Company S&C Wi-Fi/GPS Module, Equipment Under Test (EUT), is a unitized package of fault-interrupting and control components that provides fault-isolation and circuit-restoration functions on an overhead distribution system. The S&C Wi-Fi/GPS Module if a part of the S&C IntelliRupter® PulseCloser Fault Interrupter Communication Device where wired connectivity is provided through Ethernet and wireless connectivity is provided through 802.11 b/g/n (WiFi). It is an electronic Wi-Fi and GPS module use to remote access Wi-Fi capability to configure the Wi-Fi/GPS User Interface. The WAN must be routed through the Wi-Fi/GPS that will enable remote firmware updates and will be required for some cybersecurity features provided in future releases of the Wi-Fi/GPS firmware.

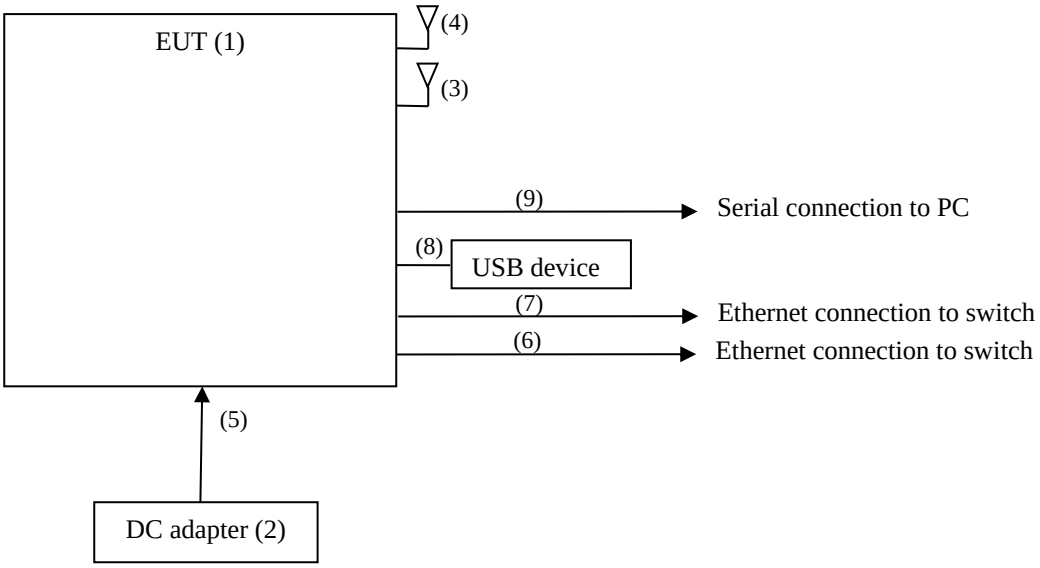

Figure 1. Block Diagram of Test Configuration

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. #
1		S&C Wi-Fi/GPS Module	005-004701-01			1
2	2.4 GHz antenna	Laird	TRA24003			

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
3	Power supply adapter	CUI	SWI-10-12-N-P5	
4	GPS antenna	Laird	GPSU15M	
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
1	Power supply adapter	CUI	1		2	N/A	CUI
2	2.4 GHz antenna	Laird	1		3	N/A	Laird
3	GPS antenna	Laird	1		4	N/A	Laird

Table 7. Ports and Cabling Information

I. Mode of Operation

In the normal operating mode of the EUT all connectivity ports are on and operational and can potentially be connected to external devices. To simulate normal operating conditions, the EUT is connected to other devices using both wired and wireless connectivity. Ethernet connectivity is exercised by connecting the EUT to an Ethernet switch and passing ping or other data traffic over it. All radios are on and operational by default in the EUT. The Wifi radio is connected to an access point.

J. Method of Monitoring EUT Operation

Continued operation of EUT is indicated by: 1) Always-on blue power LED 2) Blinking amber heartbeat LED 3) Continued ping data traffic over the data ports.

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 S&C Electric Company 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. Customer declared antenna is installed professionally.

Test Engineer(s): Deepak Giri

Test Date(s): 06/16/2020

Antenna Type	Antenna gain dBi
Dipole	3

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 "Methods and Measurements of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40 GHz"*. 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 an EMC/field intensity meter. For the purpose of this testing, the transmitter was turned on.

Test Results: The EUT was compliant with this requirement.

Test Engineer(s): Deepak Giri

Test Date(s): 06/10/2020

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
0.155	30.66	0	10	40.66	65.73	PASS	-25.07	22.47	0	10	32.47	55.73	PASS	-23.26
0.2088	27.42	0	10	37.42	63.25	PASS	-25.83	19.17	0	10	29.17	53.25	PASS	-24.08
0.354	36.48	0	10	46.48	58.87	PASS	-12.39	25.44	0	10	35.44	48.87	PASS	-13.43
0.781	25.68	0	10	35.68	56	PASS	-20.32	19.23	0	10	29.23	46	PASS	-16.77
5.66	24.12	0	10	34.12	60	PASS	-25.88	18.47	0	10	28.47	50	PASS	-21.53
13.44	30.11	0.01	10	40.12	60	PASS	-19.88	21.87	0.01	10	31.88	50	PASS	-18.12

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

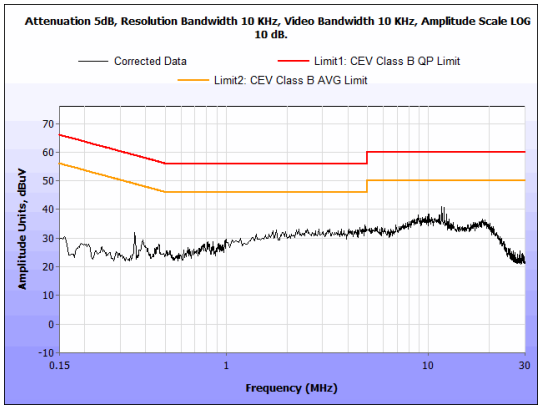

Figure 2. Conducted Emissions, 15.207(a), Phase Line

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
0.158	30.21	0	10	40.21	65.57	PASS	-25.36	27.66	0	10	37.66	55.57	PASS	-17.91
0.218	33.76	0	10	43.76	62.9	PASS	-19.14	29.63	0	10	39.63	52.9	PASS	-13.27
0.371	26.19	0	10	36.19	58.48	PASS	-22.29	21.44	0	10	31.44	48.48	PASS	-17.04
0.921	28.31	0	10	38.31	56	PASS	-17.69	20.11	0	10	30.11	46	PASS	-15.89
7.74	29.65	0	10	39.65	60	PASS	-20.35	19.47	0	10	29.47	50	PASS	-20.53
14.12	39.53	0.02	10	49.55	60	PASS	-10.45	28.91	0.02	10	38.93	50	PASS	-11.07

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

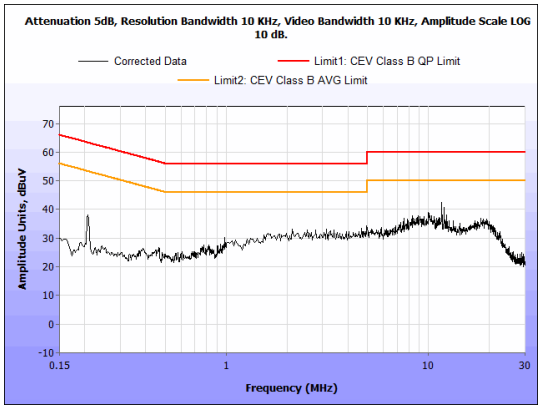

Figure 3. Conducted Emissions, 15.207(a), Neutral Line

15.207(a) Conducted Emissions Test Setup Photo

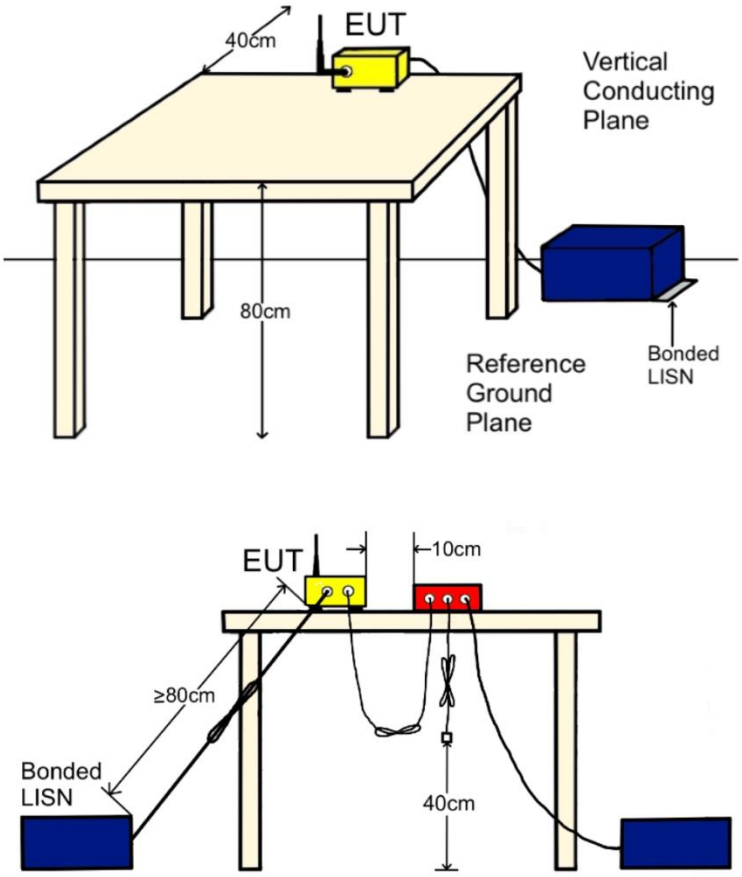

Figure 4. Conducted Emissions, 15.207(a), Test Setup

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: Method stated in 11.8.2 of ANSI C63.10-2013 was used for measuring DTS bandwidth. Measurement was performed conducted. 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): 06/16/2020

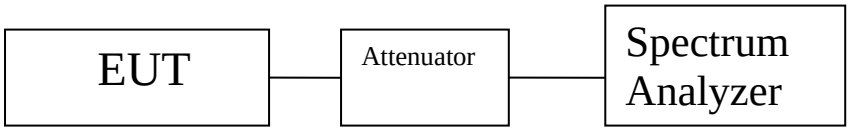

Figure 5. Block Diagram, Occupied Bandwidth Test Setup

6 dB Occupied Bandwidth Test Results

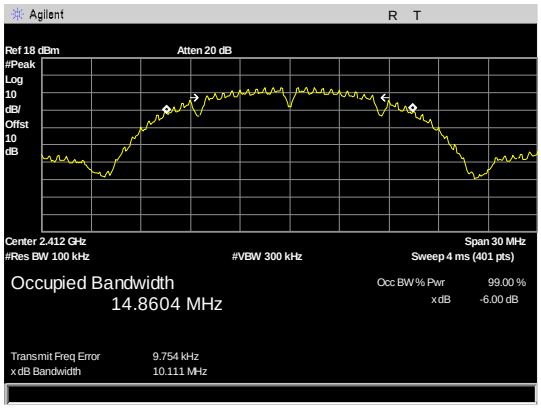

Figure 6: 6dB Occupied Bandwidth, B mode 20M Bw low channel

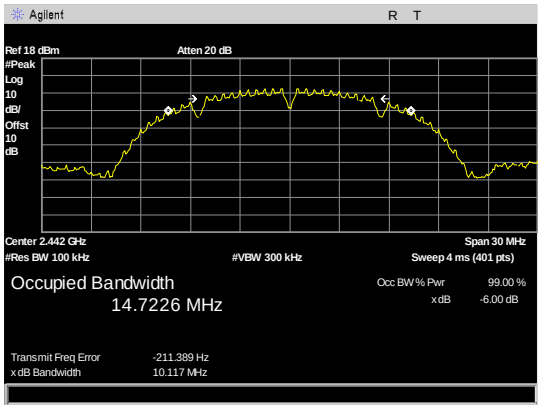

Figure 7: 6dB Occupied Bandwidth, B mode 20M Bw mid channel

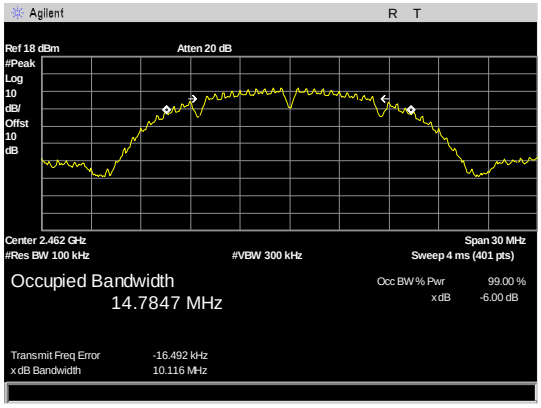

Figure 8: 6dB Occupied Bandwidth, B mode 20M Bw high channel

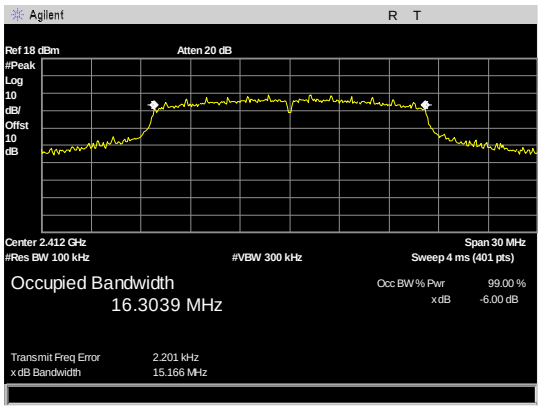

Figure 9: 6dB Occupied Bandwidth, G mode 20M Bw low channel

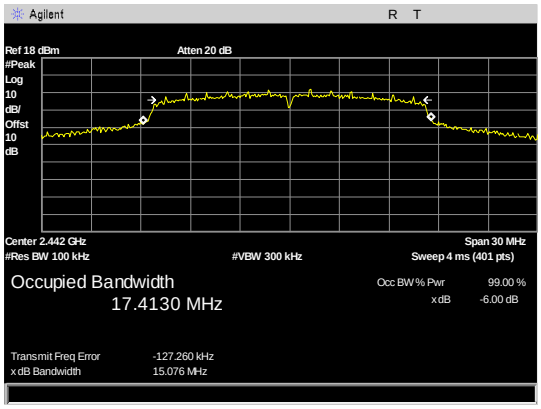

Figure 10: 6dB Occupied Bandwidth, G mode 20M Bw mid channel

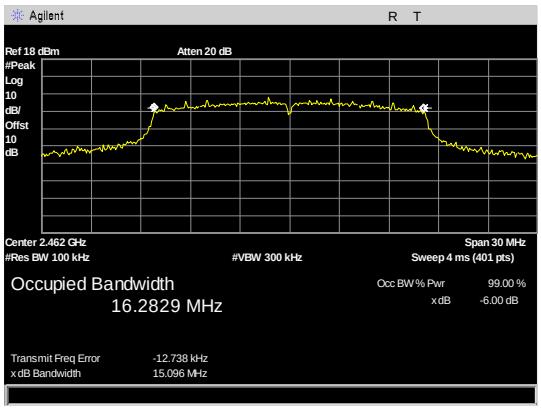

Figure 11: 6dB Occupied Bandwidth, G mode 20M Bw high channel

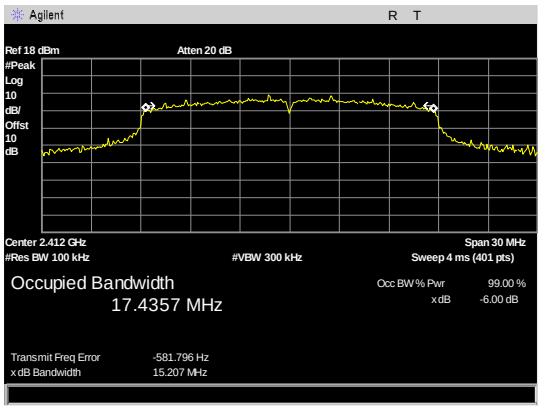

Figure 12: 6dB Occupied Bandwidth, N mode 20M Bw low channel

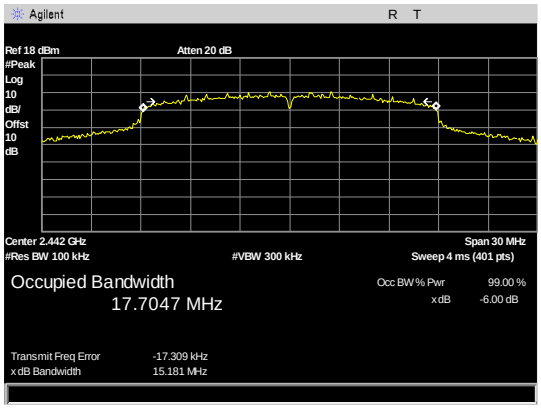

Figure 13: 6dB Occupied Bandwidth, N mode 20M Bw mid channel

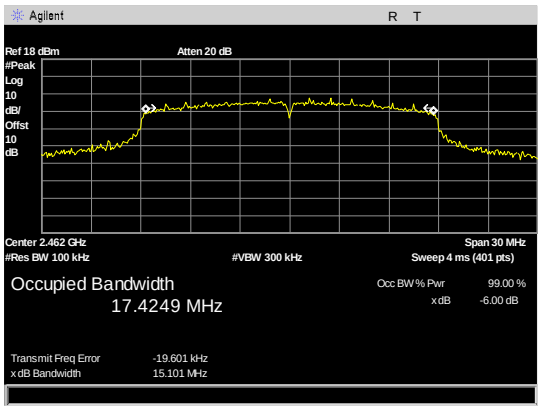

Figure 14: 6dB Occupied Bandwidth, N mode 20M Bw high channel

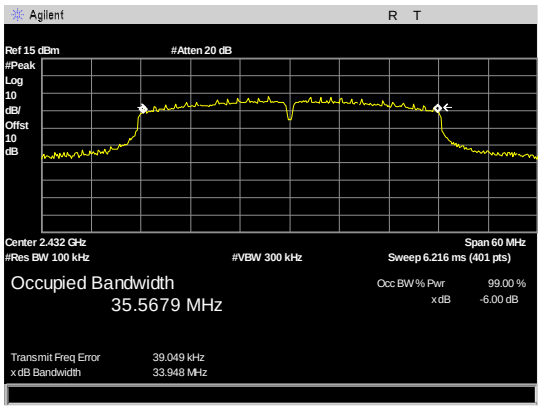

Figure 15: 6dB Occupied Bandwidth, N mode 40M Bw low channel

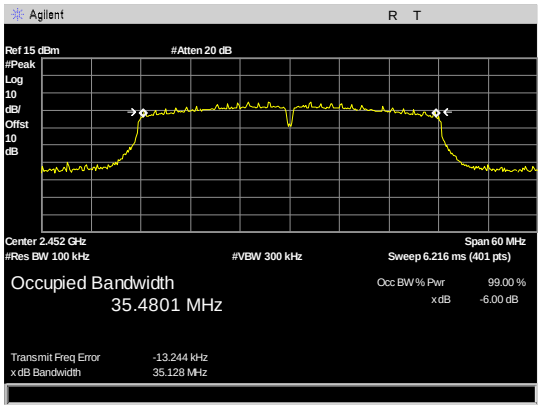

Figure 16: 6dB Occupied Bandwidth, N mode 40M Bw high channel

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 12. 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. Measurements were performed on a conducted set up with attenuator in line. Method stated in 11.9.2.2.4 of ANSI C63.10-2013 was used.

Test Results: The EUT was compliant with the Peak Power Output limits of **§15.247(b)**.

Test Engineer(s): Deepak Giri

Test Date(s): 06/16/2020

Peak Power Output Test Results

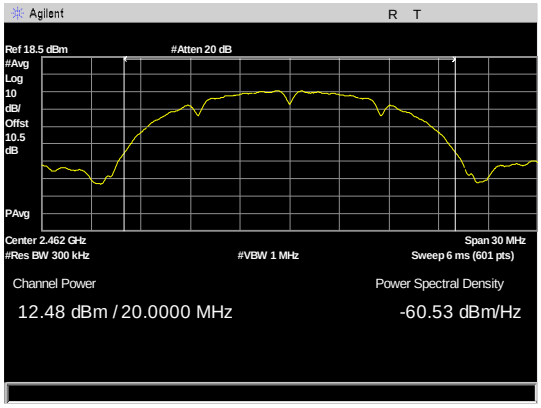

Figure 17: Output Power, B mode 20M Bw AVGSA-2 high channel

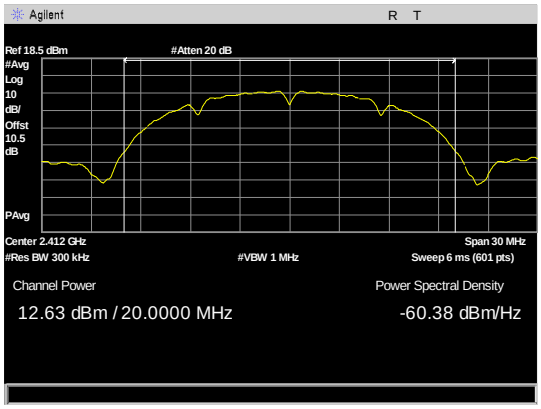

Figure 18: Output Power, B mode 20M Bw AVGSA-2 low channel

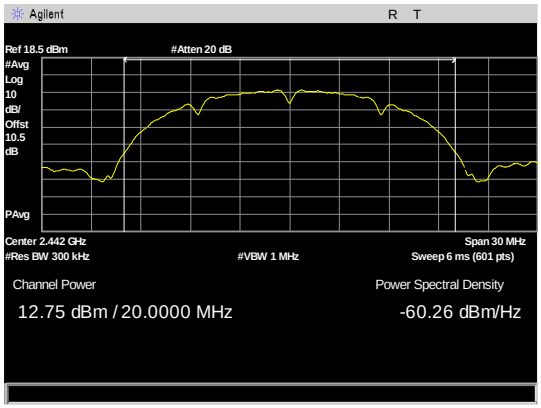

Figure 19: Output Power, B mode 20M Bw AVGSA-2 mid channel

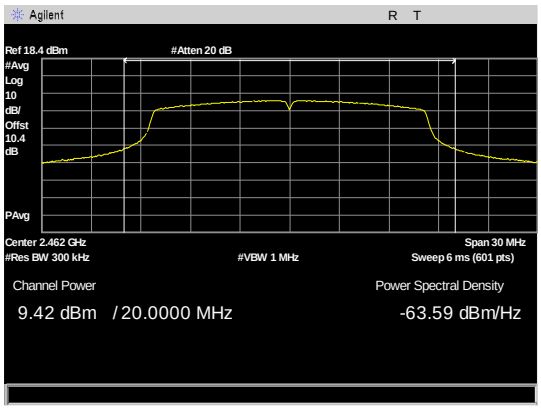

Figure 20: Output Power, G mode 20M Bw AVGSA-2 high channel

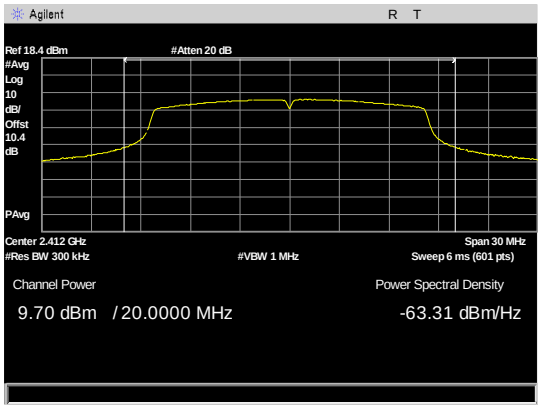

Figure 21: Output Power, G mode 20M Bw AVGSA-2 low channel

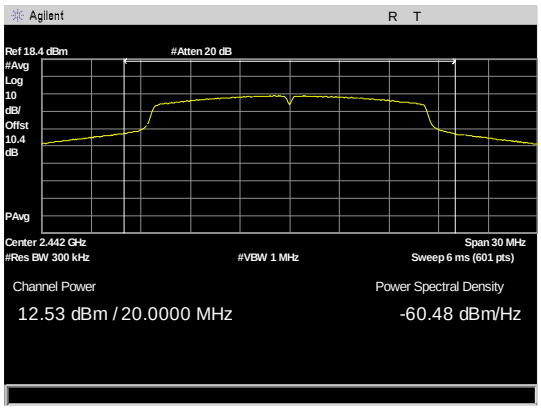

Figure 22: Output Power, G mode 20M Bw AVGSA-2 mid channel

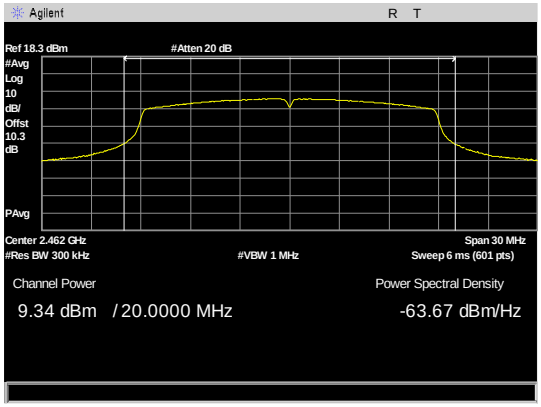

Figure 23: Output Power, N mode 20M Bw AVGSA-2 high channel

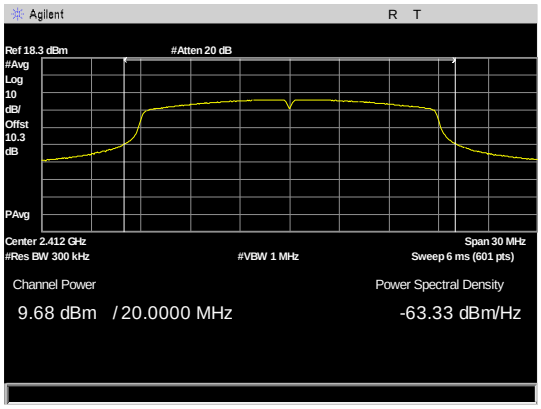

Figure 24: Output Power, N mode 20M Bw AVGSA-2 low channel

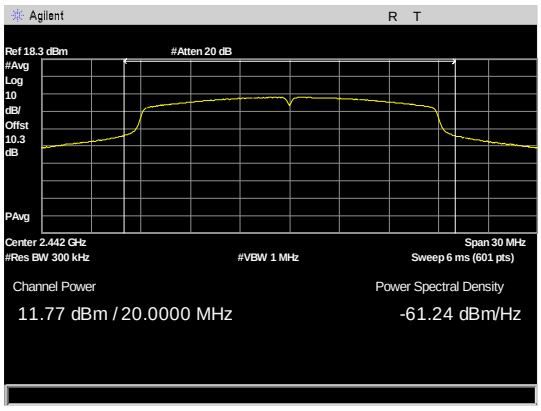

Figure 25: Output Power, N mode 20M Bw AVGSA-2 mid channel

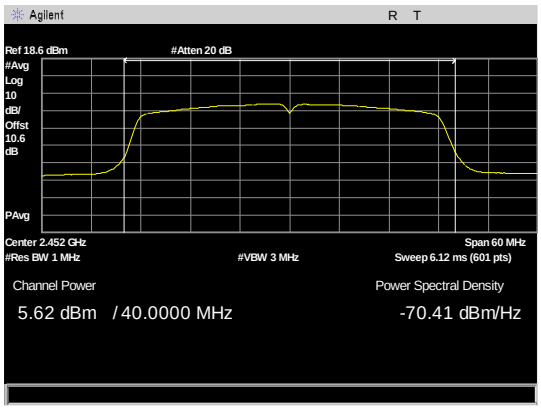

Figure 26: Output Power, N mode 40M Bw AVGSA-2 high channel

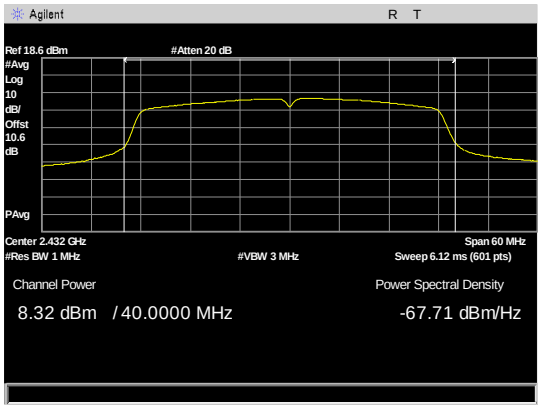

Figure 27: Output Power, N mode 40M Bw AVGSA-2 low channel

Frequency (MHz)	Mode	Bandwidth (MHz)	ON Time (ms)	OFF Time (ms)	Period (ms)	Duty Cycle (%)	Correction Factor (dB)
2412	B	20	4.45	0.50	4.95	89.9	0.5
2412	G	20	4.05	0.40	4.45	91	0.4
2412	N	20	4.5	0.30	4.8	93.7	0.3
2432	N	40	2.2	0.30	2.5	88	0.6

Figure 28. Duty Cycle Calculation

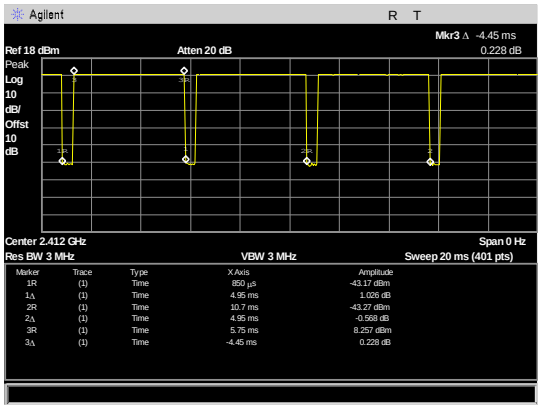

Figure 29: Duty Cycle, B Mode 20 MHz

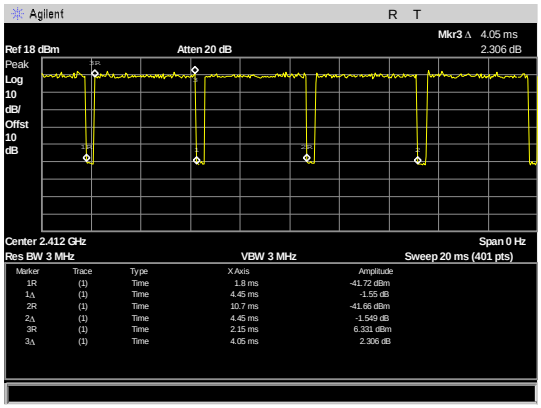

Figure 30: Duty Cycle, G Mode 20 MHz

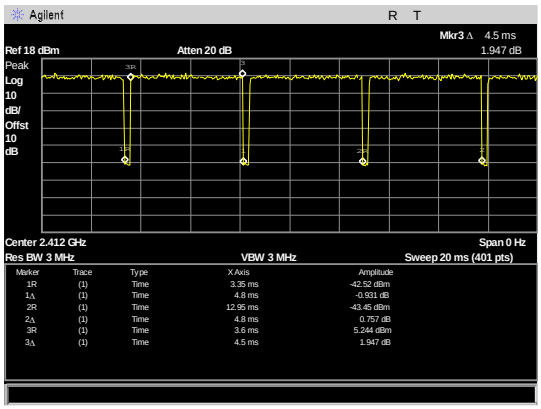

Figure 31: Duty Cycle, N Mode 20 MHz

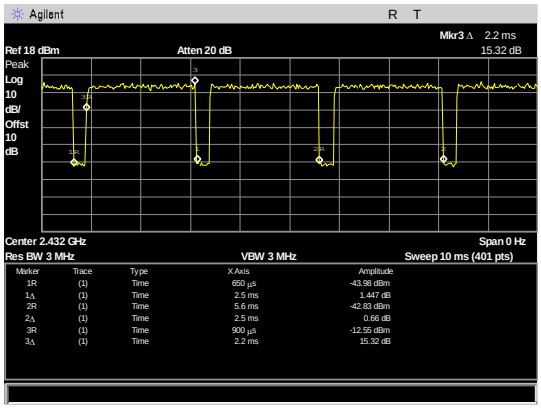

Figure 32: Duty Cycle, N Mode 40 MHz

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 13. 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 14.

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

Test Procedures: Method stated in 11.12.1 of ANSI C63.10-2013 was used for measurement. Method stated in 6.3 , 6.5 and 6.6 of ANSI C63.10-2013 were also used. Radiated test setup was used. Measurements were performed of the low, mid and high Channels. The EUT was rotated orthogonally through all three axes and plots shown are cumulative result of all three axes rotation and horizontal and vertical receiving antenna polarization. Plots shown are corrected for both antenna correction factor and distance, cable and compared to a 3 m limit line. Spurious emissions were not observed above18GHz.

Test Results: The EUT was compliant with the Radiated Spurious Emission limits of **§ 15.247(d) and § 15.209**. Emissions that appeared above the limit are not the product of transmitter which was verified by the scan of the EUT with transmitter OFF. Emissions out of the transmitter in the range of 30MHz-1GHz are under the applicable limit of 15.209. Only worst case plots are presented. For 1GHz-18GHz notch filter was used with pre-amp. Pre-amp was used from 18-25 GHz.

Test Engineer(s): Deepak Giri

Test Date(s): 06/16/2020

Radiated Spurious Emissions, Test Results

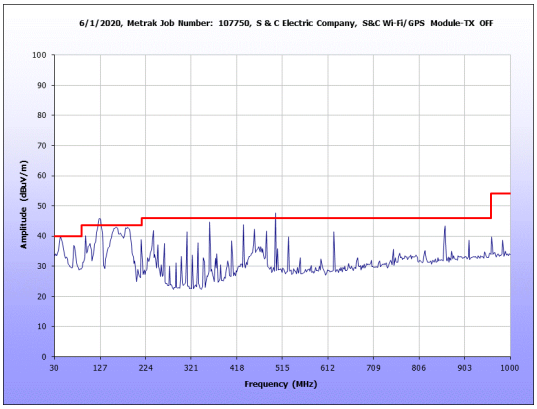

Figure 33: Radiated Spurious Emissions, Transmitter OFF 30MHz- 1 GHz

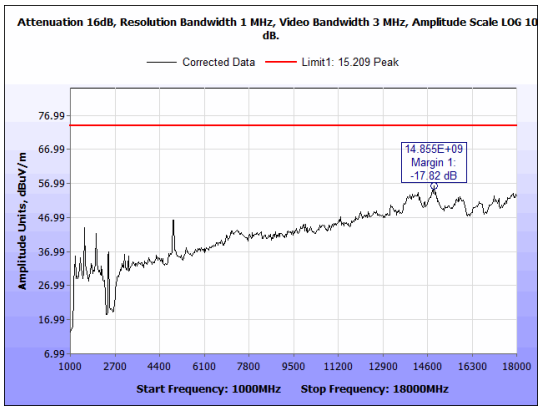

Figure 34: Radiated Spurious Emissions, B mode 20M high channel RE 1-18GHz Peak.

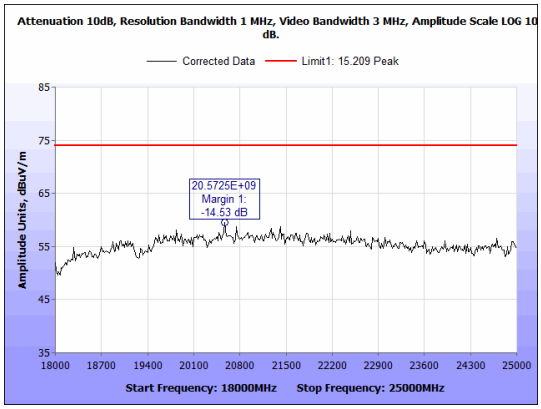

Figure 35: Radiated Spurious Emissions, B mode 20M high channel RE 18-25GHz Peak.

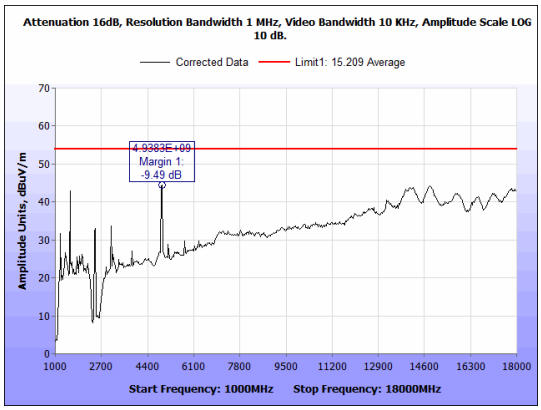

Figure 36: Radiated Spurious Emissions, B mode 20M high channel RE 1-18GHz Average.

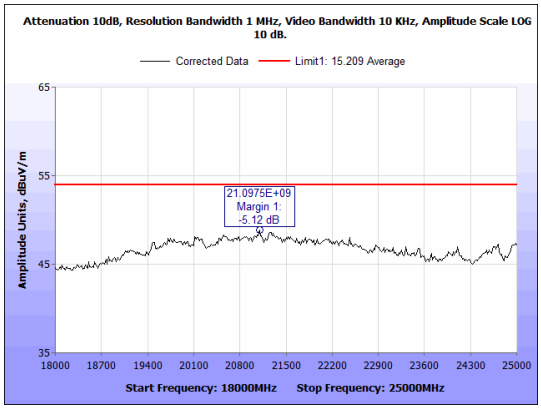

Figure 37: Radiated Spurious Emissions, B mode 20M high channel RE 18-25GHz Average.

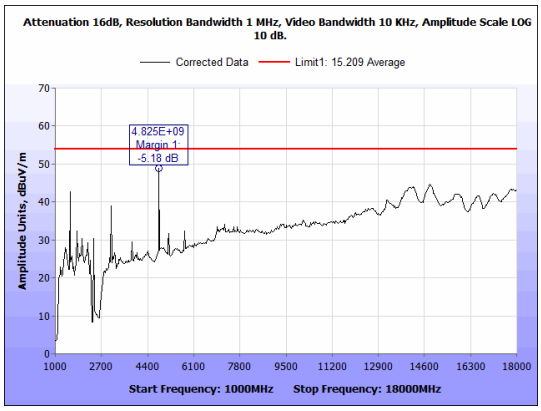

Figure 38: Radiated Spurious Emissions, B mode 20M low channel RE 1-18GHz Average.

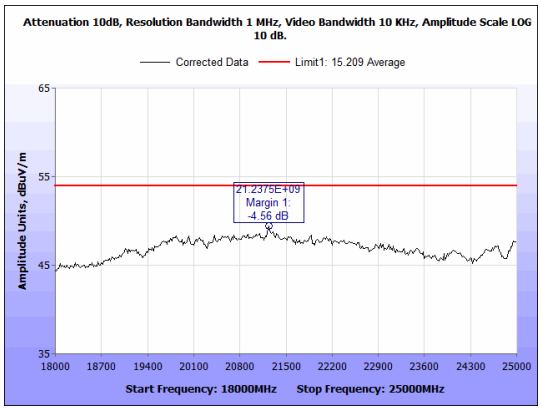

Figure 39: Radiated Spurious Emissions, B mode 20M low channel RE 18-25GHz Average.

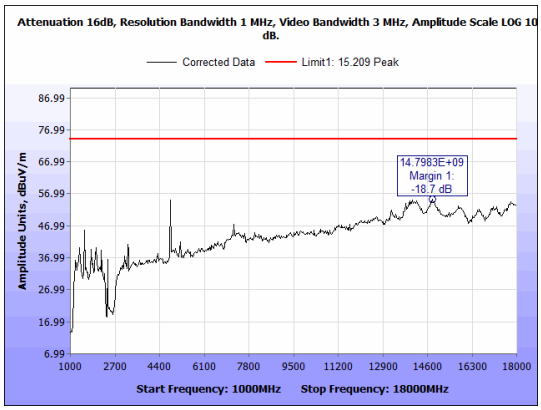

Figure 40: Radiated Spurious Emissions, B mode 20M low channel RE 1-18GHz Peak.

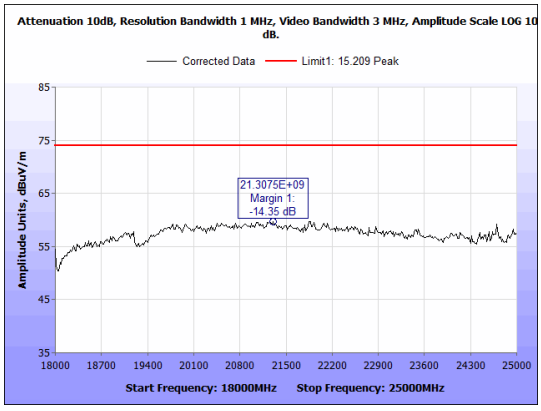

Figure 41: Radiated Spurious Emissions, B mode 20M low channel RE 18-25GHz Peak.

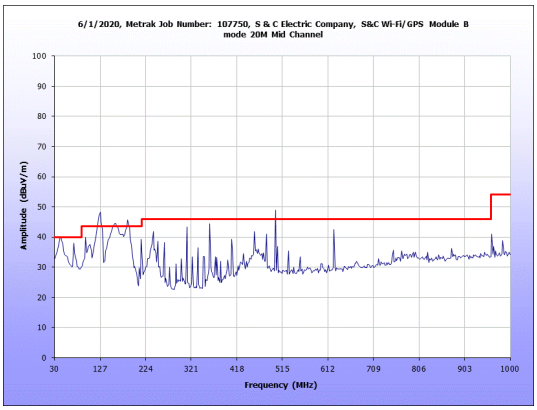

Figure 42: Radiated Spurious Emissions, B mode 20M mid channel RE 30MHz-1GHz.

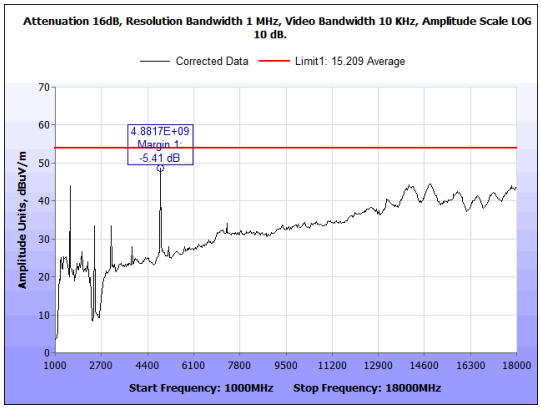

Figure 43: Radiated Spurious Emissions, B mode 20M mid channel RE 1-18GHz Average.

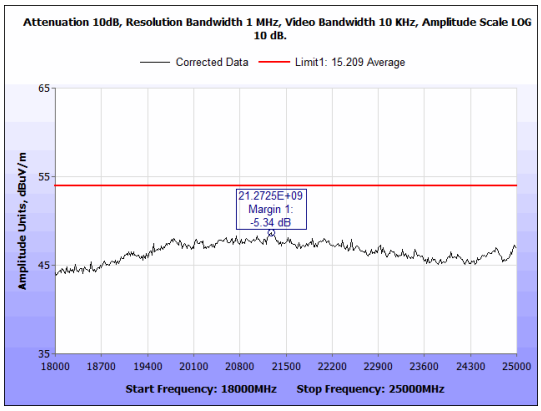

Figure 44: Radiated Spurious Emissions, B mode 20M mid channel RE 18-25GHz Average.

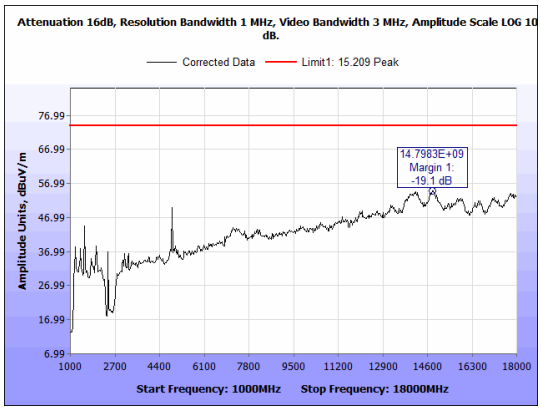

Figure 45: Radiated Spurious Emissions, B mode 20M mid channel RE 1-18GHz Peak.

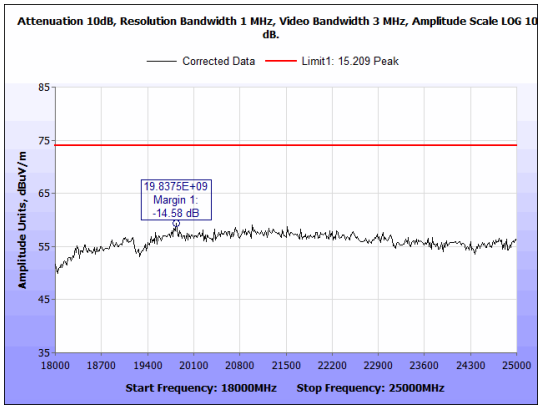

Figure 46: Radiated Spurious Emissions, B mode 20M mid channel RE 18-25GHz Peak.

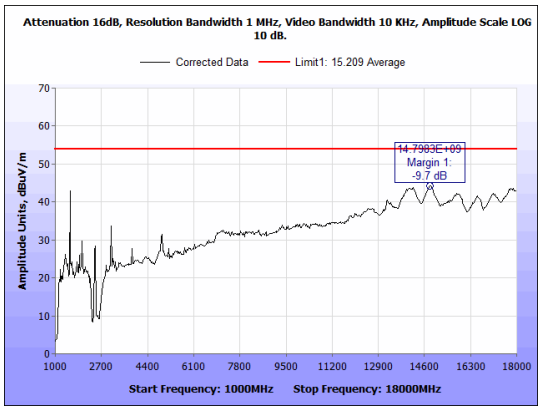

Figure 47: Radiated Spurious Emissions, G mode 20M high channel RE 1-18GHz Average.

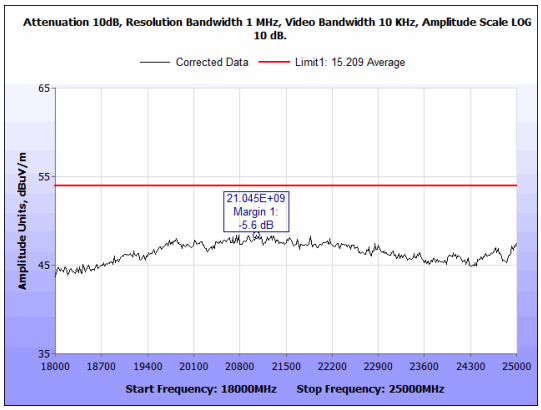

Figure 48: Radiated Spurious Emissions, G mode 20M high channel RE 18-25GHz Average.

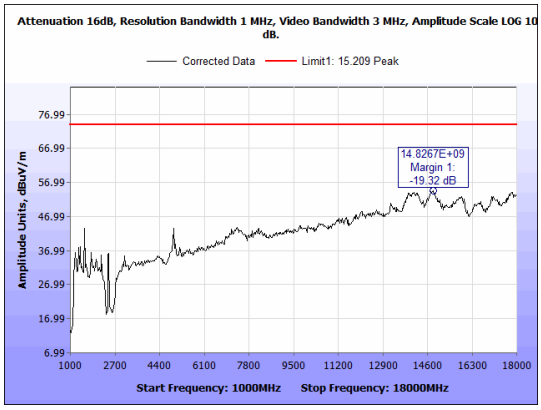

Figure 49: Radiated Spurious Emissions, G mode 20M high channel RE 1-18GHz Peak.

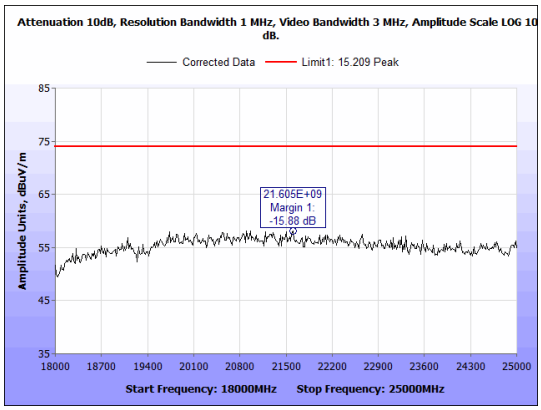

Figure 50: Radiated Spurious Emissions, G mode 20M high channel RE 18-25GHz Peak.

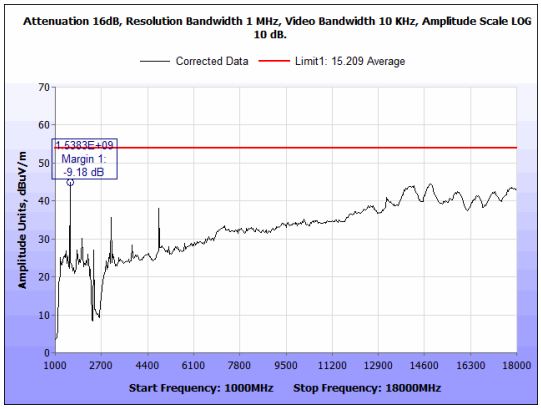

Figure 51: Radiated Spurious Emissions, G mode 20M low channel RE 1-18GHz Average.

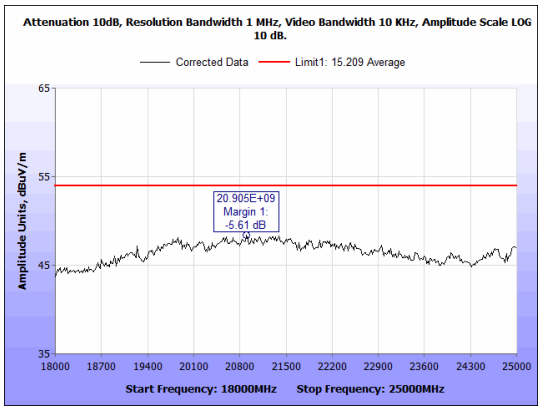

Figure 52: Radiated Spurious Emissions, G mode 20M low channel RE 18-25GHz Average.

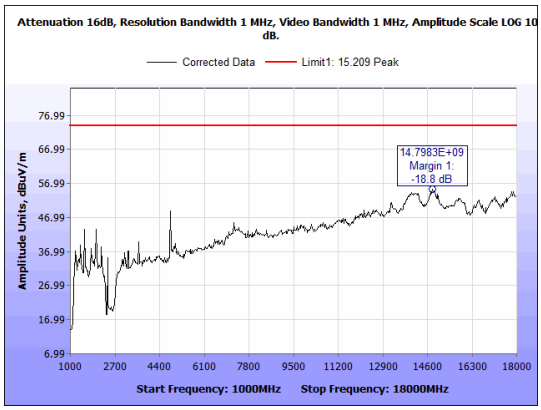

Figure 53: Radiated Spurious Emissions, G mode 20M low channel RE 1-18GHz Peak.

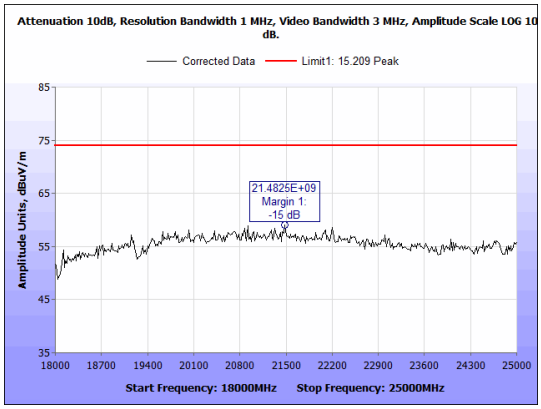

Figure 54: Radiated Spurious Emissions, G mode 20M low channel RE 18-25GHz Peak.

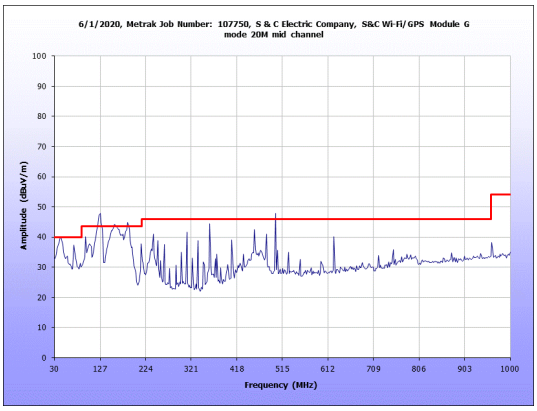

Figure 55: Radiated Spurious Emissions, G mode 20M mid channel RE 30MHz-1GHz.

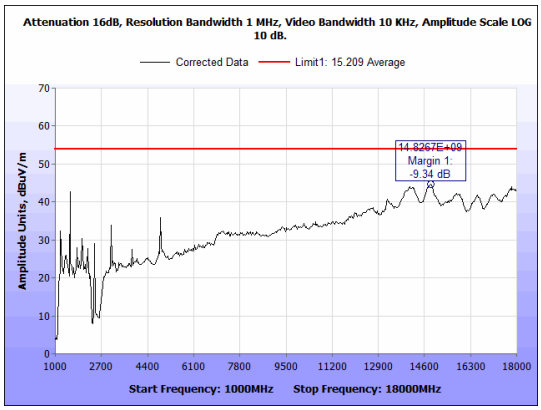

Figure 56: Radiated Spurious Emissions, G mode 20M mid channel RE 1-18GHz Average.

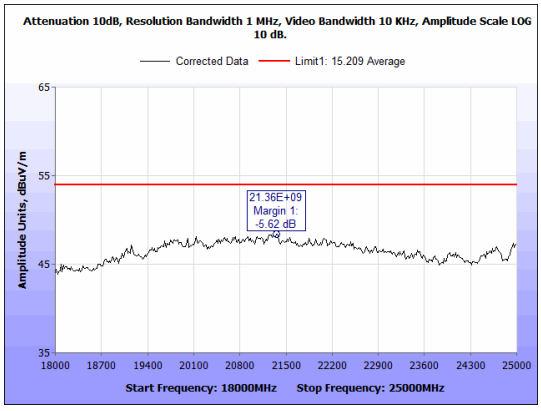

Figure 57: Radiated Spurious Emissions, G mode 20M mid channel RE 18-25GHz Average.

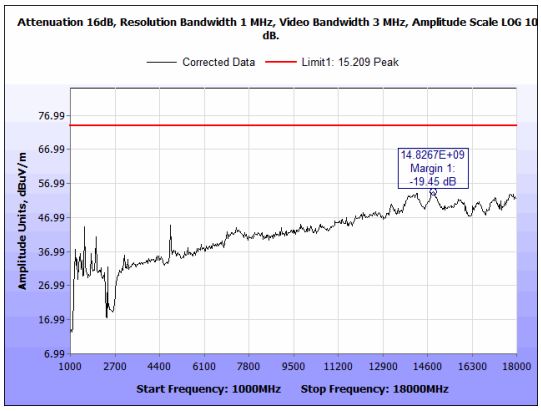

Figure 58: Radiated Spurious Emissions, G mode 20M mid channel RE 1-18GHz Peak.

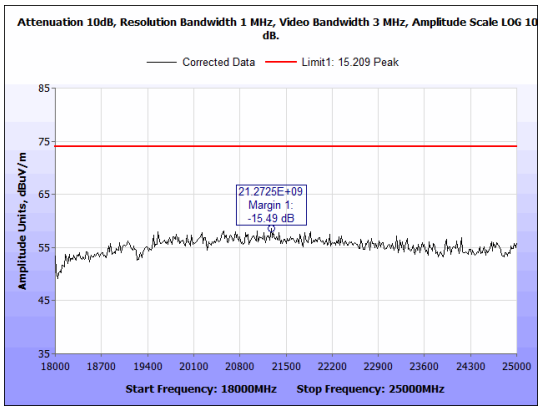

Figure 59: Radiated Spurious Emissions, G mode 20M mid channel RE 18-25GHz Peak.

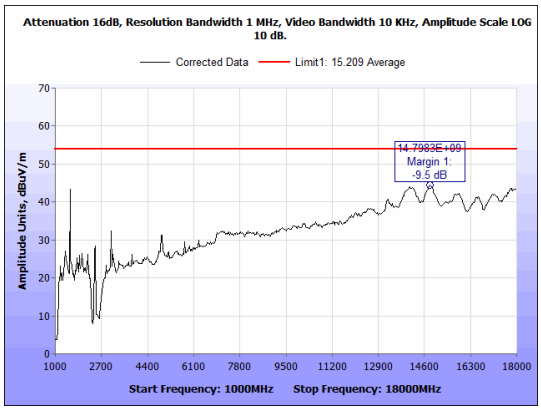

Figure 60: Radiated Spurious Emissions, N mode 20M high channel RE 1-18GHz Average.

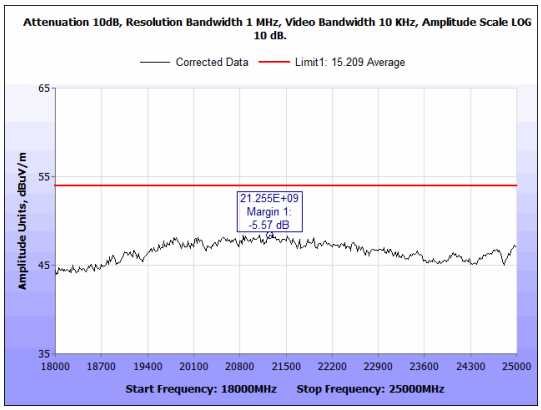

Figure 61: Radiated Spurious Emissions, N mode 20M high channel RE 18-25GHz Average.

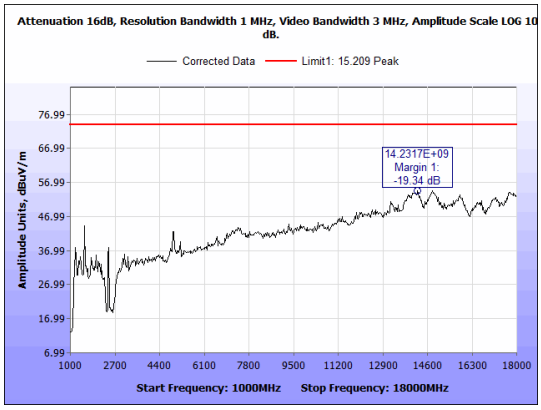

Figure 62: Radiated Spurious Emissions, N mode 20M high channel RE 1-18GHz Peak.

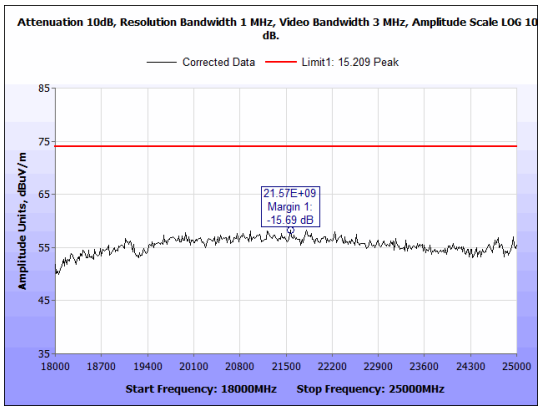

Figure 63: Radiated Spurious Emissions, N mode 20M high channel RE 18-25GHz Peak.

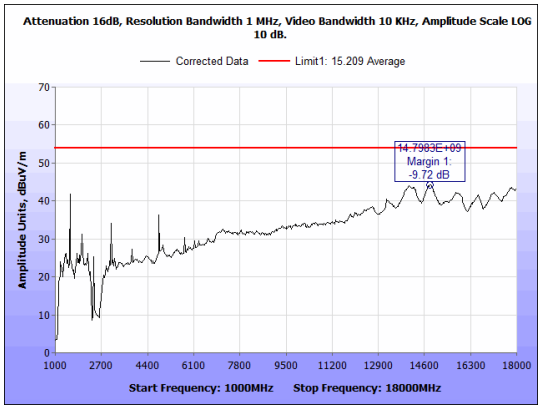

Figure 64: Radiated Spurious Emissions, N mode 20M low channel RE 1-18GHz Average.

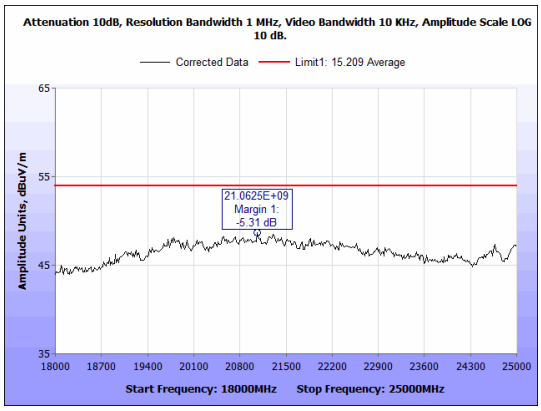

Figure 65: Radiated Spurious Emissions, N mode 20M low channel RE 18-25GHz Average.

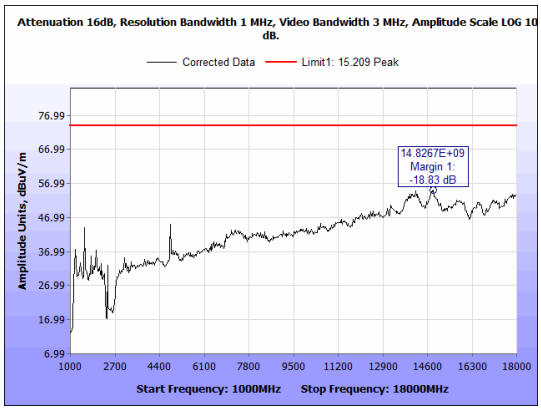

Figure 66: Radiated Spurious Emissions, N mode 20M low channel RE 1-18GHz Peak.

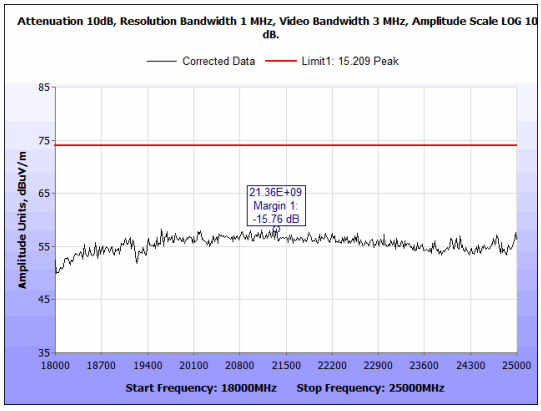

Figure 67: Radiated Spurious Emissions, N mode 20M low channel RE 18-25GHz Peak.

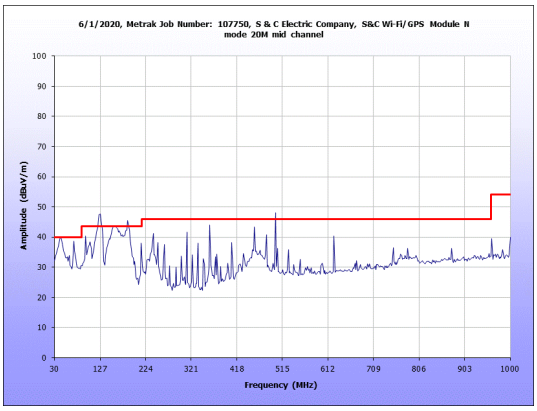

Figure 68: Radiated Spurious Emissions, N mode 20M mid channel RE 30MHz-1GHz.

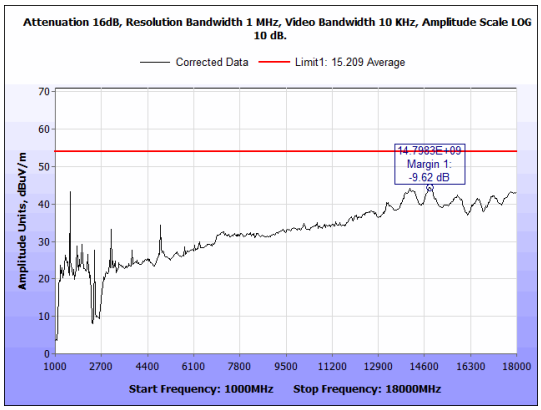

Figure 69: Radiated Spurious Emissions, N mode 20M mid channel RE 1-18GHz Average.

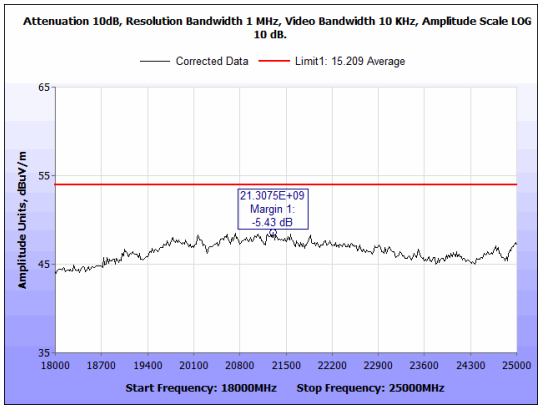

Figure 70: Radiated Spurious Emissions, N mode 20M mid channel RE 18-25GHz Average.

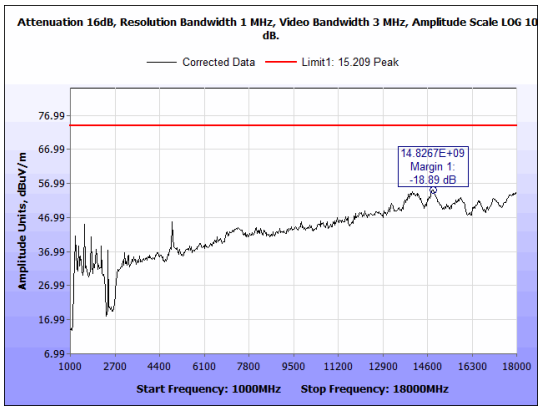

Figure 71: Radiated Spurious Emissions, N mode 20M mid channel RE 1-18GHz Peak.

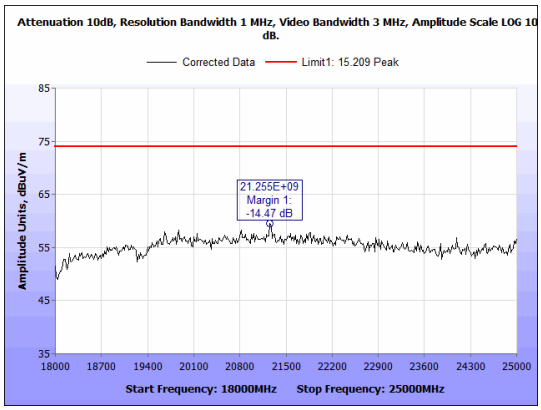

Figure 72: Radiated Spurious Emissions, N mode 20M mid channel RE 18-25GHz Peak.

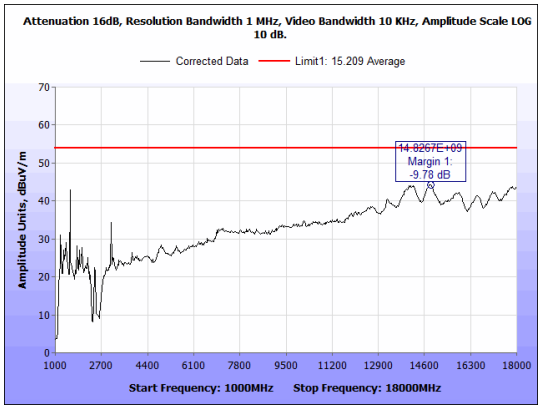

Figure 73: Radiated Spurious Emissions, N mode 40M high channel RE 1-18GHz Average.

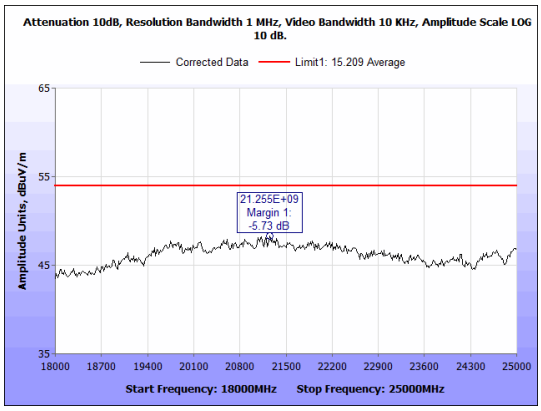

Figure 74: Radiated Spurious Emissions, N mode 40M high channel RE 18-25GHz Average.

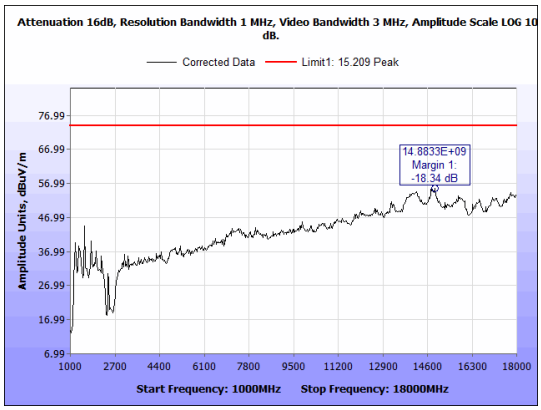

Figure 75: Radiated Spurious Emissions, N mode 40M high channel RE 1-18GHz Peak.

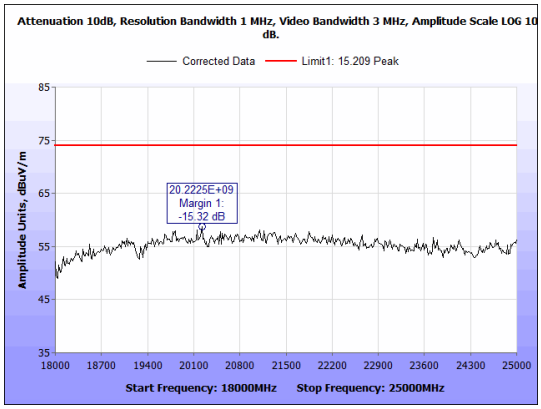

Figure 76: Radiated Spurious Emissions, N mode 40M high channel RE 18-25GHz Peak.

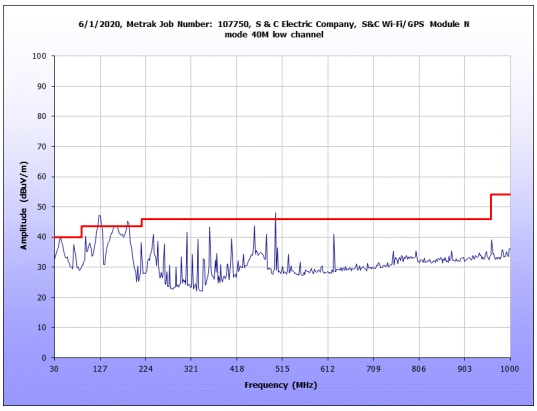

Figure 77: Radiated Spurious Emissions, N mode 40M low channel RE 30MHz-1GHz.

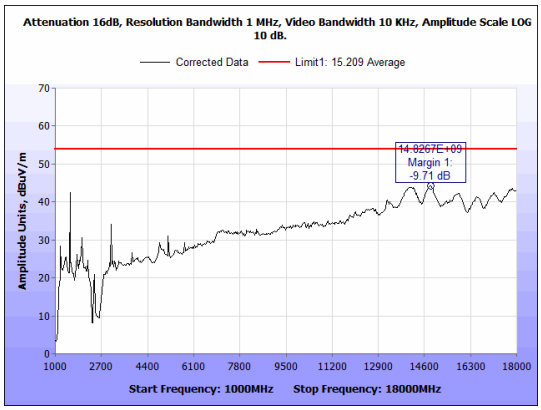

Figure 78: Radiated Spurious Emissions, N mode 40M low channel RE 1-18GHz Average.

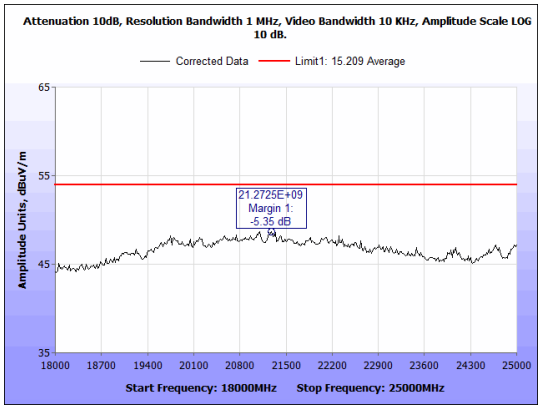

Figure 79: Radiated Spurious Emissions, N mode 40M low channel RE 18-25GHz Average.

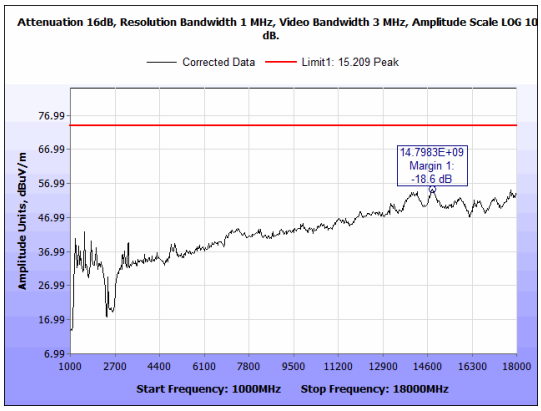

Figure 80: Radiated Spurious Emissions, N mode 40M low channel RE 1-18GHz Peak.

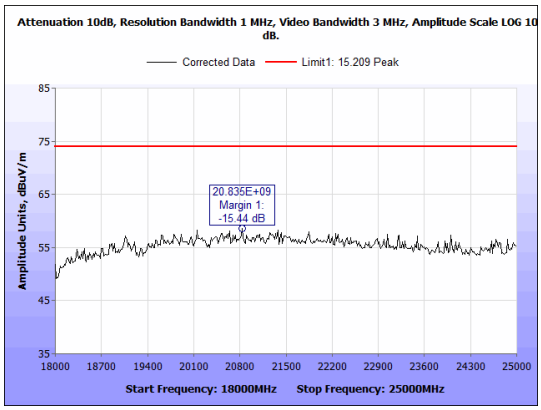

Figure 81: Radiated Spurious Emissions, N mode 40M low channel RE 18-25GHz Peak.

Radiated Band Edge Measurements

Test Procedures: Method stated in 11.13.1 of ANSI C63.10-2013 was used for band edge measurements. Standard band edge method was used defined in 6.10.5 of ANSI C63.10-2013. The transmitter was turned on. Measurements were performed of the low and high Channels. The EUT was rotated orthogonally through all three axes and cumulative results are shown below. Plots shown are corrected for both antenna correction factor, cable and distance and compared to a 3 m limit line.

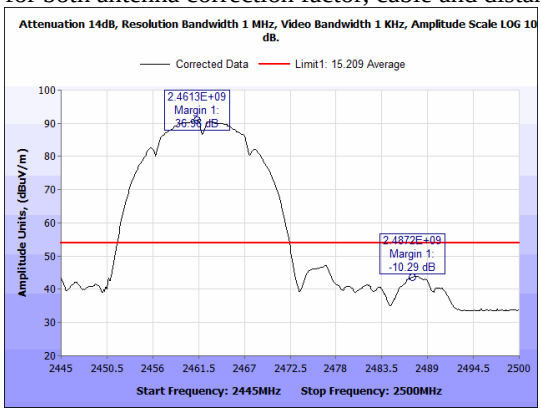

Figure 82: Radiated Spurious Emissions, B mode 20M high channel band edge Average.

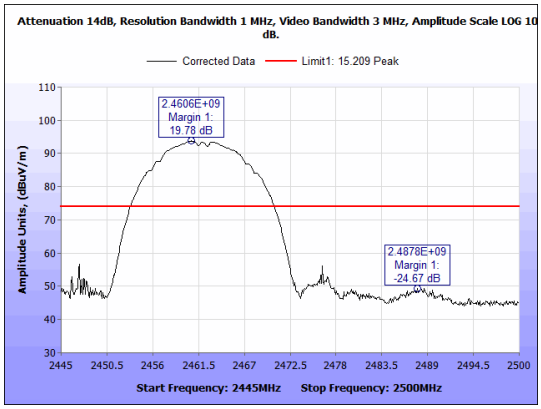

Figure 83: Radiated Spurious Emissions, B mode 20M high channel band edge Peak.

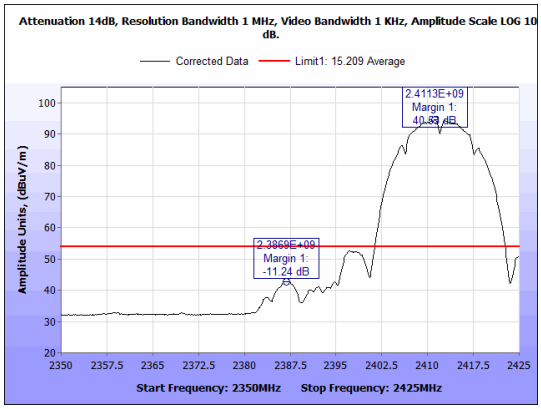

Figure 84: Radiated Spurious Emissions, B mode 20M low channel band edge Average.

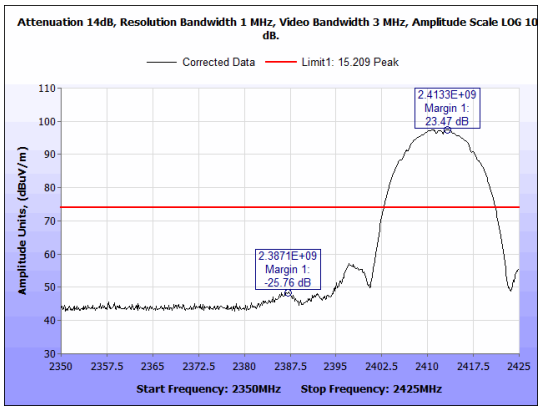

Figure 85: Radiated Spurious Emissions, B mode 20M low channel band edge Peak.

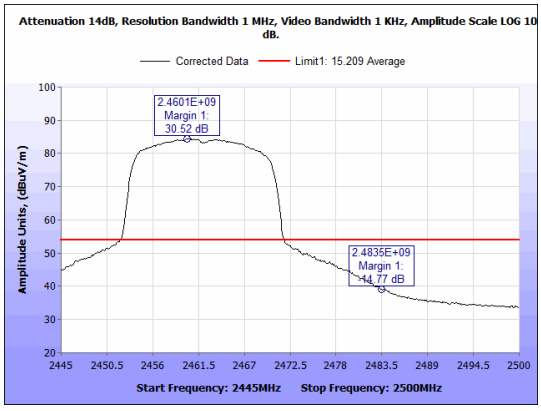

Figure 86: Radiated Spurious Emissions, G mode 20M high channel band edge Average.

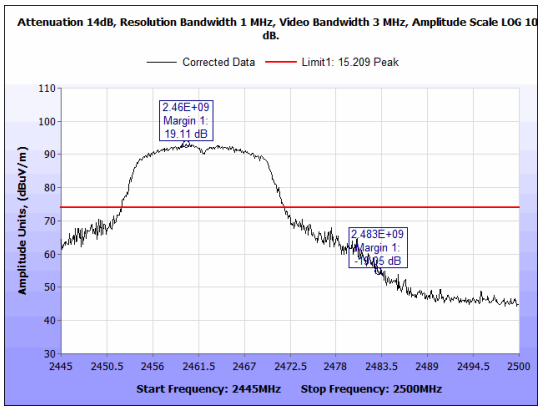

Figure 87: Radiated Spurious Emissions, G mode 20M high channel band edge Peak.

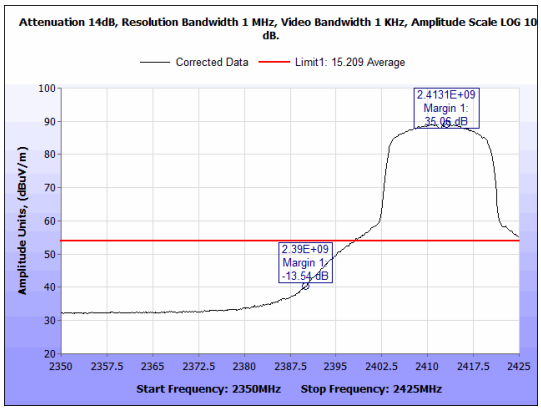

Figure 88: Radiated Spurious Emissions, G mode 20M low channel band edge Average.

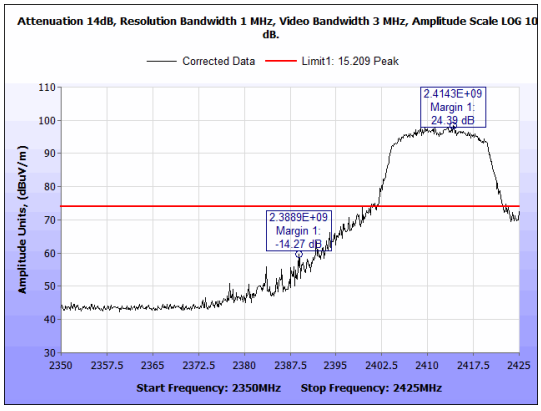

Figure 89: Radiated Spurious Emissions, G mode 20M low channel band edge Peak.

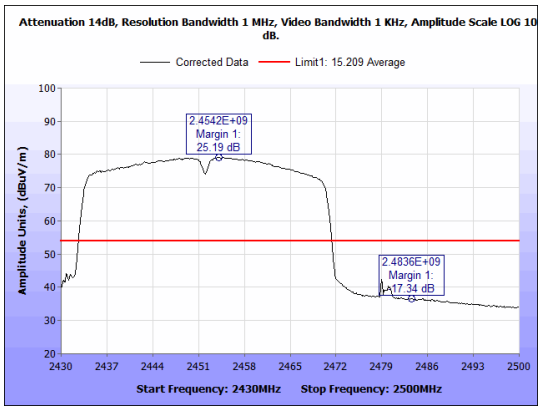

Figure 90: Radiated Spurious Emissions, N mode 40M high channel band edge Average.

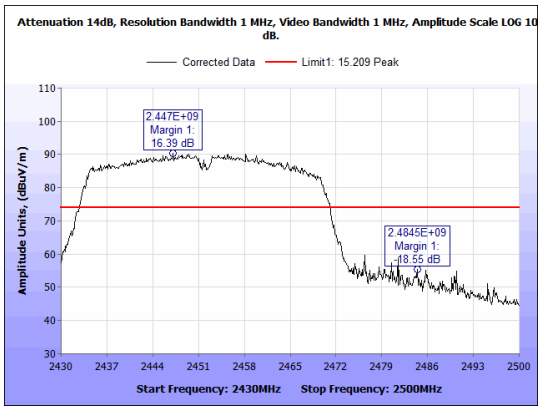

Figure 91: Radiated Spurious Emissions, N mode 40M high channel band edge Peak.

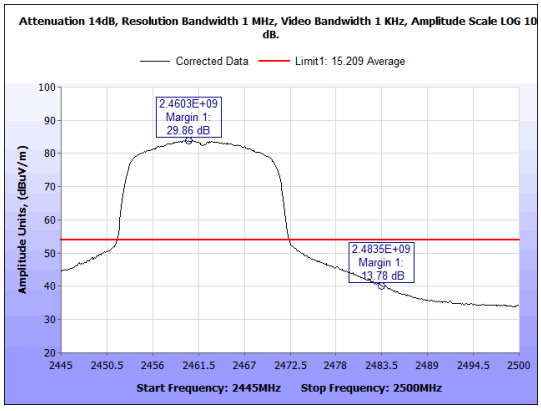

Figure 92: Radiated Spurious Emissions, N mode 20M high channel band edge Average.

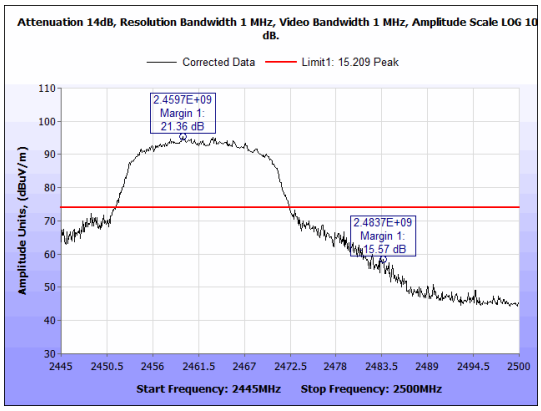

Figure 93: Radiated Spurious Emissions, N mode 20M high channel band edge Peak.

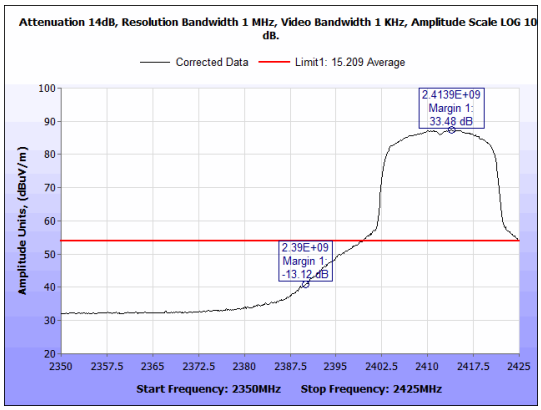

Figure 94: Radiated Spurious Emissions, N mode 20M low channel band edge Average.

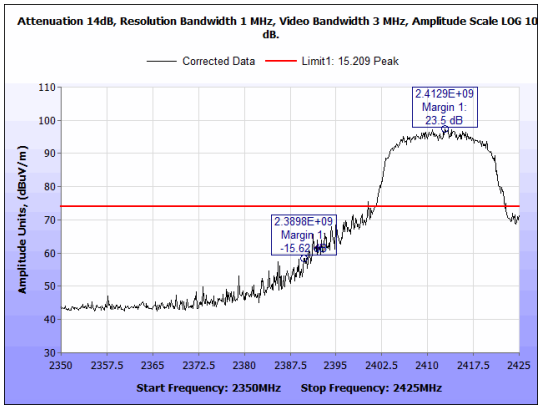

Figure 95: Radiated Spurious Emissions, N mode 20M low channel band edge Peak.

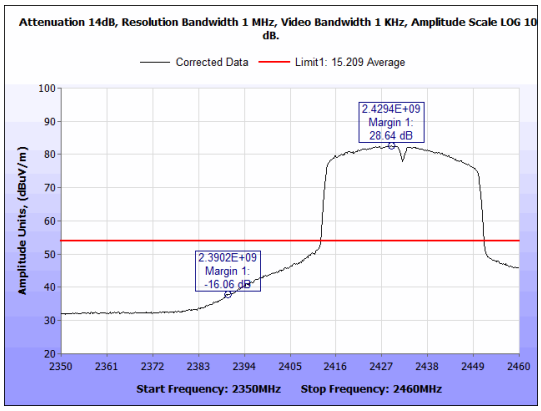

Figure 96: Radiated Spurious Emissions, N mode 40M low channel band edge Average.

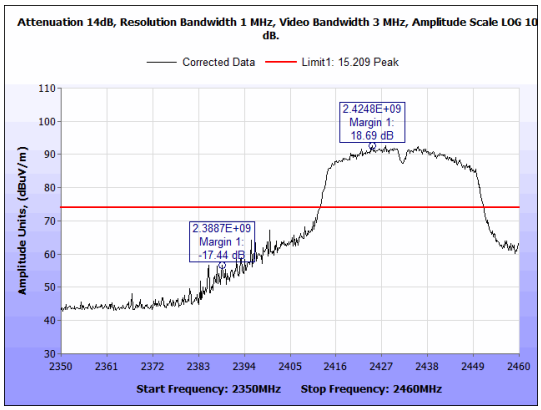

Figure 97: Radiated Spurious Emissions, N mode 40M low channel band edge Peak.

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: Method stated in 11.11.1, 11.11.2 and 11.11.3 of ANSI C63.10-2013 were used for measurement. For intentional radiators with a digital device portion which operates below 10 GHz, the spectrum was investigated as per §15.33(a)(1) and §15.33(a)(4); i.e., the lowest RF signal generated or used in the device up to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

Conducted measurements setup was used. where EUT was connected directly to receiver with inline attenuator. Measurements were performed at low, mid and high channel of each mode.

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

Test Engineer(s): Deepak Giri

Test Date(s): 06/16/2020

Spurious Emissions in Non-restricted Bands, Test Results

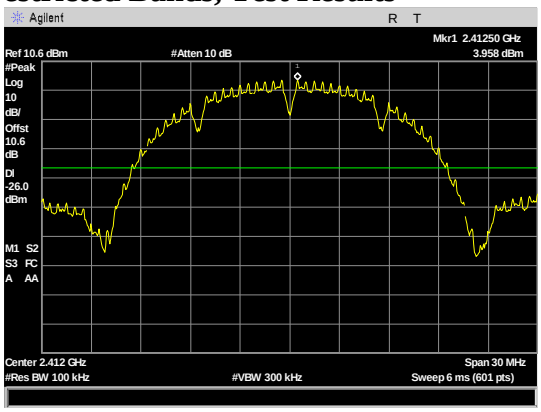

Figure 98: Conducted Spurious Emissions, B mode 20M Bw, AVGSA-2 low channel Reference Level

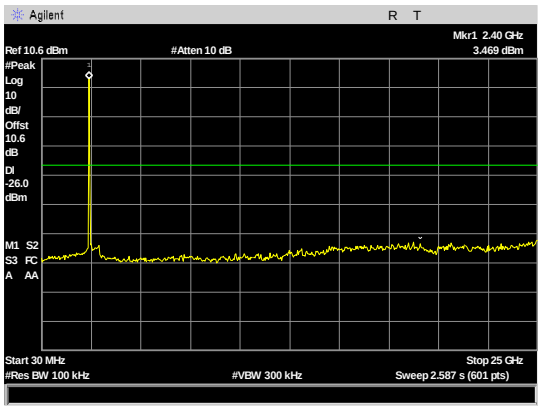

Figure 99: Conducted Spurious Emissions, B mode 20M Bw 30MHz-25GHz, AVGSA-2 low channel

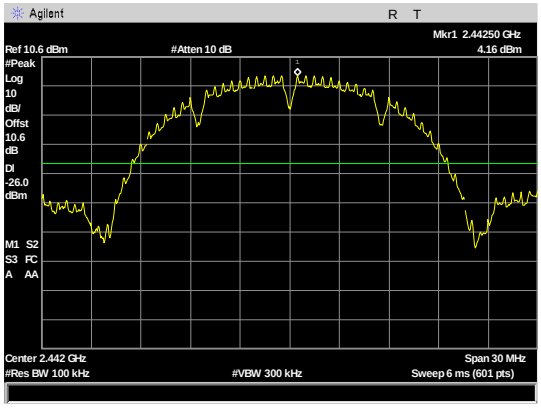

Figure 100: Conducted Spurious Emissions, B mode 20M Bw, AVGSA-2 mid channel Reference Level

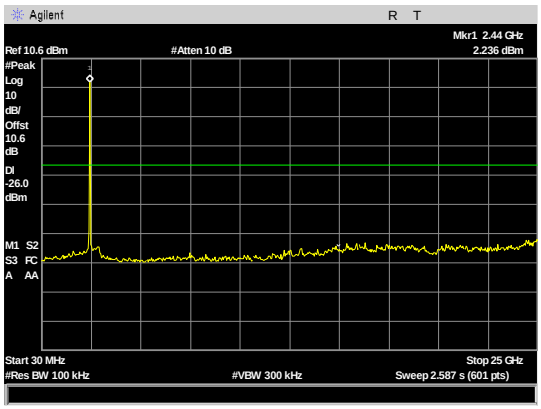

Figure 101: Conducted Spurious Emissions, B mode 20M Bw 30MHz-25GHz, AVGSA-2 mid channel

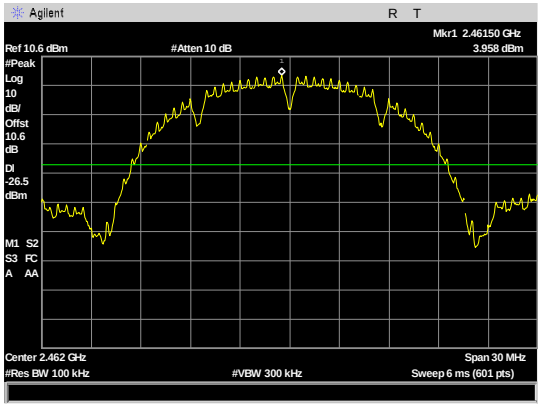

Figure 102: Conducted Spurious Emissions, B mode 20M Bw, AVGSA-2 high channel Reference Level

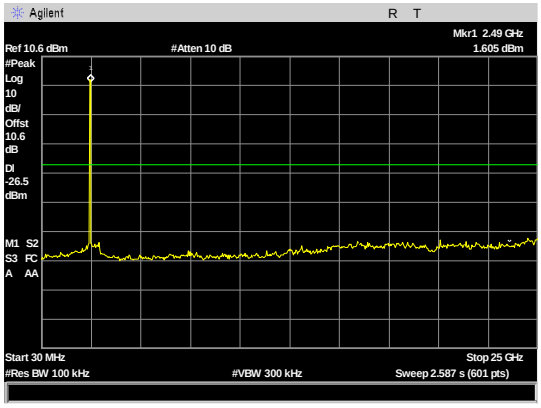

Figure 103: Conducted Spurious Emissions, B mode 20M Bw 30MHz-25GHz, AVGSA-2 high channel

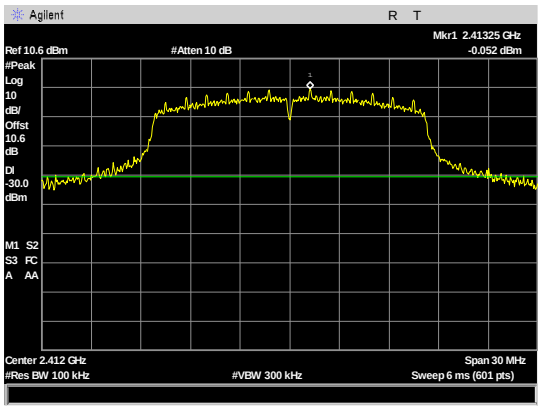

Figure 104: Conducted Spurious Emissions, G mode 20M Bw, AVGSA-2 low channel Reference Level

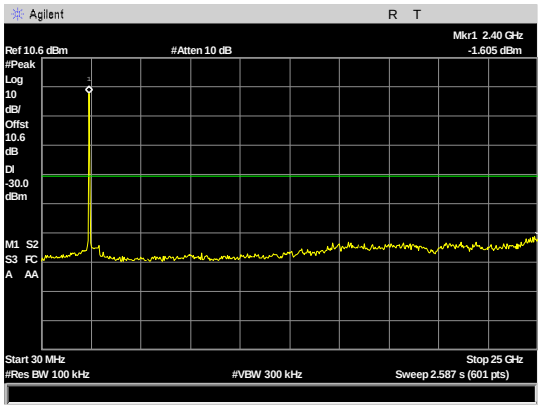

Figure 105: Conducted Spurious Emissions, G mode 20M Bw 30MHz-25GHz, AVGSA-2 low channel

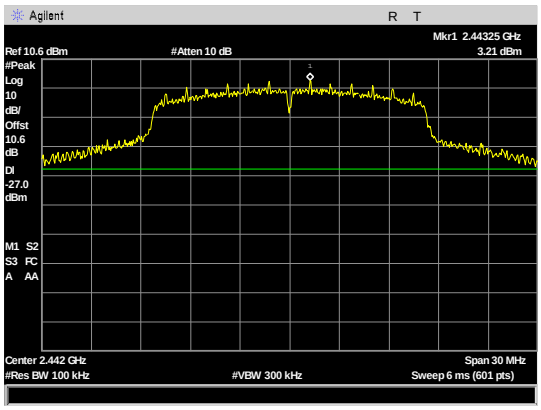

Figure 106: Conducted Spurious Emissions, G mode 20M Bw, AVGSA-2 mid channel Reference Level

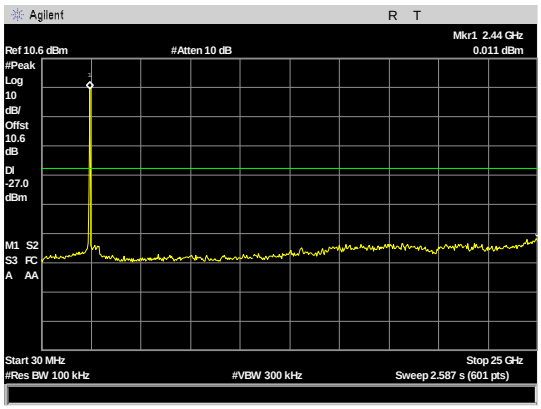

Figure 107: Conducted Spurious Emissions, G mode 20M Bw 30MHz-25GHz, AVGSA-2 mid channel

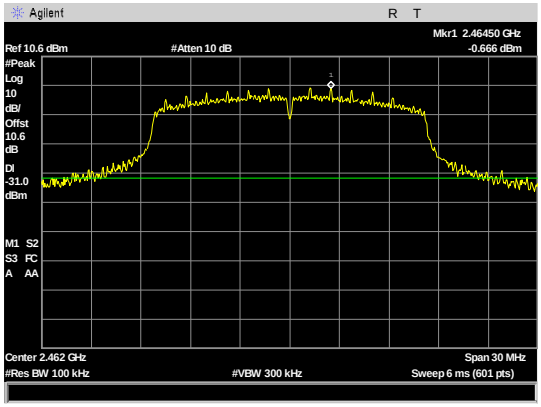

Figure 108: Conducted Spurious Emissions, G mode 20M Bw, AVGSA-2 high channel Reference Level

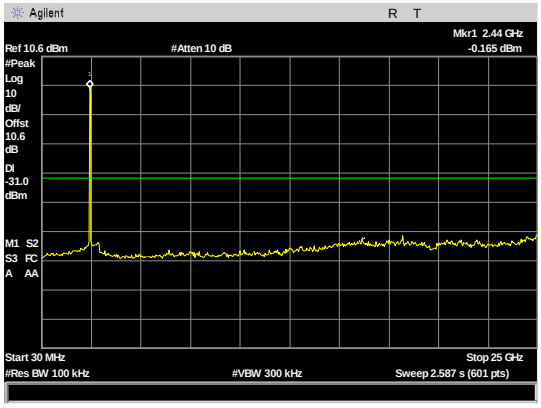

Figure 109: Conducted Spurious Emissions, G mode 20M Bw 30MHz-25GHz, AVGSA-2 high channel

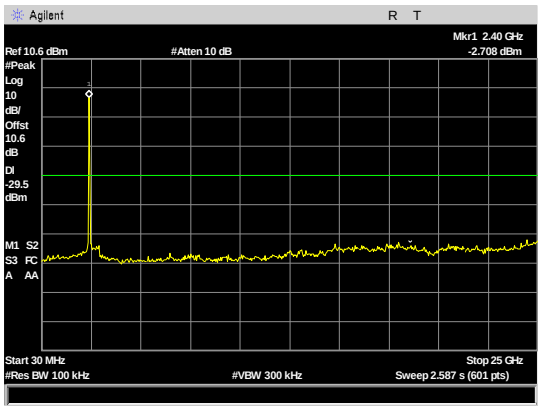

Figure 110: Conducted Spurious Emissions, N mode 20M Bw 30MHz-25GHz, AVGSA-2 low channel

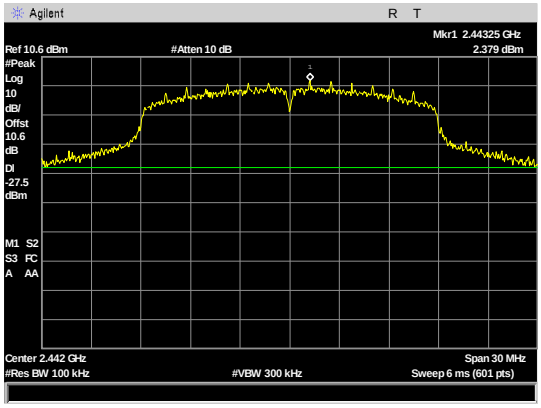

Figure 111: Conducted Spurious Emissions, N mode 20M Bw, AVGSA-2 mid channel Reference Level

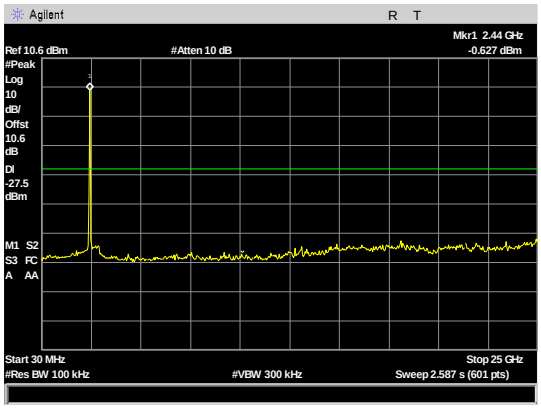

Figure 112: Conducted Spurious Emissions, N mode 20M Bw 30MHz-25GHz, AVGSA-2 mid channel

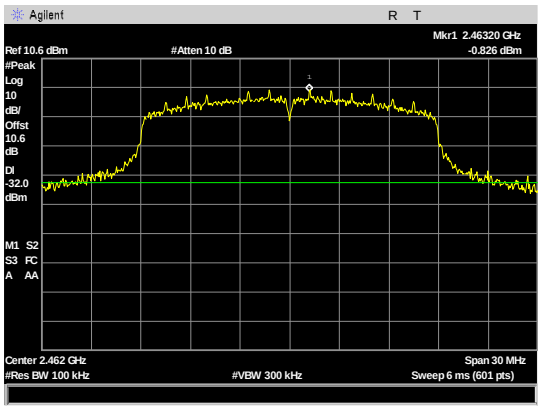

Figure 113: Conducted Spurious Emissions, N mode 20M Bw, AVGSA-2 high channel Reference Level

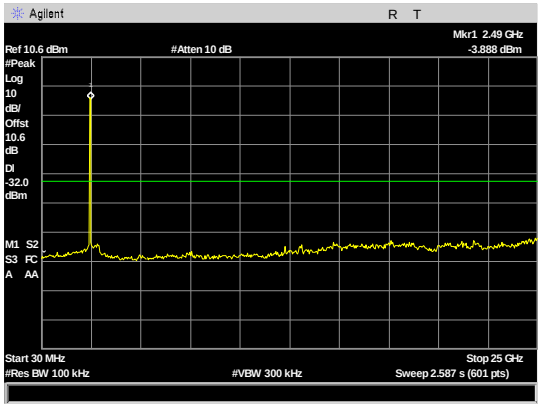

Figure 114: Conducted Spurious Emissions, N mode 20M Bw 30MHz-25GHz, AVGSA-2 high channel

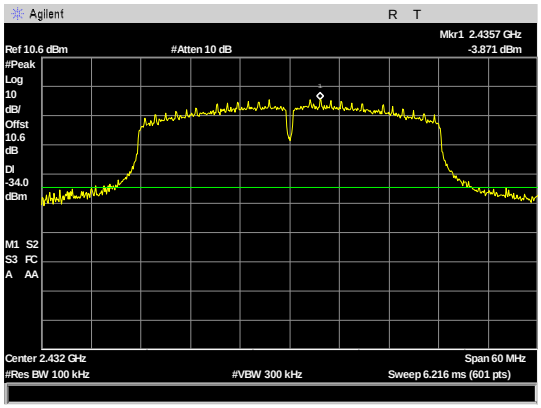

Figure 115: Conducted Spurious Emissions, N mode 40M Bw, AVGSA-2 low channel Reference Level

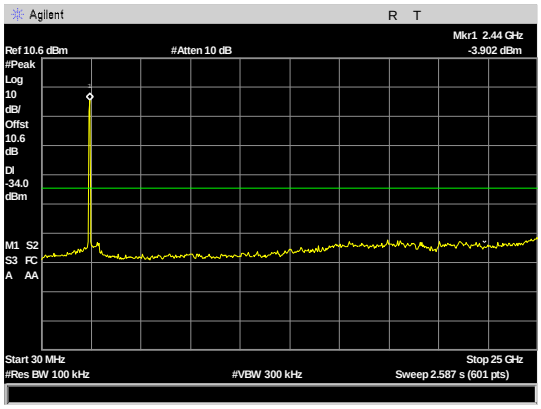

Figure 116: Conducted Spurious Emissions, N mode 40M Bw 30MHz-25GHz, AVGSA-2 low channel

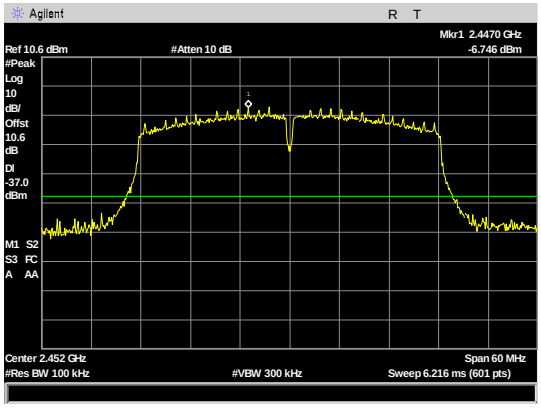

Figure 117: Conducted Spurious Emissions, N mode 40M Bw, AVGSA-2 high channel Reference Level

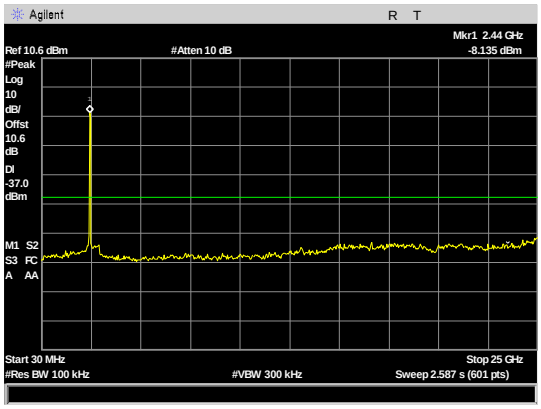

Figure 118: Conducted Spurious Emissions, N mode 40M Bw 30MHz-25GHz, AVGSA-2 high channel

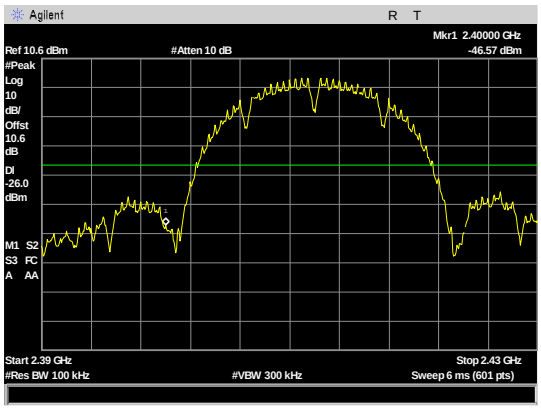

Figure 119: Conducted Spurious Emissions, B mode 20M Bw, AVGSA-2 low channel bandedge

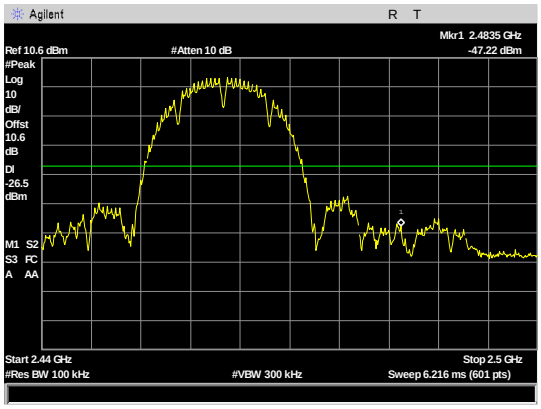

Figure 120: Conducted Spurious Emissions, B mode 20M Bw, AVGSA-2 high channel bandedge

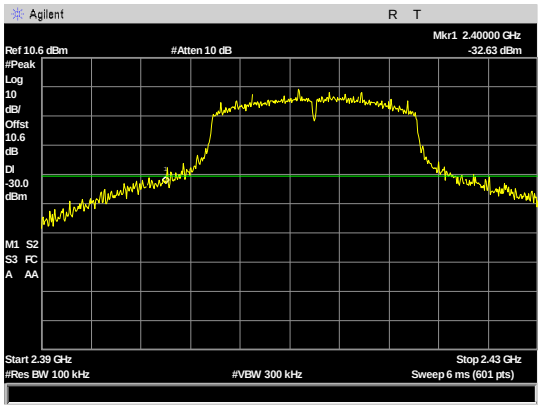

Figure 121: Conducted Spurious Emissions, G mode 20M Bw, AVGSA-2 low channel bandedge

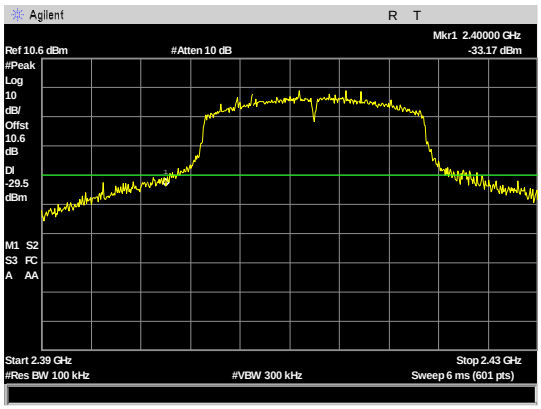

Figure 122: Conducted Spurious Emissions, N mode 20M Bw, AVGSA-2 low channel bandedge

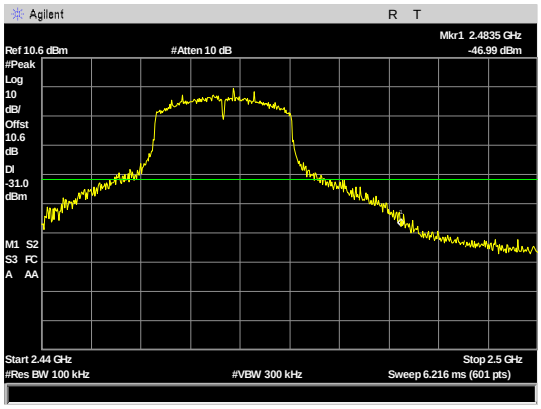

Figure 123: Conducted Spurious Emissions, G mode 20M Bw, AVGSA-2 high channel bandedge

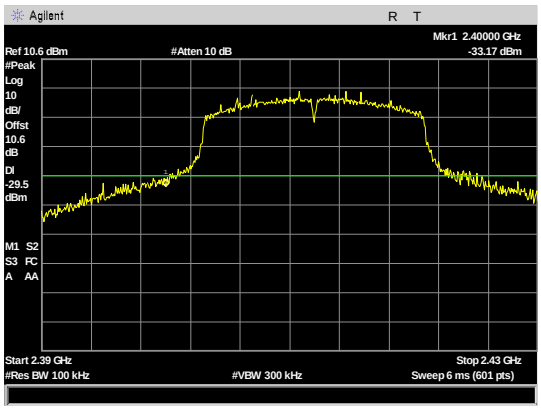

Figure 124. Conducted Spurious Emissions, N Mode 20M Bw, AVGSA-2 low Channel Bandedge

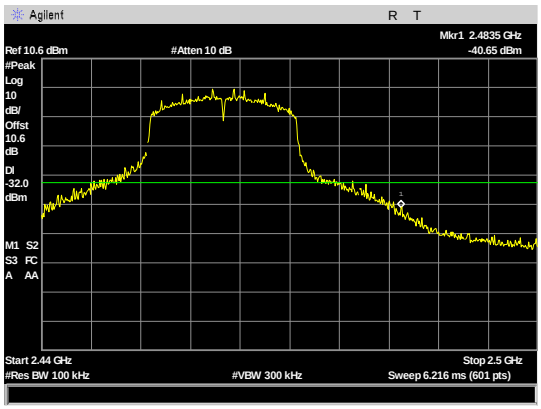

Figure 125: Conducted Spurious Emissions, N mode 20M Bw, AVGSA-2 high channel bandedge

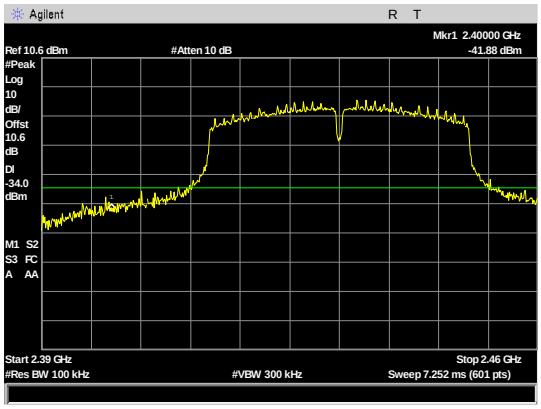

Figure 126: Conducted Spurious Emissions, N mode 40M Bw, AVGSA-2 low channel bandedge

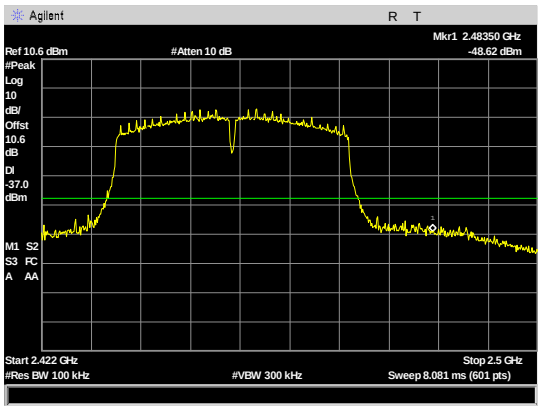

Figure 127: Conducted Spurious Emissions, N mode 40M Bw, AVGSA-2 high channel bandedge

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: Method stated in 11.10.5 of ANSI C63.10-2013 was used for G mode and N mode. Conducted test set up was used. The RBW was set to 30 kHz. Measurements were carried out at the low, mid and high channels

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: 06/16/2020

Peak Power Spectral Density

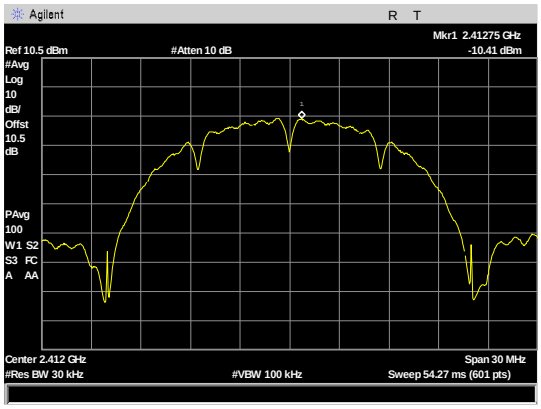

Figure 128: Power Spectral Density, B mode 20M Bw, AVGPSD-2 low channel

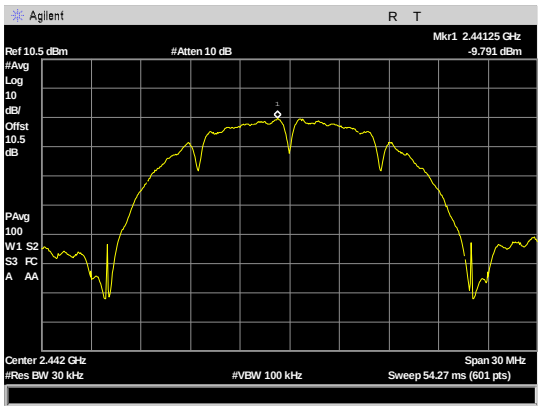

Figure 129: Power Spectral Density, B mode 20M Bw, AVGPSD-2 mid channel

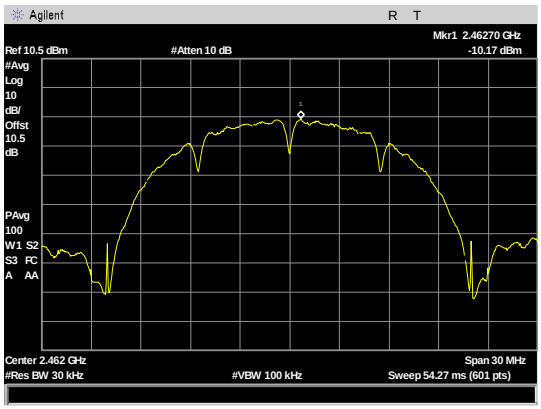

Figure 130: Power Spectral Density, B mode 20M Bw, AVGPSD-2 high channel

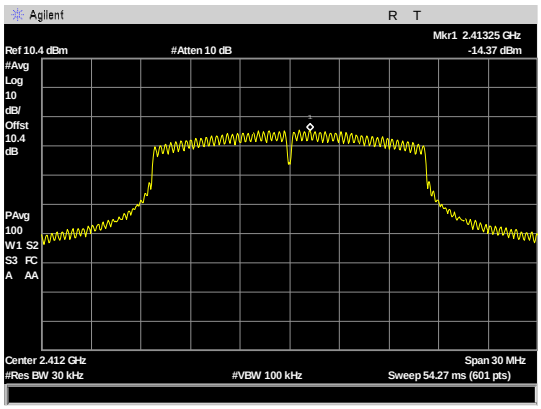

Figure 131: Power Spectral Density, G mode 20M Bw, AVGPSD-2 low channel

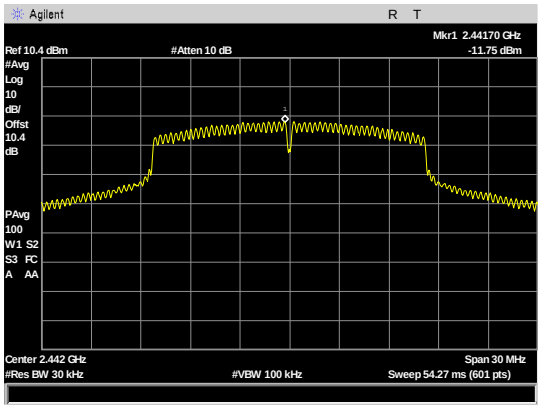

Figure 132: Power Spectral Density, G mode 20M Bw, AVGPSD-2 mid channel

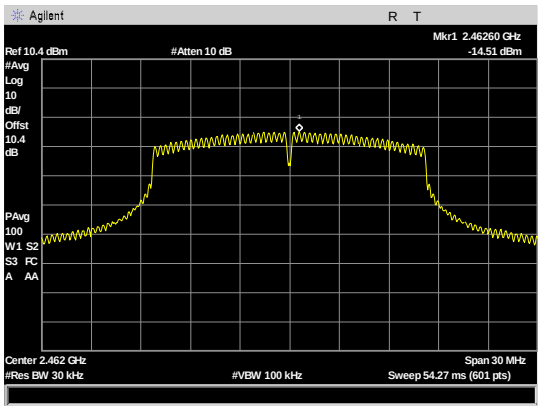

Figure 133: Power Spectral Density, G mode 20M Bw, AVGPSD-2 high channel

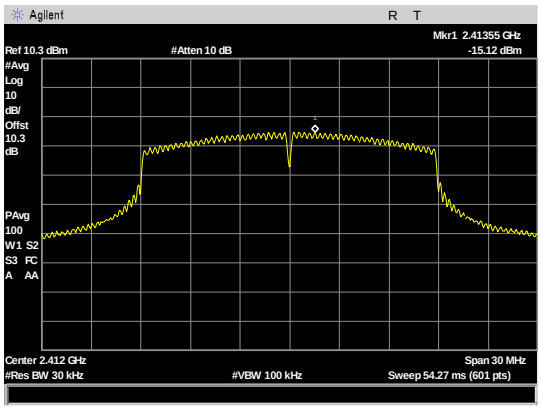

Figure 134: Power Spectral Density, N mode 20M Bw, AVGPSD-2 low channel

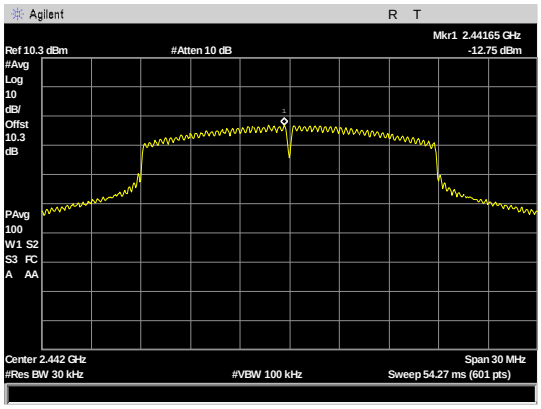

Figure 135: Power Spectral Density, N mode 20M Bw, AVGPSD-2 mid channel

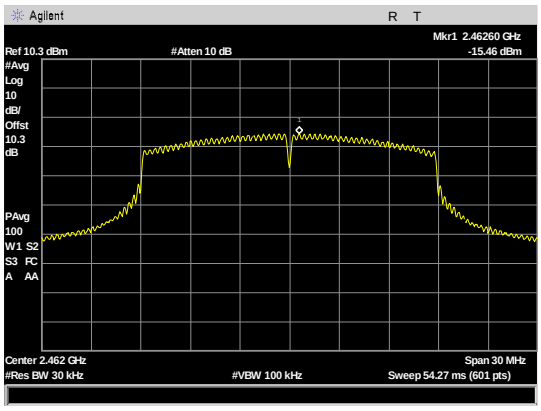

Figure 136: Power Spectral Density, N mode 20M Bw, AVGPSD-2 high channel

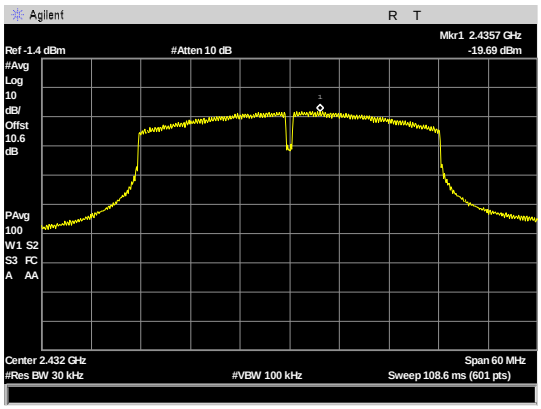

Figure 137: Power Spectral Density, N mode 40M Bw, AVGPSD-2 low channel

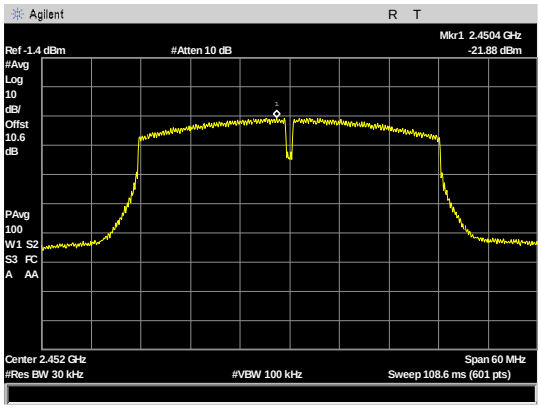

Figure 138: Power Spectral Density, N mode 40M Bw, AVGPSD-2 high channel

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**
2442	12.75	18.836	3	1.995	0.00748	1	0.99252	20	Pass

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

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.

Asset	Equipment	Manufacturer	Model	Calibration Date	Calibration Due Date
1T4300	SEMI-ANECHOIC CHAMBER (NSA)	EMC TEST SYSTEMS	NONE	06/30/2019	06/30/2020
1T4300B	Semi-Anechoic 3m Chamber sVSWR	EMC TEST SYSTEMS	NONE	06/30/2019	12/30/2020
1T4745	Antenna, Horn	ETS-Lindgren	3116	11/27/2018	07/27/2020
1T4752	Pre-Amplifier	Miteq	JS44-18004000-35-8P	Func verify	Func verify
1T4576	Antenna, Active Horn	Com-Power	AHA-118	05/08/2019	11/08/2020
1T4771	PSA Spectrum Analyzer	Agilent Technologies	E4446A	02/26/2020	08/26/2021
1T4612	Spectrum Analyzer	Agilent Technologies	E4407B	03/04/2020	09/04/2021
1T4409	EMI Receiver	Rohde & Schwarz	ESIB7	01/04/2019	01/04/2021
1T8743	Preamplifier	A.H. Systems, Inc.	PAM-0118P	Func verify	Func verify
1T4751	Antenna - Bilog	Sunol Sciences	JB6	05/02/2019	11/02/2020
1T7450	Transient Limiter	Com-Power	LIT-153A	FV	FV
1T4612	Spectrum Analyzer	Agilent Technologies	E4407B	03/04/2020	09/04/2021
1T4565	LISN (24 AMP)	Solar Electronics Company	9252-50-R-24-BNC	04/03/2019	10/03/2020
1T4504	Shielded Room	Universal Shielding Corp	N/A	not required	not required

Table 15. 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