ENGINEERING TEST REPORT

Border router/Bridge
Model(s): BRD10
FCC ID: XFF-BRD10

Applicant:

MMB Research Inc.
25 Adelaide Street East, Suite 400
Toronto, ON M5C 3A1
Canada

In Accordance With

Federal Communications Commission (FCC)
Part 15, Subpart C, Section 15.247
Digital Modulation Systems (DTS) Operating in 2400 – 2483.5 MHz Band

UltraTech's File No.: 19MMBN028_FCC15C247Z

This Test report is Issued under the Authority of Tri M. Luu Vice President of Engineering UltraTech Group of Labs Date: November 4, 2019	
Report Prepared by: Dan Huynh Issued Date: November 4, 2019	Tested by: Hung Trinh Test Dates: October 25, 2019

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EXHIBIT 1. INTRODUCTION

1.1. SCOPE

Reference:	FCC Part 15, Subpart C, Section 15.247
Title:	Code of Federal Regulations (CFR), Title 47 – Telecommunication, Part 15 – Radio Frequency Devices
Purpose of Test:	▪ Equipment Certification for Digital Modulation Systems (DTS) Operating Under §15.247 ▪ Class II permissive changes
Test Procedures:	▪ ANSI C63.4 ▪ ANSI C63.10 ▪ FCC KDB Publication No. 558074 D01 15.247 Meas Guidance v05r02
Environmental Classification:	[x] Commercial, industrial or business environment [x] Residential environment

1.2. RELATED SUBMITTAL(S)/GRANT(S)

None.

1.3. NORMATIVE REFERENCES

Publication	Year	Title
47 CFR Parts 0-19	2019	Code of Federal Regulations (CFR), Title 47 – Telecommunication
ANSI C63.4	2014	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 KHz to 40 GHz
ANSI C63.10	2013	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
FCC, KDB Publication No. 558074 D01 15.247 Meas Guidance v05r02	2019	GUIDANCE FOR COMPLIANCE MEASUREMENTS ON DIGITAL TRANSMISSION SYSTEM, FREQUENCY HOPPING SPREAD SPECTRUM SYSTEM, AND HYBRID SYSTEM DEVICES OPERATING UNDER SECTION 15.247 OF THE FCC RULES

EXHIBIT 2. PERFORMANCE ASSESSMENT

2.1. CLIENT INFORMATION

Applicant	
Name:	MMB Research Inc.
Address:	25 Adelaide Street East, Suite 400 Toronto, ON M5C 3A1 Canada
Contact Person:	Hussein Nagji Phone #: 416-636-3145 x237 Fax #: n/a Email Address: hussein.nagji@mmbnetworks.com

Manufacturer	
Name:	MMB Research Inc.
Address:	25 Adelaide Street East, Suite 400 Toronto, ON M5C 3A1 Canada
Contact Person:	Hussein Nagji Phone #: 416-636-3145 x237 Fax #: n/a Email Address: hussein.nagji@mmbnetworks.com

2.2. EQUIPMENT UNDER TEST (EUT) INFORMATION

The following information (with the exception of the Date of Receipt) has been supplied by the applicant.

Brand Name:	MMB Research Inc.
Product Name:	Border router/Bridge
Model(s):	BRD10
Serial Number:	Test Sample
Type of Equipment:	Digital Transmission System (DTS)
Input Power Supply Type:	5V, 1A via USB Hub
Primary User Functions of EUT:	Home automation/ IoT device

2.3. EUT'S TECHNICAL SPECIFICATIONS

Transmitter	
Equipment Type:	Mobile Base station (fixed use)
Intended Operating Environment:	Residential environment Commercial, industrial or business environment
Power Supply Requirement:	5V, 1A
RF Output Power Rating:	22.76 dBm Peak
Operating Frequency Range:	2405 - 2480 MHz
RF Output Impedance:	50 Ω
Duty Cycle:	Continuous
Modulation Type:	O-QPSK DSSS
Antenna Connector Types:	Integral

2.4. ASSOCIATED ANTENNA DESCRIPTIONS

Antenna Type	Manufacturer	Model	Maximum Gain (dBi)
[1]PCB trace antenna	MMB Networks	PCB trace antenna	-0.68
[2]Dual band (2.4&5G) PCB trace antenna	MMB Networks	PCB trace antenna	0.86

[1] For BLE and Zigbee modes
[2] For WiFi Mode

2.5. LIST OF EUT'S PORTS

Port Number	EUT's Port Description	Number of Identical Ports	Connector Type	Cable Type (Shielded/Non-shielded)
1	Micro USB	1	Micro USB	Shielded
2	802.15.4/BLE RF port for Mfg. test & calibration	1	SWG connector	Shielded
3	2.4GHz/5GHz RF port for Mfg. test & calibration	1	SWG connector	Shielded
4	GPIO ports	3	24 position connector plug, SMT	N/A

2.6. ANCILLARY EQUIPMENT

The EUT was tested while connected to the following representative configuration of ancillary equipment necessary to exercise the ports during tests:

Ancillary Equipment # 1	
Description:	Laptop
Brand name:	Lenovo
Model Name or Number:	ThinkPad Edge 0578
Serial Number:	IS057882 ULRBXKBG
Connected to EUT's Port:	Connected to USB Hub

Ancillary Equipment # 2	
Description:	USB Hub
Brand name:	Insignia
Model Name or Number:	NS-PCH5421-C
Serial Number:	--
Connected to EUT's Port:	Micro USB

Ancillary Equipment # 3	
Description:	AC/DC Adapter
Brand name:	Shenzhen Luda Electrical Co. Ltd
Model Name or Number:	HL-050/2000-FBOS-EE
Serial Number:	--
Connected to EUT's Port:	Connected to USB Hub DC Jack

EXHIBIT 3. EUT OPERATING CONDITIONS AND CONFIGURATIONS DURING TESTS

3.1. CLIMATE TEST CONDITIONS

The climate conditions of the test environment are as follows:

Temperature:	21 to 23 ^{o}C
Humidity:	45 to 58%
Pressure:	102 kPa
Power Input Source:	5V via USB Hub

3.2. OPERATIONAL TEST CONDITIONS & ARRANGEMENT FOR TESTS

Operating Modes:	The transmitter was operated in a continuous transmission mode with the carrier modulated as specified in the Test Data.
Special Test Software:	Test software provided by the Applicant to operate the EUT at each channel frequency continuously and in the range of typical modes of operation.
Special Hardware Used:	N/A
Transmitter Test Antenna:	The EUT is tested with the antenna fitted in a manner typical of normal intended use as integral antenna equipment as described with the test results.

Transmitter Test Signals	
Frequency Band(s):	2405 - 2480 MHz
Frequency(ies) Tested:	2405 MHz, 2440 MHz, 2480 MHz
RF Power Output: (measured maximum output power at antenna terminals)	22.76 dBm Peak
Normal Test Modulation:	O-QPSK
Modulating Signal Source:	Internal

EXHIBIT 4. SUMMARY OF TEST RESULTS

4.1. LOCATION OF TESTS

All of the measurements described in this report were performed at Ultratech Group of Labs located in the city of Oakville, Province of Ontario, Canada.

- AC Power Line Conducted Emissions were performed in UltraTech's shielded room, 24'(L) by 16'(W) by 8'(H).

- Radiated Emissions were performed at the Ultratech's 3-10 TDK Semi-Anechoic Chamber situated in the Town of Oakville, province of Ontario. This test site been calibrated in accordance with ANSI C63.4, and found to be in compliance with the requirements of Sec. 2.948 of the FCC Rules. The descriptions and site measurement data of the Oakville 3-10 TDK Semi-Anechoic Chamber has been filed with ANAB File No.: AT-1945.

4.2. APPLICABILITY & SUMMARY OF EMC EMISSION TEST RESULTS

FCC Section(s)	Test Requirements	Compliance (Yes/No)
15.203	Antenna requirements	Yes*
15.207(a)	AC Power Line Conducted Emissions	Yes
15.247(a)(2)	6 dB Bandwidth	N/A
15.247(b)(3)	Peak Conducted Output Power	Yes
15.247(d)	Band-Edge and RF Conducted Spurious Emissions at the Transmitter Antenna Terminal	Yes
15.247(d), 15.209 & 15.205	Transmitter Spurious Radiated Emissions	Yes
15.247(e)	Power Spectral Density	N/A
15.247(i), 1.1307, 1.1310, 2.1091	RF Exposure	N/A

* The EUT complies with the requirement; it employs a unique (non-standard) antenna connector or integral antenna.

4.3. MODIFICATIONS INCORPORATED IN THE EUT FOR COMPLIANCE PURPOSES

None.

EXHIBIT 5. TEST DATA

5.1. POWER LINE CONDUCTED EMISSIONS [§15.207(a)]

5.1.1. Limit(s)

The equipment shall meet the limits of the following table:

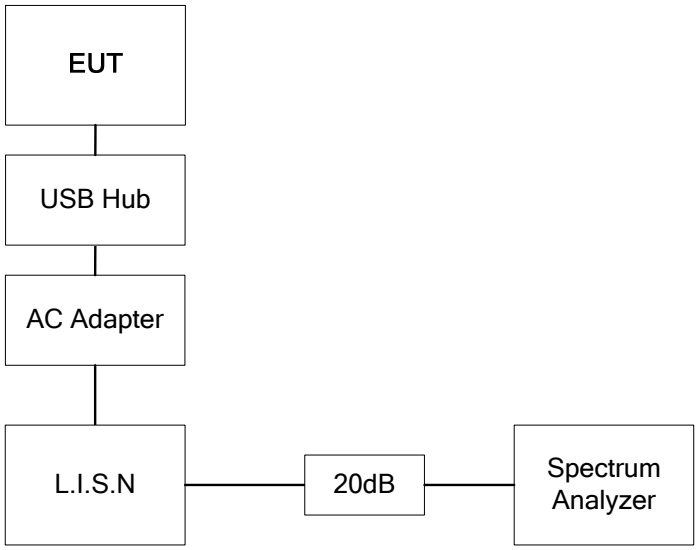
Frequency of emission (MHz)	Conducted Limits (dBμV)	
	Quasi-peak	Average
0.15–0.5 .....……..	66 to 56*	56 to 46*
0.5–5 .....……..	56	46
5-30 ……..	60 ..……..	50

*Decreases linearly with the logarithm of the frequency

5.1.2. Method of Measurements

ANSI C63.4

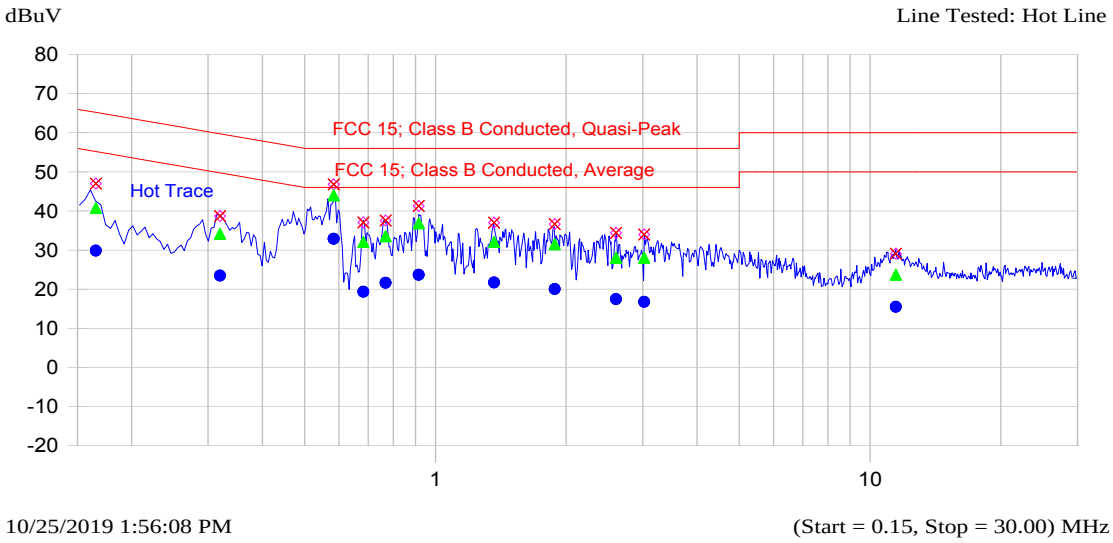
5.1.3. Test Arrangement



5.1.4. Test Data

Plot 5.1.4.1. Power Line Conducted Emissions (WiFi & Zigbee in Tx Mode)
Line Voltage: 120 VAC; Line Tested: Hot

Current Graph

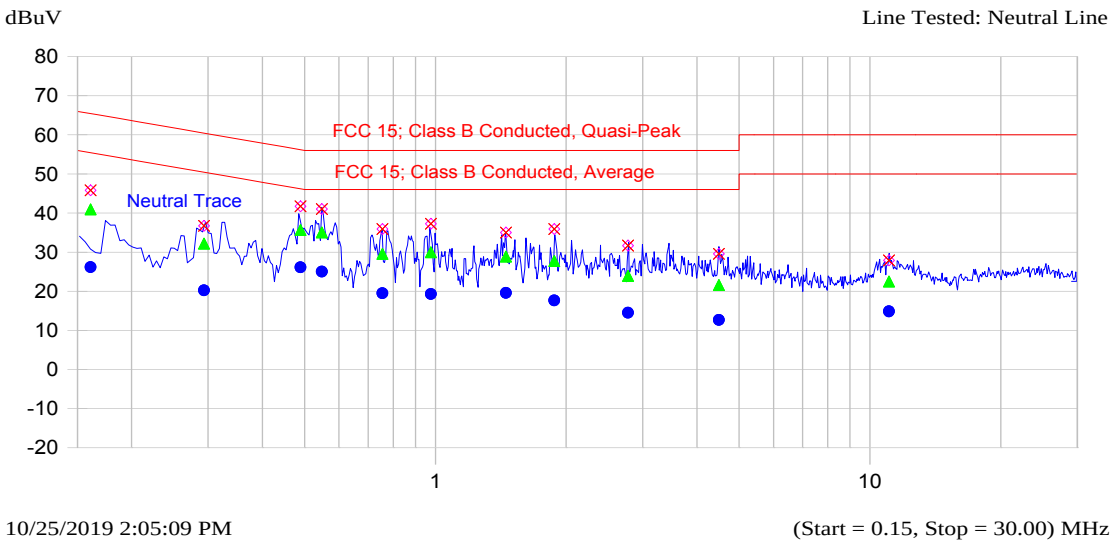


Current List

Frequency MHz	Peak dBuV	QP dBuV	QP-QP Limit dB	Avg dBuV	Avg-Avg Limit dB	Trace Name
0.165	47.0	40.7	-24.5	29.8	-25.4	Hot Trace
0.320	38.7	34.2	-25.6	23.5	-26.2	Hot Trace
0.583	46.8	44.0	-12.0	32.8	-13.2	Hot Trace
0.683	37.0	32.1	-23.9	19.3	-26.7	Hot Trace
0.768	37.5	33.5	-22.5	21.6	-24.4	Hot Trace
0.915	41.3	36.8	-19.2	23.7	-22.3	Hot Trace
1.365	37.0	32.1	-23.9	21.7	-24.3	Hot Trace
1.882	36.6	31.5	-24.5	20.0	-26.0	Hot Trace
2.604	34.4	28.0	-28.0	17.5	-28.5	Hot Trace
3.022	34.0	28.0	-28.0	16.7	-29.3	Hot Trace
11.473	29.1	23.7	-36.3	15.5	-34.5	Hot Trace

Plot 5.1.4.2. Power Line Conducted Emissions (WiFi & Zigbee in Tx Mode)
Line Voltage: 120 VAC Line Tested: Neutral

Current Graph

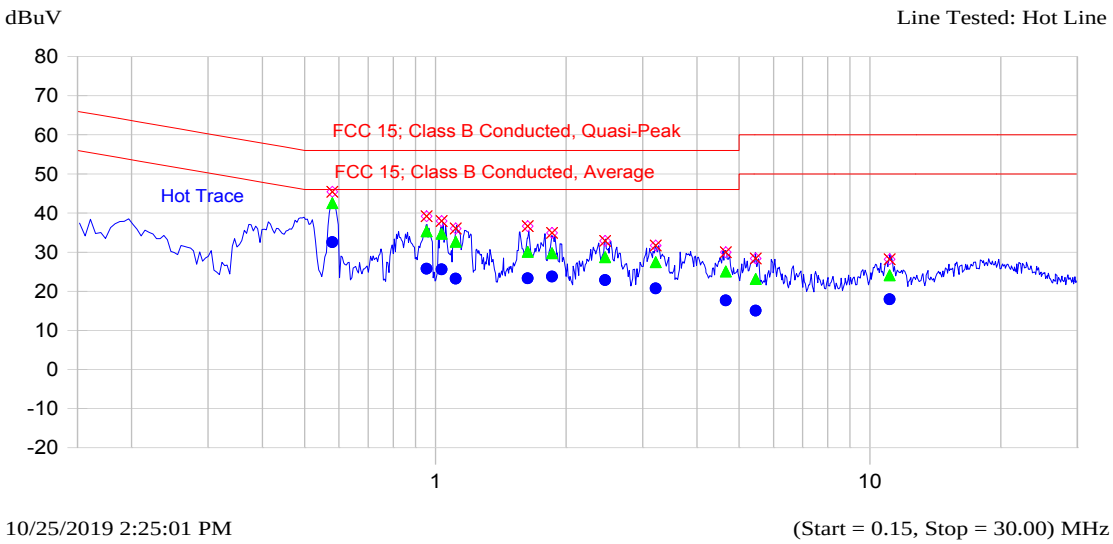


Current List

Frequency MHz	Peak dBuV	QP dBuV	QP-QP Limit dB	Avg dBuV	Avg-Avg Limit dB	Trace Name
0.161	45.8	40.9	-24.5	26.1	-29.3	Neutral Trace
0.293	36.7	32.2	-28.3	20.2	-30.2	Neutral Trace
0.490	41.7	35.7	-20.5	26.1	-20.0	Neutral Trace
0.548	41.0	35.0	-21.0	25.0	-21.0	Neutral Trace
0.755	35.9	29.6	-26.4	19.5	-26.5	Neutral Trace
0.977	37.3	30.0	-26.0	19.3	-26.7	Neutral Trace
1.454	35.0	28.9	-27.1	19.6	-26.4	Neutral Trace
1.878	35.9	27.7	-28.3	17.7	-28.3	Neutral Trace
2.776	31.7	23.9	-32.1	14.5	-31.5	Neutral Trace
4.494	29.6	21.6	-34.4	12.7	-33.3	Neutral Trace
11.066	27.9	22.5	-37.5	14.9	-35.1	Neutral Trace

Plot 5.1.4.3. Power Line Conducted Emissions (WiFi & Zigbee in Rx Mode)
Line Voltage: 120 VAC; Line Tested: Hot

Current Graph

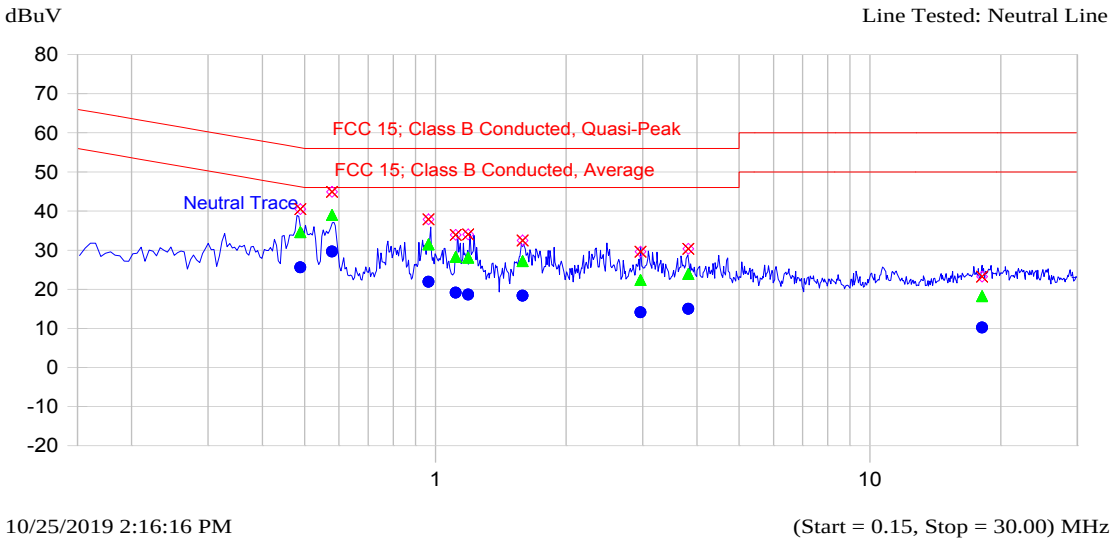


Current List

Frequency MHz	Peak dBuV	QP dBuV	QP-QP Limit dB	Avg dBuV	Avg-Avg Limit dB	Trace Name
11.106	28.1	24.1	-35.9	18.0	-32.0	Hot Trace
5.458	28.4	23.1	-36.9	15.0	-35.0	Hot Trace
4.658	29.9	25.0	-31.0	17.7	-28.3	Hot Trace
3.214	31.7	27.4	-28.6	20.7	-25.3	Hot Trace
2.458	32.8	28.7	-27.3	22.9	-23.1	Hot Trace
1.854	34.9	29.7	-26.3	23.8	-22.2	Hot Trace
1.632	36.6	30.1	-25.9	23.3	-22.7	Hot Trace
1.114	36.0	32.7	-23.3	23.2	-22.8	Hot Trace
1.033	37.9	34.7	-21.3	25.6	-20.4	Hot Trace
0.955	39.2	35.4	-20.6	25.7	-20.3	Hot Trace
0.579	45.4	42.5	-13.5	32.5	-13.5	Hot Trace

Plot 5.1.4.4. Power Line Conducted Emissions (WiFi & Zigbee in Rx Mode)
Line Voltage: 120 VAC; Line Tested: Neutral

Current Graph



Current List

Frequency MHz	Peak dBuV	QP dBuV	QP-QP Limit dB	Avg dBuV	Avg-Avg Limit dB	Trace Name
0.489	40.5	34.6	-21.6	25.6	-20.6	Neutral Trace
0.578	44.9	39.0	-17.0	29.6	-16.4	Neutral Trace
0.964	37.9	31.5	-24.5	21.9	-24.1	Neutral Trace
1.114	33.9	28.3	-27.7	19.1	-26.9	Neutral Trace
1.190	34.0	28.1	-27.9	18.6	-27.4	Neutral Trace
1.586	32.4	27.2	-28.8	18.3	-27.7	Neutral Trace
2.963	29.6	22.4	-33.6	14.1	-31.9	Neutral Trace
3.820	30.3	23.9	-32.1	15.0	-31.0	Neutral Trace
18.130	23.2	18.2	-41.8	10.2	-39.8	Neutral Trace

5.2. PEAK CONDUCTED OUTPUT POWER - DTS [§ 15.247(b)(3)]

5.2.1. Limit(s)

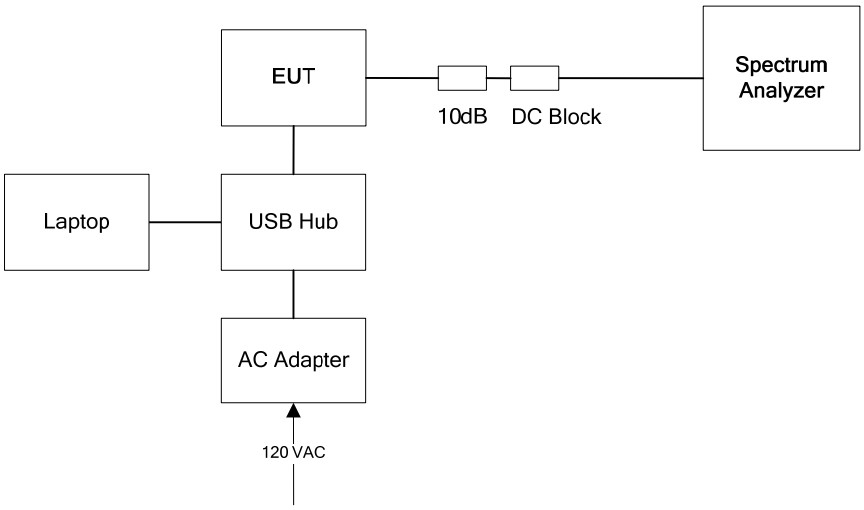
§ 15.247(b)(3): For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the *maximum conducted output power* is the highest total transmit power occurring in any mode.

§ 15.247(b)(4): The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

5.2.2. Method of Measurements & Test Arrangement

KDB 558074 D01 15.247 Meas Guidance v05r02, Section 8.3.1.1 RBW ≥ DTS bandwidth, Subclause 11.9.1.1 of ANSI C63.10

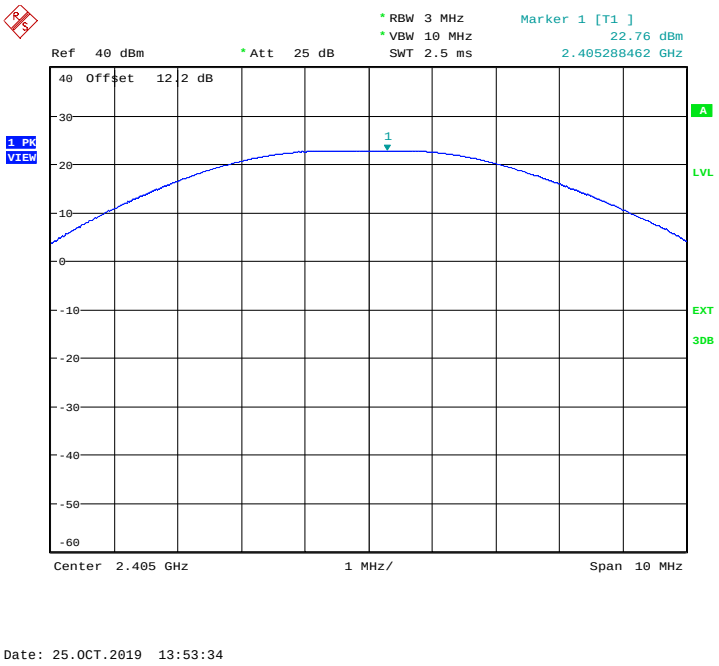
5.2.3. Test Arrangement



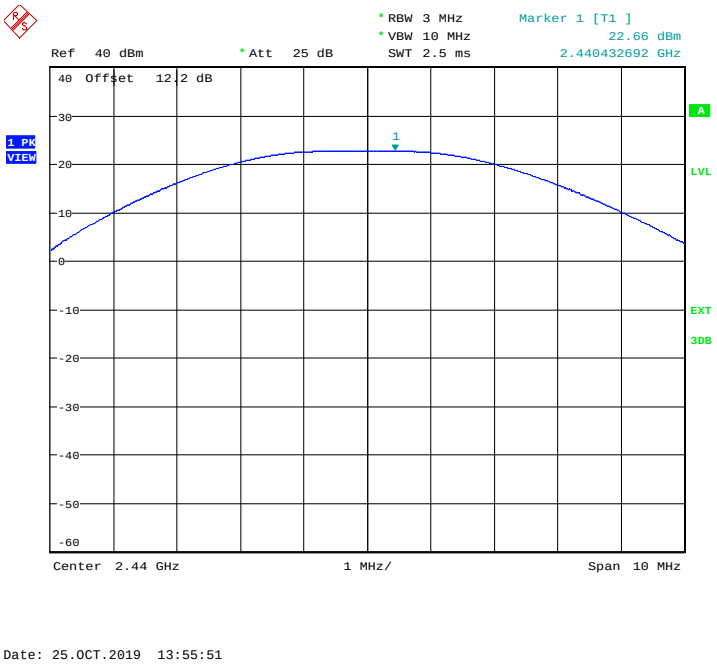
5.2.4. Test Data

Peak Conducted Power and Power Settings for EUT with -0.68 dBi PCB Trace Antenna						
Modulation	**Power Setting**	**Channel**	**Frequency (MHz)**	**Peak Power (dBm)**	**Assembly Gain (dB)**	**EIRP (dBm)**
O-QPSK	15	11	2405	22.76	-0.68	22.08
	15	18	2440	22.66	-0.68	21.98
	15	26	2480	19.16	-0.68	18.48

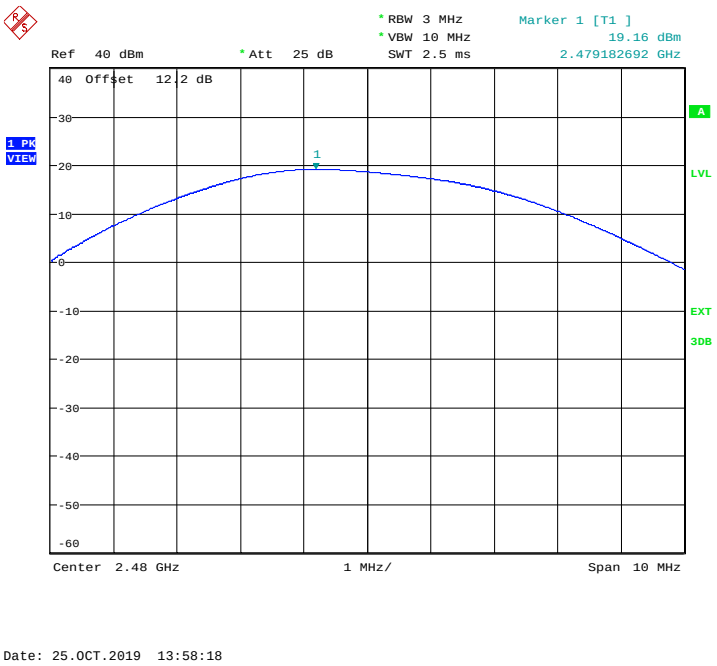
Plot 5.2.4.1. Maximum Peak Conducted Output Power, O-QPSK Modulation, Power Setting 15, Ch 11, 2405 MHz



Plot 5.2.4.2. Maximum Peak Conducted Output Power, O-QPSK Modulation, Power Setting 15, Ch 18, 2440 MHz



Plot 5.2.4.3. Maximum Peak Conducted Output Power, O-QPSK Modulation, Power Setting 15, Ch 26, 2480 MHz



5.3. TRANSMITTER SPURIOUS RADIATED EMISSIONS AT 3 METERS [§§ 15.247(d), 15.209 & 15.205]

5.3.1. Limit(s)

§ 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. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

Section 15.205(a) - Restricted Bands of Operation

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]
13.36–13.41.			

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

Section 15.209(a) - Field Strength Limits within Restricted Frequency Bands

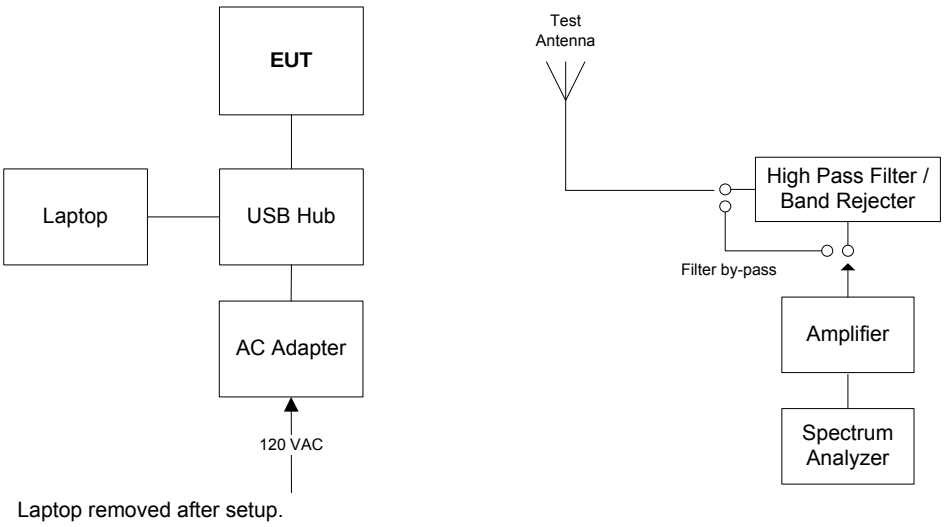
Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 - 0.490	2,400 / F (kHz)	300
0.490 - 1.705	24,000 / F (kHz)	30
1.705 - 30.0	30	30
30 – 88	100	3
88 – 216	150	3
216 – 960	200	3
Above 960	500	3

5.3.2. Method of Measurements

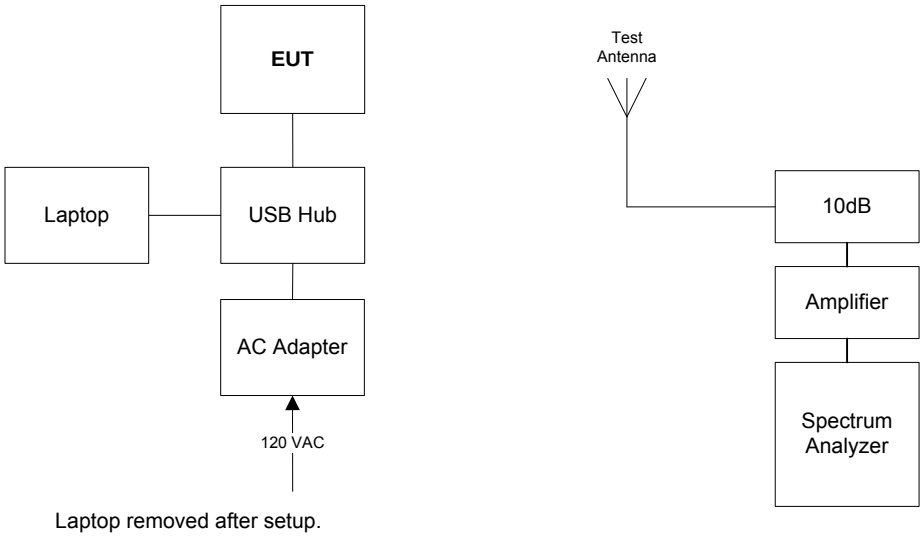
KDB 558074 D01 15.247 Meas Guidance v05r02, Sections 8.5, 8.6 and 8.7 / Subclauses 11.11, 11.12 and 11.13.of ANSI C63.10.

5.3.3. Test Arrangement

Radiated Emissions



Band-Edge Radiated Emissions



5.3.4. Test Data

5.3.4.1. Transmitter Spurious Radiated Emissions

Remark(s):

- All spurious emissions that are in excess of 20 dB below the specified limit shall be recorded.
- EUT shall be tested in three orthogonal positions.
- The simultaneous transmission was investigated and no new emissions were found.
- Exploratory tests performed to determined worst-case test configurations, the following test results at high power setting represent the worst-case.

Fundamental Frequency:	2405 MHz						
Frequency Test Range:	30 MHz – 25 GHz						
Power Setting:	15						
Frequency (MHz)	**RF Peak Level (dBµV/m)**	**RF Avg Level (dBµV/m)**	**Antenna Plane (H/V)**	**Limit 15.209 (dBµV/m)**	**Limit 15.247 (dBµV/m)**	**Margin (dB)**	**Pass/ Fail**
2405	117.24	--	V	--	--	--	--
2405	116.10	--	H	--	--	--	--
4810	48.38	34.37	H	54.0	97.2	-19.6	Pass*

*Field strength of emissions appearing within restricted frequency bands shall not exceed the limits in § 15.209.

Fundamental Frequency:	2440 MHz						
Frequency Test Range:	30 MHz – 25 GHz						
Power Setting:	15						
Frequency (MHz)	**RF Peak Level (dBµV/m)**	**RF Avg Level (dBµV/m)**	**Antenna Plane (H/V)**	**Limit 15.209 (dBµV/m)**	**Limit 15.247 (dBµV/m)**	**Margin (dB)**	**Pass/ Fail**
2440	119.08	--	V	--	--	--	--
2440	113.14	--	H	--	--	--	--
7320	53.78	42.64	V	54.0	99.1	-11.4	Pass*
7320	51.61	38.82	H	54.0	99.1	-15.2	Pass*

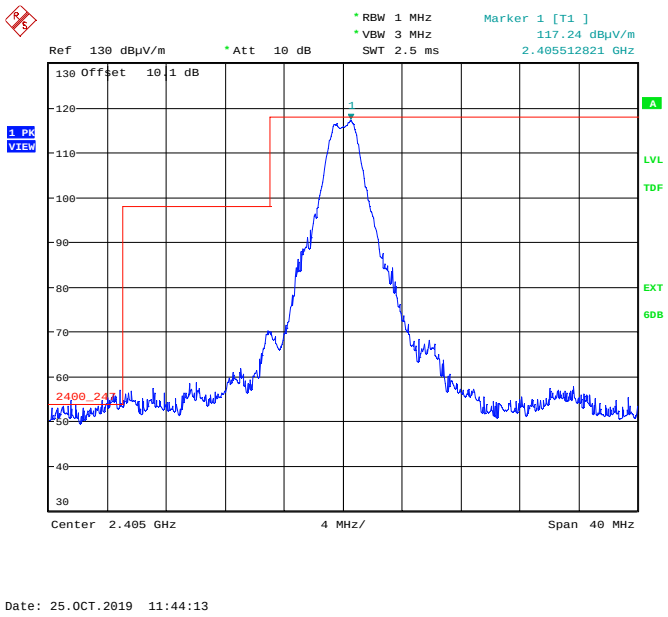
*Field strength of emissions appearing within restricted frequency bands shall not exceed the limits in § 15.209.

Fundamental Frequency:	2480 MHz						
Frequency Test Range:	30 MHz – 25 GHz						
Power Setting:	15						
Frequency (MHz)	**RF Peak Level (dBµV/m)**	**RF Avg Level (dBµV/m)**	**Antenna Plane (H/V)**	**Limit 15.209 (dBµV/m)**	**Limit 15.247 (dBµV/m)**	**Margin (dB)**	**Pass/ Fail**
2480	114.33	--	V	--	--	--	--
2480	112.41	--	H	--	--	--	--
7440	51.14	37.22	V	54.0	94.3	-16.8	Pass*
7440	50.98	37.59	H	54.0	94.3	-16.4	Pass*

*Field strength of emissions appearing within restricted frequency bands shall not exceed the limits in § 15.209.

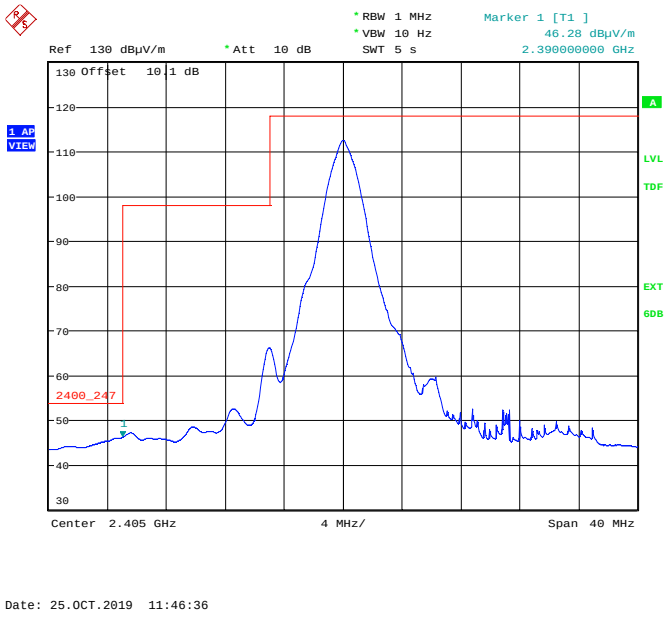
5.3.4.2. Band-Edge Radiated Emissions

Plot 5.3.4.2.1. Band-Edge Radiated Emissions, Lower Band-edge
Rx Antenna in Vertical Polarization, O-QPSK Modulation, Power Setting 15, Ch 11, 2405 MHz



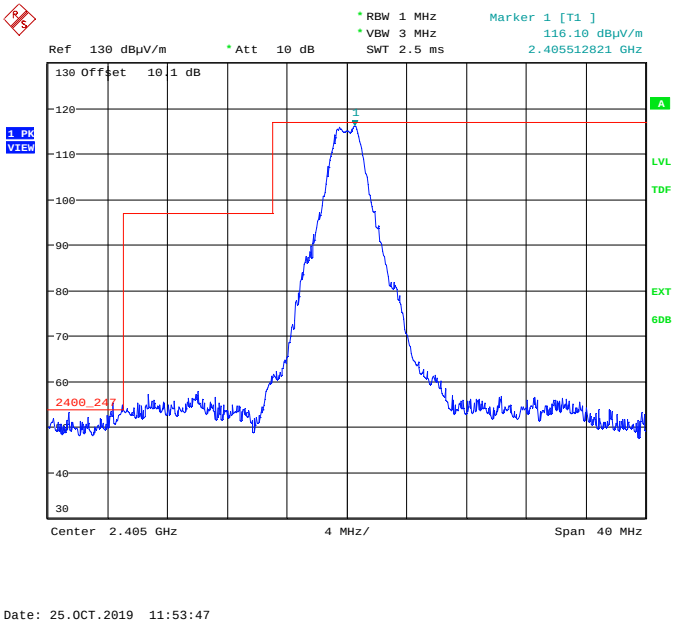
Peak: RBW = 1 MHz, VBW = 3 MHz

Plot 5.3.4.2.2. Band-Edge Radiated Emissions, Lower Band- edge
Rx Antenna in Vertical Polarization, O-QPSK Modulation, Power Setting 15, Ch 11, 2405 MHz



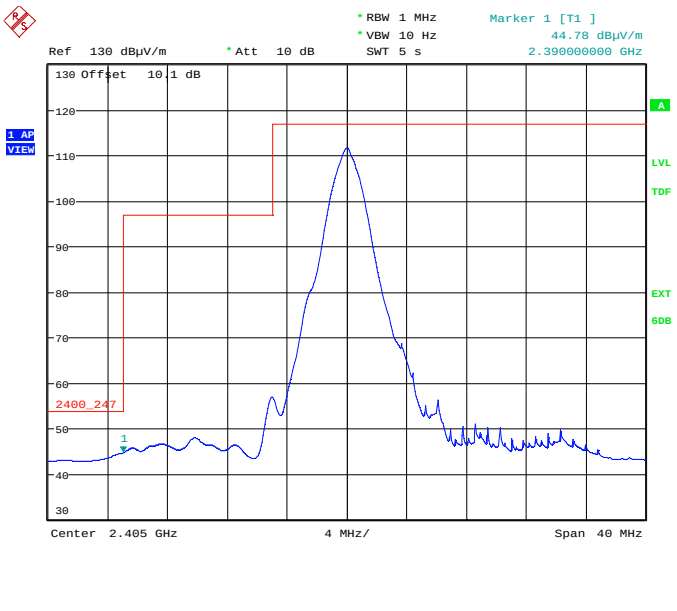
Average: RBW = 1 MHz, VBW = 10 Hz

Plot 5.3.4.2.3. Band-Edge Radiated Emissions, Lower Band-edge
Rx Antenna in Horizontal Polarization, O-QPSK Modulation, Power Setting 15, Ch 11, 2405 MHz



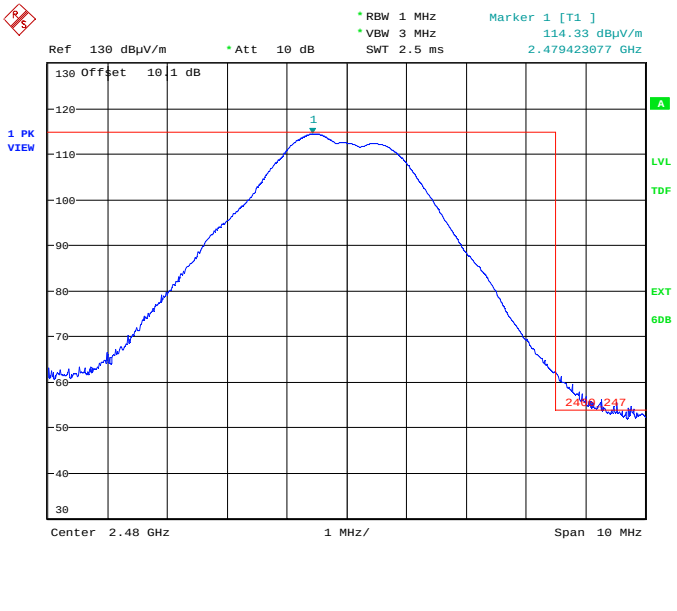
Peak: RBW = 1 MHz, VBW = 3 MHz

Plot 5.3.4.2.4. Band-Edge Radiated Emissions, Lower Band- edge
Rx Antenna in Horizontal Polarization, O-QPSK Modulation, Power Setting 15, Ch 11, 2405 MHz



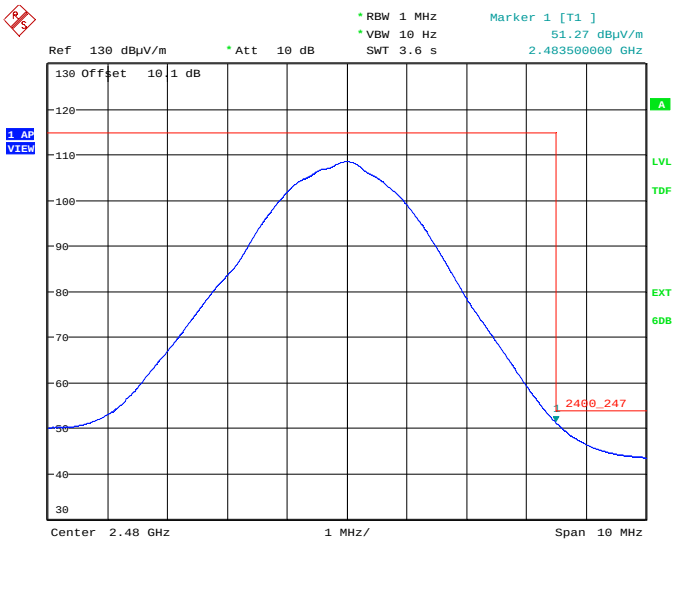
Average: RBW = 1 MHz, VBW = 10 Hz

Plot 5.3.4.2.5. Band-Edge Radiated Emissions, Higher Band-edge
Rx Antenna in Vertical Polarization, O-QPSK Modulation, Power Setting 15, Ch 26, 2480 MHz



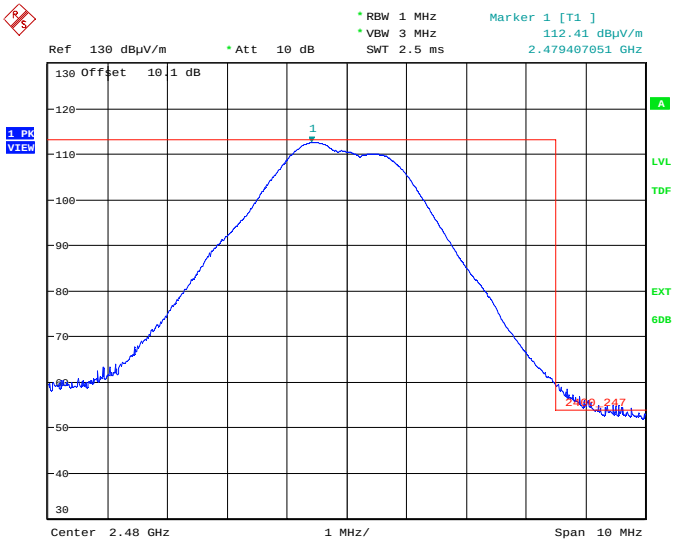
Peak: RBW = 1 MHz, VBW = 3 MHz

Plot 5.3.4.2.6. Band-Edge Radiated Emissions, Higher Band-edge
Rx Antenna in Vertical Polarization, O-QPSK Modulation, Power Setting 15, Ch 26, 2480 MHz



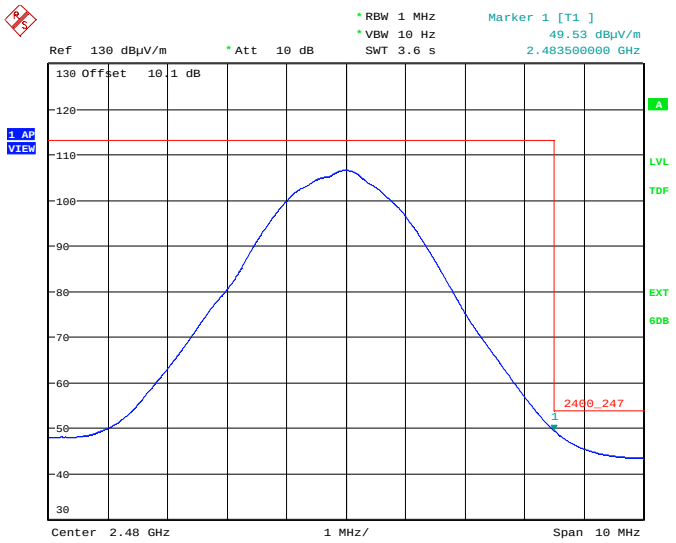
Average: RBW = 1 MHz, VBW = 10 Hz

Plot 5.3.4.2.7. Band-Edge Radiated Emissions, Higher Band-edge
Rx Antenna in Horizontal Polarization, O-QPSK Modulation, Power Setting 15, Ch 26, 2480 MHz



Peak: RBW = 1 MHz, VBW = 3 MHz

Plot 5.3.4.2.8. Band-Edge Radiated Emissions, Higher Band-edge
Rx Antenna in Horizontal Polarization, O-QPSK Modulation, Power Setting 15, Ch 26, 2480 MHz



Average: RBW = 1 MHz, VBW = 10 Hz

EXHIBIT 6. TEST EQUIPMENT LIST

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range	Cal. Due Date
Spectrum Analyzer	Agilent	E7401A	US40240432	9kHz - 1.5GHz	03 Jun 2020
Attenuator	Rohde & Schwarz	EZ-25	1023.77796.01	150kHz - 30MHz	06 Aug 2020
LISN Used	EMCO	3825/2	8907-1531	10Khz - 100Mhz	17 Dec 2019
Spectrum Analyzer	Rohde & Schwarz	FSU26	200946	20Hz–26.5 GHz	25 Jul 2020
DC Block	Hewlett Packard	11742A	12460	0.045 – 26.5 GHz	See Note 1
Attenuator	Hewlett Packard	8493C	0461	DC - 26.5 GHz	See Note 1
EMI Receiver	Rohde & Schwarz	ESU40	100037	20Hz–40 GHz	15 Mar 2020
RF Amplifier	Com-Power	PAM-0118A	551052	0.5 – 18 GHz	24 Jul 2020
RF Amplifier	Hewlett Packard	84498	3008A00769	1 – 26.5 GHz	15 May 2020
Biconilog Antenna	EMCO	3142B	1575	26-2000 MHz	10 May 2020
Horn Antenna	EMCO	3155	6570	1 – 18 GHz	11 Oct 2020
Horn Antenna	ETS-Lindgren	3160-09	001183858	18 – 26.5 GHz	27 Oct 2020
High Pass Filter	K & L	11SH10-4000/T12000	4	Cut off 2.4 GHz	See Note 1
Band Reject Filter	Micro-Tronics	BRM50701	105	Cut off 2.4-2.483 GHz	See Note 1
Note 1: Internal Verification/Calibration check					

EXHIBIT 7. MEASUREMENT UNCERTAINTY

The measurement uncertainties stated were calculated in accordance with the requirements of CISPR 16-4-2 @ IEC:2003 and JCGM 100:2008 (GUM 1995) – Guide to the Expression of Uncertainty in Measurement.

7.1. LINE CONDUCTED EMISSION MEASUREMENT UNCERTAINTY

	Line Conducted Emission Measurement Uncertainty (9 kHz – 30 MHz):	**Measured**	**Limit**
u_c	**Combined standard uncertainty:** $u_c(y) = \sqrt{\sum_{I=1}^{m} u_i^2(y)}$	**± 1.44**	**± 1.8**
U	**Expanded uncertainty U:** $U = 2u_c(y)$	**± 2.89**	**± 3.6**

7.2. RADIATED EMISSION MEASUREMENT UNCERTAINTY

	Radiated Emission Measurement Uncertainty @ 3m, Horizontal (30-1000 MHz):	**Measured (dB)**	**Limit (dB)**
u_c	**Combined standard uncertainty:** $u_c(y) = \sqrt{\sum_{I=1}^{m} u_i^2(y)}$	**± 2.39**	**± 2.6**
U	**Expanded uncertainty U:** $U = 2u_c(y)$	**± 4.79**	**± 5.2**

	Radiated Emission Measurement Uncertainty @ 3m, Vertical (30-1000 MHz):	**Measured (dB)**	**Limit (dB)**
u_c	**Combined standard uncertainty:** $u_c(y) = \sqrt{\sum_{I=1}^{m} u_i^2(y)}$	**± 2.39**	**± 2.6**
U	**Expanded uncertainty U:** $U = 2u_c(y)$	**± 4.78**	**± 5.2**

	Radiated Emission Measurement Uncertainty @ 3 m, Horizontal & Vertical (1 – 18 GHz):	**Measured (dB)**	**Limit (dB)**
u_c	**Combined standard uncertainty:** $u_c(y) = \sqrt{\sum_{I=1}^{m} u_i^2(y)}$	**± 1.87**	**Under consideration**
U	**Expanded uncertainty U:** $U = 2u_c(y)$	**± 3.75**	**Under consideration**