Test Report

Bureau Veritas Consumer Products Services Inc.

Report No	EU0026-2
Client	OSRAM SYLVANIA INC.
Address	200 Ballardvale Street Wilmington, MA 01887
Phone	978-750-3865
Items tested	iQ RF Controller
FCC ID	DZO-OSREFRMG13P
IC	23566-OSREFRMG13P
FRN	0021513163
Equipment Type	Digital Transmission System
Equipment Code	DTS
Emission Designator	1M04F1D
FCC/IC Rule Parts	CFR Title 47 FCC Part 15.247, RSS-247 Issue 2
Test Dates	January 20 – 29, 2020
Results	As detailed within this report
Prepared by	Landu Nsalambi – EMC Engineer
Authorized by	Anna Vancheva – EMC Wireless Engineer
Issue Date	1/29/2020
Conditions of Issue	This Test Report is issued subject to the conditions stated in the '*Conditions of Testing*' section on page 31 of this report.

Bureau Veritas Consumer Products Services Inc.is accredited by the American Association for Laboratory Accreditation for the specific scope of accreditation under Certificate Number 1627-01. This report may contain data which is not covered by the A2LA accreditation.

ACCREDITED Cert No. 1627-01

Contents

Contents....2
Summary....3
Test Methodology....4
Product Tested - Configuration Documentation....5
Statement of Conformity....6
Modifications Required for Compliance....6
Test Results....7
DTS (6dB) Bandwidth....7
99% Occupied Bandwidth....9
Peak Output Power....11
Peak Power Spectral Density....13
Conducted Bandedges....15
Conducted Spurious Emissions....17
Radiated Bandedges....20
Radiated Spurious Emissions....21
AC Line Conducted Emissions....29
Measurement Uncertainty....32
Conditions of Testing....33

Summary

This test report supports an application for certification of a transmitter operating pursuant to CFR Title 47 FCC Part 15.247, ISED Canada RSS-247 Issue 2.

The EUT is iQ RF Controller (Model: OSREFRMG13P). This is a radio that can support dual protocols i.e., Zigbee and Bluetooth Low Energy (BLE).
Zigbee operates in the 2405 – 2480MHz frequency. BLE radio operates in the 2402 – 2480MHz frequency range with DTS equipment code. Client declares that time division multiplexing is used between the Zigbee and BLE functions of the device. Therefore there's no simultaneous transmission capability between Zigbee and BLE.

Antenna: Internal PCB trace antenna with max 0.63dBi gain.

We found that the product met the above requirements without modification. Test samples were received in good condition.

Test Methodology

All testing was performed according to the following rules/procedures/documents:
CFR Title 47 FCC Part 15.247, ISED Canada RSS-247 Issue 2, ISED Canada RSS-Gen Issue 5, FCC KDB 558074 D01 15.247 Measurement Guidance v05r02 and ANSI C63.10-2013.

Radiated emissions were measured by rotating the device around three orthogonal planes, as well as varying the test antenna's height and polarity. Worst case results are presented in this report. AC line conducted emissions testing was performed with a 50Ω/50μH LISN. EUT operating voltage was 120VAC at 60Hz.
RF measurements were performed at the antenna port on 3 channels as follows:
Low channel = 2402 MHz
Mid channel = 2440 MHz
High channel = 2480MHz

Following bandwidths were used during radiated spurious and AC line conducted emissions tests:

Frequency	RBW	VBW
150kHz-30MHz	9kHz	30kHz
30-1000MHz	120kHz	1MHz
1-25GHz	1MHz	3MHz

Product Tested - Configuration Documentation

EUT Configuration			
Work Order:	U0026		
Company:	OSRAM SYLVANIA INC		
Company Address:	200 Ballardvale Street		
	Wilmington, MA, 01887		
Contact:	Sivakumar Thangavelu (3)		
	MN	**PN**	**SN**
EUT:			248
EUT Description:	BLE module		
EUT Max Frequency:	2480 MHz		
EUT Min Frequency:	38.4 MHz		

Support Equipment	**MN**	**SN**
HP Power Supply	E3612A	

Port Label	**Port Type**	**# ports**	**# populated**	**cable type**	**shielded**	**ferrites**	**length (m)**	**in/out**	**under test**	**comment**
DC power	Power DC	1	1	Power DC	No	No	0.1	in	yes	

Software Operating Mode Description:

Running high, mid and low channels at maximum power.

Performance Criteria:

N/A. Emissions tested only.

Statement of Conformity

RSS-GEN	RSP-100	RSS 247	Part 15	Comments
6.4			15.15(b)	There are no controls accessible to the user that varies the output power to operate in violation of the regulatory requirements.
	3.1		15.19	The label is shown in the label exhibit.
	3.2		15.21	Information to the user is shown in the instruction manual exhibit.
			15.27	No special accessories are required for compliance.
3.2			15.31	The EUT was tested in accordance with the measurement standards in this section.
6.13.2			15.33	Frequency range was investigated according to this section, unless noted in specific rule section under which the equipment operates.
6.13.1			15.35	The EUT emissions were measured using the measurement detector and bandwidth specified in this section, unless noted in specific rule section under which the equipment operates.
6.8			15.203	The antenna for this device is a non-detachable whisker antenna with 0.63 dBi gain.
8.10			15.205 15.209	The fundamental is not in a Restricted band and the spurious and harmonic emissions in the Restricted bands comply with the general emission limits of 15.209 or RSS-Gen as applicable
			15.247	The unit complies with the requirements of 15.247
		RSS 247		The unit complies with the requirements of RSS-247
6.7				Occupied Bandwidth measurements were made.

Modifications Required for Compliance

None.

Test Results

DTS (6dB) Bandwidth

LIMIT

The minimum 6 dB bandwidth shall be at least 500 kHz. [15.247(a) (2)]

MEASUREMENTS / RESULTS

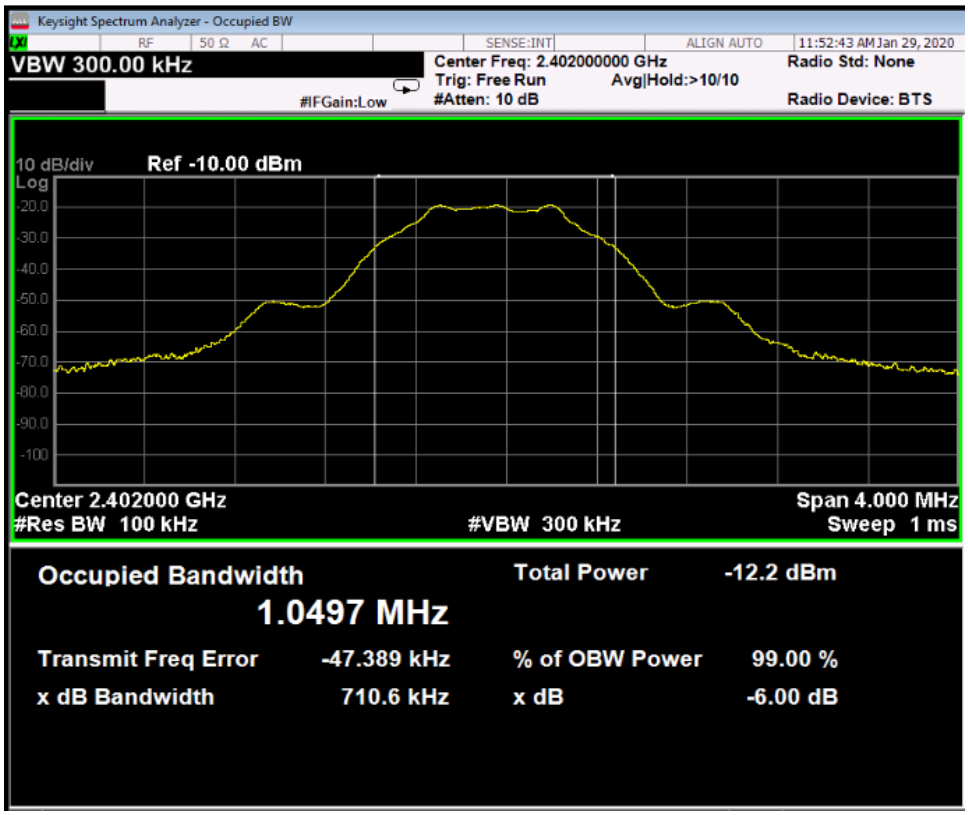
6dB Bandwidth

Date: 1/28/2020 **Company:** Osram **Work Order:** U0026
Engineer: AV **Operating Voltage/Frequency:** Battery
Temp: 23°C **Humidity:** 23% **Pressure:** 997mBar
Frequency Range: 2400-2480MHz **Measurement Type:** Conducted
Measurement Method: FCC KDB 558074 D01 15.247 Meas Guidance v05
Notes:

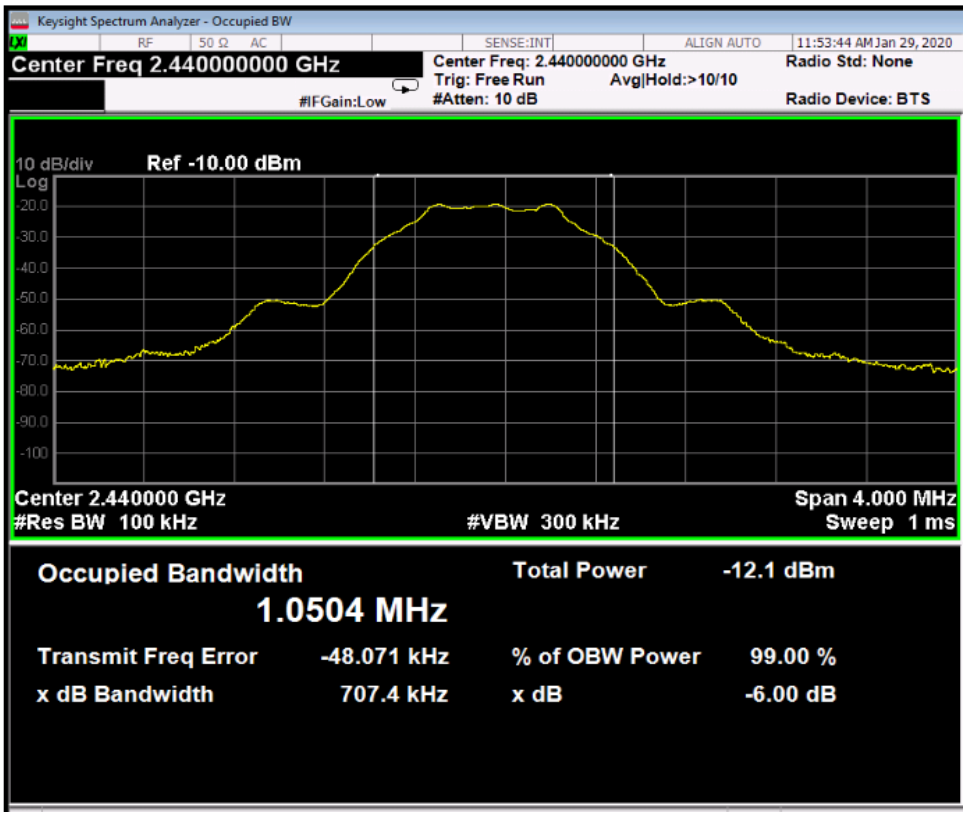
Frequency (MHz)	Reading (kHz)	6dB Bandwidth Limit (kHz)	Margin (kHz)	Result (Pass/Fail)
2402.0	710.6	≥500	211	Pass
2440.0	707.4	≥500	207	Pass
2480.0	706.6	≥500	207	Pass

Test Site: CEMI-3 **Cable:** none **Attenuator:** Asset # 2121
Analyzer: 1118472

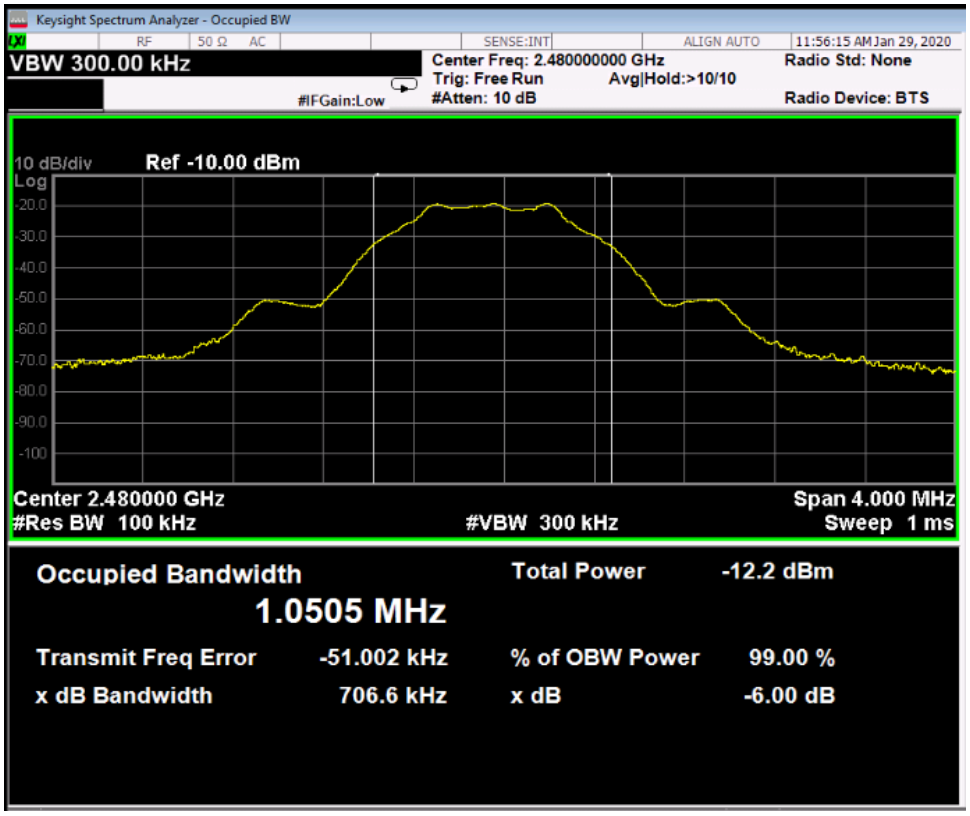
Copyright Curtis-Straus LLC 2000



6dB Bandwidth – Low Channel



6dB Bandwidth – Mid Channel



6dB Bandwidth – High Channel

99% Occupied Bandwidth

REQUIREMENT

When an occupied bandwidth is not specified in the applicable RSS, the transmitted signal bandwidth to be reported is its 99% emission bandwidth, as calculated or measured.
[RSS-GEN Issue 5 Section 6.7]

MEASUREMENTS / RESULTS

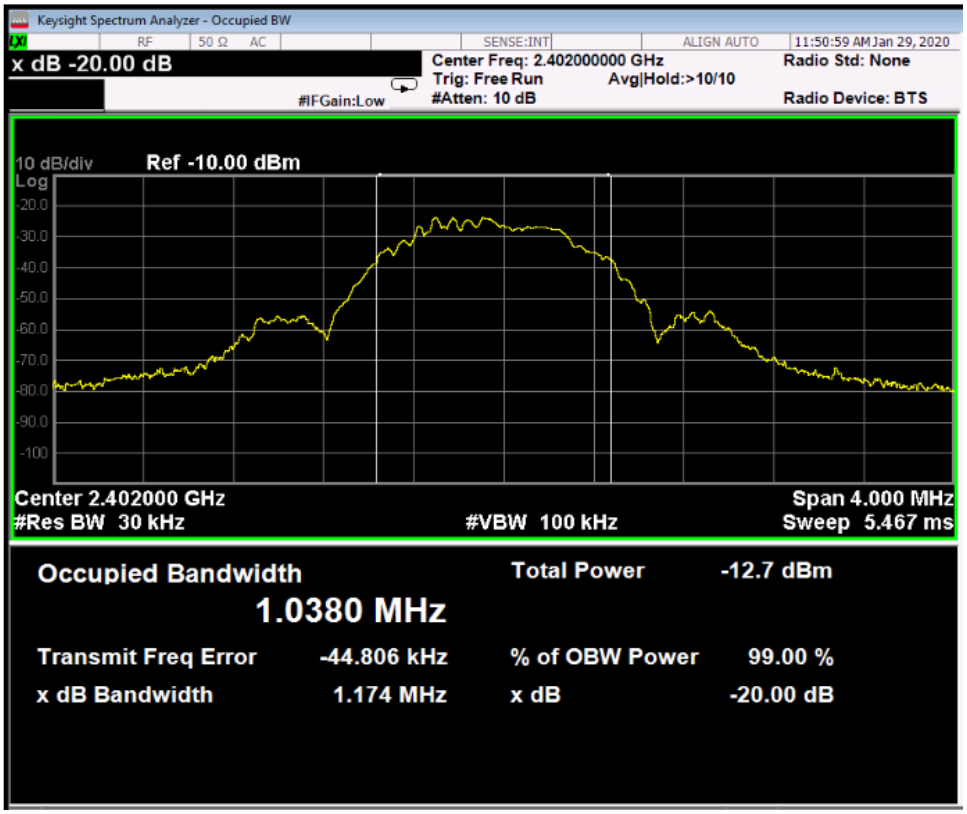
99% Occupied Bandwidth

Date: 1/28/2020 **Company:** Osram **Work Order:** U0026
Engineer: AV **Operating Voltage/Frequency:** Battery
Temp: 23°C **Humidity:** 23% **Pressure:** 997mBar
Frequency Range: 2400-2480MHz **Measurement Type:** Conducted
Measurement Method: RSS-Gen Issue 5 Section 6.7
Notes:

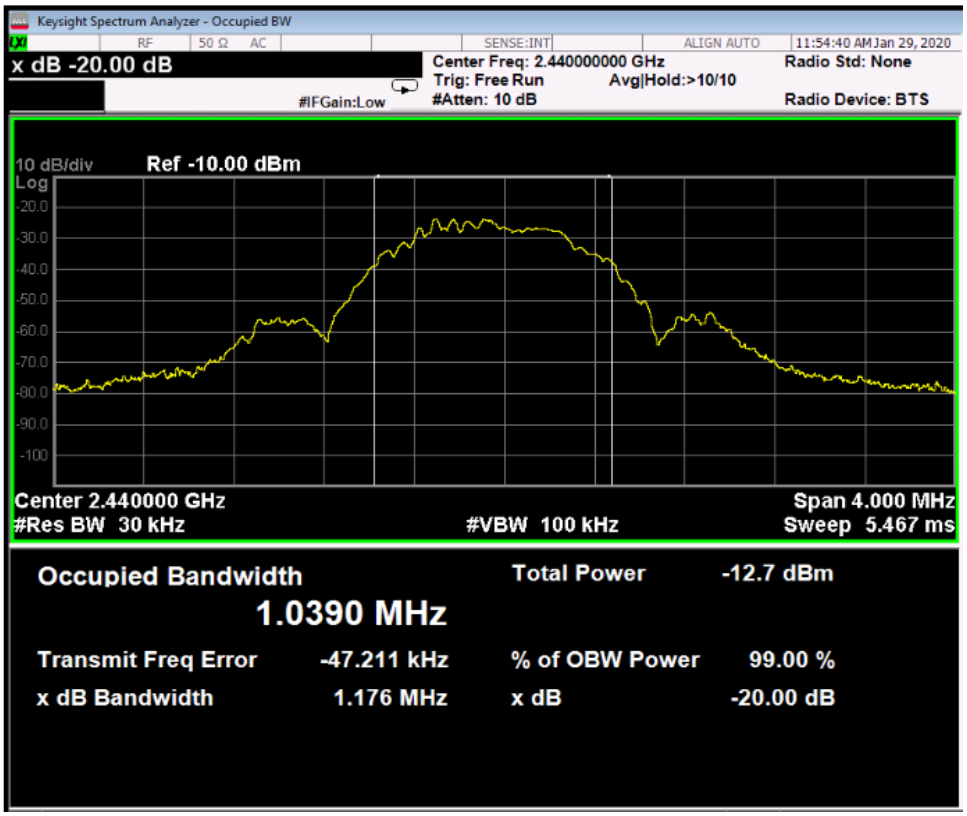
Frequency (MHz)	99% OBW (MHz)
2402	1.0380
2440	1.0390
2480	1.0386

Test Site: CEMI-3 **Cable:** none **Attenuator:** Asset # 2121
Analyzer: 1118472

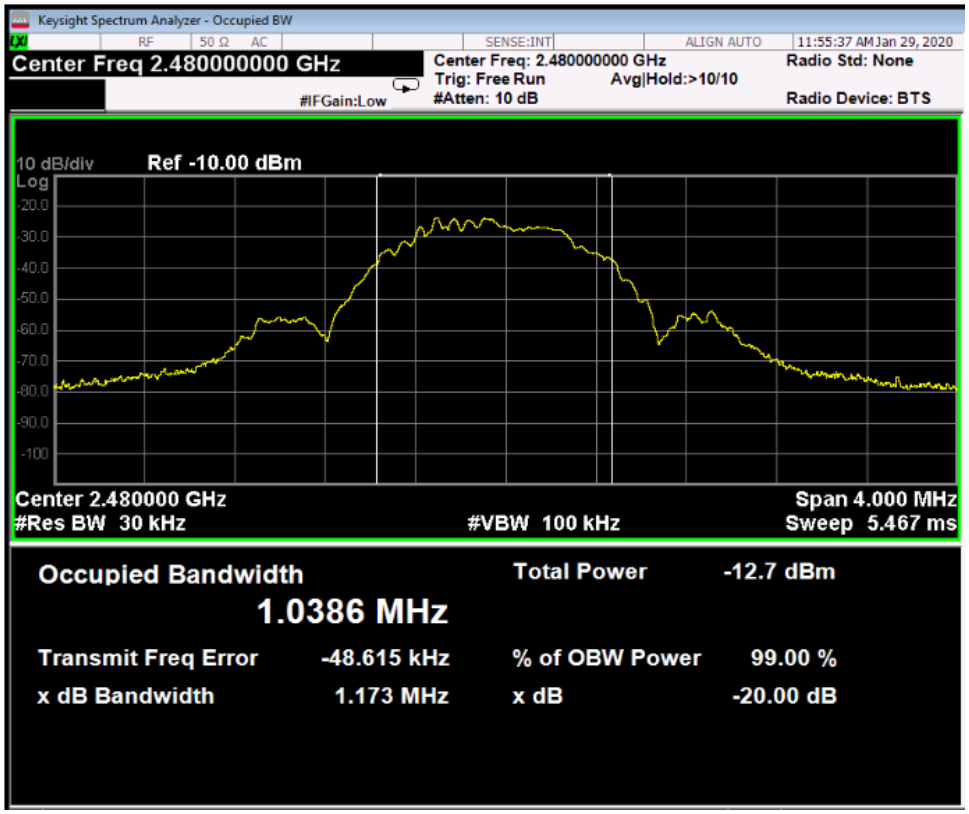
Copyright Curtis-Straus LLC 2000



Occupied Bandwidth – Low Channel



Occupied Bandwidth – Middle Channel



Occupied Bandwidth – High Channel

Peak Output Power

LIMIT

Conducted Output Power: 1 Watt per [15.247(b) (3)]

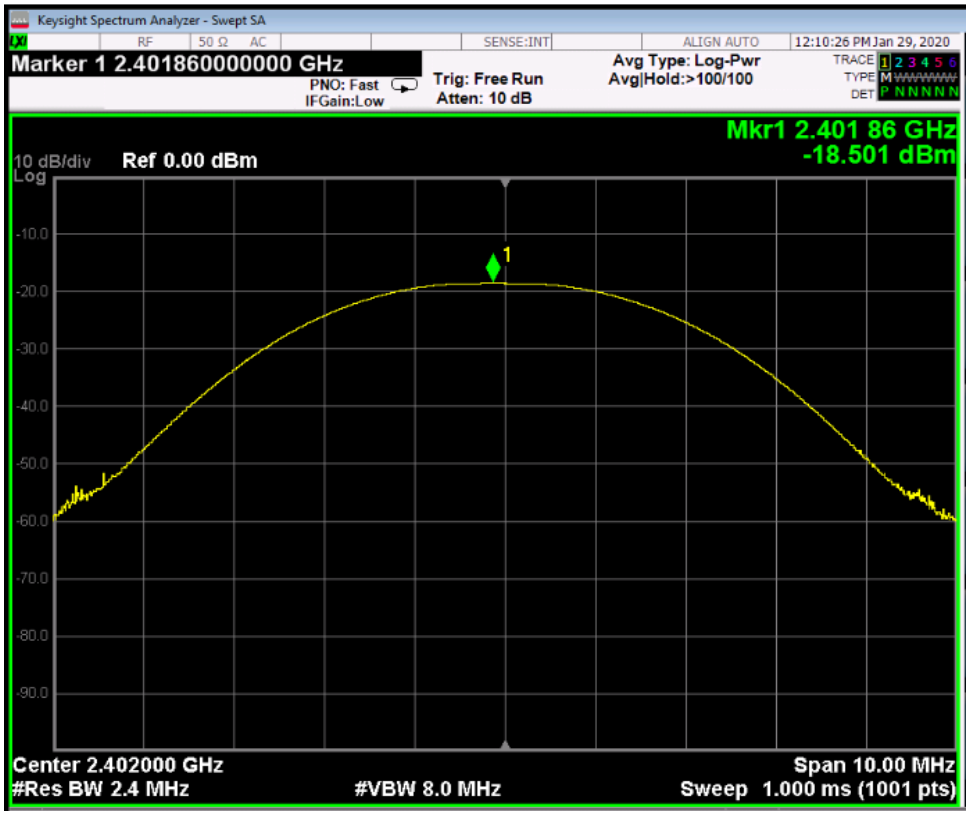
MEASUREMENTS / RESULTS

Peak Output Power

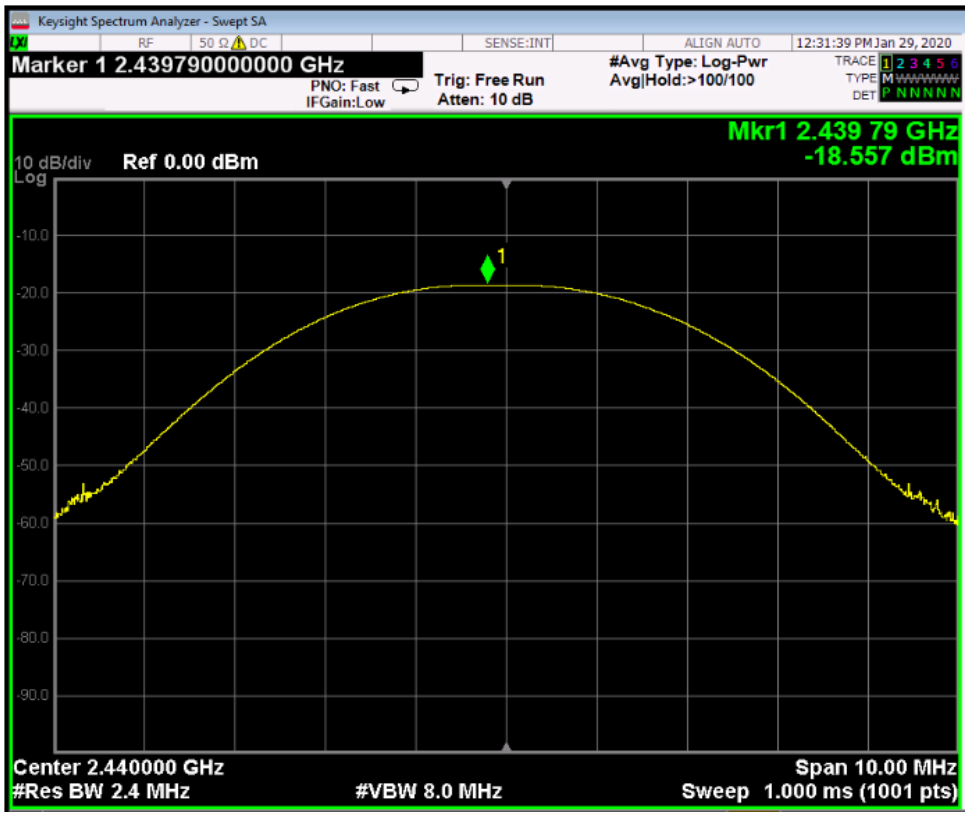
Date: 1/28/2020 **Company:** Osram **Work Order:** U0026
Engineer: AV **Operating Voltage/Frequency:** Battery
Temp: 23°C **Humidity:** 23% **Pressure:** 997mBar
Frequency Range: 2400-2480MHz **Measurement Type:** Conducted
Measurement Method: FCC KDB 558074 D01 15.247 Meas Guidance v05
Notes:

Frequency (MHz)	Peak Reading (dBm)	Cable Loss (dB)	Attenuator Loss (dB)	Peak Output Power (dBm)	Limit (dBm)	Margin (dB)	Result (Pass/Fail)
2402	-18.501	0.37	29.50	11.37	30.0	-18.63	Pass
2440	-18.557	0.37	29.50	11.31	30.0	-18.69	Pass
2480	-18.615	0.37	29.50	11.26	30.0	-18.75	Pass

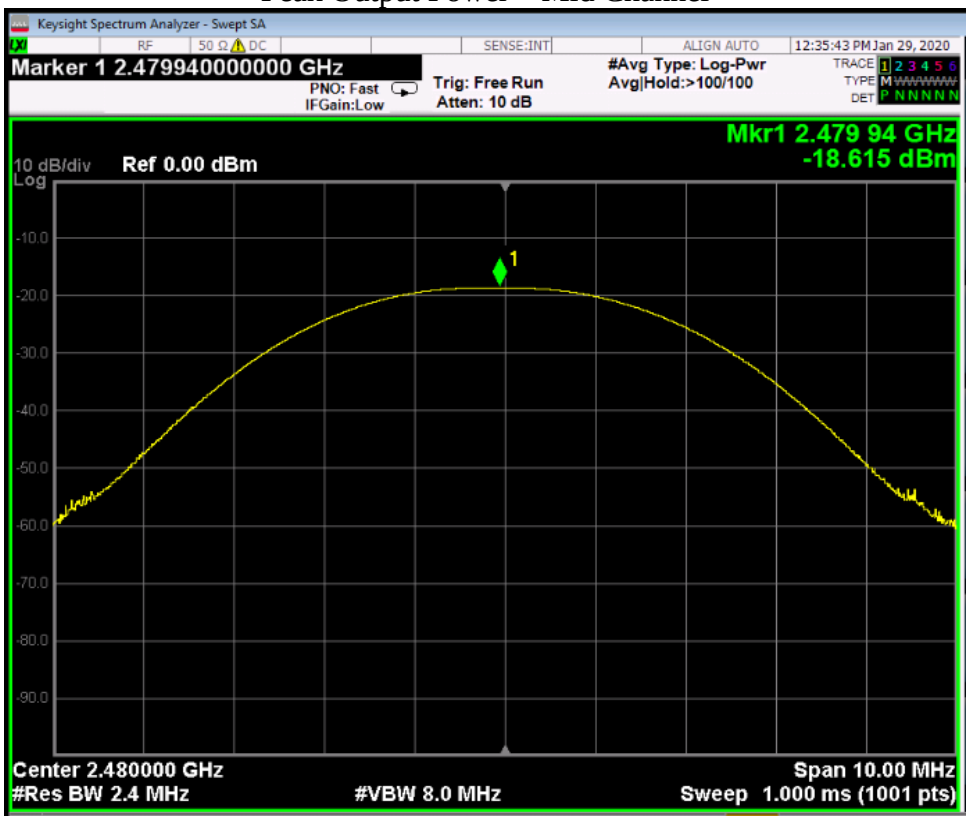
Test Site: CEMI-3 **Cable:** none **Attenuator:** Asset # 2121
Analyzer: 1118472
Peak Output Power (dBm)= Peak Reading (dBm) + Cable Loss (dB) + Attenuator Loss (dB)



Peak Output Power – Low Channel



Peak Output Power – Mid Channel



Peak Output Power – High Channel

Peak Power Spectral Density

LIMIT

…the 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. [15.247(e)]

MEASUREMENTS / RESULTS

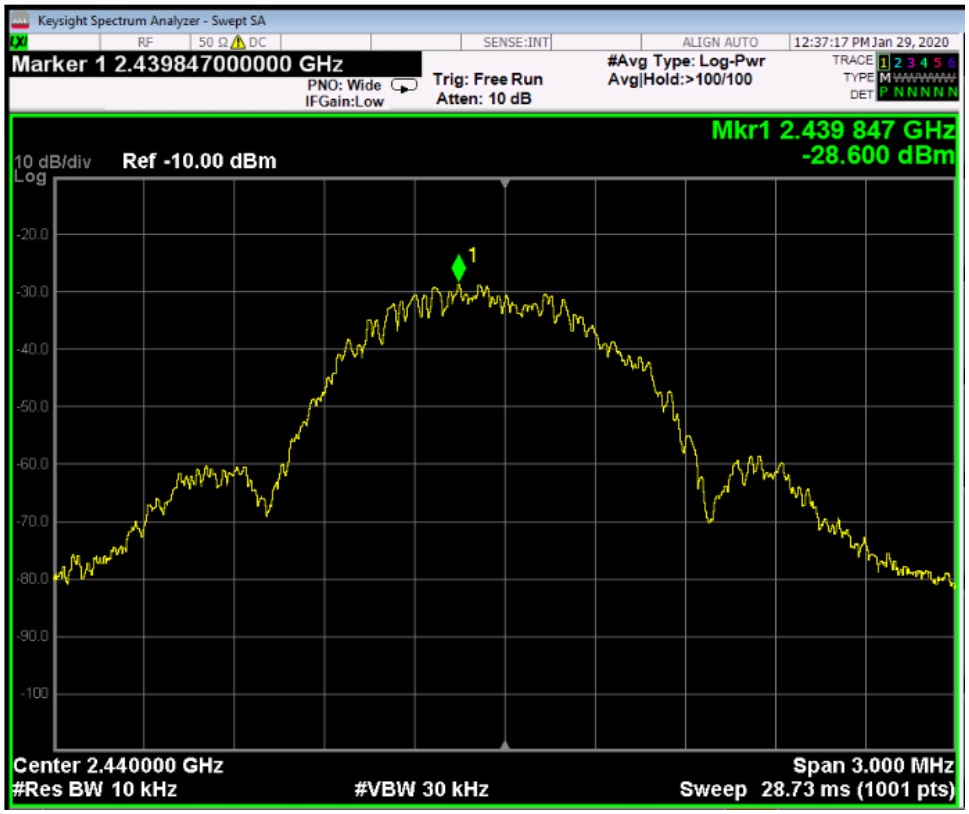
Peak Power Spectral Density

Date: 1/28/2020 **Company:** Osram **Work Order:** U0026
Engineer: AV **Operating Voltage/Frequency:** Battery
Temp: 23°C **Humidity:** 23% **Pressure:** 997mBar
Frequency Range: 2400-2480MHz **Measurement Type:** Conducted
Measurement Method: FCC KDB 558074 D01 15.247 Meas Guidance v05
Notes:

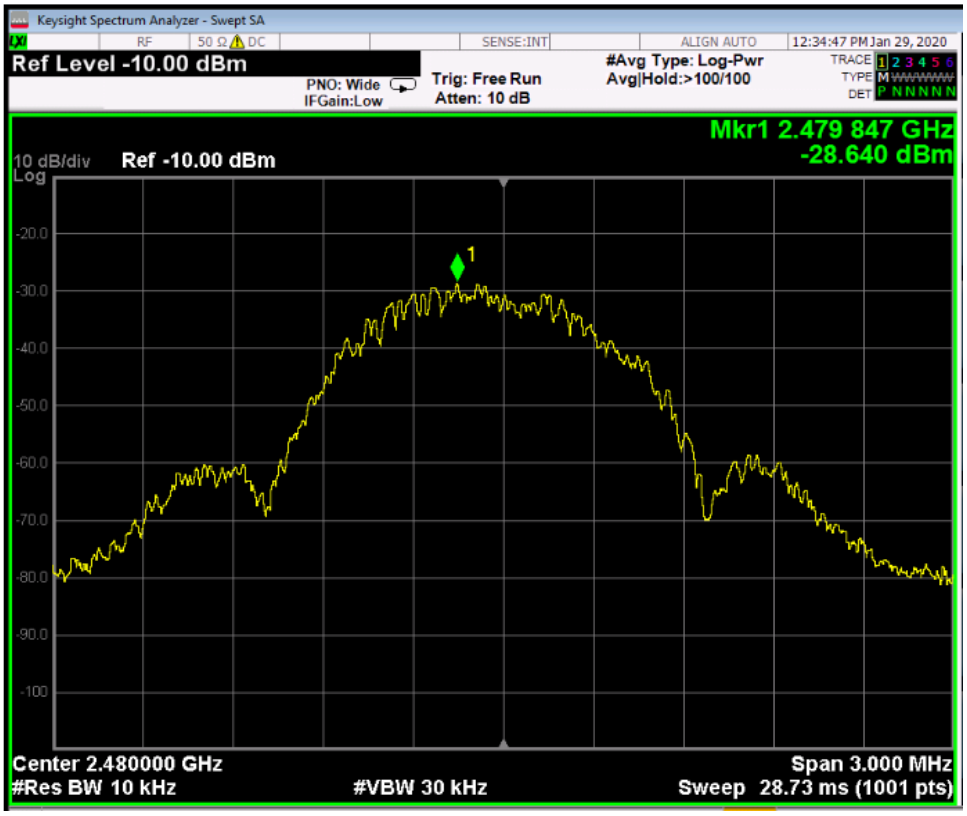
Frequency (MHz)	Peak Reading (dBm)	Cable Loss (dB)	Attenuator Loss (dB)	Peak PSD (dBm)	Limit (dBm)	Margin (dB)	Result
2402	-31.144	0.37	29.5	-1.27	8.0	-9.27	Pass
2440	-28.600	0.37	29.5	1.27	8.0	-6.73	Pass
2480	-28.640	0.37	29.5	1.23	8.0	-6.77	Pass

Test Site: CEMI-3 **Cable:** none **Attenuator:** Asset # 2121
Analyzer: 1118472
PSD(dBm) = Reading (dBm) + Cable Loss (dB) + Attenuator Loss (dBm)

Peak PSD – Low Channel



Peak PSD – Mid Channel



Peak PSD – High Channel

Conducted Bandedges

Band edges must be more than 20dB below fundamental.

MEASUREMENTS / RESULTS

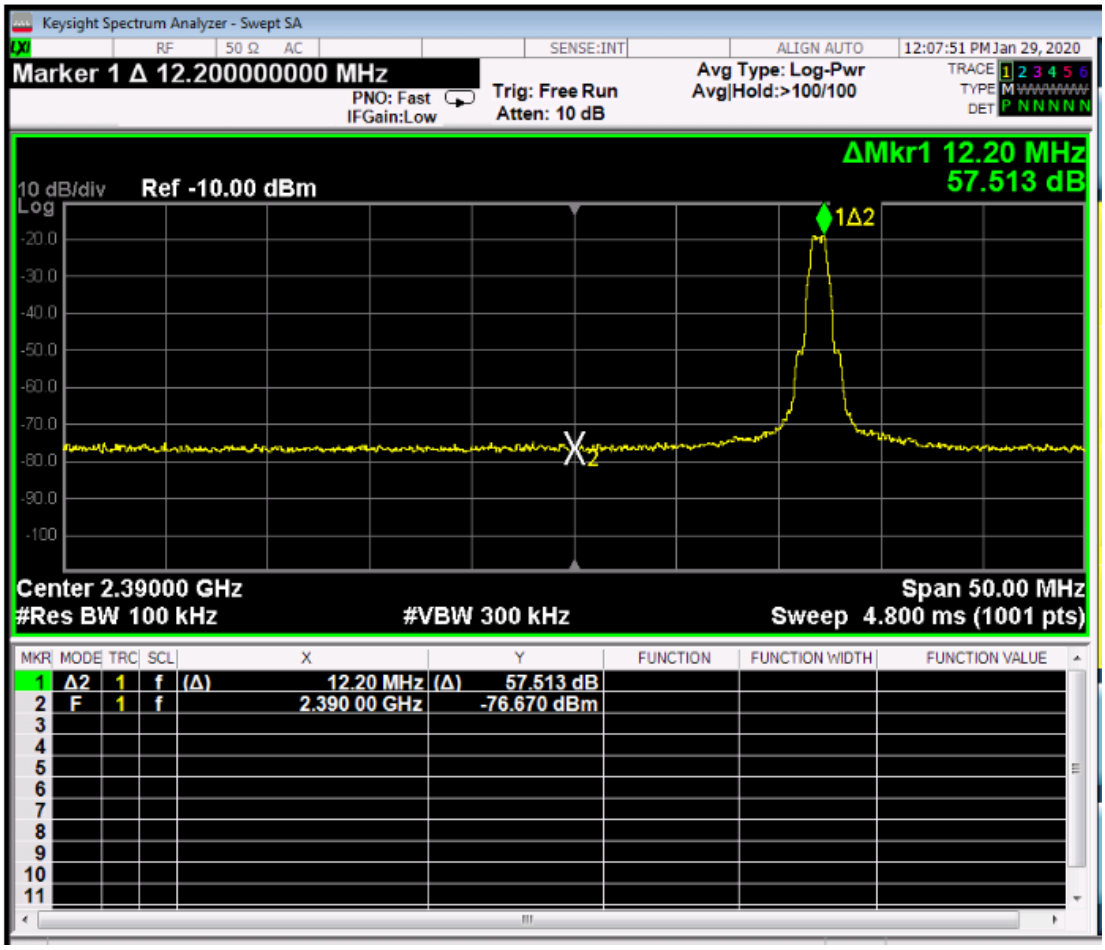
Conducted Bandedge

Date: 1/28/2020 **Company:** Osram **Work Order:** U0026
Engineer: AV **Operating Voltage/Frequency:** Battery
Temp: 23°C **Humidity:** 23% **Pressure:** 997mBar
Frequency Range: 2400-2480MHz **Measurement Type:** Conducted
Measurement Method: FCC KDB 558074 D01 15.247 Meas Guidance v05
Notes:

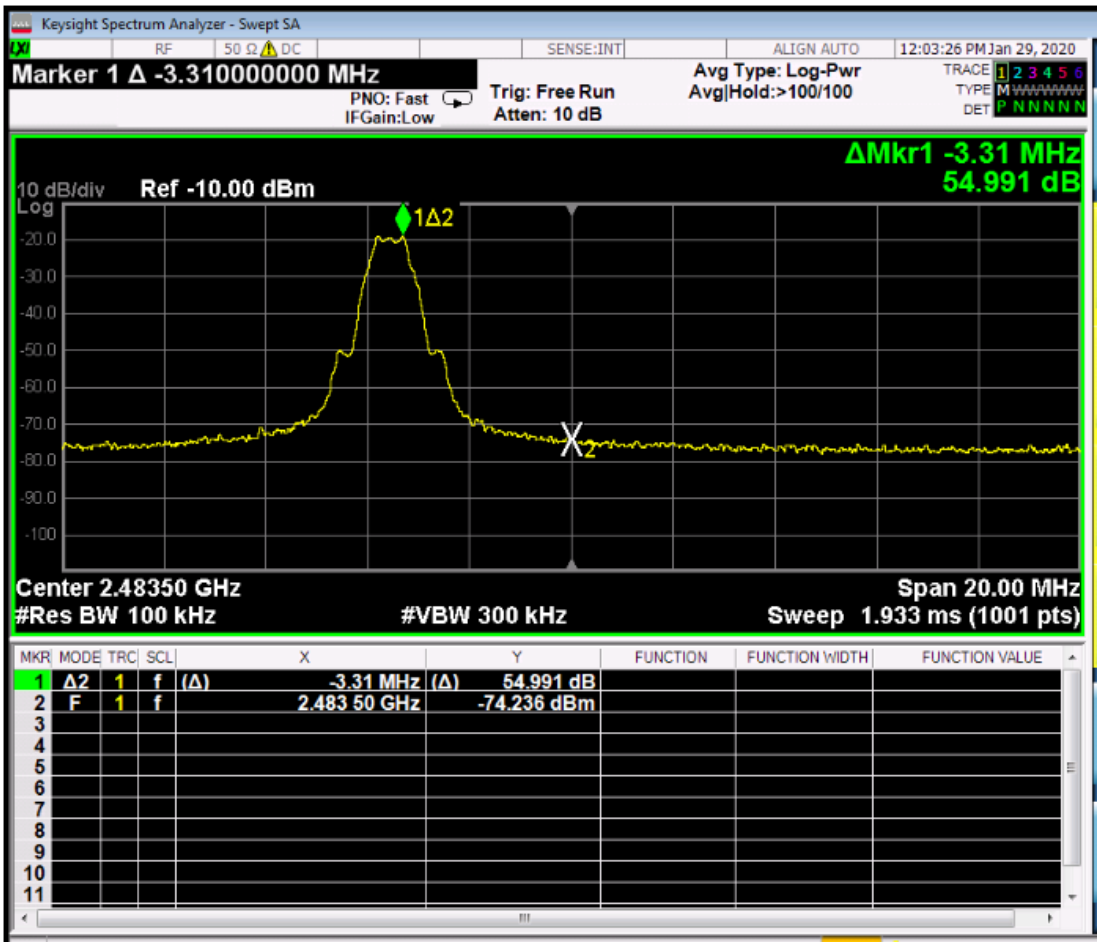
	Adjusted Bandedge (dBm)	Adjusted Fundamental (dBm)	Delta to Peak (dB)	Limit (dB)	Limit (Pass/Fail)
Low Bandedge	-76.67	-19.16	57.51	≥ 20	Pass
High Bandedge	-74.24	-19.25	54.99	≥ 20	Pass

Test Site: CEMI-3 **Cable:** none **Attenuator:** Asset # 2121
Analyzer: 1118472

Copyright Curtis-Straus LLC 2000



Low Band Edge



High Band Edge

Conducted Spurious Emissions

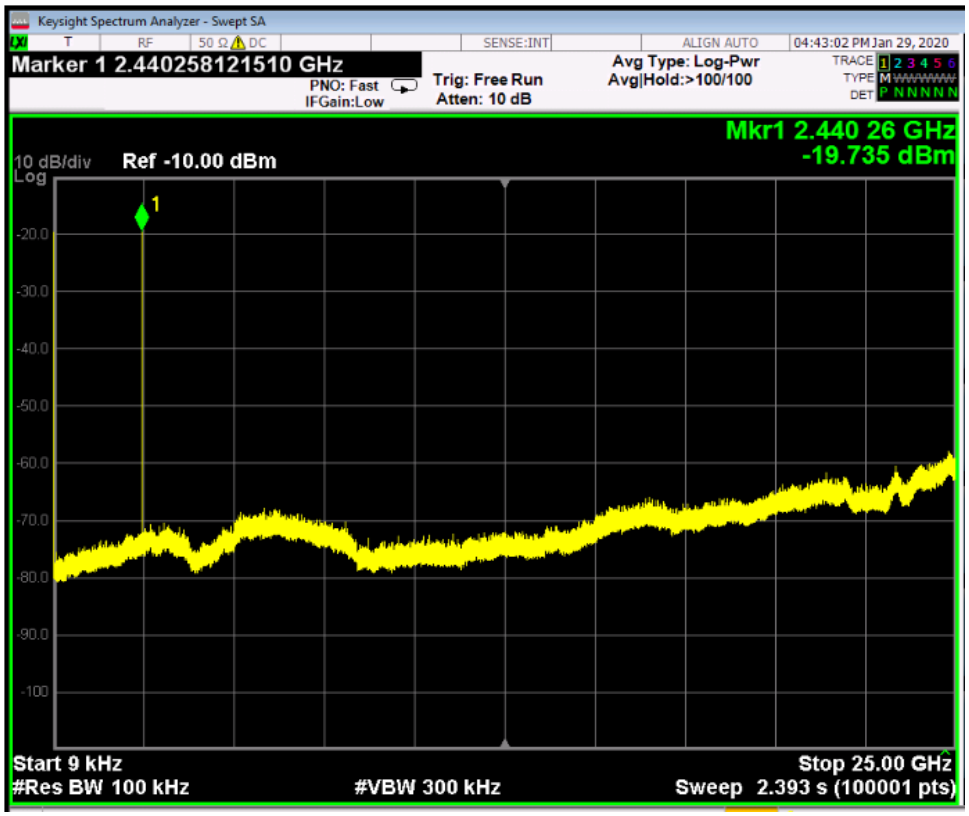
LIMITS

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 20dB below that in the 100kHz bandwidth that contains the highest level of desired power based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. [15.247(d)]

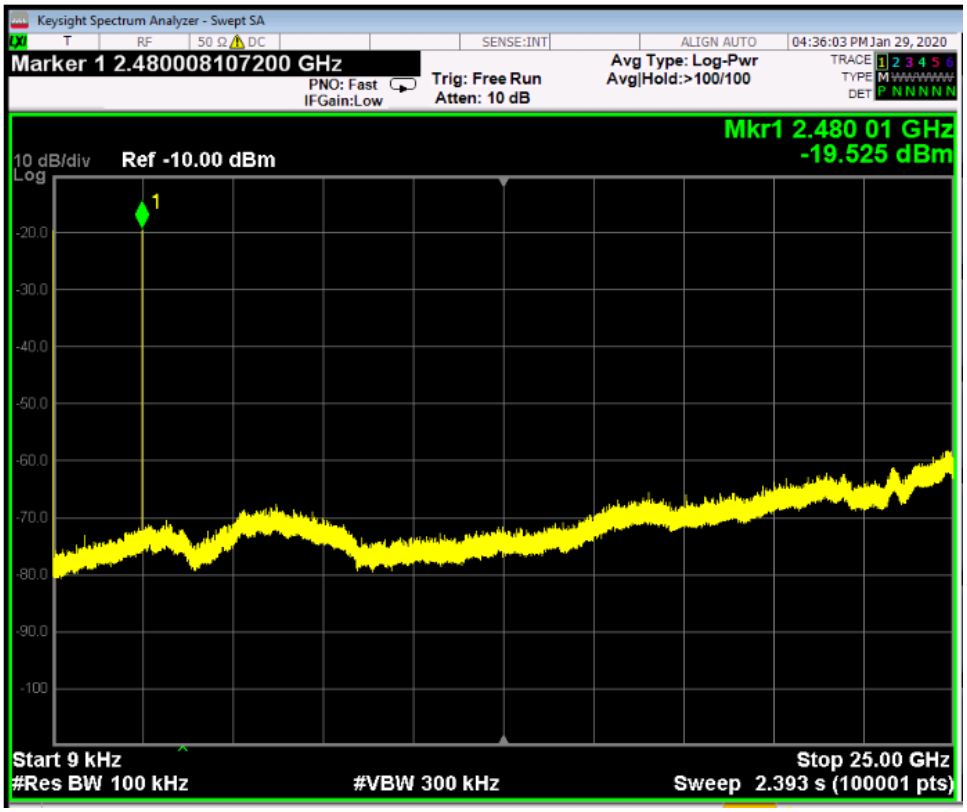
Conducted spurious emissions at the antenna port were measured in accordance with ANSI C63.10-2013 Section 11.11.

Frequency range up to 25GHz was investigated for all 3 channels (low, middle and high) at the EUT antenna port. No emissions within 20dB of their corresponding fundamental were found.

Low Channel



Mid Channel



High Channel

Test equipment used for all antenna port measurements:

Rev. 1/21/2020

Preamps /Couplers Attenuators / Filters	Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
API - 30dB 20W Attenuator	9KHz-40GHz	89-30-11	API Weinschel	703	2121	I	4/16/2020	4/16/2019
Spectrum Analyzers / Receivers /Preselectors	**Range**	**MN**	**Mfr**	**SN**	**Asset**	**Cat**	**Calibration Due**	**Calibrated on**
Rental EXA Signal Analyzer(1118472)	9KHz-26.5GHz	N9010A-526;K	AT	MY51170010	1118472	I	9/25/2020	9/25/2019
Meteorological Meters/Chambers		**MN**	**Mfr**	**SN**	**Asset**	**Cat**	**Calibration Due**	**Calibrated on**
Weather Clock (Pressure Only)		BA928	Oregon Scientific	C3166-1	831	I	5/15/2020	5/15/2018

All equipment is calibrated using standards traceable to NIST or other nationally recognized calibration standard.

Radiated Bandedges

LIMITS

Radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).
[15.247(d)]

Radiated Emissions Table

Date: 21-Jan-20 **Company:** Osram **Work Order:** U0026
Engineer: AV **EUT Operating Voltage/Frequency:** Battery
Temp: 24.6°C **Humidity:** 15% **Pressure:** 1021mbar
Frequency Range: Band edges **Measurement Distance:** 3 m
Notes: BLE

Antenna Polarization (H / V)	Frequency (MHz)	Peak Reading (dBµV)	Average Reading (dBµV)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Peak Reading (dBµV/m)	Adjusted Avg Reading (dBµV/m)	FCC Class B High Frequency - Peak Limit (dBµV/m)	FCC Class B High Frequency - Peak Margin (dB)	FCC Class B High Frequency - Peak Result (Pass/Fail)	FCC Class B High Frequency - Average Limit (dBµV/m)	FCC Class B High Frequency - Average Margin (dB)	FCC Class B High Frequency - Average Result (Pass/Fail)
Low band edge, Channel 11 at 19.5dBm, Y orientation				---	---	---	---	---	---	---	---	---	---	---
H	2390.0	36.621	36.621	38.9	32.2	4.6	34.5	34.5	74.0	-39.5	Pass	54.0	-19.5	Pass
V	2390.0	37.855	37.855	38.9	32.2	4.6	35.8	35.8	74.0	-38.2	Pass	54.0	-18.2	Pass
---	---	---		---	---	---			---		---	---		---
High band edge, Channel 26 at 10dBm, Y orientation				---	---	---			---		---	---		---
V	2483.5	43.57	43.57	38.9	32.5	4.6	41.8	41.8	74.0	-32.2	Pass	54.0	-12.2	Pass
H	2483.5	39.713	39.713	38.9	32.5	4.6	37.9	37.9	74.0	-36.1	Pass	54.0	-16.1	Pass

Table Result: Pass by -17.4 dB ***Worst Freq:*** 2483.5 MHz

Test Site: EMI Chamber 1 **Cable 1:** Asset #2466 **Cable 2:** Asset #2456 **Cable 3:** #2585
Analyzer: Asset #1170725 **Preamp:** Asset #8449B **Antenna:** Blue Horn **Preselector:** ---
CSsoft Radiated Emissions Calculator v 1.017.211
Adjusted Reading = Reading - Preamp Factor + Antenna Factor + Cable Factor

Copyright B V Littleton

Radiated Spurious Emissions

LIMITS

Radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).
[15.247(d)]

MEASUREMENTS / RESULTS
30MHz – 1GHz

Bureau Veritas Consumer Product Services Inc.
Radiated Emissions Electric Field 3m Distance
Top Peaks Vertical 30-1000MHz
Notes:
BLE Chanel 0 at 10dBm Y axis

Work Order - U0026
EUT Power Input - battery
Test Site - CH1
Conditions - 26.1°C; 28.6%RH; 1012mBar
Test Engineer - Av
EUT Maximum Frequency - 2480

Data Taken at 04:18:40 PM, Tuesday, January 28, 2020

Frequency (MHz)	Peak Reading (dBµV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBµV/m)	Lim1: FCC_pt15_209 (dBµV/m)	Lim1 Margin (dB)	Lim1 Test Results (Pass/Fail)	Worst Margin Lim1 (dB)	Antenna Height (cm)	Turntable Azimuth (degrees)
30.049	32.5	-8.1	24.4	40	-15.6	PASS	-15.6	150	315
334.531	38.4	-14.4	24	46	-22	PASS		150	0
341.297	37.3	-14.3	23	46	-23	PASS		150	0
347.214	38.4	-14.1	24.3	46	-21.7	PASS		150	0
952.737	31.6	-3.2	28.4	46	-17.6	PASS		150	315
997.721	31.7	-2.4	29.2	54	-24.8	PASS		150	135

Bureau Veritas Consumer Product Services Inc.
Radiated Emissions Electric Field 3m Distance
Top Peaks Horizontal 30-1000MHz
Notes:
BLE Chanel 0 at 10dBm Y axis

Work Order - U0026
EUT Power Input - battery
Test Site - CH1
Conditions - 26.1°C; 28.6%RH; 1012mBar
Test Engineer - Av
EUT Maximum Frequency - 2480

Data Taken at 04:28:13 PM, Tuesday, January 28, 2020

Frequency (MHz)	Peak Reading (dBµV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBµV/m)	Lim1: FCC_pt15_209 (dBµV/m)	Lim1 Margin (dB)	Lim1 Test Results (Pass/Fail)	Worst Margin Lim1 (dB)	Antenna Height (cm)	EUT Azimuth (degrees)
333.537	45.7	-14.4	31.2	46	-14.8	PASS		100	270
339.309	46	-14.4	31.6	46	-14.4	PASS		100	90
340.546	47	-14.3	32.7	46	-13.3	PASS		100	270
347.336	46.8	-14.1	32.7	46	-13.3	PASS		100	90
354.368	47.1	-13.8	33.3	46	-12.7	PASS	-12.7	100	90
361.279	44.2	-13.5	30.7	46	-15.3	PASS		100	270

Bureau Veritas Consumer Product Services Inc.
Radiated Emissions Electric Field 3m Distance
Top Peaks Vertical 30-1000MHz
Notes:
BLE Chanel 19 at 10dBm Y axis

Work Order - U0026
EUT Power Input - battery
Test Site - CH1
Conditions - 26.1°C; 28.6%RH; 1012mBar
Test Engineer - Av
EUT Maximum Frequency - 2480

Data Taken at 04:41:01 PM, Tuesday, January 28, 2020

Frequency (MHz)	Peak Reading (dBµV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBµV/m)	Lim1: FCC_pt15_209 (dBµV/m)	Lim1 Margin (dB)	Lim1 Test Results (Pass/Fail)	Worst Margin Lim1 (dB)	Antenna Height (cm)	Turntable Azimuth (degrees)
30.34	33.4	-8.3	25.1	40	-14.9	PASS	-14.9	100	225
340.036	38	-14.3	23.7	46	-22.3	PASS		150	0
347.093	38.4	-14.1	24.3	46	-21.7	PASS		150	0
822.442	33.1	-4.9	28.2	46	-17.8	PASS		200	0
941.558	32	-3.3	28.6	46	-17.4	PASS		150	180
989.597	31.2	-2.4	28.8	54	-25.2	PASS		150	180

Bureau Veritas Consumer Product Services Inc.
Radiated Emissions Electric Field 3m Distance
Top Peaks Horizontal 30-1000MHz
Notes:
BLE Chanel 19 at 10dBm Y axis

Work Order - U0026
EUT Power Input - battery
Test Site - CH1
Conditions - 26.1°C; 28.6%RH; 1012mBar
Test Engineer - Av
EUT Maximum Frequency - 2480

Data Taken at 04:50:05 PM, Tuesday, January 28, 2020

Frequency (MHz)	Peak Reading (dBµV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBµV/m)	Lim1: FCC_pt15_209 (dBµV/m)	Lim1 Margin (dB)	Lim1 Test Results (Pass/Fail)	Worst Margin Lim1 (dB)	Antenna Height (cm)	EUT Azimuth (degrees)
333.659	46.1	-14.4	31.6	46	-14.4	PASS		100	270
339.939	47.1	-14.3	32.8	46	-13.2	PASS		100	270
347.117	47.3	-14.1	33.2	46	-12.8	PASS		100	90
353.592	46.1	-13.9	32.2	46	-13.8	PASS		100	90
360.794	45.4	-13.5	31.8	46	-14.2	PASS		100	270
819.095	40.3	-5	35.3	46	-10.7	PASS	-10.7	100	0

Bureau Veritas Consumer Product Services Inc.
Radiated Emissions Electric Field 3m Distance
Top Peaks Vertical 30-1000MHz
Notes:
BLE Chanel 39 at 10dBm Y axis

Work Order - U0026
EUT Power Input - battery
Test Site - CH1
Conditions - 26.1°C; 28.6%RH; 1012mBar
Test Engineer - Av
EUT Maximum Frequency - 2480

Data Taken at 05:11:35 PM, Tuesday, January 28, 2020

Frequency (MHz)	Peak Reading (dBµV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBµV/m)	Lim1: FCC_pt15_209 (dBµV/m)	Lim1 Margin (dB)	Lim1 Test Results (Pass/Fail)	Worst Margin Lim1 (dB)	Antenna Height (cm)	Turntable Azimuth (degrees)
30.049	34.4	-8.1	26.3	40	-13.7	PASS	-13.7	150	90
345.856	39	-14.2	24.7	46	-21.3	PASS		150	45
779.471	33.7	-5.3	28.4	46	-17.6	PASS		200	90
822.369	33.5	-4.9	28.6	46	-17.4	PASS		100	315
918.568	32.1	-3.6	28.6	46	-17.4	PASS		100	0
997.308	31.2	-2.4	28.8	54	-25.2	PASS		200	315

Bureau Veritas Consumer Product Services Inc.
Radiated Emissions Electric Field 3m Distance
Top Peaks Horizontal 30-1000MHz
Notes:
BLE Chanel 39 at 10dBm Y axis

Work Order - U0026
EUT Power Input - battery
Test Site - CH1
Conditions - 26.1°C; 28.6%RH; 1012mBar
Test Engineer - Av
EUT Maximum Frequency - 2480

Data Taken at 05:11:36 PM, Tuesday, January 28, 2020

Frequency (MHz)	Peak Reading (dBµV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBµV/m)	Lim1: FCC_pt15_209 (dBµV/m)	Lim1 Margin (dB)	Lim1 Test Results (Pass/Fail)	Worst Margin Lim1 (dB)	Antenna Height (cm)	EUT Azimuth (degrees)
91.983	58.5	-22.3	36.2	43.5	-7.3	PASS	-7.3	200	0
340.255	47.8	-14.3	33.5	46	-12.5	PASS		100	135
345.638	45.7	-14.2	31.5	46	-14.5	PASS		100	315
346.899	46.5	-14.1	32.3	46	-13.7	PASS		100	135
353.543	46.5	-13.9	32.6	46	-13.4	PASS		100	135
359.849	45.8	-13.5	32.2	46	-13.8	PASS		100	315

Rev. 1/21/2020

Spectrum Analyzers / Receivers /Preselectors	Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
Rental MXE EMI Receiver(1168255)	20Hz-8.4GHz	N9038A	Agilent	MY53290009	1168255	I	9/25/2020	9/25/2019
Radiated Emissions Sites	**FCC Code**	**IC Code**	**VCCI Code**	**Range**	**Asset**	**Cat**	**Calibration Due**	**Calibrated on**
EMI Chamber 1	719150	2762A-6	A-0015	30-1000MHz	1685	I	12/7/2020	12/7/2018
Preamps /Couplers Attenuators / Filters	**Range**	**MN**	**Mfr**	**SN**	**Asset**	**Cat**	**Calibration Due**	**Calibrated on**
2311 PA	1-1000MHz	PAM-103	COM-POWER	441174	2311	II	10/14/2020	10/14/2019
2116 BRF	0.009-18000MHz	BRM50702	Micro-Tronics	G226	2116	II	11/11/2020	11/11/2019
Antennas	**Range**	**MN**	**Mfr**	**SN**	**Asset**	**Cat**	**Calibration Due**	**Calibrated on**
Red-White Bilog	30-2000MHz	JB1	Sunol	A091604-1	1105	I	9/11/2021	9/11/2019
Meteorological Meters/Chambers		**MN**	**Mfr**	**SN**	**Asset**	**Cat**	**Calibration Due**	**Calibrated on**
Weather Clock (Pressure Only)		BA928	Oregon Scientific	C3166-1	831	I	5/15/2020	5/15/2018
Asset #2658		1235C97	Control Company	181683808	2658	I	4/3/2020	4/3/2019
Cables	**Range**		**Mfr**			**Cat**	**Calibration Due**	**Calibrated on**
Asset #2456	9KHz-18GHz		MegaPhase			II	11/2/2020	11/2/2019
Asset #2466	9KHz-18GHz		MegaPhase			II	11/2/2020	11/2/2019
Asset #2585	9KHz-18GHz		Pasternack			II	10/27/2020	10/27/2019

All equipment is calibrated using standards traceable to NIST or other nationally recognized calibration standard.

Test Equipment Used (30 – 1000 MHz)

1GHz - 6GHz

Bureau Veritas Consumer Product Services Inc.
Radiated Emissions Electric Field 3m Distance
Top Peaks Vertical 1-6GHz
Notes:
BLE channel 0 at 10dB Y axis

Work Order - U0026
EUT Power Input - Battery
Test Site - ch2
Conditions - 24.6C; 15.3%RH; 1021mBar
Test Engineer - MF
EUT Maximum Frequency - 2480

Data Taken at 10:09:59 AM, Tuesday, January 21, 2020

Frequency (MHz)	Raw Peak Reading (dBµV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBµV/m)	Pk Lim: FCC_pt15_209_Peak (dBµV/m)	Margin to Peak Limit (dB)	Peak Limit Test Results (Pass/Fail)	Peak Limit Worst Margin (dB)	Av Lim: FCC_pt15_209_Average (dBµV/m)	Margin to Average Limit (dB)	Average Limit Test Result (Pass/Fail)	Average Limit Worst Margin (dB)	Antenna Height (cm)	EUT Azimuth (degrees)
2159.38	49.2	-4.4	44.7	74	-29.3	PASS		54	-9.3	PASS		200	50
2915.13	49.5	-3.7	45.8	74	-28.2	PASS		54	-8.2	PASS		100	132
4803.38	53.8	-3.5	50.3	74	-23.7	PASS	-23.7	54	-3.7	PASS	-3.7	100	306
5763.13	49.7	-1.6	48.1	74	-25.9	PASS		54	-5.9	PASS		300	81

Bureau Veritas Consumer Product Services Inc.
Radiated Emissions Electric Field 3m Distance
Top Peaks Horizontal 1-6GHz
Notes:
BLE channel 0 at 10dB Y axis

Work Order - U0026
EUT Power Input - Battery
Test Site - ch2
Conditions - 24.6C; 15.3%RH; 1021mBar
Test Engineer - MF
EUT Maximum Frequency - 2480

Data Taken at 10:09:59 AM, Tuesday, January 21, 2020

Frequency (MHz)	Raw Peak Reading (dBµV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBµV/m)	Pk Lim: FCC_pt15_209_Peak (dBµV/m)	Margin to Peak Limit (dB)	Peak Limit Results (Pass/Fail)	Peak Limit Worst Margin (dB)	Av Lim: FCC_pt15_209_Average (dBµV/m)	Margin to Avg Limit (dB)	Avg Limit Results (Pass/Fail)	Avg Limit Worst Margin (dB)	Antenna Height (cm)	EUT Azimuth (degrees)
2173.63	48.6	-4.3	44.3	74	-29.7	PASS		54	-9.7	PASS		100	274
3177.63	49.7	-4.1	45.6	74	-28.4	PASS		54	-8.4	PASS		300	254
4804.25	50.8	-3.5	47.3	74	-26.7	PASS	-26.7	54	-6.7	PASS	-6.7	200	92

Bureau Veritas Consumer Product Services Inc.
Radiated Emissions Electric Field 3m Distance
Top Peaks Vertical 1-6GHz
Notes:
BLE channel 19 at 10dB Y axis

Work Order - U0026
EUT Power Input - Battery
Test Site - ch2
Conditions - 24.6C; 15.3%RH; 1021mBar
Test Engineer - MF
EUT Maximum Frequency - 2480

Data Taken at 10:30:02 AM, Tuesday, January 21, 2020

Frequency (MHz)	Raw Peak Reading (dBµV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBµV/m)	Pk Lim: FCC_pt15_209_Peak (dBµV/m)	Margin to Peak Limit (dB)	Peak Limit Test Results (Pass/Fail)	Peak Limit Worst Margin (dB)	Av Lim: FCC_pt15_209_Average (dBµV/m)	Margin to Average Limit (dB)	Average Limit Test Result (Pass/Fail)	Average Limit Worst Margin (dB)	Antenna Height (cm)	EUT Azimuth (degrees)
1866.25	53.4	-7.1	46.4	74	-27.6	PASS		54	-7.6	PASS		300	30
2172.88	49.1	-4.3	44.7	74	-29.3	PASS		54	-9.3	PASS		100	41
2932.88	49.5	-3.8	45.7	74	-28.3	PASS		54	-8.3	PASS		200	112
4879.75	54.9	-3.6	51.3	74	-22.7	PASS		54	-2.7	PASS		200	295
5313.75	54.2	-2.5	51.7	74	-22.3	PASS	-22.3	54	-2.3	PASS	-2.3	300	315

Bureau Veritas Consumer Product Services Inc.
Radiated Emissions Electric Field 3m Distance
Top Peaks Horizontal 1-6GHz
Notes:
BLE channel 19 at 10dB Y axis

Work Order - U0026
EUT Power Input - Battery
Test Site - ch2
Conditions - 24.6C; 15.3%RH; 1021mBar
Test Engineer - MF
EUT Maximum Frequency - 2480

Data Taken at 10:30:02 AM, Tuesday, January 21, 2020

Frequency (MHz)	Raw Peak Reading (dBµV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBµV/m)	Pk Lim: FCC_pt15_209_Peak (dBµV/m)	Margin to Peak Limit (dB)	Peak Limit Results (Pass/Fail)	Peak Limit Worst Margin (dB)	Av Lim: FCC_pt15_209_Average (dBµV/m)	Margin to Avg Limit (dB)	Avg Limit Results (Pass/Fail)	Avg Limit Worst Margin (dB)	Antenna Height (cm)	EUT Azimuth (degrees)
2162.38	48.3	-4.4	43.9	74	-30.1	PASS		54	-10.1	PASS		100	30
3194	49.4	-4	45.4	74	-28.6	PASS		54	-8.6	PASS		300	295
4879.63	54	-3.6	50.4	74	-23.6	PASS	-23.6	54	-3.6	PASS	-3.6	200	112
5322.13	51.2	-2.5	48.7	74	-25.3	PASS		54	-5.3	PASS		100	152

Bureau Veritas Consumer Product Services Inc.
Radiated Emissions Electric Field 3m Distance
Top Peaks Vertical 1-6GHz
Notes:
BLE channel 39 at 10dB Y axis

Work Order - U0026
EUT Power Input - Battery
Test Site - ch2
Conditions - 24.6C; 15.3%RH; 1021mBar
Test Engineer - MF
EUT Maximum Frequency - 2480

Data Taken at 10:51:08 AM, Tuesday, January 21, 2020

Frequency (MHz)	Raw Peak Reading (dBµV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBµV/m)	Pk Lim: FCC_pt15_209_Peak (dBµV/m)	Margin to Peak Limit (dB)	Peak Limit Test Results (Pass/Fail)	Peak Limit Worst Margin (dB)	Av Lim: FCC_pt15_209_Average (dBµV/m)	Margin to Average Limit (dB)	Average Limit Test Result (Pass/Fail)	Average Limit Worst Margin (dB)	Antenna Height (cm)	EUT Azimuth (degrees)
1726.88	59.6	-8.7	50.8	74	-23.2	PASS		54	-3.2	PASS		200	73
2135	48.5	-4.6	43.9	74	-30.1	PASS		54	-10.1	PASS		200	73
3128	50.7	-4.6	46.1	74	-27.9	PASS		54	-7.9	PASS		100	101
4959.38	53.8	-3.5	50.3	74	-23.7	PASS		54	-3.7	PASS		200	305
5768.5	54.9	-1.5	53.4	74	-20.6	PASS	-20.6	54	-0.6	PASS	-0.6	100	262

Bureau Veritas Consumer Product Services Inc.
Radiated Emissions Electric Field 3m Distance
Top Peaks Horizontal 1-6GHz
Notes:
BLE channel 39 at 10dB Y axis

Work Order - U0026
EUT Power Input - Battery
Test Site - ch2
Conditions - 24.6C; 15.3%RH; 1021mBar
Test Engineer - MF
EUT Maximum Frequency - 2480

Data Taken at 10:51:08 AM, Tuesday, January 21, 2020

Frequency (MHz)	Raw Peak Reading (dBµV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBµV/m)	Pk Lim: FCC_pt15_209_Peak (dBµV/m)	Margin to Peak Limit (dB)	Peak Limit Results (Pass/Fail)	Peak Limit Worst Margin (dB)	Av Lim: FCC_pt15_209_Average (dBµV/m)	Margin to Avg Limit (dB)	Avg Limit Results (Pass/Fail)	Avg Limit Worst Margin (dB)	Antenna Height (cm)	EUT Azimuth (degrees)
2137	49.1	-4.6	44.5	74	-29.5	PASS		54	-9.5	PASS		300	283
2933.75	49.5	-3.9	45.6	74	-28.4	PASS		54	-8.4	PASS		100	30
4960.13	55.4	-3.5	51.9	74	-22.1	PASS	-22.1	54	-2.1	PASS	-2.1	200	255
5275.5	50.5	-2.7	47.8	74	-26.2	PASS		54	-6.2	PASS		300	40
5769.88	49.8	-1.5	48.3	74	-25.7	PASS		54	-5.7	PASS		200	295

6GHz-18GHz

Bureau Veritas Consumer Product Services Inc.
Radiated Emissions Electric Field 1m Distance
Top Peaks Vertical 6-18GHz
Notes:
BLE channel 0 at 10dB Y axis

Work Order - U0026
EUT Power Input - Battery
Test Site - ch2
Conditions - 24.6C; 15.3%RH; 1021mBar
Test Engineer - MF
EUT Maximum Frequency - 2480

Data Taken at 12:22:31 PM, Tuesday, January 21, 2020

Frequency (MHz)	Raw Peak Reading (dBµV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBµV/m)	Pk Lim: FCC_pt15_209_Peak (dBµV/m)	Margin to Peak Limit (dB)	Peak Limit Test Results (Pass/Fail)	Peak Limit Worst Margin (dB)	Av Lim: FCC_pt15_209_Average (dBµV/m)	Margin to Avg Limit (dB)	Avg Limit Test Results (Pass/Fail)	Avg Limit Worst Margin (dB)	Antenna Height (cm)	EUT Azimuth (degrees)
10584.9	50	4.3	54.3	83.5	-29.2	PASS		63.5	-9.2	PASS		125	128
12197.4	48.5	7.4	55.9	83.5	-27.6	PASS		63.5	-7.6	PASS		200	68
15505.2	48.3	10.4	58.7	83.5	-24.8	PASS		63.5	-4.8	PASS		125	270
16824.9	46.8	12.7	59.6	83.5	-23.9	PASS		63.5	-3.9	PASS		175	130
17912.4	46.2	13.6	59.8	83.5	-23.7	PASS	-23.7	63.5	-3.7	PASS	-3.7	125	199

Bureau Veritas Consumer Product Services Inc.
Radiated Emissions Electric Field 1m Distance
Top Peaks Horizontal 6-18GHz
Notes:
BLE channel 0 at 10dB Y axis

Work Order - U0026
EUT Power Input - Battery
Test Site - ch2
Conditions - 24.6C; 15.3%RH; 1021mBar
Test Engineer - MF
EUT Maximum Frequency - 2480

Data Taken at 12:22:31 PM, Tuesday, January 21, 2020

Frequency (MHz)	Raw Peak Reading (dBµV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBµV/m)	Pk Lim: FCC_pt15_209_Peak (dBµV/m)	Margin to Peak Limit (dB)	Peak Limit Test Results (Pass/Fail)	Peak Limit Worst Margin (dB)	Av Lim: FCC_pt15_209_Average (dBµV/m)	Margin to Avg Limit (dB)	Avg Limit Test Results (Pass/Fail)	Avg Limit Worst Margin (dB)	Antenna Height (cm)	EUT Azimuth (degrees)
10287	49.9	4.1	53.9	83.5	-29.6	PASS		63.5	-9.6	PASS		100	21
10534.5	50.1	4.3	54.3	83.5	-29.2	PASS		63.5	-9.2	PASS		150	280
16823.7	47.1	12.7	59.8	83.5	-23.7	PASS	-23.7	63.5	-3.7	PASS	-3.7	150	139
17873.4	46.2	13.5	59.8	83.5	-23.7	PASS		63.5	-3.7	PASS		125	35

Bureau Veritas Consumer Product Services Inc.
Radiated Emissions Electric Field 1m Distance
Top Peaks Vertical 6-18GHz
Notes:
BLE channel 19 at 10dB Y axis

Work Order - U0026
EUT Power Input - Battery
Test Site - ch2
Conditions - 24.6C; 15.3%RH; 1021mBar
Test Engineer - MF
EUT Maximum Frequency - 2480

Data Taken at 12:37:34 PM, Tuesday, January 21, 2020

Frequency (MHz)	Raw Peak Reading (dBµV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBµV/m)	Pk Lim: FCC_pt15_209_Peak (dBµV/m)	Margin to Peak Limit (dB)	Peak Limit Test Results (Pass/Fail)	Peak Limit Worst Margin (dB)	Av Lim: FCC_pt15_209_Average (dBµV/m)	Margin to Avg Limit (dB)	Avg Limit Test Results (Pass/Fail)	Avg Limit Worst Margin (dB)	Antenna Height (cm)	EUT Azimuth (degrees)
10533.6	49.8	4.3	54.1	83.5	-29.4	PASS		63.5	-9.4	PASS		100	69
12873	47.8	7.8	55.5	83.5	-28	PASS		63.5	-8	PASS		125	130
16817.7	46.6	12.7	59.4	83.5	-24.1	PASS	-24.1	63.5	-4.1	PASS	-4.1	100	257
17949	45.7	13.6	59.3	83.5	-24.2	PASS		63.5	-4.2	PASS		125	177

Bureau Veritas Consumer Product Services Inc.
Radiated Emissions Electric Field 1m Distance
Top Peaks Horizontal 6-18GHz
Notes:
BLE channel 19 at 10dB Y axis

Work Order - U0026
EUT Power Input - Battery
Test Site - ch2
Conditions - 24.6C; 15.3%RH; 1021mBar
Test Engineer - MF
EUT Maximum Frequency - 2480

Data Taken at 12:37:34 PM, Tuesday, January 21, 2020

Frequency (MHz)	Raw Peak Reading (dBµV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBµV/m)	Pk Lim: FCC_pt15_209_Peak (dBµV/m)	Margin to Peak Limit (dB)	Peak Limit Test Results (Pass/Fail)	Peak Limit Worst Margin (dB)	Av Lim: FCC_pt15_209_Average (dBµV/m)	Margin to Avg Limit (dB)	Avg Limit Test Results (Pass/Fail)	Avg Limit Worst Margin (dB)	Antenna Height (cm)	EUT Azimuth (degrees)
16751.7	46.2	12.7	58.8	83.5	-24.7	PASS		63.5	-4.7	PASS		200	45
17953.5	46	13.6	59.6	83.5	-23.9	PASS	-23.9	63.5	-3.9	PASS	-3.9	150	163

Bureau Veritas Consumer Product Services Inc.
Radiated Emissions Electric Field 1m Distance
Top Peaks Vertical 6-18GHz
Notes:
BLE channel 39 at 10dB Y axis

Work Order - U0026
EUT Power Input - Battery
Test Site - ch2
Conditions - 24.6C; 15.3%RH; 1021mBar
Test Engineer - MF
EUT Maximum Frequency - 2480

Data Taken at 12:57:05 PM, Tuesday, January 21, 2020

Frequency (MHz)	Raw Peak Reading (dBµV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBµV/m)	Pk Lim: FCC_pt15_209_Peak (dBµV/m)	Margin to Peak Limit (dB)	Peak Limit Test Results (Pass/Fail)	Peak Limit Worst Margin (dB)	Av Lim: FCC_pt15_209_Average (dBµV/m)	Margin to Avg Limit (dB)	Avg Limit Test Results (Pass/Fail)	Avg Limit Worst Margin (dB)	Antenna Height (cm)	EUT Azimuth (degrees)
12122.7	48.8	7.2	56	83.5	-27.5	PASS		63.5	-7.5	PASS		200	92
12720.6	48.6	7.6	56.2	83.5	-27.3	PASS		63.5	-7.3	PASS		100	22
16589.4	47.3	12.1	59.4	83.5	-24.1	PASS	-24.1	63.5	-4.1	PASS	-4.1	125	59
17954.1	45.8	13.6	59.4	83.5	-24.1	PASS		63.5	-4.1	PASS		175	294

Bureau Veritas Consumer Product Services Inc.
Radiated Emissions Electric Field 1m Distance
Top Peaks Horizontal 6-18GHz
Notes:
BLE channel 39 at 10dB Y axis

Work Order - U0026
EUT Power Input - Battery
Test Site - ch2
Conditions - 24.6C; 15.3%RH; 1021mBar
Test Engineer - MF
EUT Maximum Frequency - 2480

Data Taken at 12:57:05 PM, Tuesday, January 21, 2020

Frequency (MHz)	Raw Peak Reading (dBµV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBµV/m)	Pk Lim: FCC_pt15_209_Peak (dBµV/m)	Margin to Peak Limit (dB)	Peak Limit Test Results (Pass/Fail)	Peak Limit Worst Margin (dB)	Av Lim: FCC_pt15_209_Average (dBµV/m)	Margin to Avg Limit (dB)	Avg Limit Test Results (Pass/Fail)	Avg Limit Worst Margin (dB)	Antenna Height (cm)	EUT Azimuth (degrees)
12678.9	48.8	7.6	56.4	83.5	-27.1	PASS		63.5	-7.1	PASS		175	285
16768.2	46.6	12.7	59.3	83.5	-24.2	PASS		63.5	-4.2	PASS		175	167
17974.5	47.6	13.6	61.1	83.5	-22.4	PASS	-22.4	63.5	-2.4	PASS	-2.4	100	46

No emissions found in the 18-25GHz frequency range.

Rev. 1/17/2020

Spectrum Analyzers / Receivers /Preselectors	Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
Gold	100Hz-26.5 GHz	E4407B	Agilent	MY45113816	1284	I	5/20/2020	5/20/2019
2093 MXE EMI Receiver	20Hz-26.5GHz	N9038A	Agilent	MY51210181	2093	I	12/31/2020	12/31/2019
Rental MXE EMI Receiver(1170725)	20Hz-26.5GHz	N9038A	Agilent	MY51210151	1170725	I	5/30/2020	5/30/2019
Radiated Emissions Sites	**FCC Code**	**IC Code**	**VCCI Code**	**Range**	**Asset**	**Cat**	**Calibration Due**	**Calibrated on**
EMI Chamber 1	719150	2762A-6	A-0015	30-1000MHz	1685	I	12/7/2020	12/7/2018
EMI Chamber 1	719150	2762A-6	A-0015	1-18GHz	1685	I	12/7/2020	12/7/2018
EMI Chamber 2	719150	2762A-7	A-0015	30-1000MHz	1686	I	12/7/2020	12/7/2018
EMI Chamber 2	719150	2762A-7	A-0015	1-18GHz	1686	I	12/7/2020	12/7/2018
Preamps /Couplers Attenuators / Filters	**Range**	**MN**	**Mfr**	**SN**	**Asset**	**Cat**	**Calibration Due**	**Calibrated on**
2311 PA	1-1000MHz	PAM-103	COM-POWER	441174	2311	II	10/14/2020	10/14/2019
2111 HF Preamp	0.5-18GHz	PAM-118A	COM-POWER	551063	2111	II	10/14/2020	10/14/2019
8449B HF Preamp	1-18GHz	8449B	Agilent	1149055		II	11/24/2020	11/24/2019
8447F Rental PA	9KHz-1.3GHz	84477F	HP	3113A05395		II	6/18/2020	6/18/2019
2116 BRF	0.009-18000MHz	BRM50702	Micro-Tronics	G226	2116	II	11/11/2020	11/11/2019
Antennas	**Range**	**MN**	**Mfr**	**SN**	**Asset**	**Cat**	**Calibration Due**	**Calibrated on**
Red-Black Bilog	30-2000MHz	JB1	Sunol	A091604-2	1106	I	4/26/2021	4/26/2019
Red-Brown Bilog	30-2000MHz	JB1	Sunol	A0032406	1218	I	3/11/2021	3/11/2019
Blue Horn	1-18Ghz	3117	ETS	157647	1861	I	3/9/2021	3/9/2019
HF (White) Horn	18-26.5GHz	801-WLM	Waveline	758	758	III	Verify before Use	date of test
Meteorological Meters/Chambers		**MN**	**Mfr**	**SN**	**Asset**	**Cat**	**Calibration Due**	**Calibrated on**
Weather Clock (Pressure Only)		BA928	Oregon Scientific	C3166-1	831	I	5/15/2020	5/15/2018
Asset #2658		1235C97	Control Company	181683808	2658	I	4/3/2020	4/3/2019
Asset #2659		1235C97	Control Company	181683830	2659	I	4/3/2020	4/3/2019
Cables	**Range**		**Mfr**			**Cat**	**Calibration Due**	**Calibrated on**
Asset #2456	9KHz-18GHz		MegaPhase			II	11/2/2020	11/2/2019
Asset #2466	9KHz-18GHz		MegaPhase			II	11/2/2020	11/2/2019
Asset #2467	9KHz-18GHz		MegaPhase			II	11/2/2020	11/2/2019
Asset #2585	9KHz-18GHz		Pasternack			II	10/27/2020	10/27/2019
Asset #2324	1-26.5GHz	TM26-S1S1-120	MEGAPHASE	17139101 001	2324	II	7/24/2020	7/24/2019

All equipment is calibrated using standards traceable to NIST or other nationally recognized calibration standard.

Test Equipment Used

AC Line Conducted Emissions

LIMITS

Frequency of emission (MHz)	Quasi-peak limit (dBµV)	Average limit (dBµV)
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

[47 CFR 15.207(a)]

MEASUREMENTS / RESULTS

Bureau Veritas Consumer Product Services Inc.
Conducted Emissions per CISPR 16-2-1
Peak Detector Data
Notes:
EUT Line tested: 120VAC/60Hz; Line Phase
EUT Mode of Operation: Set at Mid channel

Work Order # - U0026
EUT Power Input - 120VAC/60 Hz
Test Site - CEMI-3
Conditions: - 23°C; 23%RH;997 mBar
Test Engineer - LN
0

Data Taken at 04:26:37 PM, Tuesday, January 28, 2020

Frequency (MHz)	Raw Pk Reading (dBµV)	Correction Factor (dB)	Adjusted Pk Amplitude (dBµV)	QP Lim: Mains_FCC&CISPR_QP_Class_B (dBµV)	Margin to the QP Limit (dB)	Pk to QP Limit Results (Pass/Fail)	Worst Margin (QP Limit) (dB)
0.167	24.7	20.2	44.9	65.1	-20.2	PASS	-20.2
0.196	19.6	20.3	39.9	63.8	-23.9	PASS	
0.249	16.3	20.3	36.6	61.8	-25.2	PASS	
0.278	15.5	20.2	35.7	60.9	-25.1	PASS	
0.31	14.4	20.3	34.6	60	-25.3	PASS	
0.439	11.6	20.2	31.9	57.1	-25.2	PASS	

Bureau Veritas Consumer Product Services Inc.
Conducted Emissions per CISPR 16-2-1, CISPR Average Detector
Quick Average Detector Data
Notes:
EUT Line tested: VAC/Hz; Line Phase
EUT Mode of Operation: Mid CH

Work Order # - U0026
EUT Power Input - 120VAC/60 Hz
Test Site - CEMI-3
Conditions: - 23°C; 23%RH;997 mBar
Test Engineer - LN
0

Data Taken at 04:26:37 PM, Tuesday, January 28, 2020

Frequency (MHz)	Raw Avg Reading (dBµV)	Correction Factor (dB)	Adjusted Avg Amplitude (dBµV)	Av Lim: Mains_FCC&CISPR_Avg_Class_B (dBµV)	Avg Margin (dB)	Avg Results (Pass/Fail)	Worst Avg Margin (dB)
0.168	15.6	20.2	35.8	55.1	-19.2	PASS	-19.2
0.204	12.7	20.4	33.1	53.5	-20.4	PASS	
0.265	7	20.3	27.2	51.3	-24.1	PASS	
26.701	4.2	23.3	27.6	50	-22.4	PASS	
26.731	3.2	23.3	26.5	50	-23.5	PASS	
26.777	2.6	23.3	25.9	50	-24.1	PASS	

Bureau Veritas Consumer Product Services Inc.
Conducted Emissions per CISPR 16-2-1
Peak Detector Data
Notes:
EUT Line tested: 120VAC/60Hz; Neutral Phase
EUT Mode of Operation: DC

Work Order # - U0026
EUT Power Input - 120VAC/ 60Hz
Test Site - CEMI-3
Conditions: - 23°C; 23%RH; 997mBar
Test Engineer - LN & AV
0

Data Taken at 04:11:41 PM, Tuesday, January 28, 2020

Frequency (MHz)	Raw Pk Reading (dBµV)	Correction Factor (dB)	Adjusted Pk Amplitude (dBµV)	QP Lim: Mains_FCC&CISPR_QP_Class_B (dBµV)	Margin to the QP Limit (dB)	Pk to QP Limit Results (Pass/Fail)	Worst Margin (QP Limit) (dB)
0.16	41.9	20.2	62.1	65.4	-3.3	PASS	-3.3
0.209	38.1	20.3	58.4	63.2	-4.8	PASS	
0.263	35.6	20.2	55.8	61.3	-5.5	PASS	
0.332	30.6	20.2	50.8	59.4	-8.6	PASS	
0.363	28	20.2	48.2	58.6	-10.5	PASS	
0.419	25.2	20.2	45.3	57.5	-12.1	PASS	

Bureau Veritas Consumer Product Services Inc.
Conducted Emissions per CISPR 16-2-1, CISPR Average Detector
Final Average Detector Data
Notes:
EUT Line tested: 120VAC/60Hz; Neutral Phase
EUT Mode of Operation: Set at Mid channel

Work Order # - U0026
EUT Power Input - 120VAC/ 60Hz
Test Site - CEMI-3
Conditions: - 23°C; 23%RH; 997mBar
Test Engineer - LN & AV
0

Data Taken at 04:11:41 PM, Tuesday, January 28, 2020

Frequency (MHz)	Raw Avg Reading (dBµV)	Correction Factor (dB)	Adjusted Avg Amplitude (dBµV)	Av Lim: Mains_FCC&CISPR_Avg_Class_B (dBµV)	Avg Margin (dB)	Avg Results (Pass/Fail)	Worst Avg Margin (dB)
0.157	15	20.2	35.2	55.6	-20.4	PASS	
0.158	15	20.2	35.2	55.6	-20.3	PASS	
0.159	15	20.2	35.2	55.5	-20.3	PASS	
0.166	15.1	20.2	35.2	55.2	-19.9	PASS	
0.208	14.6	20.3	34.9	53.3	-18.4	PASS	-18.4
0.246	11.9	20.3	32.1	51.9	-19.8	PASS	

Rev. 1/21/2020

Spectrum Analyzers / Receivers /Preselectors	Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
Rental EXA Signal Analyzer(1118472)	9KHz-26.5GHz	N9010A-526;K	AT	MY51170010	1118472	I	9/25/2020	9/25/2019
LISNs/Measurement Probes	**Range**	**MN**	**Mfr**	**SN**	**Asset**	**Cat**	**Calibration Due**	**Calibrated on**
LISN Asset 1728	150kHz-30MHz	LI-150A	Com-Power	201084	1728	I	5/29/2020	5/29/2019
LISN Asset 1729	150kHz-30MHz	LI-150A	Com-Power	201085	1729	I	5/29/2020	5/29/2019
Conducted Test Sites (Mains / Telco)	**FCC Code**		**VCCI Code**			**Cat**	**Calibration Due**	**Calibrated on**
CEMI 3	719150		A-0015			III	NA	N/A
Meteorological Meters/Chambers		**MN**	**Mfr**	**SN**	**Asset**	**Cat**	**Calibration Due**	**Calibrated on**
Weather Clock (Pressure Only)		BA928	Oregon Scientific	C3166-1	831	I	5/15/2020	5/15/2018
Cables	**Range**		**Mfr**			**Cat**	**Calibration Due**	**Calibrated on**
CEMI-11	9kHz - 2GHz		C-S			II	4/10/2020	4/10/2019
Attenuators	**Range**	**MN**	**Mfr**	**SN**	**Asset**	**Cat**	**Calibration Due**	**Calibrated on**
20dB Attenuator-64	9kHz-2GHz			N/A		II	11/24/2020	11/24/2019

All equipment is calibrated using standards traceable to NIST or other nationally recognized calibration standard.

Test Equipment Used

Measurement Uncertainty

The listed uncertainties are the worst case uncertainty for the entire range of measurement. Please note that the uncertainty values are provided for informational purposes only and are not used in determining the PASS/FAIL results.

Measurement	Expanded Uncertainty k=2	Maximum allowable uncertainty
Radiated Emissions (30-1000MHz) NIST CISPR	 5.6dB 4.6dB	 N/A 5.2dB (Ucispr)
Radiated Emissions (1-26.5GHz)	4.6dB	N/A
Radiated Emissions (above 26.5GHz)	4.9dB	N/A
Magnetic Radiated Emissions	5.6dB	N/A
Conducted Emissions NIST CISPR	 3.9dB 3.6dB	 N/A 3.6dB (Ucispr)
Telco Conducted Emissions (Current)	2.9dB	N/A
Telco Conducted Emissions (Voltage)	4.4dB	N/A
Electrostatic Discharge	11.5%	N/A
Radiated RF Immunity (Uniform Field)	1.6dB	N/A
Electrical Fast Transients	23.1%	N/A
Surge	23.1%	N/A
Conducted RF Immunity	3dB	N/A
Magnetic Immunity	12.8%	N/A
Dips and Interrupts	2.3V	N/A
Harmonics	3.5%	N/A
Flicker	3.5%	N/A
Radio frequency (@ 2.4GHz)	3.23×10^{-8}	1×10^{-7}
RF power, conducted	0.40dB	0.75dB
Maximum frequency deviation: • Within 300Hz and 6kHz of audio frequency / Within 6kHz and 25kHz of audio frequency	 3.4% 0.3dB	 5% 3dB
Adjacent channel power	1.9dB	3dB
Conducted spurious emission of transmitter, valid up to 12.75GHz	2.39dB	3dB
Conducted emission of receivers	1.3dB	3dB
Radiated emission of transmitter, valid up to 26.5GHz	3.9dB	6dB
Radiated emission of transmitter, valid up to 80GHz	3.3dB	6dB
Radiated emission of receiver, valid up to 26.5GHz	3.9dB	6dB
Radiated emission of receiver, valid up to 80GHz	3.3dB	6dB
Humidity	2.37%	5%
Temperature	0.7°C	1.0°C
Time	4.1%	10%
RF Power Density, Conducted	0.4dB	3dB
DC and low frequency voltages	1.3%	3%
Voltage (AC, <10kHz)	1.3%	2%
Voltage (DC)	0.62%	1%
The above reflects a 95% confidence level		

Conditions of Testing

[Bureau Veritas Consumer Products Services, Inc., a Massachusetts corporation], and/or its affiliates (collectively, the "Company") will conduct, at the request of the Submitter ("Client"), the tests specified on the submitted Test Request Form or equivalent in accordance with, and subject to, the following terms and conditions (collectively, "Conditions"):

1. All orders for tests are subject to acceptance by the Company, and no order will constitute a binding commitment of the Company unless and until such order is accepted by it, as evidenced by the issuance of a written report ("Test Report") by the Company. The Test Report is issued solely by the Company, is intended for the exclusive use of Client and shall not be published, used for advertising purposes, copied or replicated for distribution to any other person or entity or otherwise publicly disclosed without the prior written consent of the Company. By submitting a request for services to the Company, Client consents to the disclosure to accreditation bodies of those records of Client relevant to the accreditation body's assessment of the Company's competence and compliance with relevant accreditation criteria. The Company shall not be liable for any loss or damage whatsoever resulting from the failure of the Company to provide its services within any time period for completion estimated by the Company. If Client anticipates using the Test Report in any legal proceeding, arbitration, dispute resolution forum or other proceeding, it shall so notify the Company prior to submitting the Test Report in such proceeding. The Company has no obligation to provide a fact or expert witness at such proceeding unless the Company agrees in advance to do so for a separate and additional fee.
2. The Test Report will set forth the findings of the Company solely with respect to the test samples identified therein. Unless specifically and expressly indicated in the Test Report, the results set forth in such Test Report are not intended to be indicative or representative of the quality or characteristics of the lot from which a test sample is taken, and Client shall not rely upon the Test Report as being so indicative or representative of the lot or of the tested product in general. The Test Report will reflect the findings of the Company at the time of testing only, and the Company shall have no obligation to update the Test Report after its issuance. The Test Report will set forth the results of the tests performed by the Company based upon the written information provided to the Company. The Test Report will be based solely on the samples and written information submitted to the Company by Client, and the Company shall not be obligated to conduct any independent investigation or inquiry with respect thereto.
3. The Company may, in its sole discretion, destroy samples which have been furnished to the Company for testing and which have not been destroyed in the course of testing. The Company may delegate the performance of all or a portion of the services contemplated hereunder to an affiliate, agent or subcontractor of the Company, and Client consents to such delegation.
4. These Conditions and the Test Report represent the entire understanding of the parties hereto with respect to the subject matter hereof and of the Test Report, and no modification, variance or extrapolation with respect thereto shall be permitted without the prior written consent of the Company.
5. The names, service marks, trademarks and copyrights of the Company and its affiliates, including the names "BUREAU VERITAS," "BUREAU VERITAS CONSUMER PRODUCTS SERVICES," "BVCPS", "MTL", "ACTS", "MTL-ACTS" and CURTIS-STRAUS (collectively, the "Marks") are and shall remain the sole property of the Company or its affiliates and shall not be used by Client except solely to the extent that Client obtains the prior written approval of the Company and then only in the manner prescribed by the Company. Client shall not contest the validity of the Marks or take any action that might impair the value or goodwill associated with the Marks or the image or reputation of the Company or its affiliates.
6. Payment in full shall be due 30 days after the date of invoice. Interest shall be due on overdue amounts from the due date until paid at an interest rate of 1.5% per month or, if less, the maximum rate permitted by law. The Company reserves the right, at any time and from time to time, to revoke any credit extended to Client. Client shall reimburse the Company for any costs it incurs in collecting past due amounts, including court costs and fees and expenses of attorneys and collection agencies. The Test Report may not be used or relied upon by Client if and for so long as Client fails to pay when due any invoice issued by the Company or any affiliate of it to Client or any affiliate or subsidiary of Client together with interest and penalties, if any, accrued thereon.
7. The Company disclaims any and all responsibility or liability arising out of or in connection with e-mail transmissions of such information.
8. Client understands and agrees that the Company is neither an insurer nor a guarantor, that the Company does not take the place of Client or any designer, manufacturer, agent, buyer, distributor or transportation or shipping company, and that the Company disclaims all liability in such capacities. Client further understands that if it seeks assurance against loss or damage, it should obtain appropriate insurance.
9. Client agrees that the Company, by providing the services, does not take the place of Client nor any third party, nor does the Company release them from any of their obligations, nor does the Company otherwise assume, abridge, abrogate or undertake to discharge any duty of any third party to Client or any duty of Client or any third party to any other third party, and Client will not release any third party from its obligations and duties with respect to the tested goods.
10. Client shall, on a timely basis, (a) provide adequate instructions to the Company in order to enable the Company to perform properly its services, (b) provide, or cause Client's suppliers and contractors to provide, the Company with all documents necessary to enable the Company to perform its services, (c) furnish the Company with all relevant information regarding Client's intended use and purposes of the tested goods, (d) advise the Company of essential dates and deadlines relevant to the tested goods and (e) fully exercise all rights and remedies available to Client against third parties in respect of the tested goods.
11. The Company shall undertake due care and ordinary skill in the performance of its services to Client, and the Company shall accept responsibility only were such skill has not been exercised and, even in such event, only to the extent of the limitation of liability set forth herein.
12. If Client desires to assert a claim arising from or relating to (i) the performance, purported performance or non-performance of any services by the Company or (ii) the sale, resale, manufacture, distribution or use of any tested goods, it must submit that claim to the Company in a writing that sets forth with particularity the basis for such claim within 60 days from discovery of the potential claim and not more than six months after the date of issuance of the Test Report to Client. Client waives any and all such claims including, without limitation, claims that the Test Report is inaccurate, incomplete or misleading or that additional or

different testing is required, unless and then only to the extent that Client submits a written claim to the Company within both such time periods.

13. CLIENT SHALL, EXCEPT TO THE EXTENT OF COMPANY'S LIABILITY TO CLIENT HEREUNDER (WHICH IN NO EVENT SHALL EXCEED THE LIMITATION OF LIABILITY HEREIN), HOLD HARMLESS AND INDEMNIFY THE COMPANY, ITS AFFILIATES AND THEIR RESPECTIVE DIRECTORS, OFFICERS, EMPLOYEES, AGENTS AND SUBCONTRACTORS AGAINST ALL ACTUAL OR ALLEGED THIRD PARTY CLAIMS FOR LOSS, DAMAGE OR EXPENSE OF WHATSOEVER NATURE AND HOWSOEVER ARISING FROM OR RELATING TO (i) THE PERFORMANCE, PURPORTED PERFORMANCE OR NON-PERFORMANCE OF ANY SERVICES BY THE COMPANY OR (ii) THE SALE, RESALE, MANUFACTURE, DISTRIBUTION OR USE OF ANY TESTED GOODS.

14. EXCEPT AS MAY OTHERWISE BE EXPRESSLY AGREED TO IN WRITING BY THE COMPANY AND NOTWITHSTANDING ANY PROVISION TO THE CONTRARY CONTAINED HEREIN OR IN ANY TEST REPORT, NO WARRANTY OR GUARANTEE, EXPRESS OR IMPLIED, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR USE, IS MADE.

15. (A) IN NO EVENT WHATSOEVER SHALL THE COMPANY BE LIABLE FOR ANY CONSEQUENTIAL, SPECIAL, INCIDENTAL, EXEMPLARY OR PUNITIVE DAMAGES IN CONNECTION WITH, RELATING TO OR ARISING OUT OF THE TEST REPORT OR THE SERVICES PROVIDED BY THE COMPANY HEREUNDER, INCLUDING WITHOUT LIMITATION LOSS OF OR DAMAGE TO PROPERTY; LOSS OF INCOME, PROFIT OR USE; OR ANY CLAIMS OR DEMANDS MADE AGAINST CLIENT OR ANY OTHER PERSON BY ANY THIRD PARTY IN CONNECTION WITH, RELATING TO OR ARISING OUT OF THE SERVICES PROVIDED BY THE COMPANY HEREUNDER.

(B)NOTWITHSTANDING ANY PROVISION TO THE CONTRARY CONTAINED HEREIN, AND IN RECOGNITION OF THE RELATIVE RISKS AND BENEFITS TO CLIENT AND THE COMPANY ASSOCIATED WITH THE TESTING SERVICES CONTEMPLATED HEREBY, THE RISKS HAVE BEEN ALLOCATED SUCH THAT UNDER NO CIRCUMSTANCES WHATSOEVER SHALL THE LIABILITY OF THE COMPANY TO CLIENT OR ANY THIRD PARTY IN RESPECT OF ANY CLAIM FOR LOSS, DAMAGE OR EXPENSE, OF WHATSOEVER NATURE OR MAGNITUDE, AND HOWSOEVER ARISING, EXCEED AN AMOUNT EQUAL TO FIVE (5) TIMES THE AMOUNT OF THE FEES PAID TO THE COMPANY FOR THE SPECIFIC SERVICES WHICH GAVE RISE TO SUCH CLAIM OR U.S.$10,000, WHICHEVER IS THE LESSER AMOUNT.

16. The Company shall not be liable for any loss or damage resulting from any delay or failure in performance of its obligations hereunder resulting directly or indirectly from any event of force majeure or any event outside the control of the Company. If any such event occurs, the Company may immediately cancel or suspend its performance hereunder without incurring any liability whatsoever to Client.

Company's services, including these Conditions, shall be governed by, and construed in accordance with, the local laws of the country where the Company performs the tests or, in the case of tests performed in the United States of America, the laws of Massachusetts without regard to conflicts of laws principles. If any aspect(s) of these Conditions is found to be illegal or unenforceable, the validity, legality and enforceability of all remaining aspects of these Conditions shall not in any way be affected or impaired thereby. Any proceeding related to the subject matter hereof shall be brought, if at all, in the courts of the country where the Company performs the tests or, in the case of tests performed in the United States of America, in the courts of Massachusetts. Client waives the right to interpose any counterclaim or setoffs of any nature in any litigation arising hereunder.

The complete list of the Approved Subcontractors Bureau Veritas Consumer Products Services Inc. may use to delegate the performance of work can be provided upon request.