INTENTIONAL RADIATOR TEST REPORT

Report Reference Number:	E11183-2001_picoTera_Metis (Rev 1.4)_**Rev-1.0**
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Laboratory Accreditations (per ISO/IEC 17025:2017)

ACCREDITED
CERT #3657.02

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Manufacturer:	**picoTera Electronics Inc.**
Address:	1606-3438 Vanness Ave. Vancouver, BC, V5R 6E7 Canada
Equipment Tested:	**Metis Rev 1.4**
Model Number/HVIN:	METISR14
FCC ID:	2AX2Z-METISR14
ISED ID:	26696-METISR14

REVISION HISTORY

Date	Report Number	Details	Author's Initials
December 2, 2020	E11183-2001_picoTera_Metis (Rev 1.4)_**Rev-1.0**	Final	RS
November 9, 2020	E11183-2001_picoTera_Metis (Rev 1.4)_**Rev-0.0**	Draft	RS
All previous versions of this report have been superseded by the latest dated revision as listed in the above table. Please dispose of all previous electronic and paper printed revisions accordingly.			

REPORT AUTHORIZATION

The data documented in this report is for the test equipment provided by the manufacturer. The tests were conducted on the sample equipment as requested by the manufacturer for the purpose of demonstrating compliance with the standards outlined in Section I of this report as agreed upon by the Manufacturer under the quote 20SH08211R2.

The Manufacturer is responsible for the tested product configurations, continued product compliance, and for the appropriate auditing of subsequent products as required.

This report may comprise a partial list of tests that are required for CE, FCC and ISED Declaration of Conformity can only be produced by the manufacturer. This is to certify that the following report is true and correct to the best of our knowledge.

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QAI EMC ACCREDITATION

QAI EMC is your one-stop regulatory compliance partner for electromagnetic compatibility (EMC) and electromagnetic interference (EMI). Products are tested to the latest and applicable EMC/EMI requirements for domestic and international markets. QAI EMC goes above and beyond being a testing facility—we are your regulatory compliance partner. QAI EMC has the capability to perform RF Emissions and Immunity for all types of electronics manufacturing including Industrial, Scientific, Medical, Information Technology, Telecom, Wireless, Automotive, Marine and Avionics.

EMC Laboratory Location	FCC Designation (3m SAC)	IC Registration (3m SAC)	A2LA Certificate
Burnaby, BC, Canada	CA9543	9543A	3657.02

EMC Facility Burnaby BC, Canada

TABLE OF CONTENTS

Section I: GENERAL INFORMATION

1.1 Product Description

The information provided in this section is for the Equipment Under Test (EUT) and the corresponding Auxiliary Equipment needed to perform the tests as a complete system.

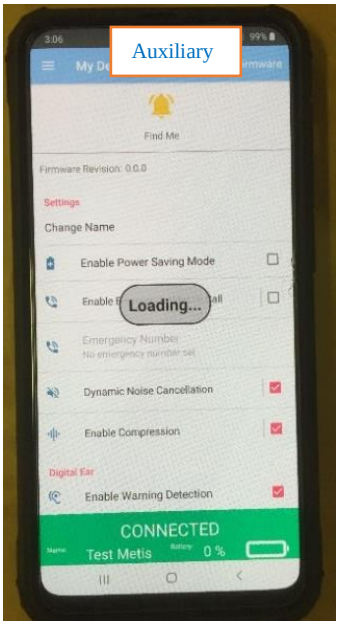


Table 1: Equipment Under Test (EUT)

EUT	**Metis Rev 1.4**
FCC ID	2AX2Z-METISR14
IC Number	26696-METISR14
Manufacturer	picoTera Electronics Inc
Model No./HVIN	METISR14
PMN	Smart Earplug Companion
FVIN	F16
Device Type	DTS; BLE
Frequency Range	BLE: 2402 - 2480 MHz
Antenna Type	Integrated
Antenna Gain	-10 dBi

Table 2: Technical Specifications

HARDWARE	Dimensions	6 cm x 6 cm x 3 cm
	Weight	56 gm
	USB Charger	100-240 VAC
	Power Consumption	< 0.2 W
ENVIRONMENTAL	Temperature	Operating: -40 to +55°C
		Storage: -40 to +55°C
	Humidity	5−95% non-condensing

1.2 Environmental Conditions

The equipment under test was operated and tested under the following environmental conditions:

Parameter	Conditions
Location	Indoors
Temperature	21ºC
Relative Humidity	48.9 %
Atmospheric Pressure	101.2 kPa

1.3 Measurement Uncertainty

Parameter	Uncertainty
Radiated Emissions, 30MHz-1GHz	± 2.40 dB
Radiated Emissions, 1GHz-40GHz	± 2.48 dB
Conducted Emissions, 0.15MHz-30MHz	± 2.82 dB
Radio Frequency	±1.5 x 10-5 MHz
Total RF Power Conducted	±1.36 dB
Spurious Emissions, Conducted	±1.36 dB
RF Power Density, Conducted	±1.36 dB
Temperature	±1ºC
Humidity	±5 %
DC and low frequency voltages	±3 %

1.4 Worst Test Case

Worst-case orientation was determined during the preliminary testing.
The final radiated emissions were performed in the worst-case orientation.

1.5 Sample Calculations of Emissions Data

Radiated and conducted emissions were performed using EMC32 software developed by Rohdes & Schwarz. Transducer factors like Antenna factors, Cable Losses and Amplifier gains were stored in the test templates which are used to perform the emissions measurements. After test is finished, data is generated from the EMC32 consisting of product details, emission plots and final data tables as shown below.

Frequency (MHz)	Q-Peak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Ant. Ht. (cm)	Pol	Turntable Position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
42.663900	33.0	1000.000	120.000	100.0	H	70.0	13.2	7.5	40.5

Quasi-Peak reading shown in the table above is already corrected by the software using correction factor shown in column "Corr." The correction factor listed under "Corr." table calculated as:

Corr.(dB) = Antenna factor + Cable loss

Or

Corr.(dB) = Antenna factor + Cable Loss - Amp gain (if pre-amplifier was used)

The final Quasi peak reading shown in the data is calculated by the software using following equation:

Corrected Quasi-Peak (dBµV/m) = Raw Quasi-Peak Reading + Antenna factor + Cable loss

To obtain the final Quasi-Peak or Average reading during power line conducted emissions, transducer factors are included in the final measurement as shown below.

Frequency (MHz)	Q-Peak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150	44.3	1000.000	9.000	GND	0.6	21.7	66.0

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150	27.2	1000.000	9.000	GND	0.6	28.8	56.0

Quasi Peak or Average reading shown in above table is already corrected by the software using the correction factor shown in column "Corr." The correction factor listed under "Corr." table calculated as:

Corr.(dB) = Antenna factor + Cable loss

The final Quasi-peak or Average reading shown in the data is calculated by the software using following equation:

Corr. Quasi-Peak/Average Reading (dBµV) = Raw Quasi-Peak/Average Reading + Antenna factor + Cable loss

The allowable margin from the limits, as per the standards, were calculated for both radiated and conducted emissions:

Margin(dB) = Limit – Quasi-Peak or Average reading

1.6 Test Equipment List

The tables below contain all the equipment used by QAI Laboratories in conducting all tests on the Equipment Under Test (EUT) as per Section 1.

Table 3: Emissions Test Equipment

Sl. NO.	Manufacturer	Model	Description	Serial No.	S/W Version	Calibration Due Date
1	AH Systems	PAM118	Amplifier (10KHz-18GHz)	189	N/A	Conditional Use
2	TTi	HA1600A	Power Analyzer; Harm/Flicker	318801	N/A	2021-Oct-01
3	TTi	AC1000A	Power Supply, Low Distortion	317113	N/A	2021-Oct-01
4	EMCO	3825/2	LISN (150kHz-30MHz)	9002-1601	N/A	2023-Oct-01
5	Sunol Sciences	DRH-118	Horn Antenna, 1.0-18 GHz	A050905	N/A	2023-07-28
6	ETS Lindgren	2165	Turntable	00043677	N/A	N/A
7	ETS Lindgren	2125	Mast	00077487	N/A	N/A
8	ETS Lindgren	S201	5-meter Semi-Anechoic Chamber	1030	N/A	N/A
9	Hewlett Packard	8449B	Preamplifier (1-26 GHz)	2933A00198	N/A	2022-Jan-22
10	Rohde & Schwarz	ESU40	EMI Receiver	100011	EMC32 v10.35.10/ FV 4.73 SP4	2023-Jul-05
11	Rohde & Schwarz	ESCI	EMI Receiver	100123	EMC32 v10.01.00/ FV 4.42 SP3	2021-Mar-26
12	Sunol Sciences	SM46C	Turntable	051204-2	N/A	N/A
13	Sunol Sciences	TWR95	Mast	TREML0001	N/A	N/A
14	Sunol Sciences	JB3	Biconilog Antenna 30MHz – 3GHz	A120106	N/A	2022-May-10
15	Sunol Sciences	JB3	Biconilog Antenna 30MHz – 3GHz	A042004	N/A	2023-Jul-30

Table 4: Measurement Software List

Sl. No.	Manufacturer	Model	Version	Description
1	Rhode & Schwarz	EMC 32	10.35.10	Emissions Test Software
2	TESEQ	WIN 3000	1.2.0	Surge, EFT & Voltage Dips Immunity Test Program
3	Thurlby Thandar Instruments	HA-PC Link Version	2.02	Harmonics and Flicker Test Program
4	VI Automation	Via EMC Immunity Executive	1.0.308	Radiated and Conducted Immunity Test Program

Note: Equipment listed above have 3 years calibration interval.

Section II: EXECUTIVE SUMMARY OF STANDARDS AND LIMITS

2.1 Purpose

The purpose of this report is to demonstrate and document the compliance of "**Metis Rev 1.4**" as per Sections 1.2 & 1.3 of this report.

2.2 Scope

The information documented in this report is based on the test methods and levels as per Quote 20SH08211R2.

FCC Title 47 Part 15 Subpart C	–15.247 Operation within the bands 902-928 MHz, 2400-2483.5 MHz. and 5725-5850 MHz.
CFR Title 47 FCC Part 15	–Radio Frequency Devices, Subpart B – Unintentional Radiators.
RSS-247 Issue 2	– Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and License-Exempt Local Area Network (LE-LAN) Devices.
RSS-Gen Issue 5	– General Requirements and Information for the Certification of Radio Apparatus.
ICES-003 Issue 6	– Information Technology Equipment (Including Digital Apparatus). – Limits and Methods of Measurement.

2.3 Summary of Results

The following tests demonstrate the testimony to "FCC and ISED" Mark Electromagnetic compatibility testing for "WP5 Wireless Platform 5" manufactured by JSF Technologies Inc.

Table 5: Summary and Result of Applicable Standards

Test or Measurement	Applicable FCC and IC Standard	Result
Antenna Requirement	FCC Title 47 Part 15 Subpart C § 15.203 RSS-Gen Issue 5 Section 7.1.2	Pass
RF Peak Power Output	FCC Title 47 Part 15 Subpart C § 15.247 RSS-Gen Issue 2:	Pass
Power Spectral Density (PSD)		Pass
Out of Band Emissions (Band Edge)		Pass
6dB Bandwidth	FCC Title 47 Part 15 Subpart C § 15.247 RSS-247 Issue 2 RSS-Gen Issue 5	Pass
99% Occupied Bandwidth	RSS-247 Issue 2 RSS-Gen Issue 5	Pass
Radiated Spurious Emissions	FCC Title 47 Part 15 Subpart C § 15.205, § 15.209, § 15.247 RSS-247-Issue 2 RSS-Gen Issue 5	Pass
AC Mains Conducted Emissions	FCC Title 47 Part 15 Subpart B § 15.109 ICES-003 Issue 6	Pass

Note: The gain of the antenna is provided by the client to measure or calculate test results and is not measured by QAI.

Section III: DATA & TEST RESULTS

3.1 Antenna Requirements

- **Date Performed:**
  October 27, 2020

- **Test Standard:**
  As per Section 2.2 of this report

- **Required Limit:**
  As per Section 2.2 of this report

- **Modifications:**
  No modification was required to **comply** for this test.

- **Result:**
  An integrated antenna is used on this product and it is not field replaceable.
  The EUT **comply** with the applicable standard.

Applicable Regulation:

The purpose of this requirement is to make certain that no other antenna, except for that provided by the responsible party, shall be used with the Equipment-Under-Test (EUT) as defined in FCC CFR 47 Part 15.203 & RSS-Gen Issue 5:

> "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 the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited. "The installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded."

Note: The gain of the antenna is provided by the client to measure or calculate test results and is not measured by QAI.

3.2 RF Peak Power Output

- **Date Performed:**
  October 15, 2020

- **Test Standard:**
  As per Section 2.2 of this report

- **Required Limit:**
  As per Section 2.2 of this report

- **Test Method:**
  FCC KDB 558074 D01 DTS Meas Guidance v04

- **Modifications:**
  No modification was required to **comply** for this test.

- **Result:**
  The EUT **comply** with the applicable standard.

Test Requirement:

As per RS 102: Controlled use is the type of approval given to a device that is intended to be used by persons who are fully aware of, and can exercise control over, their exposure. Controlled use devices are typically installed in non-public areas and are not intended for use by members of the general public. Output power level shall be the higher of the maximum conducted or equivalent isotopically radiated power (e.i.r.p.) source-based, time-averaged output power. For controlled use devices where the 8 W/kg for 1 gram of tissue applies, the exemption limits for routine evaluation in Table 7 limit are multiplied by a factor of 5.

Measurement Data:

Table 6: RF Peak Power Output

	Carrier Frequency MHz	Channel	Peak dBµV	Corrected Peak (dBuV/m)	EIRP dBm	Limit dBm	Margin dB	Peak Conducted Output Power dBm	Ant. Gain dBi (1)	Ant. Pol.	Corr. Factor dB
BLE	2402	37	63.01	62.44	3.01	30	16.99	13.01	-10	H	35.8
		37	61.72	54.14	-5.29	30	25.29	4.71	-10	V	35.8
	2426	38	48.93	61.4	1.97	30	18.03	11.97	-10	H	35.8
		38	49.09	55.45	-3.98	30	23.98	6.02	-10	V	35.8
	2480	39	52.76	60.9	1.47	30	18.53	11.47	-10	H	35.8
		39	51.46	56.73	-2.7	30	22.7	7.3	-10	V	35.8

Note1: Antenna gain value is instructed by customer.

3.3 Power Spectral Density (PSD)

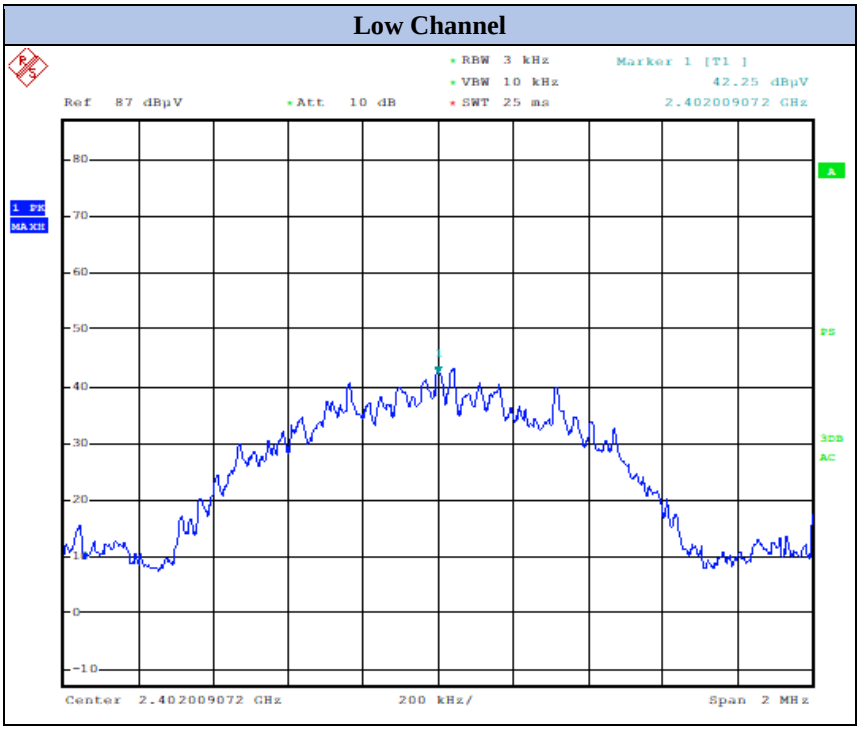
- **Date Performed:**
  October 27, 2020
- **Test Standard:**
  As per Section 2.2 of this report
- **Required Limit:**
  As per Section 2.2 of this report
- **Test Method:**
  FCC KDB 558074 D01 DTS Meas Guidance v05
- **Modifications:**
  No modification was required to **comply** for this test.
- **Result:**
  The EUT **comply** with the applicable standard.

Test Requirement:

The transmitter power spectral density conducted from the transmitter to the antenna shall not be greater than 8dBm in any 3kHz band during any time interval of continuous transmission. The power spectral density was determined using the same method as is used to determine the conducted output power).

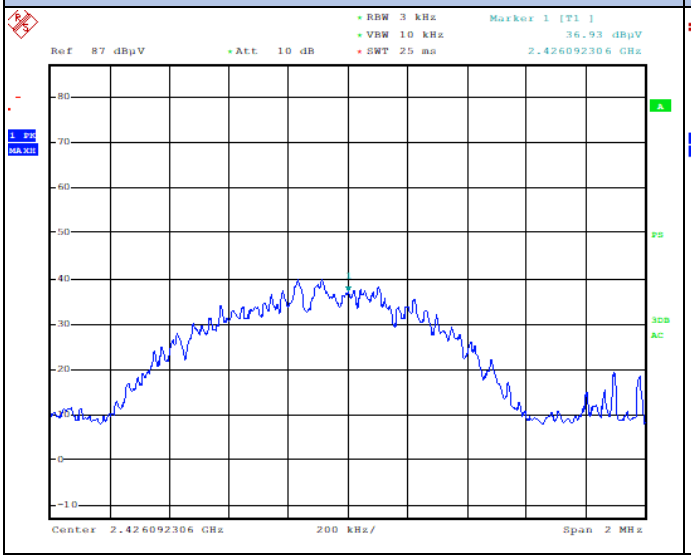
Measurement Data and Plot:

Low Channel

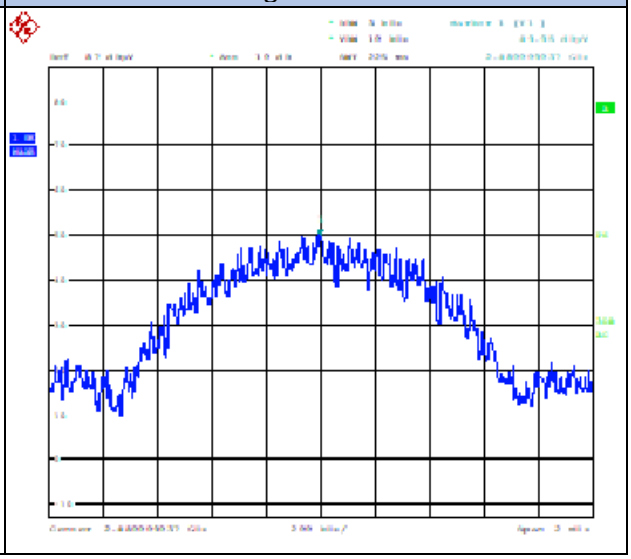


Plot 1: Power Spectral Density (PSD)–for reference only

Mid Channel



High Channel



Plot 2: Power Spectral Density (PSD)–for reference only

Table 7: Power Spectral Density (PSD

Channel	Frequency MHz	Corrected PSD dBV/m	PSD dBm	Limit dBm	Margin dB
Low	2402	78.05	-16.73	8	24.73
Mid	2426	72.73	-22.00	8	30.00
High	2480	85.75	-8.98	8	16.98

3.4 Out of Band Emissions (Band Edge)

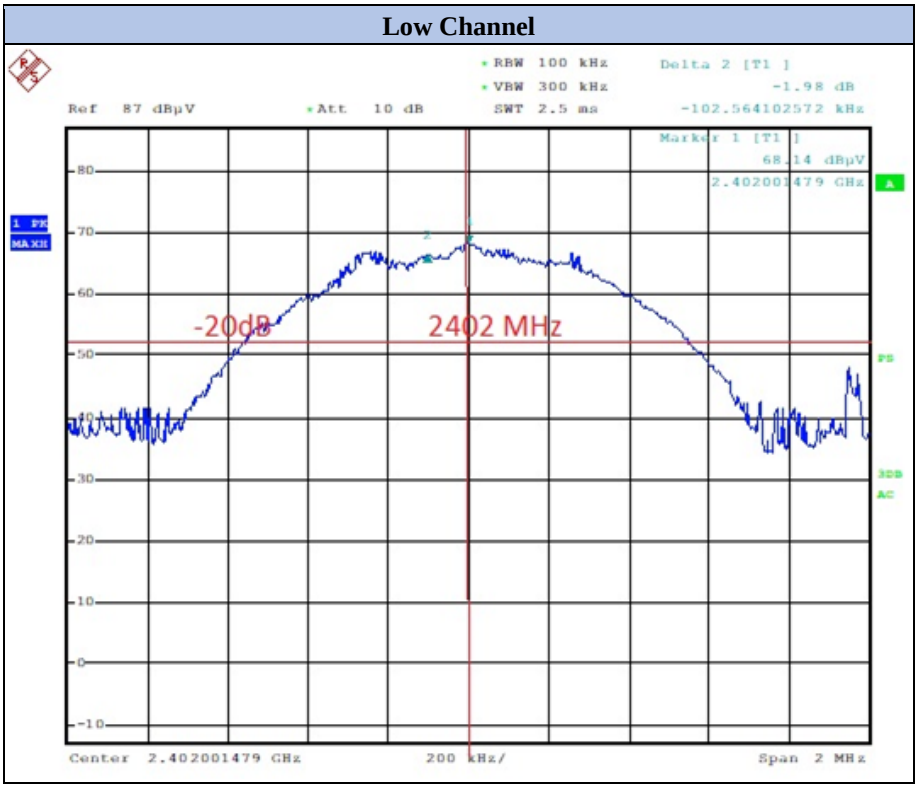
- **Date Performed:**
  October 16, 2020
- **Test Standard:**
  As per Section 2.2 of this report
- **Test Method:**
  ANSI C63.10:2013
- **Modifications:**
  No modification was required to **comply** for this test.
- **Result:**
  The EUT **comply** with the applicable standard.

Test Requirement:

In any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under Section A8.4 (4), the attenuation required shall be 30 dB instead of 20dB.

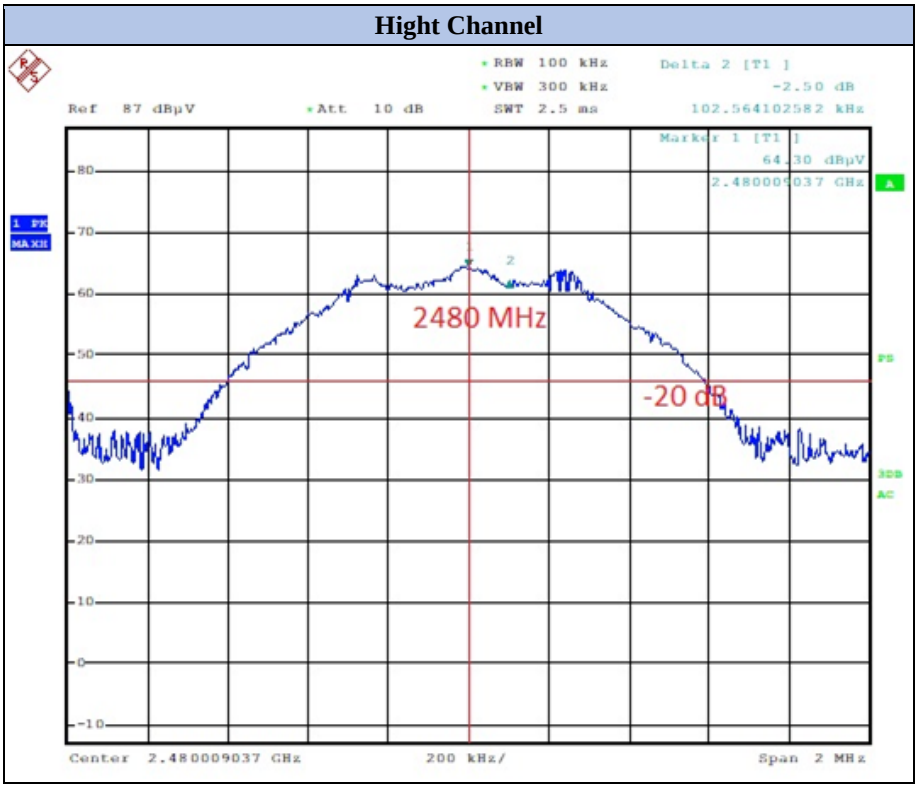
Measurement Data and Plot:

Low Channel



Plot 3: Band Edge at 2402 MHz

Hight Channel



Plot 4: Plot 5: Band Edge at 2480 MHz

3.5 6dB Bandwidth

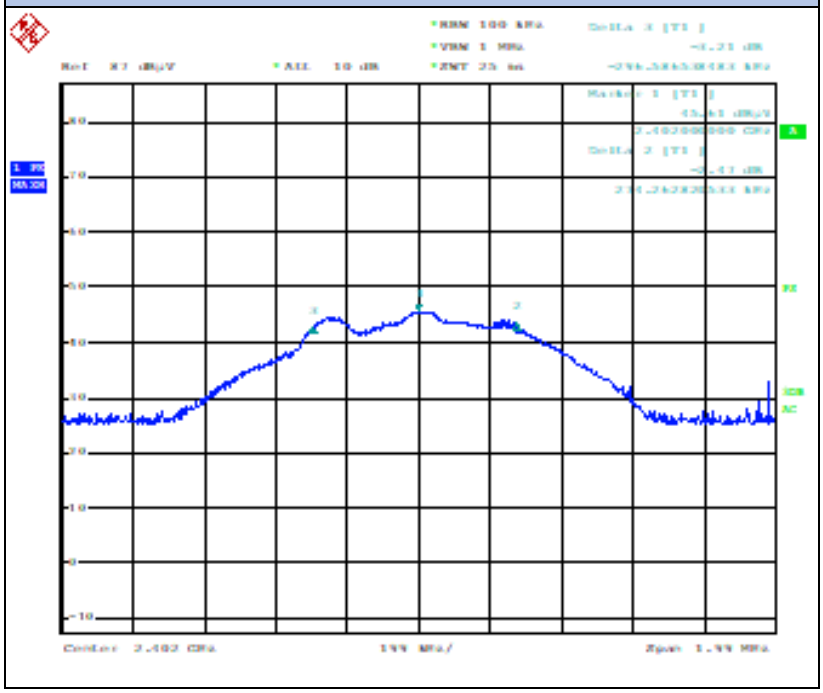
- **Date Performed:**
  October 27, 2020
- **Test Standard:**
  As per Section 2.2 of this report
- **Test Method:**
  ANSI C63.10:2013
- **Modifications:**
  No modification was required to **comply** for this test.
- **Result:**
  The EUT **comply** with the applicable standard.

Test Requirement: The value of 6 dB bandwidth is not specified in the above standards.

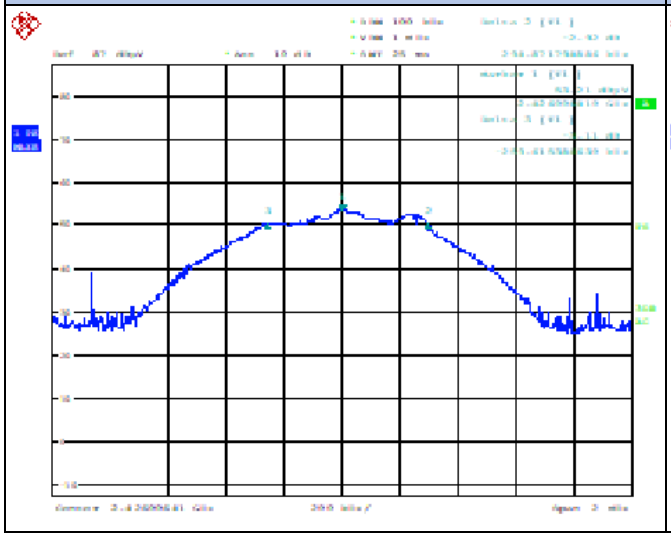
Measurement Data and Plot:

Note: BW=668.2kHz+712.9kHz=1,381.2kHz

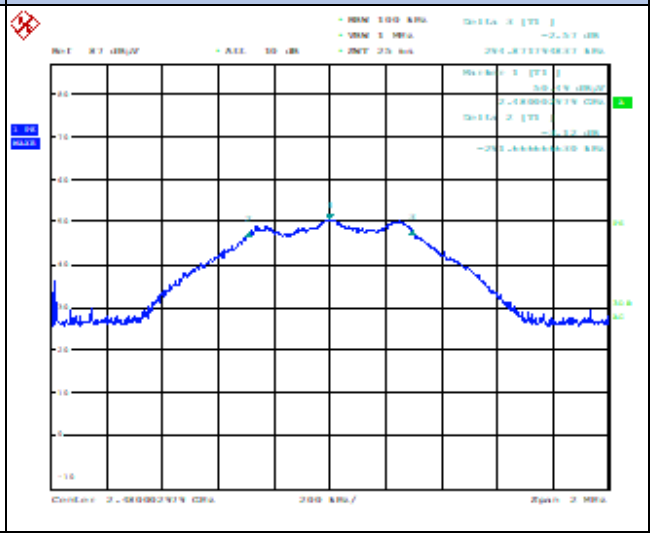
Low Channel



Mid Channel



High Channel



Plot 6: 6 dB Occupied Bandwidth

Table 8: Plot 7: 20 dB Occupied Bandwidth

Channel	Frequency MHz	Bandwidth kHz	Limit kHz	Result
Low	2402	570.8	500	Complies
Mid	2441	555.6	500	Complies
High	2480	546.1	500	Complies

3.6 99% Occupied Bandwidth

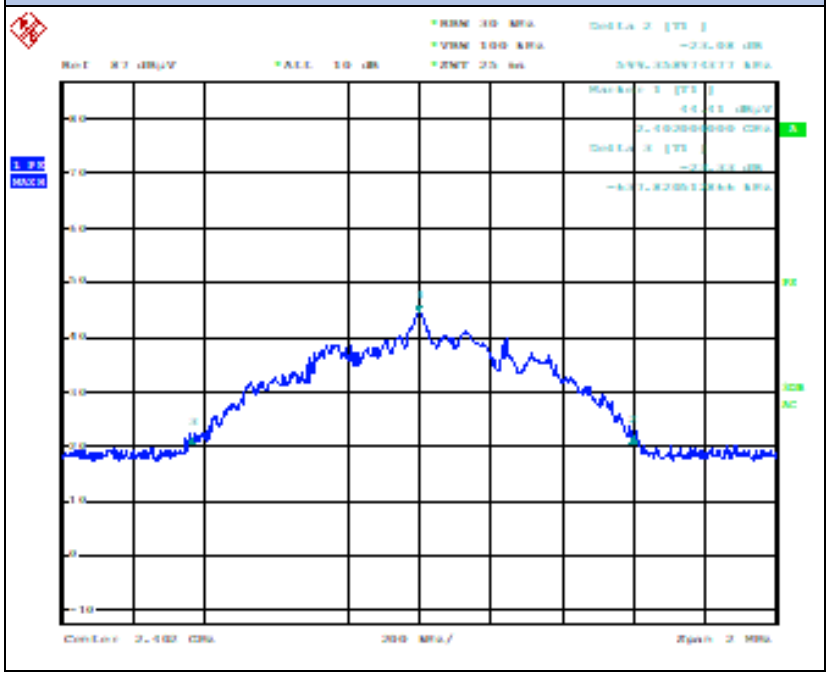
- **Date Performed:**
  October 27, 2020
- **Test Standard:**
  As per Section 2.2 of this report
- **Test Method:**
  As called in ANSI C63.10-2013.
- **Modifications:**
  No modification was required to **comply** for this test.
- **Result:**
  The EUT **comply** with the applicable standard.

Minimum Requirement:

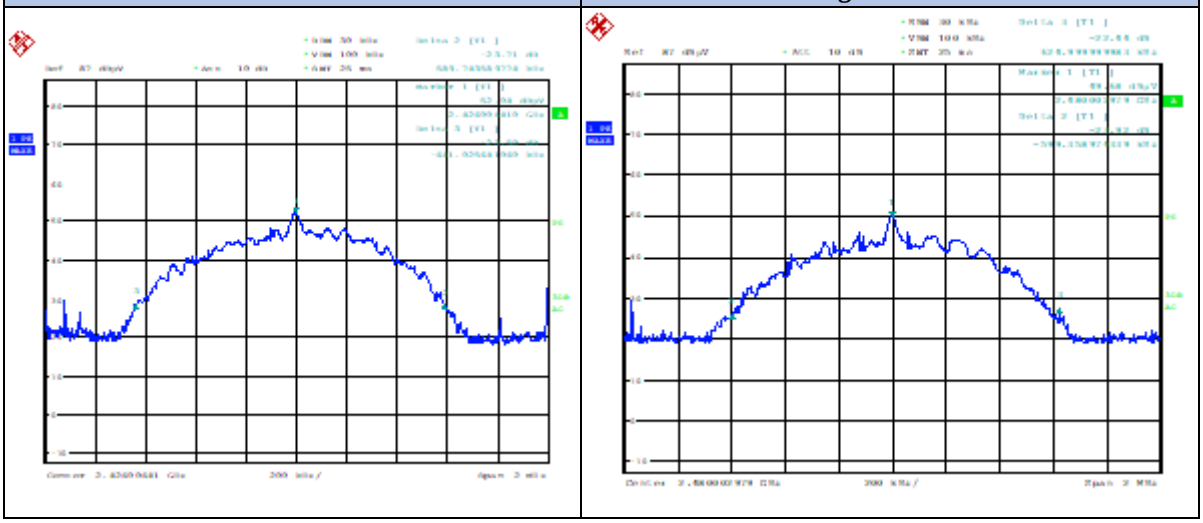
The Occupied Channel Bandwidth is the bandwidth that contains 99 % of the power of the signal.
The bandwidth shall fall completely within the frequency range specified by the standard.

Measurement Data and Plot:

Low Channel



Mid Channel | **High Channel**



Plot 8: 99% Occupied Bandwidth −for reference only

Table 9: 99% Occupied Bandwidth

Channel	Frequency MHz	Bandwidth kHz
Low	2402	1269
Mid	2441	1231
High	2480	1184

3.7 SAR Evaluation

- **Date Performed:**
  November 12, 2020
- **Test Standard:**
  As per Section 2.1 of this report
- **Required Limit:**
  As per Section 2.2 of this report
- **Test Method:**
  FCC KDB KDB 447489 and RS 102
- **Modifications:**
  No modification was required.
- **Result:**
  The EUT **comply** with the applicable standard.

Test Requirement:

4.2.3. Extremity exposure conditions: Devices that are designed or intended for use on extremities, or mainly operated in extremity only exposure conditions, i.e., hands, wrists, feet and ankles, may require extremity SAR evaluation.26 When the device also operates in close proximity to the user's body, SAR compliance for the body is also required. The 1-g body and 10-g extremity SAR Test Exclusion Thresholds in 4.3 should be applied to determine SAR test requirements.

4.3. General SAR test exclusion guidance: (a) For 100 MHz to 6 GHz and test separation distances ≤ 50 mm, the 1-g and 10-g SAR test exclusion thresholds are determined by the following:

(max. power of channel, including tune-up tolerance, mW) / (min. test separation distance, mm). [√f(GHz)] ≤ 3.0 for 1-g SAR, and ≤ 7.5 for 10-g extremity SAR,30 where f(GHz) is the RF channel transmit frequency in GHz.

Measurement Data:

Table 10: RF Peak Power Output – FCC limits

	Carrier Frequency MHz	Channel	Peak dBµV	Corrected Peak (dBuV/m)	EIRP dBm	Limit dBm	Margin dB	Peak Conducted Output Power dBm	Ant. Gain dBi (1)	Ant. Pol.	Corr. Factor dB
BLE	2402	37	63.01	62.44	3.01	13.95	See the note	13.01	-10	H	35.8

Note1: Antenna gain value is instructed by customer.
13.01 dBm=20 mW
20/5 x Sqr(2.48)= 6.3 >3

Table 11: RF Peak Power Output – ISED limits

	Carrier Frequency MHz	Channel	Peak dBµV	Corrected Peak (dBuV/m)	EIRP dBm	Limit dBm[0]	Margin dB	Peak Conducted Output Power dBm	Ant. Gain dBi [2]	Ant. Pol.	Corr. Factor dB
BLE	2402	37	63.01	62.44	3.01	10.41	-2.6	13.01	-10	H	35.8

Note 1: If peak conducted output power margin is above zero it is SAR exempt. This product has 13 mm distance from body; therefore, the limit is 11mW=8.45 dBm. This product is intended to be used in non-public areas.

Note 2: Antenna gain value is instructed by customer.

3.8 Radiated Spurious Emissions

- **Date Performed:**
  October 27, 2020
- **Test Standard:**
  As per Section 2.2 of this report
- **Test Method:**
  ANSI C63.4
- **Modifications:**
  No modification was required to **comply** for this test.
- **Result:**
  The EUT **comply** with the applicable standard.

Method of Measurement:

The EUT was tested in our 3 m SAC and was positioned on the center of the turntable. The transmitter was set for continuous transmission. The operating frequency of the device was measured for all radiated emissions 10 kHz to 4 GHz up to the 10th harmonic of the highest fundamental frequency. The EUT was pre-scanned in 3 different orthogonal orientations and was found to radiate highest when placed flat on the table top as indicated in the test photos.

Required Limits:

1) Intentional Radiator

The emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Table 12: Radiated emission limits; general requirements.

Frequency *f* (MHz)	Magnetic field strength (H-Field) (µA/m)	Measurement distance (m)	Field strength (dBµV/m)
0.009 – 0.490	6.37/(*f* in kHz)	300	(20*log(2400/*f* (kHz) + 40 dB
0.490 – 1.705	63.7/(*f* in kHz)	30	(20*log(24000/*f* (kHz) + 20 dB
1.705 – 30.0	0.08	30	49.5
30 – 88		3	40.0
88 – 216		3	43.5
216 – 960		3	46.0
above 960		3	54.0

Note 1: The above field strength limits are specified at a distance of 3 meters.
The tighter limits apply at the band edges.
Note 2: The emissions limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz.
Radiated emission limits in these three bands are based on measurements employing an average detector.

2) Restricted bands of operation.

Unwanted emissions that fall into the restricted bands specified on the table below shall comply with the limits specified on the table limits above as per §15.209 and Clause 8.9 of RSS-Gen.

3) IC Restricted Bands:

MHz	MHz	GHz
0.090 - 0.110	149.9 - 150.05	9.0 - 9.2
0.495 - 0.505	156.52475 - 156.52525	9.3 - 9.5
2.1735 - 2.1905	156.7 - 156.9	10.6 - 12.7
3.020 - 3.026	162.0125 - 167.17	13.25 - 13.4
4.125 - 4.128	167.72 - 173.2	14.47 - 14.5
4.17725 - 4.17775	240 - 285	15.35 - 16.2
4.20725 - 4.20775	322 - 335.4	17.7 - 21.4
5.677 - 5.683	399.9 - 410	22.01 - 23.12
6.215 - 6.218	608 - 614	23.6 - 24.0
6.26775 - 6.26825	960 - 1427	31.2 - 31.8
6.31175 - 6.31225	1435 - 1626.5	36.43 - 36.5
8.291 - 8.294	1645.5 - 1646.5	Above 38.6
8.362 - 8.366	1660 - 1710	
8.37625 - 8.38675	1718.8 - 1722.2	*Certain frequency bands listed in table 7 and in bands above 38.6 GHz are designated for license exempt applications. These frequency bands and the requirements that apply to related devices are set out in the 200 and 300 series of RSSs.
8.41425 - 8.41475	2200 - 2300	
12.29 - 12.293	2310 - 2390	
12.51975 - 12.52025	2483.5 - 2500	
12.57675 - 12.57725	2655 - 2900	
13.36 - 13.41	3260 - 3267	
16.42 - 16.423	3332 - 3339	
16.69475 - 16.69525	3345.8 - 3358	
16.80425 - 16.80475	3500 - 4400	
25.5 - 25.67	4500 - 5150	
37.5 - 38.25	5350 - 5460	
73 - 74.6	7250 - 7750	
74.8 - 75.2	8025 - 8500	
108 - 138	--	

4) FCC Restricted Bands:

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	Above 38.6
13.36–13.41			

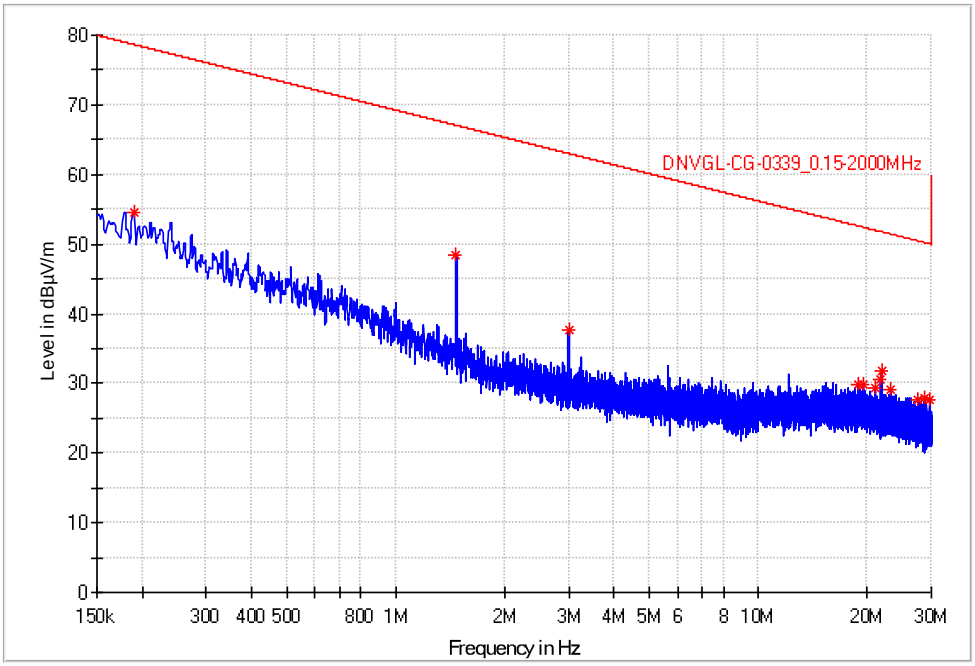
3) §15.247 (d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band 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 § 15.209(a) is not required. In addition, 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)).

Measurement Data and Plot:

Note: Measurements were also performed from 9 kHz to 30 MHz with an active loop antenna, but no emissions were found in that range.

- Test Voltage Used: 120VAC/60 Hz.
- Frequency Range: 0.15MHz. to 30MHz.

Spurious Emissions of Harmonics

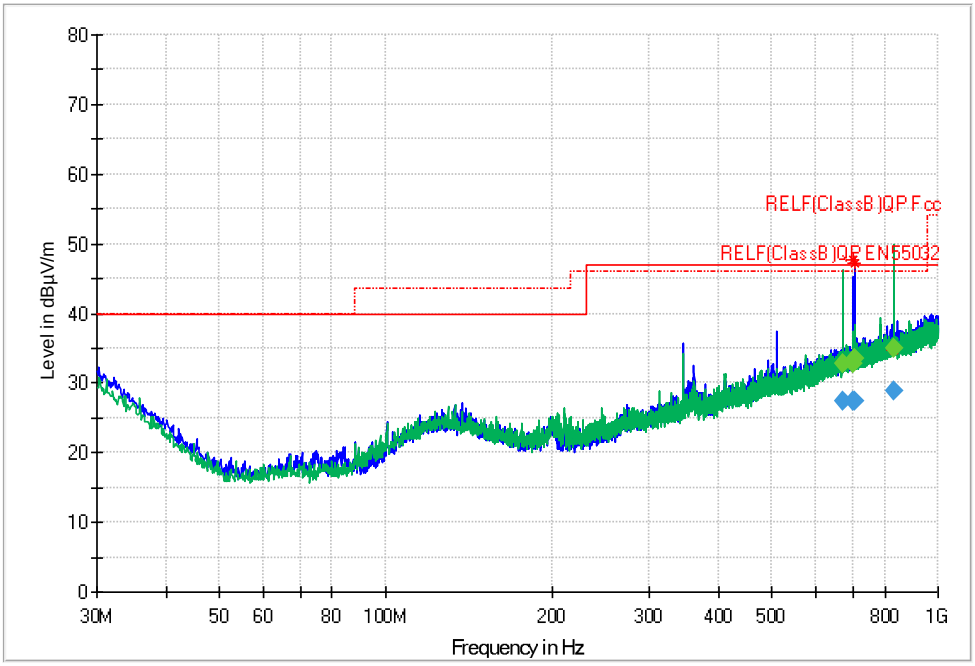


Plot 9: Radiated Spurious Emissions of Harmonics scanned at 3m SAC−for reference only

Note: No significant intermodulation frequencies detected during the simultaneous transmission of radio modules on.

Spurious Emissions, 150 kHz- 30MHz, BLE CH 37 Tx on, Charging Mode

- Test Voltage Used: 120VAC/60 Hz.
- Frequency Range: 30MHz. to 1GHz.



Plot 10: Radiated Emissions scanned at 3m SAC−for reference only

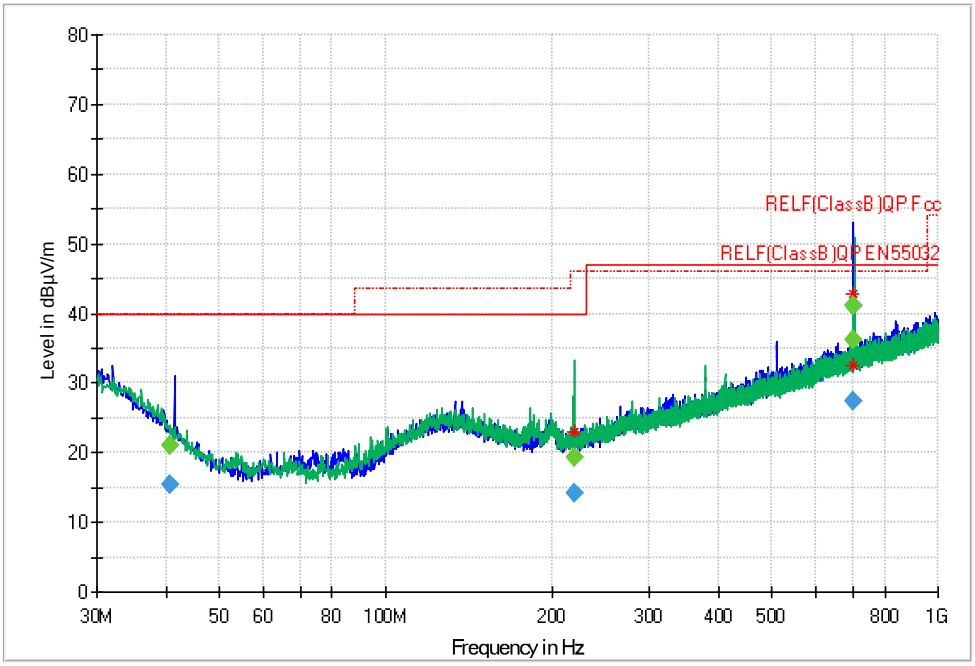
Note: No emissions of significance were observed

Table 13: Quasi Peak Data of Radiated Emissions at 3m SAC

Frequency (MHz)	Quasi Peak (dBµV/m)	Max Peak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
40.7490	15.5	---	40.0	24.5	315.0	H	176	19.6
40.7490	---	21.1	---	---	315.0	H	176	19.6
218.9658	---	19.4	---	---	251.0	V	44	18.5
218.9658	14.3	---	40.0	25.7	251.0	V	44	18.5
702.9125	41.1	---	47.0	5.9	140.0	H	313	29.9
702.9125	---	41.2	---	---	140.0	H	313	29.9
703.8721	---	36.2	---	---	225.0	H	308	29.9
703.8721	27.5	---	47.0	19.5	225.0	H	308	29.9

Spurious Emissions, 30M – 1G Hz, BLE CH 37 Tx on, Battery Mode

- Test Voltage Used: Battery
- Frequency Range: 30MHz. to 1GHz.



Plot 11: Radiated Emissions scanned at 3m SAC−for reference only

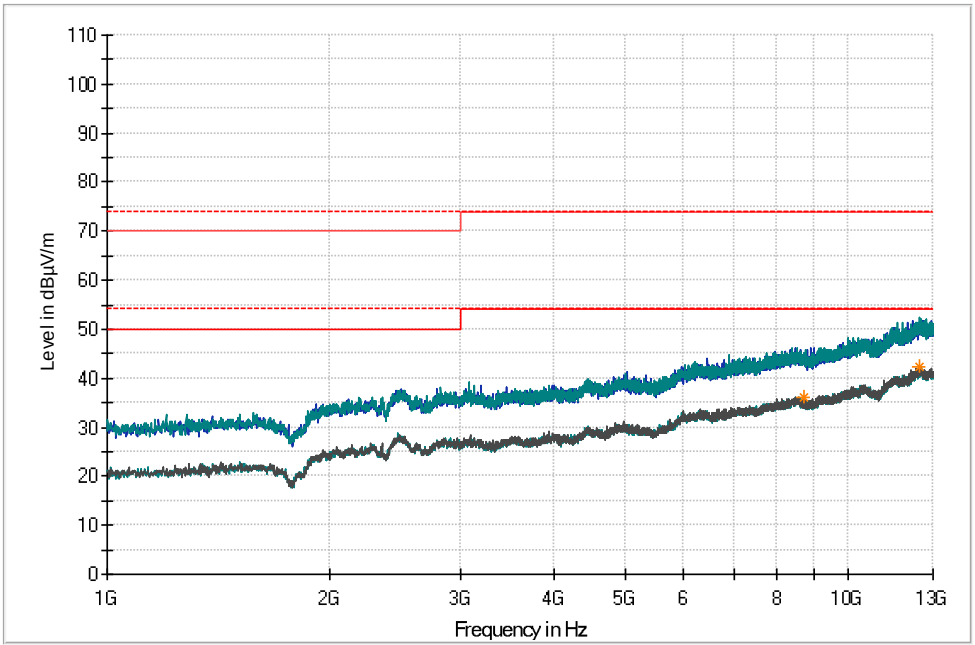
Note: No emissions of significance were observed

Table 14: Quasi Peak Data of Radiated Emissions at 3m SAC

Frequency (MHz)	Quasi Peak (dBµV/m)	Max Peak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
672.0036	---	32.8	---	---	316.0	V	309	28.9
672.0036	27.3	---	47.0	19.7	316.0	V	309	28.9
702.5780	27.4	---	47.0	19.6	167.0	H	4	29.9
702.5780	---	32.9	---	---	167.0	H	4	29.9
707.7261	27.4	---	47.0	19.6	177.0	H	102	30.0
707.7261	---	33.5	---	---	177.0	H	102	30.0
830.6702	---	35.0	---	---	358.0	V	157	31.4
830.6702	28.8	---	47.0	18.2	358.0	V	157	31.4

Spurious Emissions, 30M – 1G Hz, BLE CH 37 Tx on Charging Mode

- Test Voltage Used: 120VAC/60 Hz.
- Frequency Range: 1GHz. to 13GHz.



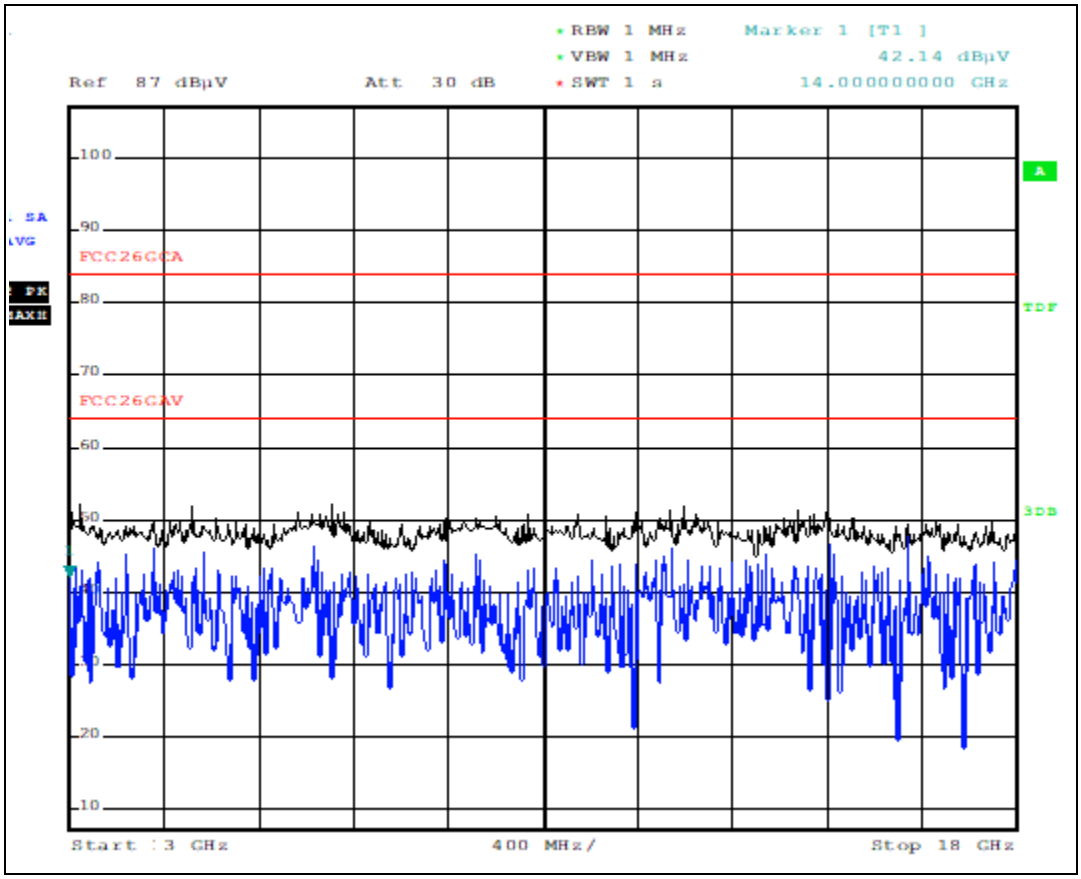
Plot 12: Radiated Emissions scanned at 3m SAC−for reference only

Note: 2.4GHz notch filter used; No emissions of significance were observed

Spurious Emissions, 1G– 13G Hz, BLE on, Charging mode

Note: (2.4 GHz was blocked and was operating No cross modulation were absorbed)

- Test Voltage Used: 120VAC/60 Hz.
- Frequency Range: 13GHz. to 18GHz.

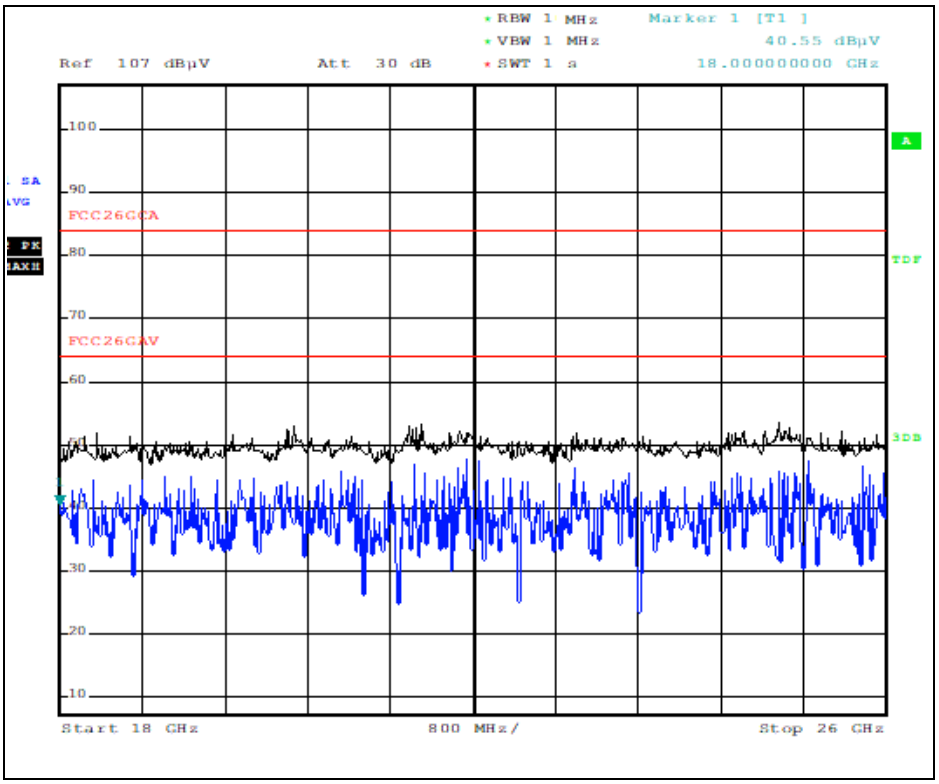


Plot 13: Radiated Emissions scanned at 3m SAC- 1m distance –for reference only

Note: No emissions of significance were observed

Spurious Emissions, 13G– 18G Hz, BLE on, Charging mode

- Test Voltage Used: 120VAC/60Hz.
- Frequency Range: 18GHz. to 26GHz.



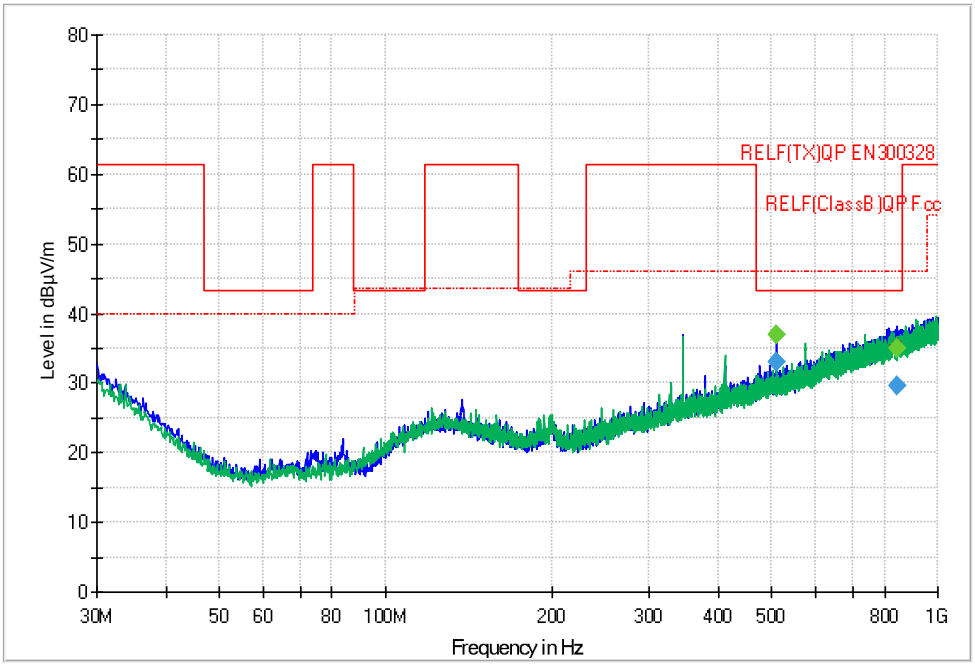
Plot 14: Radiated Emissions scanned at 3m SAC- 1m distance–for reference only

Note: No emissions of significance were observed

Spurious Emissions – Receiver Mode

- Test Voltage Used: 120VAC/60Hz.
- Frequency Range: 30MHz. to 1GHz.

The field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:



Plot 15: Spurious Emissions scanned at 3m SAC−for reference only

Table 15: Quasi Peak Data of Spurious Emissions at 3m SAC

Frequency (MHz)	Quasi Peak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
509.9444	33.1	43.4	10.3	99.0	H	189	26.6
844.6763	29.5	43.4	13.9	315.0	H	145	32.0

3.9 AC Mains Conducted Emissions

- **Date Performed:**
  October 27, 2020
- **Test Standard:**
  As per Section 2.2 of this report
- **Test Method:**
  ANSI C63.4-2014
- **Modifications:**
  No modification was required to **comply** for this test.
- **Result:**
  The EUT **comply** with the applicable standard.

Required Limit:

The radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the following limits

Table 16: FCC/ISED/CE for above standards-Class B

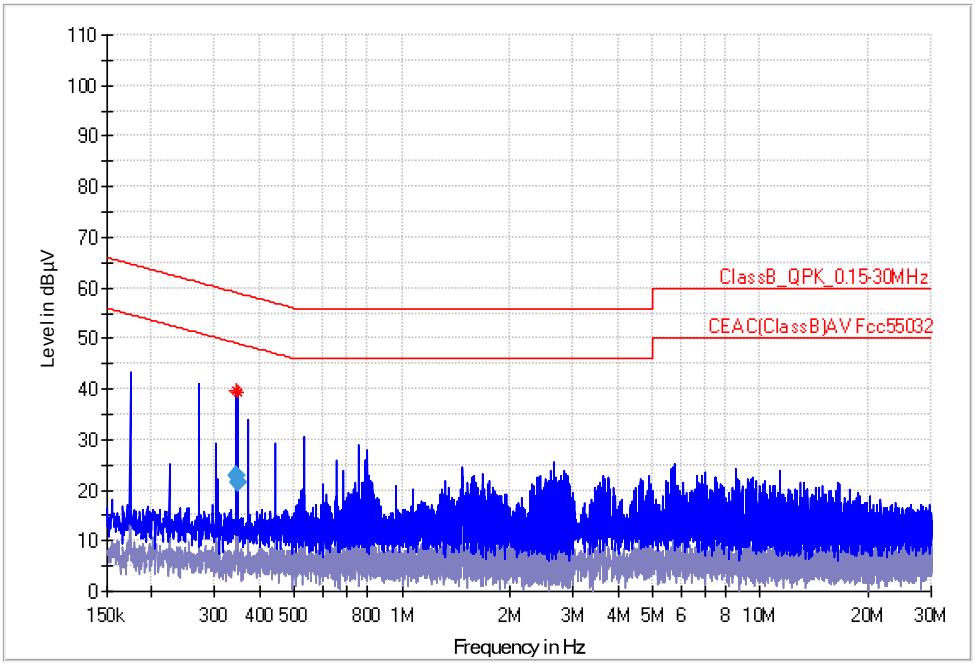
Frequency (MHz)	Conducted Limit (dBµV)- (Class B)		Result
	Quasi-Peak	Average	
0.15 – 0.50	66 to 56	56 to 46	Comply
0.50 – 5	56	46	
5 – 30	60	50	
Note 1: The lower limit shall apply at the transition frequencies. **Note 2:** The limit decreases linearly with the logarithm of the frequency in the 0.15 to 0.50 MHz.			

Method of Measurement:

Measurements were made using a test receiver with 9kHz bandwidth, CISPR Quasi-Peak and Average detector.

Measurement Data and Plot:

- Test Voltage Used: 120VAC/60Hz. **Line 1**
- Frequency Range: 150 KHz. to 30 MHz.



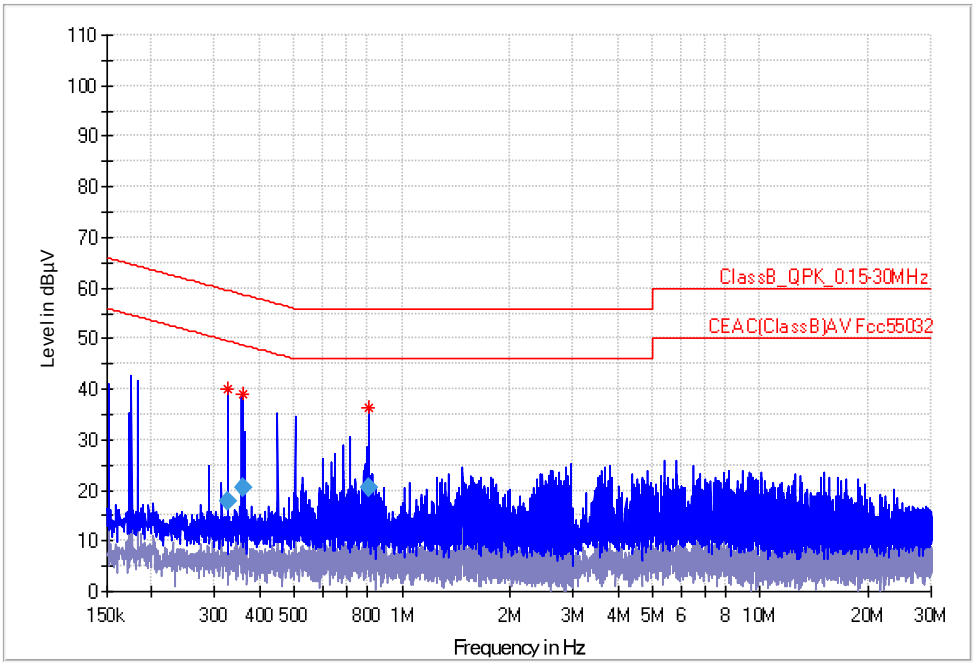
Plot 16: Conducted Emissions–Line 1–for reference only

Note: No emissions of significance were observed below 20dB of the Limit

Table 17: Quasi-Peak and Average Data of Conducted Emissions–Line 1

Frequency (MHz)	Quasi Peak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Bandwidth (kHz)	PE	Corr. (dB)
0.3440	22.7	---	59.1	36.4	9.000	GND	10.7
0.3464	21.7	---	59.0	37.4	9.000	GND	10.7

- Test Voltage Used: 120VAC/60Hz. **Line 2**
- Frequency Range: 150 KHz. to 30 MHz.



Plot 17: Conducted Emissions–Line 2–for reference only

Note: No emissions of significance were observed below 20dB of the Limit

Table 18: Quasi-Peak and Average Data of Conducted Emissions–Line 2

Frequency (MHz)	Quasi Peak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Bandwidth (kHz)	PE	Corr. (dB)
0.3268	17.8	---	59.5	41.7	9.000	GND	10.7
0.3600	20.5	---	58.7	38.3	9.000	GND	10.7
0.8040	20.4	---	56.0	35.6	9.000	GND	10.7

Appendix A: TEST SETUP PHOTOS

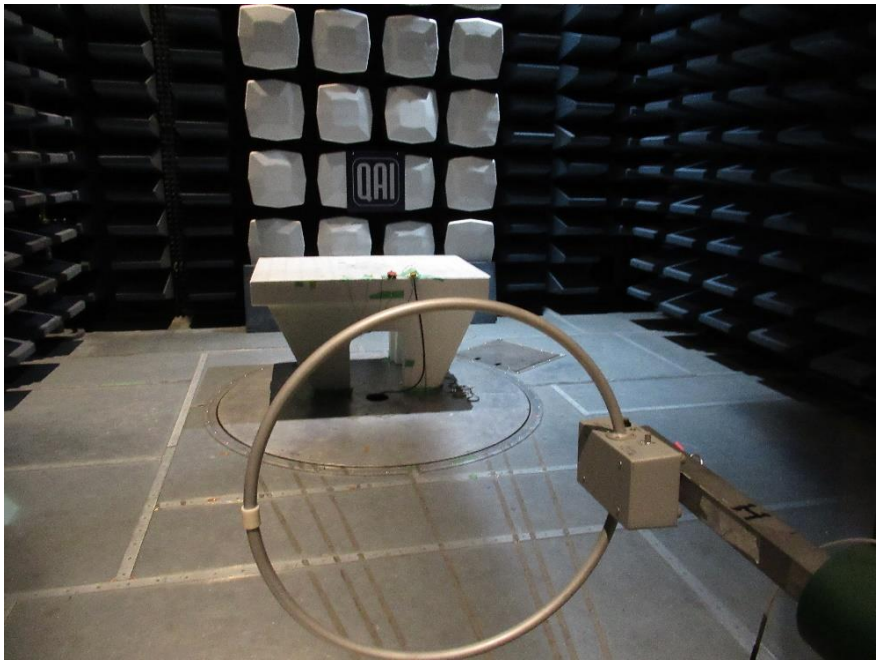


Figure 1: Radiated Emissions 9MHz – 30MHz performed in the SAC

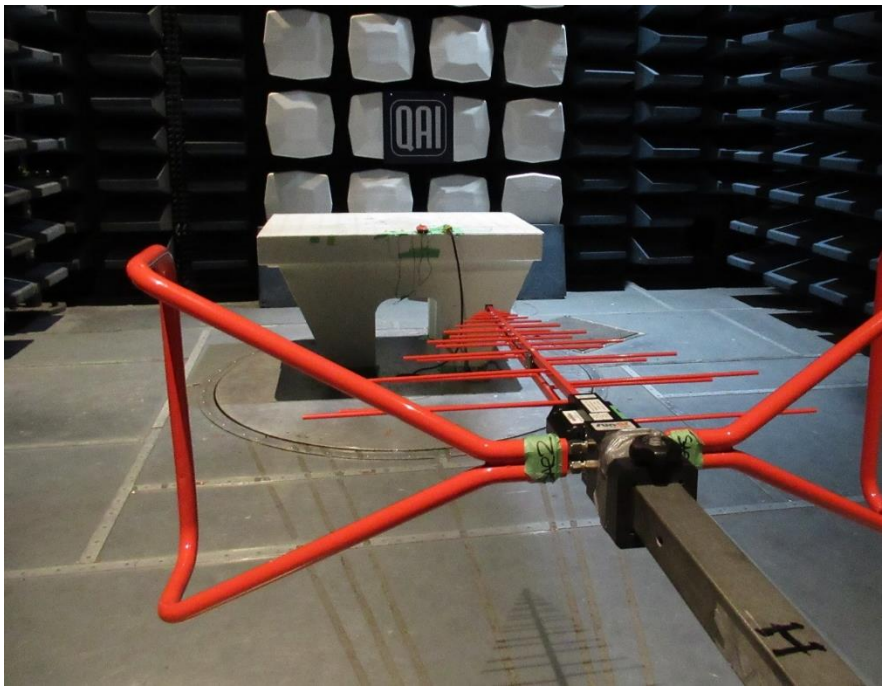


Figure 2: Radiated Emissions 30MHz – 1GHz performed in the SAC

Figure 3: Radiated Emissions 30MHz – 1GHz performed in the SAC

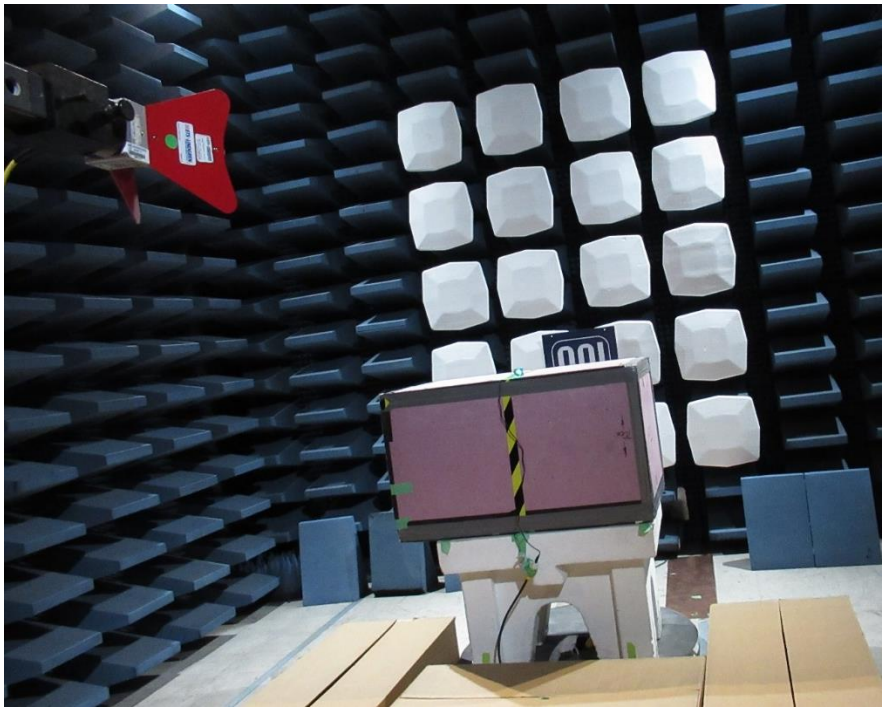


Figure 4: Radiated Emissions above 1GHz – 13GHz performed in the SAC

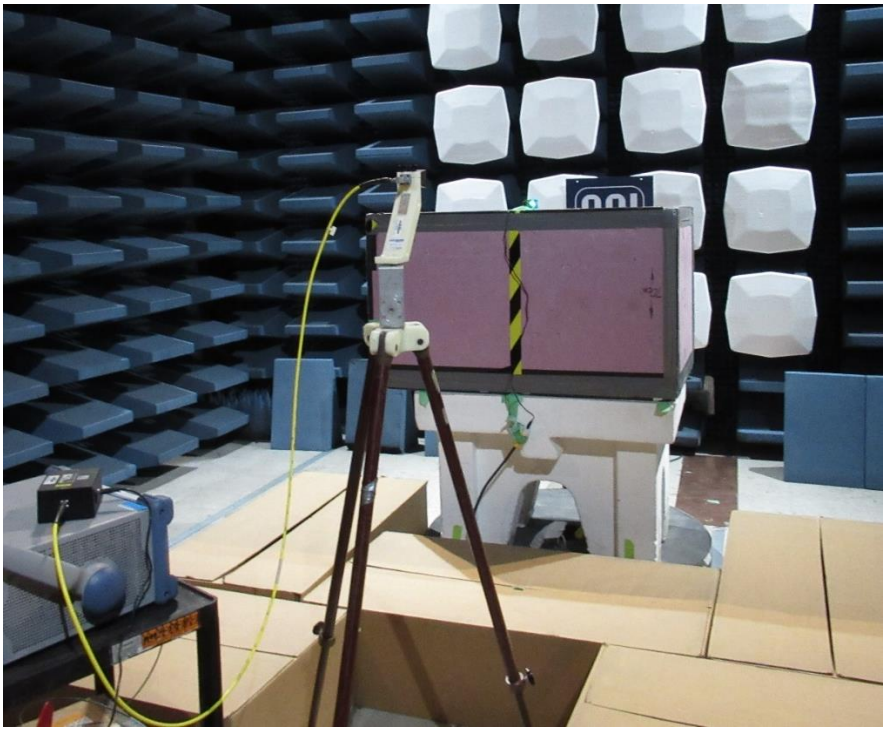


Figure 5: Radiated Emissions above 13GHz – 18GHz performed in the SAC

Figure 6: Conducted Emissions performed in the SAC

Appendix B: ABBREVIATIONS

Abbreviation	Definition
AC	Alternating Current
AM	Amplitude Modulation
CE	European Conformity
CISPR	Comité International Spécial des Perturbations Radioélectriques (International Special Committee on Radio Interference)
DC	Direct Current
EFT	Electrical Fast Transient
EMC	Electro Magnetic Compatibility
EMI	Electro Magnetic Interference
ESD	Electrostatic Discharge
EUT	Equipment Under Test
FCC	Federal Communications Commission
FVIN	Firmware Version Identification Number FVIN
IC	Industry Canada
ICES	Interference Causing Equipment Standard
IEC	International Electrotechnical Commission
LISN	Line Impedance Stabilizing Network
OATS	Open Area Test Site
RF	Radio Frequency
RMS	Root-Mean-Square
SAC	Semi-Anechoic Chamber

END OF REPORT