



FCC Part 15 Subpart

TEST REPORT

FOR

Product Name: POS System

Model : tPOS ; tPOSu ; tPOSp; tPOSd ; tPOSw ; v5PAD ; tPOSx ;
(x=0~9;a~z,A~Z or blank)
Trade Name: Canmax

Issued to

SENIOR TECH CO.,LTD.

5F., No. 165, Kang Ning Street, Xizhi Dist., New Taipei City 22150, Taiwan

Issued by

Global Certification Corp.

No.146, Sec. 2, Xiangzhang Rd., Xizhi Dist.,New Taipei City 221,
Taiwan (R.O.C.)



Note: This test refers exclusively to the test presented test model and sample. This report shall not be reproduced except in full, without the written approval of Global Certification Corporation. This document may be altered or revised by Global Certification Corporation. Personnel only, and shall be noted in the revision section of the document.



Revision History

Revision	No.	Report Number	Issue Date	Description	Author/ Revised by
1.	FR2-790101	FR2-790101	May. 18, 2018	Original Report	Michelle



TABLE OF CONTENTS	3
1. GENERAL INFORMATION	5
1.1 DESCRIPTION OF THE TESTED SAMPLES	6
2. TEST METHODOLOGY	7
2.1 GENERAL TEST PROCEDURES	7
2.2 FCC PART 15.205 RESTRICTED BANDS OF OPERATIONS	7
2.3 DESCRIPTION OF TEST MODES	8
2.4 DESCRIPTION OF THE SUPPORT EQUIPMENTS	8
3. TEST AND MEASUREMENT EQUIPMENT	9
3.1 CALIBRATION	9
3.2 EQUIPMENT	9
4. ANTENNA REQUIREMENTS	11
4.1 STANDARD APPLICABLE	11
4.2 ANTENNA CONSTRUCTION AND DIRECTIONAL GAIN	11
5. OUTPUT POWER	12
5.1 TEST SETUP	12
5.2 LIMIT	12
5.3 TEST PROCEDURE	12
5.4 TEST RESULT	12
5.5 TEST DATA	13
6. 6 DB BANDWIDTH	14
6.1 TEST SETUP	14
6.2 TEST PROCEDURE	14
6.3 LIMIT	14
6.4 RESULT	14
6.5 TEST DATA	14
7. RADIATED EMISSION	17
7.1 TEST SETUP	17
7.2 LIMIT	18
7.1 TEST PROCEDURE	19
7.2 RESULT	19
7.3 TEST DATA	19
8. AC POWER CONDUCTED EMISSIONS	29
8.1 TEST SETUP	29
8.2 LIMIT	29
8.3 TEST PROCEDURE	29
8.4 TEST SPECIFICATION	29
8.5 RESULT	30
8.6 TEST DATA	30
9. POWER SPECTRAL DENSITY	32
9.1 TEST SETUP	32
9.2 LIMIT	32
9.3 TEST PROCEDURE	32
9.4 TEST RESULTS: PASSED	33
9.5 TEST DATA	33



10.	OUT OF BAND CONDUCTED EMISSIONS MEASUREMENT -----	35
10.1	TEST SETUP-----	35
10.2	TEST PROCEDURE -----	35
10.3	LIMIT -----	35
10.4	RESULT -----	35
10.5	TEST DATA -----	35
11.	ANTENNA REQUIREMENT -----	38
11.1	STANDARD APPLICABLE:-----	38
11.2	ANTENNA CONNECTED CONSTRUCTION-----	38



1. GENERAL INFORMATION

Applicant : SENOR TECH CO.,LTD.
Address : 5F., No. 165, Kang Ning Street, Xizhi Dist., New Taipei City
22150, Taiwan
Manufacturer : SENOR TECH CO.,LTD.
Address : 5F., No. 165, Kang Ning Street, Xizhi Dist., New Taipei City
EUT : POS System
Model No. : tPOS ; tPOSu ; tPOSp; tPOSd ; tPOSw ; v5PAD ; tPOSx ;
(x=0~9;a~z,A~Z or blank)
Trade Name : SENOR
Model Differences : The major electrical and mechanical constructions of series models are identical
to the basic model, except different marketing purpose. The model, tPOS is the
testing sample, and the final test data are shown on this test report.

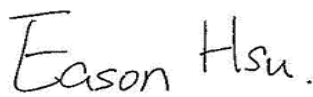
Is here with confirmed to comply with the requirements set out in the FCC Rules and Regulations Part 15 Subpart C and the measurement procedures were according to ANSI C63.4-2014. The said equipment in the configuration described in this report shows the maximum emission levels emanating from equipment are within the compliance requirements.

FCC Part 15 Subpart C 15.247

Tested By:

Approved by:

May. 18, 2018
Date


Eason Hsu, Engineer

May. 18, 2018
Date


Adam Chou, Manager

Designation Number: TW1640



1.1 DESCRIPTION OF THE TESTED SAMPLES

EUT Name : POS System
Model Number : tPOS
FCC ID : OVS-TPOS
Power From ☒Inside☒Outside
☒Adaptor ☒Battery ☐Power Supply ☐DC Power Source ☐Support Unit PC
Power Rating(Battery) : 3.8Vdc
Power Rating(Adapter) I/P : 100-240Vac 56/60Hz 0.5A
O/P : 5.0Vdc, 3.0A
Operate Frequency : Refer to the channel list as described below
Number of Channels : 40
Channel spacing : ☐N/A ☒ 2 MHz
Modulation Type : FHSS(GFSK)
Antenna Type : ☐integral antenna: ☒PCB Printing ☐a dedicated antenna
Antenna gain : 2.38 dBi

1.2 LIST OF MEASUREMENTS AND EXAMINATIONS

FCC Rule	Description of Test	Result
15.203	Antenna Requirement	Pass
15.207	AC Power Conducted Emission	Pass
15.247(d)	Radiated Emission	Pass
15.247(d)	Out of Band Conducted Spurious Emission	Pass
15.247(b)(3)	Output Power	Pass
15.247(e)	Power Spectral Density	Pass
15.247(a)(1)	6dB Bandwidth Measurement	Pass



2. TEST METHODOLOGY

All testing as described bellowed were performed in accordance with ANSI C63.4:2003 and FCC CFR 47 Part 15 Subpart C.

2.1 GENERAL TEST PROCEDURES

Conducted Emissions

The EUT is placed on a wood table, which is at 0.8 m above ground plane according to clause 15.207 and requirements of ANSI C63.4:2003. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz are using CISPR Quasi-Peak / Average detectors.

Radiated Emissions

The EUT is placed on a turn table, which is 0.8 m above ground plane. The turntable was rotated through 360 degrees to determine the position of maximum emission level. The EUT is placed at 3m away from the receiving antenna, which varied from 1m to 4m to find out the highest emission. Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.

2.2 FCC PART 15.205 RESTRICTED BANDS OF OPERATIONS

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

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
10.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	(²)
13.36 - 13.41			

¹ Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

² Above 38.6



(b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

2.3 DESCRIPTION OF TEST MODES

The EUT was tested under following modes:

Modes:

1. Continuous transmitting

Channels:

- 1. 2.402GHz (Lowest Channel)**
- 2. 2.441GHz (Middle Channel)**
- 3. 2.480GHz (Highest Channel)**

2.4 DESCRIPTION OF THE SUPPORT EQUIPMENTS

Setup Diagram

See test photographs attached in appendix 1 for the actual connections between EUT and support equipment.

Support Equipment

Peripherals Devices:

OUTSIDE SUPPORT EQUIPMENT							
No.	Equipment	Model	Serial No.	FCC ID/ BSMI ID	Trade name	Data Cable	Power Cord
1.	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Note: All the above equipment /cable were placed in worse case position to maximize emission signals during emission test

Grounding: Grounding was in accordance with the manufacturer's requirement and conditions for the intended use.



3. TEST AND MEASUREMENT EQUIPMENT

3.1 CALIBRATION

The measuring equipment utilized to perform the tests documented in the report has been calibrated once a year or in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

3.2 EQUIPMENT

The following list contains measurement equipment used for testing. The equipment conforms to the requirement of CISPR 16-1, ANSI C63.2 and. Other required standards.

Calibration of all test and measurement, including any accessories that may effect such calibration, is checked frequently to ensure the accuracy. Adjustments are made and correction factors are applied in accordance with the instructions contained in the respective.

TABLE 1 LIST OF TEST AND MEASUREMENT EQUIPMENT

Instrument	Manufacturer	Model No.	Serial No.	Calibration Due Date	Note
EMC Test Receiver	R&S	ESCI	100438	Dec. 16, 2018	
LISN #1	SCHWARZBECK	NNLK8121	550213	Feb. 02, 2019	For EUT
LISN #2	EMCO	3825/2	9001-1400	N/A	For Support Unit
RF Cable	Huber+Suhner	RG223/U	Cable-001	Dec.17, 2018	
Impedance Stabilization	Teseq GmbH	ISNT800	23334	Nov. 08, 2018	
Absorbing Clamp	COM-POWER	AB-050	421915	Aug. 17,2019	
RF Cable	Huber+Suhner	5D-FB	CABLE-007	Aug. 16,2019	
EMC Test Receiver	R&S	FSV40	101088	Sep. 28, 2018	
Bilog Antenna	SUNOL	JB1	A052204	Feb. 21, 2019	
Pre-Amplifier	WIRELESS	FPA-6592G	60028	Sep. 28, 2018	
RF Cable_NSA_Rx	HUBER + UHNER	RG213/U	Cable-004	Sep. 27, 2018	
Double Ridged Guide HORN ANTENNA	EST.LINDGREN	3117	119028	Apr.18, 2019	



SMA_Cable	HUBER SUHNER	EMC104-SM-SM -1000	170238	Mar. 05, 2019	
RF Cable (sVSWR_TX)	Huber Suhenr	SUCOFLEX 104	293864/4	Mar. 05, 2019	
Microwave Preamplifier	EMCINSTRUMEN T	EMC051845	980059	Apr. 17, 2019	
EMC Test Receiver	R&S	ESCI	100438	Dec. 16, 2018	

Calibration interval of instruments listed above is one year



4. ANTENNA REQUIREMENTS

4.1 STANDARD APPLICABLE

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

And according to FCC 47 CFR Section 15.247(b), if transmitting antennas of direction gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

4.2 ANTENNA CONSTRUCTION AND DIRECTIONAL GAIN

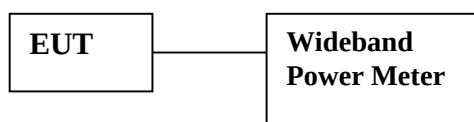
Antenna type: PCB Antenna

Antenna Gain: 2.38dBi



5. OUTPUT POWER

5.1 TEST SETUP



5.2 LIMIT

The maximum peak output power of the intentional radiator shall not exceed the following:

According to § 15.247(b)(3) , for systems using digital modulation in the bands of 902 – 928 MHz , 2400 – 2483.5 MHz: 1 Watt.

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

5.3 TEST PROCEDURE

Peak power is measured using the wideband power meter.

Power is integrated over a bandwidth greater than or equal to the 99% bandwidth.

5.4 TEST RESULT: PASSED



5.5 TEST DATA:

Configuration	Data Rate	Power Setting	Frequency	Conducted Power (dBm)	Conducted Power (W)	Max. Limit(dBm)	Max. Limit(W)
Bluetooth Low Energy	1 Mbps	Def	2402 MHz	1.39	0.00137721	30.00	1.00
		Def	2440 MHz	0.76	0.00119124	30.00	1.00
		Def	2480 MHz	0.88	0.00122462	30.00	1.00



6. 6 DB BANDWIDTH

6.1 TEST SETUP



6.2 TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer.
The minimum 6 dB bandwidth shall be at least 500kHz.

6.3 LIMIT

The minimum 6 dB bandwidth shall be at least 500kHz.

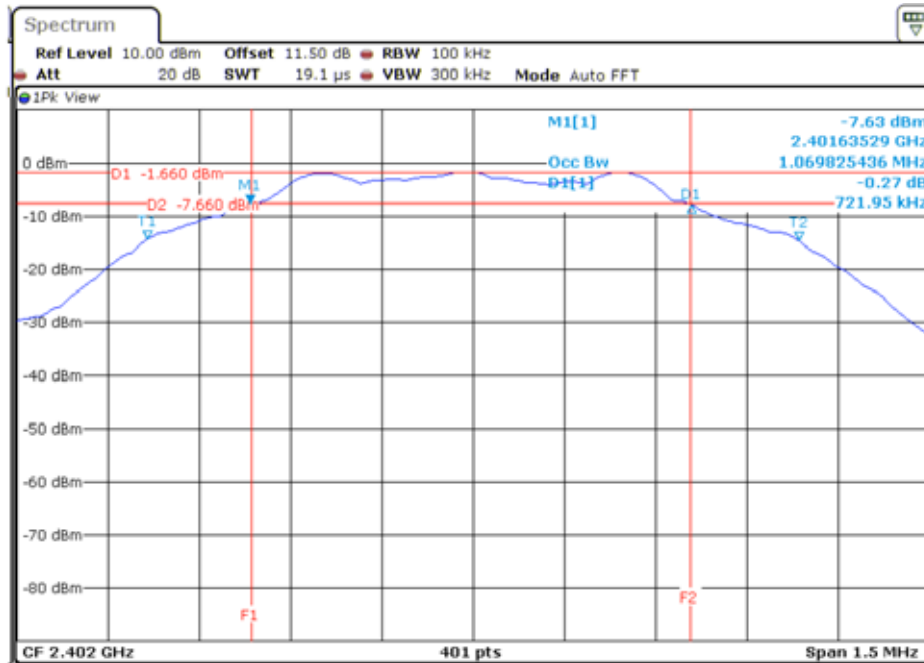
6.4 RESULT: PASSED

6.5 TEST DATA:

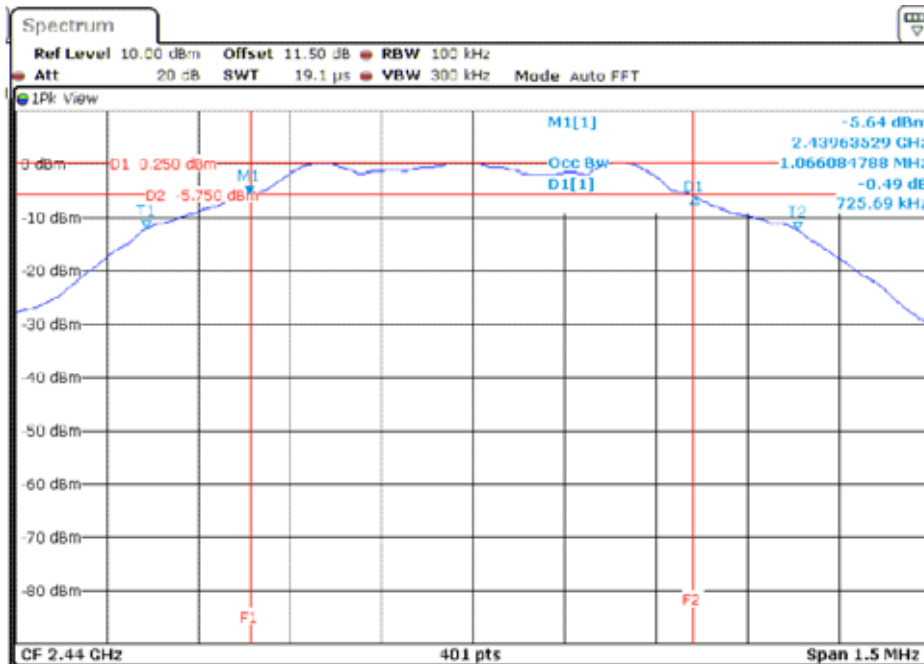
Configuration	Data Rate	Frequency	6dB Bandwidth (MHz)	99% Occupied BW	6dB Bandwidth Min. Limit (KHz)
Bluetooth Low Energy	1 Mbps	2402 MHz	0.72	1.06	500
		2440 MHz	0.72	1.06	500
		2480 MHz	0.71	1.06	500



Low-CH

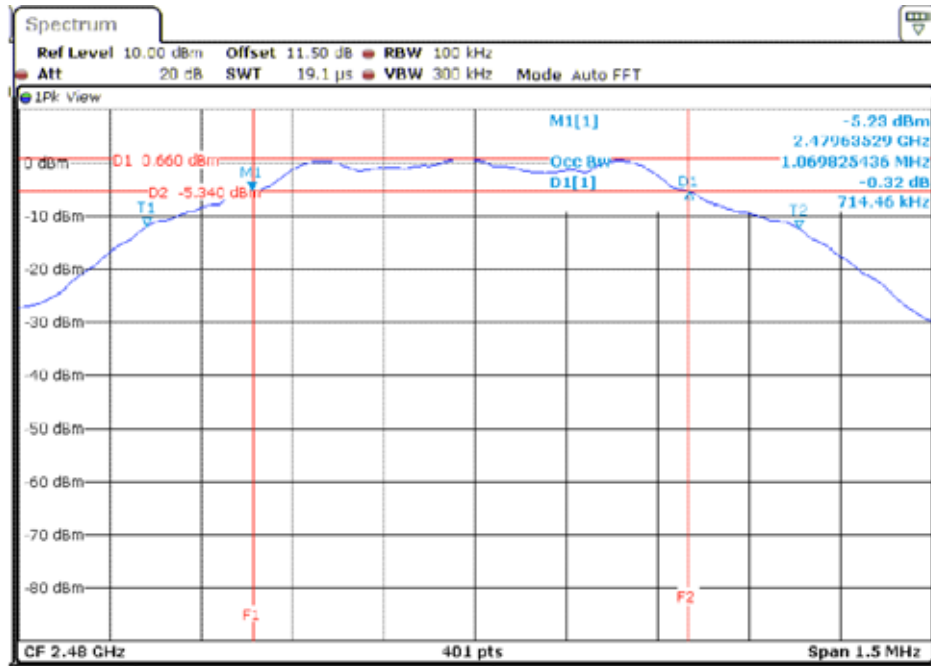


Mid-CH





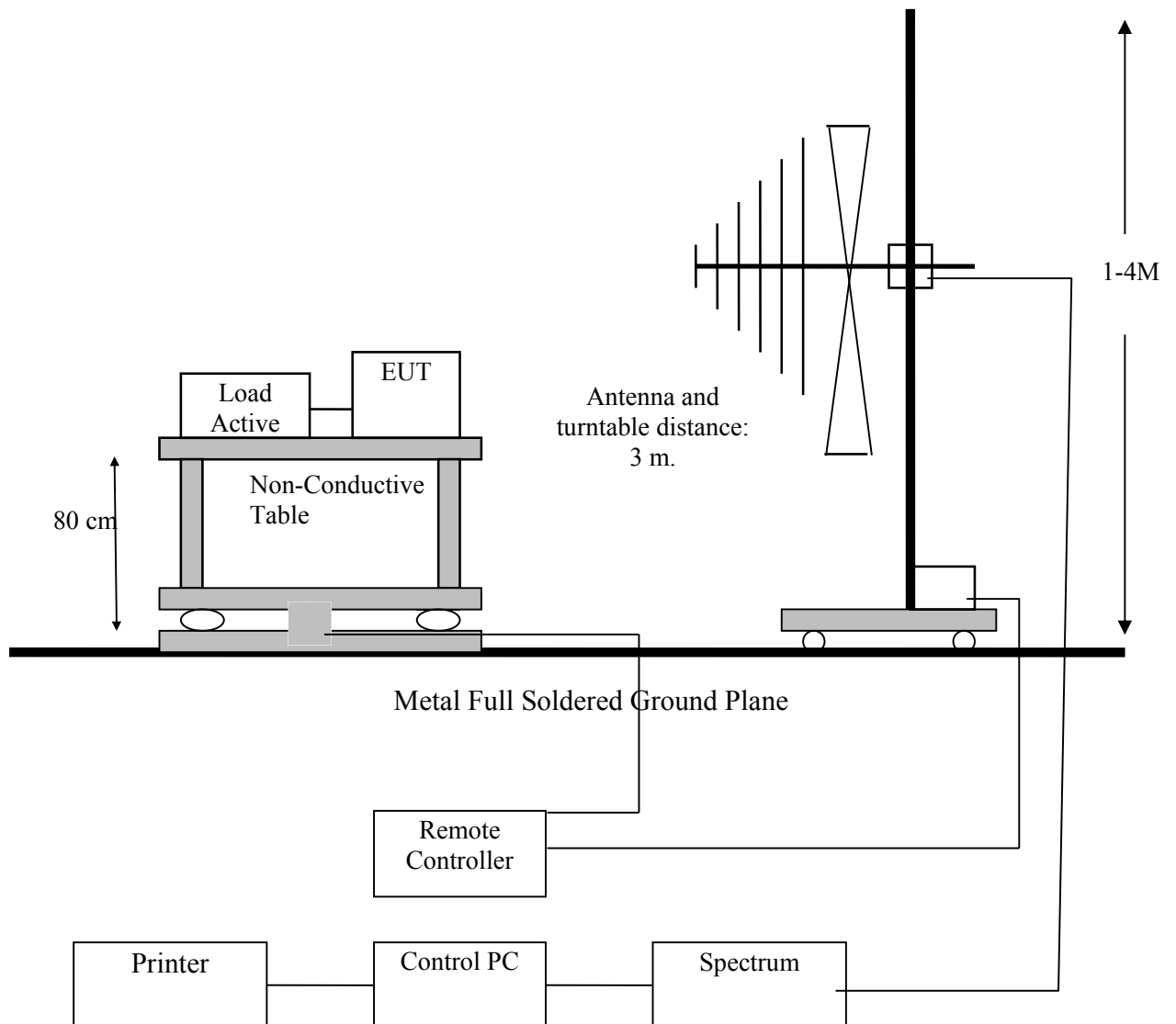
High-CH





7. RADIATED EMISSION

7.1 TEST SETUP





7.2 LIMIT

The field strength of any emissions which appear outside of this band shall not exceed the general radiated emission limits in section 15.209 as below.

Frequency (MHz)	Field Strength (mV/m)	Measurement Distance (m)
1.705-30	30	30
30-88	100*	3
88-216	150*	3
216-960	200*	3
Above 960	500*	3

**Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.*

In the above emission table, the tighter limit applies at the band edges.

Frequency (Hz)	Field Strength (μ V/m at 3-meter)	Field Strength (dB μ V/m at 3-meter)
1.705-30	30 (at 30-meter)	69.54
30-88	100	40
88-216	150	43
216-960	200	46
Above 960	500	54



7.1 TEST PROCEDURE

1. The EUT was placed on a turntable, which was 0.8m above ground plane.
2. The turntable was rotated for 360 degrees to determine the position of maximum emission level.
3. EUT was set at 3m away from the receiving antenna, which was varied from 1m to 4m to find out the highest emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was maximized by changing the polarization of receiving antenna, both horizontal and vertical.
6. Repeated above procedures until the measurements for all frequencies are completed.

7.2 RESULT: PASSED

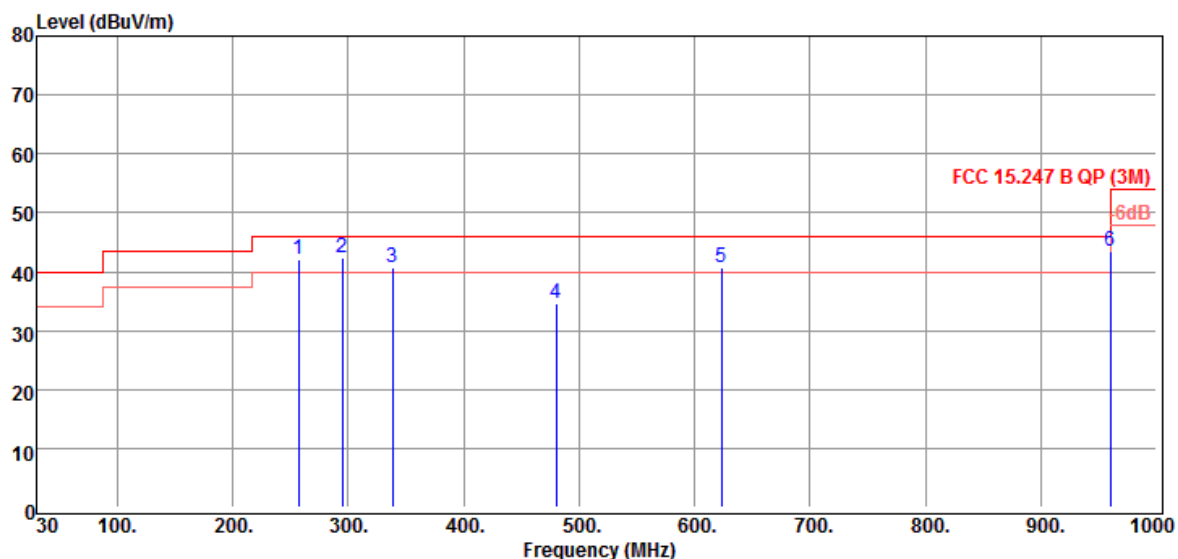
7.3 TEST DATA:

All frequencies not described in this test report and within the range of the general radiated emission limits are not detectable significantly. The table as below is representing worst emissions found.



30MHz ~ 1GMz

Horizontal



Freq		Meter	System	Cable	Antenna	Preamp	Real	Limit	Margin	Remark
MHz		Level	Factor	Loss	Factor	Gain	Level	Line		
		dBuV	dB/m	dB	dB/m	dB	dBuV/m	dBuV/m	dB	
1	256.98	49.35	-7.16	1.64	20.16	28.96	42.19	46.00	-3.81	QP
2	294.81	47.86	-5.51	1.79	21.59	28.89	42.35	46.00	-3.65	QP
3	338.46	44.64	-3.99	1.95	22.85	28.79	40.65	46.00	-5.35	QP
4	480.08	34.28	0.19	2.37	26.14	28.32	34.47	46.00	-11.53	QP
5	623.64	36.91	3.74	2.76	28.39	27.41	40.65	46.00	-5.35	QP
6	960.23	31.83	11.58	3.57	33.38	25.37	43.41	54.00	-10.59	QP

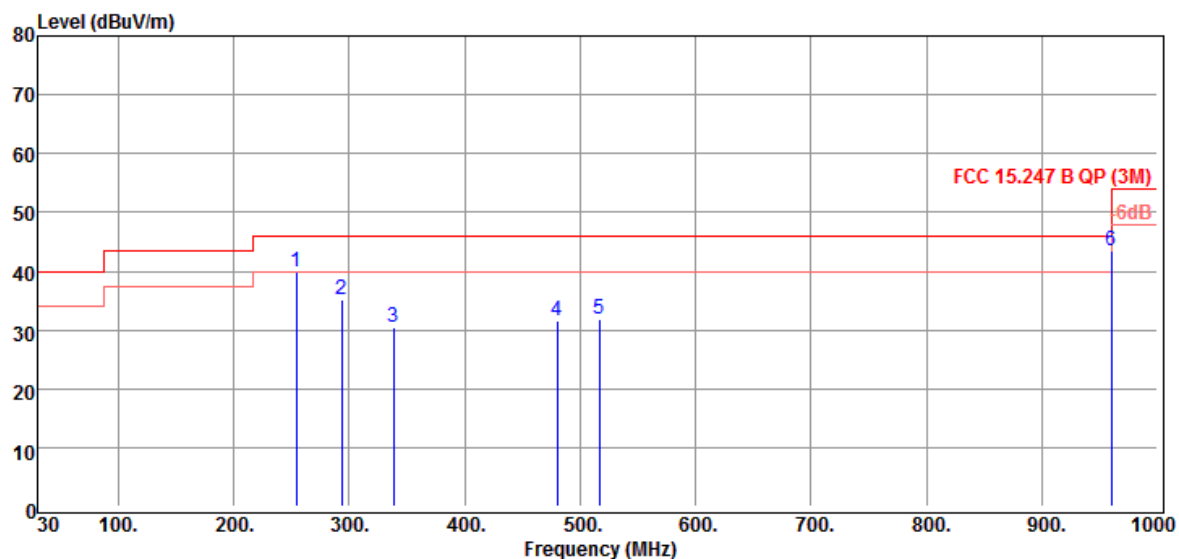
System Factor = Cable Loss + Antenna Factor - Preamp Gain

Real Level = Meter Level + System Factor

Margin = Real Level - Limit Line



VERTICAL



	Freq MHz	Meter Level dBuV	System Factor dB/m	Cable Loss dB	Antenna Factor dB/m	Preamp Gain dB	Real Level dBuV/m	Limit Line dBuV/m	Margin dB	Remark
1	254.07	47.18	-7.37	1.63	19.97	28.97	39.81	46.00	-6.19	QP
2	293.84	40.67	-5.53	1.79	21.57	28.89	35.14	46.00	-10.86	QP
3	338.46	34.39	-3.99	1.95	22.85	28.79	30.40	46.00	-15.60	QP
4	480.08	31.50	0.19	2.37	26.14	28.32	31.69	46.00	-14.31	QP
5	516.94	30.59	1.19	2.47	26.84	28.12	31.78	46.00	-14.22	QP
6	960.23	31.83	11.58	3.57	33.38	25.37	43.41	54.00	-10.59	QP

System Factor = Cable Loss + Antenna Factor - Preamp Gain

Real Level = Meter Level + System Factor

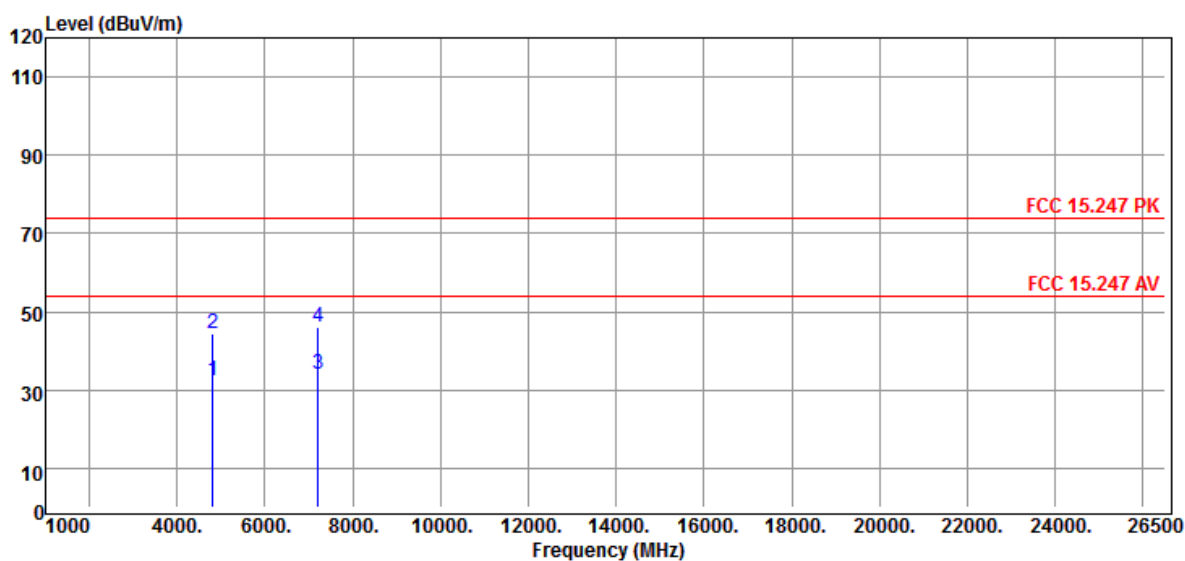
Margin = Real Level - Limit Line



1GHz ~26.5GHz

Lowest Channel

Horizontal



Freq		Meter	System	Cable	Antenna	Preamp	Real	Limit	Margin	Remark
MHz		Level	Factor	Loss	Factor	Gain	Level	Line		
		dBuV	dB/m	dB	dB/m	dB	dBuV/m	dBuV/m	dB	
1	4804.00	38.04	-5.59	6.67	34.58	46.84	32.45	54.00	-21.55	Average
2	4804.00	50.21	-5.59	6.67	34.58	46.84	44.62	74.00	-29.38	Peak
3	7206.00	36.44	-2.40	8.09	35.99	46.48	34.04	54.00	-19.96	Average
4	7206.00	48.39	-2.40	8.09	35.99	46.48	45.99	74.00	-28.01	Peak

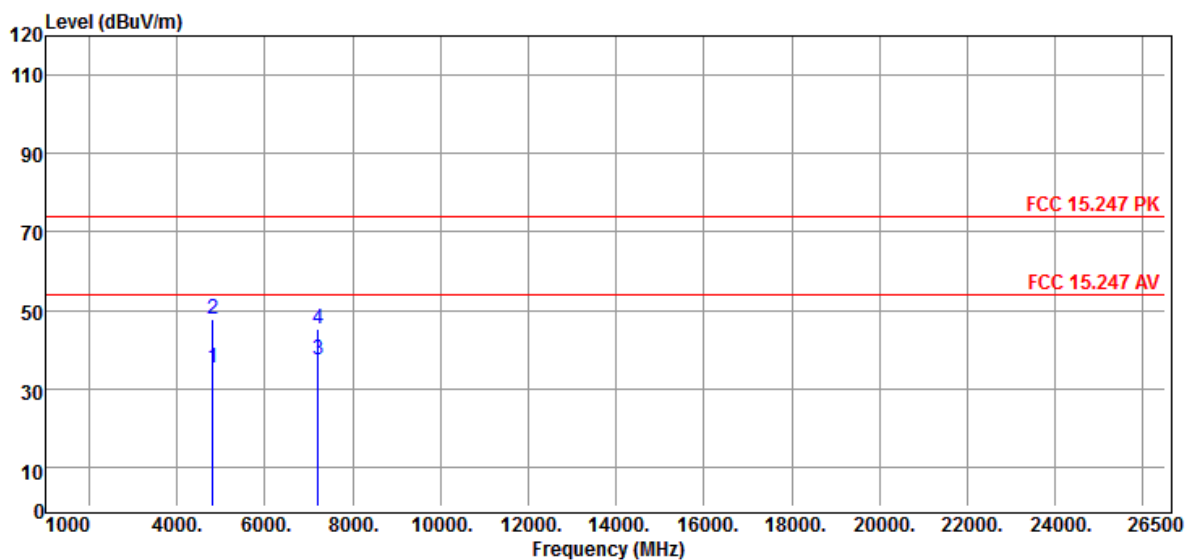
System Factor = Cable Loss + Antenna Factor - Preamp Gain

Real Level = Meter Level + System Factor

Margin = Real Level - Limit Line



Vertical



	Freq	Meter	System	Cable	Antenna	Preamp	Real	Limit	Margin	Remark
	MHz	Level	Factor	Loss	Factor	Gain	Level	Line		
		dBuV	dB/m	dB	dB/m	dB	dBuV/m	dBuV/m	dB	
1	4804.00	40.82	-5.59	6.67	34.58	46.84	35.23	54.00	-18.77	Average
2	4804.00	53.39	-5.59	6.67	34.58	46.84	47.80	74.00	-26.20	Peak
3	7206.00	39.71	-2.40	8.09	35.99	46.48	37.31	54.00	-16.69	Average
4	7206.00	47.86	-2.40	8.09	35.99	46.48	45.46	74.00	-28.54	Peak

System Factor = Cable Loss + Antenna Factor - Preamp Gain

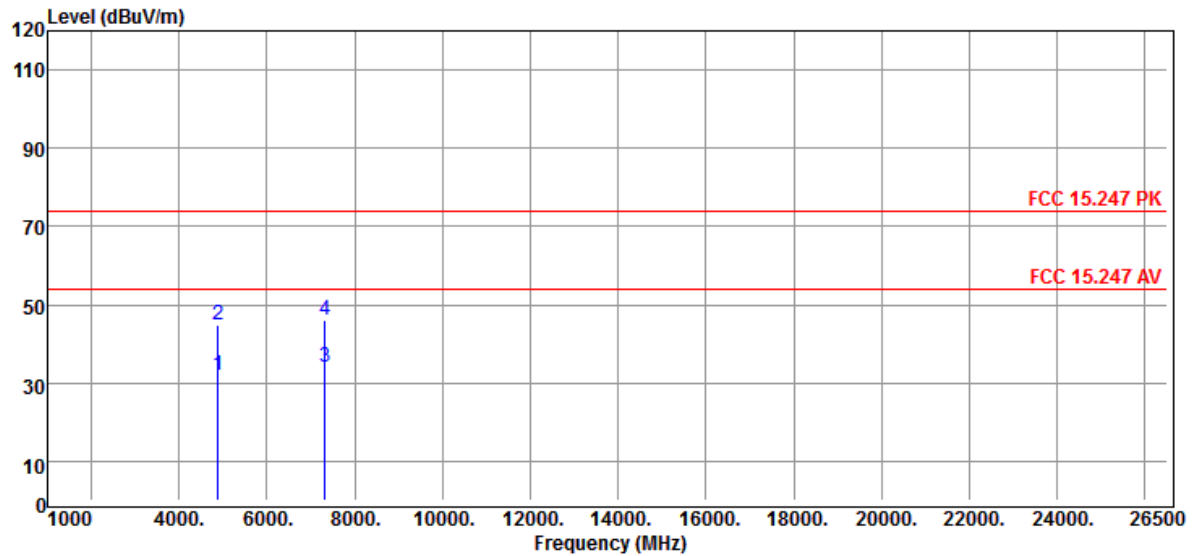
Real Level = Meter Level + System Factor

Margin = Real Level - Limit Line



Middle Channel

Horizontal



Freq		Meter	System	Cable	Antenna	Preamp	Real	Limit	Margin	Remark
MHz		Level	Factor	Loss	Factor	Gain	Level	Line		
		dBuV	dB/m	dB	dB/m	dB	dBuV/m	dBuV/m	dB	
1	4880.00	37.43	-5.45	6.74	34.63	46.82	31.98	54.00	-22.02	Average
2	4880.00	50.21	-5.45	6.74	34.63	46.82	44.76	74.00	-29.24	Peak
3	7320.00	36.24	-2.08	8.18	36.15	46.41	34.16	54.00	-19.84	Average
4	7320.00	48.33	-2.08	8.18	36.15	46.41	46.25	74.00	-27.75	Peak

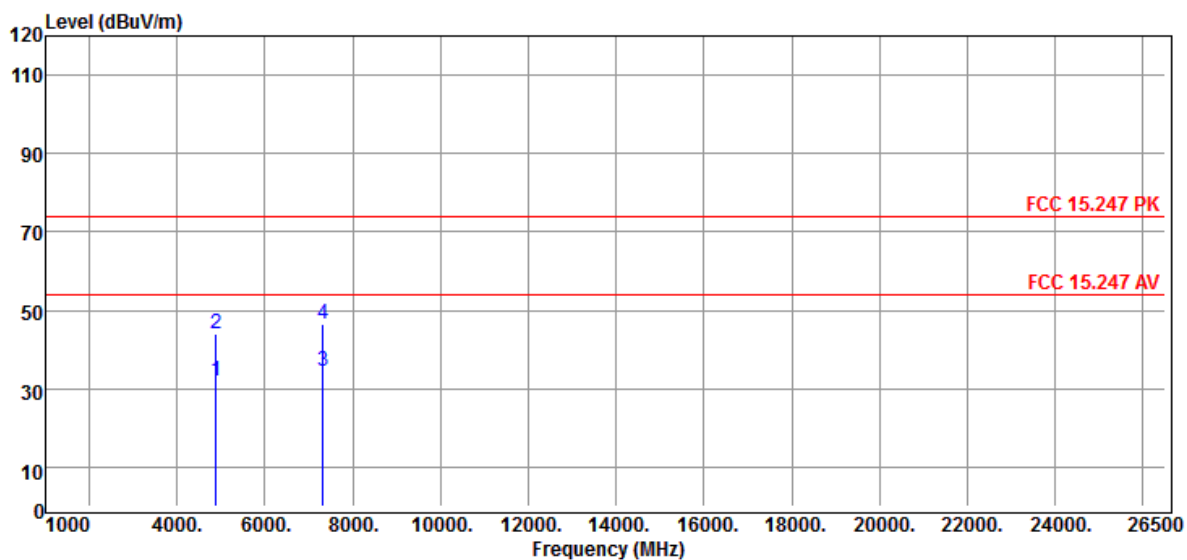
System Factor = Cable Loss + Antenna Factor - Preamp Gain

Real Level = Meter Level + System Factor

Margin = Real Level - Limit Line



Vertical



	Freq MHz	Meter Level dBUV	System Factor dB/m	Cable Loss dB	Antenna Factor dB/m	Preamp Gain dB	Real Level dBUV/m	Limit Line dBUV/m	Margin dB	Remark
1	4880.00	37.34	-5.45	6.74	34.63	46.82	31.89	54.00	-22.11	Average
2	4880.00	49.61	-5.45	6.74	34.63	46.82	44.16	74.00	-29.84	Peak
3	7320.00	36.38	-2.08	8.18	36.15	46.41	34.30	54.00	-19.70	Average
4	7320.00	48.61	-2.08	8.18	36.15	46.41	46.53	74.00	-27.47	Peak

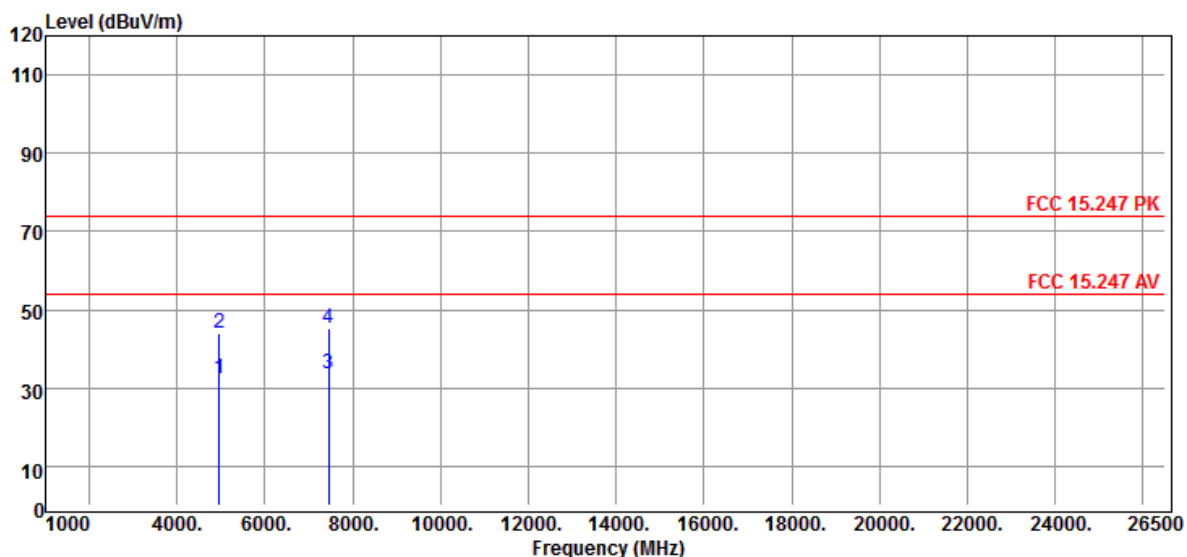
System Factor = Cable Loss + Antenna Factor - Preamp Gain

Real Level = Meter Level + System Factor

Margin = Real Level - Limit Line



Highest Channel
Horizontal



	Freq MHz	Meter Level dBuV	System Factor dB/m	Cable Loss dB	Antenna Factor dB/m	Preamp Gain dB	Real Level dBuV/m	Limit Line dBuV/m	Margin dB	Remark
1	4960.00	37.52	-5.32	6.81	34.68	46.81	32.20	54.00	-21.80	Average
2	4960.00	49.29	-5.32	6.81	34.68	46.81	43.97	74.00	-30.03	Peak
3	7440.00	35.44	-1.75	8.27	36.32	46.34	33.69	54.00	-20.31	Average
4	7440.00	47.10	-1.75	8.27	36.32	46.34	45.35	74.00	-28.65	Peak

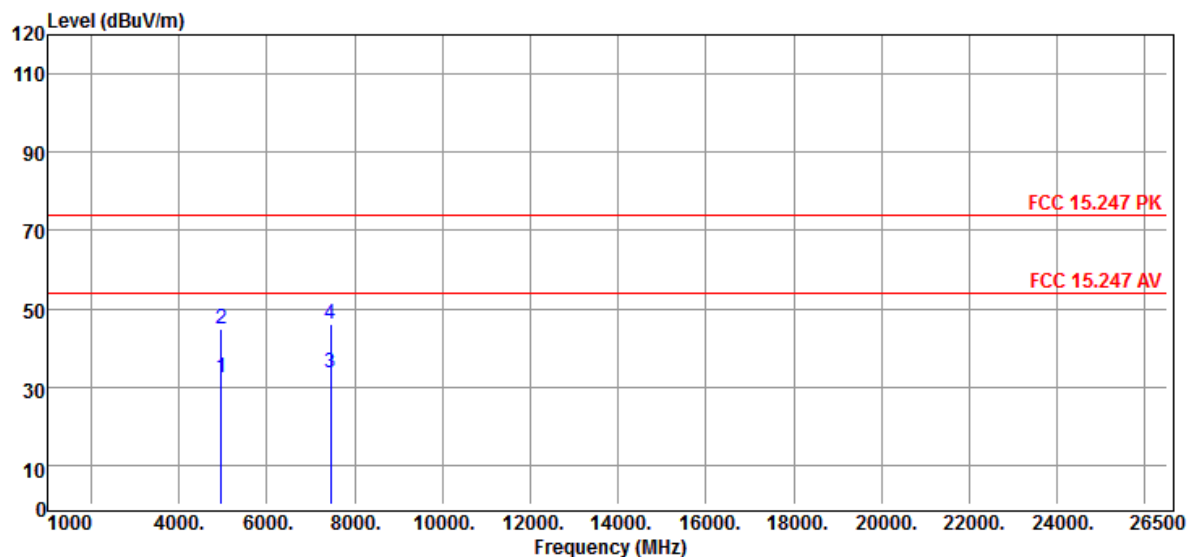
System Factor = Cable Loss + Antenna Factor - Preamp Gain

Real Level = Meter Level + System Factor

Margin = Real Level - Limit Line



Vertical



	Freq	Meter	System	Cable	Antenna	Preamp	Real	Limit	Margin	Remark
	MHz	Level	Factor	Loss	Factor	Gain	Level	Line	dB	
		dBuV	dB/m	dB	dB/m	dB	dBuV/m	dBuV/m		
1	4960.00	37.51	-5.32	6.81	34.68	46.81	32.19	54.00	-21.81	Average
2	4960.00	50.08	-5.32	6.81	34.68	46.81	44.76	74.00	-29.24	Peak
3	7440.00	35.42	-1.75	8.27	36.32	46.34	33.67	54.00	-20.33	Average
4	7440.00	47.83	-1.75	8.27	36.32	46.34	46.08	74.00	-27.92	Peak

System Factor = Cable Loss + Antenna Factor - Preamp Gain

Real Level = Meter Level + System Factor

Margin = Real Level - Limit Line



Note:

Emission level = Reading level + Correction factor

Correction factor : Antenna factor, Cable loss, PreAmp, etc.

All emissions as described above were determining by rotating the EUT through three orthogonal axes to maximizing the emissions if the EUT belongs to hand-held or body-worn devices.

Measurements from 9 kHz to 150 kHz, Peak detector setting: 100 Hz RBW

Measurements from 150 kHz to 30MHz, Peak detector setting: 10 kHz RBW

Measurements from 30 MHz to 1000 MHz, Peak detector setting: 100 kHz RBW

Measurements from 9 kHz to 150 kHz, CISPR Quasi-Peak detector: 200 Hz RBW

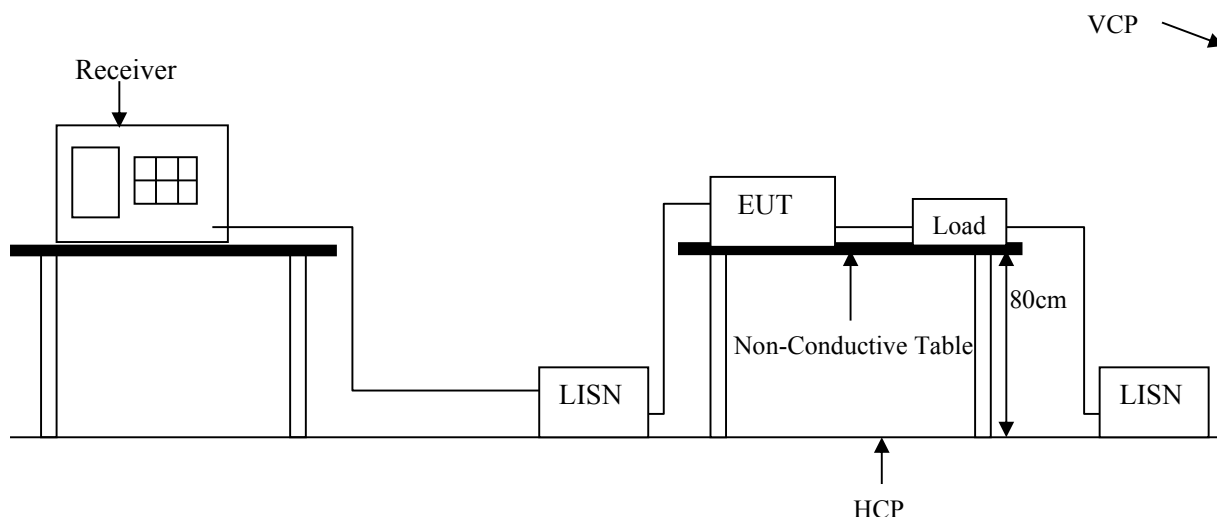
Measurements from 150 kHz to 30MHz, CISPR Quasi-Peak detector: 9 kHz RBW

Measurements from 30 MHz to 1000 MHz, CISPR Quasi-Peak detector: 120 kHz RBW

Peak detector measurement data will represent the worst case results.

8. AC POWER CONDUCTED EMISSIONS

8.1 TEST SETUP



8.2 LIMIT

Frequency range (MHz)	CLASS A		CLASS B	
	QP dB(uV)	Average dB(uV)	QP dB(uV)	Average dB(uV)
0.15-0.5	79 dBuV	66 dBuV	66 - 56 dBuV	56 - 46 dBuV
0.5-5.0	73 dBuV	60 dBuV	56 dBuV	46 dBuV
5.0-30.0	73 dBuV	60 dBuV	60 dBuV	50 dBuV

Remark: In the above table, the tighter limit applies at the band edges.

8.3 TEST PROCEDURE

The EUT and simulators are connected to the main power through a line impedance stabilization network (LISN). It provides a 50 ohm / 50 μ H coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50 ohm / 50 μ H coupling impedance with 50 ohm termination. (Please refer to the block diagram of the test setup and photograph.)

Both sides of AC line are checked for the maximum conducted emission interference. In order to find the maximum emissions, the relating positions of equipment and all of the interference cables must be changed according to EN 55022 regulations: The measurement procedure on conducted emission interference.

The resolution bandwidth of the field strength meter is set at 9 KHz.

8.4 TEST SPECIFICATION

According to PART15.207

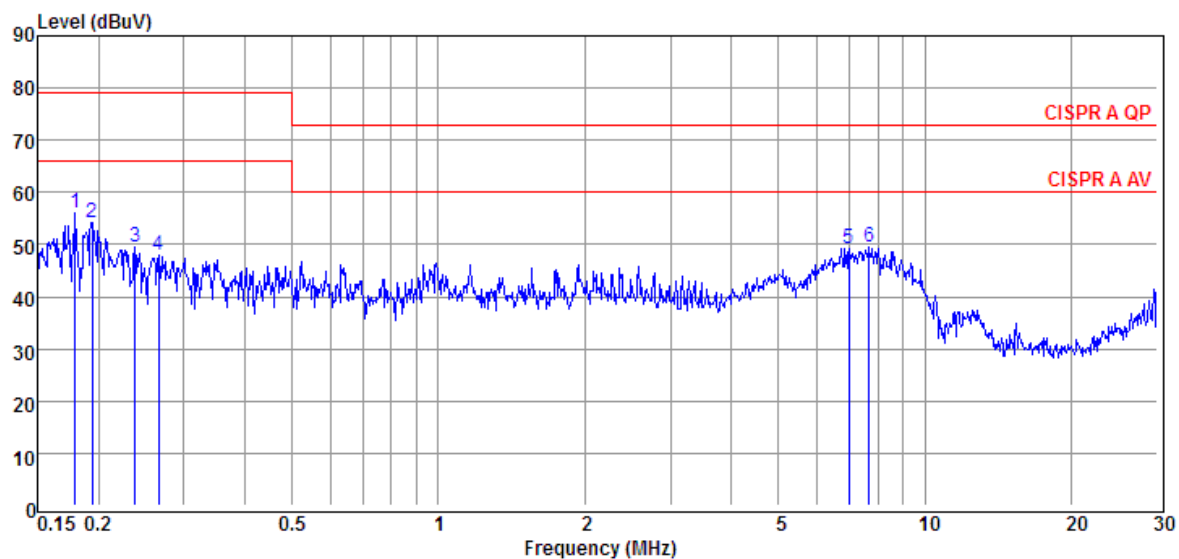


8.5 RESULT:

PASSED

8.6 TEST DATA:

LINE



	Freq MHz	Meter Level dBuV	System Factor dB	Cable Loss dB	LISN Factor dB	Real Level dBuV	Limit Line dBuV	Margin dB	Remark
1	0.18	35.84	20.12	20.11	0.01	55.96	79.00	-23.04	Peak
2	0.19	33.97	20.12	20.11	0.01	54.09	79.00	-24.91	Peak
3	0.24	29.27	20.13	20.12	0.01	49.40	79.00	-29.60	Peak
4	0.27	27.80	20.13	20.12	0.01	47.93	79.00	-31.07	Peak
5	6.99	28.73	20.52	20.40	0.12	49.25	73.00	-23.75	Peak
6	7.69	28.87	20.54	20.41	0.13	49.41	73.00	-23.59	Peak

System Factor = Cable Loss + LISN Factor

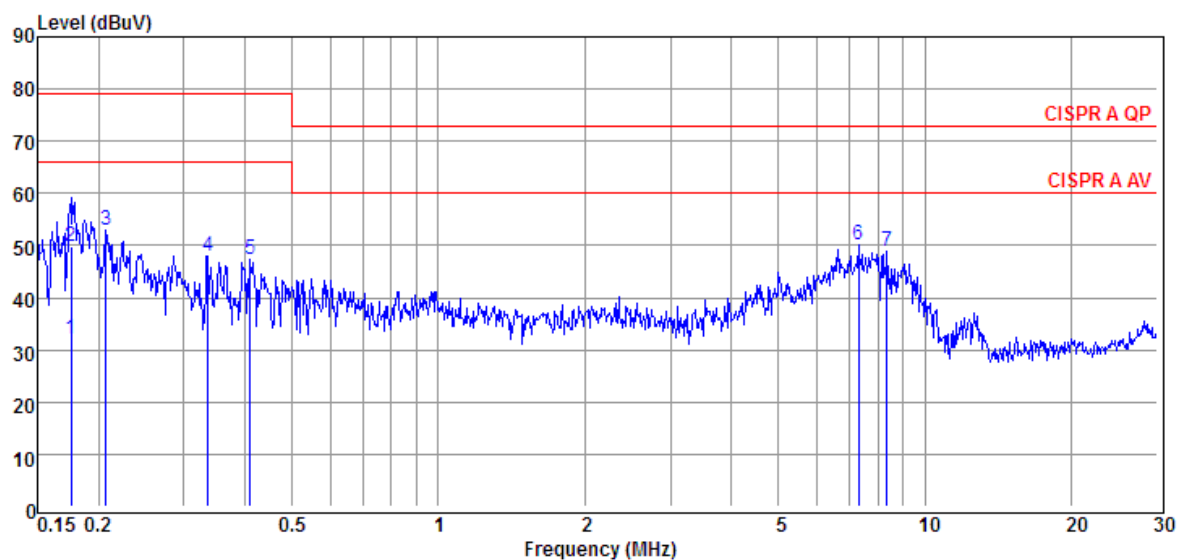
Cable Loss = Pulse limiter + Cable Insertion Loss

Real Level = Meter Level + System Factor

Margin = Real Level - Limit Line



NEUTRAL



	Freq MHz	Meter Level dBuV	System Factor dB	Cable Loss dB	LISN Factor dB	Real Level dBuV	Limit Line dBuV	Margin dB	Remark
1	0.18	11.90	20.13	20.10	0.03	32.03	66.00	-33.97	Average
2	0.18	29.66	20.13	20.10	0.03	49.79	79.00	-29.21	QP
3	0.21	32.87	20.14	20.11	0.03	53.01	79.00	-25.99	Peak
4	0.34	27.83	20.16	20.13	0.03	47.99	79.00	-31.01	Peak
5	0.41	27.27	20.17	20.14	0.03	47.44	79.00	-31.56	Peak
6	7.29	29.64	20.55	20.40	0.15	50.19	73.00	-22.81	Peak
7	8.37	28.26	20.60	20.44	0.16	48.86	73.00	-24.14	Peak

System Factor = Cable Loss + LISN Factor

Cable Loss = Pulse limiter + Cable Insertion Loss

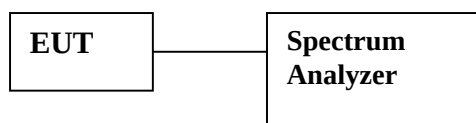
Real Level = Meter Level + System Factor

Margin = Real Level - Limit Line



9. POWER SPECTRAL DENSITY

9.1 TEST SETUP



9.2 LIMIT

According to §15.247(e) For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

9.3 TEST PROCEDURE

Refer to section 10.2 Peak Power Density(PKPPSD) Measurement Procedure of KDB Document: 558074 D01 DTS Meas Guidance v03r04

Use this procedure when the maximum peak conducted output power in the fundamental

emission is used to demonstrate compliance.

Set the RBW = 3 kHz.

Set the VBW $\geq$ 10 kHz.

Set the span to 5-30 % greater than the EBW.

Detector = peak.

Sweep time = auto couple.

Trace mode = max hold.

Allow trace to fully stabilize.

Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.

Scale the observed power level to an equivalent value in 3 kHz by adjusting (reducing) the measured power by a bandwidth correction factor (BWCF) where $BWCF = 10\log(3\text{kHz}/100\text{kHz} = -15.2 \text{ dB})$.

The resulting peak PSD level must be $\leq 8 \text{ dBm}$.

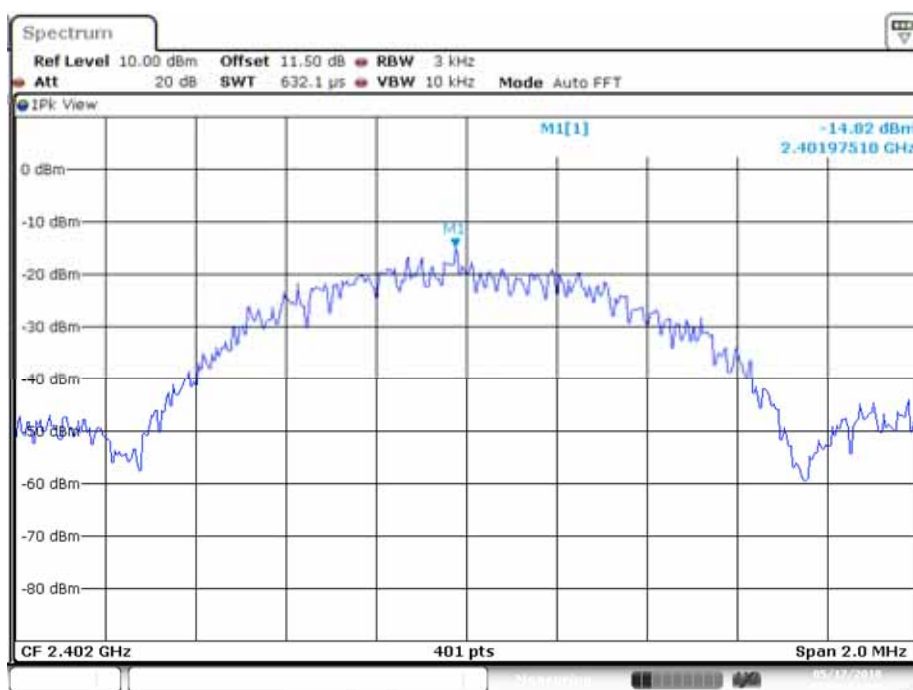


9.4 TEST RESULTS: PASSED

9.5 TEST DATA:

Configuration	Data Rate	Power Setting	Frequency	Power Density (dBm)	Power Density MAX. Limit (dBm)
Bluetooth Low Energy	1 Mbps	Def	2402 MHz	-14.82	8.00
		Def	2440 MHz	-13	8.00
		Def	2480 MHz	-12.68	8.00

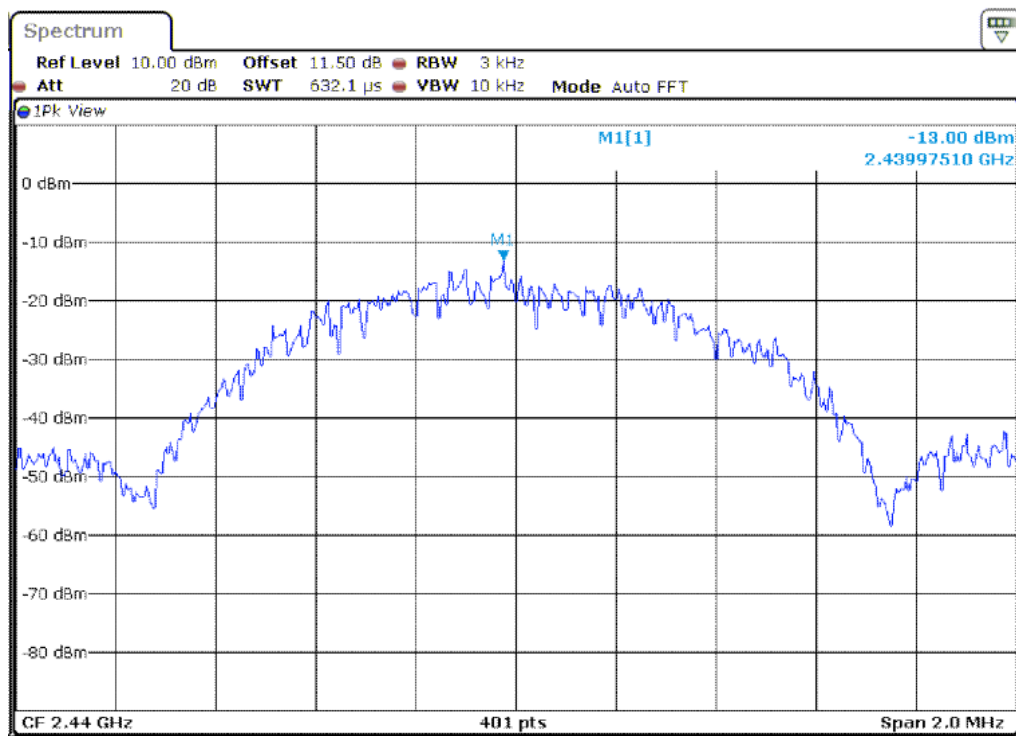
Low-CH



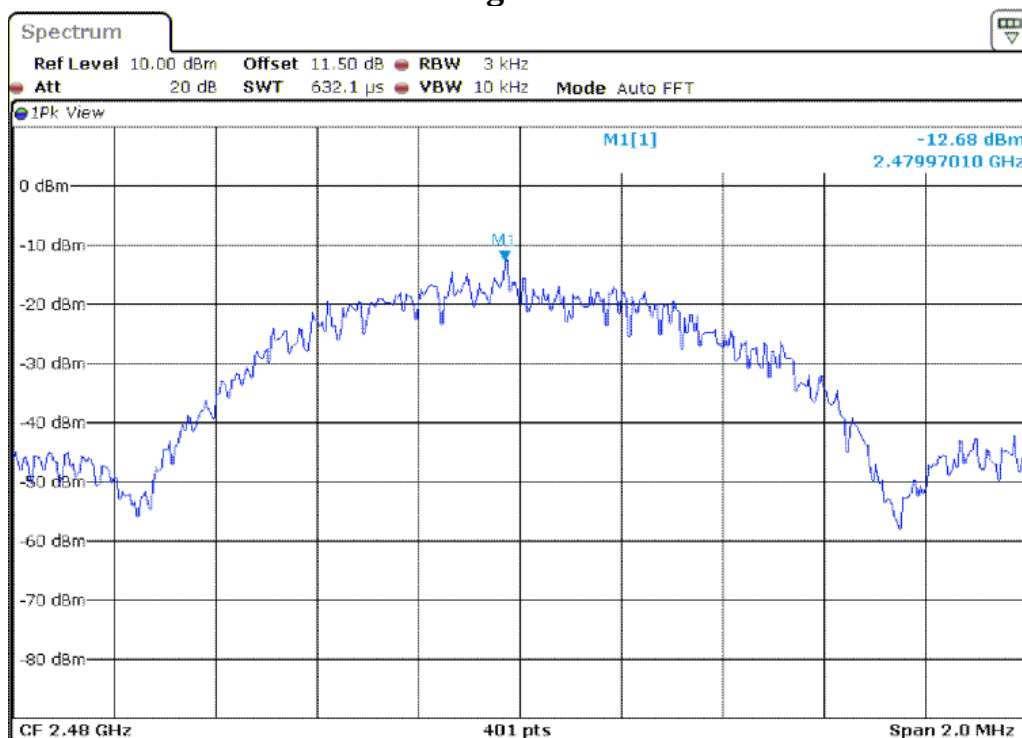
Date: 17.MAY.2018 17:00:51



Mid-CH



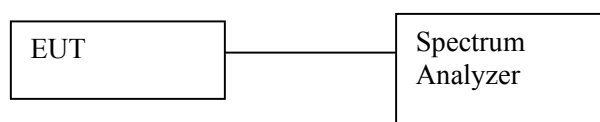
High-CH





10. OUT OF BAND CONDUCTED EMISSIONS MEASUREMENT

10.1 TEST SETUP



10.2 TEST PROCEDURE

In any 100 kHz outside the EUT pass band, the RF power produced by the modulation products of the spreading sequence, the information sequence, and the carrier frequency shall be at least 20 dB below that of the maximum in-band 100 kHz emission, antenna output of the EUT was coupled directly to spectrum analyzer 1; if an external attenuator and/or cable was used, these losses are compensated for with the analyzer offset function. All other types of emissions from the EUT shall meet the general limits for radiated frequencies outside the pass band. The test was preformed at 3 channels.

10.3 LIMIT

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 least 20 dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power.

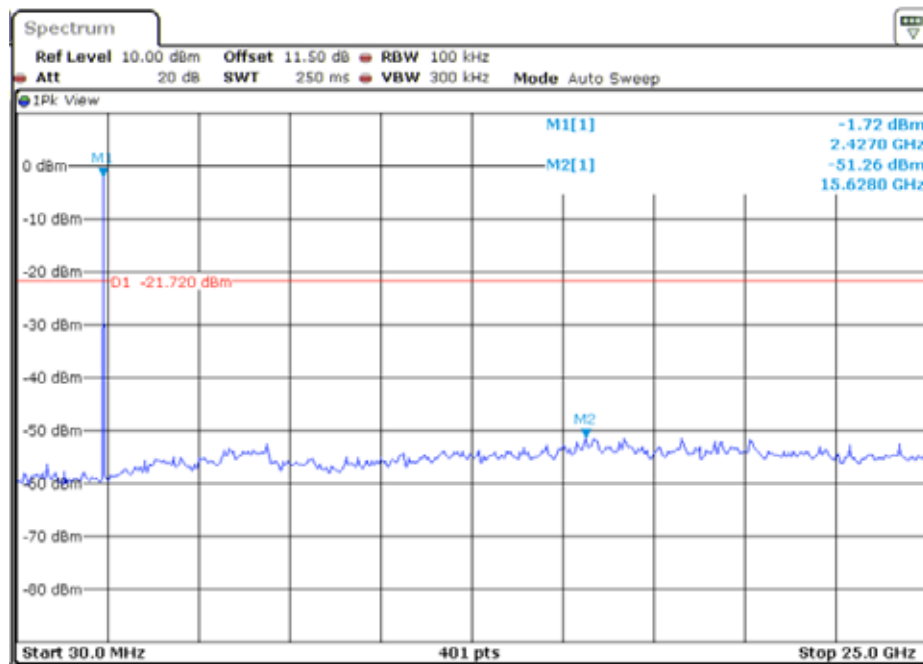
10.4 RESULT: PASSED

10.5 TEST DATA:

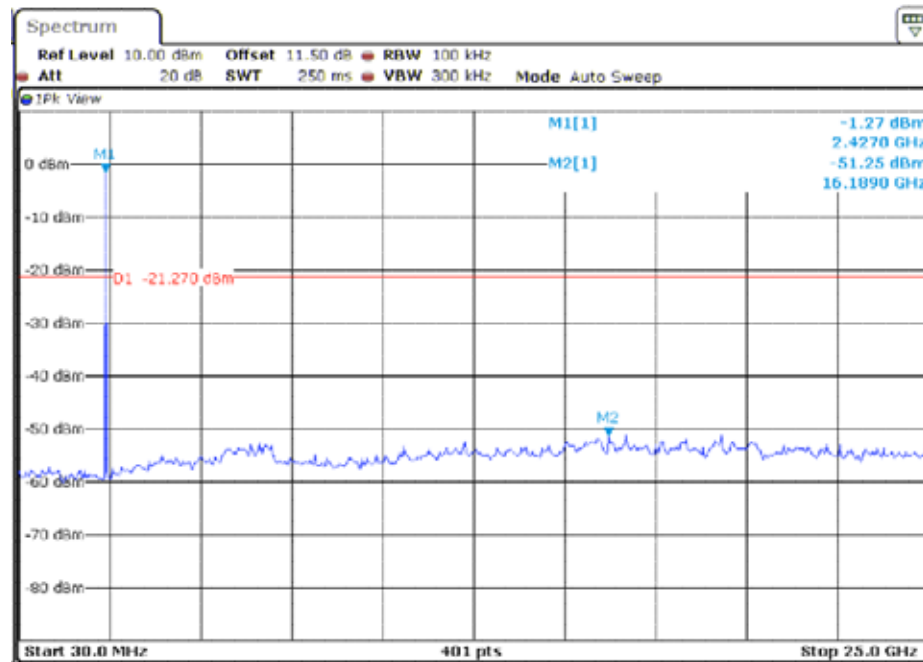
Configuration	Data Rate	Power Setting	Frequency	Limit (dBm)	Measurement (dBm)
Bluetooth Low Energy	1 Mbps	Def	2402 MHz	-21.72	-51.26
		Def	2440 MHz	-21.27	-51.25
		Def	2480 MHz	-21.66	-51.92



Low-CH

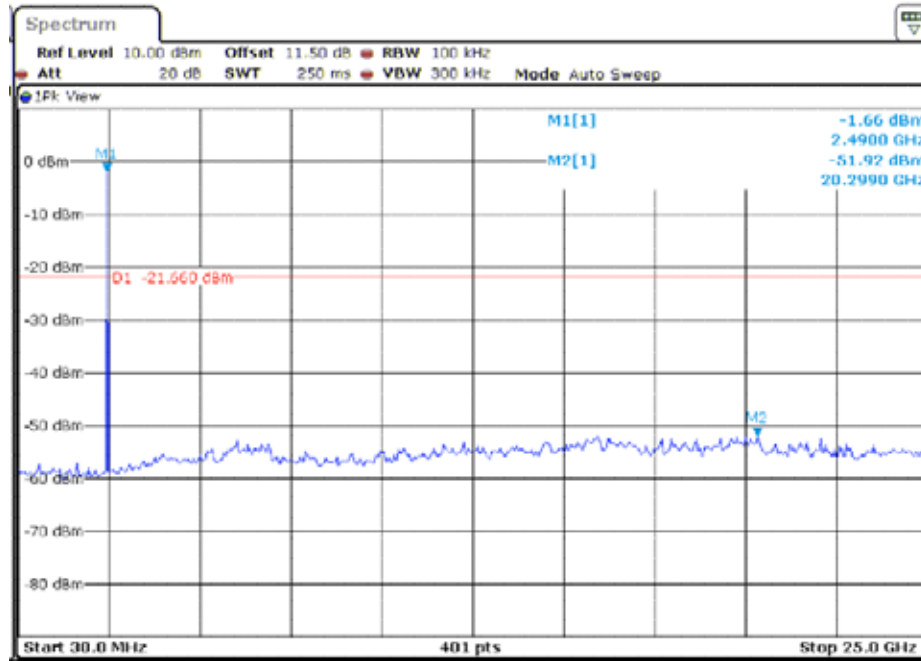


Mid-CH





High-CH





11. ANTENNA REQUIREMENT

11.1 STANDARD APPLICABLE:

According to §15.203, an intentional radiator shall be designed to ensure that no antenna other than furnished by the responsible party shall be used with the device.

And according to §15.247(c), if transmitting antennas of directional gain greater than 6dBi are used the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

According to RSS-GEN 8.3, the applicant for equipment certification, as per RSP-100, must provide a list of all antenna types that may be used with the licence-exempt transmitter, indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna.

Licence-exempt transmitters that have received equipment certification may operate with different types of antennas. However, it is not permissible to exceed the maximum equivalent isotropically radiated power (e.i.r.p.) limits specified in the applicable standard (RSS) for the licence-exempt apparatus.

Testing shall be performed using the highest gain antenna of each combination of licence-exempt transmitter and antenna type, with the transmitter output power set at the maximum level.⁹ When a measurement at the antenna connector is used to determine RF output power, the effective gain of the device's antenna shall be stated, based on a measurement or on data from the antenna manufacturer.

User manuals for transmitters equipped with detachable antennas shall also contain the following notice in a conspicuous location:

This radio transmitter (identify the device by certification number or model number if Category II) has been approved by Industry Canada to operate with the antenna types listed below with the maximum permissible gain indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Immediately following the above notice, the manufacturer shall provide a list of all antenna types approved for use with the transmitter, indicating the maximum permissible antenna gain (in dBi).

11.2 ANTENNA CONNECTED CONSTRUCTION:

The directional gains of antenna used for transmitting is 2.2dBi, and the antenna type is chip antenna which is designed with permanent attachment and no consideration of replacement. Please see EUT photo for details.