FCC Part 15.247

TEST REPORT

For

INGICS TECHNOLOGY CO., LTD.

2F., No.15-2, Changshou St., Shulin Dist., New Taipei City 238, Taiwan

FCC ID: 2AH2IIBM40R2

Report Type:	**Product Type:**
Original Report	BLE module

Report Producer : Kaylee Chiang

Report Number : RXZ1807010-00B

Report Date : 2019-02-23

Reviewed By: Jerry Chang

Prepared By: Bay Area Compliance Laboratories Corp.(Taiwan)
70, Lane 169, Sec. 2, Datong Road, Xizhi Dist.,
New Taipei City 22183, Taiwan, R.O.C.
Tel: +886 (2) 2647 6898
Fax: +886 (2) 2647 6895
www.bacl.com.tw

Revision History

Revision	No.	Report Number	Issue Date	Description	Author/ Revised by
1.0	RXZ1807010	RXZ1807010-00B	2019-02-23	Original Report	Kaylee Chiang

TABLE OF CONTENTS

1 General Information 5

1.1 Product Description for Equipment under Test (EUT) 5
1.2 Objective 6
1.3 Related Submittal(s)/Grant(s) 6
1.4 Test Methodology 6
1.5 Test Facility 6

2 System Test Configuration 7

2.1 Description of Test Configuration 7
2.2 Equipment Modifications 7
2.3 EUT Exercise Software 7
2.4 Support Equipment List and Details 7
2.5 External Cable List and Details 7
2.6 Test Mode 7
2.7 Block Diagram of Test Setup 8
2.8 Duty Cycle 10

3 Summary of Test Results 12

4 Test Equipment List and Details 13

5 FCC §15.247(i), §1.1310, § 2.1091 - Maximum Permissible Exposure (MPE) 15

5.1 Applicable Standard 15
5.2 RF Exposure Evaluation Result 15

6 FCC §15.203 – Antenna Requirements 16

6.1 Applicable Standard 16
6.2 Antenna Information 16

7 FCC §15.207(a) – AC Line Conducted Emissions 17

7.1 Applicable Standard 17
7.2 Measurement Uncertainty 17
7.3 EUT Setup 18
7.4 EMI Test Receiver Setup 18
7.5 Test Procedure 18
7.6 Corrected Factor & Margin Calculation 19
7.7 Environmental Conditions 19
7.8 Test Results 20

8 FCC §15.209, §15.205 , §15.247(d) – Spurious Emissions 26

8.1 Applicable Standard 26
8.2 Measurement Uncertainty 27
8.3 EUT Setup 28
8.4 EMI Test Receiver & Spectrum Analyzer Setup 28
8.5 Test Procedure 29
8.6 Corrected Factor & Margin Calculation 29
8.7 Test Results Summary 29
8.8 Environmental Conditions 29
8.9 Test Results 30

9 FCC §15.247(a)(2) – 6 dB Emission Bandwidth 64

9.1 Applicable Standard 64
9.2 Test Procedure 64
9.3 Environmental Conditions 64
9.4 Test Results 65

10 FCC §15.247(b)(3) – Maximum Output Power 69

10.1 Applicable Standard 69
10.2 Test Procedure 69
10.3 Environmental Conditions 69
10.4 Test Results 70

11 FCC§15.247(d) – 100 kHz Bandwidth of Frequency Band Edge 71

11.1 Applicable Standard 71
11.2 Test Procedure 71
11.3 Environmental Conditions 71
11.4 Test Results 72

12 FCC §15.247(e) – Power Spectral Density 75

12.1 Applicable Standard 75
12.2 Test Procedure 75
12.3 Environmental Conditions 75
12.4 Test Results 76

1 General Information

1.1 Product Description for Equipment under Test (EUT)

Applicant	INGICS TECHNOLOGY CO., LTD.
	2F., No.15-2, Changshou St., Shulin Dist., New Taipei City 238, Taiwan
Manufacturer	INGICS TECHNOLOGY CO., LTD.
	2F., No.15-2, Changshou St., Shulin Dist., New Taipei City 238, Taiwan
Brand(Trade) Name	INGICS
Product (Equipment)	BLE module
Main Model Name	iBM40R2
Frequency Range	2402 ~ 2480 MHz
Transmit Power	BLE(1M) Mode: 1.04 dBm (0.0013W) BLE(2M) Mode: 1.04 dBm (0.0013W)
Modulation Technique	BLE Mode: GFSK
Transmit Data Rate	BLE Mode: 1 Mbps
Number of Channels	BLE Mode: 40 Channels
Antenna Specification	Antenna 1: FPCB Antenna / 3.3 dBi Antenna 2: Chip(External) Antenna / 3.2 dBi Antenna 3: Chip(Internal) Antenna / 3.2 dBi
Power Operation (Voltage Range)	☐ AC 120V/60Hz ☐ Adapter I/P: 100-240Vac,1.2A ; O/P: 12Vdc, 3A ☐ By AC Power Cord ☐ PoE
	☒ DC Type ☐ Battery ☒ DC Power Supply: 3.3Vdc ☐ External from USB Cable ☐ External DC Adapter
	☐ Host System
Received Date	July 12, 2018
Date of Test	Jan 15, 2019 ~ Feb 21, 2019

**All measurement and test data in this report was gathered from production sample serial number: 1807010 (Assigned by BACL, Taiwan).*

1.2 Objective

This report is prepared on behalf of *INGICS TECHNOLOGY CO*., LTD. in accordance with Part 2, Subpart J, Part 15, Subparts A and C of the Federal Communication Commission's rules.

The objective is to determine compliance with FCC Part 15.247 rules for Output Power, Antenna Requirements, 6 dB Bandwidth, Power Spectral Density, 100 kHz Bandwidth of Band Edges Measurement, Conducted and Radiated Spurious Emissions.

1.3 Related Submittal(s)/Grant(s)

N/A.

1.4 Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

1.5 Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Taiwan) to collect test data is located on

☒70, Lane 169, Sec. 2, Datong Road, Xizhi Dist., New Taipei City 22183, Taiwan, R.O.C.

☐68-3, Lane 169, Sec. 2, Datong Road, Xizhi Dist., New Taipei City 22183, Taiwan, R.O.C.

Bay Area Compliance Laboratories Corp. (Taiwan) Lab is accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code: 3180) and the FCC designation No.TW3180 under the Mutual Recognition Agreement (MRA) in FCC Test. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.10.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 974454. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

2 System Test Configuration

2.1 Description of Test Configuration

For BT BLE mode, there are totally 40 channels.

Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2402	21	2442
2	2404	--	--
3	2406	--	--
4	2408	38	2476
--	--	39	2478
20	2440	40	2480

For BLE Modes were tested with channel 1, 20 and 40.

2.2 Equipment Modifications

No modification was made to the EUT.

2.3 EUT Exercise Software

The test software was used "SmartRF_Studio_7-2.6.1".

2.4 Support Equipment List and Details

Description	Manufacturer	Model Number	BSMI	FCC ID	S/N
NB	DELL	E6410	N/A	PD98260NGU	10912240367

2.5 External Cable List and Details

Cable Description	Length (m)	From	To
N/A	N/A	N/A	N/A

2.6 Test Mode

AC Line Conducted Emissions and Radiated Spurious Emissions

Mode 1: Module + Antenna 1 [FPCB].

Mode 2: Module + Antenna 2 [Chip (External)].

Mode 3: Module + Antenna 3 [Chip (Internal)].

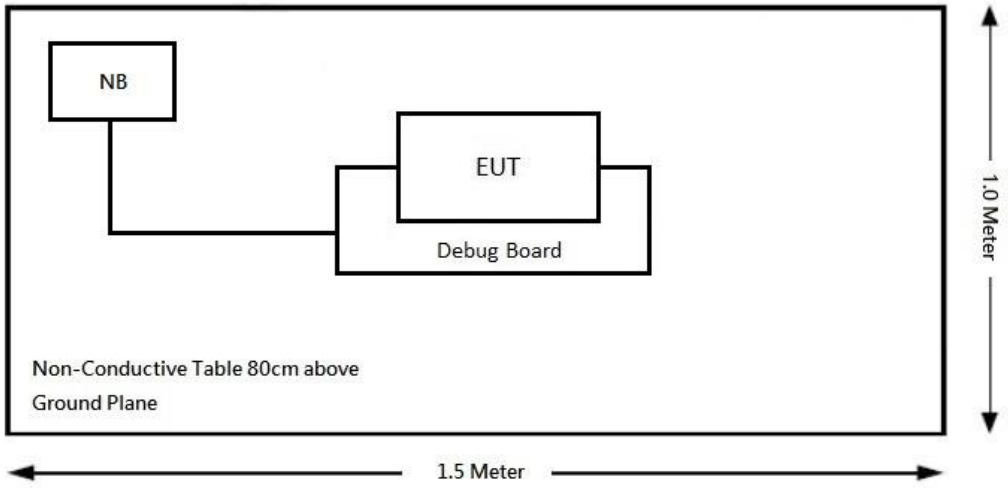
Worst case is the maximum gain for PCB type, so the antenna tests all test items.

2.7 Block Diagram of Test Setup

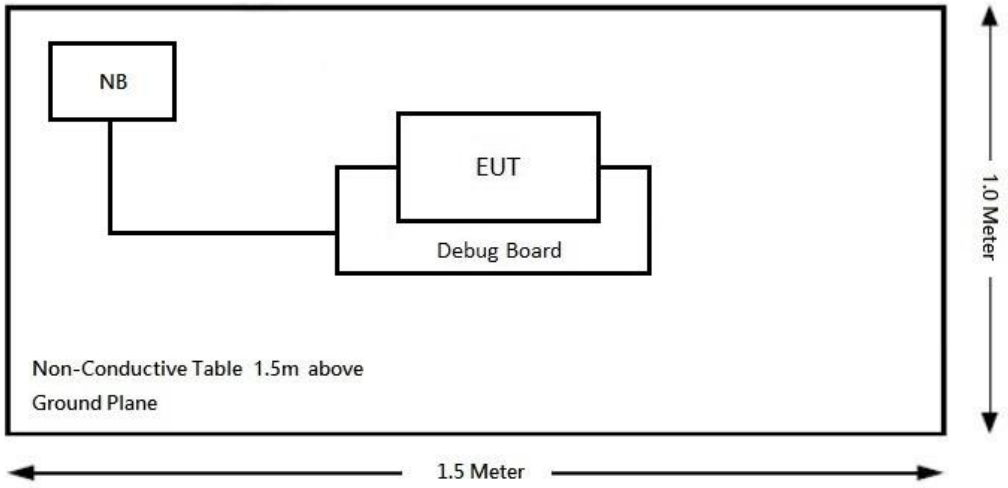
See test photographs attached in setup photos for the actual connections between EUT and support equipment.

Radiation: (Mode 1 & Mode 2 & Mode 3)

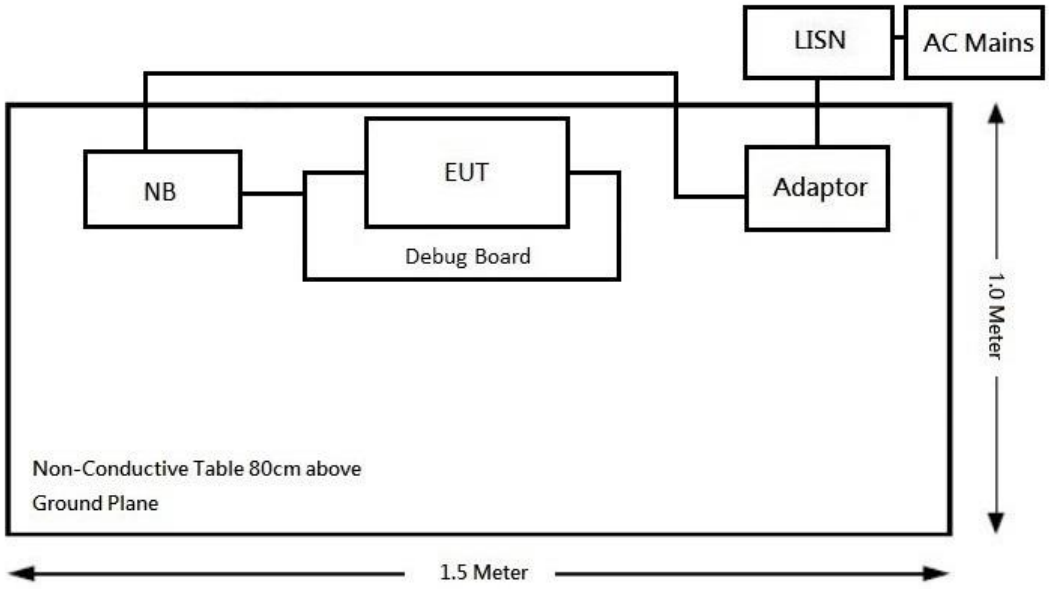
Below 1GHz:



Above 1GHz:



Conduction: (Mode 1 & Mode 2 & Mode 3)



2.8 Duty Cycle

According to KDB 558074 D01 15.247 Meas Guidance v05r01 section 6.0:

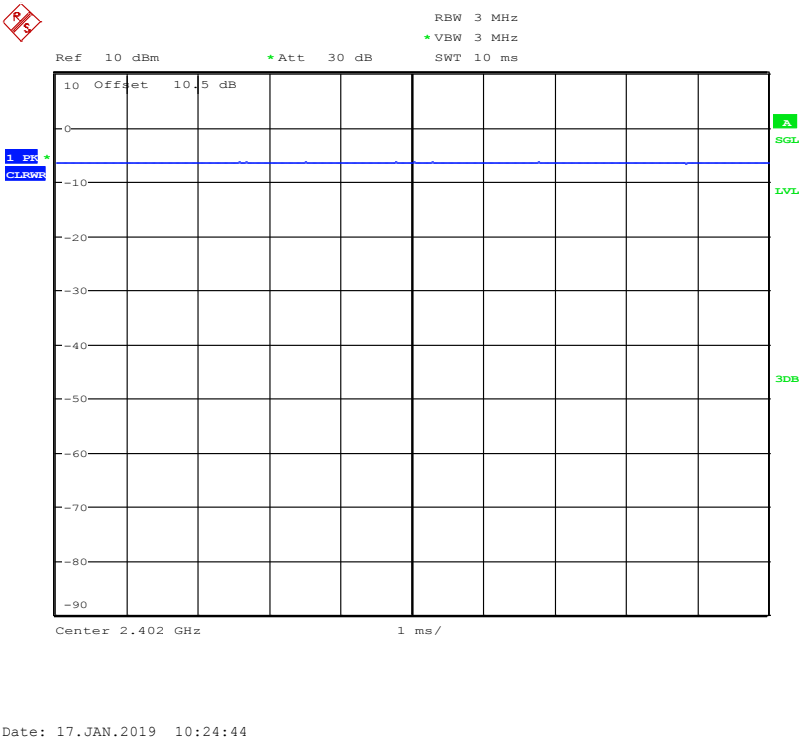
All measurements are to be performed with the EUT transmitting at 100% duty cycle at its maximum power control level; however, if 100% duty cycle cannot be achieved, measurements of duty cycle, x, and maximumpower transmission duration, T, are required for each tested mode of operation.

Radio Mode	On Time (ms)	Period (ms)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)
BLE(1M)	10	10	100	0
BLE(2M)	10	10	100	0

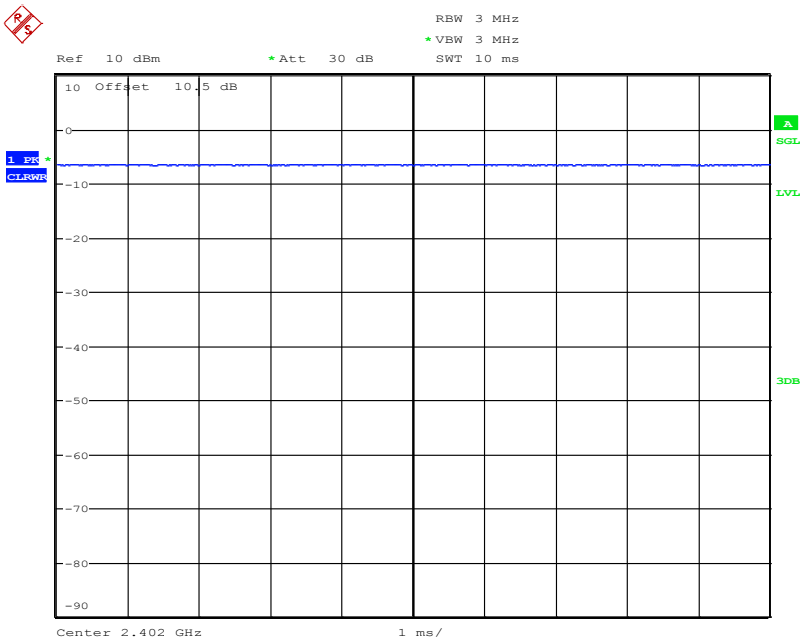
Note: Duty Cycle Correction Factor = 10*log(1/duty cycle)

Please refer to the following plots.

BLE(1M) Mode



BLE(2M) Mode



Date: 17.JAN.2019 10:26:49

3 Summary of Test Results

FCC Rules	Description of Test	Results
§15.247(i), §1.1310, §2.1091	Maximum Permissible Exposure (MPE)	Compliance
§15.203	Antenna Requirement	Compliance
§15.207(a)	AC Line Conducted Emissions	Compliance
§15.205, §15.209, §15.247(d)	Spurious Emissions	Compliance
§15.247(a)(2)	6 dB Emission Bandwidth	Compliance
§15.247(b)(3)	Maximum Peak Output Power	Compliance
§15.247(d)	100 kHz Bandwidth of Frequency Band Edge	Compliance
§15.247(e)	Power Spectral Density	Compliance

4 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due Date
AC Line Conduction Room (CON-A)					
LISN	Rohde & Schwarz	ENV216	101612	2018/02/22	2019/02/21
EMI Test Receiver	Rohde & Schwarz	ESR7	101419	2018/10/23	2019/10/22
Pulse Limiter	Rohde & Schwarz	ESH3Z2	TXZEM104	2018/08/03	2019/08/02
RF Cable	EMEC	EM-CB5D	001	2018/07/02	2019/07/01
Software	AUDIX	E3	V9.150826k	N.C.R	N.C.R
Radiated Room (966-A)					
Bilog Antenna with 6 dB Attenuator	SUNOL SCIENCES & MINI-CIRCUITS	JB6/UNAT-6+	A050115/15542_01	2018/12/11	2019/12/10
Horn Antenna	EMCO	3115	9311-4158	2018/04/20	2019/04/19
Horn Antenna	ETS-Lindgren	3116	62638	2018/08/29	2019/08/28
Preamplifier	Sonoma	310N	130602	2018/07/04	2019/07/03
Preamplifier	EM Electronics Corp.	EM01G18G	060657	2018/12/07	2019/12/06
Microware Preamplifier	EM Electronics Corporation	EM18G40G	060656	2019/01/11	2020/01/10
EMI Test Receiver	Rohde & Schwarz	ESR7	101419	2018/10/23	2019/10/22
Spectrum Analyzer	Rohde & Schwarz	FSV40	101435	2018/02/12	2019/02/13
Micro flex Cable	UTIFLEX	FSCM 64639 / (2M)	93D0127	2018/07/31	2019/07/30
Micro flex Cable	UTIFLEX	UFA210A-1-3149-300300	MFR64639 226389-001	2018/11/16	2019/11/15
Micro flex Cable	ROSNOL	K1K50-UP0264-K1K50-450CM	160309-1	2018/03/05	2019/03/04
Micro flex Cable	ROSNOL	K1K50-UP0264-K1K50-80CM	160309-2	2018/01/17	2019/01/16
Turn Table	Champro	TT-2000	060772-T	N.C.R	N.C.R
Antenna Tower	Champro	AM-BS-4500-B	060772-A	N.C.R	N.C.R
Controller	Champro	EM1000	60772	N.C.R	N.C.R
Software	Farad	EZ_EMC	BACL-03A1	N.C.R	N.C.R

Description	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due Date
Conducted Room					
Spectrum Analyzer	Rohde & Schwarz	FSU26	200268	2018/05/04	2019/05/03
Cable	WOKEN	SFL402	S02-160323-07	2018/02/12	2019/02/11
				2019/02/11	2020/02/10
Attenuator	MINI-CIRCUITS	BW-S10W5+	N/A	2018/03/08	2019/03/07
Power Sensor	KEYSIGHT	U2021XA	MY54080018	2018/03/07	2019/03/06

***Statement of Traceability:** BACL Corp. attests that all of the calibrations on the equipment items listed above were traceable to the SI System of Units via the R.O.C. Center for Measurement Standards of the Electronics Testing Center, Taiwan (ETC) or to another internationally recognized National Metrology Institute (NMI), and were compliant with the current Taiwan Accreditation Foundation (TAF) requirements*

5 FCC §15.247(i), §1.1310, § 2.1091 - Maximum Permissible Exposure (MPE)

5.1 Applicable Standard

According to subpart 15.247(i)and subpart §1.1310, systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

Limits for Maximum Permissible Exposure (MPE) (§1.1310, §2.1091)

(B) Limits for General Population/Uncontrolled Exposure				
Frequency Range (MHz)	**Electric Field Strength (V/m)**	**Magnetic Field Strength (A/m)**	**Power Density (mW/cm^2)**	**Averaging Time (minutes)**
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*($180/f^2$)	30
30–300	27.5	0.073	0.2	30
300–1500	/	/	f/1500	30
1500–100,000	/	/	1.0	30

f = frequency in MHz; * = Plane-wave equivalent power density;

According to §1.1310 and §2.1091 RF exposure is calculated.

Calculated Formulary:

Predication of MPE limit at a given distance

$S = PG/4\pi R^2$ = power density (in appropriate units, e.g. mW/cm^2);

P = power input to the antenna (in appropriate units, e.g., mW);

G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain;

R = distance to the center of radiation of the antenna (appropriate units, e.g., cm);

5.2 RF Exposure Evaluation Result

MPE evaluation:

Mode	Frequency Range (MHz)	Antenna Gain		Target Power		Evaluation Distance (cm)	Power Density (mW/cm^2)	MPE Limit (mW/cm^2)
		(dBi)	(numeric)	(dBm)	(mW)			
BLE	2402-2480	3.3	2.14	1.5	1.41	20	0.0006	1

Conclusion: The EUT meets exemption requirement- RF exposure evaluation greater than 20cm distance specified in § 2.1091. If the device built into a host as a portable usage, the additional RF exposure evaluation may be required as specified by§ 2.1093.

6 FCC §15.203 – Antenna Requirements

6.1 Applicable Standard

According to § 15.203,

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the user of a standard antenna jack or electrical connector is prohibited.

And according to FCC 47 CFR section 15.247 (b), if the 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 does not exceed 6dBi.

6.2 Antenna Information

No.	Manufacturer	Type	Antenna Gain	Result
1	TEXAS INSTRUMENTS	FPCB Antenna	3.3 dBi	Compliance
2	RIFO Technologies Corporation	Chip(External) Antenna	3.2 dBi	Compliance
3	RIFO Technologies Corporation	Chip(Internal) Antenna	3.2 dBi	Compliance

The EUT has three sets of permanent antenna configurations that are permanently connected; this meets the requirements of this section.

7 FCC §15.207(a) – AC Line Conducted Emissions

7.1 Applicable Standard

According to §15.207

For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequencies ranges.

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-Peak	Average
0.15-0.5	66 to 56 Note 1	56 to 46 Note 2
0.5-5	56	46
5-30	60	50

Note 1: Decreases with the logarithm of the frequency.

Note 2: A linear average detector is required

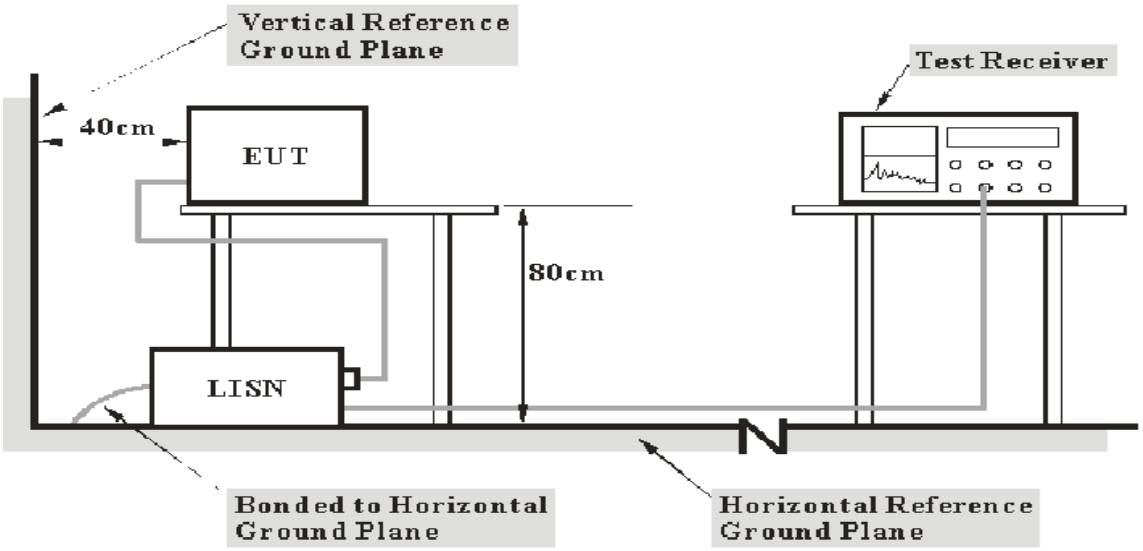
7.2 Measurement Uncertainty

Input quantities to be considered for conducted disturbance measurements maybe receiver reading, attenuation of the connection between LISN/ISN and receiver, LISN/ISN voltage division factor, LISN/ISN VDF frequency interpolation and receiver related input quantities, etc.

Based on CISPR 16-4-2:2011, the expended combined standard uncertainty of conducted disturbance test at Bay Area Compliance Laboratories Corp. (Taiwan) is shown as below. And the uncertainty will not be taken into consideration for the test data recorded in the report

Port	Expanded Measurement uncertainty
AC Mains	2.71 dB (k=2, 95% level of confidence)

7.3 EUT Setup



Note: 1. Support units were connected to second LISN.
2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.207 limits.

7.4 EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150kHz to 30MHz.

During the conducted emission test, the EMI test receiver was set with the following configurations

Frequency Range	IF B/W
150kHz – 30MHz	9kHz

7.5 Test Procedure

During the conducted emission test, the adapter was connected to the outlet of the LISN.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All data was recorded in the Quasi-peak and average detection mode.

7.6 Corrected Factor & Margin Calculation

The factor is calculated by adding LISN/ISN VDF (Voltage Division Factor), Cable Loss and Transient Limiter Attenuation. The basic equation is as follows:

Factor = LISN VDF + Cable Loss + Transient Limiter Attenuation

The "Over Limit" column of the following data tables indicates the degree of compliance with the applicable limit. For example, an over limit of -7 dB means the emission is 7 dB below the limit. The equation for Over Limit calculation is as follows:

Over Limit = Level – Limit Line

7.7 Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	55 %
ATM Pressure:	1010 hPa

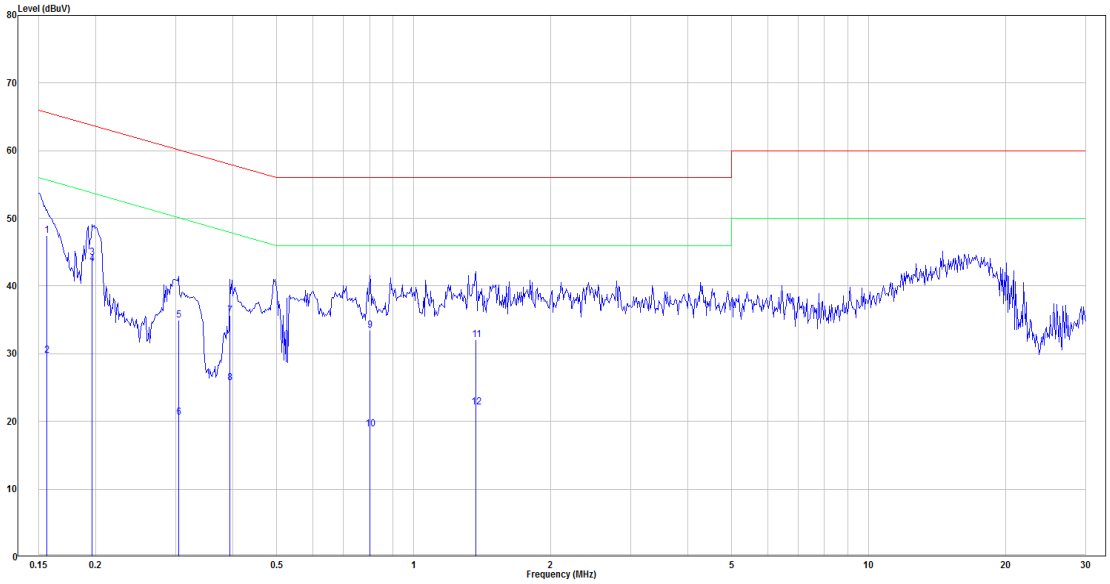
The testing was performed by Tom Hsu on 2019-01-24.

7.8 Test Results

Test Mode: Transmitting

Mode 1

Main: AC120 V, 60 Hz, Line



No.	Frequency	Reading	Correct	Result	Limit	Over limit	Remark
	(MHz)	(dBµV)	Factor(dB)	(dBµV)	(dBµV)	(dB)	
1	0.156	27.96	19.45	47.41	65.67	-18.26	QP
2	0.156	10.34	19.45	29.79	55.67	-25.87	Average
3	0.196	24.73	19.46	44.19	63.76	-19.57	QP
4	0.196	23.80	19.46	43.26	53.76	-10.50	Average
5	0.304	15.51	19.47	34.98	60.12	-25.14	QP
6	0.304	1.17	19.47	20.64	50.12	-29.49	Average
7	0.394	16.18	19.47	35.65	57.97	-22.31	QP
8	0.394	6.18	19.47	25.65	47.97	-22.32	Average
9	0.801	13.92	19.49	33.40	56.00	-22.60	QP
10	0.801	-0.62	19.49	18.87	46.00	-27.13	Average
11	1.372	12.54	19.52	32.06	56.00	-23.94	QP
12	1.372	2.58	19.52	22.10	46.00	-23.90	Average

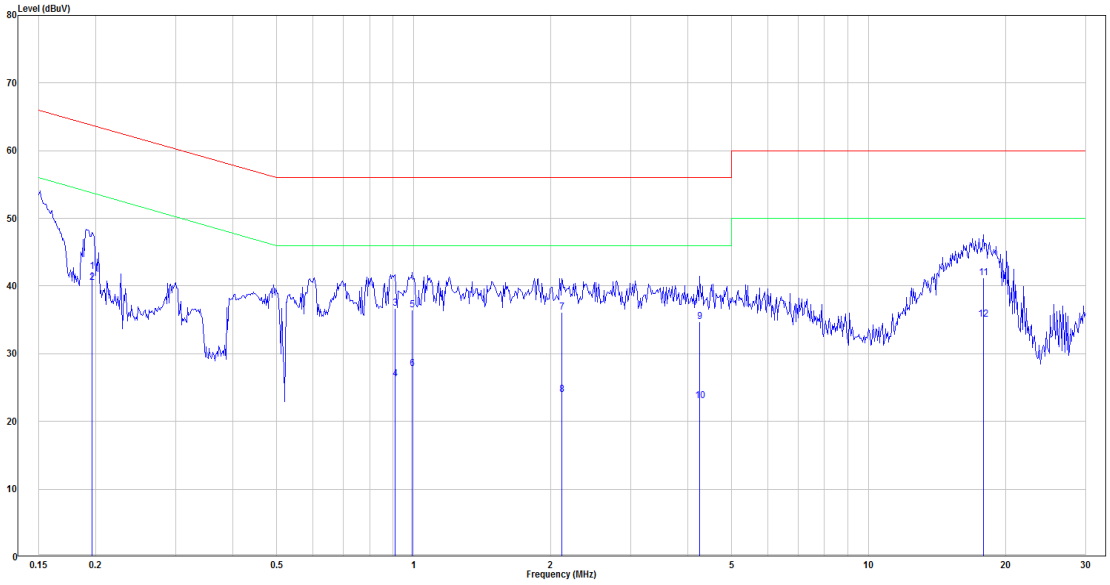
Note:

Level = Read Level + Factor

Over Limit = Level – Limit Line

Factor = (LISN, ISN, PLC or current probe) Factor + Cable Loss + Attenuator

Main: AC120 V, 60 Hz, Neutral



No.	Frequency	Reading	Correct	Result	Limit	Over limit	Remark
	(MHz)	(dBµV)	Factor(dB)	(dBµV)	(dBµV)	(dB)	
1	0.196	22.71	19.46	42.17	63.76	-21.59	QP
2	0.196	21.06	19.46	40.52	53.76	-13.25	Average
3	0.911	17.20	19.48	36.67	56.00	-19.33	QP
4	0.911	6.80	19.48	26.28	46.00	-19.72	Average
5	0.992	17.04	19.48	36.52	56.00	-19.48	QP
6	0.992	8.25	19.48	27.73	46.00	-18.27	Average
7	2.116	16.57	19.54	36.11	56.00	-19.89	QP
8	2.116	4.38	19.54	23.93	46.00	-22.07	Average
9	4.252	15.11	19.58	34.70	56.00	-21.30	QP
10	4.252	3.44	19.58	23.02	46.00	-22.98	Average
11	17.865	21.39	19.81	41.20	60.00	-18.80	QP
12	17.865	15.26	19.81	35.07	50.00	-14.93	Average

Note:

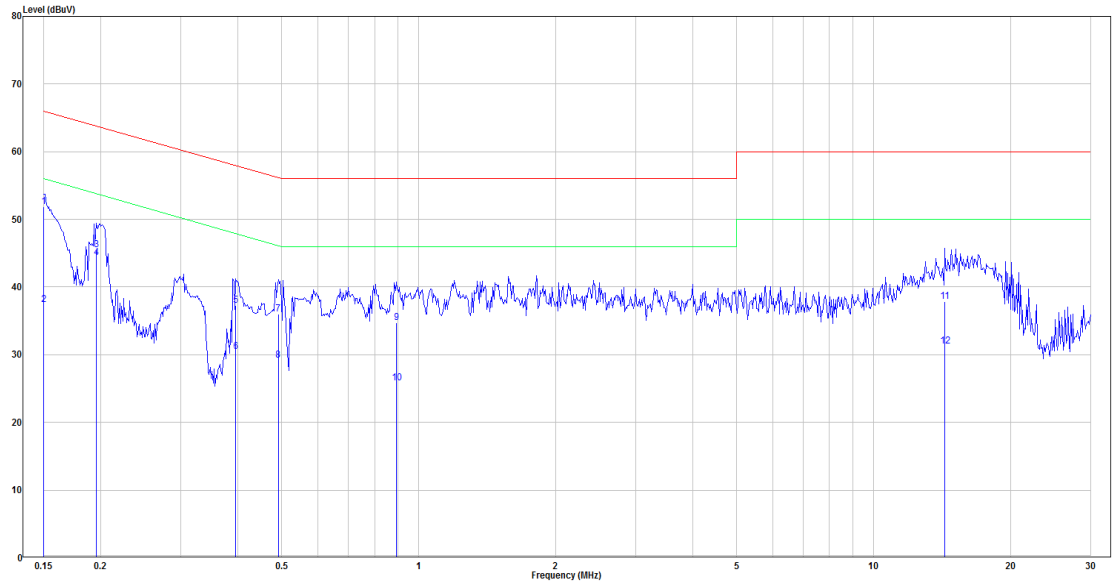
Level = Read Level + Factor

Over Limit = Level – Limit Line

Factor = (LISN, ISN, PLC or current probe) Factor + Cable Loss + Attenuator

Mode 2

Main: AC120 V, 60 Hz, Line



No.	Frequency	Reading	Correct	Result	Limit	Over limit	Remark
	(MHz)	(dBµV)	Factor(dB)	(dBµV)	(dBµV)	(dB)	
1	0.150	32.37	19.45	51.82	66.00	-14.18	QP
2	0.150	17.93	19.45	37.38	56.00	-18.62	Average
3	0.195	26.07	19.46	45.53	63.81	-18.28	QP
4	0.195	24.86	19.46	44.32	53.81	-9.49	Average
5	0.396	17.79	19.47	37.26	57.93	-20.67	QP
6	0.396	10.99	19.47	30.46	47.93	-17.46	Average
7	0.491	16.48	19.48	35.95	56.15	-20.20	QP
8	0.491	9.75	19.48	29.22	46.15	-16.93	Average
9	0.893	15.25	19.49	34.74	56.00	-21.26	QP
10	0.893	6.28	19.49	25.77	46.00	-20.23	Average
11	14.347	18.07	19.74	37.82	60.00	-22.18	QP
12	14.347	11.47	19.74	31.21	50.00	-18.79	Average

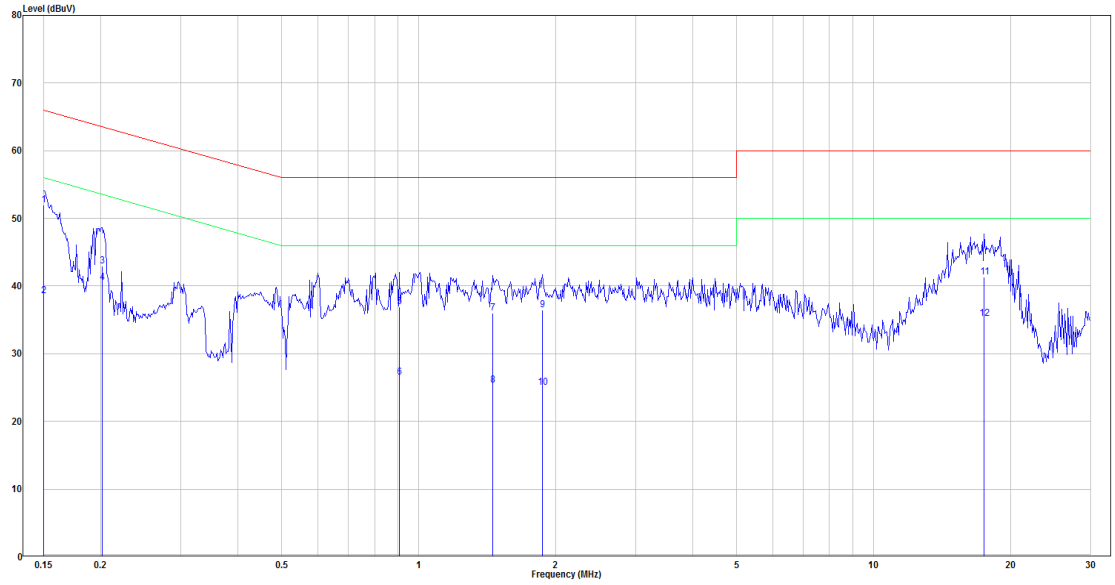
Note:

Level = Read Level + Factor

Over Limit = Level – Limit Line

Factor = (LISN, ISN, PLC or current probe) Factor + Cable Loss + Attenuator

Main: AC120 V, 60 Hz, Neutral



No.	Frequency	Reading	Correct	Result	Limit	Over limit	Remark
	(MHz)	(dBµV)	Factor(dB)	(dBµV)	(dBµV)	(dB)	
1	0.150	32.56	19.44	52.00	66.00	-14.00	QP
2	0.150	19.08	19.44	38.52	56.00	-17.48	Average
3	0.201	23.48	19.46	42.94	63.56	-20.61	QP
4	0.201	21.09	19.46	40.55	53.56	-13.01	Average
5	0.907	17.42	19.48	36.90	56.00	-19.10	QP
6	0.907	7.08	19.48	26.56	46.00	-19.44	Average
7	1.456	16.52	19.51	36.04	56.00	-19.96	QP
8	1.456	5.88	19.51	25.39	46.00	-20.61	Average
9	1.868	16.97	19.53	36.51	56.00	-19.49	QP
10	1.868	5.43	19.53	24.96	46.00	-21.04	Average
11	17.512	21.50	19.81	41.30	60.00	-18.70	QP
12	17.512	15.38	19.81	35.19	50.00	-14.81	Average

Note:

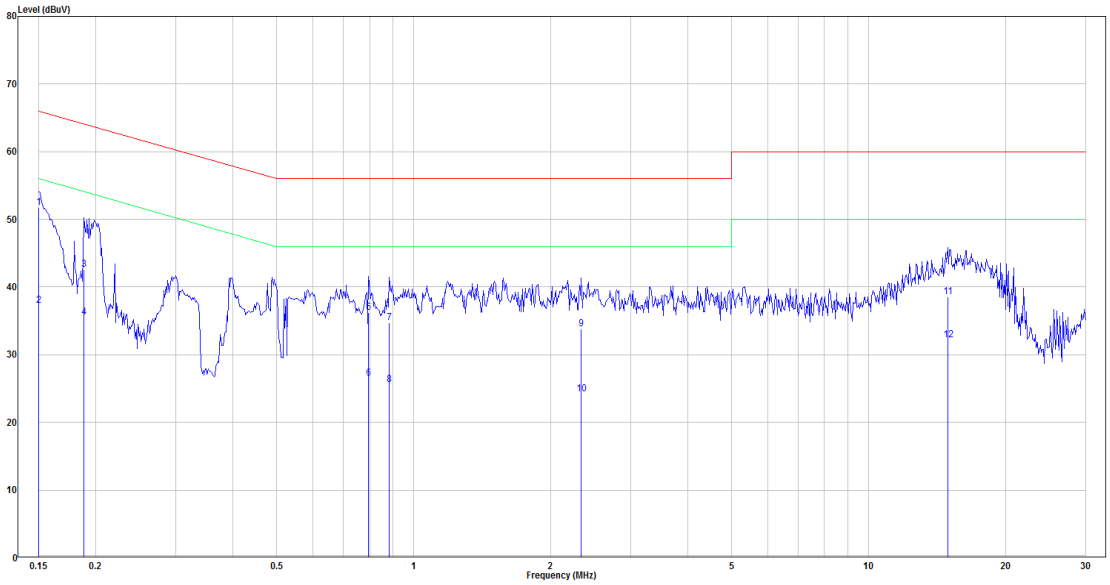
Level = Read Level + Factor

Over Limit = Level – Limit Line

Factor = (LISN, ISN, PLC or current probe) Factor + Cable Loss + Attenuator

Mode 3

Main: AC120 V, 60 Hz, Line



No.	Frequency (MHz)	Reading (dBµV)	Correct Factor(dB)	Result (dBµV)	Limit (dBµV)	Over limit (dB)	Remark
1	0.150	32.31	19.45	51.76	66.00	-14.24	QP
2	0.150	17.78	19.45	37.23	56.00	-18.77	Average
3	0.189	23.13	19.46	42.59	64.10	-21.51	QP
4	0.189	16.07	19.46	35.53	54.10	-18.57	Average
5	0.797	16.80	19.49	36.29	56.00	-19.71	QP
6	0.797	6.98	19.49	26.46	46.00	-19.54	Average
7	0.885	15.24	19.49	34.73	56.00	-21.27	QP
8	0.885	6.14	19.49	25.63	46.00	-20.37	Average
9	2.338	14.30	19.56	33.86	56.00	-22.14	QP
10	2.338	4.66	19.56	24.22	46.00	-21.78	Average
11	14.930	18.84	19.75	38.59	60.00	-21.41	QP
12	14.930	12.41	19.75	32.15	50.00	-17.85	Average

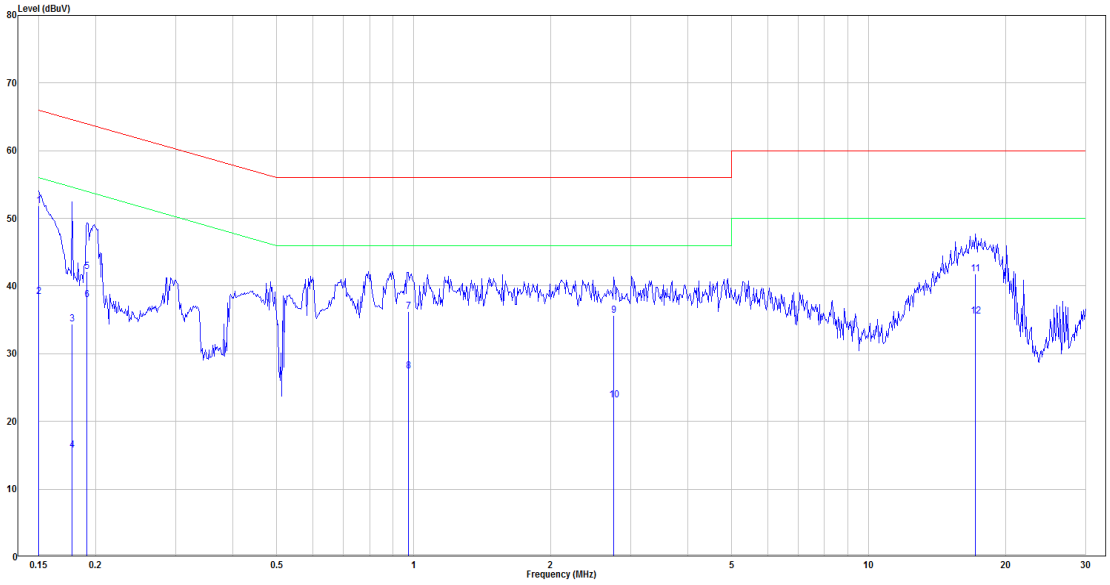
Note:

Level = Read Level + Factor

Over Limit = Level – Limit Line

Factor = (LISN, ISN, PLC or current probe) Factor + Cable Loss + Attenuator

Main: AC120 V, 60 Hz, Neutral



No.	Frequency	Reading	Correct	Result	Limit	Over limit	Remark
	(MHz)	(dBµV)	Factor(dB)	(dBµV)	(dBµV)	(dB)	
1	0.150	32.48	19.44	51.92	66.00	-14.08	QP
2	0.150	19.01	19.44	38.45	56.00	-17.55	Average
3	0.178	14.94	19.45	34.39	64.59	-30.21	QP
4	0.178	-3.72	19.45	15.73	54.59	-38.86	Average
5	0.191	22.70	19.46	42.15	63.97	-21.82	QP
6	0.191	18.55	19.46	38.00	53.97	-15.97	Average
7	0.972	16.81	19.48	36.29	56.00	-19.71	QP
8	0.972	7.97	19.48	27.45	46.00	-18.55	Average
9	2.756	16.09	19.56	35.64	56.00	-20.36	QP
10	2.756	3.59	19.56	23.15	46.00	-22.85	Average
11	17.166	22.03	19.80	41.83	60.00	-18.17	QP
12	17.166	15.72	19.80	35.52	50.00	-14.48	Average

Note:

Level = Read Level + Factor

Over Limit = Level – Limit Line

Factor = (LISN, ISN, PLC or current probe) Factor + Cable Loss + Attenuator

8 FCC §15.209, §15.205 , §15.247(d) – Spurious Emissions

8.1 Applicable Standard

As per FCC §15.35(d): Unless otherwise specified, on any frequency or frequencies above 1000 MHz, the radiated emission limits are based on the use of measurement instrumentation employing an average detector function. Unless otherwise specified, measurements above 1000 MHz shall be performed using a minimum resolution bandwidth of 1MHz.

As Per FCC §15.205(a) except as show 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	960 – 1240	4. 5 – 5. 15
0.495 – 0.505	16.69475 – 16.69525	1300 – 1427	5. 35 – 5. 46
2.1735 – 2.1905	25.5 – 25.67	1435 – 1626.5	7.25 – 7.75
4.125 – 4.128	37.5 – 38.25	1645.5 – 1646.5	8.025 – 8.5
4.17725 – 4.17775	73 – 74.6	1660 – 1710	9.0 – 9.2
4.20725 – 4.20775	74.8 – 75.2	1718.8 – 1722.2	9.3 – 9.5
6.215 – 6.218	108 – 121.94	2200 – 2300	10.6 – 12.7
6.26775 – 6.26825	123 – 138	2310 – 2390	13.25 – 13.4
6.31175 – 6.31225	149.9 – 150.05	2483.5 – 2500	14.47 – 14.5
8.291 – 8.294	156.52475 – 156.52525	2690 – 2900	15.35 – 16.2
8.362 – 8.366	156.7 – 156.9	3260 – 3267	17.7 – 21.4
8.37625 – 8.38675	162.0125 –167.17	3.332 – 3.339	22.01 – 23.12
8.41425 – 8.41475	167.72 – 173.2	3 3458 – 3 358	23.6 – 24.0
12.29 – 12.293	240 – 285	3.600 – 4.400	31.2 – 31.8
12.51975 – 12.52025	322 – 335.4		36.43 – 36.5
12.57675 – 12.57725	399.9 – 410		Above 38.6
13.36 – 13.41	608 – 614		

As per FCC §15.209(a): Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (micro volts/meter)	Measurement Distance (meters)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30	30
30 - 88	100**	3
88 - 216	150**	3
216 - 960	200**	3
Above 960	500	3

** 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.

As per FCC §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).

8.2 Measurement Uncertainty

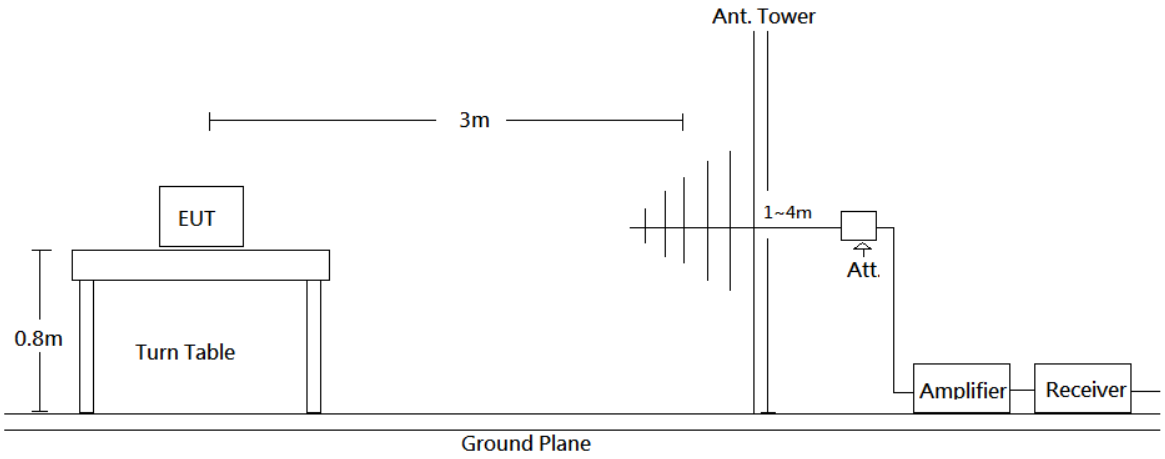
All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on CISPR 16-4-2:2011, the expended combined standard uncertainty of radiation emissions at Bay Area Compliance Laboratories Corp. (Taiwan) is shown in below table. And the uncertainty will not be taken into consideration for the test data recorded in the report.

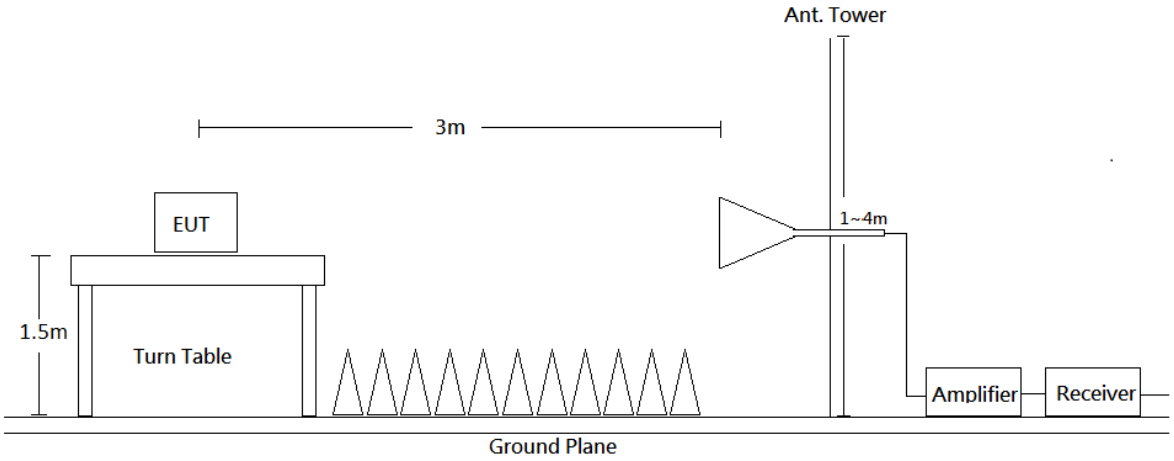
Frequency	Measurement uncertainty
30 MHz~200 MHz	3.75 dB (k=2, 95% level of confidence)
200 MHz~1 GHz	4.21 dB (k=2, 95% level of confidence)
1 GHz~6 GHz	4.83 dB (k=2, 95% level of confidence)
6 GHz~18 GHz	5.18 dB (k=2, 95% level of confidence)
18 GHz~26 GHz	4.55 dB (k=2, 95% level of confidence)
26 GHz~40 GHz	4.67 dB (k=2, 95% level of confidence)

8.3 EUT Setup

Below 1 GHz:



Above 1 GHz:



Radiated emission tests were performed in the 3 meters chamber test site, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC Part 15.209 and FCC 15.247 Limits.

8.4 EMI Test Receiver & Spectrum Analyzer Setup

The system was investigated from 30 MHz to 26.5 GHz. During the radiated emission test, the EMI test receiver was set with the following configurations measurement method 6.3 in ANSI C63.10.

Frequency Range	RBW	VBW	Detector	Duty cycle	Measurement method
30-1000 MHz	120 kHz	/	QP		QP
Above 1 GHz	1 MHz	3 MHz	PK		PK
	1 MHz	3 MHz	RMS	>98%	Ave
	1 MHz	1/T	PK	<98%	Ave

8.5 Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

All data was recorded in the Quasi-peak detector mode from 30 MHz to 1 GHz and PK and average detector modes for frequencies above 1 GHz.

8.6 Corrected Factor & Margin Calculation

The Correct Factor is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain

The "Margin" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7 dB means the emission is 7 dB below the limit. The equation for margin calculation is as follows:

Margin = Result – Limit

8.7 Test Results Summary

According to the data in the following table, the EUT complied with the FCC §15.209 Limit.

8.8 Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	55 %
ATM Pressure:	1010 hPa

The Radiation Spurious Emissions testing was performed by Tom Hsu on 2019-01-15.

The Conducted Spurious Emissions testing was performed by Tom Hsu on 2019-02-21.

8.9 Test Results

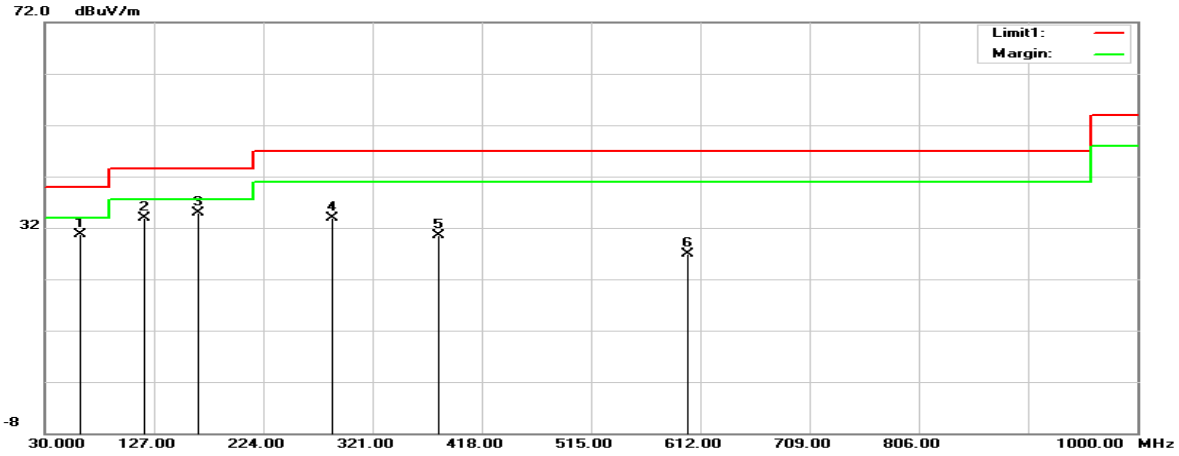
Test Mode: Transmitting

Mode 1

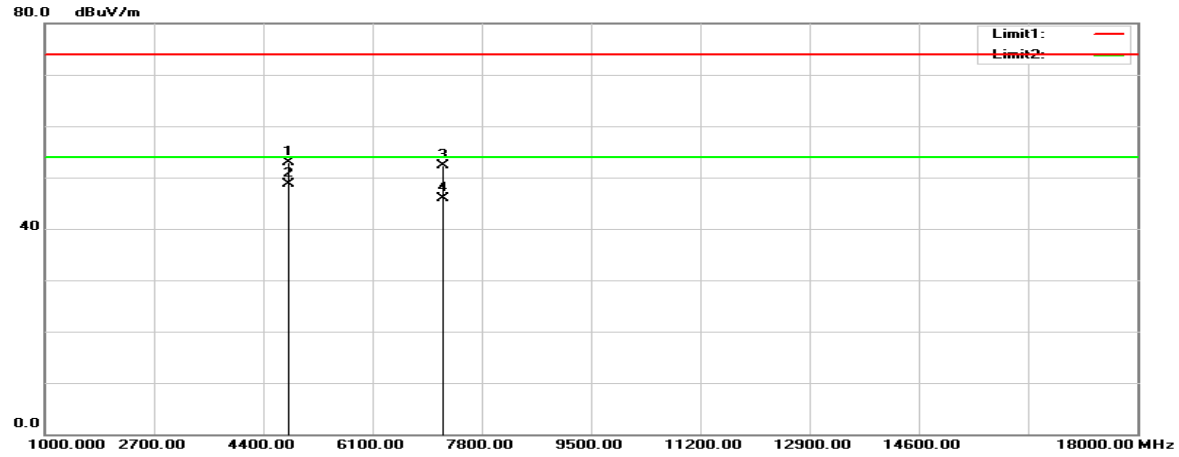
BLE(1M) Mode *(Pre-scan with three orthogonal axis, and worse case as Z axis.)*

Horizontal (*worst case is BLE mode low channel*)

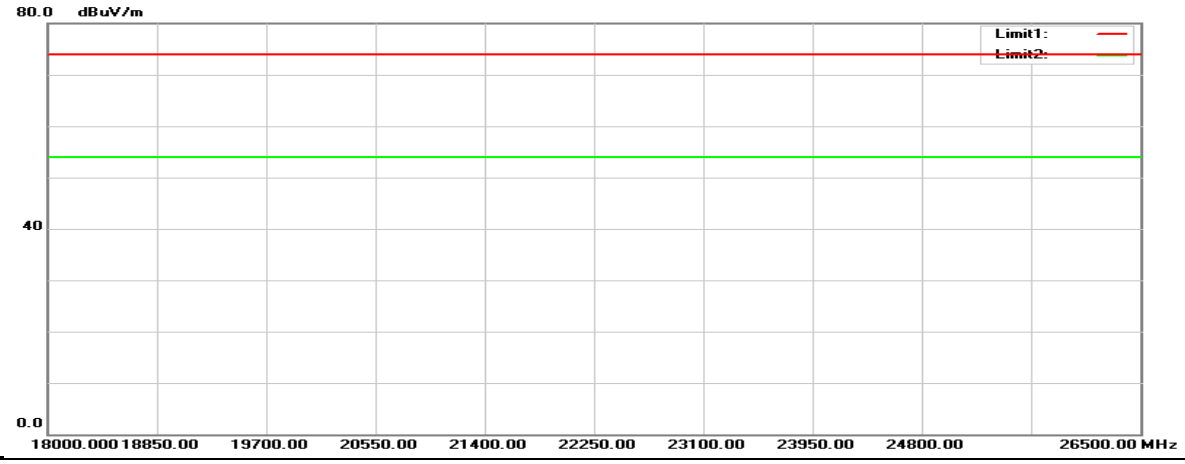
30MHz-1GHz:



1GHz-18GHz:

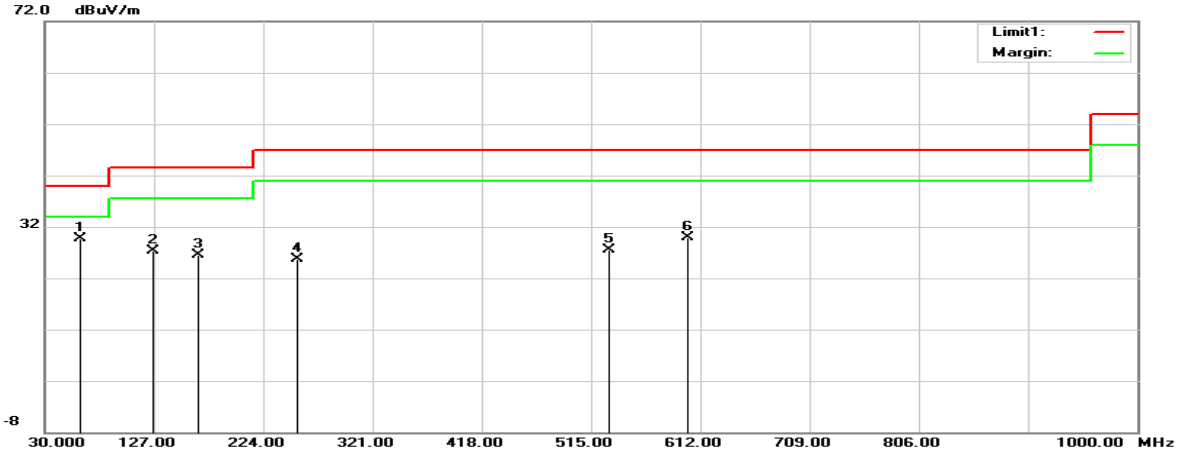


18GHz-26.5GHz:

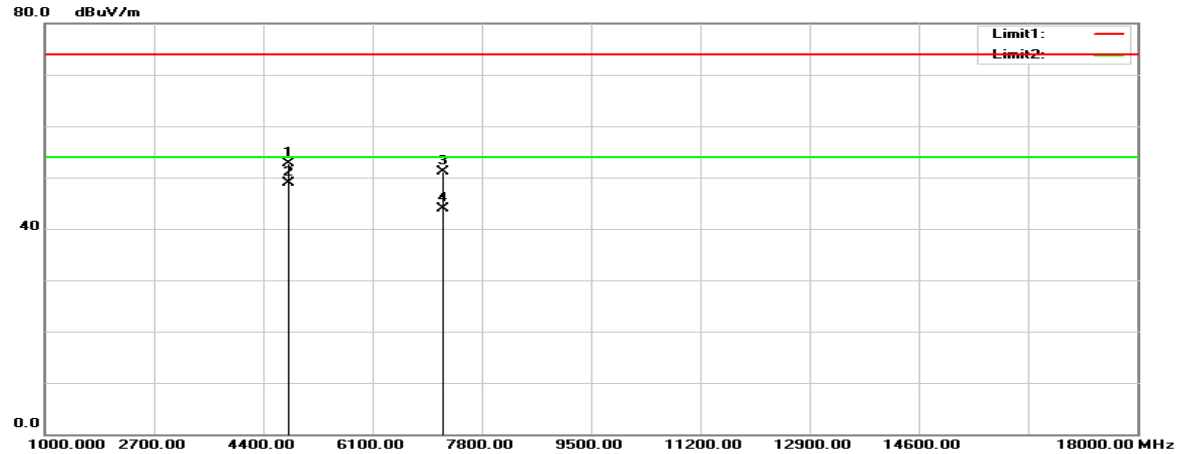


Vertical (*worst case is BLE mode low channel*)

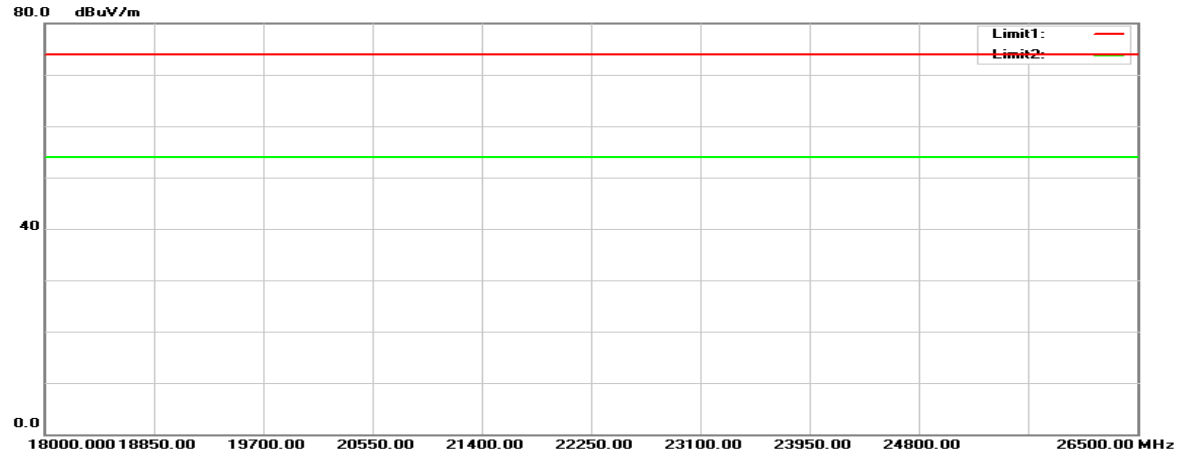
30MHz-1GHz:



1GHz-18GHz:



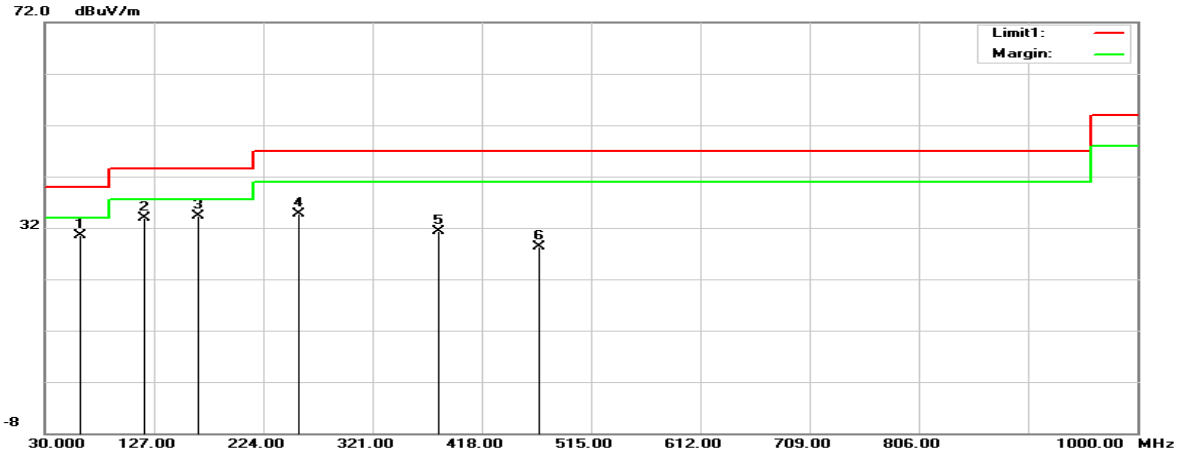
18GHz-26.5GHz:



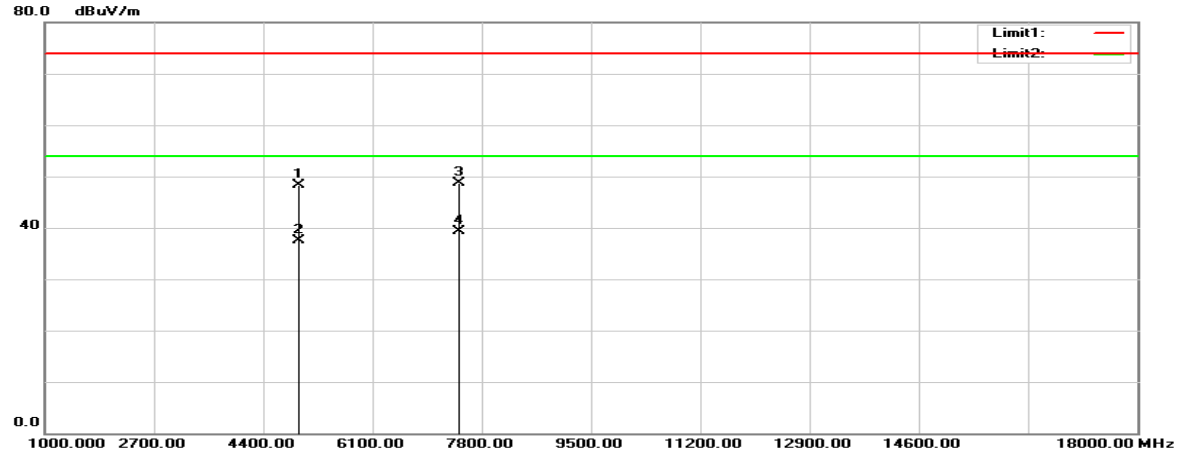
BLE(2M) Mode *(Pre-scan with three orthogonal axis, and worse case as Z axis.)*

Horizontal (*worst case is BLE mode high channel*)

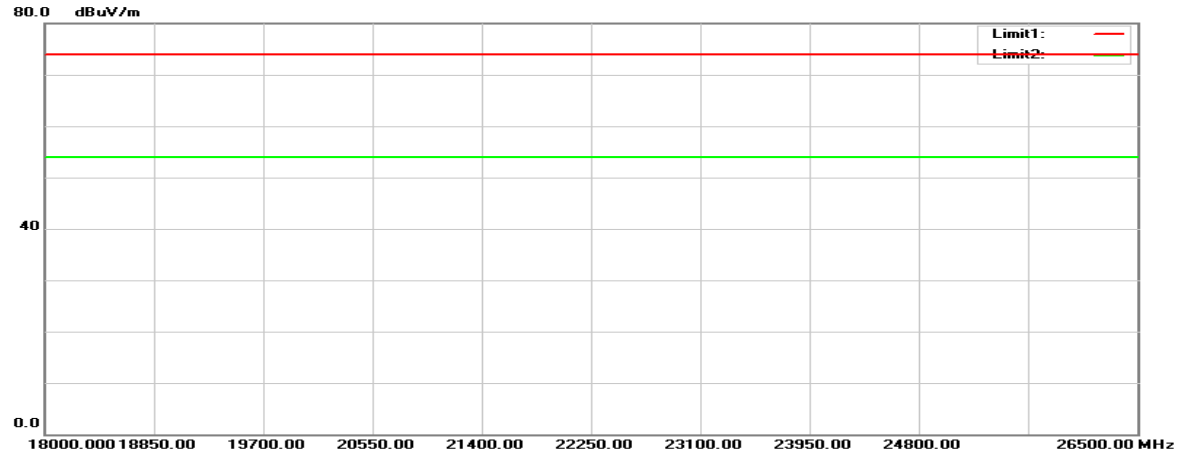
30MHz-1GHz:



1GHz-18GHz:

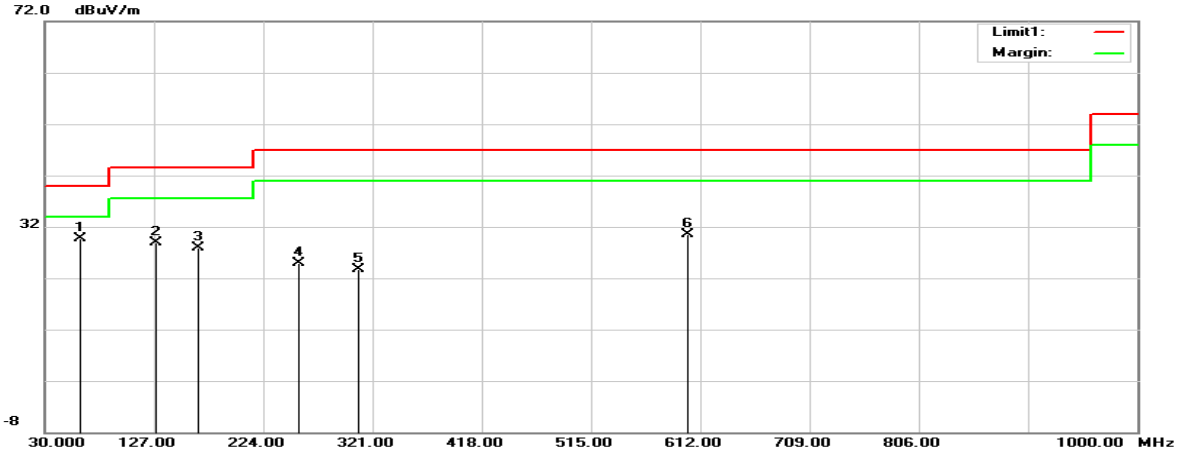


18GHz-26.5GHz:

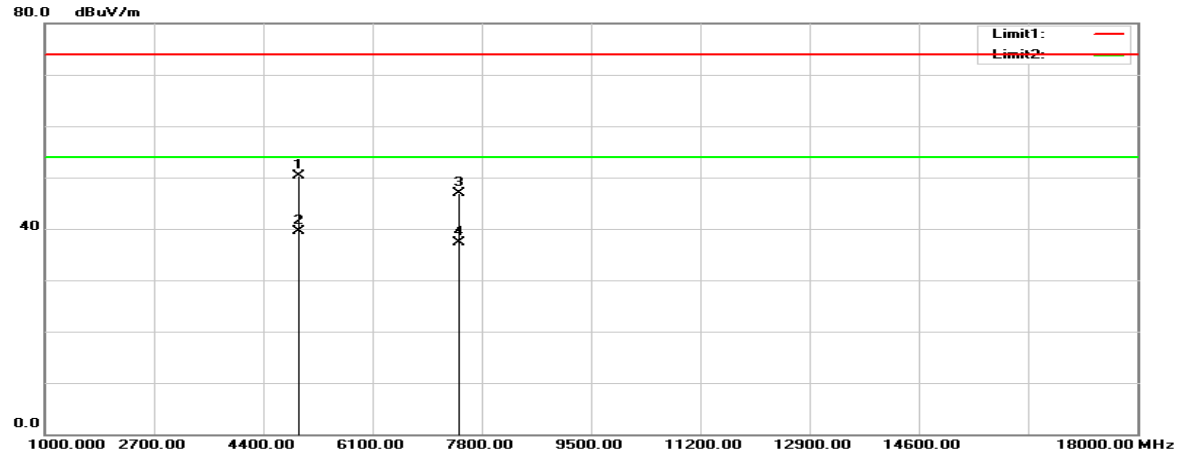


Vertical (*worst case is BLE mode high channel*)

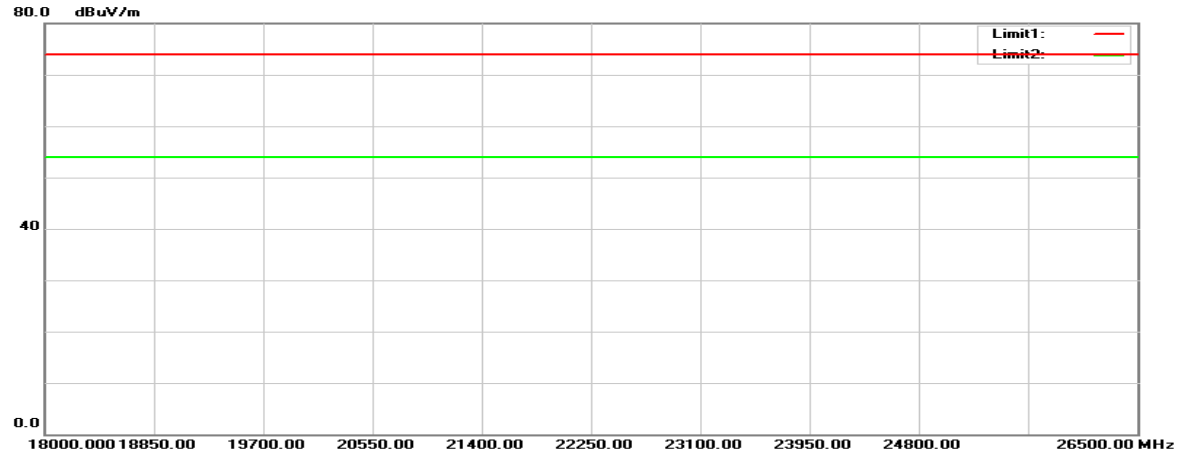
30MHz-1GHz:



1GHz-18GHz:



18GHz-26.5GHz:

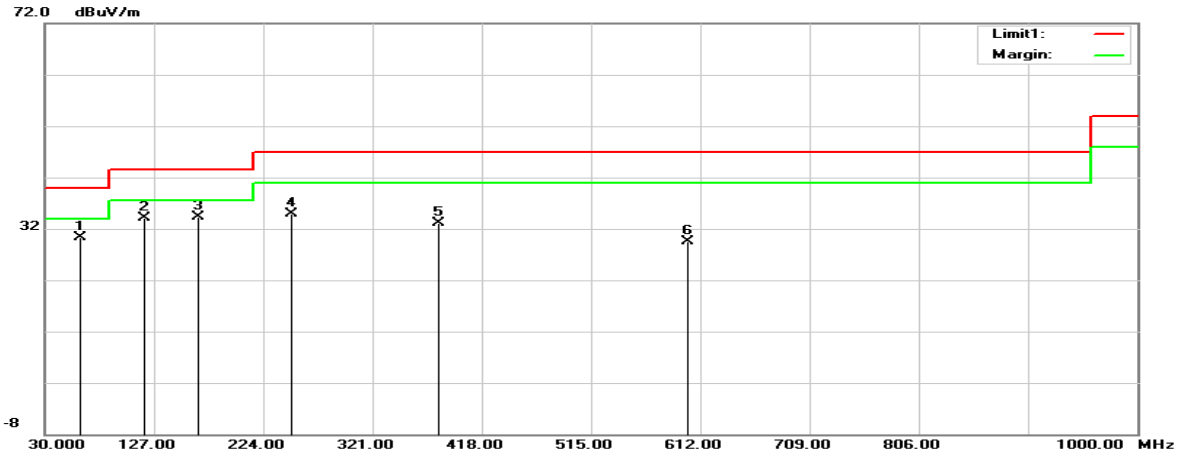


Mode 2

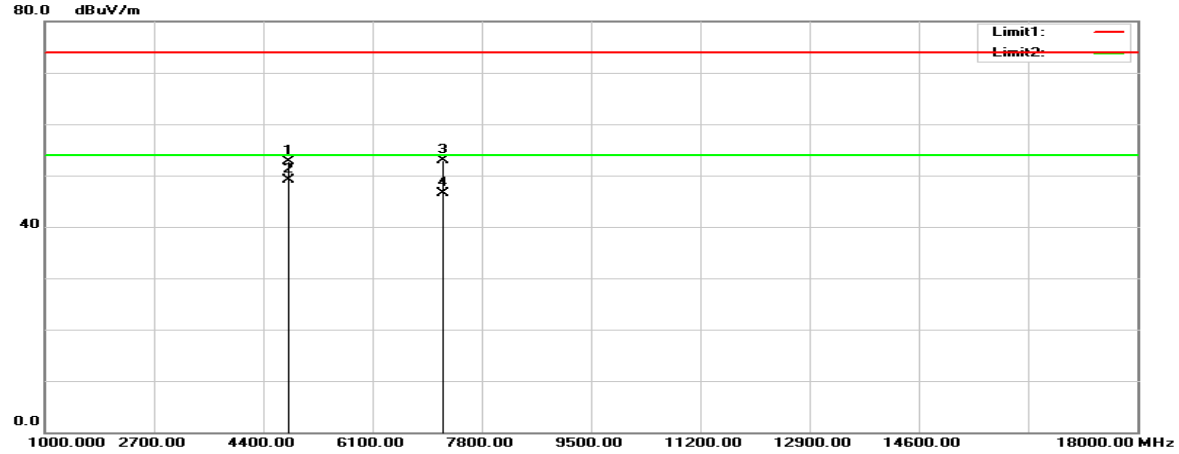
BLE(1M) Mode *(Pre-scan with three orthogonal axis, and worse case as Z axis.)*

Horizontal (*worst case is BLE mode low channel*)

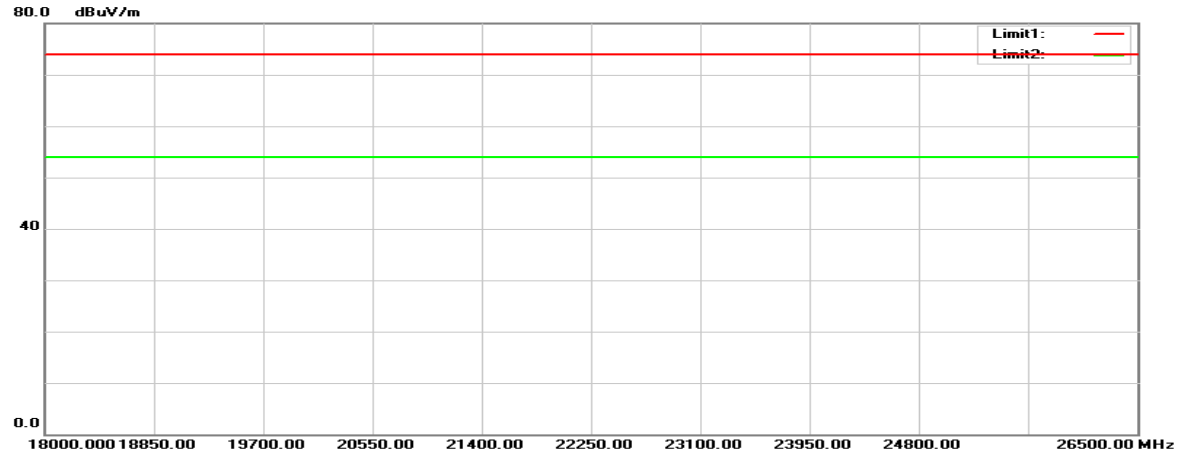
30MHz-1GHz:



1GHz-18GHz:

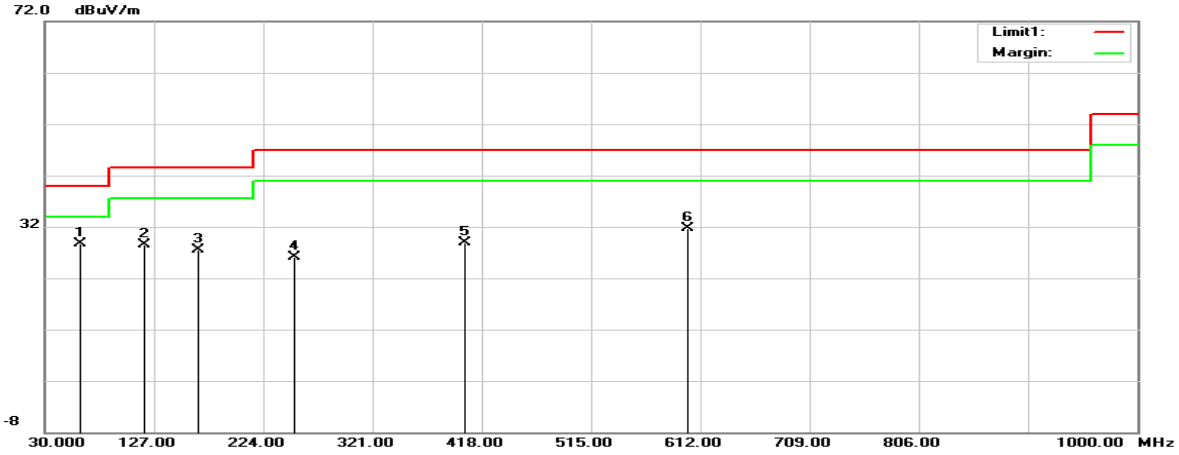


18GHz-26.5GHz:

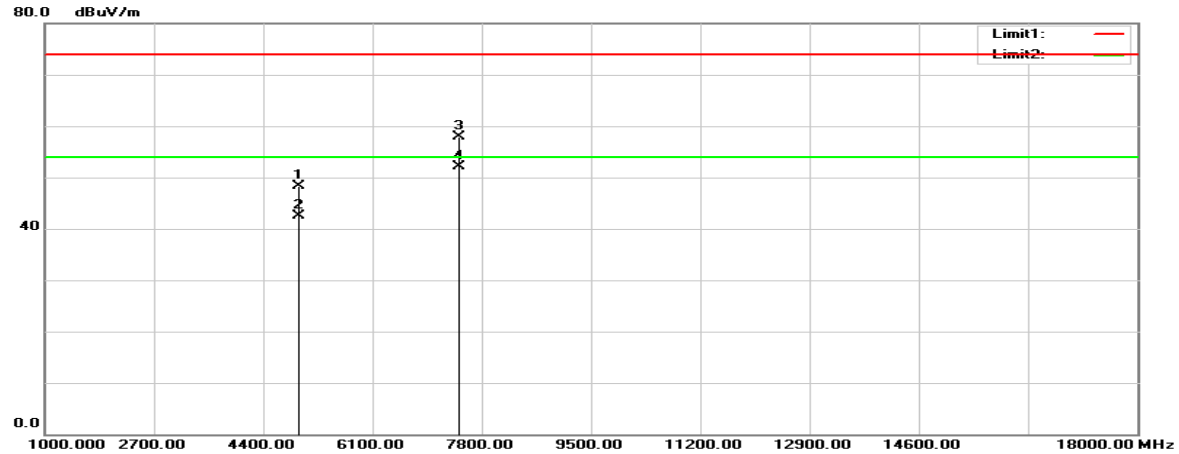


Vertical (*worst case is BLE mode high channel*)

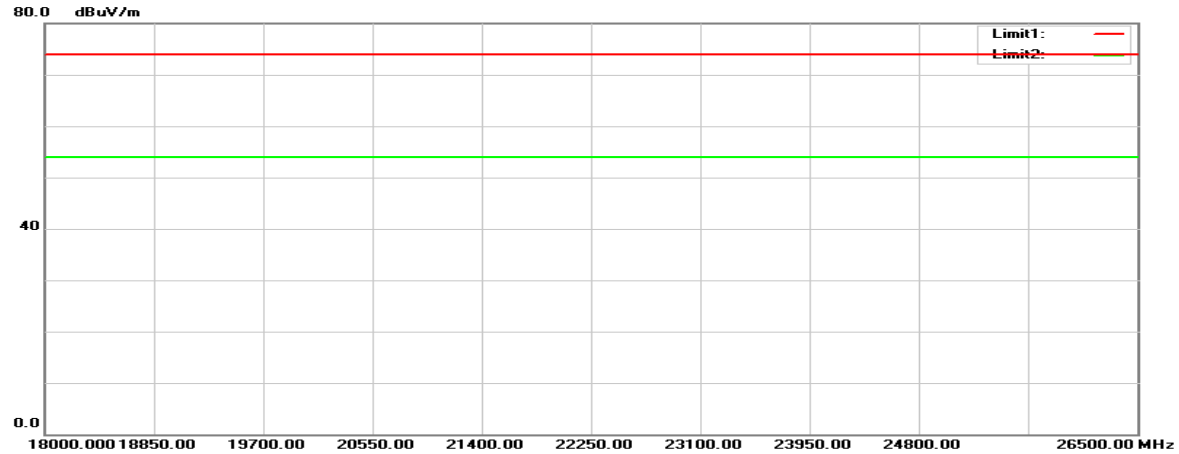
30MHz-1GHz:



1GHz-18GHz:



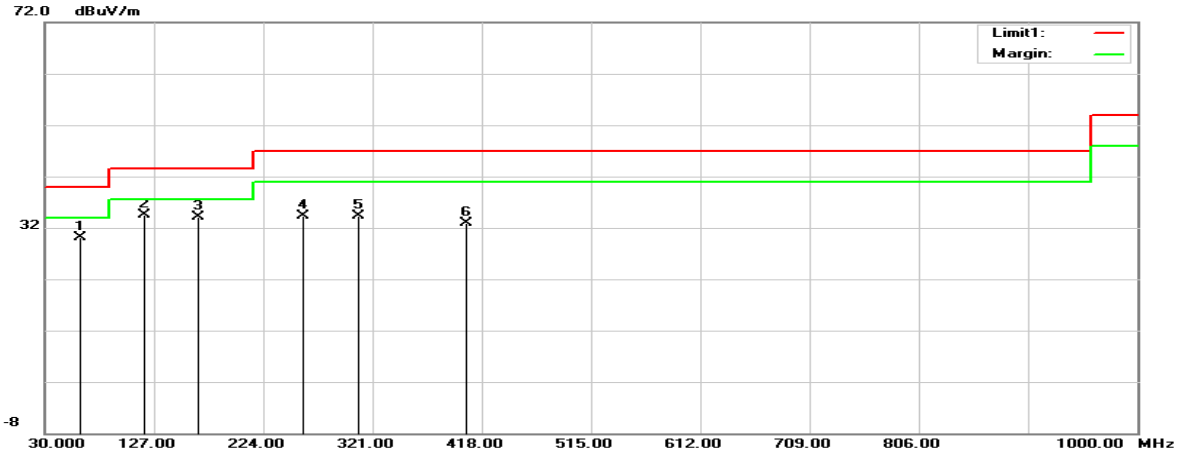
18GHz-26.5GHz:



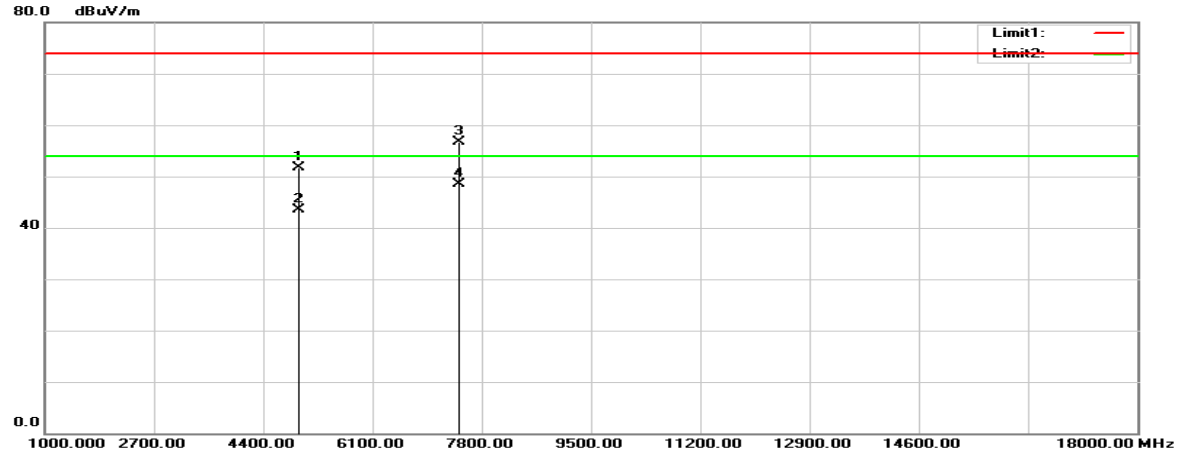
BLE(2M) Mode *(Pre-scan with three orthogonal axis, and worse case as Z axis.)*

Horizontal (*worst case is BLE mode high channel*)

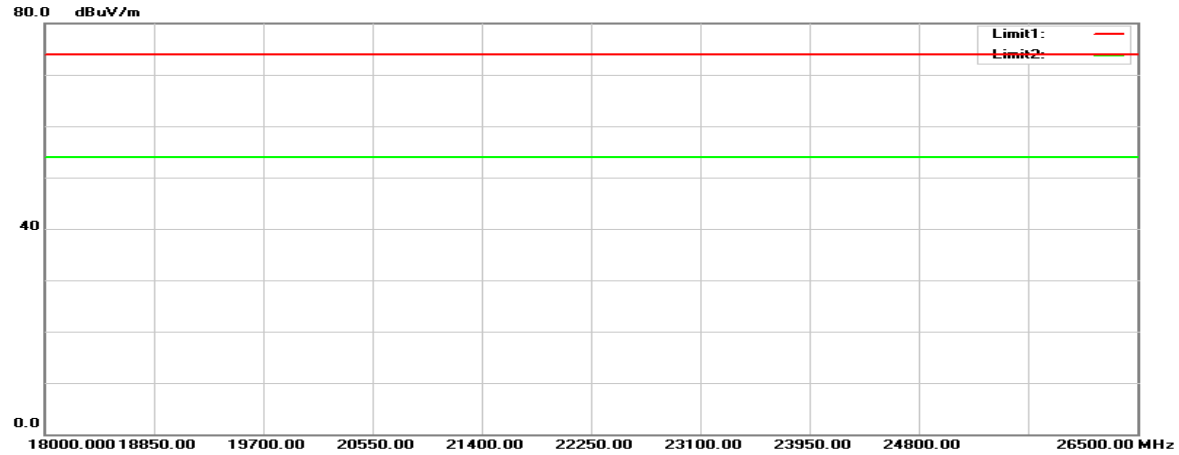
30MHz-1GHz:



1GHz-18GHz:

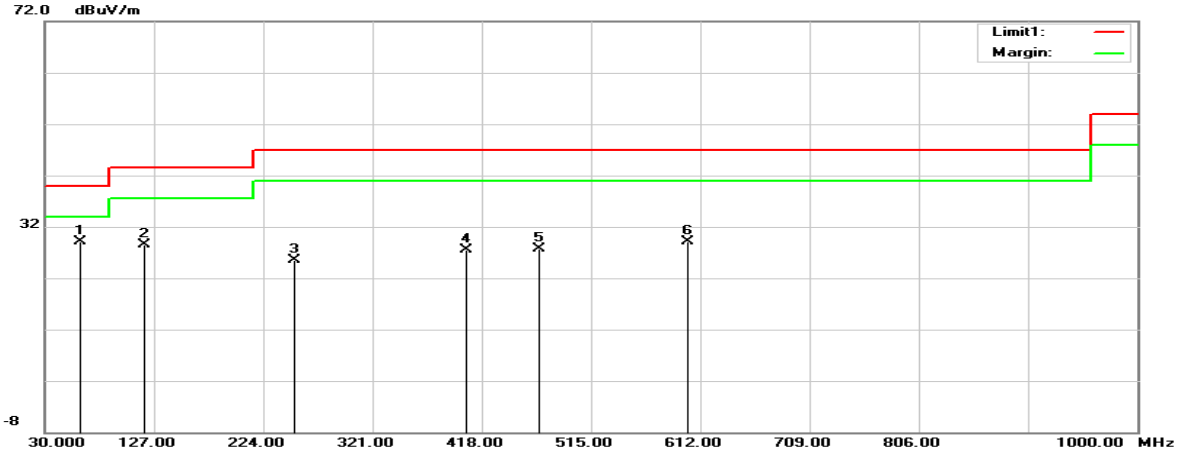


18GHz-26.5GHz:

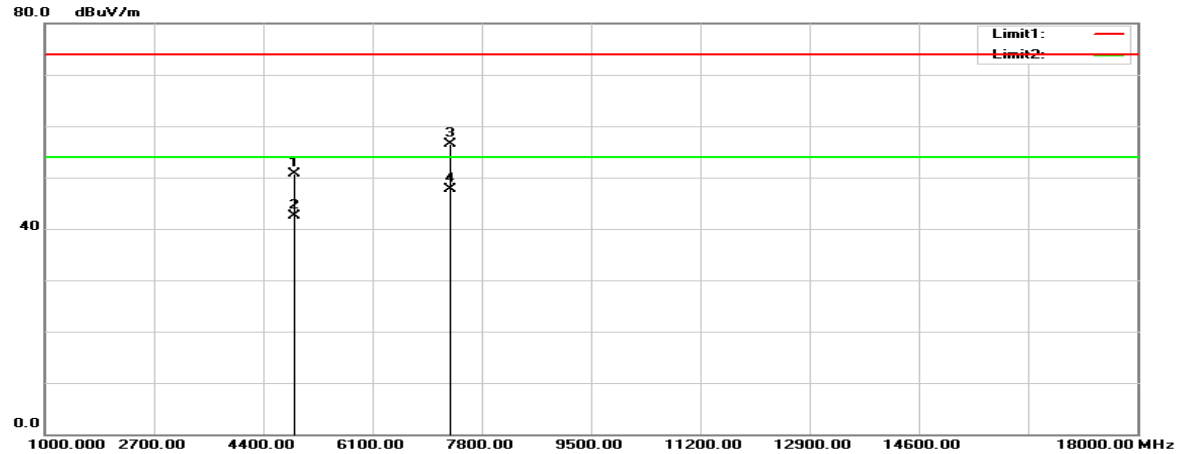


Vertical (*worst case is BLE mode middle channel*)

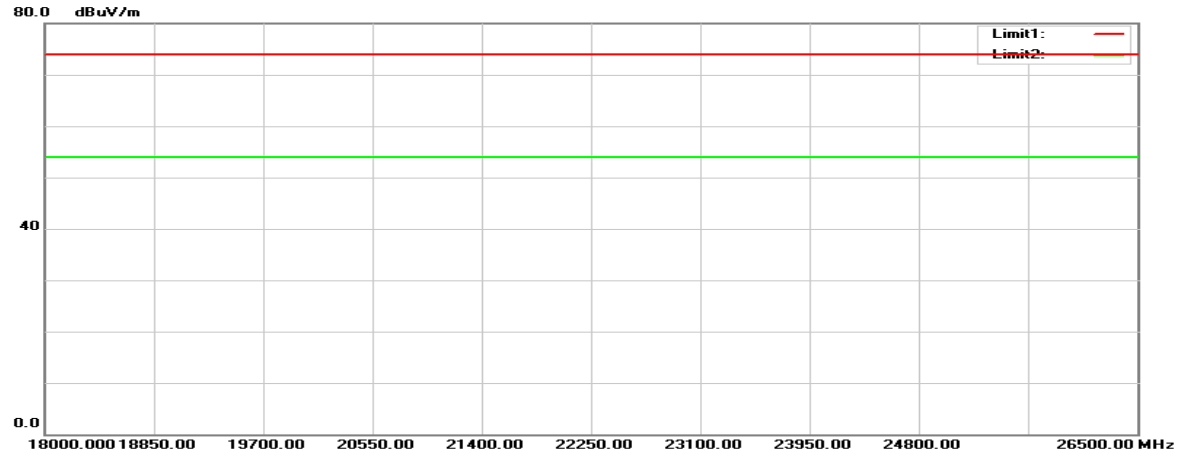
30MHz-1GHz:



1GHz-18GHz:



18GHz-26.5GHz:

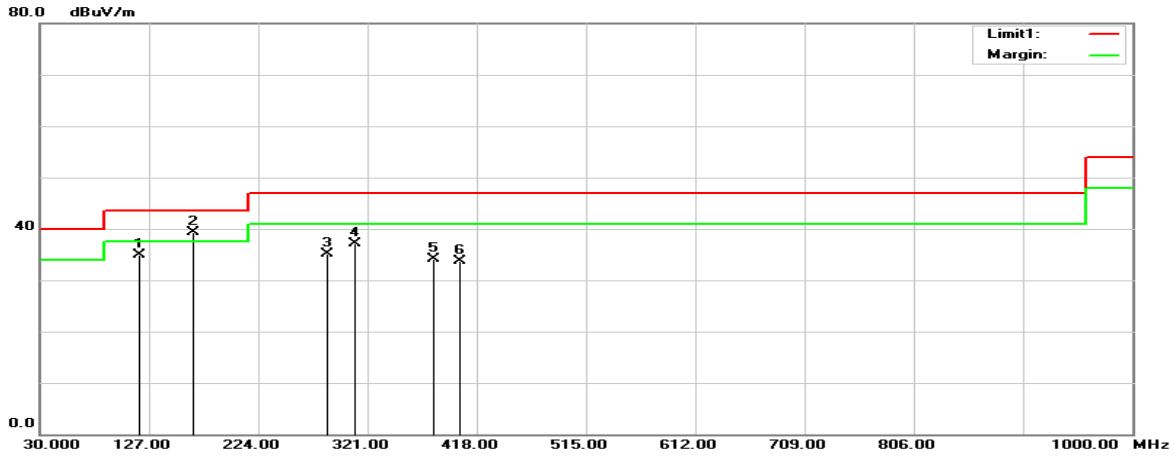


Mode 3

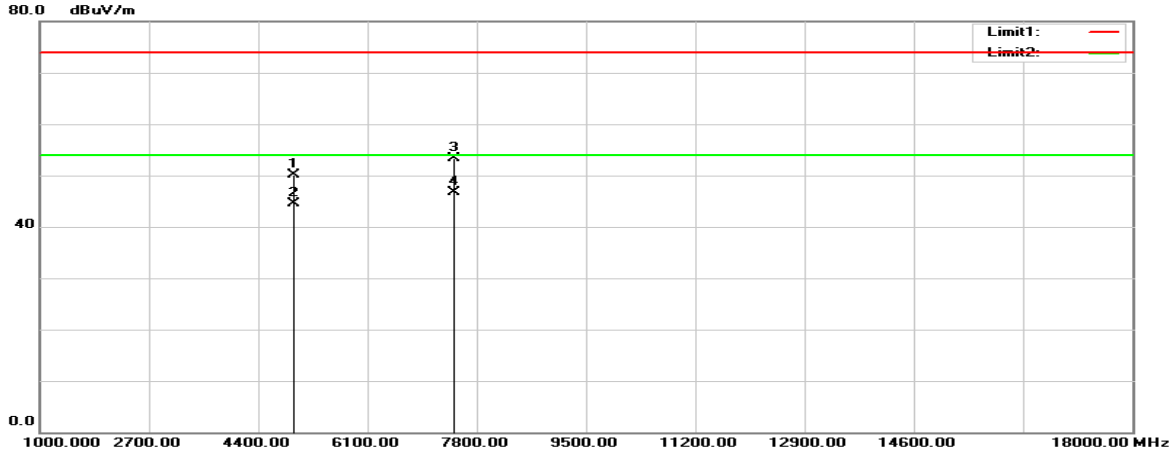
BLE(1M) Mode *(Pre-scan with three orthogonal axis, and worse case as Z axis.)*

Horizontal (*worst case is BLE mode high channel*)

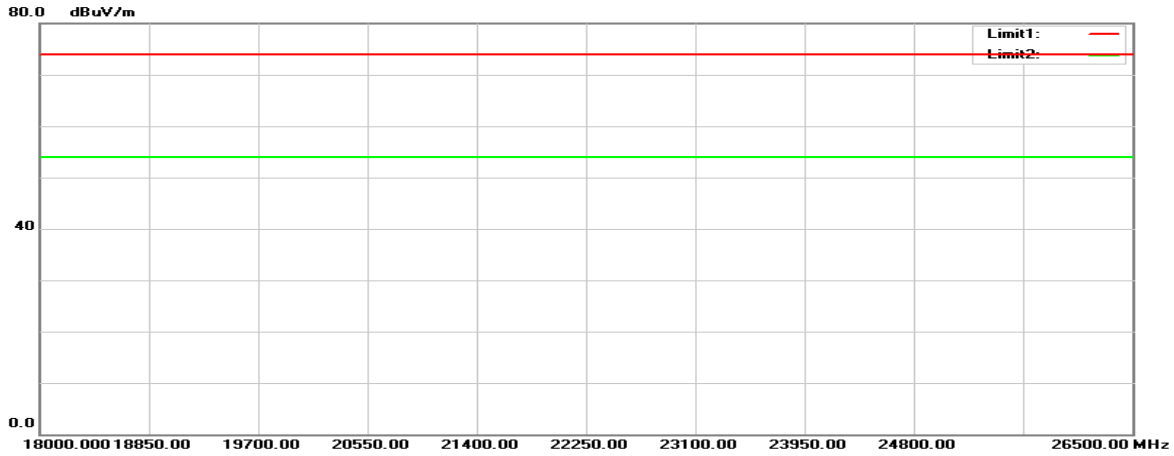
30MHz-1GHz:



1GHz-18GHz:

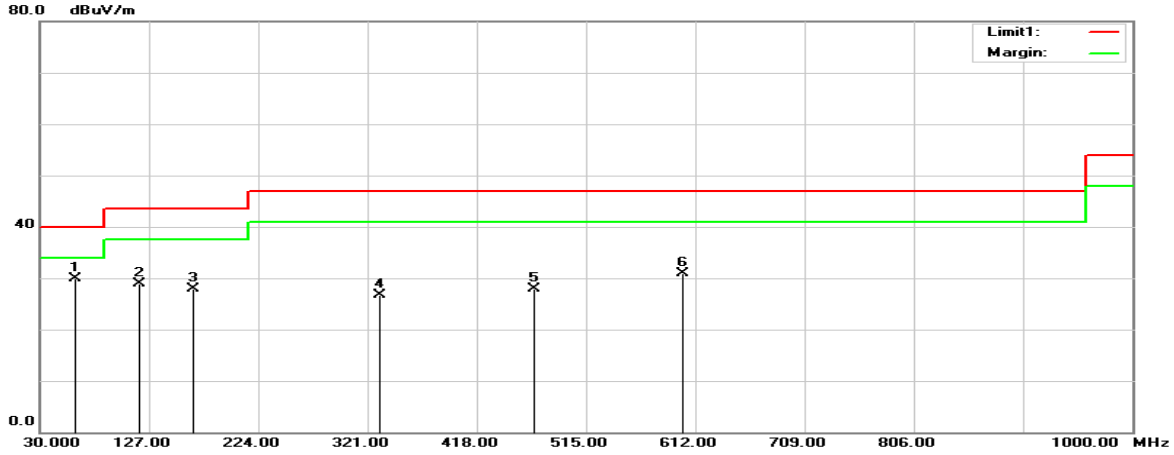


18GHz-26.5GHz:

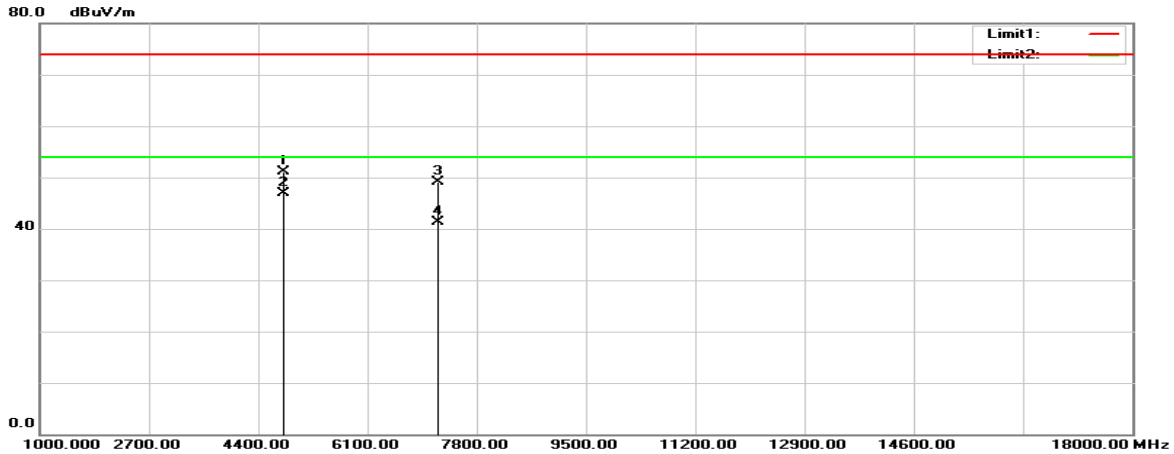


Vertical (*worst case is BLE mode low channel*)

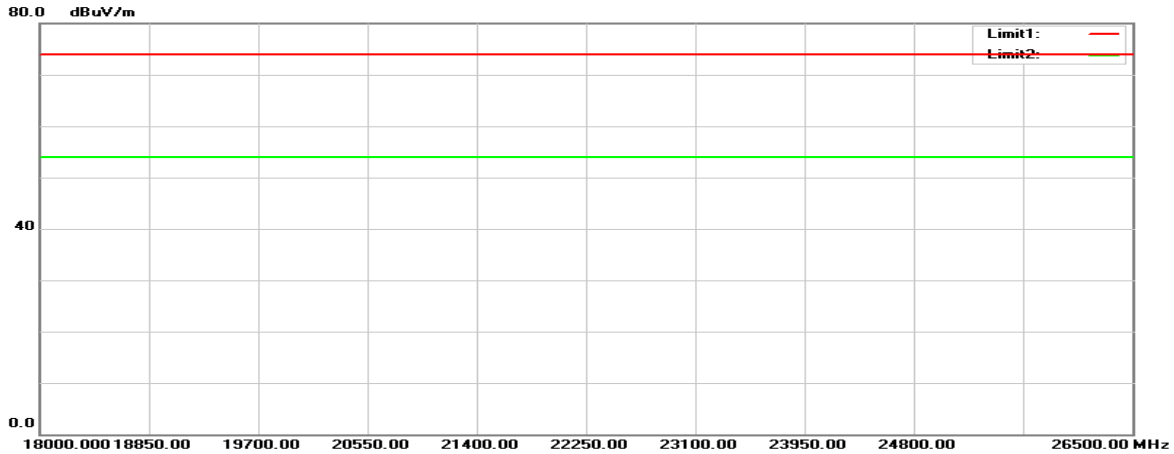
30MHz-1GHz:



1GHz-18GHz:



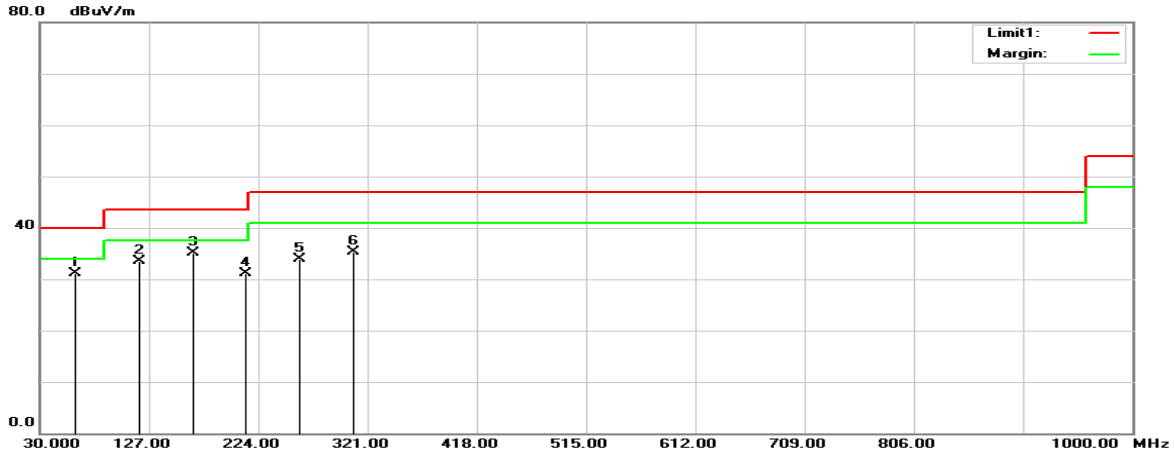
18GHz-26.5GHz:



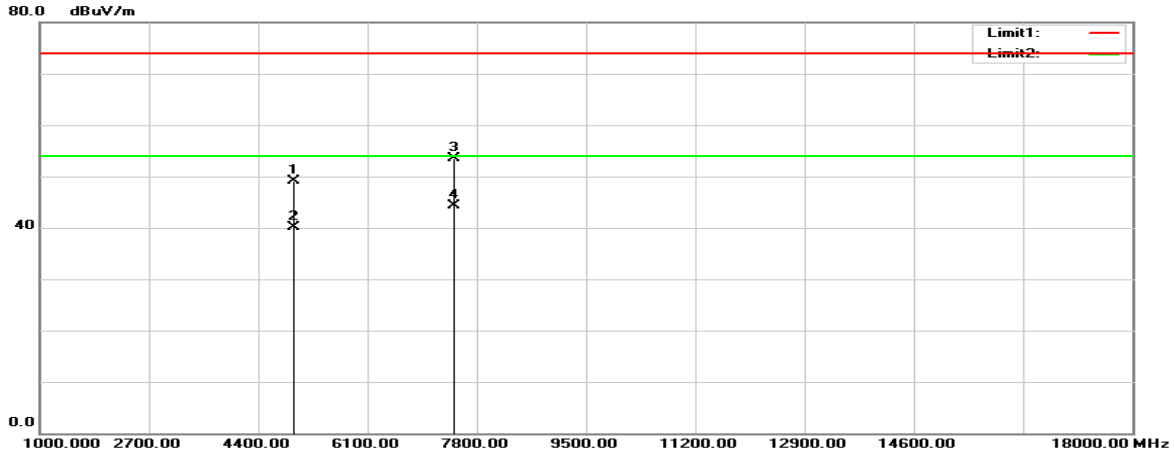
BLE(2M) Mode *(Pre-scan with three orthogonal axis, and worse case as Z axis.)*

Horizontal (*worst case is BLE mode high channel*)

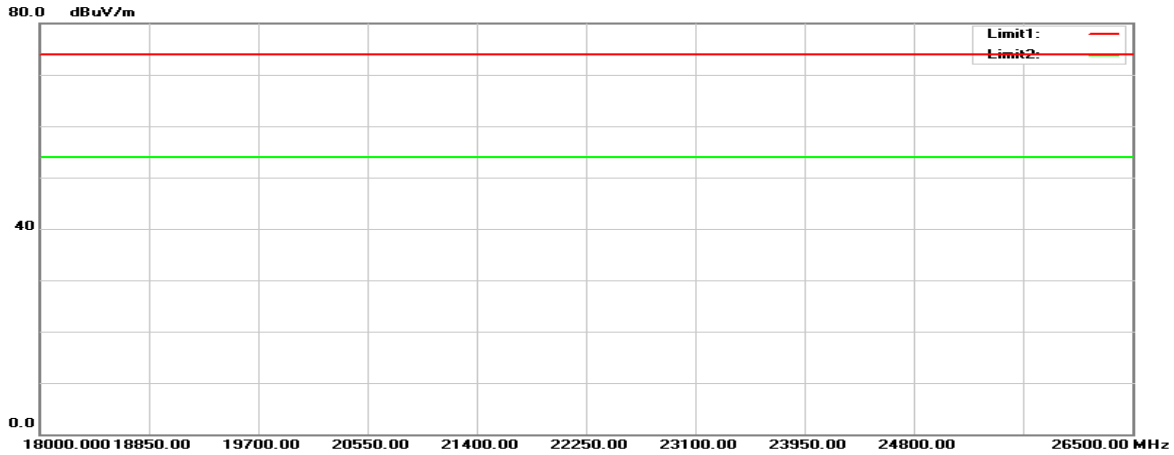
30MHz-1GHz:



1GHz-18GHz:

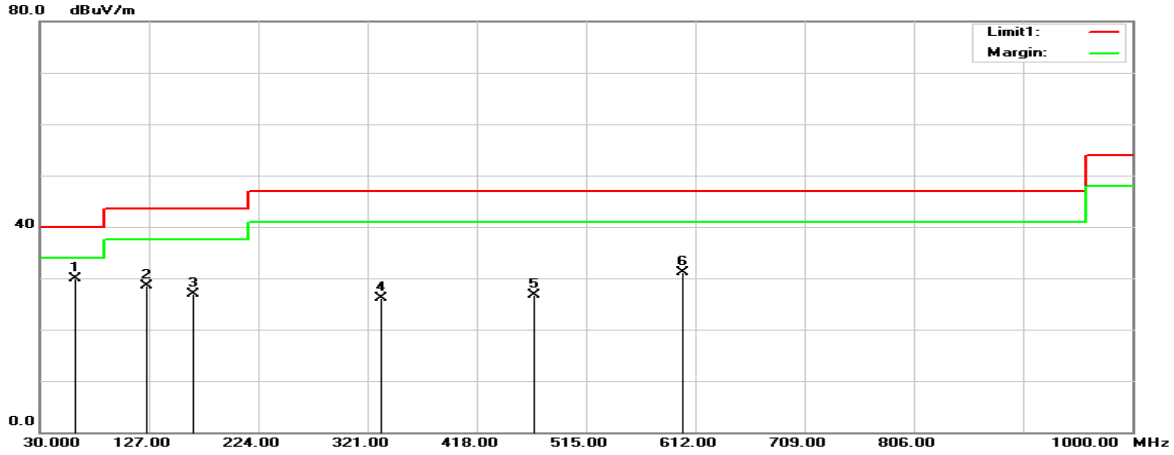


18GHz-26.5GHz:

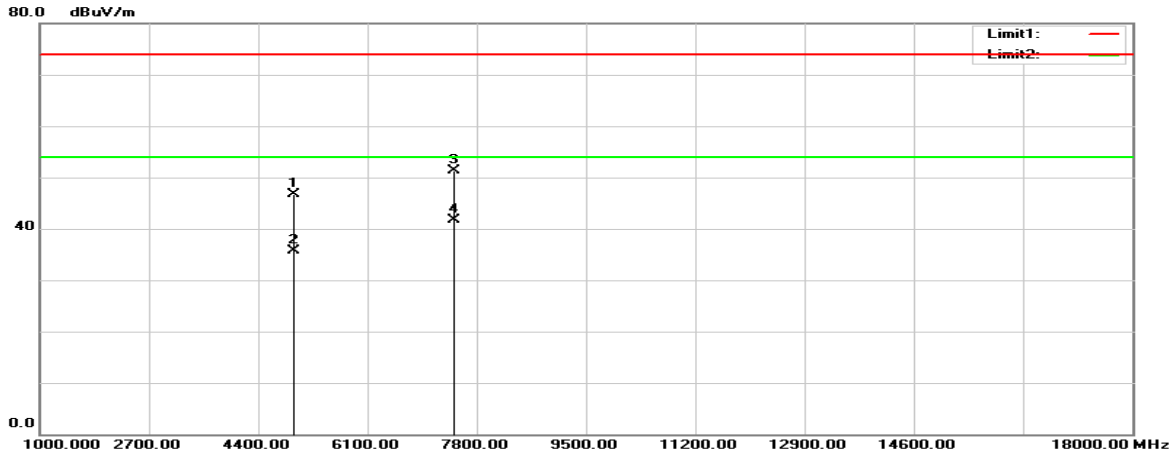


Vertical (*worst case is BLE mode high channel*)

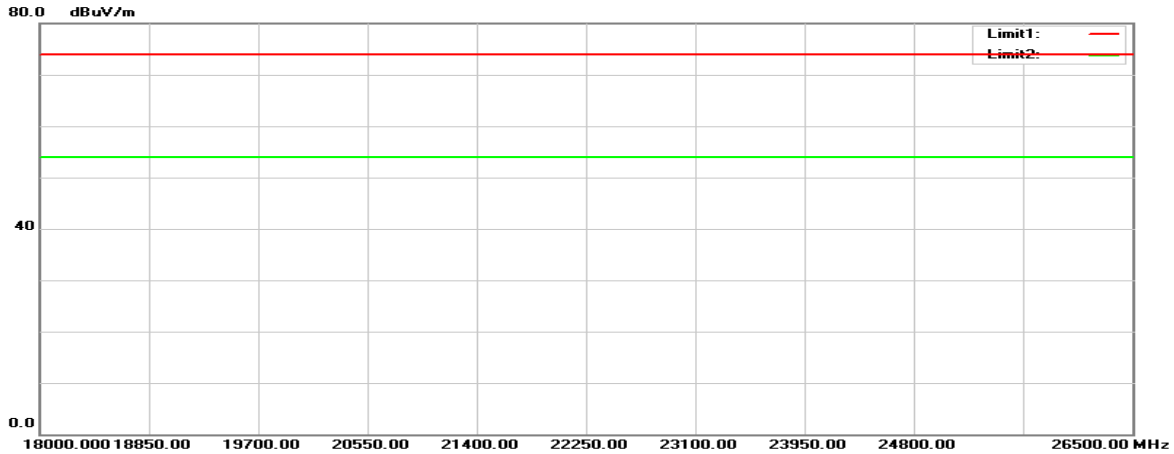
30MHz-1GHz:



1GHz-18GHz:



18GHz-26.5GHz:



Mode 1

BLE(1M) Mode

Below 1GHz

Horizontal

Frequency (MHz)	Reading (dBµV)	Correct Factor(dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
62.0100	48.09	-17.30	30.79	40.00	-9.21	100	117	QP
118.2700	44.56	-10.74	33.82	43.50	-9.68	100	100	QP
165.8000	47.35	-12.39	34.96	43.50	-8.54	100	94	QP
285.1100	44.60	-10.73	33.87	46.00	-12.13	100	66	QP
379.2000	39.10	-8.55	30.55	46.00	-15.45	100	193	QP
600.3600	31.81	-4.97	26.84	46.00	-19.16	100	103	QP

Vertical

Frequency (MHz)	Reading (dBµV)	Correct Factor(dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
61.0400	47.20	-17.42	29.78	40.00	-10.22	100	66	QP
126.0300	37.83	-10.51	27.32	43.50	-16.18	100	63	QP
165.8000	38.94	-12.39	26.55	43.50	-16.95	100	272	QP
254.0700	37.83	-12.20	25.63	46.00	-20.37	100	178	QP
531.4900	33.04	-5.57	27.47	46.00	-18.53	100	68	QP
600.3600	34.92	-4.97	29.95	46.00	-16.05	100	333	QP

Result = Reading + Correct Factor
Margin = Result – Limit
Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain
Spurious emissions more than 20 dB below the limit were not reported.

Above 1GHz

Horizontal

Frequency (MHz)	Reading (dBµV)	Correct Factor(dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
Low channel								
2390.000	64.65	-8.94	55.71	74.00	-18.29	150	302	peak
2390.000	52.99	-8.94	44.05	54.00	-9.95	150	302	AVG
2402.000	101.76	-8.84	92.92	N/A	N/A	158	215	peak
2402.000	101.23	-8.84	92.39	N/A	N/A	158	215	AVG
4804.000	53.91	-0.95	52.96	74.00	-21.04	216	295	peak
4804.000	49.73	-0.95	48.78	54.00	-5.22	216	295	AVG
7206.000	48.84	3.55	52.39	74.00	-21.61	100	281	peak
7206.000	42.40	3.55	45.95	54.00	-8.05	100	281	AVG
Middle channel								
2440.000	100.75	-8.79	91.96	N/A	N/A	162	104	peak
2440.000	100.05	-8.79	91.26	N/A	N/A	162	104	AVG
4880.000	51.18	-0.81	50.37	74.00	-23.63	100	114	peak
4880.000	46.50	-0.81	45.69	54.00	-8.31	100	114	AVG
7320.000	48.48	4.01	52.49	74.00	-21.51	100	294	peak
7320.000	41.87	4.01	45.88	54.00	-8.12	100	294	AVG
High channel								
2480.000	101.54	-8.80	92.74	N/A	N/A	158	23	peak
2480.000	100.93	-8.80	92.13	N/A	N/A	158	23	AVG
2483.500	64.94	-8.81	56.13	74.00	-17.87	150	91	peak
2483.500	52.57	-8.81	43.76	54.00	-10.24	150	91	AVG
4960.000	49.28	-0.50	48.78	74.00	-25.22	100	237	peak
4960.000	38.58	-0.50	38.08	54.00	-15.92	100	237	AVG
7440.000	48.66	3.82	52.48	74.00	-21.52	100	281	peak
7440.000	38.50	3.82	42.32	54.00	-11.68	100	281	AVG

Result = Reading + Correct Factor
Margin = Result – Limit
Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain
Spurious emissions more than 20 dB below the limit were not reported.

Vertical

Frequency (MHz)	Reading (dBµV)	Correct Factor(dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
Low channel								
2390.000	64.79	-8.94	55.85	74.00	-18.15	150	95	peak
2390.000	52.75	-8.94	43.81	54.00	-10.19	150	95	AVG
2402.000	107.57	-8.84	98.73	N/A	N/A	156	274	peak
2402.000	107.02	-8.84	98.18	N/A	N/A	156	274	AVG
4804.000	53.62	-0.95	52.67	74.00	-21.33	100	10	peak
4804.000	49.89	-0.95	48.94	54.00	-5.06	100	10	AVG
7206.000	47.48	3.55	51.03	74.00	-22.97	100	296	peak
7206.000	40.44	3.55	43.99	54.00	-10.01	100	296	AVG
Middle channel								
2440.000	106.01	-8.79	97.22	N/A	N/A	176	290	peak
2440.000	105.33	-8.79	96.54	N/A	N/A	176	290	AVG
4880.000	52.18	-0.81	51.37	74.00	-22.63	100	10	peak
4880.000	47.38	-0.81	46.57	54.00	-7.43	100	10	AVG
7320.000	47.95	4.01	51.96	74.00	-22.04	100	334	peak
7320.000	40.57	4.01	44.58	54.00	-9.42	100	334	AVG
High channel								
2480.000	106.65	-8.80	97.85	N/A	N/A	148	293	peak
2480.000	105.89	-8.80	97.09	N/A	N/A	148	293	AVG
2483.500	65.21	-8.81	56.40	74.00	-17.60	150	276	peak
2483.500	53.44	-8.81	44.63	54.00	-9.37	150	276	AVG
4960.000	50.19	-0.50	49.69	74.00	-24.31	100	18	peak
4960.000	44.41	-0.50	43.91	54.00	-10.09	100	18	AVG
7440.000	43.77	3.82	47.59	74.00	-26.41	100	360	peak
7440.000	36.02	3.82	39.84	54.00	-14.16	100	360	AVG

Result = Reading + Correct Factor
Margin = Result – Limit
Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain
Spurious emissions more than 20 dB below the limit were not reported.

BLE(2M) Mode

Below 1GHz

Horizontal

Frequency (MHz)	Reading (dBµV)	Correct Factor(dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
61.0400	48.01	-17.42	30.59	40.00	-9.41	100	132	QP
118.2700	44.67	-10.74	33.93	43.50	-9.57	100	100	QP
165.8000	46.76	-12.39	34.37	43.50	-9.13	100	103	QP
255.0400	46.84	-12.17	34.67	46.00	-11.33	100	60	QP
380.1700	39.91	-8.55	31.36	46.00	-14.64	100	74	QP
468.4400	34.74	-6.34	28.40	46.00	-17.60	100	62	QP

Vertical

Frequency (MHz)	Reading (dBµV)	Correct Factor(dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
62.0100	47.06	-17.30	29.76	40.00	-10.24	100	63	QP
128.9400	39.50	-10.52	28.98	43.50	-14.52	100	57	QP
165.8000	40.31	-12.39	27.92	43.50	-15.58	100	266	QP
256.0100	36.95	-12.07	24.88	46.00	-21.12	100	183	QP
308.3900	33.70	-10.09	23.61	46.00	-22.39	100	60	QP
600.3600	35.39	-4.97	30.42	46.00	-15.58	100	331	QP

Result = Reading + Correct Factor
Margin = Result – Limit
Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain
Spurious emissions more than 20 dB below the limit were not reported.

Above 1GHz

Horizontal

Frequency (MHz)	Reading (dBµV)	Correct Factor(dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
Low channel								
2390.000	65.40	-8.94	56.46	74.00	-17.54	150	353	peak
2390.000	52.59	-8.94	43.65	54.00	-10.35	150	353	AVG
2402.000	103.09	-8.84	94.25	N/A	N/A	172	142	peak
2402.000	101.42	-8.84	92.58	N/A	N/A	172	142	AVG
4804.000	52.55	-0.95	51.60	74.00	-22.40	100	260	peak
4804.000	42.32	-0.95	41.37	54.00	-12.63	100	260	AVG
7206.000	47.21	3.55	50.76	74.00	-23.24	100	278	peak
7206.000	37.77	3.55	41.32	54.00	-12.68	100	278	AVG
Middle channel								
2440.000	101.07	-8.79	92.28	N/A	N/A	174	17	peak
2440.000	99.35	-8.79	90.56	N/A	N/A	174	17	AVG
4880.000	50.30	-0.81	49.49	74.00	-24.51	100	240	peak
4880.000	40.61	-0.81	39.80	54.00	-14.20	100	240	AVG
7320.000	47.60	4.01	51.61	74.00	-22.39	100	298	peak
7320.000	39.00	4.01	43.01	54.00	-10.99	100	298	AVG
High channel								
2480.000	101.72	-8.80	92.92	N/A	N/A	158	22	peak
2480.000	100.14	-8.80	91.34	N/A	N/A	158	22	AVG
2483.500	64.96	-8.81	56.15	74.00	-17.85	150	14	peak
2483.500	53.76	-8.81	44.95	54.00	-9.05	150	14	AVG
4960.000	48.71	-0.50	48.21	74.00	-25.79	100	305	peak
4960.000	38.08	-0.50	37.58	54.00	-16.42	100	305	AVG
7440.000	44.94	3.82	48.76	74.00	-25.24	100	280	peak
7440.000	35.54	3.82	39.36	54.00	-14.64	100	280	AVG

Result = Reading + Correct Factor
Margin = Result – Limit
Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain
Spurious emissions more than 20 dB below the limit were not reported.

Vertical

Frequency (MHz)	Reading (dBµV)	Correct Factor(dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
Low channel								
2390.000	64.31	-8.94	55.37	74.00	-18.63	150	286	peak
2390.000	52.84	-8.94	43.90	54.00	-10.10	150	286	AVG
2402.000	107.03	-8.84	98.19	N/A	N/A	182	272	peak
2402.000	105.53	-8.84	96.69	N/A	N/A	182	272	AVG
4804.000	51.50	-0.95	50.55	74.00	-23.45	100	9	peak
4804.000	44.47	-0.95	43.52	54.00	-10.48	100	9	AVG
7206.000	44.13	3.55	47.68	74.00	-26.32	100	297	peak
7206.000	33.37	3.55	36.92	54.00	-17.08	100	297	AVG
Middle channel								
2440.000	105.65	-8.79	96.86	N/A	N/A	150	273	peak
2440.000	104.07	-8.79	95.28	N/A	N/A	150	273	AVG
4880.000	52.72	-0.81	51.91	74.00	-22.09	100	14	peak
4880.000	41.85	-0.81	41.04	54.00	-12.96	100	14	AVG
7320.000	46.43	4.01	50.44	74.00	-23.56	100	336	peak
7320.000	37.82	4.01	41.83	54.00	-12.17	100	336	AVG
High channel								
2480.000	106.51	-8.80	97.71	N/A	N/A	153	275	peak
2480.000	104.81	-8.80	96.01	N/A	N/A	153	275	AVG
2483.500	66.33	-8.81	57.52	74.00	-16.48	150	273	peak
2483.500	54.99	-8.81	46.18	54.00	-7.82	150	273	AVG
4960.000	50.85	-0.50	50.35	74.00	-23.65	100	15	peak
4960.000	40.10	-0.50	39.60	54.00	-14.40	100	15	AVG
7440.000	43.18	3.82	47.00	74.00	-27.00	100	3	peak
7440.000	33.52	3.82	37.34	54.00	-16.66	100	3	AVG

Result = Reading + Correct Factor
Margin = Result – Limit
Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain
Spurious emissions more than 20 dB below the limit were not reported.

Mode 2

BLE(1M) Mode

Below 1GHz

Horizontal

Frequency (MHz)	Reading (dBµV)	Correct Factor(dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
62.0100	47.55	-17.30	30.25	40.00	-9.75	100	116	QP
118.2700	44.80	-10.74	34.06	43.50	-9.44	100	105	QP
165.8000	46.75	-12.39	34.36	43.50	-9.14	100	94	QP
249.2200	47.20	-12.25	34.95	46.00	-11.05	100	77	QP
380.1700	41.58	-8.55	33.03	46.00	-12.97	100	77	QP
600.3600	34.45	-4.97	29.48	46.00	-16.52	100	91	QP

Vertical

Frequency (MHz)	Reading (dBµV)	Correct Factor(dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
62.0100	46.08	-17.30	28.78	40.00	-11.22	100	47	QP
118.2700	39.15	-10.74	28.41	43.50	-15.09	100	53	QP
165.8000	39.99	-12.39	27.60	43.50	-15.90	100	258	QP
252.1300	38.26	-12.23	26.03	46.00	-19.97	100	183	QP
403.4500	36.67	-7.71	28.96	46.00	-17.04	100	49	QP
600.3600	36.66	-4.97	31.69	46.00	-14.31	100	342	QP

Result = Reading + Correct Factor
Margin = Result – Limit
Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain
Spurious emissions more than 20 dB below the limit were not reported.

Above 1GHz

Horizontal

Frequency (MHz)	Reading (dBµV)	Correct Factor(dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
Low channel								
2390.000	64.82	-8.94	55.88	74.00	-18.12	150	265	peak
2390.000	52.77	-8.94	43.83	54.00	-10.17	150	265	AVG
2402.000	98.14	-8.84	89.30	N/A	N/A	152	106	peak
2402.000	97.51	-8.84	88.67	N/A	N/A	152	106	AVG
4804.000	53.74	-0.95	52.79	74.00	-21.21	100	295	peak
4804.000	50.00	-0.95	49.05	54.00	-4.95	100	295	AVG
7206.000	49.28	3.55	52.83	74.00	-21.17	100	304	peak
7206.000	42.87	3.55	46.42	54.00	-7.58	100	304	AVG
Middle channel								
2440.000	98.32	-8.79	89.53	N/A	N/A	172	147	peak
2440.000	97.75	-8.79	88.96	N/A	N/A	172	147	AVG
4880.000	52.54	-0.81	51.73	74.00	-22.27	100	296	peak
4880.000	47.96	-0.81	47.15	54.00	-6.85	100	296	AVG
7320.000	49.84	4.01	53.85	74.00	-20.15	100	311	peak
7320.000	43.16	4.01	47.17	54.00	-6.83	100	311	AVG
High channel								
2480.000	97.28	-8.80	88.48	N/A	N/A	150	298	peak
2480.000	96.49	-8.80	87.69	N/A	N/A	150	298	AVG
2483.500	64.62	-8.81	55.81	74.00	-18.19	150	107	peak
2483.500	52.52	-8.81	43.71	54.00	-10.29	150	107	AVG
4960.000	50.28	-0.50	49.78	74.00	-24.22	100	168	peak
4960.000	45.09	-0.50	44.59	54.00	-9.41	100	168	AVG
7440.000	51.09	3.82	54.91	74.00	-19.09	100	305	peak
7440.000	44.65	3.82	48.47	54.00	-5.53	100	305	AVG

Result = Reading + Correct Factor
Margin = Result – Limit
Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain
Spurious emissions more than 20 dB below the limit were not reported.

Vertical

Frequency (MHz)	Reading (dBµV)	Correct Factor(dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
Low channel								
2390.000	65.57	-8.94	56.63	74.00	-17.37	150	160	peak
2390.000	52.70	-8.94	43.76	54.00	-10.24	150	160	AVG
2402.000	100.46	-8.84	91.62	N/A	N/A	163	129	peak
2402.000	99.76	-8.84	90.92	N/A	N/A	163	129	AVG
4804.000	53.31	-0.95	52.36	74.00	-21.64	100	111	peak
4804.000	49.29	-0.95	48.34	54.00	-5.66	100	111	AVG
7206.000	50.87	3.55	54.42	74.00	-19.58	100	299	peak
7206.000	45.06	3.55	48.61	54.00	-5.39	100	299	AVG
Middle channel								
2440.000	99.91	-8.79	91.12	N/A	N/A	177	119	peak
2440.000	99.32	-8.79	90.53	N/A	N/A	177	119	AVG
4880.000	50.82	-0.81	50.01	74.00	-23.99	100	99	peak
4880.000	45.92	-0.81	45.11	54.00	-8.89	100	99	AVG
7320.000	52.74	4.01	56.75	74.00	-17.25	100	301	peak
7320.000	46.64	4.01	50.65	54.00	-3.35	100	301	AVG
High channel								
2480.000	101.82	-8.80	93.02	N/A	N/A	174	116	peak
2480.000	101.08	-8.80	92.28	N/A	N/A	174	116	AVG
2483.500	64.33	-8.81	55.52	74.00	-18.48	150	205	peak
2483.500	52.99	-8.81	44.18	54.00	-9.82	150	205	AVG
4960.000	48.83	-0.50	48.33	74.00	-25.67	100	158	peak
4960.000	42.96	-0.50	42.46	54.00	-11.54	100	158	AVG
7440.000	54.13	3.82	57.95	74.00	-16.05	100	299	peak
7440.000	48.34	3.82	52.16	54.00	-1.84	100	299	AVG

Result = Reading + Correct Factor
Margin = Result – Limit
Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain
Spurious emissions more than 20 dB below the limit were not reported.

BLE(2M) Mode

Below 1GHz

Horizontal

Frequency (MHz)	Reading (dBµV)	Correct Factor(dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
62.0100	47.35	-17.30	30.05	40.00	-9.95	100	117	QP
118.2700	45.27	-10.74	34.53	43.50	-8.97	100	114	QP
165.8000	46.44	-12.39	34.05	43.50	-9.45	100	85	QP
258.9200	46.14	-11.79	34.35	46.00	-11.65	100	67	QP
308.3900	44.37	-10.09	34.28	46.00	-11.72	100	67	QP
404.4200	40.51	-7.67	32.84	46.00	-13.16	100	14	QP

Vertical

Frequency (MHz)	Reading (dBµV)	Correct Factor(dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
61.0400	46.49	-17.42	29.07	40.00	-10.93	100	51	QP
118.2700	39.34	-10.74	28.60	43.50	-14.90	100	48	QP
251.1600	37.68	-12.25	25.43	46.00	-20.57	100	188	QP
404.4200	35.09	-7.67	27.42	46.00	-18.58	100	42	QP
468.4400	34.09	-6.34	27.75	46.00	-18.25	100	108	QP
600.3600	34.07	-4.97	29.10	46.00	-16.90	100	339	QP

Result = Reading + Correct Factor
Margin = Result – Limit
Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain
Spurious emissions more than 20 dB below the limit were not reported.

Above 1GHz

Horizontal

Frequency (MHz)	Reading (dBµV)	Correct Factor(dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
Low channel								
2390.000	64.94	-8.94	56.00	74.00	-18.00	150	251	peak
2390.000	52.70	-8.94	43.76	54.00	-10.24	150	251	AVG
2402.000	98.06	-8.84	89.22	N/A	N/A	154	108	peak
2402.000	96.38	-8.84	87.54	N/A	N/A	154	108	AVG
4804.000	53.86	-0.95	52.91	74.00	-21.09	100	280	peak
4804.000	46.52	-0.95	45.57	54.00	-8.43	100	280	AVG
7206.000	50.39	3.55	53.94	74.00	-20.06	100	299	peak
7206.000	41.74	3.55	45.29	54.00	-8.71	100	299	AVG
Middle channel								
2440.000	98.17	-8.79	89.38	N/A	N/A	150	145	peak
2440.000	96.47	-8.79	87.68	N/A	N/A	150	145	AVG
4880.000	52.41	-0.81	51.60	74.00	-22.40	100	289	peak
4880.000	44.59	-0.81	43.78	54.00	-10.22	100	289	AVG
7320.000	51.07	4.01	55.08	74.00	-18.92	100	304	peak
7320.000	42.59	4.01	46.60	54.00	-7.40	100	304	AVG
High channel								
2480.000	97.20	-8.80	88.40	N/A	N/A	150	298	peak
2480.000	95.42	-8.80	86.62	N/A	N/A	150	298	AVG
2483.500	65.33	-8.81	56.52	74.00	-17.48	150	2	peak
2483.500	52.92	-8.81	44.11	54.00	-9.89	150	2	AVG
4960.000	52.21	-0.50	51.71	74.00	-22.29	100	296	peak
4960.000	44.08	-0.50	43.58	54.00	-10.42	100	296	AVG
7440.000	52.93	3.82	56.75	74.00	-17.25	100	298	peak
7440.000	44.75	3.82	48.57	54.00	-5.43	100	298	AVG

Result = Reading + Correct Factor
Margin = Result – Limit
Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain
Spurious emissions more than 20 dB below the limit were not reported.

Vertical

Frequency (MHz)	Reading (dBµV)	Correct Factor(dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
Low channel								
2390.000	64.36	-8.94	55.42	74.00	-18.58	150	277	peak
2390.000	52.77	-8.94	43.83	54.00	-10.17	150	277	AVG
2402.000	100.44	-8.84	91.60	N/A	N/A	146	129	peak
2402.000	98.85	-8.84	90.01	N/A	N/A	146	129	AVG
4804.000	53.64	-0.95	52.69	74.00	-21.31	100	87	peak
4804.000	46.13	-0.95	45.18	54.00	-8.82	100	87	AVG
7206.000	50.83	3.55	54.38	74.00	-19.62	100	359	peak
7206.000	42.29	3.55	45.84	54.00	-8.16	100	359	AVG
Middle channel								
2440.000	99.92	-8.79	91.13	N/A	N/A	150	121	peak
2440.000	98.26	-8.79	89.47	N/A	N/A	150	121	AVG
4880.000	51.61	-0.81	50.80	74.00	-23.20	100	79	peak
4880.000	43.39	-0.81	42.58	54.00	-11.42	100	79	AVG
7320.000	52.43	4.01	56.44	74.00	-17.56	100	298	peak
7320.000	43.75	4.01	47.76	54.00	-6.24	100	298	AVG
High channel								
2480.000	101.83	-8.80	93.03	N/A	N/A	178	118	peak
2480.000	100.11	-8.80	91.31	N/A	N/A	178	118	AVG
2483.500	65.30	-8.81	56.49	74.00	-17.51	150	100	peak
2483.500	53.73	-8.81	44.92	54.00	-9.08	150	100	AVG
4960.000	49.64	-0.50	49.14	74.00	-24.86	100	95	peak
4960.000	39.60	-0.50	39.10	54.00	-14.90	100	95	AVG
7440.000	52.03	3.82	55.85	74.00	-18.15	100	343	peak
7440.000	43.44	3.82	47.26	54.00	-6.74	100	343	AVG

Result = Reading + Correct Factor
Margin = Result – Limit
Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain
Spurious emissions more than 20 dB below the limit were not reported.

Mode 3

BLE(1M) Mode

Below 1GHz

Horizontal

Frequency (MHz)	Reading (dBµV)	Correct Factor(dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
118.2700	45.60	-10.74	34.86	43.50	-8.64	100	94	QP
165.8000	51.74	-12.39	39.35	43.50	-4.15	100	97	QP
285.1100	45.88	-10.73	35.15	46.00	-10.85	100	70	QP
309.3600	47.16	-10.07	37.09	46.00	-8.91	100	75	QP
380.1700	42.59	-8.55	34.04	46.00	-11.96	100	197	QP
403.4500	41.48	-7.71	33.77	46.00	-12.23	100	191	QP

Vertical

Frequency (MHz)	Reading (dBµV)	Correct Factor(dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
61.0400	47.42	-17.42	30.00	40.00	-10.00	100	61	QP
118.2700	39.58	-10.74	28.84	43.50	-14.66	100	29	QP
165.8000	40.20	-12.39	27.81	43.50	-15.69	100	295	QP
331.6700	36.30	-9.66	26.64	46.00	-19.36	100	37	QP
468.4400	34.25	-6.34	27.91	46.00	-18.09	100	102	QP
600.3600	35.80	-4.97	30.83	46.00	-15.17	100	337	QP

Result = Reading + Correct Factor
Margin = Result – Limit
Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain
Spurious emissions more than 20 dB below the limit were not reported.

Above 1GHz

Horizontal

Frequency (MHz)	Reading (dBµV)	Correct Factor(dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
Low channel								
2390.000	64.78	-8.94	55.84	74.00	-18.16	150	359	peak
2390.000	52.57	-8.94	43.63	54.00	-10.37	150	359	AVG
2402.000	102.38	-8.84	93.54	N/A	N/A	150	174	peak
2402.000	101.83	-8.84	92.99	N/A	N/A	150	174	AVG
4804.000	51.78	-0.95	50.83	74.00	-23.17	179	201	peak
4804.000	47.10	-0.95	46.15	54.00	-7.85	179	201	AVG
7206.000	46.35	3.55	49.90	74.00	-24.10	103	267	peak
7206.000	38.65	3.55	42.20	54.00	-11.80	103	267	AVG
Middle channel								
2440.000	100.46	-8.79	91.67	N/A	N/A	150	173	peak
2440.000	99.81	-8.79	91.02	N/A	N/A	150	173	AVG
4880.000	51.82	-0.81	51.01	74.00	-22.99	190	199	peak
4880.000	47.10	-0.81	46.29	54.00	-7.71	190	199	AVG
7320.000	46.73	4.01	50.74	74.00	-23.26	100	140	peak
7320.000	38.46	4.01	42.47	54.00	-11.53	100	140	AVG
High channel								
2480.000	97.20	-8.80	88.40	N/A	N/A	124	178	peak
2480.000	96.43	-8.80	87.63	N/A	N/A	124	178	AVG
2483.500	64.56	-8.81	55.75	74.00	-18.25	150	251	peak
2483.500	52.65	-8.81	43.84	54.00	-10.16	150	251	AVG
4960.000	50.54	-0.50	50.04	74.00	-23.96	221	204	peak
4960.000	45.06	-0.50	44.56	54.00	-9.44	221	204	AVG
7440.000	49.52	3.82	53.34	74.00	-20.66	127	234	peak
7440.000	42.92	3.82	46.74	54.00	-7.26	127	234	AVG

Result = Reading + Correct Factor
Margin = Result – Limit
Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain
Spurious emissions more than 20 dB below the limit were not reported.

Vertical

Frequency (MHz)	Reading (dBµV)	Correct Factor(dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
Low channel								
2390.000	64.62	-8.94	55.68	74.00	-18.32	150	346	peak
2390.000	52.68	-8.94	43.74	54.00	-10.26	150	346	AVG
2402.000	101.36	-8.84	92.52	N/A	N/A	150	160	peak
2402.000	100.74	-8.84	91.90	N/A	N/A	150	160	AVG
4804.000	51.99	-0.95	51.04	74.00	-22.96	239	1	peak
4804.000	47.80	-0.95	46.85	54.00	-7.15	239	1	AVG
7206.000	45.63	3.55	49.18	74.00	-24.82	100	233	peak
7206.000	37.78	3.55	41.33	54.00	-12.67	100	233	AVG
Middle channel								
2440.000	99.24	-8.79	90.45	N/A	N/A	158	30	peak
2440.000	98.59	-8.79	89.80	N/A	N/A	158	30	AVG
4880.000	48.20	-0.81	47.39	74.00	-26.61	100	336	peak
4880.000	41.70	-0.81	40.89	54.00	-13.11	100	336	AVG
7320.000	47.66	4.01	51.67	74.00	-22.33	100	231	peak
7320.000	39.58	4.01	43.59	54.00	-10.41	100	231	AVG
High channel								
2480.000	97.53	-8.80	88.73	N/A	N/A	124	133	peak
2480.000	96.77	-8.80	87.97	N/A	N/A	124	133	AVG
2483.500	66.28	-8.81	57.47	74.00	-16.53	150	73	peak
2483.500	52.53	-8.81	43.72	54.00	-10.28	150	73	AVG
4960.000	47.58	-0.50	47.08	74.00	-26.92	100	343	peak
4960.000	39.81	-0.50	39.31	54.00	-14.69	100	343	AVG
7440.000	47.76	3.82	51.58	74.00	-22.42	100	121	peak
7440.000	39.47	3.82	43.29	54.00	-10.71	100	121	AVG

Result = Reading + Correct Factor
Margin = Result – Limit
Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain
Spurious emissions more than 20 dB below the limit were not reported.

BLE(2M) Mode

Below 1GHz

Horizontal

Frequency (MHz)	Reading (dBµV)	Correct Factor(dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
62.0100	48.47	-17.30	31.17	40.00	-8.83	100	128	QP
118.2700	44.31	-10.74	33.57	43.50	-9.93	100	105	QP
165.8000	47.42	-12.39	35.03	43.50	-8.47	100	88	QP
213.3300	44.30	-13.16	31.14	43.50	-12.36	100	79	QP
260.8600	45.40	-11.58	33.82	46.00	-12.18	100	61	QP
308.3900	45.43	-10.09	35.34	46.00	-10.66	100	73	QP

Vertical

Frequency (MHz)	Reading (dBµV)	Correct Factor(dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
62.0100	47.27	-17.30	29.97	40.00	-10.03	100	53	QP
125.0600	38.96	-10.51	28.45	43.50	-15.05	100	58	QP
165.8000	39.33	-12.39	26.94	43.50	-16.56	100	288	QP
332.6400	35.81	-9.64	26.17	46.00	-19.83	100	41	QP
468.4400	32.96	-6.34	26.62	46.00	-19.38	100	241	QP
600.3600	36.00	-4.97	31.03	46.00	-14.97	100	323	QP

Result = Reading + Correct Factor
Margin = Result – Limit
Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain
Spurious emissions more than 20 dB below the limit were not reported.

Above 1GHz

Horizontal

Frequency (MHz)	Reading (dBµV)	Correct Factor(dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
Low channel								
2390.000	65.17	-8.94	56.23	74.00	-17.77	150	1	peak
2390.000	52.69	-8.94	43.75	54.00	-10.25	150	1	AVG
2402.000	102.35	-8.84	93.51	N/A	N/A	149	174	peak
2402.000	100.69	-8.84	91.85	N/A	N/A	149	174	AVG
4804.000	51.82	-0.95	50.87	74.00	-23.13	256	207	peak
4804.000	43.73	-0.95	42.78	54.00	-11.22	256	207	AVG
7206.000	46.41	3.55	49.96	74.00	-24.04	100	272	peak
7206.000	36.20	3.55	39.75	54.00	-14.25	100	272	AVG
Middle channel								
2440.000	100.36	-8.79	91.57	N/A	N/A	150	174	peak
2440.000	98.66	-8.79	89.87	N/A	N/A	150	174	AVG
4880.000	51.47	-0.81	50.66	74.00	-23.34	236	202	peak
4880.000	43.34	-0.81	42.53	54.00	-11.47	236	202	AVG
7320.000	46.92	4.01	50.93	74.00	-23.07	100	239	peak
7320.000	36.28	4.01	40.29	54.00	-13.71	100	239	AVG
High channel								
2480.000	97.16	-8.80	88.36	N/A	N/A	118	177	peak
2480.000	95.28	-8.80	86.48	N/A	N/A	118	177	AVG
2483.500	64.42	-8.81	55.61	74.00	-18.39	150	187	peak
2483.500	52.91	-8.81	44.10	54.00	-9.90	150	187	AVG
4960.000	49.53	-0.50	49.03	74.00	-24.97	200	167	peak
4960.000	40.51	-0.50	40.01	54.00	-13.99	200	167	AVG
7440.000	49.77	3.82	53.59	74.00	-20.41	117	134	peak
7440.000	40.48	3.82	44.30	54.00	-9.70	117	134	AVG

Result = Reading + Correct Factor
Margin = Result – Limit
Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain
Spurious emissions more than 20 dB below the limit were not reported.

Vertical

Frequency (MHz)	Reading (dBµV)	Correct Factor(dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
Low channel								
2390.000	65.01	-8.94	56.07	74.00	-17.93	150	275	peak
2390.000	52.78	-8.94	43.84	54.00	-10.16	150	275	AVG
2402.000	101.27	-8.84	92.43	N/A	N/A	163	159	peak
2402.000	99.50	-8.84	90.66	N/A	N/A	163	159	AVG
4804.000	52.46	-0.95	51.51	74.00	-22.49	249	360	peak
4804.000	44.72	-0.95	43.77	54.00	-10.23	249	360	AVG
7206.000	45.59	3.55	49.14	74.00	-24.86	148	181	peak
7206.000	35.31	3.55	38.86	54.00	-15.14	148	181	AVG
Middle channel								
2440.000	99.23	-8.79	90.44	N/A	N/A	157	30	peak
2440.000	97.54	-8.79	88.75	N/A	N/A	157	30	AVG
4880.000	48.04	-0.81	47.23	74.00	-26.77	100	337	peak
4880.000	37.73	-0.81	36.92	54.00	-17.08	100	337	AVG
7320.000	47.79	4.01	51.80	74.00	-22.20	100	233	peak
7320.000	38.39	4.01	42.40	54.00	-11.60	100	233	AVG
High channel								
2480.000	97.53	-8.80	88.73	N/A	N/A	150	133	peak
2480.000	95.97	-8.80	87.17	N/A	N/A	150	133	AVG
2483.500	64.98	-8.81	56.17	74.00	-17.83	150	242	peak
2483.500	53.01	-8.81	44.20	54.00	-9.80	150	242	AVG
4960.000	47.25	-0.50	46.75	74.00	-27.25	161	36	peak
4960.000	36.20	-0.50	35.70	54.00	-18.30	161	36	AVG
7440.000	47.50	3.82	51.32	74.00	-22.68	100	135	peak
7440.000	37.89	3.82	41.71	54.00	-12.29	100	135	AVG

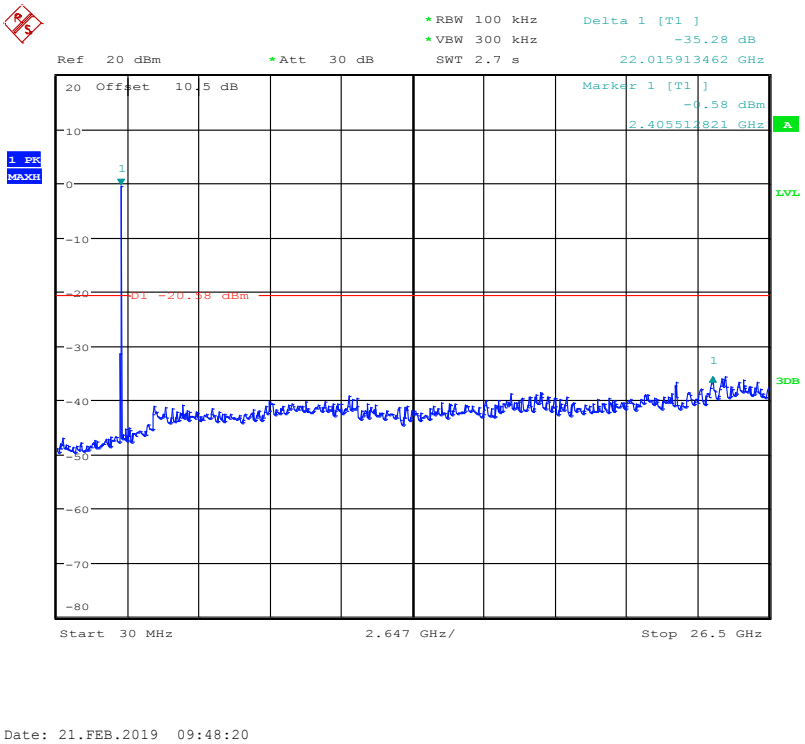
Result = Reading + Correct Factor
Margin = Result – Limit
Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain
Spurious emissions more than 20 dB below the limit were not reported.

Conducted Spurious Emissions:

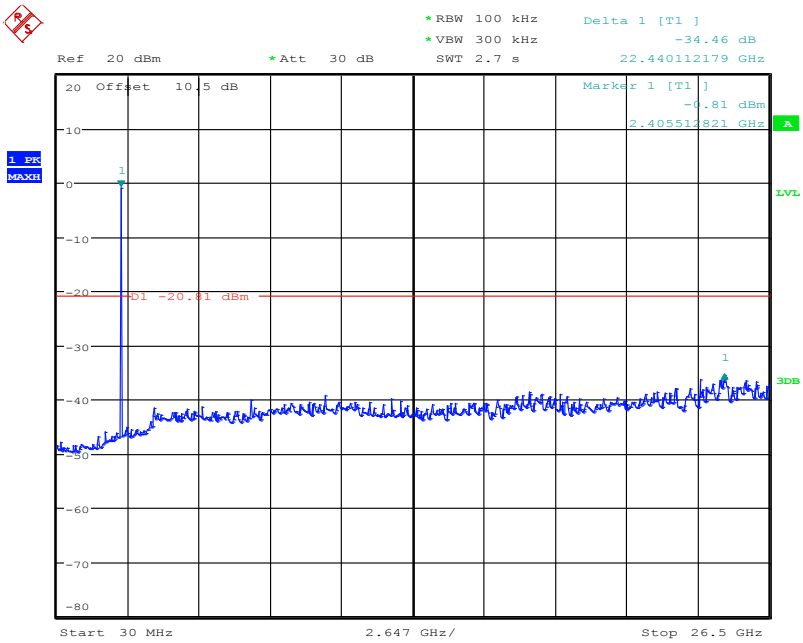
Channel	Frequency (MHz)	Delta Peak to Band Emission (dBc)	Limit (dBc)	Result
BLE(1M) Mode				
Low	2402	35.28	≥ 20	PASS
Mid	2441	34.46	≥ 20	PASS
High	2480	34.47	≥ 20	PASS
BLE(2M) Mode				
Low	2402	34.67	≥ 20	PASS
Mid	2441	34.68	≥ 20	PASS
High	2480	31.87	≥ 20	PASS

Please refer to the following plots

Mode 1
BLE(1M) Mode
Low Channel

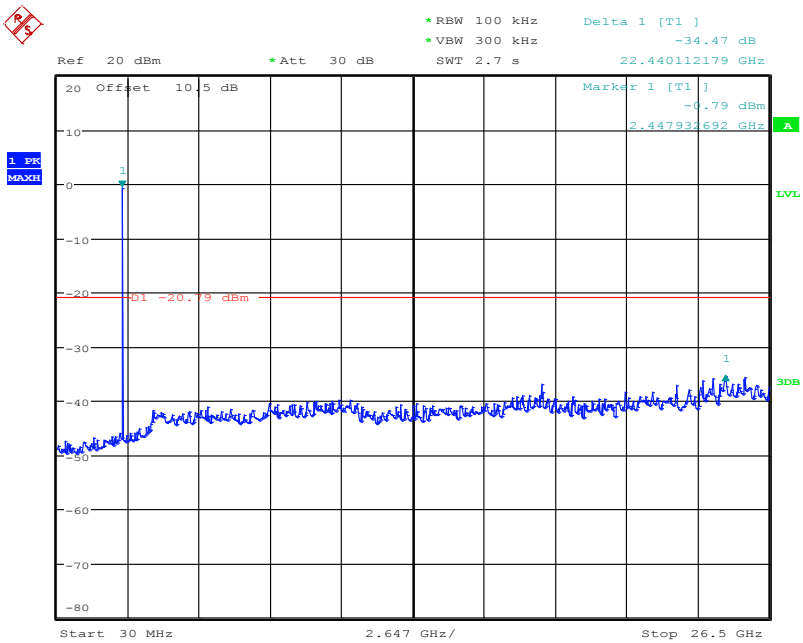


Middle Channel



Date: 21.FEB.2019 09:50:37

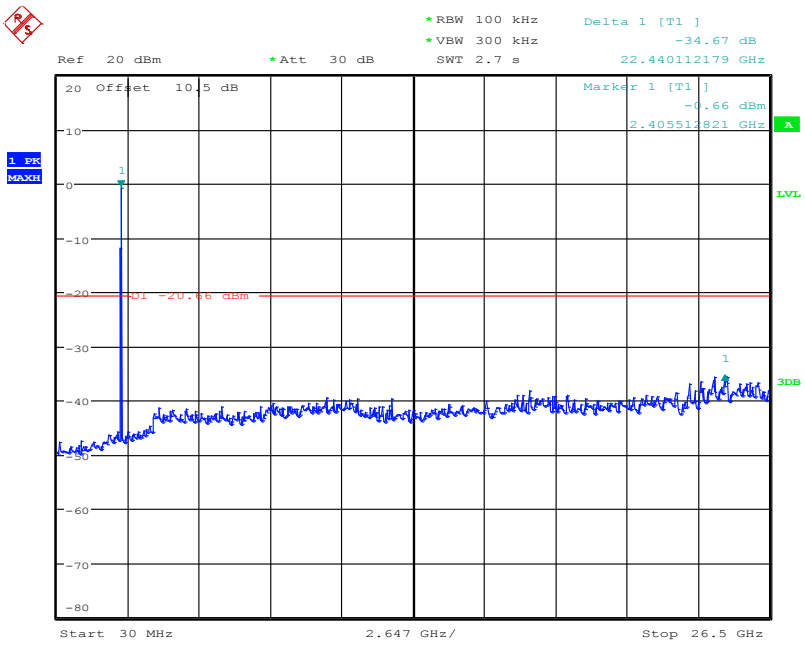
High Channel



Date: 21.FEB.2019 09:54:57

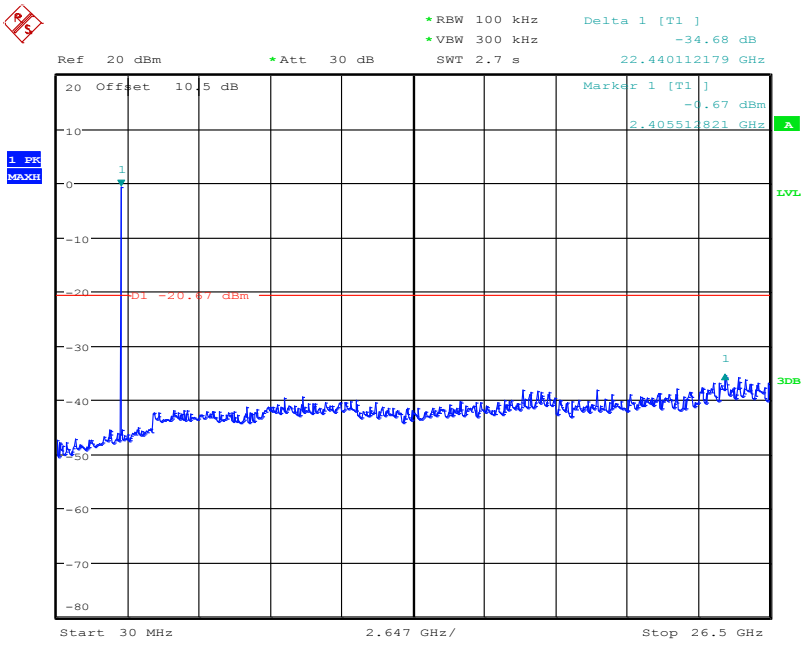
BLE(2M) Mode

Low Channel



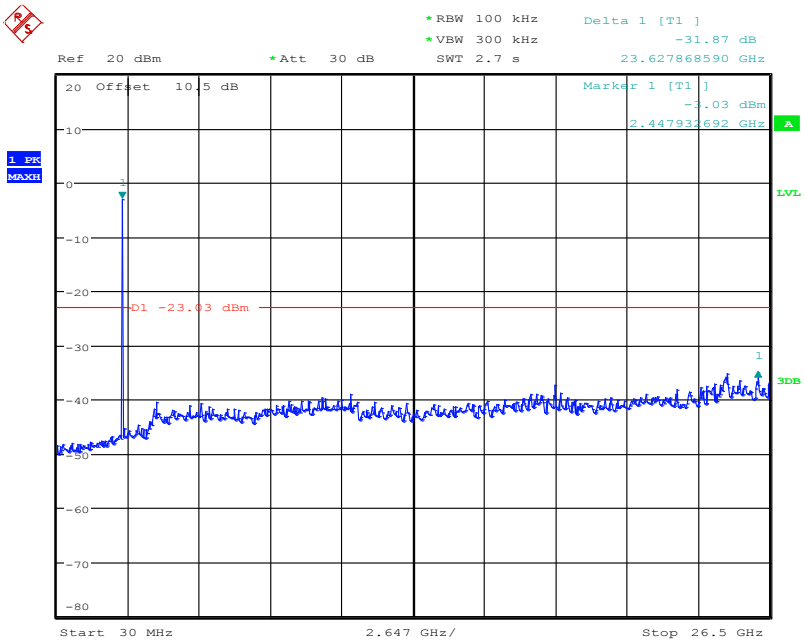
Date: 21.FEB.2019 09:57:32

Middle Channel



Date: 21.FEB.2019 09:58:57

High Channel



Date: 21.FEB.2019 10:01:33

9 FCC §15.247(a)(2) – 6 dB Emission Bandwidth

9.1 Applicable Standard

According to FCC §15.247(a)(2).

Systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

9.2 Test Procedure

The steps for the first option are as follows:

a) Set RBW = 100 kHz.

b) Set the VBW ≥ [3 × RBW].

c) Detector = peak.

d) Trace mode = max hold.

e) Sweep = auto couple.

f) Allow the trace to stabilize.

g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

9.3 Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	55 %
ATM Pressure:	1010 hPa

The testing was performed by Tom Hsu on 2019-02-21.

9.4 Test Results

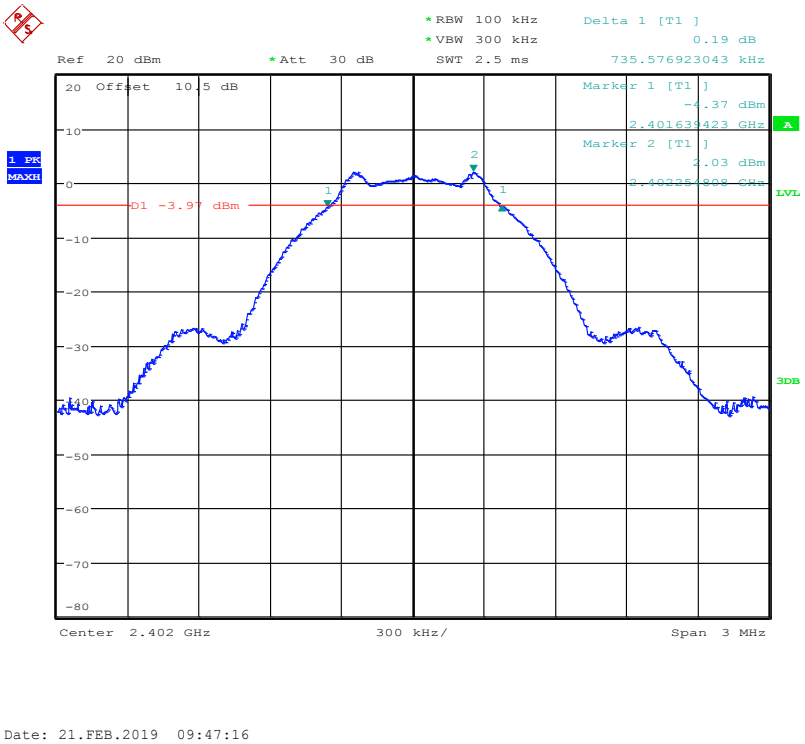
Channel	Frequency (MHz)	6 dB Emission Bandwidth (kHz)	Limit (kHz)	Result
BLE(1M) Mode				
Low	2402	735	> 500	Compliance
Middle	2440	745	> 500	Compliance
High	2480	740	> 500	Compliance
BLE(2M) Mode				
Low	2402	1504	> 500	Compliance
Middle	2440	1480	> 500	Compliance
High	2480	1504	> 500	Compliance

Please refer to the following plots

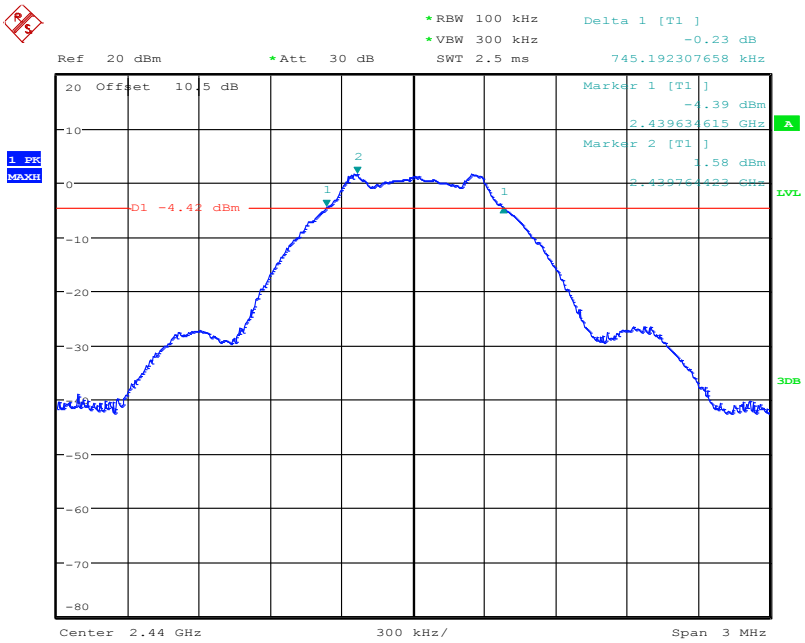
Mode 1

BLE(1M) Mode

Low Channel

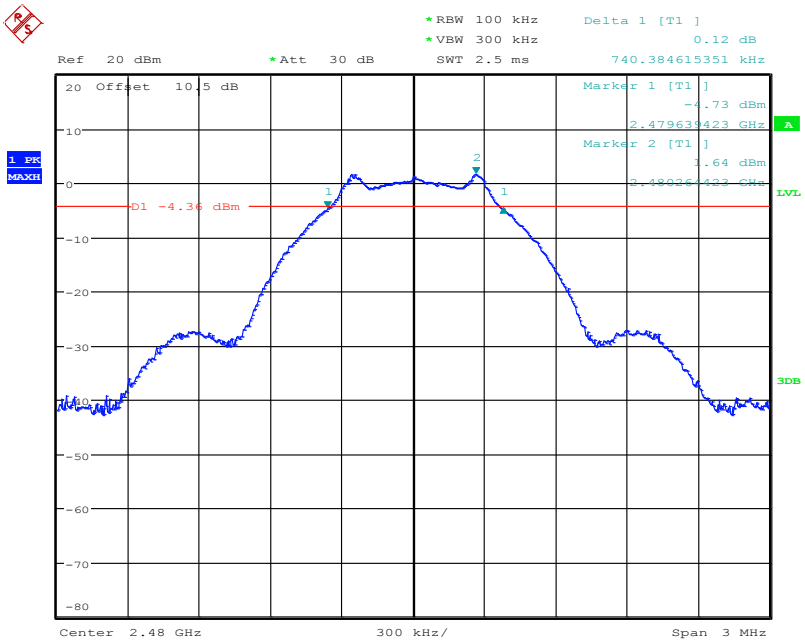


Middle Channel



Date: 21.FEB.2019 09:49:51

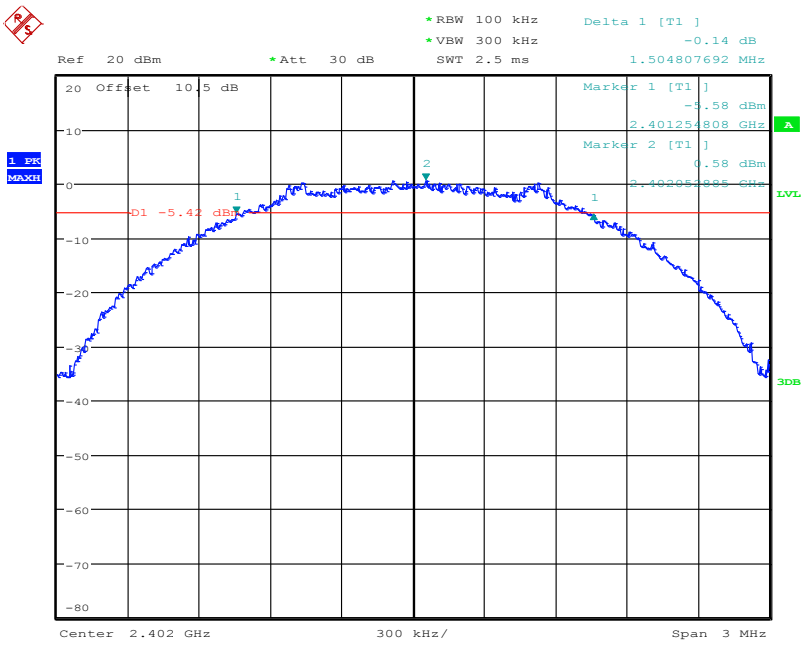
High Channel



Date: 21.FEB.2019 09:53:53

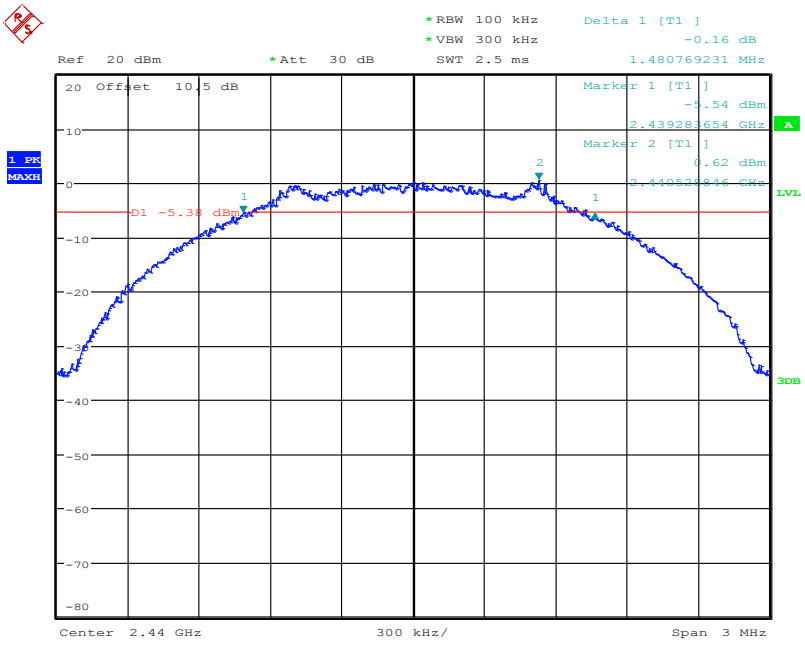
BLE(2M) Mode

Low Channel



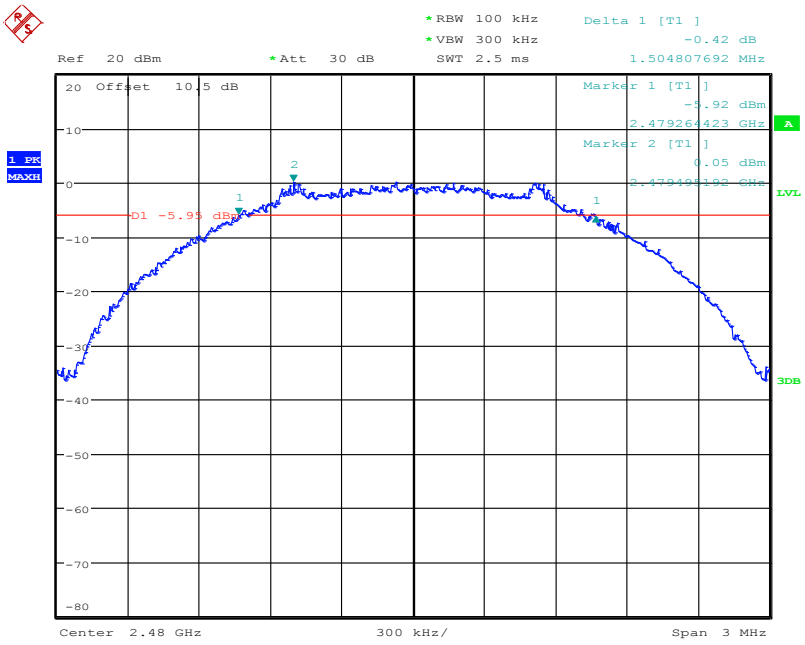
Date: 21.FEB.2019 09:56:28

Middle Channel



Date: 21.FEB.2019 09:58:11

High Channel



Date: 21.FEB.2019 10:00:29

10 FCC §15.247(b)(3) – Maximum Output Power

10.1 Applicable Standard

According to FCC §15.247(b) (3).

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

10.2 Test Procedure

1. Place the EUT on a bench and set it in transmitting mode.

2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to measuring equipment.

10.3 Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	55 %
ATM Pressure:	1010 hPa

The testing was performed by Tom Hsu on 2019-02-21.

10.4 Test Results

Channel	Frequency	Maximum peak Conducted Output Power		Limit	Result
	(MHz)	(dBm)	(W)	(W)	
BLE(1M) Mode - **Mode 1**					
Low	2402	1.04	0.0013	1	PASS
Middle	2440	0.87	0.0012	1	PASS
High	2480	0.73	0.0012	1	PASS
BLE(2M) Mode - **Mode 1**					
Low	2402	1.04	0.0013	1	PASS
Middle	2440	0.86	0.0012	1	PASS
High	2480	0.73	0.0012	1	PASS

11 FCC§15.247(d) – 100 kHz Bandwidth of Frequency Band Edge

11.1 Applicable Standard

According to FCC §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)).

11.2 Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.

2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.

3. Set RBW to 100 kHz and VBW of spectrum analyzer to 300 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.

4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.

5. Repeat above procedures until all measured frequencies were complete.

11.3 Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	55 %
ATM Pressure:	1010 hPa

The testing was performed by Tom Hsu on 2019-02-21.

11.4 Test Results

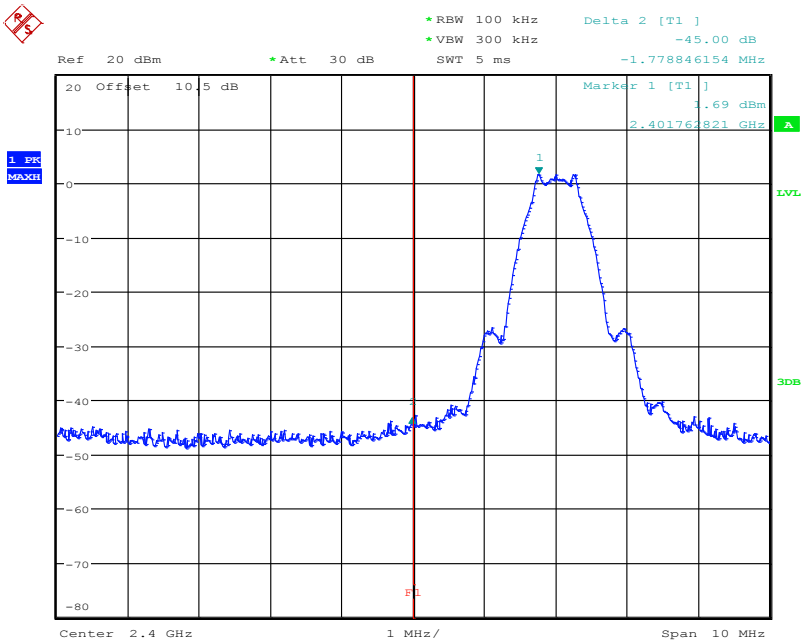
Channel	Frequency (MHz)	Delta Peak to Band Emission (dBc)	Limit (dBc)	Result
BLE(1M) Mode				
Low	2402	45.00	≥ 20	PASS
High	2480	45.89	≥ 20	PASS
BLE(2M) Mode				
Low	2402	31.22	≥ 20	PASS
High	2480	42.91	≥ 20	PASS

Please refer to the following plots

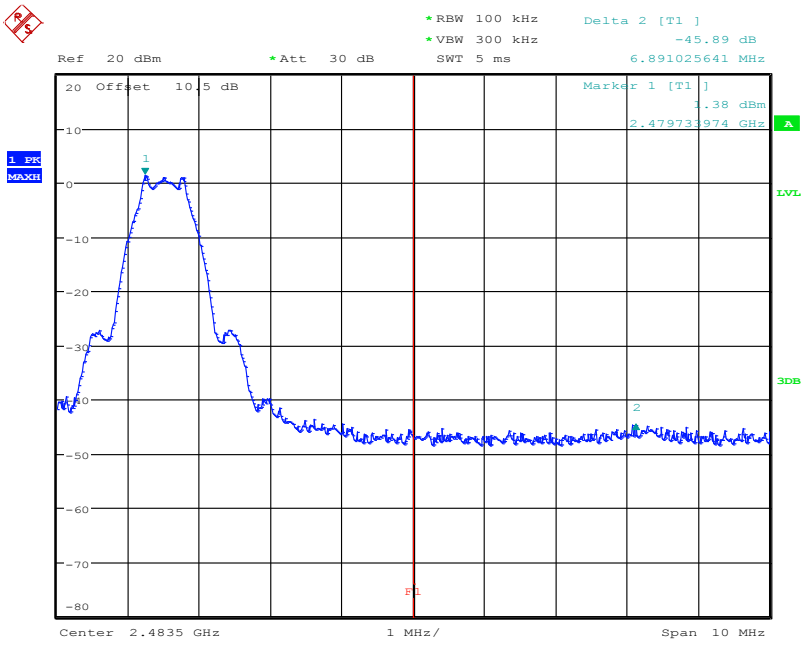
Mode 1

BLE(1M) Mode

Band Edge, Left Side

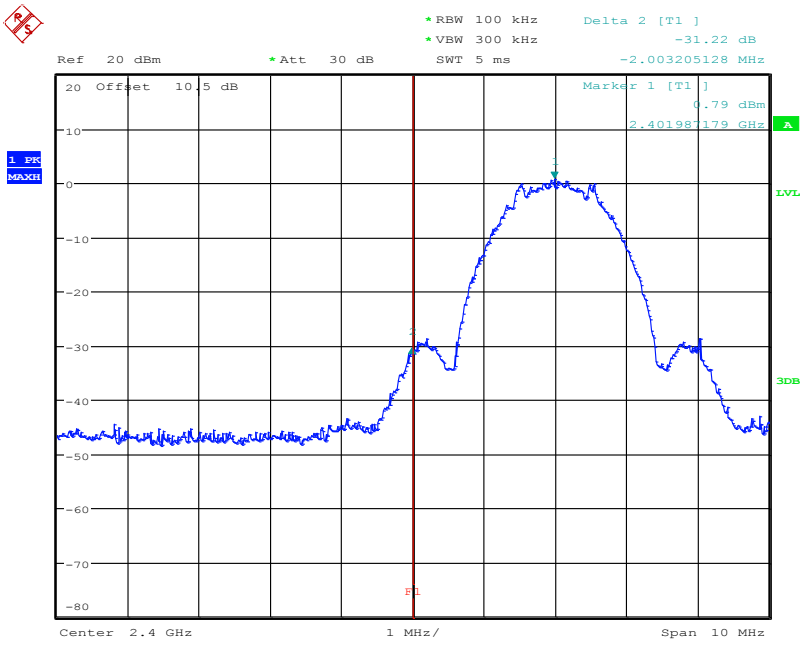


Band Edge, Right Side

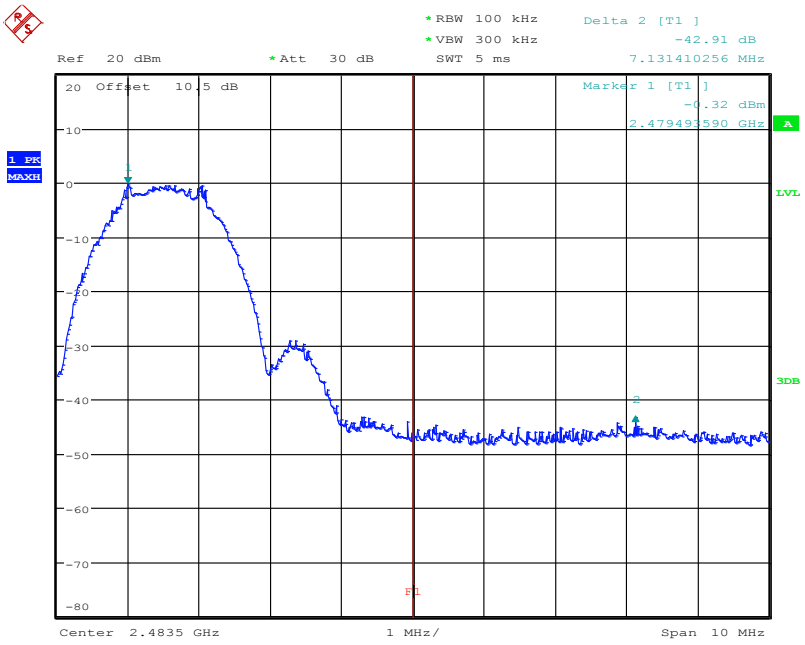


BLE(2M) Mode

Band Edge, Left Side



Band Edge, Right Side



12 FCC §15.247(e) – Power Spectral Density

12.1 Applicable Standard

According to FCC §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.

12.2 Test Procedure

According to ANSI C63.10-2013

a) Set analyzer center frequency to DTS channel center frequency.

b) Set the span to 1.5 times the DTS bandwidth.

c) Set the RBW to 3 kHz ≤ RBW ≤ 100 kHz.

d) Set the VBW ≥ [3 × RBW].

e) Detector = peak.

f) Sweep time = auto couple.

g) Trace mode = max hold.

h) Allow trace to fully stabilize.

i) Use the peak marker function to determine the maximum amplitude level within the RBW.

j) If measured value exceeds requirement, then reduce RBW (but no less than 3 kHz) and repeat

12.3 Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	55 %
ATM Pressure:	1010 hPa

The testing was performed by Tom Hsu on 2019-02-21.

12.4 Test Results

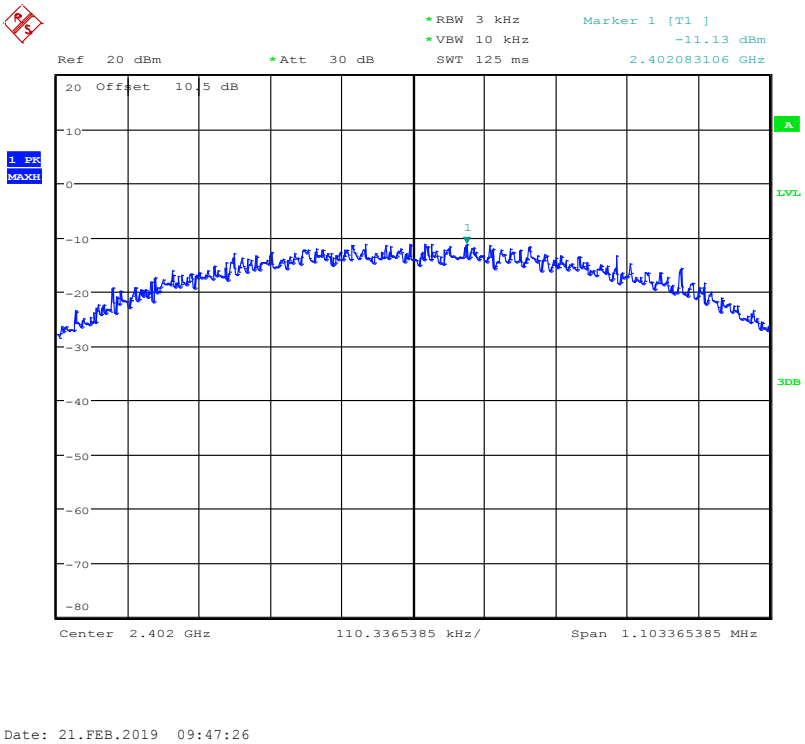
Channel	Frequency (MHz)	Power Spectral Density (dBm/3 kHz)	Limit (dBm/3 kHz)	Result
BLE(1M) Mode				
Low	2402	-11.13	8	Compliance
Middle	2440	-10.65	8	Compliance
High	2480	-9.72	8	Compliance
BLE(2M) Mode				
Low	2402	-13.31	8	Compliance
Middle	2440	-13.01	8	Compliance
High	2480	-13.50	8	Compliance

Please refer to the following plots

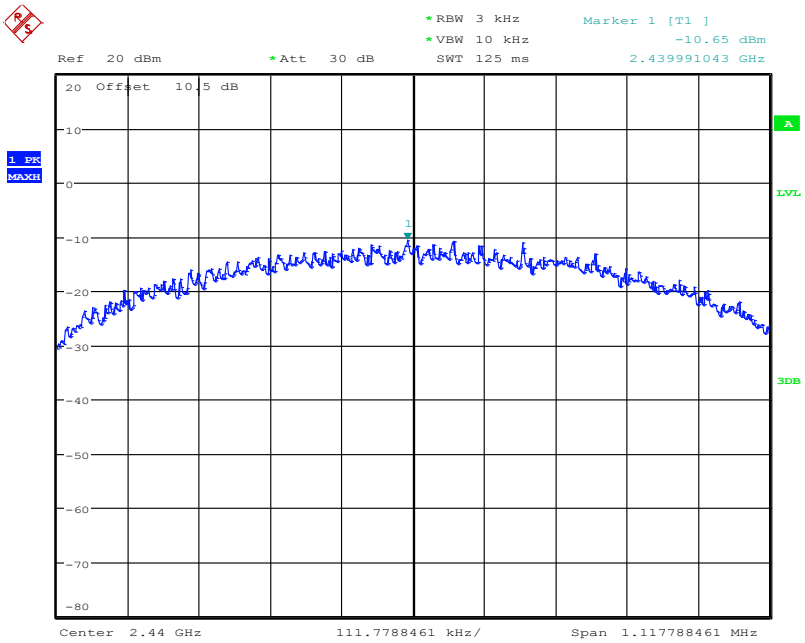
Mode 1

BLE(1M) Mode

Low Channel

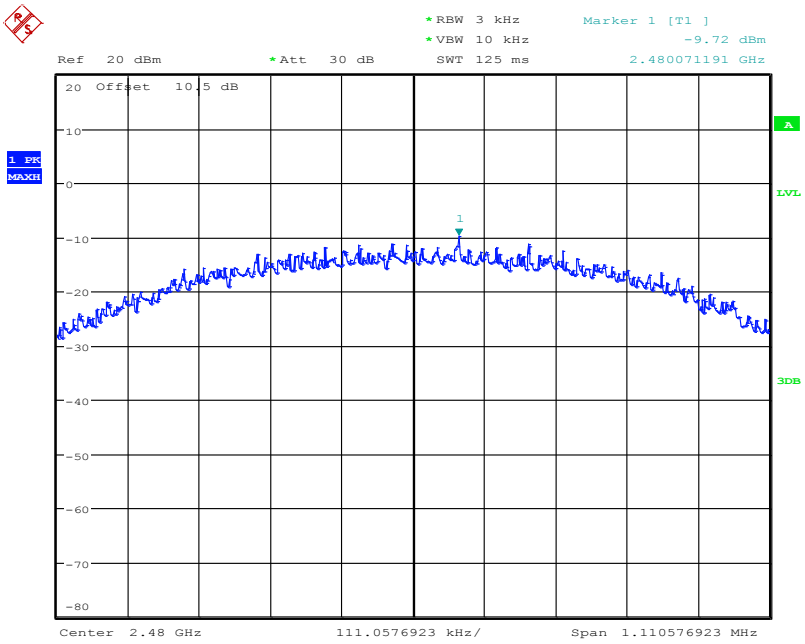


Middle Channel



Date: 21.FEB.2019 09:50:01

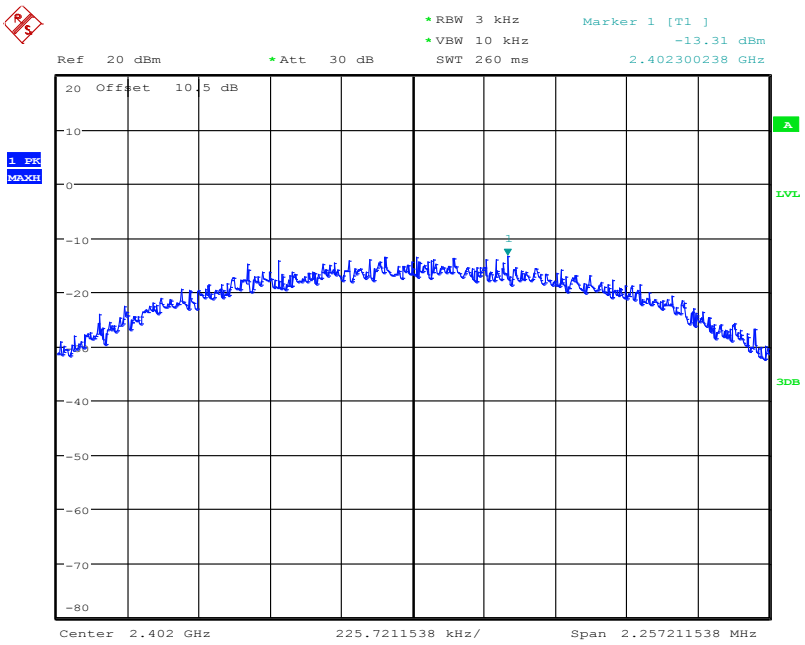
High Channel



Date: 21.FEB.2019 09:54:03

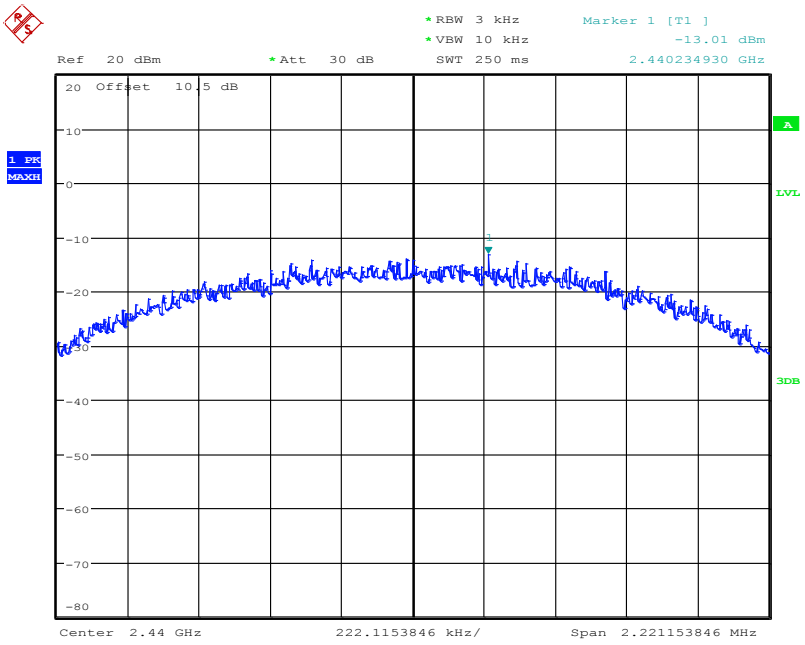
BLE(2M) Mode

Low Channel



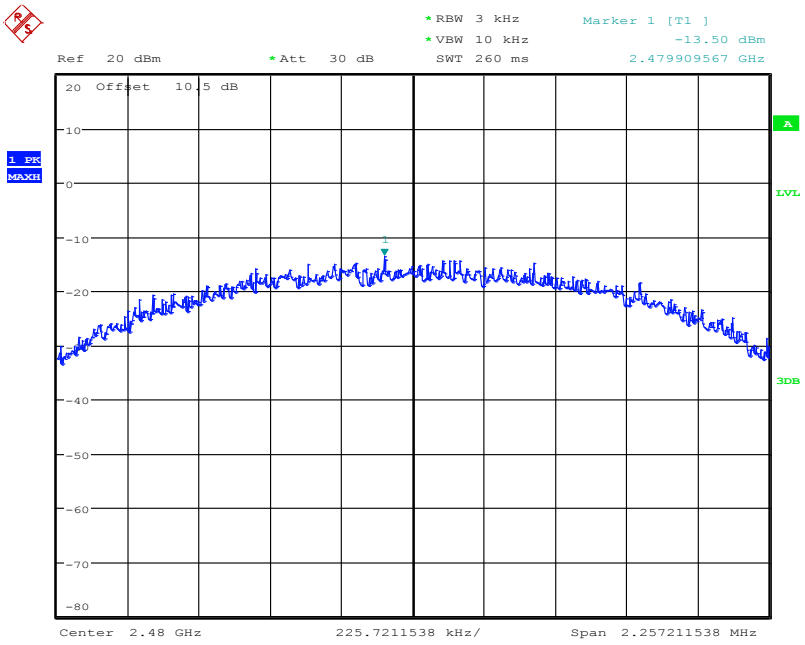
Date: 21.FEB.2019 09:56:38

Middle Channel



Date: 21.FEB.2019 09:58:21

High Channel



Date: 21.FEB.2019 10:00:39

******* END OF REPORT *******