RADIO TEST REPORT

FCC 47 CFR PART 15 SUBPART C
INDUSTRY CANADA RSS-247

Test Standard	**FCC Part 15.247** **RSS-247 issue 2 and RSS-GEN issue 5**
Product name	**Nightwave**
Brand Name	**SiOnyx**
Model No.	**CRV-500C**
Test Result	**Pass**
Statements of Conformity	**Determination of compliance is based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.**

The test Result was tested by Compliance Certification Services Inc. The test data, data evaluation, test procedures, and equipment configurations shown in this report were given in ANSI C63.10: 2013 and compliance standards.

The test results of this report relate only to the tested sample (EUT) identified in this report.
The test Report of full or partial shall not copy. Without written approval of Compliance Certification Services Inc. (Wugu Laboratory)

Approved by:

Sehni Hu
Supervisor

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.
除非另有說明，此報告結果僅對測試之樣品負責，同時此樣品僅保留90天。本報告未經本公司書面許可，不可部份複製。
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Revision History

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	June 24, 2022	Initial Issue	ALL	Allison Chen
01	July 1, 2022	See the following Note Rev.(01)	P.4, 12	Allison Chen

Note:
Rev.(01)
1. Modified applicant address, worst mode.

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1. GENERAL INFORMATION

1.1 EUT INFORMATION

FCC Applicant / Manufacturer	SiOnyx, LLC 100 Cummings Center, Suite 303B, Beverly, MA 01915, USA
IC Applicant / Manufacturer	SiOnyx, LLC 100 Cummings Centre, Suite 303B, Beverly, MA 01915, United States Of America (Excluding The State Of Alaska)
Equipment	Nightwave
Model Name	CRV-500C
Model Discrepancy	N/A
Brand Name	SiOnyx
Received Date	April 20, 2022
Date of Test	April 25~26, 2022
Power Supply	Power supply from NB.
HW Version	02
SW Version	1.80
EUT Serial #	CRV5220400034

Remark:
1. For more details, please refer to the User's manual of the EUT.
2. Disclaimer: Antenna information is provided by the applicant, test results of this report are applicable to the sample EUT received.

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1.2 EUT CHANNEL INFORMATION

Frequency Range	2402MHz-2480MHz
Modulation Type	GFSK for BLE 1 Mbps
Number of channels	40 Channels

Remark:
Refer as ANSI C63.10: 2013 clause 5.6.1 Table 4 for test channels

Number of frequencies to be tested		
Frequency range in which device operates	**Number of frequencies**	**Location in frequency range of operation**
☐ 1 MHz or less	1	Middle
☐ 1 MHz to 10 MHz	2	1 near top and 1 near bottom
☒ More than 10 MHz	3	1 near top, 1 near middle, and 1 near bottom

1.3 ANTENNA INFORMATION

Antenna Specification	☐ PIFA ☒ PCB ☐ Dipole ☐ Coils
Antenna Gain	Gain: 3.68 dBi
Antenna connector	I-PEX

Notes:
1.The antenna(s) of the EUT are permanently attached and there are no provisions for connection to an external antenna. So the EUT complies with the requirements of §15.203 and RSS-Gen 6.8.

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1.4 MEASUREMENT UNCERTAINTY

PARAMETER	UNCERTAINTY
AC Powerline Conducted Emission	+/- 1.2575
Emission bandwidth, 20dB bandwidth	+/- 0.0014
RF output power, conducted	+/- 1.14
Power density, conducted	+/- 1.40
3M Semi Anechoic Chamber / 30M~1G (Horizontally)	+/- 3.91
3M Semi Anechoic Chamber / 30M~1G (Vertically)	+/- 4.57
3M Semi Anechoic Chamber / 1G~6G	+/- 5.20
3M Semi Anechoic Chamber / 6G~18G	+/- 5.18
3M Semi Anechoic Chamber / 18G~40G	+/- 3.68

Remark:

1.This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2

2. ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report.

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1.5 FACILITIES AND TEST LOCATION

All measurement facilities used to collect the measurement data are located at No.11, Wugong 6th Rd., Wugu Dist., New Taipei City, Taiwan. (R.O.C.)

CAB identifier: TW1309

Test site	Test Engineer	Remark
AC Conduction Room	Jack Chen	-
Radiation	Ray Li	-
RF Conducted	Allen Shen	-

Remark: The lab has been recognized as the FCC accredited lad under the KDB 974614 D01 and is listed in the FCC pubic Access Link (PAL) database, FCC Registration No. :444940, the FCC Designation No.:TW1309

1.6 INSTRUMENT CALIBRATION

AC Power Line Conducted Emission Test Room					
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Date**	**Calibration Due**
CABLE	EMCI	CFD300-NL	CERF	06/28/2021	06/27/2022
EMI Test Receiver	R&S	ESCI	100064	07/05/2021	07/04/2022
LISN	SCHAFFNER	NNB 41	03/10013	02/15/2022	02/14/2023
Software	EZ-EMC(CCS-3A1-CE-Wugu)				

RF Conducted Test Site					
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Date**	**Calibration Due**
EXA Signal Analyzer	KEYSIGHT	N9010B	MY55460167	09/07/2021	09/06/2022
Power Meter	Anritsu	ML2496A	2136002	12/06/2021	12/05/2022
Power Seneor	Anritsu	MA2411B	1911386	08/19/2021	08/18/2022
Power Seneor	Anritsu	MA2411B	1911387	08/19/2021	08/18/2022
Software	Radio Test Software Ver. 21				

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3M 966 Chamber Test Site					
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Date**	**Calibration Due**
Band Reject Filters	MICRO TRONICS	BRM 50702	112	11/23/2021	11/22/2022
Bilog Antenna	Sunol Sciences	JB3	A030105	07/19/2021	07/18/2022
Coaxial Cable	HUBER SUHNER	SUCOFLEX 104PEA	20995	02/23/2022	02/22/2023
Coaxial Cable	EMCI	EMC105	190914+1111	09/17/2021	09/16/2022
Coaxial Cable	Woken	J-1099	201709090004	12/23/2021	12/22/2022
Digital Thermo-Hygro Meter	WISEWIND	1206	D07	12/28/2021	12/27/2022
Horn Antenna	ETS LINDGREN	3116	00026370	11/30/2021	11/29/2022
Horn Antenna	ETS LINDGREN	3117	00055165	07/29/2021	07/28/2022
K Type Cable	Huber+Suhner	SUCOFLEX 102	29406/2	12/05/2021	12/04/2022
Pre-Amplifier	EMEC	EM330	060609	02/23/2022	02/22/2023
Pre-Amplifier	HP	8449B	3008A00965	12/24/2021	12/23/2022
PSA Series Spectrum Analyzer	Agilent	E4446A	MY46180323	12/06/2021	12/05/2022
Antenna Tower	CCS	CC-A-1F	N/A	N.C.R	N.C.R
Controller	CCS	CC-C-1F	N/A	N.C.R	N.C.R
Turn Table	CCS	CC-T-1F	N/A	N.C.R	N.C.R
Software	e3 210616				

Remark:
1. Each piece of equipment is scheduled for calibration once a year.
2. N.C.R. = No Calibration Required.

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1.7 SUPPORT AND EUT ACCESSORIES EQUIPMENT

EUT Accessories Equipment						
No.	**Equipment**	**Brand**	**Model**	**Series No.**	**FCC ID**	**IC**
	N/A					

Support Equipment						
No.	**Equipment**	**Brand**	**Model**	**Series No.**	**FCC ID**	**IC**
1	NB(J)	TOSHIBA	PT345T-00L002	N/A	PD97260H	1000M-7260H
2	NB	Lenovo	TP0056A	N/A	N/A	N/A
3	NB(B)	Toshiba	PORTEGE R30-A	N/A	PD97260H	N/A

1.8 TEST METHODOLOGY AND APPLIED STANDARDS

The test methodology, setups and results comply with all requirements in accordance with ANSI C63.10:2013, FCC Part 2, FCC Part 15.247, RSS-247 Issue 2 and RSS-GEN Issue 5

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2. TEST SUMMARY

FCC Standard Section	IC Standard Section	Report Section	Test Item	Result
15.203	RSS-Gen 6.8	1.3	Antenna Requirement	Pass
15.207(a)	RSS-GEN 8.8	4.1	AC Conducted Emission	Pass
15.247(a)(2)	RSS-247(5.2)(a)	4.2	6 dB Bandwidth	Pass
-	RSS-GEN 6.7	4.2	Occupied Bandwidth (99%)	Pass
15.247(b)(3)	RSS-247(5.4)(d)	4.3	Output Power Measurement	Pass
15.247(e)	RSS-247(5.2)(b)	4.4	Power Spectral Density	Pass
15.247(d)	RSS-247(5.5)	4.5	Conducted Band Edge	Pass
15.247(d)	RSS-247(5.5)	4.5	Conducted Spurious Emission	Pass
15.247(d)	RSS-GEN 8.9, 8.10	4.6	Radiation Band Edge	Pass
15.247(d)	RSS-GEN 8.9, 8.10	4.6	Radiation Spurious Emission	Pass

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3. DESCRIPTION OF TEST MODES

3.1 THE WORST MODE OF OPERATING CONDITION

Operation mode	BLE Mode (1Mbps)
Test Channel Frequencies	1.Lowest Channel : 2402MHz 2.Middle Channel : 2440MHz 3.Highest Channel : 2480MHz

Remark:

1. EUT pre-scanned data rate of output power for each mode, the worst data rate were recorded in this report.

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3.2 THE WORST MODE OF MEASUREMENT

AC Power Line Conducted Emission	
Test Condition	AC Power line conducted emission for line and neutral
Power supply Mode	Mode 1: EUT power by NB
Worst Mode	☒ Mode 1 ☐ Mode 2 ☐ Mode 3 ☐ Mode 4

Radiated Emission Measurement Above 1G	
Test Condition	Radiated Emission Above 1G
Power supply Mode	Mode 1: EUT power by NB Mode 2: EUT power by Power Supply
Worst Mode	☒ Mode 1 ☐ Mode 2 ☐ Mode 3 ☐ Mode 4
Worst Position	☐ Placed in fixed position. ☒ Placed in fixed position at X-Plane (E2-Plane) ☐ Placed in fixed position at Y-Plane (E1-Plane) ☐ Placed in fixed position at Z-Plane (H-Plane)

Radiated Emission Measurement Below 1G	
Test Condition	Radiated Emission Below 1G
Power supply Mode	Mode 1: EUT power by NB Mode 2: EUT power by Power Supply
Worst Mode	☒ Mode 1 ☐ Mode 2 ☐ Mode 3 ☐ Mode 4

Remark:
1. The worst mode was record in this test report.
2. EUT pre-scanned in three axis ,X,Y, Z and two polarity, for radiated measurement. The worst case(X-Plane) were recorded in this report
3. AC power line conducted emission and for below 1G radiation emission were performed the EUT transmit at the highest output power channel as worse case.

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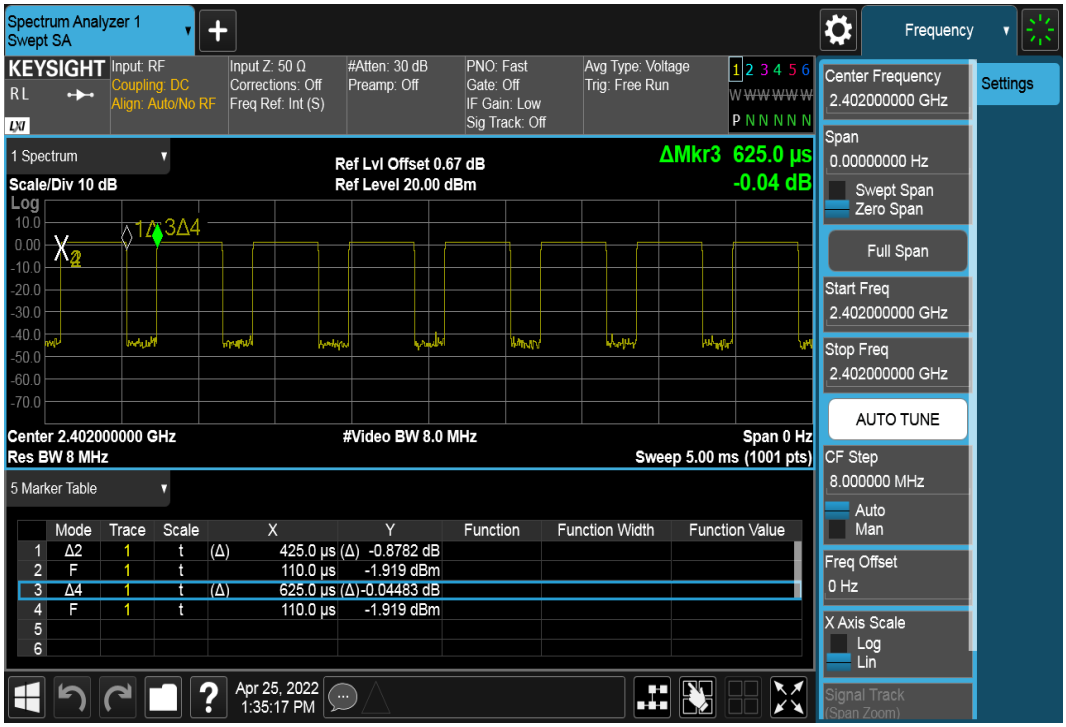
3.3 EUT DUTY CYCLE

Temperature:	25℃	**Test date:**	April 25, 2022
Humidity:	61% RH	**Tested by:**	Allen Shen

Duty Cycle				
Configuration	Duty Cycle (%) = Ton / (Ton+Toff)	Duty Factor (dB) =10*log (1/Duty Cycle)	1/T (kHz)	VBW setting (kHz)
BLE-1Mbps	68.00	1.67	2.35	3.00

BLE-1Mbps



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4. TEST RESULT

4.1 AC POWER LINE CONDUCTED EMISSION

4.1.1 Test Limit

According to §15.207(a) and RSS-GEN section 8.8,

Frequency Range (MHz)	Limits(dBμV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56*	56 to 46*
0.50 to 5	56	46
5 to 30	60	50

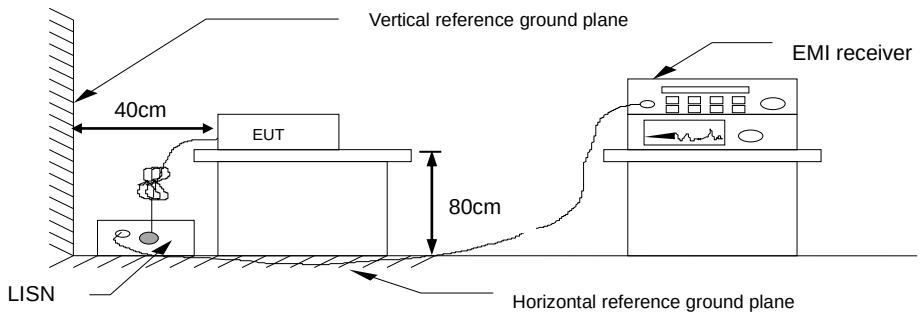
* Decreases with the logarithm of the frequency.

4.1.2 Test Procedure

Test method Refer as ANSI C63.10: 2013 clause 6.2,

1. The EUT was placed above horizontal ground plane and 0.4m above vertical ground plane
2. EUT connected to the line impedance stabilization network (LISN)
3. Receiver set RBW of 9kHz and Detector Peak, and note as quasi-peak and average.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. Recorded Line for Neutral and Line.

4.1.3 Test Setup



4.1.4 Test Result

PASS.

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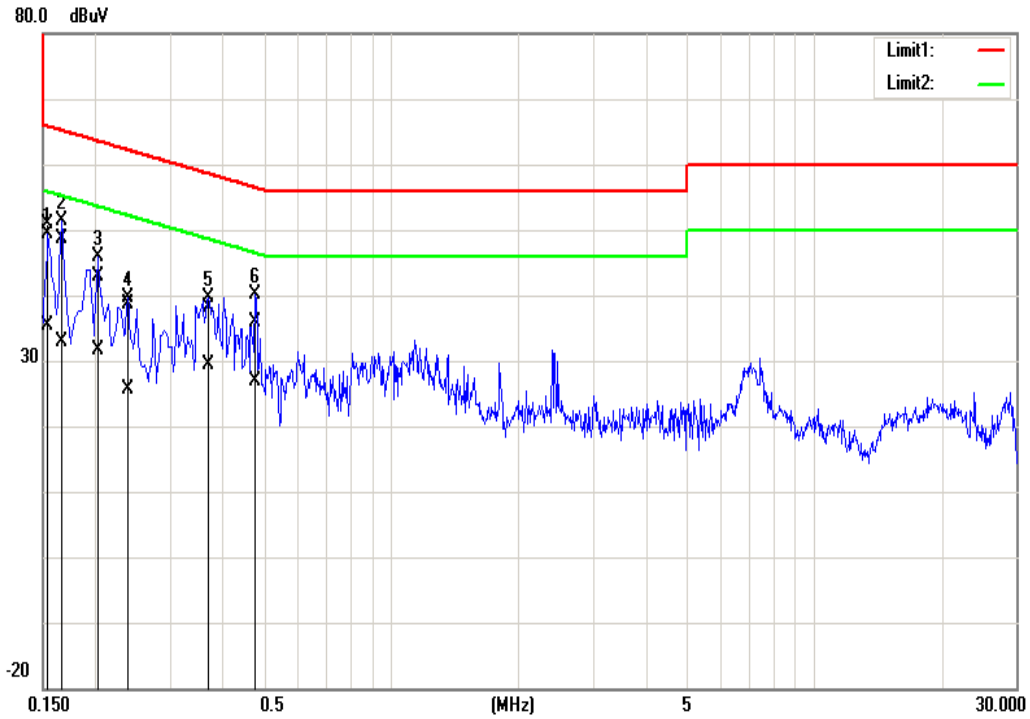
Test Data

Test Mode:	Mode 1	Temp/Hum	23.5(℃)/ 50%RH
Phase:	Line	Test Date	April 26, 2022
Test Voltage:	120Vac, 60Hz	Test Engineer	Jack Chen



Frequency (MHz)	Quasi Peak reading (dBuV)	Average reading (d uV)	Correction factor (dB)	Quasi Peak result (dBuV)	Average result (dBuV)	Quasi Peak limit (dBuV)	Average limit (dBuV)	Quasi Peak margin (dB)	Average margin (dB)	Remark
0.1540	40.64	25.18	10.17	50.81	35.35	65.78	55.78	-14.97	-20.43	Pass
0.1660	38.54	22.83	10.17	48.71	33.00	65.16	55.16	-16.45	-22.16	Pass
0.2020	32.82	21.41	10.18	43.00	31.59	63.53	53.53	-20.53	-21.94	Pass
0.2380	28.36	15.54	10.18	38.54	25.72	62.17	52.17	-23.63	-26.45	Pass
0.3700	27.94	19.23	10.19	38.13	29.42	58.50	48.50	-20.37	-19.08	Pass
0.4780	25.78	16.65	10.19	35.97	26.84	56.37	46.37	-20.40	-19.53	Pass

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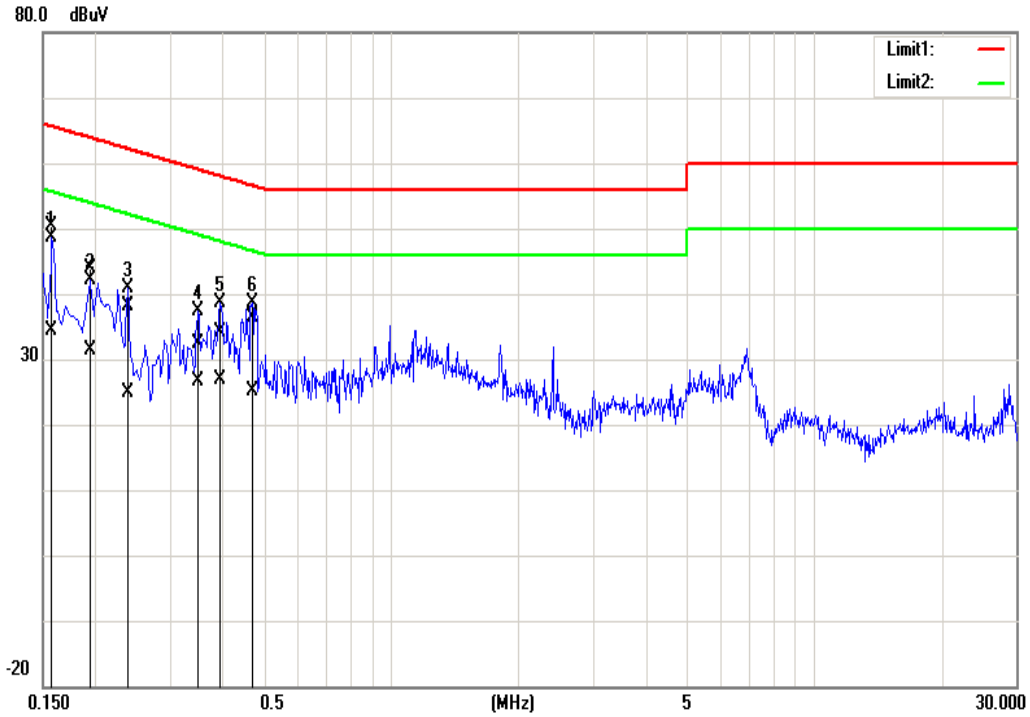
Test Mode:	Mode 1	Temp/Hum	23.5(℃)/ 50%RH
Phase:	Neutral	Test Date	April 26, 2022
Test Voltage:	120Vac, 60Hz	Test Engineer	Jack Chen



Frequency (MHz)	Quasi Peak reading dBuV)	Average reading (dBuV)	Correction factor (dB)	Quasi Peak result (dBuV)	Average result (dBuV)	Quasi Peak limit (dBuV)	Average limit (dBuV)	Quasi Peak margin (dB)	Average margin (dB)	Remark
0.1580	40.15	24.33	10.17	50.32	34.50	65.56	55.57	-15.24	-21.07	Pass
0.1940	33.72	21.19	10.17	43.89	31.36	63.86	53.86	-19.97	-22.50	Pass
0.2380	28.01	14.65	10.17	38.18	24.82	62.16	52.17	-23.98	-27.35	Pass
0.3500	22.31	16.34	10.18	32.49	26.52	58.96	48.96	-26.47	-22.44	Pass
0.3940	24.00	16.64	10.18	34.18	26.82	57.98	47.98	-23.80	-21.16	Pass
0.4700	26.20	15.04	10.18	36.38	25.22	56.51	46.51	-20.13	-21.29	Pass

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4.2 6dB BANDWIDTH AND OCCUPIED BANDWIDTH (99%)

4.2.1 Test Limit

According to §15.247(a)(2) and RSS-247 section 5.2(a)

6 dB Bandwidth ：

Limit	Shall be at least 500kHz

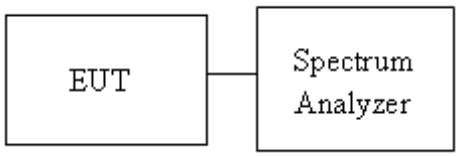
Occupied Bandwidth(99%) ： For reporting purposes only.

4.2.2 Test Procedure

Test method Refer as ANSI C63.10: 2013,

1. The EUT RF output connected to the spectrum analyzer by RF cable.
2. Setting maximum power transmit of EUT.
3. SA set RBW =100KHz, VBW = 300KHz and Detector = Peak, to measurement 6dB Bandwidth.
4. SA set RBW = 1% ~ 5% OBW, VBW = three times the RBW and Detector = Peak, to measurement 99% Bandwidth.
5. Measure and record the result of 6 dB Bandwidth and 99% Bandwidth. in the test report.

4.2.3 Test Setup



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4.2.4 Test Result

Temperature:	25℃	**Test date:**	April 25, 2022
Humidity:	61% RH	**Tested by:**	Allen Shen

Test mode: BLE-1Mbps mode / 2402-2480 MHz				
Channel	**Frequency (MHz)**	**OBW (99%) (MHz)**	**6dB BW (MHz)**	**6dB limit (kHz)**
Low	2402	1.0429	0.6905	≥500
Mid	2440	1.0521	0.7123	
High	2480	1.0488	0.6948	

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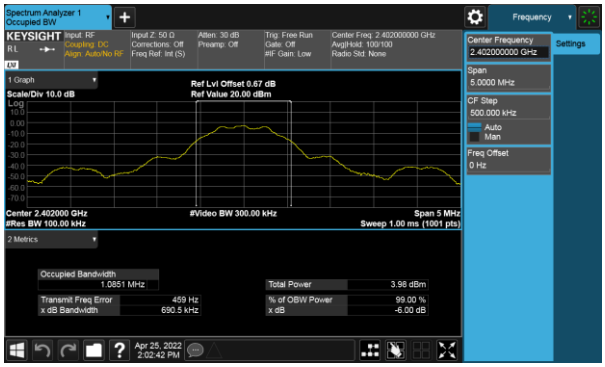
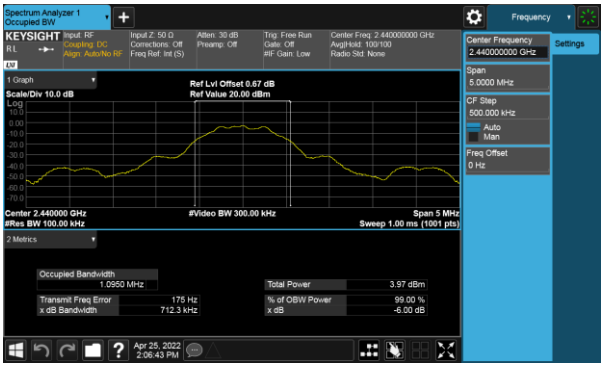
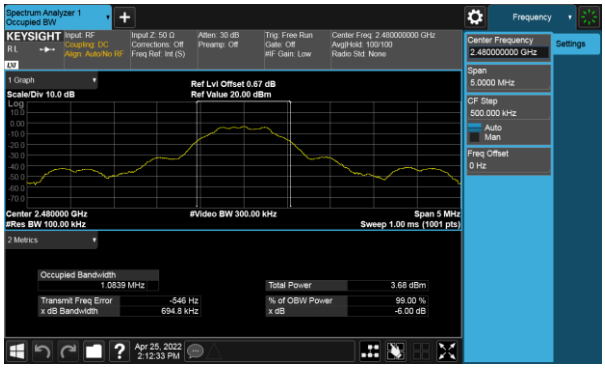
Test Data

6dB BANDWIDTH

BLE-1Mbps mode	
Low CH	**Mid CH**
	
High CH	
	

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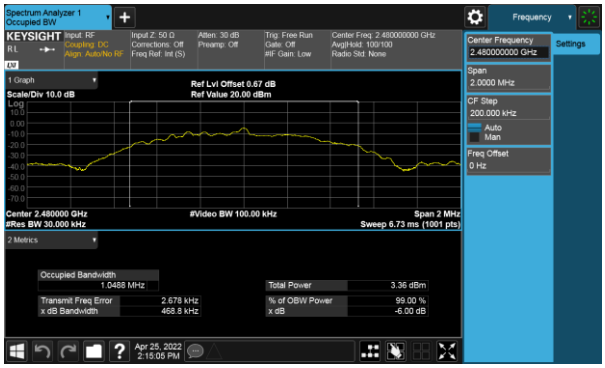
Test Data

BANDWIDTH (99%)

BLE-1Mbps mode	
Low CH	**Mid CH**
High CH	
	

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4.3 OUTPUT POWER MEASUREMENT

4.3.1 Test Limit

According to §15.247(b)(3) and RSS-247 section 5.4(d)

Peak output power：

FCC

For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement,

IC

For DTSs employing digital modulation techniques operating in the bands 902-928 MHz and 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1 W. The e.i.r.p. shall not exceed 4 W, except as provided in section 5.4(e), base on the use of antennas with directional gain not exceed 6 dBi If transmitting antennas of directional gain greater than 6dBi are used the peak output power the conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. In case of point-to-point operation, the limit has to be reduced by 1dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

Limit	☒ Antenna not exceed 6 dBi：30dBm ☐ Antenna with DG greater than 6 dBi [Limit = 30 – (DG – 6)] ☐ Point-to-point operation

Average output power：For reporting purposes only.

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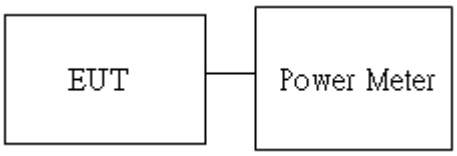
4.3.2 Test Procedure

Test method Refer as ANSI C63.10:2013.

1. The EUT RF output connected to the power meter by RF cable.
2. Setting maximum power transmit of EUT.
3. The path loss was compensated to the results for each measurement.
4. Measure and record the result of Peak output power and Average output power. in the test report.

4.3.3 Test Setup



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4.3.4 Test Result

Temperature:	25℃	**Test date:**	April 25, 2022
Humidity:	61% RH	**Tested by:**	Allen Shen

Peak output power：

BLE 1M mode:

CH	Frequency (MHz)	Power set	Peak Power Output (dBm)	Required Limit (dBm)
Low	2402	7	-2.90	30
Mid	2440	7	-2.96	30
High	2480	7	-2.91	30

Average output power：

BLE 1M mode:

CH	Frequency (MHz)	Power set	Peak Power Output (dBm)	Required Limit (dBm)
Low	2402	7	-3.01	30
Mid	2440	7	-2.98	30
High	2480	7	-2.94	30

EIRP power：

EIRP BLE 1M mode

CH	Frequency (MHz)	Power set	Max. Avg. Output Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit
Low	2402	7	-3.01	3.68	0.67	4W= 36 dBm
Mid	2440	7	-2.98	3.68	0.70	4W= 36 dBm
High	2480	7	-2.94	3.68	0.74	4W= 36 dBm

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4.4 POWER SPECTRAL DENSITY

4.4.1 Test Limit

According to §15.247(e) and RSS-247 section 5.2(b)

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.

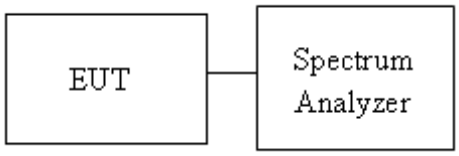
Limit	☒ Antenna not exceed 6 dBi：8dBm ☐ Antenna with DG greater than 6 dBi [Limit = 8 – (DG – 6)] ☐ Point-to-point operation：

4.4.2 Test Procedure

Test method Refer as ANSI C63.10:2013.

1. The EUT RF output connected to the spectrum analyzer by RF cable.
2. Setting maximum power transmit of EUT
3. SA set RBW = 3kHz, VBW = 10kHz, Span = 1.5 times DTS Bandwidth (6 dB BW), Detector = Peak, Sweep Time = Auto and Trace = Max hold.
4. The path loss and Duty Factor were compensated to the results for each measurement by SA.
5. Mark the maximum level.
6. Measure and record the result of power spectral density. in the test report.

4.4.3 Test Setup



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4.4.4 Test Result

Temperature:	25℃	**Test date:**	April 25, 2022
Humidity:	61% RH	**Tested by:**	Allen Shen

BLE 1M mode

Frequency (MHz)	RF Power Density (dBm/3kHz)	Maximum Limit (dBm/3kHz)	Result
2402	-17.83	8	PASS
2440	-17.76	8	PASS
2480	-18.26	8	PASS

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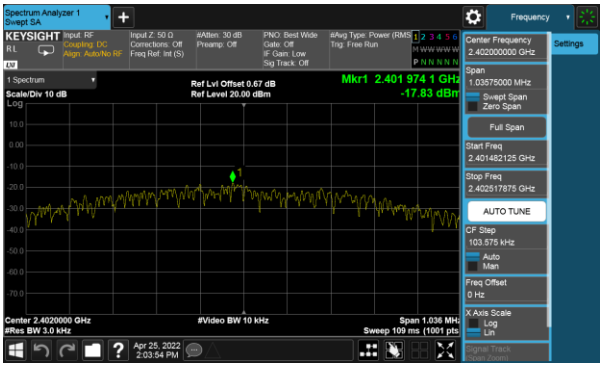
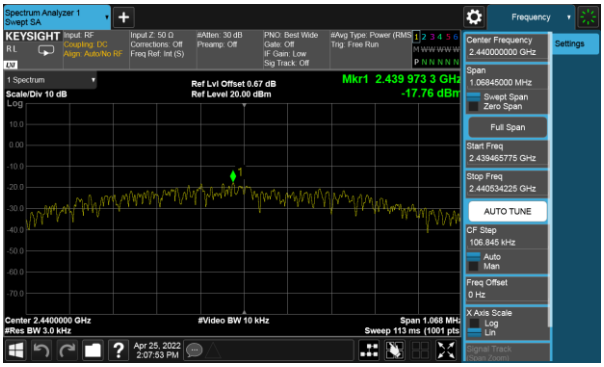
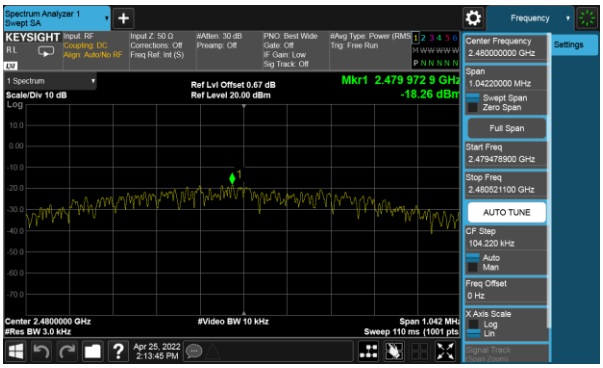
Test Data

BLE-1Mbps mode	
Low CH	**Mid CH**
	
High CH	
	

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4.5 CONDUCTED BAND EDGE AND SPURIOUS EMISSION

4.5.1 Test Limit

According to §15.247(d) and RSS-247 section 5.5

FCC: In any 100 kHz bandwidth outside the authorized frequency band,

Non-restricted bands shall be attenuated at least 20 dB/30 dB relative to the maximum PSD level in 100 kHz by RF conducted or a radiated measurement 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).

IC: In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 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 that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under section 5.4(d), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

4.5.2 Test Procedure

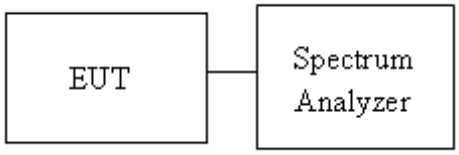
Test method Refer as ANSI C63.10:2013.

1. EUT RF output port connected to the SA by RF cable, and the path loss was compensated to result.

2. SA setting, RBW=100kHz, VBW=300kHz, Detector=Peak, Trace mode = max hold, SWT = Auto.

3. In any 100 kHz bandwidth outside the authorized frequency band, shall be attenuated at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz when conducted power procedure is used. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

4.5.3 Test Setup



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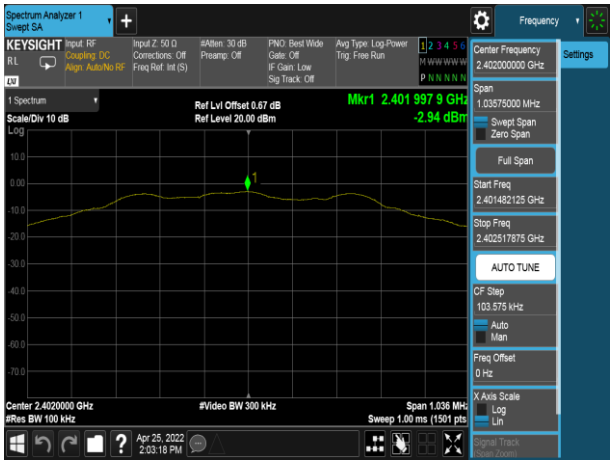
4.5.4 Test Result

Test Data

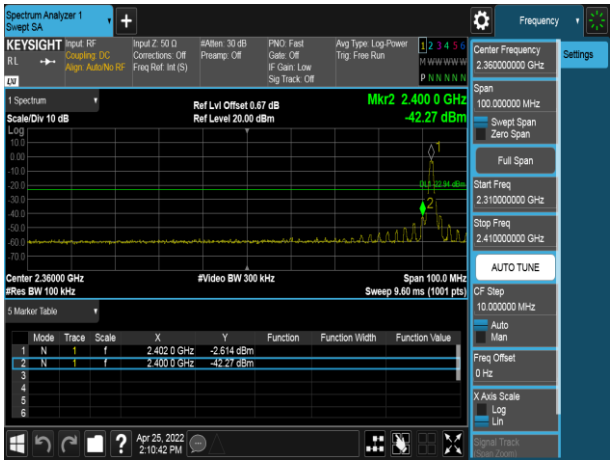
Temperature:	25℃	**Test date:**	April 25, 2022
Humidity:	61% RH	**Tested by:**	Allen Shen

BLE-1Mbps mode Low CH

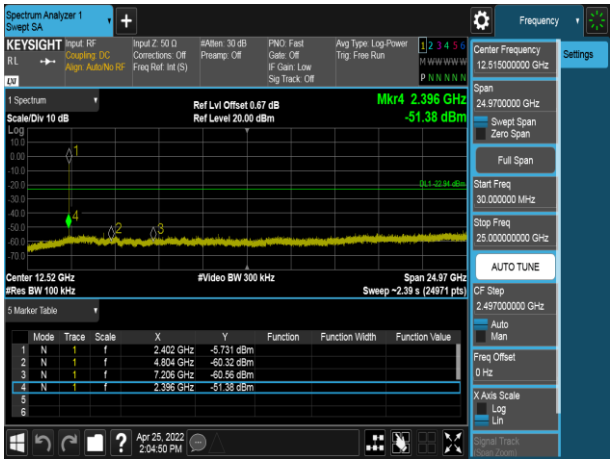
Reference Level of PSD in 100kHz



Band Edge



Spurious Emission 30MHz-25GHz



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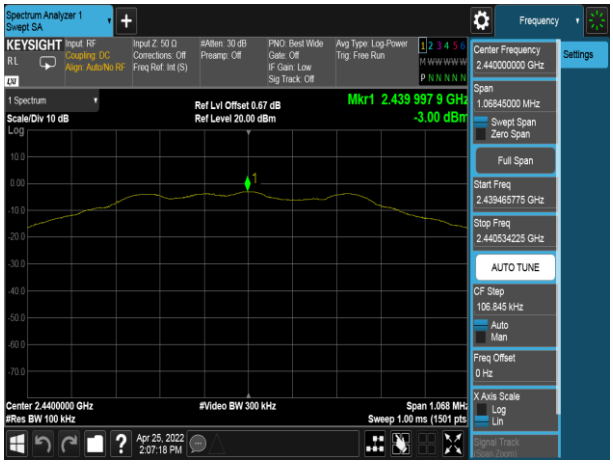
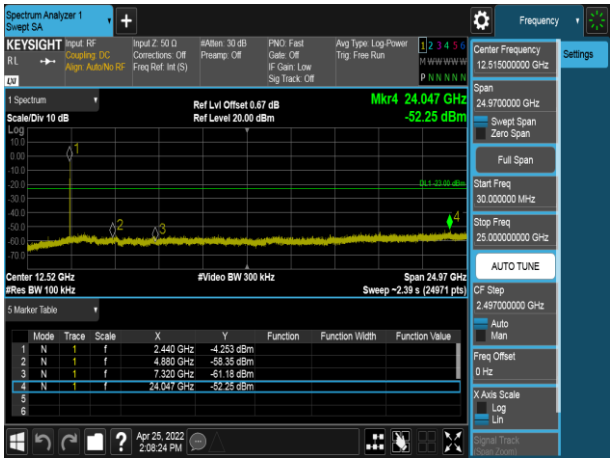
BLE-1Mbps mode Mid CH	
Reference Level of PSD in 100kHz	**Spurious Emission 30MHz-25GHz**
	

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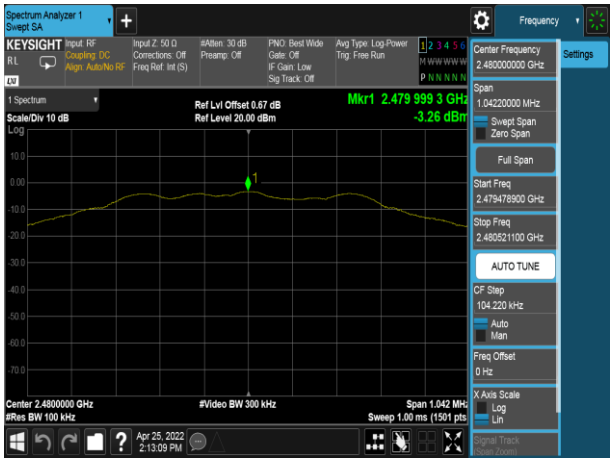
BLE-1Mbps mode High CH

Reference Level of PSD in 100kHz



Band Edge

Spurious Emission 30MHz-25GHz

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4.6 RADIATION BANDEDGE AND SPURIOUS EMISSION

4.6.1 Test Limit

FCC according to §15.247(d), §15.209 and §15.205,

IC according to RSS-247 section 5.5, RSS-Gen, Section 8.9 and 8.10

In any 100 kHz bandwidth outside the authorized frequency band, all harmonic and spurious must be least 20 dB below the highest emission level with the authorized frequency band. Radiation emission which fall in the restricted bands must also follow the FCC section 15.209 as below limit in table.

Below 30 MHz

Frequency	Field Strength (microvolts/m)	Magnetic H-Field (microamperes/m)	Measurement Distance (metres)
9-490 kHz	2,400/F (F in kHz)	2,400/F (F in kHz)	300
490-1,705 kHz	24,000/F (F in kHz)	24,000/F (F in kHz)	30
1.705-30 MHz	30	N/A	30

Above 30 MHz

Frequency (MHz)	Field Strength microvolts/m at 3 metres (watts, e.i.r.p.)	
	Transmitters	Receivers
30-88	100 (3 nW)	100 (3 nW)
88-216	150 (6.8 nW)	150 (6.8 nW)
216-960	200 (12 nW)	200 (12 nW)
Above 960	500 (75 nW)	500 (75 nW)

Remark:
Although these tests were performed other than open area test site, adequate comparison measurements were confirmed against 30 m open are test site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788.

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IC according to RSS-247 section 5.5, RSS-Gen, Section 8.9 and 8.10

RSS-Gen Table 3 and Table 5 – General Field Strength Limits for Transmitters and Receivers at Frequencies Above 30 MHz (Note)

Frequency (MHz)	Field Strength microvolts/m at 3 metres (watts, e.i.r.p.)	
	Transmitters	Receivers
30-88	100 (3 nW)	100 (3 nW)
88-216	150 (6.8 nW)	150 (6.8 nW)
216-960	200 (12 nW)	200 (12 nW)
Above 960	500 (75 nW)	500 (75 nW)

Note: Measurements for compliance with the limits in table 3 may be performed at distances other than 3 metres, in accordance with Section 6.6.

RSS-Gen Table 6: General Field Strength Limits for Transmitters at Frequencies Below 30 MHz (Transmit)

Frequency	Magnetic field strength (H-Field) (µA/m)	Measurement Distance (m)
9-490 kHz Note	6.37/F (F in kHz)	300
490-1,705 kHz	63.7/F (F in kHz)	30
1.705-30 MHz	0.08	30

Note: The emission limits for the ranges 9-90 kHz and 110-490 kHz are based on measurements employing a linear average detector.

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4.6.2 Test Procedure

Test method Refer as ANSI C63.10:2013.

1. The EUT is placed on a turntable, Above 1 GHz is 1.5m and below 1 GHz is 0.8m above ground plane. The EUT Configured un accordance with ANSI C63.10: 2013, and the EUT set in a continuous mode.

2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level. And EUT is set 3m away from the receiving antenna, which is scanned from 1m to 4m above the ground plane to find out the highest emissions. Measurement are made polarized in both the vertical and the horizontal positions with antenna.

3. Span shall wide enough to full capture the emission measured. The SA from 9KHz to 26.5GHz set to the low, Mid and High channels with the EUT transmit.

Remark:
1. Although these tests were performed other than open area test site, adequate comparison measurements were confirmed against 30 m open are test site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788.
2. No emission found between lowest internal used/generated frequency to 30MHz (9kHz~30MHz).

3. The SA setting following：

(1) Below 1G：RBW = 100kHz, VBW ≥ 3 RBW, Sweep = Auto, Detector = Peak, Trace = Max hold.

(2) Above 1G：

(2.1) For Peak measurement：RBW = 1MHz, VBW ≥ 3 RBW, Sweep = Auto, Detector = Peak, Trace = Max hold.

(2.2) For Average measurement：RBW = 1MHz, VBW

˙If Duty Cycle ≥ 98%, VBW=10Hz.

˙If Duty Cycle < 98%, VBW=1/T.

4. Data result

Actual FS=Spectrum Reading Level+Factor

Margin=Actual FS- Limit

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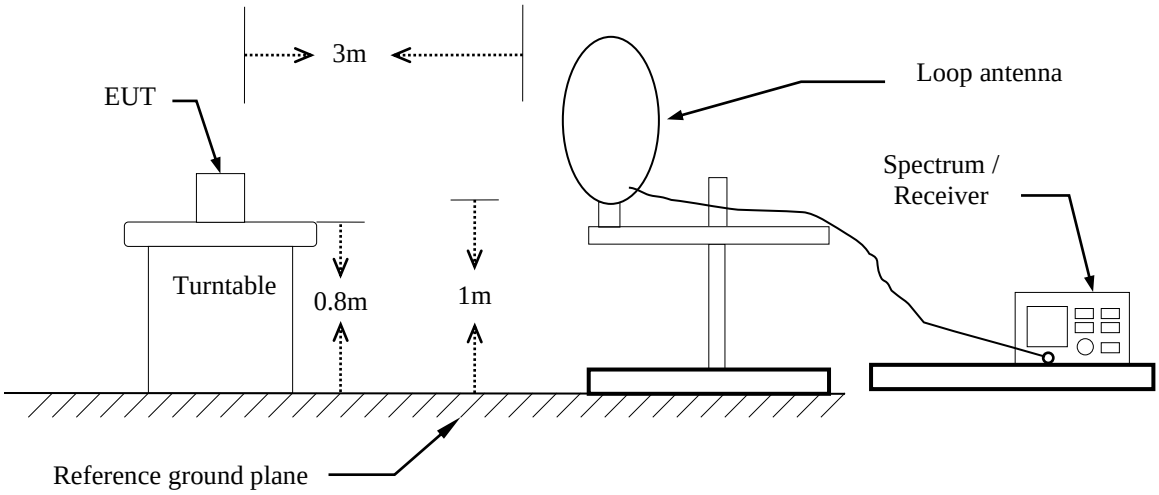
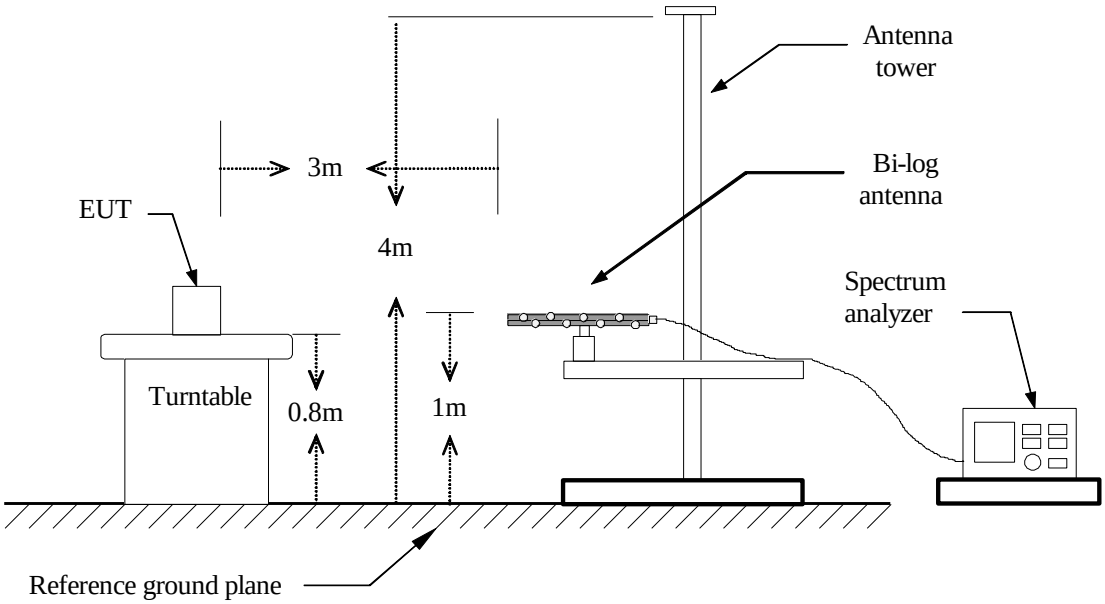
4.6.3 Test Setup

9kHz ~ 30MHz



30MHz ~ 1GHz



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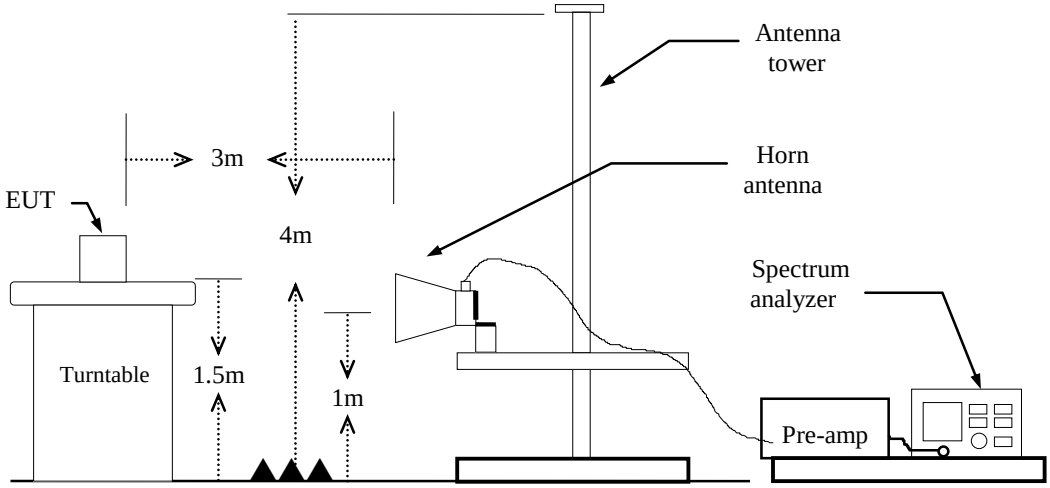
Above 1 GHz



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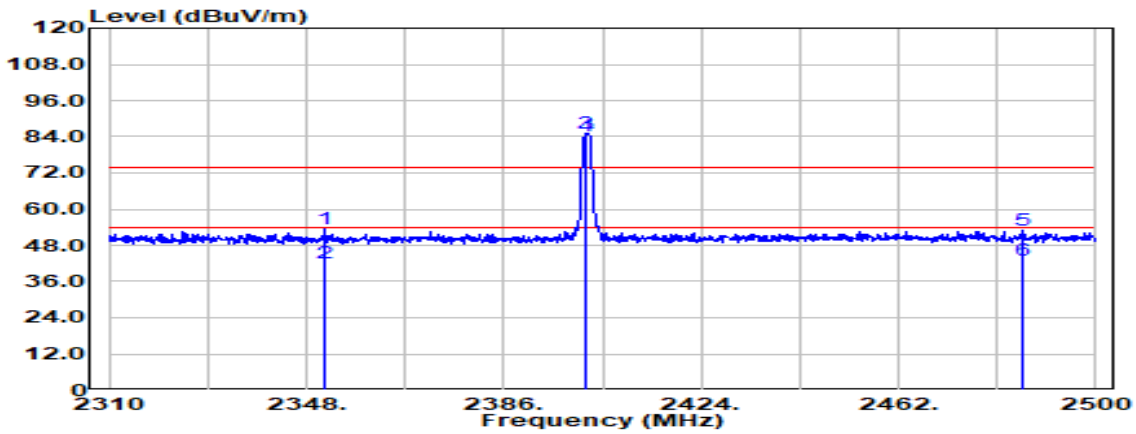
4.6.4 Test Result

Band Edge Test Data

Test Mode:	BLE-1Mbps Low CH	Temp/Hum	24.5(℃) / 56%RH
Test Item	Band Edge	Test Date	April 25, 2022
Polarize	Vertical	Test Engineer	Ray Li
Detector	Peak / Average		



Freq. (MHz)	Detector Mode (PK/QP/AV)	Spectrum Reading Level (dBμV)	Factor (dB)	Actual FS (dBμV/m)	Limit @3m (dBμV/m)	Margin (dB)
2351.420	Peak	41.25	12.29	53.53	74.00	-20.47
2351.420	Average	30.00	12.29	42.29	54.00	-11.71
2402.000	Peak	72.60	12.54	85.15	-	-
2402.000	Average	71.75	12.54	84.29	-	-
2485.750	Peak	39.72	13.09	52.81	74.00	-21.19
2485.750	Average	29.78	13.09	42.88	54.00	-11.12

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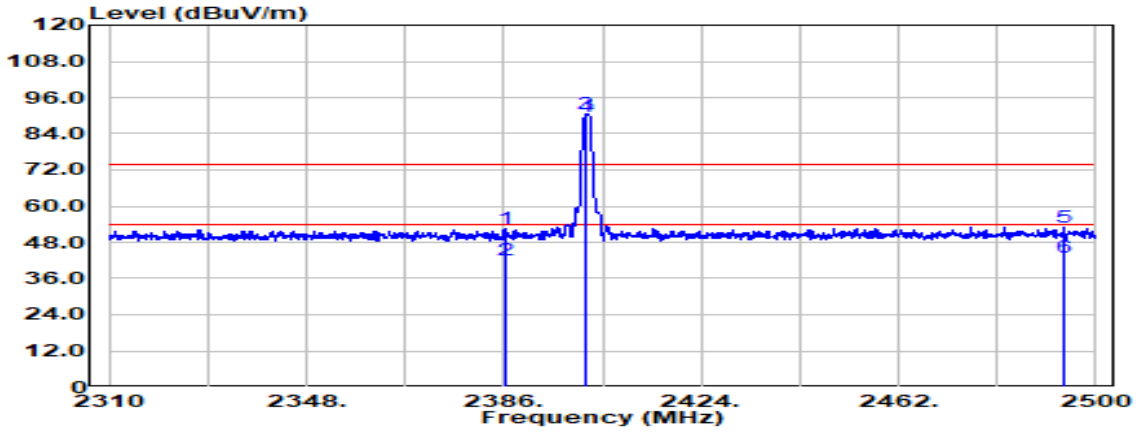
Test Mode:	BLE-1Mbps Low CH	Temp/Hum	24.5(℃) / 56%RH
Test Item	Band Edge	Test Date	April 25, 2022
Polarize	Horizontal	Test Engineer	Ray Li
Detector	Peak / Average		



Freq. (MHz)	Detector Mode (PK/QP/AV)	Spectrum Reading Level (dBμV)	Factor (dB)	Actual FS (dBμV/m)	Limit @3m (dBμV/m)	Margin (dB)
2386.380	Peak	40.05	12.46	52.51	74.00	-21.49
2386.380	Average	29.84	12.46	42.30	54.00	-11.70
2402.000	Peak	77.96	12.54	90.50	-	-
2402.000	Average	77.09	12.54	89.63	-	-
2493.825	Peak	39.85	13.15	53.00	74.00	-21.00
2493.825	Average	29.97	13.15	43.11	54.00	-10.89

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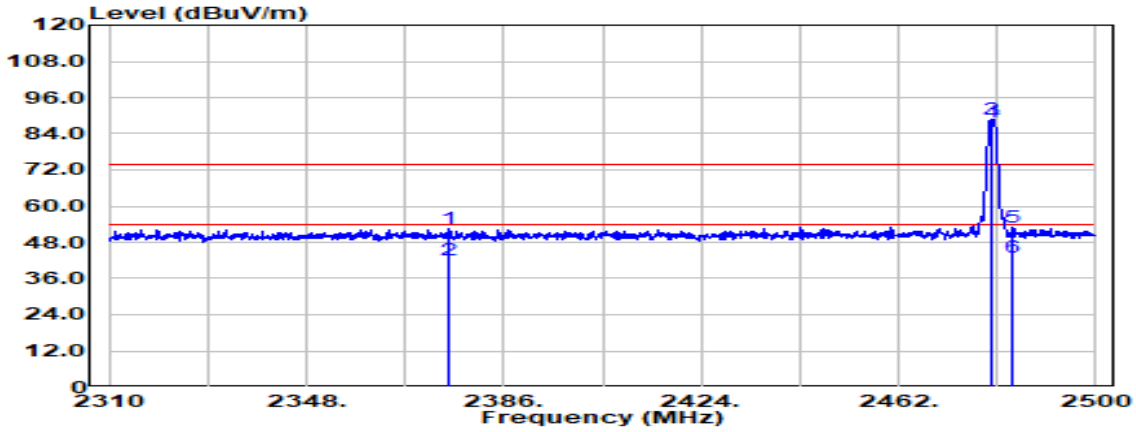
Test Mode:	BLE-1Mbps High CH	Temp/Hum	24.5(℃) / 56%RH
Test Item	Band Edge	Test Date	April 25, 2022
Polarize	Vertical	Test Engineer	Ray Li
Detector	Peak / Average		



Freq. (MHz)	Detector Mode (PK/QP/AV)	Spectrum Reading Level (dBμV)	Factor (dB)	Actual FS (dBμV/m)	Limit @3m (dBμV/m)	Margin (dB)
2375.455	Peak	40.07	12.41	52.48	74.00	-21.52
2375.455	Average	29.86	12.41	42.27	54.00	-11.73
2480.000	Peak	75.68	13.05	88.74	-	-
2480.000	Average	74.78	13.05	87.83	-	-
2484.135	Peak	39.97	13.08	53.06	74.00	-20.94
2484.135	Average	29.89	13.08	42.98	54.00	-11.02

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Test Mode:	BLE-1Mbps High CH	Temp/Hum	24.5(℃) / 56%RH
Test Item	Band Edge	Test Date	April 25, 2022
Polarize	Horizontal	Test Engineer	Ray Li
Detector	Peak / Average		

Freq. (MHz)	Detector Mode (PK/QP/AV)	Spectrum Reading Level (dBμV)	Factor (dB)	Actual FS (dBμV/m)	Limit @3m (dBμV/m)	Margin (dB)
2386.760	Peak	40.08	12.46	52.54	74.00	-21.46
2386.760	Average	29.83	12.46	42.29	54.00	-11.71
2480.000	Peak	80.79	13.05	93.84	-	-
2480.000	Average	79.97	13.05	93.02	-	-
2484.610	Peak	42.00	13.09	55.08	74.00	-18.92
2484.610	Average	30.28	13.09	43.36	54.00	-10.64

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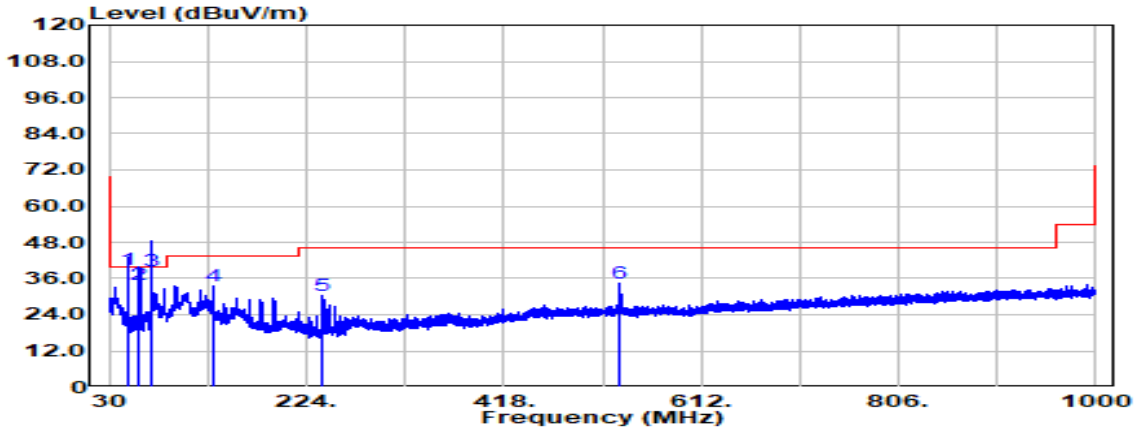
Below 1G Test Data

Test Mode:	BLE-1Mbps Mode	Temp/Hum	23.4(℃) / 60%RH
Test Item	30MHz-1GHz	Test Date	April 26, 2022
Polarize	Vertical	Test Engineer	Ray Li
Detector	Peak		



Freq. (MHz)	Detector Mode (PK/QP/AV)	Spectrum Reading Level (dBµV)	Factor (dB)	Actual FS (dBµV/m)	Limit @3m (dBµV/m)	Margin (dB)
48.066	QP	53.79	-14.82	38.97	40.00	-1.03
59.828	QP	50.18	-16.10	34.08	40.00	-5.92
72.074	QP	54.05	-15.43	38.62	40.00	-1.38
132.214	Peak	43.21	-9.66	33.55	43.50	-9.95
239.399	Peak	41.55	-11.01	30.54	46.00	-15.46
531.248	Peak	37.58	-3.34	34.24	46.00	-11.76

Note: No emission found between lowest internal used/generated frequency to 30MHz (9kHz~30MHz).

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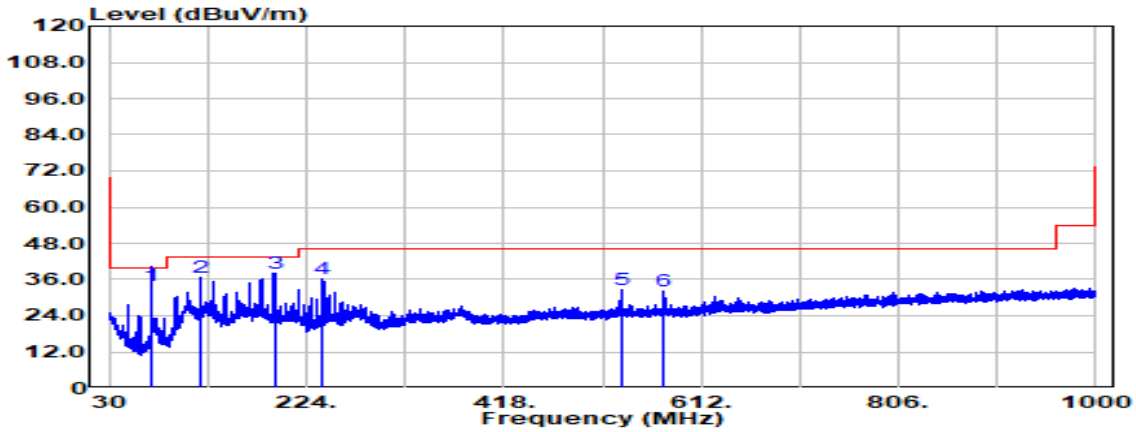
Test Mode:	BLE-1Mbps Mode	Temp/Hum	23.4(℃) / 60%RH
Test Item	30MHz-1GHz	Test Date	April 26, 2022
Polarize	Horizontal	Test Engineer	Ray Li
Detector	Peak		



Freq. (MHz)	Detector Mode (PK/QP/AV)	Spectrum Reading Level (dBμV)	Factor (dB)	Actual FS (dBμV/m)	Limit @3m (dBμV/m)	Margin (dB)
72.195	QP	49.23	-15.44	33.79	40.00	-6.21
120.331	Peak	46.01	-9.45	36.56	43.50	-6.94
192.596	Peak	49.31	-11.25	38.06	43.50	-5.44
239.520	Peak	47.30	-11.01	36.29	46.00	-9.71
532.945	Peak	35.83	-3.33	32.50	46.00	-13.50
574.655	Peak	34.56	-2.54	32.01	46.00	-13.99

Note: No emission found between lowest internal used/generated frequency to 30MHz (9kHz~30MHz).

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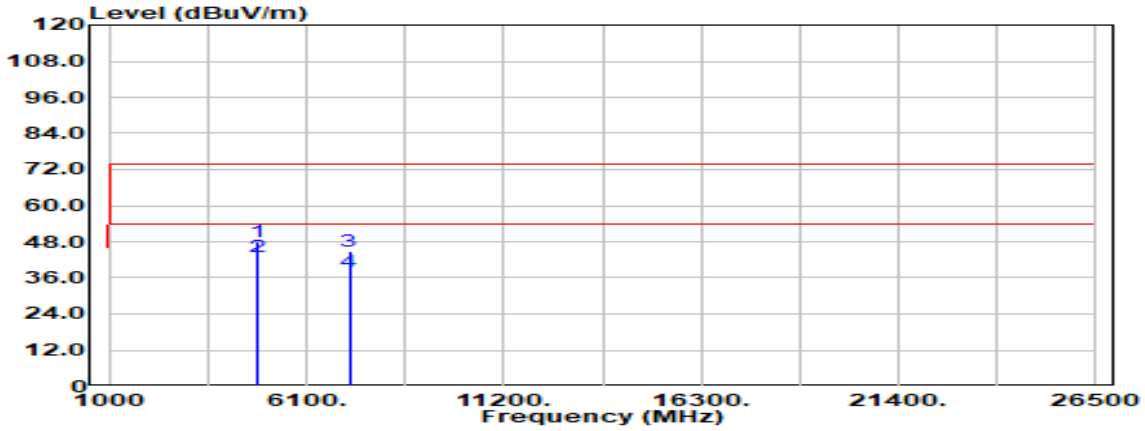
Above 1G Test Data

Test Mode:	BLE-1Mbps Low CH	Temp/Hum	23.4(℃) / 60%RH
Test Item	Harmonic	Test Date	April 26, 2022
Polarize	Vertical	Test Engineer	Ray Li
Detector	Peak		



Freq. (MHz)	Detector Mode (PK/QP/AV)	Spectrum Reading Level (dBμV)	Factor (dB)	Actual FS (dBμV/m)	Limit @3m (dBμV/m)	Margin (dB)
4804.000	Peak	38.52	9.46	47.99	74.00	-26.01
4804.000	Average	33.64	9.46	43.10	54.00	-10.90
7206.000	Peak	31.32	13.51	44.83	74.00	-29.17
7206.000	Average	24.45	13.51	37.96	54.00	-16.04
N/A						

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.

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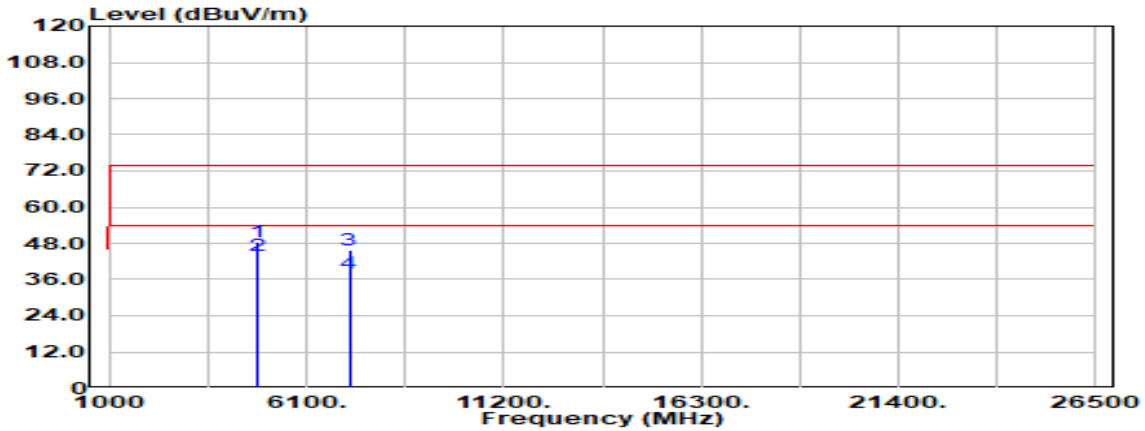
Test Mode:	BLE-1Mbps Low CH	Temp/Hum	23.4(℃) / 60%RH
Test Item	Harmonic	Test Date	April 26, 2022
Polarize	Horizontal	Test Engineer	Ray Li
Detector	Peak		



Freq. (MHz)	Detector Mode (PK/QP/AV)	Spectrum Reading Level (dBμV)	Factor (dB)	Actual FS (dBμV/m)	Limit @3m (dBμV/m)	Margin (dB)
4804.000	Peak	38.80	9.46	48.26	74.00	-25.74
4804.000	Average	34.38	9.46	43.84	54.00	-10.16
7206.000	Peak	32.05	13.51	45.56	74.00	-28.44
7206.000	Average	24.59	13.51	38.10	54.00	-15.90
N/A						

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.

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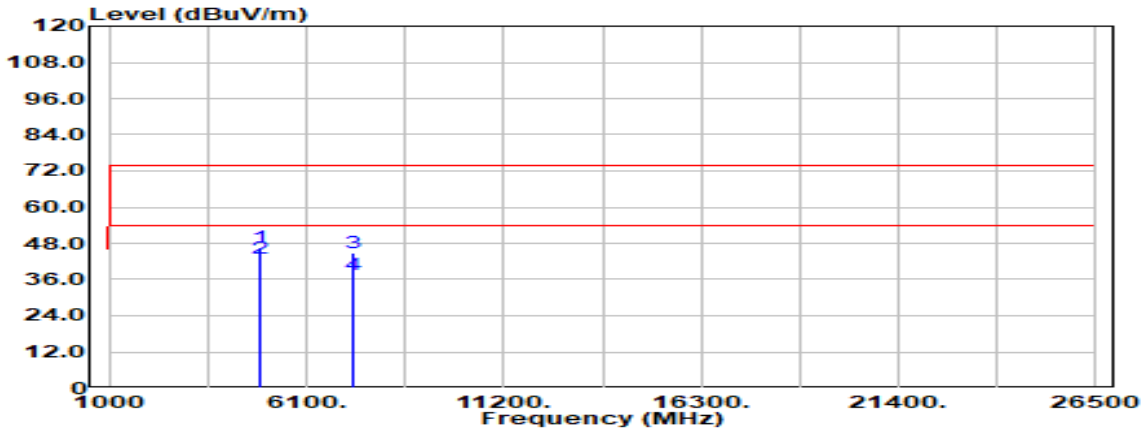
Test Mode:	BLE-1Mbps Mid CH	Temp/Hum	23.4(℃) / 60%RH
Test Item	Harmonic	Test Date	April 26, 2022
Polarize	Vertical	Test Engineer	Ray Li
Detector	Peak		



Freq. (MHz)	Detector Mode (PK/QP/AV)	Spectrum Reading Level (dBμV)	Factor (dB)	Actual FS (dBμV/m)	Limit @3m (dBμV/m)	Margin (dB)
4884.000	Peak	37.16	9.59	46.75	74.00	-27.25
4884.000	Average	33.58	9.59	43.17	54.00	-10.83
7326.000	Peak	31.75	13.24	44.99	74.00	-29.01
7326.000	Average	24.45	13.24	37.69	54.00	-16.31
N/A						

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.

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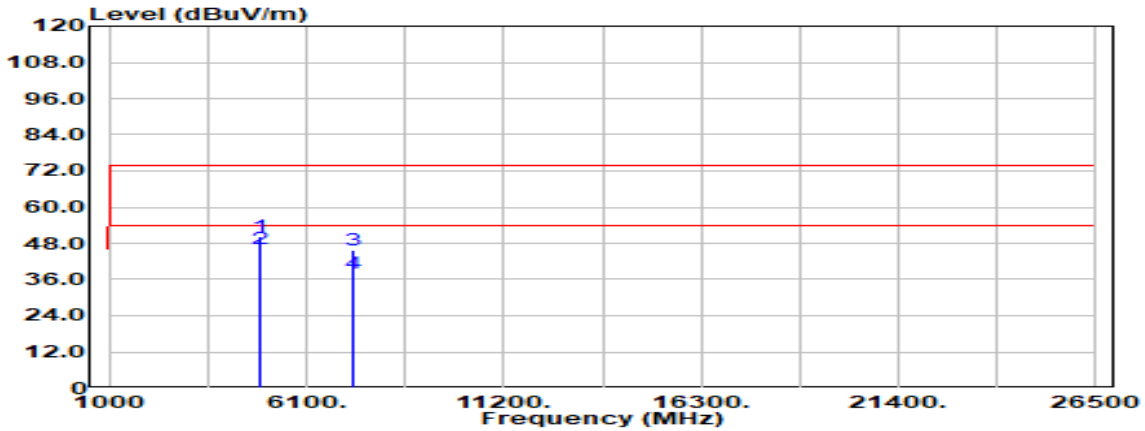
Test Mode:	BLE-1Mbps Mid CH	Temp/Hum	23.4(℃) / 60%RH
Test Item	Harmonic	Test Date	April 26, 2022
Polarize	Horizontal	Test Engineer	Ray Li
Detector	Peak		



Freq. (MHz)	Detector Mode (PK/QP/AV)	Spectrum Reading Level (dBμV)	Factor (dB)	Actual FS (dBμV/m)	Limit @3m (dBμV/m)	Margin (dB)
4884.000	Peak	40.76	9.59	50.35	74.00	-23.65
4884.000	Average	36.77	9.59	46.36	54.00	-7.64
7326.000	Peak	32.68	13.24	45.92	74.00	-28.08
7326.000	Average	24.58	13.24	37.82	54.00	-16.18
N/A						

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.

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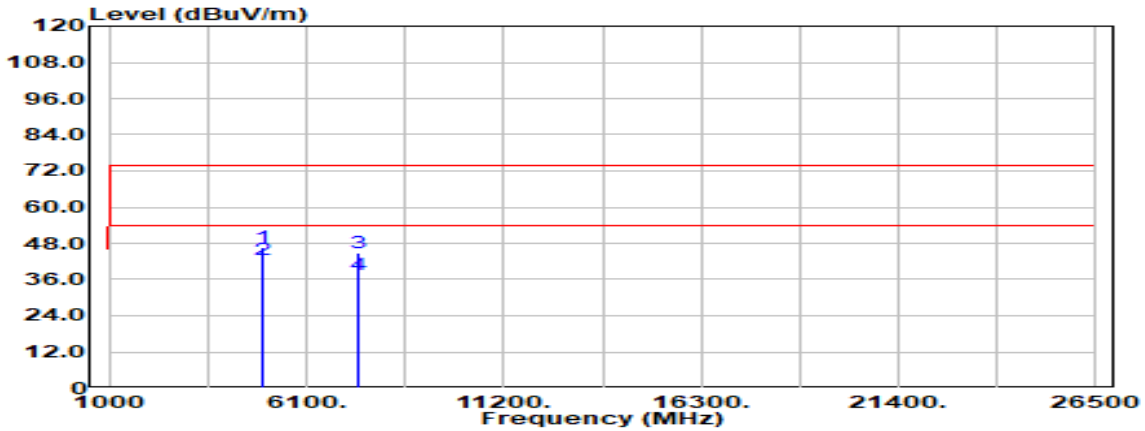
Test Mode:	BLE-1Mbps High CH	Temp/Hum	23.4(℃) / 60%RH
Test Item	Harmonic	Test Date	April 26, 2022
Polarize	Vertical	Test Engineer	Ray Li
Detector	Peak		



Freq. (MHz)	Detector Mode (PK/QP/AV)	Spectrum Reading Level (dBμV)	Factor (dB)	Actual FS (dBμV/m)	Limit @3m (dBμV/m)	Margin (dB)
4960.000	Peak	36.99	9.71	46.70	74.00	-27.30
4960.000	Average	33.07	9.71	42.77	54.00	-11.23
7440.000	Peak	31.25	13.54	44.79	74.00	-29.21
7440.000	Average	24.11	13.54	37.65	54.00	-16.35
N/A						

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.

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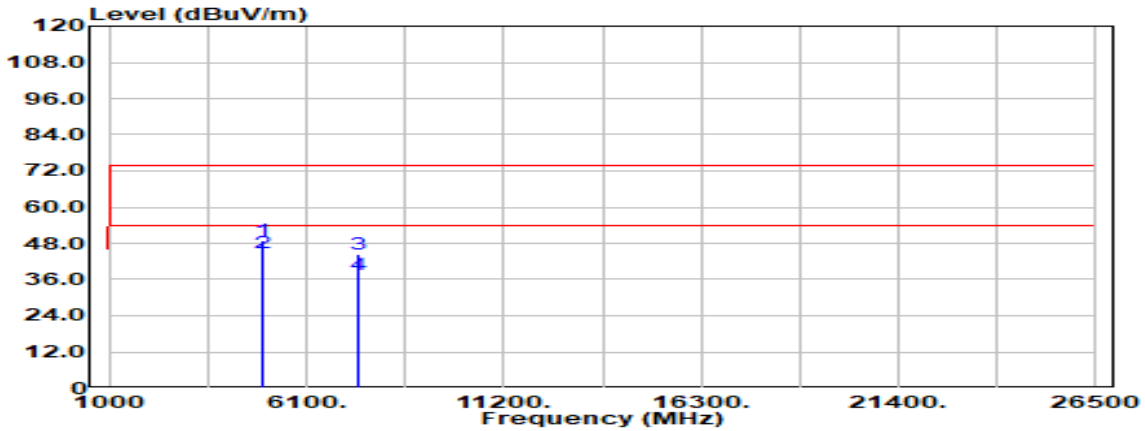
Test Mode:	BLE-1Mbps High CH	Temp/Hum	23.4(℃) / 60%RH
Test Item	Harmonic	Test Date	April 26, 2022
Polarize	Horizontal	Test Engineer	Ray Li
Detector	Peak		



Freq. (MHz)	Detector Mode (PK/QP/AV)	Spectrum Reading Level (dBμV)	Factor (dB)	Actual FS (dBμV/m)	Limit @3m (dBμV/m)	Margin (dB)
4960.000	Peak	39.27	9.71	48.98	74.00	-25.02
4960.000	Average	35.02	9.71	44.73	54.00	-9.27
7440.000	Peak	30.76	13.54	44.30	74.00	-29.70
7440.000	Average	23.95	13.54	37.49	54.00	-16.51
N/A						

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.

--End of Test Report--

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