REPORT No. : XM20080015W02

TEST REPORT

MANUFACTURER	:	Xiamen Hanin Electronic Technology Co.,Ltd.
PRODUCT NAME	:	Handheld Barcode Scanner
MODEL NAME	:	HN-3358XX-XXXR
BRAND NAME	:	HPRT
FCC ID	:	2AUTE-3358
STANDARD(S)	:	47 CFR Part 15 Subpart C
RECEIPT DATE	:	2020-08-26
TEST DATE	:	2020-08-27 ~ 2020-08-28
ISSUE DATE	:	2020-10-09

Edited by : Bowers Zeng

Bowers Zeng(Test engineer)

Review by: Elvis Wang

Elvis Wang(Auditor)

Approved by:

Anne Liu (Supervisor)

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DIRECTORY

Change History		
Version	Date	Reason for change
1.0	2020-10-09	First edition

1. Technical Information

Note: Provide by applicant.

1.1. Applicant and Manufacturer Information

Applicant:	Xiamen Hanin Electronic Technology Co.,Ltd.
Applicant Address:	Room 305A, Angye Building, Pioneering Park,Torch High-tech, Zone,Xiamen
Manufacturer:	Xiamen Hanin Electronic Technology Co.,Ltd.
Manufacturer Address:	96# Rongyuan Road,Tong'an District,Xiamen

1.2. Equipment Under Test (EUT) Description

Product Name:	Handheld Barcode Scanner
Serial No:	(N/A, marked #1 by test site)
Hardware Version:	HN-6258SRMB2-20200611
Software Version:	GL02
Modulation Type:	GFSK
Operating Frequency Range:	2402MHz - 2480MHz (40 channels, at intervals of 2MHz);
Bluetooth Version:	Bluetooth 4.2 LE
Antenna Type:	PIFA Antenna
Antenna Gain:	0dBi

Note 1: The EUT contains Bluetooth Module operating at 2.4GHz ISM band; the frequencies is F(MHz)=2402+2*n (0<=n<=39). The lowest, middle, highest channel numbers of the Bluetooth Module used and tested in this report are separately 0 (2402MHz), 19 (2440MHz) and 39 (2480MHz).

Note 2: The EUT connected to the serial port of the computer with a serial communication cable, we use the dedicated software to control the EUT continuous transmission.

Note 3: For a more detailed description, please refer to Specification or User's Manual supplied by the applicant and/or manufacturer.

1.3. Test Standards and Results

The objective of the report is to perform testing according to 47 CFR Part 15 Subpart C (Bluetooth, 2.4GHz ISM band radiators) for the EUT FCC ID Certification:

No	Identity	Document Title
1	47 CFR Part 15 (10-1-15 Edition)	Radio Frequency Devices

Test detailed items/section required by FCC rules and results are as below:

No.	Section	Description	Test Date	Test Engineer	Result
1	15.203	Antenna Requirement	N/A	N/A	PASS
2	15.247(b)	Peak Output Power	Aug 27, 2020	Elvis Wang	PASS
3	15.247(a)	Bandwidth	Sept 08, 2020	Elvis Wang	PASS
4	15.247(d)	Conducted Spurious Emission and Band Edge	Aug 27, 2020	Elvis Wang	PASS
5	15.247(e)	Power spectral density (PSD)	Sep 02, 2020	Elvis Wang	PASS
6	15.247(d)	Restricted Frequency Bands	Aug 28, 2020	Yaming Luo	PASS
7	15.207	Conducted Emission	Aug 31, 2020	Yaming Luo	PASS
8	15.209, 15.247(d)	Radiated Emission	Aug 31, 2020	Yaming Luo	PASS

Note: The tests were performed according to the method of measurements prescribed in ANSIC63.10-2013 and KDB558074 D01 15.247 Meas Guidance v05r02.

1.4. Environmental Conditions

During the measurement, the environmental conditions were within the listed ranges:

Temperature (°C):	15 - 35
Relative Humidity (%):	30 - 60
Atmospheric Pressure (kPa):	86 - 106

2. 47 CFR Part 15C Requirements

2.1. Antenna requirement

2.1.1. Applicable Standard

According to FCC 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.

2.1.2. Result: Compliant

The EUT has a permanently and irreplaceable attached antenna. Please refer to the EUT internal photos.

2.2. Peak Output Power

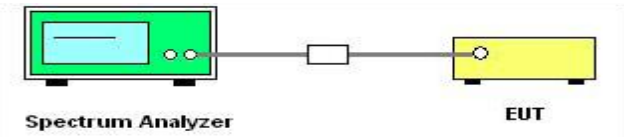
2.2.1. Requirement

According to FCC section 15.247(b)(3), For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: The maximum peak conducted output power of the intentional radiator shall not exceed 1 Watt.

2.2.2. Test Description

The measured output power was calculated by the reading of the spectrum analyzer and calibration.

A. Test Setup:



The EUT (Equipment under the test) is coupled to the Spectrum analyzer; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading, all test result in Spectrum analyzer.

B. Equipments List:

Please refer ANNEX A (1.5).

2.2.3. Test procedure

The measured output power was calculated by the reading of the spectrum analyzer and calibration. Following is the test procedure for Peak Output Power test on the spectrum analyzer：

a) Set analyzer center frequency to channel center frequency.

b) Set the RBW to 3MHz
c) Set VBW to 8MHz
d) Set span to 10MHz
e) Sweep time to auto couple.
f) Detector = peak.
g) Trace mode = max hold.
h) Allow trace to fully stabilize.
i) Use peak marker function to determine the peak amplitude level.

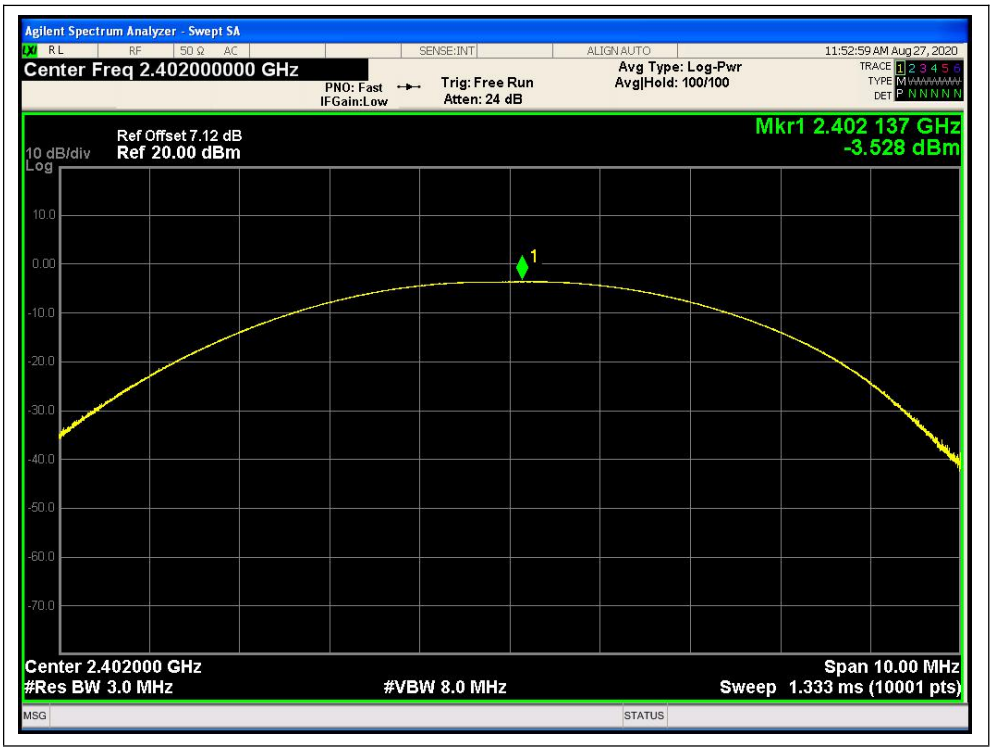
2.2.4. Test Result

The lowest, middle and highest channels are selected to perform testing to verify the conducted RF output peak power of the Module.

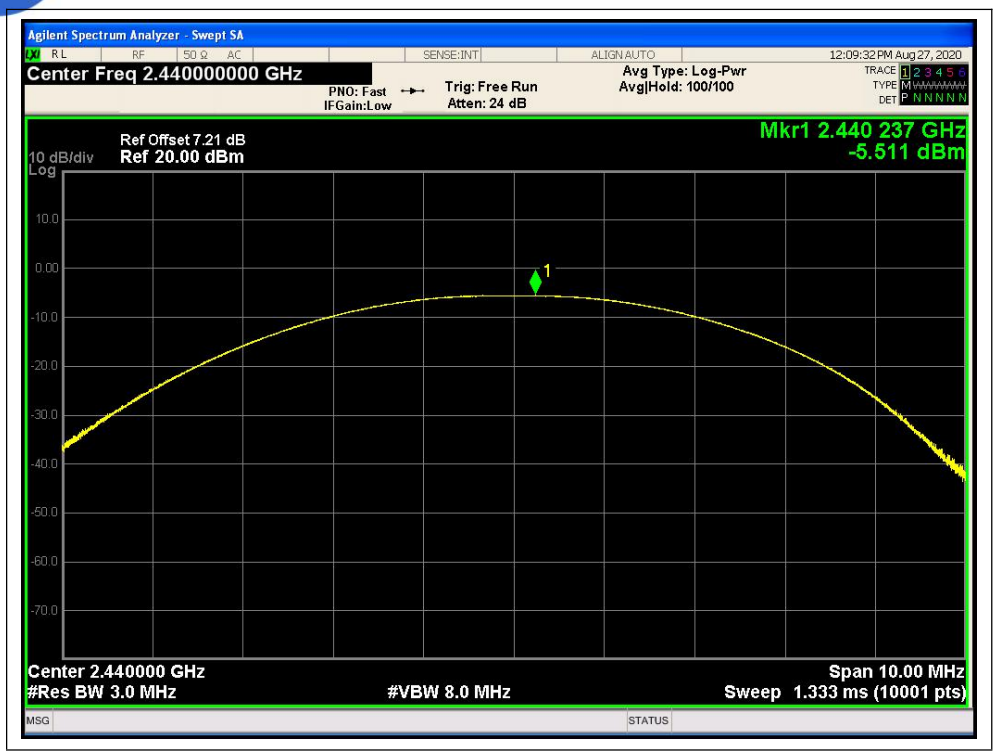
A. Test Verdict:

Channel	Frequency (MHz)	Measured Output Peak Power		Limit		Verdict
		dBm	W	dBm	W	
0	2402	-3.528	0.00044	30	1	PASS
19	2440	-5.511	0.00028			PASS
39	2480	-4.582	0.00035			PASS

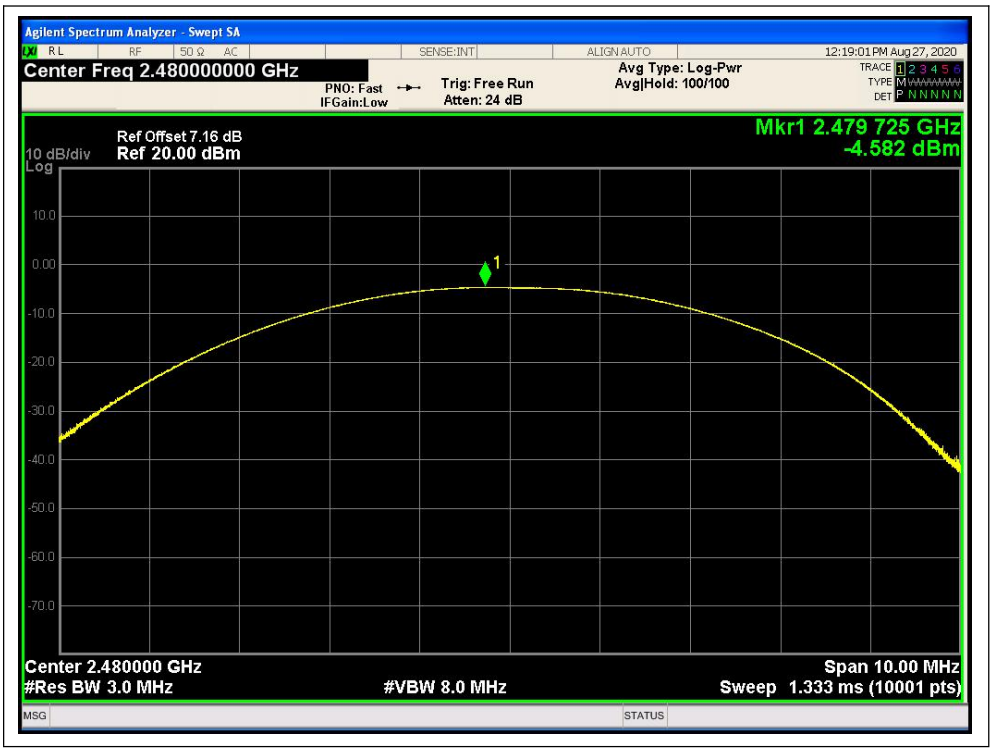
B. Test Plots:



(Channel 0, 2402MHz)



(Channel 19, 2440MHz)



(Channel 39, 2480MHz)

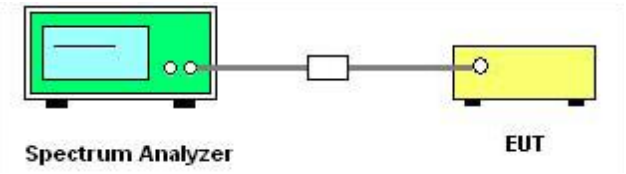
2.3. 6dB Bandwidth

2.3.1. Requirement

According to FCC section 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.

2.3.2. Test Description

A. Test Set:



The EUT is coupled to the Spectrum Analyzer; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading.

Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. In order to make an accurate measurement, set the span greater than RBW.

B. Equipments List:

Please refer ANNEX A(1.5).

2.3.3. Test procedure

The steps for the first option are as follows:
（1）Set analyzer center frequency to channel center frequency.
a) Set RBW = 100 kHz.
b) Set the VBW=300 kHz.
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.

（2）The automatic bandwidth measurement capability of an instrument may be employed using the X dB bandwidth mode with X set to 6 dB, if the functionality described in 11.8.1 (i.e., RBW = 100 kHz,VBW ≥ 3 × RBW, and peak detector with maximum hold) is implemented by the instrumentation function. When using this capability, care shall be taken so that the bandwidth measurement is not influenced by any intermediate power nulls in the fundamental emission that might be ≥6 dB.

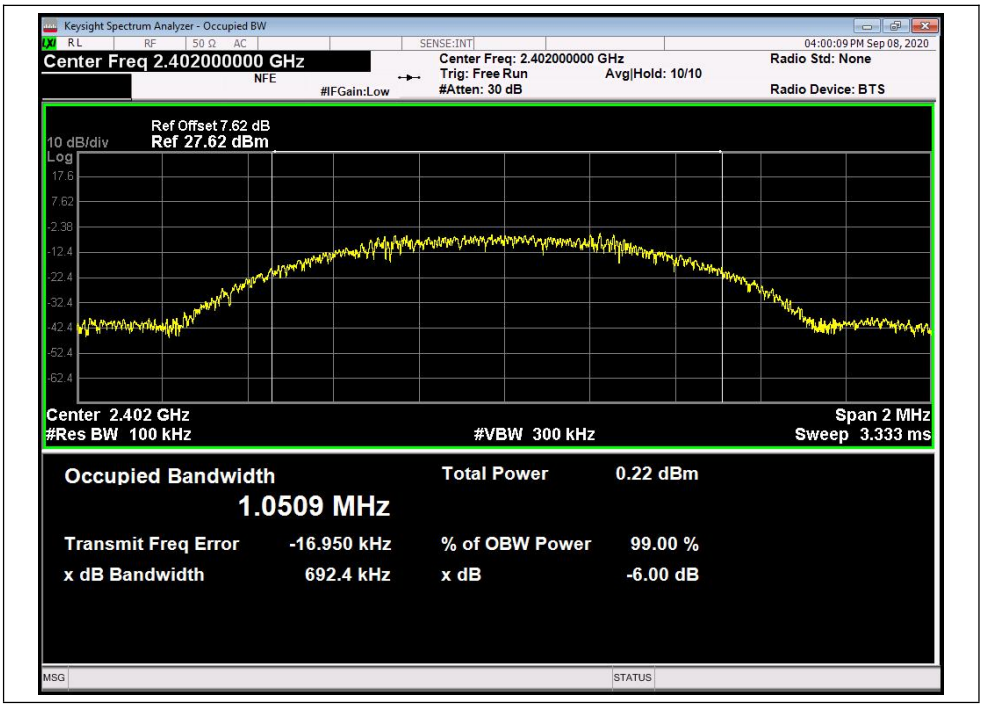
2.3.4. Test Result

The lowest, middle and highest channels are selected to perform testing to record the 6 dB bandwidth of the module.

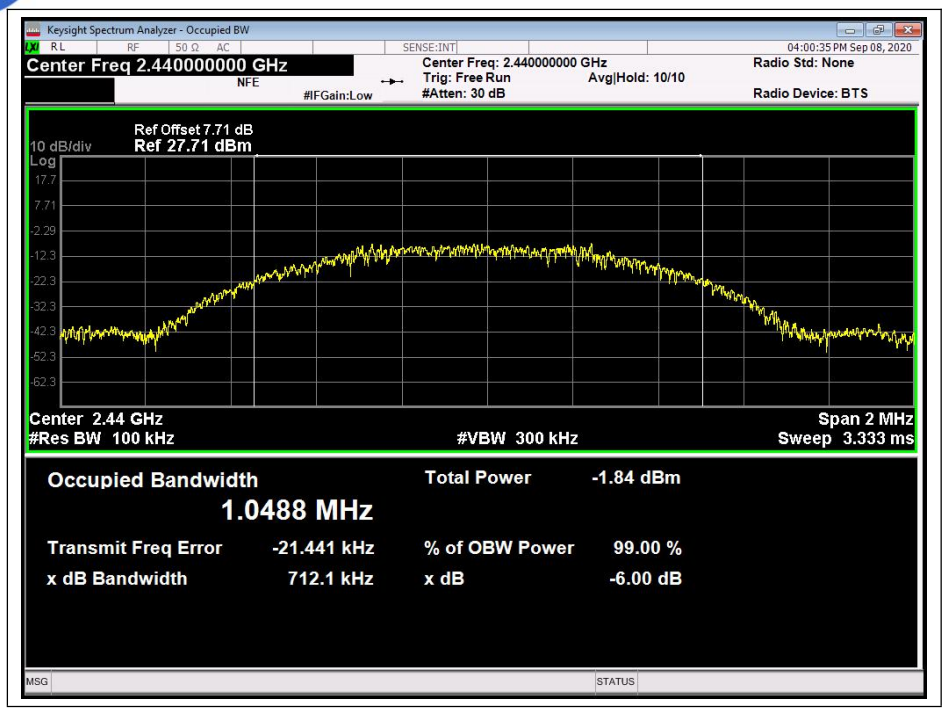
A. Test Verdict:

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limits(kHz)	Result
0	2402	0.692	≥500	PASS
19	2440	0.712	≥500	PASS
39	2480	0.707	≥500	PASS

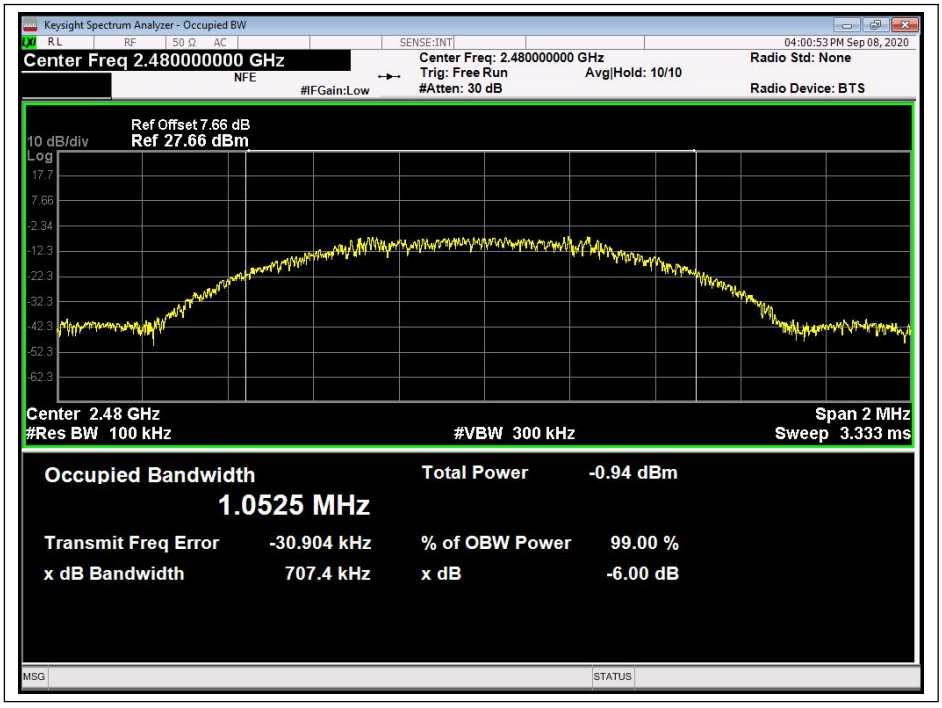
B. Test Plots:



(Channel 0: 2402MHz)



(Channel 19: 2440 MHz)



(Channel 39: 2480MHz)

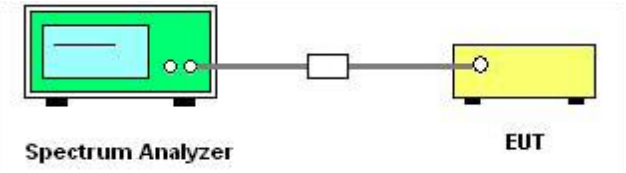
2.4. Conducted Spurious Emissions and Band Edge

2.4.1. Requirement

According to FCC section 15.247(d), in any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

2.4.2. Test Description

A. Test Set:



The EUT is coupled to the Spectrum Analyzer; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading.

Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. In order to make an accurate measurement, set the span greater than RBW.

B. Equipments List:

Please refer ANNEX A (1.5).

2.4.3. Test Procedure

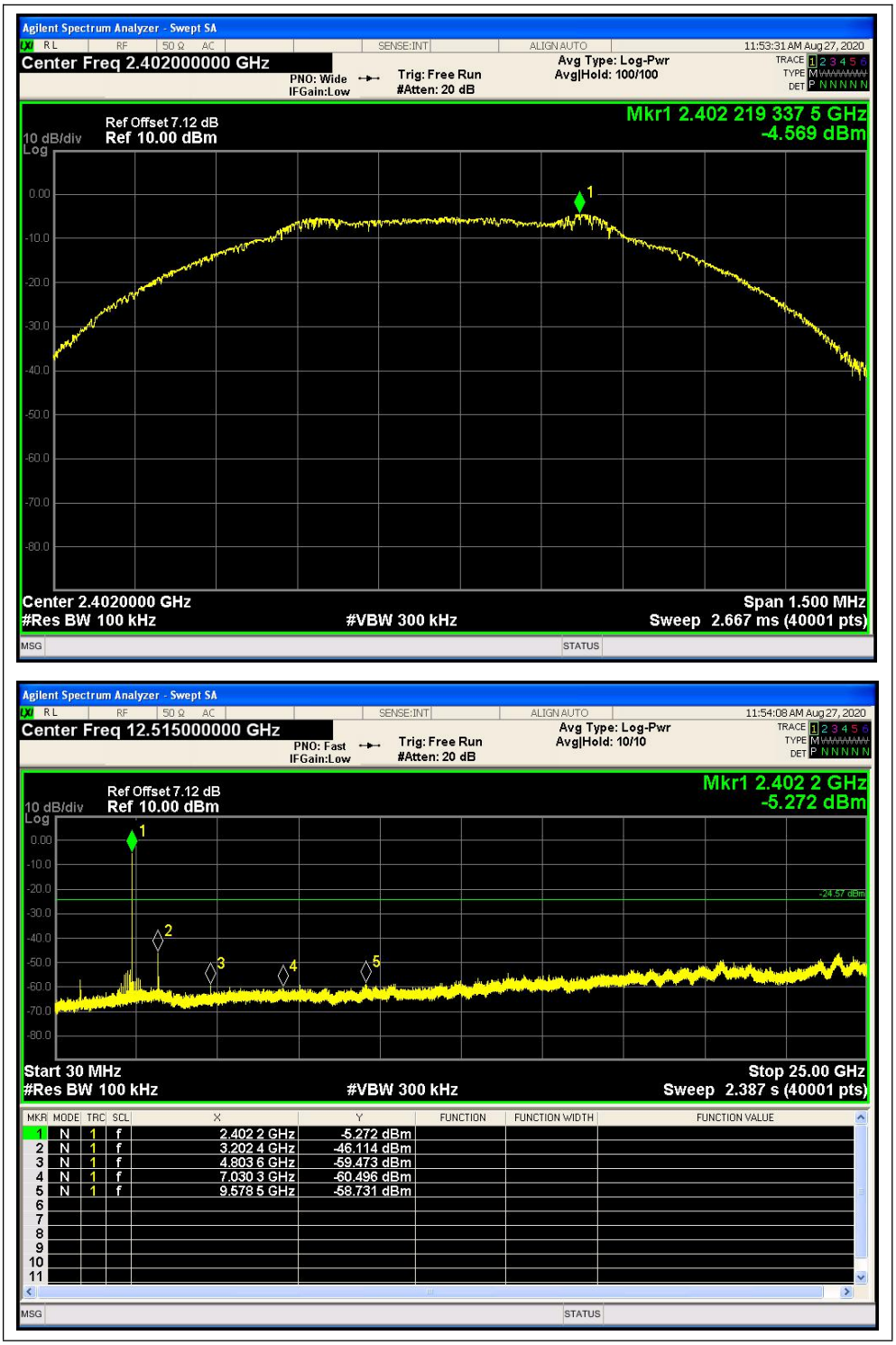
The transmitter output was connected to the spectrum analyzer via a low lose cable. Set both RBW and VBW of spectrum analyzer to 100kHz and 300kHz with suitable frequency span including 100 MHz bandwidth from band edge. The band edges was measured and recorded.

2.4.4. Test Result

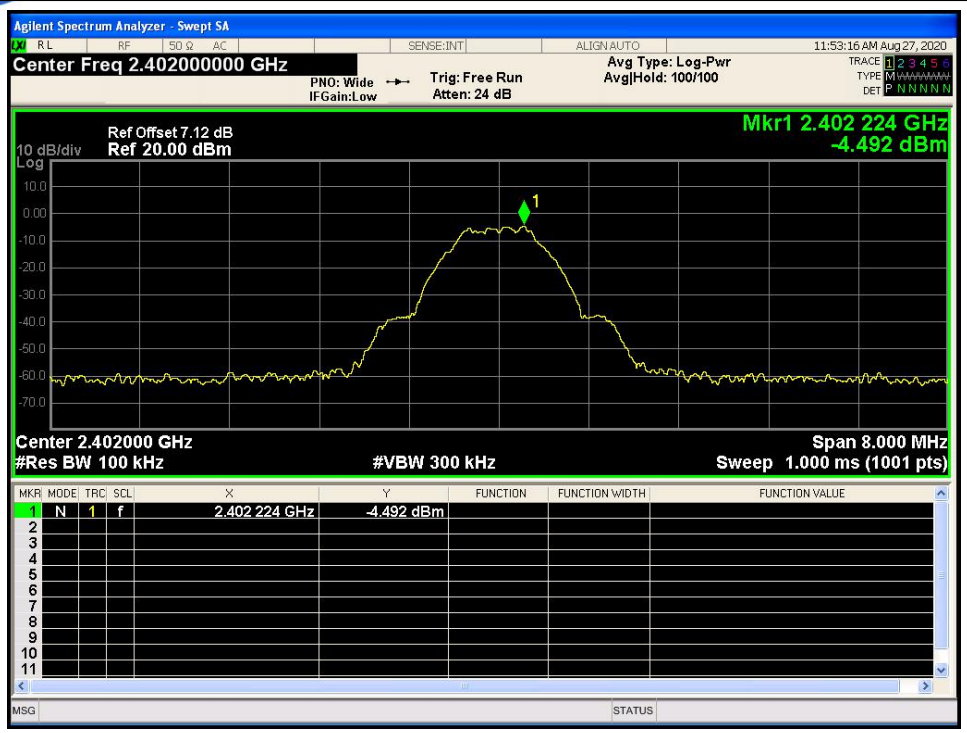
The measurement frequency range is from 30MHz to the 10th harmonic of the fundamental frequency. The lowest, middle and highest channels are tested to verify the spurious emissions.

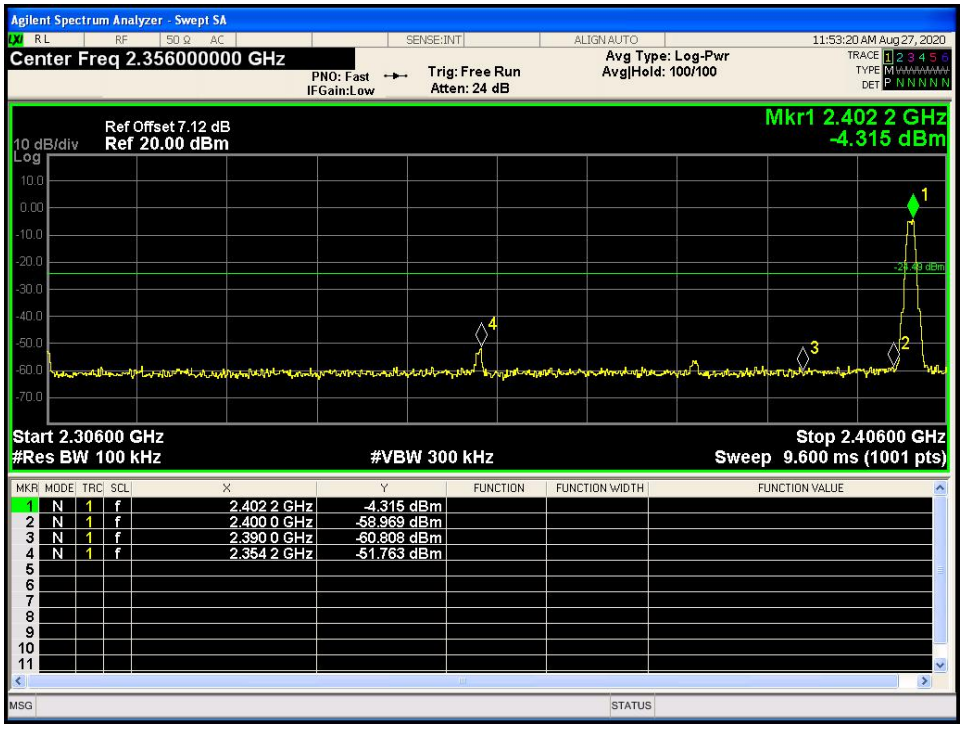
A. Test Plots:

Note: the power of the Module transmitting frequency should be ignored.

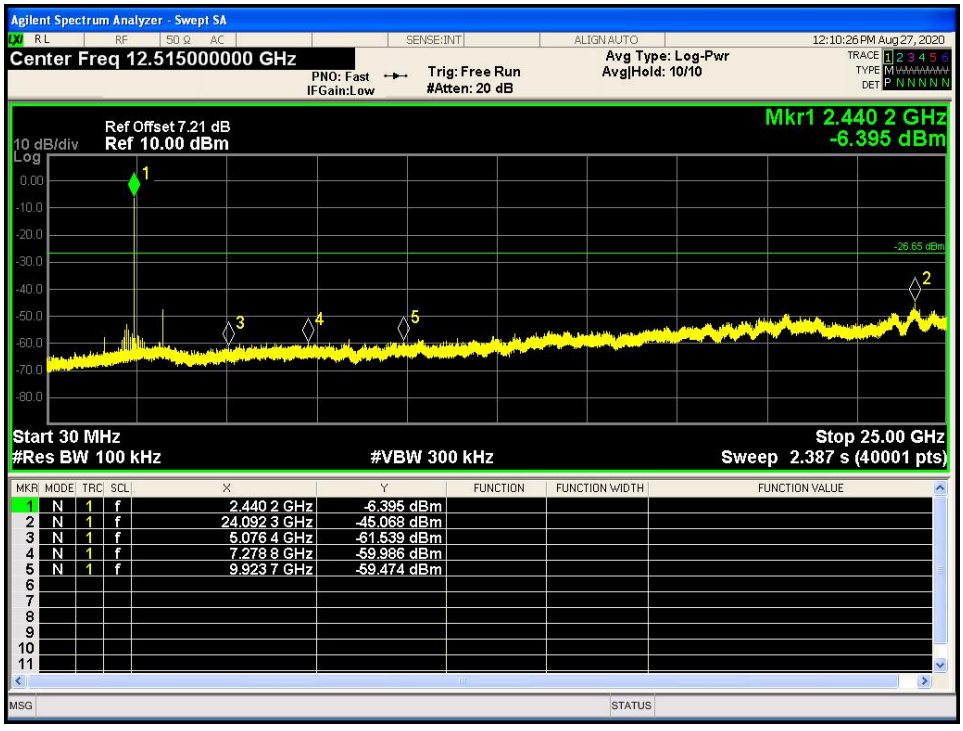


(Channel = 0, 30MHz to 25GHz)

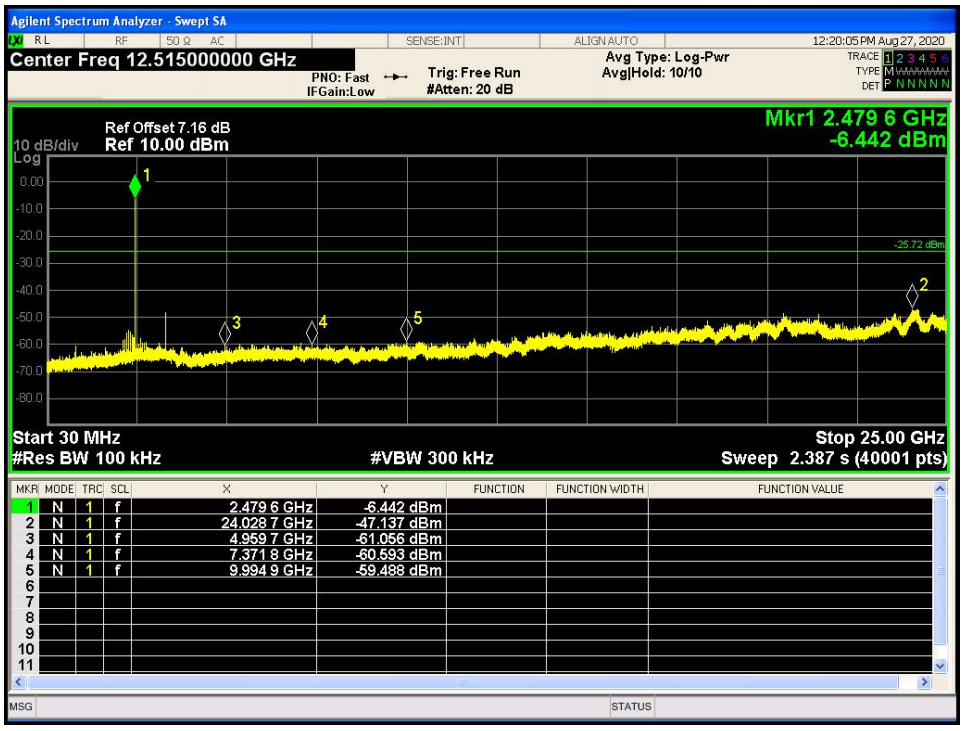




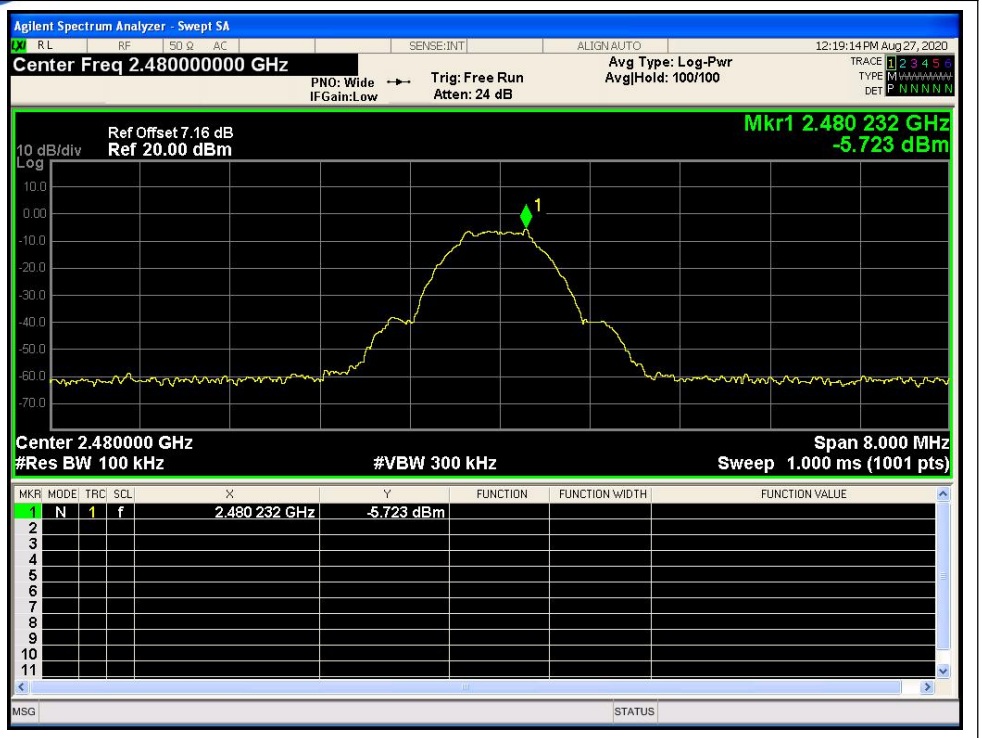
(Band Edge, Channel = 0)

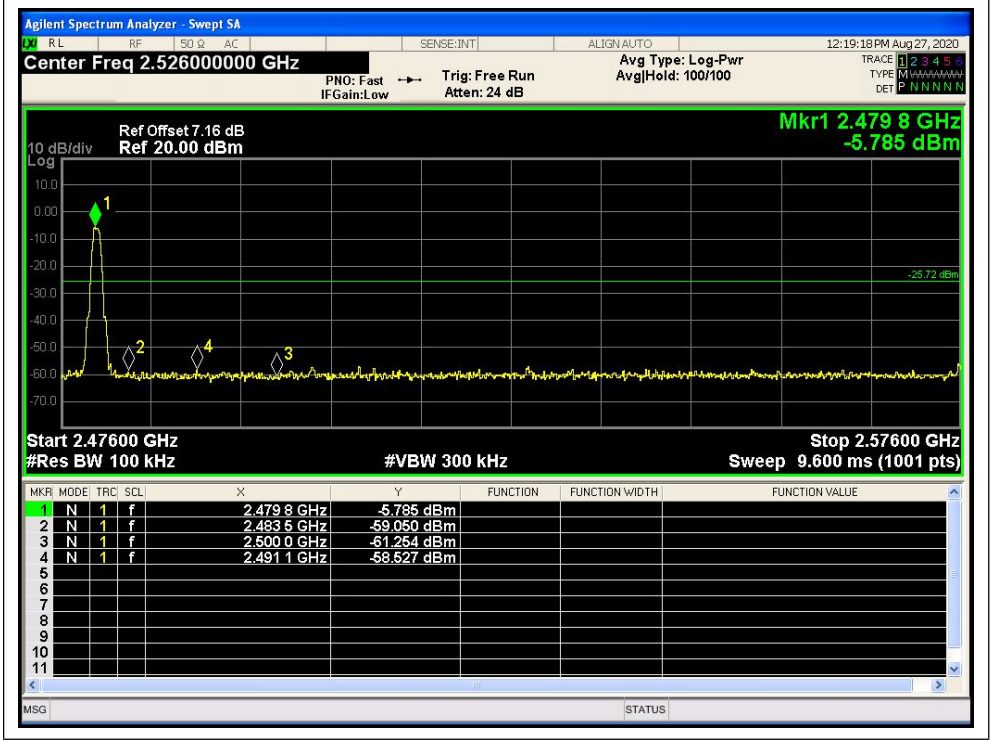


(Channel = 19, 30MHz to 25GHz)



(Channel = 39, 30MHz to 25GHz)





(Band Edge, Channel = 39)

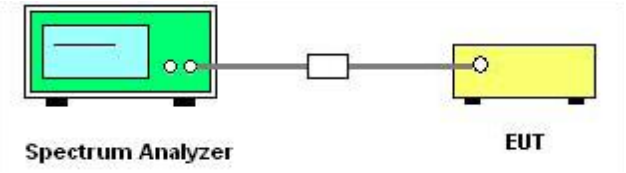
2.5. Power spectral density (PSD)

2.5.1. Requirement

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3 kHz band during any time interval of continuous transmission. 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.

2.5.2. Test Description

A. Test Set:



The EUT is coupled to the Spectrum Analyzer; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading.

B. Equipments List:

Please refer ANNEX A (1.5).

2.5.3. Test procedure

The measured power spectral density was calculated by the reading of the spectrum analyzer and calibration. Following is the test procedure for PSD test:

a) Set analyzer center frequency to channel center frequency.
b) Set the span to 1.5 times DTS
c) Set the RBW to 3 kHz
d) Set the VBW to 10 kHz
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.

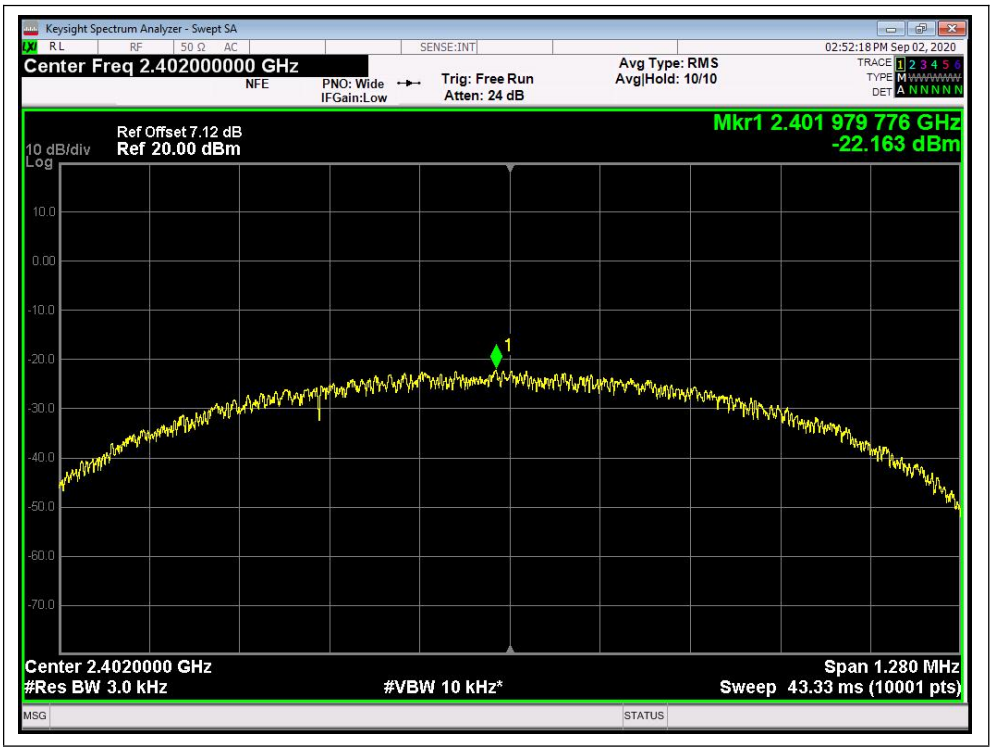
2.5.4. Test Result

The lowest, middle and highest channels are tested.

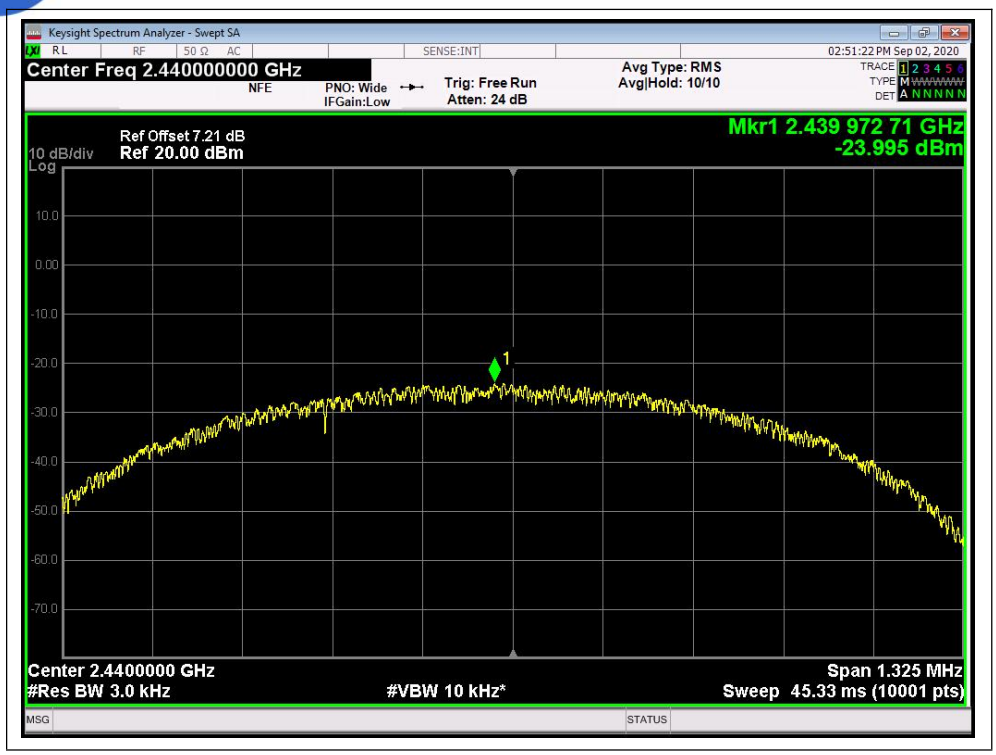
A. Test Verdict:

Spectral power density (dBm/3kHz)				
Channel	Frequency (MHz)	Measured PSD (dBm/3kHz)	Limit (dBm/3kHz)	Verdict
0	2402	-22.163	8	PASS
19	2440	-23.995	8	PASS
39	2480	-23.262	8	PASS
Measurement uncertainty: ±1.3dB				

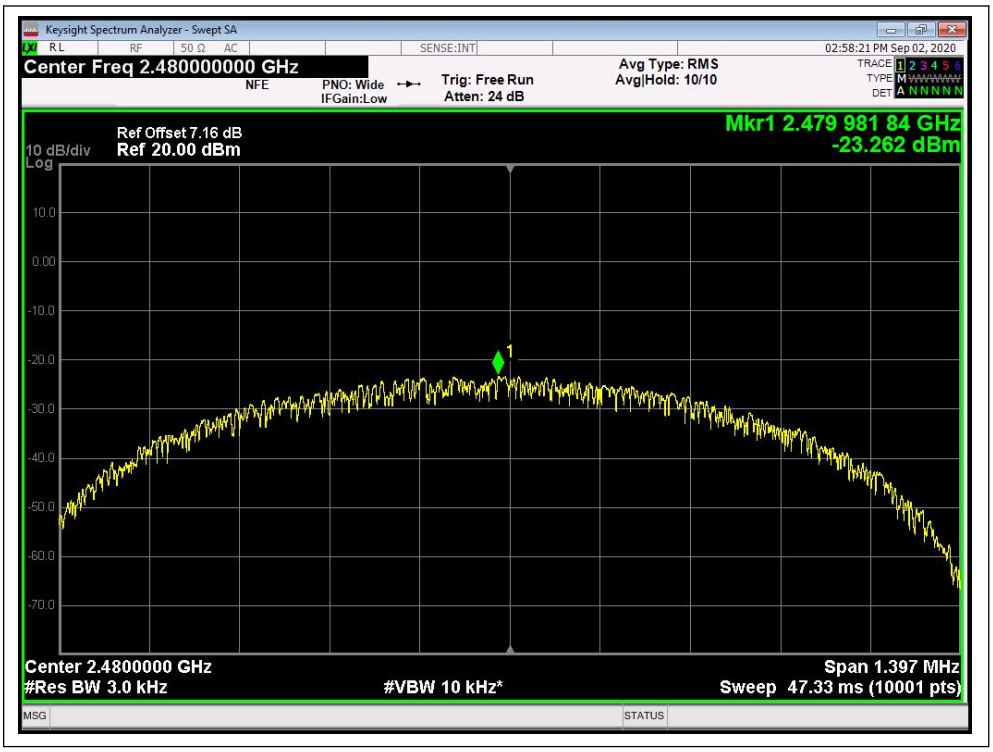
B. Test Plots:



(Channel = 0, 2402MHz)



(Channel = 19, 2440MHz)



(Channel = 39, 2480MHz)

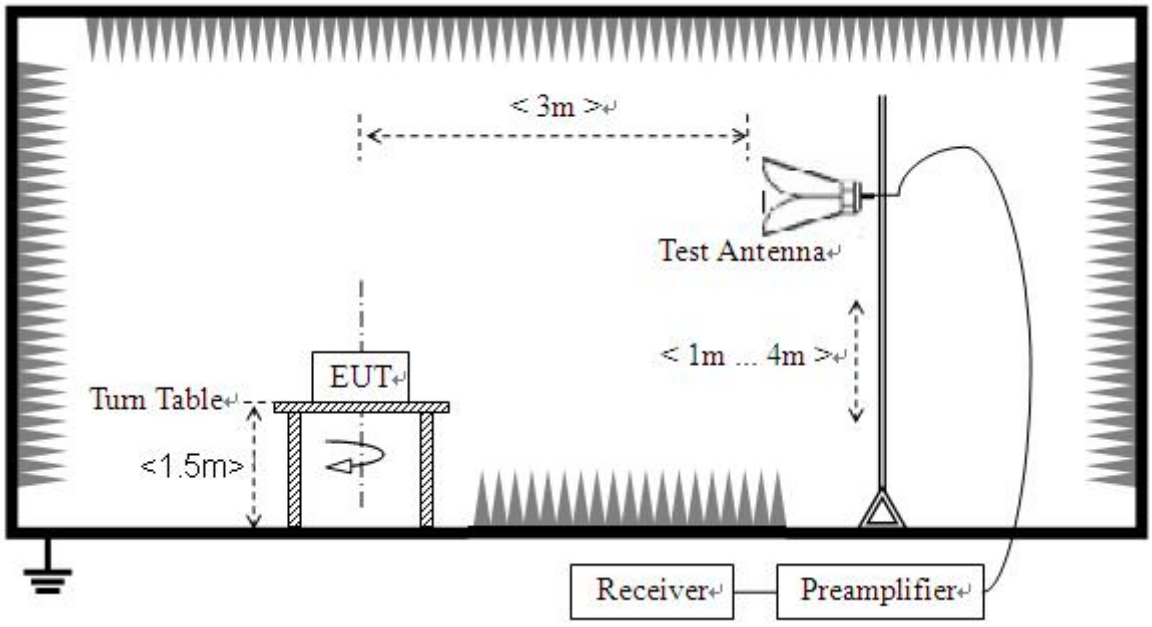
2.6. Restricted Frequency Bands

2.6.1. Requirement[i]

According to FCC section 15.247(d), in any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, 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).

2.6.2. Test Description

A. Test Setup



a. The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
f. The test-receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.
Note:
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasipeak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is ≥ 1/T (Duty cycle < 98%) or 10Hz (Duty cycle ≥ 98%) for Average detection (AV) at frequency above 1GHz.
4. All modes of operation were investigated and the worst-case emissions are reported.

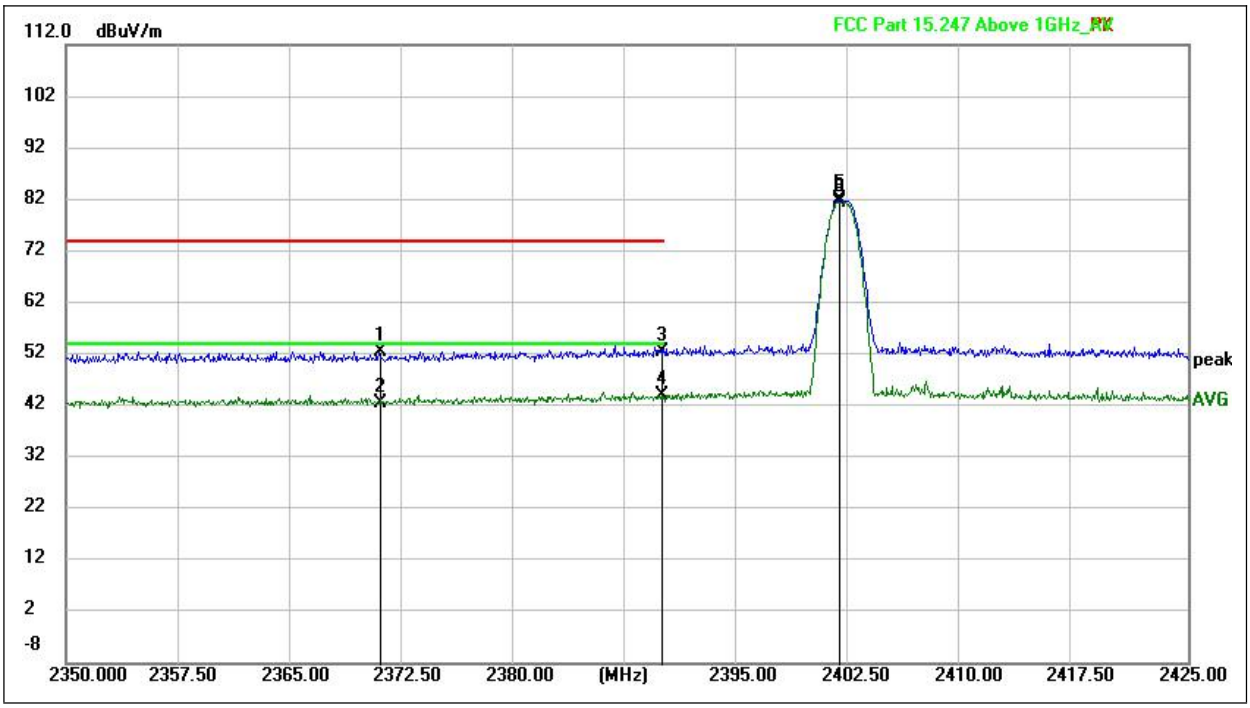
B. Equipments List:

Please refer ANNEX B(4).

2.6.3. Test Result

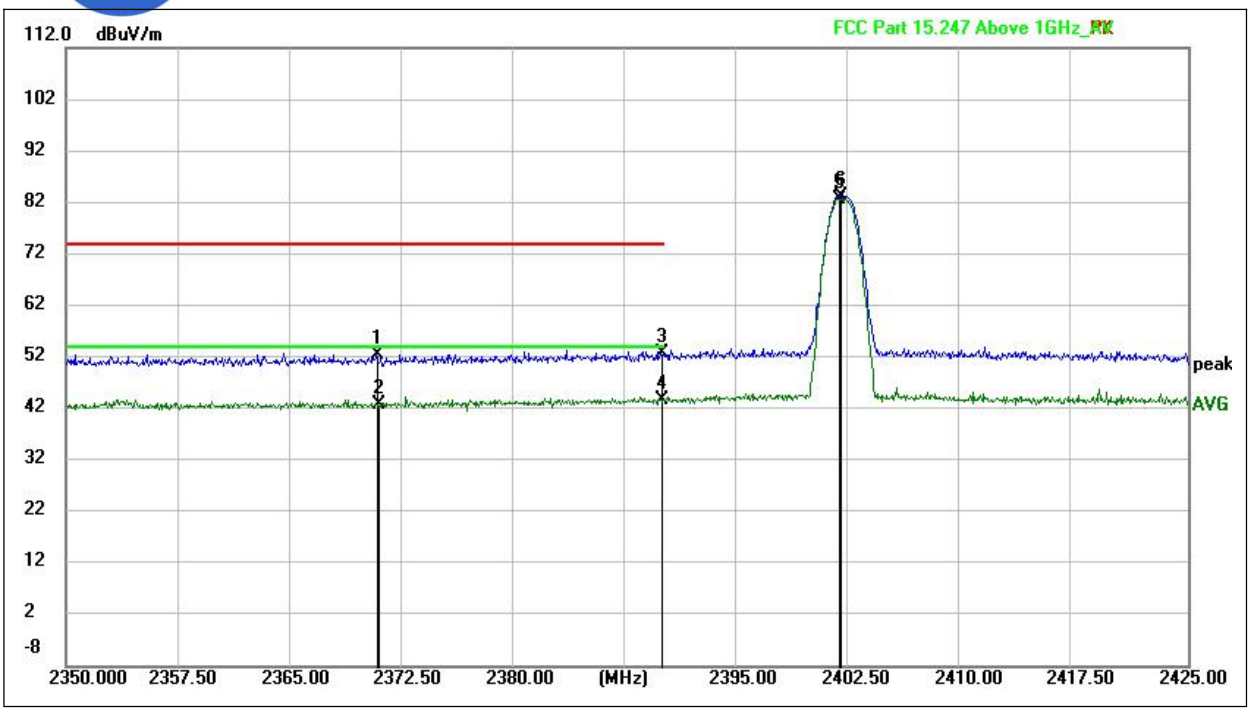
The lowest and highest channels are tested to verify Restricted Frequency Bands.
The measurement results are obtained as below:
E [dBμV/m] =U_R + A_T + A_{Factor} [dB]; AT =$L_{Cable\ loss}$ [dB]-G_{preamp} [dB]
A_T: Total correction Factor except Antenna
U_R: Receiver Reading
G_{preamp}: Preamplifier Gain
A_{Factor}: Antenna Factor at 3m

Test Plots:



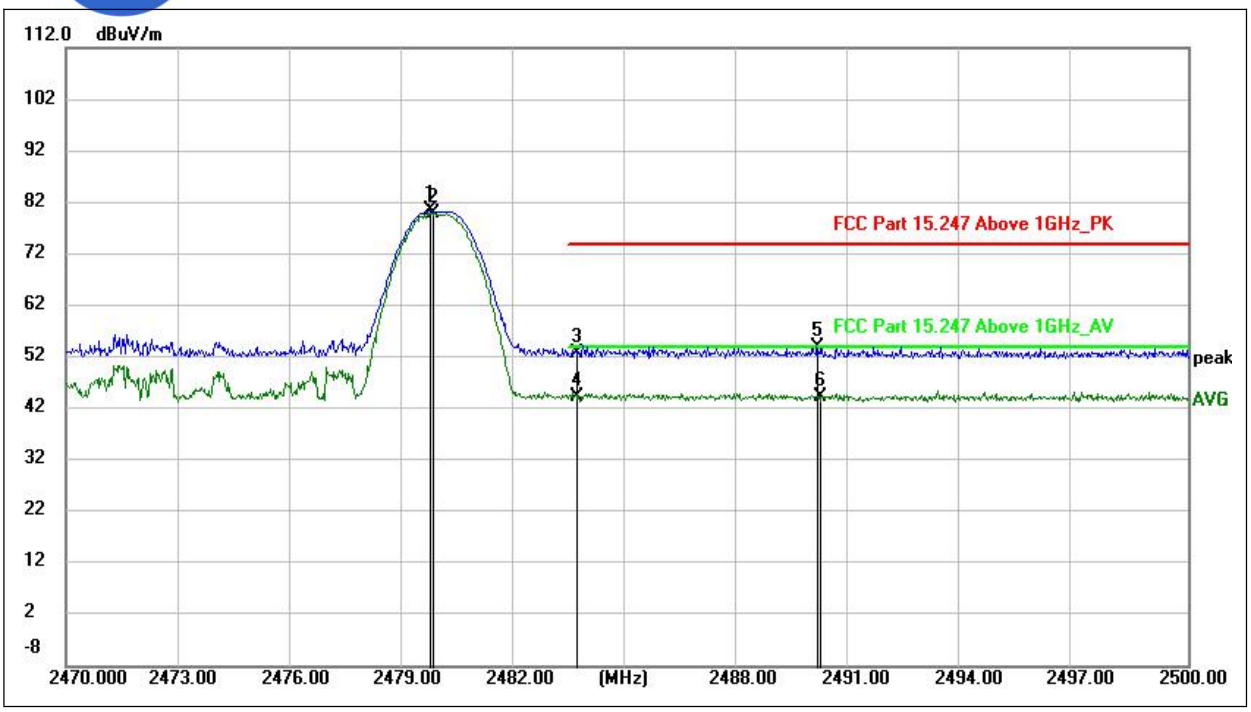
(BLE 1M PHY_2402MHz, Antenna Horizontal)

Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.	Pol
2371.004	12.27	40.16	52.43	74.00	-21.57	peak	H
2371.004	2.42	40.16	42.58	54.00	-11.42	AVG	H
2389.821	11.64	40.95	52.59	74.00	-21.41	peak	H
2389.896	2.97	40.95	43.92	54.00	-10.08	AVG	H
2401.742	40.32	41.62	81.94	N/A	N/A	peak	H
2401.742	39.80	41.62	81.42	N/A	N/A	AVG	H



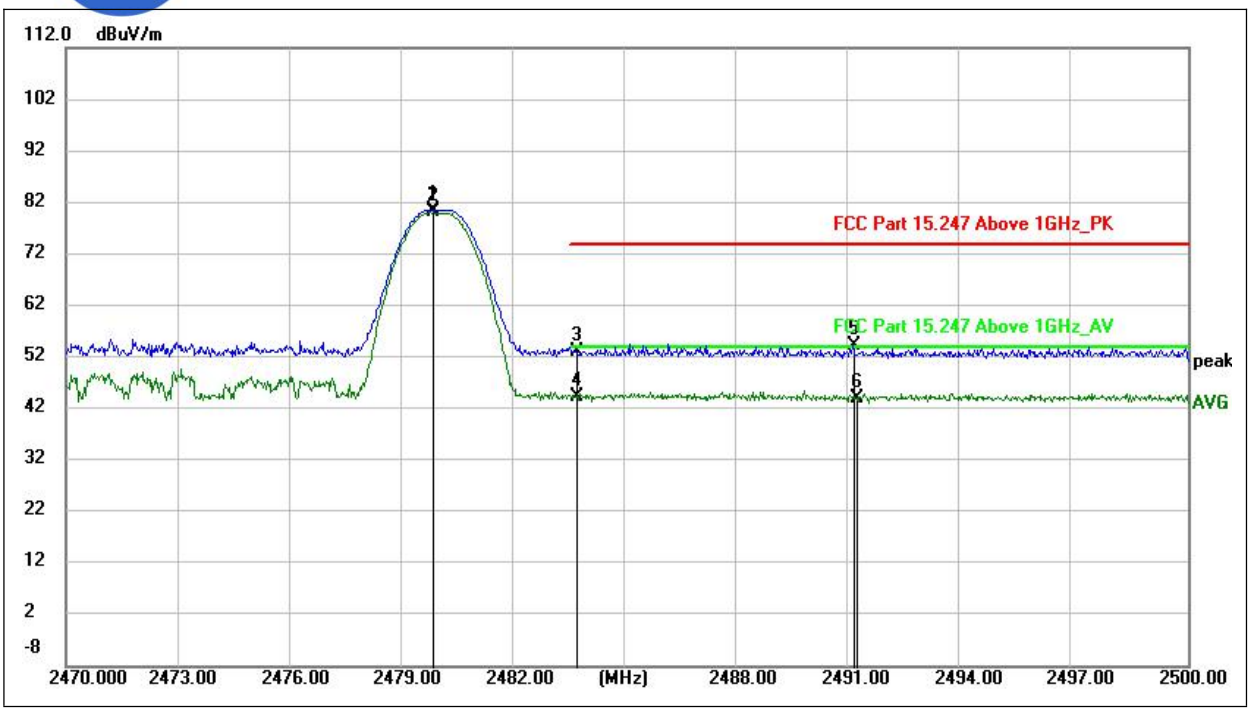
(LE 1M PHY_2402MHz, Antenna Vertical)

Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.	Pol
2370.839	12.19	40.16	52.35	74.00	-21.65	peak	V
2370.910	2.55	40.16	42.71	54.00	-11.29	AVG	V
2389.780	11.75	40.94	52.69	74.00	-21.31	peak	V
2389.780	2.79	40.94	43.73	54.00	-10.27	AVG	V
2401.742	41.11	41.62	82.73	N/A	N/A	AVG	V
2401.821	41.58	41.61	83.19	N/A	N/A	peak	V



(LE 1M PHY_2480MHz, Antenna Horizontal)

Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.	Pol
2479.741	38.62	41.77	80.39	N/A	N/A	peak	H
2479.816	38.02	41.77	79.79	N/A	N/A	AVG	H
2483.624	11.03	41.77	52.80	74.00	-21.20	peak	H
2483.624	2.58	41.77	44.35	54.00	-9.65	AVG	H
2490.084	12.48	41.56	54.04	74.00	-19.96	peak	H
2490.182	2.90	41.56	44.46	54.00	-9.54	AVG	H



(LE 1M PHY_2480MHz, Antenna Vertical)

Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.	Pol
2479.785	38.83	41.77	80.60	N/A	N/A	peak	V
2479.827	38.30	41.77	80.07	N/A	N/A	AVG	V
2483.651	11.32	41.76	53.08	74.00	-20.92	peak	V
2483.651	2.48	41.76	44.24	54.00	-9.76	AVG	V
2491.055	12.82	41.53	54.35	74.00	-19.65	peak	V
2491.128	2.53	41.53	44.06	54.00	-9.94	AVG	V

2.7. Conducted Emission

2.7.1. Requirement

According to FCC section 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 within the band 150kHz to 30MHz shall not exceed the limits in the following table, as measured using a 50μH/50Ω line impedance stabilization network (LISN).

Frequency range (MHz)	Conducted Limit (dBμV)	
	Quai-peak	Average
0.15 - 0.50	66 to 56	56 to 46
0.50 - 5	56	46
5 - 30	60	50

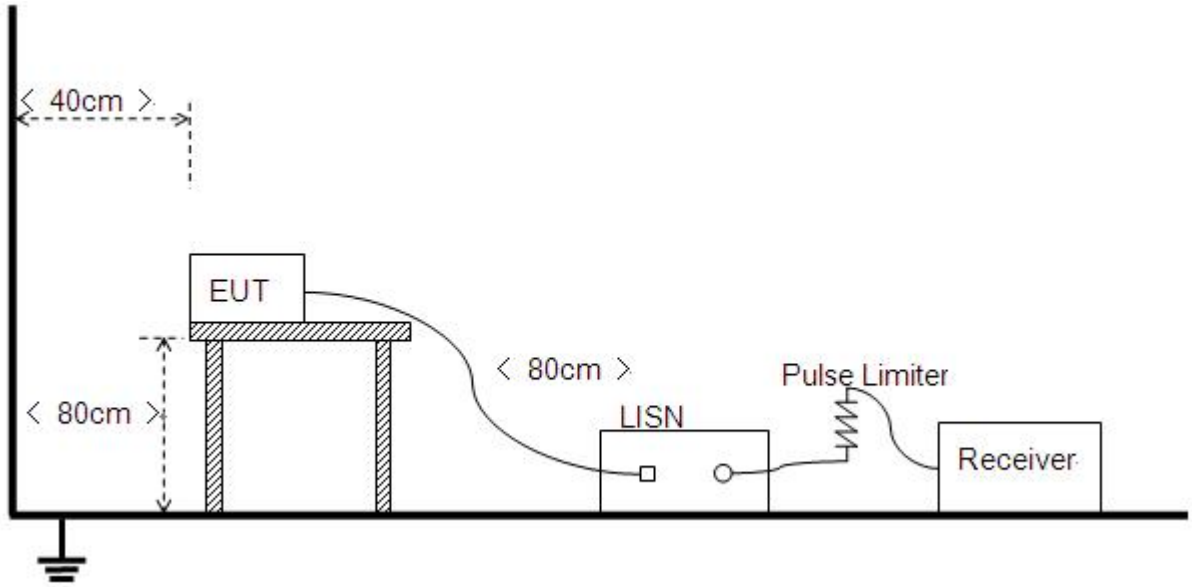
NOTE:

(a) The lower limit shall apply at the band edges.

(b) The limit decreases linearly with the logarithm of the frequency in the range 0.15 - 0.50MHz.

2.7.2. Test Description

A. Test Setup:



The Table-top EUT was placed upon a non-metallic table 0.8m above the horizontal metal reference ground plane. EUT was connected to LISN and LISN was connected to reference Ground Plane. EUT was 80cm from LISN. The set-up and test methods were according to ANSI C63.10: 2013.

B. Equipments List:

Please refer ANNEX A(1.5).

2.7.3. Test Result

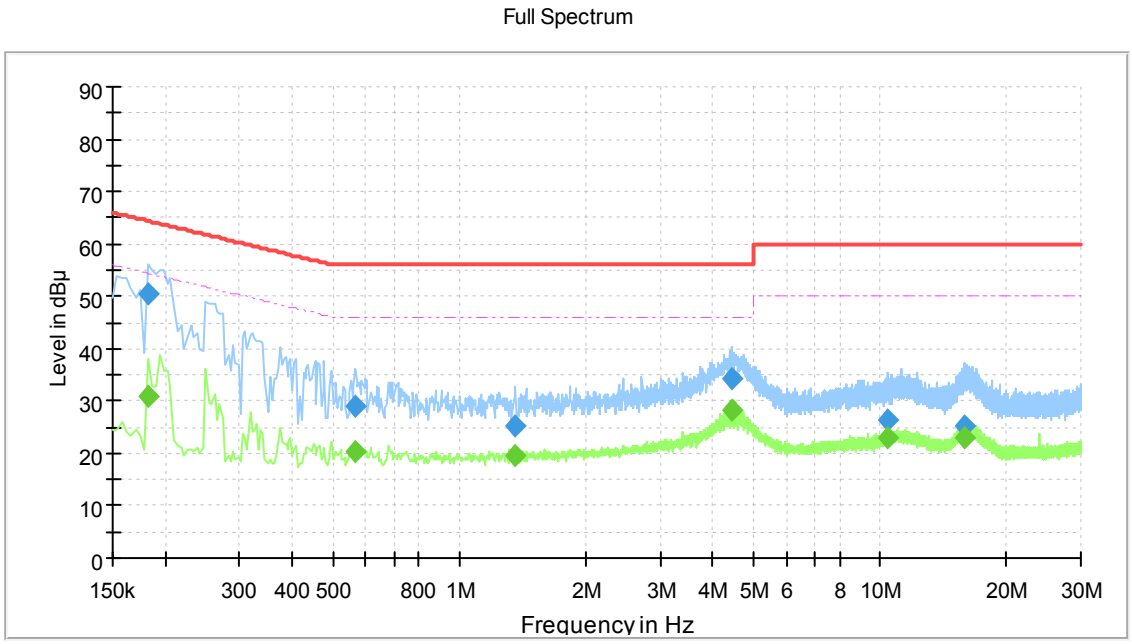
The maximum conducted interference is searched using Peak (PK), if the emission levels more than the AV and QP limits, and that have narrow margins from the AV and QP limits will be re-measured with AV and QP detectors. Tests for both L phase and N phase lines of the power mains connected to the EUT are performed. Refer to recorded points and plots below.

Note: Both of the test voltage AC 120V/60Hz and AC 230V/50Hz were considered and tested respectively, only the results of the worst case AC 120V/60Hz were recorded in this report.

A. Test setup:

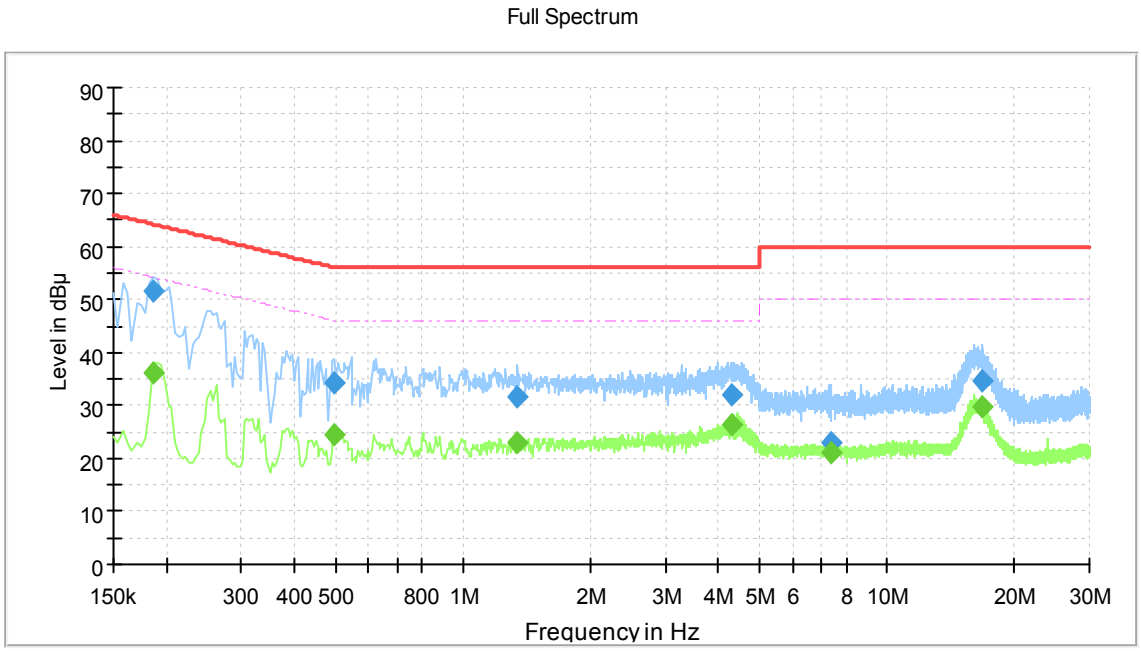
The EUT configuration of the emission tests is Charging + BT Link.

B. Test Plots:



(Plot A: L Phase)

Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Line	Corr. (dB)	Verdict
0.182000	---	30.83	54.39	23.57	L1	10.2	PASS
0.182000	50.60	---	64.39	13.80	L1	10.2	PASS
0.566000	---	20.28	46.00	25.72	L1	10.2	PASS
0.566000	29.10	---	56.00	26.90	L1	10.2	PASS
1.362000	---	19.64	46.00	26.36	L1	10.3	PASS
1.362000	25.12	---	56.00	30.88	L1	10.3	PASS
4.430000	34.43	---	56.00	21.57	L1	10.4	PASS
4.430000	---	28.18	46.00	17.82	L1	10.4	PASS
10.466000	26.21	---	60.00	33.79	L1	10.6	PASS
10.466000	---	22.90	50.00	27.10	L1	10.6	PASS
15.954000	---	23.14	50.00	26.86	L1	10.8	PASS
15.954000	25.29	---	60.00	34.71	L1	10.8	PASS



(Plot B: N Phase)

Frequency (MHz)	MaxPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Line	Corr. (dB)	Verdict
0.186000	---	36.32	54.21	17.90	N	10.2	PASS
0.186000	51.67	---	64.21	12.54	N	10.2	PASS
0.498000	---	24.37	46.03	21.66	N	10.2	PASS
0.498000	34.23	---	56.03	21.81	N	10.2	PASS
1.346000	---	22.85	46.00	23.15	N	10.3	PASS
1.346000	31.49	---	56.00	24.51	N	10.3	PASS
4.290000	32.08	---	56.00	23.92	N	10.4	PASS
4.290000	---	26.32	46.00	19.68	N	10.4	PASS
7.378000	23.10	---	60.00	36.90	N	10.4	PASS
7.378000	---	21.18	50.00	28.82	N	10.4	PASS
16.730000	---	29.65	50.00	20.35	N	10.7	PASS
16.730000	34.77	---	60.00	25.23	N	10.7	PASS

2.8. Radiated Emission

2.8.1. Requirement

According to FCC section 15.247(d), radiated emission outside the frequency band attenuation below the general limits specified in FCC section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in FCC section 15.205(a), must also comply with the radiated emission limits specified in FCC section 15.209(a).

According to FCC section 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 (μV/m)	Measurement Distance (m)
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

Note:

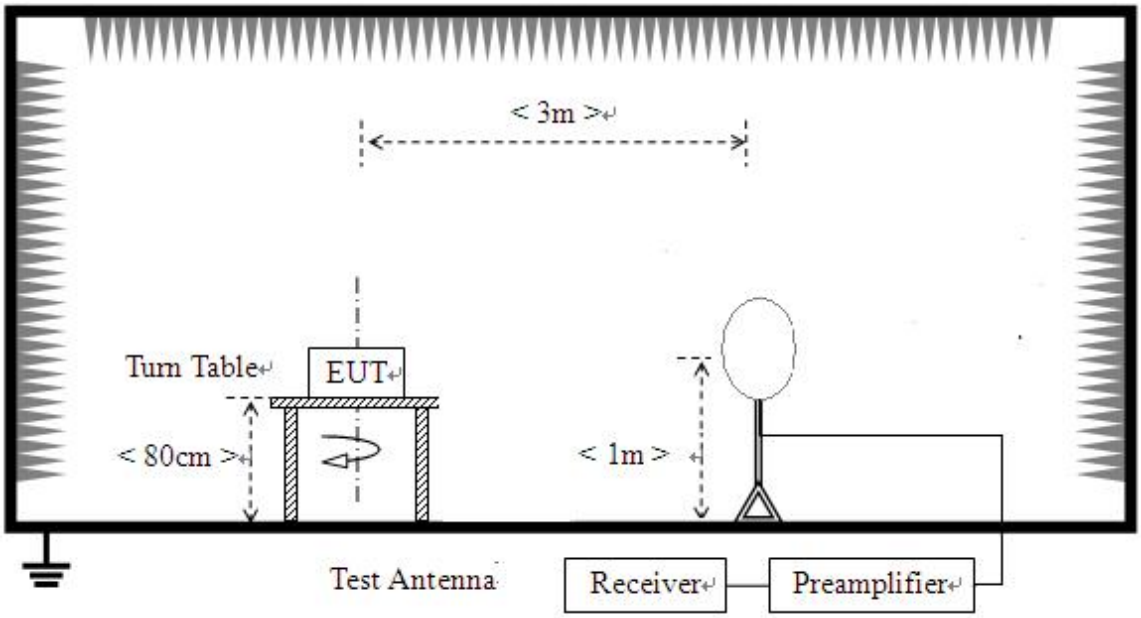
1. For Above 1000MHz, the emission limit in this paragraph is based on measurement instrumentation employing an average detector, measurement using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit.
2. For above 1000MHz, limit field strength of harmonics: 54dBuV/m@3m (AV) and 74dBuV/m@3m (PK)

In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), also should comply with the radiated emission limits specified in Section 15.209(a)(above table)

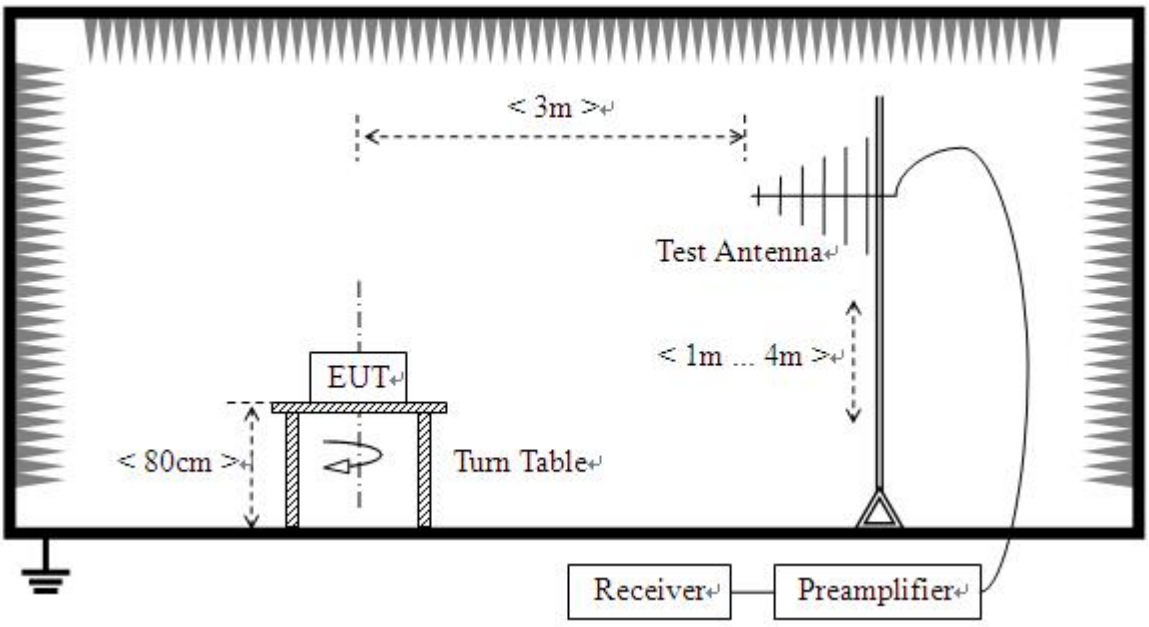
2.8.2. Test Description

A. Test Setup:

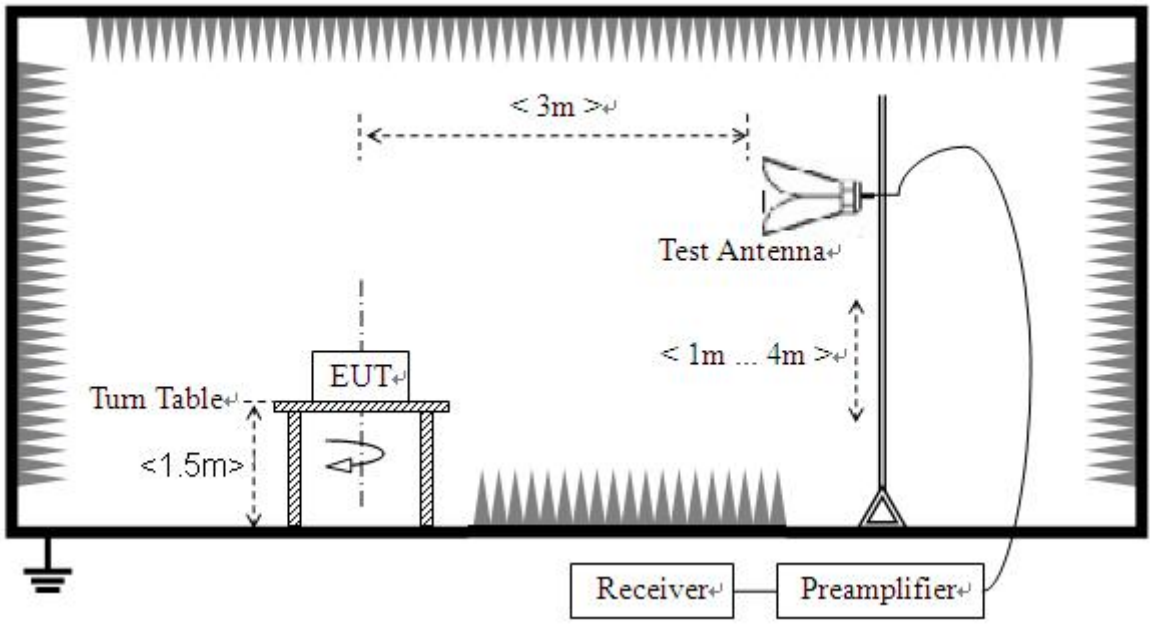
1) For radiated emissions from 9kHz to 30MHz



2) For radiated emissions from 30MHz to1GHz



3) For radiated emissions above 1GHz



The RF absorbing material used on the reference ground plane and on the turntable have a maximum height (thickness) of 30 cm (12 in) and have a minimum-rated attenuation of 20 dB at all frequencies from 1 GHz to 18 GHz. Test site have a minimum area of the ground plane covered with RF absorbing material as specified in Figure 6 of ANSI C63.4: 2014.

The test site semi-anechoic chamber has met the requirement of NSA tolerance 4dB according to the standards: ANSI C63.10:2013. For radiated emissions below or equal to 1GHz, The EUT was set-up on insulator 80cm above the Ground Plane, For radiated emissions above 1GHz, The EUT was set-up on insulator 150cm above the Ground Plane. The set-up and test methods were according to ANSI C63.10:2013.

For Radiated emission below 30MHz:

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. Parallel, perpendicular, and ground-parallel orientations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with

Maximum Hold Mode.

NOTE:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9kHz at frequency below 30MHz.

For Radiated emission above 30MHz:

a. The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.

f. The test-receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasipeak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is ≥ 1/T (Duty cycle < 98%) or 10Hz (Duty cycle ≥ 98%) for Average detection (AV) at frequency above 1GHz.
4. All modes of operation were investigated and the worst-case emissions are reported.

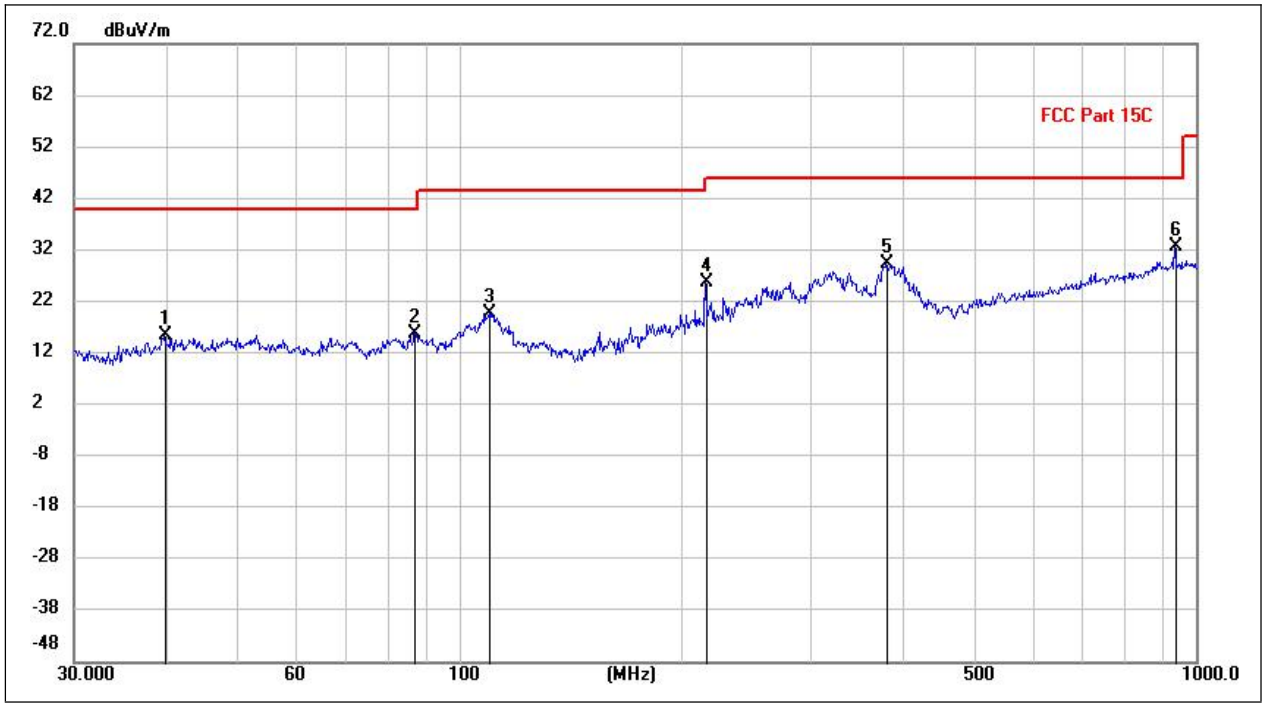
B. Equipments List:

Please refer ANNEX B(4).

2.8.3. Test Result

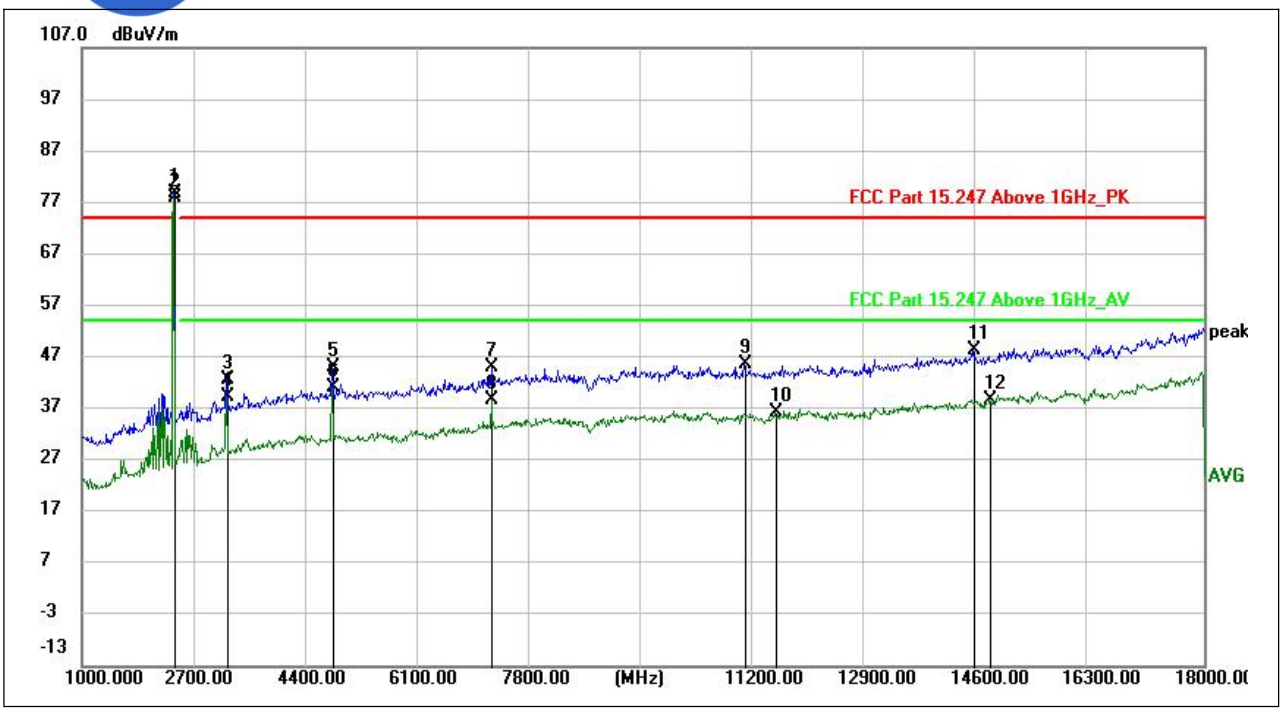
Note1: For the frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit was not recorded.

Note2: For the frequency, which started from 18GHz to 40GHz, was pre-scanned and the result which was 10dB lower than the limit was not recorded.



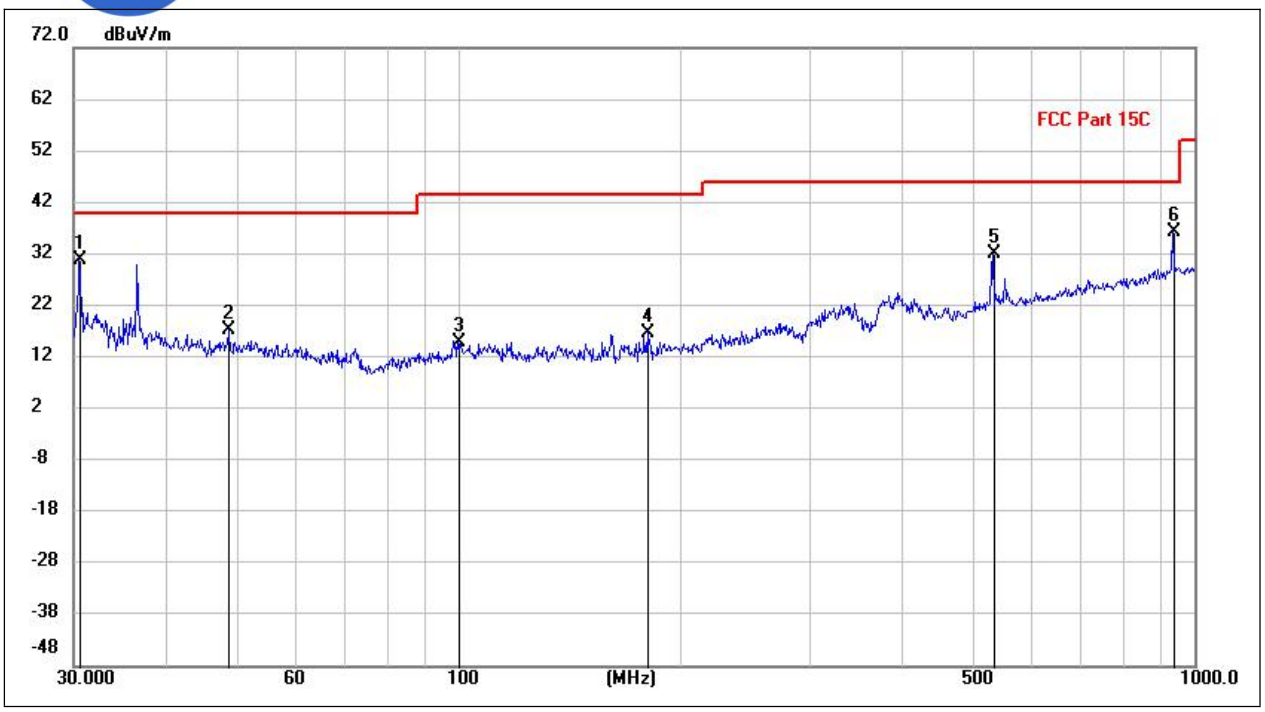
(LE 1M PHY_2402MHz, Antenna Horizontal, 30MHz to 1GHz)

Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.	Pol
39.9592	-0.11	15.64	15.53	40.00	-24.47	peak	H
87.0811	4.60	11.28	15.88	40.00	-24.12	peak	H
109.8730	4.84	14.96	19.80	43.50	-23.70	peak	H
216.2893	11.75	13.84	25.59	46.00	-20.41	peak	H
380.9814	10.24	19.09	29.33	46.00	-16.67	peak	H
937.6811	10.25	22.50	32.75	46.00	-13.25	peak	H



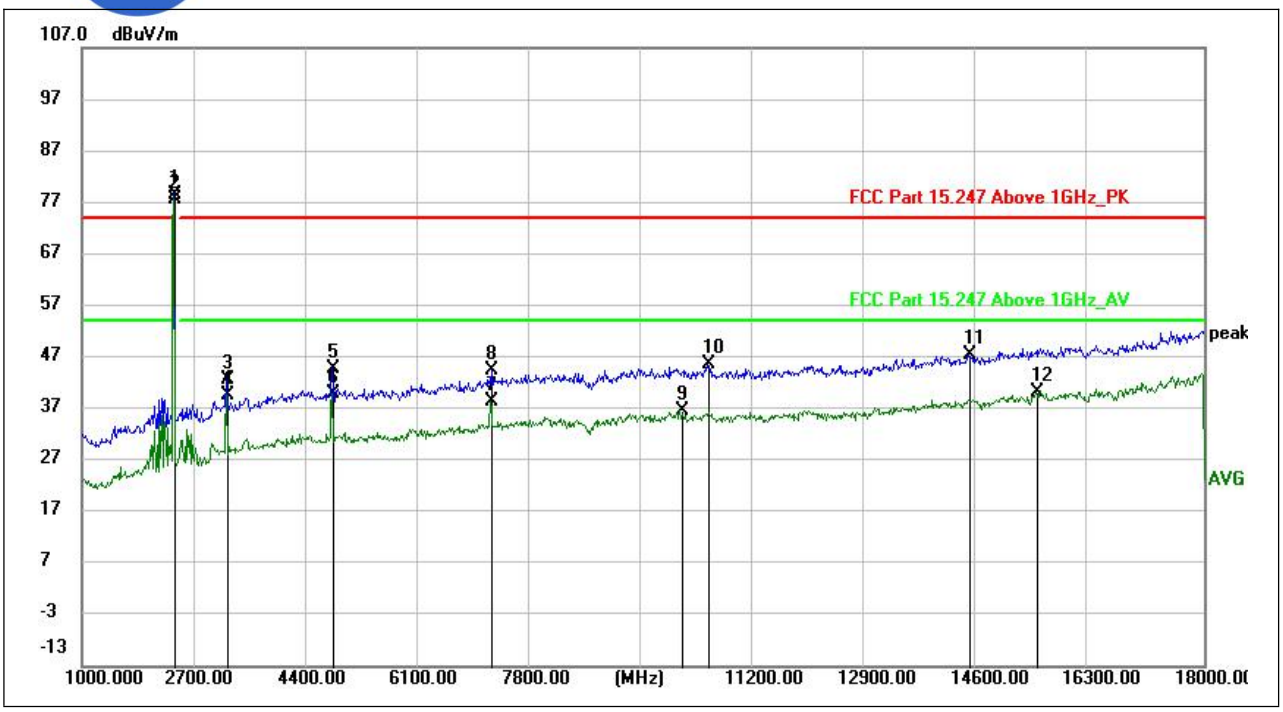
(LE 1M PHY _2402MHz, Antenna Horizontal, 1GHz to 18GHz)

Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.	Pol
2401.650	90.88	-12.20	78.68	N/A	N/A	peak	H
2401.650	90.01	-12.20	77.81	N/A	N/A	AVG	H
3202.350	50.90	-8.21	42.69	74.00	-31.31	peak	H
3202.350	47.64	-8.21	39.43	54.00	-14.57	AVG	H
4803.750	49.13	-4.00	45.13	74.00	-28.87	peak	H
4803.750	45.04	-4.00	41.04	54.00	-12.96	AVG	H
7206.700	46.66	-1.50	45.16	74.00	-28.84	peak	H
7206.700	40.32	-1.50	38.82	54.00	-15.18	AVG	H
11053.800	43.42	2.24	45.66	74.00	-28.34	peak	H
11517.050	34.03	2.38	36.41	54.00	-17.59	AVG	H
14512.450	41.20	7.23	48.43	74.00	-25.57	peak	H
14756.400	30.71	8.04	38.75	54.00	-15.25	AVG	H



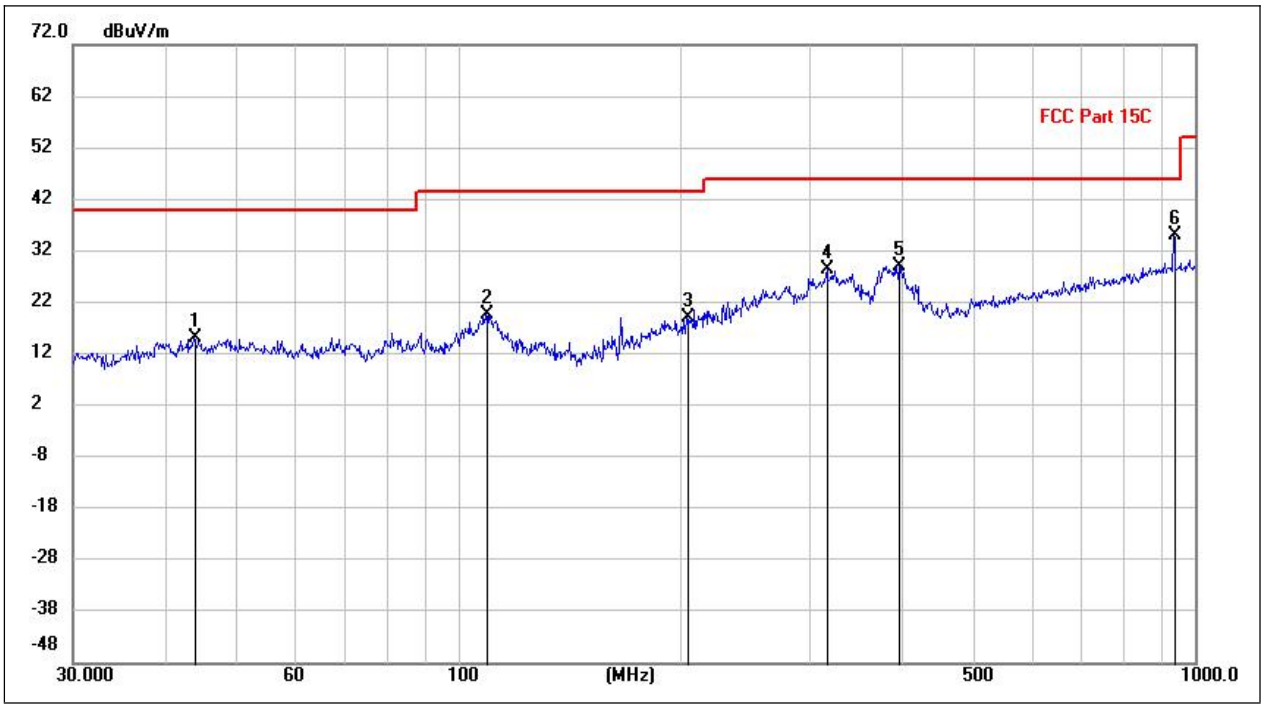
(LE 1M PHY _2402MHz, Antenna Vertical, 30MHz to 1GHz)

Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.	Pol
30.6057	17.93	12.82	30.75	40.00	-9.25	peak	V
48.8429	1.58	15.56	17.14	40.00	-22.86	peak	V
100.0705	-0.42	15.18	14.76	43.50	-28.74	peak	V
181.1563	4.10	12.68	16.78	43.50	-26.72	peak	V
532.0568	9.69	22.22	31.91	46.00	-14.09	peak	V
937.5167	7.96	28.29	36.25	46.00	-9.75	peak	V



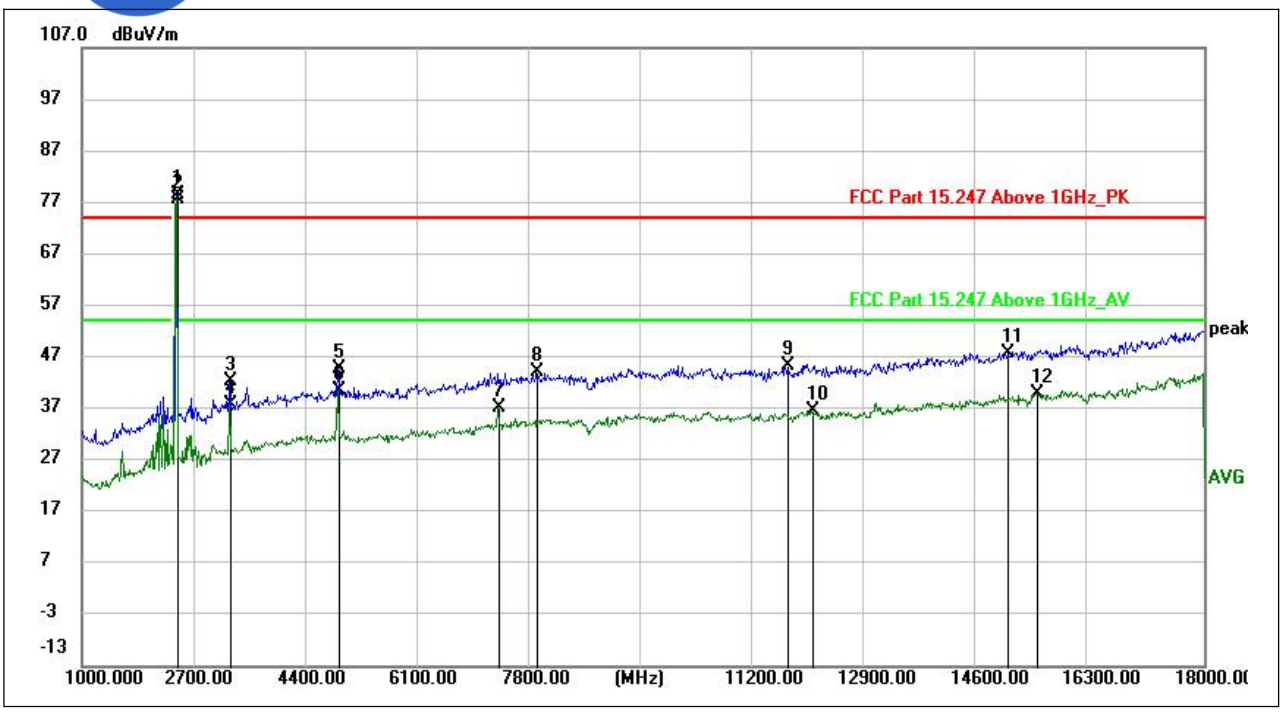
(LE 1M PHY _2402MHz, Antenna Vertical , 1GHz to 18GHz)

Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.	Pol
2401.650	90.75	-12.20	78.55	N/A	N/A	peak	V
2401.650	89.84	-12.20	77.64	N/A	N/A	AVG	V
3202.350	50.77	-8.21	42.56	74.00	-31.44	peak	V
3202.350	47.70	-8.21	39.49	54.00	-14.51	AVG	V
4803.750	48.60	-4.00	44.60	74.00	-29.40	peak	V
4803.750	44.02	-4.00	40.02	54.00	-13.98	AVG	V
7205.000	40.02	-1.51	38.51	54.00	-15.49	AVG	V
7206.700	46.04	-1.50	44.54	74.00	-29.46	peak	V
10080.550	34.93	1.63	36.56	54.00	-17.44	AVG	V
10486.850	43.31	2.44	45.75	74.00	-28.25	peak	V
14435.100	39.19	8.13	47.32	74.00	-26.68	peak	V
15466.150	30.60	9.67	40.27	54.00	-13.73	AVG	V



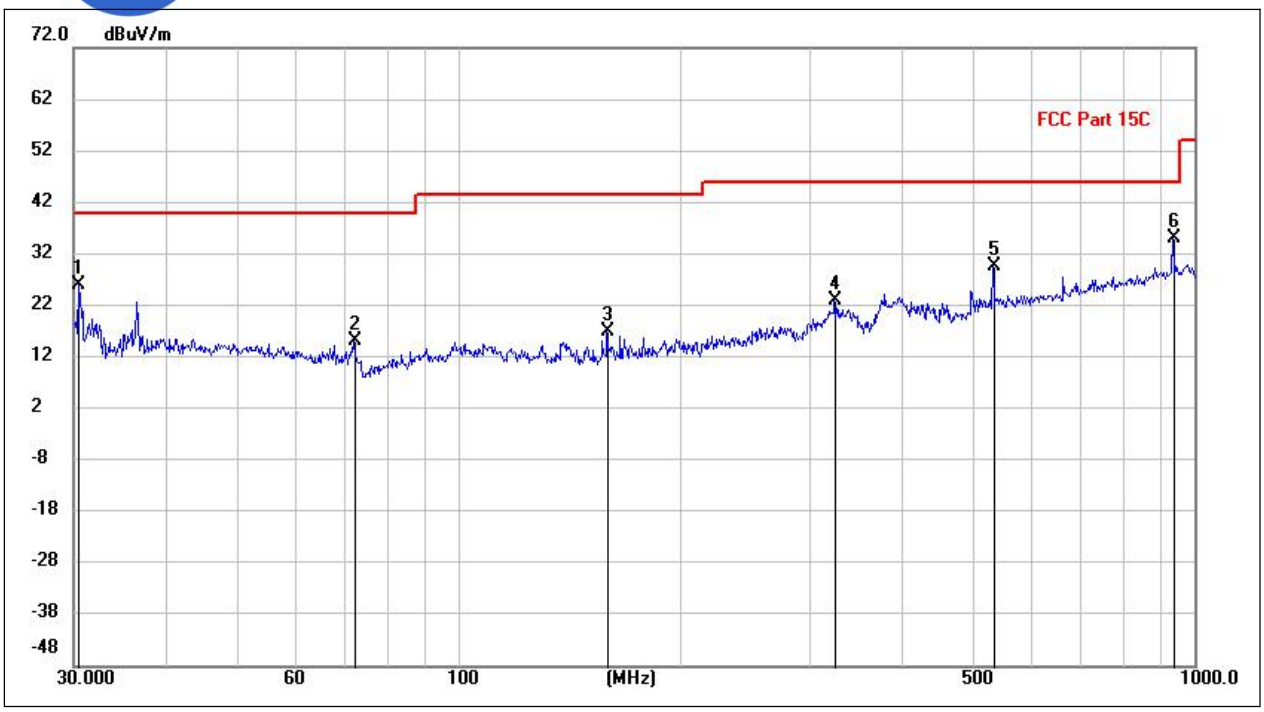
(LE 1M PHY _2440MHz, Antenna Horizontal, 30MHz to 1GHz)

Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.	Pol
43.8965	-0.10	15.27	15.17	40.00	-24.83	peak	H
109.1434	5.00	14.82	19.82	43.50	-23.68	peak	H
204.8115	5.69	13.51	19.20	43.50	-24.30	peak	H
316.7000	10.91	17.44	28.35	46.00	-17.65	peak	H
396.5195	9.75	19.26	29.01	46.00	-16.99	peak	H
937.6811	6.78	28.30	35.08	46.00	-10.92	peak	H



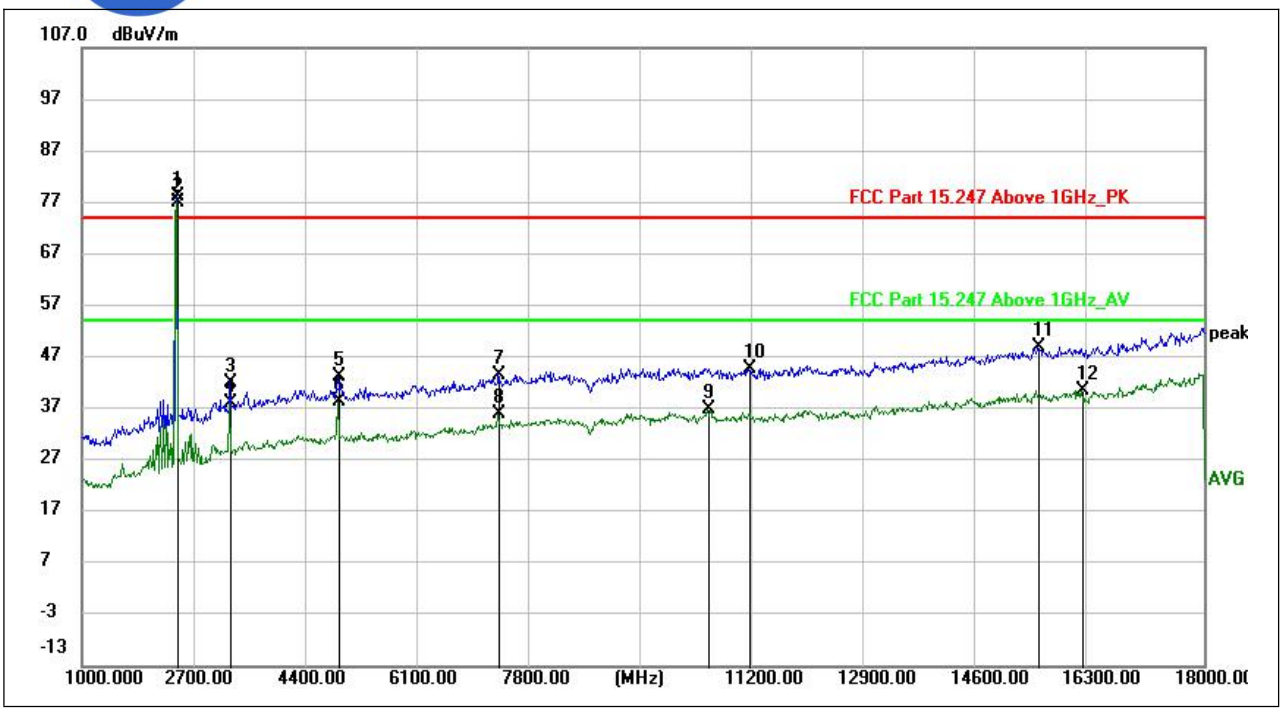
(LE 1M PHY _2440MHz, Antenna Horizontal, 1GHz to 18GHz)

Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.	Pol
2439.900	90.23	-11.83	78.40	N/A	N/A	peak	H
2439.900	89.51	-11.83	77.68	N/A	N/A	AVG	H
3253.350	50.42	-8.13	42.29	74.00	-31.71	peak	H
3253.350	45.97	-8.13	37.84	54.00	-16.16	AVG	H
4879.400	48.80	-3.99	44.81	74.00	-29.19	peak	H
4879.400	44.62	-3.99	40.63	54.00	-13.37	AVG	H
7319.750	38.59	-1.33	37.26	54.00	-16.74	AVG	H
7899.450	44.75	-0.73	44.02	74.00	-29.98	peak	H
11680.250	42.51	2.81	45.32	74.00	-28.68	peak	H
12062.750	33.32	3.20	36.52	54.00	-17.48	AVG	H
15009.700	38.55	9.31	47.86	74.00	-26.14	peak	H
15459.350	29.81	10.21	40.02	54.00	-13.98	AVG	H



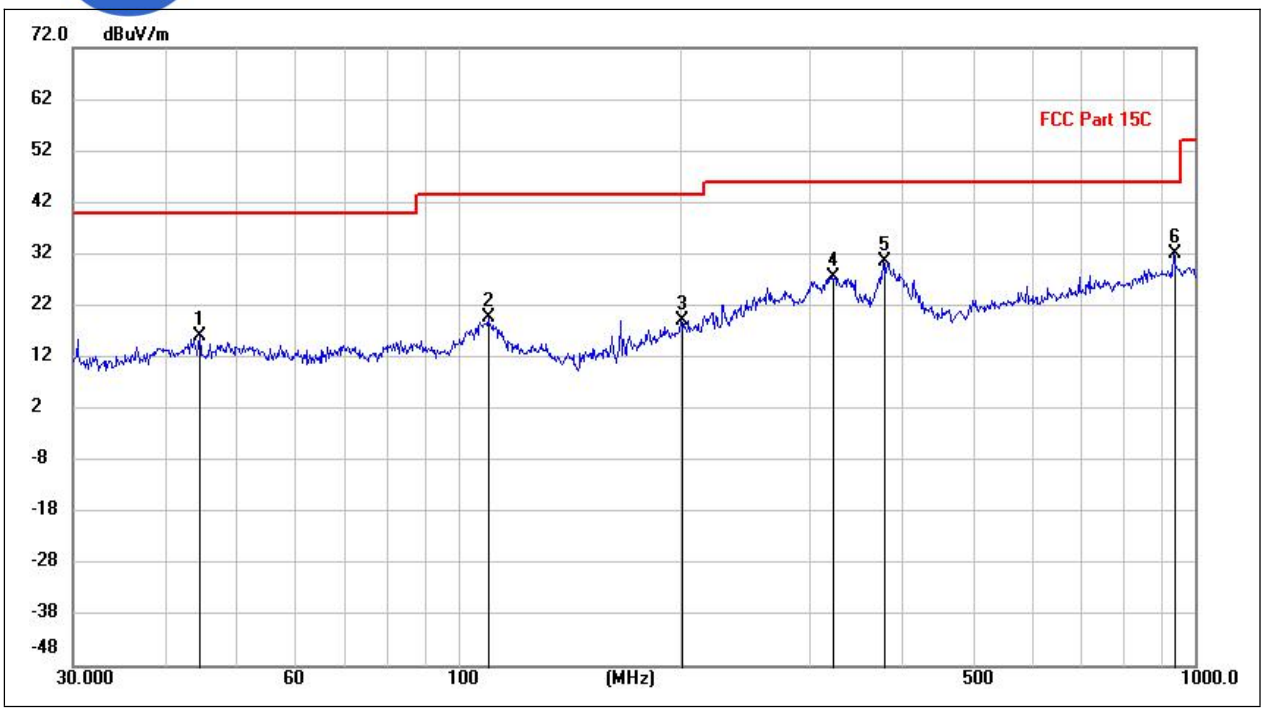
(LE 1M PHY _2440MHz, Antenna Vertical, 30MHz to 1GHz)

Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.	Pol
30.5253	13.18	12.96	26.14	40.00	-13.86	peak	V
72.1223	4.56	10.53	15.09	40.00	-24.91	peak	V
159.7004	4.97	12.10	17.07	43.50	-26.43	peak	V
325.4817	5.42	17.53	22.95	46.00	-23.05	peak	V
532.7102	7.34	22.23	29.57	46.00	-16.43	peak	V
937.6811	6.73	28.30	35.03	46.00	-10.97	peak	V



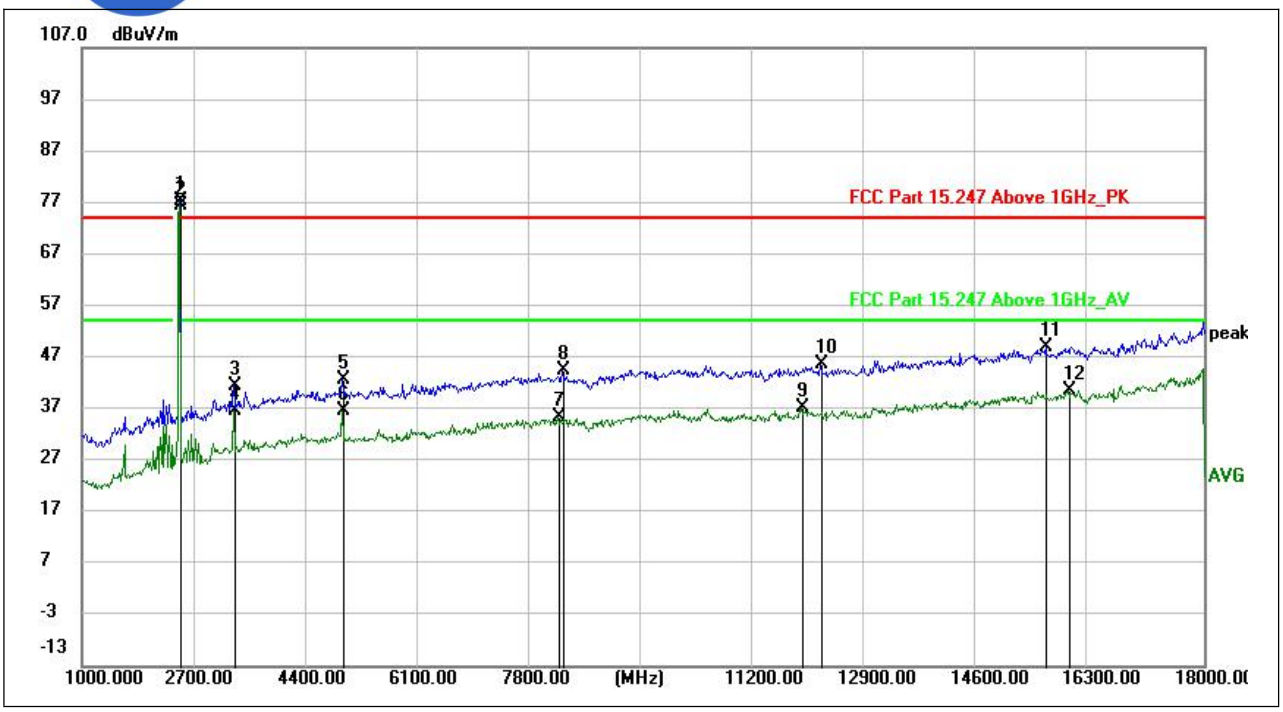
(LE 1M PHY _2440MHz, Antenna Vertical , 1GHz to 3GHz)

Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.	Pol
2439.900	90.10	-11.83	78.27	N/A	N/A	peak	V
2439.900	88.69	-11.83	76.86	N/A	N/A	AVG	V
3253.350	50.01	-8.13	41.88	74.00	-32.12	peak	V
3253.350	46.36	-8.13	38.23	54.00	-15.77	AVG	V
4879.400	47.19	-3.99	43.20	74.00	-30.80	peak	V
4879.400	42.35	-3.99	38.36	54.00	-15.64	AVG	V
7320.600	45.01	-1.33	43.68	74.00	-30.32	peak	V
7320.600	37.32	-1.33	35.99	54.00	-18.01	AVG	V
10491.950	34.29	2.50	36.79	54.00	-17.21	AVG	V
11122.650	42.60	2.11	44.71	74.00	-29.29	peak	V
15495.050	39.42	9.66	49.08	74.00	-24.92	peak	V
16156.350	30.42	10.21	40.63	54.00	-13.37	AVG	V



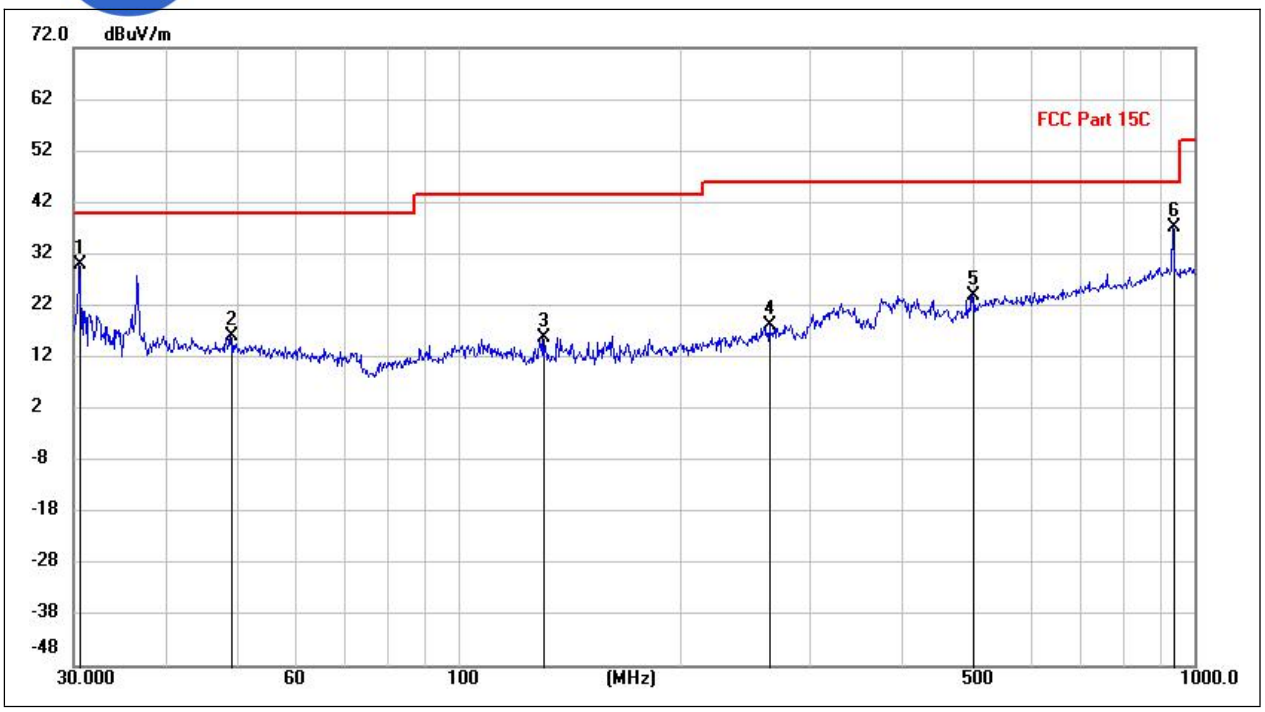
(LE 1M PHY _2480MHz, Antenna Horizontal, 30MHz to 1GHz)

Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.	Pol
44.5868	0.82	15.36	16.18	40.00	-23.82	peak	H
109.9501	4.84	14.96	19.80	43.50	-23.70	peak	H
200.8641	5.07	14.16	19.23	43.50	-24.27	peak	H
322.6408	9.78	17.78	27.56	46.00	-18.44	peak	H
378.4516	11.46	18.95	30.41	46.00	-15.59	peak	H
937.5167	3.85	28.29	32.14	46.00	-13.86	peak	H



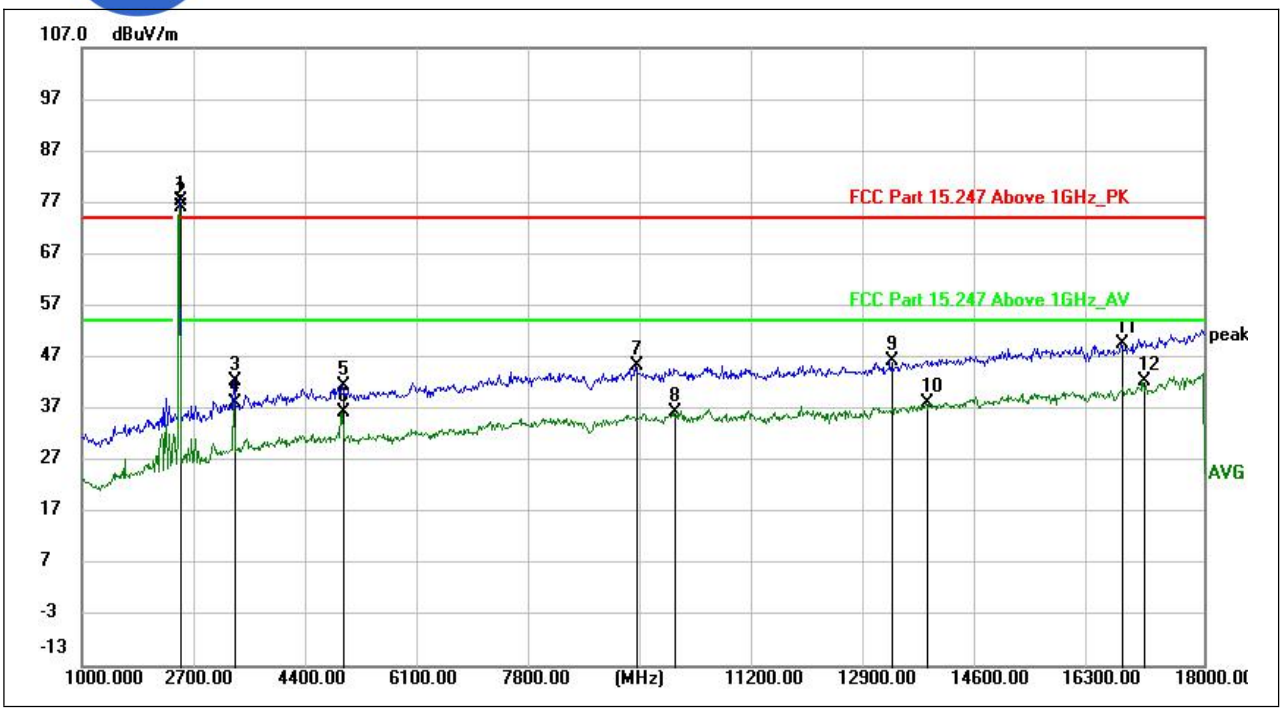
(LE 1M PHY _2480MHz, Antenna Horizontal, 1GHz to 18GHz)

Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.	Pol
2479.850	88.43	-11.21	77.22	N/A	N/A	peak	H
2479.850	87.68	-11.21	76.47	N/A	N/A	AVG	H
3306.050	49.15	-7.70	41.45	74.00	-32.55	peak	H
3306.050	44.31	-7.70	36.61	54.00	-17.39	AVG	H
4959.300	46.18	-3.53	42.65	74.00	-31.35	peak	H
4959.300	40.04	-3.53	36.51	54.00	-17.49	AVG	H
8235.200	35.51	-0.21	35.30	54.00	-18.70	AVG	H
8289.600	44.59	-0.05	44.54	74.00	-29.46	peak	H
11918.250	34.47	2.71	37.18	54.00	-16.82	AVG	H
12200.450	42.59	3.05	45.64	74.00	-28.36	peak	H
15613.200	39.50	9.35	48.85	74.00	-25.15	peak	H
15963.400	30.03	10.42	40.45	54.00	-13.55	AVG	H



(LE 1M PHY _2480MHz, Antenna Vertical, 30MHz to 1GHz)

Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.	Pol
30.5467	17.13	12.92	30.05	40.00	-9.95	peak	V
49.0403	0.54	15.60	16.14	40.00	-23.86	peak	V
130.4933	3.59	12.07	15.66	43.50	-27.84	peak	V
265.5360	2.86	15.28	18.14	46.00	-27.86	peak	V
499.6874	1.97	21.94	23.91	46.00	-22.09	peak	V
937.5167	8.83	28.29	37.12	46.00	-8.88	peak	V



(LE 1M PHY _2480MHz, Antenna Vertical , 1GHz to 18GHz)

Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.	Pol
2479.850	88.45	-11.21	77.24	N/A	N/A	peak	V
2479.850	87.35	-11.21	76.14	N/A	N/A	AVG	V
3306.050	49.92	-7.70	42.22	74.00	-31.78	peak	V
3306.050	45.73	-7.70	38.03	54.00	-15.97	AVG	V
4960.150	44.79	-3.36	41.43	74.00	-32.57	peak	V
4960.150	39.64	-3.36	36.28	54.00	-17.72	AVG	V
9413.300	44.42	0.80	45.22	74.00	-28.78	peak	V
9983.650	34.80	1.63	36.43	54.00	-17.57	AVG	V
13262.950	41.16	4.94	46.10	74.00	-27.90	peak	V
13803.550	31.88	6.21	38.09	54.00	-15.91	AVG	V
16753.050	38.18	11.27	49.45	74.00	-24.55	peak	V
17086.250	30.25	12.11	42.36	54.00	-11.64	AVG	V

Annex A Test Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for test performed on the EUT as specified in CISPR 16-1-2:

Test items	Uncertainty
Peak Output Power	±2.22dB
Power spectral density (PSD)	±2.22dB
Bandwidth	±5%
Conducted Spurious Emission	±2.77 dB
Restricted Frequency Bands	±5%
Radiated Emission	±3.1dB
Conducted Emission	±1.8dB

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

Annex B Testing Laboratory Information

1. Identification of the Responsible Testing Laboratory

Laboratory Name:	Kehu-Morlab Test Laboratory
Laboratory Address:	Unit 101, No.1732 Gangzhong Road, Xiamen Area, Pilot Free Trade Zone (Fujian) P.R. China
Telephone:	+86 592 5612050
Facsimile:	+86 592 5612095

2. Identification of the Responsible Testing Location

Name:	Kehu-Morlab Test Laboratory
Address:	Unit 101, No.1732 Gangzhong Road, Xiamen Area, Pilot Free Trade Zone (Fujian) P.R. China

3. Accreditation Certificate

Accredited Testing Laboratory:	The FCC designation number is CN1249. (Kehu-Morlab Test Laboratory)

4. Test Equipments Utilized

4.1 Conducted Test Equipments

No.	Equipment Name	Serial No.	Model No.	Manufacturer	Cal.Due Date
1	MXA Signal Analyzer	MY57150136	N9030A	Keysight	2021. 03.08
2	RF cable (30MHz-26.5GHz)	RF01	N/A	Morlab	2021.03.06
3	Coaxial cable	RF02	N/A	Morlab	2021.03.06
4	SMA connector	RF03	N/A	Xingbo	N/A
Software Version: MW 2.0.0.0					

4.2 Conducted Emission Test Equipments

No.	Equipment Name	Serial No.	Type	Manufacturer	Cal.Due Date
1	EMI Receiver	102174	ESR3	R&S	2021.03.15
2	LISN	101338	ENV432	R&S	2021.03.09

4.3Auxiliary Test Equipment

No.	Equipment Name	Model No.	Brand Name	Manufacturer	Cal.Due Date
1	Computer	E75	Think Pad	Lenovo	N/A

4.4 List of Software Used

Description	Manufacturer	Software Version
Test system	CAICT	Eagle 2.0
EMC32	R&S	V10.00.00

4.5 Radiated Test Equipments

No.	Equipment Name	Serial No.	Type	Manufacturer	Cal.Due Date
1	Anechoic Chamber	N/A	9m*6m*6m	ETS-Lindgren	2022.07.20
2	Signal Analyzer	101294	FSV40	R&S	2021.06.04
3	Linear Log Periodic Broad Band Antenna	949	VULB 9163	Schwarzbeck	2021.09.24
4	Ultra-Wideband Horn Antenna	102615	HF907	R&S	2022.01.18
5	Steatite Antennas	17868	QSH-SL-18 -26-S-20	Seibersdorf	2021.03.23
6	Ultra-Wideband Horn Antenna	17989	QSH-26-40	Schwarzbeck	2021.03.23
7	RF Switch and Control Platform	N/A	RSC	CDSI	N/A
8	Coaxial cable (N male) (9kHz -3GHz)	EMC02	N/A	Morlab	2021.03.23
9	Coaxial cable (N male) (9kHz -3GHz)	EMC03	N/A	Morlab	2021.03.23
10	Coaxial cable (N male)	EMC04	N/A	Morlab	2021.03.23

	(1GHz-26.5GHz)				
11	Coaxial cable (N male) (1GHz-26.5GHz)	EMC05	N/A	Morlab	2021.03.23
12	Pre-amplifier (1GHz-18GHz)	8810011	PAP-1G18	CDSI	2021.03.23
13	Pre-amplifier (18GHz-40GHz)	17021-17024	PAP-1840	CDSI	2021.03.23
14	High Pass Filter	EMC21	HFP-1.0/18 G-60	CDSI	2021.03.23
15	High Pass Filter	EMC22	HFP-3.0/18 G-60	CDSI	2021.03.23

END OF REPORT