REPORT No.：XM19050004W0

TEST REPORT

APPLICANT	:	Xiamen Retone Hearing Technology Co.,Ltd
PRODUCT NAME	:	Hearing Aid
MODEL NAME	:	VB20, Vigor, Vigor U, Vigor X, VB SERIES, Gio, Bro, Eggo
BRAND NAME	:	Retone
FCC ID	:	2AGPFVB20
STANDARD(S)	:	47 CFR Part 15 Subpart C
TEST DATE	:	2019-05-07 to 2019-05-19
ISSUE DATE	:	2019-05-23

Prepared by: Lion Xiao

Lion Xiao (Project Engineer)

Approved by:

Anne Liu(Supervisor)

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Kehu-Morlab Test Laboratory

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Change History		
Version	**Date**	**Reason for change**
1.0	2019-05-23	First edition

1. Technical Information

Note: Provide by applicant.

1.1. Applicant and Manufacturer Information

Applicant:	Xiamen Retone Hearing Technology Co.,Ltd
Applicant Address:	ROOM 103,NO.320 SOUTH TONGJI ROAD,JIMEI DISTRICT, XIAMEN,CHINA
Manufacturer:	Xiamen Retone Hearing Technology Co.,Ltd
Manufacturer Address:	ROOM 103,NO.320 SOUTH TONGJI ROAD,JIMEI DISTRICT, XIAMEN,CHINA

1.2. Equipment Under Test (EUT) Description

Product Name:	Hearing Aid
Serial No:	(N/A, marked #1 by test site)
Hardware Version:	V1.0
Software Version:	V1.0
Modulation Type:	GFSK
Operating Frequency Range:	2402MHz - 2480MHz (40 channels, at intervals of 2MHz);
Bluetooth Version:	Bluetooth 4.2 LE
Bluetooth Specification:	BLE 1M PHY
Antenna Type:	Ceramic Antenna
Antenna Gain:	2 dBi

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: Bluetooth 4.2 LE support 1M PHY

Note 3: 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 4: Hearing Aid, model: VB20, Vigor, Vigor U, Vigor X, VB SERIES, Gio, Bro, Eggo, have the same circuit diagram, PCB layout, software, RF module and functionality. The differences are the shape of plastic case. We selected VB20 for fully conducted testing, the differences details was explained in the declaration letter.

Note 5: 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	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	Mar 07, 2019	Lion Xiao	**PASS**
3	15.247(a)	Bandwidth	Mar 07, 2019	Lion Xiao	**PASS**
4	15.247(d)	Conducted Spurious Emission and Band Edge	Mar 07, 2019	Lion Xiao	**PASS**
5	15.247(e)	Power spectral density (PSD)	Mar 07, 2019	Lion Xiao	**PASS**
6	15.247(d)	Restricted Frequency Bands	Mar 17, 2019	Jiefeng Zhang	**PASS**
7	15.207	Conducted Emission	N/A	N/A	**PASS**
8	15.209, 15.247(d)	Radiated Emission	Mar 17, 2019 Mar 19, 2019	Jiefeng Zhang	**PASS**

Note: The tests were performed according to the method of measurements prescribed in ANSIC63.10-2013 and KDB558074 D01 v04.

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 measure output power was calculated by the reading of the spectrum

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 B(4).

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 6MHz
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.

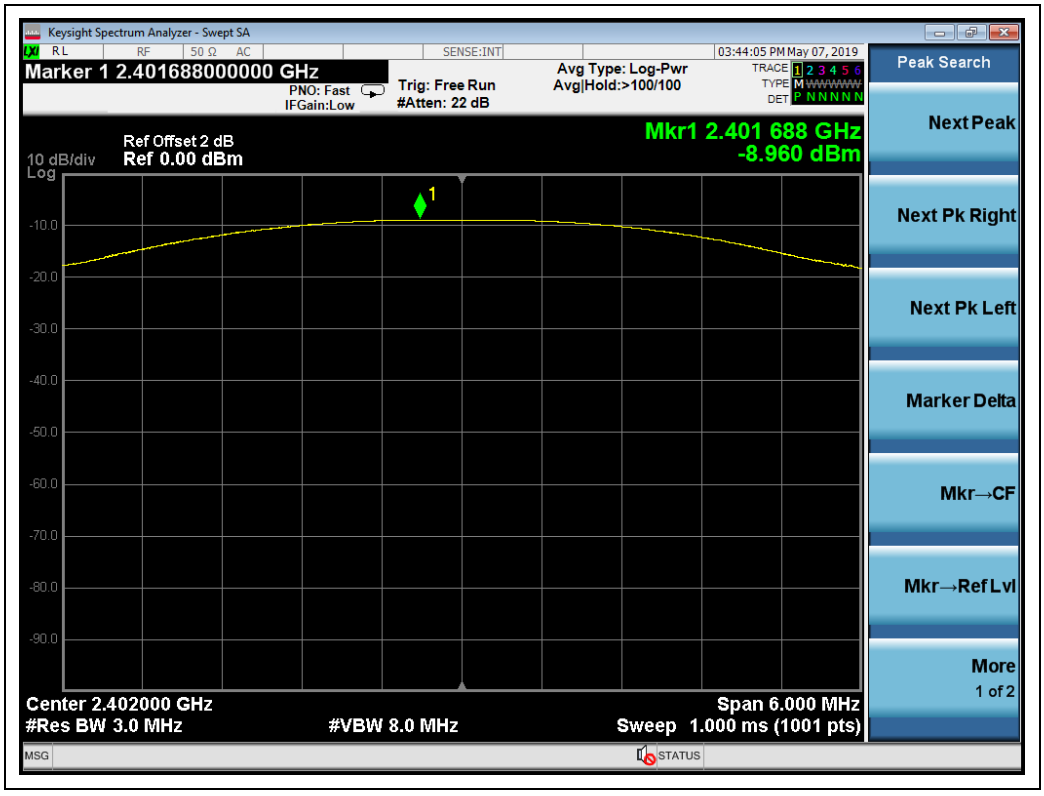
2.2.4. Test Result

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

A. Test Verdict:

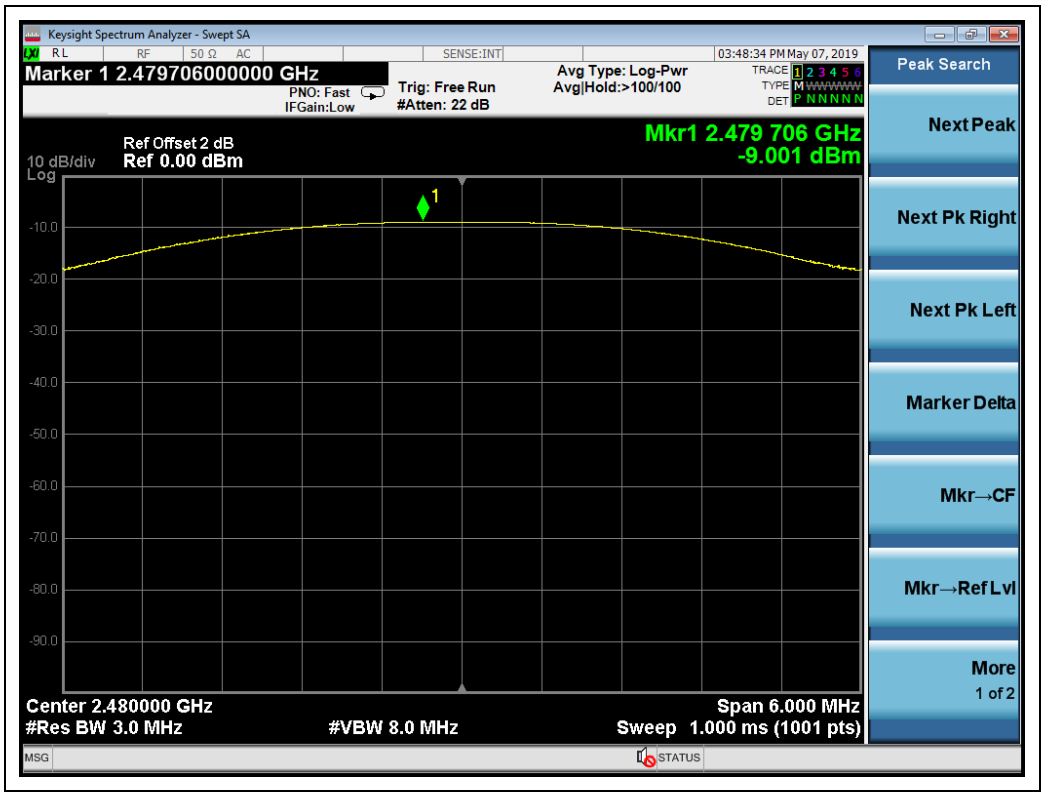
Mode	Channel	Frequency (MHz)	Measured Output Peak Power		Limit		Verdict
			dBm	W	dBm	W	
LE 1M PHY	0	2402	-8.960	0.00013	30	1	PASS
	19	2440	-9.351	0.00012	30	1	PASS
	39	2480	-9.001	0.00013	30	1	PASS

B. Test Plots:



(Bluetooth LE 1M PHY Channel 0, 2402MHz)

(Bluetooth LE 1M PHY Channel 19, 2440MHz)



(Bluetooth LE 1M PHY 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 (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 B(4).

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=100kHz

b) Set the VBW=300 kHz

c) Detector=peak

d) Trace mode=max hold.

e) Sweep = auto couple

f) Allow trace to fully 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 X RBW, and peak detector with maximum hold) is implemented by the instrumentation function. When using this capability, care shall be taken so that bandwidth measurement is not influenced by any intermediate power nulls in the fundamental emission that might be ≥6dB.

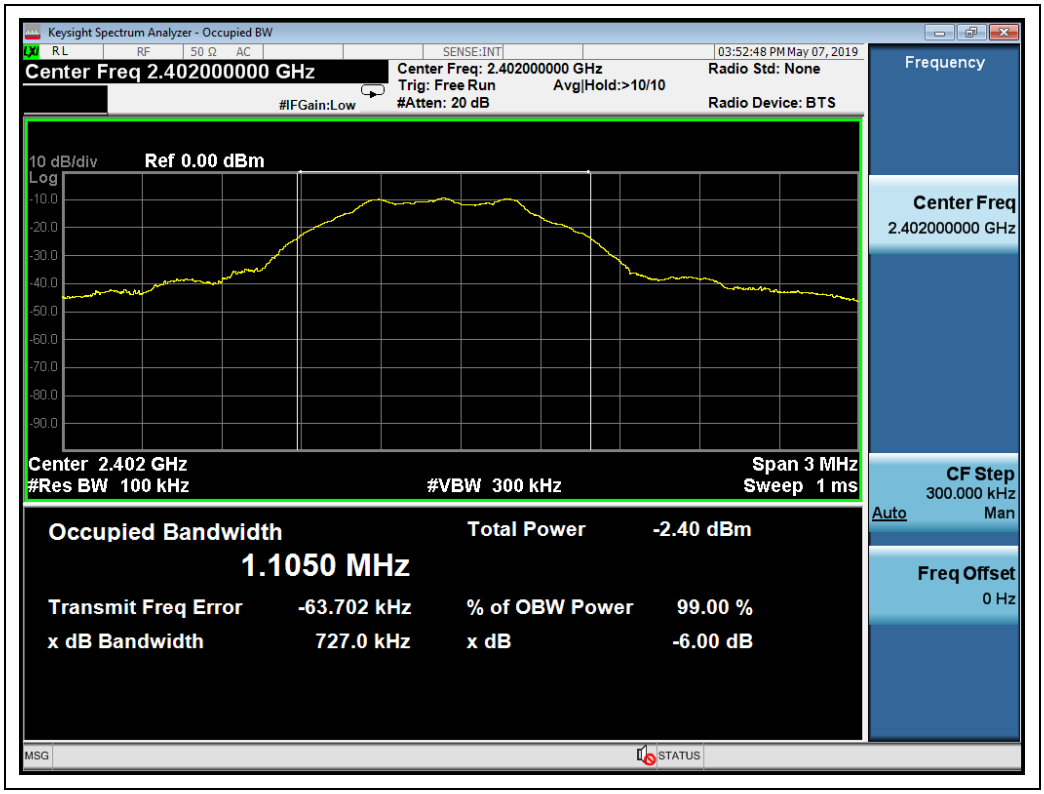
2.3.4. Test Result

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

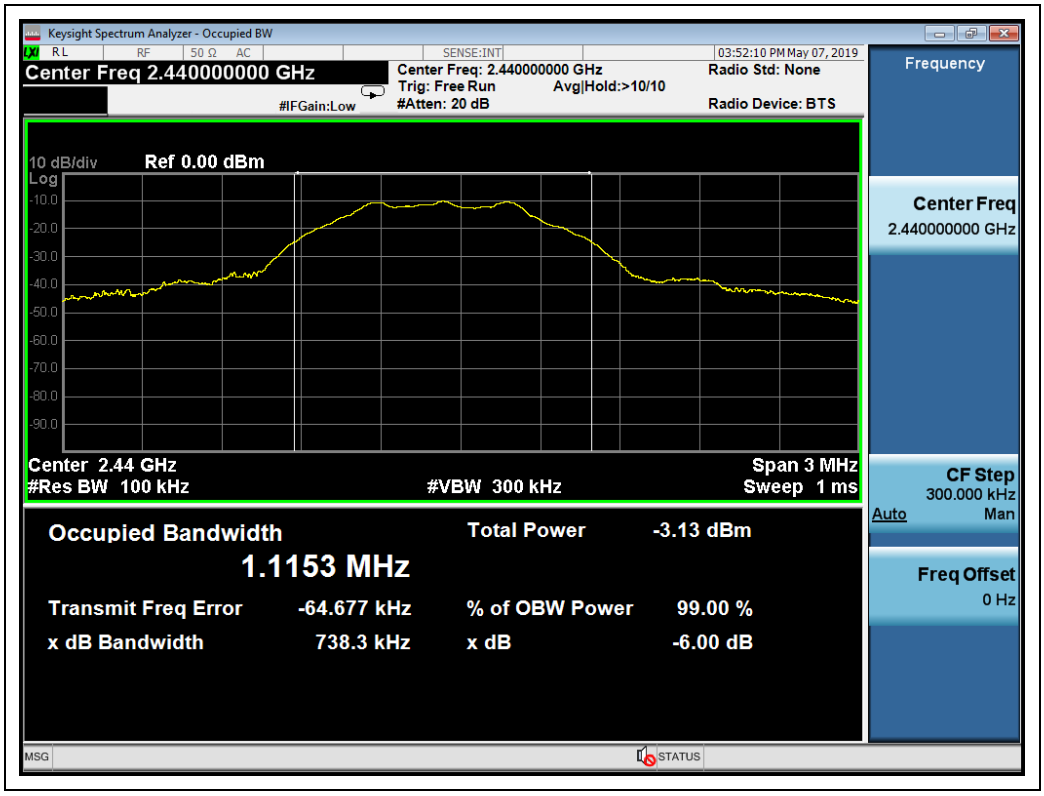
A. Test Verdict:

Mode	Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limits(kHz)	Result
LE 1M PHY	0	2402	0.727	≥500	PASS
	19	2440	0.738	≥500	PASS
	39	2480	0.741	≥500	PASS

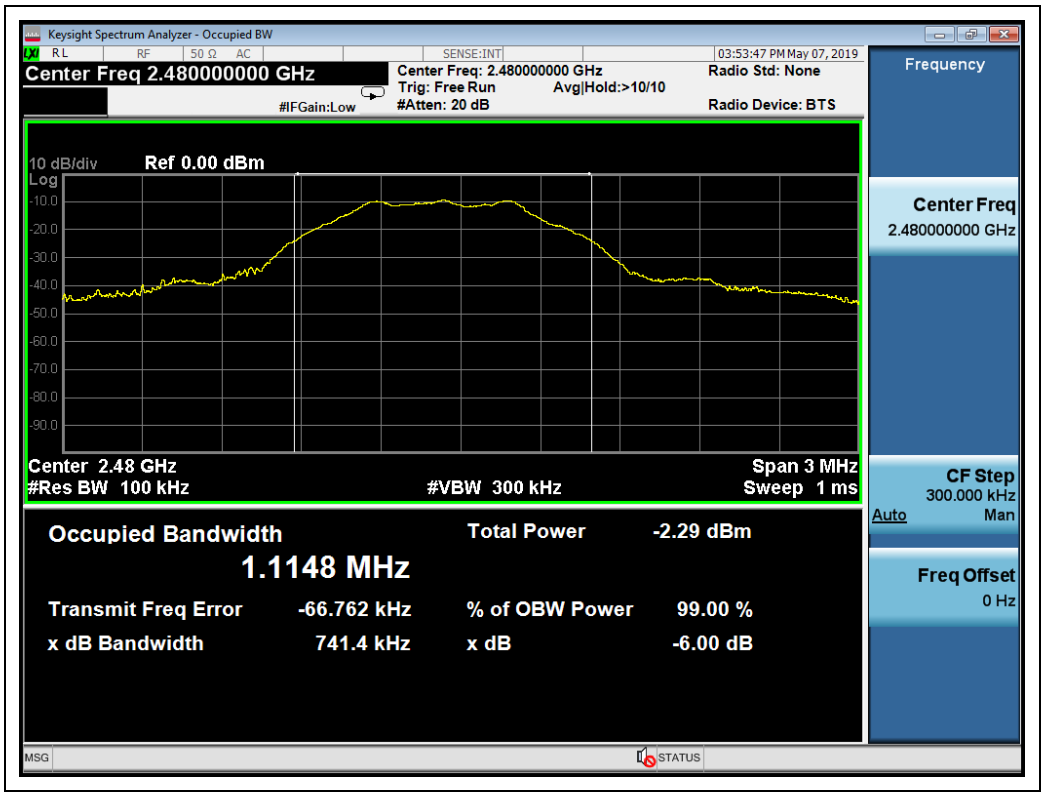
B. Test Plots



(Bluetooth LE 1M PHY Channel 0: 2402MHz)



(Bluetooth LE 1M PHY Channel 19: 2440 MHz)



(Bluetooth LE 1M PHY Channel 39: 2480MHz)

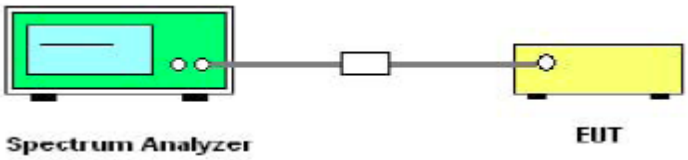
2.4. Conducted Spurious Emissions and Band Edge

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 (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.

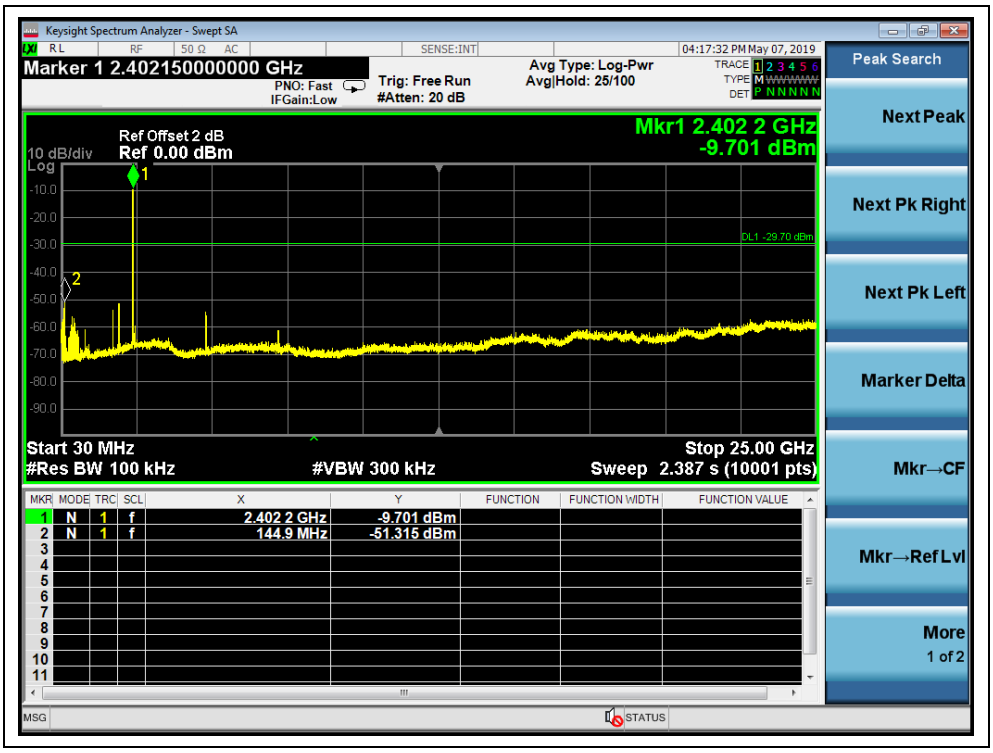
B. Equipments List:

Please refer ANNEX B (4).

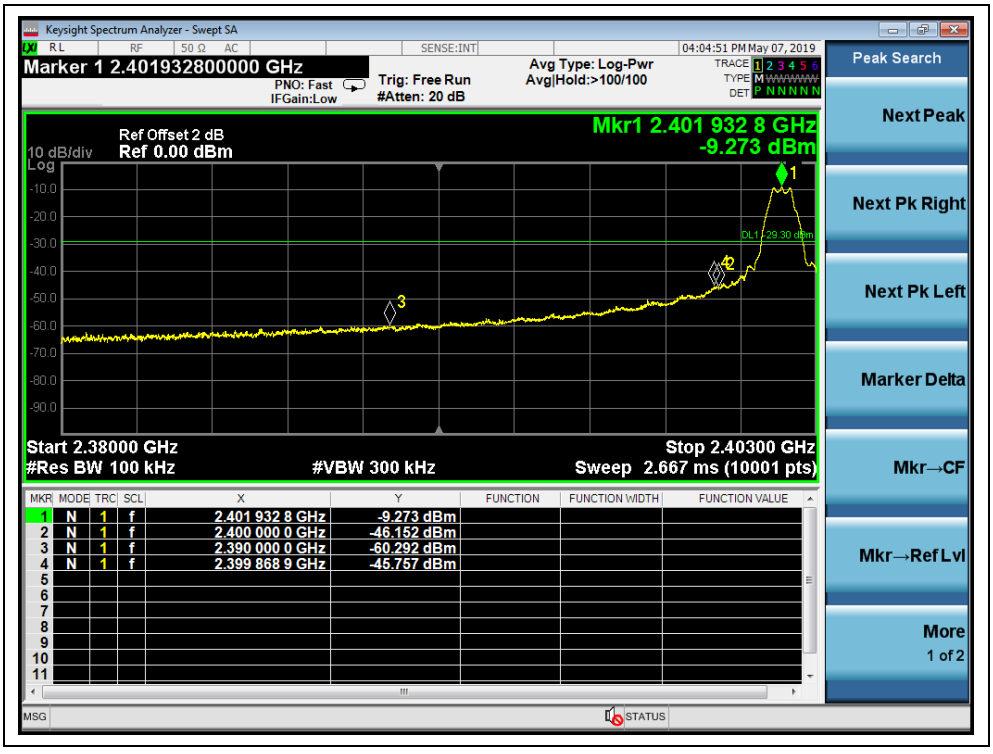
2.4.3. Test Result

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.

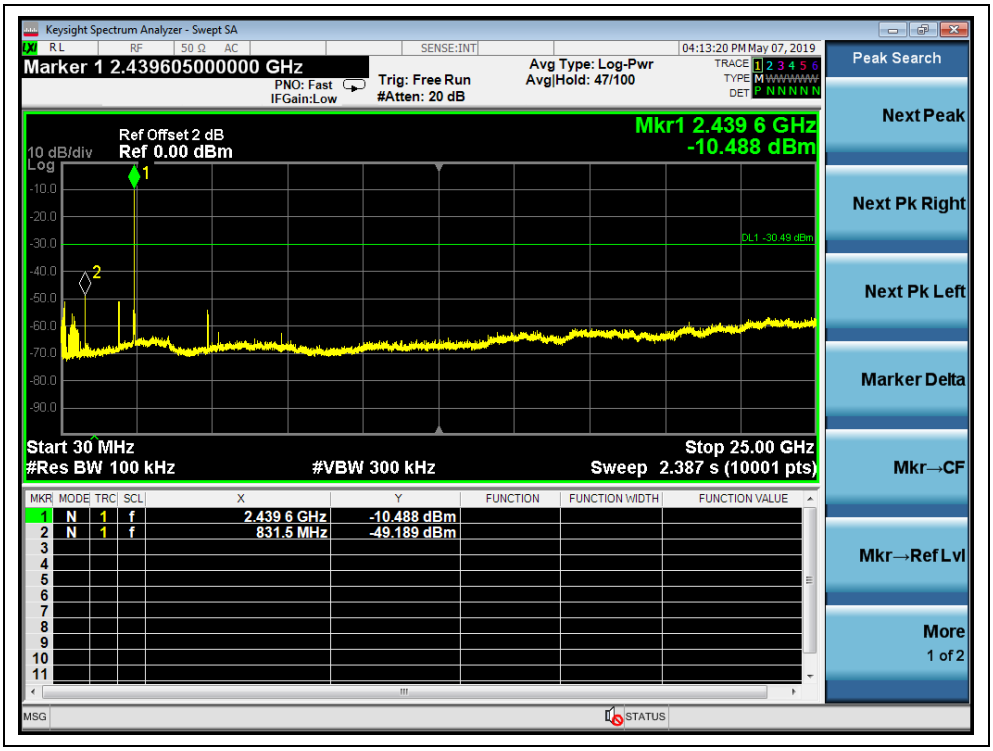
A. Test Plots:



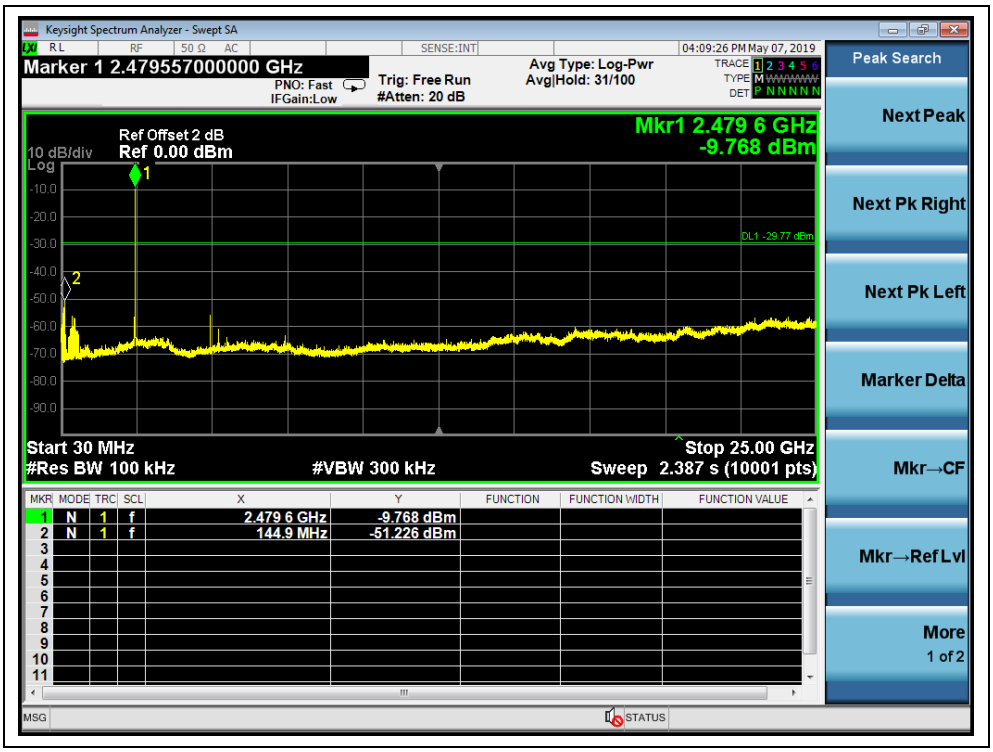
(LE 1M PHY_Conducted Spurious Emissions_Channel = 0, 30MHz to 25GHz)



(LE 1M PHY_Bandedge, Channel = 0)



(LE 1M PHY_Conducted Spurious Emissions_Channel = 19, 30MHz to 25GHz)



(LE 1M PHY_Conducted Spurious Emissions_Channel = 39, 30MHz to 25GHz)

(LE 1M PHY_Bandedge_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 (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 B (4).

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 VBW to 10 kHz
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 maximum amplitude within the RBW.

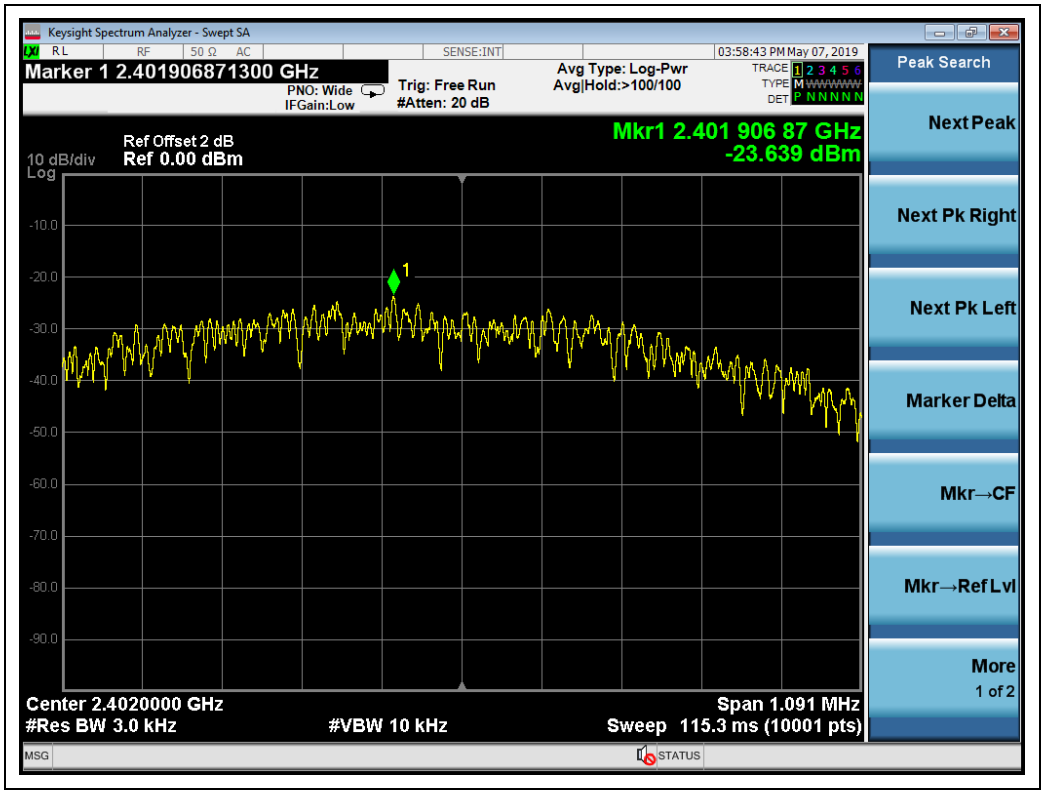
2.5.4. Test Result

The lowest, middle and highest channels are tested.

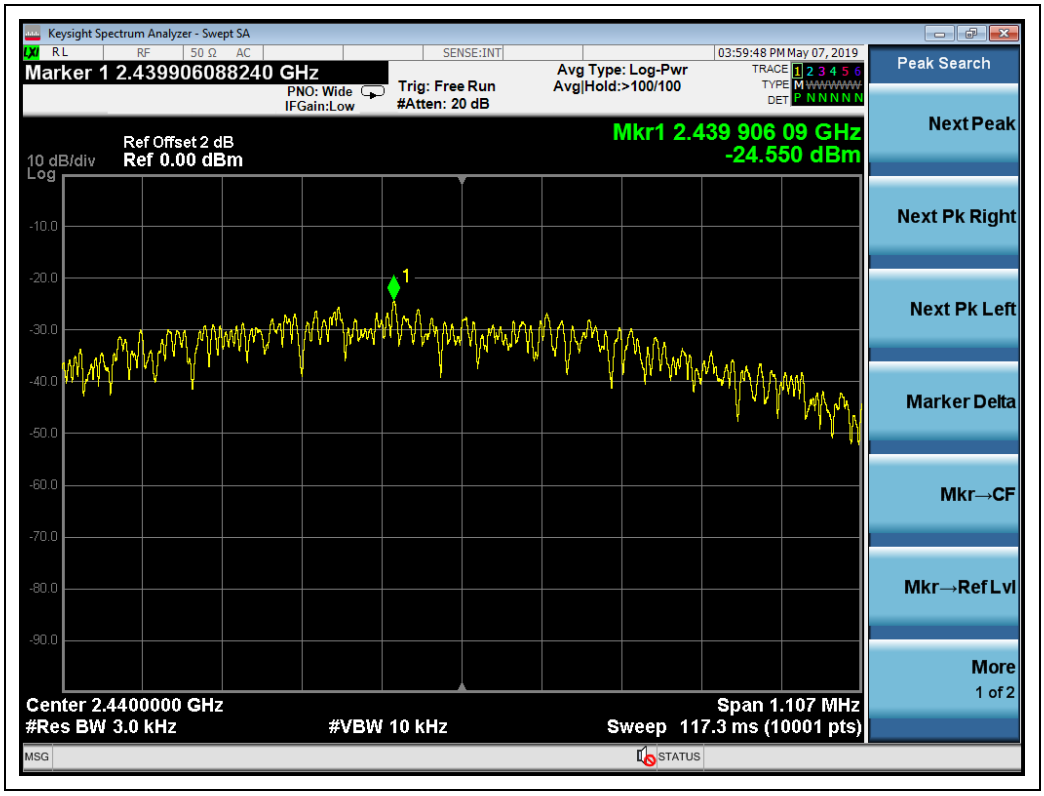
A. Test Verdict:

Mode	Channel	Frequency (MHz)	Measured PSD (dBm/3kHz)	Limit (dBm/3kHz)	Verdict
LE 1M PHY	0	2402	-23.639	8	PASS
	19	2440	-24.550	8	PASS
	39	2480	-23.689	8	PASS

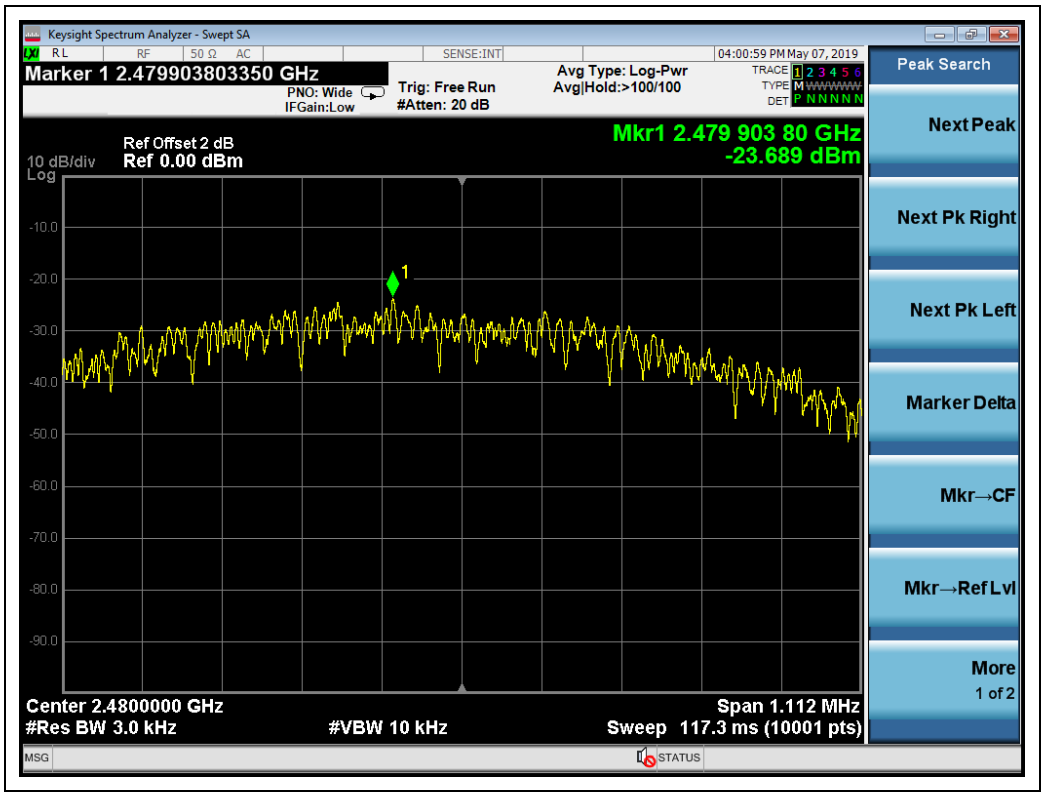
B. Test Plots



(LE 1M PHY_Channel = 0, 2402MHz)



(LE 1M PHY_Channel = 19, 2440MHz)



(LE 1M PHY_Channel = 39, 2480MHz)

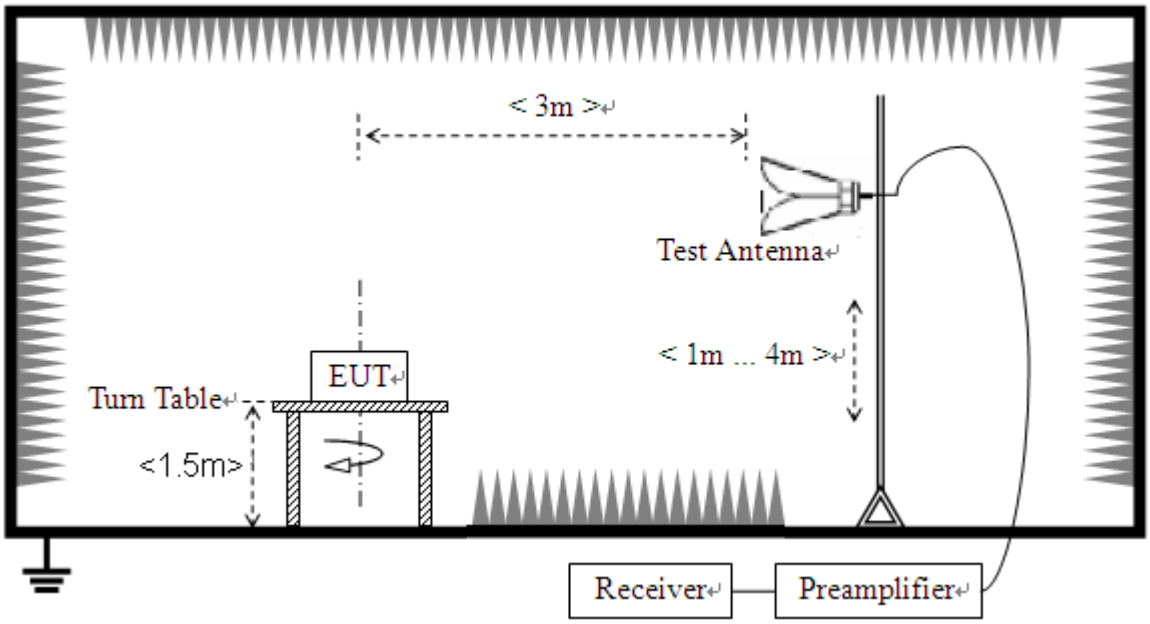
2.6. Restricted Frequency Bands

2.6.1. 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, 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.

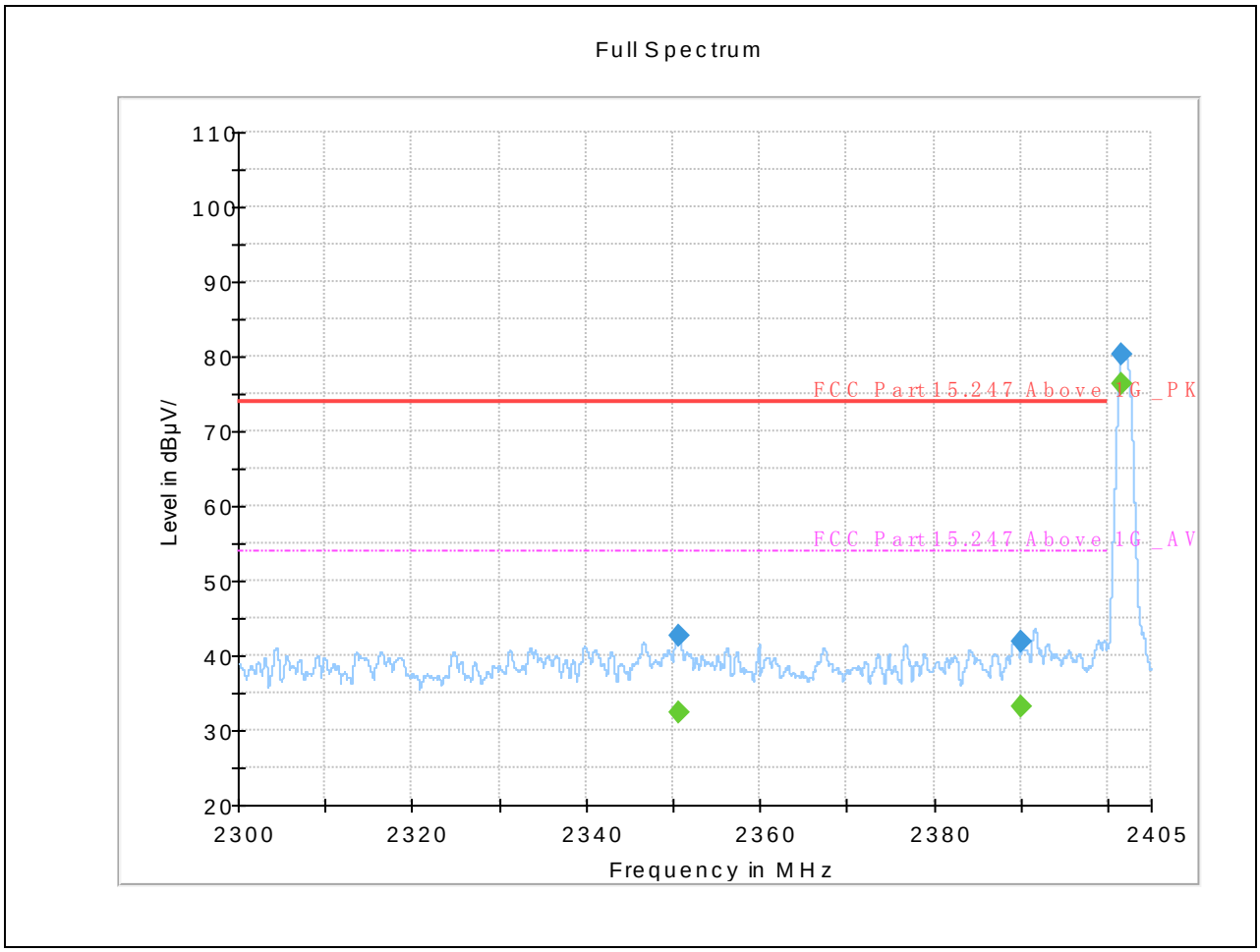
B. Equipments List:

Please refer ANNEX B(4).

2.6.3. Test Result

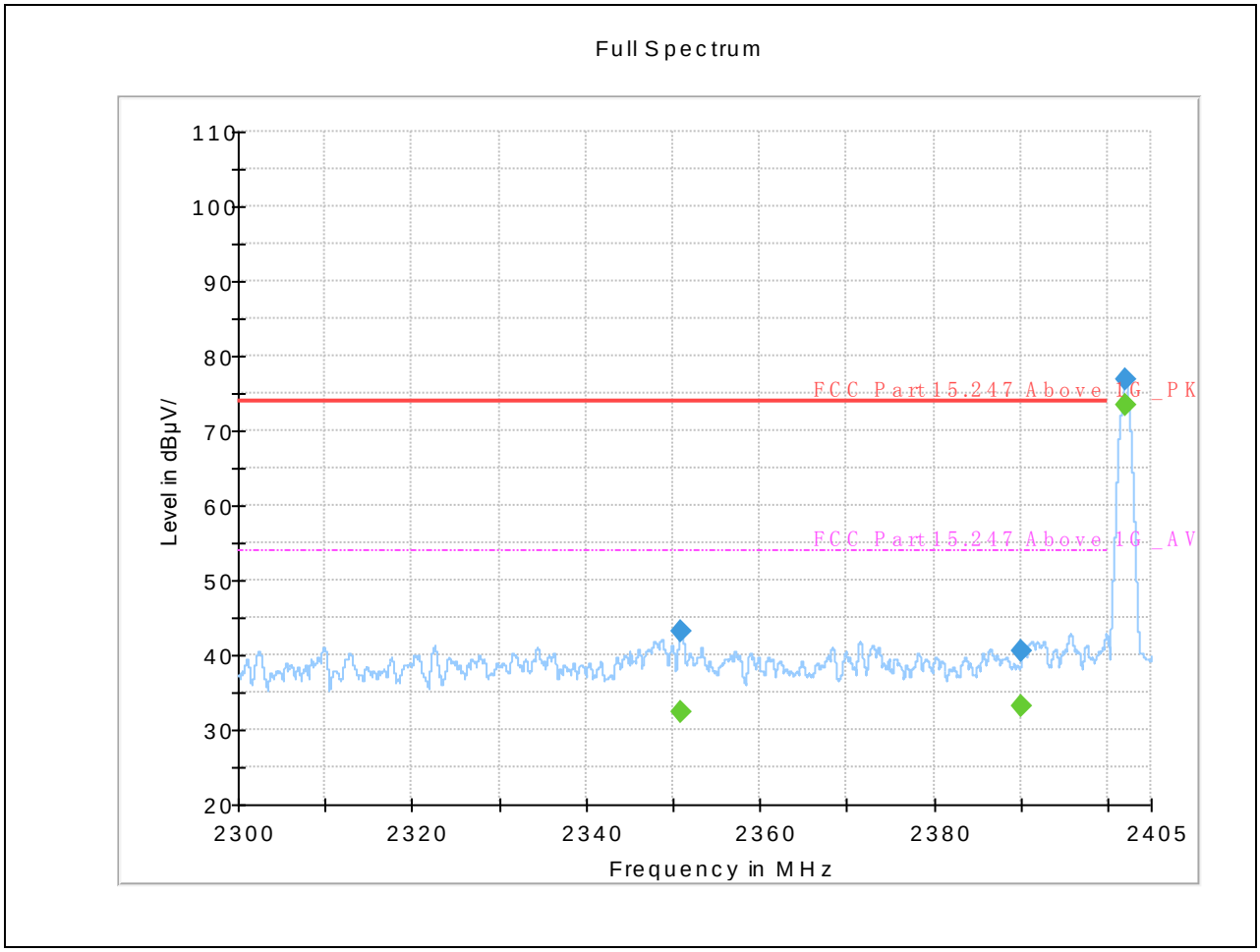
The lowest and highest channels are tested to verify Restricted Frequency Bands.
The measurement results are obtained as below:
E [dBμV/m] =U_R + A_T + A_{Factor} [dB]; AT =$L_{Cable\ loss}$ [dB]-G_{preamp} [dB]
A_T: Total correction Factor except Antenna
U_R: Receiver Reading
G_{preamp}: Preamplifier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

Test Plots:



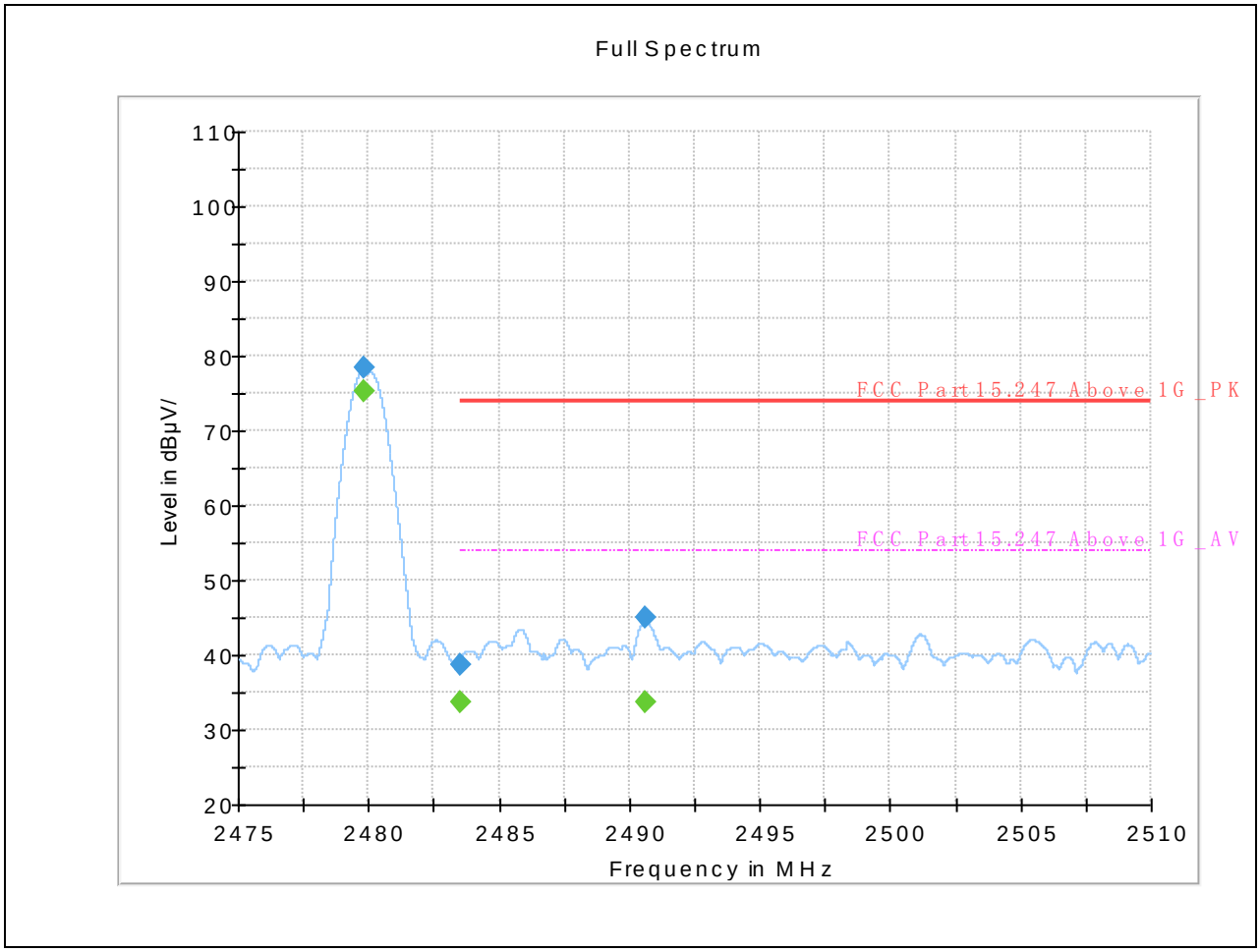
(LE 1M PHY_2402MHz, Antenna Horizontal)

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol	Corr. (dB/m)
2350.598333	---	32.34	54.00	21.66	H	7.7
2350.598333	42.63	---	74.00	31.37	H	7.7
2390.002500	---	33.20	54.00	20.80	H	8.0
2390.002500	41.85	---	74.00	32.15	H	8.0
2401.669167	---	76.20	---	---	H	8.7
2401.669167	80.16	---	---	---	H	8.7



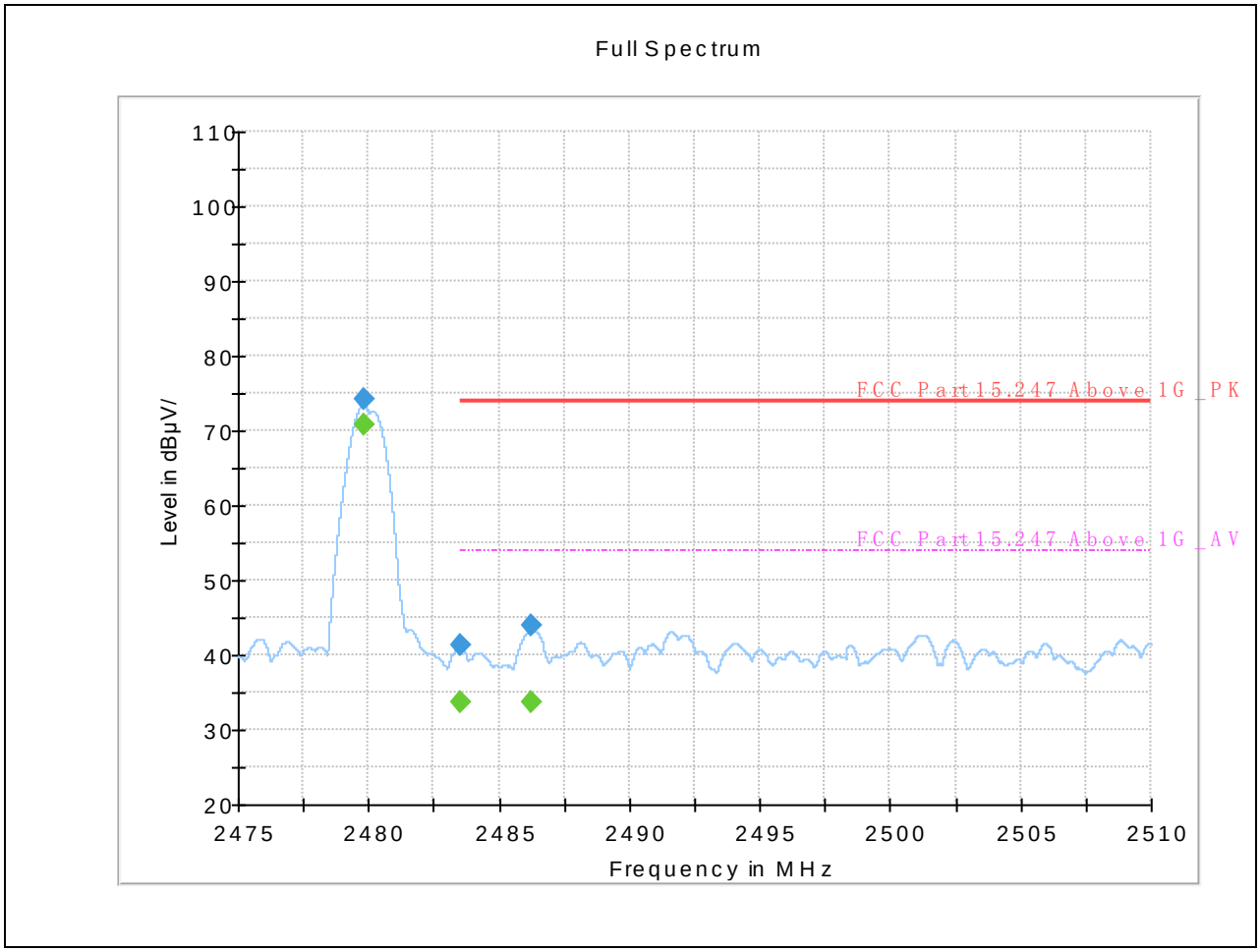
(LE 1M PHY_2402MHz, Antenna Vertical)

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol	Corr. (dB/m)
2350.965833	---	32.36	54.00	21.64	V	7.7
2350.965833	43.17	---	74.00	30.83	V	7.7
2390.002500	40.48	---	74.00	33.52	V	8.0
2390.002500	---	33.15	54.00	20.85	V	8.0
2402.036667	76.92	---	---	---	V	8.7
2402.036667	---	73.52	---	---	V	8.7



(LE 1M PHY_2480MHz, Antenna Horizontal)

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol	Corr. (dB/m)
2479.800833	---	75.26	---	---	H	8.2
2479.800833	78.46	---	---	---	H	8.2
2483.505000	38.72	---	74.00	35.28	H	8.3
2483.505000	---	33.66	54.00	20.34	H	8.3
2490.598333	44.96	---	74.00	29.04	H	8.4
2490.598333	---	33.74	54.00	20.26	H	8.4



(LE 1M PHY_2480MHz, Antenna Vertical)

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol	Corr. (dB/m)
2479.795000	74.24	---	---	---	V	8.2
2479.795000	---	70.90	---	---	V	8.2
2483.503056	41.40	---	74.00	32.60	V	8.3
2483.503056	---	33.66	54.00	20.34	V	8.3
2486.262222	---	33.60	54.00	20.40	V	8.3
2486.262222	44.01	---	74.00	29.99	V	8.3

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

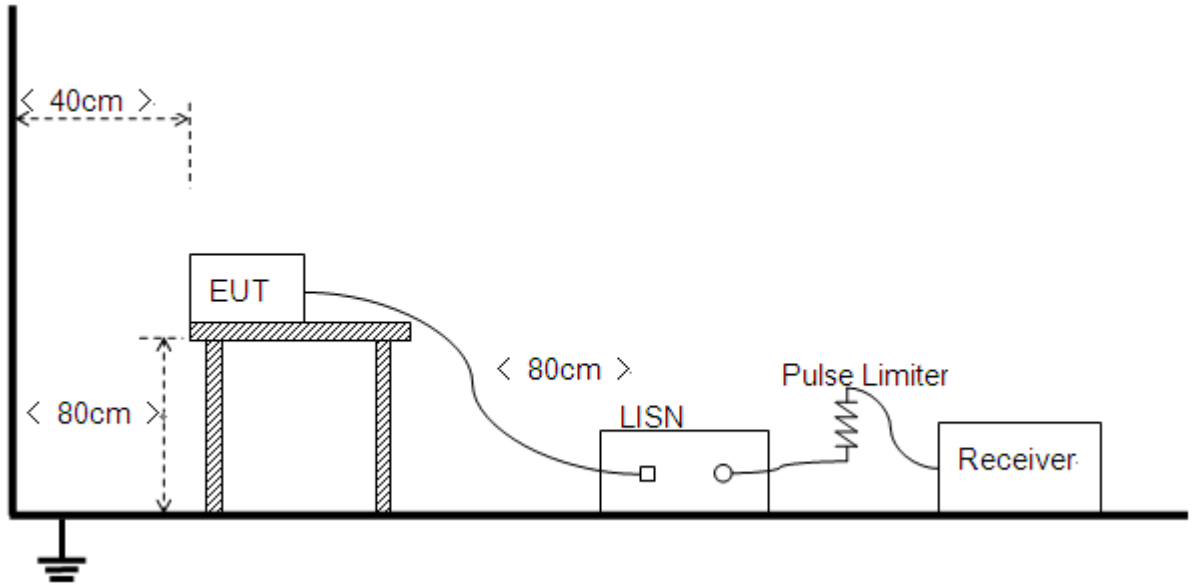
NOTE:

(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 B(4).

2.7.3. Test Result

Measurement to demonstrate compliance with the conducted limits are not required for devices which only employ battery power for operation and which do not operate from AC power lines or contain provisions for operation while connected to the AC power lines

This test case does not apply this kind of EUT

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:

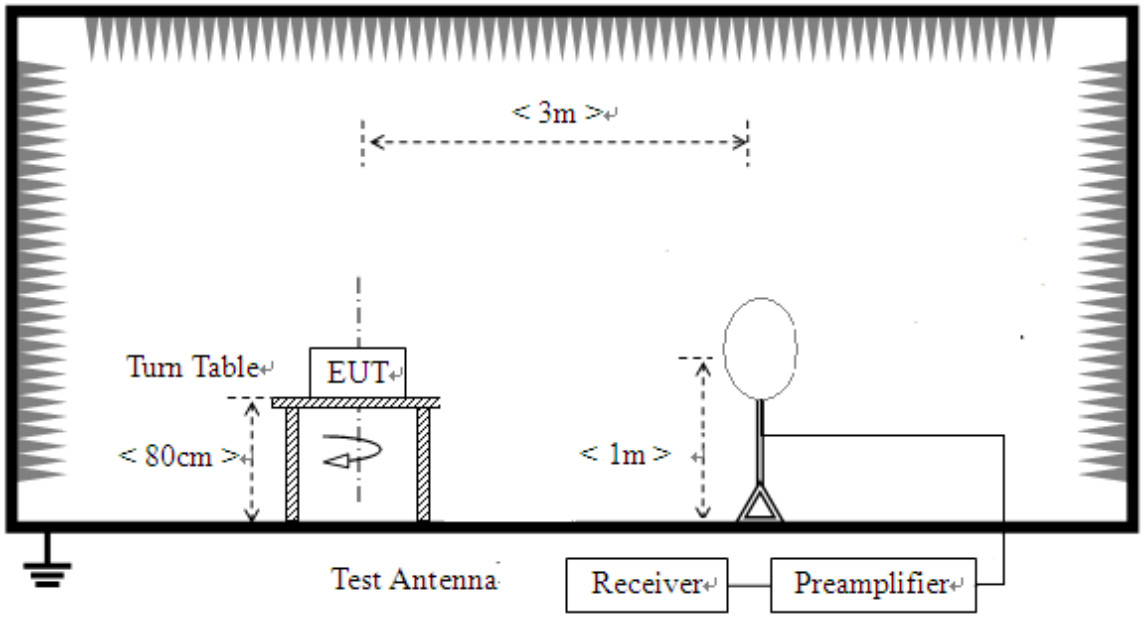
1. For Above 1000MHz, the emission limit in this paragraph is based on measurement instrumentation employing an average detector, measurement using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit.
2. For above 1000MHz, limit field strength 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)

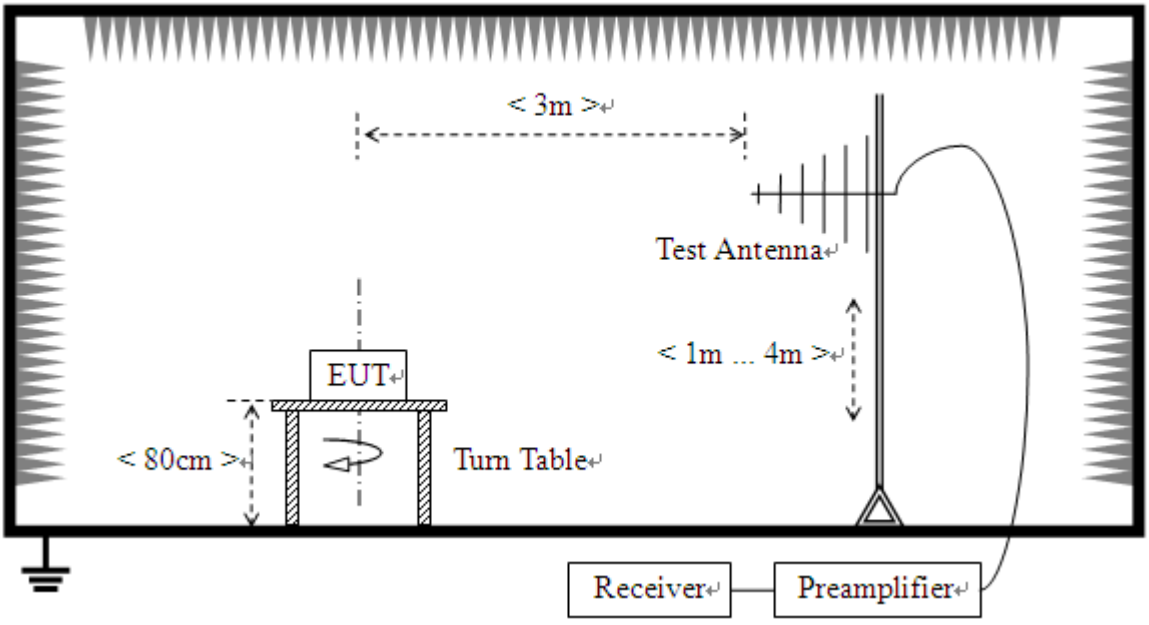
2.8.2. Test Description

A. Test Setup:

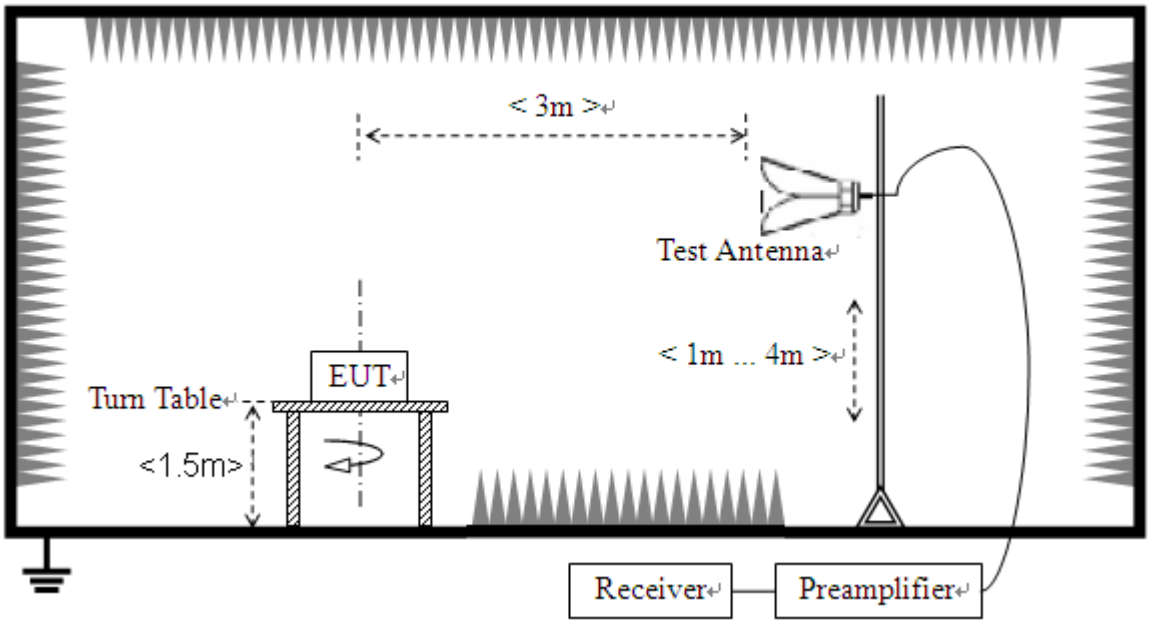
1) For radiated emissions from 9kHz to 30MHz



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 $\geqslant$ 1/T (Duty cycle < 98%) or 10Hz (Duty cycle $\geqslant$ 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

According to ANSI C63.10, because of peak detection will yield amplitudes equal to or greater than amplitudes measured with the quasi-peak (or average) detector, the measurement data from a spectrum analyzer peak detector will represent the worst-case results, if the peak measured value complies with the quasi-peak limit, it is unnecessary to perform an quasi-peak measurement.

The measurement results are obtained as below:

$E\ [dB\mu V/m] = U_R + A_T + A_{Factor}\ [dB]$; $A_T = L_{Cable\ loss}\ [dB] - G_{preamp}\ [dB]$

A_T: Total correction Factor except Antenna

U_R: Receiver Reading

G_{preamp}: Preamplifier Gain

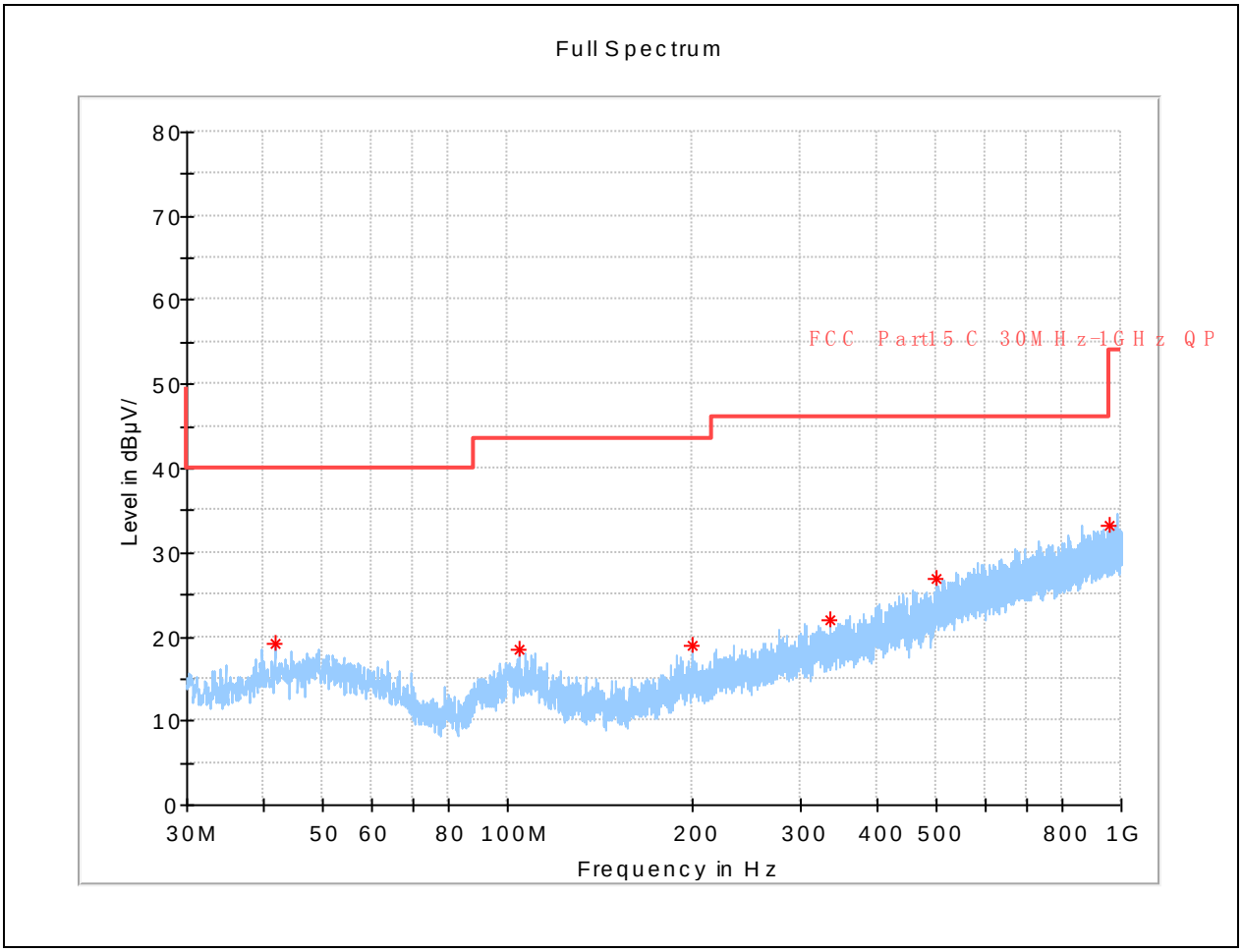
A_{Factor}: Antenna Factor at 3m

During the test, the total correction Factor A_T and A_{Factor} were built in test software.

Note1: All radiated emission tests were performed in X, Y, Z axis direction. And only the worst axis test condition was recorded in this test report.

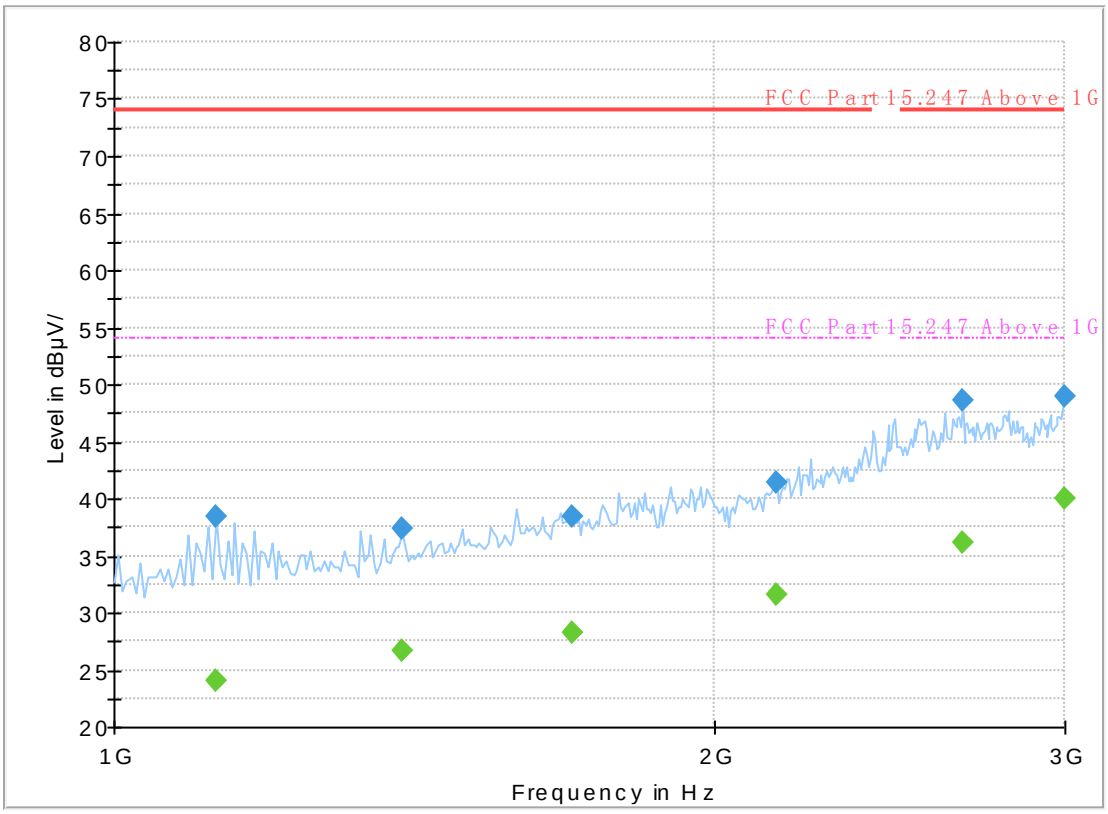
Note2: For the frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit was not recorded.

Note3: 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.



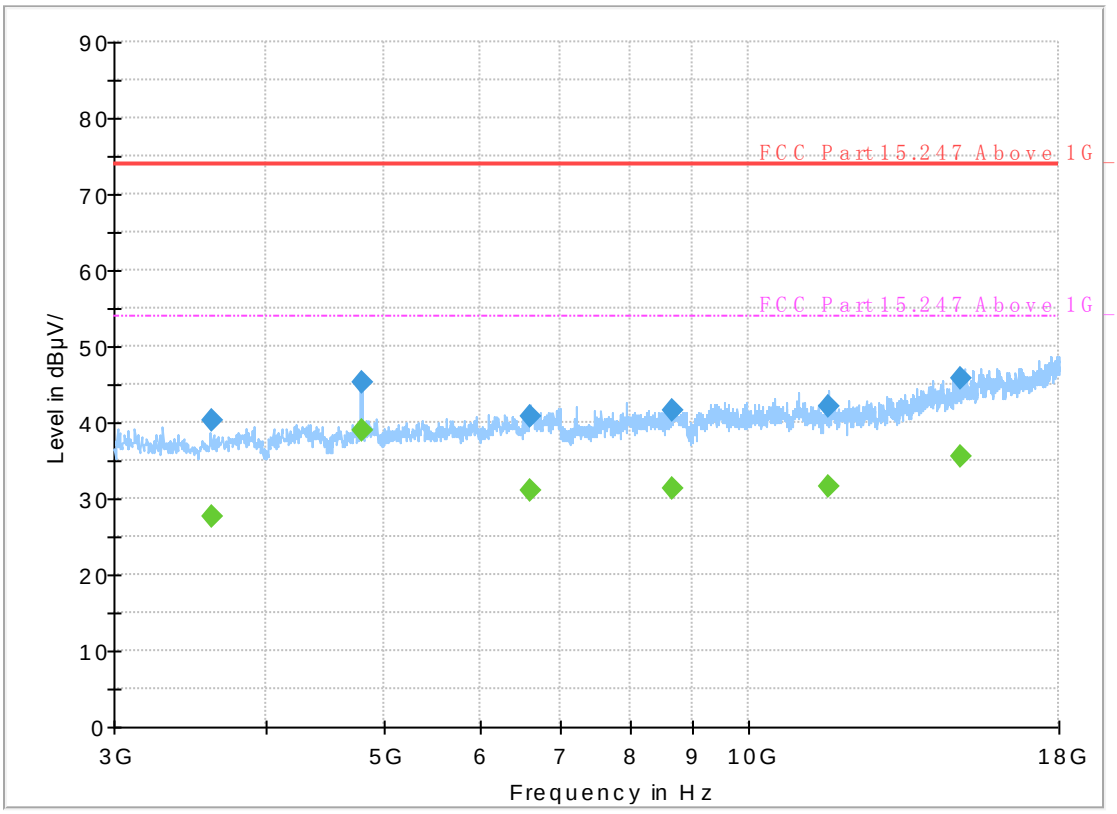
(LE 1M PHY_2402MHz, Antenna Horizontal, 30MHz to 1GHz)

Frequency (MHz)	MaxPeak (dBµV/m)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol	Corr. (dB/m)
41.720833	19.16	--	40.00	20.84	H	15.0
104.245417	18.51	--	43.50	24.99	H	14.3
200.275417	19.05	--	43.50	24.45	H	14.3
334.216250	21.95	--	46.00	24.05	H	17.3
500.732917	26.84	--	46.00	19.16	H	22.0
958.330417	33.25	--	46.00	12.75	H	28.3



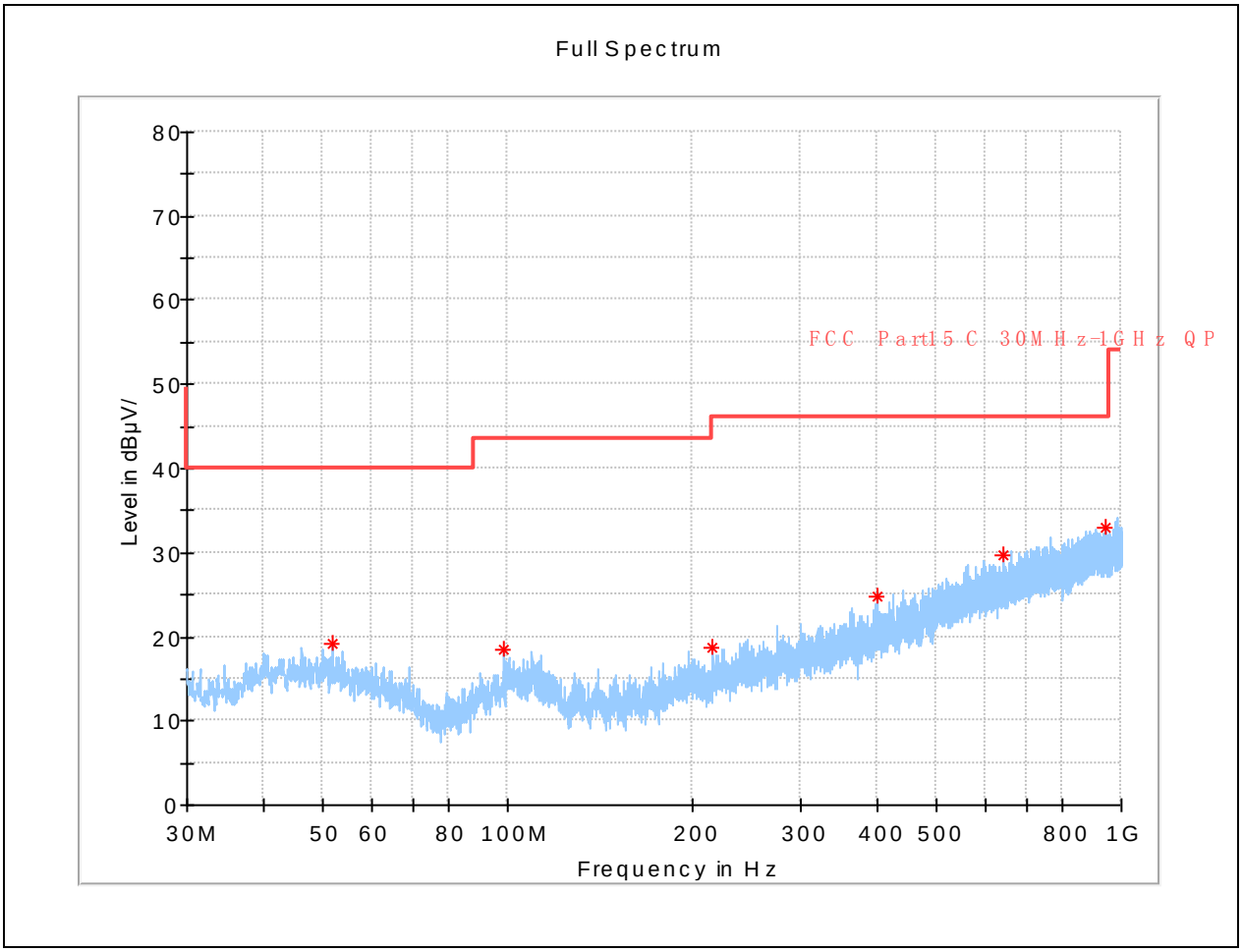
(LE 1M PHY _2402MHz, Antenna Horizontal, 1GHz to 3GHz)

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol	Corr. (dB/m)
1125.000000	---	24.02	54.00	29.98	H	-2.0
1125.000000	38.37	---	74.00	35.63	H	-2.0
1395.000000	---	26.66	54.00	27.34	H	1.5
1395.000000	37.40	---	74.00	36.60	H	1.5
1700.000000	38.36	---	74.00	35.64	H	3.9
1700.000000	---	28.27	54.00	25.73	H	3.9
2150.000000	---	31.65	54.00	22.35	H	8.2
2150.000000	41.42	---	74.00	32.58	H	8.2
2665.000000	48.66	---	74.00	25.34	H	14.8
2665.000000	---	36.22	54.00	17.78	H	14.8
3000.000000	---	39.99	54.00	14.01	H	18.4
3000.000000	49.01	---	74.00	24.99	H	18.4



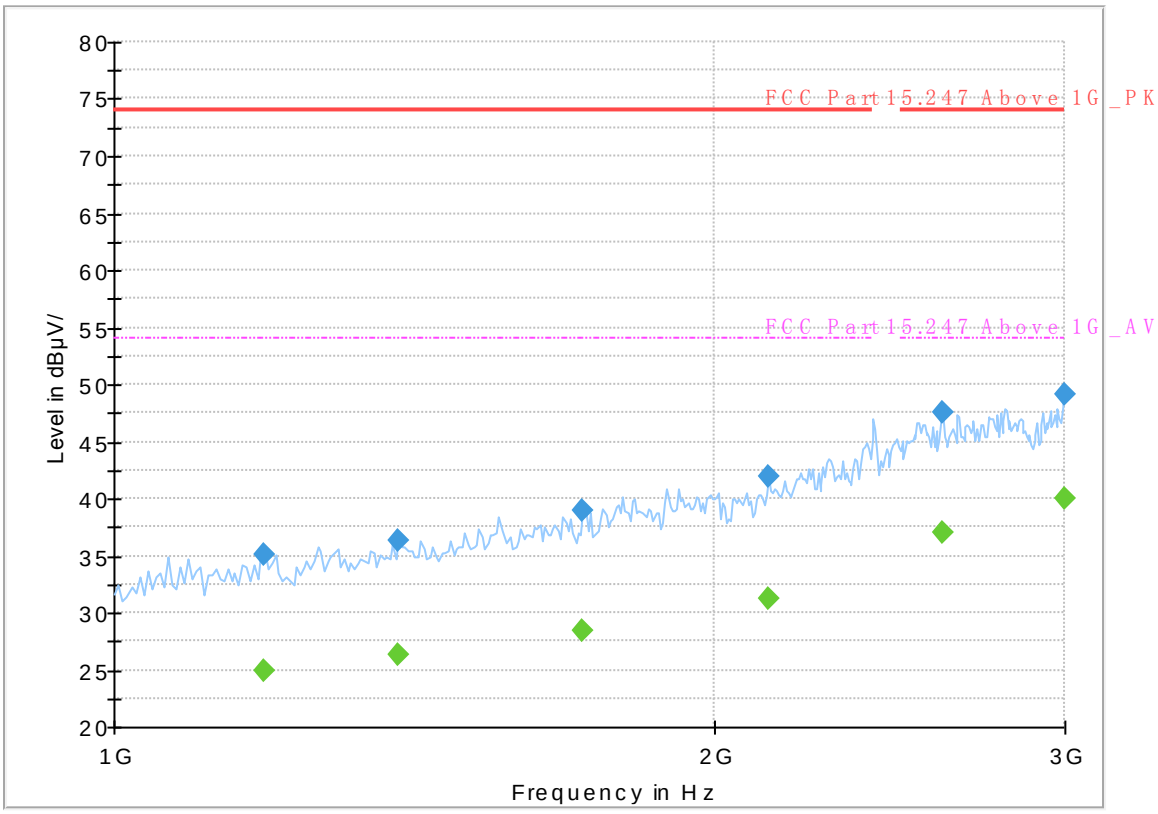
(LE 1M PHY _2402MHz, Antenna Horizontal, 3GHz to 18GHz)

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol	Corr. (dB/m)
3615.129000	40.32	---	74.00	33.68	H	-5.8
3615.129000	---	27.67	54.00	26.33	H	-5.8
4803.329668	45.33	---	74.00	28.67	H	-3.3
4803.329668	---	38.97	54.00	15.03	H	-3.3
6605.979395	---	31.14	54.00	22.86	H	-0.9
6605.979395	40.86	---	74.00	33.14	H	-0.9
8657.399025	---	31.26	54.00	22.74	H	1.3
8657.399025	41.69	---	74.00	32.31	H	1.3
11621.482424	---	31.62	54.00	22.38	H	3.3
11621.482424	42.05	---	74.00	31.95	H	3.3
14972.750357	---	35.62	54.00	18.38	H	10.0
14972.750357	45.88	---	74.00	28.12	H	10.0



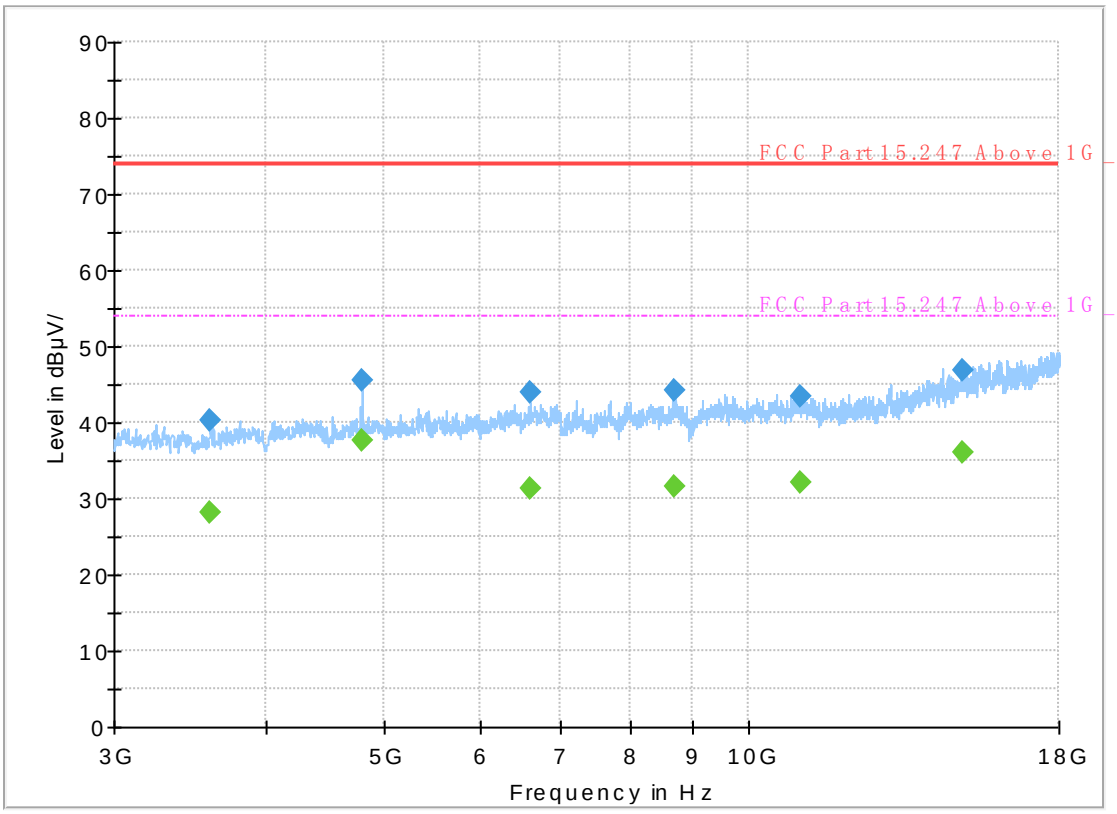
(LE 1M PHY _2402MHz, Antenna Vertical, 30MHz to 1GHz)

Frequency (MHz)	MaxPeak (dBµV/m)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol	Corr. (dB/m)
51.784583	19.09	--	40.00	20.91	V	15.6
98.587083	18.58	--	43.50	24.92	V	14.0
216.078333	18.64	--	46.00	27.36	V	13.8
401.348333	24.91	--	46.00	21.09	V	19.6
643.605833	29.69	--	46.00	16.31	V	24.3
944.629167	32.99	--	46.00	13.01	V	28.4



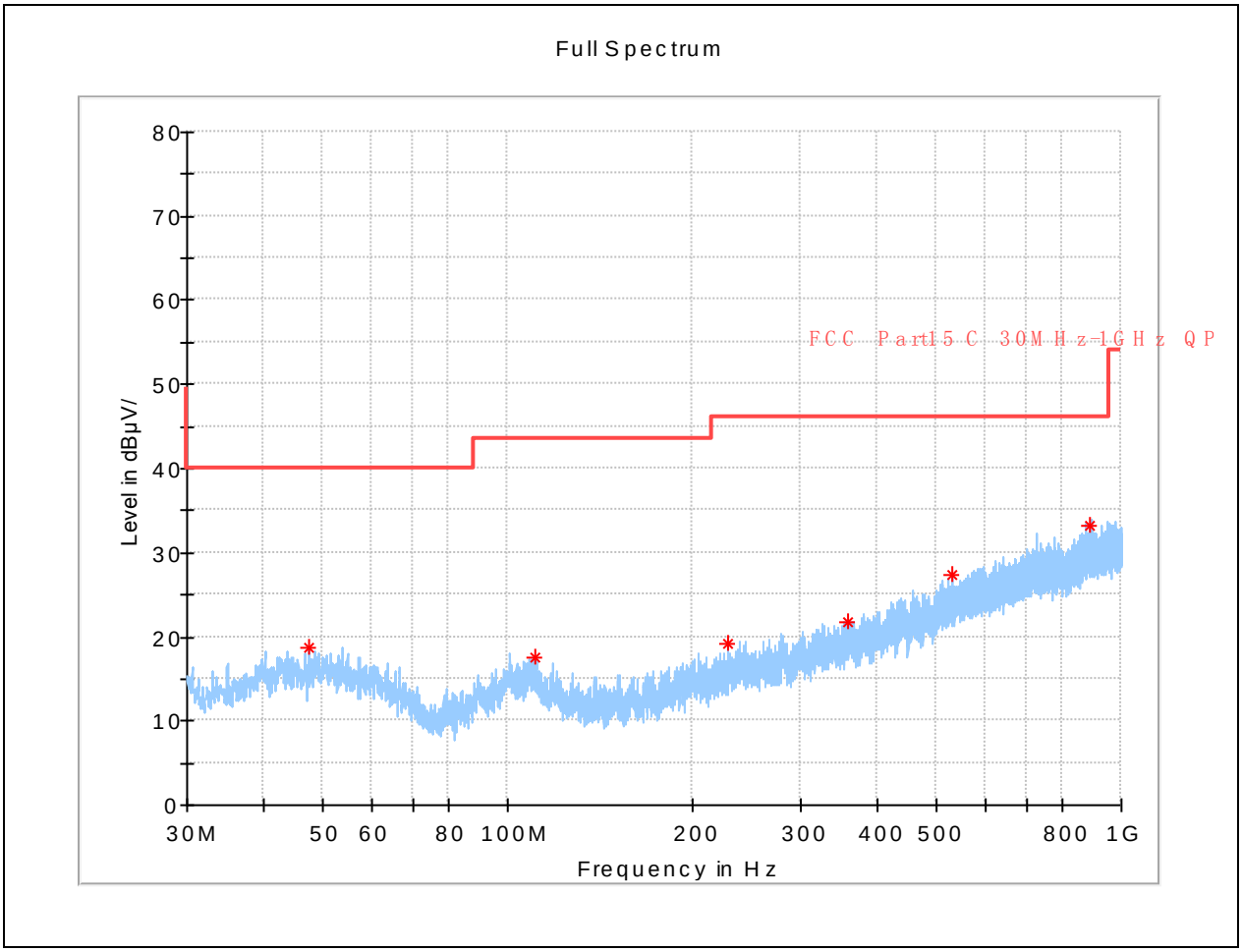
(LE 1M PHY _2402MHz, Antenna Vertical , 1GHz to 3GHz)

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol	Corr. (dB/m)
1190.000000	35.11	---	74.00	38.89	V	-0.8
1190.000000	---	24.92	54.00	29.08	V	-0.8
1390.000000	---	26.38	54.00	27.62	V	1.2
1390.000000	36.27	---	74.00	37.73	V	1.2
1720.000000	---	28.39	54.00	25.61	V	4.1
1720.000000	38.92	---	74.00	35.08	V	4.1
2130.000000	41.96	---	74.00	32.04	V	8.2
2130.000000	---	31.28	54.00	22.72	V	8.2
2605.000000	47.55	---	74.00	26.45	V	14.9
2605.000000	---	37.01	54.00	16.99	V	14.9
3000.000000	49.14	---	74.00	24.86	V	18.4
3000.000000	---	39.99	54.00	14.01	V	18.4



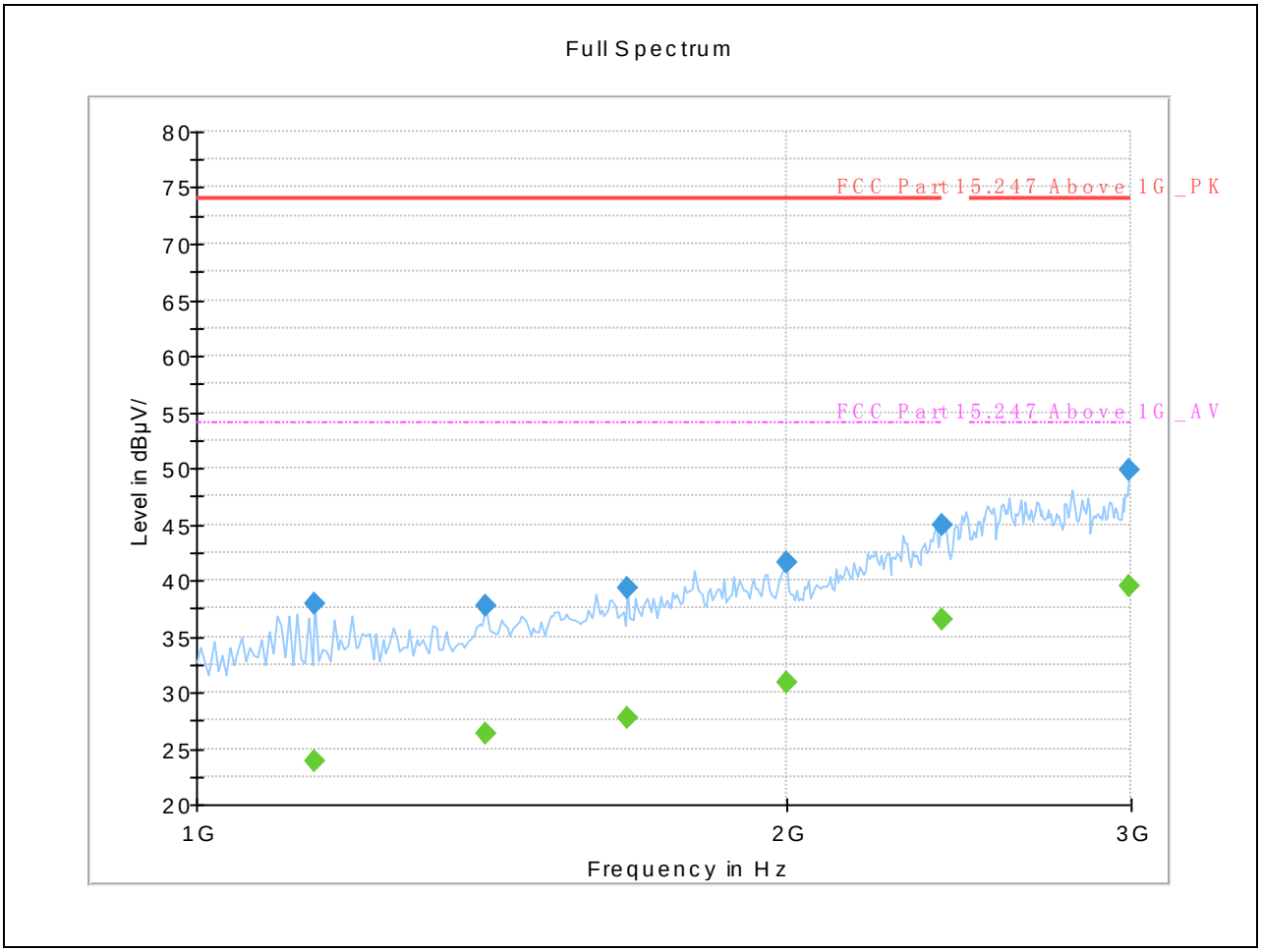
(LE 1M PHY _2402MHz, Antenna Vertical, 3GHz to 18GHz)

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol	Corr. (dB/m)
3593.619000	40.26	---	74.00	33.74	V	-5.7
3593.619000	---	28.21	54.00	25.79	V	-5.7
4803.257611	---	37.55	54.00	16.45	V	-3.3
4803.257611	45.49	---	74.00	28.51	V	-3.3
6615.092027	---	31.26	54.00	22.74	V	-0.8
6615.092027	43.94	---	74.00	30.06	V	-0.8
8679.642000	44.26	---	74.00	29.74	V	1.3
8679.642000	---	31.71	54.00	22.29	V	1.3
11012.356627	---	32.18	54.00	21.82	V	3.4
11012.356627	43.48	---	74.00	30.52	V	3.4
14992.429553	---	36.04	54.00	17.96	V	10.4
14992.429553	46.75	---	74.00	27.25	V	10.4



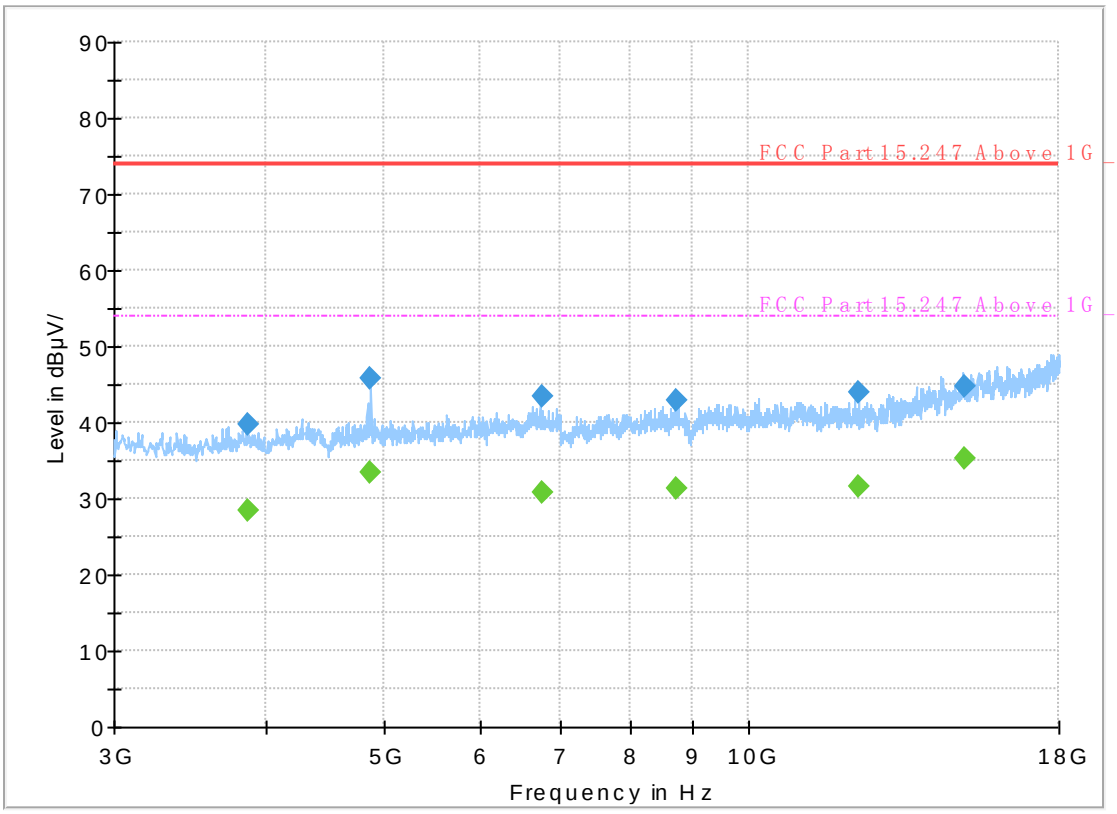
(LE 1M PHY _2440MHz, Antenna Horizontal, 30MHz to 1GHz)

Frequency (MHz)	MaxPeak (dBµV/m)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol	Corr. (dB/m)
47.338750	18.75	--	40.00	21.25	H	15.5
110.914167	17.51	--	43.50	25.99	H	14.5
228.243750	19.20	--	46.00	26.80	H	14.3
358.708750	21.83	--	46.00	24.17	H	18.5
529.024583	27.48	--	46.00	18.52	H	22.2
888.854167	33.22	--	46.00	12.78	H	27.8



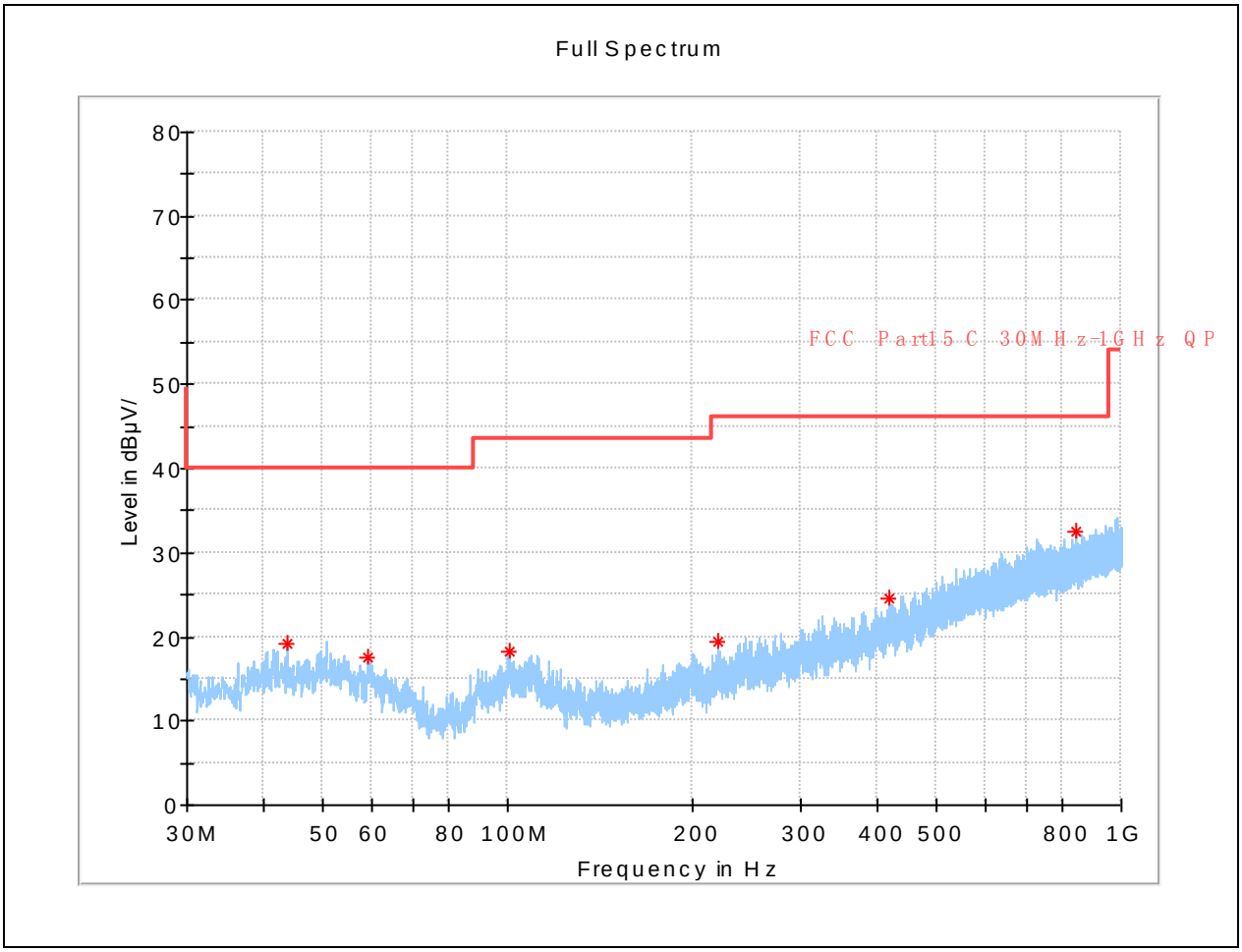
(LE 1M PHY _2440MHz, Antenna Horizontal, 1GHz to 3GHz)

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol	Corr. (dB/m)
1150.000000	37.90	---	74.00	36.10	H	-2.0
1150.000000	---	23.85	54.00	30.15	H	-2.0
1405.000000	---	26.39	54.00	27.61	H	1.5
1405.000000	37.64	---	74.00	36.36	H	1.5
1660.000000	---	27.64	54.00	26.36	H	3.2
1660.000000	39.28	---	74.00	34.72	H	3.2
2000.000000	---	30.92	54.00	23.08	H	7.5
2000.000000	41.57	---	74.00	32.43	H	7.5
2400.000000	---	36.41	54.00	17.59	H	13.5
2400.000000	44.86	---	74.00	29.14	H	13.5
2995.000000	49.77	---	74.00	24.23	H	17.9
2995.000000	---	39.50	54.00	14.50	H	17.9



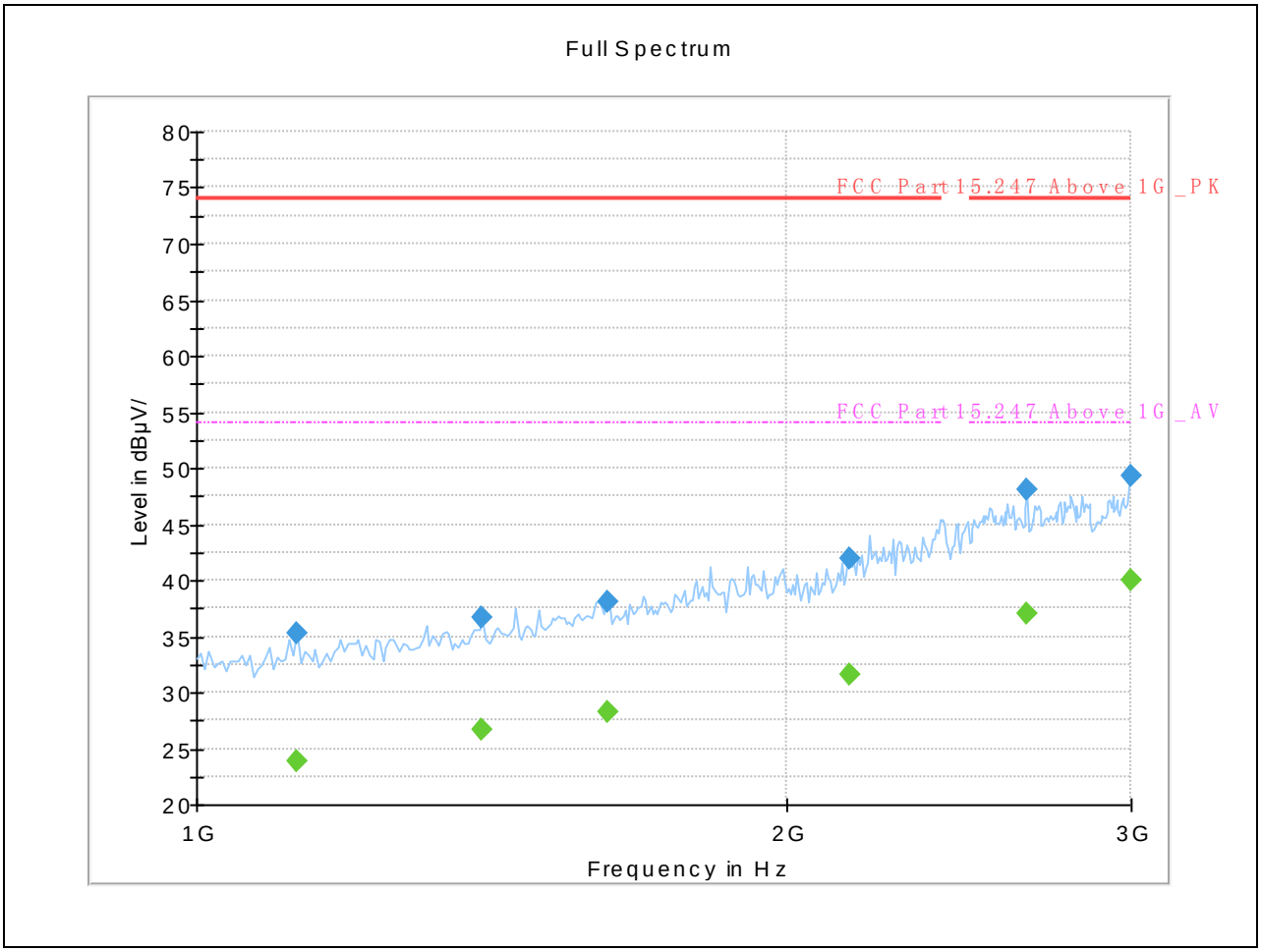
(LE 1M PHY _2440MHz, Antenna Horizontal, 3GHz to 18GHz)

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol	Corr. (dB/m)
3863.760488	39.76	---	74.00	34.24	H	-4.6
3863.760488	---	28.40	54.00	25.60	H	-4.6
4884.770363	---	33.53	54.00	20.47	H	-2.8
4884.770363	45.83	---	74.00	28.17	H	-2.8
6747.148824	43.44	---	74.00	30.56	H	-1.2
6747.148824	---	30.82	54.00	23.18	H	-1.2
8724.855075	---	31.40	54.00	22.60	H	1.4
8724.855075	42.89	---	74.00	31.11	H	1.4
12327.931676	44.06	---	74.00	29.94	H	4.3
12327.931676	---	31.59	54.00	22.41	H	4.3
15048.381019	44.76	---	74.00	29.24	H	10.3
15048.381019	---	35.22	54.00	18.78	H	10.3



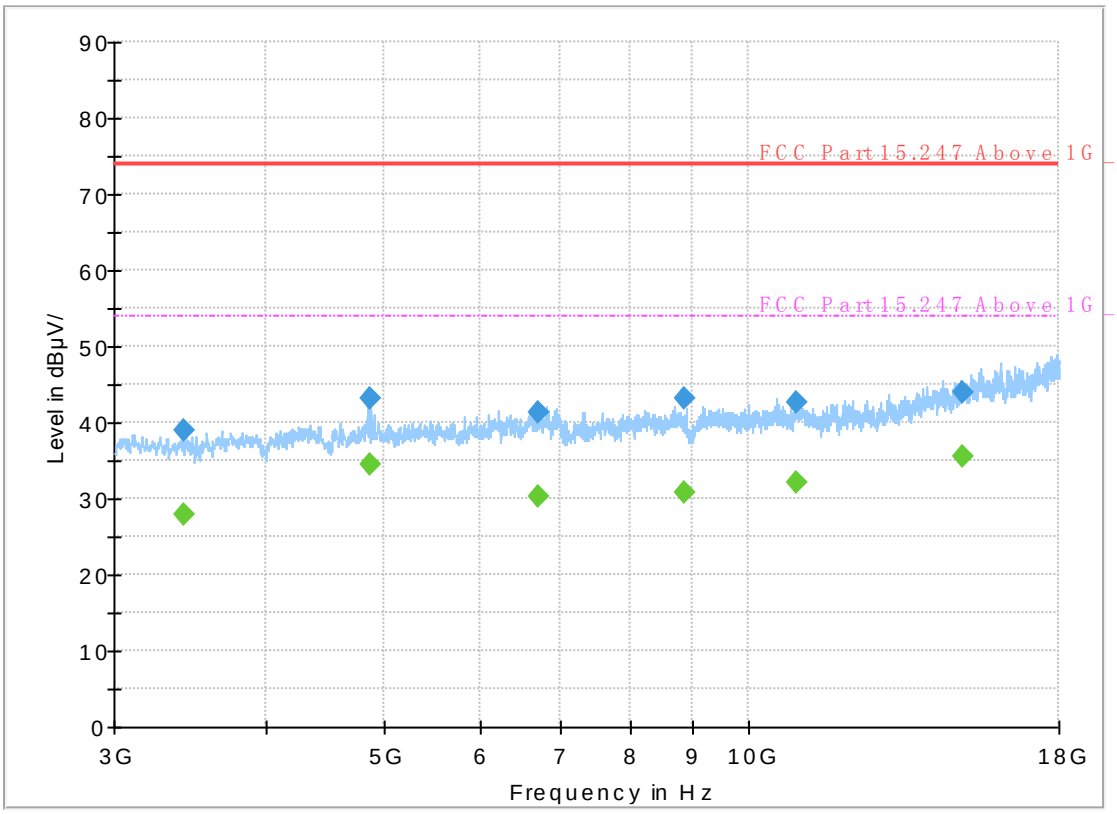
(LE 1M PHY _2440MHz, Antenna Vertical, 30MHz to 1GHz)

Frequency (MHz)	MaxPeak (dBµV/m)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol	Corr. (dB/m)
43.701250	19.27	--	40.00	20.73	V	15.3
59.140417	17.52	--	40.00	22.48	V	14.6
100.729167	18.34	--	43.50	25.16	V	15.1
220.039167	19.44	--	46.00	26.56	V	14.8
419.980417	24.49	--	46.00	21.51	V	20.3
844.597917	32.58	--	46.00	13.42	V	26.9



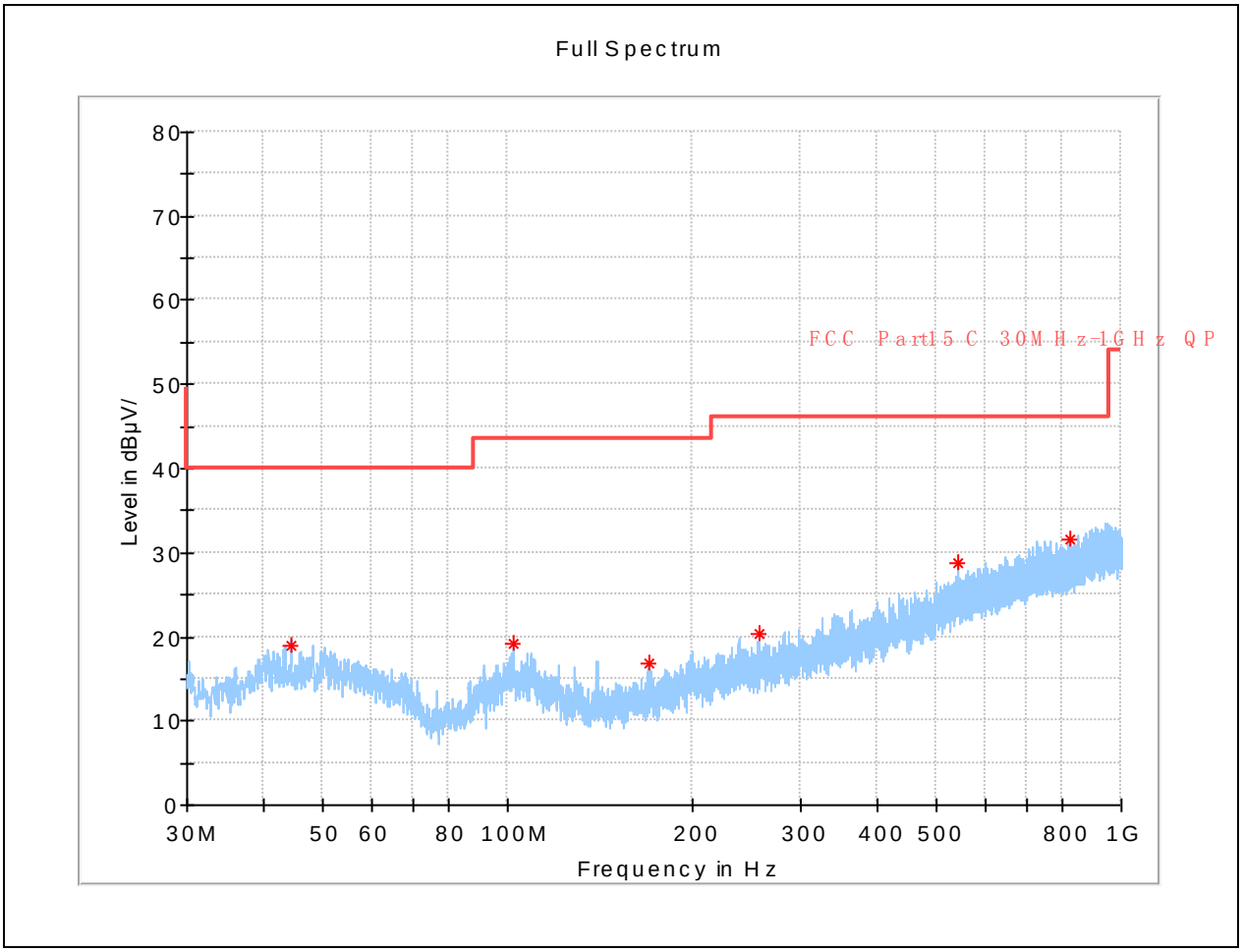
(LE 1M PHY _2440MHz, Antenna Vertical , 1GHz to 3GHz)

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol	Corr. (dB/m)
1125.000000	35.29	---	74.00	38.71	V	-2.0
1125.000000	---	23.85	54.00	30.15	V	-2.0
1400.000000	---	26.70	54.00	27.30	V	1.7
1400.000000	36.71	---	74.00	37.29	V	1.7
1620.000000	---	28.21	54.00	25.79	V	3.3
1620.000000	38.15	---	74.00	35.85	V	3.3
2155.000000	41.90	---	74.00	32.10	V	8.3
2155.000000	---	31.56	54.00	22.44	V	8.3
2655.000000	48.06	---	74.00	25.94	V	15.3
2655.000000	---	37.00	54.00	17.00	V	15.3
3000.000000	49.22	---	74.00	24.78	V	18.4
3000.000000	---	39.97	54.00	14.03	V	18.4



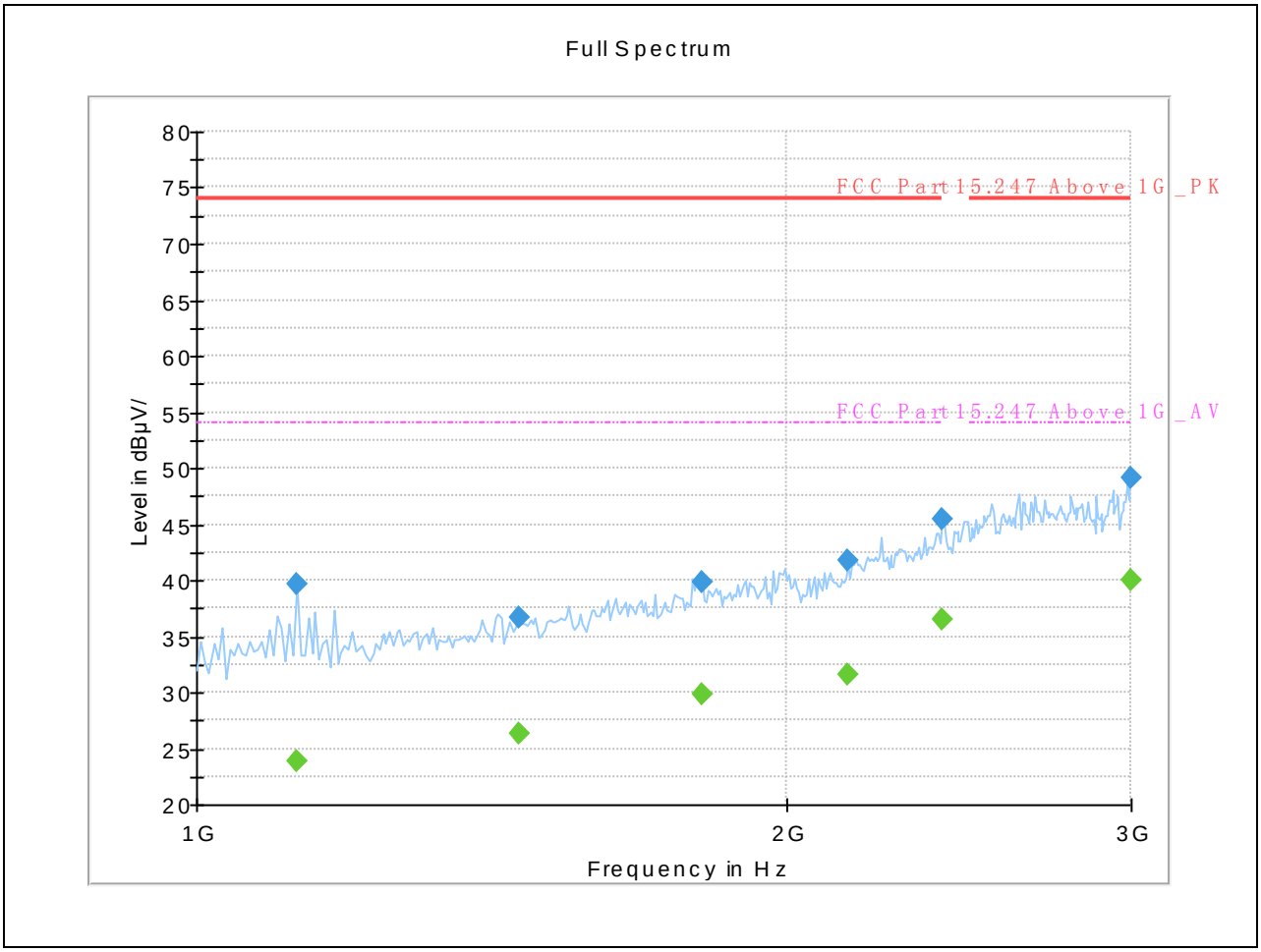
(LE 1M PHY _2440MHz, Antenna Vertical, 3GHz to 18GHz)

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol	Corr. (dB/m)
3430.995506	38.95	---	74.00	35.05	V	-5.8
3430.995506	---	27.77	54.00	26.23	V	-5.8
4883.476500	---	34.57	54.00	19.43	V	-2.8
4883.476500	43.25	---	74.00	30.75	V	-2.8
6698.153756	41.29	---	74.00	32.71	V	-0.9
6698.153756	---	30.31	54.00	23.69	V	-0.9
8852.262070	43.08	---	74.00	30.92	V	1.3
8852.262070	---	30.68	54.00	23.32	V	1.3
10939.208344	---	32.08	54.00	21.92	V	3.3
10939.208344	42.65	---	74.00	31.35	V	3.3
14979.228916	43.85	---	74.00	30.15	V	10.2
14979.228916	---	35.50	54.00	18.50	V	10.2



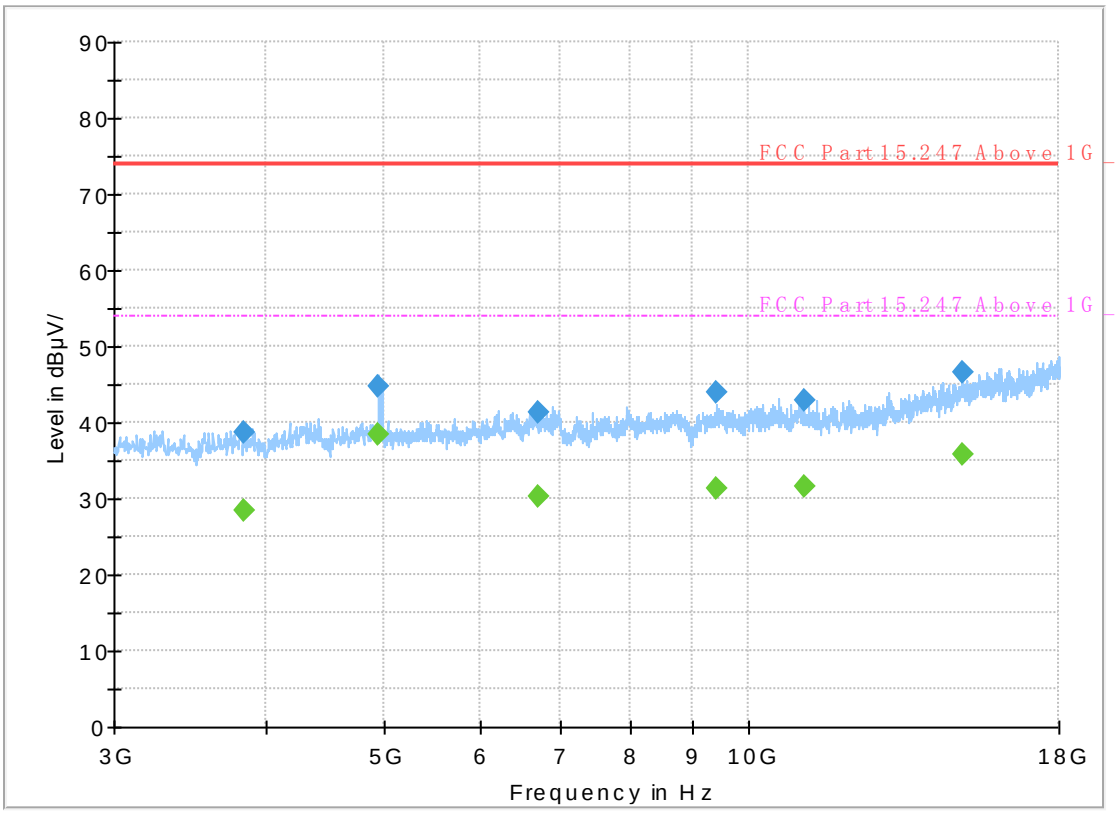
(LE 1M PHY _2480MHz, Antenna Horizontal, 30MHz to 1GHz)

Frequency (MHz)	MaxPeak (dBµV/m)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol	Corr. (dB/m)
44.347917	19.01	--	40.00	20.99	H	15.3
102.467083	19.12	--	43.50	24.38	H	14.6
169.437500	16.95	--	43.50	26.55	H	12.3
257.505417	20.32	--	46.00	25.68	H	15.6
542.887500	28.84	--	46.00	17.16	H	22.4
827.703750	31.55	--	46.00	14.45	H	26.5



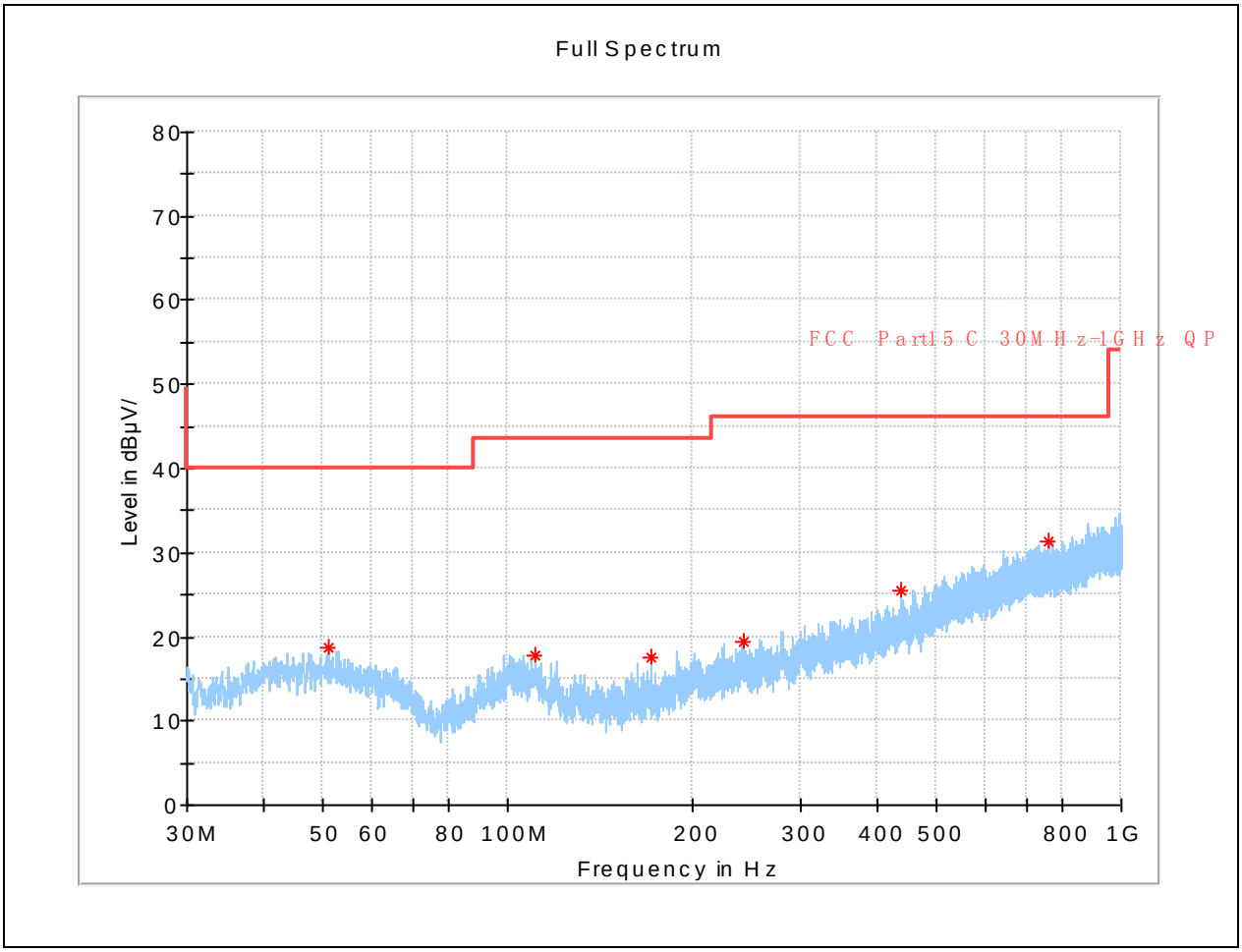
(LE 1M PHY _2480MHz, Antenna Horizontal, 1GHz to 3GHz)

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol	Corr. (dB/m)
1125.000000	39.63	---	74.00	34.37	H	-2.0
1125.000000	---	23.94	54.00	30.06	H	-2.0
1460.000000	---	26.39	54.00	27.61	H	1.6
1460.000000	36.72	---	74.00	37.28	H	1.6
1810.000000	39.83	---	74.00	34.17	H	6.0
1810.000000	---	29.81	54.00	24.19	H	6.0
2150.000000	---	31.63	54.00	22.37	H	8.2
2150.000000	41.84	---	74.00	32.16	H	8.2
2400.000000	45.36	---	74.00	28.64	H	13.5
2400.000000	---	36.44	54.00	17.56	H	13.5
3000.000000	49.08	---	74.00	24.92	H	18.4
3000.000000	---	39.99	54.00	14.01	H	18.4



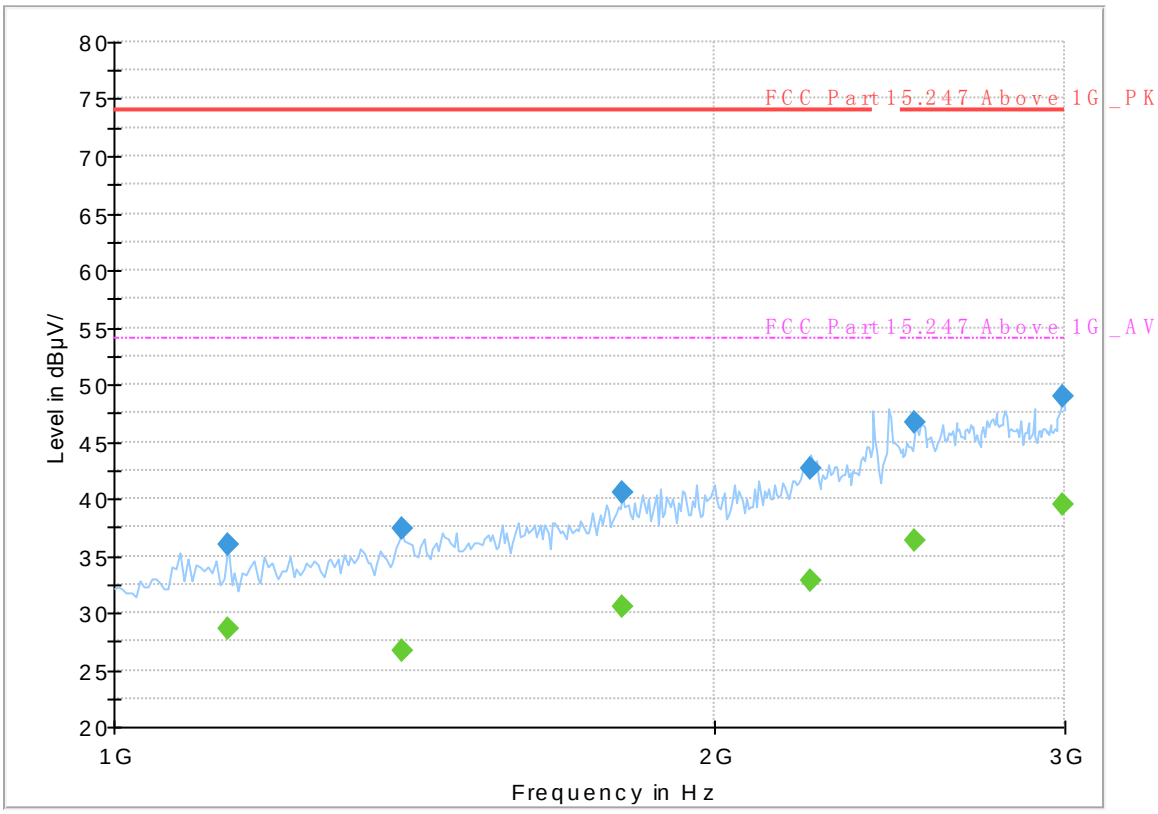
(LE 1M PHY _2480MHz, Antenna Horizontal, 3GHz to 18GHz)

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol	Corr. (dB/m)
3844.626792	---	28.44	54.00	25.56	H	-4.8
3844.626792	38.80	---	74.00	35.20	H	-4.8
4960.239019	---	38.45	54.00	15.55	H	-3.1
4960.239019	44.75	---	74.00	29.25	H	-3.1
6710.470760	41.41	---	74.00	32.59	H	-1.0
6710.470760	---	30.25	54.00	23.75	H	-1.0
9414.947250	---	31.43	54.00	22.57	H	2.0
9414.947250	43.95	---	74.00	30.05	H	2.0
11133.719482	---	31.45	54.00	22.55	H	3.2
11133.719482	42.91	---	74.00	31.09	H	3.2
15018.987675	46.48	---	74.00	26.52	H	10.8
15018.987675	---	35.90	54.00	18.10	H	10.8



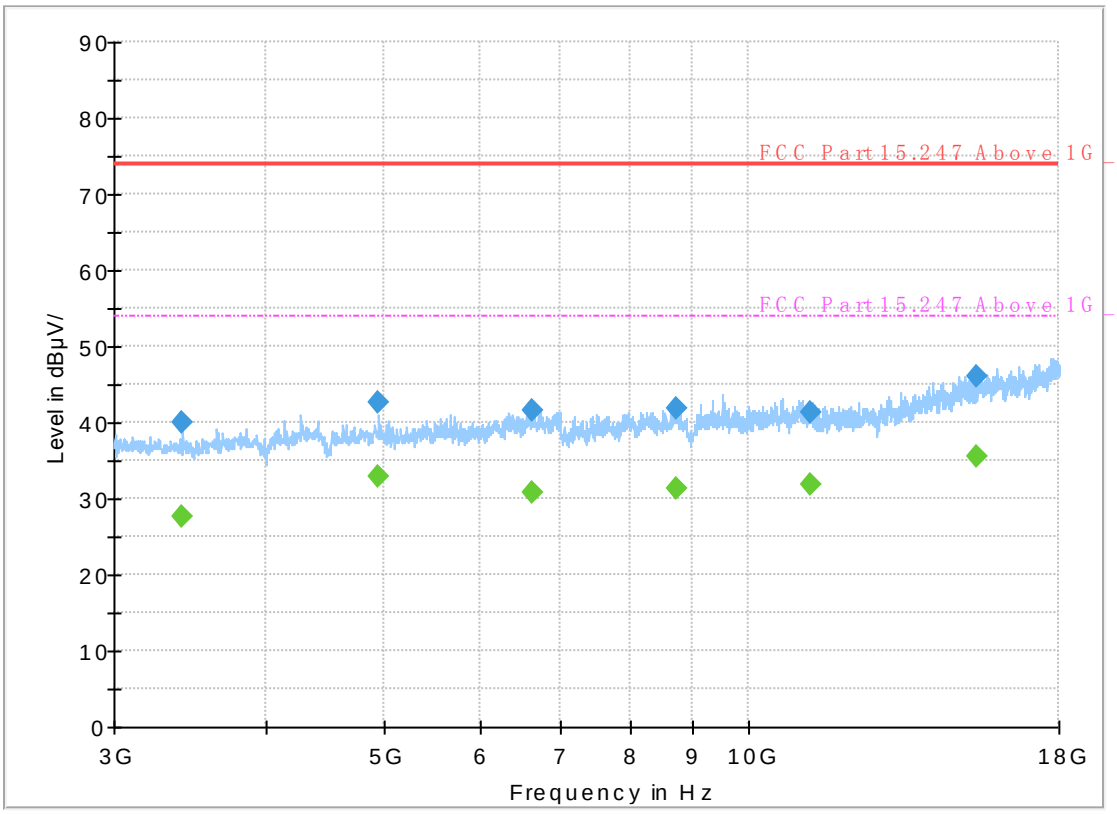
(LE 1M PHY _2480MHz, Antenna Vertical, 30MHz to 1GHz)

Frequency (MHz)	MaxPeak (dBµV/m)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol	Corr. (dB/m)
51.137917	18.79	--	40.00	21.21	V	15.8
110.833333	17.80	--	43.50	25.70	V	14.6
171.377500	17.54	--	43.50	25.96	V	12.1
242.510833	19.40	--	46.00	26.60	V	15.0
438.248750	25.61	--	46.00	20.39	V	20.3
763.764583	31.30	--	46.00	14.70	V	26.2



(LE 1M PHY _2480MHz, Antenna Vertical , 1GHz to 3GHz)

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol	Corr. (dB/m)
1140.000000	---	28.68	54.00	25.33	V	-1.9
1140.000000	36.02	---	74.00	37.98	V	-1.9
1395.000000	37.35	---	74.00	36.65	V	1.5
1395.000000	---	26.62	54.00	27.38	V	1.5
1800.000000	---	30.48	54.00	23.52	V	6.7
1800.000000	40.59	---	74.00	33.41	V	6.7
2235.000000	---	32.79	54.00	21.21	V	9.7
2235.000000	42.69	---	74.00	31.31	V	9.7
2525.000000	---	36.34	54.00	17.66	V	13.6
2525.000000	46.66	---	74.00	27.34	V	13.6
2995.000000	49.03	---	74.00	24.97	V	17.9
2995.000000	---	39.54	54.00	14.46	V	17.9



(LE 1M PHY _2480MHz, Antenna Vertical, 3GHz to 18GHz)

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol	Corr. (dB/m)
3410.758459	39.88	---	74.00	34.12	V	-5.9
3410.758459	---	27.66	54.00	26.34	V	-5.9
4960.239019	42.62	---	74.00	31.38	V	-3.1
4960.239019	---	32.80	54.00	21.20	V	-3.1
6633.845062	41.53	---	74.00	32.47	V	-0.5
6633.845062	---	30.85	54.00	23.15	V	-0.5
8710.794450	41.73	---	74.00	32.27	V	1.3
8710.794450	---	31.42	54.00	22.58	V	1.3
11249.346600	---	31.90	54.00	22.10	V	3.1
11249.346600	41.42	---	74.00	32.58	V	3.1
15421.795200	---	35.54	54.00	18.46	V	10.4
15421.795200	46.04	---	74.00	27.96	V	10.4

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

Company Name:	Kehu-Morlab Test Laboratory
Address:	Unit 101, No.1732 Gangzhong Road, Xiamen Area, Pilot Free Trade Zone (Fujian), P.R. China
Responsible Test Lab Manager:	Mr. Di Dehai
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. Facilities and Accreditations

All measurement facilities used to collect the measurement data are located at Unit 101, No.1732 Gangzhong Road, Xiamen Area, Pilot Free Trade Zone (Fujian), P.R. China.

The test site is constructed in conformance with the requirements of ANSI C63.10-2013 and CISPR Publication 22; the FCC designation number is CN1249.

4. Test Equipments Utilized

4.1 Conducted Test Equipments

No.	Equipment Name	Serial No.	Model No.	Manufacturer	Cal.Date	Cal.Due Date
1	MXA Signal Analyzer	MY53421845	N9020A	Keysight	2019.01.05	2020.01.04
2	RF cable (30MHz-26.5GHz)	RF01	N/A	Morlab	2019.01.05	2020.01.04
3	Coaxial cable	RF02	N/A	Morlab	2019.01.05	2020.01.04
4	SMA connector	RF03	N/A	Xingbo	2019.01.05	2020.01.04
Software Version: Eagle 2.0						

4.2 Auxiliary Test Equipment

No.	Equipment Name	Serial No.	Model No.	Manufacturer	Cal.Date	Cal. Due Date
1	Laptop	N/A	A1465	Apple Inc.	N/A	N/A

4.3 List of Software Used

No.	Model	Version Number	Producer	Test Item
1	EMC32	V10.00.00	Rode&Schwarz	RE

4.4 Radiated Test Equipments

RSE Test System						
No.	**Equipment Name**	**Serial No.**	**Model No.**	**Manufacturer**	**Cal. Date**	**Cal.Due Date**
1	Anechoic Chamber	N/A	9m*6m*6 m	ETS-Lindgren	2018.11.27	2019.11.26
2	Signal Analyzer	101294	FSV40	R&S	2019.01.04	2020.01.03
3	Active Ring Antenna	FMZB 1513 #269	FMZB 1513	Schwarzbeck	2019.01.02	2020.01.01
4	Linear Log Periodic Broad Band Antenna	949	VULB 9163	Schwarzbeck	2018.09.25	2019.09.24
5	Ultra-Wideband Horn Antenna	102615	HF907	R&S	2019.01.19	2020.01.18
6	Steatite Antennas	17868	QSH-SL-18-26-S-20	Seibersdorf	2019.01.12	2020.01.11
7	RF Switch and Control Platform	N/A	RSC	CDSI	2019.01.04	2020.01.03
8	Coaxial cable (N male) (9kHz -3GHz)	EMC02	N/A	Morlab	2019.01.04	2020.01.03
9	Coaxial cable (N male) (9kHz -3GHz)	EMC03	N/A	Morlab	2019.01.04	2020.01.03
10	Coaxial cable (N male) (1GHz-26.5GHz)	EMC04	N/A	Morlab	2019.01.04	2020.01.03
11	Coaxial cable	EMC05	N/A	Morlab	2019.01.04	2020.01.03

	(N male) (1GHz-26.5GHz)					
12	Pre-amplifier (1GHz-18GHz)	8810011	PAP-1G18	CDSI	2019.01.19	2020.01.18
13	Pre-amplifier (18GHz-40GHz)	17021-17024	PAP-1840	CDSI	2019.01.19	2020.01.18
14	Band stop Filter	EMC11	BJF2400/2485-60	CDSI	2019.01.19	2020.01.18
15	High Pass Filter	EMC12	HFP-3.0/18G-60	CDSI	2019.01.19	2020.01.18

END OF REPORT