TEST REPORT

APPLICANT	:	HATCH BABY,INC.
PRODUCT NAME	:	Restore - Sound Machine & Night Light
MODEL NAME	:	RESTORE03
BRAND NAME	:	Hatch
FCC ID	:	2AFYZ-RESTORE03
STANDARD(S)	:	47 CFR Part 15 Subpart C
RECEIPT DATE	:	2021-07-26
TEST DATE	:	2021-07-27 to 2021-08-13
ISSUE DATE	:	2021-09-18

Edited by : Qijie Xiao

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DIRECTORY

1. Technical Information 3
1.1. Applicant and Manufacturer Information 3
1.2. Equipment Under Test (EUT) Description 3
1.3. Test Standards and Results 4
1.4. Environmental Conditions 4
2. 47 CFR Part 15C Requirements 5
2.1. Antenna requirement 5
2.2. Peak Output Power 6
2.3. 6dB Bandwidth 9
2.4. Conducted Spurious Emissions and Band Edge 12
2.5. Power spectral density (PSD) 18
2.6. Restricted Frequency Bands 21
2.7. Conducted Emission 28
2.8. Radiated Emission 32
Annex A Test Uncertainty 54
Annex B Testing Laboratory Information 55

Change History		
Version	Date	Reason for change
1.0	2021-09-18	First edition

1. Technical Information

Note: Provide by applicant.

1.1. Applicant and Manufacturer Information

Applicant:	HATCH BABY,INC.
Applicant Address:	3525 Alameda de las Pulgas, Suite D, Menlo Park CA 94025

1.2. Equipment Under Test (EUT) Description

Product Name:	Restore - Sound Machine & Night Light
Serial No:	(N/A, marked #1 by test site)
Hardware Version:	RESTORE03
Software Version:	5.1.244
Modulation Type:	GFSK
Operating Frequency Range:	2402MHz - 2480MHz
Antenna Type:	PIFA Antenna
Antenna Gain:	2dBi

Note 1: We use the dedicated software to control the EUT continuous transmission.
Note 2: 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	Aug 12, 2021 Aug 17, 2021	Stefan Sun	**PASS**
3	15.247(a)	Bandwidth	Aug 12, 2021 Aug 17, 2021	Stefan Sun	**PASS**
4	15.247(d)	Conducted Spurious Emission and Band Edge	Aug 12, 2021 Aug 17, 2021	Stefan Sun	**PASS**
5	15.247(e)	Power spectral density (PSD)	Aug 12, 2021 Aug 17, 2021	Stefan Sun	**PASS**
6	15.247(d)	Restricted Frequency Bands	Apr 10, 2021	Qijie Xiao	**PASS**
7	15.207	Conducted Emission	Jul 27, 2021	Yaming Luo	**PASS**
8	15.209, 15.247(d)	Radiated Emission	Apr 10, 2021	Qijie Xiao	**PASS**

Note: The tests were performed according to the method of measurements prescribed in ANSIC63.10-2013 and 558074 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 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.

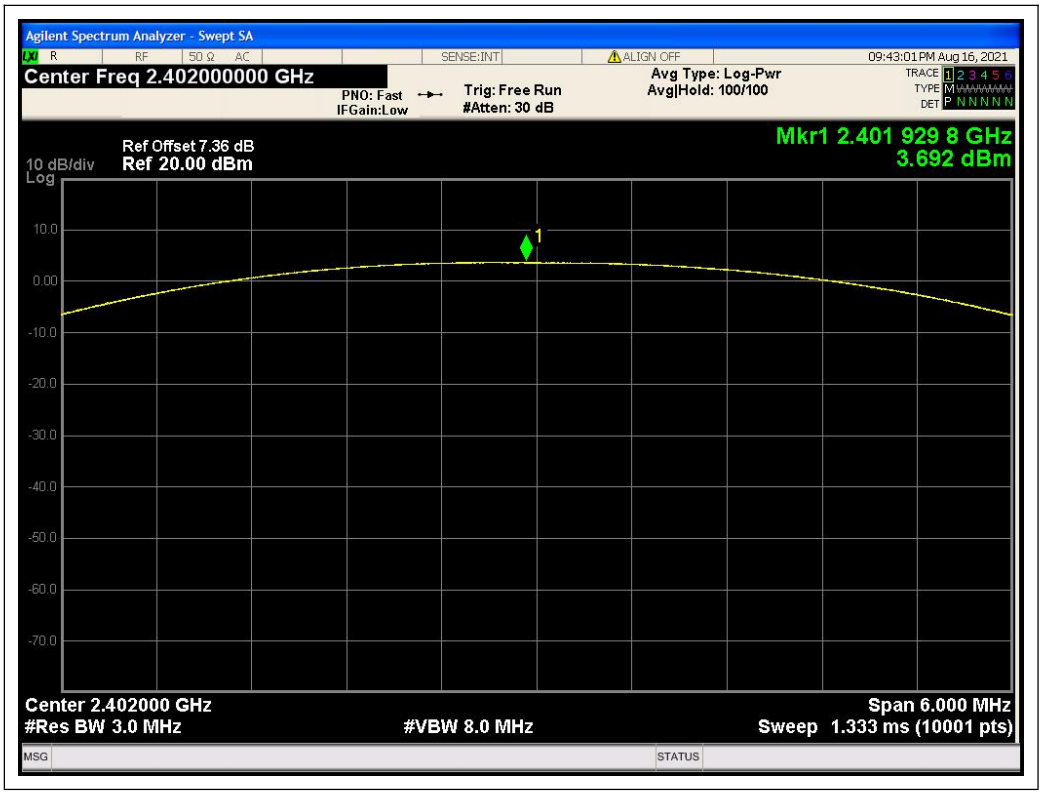
2.2.4. Test Result

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

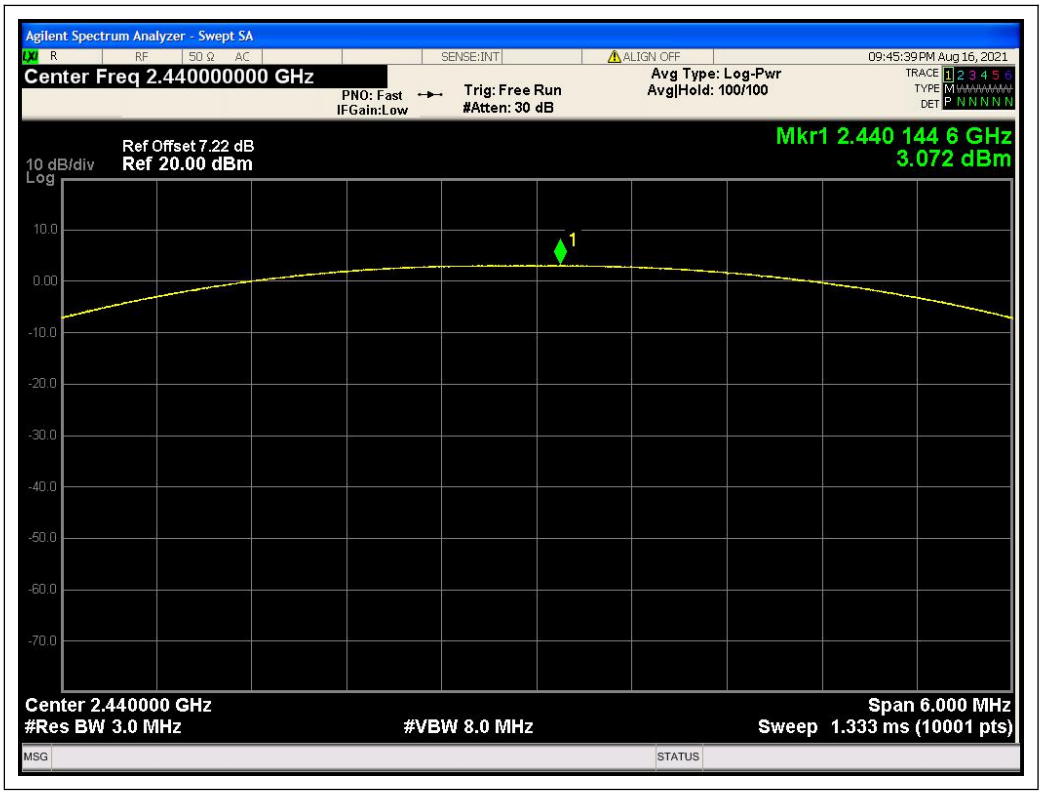
A. Test Verdict:

Mode	Channel	Frequency (MHz)	Measured Output Peak Power		Limit		Verdict
			dBm	W	dBm	W	
1M PHY	0	2402	3.692	0.002	30	1	PASS
	19	2440	3.072	0.002	30	1	PASS
	39	2480	2.622	0.001	30	1	PASS

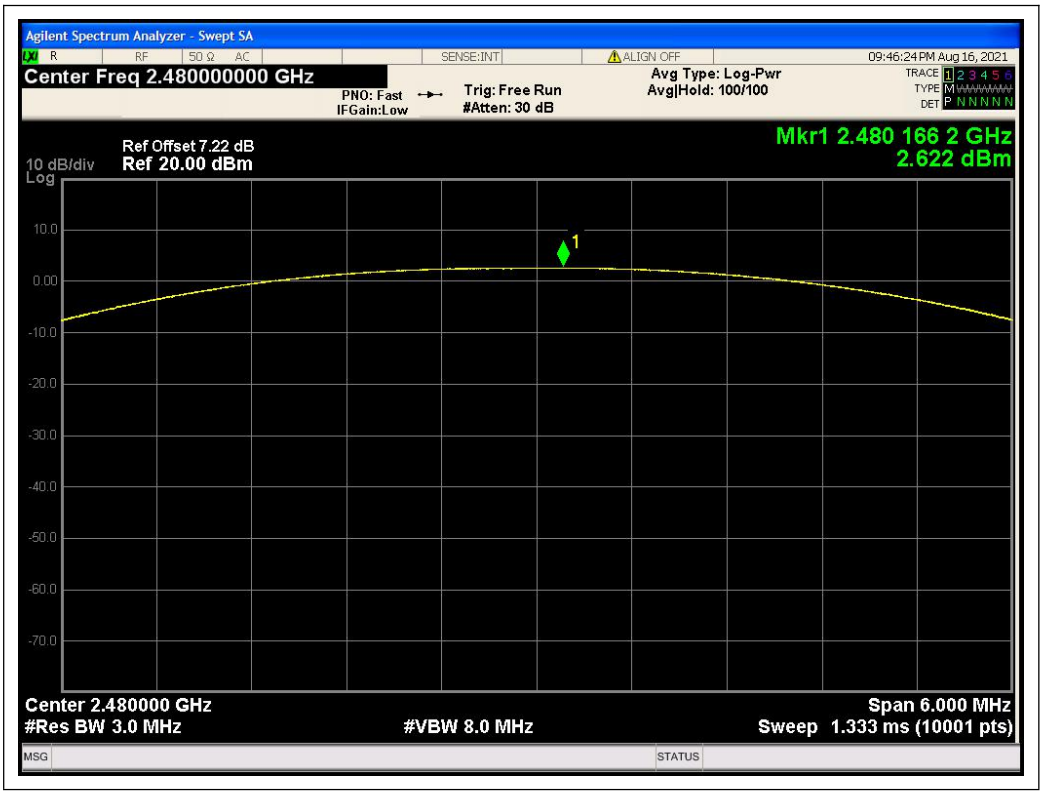
B. Test Plots:



(Bluetooth 5.1 LE 1M PHY Channel 0, 2402MHz)



(Bluetooth 5.1 LE 1M PHY Channel 19, 2440MHz)



(Bluetooth 5.1 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.

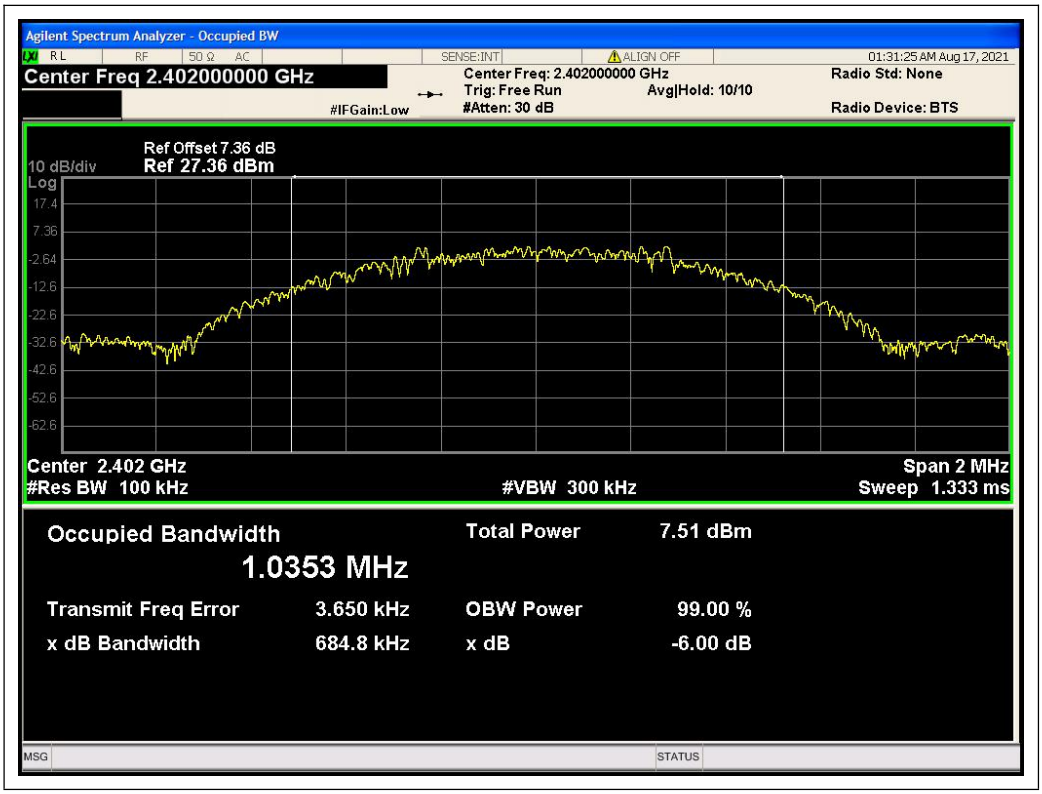
2.3.4. Test Result

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

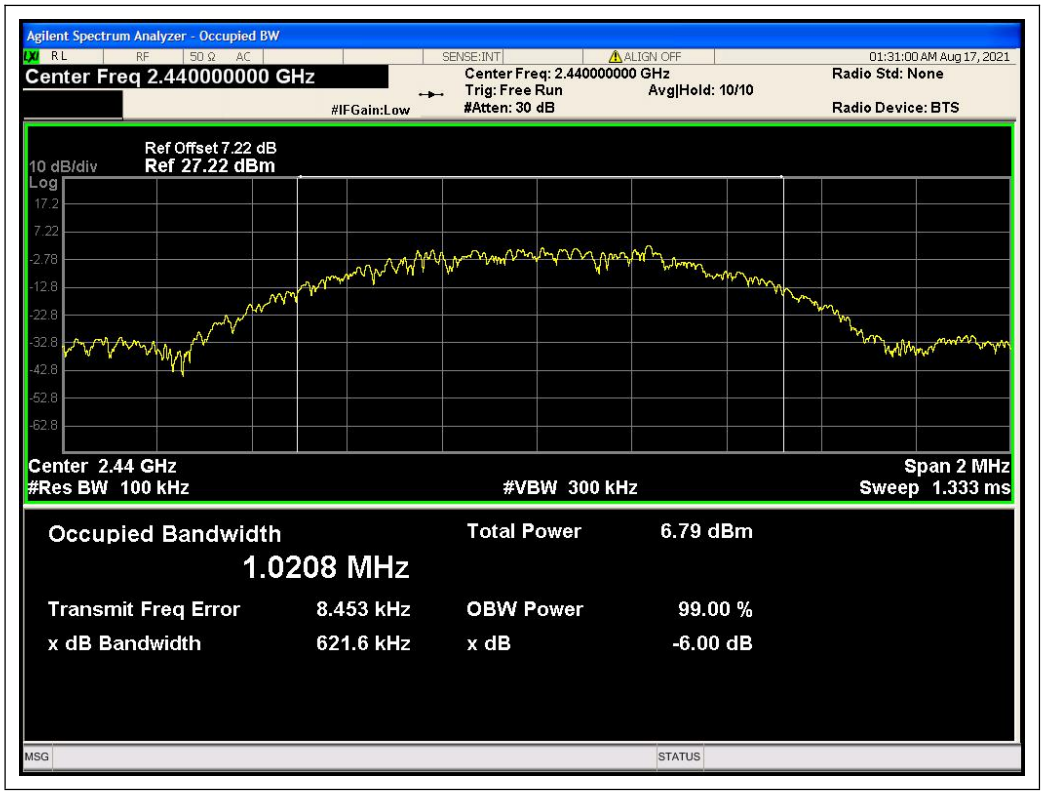
A. Test Verdict:

Mode	Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limits(kHz)	Result
1M PHY	0	2402	0.685	≥500	PASS
	19	2440	0.622	≥500	PASS
	39	2480	0.622	≥500	PASS

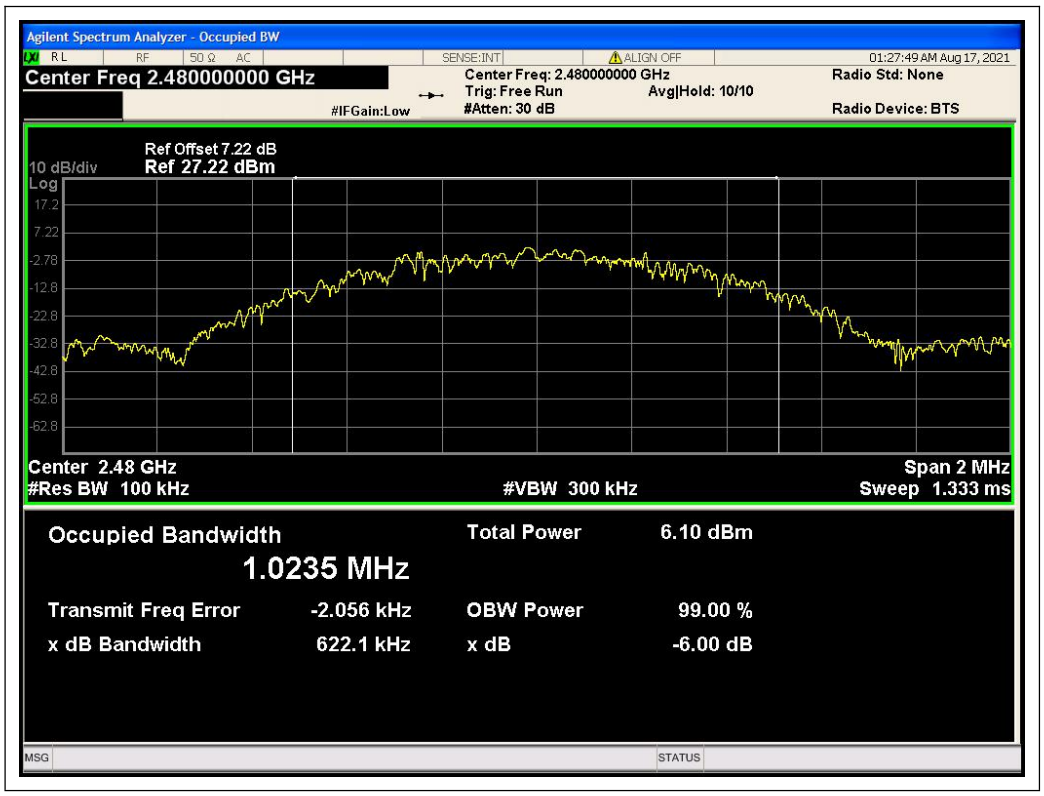
B. Test Plots



(Bluetooth 5.1 LE 1M PHY Channel 0: 2402MHz)



(Bluetooth 5.1 LE 1M PHY Channel 19: 2440 MHz)



(Bluetooth 5.1 LE 1M PHY Channel 39: 2480MHz)

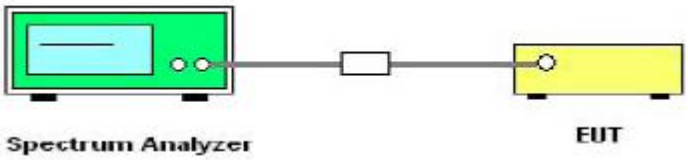
2.4. Conducted Spurious Emissions and Band Edge

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 Procedure

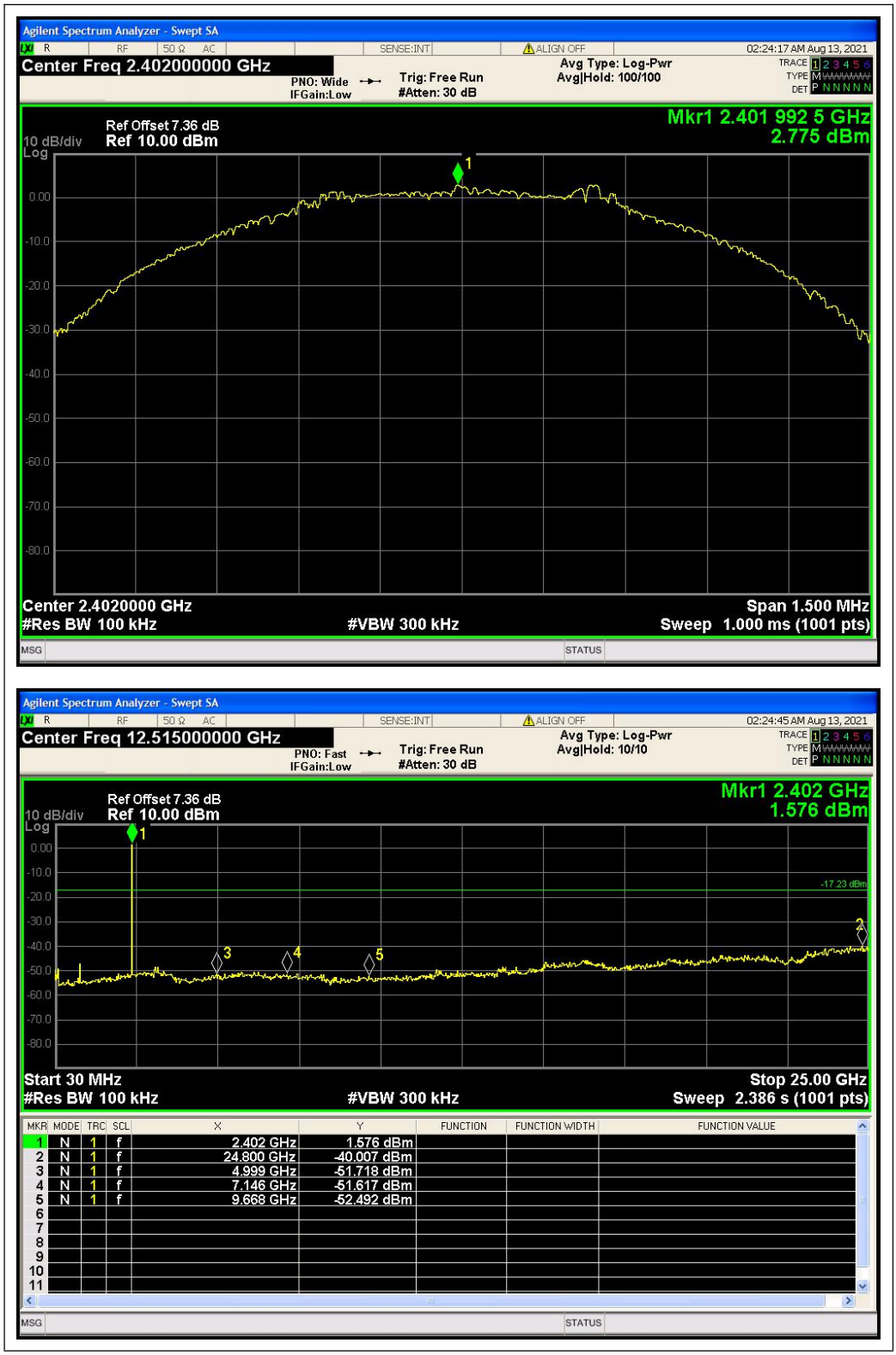
The transmitter output was connected to the spectrum analyzer via a low lose cable. Set both RBW and VBW of spectrum analyzer to 100kHz and 300kHz with suitable frequency span including 100 MHz bandwidth from band edge. The band edges was measured and recorded.

2.4.4. Test Result

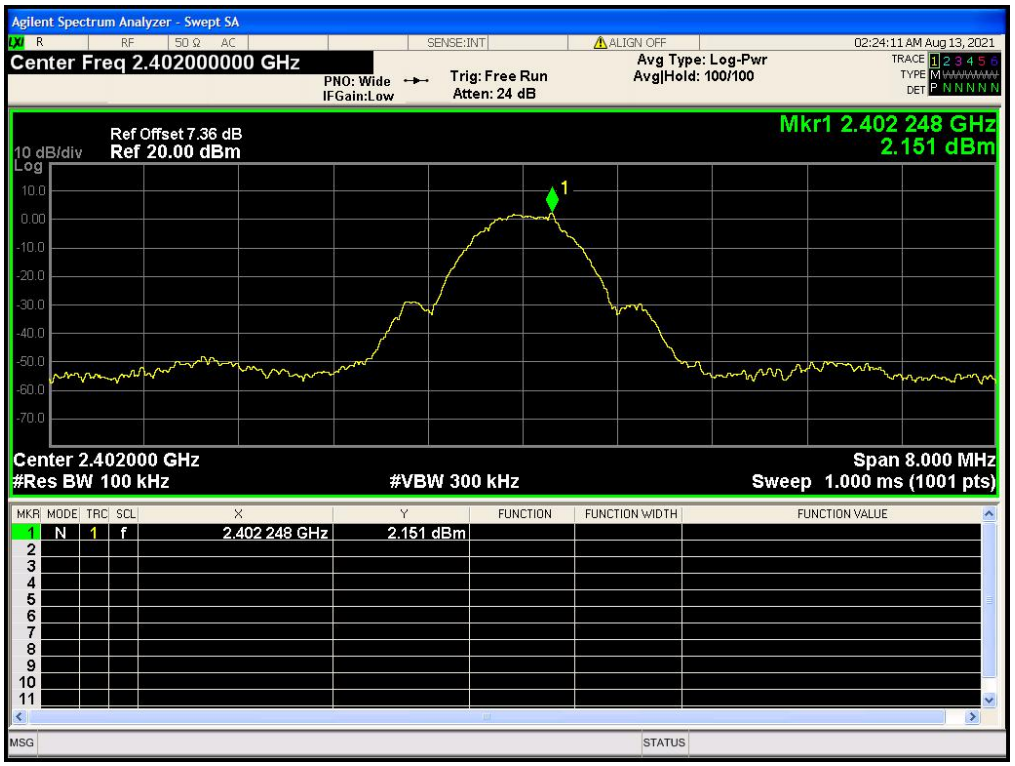
The measurement frequency range is from 30MHz to the 10th harmonic of the fundamental frequency. The lowest, middle and highest channels are tested to verify the spurious emissions.

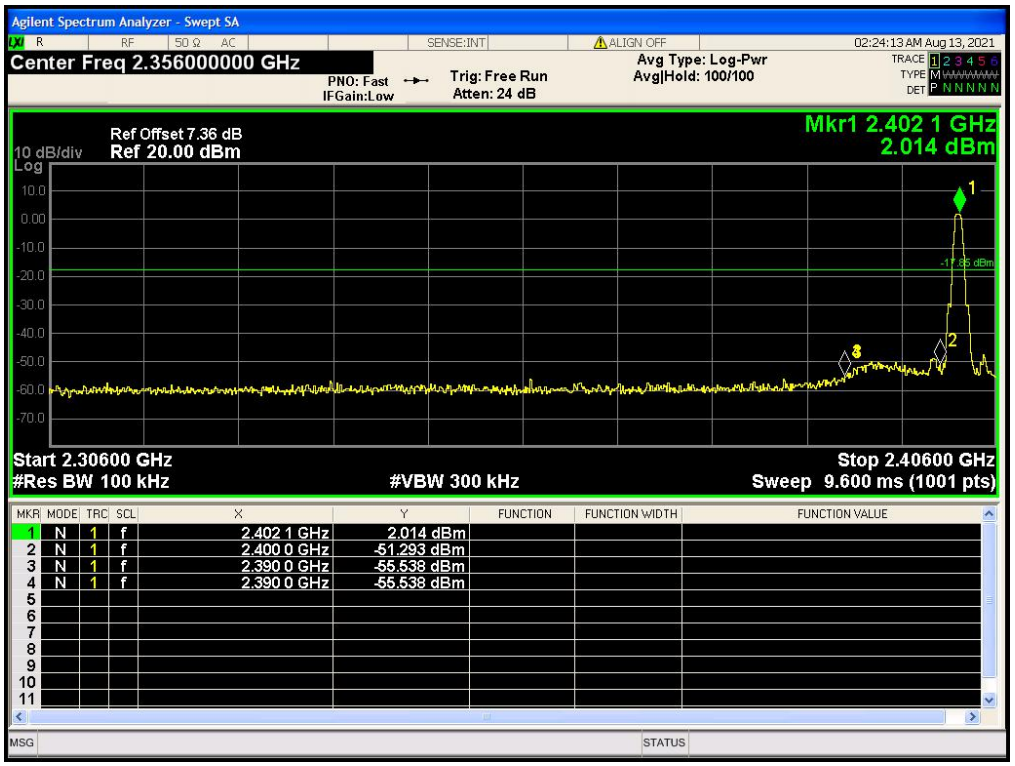
A. Test Plots:

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

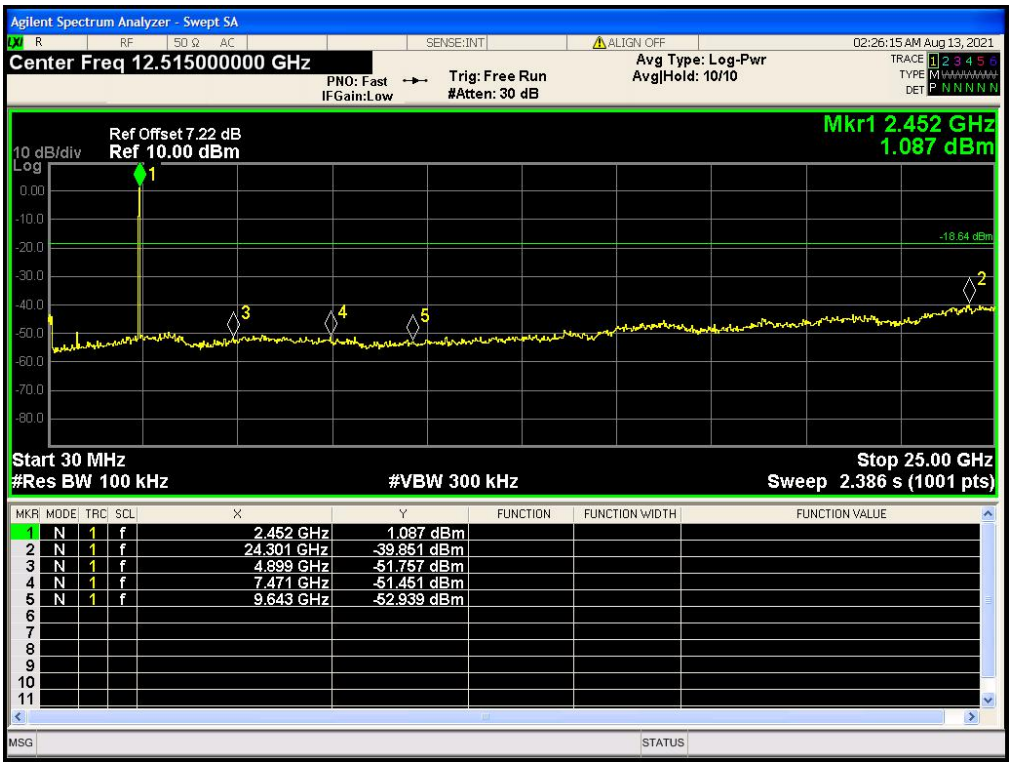


(LE 1M PHY _ Conducted Spurious Emissions _ Channel = 0, 30MHz to 25GHz)

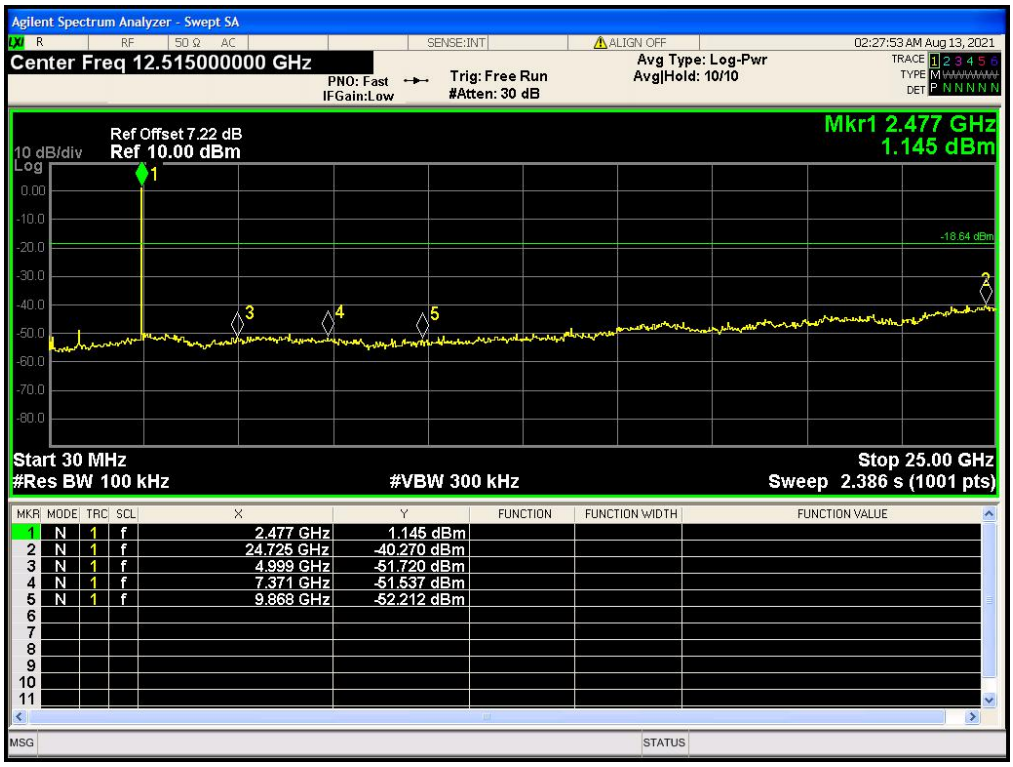




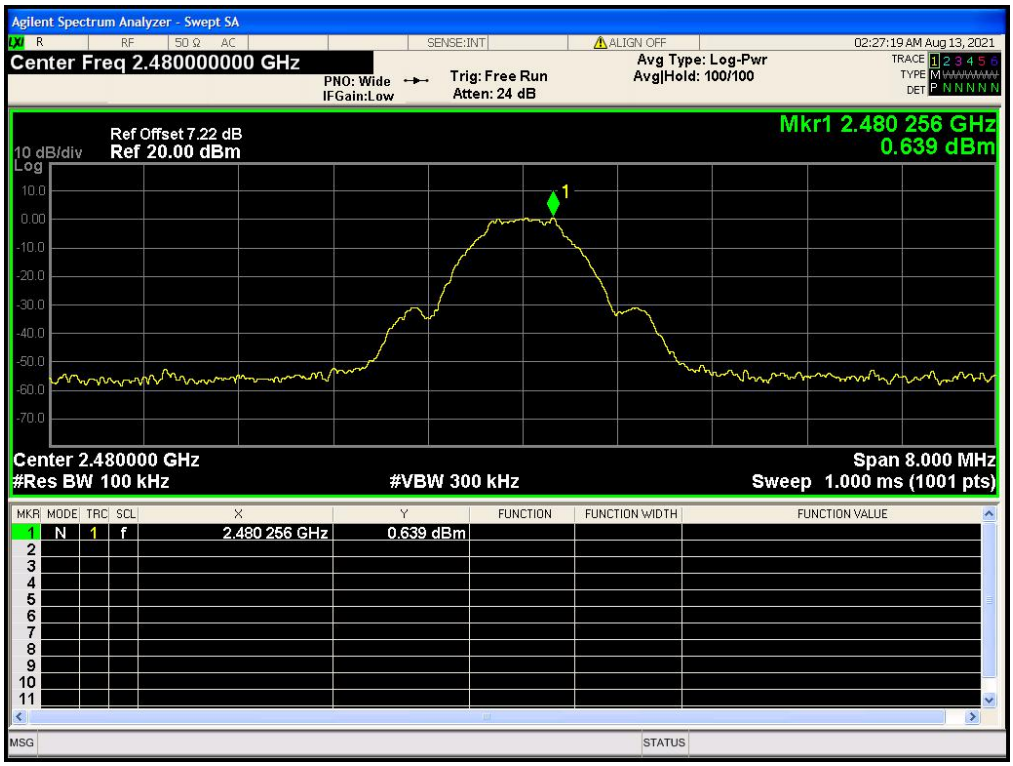
(LE 1M PHY _ Bandedge, Channel = 0)

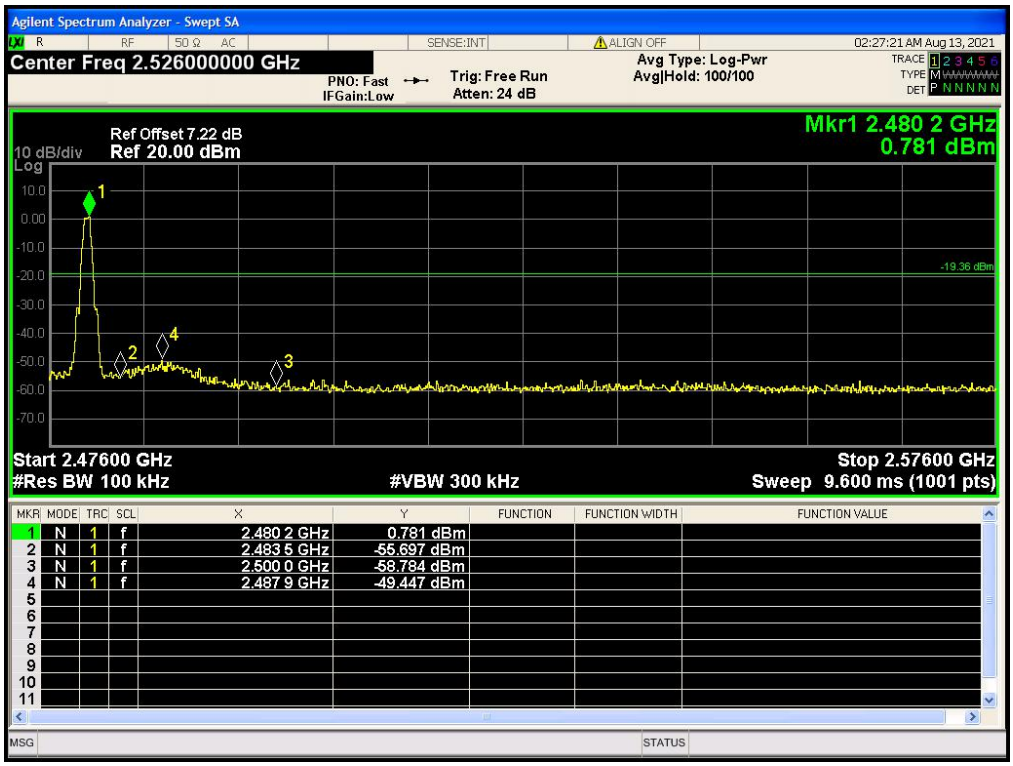


(LE 1M PHY _ Conducted Spurious Emissions _ Channel = 19, 30MHz to 25GHz)



(LE 1M PHY _ Conducted Spurious Emissions _ Channel = 39, 30MHz to 25GHz)





(LE 1M PHY _ Bandedge, 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.

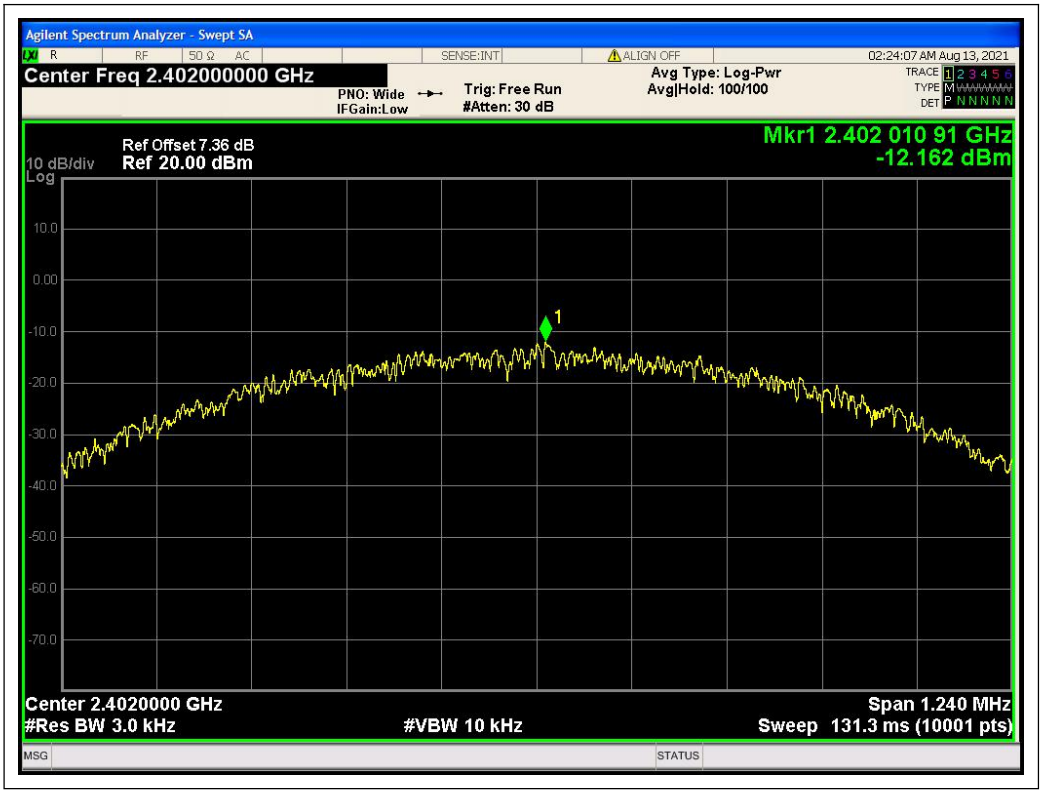
2.5.4. Test Result

The lowest, middle and highest channels are tested.

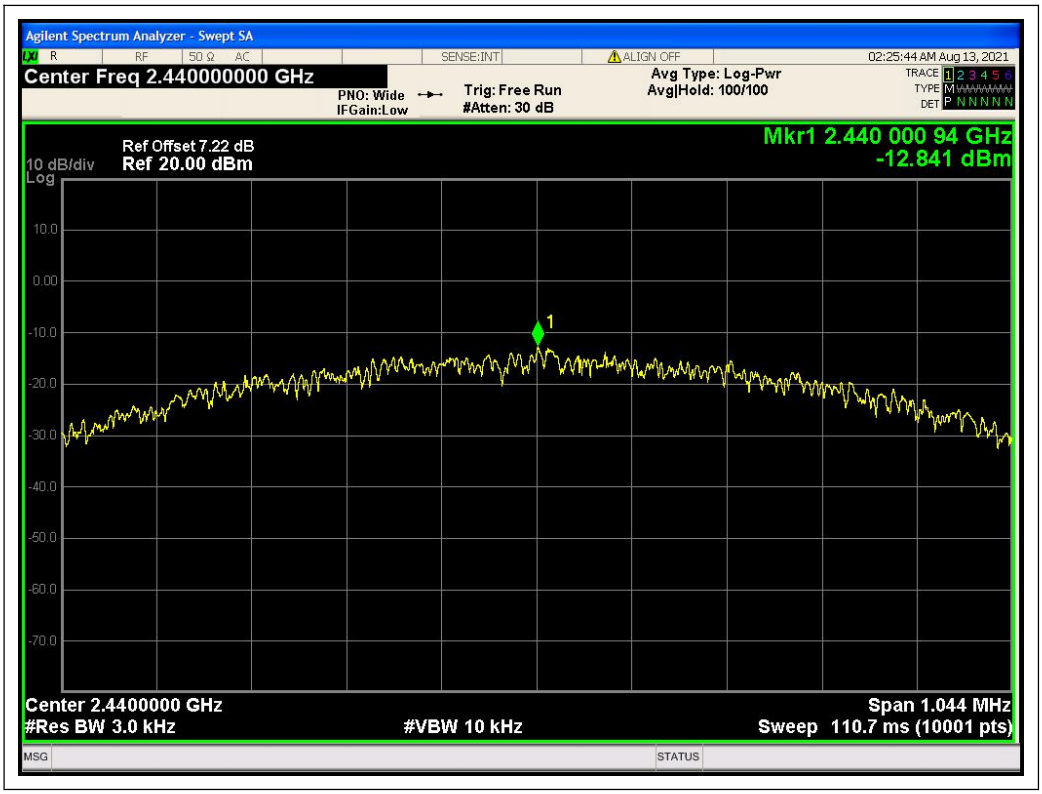
A. Test Verdict:

Mode	Channel	Frequency (MHz)	Measured PSD (dBm/3kHz)	Limit (dBm/3kHz)	Verdict
1M PHY	0	2402	-12.162	8	PASS
	19	2440	-12.841	8	PASS
	39	2480	-13.688	8	PASS

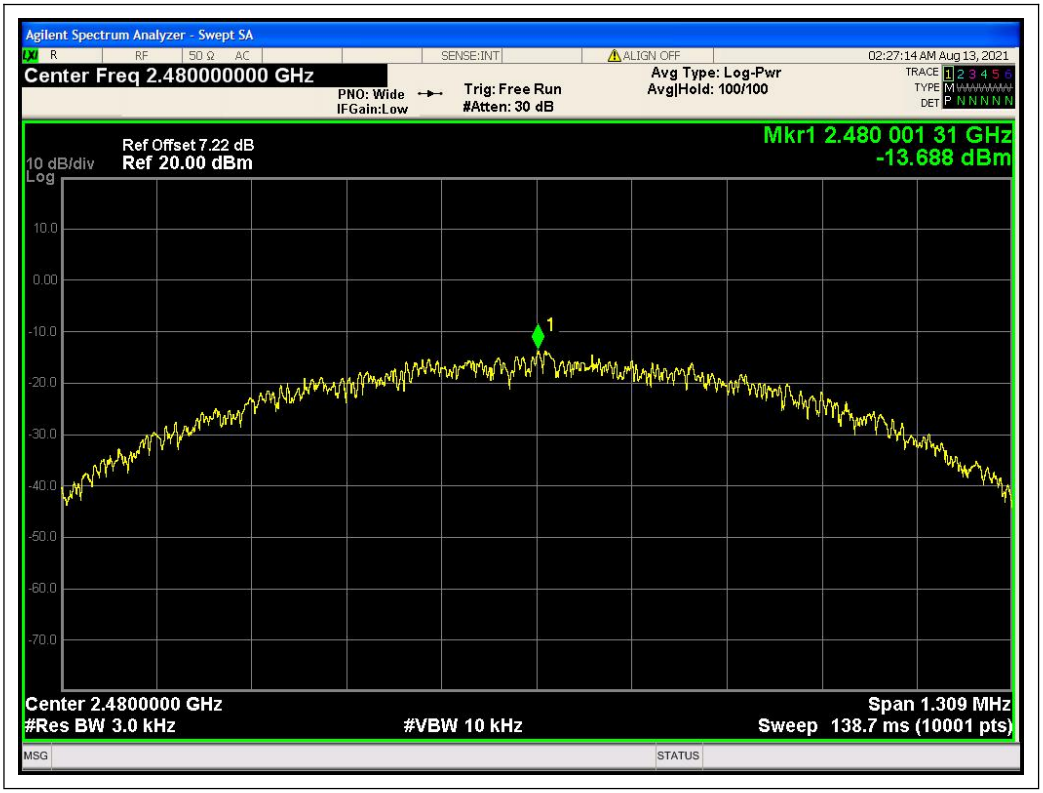
B. Test Plots



(LE 1M PHY _ Channel = 0, 2402MHz)



(LE 1M PHY_ Channel = 19, 2440MHz)



(LE 1M PHY _ Channel = 39, 2480MHz)

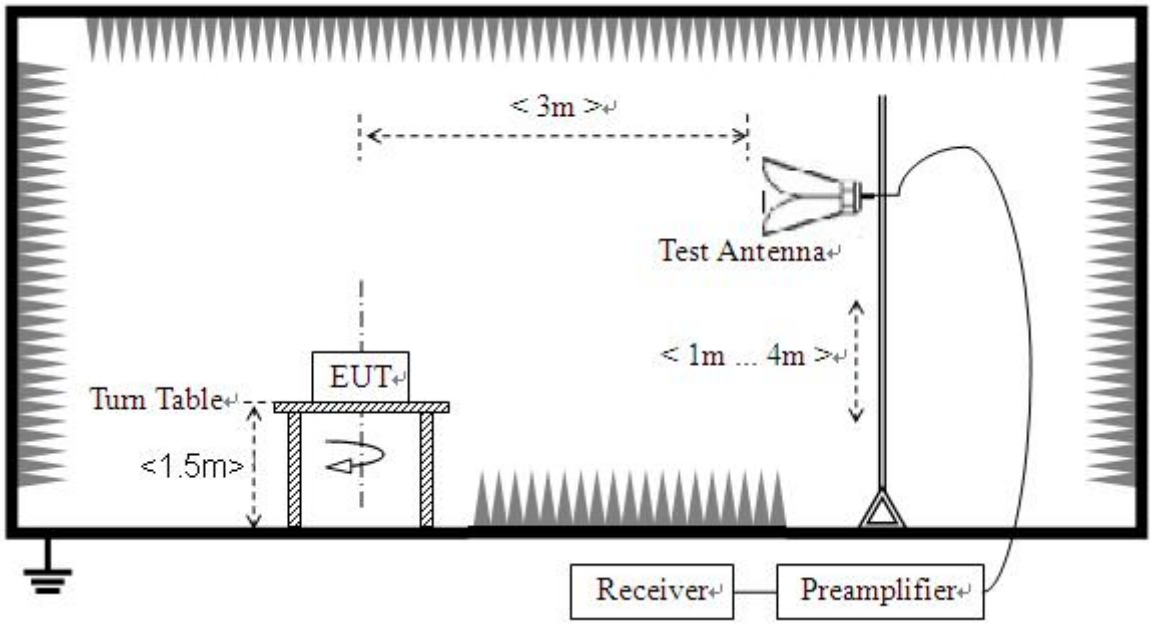
2.6. Restricted Frequency Bands

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.

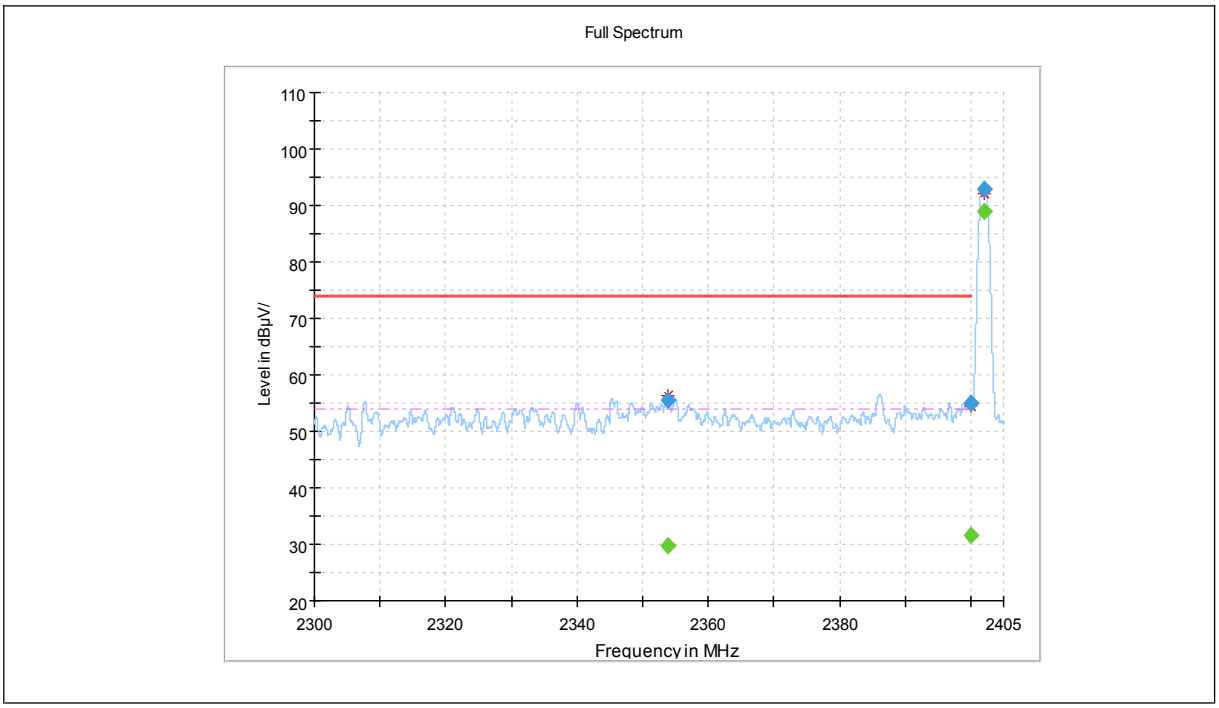
B. Equipments List:

Please refer ANNEX B(4).

2.6.3. Test Result

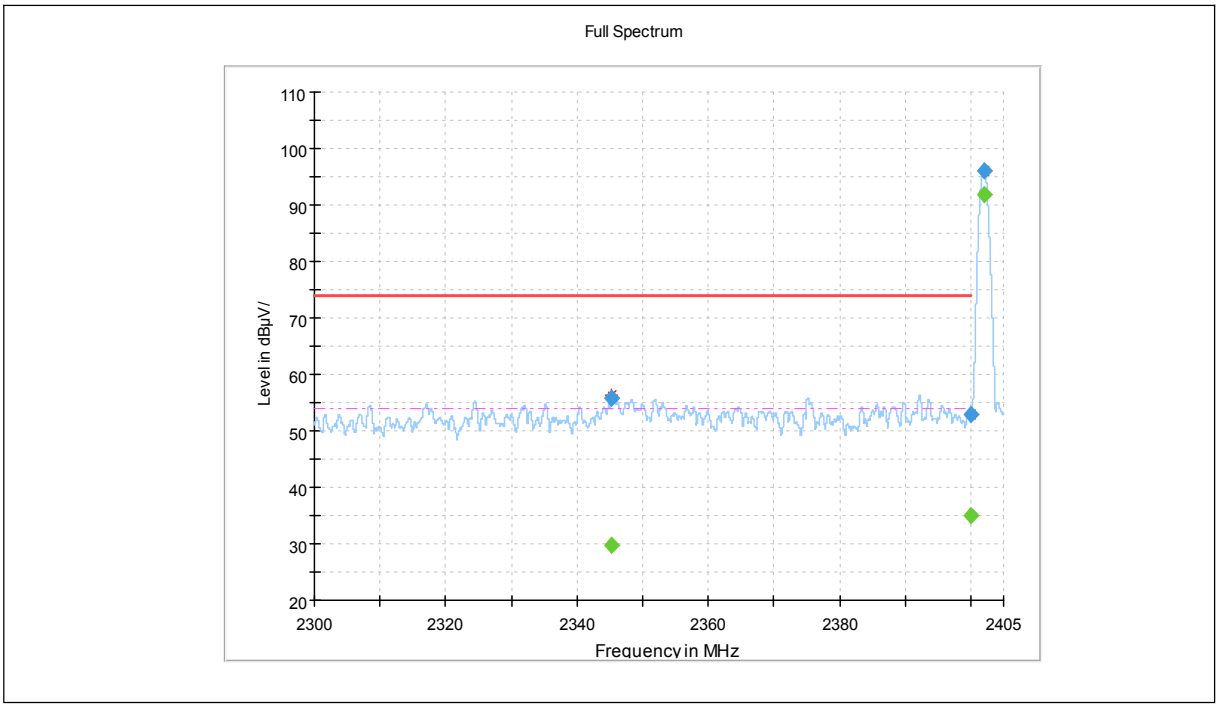
The lowest and highest channels are tested to verify Restricted Frequency Bands.
The measurement results are obtained as below:
E [dBμV/m] =U_R + A_T + A_{Factor} [dB]; AT =$L_{Cable\ loss}$ [dB]-G_{preamp} [dB]
A_T: Total correction Factor except Antenna
U_R: Receiver Reading
G_{preamp}: Preamplifier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

Test Plots:



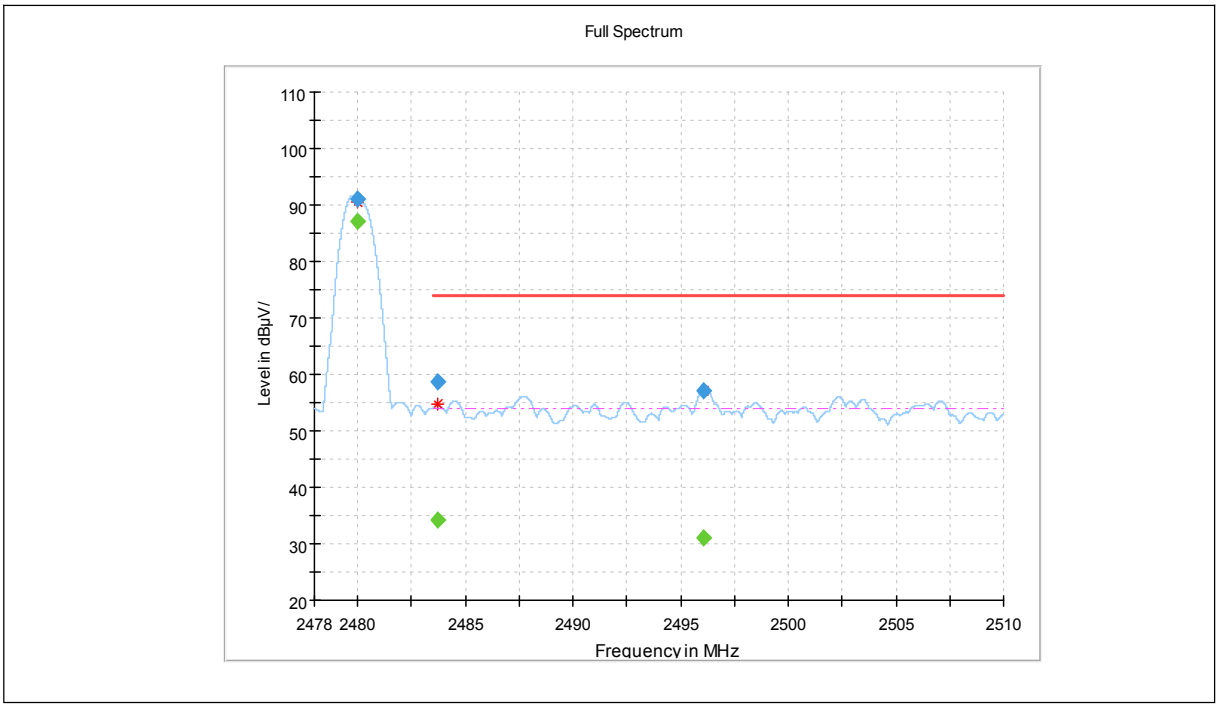
(LE 1M PHY_2402MHz, Antenna Horizontal)

Frequency (MHz)	MaxPeak (dB µ V/m)	Average (dB µ V//m)	Limit (dB µ V//m)	Margin (dB)	Pol	Corr. (dB/m)	Verdict
2353.760000	55.55	---	74.00	19.45	H	7.7	PASS
2353.760000	---	29.85	54.00	24.15	H	7.7	PASS
2399.983333	---	31.71	54.00	22.29	H	8.7	PASS
2399.983333	54.89	---	74.00	19.11	H	8.7	PASS
2402.001667	93.00	---	---	---	H	8.7	PASS
2402.001667	---	88.98	---	---	H	8.7	PASS



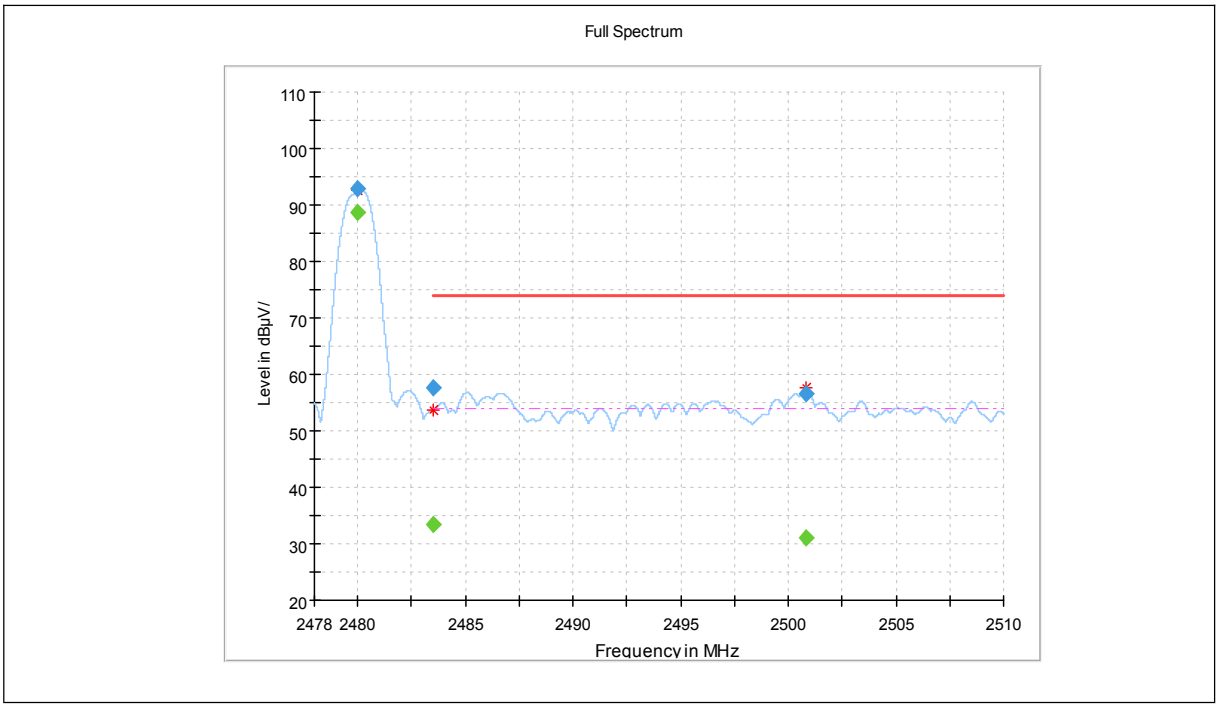
(LE 1M PHY_2402MHz, Antenna Vertical)

Frequency (MHz)	MaxPeak (dB µ V/m)	Average (dB µ V//m)	Limit (dB µ V//m)	Margin (dB)	Pol	Corr. (dB/m)	Verdict
2345.330833	---	29.64	54.00	24.36	V	7.7	PASS
2345.330833	55.86	---	74.00	17.14	V	7.7	PASS
2399.983333	52.87	---	74.00	21.13	V	8.7	PASS
2399.983333	---	34.94	54.00	19.06	V	8.7	PASS
2402.001667	95.94	---	---	---	V	8.7	PASS
2402.001667	---	91.94	---	---	V	8.7	PASS



(LE 1M PHY_2480MHz, Antenna Horizontal)

Frequency (MHz)	MaxPeak (dB µ V/m)	Average (dB µ V//m)	Limit (dB µ V//m)	Margin (dB)	Pol	Corr. (dB/m)	Verdict
2480.000000	91.11	---	---	---	H	8.2	PASS
2480.000000	---	87.07	---	---	H	8.2	PASS
2483.729778	58.77	---	74.00	15.23	H	8.3	PASS
2483.729778	---	34.23	54.00	19.77	H	8.3	PASS
2496.040889	---	31.17	54.00	22.83	H	8.4	PASS
2496.040889	57.03	---	74.00	16.97	H	8.4	PASS



(LE 1M PHY_2480MHz, Antenna Vertical)

Frequency (MHz)	MaxPeak (dB µ V/m)	Average (dB µ V//m)	Limit (dB µ V//m)	Margin (dB)	Pol	Corr. (dB/m)	Verdict
2480.000000	92.79	---	---	---	V	8.2	PASS
2480.000000	---	88.77	---	---	V	8.2	PASS
2483.509333	57.67	---	74.00	16.33	V	8.3	PASS
2483.509333	---	33.49	54.00	20.51	V	8.3	PASS
2500.830222	---	31.09	54.00	22.91	V	8.4	PASS
2500.830222	56.59	---	74.00	17.41	V	8.4	PASS

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

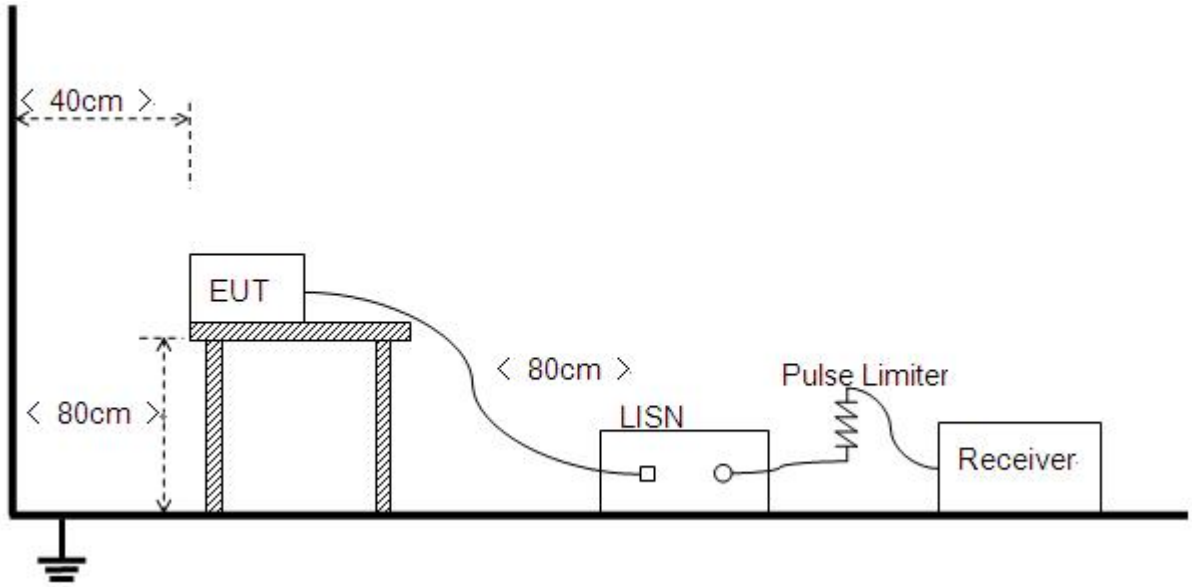
NOTE:

(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

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.

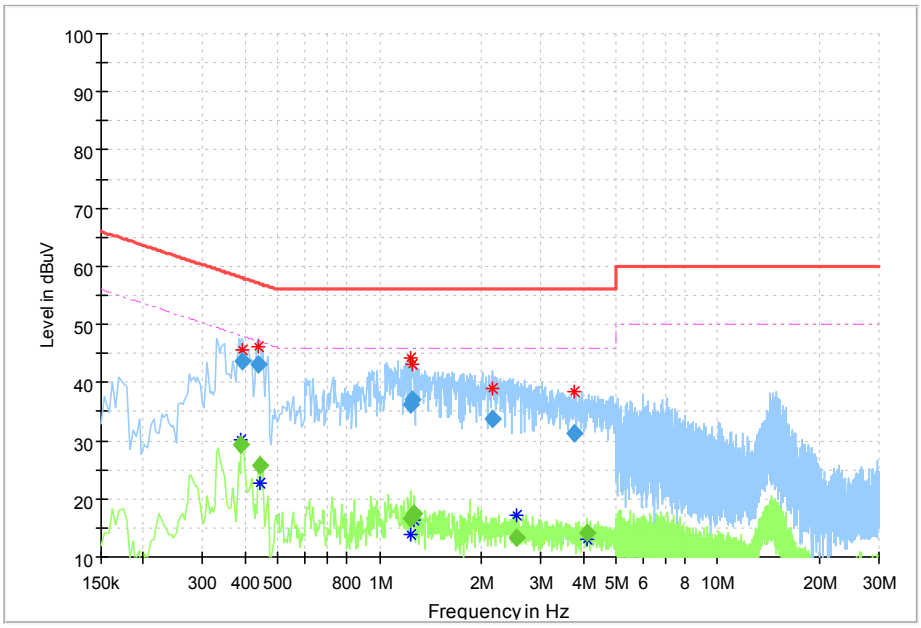
Note: Both of the test voltage AC 120V/60Hz and AC 230V/50Hz were considered and tested respectively, only the results of the worst case AC 120V/60Hz were recorded in this report.

A. Test setup:

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

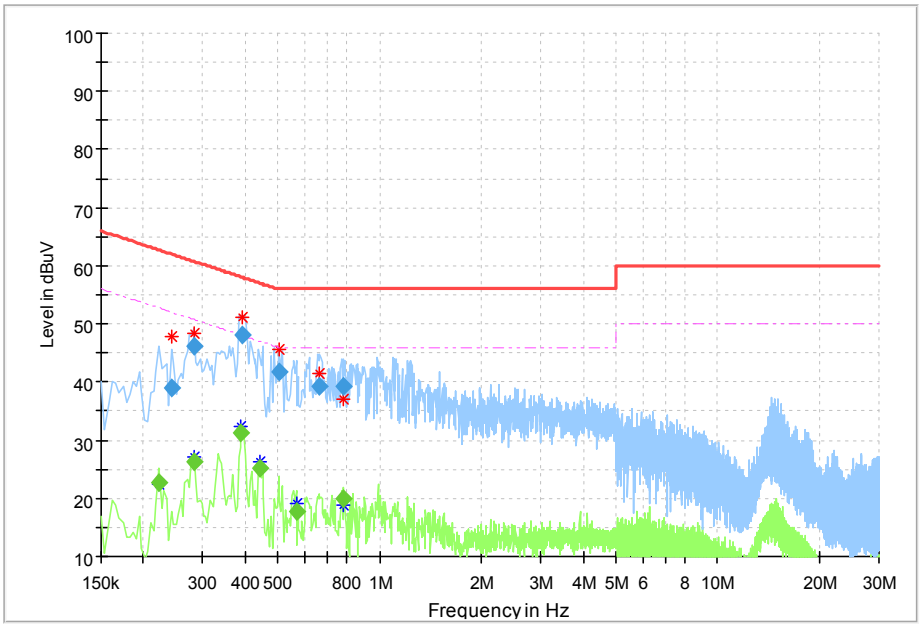
Note: The test voltage is AC 120V/60Hz.

B. Test Plots:



(Plot A: L Phase)

Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Line	Corr. (dB)	Verdict
0.390000	---	30.21	48.06	17.86	L	10.0	PASS
0.394000	45.64	---	57.98	12.34	L	10.0	PASS
0.438000	46.06	---	57.10	11.04	L	10.0	PASS
0.442000	---	22.79	47.02	24.24	L	10.0	PASS
1.234000	---	13.81	46.00	32.19	L	10.0	PASS
1.234000	44.10	---	56.00	11.90	L	10.0	PASS
1.254000	43.02	---	56.00	12.98	L	10.0	PASS
1.262000	---	16.45	46.00	29.55	L	10.0	PASS
2.158000	39.00	---	56.00	17.00	L	10.0	PASS
2.546000	---	17.07	46.00	28.93	L	10.0	PASS
3.766000	38.44	---	56.00	17.56	L	10.1	PASS
4.102000	---	13.05	46.00	32.95	L	10.1	PASS



(Plot A: N Phase)

Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Line	Corr. (dB)	Verdict
0.222000	---	22.49	52.74	30.25	N	10.0	PASS
0.242000	47.78	---	62.03	14.25	N	10.0	PASS
0.282000	---	27.11	50.76	23.64	N	10.0	PASS
0.282000	48.38	---	60.76	12.37	N	10.0	PASS
0.390000	---	32.37	48.06	15.69	N	10.0	PASS
0.394000	51.12	---	57.98	6.86	N	10.0	PASS
0.442000	---	26.27	47.02	20.75	N	10.0	PASS
0.502000	45.71	---	56.00	10.29	N	10.0	PASS
0.566000	---	19.17	46.00	26.83	N	10.0	PASS
0.666000	41.36	---	56.00	14.64	N	10.0	PASS
0.782000	37.12	---	56.00	18.88	N	10.0	PASS
0.782000	---	18.70	46.00	27.30	N	10.0	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:

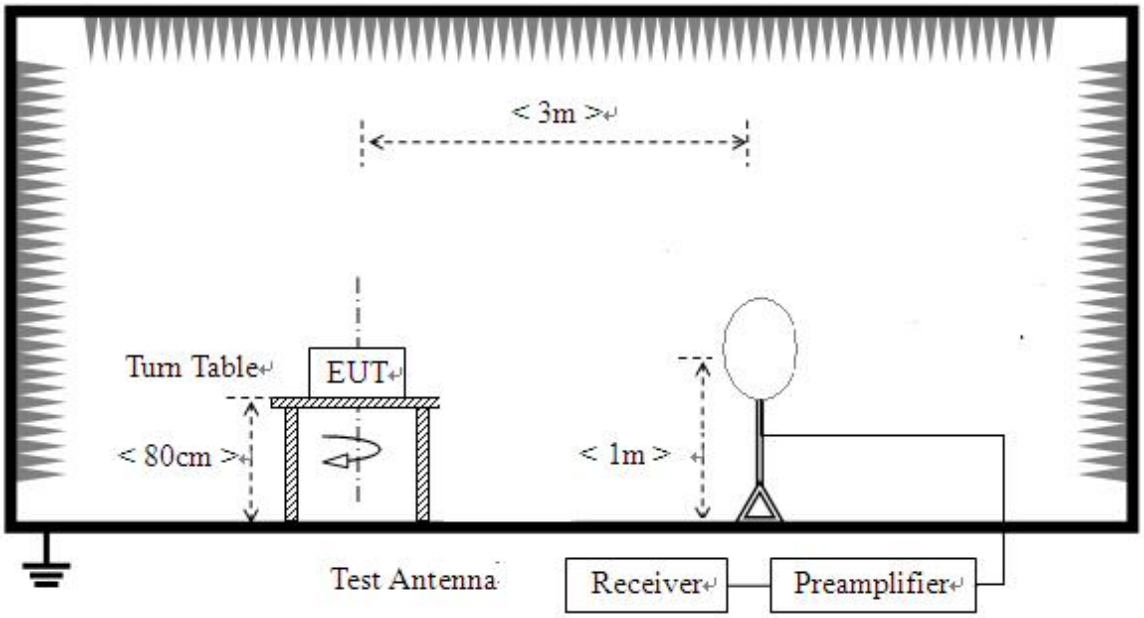
1. For Above 1000MHz, the emission limit in this paragraph is based on measurement instrumentation employing an average detector, measurement using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit.
2. For above 1000MHz, limit field strength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

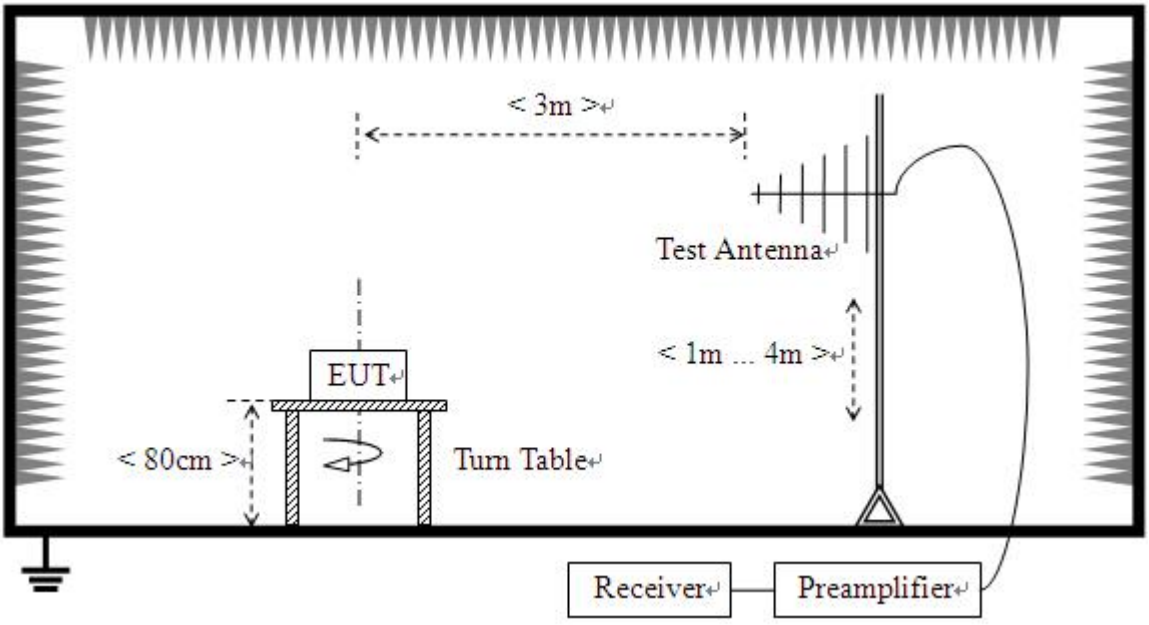
2.8.2. Test Description

A. Test Setup:

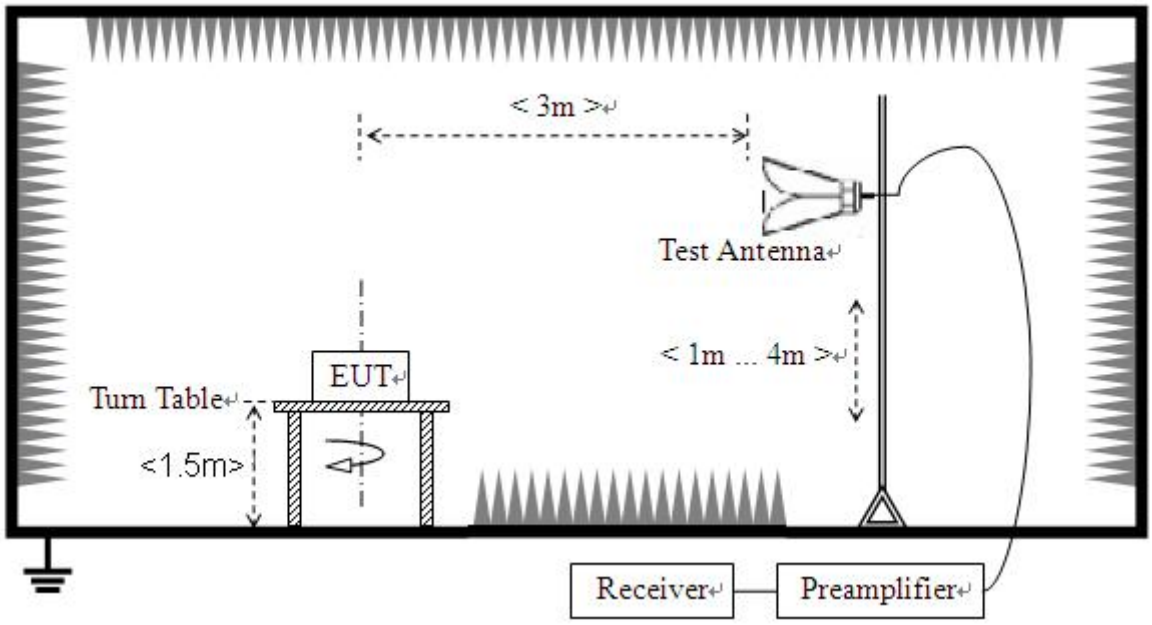
1) For radiated emissions from 9kHz to 30MHz



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.

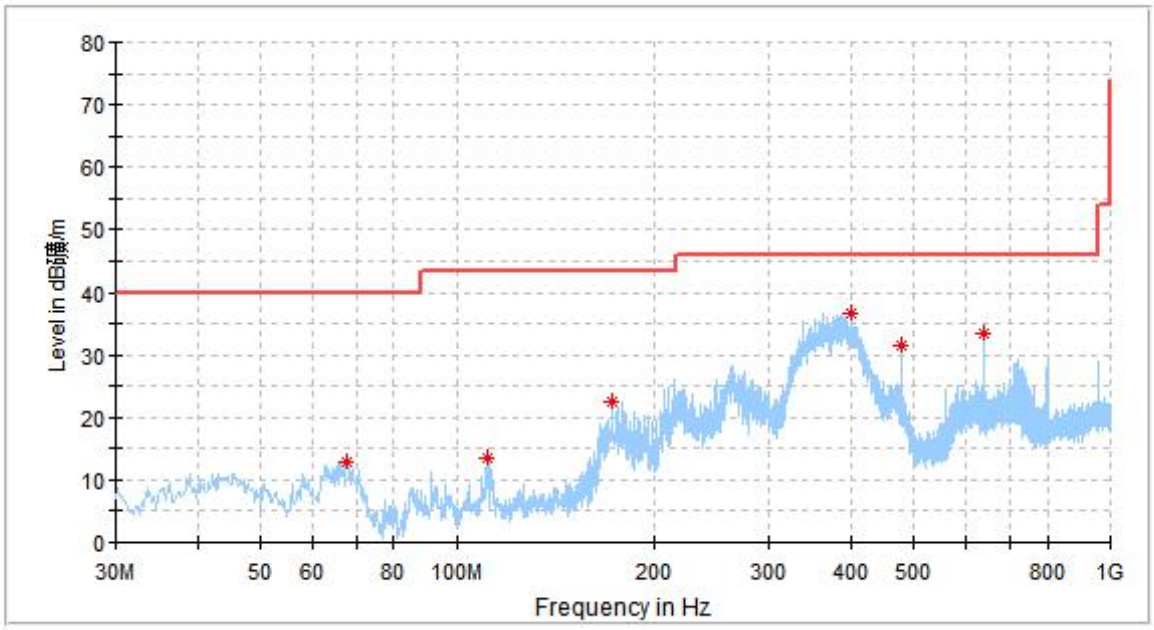
B. Equipments List:

Please refer ANNEX B(4).

2.8.3. Test Result

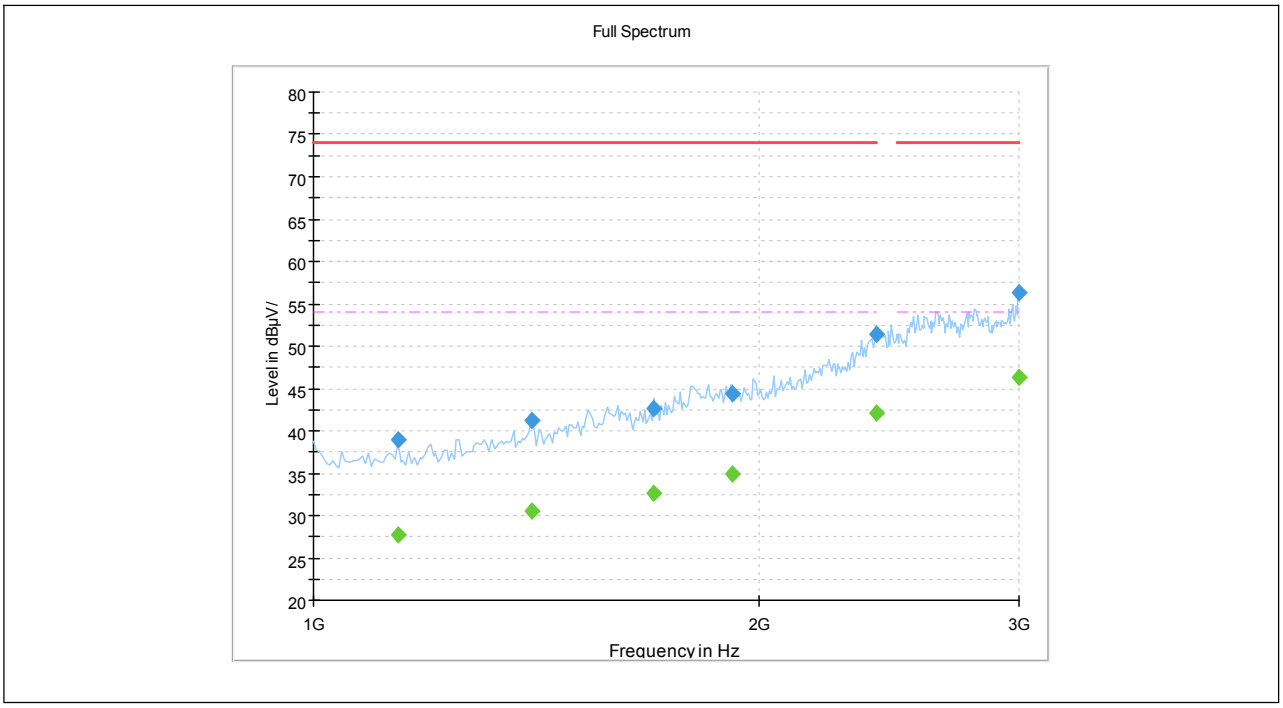
Note1: For the frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit was not recorded.

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.



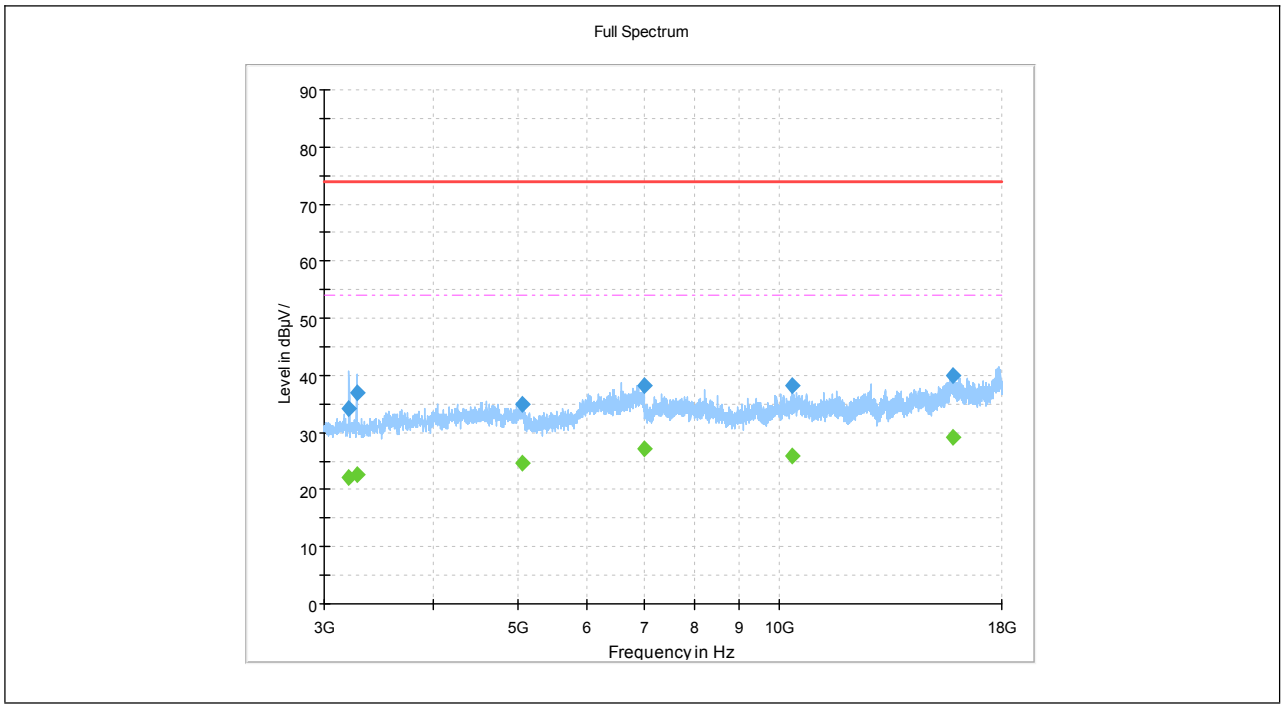
(LE 1M PHY_2402MHz, Antenna Horizontal, 30MHz to 1GHz)

Frequency (MHz)	MaxPeak (dB µ V/m)	Limit (dB µ V//m)	Margin (dB)	Pol	Corr. (dB/m)	Verdict
67.636000	13.00	40.00	27.00	H	-22.2	PASS
111.480000	13.49	43.50	30.01	H	-20.9	PASS
172.590000	22.51	43.50	20.99	H	-21.7	PASS
400.152000	36.47	46.00	9.53	H	-14.9	PASS
480.080000	31.51	46.00	14.49	H	-14.1	PASS
640.130000	33.46	46.00	12.54	H	-12.3	PASS



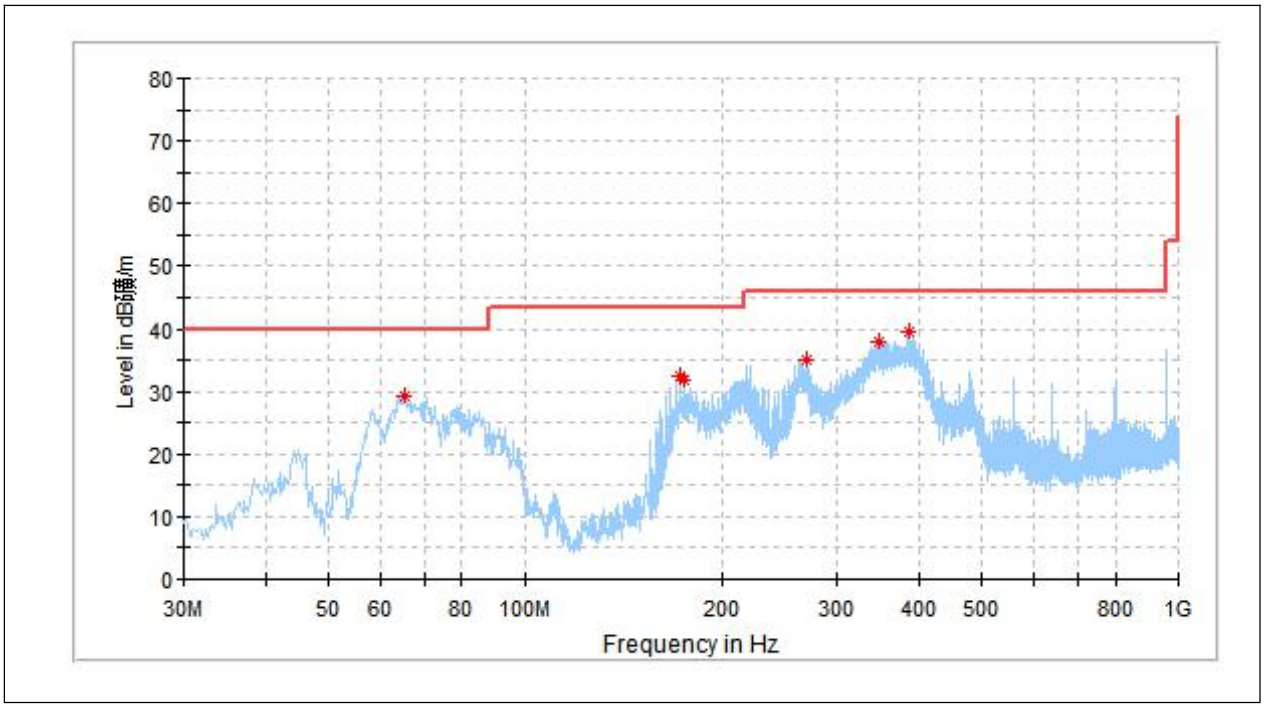
(LE 1M PHY _2402MHz, Antenna Horizontal, 1GHz to 3GHz)

Frequency (MHz)	MaxPeak (dB µ V/m)	Average (dB µ V//m)	Limit (dB µ V//m)	Margin (dB)	Pol	Corr. (dB/m)	Verdict
1140.000000	38.98	---	74.00	35.02	H	30.5	PASS
1140.000000	---	27.74	54.00	26.26	H	30.5	PASS
1405.000000	41.29	---	74.00	32.71	H	33.3	PASS
1405.000000	---	30.55	54.00	23.45	H	33.3	PASS
1700.000000	42.69	---	74.00	31.31	H	35.2	PASS
1700.000000	---	32.69	54.00	21.31	H	35.2	PASS
1920.000000	44.34	---	74.00	29.66	H	37.0	PASS
1920.000000	---	34.87	54.00	19.13	H	37.0	PASS
2400.000000	51.37	---	74.00	22.63	H	43.7	PASS
2400.000000	---	42.19	54.00	11.81	H	43.7	PASS
3000.000000	56.36	---	74.00	17.64	H	47.7	PASS
3000.000000	---	46.31	54.00	7.69	H	47.7	PASS



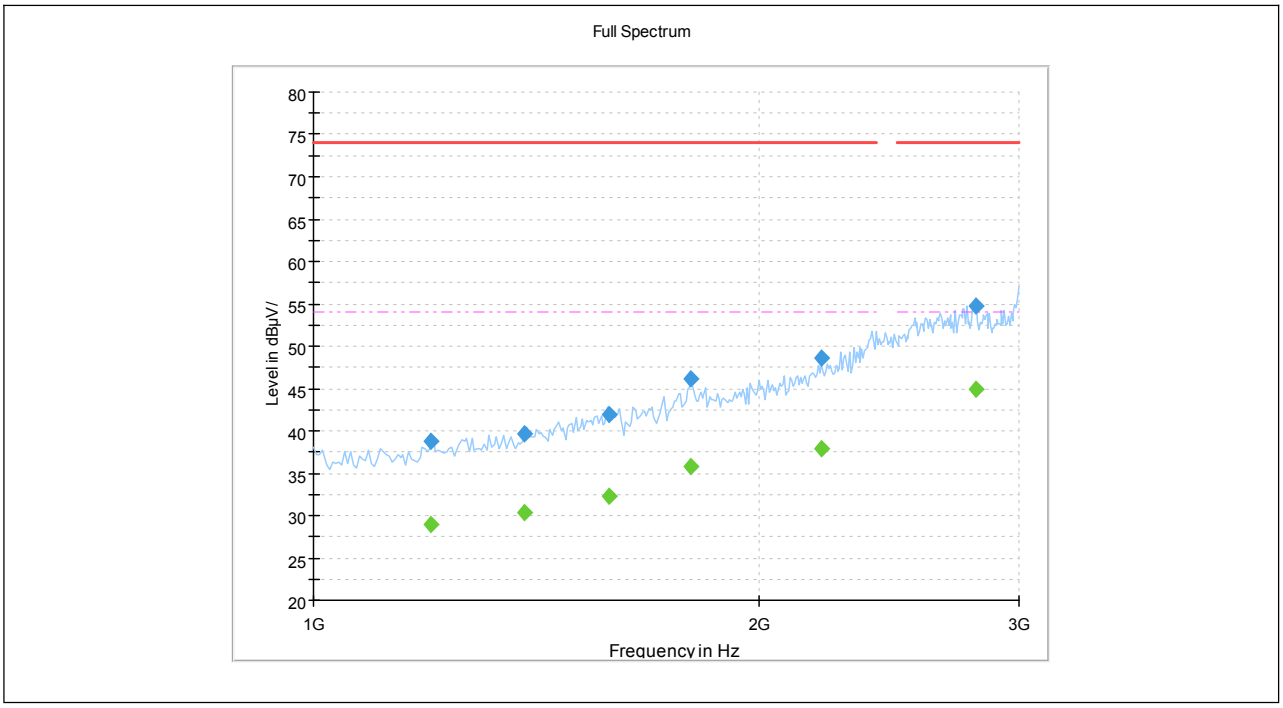
(LE 1M PHY _2402MHz, Antenna Horizontal, 3GHz to 18GHz)

Frequency (MHz)	MaxPeak (dB µ V/m)	Average (dB µ V//m)	Limit (dB µ V//m)	Margin (dB)	Pol	Corr. (dB/m)	Verdict
3204.000000	34.15	---	74.00	39.85	H	-6.4	PASS
3204.000000	---	22.03	54.00	31.97	H	-6.4	PASS
3268.500000	37.02	---	74.00	36.98	H	-3.3	PASS
3268.500000	---	22.52	54.00	31.48	H	-3.3	PASS
5065.500000	---	24.52	54.00	29.48	H	-2.7	PASS
5065.500000	34.98	---	74.00	39.02	H	-2.7	PASS
6997.500000	---	27.24	54.00	26.76	H	-0.4	PASS
6997.500000	38.27	---	74.00	35.73	H	-0.4	PASS
10353.000000	38.13	---	74.00	35.87	H	2.1	PASS
10353.000000	---	25.84	54.00	28.16	H	2.1	PASS
15832.500000	39.86	---	74.00	34.14	H	8.2	PASS
15832.500000	---	29.07	54.00	24.93	H	8.2	PASS



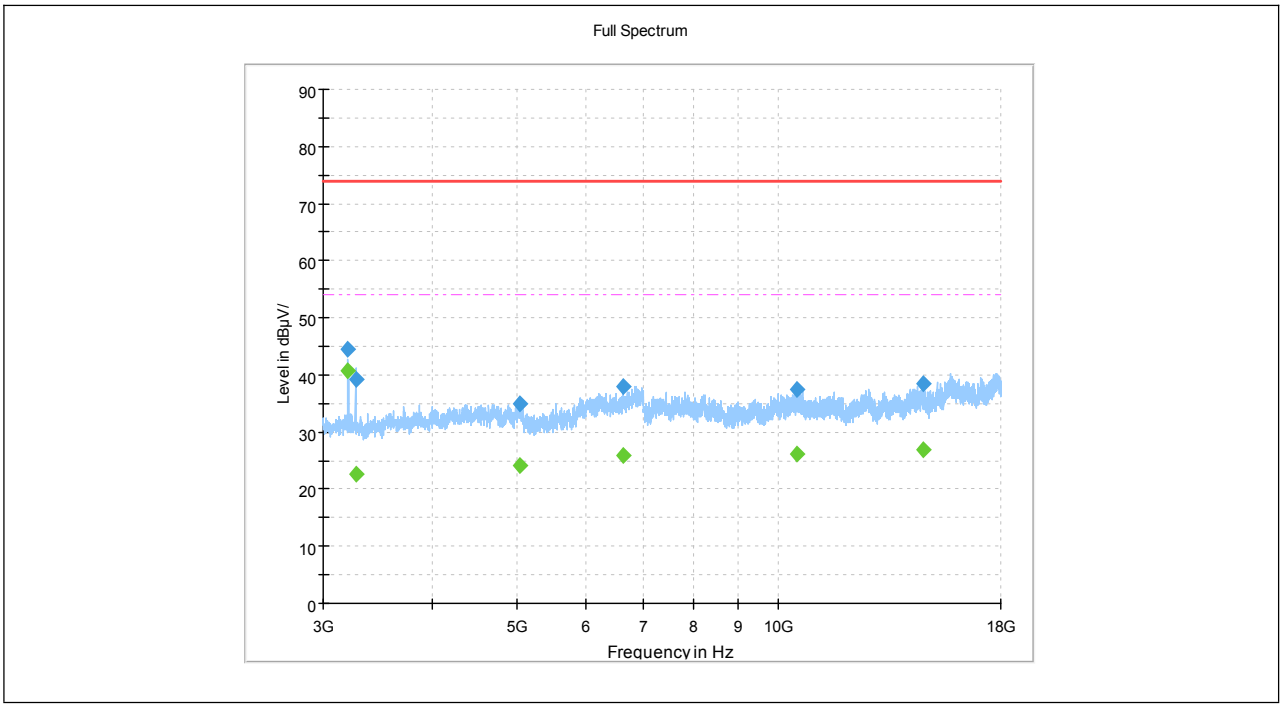
(LE 1M PHY _2402MHz, Antenna Vertical, 30MHz to 1GHz)

Frequency (MHz)	MaxPeak (dB µ V/m)	Limit (dB µ V//m)	Margin (dB)	Pol	Corr. (dB/m)	Verdict
65.502000	29.20	40.00	10.80	V	-21.3	PASS
172.784000	32.31	43.50	11.19	V	-21.8	PASS
175.306000	31.93	43.50	11.57	V	-21.9	PASS
270.366000	35.06	46.00	10.94	V	-18.9	PASS
348.742000	37.82	46.00	8.18	V	-16.6	PASS
386.960000	39.53	46.00	6.47	V	-15.4	PASS



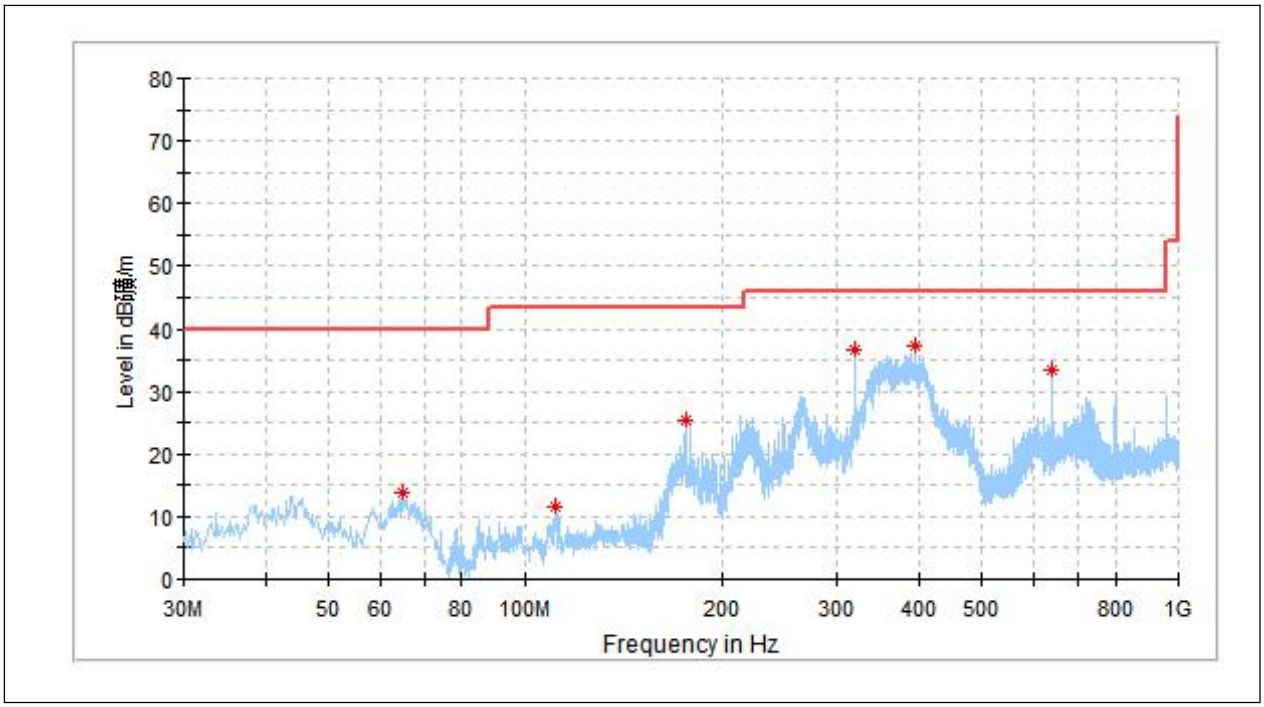
(LE 1M PHY _2402MHz, Antenna Vertical , 1GHz to 3GHz)

Frequency (MHz)	MaxPeak (dB µ V/m)	Average (dB µ V//m)	Limit (dB µ V//m)	Margin (dB)	Pol	Corr. (dB/m)	Verdict
1200.000000	38.83	---	74.00	35.17	V	31.8	PASS
1200.000000	---	28.97	54.00	25.03	V	31.8	PASS
1390.000000	---	30.38	54.00	23.62	V	33.2	PASS
1390.000000	39.63	---	74.00	34.37	V	33.2	PASS
1585.000000	---	32.23	54.00	21.77	V	34.9	PASS
1585.000000	41.93	---	74.00	32.07	V	34.9	PASS
1800.000000	46.15	---	74.00	27.85	V	38.0	PASS
1800.000000	---	35.86	54.00	18.14	V	38.0	PASS
2205.000000	48.53	---	74.00	25.47	V	39.9	PASS
2205.000000	---	37.94	54.00	16.06	V	39.9	PASS
2805.000000	54.81	---	74.00	19.19	V	45.7	PASS
2805.000000	---	44.84	54.00	9.16	V	45.7	PASS



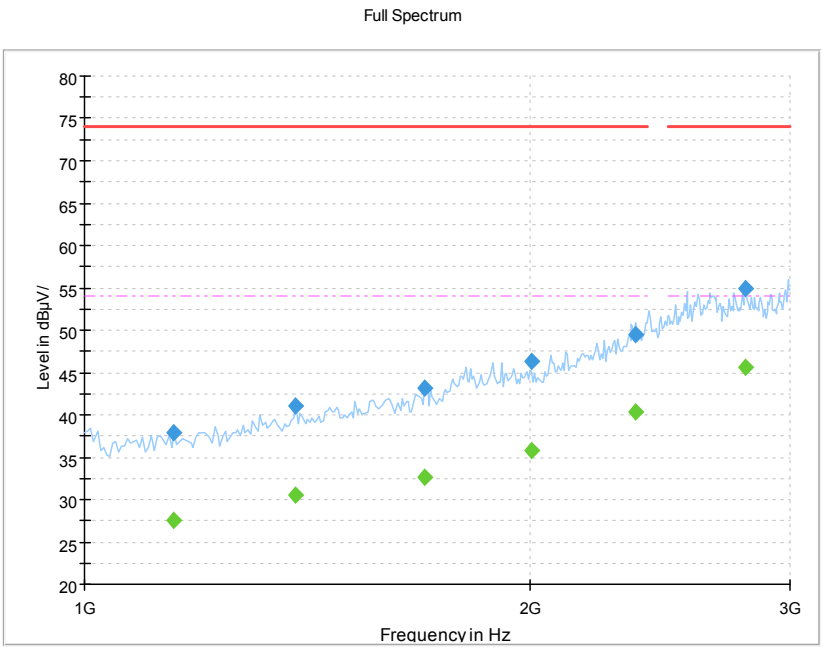
(LE 1M PHY _2402MHz, Antenna Vertical , 3GHz to 18GHz)

Frequency (MHz)	MaxPeak (dB µ V/m)	Average (dB µ V//m)	Limit (dB µ V//m)	Margin (dB)	Pol	Corr. (dB/m)	Verdict
3205.500000	44.39	---	74.00	29.61	V	-6.3	PASS
3205.500000	---	40.80	54.00	13.20	V	-6.3	PASS
3268.500000	39.30	---	74.00	34.70	V	-3.3	PASS
3268.500000	---	22.64	54.00	31.36	V	-3.3	PASS
5050.500000	34.95	---	74.00	39.05	V	-0.4	PASS
5050.500000	---	24.25	54.00	29.75	V	-0.4	PASS
6628.500000	---	25.92	54.00	28.08	V	1.7	PASS
6628.500000	37.84	---	74.00	36.16	V	1.7	PASS
10498.500000	37.40	---	74.00	36.60	V	10.7	PASS
10498.500000	---	26.20	54.00	27.80	V	10.7	PASS
14677.500000	---	26.93	54.00	27.07	V	14.4	PASS
14677.500000	38.42	---	74.00	35.58	V	14.4	PASS



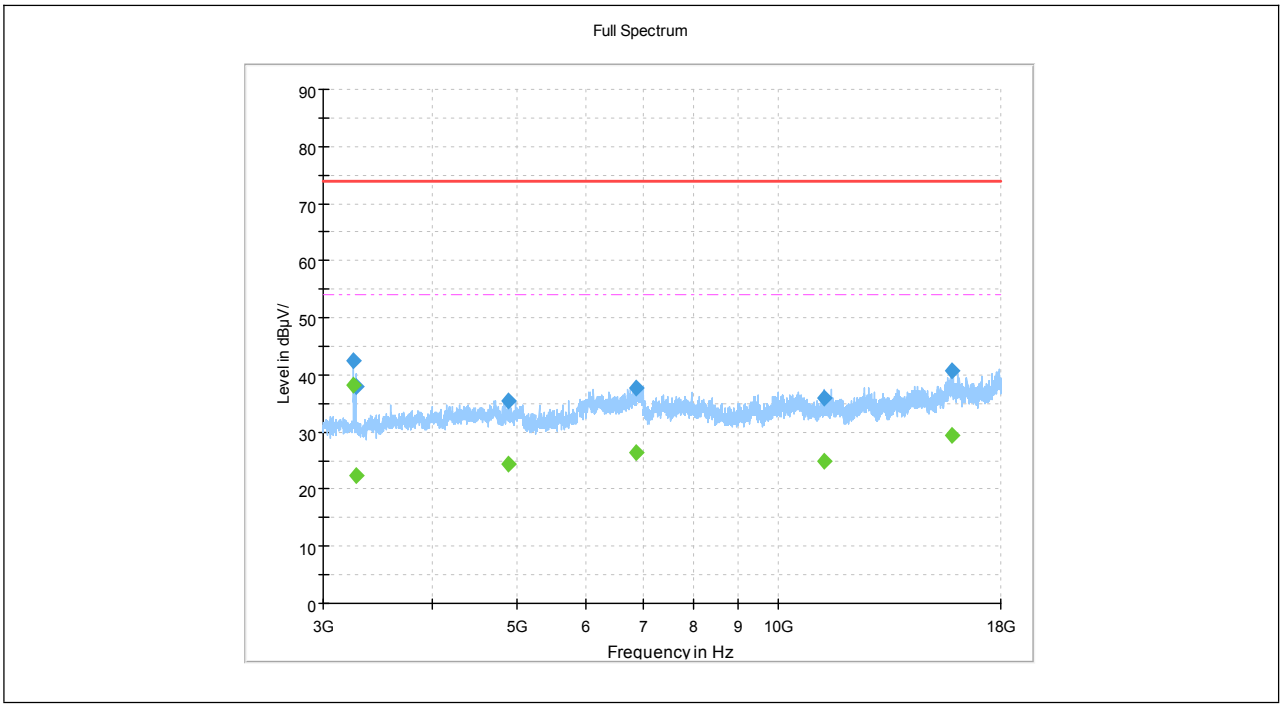
(LE 1M PHY _2440MHz, Antenna Horizontal, 30MHz to 1GHz)

Frequency (MHz)	MaxPeak (dB µ V/m)	Limit (dB µ V//m)	Margin (dB)	Pol	Corr. (dB/m)	Verdict
64.726000	13.95	40.00	26.05	H	-21.1	PASS
111.480000	11.42	43.50	32.08	H	-20.9	PASS
175.694000	25.42	43.50	18.08	H	-21.9	PASS
320.030000	36.57	46.00	9.43	H	-16.7	PASS
394.138000	37.28	46.00	8.72	H	-15.1	PASS
640.130000	33.38	46.00	12.62	H	-12.3	PASS



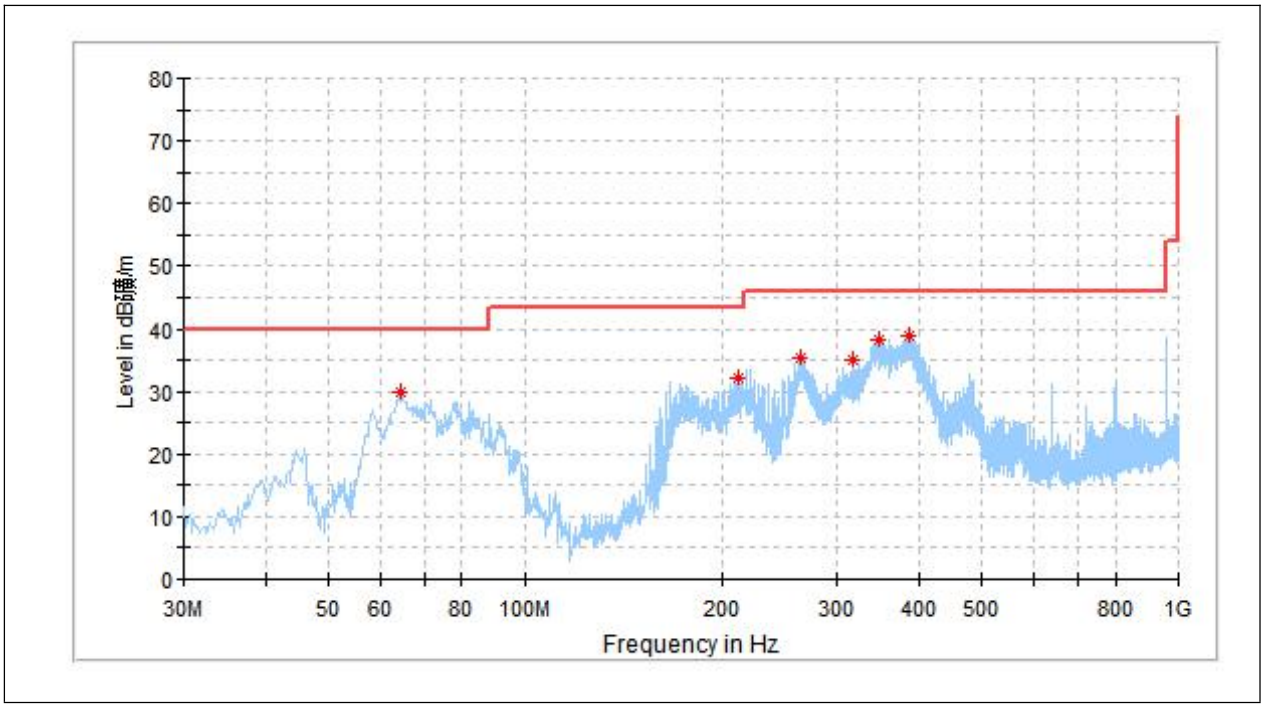
(LE 1M PHY _2440MHz, Antenna Horizontal, 1GHz to 3GHz)

Frequency (MHz)	MaxPeak (dB µ V/m)	Average (dB µ V//m)	Limit (dB µ V//m)	Margin (dB)	Pol	Corr. (dB/m)	Verdict
1150.000000	37.82	---	74.00	36.18	H	30.5	PASS
1150.000000	---	27.63	54.00	26.37	H	30.5	PASS
1390.000000	---	30.47	54.00	23.53	H	33.2	PASS
1390.000000	41.01	---	74.00	32.99	H	33.2	PASS
1700.000000	---	32.68	54.00	21.32	H	35.2	PASS
1700.000000	43.22	---	74.00	30.78	H	35.2	PASS
2005.000000	---	35.84	54.00	18.16	H	38.0	PASS
2005.000000	46.27	---	74.00	27.73	H	38.0	PASS
2360.000000	49.49	---	74.00	24.51	H	42.0	PASS
2360.000000	---	40.39	54.00	13.61	H	42.0	PASS
2800.000000	---	45.54	54.00	8.46	H	46.2	PASS
2800.000000	54.99	---	74.00	19.01	H	46.2	PASS



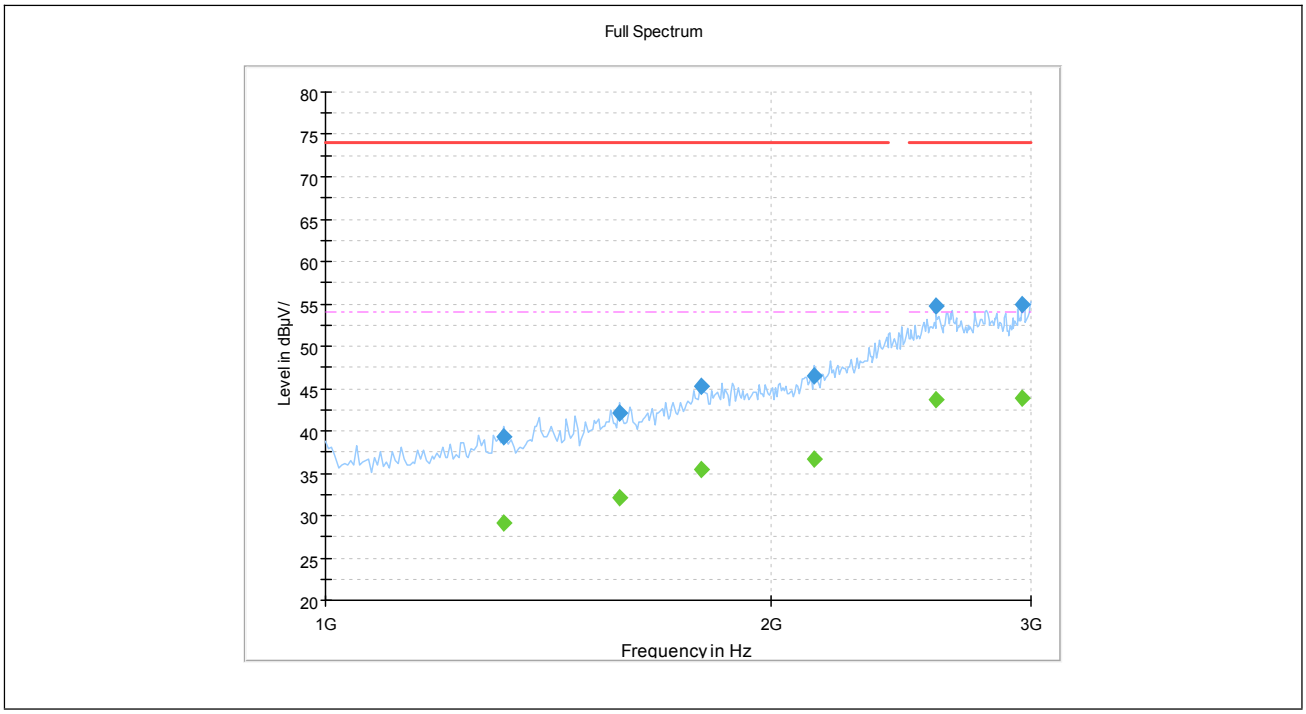
(LE 1M PHY _2440MHz, Antenna Horizontal, 3GHz to 18GHz)

Frequency (MHz)	MaxPeak (dB µ V/m)	Average (dB µ V//m)	Limit (dB µ V//m)	Margin (dB)	Pol	Corr. (dB/m)	Verdict
3253.500000	---	38.17	54.00	15.83	H	-5.9	PASS
3253.500000	42.40	---	74.00	31.60	H	-5.9	PASS
3268.500000	---	22.45	54.00	31.55	H	-2.8	PASS
3268.500000	38.08	---	74.00	35.92	H	-2.8	PASS
4896.000000	---	24.36	54.00	29.64	H	-0.3	PASS
4896.000000	35.39	---	74.00	38.61	H	-0.3	PASS
6858.000000	37.65	---	74.00	36.35	H	1.5	PASS
6858.000000	---	26.47	54.00	27.53	H	1.5	PASS
11305.500000	35.93	---	74.00	38.07	H	4.1	PASS
11305.500000	---	24.95	54.00	29.05	H	4.1	PASS
15795.000000	---	29.45	54.00	24.55	H	10.6	PASS
15795.000000	40.72	---	74.00	33.28	H	10.6	PASS



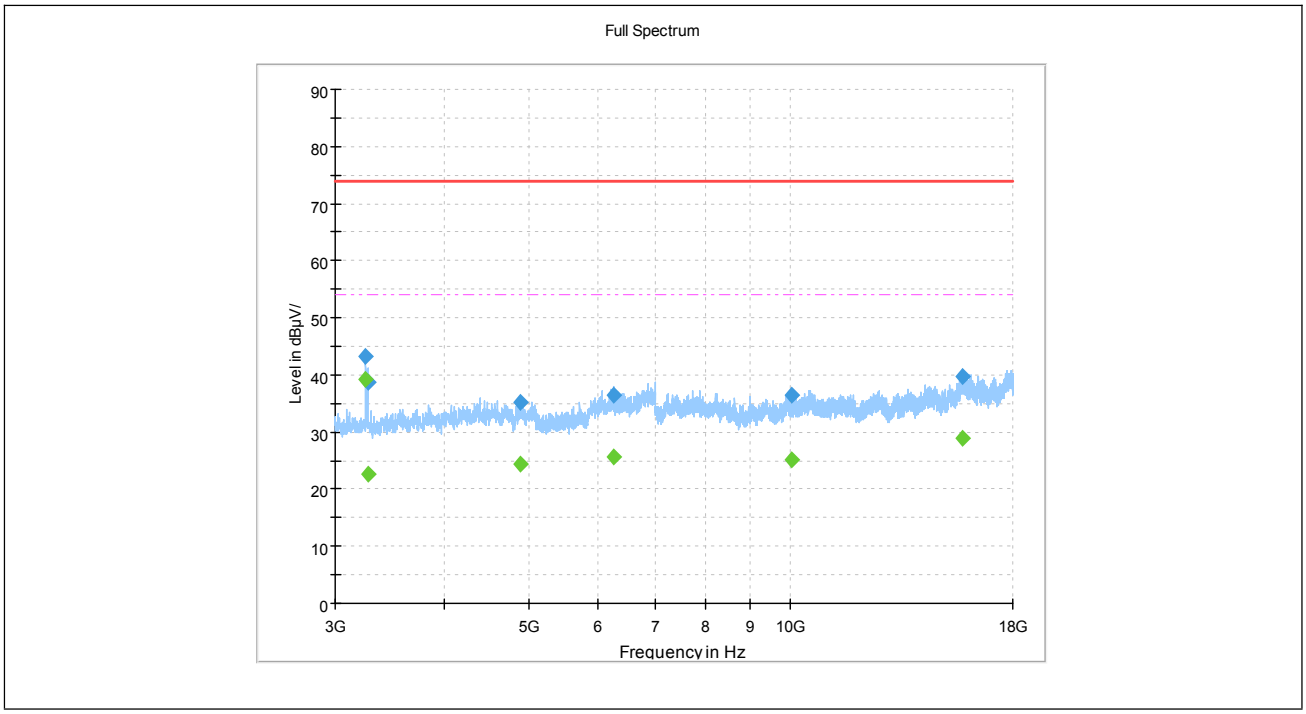
(LE 1M PHY _2440MHz, Antenna Vertical, 30MHz to 1GHz)

Frequency (MHz)	MaxPeak (dB µ V/m)	Limit (dB µ V//m)	Margin (dB)	Pol	Corr. (dB/m)	Verdict
64.532000	29.98	40.00	10.02	V	-21.0	PASS
212.554000	32.23	43.50	11.27	V	-20.1	PASS
264.352000	35.34	46.00	10.66	V	-19.3	PASS
318.284000	34.88	46.00	11.12	V	-16.7	PASS
347.772000	38.23	46.00	7.77	V	-16.6	PASS
385.990000	38.85	46.00	7.15	V	-15.4	PASS



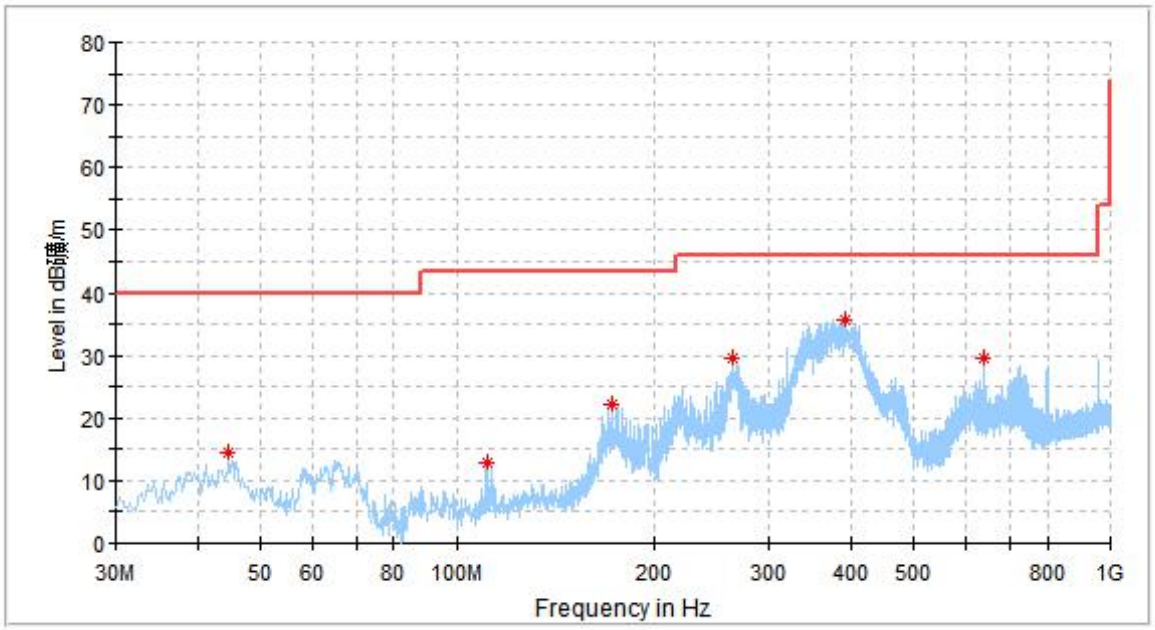
(LE 1M PHY _2440MHz, Antenna Vertical, 1GHz to 3GHz)

Frequency (MHz)	MaxPeak (dB µ V/m)	Average (dB µ V//m)	Limit (dB µ V//m)	Margin (dB)	Pol	Corr. (dB/m)	Verdict
1320.000000	39.34	---	74.00	34.66	V	32.1	PASS
1320.000000	---	29.16	54.00	24.84	V	32.1	PASS
1580.000000	42.09	---	74.00	31.91	V	34.8	PASS
1580.000000	---	32.09	54.00	21.91	V	34.8	PASS
1795.000000	45.32	---	74.00	28.68	V	37.6	PASS
1795.000000	---	35.46	54.00	18.54	V	37.6	PASS
2140.000000	46.54	---	74.00	27.46	V	38.9	PASS
2140.000000	---	36.70	54.00	17.30	V	38.9	PASS
2590.000000	---	43.61	54.00	10.39	V	44.6	PASS
2590.000000	54.77	---	74.00	19.23	V	44.6	PASS
2960.000000	---	43.93	54.00	10.07	V	45.3	PASS
2960.000000	54.96	---	74.00	19.04	V	45.3	PASS



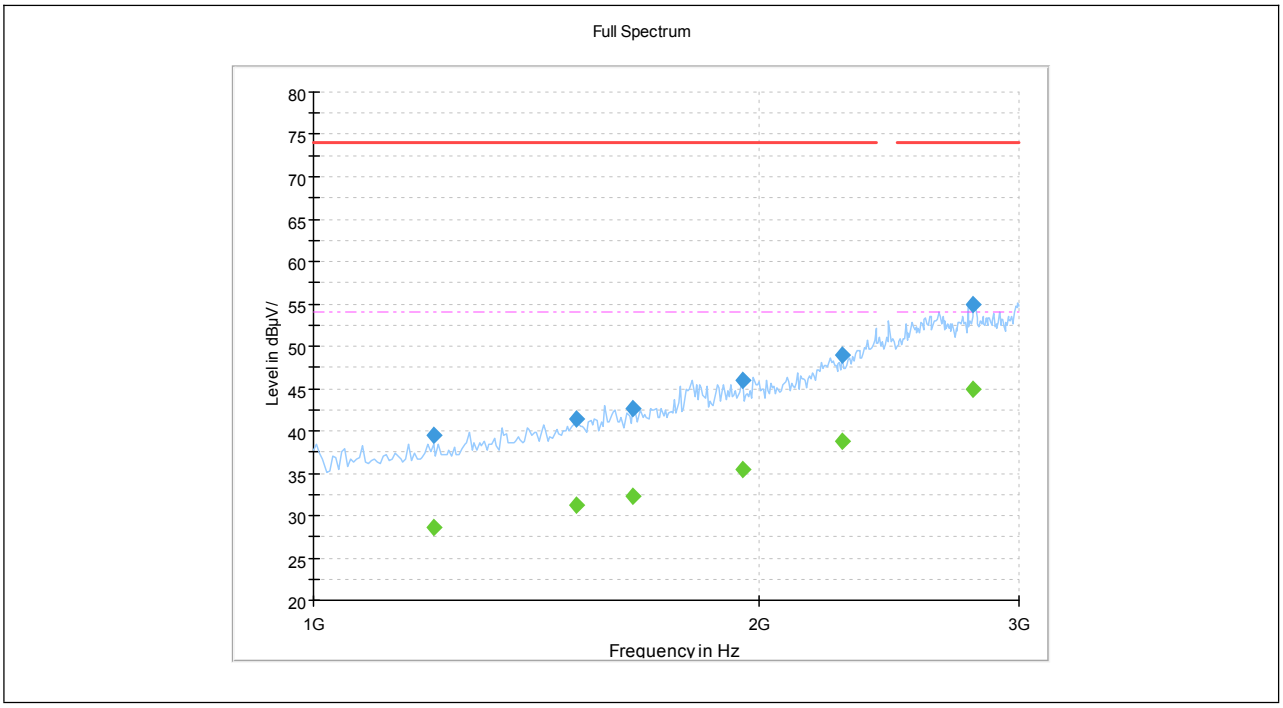
(LE 1M PHY _2440MHz, Antenna Vertical, 3GHz to 18GHz)

Frequency (MHz)	MaxPeak (dB µ V/m)	Average (dB µ V//m)	Limit (dB µ V//m)	Margin (dB)	Pol	Corr. (dB/m)	Verdict
3253.500000	43.28	---	74.00	30.72	V	-5.3	PASS
3253.500000	---	39.33	54.00	14.67	V	-5.3	PASS
3268.500000	38.70	---	74.00	35.30	V	-2.8	PASS
3268.500000	---	22.67	54.00	31.33	V	-2.8	PASS
4896.000000	35.10	---	74.00	38.90	V	-0.3	PASS
4896.000000	---	24.44	54.00	29.56	V	-0.3	PASS
6271.500000	36.50	---	74.00	37.50	V	3.4	PASS
6271.500000	---	25.52	54.00	28.48	V	3.4	PASS
10026.000000	36.39	---	74.00	37.61	V	8.6	PASS
10026.000000	---	25.02	54.00	28.98	V	8.6	PASS
15739.500000	39.84	---	74.00	34.16	V	15.2	PASS
15739.500000	---	29.01	54.00	24.99	V	15.2	PASS



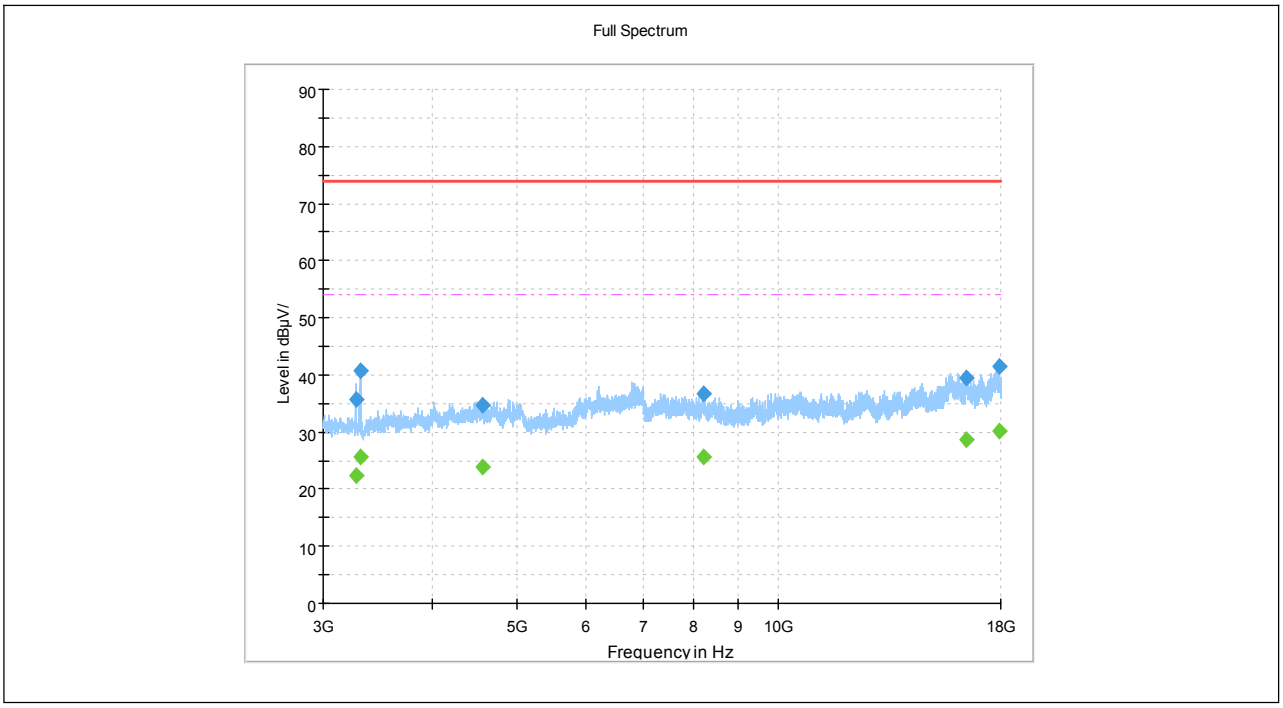
(LE 1M PHY _2480MHz, Antenna Horizontal, 30MHz to 1GHz)

Frequency (MHz)	MaxPeak (dB µ V/m)	Limit (dB µ V//m)	Margin (dB)	Pol	Corr. (dB/m)	Verdict
44.744000	14.32	40.00	25.68	H	-14.7	PASS
110.898000	12.74	43.50	30.76	H	-21.0	PASS
172.784000	22.22	43.50	21.28	H	-21.8	PASS
264.740000	29.68	46.00	16.32	H	-19.3	PASS
393.362000	35.55	46.00	10.45	H	-15.1	PASS
639.936000	29.55	46.00	16.45	H	-12.3	PASS



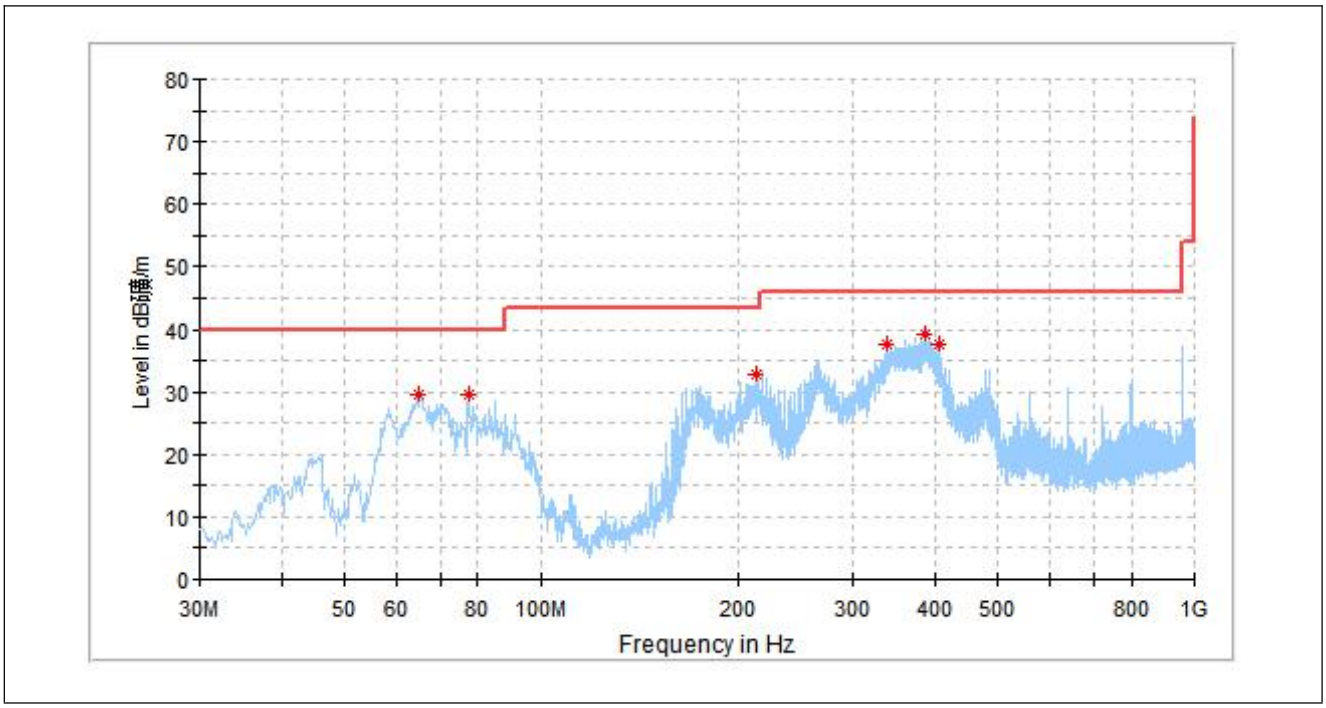
(LE 1M PHY _2480MHz, Antenna Horizontal, 1GHz to 3GHz)

Frequency (MHz)	MaxPeak (dB µ V/m)	Average (dB µ V//m)	Limit (dB µ V//m)	Margin (dB)	Pol	Corr. (dB/m)	Verdict
1205.000000	39.50	---	74.00	34.50	H	31.5	PASS
1205.000000	---	28.53	54.00	25.47	H	31.5	PASS
1505.000000	41.43	---	74.00	32.57	H	33.9	PASS
1505.000000	---	31.19	54.00	22.81	H	33.9	PASS
1645.000000	---	32.29	54.00	21.71	H	34.8	PASS
1645.000000	42.68	---	74.00	31.32	H	34.8	PASS
1950.000000	45.93	---	74.00	28.07	H	37.6	PASS
1950.000000	---	35.52	54.00	18.48	H	37.6	PASS
2280.000000	---	38.70	54.00	15.30	H	40.6	PASS
2280.000000	48.94	---	74.00	25.06	H	40.6	PASS
2795.000000	54.85	---	74.00	19.15	H	45.7	PASS
2795.000000	---	44.88	54.00	9.12	H	45.7	PASS



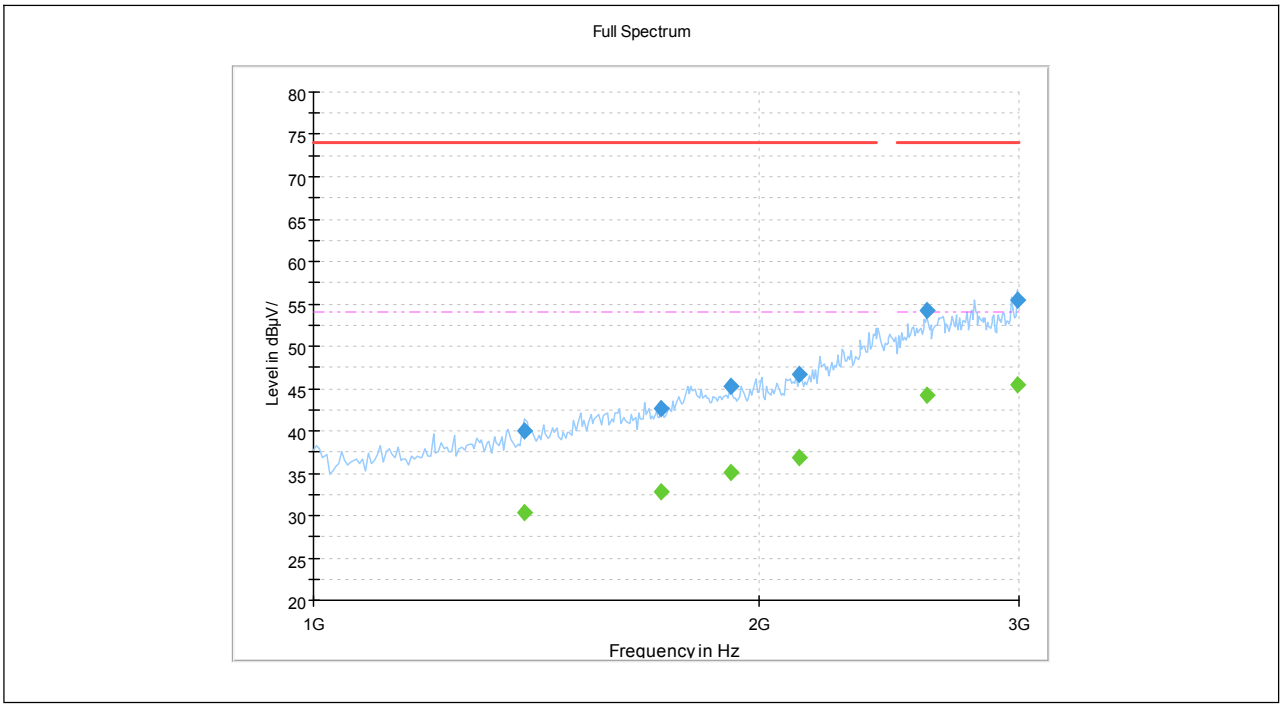
(LE 1M PHY _2480MHz, Antenna Horizontal, 3GHz to 18GHz)

Frequency (MHz)	MaxPeak (dB µ V/m)	Average (dB µ V//m)	Limit (dB µ V//m)	Margin (dB)	Pol	Corr. (dB/m)	Verdict
3268.500000	35.74	---	74.00	38.26	H	-4.6	PASS
3268.500000	---	22.25	54.00	31.75	H	-4.6	PASS
3309.000000	---	25.65	54.00	28.35	H	-3.1	PASS
3309.000000	40.83	---	74.00	33.17	H	-3.1	PASS
4576.500000	34.63	---	74.00	39.37	H	-1.5	PASS
4576.500000	---	23.96	54.00	30.04	H	-1.5	PASS
8199.000000	36.76	---	74.00	37.24	H	1.6	PASS
8199.000000	---	25.57	54.00	28.43	H	1.6	PASS
16425.000000	39.38	---	74.00	34.62	H	3.9	PASS
16425.000000	---	28.78	54.00	25.22	H	3.9	PASS
17917.500000	---	30.06	54.00	23.94	H	9.7	PASS
17917.500000	41.59	---	74.00	32.41	H	9.7	PASS



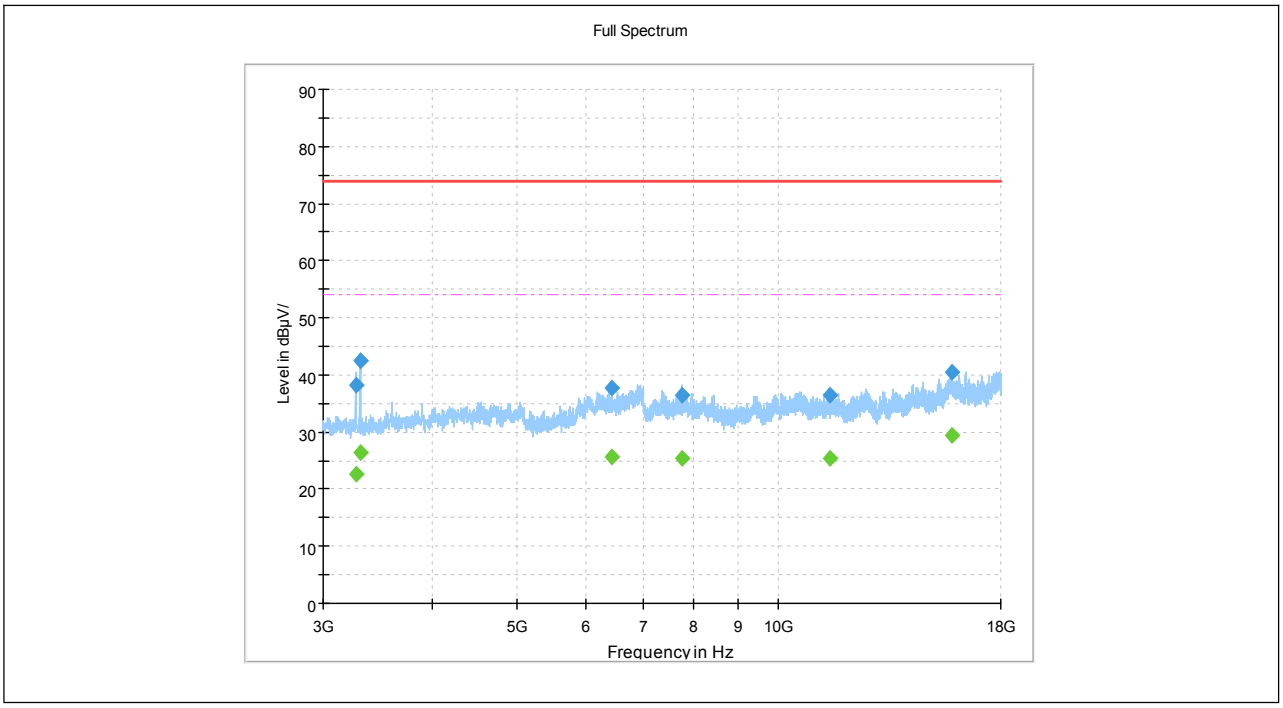
(LE 1M PHY _2480MHz, Antenna Vertical, 30MHz to 1GHz)

Frequency (MHz)	MaxPeak (dB µ V/m)	Limit (dB µ V//m)	Margin (dB)	Pol	Corr. (dB/m)	Verdict
64.726000	29.72	40.00	10.28	V	-21.1	PASS
77.336000	29.45	40.00	10.55	V	-25.3	PASS
212.942000	32.84	43.50	10.66	V	-20.0	PASS
339.042000	37.65	46.00	8.35	V	-16.7	PASS
386.184000	39.16	46.00	6.84	V	-15.4	PASS
406.554000	37.62	46.00	8.38	V	-14.4	PASS



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

Frequency (MHz)	MaxPeak (dB µ V/m)	Average (dB µ V//m)	Limit (dB µ V//m)	Margin (dB)	Pol	Corr. (dB/m)	Verdict
1390.000000	40.04	---	74.00	33.96	V	33.2	PASS
1390.000000	---	30.40	54.00	23.60	V	33.2	PASS
1720.000000	42.69	---	74.00	31.31	V	35.3	PASS
1720.000000	---	32.87	54.00	21.13	V	35.3	PASS
1915.000000	45.20	---	74.00	28.80	V	37.1	PASS
1915.000000	---	35.01	54.00	18.99	V	37.1	PASS
2130.000000	---	36.78	54.00	17.22	V	38.8	PASS
2130.000000	46.61	---	74.00	27.39	V	38.8	PASS
2600.000000	---	44.16	54.00	9.84	V	45.2	PASS
2600.000000	54.29	---	74.00	19.71	V	45.2	PASS
2990.000000	55.47	---	74.00	18.53	V	46.6	PASS
2990.000000	---	45.37	54.00	8.63	V	46.6	PASS



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

Frequency (MHz)	MaxPeak (dB µ V/m)	Average (dB µ V//m)	Limit (dB µ V//m)	Margin (dB)	Pol	Corr. (dB/m)	Verdict
3268.500000	38.24	---	74.00	35.76	V	-5.8	PASS
3268.500000	---	22.54	54.00	31.46	V	-5.8	PASS
3309.000000	42.37	---	74.00	31.63	V	-3.1	PASS
3309.000000	---	26.43	54.00	27.57	V	-3.1	PASS
6438.000000	---	25.56	54.00	28.44	V	-0.4	PASS
6438.000000	37.61	---	74.00	36.39	V	-0.4	PASS
7738.500000	36.45	---	74.00	37.55	V	1.5	PASS
7738.500000	---	25.50	54.00	28.50	V	1.5	PASS
11437.500000	---	25.37	54.00	28.63	V	4.0	PASS
11437.500000	36.35	---	74.00	37.65	V	4.0	PASS
15808.500000	40.45	---	74.00	33.55	V	10.7	PASS
15808.500000	---	29.32	54.00	24.68	V	10.7	PASS

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. 1. Identification of the Responsible Testing Laboratory

Laboratory Name:	Morlab Test Laboratory
Laboratory Address:	Unit 201, 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	2022. 03.08
2	RF cable (30MHz-26.5GHz)	RF01	N/A	Morlab	2022.03.06
3	Coaxial cable	RF02	N/A	Morlab	2022.03.06
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	2022.03.15
2	LISN	101338	ENV432	R&S	2022.03.09

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	Receiver	101799	ESR7	R&S	2022.03.15
3	Signal Analyzer	101294	FSV40	R&S	2022.06.04
4	Active Ring Antenna	FMZB 1513 #269	FMZB 1513	Schwarzbeck	2022.01.18
5	Linear Log Periodic Broad Band Antenna	949	VULB 9163	Schwarzbeck	2022.09.24
6	Ultra-Wideband Horn Antenna	102615	HF907	R&S	2022.01.18
7	Steatite Antennas	17868	QSH-SL-18 -26-S-20	Seibersdorf	2022.03.23
8	Ultra-Wideband Horn Antenna	17989	QSH-26-40	Schwarzbeck	2022.03.23
9	RF Switch and Control Platform	N/A	RSC	CDSI	N/A
10	Coaxial cable (N male) (9kHz -3GHz)	EMC02	N/A	Morlab	2022.03.23
11	Coaxial cable (N male)	EMC03	N/A	Morlab	2022.03.23

	(9kHz -3GHz)				
12	Coaxial cable (N male) (1GHz-26.5GHz)	EMC04	N/A	Morlab	2022.03.23
13	Coaxial cable (N male) (1GHz-26.5GHz)	EMC05	N/A	Morlab	2022.03.23
14	Pre-amplifier (1GHz-18GHz)	8810011	PAP-1G18	CDSI	2022.03.23
15	Pre-amplifier (18GHz-40GHz)	17021-17024	PAP-1840	CDSI	2022.03.23
16	High Pass Filter	EMC21	HFP-1.0/18 G-60	CDSI	2022.03.23
17	High Pass Filter	EMC22	HFP-3.0/18 G-60	CDSI	2022.03.23

END OF REPORT