Test Report

Applicant	:	Zhenjiang Youpu Technology Co., Ltd.
Address	:	NO. 263 Xiaomishan Road, Jingkou District, Zhenjiang, Jiangsu, China
Product Name	:	BT/Zigbee module
Brand Mark	:	Youpu
Model	:	YP02
Series model	:	N/A
Report Number	:	BLA-EMC-202504-A4602
FCC ID	:	2BOSO-YP02
Date of Receipt	:	Apr.15, 2025
Date of Test	:	Apr.16, 2025 to May 09, 2025
Test Standard	:	47 CFR Part 15, Subpart C 15.247
Test Result	:	Pass

Compiled by: charlie **Review by:** Xavier **Approved by:** Steve Zheng

Issued Date: May 12, 2025

BlueAsia of Technical Services(Shenzhen) Co.,Ltd.
Address: Building C, No. 107, Shihuan Road, Shiyan Sub-District, Baoan District, Shenzhen, Guangdong Province, China

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Revise Record

Version No.	Date	Description
01	May 19, 2025	Original

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1 General information

1.1 General information

Applicant	Zhenjiang Youpu Technology Co., Ltd.
Address	NO. 263 Xiaomishan Road, Jingkou District, Zhenjiang, Jiangsu, China
Manufacturer	Zhenjiang Youpu Technology Co., Ltd.
Address	NO. 263 Xiaomishan Road, Jingkou District, Zhenjiang, Jiangsu, China
Factory	Zhenjiang Youpu Technology Co., Ltd.
Address	NO. 263 Xiaomishan Road, Jingkou District, Zhenjiang, Jiangsu, China

1.2 General description of EUT

Product Name	BT/Zigbee module
Model No.	YP02
Series model	N/A
Differences of Series model	N/A
Operation Frequency	2405MHz-2480MHz
Modulation Type	O-QPSK
Channel Spacing	5MHz
Number of Channels	16
Antenna Type	PCB antenna
Antenna Gain	-0.52dBi(Provided by customer)
Power supply or adapter information	DC3.3V
Hardware Version	N/A
Software Version	N/A
Engineer sample no	BLA-EMC-202504-A46
Note: For a more detailed description, please refer to Specification or User's Manual supplied by the applicant and/or manufacturer.	

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2 Test summary

No.	Test item	FCC Part Section(s)	Test Method(Clause)	Result
1	Antenna Requirement	§15.203	N/A	Pass
2	Conducted Emissions at AC Power Line (150kHz-30MHz)	§15.207	ANSI C63.10-2013 Clause 6.2	Pass
3	Conducted Peak Output Power	§15.247(b)(3)	ANSI C63.10-2013 Clause 7.8.5	Pass
4	Minimum 6dB Bandwidth	§15.247a(2)	ANSI C63.10-2013 Clause 11.8.1	Pass
5	Power Spectrum Density	§15.247(d)	ANSI C63.10-2013 Clause 11.10.2	Pass
6	Conducted Band Edges Measurement	§15.247(d)	ANSI C63.10-2013 Clause 11.13	Pass
7	Conducted Spurious Emissions	§15.247(d)	ANSI C63.10-2013 Clause 11.11	Pass
8	Radiated Spurious Emissions	§15.209 §15.247(d)	ANSI C63.10-2013 Clause 6.4,6.5,6.6	Pass
9	Radiated Emissions which fall in the restricted bands	§15.209 §15.247(d)	ANSI C63.10-2013 Clause 11.12	Pass

N/A: Not Applicable

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3 Test Configuration

3.1 Test mode

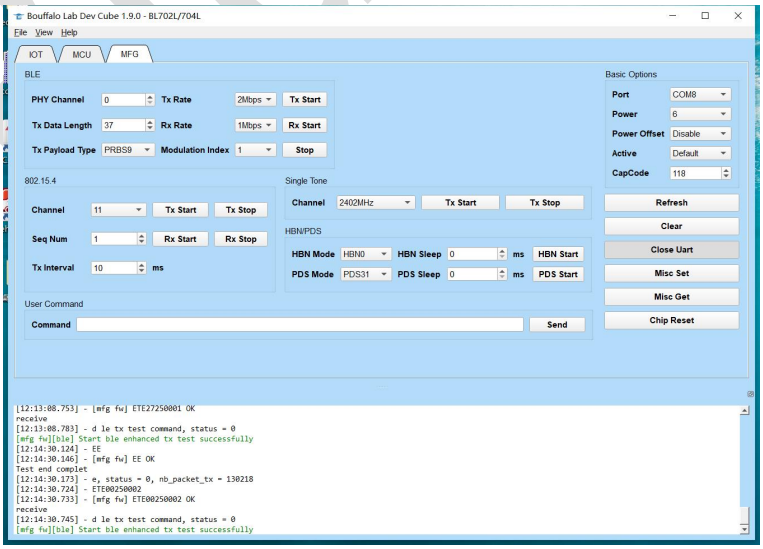
Test Mode Note 1	Description
TX	Keep the EUT in continuously transmitting with modulation mode.
RX	Keep the EUT in receiving mode
TX Low channel	Keep the EUT in continuously transmitting mode in low channel
TX middle channel	Keep the EUT in continuously transmitting mode in middle channel
TX high channel	Keep the EUT in continuously transmitting mode in high channel

Note 1: The EUT was configured to measure its highest possible emission and/or immunity level. The test modes were adapted according to the operation manual for use; the EUT was operated in the engineering mode Note 2 to fix the TX or Rx frequency that was for the purpose of the measurements.

Note 2: Special software is used. The software provided by client to enable the EUT under transmission condition continuously at specific channel frequencies individually.

Power level setup in software			
Test Software Name	Bouffalo Lab Dev Cube 1.9.0-BL702/704/706		
Mode	Channel	Frequency (MHz)	Soft Set
Zigbee	Lowest	2405	TX level : 6
	middle	2440	
	Highest	2480	

Run Software



3.2 Operation Frequency each of channel

Channel	Frequency	Channel	Frequency
0	2405MHz	10	2450MHz
1	2410MHz	11	2455MHz
2	2415MHz	12	2460MHz
3	2420MHz	13	2465MHz
4	2425MHz	14	2470MHz
5	2430MHz	15	2475MHz
7	2435MHz	16	2480MHz
8	2440MHz	/	/
9	2445MHz	/	/

3.3 Test channel

Channel	Frequency
The lowest channel	2405MHz
The middle channel	2440MHz
The Highest channel	2480MHz

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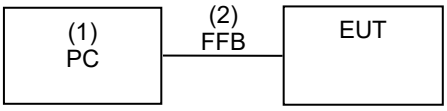
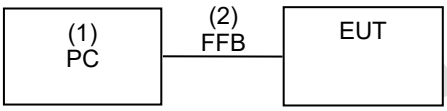
3.4 Configuration diagram of EUT

AC conducted emission:

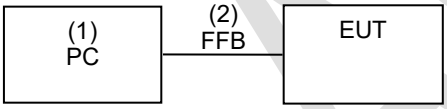


Radiated emission:



Note: see test photographs attached in APPENDIX A for the actual connections between Product and support equipment.

RF Test:



Support equipment:

Name	Device type	Brand	Mode	Series No	Remark
(1)	PC	lenovo	E460C	N/A	N/A
(2)	Fixed frequency board	N/A	N/A	N/A	N/A

3.5 Auxiliary equipment

Device Type	Manufacturer	Model Name	Serial No.	Remark
PC	lenovo	E46OC	N/A	From lab（No.BLA-ZC-BS-2022005）
Note:"--" mean no any auxiliary device during testing.				

3.6 Test environment

Environment	Temperature	Voltage
Normal	25°C	DC 3.3V

4 Laboratory information

4.1 Laboratory and accreditations

The test facility is recognized, certified, or accredited by the following organizations:

Company name:	BlueAsia of Technical Services(Shenzhen) Co., Ltd.
Address:	Building C, No. 107, Shihuan Road, Shiyan Sub-District, Baoan District, Shenzhen, Guangdong Province, China
CNAS accredited No.:	L9788
A2LA Cert. No.:	5071.01
FCC Designation No.:	CN1252
ISED CAB identifier No.:	CN0028
Telephone:	+86-755-28682673
FAX:	+86-755-28682673

4.2 Measurement uncertainty

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=1.96.

Parameter	Expanded Uncertainty
Radiated Emission(9kHz-30MHz)	±4.34dB
Radiated Emission(30Mz-1000MHz)	±4.24dB
Radiated Emission(1GHz-18GHz)	±4.68dB
AC Power Line Conducted Emission(150kHz-30MHz)	±3.45dB
Occupied Channel Bandwidth	±5 %
RF output power, conducted	±1.5 dB
Power Spectral Density, conducted	±3.0 dB
Unwanted Emissions, conducted	±3.0 dB
Temperature	±3 °C
Supply voltages	±3 %
Time	±5 %

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5 Test equipment

Radiated Spurious Emissions (Below 1GHz)

Equipment	Name	Model	Manufacture	S/N	Cal. Date	Due. Date
BLA-EMC-002-01	Anechoic chamber	9*6*6 chamber	SKET	N/A	2024/3/27	2027/3/26
BLA-EMC-002-02	Control room	966 control room	SKET	N/A	2024/3/27	2027/3/26
BLA-EMC-009	EMI receiver	ESR7	R&S	101199	2024/08/08	2025/08/07
BLA-EMC-043	Loop antenna	FMZB1519B	Schwarzbeck	00102	2024/06/29	2026/06/28
BLA-EMC-065	Broadband antenna	VULB9168	Schwarzbeck	01065P	2024/06/29	2026/06/27
BLA-XC-01	Coaxial Cable	N/A	BlueAsia	V01	N/A	N/A
BLA-XC-02	Coaxial Cable	N/A	BlueAsia	V02	N/A	N/A

Radiated Spurious Emissions (Above 1GHz)

Equipment	Name	Model	Manufacture	S/N	Cal. Date	Due. Date
BLA-EMC-001-01	Anechoic chamber	9*6*6 chamber	SKET	N/A	2023/11/16	2026/11/15
BLA-EMC-001-02	Control Room	966 control room	SKET	N/A	2023/11/16	2025/11/15
BLA-EMC-008	Spectrum	FSP40	R&S	100817	2024/08/08	2025/08/07
BLA-EMC-012	Broadband antenna	VULB9168	Schwarzbeck	00836 P:00227	2022/10/12	2025/10/11
BLA-EMC-013	Horn Antenna	BBHA9120D	Schwarzbeck	01892	2024/06/29	2026/06/28
BLA-EMC-014	Amplifier	PA_000318G-45	SKET	PA2018043003	2024/08/08	2025/08/07
BLA-EMC-046	Filter bank	2.4G/5G Filter bank	SKET	N/A	2024/06/28	2025/06/27
BLA-EMC-061	Receiver	ESPI7	R&S	101477	2024/06/28	2025/06/27
BLA-EMC-066	Amplifier	LNPA_30M01G-30	SKET	SK2021060801	2024/06/28	2025/06/27
BLA-EMC-086	Amplifier	LNPA_18G40G-50dB	SKET	SK2022071301	2024/06/28	2025/06/27
BLA-EMC-087	Horn Antenna	BBHA 9170	Schwarzbeck	1106	2024/06/29	2026/06/28
BLA-XC-03	Coaxial Cable	N/A	BlueAsia	V03	N/A	N/A
BLA-XC-04	Coaxial Cable	N/A	BlueAsia	V04	N/A	N/A

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Conducted emissions at AC power line (150 kHz-30 MHz)

Equipment	Name	Model	Manufacture	S/N	Cal. Date	Due. Date
BLA-EMC-003-001	Shield room	8*3*3	SKET	N/A	2023/11/16	2025/11/15
BLA-EMC-009	EMI receiver	ESR7	R&S	101199	2024/08/08	2025/08/07
BLA-EMC-011	LISN	ENV216	R&S	101372	2024/08/08	2025/08/07
BLA-EMC-033	Impedance transformer	DC-2GHz	DFXP	N/A	2024/06/28	2025/06/27
BLA-EMC-041	LISN	AT166-2	ATTEN	AKK1806000003	2024/08/08	2025/08/07
BLA-EMC-045	Impedance stable network	ISNT8-cat6	TESEQ	53580	2024/08/08	2025/08/07
BLA-EMC-095	Single-channel vehicle artificial power network	NNBM 8124	Schwarzbeck	01045	2024/06/28	2025/06/27
BLA-EMC-096	Single-channel vehicle artificial power network	NNBM 8124	Schwarzbeck	01075	2024/06/28	2025/06/27
BLA-XC-05	Coaxial Cable	N/A	BlueAsia	V05	N/A	N/A

RF conducted

Equipment	Name	Model	Manufacture	S/N	Cal. Date	Due. Date
BLA-EMC-003-003	Shield room	5*3*3	SKET	N/A	2023/11/16	2025/11/15
BLA-EMC-016	Signal Generator	N5182A	Agilent	MY52420567	2024/06/28	2025/06/27
BLA-EMC-038	Spectrum	N9020A	Agilent	MY49100060	2024/08/08	2025/08/07
BLA-EMC-042	Power sensor	RPR3006W	DARE	14I00889SN042	2024/08/08	2025/08/07
BLA-EMC-044	Radio communication tester	CMW500	R&S	132429	2024/08/08	2025/08/07
BLA-EMC-064	Signal Generator	N5182B	KEYSIGHT	MY58108892	2024/06/28	2025/06/27
BLA-EMC-079	Spectrum	N9020A	Agilent	MY54420161	2024/08/08	2025/08/07
BLA-EMC-088	Audio Analyzer	ATS-1	Audio Precision	ATS141094	2024/06/28	2025/06/27

Test Software Record

Software No.	Software Name	Manufacture	Software version	Test site
BLA-EMC-S001	EZ-EMC	EZ	EEMC-3A1+	RE
BLA-EMC-S002	EZ-EMC	EZ	EEMC-3A1+	RE
BLA-EMC-S003	EZ-EMC	EZ	EEMC-3A1+	CE
BLA-EMC-S010	MTS 8310	MW	2.0.0.0	RF

6 Test result

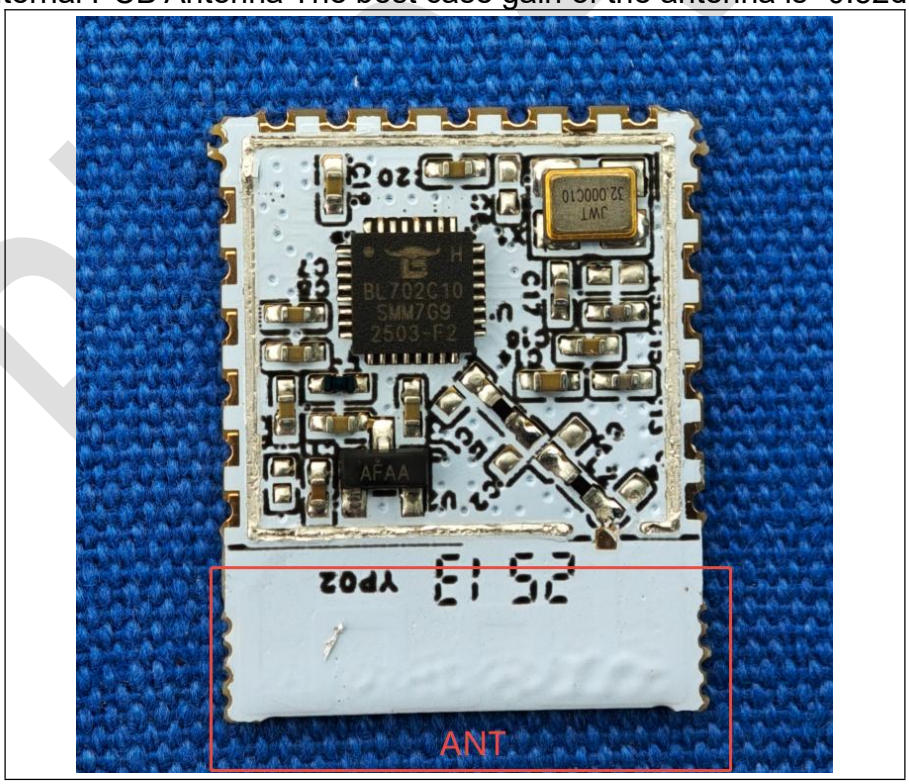
6.1 Antenna requirement

Test Standard	47 CFR Part 15, Subpart C 15.203
Test Method	N/A

6.1.1 Requirement

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 an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit permanently attached antenna or of a so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

EUT antenna:
The antenna is internal PCB Antenna The best case gain of the antenna is -0.52dBi



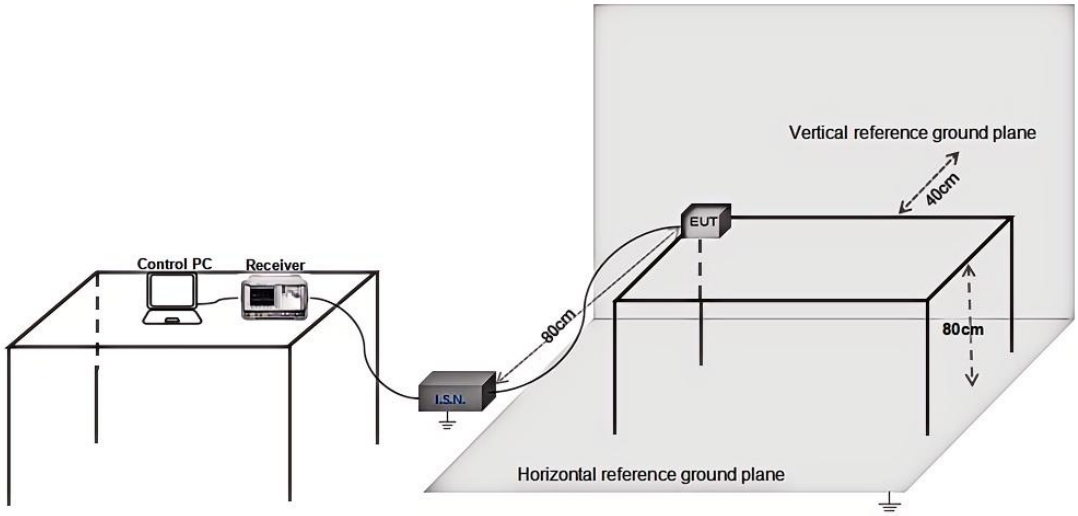
6.2 Conducted emissions at AC power line (150 kHz-30 MHz)

Test Standard	47 CFR Part 15, Subpart C 15.207
Test Method	ANSI C63.10-2013 Clause 6.2
Test Mode (Pre-Scan)	TX
Test Mode (Final Test)	TX

6.2.1 Limit

Frequency of emission(MHz)	**Conducted limit(dBμV)**	
	Quasi-peak	**Average**
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50
*Decreases with the logarithm of the frequency.		

6.2.2 Test setup



Description of test setup connection:

a) *Connect the control PC to the receiver through a USB to GPIB cable;*

b) *The receiver is connected to the LISN through a coaxial line;*

c) *Connect the power port of LISN to the EUT.*

6.2.3 Procedure

1) The mains terminal disturbance voltage test was conducted in a shielded room.

2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a 50ohm/50H + 5ohm linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.

3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane,

4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2.

5) In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10 on conducted measurement.

LISN=Read Level+ Cable Loss+ LISN Factor

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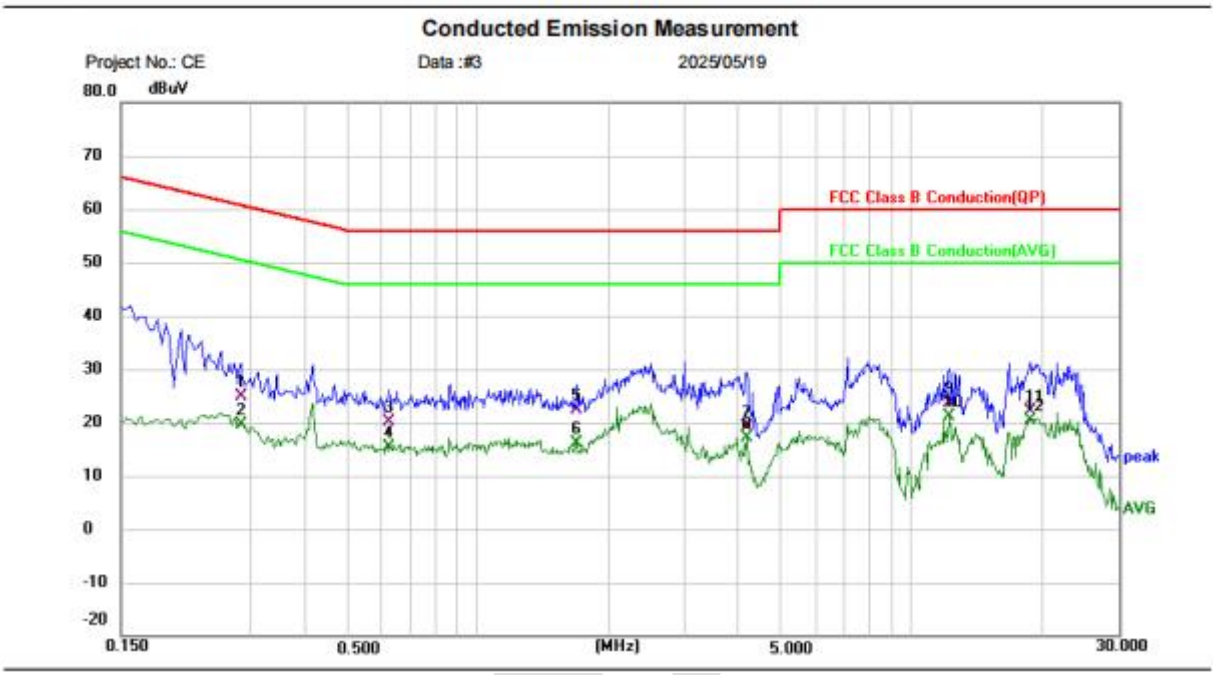
6.2.4 Test data

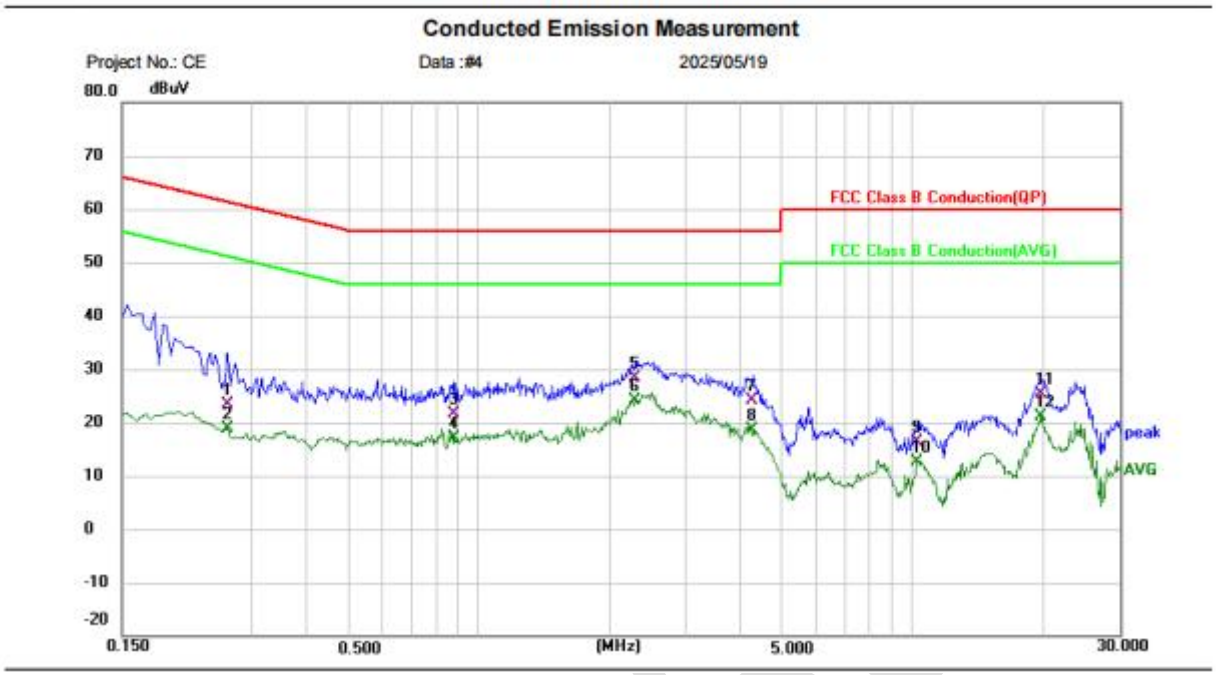
[Test mode: TX]; [Line: Line];[Power:AC120V/60Hz]



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	cm	degree	Comment
1		0.2819	15.19	9.80	24.99	60.76	-35.77	QP			
2		0.2819	9.91	9.80	19.71	50.76	-31.05	AVG			
3		0.6260	10.27	9.75	20.02	56.00	-35.98	QP			
4		0.6260	5.64	9.75	15.39	46.00	-30.61	AVG			
5		1.6900	12.46	9.81	22.27	56.00	-33.73	QP			
6		1.6900	6.24	9.81	16.05	46.00	-29.95	AVG			
7		4.1660	9.37	9.70	19.07	56.00	-36.93	QP			
8	*	4.1660	7.48	9.70	17.18	46.00	-28.82	AVG			
9		12.2460	13.82	9.83	23.65	60.00	-36.35	QP			
10		12.2460	11.34	9.83	21.17	50.00	-28.83	AVG			
11		18.7820	11.90	10.14	22.04	60.00	-37.96	QP			
12		18.7820	10.14	10.14	20.28	50.00	-29.72	AVG			

Test Result: Pass

[Test mode: TX]; [Line: Neutral];[Power:AC120V/60Hz]



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	cm	degree	Comment
1		0.2620	13.56	9.80	23.36	61.37	-38.01	QP			
2		0.2620	9.20	9.80	19.00	51.37	-32.37	AVG			
3		0.8780	11.94	9.73	21.67	56.00	-34.33	QP			
4		0.8780	7.39	9.73	17.12	46.00	-28.88	AVG			
5		2.2900	18.54	9.75	28.29	56.00	-27.71	QP			
6	*	2.2900	14.43	9.75	24.18	46.00	-21.82	AVG			
7		4.2819	14.30	9.75	24.05	56.00	-31.95	QP			
8		4.2819	8.95	9.75	18.70	46.00	-27.30	AVG			
9		10.2860	6.63	9.74	16.37	60.00	-43.63	QP			
10		10.2860	2.98	9.74	12.72	50.00	-37.28	AVG			
11		19.8420	15.18	10.11	25.29	60.00	-34.71	QP			
12		19.8420	11.00	10.11	21.11	50.00	-28.89	AVG			

Test Result: Pass

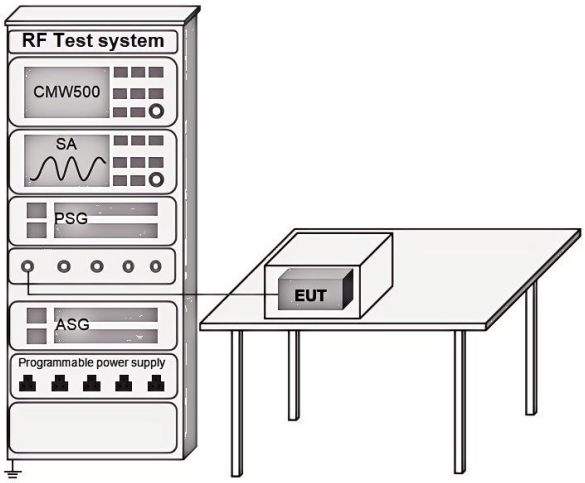
6.3 Conducted peak output Power

Test Standard	47 CFR Part 15, Subpart C 15.247(b)(3)
Test Method	ANSI C63.10-2013 Clause 7.8.5
Test Mode (Pre-Scan)	TX
Test Mode (Final Test)	TX

6.3.1 Limit

Frequency range(MHz)	Output power of the intentional radiator(watt)
902-928	1 for ≥50 hopping channels
	0.25 for 25≤ hopping channels <50
	1 for digital modulation
2400-2483.5	1 for ≥75 non-overlapping hopping channels
	0.125 for all other frequency hopping systems
	1 for digital modulation
5725-5850	1 for frequency hopping systems and digital modulation

6.3.2 Test setup



6.3.3 Test data

Note：PK power sensor is used to read PK Conducted power power directly

Pass: Please refer to appendix A for details

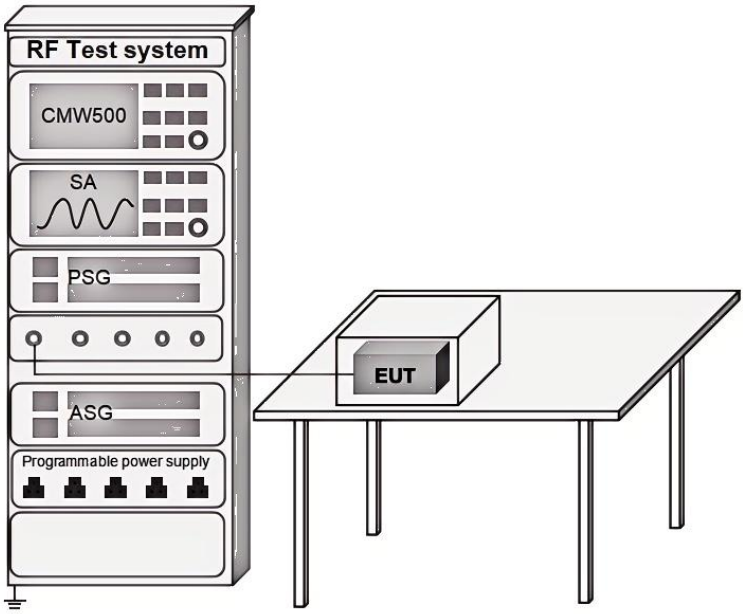
6.4 Minimum 6dB bandwidth

Test Standard	47 CFR Part 15, Subpart C 15.247a(2)
Test Method	ANSI C63.10-2013 Clause 11.8.1
Test Mode (Pre-Scan)	TX
Test Mode (Final Test)	TX

6.4.1 Limit

≥500 kHz

6.4.2 Test setup



6.4.3 Test data

Pass: Please refer to appendix A for details

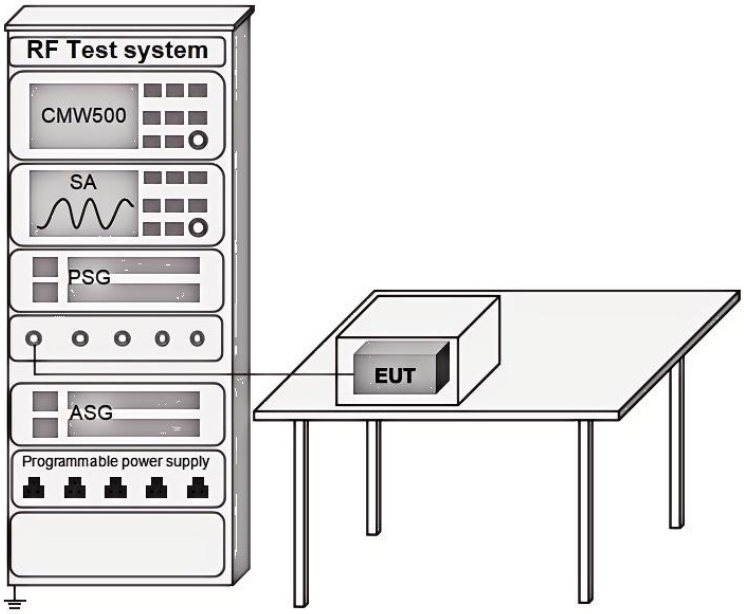
6.5 Power spectrum density

Test Standard	47 CFR Part 15, Subpart C 15.247(d)
Test Method	ANSI C63.10-2013 Clause 11.10.2
Test Mode (Pre-Scan)	TX
Test Mode (Final Test)	TX

6.5.1 Limit

≤8dBm in any 3 kHz band during any time interval of continuous transmission

6.5.2 Test setup



6.5.3 Test data

Pass: Please refer to appendix A for details

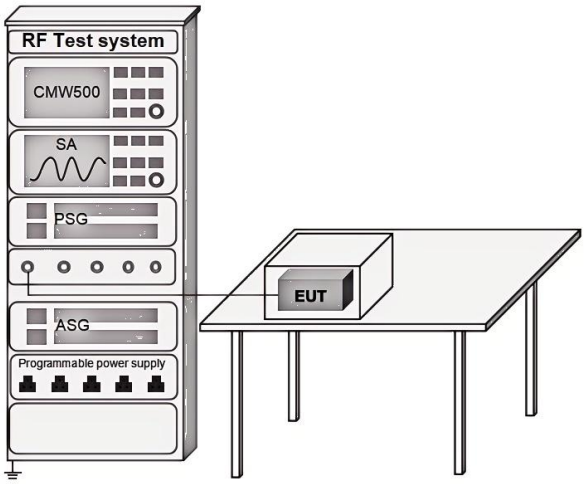
6.6 Conducted Band Edges Measurement

Test Standard	47 CFR Part 15, Subpart C 15.247(d)
Test Method	ANSI C63.10-2013 Clause 11.13
Test Mode (Pre-Scan)	TX
Test Mode (Final Test)	TX

6.6.1 Limit

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.
If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20dB.
Attenuation below the general limits specified in §15.209(a) is not required.
In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

6.6.2 Test setup



6.6.3 Test data

Pass: Please refer to appendix A for details

BlueAsia

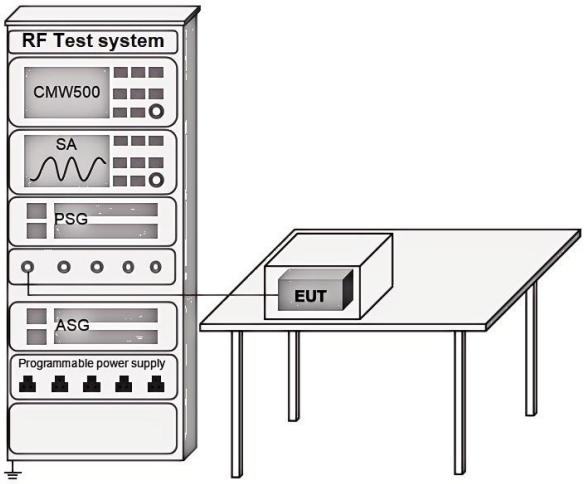
6.7 Conducted spurious emissions

Test Standard	47 CFR Part 15, Subpart C 15.247(d)
Test Method	ANSI C63.10-2013 Clause 11.11
Test Mode (Pre-Scan)	TX
Test Mode (Final Test)	TX

6.7.1 Limit

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.
If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20dB.
Attenuation below the general limits specified in §15.209(a) is not required.
In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

6.7.2 Test setup



6.7.3 Test data

Pass: Please refer to appendix A for details

BlueAsia

6.8 Radiated spurious emissions

Test Standard	47 CFR Part 15, Subpart C 15.247(d)
Test Method	ANSI C63.10-2013 Clause 6.4,6.5,6.6
Test Mode (Pre-Scan)	TX
Test Mode (Final Test)	TX

6.8.1 Limit

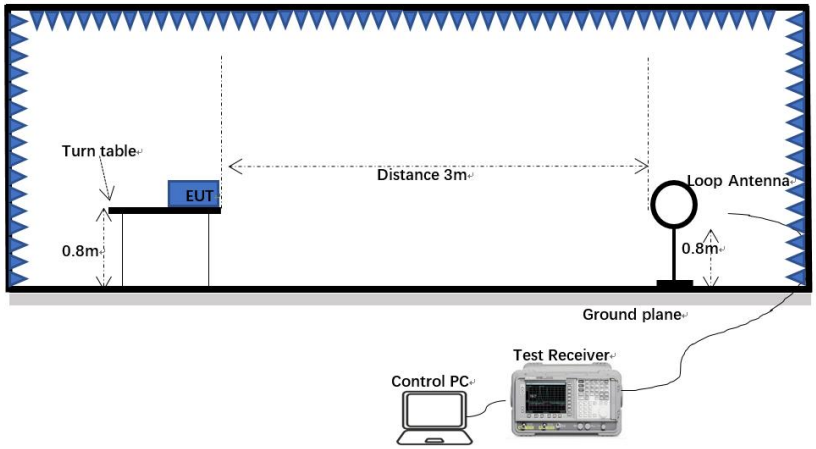
Frequency(MHz)	Field strength(microvolts/meter)	Measurement distance(meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

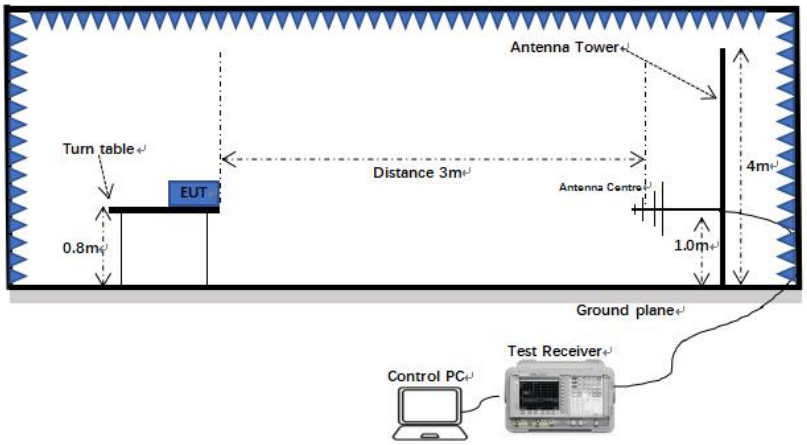
BlueAsia

6.8.2 Test setup

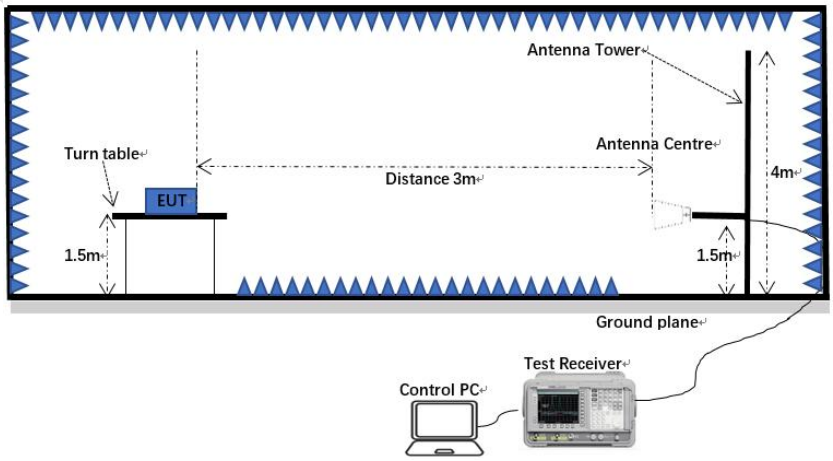
Below 1GHz：



30MHz-1GHz：



Above 1GHz：



6.8.3 Procedure

a) For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

b) For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

c) The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

d) The antenna height 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.

e) 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 (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

f) The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

g) If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

h) Test the EUT in the lowest channel, the middle channel, the highest channel.

i) The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.

j) Repeat above procedures until all frequencies measured was complete.

Note 1: Scan from 9 kHz to 25GHz, the disturbance above 12.75GHz and below 30MHz was very low. The points marked on above plots are the highest emissions could be found when testing, so only above points had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported. Fundamental frequency is blocked by filter, and only spurious emission is shown.

Note 2: For frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For the emissions whose peak level is lower than the average limit, only the peak measurement is shown in the report.

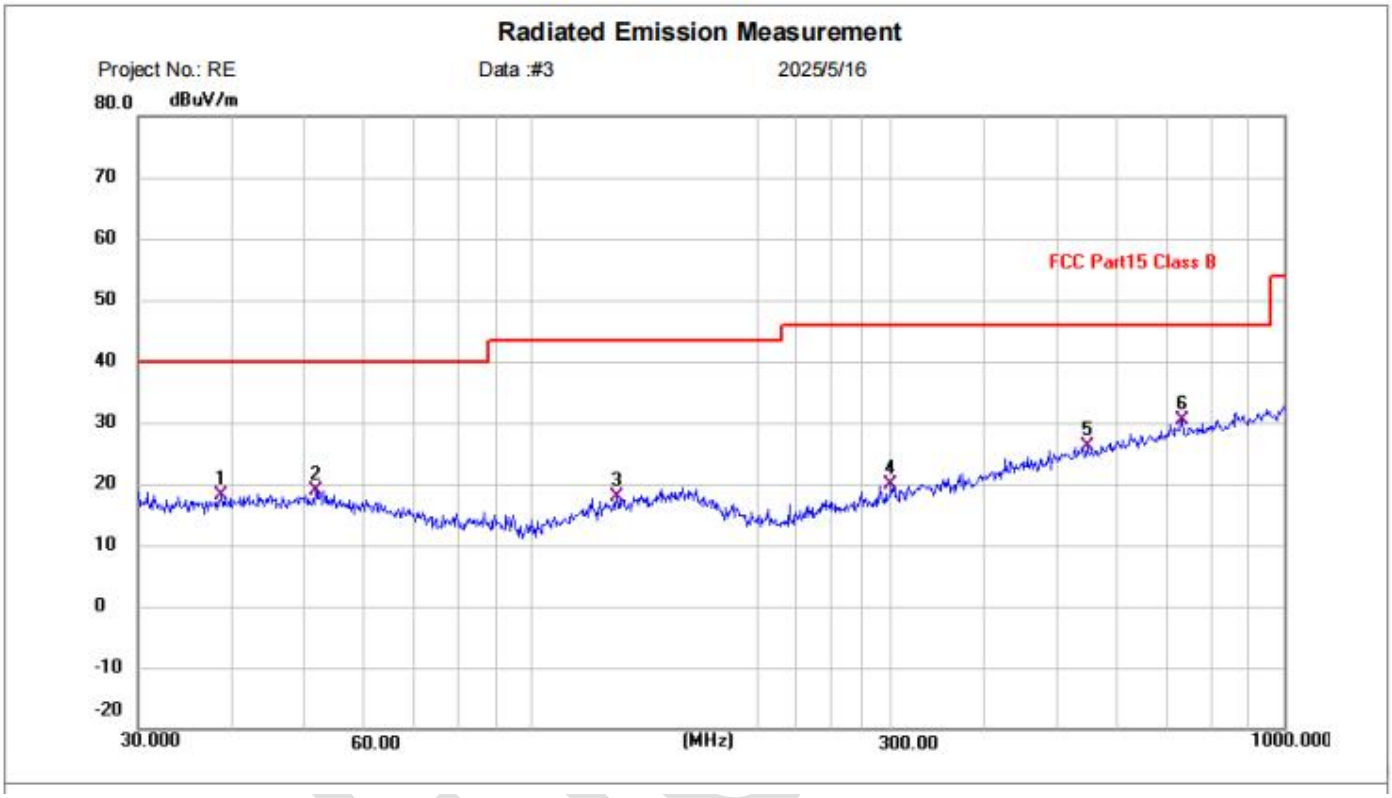
Note 3: The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Level (dBuV) = Reading (dBuV) + Factor (dB/m)

6.8.4 Test data

Below 1GHz

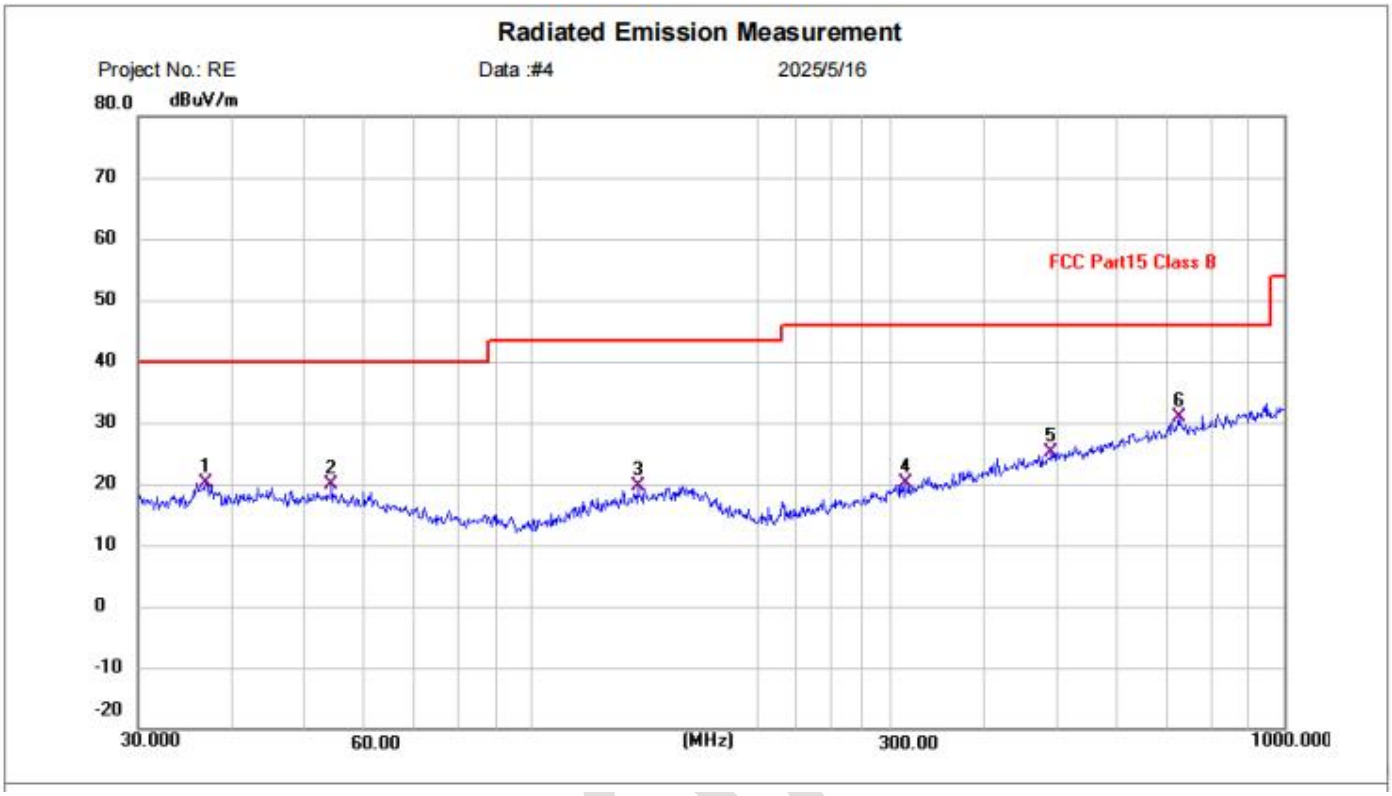
[Test mode: TX]; [Polarity: Horizontal]



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F	Remark
1	38.7517	-1.18	19.24	18.06	40.00	-21.94	QP	P	
2	51.6615	-0.99	19.89	18.90	40.00	-21.10	QP	P	
3	129.9225	-1.47	19.23	17.76	43.50	-25.74	QP	P	
4	300.3672	-0.12	20.08	19.96	46.00	-26.04	QP	P	
5	547.0976	0.27	25.74	26.01	46.00	-19.99	QP	P	
6 *	731.9202	1.53	28.95	30.48	46.00	-15.52	QP	P	

Test Result: Pass

[Test mode: TX]; [Polarity: Vertical]

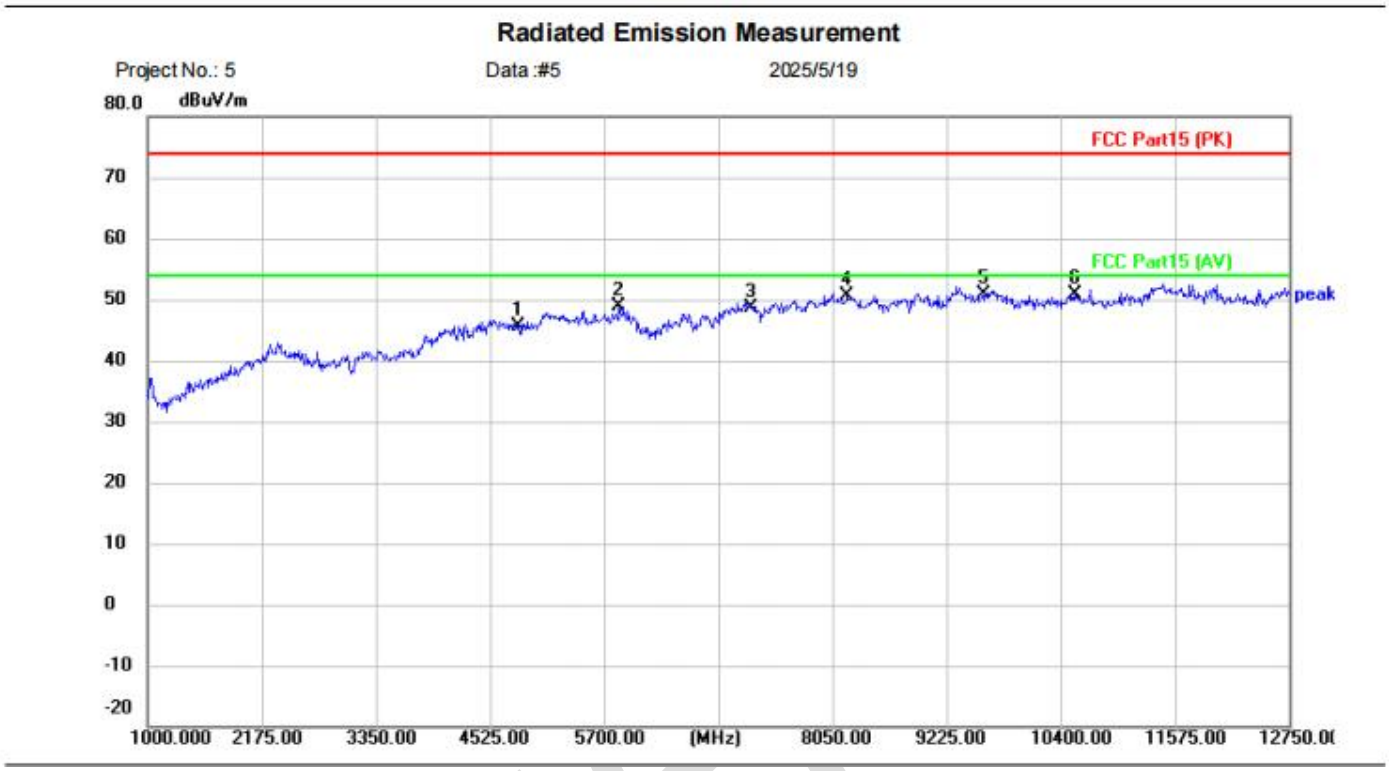


No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F	Remark
1	36.8953	1.22	18.93	20.15	40.00	-19.85	QP	P	
2	54.2610	0.30	19.64	19.94	40.00	-20.06	QP	P	
3	138.3873	-0.26	20.00	19.74	43.50	-23.76	QP	P	
4	314.3765	-0.14	20.38	20.24	46.00	-25.76	QP	P	
5	490.7447	0.15	24.99	25.14	46.00	-20.86	QP	P	
6 *	724.2611	1.85	29.08	30.93	46.00	-15.07	QP	P	

Test Result: Pass

Above 1GHz:

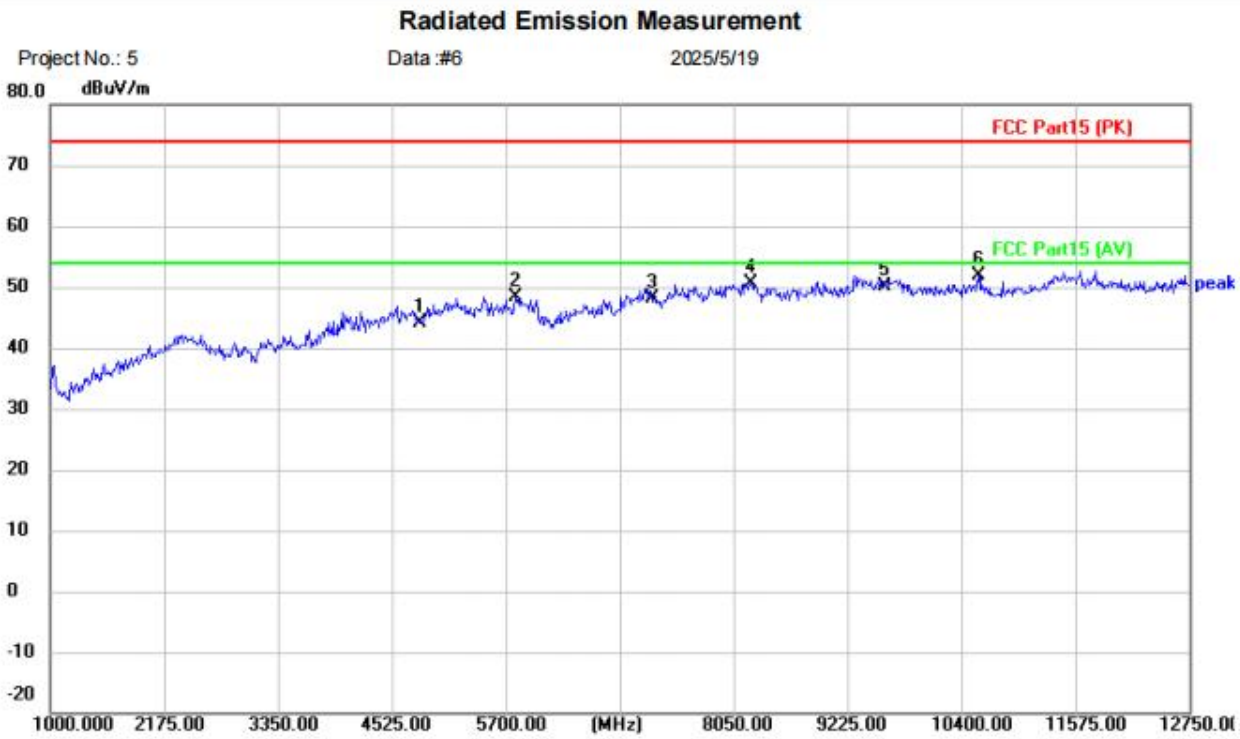
[Test mode: TX low channel]; [Polarity: Horizontal]



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		4810.000	39.32	6.31	45.63	74.00	-28.37	peak	
2		5852.750	40.09	8.88	48.97	74.00	-25.03	peak	
3		7215.000	38.30	10.42	48.72	74.00	-25.28	peak	
4		8202.750	39.18	11.48	50.66	74.00	-23.34	peak	
5		9620.000	37.62	13.16	50.78	74.00	-23.22	peak	
6	*	10541.00	37.29	13.69	50.98	74.00	-23.02	peak	

Test Result: Pass

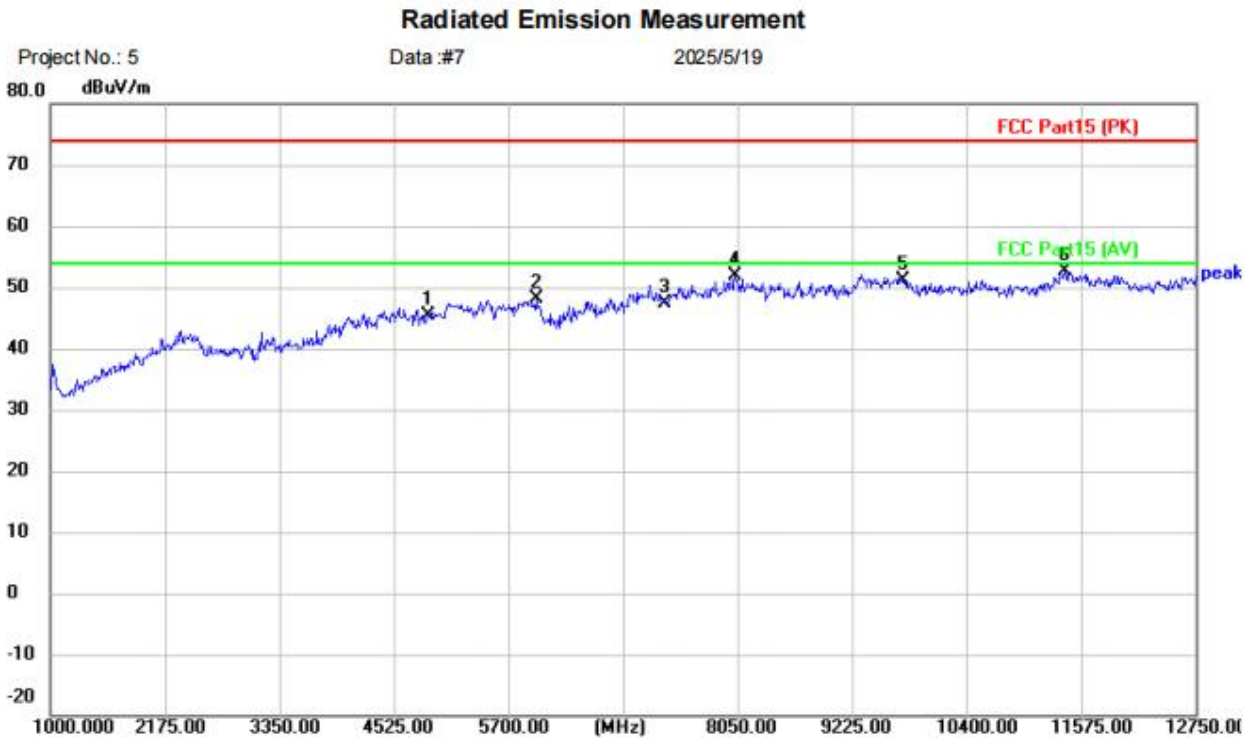
[Test mode: TX low channel]; [Polarity: Vertical]



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		4810.000	37.82	6.31	44.13	74.00	-29.87	peak	
2		5794.000	39.58	8.91	48.49	74.00	-25.51	peak	
3		7215.000	37.70	10.42	48.12	74.00	-25.88	peak	
4		8226.250	39.41	11.34	50.75	74.00	-23.25	peak	
5		9620.000	36.92	13.16	50.08	74.00	-23.92	peak	
6	*	10576.25	38.24	13.63	51.87	74.00	-22.13	peak	

Test Result: Pass

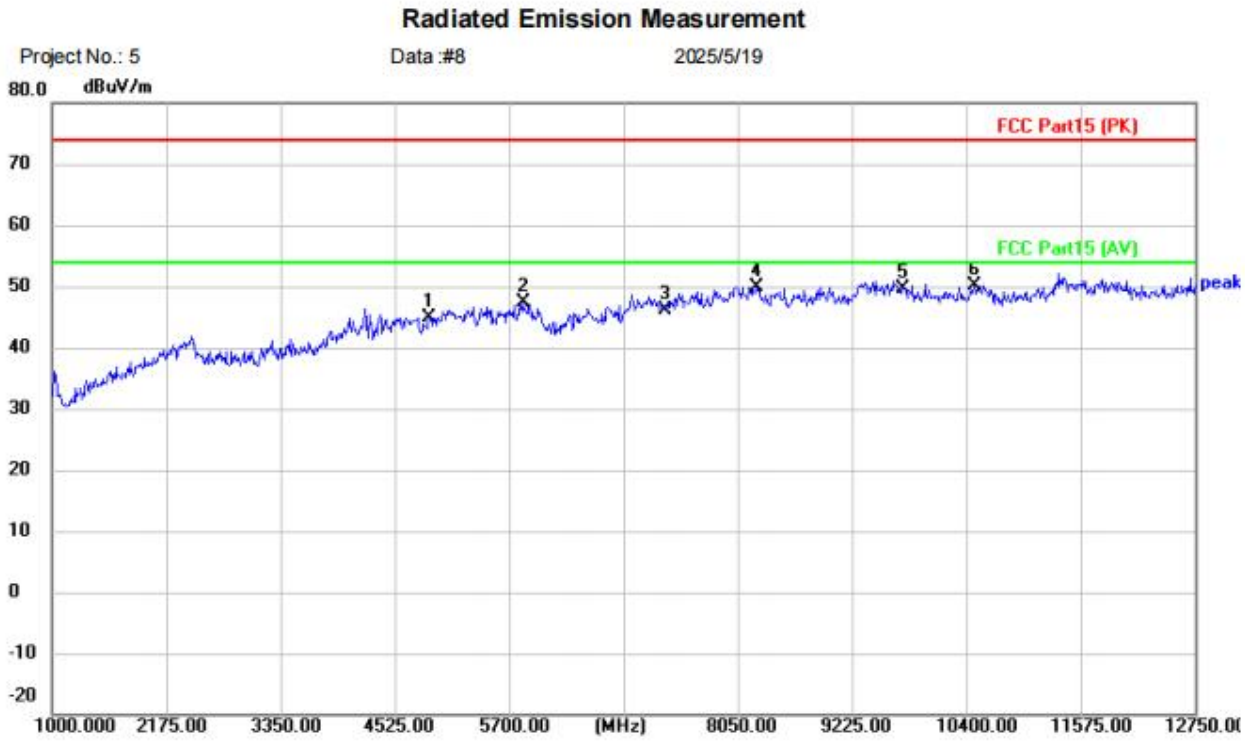
[Test mode: TX middle channel]; [Polarity: Horizontal]



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		4880.000	39.06	6.41	45.47	74.00	-28.53	peak	
2		5982.000	39.26	8.98	48.24	74.00	-25.76	peak	
3		7320.000	37.16	10.12	47.28	74.00	-26.72	peak	
4		8026.500	40.18	11.65	51.83	74.00	-22.17	peak	
5		9760.000	37.42	13.78	51.20	74.00	-22.80	peak	
6	*	11410.50	38.19	14.33	52.52	74.00	-21.48	peak	

Test Result: Pass

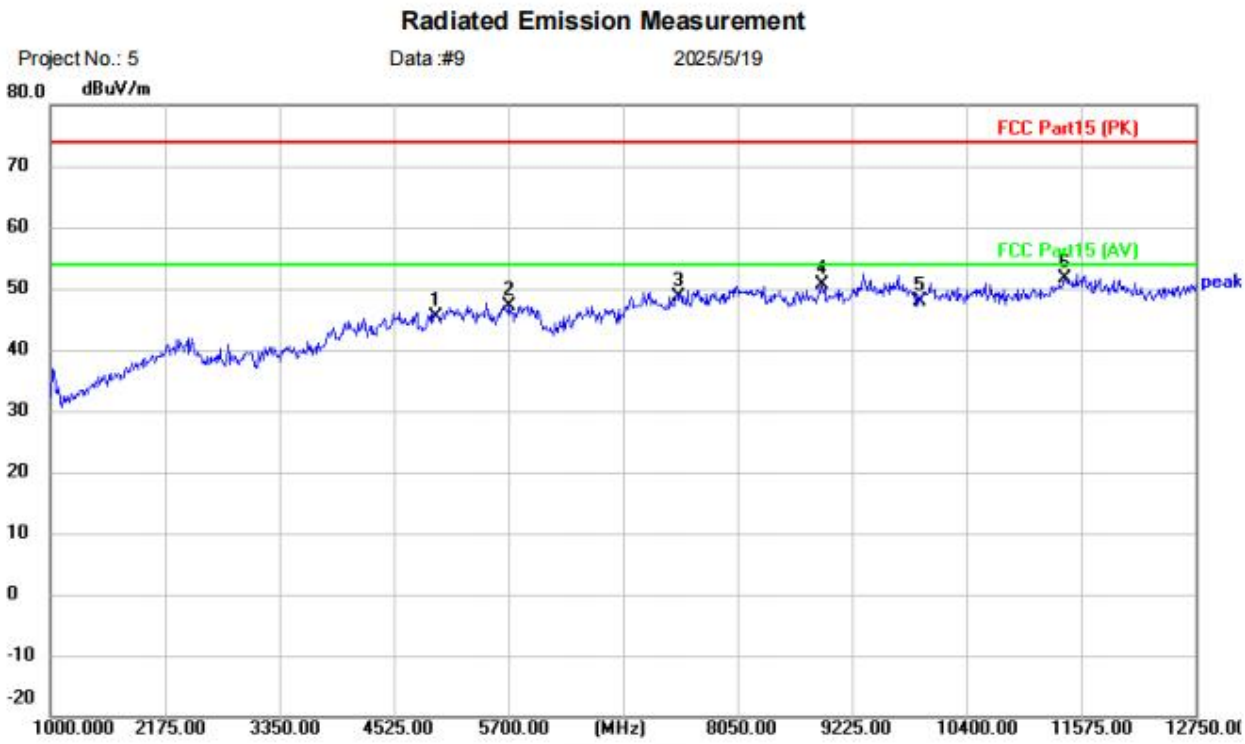
[Test mode: TX middle channel]; [Polarity: Vertical]



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		4880.000	38.35	6.41	44.76	74.00	-29.24	peak	
2		5841.000	38.53	8.89	47.42	74.00	-26.58	peak	
3		7320.000	35.90	10.12	46.02	74.00	-27.98	peak	
4		8249.750	38.61	11.20	49.81	74.00	-24.19	peak	
5		9760.000	35.94	13.78	49.72	74.00	-24.28	peak	
6	*	10482.25	36.52	13.71	50.23	74.00	-23.77	peak	

Test Result: Pass

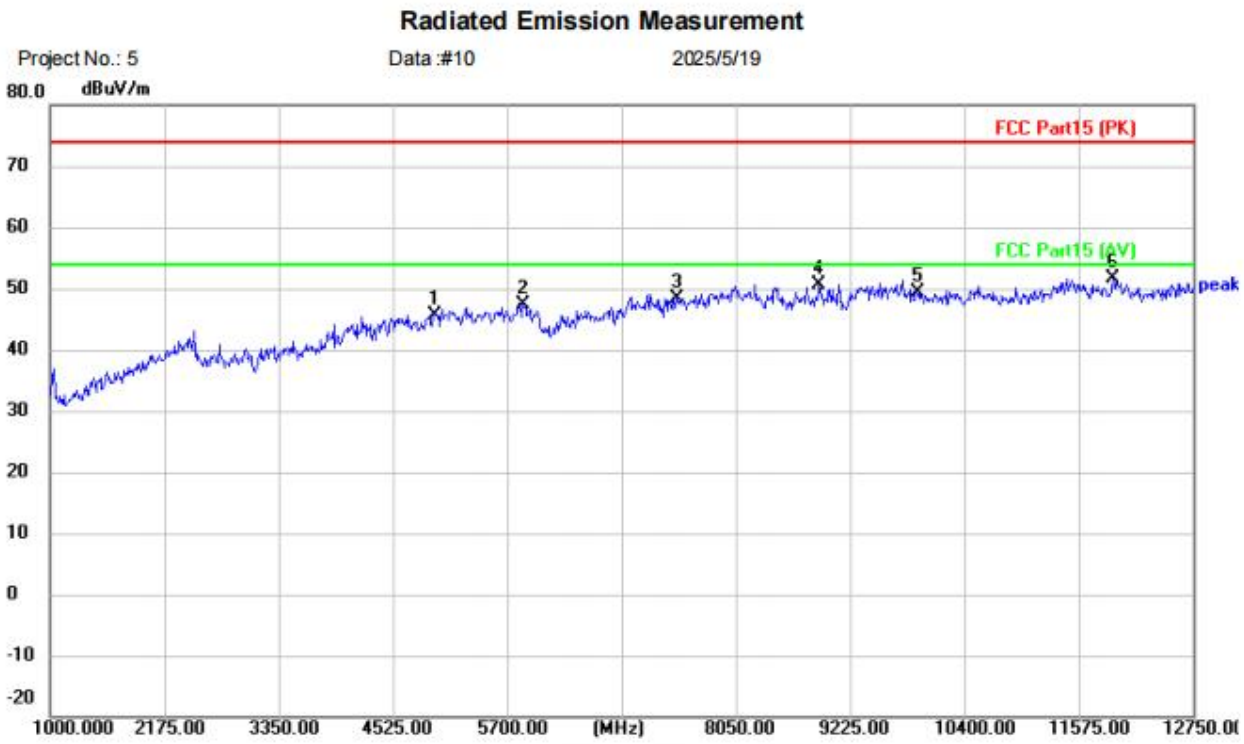
[Test mode: TX High channel]; [Polarity: Horizontal]



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		4960.000	37.86	7.41	45.27	74.00	-28.73	peak	
2		5700.000	38.20	8.95	47.15	74.00	-26.85	peak	
3		7440.000	37.49	11.03	48.52	74.00	-25.48	peak	
4		8919.500	38.31	12.38	50.69	74.00	-23.31	peak	
5		9920.000	34.84	13.16	48.00	74.00	-26.00	peak	
6	*	11410.50	37.27	14.33	51.60	74.00	-22.40	peak	

Test Result: Pass

[Test mode: TX High channel]; [Polarity: Vertical]



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		4960.000	38.25	7.41	45.66	74.00	-28.34	peak	
2		5864.500	38.35	8.93	47.28	74.00	-26.72	peak	
3		7440.000	37.30	11.03	48.33	74.00	-25.67	peak	
4		8907.750	38.11	12.57	50.68	74.00	-23.32	peak	
5		9920.000	36.25	13.16	49.41	74.00	-24.59	peak	
6	*	11927.50	37.88	13.75	51.63	74.00	-22.37	peak	

Test Result: Pass

When scanning in the range of 1GHz~ 40GHz and the interference above 12.75GHz is very small, it is a low noise signal. The point shown in the figure above is the highest emission that can be found during the test, so only the above point is shown. The fundamental frequency is blocked by the filter. Only stray emission.

6.9 Radiated emissions which fall in the restricted bands

Test Standard	47 CFR Part 15, Subpart C 15.247(d)
Test Method	ANSI C63.10-2013 Clause 6.12
Test Mode (Pre-Scan)	TX
Test Mode (Final Test)	TX

6.9.1 Limit

Frequency(MHz)	Field strength(microvolts/meter)	Measurement distance(meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

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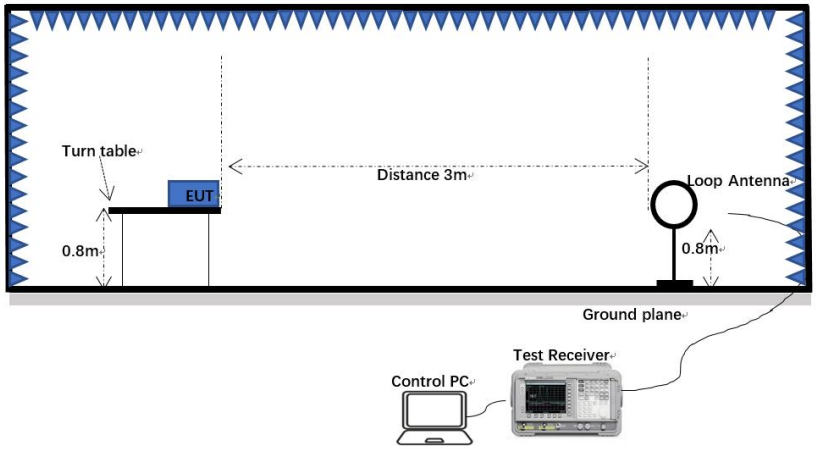
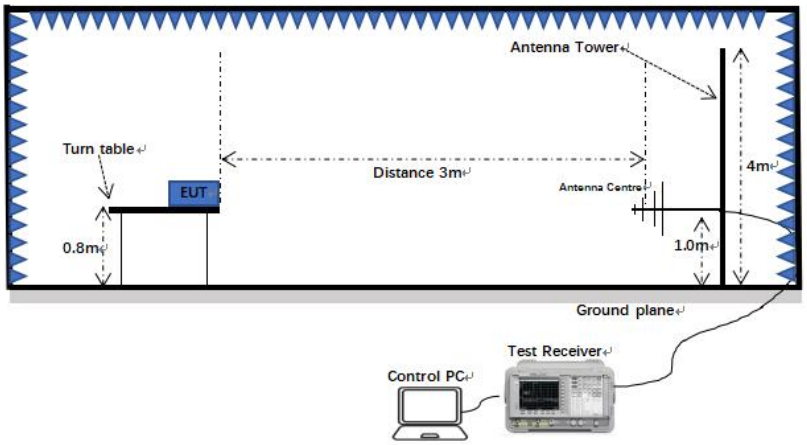
6.9.2 Test setup

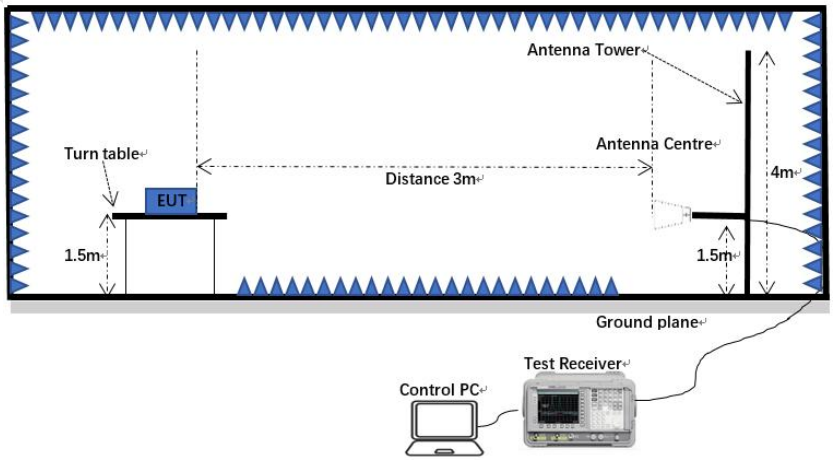
Below 1GHz：



30MHz-1GHz：



Above 1GHz：



6.9.3 Procedure

a) For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

b) For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

c) The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

d) The antenna height 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.

e) 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 (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

f) The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

g) If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

h) Test the EUT in the lowest channel, the middle channel, the highest channel.

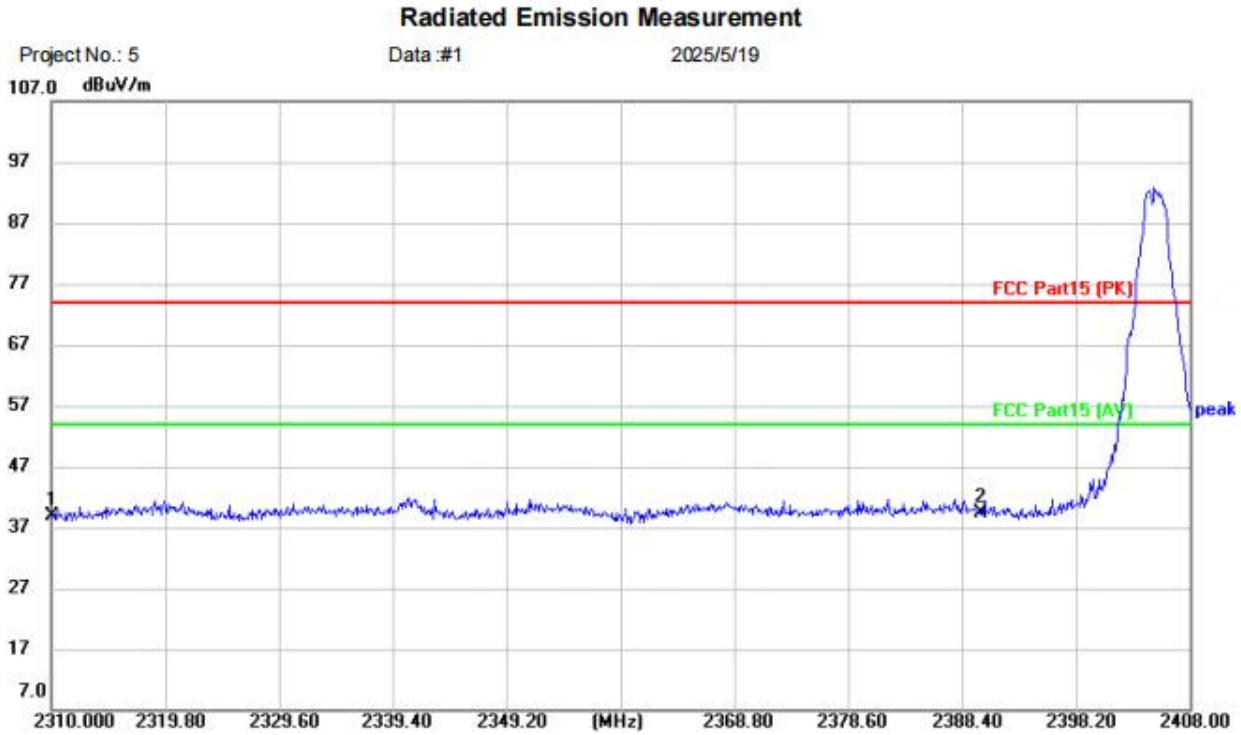
i) The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.

j) Repeat above procedures until all frequencies measured was complete.

Note 1: Level (dBuV) = Reading (dBuV) + Factor (dB/m)
Note 2: For frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For the emissions whose peak level is lower than the average limit, only the peak measurement is shown in the report.

6.9.4 Test data

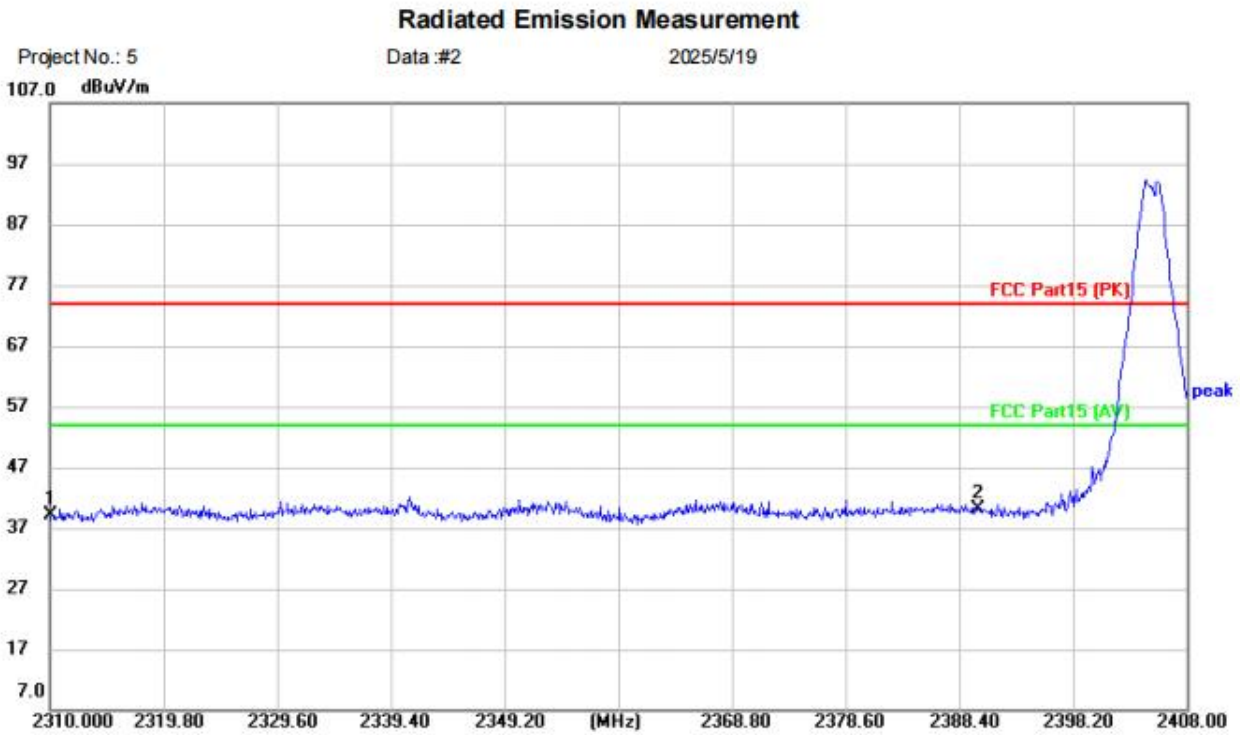
[Test mode: TX low channel]; [Polarity: Horizontal]



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		2310.000	41.82	-2.87	38.95	74.00	-35.05	peak	
2	*	2390.000	41.92	-2.44	39.48	74.00	-34.52	peak	

Test Result: Pass

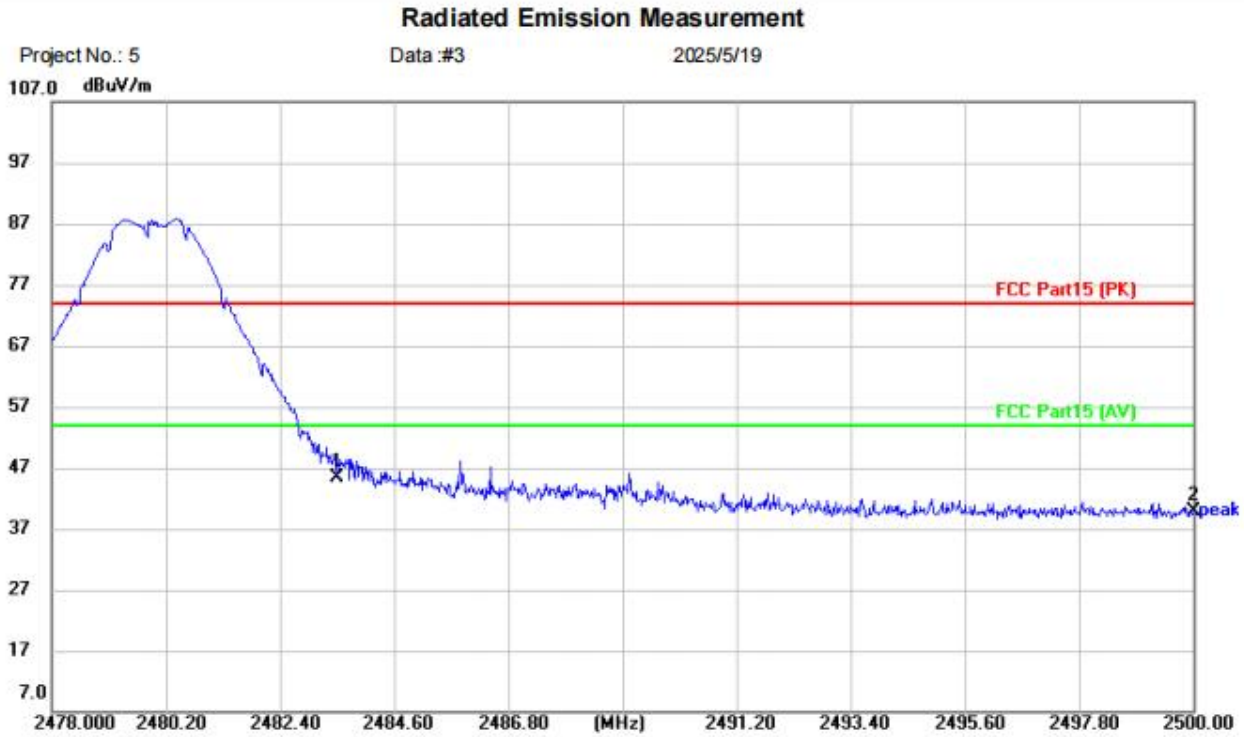
[Test mode:TX low channel]; [Polarity: Vertical]



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		2310.000	42.04	-2.87	39.17	74.00	-34.83	peak	
2	*	2390.000	42.59	-2.44	40.15	74.00	-33.85	peak	

Test Result: Pass

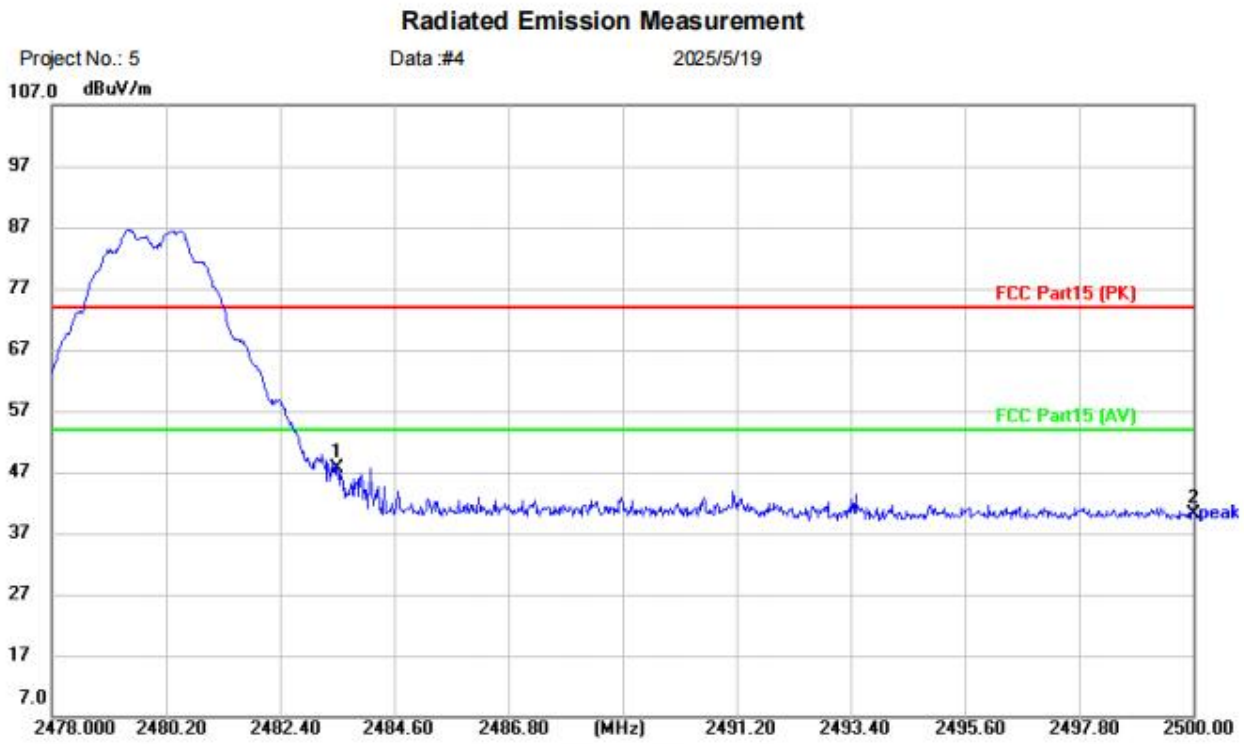
[Test mode: TX High channel]; [Polarity: Horizontal]



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	2483.500	48.19	-2.91	45.28	74.00	-28.72	peak	
2		2500.000	42.89	-3.00	39.89	74.00	-34.11	peak	

Test Result: Pass

[Test mode:TX High channel]; [Polarity: Vertical]



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	2483.500	50.56	-2.91	47.65	74.00	-26.35	peak	
2		2500.000	43.02	-3.00	40.02	74.00	-33.98	peak	

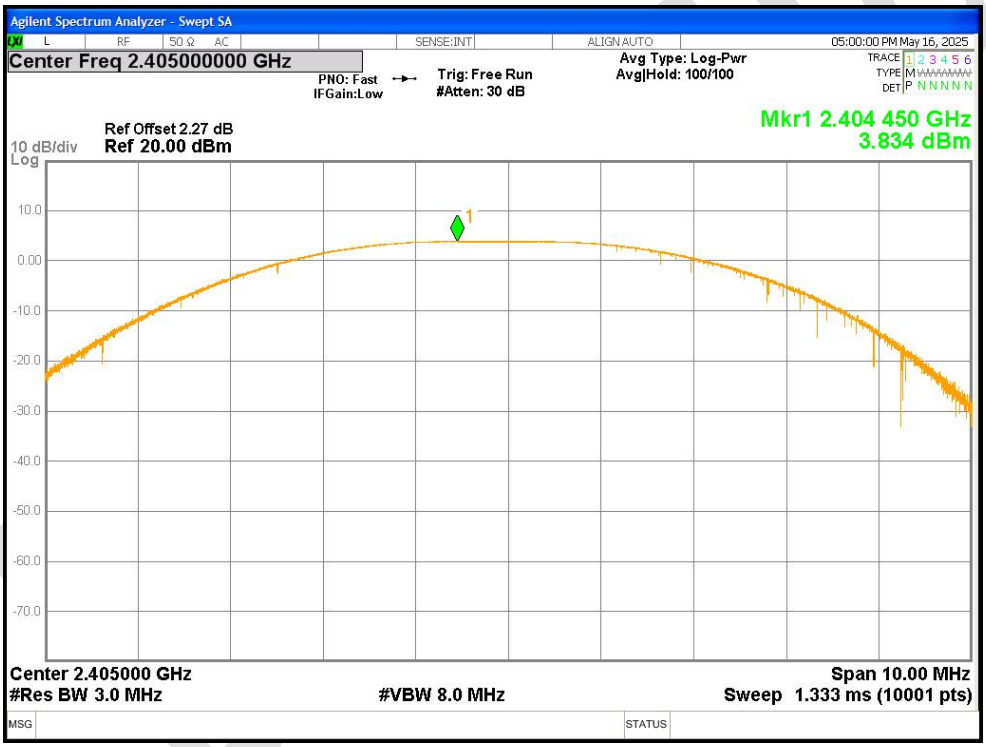
Test Result: Pass

7 Appendix A

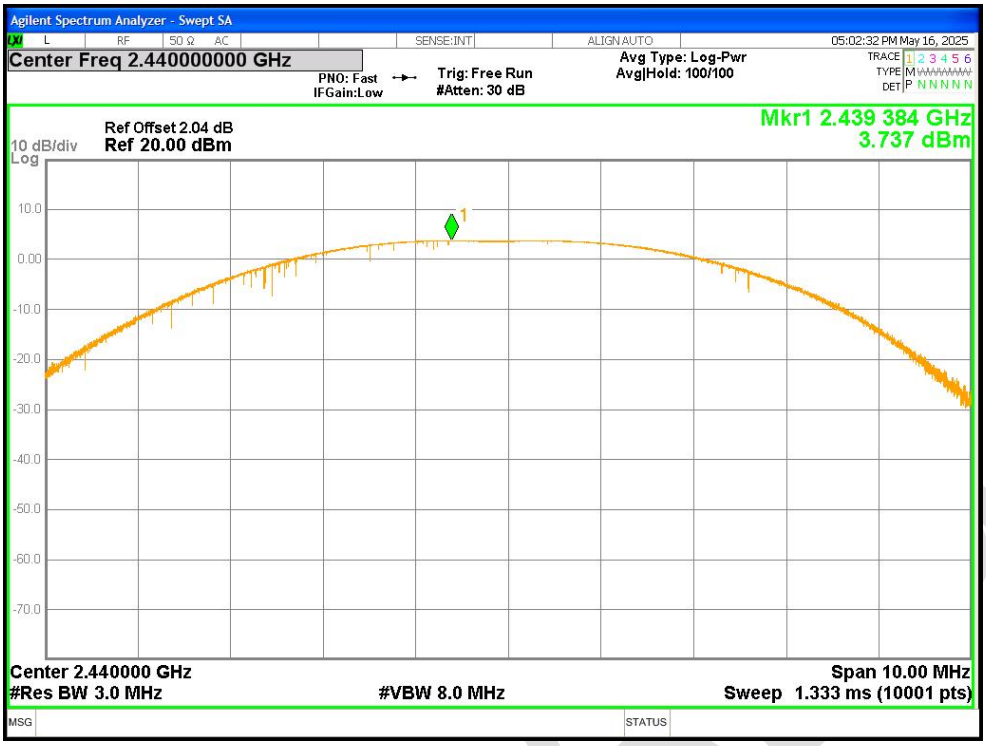
7.1 Maximum PK Conducted Output Power

Condition	Mode	Frequency (MHz)	Antenna	Conducted Power (dBm)	Limit (dBm)	Verdict
NVNT	ZIGBEE	2405	Ant1	3.834	30	Pass
NVNT	ZIGBEE	2440	Ant1	3.737	30	Pass
NVNT	ZIGBEE	2480	Ant1	3.173	30	Pass

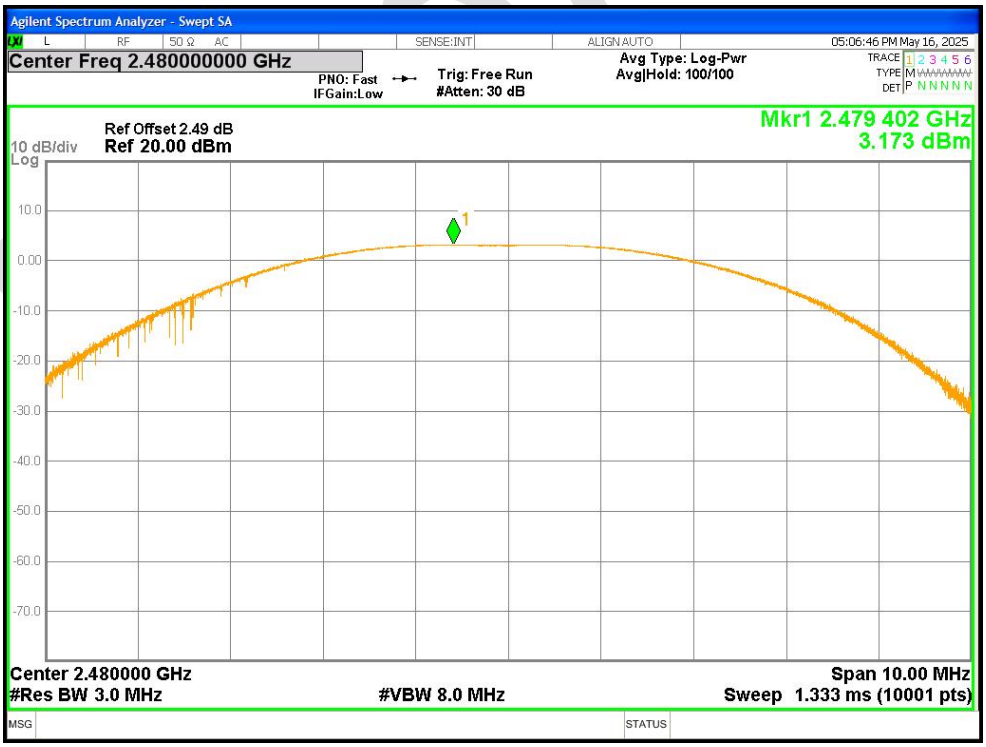
Power NVNT ZIGBEE 2405MHz Ant1



Power NVNT ZIGBEE 2440MHz Ant1



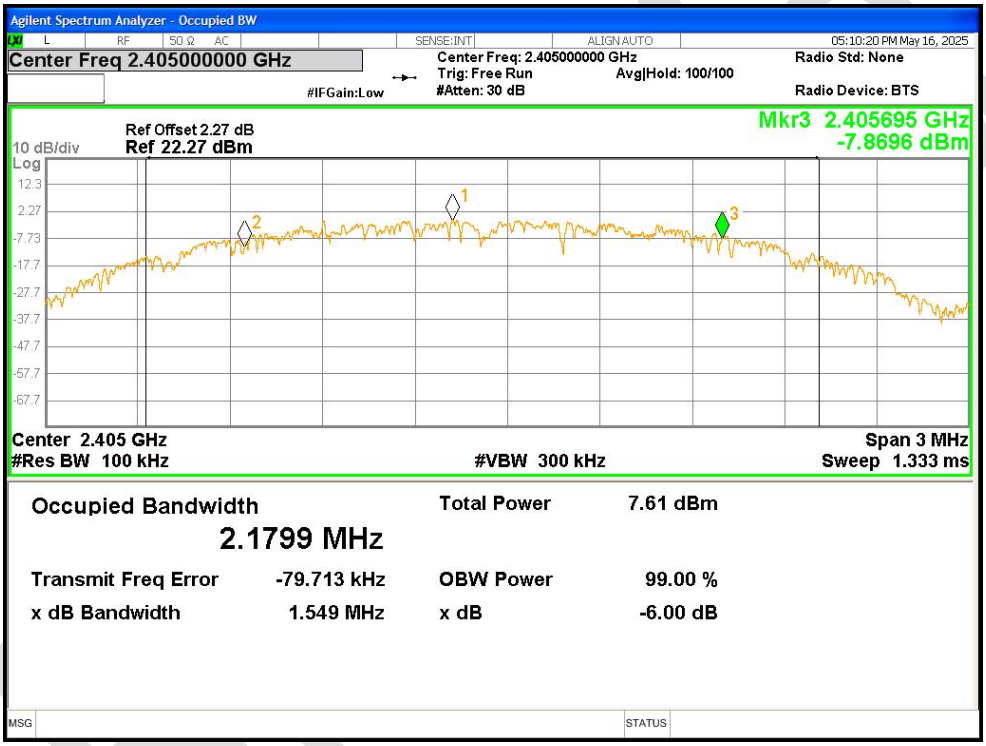
Power NVNT ZIGBEE 2480MHz Ant1



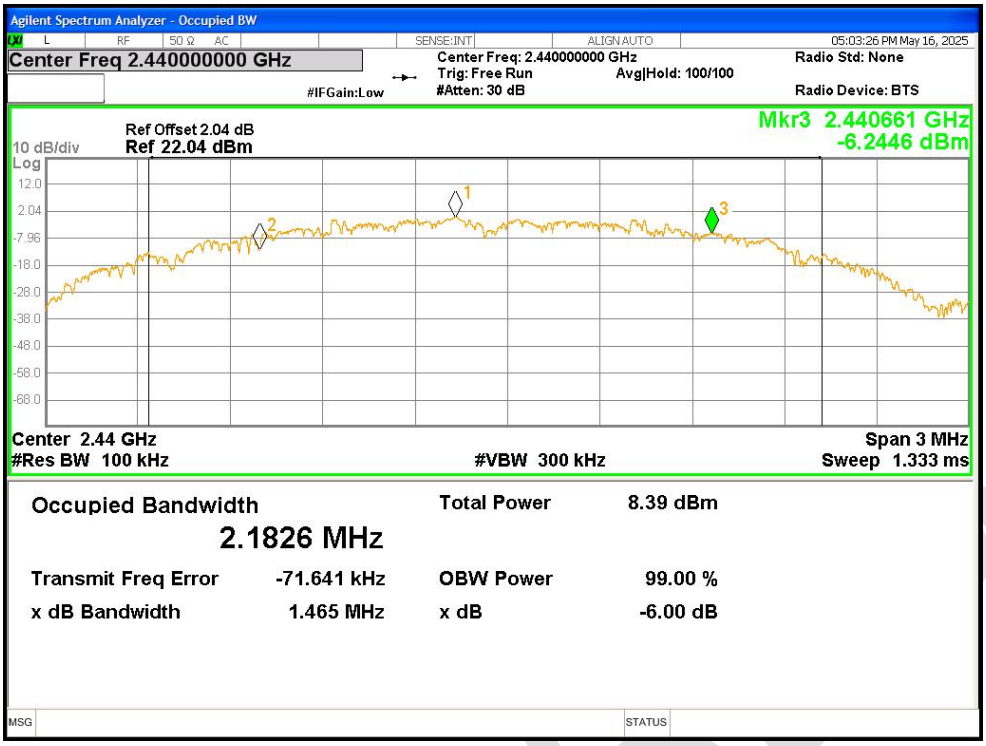
7.2-6dB Bandwidth

Condition	Mode	Frequency (MHz)	Antenna	-6 dB Bandwidth (MHz)	Limit -6 dB Bandwidth (MHz)	Verdict
NVNT	ZIGBEE	2405	Ant1	1.549	0.5	Pass
NVNT	ZIGBEE	2440	Ant1	1.465	0.5	Pass
NVNT	ZIGBEE	2480	Ant1	1.283	0.5	Pass

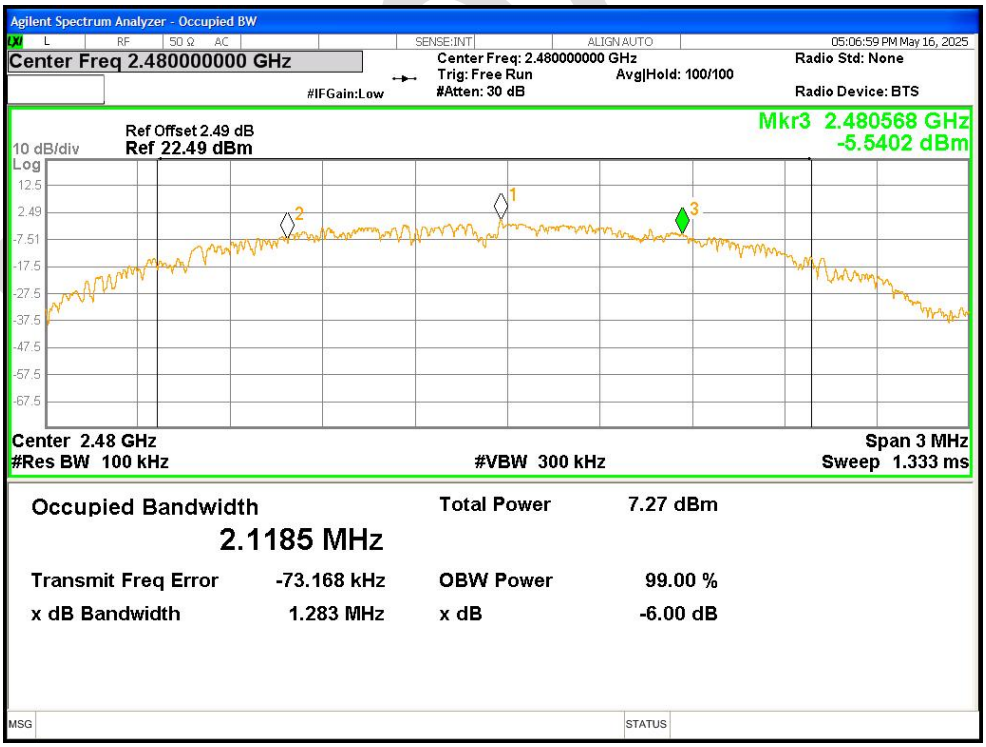
-6dB Bandwidth NVNT ZIGBEE 2405MHz Ant1



-6dB Bandwidth NVNT ZIGBEE 2440MHz Ant1



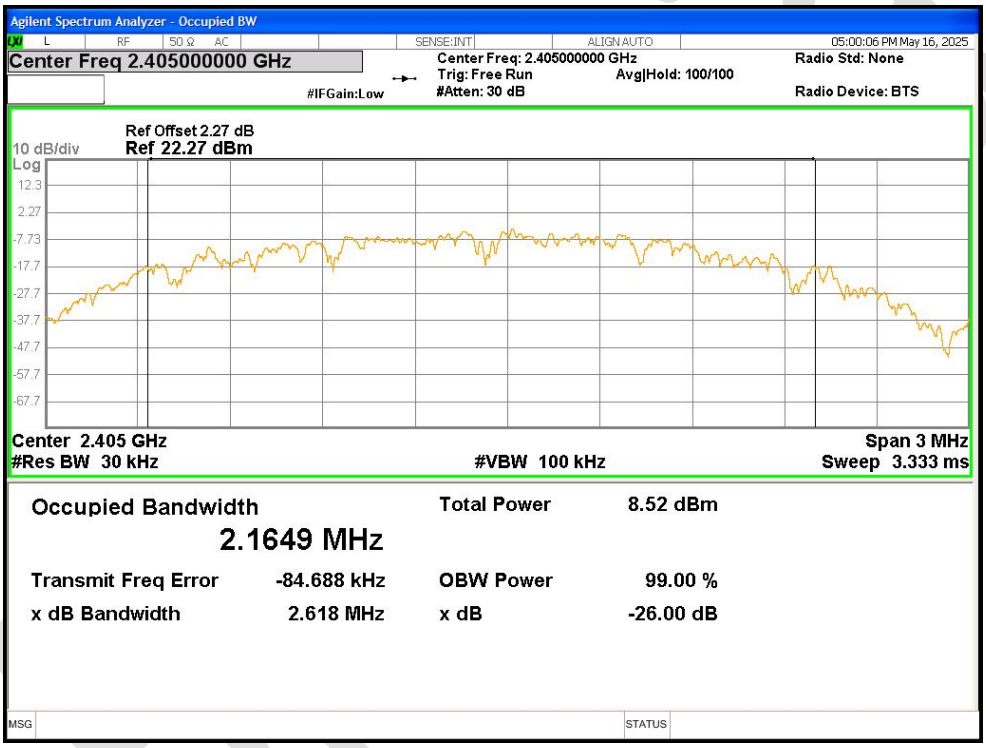
-6dB Bandwidth NVNT ZIGBEE 2480MHz Ant1



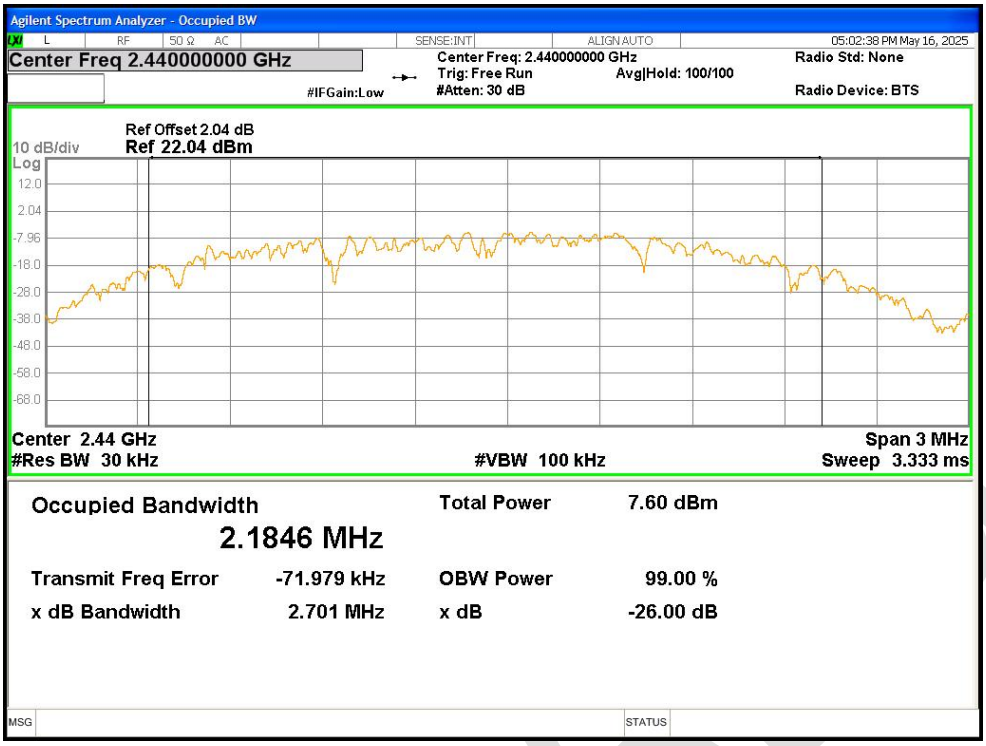
7.3 Occupied Channel Bandwidth

Condition	Mode	Frequency (MHz)	Antenna	99% OBW (MHz)
NVNT	ZIGBEE	2405	Ant1	2.1649
NVNT	ZIGBEE	2440	Ant1	2.1846
NVNT	ZIGBEE	2480	Ant1	2.2058

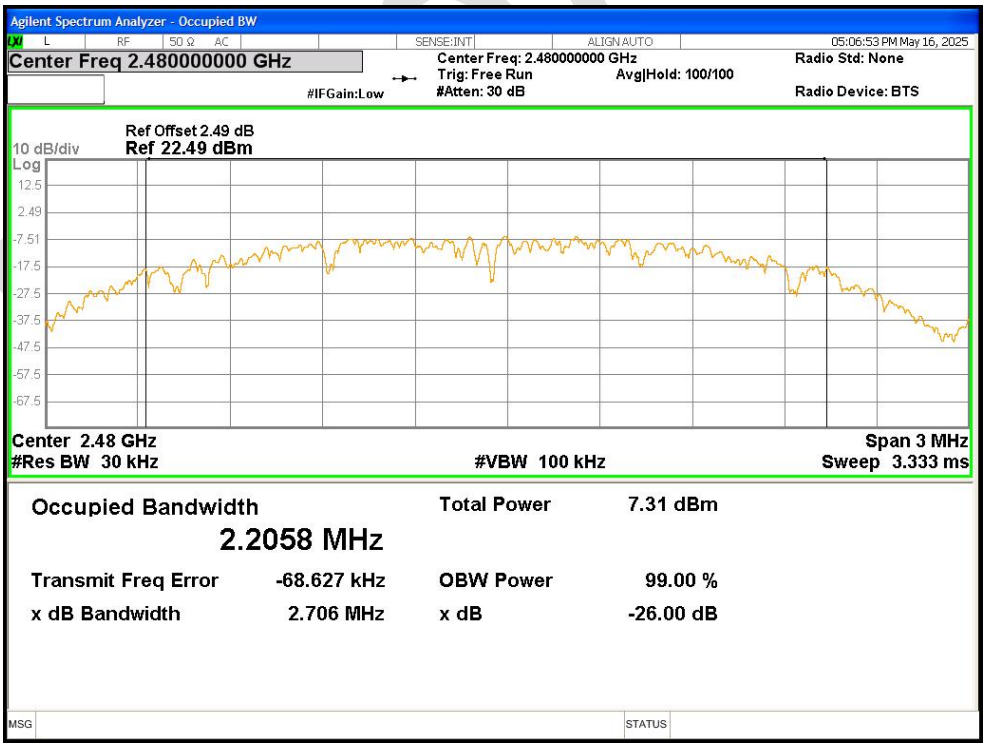
OBW NVNT ZIGBEE 2405MHz Ant1



OBW NVNT ZIGBEE 2440MHz Ant1



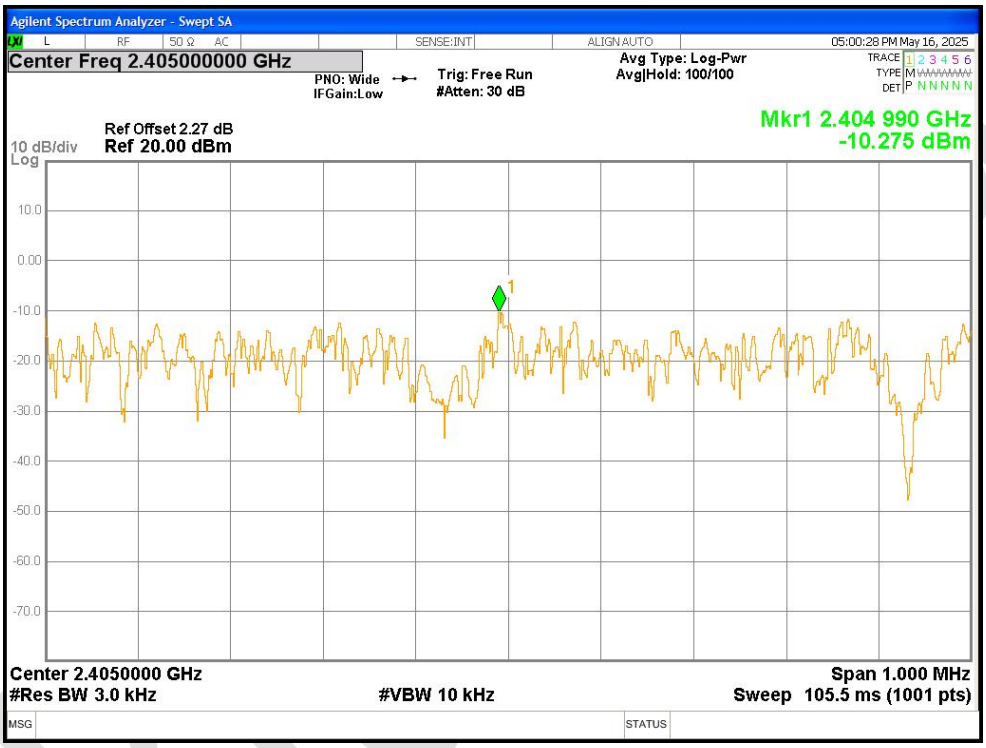
OBW NVNT ZIGBEE 2480MHz Ant1



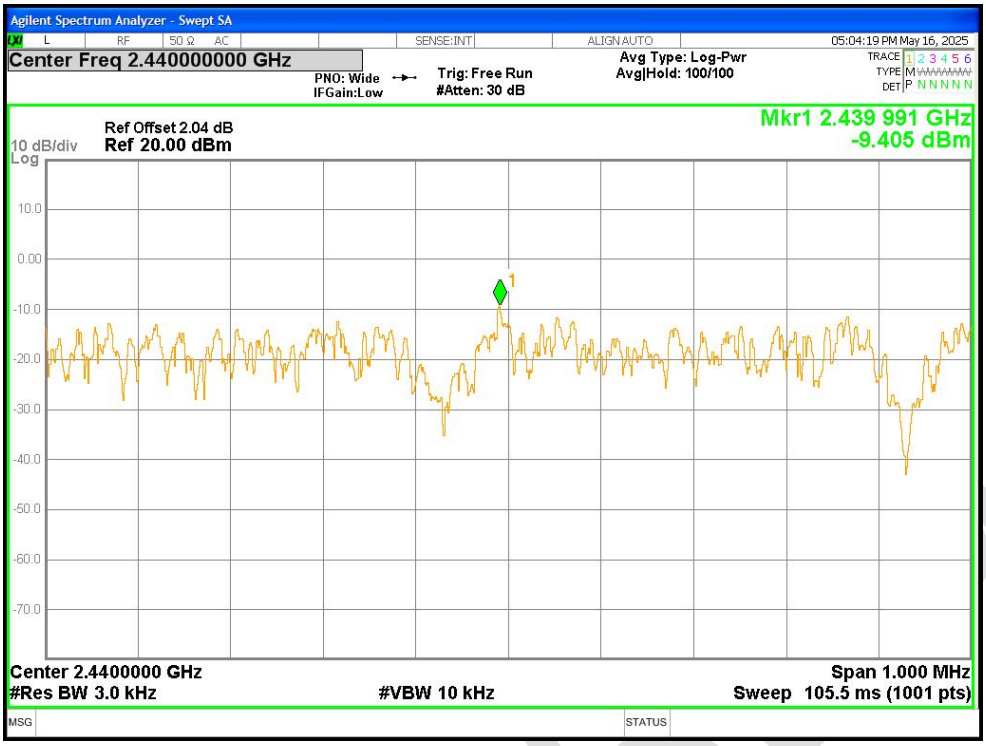
7.4 Maximum Power Spectral Density Level

Condition	Mode	Frequency (MHz)	Antenna	Max PSD (dBm)	Limit (dBm)	Verdict
NVNT	ZIGBEE	2405	Ant1	-10.275	8	Pass
NVNT	ZIGBEE	2440	Ant1	-9.405	8	Pass
NVNT	ZIGBEE	2480	Ant1	-9.944	8	Pass

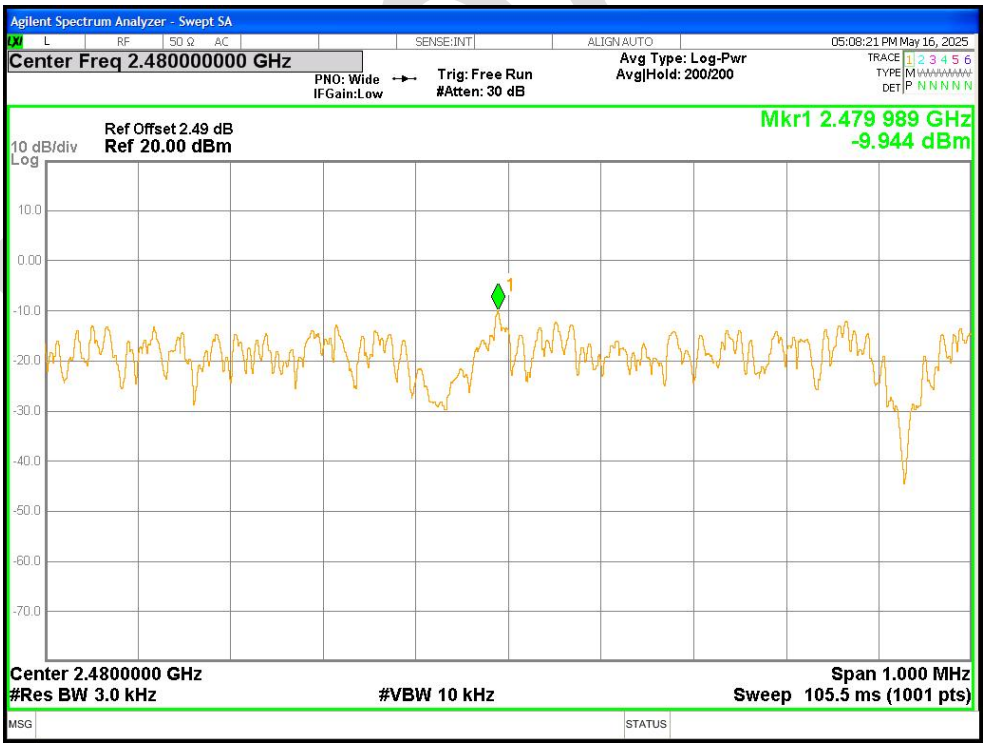
PSD NVNT BLE 1M 2405MHz Ant1



PSD NVNT BLE 1M 2440MHz Ant1



PSD NVNT BLE 1M 2480MHz Ant1

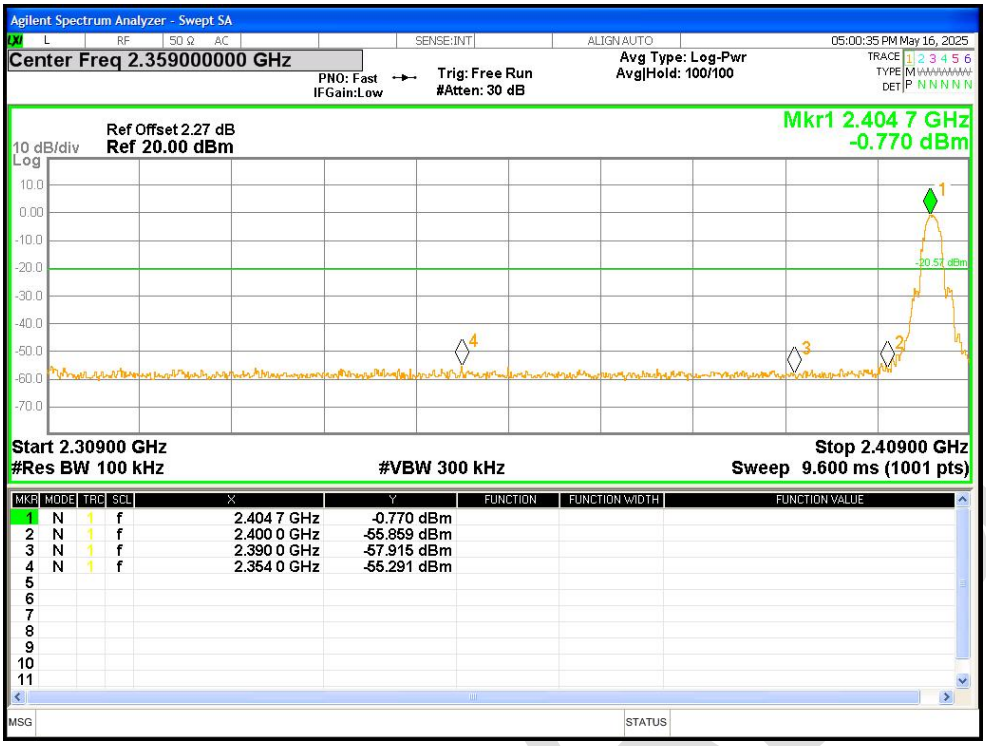


7.5 Band Edge

Condition	Mode	Frequency (MHz)	Antenna	Max Value (dBc)	Limit (dBc)	Verdict
NVNT	ZIGBEE	2405	Ant1	-54.72	-30	Pass
NVNT	ZIGBEE	2480	Ant1	-48.57	-30	Pass

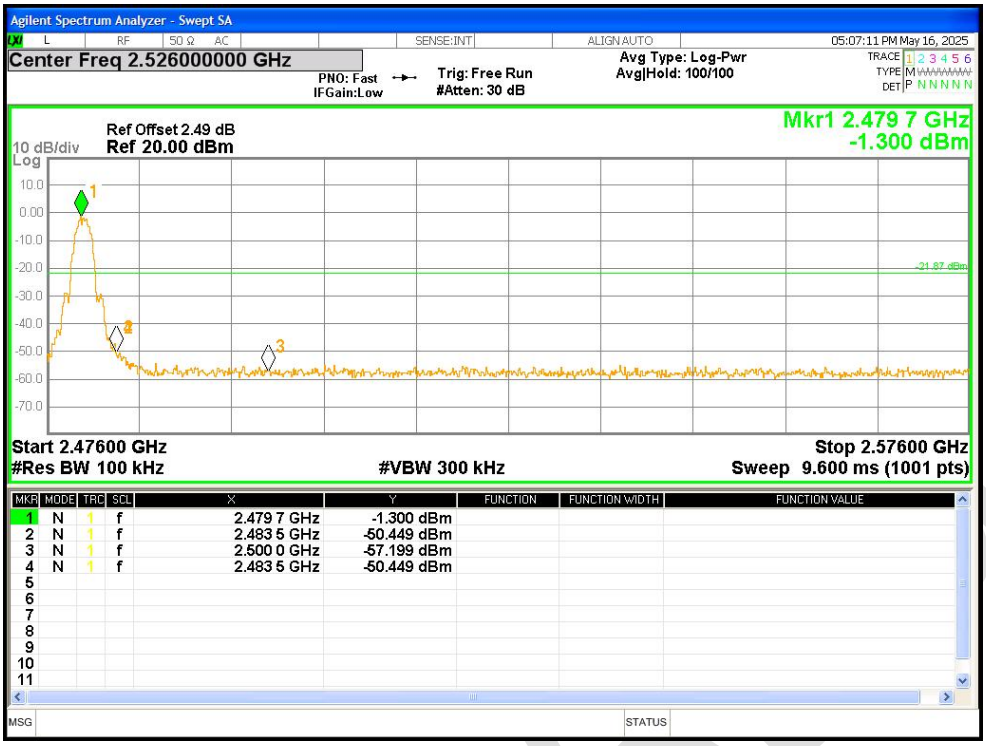
Band Edge NVNT ZIGBEE 2405MHz Ant1 Ref

Band Edge NVNT ZIGBEE 2405MHz Ant1 Emission



Band Edge NVNT ZIGBEE 2480MHz Ant1 Ref

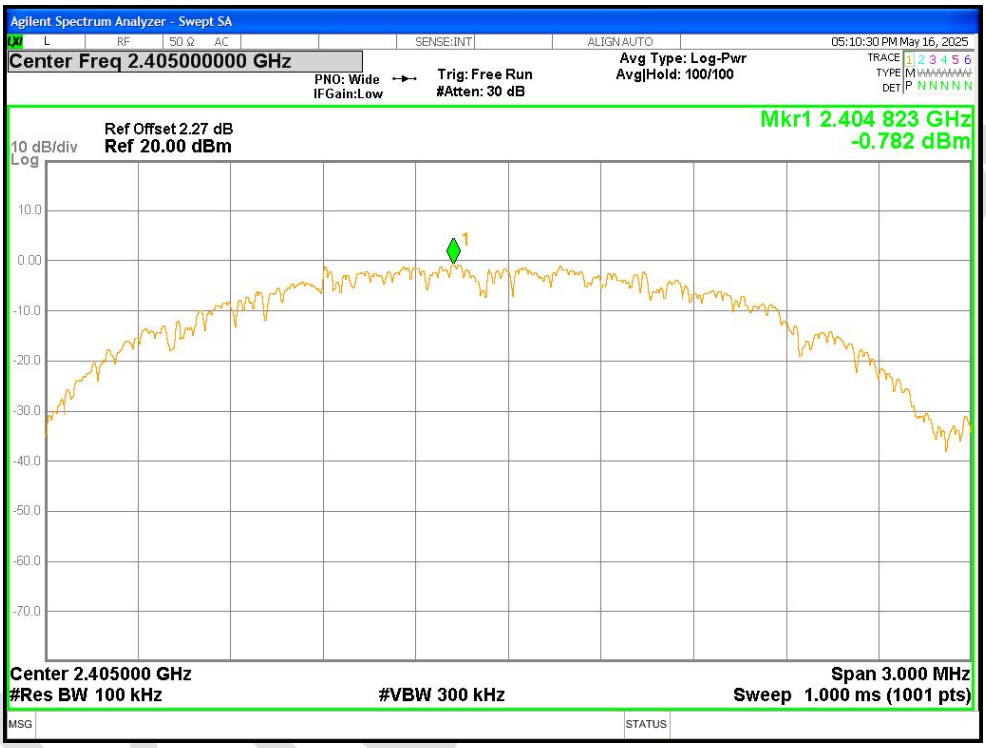
Band Edge NVNT ZIGBEE 2480MHz Ant1 Emission


Agilent Spectrum Analyzer - Swept SA
Center Freq 2.526000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 100/100
05:07:11 PM May 16, 2025
Ref Offset 2.49 dB
10 dB/div
Ref 20.00 dBm
Log
Mkr1 2.479 7 GHz
-1.300 dBm
-21.87 dBm
Start 2.47600 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.57600 GHz
Sweep 9.600 ms (1001 pts)
1 N 1 f 2.479 7 GHz -1.300 dBm
2 N 1 f 2.483 5 GHz -50.449 dBm
3 N 1 f 2.500 0 GHz -57.199 dBm
4 N 1 f 2.483 5 GHz -50.449 dBm

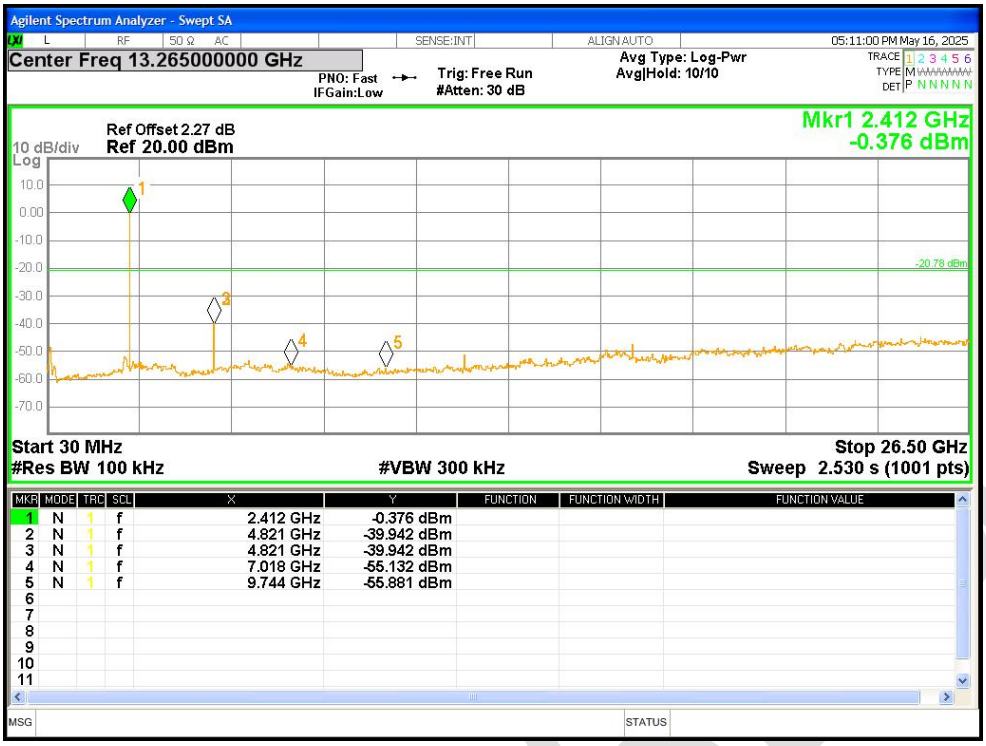
7.6 Conducted RF Spurious Emission

Condition	Mode	Frequency (MHz)	Antenna	Max Value (dBc)	Limit (dBc)	Verdict
NVNT	ZIGBEE	2405	Ant1	-39.16	-30	Pass
NVNT	ZIGBEE	2440	Ant1	-43.56	-30	Pass
NVNT	ZIGBEE	2480	Ant1	-43.53	-30	Pass

Tx. Spurious NVNT BLE 1M 2405MHz Ant1 Ref

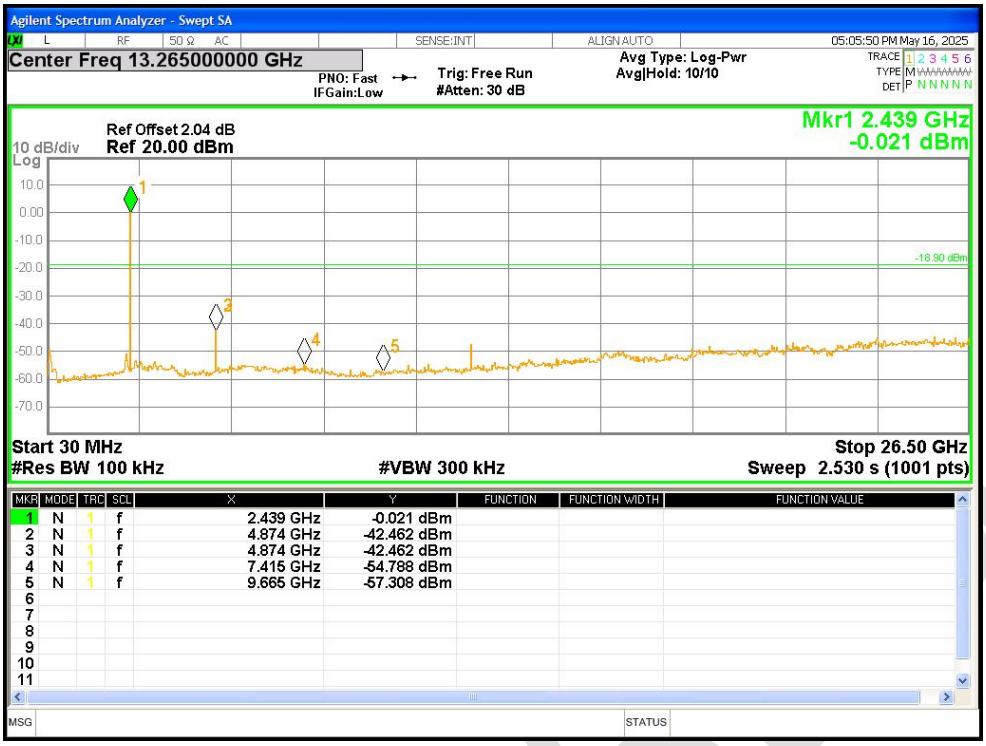


Tx. Spurious NVNT BLE 1M 2405MHz Ant1 Emission

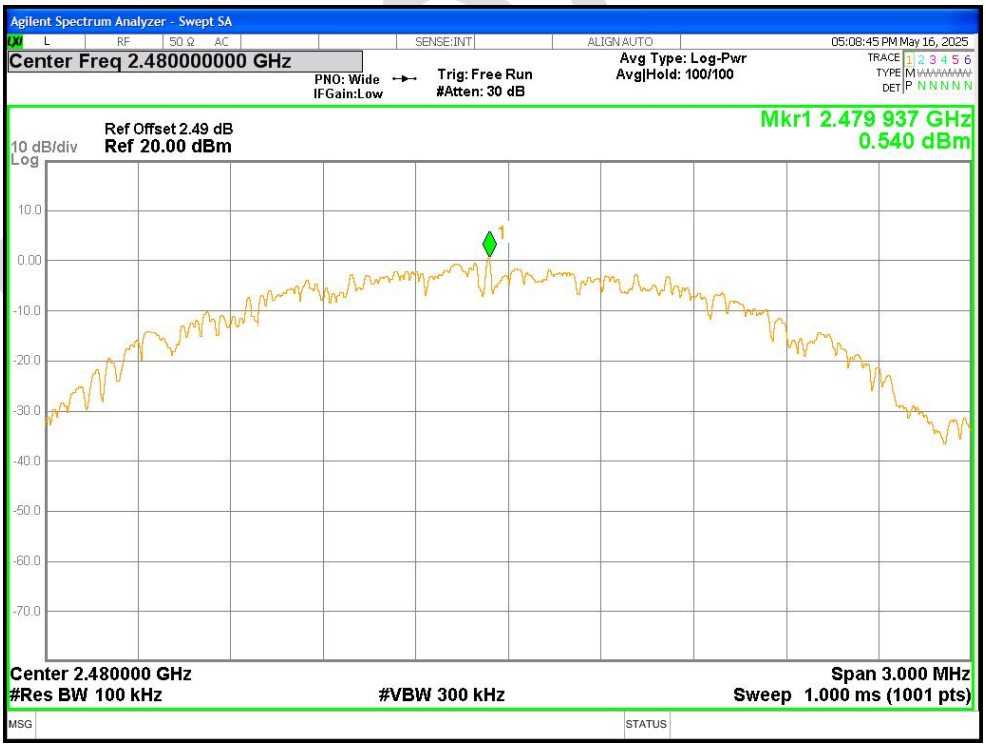
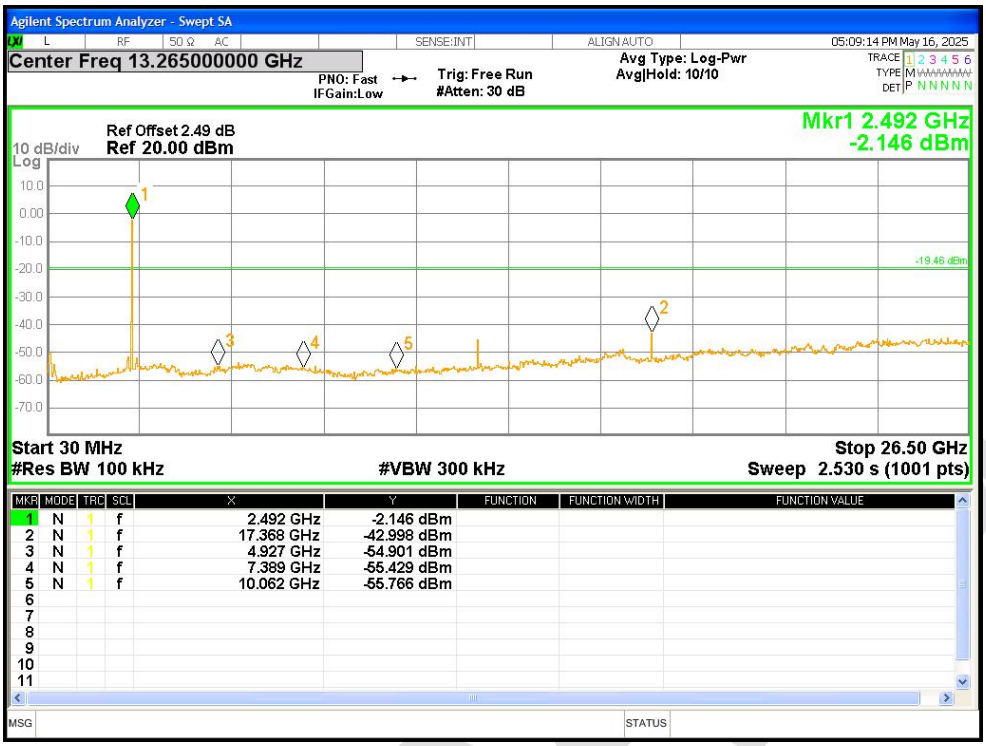


Tx. Spurious NVNT BLE 1M 2440MHz Ant1 Ref

Tx. Spurious NVNT BLE 1M 2440MHz Ant1 Emission



Tx. Spurious NVNT BLE 1M 2480MHz Ant1 Ref



Tx. Spurious NVNT BLE 1M 2480MHz Ant1 Emission