FCC Radio Test Report

FCC ID: XXXX

Report No.	:	eLAB-FCC-2-2403X002
Equipment	:	PJ-WPD-800
Model Name	:	VS20085
Brand Name	:	ViewSonic
Applicant	:	ViewSonic Corporation
Address	:	10 Pointe Dr. Suite 200. Brea, CA 92821 United States
Radio Function	:	Bluetooth Low Energy (5.0)
FCC Rule Part(s)	:	FCC CFR Title 47, Part 15, Subpart C (15.247)
Measurement Procedure(s)	:	ANSI C63.10-2013
Date of Receipt	:	2024/3/14
Date of Test	:	2024/3/28~2024/4/18
Issued Date	:	2024/5/16

The above equipment has been tested and found in compliance with the requirement of the above standards by eTest certification Laboratory Inc. hereinafter referred to as “eLAB”.

Prepared by :

Ray.chen

Ray Chen, Engineer

Approved by :

Sam Chuang

Sam Chuang, Director

Testing Laboratory
4045

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Declaration

eLAB represents to the client that testing is done in accordance with standard procedures as applicable and that test instruments used has been calibrated with standards traceable to international standard(s) and/or national standard(s).

eLAB's reports apply only to the specific samples tested under conditions. It is manufacture's responsibility to ensure that additional production units of this model are manufactured with the identical electrical and mechanical components. **eLAB** shall have no liability for any declarations, inferences or generalizations drawn by the client or others from **eLAB** issued reports.

This report is the confidential property of the client. As a mutual protection to the clients, the public and ourselves, the test report shall not be reproduced, except in full, without our written approval.

eLAB's laboratory quality assurance procedures are in compliance with the **ISO/IEC 17025** requirements, and accredited by the conformity assessment authorities listed in this test report.

eLAB is not responsible for the sampling stage, so the results only apply to the sample as received.

The information, data and test plan are provided by manufacturer which may affect the validity of results, so it is manufacturer's responsibility to ensure that the apparatus meets the essential requirements of applied standards and in all the possible configurations as representative of its intended use.

Limitation

For the use of the authority's logo is limited unless the Test Standard(s)/Scope(s)/Item(s) mentioned in this test report is (are) included in the conformity assessment authorities acceptance respective.

Please note that the measurement uncertainty is provided for informational purpose only and are not use in determining the Pass/Fail results.

CONTENTS

REVISION HISTORY

Report No.	Version	Description	Issued Date	Note
eLAB-FCC-2-2403X002	R00	Original Report.	2024/5/16	Valid

1 SUMMARY OF TEST RESULTS

Test procedures according to the technical standards.

Standard(s) Section	Description	Result	Remark
15.207	AC Power Line Conducted Emissions	Pass	------
15.205 15.209 15.247(d)	Radiated Emissions	Pass	------
15.247(a)(2)	Bandwidth	Pass	------
15.247(b)(3)	Output Power	Pass	------
15.247(e)	Power Spectral Density	Pass	------
15.247(d)	Antenna conducted Spurious Emission	Pass	------
15.203	Antenna Requirement	Pass	------

NOTE:
(1) ”N/A” denotes test is not applicable in this Test Report.
(2) The report format version is FR15CBT4.0_V1.0

1.1 TEST FACILITY

The test locations stated below are under the TAF Accreditation and FCC designation number is 4045.The satellite facilities under the test firm used to collect the test data in this report are:
No. 91, Ln. 298, Wengong 1st Rd., Guishan Dist., Taoyuan City 333001, Taiwan

■ CB03 ■ C01

1.2 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement **y** ± **U**, where expanded uncertainty **U** is based on a standard uncertainty multiplied by a coverage factor of **k = 2**, providing a level of confidence of approximately **95 %**. The measurement instrumentation uncertainty considerations contained in CISPR 16-4-2. The eLAB measurement uncertainty is less than the CISPR 16-4-2 U_{cispr} requirement.

A. AC power line conducted emissions test:

Test Site	Method	Measurement Frequency Range	U (dB)
C01	CISPR	150 kHz ~ 30MHz	3.4

B. Radiated emissions test:

Test Site	Method	Measurement Frequency Range	Ant. H / V	U (dB)
CB03	CISPR	0.009 kHz ~ 30 MHz	-	2.9
		30 MHz ~ 1000 MHz	H	3.2
			V	4.0
		1 GHz ~ 6 GHz	H	4.8
			V	4.9
		6 GHz ~ 18 GHz	H	4.8
			V	4.7
		18 GHz	-	4.1

C. Conducted test:

Test Item	U, (dB)
Occupied Bandwidth	1.0502
Output power	1.0406
Power Spectral Density	1.0502
Conducted Spurious emissions	1.1484
Conducted Band edges	1.0518

NOTE:
Unless specifically mentioned, the uncertainty of measurement has not been taken into account to declare the compliance or non-compliance to the specification.

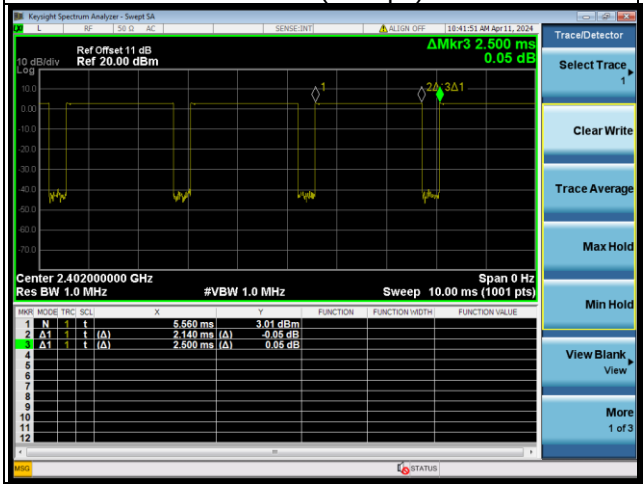
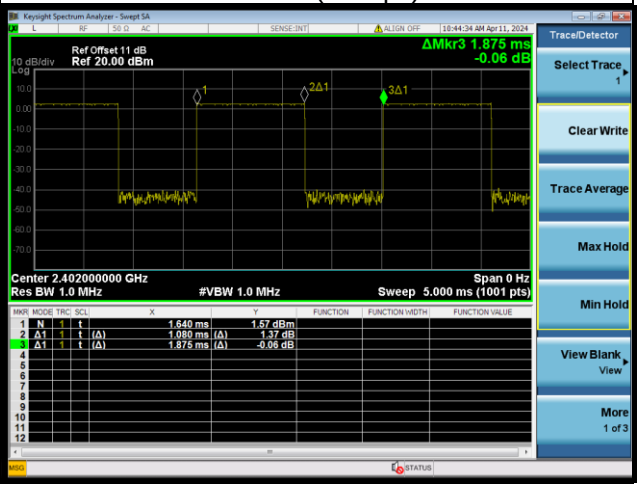
1.3 TABLE OF PARAMETERS OF TEXT SOFTWARE SETTING

Test Software	teraterm-4.107			
Modulation Mode	2402 MHz	2440 MHz	2480 MHz	Data Rate
BLE 5.0	DEF	DEF	DEF	1 Mbps
BLE 5.0	DEF	DEF	DEF	2 Mbps

1.4 DUTY CYCLE

If duty cycle is ≥ 98 %, duty factor is not required.
If duty cycle is < 98 %, duty factor shall be considered.

Remark	Delta 1			Delta 2	On Time/Period	10 log(1/Duty Cycle)
Mode	ON (ms)	Numbers (ON)	On Time (B) (ms)	Period (ON+OFF) (ms)	Duty Cycle (%)	Duty Factor (dB)
BLE 5.0 (1 Mbps)	2.140	1	2.140	2.500	85.60%	0.68
BLE 5.0 (2 Mbps)	1.080	1	1.080	1.875	57.60%	2.40

BLE 5.0 (1 Mbps)	BLE 5.0 (2 Mbps)
	

2 GENERAL INFORMATION

2.1 DESCRIPTION OF EUT

Equipment	PJ-WPD-800
Model Name	VS20085
Brand Name	ViewSonic
Serial Number	N/A
Test Software Version	teraterm-4.107
Operation Band	2400 MHz ~ 2483.5 MHz
Operation Frequency	2402 MHz ~ 2480 MHz
Modulation Technology	GFSK
Transfer Rate	1 Mbps, 2 Mbps
Output Power Max.	1 Mbps: 9.65 dBm (0.0092 W) 2 Mbps: 10.11 dBm (0.0103 W)

NOTE:

(1) The above EUT information is declared by manufacturer and for more detailed features description, please refers to the manufacturer's specifications or user's manual.

(2) Channel List:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
00	2402	20	2442
01	2404	21	2444
02	2406	22	2446
03	2408	23	2448
04	2410	24	2450
05	2412	25	2452
06	2414	26	2454
07	2416	27	2456
08	2418	28	2458
09	2420	29	2460
10	2422	30	2462
11	2424	31	2464
12	2426	32	2466
13	2428	33	2468
14	2430	34	2470
15	2432	35	2472
16	2434	36	2474
17	2436	37	2476
18	2438	38	2478
19	2440	39	2480

(3) Table for Filed Antenna:

Brand Name	Model Name	Type	Frequency (MHz)	Gain (dBi)
ViewSonic	HP47D	PCB	N/A	4.83

(4) The above Antenna information is derived from the antenna data sheet provided by manufacturer and for more detailed features description, please refer to the manufacturer's specifications, the laboratory shall not be held responsible.

2.2 TEST MODES

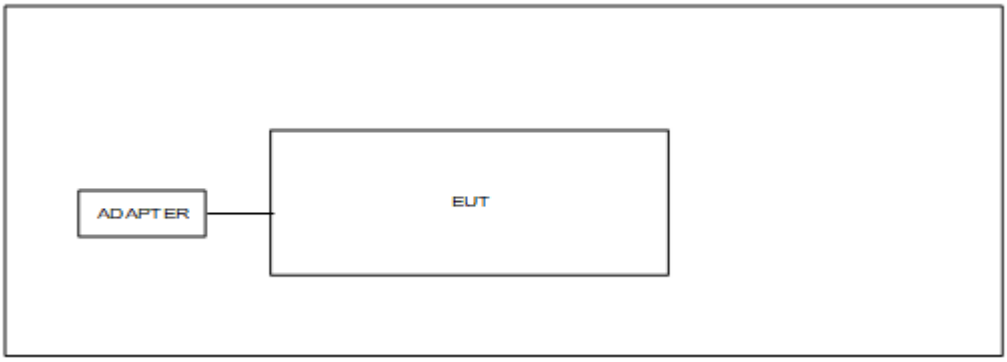
Test Items	Test mode	Channel	Note
AC power line conducted emissions	Normal	-	-
Transmitter Radiated Emissions (below 1GHz)	1 Mbps	00	-
Transmitter Radiated Emissions (above 1GHz)	1/2 Mbps	00/39	Bandedge
	1/2 Mbps	00/19/39	Harmonic
Bandwidth	1/2 Mbps	00/19/39	-
Output Power	1/2 Mbps	00/19/39	-
Power Spectral Density	1/2 Mbps	00/19/39	-
Antenna conducted Spurious Emission	1/2 Mbps	00/19/39	-

NOTE:
(1) For radiated emission band edge test, both Vertical and Horizontal are evaluated, but only the worst case (Horizontal) is recorded.

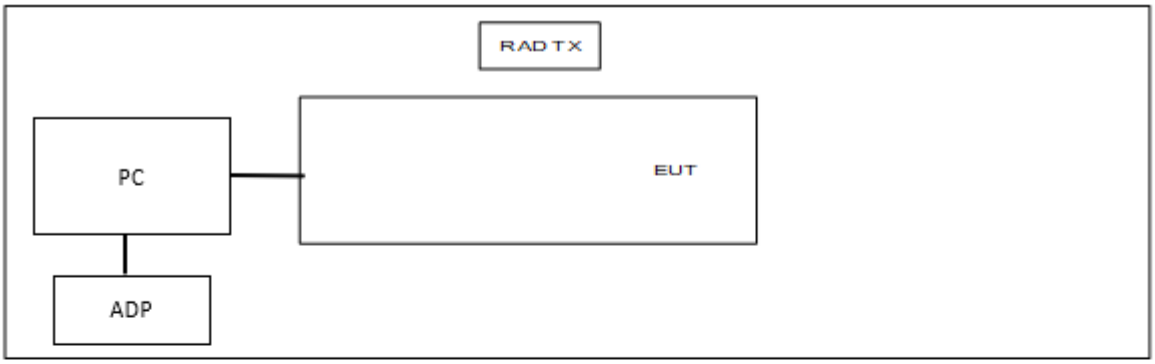
2.3 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

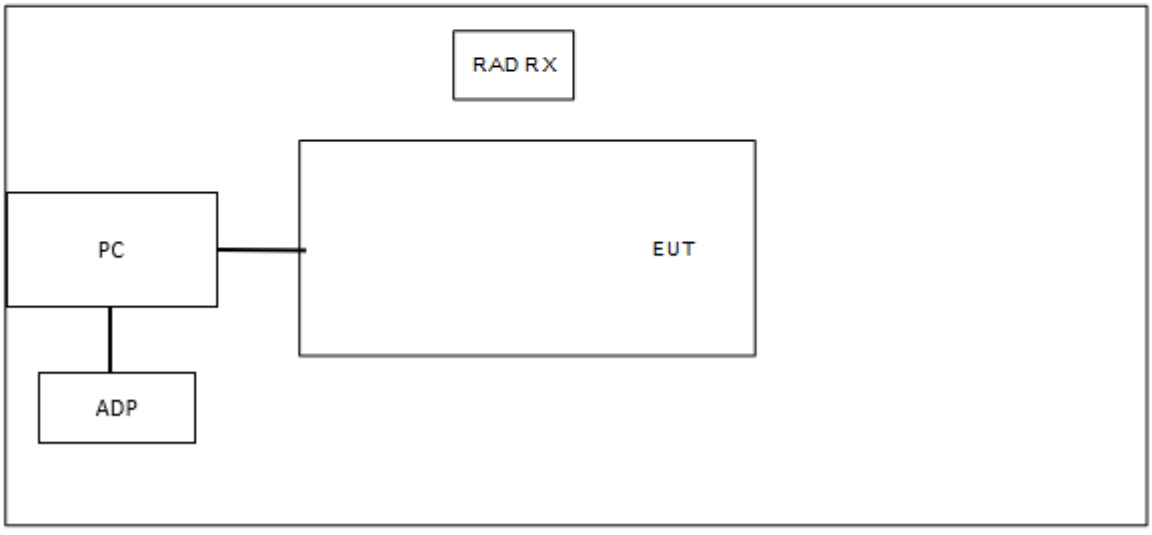
Equipment letters and Cable numbers refer to item numbers described in the tables of clause 2.4.

AC power line conducted emissions



Radiated Emissions





2.4 SUPPORT UNITS

Item	Equipment	Brand	Model No.	Remarks
A	NB	Dynabook	TECRA A40-J	Furnished by test lab.
B	ADP	Dynabook	PAS352E-1AC3	Furnished by test lab.
C	Fixture	ViewSonic	5800-2CUART	Supplied by test requester.
D	Remote Controller	OHSUNG	G10	Supplied by test requester

Item	Cable Type	Ferrite Core	Length	Shielded	Remarks
1	Micro USB	N/A	1.6m	YES	Supplied by test requester.

3 AC POWER LINE CONDUCTED EMISSIONS TEST

3.1 LIMIT

Frequency (MHz)	Limit (dBμV)	
	Quasi-peak	Average
0.15 - 0.5	66 - 56 *	56 - 46 *
0.50 - 5.0	56	46
5.0 - 30.0	60	50

NOTE:
(1) The tighter limit applies at the band edges.
(2) The limit of " * " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.
(3) The test result calculated as following:
Measurement Value = Reading Level + Correct Factor
Correct Factor = Insertion Loss + Cable Loss + Attenuator Factor (if use)
Margin Level = Measurement Value – Limit Value
Calculation example:

Reading Level (dBμV)		Correct Factor (dB)		Measurement Value (dBμV/m)		Limit Value (dBμV/m)		Margin Level (dB)
38.22	+	3.45	=	41.67	-	60	=	-18.33

The following table is the setting of the receiver.

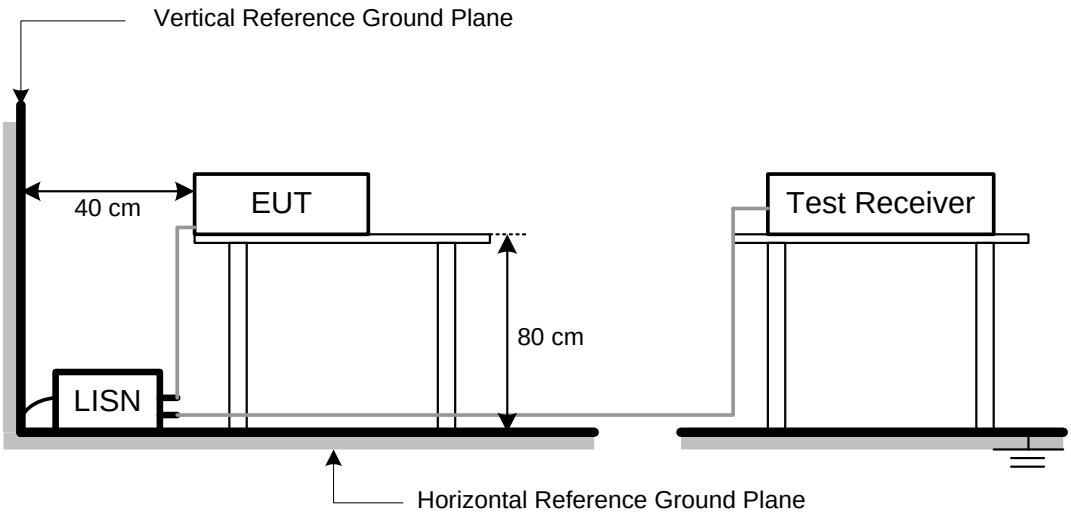
Receiver Parameter	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 KHz

3.2 TEST PROCEDURE

a. The EUT was placed 0.8 m above the horizontal ground plane with the EUT being connected to the power mains through a line impedance stabilization network (LISN).
All other support equipment were powered from an additional LISN(s).
The LISN provides 50 Ohm/50uH of impedance for the measuring instrument.
b. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle to keep the cable above 40 cm.
c. Excess I/O cables that are not connected to a peripheral shall be bundled in the center.
The end of the cable will be terminated, using the correct terminating impedance.
The overall length shall not exceed 1 m.
d. The LISN is spaced at least 80 cm from the nearest part of the EUT chassis.
e. For the actual test configuration, please refer to the related Item – EUT TEST PHOTO.

NOTE:
(1) In the results, each reading is marked as Peak, QP or AVG per the detector used.
BW=9 kHz (6 dB Bandwidth)
(2) All readings are Peak unless otherwise stated QP or AVG in column of Note. Both the QP and the AVG readings must be less than the limit for compliance.

3.3 TEST SETUP



3.4 TEST RESULT

Please refer to the **APPENDIX A**.

4 RADIATED EMISSIONS TEST

4.1 LIMIT

In case the emission fall within the restricted band specified on 15.205, then the 15.209 limit in the table below has to be followed.

LIMITS OF RADIATED EMISSIONS MEASUREMENT (9 kHz to 1000 MHz)

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
960~1000	500	3

LIMITS OF RADIATED EMISSIONS MEASUREMENT (Above 1000 MHz)

Frequency (MHz)	Radiated Emissions (dBuV/m)		Measurement Distance (meters)
	Peak	Average	
Above 1000	74	54	3

NOTE:
(1) The limit for radiated test was performed according to FCC CFR Title 47, Part 15, Subpart C.
(2) The tighter limit applies at the band edges.
(3) Emission level (dBuV/m)=20log Emission level (uV/m).
(4) The test result calculated as following:
Measurement Value = Reading Level + Correct Factor
Correct Factor = Antenna Factor + Cable Loss - Amplifier Gain(if use)
Margin Level = Measurement Value - Limit Value
Calculation example:

Reading Level (dBµV)		Correct Factor (dB/m)		Measurement Value (dBµV/m)		Limit Value (dBµV/m)		Margin Level (dB)
41.91	+	-8.36	=	33.55	-	4.35	=	-9.95

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RBW / VBW (Emission in restricted band)	1MHz / 3MHz for Peak, 1MHz / 1/T for Average

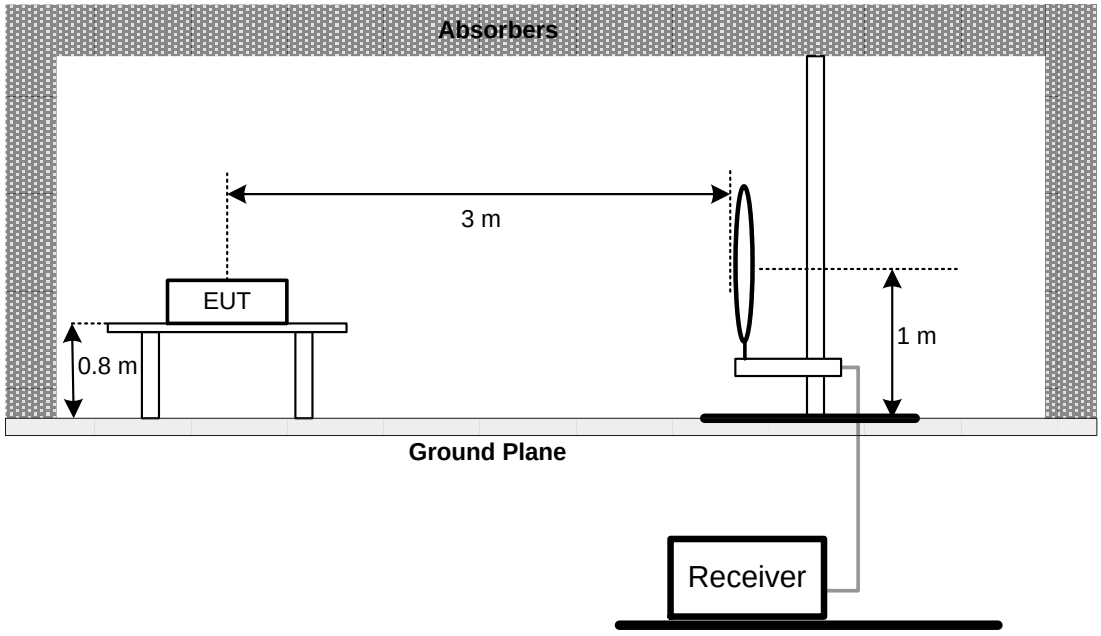
Spectrum Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9KHz~90KHz for PK/AVG detector
Start ~ Stop Frequency	90KHz~110KHz for QP detector
Start ~ Stop Frequency	110KHz~490KHz for PK/AVG detector
Start ~ Stop Frequency	490KHz~30MHz for QP detector
Start ~ Stop Frequency	30MHz~1000MHz for QP detector

4.2 TEST PROCEDURE

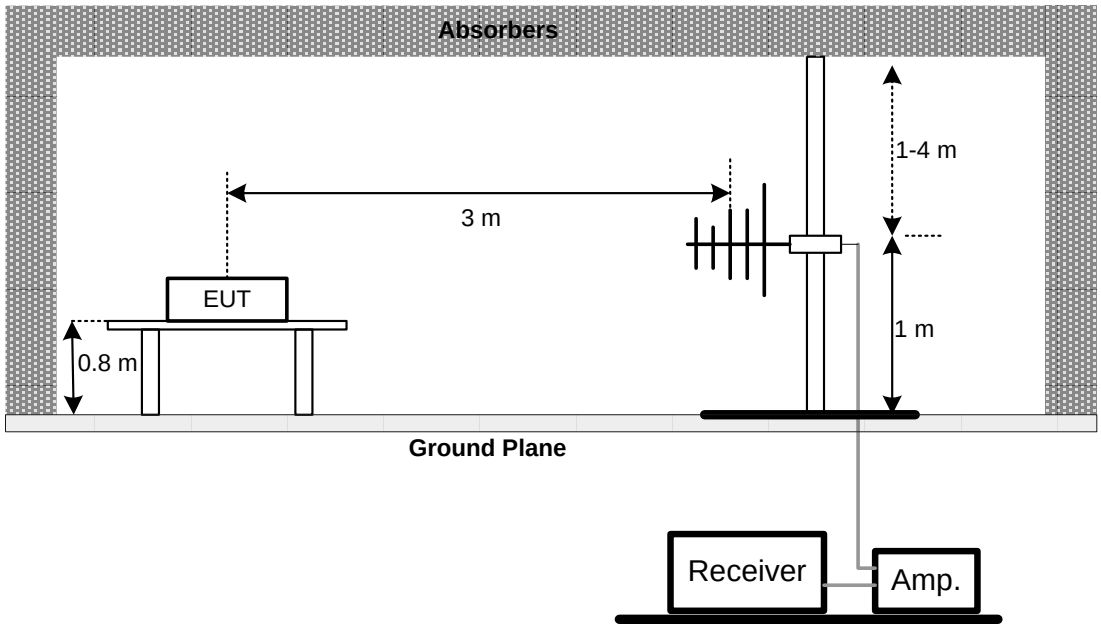
a. The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 0.8 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(below 1GHz)
b. The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 1.5 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(above 1GHz)
c. The height of the equipment or of the substitution antenna shall be 0.8 m or 1.5 m, the height of the test antenna shall vary between 1 m to 4 m. 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 find the maximum reading (used Bore sight function).
e. The receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1GHz.
f. The initial step in collecting radiated emission data is a receiver peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
g. All readings are Peak unless otherwise stated QP in column of Note. Peak denotes that the Peak reading compliance with the QP Limits and then QP Mode measurement didn‘t perform. (below 1GHz)
h. All readings are Peak Mode value unless otherwise stated AVG in column of Note. If the Peak Mode Measured value compliance with the Peak Limits and lower than AVG Limits, the EUT shall be deemed to meet both Peak & AVG Limits and then only Peak Mode was measured, but AVG Mode didn‘t perform. (above 1GHz)
i. For the actual test configuration, please refer to the related Item – EUT TEST PHOTO.

4.3 TEST SETUP

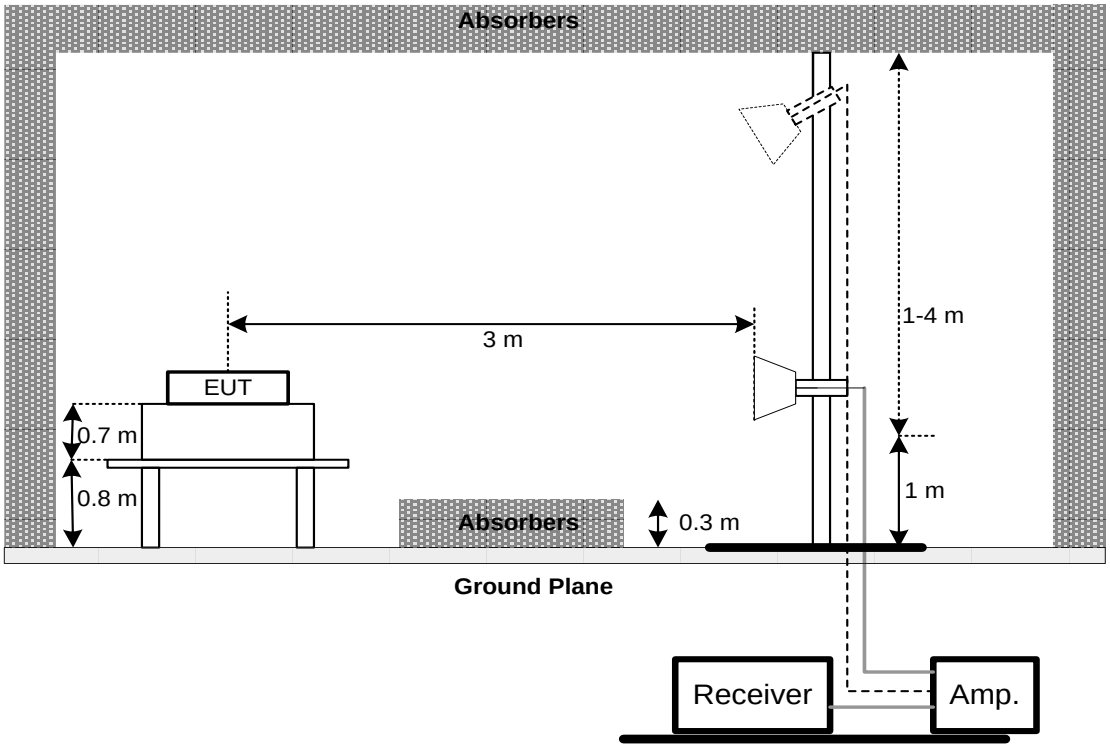
9 kHz to 30 MHz



30 MHz to 1 GHz



Above 1 GHz



4.4 EUT OPERATING CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

4.5 TEST RESULT – BELOW 30 MHZ

There were no emissions found below 30 MHz within 20 dB of the limit.

4.6 TEST RESULT – 30 MHZ TO 1 GHZ

Please refer to the APPENDIX B.

4.7 TEST RESULT – ABOVE 1 GHZ

Please refer to the APPENDIX C.

NOTE:

(1) No limit: This is fundamental signal, the judgment is not applicable.
For fundamental signal judgment was referred to Peak output test.

5 BANDWIDTH TEST

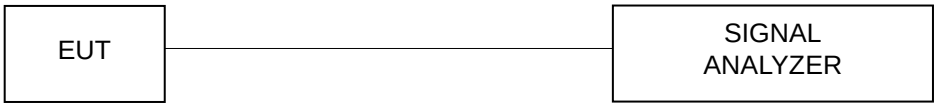
5.1 APPLIED PROCEDURES / LIMIT

FCC Part15, Subpart C (15.247)				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247(a)(2)	Bandwidth	>= 500KHz (6dB bandwidth)	2400-2483.5	PASS

5.2 TEST PROCEDURE

a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,
b. Spectrum Setting : RBW= 100KHz, VBW=300KHz, Sweep time = 2.5 ms.

5.3 TEST SETUP



5.4 EUT OPERATION CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

5.5 TEST RESULTS

Please refer to the APPENDIX D.

6 OUTPUT POWER TEST

6.1 APPLIED PROCEDURES / LIMIT

FCC Part15, Subpart C (15.247)				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247(b)(3)	Maximum Output Power	1 watt or 30dBm	2400-2483.5	PASS

6.2 TEST PROCEDURE

a. The EUT was directly connected to the power meter and antenna output port as show in the block diagram below,
b. The maximum peak conducted output power was performed in accordance with FCC KDB 558074 D01 15.247 Meas Guidance.

6.3 TEST SETUP

6.4 EUT OPERATION CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

6.5 TEST RESULTS

Please refer to the APPENDIX E.

7 POWER SPECTRAL DENSITY TEST

7.1 APPLIED PROCEDURES / LIMIT

FCC Part15, Subpart C (15.247)				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247(e)	Power Spectral Density	8 dBm (in any 3KHz)	2400-2483.5	PASS

7.2 TEST PROCEDURE

a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,
b. Spectrum Setting: RBW=3KHz, VBW=10 KHz, Sweep time = auto.

7.3 TEST SETUP

7.4 EUT OPERATION CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

7.5 TEST RESULTS

Please refer to the APPENDIX F.

8 ANTENNA CONDUCTED SPURIOUS EMISSION

8.1 APPLIED PROCEDURES / LIMIT

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits.

8.2 TEST PROCEDURE

a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,
b. Spectrum Setting: RBW= 100KHz, VBW=300KHz, Sweep time = 10 ms.

8.3 TEST SETUP

8.4 EUT OPERATION CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

8.5 TEST RESULTS

Please refer to the APPENDIX G.

9 LIST OF MEASURING EQUIPMENTS

AC Power Line Conducted Emissions						
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated Date	Calibrated Until
1	TWO-LINE V-NETWORK	R&S	ENV216	101051	2023/7/21	2024/7/20
2	Test Cable	EMCI	EMCRG142S-SM-SM-5000	230609	2023/7/19	2024/7/18
3	EMI Test Receiver	R&S	ESR3	103133	2023/6/29	2024/6/28
4	Measurement Software	Farad	EZ_EMC (Ver. NB-03A1-01)	N/A	N/A	N/A

Radiated Emissions						
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated Date	Calibrated Until
1	Log-Bicon Antenna	Schwarzbeck	VULB 9168	01577	2023/7/6	2024/7/5
2	Attenuator	EMCI	EMCI-N-6-05	AT-N0575	2023/7/6	2024/7/5
3	Pre-Amplifier	EMCI	EMC001330	980908	2023/7/12	2024/7/11
4	Test Cable	EMCI	EMC104-SM-SM-6000	230539	2023/7/14	2024/7/13
5	Test Cable	EMCI	EMC104-SM-SM-2500	230542	2023/7/14	2024/7/13
6	Test Cable	EMCI	EMC104-SM-SN-1000	230543	2023/7/14	2024/7/13
7	EXA Signal Analyzer	Keysight	N9010A	MY52220990	2023/8/11	2024/8/10
8	Loop Ant.	EMCI	LPA600	296	2023/10/31	2024/10/30
9	Pre-Amplifier	EMCI	EMC001340	980969	2023/7/18	2024/7/17
10	Test Cable	EMCI	EMC104-SM-SM-6000	230539	2023/7/14	2024/7/13
11	Test Cable	EMCI	EMC104-SM-SM-2500	230542	2023/7/14	2024/7/13
12	Test Cable	EMCI	EMC104-SM-SN-1000	230543	2023/7/14	2024/7/13
13	EXA Signal Analyzer	Keysight	N9010A	MY52220990	2023/8/11	2024/8/10
14	Horn Antenna	RFSPIN	DRH18-E	KV2D01A18ES	2023/6/30	2024/6/29
15	Pre-Amplifier	EMCI	EMC118A45SE	980960	2023/7/18	2024/7/17
16	Test Cable	EMCI	EMC104-SM-SM-6000	230539	2023/7/14	2024/7/13
17	Test Cable	EMCI	EMC104-SM-SM-2500	230542	2023/7/14	2024/7/13
18	Test Cable	EMCI	EMC104-SM-SN-1000	230543	2023/7/14	2024/7/13
19	EXA Signal Analyzer	Keysight	N9010A	MY52220990	2023/8/11	2024/8/10
20	Measurement Software	Farad	EZ_EMC (Ver. NB-03A1-01)	N/A	N/A	N/A

Bandwidth						
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated Date	Calibrated Until
1	EXA Signal Analyzer	Keysight	N9010A	MY52220990	2023/8/11	2024/8/10

Output Power						
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated Date	Calibrated Until
1	EXA Signal Analyzer	Keysight	N9010A	MY52220990	2023/8/11	2024/8/10

Power Spectral Density						
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated Date	Calibrated Until
1	EXA Signal Analyzer	Keysight	N9010A	MY52220990	2023/8/11	2024/8/10

Antenna conducted Spurious Emission						
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated Date	Calibrated Until
1	EXA Signal Analyzer	Keysight	N9010A	MY52220990	2023/8/11	2024/8/10

Remark: “N/A” denotes no model name, no serial no. or no calibration specified.
All calibration period of equipment list is one year.

10 EUT TEST PHOTO

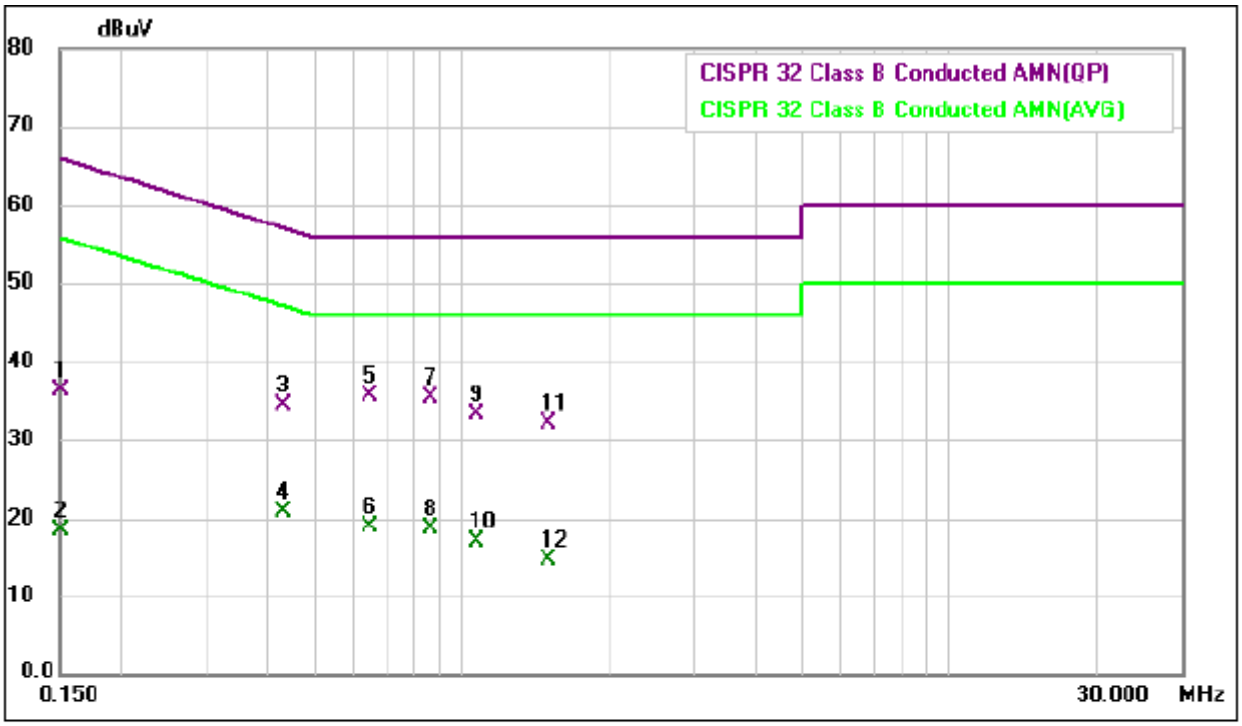
Please refer to APPENDIX-TP-2403X002-1

11 EUT PHOTOS

Please refer to APPENDIX-EP-2403X002-1/ EP-2403X002-2

APPENDIX A AC POWER LINE CONDUCTED EMISSIONS

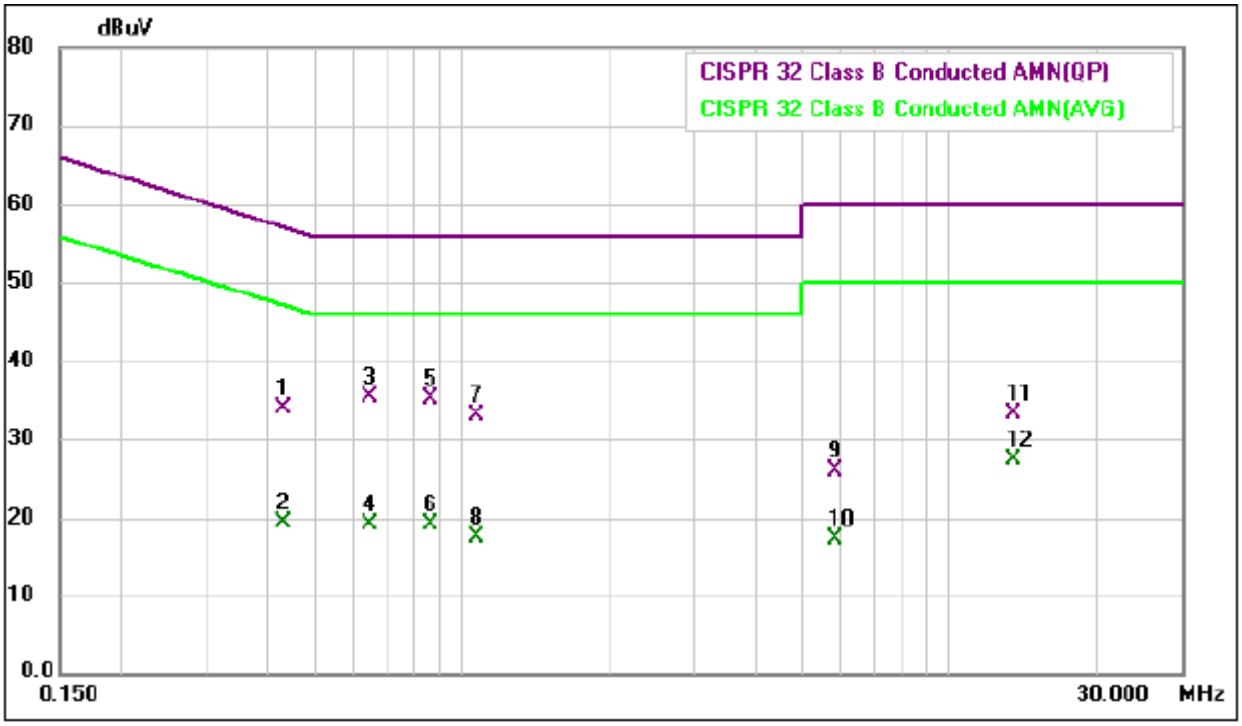
Test Mode	Normal	Tested Date	2024/4/18
Test Frequency	-	Phase	Line



No.	Mk	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Measurement (dBuV)	Limit (dBuV)	Over (dB)	Detector	Comment
1		0.150000	26.70	9.64	36.34	66.00	-29.66	QP	
2		0.150000	8.90	9.64	18.54	56.00	-37.46	AVG	
3		0.431250	24.90	9.64	34.54	57.23	-22.69	QP	
4		0.431250	11.30	9.64	20.94	47.23	-26.29	AVG	
5	*	0.647250	25.90	9.65	35.55	56.00	-20.45	QP	
6		0.647250	9.30	9.65	18.95	46.00	-27.05	AVG	
7		0.861000	25.80	9.66	35.46	56.00	-20.54	QP	
8		0.861000	9.00	9.66	18.66	46.00	-27.34	AVG	
9		1.077000	23.70	9.67	33.37	56.00	-22.63	QP	
10		1.077000	7.30	9.67	16.97	46.00	-29.03	AVG	
11		1.509000	22.40	9.69	32.09	56.00	-23.91	QP	
12		1.509000	4.90	9.69	14.59	46.00	-31.41	AVG	

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.
(3) *: Maximum data x: Over limit !: Over margin

Test Mode	Normal	Tested Date	2024/4/18
Test Frequency	-	Phase	Neutral

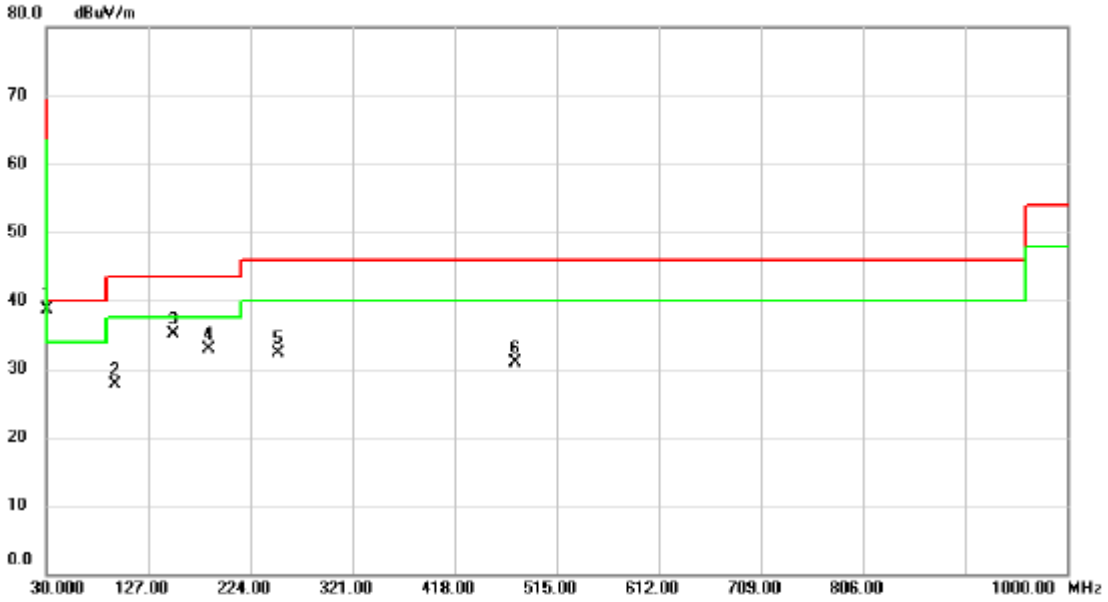


No.	Mk	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Measurement (dBuV)	Limit (dBuV)	Over (dB)	Detector	Comment
1		0.431250	24.30	9.64	33.94	57.23	-23.29	QP	
2		0.431250	9.70	9.64	19.34	47.23	-27.89	AVG	
3	*	0.647250	25.80	9.65	35.45	56.00	-20.55	QP	
4		0.647250	9.50	9.65	19.15	46.00	-26.85	AVG	
5		0.861000	25.50	9.66	35.16	56.00	-20.84	QP	
6		0.861000	9.50	9.66	19.16	46.00	-26.84	AVG	
7		1.077000	23.40	9.67	33.07	56.00	-22.93	QP	
8		1.077000	7.90	9.67	17.57	46.00	-28.43	AVG	
9		5.813250	16.30	9.79	26.09	60.00	-33.91	QP	
10		5.813250	7.60	9.79	17.39	50.00	-32.61	AVG	
11		13.598250	23.30	9.88	33.18	60.00	-26.82	QP	
12		13.598250	17.50	9.88	27.38	50.00	-22.62	AVG	

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.
(3) *: Maximum data x: Over limit !: Over margin

APPENDIX B RADIATED EMISSIONS - 30 MHZ TO 1 GHZ

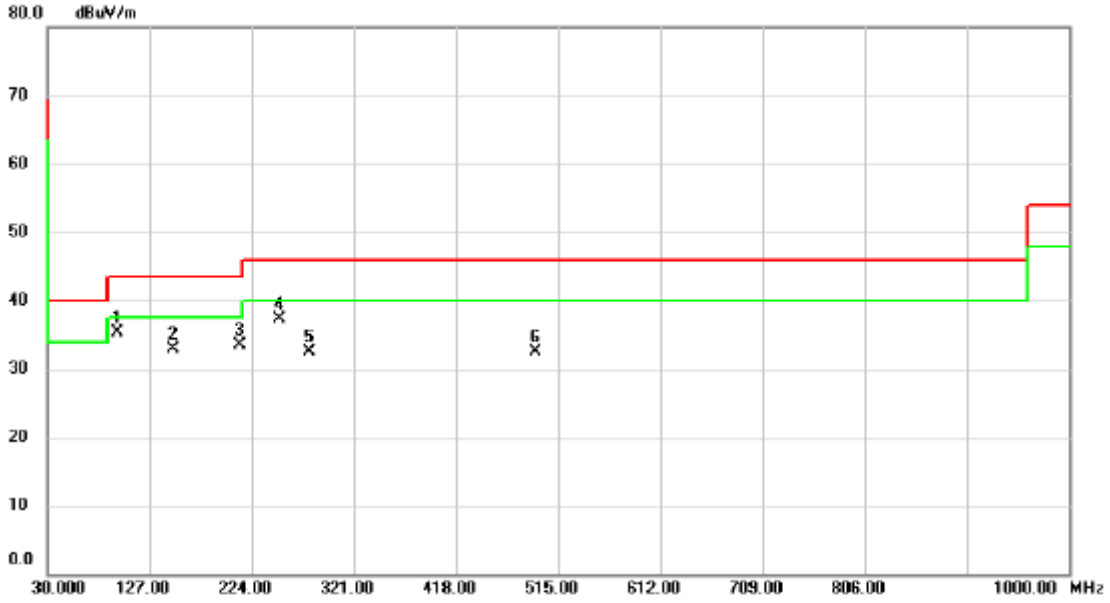
Test Mode	BLE 5.0 (1 Mbps)	Test Date	2024/4/12
Test Frequency	2480MHz	Polarization	Vertical
Temp	23°C	Hum.	64%



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	30.0000	52.85	-14.06	38.79	40.00	-1.21	peak	
2		94.9900	45.13	-17.40	27.73	43.50	-15.77	peak	
3		151.2500	47.08	-12.00	35.08	43.50	-8.42	peak	
4		184.2300	47.04	-14.12	32.92	43.50	-10.58	peak	
5		250.1900	45.66	-13.31	32.35	46.00	-13.65	peak	
6		475.2300	38.21	-7.22	30.99	46.00	-15.01	peak	

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.
(3) *: Maximum data x: Over limit !: Over margin

Test Mode	BLE 5.0 (1 Mbps)	Test Date	2024/4/12
Test Frequency	2480MHz	Polarization	Horizontal
Temp	23°C	Hum.	64%

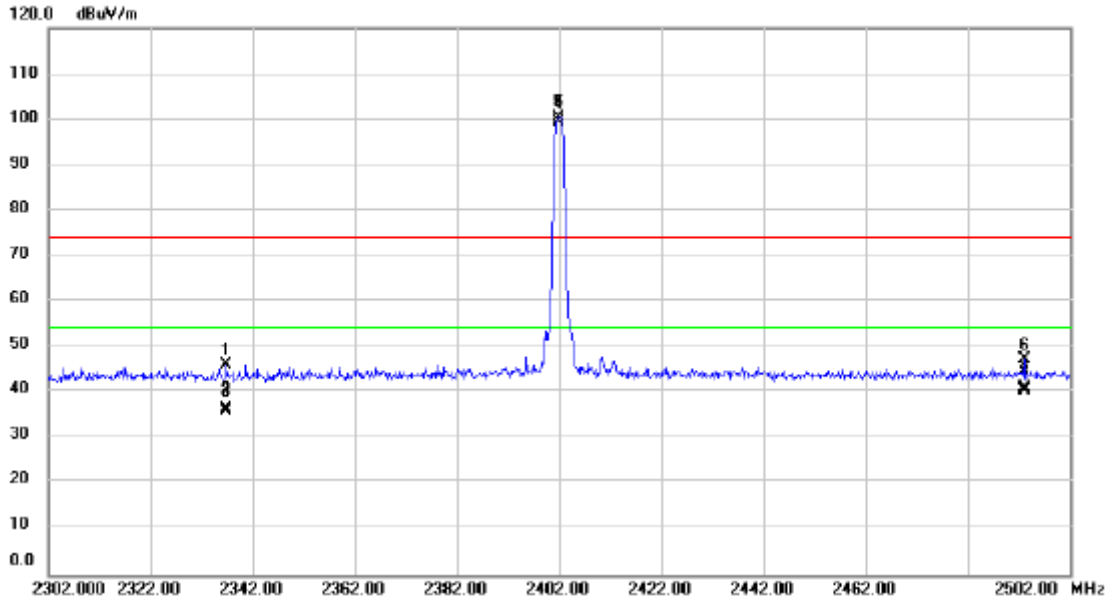


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	96.9300	52.54	-17.16	35.38	43.50	-8.12	peak	
2		149.3100	44.93	-12.07	32.86	43.50	-10.64	peak	
3		212.3600	49.10	-15.53	33.57	43.50	-9.93	peak	
4		250.1900	50.53	-13.31	37.22	46.00	-8.78	peak	
5		279.2900	44.64	-12.09	32.55	46.00	-13.45	peak	
6		493.6600	39.38	-6.95	32.43	46.00	-13.57	peak	

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.
(3) *: Maximum data x: Over limit !: Over margin

APPENDIX C RADIATED EMISSIONS - ABOVE 1 GHZ

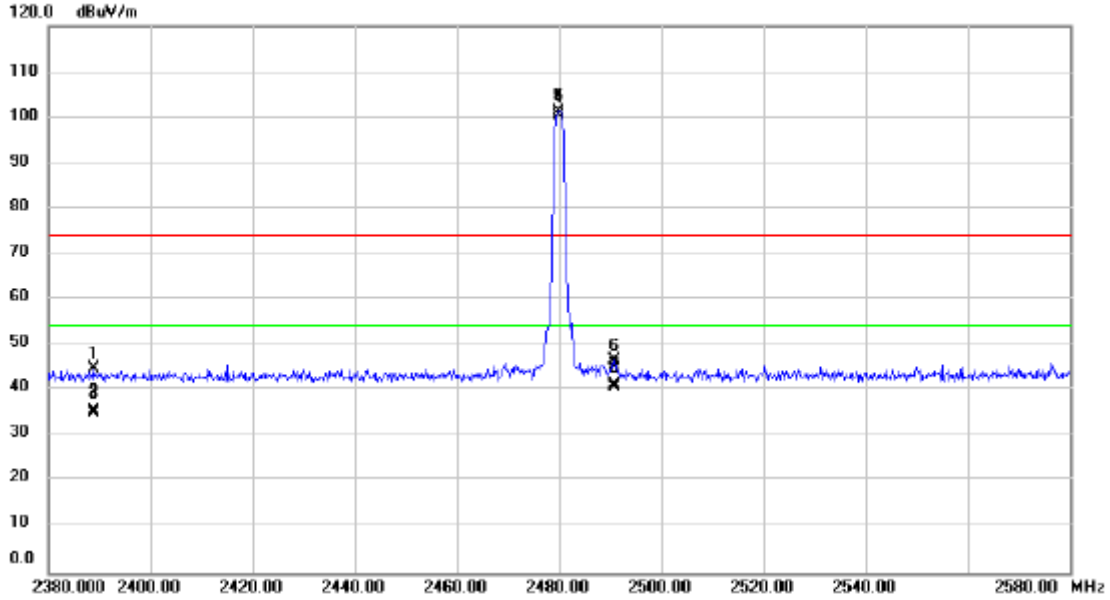
Test Mode	BLE 5.0 (1 Mbps)	Test Date	2024/3/28
Test Frequency	2402MHz	Polarization	Horizontal
Temp	25°C	Hum.	60%



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		2336.800	42.58	3.44	46.02	74.00	-27.98	peak	
2		2336.800	33.06	3.44	36.50	54.00	-17.50	AVG	DCF 0.68db
3		2336.800	32.38	3.44	35.82	54.00	-18.18	AVG	
4	X	2401.800	96.87	3.55	100.42	74.00	26.42	peak	
5	*	2401.800	95.99	3.55	99.54	54.00	45.54	AVG	
6		2493.000	43.42	3.71	47.13	74.00	-26.87	peak	
7		2493.000	37.38	3.71	41.09	54.00	-12.91	AVG	DCF 0.68db
8		2493.000	36.70	3.71	40.41	54.00	-13.59	AVG	

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.
(3) X and * represent fundamental frequency and with no limit.

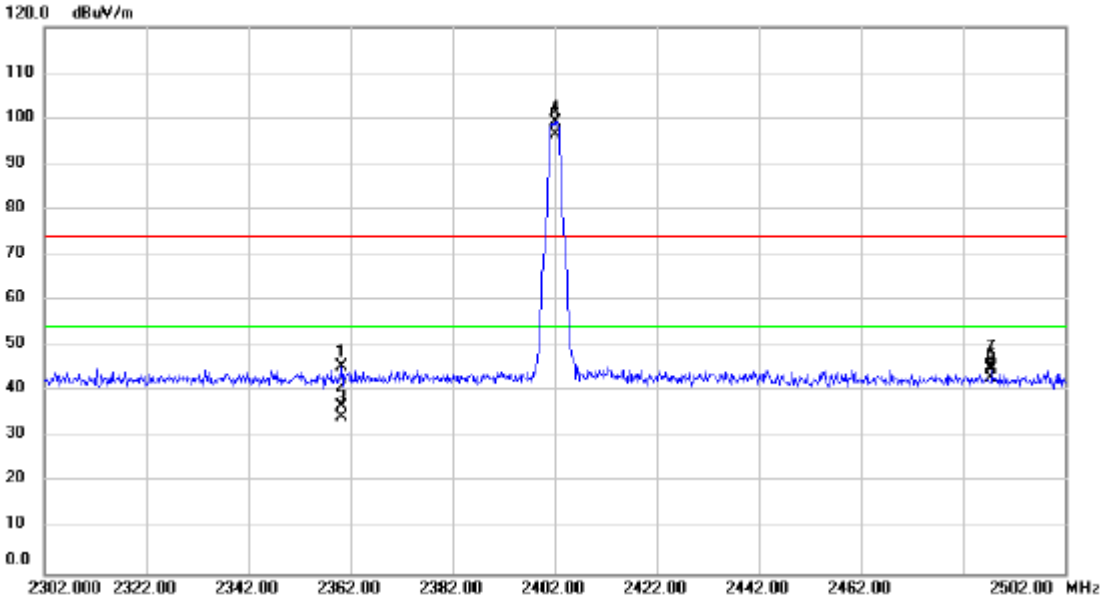
Test Mode	BLE 5.0 (1 Mbps)	Test Date	2024/3/28
Test Frequency	2480MHz	Polarization	Horizontal
Temp	25°C	Hum.	60%



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		2388.800	41.44	3.53	44.97	74.00	-29.03	peak	
2		2388.800	31.99	3.53	35.52	54.00	-18.48	AVG	DCF 0.68db
3		2388.800	31.31	3.53	34.84	54.00	-19.16	AVG	
4	X	2479.800	97.62	3.69	101.31	74.00	27.31	peak	
5	*	2479.800	96.68	3.69	100.37	54.00	46.37	AVG	
6		2490.800	42.86	3.71	46.57	74.00	-27.43	peak	
7		2490.800	37.64	3.71	41.35	54.00	-12.65	AVG	DCF 0.68db
8		2490.800	36.96	3.71	40.67	54.00	-13.33	AVG	

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.
(3) X and * represent fundamental frequency and with no limit.

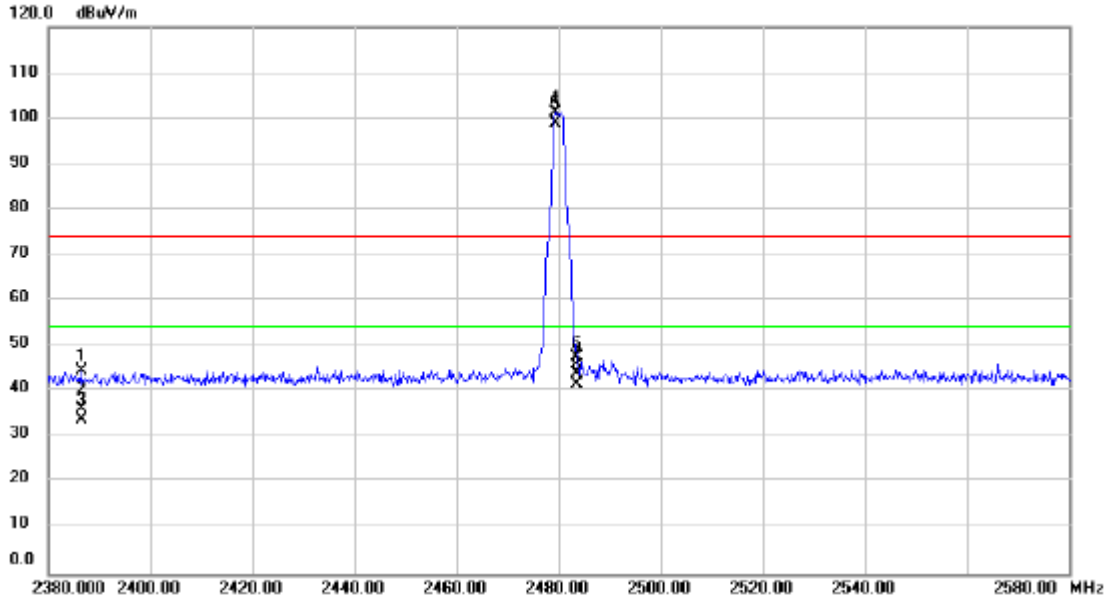
Test Mode	BLE 5.0 (2 Mbps)	Test Date	2024/3/28
Test Frequency	2404MHz	Polarization	Horizontal
Temp	25°C	Hum.	60%



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		2360.200	41.83	3.48	45.31	74.00	-28.69	peak	
2		2360.200	33.17	3.48	36.65	54.00	-17.35	AVG	DCF 2.40db
3		2360.200	30.77	3.48	34.25	54.00	-19.75	AVG	
4	X	2402.000	95.61	3.55	99.16	74.00	25.16	peak	
5	*	2402.000	92.96	3.55	96.51	54.00	42.51	AVG	
6		2487.600	41.02	3.71	44.73	74.00	-29.27	peak	
7		2487.600	41.73	3.71	45.44	54.00	-8.56	AVG	DCF 2.40db
8		2487.600	39.33	3.71	43.04	54.00	-10.96	AVG	

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.
(3) X and * represent fundamental frequency and with no limit.

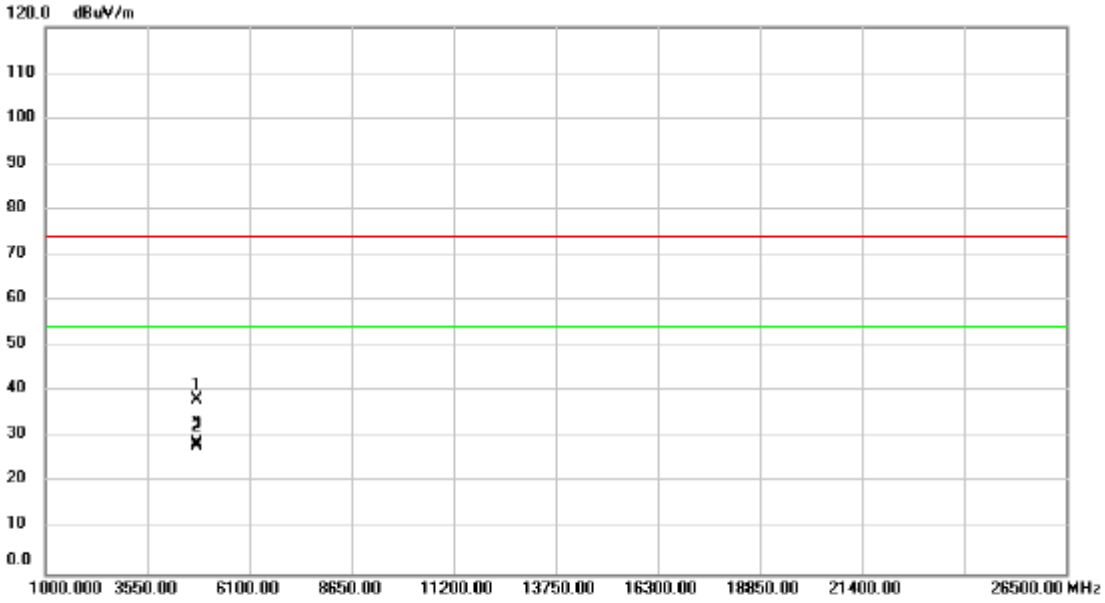
Test Mode	BLE 5.0 (2Mbps)	Test Date	2024/3/28
Test Frequency	2478MHz	Polarization	Horizontal
Temp	25°C	Hum.	60%



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		2386.400	40.98	3.53	44.51	74.00	-29.49	peak	
2		2386.400	32.77	3.53	36.30	54.00	-17.70	AVG	DCF 2.40db
3		2386.400	30.37	3.53	33.90	54.00	-20.10	AVG	
4	X	2479.400	97.65	3.69	101.34	74.00	27.34	peak	
5	*	2479.400	95.05	3.69	98.74	54.00	44.74	AVG	
6		2483.500	43.88	3.71	47.59	74.00	-26.41	peak	
7		2483.500	40.32	3.71	44.03	54.00	-9.97	AVG	DCF 2.40db
8		2483.500	37.92	3.71	41.63	54.00	-12.37	AVG	

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.
(3) X and * represent fundamental frequency and with no limit.

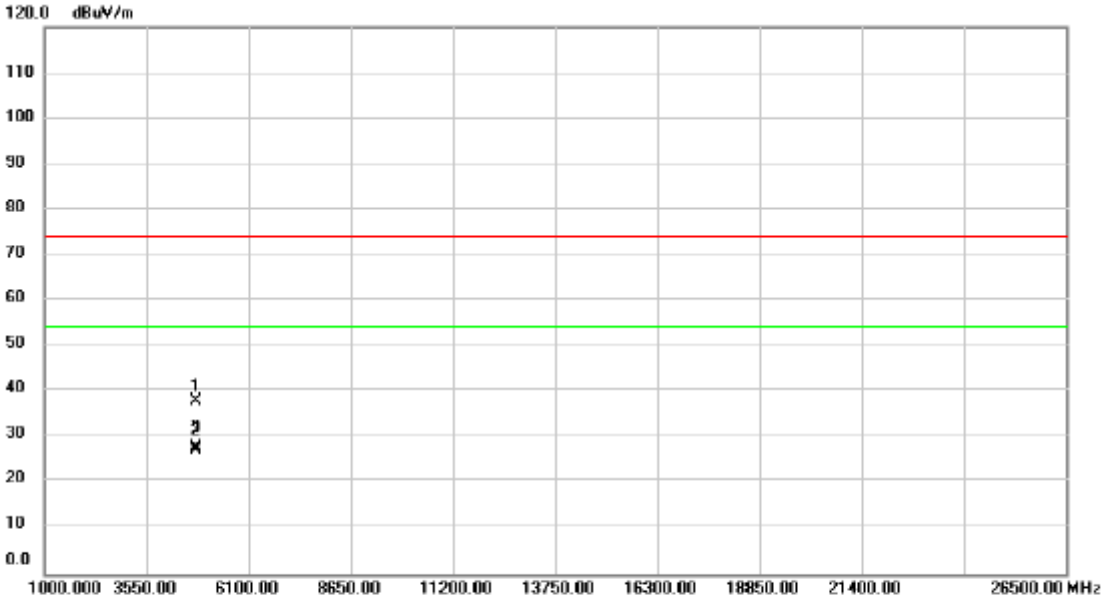
Test Mode	BLE 5.0 (1 Mbps)	Test Date	2024/3/28
Test Frequency	2402MHz	Polarization	Vertical
Temp	25°C	Hum.	60%



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		4804.000	38.63	-0.28	38.35	74.00	-35.65	peak	
2		4804.000	28.24	-0.28	27.96	54.00	-26.04	AVG	
3	*	4804.000	28.92	-0.28	28.64	54.00	-25.36	AVG	DCF 0.68db

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.
(3) *: Maximum data x: Over limit !: Over margin

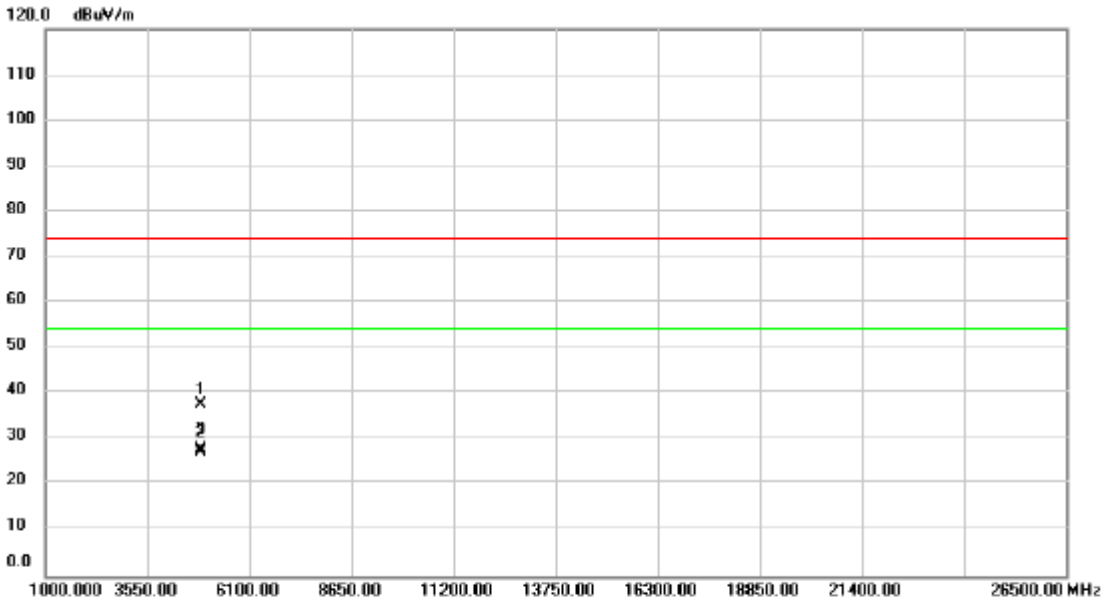
Test Mode	BLE 5.0 (1 Mbps)	Test Date	2024/3/28
Test Frequency	2402MHz	Polarization	Horizontal
Temp	25°C	Hum.	60%



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		4804.000	38.20	-0.28	37.92	74.00	-36.08	peak	
2		4804.000	27.34	-0.28	27.06	54.00	-26.94	AVG	
3	*	4804.000	28.02	-0.28	27.74	54.00	-26.26	AVG	DCF 0.68db

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.
(3) *: Maximum data x: Over limit !: Over margin

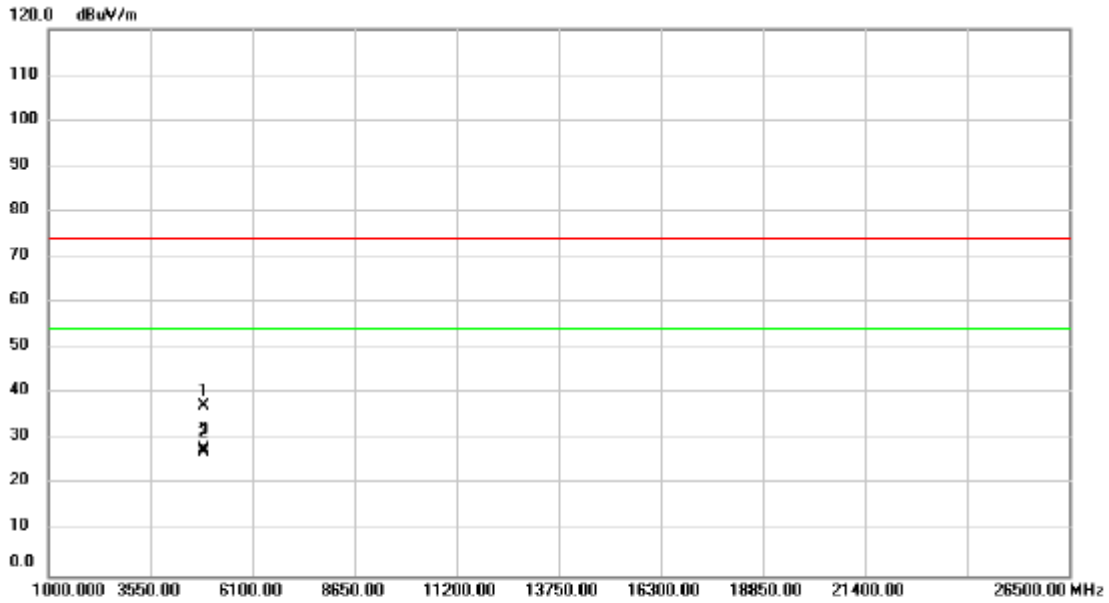
Test Mode	BLE 5.0 (1 Mbps)	Test Date	2024/3/28
Test Frequency	2440MHz	Polarization	Vertical
Temp	25°C	Hum.	60%



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		4880.000	37.69	-0.10	37.59	74.00	-36.41	peak	
2		4880.000	27.31	-0.10	27.21	54.00	-26.79	AVG	
3	*	4880.000	27.99	-0.10	27.89	54.00	-26.11	AVG	DCF 0.68db

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.
(3) *: Maximum data x: Over limit !: Over margin

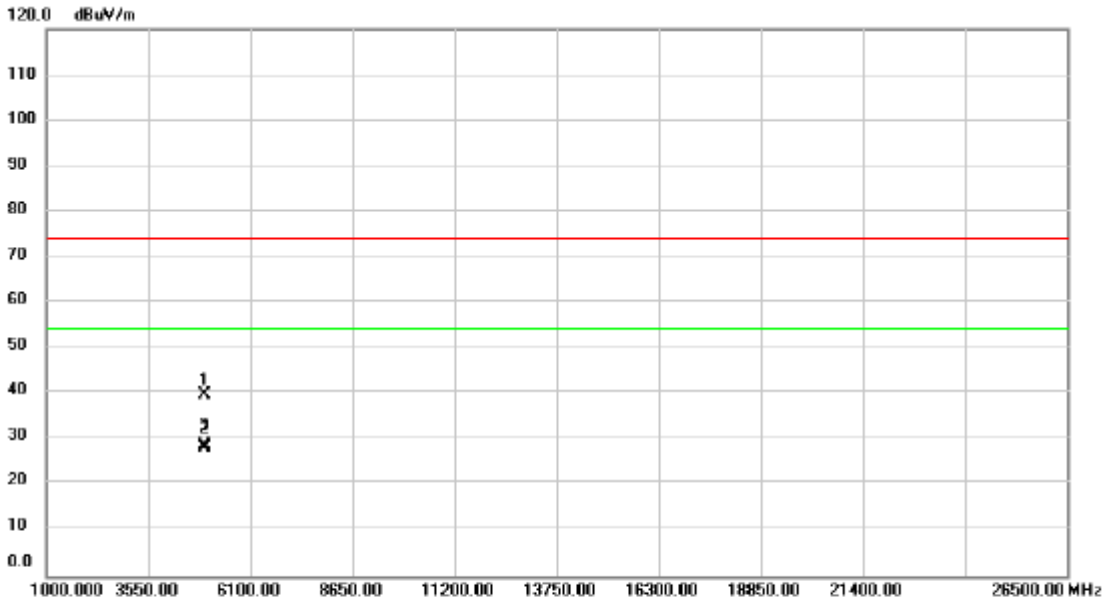
Test Mode	BLE 5.0 (1 Mbps)	Test Date	2024/3/28
Test Frequency	2440MHz	Polarization	Horizontal
Temp	25°C	Hum.	60%



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		4880.000	37.44	-0.10	37.34	74.00	-36.66	peak	
2		4880.000	27.12	-0.10	27.02	54.00	-26.98	AVG	
3	*	4880.000	27.80	-0.10	27.70	54.00	-26.30	AVG	DCF 0.68db

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.
(3) *: Maximum data x: Over limit !: Over margin

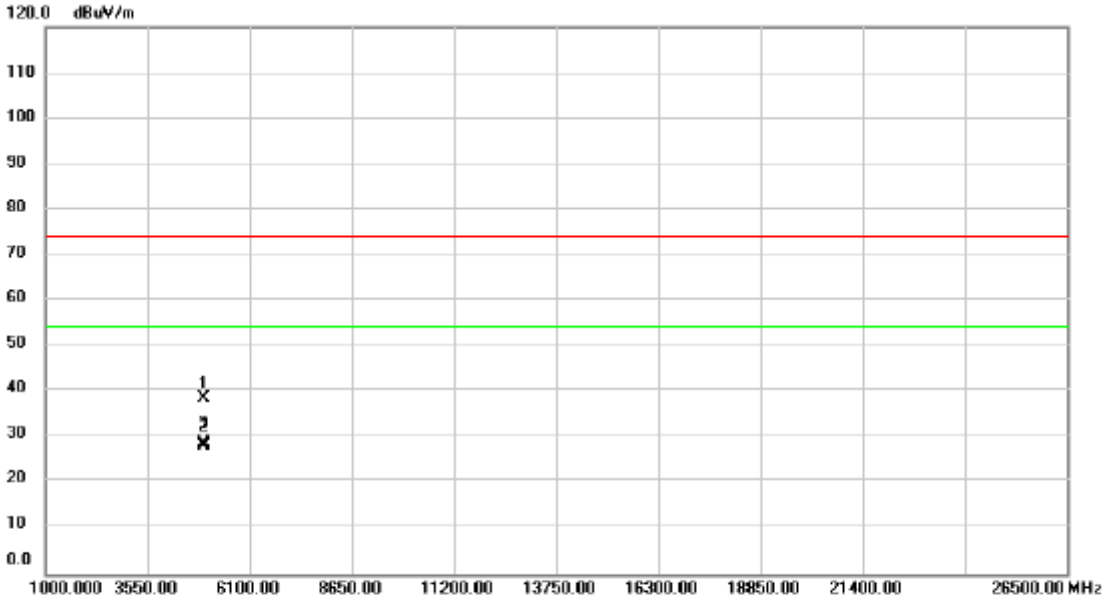
Test Mode	BLE 5.0 (1 Mbps)	Test Date	2024/3/28
Test Frequency	2480MHz	Polarization	Vertical
Temp	25°C	Hum.	60%



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		4960.000	39.70	0.06	39.76	74.00	-34.24	peak	
2		4960.000	28.03	0.06	28.09	54.00	-25.91	AVG	
3	*	4960.000	28.71	0.06	28.77	54.00	-25.23	AVG	DCF 0.68db

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.
(3) *: Maximum data x: Over limit !: Over margin

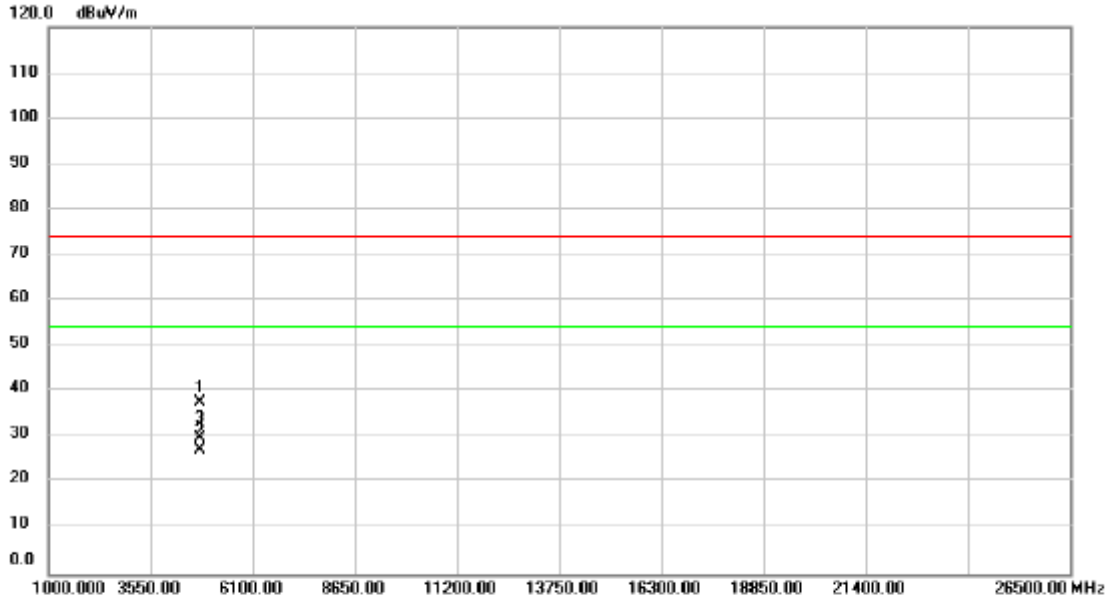
Test Mode	BLE 5.0 (1 Mbps)	Test Date	2024/3/28
Test Frequency	2480MHz	Polarization	Horizontal
Temp	25°C	Hum.	60%



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		4960.000	38.55	0.06	38.61	74.00	-35.39	peak	
2		4960.000	27.90	0.06	27.96	54.00	-26.04	AVG	
3	*	4960.000	28.58	0.06	28.64	54.00	-25.36	AVG	DCF 0.68db

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.
(3) *: Maximum data x: Over limit !: Over margin

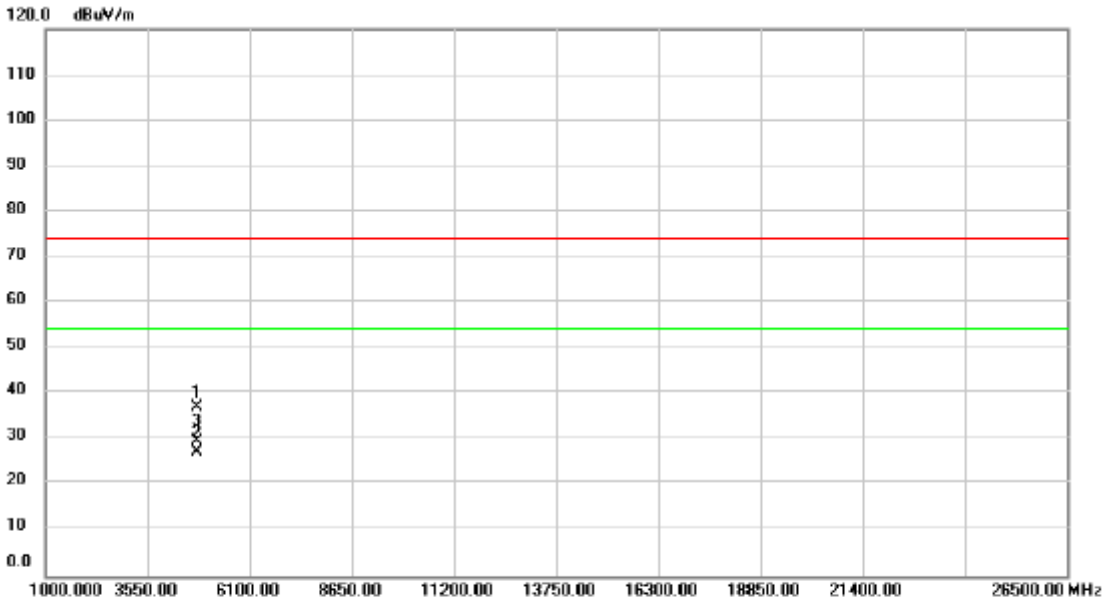
Test Mode	BLE 5.0 (2 Mbps)	Test Date	2024/3/28
Test Frequency	2404MHz	Polarization	Vertical
Temp	25°C	Hum.	60%



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		4804.000	37.86	-0.28	37.58	74.00	-36.42	peak	
2		4804.000	27.55	-0.28	27.27	54.00	-26.73	AVG	
3	*	4804.000	29.95	-0.28	29.67	54.00	-24.33	AVG	DCF 2.40db

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.
(3) *: Maximum data x: Over limit !: Over margin

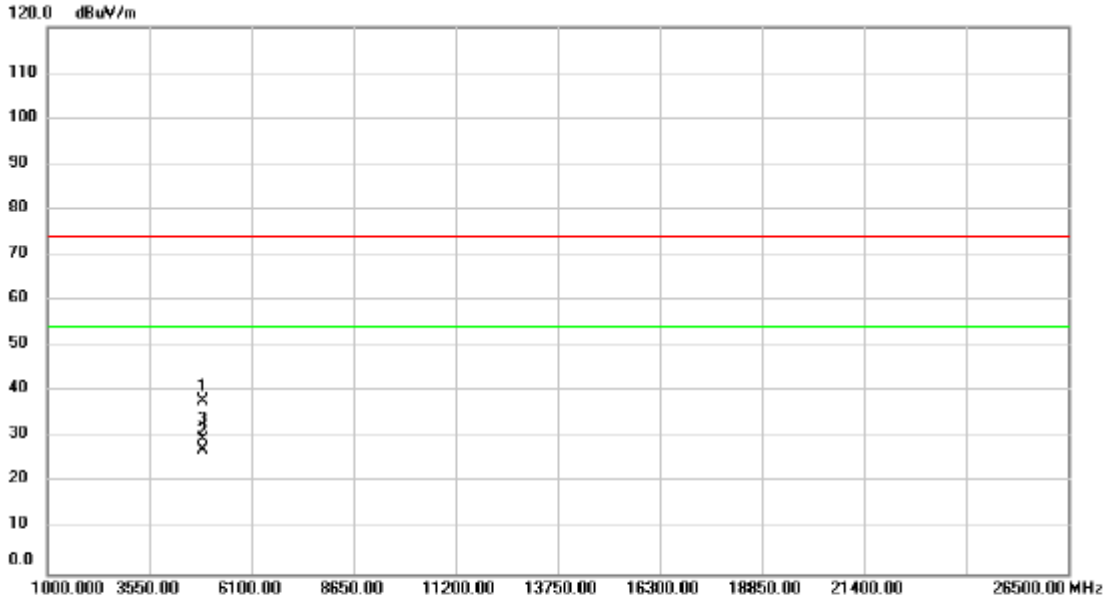
Test Mode	BLE 5.0 (2 Mbps)	Test Date	2024/3/28
Test Frequency	2404MHz	Polarization	Horizontal
Temp	25°C	Hum.	60%



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		4804.000	37.43	-0.28	37.15	74.00	-36.85	peak	
2		4804.000	27.32	-0.28	27.04	54.00	-26.96	AVG	
3	*	4804.000	29.72	-0.28	29.44	54.00	-24.56	AVG	DCF 2.40db

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.
(3) *: Maximum data x: Over limit !: Over margin

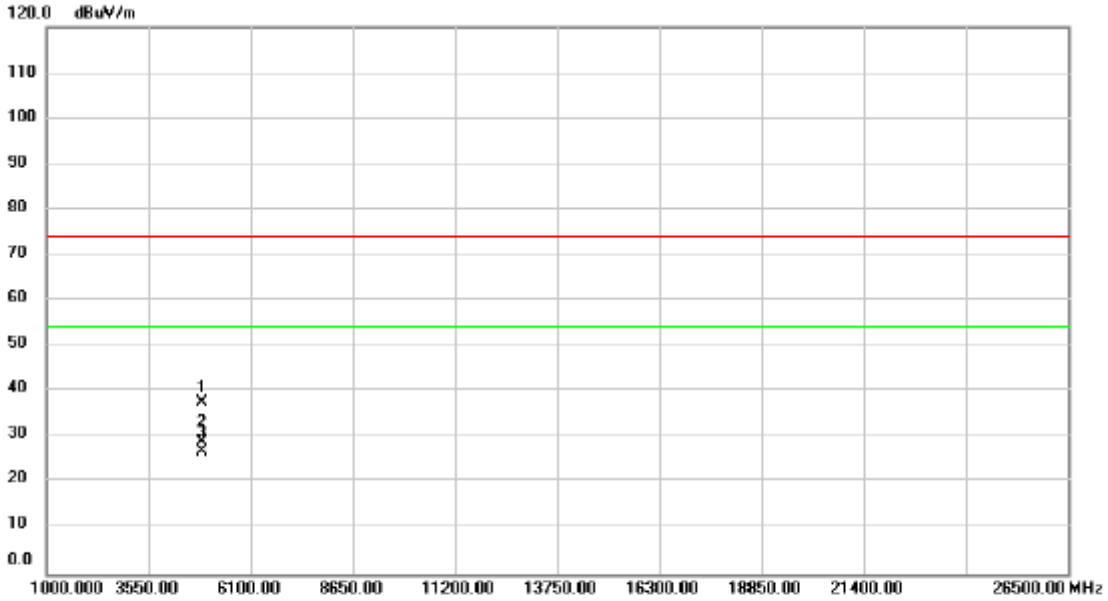
Test Mode	BLE 5.0 (2 Mbps)	Test Date	2024/3/28
Test Frequency	2440MHz	Polarization	Vertical
Temp	25°C	Hum.	60%



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		4880.000	38.00	-0.10	37.90	74.00	-36.10	peak	
2		4880.000	27.12	-0.10	27.02	54.00	-26.98	AVG	
3	*	4880.000	29.52	-0.10	29.42	54.00	-24.58	AVG	DCF 2.40db

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.
(3) *: Maximum data x: Over limit !: Over margin

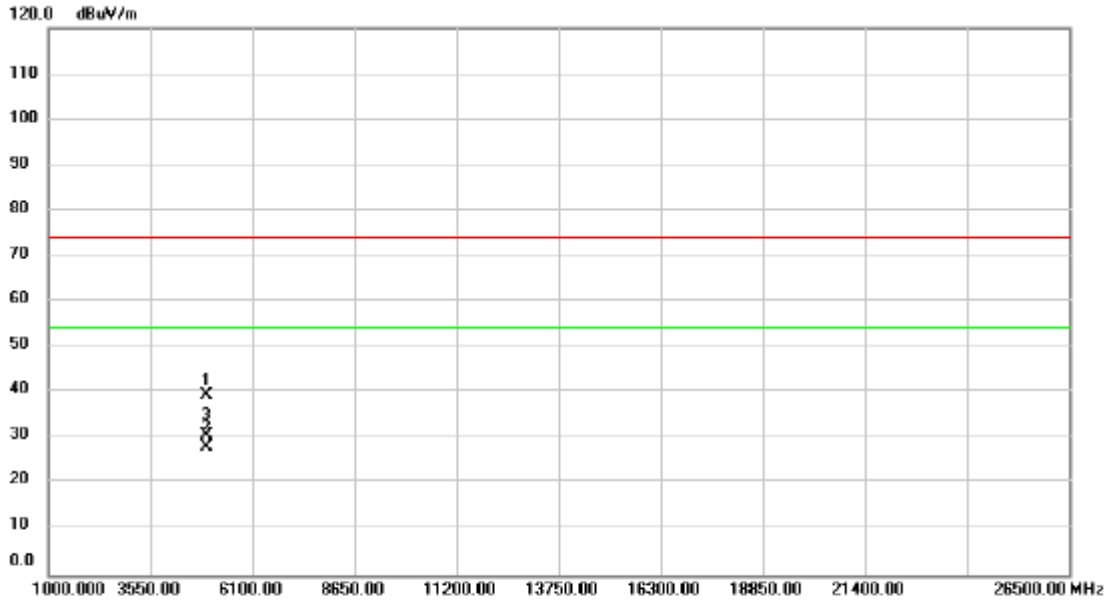
Test Mode	BLE 5.0 (2 Mbps)	Test Date	2024/3/28
Test Frequency	2440MHz	Polarization	Horizontal
Temp	25°C	Hum.	60%



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		4880.000	37.69	-0.10	37.59	74.00	-36.41	peak	
2	*	4880.000	29.38	-0.10	29.28	54.00	-24.72	AVG	DCF 2.40db
3		4880.000	26.98	-0.10	26.88	54.00	-27.12	AVG	

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.
(3) *: Maximum data x: Over limit !: Over margin

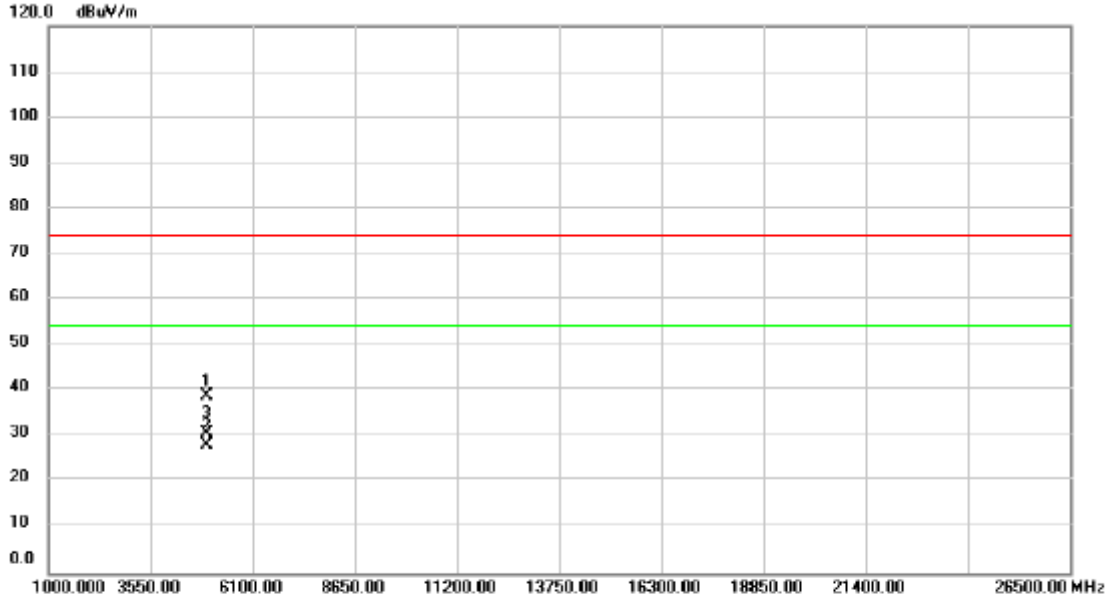
Test Mode	BLE 5.0 (2 Mbps)	Test Date	2024/3/28
Test Frequency	2478MHz	Polarization	Vertical
Temp	25°C	Hum.	60%



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		4960.000	39.49	0.06	39.55	74.00	-34.45	peak	
2		4960.000	27.97	0.06	28.03	54.00	-25.97	AVG	
3	*	4960.000	30.37	0.06	30.43	54.00	-23.57	AVG	DCF 2.40db

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.
(3) *: Maximum data x: Over limit !: Over margin

Test Mode	BLE 5.0 (2 Mbps)	Test Date	2024/3/28
Test Frequency	2478MHz	Polarization	Horizontal
Temp	25°C	Hum.	60%



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		4960.000	38.85	0.06	38.91	74.00	-35.09	peak	
2		4960.000	27.99	0.06	28.05	54.00	-25.95	AVG	
3	*	4960.000	30.39	0.06	30.45	54.00	-23.55	AVG	DCF 2.40db

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.
(3) *: Maximum data x: Over limit !: Over margin

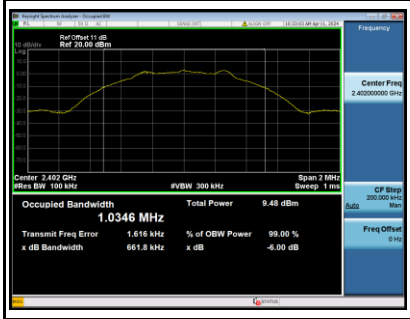
APPENDIX D BANDWIDTH

Test Mode	1Mbps

Frequency (MHz)	6dB Bandwidth (MHz)	99% Occupied BW (MHz)	Min. Limit (kHz)	Test Result
2402	0.66	1.02	500	Pass
2440	0.66	1.02	500	Pass
2480	0.66	1.02	500	Pass

6dB Bandwidth

2402 MHz

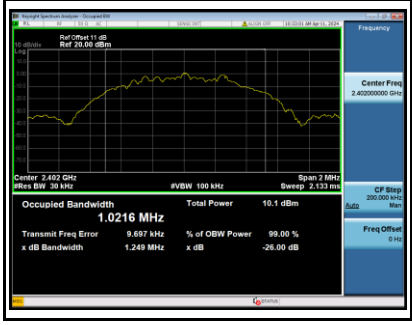


2440 MHz

2480 MHz

99% Occupied BW

2402 MHz



2440 MHz

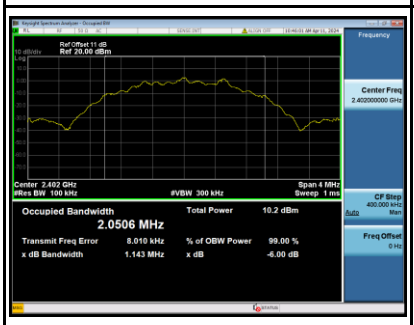
2480 MHz

Test Mode	2Mbps

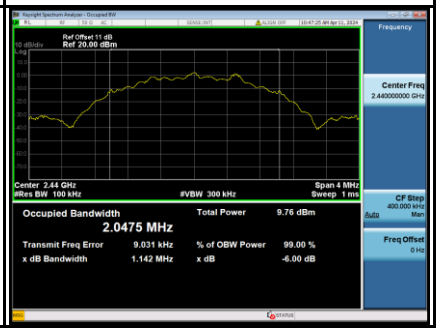
Frequency (MHz)	6dB Bandwidth (MHz)	99% Occupied BW (MHz)	Min. Limit (kHz)	Test Result
2402	1.14	2.05	500	Pass
2440	1.14	2.05	500	Pass
2480	1.15	2.05	500	Pass

6dB Bandwidth

2402 MHz



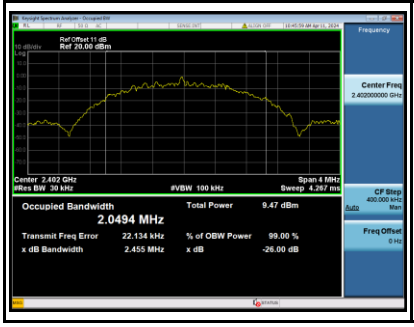
2440 MHz



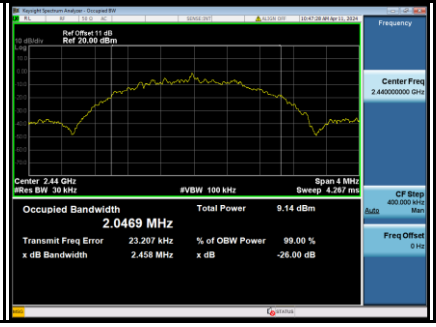
2480 MHz

99% Occupied BW

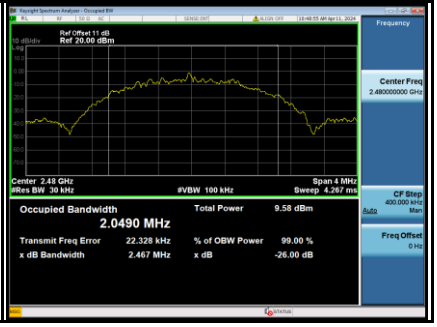
2402 MHz



2440 MHz



2480 MHz



APPENDIX E OUTPUT POWER

Test Mode	1Mbps	Tested Date	2024/4/11

Frequency (MHz)	Conducted Power (dBm)	Conducted Power (W)	Max. Limit (dBm)	Max. Limit (W)	Test Result
2402	9.57	0.0091	30.00	1.0000	Pass
2440	9.15	0.0082	30.00	1.0000	Pass
2480	9.65	0.0092	30.00	1.0000	Pass

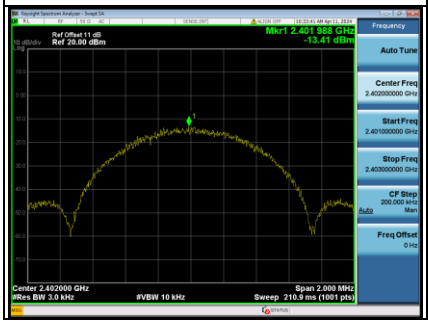
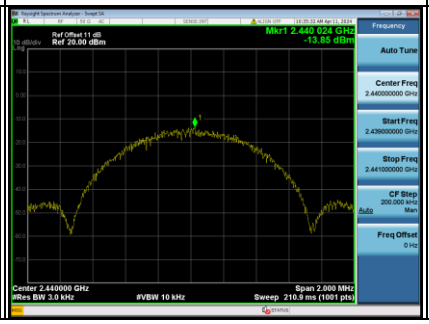
Test Mode	2Mbps	Tested Date	2024/4/11

Frequency (MHz)	Conducted Power (dBm)	Conducted Power (W)	Max. Limit (dBm)	Max. Limit (W)	Test Result
2402	10.11	0.0103	30.00	1.0000	Pass
2440	9.57	0.0091	30.00	1.0000	Pass
2480	10.09	0.0102	30.00	1.0000	Pass

APPENDIX F POWER SPECTRAL DENSITY TEST

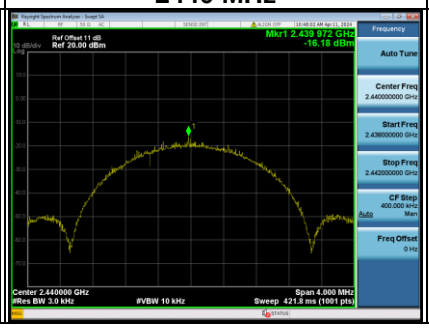
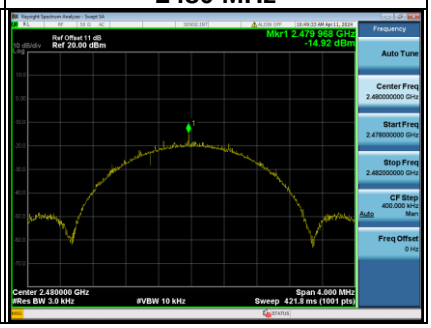
Test Mode	1Mbps

Frequency (MHz)	Power Density (dBm/3kHz)	Max. Limit (dBm/3kHz)	Test Result
2402	-13.41	8	Pass
2440	-13.85	8	Pass
2480	-13.26	8	Pass

2402 MHz	2440 MHz	2480 MHz
		

Test Mode	2Mbps

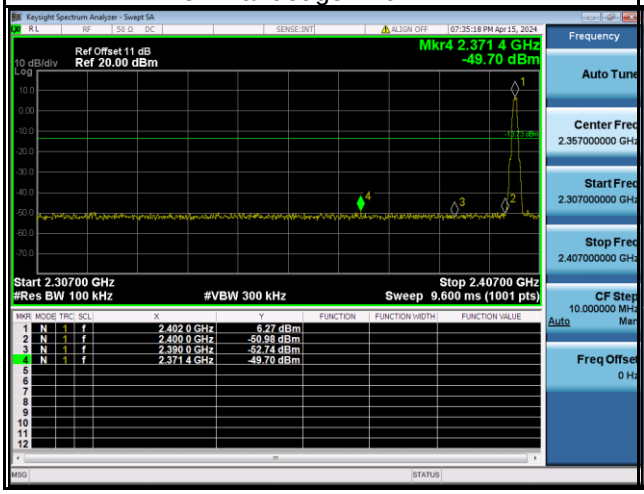
Frequency (MHz)	Power Density (dBm/3kHz)	Max. Limit (dBm/3kHz)	Test Result
2402	-14.65	8	Pass
2440	-16.18	8	Pass
2480	-14.92	8	Pass

2402 MHz	2440 MHz	2480 MHz
		

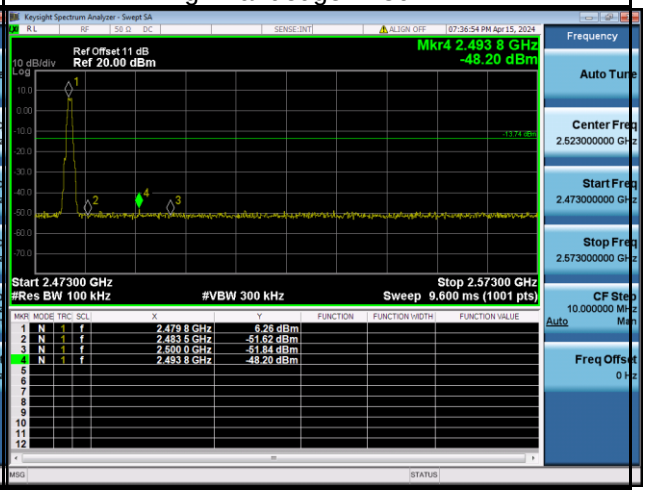
APPENDIX G ANTENNA CONDUCTED SPURIOUS EMISSION

Test Mode	1Mbps

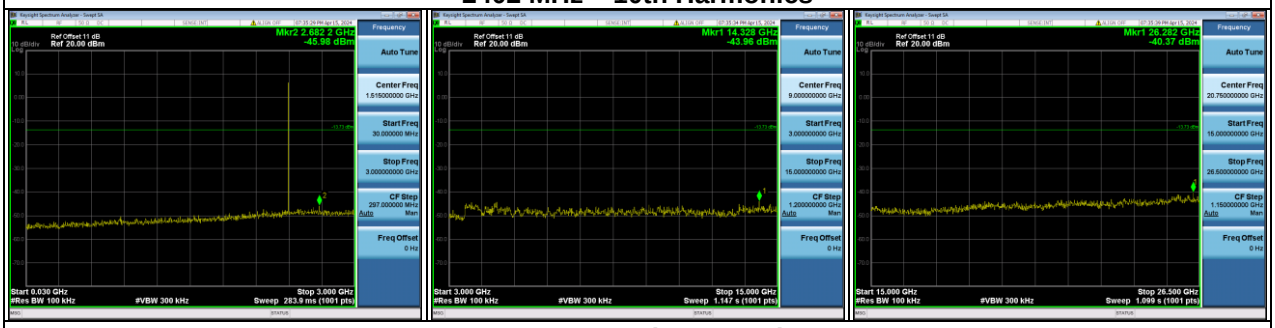
Low Bandedge-2402 MHz



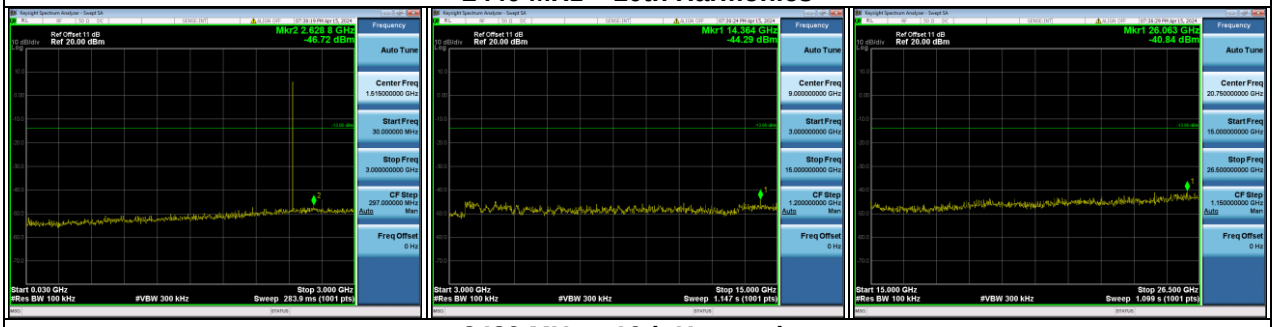
High Bandedge-2480 MHz



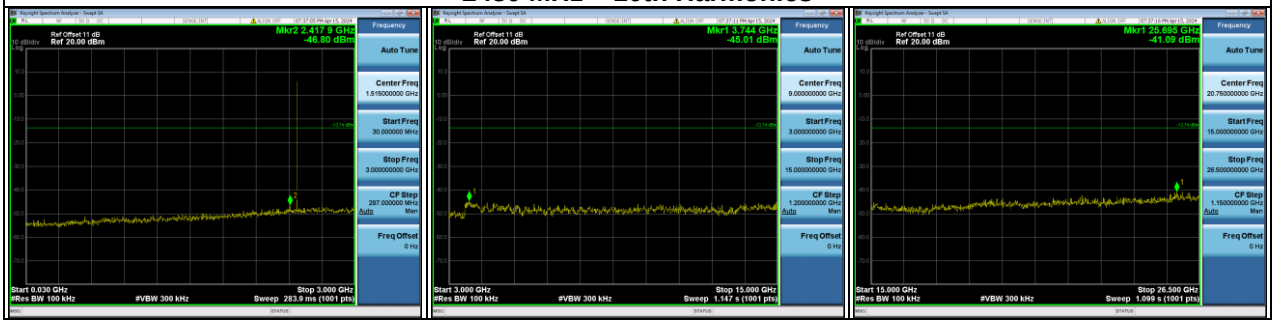
2402 MHz – 10th Harmonics



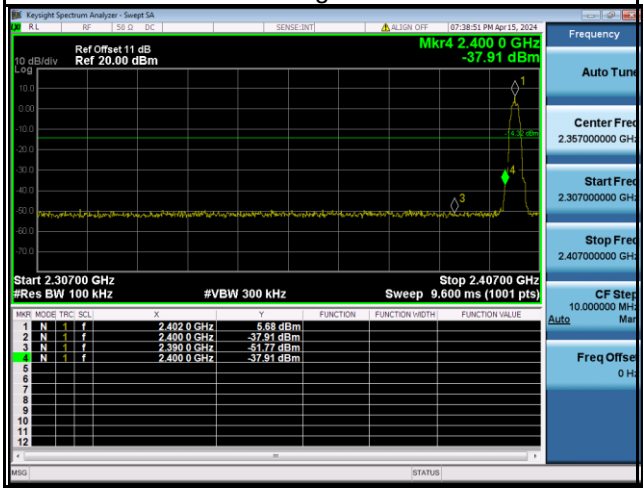
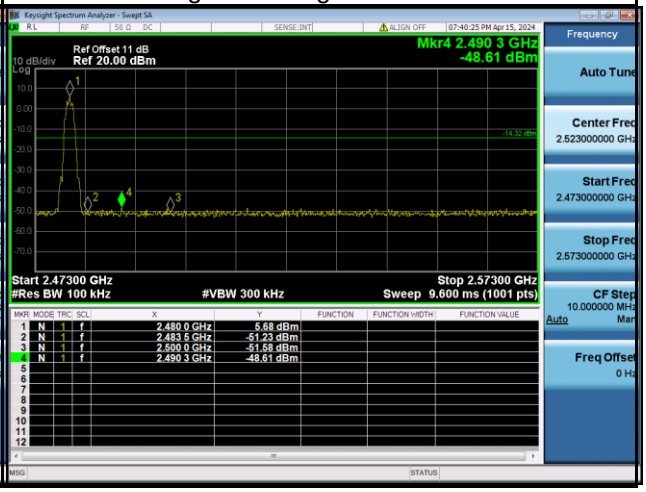
2440 MHz – 10th Harmonics



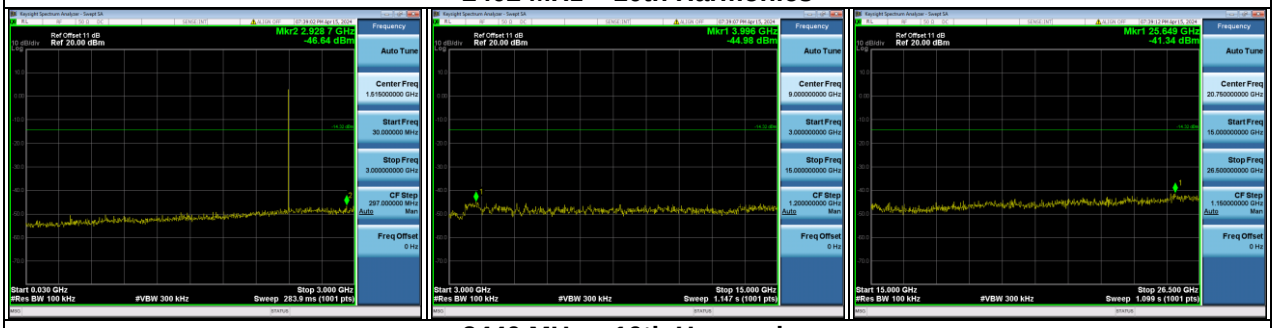
2480 MHz – 10th Harmonics



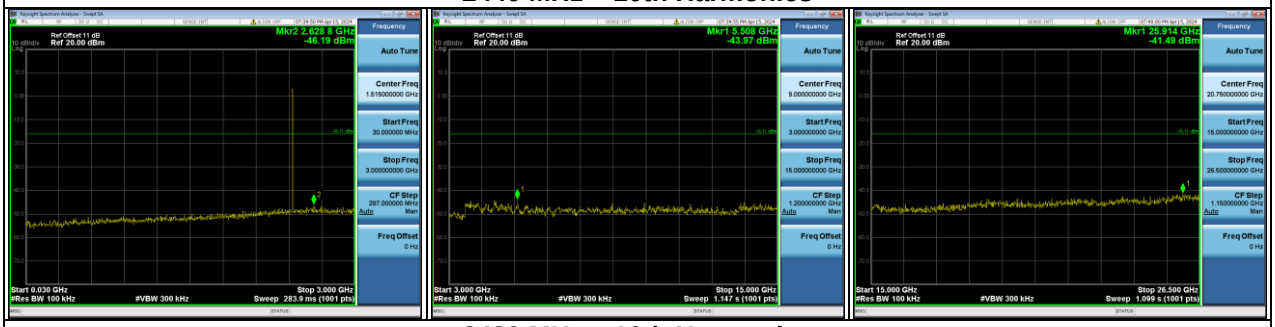
Test Mode	2Mbps

Low Bandedge-2402 MHz	High Bandedge-2480 MHz
	

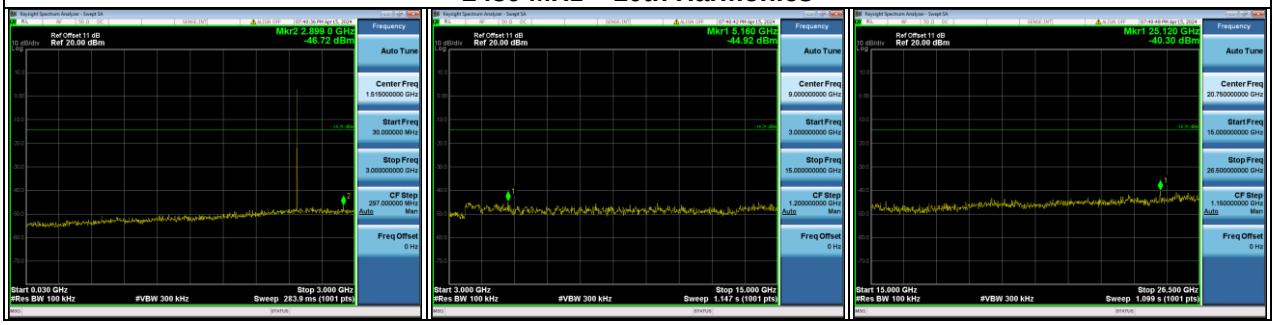
2402 MHz – 10th Harmonics



2440 MHz – 10th Harmonics



2480 MHz – 10th Harmonics



End of Test Report