TCT 通测检测 TESTING CENTRE TECHNOLOGY

TEST REPORT

FCC ID. ..... :	2A85Y-V83P	
Test Report No..... :	TCT230829E013	
Date of issue..... :	Oct. 31, 2023	
Testing laboratory ..... :	SHENZHEN TONGCE TESTING LAB	
Testing location/ address:	2101 & 2201, Zhenchang Factory, Renshan Industrial Zone, Fuhai Subdistrict, Bao'an District, Shenzhen, Guangdong, 518103, People's Republic of China	
Applicant's name..... :	DONGGUAN ESWN TECHNOLOGY CO., LTD	
Address..... :	Room106, No.15 chukeng Industrial Road, Dongkeng Town, Dongguan City, Guangdong Province, China	
Manufacturer's name ... :	DONGGUAN ESWN TECHNOLOGY CO., LTD	
Address..... :	Room106, No.15 chukeng Industrial Road, Dongkeng Town, Dongguan City, Guangdong Province, China	
Standard(s) ..... :	FCC CFR Title 47 Part 15 Subpart C Section 15.249 ANSI C63.10:2013	
Product Name..... :	Mechanical Keyboard	
Trade Mark ..... :	N/A	
Model/Type reference..... :	MK PRO V2, V83P, V83PRO, V83Pro, V83PLUS, KB83Rro	
Rating(s)..... :	Rechargeable Li-ion Battery DC 3.7V	
Date of receipt of test item ..... :	Aug. 29, 2023	
Date (s) of performance of test..... :	Aug. 29, 2023 - Oct. 31, 2023	
Tested by (+signature) ... :	Yannie ZHONG	Yannie Zhong
Check by (+signature).... :	Beryl ZHAO	Beryl Zhao
Approved by (+signature):	Tomsin	Tomsin

SHENZHEN TONGCE TESTING LAB TCT

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1. General Product Information

1.1. EUT description

Product Name.....:	Mechanical Keyboard
Model/Type reference.....:	MK PRO V2
Sample Number.....:	TCT230829E012-0101
Operation Frequency.....:	2402MHz~2480MHz
Channel Separation .....:	2MHz
Number of Channel.....:	40
Modulation Technology .....:	GFSK
Antenna Type.....:	PCB Antenna
Antenna Gain.....:	3.85dBi
Rating(s).....:	Rechargeable Li-ion Battery DC 3.7V

Note: The antenna gain listed in this report is provided by applicant, and the test laboratory is not responsible for this parameter.

1.2. Model(s) list

No.	Model No.	Tested with
1	MK PRO V2	☒
Other models	V83P, V83PRO, V83Pro, V83PLUS, KB83Rro	☐

Note: MK PRO V2 is tested model, other models are derivative models. The models are identical in circuit and PCB layout, only different on the model names. So the test data of MK PRO V2 can represent the remaining models.

1.3. Operation Frequency

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
0	2402MHz	10	2422MHz	20	2442MHz	30	2462MHz
1	2404MHz	11	2424MHz	21	2444MHz	31	2464MHz
…	…	…	…	…	…	…	…
8	2418MHz	18	2438MHz	28	2458MHz	38	2478MHz
9	2420MHz	19	2440MHz	29	2460MHz	39	2480MHz
Remark: Channel 0, 19 & 39 have been tested.							

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2. Test Result Summary

Requirement	CFR 47 Section	Result
Antenna Requirement	§15.203	PASS
AC Power Line Conducted Emission	§15.207	PASS
Field Strength of Fundamental	§15.249 (a)	PASS
Spurious Emissions	§15.249 (a) (d)/ §15.209	PASS
Band Edge	§15.249 (d)/ §15.205	PASS
20dB Occupied Bandwidth	§15.215 (c)	PASS

Note:

1. Pass: Test item meets the requirement.

2. Fail: Test item does not meet the requirement.

3. N/A: Test case does not apply to the test object.

4. The test result judgment is decided by the limit of test standard.

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3. General Information

3.1. Test Environment and Mode

Operating Environment:		
Condition	Conducted Emission	Radiated Emission
Temperature:	23.5 °C	24.1 °C
Humidity:	52 % RH	54 % RH
Atmospheric Pressure:	1010 mbar	1010 mbar
Test Mode:		
Engineering mode:	Keep the EUT in continuous transmitting by select channel and modulations with Fully-charged battery	
The sample was placed 0.8m & 1.5m for the measurement below & above 1GHz above the ground plane of 3m chamber. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating the turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case(Z axis) are shown in Test Results of the following pages.		

3.2. Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Equipment	Model No.	Serial No.	FCC ID	Trade Name
Adapter	ETA0U82CBC	RT10206CS/AE	/	SAMSUNG

Note:

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.

2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

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4. Facilities and Accreditations

4.1. Facilities

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

- FCC - Registration No.: 645098

  SHENZHEN TONGCE TESTING LAB

  Designation Number: CN1205

  The testing lab has been registered and fully described in a report with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files.

- IC - Registration No.: 10668A-1

  SHENZHEN TONGCE TESTING LAB

  CAB identifier: CN0031

  The testing lab has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing.

4.2. Location

SHENZHEN TONGCE TESTING LAB

Address: 2101 & 2201, Zhenchang Factory Renshan Industrial Zone, Fuhai Subdistrict, Bao'an District, Shenzhen, Guangdong, 518103, People's Republic of China

TEL: +86-755-27673339

4.3. Measurement Uncertainty

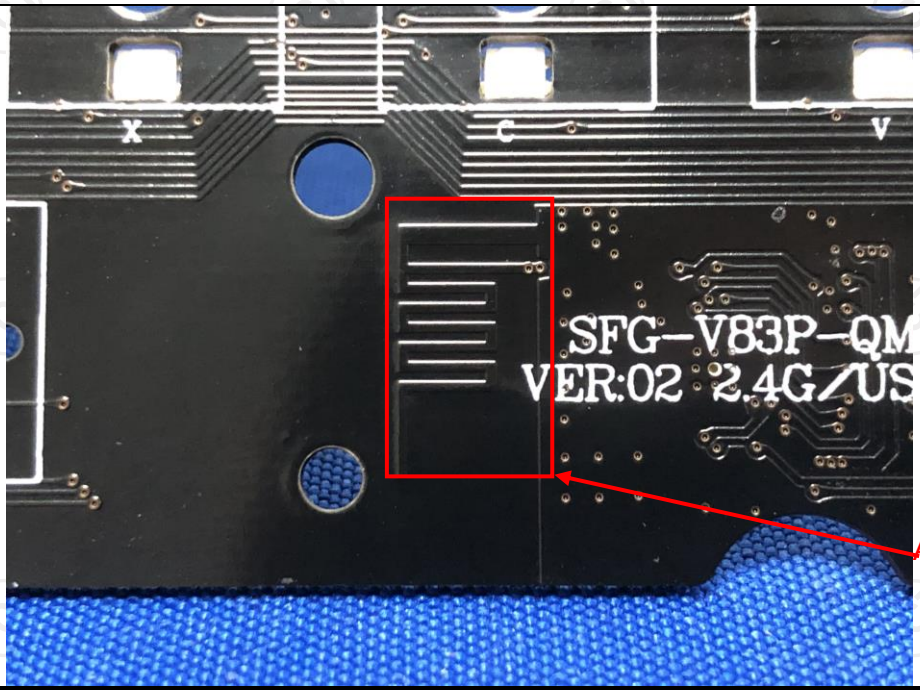
The reported uncertainty of measurement y ± U, where expended uncertainty U is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95 %.

No.	Item	MU
1	Conducted Emission	± 3.10 dB
2	RF power, conducted	± 0.12 dB
3	Spurious emissions, conducted	± 0.11 dB
4	All emissions, radiated(<1 GHz)	± 4.56 dB
5	All emissions, radiated(1 GHz - 18 GHz)	± 4.22 dB
6	All emissions, radiated(18 GHz- 40 GHz)	± 4.36 dB

5. Test Results and Measurement Data

5.1. Antenna Requirement

Standard requirement:	FCC Part15 C Section 15.203
15.203 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 a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.	
E.U.T Antenna:	
The EUT antenna is PCB antenna which permanently attached, and the best case gain of the antenna is 3.85dBi.	



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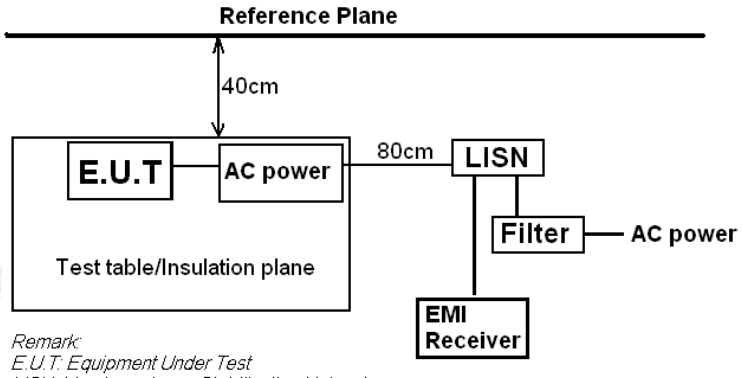
5.2. Conducted Emission

5.2.1. Test Specification

<table>
<tr><td>Test Requirement:</td><td>FCC Part15 C Section 15.207</td></tr>
<tr><td>Test Method:</td><td>ANSI C63.10:2013</td></tr>
<tr><td>Frequency Range:</td><td>150 kHz to 30 MHz</td></tr>
<tr><td>Receiver setup:</td><td>RBW=9 kHz, VBW=30 kHz, Sweep time=auto</td></tr>
<tr><td>Limits:</td><td>
<table>
<tr><td rowspan="2">Frequency range (MHz)</td><td colspan="2">Limit (dBuV)</td></tr>
<tr><td>Quasi-peak</td><td>Average</td></tr>
<tr><td>0.15-0.5</td><td>66 to 56*</td><td>56 to 46*</td></tr>
<tr><td>0.5-5</td><td>56</td><td>46</td></tr>
<tr><td>5-30</td><td>60</td><td>50</td></tr>
</table>
</td></tr>
<tr><td>Test Setup:</td><td> 

Remark:
E.U.T: Equipment Under Test
LISN: Line Impedence Stabilization Network
Test table height=0.8m</td></tr>
<tr><td>Test Mode:</td><td>Charging + Transmitting Mode</td></tr>
<tr><td>Test Procedure:</td><td>1. The E.U.T and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm/50uH coupling impedance for the measuring equipment.
2. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs).
3. Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10:2013 on conducted measurement.</td></tr>
<tr><td>Test Result:</td><td>PASS</td></tr>
</table>

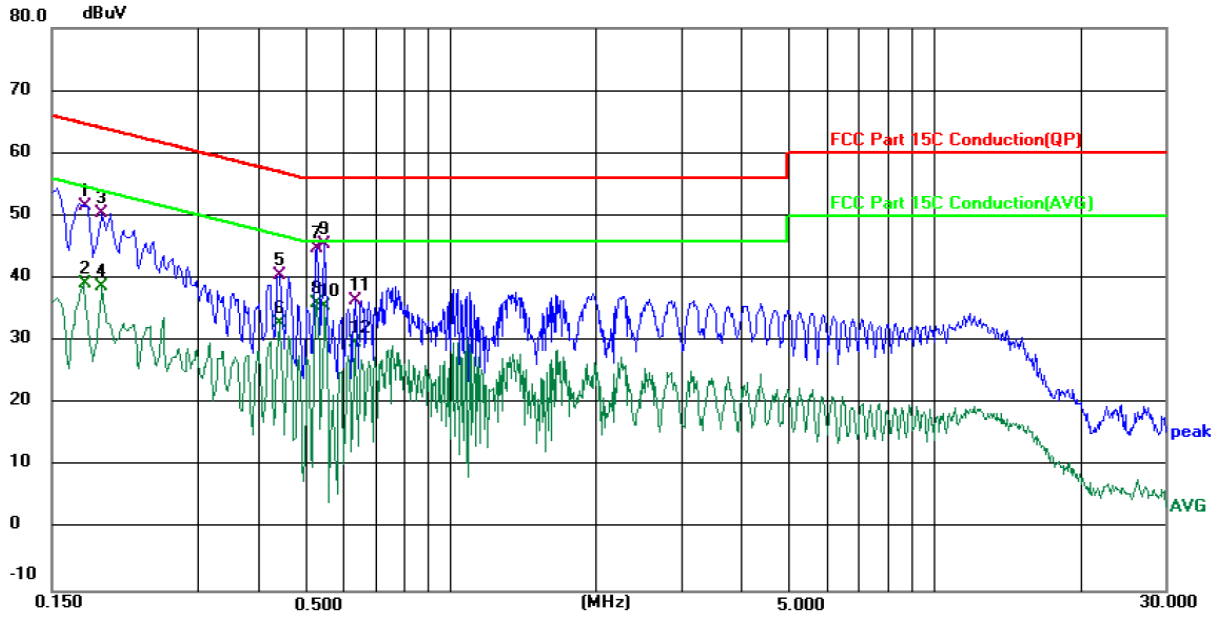
5.2.2. Test Instruments

Conducted Emission Shielding Room Test Site (843)				
Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
EMI Test Receiver	R&S	ESCI3	100898	Jun. 29, 2024
Line Impedance Stabilisation Newtork(LISN)	Schwarzbeck	NSLK 8126	8126453	Feb. 20, 2024
Line-5	TCT	CE-05	/	Jul. 03, 2024
EMI Test Software	Shurple Technology	EZ-EMC	/	/

5.2.3. Test data

Please refer to following diagram for individual

Conducted Emission on Line Terminal of the power line (150 kHz to 30MHz)



Site 844 Shielding Room | Phase: *L1* | Temperature: 23.5 (℃) | Humidity: 52 %

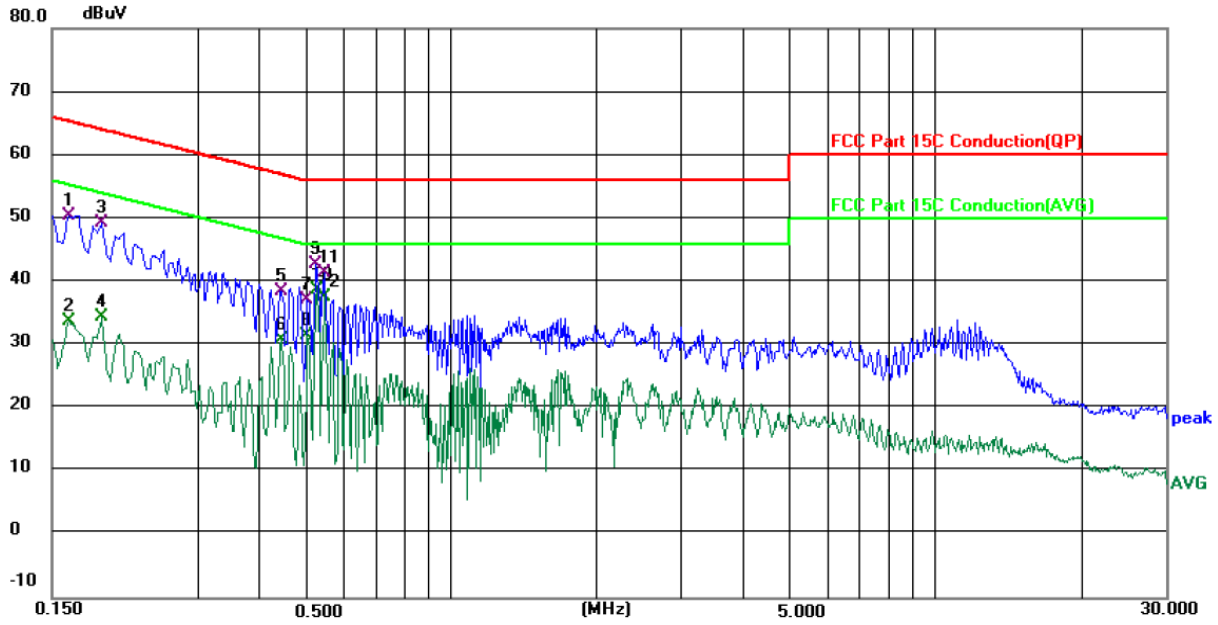
Limit: FCC Part 15C Conduction(QP) | Power: DC 5V(Adapter Input AC 120V/60Hz)

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.1739	41.52	10.13	51.65	64.77	-13.12	QP	
2		0.1739	28.98	10.13	39.11	54.77	-15.66	AVG	
3		0.1900	40.33	10.14	50.47	64.04	-13.57	QP	
4		0.1900	28.67	10.14	38.81	54.04	-15.23	AVG	
5		0.4420	30.94	9.51	40.45	57.02	-16.57	QP	
6		0.4420	23.36	9.51	32.87	47.02	-14.15	AVG	
7		0.5299	35.25	9.43	44.68	56.00	-11.32	QP	
8	*	0.5299	26.57	9.43	36.00	46.00	-10.00	AVG	
9		0.5500	36.07	9.41	45.48	56.00	-10.52	QP	
10		0.5500	26.12	9.41	35.53	46.00	-10.47	AVG	
11		0.6340	27.05	9.33	36.38	56.00	-19.62	QP	
12		0.6340	20.28	9.33	29.61	46.00	-16.39	AVG	

Note:

Freq. = Emission frequency in MHz
Reading level (dBμV) = Receiver reading
Corr. Factor (dB) = LISN factor + Cable loss
Measurement (dBμV) = Reading level (dBμV) + Corr. Factor (dB)
Limit (dBμV) = Limit stated in standard
Margin (dB) = Measurement (dBμV) – Limits (dBμV)
Q.P. =Quasi-Peak
AVG =average
** is meaning the worst frequency has been tested in the frequency range 150 kHz to 30MHz*

Conducted Emission on Neutral Terminal of the power line (150 kHz to 30MHz)



Site 844 Shielding Room Phase: N Temperature: 23.5 (℃) Humidity: 52 %

Limit: FCC Part 15C Conduction(QP) Power: DC 5V(Adapter Input AC 120V/60Hz)

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.1620	40.23	10.10	50.33	65.36	-15.03	QP	
2		0.1620	23.64	10.10	33.74	55.36	-21.62	AVG	
3		0.1900	39.14	10.14	49.28	64.04	-14.76	QP	
4		0.1900	24.40	10.14	34.54	54.04	-19.50	AVG	
5		0.4460	28.90	9.50	38.40	56.95	-18.55	QP	
6		0.4460	21.36	9.50	30.86	46.95	-16.09	AVG	
7		0.5060	27.70	9.45	37.15	56.00	-18.85	QP	
8		0.5060	22.04	9.45	31.49	46.00	-14.51	AVG	
9		0.5260	33.44	9.43	42.87	56.00	-13.13	QP	
10	*	0.5299	29.30	9.43	38.73	46.00	-7.27	AVG	
11		0.5460	31.93	9.41	41.34	56.00	-14.66	QP	
12		0.5460	28.19	9.41	37.60	46.00	-8.40	AVG	

Note1:

Freq. = Emission frequency in MHz

Reading level (dBμV) = Receiver reading

Corr. Factor (dB) = LISN factor + Cable loss

Measurement (dBμV) = Reading level (dBμV) + Corr. Factor (dB)

Limit (dBμV) = Limit stated in standard

Margin (dB) = Measurement (dBμV) – Limits (dBμV)

Q.P. =Quasi-Peak AVG =average

** is meaning the worst frequency has been tested in the frequency range 150 kHz to 30MHz.*

5.3. Radiated Emission Measurement

5.3.1. Test Specification

<table>
<tr><td>Test Requirement:</td><td>FCC Part15 C Section 15.209</td></tr>
<tr><td>Test Method:</td><td>ANSI C63.10:2013</td></tr>
<tr><td>Frequency Range:</td><td>9 kHz to 25 GHz</td></tr>
<tr><td>Measurement Distance:</td><td>3 m</td></tr>
<tr><td>Antenna Polarization:</td><td>Horizontal & Vertical</td></tr>
<tr><td>Receiver Setup:</td><td>
<table>
<tr><td>Frequency</td><td>Detector</td><td>RBW</td><td>VBW</td><td>Remark</td></tr>
<tr><td>9kHz- 150kHz</td><td>Quasi-peak</td><td>200Hz</td><td>1kHz</td><td>Quasi-peak Value</td></tr>
<tr><td>150kHz-30MHz</td><td>Quasi-peak</td><td>9kHz</td><td>30kHz</td><td>Quasi-peak Value</td></tr>
<tr><td>30MHz-1GHz</td><td>Quasi-peak</td><td>120kHz</td><td>300kHz</td><td>Quasi-peak Value</td></tr>
<tr><td rowspan="2">Above 1GHz</td><td>Peak</td><td>1MHz</td><td>3MHz</td><td>Peak Value</td></tr>
<tr><td>Peak</td><td>1MHz</td><td>10Hz</td><td>Average Value</td></tr>
</table>
</td></tr>
<tr><td>Limit(Field strength of the fundamental signal):</td><td>
<table>
<tr><td>Frequency</td><td>Limit (dBuV/m @3m)</td><td>Remark</td></tr>
<tr><td rowspan="2">2400MHz-2483.5MHz</td><td>94.00</td><td>Average Value</td></tr>
<tr><td>114.00</td><td>Peak Value</td></tr>
</table>
</td></tr>
<tr><td>Limit(Spurious Emissions):</td><td>
<table>
<tr><td>Frequency</td><td>Limit (dBuV/m @3m)</td><td>Remark</td></tr>
<tr><td>0.009-0.490</td><td>2400/F(KHz)</td><td>Quasi-peak Value</td></tr>
<tr><td>0.490-1.705</td><td>24000/F(KHz)</td><td>Quasi-peak Value</td></tr>
<tr><td>1.705-30</td><td>30</td><td>Quasi-peak Value</td></tr>
<tr><td>30MHz-88MHz</td><td>40.0</td><td>Quasi-peak Value</td></tr>
<tr><td>88MHz-216MHz</td><td>43.5</td><td>Quasi-peak Value</td></tr>
<tr><td>216MHz-960MHz</td><td>46.0</td><td>Quasi-peak Value</td></tr>
<tr><td>960MHz-1GHz</td><td>54.0</td><td>Quasi-peak Value</td></tr>
<tr><td rowspan="2">Above 1GHz</td><td>54.0</td><td>Average Value</td></tr>
<tr><td>74.0</td><td>Peak Value</td></tr>
</table>
</td></tr>
<tr><td>Limit (band edge) :</td><td>Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in Section 15.209, whichever is the lesser attenuation.</td></tr>
<tr><td>Test Procedure:</td><td>1. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber in below 1GHz, 1.5m above the ground in above 1GHz. The table was rotated 360 degrees to determine the position of the highest radiation.
2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
3. 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.</td></tr>
</table>

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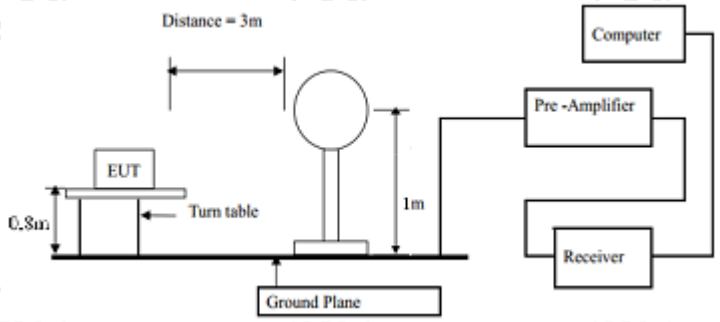
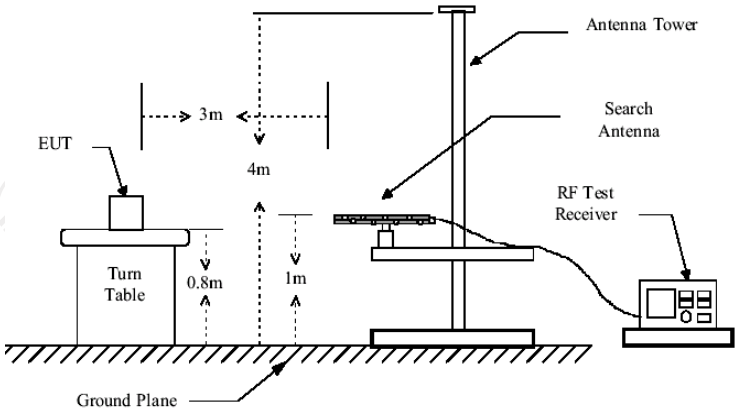
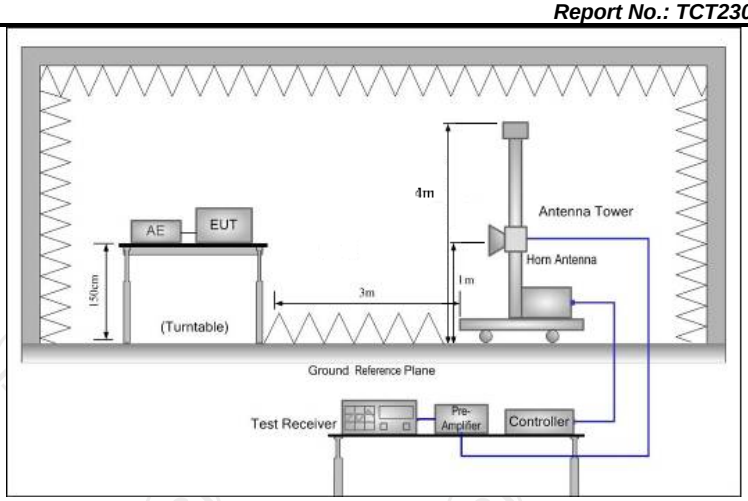
	4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading. 5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. 6. 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.
Test setup:	For radiated emissions below 30MHz  30MHz to 1GHz  Above 1GHz (The diagram below shows the test setup that is utilized to make the measurements for emission from 1GHz to the tenth harmonic of the highest fundamental frequency or to 40GHz emissions, whichever is lower.)

	
Test results:	PASS

5.3.2. Test Instruments

Radiated Emission Test Site (966)				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
EMI Test Receiver	R&S	ESIB7	100197	Jun. 29, 2024
Spectrum Analyzer	R&S	FSQ40	200061	Jun. 29, 2024
Pre-amplifier	SKET	LNPA_0118G-45	SK2021012102	Feb. 20, 2024
Pre-amplifier	SKET	LNPA_1840G-50	SK202109203500	Feb. 20, 2024
Pre-amplifier	HP	8447D	2727A05017	Jun. 27, 2024
Loop antenna	Schwarzbeck	FMZB1519B	00191	Jul. 02, 2024
Broadband Antenna	Schwarzbeck	VULB9163	340	Jul. 01, 2024
Horn Antenna	Schwarzbeck	BBHA 9120D	631	Jul. 01, 2024
Horn Antenna	Schwarzbeck	BBHA 9170	00956	Feb. 24, 2024
Antenna Mast	Keleto	RE-AM	/	/
Coaxial cable	SKET	RC-18G-N-M	/	Feb. 24, 2024
Coaxial cable	SKET	RC_40G-K-M	/	Feb. 24, 2024
EMI Test Software	Shurple Technology	EZ-EMC	/	/

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5.3.3. Test Data

Field Strength of Fundamental

Frequency (MHz)	Emission PK (dBuV/m)	Horizontal /Vertical	Limits PK (dBuV/m)	Margin (dB)
2402	86.52	H	114	-27.48
2402	73.99	V	114	-40.01
2440	84.88	H	114	-29.12
2440	77.55	V	114	-36.45
2480	87.86	H	114	-26.14
2480	76.73	V	114	-37.27

Frequency (MHz)	Emission AV (dBuV/m)	Horizontal /Vertical	Limits AV (dBuV/m)	Margin (dB)
2402	85.87	H	94	-8.13
2402	73.32	V	94	-20.68
2440	84.32	H	94	-9.68
2440	77.02	V	94	-16.98
2480	87.20	H	94	-6.80
2480	75.85	V	94	-18.15

Spurious Emissions

Frequency Range (9 kHz-30MHz)

Frequency (MHz)	Level@3m (dBμV/m)	Limit@3m (dBμV/m)
--	--	--
--	--	--
--	--	--
--	--	--

Note: *1. Emission Level=Reading+ Cable loss-Antenna factor-Amp factor.*

2. The emission levels are 20 dB below the limit value, which are not reported. It is deemed to comply with the requirement.

3. For fundamental frequency, RBW >20dB BW , VBW>=RBW, PK detector is for PK value, RMS detector is for AV value.

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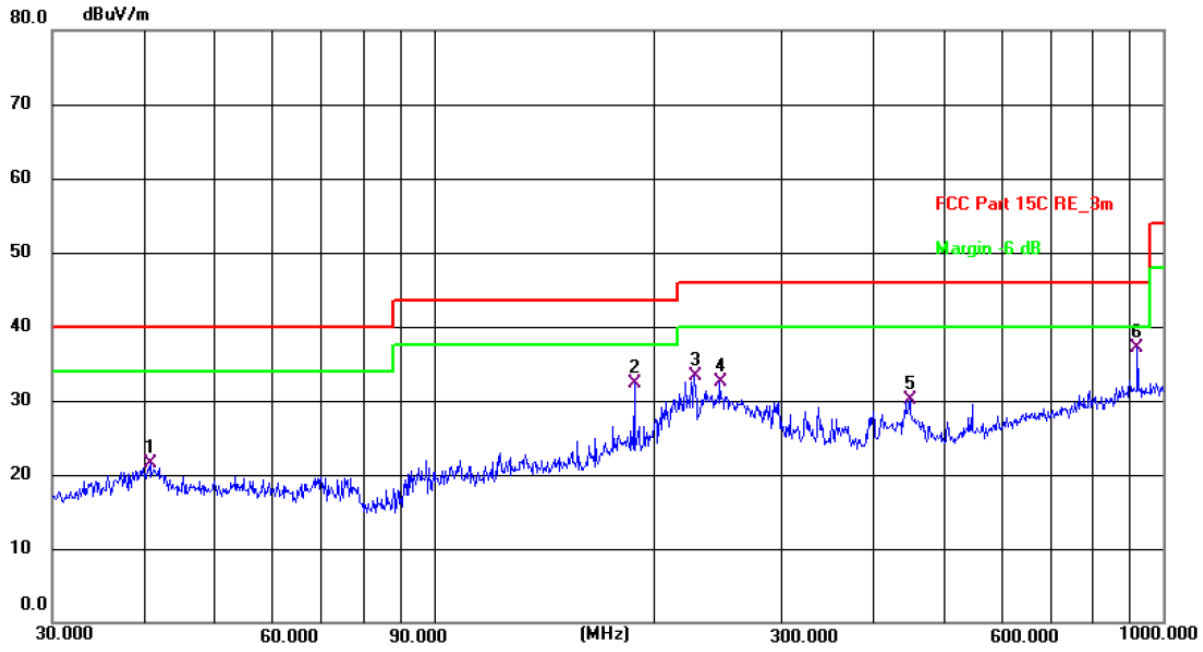
Frequency Range (30MHz-1GHz)

Horizontal:

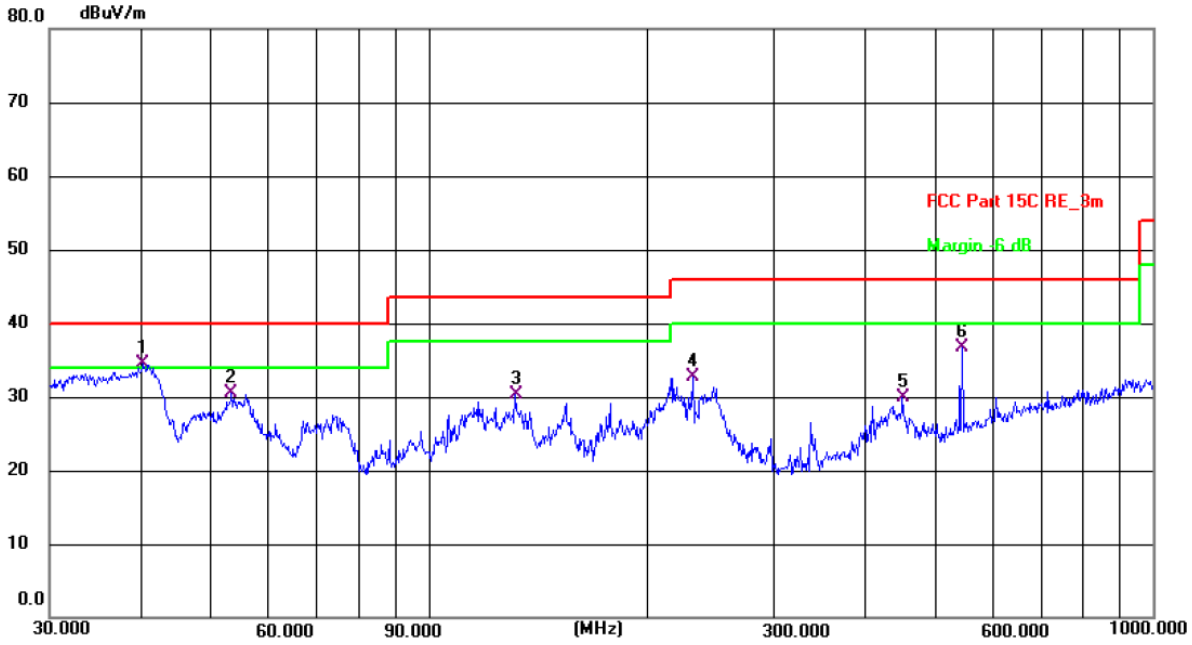


Site #2 3m Anechoic Chamber Polarization: ***Horizontal*** Temperature: 24.1(C) Humidity: 54 %

Limit: FCC Part 15C RE_3m Power: DC 3.7 V

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F	Remark
1	40.8445	7.10	14.35	21.45	40.00	-18.55	QP	P	
2	188.4125	20.64	11.57	32.21	43.50	-11.29	QP	P	
3	227.6906	20.78	12.48	33.26	46.00	-12.74	QP	P	
4	246.8149	19.56	13.01	32.57	46.00	-13.43	QP	P	
5	449.5558	11.65	18.36	30.01	46.00	-15.99	QP	P	
6 *	922.5157	11.14	26.00	37.14	46.00	-8.86	QP	P	

Vertical:



Site #2 3m Anechoic Chamber Polarization: *Vertical* Temperature: 24.1(C) Humidity: 54 %

Limit: FCC Part 15C RE_3m Power: DC 3.7 V

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F	Remark
1 *	40.4170	20.07	14.39	34.46	40.00	-5.54	QP	P	
2	53.5052	17.09	13.35	30.44	40.00	-9.56	QP	P	
3	131.7577	16.37	13.90	30.27	43.50	-13.23	QP	P	
4	231.7178	20.03	12.66	32.69	46.00	-13.31	QP	P	
5	451.1350	11.54	18.39	29.93	46.00	-16.07	QP	P	
6	545.1825	16.63	20.09	36.72	46.00	-9.28	QP	P	

Note: *Measurements were conducted in all channels (high, middle, low), and the worst case (Highest channel) was submitted only.*

Above 1GHz

Low channel: 2402MHz									
Frequency (MHz)	Ant. Pol. H/V	Peak reading (dBμV)	AV reading (dBuV)	Correction Factor (dB/m)	Emission Level		Peak limit (dBμV/m)	AV limit (dBμV/m)	Margin (dB)
					Peak (dBμV/m)	AV (dBμV/m)			
4804	H	47.38	---	-3.94	43.44	---	74	54	-10.56
7206	H	43.85	---	0.52	44.37	---	74	54	-9.63
---	---	---	---	---	---	---	---	---	---
4804	V	47.52	---	-3.94	43.58	---	74	54	-10.42
7206	V	41.49	---	0.52	42.01	---	74	54	-11.99
---	---	---	---	---	---	---	---	---	---

Middle channel: 2440MHz									
Frequency (MHz)	Ant. Pol. H/V	Peak reading (dBμV)	AV reading (dBμV)	Correction Factor (dB/m)	Emission Level		Peak limit (dBμV/m)	AV limit (dBμV/m)	Margin (dB)
					Peak (dBμV/m)	AV (dBμV/m)			
4880	H	46.57	---	-3.98	42.59	---	74	54	-11.41
7320	H	41.38	---	0.57	41.95	---	74	54	-12.05
---	---	---	---	---	---	---	---	---	---
4880	V	48.81	---	-3.98	44.83	---	74	54	-9.17
7320	V	43.37	---	0.57	43.94	---	74	54	-10.06
---	---	---	---	---	---	----	---	---	---

High channel: 2480MHz									
Frequency (MHz)	Ant. Pol. H/V	Peak reading (dBμV)	AV reading (dBμV)	Correction Factor (dB/m)	Emission Level		Peak limit (dBμV/m)	AV limit (dBμV/m)	Margin (dB)
					Peak (dBμV/m)	AV (dBμV/m)			
4960	H	46.80	---	-3.98	42.82	---	74	54	-11.18
7440	H	43.22	---	0.57	43.79	---	74	54	-10.21
---	---	---	---	---	---	---	---	---	---
4960	V	47.34	---	-3.98	43.36	---	74	54	-10.64
7440	V	43.39	---	0.57	43.96	---	74	54	-10.04
---	---	---	---	---	---	---	---	---	---

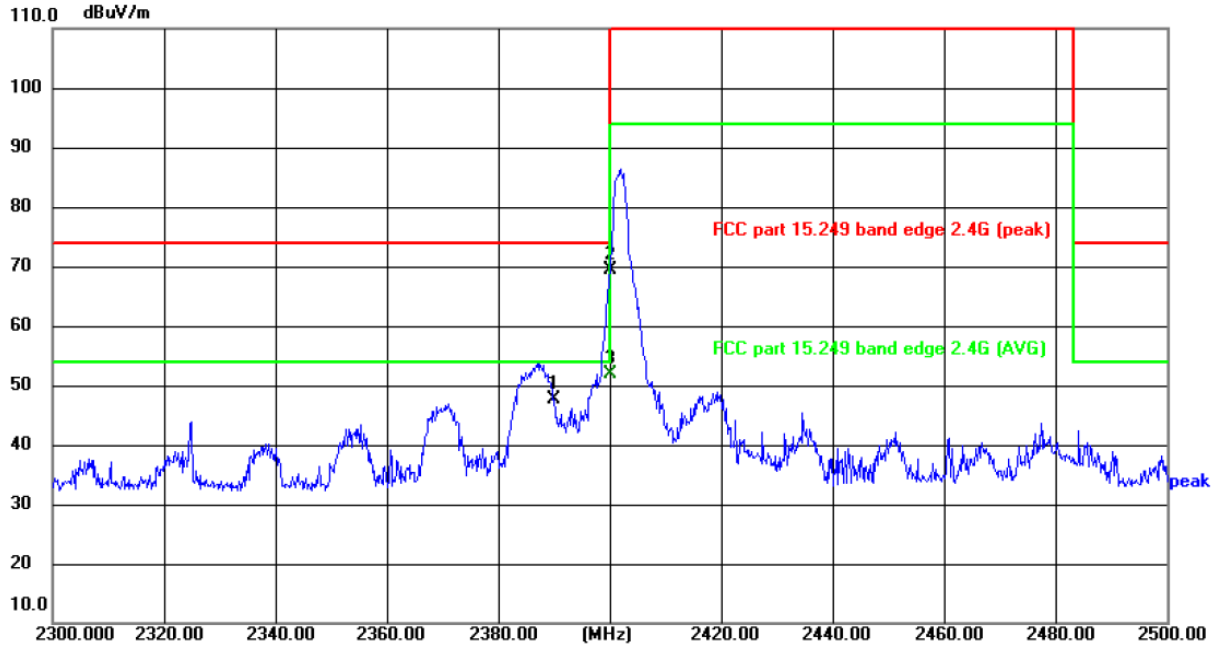
Note:

1. *Emission Level=Peak Reading + Correction Factor; Correction Factor= Antenna Factor + Cable loss – Pre-amplifier*
2. *Margin (dB) = Emission Level (Peak) (dBμV/m)-Average limit (dBμV/m)*
3. *The emission levels of other frequencies are very lower than the limit and not show in test report.*
4. *Measurements were conducted from 1 GHz to the 10th harmonic of highest fundamental frequency.*
5. *Data of measurement shown "---"in the above table mean that the reading of emissions is attenuated more than 20 dB below the limits or the field strength is too small to be measured.*
6. *All the restriction bands are compliance with the limit of 15.209.*

Band Edge Requirement

Lowest channel 2402:

Horizontal:

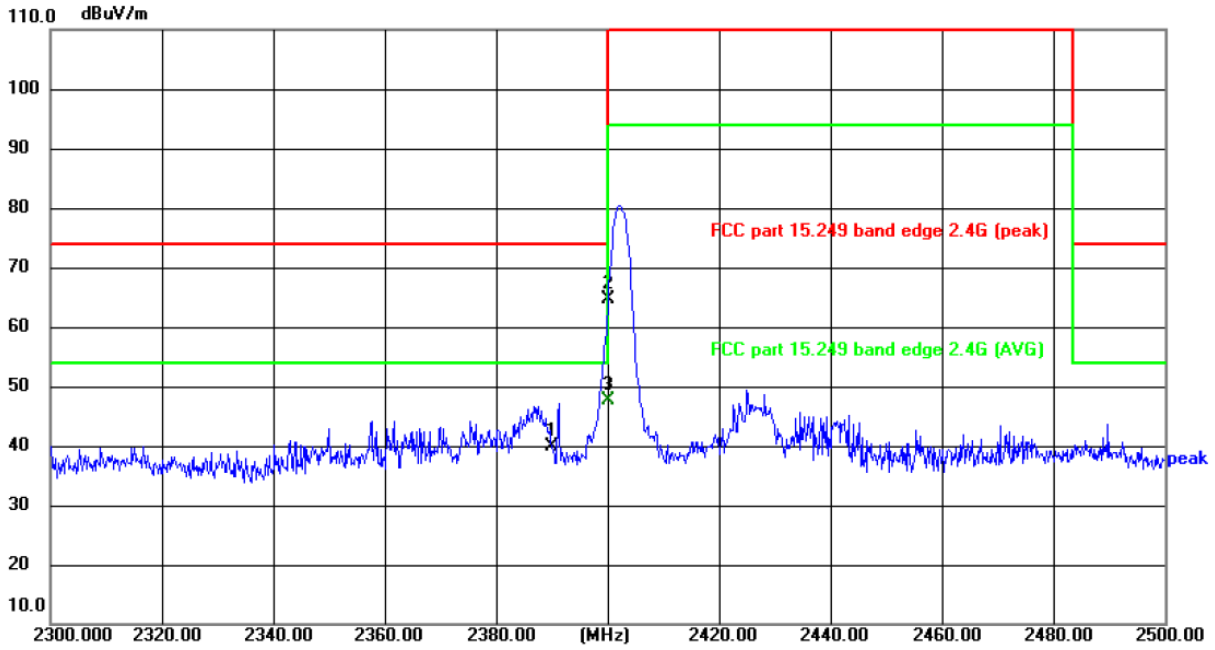


Site: #3 3m Anechoic Chamber Polarization: *Horizontal* Temperature: 25.3(℃) Humidity: 50 %

Limit: FCC part 15.249 band edge 2.4G (peak) Power:DC 3.7 V

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F	Remark
1	2390.000	64.22	-16.53	47.69	74.00	-26.31	peak	P	
2	2400.000	85.91	-16.54	69.37	74.00	-4.63	peak	P	
3 *	2400.000	68.53	-16.54	51.99	54.00	-2.01	AVG	P	

Vertical:



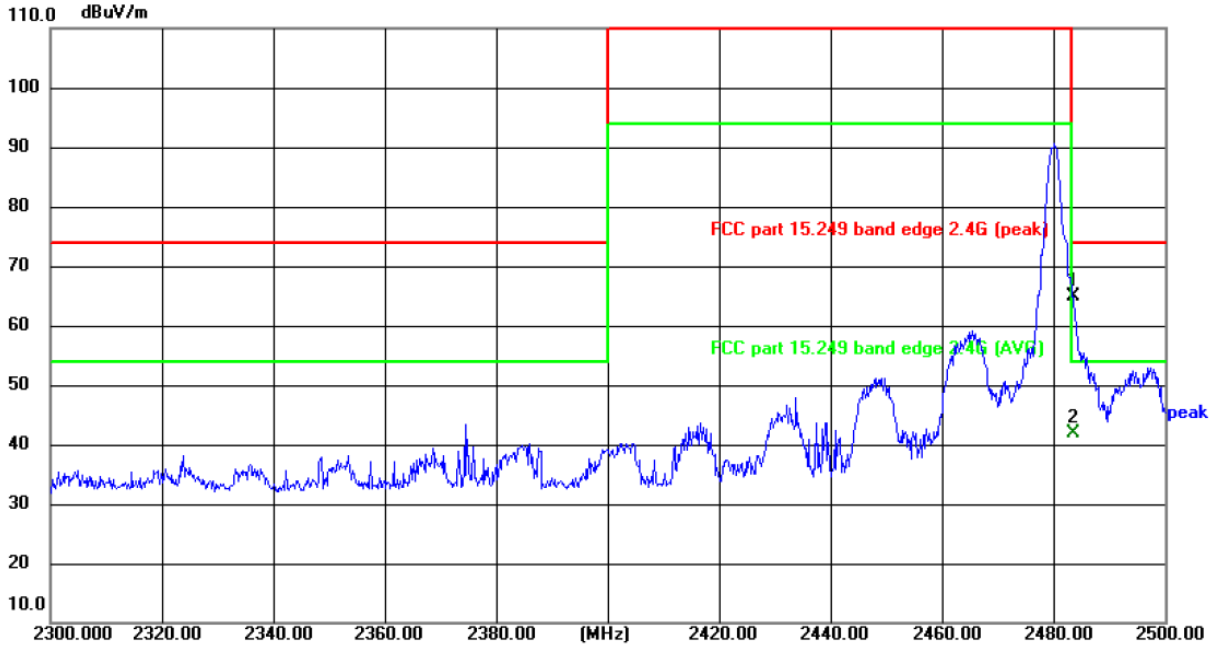
Site: #3 3m Anechoic Chamber Polarization: *Vertical* Temperature: 25.3(℃) Humidity: 50 %

Limit: FCC part 15.249 band edge 2.4G (peak) Power:DC 3.7 V

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F	Remark
1	2390.000	56.29	-16.53	39.76	74.00	-34.24	peak	P	
2	2400.000	81.28	-16.54	64.74	74.00	-9.26	peak	P	
3 *	2400.000	64.28	-16.54	47.74	54.00	-6.26	AVG	P	

Highest channel 2480:

Horizontal:

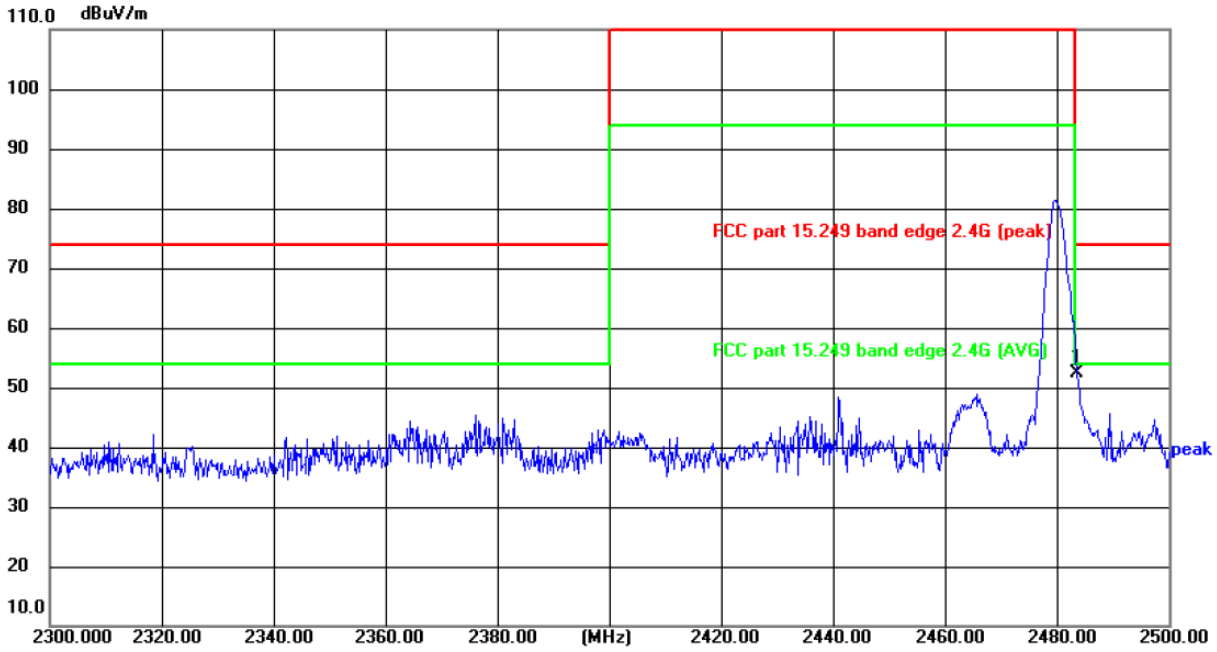


Site: #3 3m Anechoic Chamber Polarization: *Horizontal* Temperature: 25.3(℃) Humidity: 50 %

Limit: FCC part 15.249 band edge 2.4G (peak) Power:DC 3.7 V

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F	Remark
1 *	2483.500	81.24	-16.43	64.81	74.00	-9.19	peak	P	
2	2483.500	58.20	-16.43	41.77	54.00	-12.23	AVG	P	

Vertical:



Site: #3 3m Anechoic Chamber Polarization: *Vertical* Temperature: 25.3(℃) Humidity: 50 %

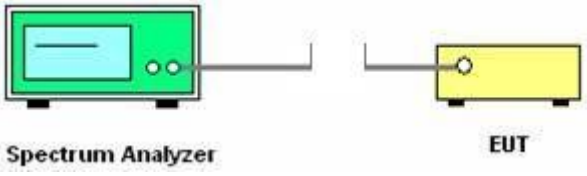
Limit: FCC part 15.249 band edge 2.4G (peak) Power:DC 3.7 V

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F	Remark
1 *	2483.500	68.72	-16.43	52.29	74.00	-21.71	peak	P	

Note: *Measurements were conducted in all channels (high, middle, low), and the worst case (Highest channel) was submitted only.*

5.4. 20dB Occupied Bandwidth

5.4.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.215(c)
Test Method:	ANSI C63.10: 2013
Limit:	N/A
	1. According to the follow Test-setup, keep the relative position between the artificial antenna and the EUT. 2. Set to the maximum power setting and enable the EUT transmit continuously. 3. Use the following spectrum analyzer settings for 20dB Bandwidth measurement. Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel; RBW≥1% of the 20 dB bandwidth; VBW≥RBW; Sweep = auto; Detector function = peak; Trace = max hold. 4. Measure and record the results in the test report.
Test setup:	
Test Mode:	Transmitting mode with modulation
Test results:	PASS

5.4.2. Test Instruments

Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	N9020A	MY49100619	Jun. 28, 2024

5.4.3. Test data

Test Channel	20dB Occupy Bandwidth (kHz)	Limit	Conclusion
Lowest	1089	---	PASS
Middle	1109	---	PASS
Highest	1095	---	PASS

Test plots as follows:

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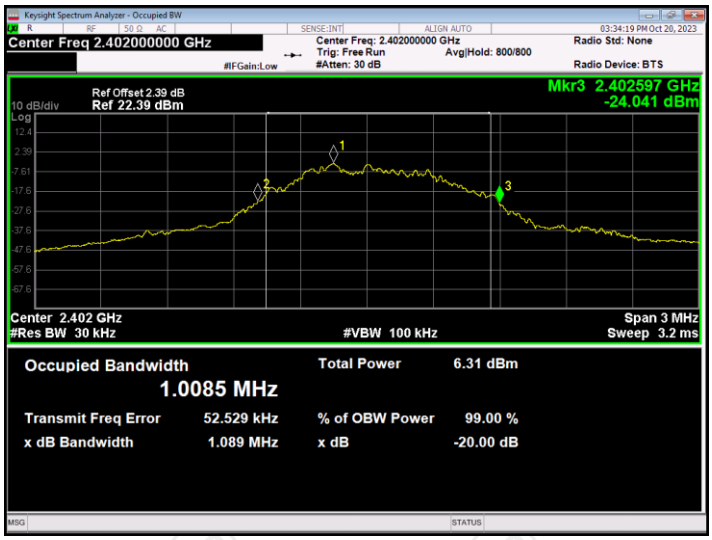
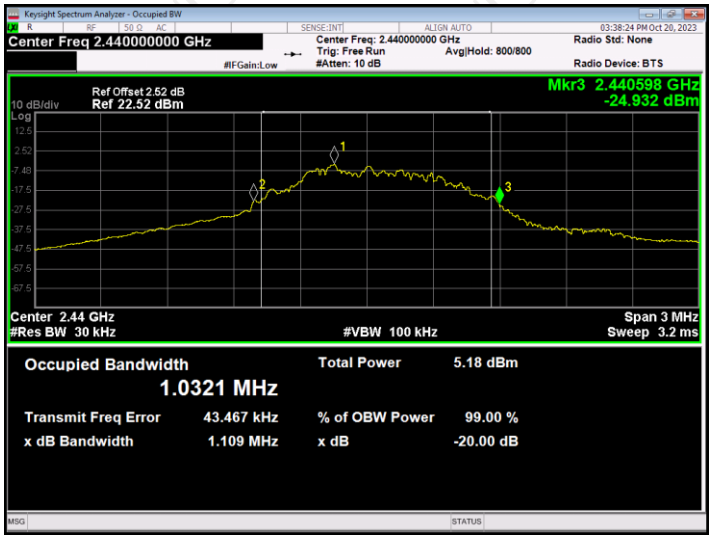
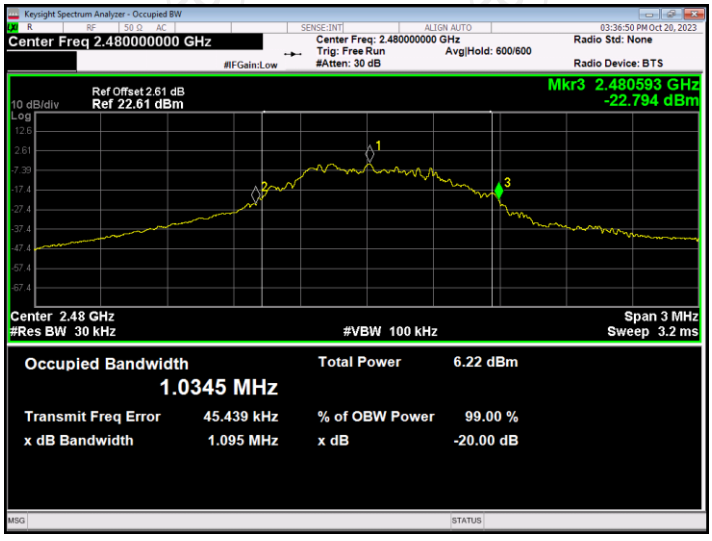
Lowest channel



Middle channel



Highest channel



Appendix B: Photographs of Test Setup

Refer to the test report No. TCT230829E012

Appendix C: Photographs of EUT

Refer to the test report No. TCT230829E012

*****END OF REPORT*****

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