

TEST REPORT

FCC ID..... :	2BBVL-AION7XX01	
Test Report No..... :	TCT240523E014	
Date of issue..... :	Jul. 22, 2024	
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..... :	TES Touch Embedded Solutions Inc. Taiwan Branch	
Address..... :	7F., No.141, Sec. 3, Ren ai Rd., Da an Dist., Taipei City 106, Taiwan, 222106 China	
Manufacturer's name ... :	TES Touch Embedded Solutions Inc. Taiwan Branch	
Address..... :	7F., No.141, Sec. 3, Ren ai Rd., Da an Dist., Taipei City 106, Taiwan, 222106 China	
Standard(s)	FCC CFR Title 47 Part 15 Subpart C Section 15.247 FCC KDB 558074 D01 15.247 Meas Guidance v05r02 ANSI C63.10:2013	
Product Name..... :	AIO Core Board module	
Trade Mark	TES/MicroTouch 	
Model/Type reference..... :	AION7XX01	
Rating(s)..... :	DC 4.2V	
Date of receipt of test item	May 23, 2024	
Date (s) of performance of test..... :	May 23, 2024 ~ Jul. 22, 2024	
Tested by (+signature) ... :	Aaron MO	
Check by (+signature).... :	Beryl ZHAO	
Approved by (+signature):	Tomsin	

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1. General Product Information

1.1. EUT description

Product Name.....:	AIO Core Board module
Model/Type reference.....:	AION7XX01
Sample Number.....:	TCT240523E013-0101
Bluetooth Version	V5.2 (This report is for BLE)
Operation Frequency	2402MHz~2480MHz
Channel Separation	2MHz
Data Rate.....:	LE 1M PHY, LE 2M PHY
Number of Channel	40
Modulation Type.....:	GFSK
Antenna Type.....:	External Antenna
Antenna Gain.....:	Support two antenna Antenna a: -1.96dBi Antenna b: 1.54dBi
Rating(s).....:	DC 4.2V

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

None.

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.

2. Test Result Summary

Requirement	CFR 47 Section	Result
Antenna requirement	§15.203/§15.247 (c)	PASS
AC Power Line Conducted Emission	§15.207	PASS
Conducted Peak Output Power	§15.247 (b)(3)	PASS
6dB Emission Bandwidth	§15.247 (a)(2)	PASS
Power Spectral Density	§15.247 (e)	PASS
Band Edge	§15.247(d)	PASS
Spurious Emission	§15.205/§15.209	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.
5. Those test results (Conducted Emission, Conducted Output Power, 6dB Emission Bandwidth, Power Spectral Density, Band Edge) was based on FCC ID: 2BBVL-AION7XX01; Change antenna.

3. General Information

3.1. Test environment and mode

Operating Environment:	
Condition	Radiated Emission
Temperature:	25.1 °C
Humidity:	53 % RH
Atmospheric Pressure:	1010 mbar
Voltage:	DC 4.2V by Mainboard (Mainboard power by adapter)
Test Software:	
Software Information:	ADB Tool
Power Level:	0x06
Test Mode:	
Engineer mode:	Keep the EUT in continuous transmitting by select channel
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
BOX PC	TBX-100N7020011002	/	/	MicroTouch
Media Player	IDX-300	/	/	MicroTouch

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.
3. For conducted measurements (Output Power, 6dB Emission Bandwidth, Power Spectral Density, Spurious Emissions), the antenna of EUT is connected to the test equipment via temporary antenna connector, the antenna connector is soldered on the antenna port of EUT, and the temporary antenna connector is listed in the Test Instruments.

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

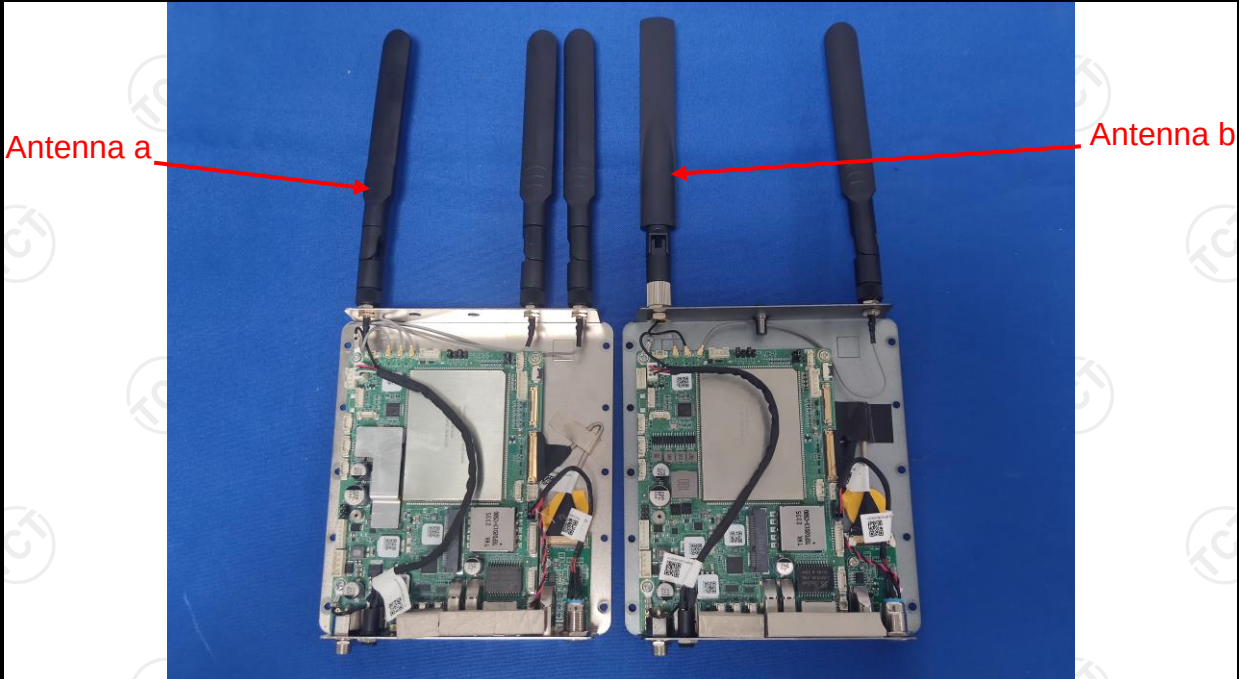
4.3. Measurement Uncertainty

The reported uncertainty of measurement $y \pm U$, 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

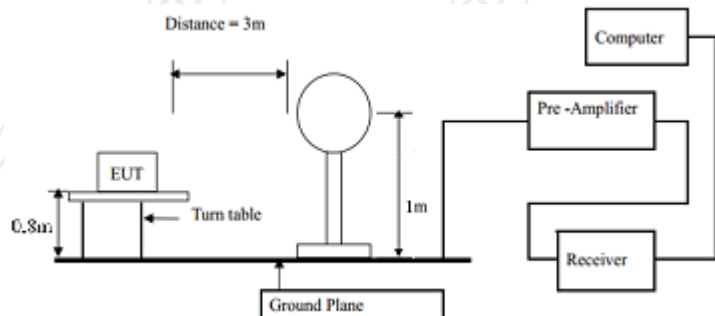
5. Test Results and Measurement Data

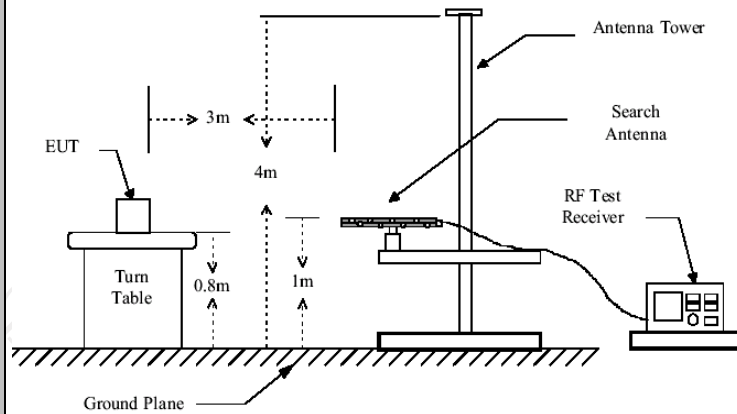
5.1. Antenna requirement

Standard requirement:	FCC Part15 C Section 15.203 /247(c)
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. 15.247(c) (1)(i) requirement: (i) Systems operating in the 2400-2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.	
E.U.T Antenna:	
The EUT test with a external antenna for maximum gain which are detachable, and the best case gain of the the antenna a is -1.96dBi, antenna b is 1.54dBi.	
	

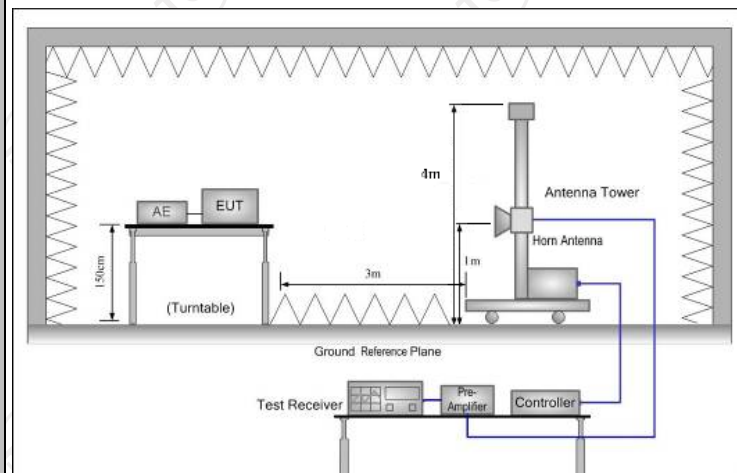
5.2. Radiated Spurious Emission Measurement

5.2.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.209					
Test Method:	ANSI C63.10:2013					
Frequency Range:	9 kHz to 25 GHz					
Measurement Distance:	3 m					
Antenna Polarization:	Horizontal & Vertical					
Operation mode:	Refer to item 3.1					
Receiver Setup:	Frequency	Detector	RBW	VBW	Remark	
	9kHz- 150kHz	Quasi-peak	200Hz	1kHz	Quasi-peak Value	
	150kHz- 30MHz	Quasi-peak	9kHz	30kHz	Quasi-peak Value	
	30MHz-1GHz	Quasi-peak	120KHz	300KHz	Quasi-peak Value	
	Above 1GHz	Peak	1MHz	3MHz	Peak Value	
Peak		1MHz	10Hz	Average Value		
Limit:	Frequency		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		30		30	
	30-88		100		3	
	88-216		150		3	
	216-960		200		3	
	Above 960		500		3	
	Frequency		Field Strength (microvolts/meter)		Measurement Distance (meters)	Detector
	Above 1GHz		500		3	Average
			5000		3	Peak
	Test setup:	For radiated emissions below 30MHz				
						
		30MHz to 1GHz				



Above 1GHz



Test Procedure:

1. For the radiated emission test below 1GHz:
The EUT was placed on a turntable with 0.8 meter above ground. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high PASS filter are used for the test in order to get better signal level.
For the radiated emission test above 1GHz:
Place the measurement antenna on a turntable with 1.5 meter above ground, which is away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final

	measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane. 2. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level 3. For measurement below 1GHz, If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported. 4. Use the following spectrum analyzer settings: (1) Span shall wide enough to fully capture the emission being measured; (2) Set RBW=120 kHz for $f < 1$ GHz; VBW $\geq$ RBW; Sweep = auto; Detector function = peak; Trace = max hold; (3) Set RBW = 1 MHz, VBW= 3MHz for $f > 1$ GHz for peak measurement. For average measurement: VBW = 10 Hz, when duty cycle is no less than 98 percent. VBW $\geq 1/T$, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.
Test mode:	Refer to section 3.1 for details
Test results:	PASS

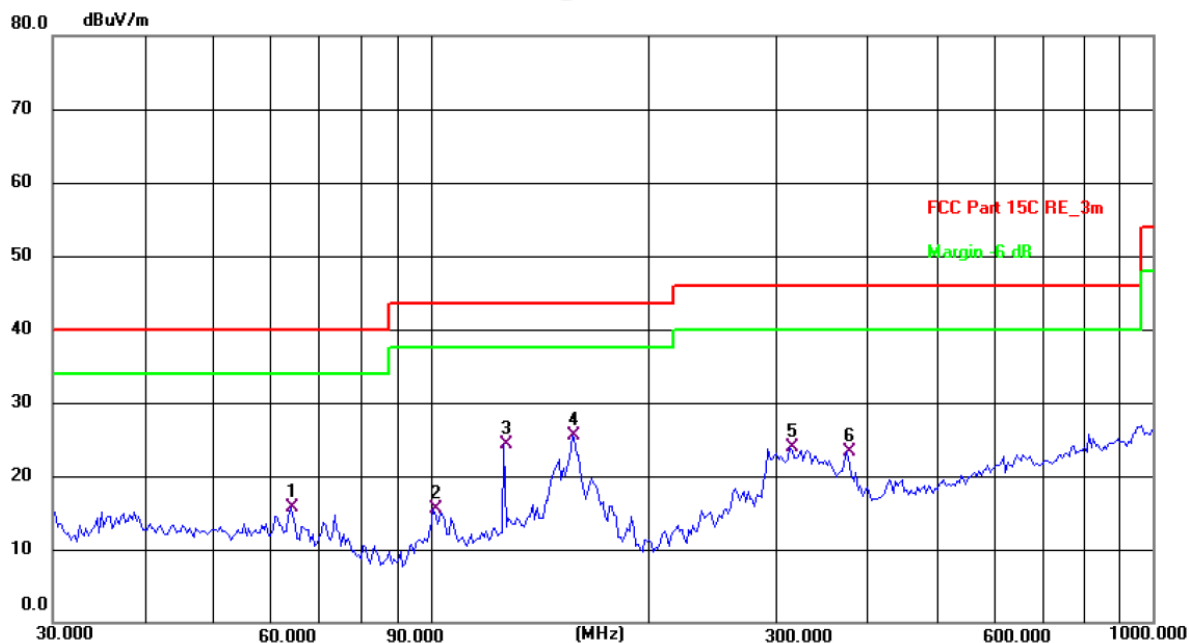
5.2.2. Test Instruments

Radiated Emission Test Site (966)				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
EMI Test Receiver	R&S	ESCI7	100529	Jan. 31, 2025
Spectrum Analyzer	R&S	FSQ40	200061	Jun. 26, 2025
Pre-amplifier	HP	8447D	2727A05017	Jun. 26, 2025
Pre-amplifier	SKET	LNPA_0118G-45	SK2021012102	Jan. 31, 2025
Pre-amplifier	SKET	LNPA_1840G-50	SK202109203500	Jan. 31, 2025
Loop antenna	Schwarzbeck	FMZB1519B	00191	Jun. 26, 2025
Broadband Antenna	Schwarzbeck	VULB9163	340	Jun. 28, 2025
Horn Antenna	Schwarzbeck	BBHA 9120D	631	Jun. 28, 2025
Horn Antenna	Schwarzbeck	BBHA 9170	00956	Feb. 02, 2025
Coaxial cable	SKET	RE-03-D	/	Jun. 26, 2025
Coaxial cable	SKET	RE-03-M	/	Jun. 26, 2025
Coaxial cable	SKET	RE-03-L	/	Jun. 26, 2025
Coaxial cable	SKET	RE-04-D	/	Jun. 26, 2025
Coaxial cable	SKET	RE-04-M	/	Jun. 26, 2025
Coaxial cable	SKET	RE-04-L	/	Jun. 26, 2025
Antenna Mast	Keleto	RE-AM	/	/
EMI Test Software	EZ_EMG	FA-03A2 RE+	1.1.4.2	/

5.2.3. Test Data

Please refer to following diagram for individual
Below 1GHz

Horizontal:



Site: 3m Anechoic Chamber1

Polarization: **Horizontal**

Temperature: 25.1(C)

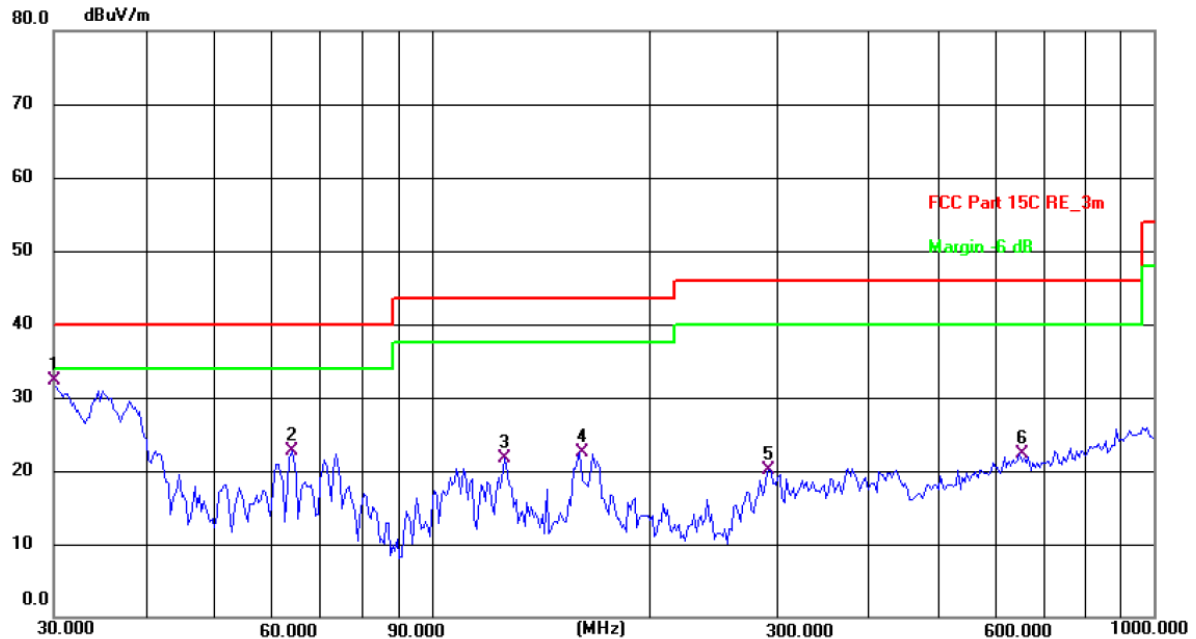
Humidity: 53 %

Limit: FCC Part 15C RE_3m

Power: DC 4.2 V

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F	Remark
1	63.9828	29.00	-13.27	15.73	40.00	-24.27	QP	P	
2	100.9339	30.86	-15.32	15.54	43.50	-27.96	QP	P	
3	126.3286	37.19	-12.93	24.26	43.50	-19.24	QP	P	
4 *	157.0074	36.78	-11.28	25.50	43.50	-18.00	QP	P	
5	314.3765	34.29	-10.46	23.83	46.00	-22.17	QP	P	
6	377.2591	32.88	-9.59	23.29	46.00	-22.71	QP	P	

Vertical:



Site: 3m Anechoic Chamber1

Polarization: **Vertical**

Temperature: 25.1(C) Humidity: 53 %

Limit: FCC Part 15C RE_3m

Power: DC 4.2 V

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F	Remark
1 *	30.0000	45.36	-13.00	32.36	40.00	-7.64	QP	P	
2	63.9827	36.04	-13.27	22.77	40.00	-17.23	QP	P	
3	126.3285	34.59	-12.93	21.66	43.50	-21.84	QP	P	
4	160.3456	33.92	-11.37	22.55	43.50	-20.95	QP	P	
5	293.0842	31.24	-11.05	20.19	46.00	-25.81	QP	P	
6	651.9417	26.41	-4.01	22.40	46.00	-23.60	QP	P	

Note: 1. The low frequency, which started from 9KHz~30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported

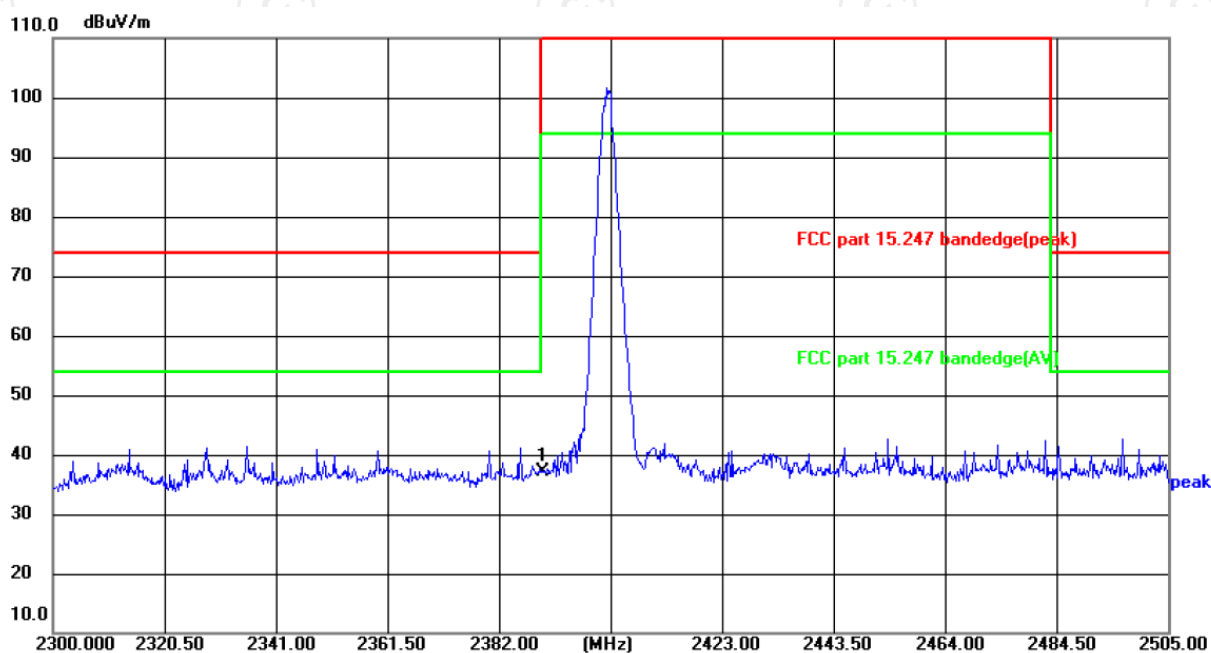
2. Speed for 1M and 2M modulations of EUT have been tested, but the test data only show the worst case in this report, and we found the worst case is 1M speed modulation. Measurements were conducted in all three channels (high, middle, low), and the worst case Mode (Middle channel) was submitted only.
Antenna a and Antenna b have been tested, but the test data only show the worst case model (Antenna b) in this report.

3. Freq. = Emission frequency in MHz
 $\text{Measurement (dB}\mu\text{V/m)} = \text{Reading level (dB}\mu\text{V)} + \text{Corr. Factor (dB)}$
 $\text{Correction Factor} = \text{Antenna Factor} + \text{Cable loss} - \text{Pre-amplifier}$
 $\text{Limit (dB}\mu\text{V/m)} = \text{Limit stated in standard}$
 $\text{Margin (dB)} = \text{Measurement (dB}\mu\text{V/m)} - \text{Limits (dB}\mu\text{V/m)}$
 * is meaning the worst frequency has been tested in the test frequency range

Test Result of Radiated Spurious at Band edges

Lowest channel 2402:

Horizontal:



Site: 3m Anechoic Chamber

Polarization: **Horizontal**

Temperature: 23.1(°C)

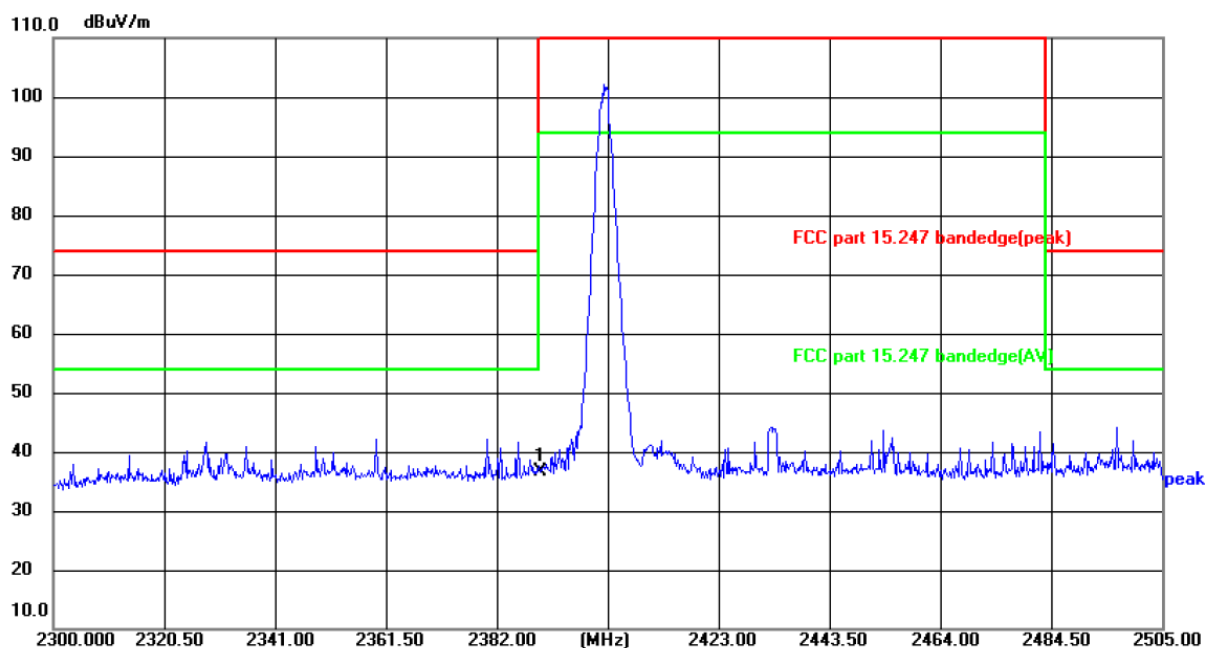
Humidity: 60 %

Limit: FCC part 15.247 bandedge(peak)

Power: DC 4.2 V

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F	Remark
1 *	2390.000	52.95	-15.86	37.09	74.00	-36.91	peak	P	

Vertical:



Site: 3m Anechoic Chamber

Polarization: **Vertical**

Temperature: 23.1(°C)

Humidity: 60 %

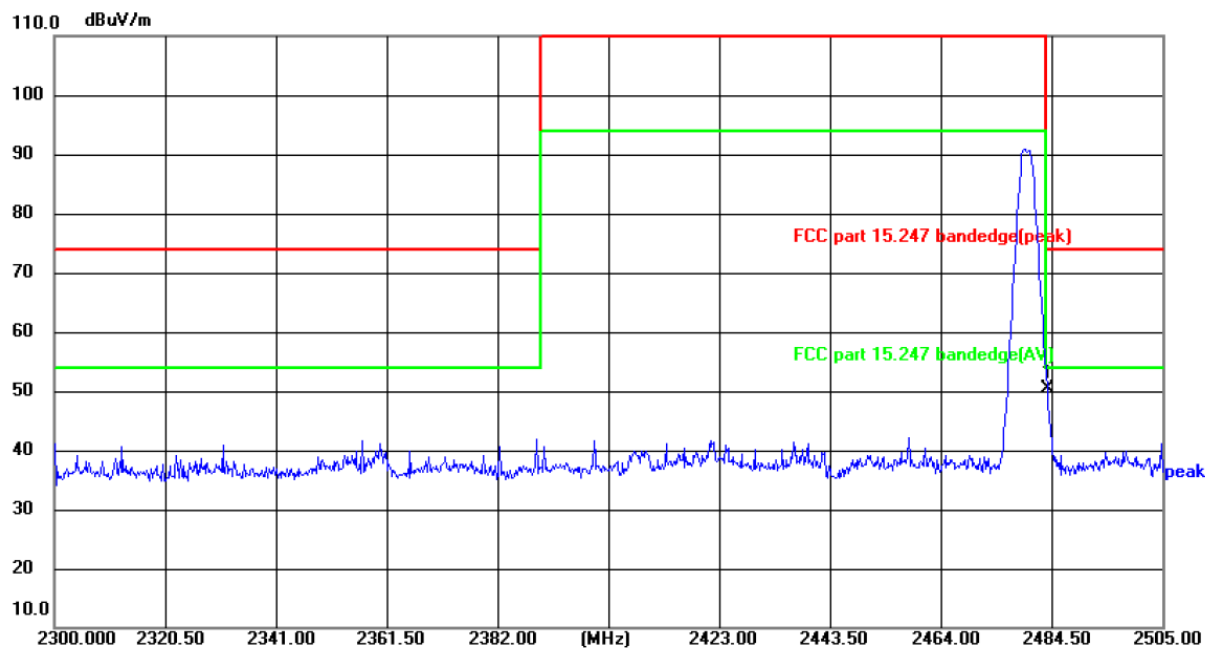
Limit: FCC part 15.247 bandedge(peak)

Power: DC 4.2 V

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F	Remark
1 *	2390.000	52.45	-15.86	36.59	74.00	-37.41	peak	P	

Highest channel 2480:

Horizontal:



Site: 3m Anechoic Chamber

Polarization: **Horizontal**

Temperature: 23.1(°C)

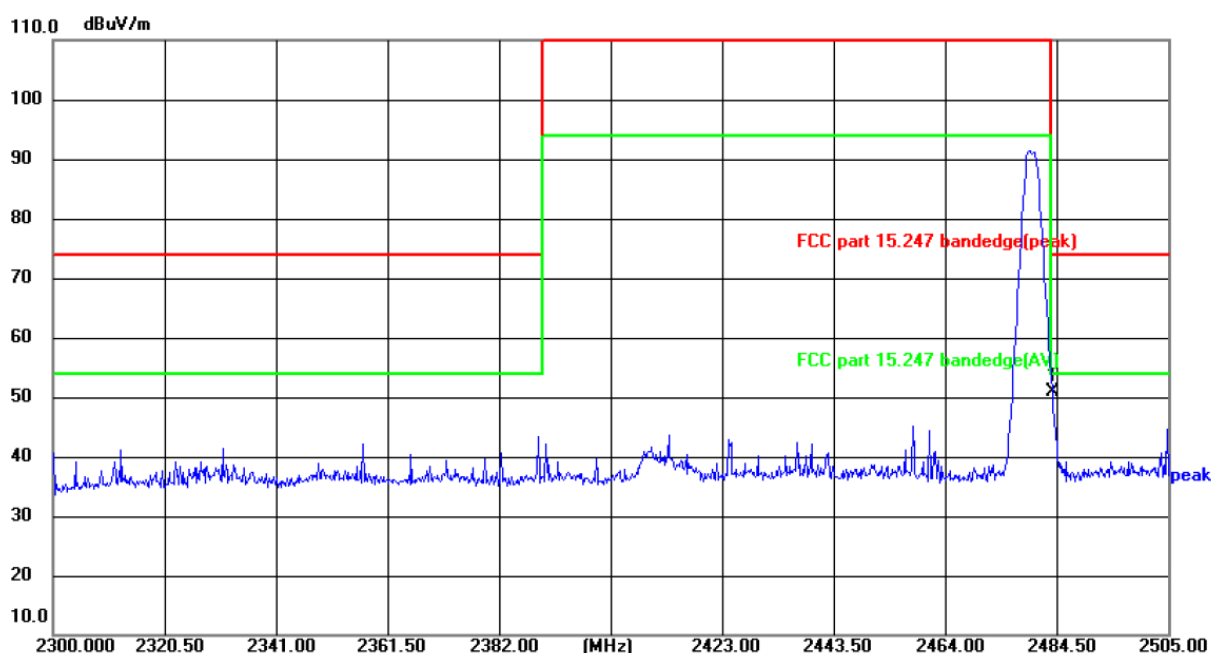
Humidity: 60 %

Limit: FCC part 15.247 bandedge(peak)

Power: DC 4.2 V

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F	Remark
1 *	2483.500	66.30	-15.87	50.43	74.00	-23.57	peak	P	

Vertical:



Site: 3m Anechoic Chamber

Polarization: **Vertical**

Temperature: 23.1(°C)

Humidity: 60 %

Limit: FCC part 15.247 bandedge(peak)

Power: DC 4.2 V

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F	Remark
1 *	2483.500	66.80	-15.87	50.93	74.00	-23.07	peak	P	

Note: 1. Speed for 1M and 2M modulations of EUT have been tested, but the test data only show the worst case in this report, and we found the worst case is 1M speed modulation.

2. Antenna a and Antenna b have been tested, but the test data only show the worst case model (Antenna b) in this report.

Above 1GHz

Low channel: 2402 MHz

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)			
4804	H	45.48	---	0.66	46.14	---	74	54	-7.86
7206	H	35.27	---	9.50	44.77	---	74	54	-9.23
---	H	---	---	---	---	---	---	---	---
4804	V	44.61	---	0.66	45.27	---	74	54	-8.73
7206	V	35.33	---	9.50	44.83	---	74	54	-9.17
---	V	---	---	---	---	---	---	---	---

Middle channel: 2440 MHz

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	44.24	---	0.99	45.23	---	74	54	-8.77
7320	H	34.55	---	9.87	44.42	---	74	54	-9.58
---	H	---	---	---	---	---	---	---	---
4880	V	44.96	---	0.99	45.95	---	74	54	-8.05
7320	V	35.01	---	9.87	44.88	---	74	54	-9.12
---	V	---	---	---	---	---	---	---	---

High channel: 2480 MHz

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	45.09	---	1.33	46.42	---	74	54	-7.58
7440	H	35.52	---	10.22	45.74	---	74	54	-8.26
---	H	---	---	---	---	---	---	---	---
4960	V	43.93	---	1.33	45.26	---	74	54	-8.74
7440	V	34.65	---	10.22	44.87	---	74	54	-9.13
---	V	---	---	---	---	---	---	---	---

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. Speed for 1M and 2M modulations of EUT have been tested, but the test data only show the worst case in this report, and we found the worst case is 1M speed modulation.
7. Antenna a and Antenna b have been tested, but the test data only show the worst case model (Antenna b) in this report.
8. All the restriction bands are compliance with the limit of 15.209.

Appendix B: Photographs of Test Setup

Refer to the test report No. TCT240523E013

Appendix C: Photographs of EUT

Refer to the test report No. TCT240523E013

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