

RF MEASUREMENT REPORT

FCC ID: 2A5WLTSB71

Applicant: Suzhou Unison Auto Electronic Co., Ltd.

Product: TPMS Sensor

Model No.: TSB71

Family Model: TSB71-10901, TSB71-10901B, TSB71-10901T,
TSB71-10901S, 10901, 10901S, 10901B, 10901T,
PDQ-222BLE

Brand Name: Unison Sensor

FCC Classification: Digital Transmission System (DTS)

FCC Rule Part(s): Part 15 Subpart C (Section 15.247)

Result: Complies

Received Date: 2023-10-24

Test Date: 2023-11-17 ~ 2023-11-22

Reviewed By:

Sunny Sun

Approved By:

Robin Wu



The test results relate only to the samples tested.

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.10-2013. Test results reported herein relate only to the item(s) tested.

The test report shall not be reproduced except in full without the written approval of MRT Technology (Suzhou) Co., Ltd.

Revision History

Report No.	Version	Description	Issue Date	Note
2310RSU036-U1	V01	Initial Report	2023-12-05	Valid

CONTENTS

Description	Page
1. General Information	5
1.1. Applicant	5
1.2. Manufacturer	5
1.3. Testing Facility	5
1.4. Product Information.....	6
1.5. Radio Specification under Test	6
1.6. Working Frequencies	6
1.7. Antenna Details.....	6
2. Test Configuration.....	7
2.1. Test Mode.....	7
2.2. Test System Connection Diagram	7
2.3. Test Software	7
2.4. Applied Standards.....	8
2.5. Test Environment Condition	8
3. Antenna Requirements	9
4. Measuring Instrument.....	10
5. Decision Rules and Measurement Uncertainty	11
5.1. Decision Rules	11
5.2. Measurement Uncertainty	11
6. Test Result.....	12
6.1. Summary	12
6.2. 6dB Bandwidth Measurement.....	13
6.2.1. Test Limit	13
6.2.2. Test Procedure	13
6.2.3. Test Setting	13
6.2.4. Test Setup	13
6.2.5. Test Result	13
6.3. Output Power Measurement	14
6.3.1. Test Limit	14
6.3.2. Test Procedure	14
6.3.3. Test Setting	14
6.3.4. Test Setup	14
6.3.5. Test Result	14
6.4. Power Spectral Density Measurement	15
6.4.1. Test Limit	15

6.4.2.	Test Procedure	15
6.4.3.	Test Setting	15
6.4.4.	Test Setup	15
6.4.5.	Test Result	15
6.5.	Conducted Band Edge and Out-of-Band Emissions Measurement	16
6.5.1.	Test Limit	16
6.5.2.	Test Procedure	16
6.5.3.	Test Setting	16
6.5.4.	Test Setup	16
6.5.5.	Test Result	17
6.6.	Radiated Spurious Emission Measurement.....	18
6.6.1.	Test Limit	18
6.6.2.	Test Procedure	18
6.6.3.	Test Setting	18
6.6.4.	Test Setup	20
6.6.5.	Test Result	21
6.7.	Radiated Restricted Band Edge Measurement	22
6.7.1.	Test Limit	22
6.7.2.	Test Procedure	23
6.7.3.	Test Setting	23
6.7.4.	Test Setup	24
6.7.5.	Test Result	24
6.8.	AC Conducted Emissions Measurement.....	25
6.8.1.	Test Limit	25
6.8.2.	Test Setup	25
6.8.3.	Test Result	25
Appendix A - Test Result.....		26
A.1	Duty Cycle Test Result.....	26
A.2	6dB Bandwidth Test Result	27
A.3	Output Power Test Result	28
A.4	Power Spectral Density Test Result.....	29
A.5	Conducted Band Edge and Out-of-Band Emissions Test Result.....	30
A.6	Radiated Spurious Emission Test Result.....	32
A.7	Radiated Restricted Band Edge Test Result.....	35
Appendix B - Test Setup Photograph		43
Appendix C - EUT Photograph		44

1. General Information

1.1. Applicant

Suzhou Unison Auto Electronic Co., Ltd.

No.35 building, Yangtai Rd., Suzhou Industrial Park, Suzhou, Jiangsu, P.R.China

1.2. Manufacturer

Suzhou Unison Auto Electronic Co., Ltd.

No.35 building, Yangtai Rd., Suzhou Industrial Park, Suzhou, Jiangsu, P.R.China

1.3. Testing Facility

☒	Test Site – MRT Suzhou Laboratory Laboratory Location (Suzhou - Wuzhong) D8 Building, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China Laboratory Location (Suzhou - SIP) 4b Building, Liando U Valley, No.200 Xingpu Rd., Shengpu Town, Suzhou Industrial Park, China Laboratory Accreditations A2LA: 3628.01 CNAS: L10551 FCC: CN1166 ISED: CN0001 VCCI: ☐ R-20025 ☐ G-20034 ☐ C-20020 ☐ T-20020 ☐ R-20141 ☐ G-20134 ☐ C-20103 ☐ T-20104
☐	Test Site – MRT Shenzhen Laboratory Laboratory Location (Shenzhen) 1G, Building A, Junxiangda Building, Zhongshanyuan Road West, Nanshan District, Shenzhen, China Laboratory Accreditations A2LA: 3628.02 CNAS: L10551 FCC: CN1284 ISED: CN0105
☐	Test Site – MRT Taiwan Laboratory Laboratory Location (Taiwan) No. 38, Fuxing 2nd Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.) Laboratory Accreditations TAF: 3261 FCC: 291082, TW3261 ISED: TW3261

1.4. Product Information

Product Name	TPMS Sensor
Model No.	TSB71
Family Model	TSB71-10901, TSB71-10901B, TSB71-10901T, TSB71-10901S, 10901, 10901S, 10901B, 10901T, PDQ-222BLE
Brand Name	Unison Sensor
EUT Identification No.	20231024Sample#05 (Conducted) 20231026Sample#01 (Radiated)
Software Version	TSB71_V1.01B00
Wireless Specification	2402 ~ 2480MHz
Operating Temperature	-40 ~ 105°C
Operating Voltage	3.0Vdc (By internal lithium battery)
Antenna Information	Refer to Section 1.7
Notes: 1. The only difference between TSB71 and family models are different model names and different colors of housing shell and valve for different customers, others are the same. Model TSB 71 was selected for test by the manufacturer. 2. The information of EUT was provided by the manufacturer, and the accuracy of the information shall be the responsibility of the manufacturer.	

1.5. Radio Specification under Test

Bluetooth Frequency	2402 ~ 2480MHz
Channel Number	3
Type of modulation	GFSK
Data Rate	2Mbps

1.6. Working Frequencies

Frequency	Frequency	Frequency
2402 MHz	2426 MHz	2480 MHz

1.7. Antenna Details

Antenna Type	Frequency Band (MHz)	Antenna Gain (dBi)
Monopole Antenna	2402 ~ 2480	4.30

Note: The antenna gain is from antenna datasheet provided by the manufacturer.

2. Test Configuration

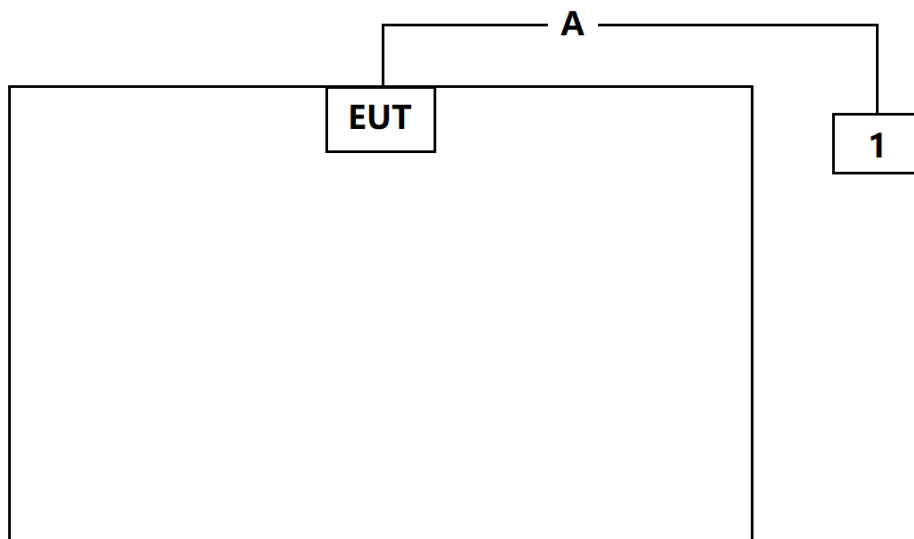
2.1. Test Mode

Mode 1: Transmit by 2.4GHz Wireless

2.2. Test System Connection Diagram

The device was tested per the guidance ANSI C63.10: 2013 was used to reference the appropriate EUT setup for radiated emissions testing and AC line conducted testing.

Connection Diagram



Cable Type		Cable Description	Length
A	USB Cable	Shielding	> 10m
Product		Manufacturer	Model No.
1	Notebook	DELL	Vostro 3400

2.3. Test Software

The test utility software used during testing was “NcpCommander”, and the version was 0.61.0.0.

2.4. Applied Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- FCC Part 15.247
- KDB 558074 D01v05r02
- ANSI C63.10-2013

2.5. Test Environment Condition

Ambient Temperature	15 ~ 35°C
Relative Humidity	20 ~75%RH

3. Antenna Requirements

Excerpt from §15.203 of the FCC Rules/Regulations:

“An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.”

- The antenna of the device is **permanently attached**.
- There are no provisions for connection to an external antenna.

Conclusion:

The unit complies with the requirement of §15.203.

4. Measuring Instrument

Instrument	Manufacturer	Model No.	Asset No.	Cali. Interval	Cali. Due Date	Test Site
EMI Test Receiver	R&S	ESR7	MRTSUE06001	1 year	2023-12-28	WZ-AC1
Signal Analyzer	Keysight	N9010B	MRTSUE06607	1 year	2024-10-23	WZ-AC1
Loop Antenna	Schwarzbeck	FMZB 1519	MRTSUE06025	1 year	2024-09-17	WZ-AC1
TRILOG Antenna	Schwarzbeck	VULB 9168	MRTSUE06172	1 year	2024-06-09	WZ-AC1
Horn Antenna	Schwarzbeck	BBHA 9120D	MRTSUE06023	1 year	2024-08-09	WZ-AC1
Horn Antenna	Schwarzbeck	BBHA 9170	MRTSUE06024	1 year	2024-10-11	WZ-AC1
Preamplifier	Agilent	83017A	MRTSUE06076	1 year	2024-05-07	WZ-AC1
Preamplifier	EMCI	EMC184045SE	MRTSUE06640	1 year	2024-01-12	WZ-AC1
Thermohygrometer	testo	608-H1	MRTSUE06403	1 year	2024-05-31	WZ-AC1
Thermohygrometer	testo	608-H1	MRTSUE11039	1 year	2024-10-25	WZ-AC1
Anechoic Chamber	TDK	WZ-AC1	MRTSUE06212	1 year	2024-04-20	WZ-AC1
USB Power Sensor	Keysight	U2021XA	MRTSUE06446	1 year	2024-05-23	WZ- SR4
Signal Analyzer	Keysight	N9010B	MRTSUE06457	1 year	2024-05-23	WZ-SR4
Attenuator	MVE	MVE2213	MRTSUE11095	1 year	2024-06-08	WZ-SR4
Thermohygrometer	testo	608-H1	MRTSUE11256	1 year	2024-10-19	WZ-SR4
Shielding Room	HUAMING	WZ-SR4	MRTSUE06441	N/A	N/A	WZ-SR4

Software	Version	Function
EMI Software	V3.0.0	EMI Test Software
Controller_MF 7802	2.03C	RE Antenna & Turntable
BenchVue Power Meter	2018.1	Power

5. Decision Rules and Measurement Uncertainty

5.1. Decision Rules

The Decision Rule is based on Simple Acceptance in accordance with ISO Guide 98-4: 2012 Clause 8.2.
(Measurement uncertainty is not taken into account when stating conformity with a specified requirement.)

5.2. Measurement Uncertainty

Where relevant, the following test uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k = 2$.

Radiated Emission Measurement	
The maximum measurement uncertainty is evaluated as:	
Coaxial:	9kHz~30MHz: 2.61dB
Coplanar:	9kHz~30MHz: 2.62dB
Horizontal:	30MHz~200MHz: 3.79dB
	200MHz~1GHz: 3.91dB
	1GHz~40GHz: 4.99dB
Vertical:	30MHz~200MHz: 4.06dB
	200MHz~1GHz: 5.21dB
	1GHz~40GHz: 4.90dB
Spurious Emissions, Conducted	
Measuring Uncertainty for a Level of Confidence of 95% ($U=2U_c(y)$):	
2.2dB	
Output Power	
Measuring Uncertainty for a Level of Confidence of 95% ($U=2U_c(y)$):	
1.4dB	
Power Spectrum Density	
Measuring Uncertainty for a Level of Confidence of 95% ($U=2U_c(y)$):	
2.2dB	
Occupied Bandwidth	
Measuring Uncertainty for a Level of Confidence of 95% ($U=2U_c(y)$):	
2.7%	

6. Test Result

6.1. Summary

FCC Section(s)	Test Description	Test Condition	Verdict
15.247(a)(2)	6dB Bandwidth	Conducted	Pass
15.247(b)(3)	Output Power		Pass
15.247(e)	Power Spectral Density		Pass
15.247(d)	Band Edge / Out-of-Band Emissions		Pass
15.205 15.209	General Field Strength (Restricted Bands and Radiated Emission)	Radiated	Pass
15.207	AC Conducted Emissions 150kHz - 30MHz	Line Conducted	N/A

Notes:

1. The analyzer plots shown in this section were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables and attenuators used as part of the system to connect the EUT to the analyzer at all frequencies of interest.
2. For radiated emission test, every axis (X, Y, Z) was also verified. The test results shown in the following sections represent the worst-case emissions.
3. "N/A" means that the test item is not applicable, and the detailed information refers to relevant section.

6.2. 6dB Bandwidth Measurement

6.2.1. Test Limit

The minimum 6dB bandwidth shall be at least 500 kHz.

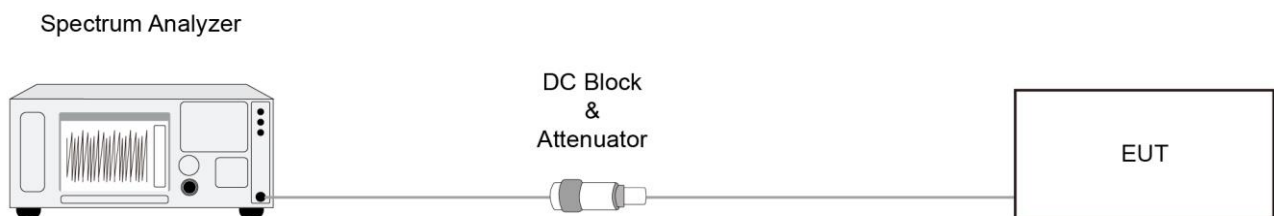
6.2.2. Test Procedure

ANSI C63.10 - 2013 - Section 11.8

6.2.3. Test Setting

1. The Spectrum's automatic bandwidth measurement capability was used to perform the 6dB bandwidth measurement. The "X" dB bandwidth parameter was set to $X = 6$. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
2. Set RBW = 100 kHz
3. $VBW \geq 3 \times RBW$
4. Detector = Peak
5. Trace mode = Max hold
6. Sweep = Auto couple
7. Allow the trace to stabilize

6.2.4. Test Setup



6.2.5. Test Result

Refer to Appendix A.2.

6.3. Output Power Measurement

6.3.1. Test Limit

The maximum output power shall be less 1 Watt (30dBm).

The conducted output power limit specified in paragraph FCC Part 15.247(b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs FCC Part 15.247(b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

6.3.2. Test Procedure

ANSI C63.10 - 2013 - Section 11.9.1.3

ANSI C63.10 - 2013 - Section 11.9.2.3.2

6.3.3. Test Setting

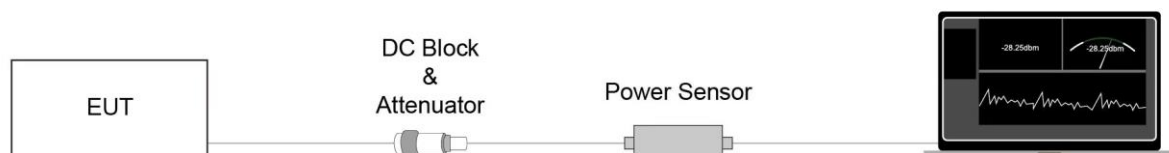
Method PKPM1 (Peak Power Measurement of Signals with DTS BW $\leq$ 50MHz)

Peak power measurements were performed only when the EUT was transmitting at its maximum power control level using a broadband power meter with a pulse sensor. The pulse sensor employs a VBW = 50MHz so this method was only used for signals whose DTS bandwidth was less than or equal to 50MHz.

Average Power Measurement

Average power measurements were performed only when the EUT was transmitting at its maximum power control level using a broadband power meter with a pulse sensor. The power meter implemented triggering and gating capabilities which were set up such that power measurements were recorded only during the ON time of the transmitter.

6.3.4. Test Setup



6.3.5. Test Result

Refer to Appendix A.3.

6.4. Power Spectral Density Measurement

6.4.1. Test Limit

The maximum permissible power spectral density is 8dBm in any 3 kHz band.

The same method of determining the conducted output power shall be used to determine the power spectral density.

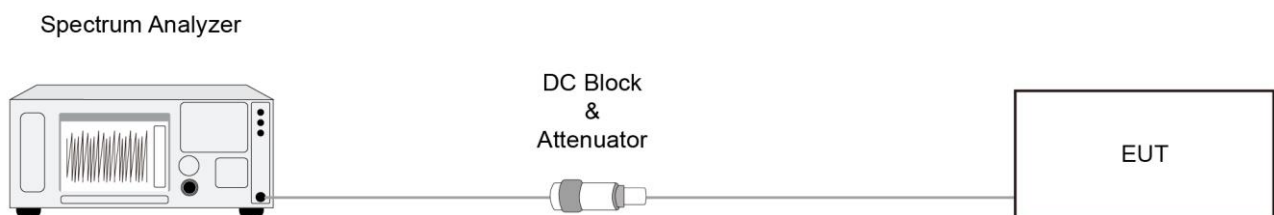
6.4.2. Test Procedure

ANSI C63.10-2013 Section 11.10.2

6.4.3. Test Setting

1. Analyzer was set to the center frequency of the DTS channel under investigation
2. Span = 1.5 times the DTS channel bandwidth
3. RBW = 3kHz
4. VBW = 10kHz
5. Detector = peak
6. Sweep time = auto couple
7. Trace mode = max hold
8. Trace was allowed to stabilize

6.4.4. Test Setup



6.4.5. Test Result

Refer to Appendix A.4.

6.5. Conducted Band Edge and Out-of-Band Emissions Measurement

6.5.1. Test Limit

The limit for out-of-band spurious emissions at the band edge is 20dB below the fundamental emission level, as determined from the in-band power measurement of the DTS channel performed in a 100 kHz bandwidth per the PSD procedure.

6.5.2. Test Procedure

ANSI C63.10-2013 - Section 11.11

6.5.3. Test Setting

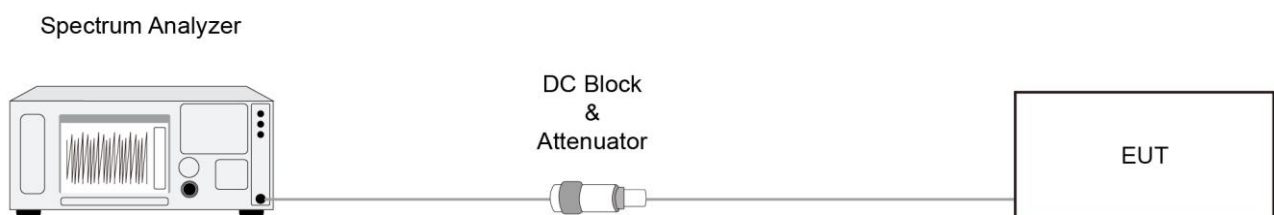
Reference level measurement

1. Set instrument center frequency to DTS channel center frequency
2. Set the span to ≥ 1.5 times the DTS bandwidth
3. Set the RBW = 100 kHz
4. Set the VBW $\geq 3 \times$ RBW
5. Detector = peak
6. Sweep time = auto couple
7. Trace mode = max hold
8. Allow trace to fully stabilize

Emission level measurement

1. Set the center frequency and span to encompass frequency range to be measured
2. RBW = 100kHz
3. VBW = 300kHz
4. Detector = Peak
5. Trace mode = max hold
6. Sweep time = auto couple
7. The trace was allowed to stabilize

6.5.4. Test Setup



6.5.5. Test Result

Refer to Appendix A.5.

6.6. Radiated Spurious Emission Measurement

6.6.1. Test Limit

All out of band emissions appearing in a restricted band as specified in Section 15.205 of the Title 47 CFR must not exceed the limits shown in Table per Section 15.209.

FCC Part 15 Subpart C Paragraph 15.209		
Frequency [MHz]	Field Strength [$\mu\text{V/m}$]	Measured 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

6.6.2. Test Procedure

ANSI C63.10 - 2013 - Section 11.11 & 11.12

ANSI C63.10 - 2013 - Section 6.3 (General Requirements)

ANSI C63.10 - 2013 - Section 6.4 (Standard test method below 30MHz)

ANSI C63.10 - 2013 - Section 6.5 (Standard test method above 30MHz to 1GHz)

ANSI C63.10 - 2013 - Section 6.6 (Standard test method above 1GHz)

6.6.3. Test Setting

Table 1 - RBW as a function of frequency

Frequency	RBW
9 ~ 150 kHz	200 ~ 300 Hz
0.15 ~ 30 MHz	9 ~ 10 kHz
30 ~ 1000 MHz	100 ~ 120 kHz
> 1000MHz	1MHz

Quasi-Peak Measurements below 1GHz

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. Span was set greater than 1MHz
3. RBW = as specified in Table 1
4. Detector = CISPR quasi-peak
5. Sweep time = auto couple
6. Trace was allowed to stabilize

Peak Measurements above 1GHz

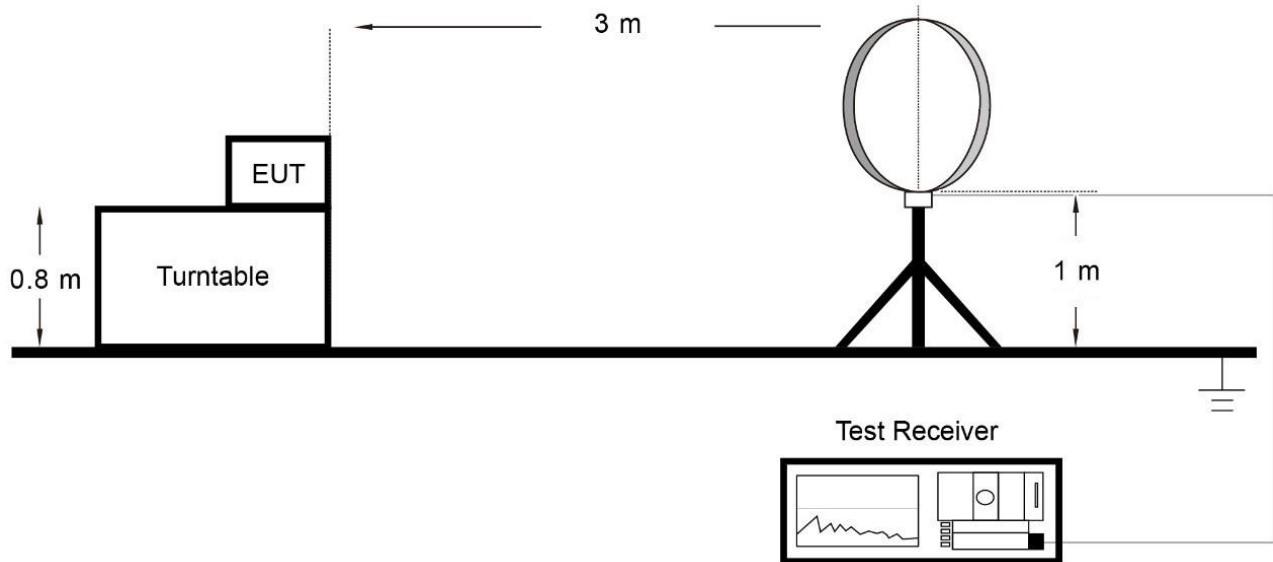
1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW = 3MHz
4. Detector = peak
5. Sweep time = auto couple
6. Trace mode = max hold
7. Trace was allowed to stabilize

Average Measurements above 1GHz (Method VB)

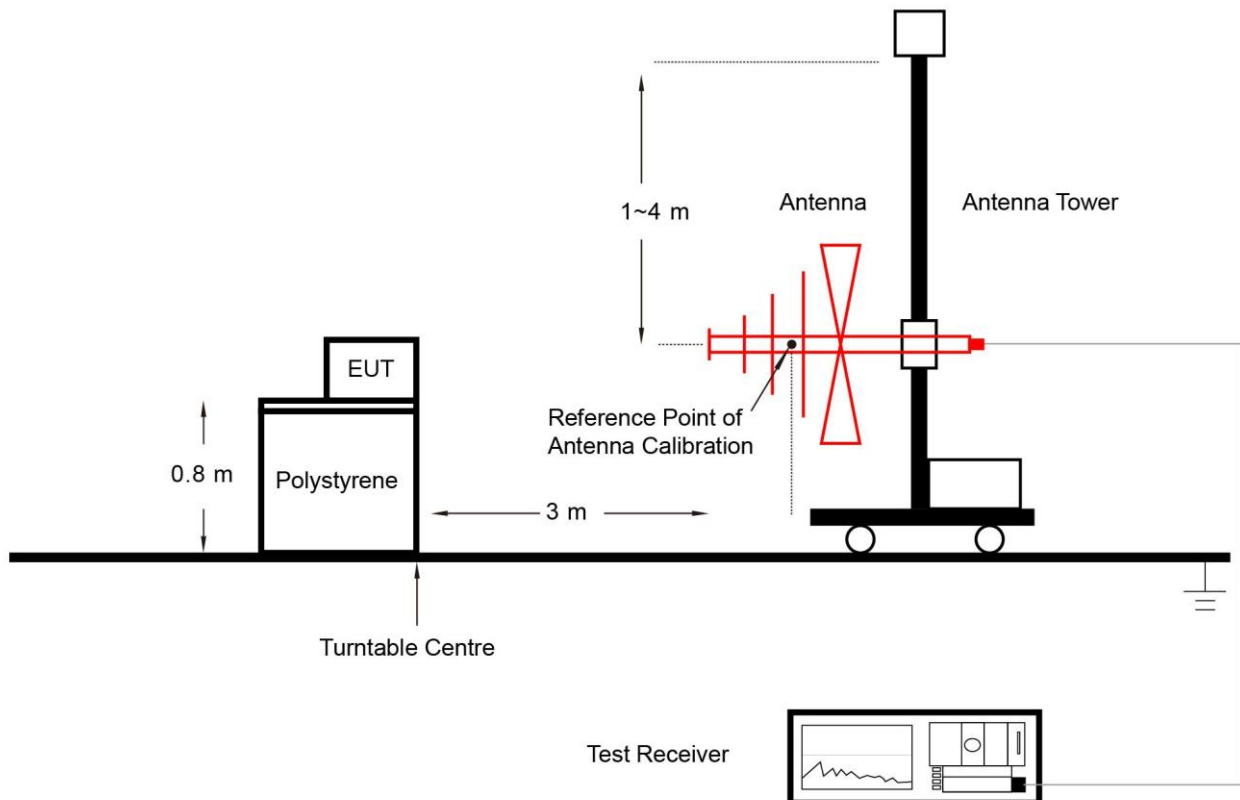
1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW; If the EUT is configured to transmit with duty cycle $\geq 98\%$, set VBW = 10 Hz.
If the EUT duty cycle is $< 98\%$, set VBW $\geq 1/T$. T is the minimum transmission duration.
4. Detector = Peak
5. Sweep time = auto
6. Trace mode = max hold
7. Trace was allowed to stabilize

6.6.4. Test Setup

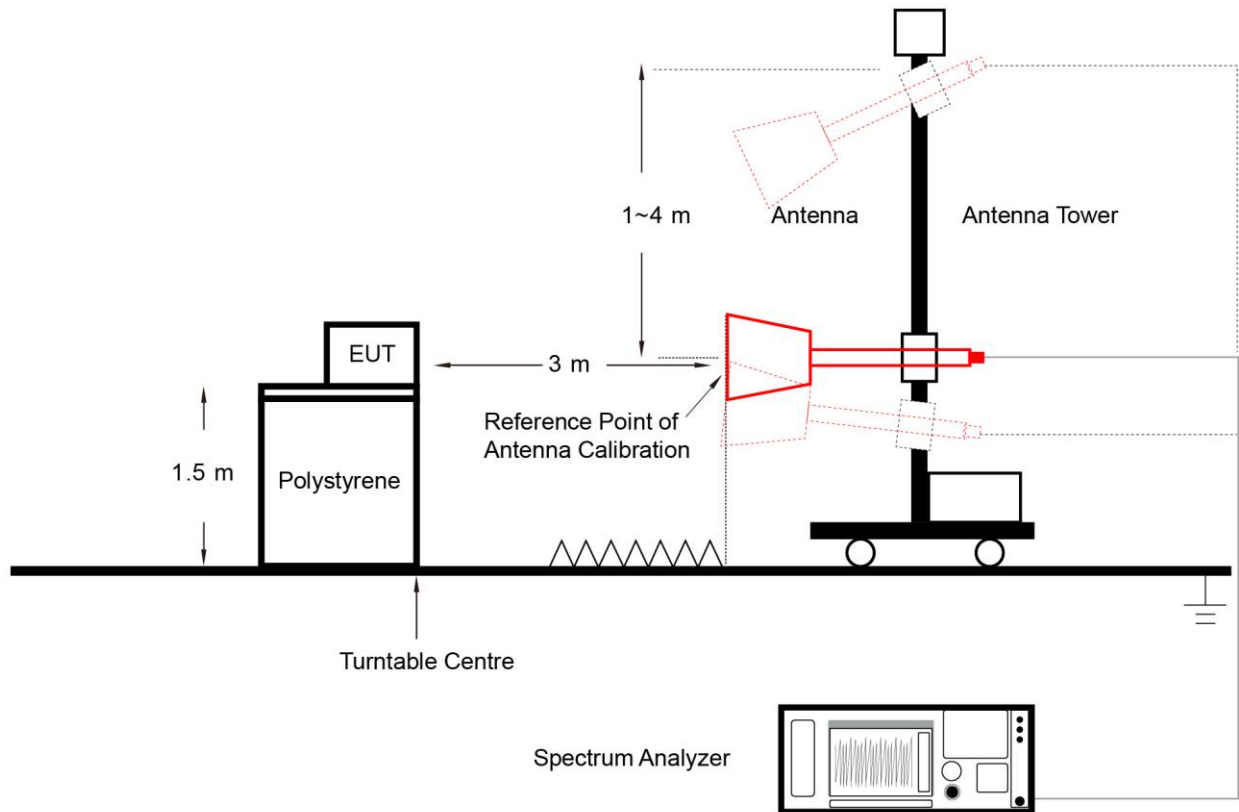
Below 30MHz Test Setup:



Below 1GHz Test Setup:



Above 1GHz Test Setup:



6.6.5. Test Result

Refer to Appendix A.6.

6.7. Radiated Restricted Band Edge Measurement

6.7.1. Test Limit

For 15.205 requirement:

Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a) of FCC part 15, must also comply with the radiated emission limits specified in Section 15.209(a).

Frequency (MHz)	Frequency (MHz)	Frequency (MHz)	Frequency (GHz)
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
¹ 0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2690 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	(²)
13.36 - 13.41	--	--	--

All out of band emissions appearing in a restricted band as specified in Section 15.205 of the Title 47CFR must not exceed the limits shown in Table per Section 15.209.

FCC Part 15 Subpart C Paragraph 15.209		
Frequency [MHz]	Field Strength [$\mu\text{V/m}$]	Measured 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

6.7.2. Test Procedure

ANSI C63.10-2013 Section 6.3 & 6.6 & 11.13

6.7.3. Test Setting

Peak Field Strength Measurements

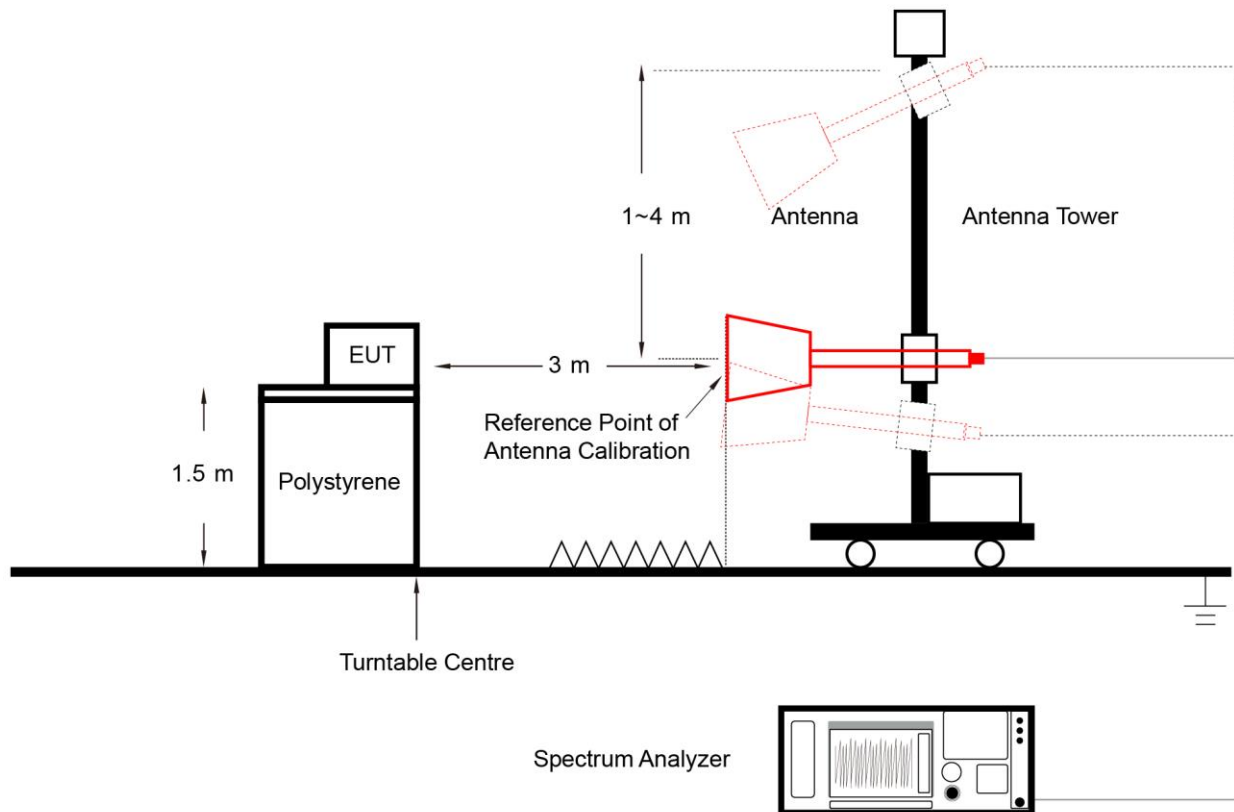
1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW = 3MHz
4. Detector = peak
5. Sweep time = auto couple
6. Trace mode = max hold
7. Trace was allowed to stabilize

Average Field Strength Measurements

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW $\geq 1/T$
4. As an alternative, the instrument may be set to linear detector mode. Ensure that video filtering is applied in linear voltage domain (rather than in a log or dB domain). Some instruments require linear display mode in order to accomplish this. Others have a setting for Average-VBW Type, which can be set to "Voltage" regardless of the display mode
5. Detector = Peak

6. Sweep time = auto
7. Trace mode = max hold
8. Allow max hold to run for at least 50 times (1/duty cycle) traces

6.7.4. Test Setup



6.7.5. Test Result

Refer to Appendix A.7.

6.8. AC Conducted Emissions Measurement

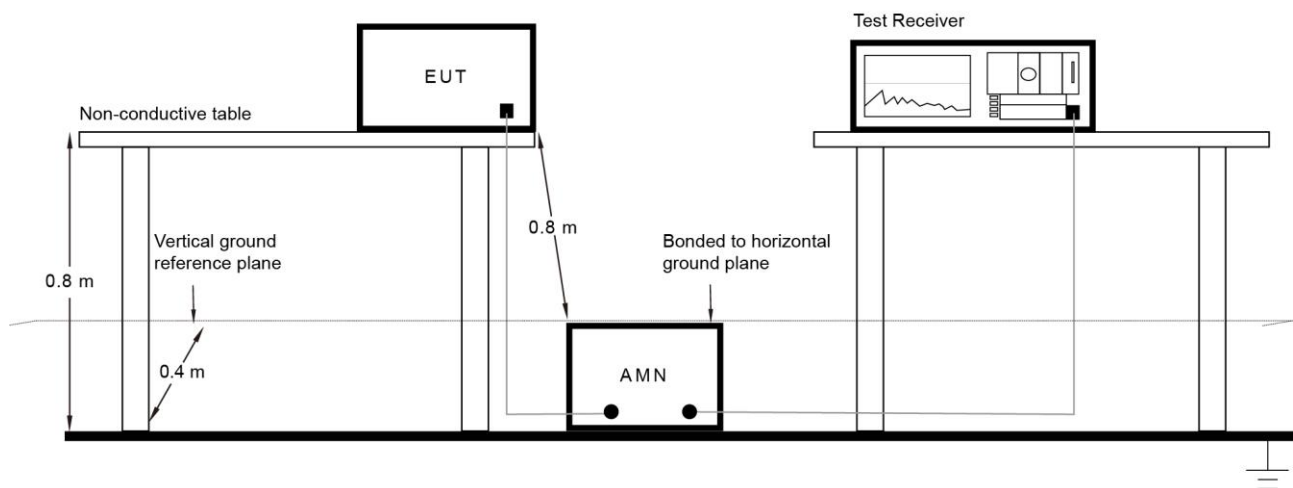
6.8.1. Test Limit

FCC Part 15 Subpart C Paragraph 15.207 Limits		
Frequency (MHz)	QP (dB μ V)	AV (dB μ V)
0.15 - 0.50	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30	60	50

Note 1: The lower limit shall apply at the transition frequencies.

Note 2: The limit decreases linearly with the logarithm of the frequency in the range 0.15MHz to 0.5MHz.

6.8.2. Test Setup



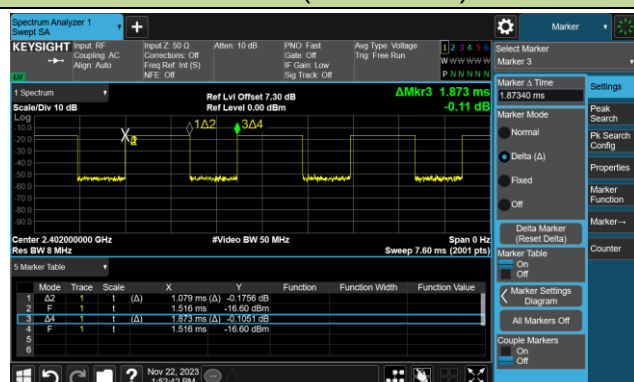
6.8.3. Test Result

The EUT is powered by battery, so this item is not applicable.

Appendix A - Test Result

A.1 Duty Cycle Test Result

Test Site	WZ-SR4	Test Engineer	Jeff Yang
Test Date	2023-11-22		

Test Mode	Duty Cycle
Mode 1	57.61%
Duty Cycle (T = Transmission Duration)	
2402MHz (T = 1.079ms)	
	

Note: Duty Cycle = 1.079 ms / 1.873 ms * 100% = 57.61%.

A.2 6dB Bandwidth Test Result

Test Site	WZ-SR4	Test Engineer	Jeff Yang
Test Date	2023-11-22		

Test Mode	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (MHz)
Mode 1	2402	1.180	≥ 0.5
	2426	1.173	≥ 0.5
	2480	1.179	≥ 0.5



A.3 Output Power Test Result

Test Site	WZ-SR4	Test Engineer	Jeff Yang
Test Date	2023-11-22		

Test Result of Peak Output Power

Test Mode	Frequency (MHz)	Peak Power (dBm)	Limit (dBm)	Result
Mode 1	2402	-13.75	≤ 30.00	Pass
	2426	-13.62	≤ 30.00	Pass
	2480	-13.22	≤ 30.00	Pass

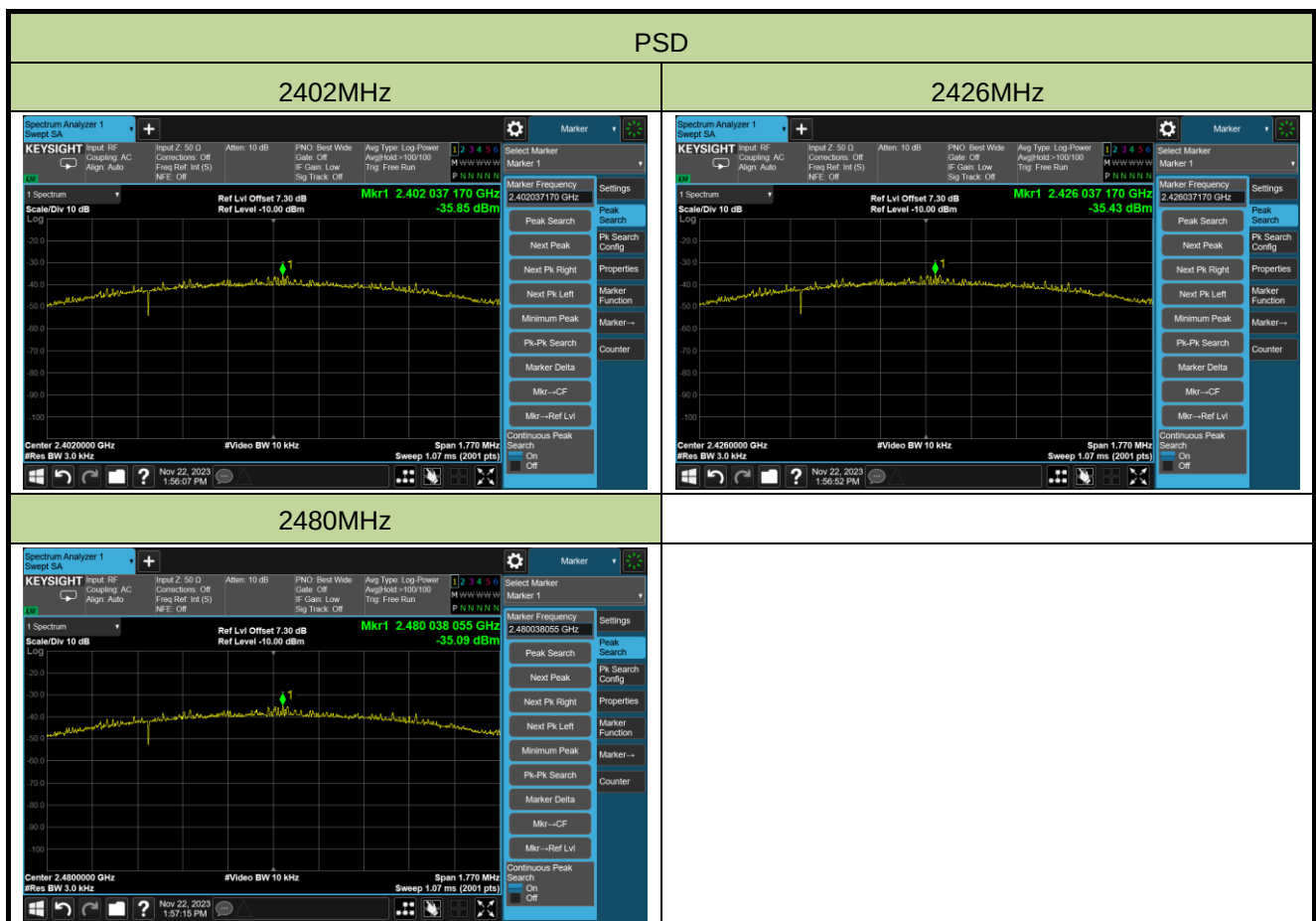
Test Result of Average Output Power (Reporting Only)

Test Mode	Frequency (MHz)	Average Power (dBm)	Limit (dBm)	Result
Mode 1	2402	-16.63	≤ 30.00	Pass
	2426	-16.23	≤ 30.00	Pass
	2480	-15.78	≤ 30.00	Pass

A.4 Power Spectral Density Test Result

Test Site	WZ-SR4	Test Engineer	Jeff Yang
Test Date	2023-11-22		

Test Mode	Frequency (MHz)	PSD Result (dBm/3kHz)	Limit (dBm/3kHz)	Result
Mode 1	2402	-35.85	≤ 8.00	Pass
	2426	-35.43	≤ 8.00	Pass
	2480	-35.09	≤ 8.00	Pass



A.5 Conducted Band Edge and Out-of-Band Emissions Test Result

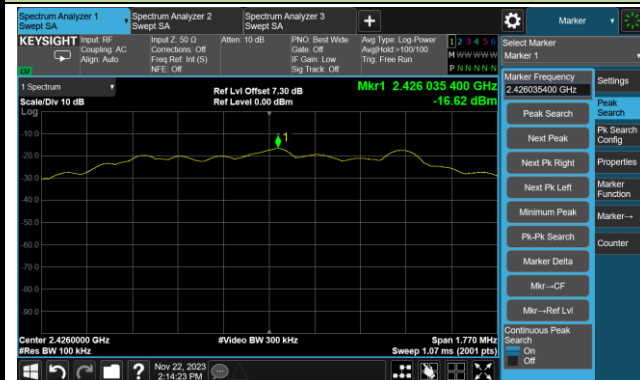
Test Site	WZ-SR4	Test Engineer	Jeff Yang
Test Date	2023-11-22		

Test Mode	Frequency (MHz)	Limit (dBc)	Result
Mode 1	2402	20	Pass
	2426	20	Pass
	2480	20	Pass



2426MHz

100kHz PSD Reference Level

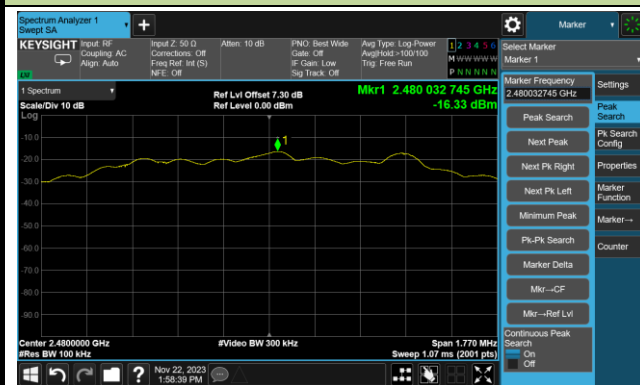


Spurious Emission 30MHz ~ 25GHz

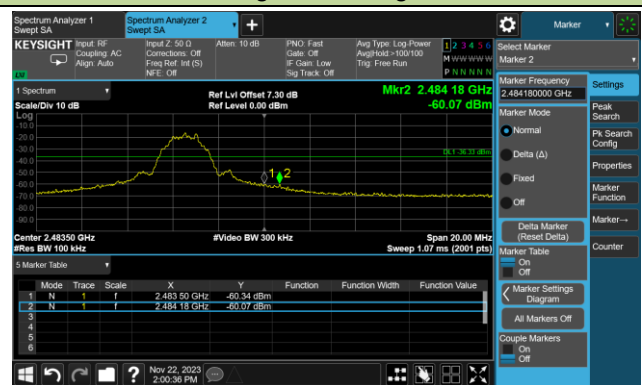


2480MHz

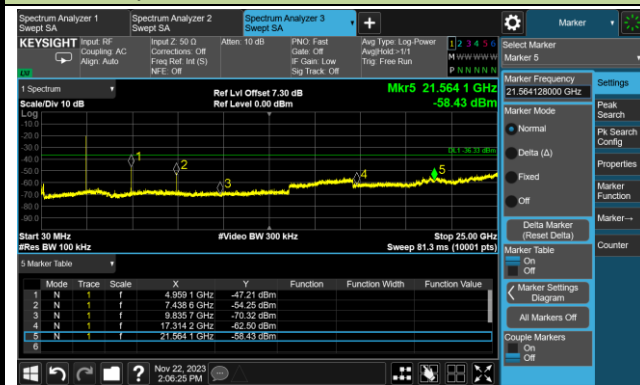
100kHz PSD Reference Level



High Band Edge



Spurious Emission 30MHz ~ 25GHz



A.6 Radiated Spurious Emission Test Result

Test Site	WZ-AC1	Test Engineer	Carl Jiang
Test Date	2023-11-17 ~ 2023-11-19	Test Mode	Mode 1
Remark	1. Average measurement was not performed if peak level lower than average limit. 2. Other frequency was 20dB below limit line within 1-18GHz, there is not show in the report.		

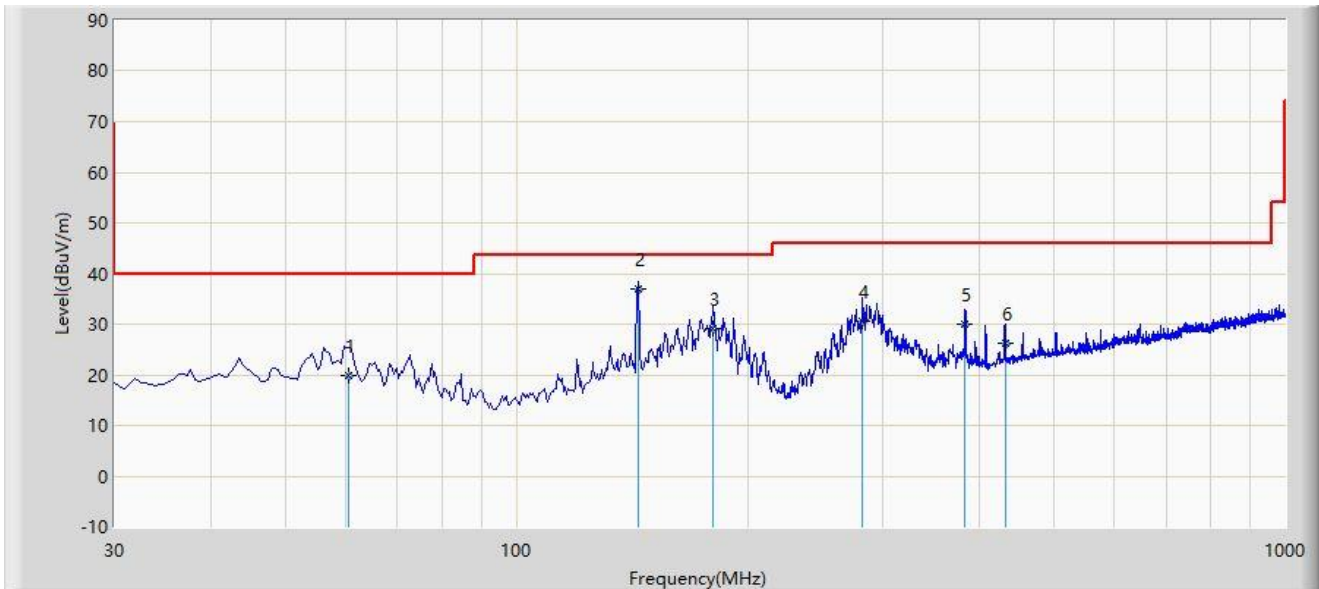
Test Freq. (MHz)	Frequency (MHz)	Reading Level (dBμV)	Factor (dB/m)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
2402	4808.0	49.0	3.0	52.0	74.0	-22.0	Peak	Horizontal
	4808.0	44.8	3.0	47.8	54.0	-6.2	Average	Horizontal
	10945.0	36.4	14.1	50.5	74.0	-23.5	Peak	Horizontal
	12007.5	36.6	12.4	49.0	74.0	-25.0	Peak	Horizontal
	4808.0	54.6	3.0	57.6	74.0	-16.4	Peak	Vertical
	4808.0	49.2	3.0	52.2	54.0	-1.8	Average	Vertical
	10826.0	34.9	14.0	48.9	74.0	-25.1	Peak	Vertical
	12228.5	36.5	12.5	49.0	74.0	-25.0	Peak	Vertical
2426	4850.5	48.0	3.0	51.0	74.0	-23.0	Peak	Horizontal
	4850.5	41.7	3.0	44.7	54.0	-9.3	Average	Horizontal
	7273.0	45.5	8.4	53.9	74.0	-20.1	Peak	Horizontal
	7273.0	40.3	8.4	48.7	54.0	-5.3	Average	Horizontal
	10919.5	36.2	14.0	50.2	74.0	-23.8	Peak	Horizontal
	4850.5	52.5	3.0	55.5	74.0	-18.5	Peak	Vertical
	4850.5	47.0	3.0	50.0	54.0	-4.0	Average	Vertical
	7273.0	45.4	8.4	53.8	74.0	-20.2	Peak	Vertical
	7273.0	39.3	8.4	47.7	54.0	-6.3	Average	Vertical
	11081.0	35.9	14.0	49.9	74.0	-24.1	Peak	Vertical
2480	4961.0	46.7	3.4	50.1	74.0	-23.9	Peak	Horizontal
	7443.0	43.8	8.6	52.4	74.0	-21.6	Peak	Horizontal
	7443.0	38.9	8.6	47.5	54.0	-6.5	Average	Horizontal
	11038.5	35.6	14.1	49.7	74.0	-24.3	Peak	Horizontal
	4961.0	48.8	3.4	52.2	74.0	-21.8	Peak	Vertical
	4961.0	42.9	3.4	46.3	54.0	-7.7	Average	Vertical
	7434.5	45.0	8.5	53.5	74.0	-20.5	Peak	Vertical
	7434.5	40.0	8.5	48.5	54.0	-5.5	Average	Vertical
	10996.0	35.3	14.4	49.7	74.0	-24.3	Peak	Vertical

Note: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB/m)

Factor (dB/m) = Cable Loss (dB) + Antenna Factor (dB/m) - Pre_Amplifier Gain (dB)

The Result of Radiated Emission 30MHz ~ 1GHz:

Site: WZ-AC1	Test Date: 2023-11-20
Limit: FCC_Part15.209_RSE(3m)	Engineer: Carl Jiang
Probe: VULB 9168_25-2000MHz	Polarity: Horizontal
EUT: TPMS Sensor	Power: By Battery
Test Mode: Transmit at 2480MHz	



No	Mark	Frequency (MHz)	Measure Level (dBμV/m)	Reading Level (dBμV)	Margin (dB)	Limit (dBμV/m)	Factor (dB/m)	Type
1		60.500	19.803	1.900	-20.197	40.000	17.903	QP
2	*	143.900	37.052	19.100	-6.448	43.500	17.953	QP
3		180.300	29.056	12.200	-14.444	43.500	16.855	QP
4		282.200	30.471	12.300	-15.529	46.000	18.171	QP
5		383.600	29.876	9.300	-16.124	46.000	20.576	QP
6		432.000	26.261	4.300	-19.739	46.000	21.962	QP

Note 1: " * ", means this data is the worst emission level.

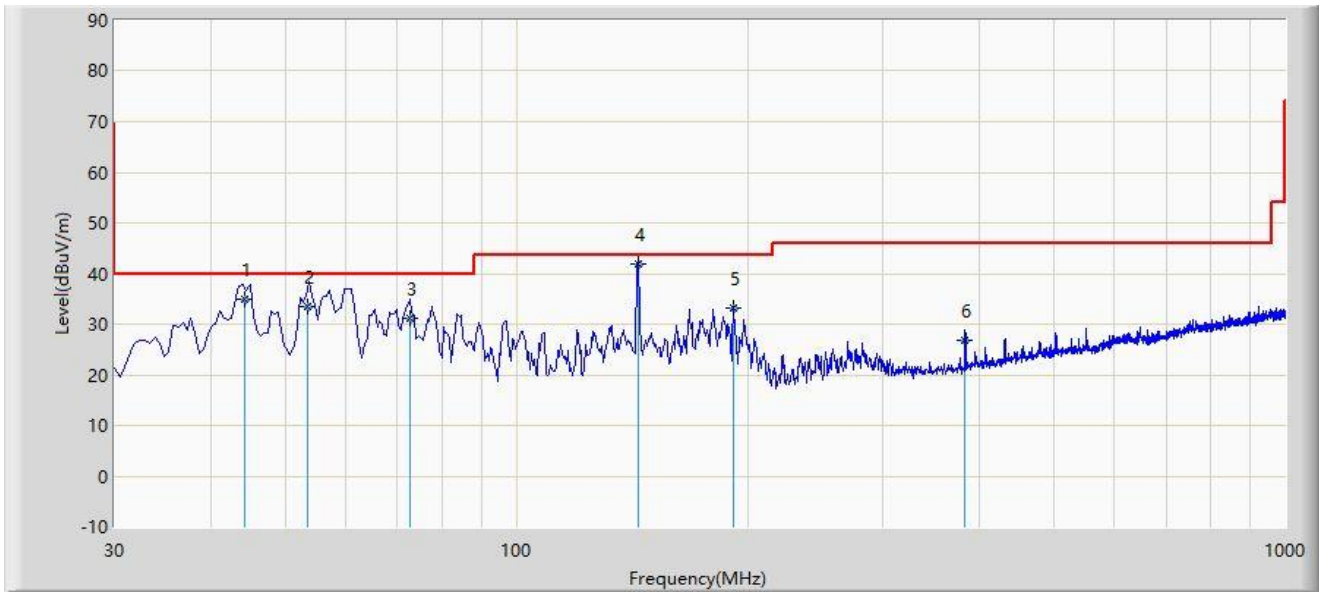
Note 2: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB/m).

Note 3: Factor (dB/m) = Cable Loss (dB) + Antenna Factor (dB/m).

Note 4: The amplitude of radiated emissions (frequency range from 9kHz to 30MHz and 18GHz to 25GHz) is that proximity to ambient noise, which also are attenuated more than 20 dB below the permissible value.

Therefore, the data is not presented in the report.

Site: WZ-AC1	Test Date: 2023-11-20
Limit: FCC_Part15.209_RSE(3m)	Engineer: Carl Jiang
Probe: VULB 9168_25-2000MHz	Polarity: Vertical
EUT: TPMS Sensor	Power: By Battery
Test Mode: Transmit at 2480MHz	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB/m)	Type
1		44.400	34.787	16.370	-5.213	40.000	18.417	QP
2		53.400	33.522	15.000	-6.478	40.000	18.522	QP
3		72.800	31.184	15.300	-8.816	40.000	15.884	QP
4	*	143.900	42.012	24.060	-1.488	43.500	17.953	QP
5		191.800	33.289	17.900	-10.211	43.500	15.389	QP
6		383.600	26.676	6.100	-19.324	46.000	20.576	QP

Note 1: " * ", means this data is the worst emission level.

Note 2: Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB/m).

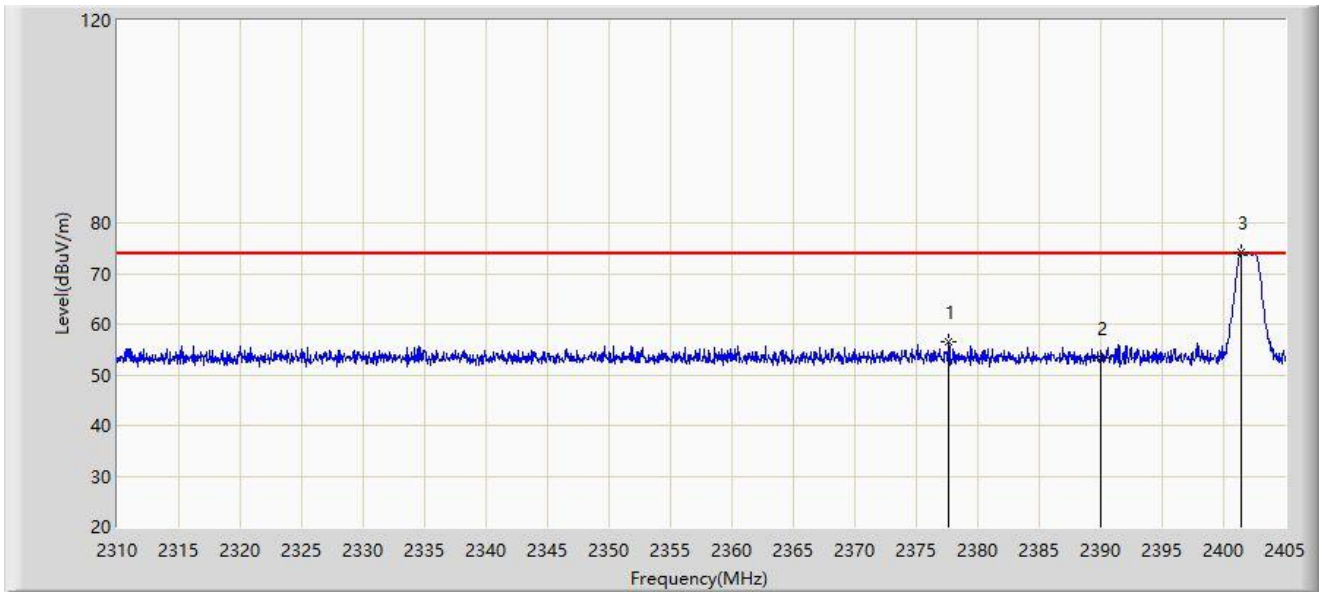
Note 3: Factor (dB/m) = Cable Loss (dB) + Antenna Factor (dB/m).

Note 4: The amplitude of radiated emissions (frequency range from 9kHz to 30MHz and 18GHz to 25GHz) is that proximity to ambient noise, which also are attenuated more than 20 dB below the permissible value.

Therefore, the data is not presented in the report.

A.7 Radiated Restricted Band Edge Test Result

Site: WZ-AC1	Test Date: 2023-11-19
Limit: FCC_2.4G_RE(3m)	Engineer: Carl Jiang
Probe: BBHA9120D_1167_1-18GHz	Polarity: Horizontal
EUT: TPMS Sensor	Power: By Battery
Test Mode: Transmit at 2402MHz	



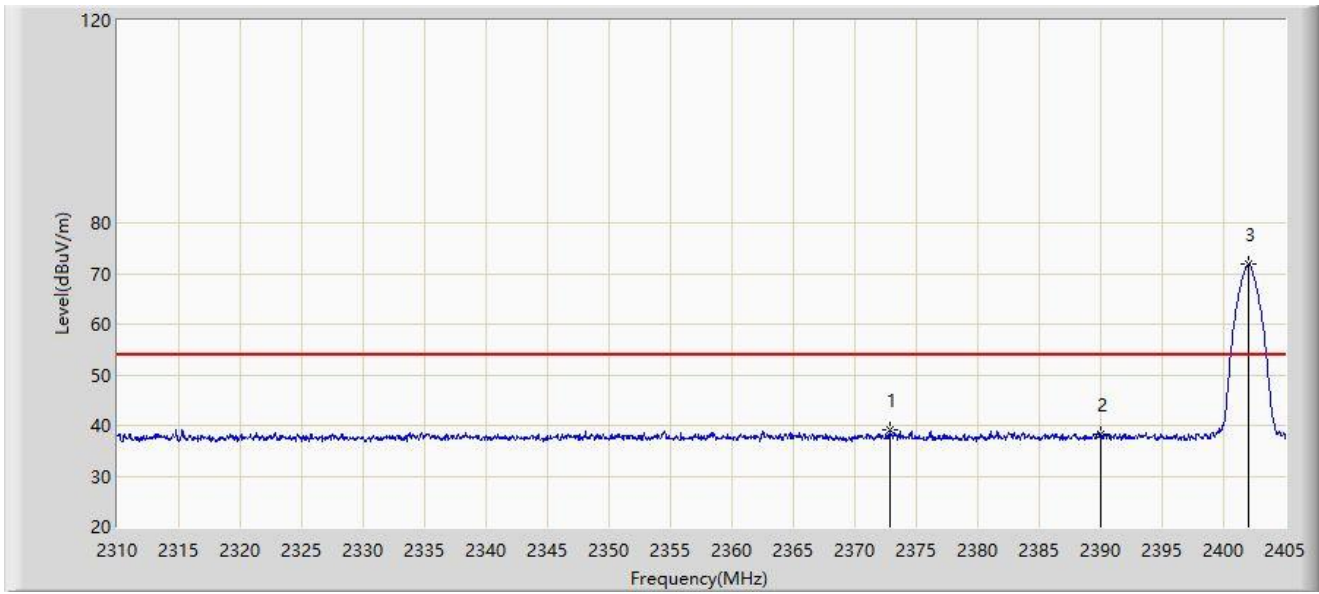
No	Mark	Frequency (MHz)	Measure Level (dBμV/m)	Reading Level (dBμV)	Margin (dB)	Limit (dBμV/m)	Factor (dB/m)	Type
1	*	2377.593	56.666	25.382	-17.334	74.000	31.284	PK
2		2390.000	53.457	22.203	-20.543	74.000	31.254	PK
3		2401.437	74.253	42.995	N/A	N/A	31.258	PK

Note 1: " * ", means this data is the worst emission level.

Note 2: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB/m).

Note 3: Factor (dB/m) = Cable Loss (dB) + Antenna Factor (dB/m).

Site: WZ-AC1	Test Date: 2023-11-19
Limit: FCC_2.4G_RE(3m)	Engineer: Carl Jiang
Probe: BBHA9120D_1167_1-18GHz	Polarity: Horizontal
EUT: TPMS Sensor	Power: By Battery
Test Mode: Transmit at 2402MHz	



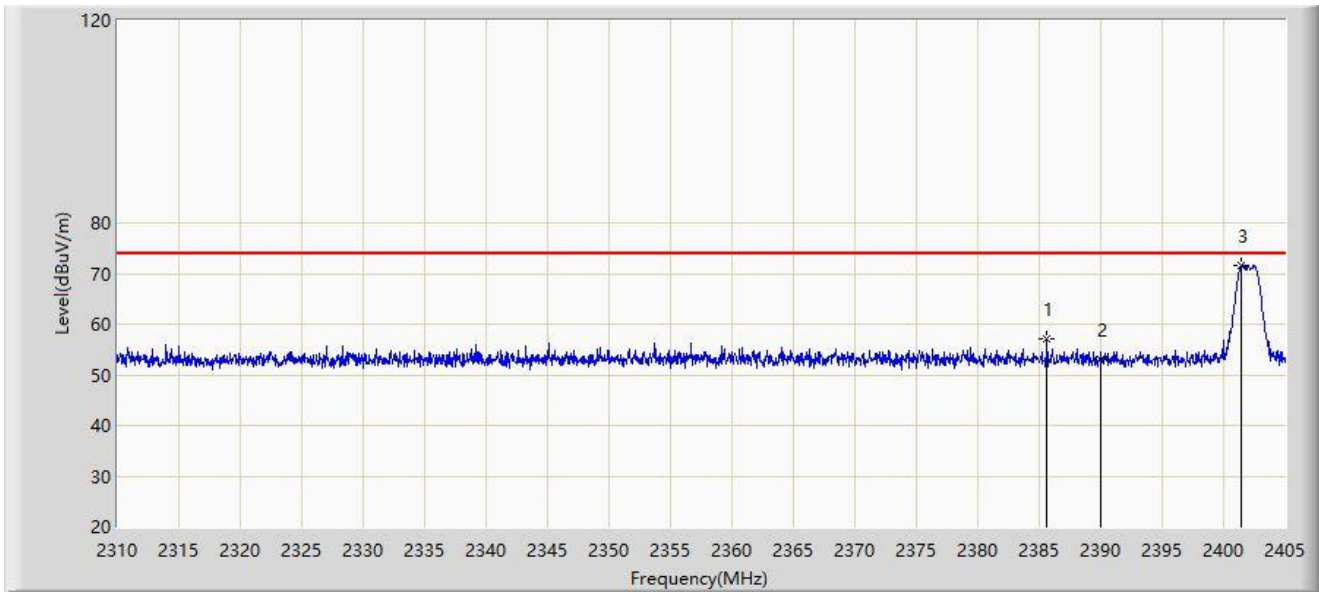
No	Mark	Frequency (MHz)	Measure Level (dBμV/m)	Reading Level (dBμV)	Margin (dB)	Limit (dBμV/m)	Factor (dB/m)	Type
1	*	2372.843	39.208	7.908	-14.792	54.000	31.301	AV
2		2390.000	38.189	6.935	-15.811	54.000	31.254	AV
3		2402.008	71.776	40.518	N/A	N/A	31.258	AV

Note 1: " * ", means this data is the worst emission level.

Note 2: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB/m).

Note 3: Factor (dB/m) = Cable Loss (dB) + Antenna Factor (dB/m).

Site: WZ-AC1	Test Date: 2023-11-19
Limit: FCC_2.4G_RE(3m)	Engineer: Carl Jiang
Probe: BBHA9120D_1167_1-18GHz	Polarity: Vertical
EUT: TPMS Sensor	Power: By Battery
Test Mode: Transmit at 2402MHz	



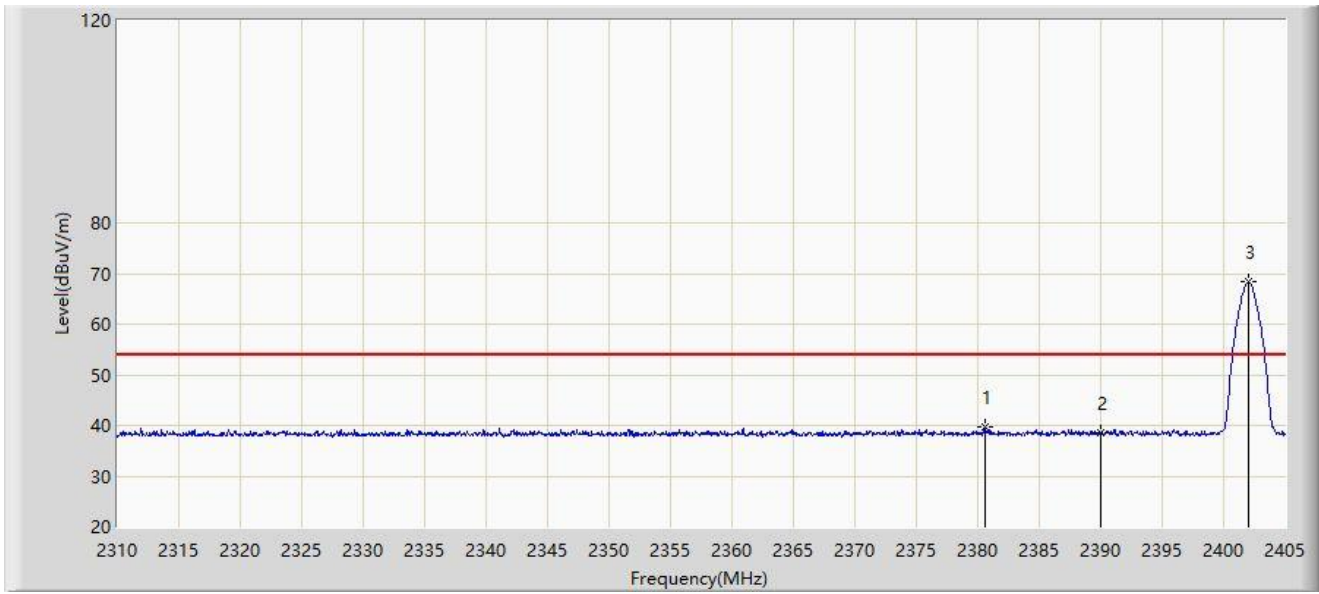
No	Mark	Frequency (MHz)	Measure Level (dBμV/m)	Reading Level (dBμV)	Margin (dB)	Limit (dBμV/m)	Factor (dB/m)	Type
1	*	2385.620	56.987	25.730	-17.013	74.000	31.258	PK
2		2390.000	53.037	21.783	-20.963	74.000	31.254	PK
3		2401.437	71.498	40.240	N/A	N/A	31.258	PK

Note 1: " * ", means this data is the worst emission level.

Note 2: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB/m).

Note 3: Factor (dB/m) = Cable Loss (dB) + Antenna Factor (dB/m).

Site: WZ-AC1	Test Date: 2023-11-19
Limit: FCC_2.4G_RE(3m)	Engineer: Carl Jiang
Probe: BBHA9120D_1167_1-18GHz	Polarity: Vertical
EUT: TPMS Sensor	Power: By Battery
Test Mode: Transmit at 2402MHz	



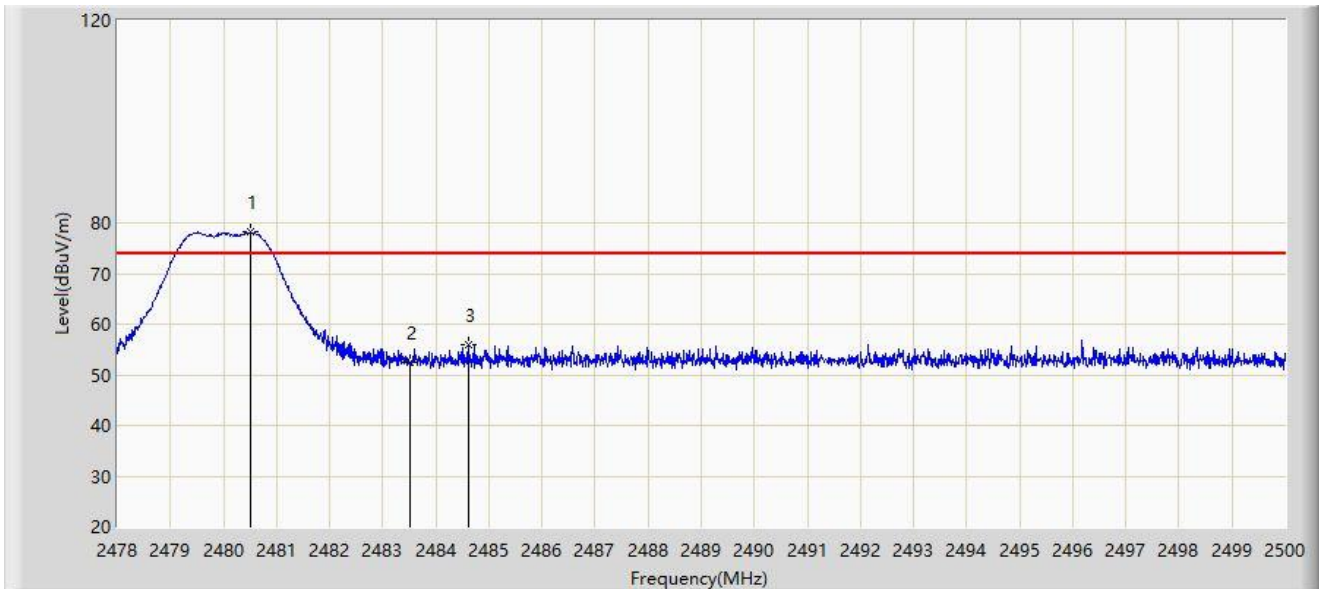
No	Mark	Frequency (MHz)	Measure Level (dBμV/m)	Reading Level (dBμV)	Margin (dB)	Limit (dBμV/m)	Factor (dB/m)	Type
1	*	2380.538	39.854	8.581	-14.146	54.000	31.273	AV
2		2390.000	38.575	7.321	-15.425	54.000	31.254	AV
3		2402.008	68.300	37.042	N/A	N/A	31.258	AV

Note 1: " * ", means this data is the worst emission level.

Note 2: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB/m).

Note 3: Factor (dB/m) = Cable Loss (dB) + Antenna Factor (dB/m).

Site: WZ-AC1	Test Date: 2023-11-19
Limit: FCC_2.4G_RE(3m)	Engineer: Carl Jiang
Probe: BBHA9120D_1167_1-18GHz	Polarity: Horizontal
EUT: TPMS Sensor	Power: By Battery
Test Mode: Transmit at 2480MHz	



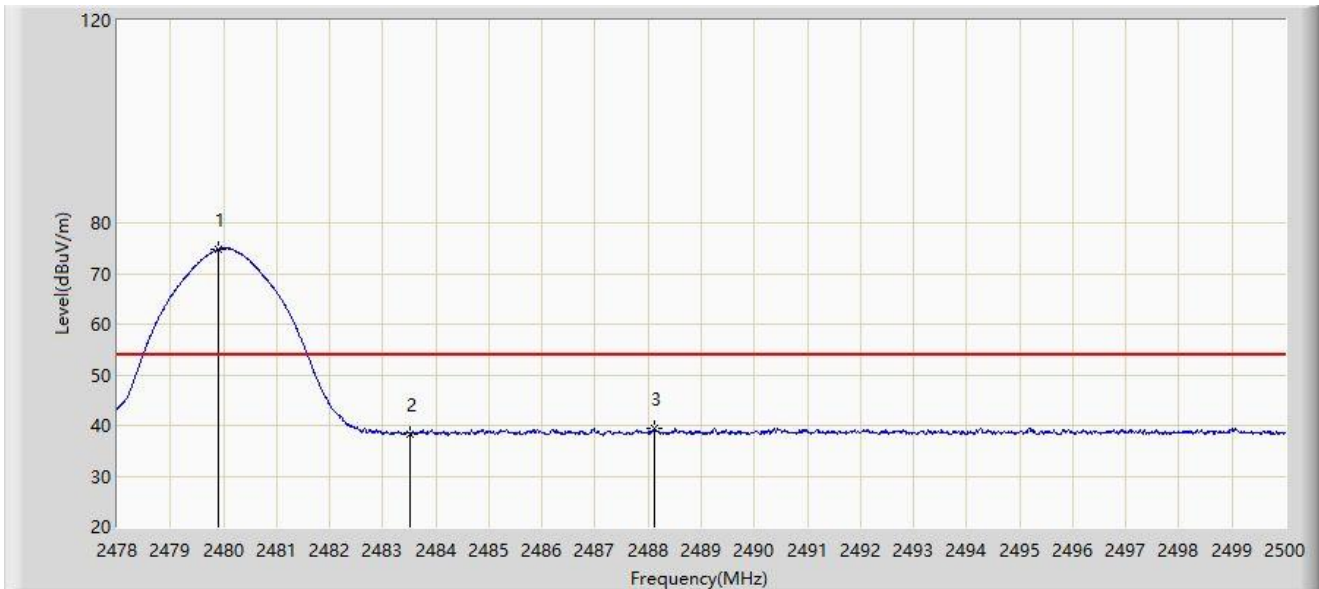
No	Mark	Frequency (MHz)	Measure Level (dBμV/m)	Reading Level (dBμV)	Margin (dB)	Limit (dBμV/m)	Factor (dB/m)	Type
1		2480.497	78.267	47.043	N/A	N/A	31.224	PK
2		2483.500	52.435	21.209	-21.565	74.000	31.226	PK
3	*	2484.611	55.908	24.681	-18.092	74.000	31.227	PK

Note 1: " * ", means this data is the worst emission level.

Note 2: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB/m).

Note 3: Factor (dB/m) = Cable Loss (dB) + Antenna Factor (dB/m).

Site: WZ-AC1	Test Date: 2023-11-19
Limit: FCC_2.4G_RE(3m)	Engineer: Carl Jiang
Probe: BBHA9120D_1167_1-18GHz	Polarity: Horizontal
EUT: TPMS Sensor	Power: By Battery
Test Mode: Transmit at 2480MHz	



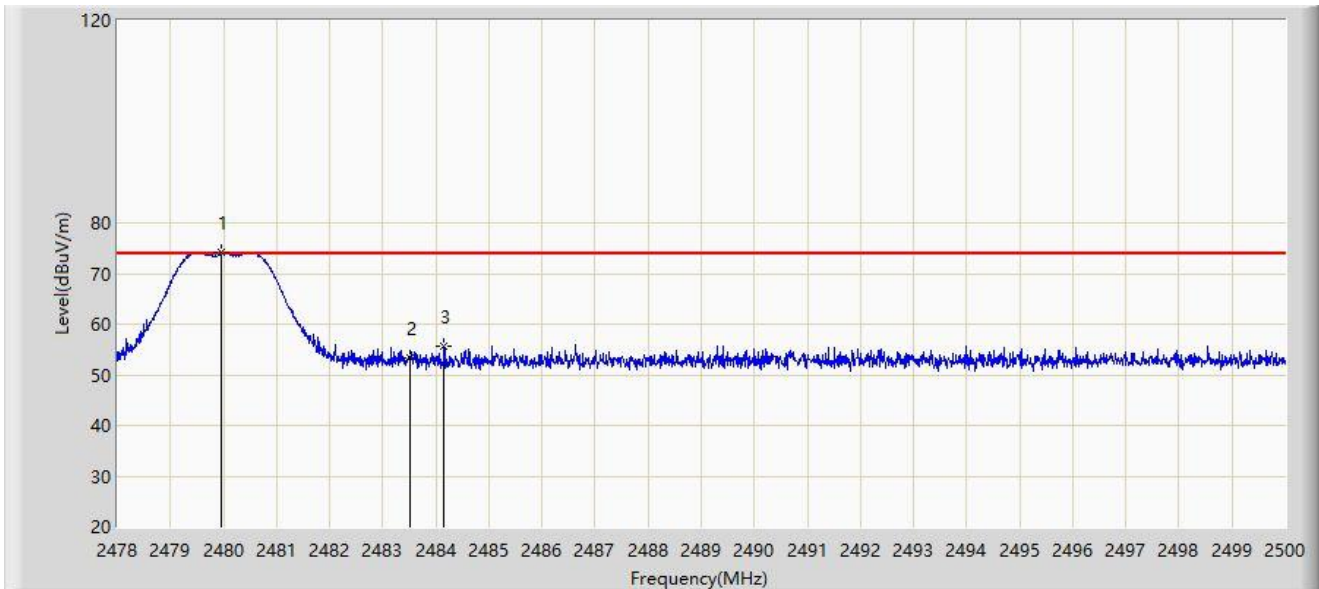
No	Mark	Frequency (MHz)	Measure Level (dBμV/m)	Reading Level (dBμV)	Margin (dB)	Limit (dBμV/m)	Factor (dB/m)	Type
1		2479.903	74.831	43.607	N/A	N/A	31.224	AV
2		2483.500	38.291	7.065	-15.709	54.000	31.226	AV
3	*	2488.109	39.527	8.297	-14.473	54.000	31.230	AV

Note 1: " * ", means this data is the worst emission level.

Note 2: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB/m).

Note 3: Factor (dB/m) = Cable Loss (dB) + Antenna Factor (dB/m).

Site: WZ-AC1	Test Date: 2023-11-19
Limit: FCC_2.4G_RE(3m)	Engineer: Carl Jiang
Probe: BBHA9120D_1167_1-18GHz	Polarity: Vertical
EUT: TPMS Sensor	Power: By Battery
Test Mode: Transmit at 2480MHz	



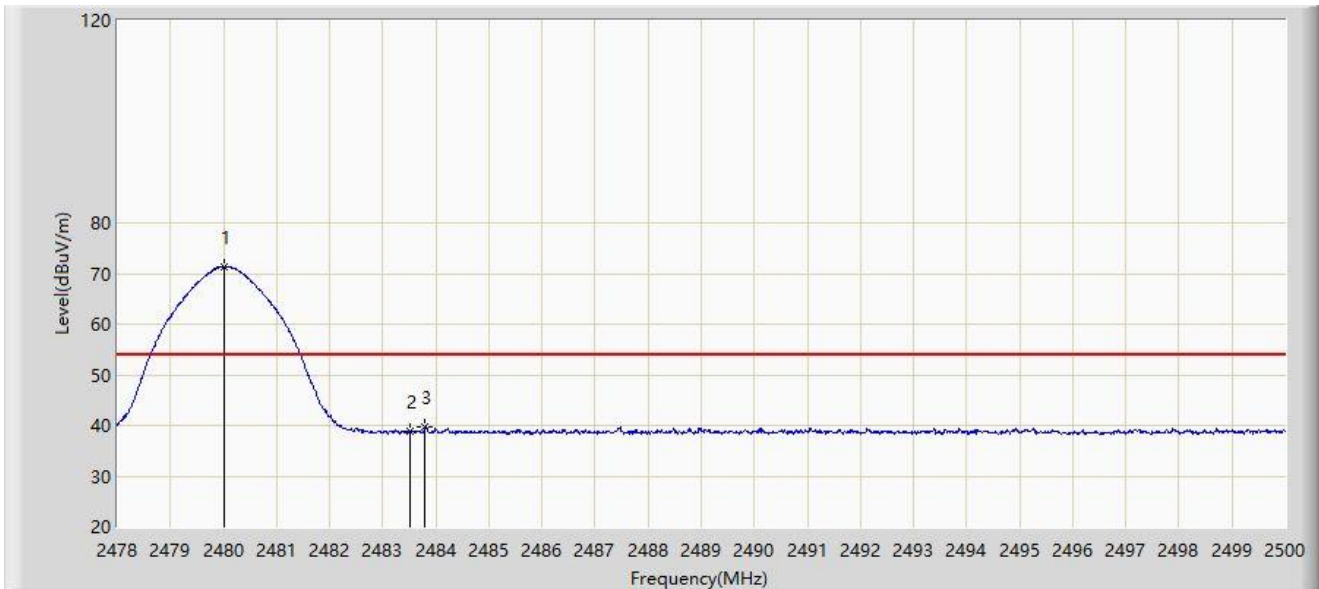
No	Mark	Frequency (MHz)	Measure Level (dBμV/m)	Reading Level (dBμV)	Margin (dB)	Limit (dBμV/m)	Factor (dB/m)	Type
1		2479.958	74.210	42.986	N/A	N/A	31.224	PK
2		2483.500	53.348	22.122	-20.652	74.000	31.226	PK
3	*	2484.160	55.572	24.345	-18.428	74.000	31.227	PK

Note 1: " * ", means this data is the worst emission level.

Note 2: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB/m).

Note 3: Factor (dB/m) = Cable Loss (dB) + Antenna Factor (dB/m).

Site: WZ-AC1	Test Date: 2023-11-19
Limit: FCC_2.4G_RE(3m)	Engineer: Carl Jiang
Probe: BBHA9120D_1167_1-18GHz	Polarity: Vertical
EUT: TPMS Sensor	Power: By Battery
Test Mode: Transmit at 2480MHz	



No	Mark	Frequency (MHz)	Measure Level (dBμV/m)	Reading Level (dBμV)	Margin (dB)	Limit (dBμV/m)	Factor (dB/m)	Type
1		2480.013	71.420	40.196	N/A	N/A	31.224	AV
2		2483.500	38.900	7.674	-15.100	54.000	31.226	AV
3	*	2483.797	39.680	8.454	-14.320	54.000	31.226	AV

Note 1: " * ", means this data is the worst emission level.

Note 2: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB/m).

Note 3: Factor (dB/m) = Cable Loss (dB) + Antenna Factor (dB/m).

Appendix B - Test Setup Photograph

Refer to “2310RSU036-UT” file.

Appendix C - EUT Photograph

Refer to “2310RSU036-UE” file.

The End
