



RF MEASUREMENT REPORT

FCC ID: 2A7MKSRR520
Applicant: Beijing Jingwei Hirain Technologies Co., Inc.
Product: Rear short-range ranging sensor
Model No.: SRR520
Brand Name: JINGWEI HIRAIN
FCC Classification: Part 95 Vehicular Radar Systems (VRD)
FCC Rule(s): FCC Part 95, Subpart M
Received Date: 2022-12-01
Test Date: 2022-12-05 ~ 2022-12-07

Reviewed By:

Jame Yuan

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
2212RSU004-U1	Rev. 01	Initial Report	2023-01-17	Valid

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1. General Information

1.1. Applicant

Beijing Jingwei Hirain Technologies Co., Inc.

4F, Block 1, No.14 Jiuxianqiao Road, Chaoyang District, Beijing, P.R.China

1.2. Manufacturer

Beijing Jingwei Hirain Technologies Co., Inc.

4F, Block 1, No.14 Jiuxianqiao Road, Chaoyang District, Beijing, 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 FCC: CN1166 VCCI: ☐ R-20025 ☐ G-20034 ☐ C-20020 ☐ T-20020 ☐ R-20141 ☐ G-20134 ☐ C-20103 ☐ T-20104 CNAS: L10551 ISED: CN0001
☐	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 FCC: CN1284 CNAS: L10551 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: L3261-190725 FCC: 291082, TW3261 ISED: TW3261

1.4. Product Information

Product Name	Rear short-range ranging sensor
Model No.	SRR520
EUT Identification No.	22021201Sample#02
Product Voltage	9 ~ 16VDC (12VDC nominal)
Working Temperature Rang	-40°C ~ 85°C
Remark: 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

Working Frequency Range	76 ~ 77GHz
Radar Type	Non-pulsed Radar (FMCW)
Modulation type	Fast chirp
Sweep Bandwidth	376MHz
Sweep time	50ms
Sweep rate	18.38 MHz/ μ s

2. Test Configuration

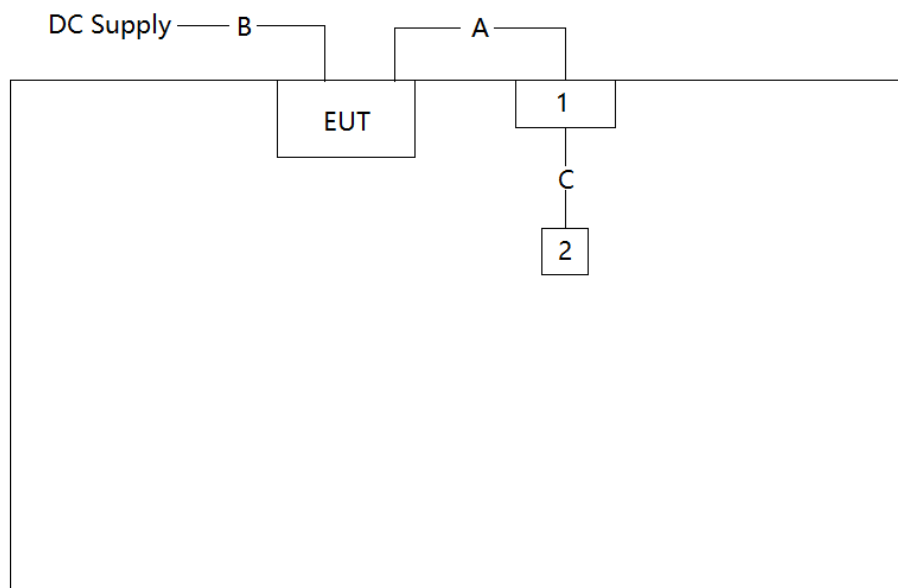
2.1. Test Mode

Mode 1: Collocated Tx/Rx mode by DC 12V

Note 1: The test sample was provided by the manufacturer, which was configured into Collocated Tx/Rx mode after power on.

2.2. Test System Connection Diagram

Connection Diagram



Cable Type		Cable Description
A	Power Cable	Non shielded, 2.0m
B	Power Cable	Non shielded, 2.0m
C	USB Cable	Shielded, 1.0m

2.3. Test System Details

Product		Manufacturer	Model No.
1	CAN Tool	N/A	4E-U
2	Notebook	Lenovo	X260

2.4. Test Software

The test utility software used during testing was “ZCANPRO.exe”.

2.5. Applied Standards

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

- FCC Part 95, Subpart M
- KDB 653005 D01v01r02
- ANSI C63.10-2013
- ANSI C63.10-2020
- ANSI C63.26-2015

2.6. Test Environment Condition

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

3. Measuring Instrument

Instrument	Manufacturer	Model No.	Asset No.	Cali. Interval	Cali. Due Date	Test Site
EMI Test Receiver	R&S	ESR3	MRTSUE06185	1 year	2022-12-29	SIP-AC1
Signal Analyzer	Keysight	N9010B	MRTSUE06603	1 year	2023-10-25	SIP-AC1
Anechoic Chamber	RIKEN	SIP-AC1	MRTSUE06554	1 year	2022-12-23	SIP-AC1
Loop Antenna	Schwarzbeck	FMZB 1519 B	MRTSUE06937	1 year	2023-03-14	SIP-AC1
Preamplifier	EMCI	EMC051845SE	MRTSUE06600	1 year	2023-11-07	SIP-AC1
Horn Antenna	R&S	HF907	MRTSUE06610	1 year	2023-07-13	SIP-AC1
Thermohygrometer	testo	608-H1	MRTSUE06616	1 year	2023-11-01	SIP-AC1
Thermohygrometer	testo	608-H1	MRTSUE06620	1 year	2023-11-27	SIP-AC1
TRILOG Antenna	Schwarzbeck	VULB 9168	MRTSUE06645	1 year	2023-07-30	SIP-AC1
Signal Analyzer	Keysight	N9020B	MRTSUE06604	1 year	2023-11-07	SIP-AC3
Horn Antenna	Schwarzbeck	BBHA 9170	MRTSUE06599	1 year	2023-10-13	SIP-AC3
Preamplifier	EMCI	EMC184045SE	MRTSUE06602	1 year	2023-10-10	SIP-AC3
Thermohygrometer	testo	608-H1	MRTSUE06619	1 year	2023-11-01	SIP-AC3
Thermohygrometer	testo	608-H1	MRTSUE06622	1 year	2023-11-27	SIP-AC3
Anechoic Chamber	RIKEN	SIP-AC3	MRTSUE06782	1 year	2022-12-23	SIP-AC3
Signal Analyzer	Keysight	N9030B	MRTSUE06395	1 year	2023-07-08	SIP-TR1/SIP-TR2
Temperature Chamber	BAOYT	BYG-408CS	MRTSUE06847	1 year	2023-02-22	SIP-TR1
Thermohygrometer	testo	Testo 608-H1	MRTSUE11022	1 year	2023-11-01	SIP-TR1
Thermohygrometer	testo	608-H1	MRTSUE11109	1 year	2023-03-21	SIP-TR2
Waveguide Harmonic Mixer	Keysight	M1970V	MRTSUE06271	N/A	N/A	SIP-TR2
Waveguide Harmonic Mixer	Keysight	M1970W	MRTSUE06272	N/A	N/A	SIP-TR1/SIP-TR2
mmWave Antenna	MI-WWAVE	261U-25/383	MRTSUE06273	N/A	N/A	SIP-TR2
mmWave Antenna	MI-WWAVE	261G/387	MRTSUE06274	N/A	N/A	SIP-TR2
mmWave Antenna	MI-WWAVE	261F/387	MRTSUE06275	N/A	N/A	SIP-TR2
mmWave Extension Module	Keysight	N9029AV05	MRTSUE06367	N/A	N/A	SIP-TR2
mmWave Extension Module	Keysight	N9029AV06	MRTSUE06368	N/A	N/A	SIP-TR2
mmWave Antenna	A-INFO	LB-15-25-A	MRTSUE06409	N/A	N/A	SIP-TR2
mmWave Antenna	A-INFO	LB-10-25-A	MRTSUE06410	N/A	N/A	SIP-TR1/SIP-TR2
mmWave Antenna	VDI	WR3/4	MRTSUE06277	N/A	N/A	SIP-TR2
mmWave Extension Module	Keysight	N9029AV03	MRTSUE06366	N/A	N/A	SIP-TR2

Software	Version	Function
EMI Test Software	V3	EMI Test Software
Controller_MF 7802BS	1.02	RE Antenna & Turntable
MotorContor	V 2	mmw

4. 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

Measurement Uncertainty for a Level of Confidence of 95% ($U=2U_c(y)$):

Coaxial: 9kHz~30MHz: 2.59dB

Coplanar: 9kHz~30MHz: 2.60dB

Horizontal: 30MHz~200MHz: 3.85dB

200MHz~1GHz: 4.36dB

1GHz~40GHz: 4.98dB

Vertical: 30MHz~200MHz: 4.06dB

200MHz~1GHz: 5.28dB

1GHz~40GHz: 4.91dB

5. Test Result

5.1. Summary

FCC Part Section(s)	Test Description	Test Condition	Verdict
95.3367	EIRP	Radiated	Pass
2.1049	Occupied bandwidth		Pass
95.3379(a)	Unwanted Emissions		Pass
95.3379(b)	Frequency stability		Pass

Note: The radiation measurements are performed in X, Y, Z axis positioning. Only the worst-case data are shown in the report.

5.2. Equivalent Isotropically Radiated Power (EIRP)

5.2.1. Test Limit

The fundamental radiated emission limits within the 76-81 GHz band are expressed in terms of Equivalent Isotropically Radiated Power (EIRP) and are as follows:

- (a) The maximum power (EIRP) within the 76-81 GHz band shall not exceed 50 dBm based on measurements employing a power averaging detector with a 1 MHz Resolution Bandwidth (RBW).
- (b) The maximum peak power (EIRP) within the 76-81 GHz band shall not exceed 55 dBm based on measurements employing a peak detector with a 1 MHz RBW.

5.2.2. Test Procedure

ANSI C63.10 Section 9.10

ANSI C63.26 Section 4.6.2

KDB 653005 D01v01r02 Section 4.b) & 4.c)

Note: Far-field boundary calculation as below.

According to ANSI C63.10-2013, Clause 9.1, the far-field boundary for mm-wave antennas is $2D^2/\lambda$. For fundamental or out-of-band emissions the far-field boundary distance of the EUT antenna or measurement antenna, whichever is largest, shall be used.

- D is the largest dimension of the antenna aperture in meters.
- λ is the wavelength in m

Far-field boundary calculation			
Frequency Range (GHz)	λ (m)	D (m)	$R_{(Far\ Field)}$ (m)
76 ~ 81	0.0037	0.026	0.365

The measurement is performed at a minimum distance of $0.75m > R_{(Far\ Field)}$

5.2.3. Test Setting

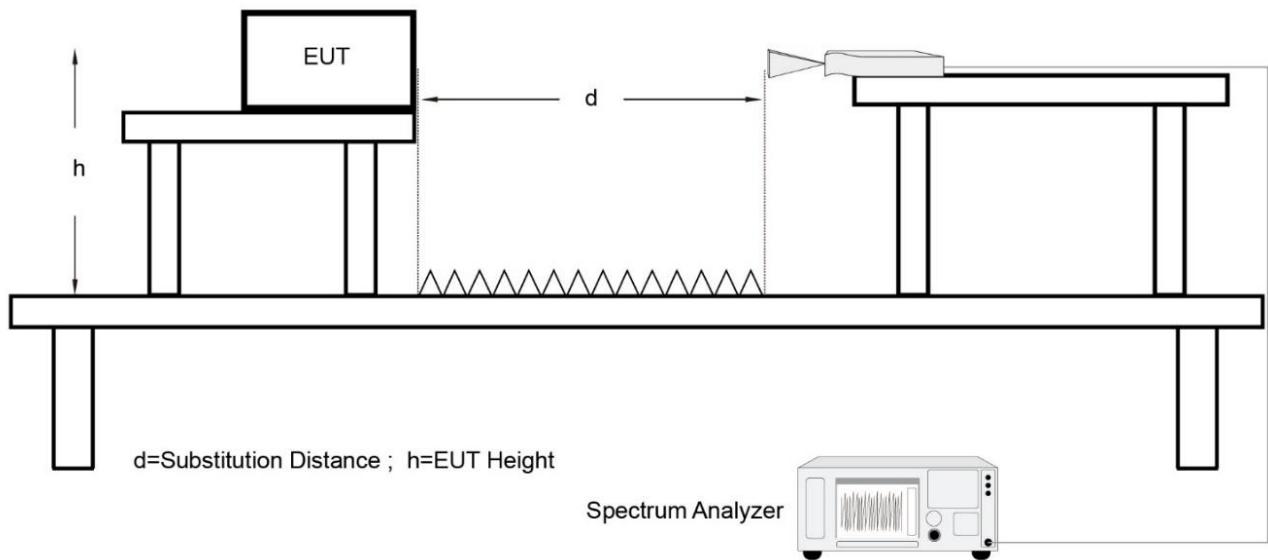
For the maximum power (EIRP)

1. Span = approximately $2 \times$ the OBW, centered on the carrier frequency
2. Set the RBW = 1MHz
3. Set the VBW $\geq 3 \times$ RBW
4. Detector function = Average
5. Sweep time $\geq$ (number of points in sweep) $\times$ (transmission symbol period).
6. Trace mode = Average

7. Allow the trace to stabilize
8. Use the integrated band/channel power analyzer function to determine the average power.

For the maximum peak power (EIRP)

1. Span = approximately $2 \times$ the OBW, centered on the carrier frequency
2. Set the RBW = 1MHz
3. Set the VBW $\geq 3 \times$ RBW
4. Detector function = Peak
5. Sweep time $\geq$ (number of points in sweep) $\times$ (transmission symbol period).
6. Trace mode = max hold
7. Allow the trace to stabilize
8. Use the peak search function to mark the max value of the emission.

5.2.4. Test Setup

5.2.5. Test Result

Test Engineer	Chase Zhu	Temperature	24.3°C
Test Site	SIP-TR2	Relative Humidity	56.3%
Test Date	2022-12-05		

EIRP (dBm)		EIRP Limit (dBm)		Result
Peak	Average	Peak	Average	
32.41	21.64	≤ 55	≤ 50	Pass

5.3. Occupied bandwidth

5.3.1. Test Limit

N/A

5.3.2. Test Procedure

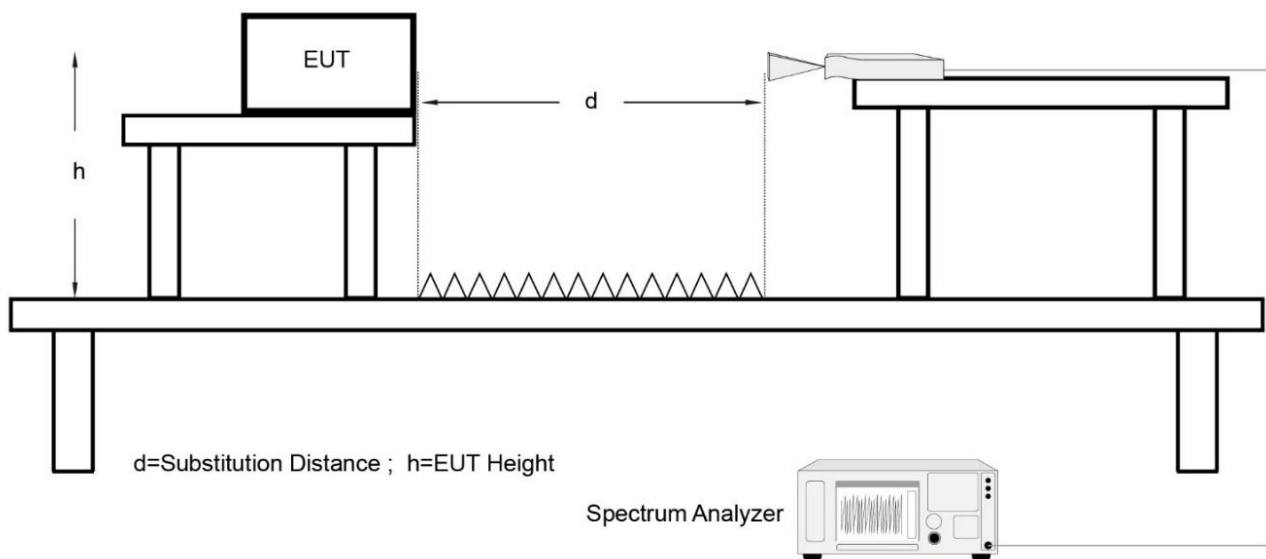
ANSI C63.10-2013 Section 6.9

ANSI C63.26 Section 4.6.2

5.3.3. Test Setting

1. Span = $1.5 \times \text{OBW}$, centered on the carrier frequency
2. RBW = 1% to 5% of the anticipated OBW
(RBW=1MHz, refer to ANSI C63.10-2020 clause 9.4, larger bandwidth is not possible, so we choose the minimum 1MHz RBW.)
3. Set the VBW $\geq 3 \times \text{RBW}$
4. Detector function = Peak
5. Trace mode = max hold.
6. Use the 99% power bandwidth function of the instrument and report the measured bandwidth.

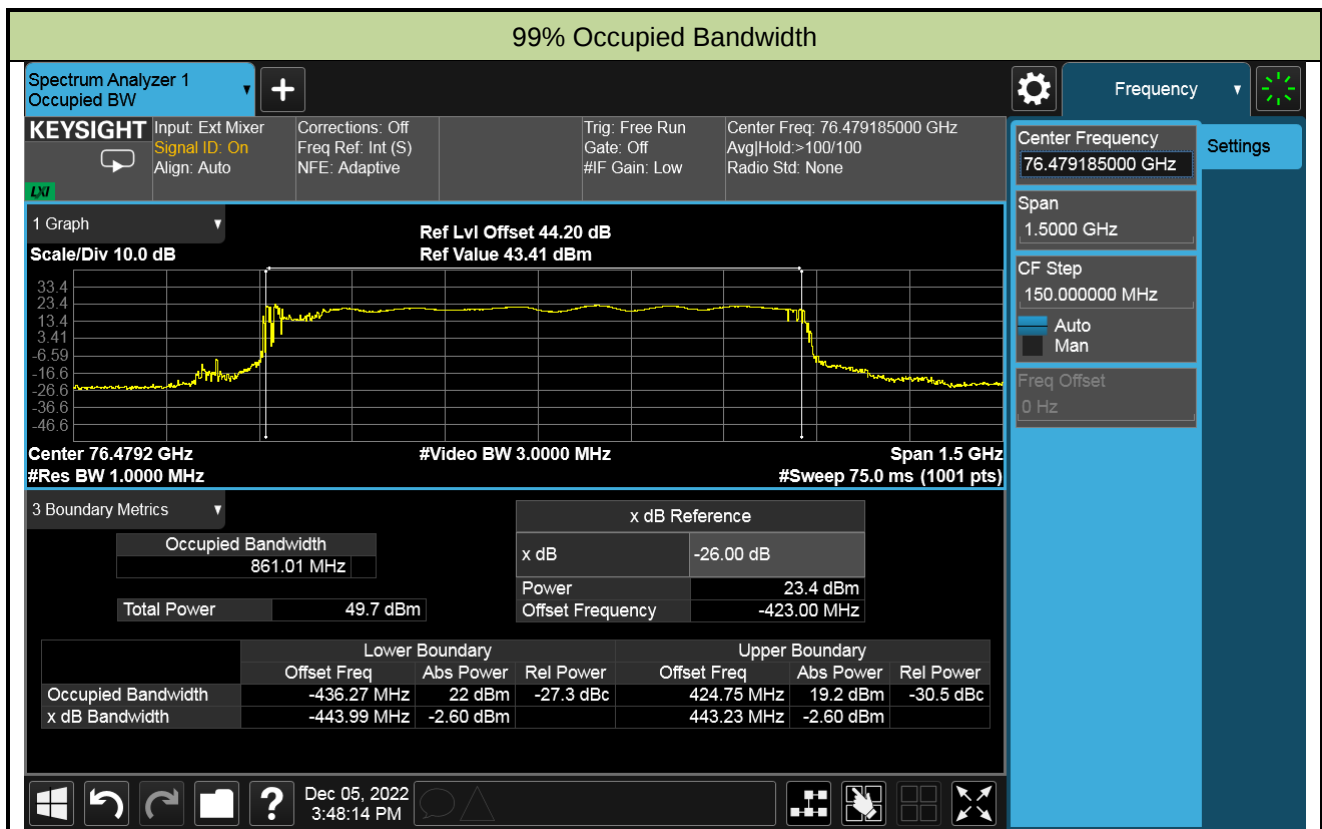
5.3.4. Test Setup



5.3.5. Test Result

Test Engineer	Chase Zhu	Temperature	24.3°C
Test Site	SIP-TR2	Relative Humidity	56.3%
Test Date	2022-12-05		

99% Bandwidth (MHz)	f _L (MHz)	f _L Limit (MHz)	f _H (MHz)	f _H Limit (MHz)	Result
861.01	76042.915	≥ 76000	76903.935	≤ 81000	Pass



5.4. Unwanted Emissions

5.4.1. Test Limit

The power density of any emissions outside the 76-81 GHz band shall consist solely of spurious emissions and shall not exceed the following:

- (1) Radiated emissions below 40 GHz shall not exceed the field strength as shown in the following emissions table.

Frequency (MHz)	Field Strength (uV/m)	Measurement Distance (m)
0.009 ~ 0.490	2400/F(kHz)	300
0.490 ~ 1.705	24000/F(kHz)	30
1.705 ~ 30.0	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

- (i) The tighter limit applies at the band edges.
- (ii) The limits in the table are based on the frequency of the unwanted emissions and not the fundamental frequency. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.
- (iii) The emissions limits shown in the table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9.0-90.0 kHz, 110.0-490.0 kHz, and above 1000 MHz. Radiated emissions limits in these three bands are based on measurements employing an average detector with a 1 MHz RBW.

- (2) The power density of radiated emissions outside the 76-81 GHz band above 40.0 GHz shall not exceed the following, based on measurements employing an average detector with a 1 MHz RBW:

- (i) For radiated emissions between 40 GHz and 200 GHz: 600 pW/cm² at a distance of 3 meters from the exterior surface of the radiating structure.
- (ii) For radiated emissions above 200 GHz: 1000 pW/cm² at a distance of 3 meters from the exterior surface of the radiating structure.

- (3) For field disturbance sensors and radar systems operating in the 76-81 GHz band, the spectrum shall be investigated up to 231.0 GHz.

5.4.2. Test Procedure

ANSI C63.10 Section 9.12 & 9.13

ANSI C63.26 Section 4.6.2

Note: Far-field boundary calculation as below.

According to ANSI C63.10-2013, Clause 9.1, the far-field boundary for mm-wave antennas is $2D^2/\lambda$. For spurious and harmonic emissions the far-field boundary distance shall be based on the measurement antenna.

- D is the largest dimension of the antenna aperture in meters.
- λ is the wavelength in m

Far-field boundary calculation			
Frequency Range (GHz)	λ (m)	D (m)	$R_{(\text{Far Field})}$ (m)
40.00 ~ 50.00	0.006	0.046	0.705
50.00 ~ 75.00	0.004	0.036	0.648
75.00 ~ 110.00	0.0027	0.026	0.501
110.00 ~ 140.00	0.0021	0.020	0.381
140.00 ~ 220.00	0.0014	0.014	0.280
220.00 ~ 231.00	0.0013	0.0055	0.047

For 40.00 ~ 231.00GHz, Our measurement is performed at a minimum distance of 0.75m $> R_{(\text{Far Field})}$.

5.4.3. Test Setting

Measurement of harmonic and spurious emissions above 40 GHz

1. Connect the test antenna covering the appropriate frequency range to a spectrum analyzer via an external mixer.
2. Set spectrum analyzer RBW = 1MHz, VBW = 3MHz, average detector.
3. Maximize all observed emissions. Note the maximum power indicated on the spectrum analyzer. Adjust this reading, if necessary, by the conversion loss of the external mixer used at the frequency under investigation and the external mixer IF cable loss.
4. Calculate the maximum field strength of the emission at the measurement distance.
5. Calculate the power density at the distance specified by the limit from the field strength at the distance specified by the limit.
6. Repeat the preceding sequence for every emission observed in the frequency band under investigation.

Measurement of harmonic and spurious emissions below 40 GHz

Peak Field Strength Measurements

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

Table 1 – RBW

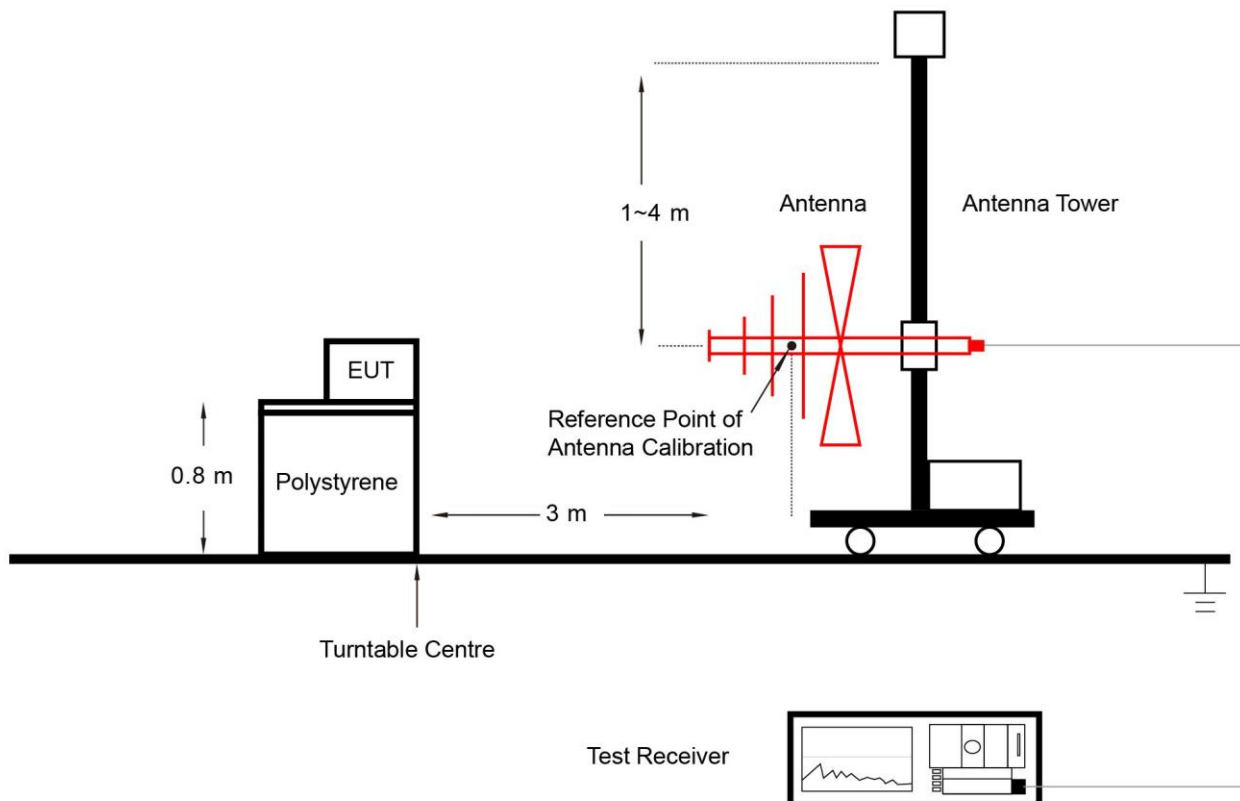
Frequency	RBW
9 ~ 90 kHz	1 MHz
90 ~ 110 kHz	200 Hz
110 ~ 490 kHz	1 MHz
0.49 ~ 30 MHz	9 kHz
30 ~ 1000 MHz	120 kHz
> 1000 MHz	1 MHz

Average Field Strength Measurements

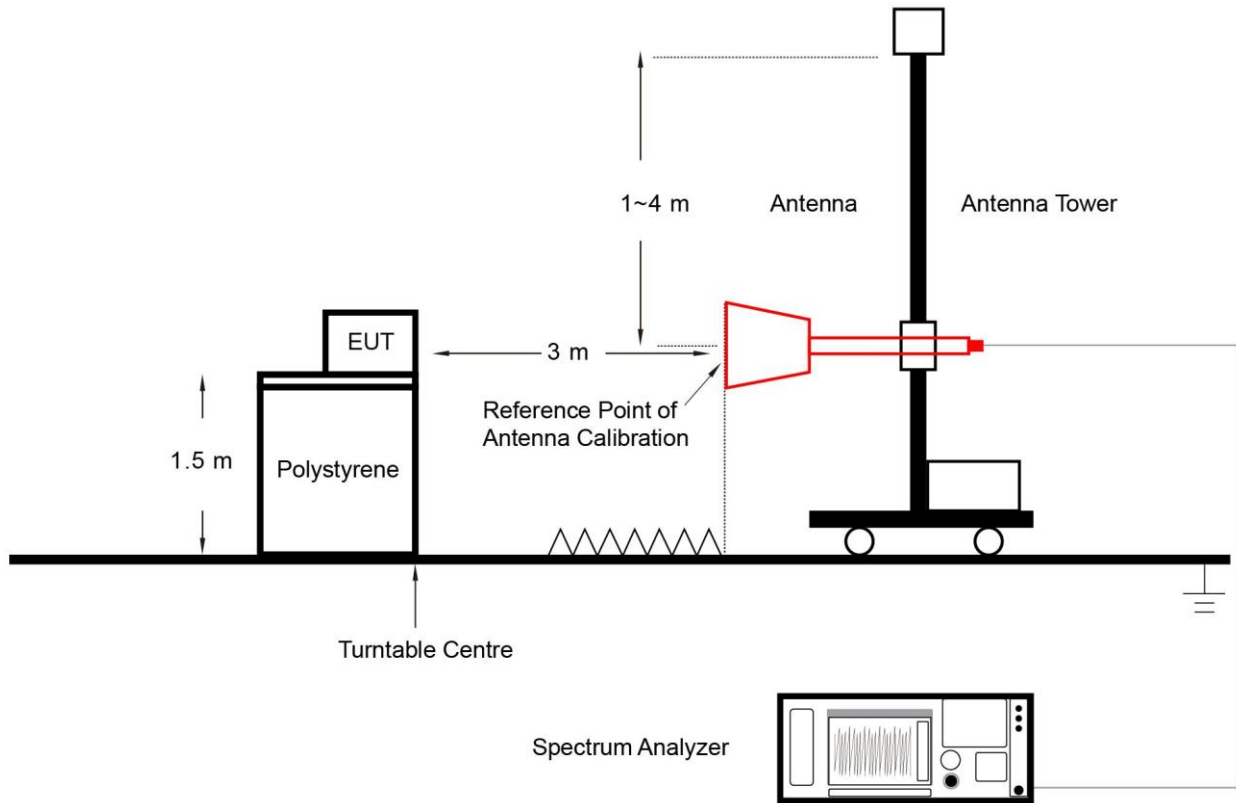
1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW $\geq 1/T$
4. As an alternative, the instrument may be set to linear detector mode. Ensure that video filtering is applied in linear voltage domain (rather than in a log or dB domain). 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.

5.4.4. Test Setup

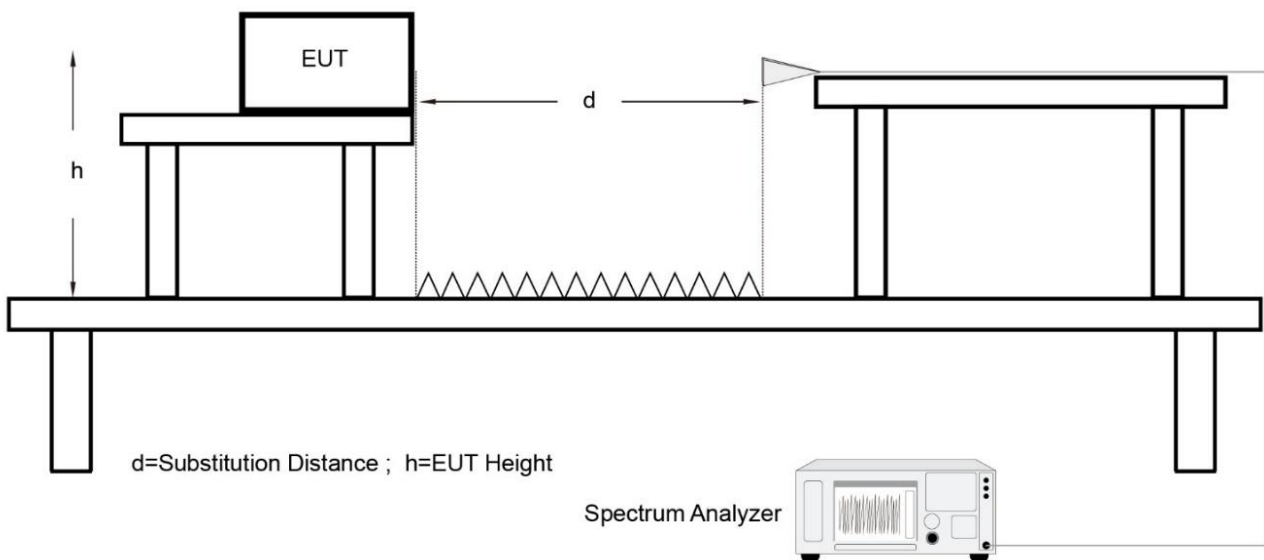
Below 1GHz Test Setup:



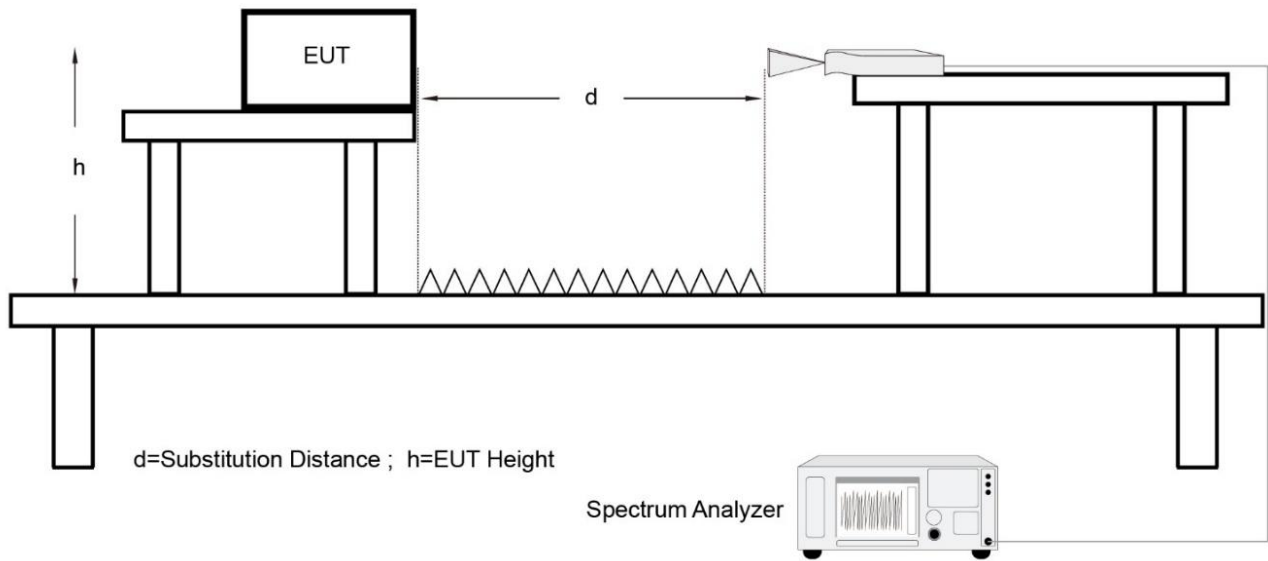
1GHz ~ 40GHz Test Setup:



40GHz ~ 50GHz Test Setup:



Above 50GHz Test Setup:



5.4.5. Test Results

Test Engineer	Mero Zhou	Temperature	25.4°C
Test Site	SIP-AC1	Relative Humidity	66.5%
Test Date	2022-12-06	Test Mode	Mode 1

Frequency (MHz)	Reading Level (dBμV)	Factor (dB/m)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
Below 1GHz							
83.4	10.2	12.7	22.9	40.0	-17.1	Peak	Horizontal
137.2	14.0	17.3	31.3	43.5	-12.2	Peak	Horizontal
208.5	16.6	14.5	31.1	43.5	-12.4	Peak	Horizontal
254.6	17.5	16.7	34.2	46.0	-11.8	Peak	Horizontal
400.1	13.6	20.7	34.3	46.0	-11.7	Peak	Horizontal
700.3	9.8	26.8	36.6	46.0	-9.4	Peak	Horizontal
45.5	8.9	17.7	26.6	40.0	-13.4	Peak	Vertical
83.8	10.3	12.7	23.0	40.0	-17.0	Peak	Vertical
209.5	13.0	14.5	27.5	43.5	-16.0	Peak	Vertical
254.6	14.3	16.7	31.0	46.0	-15.0	Peak	Vertical
393.8	11.2	20.6	31.8	46.0	-14.2	Peak	Vertical
700.3	6.2	26.8	33.0	46.0	-13.0	Peak	Vertical

Notes:

- Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB/m)
Factor (dB/m) = Cable Loss (dB) + Antenna Factor (dB/m)
- Quasi-Peak measurement was not performed when peak measure level was lower than the quasi-peak limit.
- The amplitude of radiated emissions (frequency range from 9KHz to 30MHz) 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.

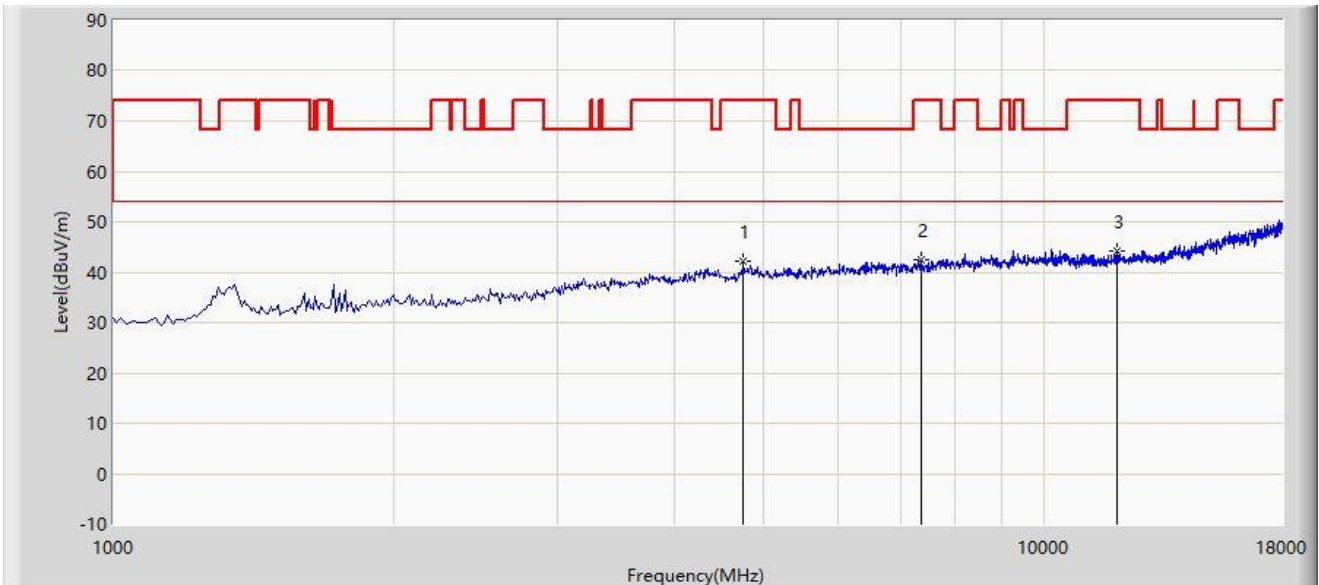
Test Engineer	Mero Zhou	Temperature	25.4°C
Test Site	SIP-AC1 & SIP-AC3	Relative Humidity	66.5%
Test Date	2022-12-06	Test Mode	Mode 1

Frequency (MHz)	Reading Level (dBμV)	Factor (dB/m)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
1 ~ 40 GHz							
4748.5	52.2	-10.1	42.1	74.0	-31.9	Peak	Horizontal
7366.5	49.3	-6.9	42.4	74.0	-31.6	Peak	Horizontal
11973.5	47.7	-3.6	44.1	74.0	-29.9	Peak	Horizontal
3915.5	51.0	-11.3	39.7	74.0	-34.3	Peak	Vertical
7672.5	48.9	-6.6	42.3	74.0	-31.7	Peak	Vertical
12441.0	48.1	-3.0	45.1	74.0	-28.9	Peak	Vertical
19925.0	55.4	-10.7	44.7	74.0	-29.3	Peak	Horizontal
22697.0	54.8	-8.2	46.6	74.0	-27.4	Peak	Horizontal
38031.0	62.3	-2.3	60.0	74.0	-14.0	Peak	Horizontal
38031.0	45.8	-2.3	43.5	54.0	-10.5	Average	Horizontal
19408.0	54.8	-10.5	44.3	74.0	-29.7	Peak	Vertical
22565.0	54.8	-8.4	46.4	74.0	-27.6	Peak	Vertical
39241.0	53.1	0.0	53.1	74.0	-20.9	Peak	Vertical
39241.0	41.1	0.0	41.1	54.0	-12.9	Average	Vertical

Notes:

- Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB/m)
Factor (dB/m) = Cable Loss (dB) + Antenna Factor (dB/m) - Pre_Amplifier Gain (dB)
- Average measurement was not performed when the peak level lower than average limit

Site: SIP-AC1	Test Date: 2022-12-06
Limit: FCC_Part15.209_RSE(3m)	Engineer: Mero Zhou
Probe: HF907_102862_1-18GHz	Polarity: Horizontal
EUT: Rear short-range ranging sensor	Power: DC 12V
Test Mode: Mode 1	



No	Mark	Frequency (MHz)	Measure Level (dBμV/m)	Reading Level (dBμV)	Margin (dB)	Limit (dBμV/m)	Factor (dB/m)	Type
1		4748.500	42.103	52.166	-31.897	74.000	-10.063	PK
2		7366.500	42.415	49.325	-31.585	74.000	-6.910	PK
3	*	11973.500	44.078	47.722	-29.922	74.000	-3.645	PK

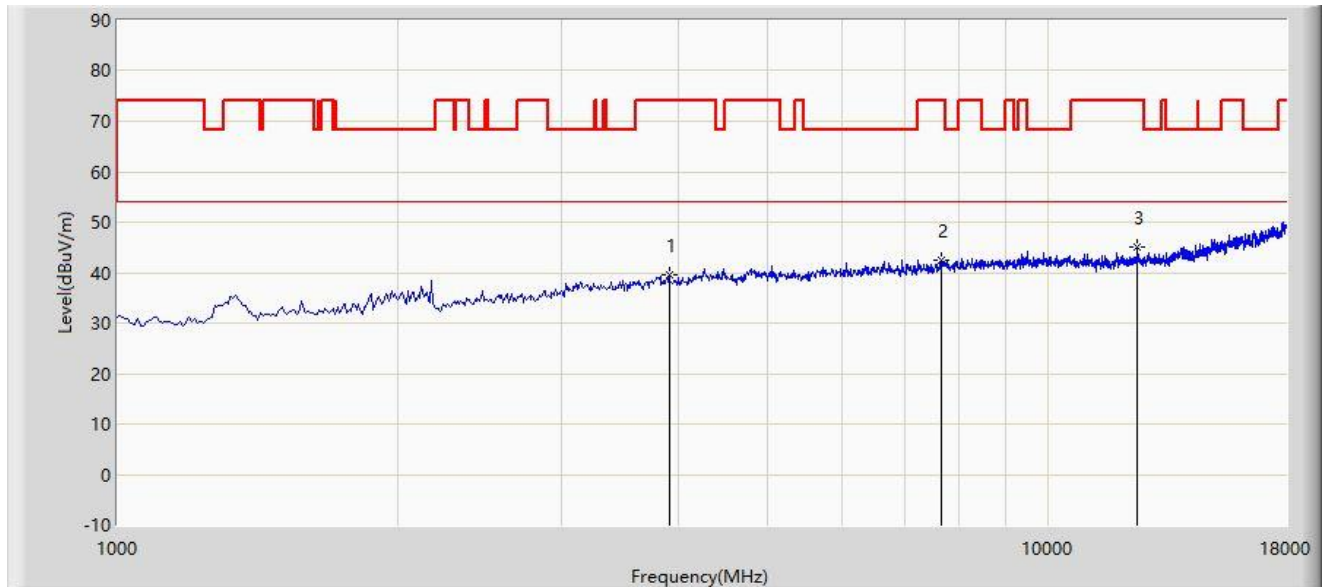
Note 1: " * ", means this data is the worst emission level.

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

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

Note 4: Average measurement was not performed when peak measure level was lower than the average limit.

Site: SIP-AC1	Test Date: 2022-12-06
Limit: FCC_Part15.209_RSE(3m)	Engineer: Mero Zhou
Probe: HF907_102862_1-18GHz	Polarity: Vertical
EUT: Rear short-range ranging sensor	Power: DC 12V
Test Mode: Mode 1	



No	Mark	Frequency (MHz)	Measure Level (dBμV/m)	Reading Level (dBμV)	Margin (dB)	Limit (dBμV/m)	Factor (dB/m)	Type
1		3915.500	39.663	50.999	-34.337	74.000	-11.336	PK
2		7672.500	42.332	48.915	-31.668	74.000	-6.584	PK
3	*	12441.000	45.070	48.050	-28.930	74.000	-2.980	PK

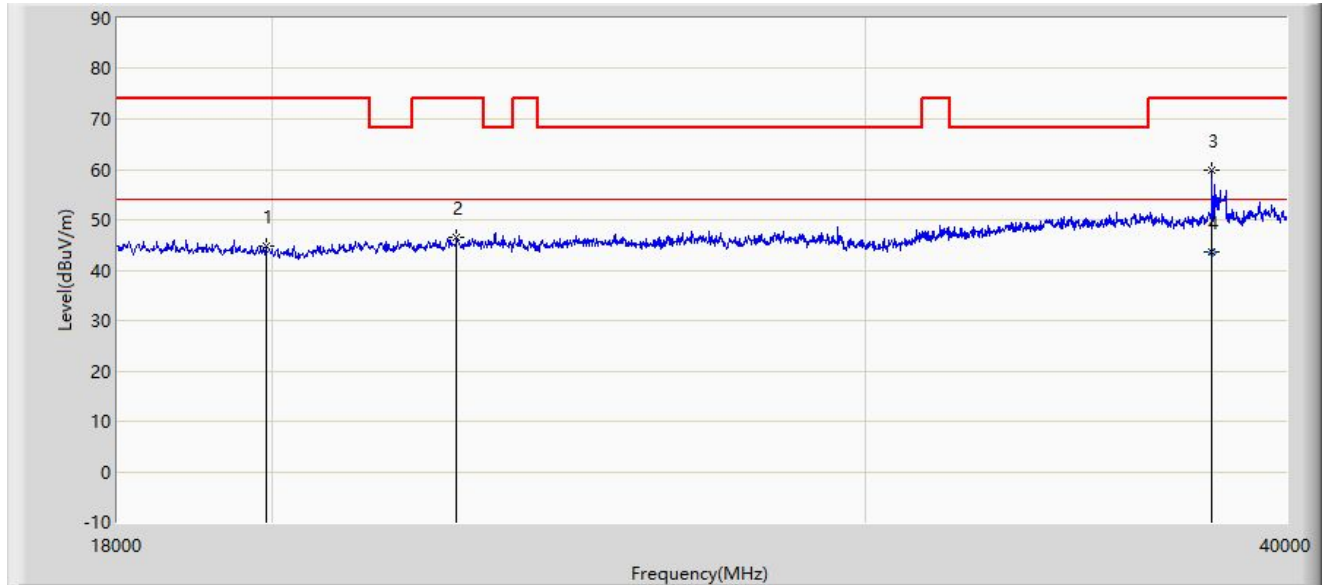
Note 1: " * ", means this data is the worst emission level.

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

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

Note 4: Average measurement was not performed when peak measure level was lower than the average limit.

Site: SIP-AC3	Test Date: 2022-12-06
Limit: FCC_Part15.209_RSE(3m)	Engineer: Mero Zhou
Probe: BBHA 9170_00935_18-40GHz	Polarity: Horizontal
EUT: Rear short-range ranging sensor	Power: DC 12V
Test Mode: Mode 1	



No	Mark	Frequency (MHz)	Measure Level (dBμV/m)	Reading Level (dBμV)	Margin (dB)	Limit (dBμV/m)	Factor (dB/m)	Type
1		19925.000	44.740	55.421	-29.260	74.000	-10.681	PK
2		22697.000	46.660	54.842	-27.340	74.000	-8.183	PK
3		38031.000	59.947	62.258	-14.053	74.000	-2.311	PK
4	*	38031.000	43.508	45.820	-10.492	54.000	-2.311	AV

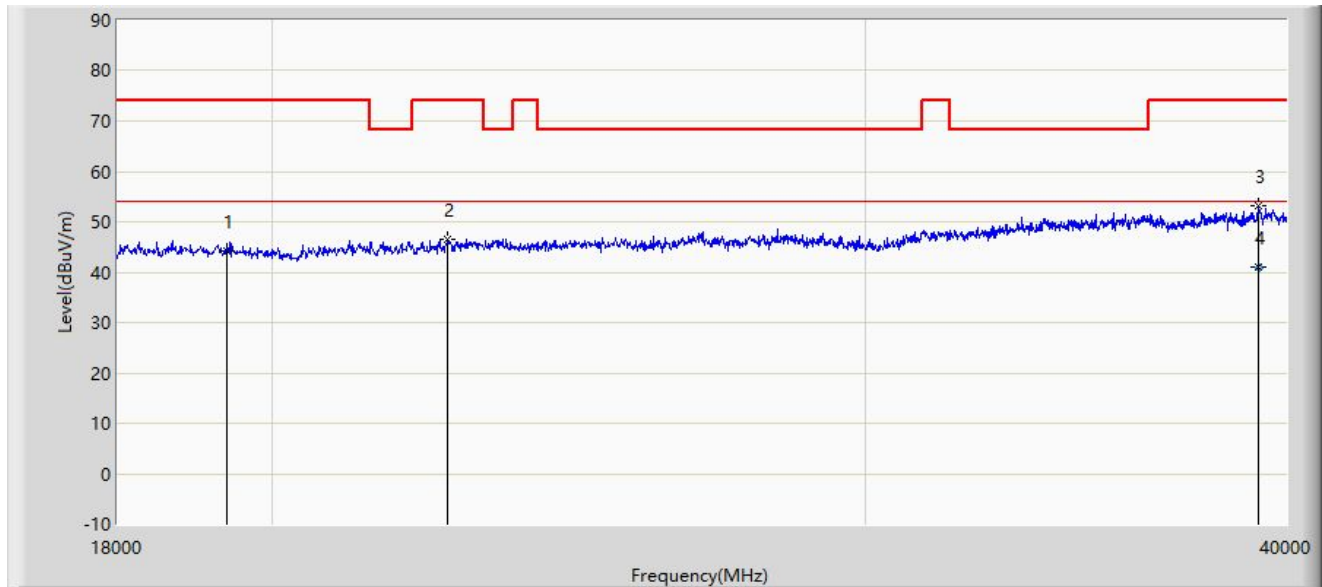
Note 1: " * ", means this data is the worst emission level.

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

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

Note 4: Average measurement was not performed when peak measure level was lower than the average limit.

Site: SIP-AC3	Test Date: 2022-12-06
Limit: FCC_Part15.209_RSE(3m)	Engineer: Mero Zhou
Probe: BBHA 9170_00935_18-40GHz	Polarity: Vertical
EUT: Rear short-range ranging sensor	Power: DC 12V
Test Mode: Mode 1	



No	Mark	Frequency (MHz)	Measure Level (dBμV/m)	Reading Level (dBμV)	Margin (dB)	Limit (dBμV/m)	Factor (dB/m)	Type
1		19408.000	44.226	54.754	-29.774	74.000	-10.528	PK
2		22565.000	46.392	54.795	-27.608	74.000	-8.404	PK
3		39241.000	53.062	53.070	-20.938	74.000	-0.008	PK
4	*	39241.000	41.132	41.140	-12.868	54.000	-0.008	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) - Pre_Amplifier Gain (dB).

Note 4: Average measurement was not performed when peak measure level was lower than the average limit.

Test Engineer	Chase Zhu	Temperature	24.3°C
Test Site	SIP-TR2	Relative Humidity	51.3%
Test Date	2022-12-05 ~ 2022-12-06	Test Mode	Mode 1

Frequency (GHz)	Factor (dB/m)	Measure Level @0.75m (dBμV/m)	Measure Level @3m (dBμV/m)	Power Density (pW/cm ²)	Limit (pW/cm ²)	Result
40GHz ~ 231GHz						
42.9	46.6	48.0	36.0	0.00105	600.0	Pass
61.0	42.7	68.5	56.5	0.11737	600.0	Pass
83.3	44.9	72.9	60.9	0.32325	600.0	Pass
110.3	58.8	63.1	51.1	0.03385	600.0	Pass
151.7	61.3	65.3	53.3	0.05617	600.0	Pass
175.7	62.1	66.7	54.7	0.07754	600.0	Pass
229.0	62.4	67.2	55.2	0.08700	1000.0	Pass

Notes:

- Measure Level @0.75m = Reading Level @0.75m + Factor
Factor (dB/m) = Cable Loss (dB) + Antenna Factor (dB/m) + Mixer Conversion Loss (dB)
- Measure Level @3m = Measure Level @0.75m + 20 * log(0.75m / 3m)
- Power Density = $(10^8 / 377) * \{10^{[(\text{Measure Level @3m} - 120) / 20]}\}^2$
- The Vertical and Horizontal polarization were evaluated, only the worst case test results are shown in the table.
- The distance of testing is 0.75m and the height of testing is 0.45m.

5.5. Frequency Stability

5.5.1. Test Limit

Fundamental emissions must be contained within the frequency bands 76 - 81GHz during all conditions of operation. Equipment is presumed to operate over the temperature range -20 to +50 degrees Celsius with an input voltage variation of 85% to 115% of rated input voltage, unless justification is presented to demonstrate otherwise.

5.5.2. Test Procedure

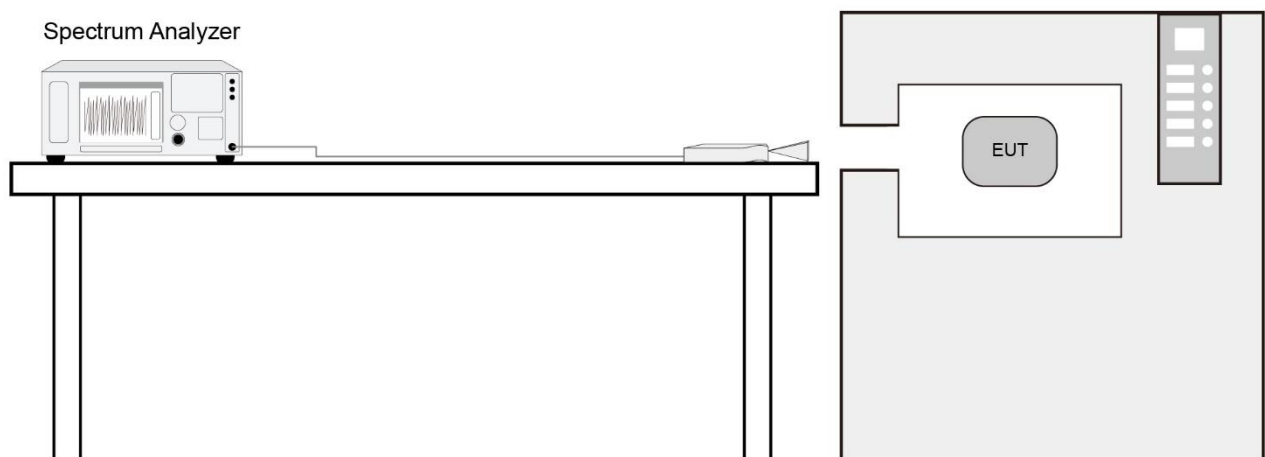
ANSI C63.10 Section 9.14

ANSI C63.26 Section 5.6.3

5.5.3. Test Setting

1. Arrange EUT and test equipment according to Section 5.5.4.
2. With the EUT at ambient temperature (20 °C) and voltage source set to the EUT nominal operating voltage
3. Record the Low and high frequencies (f_L and f_H) of the fundamental frequency emission. The applicable spurious emissions limit 600pW/cm² (-1.61dBm) was used to define f_L and f_H .
4. Vary EUT power supply between 85% and 115% of nominal Voltage, record the f_L and f_H .
5. Set the power supply to 100% nominal setting, and raise EUT operating temperature to 50 °C.
6. Record the f_L and f_H of the fundamental frequency emission.
7. Repeat step 9 at each 10°C increment down to -20 °C.

5.5.4. Test Setup



5.5.5. Test Result

Test Engineer	Nandy Zhang	Temperature	24.4°C
Test Site	SIP-TR1	Relative Humidity	56.7%
Test Date	2022-12-07	Test Mode	Mode 1

Voltage (%)	Power (VDC)	Temp (°C)	f _L (GHz)	f _H (GHz)	Limit (GHz)	Result
100	12.0	- 20	76.0445	76.9091	76 ~ 81	Pass
		- 10	76.0429	76.9083	76 ~ 81	Pass
		0	76.0409	76.9110	76 ~ 81	Pass
		+ 10	76.0409	76.9139	76 ~ 81	Pass
		+ 20	76.0413	76.9158	76 ~ 81	Pass
		+ 30	76.0397	76.9058	76 ~ 81	Pass
		+ 40	76.0407	76.9170	76 ~ 81	Pass
		+ 50	76.0397	76.9114	76 ~ 81	Pass
115	13.8	+ 20	76.0410	76.9213	76 ~ 81	Pass
85	10.2	+ 20	76.0434	76.9089	76 ~ 81	Pass

Appendix A - Test Setup Photograph

Refer to “2212RSU004-UT” file.

Appendix B - EUT Photograph

Refer to “2212RSU004-UE” file.

_____ The End _____