TEST REPORT

Reference No.	:	WTD23D10233341W001
FCC ID	:	2AZUC-MS033C
Applicant	:	Shenzhen Mosentek Technology Co., Ltd.
Address	:	5F, Building H, Block C, Dayangtian Industry Park, Shiwei Community, Matian Street, Guangming District, Shenzhen, P.R.China
Manufacturer	:	Shenzhen Mosentek Technology Co., Ltd.
Address	:	5F, Building H, Block C, Dayangtian Industry Park, Shiwei Community, Matian Street, Guangming District, Shenzhen, P.R.China
Product	:	Highbay 5.8GHz Microwave Motion Sensor
Model(s)	:	MS012HR-A, MS012HR-C, MS012HR-D, MSH012HR-A, MSH012HR-C, MSH012HR-D, MS033C, MS033D, MS033C-A, MS033C-D, MS026, MS027
Standards	:	FCC CFR47 Part 15 Section 15.249
Date of Receipt sample	:	2023-11-23
Date of Test	:	2023-11-23 to 2023-11-30
Date of Issue	:	2023-12-01
Test Result	:	Pass

Remarks:
The results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company. The report would be invalid without specific stamp of test institute and the signatures of compiler and approver.

Prepared By:
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Compiled by:

Will Tan / Project Engineer

Approved by:

Deval Qin /Designated Reviewer

2 Contents

3 Revision History

Test Report No.	Date of Receipt Sample	Date of Test	Date of Issue	Purpose	Comment	Approved
WTD23D10233341W001	2023-11-23	2023-11-23 to 2023-11-30	2023-12-01	Original	-	Valid

4 General Information

4.1 General Description of E.U.T

Product:	Highbay 5.8GHz Microwave Motion Sensor
Model(s):	MS012HR-A, MS012HR-C, MS012HR-D, MSH012HR-A, MSH012HR-C, MSH012HR-D, MS033C, MS033D, MS033C-A, MS033C-D, MS026, MS027
Model Differences:	Only the model and appearance are different are different for different market requirement. the test sample model name is MS033C.
Type of Modulation:	Linear polarization
Frequency Range:	5.83GHz-5.87GHz
Hardware Version:	V1.0
Software Version:	V3.5
Antenna Gain:	1.7dBi

Note:

#: The antenna gain is provided by the applicant, and the applicant should be responsible for its authenticity, WALTEK lab has not verified the authenticity of its information.

Antenna installation:	Internal permanent antenna

4.2 Details of E.U.T.

Ratings:	11-15VDC, 22mA

4.3 Channel List

Channel No.	Frequency (MHz)
1	5858

4.4 Test Mode

All test mode(s) and condition(s) mentioned were considered and evaluated respectively by performing full tests, the worst data were recorded and reported.

Test mode	Channel No.
Transmitting	5858MHz

5 Equipment Used during Test

5.1 Equipments List

3m Semi-anechoic Chamber for Radiation Emissions						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Last Calibration Date**	**Calibration Due Date**
1	Spectrum Analyzer	R&S	FSP30	100091	2023-04-24	2024-04-23
2	Broad-band Horn Antenna(1-18GHz)	SCHWARZBECK	BBHA 9120 D	667	2023-02-02	2024-02-01
3	Broadband Preamplifier	COMPLIANCE DIRECTION	PAP-1G18	2004	2023-08-08	2024-08-07
4	Coaxial Cable (above 1GHz)	Top	1GHz-18GHz	N/A	2023-02-02	2024-02-01
3m Semi-anechoic Chamber for Radiation Emissions						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No**	**Last Calibration Date**	**Calibration Due Date**
1	Test Receiver	R&S	ESCI	101296	2023-04-24	2024-04-23
2	Trilog Broadband Antenna	SCHWARZBECK	VULB9160	9160-3325	2023-11-04	2024-11-03
3	Active Loop Antenna	Com-Power Corp.	AL-130R	10160007	2023-05-07	2024-05-06
4	Amplifier	ANRITSU	MH648A	M43381	2023-04-24	2024-04-23
5	Cable	HUBER+SUHNER	CBL2	525178	2023-04-24	2024-04-23
RF Conducted Testing						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Last Calibration Date**	**Calibration Due Date**
1.	Spectrum Analyzer	R&S	FSL6	100959	2023-04-24	2024-04-23
2	Coaxial Cable	Top	10Hz-30GHz	-	2023-04-24	2024-04-23
3	Antenna Connector*	Realacc	45RSm	-	2023-04-24	2024-04-23
4	DC Block	Gwave	GDCB-3G-N-SMA	140307001	2023-04-24	2024-04-23

Test Software:

Test Item	Software name	Software version
Radiated Emission(3m)	EZ-EMC	EZ-EMC(RA-03A1-1)

5.2 Measurement Uncertainty

Parameter	Uncertainty
Radio Frequency	± 1 x 10^{-6}
RF Power	± 1.0 dB
RF Power Density	± 2.2 dB
Radiated Spurious Emissions test	± 5.03 dB (Bilog antenna 30M~1000MHz)
	± 5.47 dB (Horn antenna 1000M~25000MHz)

5.3 Test Facility

The test facility has a test site registered with the following organizations:

ISED CAB identifier: CN0013. Test Firm Registration No.: 7760A.

Waltek Testing Group Co., Ltd. Has been registered and fully described in a report filed with the Industry Canada. The acceptance letter from the Industry Canada is maintained in our files. Registration number 7760A, October 15, 2016.

FCC Designation No.: CN1201. Test Firm Registration No.: 523476.

Waltek Testing Group Co., Ltd. EMC Laboratory `has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration number 523476, September 10, 2019.

5.4 Test Equipment Calibration

All the test equipments used are valid and calibrated by GUANG ZHOU GRG METROLOGY & TEST CO., L TD. address is No.163, Pingyun Rd. West of Huangpu Ave,Tianhe District, Guangzhou, Guangdong, China.

6 Test Summary

Test Items	Test Requirement	Result
Conducted Emissions	15.207	N/A
Radiated Emission	15.249(a) 15.209 15.205(a)	PASS
Outside Restricted band	15.249 15.205 15.209	PASS
20dB Bandwidth	15:215(c)	PASS
Antenna Requirement	15.203	PASS

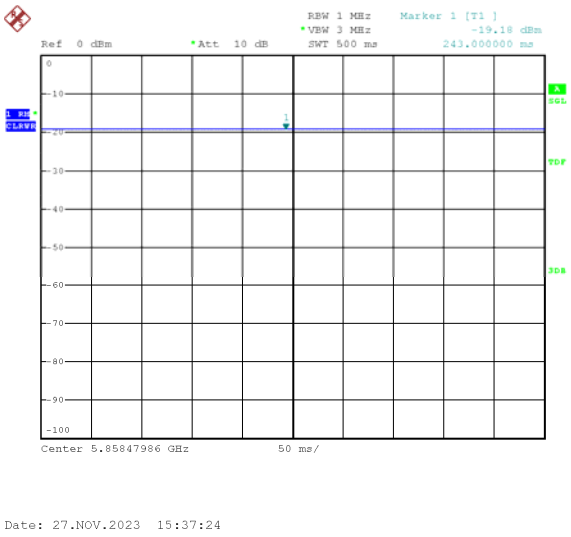
7 Duty Cycle

Type of Modulation	Duty Cycle %	Duty Cycle Factor(dB)	Average Factor(dB)
Linear polarization	100	0	0

Remark:

Duty cycle factor=10*log (1/Duty cycle);

Average factor=20log$_{10}$Duty cycle



8 Radiation Emission Test

Test Requirement: FCC Part15 Paragraph 15.249&15.209&15.205

Test Method: ANSI 63.10: 2013

Measurement Distance: 3m

Test Result: PASS

15.249(a)Limit:

Fundamental frequency	Field strength of fundamental		Field strength of harmonics	
	mV/m	dBuV/m	uV/m	dBuV/m
902-928 MHz	50	94	500	54
2400-2483.5 MHz	50	94	500	54
5725-5875 MHz	50	94	500	54
24.0-24.25 GHz	250	108	2500	68

15.209 Limit:

Frequency (MHz)	Field Strength		Field Strength Limit at 3m Measurement Dist	
	uV/m	Distance (m)	uV/m	dBuV/m
0.009 ~ 0.490	2400/F(kHz)	300	10000 * 2400/F(kHz)	$20\log^{(2400/F(kHz))}$ + 80
0.490 ~ 1.705	24000/F(kHz)	30	100 * 24000/F(kHz)	$20\log^{(24000/F(kHz))}$ + 40
1.705 ~ 30	30	30	100 * 30	$20\log^{(30)}$ + 40
30 ~ 88	100	3	100	$20\log^{(100)}$
88 ~ 216	150	3	150	$20\log^{(150)}$
216 ~ 960	200	3	200	$20\log^{(200)}$
Above 960	500	3	500	$20\log^{(500)}$

Note: RF Voltage(dBuV)=20 $\log_{10}$ RF Voltage(uV)

8.1 EUT Operation

Operating Environment **:**

Temperature: 23.5 °C

Humidity: 51.1 % RH

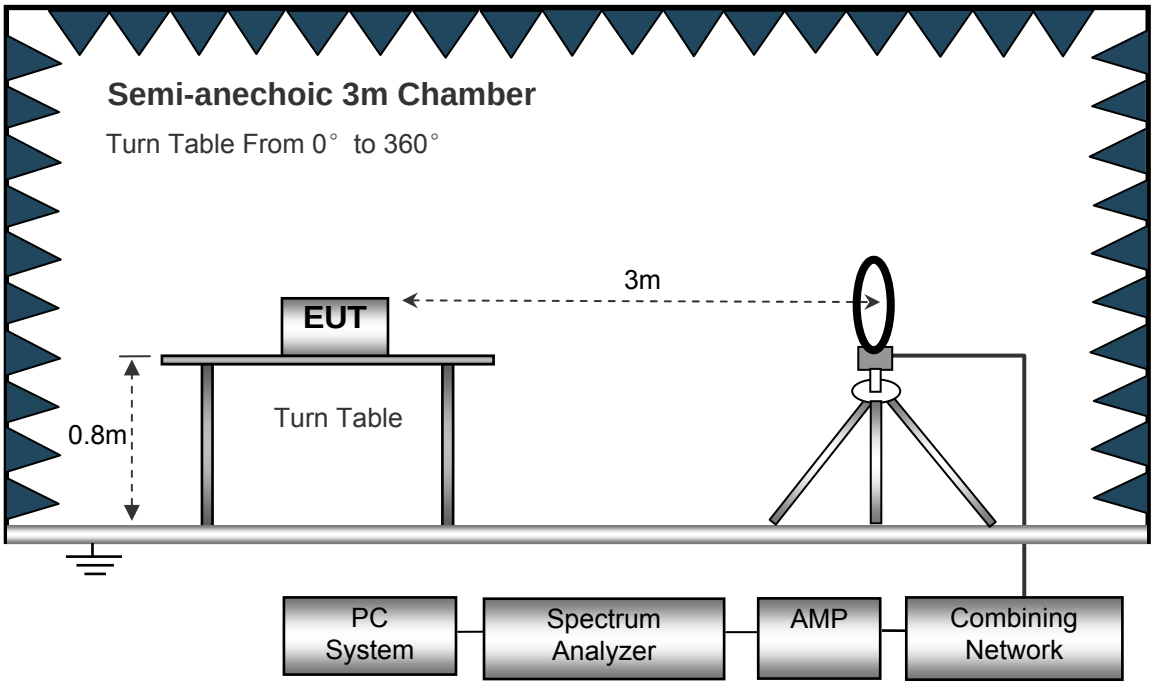
Atmospheric Pressure: 101.2kPa

EUT Operation **:**

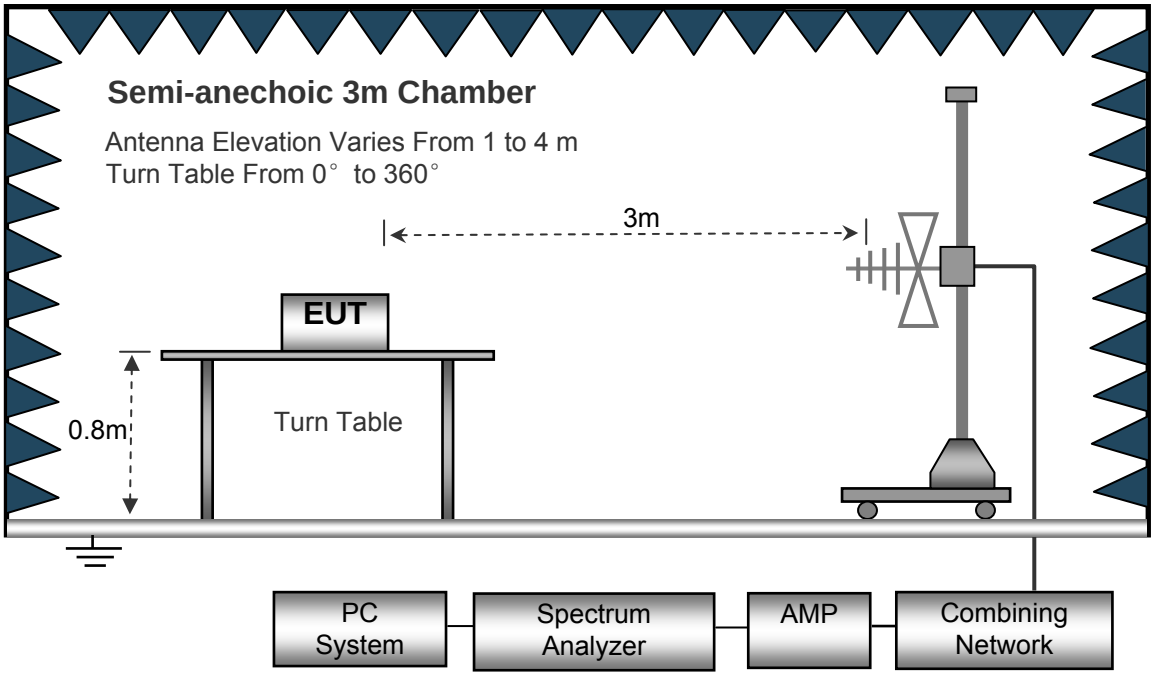
The test was performed in transmitting mode, the test data were shown in the report.

8.2 Test Setup

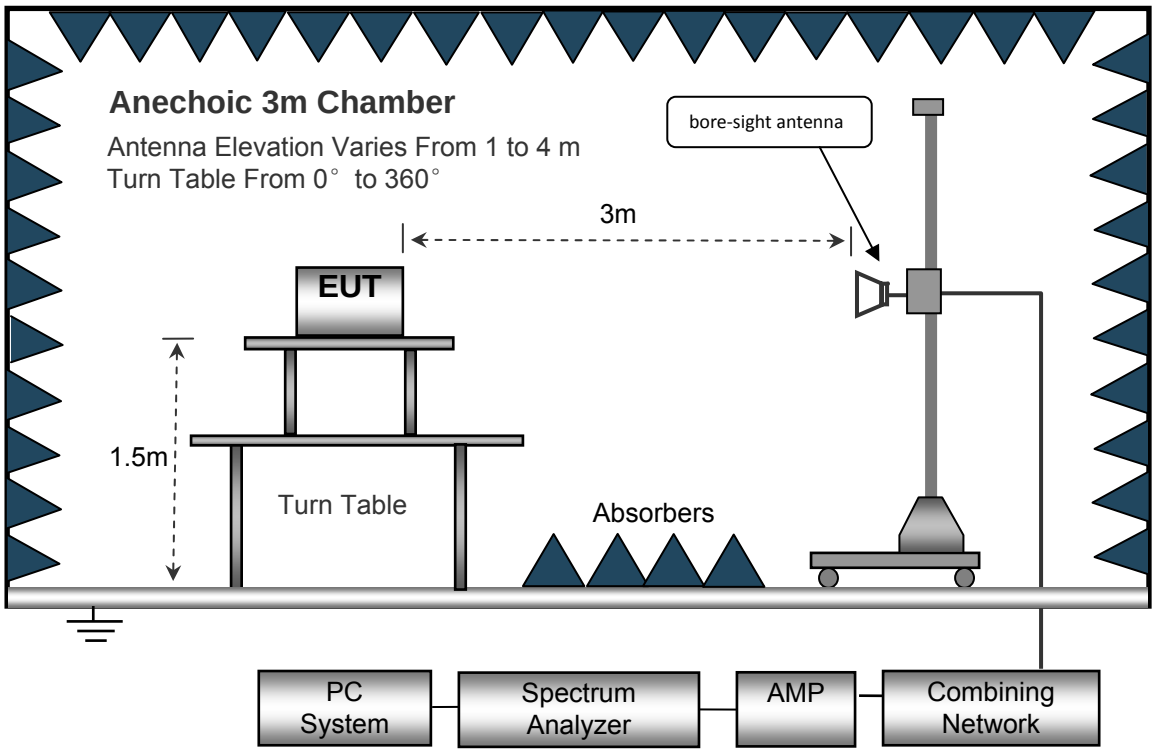
The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site, using the setup accordance with the ANSI C63.10.
The test setup for emission measurement below 30MHz.



The test setup for emission measurement from 30MHz to 1GHz.



The test setup for emission measurement above 1 GHz.



8.3 Spectrum Analyzer Setup

Below 30MHz

Sweep Speed	Auto
IF Bandwidth	10kHz
Video Bandwidth	10kHz
Resolution Bandwidth	10kHz

30MHz ~ 1GHz

Sweep Speed	Auto
Detector	PK
Resolution Bandwidth	100kHz
Video Bandwidth	300kHz

Above 1GHz

Sweep Speed	Auto
Detector	PK
Resolution Bandwidth	1MHz
Video Bandwidth	3MHz
Detector	Ave.
Resolution Bandwidth	1MHz
Video Bandwidth	10Hz

8.4 Test Procedure

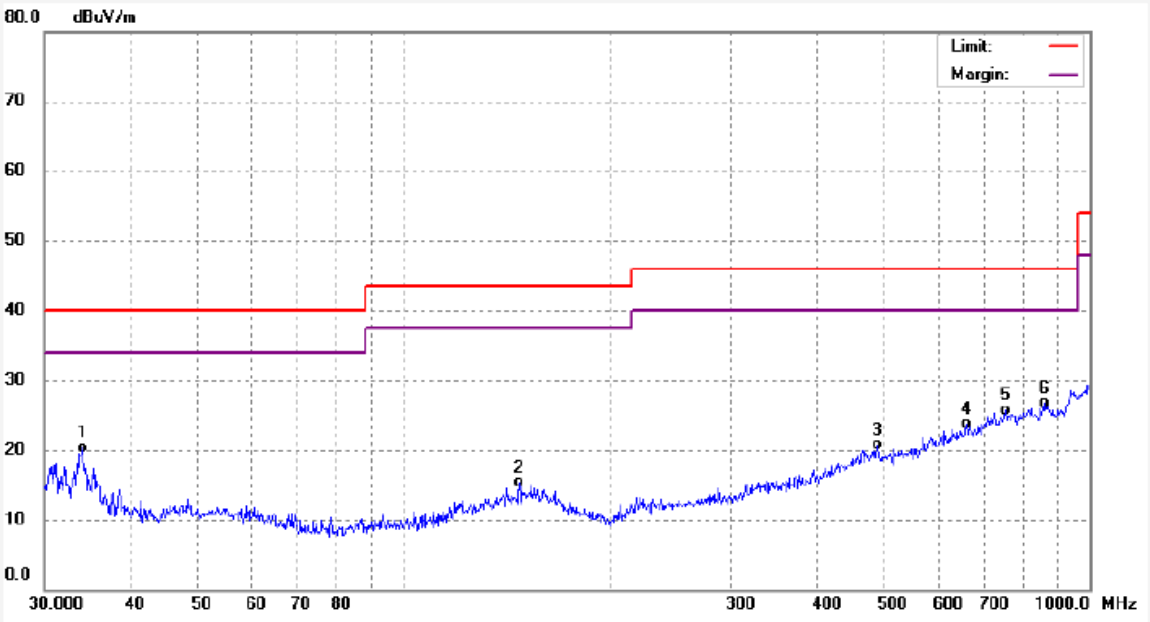
1. The EUT is placed on a turntable, which is 0.8m above ground plane for below 1GHz and 1.5m above 1GHz.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is moved from 1m to 4m to find out the maximum emissions. The spectrum was investigated from the lowest radio frequency signal generated in the device, without going below 9 kHz, up to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Repeat above procedures until the measurements for all frequencies are complete.
7. The radiation measurements are tested under 3-axes(X,Y,Z) position(X denotes lying on the table, Y denotes side stand and Z denotes vertical stand), After pre-test, It was found that the worse radiation emission was get at the X position. So the data shown was the X position only.

8.5 Test Result

Test Frequency : 9KHz~ 30MHz
The measurements were more than 20 dB below the limit and not reported.

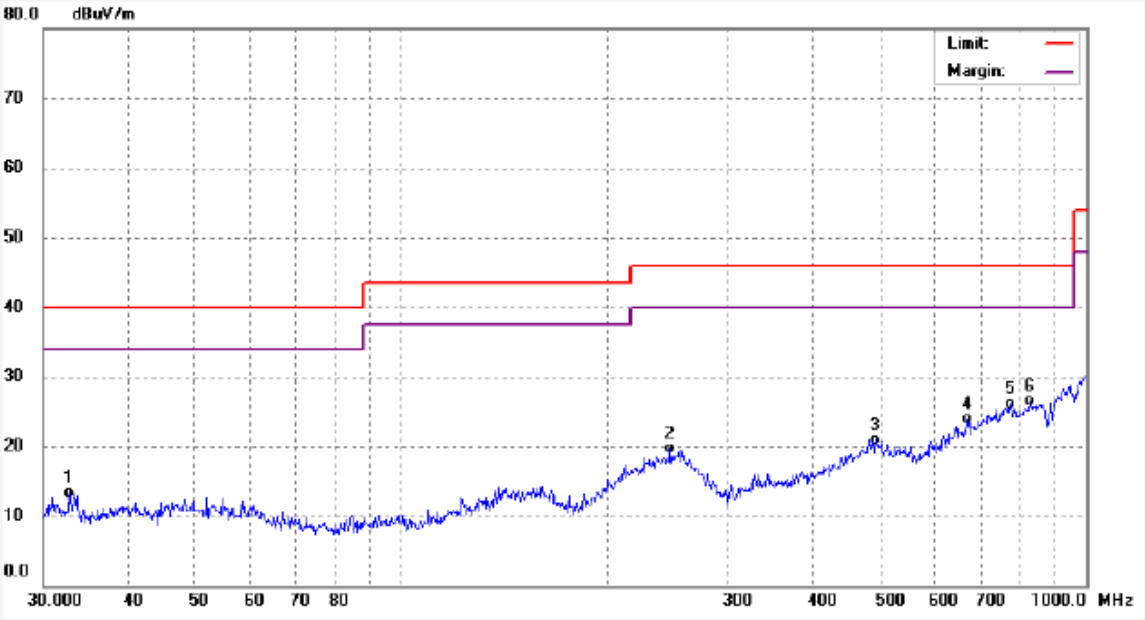
Test Frequency: 30MHz ~ 1GHz

Antenna Polarization: Vertical



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	34.0363	36.92	-16.64	20.28	40.00	-19.72	QP	
2	147.4036	29.45	-14.06	15.39	43.50	-28.11	QP	
3	489.0267	30.33	-9.67	20.66	46.00	-25.34	QP	
4	661.1503	29.87	-6.13	23.74	46.00	-22.26	QP	
5	752.7431	29.32	-3.59	25.73	46.00	-20.27	QP	
6	857.0245	28.99	-2.22	26.77	46.00	-19.23	QP	

Antenna Polarization: Horizontal



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	32.6340	30.01	-16.67	13.34	40.00	-26.66	QP	
2	246.8148	29.15	-9.53	19.62	46.00	-26.38	QP	
3	492.4685	29.65	-8.65	21.00	46.00	-25.00	QP	
4	670.4891	29.74	-5.77	23.97	46.00	-22.03	QP	
5	774.1584	29.75	-3.72	26.03	46.00	-19.97	QP	
6	827.4933	29.09	-2.65	26.44	46.00	-19.56	QP	

Test Frequency: 1GHz ~ 40GHz

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.249/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB/m)	(dBμV/m)	(dBμV/m)	(dB)
channel: 5858MHz									
5858.00	81.76	PK	234	1.13	H	-2.23	79.53	114.00	-34.47
5858.00	75.52	PK	312	1.2	V	-2.23	73.29	114.00	-40.47
11716.52	45.86	PK	80	1.7	H	-13.19	32.67	74.00	-41.33
11716.52	44.82	PK	301	1.9	V	-13.19	31.63	74.00	-42.37
17574.73	43.99	PK	183	1.3	H	-13.14	30.85	74.00	-43.15
17574.73	42.88	PK	251	1.6	V	-13.14	29.74	74.00	-44.26
23432.68	42.70	PK	182	1.8	H	-13.08	29.62	74.00	-44.38
23432.68	42.95	PK	315	1.4	V	-13.08	29.87	74.00	-44.13
29290.56	45.09	PK	269	1.9	H	0.09	45.18	74.00	-28.82
29290.56	42.77	PK	302	1.8	V	0.09	42.86	74.00	-31.14
35148.56	46.85	PK	340	1.5	H	3.01	49.86	74.00	-24.14
35148.56	46.04	PK	294	1.1	V	3.01	49.05	74.00	-24.95

AV = Peak +20Log10(duty cycle) =PK+(0) [refer to section 8 for more detail]

Margin=AV-Limit

Frequency	PK	Turn table Angle	RX Antenna		Duty cycle Factor	AV	FCC Part 15.249/209/205	
			Height	Polar			Limit	Margin
(MHz)	(dBμV/m)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
channel: 5858MHz								
5858.00	79.53	234	1.13	H	0.00	79.53	94.00	-14.47
5858.00	73.29	312	1.2	V	0.00	73.29	94.00	-20.71
11716.52	32.67	80	1.7	H	0.00	32.67	54.00	-21.33
11716.52	31.63	301	1.9	V	0.00	31.63	54.00	-22.37
17574.73	30.85	183	1.3	H	0.00	30.85	54.00	-23.15
17574.73	29.74	251	1.6	V	0.00	29.74	54.00	-24.26
23432.68	29.62	182	1.8	H	0.00	29.62	54.00	-24.38
23432.68	29.87	315	1.4	V	0.00	29.87	54.00	-24.13
29290.56	45.18	269	1.9	H	0.00	45.18	54.00	-8.82
29290.56	42.86	302	1.8	V	0.00	42.86	54.00	-11.14
35148.56	49.86	340	1.5	H	0.00	49.86	54.00	-4.14
35148.56	49.05	294	1.1	V	0.00	49.05	54.00	-4.95

9 Restricted band

Test Requirement: FCC Part15 Paragraph 15.205

Test Method: ANSI C63.10: 2013

Test Result: N/A

9.1 Requiments:

emissions that fall in the restricted bands(15.205).Above 1000MHz, compliance with the emissions limits in section 15.209 shall be demonstrated based on the average value of the measured emissions,The provisions in section 15.35apply to these measurements.

9.2 Test Result

Mode: Continuously Transmitting

Antenna Polarization: Vertical

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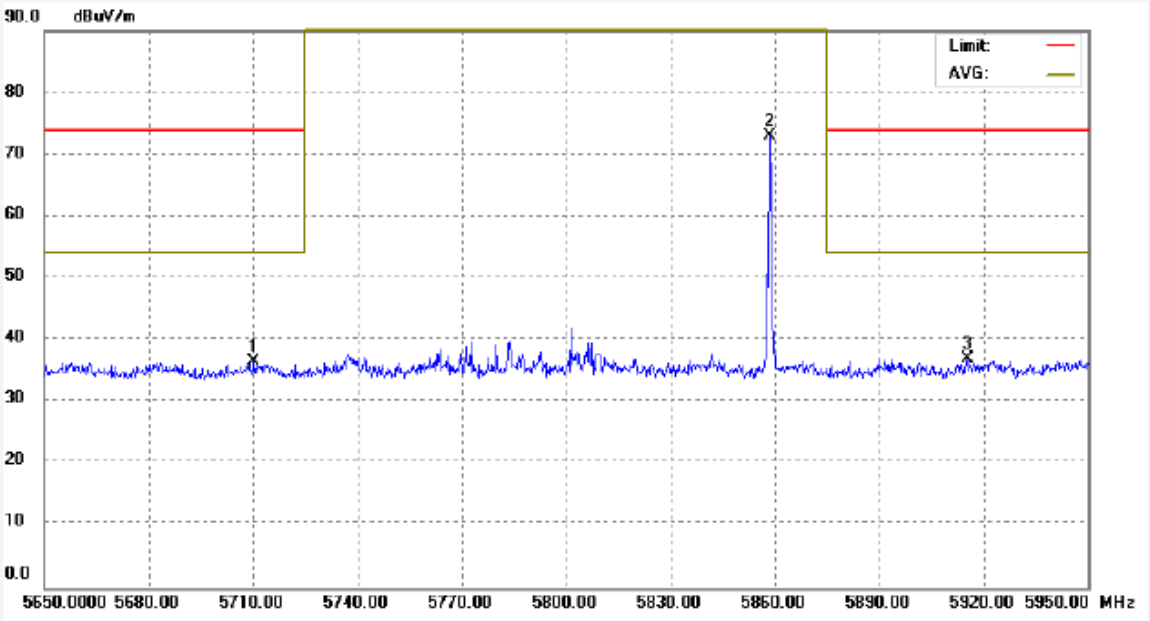
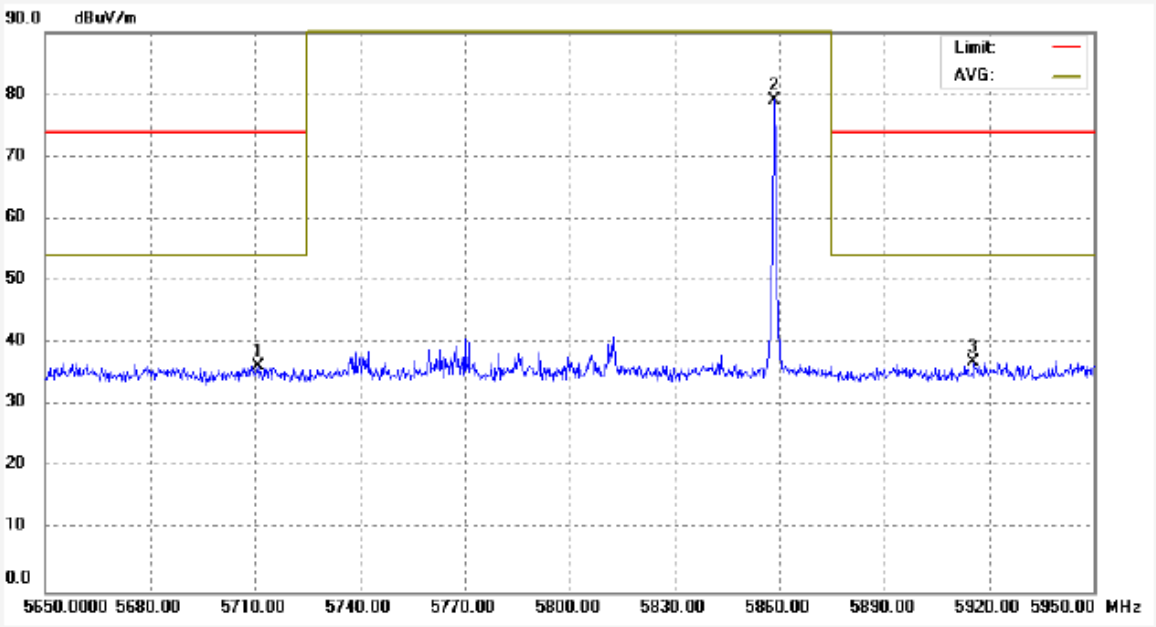


No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	5710.300	39.68	-3.19	36.49	74.00	-37.51	peak	
2	5858.500	76.02	-2.93	73.09	114.00	-40.91	peak	
3	5915.200	39.93	-2.83	37.10	74.00	-36.90	peak	

Antenna Polarization: Horizontal



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	5710.900	39.58	-3.18	36.40	74.00	-37.60	peak	
2	5858.500	82.13	-2.93	79.20	114.00	-34.80	peak	
3	5915.500	39.85	-2.83	37.02	74.00	-36.98	peak	

10 20 dB Bandwidth Measurement

Test Requirement: FCC CFR47 Part 15 Section 15.215(c)

Test Method: ANSI C63.10:2013

Test Mode: Transmitting

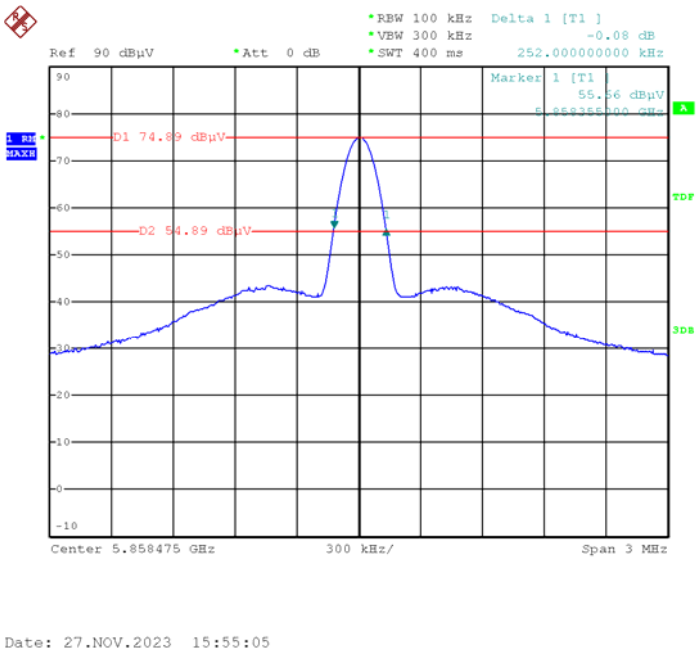
10.1 Test Procedure

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
2. Set the spectrum analyzer: RBW = 1%-5% OBW, VBW = 3RBW

10.2 Test Result

Frequency (MHz)	Bandwidth Emission (KHz)
5858	252.00

Low channel Test plots



11 Antenna Requirement

According to the FCC Part 15 Paragraph 15.203, 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. This product has a Internal Antenna , fulfil the requirement of this section.

12 RF Exposure

Remark: Please refer to MPE test report: WTD23D10233341W002.

13 Photographs - Constructional Details

Note: Please refer to appendix: Appendix- MS033C-Photos

======End of Report======