RF MEASUREMENT REPORT

FCC ID:	VZ43682N
Applicant:	Doran Mfg, LCC
Product:	Tire Pressure Monitoring System Sensor
Model No.:	3682, 3682A, 3682B, 3682C
Brand Name:	Doran
FCC Classification:	FCC Part 15 Security/Remote Control Transmitter (DSC)
FCC Rule Part(s):	Part 15.231
Result:	Complies
Received Date:	2023-08-07
Test Date:	2023-08-11 ~ 2023-08-17

Reviewed By: Sunny Sun

Sunny Sun

Approved By: Robin Wu

Robin Wu

ACCREDITED
TESTING LABORATORY
CERTIFICATE #3628.01

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
2308RSU018-U2	V01	Initial Report	2023-08-28	Valid

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1. General Information

1.1. Applicant

Doran Mfg, LCC

4362 Glendale Milford Road, Cincinnati OH 45242 United States

1.2. Manufacturer

Doran Mfg, LCC

4362 Glendale Milford Road, Cincinnati OH 45242 United States

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: L3261-190725				
	FCC: 291082, TW3261		ISED: TW3261		

1.4. Product Information

Product	Tire Pressure Monitoring System Sensor
Model No.	3682, 3682A, 3682B, 3682C
Brand Name	Doran
Operating Voltage	2.3 ~ 3.6Vdc, Nominal 3.0Vdc (By internal lithium battery)
Operating Temperature	-40 ~ 120°C
EUT Identification No.	20230807Sample#06

Notes:

1. The difference between 3682 and 3682A, 3682B, 3682C is different appearance, model name, label and software, and they have the same circuit schematic, PCB and RF characteristics. Model 3682 was selected for testing is required 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

Frequency Range	434.1MHz
Type of Modulation	FSK
Antenna Type	Monopole Antenna
Antenna Gain	0 dBi

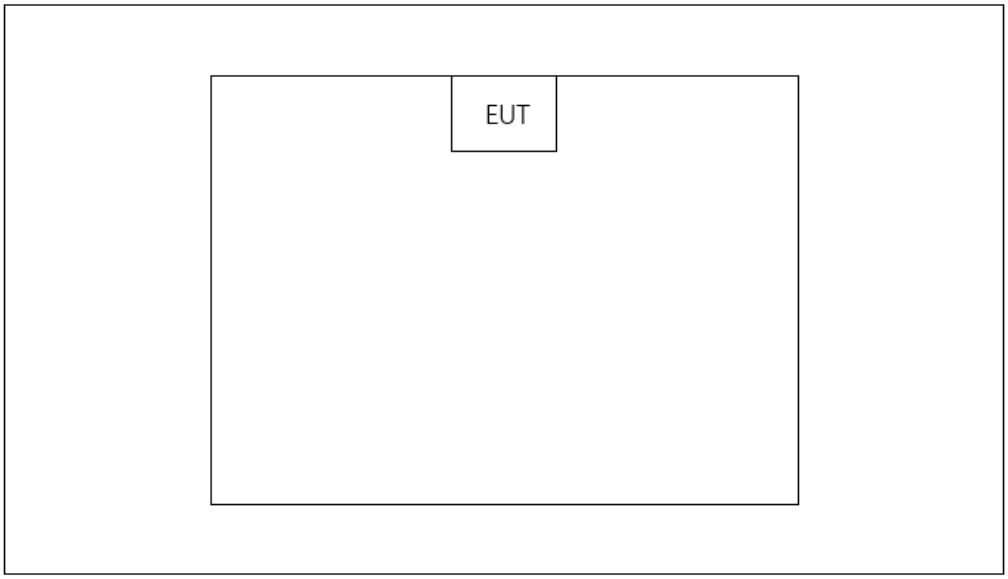
2. Test Configuration

2.1. Test Mode

Mode 1: Transmit at 434.1MHz

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.

Connection Diagram – Radiated Emission testing


2.3. Applied Standards

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

- FCC Part 15.231
- ANSI C63.10-2013

2.4. 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
TRILOG Antenna	Schwarzbeck	VULB 9162	MRTSUE06022	1 year	2024-05-15	WZ-AC2
EMI Test Receiver	Agilent	N9038A	MRTSUE06125	1 year	2024-05-23	WZ-AC2
Thermohygrometer	Mingle	ETH529	MRTSUE06170	1 year	2023-11-27	WZ-AC2
Horn Antenna	Schwarzbeck	BBHA 9120D	MRTSUE06171	1 year	2023-10-13	WZ-AC2
Preamplifier	Schwarzbeck	BBV 9718	MRTSUE06176	1 year	2024-05-07	WZ-AC2
Anechoic Chamber	RIKEN	WZ-AC2	MRTSUE06213	1 year	2024-04-20	WZ-AC2
Thermohygrometer	testo	608-H1	MRTSUE11038	1 year	2023-11-01	WZ-AC2
Loop Antenna	Schwarzbeck	FMZB 1519	MRTSUE06025	1 year	2023-09-29	WZ-AC2

Software	Version	Function
EMI Software	V3.0.0	EMI Test Software
Controller_MF 7802	1.02	RE Antenna & Turntable

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.

Conducted Emission Measurement
The maximum measurement uncertainty is evaluated as: 9kHz~150kHz: 3.58dB 150kHz~30MHz: 3.20dB
Radiated Emission Measurement
The maximum measurement uncertainty is evaluated as: Coaxial: 9kHz~30MHz: 2.59dB Coplanar: 9kHz~30MHz: 2.60dB Horizontal: 30MHz~200MHz: 3.85dB 200MHz~1GHz: 4.36dB 1GHz~5GHz: 4.98dB Vertical: 30MHz~200MHz: 4.06dB 200MHz~1GHz: 5.28dB 1GHz~5GHz: 4.91dB

6. Test Result

6.1. Summary

FCC Part Section(s)	Test Description	Test Condition	Verdict
15.207	AC Conducted Emissions 150kHz - 30MHz	Line Conducted	N/A
15.205,15.231(e)	Radiated Spurious Emissions	Radiated	Pass
15.231(c)	20dB Bandwidth		Pass
15.231(e)	Transmission Time		Pass

Notes:

1) The radiation measurements are performed in X, Y, Z axis positioning. Only the worst case is shown in the report.

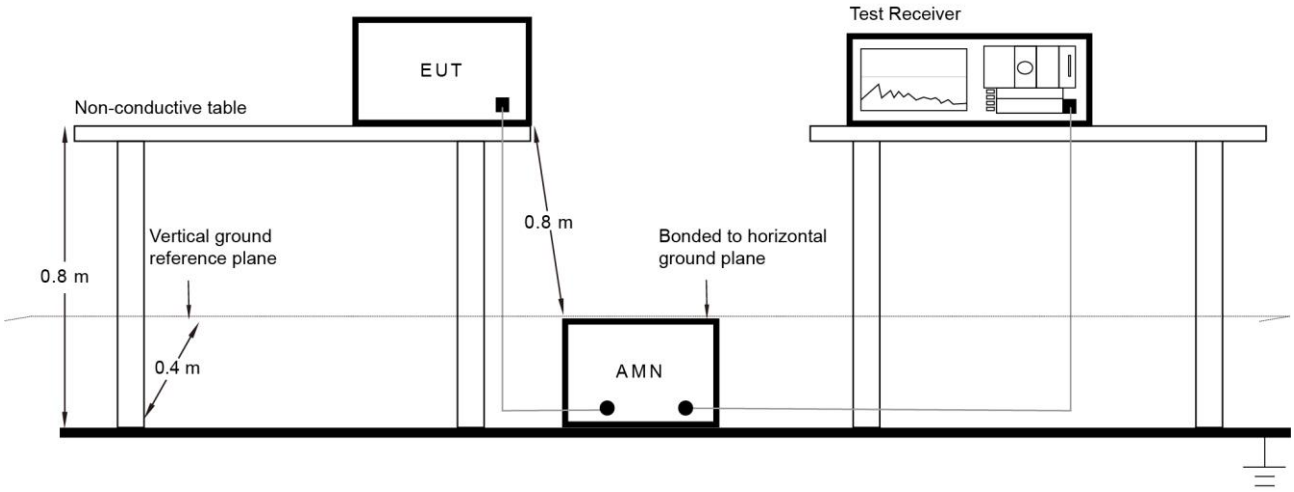
2) “N/A” means this item is not applicable, and the details refer to relevant section.

6.2. Conducted Emission

6.2.1. Test Limit

FCC Part 15.207 Limits		
Frequency (MHz)	QP (dBμV)	AV (dBμV)
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.		

6.2.2.Test Setup



6.2.3.Test Result

The device is powered by internal battery, so this requirement is not applicable.

6.3. Radiated Emissions

6.3.1. Test Limit

According to §15.231(e), the field strength of emissions from intentional radiators operated under this section shall not exceed the following:

Fundamental Frequency (MHz)	Field strength of fundamental (microvolts/meter)	Field strength of spurious emission (microvolts/meter)
40.66 - 40.70	1000	100
70 - 130	500	50
130 - 174	500 to 1500	50 to 150
174 - 260	1500	150
260 - 470	1500 to 5000	150 to 500
Above 470	5000	500

The limits on the field strength of the spurious emissions in the above table are based on the fundamental frequency of the intentional radiator. Spurious emissions shall be attenuated to the average (or, alternatively, CISPR quasi-peak) limits shown in this table or to the general limits shown in §15.209, whichever limit permits a higher field strength.

The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in §15.35 for limiting peak emissions apply. Spurious Radiated Emissions measurements start below or at the lowest crystal frequency.

Compliance with the provisions of §15.205 shall be demonstrated using the measurement instrumentation specified in that section.

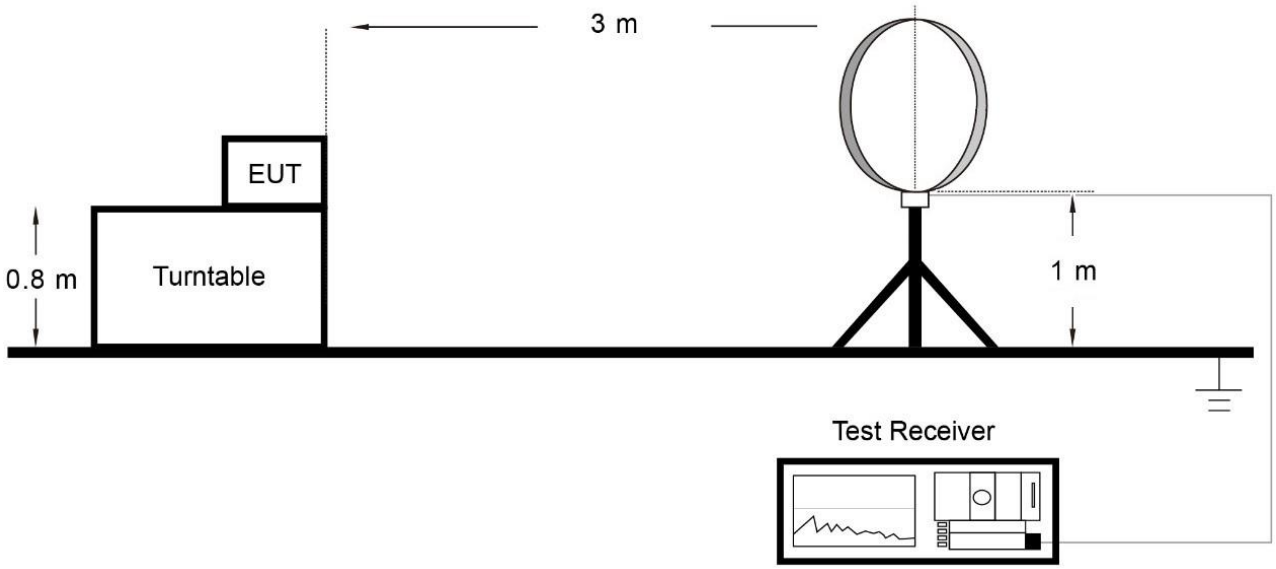
For 15.205 requirement:

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).

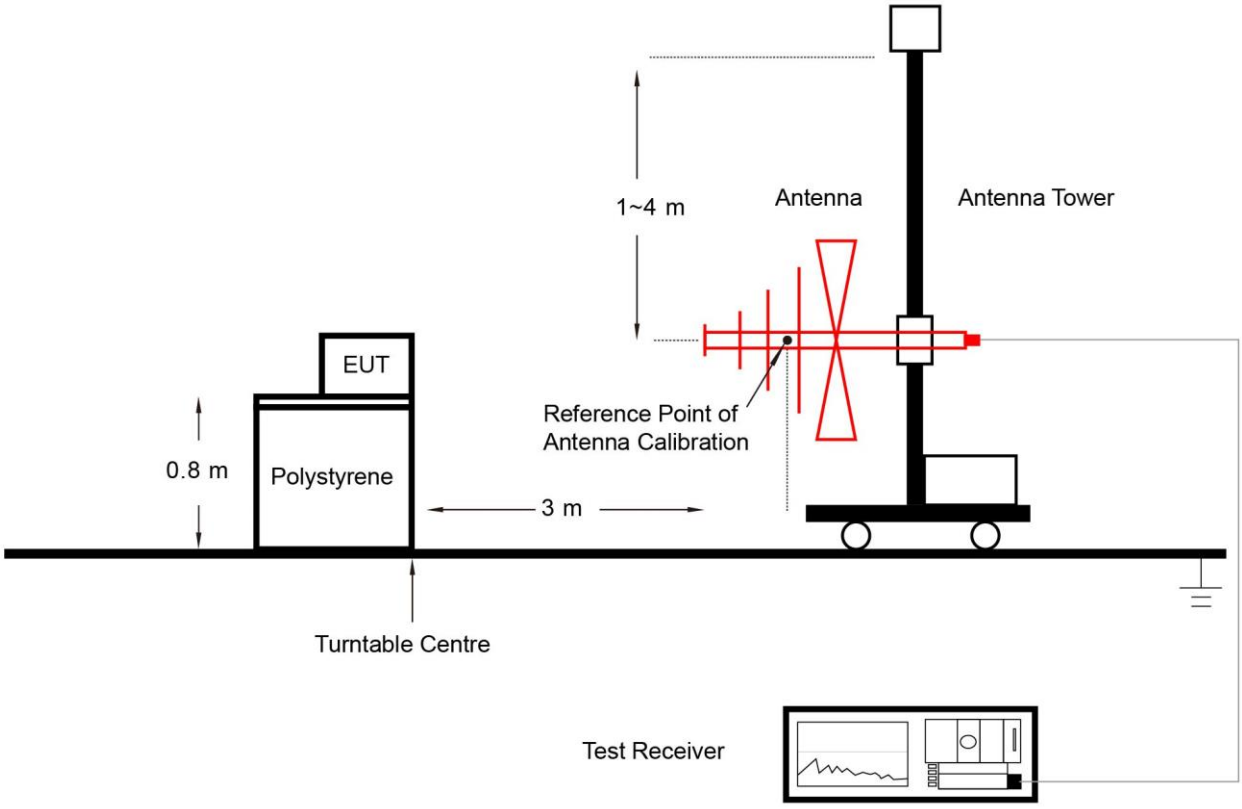
Frequency (MHz)	Frequency (MHz)	Frequency (MHz)	Frequency (GHz)
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
[1] 0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	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	--	--	--

6.3.2. Test Setup

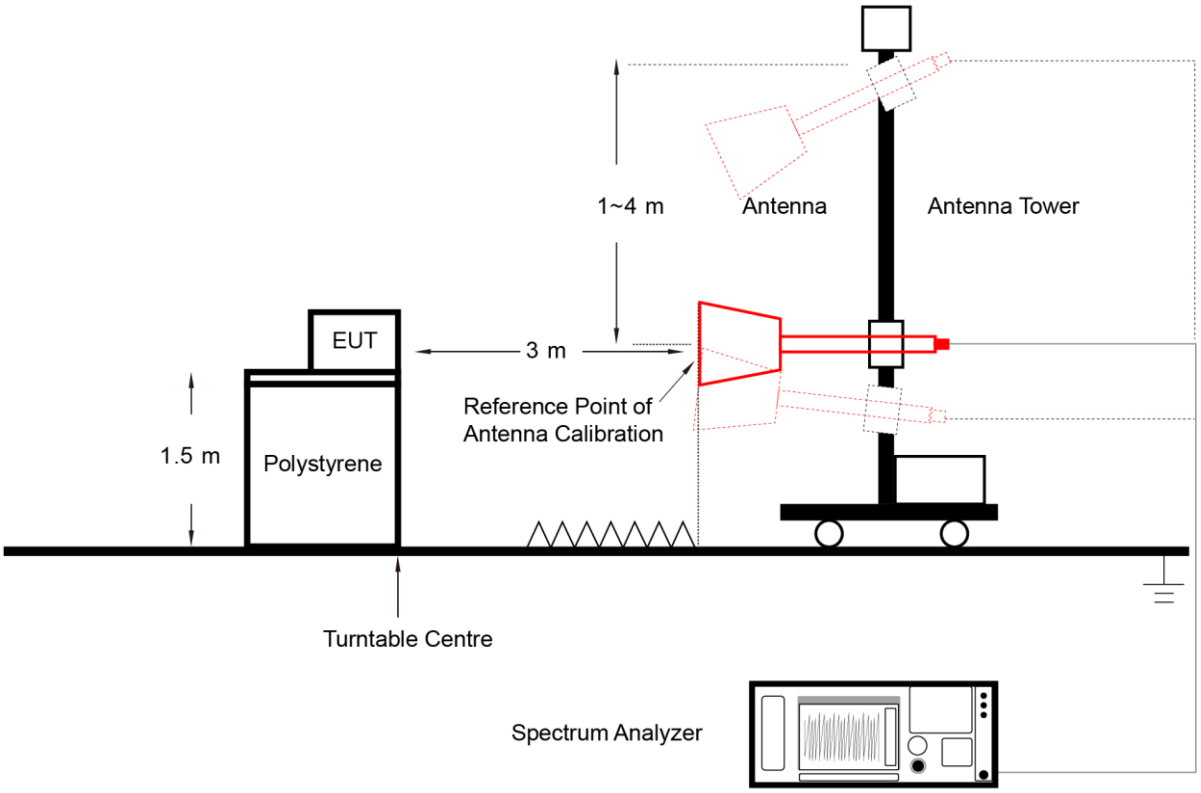
Below 30MHz Test Setup:



Below 1GHz Test Setup:



Above 1GHz Test Setup:



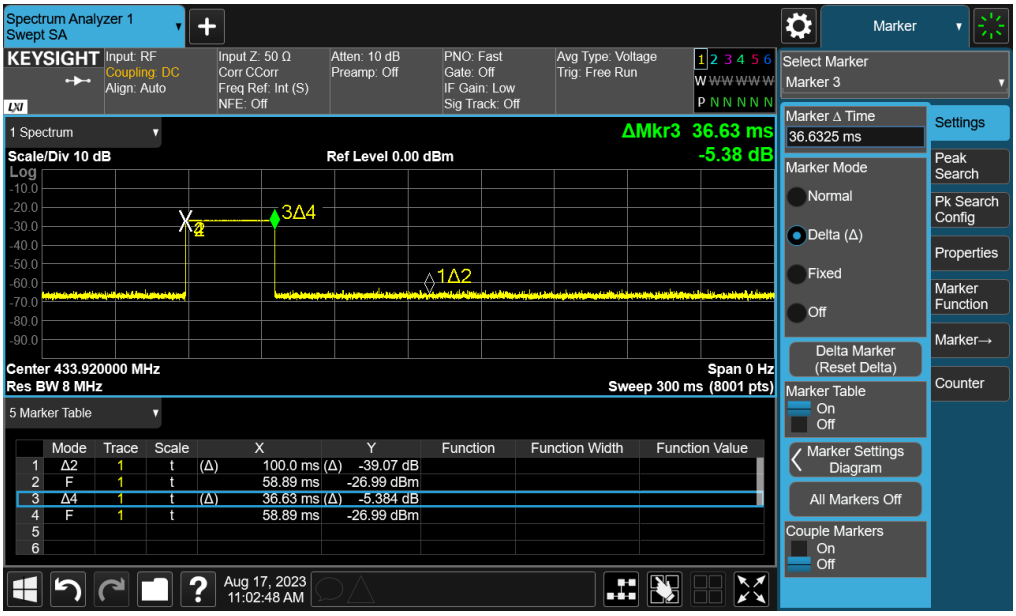
6.3.3.Test Results

Test Site	WZ-AC2	Test Engineer	Dick Shen
Test Date	2023-08-17		

Test Mode	Time On (ms)	One Period (ms)	Duty Cycle (%)	Duty Cycle Factor (dB)
Mode 1	36.63	100	36.63	-8.72

Note: Duty Cycle Factor (dB) = 20*Log_{10}(Duty Cycle) (dB).

Mode 1



Test Site	WZ-AC2	Test Engineer	Dick Shen
Test Date	2023-08-11	Remark	Fundamental Radiated Emission

Frequency (MHz)	Reading Level (dBμV)	Factor (dB/m)	Duty Cycle Factor (dB)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
Mode 1								
434.1	55.224	23.955	N/A	79.179	92.872	-13.693	PK	Horizontal
	55.224	23.955	-8.720	70.459	72.872	-2.413	AV	Horizontal
	57.312	23.955	N/A	81.267	92.872	-11.605	PK	Vertical
	57.312	23.955	-8.720	72.547	72.872	-0.325	AV	Vertical

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

Average Measure Level = Peak Measure Level + Duty Cycle Factor

Factor (dB/m) = Cable Loss (dB) + Antenna Factor (dB/m)

Test Site	WZ-AC2	Test Engineer	Dick Shen
Test Date	2023-08-11	Remark	Radiated Spurious Emissions

Above 1GHz:

Frequency (MHz)	Reading Level (dBμV)	Factor (dB/m)	Duty Cycle Factor (dB)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
Mode 1								
1302.000	53.200	-5.191	N/A	48.009	74.000	-25.991	PK	Horizontal
1302.000	53.200	-5.191	-8.720	39.289	54.000	-14.711	AV	Horizontal
3906.000	42.942	-0.353	N/A	42.589	74.000	-31.411	PK	Horizontal
3906.000	42.942	-0.353	-8.720	33.869	54.000	-20.131	AV	Horizontal
4340.000	49.401	1.518	N/A	50.919	74.000	-23.081	PK	Horizontal
4340.000	49.401	1.518	-8.720	42.199	54.000	-11.801	AV	Horizontal
1302.000	42.448	-5.191	N/A	37.257	74.000	-36.743	PK	Vertical
1302.000	42.448	-5.191	-8.720	28.537	54.000	-25.463	AV	Vertical
1474.000	38.203	-5.250	N/A	32.953	74.000	-41.047	PK	Vertical
1474.000	38.203	-5.250	-8.720	24.233	54.000	-29.767	AV	Vertical
4340.000	45.623	1.518	N/A	47.141	74.000	-26.859	PK	Vertical
4340.000	45.623	1.518	-8.720	38.421	54.000	-15.579	AV	Vertical

Note: Peak 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 Measure Level = Peak Measure Level + Duty Cycle Factor

Test Site	WZ-AC2	Test Engineer	Dick Shen
Test Date	2023-08-17	Remark	Radiated Spurious Emissions

Below 1GHz:

Frequency (MHz)	Reading Level (dBμV)	Factor (dB/m)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
Mode 1							
52.8	1.0	20.4	21.4	40.0	-18.6	QP	Horizontal
106.1	0.5	18.5	19.0	43.5	-24.5	QP	Horizontal
197.3	0.6	18.9	19.5	43.5	-24.0	QP	Horizontal
566.9	0.2	26.2	26.4	46.0	-19.6	QP	Horizontal
758.0	0.3	29.6	29.9	46.0	-16.1	QP	Horizontal
868.1	1.4	30.8	32.2	46.0	-13.8	QP	Horizontal
46.0	1.2	20.1	21.3	40.0	-18.7	QP	Vertical
103.2	1.2	18.6	19.8	43.5	-23.7	QP	Vertical
196.4	0.5	18.9	19.4	43.5	-24.1	QP	Vertical
287.5	2.1	20.8	22.9	46.0	-23.1	QP	Vertical
573.2	0.1	26.4	26.5	46.0	-19.5	QP	Vertical
775.0	1.4	29.3	30.7	46.0	-15.3	QP	Vertical

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

Factor (dB/m) = Cable Loss (dB) + Antenna Factor (dB/m)

6.4. 20dB Bandwidth

6.4.1. Test Limit

According to FCC Part 15.231(c), the bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70MHz and below 900MHz. Bandwidth is determined at the points 20 dB down from the modulated carrier.

6.4.2.Test Procedure

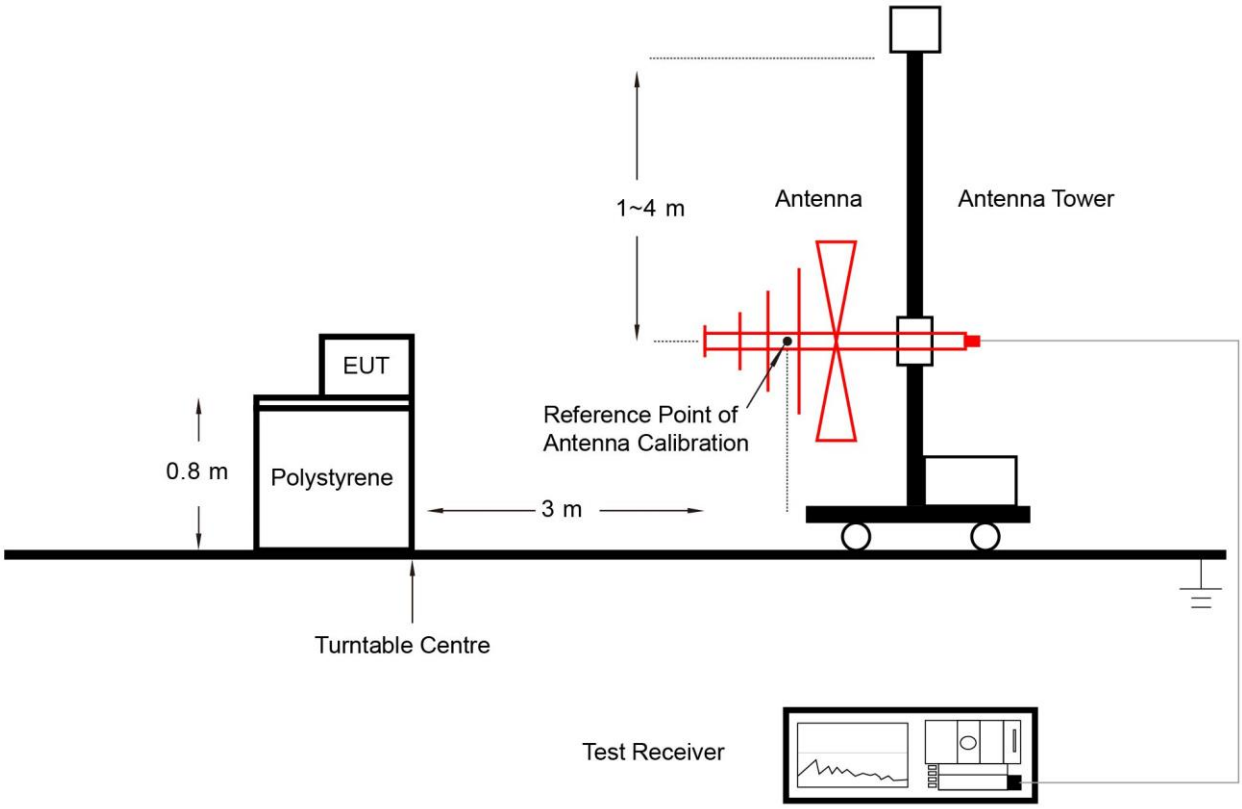
ANSI C63.10-2013 Clause 6.9.2

6.4.3.Test Setting

20dB Bandwidth:

1. The Spectrum's automatic bandwidth measurement capability was used to perform the 20dB bandwidth measurement. The "X" dB bandwidth parameter was set to X = 20. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
2. Set the spectrum span shall be between 2 times and 5 times the OBW
3. Set RBW = 1% to 5% of the OBW
4. VBW ≥ 3 × RBW
5. Detector = Peak
6. Trace mode = Max hold
7. Sweep = Auto couple

6.4.4. Test Setup

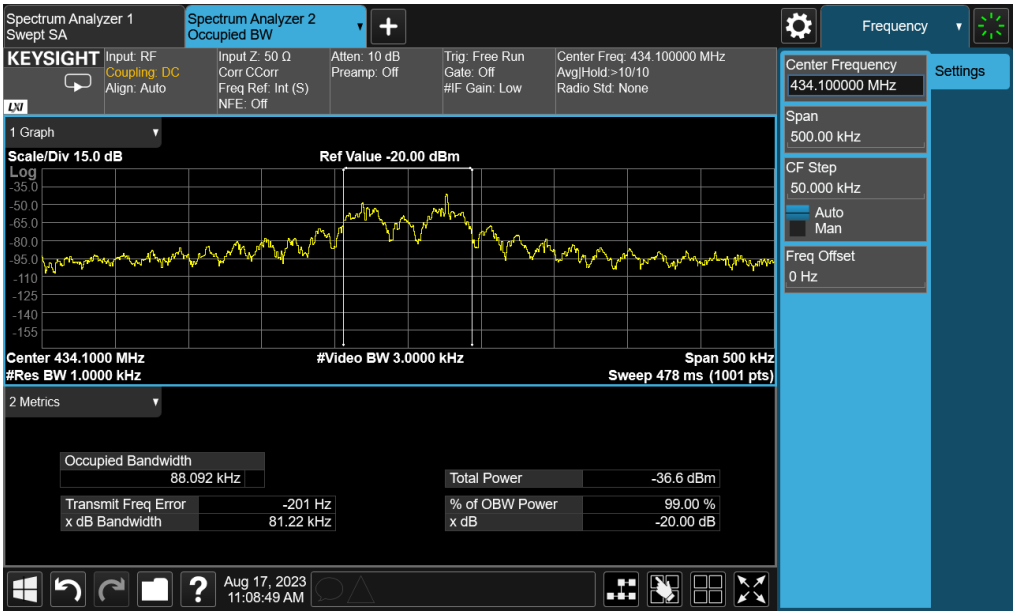


6.4.5. Test Result

Test Site	WZ-AC2	Test Engineer	Dick Shen
Test Date	2023-08-17		

Test Mode	20dB Bandwidth (kHz)	Limit (kHz)	Result
Mode 1	81.22	≤ 1085.25	Pass

Note: Limit = Fundamental Frequency * 0.25% = 434.1MHz * 0.25% = 1085.25 kHz

Mode 1


6.5. Transmission Time

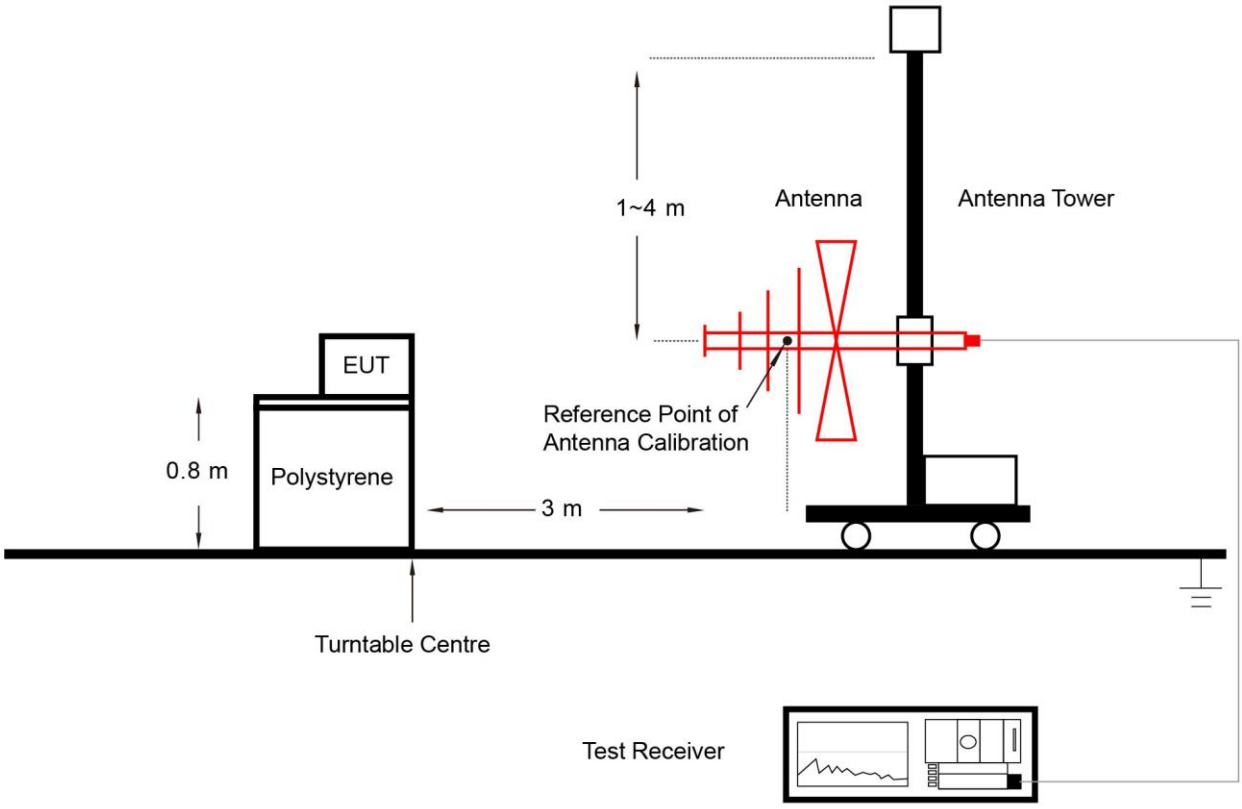
6.5.1. Test Limit

According to FCC 15.231(e), devices operated under the provisions of this paragraph shall be provided with a means for automatically limiting operation so that the duration of each transmission shall not be greater than one second and the silent period between transmissions shall be at least 30 times the duration of the transmission but in no case less than 10 seconds.

6.5.2. Test Procedure

With the EUT's antenna attached, the EUT's output signal was received by the test antenna, which was connected to the spectrum analyzer. Set the center frequency to fundamental frequency, then set the spectrum analyzer to Zero Span for the release time reading. During the testing, the switch was released then the EUT automatically deactivated.

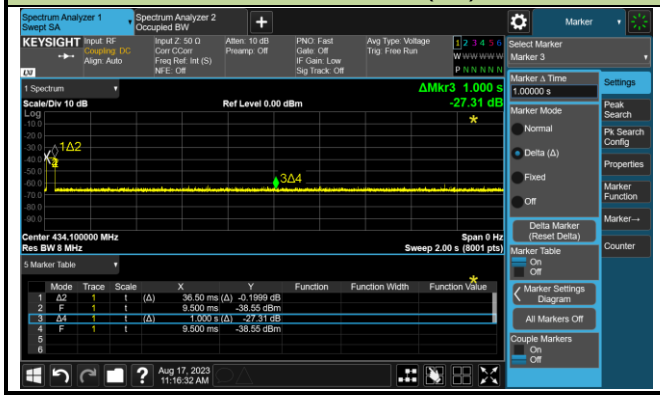
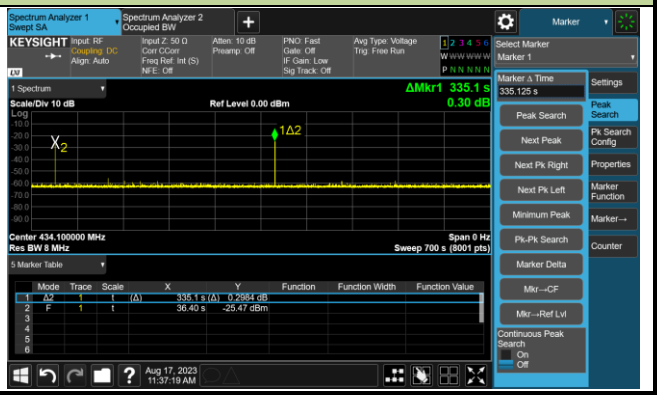
6.5.3. Test Setup



6.5.4. Test Result

Test Site	WZ-AC2	Test Engineer	Dick Shen
Test Date	2023-08-17		

Test Mode	Item	Measured Value	Limit	Result
Mode 1	Transmission Time (T_{on})	36.5 ms	≤ 1 s	Pass
	Silent Time	335.1 s	≥ 10 s	Pass
	Silent Time/Transmission Time	9180.82	≥ 30 times	Pass

Mode 1	
Transmission Time (T_{on})	Silent Time
	

Appendix A - Test Setup Photograph

Refer to “2308RSU018-UT” file.

Appendix B - EUT Photograph

Refer to “2308RSU018-UE” file.