



RF MEASUREMENT REPORT

FCC ID: VZ43607N

Applicant: Doran Manufacturing LLC

Product: Doran TPMS Sensor for OTR

Model No.: 3607

Brand Name: Doran

FCC Classification: FCC Part 15 Security/Remote Control Transmitter (DSC)

FCC Rule Part(s): Part 15.231

Result: Complies

Test Date: 2022-09-19 ~ 2022-10-20

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
2209RSU008-U2	Rev. 01	Initial Report	2022-10-20	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	6
2. Test Configuration.....	7
2.1. Test Mode	7
2.2. Test System Connection Diagram	7
2.3. Applied Standards	7
2.4. Test Environment Condition.....	7
3. Antenna Requirements	8
4. Measuring Instrument.....	9
5. Decision Rules and Measurement Uncertainty	10
5.1. Decision Rules.....	10
5.2. Measurement Uncertainty	10
6. Test Result	11
6.1. Summary	11
6.2. Conducted Emission.....	12
6.2.1. Test Limit.....	12
6.2.2. Test Setup.....	12
6.2.3. Test Result	12
6.3. Radiated Emissions	13
6.3.1. Test Limit.....	13
6.3.2. Test Setup.....	15
6.3.3. Test Results	16
6.4. 20dB Bandwidth.....	19
6.4.1. Test Limit.....	19
6.4.2. Test Procedure.....	19
6.4.3. Test Setting	19
6.4.4. Test Setup.....	19
6.4.5. Test Result	20
6.5. Transmission Time.....	21
6.5.1. Test Limit.....	21

6.5.2. Test Procedure.....	21
6.5.3. Test Setup.....	21
6.5.4. Test Result.....	22
Appendix A - Test Setup Photograph	23
Appendix B - EUT Photograph.....	24

1.4. Product Information

Product	Doran TPMS Sensor for OTR
Model No.	3607
Brand Name	Doran
Operating Voltage	3.0Vdc (By internal lithium battery)
Operating Temperature	-40 ~ 120°C
Test Device Identification No.	20220905Sample#05, Conducted Test 20220929Sample#02, Radiated Test
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

Frequency Range	434.10MHz
Type of Modulation	FSK
Antenna Type	PCB Antenna
Antenna Gain	0 dBi

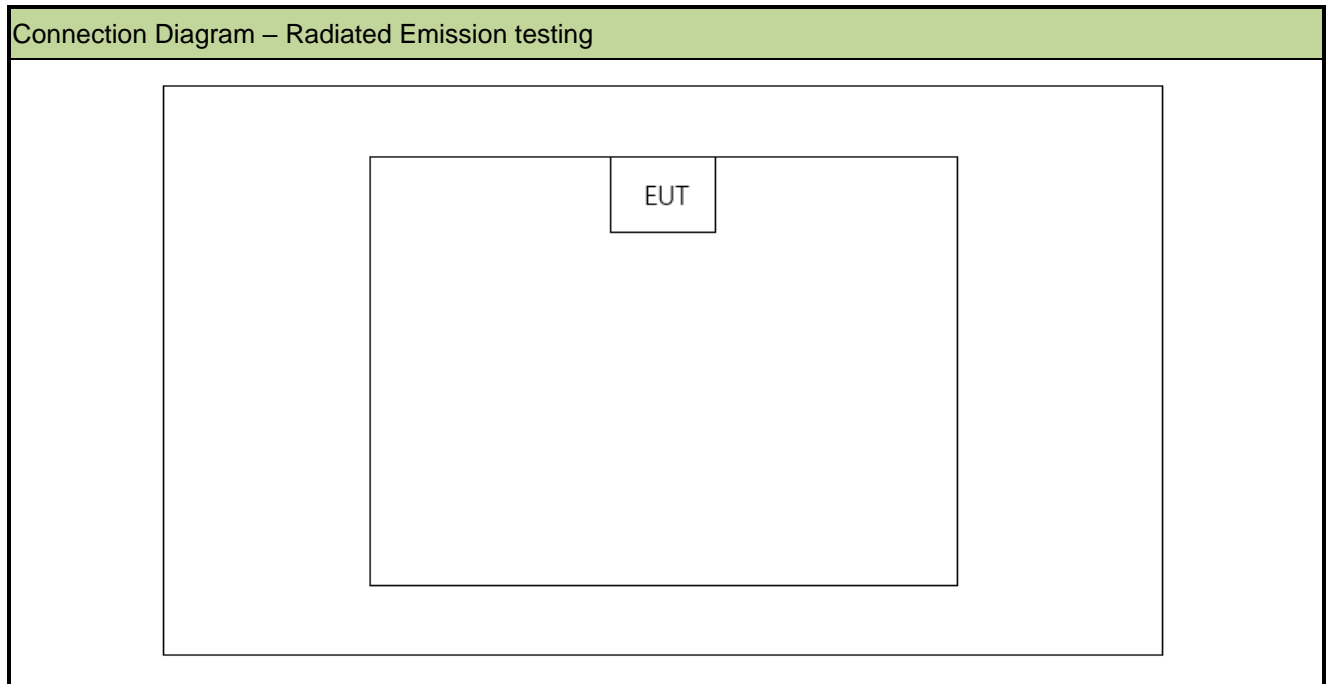
2. Test Configuration

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 and AC line conducted 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
EMI Test Receiver	R&S	ESR3	MRTSUE06185	1 year	2022-12-29	SIP-AC3
Signal Analyzer	Keysight	N9010B	MRTSUE06559	1 year	2023-06-01	SIP-AC3
Loop Antenna	Schwarzbeck	FMZB 1519 B	MRTSUE06937	1 year	2023-03-14	SIP-AC3
TRILOG Antenna	Schwarzbeck	VULB 9168	MRTSUE06646	1 year	2023-08-16	SIP-AC3
Horn Antenna	R&S	HF907	MRTSUE06611	1 year	2023-07-30	SIP-AC3
Preamplifier	EMCI	EMC012645SE	MRTSUE06642	1 year	2023-01-13	SIP-AC3
Thermohygrometer	testo	608-H1	MRTSUE06619	1 year	2022-11-02	SIP-AC3
Thermohygrometer	testo	608-H1	MRTSUE06622	1 year	2022-11-28	SIP-AC3
Anechoic Chamber	RIKEN	SIP-AC3	MRTSUE06782	1 year	2022-12-23	SIP-AC3
Signal Analyzer	Keysight	N9010B	MRTSUE06558	1 year	2023-06-01	SIP-TR1
Thermohygrometer	testo	608-H1	MRTSUE11022	1 year	2022-11-02	SIP-TR1

Software	Version	Function
EMI Software	V3.0.0	EMI Test Software
Controller_MF 7802BS	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: 3.74dB 150kHz~30MHz: 3.44dB
Radiated Emission Measurement
The maximum measurement uncertainty is evaluated as: Horizontal: 30MHz~300MHz: 5.04dB 300MHz~1GHz: 4.95dB 1GHz~40GHz: 6.40dB Vertical: 30MHz~300MHz: 5.24dB 300MHz~1GHz: 6.03dB 1GHz~40GHz: 6.40dB

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

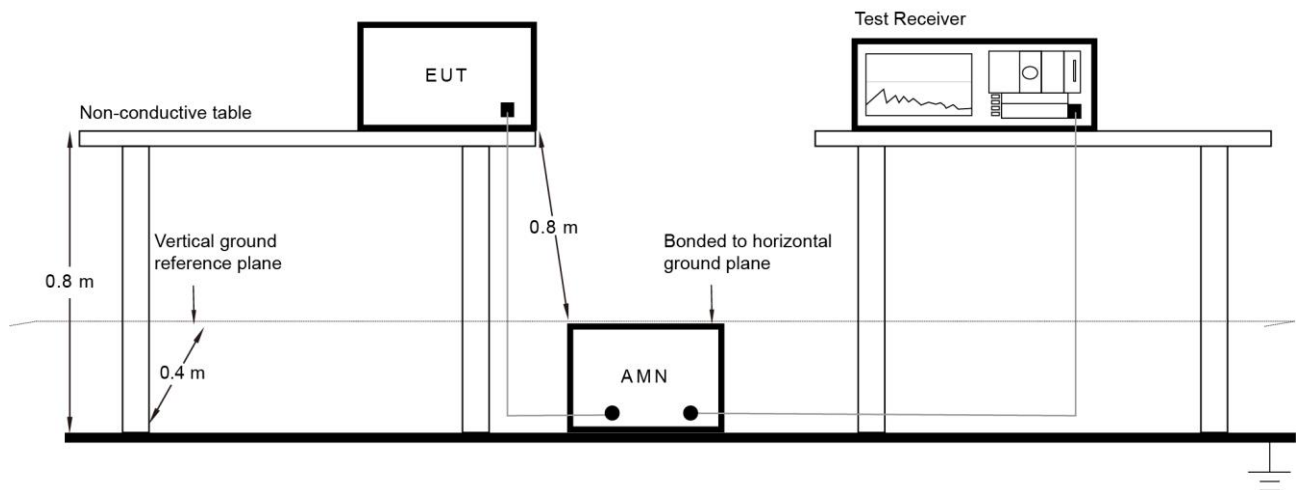
6.2.1. Test Limit

FCC Part 15.207 Limits		
Frequency (MHz)	QP (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.

6.2.2. 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.

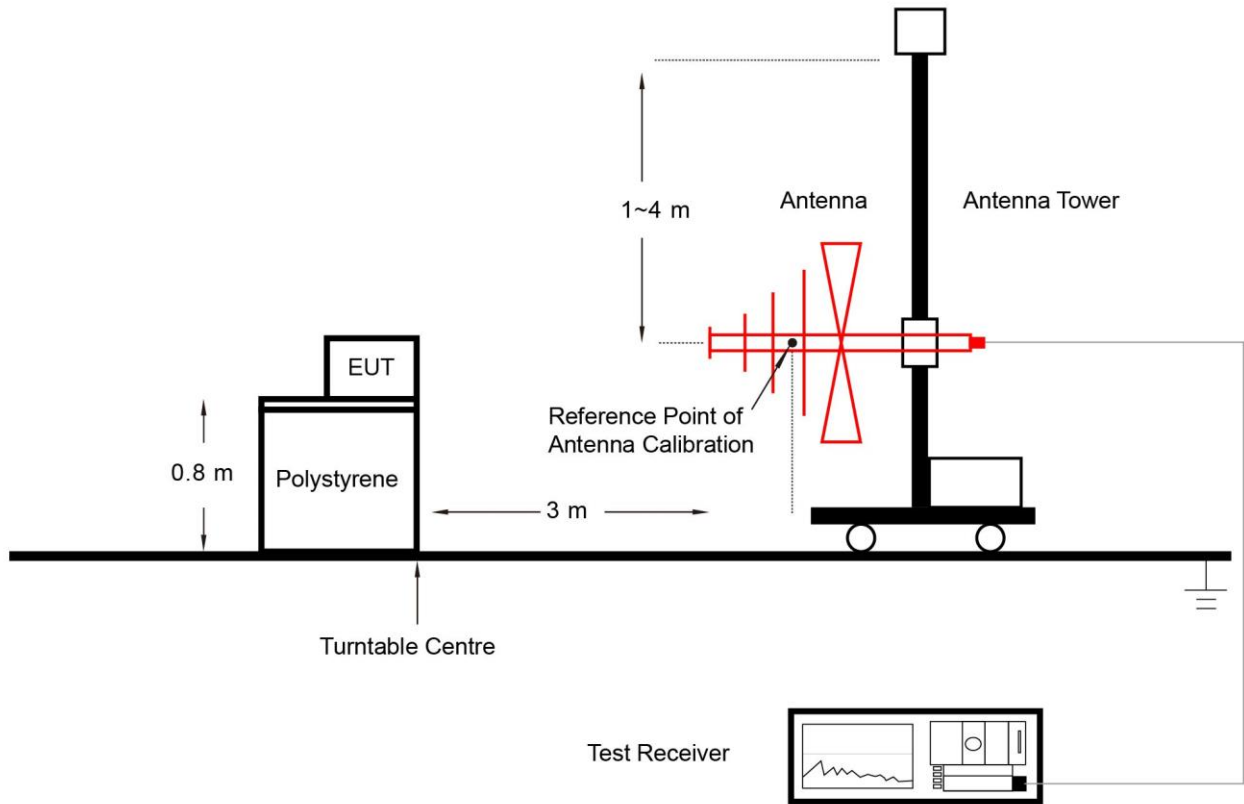
For 15.205 requirement:

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).

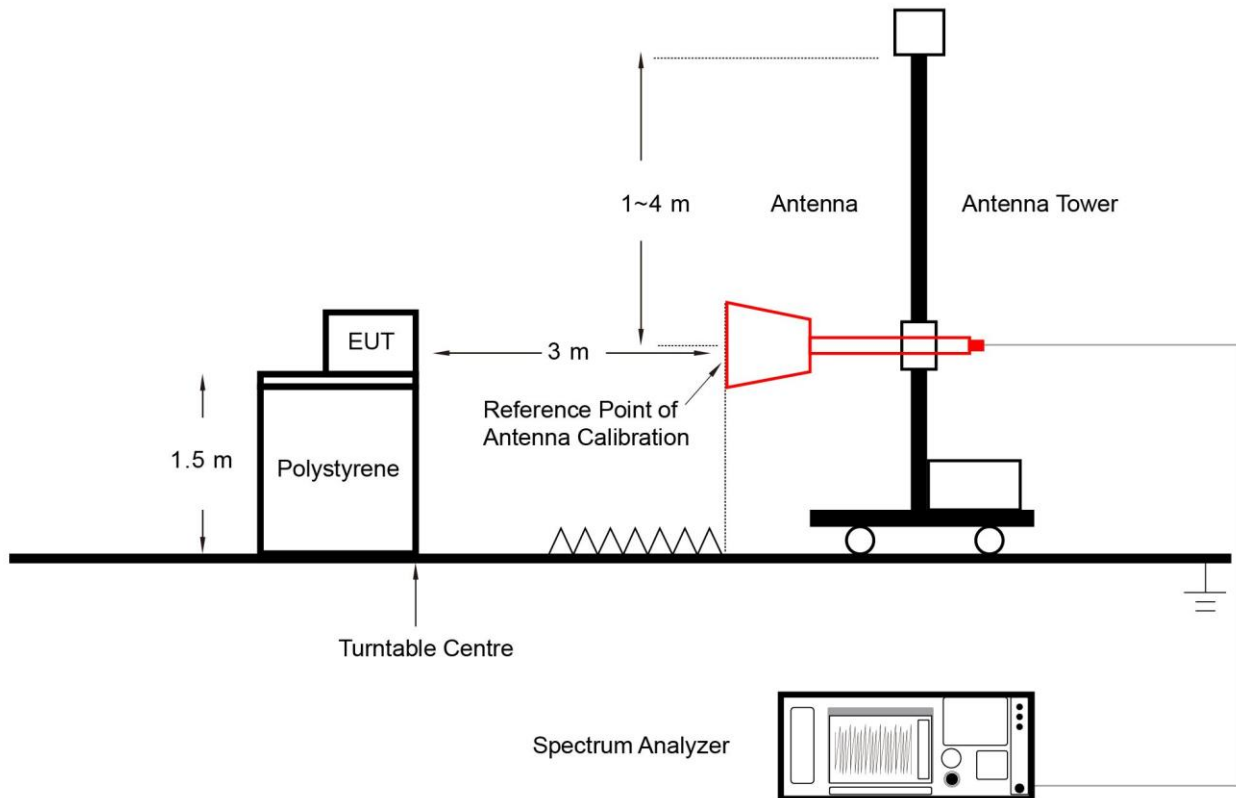
Frequency (MHz)	Frequency (MHz)	Frequency (MHz)	Frequency (GHz)
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
¹ 0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775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



Above 1GHz Test Setup:

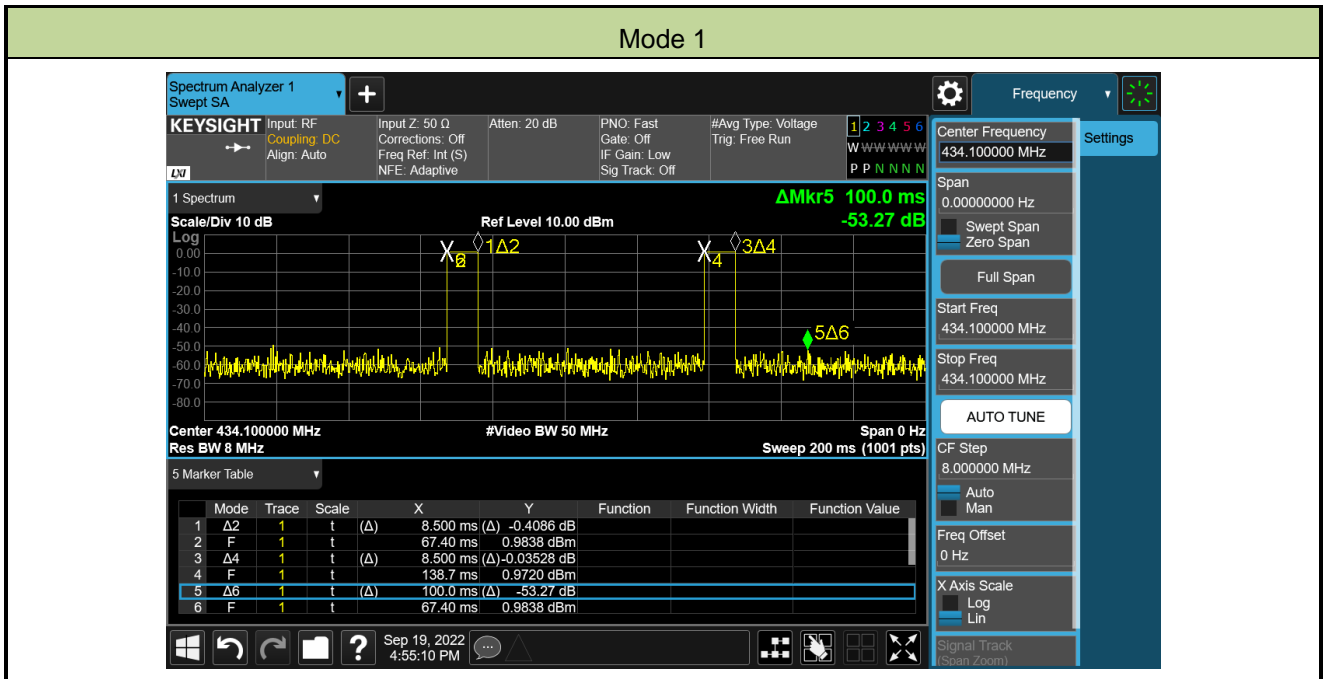


6.3.3. Test Results

Test Site	SIP-AC3	Test Engineer	Simon Lu
Test Date	2022-09-19		

Test Mode	Time On (ms)	One Period (ms)	Duty Cycle (%)	Duty Cycle Factor (dB)
Mode 1	17.00	100	17.00	-15.39

Note: Duty Cycle Factor (dB) = 20*Log₁₀(Duty Cycle) (dB).



Test Site	SIP-AC3	Test Engineer	Simon Lu
Test Date	2022-09-20	Remark	Fundamental Radiated Emission

Frequency (MHz)	Reading Level (dB μ V)	Factor (dB/m)	Duty Cycle Factor (dB)	Measure Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Detector	Polarization
Mode 1								
434.1	57.11	21.82	N/A	78.93	92.87	-13.94	PK	Horizontal
	57.11	21.82	-15.39	63.54	72.87	-9.33	AV	Horizontal
	53.76	21.82	N/A	75.58	92.87	-17.29	PK	Vertical
	53.76	21.82	-15.39	60.19	72.87	-12.68	AV	Vertical
Note: Measure Level (dB μ V/m) = Reading Level (dB μ V) + Factor (dB/m) Average Measure Level = Peak Measure Level + Duty Cycle Factor Factor (dB/m) = Cable Loss (dB) + Antenna Factor (dB/m)								

Test Site	SIP-AC3	Test Engineer	Simon Lu
Test Date	2022-09-20	Remark	Radiated Spurious Emissions

Frequency (MHz)	Reading Level (dB μ V)	Factor (dB/m)	Duty Cycle Factor (dB)	Measure Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Detector	Polarization
Mode 1								
868.08	18.49	28.76	N/A	47.25	74.00	-25.62	PK	Horizontal
868.08	18.49	28.76	-15.39	31.86	54.00	-21.01	AV	Horizontal
2170.00	63.33	-15.41	N/A	47.92	74.00	-26.08	PK	Horizontal
2170.00	63.33	-15.41	-15.39	32.53	54.00	-21.47	AV	Horizontal
2604.00	61.15	-13.95	N/A	47.20	74.00	-26.80	PK	Horizontal
2604.00	61.15	-13.95	-15.39	31.81	54.00	-22.19	AV	Horizontal
3038.00	68.05	-12.44	N/A	55.61	74.00	-18.39	PK	Horizontal
3038.00	68.05	-12.44	-15.39	40.22	54.00	-13.78	AV	Horizontal
3908.00	64.19	-9.55	N/A	54.64	74.00	-19.36	PK	Horizontal
3908.00	64.19	-9.55	-15.39	39.25	54.00	-14.75	AV	Horizontal
4342.00	60.81	-8.91	N/A	51.90	74.00	-22.10	PK	Horizontal
4342.00	60.81	-8.91	-15.39	36.51	54.00	-17.49	AV	Horizontal
868.08	6.65	28.76	N/A	35.41	72.87	-37.46	PK	Vertical
868.08	6.65	28.76	-15.39	20.02	52.87	-32.85	AV	Vertical
2170.00	57.82	-15.41	N/A	42.41	74.00	-31.59	PK	Vertical
2170.00	57.82	-15.41	-15.39	27.02	54.00	-26.98	AV	Vertical
2604.00	59.12	-13.95	N/A	45.17	74.00	-28.83	PK	Vertical
2604.00	59.12	-13.95	-15.39	29.78	54.00	-24.22	AV	Vertical
3038.00	64.94	-12.44	N/A	52.50	74.00	-21.50	PK	Vertical
3038.00	64.94	-12.44	-15.39	37.11	54.00	-16.89	AV	Vertical
3906.00	60.80	-9.56	N/A	51.24	74.00	-22.76	PK	Vertical
3906.00	60.80	-9.56	-15.39	35.85	54.00	-18.15	AV	Vertical
4342.00	60.70	-8.91	N/A	51.79	74.00	-22.21	PK	Vertical
4342.00	60.70	-8.91	-15.39	36.40	54.00	-17.60	AV	Vertical

Note 1: Peak Measure Level (dB μ V/m) = Reading Level (dB μ V) + 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

Note 2: The test trace is same as the ambient noise (the test frequency range: 9 kHz ~ 30 MHz), therefore no data appear in the report.

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

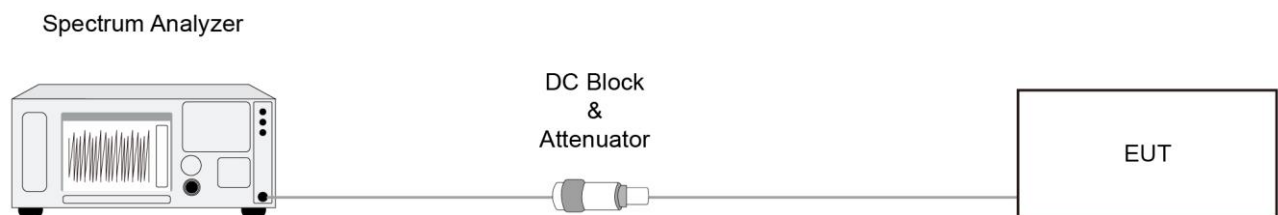
ANSI C63.10-2013 Clause 6.9.2

6.4.3. Test Setting

20dB Bandwidth:

1. Set the spectrum span shall be between 2 times and 5 times the OBW
2. Set RBW = 1% to 5% of the OBW
3. VBW $\geq 3 \times$ RBW
4. Detector = Peak
5. Trace mode = Max hold
6. Sweep = Auto couple

6.4.4. Test Setup

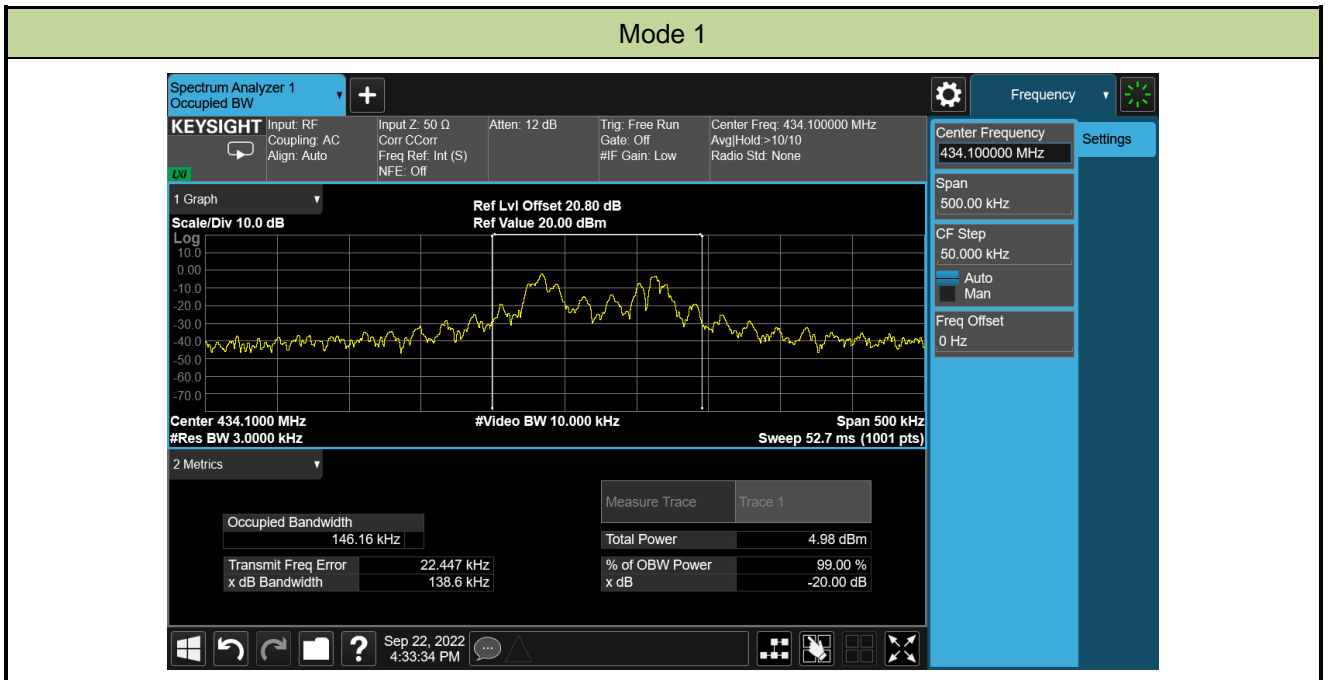


6.4.5. Test Result

Test Site	SIP-TR1	Test Engineer	Chase Zhu
Test Date	2022-09-22		

Test Mode	20dB Bandwidth (kHz)	Limit (kHz)	Result
Mode 1	138.6	≤ 1085.25	Pass

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



6.5. Transmission Time

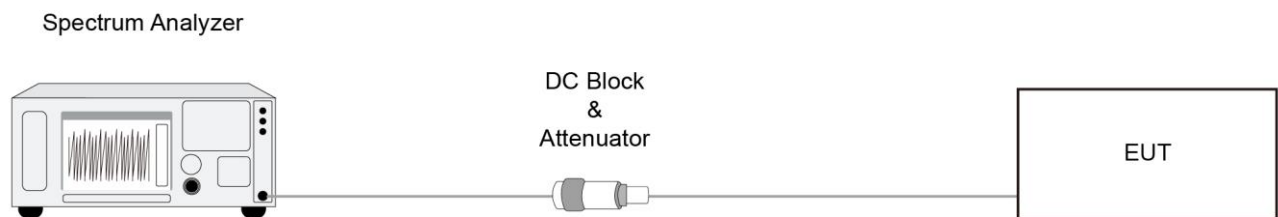
6.5.1. Test Limit

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.

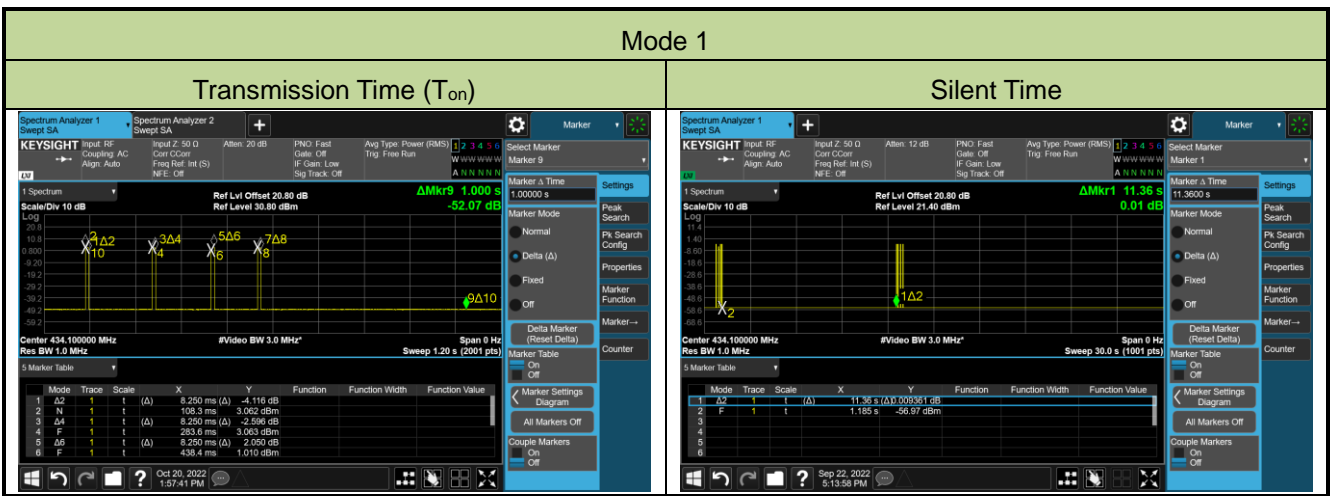
6.5.3. Test Setup



6.5.4. Test Result

Test Site	SIP-TR1	Test Engineer	Chase Zhu
Test Date	2022-09-22 ~ 2022-10-20		

Test Mode	Item	Measured Value	Limit	Result
Mode 1	Transmission Time (T _{on})	33 ms	≤ 1 s	Pass
	Silent Time	11.36 s	≥ 10 s	Pass
	Silent Time/Transmission Time	344.24	≥ 30 times	Pass



Appendix A - Test Setup Photograph

Refer to "2209RSU008-UT" file.

Appendix B - EUT Photograph

Refer to "2209RSU008-UE" file.