



# RF MEASUREMENT REPORT

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**FCC ID:** VZ4368485N

**Applicant:** Doran Manufacturing LLC

**Product:** Doran TPMS Sensor for Truck with 433.92MHz

**Model No.:** 3684, 3685, 3685A, 3684C

**Brand Name:** Doran

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

**FCC Rule Part(s):** Part 15.231

**Result:** Complies

**Received Date:** 2022-12-14

**Test Date:** 2022-12-26 ~ 2023-03-07

**Reviewed By:**

\_\_\_\_\_  
Kevin Guo

**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.

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### Revision History

Report No.	Version	Description	Issue Date	Note
2212RSU052-U2	V01	Initial Report	2023-01-19	Invalid
2212RSU052-U2	V02	Add two test modes	2023-03-09	Valid

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#### 1.4. Product Information

Product	Doran TPMS Sensor for Truck with 433.92MHz
Model No.	3684, 3685, 3685A, 3684C
Brand Name	Doran
Operating Voltage	2.3 ~ 3.6Vdc, Nominal 3.0Vdc (By internal lithium battery)
Operating Temperature	-40 ~ 120°C
Test Device Information	
Test Model	3684, 3684C, 3685A
Test Device Identification No.	20221219Sample#04 (3684) 20230215Sample#06 (3684C) 20230215Sample#10 (3685A) 20230306Sample#01 (3685A)
Notes:	
<ol style="list-style-type: none"> <li>The model 3685 is the same as 3684 except different model number and low- frequency inductor, which does not affect radio parameters.</li> <li>The model 3684C is the same as 3684 except different model number and software version.</li> <li>The model 3685A is the same as 3684 except different model number, software version and low- frequency inductor.</li> <li>The information of EUT was provided by the manufacturer, and the accuracy of the information shall be the responsibility of the manufacturer.</li> </ol>	

#### 1.5. Radio Specification

Frequency Range	433.92MHz
Type of Modulation	FSK
Antenna Type	PCB Antenna
Antenna Gain	0 dBi

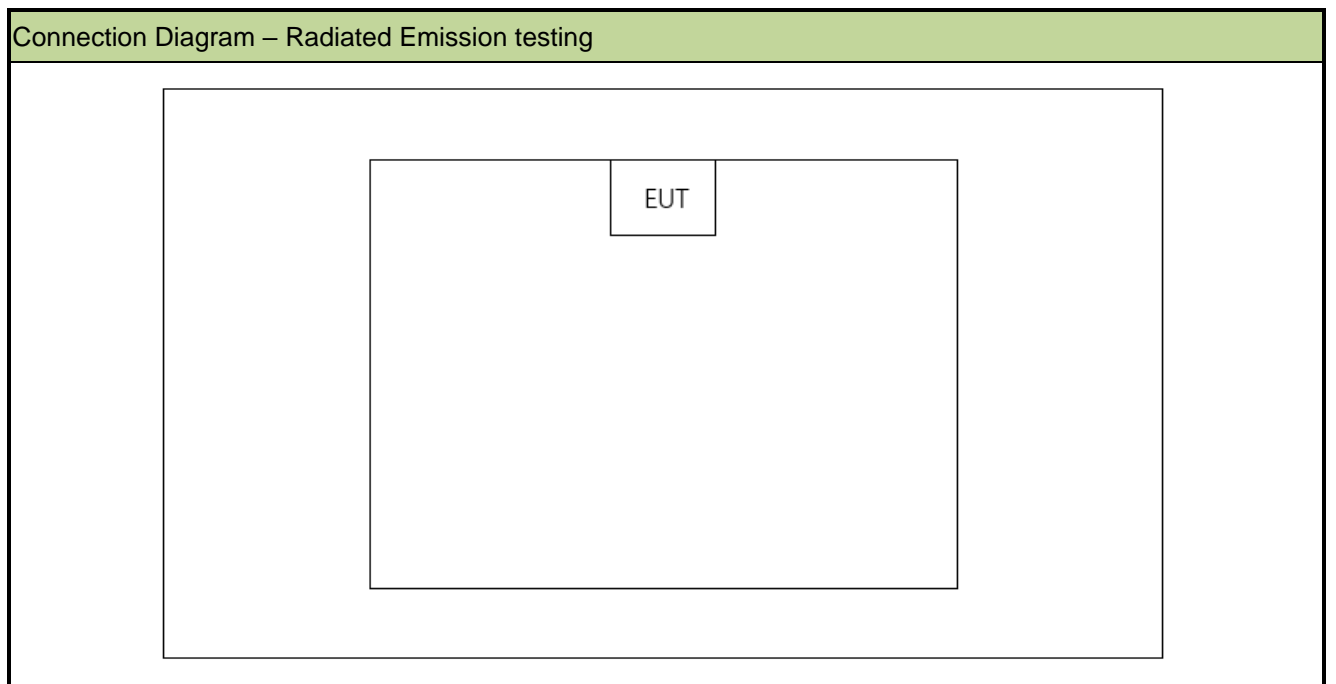
## 2. Test Configuration

### 2.1. Test Mode

Mode 1: Transmit at 433.92MHz with Model 3684
Mode 2: Transmit at 433.92MHz with Model 3684C
Mode 3: Transmit at 433.92MHz with Model 3685A

### 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.



### 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
Horn Antenna	Schwarzbeck	BBHA 9120D	MRTSUE06023	1 year	2023-08-22	WZ-AC1
Preamplifier	Agilent	83017A	MRTSUE06076	1 year	2023-05-08	WZ-AC1
TRILOG Antenna	Schwarzbeck	VULB 9168	MRTSUE06172	1 year	2023-06-21	WZ-AC1
Loop Antenna	Schwarzbeck	FMZB 1519	MRTSUE06025	1 year	2023-09-29	WZ-AC1
Anechoic Chamber	TDK	WZ-AC1	MRTSUE06212	1 year	2023-04-21	WZ-AC1
Thermohygrometer	testo	608-H1	MRTSUE06403	1 year	2023-06-06	WZ-AC1
Signal Analyzer	Keysight	N9010B	MRTSUE06457	1 year	2023-06-04	WZ-AC1
Thermohygrometer	testo	608-H1	MRTSUE11039	1 year	2023-11-01	WZ-AC1

Software	Version	Function
EMI Software	V3.0.0	EMI Test Software
Controller_MF 7802	2.03C	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

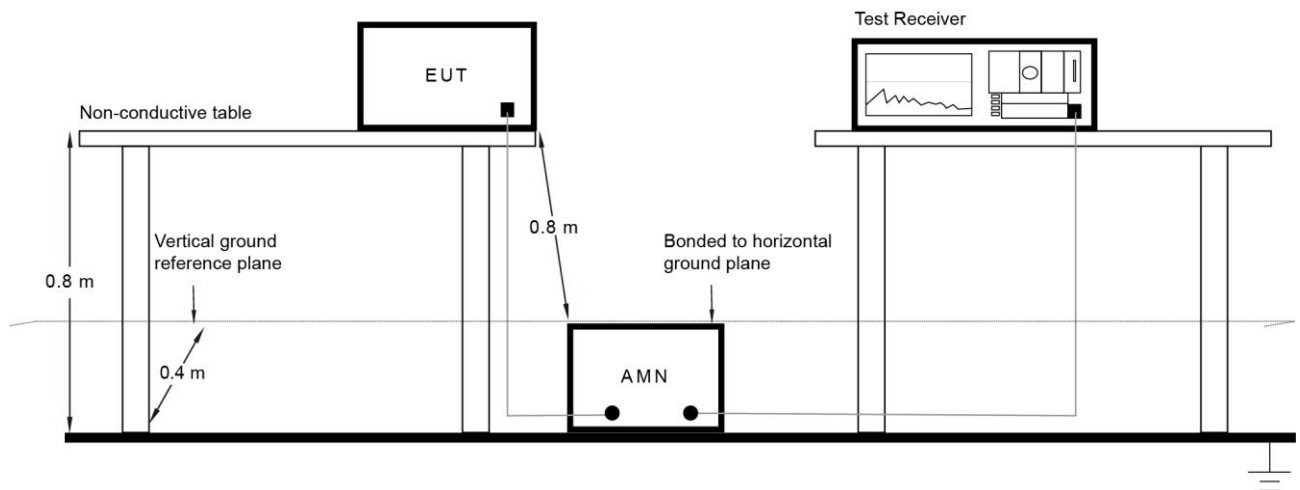
### 6.2.1. Test Limit

FCC Part 15.207 Limits		
Frequency (MHz)	QP (dB $\mu$ V)	AV (dB $\mu$ 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.

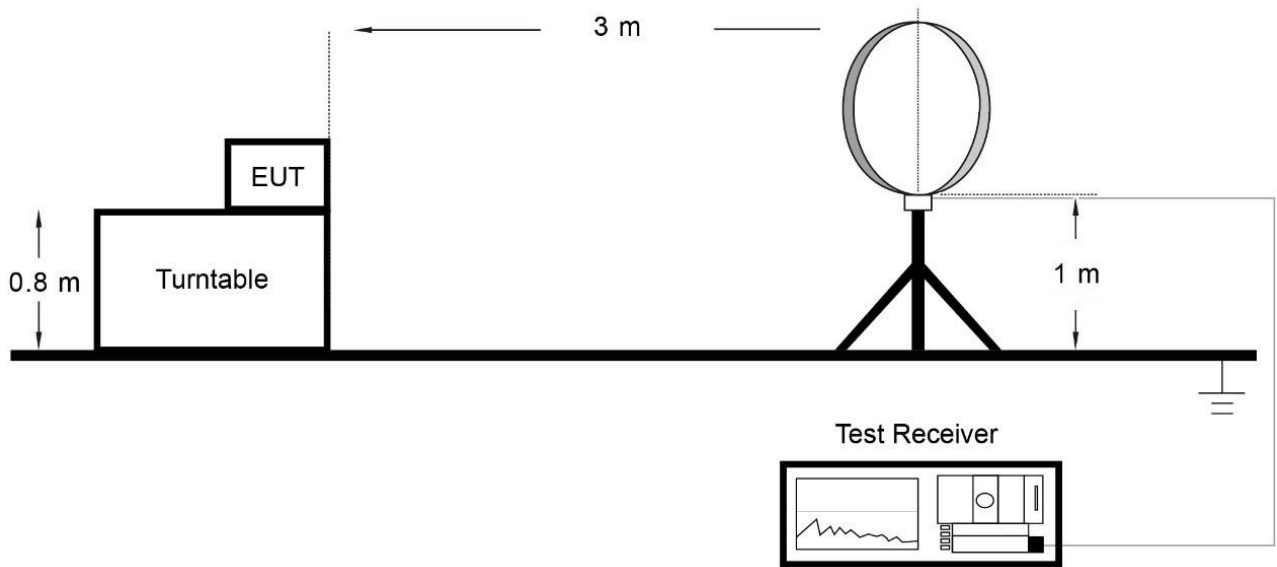
**For 15.205 requirement:**

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).

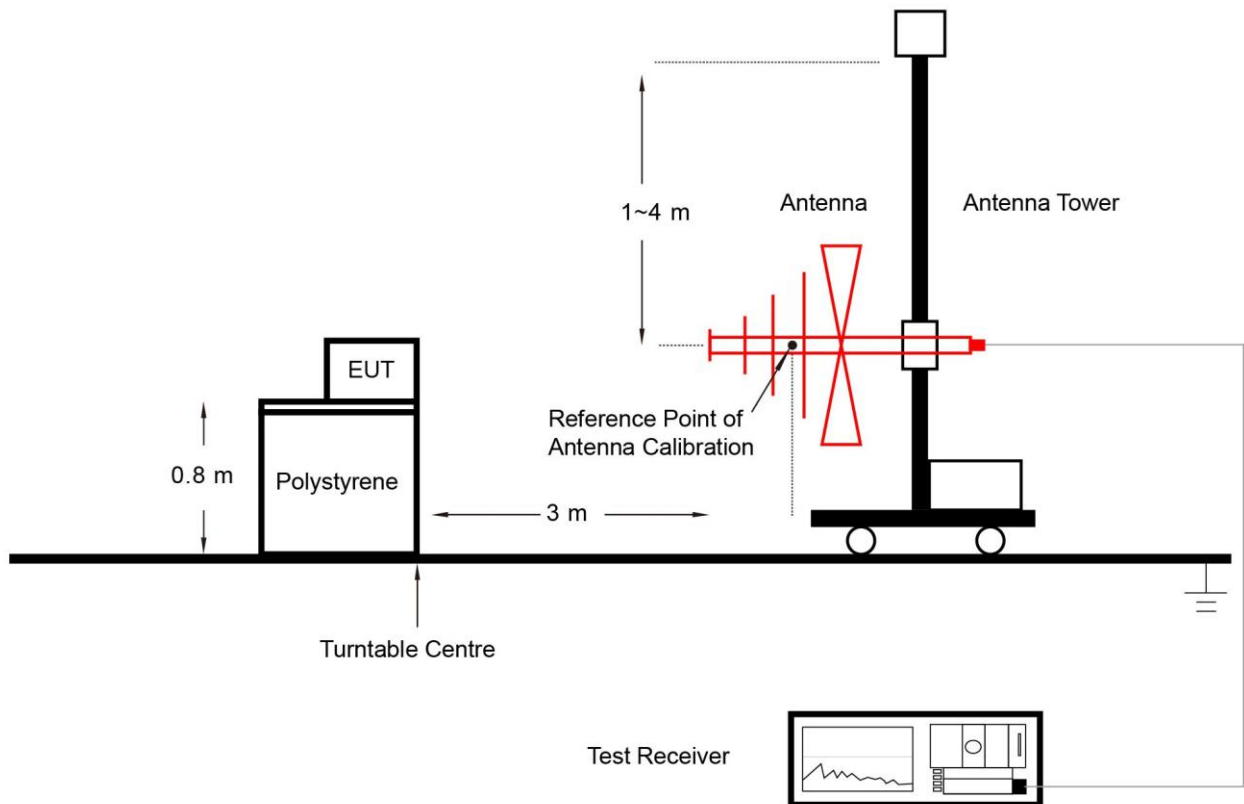
Frequency (MHz)	Frequency (MHz)	Frequency (MHz)	Frequency (GHz)
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
<sup>1</sup> 0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 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	( <sup>2</sup> )
13.36 - 13.41	--	--	--

### 6.3.2. Test Setup

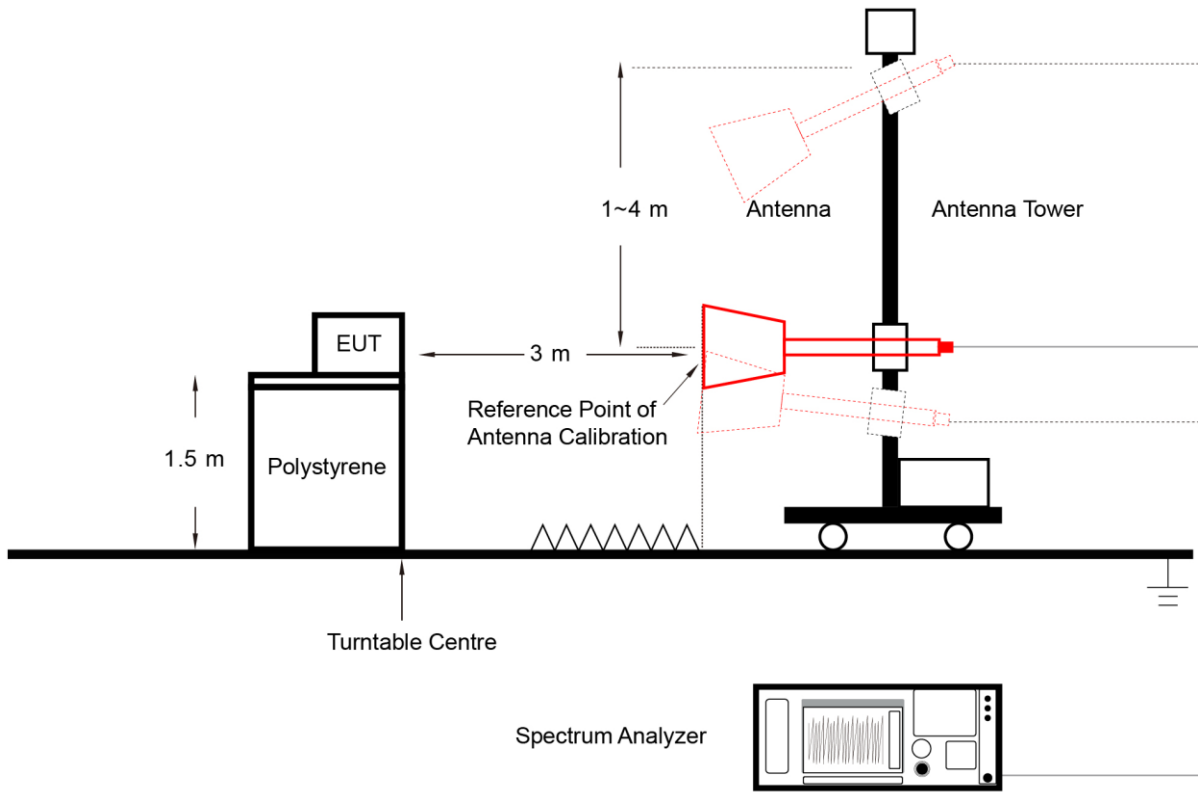
Below 30MHz Test Setup:



Below 1GHz Test Setup:



Above 1GHz Test Setup:



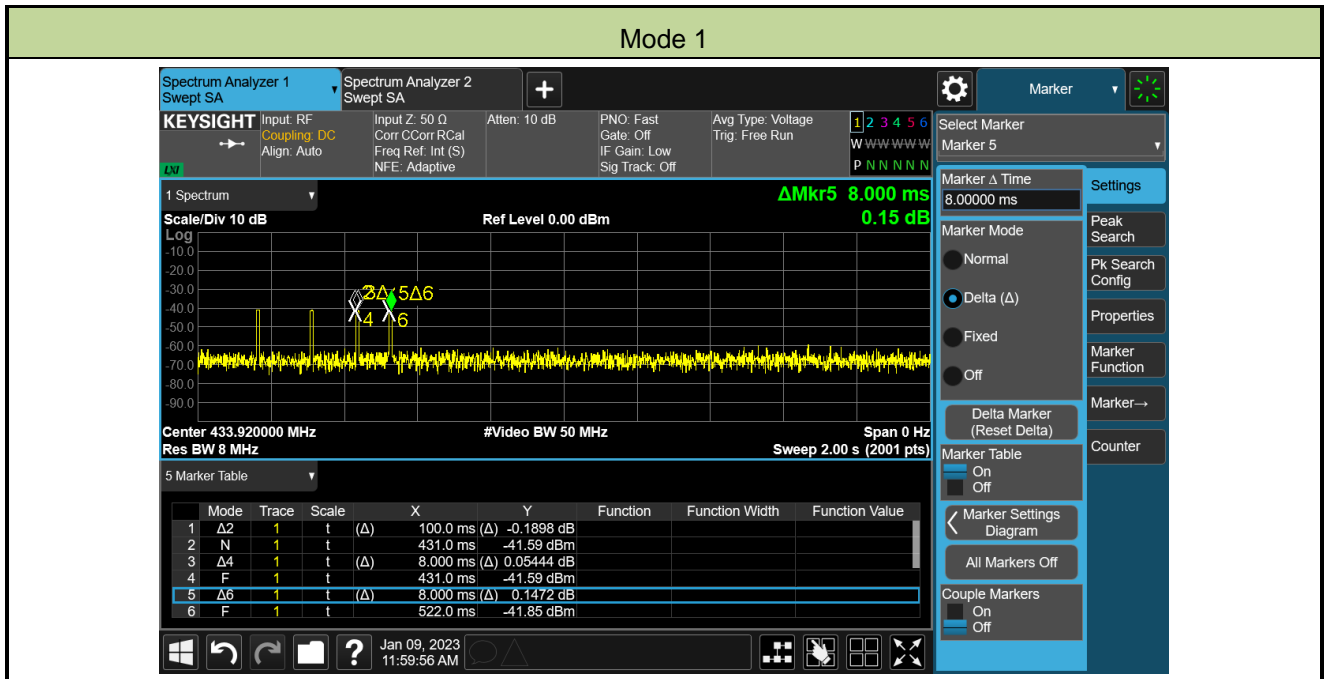


### 6.3.3. Test Results

Test Site	WZ-AC1	Test Engineer	Charles Zhang
Test Date	2023-01-09	Model	3684

Test Mode	Time On (ms)	One Period (ms)	Duty Cycle (%)	Duty Cycle Factor (dB)
Mode 1	16.00	100	16	-15.92

Note: Duty Cycle Factor (dB) = 20\*Log<sub>10</sub>(Duty Cycle) (dB).



Test Site	WZ-AC1	Test Engineer	Charles Zhang
Test Date	2022-12-29	Remark	Fundamental Radiated Emission
Model	3684		

Frequency (MHz)	Reading Level (dB $\mu$ V)	Factor (dB/m)	Duty Cycle Factor (dB)	Measure Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Detector	Polarization
Mode 1								
433.92	56.272	21.868	N/A	78.140	92.866	-14.726	PK	Horizontal
	56.272	21.868	-15.920	62.220	72.866	-10.646	AV	Horizontal
	51.860	21.868	N/A	73.728	92.866	-19.138	PK	Vertical
	51.860	21.868	-15.920	57.808	72.866	-15.058	AV	Vertical
Note: Measure Level (dB $\mu$ V/m) = Reading Level (dB $\mu$ 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	WZ-AC1	Test Engineer	Charles Zhang
Test Date	2022-12-26	Remark	Radiated Spurious Emissions
Model	3684		

Frequency (MHz)	Reading Level (dB $\mu$ V)	Factor (dB/m)	Duty Cycle Factor (dB)	Measure Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Detector	Polarization
Mode 1								
1302.000	53.268	-6.106	N/A	47.162	74.000	-26.838	PK	Horizontal
1302.000	53.268	-6.106	-15.920	31.242	54.000	-22.758	AV	Horizontal
2170.000	52.549	-3.341	N/A	49.208	74.000	-24.792	PK	Horizontal
2170.000	52.549	-3.341	-15.920	33.288	54.000	-20.712	AV	Horizontal
2604.000	65.508	-3.131	N/A	62.377	74.000	-11.623	PK	Horizontal
2604.000	65.508	-3.131	-15.920	46.457	54.000	-7.543	AV	Horizontal
3038.000	59.183	-1.440	N/A	57.743	74.000	-16.257	PK	Horizontal
3038.000	59.183	-1.440	-15.920	41.823	54.000	-12.177	AV	Horizontal
4340.000	41.486	1.416	N/A	42.902	74.000	-31.098	PK	Horizontal
4340.000	41.486	1.416	-15.920	26.982	54.000	-27.018	AV	Horizontal
4812.000	37.750	2.796	N/A	40.546	74.000	-33.454	PK	Horizontal
4812.000	37.750	2.796	-15.920	24.626	54.000	-29.374	AV	Horizontal
1302.000	50.900	-6.106	N/A	44.794	74.000	-29.206	PK	Vertical
1302.000	50.900	-6.106	-15.920	28.874	54.000	-25.126	AV	Vertical
2170.000	57.896	-3.341	N/A	54.555	74.000	-19.445	PK	Vertical
2170.000	57.896	-3.341	-15.920	38.635	54.000	-15.365	AV	Vertical
2604.000	62.155	-3.131	N/A	59.024	74.000	-14.976	PK	Vertical
2604.000	62.155	-3.131	-15.920	43.104	54.000	-10.896	AV	Vertical
3038.000	53.208	-1.440	N/A	51.768	74.000	-22.232	PK	Vertical
3038.000	53.208	-1.440	-15.920	35.848	54.000	-18.152	AV	Vertical
3472.000	51.917	-0.913	N/A	51.004	74.000	-22.996	PK	Vertical
3472.000	51.917	-0.913	-15.920	35.084	54.000	-18.916	AV	Vertical
3906.000	46.538	0.269	N/A	46.807	74.000	-27.193	PK	Vertical
3906.000	46.538	0.269	-15.920	30.887	54.000	-23.113	AV	Vertical

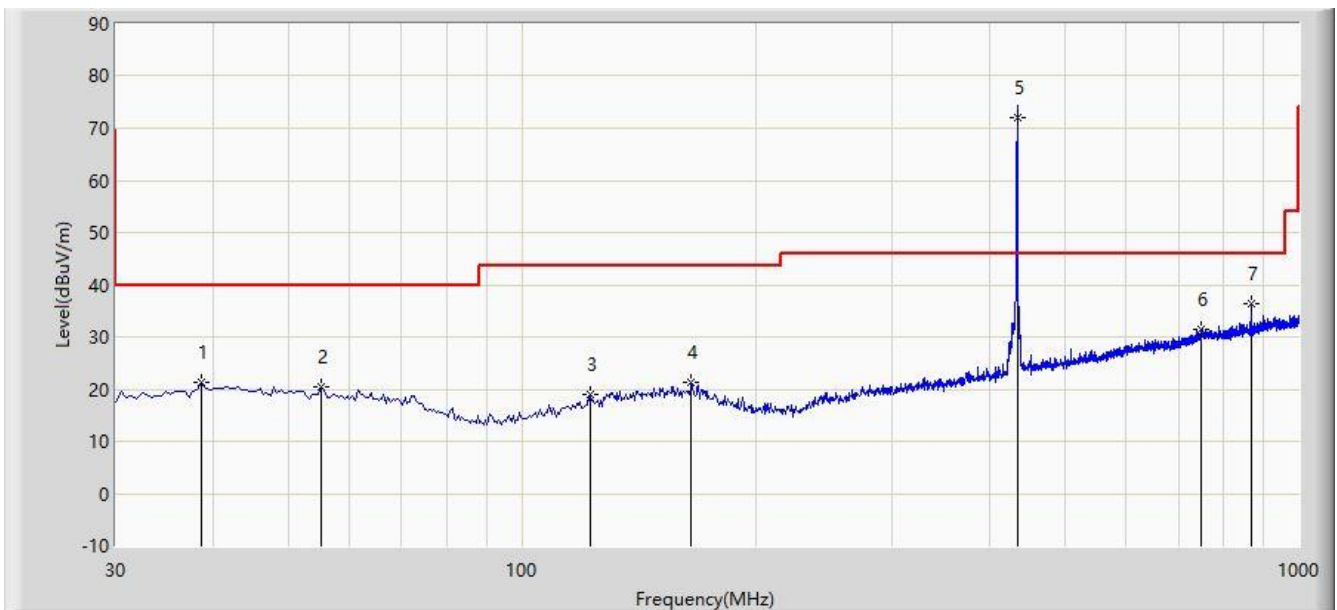
Note: Peak Measure Level (dB $\mu$ V/m) = Reading Level (dB $\mu$ V) + Factor (dB/m)

Factor (dB/m) = Cable Loss (dB) + Antenna Factor (dB/m) - Pre\_Amplifier Gain (dB)

Average Measure Level = Peak Measure Level + Duty Cycle Factor

**The Result of Radiated Emission below 1GHz (3684):**

Site: WZ-AC1	Test Date: 2022-12-27
Limit: FCC_Part15.209_RSE(3m)	Engineer: Charles Zhang
Probe: VULB 9168_25-2000MHz	Polarity: Horizontal
EUT: Doran TPMS Sensor for Truck with 433.92MHz	Power: By Battery
Mode 1	



No	Mark	Frequency (MHz)	Measure Level (dB $\mu$ V/m)	Reading Level (dB $\mu$ V)	Margin (dB)	Limit (dB $\mu$ V/m)	Factor (dB/m)	Type
1		38.730	21.195	3.074	-18.805	40.000	18.121	PK
2		55.220	20.429	2.548	-19.571	40.000	17.881	PK
3		122.635	19.104	3.081	-24.396	43.500	16.023	PK
4		165.315	21.347	3.300	-22.153	43.500	18.047	PK
5	*	433.920	71.923	50.052	N/A	N/A	21.870	PK
6		750.225	31.520	3.314	-14.480	46.000	28.206	PK
7		868.080	36.453	7.380	-9.547	46.000	29.073	PK

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

Note 2: Measure Level (dB $\mu$ V/m) = Reading Level (dB $\mu$ V) + Factor (dB/m).

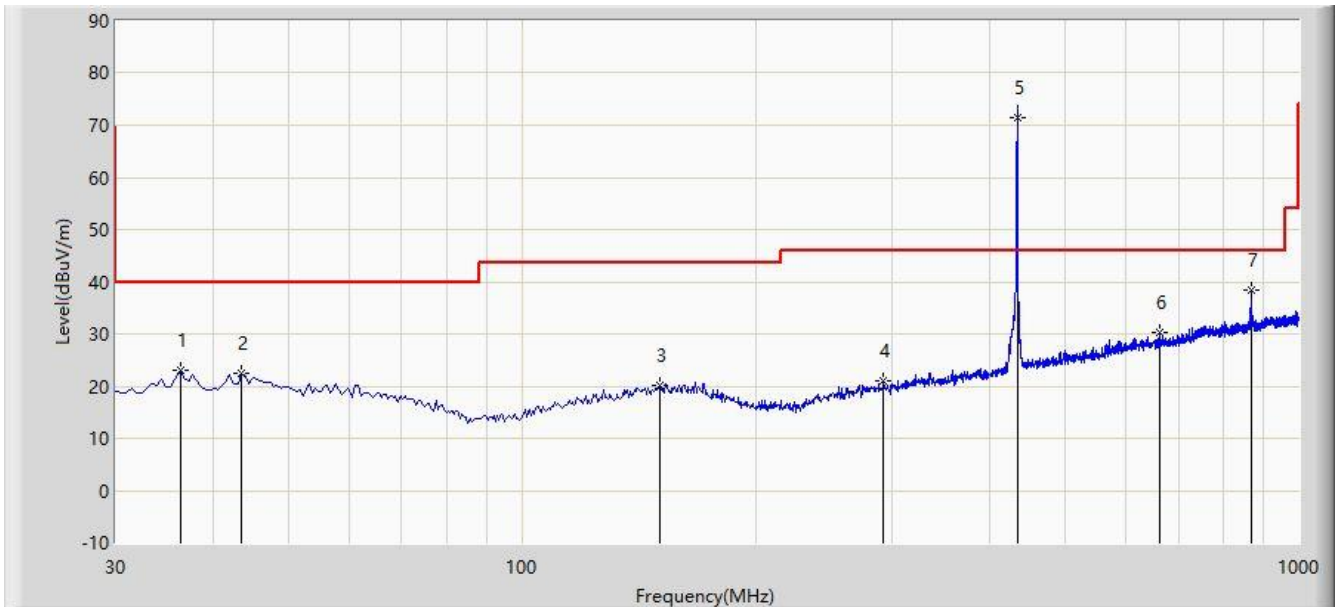
Note 3: Factor (dB/m) = Cable Loss (dB) + Antenna Factor (dB/m).

Note 4: Quasi-Peak measurement was not performed when peak measure level was lower than the quasi-peak limit.

Note 5: Point (5) is the fundamental frequency.

Note 6: 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.

Site: WZ-AC1	Test Date: 2022-12-27
Limit: FCC_Part15.209_RSE(3m)	Engineer: Charles Zhang
Probe: VULB 9168_25-2000MHz	Polarity: Vertical
EUT: Doran TPMS Sensor for Truck with 433.92MHz	Power: By Battery
Mode 1	



No	Mark	Frequency (MHz)	Measure Level (dB $\mu$ V/m)	Reading Level (dB $\mu$ V)	Margin (dB)	Limit (dB $\mu$ V/m)	Factor (dB/m)	Type
1		36.305	23.080	5.219	-16.920	40.000	17.862	PK
2		43.580	22.595	4.223	-17.405	40.000	18.372	PK
3		150.765	20.285	2.248	-23.215	43.500	18.038	PK
4		292.385	21.029	2.794	-24.971	46.000	18.235	PK
5	*	433.920	71.356	49.485	N/A	N/A	21.870	PK
6		663.410	30.158	3.816	-15.842	46.000	26.342	PK
7		868.080	38.540	9.467	-7.460	46.000	29.073	PK

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

Note 2: Measure Level (dB $\mu$ V/m) = Reading Level (dB $\mu$ V) + Factor (dB/m).

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

Note 4: Quasi-Peak measurement was not performed when peak measure level was lower than the quasi-peak limit.

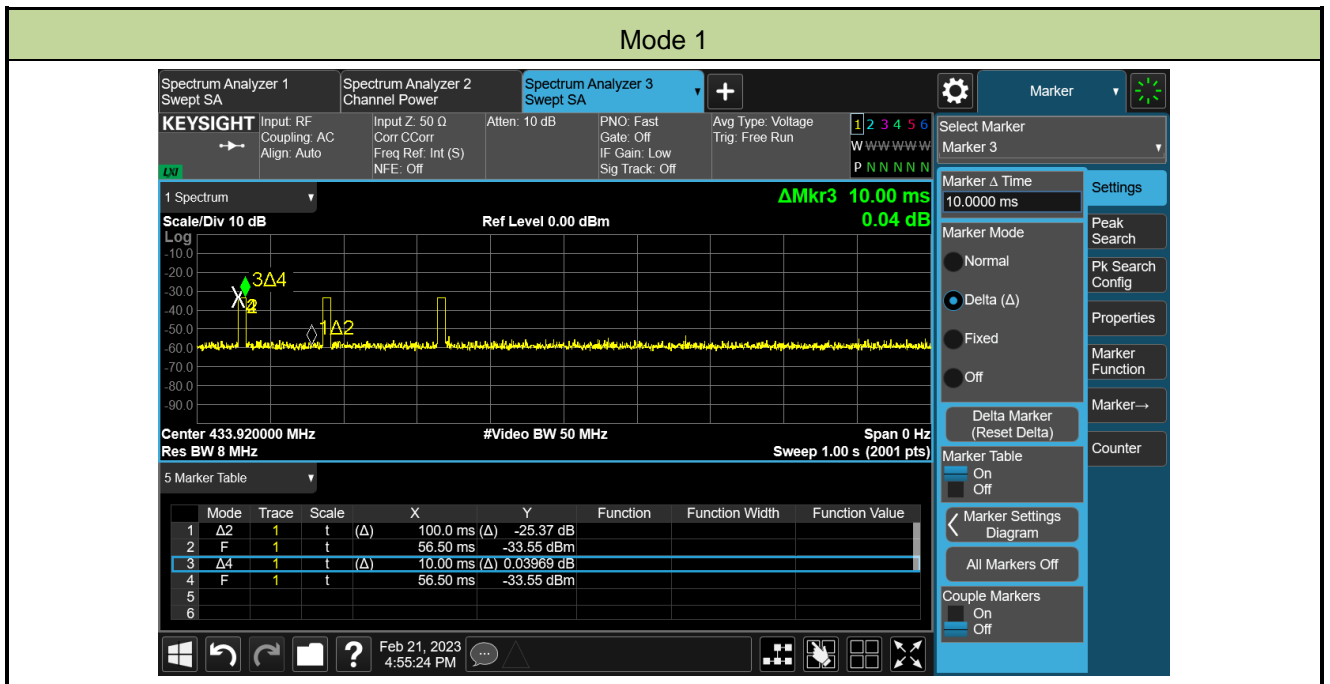
Note 5: Point (5) is the fundamental frequency.

Note 6: 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 Site	WZ-AC1	Test Engineer	Charles Zhang
Test Date	2023-02-21	Model	3684C

Test Mode	Time On (ms)	One Period (ms)	Duty Cycle (%)	Duty Cycle Factor (dB)
Mode 2	10.00	100	10	-20

Note: Duty Cycle Factor (dB) = 20\*Log<sub>10</sub>(Duty Cycle) (dB).



Test Site	WZ-AC1	Test Engineer	Charles Zhang
Test Date	2023-02-20	Remark	Fundamental Radiated Emission
Model	3684C		

Frequency (MHz)	Reading Level (dB $\mu$ V)	Factor (dB/m)	Duty Cycle Factor (dB)	Measure Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Detector	Polarization
Mode 2								
433.92	58.654	21.871	N/A	80.525	92.866	-12.341	PK	Horizontal
	58.654	21.871	-20.000	60.525	72.866	-12.341	AV	Horizontal
	51.906	21.869	N/A	73.775	92.866	-19.091	PK	Vertical
	51.906	21.869	-20.000	53.775	72.866	-19.091	AV	Vertical

Note: Measure Level (dB $\mu$ V/m) = Reading Level (dB $\mu$ 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	WZ-AC1	Test Engineer	Charles Zhang
Test Date	2023-02-20	Remark	Radiated Spurious Emissions
Model	3684C		

Frequency (MHz)	Reading Level (dBμV)	Factor (dB/m)	Duty Cycle Factor (dB)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
Mode 2								
1302.000	68.136	-6.106	N/A	62.030	74.000	-11.970	PK	Horizontal
1302.000	68.136	-6.106	-20.000	42.030	54.000	-11.970	AV	Horizontal
2170.000	53.095	-3.341	N/A	49.754	74.000	-24.246	PK	Horizontal
2170.000	53.095	-3.341	-20.000	29.754	54.000	-24.246	AV	Horizontal
2604.000	63.881	-3.131	N/A	60.750	74.000	-13.250	PK	Horizontal
2604.000	63.881	-3.131	-20.000	40.750	54.000	-13.250	AV	Horizontal
3038.000	51.941	-1.440	N/A	50.501	74.000	-23.499	PK	Horizontal
3038.000	51.941	-1.440	-20.000	30.501	54.000	-23.499	AV	Horizontal
3472.000	48.897	-0.913	N/A	47.984	74.000	-26.016	PK	Horizontal
3472.000	48.897	-0.913	-20.000	27.984	54.000	-26.016	AV	Horizontal
3906.000	46.326	0.269	N/A	46.595	74.000	-27.405	PK	Horizontal
3906.000	46.326	0.269	-20.000	26.595	54.000	-27.405	AV	Horizontal
1302.000	68.007	-6.106	N/A	61.901	74.000	-12.099	PK	Vertical
1302.000	68.007	-6.106	-20.000	41.901	54.000	-12.099	AV	Vertical
2170.000	55.074	-3.341	N/A	51.733	74.000	-22.267	PK	Vertical
2170.000	55.074	-3.341	-20.000	31.733	54.000	-22.267	AV	Vertical
2604.000	64.860	-3.131	N/A	61.729	74.000	-12.271	PK	Vertical
2604.000	64.860	-3.131	-20.000	41.729	54.000	-12.271	AV	Vertical
3906.000	41.976	0.269	N/A	42.245	74.000	-31.755	PK	Vertical
3906.000	41.976	0.269	-20.000	22.245	54.000	-31.755	AV	Vertical
4340.000	42.286	1.416	N/A	43.702	74.000	-30.298	PK	Vertical
4340.000	42.286	1.416	-20.000	23.702	54.000	-30.298	AV	Vertical

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

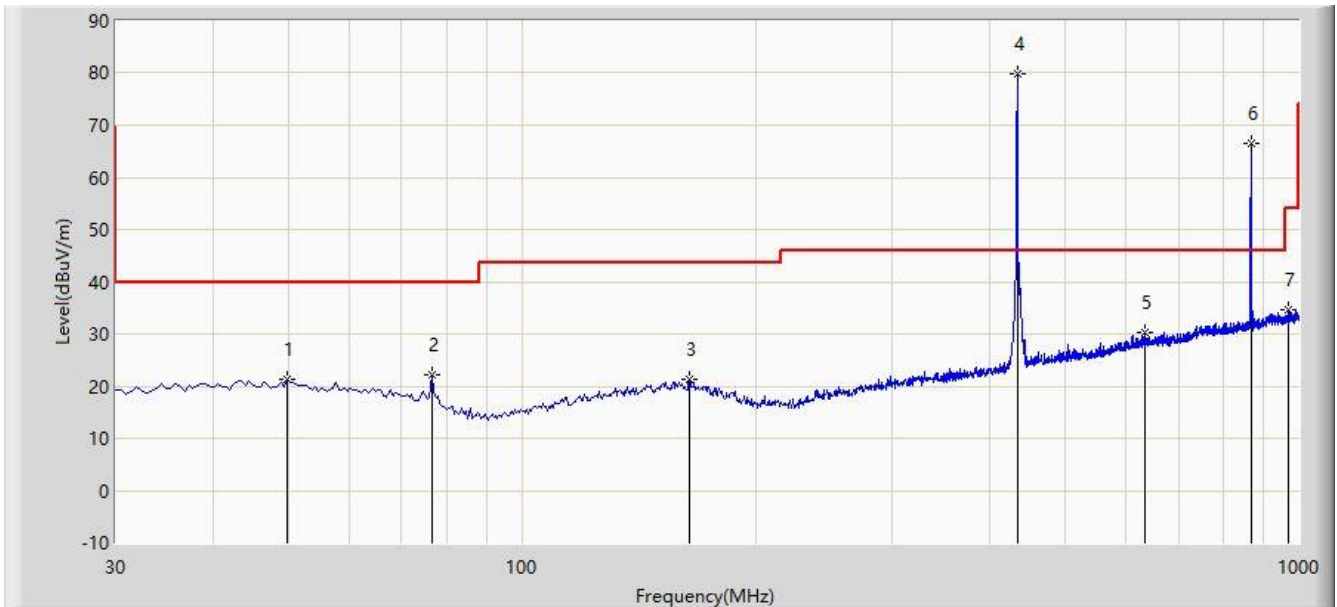
Factor (dB/m) = Cable Loss (dB) + Antenna Factor (dB/m) - Pre\_Amplifier Gain (dB)

Average Measure Level = Peak Measure Level + Duty Cycle Factor



**The Result of Radiated Emission below 1GHz (3684C):**

Site: WZ-AC1	Test Date: 2023-02-20
Limit: FCC_Part15.209_RSE(3m)	Engineer: Charles Zhang
Probe: VULB 9168_25-2000MHz	Polarity: Horizontal
EUT: Doran TPMS Sensor for Truck with 433.92MHz	Power: By Battery
Mode 2	



No	Mark	Frequency (MHz)	Measure Level (dB $\mu$ V/m)	Reading Level (dB $\mu$ V)	Margin (dB)	Limit (dB $\mu$ V/m)	Factor (dB/m)	Type
1		49.885	21.168	2.927	-18.832	40.000	18.241	PK
2		76.560	22.204	7.277	-17.796	40.000	14.927	PK
3		164.345	21.444	3.378	-22.056	43.500	18.065	PK
4	*	434.005	79.948	58.074	N/A	N/A	21.873	PK
5		632.855	30.293	4.235	-15.707	46.000	26.058	PK
6		867.595	66.432	37.342	-6.434	72.866	29.090	PK
		867.595	46.432	37.342	-6.434	52.866	29.090	Average
7		971.870	34.738	4.765	-19.262	54.000	29.973	PK

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

Note 2: Measure Level (dB $\mu$ V/m) = Reading Level (dB $\mu$ V) + Factor (dB/m).

Average Measure Level = Peak Measure Level + Duty Cycle Factor

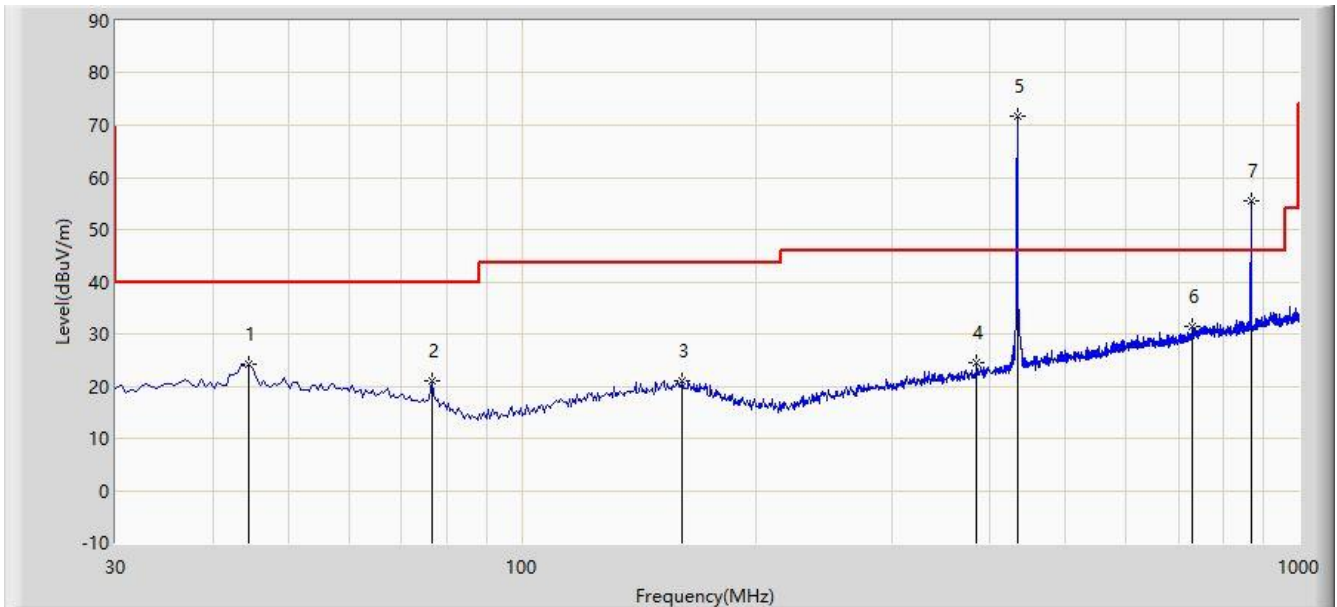
Note 3: Factor (dB/m) = Cable Loss (dB) + Antenna Factor (dB/m).

Note 4: Quasi-Peak measurement was not performed when peak measure level was lower than the quasi-peak limit.

Note 5: Point (4) is the fundamental frequency.

Note 6: Point (6) complies with the limit in Part 15.231.

Site: WZ-AC1	Test Date: 2023-02-20
Limit: FCC_Part15.209_RSE(3m)	Engineer: Charles Zhang
Probe: VULB 9168_25-2000MHz	Polarity: Vertical
EUT: Doran TPMS Sensor for Truck with 433.92MHz	Power: By Battery
Mode 2	



No	Mark	Frequency (MHz)	Measure Level (dB $\mu$ V/m)	Reading Level (dB $\mu$ V)	Margin (dB)	Limit (dB $\mu$ V/m)	Factor (dB/m)	Type
1		44.550	24.101	5.724	-15.899	40.000	18.377	PK
2		76.560	21.101	6.174	-18.899	40.000	14.927	PK
3		160.950	21.018	2.865	-22.482	43.500	18.153	PK
4		384.535	24.399	3.942	-21.601	46.000	20.457	PK
5	*	434.005	71.817	49.943	N/A	N/A	21.873	PK
6		729.855	31.482	4.227	-14.518	46.000	27.255	PK
7		867.595	55.597	26.507	-17.269	72.866	29.090	PK
		867.595	35.597	26.507	-17.269	52.866	29.090	Average

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

Note 2: Measure Level (dB $\mu$ V/m) = Reading Level (dB $\mu$ V) + Factor (dB/m).

Average Measure Level = Peak Measure Level + Duty Cycle Factor

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

Note 4: Quasi-Peak measurement was not performed when peak measure level was lower than the quasi-peak limit.

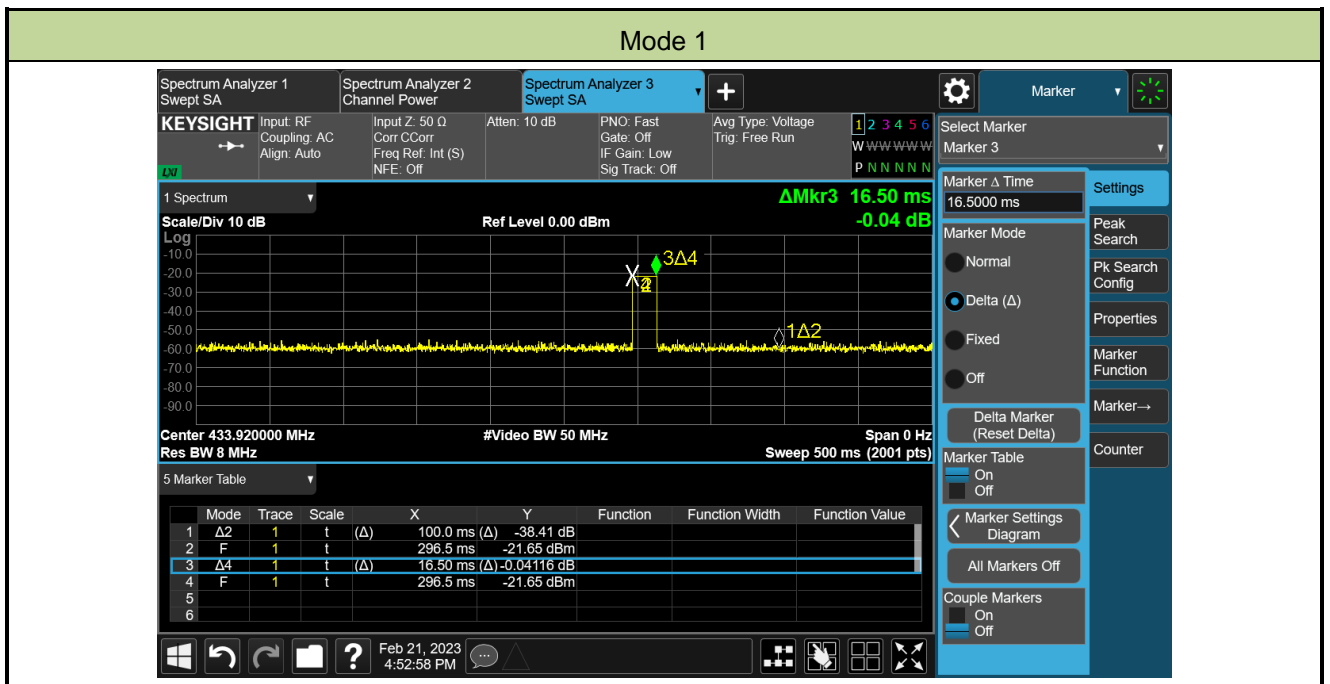
Note 5: Point (5) is the fundamental frequency.

Note 6: Point (7) complies with the limit in Part 15.231.

Test Site	WZ-AC1	Test Engineer	Charles Zhang
Test Date	2023-02-21	Model	3685A

Test Mode	Time On (ms)	One Period (ms)	Duty Cycle (%)	Duty Cycle Factor (dB)
Mode 3	16.5	100	16.5	-15.65

Note: Duty Cycle Factor (dB) =  $20 \cdot \log_{10}(\text{Duty Cycle})$  (dB).



Test Site	WZ-AC1	Test Engineer	Charles Zhang
Test Date	2023-02-20	Remark	Fundamental Radiated Emission
Model	3685A		

Frequency (MHz)	Reading Level (dB $\mu$ V)	Factor (dB/m)	Duty Cycle Factor (dB)	Measure Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Detector	Polarization
Mode 3								
433.92	59.017	21.869	N/A	80.886	92.866	-11.980	PK	Horizontal
	59.017	21.869	-15.650	65.236	72.866	-7.630	AV	Horizontal
	51.223	21.871	N/A	73.094	92.866	-19.772	PK	Vertical
	51.223	21.871	-15.650	57.444	72.866	-15.422	AV	Vertical

Note: Measure Level (dB $\mu$ V/m) = Reading Level (dB $\mu$ 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	WZ-AC1	Test Engineer	Charles Zhang
Test Date	2023-02-20	Remark	Radiated Spurious Emissions
Model	3685A		

Frequency (MHz)	Reading Level (dBμV)	Factor (dB/m)	Duty Cycle Factor (dB)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
Mode 3								
1302.000	69.415	-6.106	N/A	63.309	74.000	-10.691	PK	Horizontal
1302.000	69.415	-6.106	-15.650	47.659	54.000	-6.341	AV	Horizontal
1736.000	48.077	-6.400	N/A	41.677	74.000	-32.323	PK	Horizontal
1736.000	48.077	-6.400	-15.650	26.027	54.000	-27.973	AV	Horizontal
2170.000	51.816	-3.341	N/A	48.475	74.000	-25.525	PK	Horizontal
2170.000	51.816	-3.341	-15.650	32.825	54.000	-21.175	AV	Horizontal
3038.000	44.732	-1.440	N/A	43.292	74.000	-30.708	PK	Horizontal
3038.000	44.732	-1.440	-15.650	27.642	54.000	-26.358	AV	Horizontal
3906.000	43.780	0.269	N/A	44.049	74.000	-29.951	PK	Horizontal
3906.000	43.780	0.269	-15.650	28.399	54.000	-25.601	AV	Horizontal
4338.000	45.378	1.417	N/A	46.795	74.000	-27.205	PK	Horizontal
4338.000	45.378	1.417	-15.650	31.145	54.000	-22.855	AV	Horizontal
1302.000	69.683	-6.106	N/A	63.577	74.000	-10.423	PK	Vertical
1302.000	69.683	-6.106	-15.650	47.927	54.000	-6.073	AV	Vertical
2604.000	56.137	-3.131	N/A	53.006	74.000	-20.994	PK	Vertical
2604.000	56.137	-3.131	-15.650	37.356	54.000	-16.644	AV	Vertical
3038.000	57.351	-1.440	N/A	55.911	74.000	-18.089	PK	Vertical
3038.000	57.351	-1.440	-15.650	40.261	54.000	-13.739	AV	Vertical
3470.000	48.113	-0.920	N/A	47.193	74.000	-26.807	PK	Vertical
3470.000	48.113	-0.920	-15.650	31.543	54.000	-22.457	AV	Vertical
3906.000	46.675	0.269	N/A	46.944	74.000	-27.056	PK	Vertical
3906.000	46.675	0.269	-15.650	31.294	54.000	-22.706	AV	Vertical
4340.000	42.970	1.416	N/A	44.386	74.000	-29.614	PK	Vertical
4340.000	42.970	1.416	-15.650	28.736	54.000	-25.264	AV	Vertical

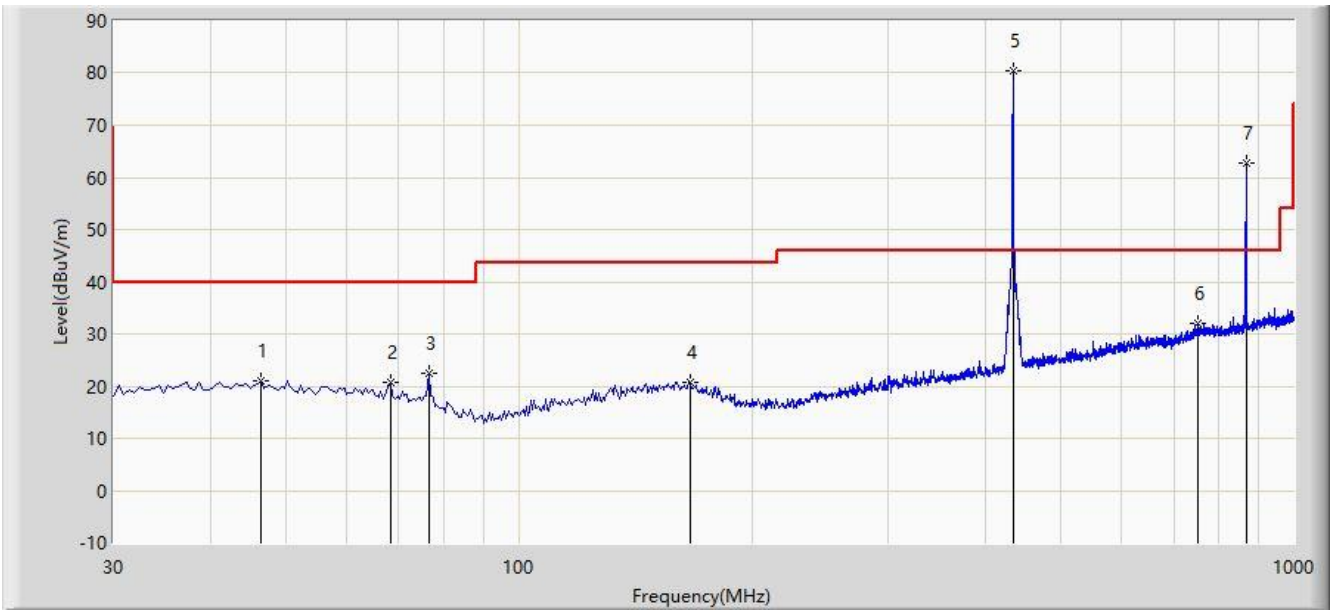
Note: Peak Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB/m)

Factor (dB/m) = Cable Loss (dB) + Antenna Factor (dB/m) - Pre\_Amplifier Gain (dB)

Average Measure Level = Peak Measure Level + Duty Cycle Factor

**The Result of Radiated Emission below 1GHz (3685A):**

Site: WZ-AC1	Test Date: 2023-02-20
Limit: FCC_Part15.209_RSE(3m)	Engineer: Charles Zhang
Probe: VULB 9168_25-2000MHz	Polarity: Horizontal
EUT: Doran TPMS Sensor for Truck with 433.92MHz	Power: By Battery
Mode 3	



No	Mark	Frequency (MHz)	Measure Level (dBμV/m)	Reading Level (dBμV)	Margin (dB)	Limit (dBμV/m)	Factor (dB/m)	Type
1		46.490	21.017	2.658	-18.983	40.000	18.359	PK
2		68.315	20.603	4.154	-19.397	40.000	16.448	PK
3		76.560	22.339	7.412	-17.661	40.000	14.927	PK
4		166.770	20.768	2.778	-22.732	43.500	17.990	PK
5	*	434.005	80.529	58.655	N/A	N/A	21.873	PK
6		750.710	32.006	3.783	-13.994	46.000	28.223	PK
7		868.080	62.645	33.572	-10.221	72.866	29.073	PK
		868.080	46.995	33.572	-5.871	52.866	29.073	Average

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

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

Average Measure Level = Peak Measure Level + Duty Cycle Factor

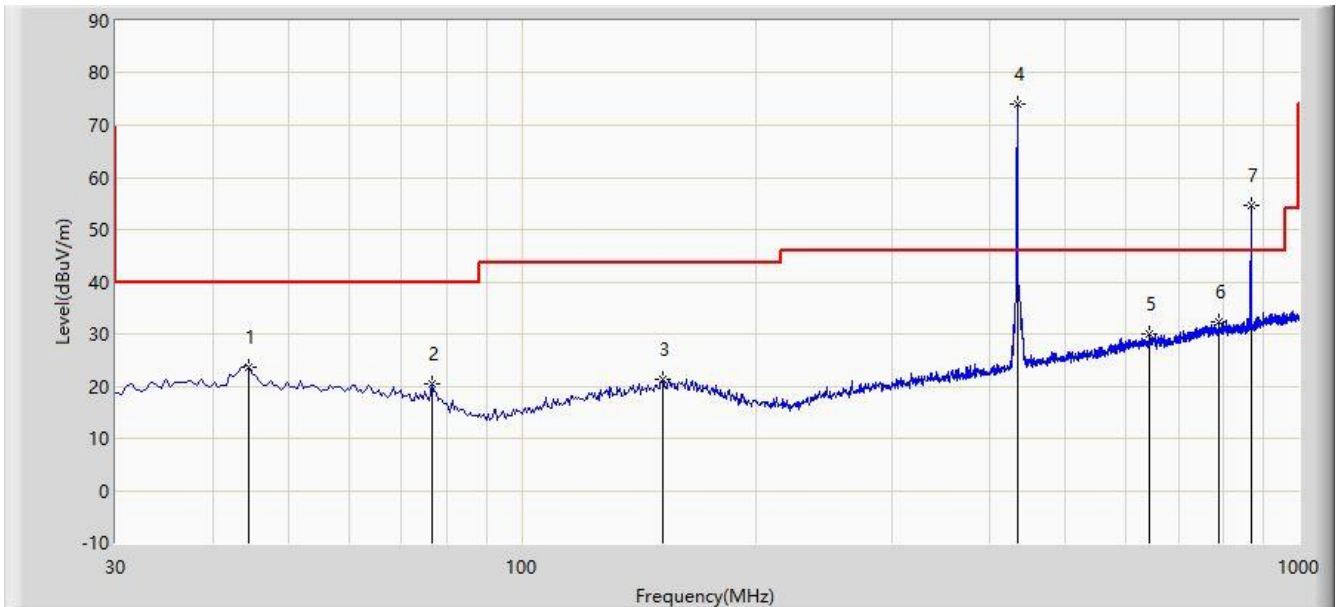
Note 3: Factor (dB/m) = Cable Loss (dB) + Antenna Factor (dB/m).

Note 4: Quasi-Peak measurement was not performed when peak measure level was lower than the quasi-peak limit.

Note 5: Point (5) is the fundamental frequency.

Note 6: Point (7) complies with the limit in Part 15.231.

Site: WZ-AC1	Test Date: 2023-02-20
Limit: FCC_Part15.209_RSE(3m)	Engineer: Charles Zhang
Probe: VULB 9168_25-2000MHz	Polarity: Vertical
EUT: Doran TPMS Sensor for Truck with 433.92MHz	Power: By Battery
Mode 3	



No	Mark	Frequency (MHz)	Measure Level (dB $\mu$ V/m)	Reading Level (dB $\mu$ V)	Margin (dB)	Limit (dB $\mu$ V/m)	Factor (dB/m)	Type
1		44.550	23.714	5.337	-16.286	40.000	18.377	PK
2		76.560	20.466	5.539	-19.534	40.000	14.927	PK
3		151.735	21.212	3.127	-22.288	43.500	18.086	PK
4	*	434.005	74.169	52.295	N/A	N/A	21.873	PK
5		643.525	29.870	3.729	-16.130	46.000	26.140	PK
6		788.540	32.361	4.111	-13.639	46.000	28.250	PK
7		867.595	54.621	25.531	-18.245	72.866	29.090	PK
		867.595	38.971	25.531	-13.895	52.866	29.090	Average

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

Note 2: Measure Level (dB $\mu$ V/m) = Reading Level (dB $\mu$ V) + Factor (dB/m).

Average Measure Level = Peak Measure Level + Duty Cycle Factor

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

Note 4: Quasi-Peak measurement was not performed when peak measure level was lower than the quasi-peak limit.

Note 5: Point (4) is the fundamental frequency.

Note 6: Point (7) complies with the limit in Part 15.231.

## **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

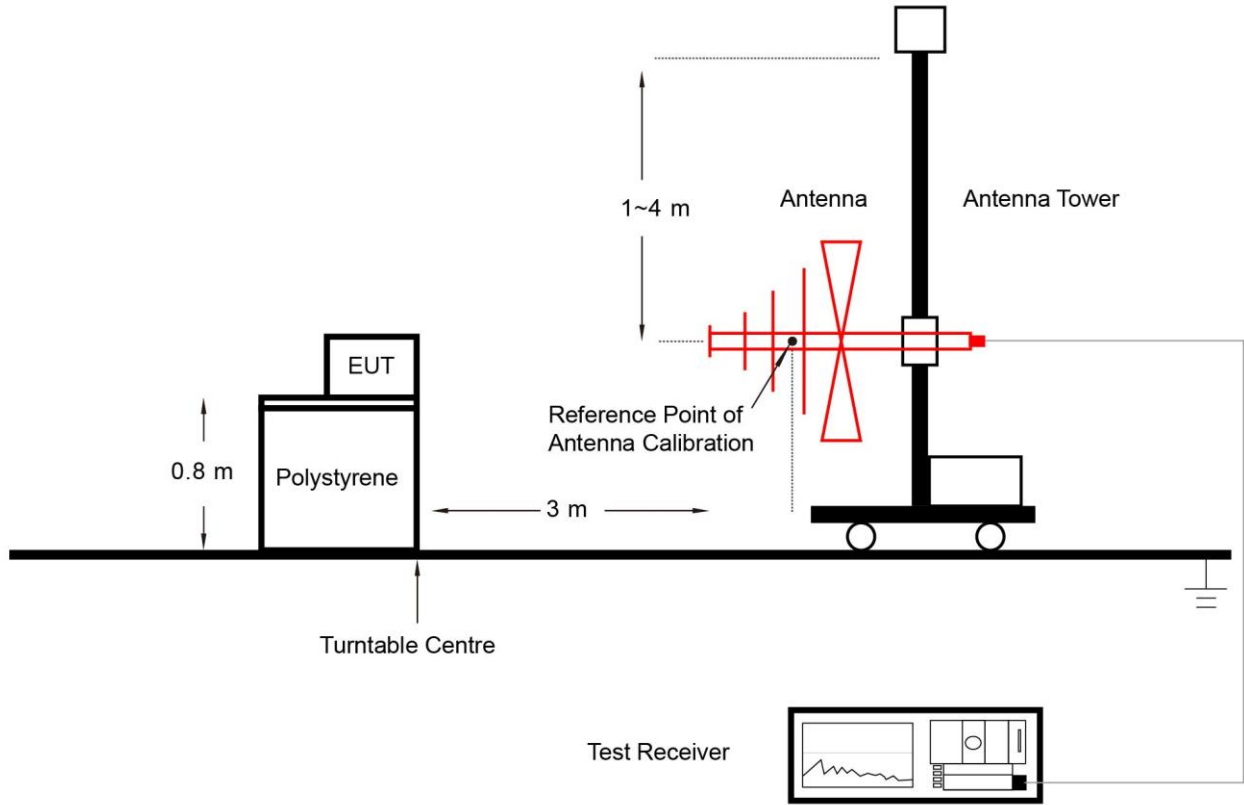
### **6.4.3. Test Setting**

#### **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	WZ-AC1	Test Engineer	Charles Zhang
Test Date	2022-12-29		

Test Mode	20dB Bandwidth (kHz)	Limit (kHz)	Result
Mode 1	117.5	≤ 1084.80	Pass

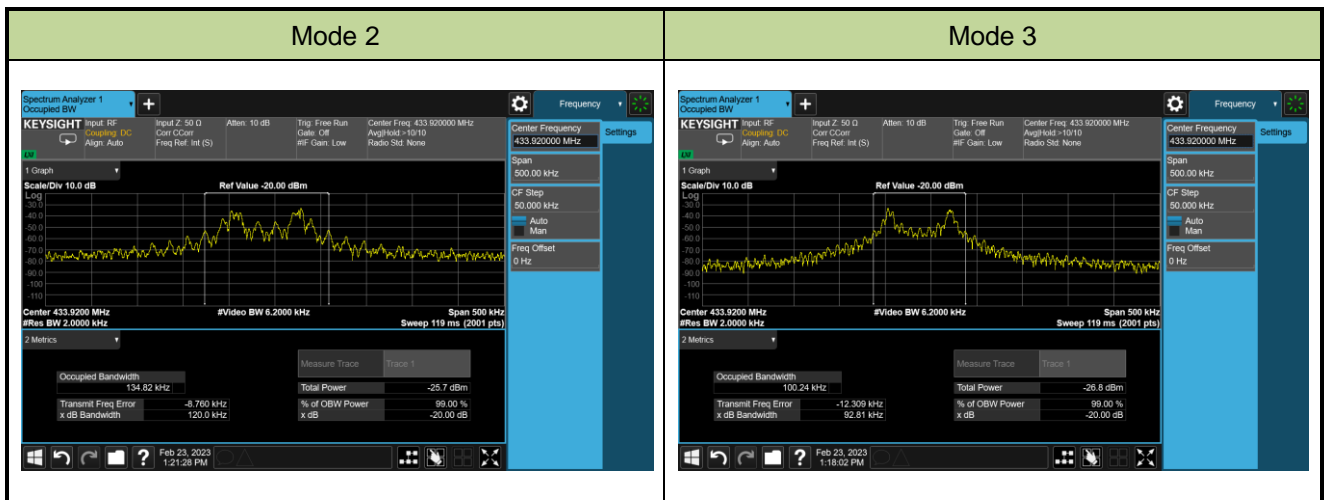
Note: Limit = Fundamental Frequency \* 0.25% = 433.92MHz \* 0.25% = 1084.80 kHz



Test Site	WZ-AC1	Test Engineer	Charles Zhang
Test Date	2023-02-23		

Test Mode	20dB Bandwidth (kHz)	Limit (kHz)	Result
Mode 2	120.0	≤ 1084.80	Pass
Mode 3	92.81	≤ 1084.80	Pass

Note: Limit = Fundamental Frequency \* 0.25% = 433.92MHz \* 0.25% = 1084.80 kHz



## 6.5. Transmission Time

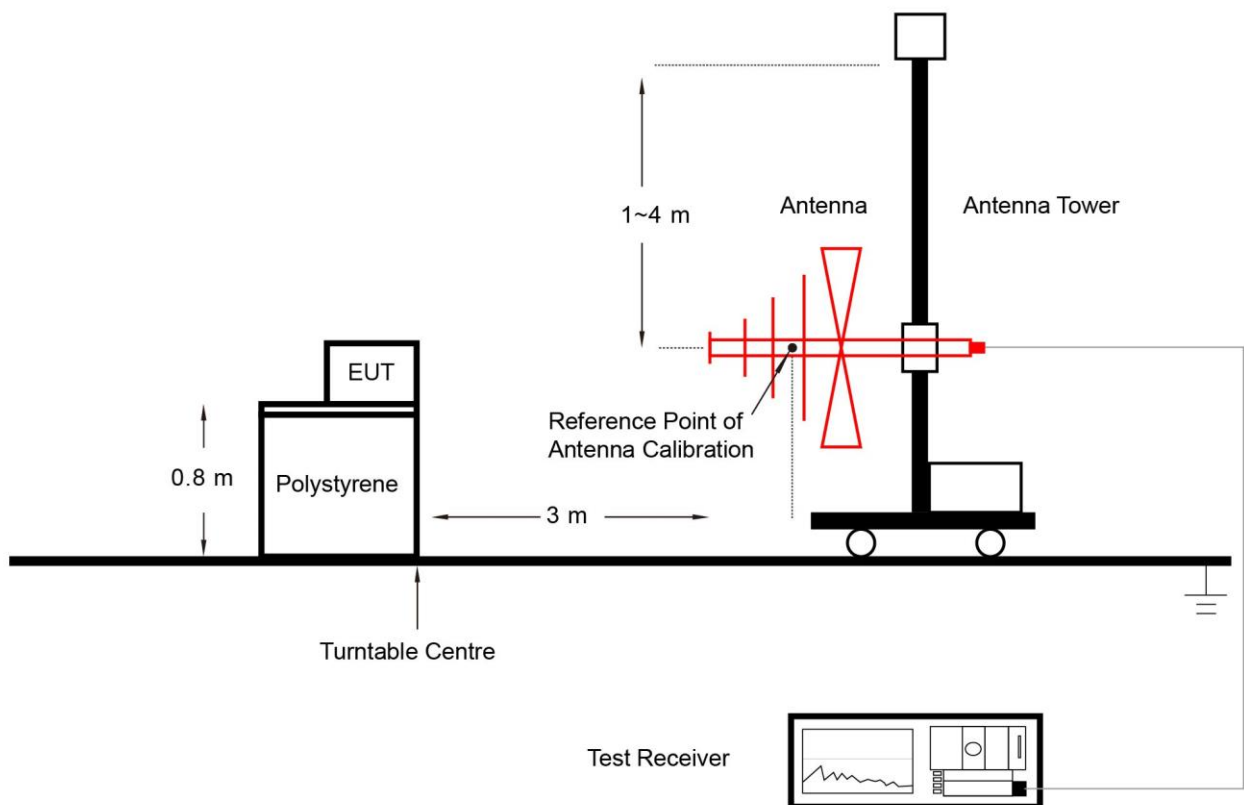
### 6.5.1. Test Limit

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.

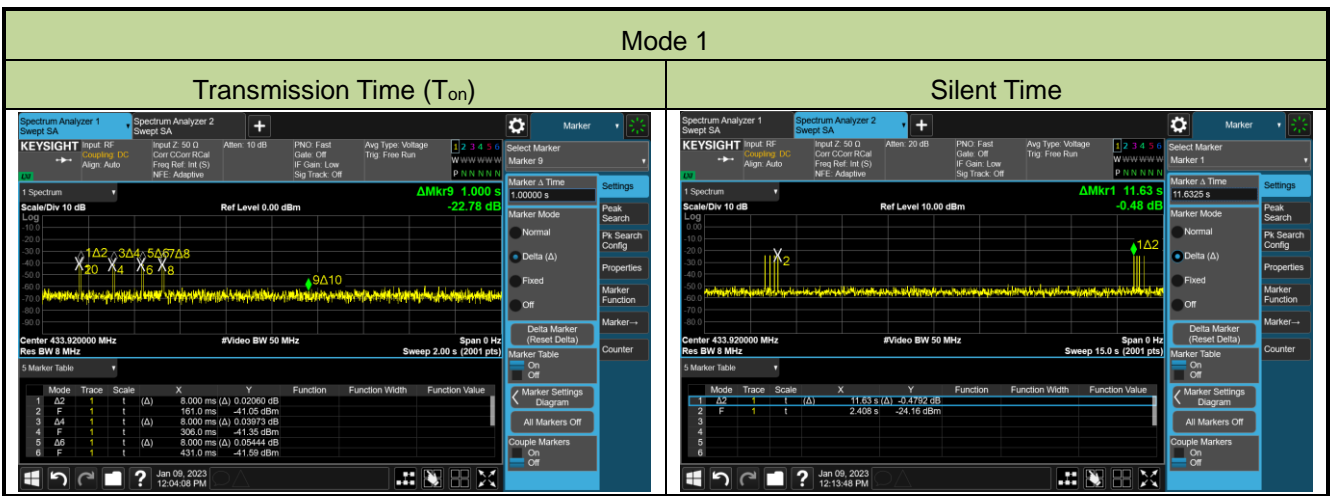
### 6.5.3. Test Setup



6.5.4. Test Result

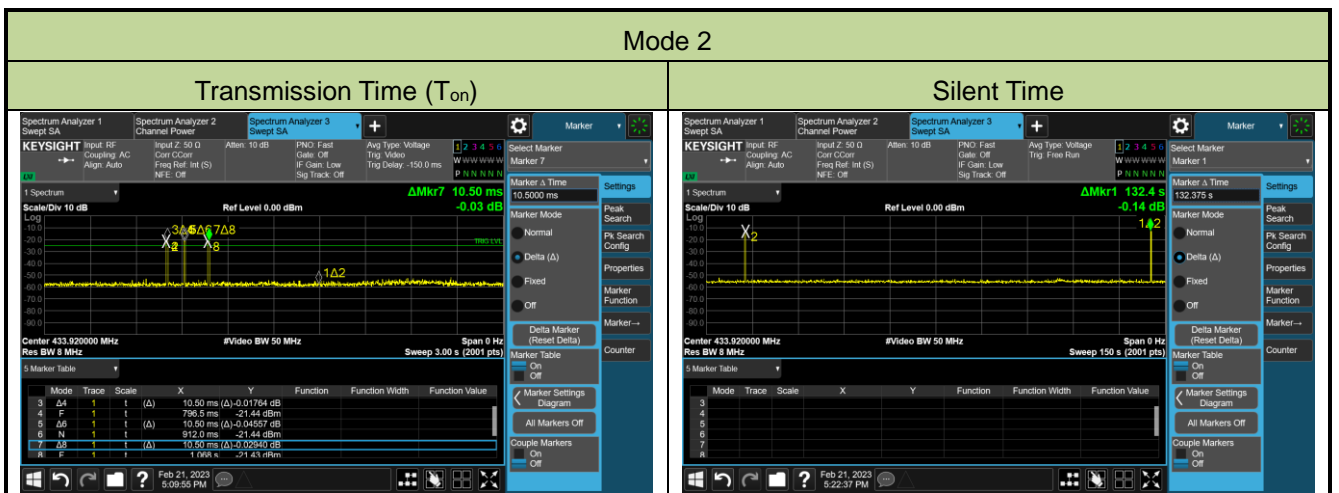
Test Site	WZ-AC1	Test Engineer	Charles Zhang
Test Date	2023-01-09		

Test Mode	Item	Measured Value	Limit	Result
Mode 1	Transmission Time (T <sub>on</sub> )	32 ms	≤ 1 s	Pass
	Silent Time	11.63 s	≥ 10 s	Pass
	Silent Time/Transmission Time	363.44	≥ 30 times	Pass



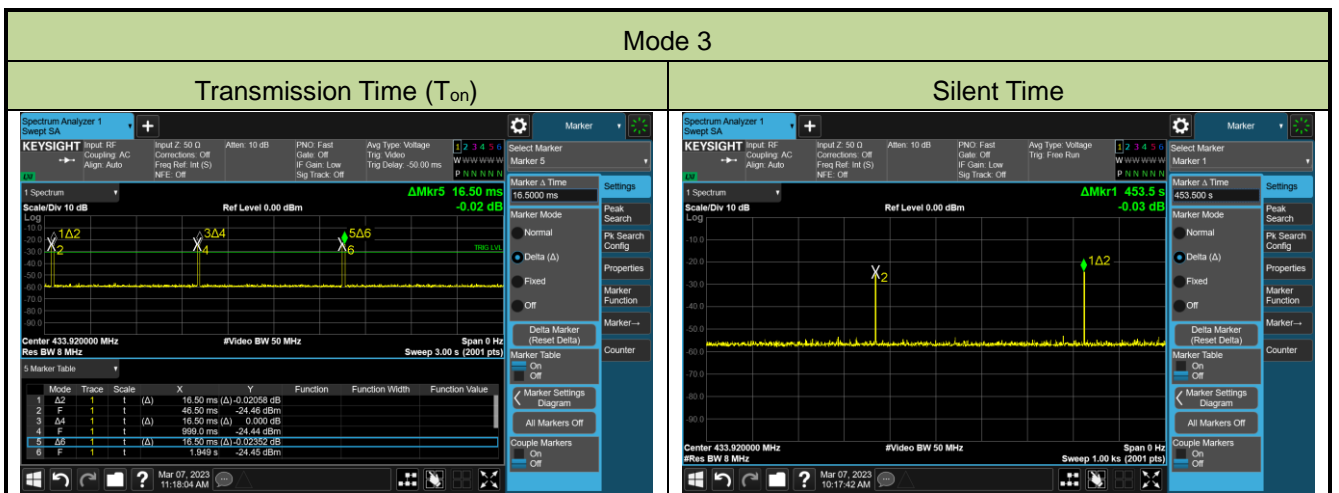
Test Site	WZ-AC1	Test Engineer	Charles Zhang
Test Date	2023-02-21		

Test Mode	Item	Measured Value	Limit	Result
Mode 2	Transmission Time (T <sub>on</sub> )	31.5 ms	≤ 1 s	Pass
	Silent Time	132.4 s	≥ 10 s	Pass
	Silent Time/Transmission Time	4203	≥ 30 times	Pass



Test Site	WZ-AC1	Test Engineer	Charles Zhang
Test Date	2023-03-07		

Test Mode	Item	Measured Value	Limit	Result
Mode 3	Transmission Time ( $T_{on}$ )	49.5 ms	$\leq 1$ s	Pass
	Silent Time	453.5 s	$\geq 10$ s	Pass
	Silent Time/Transmission Time	9161	$\geq 30$ times	Pass



## **Appendix A - Test Setup Photograph**

Refer to "2212RSU052-UT" file.



## Appendix B - EUT Photograph

Refer to "2212RSU052-UE" file.