



MEASUREMENT REPORT

FCC PART 15.231(e) & RSS 210 Issue 10

FCC ID: VZ43685
IC: 12007A-3685
Applicant: DORAN MANUFACTURING, LLC.
Application Type: Certification
Product: Truck TPMS sensor
Model No.: 3685-A
Serial Model No.: 3685, 3685-G, 3685-D
FCC Classification: FCC Part 15 Security/Remote Control Transmitter (DSC)
FCC Rule Part(s): Part 15.231(e)
ISED Rule(s): RSS-210 Issue 10 - Annex A, RSS-GEN Issue 5
Test Procedure(s): ANSI C63.10-2013
Test Date: December 01 ~ 04, 2020

Reviewed By: Vincent Yu
(Vincent Yu)

Approved By: Robin Wu
(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
2011RSU079-U1	Rev. 01	Initial Report	12-23-2020	Valid

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1. GENERAL INFORMATION

1.1. Applicant

For FCC:

DORAN MANUFACTURING, LLC.

2851 MASSACHUSETTS AVENUE, CINCINNATI, OH 45225

For ISED:

Doran Mfg, LLC

2851 Massachusetts Ave., Cincinnati, OH 45225, United States Of America

1.2. Manufacturer

For FCC:

DORAN MANUFACTURING, LLC.

2851 MASSACHUSETTS AVENUE, CINCINNATI, OH 45225

For ISED:

Doran Mfg, LLC

2851 Massachusetts Ave., Cincinnati, OH 45225, United States Of America

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			
☐	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	

2. PRODUCT INFORMATION

2.1. Equipment Description

Product Name:	Truck TPMS sensor
Model No.:	3685-A
Serial Model No.:	3685, 3685-G, 3685-D
HVIN:	3685-A, 3685, 3685-G, 3685-D
PMN:	Truck TPMS sensor
Working Frequency:	433.92MHz
Modulation:	FSK
Identification Number:	01010116

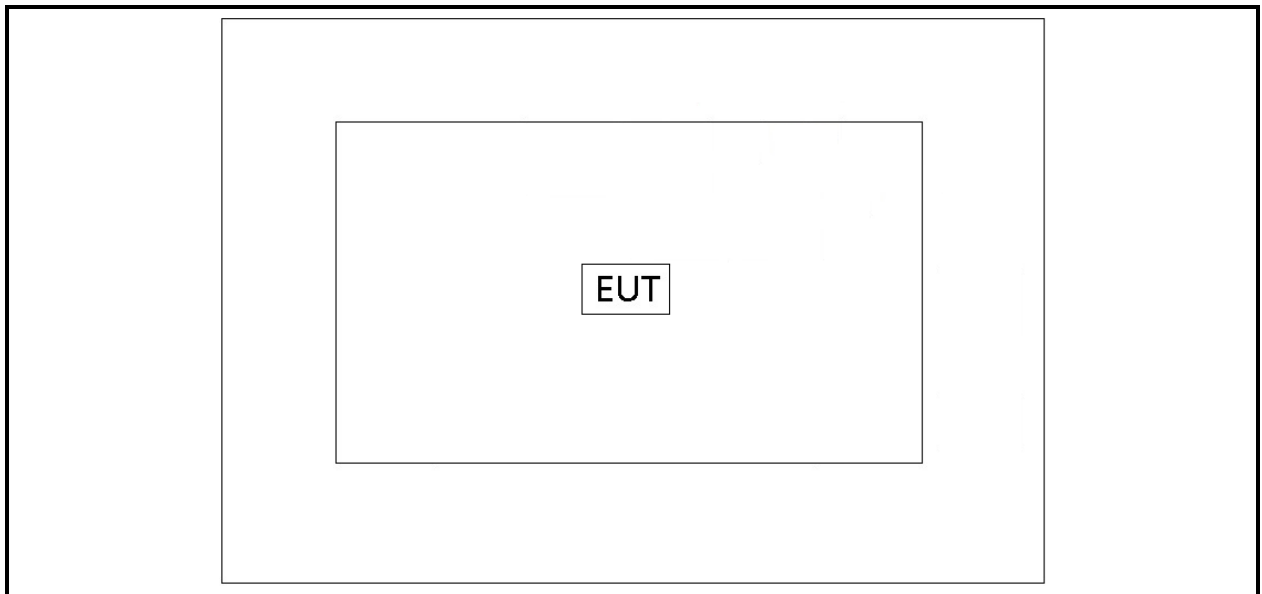
Note: The different models are only for marketing different clients, others are the same.

2.2. Test Mode

Test Mode	Transmit
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2.3. Test Configuration

ANSI C63.10-2013 was used to reference the appropriate EUT setup for test.



2.4. Test Environment Condition

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

2.5. Description of Test Software

The sample provided by the manufacturer is always in the transmitting state after power-on.

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. TEST EQUIPMENT CALIBRATION DATE

Conducted Emission (WZ-SR2)

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EMI Test Receiver	R&S	ESR3	MRTSUE06185	1 year	2021/01/18
Two-Line V-Network	R&S	ENV216	MRTSUE06002	1 year	2021/06/11
Temperature Humidity Meter	testo	608-H1	MRTSUE06404	1 year	2021/07/26
Shielding Room	MIX-BEP	Chamber-SR2	MRTSUE06215	N/A	N/A

Conducted Emission (SIP-SR2)

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EMI Test Receiver	R&S	ESR3	MRTSUE06613	1 year	2021/07/02
Two-Line V-Network	R&S	ENV216	MRTSUE06003	1 year	2021/06/11
Temperature Humidity Meter	testo	608-H1	MRTSUE06621	1 year	2020/12/29

Radiated Emission (WZ-AC1)

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EMI Test Receiver	R&S	ESR7	MRTSUE06001	1 year	2021/01/18
PXA Signal Analyzer	Keysight	N9030B	MRTSUE06395	1 year	2021/08/30
Loop Antenna	Schwarzbeck	FMZB 1519	MRTSUE06025	1 year	2021/10/22
Bilog Period Antenna	Schwarzbeck	VULB 9168	MRTSUE06172	1 year	2021/08/08
Horn Antenna	Schwarzbeck	BBHA 9120D	MRTSUE06023	1 year	2021/09/27
Horn Antenna	Schwarzbeck	BBHA9170	MRTSUE06597	1 year	2020/12/17
Microwave System Amplifier	Agilent	83017A	MRTSUE06076	1 year	2021/11/14
Preamplifier	Schwarzbeck	BBV 9721	MRTSUE06121	1 year	2021/06/11
Temperature Humidity Meter	testo	608-H1	MRTSUE06403	1 year	2021/07/26
Anechoic Chamber	TDK	Chamber-AC1	MRTSUE06212	1 year	2021/04/30

Radiated Emission (WZ-AC2)

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
MXE EMI Receiver	Keysight	N9038A	MRTSUE06125	1 year	2021/07/02
Loop Antenna	Schwarzbeck	FMZB 1519	MRTSUE06025	1 year	2021/10/22
Bilog Period Antenna	Schwarzbeck	VULB 9162	MRTSUE06022	1 year	2021/05/26
Broad-Band Horn Antenna	Schwarzbeck	BBHA 9120D	MRTSUE06171	1 year	2021/10/25
Horn Antenna	Schwarzbeck	BBHA9170	MRTSUE06597	1 year	2020/12/17
Broadband Coaxial Preamplifier	Schwarzbeck	BBV 9718	MRTSUE06176	1 year	2021/11/14
Preamplifier	Schwarzbeck	BBV 9721	MRTSUE06121	1 year	2021/06/11
Temperature Humidity Meter	Minggao	ETH529	MRTSUE06170	1 year	2020/12/15
Anechoic Chamber	RIKEN	Chamber-AC2	MRTSUE06213	1 year	2021/04/30

Radiated Emission (SIP-AC1)

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EMI Test Receiver	R&S	ESR3	MRTSUE06612	1 year	2021/07/02
EXA Signal Analyzer	Keysight	N9010B	MRTSUE06559	1 year	2021/07/23
Loop Antenna	Schwarzbeck	FMZB 1519	MRTSUE06025	1 year	2021/10/22
Bilog Period Antenna	Schwarzbeck	VULB9168	MRTSUE06645	1 year	2021/08/30
Double Ridged Horn Antenna	R&S	HF907	MRTSUE06610	1 year	2021/08/30
Preamplifier	EMCI	EMC051845SE	MRTSUE06600	1 year	2021/11/09
Temperature Humidity Meter	testo	608-H1	MRTSUE06620	1 year	2020/12/29
Anechoic Chamber	RIKEN	SIP-AC1	MRTSUE06554	1 year	2020/12/25

Radiated Emission (SIP-AC2)

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EMI Test Receiver	R&S	ESR3	MRTSUE06613	1 year	2021/07/02
MXA Signal Analyzer	Keysight	N9020B	MRTSUE06604	1 year	2021/09/26
Loop Antenna	Schwarzbeck	FMZB 1519	MRTSUE06025	1 year	2021/10/22
Bilog Period Antenna	Schwarzbeck	VULB9168	MRTSUE06646	1 year	2021/08/30
Horn Antenna	Schwarzbeck	BBHA9120D	MRTSUE06648	1 year	2020/12/17
Horn Antenna	Schwarzbeck	BBHA9170	MRTSUE06599	1 year	2020/12/17
Preamplifier	EMCI	EMC051845SE	MRTSUE06644	1 year	2021/11/09
Preamplifier	EMCI	EMC184045SE	MRTSUE06602	1 year	2021/10/12
Temperature Humidity Meter	testo	608-H1	MRTSUE06624	1 year	2020/12/29
Anechoic Chamber	RIKEN	SIP-AC2	MRTSUE06781	1 year	2020/12/25

Radiated Emission (SIP-AC3)

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EMI Test Receiver	R&S	ESR3	MRTSUE06612	1 year	2021/07/02
EXA Signal Analyzer	Keysight	N9010B	MRTSUE06559	1 year	2021/07/23
Loop Antenna	Schwarzbeck	FMZB 1519	MRTSUE06025	1 year	2021/10/22
Bilog Period Antenna	Schwarzbeck	VULB9168	MRTSUE06647	1 year	2021/08/08
Double Ridged Horn Antenna	R&S	HF907	MRTSUE06611	1 year	2021/09/13
Horn Antenna	Schwarzbeck	BBHA9170	MRTSUE06598	1 year	2020/12/17
Preamplifier	EMCI	EMC012645SE	MRTSUE06642	1 year	2021/01/16
Preamplifier	EMCI	EMC184045SE	MRTSUE06641	1 year	2021/01/16
Temperature Humidity Meter	testo	608-H1	MRTSUE06622	1 year	2020/12/29
Anechoic Chamber	RIKEN	SIP-AC3	MRTSUE06782	1 year	2020/12/25

Conducted Test Equipment (WZ-TR3)

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EXA Signal Analyzer	Agilent	N9020A	MRTSUE06106	1 year	2021/04/14
EXA Signal Analyzer	Keysight	N9010B	MRTSUE06607	1 year	2021/01/08
Signal Analyzer	R&S	FSV40	MRTSUE06218	1 year	2021/04/14
Power Meter	Agilent	U2021XA	MRTSUE06030	1 year	2021/10/22
USB wideband power sensor	Keysight	U2021XA	MRTSUE06446	1 year	2021/08/30
USB wideband power sensor	Keysight	U2021XA	MRTSUE06447	1 year	2021/08/08
Bluetooth Test Set	Anritsu	MT8852B-042	MRTSUE06389	1 year	2021/06/11
Audio Analyzer	Agilent	U8903B	MRTSUE06143	1 year	2021/06/11
Modulation Analyzer	HP	HP8901A	MRTSUE06098	1 year	2021/09/26
Wideband Radio Communication Tester	R&S	CMW 500	MRTSUE06243	1 year	2021/10/20
DC Power Supply	GWINSTEK	DPS-3303C	MRTSUE06064	N/A	N/A
Temperature & Humidity Chamber	BAOYT	BYH-150CL	MRTSUE06051	1 year	2021/10/22
Thermal Hygrometer	testo	608-H1	MRTSUE06401	1 year	2021/07/26

Conducted Test Equipment (SIP-SR5)

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
Signal Analyzer	R&S	FSV40	MRTSUE06218	1 year	2021/04/14
PXA Signal Analyzer	Keysight	N9030B	MRTSUE06395	1 year	2021/08/30
USB wideband power sensor	Agilent	U2021XA	MRTSUE06595	1 year	2021/09/26
USB wideband power sensor	Agilent	U2021XA	MRTSUE06596	1 year	2021/09/26
Wideband Radio Communication Tester	R&S	CMW 500	MRTSUE06243	1 year	2021/10/20
Bluetooth Test Set	Anritsu	MT8852B-042	MRTSUE06389	1 year	2021/06/11
Temperature Chamber	BAOYT	BYG-408CS	MRTSUE06847	1 year	2021/03/31
Thermal Hygrometer	testo	622	MRTSUE06629	1 year	2020/12/30

Software	Version	Function
EMI Software	V3	EMI Test Software

5. 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)	RSS Section(s)	Test Description	Test Condition	Test Result	Reference
15.207	RSS-Gen Clause 8.8	AC Conducted Emissions 150kHz - 30MHz	Line Conducted	N/A	Section 6.2
15.205, 15.231(e)	RSS-210, A1.4	Radiated Spurious Emissions	Radiated	Pass	Section 6.3
15.231(c)	RSS-210, A1.3	20dB & 99% Bandwidth		Pass	Section 6.4
15.231(e)	RSS-210, A1.4	Transmission Time		Pass	Section 6.5

Notes:

- 1) The test results shown in the following sections represent the worst-case emissions.
- 2) The radiation measurements are performed in X, Y, Z axis positioning. Only the worst case is shown in the report.
- 3) "N/A" means that the test item is not applicable, and the detailed information refers to relevant section.

6.2. Conducted Emission

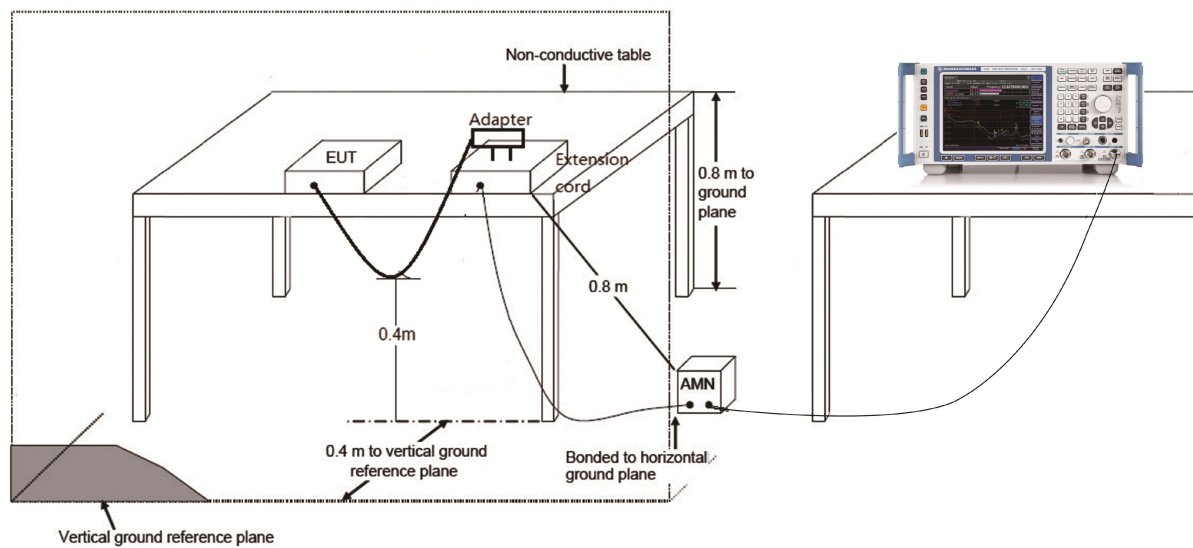
6.2.1. Test Limit

FCC Part 15.207 & RSS-Gen 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

This 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:

FCC Part 15.231(e) Limits		
Fundamental Frequency (MHz)	Field strength of fundamental (microvolts/meter)	Field strength of spurious emission (microvolts/meter)
40.66 - 40.77	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

Note 1: The above field strength limits are specified at a distance of 3 meters. The tighter limits apply at the band edges.

Note 2: 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.

FCC Part 15 Subpart C Paragraph 15.209		
Frequency [MHz]	Field Strength [uV/m]	Measured Distance [Meters]
0.009 - 0.490	2400/F (kHz)	300
0.490 - 1.705	24000/F (kHz)	30
1.705 - 30	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

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
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	--
13.36 - 13.41	--	--	--

According to A1.4 of the RSS-210, the field strength of emissions from intentional radiators shall not exceed the following:

RSS-210 - A1.4 Limits	
Fundamental Frequency (MHz)	Field strength of fundamental ($\mu\text{V/m}$ at 3 m)
70 - 130	500
130 - 174	500 to 1500
174 - 260	1500
260 - 470	1500 to 5000
Above 470	5000

Note 1: Linear interpolation with frequency, f , in MHz,
For 130-174 MHz: Field Strength ($\mu\text{V/m}$) = $(22.73 \times f) - 2454.55$
For 260-470 MHz: Field Strength ($\mu\text{V/m}$) = $(16.67 \times f) - 2833.33$
Note 2: Frequency bands 225-328.6 MHz and 335.4-399.9 MHz are designated for the exclusive use of the Government of Canada. Manufacturers should be aware of possible harmful interference and degradation of their licence-exempt radio equipment in these frequency bands.

RSS-Gen Section 8.9			
Frequency (MHz)	Field Strength ($\mu\text{V/m}$)	Magnetic Field Strength (H-Field) ($\mu\text{A/m}$)	Measured Distance (m)
0.009 - 0.490	--	$6.37/F$ (F in kHz)	300
0.490 - 1.705	--	$6.37/F$ (F in kHz)	30
1.705 - 30	--	0.08	30
30 - 88	100	--	3
88 - 216	150	--	3
216 - 960	200	--	3
Above 960	500	--	3

For RSS-Gen Section 8.10 Requirement

Radiated emissions which fall in the restricted bands, as defined in Section 8.10 of RSS-Gen, must also comply with the radiated emission limits specified in Section 8.9.

Frequency (MHz)	Frequency (MHz)	Frequency (GHz)
0.090 - 0.110	149.9 - 150.05	9.0 - 9.2
0.495 - 0.505	156.52475 - 156.52525	9.3 - 9.5
2.1735 - 2.1905	156.7 - 156.9	10.6 - 12.7
3.020 - 3.026	162.0125 - 167.17	13.25 - 13.4
4.125 - 4.128	167.72 - 173.2	14.47 - 14.5
4.17725 - 4.17775	240 - 285	15.35 - 16.2
4.20725 - 4.20775	322 - 335.4	17.7 - 21.4
5.677 - 5.683	399.9 - 410	22.01 - 23.12
6.215 - 6.218	608 - 614	23.6 - 24.0
6.26775 - 6.26825	960 - 1427	31.2 - 31.8
6.31175 - 6.31225	1435 - 1626.5	36.43 - 36.5
8.291 - 8.294	1645.5 - 1646.5	Above 38.6
8.362 - 8.366	1660 - 1710	--
8.37625 - 8.38675	1718.8 -1722.2	
8.41425 - 8.41475	2200 - 2300	
12.29 - 12.293	2310 -2390	
12.51975 - 12.52025	2483.5 -2500	
12.57675 - 12.57725	2655 - 2900	
13.36 -13.41	3260 - 3267	
16.42 - 16.423	3332 -3339	
16.69475 - 16.69525	3345.8 - 3358	
16.80425 - 16.80475	3500 - 4400	
25.5 - 25.67	4500 - 5150	
37.5 - 38.25	5350 - 5460	
73 - 74.6	7250 - 7750	
74.8 - 75.2	8025 - 8500	
108 - 138		

6.3.2. Test Procedure Used

ANSI C63.10-2013 Section 6.3 (General Requirements)

ANSI C63.10-2013 Section 6.4 (Radiated emissions below 30 MHz)

ANSI C63.10-2013 Section 6.5 (Radiated emissions above 30 MHz and below 1000 MHz)

ANSI C63.10-2013 Section 6.6 (Radiated emissions above 1000 MHz)

ANSI C63.10-2013 Section 7.5 (Procedure for determining the average value of pulsed emissions)

6.3.3. Test Setting

Table 1 - RBW as a function of frequency

Frequency	RBW
9 ~ 150 kHz	200 Hz
0.15 ~ 30 MHz	9 kHz
30 ~ 1000 MHz	120 kHz
> 1000 MHz	1 MHz

Quasi-Peak Measurements below 1GHz

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = as specified in Table 1
3. Detector = CISPR quasi-peak (a linear average detector for 9-90 kHz and 110-490 kHz)
4. Sweep time = auto couple
5. Trace was allowed to stabilize

Peak Measurements above 1GHz

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW = 3MHz
4. Detector = peak
5. Sweep time = auto couple
6. Trace mode = max hold

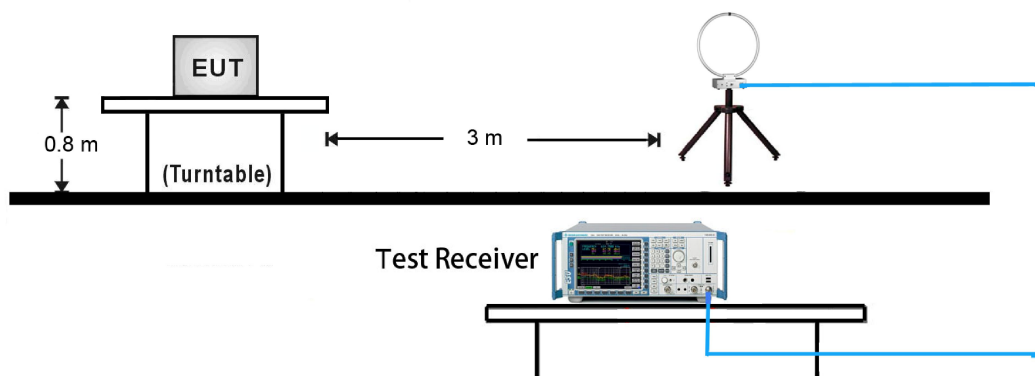
7. Trace was allowed to stabilize

Average Measurement of pulsed emissions

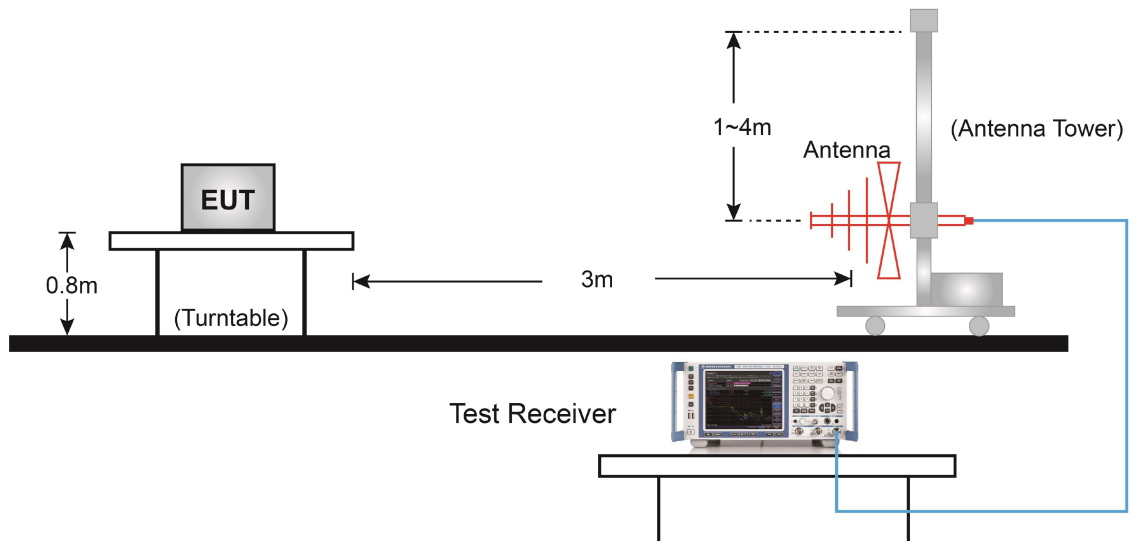
1. Make EUT is transmitting to obtain the “worst-case” pulse ON time.
2. Couple the final radio frequency output signal to the input of a spectrum analyzer.
3. Adjust the center frequency of the spectrum analyzer to the center of the RF signal.
4. Set the spectrum analyzer for ZERO SPAN.
5. Sweep time = 100ms
6. Set the TRIGGER on the spectrum analyzer to capture at least one period of the pulse train, including any blanking intervals.
7. Determine the total maximum pulse “ON time” (t_{ON}) over one period of the pulse train.
8. The duty cycle is then determined by dividing the total maximum “ON time” by the period of the pulse train ($t_{ON}/100ms$).
9. Determine the duty cycle correction factor. Duty Cycle Factor = $20 \cdot \log(\text{Duty Cycle})$
10. This correction factor may then be subtracted from the peak pulse amplitude (in dB) to find the average emission.

6.3.4. Test Setup

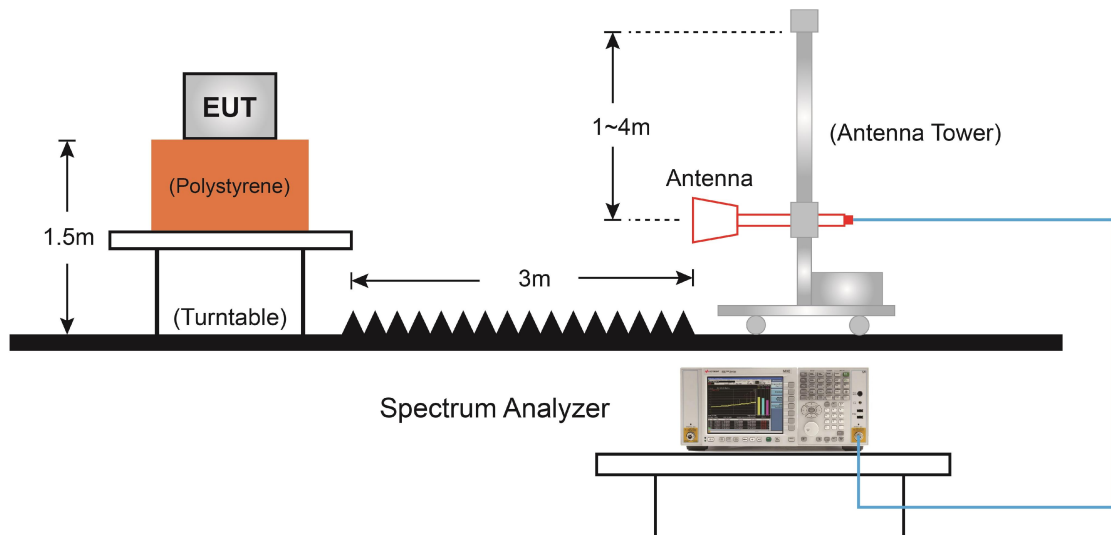
Below 30MHz Test Setup:



30MHz ~ 1GHz Test Setup:



Above 1GHz Test Setup:



6.3.5. Test Results

Product	Truck TPMS sensor	Test Engineer	Jason Gao
Test Site	WZ-AC2	Test Date	2020/12/01

Time On (ms)	One Period (ms)	Duty Cycle (%)	Duty Cycle Factor (dB)
16.00	100	16.0	-15.9

Note: Duty Cycle Factor = 20*Log (Duty Cycle)



Product	Truck TPMS sensor	Test Engineer	Jason Gao
Test Site	WZ-AC2	Test Date	2020/12/04
Remark	Fundamental Radiated Emission		

Frequency (MHz)	Reading Level (dBμV)	Factor (dB)	Duty Cycle Factor (dB)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
433.92	48.4	23.9	NA	72.3	92.9	-20.6	PK	Horizontal
	48.4	23.9	-15.9	56.4	72.9	-16.5	AV	Horizontal
	52.3	23.9	NA	76.2	92.9	-16.7	PK	Vertical
	52.3	23.9	-15.9	60.3	72.9	-12.6	AV	Vertical

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

Average Measure Level = Peak Measure Level + Duty Cycle Factor

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

Product	Truck TPMS sensor	Test Engineer	Jason Gao
Test Site	WZ-AC2	Test Date	2020/12/04
Remark	Radiated Spurious Emissions		

Frequency (MHz)	Reading Level (dBμV)	Factor (dB)	Duty Cycle Factor (dB)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
868.1	6.1	31.3	N/A	37.4	46.0	-8.6	PK	Horizontal
1302.5	55.7	-4.5	N/A	51.2	74.0	-22.8	PK	Horizontal
1735.0	42.0	-4.4	N/A	37.6	74.0	-36.4	PK	Horizontal
2170.0	49.1	-1.1	N/A	48.0	74.0	-26.0	PK	Horizontal
2602.5	41.5	-1.1	N/A	40.4	74.0	-33.6	PK	Horizontal
3037.5	43.8	-1.1	N/A	42.7	74.0	-31.3	PK	Horizontal
3472.5	41.1	-0.3	N/A	40.8	74.0	-33.2	PK	Horizontal
3905.0	44.8	0.4	N/A	45.2	74.0	-28.8	PK	Horizontal
4340.0	40.3	2.2	N/A	42.5	74.0	-31.5	PK	Horizontal
5207.5	34.3	4.1	N/A	38.4	74.0	-35.6	PK	Horizontal
867.6	7.9	31.3	N/A	39.2	46.0	-6.8	PK	Vertical
1302.5	59.4	-4.5	N/A	54.9	74.0	-19.1	PK	Vertical
1302.5	59.4	-4.5	-15.9	39.0	54.0	-15.0	AV	Vertical
1735.0	57.1	-4.4	N/A	52.7	74.0	-21.3	PK	Vertical
2170.0	59.5	-1.1	N/A	58.4	74.0	-15.6	PK	Vertical
2170.0	59.5	-1.1	-15.9	42.5	54.0	-11.5	AV	Vertical
2605.0	43.9	-1.1	N/A	42.8	74.0	-31.2	PK	Vertical
3037.5	50.8	-1.1	N/A	49.7	74.0	-24.3	PK	Vertical
3472.5	46.2	-0.3	N/A	45.9	74.0	-28.1	PK	Vertical
3905.0	45.1	0.4	N/A	45.5	74.0	-28.5	PK	Vertical
4340.0	42.4	2.2	N/A	44.6	74.0	-29.4	PK	Vertical
5207.5	42.6	4.1	N/A	46.7	74.0	-27.3	PK	Vertical

Note 1: Peak Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) – Pre_Amplifier Gain (dB)

Note 2: QP measurement was not performed when peak measure level was lower than the QP limit by more than 6dB.

Note 3: Average measurement was not performed when the peak level lower than average limit.

6.4. Occupied 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.

According to Section A.1.3 of RSS-210, The occupied bandwidth of momentarily operated devices shall be less than or equal to 0.25% of the centre frequency for devices operating between 70 MHz and 900 MHz.

6.4.2. Test Procedure used

ANSI C63.10-2013 Clause 6.9.2 (20dB Bandwidth)

ANSI C63.10-2013 Clause 6.9.3 (99% Bandwidth)

6.4.3. Test Setting

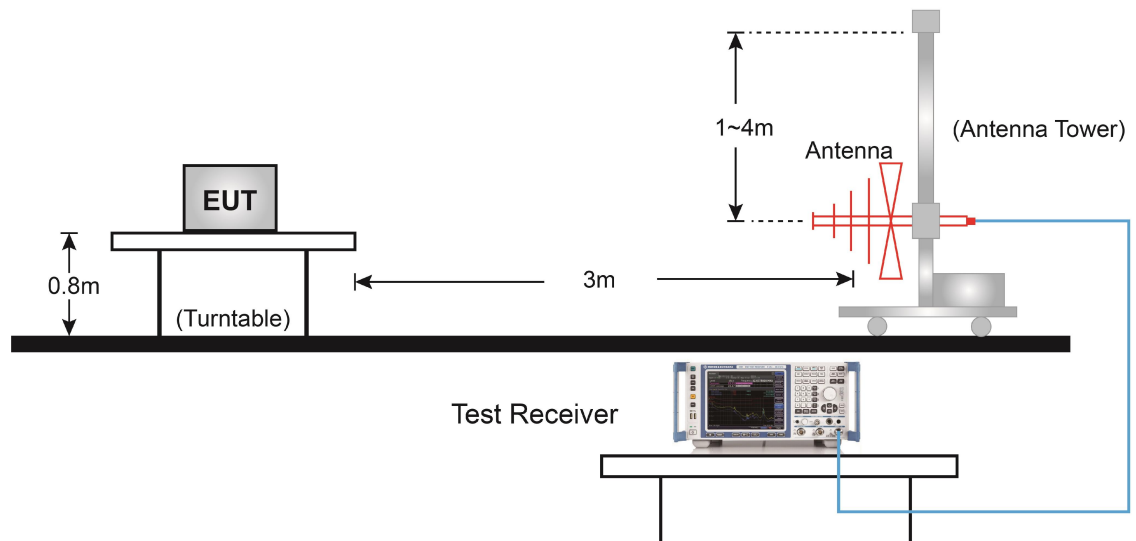
20dB Bandwidth:

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

99% Bandwidth:

1. Set the spectrum span shall be between 1.5 times and 5.0 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

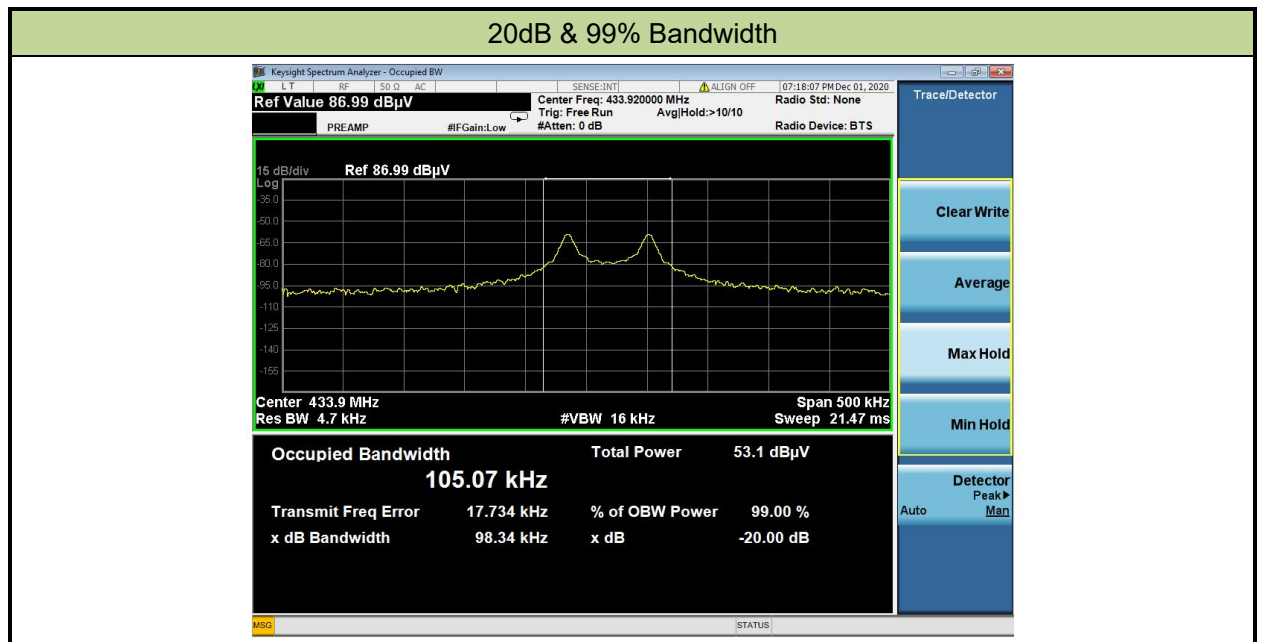


6.4.5. Test Result

Product	Truck TPMS sensor	Test Engineer	Jason Gao
Test Site	WZ-AC2	Test Date	2020/12/01

Center Frequency (MHz)	20dB Bandwidth (KHz)	99% Bandwidth (kHz)	Limit (kHz)	Result
433.92	98.34	105.07	≤ 1084.8	Pass

Note: Limit = Center Frequency (MHz) * 0.25% = 433.92 MHz * 0.25% = 1084.8 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.

According to Section A.1.4(b) of RSS-210, devices operated under the provisions of this section shall be capable of automatically limiting their operation so that the duration of each transmission is not greater than 1 second and the silent period between transmissions is at least 30 times the duration of the transmission, but not less than 10 seconds under any circumstances.

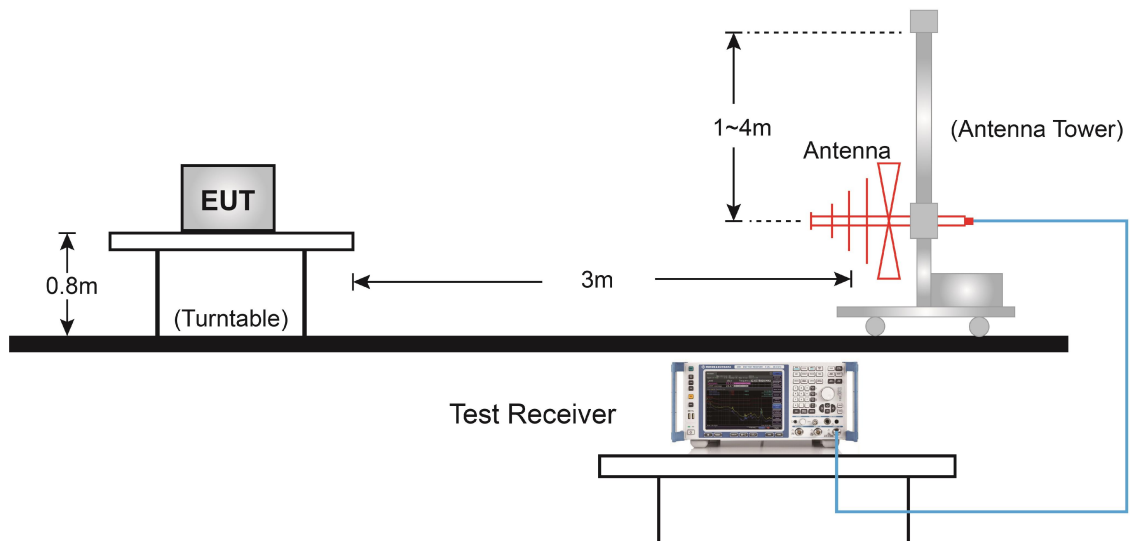
6.5.2. Test Procedure

ANSI C63.10-2013 Clause 7.4.

6.5.3. Test Setting

1. Trigger the spectrum analyzer sweep on the RF waveform of the unlicensed wireless device.
2. Set the spectrum analyzer sweep time greater than the specified time for periodic operation.
3. Manually activate and deactivate the unlicensed wireless device and confirm that it ceases transmission within the specified time of deactivation.
4. Verify and document that periodic transmissions at regular predetermined intervals do not exist, except where regulatory requirements allow polling or supervision transmissions, including data, to determine system integrity. Compliance is addressed by an attestation supported by the equipment theory of operation.

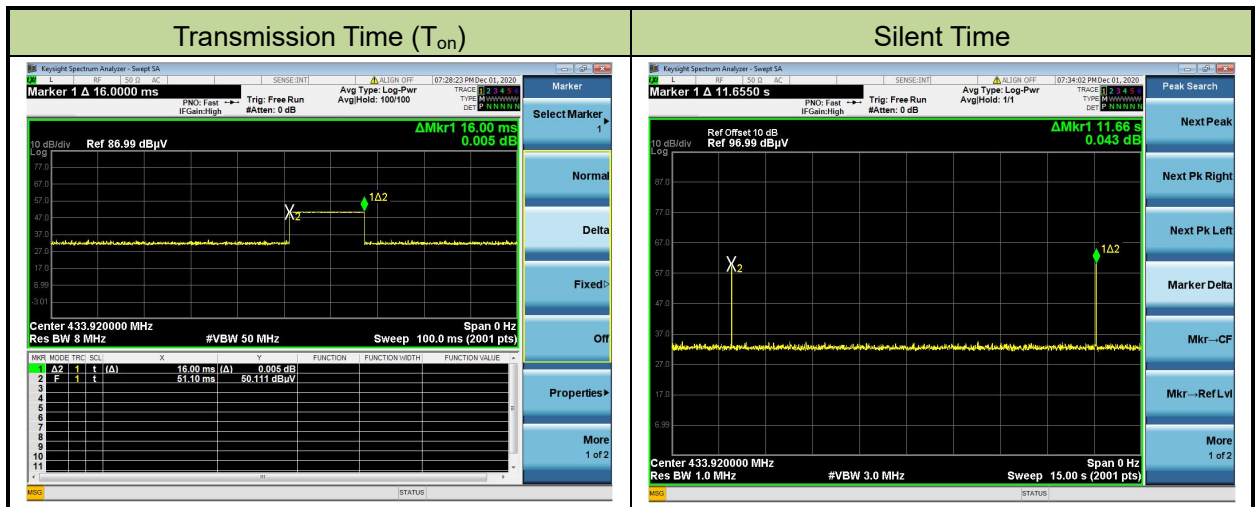
6.5.4. Test Setup



6.5.5. Test Result

Product	Truck TPMS sensor	Test Engineer	Jason Gao
Test Site	WZ-AC2	Test Date	2020/12/01

Frequency	Item	Measured Value	Limit	Result
433.92MHz	Transmission Time (T_{on})	16.00 ms	≤ 1 s	Pass
	Silent Time	11.66 s	≥ 10 s	Pass
	Silent Time/Transmission Time	729 times	≥ 30 times	Pass



7. CONCLUSION

The data collected relate only the item(s) tested and show that the unit is compliance with FCC Part 15.231(e) and Annex A of RSS-210 Rules.

The End

Appendix A - Test Setup Photograph

Refer to the "2011RSU079-UT" file.

Appendix B - EUT Photograph

Refer to the "2011RSU079-UE" file.