FCC Test Report

(Class II Permissive Change)

Product Name	Tire Pressure Monitoring Sensor
Model No.	TIS-09DH
FCC ID.	KR5TIS-09DH

Applicant	Continental Automotive GmbH
Address	Siemensstrasse 12, SV C TS RBG EMC-Laboratory, 93055 Regensburg, Germany

Date of Receipt	Dec. 24, 2019
Issued Date	Feb. 11, 2020
Report No.	19C0374R-RFUSP14V00
Report Version	V1.0

Test Report

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Product Name	Tire Pressure Monitoring Sensor
Applicant	Continental Automotive GmbH
Address	Siemensstrasse 12, SV C TS RBG EMC-Laboratory, 93055 Regensburg, Germany
Manufacturer	Continental Automotive GmbH
Model No.	TIS-09DH
FCC ID.	KR5TIS-09DH
EUT Rated Voltage	DC 3V(Power by Battery)
EUT Test Voltage	DC 3V(Power by Battery)
Trade Name	Continental
Applicable Standard	FCC CFR Title 47 Part 15 Subpart C ANSI C63.4: 2014, ANSI C63.10: 2013
Test Result	Complied

Documented By : Jinn Chen

(Senior Adm. Specialist / Jinn Chen)

Tested By : Bill Lin

(Senior Engineer / Bill Lin)

Approved By :

(Director / Vincent Lin)

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Attachment 1: EUT Test Photographs

Attachment 2: EUT Detailed Photographs

1. General Information

1.1. EUT Description

Product Name	Tire Pressure Monitoring Sensor
Trade Name	Continental
Model No.	TIS-09DH
FCC ID	KR5TIS-09DH
Frequency Range	433.92 MHz
Number of Channels	1
Type of Modulation	ASK/FSK
Antenna Type	Integral antenna

Frequency of Each Channel:

Channel	Frequency
Channel 1:	433.92 MHz

Note:

1. The EUT is a Tire Pressure Monitoring Sensor with a built-in 433.92 MHz transmitter.
2. The antenna of EUT is conform to FCC 15.203.
3. These tests are conducted on a sample for the purpose of demonstrating compliance of transmitter with Part 15 Subpart C Paragraph 15.231.
4. The radiation measurements are performed in X, Y, Z axis positioning. Only the worst case is shown in the report.
5. This is to request a Class II permissive change for FCC ID: KR5TIS-09DH, originally granted on 09/13/2018.
   The major change filed under this application is:
   Change #1: The difference is again just the addition of an anti-corrosion layer to the antenna.

Test Mode	Mode 1: Transmit

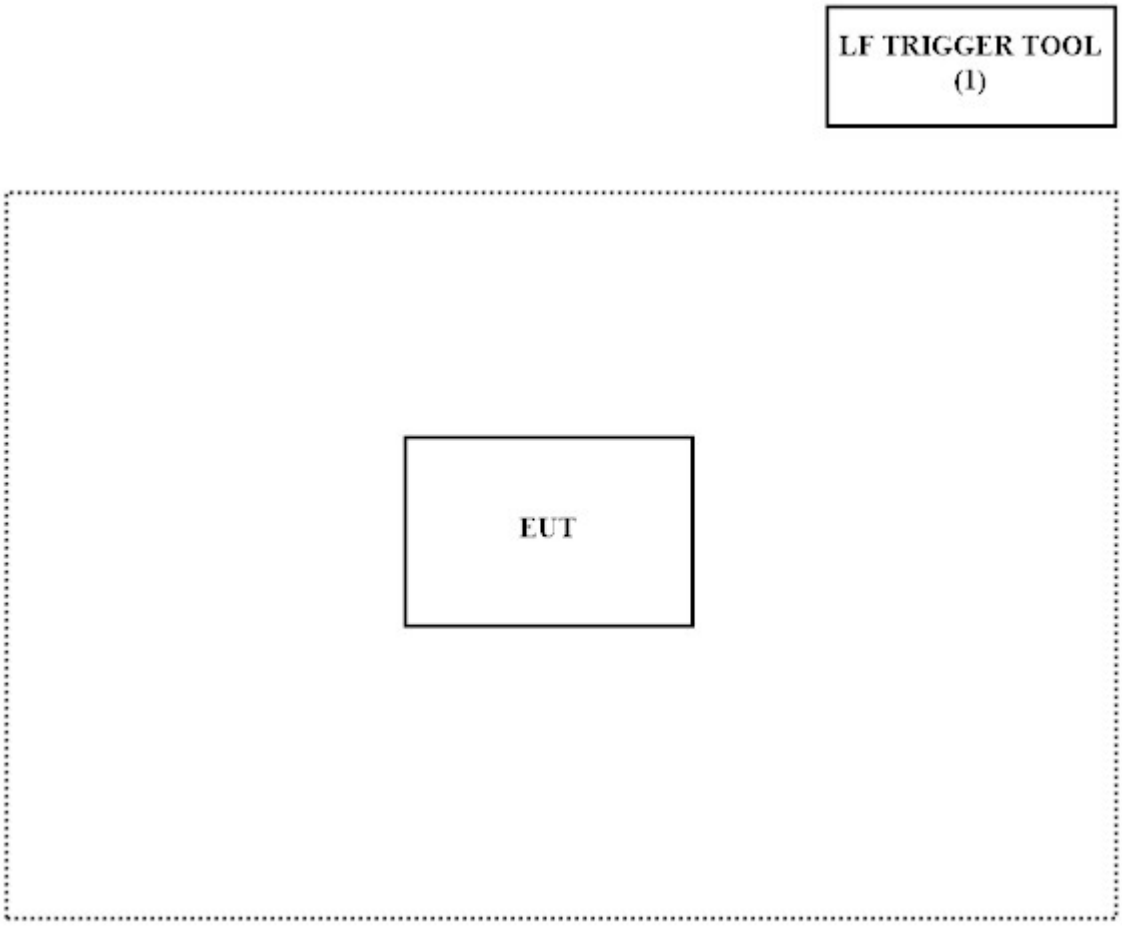
1.3. Tested System Details

The types for all equipments, plus descriptions of all cables used in the tested system (including inserted cards) are:

Product		Manufacturer	Model No.	Serial No.	Power Cord
1	LF TRIGGER TOOL	Continental	N/A	N/A	N/A

Signal Cable Type	Signal cable Description
N/A	

1.4. Configuration of tested System



1.5. EUT Exercise Software

1	Setup the EUT as shown in section 1.4.
2	Use the LF TRIGGER TOOL to trigger EUT transmit signal.
3	Make sure the frequency and signal are correct.
4	Start testing.

1.6. Test Facility

Ambient conditions in the laboratory:

Performed Item	Items	Required	Actual
Radiated Emission	Temperature (°C)	10~40 °C	25.7°C
	Humidity (%RH)	10~90 %	42.3%

USA : FCC Registration Number: TW0023

Canada : IC Registration Number: 4075A

Site Description : Accredited by TAF
Accredited Number: 3023

Test Laboratory : DEKRA Testing and Certification Co., Ltd
Address : No.159, Sec. 2, Wenhua 1st Rd., Linkou Dist.,
New Taipei City 24457, Taiwan, R.O.C.
Phone number : 886-2-2602-7968
Fax number : 866-2-2602-3286
Email address : info.tw@dekra.com
Website : http://www.dekra.com.tw

1.7. List of Test Equipment

For Conducted measurements /ASR4

	Equipment	Manufacturer	Model No.	Serial No.	Cali. Data	Due. Data
X	Spectrum Analyzer	R&S	FSV30	103464	2019.01.25	2020.01.24
	Power Meter	Anritsu	ML2496A	1548003	2019.12.17	2020.12.16
	Power Sensor	Anritsu	MA2411B	1531024	2019.12.17	2020.12.16
	Power Sensor	Anritsu	MA2411B	1531025	2019.12.17	2020.12.16
	Bluetooth Tester	R&S	CBT	101238	2019.01.21	2020.01.20

Note:

1. All equipments are calibrated every one year.
2. The test instruments marked with “X” are used to measure the final test results.
3. Test Software version : DEKRA Conduction Test System V9.0.5

For Radiated measurements /ACB1

	Equipment	Manufacturer	Model No.	Serial No.	Cali. Data	Due. Data
X	Loop Antenna	AMETEK	HLA6121	49611	2019.02.22	2020.02.21
X	Bi-Log Antenna	SCHWARZBECK	VULB9168	9168-953	2020.01.03	2021.01.02
X	Horn Antenna	ETS-Lindgren	3117	02001259	2019.10.15	2020.10.14
	Horn Antenna	Com-Power	AH-840	101087	2019.05.30	2020.05.29
X	Pre-Amplifier	EMCI	EMC001330	980316	2019.06.14	2020.06.13
X	Pre-Amplifier	EMCI	EMC051835SE	980311	2019.06.13	2020.06.12
	Pre-Amplifier	EMCI	EMC05820SE	980310	2019.06.24	2020.06.23
	Pre-Amplifier	EMCI	EMC184045SE	980314	2019.05.28	2020.05.27
	Filter	MICRO TRONICS	BRM50702	G251	2019.09.03	2020.09.02
	Filter	MICRO TRONICS	BRM50716	G188	2019.09.03	2020.09.02
X	EMI Test Receiver	R&S	ESR7	101602	2019.12.16	2020.12.15
X	Spectrum Analyzer	R&S	FSV40	101148	2019.02.08	2020.02.07
X	Coaxial Cable	SUHNER	SUCOFLEX 106	RF002	2019.07.03	2020.07.02
	Mircoflex Cable	HUBER SUHNER	SUCOFLEX 102	MY3381/2	2019.05.28	2020.05.27

Note:

1. All equipments are calibrated every one year.
2. The test instruments marked with “X” are used to measure the final test results.
3. Test Software version : DEKRA Testing System V1.1

1.8. Uncertainty

Uncertainties have been calculated according to the DEKRA internal document, and is described in each test chapter of this report.
The reported expanded uncertainties are based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95%.
Measurement uncertainties evaluated for each testing system and associated connections are given here to provide the system information for reference. Compliance determinations do not take into account measurement uncertainties for each testing system, but are based on the results of the compliance measurement.

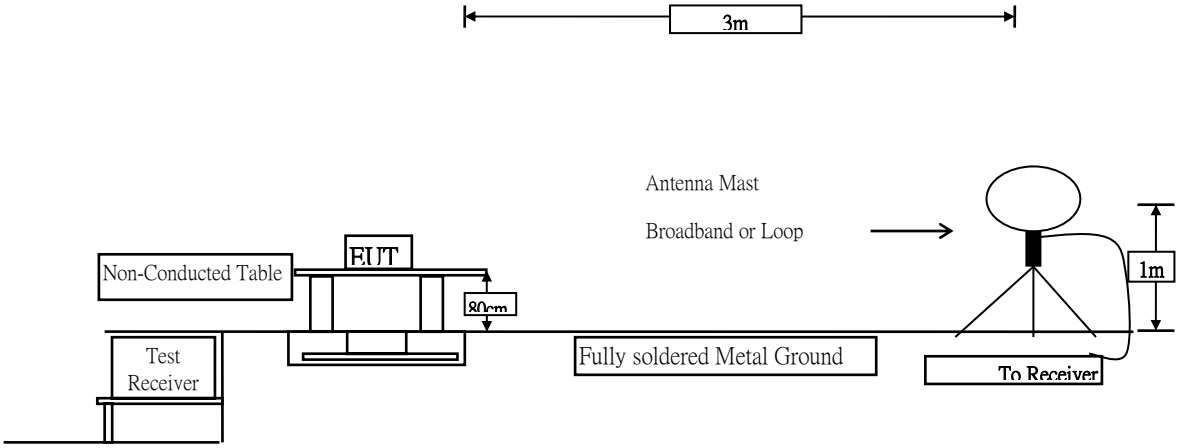
1.9. Test Item

Emission	
Performed Item	Test
Conducted Emission	--
Radiated Emission	Pass
Transmit time	--
Occupied Bandwidth	--
Duty Cycle	Pass

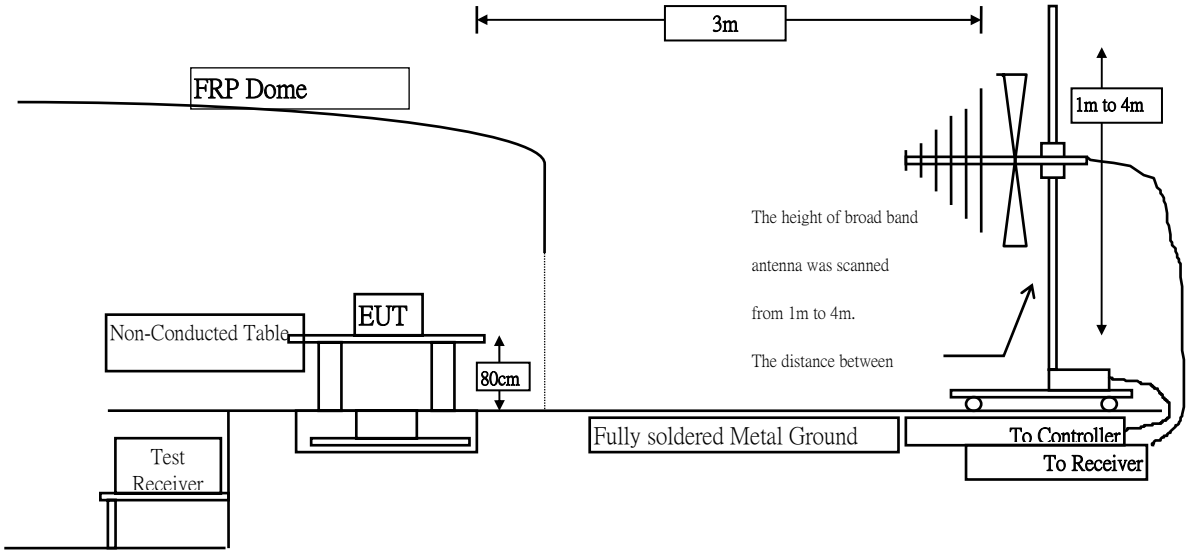
2. Radiated Emission

2.1. Test Setup

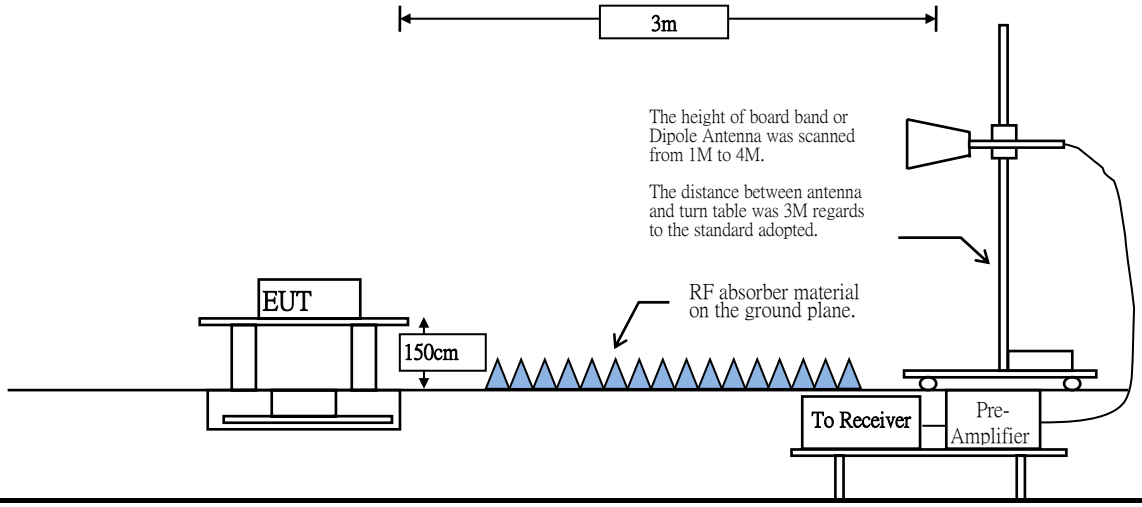
Radiated Emission Under 30MHz



Radiated Emission Below 1GHz



Radiated Emission Above 1GHz



2.2. Limits

➢ Fundamental and Harmonics Emission Limits

FCC Part 15 Subpart C Paragraph 15.231(e) Limits		
Fundamental Frequency MHz	Field Strength of Fundamental	Field Strength of Spurious Emission
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

Remarks : 1. RF Voltage (dBuV) = 20 log RF Voltage (uV)

2. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

3. The emission limit in this paragraph is based on measurement instrumentation employing an average detector.

➢ Spurious electric field strength limits

FCC Part 15 Subpart C Paragraph 15.209 Limits			
Frequency MHz	uV/m	dBuV/m	Measurement distance (meter)
0.009-0.490	2400/F(kHz)	See Remark[1]	300
0.490-1.705	24000/F(kHz)	See Remark[1]	30
1.705-30	30	29.5	30
30-88	100	40	3
88-216	150	43.5	3
216-960	200	46	3
Above 960	500	54	3

Remarks : 1. RF Voltage (dBuV) = 20 log RF Voltage (uV)

2. In the Above Table, the tighter limit applies at the band edges.

3. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

2.3. Test Procedure

Measuring the frequency range below 1GHz, the EUT is placed on a turn table which is 0.8 meter above ground,when measuring the frequency range above 1GHz, the EUT is placed on a turn table which is 1.5 meter above ground.

The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

The turn table is rotated 360 degrees to determine the position of the maximum emission level.

The antenna can move up and down between 1 meter and 4 meters to find out the maximum emission level.

Both horizontal and vertical polarization of the antenna are set on measurement. In order to find the maximum emission, all of the interface cables must be manipulated according to ANSI C63.10: 2013 on radiated measurement.

The resolution bandwidth below 30MHz setting on the field strength meter is 9kHz and 30MHz~1GHz is 120kHz and above 1GHz is 1MHz.

Radiated emission measurements below 30MHz are made using Loop Antenna and 30MHz~1GHz are made using broadband Bilog antenna and above 1GHz are made using Horn Antennas.

The measurement is divided into the Preliminary Measurement and the Final Measurement.

The suspected frequencies are searched for in Preliminary Measurement with the measurement antenna kept pointed at the source of the emission both in azimuth and elevation, with the polarization of the antenna oriented for maximum response. The antenna is pointed at an angle towards the source of the emission, and the EUT is rotated in both height and polarization to maximize the measured emission. The emission is kept within the illumination area of the 3 dB bandwidth of the antenna.

The measurement frequency range form 9kHz - 10th Harmonic of fundamental was investigated.

2.4. Uncertainty

Horizontal polarization：

30-300MHz: ±4.08dB；300M-1GHz: ±3.86dB；1-18GHz: ±3.77dB；18-40GHz: ±3.98dB

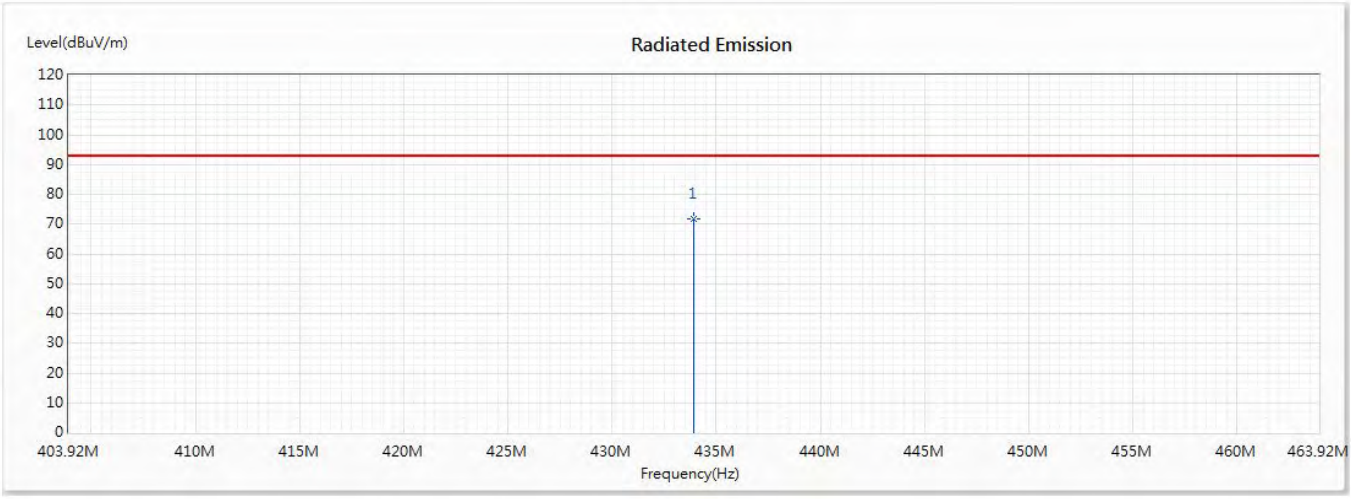
Vertical polarization：

30-300MHz: ±4.81dB；300M-1GHz: ±3.87dB；1-18GHz : ±3.83dB；18-40GHz: ±3.98dB

2.5. Test Result

Product	Tire Pressure Monitoring Sensor
Test Item	Fundamental Radiated Emission
Test Mode	Mode 1: Transmit_ASK
Date of Test	2020/01/04

Horizontal_X-Axis



No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB/m)	Detector Type
* 1	433.92	71.60	92.86	-21.26	78.00	-6.40	PK

Note:

1. Measurement Level = Reading Level + Correct Factor
2. Average Limit=20log(2416.17)=67.662dBuV、Peak Limit=87.662dBuV

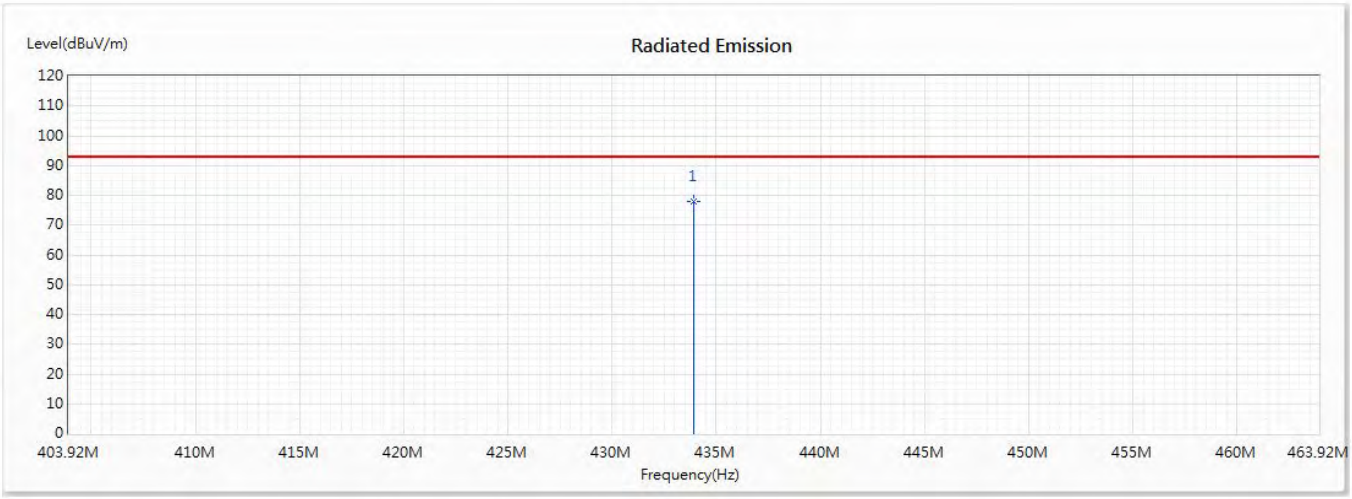
Frequency	Peak Measurement	Duty Cycle Factor	Measurement Level	Margin	Limit
MHz	dBuV/m	dB	dBuV/m	dB	dBuV/m
Average Detector:					
433.92	71.6	-13.854	57.746	-15.114	72.860

Note:

1. Average Measurement=Peak Measurement + Duty Cycle Factor
2. The Duty Cycle is refer to section 15.

Product	Tire Pressure Monitoring Sensor
Test Item	Fundamental Radiated Emission
Test Mode	Mode 1: Transmit_ASK
Date of Test	2020/01/04

Vertical X-Axis



No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB/m)	Detector Type
* 1	433.92	77.90	92.86	-14.96	84.30	-6.40	PK

Note:

1. Measurement Level = Reading Level + Correct Factor
2. Average Limit=20log(2416.17)=67.662dBuV、Peak Limit=87.662dBuV

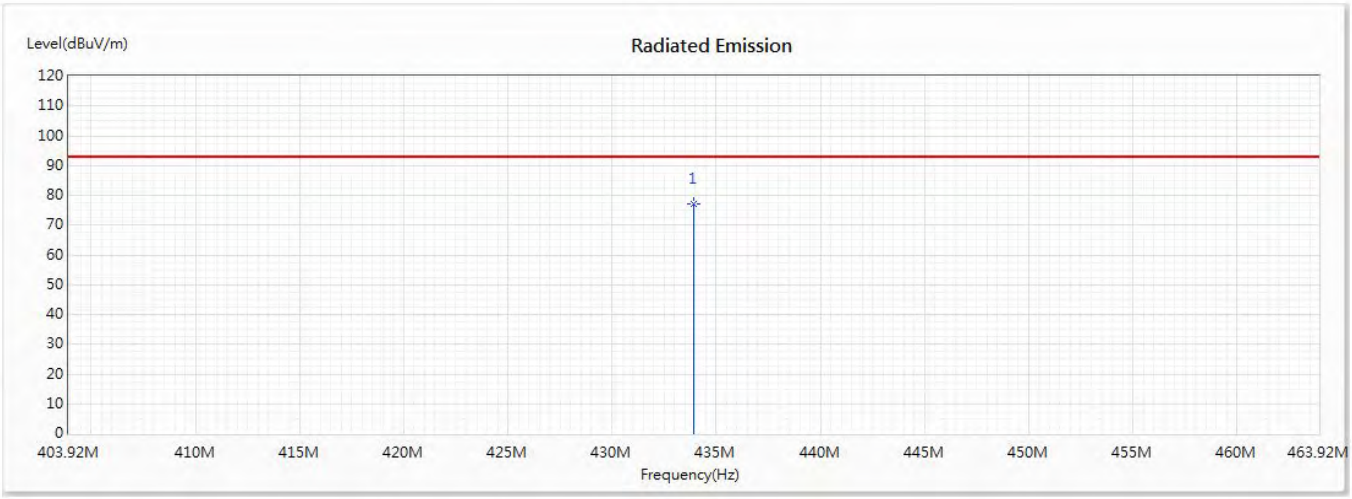
Frequency	Peak Measurement	Duty Cycle Factor	Measurement Level	Margin	Limit
MHz	dBuV/m	dB	dBuV/m	dB	dBuV/m
Average Detector:					
433.92	77.9	-13.854	64.046	-8.814	72.860

Note:

1. Average Measurement=Peak Measurement + Duty Cycle Factor
2. The Duty Cycle is refer to section 15.

Product	Tire Pressure Monitoring Sensor
Test Item	Fundamental Radiated Emission
Test Mode	Mode 1: Transmit_ASK
Date of Test	2020/01/04

Horizontal_Y-Axis



No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB/m)	Detector Type
* 1	433.92	77.20	92.86	-15.66	83.60	-6.40	PK

Note:

1. Measurement Level = Reading Level + Correct Factor
2. Average Limit=20log(2416.17)=67.662dBuV、Peak Limit=87.662dBuV

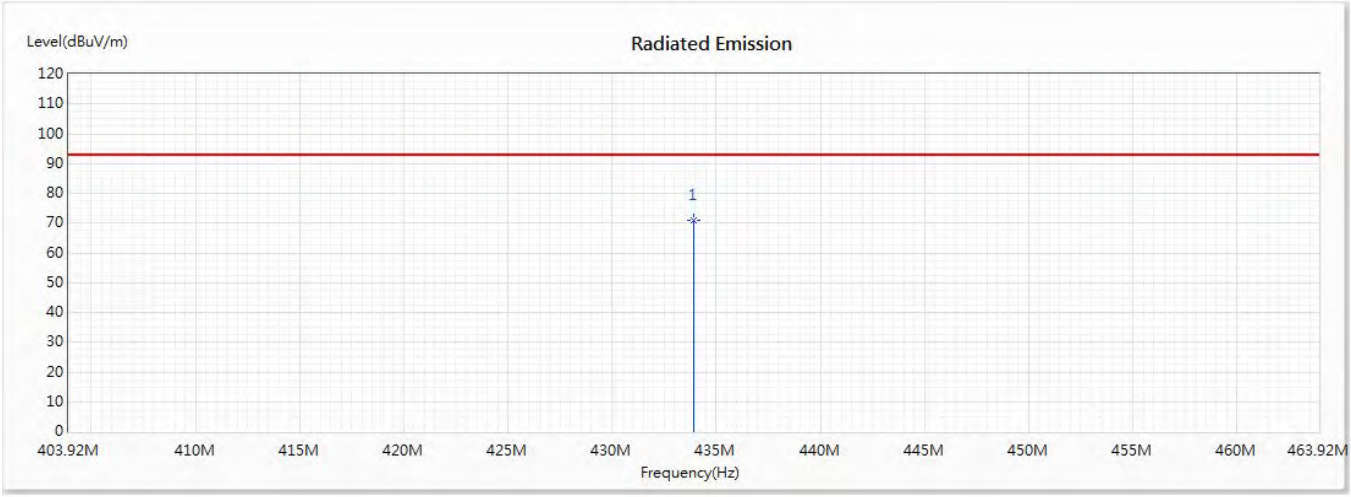
Frequency	Peak Measurement	Duty Cycle Factor	Measurement Level	Margin	Limit
MHz	dBuV/m	dB	dBuV/m	dB	dBuV/m
Average Detector:					
433.92	77.2	-13.854	63.346	-9.514	72.860

Note:

1. Average Measurement=Peak Measurement + Duty Cycle Factor
2. The Duty Cycle is refer to section 15.

Product	Tire Pressure Monitoring Sensor
Test Item	Fundamental Radiated Emission
Test Mode	Mode 1: Transmit_ASK
Date of Test	2020/01/04

Vertical Y-Axis



No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB/m)	Detector Type
* 1	433.92	70.80	92.86	-22.06	77.20	-6.40	PK

Note:

1. Measurement Level = Reading Level + Correct Factor
2. Average Limit=20log(2416.17)=67.662dBuV、Peak Limit=87.662dBuV

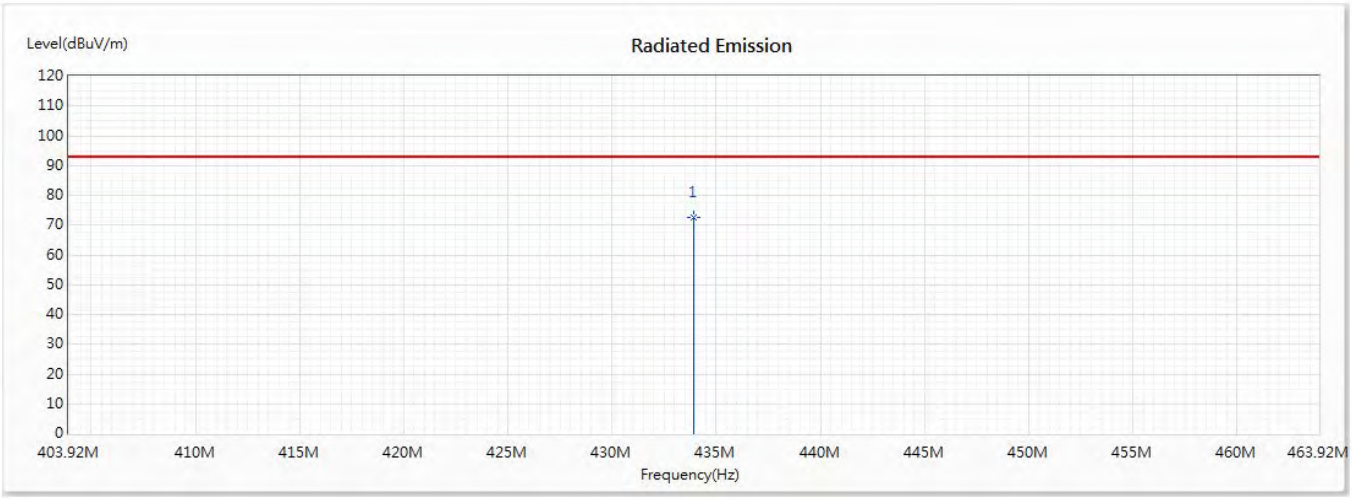
Frequency	Peak Measurement	Duty Cycle Factor	Measurement Level	Margin	Limit
MHz	dBuV/m	dB	dBuV/m	dB	dBuV/m
Average Detector:					
433.92	70.8	-13.854	56.946	-15.914	72.860

Note:

1. Average Measurement=Peak Measurement + Duty Cycle Factor
2. The Duty Cycle is refer to section 15.

Product	Tire Pressure Monitoring Sensor
Test Item	Fundamental Radiated Emission
Test Mode	Mode 1: Transmit_ASK
Date of Test	2020/01/04

Horizontal_Z-Axis



No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB/m)	Detector Type
* 1	433.92	72.50	92.86	-20.36	78.90	-6.40	PK

Note:

1. Measurement Level = Reading Level + Correct Factor
2. Average Limit=20log(2416.17)=67.662dBuV、Peak Limit=87.662dBuV

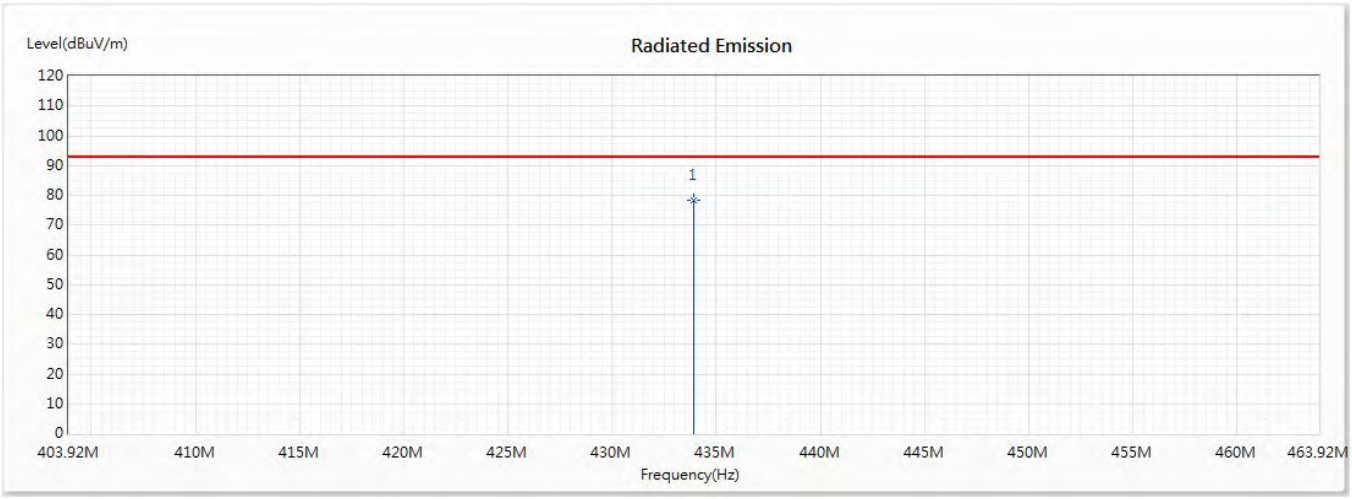
Frequency	Peak Measurement	Duty Cycle Factor	Measurement Level	Margin	Limit
MHz	dBuV/m	dB	dBuV/m	dB	dBuV/m
Average Detector:					
433.92	72.5	-13.854	58.646	-14.214	72.860

Note:

1. Average Measurement=Peak Measurement + Duty Cycle Factor
2. The Duty Cycle is refer to section 15.

Product	Tire Pressure Monitoring Sensor
Test Item	Fundamental Radiated Emission
Test Mode	Mode 1: Transmit_ASK
Date of Test	2020/01/04

Vertical Z-Axis



No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB/m)	Detector Type
* 1	433.92	78.20	92.86	-14.66	84.60	-6.40	PK

Note:

1. Measurement Level = Reading Level + Correct Factor
2. Average Limit=20log(2416.17)=67.662dBuV、Peak Limit=87.662dBuV

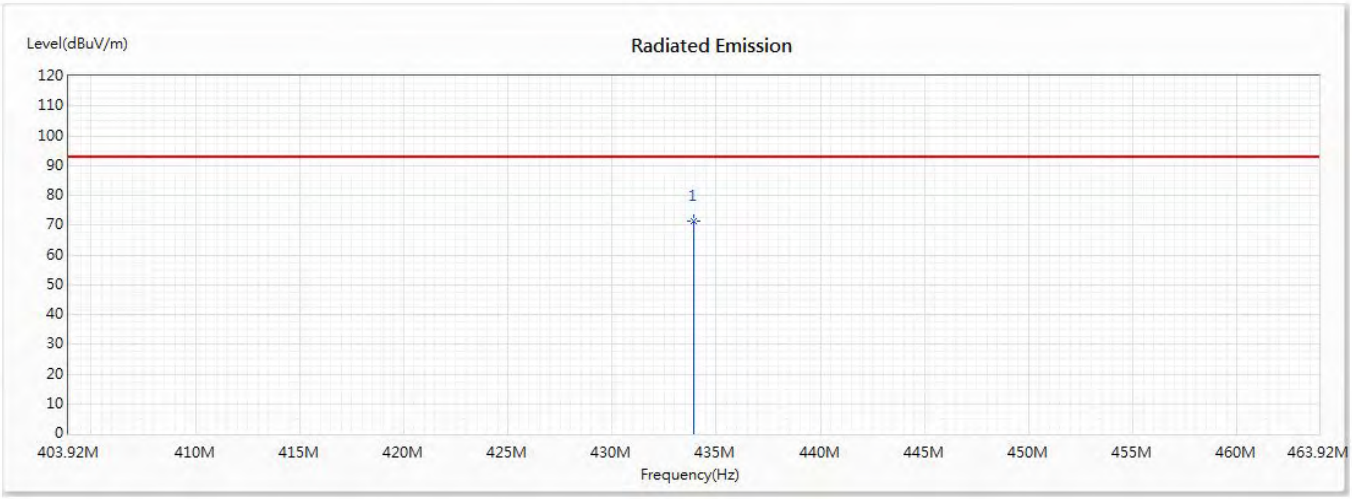
Frequency	Peak Measurement	Duty Cycle Factor	Measurement Level	Margin	Limit
MHz	dBuV/m	dB	dBuV/m	dB	dBuV/m
Average Detector:					
433.92	78.2	-13.854	64.346	-8.514	72.860

Note:

1. Average Measurement=Peak Measurement + Duty Cycle Factor
2. The Duty Cycle is refer to section 15.

Product	Tire Pressure Monitoring Sensor
Test Item	Fundamental Radiated Emission
Test Mode	Mode 1: Transmit_FSK
Date of Test	2020/01/04

Horizontal_X-Axis



No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB/m)	Detector Type
* 1	433.92	71.40	92.86	-21.46	77.80	-6.40	PK

Note:

1. Measurement Level = Reading Level + Correct Factor
2. Average Limit=20log(2416.17)=67.662dBuV、Peak Limit=87.662dBuV

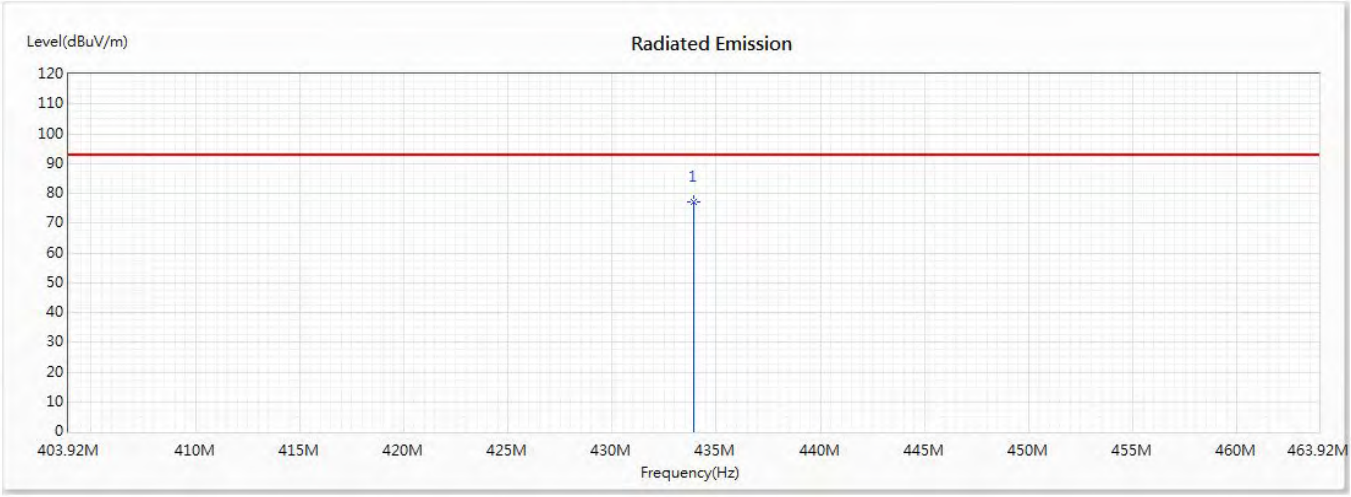
Frequency MHz	Peak Measurement dBuV/m	Duty Cycle Factor dB	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
Average Detector:					
433.92	71.4	-13.793	57.607	-15.253	72.860

Note:

1. Average Measurement=Peak Measurement + Duty Cycle Factor
2. The Duty Cycle is refer to section 15.

Product	Tire Pressure Monitoring Sensor
Test Item	Fundamental Radiated Emission
Test Mode	Mode 1: Transmit_FSK
Date of Test	2020/01/04

Vertical X-Axis



No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB/m)	Detector Type
* 1	433.92	77.30	92.86	-15.56	83.70	-6.40	PK

Note:

1. Measurement Level = Reading Level + Correct Factor
2. Average Limit=20log(2416.17)=67.662dBuV、Peak Limit=87.662dBuV

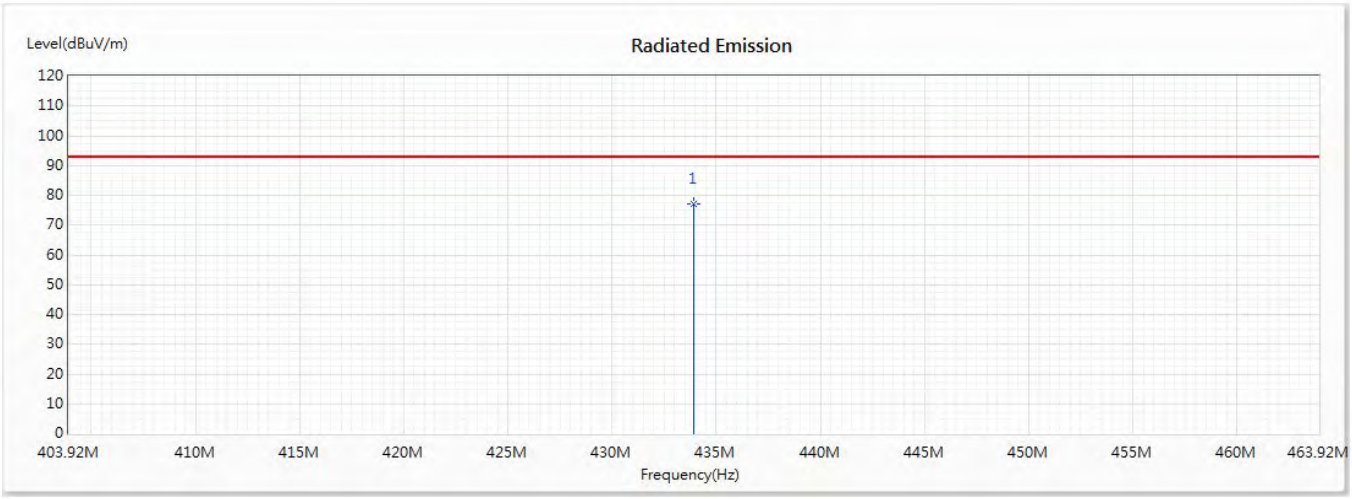
Frequency	Peak Measurement	Duty Cycle Factor	Measurement Level	Margin	Limit
MHz	dBuV/m	dB	dBuV/m	dB	dBuV/m
Average Detector:					
433.92	77.3	-13.793	63.507	-9.353	72.860

Note:

1. Average Measurement=Peak Measurement + Duty Cycle Factor
2. The Duty Cycle is refer to section 15.

Product	Tire Pressure Monitoring Sensor
Test Item	Fundamental Radiated Emission
Test Mode	Mode 1: Transmit_FSK
Date of Test	2020/01/04

Horizontal_Y-Axis



No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB/m)	Detector Type
* 1	433.92	77.10	92.86	-15.76	83.50	-6.40	PK

Note:

1. Measurement Level = Reading Level + Correct Factor
2. Average Limit=20log(2416.17)=67.662dBuV、Peak Limit=87.662dBuV

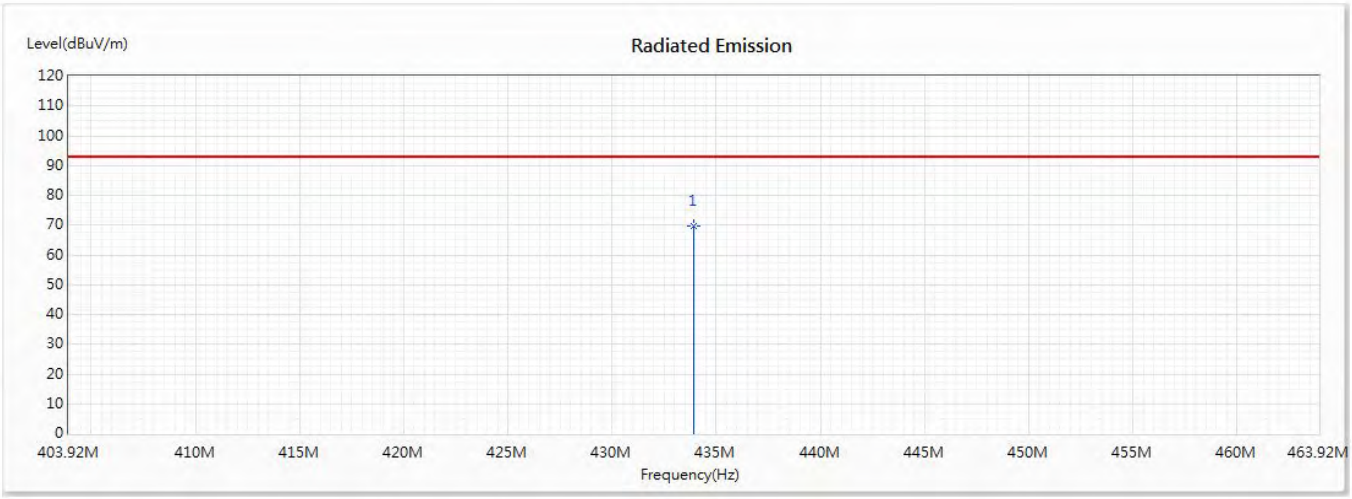
Frequency	Peak Measurement	Duty Cycle Factor	Measurement Level	Margin	Limit
MHz	dBuV/m	dB	dBuV/m	dB	dBuV/m
Average Detector:					
433.92	77.1	-13.793	63.307	-9.553	72.860

Note:

1. Average Measurement=Peak Measurement + Duty Cycle Factor
2. The Duty Cycle is refer to section 15.

Product	Tire Pressure Monitoring Sensor
Test Item	Fundamental Radiated Emission
Test Mode	Mode 1: Transmit_FSK
Date of Test	2020/01/04

Vertical Y-Axis



No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB/m)	Detector Type
* 1	433.92	69.80	92.86	-23.06	76.20	-6.40	PK

Note:

1. Measurement Level = Reading Level + Correct Factor
2. Average Limit=20log(2416.17)=67.662dBuV、Peak Limit=87.662dBuV

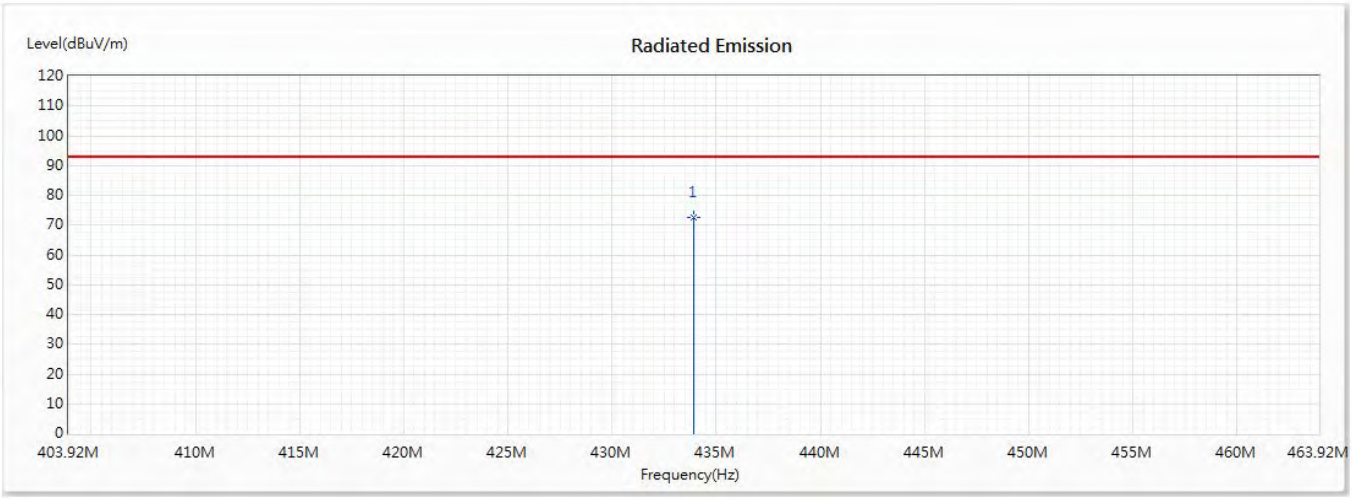
Frequency	Peak Measurement	Duty Cycle Factor	Measurement Level	Margin	Limit
MHz	dBuV/m	dB	dBuV/m	dB	dBuV/m
Average Detector:					
433.92	69.8	-13.793	56.007	-16.853	72.860

Note:

1. Average Measurement=Peak Measurement + Duty Cycle Factor
2. The Duty Cycle is refer to section 15.

Product	Tire Pressure Monitoring Sensor
Test Item	Fundamental Radiated Emission
Test Mode	Mode 1: Transmit_FSK
Date of Test	2020/01/04

Horizontal_Z-Axis



No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB/m)	Detector Type
* 1	433.92	72.60	92.86	-20.26	79.00	-6.40	PK

Note:

1. Measurement Level = Reading Level + Correct Factor
2. Average Limit=20log(2416.17)=67.662dBuV、Peak Limit=87.662dBuV

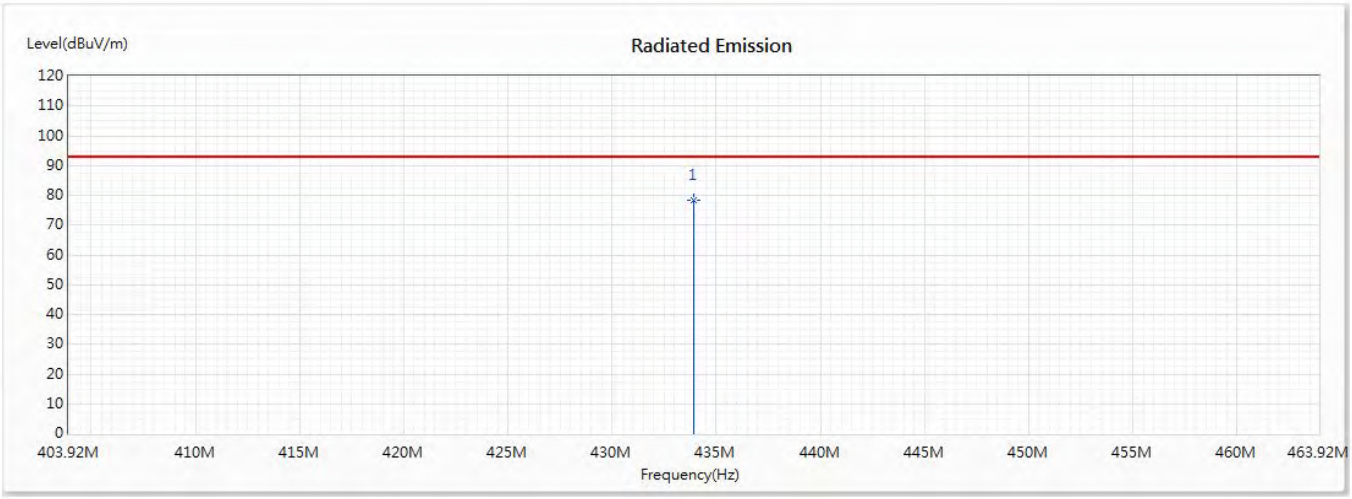
Frequency	Peak Measurement	Duty Cycle Factor	Measurement Level	Margin	Limit
MHz	dBuV/m	dB	dBuV/m	dB	dBuV/m
Average Detector:					
433.92	72.6	-13.793	58.807	-14.053	72.860

Note:

1. Average Measurement=Peak Measurement + Duty Cycle Factor
2. The Duty Cycle is refer to section 15.

Product	Tire Pressure Monitoring Sensor
Test Item	Fundamental Radiated Emission
Test Mode	Mode 1: Transmit_FSK
Date of Test	2020/01/04

Vertical Z-Axis



No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB/m)	Detector Type
* 1	433.92	78.30	92.86	-14.56	84.70	-6.40	PK

Note:

1. Measurement Level = Reading Level + Correct Factor
2. Average Limit=20log(2416.17)=67.662dBuV、Peak Limit=87.662dBuV

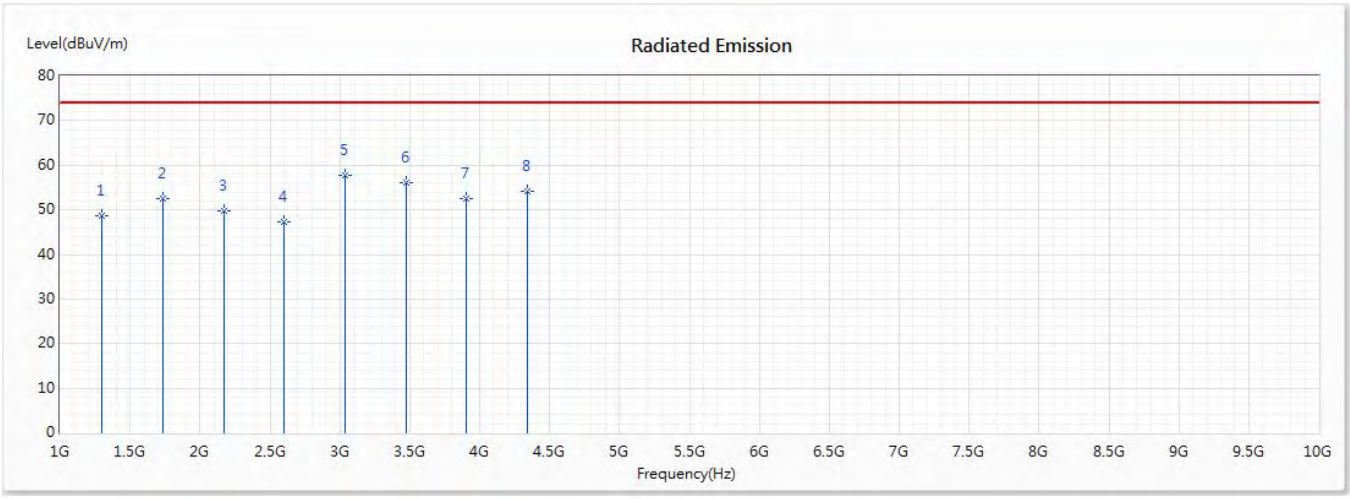
Frequency	Peak Measurement	Duty Cycle Factor	Measurement Level	Margin	Limit
MHz	dBuV/m	dB	dBuV/m	dB	dBuV/m
Average Detector:					
433.92	78.3	-13.793	64.507	-8.353	72.860

Note:

1. Average Measurement=Peak Measurement + Duty Cycle Factor
2. The Duty Cycle is refer to section 15.

Product	Tire Pressure Monitoring Sensor
Test Item	Harmonic Radiated Emission
Test Mode	Mode 1: Transmit_ASK
Date of Test	2020/01/07

Horizontal



No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB/m)	Detector Type
1	1301	48.73	74.00	-25.27	59.40	-10.67	PK
2	1735	52.51	74.00	-21.49	62.58	-10.07	PK
3	2169	49.67	74.00	-24.33	57.74	-8.07	PK
4	2603	47.36	74.00	-26.64	54.79	-7.43	PK
* 5	3037	57.63	74.00	-16.37	64.72	-7.09	PK
6	3471	56.07	74.00	-17.93	63.64	-7.57	PK
7	3905	52.52	74.00	-21.48	59.61	-7.09	PK
8	4339.2	54.13	74.00	-19.87	61.01	-6.88	PK

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss –Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

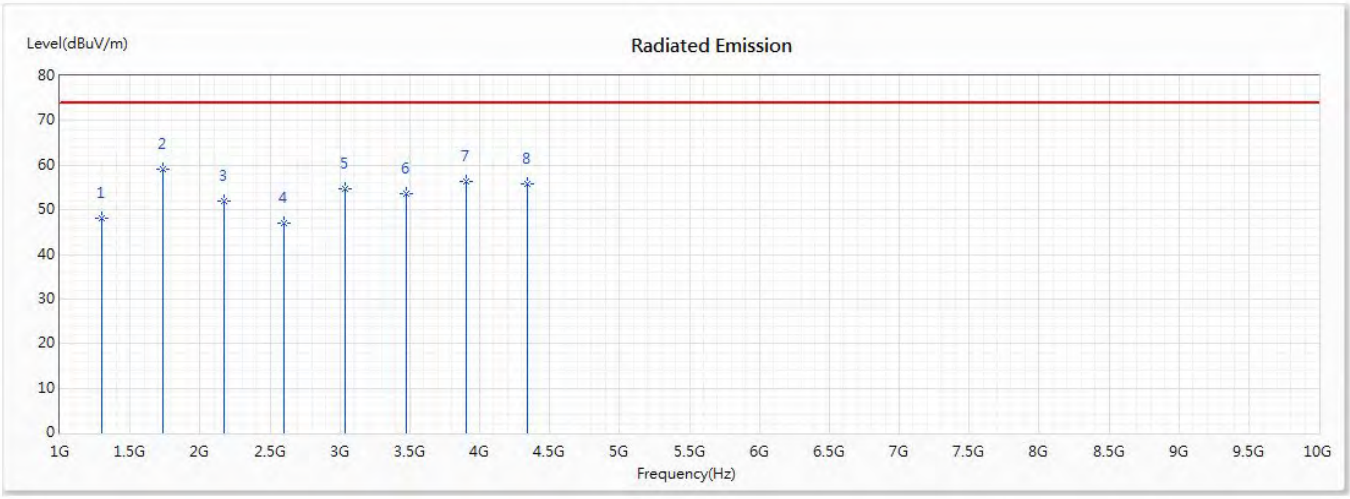
Frequency	Peak Measurement	Duty Cycle Factor	Measurement Level	Margin	Limit
MHz	dBuV/m	dB	dBuV/m	dB	dBuV/m
Average Detector:					
3037	57.63	-13.854	43.776	-10.224	54.000
3471	56.07	-13.854	42.216	-11.784	54.000
4339.2	54.13	-13.854	40.276	-13.724	54.000

Note:

1. Average Measurement=Peak Measurement + Duty Cycle Factor
2. The Duty Cycle is refer to section 15.

Product	Tire Pressure Monitoring Sensor
Test Item	Harmonic Radiated Emission
Test Mode	Mode 1: Transmit_ASK
Date of Test	2020/01/07

Vertical



No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB/m)	Detector Type
1	1301	48.23	74.00	-25.77	58.90	-10.67	PK
* 2	1735	58.97	74.00	-15.03	69.04	-10.07	PK
3	2169	52.03	74.00	-21.97	60.10	-8.07	PK
4	2603	47.10	74.00	-26.90	54.53	-7.43	PK
5	3037	54.83	74.00	-19.17	61.92	-7.09	PK
6	3471	53.73	74.00	-20.27	61.30	-7.57	PK
7	3905	56.41	74.00	-17.59	63.50	-7.09	PK
8	4339.2	55.74	74.00	-18.26	62.62	-6.88	PK

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss –Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

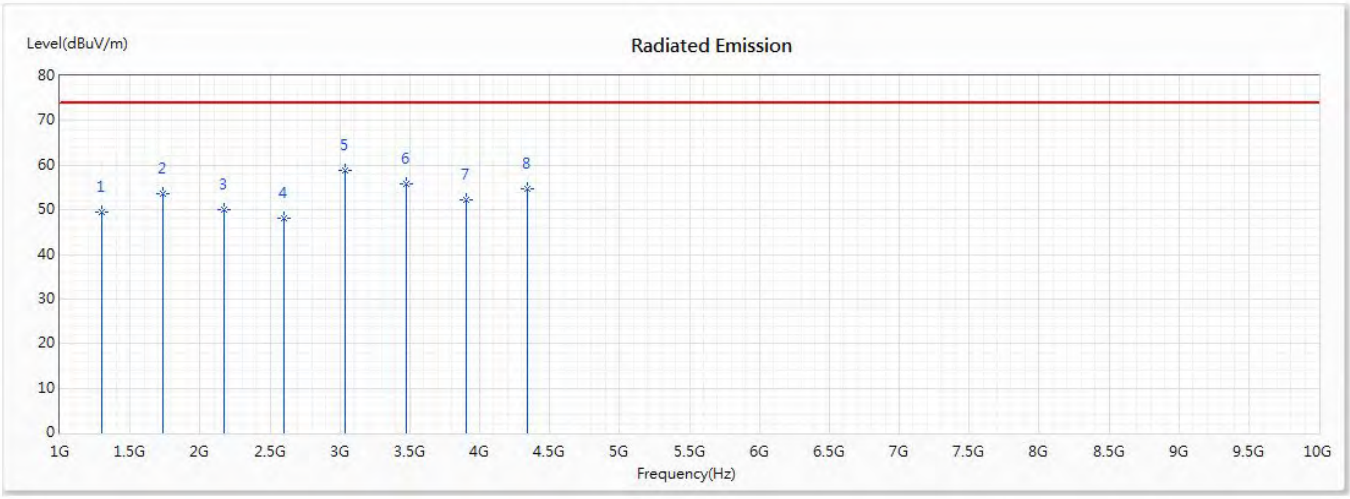
Frequency	Peak Measurement	Duty Cycle Factor	Measurement Level	Margin	Limit
MHz	dBuV/m	dB	dBuV/m	dB	dBuV/m
Average Detector:					
1735	58.97	-13.854	45.116	-8.884	54.000
3037	54.83	-13.854	40.976	-13.024	54.000
3905	56.41	-13.854	42.556	-11.444	54.000
4339.2	55.74	-13.854	41.886	-12.114	54.000

Note:

1. Average Measurement=Peak Measurement + Duty Cycle Factor
2. The Duty Cycle is refer to section 15.

Product	Tire Pressure Monitoring Sensor
Test Item	Harmonic Radiated Emission
Test Mode	Mode 1: Transmit_FSK
Date of Test	2020/01/07

Horizontal



No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB/m)	Detector Type
1	1301	49.43	74.00	-24.57	60.10	-10.67	PK
2	1735	53.62	74.00	-20.38	63.69	-10.07	PK
3	2169	50.17	74.00	-23.83	58.24	-8.07	PK
4	2603	48.02	74.00	-25.98	55.45	-7.43	PK
* 5	3037	58.88	74.00	-15.12	65.97	-7.09	PK
6	3471	55.87	74.00	-18.13	63.44	-7.57	PK
7	3905	52.31	74.00	-21.69	59.40	-7.09	PK
8	4339.2	54.83	74.00	-19.17	61.71	-6.88	PK

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss –Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

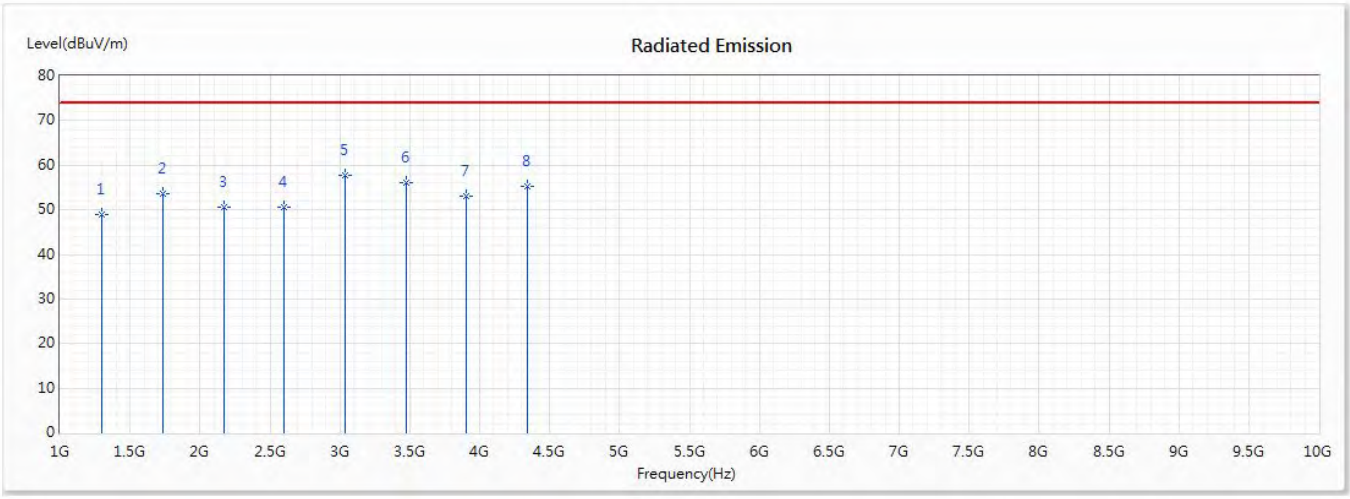
Frequency	Peak Measurement	Duty Cycle Factor	Measurement Level	Margin	Limit
MHz	dBuV/m	dB	dBuV/m	dB	dBuV/m
Average Detector:					
3037	58.88	-13.793	45.087	-8.913	54.000
3471	55.87	-13.793	42.077	-11.923	54.000
4339.2	54.83	-13.793	41.037	-12.963	54.000

Note:

1. Average Measurement=Peak Measurement + Duty Cycle Factor
2. The Duty Cycle is refer to section 15.

Product	Tire Pressure Monitoring Sensor
Test Item	Harmonic Radiated Emission
Test Mode	Mode 1: Transmit_FSK
Date of Test	2020/01/07

Vertical



No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB/m)	Detector Type
1	1301	48.81	74.00	-25.19	59.48	-10.67	PK
2	1735	53.58	74.00	-20.42	63.65	-10.07	PK
3	2169	50.60	74.00	-23.40	58.67	-8.07	PK
4	2603	50.46	74.00	-23.54	57.89	-7.43	PK
* 5	3037	57.62	74.00	-16.38	64.71	-7.09	PK
6	3471	55.96	74.00	-18.04	63.53	-7.57	PK
7	3905	52.95	74.00	-21.05	60.04	-7.09	PK
8	4339.2	55.33	74.00	-18.67	62.21	-6.88	PK

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss –Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

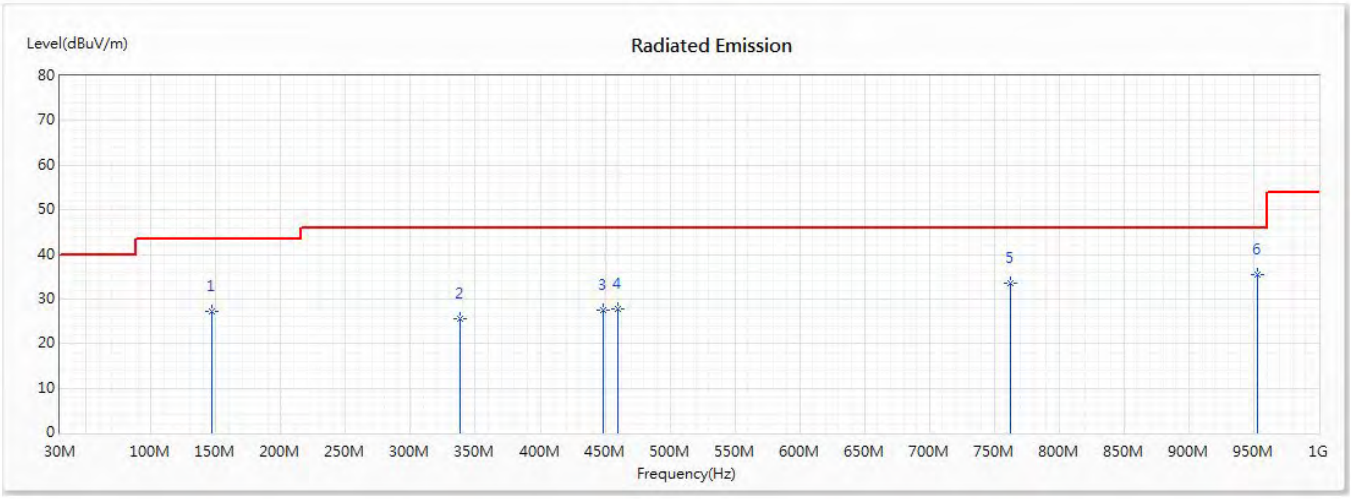
Frequency	Peak Measurement	Duty Cycle Factor	Measurement Level	Margin	Limit
MHz	dBuV/m	dB	dBuV/m	dB	dBuV/m
Average Detector:					
3037	57.62	-13.793	43.827	-10.173	54.000
3471	55.96	-13.793	42.167	-11.833	54.000
4339.2	55.33	-13.793	41.537	-12.463	54.000

Note:

1. Average Measurement=Peak Measurement + Duty Cycle Factor
2. The Duty Cycle is refer to section 15.

Product	Tire Pressure Monitoring Sensor
Test Item	General Radiated Emission
Test Mode	Mode 1: Transmit_ASK
Date of Test	2020/01/04

Horizontal



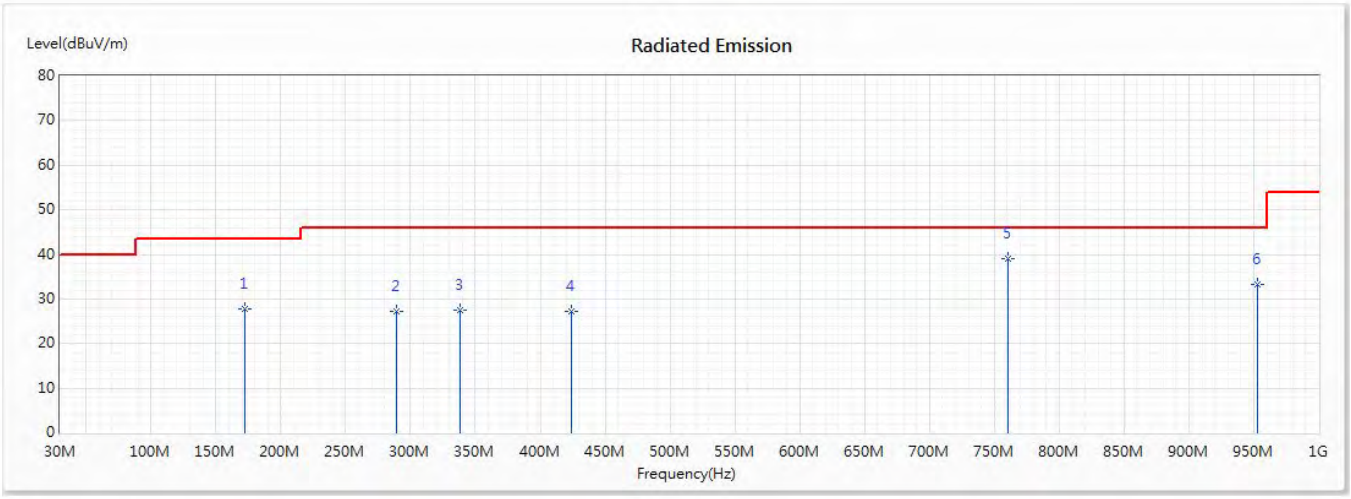
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB/m)	Detector Type
1	147.2	27.25	43.50	-16.25	37.79	-10.54	QP
2	338.1	25.50	46.00	-20.50	34.31	-8.81	QP
3	449	27.62	46.00	-18.38	33.87	-6.25	QP
4	460.3	27.82	46.00	-18.18	33.83	-6.01	QP
5	762.1	33.54	46.00	-12.46	34.15	-0.61	QP
* 6	953	35.39	46.00	-10.61	33.58	1.81	QP

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. Correct Factor = Antenna factor + Cable loss –Amplifier gain.
4. The emission levels of other frequencies are very lower than the limit and not show in test report.
5. No emission found between lowest internal used/generated frequency to 30MHz.

Product	Tire Pressure Monitoring Sensor
Test Item	General Radiated Emission
Test Mode	Mode 1: Transmit_ASK
Date of Test	2020/01/04

Vertical



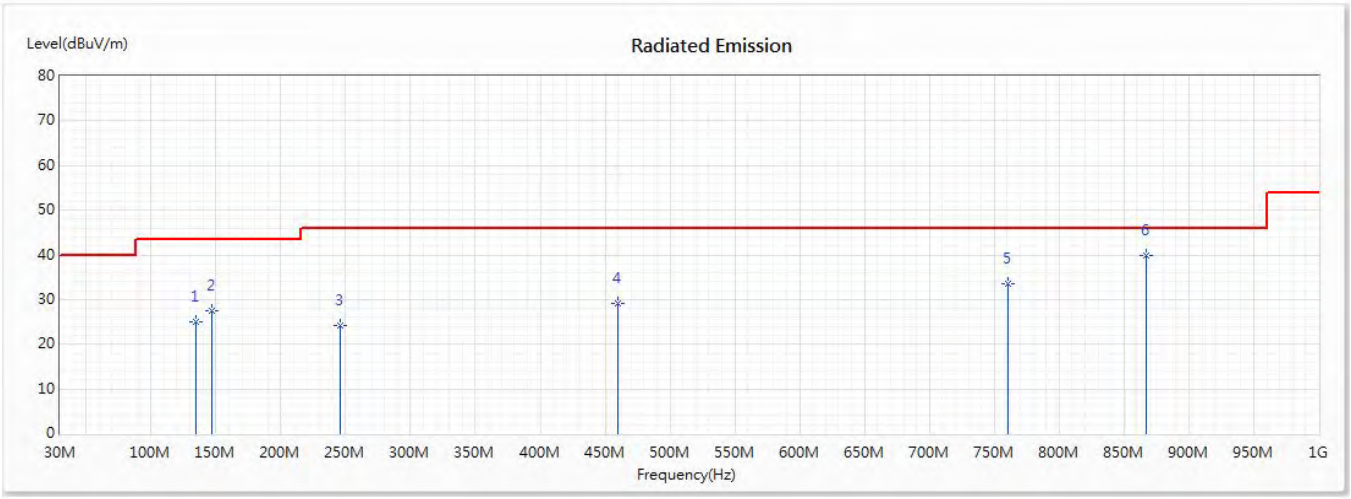
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB/m)	Detector Type
1	172.5	27.63	43.50	-15.87	38.13	-10.50	QP
2	289	27.24	46.00	-18.76	37.29	-10.05	QP
3	338.1	27.39	46.00	-18.61	36.20	-8.81	QP
4	423.8	27.28	46.00	-18.72	34.00	-6.72	QP
* 5	760.7	39.07	46.00	-6.93	39.71	-0.64	QP
6	953	33.40	46.00	-12.60	31.59	1.81	QP

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. Correct Factor = Antenna factor + Cable loss –Amplifier gain.
4. The emission levels of other frequencies are very lower than the limit and not show in test report.
5. No emission found between lowest internal used/generated frequency to 30MHz.

Product	Tire Pressure Monitoring Sensor
Test Item	General Radiated Emission
Test Mode	Mode 1: Transmit_FSK
Date of Test	2020/01/04

Horizontal



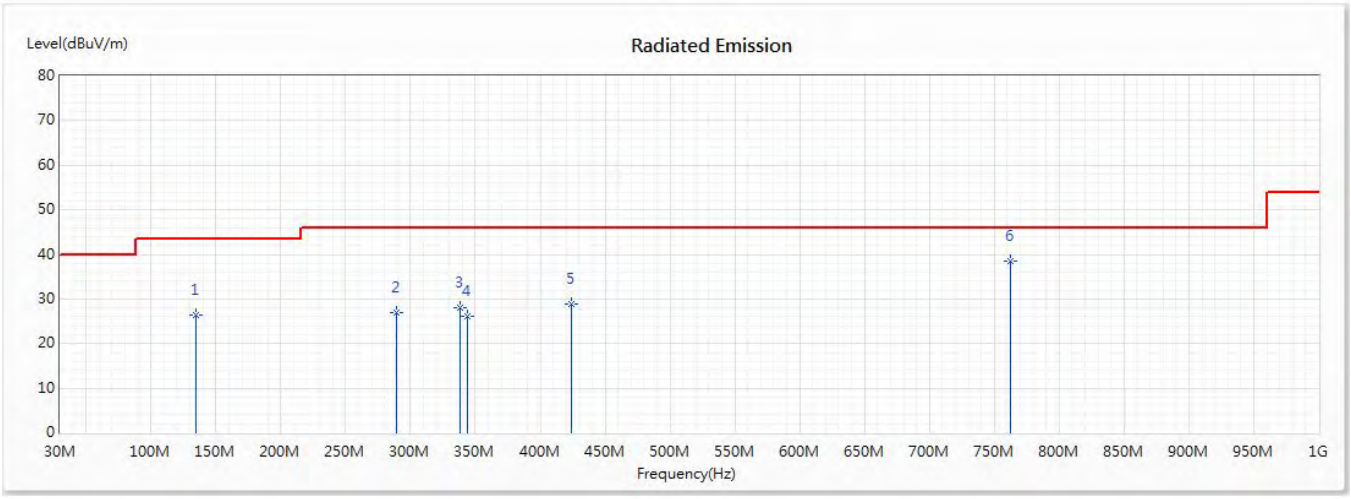
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB/m)	Detector Type
1	134.6	25.04	43.50	-18.46	36.43	-11.39	QP
2	147.2	27.37	43.50	-16.13	37.91	-10.54	QP
3	245.5	24.08	46.00	-21.92	35.59	-11.51	QP
4	460.3	29.14	46.00	-16.86	35.15	-6.01	QP
5	760.7	33.62	46.00	-12.38	34.26	-0.64	QP
* 6	867.3	39.80	46.00	-6.20	39.38	0.42	QP

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. Correct Factor = Antenna factor + Cable loss –Amplifier gain.
4. The emission levels of other frequencies are very lower than the limit and not show in test report.
5. No emission found between lowest internal used/generated frequency to 30MHz.

Product	Tire Pressure Monitoring Sensor
Test Item	General Radiated Emission
Test Mode	Mode 1: Transmit_FSK
Date of Test	2020/01/04

Vertical



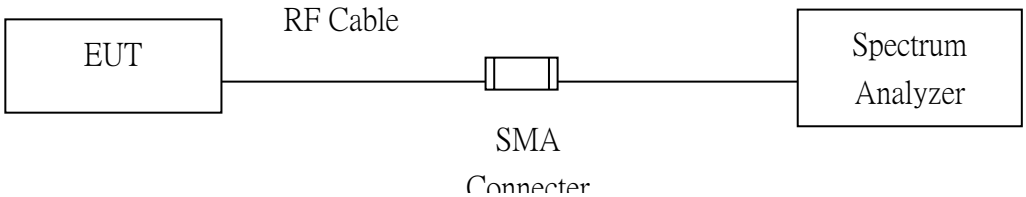
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB/m)	Detector Type
1	134.6	26.52	43.50	-16.98	37.91	-11.39	QP
2	289	26.96	46.00	-19.04	37.01	-10.05	QP
3	338.1	27.93	46.00	-18.07	36.74	-8.81	QP
4	343.7	26.20	46.00	-19.80	34.93	-8.73	QP
5	423.8	28.75	46.00	-17.25	35.47	-6.72	QP
* 6	762.1	38.40	46.00	-7.60	39.01	-0.61	QP

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. Correct Factor = Antenna factor + Cable loss –Amplifier gain.
4. The emission levels of other frequencies are very lower than the limit and not show in test report.
5. No emission found between lowest internal used/generated frequency to 30MHz.

3. Duty Cycle

3.1. Test Setup

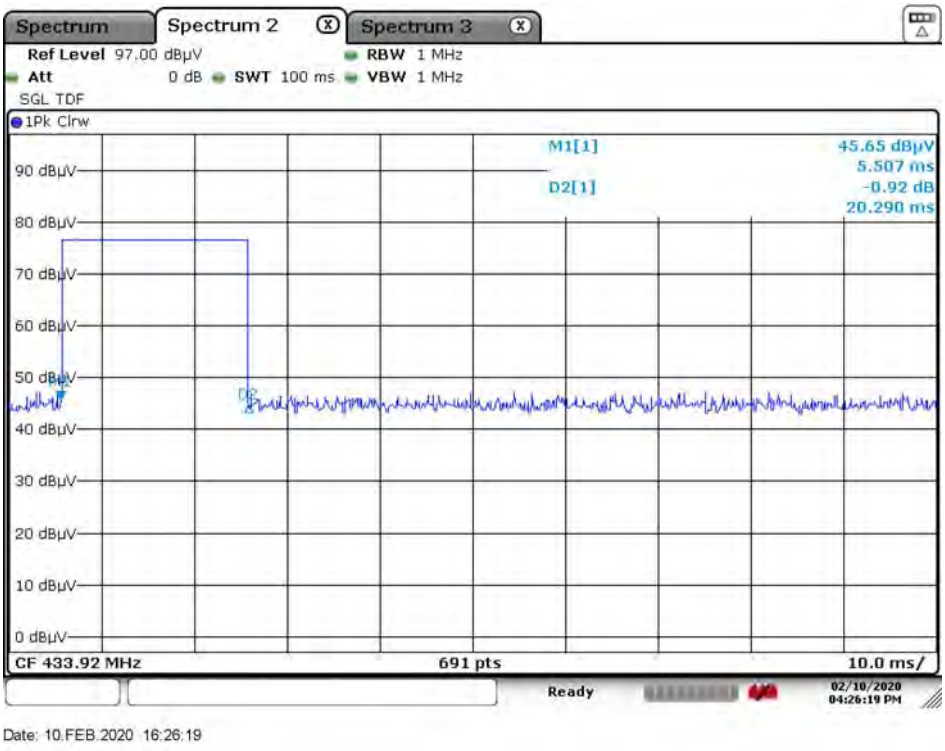


3.2. Uncertainty

± 2.31ms

3.3. Test Result of Duty Cycle

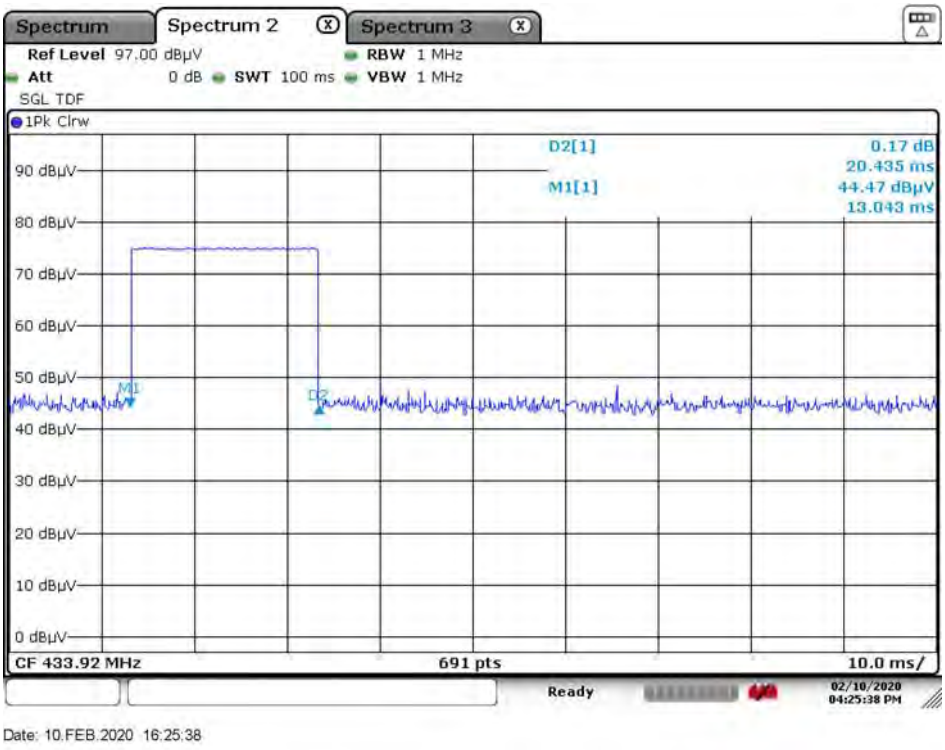
Product : Tire Pressure Monitoring Sensor
Test Item : Duty Cycle Data
Test Mode : Normal mode_ASK



Time on of 100ms= 20.29ms*1= 20.29ms
Duty Cycle=20.29ms / 100ms= 0.2029
Duty Cycle correction factor= 20 LOG 0.2029= -13.854dB

Duty Cycle correction factor	**-13.854**	**dB**

Product : Tire Pressure Monitoring Sensor
Test Item : Duty Cycle Data
Test Mode : Normal mode_FSK



Time on of 100ms= 20.435ms*1= 20.435ms
Duty Cycle=20.435ms / 100ms= 0.20435
Duty Cycle correction factor= 20 LOG 0. 20435= -13.793dB

Duty Cycle correction factor	**-13.793**	**dB**

4. EMI Reduction Method During Compliance Testing

No modification was made during testing.