FCC Test Report

Product Name	Tire Pressure Monitoring Sensor - TPMS
Model No.	TIS-19
FCC ID.	KR5TIS-19

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

Date of Receipt	Nov. 16, 2018
Issued Date	Dec. 06, 2018
Report No.	18B0258R-RFUSP14V00
Report Version	V1.0

The test results relate only to the samples tested.

The test results shown in the test report are traceable to the national/international standard through the calibration of the equipment and evaluated measurement uncertainty herein.

This report must not be used to claim product endorsement by TAF or any agency of the government.

Test Report

Issued Date : Dec. 06, 2018

Report No. : 18B0258R-RFUSP14V00

Product Name	Tire Pressure Monitoring Sensor - TPMS
Applicant	Continental Automotive GmbH
Address	Siemensstrasse 12, SV C TS RBG EMC-Laboratory, 93055 Regensburg, Germany
Manufacturer	Continental Automotive GmbH
Model No.	TIS-19
FCC ID.	KR5TIS-19
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: 2017 ANSI C63.4: 2014, ANSI C63.10: 2013
Test Result	Complied

Documented By : Jinn Chen

(Senior Adm. Specialist / Jinn Chen)

Tested By : Ivan Chuang

(Senior Engineer / Ivan Chuang)

Approved By :

(Director / Vincent Lin)

TABLE OF CONTENTS

1. General Information

1.1. EUT Description

Product Name	Tire Pressure Monitoring Sensor - TPMS
Trade Name	Continental
Model No.	TIS-19
FCC ID	KR5TIS-19
Frequency Range	433.92 MHz
Number of Channels	1
Type of Modulation	ASK/FSK
Antenna Type	Internal antenna

Frequency of Each Channel:

Channel	Frequency
Channel 1:	433.92 MHz

Note:

1. The EUT is a Tire Pressure Monitoring Sensor - TPMS 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.

Test Mode	Mode 1: Transmit

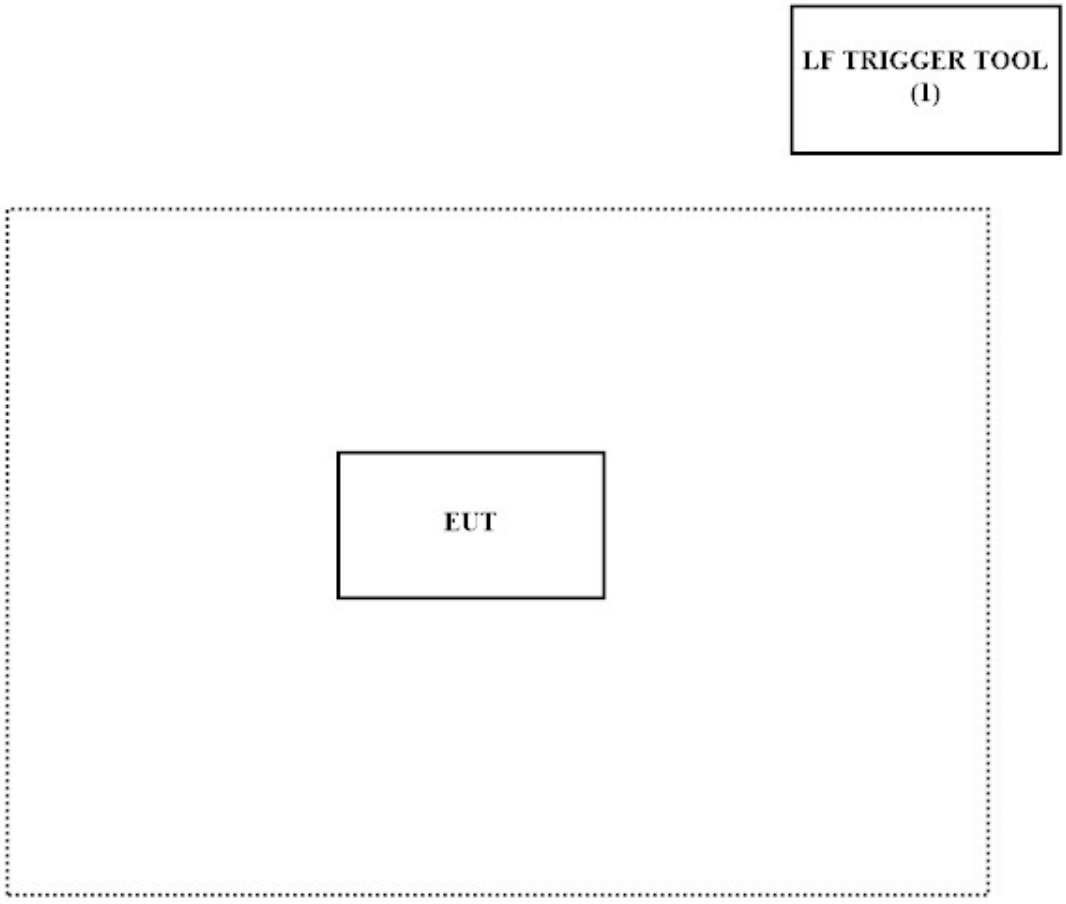
1.3. Tested System Details

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	Verify that the EUT works properly.

1.6. Test Facility

Ambient conditions in the laboratory:

Items	Required (IEC 68-1)	Actual
Temperature (°C)	15-35	20-35
Humidity (%RH)	25-75	30-65
Barometric pressure (mbar)	860-1060	950-1000

The related certificate for our laboratories about the test site and management system can be downloaded from DEKRA Testing and Certification Co., Ltd. Web Site:
http://www.dekra.com.tw/english/about/certificates.aspx?bval=5
The address and introduction of DEKRA Testing and Certification Co., Ltd. laboratories can be founded in our Web site: http://www.dekra.com.tw/index_en.aspx

Site Description: Accredited by TAF
Accredited Number: 3023

Site Name: DEKRA Testing and Certification Co., Ltd.
Site Address: No.159, Sec. 2, Wenhua 1st Rd., Linkou Dist.,
New Taipei City 24457, Taiwan.
TEL: 886-2-2602-7968 / FAX : 866-2-2602-3286
E-Mail : info.tw@dekra.com

FCC Accreditation Number: TW0023

1.7. List of Test Equipment

For Conduction measurements /ASR1

	Equipment	Manufacturer	Model No.	Serial No.	Cali. Data	Due. Data
	EMI Test Receiver	R&S	ESR7	101601	2018.02.08	2019.02.07
	Two-Line V-Network	R&S	ENV216	101306	2018.03.09	2019.03.08
	Two-Line V-Network	R&S	ENV216	101307	2018.03.20	2019.03.19
	Coaxial Cable	Quietek	RG400_BNC	RF001	2018.05.24	2019.05.23

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 : QuieTek EMI 2.0 V2.1.113

For Conducted measurements /ASR2

	Equipment	Manufacturer	Model No.	Serial No.	Cali. Data	Due. Data
	Spectrum Analyzer	R&S	FSV30	103464	2018.01.23	2019.01.22
	Power Meter	Anritsu	ML2496A	1548003	2017.12.11	2018.12.10
	Power Sensor	Anritsu	MA2411B	1531024	2017.12.11	2018.12.10
	Power Sensor	Anritsu	MA2411B	1531025	2017.12.11	2018.12.10
	Bluetooth Tester	R&S	CBT	101238	2018.01.18	2019.01.17

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 V9.0.1

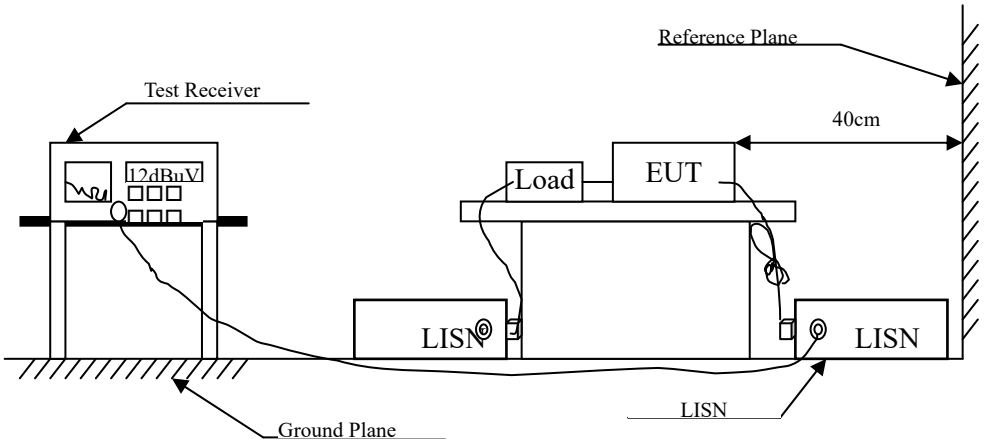
For Radiated measurements /ACB1

	Equipment	Manufacturer	Model No.	Serial No.	Cali. Data	Due. Data
X	Loop Antenna	AMETEK	HLA6121	49611	2018.01.26	2019.01.25
X	Bi-Log Antenna	SCHWARZBECK	VULB9168	9168-674	2018.04.02	2019.04.01
X	Horn Antenna	ETS-Lindgren	3117	00203761	2018.11.01	2019.10.30
	Horn Antenna	Com-Power	AH-840	101087	2018.06.01	2019.05.31
X	Pre-Amplifier	EMCI	EMC001330	980316	2018.06.01	2019.05.31
X	Pre-Amplifier	EMCI	EMC051835SE	980311	2018.06.04	2019.06.03
	Pre-Amplifier	EMCI	EMC05820SE	980310	2018.06.04	2019.06.03
	Pre-Amplifier	EMCI	EMC184045SE	980314	2018.05.16	2019.05.15
	Filter	MICRO TRONICS	BRM50702	G251	2018.09.04	2019.09.03
	Filter	MICRO TRONICS	BRM50716	G188	2018.09.04	2019.09.03
X	EMI Test Receiver	R&S	ESR7	101602	2017.12.11	2018.12.10
X	Spectrum Analyzer	R&S	FSV40	101148	2018.02.08	2019.02.07
X	Coaxial Cable	SUHNER	SUCOFLEX 106	RF002	2018.05.25	2019.05.24
	Mircoflex Cable	HUBER SUHNER	SUCOFLEX 102	MY3381/2	2018.05.16	2019.05.15

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 : QuieTek EMI 2.0 V2.1.113

2. Conducted Emission

2.1. Test Setup



2.2. Limits

FCC Part 15 Subpart C Paragraph 15.207 Limits (dBuV)		
Frequency MHz	QP	AV
0.15 - 0.50	66-56	56-46
0.50-5.0	56	46
5.0 - 30	60	50

Remarks : In the above table, the tighter limit applies at the band edges.

2.3. Test Procedure

The EUT and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50 ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refers to the block diagram of the test setup and photographs.)

Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.4: 2014 on conducted measurement.

Conducted emissions were invested over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9kHz.

2.4. Uncertainty

± 2.35 dB

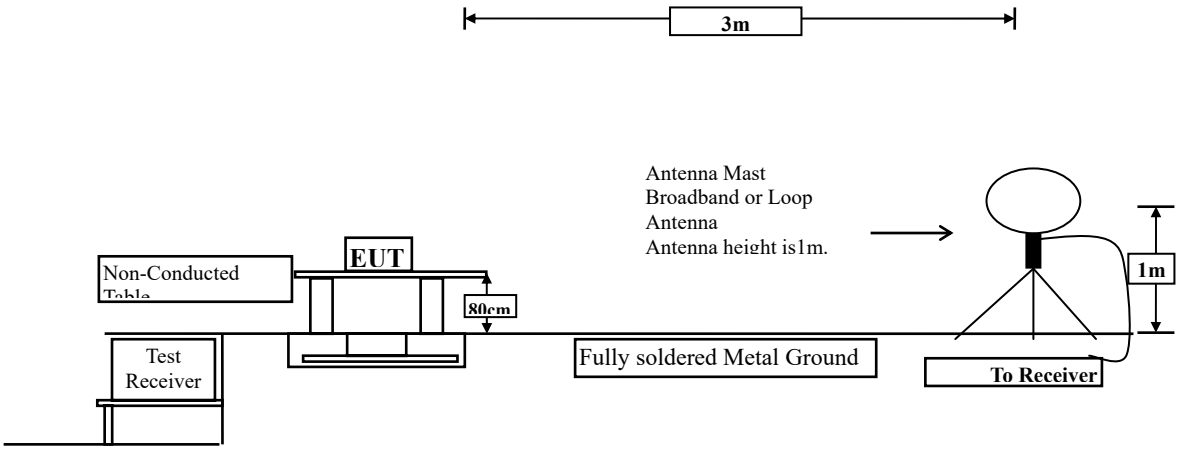
2.5. Test Result

Owing to the Battery operation of EUT, this test item is not performed.

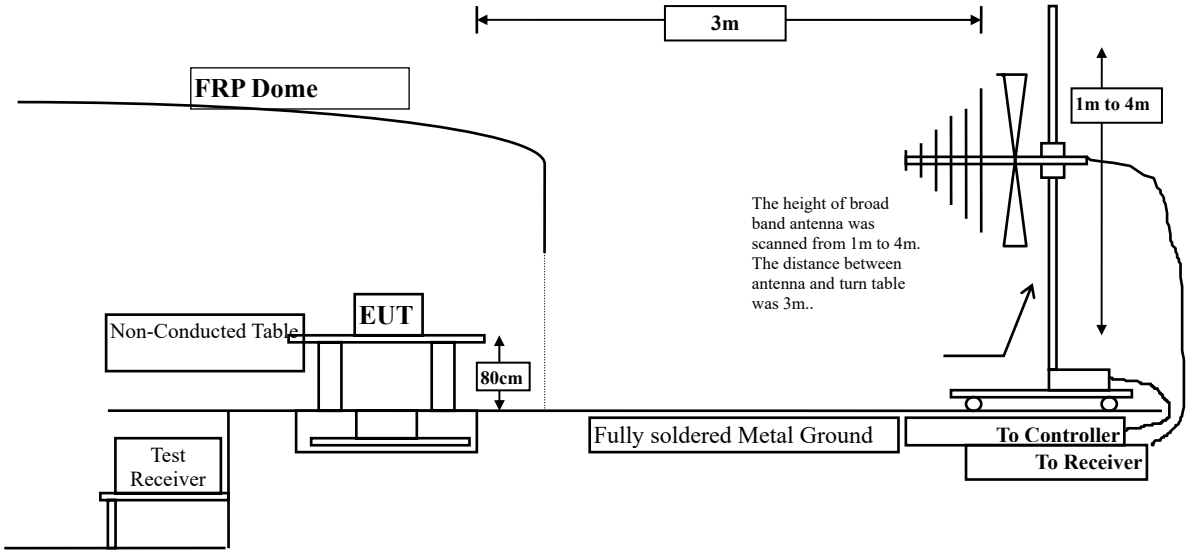
3. Radiated Emission

3.1. Test Setup

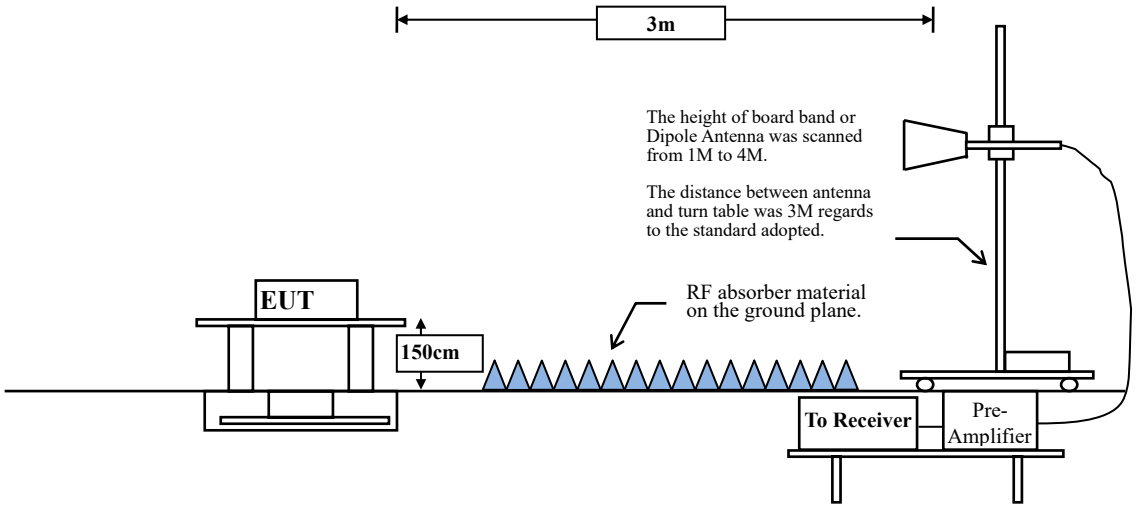
Radiated Emission Under 30MHz



Radiated Emission Below 1GHz



Radiated Emission Above 1GHz



3.2. 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.

3.3. 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.

3.4. 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

3.5. Test Result

Product	Tire Pressure Monitoring Sensor - TPMS
Test Item	Fundamental Radiated Emission
Test Mode	Mode 1: Transmit (ASK)
Date of Test	2018/11/21

Fundamental Power (X-Line)

Peak Detector:

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV/m	dB	dBuV/m
Horizontal					
433.920	-7.194	73.300	66.106	-26.764	92.870
Vertical					
433.920	-7.194	82.000	74.806	-18.064	92.870

Average Detector:

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV/m	dB	dBuV/m
Horizontal					
433.920	-7.194	53.200	46.006	-26.864	72.870
Vertical					
433.920	-7.194	59.600	52.406	-20.464	72.870

Note:

1. Measurement Level = Reading Level + Correct Factor
2. Average Limit=20log(4398.67)=72.870dBuV、Peak Limit=92.870dBuV

Product	Tire Pressure Monitoring Sensor - TPMS
Test Item	Fundamental Radiated Emission
Test Mode	Mode 1: Transmit (ASK)
Date of Test	2018/11/21

Fundamental Power (Y-Line)

Peak Detector:

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV/m	dB	dBuV/m
Horizontal					
433.920	-7.194	72.500	65.306	-27.564	92.870
Vertical					
433.920	-7.194	81.600	74.406	-18.464	92.870

Average Detector:

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV/m	dB	dBuV/m
Horizontal					
433.920	-7.194	50.600	43.406	-29.464	72.870
Vertical					
433.920	-7.194	59.700	52.506	-20.364	72.870

Note:

1. Measurement Level = Reading Level + Correct Factor
2. Average Limit=20log(4398.67)=72.870dBuV、Peak Limit=92.870dBuV

Product	Tire Pressure Monitoring Sensor - TPMS
Test Item	Fundamental Radiated Emission
Test Mode	Mode 1: Transmit (ASK)
Date of Test	2018/11/21

Fundamental Power (Z-Line)

Peak Detector:

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV/m	dB	dBuV/m
Horizontal					
433.920	-7.194	82.100	74.906	-17.964	92.870
Vertical					
433.920	-7.194	70.500	63.306	-29.564	92.870

Average Detector:

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV/m	dB	dBuV/m
Horizontal					
433.920	-7.194	60.000	52.806	-20.064	72.870
Vertical					
433.920	-7.194	48.400	41.206	-31.664	72.870

Note:

1. Measurement Level = Reading Level + Correct Factor
2. Average Limit=20log(4398.67)=72.870dBuV、Peak Limit=92.870dBuV

Product	Tire Pressure Monitoring Sensor - TPMS
Test Item	Fundamental Radiated Emission
Test Mode	Mode 1: Transmit (FSK)
Date of Test	2018/11/21

Fundamental Power (X-Line)

Peak Detector:

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV/m	dB	dBuV/m
Horizontal					
433.920	-7.194	62.300	55.106	-37.764	92.870
Vertical					
433.920	-7.194	71.500	64.306	-28.564	92.870

Average Detector:

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV/m	dB	dBuV/m
Horizontal					
433.920	-7.194	42.600	35.406	-37.464	72.870
Vertical					
433.920	-7.194	50.300	43.106	-29.764	72.870

Note:

1. Measurement Level = Reading Level + Correct Factor
2. Average Limit=20log(4398.67)=72.870dBuV、Peak Limit=92.870dBuV

Product	Tire Pressure Monitoring Sensor - TPMS
Test Item	Fundamental Radiated Emission
Test Mode	Mode 1: Transmit (FSK)
Date of Test	2018/11/21

Fundamental Power (Y-Line)

Peak Detector:

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV/m	dB	dBuV/m
Horizontal					
433.920	-7.194	63.000	55.806	-37.064	92.870
Vertical					
433.920	-7.194	71.500	64.306	-28.564	92.870

Average Detector:

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV/m	dB	dBuV/m
Horizontal					
433.920	-7.194	43.700	36.506	-36.364	72.870
Vertical					
433.920	-7.194	49.800	42.606	-30.264	72.870

Note:

1. Measurement Level = Reading Level + Correct Factor
2. Average Limit=20log(4398.67)=72.870dBuV、Peak Limit=92.870dBuV

Product	Tire Pressure Monitoring Sensor - TPMS
Test Item	Fundamental Radiated Emission
Test Mode	Mode 1: Transmit (FSK)
Date of Test	2018/11/21

Fundamental Power (Z-Line)

Peak Detector:

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV/m	dB	dBuV/m
Horizontal					
433.920	-7.194	71.600	64.406	-28.464	92.870
Vertical					
433.920	-7.194	60.900	53.706	-39.164	92.870

Average Detector:

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV/m	dB	dBuV/m
Horizontal					
433.920	-7.194	51.000	43.806	-29.064	72.870
Vertical					
433.920	-7.194	40.100	32.906	-39.964	72.870

Note:

1. Measurement Level = Reading Level + Correct Factor
2. Average Limit=20log(4398.67)=72.870dBuV、Peak Limit=92.870dBuV

Product	Tire Pressure Monitoring Sensor - TPMS
Test Item	Harmonic Radiated Emission
Test Mode	Mode 1: Transmit (ASK)
Date of Test	2018/11/21

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Peak Limit	Average Limit
MHz	dB	dBuV	dBuV/m	dB	dBuV/m	dBuV/m
Horizontal						
Peak						
1301.760	-12.812	41.600	28.789	-45.211	74.000	54.000
1735.680	-11.351	43.490	32.139	-41.861	74.000	54.000
2169.600	-9.432	38.920	29.489	-44.511	74.000	54.000
2603.520	-8.464	41.080	32.617	-41.383	74.000	54.000
3037.440	-8.132	47.880	39.748	-34.252	74.000	54.000
3471.360	-7.711	40.380	32.669	-41.331	74.000	54.000
3905.280	-7.221	43.340	36.120	-37.880	74.000	54.000
4339.200	-6.721	41.730	35.009	-38.991	74.000	54.000
Average						
--					74.000	54.000

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.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, 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.

Product	Tire Pressure Monitoring Sensor - TPMS
Test Item	Harmonic Radiated Emission
Test Mode	Mode 1: Transmit (ASK)
Date of Test	2018/11/21

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Peak Limit	Average Limit
MHz	dB	dBuV	dBuV/m	dB	dBuV/m	dBuV/m
Vertical						
Peak						
1301.760	-12.812	48.770	35.959	-38.041	74.000	54.000
1735.680	-11.351	55.080	43.729	-30.271	74.000	54.000
2169.600	-9.432	39.300	29.869	-44.131	74.000	54.000
2603.520	-8.464	45.730	37.267	-36.733	74.000	54.000
3037.440	-8.132	56.420	48.288	-25.712	74.000	54.000
3471.360	-7.711	41.050	33.339	-40.661	74.000	54.000
3905.280	-7.221	44.780	37.560	-36.440	74.000	54.000
4339.200	-6.721	41.850	35.129	-38.871	74.000	54.000
Average						
--					74.000	54.000

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.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, 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.

Product	Tire Pressure Monitoring Sensor - TPMS
Test Item	Harmonic Radiated Emission
Test Mode	Mode 1: Transmit (FSK)
Date of Test	2018/11/21

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Peak Limit	Average Limit
MHz	dB	dBuV	dBuV/m	dB	dBuV/m	dBuV/m
Horizontal						
Peak						
1301.760	-12.812	41.660	28.849	-45.151	74.000	54.000
1735.680	-11.351	43.940	32.589	-41.411	74.000	54.000
2169.600	-9.432	38.950	29.519	-44.481	74.000	54.000
2603.520	-8.464	41.050	32.587	-41.413	74.000	54.000
3037.440	-8.132	47.610	39.478	-34.522	74.000	54.000
3471.360	-7.711	40.210	32.499	-41.501	74.000	54.000
3905.280	-7.221	43.670	36.450	-37.550	74.000	54.000
4339.200	-6.721	41.710	34.989	-39.011	74.000	54.000
Average						
--					74.000	54.000

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.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, 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.

Product	Tire Pressure Monitoring Sensor - TPMS
Test Item	Harmonic Radiated Emission
Test Mode	Mode 1: Transmit (FSK)
Date of Test	2018/11/21

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Peak Limit	Average Limit
MHz	dB	dBuV	dBuV/m	dB	dBuV/m	dBuV/m
Vertical						
Peak						
1301.760	-12.812	48.850	36.039	-37.961	74.000	54.000
1735.680	-11.351	55.950	44.599	-29.401	74.000	54.000
2169.600	-9.432	39.150	29.719	-44.281	74.000	54.000
2603.520	-8.464	45.940	37.477	-36.523	74.000	54.000
3037.440	-8.132	56.130	47.998	-26.002	74.000	54.000
3471.360	-7.711	41.180	33.469	-40.531	74.000	54.000
3905.280	-7.221	45.100	37.880	-36.120	74.000	54.000
4339.200	-6.721	42.440	35.719	-38.281	74.000	54.000
Average						
--					74.000	54.000

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.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, 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.

Product	Tire Pressure Monitoring Sensor - TPMS
Test Item	General Radiated Emission
Test Mode	Mode 1: Transmit (ASK)
Date of Test	2018/11/21

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV/m	dB	dBuV/m
Horizontal					
Quasi-Peak					
56.710	-11.747	33.348	21.601	-18.399	40.000
79.203	-15.483	40.945	25.462	-14.538	40.000
159.333	-10.845	31.303	20.458	-23.042	43.500
268.986	-11.384	30.706	19.321	-26.679	46.000
350.522	-9.167	32.190	23.023	-22.977	46.000
500.942	-5.939	34.295	28.357	-17.643	46.000
Vertical					
Quasi-Peak					
51.087	-11.048	35.053	24.005	-15.995	40.000
98.884	-16.311	38.079	21.768	-21.732	43.500
149.493	-11.097	32.140	21.043	-22.457	43.500
287.261	-10.727	32.642	21.915	-24.085	46.000
515.000	-5.723	31.937	26.214	-19.786	46.000
607.783	-3.956	32.280	28.323	-17.677	46.000

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.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, 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.
8. No emission found between lowest internal used/generated frequency to 30MHz.

Product	Tire Pressure Monitoring Sensor - TPMS
Test Item	General Radiated Emission
Test Mode	Mode 1: Transmit (FSK)
Date of Test	2018/11/21

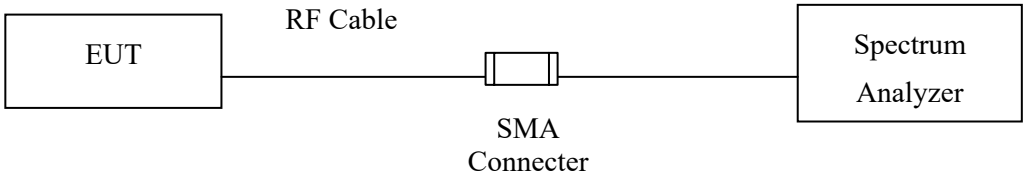
Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV/m	dB	dBuV/m
Horizontal					
Quasi-Peak					
53.899	-11.397	33.197	21.800	-18.200	40.000
79.203	-15.483	41.393	25.910	-14.090	40.000
166.362	-11.051	32.981	21.930	-21.570	43.500
329.435	-9.655	32.201	22.546	-23.454	46.000
574.043	-4.614	31.148	26.534	-19.466	46.000
610.594	-3.940	32.339	28.399	-17.601	46.000
Vertical					
Quasi-Peak					
53.899	-11.397	37.294	25.897	-14.103	40.000
79.203	-15.483	44.399	28.916	-11.084	40.000
98.884	-16.311	39.736	23.425	-20.075	43.500
150.899	-11.057	32.297	21.240	-22.260	43.500
333.652	-9.559	32.453	22.894	-23.106	46.000
606.377	-3.966	34.032	30.067	-15.933	46.000

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.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, 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.
8. No emission found between lowest internal used/generated frequency to 30MHz.

4. Transmit time

4.1. Test Setup



4.2. Limits

In addition, 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.

4.3. Uncertainty

± 2.31ms

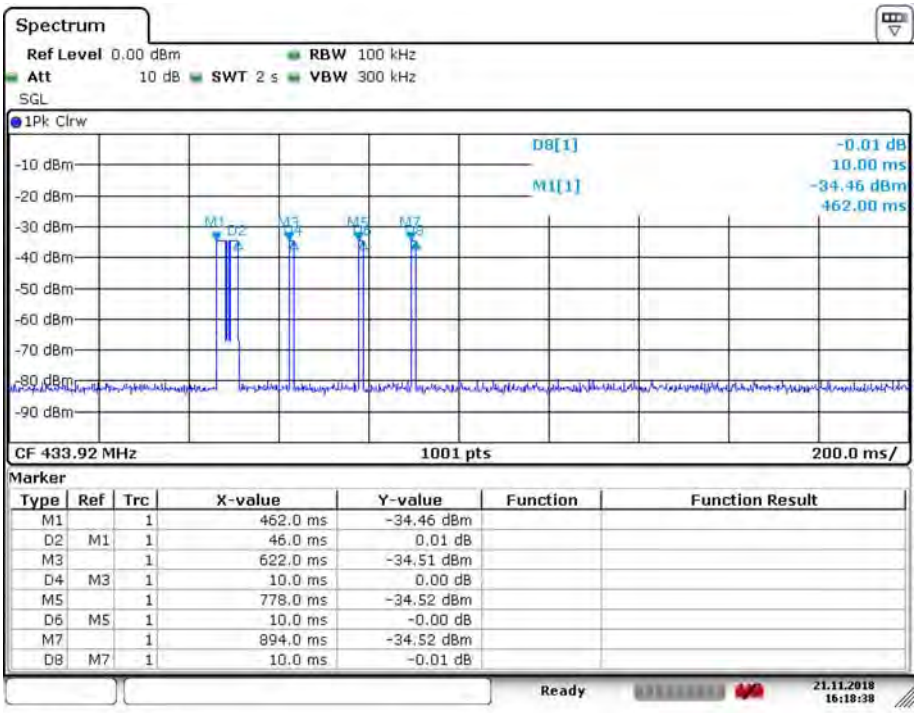
4.4. Test Result

Product Tire Pressure Monitoring Sensor - TPMS
Test Item Transmit time
Test Mode Mode 1: Transmit (ASK)

Channel No.	Frequency (MHz)	Measurement Value (Sec)	Limit (Sec)	Result
1 (Transmit time)	433.92	0.076	< 1	Pass
1 (Silent period time)	433.92	15.6	> 10	Pass
1 (Silent period time)	433.92	15.6	> 2.28	Pass

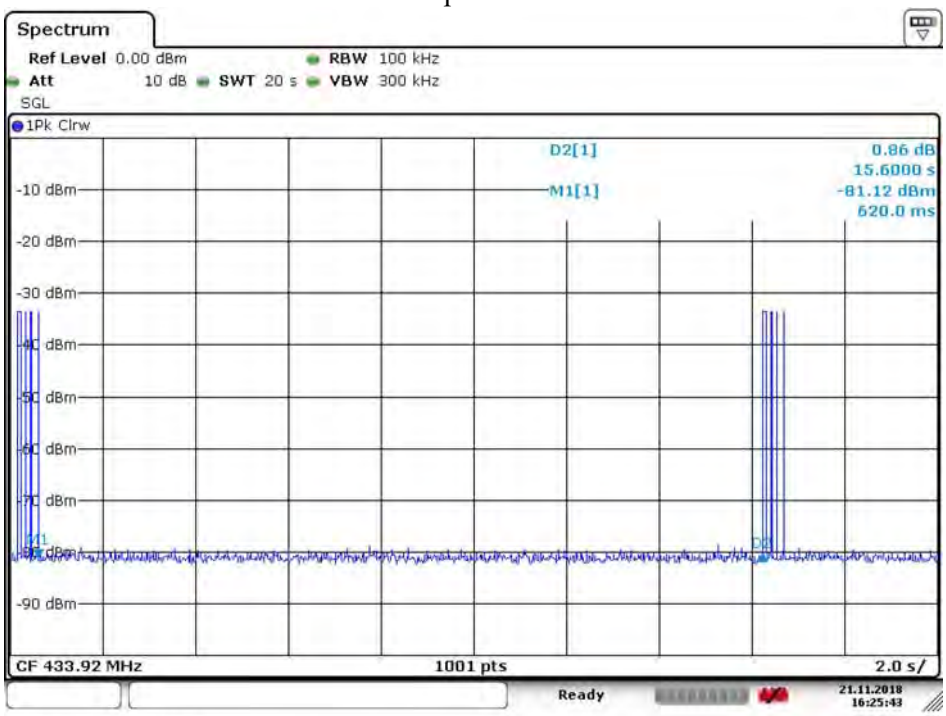
Note: Silent period time Limit =10s and Transmissions * 30 times =0.076s * 30 =2.28s

Transmit time



Date: 21.NOV.2018 16:18:38

Silent period time



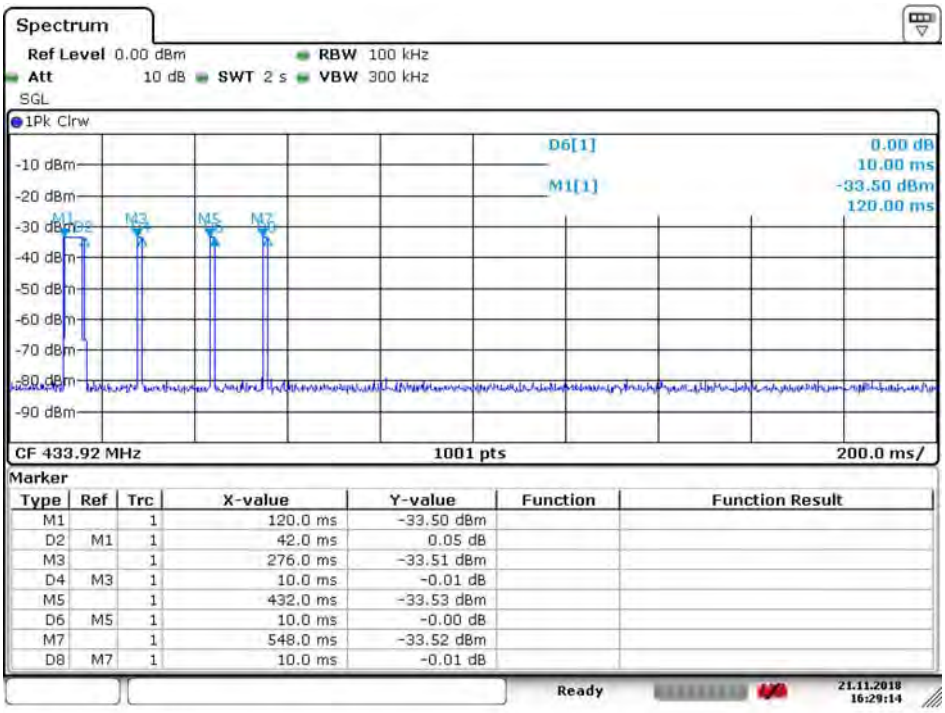
Date: 21.NOV.2018 16:25:43

Product Tire Pressure Monitoring Sensor - TPMS
Test Item Transmit time
Test Mode Mode 1: Transmit (FSK)

Channel No.	Frequency (MHz)	Measurement Value (Sec)	Limit (Sec)	Result
1 (Transmit time)	433.92	0.072	< 1	Pass
1 (Silent period time)	433.92	15.62	> 10	Pass
1 (Silent period time)	433.92	15.62	> 2.16	Pass

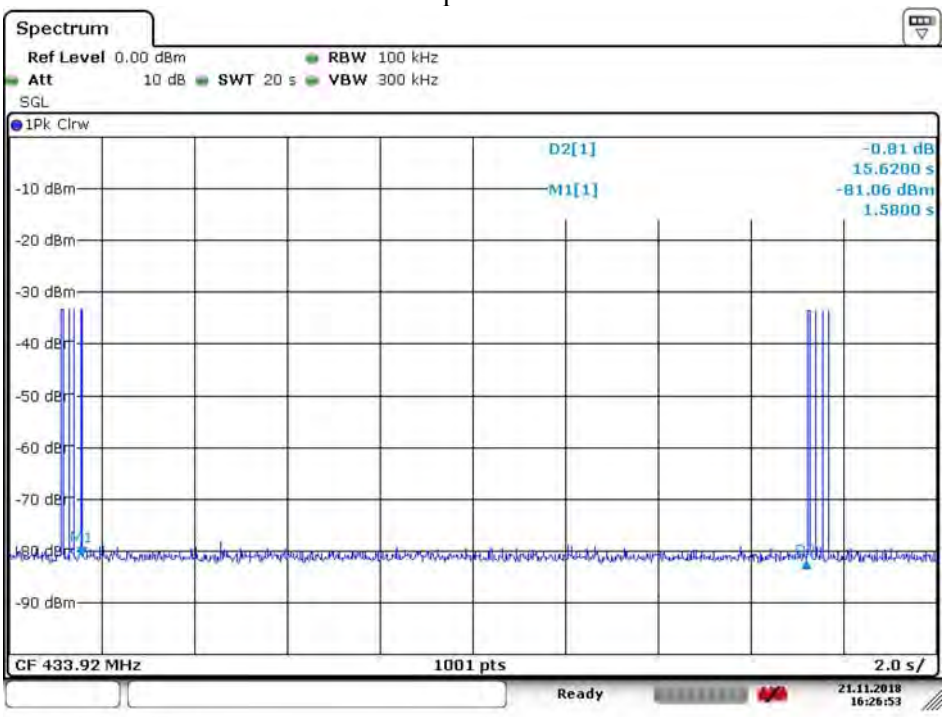
Note: Silent period time Limit =10s and Transmissions * 30 times =0.072s * 30 =2.16s

Transmit time



Date: 21.NOV.2018 16:29:14

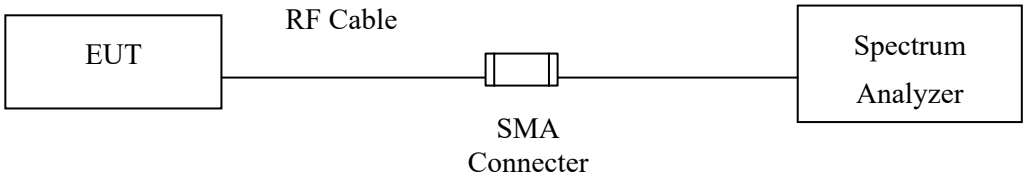
Silent period time



Date: 21.NOV.2018 16:26:54

5. Occupied Bandwidth

5.1. Test Setup



5.2. Limits

The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70MHz and below 900MHz. For devices operating above 900MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier

5.3. Uncertainty

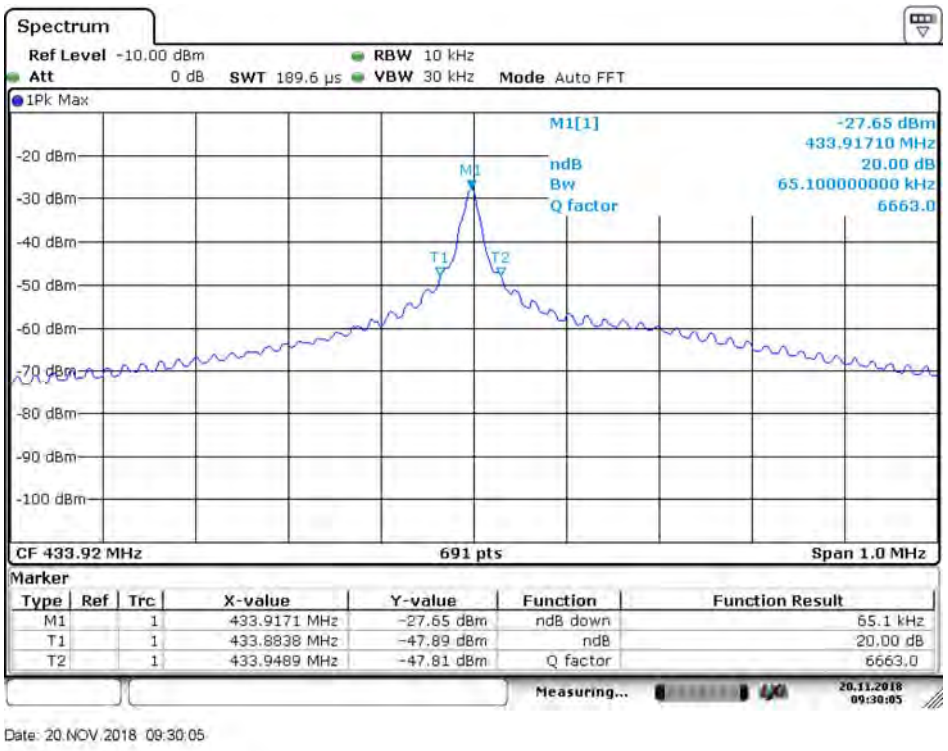
±279.2Hz

5.4. Test Result

Product Tire Pressure Monitoring Sensor - TPMS
Test Item Occupied Bandwidth
Test Mode Mode 1: Transmit (ASK)

Channel No.	Frequency (MHz)	Measurement Value (MHz)	Limit (MHz)	Result
1	433.92	0.0651	1.0848	Pass

Note: Limit = 433.92MHz * 0.25%= 1.0848MHz

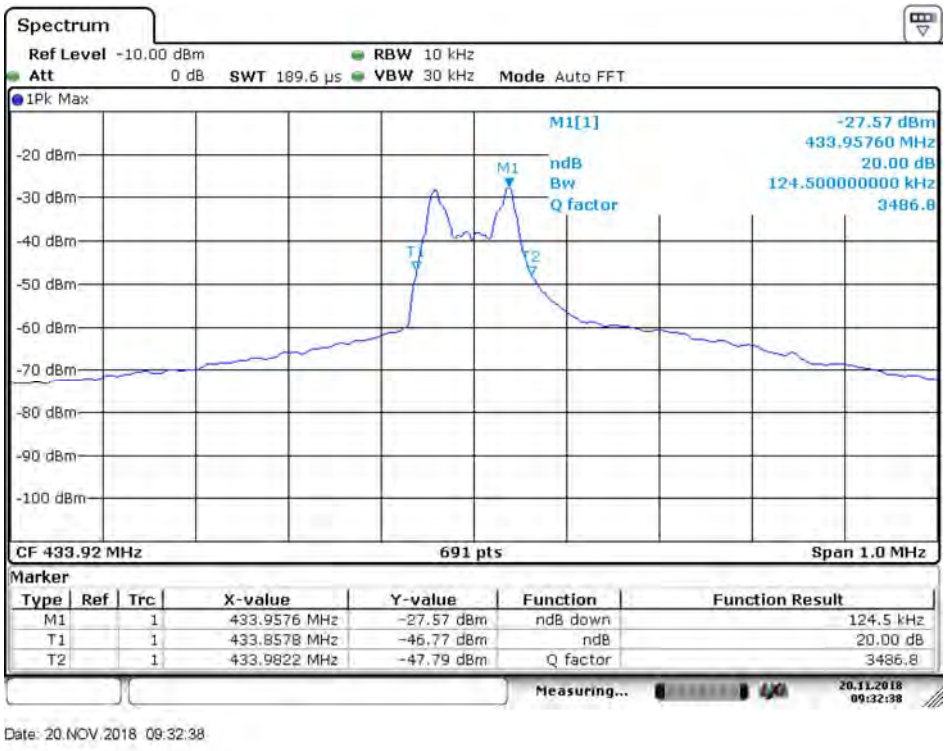


Date: 20.NOV.2018 09:30:05

Product Tire Pressure Monitoring Sensor - TPMS
Test Item Occupied Bandwidth
Test Mode Mode 1: Transmit (FSK)

Channel No.	Frequency (MHz)	Measurement Value (MHz)	Limit (MHz)	Result
1	433.92	0.1245	1.0848	Pass

Note: Limit = 433.92MHz * 0.25%= 1.0848MHz



Date: 20.NOV.2018 09:32:38

6. EMI Reduction Method During Compliance Testing

No modification was made during testing.