

FCC Test Report

Product Name : Tire Pressure Monitoring System (TPMS)
Model No. : P11x
FCC ID. : 2AEJRP11X0

Applicant : Picolink Technology Co., Ltd.
Address : Rm.5, 8F, No.100, Sec.1, Jiafeng 11th Rd., Zhubei
City, Hsinchu County 302, Taiwan(R.O.C.)

Date of Receipt : 2015/04/23
Issued Date : 2015/05/18
Report No. : 1540501R-RFUSP14V00
Report Version : V1.0



The test results relate only to the samples tested.

The test report shall not be reproduced except in full without the written approval of QuieTek Corporation.

Test Report Certification

Issued Date : 2015/05/18

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 Applicant : Picolink Technology Co., Ltd.
 Address : Rm.5, 8F, No.100, Sec.1, Jiafeng 11th Rd., Zhubei City,
 Hsinchu County 302, Taiwan(R.O.C.)
 Manufacturer : Picolink Technology Co., Ltd.
 Model No. : P11x
 Trade Name : Picolink
 FCC ID. : 2AEJRP11X0
 EUT Voltage : DC 3V
 Applicable Standard : FCC 15 Subpart C Section 15.231(b): 2012
 Test Result : Complied

The test results relate only to the samples tested.

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This report must not be used to claim product endorsement by NVLAP any agency of the U.S. Government

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 (Ken Huang / Engineer)

Approved By : *Roy Wang*
 (Roy Wang / Director)

Laboratory Information

We, **Quietek Corporation**, are an independent RF consultancy that was established the whole facility in our laboratories. The test facility has been accredited/accepted (audited or listed) by the following related bodies in compliance with ISO 17025 specified testing scopes:

Taiwan R.O.C.	:	TAF, Accreditation Number: 3024 NCC, Certificate No : NCC-RCB-07
USA	:	FCC, Registration Number: 365520
Canada	:	IC, Submission No: 150981

The related certificate for our laboratories about the test site and management system can be downloaded from Quietek Corporation's Web Site:<http://www.quietek.com/chinese/about/certificates.aspx?bval=5>

The address and introduction of Quietek Corporation's laboratories can be founded in our Web site : <http://www.quietek.com/>

If you have any comments, Please don't hesitate to contact us. Our contact information is as below:

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Linkou Testing Laboratory:

No.5-22, Ruishukeng, Linkou Dist., New Taipei City 24451, Taiwan, R.O.C.
TEL : 886-2-8601-3788 / FAX : 886-2-8601-3789 E-Mail : service@quietek.com

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1. General Information

1.1. EUT Description

Product Name	Tire Pressure Monitoring System (TPMS)
Model No.	P11x
Trade Name	Picolink
Frequency Range/Channel Number	433.920 MHz / 1 Channel
Antenna Gain	0dBi
Type of Modulation	FSK
Antenna Type	Soldered on PCB

Working Frequency of Each Channel	
Channel	Frequency
01	433.92MHz

Note:

1. This device is a Tire Pressure Monitoring System (TPMS) included a 433.92MHz transmitter and receiver function.
2. These tests are conducted on a sample for the purpose of demonstrating compliance with Part 15 Subpart C Paragraph 15.231.
3. The radiation measurements are performed in X, Y, Z axis positioning. Only the worst case is shown in the report.

1.2. Test Mode

QuieTek verified the construction and function in typical operation. All the test modes are performed in normal operation and are defined as:

Pre-Test Mode	
TX	Mode 1: Transmitter_Power by Battery (DC 3V)
Final Test Mode	
TX	Mode 1: Transmitter_Power by Battery (DC 3V)

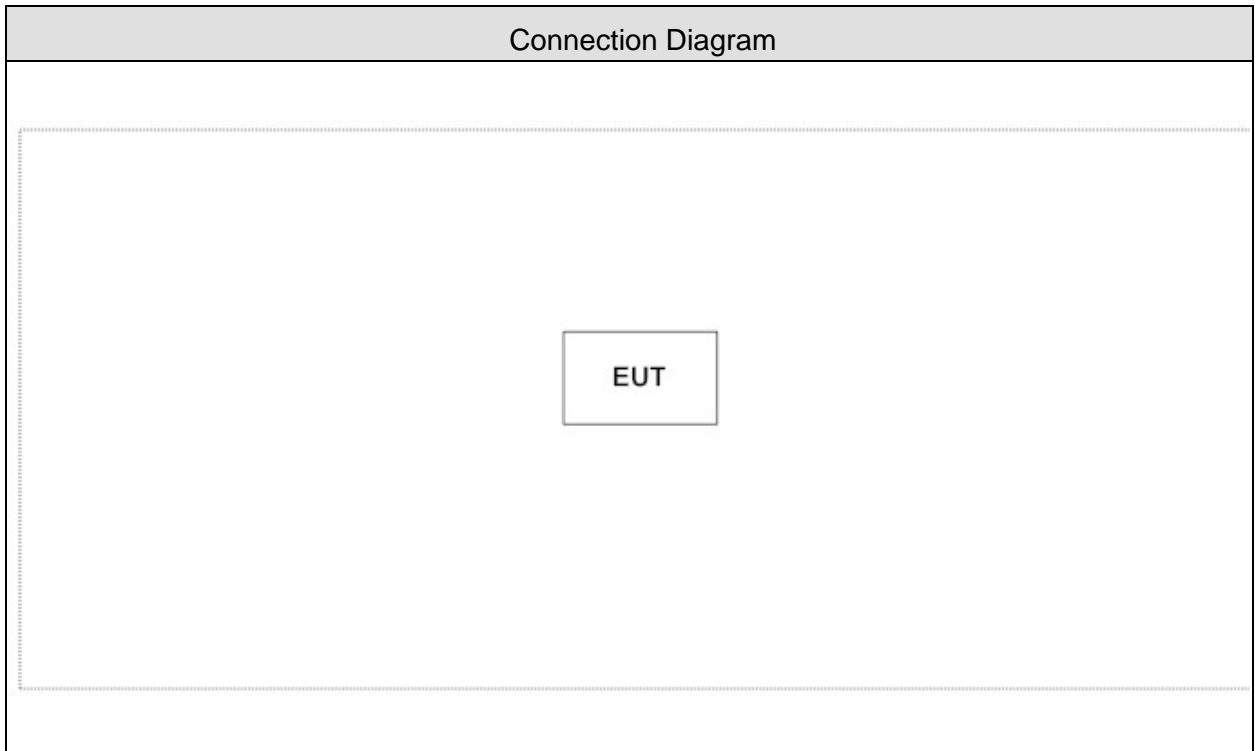
Emission	
Performed Item	
Conducted Emission	No
Radiated Emission	Yes
Occupied Bandwidth	Yes
Duty cycle	Yes
Transmitter time	Yes

1.3. Tested System Details

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

N/A

1.4. Configuration of tested System



1.5. EUT Exercise Software

1	Setup the EUT as shown in section 1.4.
2	Turn on the EUT power.
3	The RF signal's status will continue transmit through EUT.
4	Repeat the above procedure.

1.6. Test Facility

Ambient conditions in the laboratory:

Items	Test Item	Required (IEC 68-1)	Actual
Temperature (°C)	FCC PART 15 C 15.231 Radiated Emission	15 - 35	25
Humidity (%RH)		25 - 75	50
Barometric pressure (mbar)		860 - 1060	950-1000
Temperature (°C)	FCC PART 15 C 15.231 Occupied Bandwidth	15 - 35	25
Humidity (%RH)		25 - 75	50
Barometric pressure (mbar)		860 - 1060	950-1000
Temperature (°C)	FCC PART 15 C 15.231 Duty Cycle	15 - 35	25
Humidity (%RH)		25 - 75	50
Barometric pressure (mbar)		860 - 1060	950-1000
Temperature (°C)	FCC PART 15 C 15.231 Transmitter Time	15 - 35	25
Humidity (%RH)		25 - 75	50
Barometric pressure (mbar)		860 - 1060	950-1000

2. Radiated Emission

2.1. Test Equipment

The following test equipments are used during the test:

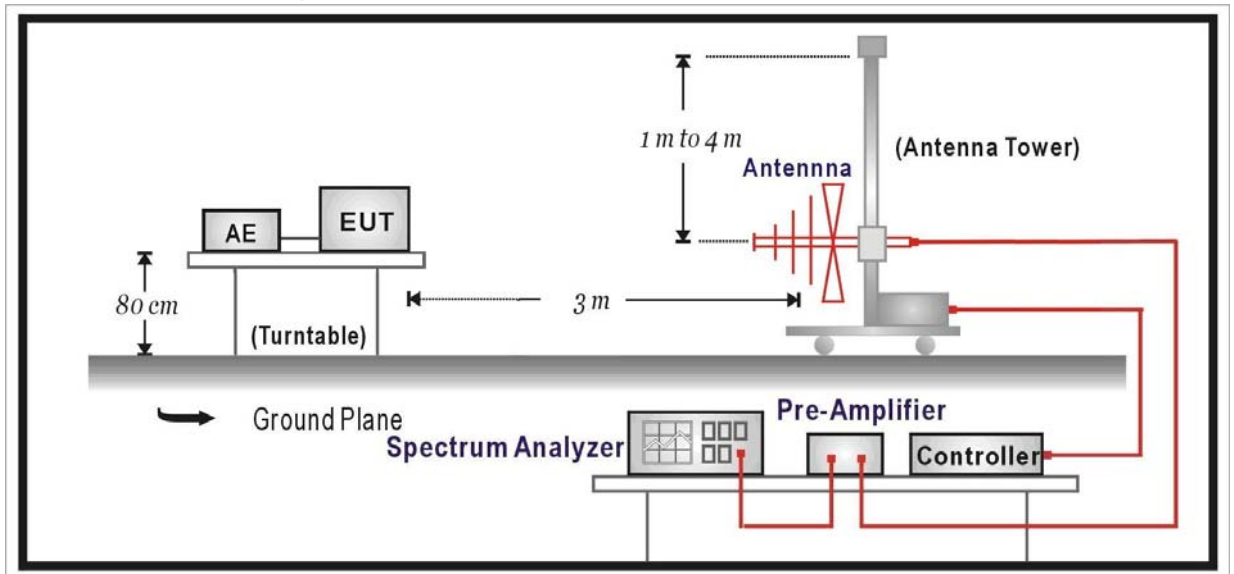
Radiated Emission / CB1

Instrument	Manufacturer	Model No.	Serial No	Next Cal. Date
Bilog Antenna	SCHAFFNER	CBL6112B	2895(CB1)	2015/08/14
Double Ridged Guide				
Horn Antenna	Schwarzback	BBHA 9120	D743	2016/01/26
Pre-Amplifier	EMCI	EMC0031835	980233	2016/01/18
Pre-Amplifier	QuiieTek	AP-025C	CHM-0706049	2016/01/18
Spectrum Analyzer	Agilent	E4440A	MY46187335	2016/01/07
k Type Cable	Huber Suhner	Sucoflex 102	25623/2	2016/01/26

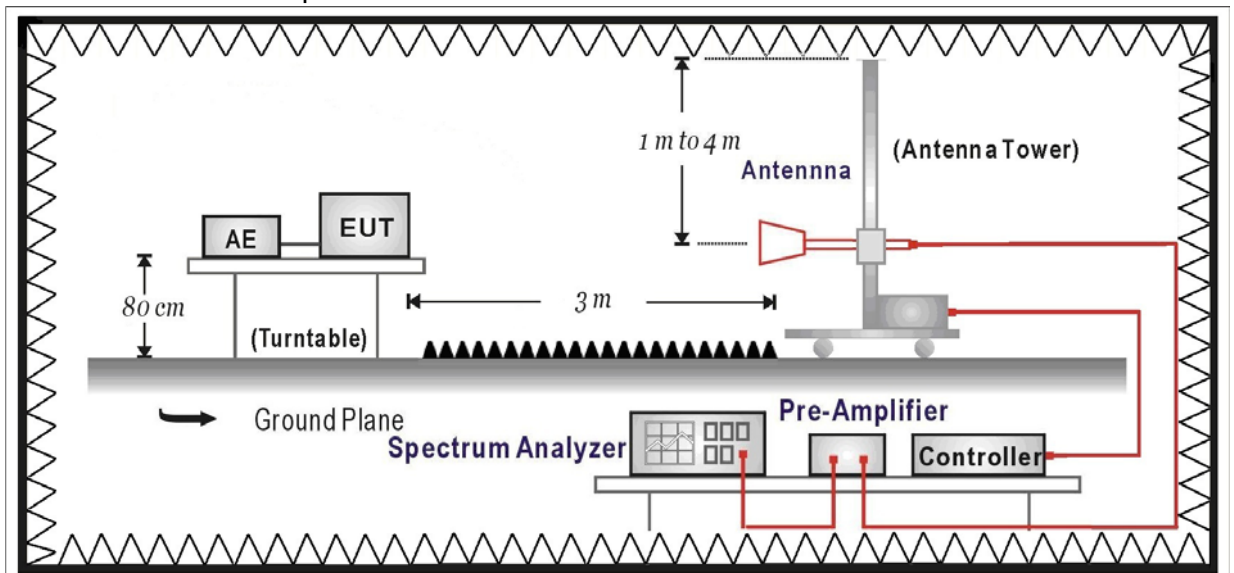
Note: 1. All equipments that need to calibrate are with calibration period of 1 year.

2.2. Test Setup

Under 1GHz Test Setup:



Above 1GHz Test Setup:



2.3. Limits

➤ Fundamental and Harmonics Emission Limits

FCC Part 15 Subpart C Paragraph 15.231(b) Limits				
Fundamental Frequency MHz	Field Strength of Fundamental		Field Strength of Harmonics	
	uV/m	dBuV/m	uV/m	dBuV/m
40.66-40.70	2250	67.04	225	47.04
70-130	1250	61.94	125	41.94
130-174	1250-3750	61.94-71.48	125-375	41.94-51.48
174-260	3750	71.48	375	51.48
260-470	3750-12500	71.48-81.94	375-1250	51.48-61.94
above 470	12500	81.94	1250	61.94

- 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.

2.4. Test Procedure

The EUT and its simulators are placed on a turn table which is 0.8 meter above ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

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

Both horizontal and vertical polarizations 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 C63.4: 2009 on radiated measurement.

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

Radiated emission measurements below 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 beamwidth of the antenna.

The worst radiated emission is measured on the Final Measurement.

The frequency range from 30MHz to 10th harmonics is checked.

2.5. Test Specification

According to FCC Part 15 Subpart C Paragraph 15.231(b): 2012

2.6. Uncertainty

± 3.8 dB below 1GHz

± 3.9 dB above 1GHz

2.7. Test Result

Product	Tire Pressure Monitoring System (TPMS)		
Test Item	Fundamental Radiated Emission		
Test Mode	Mode 1: Transmitter_Power by Battery (DC 3V)		
Date of Test	2015/05/06	Test Site	CB1

Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Peak Measurement Level (dBuV/m)	Average Measurement Level (dBuV/m)	Average Limit (dBuV/m)
Horizontal					
433.920	15.843	58.685	74.527	54.527	80.830
Vertical					
433.920	15.843	52.609	68.451	48.451	80.830

Note1:

Peak Measurement Level = Reading Level + Correct Factor

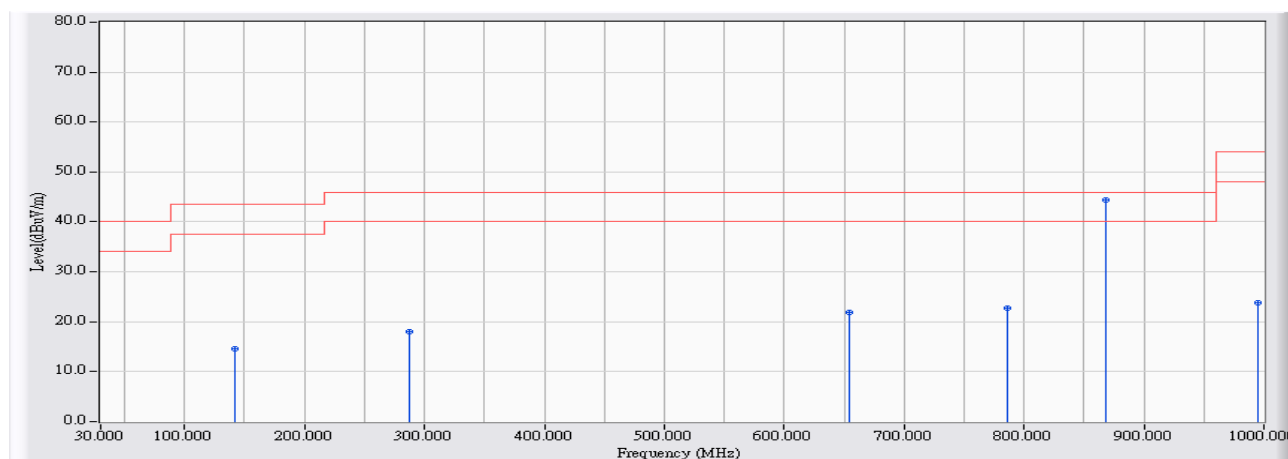
Average Measurement Level = Peak Measurement Level + 20*Log (Duty Cycle)

Duty Cycle(Only Ton)= Ton/ Ton+off=(8.4ms/207.6ms)=0.04

20*Log(Duty Cycle) =-27.859

30MHz-1GHz Spurious :

Site : CB1	Time : 2015/05/06 - 22:57
Limit : FCC_CLASS_B_03M_QP	Margin : 6
Probe : CB1_FCC_EFS_30-1G-2_1011 - HORIZONTAL	Power : DC 3V
EUT : Tire Pressure Monitoring System (TPMS)	Note : 433MHz-Tx

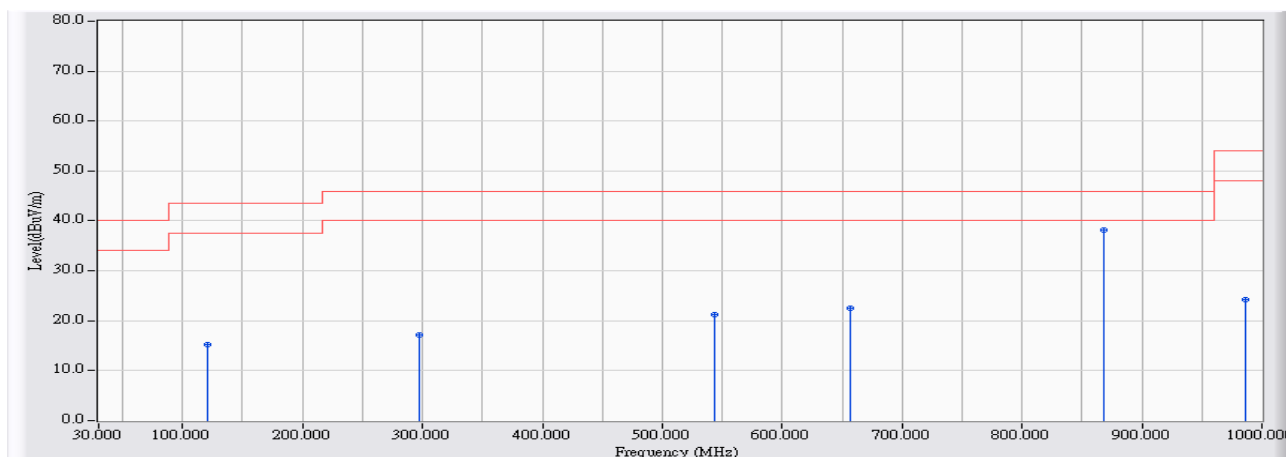


	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	141.494	10.058	4.554	14.612	-28.888	43.500	QUASPEAK
2	287.406	12.533	5.393	17.926	-28.074	46.000	QUASPEAK
3	654.368	17.760	4.100	21.860	-24.140	46.000	QUASPEAK
4	786.707	19.051	3.702	22.754	-23.246	46.000	QUASPEAK
5	* 867.661	19.389	25.028	44.417	-1.583	46.000	QUASPEAK
6	994.668	20.245	3.634	23.879	-30.121	54.000	QUASPEAK

Note:

1. All Readings below 1GHz are QUASPEAK, above are performed with QUASPEAK measurements as necessary.
2. " * ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor.

Site : CB1	Time : 2015/05/06 - 22:51
Limit : FCC_CLASS_B_03M_QP	Margin : 6
Probe : CB1_FCC_EFS_30-1G-2_1011 - VERTICAL	Power : DC 3V
EUT : Tire Pressure Monitoring System (TPMS)	Note : 433MHz-Tx



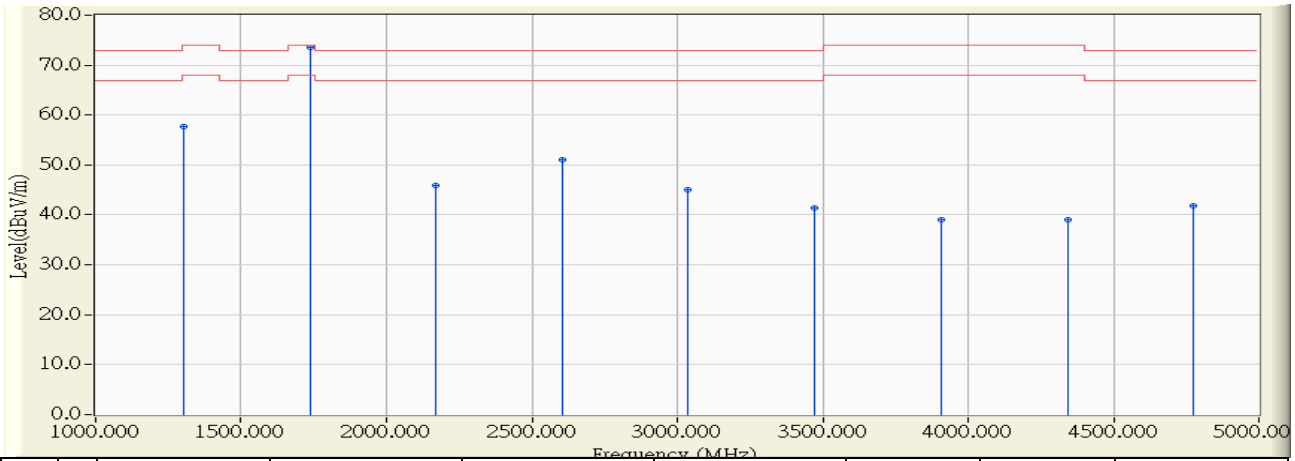
	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	120.165	10.809	4.427	15.236	-28.264	43.500	QUASPEAK
2	297.101	12.702	4.466	17.168	-28.832	46.000	QUASPEAK
3	543.843	17.315	3.913	21.228	-24.772	46.000	QUASPEAK
4	656.792	17.773	4.773	22.545	-23.455	46.000	QUASPEAK
5	* 867.661	19.389	18.735	38.124	-7.876	46.000	QUASPEAK
6	986.427	20.178	4.030	24.208	-29.792	54.000	QUASPEAK

Note:

1. All Readings below 1GHz are QUASPEAK, above are performed with QUASPEAK measurements as necessary.
2. " * ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor.

Above 1GHz Spurious:

Site : CB1	Time : 2015/05/07 – 16:30
Limit : NCC_3.4.2_H_433.92MHz_03M_PK	Margin : 6
Probe : CB1_FCC_EFS_1-18G-1_0901 - HORIZONTAL	Power : DC 3V
EUT : Tire Pressure Monitoring System (TPMS)	Note : 433MHz-Tx



	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	1301.380	-10.067	67.850	57.783	-16.217	74.000	PEAK
2	* 1736.380	-8.335	81.880	73.545	-0.455	74.000	PEAK
3	2169.270	-5.699	51.580	45.881	-26.989	72.870	PEAK
4	2603.830	-2.926	54.010	51.084	-21.786	72.870	PEAK
5	3036.930	-4.011	49.050	45.040	-27.830	72.870	PEAK
6	3470.500	-3.832	45.240	41.408	-31.462	72.870	PEAK
7	3905.350	-2.530	41.490	38.959	-35.041	74.000	PEAK
8	4345.137	-1.651	40.640	38.989	-35.011	74.000	PEAK
9	4773.480	-0.698	42.550	41.852	-31.018	72.870	PEAK

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. " * ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor.
4. The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.

Site : CB1	Time : 2015/05/07 – 16:30
Limit : NCC_3.4.2_H_433.92MHz_03M_AV	Margin : 6
Probe : CB1_FCC_EFS_1-18G-1_0901 - HORIZONTAL	Power : DC 3V
EUT : Tire Pressure Monitoring System (TPMS)	Note : 433MHz-Tx

		Frequency (MHz)	Peak Measurement (dBuV/m)	Duty Cycle Factor (dB)	Measurement Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		1301.38	57.783	-20.000	37.783	-16.217	54.000	Average
2	*	1736.38	73.545	-20.000	53.545	-0.455	54.000	Average

Note1:

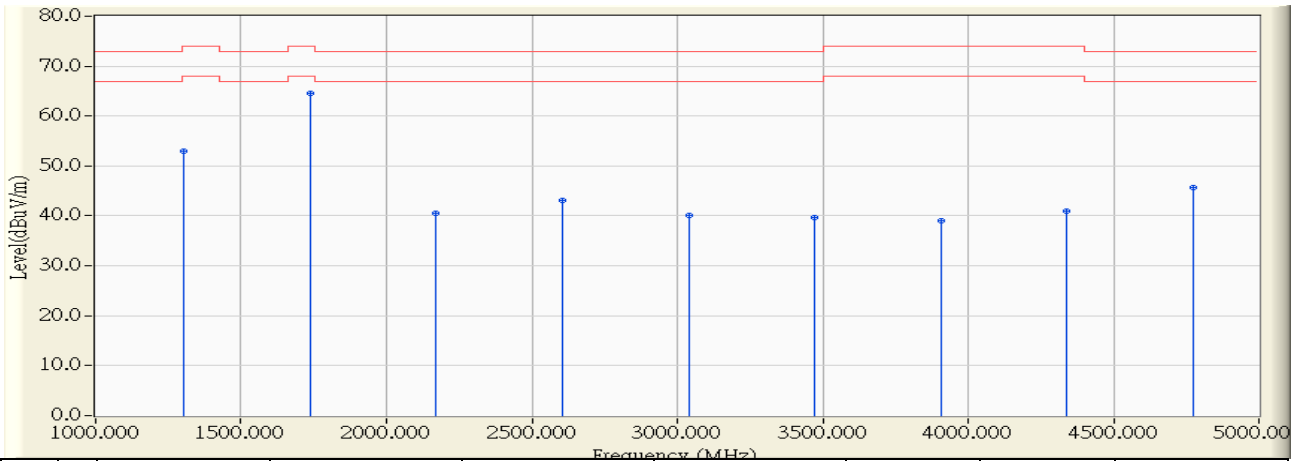
Peak Measure Value=Reading Value + Correct Factor

Average Measure Value=Peak Measure Value+20*LOG(Duty Cycle)

Duty Cycle=(Ton/(Ton+Toff))=8.4/207.6=0.04

20*LOG(Duty Cycle)=-27.859

Site : CB1	Time : 2015/05/07 – 17:00
Limit : NCC_3.4.2_H_433.92MHz_03M_PK	Margin : 6
Probe : CB1_FCC_EFS_1-18G-1_0901 - VERTICAL	Power : DC 3V
EUT : Tire Pressure Monitoring System (TPMS)	Note : 433MHz-Tx



	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	1301.940	-10.064	63.040	52.976	-21.024	74.000	PEAK
2	* 1736.340	-8.335	72.840	64.505	-9.495	74.000	PEAK
3	2169.410	-5.698	46.300	40.603	-32.267	72.870	PEAK
4	2603.770	-2.926	46.120	43.194	-29.676	72.870	PEAK
5	3038.750	-4.009	44.070	40.060	-32.810	72.870	PEAK
6	3470.660	-3.832	43.480	39.648	-33.222	72.870	PEAK
7	3905.360	-2.530	41.600	39.069	-34.931	74.000	PEAK
8	4338.560	-1.662	42.580	40.917	-33.083	74.000	PEAK
9	4772.160	-0.702	46.450	45.749	-27.121	72.870	PEAK

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. " * ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor.
4. The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.

Site : CB1	Time : 2015/05/07 – 17:00
Limit : NCC_3.4.2_H_433.92MHz_03M_AV	Margin : 6
Probe : CB1_FCC_EFS_1-18G-1_0901 - VERTICAL	Power : DC 3V
EUT : Tire Pressure Monitoring System (TPMS)	Note : 433MHz-Tx

		Frequency (MHz)	Peak Measurement (dBuV/m)	Duty Cycle Factor (dB)	Measurement Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		1301.94	63.04	-20.000	43.040	-10.960	54.000	Average
2	*	1736.34	72.84	-20.000	52.840	-1.160	54.000	Average

Note1:

Peak Measure Value=Reading Value + Correct Factor

Average Measure Value=Peak Measure Value+20*LOG(Duty Cycle)

Duty Cycle=(Ton/(Ton+Toff))=8.4/207.6=0.04

20*LOG(Duty Cycle)=-27.859

3. Occupied Bandwidth

3.1. Test Equipment

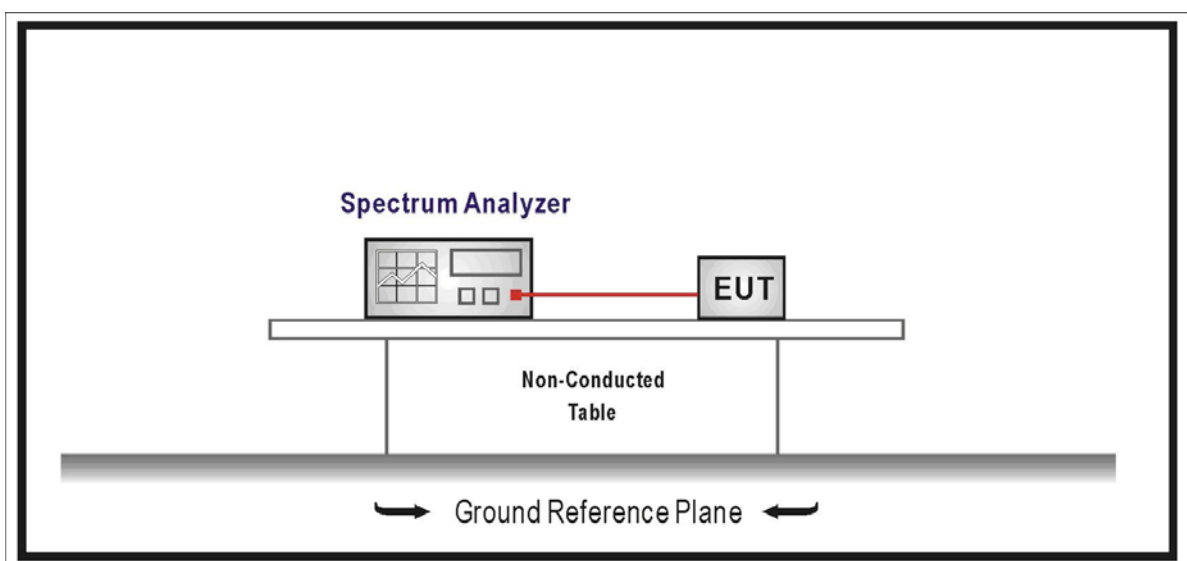
The following test equipments are used during the radiated emission tests:

Occupied Bandwidth / SR7

Instrument	Manufacturer	Model No.	Serial No	Next Cal. Date
Spectrum Analyzer	Agilent	N9010A-EXA	US47140172	2015/07/14

Note: 1. All equipments that need to calibrate are with calibration period of 1 year.

3.2. Test Setup



3.3. Limits

The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, 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.

3.4. Test Specification

According to FCC Part 15 Subpart C Paragraph 15.231(b): 2012

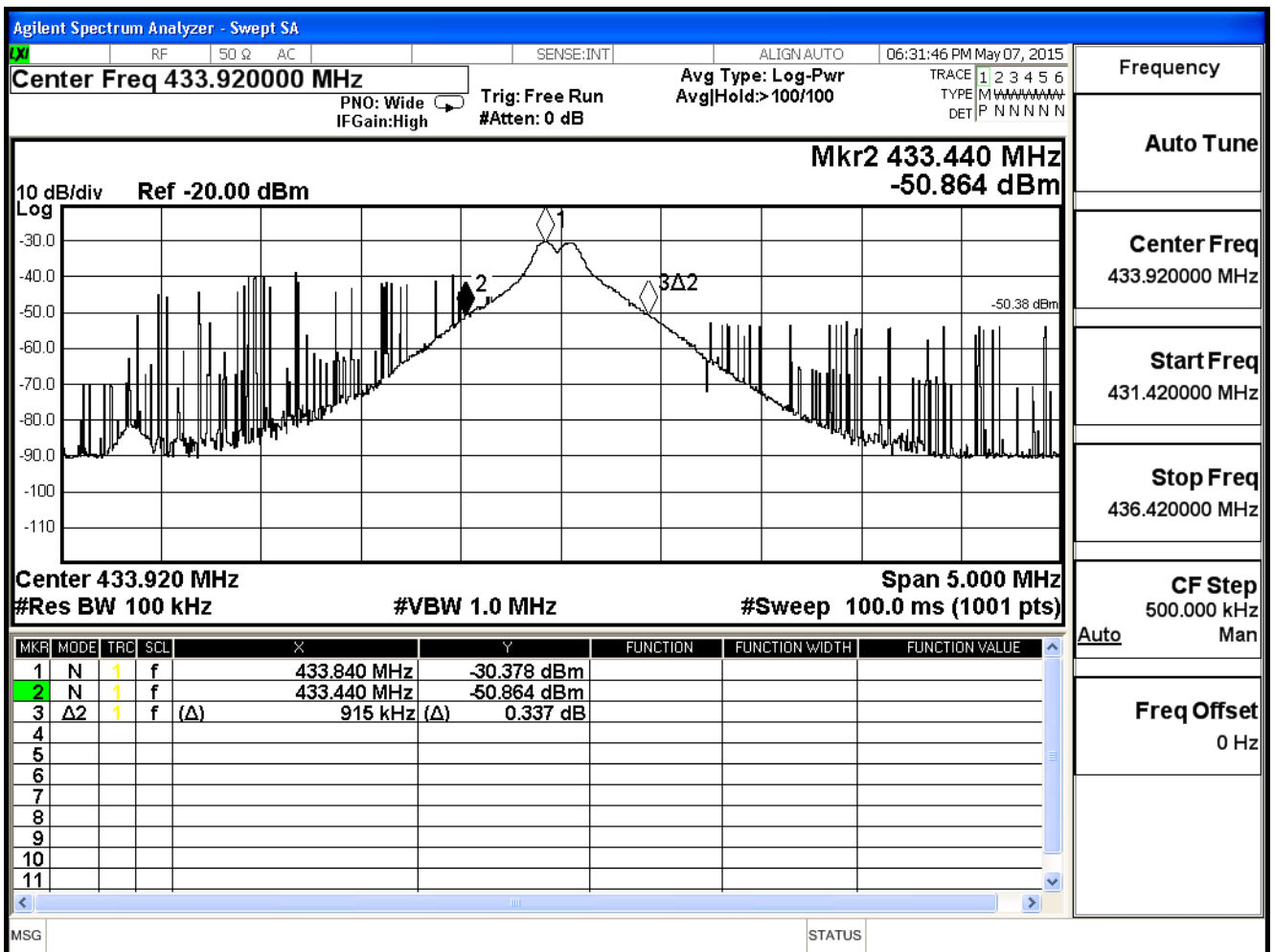
3.5. Uncertainty

± 150Hz

3.6. Test Result

Product	Tire Pressure Monitoring System (TPMS)		
Test Item	Occupied Bandwidth		
Test Mode	Mode 1: Transmitter_Power by Battery (DC 3V)		
Date of Test	2015/05/07	Test Site	SR7

Center Frequency	433.920 MHz
Allowable Bandwidth (433.92 MHz: 0.25%)	1.08480 MHz
Bandwidth at 20dB down (Max)	915kHz
Result	PASS



4. Duty cycle

4.1. Test Equipment

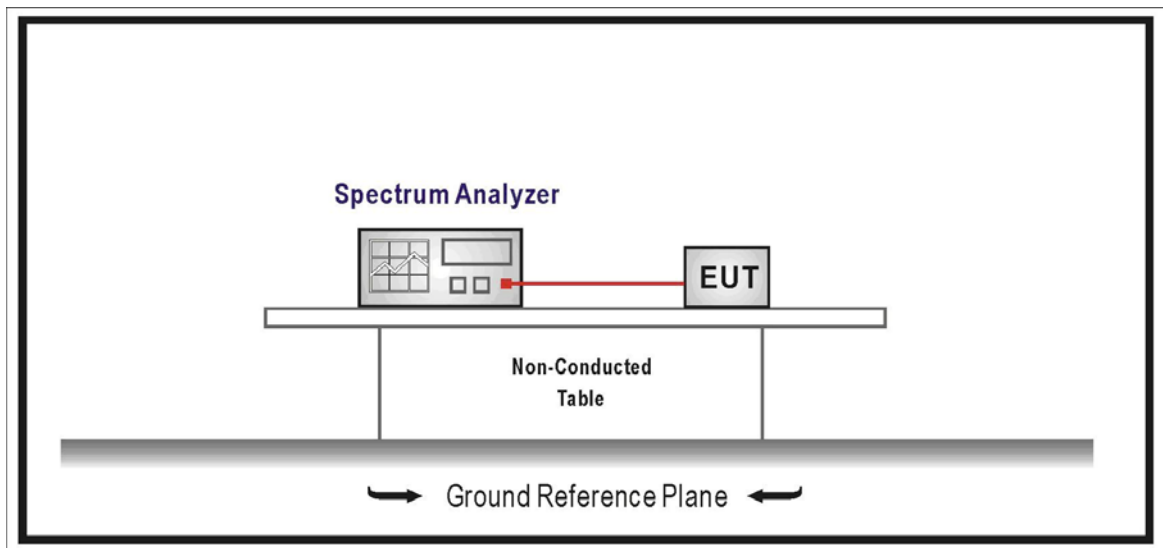
The following test equipments are used during the radiated emission tests:

Duty cycle / SR7

Instrument	Manufacturer	Model No.	Serial No	Next Cal. Date
Spectrum Analyzer	Agilent	N9010A-EXA	US47140172	2015/07/14

Note: 1. All equipments that need to calibrate are with calibration period of 1 year.

4.2. Test Setup



4.3. Limits

N/A

4.4. Test Specification

According to FCC Part 15 Subpart C Paragraph 15.231(b): 2012

4.5. Uncertainty

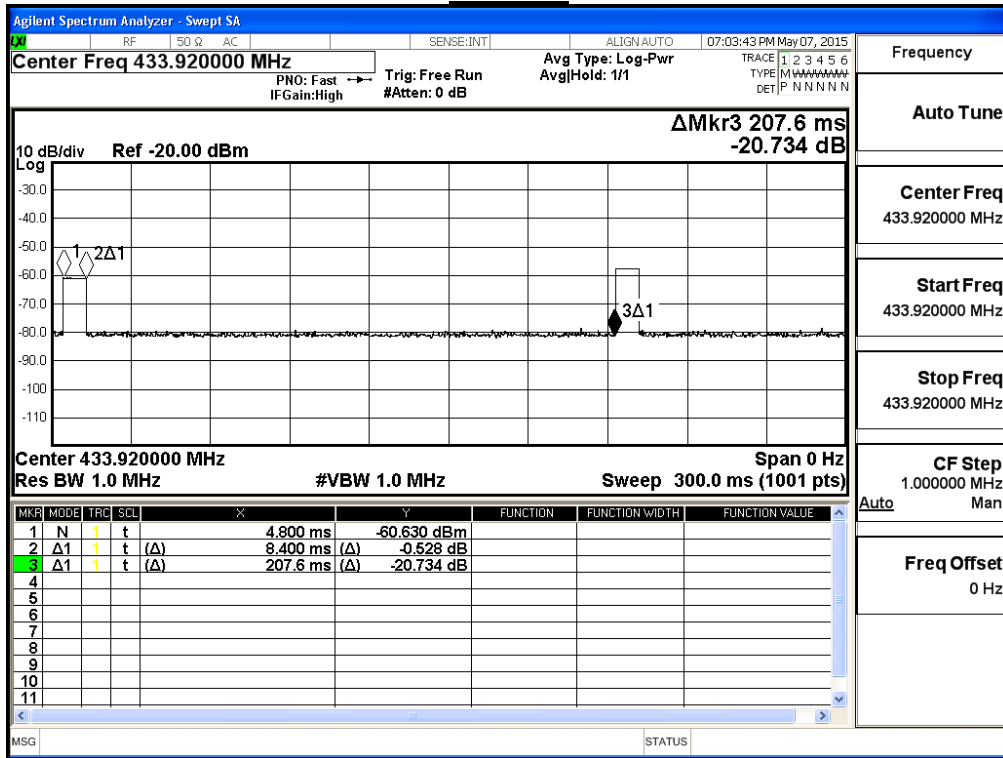
± 25msec

4.6. Test Result

Product	Tire Pressure Monitoring System (TPMS)		
Test Item	Duty Cycle		
Test Mode	Mode 1: Transmitter_Power by Battery (DC 3V)		
Date of Test	2015/05/07	Test Site	SR7

Center Frequency	433.920 MHz
Duty Cycle(Only Ton)	
= Ton/ Ton+off=(8.40ms/207.6ms)	
=0.04	

315MHz



5. Transmitter time

5.1. Test Equipment

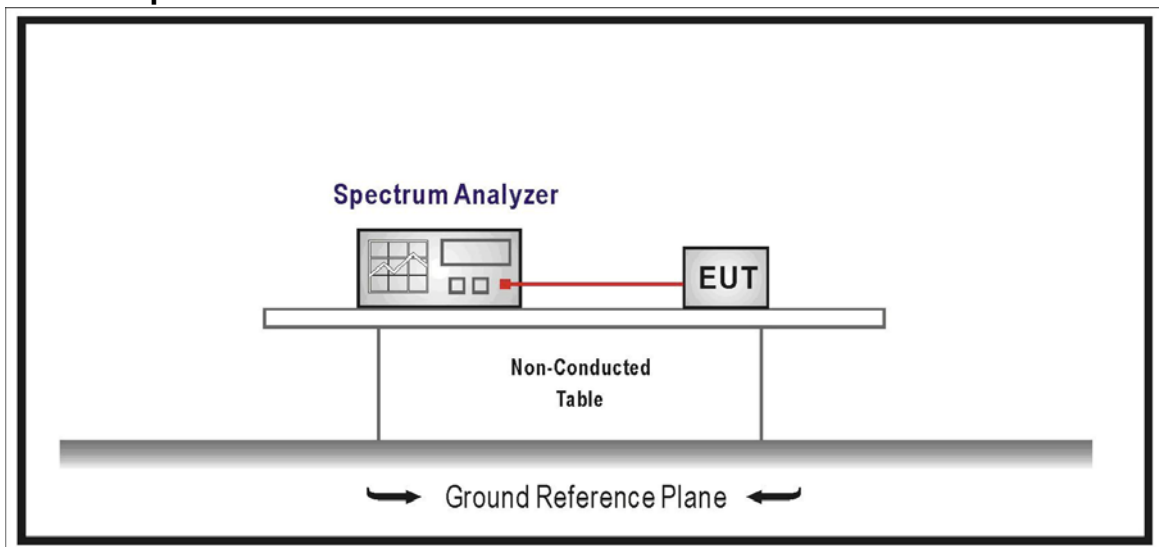
The following test equipments are used during the radiated emission tests:

Transmitter time / SR7

Instrument	Manufacturer	Model No.	Serial No	Next Cal. Date
Spectrum Analyzer	Agilent	N9010A-EXA	US47140172	2015/07/14

Note: 1. All equipments that need to calibrate are with calibration period of 1 year.

5.2. Test Setup



5.3. Limits

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.

5.4. Test Specification

According to FCC Part 15 Subpart C Paragraph 15.231(b): 2012

5.5. Uncertainty

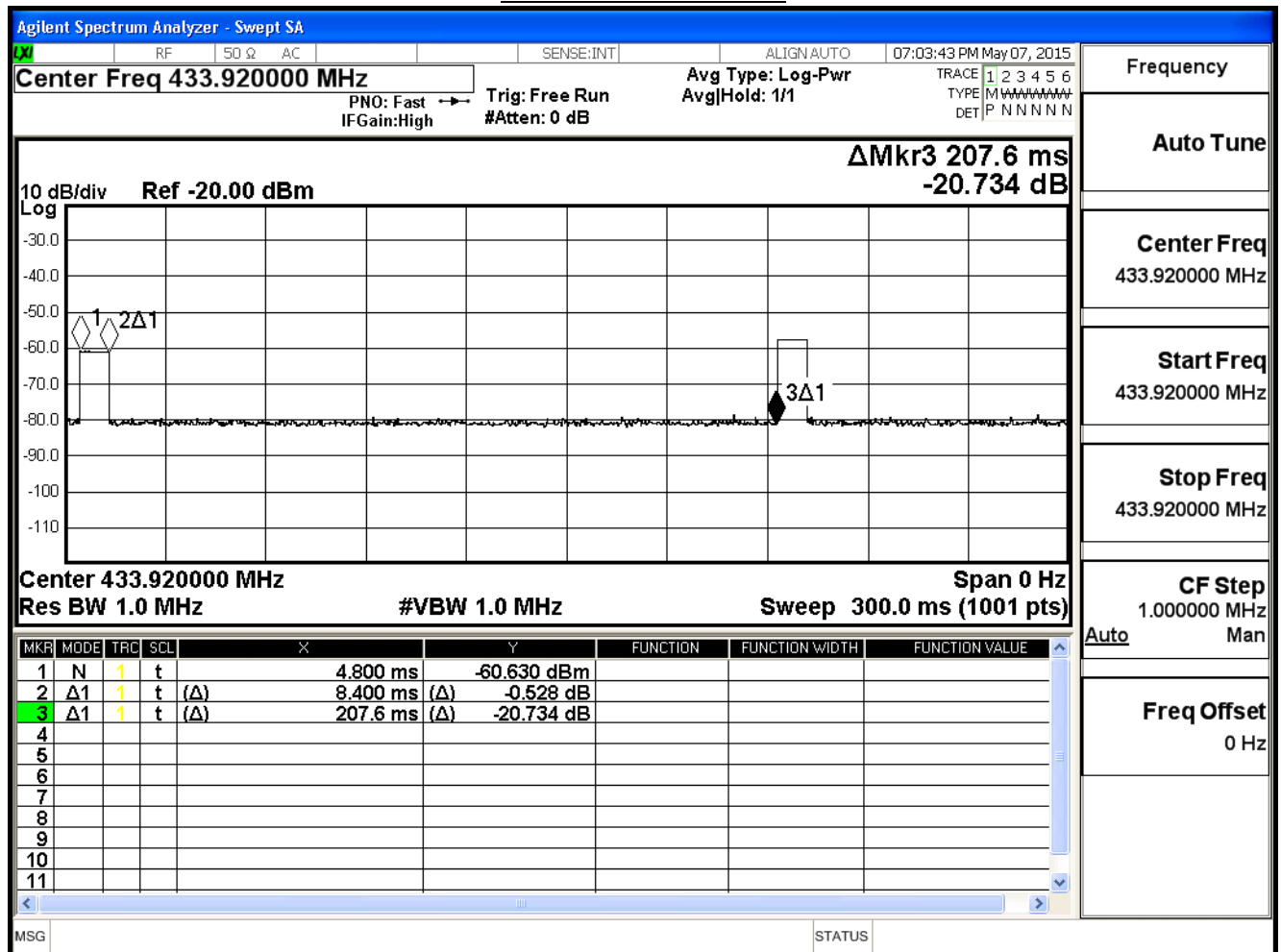
± 25msec

5.6. Test Result

Product	Tire Pressure Monitoring System (TPMS)		
Test Item	Transmitter time		
Test Mode	Mode 1: Transmitter_Power by Battery (DC 3V)		
Date of Test	2015/05/07	Test Site	SR7

Center Frequency	433.920 MHz
Transmitter time = 8.4ms < 5 sec.	Below 60.6 sec.
Result	PASS

Transmitter time in 300ms



Total Transmitter time in 300sec.

