

FCC Test Report

Product Name : Tire Pressure Monitoring System-C Series

Trade Name : Picolink

Model No. : C2

FCC ID. : 2AEJRPC20X

Applicant : Picolink Technology Co., Ltd

Address : Rm.5, 8F, No.100, Sec. 1, Jiafeng 11th

Rd., Zhubei City 302, Taiwan

Date of Receipt: Jun. 03, 2016

Issued Date : Oct. 14, 2016

Report No. : 1660178R-RFUSP14V00

Report Version : V1.0





The declaration results relate only to the samples calculated.

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



Test Report Certification

Issued Date : Oct. 14, 2016

Report No.: 1660178R-RFUSP14V00



Product Name : Tire Pressure Monitoring System-C Series

Applicant : Picolink Technology Co., Ltd

Address : Rm.5, 8F, No.100, Sec. 1, Jiafeng 11th Rd., Zhubei City 302,

Taiwan

Manufacturer : Picolink Technology Co., Ltd

Model No. : C2

FCC ID. : 2AEJRPC20X

EUT Voltage : DC 3V (Power by Battery)

Testing Voltage : DC 3V (Power by Battery)

Trade Name : Picolink

Applicable Standard : FCC 15 Subpart C Section 15.231(b): 2015

Test Lab : Hsin Chu Laboratory

Test Result : Complied

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

Documented By : (Demi Chang / Senior Engineering Adm. Specialist)

Tested By : Scott Chang

(Scott Chang / Assistant Engineer)

Approved By :

(Roy Wang / Director)



Revision History

Report No.	Version	Description	Issued Date
1660178R-RFUSP14V00	V1.0	Initial issue of report.	Oct. 14, 2016



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

USA : FCC, Registration Number: 834100

Canada : IC, Submission No: 181665 / IC Registration Number: 4075C-4

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/english/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/index en.aspx

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

Hsin Chu Laboratory:

No. 75-2, 3rd Lin, WangYe Keng, Yonghxing Tsuen, Qionglin Shiang, Hsinchu County 307, Taiwan (R.O.C.) TEL:+886-3-592-8859 E-Mail: service@quietek.com

Lin Kou Laboratory:

No. 5-22, Ruishukeng, Linkou Dist., New Taipei City 24451, Taiwan (R.O.C.)



TABLE OF CONTENTS

Description		Page
1.	General Information	6
1.1.	EUT Description	6
1.2.	Test Mode	7
1.3.	Tested System Details	8
1.4.	Configuration of tested System	8
1.5.	EUT Exercise Software	8
2.	Radiated Emission	9
2.1.	Test Equipment	9
2.2.	Test Setup	9
2.3.	Limits	10
2.4.	Test Procedure	11
2.5.	Test Specification	11
2.6.	Uncertainty	11
2.7.	Test Result	12
3.	Occupied Bandwidth	23
3.1.	Test Equipment	23
3.2.	Test Setup	23
3.3.	Limits	23
3.4.	Test Specification	23
3.5.	Uncertainty	23
3.6.	Test Result	24
4.	Duty cycle	25
4.1.	Test Equipment	25
4.2.	Test Setup	25
4.3.	Limits	25
4.4.	Test Specification	25
4.5.	Uncertainty	25
4.6.	Test Result	26
5.	Transmitter time	27
5.1.	Test Equipment	27
5.2.	Test Setup	27
5.3.	Limits	27
5.4.	Test Specification	27
5.5.	Uncertainty	27
5.6.	Test Result	28
Attachment 1		30
	Test Setup Photograph	30
Attachment 2		32
	EUT External Photograph	32
Attachment 3		33
	FUT Internal Photograph	33



1. General Information

1.1. EUT Description

Product Name	Tire Pressure Monitoring System-C Series
Trade Name	Picolink
Model No.	C2
Frequency Range	433.92 MHz
Channel Number	1
Type of Modulation	FSK

Antenna Information	
Antenna Type	Soldered on PCB Antenna
Antenna Gain	0 dBi

Working Frequency of Each Channel			
Channel Frequency			
001	433.92 MHz		

- 1. This device is a Tire Pressure Monitoring System-C Series included a 433.92MHz transceiver 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.
- 4. This device is a composite device in accordance with Part 15 regulations. The function receiving was measured and made a test report that the report number is 1660178R-RFUSP01V00 under Declaration of Conformity.



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: Transmit				
Final Test Mode				
TX	Mode 1: Transmit			

Emission			
Performed Item Mode 1			
Conducted Emission	No		
Radiated Emission	Yes		
Occupied Bandwidth	Yes		
Duty cycle	Yes		
Transmitter time	Yes		

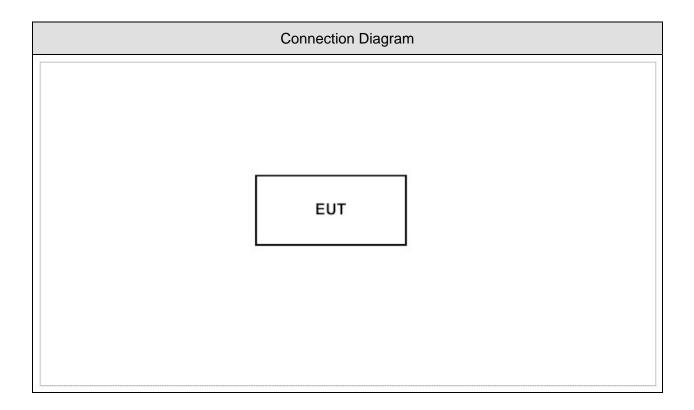


1.3. Tested System Details

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

Product	Manufacturer	Model No.	Serial No.	FCC ID	Power Cord
N/A					

1.4. Configuration of tested System



1.5. EUT Exercise Software

	1	Setup the EUT as shown in section 1.4.
	2	The EUT will transmit automatically.
Ī	3	Verify that the EUT works properly.



2. Radiated Emission

2.1. Test Equipment

The following test equipments are used during the test:

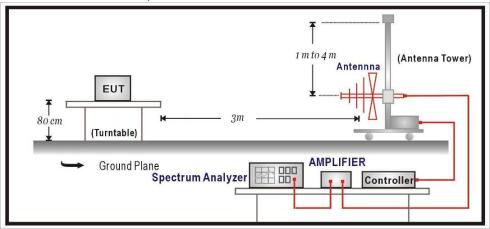
Radiated Emission / CB1

Instrument	Manufacturer	Model No.	Serial No	Next Cal. Date
Bilog Antenna	Schaffner	CBL6112B	2895	2017/08/14
Double Ridged Guide Horn Antenna	Schwarzbeck	BBHA 9120	D743	2017/01/14
Pre-Amplifier	EMCI	EMC0031835	4583/10/13	2017/01/26
Pre-Amplifier	QuieTek	AP-025C	CHM-0706049	2017/01/03
Spectrum Analyzer	Agilent	E4440A	MY46187335	2016/12/24
k Type Cable	Huber+Suhner	SF 102	25623/2	2017/01/11
Horn Antenna	Schwarzbeck	BBHA 9170	203	2017/08/28
Signal & Spectrum Analyzer	R&S	FSV40	101049	2017/01/05

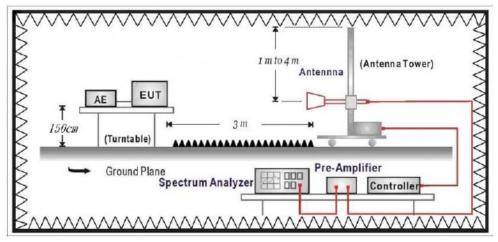
Note: All equipments that need to calibrate are with calibration period of 1 year.

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		ength of mental	Field Strength of Harmonics				
MHz	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.

Page: 10 of 36



2.4. Test Procedure

The EUT and its simulators are placed on a turn table which is 0.8 and 1.5 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 C63.10: 2013 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 harminics is checked.

2.5. Test Specification

According to FCC Part 15 Subpart C Paragraph 15.231(b): 2015

2.6. Uncertainty

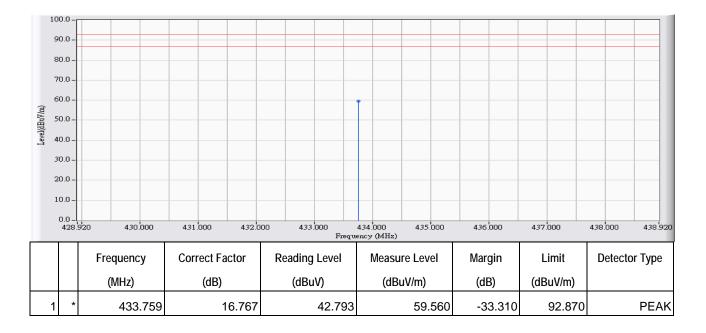
± 3.8 dB below 1GHz

± 3.9 dB above 1GHz



2.7. Test Result

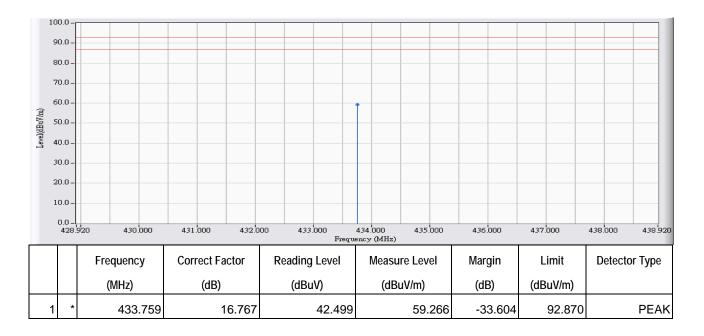
Site : CB1	Time : 2016/10/12 - 18:51
Limit : FCC_SpartC_15.231(e)_F_433.92MHz_03M_PK	Margin : 6
Probe : CB1_FCC_30M-1G-4_9161 - HORIZONTAL	Power : DC 3V (Power by Battery)
EUT : Tire Pressure Monitoring System-C Series	Note : Mode 1: Transmit_ X-axis



- 1. All Reading Levels are Peak value.
- 2. " * ", means this data is the worst emission level.
- 3. Measurement Level = Reading Level + Correct Factor.



Site : CB1	Time : 2016/10/12 - 18:54
Limit : FCC_SpartC_15.231(e)_F_433.92MHz_03M_PK	Margin : 6
Probe: CB1_FCC_30M-1G-4_9161 - VERTICAL	Power : DC 3V (Power by Battery)
EUT : Tire Pressure Monitoring System-C Series	Note : Mode 1: Transmit_ X-axis



- 1. All Reading Levels are Peak value.
- 2. " * ", means this data is the worst emission level.
- 3. Measurement Level = Reading Level + Correct Factor.



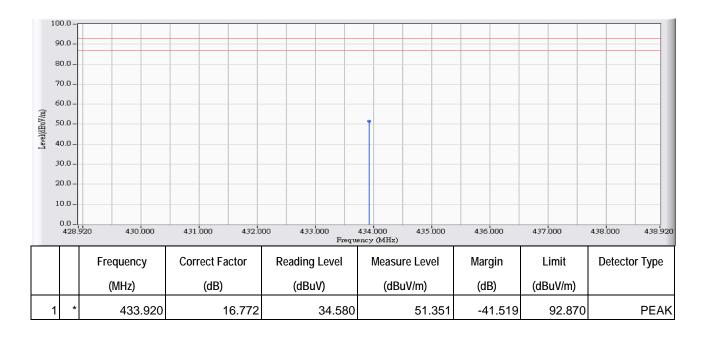
Site : CB1	Time : 2016/10/12 - 19:09
Limit : FCC_SpartC_15.231(e)_F_433.92MHz_03M_PK	Margin : 6
Probe: CB1_FCC_30M-1G-4_9161 - HORIZONTAL	Power : DC 3V (Power by Battery)
EUT : Tire Pressure Monitoring System-C Series	Note : Mode 1: Transmit_ Y-axis



- 1. All Reading Levels are Peak value.
- 2. " * ", means this data is the worst emission level.
- 3. Measurement Level = Reading Level + Correct Factor.



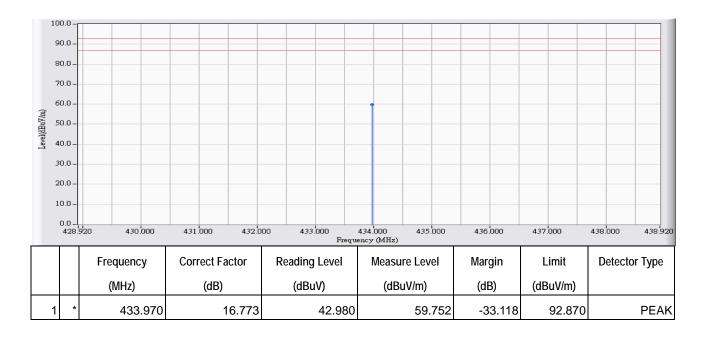
Site : CB1	Time : 2016/10/12 - 19:11
Limit : FCC_SpartC_15.231(e)_F_433.92MHz_03M_PK	Margin : 6
Probe : CB1_FCC_30M-1G-4_9161 - VERTICAL	Power : DC 3V (Power by Battery)
EUT : Tire Pressure Monitoring System-C Series	Note : Mode 1: Transmit_ Y-axis



- 1. All Reading Levels are Peak value.
- 2. " * ", means this data is the worst emission level.
- 3. Measurement Level = Reading Level + Correct Factor.



Site : CB1	Time : 2016/10/12 - 19:16
Limit : FCC_SpartC_15.231(e)_F_433.92MHz_03M_PK	Margin : 6
Probe: CB1_FCC_30M-1G-4_9161 - HORIZONTAL	Power : DC 3V (Power by Battery)
EUT : Tire Pressure Monitoring System-C Series	Note : Mode 1: Transmit_ Z-axis



- 1. All Reading Levels are Peak value.
- 2. " * ", means this data is the worst emission level.
- 3. Measurement Level = Reading Level + Correct Factor.



Site : CB1	Time : 2016/10/12 - 19:17
Limit : FCC_SpartC_15.231(e)_F_433.92MHz_03M_PK	Margin : 6
Probe : CB1_FCC_30M-1G-4_9161 - VERTICAL	Power : DC 3V (Power by Battery)
EUT : Tire Pressure Monitoring System-C Series	Note : Mode 1: Transmit_ Z-axis



- 1. All Reading Levels are Peak value.
- 2. " * ", means this data is the worst emission level.
- 3. Measurement Level = Reading Level + Correct Factor.



Product	Tire Pressure Monitoring System-C Series		
Test Item	Fundamental Radiated Emission		
Test Mode	Mode 1: Transmit		
Date of Test	2016/10/12 Test Site CB1		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(X-axis)	16.767	42.793	59.560	50.737	80.830
433.920(Y-axis)	16.772	34.950	51.721	42.898	80.830
433.920(Z-axis)	16.773	42.980	59.752	50.927	80.830
Vertical					
433.920(X-axis)	16.767	42.499	59.266	50.443	80.830
433.920(Y-axis)	16.772	34.580	51.351	42.528	80.830
433.920(Z-axis)	16.772	36.780	53.551	44.728	80.830

Peak Measurement Level = Reading Level +Correct factor

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

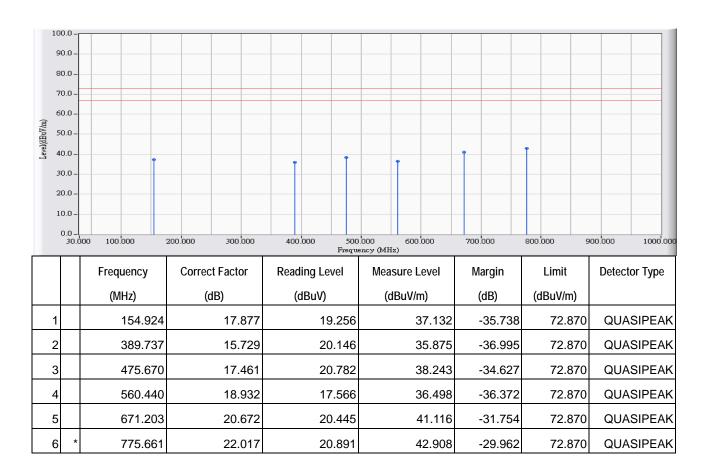
(Duty Cycle)=(Ton/(Ton+Toff)=36.21/100=0.362

20Log(Duty Cycle)= -8.823



30MHz-1GHz Spurious:

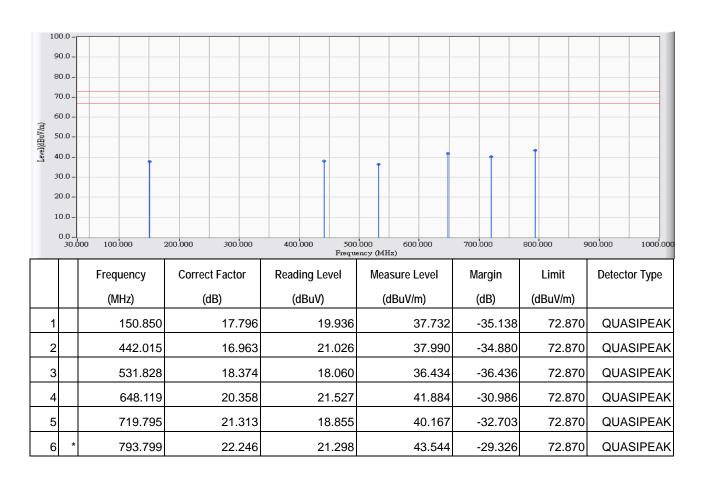
Site : CB1	Time : 2016/10/12 - 14:42
Limit : FCC_SpartC_15.231(e)_H_433.92MHz_03M_PK	Margin : 6
Probe : CB1_FCC_30M-1G-4_9161 - HORIZONTAL	Power : DC 3V (Power by Battery)
EUT : Tire Pressure Monitoring System-C Series	Note : Mode 1: Transmit



- 1. All Reading Levels are Quasi-Peak value.
- 2. " * ", means this data is the worst emission level.
- 3. Measurement Level = Reading Level + Correct Factor.



Site : CB1	Time : 2016/10/12 - 14:45
Limit : FCC_SpartC_15.231(e)_H_433.92MHz_03M_PK	Margin : 6
Probe: CB1_FCC_30M-1G-4_9161 - VERTICAL	Power : DC 3V (Power by Battery)
EUT : Tire Pressure Monitoring System-C Series	Note : Mode 1: Transmit

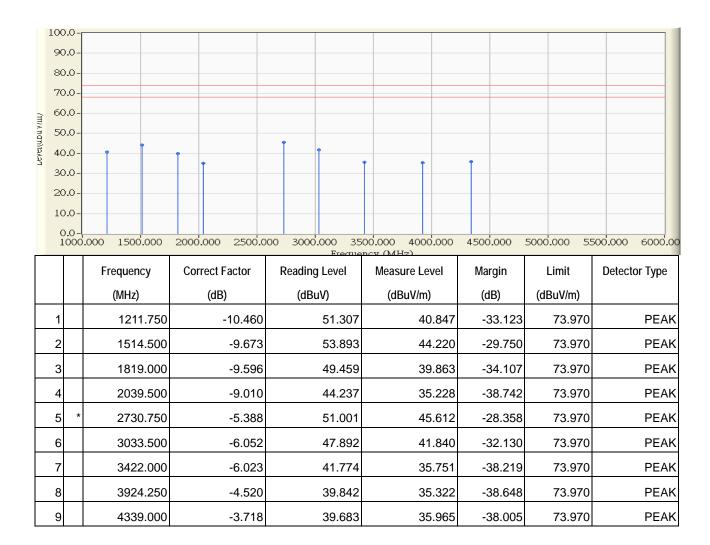


- 1. All Reading Levels are Quasi-Peak value.
- 2. " * ", means this data is the worst emission level.
- 3. Measurement Level = Reading Level + Correct Factor.



Above 1GHz Spurious:

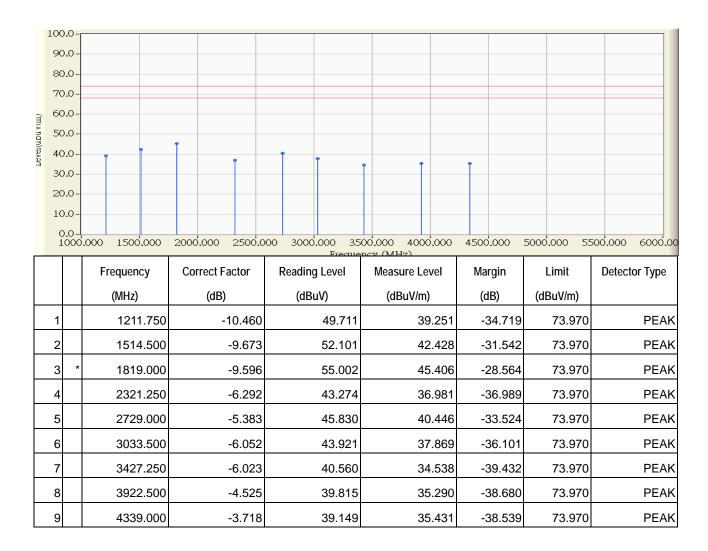
Site : CB1	Time : 2016/10/12 - 16:33
Limit : FCC_SpartC_15.231(e)_H_03M_PK	Margin : 6
Probe : CB1_FCC_EFS_1-18G_H2 - HORIZONTAL	Power : DC 3V (Power by Battery)
EUT : Tire Pressure Monitoring System-C Series	Note : Mode 1: Transmit



- 1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
- 2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
- 3. " * ", means this data is the worst emission level.
- 4. Measurement Level = Reading Level + Correct Factor.
- Average Measurement Level = Peak Measurement Level + 20Log (Duty Cycle)
 Duty Cycle(Only Ton)= Ton/ (Ton+off)=8.45/100=0.0845
 20*Log(Duty Cycle) = -21.463
- 6. The average measurement was not performed when the peak measured data under the limit of peak detection.



Site : CB1	Time : 2016/10/12 - 16:36
Limit : FCC_SpartC_15.231(e)_H_03M_PK	Margin : 6
Probe : CB4_FCC_EFS_1-18G_H2 - VERTICAL	Power : DC 3V (Power by Battery)
EUT : Tire Pressure Monitoring System-C Series	Note : Mode 1: Transmit



- 1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
- 2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
- 3. " * ", means this data is the worst emission level.
- 4. Measurement Level = Reading Level + Correct Factor.
- Average Measurement Level = Peak Measurement Level + 20Log (Duty Cycle)
 Duty Cycle(Only Ton)= Ton/ (Ton+off)=8.45/100=0.0845
 20*Log(Duty Cycle) = -21.463
- 6. The average measurement was not performed when the peak measured data under the limit of peak detection.



3. Occupied Bandwidth

3.1. Test Equipment

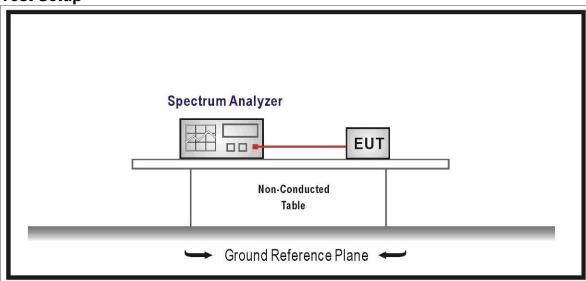
The following test equipments are used during the radiated emission tests:

Occupied Bandwidth / SR7

Instrument	Manufacturer	Model No.	Serial No	Next Cal. Date
Spectrum Analyzer	Agilent	N9010A	US47140172	2017/08/08
Signal & Spectrum	R&S	FSV40	101049	2017/01/05
Analyzer				
Signal Analyzer	R&S	FSV7	101650	2016/11/30

Note: 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): 2015

3.5. Uncertainty

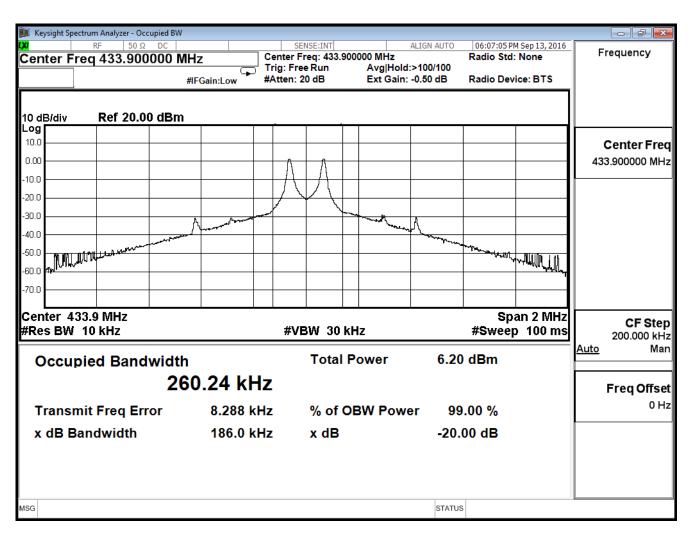
± 150Hz



3.6. Test Result

Product	Tire Pressure Monitoring System-C Series			
Test Item	Occupied Bandwidth			
Test Mode	Mode 1: Transmit			
Date of Test	2016/10/12	Test Site	SR7	

Center Frequency	433.92 MHz
Allowable Bandwidth (70-900 MHz: 0.25%, Above 900MHz: 0.5%)	1.0848MHz
Bandwidth at 20dB down (Max)	186.0KHz
Result	PASS





4. Duty cycle

4.1. Test Equipment

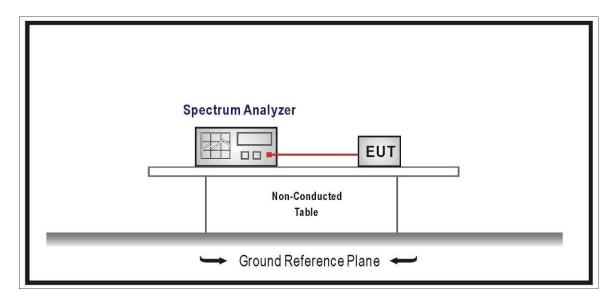
The following test equipments are used during the radiated emission tests:

Duty cycle / SR7

Instrument	Manufacturer	Model No.	Serial No	Next Cal. Date
Spectrum Analyzer	Agilent	N9010A	US47140172	2017/08/08
Signal & Spectrum	R&S	FSV40	101049	2017/01/05
Analyzer				
Signal Analyzer	R&S	FSV7	101650	2016/11/30

Note: 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): 2015

4.5. Uncertainty

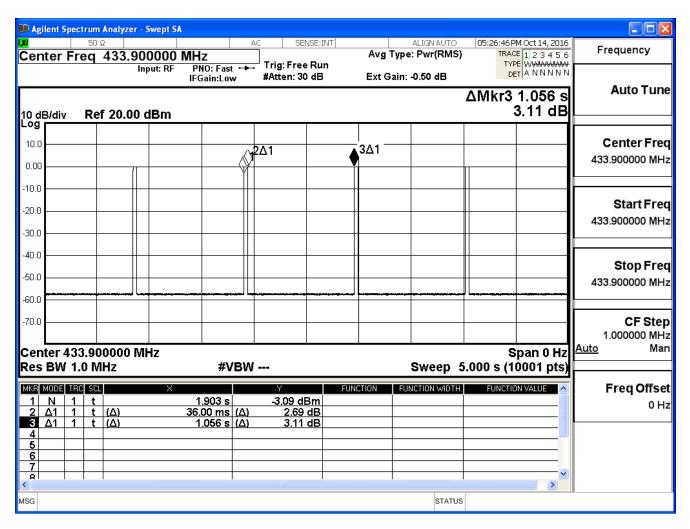
± 25msec



4.6. Test Result

Product	Tire Pressure Monitoring System-C Series			
Test Item	Duty Cycle			
Test Mode	Mode 1: Transmit			
Date of Test	2016/10/12	Test Site	SR7	

Center Frequency	433.92 MHz
Ton= 36.00ms	
Ton+Toff= 105.6ms	
Duty Cycle= 36 / 105.6 =0.034	





5. Transmitter time

5.1. Test Equipment

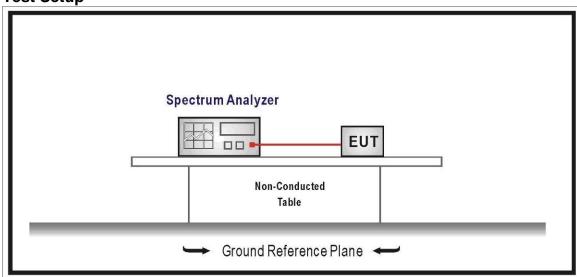
The following test equipments are used during the radiated emission tests:

Transmitter time / SR7

Instrument	Manufacturer	Model No.	Serial No	Next Cal. Date
Spectrum Analyzer	Agilent	N9010A	US47140172	2017/08/08
Signal & Spectrum	R&S	FSV40	101049	2017/01/05
Analyzer				
Signal Analyzer	R&S	FSV7	101650	2016/11/30

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

5.2. Test Setup



5.3. Limits

A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released. A transmitter activated automatically shall cease transmission within 5 seconds after activation.

5.4. Test Specification

According to FCC Part 15 Subpart C Paragraph 15.231(b): 2015

5.5. Uncertainty

± 25msec



5.6. Test Result

Product	Tire Pressure Monitoring System-C Series		
Test Item	Transmitter time		
Test Mode	Mode 1: Transmit		
Date of Test	2016/10/11	Test Site	SR7

Frequency	Transmitter time (ms.)		Silent period (sec.)	
(MHz)	Measure value	Limit	Measure value	Limit
433.92	36	1000	90.66	10

