

# TEST REPORT

**Applicant:** JIANGYIN PREMIER AUTOPARTS INDUSTRY CO.,LTD

**Address of Applicant:** No.243, Chenglu Road, Huashi Town, Jiangyin City, Jiangsu, China.

**Manufacturer/Factory:** JIANGYIN PREMIER AUTOPARTS INDUSTRY CO.,LTD

**Address of Manufacturer/Factory:** No.243, Chenglu Road, Huashi Town, Jiangyin City, Jiangsu, China.

**Equipment Under Test (EUT)**

Product Name: TPMS Sensor

Model No.: S1

Trade Mark: N/A

**FCC ID:** 2AYQ8-S1

**Applicable standards:** FCC CFR Title 47 Part 15 Subpart C Section 15.231

**Date of sample receipt:** Sep. 15,2021

**Date of Test:** Sep. 15,2021-Sep. 24,2021

**Date of report issued:** Sep. 24,2021

**Test Result :** PASS \*

\* In the configuration tested, the EUT complied with the standards specified above.

Authorized Signature:



**Robinson Luo**

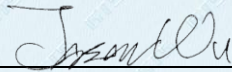
**Laboratory Manager**

This results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company. The report would be invalid without specific stamp of test institute and the signatures of compiler and approver.

## 2 Version

Version No.	Date	Description
00	Sep. 24,2021	Original

Prepared By:

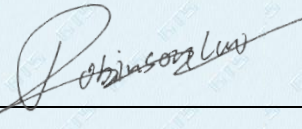


Date:

Sep. 24,2021

Project Engineer

Check By:



Date:

Sep. 24,2021

Reviewer

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## 4 Test Summary

Test Item	Section in CFR 47	Result
Antenna requirement	15.203	Pass
Field strength of the fundamental signal	15.231 (e)	Pass
Spurious emissions	15.231 (e)/15.209	Pass
20dB Bandwidth	15.231 (c)	Pass
Dwell time	15.231 (e)	Pass

Pass: The EUT complies with the essential requirements in the standard.

### 4.1 Measurement Uncertainty

Test Item	Frequency Range	Measurement Uncertainty	Notes
Radiated Emission	30MHz-200MHz	3.8039dB	(1)
Radiated Emission	200MHz-1GHz	3.9679dB	(1)
Radiated Emission	1GHz-18GHz	4.29dB	(1)
Radiated Emission	18GHz-40GHz	3.30dB	(1)

Note (1): The measurement uncertainty is for coverage factor of k=2 and a level of confidence of 95%.

## 5 General Information

### 5.1 General Description of EUT

Product Name:	TPMS Sensor
Model No.:	S1
Test sample(s) ID:	GTSL202109000168-1
Sample(s) Status:	Engineer sample
Hardware version:	V1.0
Software version:	V1.0
Operation Frequency:	433.92MHz
Modulation technology:	ASK
Antenna Type:	Internal Antenna
Antenna gain:	0dBi
Power supply:	DC 3V From Battery

## 5.2 Test mode

Transmitting mode	Keep the EUT in transmitting mode.
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### Per-test mode.

We have verified the construction and function in typical operation, The EUT was placed on three different polar directions; i.e. X axis, Y axis, Z axis. which only the worst case was shown in this test report and defined as follows:

Axis	X	Y	Z
Field Strength(dBuV/m)	78.44	77.16	76.30

## 5.3 Description of Support Units

None.
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## 5.4 Test Facility

<p>The test facility is recognized, certified, or accredited by the following organizations:</p> <ul style="list-style-type: none"> <li>• <b>FCC—Registration No.: 381383</b> Designation Number: CN5029 Global United Technology Services Co., Ltd., Shenzhen EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in files.</li> <li>• <b>IC —Registration No.: 9079A</b> CAB identifier: CN0091 The 3m Semi-anechoic chamber of Global United Technology Services Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing</li> <li>• <b>NVLAP (LAB CODE:600179-0)</b> Global United Technology Services Co., Ltd., is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP).</li> </ul>
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## 5.5 Test Location

All tests were performed at:
<p>Global United Technology Services Co., Ltd. No. 123-128, Tower A, Jinyuan Business Building, No.2, Laodong Industrial Zone, Xixiang Road, Baoan District, Shenzhen, Guangdong, China 518102 Tel: 0755-27798480 Fax: 0755-27798960</p>

## 5.6 Other Information Requested by the Customer

None.
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## 5.7 Deviation from Standards

None.
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## 5.8 Abnormalities from Standard Conditions

None.
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## 5.9 Additional instructions

Software (Used for test) from client

Mode	Special test SW was built-in by manufacturer.
Power set	Default

## 6 Test Instruments list

Radiated Emission:						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	3m Semi- Anechoic Chamber	ZhongYu Electron	9.2(L)*6.2(W)* 6.4(H)	GTS250	July. 02 2020	July. 01 2025
2	Control Room	ZhongYu Electron	6.2(L)*2.5(W)* 2.4(H)	GTS251	N/A	N/A
3	EMI Test Receiver	Rohde & Schwarz	ESU26	GTS203	June. 24 2021	June. 23 2022
4	BiConiLog Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9163	GTS214	June. 24 2021	June. 23 2022
5	Double -ridged waveguide horn	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120 D	GTS208	June. 24 2021	June. 23 2022
6	Horn Antenna	ETS-LINDGREN	3160	GTS217	June. 24 2021	June. 23 2022
7	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
8	Coaxial Cable	GTS	N/A	GTS213	June. 24 2021	June. 23 2022
9	Coaxial Cable	GTS	N/A	GTS211	June. 24 2021	June. 23 2022
10	Coaxial cable	GTS	N/A	GTS210	June. 24 2021	June. 23 2022
11	Coaxial Cable	GTS	N/A	GTS212	June. 24 2021	June. 23 2022
12	Amplifier(100kHz-3GHz)	HP	8347A	GTS204	June. 24 2021	June. 23 2022
13	Amplifier(2GHz-20GHz)	HP	84722A	GTS206	June. 24 2021	June. 23 2022
14	Amplifier (18-26GHz)	Rohde & Schwarz	AFS33-18002 650-30-8P-44	GTS218	June. 24 2021	June. 23 2022
15	Band filter	Amindeon	82346	GTS219	June. 24 2021	June. 23 2022
16	Power Meter	Anritsu	ML2495A	GTS540	June. 24 2021	June. 23 2022
17	Power Sensor	Anritsu	MA2411B	GTS541	June. 24 2021	June. 23 2022
18	Wideband Radio Communication Tester	Rohde & Schwarz	CMW500	GTS575	June. 24 2021	June. 23 2022
19	Splitter	Agilent	11636B	GTS237	June. 24 2021	June. 23 2022
20	Loop Antenna	ZHINAN	ZN30900A	GTS534	June. 24 2021	June. 23 2022
21	Breitband hornantenne	SCHWARZBECK	BBHA 9170	GTS579	Oct. 18 2020	Oct. 17 2021
22	Amplifier	TDK	PA-02-02	GTS574	Oct. 18 2020	Oct. 17 2021
23	Amplifier	TDK	PA-02-03	GTS576	Oct. 18 2020	Oct. 17 2021
24	PSA Series Spectrum Analyzer	Rohde & Schwarz	FSP	GTS578	June. 24 2021	June. 23 2022

RF Conducted Test:						
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	MXA Signal Analyzer	Agilent	N9020A	GTS566	June. 24 2021	June. 23 2022
2	EMI Test Receiver	R&S	ESCI 7	GTS552	June. 24 2021	June. 23 2022
3	Spectrum Analyzer	Agilent	E4440A	GTS533	June. 24 2021	June. 23 2022
4	MXG vector Signal Generator	Agilent	N5182A	GTS567	June. 24 2021	June. 23 2022
5	ESG Analog Signal Generator	Agilent	E4428C	GTS568	June. 24 2021	June. 23 2022
6	USB RF Power Sensor	DARE	RPR3006W	GTS569	June. 24 2021	June. 23 2022
7	RF Switch Box	Shongyi	RFSW3003328	GTS571	June. 24 2021	June. 23 2022
8	Programmable Constant Temp & Humi Test Chamber	WEWON	WHTH-150L-40-880	GTS572	June. 24 2021	June. 23 2022

General used equipment:						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	Humidity/ Temperature Indicator	KTJ	TA328	GTS243	June. 24 2021	June. 23 2022
2	Barometer	ChangChun	DYM3	GTS255	June. 24 2021	June. 23 2022

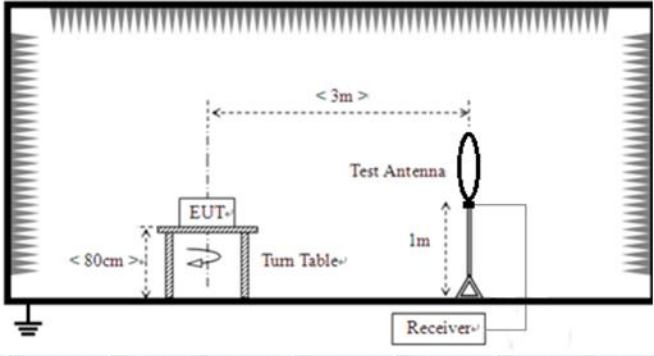


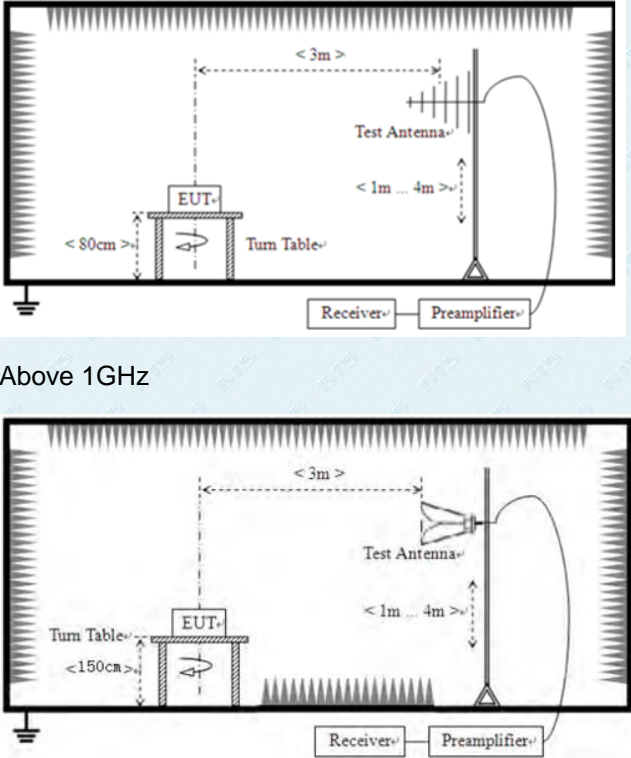
## 7 Test results and Measurement Data

### 7.1 Antenna requirement

<b>Standard requirement:</b>	FCC Part15 C Section 15.203
<b>15.203 requirement:</b> An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.	
<b>EUT Antenna:</b>	
The antenna is integral antenna, the best case gain of the antenna is 0dBi, reference to the appendix II for details.	

## 7.2 Radiated Emission Method

Test Requirement:	FCC Part15 C Section 15.231 (e)& Section 15.209				
Test Method:	ANSI C63.10:2013				
Test Frequency Range:	9kHz to 6000MHz				
Test site:	Measurement Distance: 3m				
Receiver setup:	Frequency	Detector	RBW	VBW	Value
	9KHz-150KHz	Quasi-peak	200Hz	600Hz	Quasi-peak
	150KHz-30MHz	Quasi-peak	9KHz	30KHz	Quasi-peak
	30MHz-1GHz	Quasi-peak	100KHz	300KHz	Quasi-peak
	Above 1GHz	Peak	1MHz	3MHz	Peak
Peak		1MHz	10Hz	Average	
Limit: (Field strength of the fundamental signal)	Frequency	Limit (dBuV/m @3m)		Remark	
	433.921MHz	72.87		Average Value	
		92.87		Peak Value	
Limit: (Spurious Emissions)	Frequency	Limit (uV/m)	Value	Measurement Distance	
	0.009MHz-0.490MHz	2400/F(KHz)	QP	300m	
	0.490MHz-1.705MHz	24000/F(KHz)	QP	300m	
	1.705MHz-30MHz	30	QP	30m	
	30MHz-88MHz	100	QP	3m	
	88MHz-216MHz	150	QP		
	216MHz-960MHz	200	QP		
	960MHz-1GHz	500	QP		
	Above 1GHz	500	Average		
		5000	Peak		
Or The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level whichever limit permits a higher field strength.					
Test setup:	Below 30MHz				
					
Below 1GHz					

	 <p>Above 1GHz</p>						
<p>Test Procedure:</p>	<ol style="list-style-type: none"> <li>1. The EUT was placed on the top of a rotating table (0.8 meters for below 1GHz and 1.5 meters for above 1GHz) above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation.</li> <li>2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.</li> <li>3. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.</li> <li>4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading.</li> <li>5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.</li> <li>6. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.</li> </ol>						
<p>Test Instruments:</p>	<p>Refer to section 6.0 for details</p>						
<p>Test mode:</p>	<p>Refer to section 5.2 for details</p>						
<p>Test environment:</p>	<table border="1"> <tr> <td>Temp.:</td> <td>25 °C</td> <td>Humid.:</td> <td>50%</td> <td>Press.:</td> <td>1 010mbar</td> </tr> </table>	Temp.:	25 °C	Humid.:	50%	Press.:	1 010mbar
Temp.:	25 °C	Humid.:	50%	Press.:	1 010mbar		
<p>Test voltage:</p>	<p>DC 3.0V</p>						
<p>Test results:</p>	<p>Pass</p>						

**Measurement data:**

The emissions from 30MHz to 5GHz are measured peak and average level, below 1 GHz measured QP level, detailed test data please see below. Besides, we tested 3 directions and recorded the worst data.

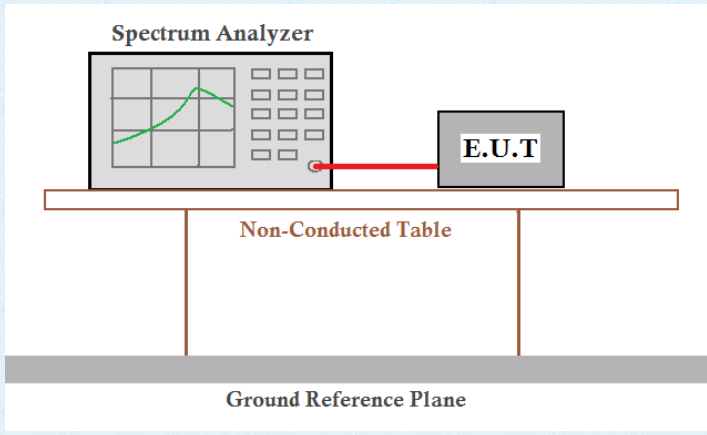
Emission Styles	Frequency (MHz)	Reading (dBUV/m)	Limit (dBUV/m)	Margin (dB)	Detector	Direction (H/V)
Fundamental	433.921	78.44	92.87	14.43	PK	H
Spurious	446.254	41.25	46.00	4.75	PK	H
Harmonics	867.842	51.05	72.87	21.82	PK	H
Harmonics	1301.763	48.33	72.87	24.54	PK	H
--	--	--	--	--	--	--
Fundamental	433.921	63.25	92.87	29.62	PK	V
Spurious	446.254	42.09	46.00	3.91	PK	V
Harmonics	867.842	50.51	72.87	22.36	PK	V
Harmonics	1301.763	47.22	72.87	25.65	PK	V
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Emission Styles	Frequency (MHz)	PK Level (dBUV/m)	AV Factor (dB/m)	AV Level (dBUV/m)	Limit (dBUV/m)	Margin (dB)	Direction (H/V)
Fundamental	433.921	78.44	-12.96	65.48	72.87	7.39	H
Harmonics	867.842	51.05	-12.96	38.09	52.87	14.78	H
Harmonics	1301.763	48.33	-12.96	35.37	52.87	17.50	H
--	--	--	--	--	--	--	--
Fundamental	433.921	63.25	-12.96	50.29	72.87	22.58	V
Harmonics	867.842	50.51	-12.96	37.55	52.87	15.32	V
Harmonics	1301.763	47.22	-12.96	34.26	52.87	18.61	V
--	--	--	--	--	--	--	--

Note:

1. AV Level (dBUV/m)= PK Level (dBUV/m)+ AV Factor(dB)
2. AV Factor=20\*log(Duty Cycle)=20\*log(0.225)=-12.96

### 7.3 20dB Occupy Bandwidth

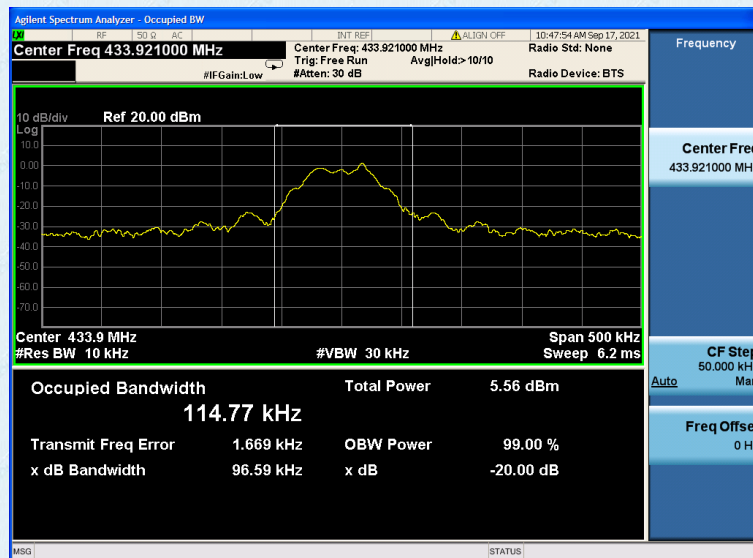
Test Requirement:	FCC Part15 C Section 15.231 (c)				
Test Method:	ANSI C63.10:2013				
Limit:	The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.				
Test setup:					
Test Instruments:	Refer to section 6.0 for details				
Test mode:	Refer to section 5.2 for details				
Test environment:	Temp.:	25 °C	Humid.:	50%	Press.: 1 010mbar
Test results:	Pass				

### Measurement Data

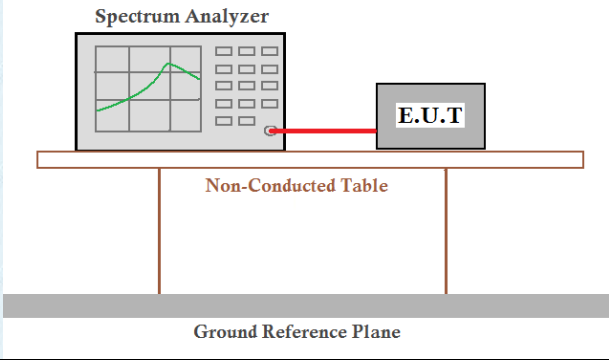
Modulation	Test Frequency (MHz)	20dB bandwidth (MHz)	Limit (MHz)	Result
ASK	433.921	0.09659	1.0848	Pass

Note: Limit= Fundamental frequency×0.25%=433.921×0.25%=1.0848MHz

Test plot as follows:



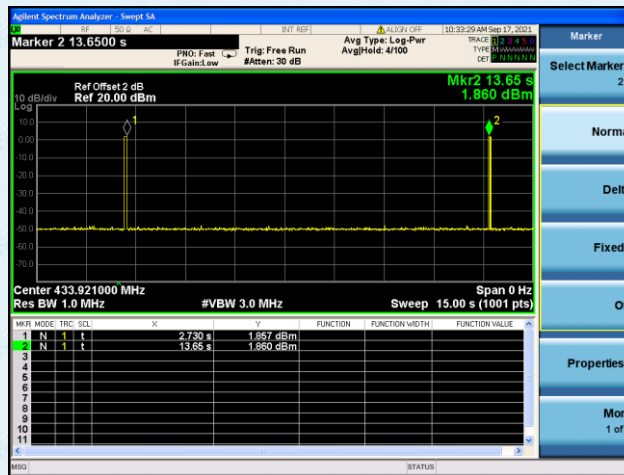
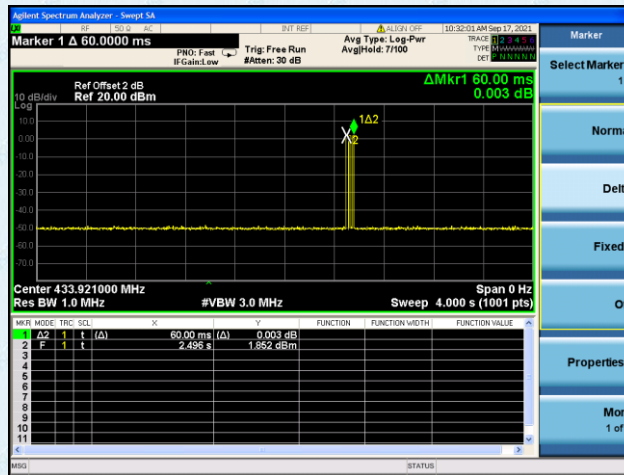
## 7.4 Dwell time

Test Requirement:	FCC Part15 C Section 15.231 (e)				
Test Method:	ANSI C63.10:2013				
Receiver setup:	RBW=100KHz, VBW=300KHz, span=0Hz, detector: Peak				
Limit:	Not more than 1seconds				
Test setup:					
Test Instruments:	Refer to section 6.0 for details				
Test mode:	Refer to section 5.2 for details				
Test environment:	Temp.:	25 °C	Humid.:	50%	Press.: 1 010mbar
Test results:	Pass				

### Measurement data:

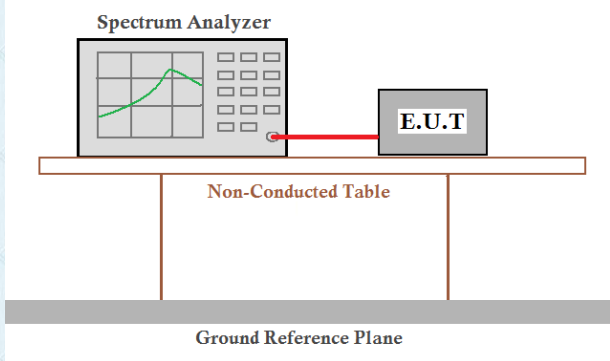
Modulation	Duration of each TX(second):	Limit (second)	Result
ASK	0.060	<1.0	Pass

## ASK





## 7.5 Duty Cycle

Test Requirement:	FCC Part15 C Section 15.231
Test Method:	ANSI C63.10:2013
Receiver setup:	RBW=100KHz, VBW=300KHz, span=0Hz, detector: Peak
Limit:	No dedicated limit specified in the Rules.
Test Procedure:	<ol style="list-style-type: none"> <li>1. Place the EUT on the table and set it in transmitting mode.</li> <li>2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.</li> <li>3. Set centre frequency of spectrum analyzer=operating frequency.</li> <li>4. Set the spectrum analyzer as RBW=100kHz, VBW=100KHz, Span=0Hz, Adjust Sweep=100ms to obtain the "worst-case" pulse on time</li> <li>5. Repeat above procedures until all frequency measured was complete.</li> </ol>
Test setup:	 <p>The diagram illustrates the test setup. A Spectrum Analyzer is connected via a red cable to an E.U.T. (Equipment Under Test). Both are placed on a Non-Conducted Table. Below the table is a Ground Reference Plane.</p>
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

### Measurement data:

Calculate Formula: Duty cycle factor =  $20 \log(\text{Duty cycle})$   
 Duty cycle = on time / 0.1 seconds or period, whichever is less

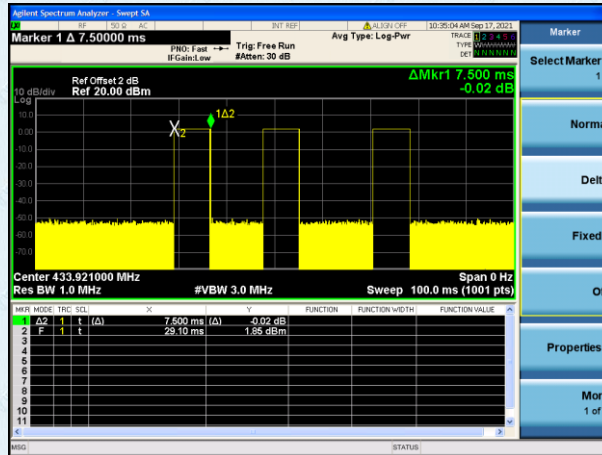
Test data:

In a transmit cycle 100ms period found burst 3pcs, the Duty Cycle can calculate as below:

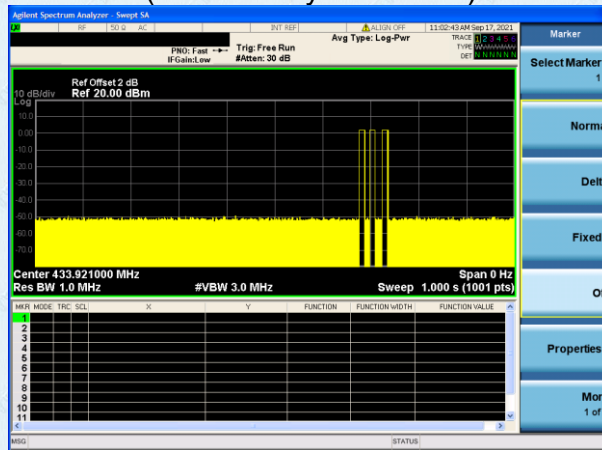
$$\text{Duty Cycle} = (7.5 \times 3) / 100 = 22.5 / 100 = 0.225$$

$$\text{AV Factor} = 20 \times \log(\text{Duty Cycle}) = 20 \times \log(0.225) = -12.96$$

Test plot as follows:



(Transmit cycle 100ms)



(Total Bursts in a transmit cycle 3pcs)

## 8 Test Setup Photo

Reference to the **appendix I** for details.

## 9 EUT Constructional Details

Reference to the **appendix II** for details.

-----End-----