TEST REPORT

Applicant:	Shenzhen Kexuntong Technology Co., Ltd.
Address of Applicant:	811, Building 1, Jingji Yujing Times Building, Huanggekeng Community, Longcheng Street, Longgang District, Shenzhen
Manufacturer:	Shenzhen Kexuntong Technology Co., Ltd.
Address of Manufacturer:	811, Building 1, Jingji Yujing Times Building, Huanggekeng Community, Longcheng Street, Longgang District, Shenzhen

Equipment Under Test (EUT)

Product Name:	TPMS Sensor
Trademark:	N/A
Model No.:	S1
FCC ID:	**2AYYJ-S1**
Applicable standards:	FCC CFR Title 47 Part 15 Subpart C Section 15.231
Date of sample receipt:	Jan.01,2021
Date of Test:	Jan.01,2021- Jan.27,2021
Date of report issued:	Jan.27,2021
Test Result :	PASS *

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

Authorized Signature:

Robinson Lo
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
01	*Jan.27,2021*	*Original*

Prepared By: ***Date:*** *Jan.27,2021*

Project Engineer

Check By: ***Date:*** *Jan.27,2021*

Reviewer

3 Contents

Page

1 COVER PAGE 1

2 VERSION 2

3 CONTENTS 3

4 TEST SUMMARY 4

4.1 MEASUREMENT UNCERTAINTY 4

5 GENERAL INFORMATION 5

5.1 GENERAL DESCRIPTION OF EUT 5
5.2 TEST MODE 6
5.3 DESCRIPTION OF SUPPORT UNITS 6
5.4 TEST FACILITY 6
5.5 TEST LOCATION 6
5.6 OTHER INFORMATION REQUESTED BY THE CUSTOMER 6
5.7 DEVIATION FROM STANDARDS 6
5.8 ABNORMALITIES FROM STANDARD CONDITIONS 6
5.9 ADDITIONAL INSTRUCTIONS 6

6 TEST INSTRUMENTS LIST 7

7 TEST RESULTS AND MEASUREMENT DATA 9

7.1 ANTENNA REQUIREMENT 9
7.2 RADIATED EMISSION METHOD 10
7.3 20DB OCCUPY BANDWIDTH 14
7.4 DEACTIVATION TIME 15
7.5 DUTY CYCLE 16

8 TEST SETUP PHOTO 18

9 EUT CONSTRUCTIONAL DETAILS 18

4 Test Summary

Test Item	Section in CFR 47	Result
Antenna Requirement	15.203	Pass
Conduction Emission	15.207	N/A
Field strength of the Fundamental Signal	15.231 (e)	Pass
Spurious Emissions	15.231 (e)/15.209	Pass
20dB Bandwidth	15.231 (c)	Pass
Transmission 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
Serial No.:	N/A
Test sample(s) ID:	GTSL202101000141-1
Operation Frequency:	315.0MHz
Channel Number	1
Modulation technology:	ASK
Antenna Type:	Internal Antenna
Antenna gain:	0
Power supply:	DC 3.0V From Battery

5.2 Test mode

Transmitting mode	Keep the EUT in transmitting mode.

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
315MHz	Field Strength(dBuV/m)	76.01	74.16	71.65

5.3 Description of Support Units

None.

5.4 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

● **FCC —Registration No.: 381383**

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. Registration 381383.

● **IC —Registration No.: 9079A**

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 with Registration No.: 9079A

● **NVLAP (LAB CODE:600179-0)**

Global United Technology Services Co., Ltd., is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP). LAB CODE:600179-0

5.5 Test Location

All tests were performed at:

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

5.6 Other Information Requested by the Customer

None.

5.7 Deviation from Standards

None.

5.8 Abnormalities from Standard Conditions

None.

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. 25 2020	June. 24 2021
4	BiConiLog Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9163	GTS214	June. 25 2020	June. 24 2021
5	Double -ridged waveguide horn	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120 D	GTS208	June. 25 2020	June. 24 2021
6	Horn Antenna	ETS-LINDGREN	3160	GTS217	June. 25 2020	June. 24 2021
7	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
8	Coaxial Cable	GTS	N/A	GTS213	June. 25 2020	June. 24 2021
9	Coaxial Cable	GTS	N/A	GTS211	June. 25 2020	June. 24 2021
10	Coaxial cable	GTS	N/A	GTS210	June. 25 2020	June. 24 2021
11	Coaxial Cable	GTS	N/A	GTS212	June. 25 2020	June. 24 2021
12	Amplifier(100kHz-3GHz)	HP	8347A	GTS204	June. 25 2020	June. 24 2021
13	Amplifier(2GHz-20GHz)	HP	84722A	GTS206	June. 25 2020	June. 24 2021
14	Amplifier (18-26GHz)	Rohde & Schwarz	AFS33-18002 650-30-8P-44	GTS218	June. 25 2020	June. 24 2021
15	Band filter	Amindeon	82346	GTS219	June. 25 2020	June. 24 2021
16	Power Meter	Anritsu	ML2495A	GTS540	June. 25 2020	June. 24 2021
17	Power Sensor	Anritsu	MA2411B	GTS541	June. 25 2020	June. 24 2021
18	Wideband Radio Communication Tester	Rohde & Schwarz	CMW500	GTS575	June. 25 2020	June. 24 2021
19	Splitter	Agilent	11636B	GTS237	June. 25 2020	June. 24 2021
20	Loop Antenna	ZHINAN	ZN30900A	GTS534	June. 25 2020	June. 24 2021
21	Breitband hornantenne	SCHWARZBECK	BBHA 9170	GTS579	Oct. 19 2020	Oct. 18 2021
22	Amplifier	TDK	PA-02-02	GTS574	Oct. 19 2020	Oct. 18 2021
23	Amplifier	TDK	PA-02-03	GTS576	Oct. 19 2020	Oct. 18 2021
24	PSA Series Spectrum Analyzer	Rohde & Schwarz	FSP	GTS578	June. 25 2020	June. 24 2021

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. 25 2020	June. 24 2021
2	EMI Test Receiver	R&S	ESCI 7	GTS552	June. 25 2020	June. 24 2021
3	Spectrum Analyzer	Agilent	E4440A	GTS533	June. 25 2020	June. 24 2021
4	MXG vector Signal Generator	Agilent	N5182A	GTS567	June. 25 2020	June. 24 2021
5	ESG Analog Signal Generator	Agilent	E4428C	GTS568	June. 25 2020	June. 24 2021
6	USB RF Power Sensor	DARE	RPR3006W	GTS569	June. 25 2020	June. 24 2021
7	RF Switch Box	Shongyi	RFSW3003328	GTS571	June. 25 2020	June. 24 2021
8	Programmable Constant Temp & Humi Test Chamber	WEWON	WHTH-150L-40-880	GTS572	June. 25 2020	June. 24 2021

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. 25 2020	June. 24 2021
2	Barometer	ChangChun	DYM3	GTS255	June. 25 2020	June. 24 2021

7 Test results and Measurement Data

7.1 Antenna Requirement

Standard requirement:	FCC Part15 C Section 15.203
15.203 requirement: 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.	
EUT Antenna:	
The antenna is Internal 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 5000MHz
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
315MHz	87.66	Peak Value
	67.66	Average Value

Limit:
(Spurious Emissions)

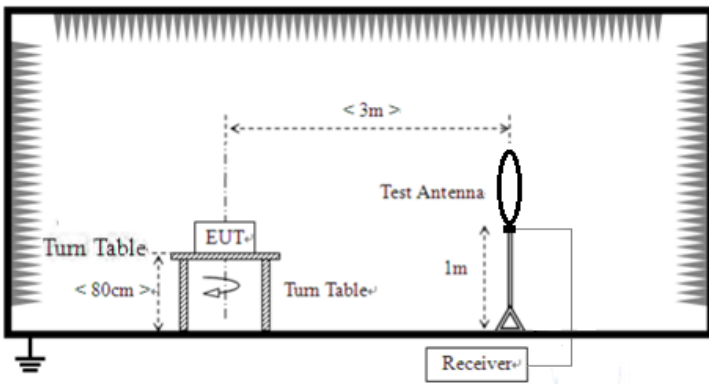
Fundamental Frequency (MHz)	Field Strength of fundamental (microvolts/meter)	Field Strength of Unwanted Emissions (microvolts/meter)
40.66-40.70	1,000	100
70-130	500	50
130-174	500 to 1,500**	50 to 1,50**
174-260	1,500	1,50
260-470	1,500 to 5,000**	1,50 to 5,00**
Above 470	5,000	5,00

Frequency (MHz)	Class B(dBuV/m @3m)	
	Peak	Average
Above 1000	74	54

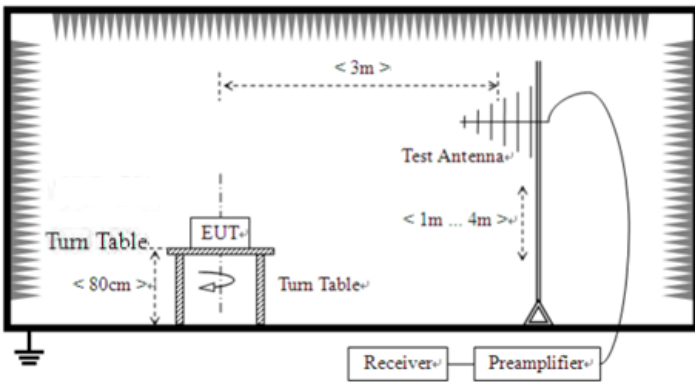
Or The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level whichever limit permits a higher field strength.

Test setup:

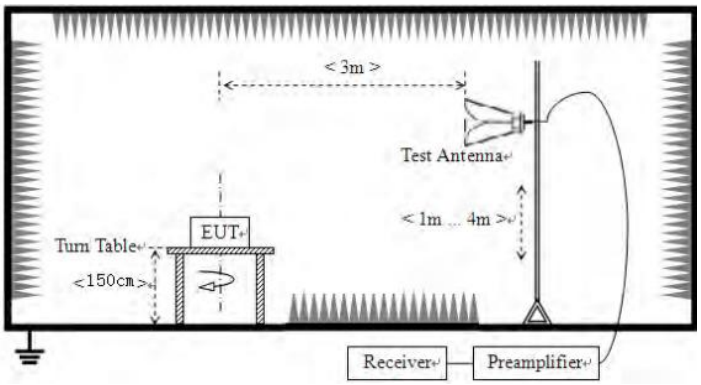
Below 30MHz



Below 1GHz



Above 1GHz



Test Procedure:	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. 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. 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. 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. 5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. 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.
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 voltage:	DC 3.0V
Test results:	Pass

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.

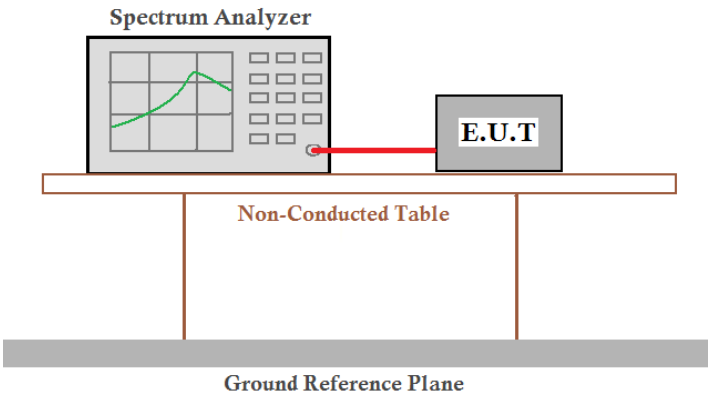
Emission Styles	Frequency (MHz)	Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Direction (H/V)
Fundamental	315.000	76.01	87.66	11.65	PK	H
Spurious	446.528	40.25	46.00	5.75	PK	H
Harmonics	630.000	50.34	67.66	17.32	PK	H
Harmonics	945.000	47.57	67.66	20.09	PK	H
--	--	--	--	--	--	--
Fundamental	315.000	61.97	87.66	25.69	PK	V
Spurious	446.528	41.72	46.00	4.28	PK	V
Harmonics	630.000	49.68	67.66	17.98	PK	V
Harmonics	945.000	48.34	67.66	19.32	PK	V
--	--	--	--	--	--	--

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	315.000	76.01	-20.27	55.74	67.66	11.92	H
Harmonics	630.000	50.34	-20.27	30.07	47.66	17.59	H
Harmonics	945.000	47.57	-20.27	27.30	47.66	20.36	H
--	--	--	--	--	--	--	--
Fundamental	315.000	61.97	-20.27	41.70	67.66	25.96	V
Harmonics	630.000	49.68	-20.27	29.41	47.66	18.25	V
Harmonics	945.000	48.34	-20.27	28.07	47.66	19.59	V
--	--	--	--	--	--	--	--

Note:

1. AV Level (dBuV/m)= PK Level (dBuV/m)+ AV Factor(dB)
2. AV Factor=20*log(Duty Cycle)=20*log(0.0969)= -20.27

7.3 20dB Occupy Bandwidth

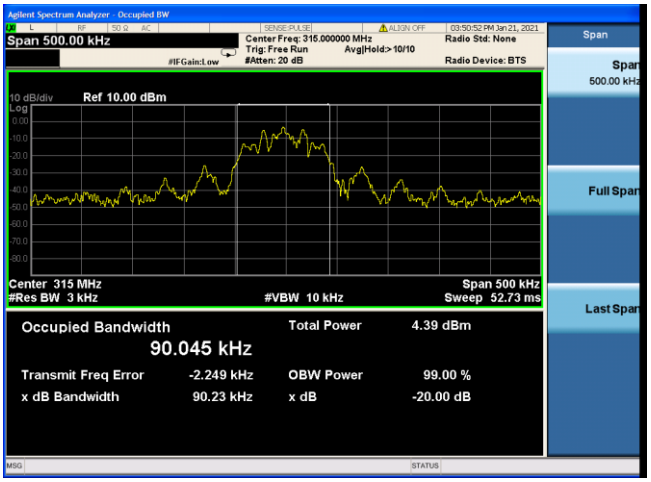
Test Requirement:	FCC Part15 C Section 15.231 (c)
Test Method:	ANSI C63.10:2013
Limit:	The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% 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 results:	Pass

Measurement Data

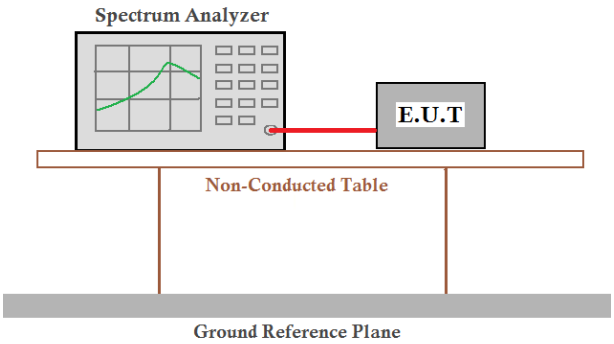
Test Frequency (MHz)	20dB bandwidth (MHz)	Limit (MHz)	Result
315.00	0.09023	0.7875	Pass

Note: Limit= Fundamental frequency×0.25%
315.00×0.25%=0.7875MHz

Test plot as follows:



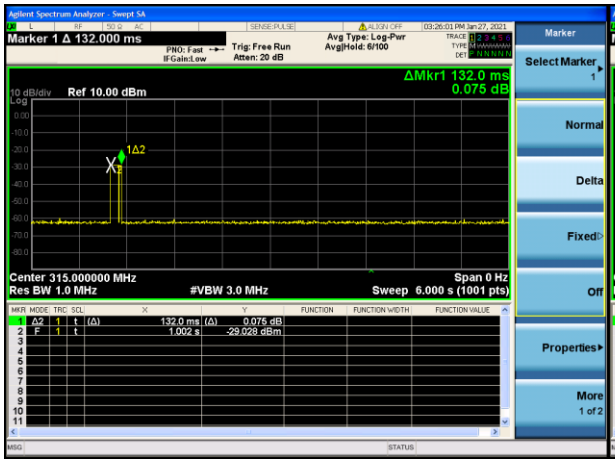
7.4 Deactivation Time

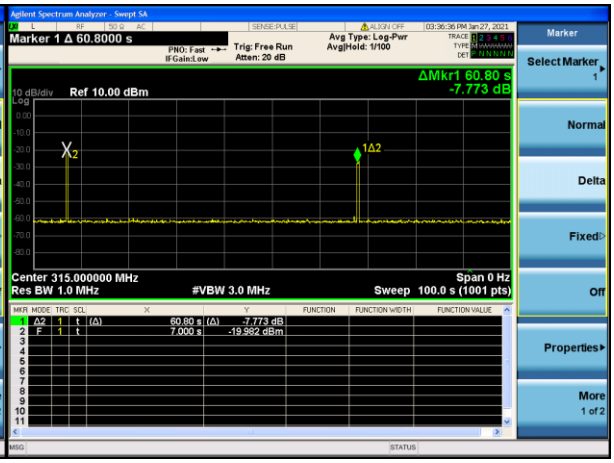
Test Requirement:	FCC Part15 C Section 15.231 (e)
Test Method:	ANSI C63.10:2013
Receiver setup:	RBW=100KHz, VBW=300KHz, span=0Hz, detector: Peak
Limit:	Not more than 5 seconds
Test setup:	
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Measurement data:

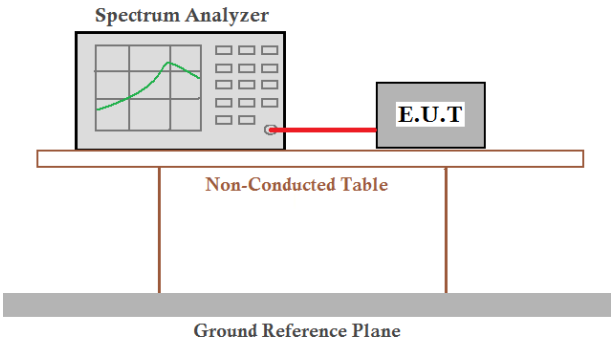
Note: The transmitter was automatically activated, and the carrier frequency 315MHz:

Frequency (MHz)	Transmission time (S)	Limit (S)	Silent time (S)	Limit (S)	Result
315	0.132	1	60.80	30 times Transmission time; no less than 10s	Pass





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:	1. Place the EUT on the table and set it in transmitting mode. 2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer. 3. Set centre frequency of spectrum analyzer=operating frequency. 4. Set the spectrum analyzer as RBW=100kHz, VBW=100KHz, Span=0Hz, Adjust Sweep=100ms to obtain the “worst-case” pulse on time 5. Repeat above procedures until all frequency measured was complete.
Test setup:	
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Measurement data:

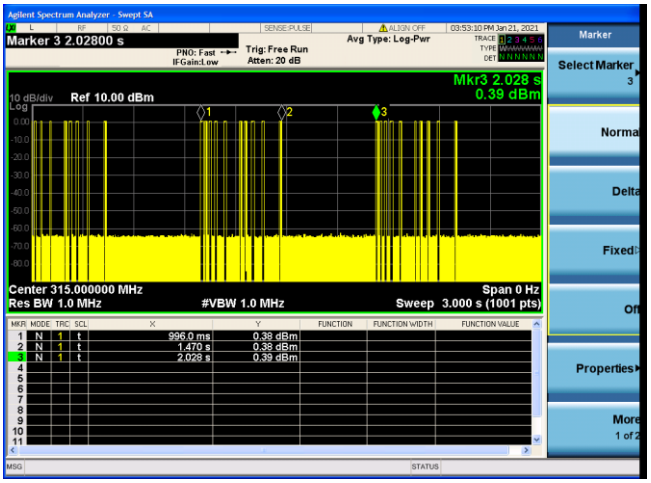
Calculate Formula: Duty cycle factor =20 log(Duty cycle)

Duty cycle=on time/0.1 seconds or period, whichever is less

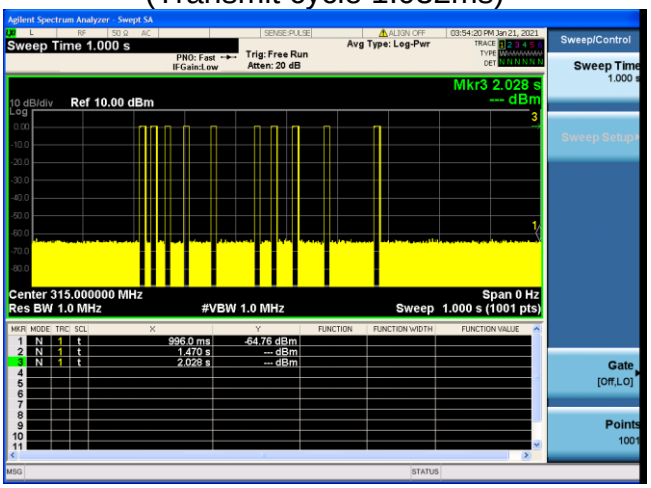
Test data:

In a transmit cycle 1032ms period found burst 10pcs, the Duty Cycle can calculate as below:
Duty Cycle= (10*10)/ 1032=(100)/ 1032=0.0969
AV Factor=20*log(Duty Cycle)=20*log(0.0969)=-20.27

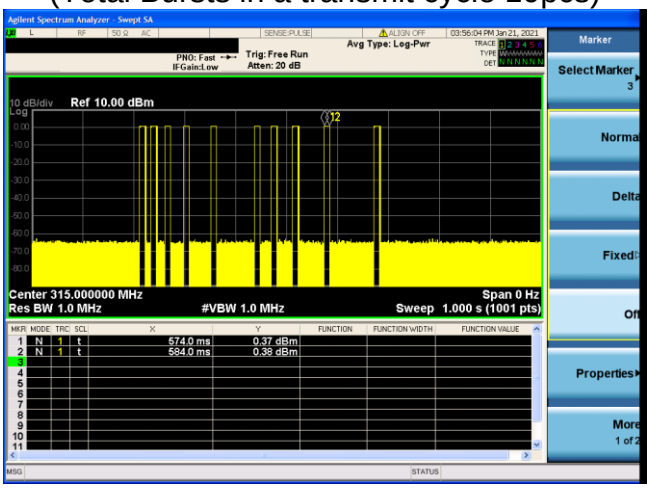
Test plot as follows:



(Transmit cycle 1.032ms)



(Total Bursts in a transmit cycle 10pcs)



(Time per burst: 10ms*10pcs)

8 Test Setup Photo

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

9 EUT Constructional Details

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

------ End ------