FCC REPORT

Applicant:	JINAN WANBIN IMPORT&EXPORT TRADE CO.,LTD
Address of Applicant:	Suite 3-101, Building No.18, Spring Garden, Happy Street 25-27-29, Huaiyin District, Jinan City, Shandong Province, China
Manufacturer/Factory:	JINAN WANBIN IMPORT&EXPORT TRADE CO.,LTD
Address of Manufacturer/Factory:	Suite 3-101, Building No.18, Spring Garden, Happy Street 25-27-29, Huaiyin District, Jinan City, Shandong Province, China

Equipment Under Test (EUT)

Product Name:	Tyre Pressure Sensors (TPMS Sensors)
Model No.:	WBE-A
FCC ID:	2APXO-WBEA
Applicable standards:	FCC CFR Title 47 Part 15 Subpart C Section 15.231
Date of sample receipt:	May 18, 2018
Date of Test:	May 18-22, 2018
Date of report issued:	May 23, 2018
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	*May 23, 2018*	*Original*

Prepared By:	Tiger. Chen	***Date:***	*May 23, 2018*
	Project Engineer		
Check By:	Andy. wu	***Date:***	*May 23, 2018*
	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	9kHz ~ 30MHz	± 4.34dB	(1)
Radiated Emission	30MHz ~ 1000MHz	± 4.24dB	(1)
Radiated Emission	1GHz ~ 26.5GHz	± 4.68dB	(1)
AC Power Line Conducted Emission	0.15MHz ~ 30MHz	± 3.45dB	(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:	Tyre Pressure Sensors (TPMS Sensors)
Model No.:	WBE-A
Test sample(s) ID:	GTS201805000112-1
Sample(s) Status	Engineer sample
Serial No.	N/A
Hardware version	N/A
Software version	N/A
Operation Frequency:	433.93MHz
Modulation technology:	FSK or ASK
Antenna Type:	Integral Antenna
Antenna gain:	0dBi (declare by applicant)
Power supply:	DC 3V by Button battery

Remark: Though the pre built-in firmware, this TPMS sensor transmit per 30s

5.2 Test mode

Transmitting mode	Keep the EUT in transmitting mode. (New battery is used during all test)

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)	68.11	69.71	67.38

5.3 Description of Support Units

Manufacturer	Description	Model	Serial Number
N/A	Adapter	CW1201500	N/A
Hamaton	TPMS Reset Tool	HTT0110A	N/A

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, January 08, 2018.

● **Industry Canada (IC) —Registration No.: 9079A-2**

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-2, August 15, 2016

5.5 Test Location

All tests were performed at:

Global United Technology Services Co., Ltd.
No. 301-309, 3/F., Jinyuan Business Building, No.2, Laodong Industrial Zone,
Xixiang Road, Baoan District, Shenzhen, Guangdong, China
Tel: 0755-27798480
Fax: 0755-27798960

5.6 Other Information Requested by the Customer

None.

5.7 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 03 2015	July 02 2020
2	Control Room	ZhongYu Electron	6.2(L)*2.5(W)* 2.4(H)	GTS251	N/A	N/A
3	Spectrum Analyzer	Agilent	E4440A	GTS533	June 28 2017	June 27 2018
4	EMI Test Receiver	Rohde & Schwarz	ESU26	GTS203	June 28 2017	June 27 2018
5	BiConiLog Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9163	GTS214	June 28 2017	June 27 2018
6	Double -ridged waveguide horn	SCHWARZBECK MESS-ELEKTRONIK	9120D-829	GTS208	June 28 2017	June 27 2018
7	Horn Antenna	ETS-LINDGREN	3160	GTS217	June 28 2017	June 27 2018
8	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
9	Coaxial Cable	GTS	N/A	GTS213	June 28 2017	June 27 2018
10	Coaxial Cable	GTS	N/A	GTS211	June 28 2017	June 27 2018
11	Coaxial cable	GTS	N/A	GTS210	June 28 2017	June 27 2018
12	Coaxial Cable	GTS	N/A	GTS212	June 28 2017	June 27 2018
13	Amplifier(100kHz-3GHz)	HP	8347A	GTS204	June 28 2017	June 27 2018
14	Amplifier(2GHz-20GHz)	HP	8349B	GTS206	June 28 2017	June 27 2018
15	Amplifier (18-26GHz)	Rohde & Schwarz	AFS33-18002 650-30-8P-44	GTS218	June 28 2017	June 27 2018
16	Band filter	Amindeon	82346	GTS219	June 28 2017	June 27 2018
17	Power Meter	Anritsu	ML2495A	GTS540	June 28 2017	June 27 2018
18	Power Sensor	Anritsu	MA2411B	GTS541	June 28 2017	June 27 2018

Conducted Emission:						
Item	**Test Equipment**	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal.Date (mm-dd-yy)**	**Cal.Due date (mm-dd-yy)**
1	Shielding Room	ZhongYu Electron	7.3(L)x3.1(W)x2.9(H)	GTS252	May.16 2014	May.15 2019
2	EMI Test Receiver	R&S	ESCI 7	GTS552	June 28 2017	June 27 2018
3	Coaxial Switch	ANRITSU CORP	MP59B	GTS225	June 28 2017	June 27 2018
4	Artificial Mains Network	SCHWARZBECK MESS	NSLK8127	GTS226	June 28 2017	June 27 2018
5	Coaxial Cable	GTS	N/A	GTS227	N/A	N/A
6	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
7	Thermo meter	KTJ	TA328	GTS233	June 28 2017	June 27 2018

General used equipment:						
Item	**Test Equipment**	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal.Date (mm-dd-yy)**	**Cal.Due date (mm-dd-yy)**
1	Barometer	ChangChun	DYM3	GTS257	June 28 2017	June 27 2018

7 Test results and Measurement Data

7.1 Antenna requirement

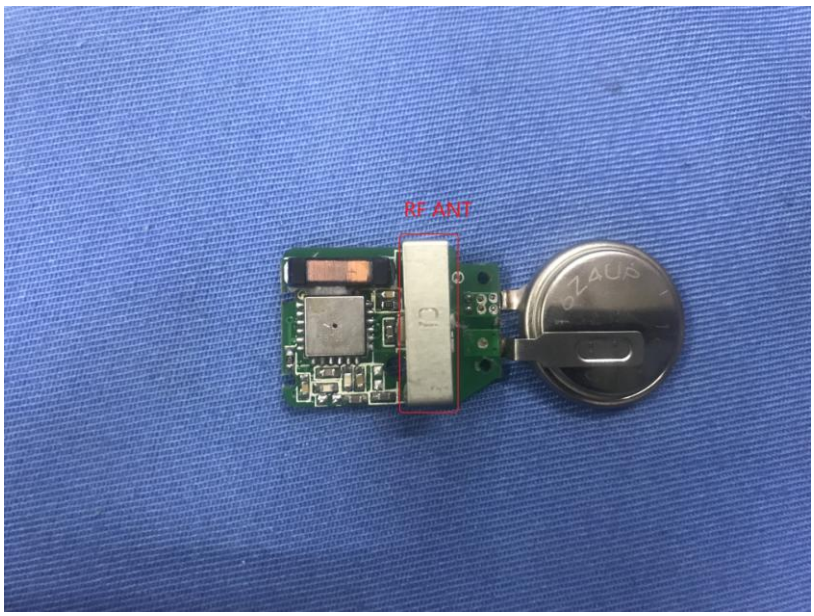
Standard requirement:	FCC Part15 C Section 15.203

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 integral antenna, the best case gain of the antenna is 0dBi.



7.2 Radiated Emission Method

Test Requirement:	FCC Part15 C 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	PK/AV	200Hz	600Hz	PK/AV
150KHz-30MHz	PK/AV/QP	9KHz	30KHz	PK/AV/QP
30MHz-1GHz	Quasi-peak	120KHz	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
433.93MHz	72.87	Average Value
	92.87	Peak Value

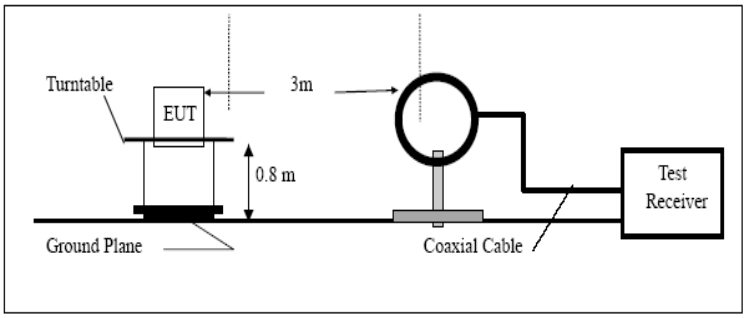
Limit:
(Spurious Emissions)

Frequency	Limit (uV/m)	Value	Measurement Distance
0.009MHz-0.490MHz	2400/F(KHz)	PK/AV	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	

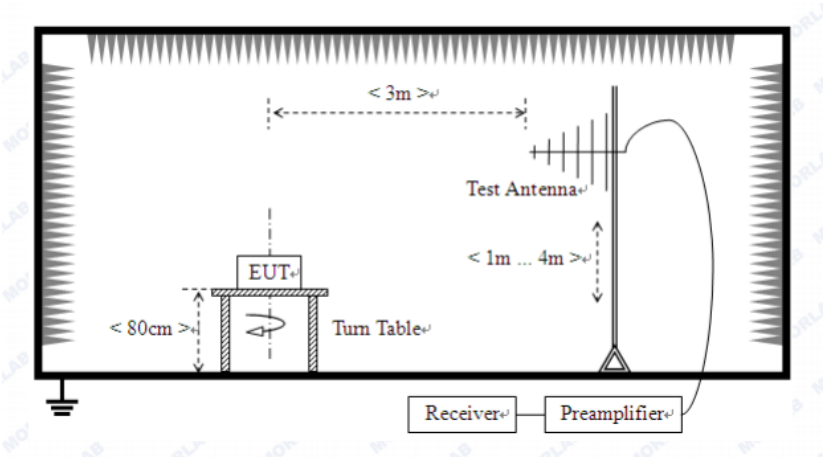
Or The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level whichever limit permits a higher field strength.

Test setup:

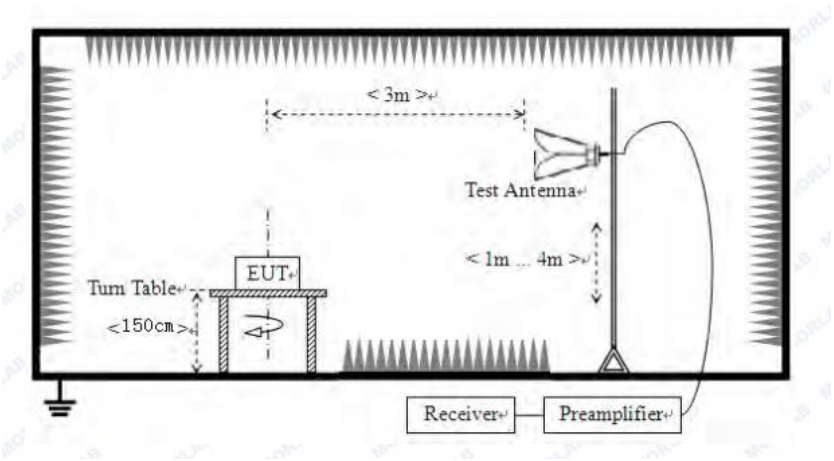
Below 30MHz



Below 1GHz



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 results:	Pass

Measurement data:

7.2.1 Field Strength of The Fundamental Signal

ASK

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	PK Level (dBuV/m)	AV Limit (dBuV/m)	Over Limit (dB)	polarization
433.93	78.05	16.17	3.02	29.56	67.68	72.87	-5.19	Horizontal
433.93	76.30	16.17	3.02	29.56	65.93	72.87	-6.94	Vertical

FSK

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	PK Level (dBuV/m)	AV Limit (dBuV/m)	Over Limit (dB)	polarization
433.93	77.22	16.17	3.02	29.56	66.85	72.87	-6.02	Horizontal
433.93	80.08	16.17	3.02	29.56	69.71	72.87	-3.16	Vertical

7.2.2 Spurious emissions

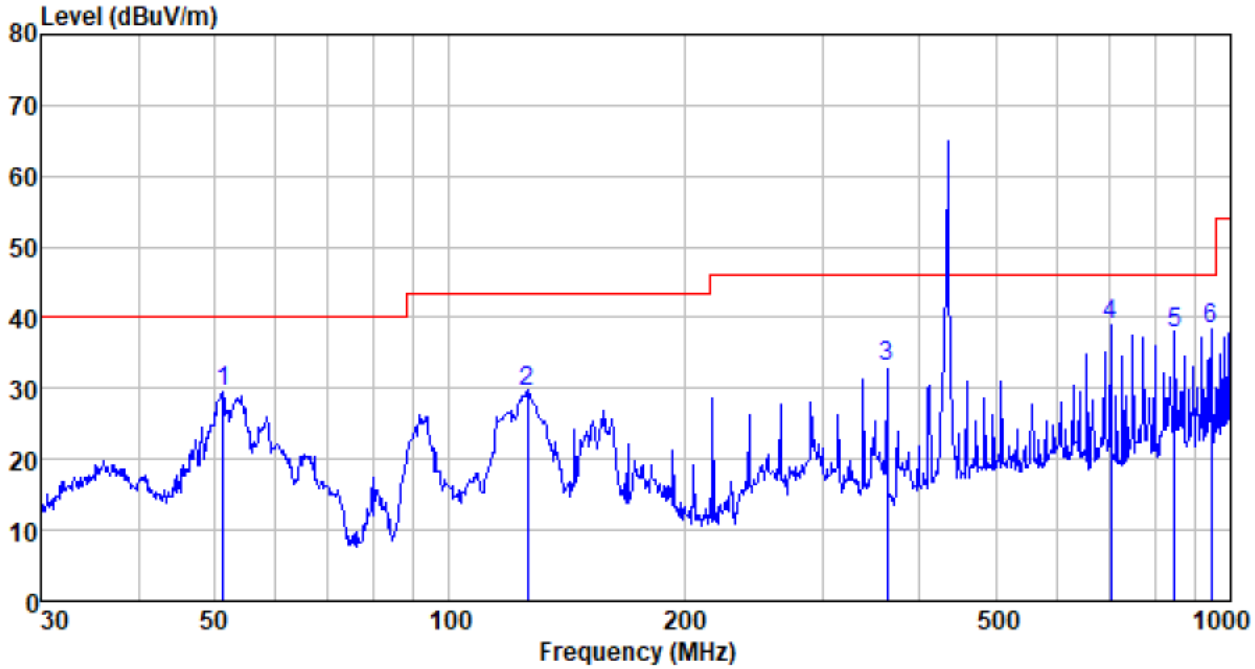
Below 30MHz

The low frequency, which started from 9 kHz to 30 MHz, was pre-scanned and the result which was 20 dB lower than the limit line per 15.31(o) was not reported.

Below 1GHz:

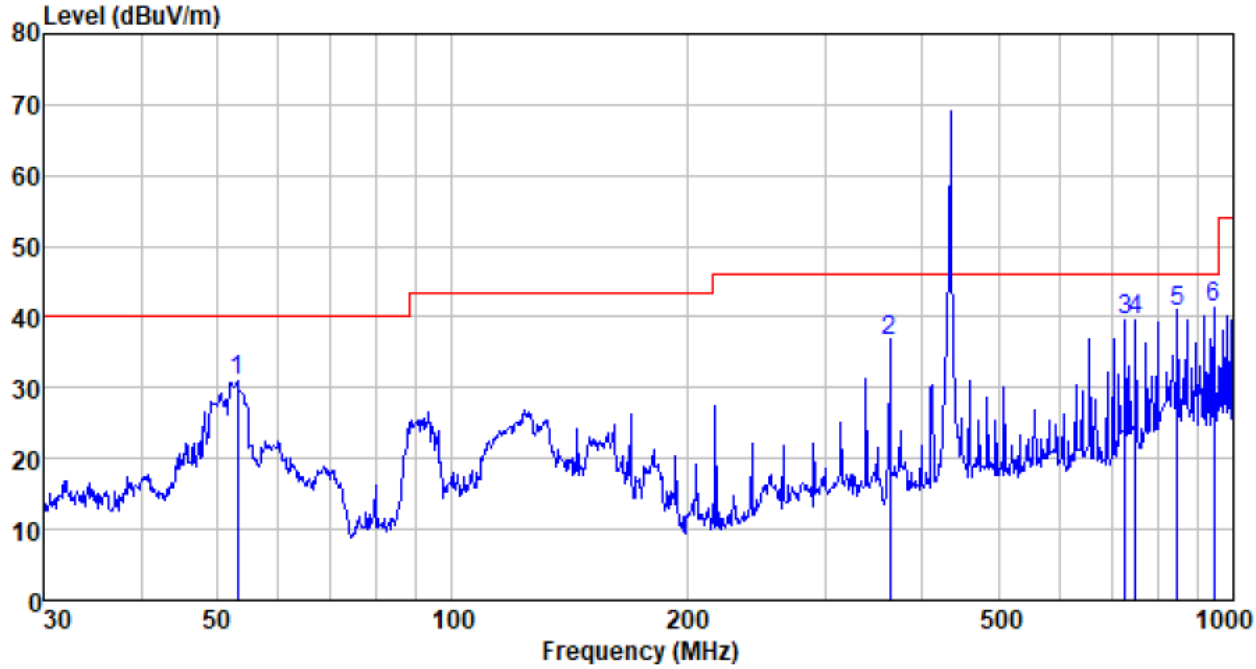
Vertical:

ASK:



Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV	Limit level dBuV/m	Over limit dB	Remark
51.301	46.53	12.20	0.78	30.08	29.43	40.00	-10.57	QP
125.886	49.17	8.75	1.41	29.69	29.64	43.50	-13.86	QP
362.985	45.37	14.74	2.68	29.82	32.97	46.00	-13.03	QP
701.761	44.22	19.80	4.09	29.20	38.91	46.00	-7.09	QP
848.056	40.66	21.72	4.65	29.19	37.84	46.00	-8.16	QP
945.440	40.23	22.46	5.03	29.25	38.47	46.00	-7.53	QP

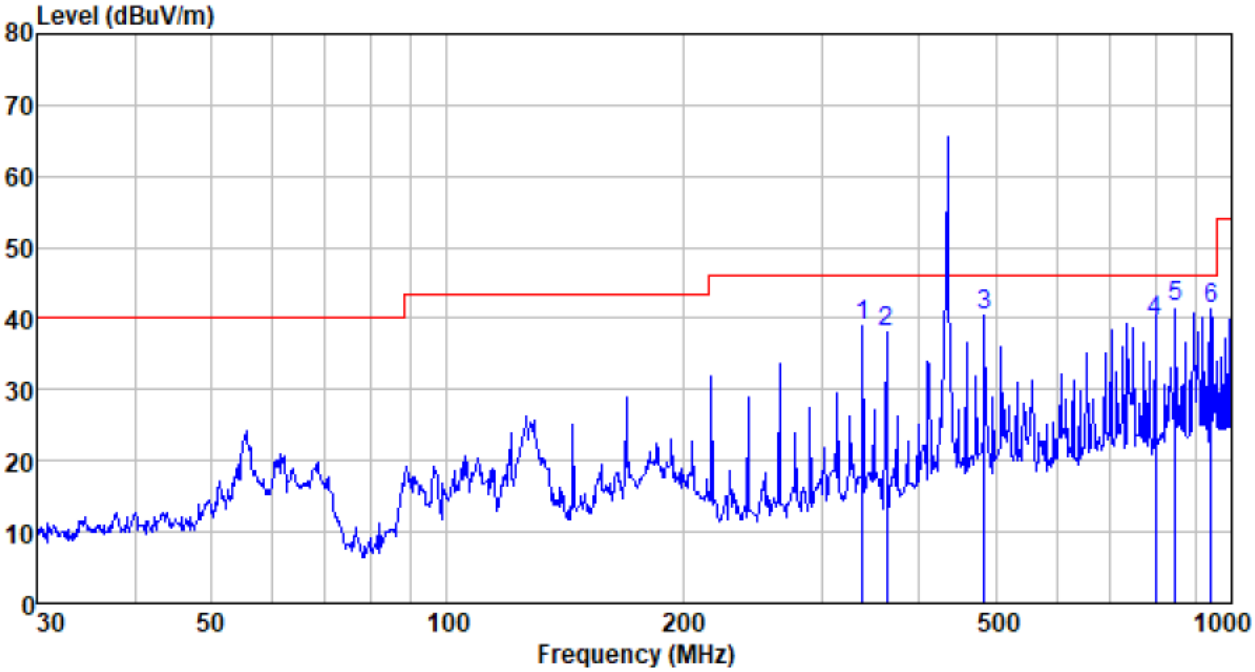
FSK:



Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV	Limit level dBuV/m	Over limit dB	Remark
53.131	48.41	11.93	0.80	30.08	31.06	40.00	-8.94	QP
362.985	48.96	14.74	2.68	29.82	36.56	46.00	-9.44	QP
726.805	44.34	20.21	4.19	29.17	39.57	46.00	-6.43	QP
750.108	43.78	20.53	4.28	29.15	39.44	46.00	-6.56	QP
848.056	43.62	21.72	4.65	29.19	40.80	46.00	-5.20	QP
945.440	43.08	22.46	5.03	29.25	41.32	46.00	-4.68	QP

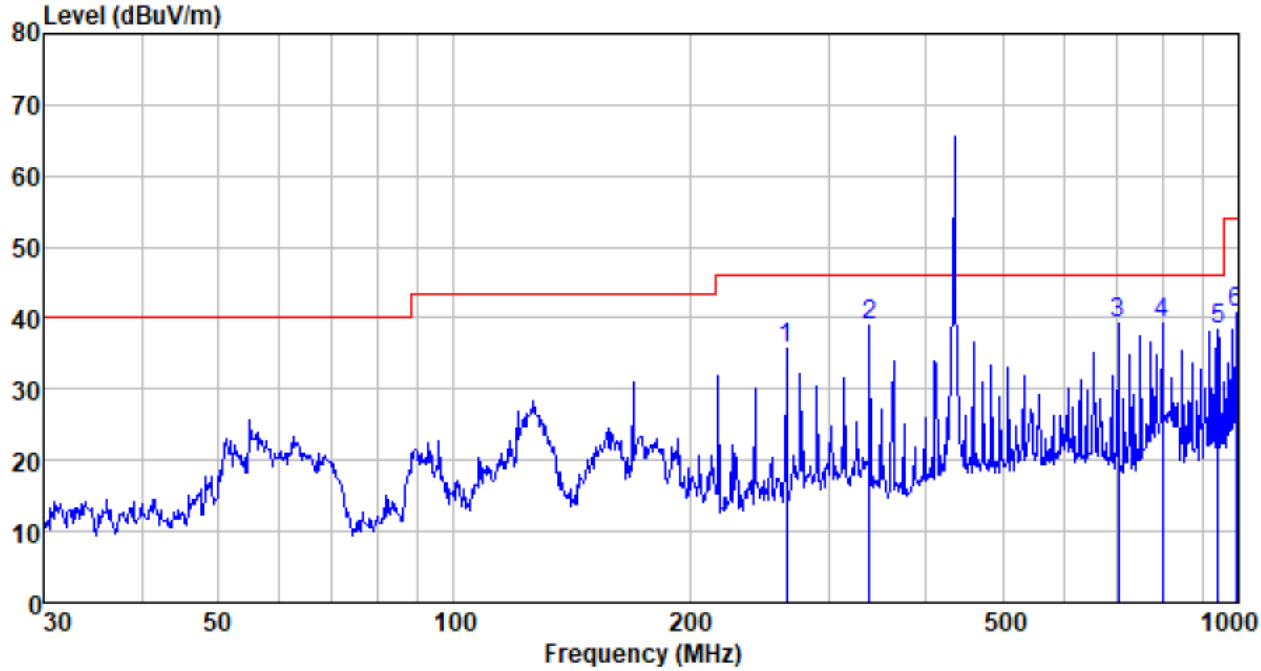
Horizontal:

ASK:



Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV	Limit level dBuV/m	Over limit dB	Remark
338.400	52.17	14.26	2.57	29.96	39.04	46.00	-6.96	QP
362.985	50.51	14.74	2.68	29.82	38.11	46.00	-7.89	QP
483.910	49.42	17.20	3.23	29.52	40.33	46.00	-5.67	QP
798.980	42.89	21.30	4.45	29.10	39.54	46.00	-6.46	QP
848.056	44.31	21.72	4.65	29.19	41.49	46.00	-4.51	QP
942.131	43.08	22.45	5.01	29.26	41.28	46.00	-4.72	QP

FSK :



Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV	Limit level dBuV/m	Over limit dB	Remark
265.676	51.13	12.34	2.20	29.93	35.74	46.00	-10.26	QP
338.400	52.09	14.26	2.57	29.96	38.96	46.00	-7.04	QP
701.761	44.57	19.80	4.09	29.20	39.26	46.00	-6.74	QP
798.980	42.73	21.30	4.45	29.10	39.38	46.00	-6.62	QP
942.131	40.16	22.45	5.01	29.26	38.36	46.00	-7.64	QP
993.011	42.08	22.75	5.19	29.21	40.81	54.00	-13.19	QP

Above 1G:

Peak value:

ASK:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	PK Level (dBuV/m)	AV Limit (dBuV/m)	Over Limit (dB)	Polarization
1230	40.86	25.47	4.49	35.94	34.88	54	-19.12	Vertical
2145	37.25	27.52	5.12	36.51	33.38	54	-20.62	Vertical
2985	36.7	28.46	5.91	37.19	33.88	54	-20.12	Vertical
3880	35.57	29.49	7.66	37.46	35.26	54	-18.74	Vertical
4670	37.63	31.61	8.48	37.64	40.08	54	-13.92	Vertical
5750	34.5	32.56	9.86	36.66	40.26	54	-13.74	Vertical
1215	41.24	25.42	4.48	35.93	35.21	54	-18.79	Horizontal
2105	36.97	27.03	5.08	36.48	32.6	54	-21.4	Horizontal
2965	37.6	28.44	5.89	37.17	34.76	54	-19.24	Horizontal
3835	35.59	29.42	7.58	37.45	35.14	54	-18.86	Horizontal
4705	34.87	31.66	8.52	37.64	37.41	54	-16.59	Horizontal
5765	35.31	32.59	9.88	36.63	41.15	54	-12.85	Horizontal

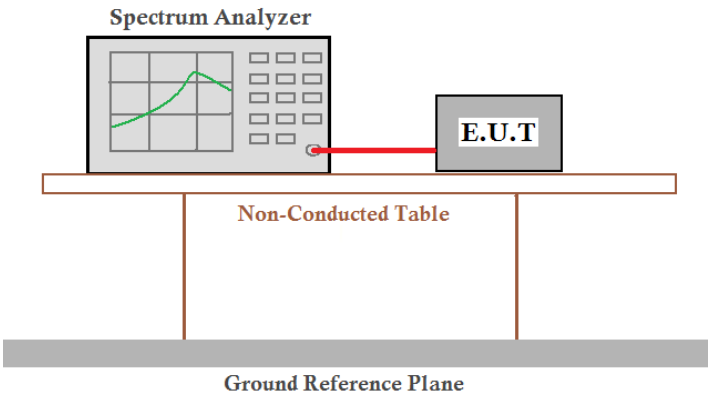
FSK:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	PK Level (dBuV/m)	AV Limit (dBuV/m)	Over Limit (dB)	Polarization
1145	41.08	24.96	4.42	35.89	34.57	54	-19.43	Vertical
2050	37.53	26.45	5.01	36.44	32.55	54	-21.45	Vertical
2910	38.28	28.44	5.85	37.12	35.45	54	-18.55	Vertical
3875	35.63	29.47	7.66	37.46	35.3	54	-18.7	Vertical
4695	35.39	31.65	8.51	37.64	37.91	54	-16.09	Vertical
5725	34.75	32.53	9.83	36.68	40.43	54	-13.57	Vertical
1180	39.44	25.25	4.45	35.91	33.23	54	-20.77	Horizontal
2125	37.03	27.24	5.1	36.49	32.88	54	-21.12	Horizontal
2915	36.74	28.44	5.85	37.13	33.9	54	-20.1	Horizontal
3865	34.84	29.45	7.64	37.46	34.47	54	-19.53	Horizontal
4680	34.54	31.63	8.49	37.64	37.02	54	-16.98	Horizontal
5740	35.9	32.56	9.86	36.66	41.66	54	-12.34	Horizontal

Remark:

1. *Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor*
2. *Average value=Peak value + Duty cycle factor*

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

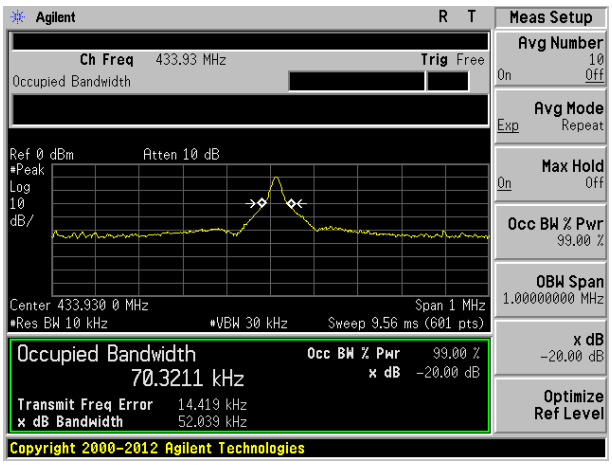
Measurement Data

Modulation	Test Frequency (MHz)	20dB bandwidth (MHz)	Limit (MHz)	Result
ASK	433.93	0.052	1.084	Pass
FSK	433.93	0.148	1.084	Pass

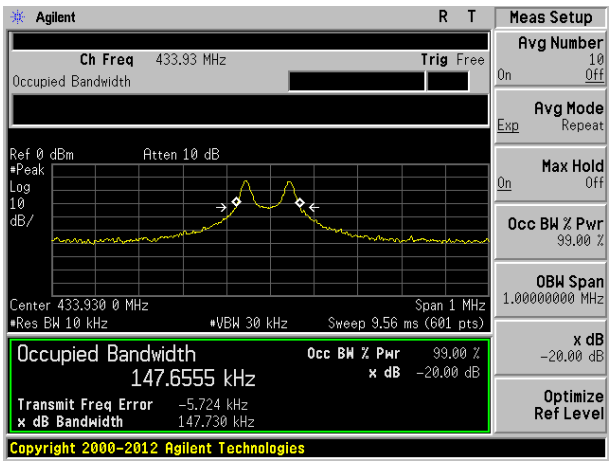
Note: Limit= Fundamental frequency×0.25%=433.93×0.25%=1.084MHz

Test plot as follows:

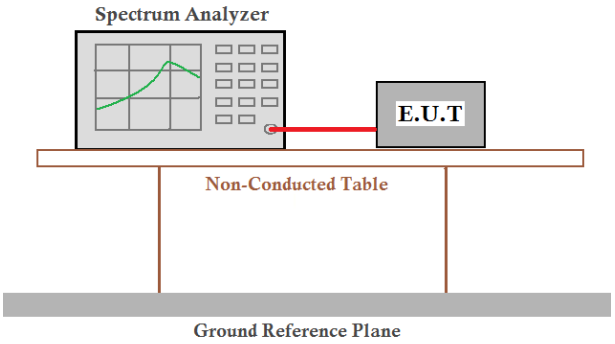
ASK



FSK



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:	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.
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:

Modulation	Duration of each TX(second):	Limit (second)	Result
ASK	0.2377	<1.0	Pass
FSK	0.2462	<1.0	Pass

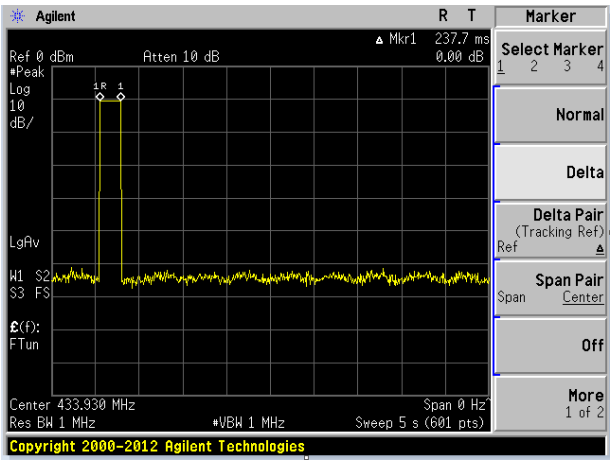
Silent Period Limit: 10s

Silent Period of ASK=0.2377X30=7.131s<10s
Silent Period of FSK=0.2462X30=7.386s<10s

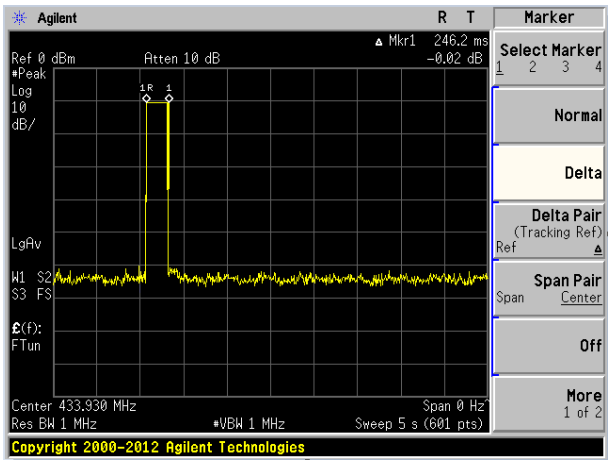
Result:

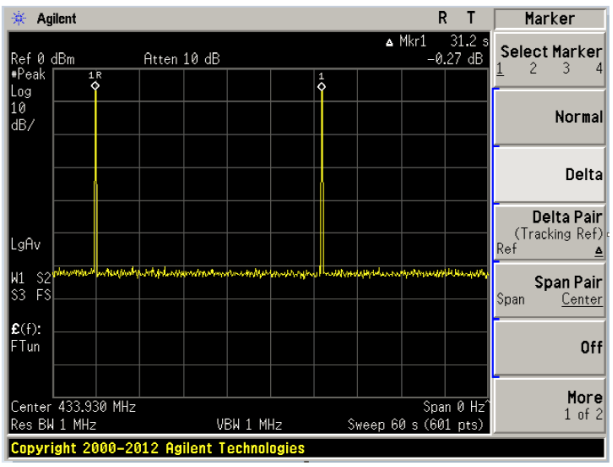
Silent Period of ASK=31.2s>10s
Silent Period of FSK=30.6s>10s

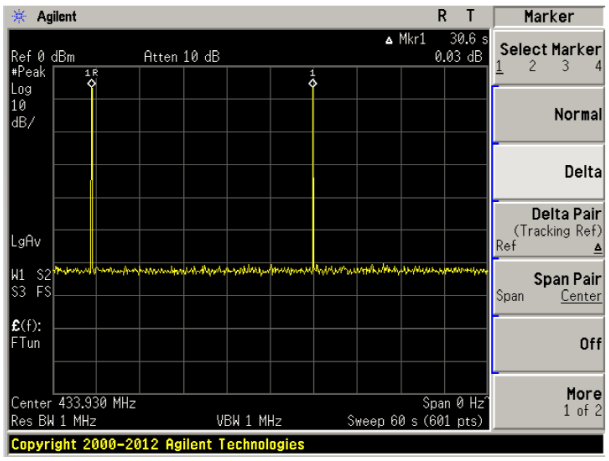
ASK


Agilent
R T
Marker
Mkr1 237.7 ms
0.00 dB
Ref 0 dBm
Atten 10 dB
#Peak
Log
10
dB/
LgAv
W1 S2
S3 FS
£(f):
FTun
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref
Span Pair
Span Center
Off
More
1 of 2
Center 433.930 MHz
Span 0 Hz
Res BW 1 MHz
#VBW 1 MHz
Sweep 5 s (601 pts)
Copyright 2000-2012 Agilent Technologies

FSK

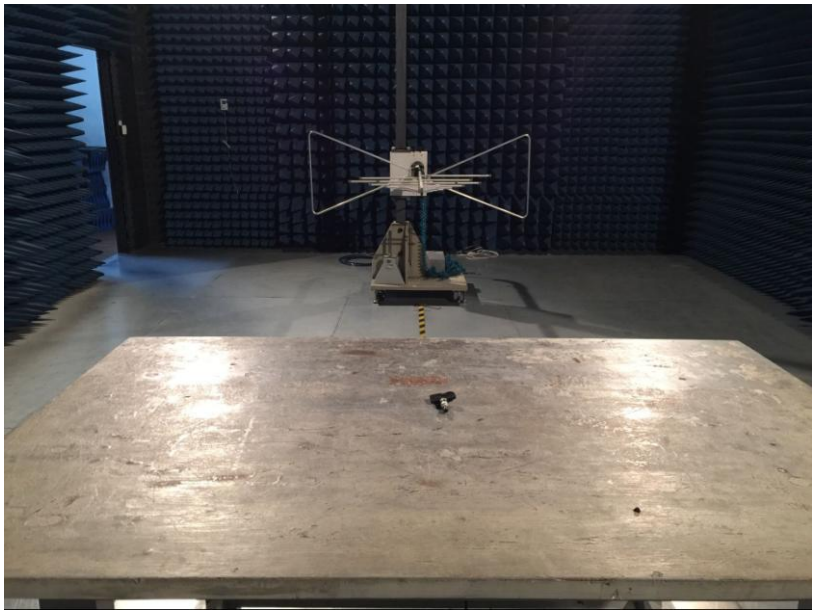

Agilent
R T
Marker
Mkr1 246.2 ms
-0.02 dB
Ref 0 dBm
Atten 10 dB
#Peak
Log
10
dB/
LgAv
W1 S2
S3 FS
£(f):
FTun
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref
Span Pair
Span Center
Off
More
1 of 2
Center 433.930 MHz
Span 0 Hz
Res BW 1 MHz
#VBW 1 MHz
Sweep 5 s (601 pts)
Copyright 2000-2012 Agilent Technologies

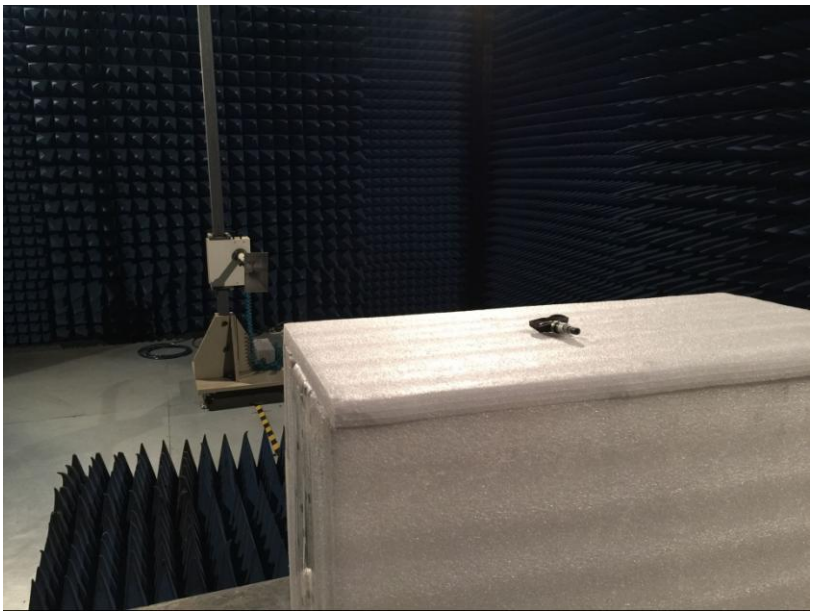

Agilent
R T
Marker
Mkr1 31.2 s
-0.27 dB
Ref 0 dBm
Atten 10 dB
#Peak
Log
10
dB/
LgAv
W1 S2
S3 FS
£(f):
FTun
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref
Span Pair
Span Center
Off
More
1 of 2
Center 433.930 MHz
Span 0 Hz
Res BW 1 MHz
VBW 1 MHz
Sweep 60 s (601 pts)
Copyright 2000-2012 Agilent Technologies


Agilent
R T
Marker
Mkr1 30.6 s
0.03 dB
Ref 0 dBm
Atten 10 dB
#Peak
Log
10
dB/
LgAv
W1 S2
S3 FS
£(f):
FTun
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref
Span Pair
Span Center
Off
More
1 of 2
Center 433.930 MHz
Span 0 Hz
Res BW 1 MHz
VBW 1 MHz
Sweep 60 s (601 pts)
Copyright 2000-2012 Agilent Technologies

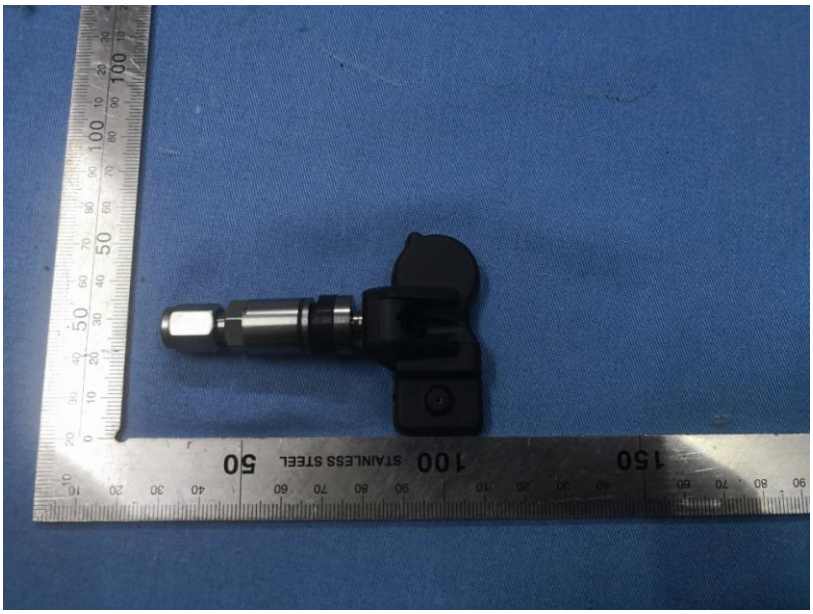
8 Test Setup Photo

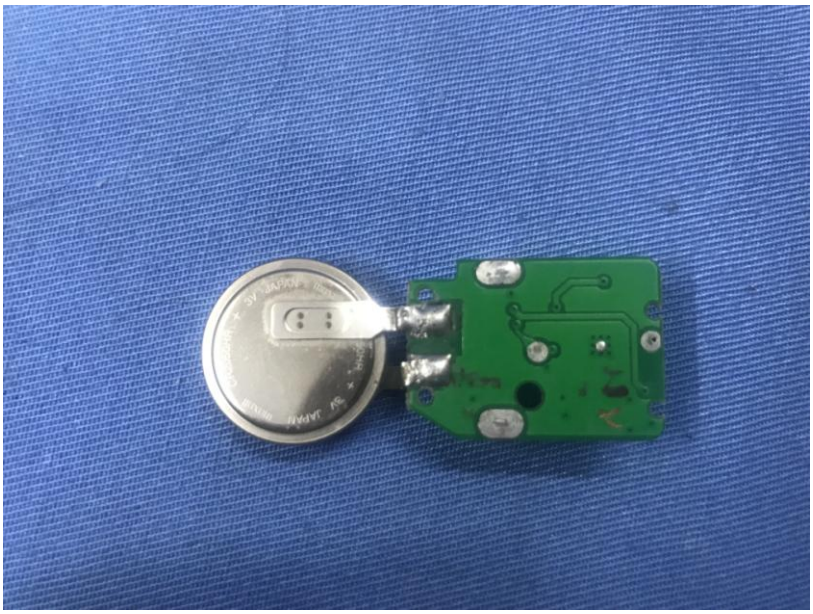
Radiated Emission

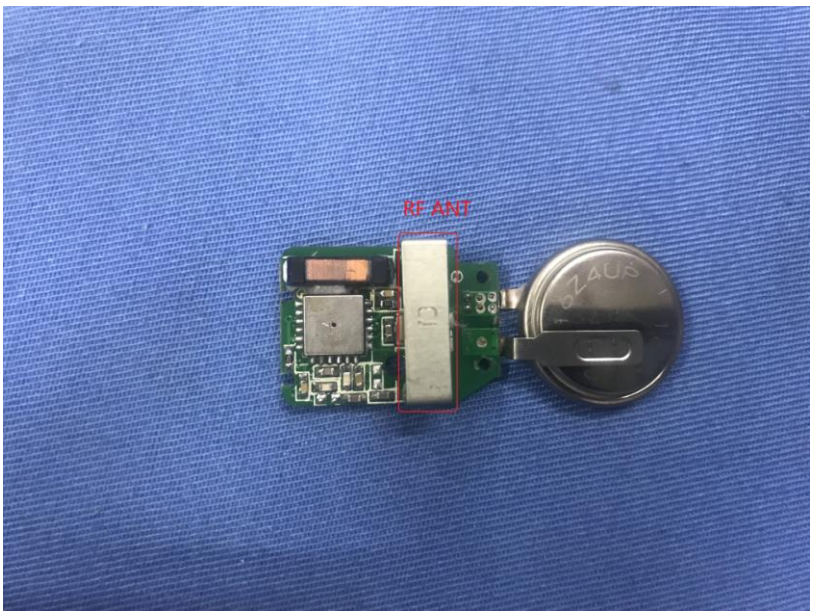




9 EUT Constructional Details







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