TEST REPORT

FCC PART 15 SUBPART C 15.231

Test Report
On Behalf of
Wenzhou Weili car fittings CO.,LTD
For
Tire Pressure Monitor

Model No.: E315

FCC ID: 2AW4O-E315

Prepared for :	**Wenzhou Weili car fittings CO.,LTD** **NO.518-1 WANJING ROAD,NORTH INDUSTIAL ZONE,RUIAN,ZHEJIANG, CHINA**
Prepared By :	**Shenzhen HUAK Testing Technology Co., Ltd.** **1F, B2 Building, Junfeng Zhongcheng Zhizao Innovation Park, Fuhai Street, Bao'an District, Shenzhen City, China**
Date of Test:	**Jul. 21, 2020 ~ Jul. 30, 2020**
Date of Report:	**Jul. 30, 2020**
Report Number:	**HK2007281958-E**

TEST RESULT CERTIFICATION

Applicant's name ..... :	Wenzhou Weili car fittings CO.,LTD
Address ..... :	NO.518-1 WANJING ROAD,NORTH INDUSTIAL ZONE,RUIAN,ZHEJIANG, CHINA
Manufacture's Name..... :	Wenzhou Weili car fittings CO.,LTD
Address ..... :	NO.518-1 WANJING ROAD,NORTH INDUSTIAL ZONE,RUIAN,ZHEJIANG, CHINA

Product description

Trade Mark ..... :	N/A
Product name..... :	Tire Pressure Monitor
Model and/or type reference .:	E315
Standards..... :	**47 CFR FCC Part 15 Subpart C 15.231**

Date of Test ..... :

Date (s) of performance of tests ..... :	Jul. 21, 2020 ~ Jul. 30, 2020
Date of Issue..... :	Jul. 30, 2020
Test Result ..... :	**Pass**

Prepared by: Gary Qian

Project Engineer

Reviewed by: Eden Hu

Project Supervisor

Approved by: Jason Zhou

Technical Director

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1. SUMMARY

1.1. TEST STANDARDS

The tests were performed according to following standards:

FCC Rules Part 15.231: Periodic operation in the band 40.66-40.70 MHz and above 70 MHz.

ANSI C63.10: 2013 : American National Standard for Testing Unlicensed Wireless Devices

1.2. Test Description

Standard Section	Test Item	Result
15.203	Antenna Requirement	PASS
15.207	Conducted Emission	N/A
15.205/15.209/15.231(e)	Spurious Emission	PASS
15.231(c)	20dB Occupied Bandwidth	PASS
15.231(e)	Deactivation Testing	PASS
Remark: "N/A" is an abbreviation for Not Applicable.		

1.3. Test Facility

1.3.1 Address of the test laboratory

Shenzhen HUAK Testing Technology Co., Ltd.
Add.:1F, B2 Building, Junfeng Zhongcheng Zhizao Innovation Park,Heping Community, Fuhai Street, Bao'an District, Shenzhen, China

There is one 3m semi-anechoic chamber and two line conducted labs for final test. The Test Sites meet the requirements in documents ANSI C63.4 and CISPR 32/EN 55032 requirements.

1.3.2 Laboratory accreditation

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

IC Registration No.: 21210

The 3m alternate test site of Shenzhen HUAK Testing Technology Co., Ltd. EMC Laboratory has been registered by Certification and Engineer Bureau of Industry Canada for the performance of with Registration No.: 21210 on May 24, 2016.

1.4. Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16 - 4 “Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements“ and is documented in the Shenzhen HUAK Testing Technology Co., Ltd. quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for HUAK laboratory is reported:

Test	Measurement Uncertainty	Notes
Transmitter power conducted	±0.57 dB	(1)
Transmitter power Radiated	±2.20 dB	(1)
Conducted spurious emission 9KHz-40 GHz	±2.20 dB	(1)
Occupied Bandwidth	±0.01ppm	(1)
Radiated Emission 30~1000MHz	±4.10dB	(1)
Radiated Emission Above 1GHz	±4.32dB	(1)
Conducted Disturbance0.15~30MHz	±3.20dB	(1)

(1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

2. GENERAL INFORMATION

2.1. Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Normal Temperature:	25°C
Relative Humidity:	55 %
Air Pressure:	101 kPa

2.2. General Description of EUT

Product Name	Tire Pressure Monitor	
Model No.	E315	
Trade Mark	N/A	
Test Power Supply	DC 3.0V from Battery	
Product Description	Operation Frequency:	315MHz
	Number of Channel:	1 Channels
	Modulation Type:	ASK
	Antenna Type:	Internal Antenna
	Antenna Gain(Peak):	-2 dbi

Remark:
1)For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

2.3. DESCRIPTION OF TEST SETUP

Operation of EUT during conducted testing:

N/A

Operation of EUT during Radiation and Above1GHz Radiation testing:

EUT

2.4. List of channels

Channel	Freq. (MHz)	Note (Modulation Type)
01	315	ASK

2.5. Equipments Used during the Test

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	L.I.S.N. Artificial Mains Network	R&S	ENV216	HKE-002	Dec. 26, 2019	1 Year
2.	Receiver	R&S	ESCI 7	HKE-010	Dec. 26, 2019	1 Year
3.	RF automatic control unit	Tonscend	JS0806-2	HKE-060	Dec. 26, 2019	1 Year
4.	Spectrum analyzer	R&S	FSP40	HKE-025	Dec. 26, 2019	1 Year
5.	Spectrum analyzer	Agilent	N9020A	HKE-048	Dec. 26, 2019	1 Year
6.	Preamplifier	Schwarzbeck	BBV 9743	HKE-006	Dec. 26, 2019	1 Year
7.	EMI Test Receiver	Rohde & Schwarz	ESCI 7	HKE-010	Dec. 26, 2019	1 Year
8.	Bilog Broadband Antenna	Schwarzbeck	VULB9163	HKE-012	Dec. 26, 2019	1 Year
9.	Loop Antenna	Schwarzbeck	FMZB 1519 B	HKE-014	Dec. 26, 2019	1 Year
10.	Horn Antenna	Schewarzbeck	9120D	HKE-013	Dec. 26, 2019	1 Year
11.	Pre-amplifier	EMCI	EMC051845 SE	HKE-015	Dec. 26, 2019	1 Year
12.	Pre-amplifier	Agilent	83051A	HKE-016	Dec. 26, 2019	1 Year
13.	EMI Test Software EZ-EMC	Tonscend	JS1120-B Version	HKE-083	Dec. 27, 2018	N/A
14.	Power Sensor	Agilent	E9300A	HKE-086	Dec. 26, 2019	1 Year
15.	Spectrum analyzer	Agilent	N9020A	HKE-048	Dec. 26, 2019	1 Year
16.	Signal generator	Agilent	N5182A	HKE-029	Dec. 26, 2019	1 Year
17.	Signal Generator	Agilent	83630A	HKE-028	Dec. 26, 2019	1 Year
18.	Shielded room	Shiel Hong	4*3*3	HKE-039	Dec. 27, 2017	3 Year
19.	Power Meter	R&S	NRVD	SEL0069	Dec. 26, 2019	1 Year
20	High Gain Antenna	Schewarzbeck	LB-180400K F	HKE-054	Dec. 26, 2019	1 Year

The calibration interval was one year

2.6. Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended to comply with Section 15.231 of the FCC Part 15, Subpart C Rules.

2.7. Modifications

No modifications were implemented to meet testing criteria. Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Description	Information	Manufacturer	Remark	Certificate
/	/	/	/	/
/	/	/	/	/

3. TEST CONDITIONS AND RESULTS

3.1. Conducted Emissions Test

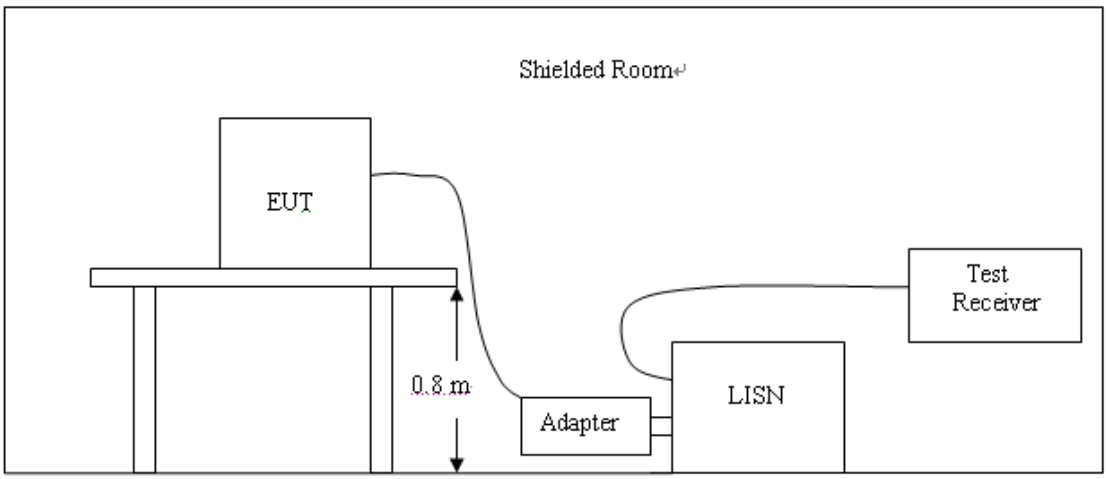
LIMIT

According to FCC CFR Title 47 Part 15 Subpart C Section 15.207 and RSS Gen 8.8, AC Power Line Conducted Emissions Limits for Licence-Exempt Radio Apparatus as below:

Frequency range (MHz)	Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

TEST CONFIGURATION



TEST PROCEDURE

1. The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is a tabletop system; a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10:2013.
2. Support equipment, if needed, was placed as per ANSI C63.10:2013
3. All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10:2013.
4. The adapter received AC120V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
5. All support equipments received AC power from a second LISN, if any.
6. The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
7. Analyzer / Receiver scanned from 150 KHz to 30MHz for emissions in each of the test modes.
8. During the above scans, the emissions were maximized by cable manipulation.

TEST RESULTS

N/A

Note: not applicable to this device, which is powered by dry battery

3.2. Radiated Emissions and Band Edge

Limit

Intentional radiators may operate at a periodic rate exceeding that specified in paragraph (a) of this section and may be employed for any type of operation, including operation prohibited in paragraph (a) of this section, provided the intentional radiator complies with the provisions of paragraphs (b) through (d) of this section, except the field strength table in paragraph (b) of this section is replaced by the following:

Radiated emission limits

Fundamental frequency (MHz)	Field strength of fundamental (microvolts/meter)	Field strength of spurious emission (microvolts/meter)
40.66-40.70	1,000	100
70-130	500	50
130-174	500 to 1,500[1]	50 to 150[1]
174-260	1,500	150
260-470	1,500 to 5,000[1]	150 to 500[1]
Above 470	5,000	500

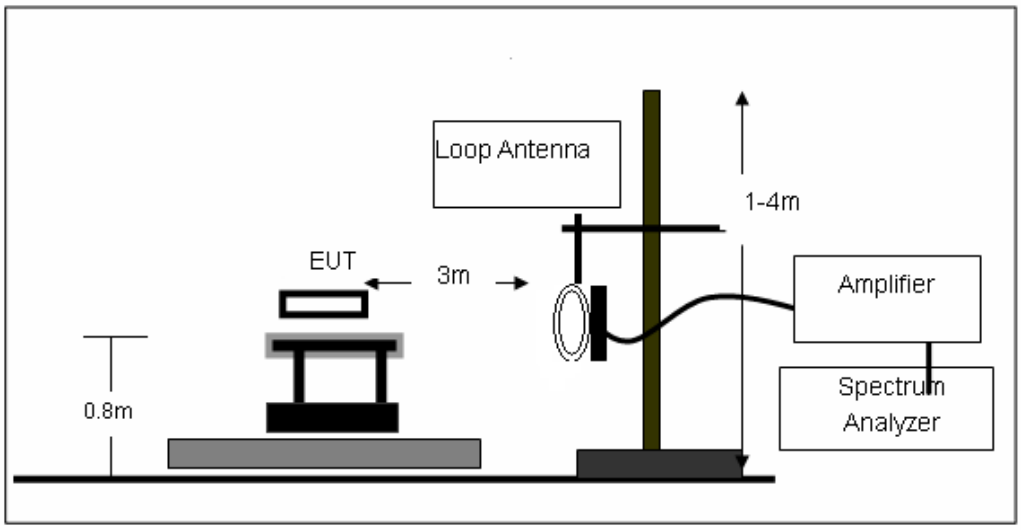
The limits on the field strength of the spurious emissions in the above table are based on the fundamental frequency of the intentional radiator. Spurious emissions shall be attenuated to the average (or, alternatively, CISPR quasi-peak) limits shown in this table or to the general limits shown in §15.209, whichever limit permits a higher field strength.

The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in §15.35 for limiting peak emissions apply. Spurious Radiated Emissions measurements starting below or at the lowest crystal frequency.

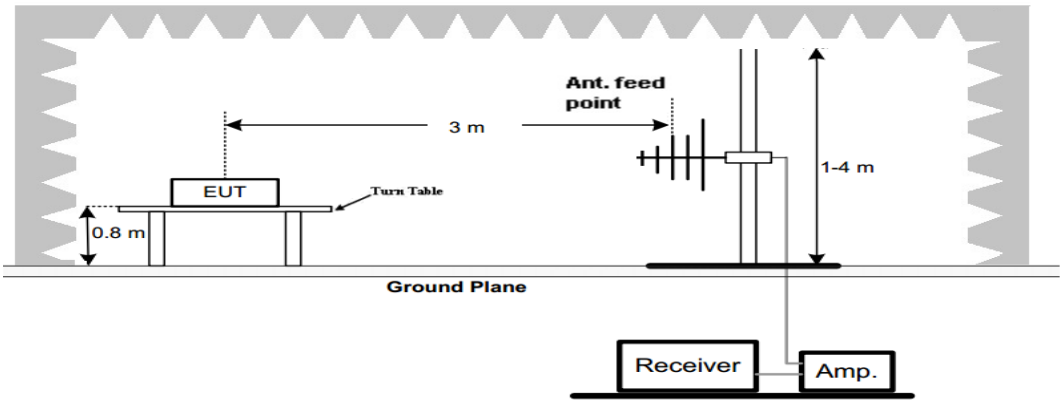
Compliance with the provisions of §15.205 shall be demonstrated using the measurement instrumentation specified in that section.

TEST CONFIGURATION

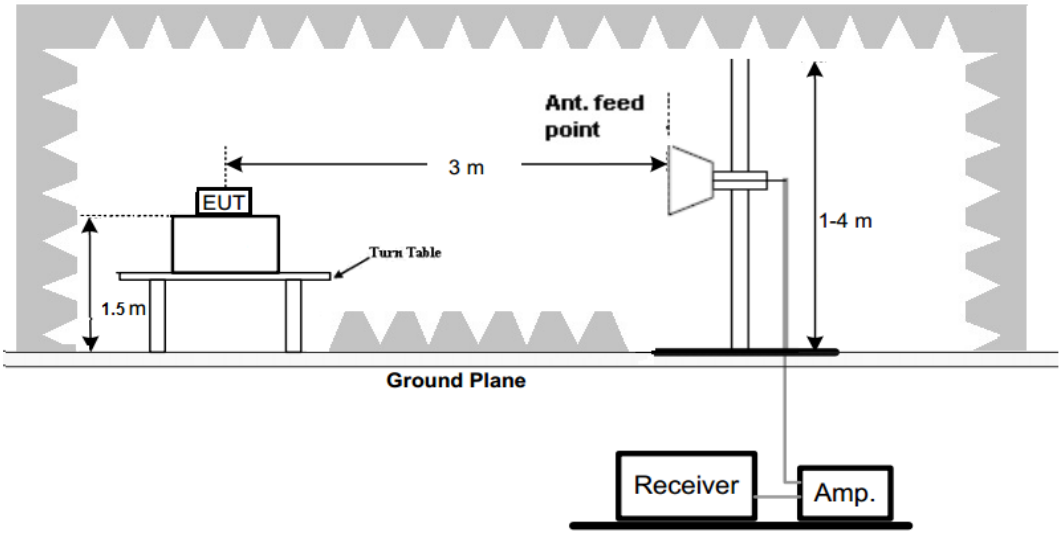
(A) Radiated Emission Test Set-Up, Frequency Below 30MHz



(B) Radiated Emission Test Set-Up, Frequency below 1000MHz



(C) Radiated Emission Test Set-Up, Frequency above 1000MHz



Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and the Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

Corr. Ampl. = Indicated Reading +Ant.Loss +Cab. Loss – Ampl.Gain

The "Margin" column of the following data tables indicates the degree of compliance with the applicable limit.For example, a margin of -6dB V means the emission is 6dB V below the maximum limit. The equation for margin calculation is as follows:

Margin = Corr. Ampl. – Limit

[Where F is the frequency in MHz, the formulas for calculating the maximum permitted fundamental field strengths are as follows: for the band 260-470 MHz, μV/m at 3 meters =16.6667(F) – 2833.3333. The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level.]

TEST RESULTS

Note: The calculation method and calculated value of AV Factor value, on page 16 of the report

AV Factor= -11.89

Horizontal

No.	Frequency	Reading	Corr. Factor	AV Factor	Result	Limit	Margin	Detector
	MHz	dBuV/m	(dB)	(dB)	dBuV/m	dBuV/m	dB	
1	315	51.56	12.33	/	63.89	87.66	23.77	PK
	315	/	/	-11.89	52.00	67.66	15.66	AV
2.	630	10.90	15.82	/	26.72	67.66	39.82	PK
	630	/	/	-11.89	14.83	47.66	32.83	AV
3	945	6.9	19.33	/	26.23	67.66	41.43	PK
	945	/	/	-11.89	14.34	47.66	33.32	AV

Vertical

No.	Frequency	Reading	Corr. Factor	AV Factor	Result	Limit	Margin	Detector
	MHz	dBuV/m	(dB)	(dB)	dBuV/m	dBuV/m	dB	
1	315	53.54	12.33	/	65.87	87.66	21.79	PK
	315	/	/	-11.89	53.98	67.66	13.68	AV
2.	630	14.09	15.82	/	29.91	67.66	37.75	PK
	630	/	/	-11.89	18.02	47.66	29.64	AV
3	945	7.01	19.33	/	26.34	67.66	41.32	PK
	945	/	/	-11.89	14.45	47.66	33.21	AV

Above 1GHz:

Horizontal

No.	Frequency	Reading	Corr. Factor	AV Factor	Result	Limit	Margin	Detector
	MHz	dBuV/m	(dB)	(dB)	dBuV/m	dBuV/m	dB	
1	1260.66	29.37	25.83	/	55.20	74	18.80	PK
	1260.66	/	/	-11.89	43.31	54	10.69	AV
2.	1575.09	30.48	27.25	/	57.73	74	16.27	PK
	1575.09	/	/	-11.89	45.84	54	8.16	AV

Vertical

No.	Frequency	Reading	Corr. Factor	AV Factor	Result	Limit	Margin	Detector
	MHz	dBuV/m	(dB)	(dB)	dBuV/m	dBuV/m	dB	
1	1260.66	30.23	25.83	/	56.06	74	17.94	PK
	1260.66	/	/	-11.89	44.17	54	9.83	AV

2.	1575.09	31.33	27.25	/	58.58	74	15.42	PK
	1575.09	/	/	-11.89	46.69	54	7.31	AV

Note: Testing is carried out with frequency rang 30MHz to the tenth harmonics, which above 5th Harmonics are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

The fundamental frequency is 315MHz, so the fundamental and spurious emissions radiated limit base on the the operating frequency 315MHz.

Frequency Range (9 kHz-30MHz)

Frequency (MHz)	Level@3m (dBμV/m		Limit@3m (dBμV/m)	
--	--	--	--	--
--	--	--	--	--
--	--	--	--	--

Note: 1. Emission Level=Reading+ Cable loss-Antenna factor-Amp factor

2. The emission levels are 20 dB below the limit value, which are not reported. It is deemed to comply with the requirement.

3.3. 20dB Bandwidth

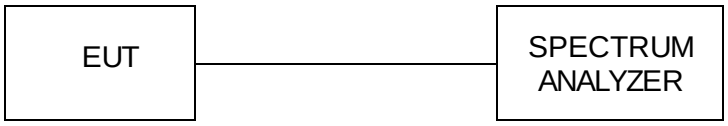
Limit

According to FCC Part 15.231(c), 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. Bandwidth is determined at the points 20 dB down from the modulated carrier.

Test Procedure

With the EUT's antenna attached, the EUT's 20dB Bandwidth power was received by the test antenna, which was connected to the spectrum analyzer with the START, and STOP frequencies set to the EUT'soperation band.

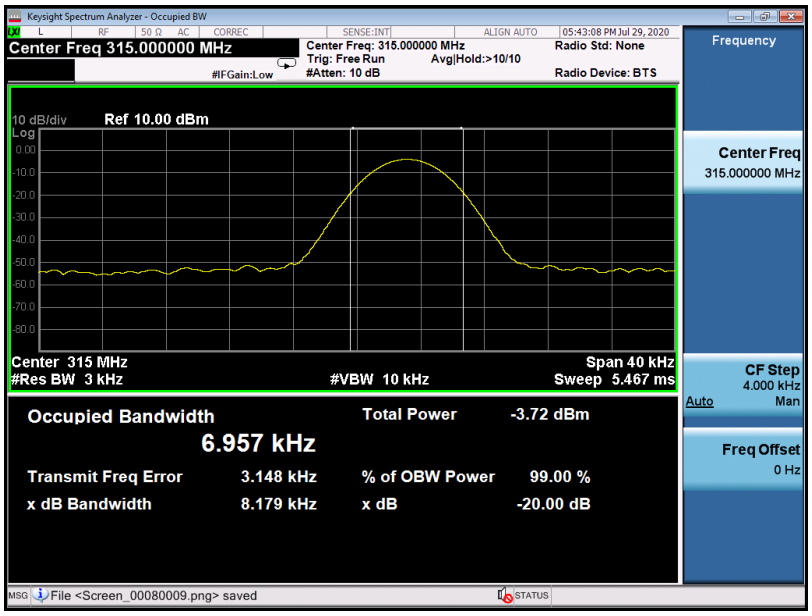
Test Configuration



Test Results

Modulation	Channel Frequency (MHz)	99% OBW (KHz)	20dB bandwidth (KHz)	Limit (KHz)	Result
ASK	315	6.957	8.179	0.25%*315MHz=787.5	Pass

Test plot as follows:



3.4. Transmission Time

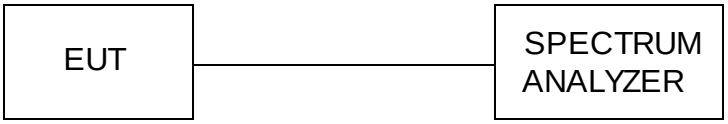
Limit

devices operated under the provisions of this paragraph shall be provided with a means for automatically limiting operation so that 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.

Test Procedure

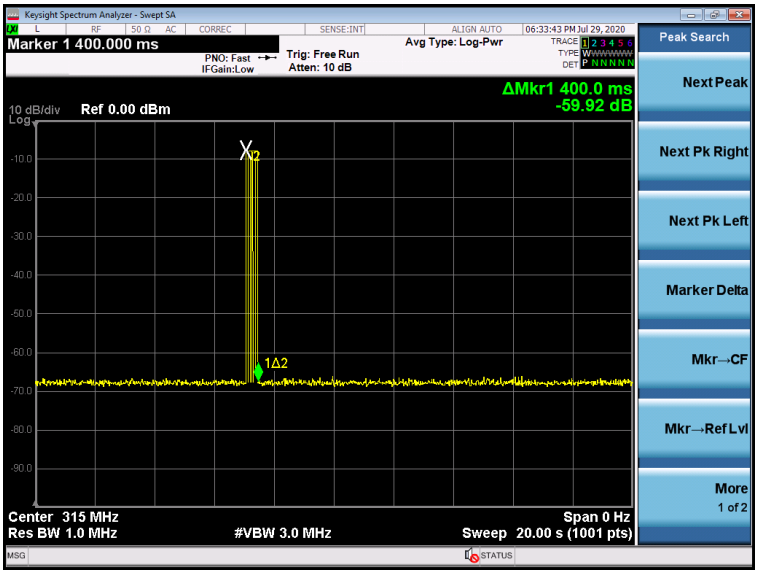
With the EUT's antenna attached, the EUT's output signal was received by the test antenna, which was connected to the spectrum analyzer. Set the center frequency to 315MHz, than set the spectrum analyzer to Zero Span for the release time reading. During the testing, the switch was released then the EUT automatically deactivated.

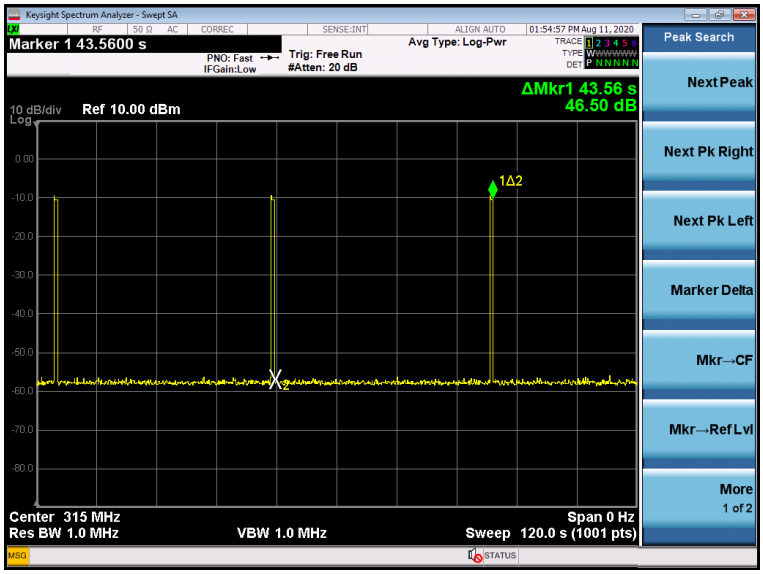
Test Configuration



Test Results

Test Frequency (MHz)	Test item	Test date (s)	Limit	Result
315	silent period between transmissions	43.56	Silent period＞12s	PASS
	Transmisson time	0.400	Duration of each Transmisson ≤1s	PASS




Keysight Spectrum Analyzer - Swept SA
Marker 1 43.5600 s
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 20 dB
Avg Type: Log-Pwr
01:54:57 PM Aug 11, 2020
ΔMkr1 43.56 s
46.50 dB
10 dB/div
Log
Ref 10.00 dBm
1Δ2
Center 315 MHz
Res BW 1.0 MHz
VBW 1.0 MHz
Span 0 Hz
Sweep 120.0 s (1001 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2
MSG
STATUS

3.5. Duty Cycle

Limit

According to FCC Part 15.231(b)(2) and 15.35 (c),For pulse operation transmitter, the averaging pulsed emissions are calculated by peak value of measured emission plus duty cycle factor.

Test Procedure

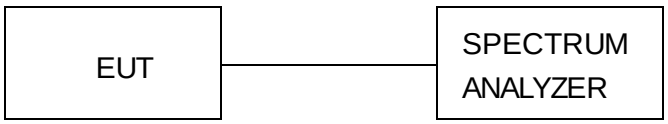
1) The EUT was placed on a turntable which is 0.8m above ground plane.

2) Set EUT operating in continuous transmitting mode

3) Set Test Receiver into spectrum analyzer mode, Tune the spectrum analyzer to the transmitter carrier
frequency, and set the spectrum analyzer resolution bandwidth(RBW) to 1000kHz and video bandwidth(VBW) to 1000kHz, Span was set to 0Hz.

4) The Duty Cycle was measured and recorded.

Test Configuration

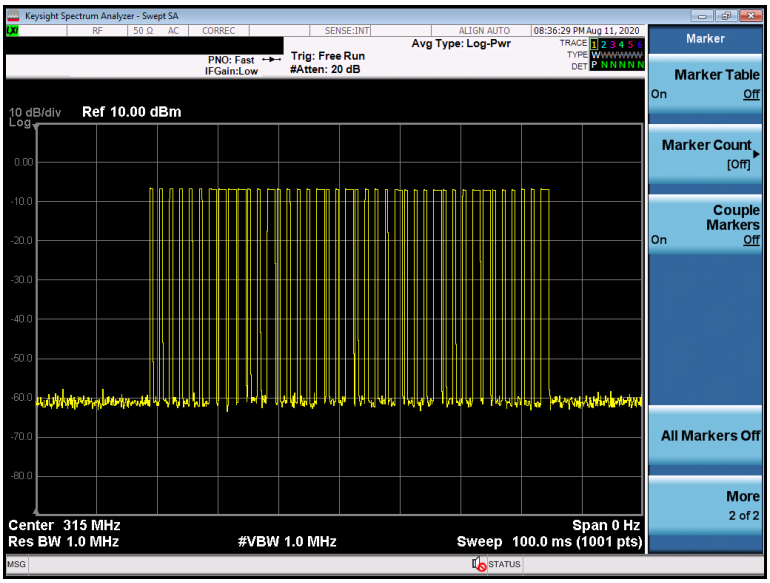


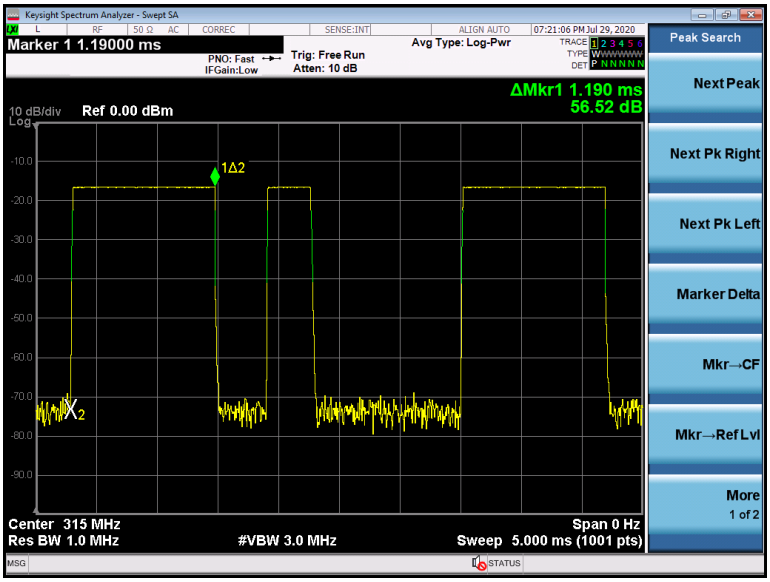
Test Results

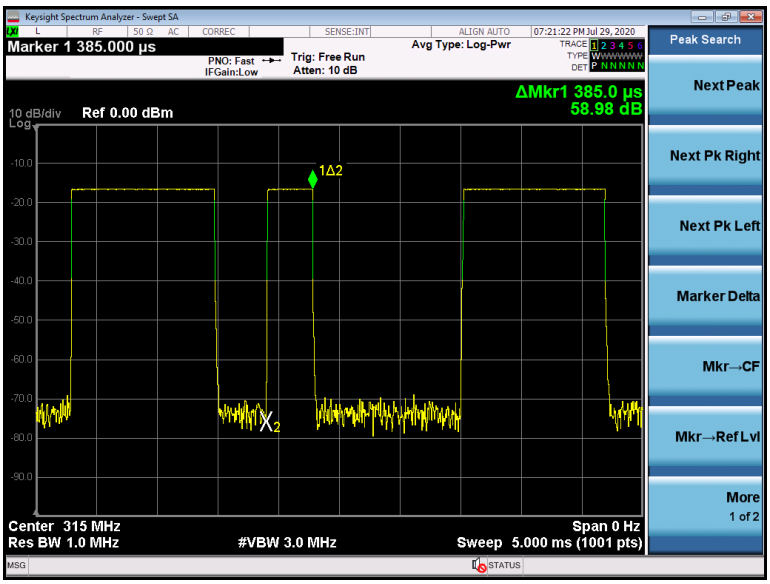
Duty cycle numbers	T on time (ms)	Duty cycle
41	25.445	0.25445

1. AV Level (dBuV/m)= PK Level (dBuV/m)+ AV Factor(dB)
2. Duty Cycle= (1.19*12ms+0.385*29ms)/100ms = 0.25445
   AV Factor=20*log(Duty Cycle)=20*log(0.25445)= -11.89

Test plot as follows:



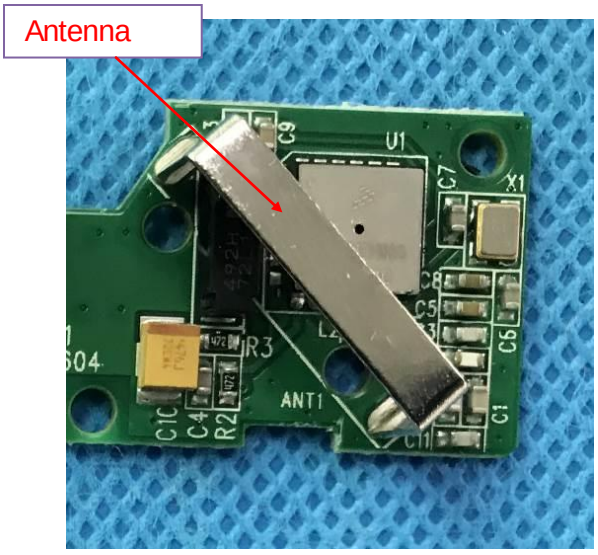




3.6. ANTENNA REQUIREMENT

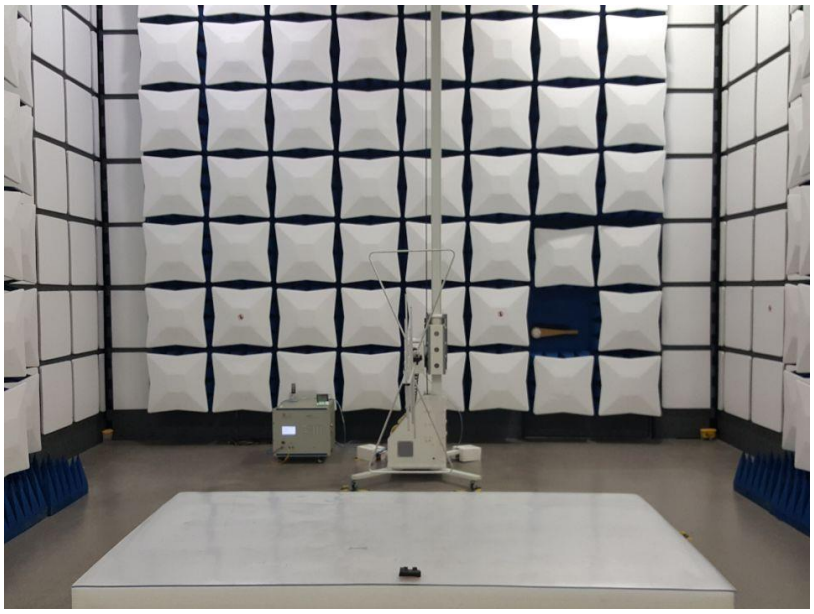
Antenna Connected Construction

The Internal Antenna used in the product is a permanently connected antenna that complies with the provisions of part 15.203 requirement in this section. The antenna used in this product is a Internal Antenna, The directional gains of antenna used for transmitting is -2 dBi.

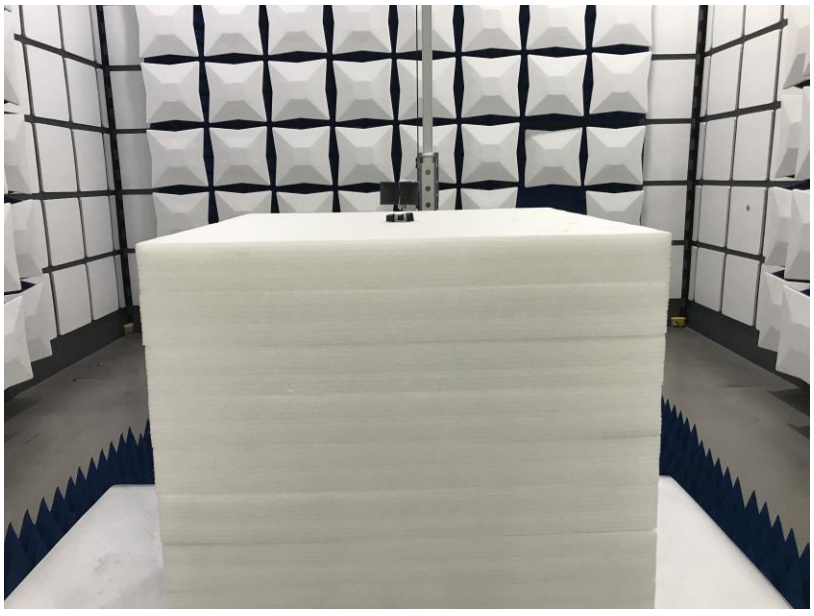


4. Test Setup Photos of the EUT

30MHz-1000MHz

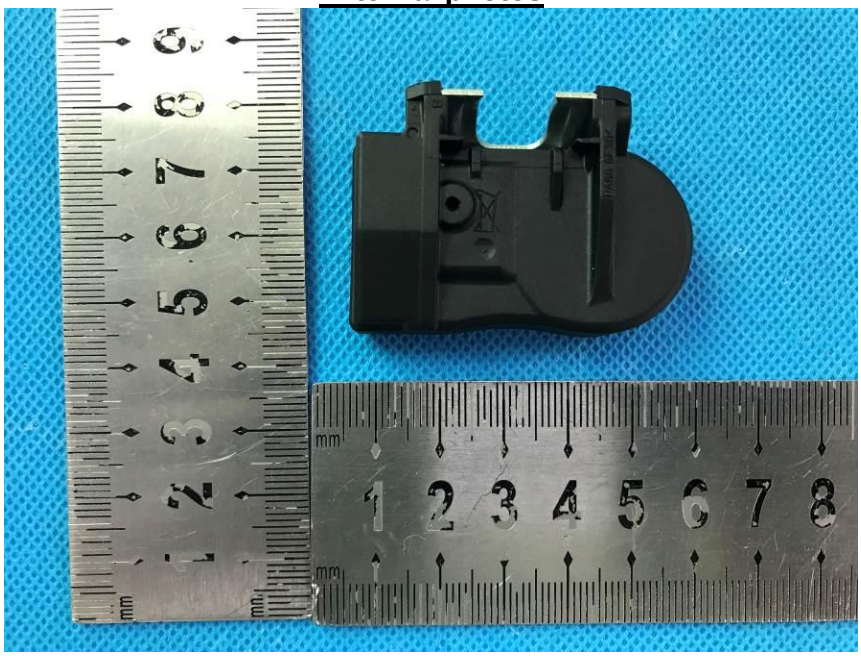


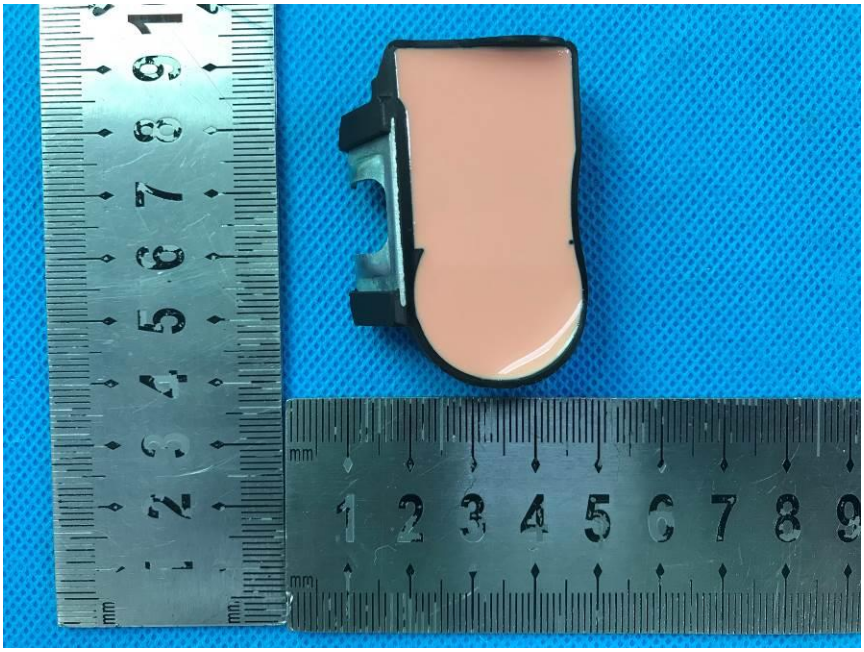
Above 1000MHz

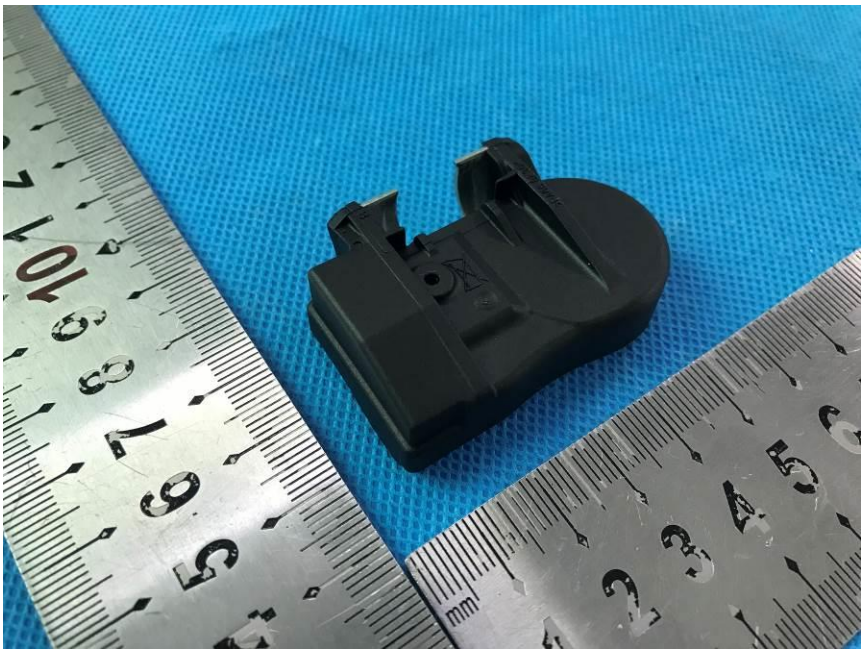


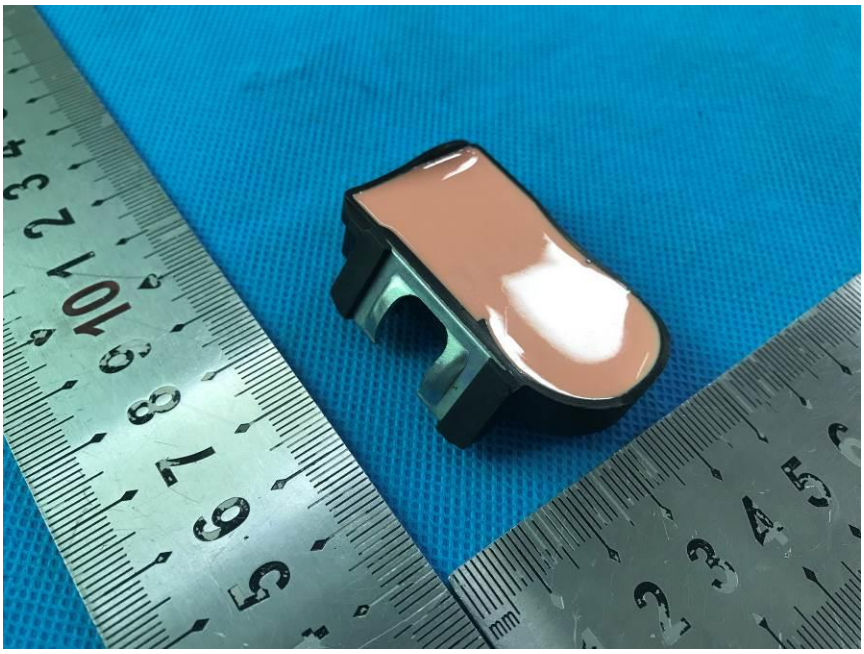
5. PHOTOS OF THE EUT

External photos

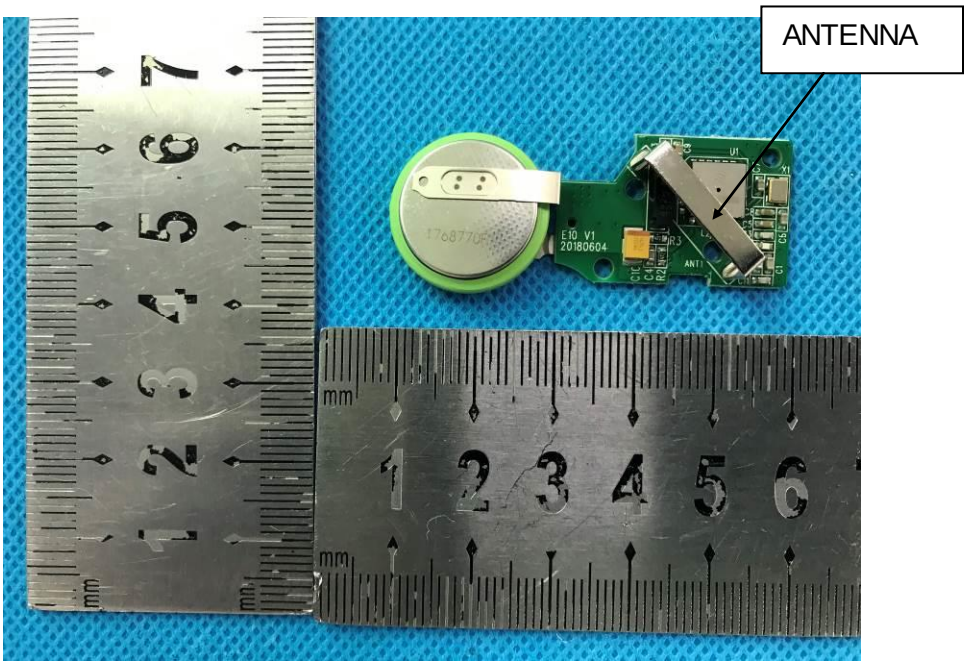


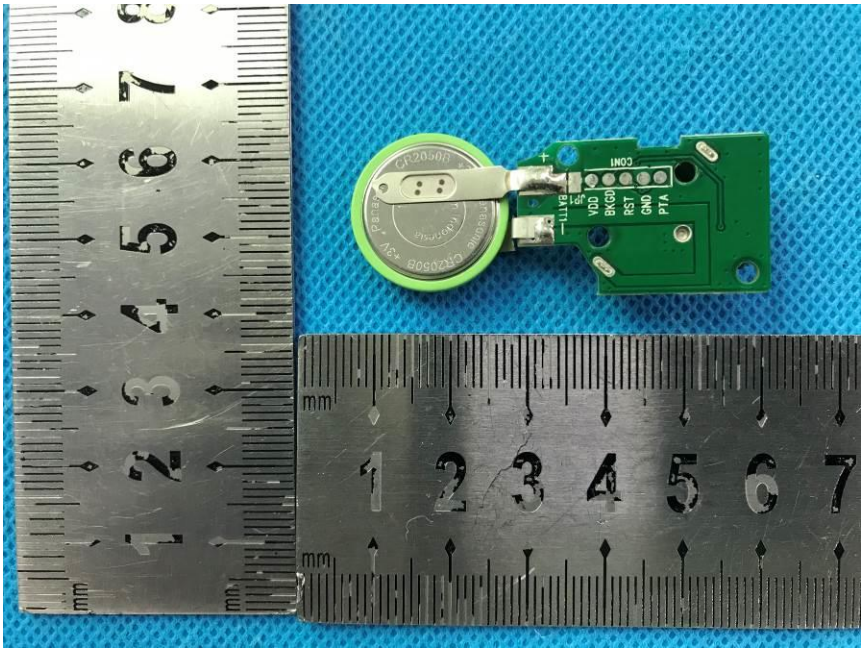






Internal photos





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