Microtest
微测检测

Test Report

FCC ID: 2ANP2-TS01

Date of issue: July 07, 2017

Report Number:	MTi170920E049
Sample Description:	Tire Pressure Sensor
Model(s):	Pro-Sensor(433MHz)
Applicant:	Shenzhen Auzone Technology Co.,Ltd
Address:	404, fuyuan waterfront building, 47 district, baoan district, shenzhen, China.
Date of Test:	June 28, 2017 to July 07, 2017

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1 PRODUCT INFORMATION

General	
Applicant's name:	Shenzhen Auzone Technology Co.,Ltd
Address:	404, fuyuan waterfront building, 47 district, baoan district, shenzhen
Manufacture's Name:	ShenZhen Porcsi Technology Co.,Ltd.
Address:	2 / f, building 10, jianyida science park, shiyan, baoan district, shenzhen city, guangdong province, China
Product description	
Product name:	Tire Pressure Sensor
Trademark:	N/A
Model name:	Pro-Sensor(433MHz)
Serial Model:	N/A
Standards:	47 CFR Part 15, Subpart C
Test Procedure:	ANSI C63.10-2013

This device described above has been tested by Shenzhen Microtest Co.,Ltd. and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.

Tested by: Demi Mu July 07, 2017

Reviewed by: Smith Chen July 07, 2017

Approved by: Tom Xue July 07, 2017

2 Summary of Test Result

Item	FCC Part No.	Description of T	Result
1	15.203	Antenna requirement	Pass
2	15.207	AC power line conducted emission	N/A
3	15.231(c)	20dB bandwidth	Pass
4	15.231(e)	Radiated emission	Pass
5	15.231(e)	Silent time	Pass
The meaning of symbols: “N/A” – Not Applicable			

3 General description

3.1 Feature of equipment under test (EUT)

Product name:	Tire Pressure Sensor
Model name:	Pro-Sensor(433MHz)
Serial Model:	N/A
Tx/Rx frequency range:	Tx:433.92MHz
Modulation type:	ASK
Power source:	DC 3V (CR2050HR battery)
Adapter information:	N/A
Antenna designation:	Chip antenna (Antenna Gain: -4.96dBi)
Hardware version:	V1.0
Software version:	V1.0

3.2 Operation channel list

Channel	Frequency
1	433.92MHz

3.3 Frequency Channel Under Test

Channel	Frequency
1	433.92MHz

3.4 EUT operation mode

During testing, RF test program provided by the manufacture to control the Tx operation followed the test requirement. New battery is used during all test.

3.5 Test conditions

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

- Temperature: 20ºC~30ºC
- Humidity: 30%~70%
- Atmospheric pressure: 98kPa~101kPa

3.6 Ancillary equipment list

Equipment	Model	S/N	Manufacturer
/	/	/	/

3.7 Measurement uncertainty

Measurement Uncertainty for a Level of Confidence of 95 %, U=2xUc(y)

RF frequency	1 x 10^{-7}
RF power, conducted	± 1 dB
Conducted emission(150kHz~30MHz)	± 2.5 dB
Radiated emission(30MHz~1GHz)	± 4.2 dB
Radiated emission (above 1GHz)	± 4.3 dB
Temperature	±1 degree
Humidity	± 5 %

4 Testing site for laboratory

Test Site	Shenzhen Toby Technology Co., Ltd.
Test Site Location	1 A/F., Bldg.6, Yusheng Industrial Zone The National Road No.107 Xixiang Section 467, Shenzhen, Guangdong, China
FCC Registration No.:	811562
CNAS Registration No.:	CNAS L5813

5 List of test equipment

For Conducted emission

Equipment	Manufacturer	Model	Serial No.	Calibration Due
LISN	Schwarzbeck	NSLK8127	#841	2018/09/25
LISN	Laplace	LISN-16A	003420	2017/11/04
EMI Test Receiver	R&S	ESCI3	101368	2017/11/04

For Radiated test

Equipment	Manufacturer	Model	Serial No.	Calibration Due
Broadband TRILOG Antenna	Schwarabeck	VULB9163	9163-872	2017/11/14
Horn Antenna	Schwarzbeck	BBHA 9120 D	9120D-1145	2017/11/14
Horn Antenna	Schwarzbeck	BBHA 9170	373	2017/11/14
Amplifier	HP	8447D	3113A06150	2017/11/04
Amplifier	Agilent	8449B	3008A02400	2018/08/20
Test Receiver	Schwarabeck	ESPI	100314	2017/11/04
Spectrum analyzer	Agilent	E4407B	MY41441082	2017/11/04

For RF conducted test

Equipment	Manufacturer	Model	Serial No.	Calibration Due
Spectrum Analyzer	Agilent	N9020A	MY49100060	2018/02/22
PSG Analog S.G.	Agilent	N5182A	MY49060455	2018/02/22
Power Radio	DARE	RPR3006W	16I00054SNO16	2018/02/22
Amplifier	Agilent	HP8447D	3113A06150	2018/02/22
Horn Antenna	Schwarzbeck	BBHA 9120 D	9120D-1145	2018/02/22

Note: the calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

6 Test Result

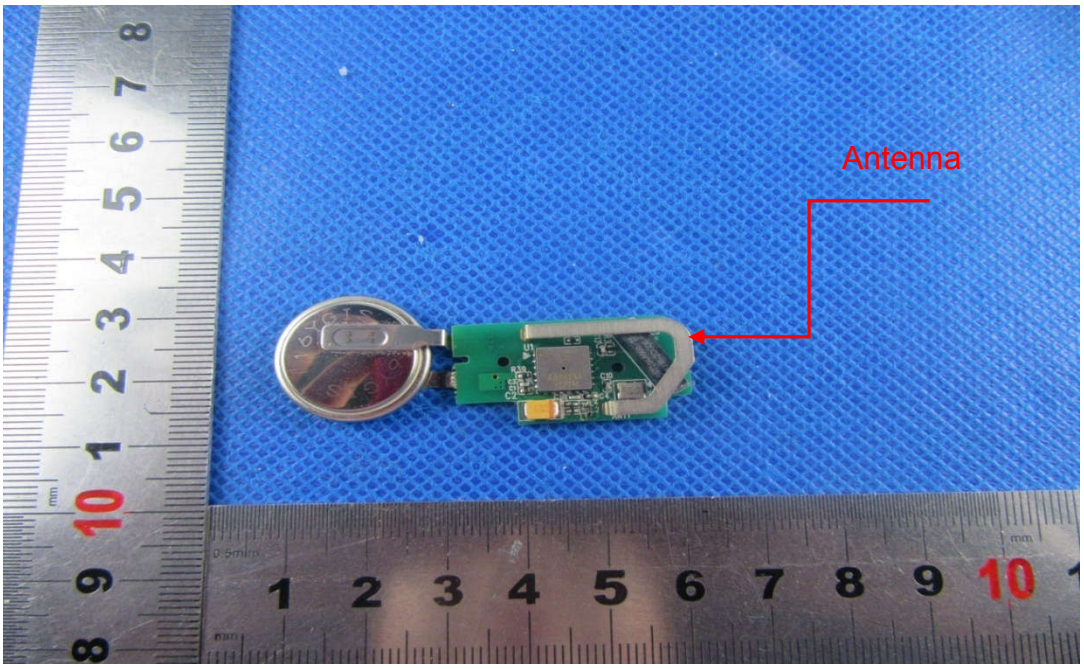
6.1 Antenna requirement

6.1.1 Requirement defined in FCC 15.203

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 shall be considered sufficient to comply with the provisions of this section. 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. This requirement does not apply to carrier current devices or to devices operated under the provisions of §15.211, §15.213, §15.217, §15.219, or §15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

6.1.2 EUT antenna description

The radio antenna of EUT is an internal permanently attached antenna, the maximum gain is -4.96dBi. So the antenna meets the requirement of this part.



6.2 Conducted emission

6.2.1 Limit

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

Note: Decreases with the logarithm of the frequency from 0.15MHz to 0.5MHz.

6.2.2 Test method

1. The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipment powered from additional LISN(s). The LISN provide 50 Ohm/50uH of coupling impedance for the measuring instrument.

2. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.

3. I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.

4. LISN is at least 80 cm from nearest part of EUT chassis.

5. The resolution bandwidth of EMI test receiver is set at 9kHz.

6.2.3 Test Result

Not application because of the EUT is power by battery.

6.3 Field strength of fundamental and harmonic emissions

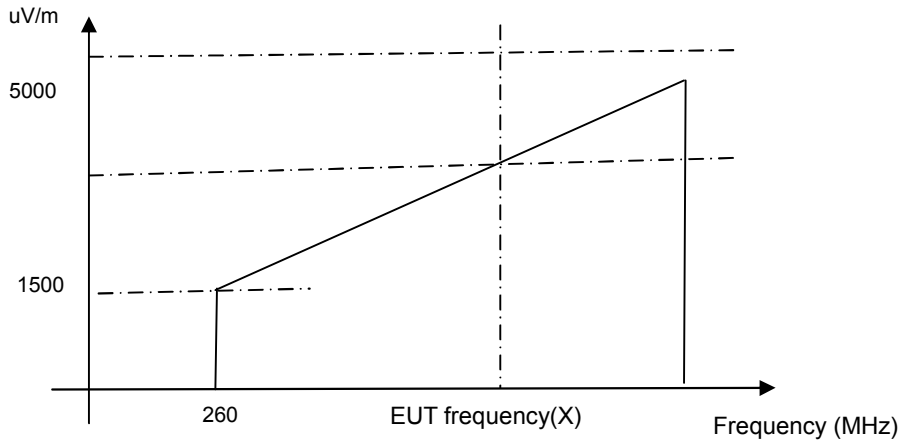
6.3.1 Limits

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:

Fundamental frequency (MHz)	Field strength of fundamental (microvolts/meter)	Field strength of spurious emissions (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

[1]Linear interpolations.

For example for 433.92MHz



The Field Strength of Fundamental Emissions (Operating Frequency) is:

3750 uV/m = 20*log (3750) dBuV/m = 71.48 dBuV/m

12500 uV/m = 20*log (12500) dBuV/m = 81.94 dBuV/m

For example the Fundamental emission is 433.925MHz, the limit is X.

(433.925-260)/(470-260)=(X-1500)/(5000-1500)

173.925/210 =(X-3750)/3500

X = 5725.95uV/m

AV Limit = 20*log (5725.925) dBuV/m = 75.16 dBuV/m

PK Limit = 95.16 dBuV/m

6.3.2 Test Method

1. The EUT is placed on a turntable, which is 0.8m above ground plane for test frequency range blew 1GHz, and 1.5m above ground plane for test frequency range above 1GHz.

2. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.

3. Use the following spectrum analyzer settings:

Span = wide enough to fully capture the emission being measured
RBW = 1 MHz for f ≥ 1GHz
RBW = 100 kHz for f < 1 GHz
VBW ≥ RBW
Sweep = Auto
Detector function = Peak
Trace = max hold

4. Follow the guidelines in ANSI C63.4-2014 with respect to maximizing the emission by rotating the EUT, adjusting the measurement antenna height and polarization, etc. The peak reading of the emission, after being corrected by the antenna factor, cable loss, pre-amp gain, etc., is the peak field strength, submit this data. Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.

5. The peak level for above 1GHz, once corrected, must comply with the limit specified in Section 15.209. Set the spectrum to

RBW = 1MHz
VBW = 10Hz
Detector = PK for AV value, while maintaining all of the other instrument settings

6.3.3 Test Result

Test modulation: ASK

Field Strength of Fundamental Emissions and Field strength of spurious emissions Value				
Operating Frequency (MHz)	Field Strength (dBuV/m)	Detector	AV Limit @3m (dBuV/m)	Polarity
433.925	59.91	Peak	72.87	Vertical
	70.62	Peak	72.87	Horizontal
864.850	30.90	Peak	52.87	Vertical
	41.10	Peak	52.87	Horizontal

Note: If the PK measured values lower than average mode limit, the EUT shall be deemed to meet average limits and then no additional average mode measurement performed.

occupied bandwidth

6.3.4 Test method

Use the following spectrum analyzer settings:

Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel
RBW ≥1% of the 20 dB bandwidth
VBW ≥RBW
Sweep = auto
Detector function = peak
Trace = max hold

The EUT should be transmitting at its maximum data rate. Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. Use the marker-delta function to measure 20 dB down one side of the emission. Reset the marker-delta function, and move the marker to the other side of the emission, until it is (as close as possible to) even with the reference marker level. The marker-delta reading at this point is the 20 dB bandwidth and 99% occupied bandwidth of the emission.

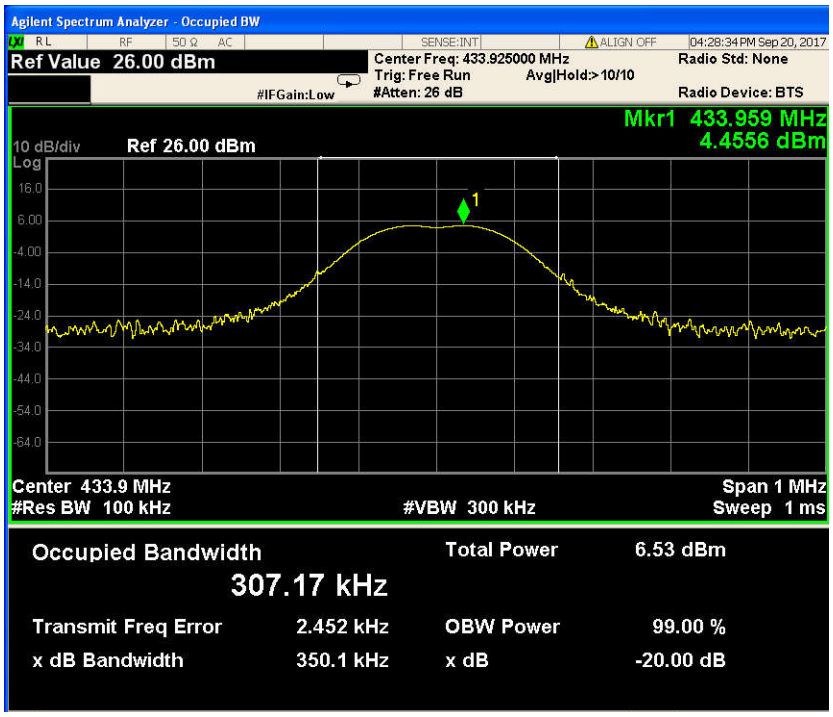
6.3.5 Test result

Test modulation: ASK

Frequency (MHz)	20dB emission bandwidth (MHz)	99% occupied bandwidth (MHz)
433.92	0.35	0.307

Test plots as below

433.92MHz



6.4 Radiated emission & Band edge spurious emission

6.4.1 Limit

Emissions radiated outside of the specified frequency bands, except for harmonic emissions, (b)shall be attenuated by at least 50 dB below the level of the fundamental emissions or to the general field strength limits listed in RSS-Gen, whichever is less stringent.

Frequency (MHz)	Field strength μV/m	Field strength dBμV/m	Detector	Measurement distance
30-88	100	40	QP	3m
88-216	150	43.5	QP	
216-960	200	46	QP	
960-1000	500	54	QP	
Above 1000	500	54	AV	
Above 1000	5000	74	PK	

6.4.2 Test method

1. The EUT is placed on a turntable, which is 0.8m above ground plane for test frequency range blew 1GHz, and 1.5m above ground plane for test frequency range above 1GHz.

2. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.

3. Use the following spectrum analyzer settings:

Span = wide enough to fully capture the emission being measured
RBW = 1 MHz for f ≥ 1GHz
100 kHz for f < 1 GHz, VBW ≥ RBW
Sweep = auto
Detector function = peak
Trace = max hold

4. Follow the guidelines in ANSIC63.10-2013 with respect to maximizing the emission by rotating the EUT, adjusting the measurement antenna height and polarization, etc. The peak reading of the emission, after being corrected by the antenna factor, cable loss, pre-amp gain, etc., is the peak field strength, submit this data. Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.

5. The peak level, once corrected, must comply with the limit specified in Section 15.209. Set the RBW = 1MHz, VBW = 10Hz, Detector = PK for AV value, while maintaining all of the other instrument settings.

6.4.3 Test Result

Remark:
If the PK measured values lower than average mode limit, the EUT shall be deemed to meet average limits and then no additional average mode measurement performed.

Radiated emission (ASK mode)

Transmitter channel: 433.92MHz					
Frequency	Ant. Polarization	Emission level	Limits	Detector	Result
(MHz)	H / V	dBμV/m	dBμV/m		
50.763	V	12.90	43.5	QP	Pass
205.675	H	12.30	43.5	QP	
255.622	V	11.40	46	QP	
101.288	H	10.80	46	QP	
1280.642	V	45.18	72.87	PK	
1280.641	H	43.25	72.87	PK	

6.5 Time of occupancy (dwell time)

6.5.1 Limit

In addition, 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.

6.5.2 Test method

Setup the EUT as show in the block diagram above.

Set Spectrum Analyzer

Centre Frequency = Fundamental Frequency

RBW=100 kHz, VBW= 300 kHz

Span= 0 Hz

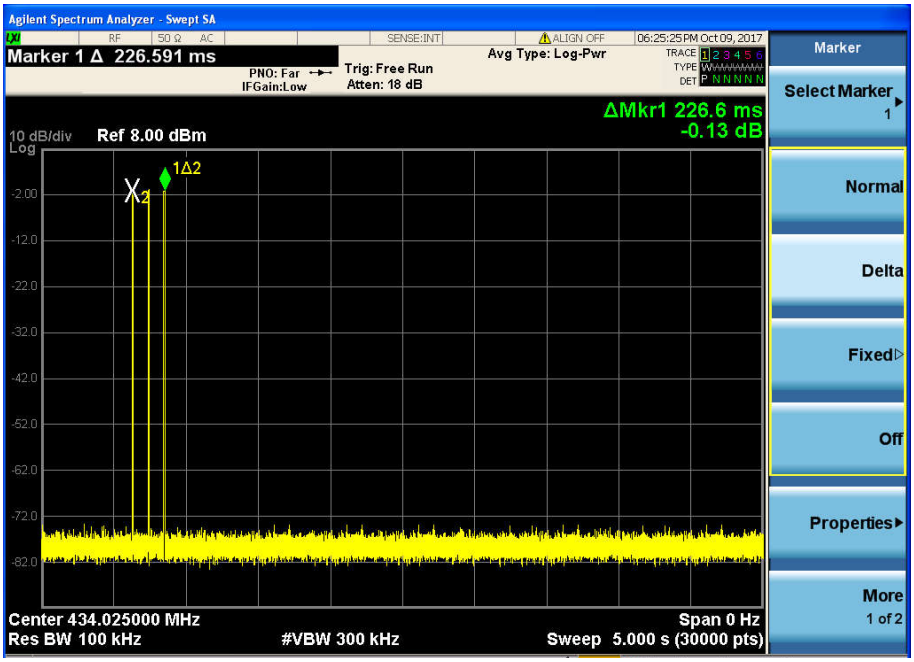
Sweep Time= 5 Seconds.

Setup the EUT as normal operation and press Transmitter button

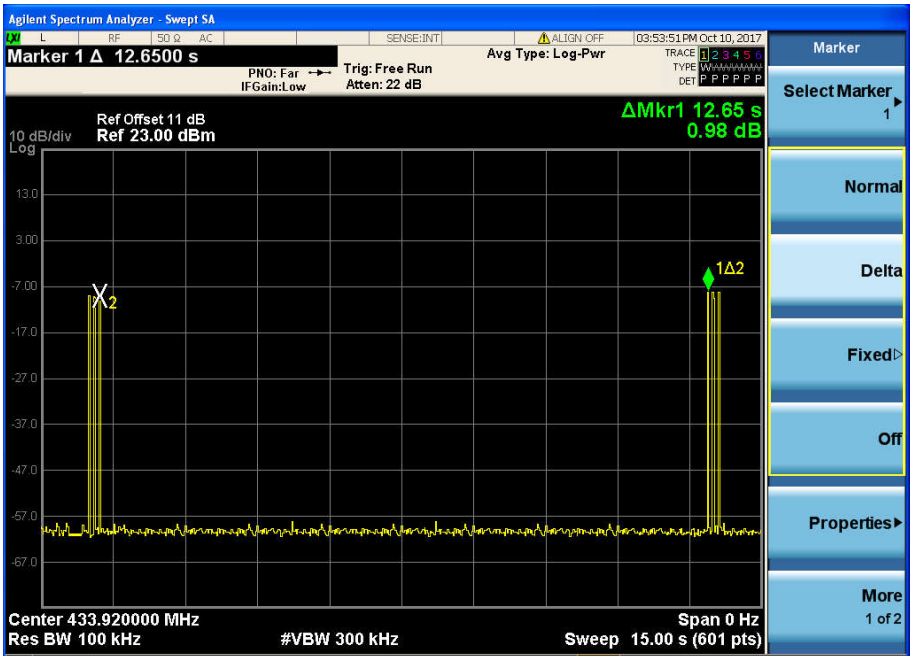
Release the button, use Delta Mark function to test the time.

6.5.3 Test Result

Each transmission (s)	Limit(s)	Result
0.2266	1	PASS



Silence time (s)	Limit(s)	Result
12.65	10	PASS



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