

TEST REPORT

Application No.: SHEM1905013714CR
FCC ID: 2ATCK-TPMDN
IC: 25126-TPMDN
Applicant: Baolong Huf Shanghai Electronics Co., Ltd.
Address of Applicant: 1st Floor, Building 5, 5500 Shenzhuan Rd, Songjiang, Shanghai
Manufacturer: Baolong Huf Shanghai Electronics Co., Ltd.
Address of Manufacturer: 1st Floor, Building 5, 5500 Shenzhuan Rd, Songjiang, Shanghai
Factory: Baolong Huf Shanghai Electronics Co., Ltd.
Address of Factory: 1st Floor, Building 5, 5500 Shenzhuan Rd, Songjiang, Shanghai
Equipment Under Test (EUT):
EUT Name: TPMS-sensor
Model No.: TPM-D-N
Standard(s) : 47 CFR Part 15, Subpart C 15.231
 RSS-210 Issue 9 August 2016 (Amendment)
 RSS-Gen Issue 5, April 2018
Date of Receipt: 2019-05-31
Date of Test: 2019-06-11 to 2019-06-15
Date of Issue: 2019-06-19

Test Result:	Pass*
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* In the configuration tested, the EUT complied with the standards specified above.

Parlam Zhan

Parlam Zhan
E&E Section Manager

The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards. Any mention of SGS International Electrical Approvals or testing done by SGS International Electrical Approvals in connection with, distribution or use of the product described in this report must be approved by SGS International Electrical Approvals in writing.



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Revision Record			
Version	Description	Date	Remark
00	Original	2019-06-19	/

Authorized for issue by:			
		<i>Vincent Zhu</i>	
		_____ Vincent Zhu / Project Engineer	
		<i>Parlam zhan</i>	
		_____ Parlam Zhan /Reviewer	

2 Test Summary

Radio Spectrum Technical Requirement				
Item	FCC Requirement	IC Requirement	Method	Result
Antenna Requirement	47 CFR Part 15, Subpart C 15.203	RSS-Gen Section 8.1.3	N/A	Pass

N/A: Not applicable

Radio Spectrum Matter Part				
Item	Requirement	IC Requirement	Method	Result
20dB Bandwidth	47 CFR Part 15, Subpart C 15.231	RSS-210 A1.3	ANSI C63.10 (2013) Section 6.9	Pass
Dwell Time	47 CFR Part 15, Subpart C 15.231(e)	RSS-210 A1.1	ANSI C63.10 (2013) Section 7.8.4	Pass
Field Strength of the Fundamental Signal	47 CFR Part 15, Subpart C 15.231(e)	RSS-210 A1.2	ANSI C63.10 (2013) Section 6.5	Pass
Radiated Emissions	47 CFR Part 15, Subpart C 15.231	RSS-210 A1.2	ANSI C63.10 (2013) Section 6.4&6.5&6.6	Pass
99% Bandwidth	N/A	RSS-210 A1.3	RSS-Gen Section 6.7	Pass
Frequency Stability	RSS-Gen April 2018	RSS-Gen Section 6.11	RSS-Gen Section 8.11	Pass (Note 1)

Note: (1) Frequency stability requested in RSS GEN S8.11 has been complied since the result of occupied bandwidth can demonstrate.

(2) There are two sensors mentioned in this report and external photo, and they are similar in electrical and electronic characters. The main difference is material(One valve is mainly made of aluminum,and the other one is mainly cooper and rubber).

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4 General Information

4.1 Details of E.U.T.

Power supply:	DC 3.0 V By battery
Test voltage:	DC 3.0V
Modulation Type	FSK
Number of Channels	1
Operation Frequency	433.92MHz
Antenna Type	Monopole antenna
Transmitter type	Periodic

4.2 Description of Support Units

Description	Manufacturer	Model No.	Serial No.
Smart Tool	Baolong Huf Shanghai Electronics Co., Ltd.	GJ006	/

Remark: Smart tools mainly provide data acquisition, data transmission and other functions for a transmitter, a repeater and a receiving terminal module of a truck. Auxiliary tool functions include reading data of the transmitter, reading the ID of the vehicle head

4.3 Measurement Uncertainty

No.	Item	Measurement Uncertainty
1	Radio Frequency	$\pm 8.4 \times 10^{-8}$
2	Timeout	$\pm 2s$
3	Duty cycle	$\pm 0.37\%$
4	Occupied Bandwidth	$\pm 3\%$
5	RF conducted power	$\pm 0.6dB$
6	RF power density	$\pm 2.84dB$
7	Conducted Spurious emissions	$\pm 0.75dB$
8	RF Radiated power	$\pm 4.6dB$ (Below 1GHz)
		$\pm 4.1dB$ (Above 1GHz)
9	Radiated Spurious emission test	$\pm 4.2dB$ (Below 30MHz)
		$\pm 4.4dB$ (30MHz-1GHz)
		$\pm 4.8dB$ (1GHz-18GHz)
		$\pm 5.2dB$ (Above 18GHz)
10	Temperature test	$\pm 1^{\circ}C$
11	Humidity test	$\pm 3\%$
12	Supply voltages	$\pm 1.5\%$
13	Time	$\pm 3\%$

Note: The measurement uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

4.4 Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. E&E Lab

588 West Jindu Road, Xinqiao, Songjiang, 201612 Shanghai, China

Tel: +86 21 6191 5666

Fax: +86 21 6191 5678

No tests were sub-contracted.

4.5 Test Facility

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

- **CNAS (No. CNAS L0599)**

CNAS has accredited SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration Laboratories (CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing.

- **NVLAP (Certificate No. 201034-0)**

SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP). Certificate No. 201034-0.

- **FCC –Designation Number: CN5033**

SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. has been recognized as an accredited testing laboratory.

Designation Number: CN5033. Test Firm Registration Number: 479755.

- **Innovation, Science and Economic Development Canada**

SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. EMC Laboratory has been recognized by ISED as an accredited testing laboratory.

IC Registration No.: 8617A-1. CAB identifier: CN0020.

- **VCCI (Member No.: 3061)**

The 3m Semi-anechoic chamber and Shielded Room of SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-13868, C-14336, T-12221, G-10830 respectively.

4.6 Deviation from Standards

None

4.7 Abnormalities from Standard Conditions

None

5 Equipment List

Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
Radiated Test					
EMI test Receiver	R&S	ESU40	SHEM051-1	2018-12-20	2019-12-19
Spectrum Analyzer	R&S	FSP-30	SHEM002-1	2018-12-20	2019-12-19
Loop Antenna (9kHz-30MHz)	Schwarzbeck	FMZB1519	SHEM135-1	2017-04-10	2020-04-09
Antenna (25MHz-2GHz)	Schwarzbeck	VULB9168	SHEM048-1	2017-02-28	2020-02-27
Antenna (25MHz-3GHz)	Schwarzbeck	HL562	SHEM010-1	2017-02-28	2020-02-27
Horn Antenna (1-8GHz)	Schwarzbeck	HF906	SHEM009-1	2017-10-24	2020-10-23
Horn Antenna (1-18GHz)	Schwarzbeck	BBHA9120D	SHEM050-1	2017-01-14	2020-01-13
Horn Antenna (14-40GHz)	Schwarzbeck	BBHA 9170	SHEM049-1	2017-12-03	2020-12-02
Pre-amplifier (9kHz-2GHz)	CLAVIIO	BDLNA-0001	SHEM164-1	2018-08-13	2019-08-12
Pre-amplifier (1-18GHz)	CLAVIIO	BDLNA-0118	SHEM050-2	2018-08-13	2019-08-12
High-amplifier (14-40GHz)	Schwarzbeck	10001	SHEM049-2	2018-12-20	2019-12-19
Signal Generator	R&S	SMR40	SHEM058-1	2018-08-13	2019-08-12
Band Filter	LORCH	9BRX-875/X150	SHEM156-1	/	/
Band Filter	LORCH	13BRX-1950/X500	SHEM083-2	/	/
Band Filter	LORCH	5BRX-2400/X200	SHEM155-1	/	/
Band Filter	LORCH	5BRX-5500/X1000	SHEM157-2	/	/
High pass Filter	Wainwright	WHK3.0/18G	SHEM157-1	/	/
High pass Filter	Wainwright	WHKS1700	SHEM157-3	/	/
Semi/Fully Anechoic	ST	11*6*6M	SHEM078-2	2017-07-22	2020-07-21
RE test Cable	/	RE01, RE02, RE06	/	2018-12-26	2019-12-25

6 Radio Spectrum Technical Requirement

6.1 Antenna Requirement

6.1.1 Test Requirement:

47 CFR Part 15, Subpart C 15.203

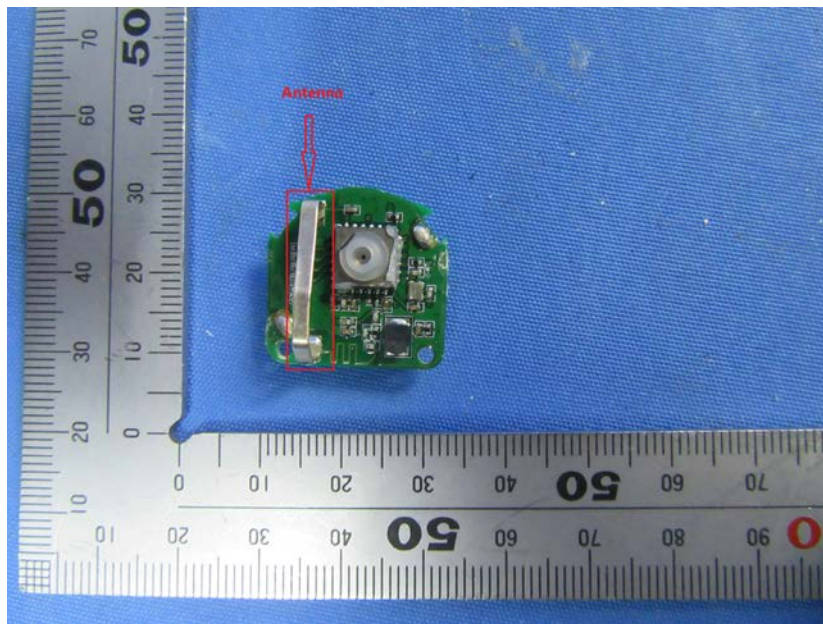
6.1.2 Conclusion

Standard 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 an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit permanently attached antenna or of an 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 Monopole antenna and no consideration of replacement.



7 Radio Spectrum Matter Test Results

7.1 20dB Bandwidth

Test Requirement 47 CFR Part 15, Subpart C 15.231(c)

Test Method: ANSI C63.10 (2013) Section 6.9

Limit:

Frequency range(MHz)	Limit
70-900	No wider than 0.25% of the center frequency
Above 900	No wider than 0.5% of the center frequency

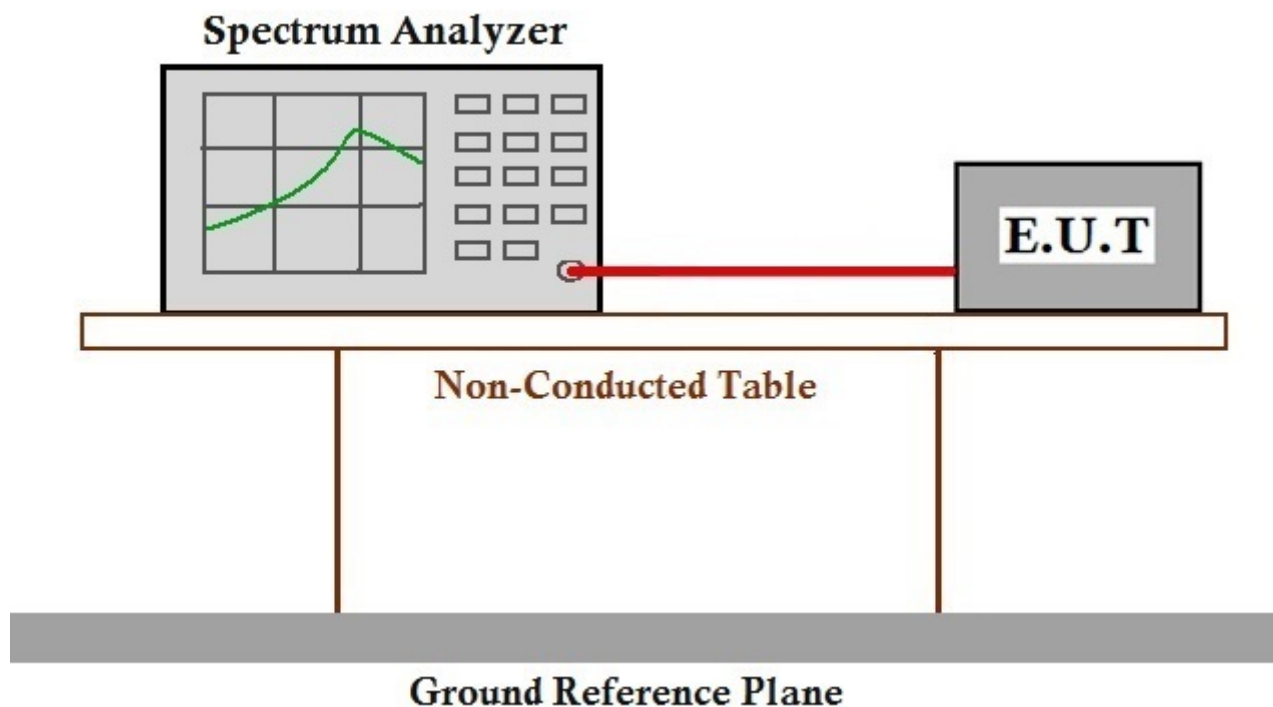
7.1.1 E.U.T. Operation

Operating Environment:

Temperature: 20 °C Humidity: 50 % RH Atmospheric Pressure: 1010 mbar

Test mode a:TX mode_Keep the EUT in transmitting with modulation mode.

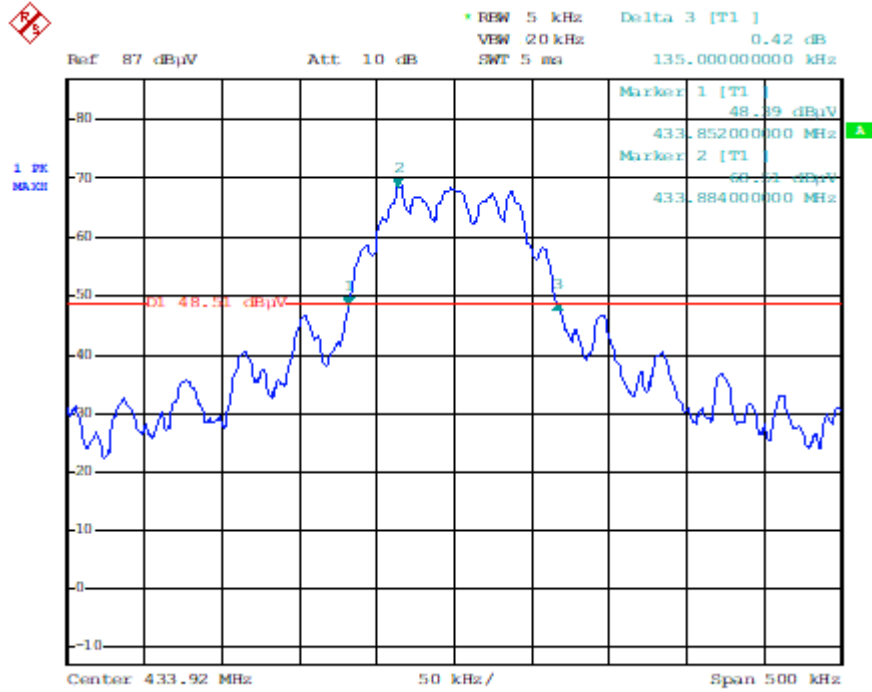
7.1.2 Test Setup Diagram



7.1.3 Measurement Procedure and Data

Frequency(MHz)	20dB bandwidth (kHz)	Limit (kHz)	Results
433.92	135.00	1084.80	Pass

Test plot as follows:



7.2 Dwell Time

Test Requirement	47 CFR Part 15, Subpart C 15.231(e)
Test Method:	ANSI C63.10 (2013) Section 7.8.4
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.

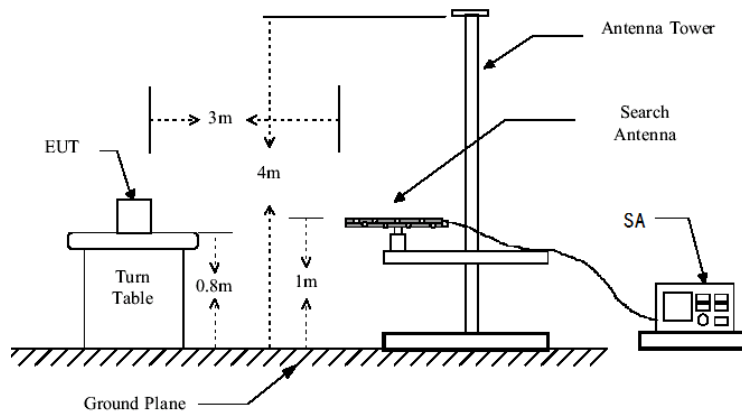
7.2.1 E.U.T. Operation

Operating Environment:

Temperature: 20 °C Humidity: 50 % RH Atmospheric Pressure: 1010 mbar

Test mode a:TX mode_Keep the EUT in transmitting with modulation mode.

7.2.2 Test Setup Diagram

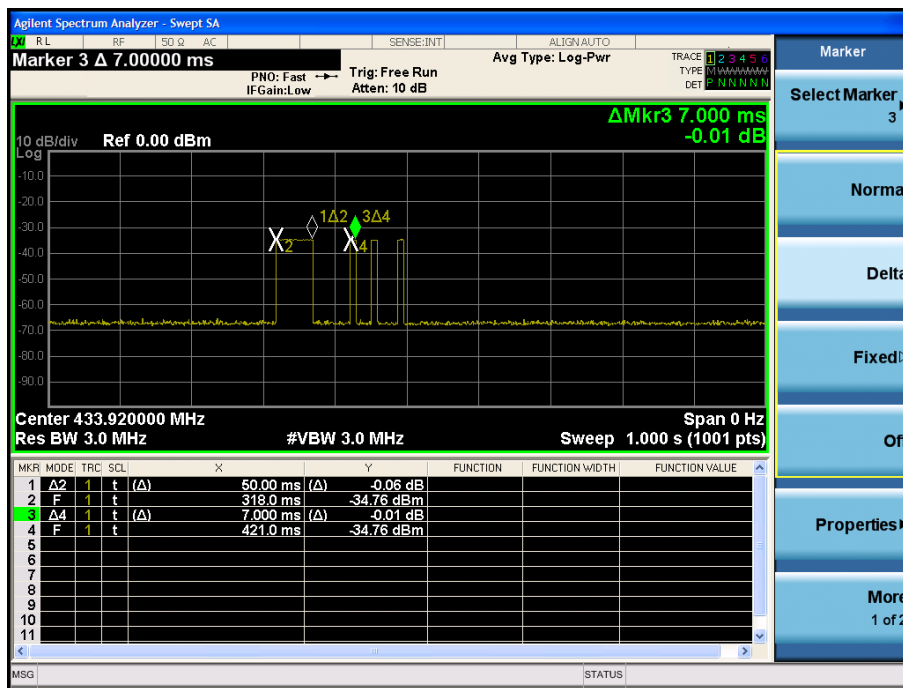


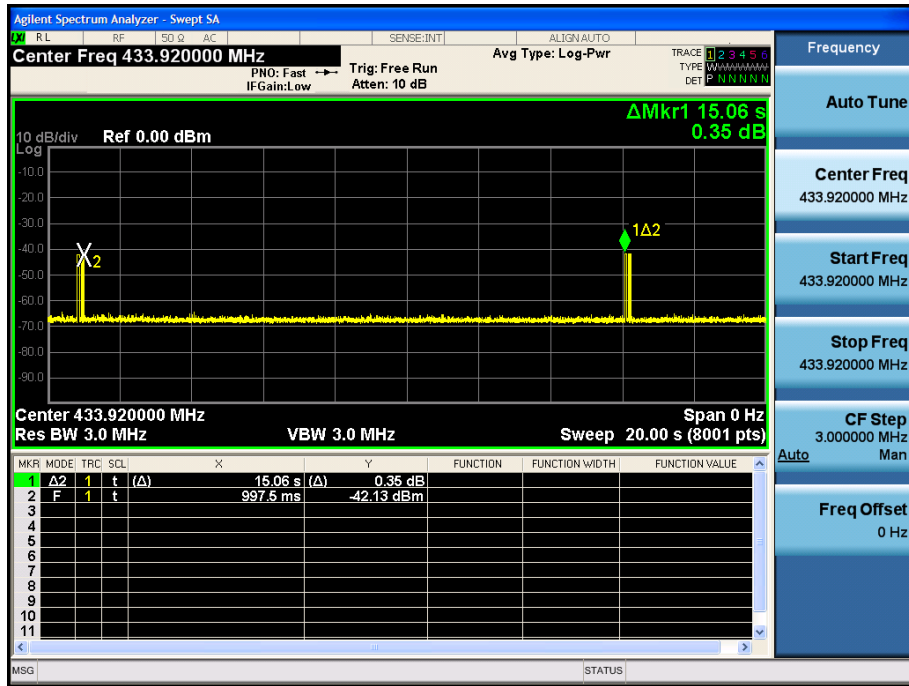
7.2.3 Measurement Procedure and Data

Frequency(MHz)	Duration of each Transmission Time(s)	Limit: not more than 1 seconds(s)	Results
433.92	0.071	1	Pass

Frequency(MHz)	The silent period (s)	Limit: At least 30 times the duration of the transmission but in no case less than 10s	Results
433.92	15.06	>10s	Pass

Test plot as follows:





7.3 Field Strength of the Fundamental Signal (15.231(e))

Test Requirement: 47 CFR Part 15, Subpart C 15.231(e)
Test Method: ANSI C63.10 (2013) Section 6.5
Limit:

Fundamental frequency(MHz)	Field strength of fundamental(microvolts/meter)	Field strength of spurious emissions(microvolts/meter)
40.66-40.70	1000	100
70-130	500	50
130-174	500 to 1500	50 to 150
174-260	1500	150
260-470	1500 to 5000	150 to 500
Above 470	5000	500

Remark: the emission limit is based on measurement instrumentation employing an average detector at a distance of 3 meters. The frequencies above 1000MHz are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

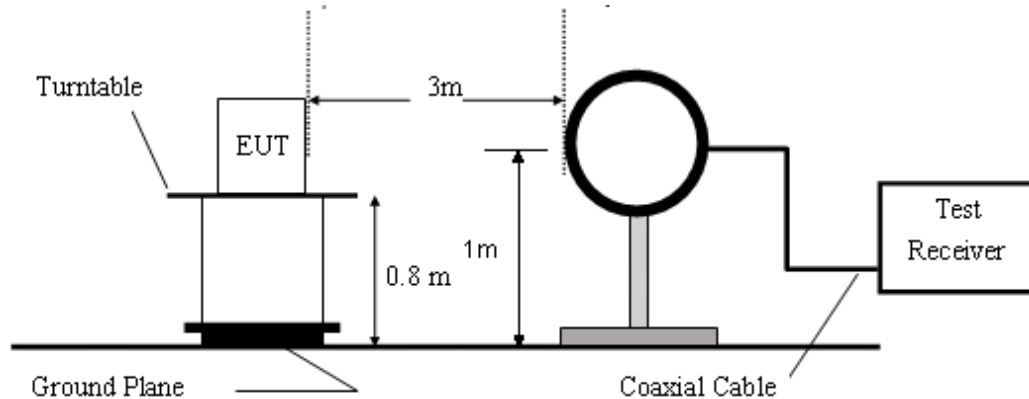
7.3.1 E.U.T. Operation

Operating Environment:

Temperature: 20 °C Humidity: 50 % RH Atmospheric Pressure: 1010 mbar

Test mode a:TX mode_Keep the EUT in transmitting with modulation mode.

7.3.2 Test Setup Diagram



7.3.3 Measurement Procedure and Data

- a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- c. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- d. 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.
- e. 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 (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- g. 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.
- h. The radiation measurements are performed in X, Y, Z axis positioning. And found the X axis positioning which it is worse case, only the test worst case mode is recorded in the report.

Remark: Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor

Test channel	Freq. (MHz)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
Channel 1	433.92	67.91	72.87	-4.96	Peak	Vertical
		73.07	92.87	-19.80	Peak	Horizontal
		56.78	72.87	-16.09	Average	Horizontal

Remark: If the Peak value below the AV Limit, the AV test doesn't perform for this submission.

7.4 Radiated Emissions

Test Requirement 47 CFR Part 15, Subpart C 15.231(b)
 Test Method: ANSI C63.10 (2013) Section 6.4&6.5&6.6
 Limit:

Frequency(MHz)	Field strength(microvolts/meter)	Measurement distance(meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

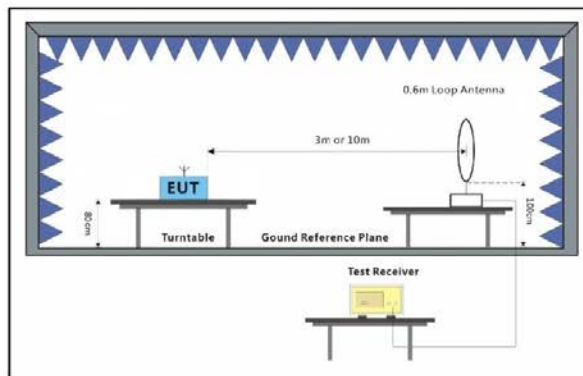
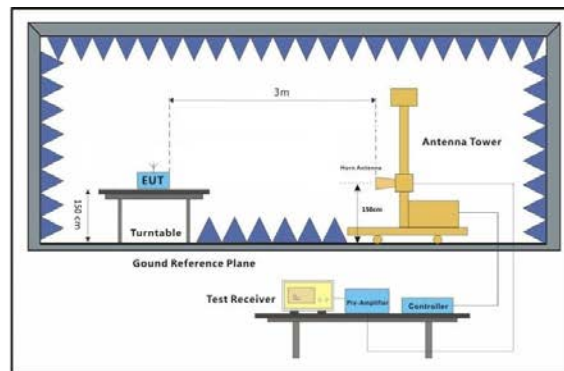
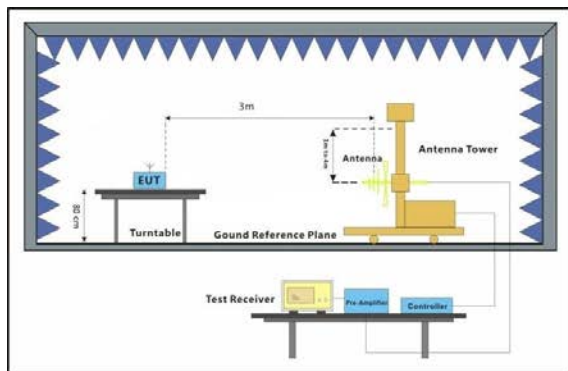
7.4.1 E.U.T. Operation

Operating Environment:

Temperature: 20 °C Humidity: 50 % RH Atmospheric Pressure: 1010 mbar

Test mode a:TX mode_Keep the EUT in transmitting with modulation mode.

7.4.2 Test Setup Diagram

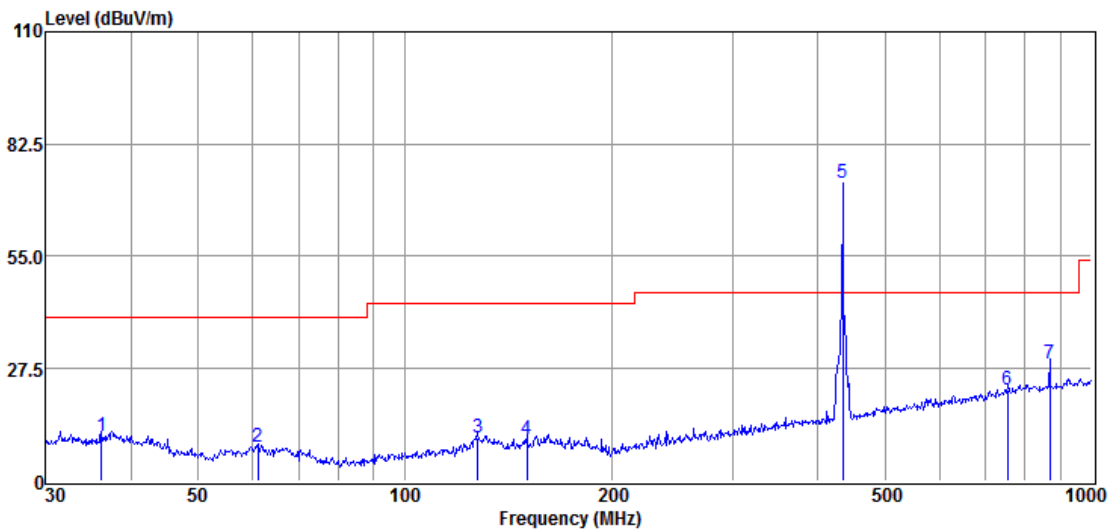


7.4.3 Measurement Procedure and Data

For testing performed with the loop antenna, the center of the loop was positioned 1 m above the ground and positioned with its plane vertical at the specified distance from the EUT. During testing the loop was rotated about its vertical axis for maximum response at each azimuth and also investigated with the loop positioned in the horizontal plane. Only the worst position of vertical was shown in the report.

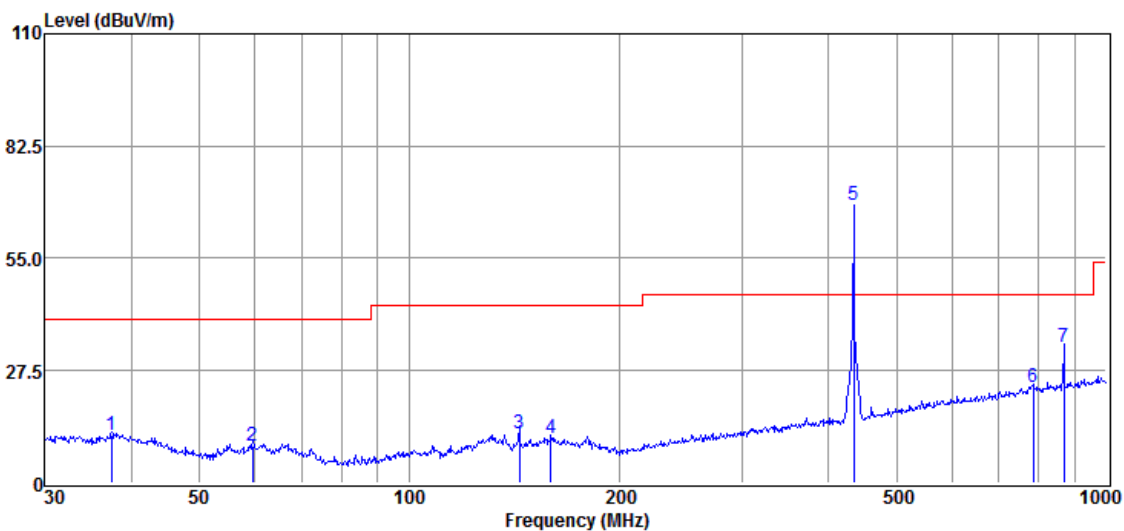
30MHz-1GHz

Horizontal



Item	Freq.	Read Level	Antenna Factor	Preamp Factor	Cable Loss	Result Level	Limit Line	Over Limit	Detector
(Mark)	(MHz)	(dBμV)	(dB/m)	(dB)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
1	36.127	36.99	15.95	42.35	0.48	11.07	40.00	-28.93	QP
2	61.132	37.54	12.45	42.32	0.59	8.26	40.00	-31.74	QP
3	127.665	39.30	12.14	42.27	1.41	10.58	43.50	-32.92	QP
4	150.538	39.22	11.99	42.23	1.36	10.34	43.50	-33.16	QP
5	433.920	95.89	15.87	41.81	3.12	73.07	Fundamental signal		
6	755.387	38.84	21.20	41.99	4.22	22.27	46.00	-23.73	QP
7	869.130	43.60	22.45	41.74	4.56	28.87	46.00	-17.13	QP

Vertical



Item	Freq.	Read Level	Antenna Factor	Preamp Factor	Cable Loss	Result Level	Limit Line	Over Limit	Detector
(Mark)	(MHz)	(dBμV)	(dB/m)	(dB)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
1	37.416	37.49	16.07	42.34	0.42	11.64	40.00	-28.36	QP
2	59.649	38.32	12.50	42.33	0.58	9.07	40.00	-30.93	QP
3	143.830	41.28	11.51	42.24	1.37	11.92	43.50	-31.58	QP
4	159.784	38.56	13.10	42.22	1.44	10.88	43.50	-32.62	QP
5	433.920	90.73	15.87	41.81	3.12	67.91	Fundamental signal		
6	785.093	39.27	21.67	41.99	4.32	23.27	46.00	-22.73	QP
7	869.130	47.85	22.45	41.74	4.56	33.12	46.00	-12.88	QP

1GHz to 6GHz

Mark	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Emission (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Detector	polarization
1	1287.726	46.14	-12.31	33.83	54	-20.17	peak	Horizontal
2	1894.833	44.34	-10.03	34.31	54	-19.69	peak	Horizontal
3	2717.703	41.89	-6.23	35.66	54	-18.34	peak	Horizontal
4	1282.867	43.83	-12.32	31.51	54	-22.49	peak	Vertical
5	1845.547	43.73	-10.19	33.54	54	-20.46	peak	Vertical
6	3101.07	41.07	-4.97	36.10	54	-17.90	peak	Vertical

Remark:

- 1) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

$$\text{Final Test Level} = \text{Receiver Reading Level} + \text{Factor}$$

$$\text{Factor} = \text{Antenna Factor} + \text{Cable Factor} - \text{Preamplifier Factor}$$
- 2) No any other emissions level which are attenuated less than 20dB below the limit. According to 15.31(o), the amplitude of spurious emissions from intentional radiators and emissions from unintentional radiators which are attenuated more than 20 dB below the permissible value need not be reported unless specifically required elsewhere in this Part. Hence there no other emissions have been reported.

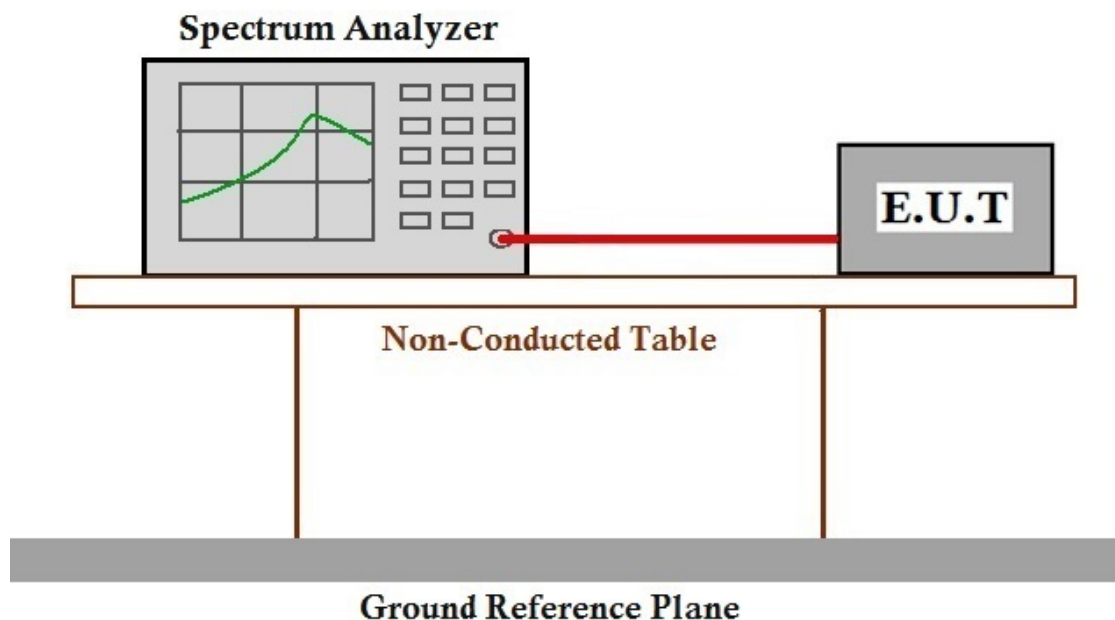
7.5 99% Bandwidth

Test Requirement RSS-210 A1.3
 Test Method: RSS-Gen Section 6.7

7.5.1 E.U.T. Operation

Operating Environment:
 Temperature: 20 °C Humidity: 50 % RH Atmospheric Pressure: 1010 mbar
 Test mode a:TX mode_Keep the EUT in transmitting with modulation mode.

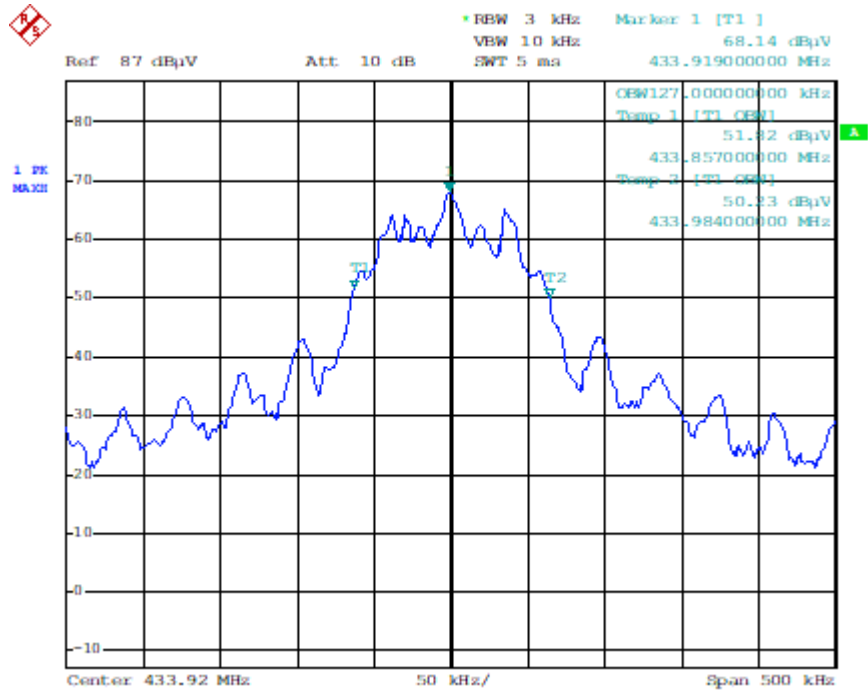
7.5.2 Test Setup Diagram



7.5.3 Measurement Procedure and Data



Frequency (MHz)	Bandwidth (MHz)	Limit(MHz)	Result
433.92	0.127	1.085	PASS





8 Test Setup Photographs

Refer to the < Test Setup photos-FCC>.

9 EUT Constructional Details

Refer to the < External Photos > & < Internal Photos >.

- End of the Report -