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TEST REPORT

Report No. .....:	**CHTEW21010085**	Report verification :
Project No. .....:	**SHT1910034902EW**	
IC ..... :	**26883-WA0201**	
Applicant's name..... :	**IOT AONCHIP S.L.**	
Address.....:	CEMENTIRI VELL, 12 1 - 1, 08221 TERRASSA - BARCELONA, SPAIN	
Test item description ..... :	**WATERSENS**	
Trade Mark .....:	AOnChip	
Model/Type reference.....:	WA020100	
Listed Model(s) .....:	-	
Standard ..... :	**RSS-210 Issue 10: December 2019** **RSS-Gen Issue 5: April 2018**	
Date of receipt of test sample.....:	Dec.14, 2020	
Date of testing.....:	Dec.14, 2020- Jan.14, 2021	
Date of issue.....:	Jan.15, 2021	
Result.....:	**PASS**	

Compiled by (position+printedname+signature)...:	File administrators Echo Wei	Echo Wei
Supervised by (position+printedname+signature)....:	Project Engineer Kiki Kong	Kiki Kong
Approved by (position+printedname+signature)....:	RF Manager Hans Hu	Hans Hu

Testing Laboratory Name ..... :	**Shenzhen Huatongwei International Inspection Co., Ltd.**
Address.....:	1/F, Bldg 3, Hongfa Hi-tech Industrial Park, Genyu Road, Tianliao, Gongming, Shenzhen, China

Contents

1. TEST STANDARDS AND REPORT VERSION

1.1. Test Standards

The tests were performed according to following standards:

RSS-210 Issue 10: 2019: Licence-Exempt Radio Apparatus: Category I Equipment
RSS-Gen Issue 5: 2018: General Requirements for Compliance of Radio Apparatus
ANSI C63.10-2013: American National Standard for Testing Unlicensed Wireless Devices.

1.2. Report version information

Revision No.	Date of issue	Description
N/A	2021-01-15	Original

2. TEST DESCRIPTION

Test Item	Section in CFR 47	Result
Antenna requirement	RSS-Gen 6.8	PASS
AC Power Line Conducted Emissions	RSS-Gen 8.8	N/A
Field Strength of the Fundamental and Mask Measurement	RSS-210 B.6(a)(b)(c)	PASS
99% Occupied Bandwidth	RSS-Gen 6.7	PASS
Radiated Emission	RSS-210 B.6(d)& RSS-Gen 8.9	PASS
Frequency Stability	RSS-210 B.6	PASS

3. SUMMARY

3.1. Client Information

Applicant:	IOT AONCHIP S.L.
Address:	CEMENTIRI VELL, 12 1 - 1, 08221 TERRASSA - BARCELONA, SPAIN
Manufacturer:	IOT AONCHIP S.L.
Address:	CEMENTIRI VELL, 12 1 - 1, 08221 TERRASSA - BARCELONA, SPAIN

3.2. Product Description

Name of EUT:	WATERSENS	
Trade Mark:	AOnChip	
Model No.:	WA020100	
Listed Model(s):	-	
Test sample No.:	RF Conducted sample No.:	YPHT19100349002
	RF Radiated sample No.:	YPHT19100349001
	EMI sample No.:	YPHT19100349001
Power supply:	DC 3.6V	
Hardware version:	02.01.00	
Software version:	01.01.12	
RF Specification		
Operation frequency:	13.56MHz	
Channel number:	1	
Modulation Type:	ASK	
Antenna type:	FPC antenna	

3.3. EUT operation mode

TEST MODE

For RF test items
The engineering test program was provided and enabled to make EUT continuous transmit.
For AC power line conducted emissions:
The EUT was set to connect with large package sizes transmission.

3.4. Support unit used in test configuration and system

The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application.

The following peripheral devices and interface cables were connected during the measurement:

Whether support unit is used?					
✓ Yes					
Item	Equipement	Trade Name	Model No.	IC ID	Power cord
1	samsung	-	Galaxy S7 edge	-	-
2					

4. TEST ENVIRONMENT

4.1. Testing Laboratory Information

Laboratory Name	Shenzhen Huatongwei International Inspection Co., Ltd.	
Laboratory Location	1/F, Bldg 3, Hongfa Hi-tech Industrial Park, Genyu Road, Tianliao, Gongming, Shenzhen, China	
Connect information:	Tel: 86-755-26715499 E-mail: cs@szhtw.com.cn http://www.szhtw.com.cn	
Qualifications	Type	Accreditation Number
	Canada	5377A

4.2. Environmental conditions

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

Temperature:	15~35°C
Relative Humidity:	30~60 %
Air Pressure:	950~1050mba

4.3. 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 in calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report according to TR-100028-01 “Electromagnetic compatibility and Radio spectrum Matters (ERM);Uncertainties in the measurement of mobile radio equipment characteristics;Part 1” and TR-100028-02 “Electromagnetic compatibility and Radio spectrum Matters (ERM);Uncertainties in the measurementof mobile radio equipment characteristics;Part 2” and is documented in the Shenzhen Huatongwei International Inspection Co., Ltd quality system according to ISO/IEC 17025. Further more, 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.

Here after the best measurement capability for Shenzhen Huatongwei is reported:

Test Items	Measurement Uncertainty	Notes
Conducted Disturbance 150kHz~30MHz	3.02 dB	(1)
Radiated Emissions Below 1GHz	4.90 dB	(1)
Occupied Bandwidth	15 Hz	(1)

(1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=1.96.

4.4. Equipments Used during the Test

● Conducted Emission							
Used	Test Equipment	Manufacturer	Equipment No.	Model No.	Serial No.	Last Cal. Date (YY-MM-DD)	Next Cal. Date (YY-MM-DD)
●	Shielded Room	Albatross projects	HTWE0114	N/A	N/A	2018/09/28	2023/09/27
●	EMI Test Receiver	R&S	HTWE0111	ESCI	101247	2020/10/19	2021/10/18
●	Artificial Mains	SCHWARZBECK	HTWE0113	NNLK 8121	573	2020/10/15	2021/10/14
●	Pulse Limiter	R&S	HTWE0033	ESH3-Z2	100499	2020/10/15	2021/10/14
●	RF Connection Cable	HUBER+SUHNER	HTWE0113-02	ENVIROFLEX_142	EF-NM-BNCM-2M	2020/10/15	2021/10/14
●	Test Software	R&S	N/A	ES-K1	N/A	N/A	N/A

● Radiated emission-6th test site							
Used	Test Equipment	Manufacturer	Equipment No.	Model No.	Serial No.	Last Cal. Date (YY-MM-DD)	Next Cal. Date (YY-MM-DD)
●	Semi-Anechoic Chamber	Albatross projects	HTWE0127	SAC-3m-02	C11121	2018/09/30	2021/09/29
●	EMI Test Receiver	R&S	HTWE0099	ESCI	100900	2020/10/19	2021/10/18
●	Loop Antenna	R&S	HTWE0170	HFH2-Z2	100020	2018/04/02	2021/04/01
●	Ultra-Broadband Antenna	SCHWARZBECK	HTWE0123	VULB9163	538	2018/04/04	2021/04/03
●	Pre-Amplifer	SCHWARZBECK	HTWE0295	BBV 9742	N/A	2020/11/13	2021/11/12
●	RF Connection Cable	HUBER+SUHNER	HTWE0062-01	N/A	N/A	2020/05/27	2021/05/26
●	RF Connection Cable	HUBER+SUHNER	HTWE0062-02	SUCOFLEX104	501184/4	2020/05/27	2021/05/26
●	Test Software	R&S	N/A	ES-K1	N/A	N/A	N/A

● Radiated emission-7th test site							
Used	Test Equipment	Manufacturer	Equipment No.	Model No.	Serial No.	Last Cal. Date (YY-MM-DD)	Next Cal. Date (YY-MM-DD)
●	Semi-Anechoic Chamber	Albatross projects	HTWE0122	SAC-3m-01	N/A	2018/09/27	2021/09/26
●	Spectrum Analyzer	R&S	HTWE0098	FSP40	100597	2020/10/20	2021/10/19
●	Horn Antenna	SCHWARZBECK	HTWE0126	9120D	1011	2020/04/01	2023/03/31
●	Broadband Horn Antenna	SCHWARZBECK	HTWE0103	BBHA9170	BBHA9170472	2018/10/11	2021/10/11
●	Pre-amplifier	CD	HTWE0071	PAP-0102	12004	2020/11/13	2021/11/12
●	Broadband Pre-amplifier	SCHWARZBECK	HTWE0201	BBV 9718	9718-248	2020/05/23	2021/05/22
●	RF Connection Cable	HUBER+SUHNER	HTWE0120-01	6m 18GHz S Serisa	N/A	2020/05/10	2021/05/09
●	RF Connection Cable	HUBER+SUHNER	HTWE0120-02	6m 3GHz RG Serisa	N/A	2020/05/10	202105/09
●	RF Connection Cable	HUBER+SUHNER	HTWE0120-03	6m 3GHz RG Serisa	N/A	2020/05/10	2021/05/09
●	RF Connection Cable	HUBER+SUHNER	HTWE0120-04	6m 3GHz RG Serisa	N/A	2020/05/10	2021/05/09
●	RF Connection Cable	HUBER+SUHNER	HTWE0121-01	6m 18GHz S Serisa	N/A	2020/05/10	2021/05/09
●	Test Software	Audix	N/A	E3	N/A	N/A	N/A

●	RF Conducted Method					
Used	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal. Date (YY-MM-DD)	Next Cal. Date (YY-MM-DD)
●	Signal and spectrum Analyzer	R&S	FSV40	100048	2020/10/19	2021/10/18
●	Spectrum Analyzer	Agilent	N9020A	MY50510187	2020/10/19	2021/10/18
○	Radio communication tester	R&S	CMW500	137688-Lv	2020/10/19	2021/10/18

5. TEST CONDITIONS AND RESULTS

5.1. Antenna requirement

Requirement

RSS-Gen 6.8

A transmitter can only be sold or operated with antennas with which it was approved. Transmitter may be approved with multiple antenna types. An antenna type comprises antennas having similar in-band and out-of-band radiation patterns. Testing shall be performed using the highest gain antenna of each combination of transmitter and antenna type for which approval is being sought, with the transmitter output power set at the maximum level. Any antenna of the same type having equal or lesser gain as an antenna that had been successfully tested with the transmitter, will also be considered approved with the transmitter, and may be used and marketed with the transmitter. For Category I transmitters, the manufacturer shall include with the application for certification a list of acceptable antenna types to be used with the transmitter.
When a measurement at the antenna connector is used to determine RF output power, the effective gain of the device's antenna shall be stated, based on measurement or on data from the antenna manufacturer. For transmitters of RF output power of 10 milliwatts or less, only the portion of the antenna gain that is in excess of 6 dBi (6 dB above isotropic gain) shall be added to the measured RF output power to demonstrate compliance with the radiated power limits specified in the applicable standard. For transmitters of output power greater than 10 milliwatts, the total antenna gain shall be added to the measured RF output power to demonstrate compliance to the specified radiated power limits.

TEST RESULTS

☒ **Passed** ☐ **Not Applicable**

The antenna type is a FPC antenna, the directional gain of the antenna less than 6 dBi, please refer to the below antenna photo.

5.2. AC Power Conducted Emissions

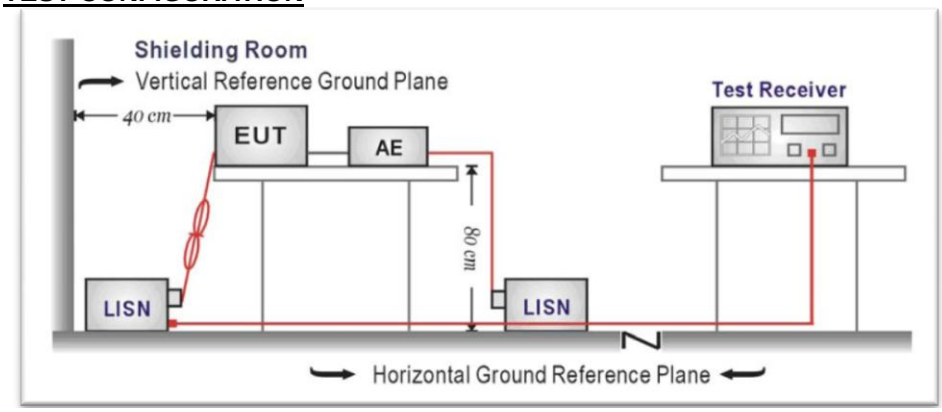
LIMIT

RSS-Gen Section 8.8

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 EUT was setup according to ANSI C63.10:2013
2. The EUT was placed on a plat form of nominal size, 1 m by 1.5 m, raised 80 cm above the conducting ground plane. The vertical conducting plane was located 40 cm to the rear of the EUT. All other surfaces of EUT were at least 80 cm from any other grounded conducting surface.
3. The EUT and simulators are connected to the main power through a line impedance stabilization network (LISN). The LISN provides a 50ohm / 50uH coupling impedance for the measuring equipment.
4. The peripheral devices are also connected to the main power through a LISN. (Please refer to the block diagram of the test setup and photographs)
5. Each current-carrying conductor of the EUT power cord, except the ground (safety) conductor,was individually connected through a LISN to the input power source.
6. The excess length of the power cord between the EUT and the LISN receptacle were folded back and forth at the center of the lead to form a bundle not exceeding 40 cm in length.
7. Conducted emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9 kHz.
8. During the above scans, the emissions were maximized by cable manipulation.

TEST MODE:

Please refer to the clause 3.3

TEST RESULTS

☐ **Passed** ☒ **Not Applicable**

NOTE: The EUT is powered by batteries

5.3. Field Strength of the Fundamental and Mask Measurement

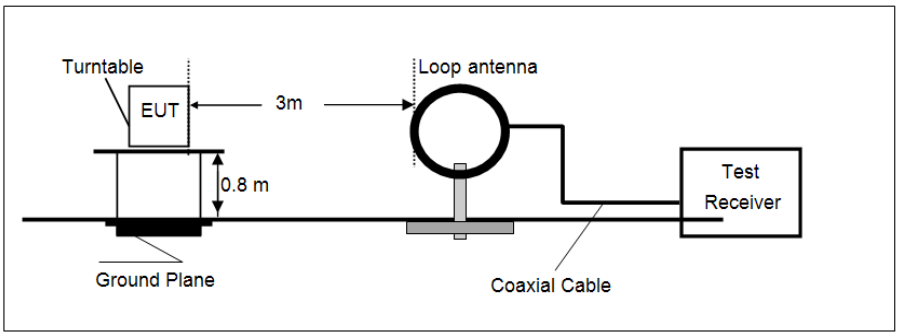
LIMIT

RSS-210 Annex B.6(a)(b)(c)

Fundamental frequency(MHz)	Field strength of fundamental (uV/m @30m)	Field strength of fundamental (dBuV/m @3m)
13.553-13.567	15848	124.0
13.410-13.553&13.567-13.710	334	90.5
13.110-13.410&13.710-14.010	106	80.5

Note: Limit dBuV/m @3m =Limit dBuV/m @30m +40*log(30/3)= Limit dBuV/m @30m + 40.

TEST CONFIGURATION



TEST PROCEDURE

1. The EUT was setup and tested according to ANSI C63.10:2013 requirements.
2. The EUT is placed on a turn table which is 0.8 meter above ground. The turn table is rotated 360 degrees to determine the position of the maximum emission level.
3. The EUT waspositioned such that the distance from antenna to the EUT was 3 meters.
4. The antenna is scanned from 1 meter to 4 meters to find out the maximum emission level. Thisis repeated for both horizontal and vertical polarization of the antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10:2013 on radiated measurement.

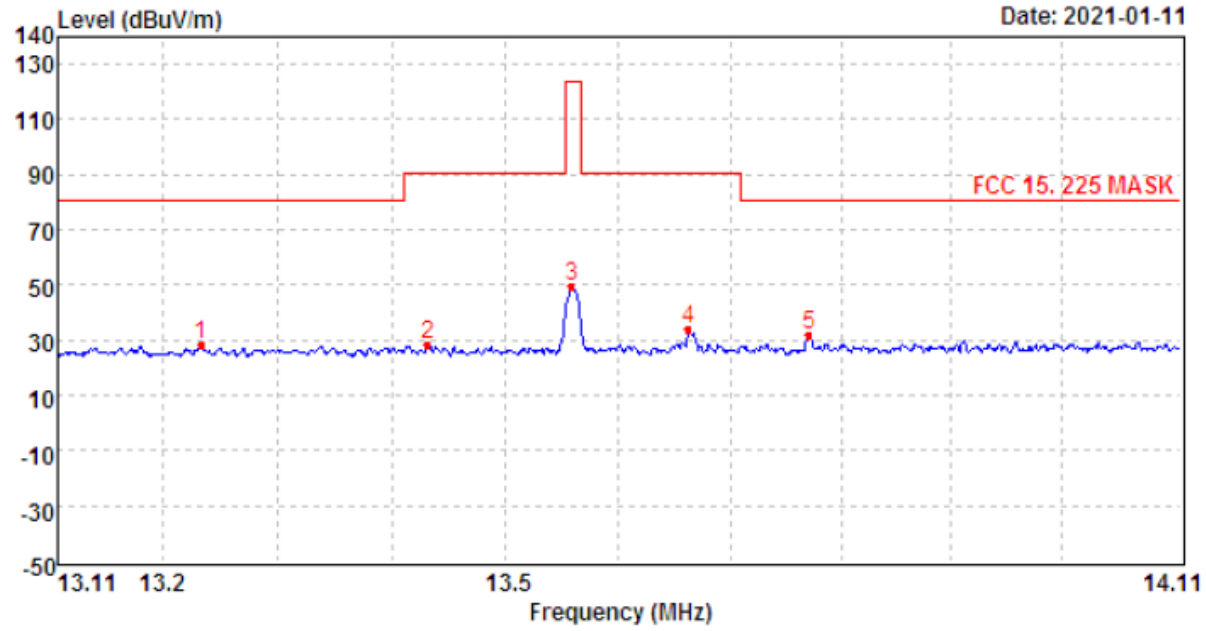
TEST MODE:

Please refer to the clause 3.3

TEST RESULTS

☒ **Passed** ☐ **Not Applicable**

Field Strength of The Fundamental and Mask



Mark	Frequency MHz	Reading dBuV/m	Antenna dB	Cable dB	Preamp dB	Level dBuV/m	Limit dBuV/m	Over limit	Remark
1	13.23	7.99	20.18	0.54	0.00	28.71	80.50	-51.79	Peak
2	13.43	7.60	20.10	0.54	0.00	28.24	90.50	-62.26	Peak
3	13.56	28.70	20.05	0.54	0.00	49.29	124.00	-74.71	Peak
4	13.66	13.44	20.01	0.54	0.00	33.99	90.50	-56.51	Peak
5	13.77	11.50	19.96	0.54	0.00	32.00	80.50	-48.50	Peak

5.4. 99% Occupied Bandwidth

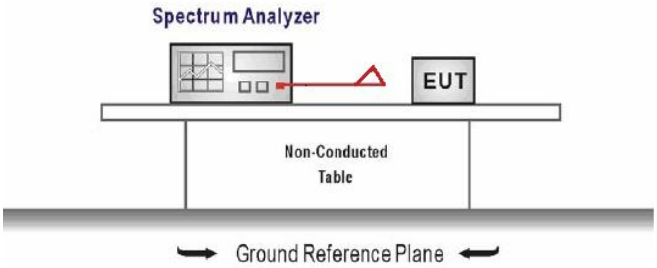
Requirement

RSS-Gen Scetion 6.7

Limit

Intentional radiators must be designed to ensure that the 99% Occupied bandwidth in the specific band 13.553~13.567MHz.

TEST CONFIGURATION



TEST PROCEDURE

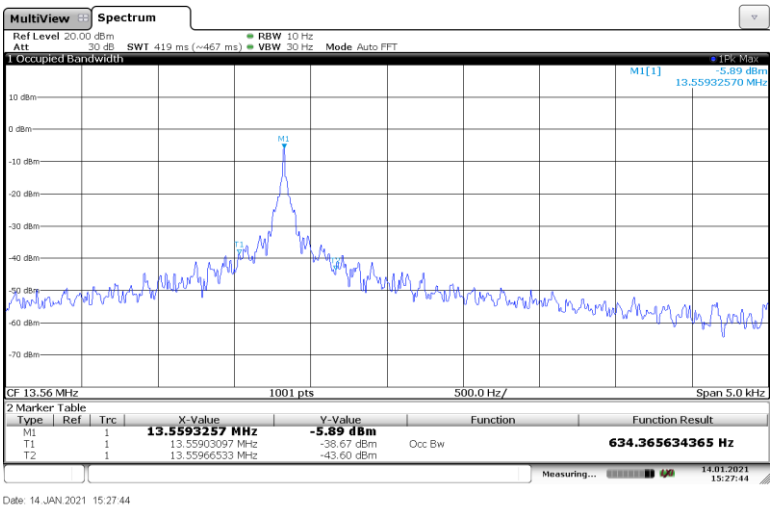
1. The transmitter output was connected to the spectrum analyzer through an attenuator, the path loss was compensated to the results for each measurement.
2. Set to the maximum power setting and enable the EUT transmit continuously
3. Use the following spectrum analyzer settings:
   Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel
   RBW ≥ 1% -5%of the 99% occupied bandwidth, VBW ≥ RBW
   Sweep = auto, Detector function = peak, Trace = max hold
4. Measure and record the results in the test report.

TEST MODE:

Please refer to the clause 3.3

TEST RESULTS

☒ **Passed** ☐ **Not Applicable**



Frequency Range (MHz)	f_L>13.553
	f_H<13.567
99% Bandwidth(Hz):	634.37

5.5. Radiated Emission

LIMIT

RSS-210 B.6(d)& RSS-Gen 8.9

Limit for frequency below 30MHz:

Frequency	Limit (uV/m)	Measurement Distance(m)	Remark
0.009~0.490	2400/F(kHz)	300	Quasi-peak
0.490~1.705	24000/F(kHz)	30	Quasi-peak
1.705~30.0	30	30	Quasi-peak

Note: Limit dBuV/m @3m = Limit dBuV/m @300m + 40*log(300/3)= Limit dBuV/m @300m +80,

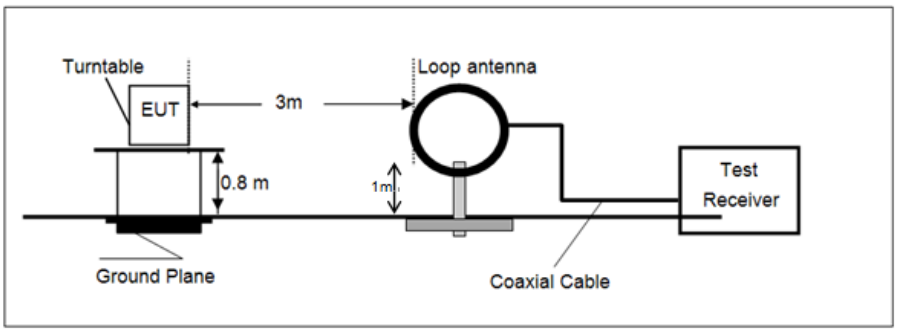
Limit dBuV/m @3m = Limit dBuV/m @30m +40*log(30/3)= Limit dBuV/m @30m + 40.

Limit for frequency above 30MHz:

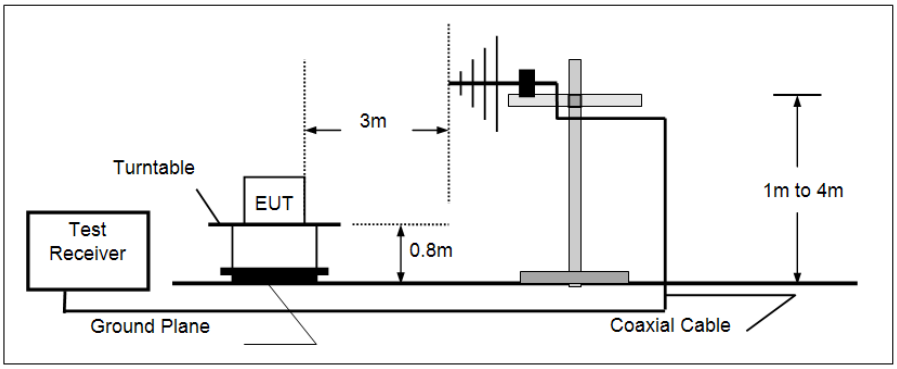
Frequency	Limit (dBuV/m@3m)	Remark
30MHz~88MHz	40.00	Quasi-peak
88MHz~216MHz	43.50	Quasi-peak
216MHz~960MHz	46.00	Quasi-peak
960MHz-1GHz	54.00	Quasi-peak
Above 1GHz	54.00	Average
	74.00	Peak

TEST CONFIGURATION

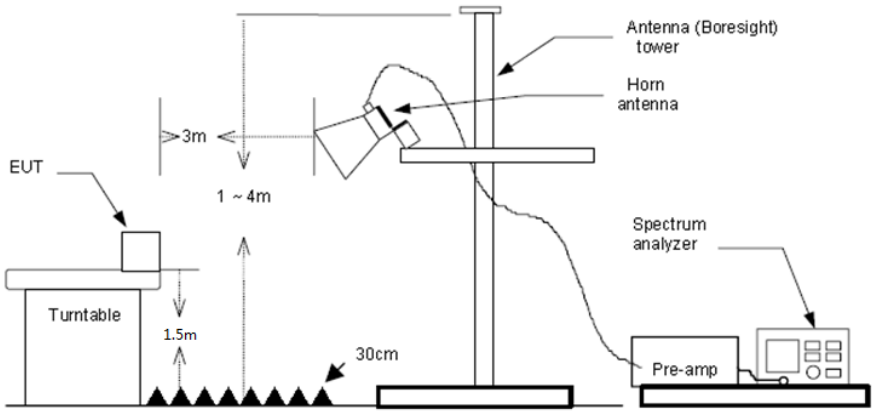
- 9 kHz ~ 30 MHz



- 30 MHz ~ 1 GHz



- Above 1 GHz



TEST PROCEDURE

1. The EUT was setup and tested according to ANSI C63.10:2013 requirements.
2. The EUT is placed on a turn table which is 0.8 meter above ground for below 1 GHz, and 1.5 m for above 1 GHz. The turn table is rotated 360 degrees to determine the position of the maximum emission level.
3. The EUT was set 3 meters from the receiving antenna, which was mounted on the top of a variable height antenna tower.
4. For each suspected emission, the EUT was arranged to its worst case and then tune the Antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level to comply with the guidelines.
5. Set to the maximum power setting and enable the EUT transmit continuously.
6. Use the following spectrum analyzer settings
   (1) Span shall wide enough to fully capture the emission being measured;
   (2) Below 30MHz:
   RBW=10 kHz, VBW=30 kHz, Sweep=auto, Detector function=peak, Trace=max hold;
   (3) 30MHz to 1 GHz:
   RBW=120 kHz, VBW=300 kHz, Sweep=auto, Detector function=peak, Trace=max hold;
   If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.
   (4) From 1 GHz to 10th harmonic:
   RBW=1MHz, VBW=3MHz Peak detector for Peak value.
   RBW=1MHz, VBW=3MHz RMS detector for Average value.

TEST MODE:

Please refer to the clause 3.3

TEST RESULTS

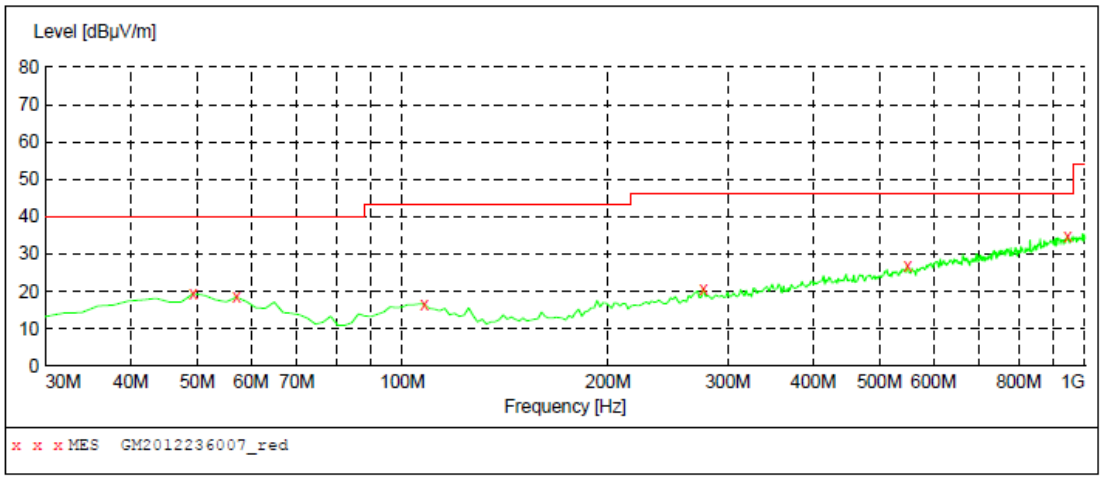
☒ **Passed** ☐ **Not Applicable**

Below 30MHz:

Mark	Frequnency (MHz)	Reading (dBuV/m)	Antenna (dB)	Cable (dB)	Preamp (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over Limit	Remark
1	0.01	14.78	22.31	0.20	0.00	37.29	127.60	-90.31	Peak
2	0.05	14.84	22.30	0.21	0.00	37.35	113.62	-76.27	Peak
3	0.10	24.29	22.30	0.22	0.00	46.81	107.60	-60.79	Peak
4	0.61	23.12	22.20	0.28	0.00	45.60	71.90	-26.30	Peak
5	3.58	17.91	22.20	0.38	0.00	40.49	69.54	-29.05	Peak
6	13.97	19.93	20.05	0.54	0.00	40.52	69.54	-29.02	Peak

Above 30MHz:

Polarization:	Vertical

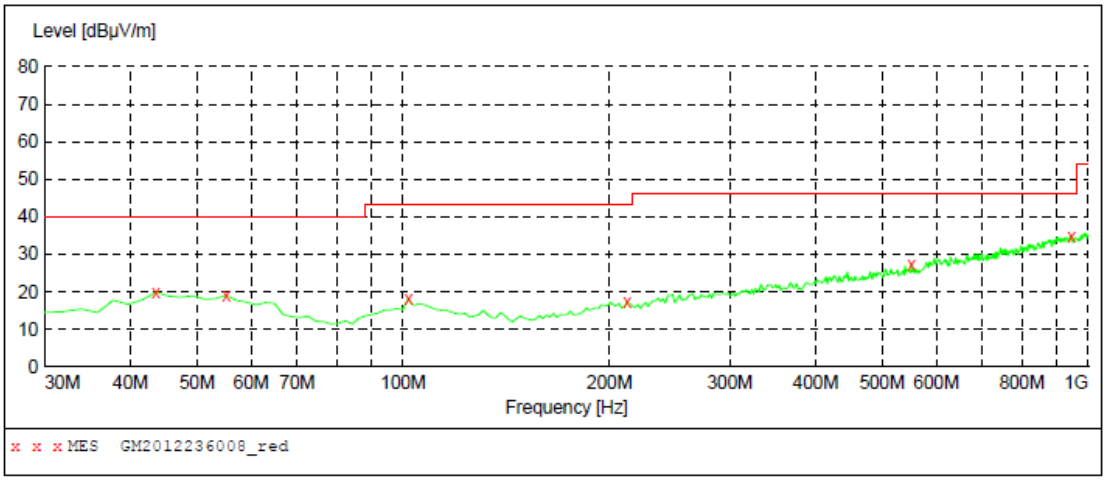


MEASUREMENT RESULT: "GM2012236007_red"

12/23/2020 9:10AM

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
49.400000	19.50	-8.8	40.0	20.5	QP	100.0	257.00	VERTICAL
57.160000	18.50	-9.4	40.0	21.5	QP	100.0	245.00	VERTICAL
107.600000	16.70	-10.7	43.5	26.8	QP	100.0	160.00	VERTICAL
276.380000	20.80	-7.9	46.0	25.2	QP	100.0	197.00	VERTICAL
549.920000	26.70	-0.6	46.0	19.3	QP	100.0	0.00	VERTICAL
943.740000	34.80	7.6	46.0	11.2	QP	100.0	98.00	VERTICAL

Polarization:	Horizontal



MEASUREMENT RESULT: "GM2012236008_red"

12/23/2020 9:14AM

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
43.580000	19.90	-9.2	40.0	20.1	QP	100.0	90.00	HORIZONTAL
55.220000	19.10	-9.1	40.0	20.9	QP	100.0	68.00	HORIZONTAL
101.780000	18.10	-10.3	43.5	25.4	QP	100.0	0.00	HORIZONTAL
212.360000	17.20	-10.5	43.5	26.3	QP	100.0	106.00	HORIZONTAL
551.860000	27.40	-0.5	46.0	18.6	QP	100.0	212.00	HORIZONTAL
945.680000	34.90	7.6	46.0	11.1	QP	100.0	0.00	HORIZONTAL

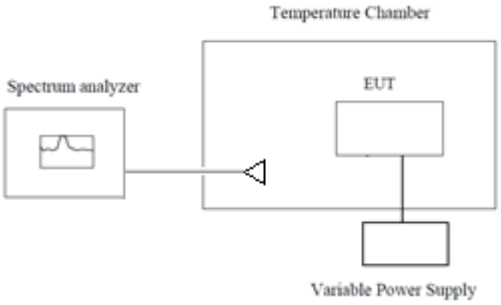
5.6. Frequency Stability

LIMIT

RSS-210 Annex B.6

The frequency tolerance of the carrier signal shall be maintained within ±0.01%(100ppm) of the operating frequency over a temperature variation of −20 degrees to + 50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

TEST CONFIGURATION



TEST PROCEDURE

1. The equipment under test was connected to an external power supply.
2. RF output was connected to a frequency counter or spectrum analyzer via feed through attenuators.
3. The EUT was placed inside the temperature chamber.
4. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and measure EUT 25℃ operating frequency as reference frequency.
5. Turn EUT off and set the chamber temperature to –20℃. After the temperature stabilized for approximately 30 minutes recorded the frequency.
6. Repeat step measure with 10℃ increased per stage until the highest temperature of +50℃ reached.

TEST MODE:

Please refer to the clause 3.3

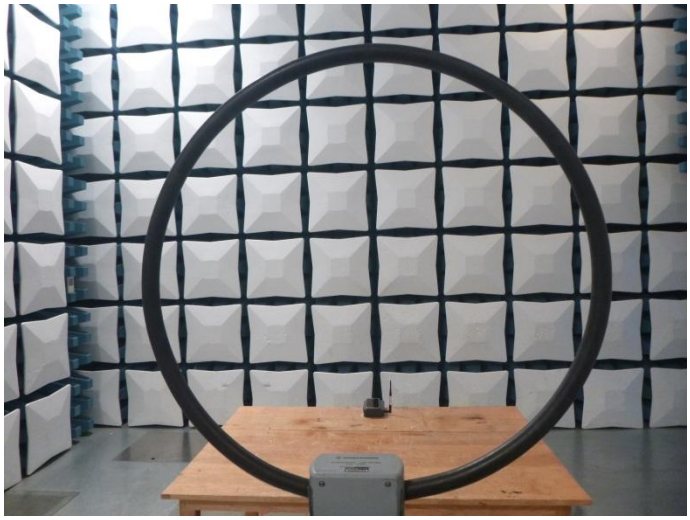
TEST RESULTS

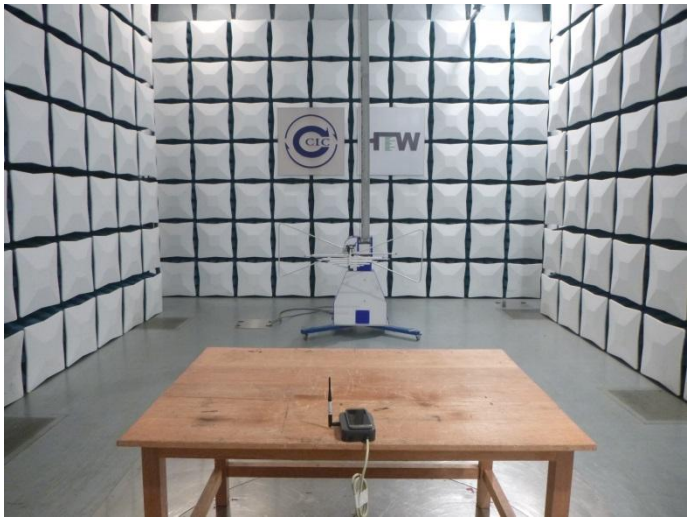
☒ **Passed** ☐ **Not Applicable**

Test Enviroment		Frequency Reading(MHz)	Frequency Error(%)	Limit	Result
Voltage	Temperature(℃)				
DC3.60V	-20	13.55940	0.00060	±0.01%	Pass
	-10	13.55938	0.00062	±0.01%	Pass
	0	13.55941	0.00059	±0.01%	Pass
	10	13.55939	0.00061	±0.01%	Pass
	20	13.55940	0.00060	±0.01%	Pass
	30	13.55937	0.00063	±0.01%	Pass
	40	13.55938	0.00062	±0.01%	Pass
	50	13.55942	0.00058	±0.01%	Pass
DC3.06V	20	13.55941	0.00059	±0.01%	Pass
DC4.14V	20	13.55939	0.00061	±0.01%	Pass

6. TEST SETUP PHOTOS OF THE EUT

Radiated Emissions





7. EXTERNAL AND INTERNAL PHOTOS OF THE EUT

Reference to the test report No.: CHTEW21010084.

--------End of Report--------