

TEST REPORT

FCC ID: 2ACMYAWS22R

Product: 4.3" LCD Real-Time Digital Wireless Monitor

Model No.: AWS22R

Additional Model: N/A

Trade Mark: N/A

Report No.: TCT161008E001

Issued Date: Oct. 18, 2016

Issued for:

Atoms Labs LLC

2670 Firewheel Dr. Suite D, Flower Mound ,TX 75028, UAS

Issued By:

Shenzhen Tongce Testing Lab.

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Appendix A: Photographs of Test Setup

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1. Test Certification

Product:	4.3" LCD Real-Time Digital Wireless Monitor
Model No.:	AWS22R
Additional Model:	N/A
Applicant:	Atoms Labs LLC
Address:	2670 Firewheel Dr. Suite D, Flower Mound ,TX 75028, UAS
Manufacturer:	Atoms Labs LLC
Address:	2670 Firewheel Dr. Suite D, Flower Mound ,TX 75028, UAS
Date of Test:	Oct. 08 – Oct. 17, 2016
Applicable Standards:	FCC CFR Title 47 Part 15 Subpart C Section 15.247

The above equipment has been tested by Shenzhen Tongce Testing Lab. and found compliance with the requirements set forth in the technical standards mentioned above. The results of testing in this report apply only to the product/system, which was tested. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Tested By:

Beryl Zhao

Beryl Zhao

Date:

Oct. 17, 2016

Reviewed By:

Joe Zhou

Joe Zhou

Date:

Oct. 18, 2016

Approved By:

Tomsin

Tomsin

Date:

Oct. 18, 2016

2. Test Result Summary

Requirement	CFR 47 Section	Result
Antenna Requirement	§15.203/§15.247 (c)	PASS
AC Power Line Conducted Emission	§15.207	PASS
Conducted Peak Output Power	§15.247 (b)(1) §2.1046	PASS
20dB Occupied Bandwidth	§15.247 (a)(1) §2.1049	PASS
Carrier Frequencies Separation	§15.247 (a)(1)	PASS
Hopping Channel Number	§15.247 (a)(1)	PASS
Dwell Time	§15.247 (a)(1)	PASS
Radiated Emission	§15.205/§15.209 §2.1053, §2.1057	PASS
Band Edge	§15.247(d) §2.1051, §2.1057	PASS

Note:

1. PASS: Test item meets the requirement.
2. Fail: Test item does not meet the requirement.
3. N/A: Test case does not apply to the test object.
4. The test result judgment is decided by the limit of test standard.

3. EUT Description

Product Name:	4.3" LCD Real-Time Digital Wireless Monitor
Model :	AWS22R
Additional Model:	N/A
Trade Mark:	N/A
Operation Frequency:	2414.25MHz~2461.50MHz
Number of Channel:	15
Modulation Technology:	FHSS
Antenna Type:	External Antenna
Antenna Gain:	2 dBi
Power Supply:	Adapter Information 1: MODEL: KSAS0050500100VUD INPUT: 100-240V~50/60Hz 0.18A OUTPUT: 5.0V, 1.0A Adapter Information 2: MODEL: GQ05-050100-AU INPUT: 100-240V~50/60Hz 0.3A Max OUTPUT: 5.0V, 1.0A

Operation Frequency each of channel

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
1	2414.25 MHz	5	2427.75 MHz	9	2441.25 MHz	13	2454.75 MHz
2	2417.625 MHz	6	2431.125 MHz	10	2444.625 MHz	14	2458.125 MHz
3	2421MHz	7	2434.5 MHz	11	2448 MHz	15	2461.50 MHz
4	2424.375 MHz	8	2437.875 MHz	12	2451.375 MHz		

Remark: Channel 1, 8 & 15 have been tested.

The EUT has two adapters, two batteries, two LCD screens:

Adapter 1	MODEL: KSAS0050500100VUD INPUT: 100-240V~50/60Hz 0.18A OUTPUT: 5.0V, 1.0A
Adapter 2	MODEL: GQ05-050100-AU INPUT: 100-240V~50/60Hz 0.3A Max OUTPUT: 5.0V, 1.0A
Battery 1	MODEL: 505068 CAPACITY: 1800mAh VOLTAGE: DC 3.7V
Battery 2	MODEL: 505068PL CAPACITY: 1800mAh VOLTAGE: DC 3.7V
LCD screen 1	ZSX-4300Q-V02
LCD screen 2	MODEL: KD43G20-40NC-A90

4. Genera Information

4.1. Test environment and mode

Operating Environment:	
Temperature:	25.0 °C
Humidity:	56 % RH
Atmospheric Pressure:	1010 mbar
Test Mode:	
Engineering mode:	Keep the EUT in continuous transmitting by select channel and modulations
<p>The sample was placed 0.8m & 1.5m for the measurement below & above 1GHz above the ground plane of 3m chamber. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating the turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages.</p>	

4.2. 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.

Equipment	Model No.	Serial No.	FCC ID	Trade Name
/	/	/	/	/

Note:

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.
3. For conducted measurements (Output Power, 20dB Occupied Bandwidth, Carrier Frequencies Separation, Hopping Channel Number, Dwell Time, Spurious Emissions), the antenna of EUT is connected to the test equipment via temporary antenna connector, the antenna connector is soldered on the antenna port of EUT, and the temporary antenna connector is listed in the Test Instruments.

5. Facilities and Accreditations

5.1. Facilities

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

- FCC - Registration No.: 572331

Shenzhen Tongce Testing Lab

The 3m Semi-anechoic chamber has been registered and fully described in a report with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files.

- IC - Registration No.: 10668A-1

The 3m Semi-anechoic chamber of Shenzhen TCT Testing Technology Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing

- CNAS - Registration No.: CNAS L6165

Shenzhen TCT Testing Technology Co., Ltd. is accredited to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration laboratories for the competence of testing. The Registration No. is CNAS L6165.

5.2. Location

Shenzhen Tongce Testing Lab

Address: 1F, Leinuo Watch Building, Fuyong Town, Baoan Dist, Shenzhen, China

Tel: 86-755-36638142

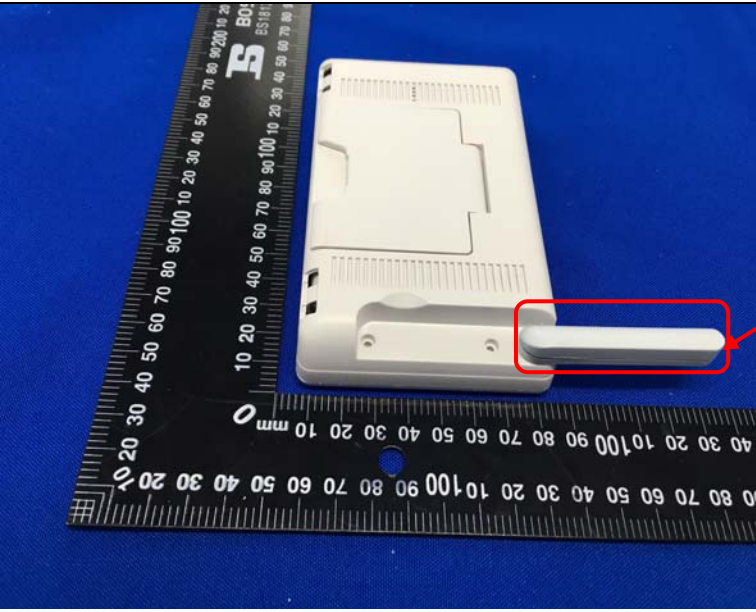
5.3. Measurement Uncertainty

The reported uncertainty of measurement $y \pm U$, where expanded uncertainty U is based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately 95 %.

No.	Item	MU
1	Conducted Emission	$\pm 2.56\text{dB}$
2	RF power, conducted	$\pm 0.12\text{dB}$
3	Spurious emissions, conducted	$\pm 0.11\text{dB}$
4	All emissions, radiated(<1G)	$\pm 3.92\text{dB}$
5	All emissions, radiated(>1G)	$\pm 4.28\text{dB}$
6	Temperature	$\pm 0.1^\circ\text{C}$
7	Humidity	$\pm 1.0\%$

6. Test Results and Measurement Data

6.1. Antenna requirement

Standard requirement:	FCC Part15 C Section 15.203 /247(c)
<p>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.</p> <p>15.247(c) (1)(i) requirement: (i) Systems operating in the 2400-2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.</p>	
E.U.T Antenna:	
<p>The antenna is an internal antenna which permanently attached, and the best case gain of the antenna is 2dBi.</p>	
	

6.2. Conducted Emission

6.2.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.207														
Test Method:	ANSI C63.10:2013														
Frequency Range:	150 kHz to 30 MHz														
Receiver setup:	RBW=9 kHz, VBW=30 kHz, Sweep time=auto														
Limits:	<table border="1"> <thead> <tr> <th rowspan="2">Frequency range (MHz)</th> <th colspan="2">Limit (dBuV)</th> </tr> <tr> <th>Quasi-peak</th> <th>Average</th> </tr> </thead> <tbody> <tr> <td>0.15-0.5</td> <td>66 to 56*</td> <td>56 to 46*</td> </tr> <tr> <td>0.5-5</td> <td>56</td> <td>46</td> </tr> <tr> <td>5-30</td> <td>60</td> <td>50</td> </tr> </tbody> </table>	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
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													
Test Setup:	<p><i>Remark</i> E.U.T: Equipment Under Test LISN: Line Impedance Stabilization Network Test table height=0.8m</p>														
Test Mode:	Refer to item 4.1														
Test Procedure:	<ol style="list-style-type: none"> 1. The E.U.T and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm/50uH coupling impedance for the measuring equipment. 2. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs). 3. Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10: 2013 on conducted measurement. 														
Test Result:	PASS														

6.2.2. Test Instruments

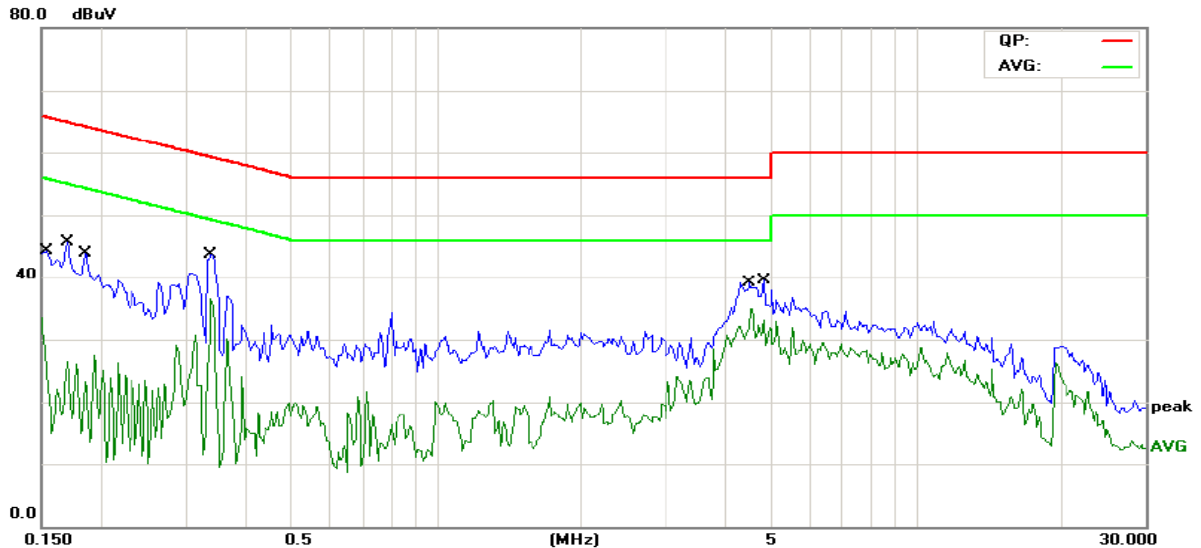
Conducted Emission Shielding Room Test Site (843)				
Equipment	Manufacturer	Model	Serial Number	Calibration Due
EMI Test Receiver	R&S	ESCS30	100139	Aug. 11, 2017
LISN	Schwarzbeck	NSLK 8126	8126453	Aug. 16, 2017
Coax cable	TCT	CE-05	N/A	Aug. 11, 2017
EMI Test Software	Shurple Technology	EZ-EMC	N/A	N/A

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

6.2.3. Test data

Please refer to following diagram for individual

Conducted Emission on Line Terminal of the power line (150 kHz to 30MHz)



Site Chamber #2 Phase: L1 Temperature: 23 (C)
Limit: FCC Part 15B Class B Conduction(QP) Power: AC 120V/60Hz Humidity: 54 %

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.1539	28.09	11.47	39.56	65.78	-26.22	QP	
2		0.1539	12.45	11.47	23.92	55.78	-31.86	AVG	
3		0.1695	28.16	11.46	39.62	64.98	-25.36	QP	
4		0.1695	12.53	11.46	23.99	54.98	-30.99	AVG	
5		0.1852	24.73	11.46	36.19	64.24	-28.05	QP	
6		0.1852	10.06	11.46	21.52	54.24	-32.72	AVG	
7		0.3375	28.87	11.38	40.25	59.26	-19.01	QP	
8	*	0.3375	20.69	11.38	32.07	49.26	-17.19	AVG	
9		4.4961	22.17	10.79	32.96	56.00	-23.04	QP	
10		4.4961	13.53	10.79	24.32	46.00	-21.68	AVG	
11		4.8008	22.58	10.68	33.26	56.00	-22.74	QP	
12		4.8008	12.80	10.68	23.48	46.00	-22.52	AVG	

Note:

Freq. = Emission frequency in MHz

Reading level (dBuV) = Receiver reading

Corr. Factor (dB) = Antenna factor + Cable loss

Measurement (dBuV) = Reading level (dBuV) + Corr. Factor (dB)

Limit (dBuV) = Limit stated in standard

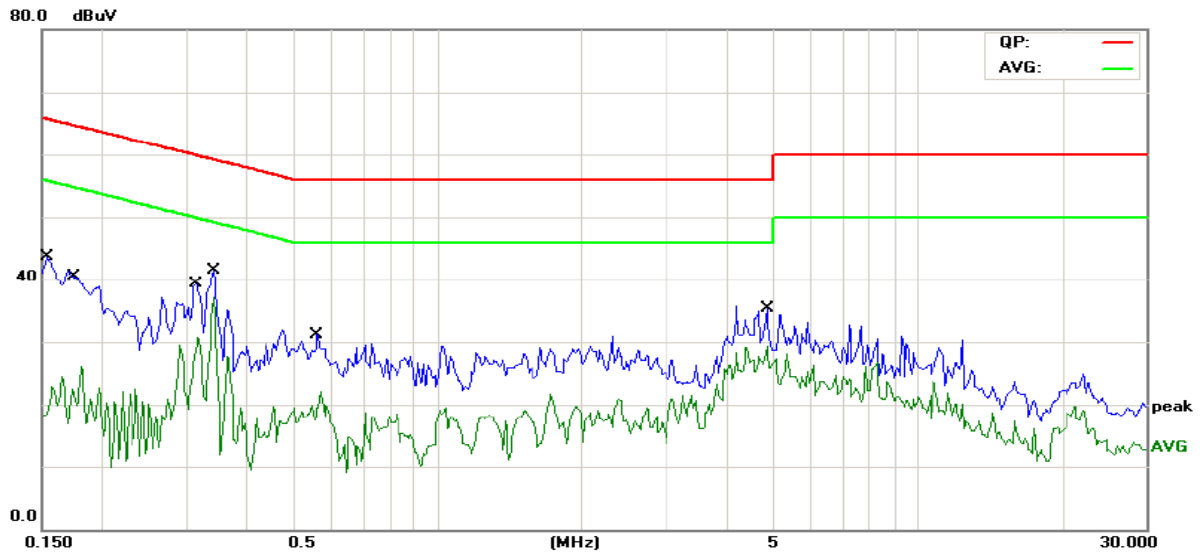
Margin (dB) = Measurement (dBuV) – Limits (dBuV)

Q.P. =Quasi-Peak

AVG =average

* is meaning the worst frequency has been tested in the frequency range 150 kHz to 30MHz

Conducted Emission on Neutral Terminal of the power line (150 kHz to 30MHz)



Site Chamber #2 Phase: **N** Temperature: 23 (C)
Limit: FCC Part 15B Class B Conduction(QP) Power: AC 120V/60Hz Humidity: 54 %

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.1539	23.98	11.47	35.45	65.78	-30.33	QP	
2		0.1539	11.38	11.47	22.85	55.78	-32.93	AVG	
3		0.1758	22.30	11.46	33.76	64.68	-30.92	QP	
4		0.1758	10.75	11.46	22.21	54.68	-32.47	AVG	
5		0.3141	25.37	11.39	36.76	59.86	-23.10	QP	
6		0.3141	22.20	11.39	33.59	49.86	-16.27	AVG	
7		0.3414	27.68	11.38	39.06	59.17	-20.11	QP	
8	*	0.3414	24.92	11.38	36.30	49.17	-12.87	AVG	
9		0.5641	13.01	11.28	24.29	56.00	-31.71	QP	
10		0.5641	7.91	11.28	19.19	46.00	-26.81	AVG	
11		4.8555	17.18	10.66	27.84	56.00	-28.16	QP	
12		4.8555	11.33	10.66	21.99	46.00	-24.01	AVG	

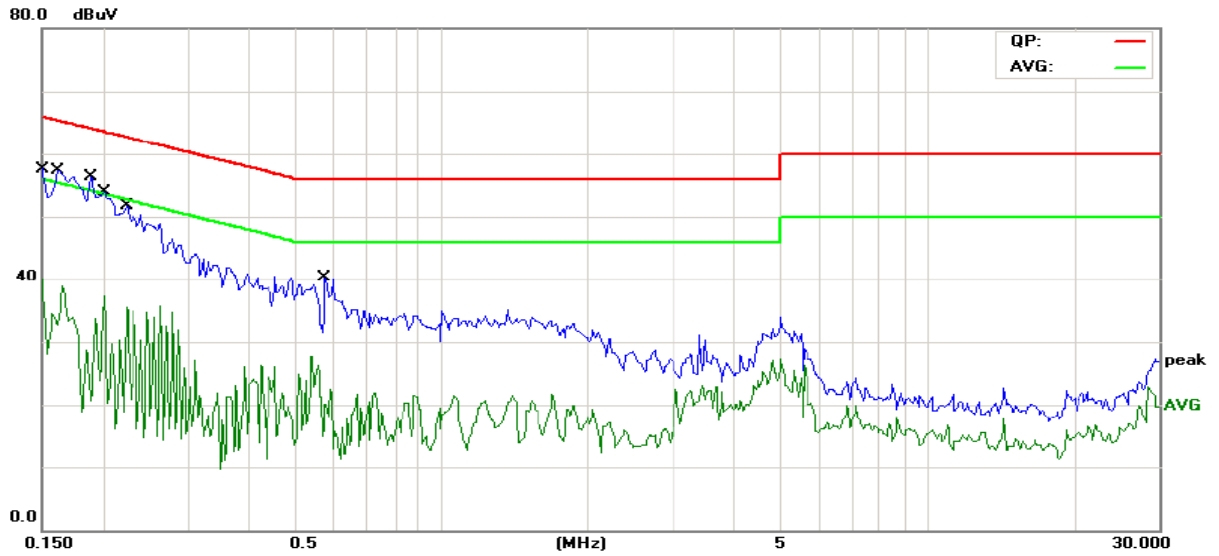
Note1:

- Freq. = Emission frequency in MHz
- Reading level (dBuV) = Receiver reading
- Corr. Factor (dB) = Antenna factor + Cable loss
- Measurement (dBuV) = Reading level (dBuV) + Corr. Factor (dB)
- Limit (dBuV) = Limit stated in standard
- Margin (dB) = Measurement (dBuV) – Limits (dBuV)
- Q.P. =Quasi-Peak AVG =average
- * is meaning the worst frequency has been tested in the frequency range 150 kHz to 30MHz.

Note2:

Measurements were conducted in all three channels (high, middle, low), two batteries (battery 1 and battery 2), two LCD screens(LCD screen 1 and LCD screen 2) and adapter1, and the worst case Mode (Highest channel, battery 1 LCD screen 1 and adapter1) was submitted only.

Conducted Emission on Line Terminal of the power line (150 kHz to 30MHz)

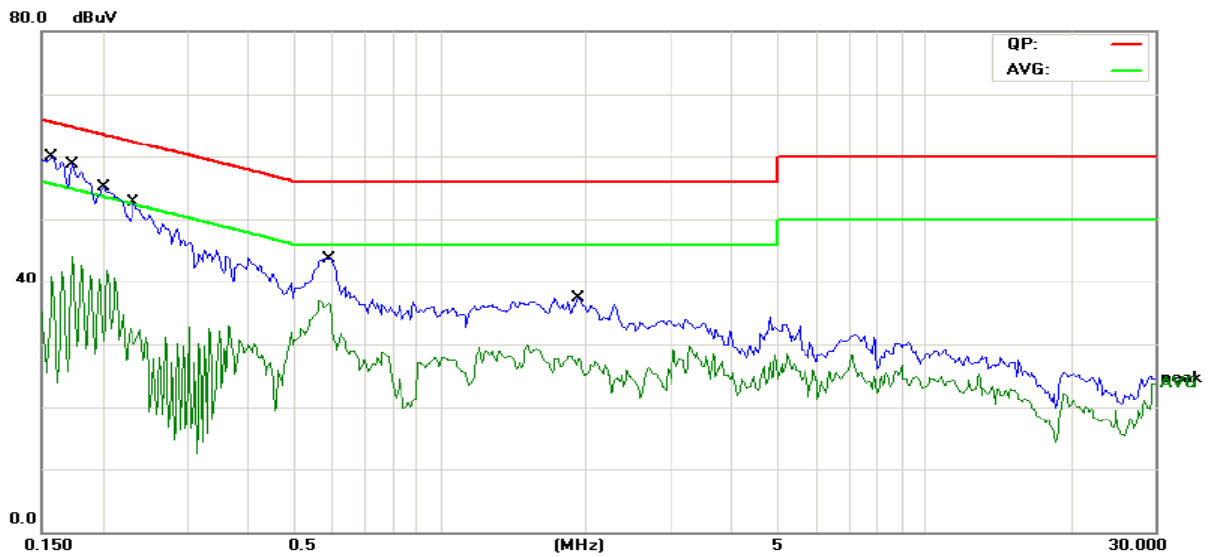


Site Chamber #2 Phase: **L1** Temperature: 23 (C)
 Limit: FCC Part 15B Class B Conduction(QP) Power: AC 120V/60Hz Humidity: 54 %

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.1500	40.14	11.47	51.61	65.99	-14.38	QP	
2		0.1500	21.37	11.47	32.84	55.99	-23.15	AVG	
3		0.1617	39.70	11.47	51.17	65.37	-14.20	QP	
4		0.1617	21.34	11.47	32.81	55.37	-22.56	AVG	
5		0.1891	36.85	11.46	48.31	64.07	-15.76	QP	
6		0.1891	18.85	11.46	30.31	54.07	-23.76	AVG	
7	*	0.2008	38.25	11.45	49.70	63.57	-13.87	QP	
8		0.2008	22.47	11.45	33.92	53.57	-19.65	AVG	
9		0.2242	35.58	11.44	47.02	62.66	-15.64	QP	
10		0.2242	19.52	11.44	30.96	52.66	-21.70	AVG	
11		0.5757	20.35	11.27	31.62	56.00	-24.38	QP	
12		0.5757	7.00	11.27	18.27	46.00	-27.73	AVG	



Conducted Emission on Neutral Terminal of the power line (150 kHz to 30MHz)



Site Chamber #2 Phase: **N** Temperature: 23 (C)
 Limit: FCC Part 15B Class B Conduction(QP) Power: AC 120V/60Hz Humidity: 54 %

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.1578	41.59	11.47	53.06	65.57	-12.51	QP	
2		0.1578	23.95	11.47	35.42	55.57	-20.15	AVG	
3	*	0.1734	41.72	11.46	53.18	64.79	-11.61	QP	
4		0.1734	25.71	11.46	37.17	54.79	-17.62	AVG	
5		0.2008	38.39	11.45	49.84	63.57	-13.73	QP	
6		0.2008	22.97	11.45	34.42	53.57	-19.15	AVG	
7		0.2320	35.50	11.43	46.93	62.37	-15.44	QP	
8		0.2320	21.10	11.43	32.53	52.37	-19.84	AVG	
9		0.5914	27.99	11.26	39.25	56.00	-16.75	QP	
10		0.5914	22.25	11.26	33.51	46.00	-12.49	AVG	
11		1.9352	19.47	11.65	31.12	56.00	-24.88	QP	
12		1.9352	13.00	11.65	24.65	46.00	-21.35	AVG	

Note1:

Freq. = Emission frequency in MHz

Reading level (dBuV) = Receiver reading

Corr. Factor (dB) = Antenna factor + Cable loss

Measurement (dBuV) = Reading level (dBuV) + Corr. Factor (dB)

Limit (dBuV) = Limit stated in standard

Margin (dB) = Measurement (dBuV) – Limits (dBuV)

Q.P. =Quasi-Peak AVG =average

* is meaning the worst frequency has been tested in the frequency range 150 kHz to 30MHz.

Note2:

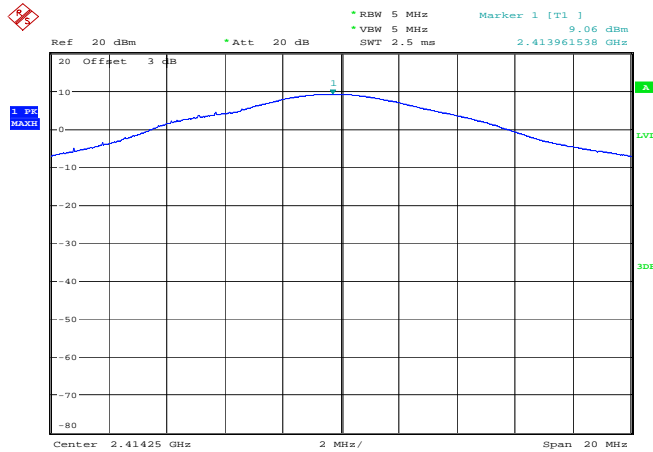
Measurements were conducted in all three channels (high, middle, low), two batteries (battery 1 and battery 2), two LCD screens(LCD screen 1 and LCD screen 2) and adapter 2, and the worst case Mode (Highest channel, battery 1 LCD screen 1 and adapter2) was submitted only.

6.3.3. Test Data

Test channel	Peak Output Power (dBm)	Limit (dBm)	Result
Lowest	9.06	21.00	PASS
Middle	8.87	21.00	PASS
Highest	8.66	21.00	PASS

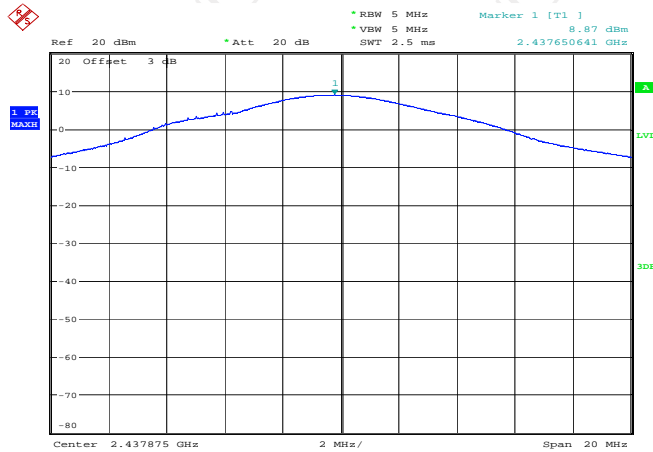
Test plots as follows:

Lowest channel



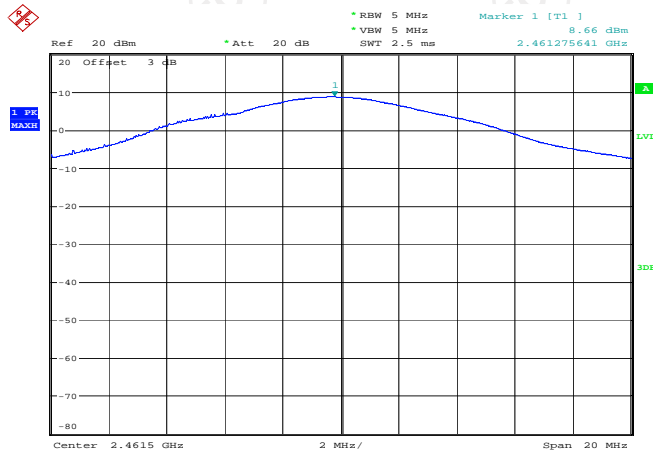
Date: 12.OCT.2016 12:09:02

Middle channel



Date: 12.OCT.2016 12:14:41


Highest channel



Date: 12.OCT.2016 12:08:28

6.4. 20dB Occupy Bandwidth

6.4.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.247 (a)(1)
Test Method:	ANSI C63.10:2013 and DA00-705
Limit:	N/A
Test Setup:	 <p style="text-align: center;">Spectrum Analyzer EUT</p>
Test Mode:	Transmitting mode with modulation
Test Procedure:	<ol style="list-style-type: none"> 1. The testing follows FCC Public Notice DA 00-705 Measurement Guidelines. 2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement. 3. Set to the maximum power setting and enable the EUT transmit continuously. 4. Use the following spectrum analyzer settings for 20dB Bandwidth measurement. Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel; RBW\geq1% of the 20 dB bandwidth; VBW\geqRBW; Sweep = auto; Detector function = peak; Trace = max hold. 5. Measure and record the results in the test report.
Test Result:	PASS

6.4.2. Test Instruments

RF Test Room				
Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	R&S	FSU	200054	Aug. 11, 2017
RF cable	TCT	RE-06	N/A	Aug. 12, 2017
Antenna Connector	TCT	RFC-01	N/A	Aug. 12, 2017

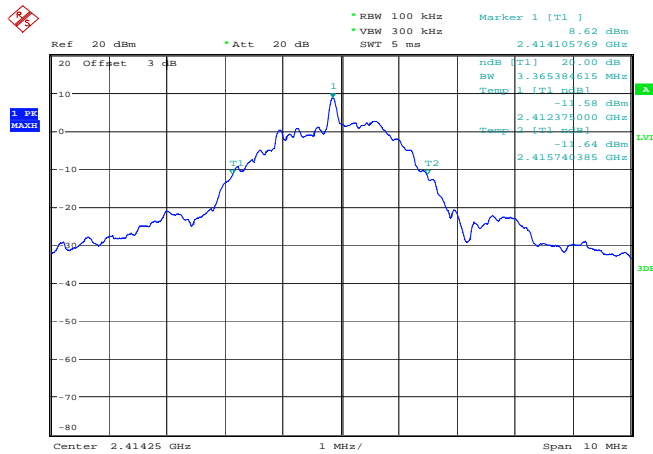
Note: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

6.4.3. Test data

Test channel	20dB Occupy Bandwidth (kHz)	Conclusion
Lowest	3365.38	PASS
Middle	3349.36	PASS
Highest	3365.38	PASS

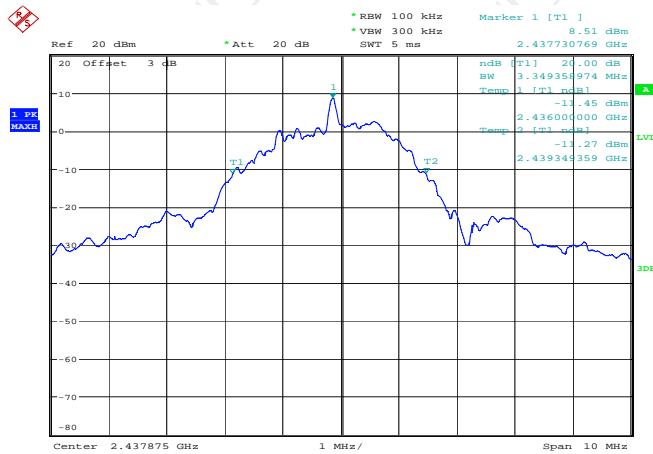
Test plots as follows:

Lowest channel



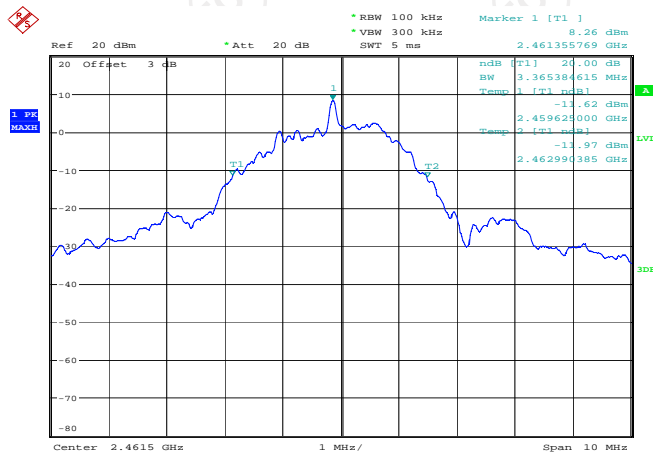
Date: 12.OCT.2016 12:30:02

Middle channel



Date: 12.OCT.2016 12:31:28

Highest channel



Date: 12.OCT.2016 12:27:03

6.5.3. Test data

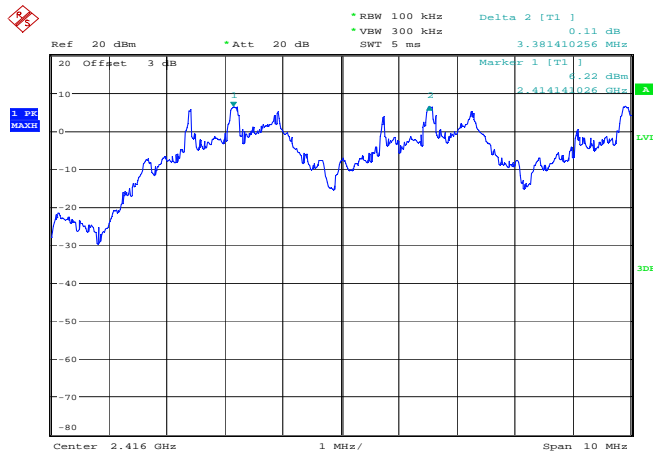
Test channel	Carrier Frequencies Separation (kHz)	Limit (kHz)	Result
Lowest	3381.41	2243.59	PASS
Middle	3381.41	2243.59	PASS
Highest	3381.41	2243.59	PASS

Note: According to section 6.4

20dB bandwidth (kHz) (worse case)	Limit (kHz) (Carrier Frequencies Separation)
3365.38	2243.59

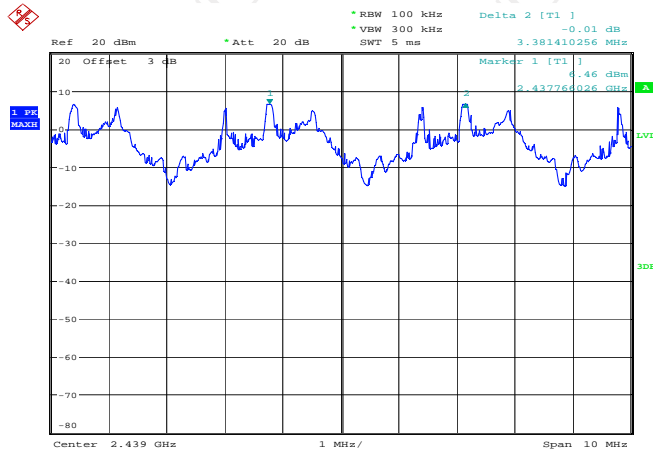
Test plots as follows:

Lowest channel



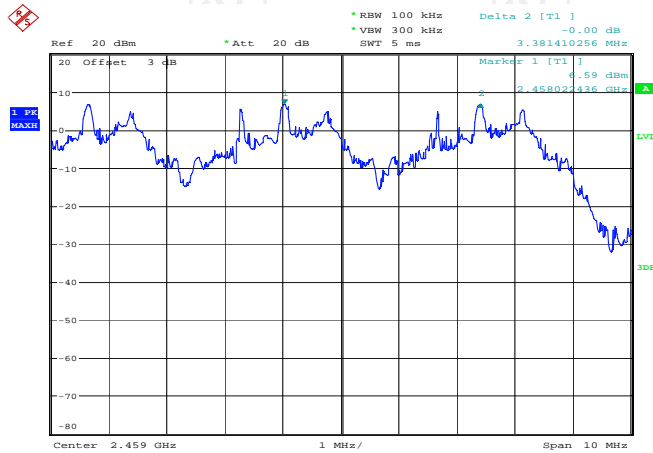
Date: 12.OCT.2016 21:01:01

Middle channel



Date: 12.OCT.2016 21:04:46

Highest channel



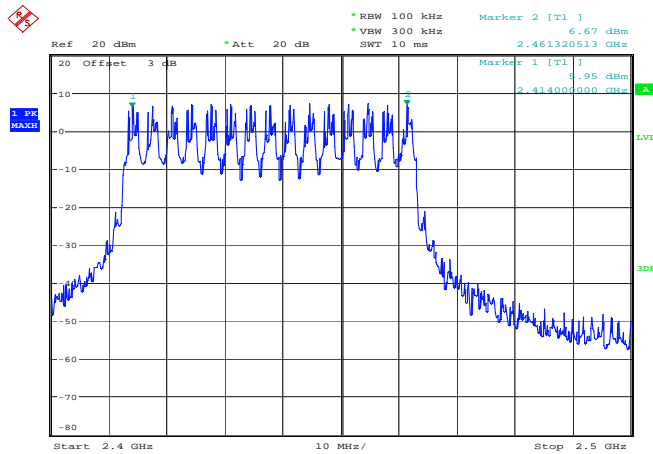
Date: 12.OCT.2016 21:09:07

6.6.3. Test data

Test Mode	Hopping channel numbers	Limit	Result
Hopping	15	15	PASS

Test plots as follows:





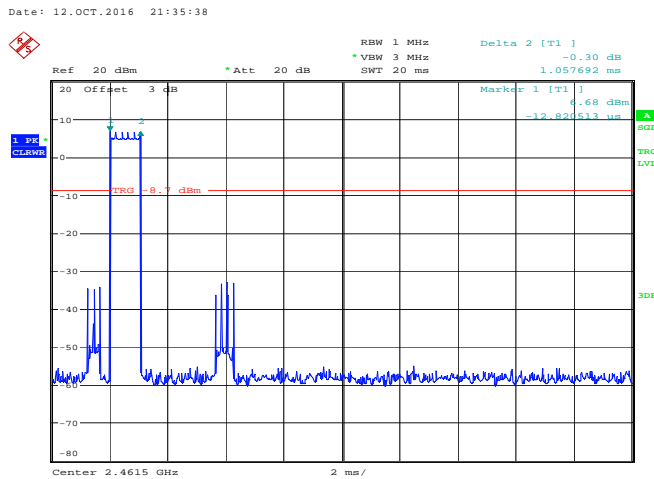
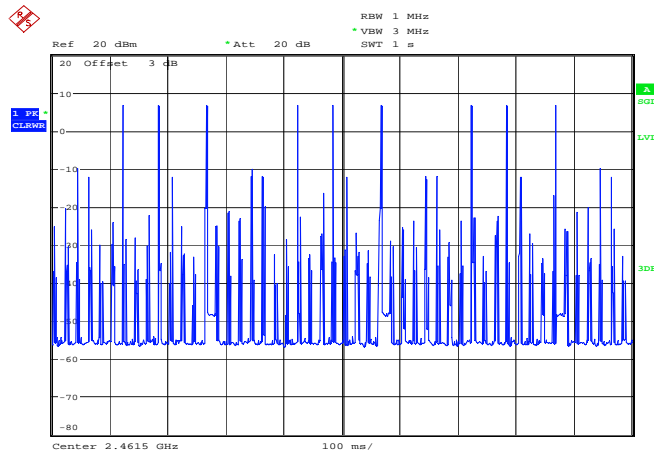
Date: 12.OCT.2016 20:53:26

6.7.3. Test Data

Test Mode	Dwell time	Limit (second)	Result
Hopping	0.057	400ms	PASS

$$\text{Dwell time} = 0.4 * 15 * 9 / 1000 \text{ms} * 1.058 \text{ms} = 0.057$$

Test plots as follows:



Date: 12.OCT.2016 21:40:01

6.8. Pseudorandom Frequency Hopping Sequence

Test Requirement:

FCC Part15 C Section 15.247 (a)(1) requirement:

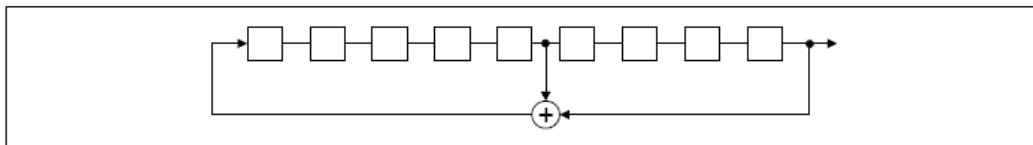
Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

Alternatively. Frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW. The system shall hop to channel frequencies that are selected at the system hopping rate from a Pseudorandom ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

EUT Pseudorandom Frequency Hopping Sequence

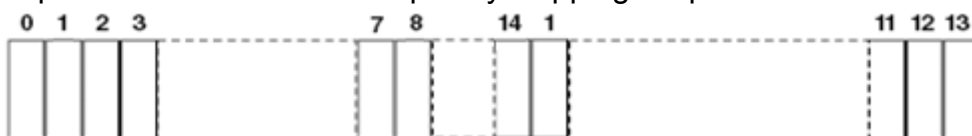
The pseudorandom sequence may be generated in a nine-stage shift register whose 5th and 9th stage outputs are added in a modulo-two addition stage. And the result is fed back to the input of the first stage. The sequence begins with the first one of 9 consecutive ones; i.e. the shift register is initialized with nine ones.

- Number of shift register stages: 9
- Length of pseudo-random sequence: $2^9 - 1 = 511$ bits
- Longest sequence of zeros: 8 (non-inverted signal)



Linear Feedback Shift Register for Generation of the PRBS sequence


An example of Pseudorandom Frequency Hopping Sequence as follow:



Each frequency used equally on the average by each transmitter.
The system receivers have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shift frequencies in synchronization with the transmitted signals.

6.9. Conducted Band Edge Measurement

6.9.1. Test Specification

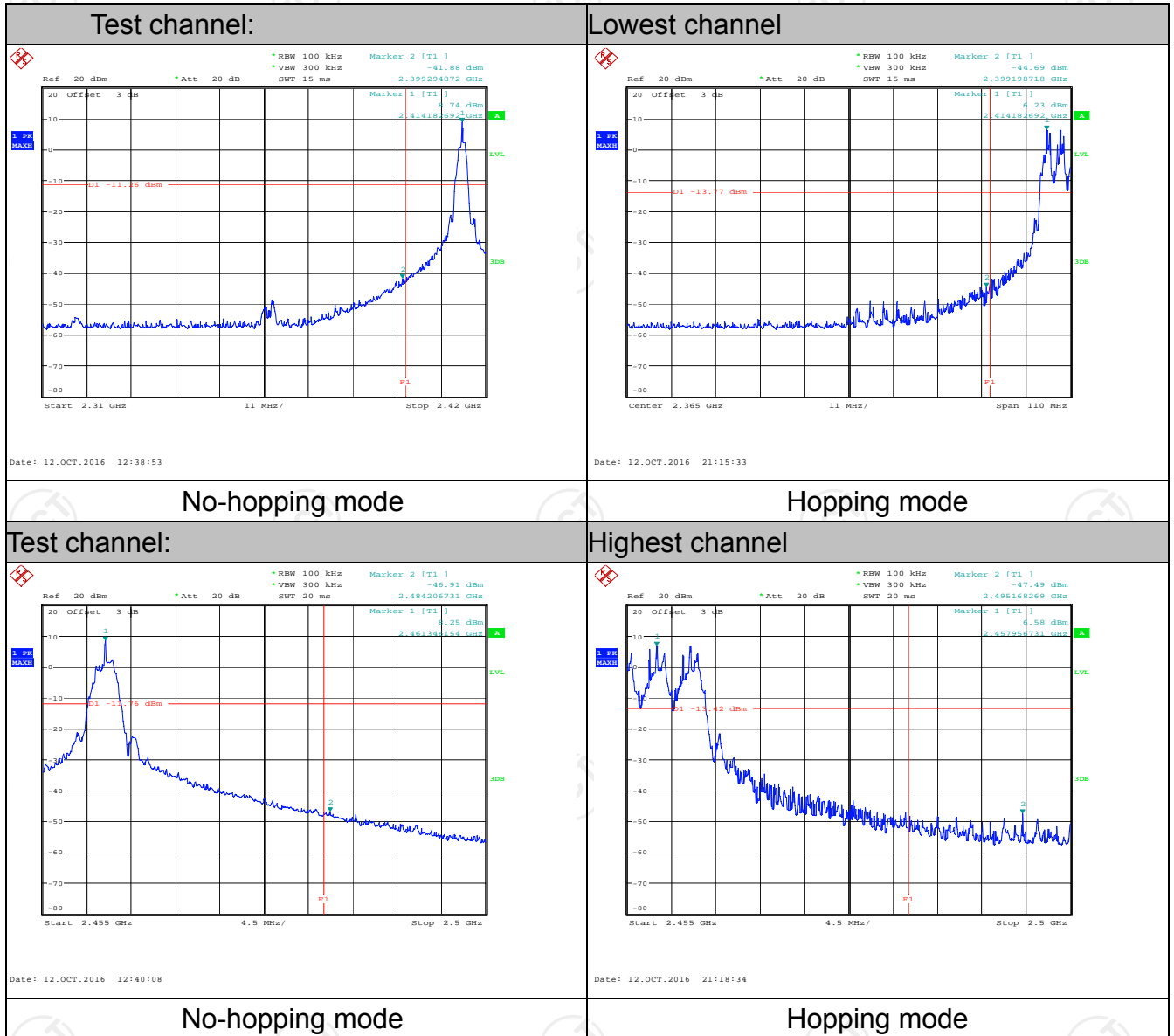
Test Requirement:	FCC Part15 C Section 15.247 (d)
Test Method:	ANSI C63.10:2013 and DA00-705
Limit:	In any 100 kHz bandwidth outside the intentional radiation frequency band, the radio frequency power shall be at least 20 dB below the highest level of the radiated power. In addition, radiated emissions which fall in the restricted bands must also comply with the radiated emission limits.
Test Setup:	 <p style="text-align: center;">Spectrum Analyzer EUT</p>
Test Mode:	Transmitting mode with modulation
Test Procedure:	<ol style="list-style-type: none"> 1. The testing follows the guidelines in Band-edge Compliance of RF Conducted Emissions of FCC Public Notice DA 00-705 Measurement Guidelines. 2. Set to the maximum power setting and enable the EUT transmit continuously. 3. Set RBW = 100 kHz ($\geq 1\%$ span=10MHz), VBW = 300 kHz (\geqRBW). Band edge emissions must be at least 20 dB down from the highest emission level within the authorized band as measured with a 100kHz RBW. The attenuation shall be 30 dB instead of 20 dB when RMS conducted output power procedure is used. 4. Enable hopping function of the EUT and then repeat step 2 and 3. 5. Measure and record the results in the test report.
Test Result:	PASS

6.9.2. Test Instruments

RF Test Room				
Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	R&S	FSU	200054	Aug. 11, 2017
RF cable	TCT	RE-06	N/A	Aug. 12, 2017
Antenna Connector	TCT	RFC-01	N/A	Aug. 12, 2017

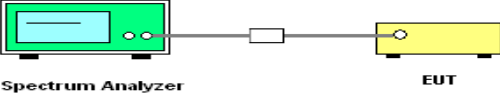
Note: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

6.9.3. Test Data



6.10. Conducted Spurious Emission Measurement

6.10.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.247 (d)
Test Method:	ANSI C63.10:2013 and DA00-705
Limit:	In any 100 kHz bandwidth outside the intentional radiation frequency band, the radio frequency power shall be at least 20 dB below the highest level of the radiated power. In addition, radiated emissions which fall in the restricted bands must also comply with the radiated emission limits.
Test Setup:	 <p style="text-align: center;">Spectrum Analyzer EUT</p>
Test Mode:	Transmitting mode with modulation
Test Procedure:	<ol style="list-style-type: none"> 1. The testing follows the guidelines in Spurious RF Conducted Emissions of FCC Public Notice DA 00-705 Measurement Guidelines 2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement. 3. Set to the maximum power setting and enable the EUT transmit continuously. 4. Set RBW = 100 kHz, VBW = 300kHz, scan up through 10th harmonic. All harmonics / spurs must be at least 20 dB down from the highest emission level within the authorized band as measured with a 100 kHz RBW. 5. Measure and record the results in the test report. 6. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
Test Result:	PASS

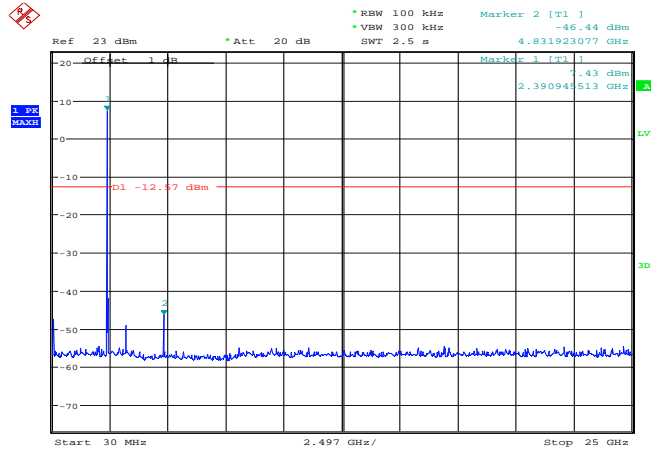
6.10.2. Test Instruments

RF Test Room				
Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	R&S	FSQ	200061	Aug. 11, 2017
RF cable	TCT	RE-06	N/A	Aug. 12, 2017
Antenna Connector	TCT	RFC-01	N/A	Aug. 12, 2017

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

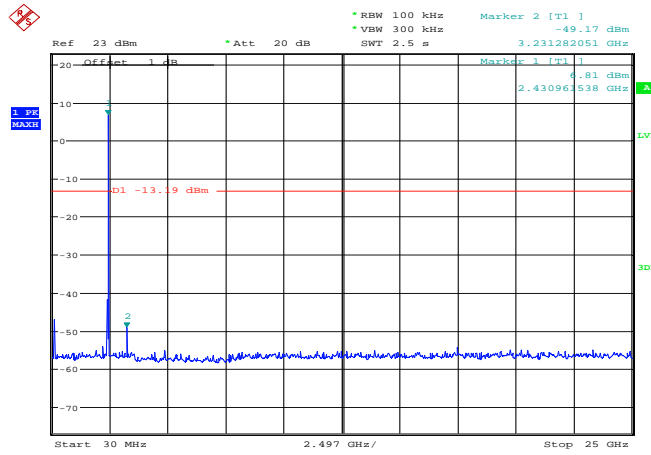
6.10.3. Test Data

Lowest Channel



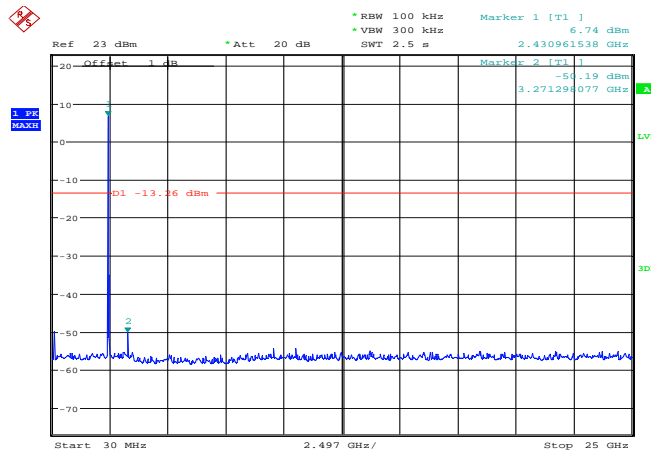
Date: 12.OCT.2016 23:04:18

Middle Channel



Date: 12.OCT.2016 23:05:41

Highest Channel

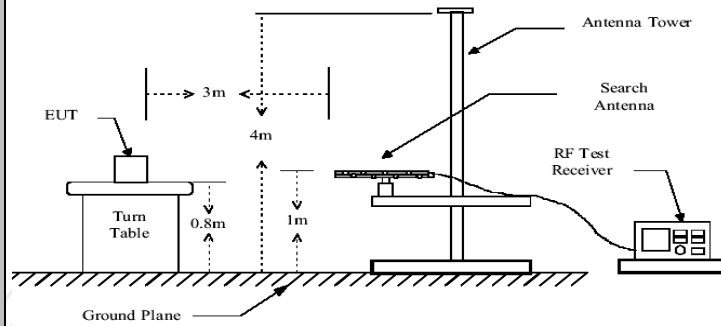


Date: 12.OCT.2016 23:06:48

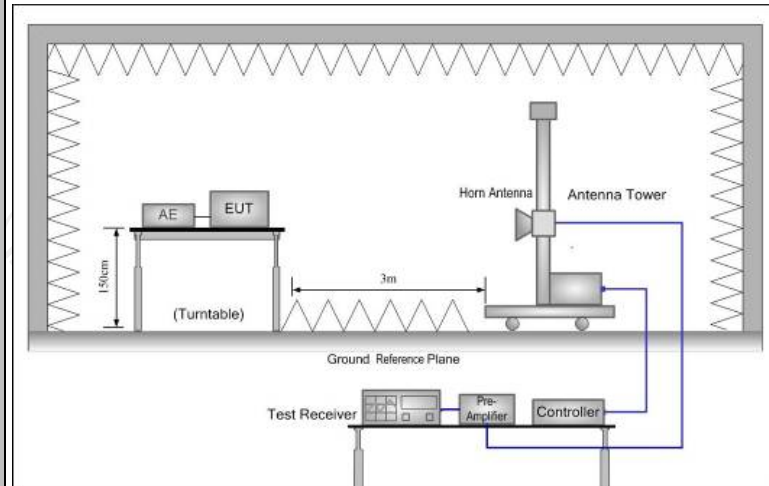
6.11. Radiated Spurious Emission Measurement

6.11.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.209					
Test Method:	ANSI C63.10: 2013					
Frequency Range:	9 kHz to 25 GHz					
Measurement Distance:	3 m					
Antenna Polarization:	Horizontal & Vertical					
Receiver Setup:	Frequency	Detector	RBW	VBW	Remark	
	9kHz- 150kHz	Quasi-peak	200Hz	1kHz	Quasi-peak Value	
	150kHz- 30MHz	Quasi-peak	9kHz	30kHz	Quasi-peak Value	
	30MHz-1GHz	Quasi-peak	100KHz	300KHz	Quasi-peak Value	
	Above 1GHz	Peak	1MHz	3MHz	Peak Value	
		Peak	1MHz	10Hz	Average Value	
Limit:	Frequency	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	30	30			
	30-88	100	3			
	88-216	150	3			
	216-960	200	3			
	Above 960	500	3			
	Frequency	Field Strength (microvolts/meter)	Measurement Distance (meters)	Detector		
	Above 1GHz	500	3	Average		
	5000	3	Peak			
Test setup:	For radiated emissions below 30MHz					
	<p>Distance = 3m</p> <p>EUT</p> <p>Turn table</p> <p>Ground Plane</p> <p>Computer</p> <p>Pre -Amplifier</p> <p>Receiver</p>					
	30MHz to 1GHz					



Above 1GHz



Test Mode:

Transmitting mode with modulation

Test Procedure:

1. The testing follows the guidelines in Spurious Radiated Emissions of FCC Public Notice DA 00-705 Measurement Guidelines.
2. For the radiated emission test below 1GHz:
The EUT was placed on a turntable with 0.8 meter above ground. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower. 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.
- For the radiated emission test above 1GHz:
Place the measurement antenna on a turntable with 1.5 meter above ground, which is away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT,

	<p>depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.</p> <p>3. Set to the maximum power setting and enable the EUT transmit continuously.</p> <p>4. Use the following spectrum analyzer settings:</p> <p>(1) Span shall wide enough to fully capture the emission being measured;</p> <p>(2) Set RBW=100 kHz for f < 1 GHz, RBW=1MHz for f>1GHz ; VBW≥RBW; Sweep = auto; Detector function = peak; Trace = max hold for peak</p> <p>(3) For average measurement: use duty cycle correction factor method per 15.35(c). Duty cycle = On time/100 milliseconds On time = N1*L1+N2*L2+...+Nn-1*LNn-1+Nn*Ln Where N1 is number of type 1 pulses, L1 is length of type 1 pulses, etc. Average Emission Level = Peak Emission Level + 20*log(Duty cycle)</p> <p>Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level</p>
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Test results:	PASS
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6.11.2. Test Instruments

Radiated Emission Test Site (966)				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
ESPI Test Receiver	ROHDE&SCHW ARZ	ESVD	100008	Aug. 11, 2017
Spectrum Analyzer	ROHDE&SCHW ARZ	FSEM	848597/001	Aug. 11, 2017
Spectrum Analyzer	Agilent	N9020A	MY49100060	Aug. 12, 2017
Pre-amplifier	EM Electronics Corporation CO.,LTD	EM30265	07032613	Aug. 11, 2017
Pre-amplifier	HP	8447D	2727A05017	Aug. 11, 2017
Loop antenna	ZHINAN	ZN30900A	12024	Aug. 13, 2017
Broadband Antenna	Schwarzbeck	VULB9163	340	Aug. 13, 2017
Horn Antenna	Schwarzbeck	BBHA 9120D	631	Aug. 13, 2017
Horn Antenna	Schwarzbeck	BBHA 9170	373	Aug. 13, 2017
Antenna Mast	CCS	CC-A-4M	N/A	N/A
Coax cable	TCT	RE-low-01	N/A	Aug. 11, 2017
Coax cable	TCT	RE-high-02	N/A	Aug. 11, 2017
Coax cable	TCT	RE-low-03	N/A	Aug. 11, 2017
Coax cable	TCT	RE-high-04	N/A	Aug. 11, 2017
EMI Test Software	Shurple Technology	EZ-EMC	N/A	N/A

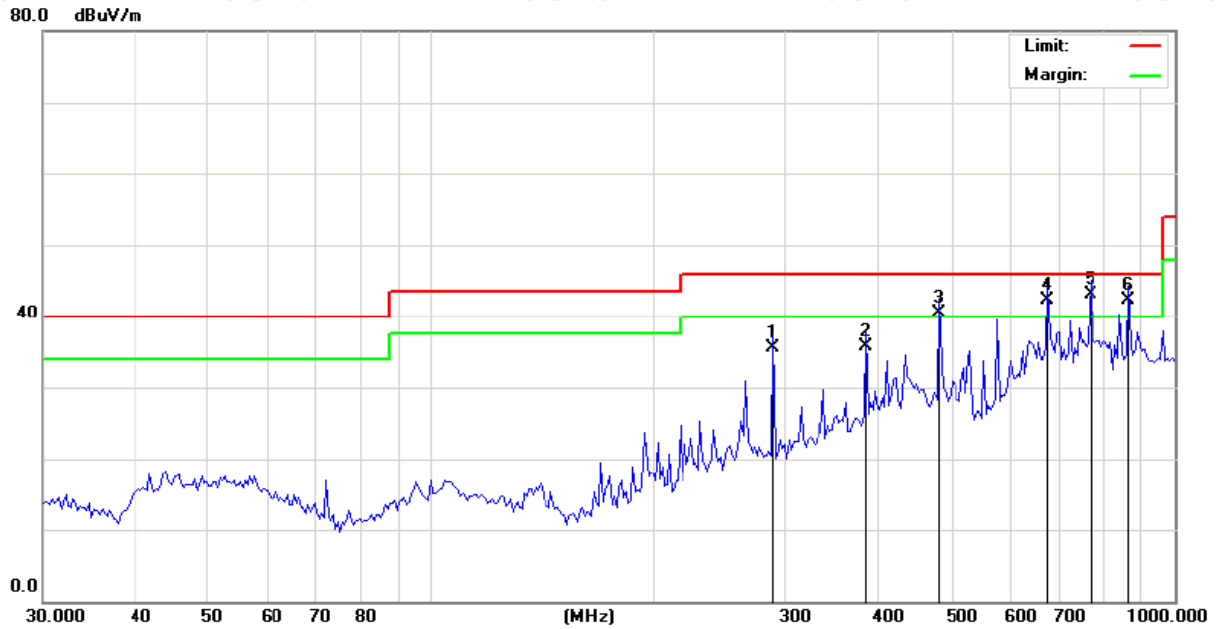
Note: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

6.11.3. Test Data

Please refer to following diagram for individual

Below 1GHz

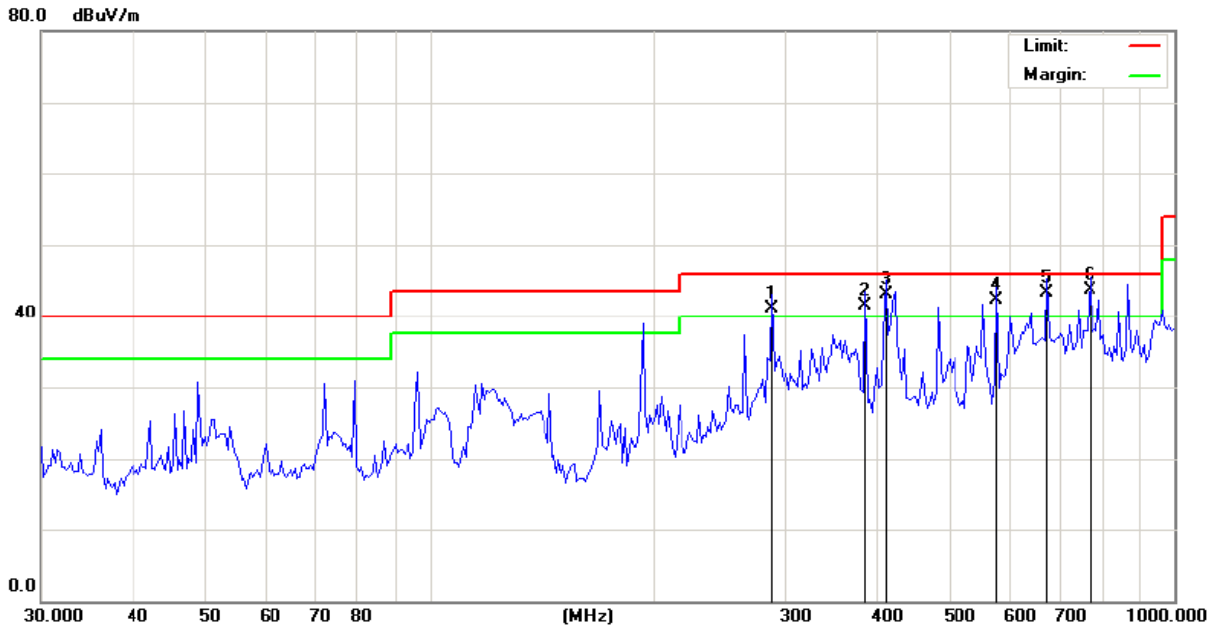
Horizontal:



Site: Polarization: **Horizontal** Temperature: 23
 Limit: FCC Part 15B Class B RE_3 m Power: Humidity: 54 %

No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	Comment
1		288.2840	42.50	-7.08	35.42	46.00	-10.58	QP	0	
2		384.5446	40.10	-4.36	35.74	46.00	-10.26	QP	0	
3	!	481.5110	43.10	-2.60	40.50	46.00	-5.50	QP	0	
4	!	674.6766	41.20	1.17	42.37	46.00	-3.63	QP	0	
5	*	771.0475	37.30	5.88	43.18	46.00	-2.82	QP	0	
6	!	868.8860	36.40	5.95	42.35	46.00	-3.65	QP	0	

Vertical:



Site: Polarization: **Vertical** Temperature: 23
 Limit: FCC Part 15B Class B RE_3 m Power: Humidity: 54 %

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Antenna Height cm	Table Degree degree	Comment
1	!	288.2840	48.10	-7.08	41.02	46.00	-4.98	QP	0	
2	!	384.5446	45.80	-4.36	41.44	46.00	-4.56	QP	0	
3	!	409.6505	47.00	-3.88	43.12	46.00	-2.88	QP	0	
4	!	578.0357	42.70	-0.48	42.22	46.00	-3.78	QP	0	
5	!	674.6766	42.10	1.17	43.27	46.00	-2.73	QP	0	
6	*	771.0475	37.80	5.88	43.68	46.00	-2.32	QP	0	

Note: 1. The low frequency, which started from 9KHz~30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported

2. Measurements were conducted in all three channels (high, middle, low), two batteries (battery 1 and battery 2), and two LCD screens(LCD screen 1 and LCD screen 2), and the worst case Mode (Highest channel, battery 1 and LCD screen 1) was submitted only.

Above 1GHz

Low channel: 2414.25 MHz									
Frequency (MHz)	Ant. Pol. H/V	Peak reading (dB μ V)	AV reading (dB μ V)	Correction Factor (dB/m)	Emission Level		Peak limit (dB μ V/m)	AV limit (dB μ V/m)	Margin (dB)
					Peak (dB μ V/m)	AV (dB μ V/m)			
2390	H	43.73	---	-8.27	35.46	---	74	54	-18.54
4828.5	H	43.95	---	0.66	44.61	---	74	54	-9.39
7242.75	H	34.09	---	9.5	43.59	---	74	54	-10.41
---	H	---	---	---	---	---	---	---	---
2390	V	43.78	---	-8.27	35.51	---	74	54	-18.49
4828.5	V	45.51	---	0.66	46.17	---	74	54	-7.83
7242.75	V	40.38	---	9.5	49.88	---	74	54	-4.12
---	V	---	---	---	---	---	---	---	---

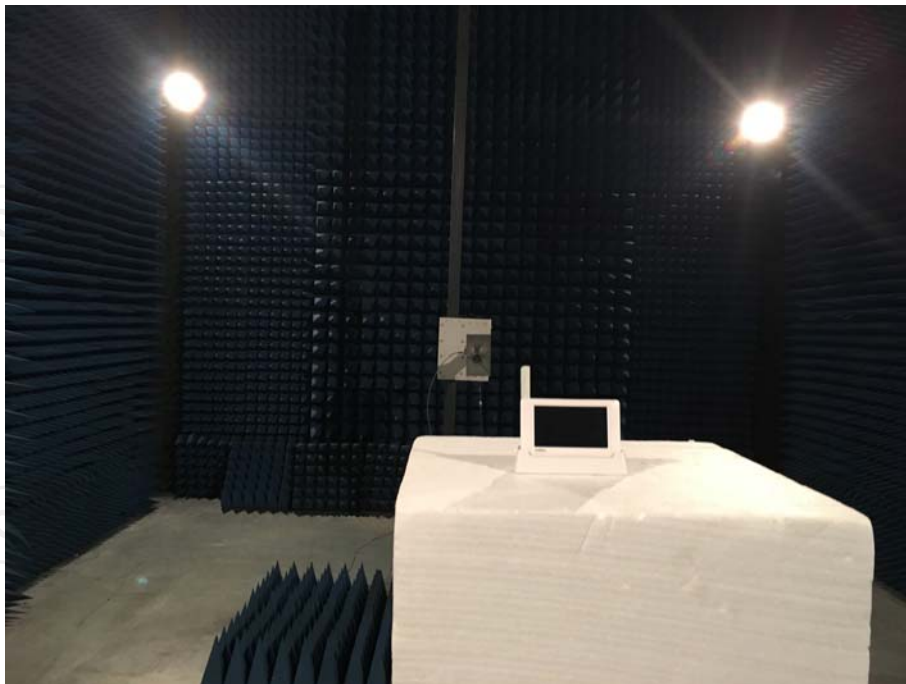
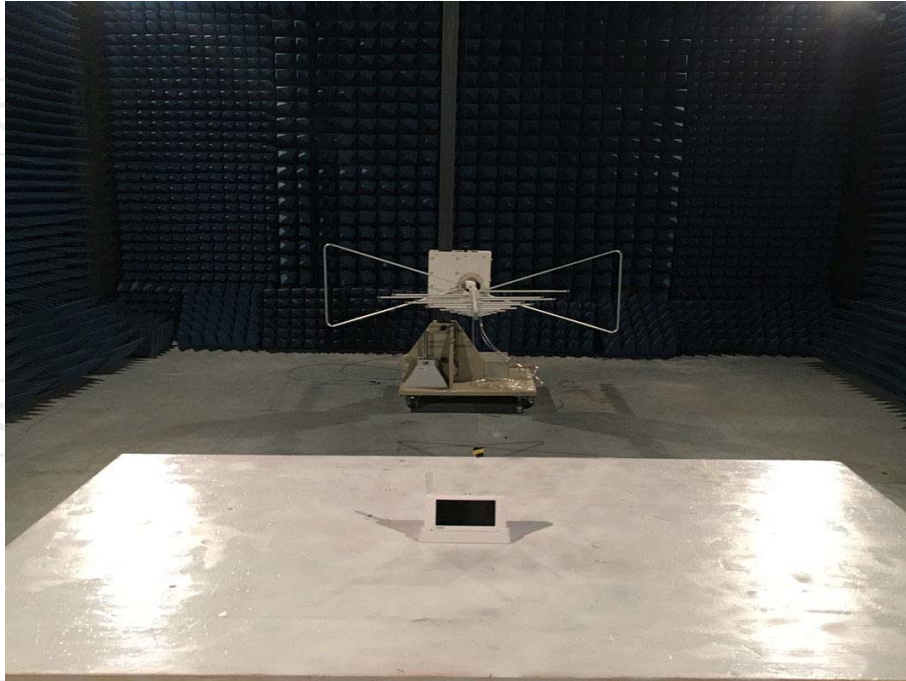
Middle channel: 2437.875 MHz									
Frequency (MHz)	Ant. Pol. H/V	Peak reading (dB μ V)	AV reading (dB μ V)	Correction Factor (dB/m)	Emission Level		Peak limit (dB μ V/m)	AV limit (dB μ V/m)	Margin (dB)
					Peak (dB μ V/m)	AV (dB μ V/m)			
4875.75	H	41.45	---	0.99	42.44	---	74	54	-11.56
7313.625	H	38.91	---	9.87	48.78	---	74	54	-5.22
---	H	---	---	---	---	---	---	---	---
4875.75	V	42.66	---	0.99	43.65	---	74	54	-10.35
7313.625	V	39.37	---	9.87	49.24	---	74	54	-4.76
---	V	---	---	---	---	---	---	---	---

High channel: 2461.50 MHz									
Frequency (MHz)	Ant. Pol. H/V	Peak reading (dB μ V)	AV reading (dB μ V)	Correction Factor (dB/m)	Emission Level		Peak limit (dB μ V/m)	AV limit (dB μ V/m)	Margin (dB)
					Peak (dB μ V/m)	AV (dB μ V/m)			
2483.5	H	45.68	---	-7.83	37.85	---	74	54	-16.15
4923.0	H	48.02	---	1.33	49.35	---	74	54	-4.65
7384.5	H	39.61	---	10.22	49.83	---	74	54	-4.17
---	H	---	---	---	---	---	---	---	---
2483.5	V	47.79	---	-7.83	39.96	---	74	54	-14.04
4923.0	V	47.13	---	1.33	48.46	---	74	54	-5.54
7384.5	V	39.36	---	10.22	49.58	---	74	54	-4.42
---	V	---	---	---	---	---	---	---	---

Note:

1. Emission Level=Peak Reading + Correction Factor; Correction Factor= Antenna Factor + Cable loss – Pre-amplifier
2. Margin (dB) = Emission Level (Peak) (dB μ V/m)-Average limit (dB μ V/m)
3. The emission levels of other frequencies are very lower than the limit and not show in test report.
4. Measurements were conducted from 1 GHz to the 10th harmonic of highest fundamental frequency.
5. Data of measurement shown “---“in the above table mean that the reading of emissions is attenuated more than 20 dB below the limits or the field strength is too small to be measured.
6. Measurements were conducted in all three channels (high, middle, low), two batteries (battery 1 and battery 2), and two LCD screens(LCD screen 1 and LCD screen 2), and the worst case Mode (Highest channel, battery 1 and LCD screen 1) was submitted only.

Appendix A: Photographs of Test Setup
Product: 4.3" LCD Real-Time Digital Wireless Monitor
Model: AWS22R
Radiated Emission

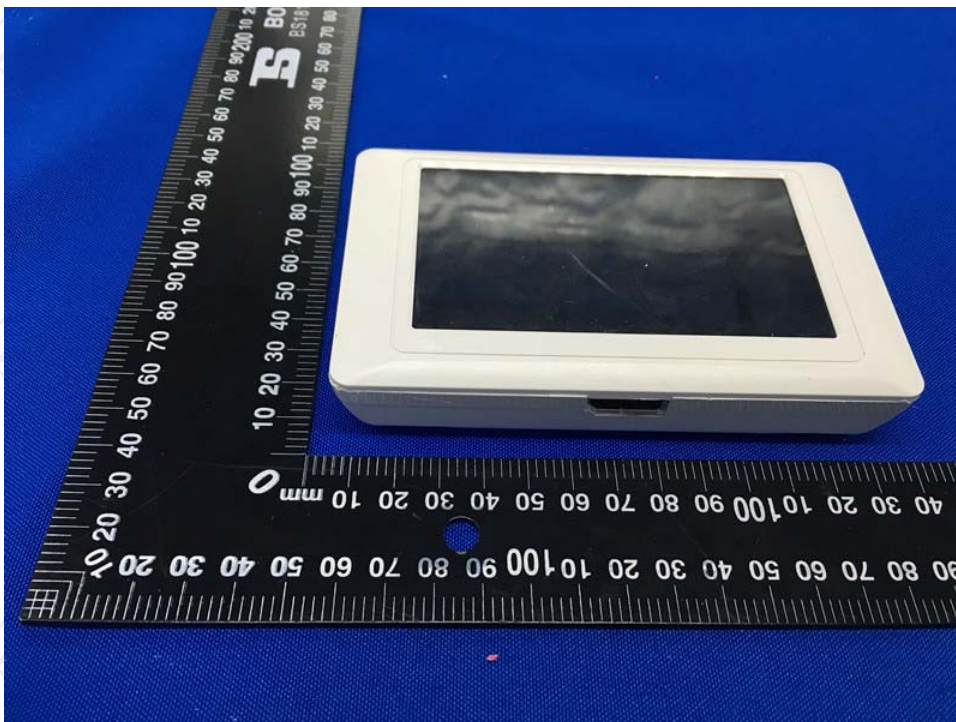


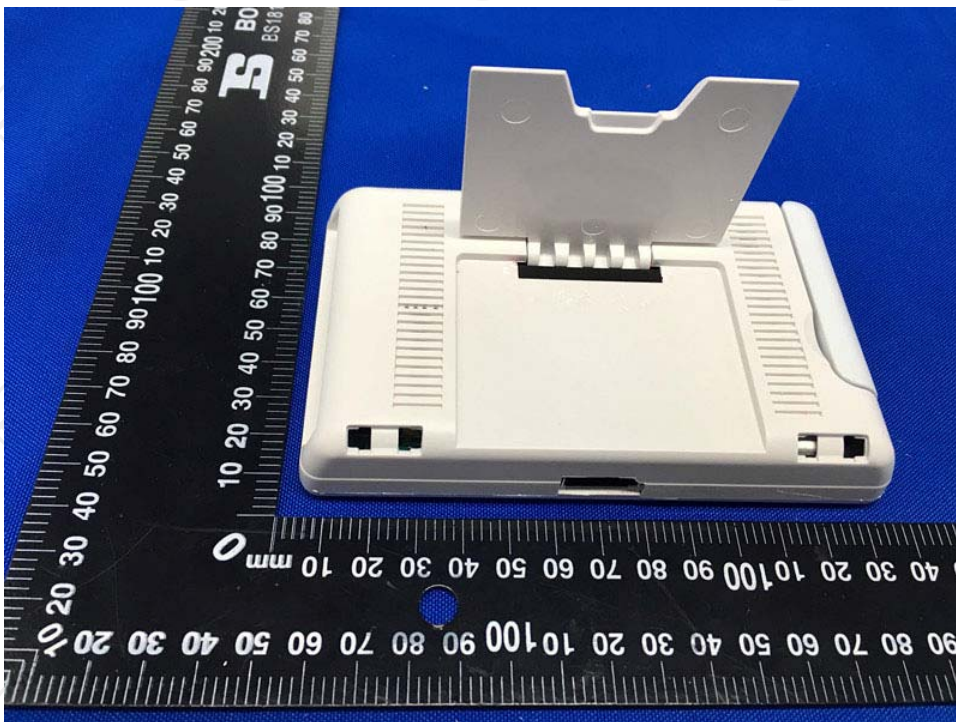
CE



**Appendix B: Photographs of EUT
Model: AWS22R
External Photos**

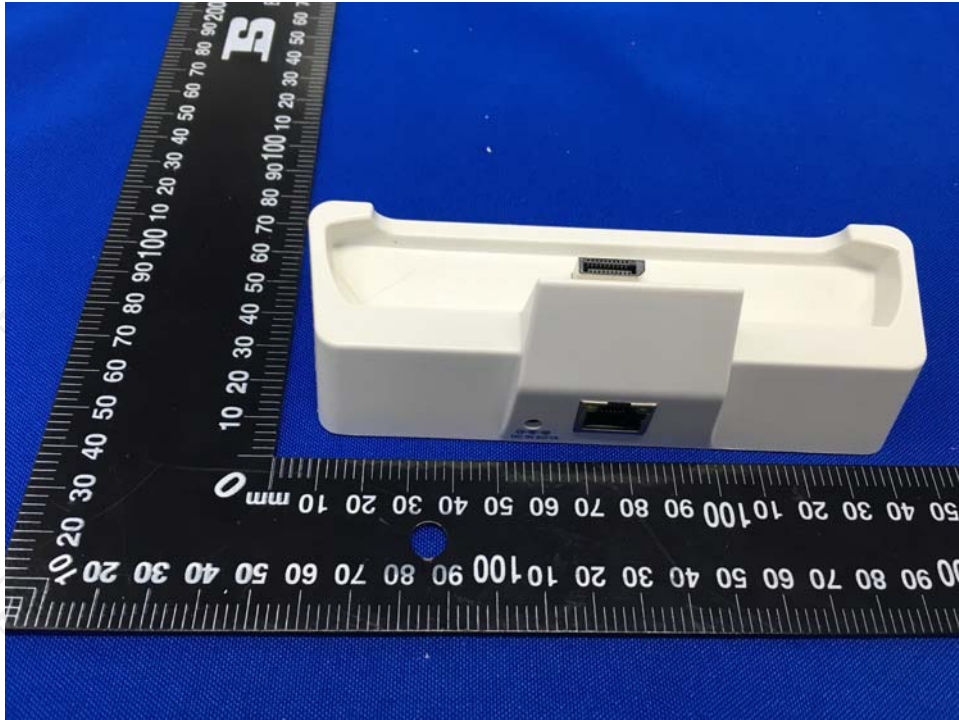




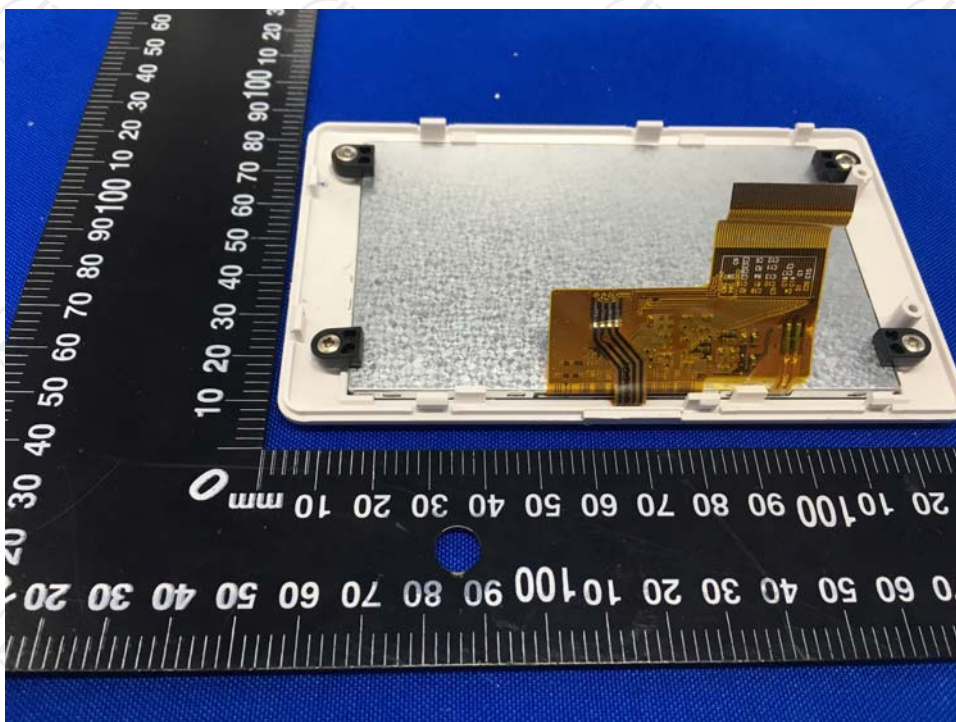


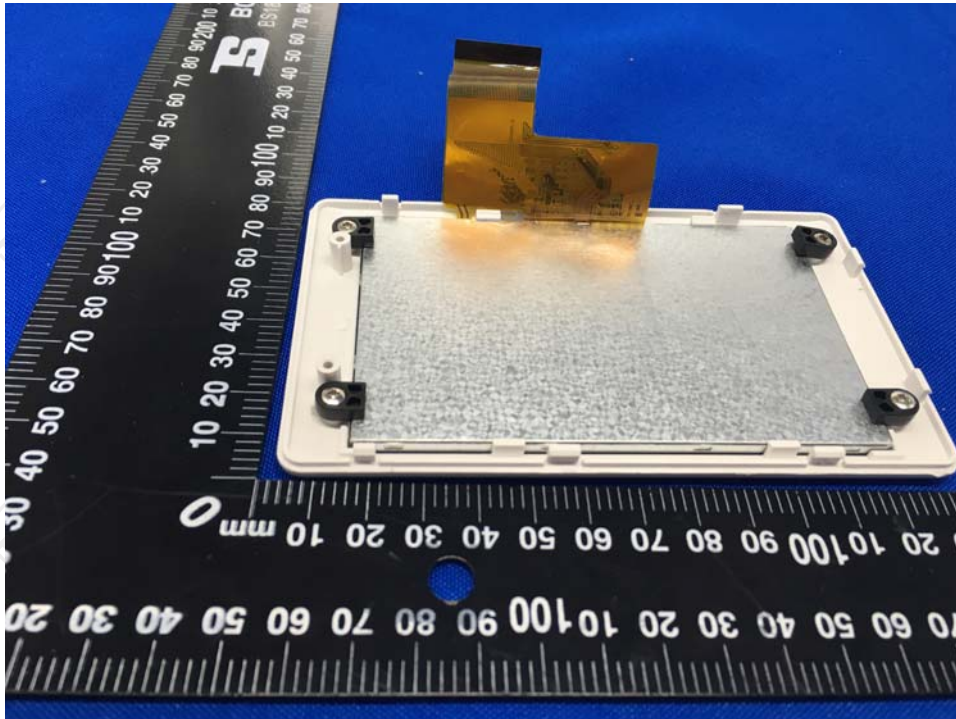


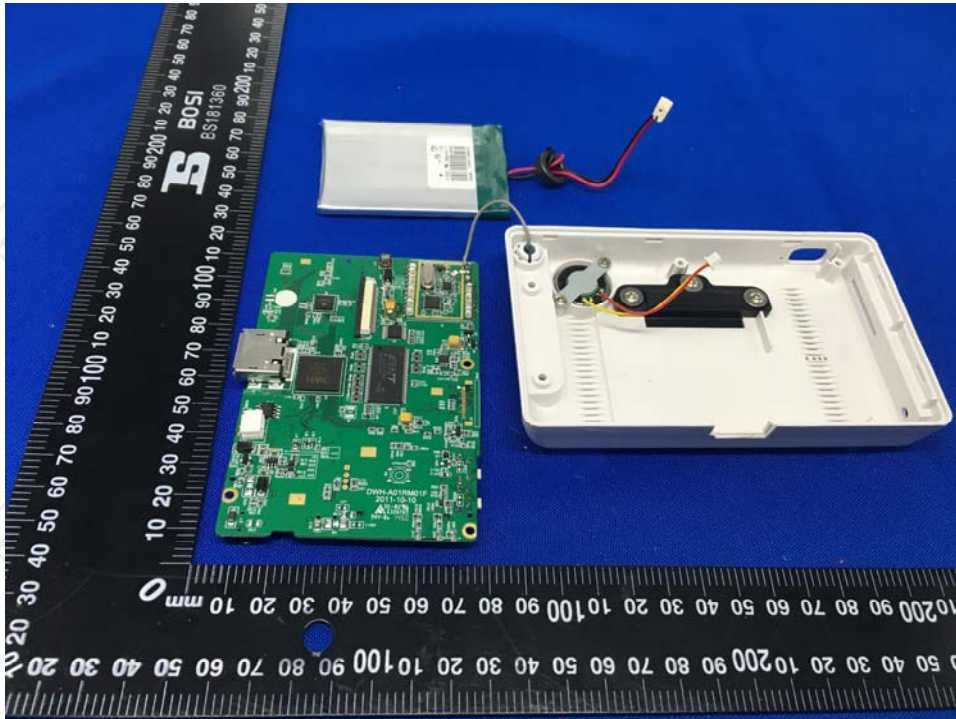


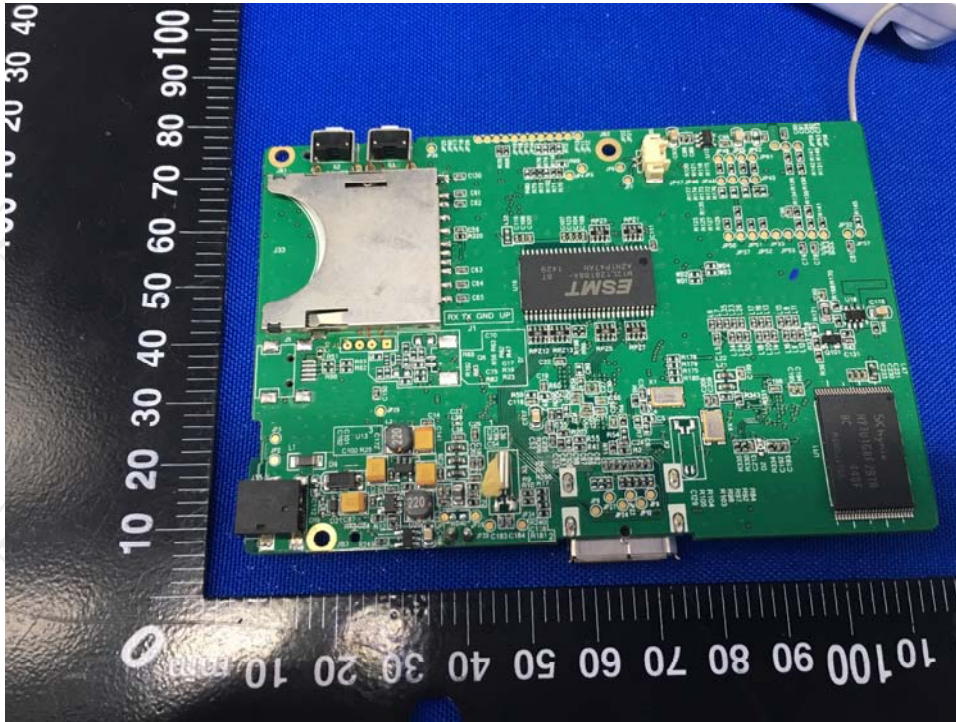


Model: AWS22R
Internal Photos









*******END OF REPORT*******