FCC PART 15 TEST REPORT

The device described below is tested by Dongguan Nore Testing Center Co., Ltd. to determine the maximum emission levels emanating from the device, the severe levels which the device can endure and E.U.T.'s performance criterion. The test results, data evaluation, test procedures, and equipment of configurations shown in this report were made in accordance with the procedures in ANSI C63.10(2013).

Applicant	:	Altis Technology (Hong Kong) Ltd.
Address	:	Suite 711, Lu Plaza, 2 Wing Yip Street, Kwun Tong Hong Kong China
Manufacturer	:	Altis Technology (Hong Kong) Ltd.
Address	:	Suite 711, Lu Plaza, 2 Wing Yip Street, Kwun Tong Hong Kong China
E.U.T.	:	Weather Radio Combo
Brand Name	:	N/A
Model No.	:	WR990
FCC ID	:	2AHJMMWRIIJ
Measurement Standard	:	FCC PART 15.231
Date of Receiver	:	February 26, 2020
Date of Test	:	February 26, 2020 to March 23, 2020
Date of Report	:	March 23, 2020

This Test Report is Issued Under the Authority of :

Prepared by	Approved by Authorized Signer
Alina Guo / Engineer	Iori Fan / Authorized Signatory

This test report is for the customer shown above and their specific product only. This report applies to above tested sample only and shall not be reproduced in part without written approval of Dongguan Nore Testing Center Co., Ltd.

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Address: Building D, Gaosheng Science and Technology Park, Hongtu Road, Nancheng District, Dongguan City, Guangdong Province, China

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Revision History of This Test Report

Report Number	Description	Issued Date
NTC2002096FV00	Initial Issue	2020-03-23

1. GENERAL INFORMATION

1.1 Product Description for Equipment under Test

E.U.T.	:	Weather Radio Combo
Main Model Name	:	WR990
Additional Model name	:	N/A
Rating	:	2* DC 1.5V AAA Battery
Adapter	:	N/A
Test Voltage	:	DC 3V AAA Battery
Cable	:	N/A
I/O Port	:	N/A
Hardware version	:	V02
Software version	:	V02
Description of model difference	:	N/A
Note	:	N/A
Remark	:	N/A

Technical parameters

Frequency:	:	433.92MHz
Modulation	:	ASK
Antenna Type	:	Integral
Antenna Gain	:	1dBi
Number of Channels	:	1
Transmission type	:	Periodic

1.2 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for FCC ID: **2AHJMMWRIIJ** filing to comply with Section 15.231 of the FCC Part 15, Subpart C Rule.

1.3 Test Methodology

The radiated emission measurement was performed according to the procedures in ANSI C63.10 (2013). Radiated emission measurement was performed in semi-anechoic chamber. For radiated emission measurement, preliminary scans were performed in the semi-anechoic chamber only to determine the worst case modes. All radiated tests were performed at an antenna to EUT distance of 3 meters.

1.4 Equipment Modifications

Not available for this EUT intended for grant.

1.5 Support Device

N/A

1.6 Test Facility and Location

Site Description

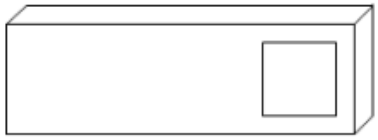
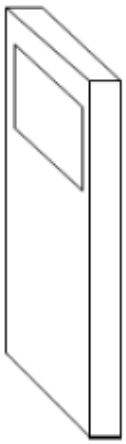
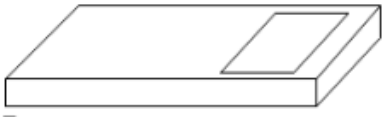
EMC Lab	:	Listed by CNAS, August 13, 2018 The certificate is valid until August 13, 2024 The Laboratory has been assessed and proved to be in compliance with CNAS/CL01 The Certificate Registration Number is L5795. Listed by A2LA, November 01, 2017 The certificate is valid until December 31, 2021 The Laboratory has been assessed and proved to be in compliance with ISO17025 The Certificate Registration Number is 4429.01 Listed by FCC, November 06, 2017 The Designation Number is CN1214 Test Firm Registration Number: 907417 Listed by Industry Canada, June 08, 2017 The Certificate Registration Number. Is 46405-9743
Name of Firm	:	Dongguan Nore Testing Center Co., Ltd. (Dongguan NTC Co., Ltd.)
Site Location	:	Building D, Gaosheng Science and Technology Park, Hongtu Road, Nancheng District, Dongguan City, Guangdong Province, China

1.7 Summary of Test Results

FCC Rules	Description Of Test	Result
§15.207	AC Power Conducted Emission	N/A see note 2
§15.231(e)&15.209	Radiated Emission	Compliant
§15.231(c)	Occupied bandwidth	Compliant
§15.231(e)	Transmission time	Compliant
§15.203	Antenna Requirement	Compliant

Note: 1. The EUT has been tested as an independent unit. And continual transmitting in maximum power (New batteries were used during test)
2. AC Power Conducted Emission is not applicable due to the EUT only can be powered by battery.
3. The EUT is a portable device and can be operated in multiple orientations, so X,Y,Z three orientations are tested during preliminary measurement. The worst case was Z.

Example:

X Plane	Y Plane	Z Plane
		

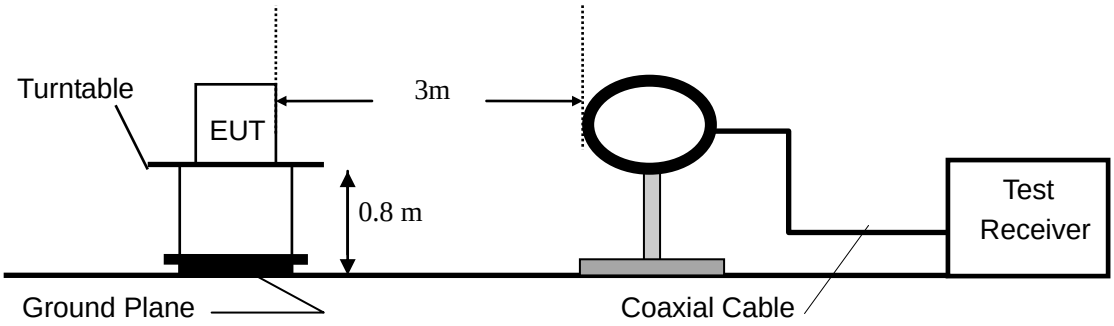
1.8 Deviations and Abnormalities from Standard Conditions

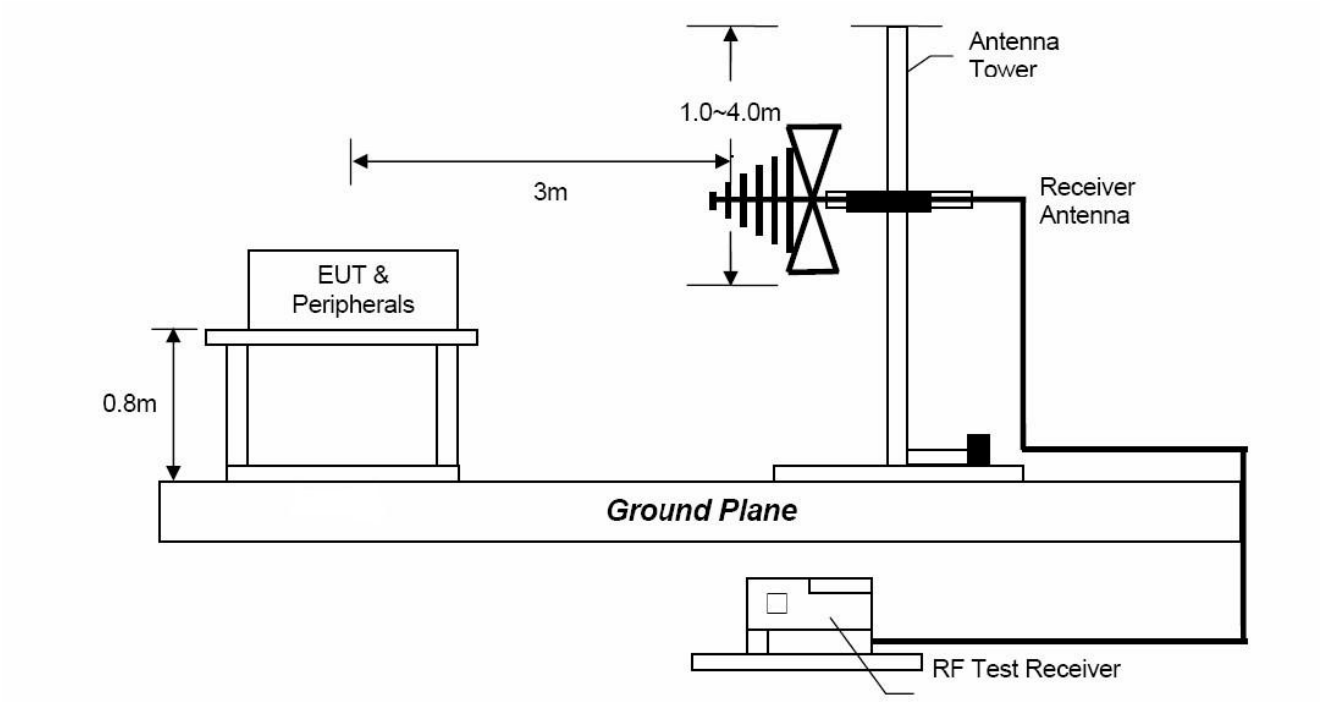
No additions, deviations and exclusions from the standard.

2. Radiated Emission Test

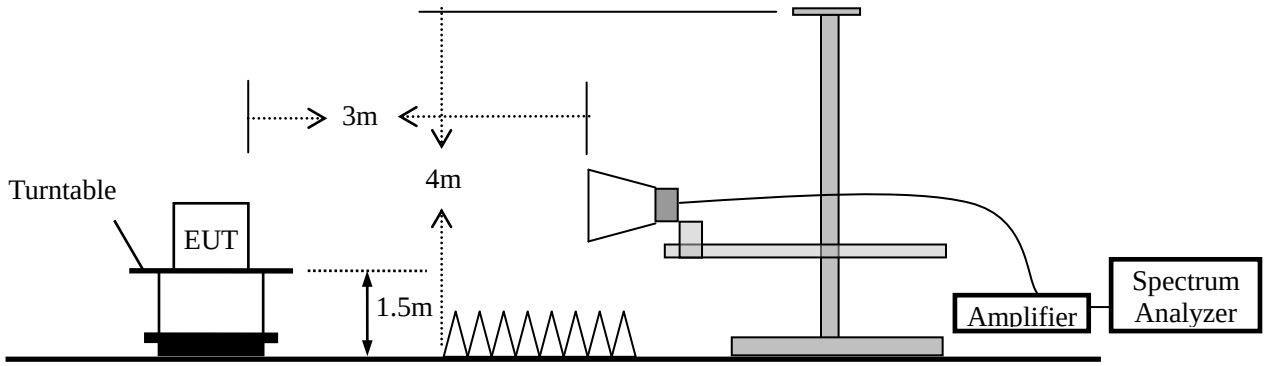
2.1 Test SET-UP (Block Diagram of Configuration)

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





(2) Radiated Emission Test Set-Up, Frequency above 1GHz



2.2 Measurement Procedure

a. Blow 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi- anechoic chamber room.
b. For the radiated emission test above 1GHz:
   The EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter full anechoic chamber room. The table was rotated 360 degrees to determine the position of the highest radiation. Place the measurement antenna 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, 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.
c. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
d. The height of antenna 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 and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading. The test-receiver system was set to peak detect function and specified bandwidth with maximum hold mode.
f. A Quasi-peak measurement was then made for that frequency point for below 1GHz test. PK and AV for above 1GHz emission test.

During the radiated emission test, the spectrum analyzer was set with the following configurations:

Frequency Band (MHz)	Level	Resolution Bandwidth	Video Bandwidth
30 to 1000	QP	120 kHz	300 kHz
Above 1000	Peak	1 MHz	3 MHz
	Average	1 MHz	10 Hz

2.3 Limit

Table A [0.009MHz~1GHz]

Frequency range MHz	Distance Meters	Field Strengths Limit (15.209) μV/m
0.009 ~ 0.490	300	2400/F(kHz)
0.490 ~ 1.705	30	24000/F(kHz)
1.705 ~ 30	30	30
30 ~ 88	3	100
88 ~ 216	3	150
216 ~ 960	3	200
Above 960	3	500

Remark：(1) Emission level (dB)μV = 20 log Emission level μV/m
(2) The smaller limit shall apply at the cross point between two frequency bands.
(3) As shown in 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.
(4) The frequency range scanned is from the lowest radio frequency signal generated in the device which is greater than 9 kHz to the tenth harmonic of the highest fundamental frequency or 40 GHz, whichever is lower.

Table B

Fundamental Frequency (MHz)	Field Strength of Fundamental		Field Strength of Spurious Emissions	
	μV/m	dBμV/m	μV/m	dBμV/m
40.66-40.70	1000	60	100	40
70-130	500	53.98	50	33.98
130-174	500-1500**	53.98-63.52	50-150**	33.98-43.52
174-260	1500	63.52	150	43.52
260-470	1500-5000**	63.52-73.98	150-500**	43.52-53.98
Above 470	5000	73.98	500	53.98

**) Linear interpolations

2.4 Measurement Results

Note: (1) Emission Level= Reading Level+Probe Factor +Cable Loss
(2) Factor= Antenna Gain + Cable Loss – Amplifier Gain
(3) Measurement uncertainty: ±4.6dB
(4) Emission (the row indicated by bold) within the restricted band meets the requirement of FCC part 15 Section 15.205.
(5) Horn antenna used for the emission over 1000MHz.
(6) For spurious emissions limits and the general limits (§15.209) in the table above, a higher field strength limits is applicable.
(7) Average values were determined by duty cycle factor below:
Period of time =100ms
Effective period of the cycle = Ton*number=0.6ms*27=16.2ms;
Duty cycle =16.2ms / 100ms =0.162
AV Factor=20log0.162=-15.81
Example: For 433.92MHz, AV=77.52(Peak)-15.81(AV factor)=61.71.

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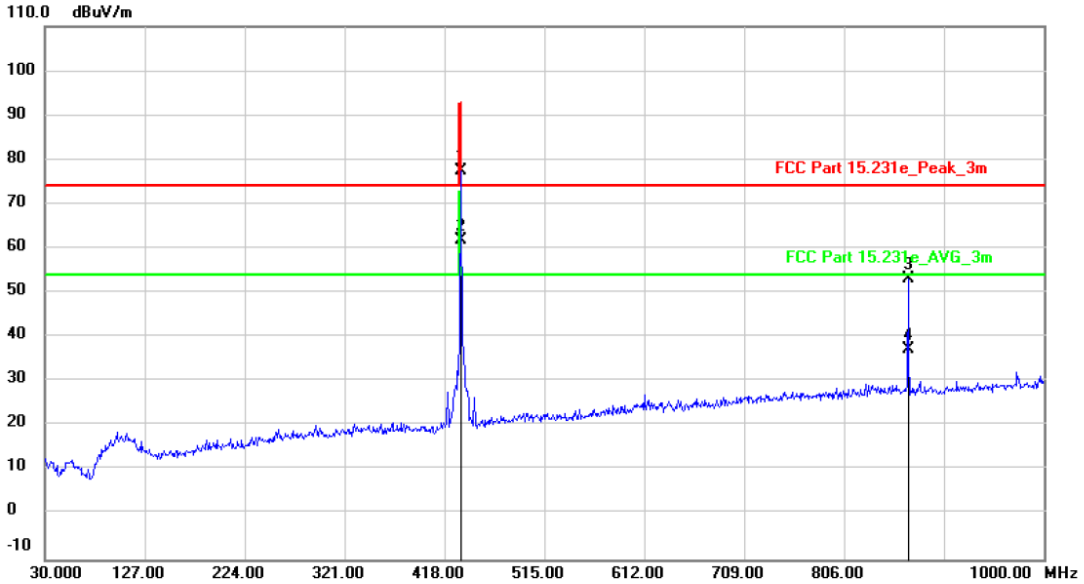
Radiated Emission Measurement

File : WR990 Data :#9 Date: 2020/3/20 Time: 13:31:02



Site
Limit: FCC Part 15.231e_Peak_3m
EUT: Weather Radio Combo
M/N: WR990
Mode: TX
Note:

Polarization: ***Horizontal***
Power: DC3V
Distance: 3m

Temperature: 26
Humidity: 47 %

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		433.9200	85.87	-8.35	77.52	92.87	-15.35	peak			
2	*	433.9200	70.06	-8.35	61.71	72.87	-11.16	AVG			
3		867.8400	54.29	-1.12	53.17	74.00	-20.83	peak			
4		867.8400	38.48	-1.12	37.36	54.00	-16.64	AVG			

Note: Below 30MHz, the emissions are lower than 20dB below the allowable limit.

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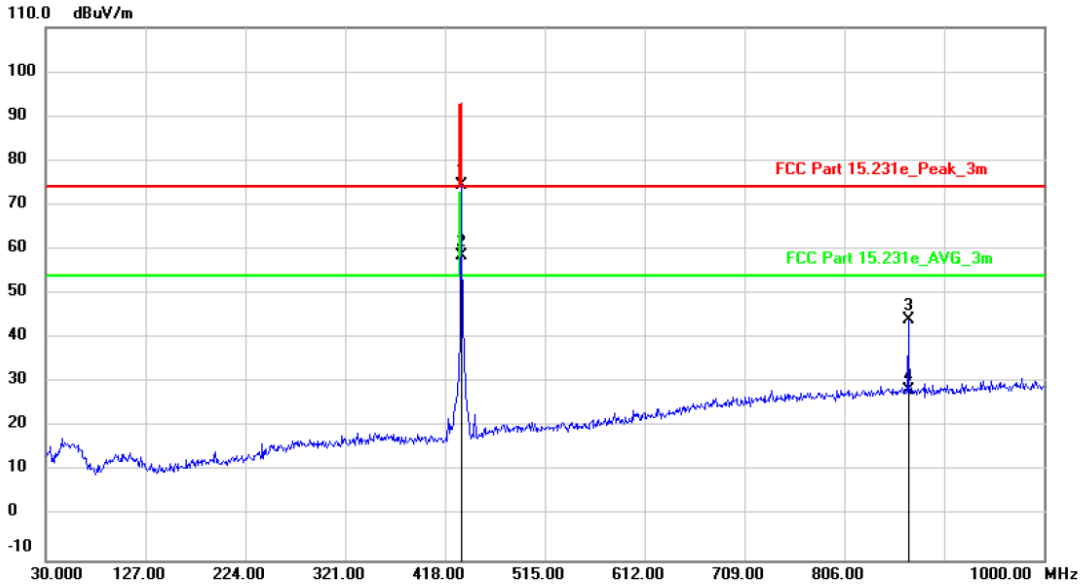
Radiated Emission Measurement

File :WR990 Data :#10 Date: 2020/3/20 Time: 13:38:24



Site
Limit: FCC Part 15.231e_Peak_3m
EUT: Weather Radio Combo
M/N: WR990
Mode: TX
Note:

Polarization: ***Vertical***
Power: DC3V
Distance: 3m

Temperature: 26
Humidity: 47 %

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		433.9200	85.81	-11.35	74.46	92.87	-18.41	peak			
2	*	433.9200	70.00	-11.35	58.65	72.87	-14.22	AVG			
3		867.8400	45.21	-1.12	44.09	74.00	-29.91	peak			
4		867.8400	29.40	-1.12	28.28	54.00	-25.72	AVG			

Note: Below 30MHz, the emissions are lower than 20dB below the allowable limit.

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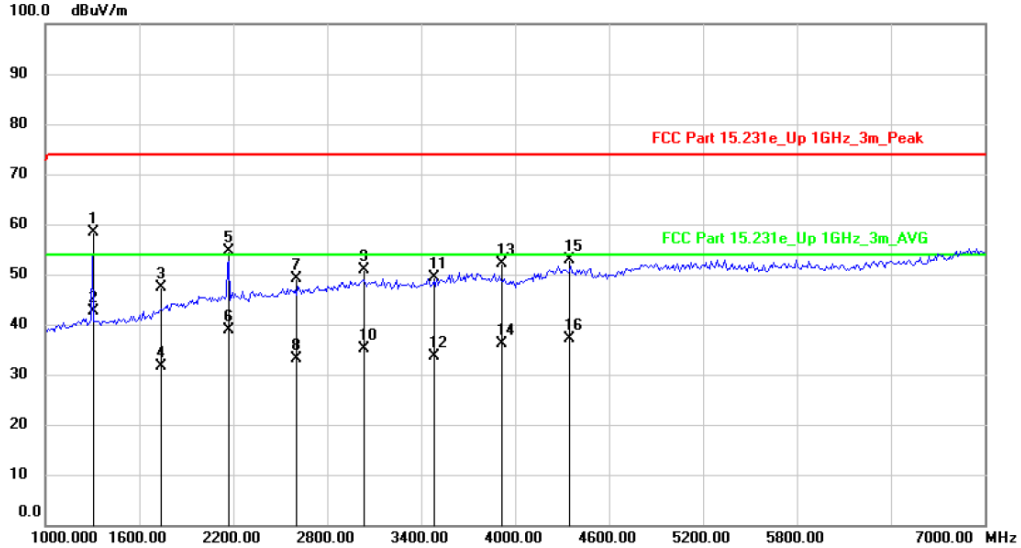
Radiated Emission Measurement

File : WR990 Data :#11 Date: 2020/3/20 Time: 13:45:57



Site
Limit: FCC Part 15.231e_Up 1GHz_3m_Peak
EUT: Weather Radio Combo
M/N: WR990
Mode: TX
Note:

Polarization: ***Horizontal***
Power: DC3V
Distance: 3m

Temperature: 26
Humidity: 47 %

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		1301.760	66.01	-7.61	58.40	74.00	-15.60	peak			
2	*	1301.760	50.20	-7.61	42.59	54.00	-11.41	AVG			
3		1735.680	51.69	-4.33	47.36	74.00	-26.64	peak			
4		1735.680	35.88	-4.33	31.55	54.00	-22.45	AVG			
5		2169.600	55.11	-0.47	54.64	74.00	-19.36	peak			
6		2169.600	39.30	-0.47	38.83	54.00	-15.17	AVG			
7		2603.520	48.25	0.77	49.02	74.00	-24.98	peak			
8		2603.520	32.44	0.77	33.21	54.00	-20.79	AVG			
9		3037.440	49.12	1.85	50.97	74.00	-23.03	peak			
10		3037.440	33.31	1.85	35.16	54.00	-18.84	AVG			
11		3471.360	46.77	2.68	49.45	74.00	-24.55	peak			
12		3471.360	30.96	2.68	33.64	54.00	-20.36	AVG			
13		3905.280	48.31	3.75	52.06	74.00	-21.94	peak			
14		3905.280	32.50	3.75	36.25	54.00	-17.75	AVG			
15		4339.200	48.19	4.75	52.94	74.00	-21.06	peak			
16		4339.200	32.38	4.75	37.13	54.00	-16.87	AVG			

Other emissions are lower than 20dB below the allowable limit. And according to FCC rule, they had not recorded in the report.

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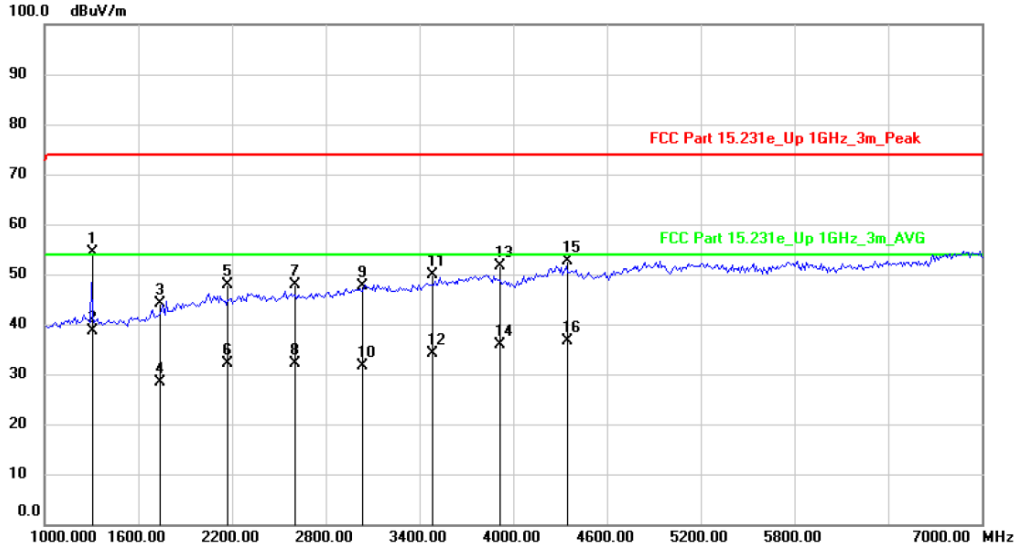
Radiated Emission Measurement

File : WR990 Data :#12 Date: 2020/3/20 Time: 13:52:09



Site
Limit: FCC Part 15.231e_Up 1GHz_3m_Peak
EUT: Weather Radio Combo
M/N: WR990
Mode: TX
Note:

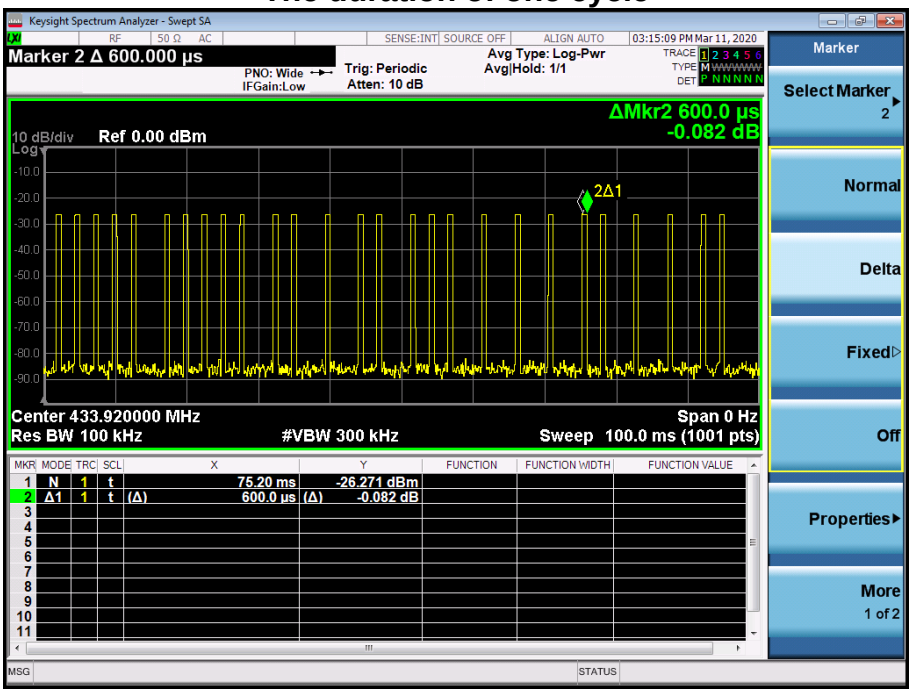
Polarization: ***Vertical***
Power: DC3V
Distance: 3m

Temperature: 26
Humidity: 47 %

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		1301.760	61.44	-7.09	54.35	74.00	-19.65	peak			
2	*	1301.760	45.63	-7.09	38.54	54.00	-15.46	AVG			
3		1735.680	48.50	-4.33	44.17	74.00	-29.83	peak			
4		1735.680	32.69	-4.33	28.36	54.00	-25.64	AVG			
5		2169.600	48.43	-0.47	47.96	74.00	-26.04	peak			
6		2169.600	32.62	-0.47	32.15	54.00	-21.85	AVG			
7		2603.520	47.19	0.77	47.96	74.00	-26.04	peak			
8		2603.520	31.38	0.77	32.15	54.00	-21.85	AVG			
9		3037.440	45.68	1.85	47.53	74.00	-26.47	peak			
10		3037.440	29.87	1.85	31.72	54.00	-22.28	AVG			
11		3471.360	47.31	2.68	49.99	74.00	-24.01	peak			
12		3471.360	31.50	2.68	34.18	54.00	-19.82	AVG			
13		3905.280	47.88	3.75	51.63	74.00	-22.37	peak			
14		3905.280	32.07	3.75	35.82	54.00	-18.18	AVG			
15		4339.200	47.79	4.75	52.54	74.00	-21.46	peak			
16		4339.200	31.98	4.75	36.73	54.00	-17.27	AVG			

Other emissions are lower than 20dB below the allowable limit. And according to FCC rule, they had not recorded in the report.

The duration of one cycle



3. Occupied Bandwidth

3.1 Measurement Procedure

Same as section 2.2.

3.2 Test SET-UP (Block Diagram of Configuration)

Same as section 2.1.

3.3 Limit

Please refer section 15.231
According to 15.231(C), the bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70MHz and below 900MHz.

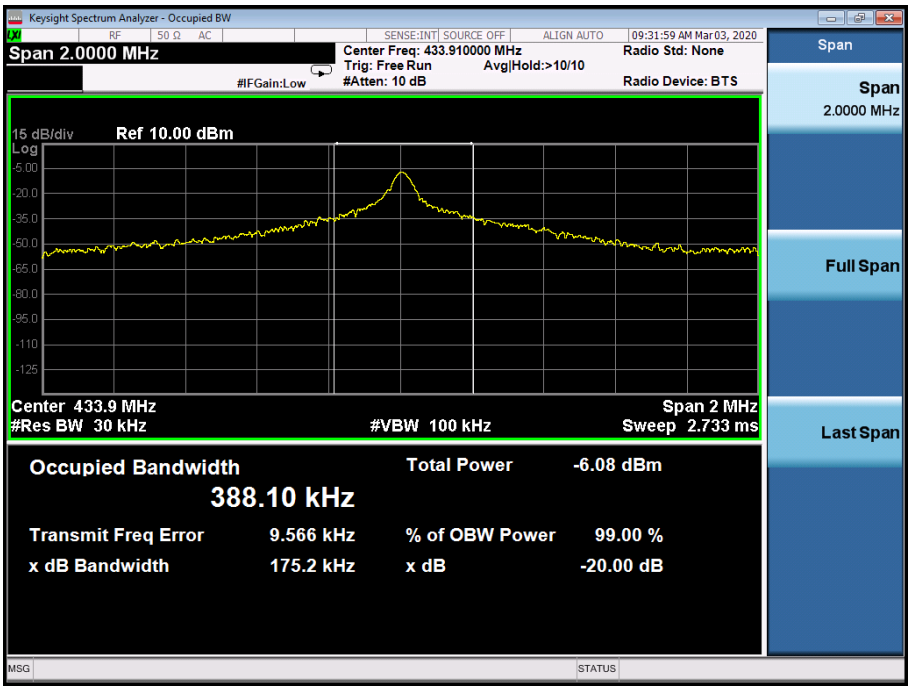
Limit = 433.92*0.25% = 1.08 MHz

3.4 Measurement Results

20dB Bandwidth	Limit
175.2KHz	1.08MHz

Please refer to the following plot.

20dB Bandwidth



4. Transmission Time

4.1 Measurement Procedure

Same as section 2.2.

4.2 Test SET-UP (Block Diagram of Configuration)

Same as section 2.1.

4.3 Limit

According to 15.231(e), 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 lest 30 times the duration of transmission but in no case less than 10 seconds.

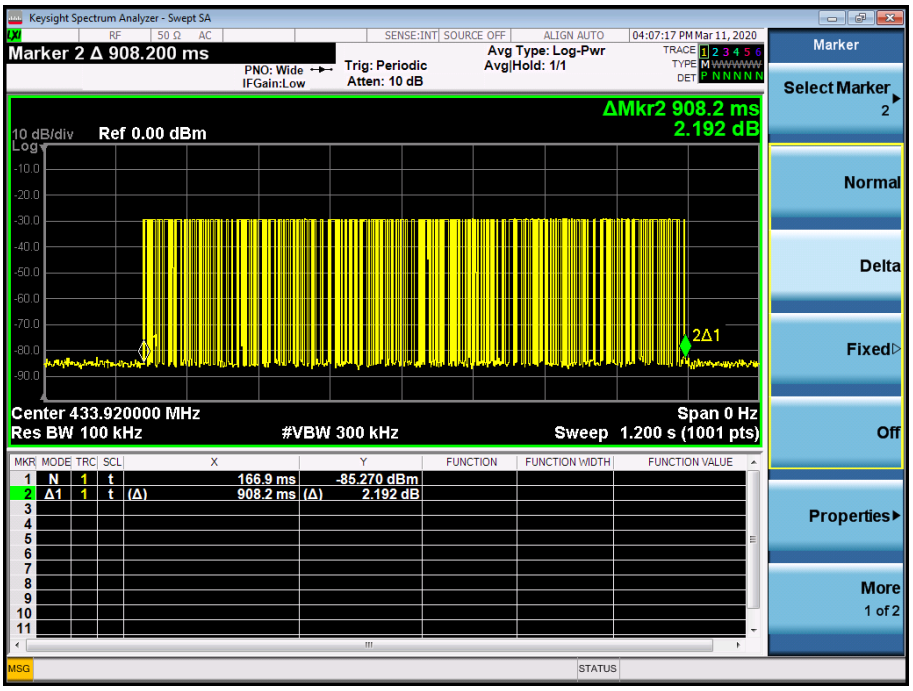
4.4 Measurement Results

Transmission of one time	Limit	Result
0.9082s	1s	PASS

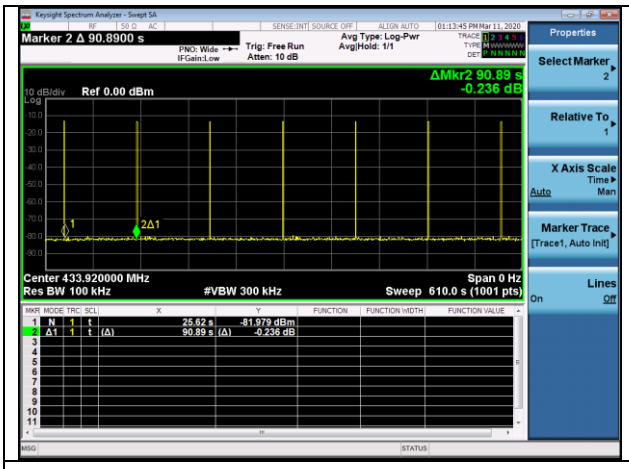
The silent period time	Limit	Limit
90.89s	10s	PASS

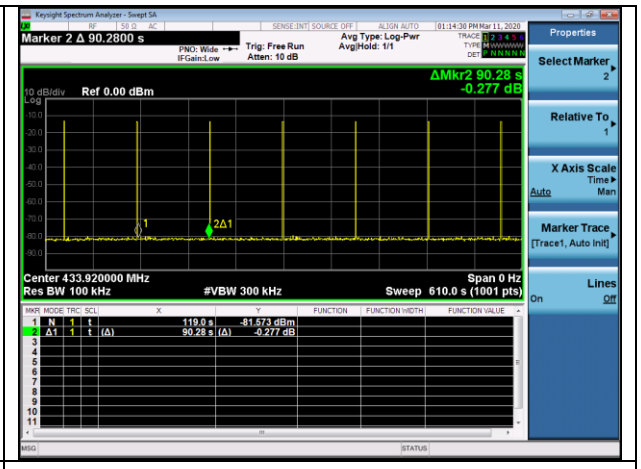
Please refer to the following plot.

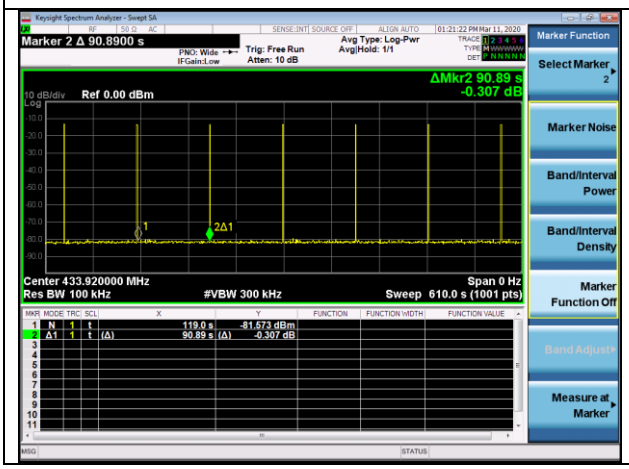
The transmission of one time



The silent period time







5. Antenna Application

5.1 Antenna requirement

According to of FCC part 15C section 15.203 and 15.240:

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.

5.2 Measurement Results

The antenna is integrated on the main Integral and no consideration of replacement, and the best case gain of the antenna is 1dBi. So, the antenna is consider meet the requirement.

6. Test Equipment List

Description	Manufacturer	Model Number	Serial Number	Characteristics	Calibration Date	Calibration Due Date
Test Receiver	Rohde & Schwarz	ESCI7	100837	9KHz~7GHz	Mar. 13, 2020	Mar. 12, 2021
Antenna	Schwarzbeck	VULB9162	9162-010	30MHz~7GHz	Mar. 14, 2020	Mar. 13, 2021
Cable	Huber+Suhner	CBL2-NN-1M	22390001	9KHz~7GHz	Mar. 13, 2020	Mar. 12, 2021
Cable	Huber+Suhner	CIL02	N/A	9KHz~7GHz	Mar. 13, 2020	Mar. 12, 2021
RF Cable	Huber+Suhner	SF-104	MY16559/4	9KHz~25GHz	Apr. 25, 2019	Apr. 25, 2020
Power Amplifier	HP	HP 8447D	1145A00203	100KHz~1.3GHz	Mar. 13, 2020	Mar. 12, 2021
Horn Antenna	Schwarzbeck	BBHA9170	9170-242	15GHz~40GHz	Mar. 13, 2020	Mar. 12, 2021
Horn Antenna	Com-Power	AH-118	071078	1GHz~18GHz	Mar. 14, 2020	Mar. 13, 2021
RF Cable	Huber+Suhner	SF-104	N/A	9KHz~40GHz	Apr. 25, 2019	Apr. 24, 2020
Loop antenna	Daze	ZA30900A	0708	9KHz~30MHz	Apr. 25, 2019	Apr. 24, 2020
Spectrum Analyzer	Rohde & Schwarz	FSU26	200409/026	20Hz~26.5GHz	Apr. 25, 2019	Apr. 24, 2020
Spectrum Analyzer	Rohde & Schwarz	FSV40	101003	10Hz~40GHz	Apr. 06, 2019	Apr. 05, 2020
Pre-Amplifier	EMCI	EMC 184045	980102	18GHz~40GHz	Nov. 03, 2019	Nov. 02, 2020
Pre-Amplifier	Agilent	8449B	3008A02964	1GHz~26.5GHz	Apr. 25, 2019	Apr. 24, 2020
L.I.S.N.	Rohde & Schwarz	ENV 216	101317	9KHz~30MHz	Mar. 13, 2020	Mar. 12, 2021
Temporary antenna connector	TESCOM	SS402	N/A	9KHz-25GHz	N/A	N/A
Power Meter	Anritsu	ML2495A	1139001	100k-65GHz	Nov. 03, 2019	Nov. 02, 2020
Power Sensor	Anritsu	MA2411B	100345	300M-40GHz	Nov. 03, 2019	Nov. 02, 2020

Note: The temporary antenna connector is soldered on the PCB board in order to perform conducted tests and this temporary antenna connector is listed in the equipment list.

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