

TEST REPORT

Reference No. : WTS14S0413448E
FCC ID : 2AAGEAV5-AV7
Applicant : Chengdu Vantron Technology, Ltd.
Address : No.5 Gaopeng Road, Hi-Tech Zone, Chengdu, Sichuan, P.R. China
610045
Manufacturer : The same as above
Address : The same as above
Product Name : AirVend 5, AirVend 7
Model No. : AV 5, AV 7
Standards : FCC CFR47 Part 15 Section 15.225: 2012
Date of Receipt sample : Apr.26, 2014
Date of Test : May 04 – Jun.05, 2014
Date of Issue : Jun.13, 2014
Test Result : **Pass ***

Remarks:

The results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company. The report would be invalid without specific stamp of test institute and the signatures of compiler and approver.

Prepared By:

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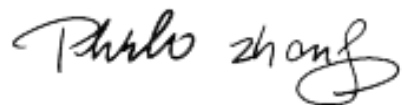
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Compiled by:



Zero Zhou / Project Engineer

Approved by:



Philo Zhong / Manager

2 Test Summary

Test Items	Test Requirement	Result
Conducted Emissions	15.207	N/A
Radiated Spurious Emissions	15.205(a) 15.209 15.225	PASS
Frequency Tolerance	15.225	PASS
20dB Bandwidth	15.215(c)	PASS
Antenna Requirement	15.203	PASS

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4 General Information

4.1 General Description of E.U.T.

Product Name	: AirVend 5, AirVend 7
Model No.	: AV 5, AV 7
Model Difference	: The models are different in size and appearance. Two models were tested. The worst data of AV 5 is recorded in the report.
Type of Modulation	: ASK
Frequency Range	: 13.56 MHz
The Lowest Oscillator	: 32.768 kHz
Antenna installation	: Loop Antenna

4.2 Details of E.U.T.

Technical Data	: DC 12-34V
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4.3 Test Facility

The test facility has a test site registered with the following organizations:

- **IC – Registration No.: 7760A-1**

Waltek Services (Shenzhen) Co., Ltd. has been registered and fully described in a report filed with the Industry Canada. The acceptance letter from the Industry Canada is maintained in our files. Registration 7760A-1, July 12, 2012.

- **FCC – Registration No.: 880581**

Waltek Services (Shenzhen) Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 880581, April 29, 2014.

5 Equipment Used during Test

5.1 Equipments List

3m Semi-anechoic Chamber for Radiated Spurious Emissions						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Calibration Due Date
1	EMC Analyzer	Agilent	E7405A	MY45114943	Sep.18,2013	Sep.17,2014
2	Active Loop Antenna	Beijing Dazhi	ZN30900A	-	Sep.18,2013	Sep.17,2014
3	Trilog Broadband Antenna	SCHWARZBECK	VULB9163	336	Apr.19,2014	Apr.18,2015
4	Coaxial Cable (below 1GHz)	Top	TYPE16(13M)	-	Sep.18,2013	Sep.17,2014
5	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9120 D	667	Apr.19,2014	Apr.18,2015
6	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9170	335	Apr.19,2014	Apr.18,2015
7	Broadband Preamplifier	COMPLIANCE DIRECTION	PAP-1G18	2004	Mar.17,2014	Mar.16,2015
8	Coaxial Cable (above 1GHz)	Top	1GHz-25GHz	EW02014-7	Apr.10,2014	Apr.09,2015
9	Humidity Chamber	GF	GTH-225-40-1P	IAA061213	May 15,2014	May 14,2015

5.2 Measurement Uncertainty

Test Item	Frequency Range	Uncertainty	Note
Radiated Spurious Emissions	30MHz~1000MHz	$\pm 5.03\text{dB}$	(1)
	1000M~6000MHz	$\pm 5.47\text{ dB}$	(1)

(1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=2$.

5.3 Test Equipment Calibration

All the test equipments used are valid and calibrated by CEPREI Certification Body that address is No.110 Dongguan Zhuang RD. Guangzhou, P.R.China.

6 Conducted Emission

Test Requirement:	FCC CFR 47 Part 15 Section 15.207
Test Method:	ANSI C63.4:2003
Test Result:	PASS
Frequency Range:	150kHz to 30MHz
Class/Severity:	Class B
Remark:	This device powered by DC source, this test is not applicable.

7 Radiated Spurious Emissions

Test Requirement: FCC Part15 Paragraph 15.225

Test Method: ANSI C63.4:2003

Test Result: PASS

Measurement Distance: 3m

Limit:

FCC Part15 Paragraph 15.209

Frequency (MHz)	Field Strength		Field Strength Limit at 3m Measurement Dist	
	uV/m	Distance (m)	uV/m	dBuV/m
0.009 ~ 0.490	2400/F(kHz)	300	10000 * 2400/F(kHz)	$20\log^{(2400/F(kHz))} + 80$
0.490 ~ 1.705	24000/F(kHz)	30	100 * 24000/F(kHz)	$20\log^{(24000/F(kHz))} + 40$
1.705 ~ 30	30	30	100 * 30	$20\log^{(30)} + 40$
30 ~ 88	100	3	100	$20\log^{(100)}$
88 ~ 216	150	3	150	$20\log^{(150)}$
216 ~ 960	200	3	200	$20\log^{(200)}$
Above 960	500	3	500	$20\log^{(500)}$

FCC Part15 Paragraph 15.225

(a) The field strength of any emissions within the band 13.553-13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters, equal to 124dBuV/m at 3 meters.

(b) Within the bands 13.410-13.553 MHz and 13.567-13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters, equal to 90.5dBuV/m at 3 meters..

(c) Within the bands 13.110-13.410 MHz and 13.710-14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters, equal to 80.5dBuV/m at 3 meters..

(d) The field strength of any emissions appearing outside of the 13.110-14.010 MHz band shall not exceed the general radiated emission limits in § 15.209.

7.1 EUT Operation

Operating Environment :

Temperature: 23.5 °C

Humidity: 51.1 % RH

Atmospheric Pressure: 101.2kPa

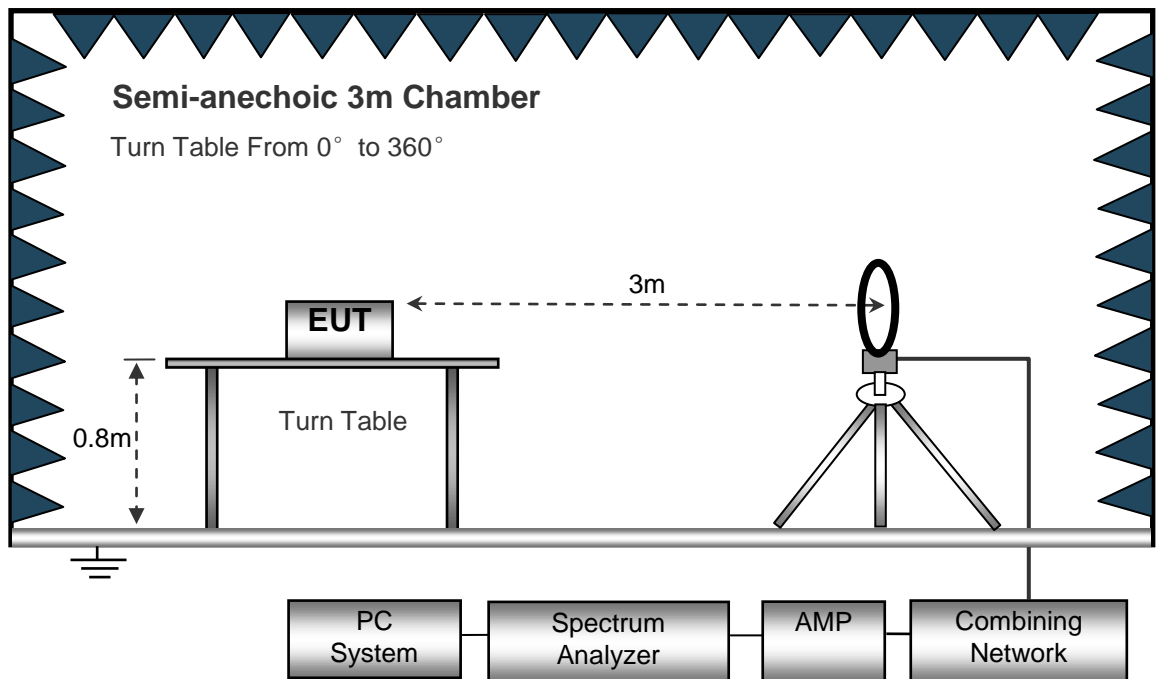
EUT Operation :

The test was performed in transmitting mode, the test data were shown in the report.

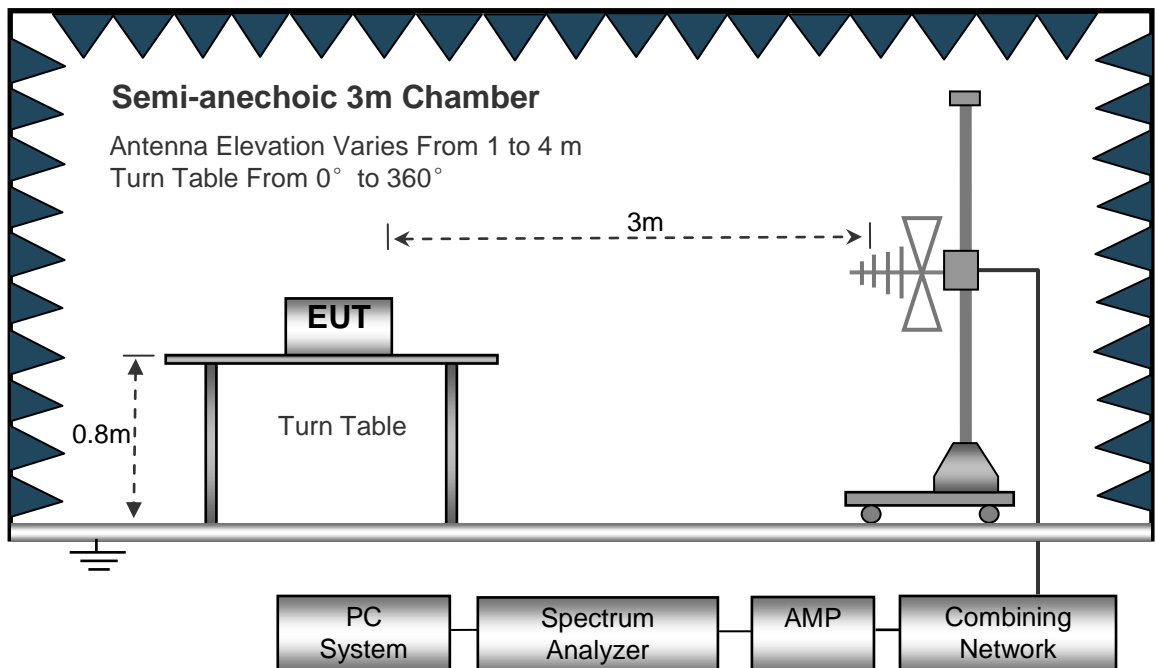
7.2 Test Setup

The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site, using the setup accordance with the ANSI C63.4: 2003.

The test setup for emission measurement below 30MHz.



The test setup for emission measurement from 30 MHz to 1 GHz.



7.3 Spectrum Analyzer Setup

Below 30MHz

Sweep Speed Auto
IF Bandwidth..... 10kHz
Video Bandwidth..... 10kHz
Resolution Bandwidth..... 10kHz

30MHz ~ 1GHz

Sweep Speed Auto
Detector PK
Resolution Bandwidth..... 100kHz
Video Bandwidth..... 300kHz

7.4 Test Procedure

1. The EUT is placed on a turntable, which is 0.8m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is moved from 1m to 4m to find out the maximum emissions. The spectrum was investigated from the lowest radio frequency signal generated in the device, without going below 9 kHz, up to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Repeat above procedures until the measurements for all frequencies are complete.
7. The radiation measurements are tested under 3-axes(X, Y, Z) position(X denotes lying on the table, Y denotes side stand and Z denotes vertical stand). After pre-test, It was found that the worse radiation emission was get at the X position. So the data shown was the X position only.

7.5 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:
$$\text{Corr. Ampl.} = \text{Indicated Reading} + \text{Antenna Factor} + \text{Cable Factor} - \text{Amplifier Gain}$$

The “Margin” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dB means the emission is 7dB below the maximum limit for Class B. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Corr. Amp.} - \text{Limit}$$

7.6 Summary of Test Results

Test Frequency: 32.768kHz ~ 30MHz Note: Correct factor = Cable loss + Antenna factor

Frequency (MHz)	Receiver Reading	Detector	Correct factor	Extrapolation factor	Measurement results (calculated)	Limits	Margin
	dBμV@3m	PK/QP	dB/m	dB	dBμV/m @300m&30m	dBμV/m @300m	dB
0.120	40.52	QP	20.60	80.00	-18.88	26.78	-45.66
2.697	18.24	QP	20.20	40.00	-1.56	29.54	-31.10
16.594	20.17	QP	19.90	40.00	0.07	29.54	-29.47

Frequency Range (MHz)	Frequency (MHz)	Recei ver Readi ng	Detect or	Correct factor	Extrap olation factor	Measuremen t results (calculated)	Limits	Margin
	dBμV @3m	dBμV/ m	PK/ QP	dB	dB	dBμV/m @30m	dBμV/m @30m	dBμV/ m
13.110~ 13.410	13.395	28.54	QP	21.55	40.00	10.09	40.50	-30.40
13.410~ 13.553	13.551	38.64	QP	21.55	40.00	20.19	50.50	-30.31
13.553~13. 567 Fundamental	13.559	66.88	QP	21.55	40.00	48.43	84.00	-35.57
13.567~ 13.710	13.568	39.51	QP	21.55	40.00	21.06	50.50	-29.44
13.710~ 14.010	13.842	29.02	QP	21.55	40.00	10.57	40.50	-29.93

Test Frequency : 30MHz ~ 1GHz

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.225/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP /Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
38.09	19.21	QP	232	1.5	H	14.14	33.35	40	-6.65
38.09	17.62	QP	178	1.7	V	14.14	31.76	40	-8.24
213.11	19.52	QP	116	1.5	H	12.50	32.02	40	-7.98
213.11	21.78	QP	355	1.7	V	12.50	34.28	40	-5.72
493.52	11.87	QP	51	1.5	H	21.65	33.52	40	-6.48
493.52	12.56	QP	351	1.7	V	21.65	34.21	40	-5.79

8 Frequency Tolerance

Test Requirement: FCC Part15.225

Test Method: ANSI C63.4:2003

Limit The frequency tolerance of the carrier signal shall be maintained within +/- 0.01% 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.

8.1 Test Procedure

- 1.The EUT was placed on a turn table which is 0.8m above ground plane.
- 2.Set EUT as normal operation
- 3.Set SPA Center Frequency = fundamental frequency, RBW, VBW= 10kHz, Span =100kHz.
- 4.Set SPA Max hold. Mark peak.
- 5.The normal test voltage is DC 34V.

8.2 Test Result

Power Supply	Temperature (°C)	Measured Frequency (MHz)	Frequency Error	Part 15.225 Limit
DC 34.0V	-20	13.55984	-0.0012%	±0.01%
	20	13.55981	-0.0014%	±0.01%
	50	13.55981	-0.0014%	±0.01%
DC 28.9V	-20	13.55984	-0.0012%	±0.01%
	20	13.55986	-0.0010%	±0.01%
	50	13.55991	-0.0007%	±0.01%
DC 39.1V	-20	13.55989	-0.0008%	±0.01%
	20	13.55990	-0.0007%	±0.01%
	50	13.55986	-0.0010%	±0.01%

9 20dB Bandwidth

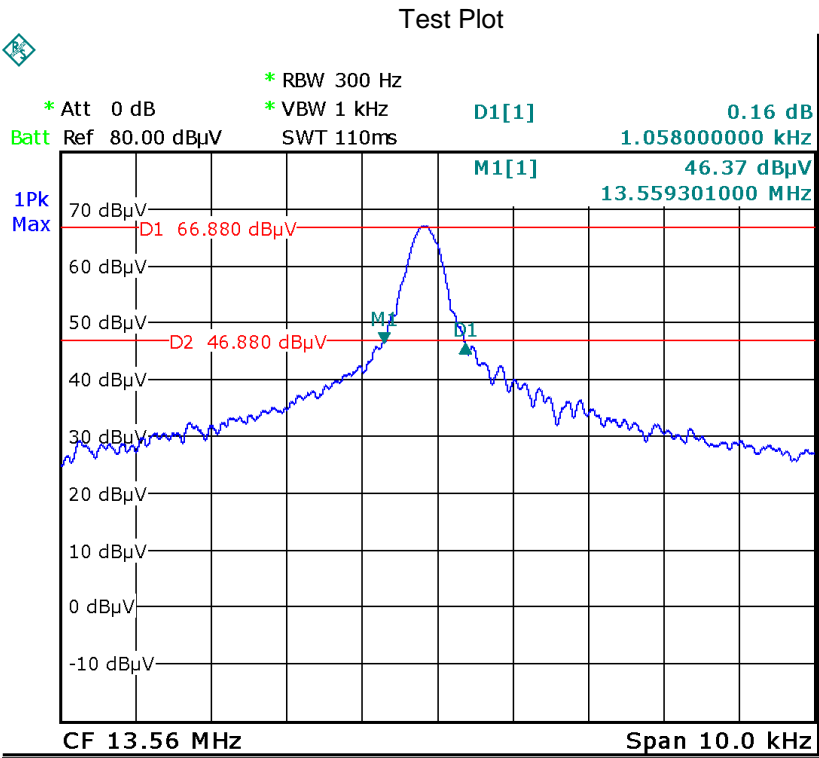
Test Requirement: FCC Part15.215
Test Method: ANSI C63.4:2003

9.1 Test Procedure

- 1. The transmitter output (antenna port) was connected to the spectrum analyzer in peak mode.
- 2. 20dB Bandwidth the resolution bandwidth of 1 kHz and the video bandwidth of 1 kHz were used.
- 3. Measured the spectrum width with power higher than 20dB below carrier.

9.2 Test Result

Frequency(MHz)	Bandwidth Emission(kHz)
13.56	1.058



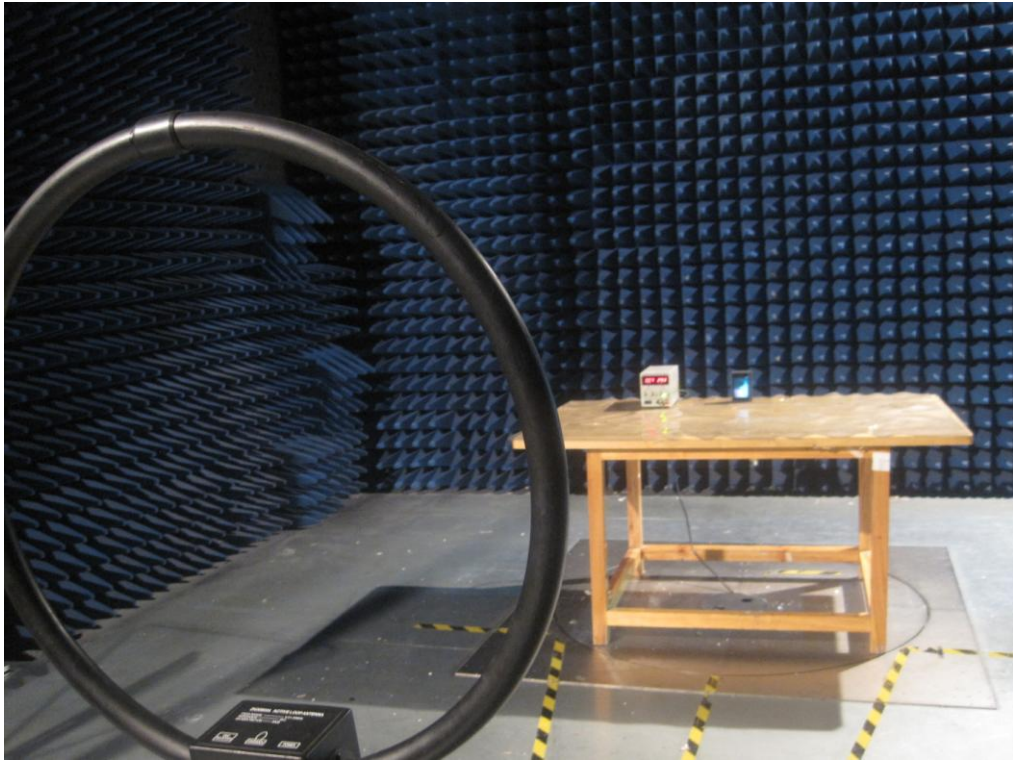
10 Antenna Requirement

According to the FCC Part 15 Paragraph 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna to the intentional radiator shall be considered sufficient to comply with the provisions of this section. This product use a permanent Loop antenna, fulfill the requirement of this section

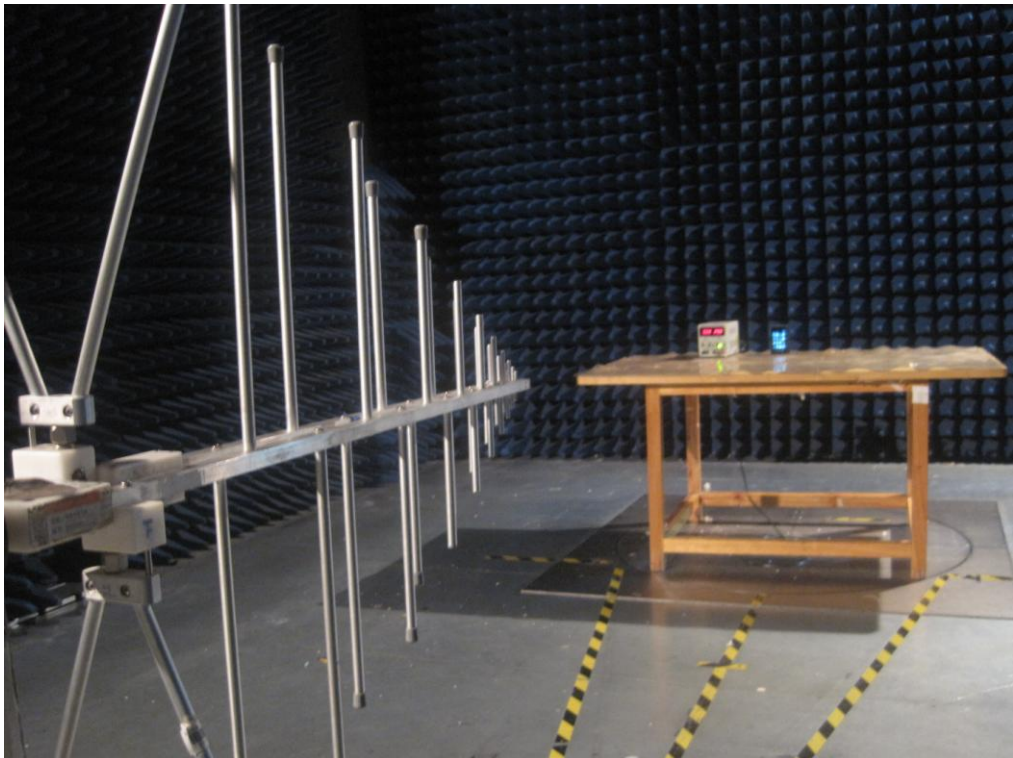
11 Photographs of Testing

11.1 Radiation Emission Test Setup

AV 5: Below 30MHz



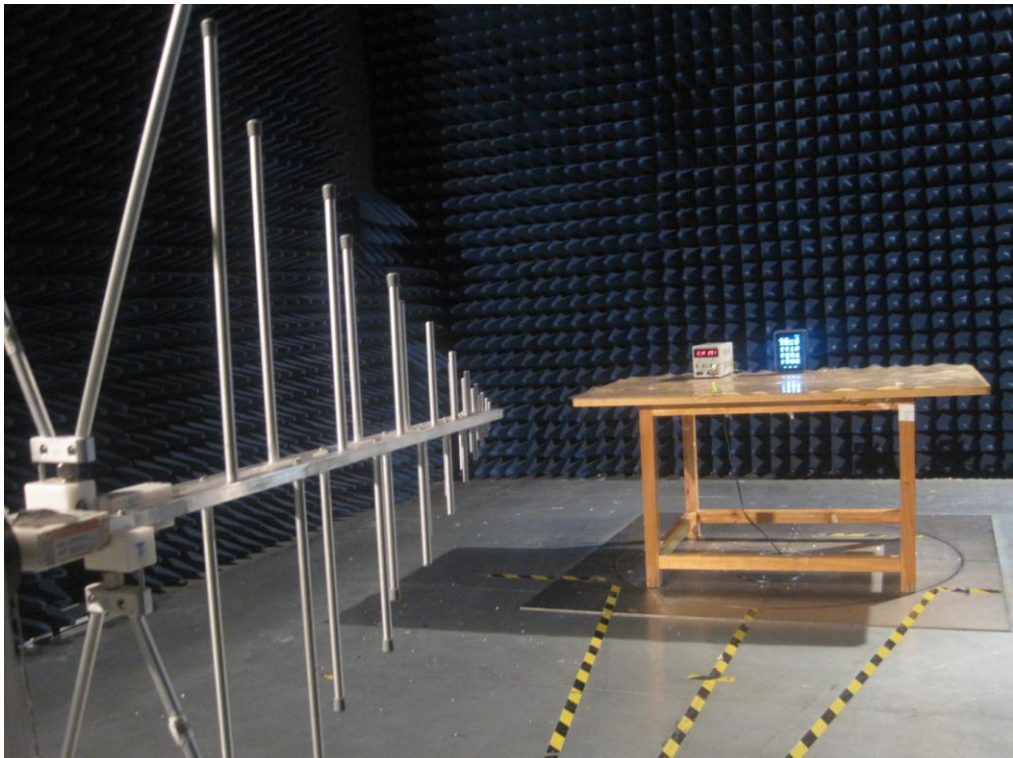
AV 5: From 30MHz to 1GHz



AV 7: Below 30MHz



AV 7: From 30MHz to 1GHz



12 Photographs - Constructional Details

Remark: Please refer to Reference No. WTS14S0413447E report.

=====End of Report=====