FCC 47 CFR PART 90

TEST REPORT

For

Applicant :	**Advanced Wireless Communications**
Address :	**20809 Kensington Blvd Lakeville, MN 55044-8353 USA**
Product Name :	**UHF Callbox**
Brand Name :	**Callbox**
Model Name :	**AWCBX400**
FCC ID :	**Q9SAWCBX400**
Report No. :	**STS120212F1**
Date of Issue :	**February 20, 2012**

Issued by :	**Shenzhen Super Test Service Technology Co., Ltd.**
Address :	**No.5, 2nd Langshan Road, North District, Hi-tech Industrial Park, Nanshan, Shenzhen, Guangdong, China**
Tel :	**86-755-2795 8522**
Fax :	**86-755-2795 8022**

CONTENTS

1. TEST RESULT CERTIFICATION

Applicant Name:	Advanced Wireless Communications
Address:	20809 Kensington Blvd Lakeville, MN 55044-8353 USA
Manufacturer Name:	Allcomm Electronic Co., LTD
Address:	Tang Xia Yong Village, SongGang Town, Baoan District, Shenzhen, Guang Dong, PRC
Equipment Under Test:	UHF Callbox
Brand Name:	Callbox
Model Number:	AWCBX400
FCC ID：	Q9SAWCBX400
Test Standard	FCC 47 CFR Part 90
File Number:	STS120212F1
Date of Test:	February. 10, 2012- February. 20, 2012

We (STS) hereby certify that the test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in TIA/EIA 603-C-2004 and the energy emitted by the sample EUT tested as described in this report is in compliance with radiated emission limits of FCC Rules Part 90.

The test results of this report relate only to the tested sample identified in this report.

Tested by (+ signature): Zhang Ling

Zhang Ling February. 20, 2012

Review by (+ signature): July Wen

July Wen February. 20, 2012

Approved by (+ signature): Terry Yang

Terry Yang February. 20, 2012

2. Technical Information

Note: the following data is based on the information by the applicant.

2.1 EUT Description

Product	UHF Callbox
Brand Name	Callbox
Model Number	AWCBX400
Series Model Name:	N/A
Series Model Difference description:	N/A
Power Supply	DC 9V by Battery
Frequency Range	450.000 MHz-470.000 MHz
Modulation Technique	FM
Channel Number	16
Test Frequency	450.125MHz - 460.125MHz – 469.975MHz
Antenna Gain	1.5dBi
Temperature Range	-10℃-50℃

Note:

1. *This submittal(s) (test report) is intended for FCC ID: Q9SAWCBX400 filing to comply with the FCC Part 90, Subpart I Rules.*
2. *Please refer to Appendix B for the photographs of the EUT. For more details, please refer to the User's manual of the EUT.*

2.2 Objective

The tests documented in this report were performed in accordance with TIA/EIA 603-C-2004 and FCC CFR 47 Rules Part 90 Subpart I.

No.	Identity	Document Title
1	47 CFR Part 2 (10-1-05 Edition)	Radio Frequency Devices
2	47 CFR Part 90 (10-1-09 Edition)	Private Land Mobile Radio Services

2.3 Test Standards and Results

Test items and the results are as bellow:

№	Test Type	Para. Number	Limit	Result
1	Power and Antenna High Limits	2.1046; 90.205	Refer to 90.205	PASS
2	Modulation Characteristic	2.1047; 90.207	Refer to 90.207	PASS
3	Occupied Bandwidth	2.1049; 90.209	Refer to 90.209	PASS
4	Emission Mask	2.1053; 90.210	Refer to 90.210	PASS
5	Frequency Stability vs. Temperature	2.1055; 90.213	Refer to 90.213	PASS
6	Frequency Stability vs. Voltage	2.1055; 90.213	Refer to 90.213	PASS
7	Transmitter Frequency Behavior	90.214	Refer to 90.214	PASS
8	Lined conducted emission	15.109	Refer to 15.109	N/A

2.4 Environmental Conditions

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

- Temperature: 15-35ºC
- Humidity: 30-60%
- Atmospheric pressure: 86-106 k Pa

3. Details of Test

3.1 Identification of the Responsible Testing Laboratory

Company:	Shenzhen Super Test Service Technology Co., Ltd.
Address:	No.5, Langshan 2nd Rd., North Hi-Tech Industrial park, Nanshan, Shenzhen, Guangdong, China

3.2 Identification of the Responsible Testing Location

Test Site:	Most Technology Service Co., Ltd.
Location:	No.5, Langshan 2nd Rd., North Hi-Tech Industrial park, Nanshan, Shenzhen, Guangdong, China
Description:	There is one 3m semi-anechoic an area test sites and two line conducted labs for final test. The Open Area Test Sites and the Line Conducted labs are constructed and calibrated to meet the FCC requirements in documents TIA/EIA 603-C-2004/ANSI C63.4:2009 and CISPR 16 requirements. The FCC Registration Number is **490827.**
Site Filing:	The site description is on file with the Federal Communications Commission, 7435 Oakland Mills Road, Columbia, MD 21046.
Instrument Tolerance:	All measuring equipment is in accord with TIA/EIA 603-C-2004/ANSI C63.4:2009 and CISPR 16 requirements that meet industry regulatory agency and accreditation agency requirement.
Ground Plane:	Two conductive reference ground planes were used during the Line Conducted Emission, one in vertical and the other in horizontal. The dimensions of these ground planes are as below. The vertical ground plane was placed distancing 40 cm to the rear of the wooden test table on where the EUT and the support equipment were placed during test. The horizontal ground plane projected 50 cm beyond the footprint of the EUT system and distanced 80 cm to the wooden test table. For Radiated Emission Test, one horizontal conductive ground plane extended at least 1m beyond the periphery of the EUT and the largest measuring antenna, and covered the entire area between the EUT and the antenna.

3.3 List of Test Equipments

No.	Equipment	Manufacturer	Model No.	S/N	Calibration due date
1	Test Receiver	Rohde & Schwarz	ESCI	100492	2012/03/14
2	L.I.S.N.	Rohde & Schwarz	ENV216	100093	2012/03/14
3	Coaxial Switch	Anritsu Corp	MP59B	6200283933	2012/03/14
4	Terminator	Hubersuhner	50Ω	No.1	2012/03/14
5	RF Cable	SchwarzBeck	N/A	No.1	2012/03/14
6	Bilog Antenna	Sunol	JB3	A121206	2012/03/14
7	Cable	Resenberger	N/A	NO.1	2012/03/14
8	DC Power Filter	DuoJi	DL2×30B	N/A	2012/03/14
9	Single Phase Power Line Filter	DuoJi	FNF 202B30	N/A	2012/03/14
10	3 Phase Power Line Filter	DuoJi	FNF 402B30	N/A	2012/03/14
11	Absorbing Clamp	Luthi	MDS21	3635	2012/03/14
12	Coaxial Switch	Anritsu Corp	MP59B	6200283933	2012/03/14
13	AC Power Source	Kikusui	AC40MA	LM003232	2012/03/14
14	Test Analyzer	Kikusui	KHA1000	LM003720	2012/03/14
15	Line Impendence Network	Kikusui	LIN40MA-PCR-L	LM002352	2012/03/14
16	ESD Tester	Kikusui	KES4021	LM003537	2012/03/14
17	EMCPRO System	EM Test	UCS-500-M4	V0648102026	2012/03/14
18	Signal Generator	IFR	2032	203002/100	2012/03/14
19	Amplifier	A&R	150W1000	301584	2012/03/14
20	CDN	FCC	FCC-801-M3-25	107	2012/03/14
21	EM Injection Clamp	FCC	F-203I-23mm	403	2012/03/14
22	Telecommunication Antenna	European Antennas	PSA 75301R/170	0304213	2012/03/14

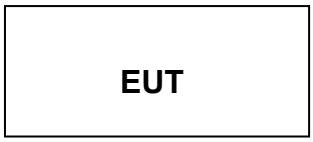
NOTE: Equipments listed above have been calibrated and are in the period of validation.

3.4 Environmental Conditions

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

- Temperature: 15-35ºC
- Humidity: 30-60%
- Atmospheric pressure: 86-106 k Pa

3.5 Configuration of Tested System



3.6 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/Type No.	Identifier	Series No.	Note

4. Test Methodology

4.1 General Test Procedures

Conducted Emissions

The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirement in Section 13.1.4.1 of TIA/EIA 603-C-2004. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-peak and average detector modes.

Radiated Emissions

The EUT is placed on a turn table, which is 0.8 m above ground plane. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna, which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the maximum emissions, exploratory radiated emission measurements were made according to the requirements in Section 13.1.4.1 of TIA/EIA 603-C-2004.

4.2 Description of Test Modes

The EUT has been tested under normal operating condition.

Three channels (The top channel, the middle channel and the bottom channel) are chosen for testing.

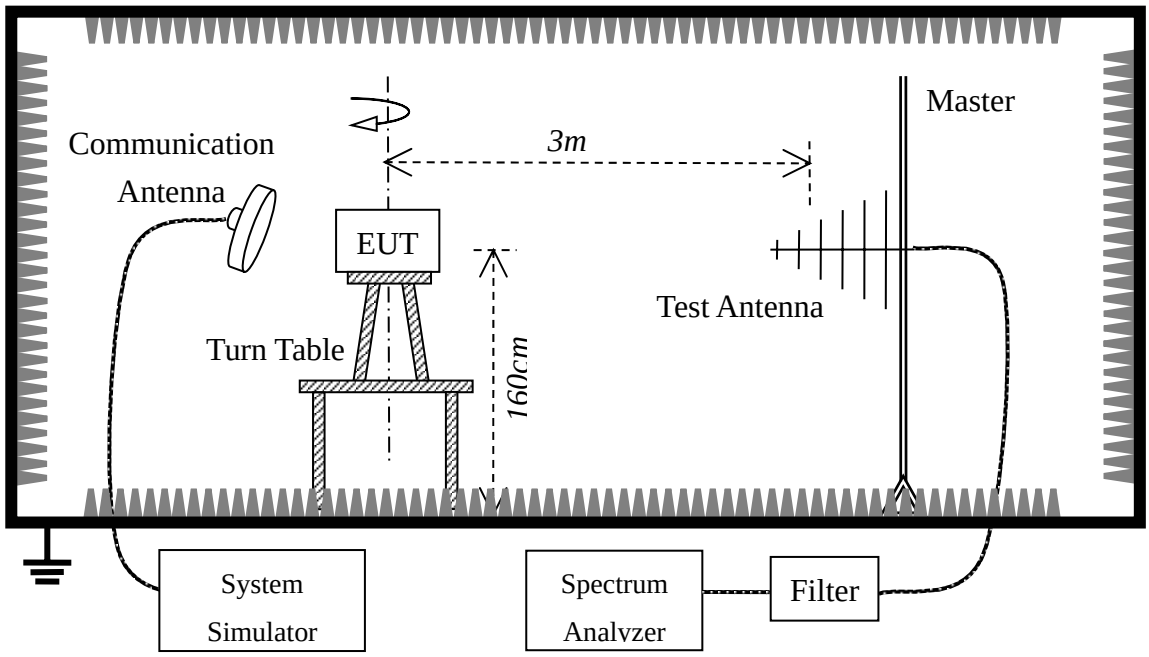
5. FCC Part 90 Requirements

5.1 Power and Antenna High Limits

LIMIT

According to CFR 47 section 90.205, Maximum ERP is dependent upon the station's antenna HAAT and required service area.

TEST CONFIGURATION



TEST PROCEDURE

1. On a test site, the EUT shall be placed on a turntable and in the position closest to the normal use as declared by the user.

2. The test antenna shall be oriented initially for vertical polarization located 3m from the EUT to correspond to the transmitter.

3. The output of the antenna shall be connected to the measuring receiver and either a peak or quasi-peak detector was used for the measurement as indicated on the report. The detector selection is based on how close the emission level was approaching the limit.

4. The transmitter shall be switched on; if possible, without the modulation and the measurement receiver shall be tuned to the frequency of the transmitter under test.

5. The test antenna shall be raised and lowered through the specified range of height until the measuring receiver detects a maximum signal level.

6. The transmitter shall than be rotated through 360°in the horizontal plane, until the maximum signal level is detected by the measuring receiver.

7. The test antenna shall be raised and lowered again through the specified range of height until the measuring receiver detects a maximum signal level.

8. The maximum signal level detected by the measuring receiver shall be noted.

9. The measurement shall be repeated with the test antenna set to horizontal polarization.

10. Replace the antenna with a proper Antenna (substitution antenna).

11. The substitution antenna shall be oriented for vertical polarization and, if necessary, the length of the substitution antenna shall be adjusted to correspond to the frequency of transmitting.

12. The substitution antenna shall be connected to a calibrated signal generator.

13. If necessary, the input attenuator setting of the measuring receiver shall be adjusted in order to increase the sensitivity of the measuring receiver.

14. The test antenna shall be raised and lowered through the specified range of the height to ensure that the maximum signal is received.

15. The input signal to substitution antenna shall be adjusted to the level that produces a level detected by the measuring receiver, that is equal to the level noted while the transmitter radiated power was measured, corrected for the change of input attenuation setting of the measuring receiver.

16. The input level to the substitution antenna shall be recorded as power level in dBm, corrected for any change of input attenuator setting of the measuring receiver.
17. The measurement shall be repeated with the test antenna and the substitution antenna oriented for horizontal polarization.

TEST RESULTS

Chan	Freq.	Antenna	Reading	Factor	AntennaGain	E.R.P
	(MHz)	Polarity	(dBm)	(dB)	(dB)	(dBm)
Low	450.125	V	6.87	22.39	1.11	30.37
	450.125	H	6.73	22.39	1.11	30.23
Middle	460.125	V	6.57	22.63	1.12	30.32
	460.125	H	6.13	22.63	1.12	30.88
High	469.975	V	6.14	23.32	1.13	30.59
	469.975	H	5.82	23.32	1.13	30.27

Note:

E.R.P(dBm) = SG output power (dBm) + Factor (dB) + Antenna gain (dB)

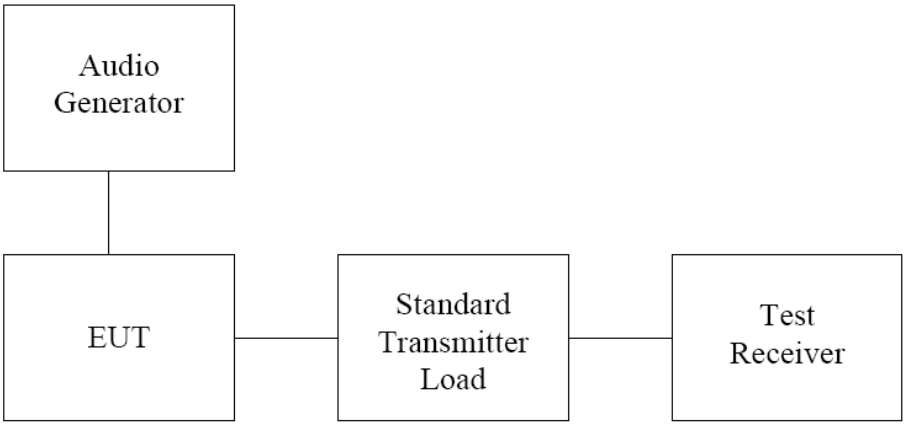
5.2 Modulation Characteristic

LIMIT

According to CFR 47 section 2.1047 a, for Voice modulation communication equipment, the frequency response of the audio modulation circuit over a range of 100 to 5000 Hz shall be measured.

According to CFR 47 section 90.205, Equipment which employs modulation limiting, a curve showing the percentage of modulation versus the modulation input voltage shall be supplied.

TEST CONFIGURATION



TEST PROCEDURE

Modulation limits is the transmitter circuit's ability to limit the transmitter form producing deviations in excess of rated system deviation.

The audio signal generator is connected to the audio input of the EUT with its full rating.

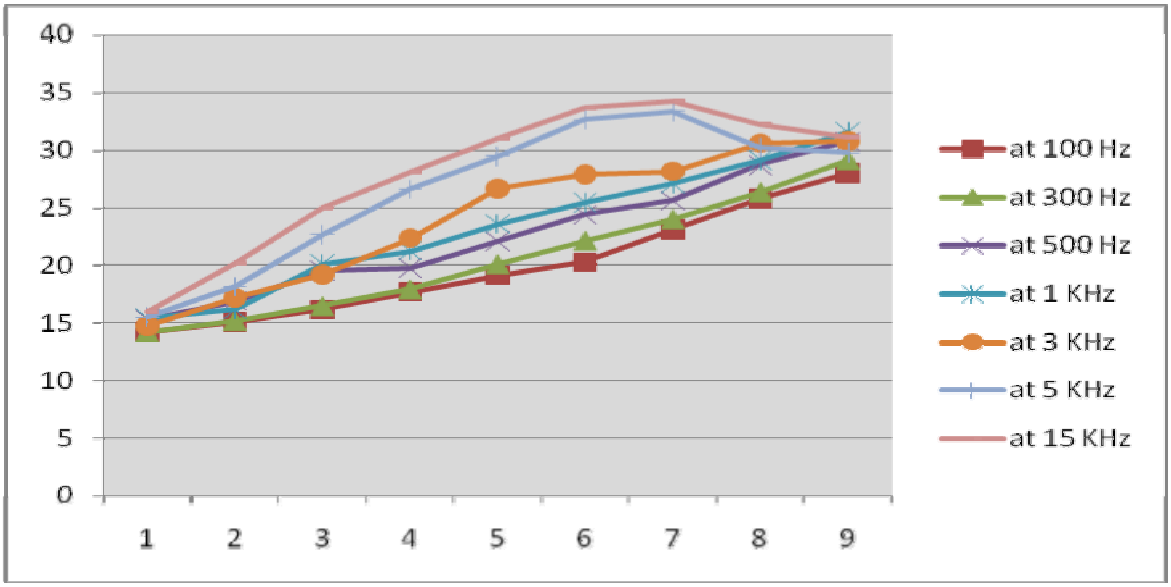
The modulation response is measured at certain modulation frequencies, related to 1000 Hz reference signal.

Tests are performed for positive and negative modulation.

TEST RESULTS

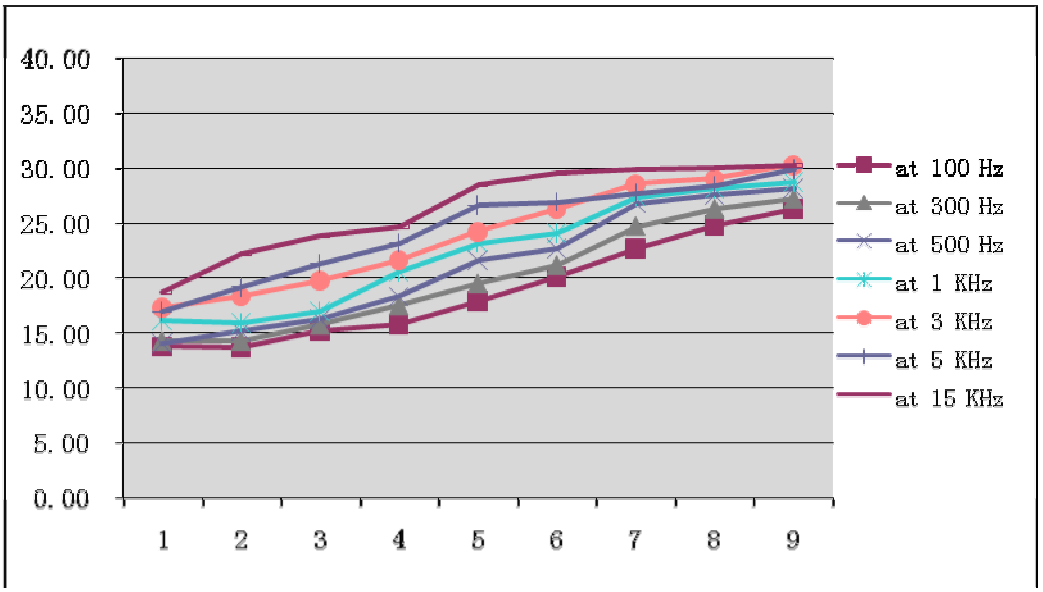
The Low Channel (450.125 MHz)

Modulation Level (dB)	Peak Frequency Deviation						
	at 100 Hz	at 300 Hz	at 500 Hz	at 1 KHz	at 3 KHz	at 5 KHz	at 15 KHz
-20	14.39	14.25	14.16	15.62	17.49	17.21	18.58
-15	14.15	14.29	15.33	16.24	18.41	19.46	22.04
-10	15.68	15.79	16.42	17.32	19.85	21.59	23.63
-5	16.28	17.51	18.46	20.92	21.76	23.43	24.54
0	18.36	19.51	21.75	23.48	24.33	26.85	28.33
+5	20.56	21.17	22.82	24.34	26.33	27.14	29.34
+10	23.14	24.69	26.95	27.65	28.63	27.92	29.65
+15	25.24	26.28	27.72	28.45	29.15	28.56	29.83
+20	26.78	27.19	28.31	29.02	30.42	30.12	30.07



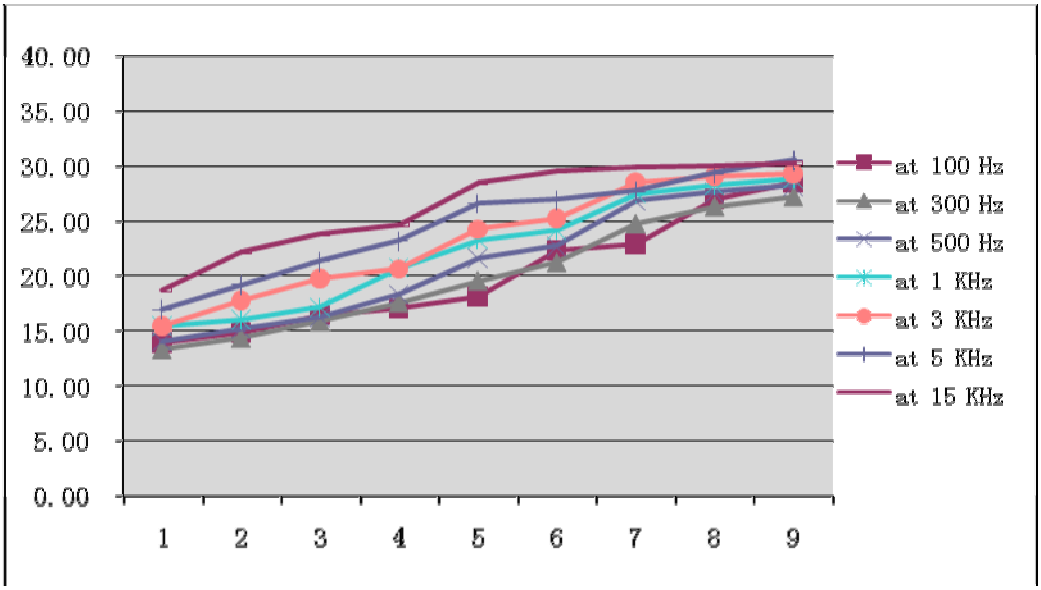
The Middle Channel (460.125 MHz)

Modulation Level (dB)	Peak Frequency Deviation						
	at 100 Hz	at 300 Hz	at 500 Hz	at 1 KHz	at 3 KHz	at 5 KHz	at 15 KHz
-20	13.82	14.32	14.04	16.18	17.29	16.99	13.82
-15	13.73	14.30	15.19	15.94	18.32	19.24	13.73
-10	15.26	15.80	16.28	17.02	19.76	21.35	15.26
-5	15.86	17.52	18.32	20.62	21.62	23.21	15.86
0	17.94	19.52	21.61	23.18	24.24	26.63	17.94
+5	20.14	21.18	22.68	24.04	26.24	26.92	20.14
+10	22.72	24.70	26.81	27.35	28.54	27.70	22.72
+15	24.82	26.29	27.58	28.15	29.06	28.34	24.82
+20	26.36	27.20	28.17	28.72	30.33	29.90	26.36



The High Channel (469.975 MHz)

Modulation Level (dB)	Peak Frequency Deviation						
	at 100 Hz	at 300 Hz	at 500 Hz	at 1 KHz	at 3 KHz	at 5 KHz	at 15 KHz
-20	13.94	13.35	14.09	15.43	15.43	17.02	18.73
-15	14.92	14.39	15.26	16.05	17.79	19.27	22.19
-10	16.45	15.89	16.35	17.13	19.79	21.38	23.78
-5	17.05	17.61	18.39	20.73	20.65	23.24	24.69
0	18.13	19.61	21.68	23.29	24.27	26.66	28.48
+5	22.33	21.27	22.75	24.15	25.27	26.95	29.49
+10	22.91	24.79	26.88	27.46	28.57	27.73	29.84
+15	27.01	26.38	27.65	28.26	29.09	29.37	29.98
+20	28.55	27.29	28.24	28.83	29.36	30.56	30.22

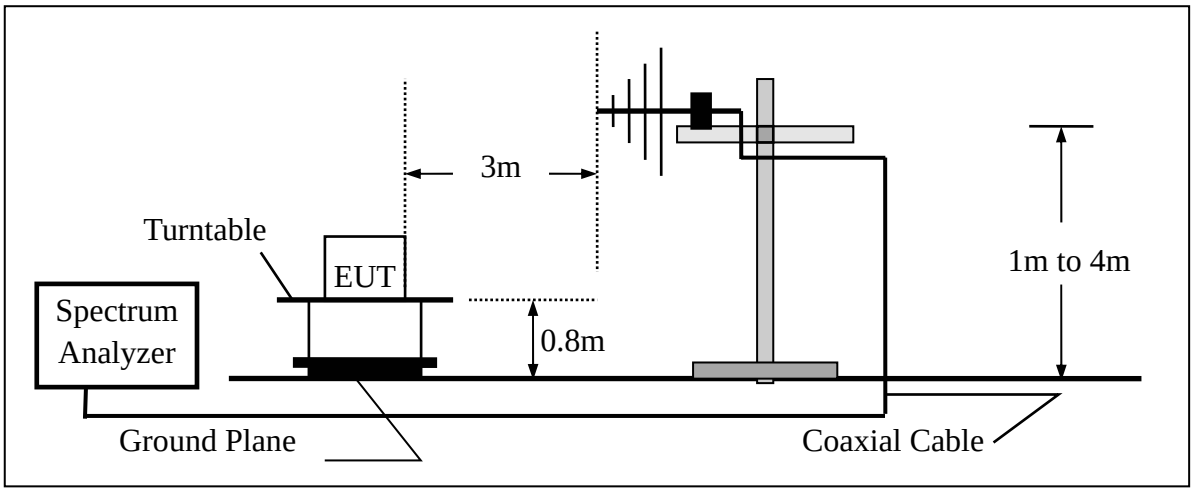


5.3 Occupied Bandwidth

LIMIT

According to FCC CFR 47 Part 90 Section 90.209, for other types of emissions, the maximum authorized bandwidth shall not be more than that normally authorized for voice operations.

TEST CONFIGURATION



TEST PROCEDURE

1. The EUT is placed on a turntable, which is 0.8m above ground plane.
2. Set EUT as normal operation.
3. Set SPA center frequency=fundamental frequency, RBW=10 KHz, VBW=30 KHz, Span=200 KHz.
4. Set SPA max. Hold. Mark peak, -26dB.

TEST RESULTS

Channel	Frequency	Occupied Bandwidth	Result
Bottom	450.125 MHz	11.06 KHz	PASS
Middle	460.125 MHz	11.05 KHz	PASS
Top	469.975MHz	11.08 KHz	PASS

Please check to the emission mask on page 25-26.

PASS

5.4 Emission Mask

LIMIT

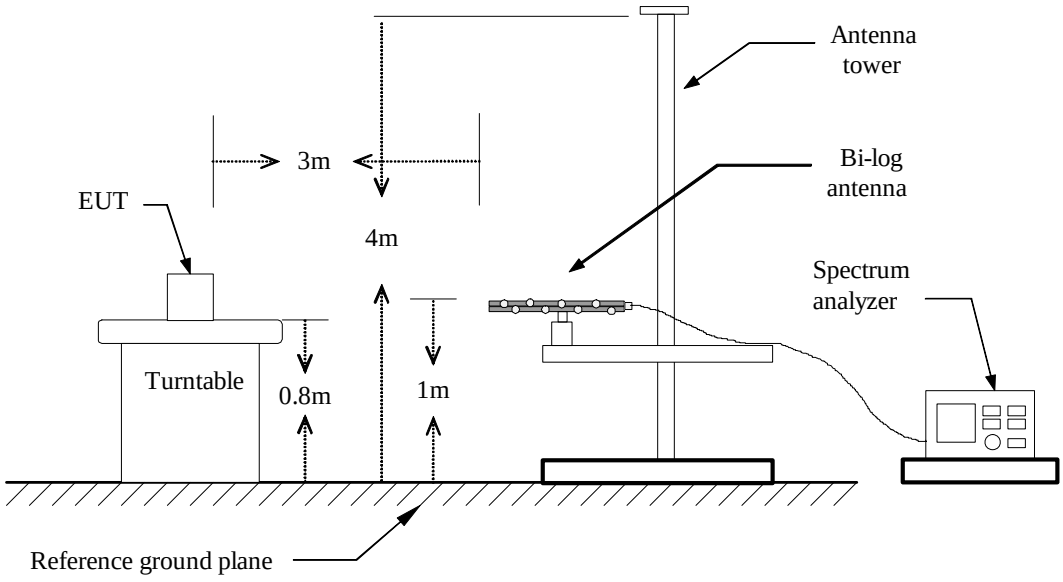
According to CFR 47 section 90.210, the mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with the following schedule:

(1) On any frequency removed from the operating frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth: at least 25 dB;

(2) On any frequency removed from the operating frequency by more than 100 percent up to and including 250 percent of the authorized bandwidth: at least 35 dB;

(3) On any frequency removed from the operating frequency by more than 250 percent of the authorized bandwidth: at least 43+10log $_{10}$ *(mean output power in watts) dB;

TEST CONFIGURATION



TEST PROCEDURE

1. On a test site, the EUT shall be placed on a turntable and in the position closest to the normal use as declared by the user.

2. The test antenna shall be oriented initially for vertical polarization located 3m from the EUT to correspond to the transmitter.

3. The output of the antenna shall be connected to the measuring receiver and either a peak or quasi-peak detector was used for the measurement as indicated on the report. The detector selection is based on how close the emission level was approaching the limit.

4. The transmitter shall be switched on; if possible, without the modulation and the measurement receiver shall be tuned to the frequency of the transmitter under test.

5. The test antenna shall be raised and lowered through the specified range of height until the measuring receiver detects a maximum signal level.

6. The transmitter shall than be rotated through 360°in the horizontal plane, until the maximum signal level is detected by the measuring receiver.

7. The test antenna shall be raised and lowered again through the specified range of height until the measuring receiver detects a maximum signal level.

8. The maximum signal level detected by the measuring receiver shall be noted.

9. The measurement shall be repeated with the test antenna set to horizontal polarization.

10. Replace the antenna with a proper Antenna (substitution antenna).

11. The substitution antenna shall be oriented for vertical polarization and, if necessary, the length of the substitution antenna shall be adjusted to correspond to the frequency of transmitting.

12. The substitution antenna shall be connected to a calibrated signal generator.

13. If necessary, the input attenuator setting of the measuring receiver shall be adjusted in order to increase the sensitivity of the measuring receiver.

14. The test antenna shall be raised and lowered through the specified range of the height to ensure that the maximum signal is received.

15. The input signal to substitution antenna shall be adjusted to the level that produces a level detected by the measuring receiver, that is equal to the level noted while the transmitter radiated power was measured, corrected for the change of input attenuation setting of the measuring receiver.

16. The input level to the substitution antenna shall be recorded as power level in dBm, corrected for any change of input attenuator setting of the measuring receiver.

17. The measurement shall be repeated with the test antenna and the substitution antenna oriented for horizontal polarization.

TEST RESULTS

The Unwanted Radiated Emission

The Low Channel (450.125 MHz)

Frequency (MHz)	Antenna Polarization	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dB)	Emission level (dBm)	Limit (dBm)	Margin (dB)
900.03	V	-18.15	10.69	8.31	-20.53	-13	-7.53
Other	V	--	--	--	--	-13	> 10 dB
--	V	--	--	--	--	-13	> 10 dB
--	V	--	--	--	--	-13	> 10 dB
900.07	H	-22.74	10.69	8.31	-25.12	-13	-12.12
Other	H	--	--	--	--	-13	> 10 dB
--	H	--	--	--	--	-13	> 10 dB
--							

Notes:

(1) "--" in the table above means that the emissions are too small to be measured and are at least 10 dB below the limit.

(2) Emisiion Level=S.G ourput power(dBm)-Cable loss(db)+Antenna Gain(dBi)

The Middle Channel (460.125 MHz)

Frequency (MHz)	Antenna Polarization	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dB)	Emission level (dBm)	Limit (dBm)	Margin (dB)
920.08	V	-19.14	10.72	8.35	-21.51	-13	-8.51
0ther	V	--	--	--	--	-13	> 10 dB
--	V	--	--	--	--	-13	> 10 dB
--	V	--	--	--	--	-13	> 10 dB
--	V	--	--	--	--	-13	> 10 dB
--	V	--	--	--	--	-13	> 10 dB
920.11	H	-21.49	10.72	8.35	-23.86	-13	-10.86
Other	H	--	--	--	--	-13	> 10 dB
--	H	--	--	--	--	-13	> 10 dB
--	H	--	--	--	--	-13	> 10 dB
--	H	--	--	--	--	-13	> 10 dB
--							

Notes:

(1) "--" in the table above means that the emissions are too small to be measured and are at least 10 dB below the limit.

(2) Emisiion Level=S.G ourput power(dBm)-Cable loss(db)+Antenna Gain(dBi)

The High Channel (469.975 MHz)

Frequency (MHz)	Antenna Polarization	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dB)	Emission level (dBm)	Limit (dBm)	Margin (dB)
940.13	V	-18.41	10.90	8.69	-20.62	-13	-7.62
Other	V	--	--	--	--	-13	> 10 dB
--	V	--	--	--	--	-13	> 10 dB
--	V	--	--	--	--	-13	> 10 dB
940.15	H	-22.13	10.90	8.69	-24.34	-13	-11.34
Other	H	--	--	--	--	-13	> 10 dB
--	H	--	--	--	--	-13	> 10 dB
--	H	--	--	--	--	-13	> 10 dB
--	H	--	--	--	--	-13	> 10 dB
--							

Notes:

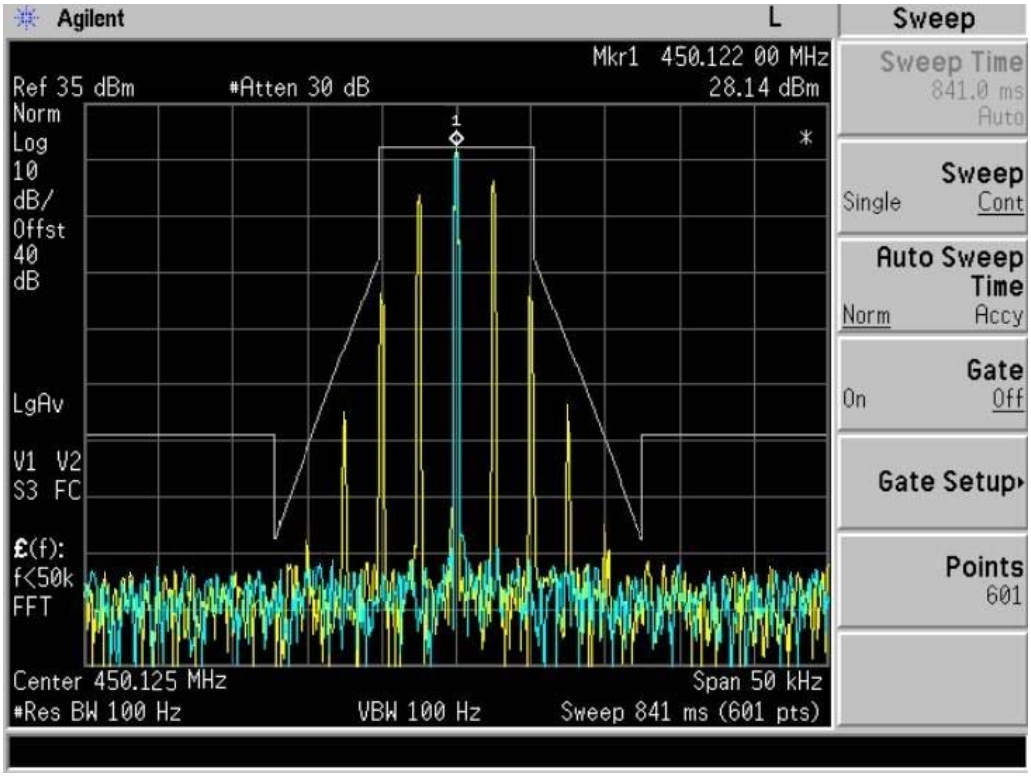
(1) "--" in the table above means that the emissions are too small to be measured and are at least 10 dB below the limit.

(2) Emisiion Level=S.G ourput power(dBm)-Cable loss(db)+Antenna Gain(dBi)

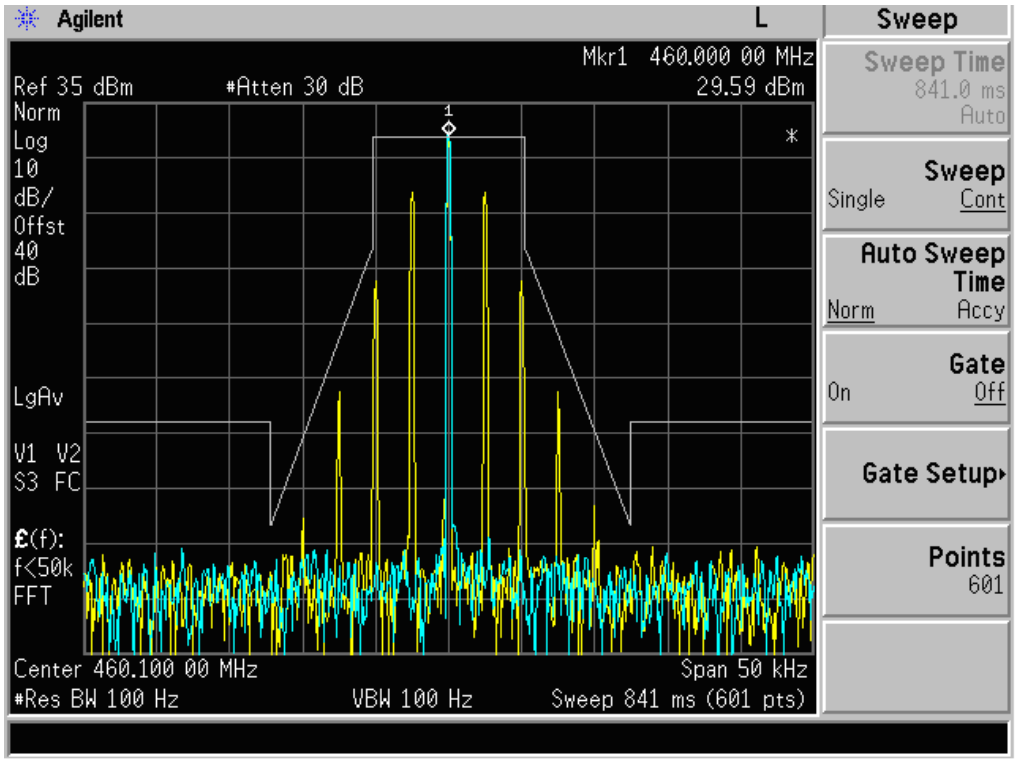
Maximum Transmitter Power (P)	29.59 dBm
Require attenuation	$43+10\log_{10}$ (0.91)= 42.59 dB
Emission Limits	P-[$43+10\log_{10}$ (0.91)]= -13 dBm

Emission Mask:

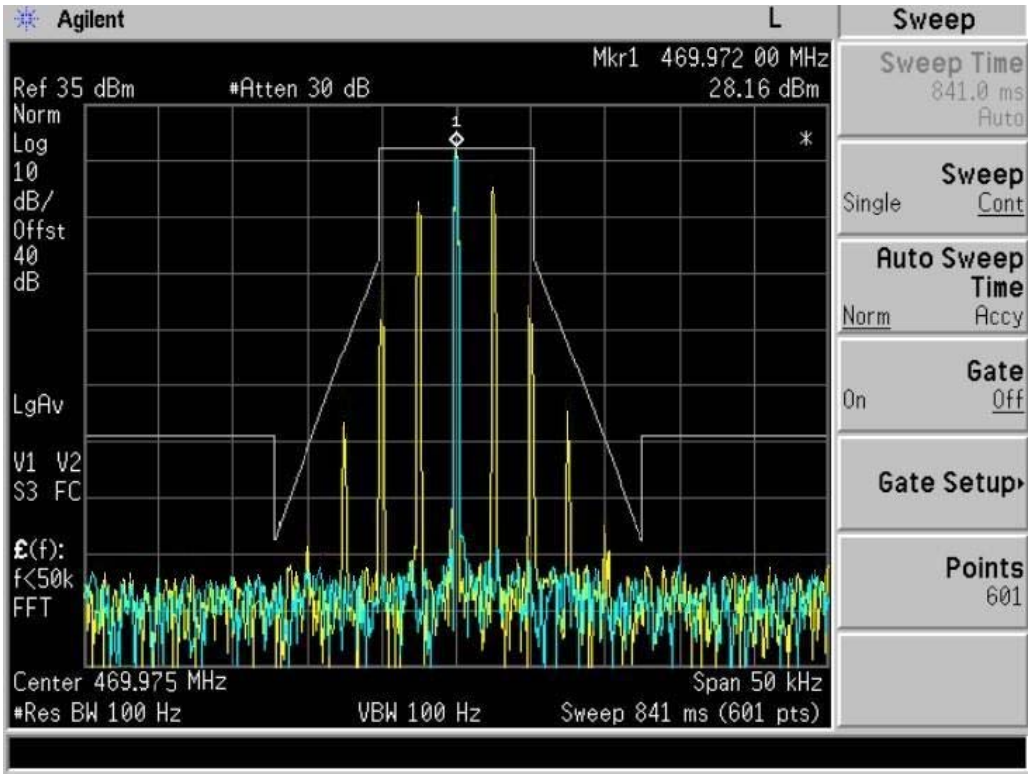
The Low Channel (450.125 MHz)



The Middle Channel (460.125 MHz)



The High Channel (469.975 MHz)



5.5 Conducted Spurious Emissions Tests

LIMIT

According to CFR 47 section 90.210, the mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with the following schedule:

(1) On any frequency removed from the operating frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth: at least 25 dB;

(2) On any frequency removed from the operating frequency by more than 100 percent up to and including 250 percent of the authorized bandwidth: at least 35 dB;

(3) On any frequency removed from the operating frequency by more than 250 percent of the authorized bandwidth: at least $43+10\log_{10}$ *(mean output power in watts) dB;

TEST PROCEDURE

Based on ANSI/TIA-603-C-2004

1. The EUT is coupled to the Spectrum Analyzer with the suitable Attenuators.
2. Set the spectrum analyzer to measure peak hold with the required settings.
3. Set the spectrum analyzer to measure peak hold with the required settings. Offset the spectrum analyzer reference level by the path loss measured above.
4. Measure and record all spurious emissions up to the tenth harmonic of the carrier frequency.
5. Measurements are to be performed with the EUT set to the low, middle and high channel of each frequency band.
6. If necessary steps 6 and 7 may be performed with the spectrum analyzer set to average detector.

RESULTS

No.	Frequency (MHz)	Conducted Emission Power (dBm)	Limit (dBm)
Low Channel (450.125MHz)			
1	450.125	29.08	---
2	900.250	-32.39	-13
3	1350.360	-38.15	-13
4	1800.500	---	-13
5	2250.625	---	-13
6	--	---	-13
Middle Channel (460.125MHz)			
1	460.125	29.16	---
2	920.250	-35.03	-13
3	1380.375	-40.75	-13
4	1840.500	---	-13
5	2300.625	---	-13
6	--	---	-13
High Channel (469.975MHz)			
1	469.975	29.32	---
2	939.950	-34.11	-13
3	1409.925	-41.56	-13
4	1879.900	---	-13
5	2349.875	---	-13
6	--	---	-13

Notes:

(1) "--" in the table above means that the emissions are too small to be measured and are at least 10 dB below the limit.

5.6 Frequency Stability vs. Temperature

LIMIT

a). According to FCC Part 2 Section 2.1055(a)(1), the frequency stability shall be measured with variation of ambient temperature from －30℃ to +50℃ centigrade.

b). According to FCC Part 2 Section 2.1055(d)(1), vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.

c). According to FCC Part 90 Section 90.213, for output power > 2Wats, the limits is 2.5 ppm.

TEST PROCEDURE

The EUT power was supplied by DC power supply and the RF output was connected to a frequency counter via feed through attenuators. The EUT was placed inside the temperature chamber. The DC leads and the RF output cable, exited the chamber through an opening made for that purpose.

After the temperature stabilized the frequency output was recorded form the counter.

RESULTS

The Low Channel (450.125 MHz)

Temperature (℃)	Frequency Error (K Hz)	Frequency Error (%)	Frequency Error (ppm)	Limit (ppm)
-30	-7.432	-0.000017	-0.17	±2.5
-20	-5.150	-0.000013	-0.13	±2.5
-10	4.859	0.000012	0.12	±2.5
0	1.524	0.000003	0.03	±2.5
10	5.650	0.000013	0.13	±2.5
20	7.237	0.000016	0.16	±2.5
30	-6.550	-0.000016	-0.16	±2.5
40	-7.831	-0.000019	-0.19	±2.5
50	-8.579	-0.000032	-0.21	±2.5

The Middle Channel (460.125 MHz)

Temperature (℃)	Frequency Error (K Hz)	Frequency Error (%)	Frequency Error (ppm)	Limit (ppm)
-30	-7.062	-0.000016	-0.16	±2.5
-20	-5.156	-0.000012	-0.12	±2.5
-10	3.525	0.000008	0.08	±2.5
0	1.309	0.000003	0.03	±2.5
10	3.580	0.000008	0.08	±2.5
20	4.561	0.000010	0.10	±2.5
30	5.090	-0.000011	-0.11	±2.5
40	-6.650	-0.000015	-0.15	±2.5
50	-7.150	-0.000016	-0.16	±2.5

The High Channel (469.975 MHz)

Temperature (℃)	Frequency Error (K Hz)	Frequency Error (%)	Frequency Error (ppm)	Limit (ppm)
-30	-6.510	-0.000014	-0.14	±2.5
-20	-5.360	-0.000011	-0.11	±2.5
-10	-1.895	0.000004	0.04	±2.5
0	2.535	0.000005	0.05	±2.5
10	2.869	0.000006	0.06	±2.5
20	3.175	0.000007	0.07	±2.5
30	-3.695	0.000008	-0.08	±2.5
40	4.295	0.000009	0.09	±2.5
50	5.350	0.000011	0.11	±2.5

5.7 Frequency Stability vs. Voltage

LIMIT

a). According to FCC Part 2 Section 2.1055(a)(1), the frequency stability shall be measured with variation of ambient temperature from －30℃ to +50℃ centigrade.

b). According to FCC Part 2 Section 2.1055(d)(1), vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.

c). According to FCC Part 90 Section 90.213, for output power > 2Wats, the limits is 2.5 ppm.

TEST PROCEDURE

An external variable DC power supply was connected to the EUT.

For hand carried, The DC power equipment primary supply voltage was reduced to the end point as specified by the manufacturer. The output frequency was recorded for highest and lowest voltage.

RESULTS

The Low Channel (450.125 MHz)

Voltage (V)	Frequency Error (Hz)	Frequency Error (%)	Frequency Error (ppm)	Limit (%)
9.0	4023	0.000009	0.09	±2.5
8.1	3605	0.000008	0.08	±2.5
9.9	4560	0.000010	0.10	±2.5

The Middle Channel (460.125 MHz)

Voltage (V)	Frequency Error (Hz)	Frequency Error (%)	Frequency Error (ppm)	Limit (%)
9.0	4065	0.000009	0.09	±2.5
8.1	4550	0.000010	0.10	±2.5
9.9	5152	0.000012	0.12	±2.5

The High Channel (469.975 MHz)

Voltage (V)	Frequency Error (Hz)	Frequency Error (%)	Frequency Error (ppm)	Limit (%)
9.0	3750	0.000008	0.08	±2.5
8.1	2963	0.000006	0.06	±2.5
9.9	4865	0.000011	0.11	±2.5

5.8 Transmitter Frequency Behavior

Provisions Applicable

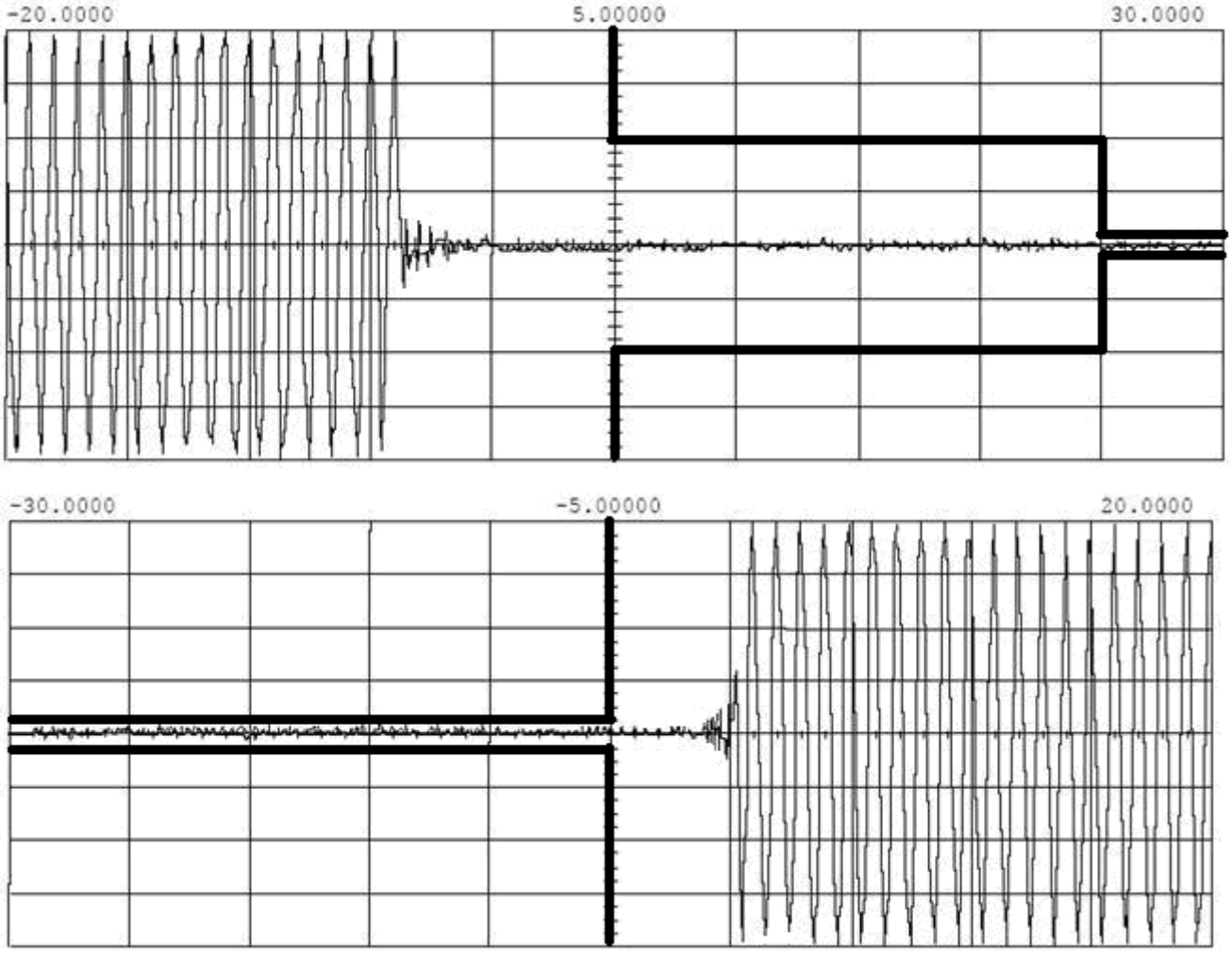
Section 90.214

TEST PROCEDURE

TIA/EIA-603 2.2.19

RESULTS

Please refer to the test plot.



No non-compliance noted

Conclusion: PASS

5.9 LINE CONDUCTED EMISSION TEST

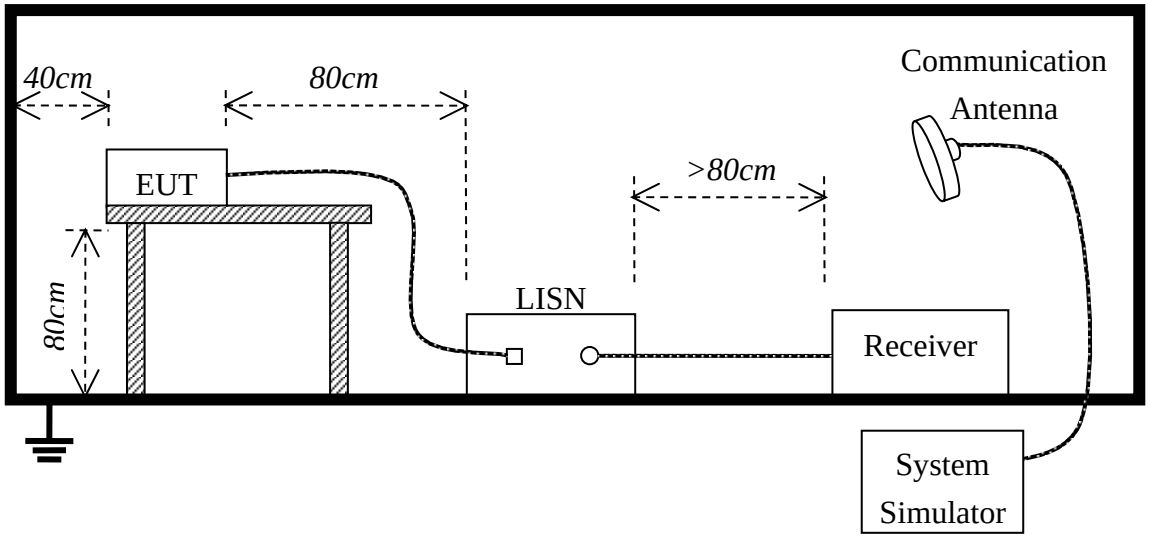
LIMITS OF LINE CONDUCTED EMISSION TEST

Frequency	Maximum RF Line Voltage	
	Q.P.(dBuV)	Average(dBuV)
150kHz-500kHz	66-56	56-46
500kHz-5MHz	56	46
5MHz-30MHz	60	50

***Note:** 1. the lower limit shall apply at the transition frequency.*

2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz

BLOCK DIAGRAM OF TEST SETUP



PRELIMINARY PROCEDURE OF LINE CONDUCTED EMISSION TEST

1) The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. When the EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per FCC Part 15 (see Test Facility for the dimensions of the ground plane used). When the EUT is floor-standing equipment, it is placed on the ground plane which has a 3-12 mm non-conductive covering to insulate the EUT from the ground plane.
2) Support equipment, if needed, was placed as per FCC Part 15.
3) All I/O cables were positioned to simulate typical actual usage as per FCC Part 15.
4) The EUT received AC120V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
5) All support equipments received power from a second LISN supplying power of AC 120V/60Hz, if any.
6) The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
7) Analyzer / Receiver scanned from 150 kHz to 30 MHz for emissions in each of the test modes.
8) During the above scans, the emissions were maximized by cable manipulation.
9) The following test mode(s) were scanned during the preliminary test:

Preliminary Conducted Emission Test				
Frequency Range Investigated		150KHz TO 30 MHz		
Mode of operation	Date	Report No.	Data#	Worst Mode
TX Mode				☐
RX Mode				

Then, the EUT configuration and cable configuration of the above highest emission level were recorded for reference of final testing.

FINAL PROCEDURE OF LINE CONDUCTED EMISSION TEST

EUT and support equipment was set up on the test bench as per step 9 of the preliminary test.

A scan was taken on both power lines, Line 1 and Line 2, recording at least the six highest emissions. Emission frequency and amplitude were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit. If EUT emission level was less –2dB to the A.V. limit in Peak mode, then the emission signal was re-checked using Q.P and Average detector.

The test data of the worst case condition(s) was reported on the Summary Data page.

TEST RESULT OF LINE CONDUCTED EMISSION TEST

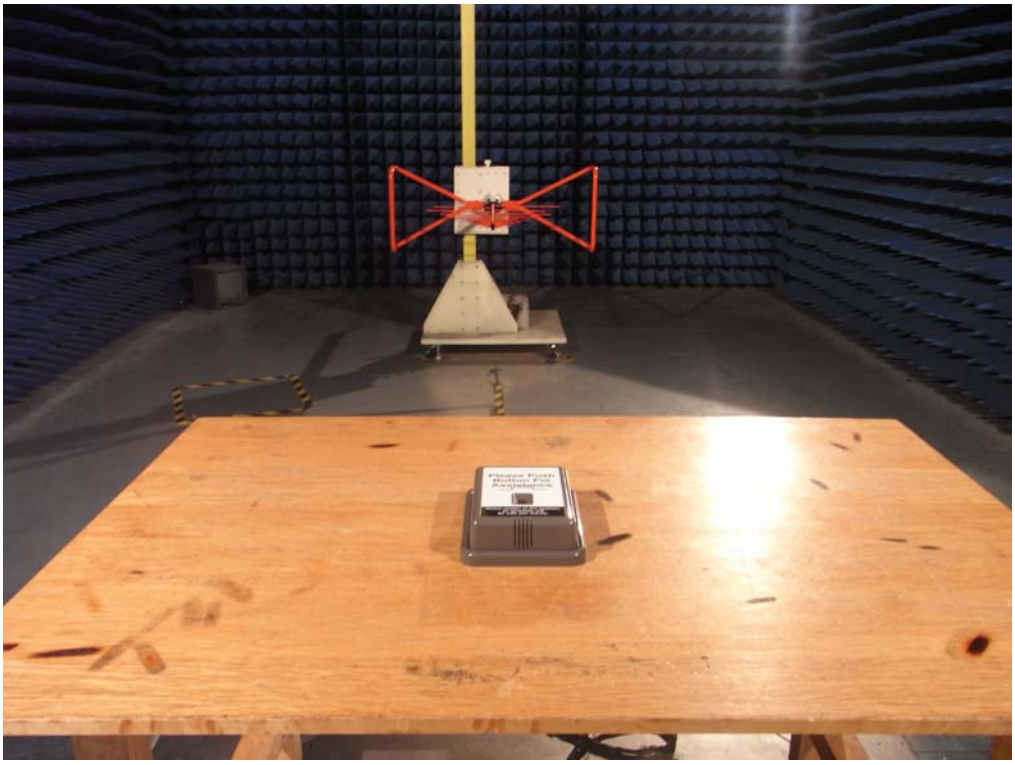
The EUT is powered by Battery.

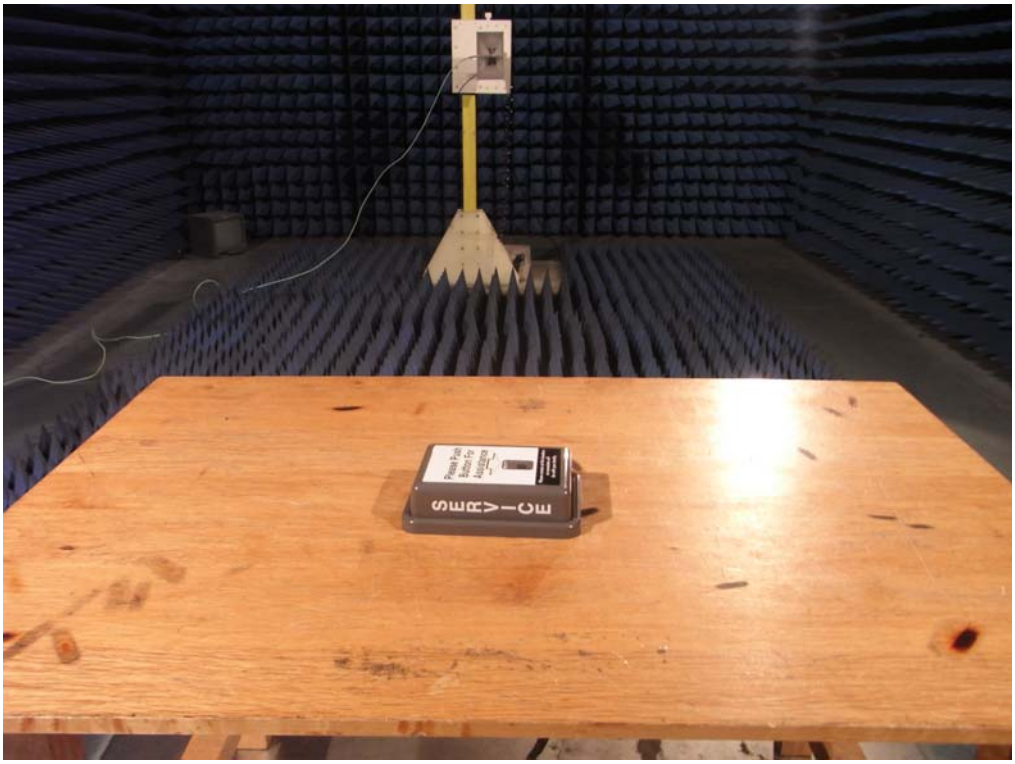
Not applicable.

Annex A

Photographs of the Test Setup

Radiated Emission Setup Photo





Annex B

Photographs of the EUT

FRONT VIEW OF SAMPLE

BACK VIEW OF SAMPLE

LEFT VIEW OF SAMPLE

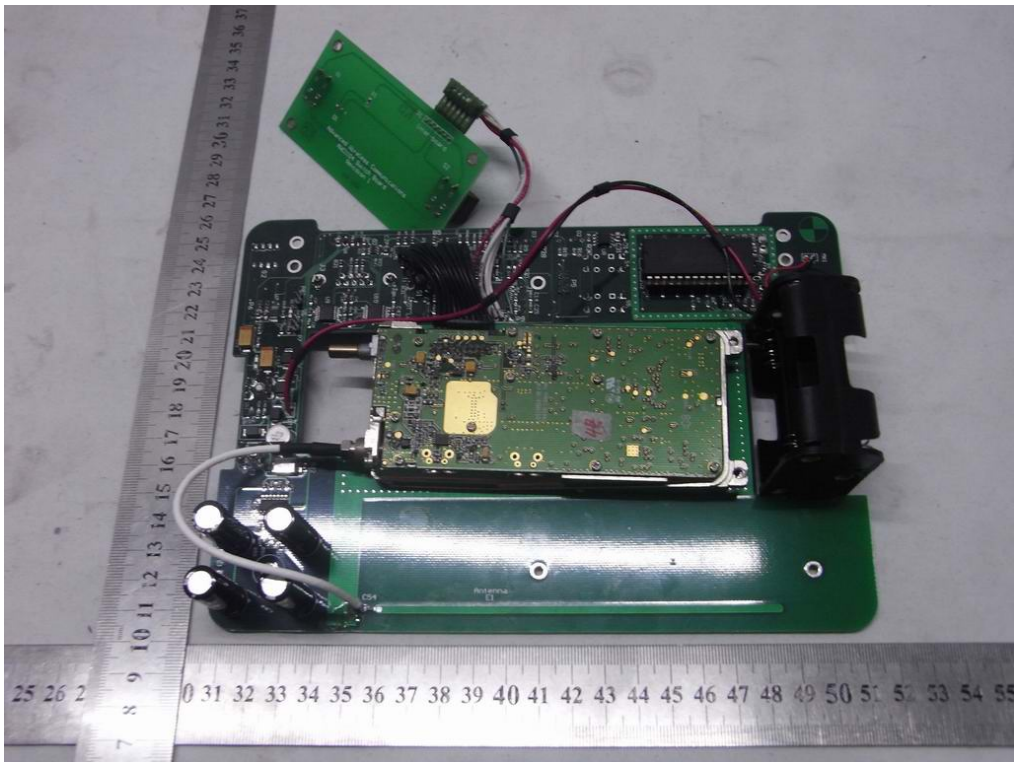
RIGHT VIEW OF SAMPLE

UP VIEW OF SAMPLE

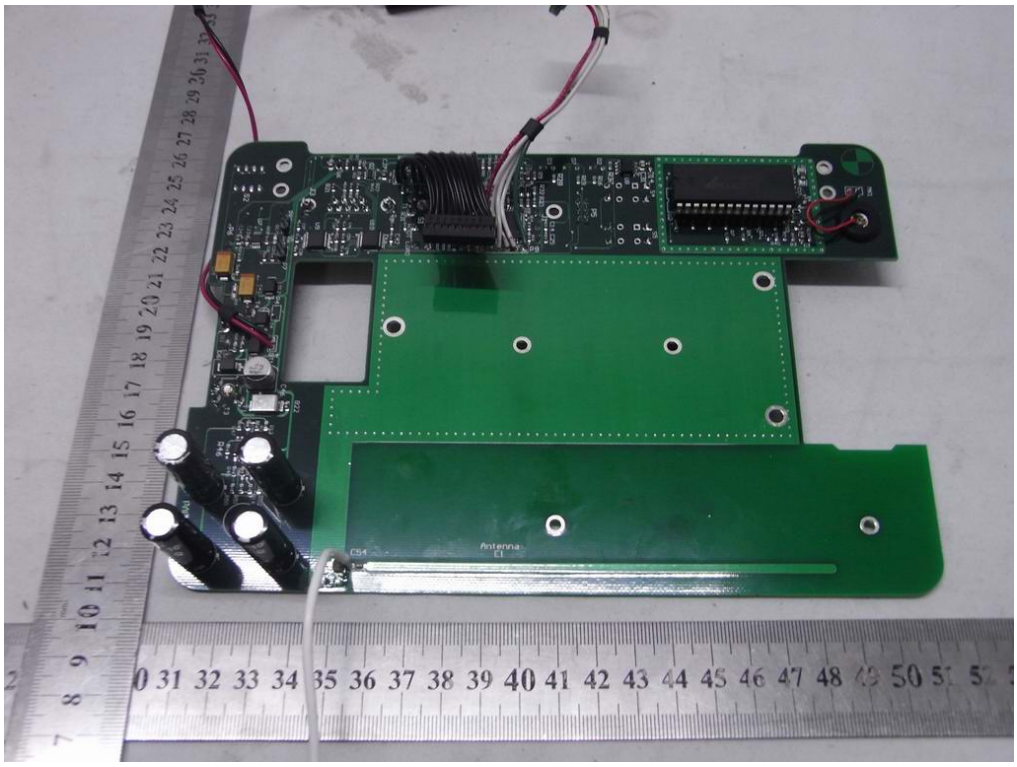
DOWN VIEW OF SAMPLE

INTERNAL PHOTO OF SAMPLE-1

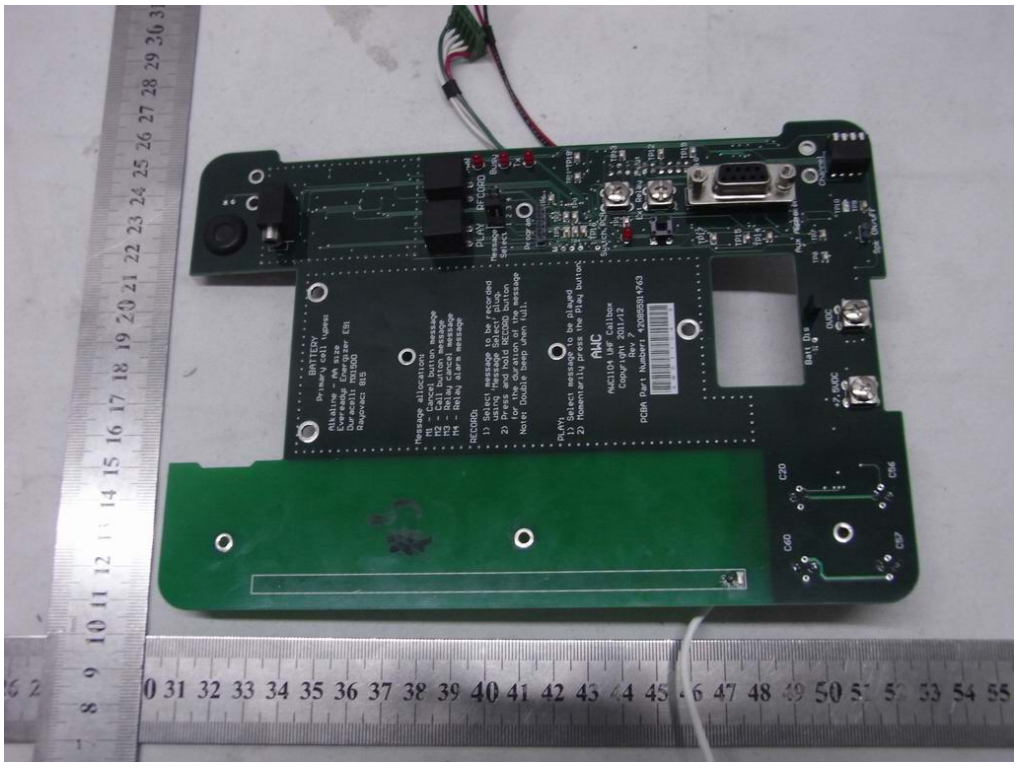
INTERNAL PHOTO OF SAMPLE-2



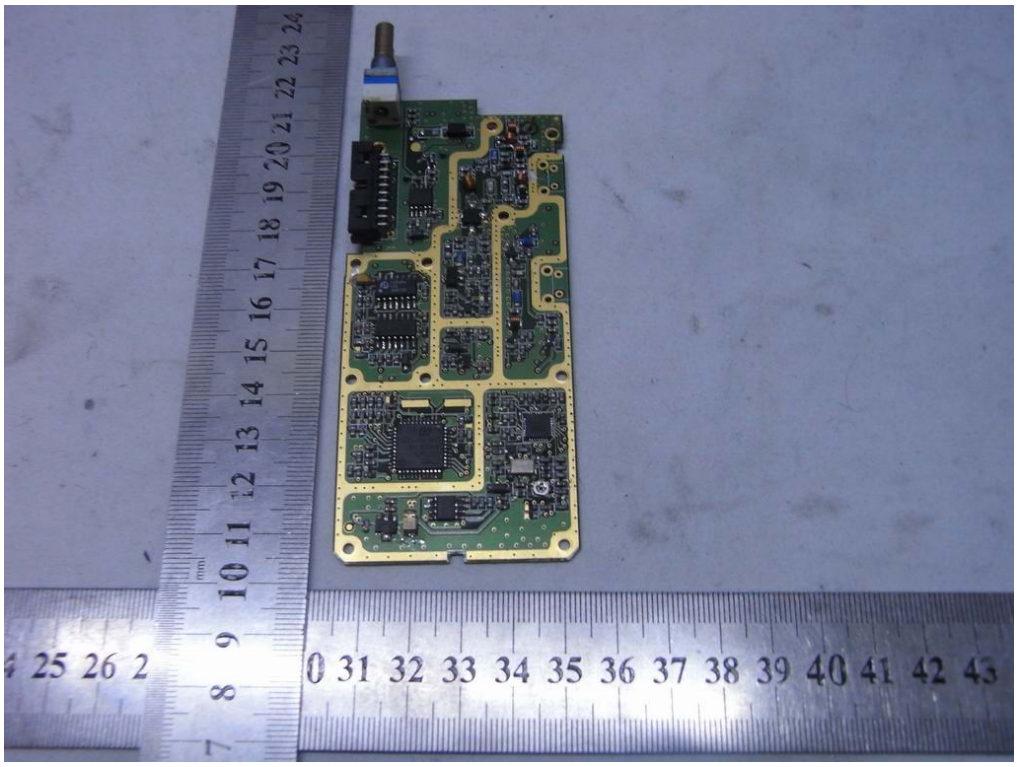
INTERNAL PHOTO OF SAMPLE-3



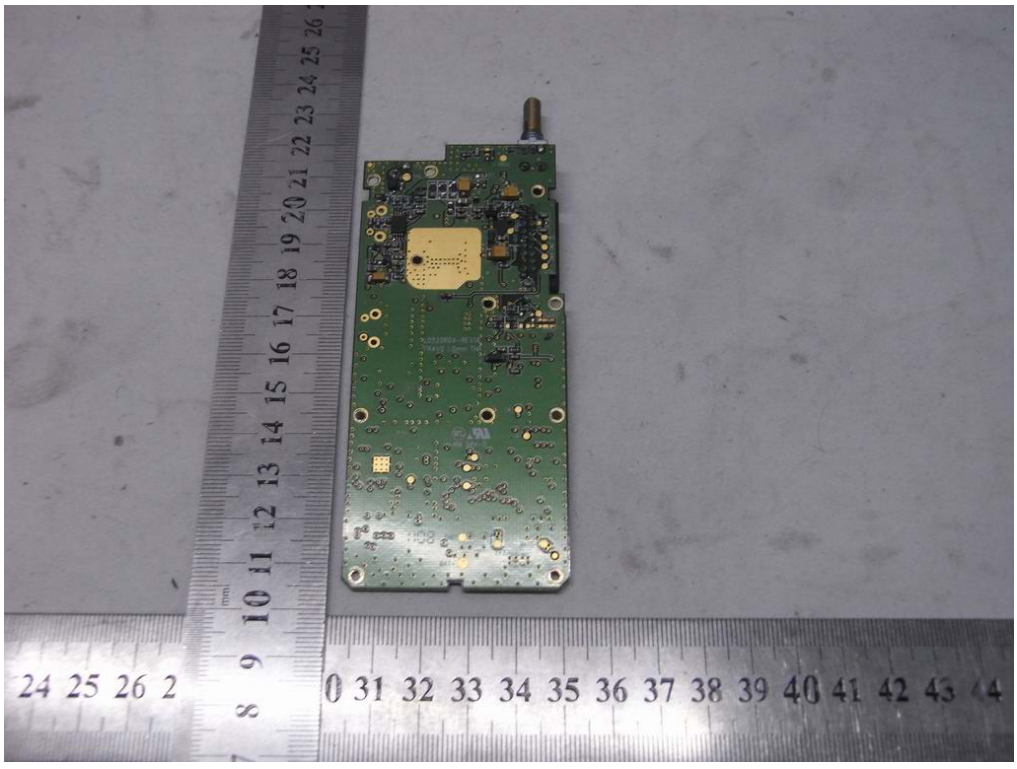
INTERNAL PHOTO OF SAMPLE-4



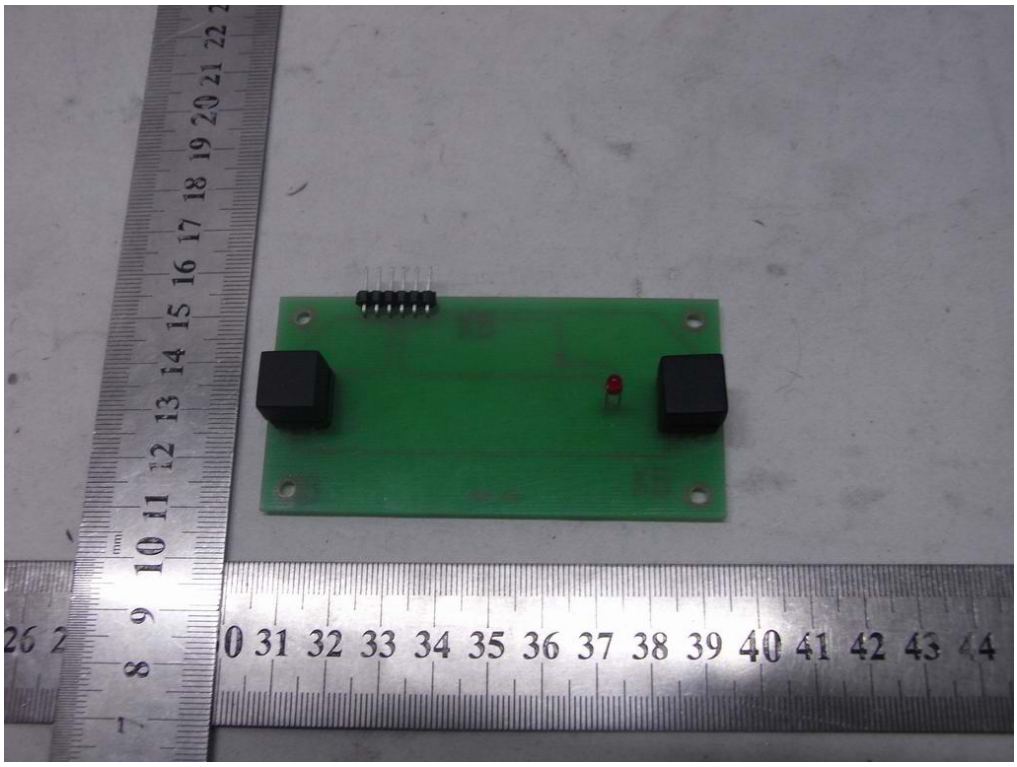
INTERNAL PHOTO OF SAMPLE-5



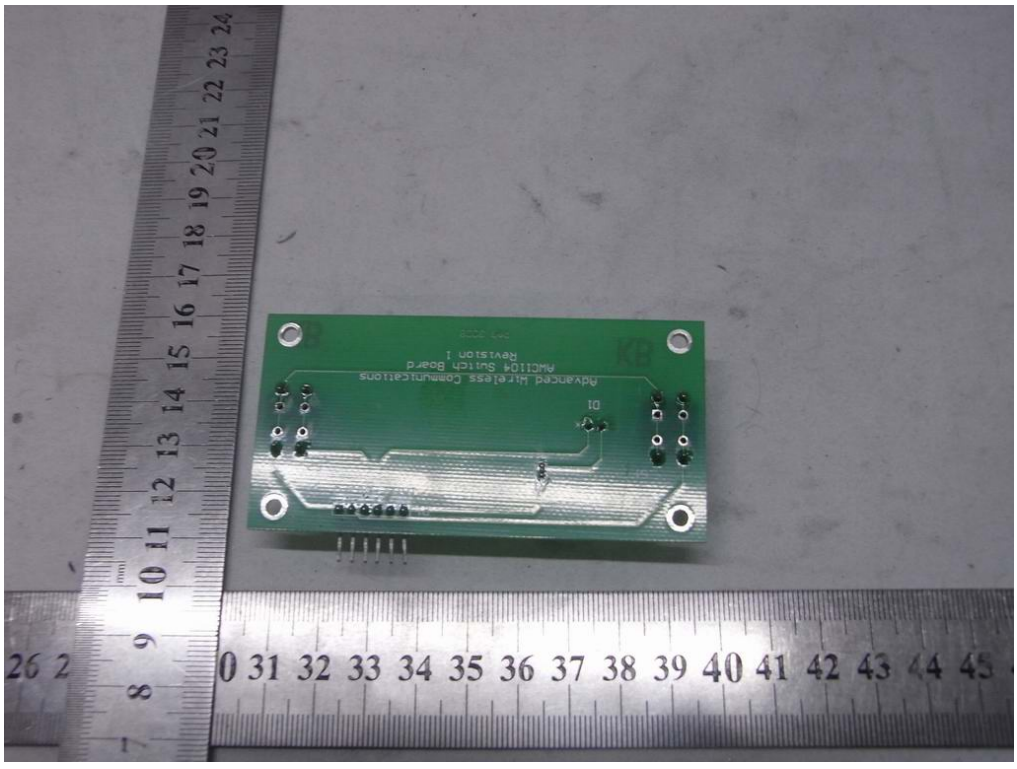
INTERNAL PHOTO OF SAMPLE-6



INTERNAL PHOTO OF SAMPLE-7



INTERNAL PHOTO OF SAMPLE-8



*** End of the Reports***