

FCC 47 CFR PART 15 SUBPART C

Product Type : Wireless Energy Monitor (433MHz version)
Applicant : Dongguan BaoshanElectronic Ltd.
Address : Baoshan industry zone, ZMT town, Dongguan city, GD province, China
Trade Name : AML
Model Number : 1208J
Test Specification : FCC 47 CFR PART 15 SUBPART C: Oct., 2011
ANSI C63.4-2009
Application Purpose : Original
Receive Date : February 19, 2013
Test Period : March 20, 2013~ April 16, 2013
Issue Date : May 13, 2013

Issue by

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Taiwan Accreditation Foundation accreditation number: 1330

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Revision History

Rev.	Issue Date	Revisions	Revised By
00	May 13, 2013	Initial Issue	

Verification of Compliance

Issued Date: 05/13/2013

Product Type : Wireless Energy Monitor (433MHz version)
Applicant : Dongguan BaoshanElectronic Ltd.
Address : Baoshan industry zone, ZMT town, Dongguan city, GD province, China
Trade Name : AML
Model Number : 1208J
FCC ID : YA8-1208J
EUT Rated Voltage : DC 3.0V
Test Voltage : DC 3.0V
Applicable Standard : FCC 47 CFR PART 15 SUBPART C: Oct., 2011
ANSI C63.4-2009
Test Result : Complied
Application Purpose : Original
Performing Lab. : A Test Lab Techno Corp.
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Taiwan Accreditation Foundation accreditation number: 1330
<http://www.atl-lab.com.tw/e-index.htm>



The above equipment was tested by A Test Lab Techno Corp. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.4: 2009 and the energy emitted by the sample tested as described in this report is in compliance with the requirements of FCC Rules Part 15.207, 15.209, 15.231 .

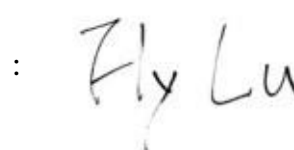
The test results of this report relate only to the tested sample identified in this report.

Approved By



(Manager)

Reviewed By



(Testing Engineer)

(Fly Lu)

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1 General Information

1.1. Summary of Test Result

FCC Rules	Test	Results	Section
§15.207	AC Power Conducted Emission	N/A	4.5
§15.231(e)	Transmitter time, Silent Period	PASS	5.5
§15.205,§15.209, §15.35(c),§15.231(e)	Transmitter field strength of emissions	PASS	5.5
§15.231(c)	Bandwidth of the emission	PASS	6.5
CFR 47 Part 15.231(2013) / ANSI C63.4: 2009			

The test results of this report relate only to the tested sample(s) identified in this report. Manufacturer or whom it may concern should recognize the pass or fail of the test result.

1.2. Measurement Uncertainty

Radiated Emission

The measurement uncertainty of is evaluated as $\pm 3.072\text{dB}$.

2 EUT Description

Applicant	Dongguan BaoshanElectronic Ltd.	
Applicant Address	Baoshan industry zone, ZMT town, Dongguan city, GD province, China	
Manufacturer	Dongguan BaoshanElectronic Ltd.	
Manufacturer Address	Baoshan industry zone, ZMT town, Dongguan city, GD province, China	
Product	Wireless Energy Monitor (433MHz version)	
Trade Name	AML	
Model Number	1208J	
FCC ID	YA8-1208J	
Frequency Range	Normal mode	433.72MHz
	Learning mode	434.72MHz
Modulation Type	2-FSK	
Antenna Type	Helical antenna	
Antenna Gain	2.0 dBi	

3 Test Methodology

3.1. Mode of Operation

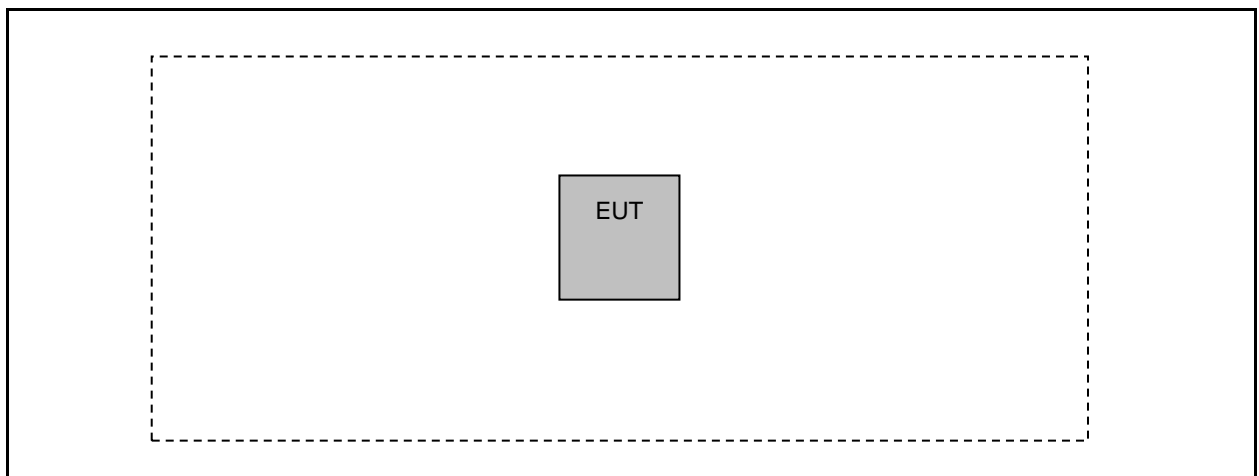
Test Mode
Mode 1: Transmitter Mode at 433.72Mz.

Note: We choose 433.72MHz to perform the all test, for 434.72MHz is exact same with 433.72MHz, same module, and same RF character, except frequency.

3.2. EUT Exercise Software

1	Setup the EUT as shown on 3.3.
2	Turn on the power of all equipment.
3	The EUT will start to operate function.

3.3. Configuration of Test System Details



3.4. Test Site Environment

Items	Required (IEC 68-1)	Actual
Temperature (°C)	15-35	26
Humidity (%RH)	25-75	60
Barometric pressure (mbar)	860-1060	950

4 Conducted Emission Measurement

4.1. Limit

Frequency (MHz)	Quasi-peak	Average
0.15 - 0.5	66 to 56	56 to 46
0.50 - 5.0	56	46
5.0 - 30.0	60	50

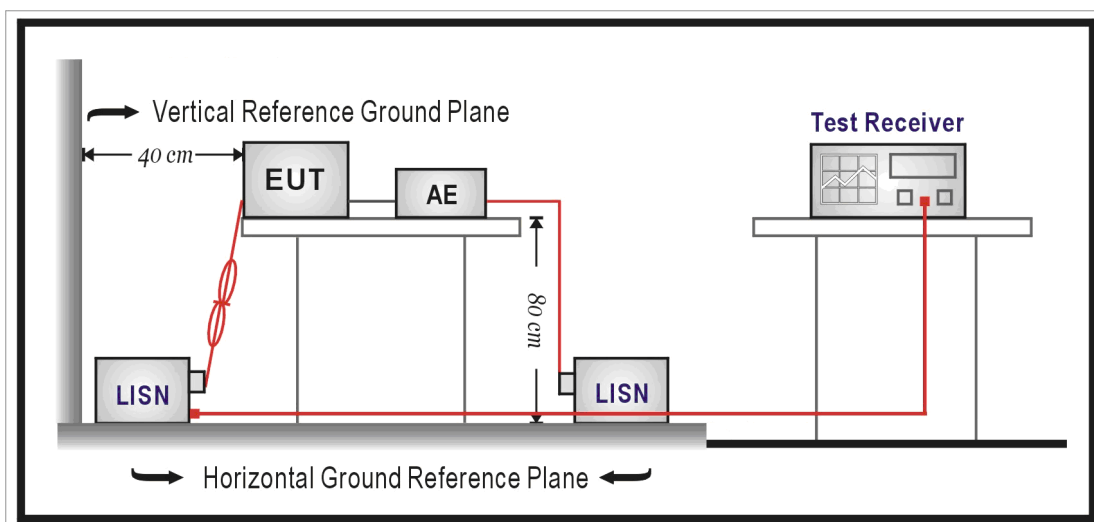
4.2. Test Instruments

Describe	Manufacturer	Model Number	Serial Number	Cal. Date	Remark
Test Receiver	R&S	ESCI	100367	06/18/2012	(1)
LISN	R&S	ENV216	101040	03/07/2013	(1)
LISN	R&S	ENV216	101041	03/07/2013	(1)
Test Site	ATL	TE02	TE02	N.C.R.	-----

Remark: (1) Calibration period 1 year. (2) Calibration period 2 years. (3) Calibration period 3 years.

Note: N.C.R. = No Calibration Request.

4.3. Test Setup



4.4. Test Procedure

The power line conducted emission measurements were performed in a shielded enclosure. The EUT was assembled on a wooden table which is 80 centimeters high, was placed 40 centimeters from the back wall and at least 1 meter from the sidewall.

Power was fed to the EUT from the public utility power grid through a line filter and EMCO Model 3162/2 SH Line Impedance Stabilization Networks (LISN). The LISN housing, measuring instrumentation case, ground plane, etc., were electrically bonded together at the same RF potential. The Spectrum analyzer was connected to the AC line through an isolation transformer. The 50-ohm output of the LISN was connected to the spectrum analyzer directly. Conducted emission levels were in the CISPR quasi-peak detection mode. The analyzer's 6 dB bandwidth was set to 9 KHz. No post-detector video filter was used.

The spectrum was scanned from 150 KHz to 30 MHz. The physical arrangement of the test system and associated cabling was varied (within the scope of arrangements likely to be encountered in actual use) to determine the effect on the unit's emanations in amplitude and frequency. All spurious emission frequencies were observed. The highest emission amplitudes relative to the appropriate limit were measured and have been recorded in paragraph 4.1.

4.5. Test Result

Not applicant, the EUT's power source is use DC Battery.

5 Radiated Emissions Measurement

5.1. Limit

According to FCC Part 15.231(e) and RSS-210 A1.1.5 requirement:

In addition to the provisions of §RSS-210 section 2.7 Table1, the field strength of emissions from intentional radiator operated under this section shall not exceed the following:

Fundamental and harmonics emission limits

Frequency range (MHz)	Peak Field Strength of Fundamental (dB μ V/m@3m)	Average Field Strength of Fundamental (dB μ V/m@3m)
433.72	92.9	72.9

General Radiated emission Limit

Frequency range (MHz)	Field Strength of Fundamental (microvolts/m at 3m)	Field strength of spurious emission (microvolts/m at 3m)
40.66 to 40.70	1,000	100
70 to 130	500	50
130 to 174	500 to 1,500	50 to 150
174 to 260	1,500	150
260 to 470	1,500 to 5,000	150 to 500
470 and above	5,000	500

Remark: 1. The table above tighter limit applies at the band edges.

2. The measurement distance in meters, which that between form closest point of EUT to instrument antenna.

5.2. Test Instruments

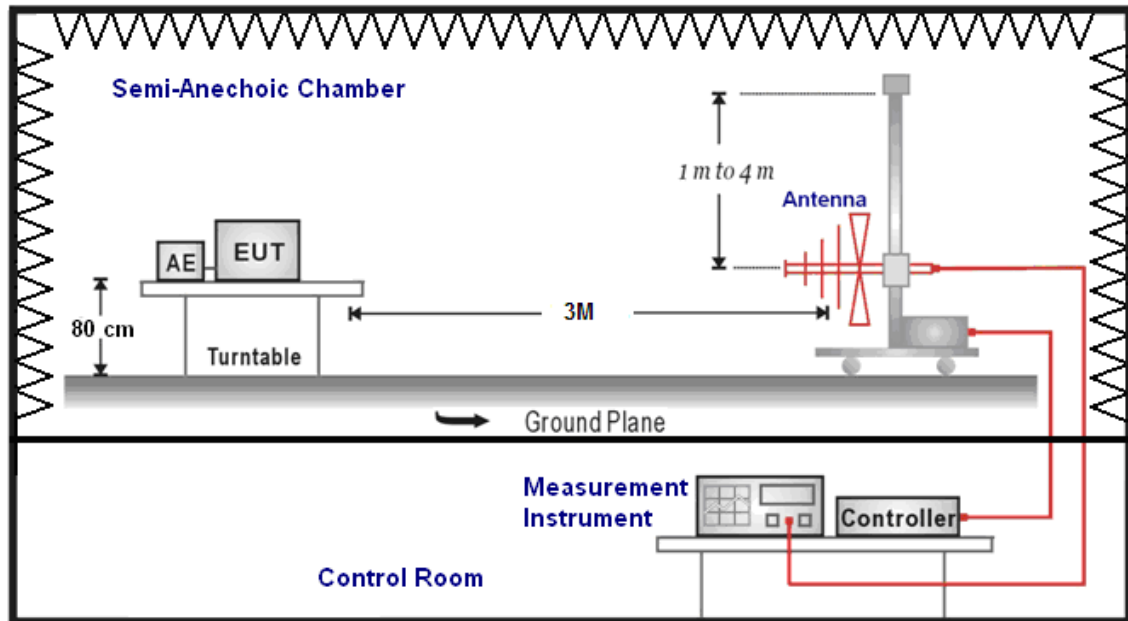
3 Meter Chamber					
Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Remark
RF Pre-selector	Agilent	N9039A	MY46520256	01/16/2013	(2)
Signal Analyzer	Rohde & Schwarz	FSIQ26	8386001667	09/22/2012	(1)
Spectrum Analyzer	Rohde & Schwarz	FSEM30	859759/153	09/22/2012	(1)
Pre Amplifier	Agilent	8449B	3008A02237	02/22/2013	(1)
Pre Amplifier	Agilent	8447D	2944A10961	02/22/2013	(1)
Broadband Antenna (30MHz~1GHz)	SCHWARZBECK MESS-ELEKTRONIK	VULB9163	9163-270	07/29/2012	(1)
Horn Antenna (1~18GHz)	SCHWARZBECK MESS-ELEKTRONIK	BBHA9120D	9120D-550	06/15/2012	(1)
Horn Antenna (18~40GHz)	SCHWARZBECK MESS-ELEKTRONIK	BBHA9170	9170-320	06/21/2012	(1)
Test Site	ATL	TE01	888001	12/20/2012	(1)

Remark: (1) Calibration period 1 year. (2) Calibration period 2 years. (3) Calibration period 3 years.

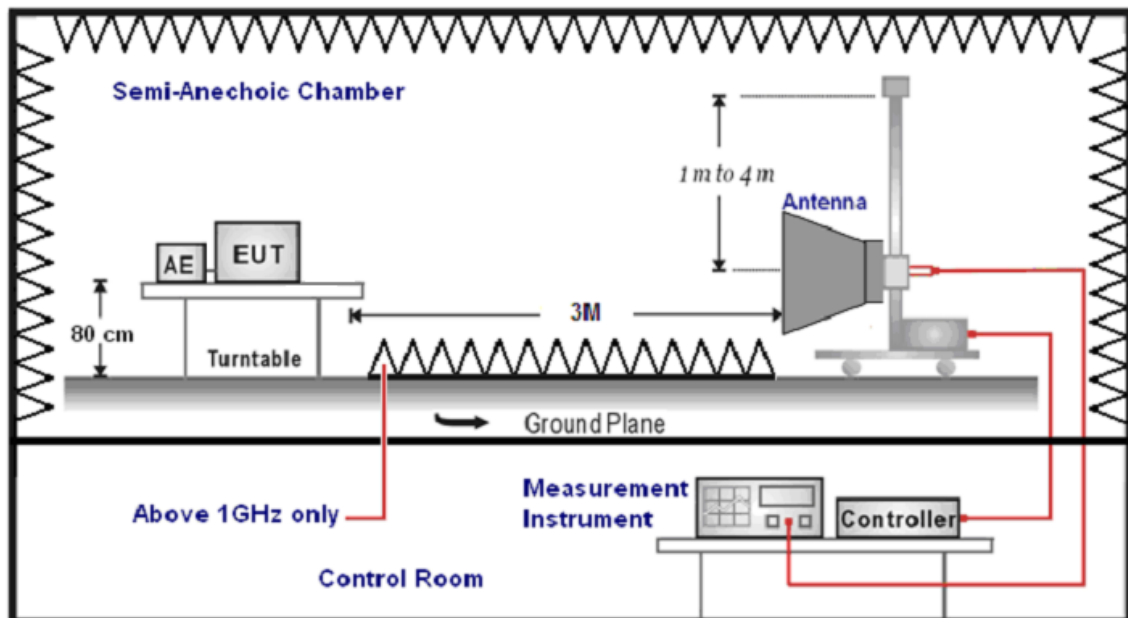
Note: N.C.R. = No Calibration Request.

5.3. Setup

Below 1GHz



Above 1GHz



5.4. Test Procedure

Final radiation measurements were made on a three-meter, Semi Anechoic Chamber. The EUT system was placed on a nonconductive turntable which is 0.8 meters height, top surface 1.0 x 1.5 meter. The spectrum was examined from 250 MHz to 2.5 GHz in order to cover the whole spectrum below 10th harmonic which could generate from the EUT. During the test, EUT was set to transmit continuously & Measurements spectrum range from 30 MHz to 26.5 GHz is investigated.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, and then the video bandwidth is set to 1 MHz for peak measurements and 10 Hz for average measurements.

A nonconductive material surrounded the EUT to supporting the EUT for standing on three orthogonal planes. At each condition, the EUT was rotated 360 degrees, and the antenna was raised and lowered from one to four meters to find the maximum emission levels. Measurements were taken using both horizontal and vertical antenna polarization.

SCHWARZBECK MESS-ELEKTRONIK Biconilog Antenna (model VULB9163) at 3 Meter and the SCHWARZBECK Double Ridged Guide Antenna (model BBHA9120D&9170) was used in frequencies 1 – 26.5 GHz at a distance of 1 meter. All test results were extrapolated to equivalent signal at 3 meters utilizing an inverse linear distance extrapolation Factor (20dB/decade).

For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than average limit (that means the emission level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.

Appropriate preamplifiers were used for improving sensitivity and precautions were taken to avoid overloading or desensitizing the spectrum analyzer. No post – detector video filters were used in the test.

The spectrum analyzer's 6 dB bandwidth was set to 1 MHz, and the analyzer was operated in the peak detection mode, for frequencies both below and up 1 GHz. The average levels were obtained by subtracting the duty cycle correction factor from the peak readings.

The following procedures were used to convert the emission levels measured in decibels referenced to 1 microvolt (dBuV) into field intensity in micro volts per meter (uV/m).

The actual field intensity in decibels referenced to 1 microvolt in to field intensity in micro volts per meter (dBuV/m).

The actual field intensity in referenced to 1 microvolt per meter (dBuV/m) is determined by algebraically adding the measured reading in dBuV, the antenna factor (dB), and cable loss (dB) and Subtracting the gain of preamplifier (dB) is auto calculate in spectrum analyzer.

(1) $\text{Amplitude (dBuV/m)} = \text{FI (dBuV)} + \text{AF (dBuV)} + \text{CL (dBuV)} - \text{Gain (dB)}$

FI= Reading of the field intensity.

AF= Antenna factor.

CL= Cable loss.

P.S Amplitude is auto calculate in spectrum analyzer.

(2) $\text{Actual Amplitude (dBuV/m)} = \text{Amplitude (dBuV)} - \text{Dis(dB)}$

The FCC specified emission limits were calculated according the EUT operating frequency and by following linear interpolation equations:

(a) For fundamental frequency : Transmitter Output < +30dBm

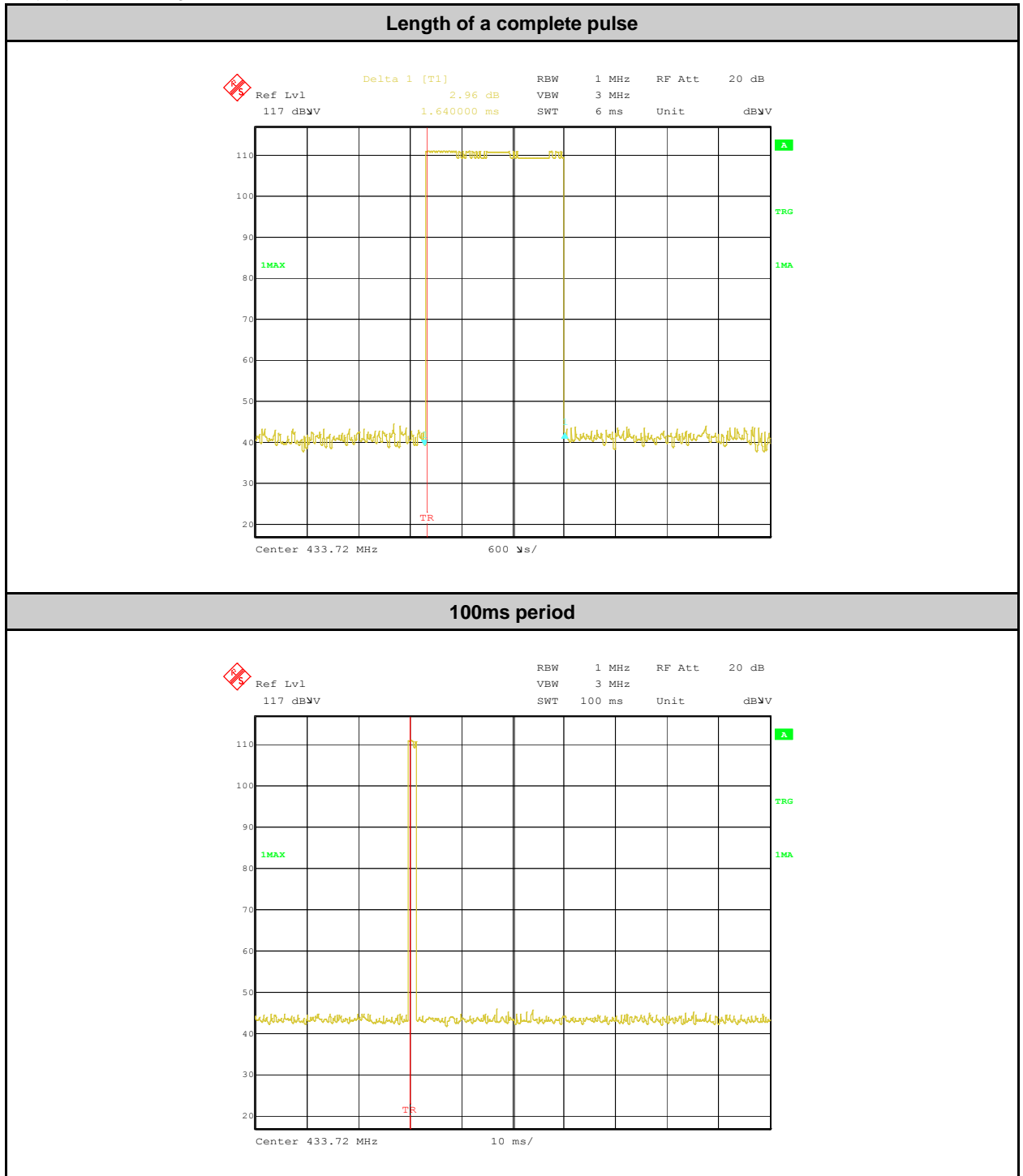
(b) For spurious frequency : Spurious emission limits = fundamental emission limit /10

Data of measurement within this frequency range without mark in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

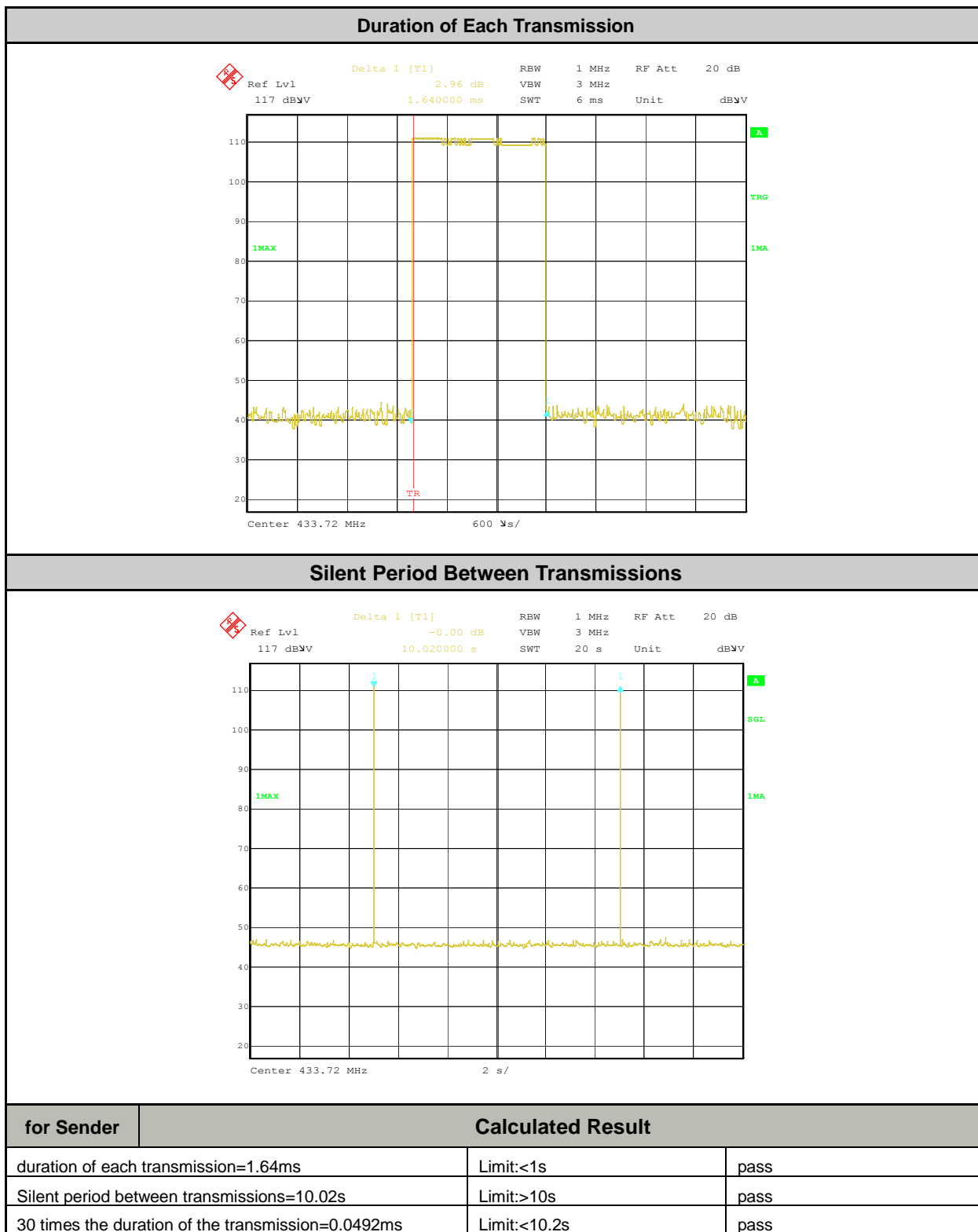
In addition, new battery was used during all tests.

5.5. Test Result

Duty Cycle Test Diagrams



The EUT was complied with the requirement of FCC 15.231 (e), it 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 least 30 times the duration of the transmission but in no case less than 10 seconds.



Calculation of Average Factor

The output field strengths of specification in accordance with the FCC & RSS-210 rules specify measurements with an average detector. During the test, a spectrum analyzer incorporating a peak detector was used. Therefore, a reduction factor can be applied to the resultant peak signal level and compared to the limit for measurement instrumentation incorporating an average detector.

Please see the diagrams below.

$$\text{Duty Cycle} = T_{on}/T_p$$

$$\text{Duty Cycle} = T_{on}/T_p = 1.64\text{ms}/100\text{ms} = 0.0164$$

$$\text{Duty Cycle Factor} = 20\log(\text{Duty Cycle}) = 20\log(0.0164) = -35.70$$

$$\text{Average Amplitude} = \text{Peak Amplitude} + \text{Duty Cycle Factor}$$



Field strength of fundamental:

Standard:

FCC Part 15.231

Test Distance:

3m

Test item:

Field strength of fundamental

Power:

DC 3.0V

Model Number:

1208J

Temp.(°C)/Hum.(%RH):

26(°C)/60%RH

Mode:

Mode 1

Date:

03/22/2013

Test By:

Fly Lu

Frequency (MHz)	Ant. Polar.	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
433.72	H	90.77	-2.52	88.25	92.9	-4.65	Peak
433.72	H	/	/	52.55	72.9	-20.35	AVG
433.72	V	92.23	-2.52	89.71	92.9	-3.19	Peak
433.72	V	/	/	54.01	72.9	-18.89	AVG

Note: Average Amplitude =Peak Amplitude + Duty Cycle Factor

Duty Cycle Factor=-35.70



Spurious Radiated Emissions:

Spurious Radiated Emissions:							
Standard:		FCC Part 15.231		Test Distance:		3m	
Test item:		Spurious Radiated Emissions		Power:		DC 3.0V	
Model Number:		1208J		Temp.(°C)/Hum.(%RH):		26(°C)/60%RH	
Mode:		Mode 1		Date:		03/22/2013	
				Test By:		Fly Lu	
Frequency (MHz)	Ant. Polar.	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
867	H	66.86	3.86	70.72	72.9	-2.18	Peak
867	H	/	/	35.02	52.9	-17.88	AVG
1301	H	57.38	0.59	57.97	74.0	-16.03	Peak
1301	H	/	/	22.27	54.0	-31.73	AVG
867	V	67.05	3.86	70.91	72.9	-1.99	Peak
867	V	/	/	35.21	52.9	-17.69	AVG
1301	V	58.09	0.59	58.68	74.0	-15.32	Peak
1301	V	/	/	22.98	54.0	-31.02	AVG

Note: Average Amplitude = Peak Amplitude + Duty Cycle Factor

Duty Cycle Factor = -35.70

6 Bandwidth Measurement

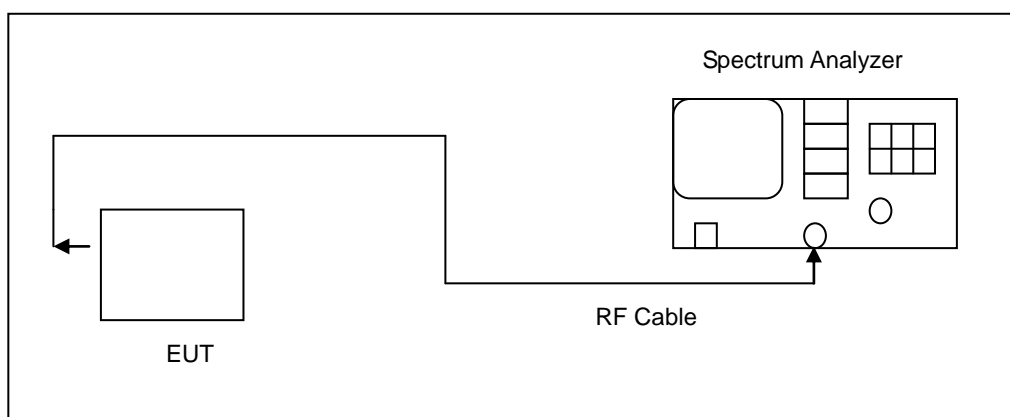
6.1. Limit

According to 15.231(c) requirement:

Bandwidth is determined at the points 20 dB down from the modulated carrier.

B.W Limit = $0.25\% \times f \text{ (MHz)} = 0.25\% \times 433.72 \text{ MHz} = 1084.3 \text{ kHz}$

6.2. Test Setup



6.3. Test Instruments

Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Remark
Signal Analyzer	Rohde & Schwarz	FSIQ26	8386001667	09/22/2012	(1)
Spectrum Analyzer	Rohde & Schwarz	FSEM30	859759/153	09/22/2012	(1)
Test Site	ATL	TE05	TE05	N.C.R.	-----

dRemark: (1) Calibration period 1 year. (2) Calibration period 2 years. (3) Calibration period 3 years.

Note: N.C.R. = No Calibration Request.

6.4. Test Procedure

20dB Bandwidth

The RF output port of the Equipment-Under-Test is directly coupled to the input of the EMC analyzer through a specialized RF connector and a 10dB passive attenuator. A fully charged battery was used for the supply voltage. The RF function of the EUT was enabled. The spectrum analyzer used the following settings:

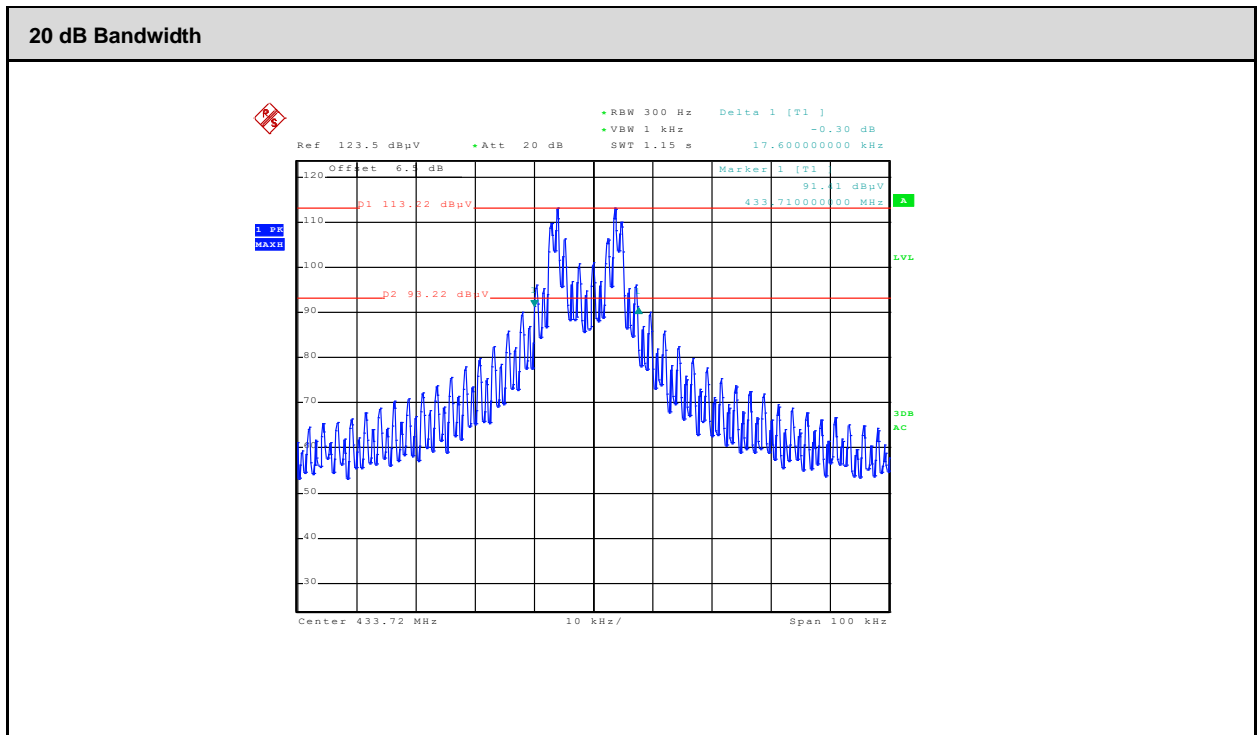
1. Span = 100 kHz
2. RBW \geq 1% of the 20dB span
3. VBW \geq RBW
4. Sweep = auto
5. Detector function = peak
6. Trace = max hold

The trace was allowed to stabilize. The EUT was transmitting at its maximum data rate. The marker-to-peak function was used to set the marker to the peak of the emission. The marker-delta function was used to measure 20dB down one side of the emission. The marker-delta function and marker was moved to the other side of the emission until it was even with the reference marker. The marker-delta reading at this point was the 20dB bandwidth of the emission.

6.5. Test Result

Model Number	1208J		
Mode	Mode 1		
Date of Test	03/28/2013	Test Site	TE02
Frequency (MHz)	20 dB Bandwidth (KHz)	Limited (KHz)	
433.72	17.6	1084.3	

6.6. Test Graphs



End of Report