FCC 47 CFR PART 15 SUBPART C

Product Type	:	Remote Control Transmitter
Applicant	:	Hearth & Home Technologies
Address		20802 Kensington Blvd Lakeville Minnesota United States 55044
Trade Name	:	HEARTH & HOME TECHNOLOGIES
Model Number	:	RC300
Test Specification	:	FCC 47 CFR PART 15 SUBPART C: Oct., 2009 Canada RSS-210 ISSUE 8: Dec., 2010 Canada RSS-Gen ISSUE 3: Dec., 2010 ANSI C63.4-2003
Application Purpose	:	Class II Permissive Change
Issue Date	:	Dec. 14, 2010

Issue by

A Test Lab Techno Corp.
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Taiwan Accreditation Foundation accreditation number: 1330

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Revision History

Rev.	Issue Date	Revisions	Revised By
00	Dec. 14, 2010	Initial Issue	

Verification of Compliance

Issued Date: 2010/12/22

Product Type	:	Remote Control Transmitter
Applicant	:	Hearth & Home Technologies
Address	:	20802 Kensington Blvd Lakeville Minnesota United States 55044
Trade Name	:	HEARTH & HOME TECHNOLOGIES
Model Number	:	RC300
FCC ID	:	ULE-RC300
EUT Rated Voltage	:	DC 4.5V (AAA Battery * 3 PCS)
Test Voltage	:	DC 4.5V (AAA Battery * 3 PCS)
Applicable Standard	:	FCC 47 CFR PART 15 SUBPART C: Oct., 2009 Canada RSS-210 ISSUE 8: Dec., 2010 Canada RSS-Gen ISSUE 3: Dec., 2010 ANSI C63.4-2003
Application Purpose	:	Class II Permissive Change
Test Result	:	Complied
Performing Lab.	:	A Test Lab Techno Corp. No. 140-1, Changan Street, Bade City, Taoyuan County 334, Taiwan R.O.C. Tel：+886-3-2710188 / Fax：+886-3-2710190 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: 2003 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, 15.225.
The test results of this report relate only to the tested sample identified in this report.

Approved By	:	Reviewed By	:	
(Manager)	(Miller Lee)	(Testing Engineer)		(Gary Wu)

TABLE OF CONTENTS

1 General Information

1.1 Summary of Test Result

Reference		Test	Results	Section
47 CFR Part 15.225	RSS 210 Issue7			
15.207	7.2.2	AC Power Conducted Emission	N/A	4.5
15.231(a)	A1.1.1(a)	Transmitter deactivation time	PASS	5.5
15.231(b)	A1.1.2	Transmitter field strength of emissions	PASS	5.5
15.231(c)	A1.1.3	Bandwidth of the emission	PASS	6.5
CFR 47 Part 15.231(2010) / RSS 210 Issue7 (2007) / ANSI C63.4: 2003 / RSS-Gen Issue 2: 2007				
Class II Permissive Change: The manufacture of this product use the software to control the device then enhance the transmit rate from 9 times/per sec to 11 times/sec; only add two times/sec into this new device. **All requirement items have re-tested.**				

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 30 MHz - 1GHz is evaluated as ± 3.072dB.

2 EUT Description

Applicant	:	Hearth & Home Technologies
Applicant Address	:	20802 Kensington Blvd Lakeville Minnesota United States 55044
Manufacturer	:	GRAND MATE CO., LTD.
Manufacturer Address	:	NO.38,YUAN-CHEN RD,TAIPING CITY,TAICHUNG,TAIWAN,R.O.C
Product	:	Remote Control Transmitter
Trade Name	:	HEARTH & HOME TECHNOLOGIES
Model Number	:	RC300
FCC ID	:	ULE-RC300
Frequency Range	:	433.91 MHz
Modulation Type	:	ASK
Number of Channels	:	1 Channel
Antenna Type	:	PCB Antenna

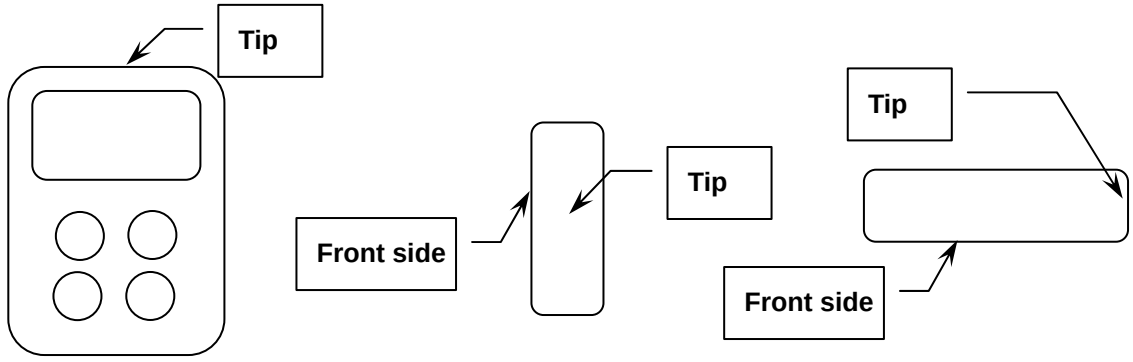
3 Test Methodology

3.1. Mode of Operation

Test Mode
Mode 1: Transmitter Mode

Then, the above highest fundamental level mode of the configuration of the EUT and antenna was chosen for all final test items.

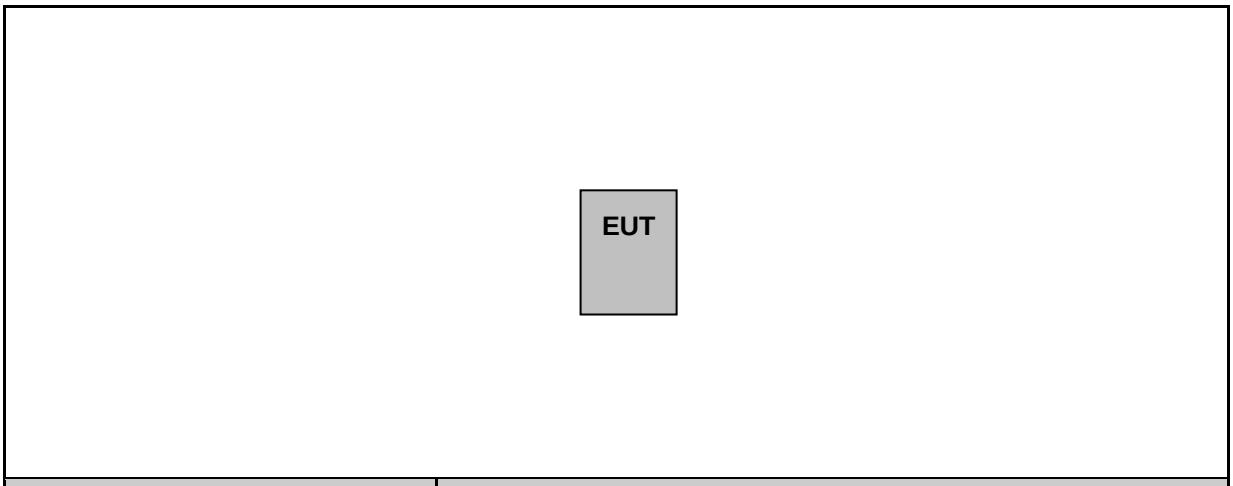
By preliminary testing and verifying three axis (X, Y and Z) position of EUT transmitted status, it was found that “X axis” position was the worst, then the final test was executed the worst condition and test data were recorded in this report.



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



Signal Cable Type		Signal Cable Description
A	-----	-----

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

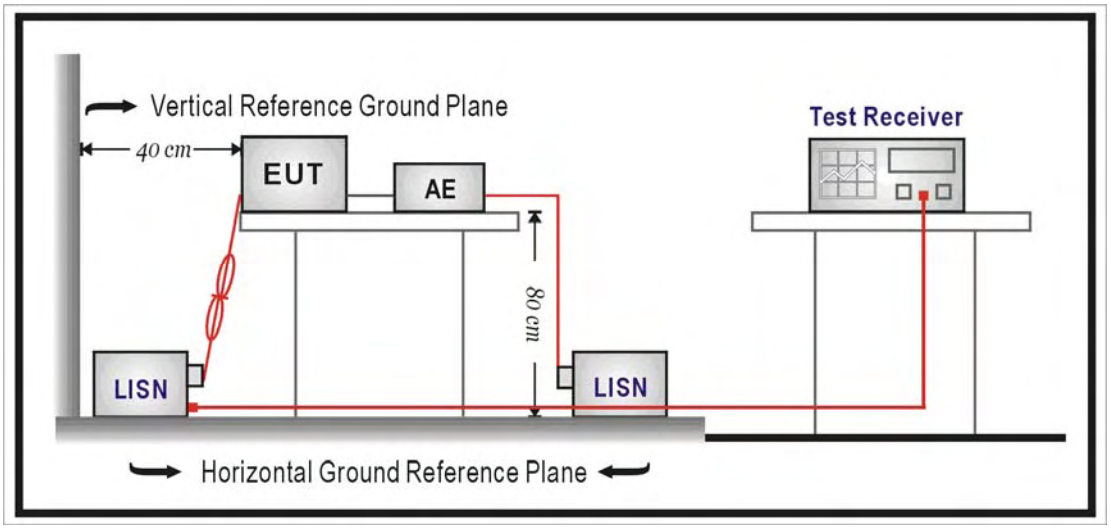
4.2. Test Instruments

Describe	Manufacturer	Model Number	Serial Number	Cal. Date	Remark
Test Receiver	R&S	ESCI	100367	07/01/2010	(1)
LISN	R&S	ENV216	101040	03/02/2010	(1)
LISN	R&S	ENV216	101041	03/02/2010	(1)
Test Site	ATL	TE02	TE02	N.C.R.	-----

Remark: (1) Calibration period 1 year. (2) Calibration period 2 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 AAA Battery 1.5 A * 3 PCS.

5 Radiated Emissions Measurement

5.1. Limit

According to FCC Part 15.231(b) and RSS-210 A1.1.2 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	Peak Field Strength of Fundamental		Average Field Strength of Fundamental
(MHz)	(μV/m@3m)	(dBμV/m@3m)	(dBμV/m@3m)
433.91	10964.78	100.80	80.80

General Radiated emission Limit

Frequency range	Field Strength of Fundamental	Field Strength of Harmonics
(MHz)	(uV/m at 3m)	(uV/m at 3m)
40.66 to 40.70	2250 (67.04 dBuV)	225 (47.04 dBuV)
70 to 130	1250 (61.94 dBuV)	125 (41.94 dBuV)
130 to 174	1250 (61.94 dBuV) to 3750 (71.48 dBuV)	125 (41.94 dBuV) to 375 (51.48 dBuV)
174 to 260	3750 (71.48 dBuV)	375 (51.48 dBuV)
260 to 470	3750 (71.48 dBuV) to 12500 (81.84 dBuV)	375 (51.48 dBuV) to 1250 (61.94 dBuV)
470 and above	12500 (81.84 dBuV)	1250 (61.94 dBuV)

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

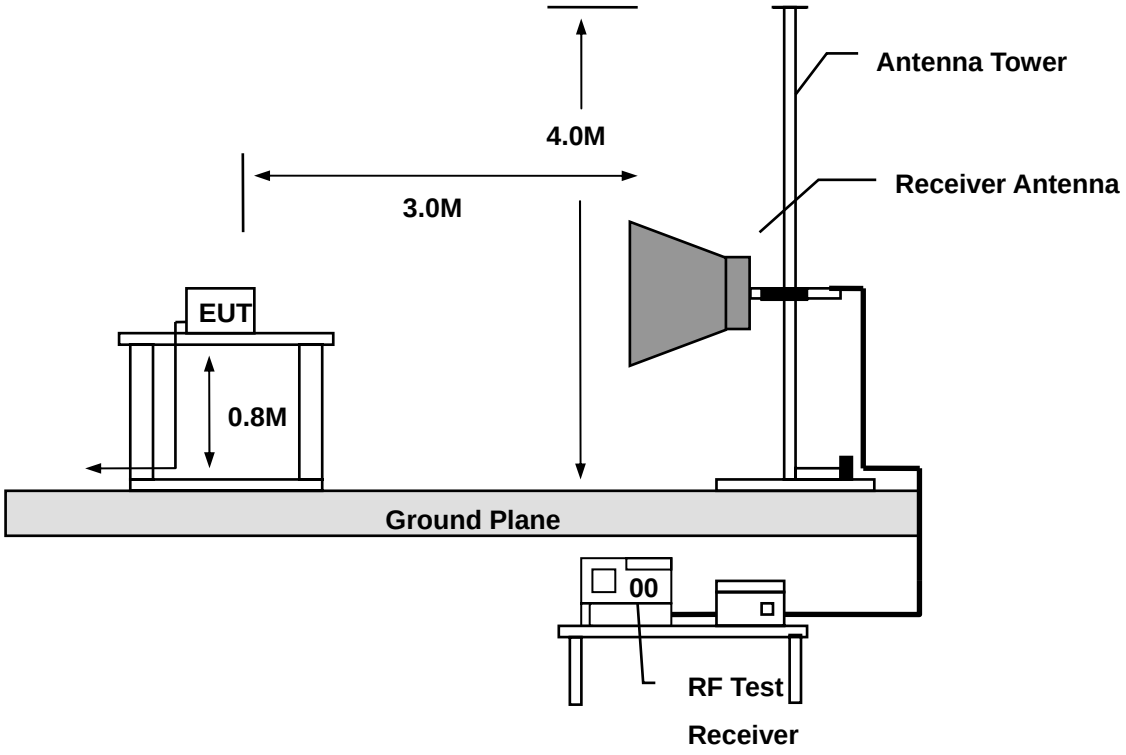
2. The measurement distance in meters, which that between form closest point of EUT to instrument antenna.

5.2. Test Instruments

3 Meter Chamber					
Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Remark
RF Pre-selector	Agilent	N9039A	MY46520256	01/07/2009	(2)
Spectrum Analyzer	Agilent	E4446A	MY46180578	02/24/2010	(1)
Pre Amplifier	Agilent	8449B	3008A02237	02/24/2010	(1)
Pre Amplifier	Agilent	8447D	2944A10961	02/24/2010	(1)
Bi-log Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9163	9163-270	08/02/2010	(1)
Horn Antenna	SCHWARZBECK MESS-ELEKTRONIK	BBHA9120D	9120D-550	06/29/2010	(1)
Horn Antenna	SCHWARZBECK MESS-ELEKTRONIK	BBHA9170	9170-320	06/29/2010	(1)
Test Site	ATL	TE01	888001	07/30/2010	(1)

Remark: (1) Calibration period 1 year. (2) Calibration period 2 years.
NOTE: N.C.R. = No Calibration Request.

5.3. Setup



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 tree 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 (mode 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 pre meter (uV/m).

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

The actual field is 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) Amplitude (dBuV/m) = FI (dBuV) +AF (dBuV) +CL (dBuV)-Gain (dB)

FI= Reading of the field intensity.

AF= Antenna factor.

CL= Cable loss.

P.S Amplitude is auto calculate in spectrum analyzer.

(2) Actual Amplitude (dBuV/m) = Amplitude (dBuV)-Dis(dB)

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

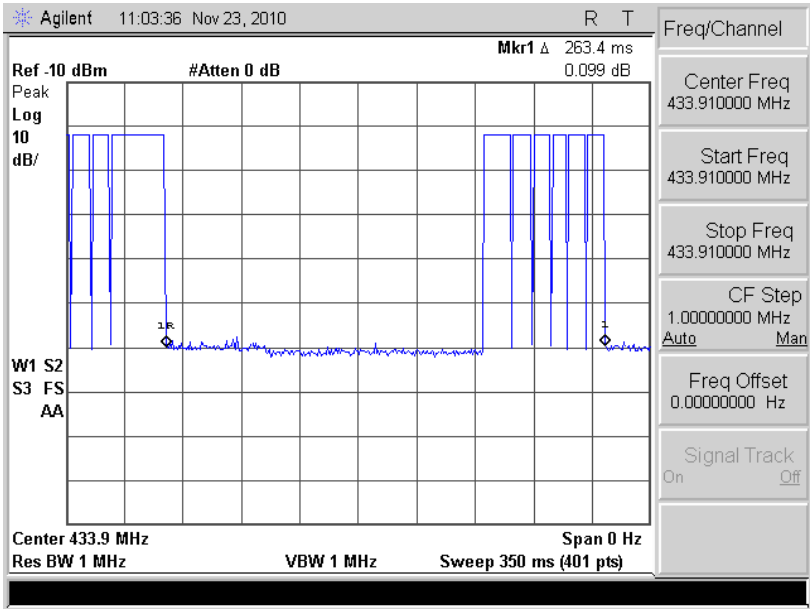
(a) For fundamental frequency : Transmitter Output < +30dBm

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

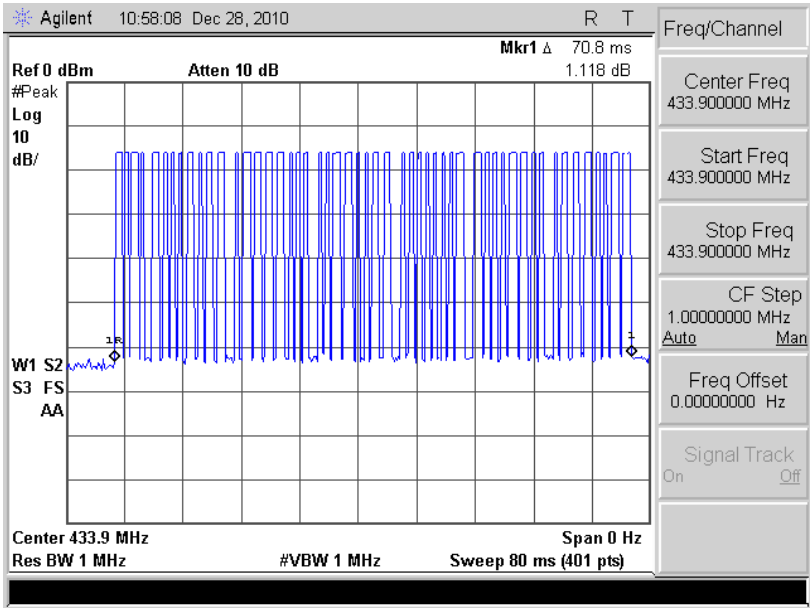
5.5. Test Result

Duty Cycle Test Diagrams

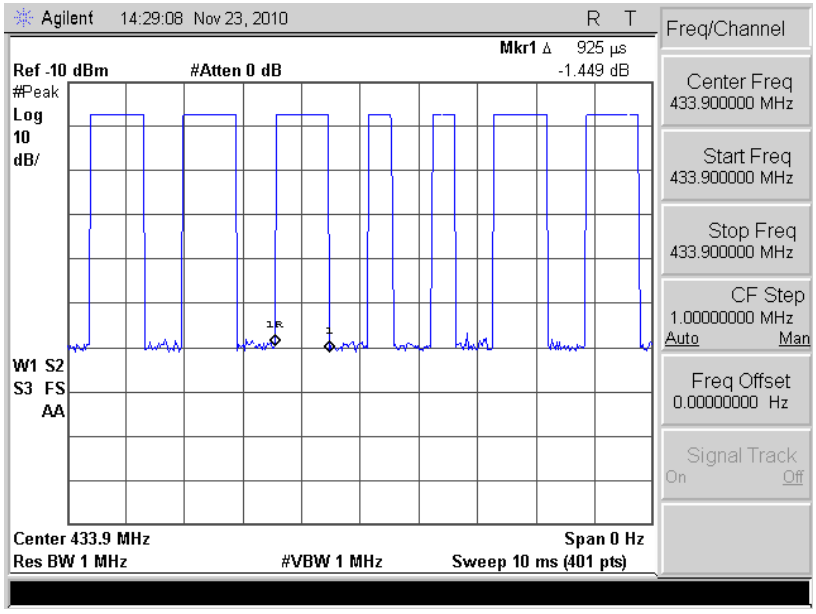
Length of a complete pulse train

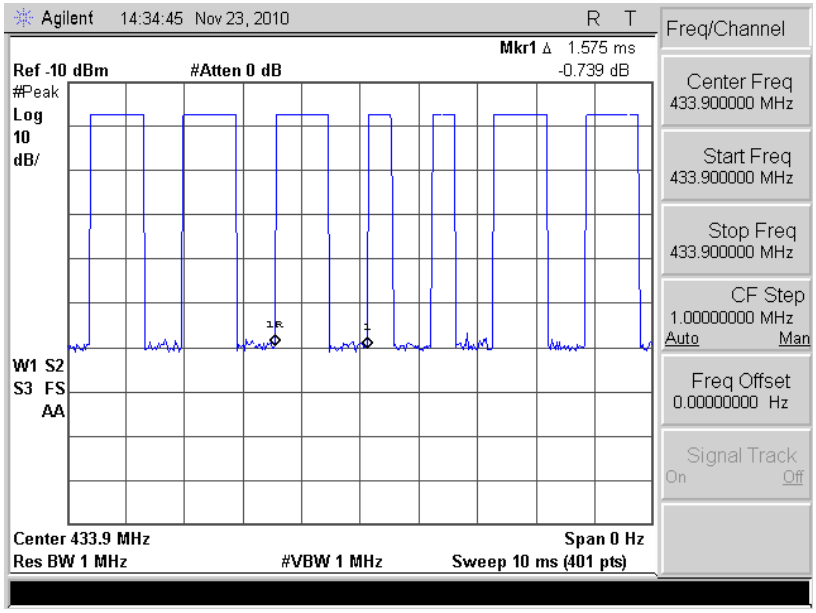


Total Number of Pulse

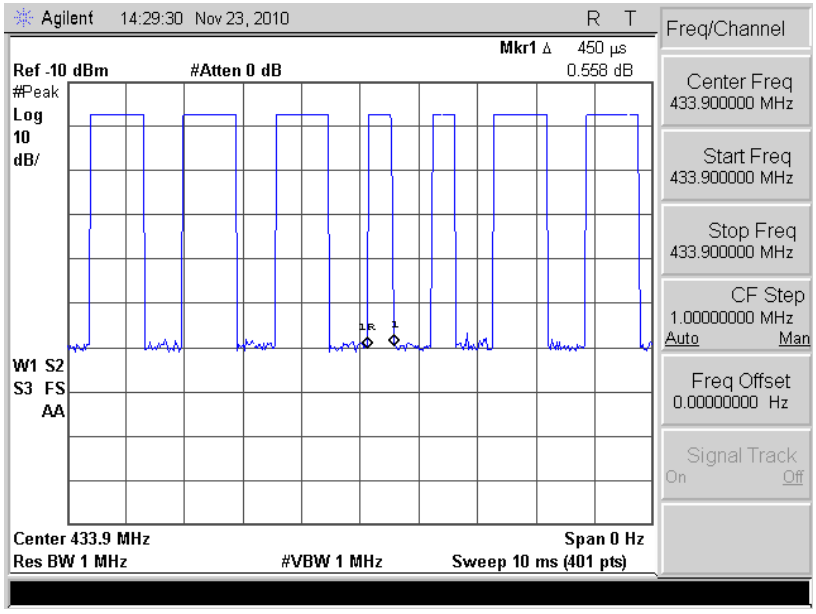


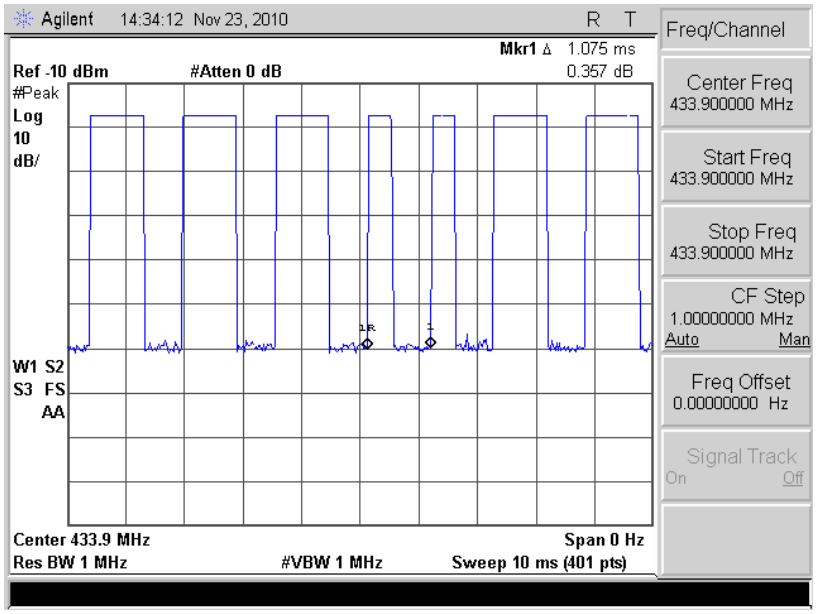
Time Slot Test Diagrams

Long Pulse _ Ton


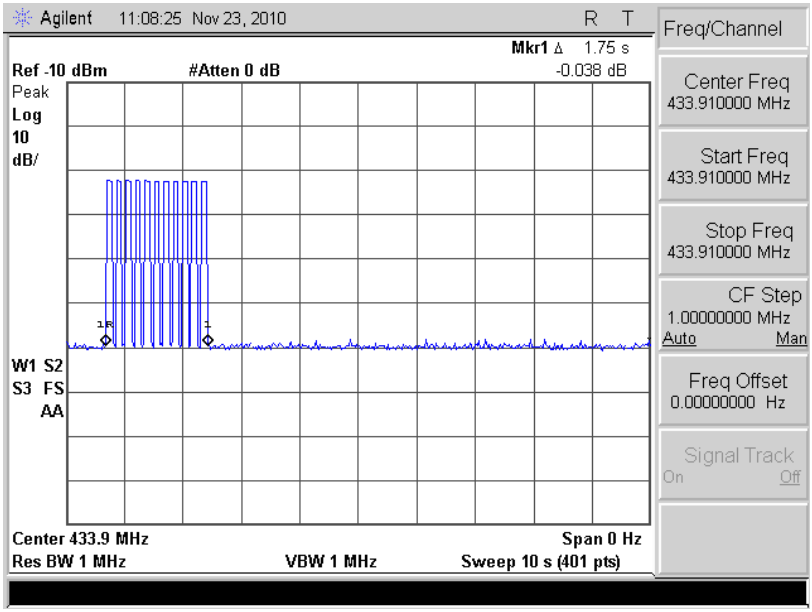
Long Pulse _ Ton+Toff


Time Slot Test Diagrams

Short Pulse _ Ton


Short Pulse _ Ton+Toff


The EUT was complied with the requirement of FCC 15.231 (a) (1), which employed a switch that will automatically deactivate the transmitter within less than 5 seconds of being released.



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.

(*) Canada : When the field strength (or envelope power) is not constant or when it is in pulses, and an averaging detector is specified to be used, the value of field strength or power over one complete pulse train, excluding blanking intervals, shall be averaged as long as the pulse train does not exceed 0.1 seconds. In cases where the pulse train exceeds 0.1 seconds, the average value (of field strength or output power) shall be determined during a 0.1 second interval during which the field strength or power is at its maximum value.

Duty Cycle Results

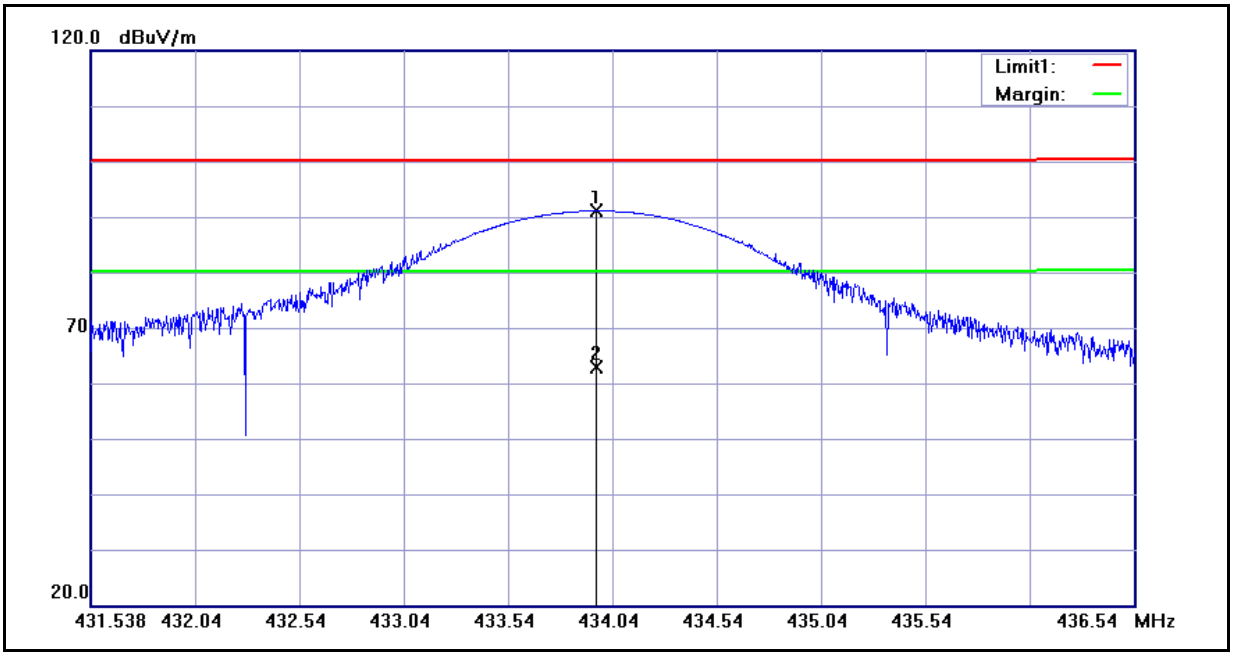
Item	Results		Note
Length of a complete pulse train	263.4 > 100.00	ms	Section 2.7 (*)
Long Pulse (Number of Pulse)	23.00		-----
Short Pulse (Number of Pulse)	29.00		-----
Long Pulse (T)	0.925	ms	-----
Short Pulse (T)	0.450	ms	-----
Total ON interval in a complete pulse train	72.25	ms	-----
Duty Cycle	0.7225		-----
Averaging Factor (20 log * Duty Cycle)	-2.82		-----

Please see the diagrams below.

Note:

1. RB=100 KHz, VB=300 KHz, SPAN=0
2. Total ON interval in a complete pulse train = (Long Pulse * Long Pulse (Number of Pulse)) + (Short Pulse * Short Pulse (Number of Pulse))
3. Duty Cycle= $\frac{\text{(Total On Interval in a Complete Pulse Train)}}{\text{(Length of a Complete Pulse Train)}}$

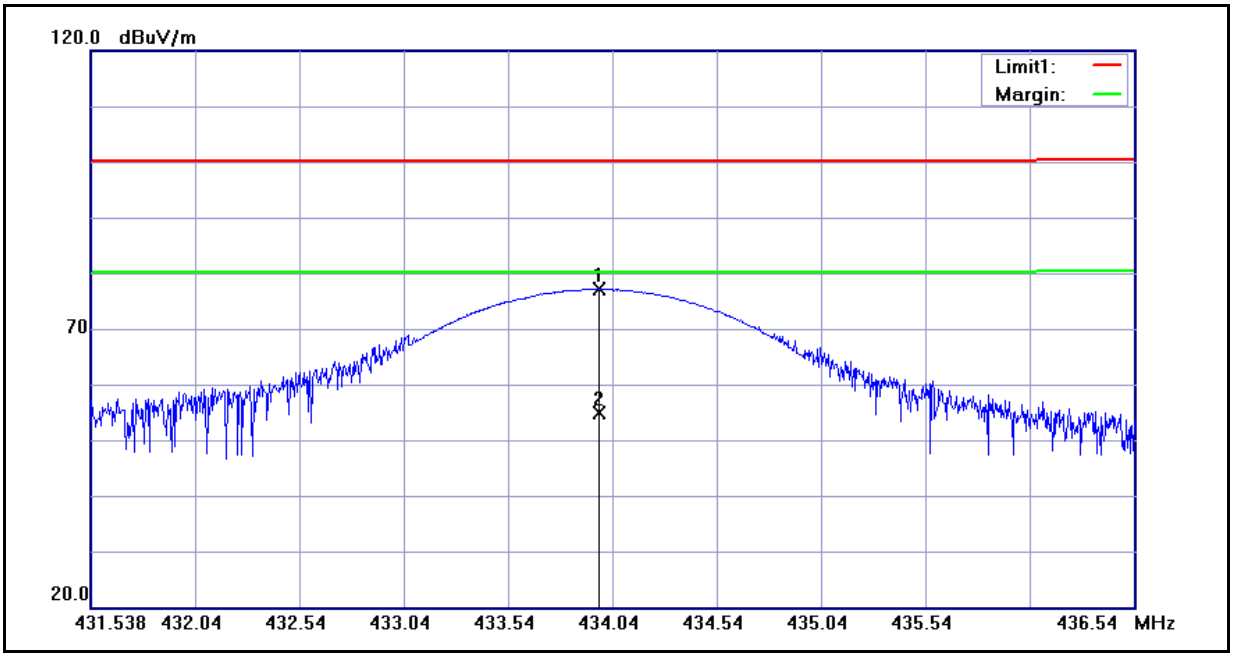
Standard:	FCC Part 15C	Test Distance:	3m
Test item:	Radiated Emission	Power:	DC 4.5V
Model Number:	RC300	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Mode:	Mode 1	Date:	12/03/2010
Ant.Polar.:	Horizontal	Test By:	Gary Wu



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	433.9575	99.24	-8.13	91.11	100.80	-9.69	peak
2	433.9575	70.90	-8.13	62.77	80.80	-18.03	AVG

Fundamental Frequency:

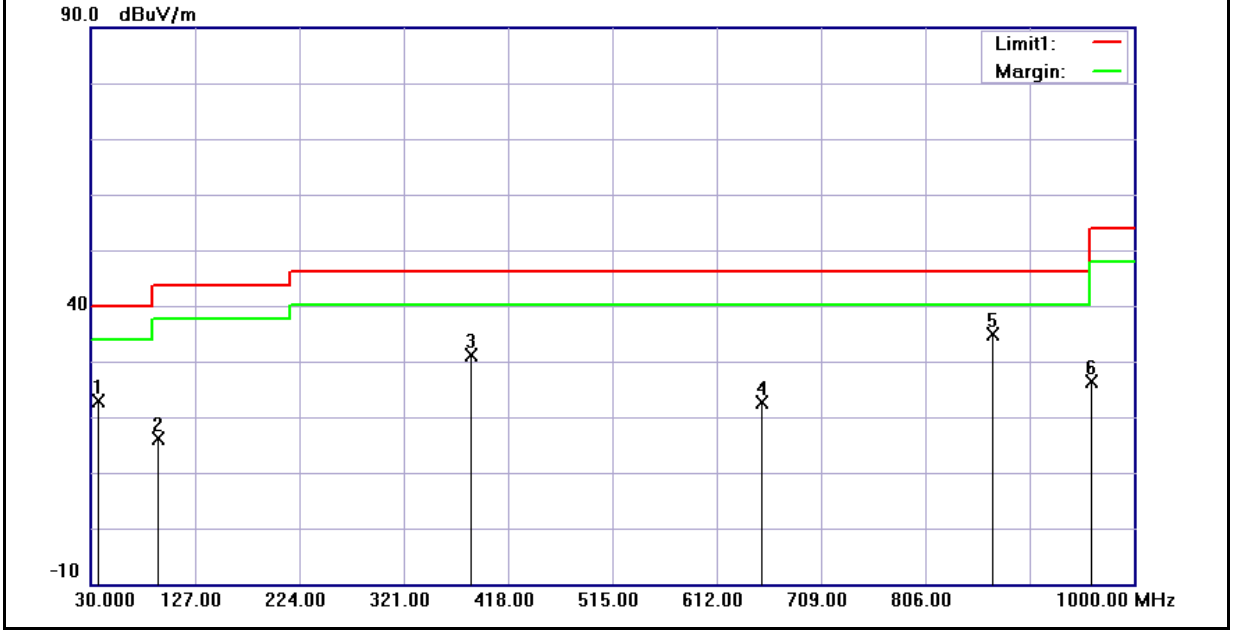
Standard:	FCC Part 15C	Test Distance:	3m
Test item:	Radiated Emission	Power:	DC 4.5V
Model Number:	RC300	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Mode:	Mode 1	Date:	12/03/2010
Ant.Polar.:	Vertical	Test By:	Gary Wu



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	433.9725	85.27	-8.13	77.14	100.80	-23.66	peak
2	433.9725	63.12	-8.13	54.99	80.80	-25.81	AVG

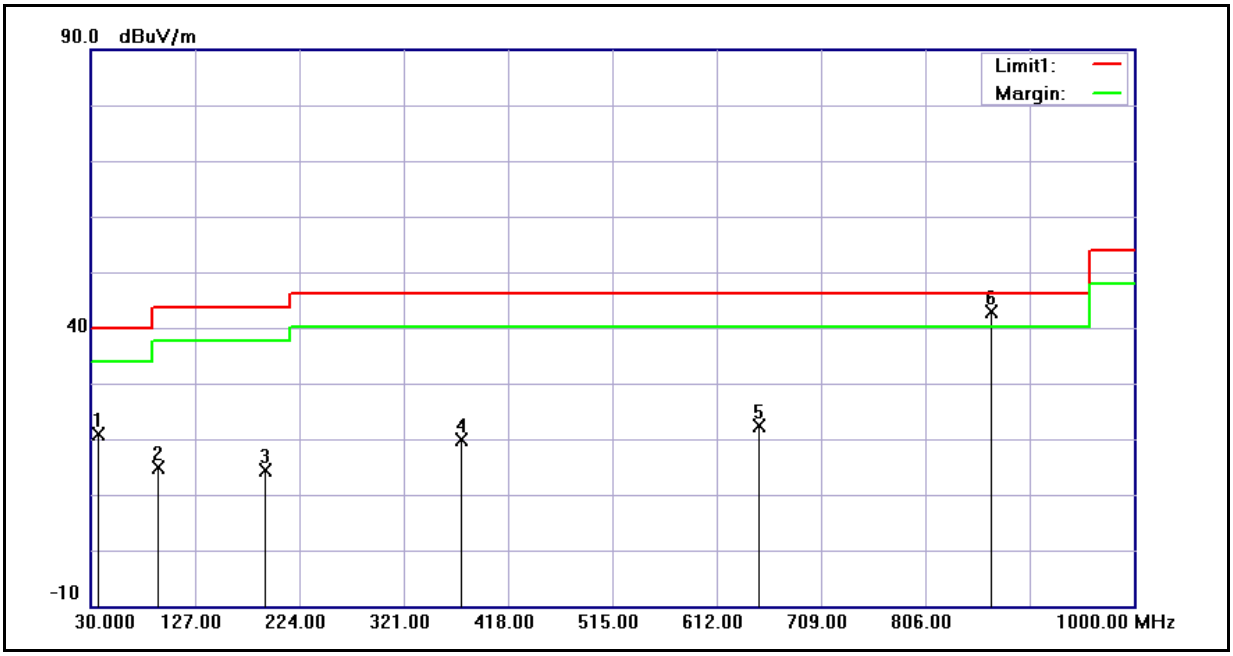
Spurious Radiated Emissions:

Standard:	FCC Part 15C	Test Distance:	3m
Test item:	Radiated Emission	Power:	DC 4.5V
Model Number:	RC300	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Mode:	Mode 1	Date:	11/23/2010
Ant.Polar.:	Horizontal	Test By:	Gary Wu



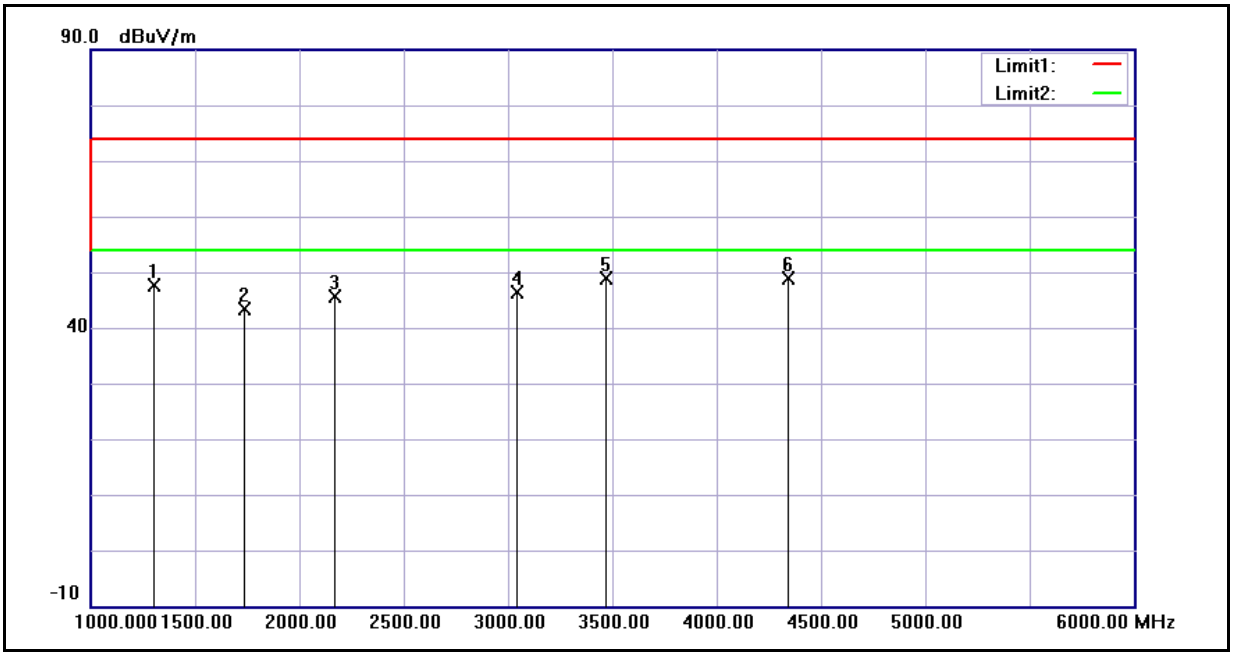
No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	37.0000	35.56	-12.73	22.83	40.00	-17.17	QP
2	92.5000	31.40	-15.24	16.16	43.52	-27.36	QP
3	384.0000	39.56	-8.47	31.09	46.02	-14.93	QP
4	654.0000	26.57	-4.01	22.56	46.02	-23.46	QP
5	868.5000	35.50	-0.57	34.93	46.02	-11.09	QP
6	960.5000	25.31	1.07	26.38	54.00	-27.62	QP

Standard:	FCC Part 15C	Test Distance:	3m
Test item:	Radiated Emission	Power:	DC 4.5V
Model Number:	RC300	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Mode:	Mode 1	Date:	11/23/2010
Ant.Polar.:	Vertical	Test By:	Gary Wu



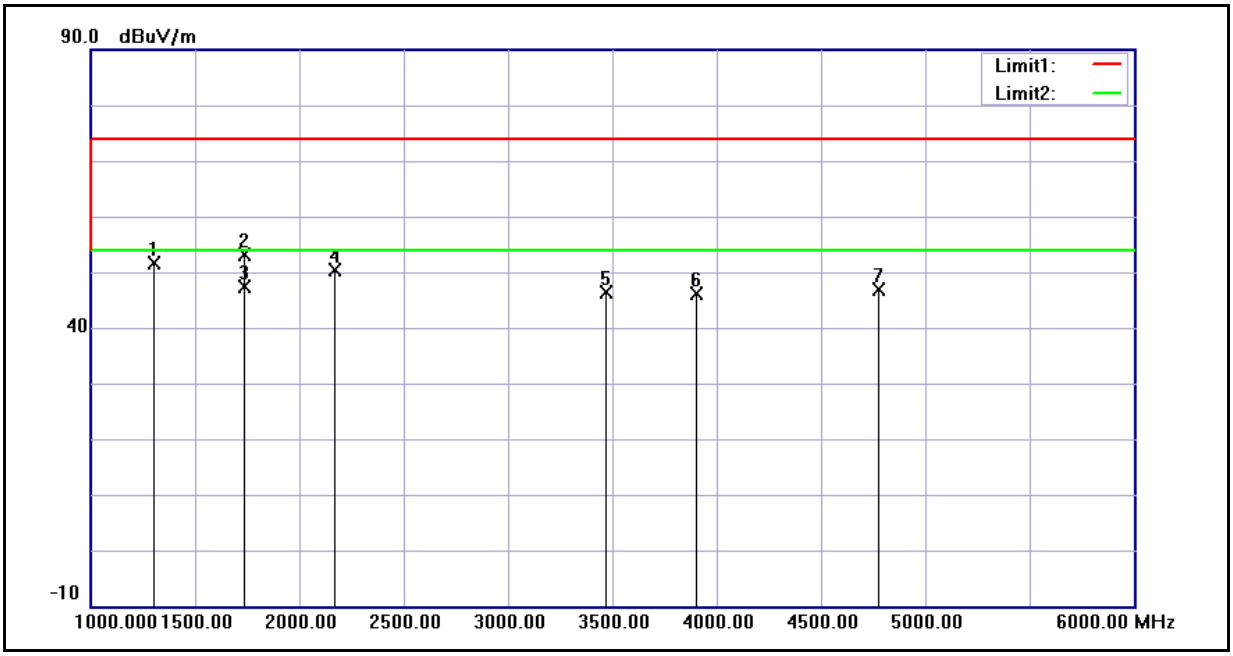
No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	36.5000	33.68	-12.84	20.84	40.00	-19.16	QP
2	92.5000	30.12	-15.24	14.88	43.52	-28.64	QP
3	192.0000	28.13	-13.79	14.34	43.52	-29.18	QP
4	375.0000	28.31	-8.47	19.84	46.02	-26.18	QP
5	652.0000	26.35	-4.03	22.32	46.02	-23.70	QP
6	868.0000	43.51	-0.57	42.94	46.02	-3.08	QP

Standard:	FCC Part 15C	Test Distance:	3m
Test item:	Radiated Emission	Power:	DC 4.5V
Model Number:	RC300	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Mode:	Mode 1	Date:	11/23/2010
Ant.Polar.:	Horizontal	Test By:	Gary Wu



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1300.000	52.27	-4.68	47.59	74.00	-26.41	peak
2	1735.000	46.21	-2.73	43.48	74.00	-30.52	peak
3	2170.000	46.73	-1.11	45.62	74.00	-28.38	peak
4	3040.000	44.09	2.39	46.48	74.00	-27.52	peak
5	3470.000	45.65	3.34	48.99	74.00	-25.01	peak
6	4340.000	42.47	6.36	48.83	74.00	-25.17	peak

Standard:	FCC Part 15C	Test Distance:	3m
Test item:	Radiated Emission	Power:	DC 4.5V
Model Number:	RC300	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Mode:	Mode 1	Date:	11/23/2010
Ant.Polar.:	Vertical	Test By:	Gary Wu



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1300.000	56.26	-4.68	51.58	74.00	-22.42	peak
2	1735.000	55.85	-2.73	53.12	74.00	-20.88	peak
3	1735.000	50.12	-2.73	47.39	54.00	-6.61	AVG
4	2170.000	51.56	-1.11	50.45	74.00	-23.55	peak
5	3470.000	43.08	3.34	46.42	74.00	-27.58	peak
6	3905.000	41.19	4.97	46.16	74.00	-27.84	peak
7	4775.000	39.02	7.75	46.77	74.00	-27.23	peak

6 99% Occupied Bandwidth Measurement

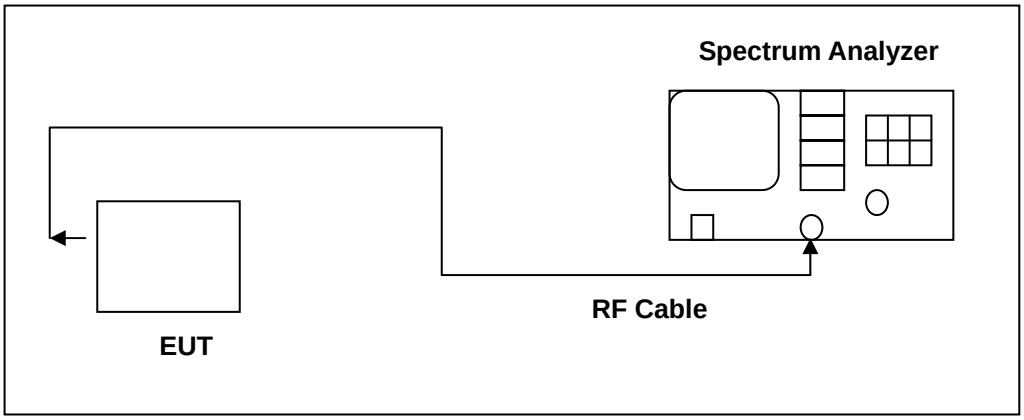
6.1. Limit

According to RSS-210 Section A1.1.3 requirement:

The 99% bandwidth shall be no wider than 0.25% of the centre frequency for devices operating between 70-900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the centre frequency.

B.W Limit = 0.25% * f (MHz) = 0.25% * 433.91 MHz = 1084.775 kHz

6.2. Test Setup



6.3. Test Instruments

Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Remark
Spectrum Analyzer	Agilent	E4445A	MY46181986	05/14/2009	(2)
Test Site	ATL	TE06	TE06	N.C.R.	-----

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

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

6.4. Test Procedure

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 Bluetooth frequency hopping function of the EUT was enabled. The spectrum analyzer used the following settings:

1. Span = 200 kHz
2. RBW ≥ 1% of the 20dB span
3. VBW ≥ 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	RC300			
Mode	Mode 1			
Date of Test	11/23/2010		Test Site	TE06
Frequency (MHz)	20 dB Bandwidth (KHz)	99% Bandwidth (KHz)	Limited (KHz)	
433.91	57.0000	135.4612	1084.775	

6.6. Test Graphs

20 dB Bandwidth