

FCC PART 15.231
MEASUREMENT AND TEST REPORT
FOR

Lok8u Limited

Vally Farm, Hanbury Road, Hanbury, Worcs, B604HJ, United Kingdom

FCC ID: XYALOK8UFRMBS

Report Concerns: Original Report	Equipment Type: FREEDOM-MBS
Model:	<u>FREEDOM-MBS001</u>
Report No.:	<u>STR11108076I</u>
Test Date:	<u>2011-11-25 to 2011-12-13</u>
Issue Date:	<u>2011-12-16</u>
Tested By:	<u>Seven Song / Engineer</u> <i>Seven Song</i>
Reviewed By:	<u>Lahm Peng / EMC Manager</u> <i>Lahm peng</i>
Approved & Authorized By:	<u>Jandy so / PSQ Manager</u> <i>Jandyso</i>
Prepared By:	SEM.Test Compliance Service Co., Ltd 3/F, Jinbao Commerce Building, Xin'an Fanshen Road, Bao'an District, Shenzhen, P.R.C. (518101) Tel.: +86-755-33663308 Fax.: +86-755-33663309 Website: www.semtest.com.cn

Note: This test report is limited to the above client company and the product model only. It may not be duplicated without prior permitted by SEM.Test Compliance Service Co., Ltd.

TABLE OF CONTENTS

1. GENERAL INFORMATION.....	3
1.1 PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT).....	3
1.2 TEST STANDARDS.....	3
1.3 TEST METHODOLOGY.....	3
1.4 TEST FACILITY.....	4
1.5 EUT EXERCISE SOFTWARE.....	4
1.6 ACCESSORIES EQUIPMENT LIST AND DETAILS.....	4
1.7 EUT CABLE LIST AND DETAILS.....	4
2. SUMMARY OF TEST RESULTS.....	5
3. §15.203 ANTENNA REQUIREMENT.....	6
3.1 STANDARD APPLICABLE.....	6
3.2 TEST RESULT.....	6
4. §15.207 (A) CONDUCTED EMISSION.....	7
4.1 MEASUREMENT UNCERTAINTY.....	7
4.2 TEST EQUIPMENT LIST AND DETAILS.....	7
4.3 TEST PROCEDURE.....	7
4.4 BASIC TEST SETUP BLOCK DIAGRAM.....	7
4.5 ENVIRONMENTAL CONDITIONS.....	8
4.6 TEST RECEIVER SETUP.....	8
4.7 SUMMARY OF TEST RESULTS/PLOTS.....	8
4.8 CONDUCTED EMISSIONS TEST DATA.....	8
5. §15.205, §15.209, §15.231 (B) RADIATED EMISSION.....	11
5.1 MEASUREMENT UNCERTAINTY.....	11
5.2 STANDARD APPLICABLE.....	11
5.3 TEST EQUIPMENT LIST AND DETAILS.....	12
5.4 TEST PROCEDURE.....	12
5.5 CORRECTED AMPLITUDE & MARGIN CALCULATION.....	13
5.6 ENVIRONMENTAL CONDITIONS.....	13
5.7 SUMMARY OF TEST RESULTS/PLOTS.....	13
6. §15.231(C) 20DB BANDWIDTH TESTING.....	18
6.1 STANDARD APPLICABLE.....	18
6.2 TEST EQUIPMENT LIST AND DETAILS.....	18
6.3 TEST PROCEDURE.....	18
6.4 ENVIRONMENTAL CONDITIONS.....	18
6.5 SUMMARY OF TEST RESULTS/PLOTS.....	18
7. §15.231(A) DEACTIVATION TESTING.....	20
7.1 STANDARD APPLICABLE.....	20
7.2 TEST EQUIPMENT LIST AND DETAILS.....	20
7.3 TEST PROCEDURE.....	20
7.4 ENVIRONMENTAL CONDITIONS.....	20
7.5 SUMMARY OF TEST RESULTS/PLOTS.....	20
8. §15.231(B) DUTY CYCLE.....	22
8.1 STANDARD APPLICABLE.....	22
8.2 TEST EQUIPMENT LIST AND DETAILS.....	22
8.3 TEST PROCEDURE.....	22
8.4 ENVIRONMENTAL CONDITIONS.....	22
8.5 SUMMARY OF TEST RESULTS/PLOTS.....	22

1. GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

Client Information

Applicant: Lok8u Limited
Address of applicant: Vally Farm, Hanbury Road, Hanbury, Worcs, B604HJ, United Kingdom

Manufacturer: China 2 West Group
Address of manufacturer: 201 Xin Yi Fa Shang Mao Da Sha, #63 of Ji Da Road, Xiangzhou Distrcit, Zhu Hai, GD PRC

General Description of E.U.T

Items	Description
EUT Description:	FREEDOM-MBS
Trade Name:	Lok8u
Model No.:	FREEDOM-MBS001
Rated Voltage:	Operating: DC 3.7V Charging: DC 5V
Frequency Range:	433.92MHz
Antenna Type:	Integral Antenna
Comment:	Auto Operated Device
For more information refer to the circuit diagram form and the user's manual.	

The test data is gathered from a production sample, provided by the manufacturer,

1.2 Test Standards

The following report is prepared on behalf of the Lok8u Limited in accordance with FCC Part 15, Subpart C, and section 15.231, 15.203, 15.205 and 15.209 of the Federal Communication Commissions rules.

The objective is to determine compliance with FCC Part 15, Subpart C, and section 15.231, 15.203, 15.205 and 15.209 of the Federal Communication Commissions rules.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product, which result in lowering the emission/immunity, should be checked to ensure compliance has been maintained.

1.3 Test Methodology

All measurements contained in this report were conducted with ANSI C63.4-2003, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

The equipment under test (EUT) was configured to measure its highest possible emission level. The test modes were adapted accordingly in reference to the Operating Instructions. The EUT was set to keep transmitting during the test.

1.4 Test Facility

- **FCC – Registration No.: 994117**

SEM.Test Compliance Services 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 and the Registration is 994117.

- **Industry Canada (IC) Registration No.: 7673A**

The 3m Semi-anechoic chamber of SEM.Test Compliance Services Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 7673A.

- **CNAS Registration No.: L4062**

Shenzhen SEM.Test Electronics Service Co., Ltd. is a testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L4062. All measurement facilities used to collect the measurement data are located at 3/F, Jinbao Commerce Building, Xin'an Fanshen Road, Bao'an District, Shenzhen, P.R.C (518101)

1.5 EUT Exercise Software

The EUT exercise program used during the testing was designed to exercise the system components. The test software, provided by the customer, is started while the whole system is running.

1.6 Accessories Equipment List and Details

Description	Manufacturer	Model	Serial Number
/	/	/	/
/	/	/	/

1.7 EUT Cable List and Details

Cable Description	Length (M)	Shielded/Unshielded	With Core/Without Core
/	/	/	/

2. SUMMARY OF TEST RESULTS

Description of Test	Result
§15.203 Antenna Requirement	Compliant
§15.205 Restricted Band	Compliant
§15.207 Conducted Emission	Compliant
§15.209 General Requirement	Compliant
§15.231 (a) Deactivation Testing	Compliant
§15.231 (c) 20dB Band Width Testing	Compliant
§15.231 (b) Radiated Emission	Compliant

3. §15.203 ANTENNA REQUIREMENT

3.1 Standard Applicable

According to FCC 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 or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

3.2 Test Result

This product has an Integral antenna, fulfill the requirement of this section.

4. §15.207 (a) CONDUCTED EMISSION

4.1 Measurement Uncertainty

Base on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of any conducted emissions measurement is ± 2.88 dB.

4.2 Test Equipment List and Details

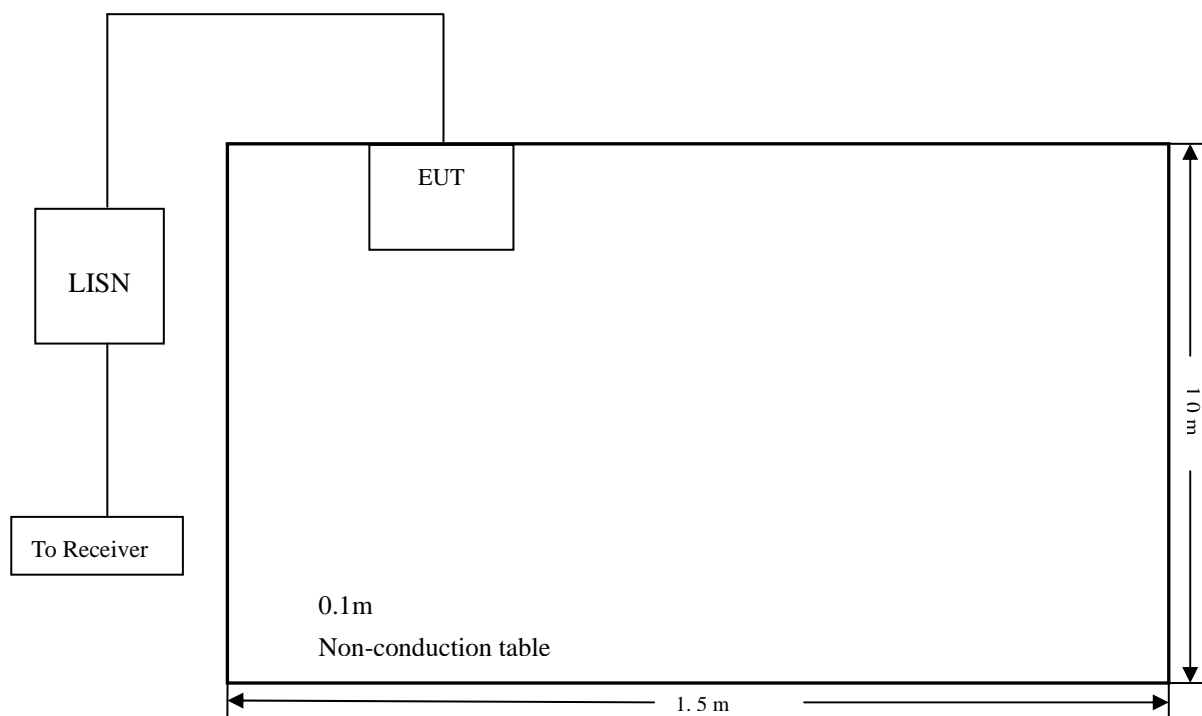
Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
EMI Test Receiver	Rohde & Schwarz	ESPI	101611	2010-12-20	2011-12-19
L.I.S.N	Schwarz beck	NSLK8126	8126-224	2010-12-20	2011-12-19
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100911	2010-12-20	2011-12-19
AMN	EMCO	3825/2	11967C	2010-12-20	2011-12-19
Power Divider	Weinschel	1506A	PM204	2010-12-20	2011-12-19
Current Probe	FCC	F-33-4	091684	2010-12-20	2011-12-19

4.3 Test Procedure

The setup of EUT is according with per ANSI C63.4-2003 measurement procedure. The specification used was with the FCC Part 15.207 Limit.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

4.4 Basic Test Setup Block Diagram



4.5 Environmental Conditions

Temperature:	25 °C
Relative Humidity:	52%
ATM Pressure:	1012 mbar

4.6 Test Receiver Setup

During the conducted emission test, the test receiver was set with the following configurations:

Start Frequency 150 kHz
 Stop Frequency..... 30 MHz
 Sweep Speed Auto
 IF Bandwidth..... 10 kHz
 Quasi-Peak Adapter Bandwidth 9 kHz
 Quasi-Peak Adapter Mode Normal

4.7 Summary of Test Results/Plots

According to the data in section 3.8, the EUT complied with the FCC Part 15.207 Conducted margin for a Class B device, with the *worst* margin reading of:

-5.46 dBμV at 0.422 MHz in the Line mode, Peak detector, 0.15-30MHz

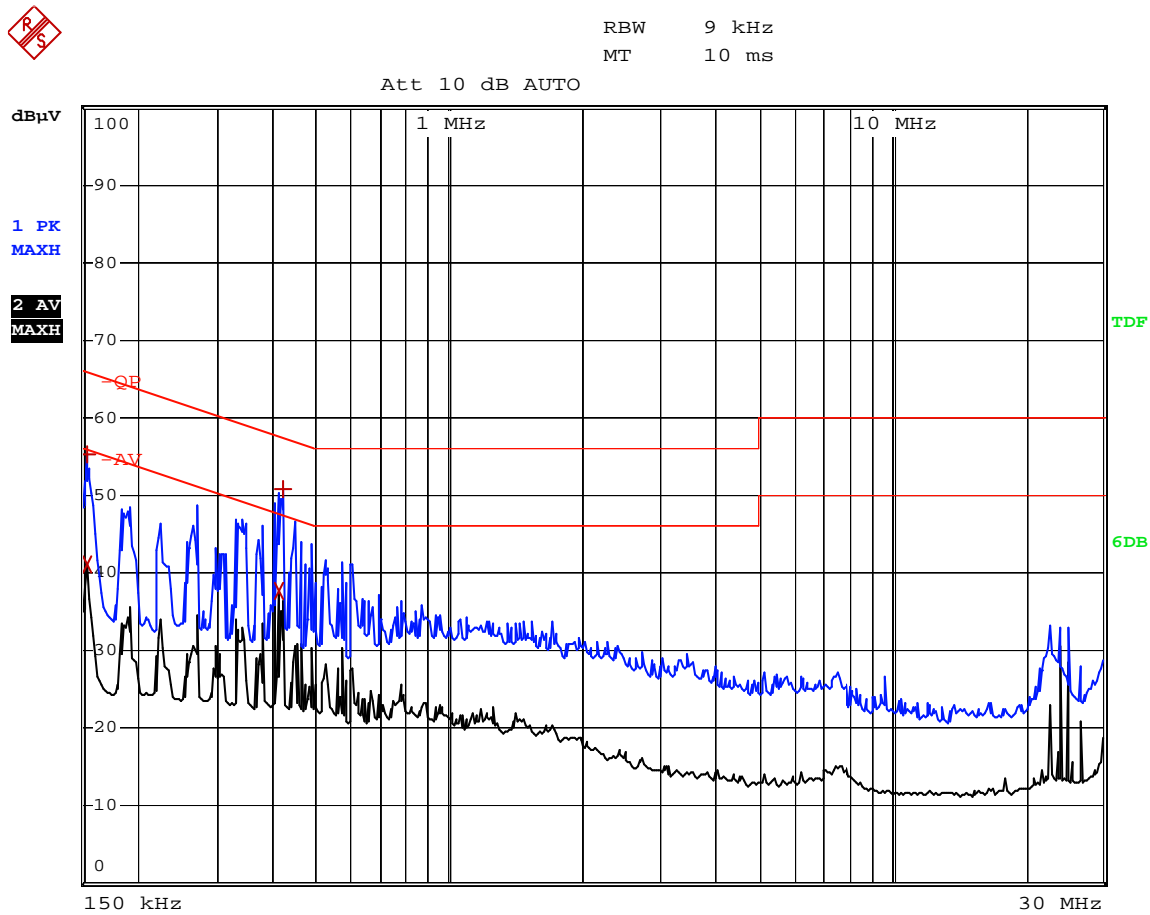
4.8 Conducted Emissions Test Data

LINE CONDUCTED EMISSIONS				FCC 15.207	
Frequency	Amplitude	Detector	Phase	Limit	Margin
MHz	dBμV	QP/Ave/Pk	Line/Neutral	dBμV	dB
0.422	51.95	Peak	Line	57.41	-5.46
0.418	50.66	Peak	Neutral	57.49	-6.83
0.410	37.97	Ave	Line	47.65	-9.68
0.410	37.73	Ave	Neutral	47.65	-9.92
0.154	55.13	Peak	Neutral	65.78	-10.65
0.154	53.44	Peak	Line	65.78	-12.34
0.154	41.08	Ave	Neutral	55.78	-14.70
0.154	38.72	Ave	Line	55.78	-17.06

Note: Emission attenuated more than 20dB is not reported.

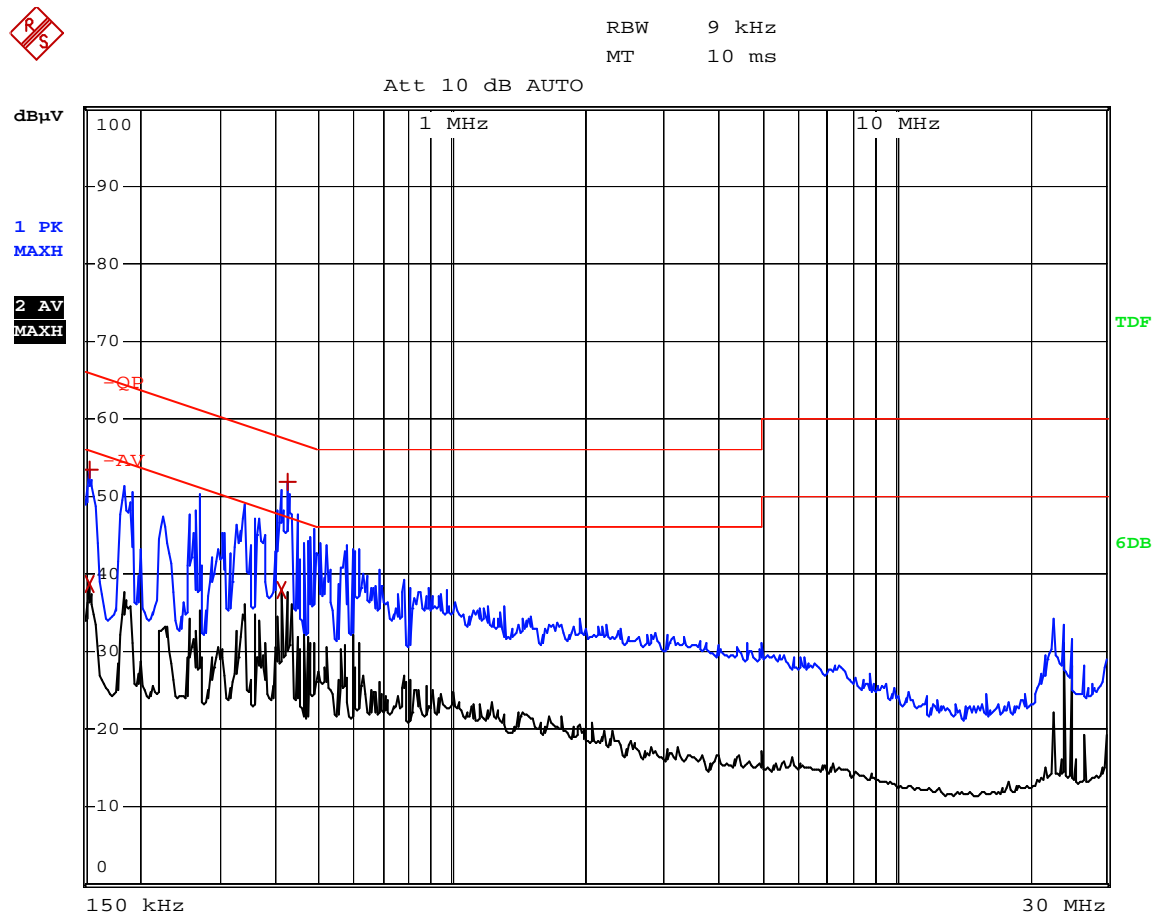
Plot of Conducted Emissions Test Data

Conducted Disturbance
EUT: FREEDOM-MBS
M/N: FREEDOM-MBS001
Operating Condition: Charging
Test Specification: N
Comment: AC 120V/60Hz; DC 5V adapter



Plot of Conducted Emissions Test Data

Conducted Disturbance
EUT: FREEDOM-MBS
M/N: FREEDOM-MBS001
Operating Condition: Charging
Test Specification: L
Comment: AC 120V/60Hz; DC 5V adapter



5. §15.205, §15.209, §15.231 (b) RADIATED EMISSION

5.1 Measurement Uncertainty

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement is ± 5.10 dB.

5.2 Standard Applicable

According to §15.231(b), the field strength of emissions from intentional radiators operated under this section shall not exceed the following:

Fundamental frequency (MHz)	Field strength of fundamental (microvolts/meter)	Field strength of spurious emissions (microvolts/meter)
40.66-40.70.....	2,250.....	225
70-130.....	1,250.....	125
130-174.....	\1\ 1,250 to 3,750	\1\ 125 to 375
174-260.....	3,750.....	375
260-470.....	\1\ 3,750 to 12,500	\1\ 375 to 1,250
Above 470.....	12,500.....	1,250

\1\ Linear interpolations.

The limits on the field strength of the spurious emissions in the above table are based on the fundamental frequency of the intentional radiator. Spurious emissions shall be attenuated to the average (or, alternatively, CISPR quasi-peak) limits shown in this table or to the general limits shown in §15.209, whichever limit permits a higher field strength.

compliance with the provisions of §15.205 shall be demonstrated using the measurement instrumentation specified in that section.

Spurious Radiated Emissions measurements starting below or at the lowest crystal frequency.

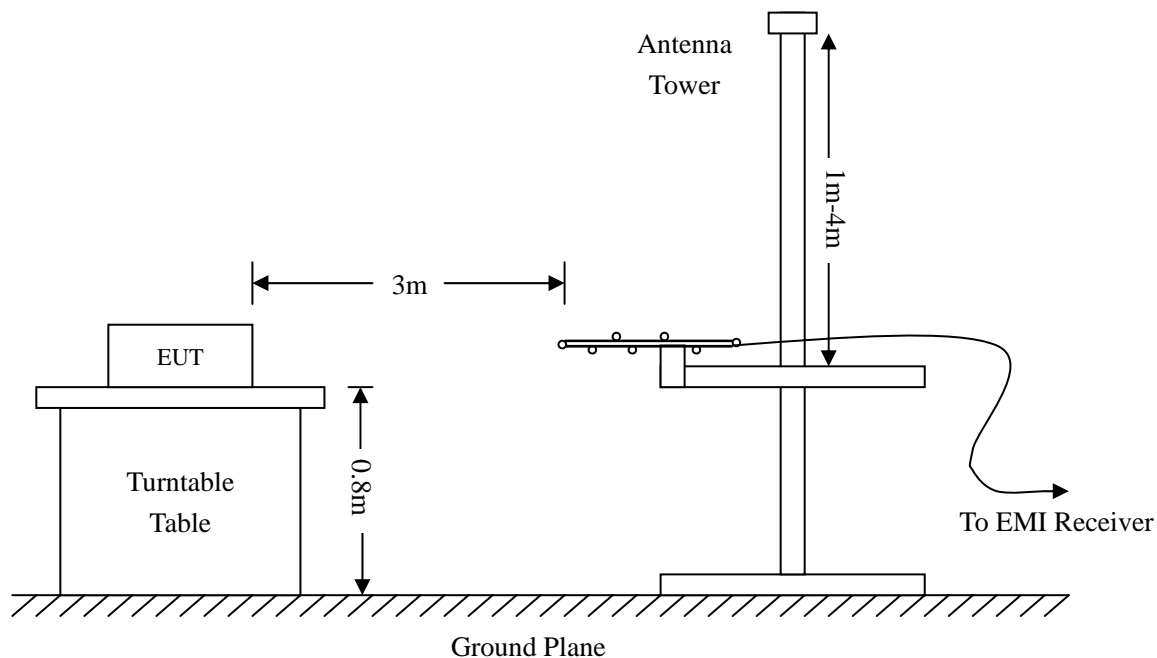
5.3 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
Spectrum Analyzer	R&S	FSP	836079/035	2010-12-20	2011-12-19
EMI Test Receiver	R&S	ESVB	825471/005	2010-12-20	2011-12-19
Positioning Controller	C&C	CC-C-1F	N/A	2010-12-20	2011-12-19
RF Switch	EM	EMSW18	SW060023	2010-12-20	2011-12-19
Pre-amplifier	Agilent	8447F	3113A06717	2010-12-20	2011-12-19
Pre-amplifier	Compliance Direction	PAP-0118	24002	2010-12-20	2011-12-19
Trilog Broadband Antenna	SCHWARZBECK	VULB9163	9163-333	2010-12-20	2011-12-19
Horn Antenna	ETS	3117	00086197	2011.01.09	2012.01.08
Loop Antenna	SCHWARZECK	HFRA 5165	9365	2011-01-09	2012-01-08

Statement of Traceability: All calibrations have been performed per the NVLAP requirements traceable to the NIST.

5.4 Test Procedure

The setup of EUT is according with per ANSI C63.4-2003 measurement procedure. The specification used was with the FCC Part 15.205 15.231(b) and FCC Part 15.209 Limit.



5.5 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and the Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

$$\text{Corr. Ampl.} = \text{Indicated Reading} + \text{Ant. Loss} + \text{Cab. Loss} - \text{Ampl. Gain}$$

The “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -6dB μ V means the emission is 6dB μ V below the maximum limit for Class B. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Corr. Ampl.} - \text{FCC Part 15.231 Limit}$$

5.6 Environmental Conditions

Temperature:	21° C
Relative Humidity:	50%
ATM Pressure:	1011 mbar

5.7 Summary of Test Results/Plots

According to the data below, the FCC Part 15.205, 15.209 and 15.231 standards, and had the worst margin of:

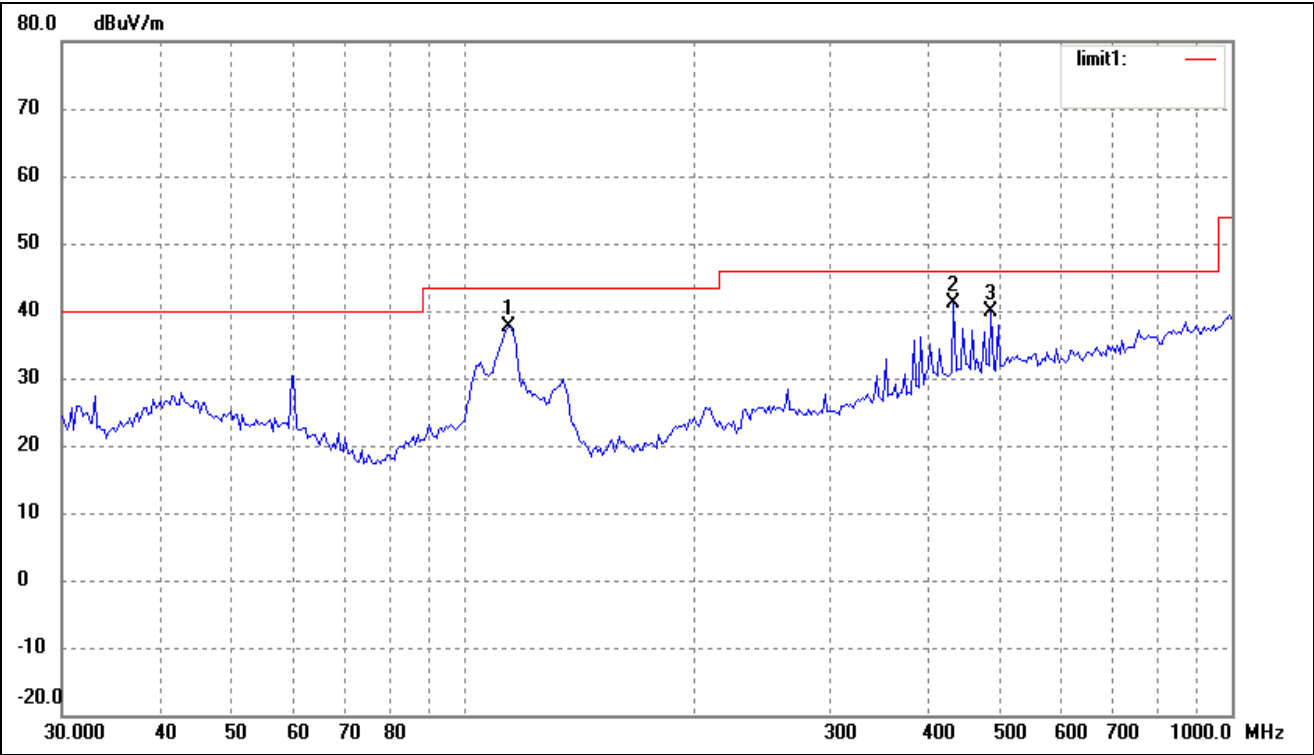
**-3.96 dB μ V at 113.7142 MHz in the Vertical, Peak Detector polarization, Charging Mode, 9kHz to 1GHz,
3Meters**

**-2.85 dB μ V at 433.9200 MHz in the Vertical, Ave Detector polarization, Transmitting Mode, 9kHz to 5GHz,
3Meters**

Plot of Radiation Emissions Test Data

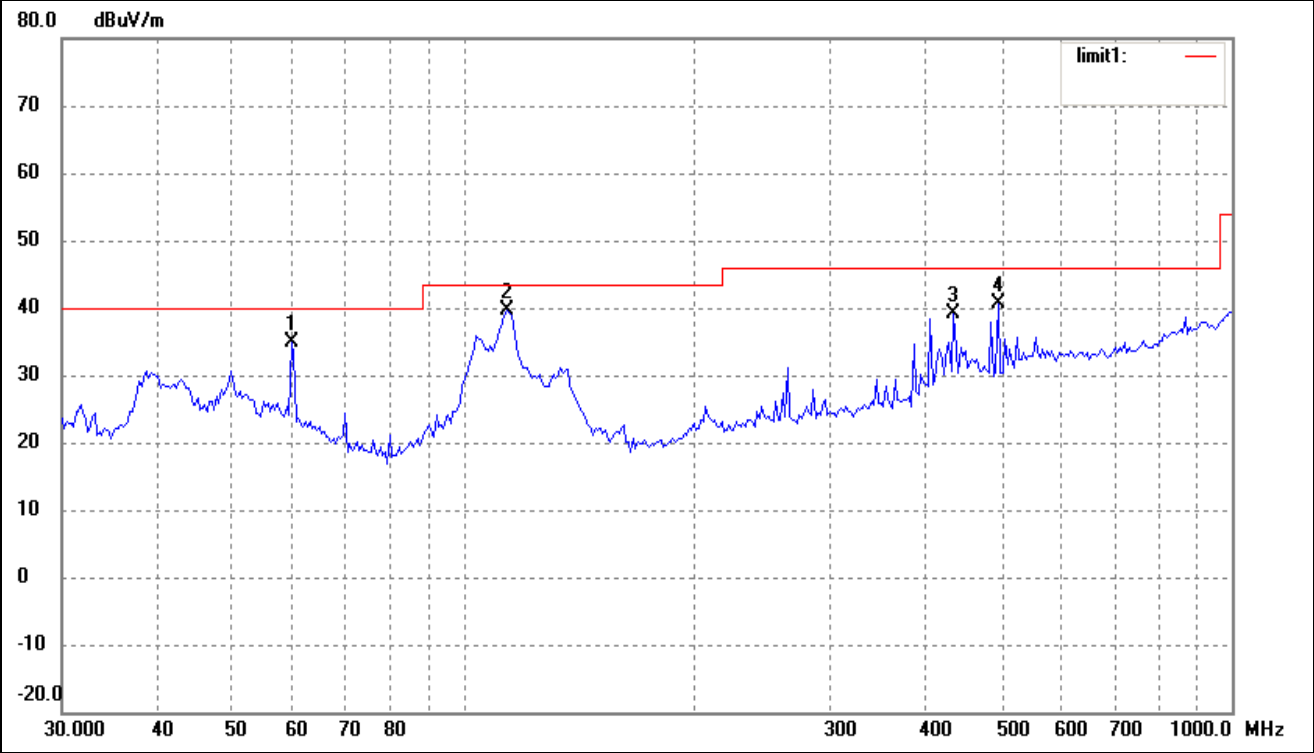
Radiated Disturbance
EUT: FREEDOM-MBS
M/N: FREEDOM-MBS001
Operating Condition: Charging
Test Specification: Horizontal & Vertical
Comment:

Horizontal



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(°)	(cm)	
1	114.5146	30.84	6.85	37.69	43.50	-5.81	223	100	peak
2	434.0649	29.31	11.93	41.24	46.00	-4.76	214	100	peak
3	485.6093	26.88	13.00	39.88	46.00	-6.12	200	100	peak

Vertical

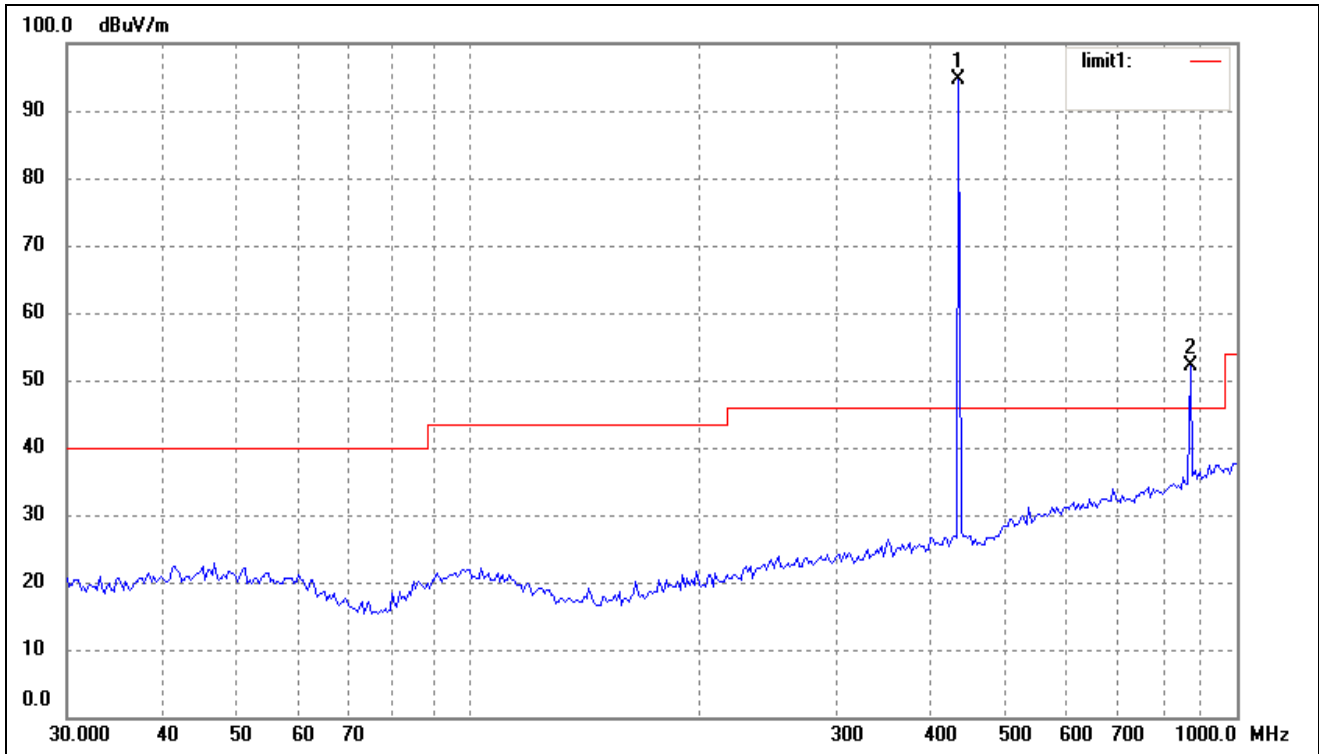


No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(°)	(cm)	
1	59.6492	27.35	7.55	34.90	40.00	-5.10	135	100	peak
2	113.7142	32.56	6.98	39.54	43.50	-3.96	85	100	peak
3	434.0649	27.31	11.93	39.24	46.00	-6.76	61	100	peak
4	495.9343	26.63	14.01	40.64	46.00	-5.36	110	100	peak

Plot of Radiation Emissions Test

Transmitting Mode

Horizontal:

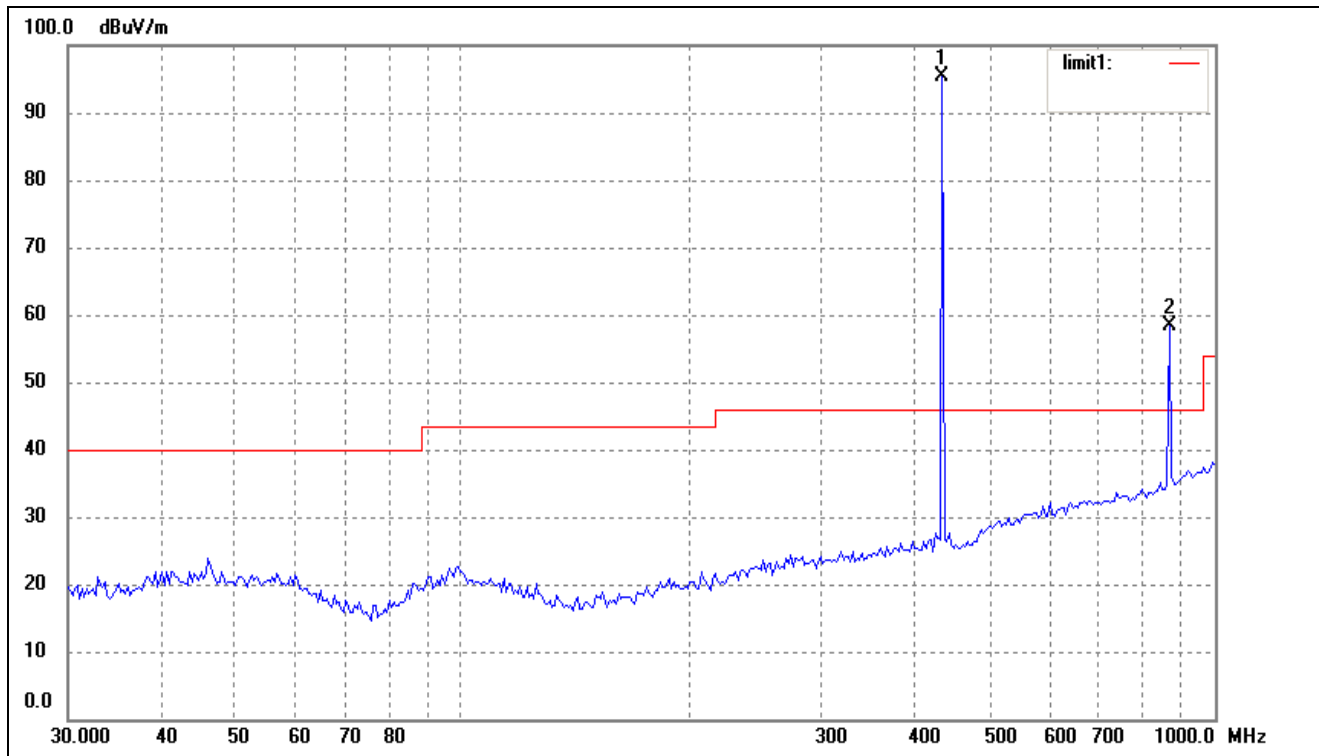


No.	Frequency MHz	Reading dBuV/m	Corr. Factor (dB)	Dutycycle Factor (dB)	Result dBuV/m	Limit dBuV/m	Margin (dB)	Deg. (°)	Height (cm)	Remark
1	433.9200	82.63	11.93	N/A	94.56	100.80	-6.24	360	100	peak
2	867.7850	31.93	20.32	N/A	52.25	80.80	-28.55	270	100	peak
	433.9200	/	/	-17.39	77.17	80.80	-3.63	360	100	Ave
	867.7850	/	/	-17.39	34.86	60.80	-25.94	270	100	Ave

Above 1GHz

No.	Frequency MHz	Reading dBuV/m	Corr. Factor (dB)	Dutycycle Factor (dB)	Result dBuV/m	Limit dBuV/m	Margin dB	Deg. (°)	Height (cm)	Remark
1	1301.6775	21.35	26.95	N/A	48.30	74.00	-25.70	360	100	Peak
2	1735.5700	16.83	27.77	N/A	44.60	74.00	-29.40	360	100	Peak
	1301.6775	/	/	-17.39	30.91	54.00	-23.09	180	100	Ave
	1735.5700	/	/	-17.39	27.21	54.00	-26.79	180	100	Ave

Vertical:



No.	Frequency MHz	Reading dBuV/m	Corr. Factor (dB)	Dutycycle Factor (dB)	Result dBuV/m	Limit dBuV/m	Margin (dB)	Deg. (°)	Height (cm)	Remark
1	433.9200	83.41	11.93	N/A	95.34	100.80	-5.46	360	100	peak
2	867.7850	38.19	20.29	N/A	58.48	80.80	-22.32	176	100	peak
	433.9200	/	/	-17.39	77.95	80.80	-2.85	360	100	Ave
	867.7850	/	/	-17.39	41.09	60.80	-19.71	176	100	Ave

Above 1GHz

No.	Frequency MHz	Reading dBuV/m	Corr. Factor (dB)	Dutycycle Factor (dB)	Result dBuV/m	Limit dBuV/m	Margin dB	Deg. (°)	Height (cm)	Remark
1	1301.6775	21.35	26.95	N/A	50.32	74.00	-23.68	360	100	Peak
2	1735.5700	16.83	27.77	N/A	46.50	74.00	-27.50	360	100	Peak
	1301.6775	/	/	-17.39	32.93	54.00	-21.07	180	100	Ave
	1735.5700	/	/	-17.39	29.11	54.00	-24.89	180	100	Ave

Note: The EUT was tested in all three orthogonal planes and frequency rang 9 kHz to the tenth harmonics.

Emissions attenuated closely to the noise base are not reported. The fundamental frequency is 433.9200MHz, so the fundamental and spurious emissions radiated limit base on the operating frequency 433.9200MHz.

The measurements greater than 20dB below the limit from 9kHz to 30MHz..

6. §15.231(c) 20dB BANDWIDTH TESTING

6.1 Standard Applicable

According to FCC 15.231(c), The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. Bandwidth is determined at the points 20 dB down from the modulated carrier.

6.2 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
Spectrum Analyzer	Agilent	E4402B	US41192821	2010-12-20	2011-12-19
Attenuator	ATTEN	DC-4GHz	ATS100-4-20	2010-12-20	2011-12-19

Statement of Traceability: All calibrations have been performed per the NVLAP requirements traceable to the NIST.

6.3 Test Procedure

With the EUT's antenna attached, the EUT's 20dB Bandwidth power was received by the test antenna, which was connected to the spectrum analyzer with the START, and STOP frequencies set to the EUT's operation band.

6.4 Environmental Conditions

Temperature:	21° C
Relative Humidity:	52%
ATM Pressure:	1011 mbar

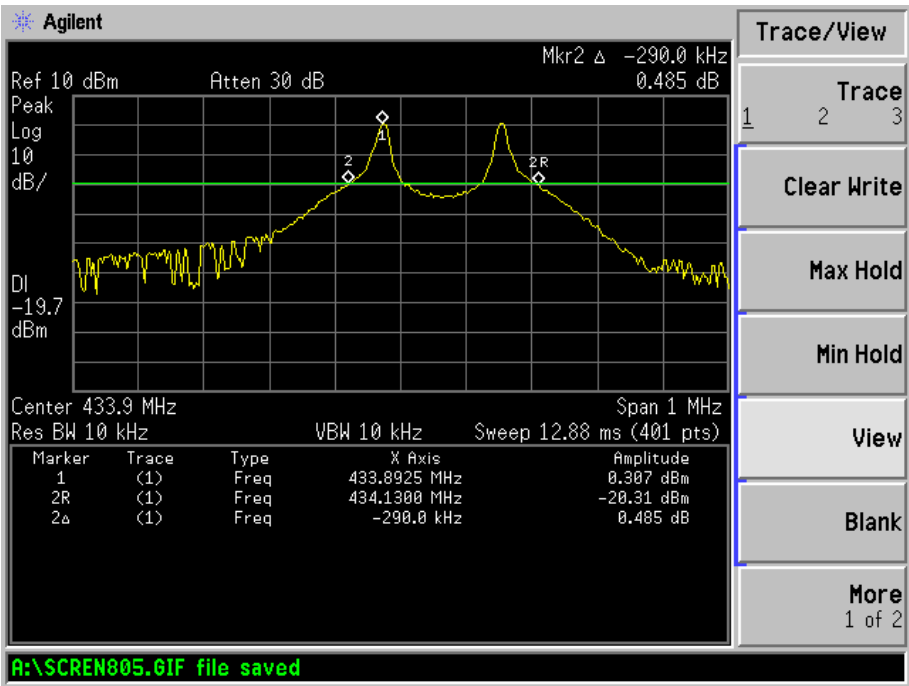
6.5 Summary of Test Results/Plots

Frequency MHz	20dB Bandwidth kHz	Limit kHz
433.9200	290	1084

Limit=Fundamental Frequency \times 0.25%=433.92 \times 0.25%=1084.8kHz

Test Result Pass

Refer to the attached plots.



7. §15.231(a) DEACTIVATION TESTING

7.1 Standard Applicable

According to FCC 15.231 (a)(3) Periodic transmissions at regular predetermined intervals are not permitted. However, polling or supervision transmissions, including data, to determine system integrity of transmitters used in security or safety applications are allowed if the total duration of transmissions does not exceed more than two seconds per hour for each transmitter. There is no limit on the number of individual transmissions, provided the total transmission time does not exceed two seconds per hour.

7.2 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
Spectrum Analyzer	Agilent	E4402B	US41192821	2010-12-20	2011-12-19
Attenuator	ATTEN	DC-4GHz	ATS100-4-20	2010-12-20	2011-12-19

Statement of Traceability: All calibrations have been performed per the NVLAP requirements traceable to the NIST.

7.3 Test Procedure

With the EUT's antenna attached, the EUT's output signal was received by the test antenna, which was connected to the spectrum analyzer. Set the center frequency to 433.9200MHz, than set the spectrum analyzer to Zero Span for the release time reading. During the testing, the switch was released then the EUT automatically deactivated.

7.4 Environmental Conditions

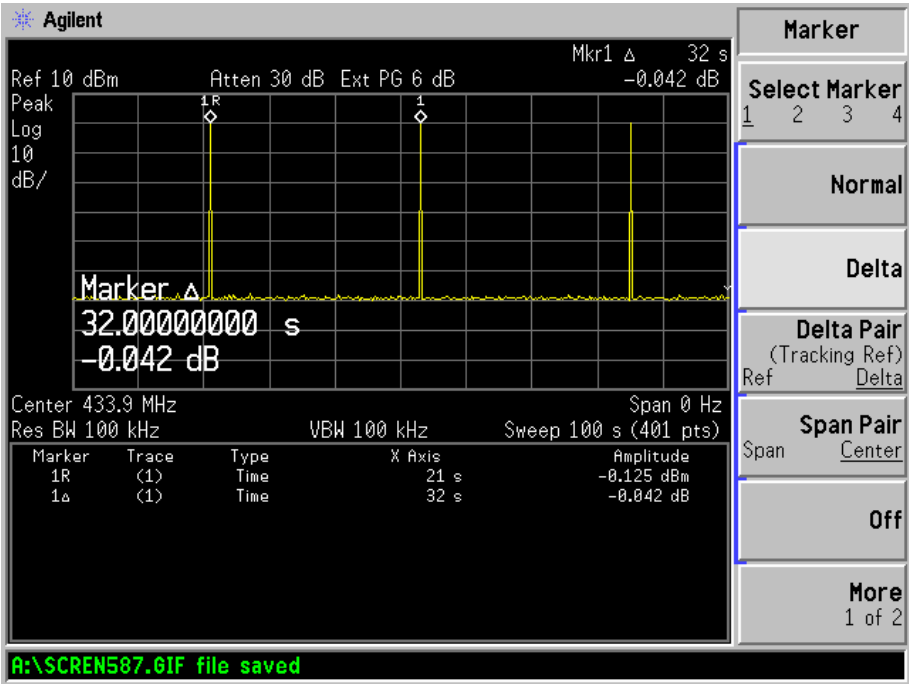
Temperature:	20° C
Relative Humidity:	52%
ATM Pressure:	1011 mbar

7.5 Summary of Test Results/Plots

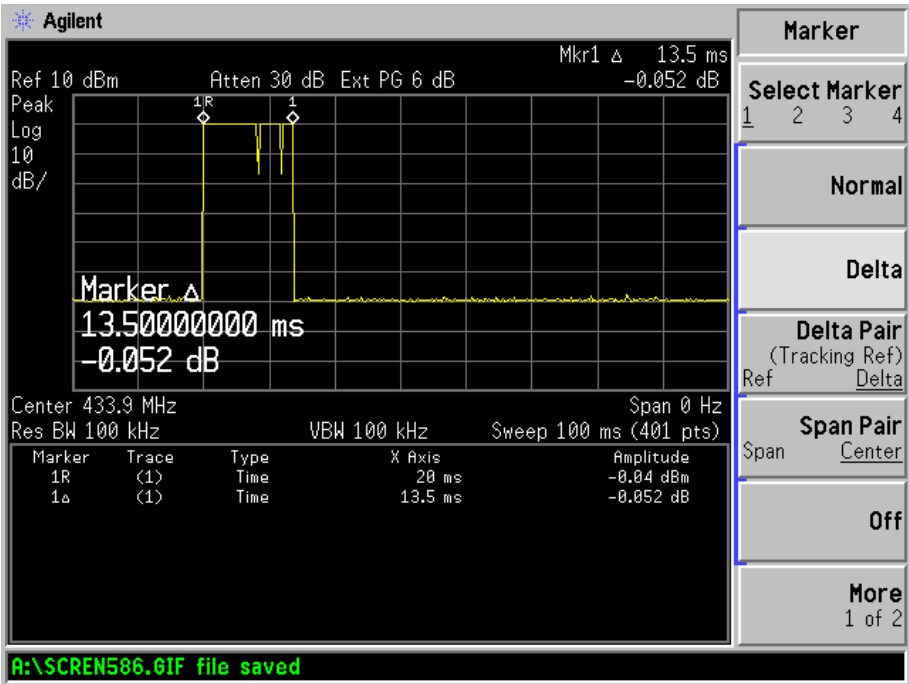
Refer to the attached plots.

The transmission time <2s

Period of Pulse



Width of Pulse



$$T_{on} = 13.5 * (3600/32) = 1518.75ms = 1.519s < 2s$$

Test Result: Pass

8. §15.231(b) Duty Cycle

8.1 Standard Applicable

According to FCC 15.231 (b)(2) and 15.35 (c), For pulse operation transmitter, the averaging pulsed emissions are calculated by peak value of measured emission plus duty cycle factor.

8.2 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
Spectrum Analyzer	Agilent	E4402B	US41192821	2010-12-20	2011-12-19
Attenuator	ATTEN	DC-4GHz	ATS100-4-20	2010-12-20	2011-12-19

Statement of Traceability: All calibrations have been performed per the NVLAP requirements traceable to the NIST.

8.3 Test Procedure

With the EUT's antenna attached, the EUT's output signal was received by the test antenna, which was connected to the spectrum analyzer. Set the center frequency to 433.92MHz, then set the spectrum analyzer to Zero Span for the release time reading. During the testing, the switch was released then the EUT automatically deactivated.

8.4 Environmental Conditions

Temperature:	20° C
Relative Humidity:	52%
ATM Pressure:	1011 mbar

8.5 Summary of Test Results/Plots

$T_p = 32s > 100ms$

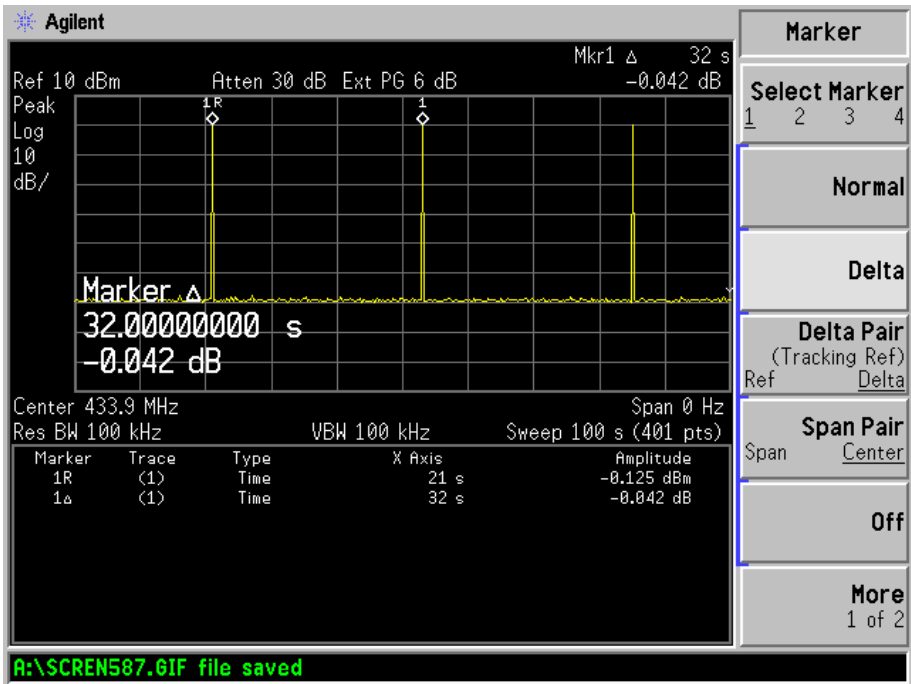
$T_{on} = 13.5ms$

Duty Cycle = T_{on} / T_p or $100ms$ (which is less) * 100% = $13.5/100=13.5\%$

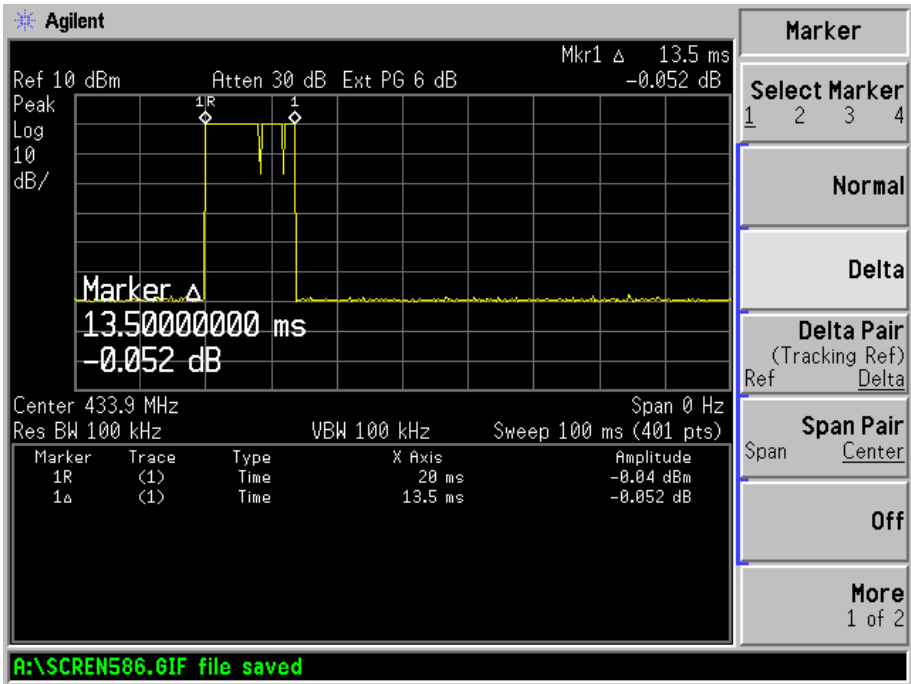
Factor = $20 * \log (T_{on}/T_p) = -17.39dB$

Refer to the attached plots.

Period of Pulse



Width of Pulse



***** END OF REPORT *****