FCC PART 15.249

MEASUREMENT AND TEST REPORT

FOR

Hong Kong RFID Ltd.

Unit 207A, 2/F, Building 9, No. 5 Science Park West Avenue, Hong Kong Science Park, Shatin, N.T., Hong Kong

FCC ID: XNOHKRAT001

Report Concerns: Original Report	**Equipment Type:** Wireless 2.4GHz Active RFID Transpoinder

Model:	HKRAT
Report No.:	STR10078139I
Test Date:	2010-08-02 to 2010-08-12
Issue Date:	2010-08-20
Test Engineer:	Susan Su
Reviewed By:	Lahm Peng
Approved & Authorized By:	Jandy so/PSQ Manager

Prepared By:

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1. GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

Client Information

Applicant:	Hong Kong RFID Ltd.
Address of applicant:	Unit 207A, 2/F, Building 9, No. 5 Science Park West Avenue, Hong Kong Science Park, Shatin, N.T., Hong Kong
Manufacturer:	Hong Kong RFID Ltd.
Address of manufacturer:	Unit 207A, 2/F, Building 9, No. 5 Science Park West Avenue, Hong Kong Science Park, Shatin, N.T., Hong Kong

General Description of E.U.T

Items	Description
EUT Description:	Wireless 2.4GHz Active RFID Transponder
Trade Name:	Hussar™
Model No.:	HKRAT
Adding Models:	HKRAT-NT01, HKRAT-NT02, HKRAT-RT01
Rated Voltage:	DC 3V
Rated Current:	<1mA
Output Power:	<10mW
Frequency Range:	2448 MHz
No. of Channel:	/
Antenna Type:	Integral Antenna
Size:	5.2X3.0X0.2cm
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. The others models listed in the report have different plastic case appearance and color of HKRAT without circuit and electronic construction changed, declared by the manufacturer.

1.2 Test Standards

The following report is prepared on behalf of the Hong Kong RFID Ltd. in accordance with FCC Part 15, Subpart B, Subpart C, and section 15.107, 15.203, 15.205, 15.207, 15.209 and 15.249 of the Federal Communication Commissions rules.

The objective is to determine compliance with FCC Part 15, Subpart C, and section 15.107,15.203, 15.205, 15.207, 15.209 and 15.249 of the Federal Communication Commissions rules.

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

1.3 Related Submittal(s)/Grant(s)

No Related Submittal(s).

1.4 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 according to the Operating Instructions and let the EUT keep transmitting.

1.5 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.

1.6 EUT Exercise Software

The EUT exercise program used during the testing was designed to exercise the system components. The test software is started while the whole system is on.

1.7 Accessories Equipment List and Details

Manufacturer	Description	Model	Serial Number
/	/	/	/

1.8 EUT Cable List and Details

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

2. SUMMARY OF TEST RESULTS

FCC RULES	DESCRIPTION OF TEST	RESULT
§15.203	Antenna Requirement	Compliant
§15.207 (a)	Conducted Emission	N/A
§15.205	Restricted Band of Operation	Compliant
§15.209	Radiated Emission	Compliant
§15.249(a)	Field Strength	Compliant
§15.249(d)	Out of Band 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. §15.205, §15.209, §15.249 (a)- RADIATED EMISSION

4.1 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.

4.2 Standard Applicable

According to §15.249(a), the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental Frequency	Field strength of fundamental (milli-volts/meter)	Field strength of fundamental (micro-volts/meter)
902-928 MHz	50	500
2400-2483.5 MHz	50	500
5725-5875 MHz	50	500
24.0-24.25 GHz	250	2500

The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in §15.35 for limiting peak emissions apply.

EMISSIONS RADIATED OUTSIDE OF THE SPECIFIED FREQUENCY BANDS, EXCEPT FOR HARMONICS, SHALL BE ATTENUATED BY AT LEAST 20 dB BELOW THE LEVEL OF THE FUNDAMENTAL OR TO THE GENERAL RADIATED EMISSION LIMITS IN 15.209,WHICHEVER IS THE LESSER ATTENUATION.

Emissions that fall in the restricted bands (15.205) must be less than 54dBuV/m otherwise the spurious and harmonics must be attenuated by at least 20dB.

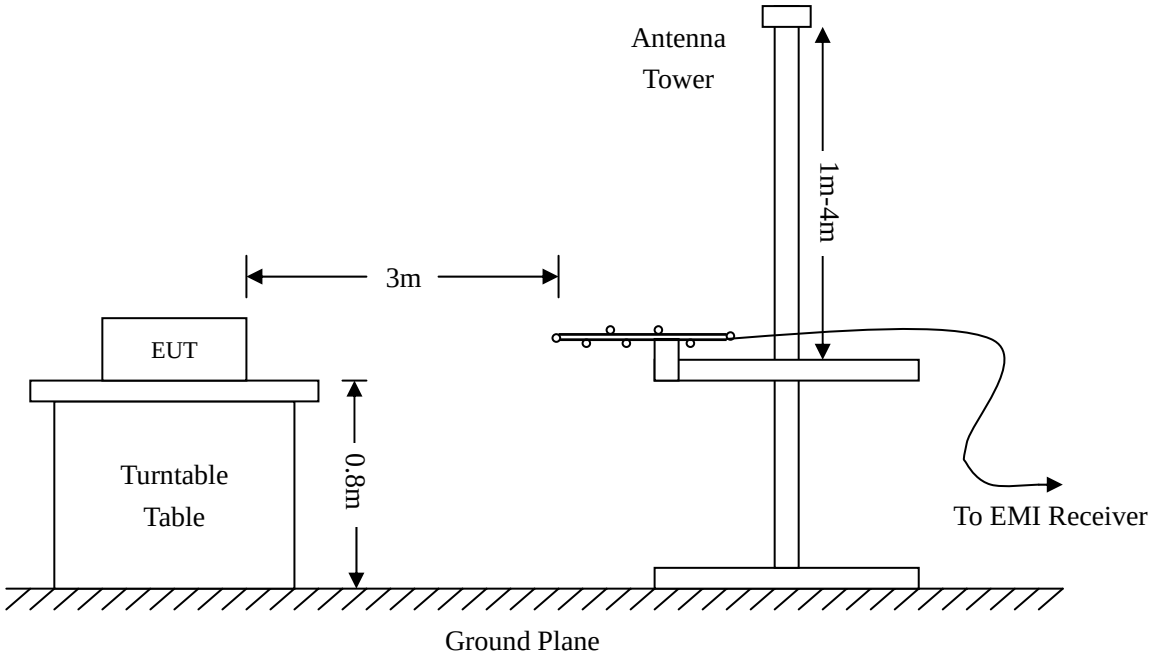
4.3 Test Equipment List and Details

Description	Manufacturer	Model	Serial No.	Cal. Date	Due. Date
Spectrum Analyzer	R&S	FSP	836079/035	2010-04-16	2011-04-15
EMI Test Receiver	R&S	ESVB	825471/005	2010-08-12	2011-08-11
Positioning Controller	C&C	CC-C-1F	N/A	2010-08-12	2011-08-11
RF Switch	EM	EMSW18	SW060023	2010-08-12	2011-08-11
Pre-amplifier	Agilent	8447F	3113A06717	2010-08-12	2011-08-11
Pre-amplifier	Compliance Direction	PAP-0118	24002	2010-08-12	2011-08-11
Trilog Broadband Antenna	SCHWARZBECK	VULB9163	9163-333	2010-07-21	2011-07-20
Horn Antenna	ETS	3117	00086197	2010-07-21	2011-07-20

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

4.4 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 15.247(a) and FCC Part 15.209 Limit.
The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.
The spacing between the peripherals was 10 cm.



4.5 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:

Corr. Ampl. = Indicated Reading + Ant. Factor + Cable Loss – Ampl. Gain

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

Margin = Corr. Ampl. – FCC Part 15 Limit

4.6 Environmental Conditions

Temperature:	24 °C
Relative Humidity:	60 %
ATM Pressure:	1012 mbar

4.7 Summary of Test Results/Plots

According to the data below, the FCC Part 15.205, 15.209 and 15.249 standards, and had the worst margin of:

-8.90 dBμV at **4895.650 MHz** in the **Vertical** polarization, **30 MHz to 25 GHz, 3Meters**

Plot of Radiation Emissions Test

Radiated Disturbance

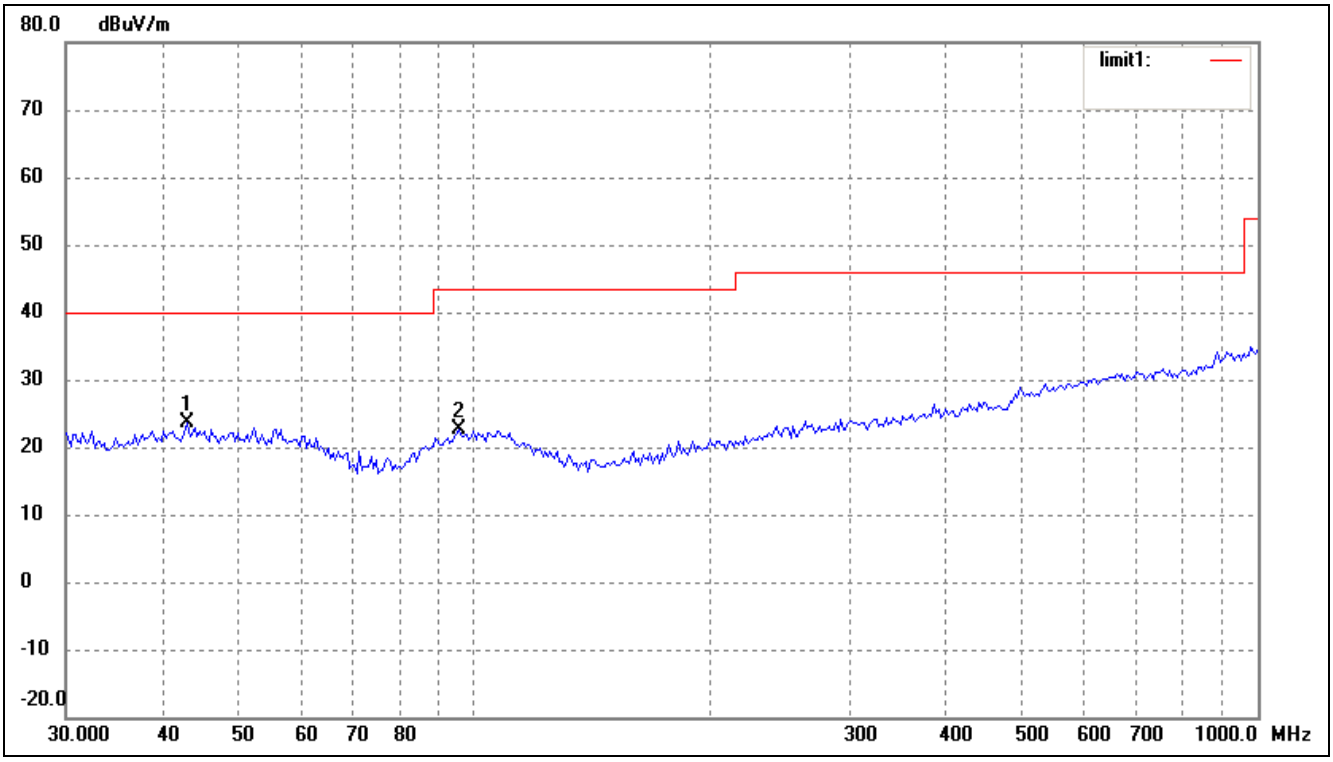
EUT: Wireless 2.4GHz Active RFID Transponder

M/N: HKRAT

Operating Condition: Transmitting below 1GHz

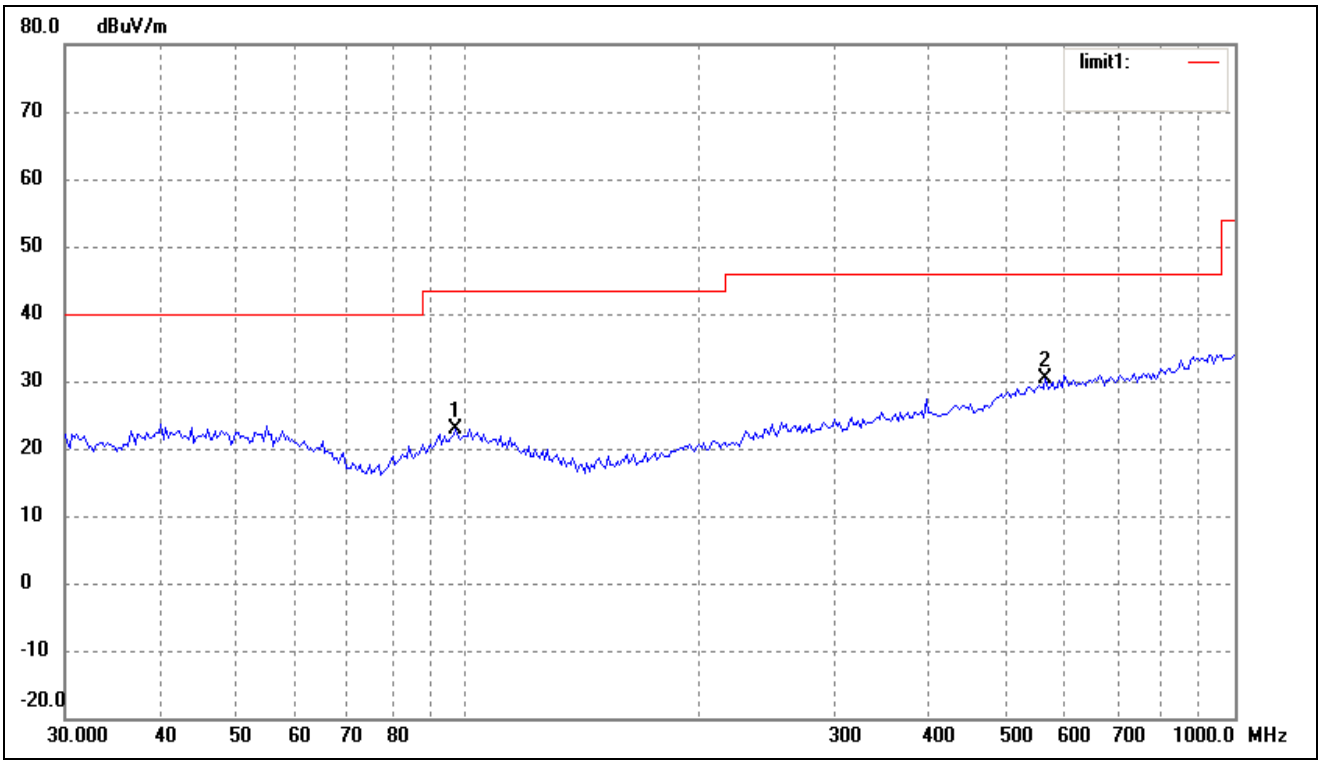
Test Specification: Horizontal & Vertical

Horizontal:



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(°)	(cm)	
1	42.8998	15.78	7.97	23.75	40.00	-16.25	145	100	peak
2	95.4270	15.02	7.50	22.52	43.50	-20.98	96	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	96.7749	15.30	7.59	22.89	43.50	-20.61	315	100	peak
2	566.6223	16.60	13.76	30.36	46.00	-15.64	76	100	peak

Spurious Emission Above 1GHz

Frequency MHz	Detector	Meter Reading dBuV	Direction Degree	Polar H / V	Antenna Loss dB	Cable loss dB	Amplifier dB	Correction Amplitude dBuV/m	Limit dBuV/m	Margin dB
4896	AV	33.2	24	V	34.1	5.2	33	39.5	54	-14.5
4896	AV	29.7	341	H	34.1	5.2	33	36.0	54	-18.0
4896	PK	58.8	177	V	34.1	5.2	33	65.1	74	-8.9
4896	PK	55.3	28	H	34.1	5.2	33	61.6	74	-12.4
7344	AV	27.2	325	V	37.4	6.1	33.5	37.2	54	-16.8
7344	AV	24.1	91	H	37.4	6.1	33.5	34.1	54	-19.9
7344	PK	52.8	77	V	37.4	6.1	33.5	62.8	74	-11.2
7344	PK	49.7	267	H	37.4	6.1	33.5	59.7	74	-14.3
2448	AV	72.8	33	V	29.1	3.7	34	71.6	94	-22.4
2448	AV	69.9	34	H	29.1	3.7	34	68.7	94	-25.3
2448	PK	98.4	164	V	29.1	3.7	34	97.2	114	-16.8
2448	PK	95.5	159	H	29.1	3.7	34	94.3	114	-19.7

Note: Testing is carried out with frequency rang 30MHz to the tenth harmonics, which above 5th Harmonics is close to the noise base even antenna close up to 1meter distance according the measurement of ANSI C63.4. Emissions 20dB lower than the limit are not reported.

5. §15.249(b) OUT OF BAND EMISSIONS

5.1 Standard Applicable

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

5.2 Test Equipment List and Details

Description	Manufacturer	Model	Serial No.	Cal. Date	Due. Date
Spectrum Analyzer	R&S	FSP	836079/035	2010-04-16	2011-04-15
EMI Test Receiver	R&S	ESVB	825471/005	2010-08-12	2011-08-11
Positioning Controller	C&C	CC-C-1F	N/A	2010-08-12	2011-08-11
RF Switch	EM	EMSW18	SW060023	2010-08-12	2011-08-11
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Horn Antenna	ETS	3117	00086197	2010-07-21	2011-07-20

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

5.3 Test Procedure

As the radiation test, set the Lowest and Highest Transmitting Channel, observed the outside band of 2400MHz to 2438.5MHz, than mark the higher-level emission for comparing with the FCC rules.

5.4 Environmental Conditions

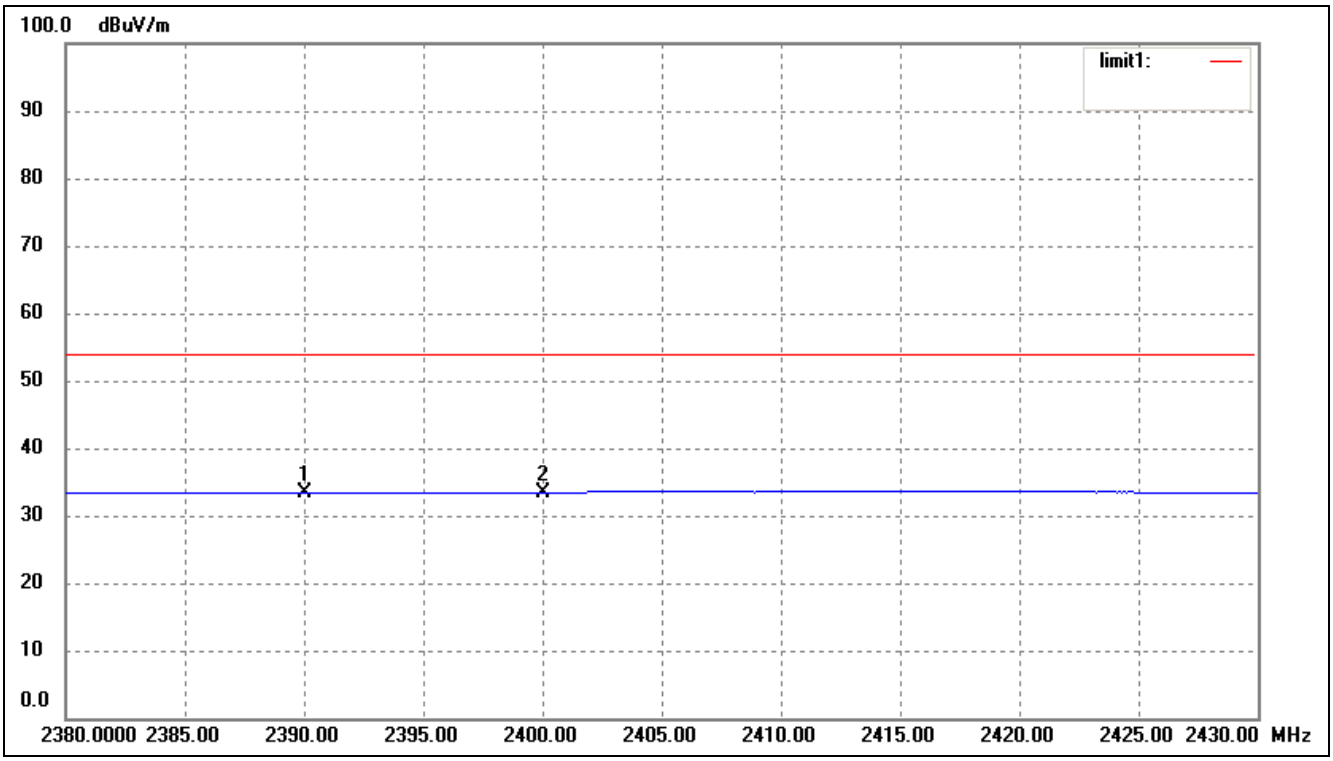
Temperature:	24 °C
Relative Humidity:	60 %
ATM Pressure:	1012 mbar

5.5 Summary of Test Results/Plots

Frequency MHz	Limit dBuv	Result
Low Edge	<54	Pass
High Edge	<54	Pass

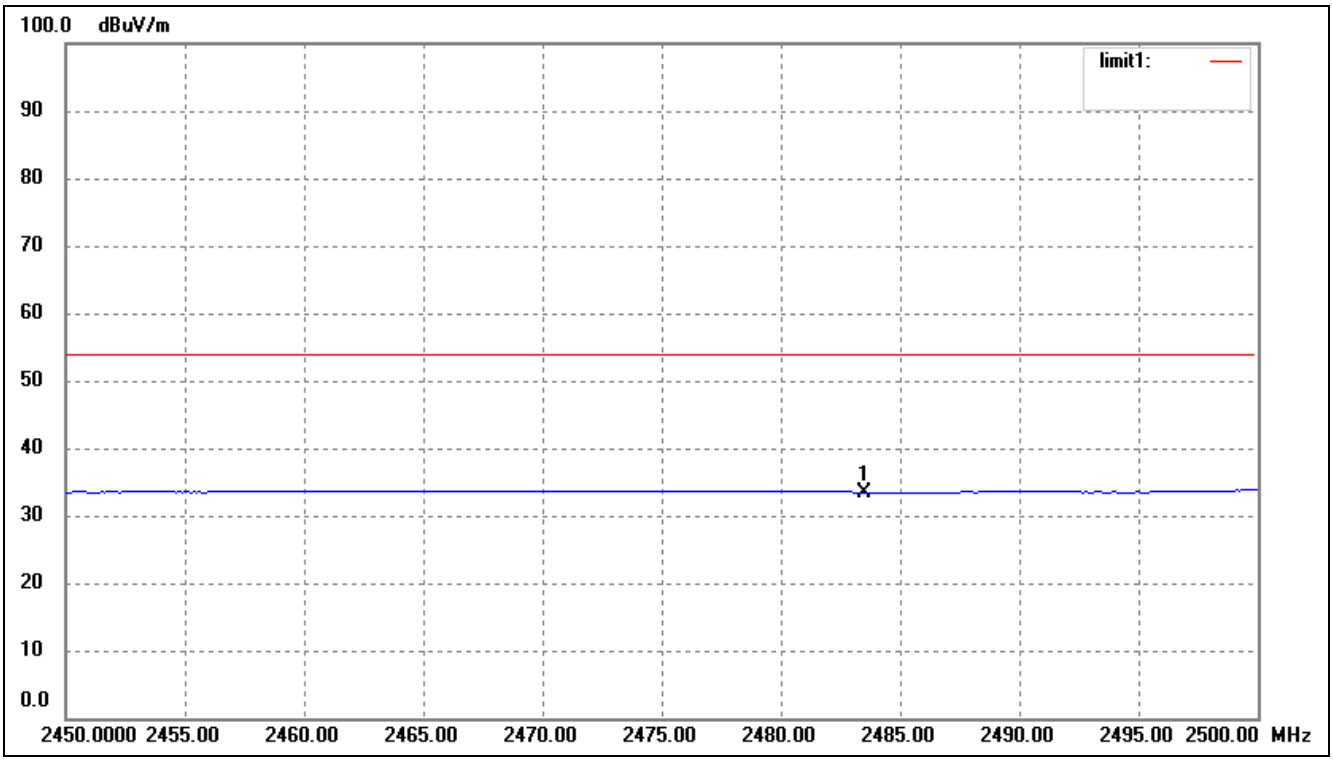
The edge emissions are below the FCC 15.209 Limits. Please refer to the test plots below.

Lowest Bandedge



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
1	2390.000	37.90	-4.54	33.36	54.00	-20.64	Ave Detector
	2390.000	63.50	-4.54	58.96	74.00	-15.04	Peak Detector
2	2400.000	37.92	-4.52	33.40	54.00	-20.60	Ave Detector
	2400.000	63.52	-4.52	59.00	74.00	-15.00	Peak Detector

Highest Bandedge



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
1	2483.500	37.83	-4.35	33.48	54.00	-20.52	Ave Detector
	2483.500	63.43	-4.35	59.08	74.00	-14.92	Peak Detector

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