

FCC PART 15.249 MEASUREMENT AND TEST REPORT FOR

ATEN Technology, Inc., dba IOGEAR

19641 Da Vinci, Foothill Ranch, California, United States

FCC ID: QLERXGKM581R

Report Concerns: Original Report	Equipment Type: 2.4G keyboard (Receiver)
Model:	<u>GKM581R</u>
Report No.:	<u>STR10088012I</u>
Test Date:	<u>2010-08-03 to 2010-09-03</u>
Issue Date:	<u>2010-09-07</u>
Tested By:	<u>Susan Su / Engineer</u> <i>Susan Su</i>
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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.

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1. GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

Client Information

Applicant: ATEN Technology, Inc., dba IOGEAR
 Address of applicant: 19641 Da Vinci, Foothill Ranch, California, United States

Manufacturer: ATEN Technology, Inc., dba IOGEAR
 Address of manufacturer: 19641 Da Vinci, Foothill Ranch, California, United States

General Description of E.U.T

Items	Description
EUT Description:	2.4G keyboard (Receiver)
Trade Name:	/
Model No.:	GKM581R
Add Models:	GKM581RW1, GKM581RW2, GKM581RW3, GKM581RW4, GKM581RW5, GKM581RW6
Rated Voltage:	DC 5V
Output Power:	<0dBm
Frequency Range:	2403~2478MHz
Channel Separation:	1MHz
Antenna Type:	Integral Antenna
Size:	5.3x1.6x0.8 cm
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 appearance of GKM581R only without circuit and electronic construction changed, declared by the manufacturer.

1.2 Test Standards

The following report is prepared on behalf of the ATEN Technology, Inc., dba IOGEAR 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
Notebook	ASUS	X50R	N/A

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	Compliant
§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 Number	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

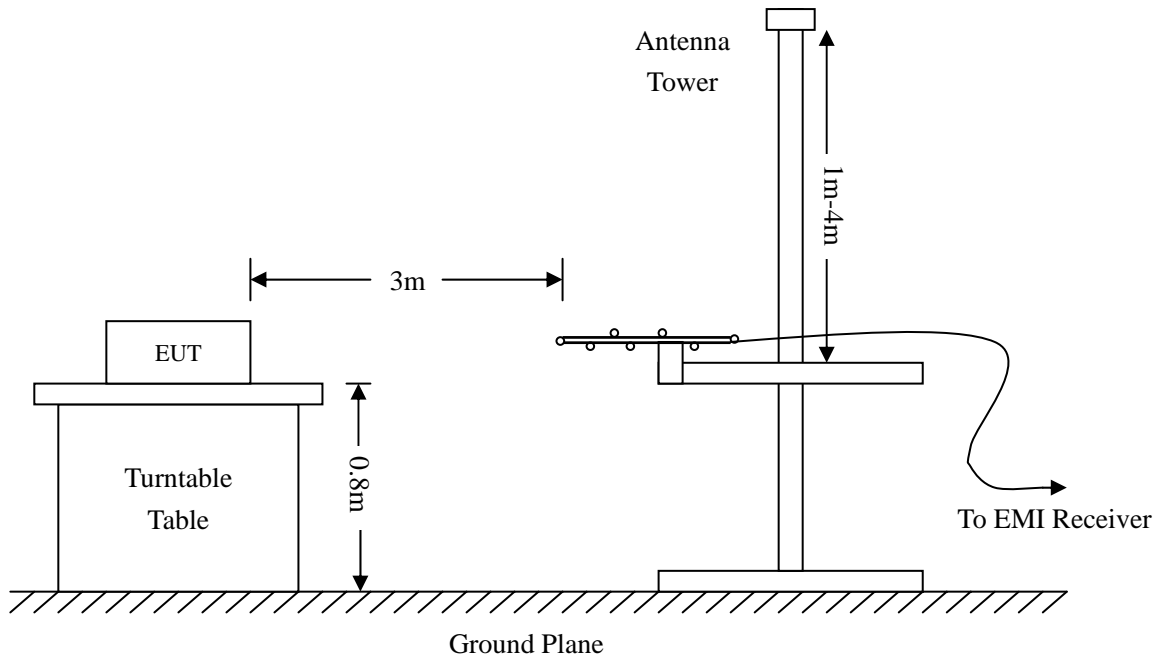
Statement of Traceability: All calibrations have been performed per the NVLAP requirements traceable to the NIST.

4.4 Test Procedure

The setup of EUT is according with per ANSI C63.4-2009 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:

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

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

$$\text{Margin} = \text{Corr. Ampl.} - \text{FCC Part 15 Limit}$$

4.6 Environmental Conditions

Temperature:	24 °C
Relative Humidity:	52%
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:

-4.1 dB μ V at 7434 MHz in the Horizontal polarization, 30 MHz to 25 GHz, 3Meters

Note: this EUT was tested in 3 orthogonal positions and the worst case position data was reported.

Plot of Radiation Emissions Test

Radiated Disturbance

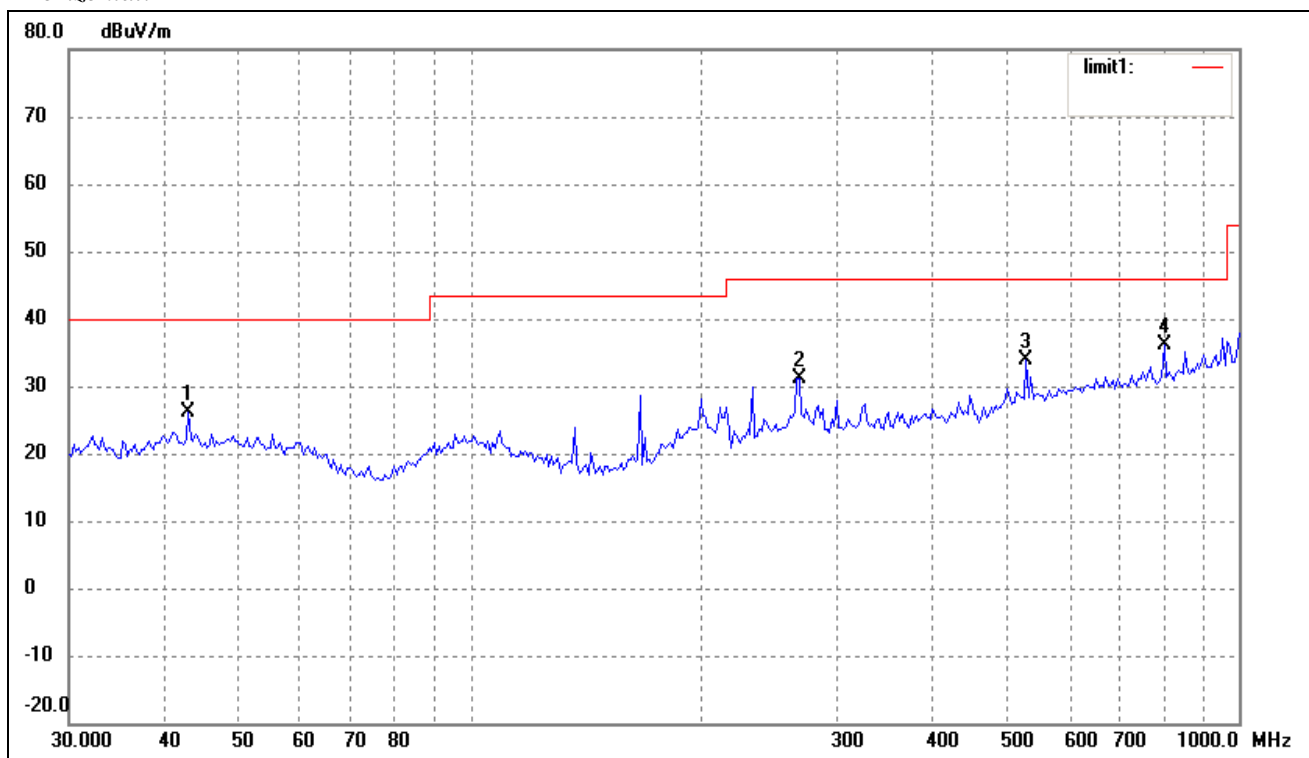
EUT: 2.4G keyboard

M/N: GKM581R

Operating Condition: Transmitting below 1GHz (Low Channel)

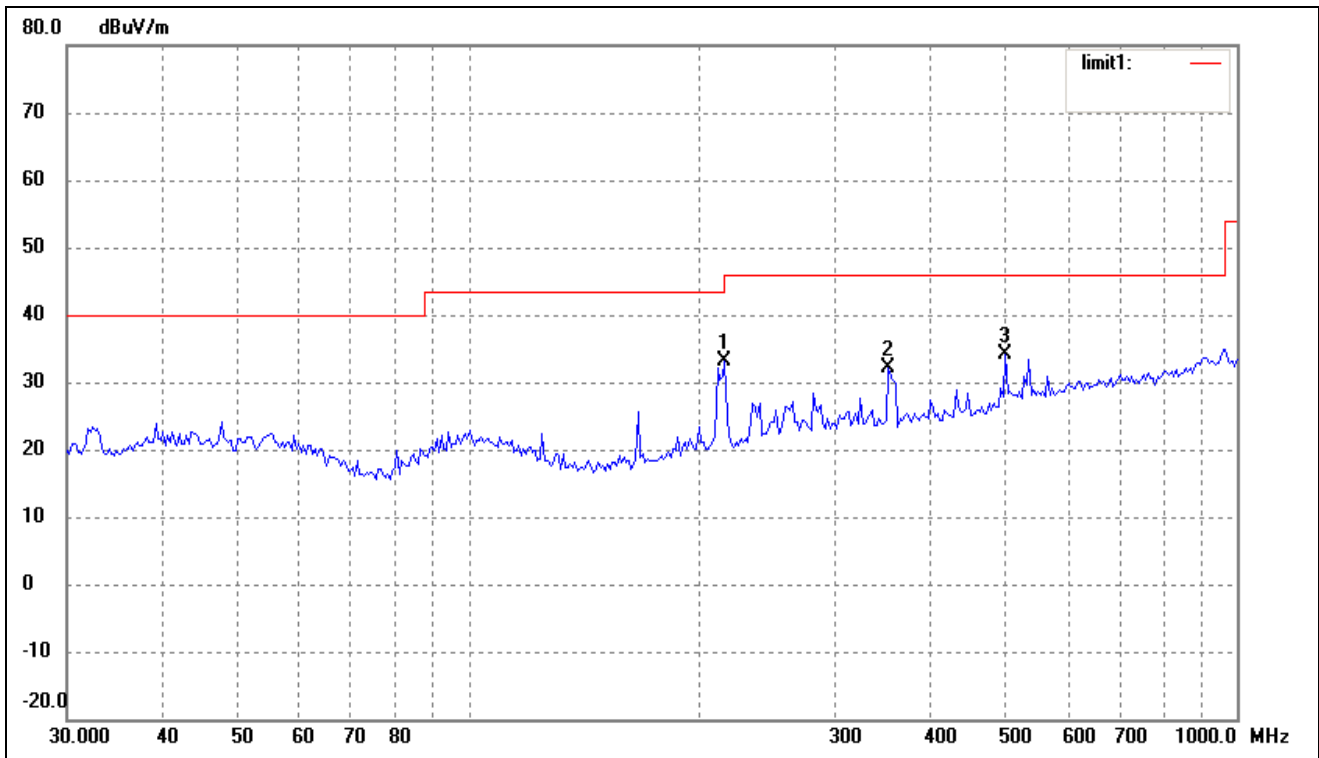
Test Specification: Horizontal & Vertical

Horizontal:



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	42.8998	18.15	7.97	26.12	40.00	-13.88	122	100	peak
2	267.5455	23.12	8.12	31.24	46.00	-14.76	21	100	peak
3	528.2458	20.95	12.91	33.86	46.00	-12.14	36	100	peak
4	798.9797	20.59	15.50	36.09	46.00	-9.91	58	100	peak

Vertical:



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	215.2678	27.03	6.18	33.21	43.50	-10.29	336	100	peak
2	351.7079	22.69	9.48	32.17	46.00	-13.83	28	100	peak
3	499.4247	21.25	12.88	34.13	46.00	-11.87	84	100	peak

Radiated Disturbance

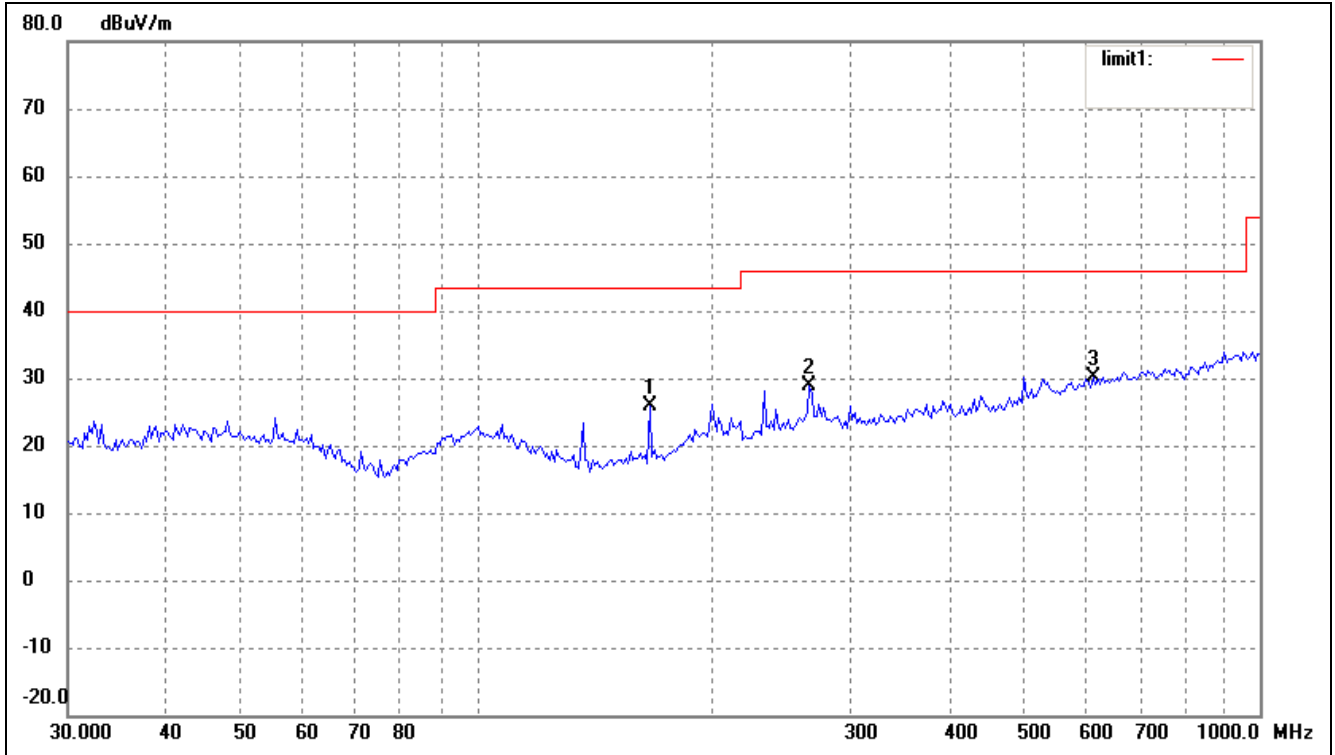
EUT: 2.4G keyboard

M/N: GKM581R

Operating Condition: Transmitting below 1GHz (Middle Channel)

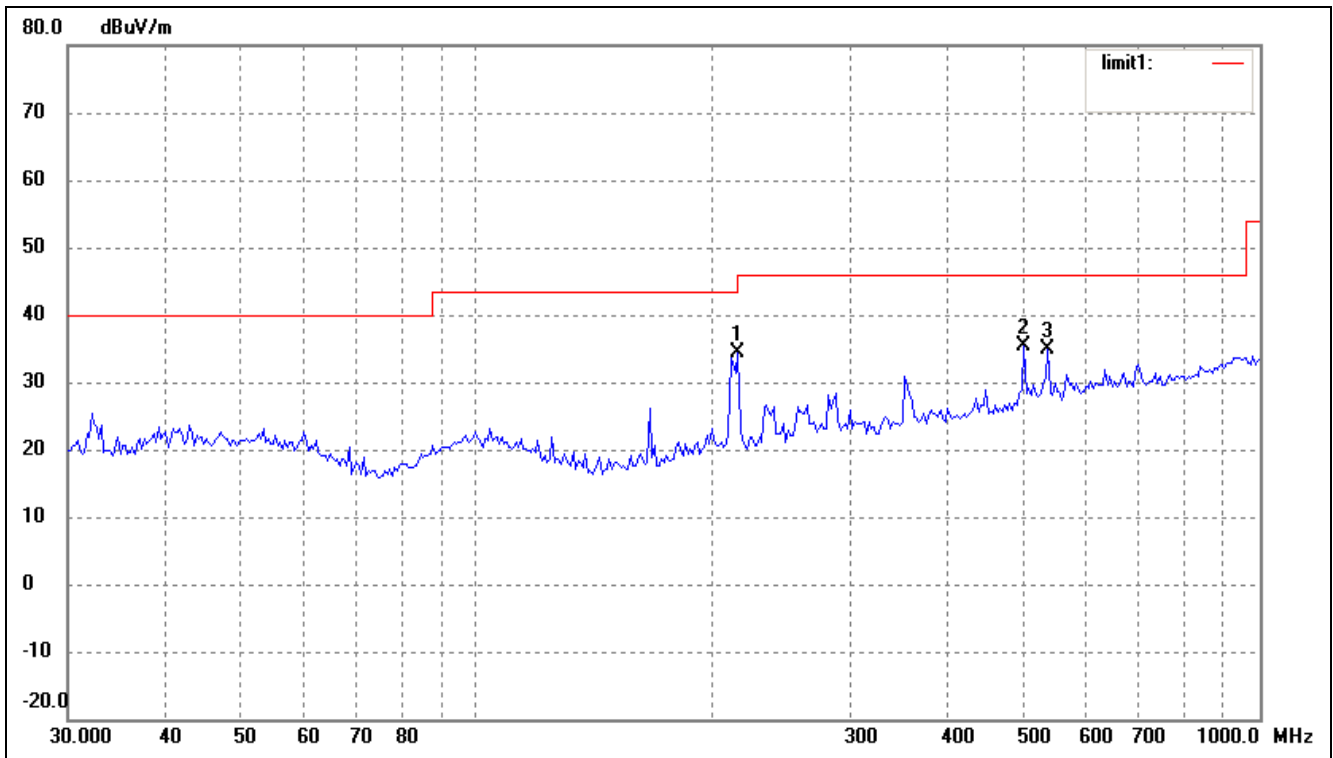
Test Specification: Horizontal & Vertical

Horizontal



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	166.0680	21.87	3.93	25.80	43.50	-17.70	215	100	peak
2	265.6757	20.69	8.07	28.76	46.00	-17.24	64	100	peak
3	612.0642	15.90	14.21	30.11	46.00	-15.89	6	100	peak

Vertical



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	215.2678	28.09	6.18	34.27	43.50	-9.23	336	100	peak
2	499.4247	22.39	12.88	35.27	46.00	-10.73	54	100	peak
3	535.7073	21.39	13.37	34.76	46.00	-11.24	215	100	peak

Radiated Disturbance

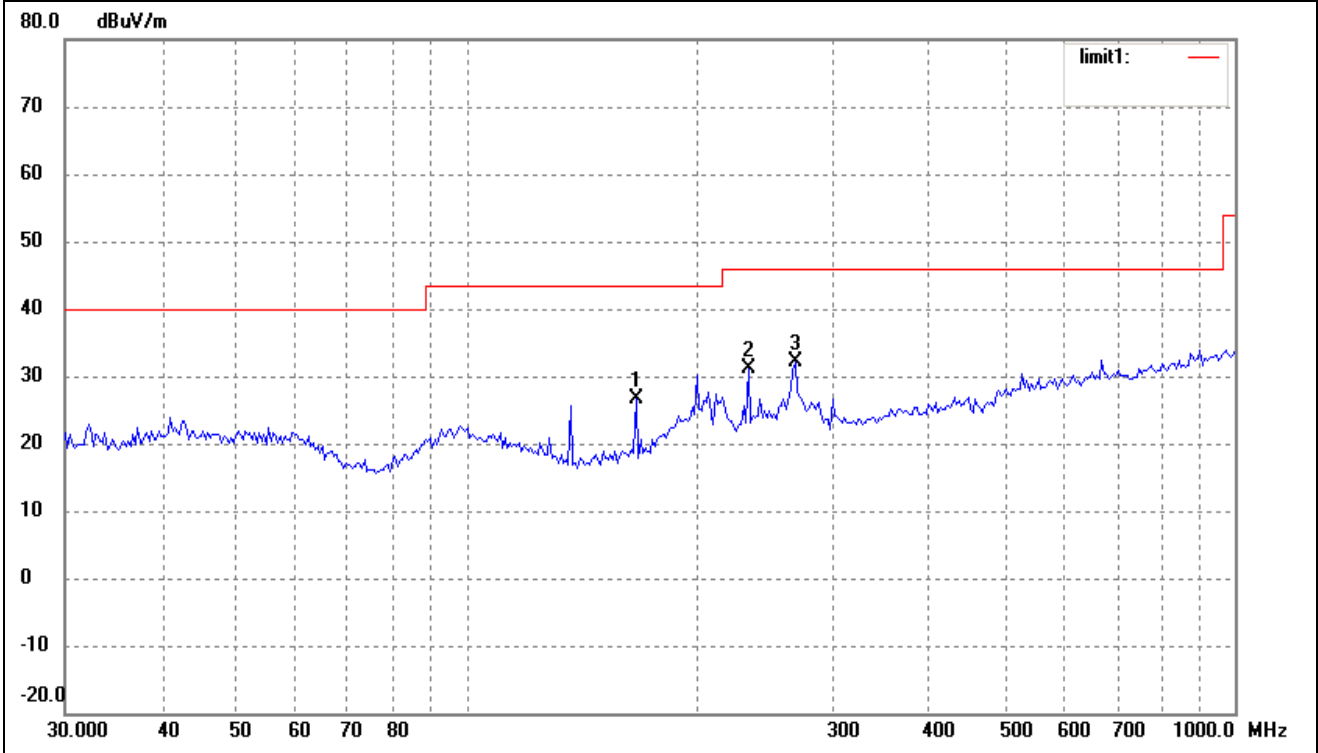
EUT: 2.4G keyboard

M/N: GKM581R

Operating Condition: Transmitting below 1GHz (High Channel)

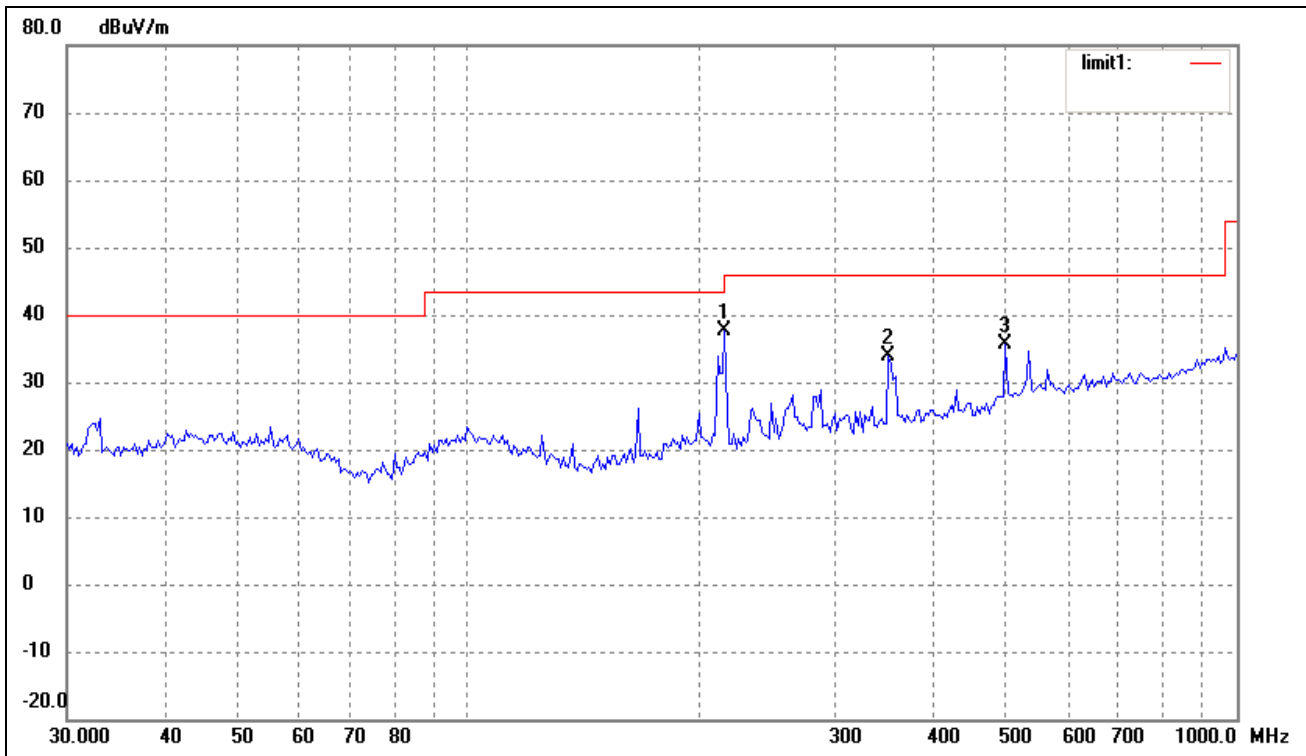
Test Specification: Horizontal & Vertical

Horizontal



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	166.0680	22.67	3.93	26.60	43.50	-16.90	77	100	peak
2	232.5318	23.98	7.03	31.01	46.00	-14.99	58	100	peak
3	267.5455	24.05	8.12	32.17	46.00	-13.83	94	100	peak

Vertical



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	215.2678	31.37	6.18	37.55	43.50	-5.95	227	100	QP
2	351.7079	24.45	9.48	33.93	46.00	-12.07	5	100	peak
3	499.4247	22.82	12.88	35.70	46.00	-10.30	61	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
Low Channel 2403MHz (1G to 25GHz)										
4806.0	AV	41.2	70	V	34.1	5.2	33.0	47.5	54	-6.5
4806.0	AV	38.8	170	H	34.1	5.2	33.0	45.1	54	-8.9
4806.0	PK	52.3	45	V	34.1	5.2	33.0	58.6	74	-15.4
4806.0	PK	51.2	332	H	34.1	5.2	33.0	57.5	74	-16.5
7209.0	AV	38.8	97	V	37.4	6.1	33.5	48.8	54	-5.2
7209.0	AV	39.6	22	H	37.4	6.1	33.5	49.6	54	-4.4
7209.0	PK	48.8	270	V	37.4	6.1	33.5	58.8	74	-15.2
7209.0	PK	50.2	180	H	37.4	6.1	33.5	60.2	74	-13.8
2403.0	AV	81.7	69	V	29.1	3.7	34.0	80.5	94	-13.5
2403.0	AV	83.6	270	H	29.1	3.7	34.0	82.4	94	-11.6
2403.0	PK	93.0	45	V	29.1	3.7	34.0	91.8	114	-22.2
2403.0	PK	94.8	268	H	29.1	3.7	34.0	93.6	114	-20.4
Middle Channel 2448MHz (1G to 25GHz)										
4886	AV	40.1	268	V	34.1	5.2	33.0	46.4	54	-7.6
4886	AV	41.4	270	H	34.1	5.2	33.0	47.7	54	-6.3
4886	PK	51.1	222	V	34.1	5.2	33.0	57.4	74	-16.6
4886	PK	51.0	260	H	34.1	5.2	33.0	57.3	74	-16.7
7329	AV	36.8	270	V	37.4	6.1	33.5	46.8	54	-7.2
7329	AV	38.2	89	H	37.4	6.1	33.5	48.2	54	-5.8
7329	PK	47.2	44	V	37.4	6.1	33.5	57.2	74	-16.8
7329	PK	48.8	45	H	37.4	6.1	33.5	58.8	74	-15.2
2443	AV	81.8	95	V	29.1	3.7	34.0	80.6	94	-13.4
2443	AV	83.3	96	H	29.1	3.7	34.0	82.1	94	-11.9
2443	PK	92.4	290	V	29.1	3.7	34.0	91.2	114	-22.8
2443	PK	93.6	60	H	29.1	3.7	34.0	92.4	114	-21.6

High Channel 2478MHz (1G to 25GHz)										
4956	AV	39.5	87	V	34.1	5.2	33.0	45.8	54	-8.2
4956	AV	41.2	32	H	34.1	5.2	33.0	47.5	54	-6.5
4956	PK	59.9	86	V	34.1	5.2	33.0	66.2	74	-7.8
4956	PK	61.5	60	H	34.1	5.2	33.0	67.8	74	-6.2
7434	AV	37.4	78	V	37.4	6.1	33.5	47.4	54	-6.6
7434	AV	39.9	180	H	37.4	6.1	33.5	49.9	54	-4.1
7434	PK	47.7	45	V	37.4	6.1	33.5	57.7	74	-16.3
7434	PK	50.3	335	H	37.4	6.1	33.5	60.3	74	-13.7
2478	AV	74.8	85	V	29.1	3.7	34.0	73.6	94	-20.4
2478	AV	73.6	90	H	29.1	3.7	34.0	72.4	94	-21.6
2478	PK	94.0	90	V	29.1	3.7	34.0	92.8	114	-21.2
2478	PK	92.7	44	H	29.1	3.7	34.0	91.5	114	-22.5

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 Number	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.

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

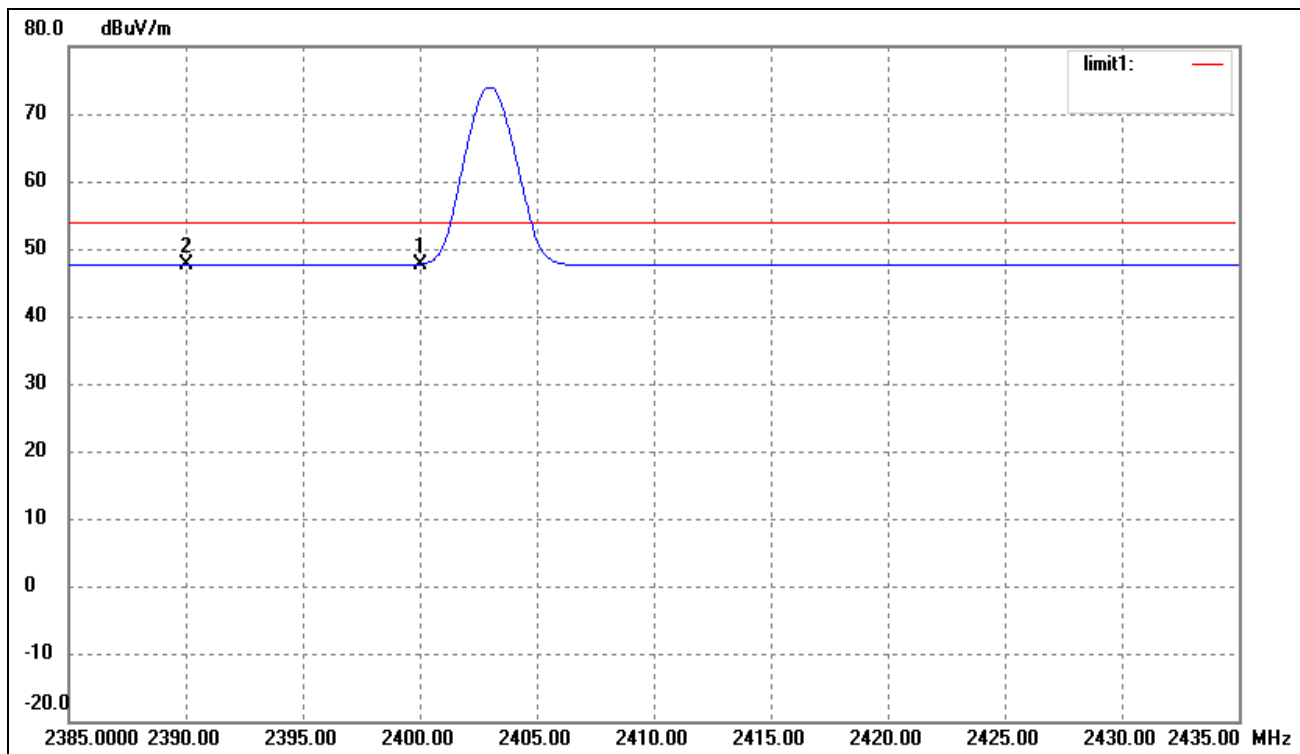
Temperature:	25 °C
Relative Humidity:	61 %
ATM Pressure:	1012 mbar

5.5 Summary of Test Results/Plots

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

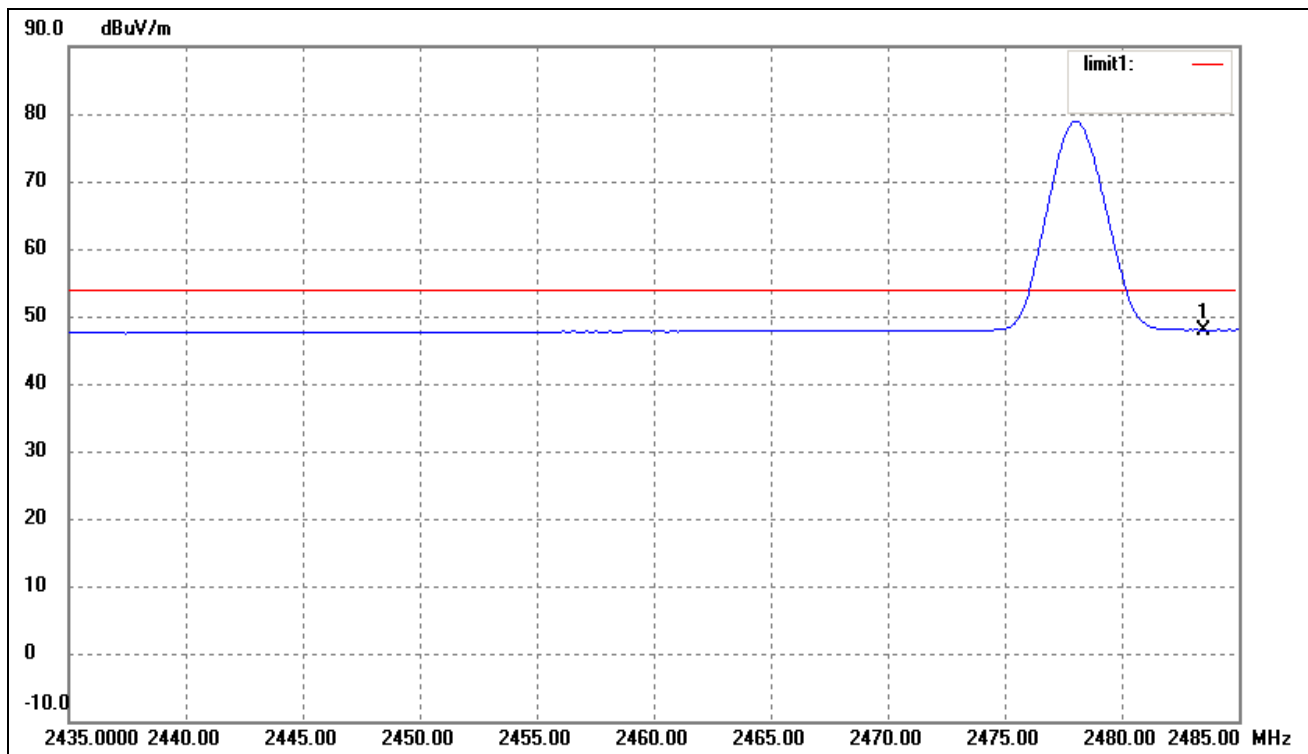
The edge emissions are below the FCC 15.209 Limits. Please refer to the test plots below.

Lowest Bandedge



No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2390.000	12.57	35.59	48.16	54.00	-5.84	Average Detector
	2390.000	22.08	35.59	57.67	74.00	-16.33	Peak Detector
2	2400.000	12.57	35.68	48.25	54.00	-5.75	Average Detector
	2400.000	22.43	35.68	58.11	74.00	-15.89	Peak Detector

Highest Bandedge



No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2483.500	12.15	35.97	48.12	54.00	-5.88	Average Detector
	2483.500	21.96	35.97	57.93	74.00	-16.07	Peak Detector

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