Radio Test Report

FCC ID: H8GGR75

This report concerns (check one) : ■ **Original Grant** □ **Class I Change**

Issued Date	:	Dec. 10, 2010
Project No.	:	R1011004
Equipment	:	2.4G RF Keyboard
Model Name	:	GR-75; GRS-75; 7700; G7700; 9400; G9400
Applicant	:	A-FOUR TECH CO., LTD.
Address	:	6F, No.108, Min-Chuan Rd., Hsin-Tien, Taipei, Taiwan, R.O.C.

Tested by: Neutron Engineering Inc. EMC Laboratory

Date of Receipt: Nov. 15, 2010

Date of Test: Nov. 15, 2010 ~ Nov. 30, 2010

Testing Engineer : Rush Kao
(Rush Kao)

Technical Manager : Jeff Yang
(Jeff Yang)

Authorized Signatory : Andy Chiu
(Andy Chiu)

Neutron Engineering Inc.
B1, No. 37, Lane 365, YangGuang St.,
NeiHu District 114, Taipei, Taiwan.
TEL: +886-2-2657-3299
FAX: +886-2-2657-3331

NVLAP Lab Code: 200145-0

ilac-MRA TAF Testing Laboratory 0659

Declaration

Neutron represents to the client that testing is done in accordance with standard procedures as applicable and that test instruments used has been calibrated with the standards traceable to National Measurement Laboratory (**NML**) of **R.O.C**., or National Institute of Standards and Technology (**NIST**) of **U.S.A.**

Neutron's reports apply only to the specific samples tested under conditions. It is manufacture's responsibility to ensure that additional production units of this model are manufactured with the identical electrical and mechanical components. **Neutron** shall have no liability for any declarations, inferences or generalizations drawn by the client or others from **Neutron** issued reports.

Neutron's reports must not be used by the client to claim product endorsement by the authorities or any agency of the Government.

This report is the confidential property of the client. As a mutual protection to the clients, the public and **Neutron-self**, extracts from the test report shall not be reproduced except in full with **Neutron**'s authorized written approval.

Neutron's laboratory quality assurance procedures are in compliance with the **ISO Guide 17025** requirements, and accredited by the conformity assessment authorities listed in this test report.

Limitation

For the use of the authority's logo is limited unless the Test Standard(s)/Scope(s)/Item(s) mentioned in this test report is (are) included in the conformity assessment authorities acceptance respective.

Table of Contents Page

Table of Contents Page

1. CERTIFICATION

Equipment : 2.4G RF Keyboard
Brand Name : A4TECH
Model Name : GR-75; GRS-75; 7700; G7700; 9400; G9400
Applicant : A-FOUR TECH CO., LTD.
Date of Test : Nov. 15, 2010 ~ Nov. 30, 2010
Standards : FCC Part15, Subpart C(15.247) / ANCI C63.4 : 2003

The above equipment has been tested and found compliance with the requirement of the relative standards by Neutron Engineering Inc. EMC Laboratory.
The test data, data evaluation, and equipment configuration contained in our test report (Ref No. NEI-FCCP-1-R1011004) were obtained utilizing the test procedures, test instruments, test sites that has been accredited by the Authority of NVLAP and TAF according to the ISO-17025 quality assessment standard and technical standard(s).

2. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:

FCC Part15, Subpart C			
Standard Section	Test Item	Judgment	Remark
15.207	Conducted Emission	N/A	
15.247 (c)	Antenna conducted Spurious Emission	PASS	
15.247 (a)(2)	6dB Bandwidth	PASS	
15.247 (b)	Peak Output Power	PASS	
15.247 (c)	Radiated Spurious Emission	PASS	
15.247 (d)	Power Spectral Density	PASS	
15.203	Antenna Requirement	PASS	
1.1307 1.1310 2.1091 2.1093	RF Exposure Compliance	PASS	

NOTE:

(1)" N/A" denotes test is not applicable in this Test Report

2.1 TEST FACILITY

The test facilities used to collect the test data in this report:

CB08: (VCCI RN: G-91; FCC RN: 614388; IC Assigned Code: 4428C-1)
1F., No. 61, Ln. 77, Sing-ai Rd., Neihu Dist., Taipei City 114, Taiwan (R.O.C.)

2.2 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement **y** ± **U**，where expended uncertainty **U** is based on a standard uncertainty multiplied by a coverage factor of **k=2**，providing a level of confidence of approximately **95**%。

The measurement instrumentation uncertainty considerations contained in CISPR 16-4-2.

Test Site	Method	Measurement Frequency Range	Ant. H / V	U，(dB)	NOTE
CB08	ANSI	30MHz ~ 200MHz	V	3.22	
		30MHz ~ 200MHz	H	3.35	
		200MHz ~ 1,000MHz	V	3.24	
		200MHz ~ 1,000MHz	H	3.11	
		1000MHz ~ 18000MHz	V	4.05	
		1000MHz ~ 18000MHz	H	3.97	
		18000MHz ~ 40000MHz	V	4.04	
		18000MHz ~ 40000MHz	H	4.01	

Our calculated Measurement Instrumentation Uncertainty is shown in the tables above. These are our U_{lab} values in CISPR 16-4-2 terminology.

Since Table 1 of CISPR 16-4-2 has values of measurement instrumentation uncertainty, called U_{CISPR}, as follows:

Conducted Disturbance (mains port) – 150 kHz – 30 MHz : 3.6 dB

Radiated Disturbance (electric field strength on an open area test site or alternative test site) – 30 MHz – 1000 MHz : 5.2 dB

It can be seen that our U_{lab} values are smaller than U_{CISPR}.

3. GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

Equipment	2.4G RF Keyboard
Brand Name	A4TECH
Model Name	GR-75; GRS-75; 7700; G7700; 9400; G9400
OEM Brand/Model Name	N/A
Model Difference	Models' differences between each other only the changes of model name which do not affect the EMI performance. Model GR-75 was used for final testing and collecting test data included in this report.
Product Description	The EUT is a 2.4G RF Keyboard. Operation Frequency: 2407~2473MHz Modulation Type: GFSK Number Of Channel 14CH (Note 2) Antenna Designation: Please refer to the Note 3. Antenna Gain(Peak) Please refer to the Note 3. Output Power: 1.76 dBm (Max.) Based on the application, features, or specification exhibited in User's Manual, the EUT is considered as an ITE/Computing Device. More details of EUT technical specification, please refer to the User's Manual.
Power Source	Battery supplied
Power Rating	DC 3V
Connecting I/O Port(s)	Please refer to the User's Manual
Products Covered	NA

Note:

1. For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

2. Channel List:

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
01	2407	06	2430	11	2456
02	2411	07	2434	12	2460
03	2415	08	2437	13	2468
04	2422	09	2445	14	2473
05	2426	10	2451		

3. Table of Filed Antenna:

Antenna	Brand	Model Name	Type	Connector Type	Gain (dBi)
1	N/A	N/A	Ant. On PCB	N/A	0.44

3.2 DESCRIPTION OF TEST MODES

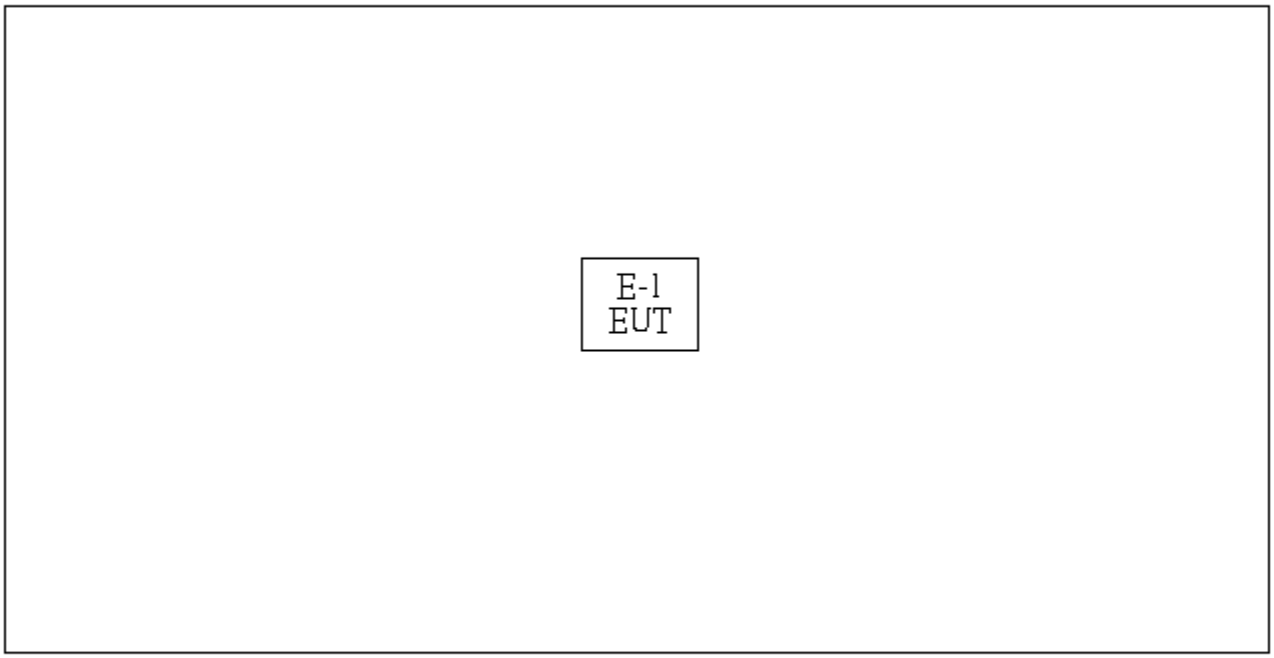
To investigate the maximum EMI emission characteristics generated from EUT, the test system was pre-scanning tested based on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Pretest Test Mode	Description
Mode 1	2407MHz
Mode 2	2437MHz
Mode 3	2473MHz

For Radiated Test (30 -1000MHz)	
Final Test Mode	Description
Mode 2	2437MHz

For Radiated Test (Above 1000MHz)	
Final Test Mode	Description
Mode 1	2407MHz
Mode 2	2437MHz
Mode 3	2473MHz

3.3 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED



3.4 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Item	Equipment	Mfr/Brand	Model/Type No.	FCC ID	Series No.	Note
E-1	2.4G RF Keyboard	A4TECH	GR-75	H8GGR75	N/A	EUT

Item	Shielded Type	Ferrite Core	Length	Note
N/A	-	-	-	

Note:

(1) For detachable type I/O cable should be specified the length in cm in 『Length』 column.

4. EMC EMISSION TEST

4.1 RADIATED EMISSION MEASUREMENT

4.1.1 RADIATED EMISSION LIMITS (Frequency Range 9kHz-1000MHz)

20dBc in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on15.205(a), then the 15.209(a) limit in the table below has to be followed.

Frequencies (MHz)	Field Strength (micorvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000MHz)

FREQUENCY (MHz)	Class B (dBuV/m) (at 3m)	
	PEAK	AVERAGE
Above 1000	74	54

Notes:

(1) The limit for radiated test was performed according to FCC PART 15C.

(2) The tighter limit applies at the band edges.

(3) Emission level (dBuV/m)=20log Emission level (uV/m).

4.1.2 MEASUREMENT INSTRUMENTS LIST

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP-40	100129	Aug. 31, 2011
2	Horn Antenna	Schwarzbeck	BBHA 9120	D-325	Dec. 15, 2010
3	Microwave Pre_amplifier	Agilent	8449B	3008A01714	Apr. 20, 2011
4	Microflex Cable	N/A	N/A	1m	May. 19, 2011
5	Microflex Cable	AISI	S104-SMAP-1	10m	Aug. 22, 2011
6	Microflex Cable	N/A	N/A	3m	Aug. 22, 2011
7	Test Cable	N/A	LMR-400	966_12m	Jun. 17, 2011
8	Test Cable	N/A	LMR-400	966_3m	Jun. 17, 2011
9	Pre-Amplifier	EMC	EMC-330	980001	Jun. 03, 2011
10	Log-Bicon Antenna	Schwarzbeck	VULB9168-352	9168-352	Jun. 17, 2011

Remark: ” N/A” denotes No Model Name / Serial No. and No Calibration specified.

4.1.3 TEST PROCEDURE

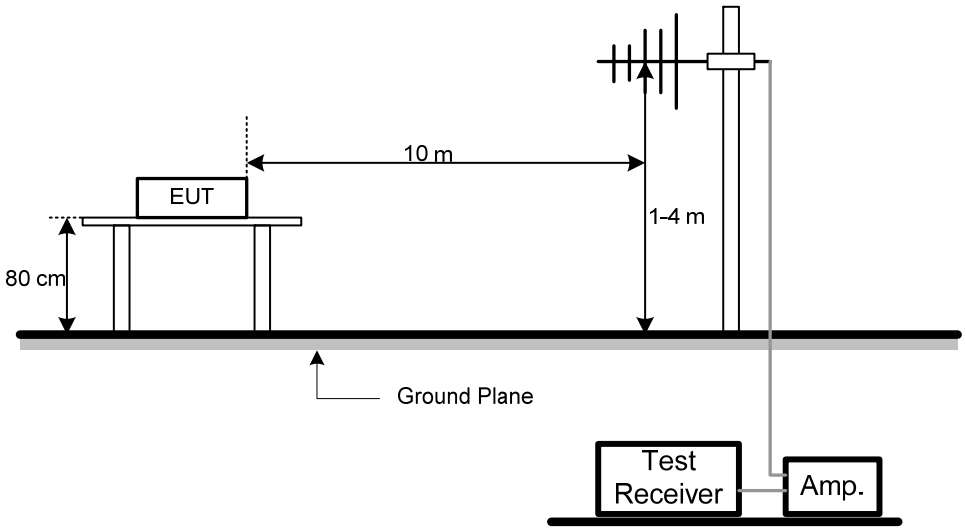
a. The measuring distance of at 3 m shall be used for measurements at frequency up to 1GHz. For frequencies above 1GHz, any suitable measuring distance may be used.
b. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3m meter open area test site. The table was rotated 360 degrees to determine the position of the highest radiation.
c. The height of the equipment or of the substitution antenna shall be 0.8 m; the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
d. The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
e. If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed.
f. For the actual test configuration, please refer to the related Item –EUT Test Photos.

4.1.4 DEVIATION FROM TEST STANDARD

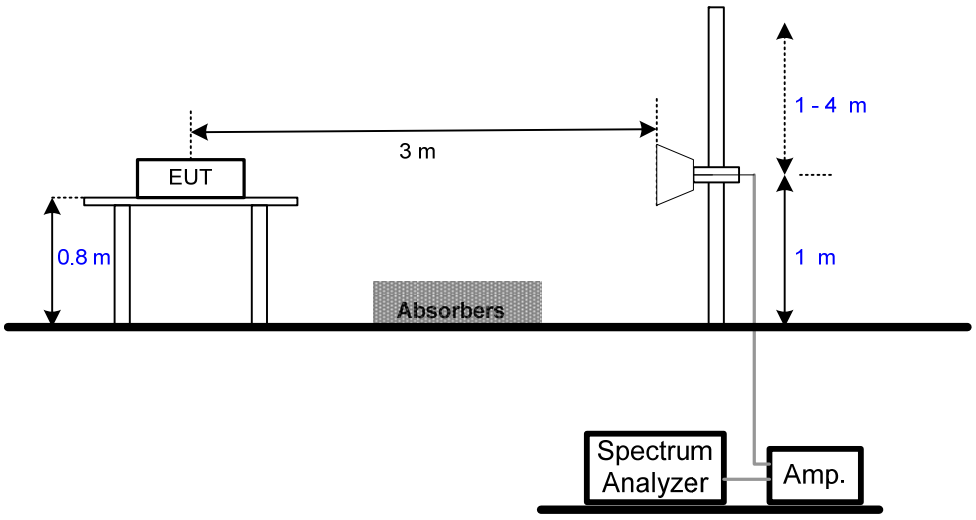
No deviation

4.1.5 TEST SETUP

Radiated Emission Test Set-Up Frequency 30 - 1000MHz



Radiated Emission Test Set-Up Frequency Above 1 GHz



4.1.6 EUT OPERATING CONDITIONS

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test.This operation condition was tested and used to collect the included data.

4.1.7 TEST RESULTS-BETWEEN 30MHz – 1000MHz

EUT：	2.4G RF Keyboard	Model Name ：	GR-75
Temperature：	23°C	Relative Humidity：	43%
Test Voltage：	DC 3V		
Test Mode ：	2437MHz		

Freq. (MHz)	Polarization H/V	Reading Level (dBuV)	Correct Factor(dB)	Measurement (dBuV/m)	Limit(Quasi-Peak) (dBuV/m)	Margin (dB)	Note
64.9200	V	36.47	-18.21	18.26	40.00	- 21.74	
138.6400	V	36.04	-17.08	18.96	43.50	- 24.54	
189.0800	V	40.18	-19.12	21.06	43.50	- 22.44	
291.9000	V	34.36	-15.99	18.37	46.00	- 27.63	
470.3800	V	31.10	-11.53	19.57	46.00	- 26.43	
625.5800	V	30.97	-8.40	22.57	46.00	- 23.43	

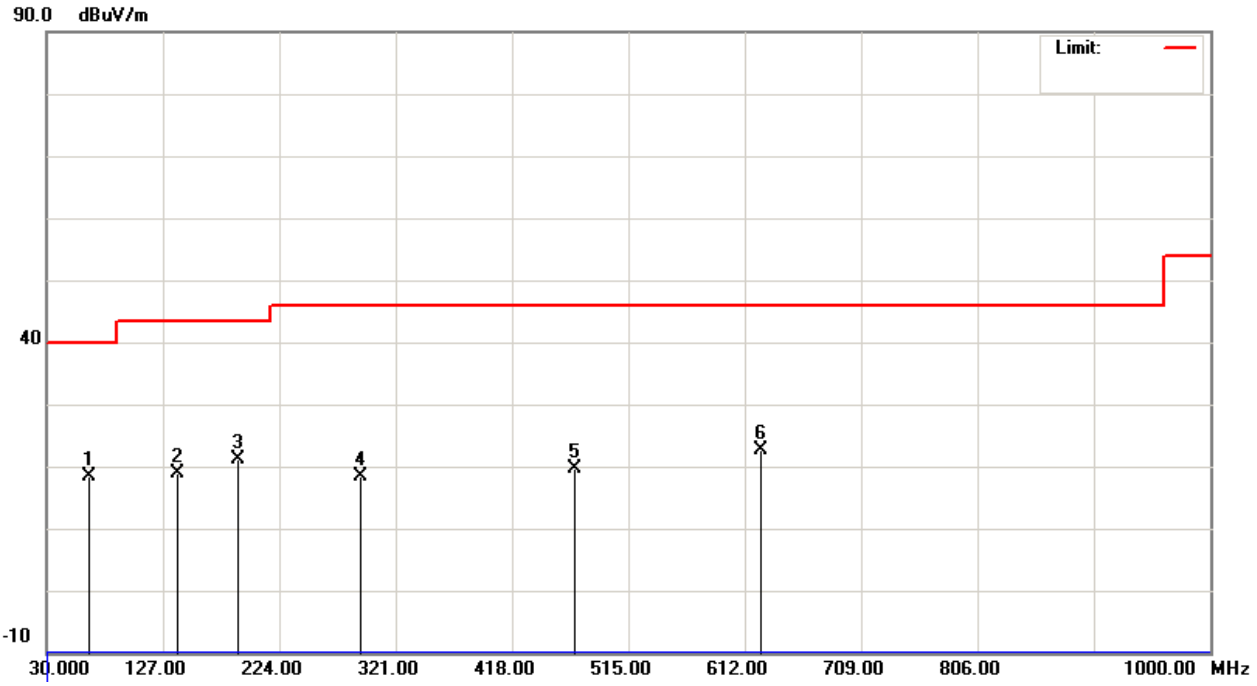
Remark：

(1) Reading in which marked as QP or Peak means measurements by using are Quasi-Peak Mode or Peak Mode with Detector BW=120KHz；SPA setting in RBW=120KHz, VBW =120KHz, Swp. Time = 0.3 sec./MHz。

(2) All readings are Peak unless otherwise stated QP in column of『Note』. Peak denotes that the Peak reading compliance with the QP Limits and then QP Mode measure-ment didn't perform。

(3) Measuring frequency range from 30MHz to 1000MHz。

(4) If the peak scan value is under the limit for more than 20dB, the signal will not show in table。



EUT：	2.4G RF Keyboard	Model Name ：	GR-75
Temperature：	23°C	Relative Humidity：	43%
Test Voltage：	DC 3V		
Test Mode ：	2437MHz		

Freq. (MHz)	Polarization H/V	Reading Level (dBuV)	Correct Factor(dB)	Measurement (dBuV/m)	Limit(Quasi-Peak) (dBuV/m)	Margin (dB)	Note
39.7000	H	34.06	-16.67	17.39	40.00	- 22.61	
109.5400	H	36.99	-19.97	17.02	43.50	- 26.48	
216.2400	H	37.45	-19.21	18.24	46.00	- 27.76	
249.2200	H	35.82	-17.63	18.19	46.00	- 27.81	
613.9400	H	31.45	-8.52	22.93	46.00	- 23.07	
656.6200	H	31.56	-8.04	23.52	46.00	- 22.48	

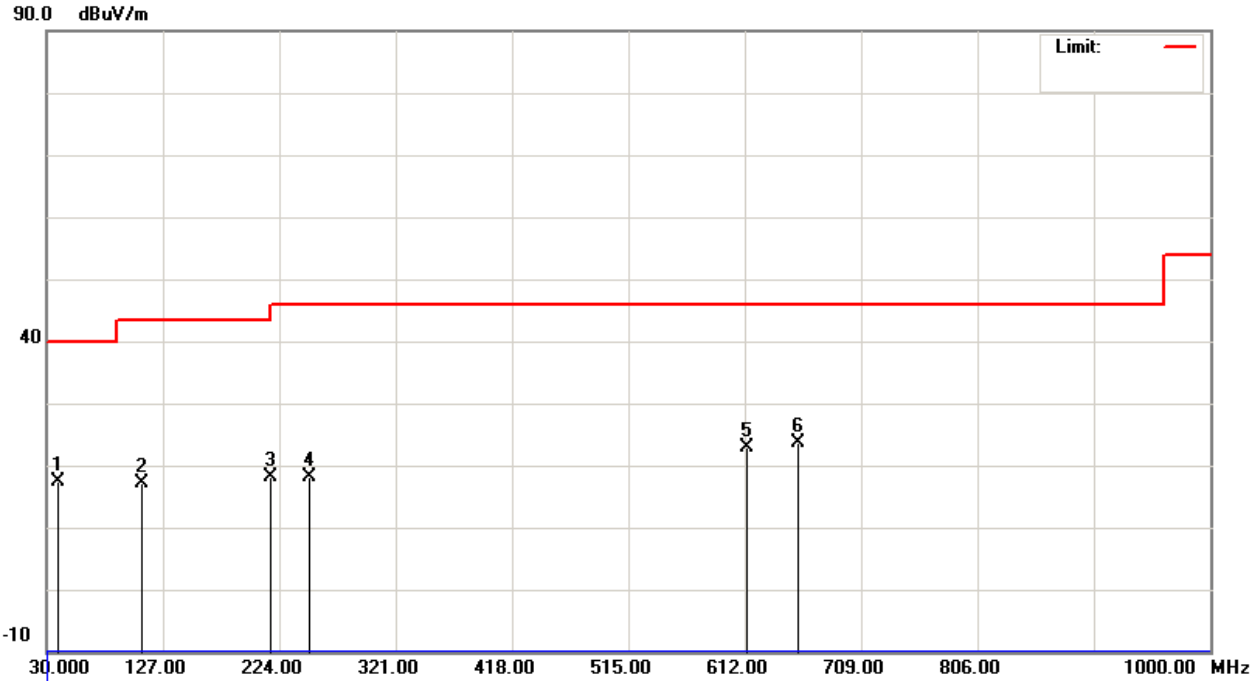
Remark：

(1) Reading in which marked as QP or Peak means measurements by using are Quasi-Peak Mode or Peak Mode with Detector BW=120KHz；SPA setting in RBW=120KHz, VBW =120KHz, Swp. Time = 0.3 sec./MHz。

(2) All readings are Peak unless otherwise stated QP in column of 『Note』. Peak denotes that the Peak reading compliance with the QP Limits and then QP Mode measure-ment didn't perform。

(3) Measuring frequency range from 30MHz to 1000MHz。

(4) If the peak scan value is under the limit for more than 20dB, the signal will not show in table。



4.1.8 TEST RESULTS-ABOVE 1000MHz

EUT：	2.4G RF Keyboard	Model Name ：	GR-75
Temperature：	24°C	Relative Humidity：	51%
Test Voltage :	DC 3V		
Test Mode ：	2407MHz		

Freq. (MHz)	Axis X/Y/Z	Polarization H/V	Reading Level(dBuV) Peak	Reading Level(dBuV) AV	Correct Factor(dB)	Measurement(dBuV/m) Peak	Measurement(dBuV/m) AV	Limit(dBuV/m) Peak	Limit(dBuV/m) AV	Margin (dB)	Note
2390.000	X	V	22.29	10.89	31.26	53.55	42.15	74.00	54.00	- 11.85	AV/E
2407.000	X	V	47.51	12.52	31.34	78.85	43.86	-	-	-	F
4813.970	X	V	49.06	29.86	2.86	51.92	32.72	74.00	54.00	- 21.28	AV/H
7220.690	X	V	55.00	30.43	8.62	63.62	39.05	74.00	54.00	- 10.38	Peak/H

Remark：

(1) Spectrum Setting :
QP: 30MHz – 1000MHz: RBW= 100KHz, VBW=100KHz, Sweep time = 200 ms.
Peak: 1GHz- 25GHz: RBW= 1MHz, VBW= 1MHz, Sweep time = Auto
AV: 1GHz- 25GHz: RBW= 1MHz, VBW= 10Hz, Sweep time = Auto

(2) All readings are Peak unless otherwise stated QP in column of『Note』. Peak denotes that the Peak reading compliance with the QP Limits and then QP Mode measurement didn't perform。

(3) Measuring frequency range from 30MHz to 1000MHz or the 10th harmonic of highest fundamental frequency。"F" denotes fundamental frequency; "H" denotes spurious frequency. "E" denotes band edge frequency. (This judgment method includes the Band Edge Requirement.)

(4) Radiated emissions measured in frequency range above 1000MHz were made with an instrument using Peak detector mode and AV detector mode of the emission 。

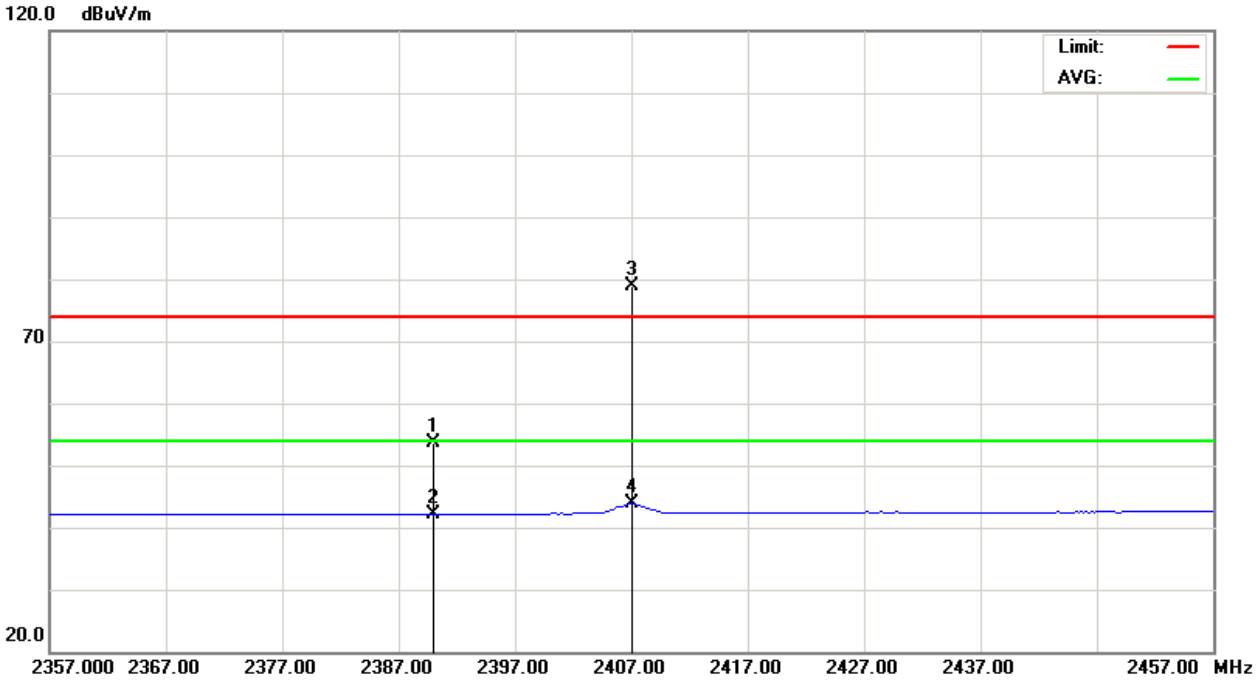
(5) Data of measurement within this frequency range shown " * " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

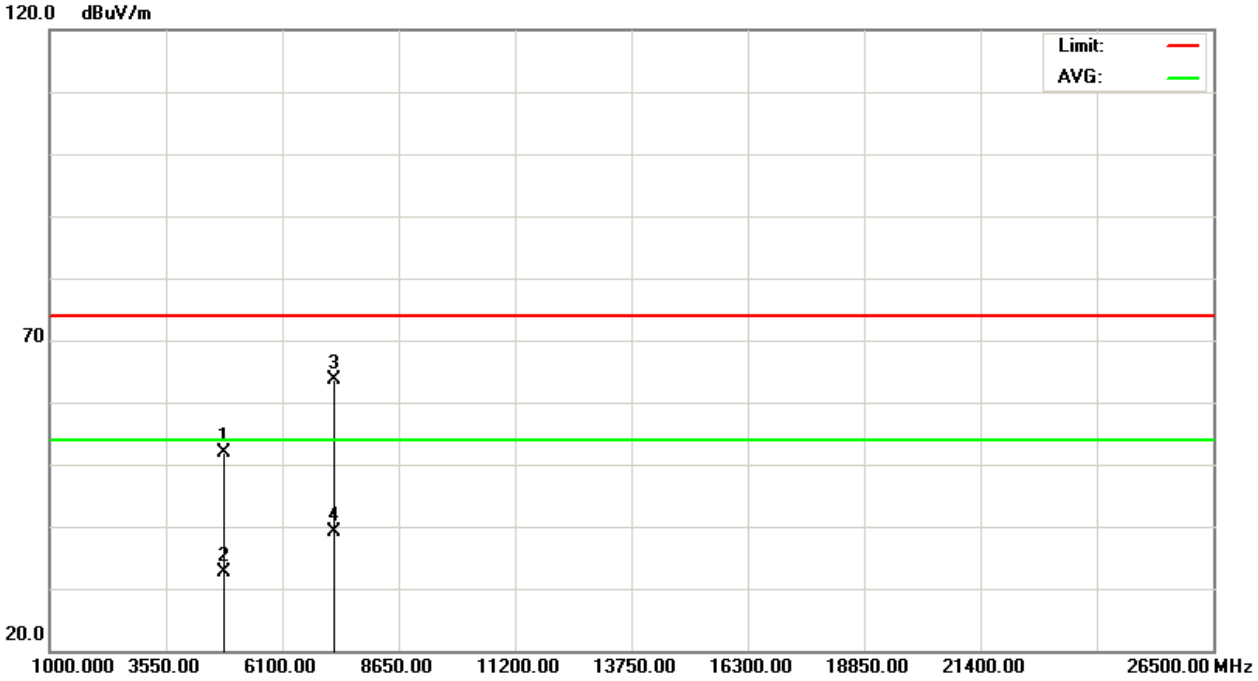
(6) A preamp and high pass filter were used for this test in order to provide sufficient measurement sensitivity.

(7) EUT Orthogonal Axes：
"X" - denotes Laid on Table；"Y" - denotes Vertical Stand；"Z" - denotes Side Stand

(8) During the measurements above 1GHz it is taken care of that the EUT is always within the 3dB cone of radiation BW of the used antenna.

Orthogonal Axes：X
2407MHz (Above 1000 MHz, Vertical)





EUT：	2.4G RF Keyboard	Model Name ：	GR-75
Temperature：	24°C	Relative Humidity：	51%
Test Voltage :	DC 3V		
Test Mode ：	2407MHz		

Freq. (MHz)	Axis X/Y/Z	Polarization H/V	Reading Level(dBuV)		Correct Factor(dB)	Measurement(dBuV/m)		Limit(dBuV/m)		Margin (dB)	Note
			Peak	AV		Peak	AV	Peak	AV		
2390.000	X	H	22.08	10.94	31.26	53.34	42.20	74.00	54.00	- 11.80	AV/E
2407.000	X	H	61.90	15.90	31.34	93.24	47.24	-	-	-	F
4813.810	X	H	48.05	29.67	2.86	50.91	32.53	74.00	54.00	- 21.47	AV/H
7220.870	X	H	53.21	30.27	8.62	61.83	38.89	74.00	54.00	- 12.17	Peak/H

Remark：

(1) Spectrum Setting :
QP: 30MHz – 1000MHz: RBW= 100KHz, VBW=100KHz, Sweep time = 200 ms.
Peak: 1GHz- 25GHz: RBW= 1MHz, VBW= 1MHz, Sweep time = Auto
AV: 1GHz- 25GHz: RBW= 1MHz, VBW= 10Hz, Sweep time = Auto

(2) All readings are Peak unless otherwise stated QP in column of『Note』. Peak denotes that the Peak reading compliance with the QP Limits and then QP Mode measurement didn't perform。

(3) Measuring frequency range from 30MHz to 1000MHz or the 10th harmonic of highest fundamental frequency。"F" denotes fundamental frequency; "H" denotes spurious frequency. "E" denotes band edge frequency. (This judgment method includes the Band Edge Requirement.)

(4) Radiated emissions measured in frequency range above 1000MHz were made with an instrument using Peak detector mode and AV detector mode of the emission 。

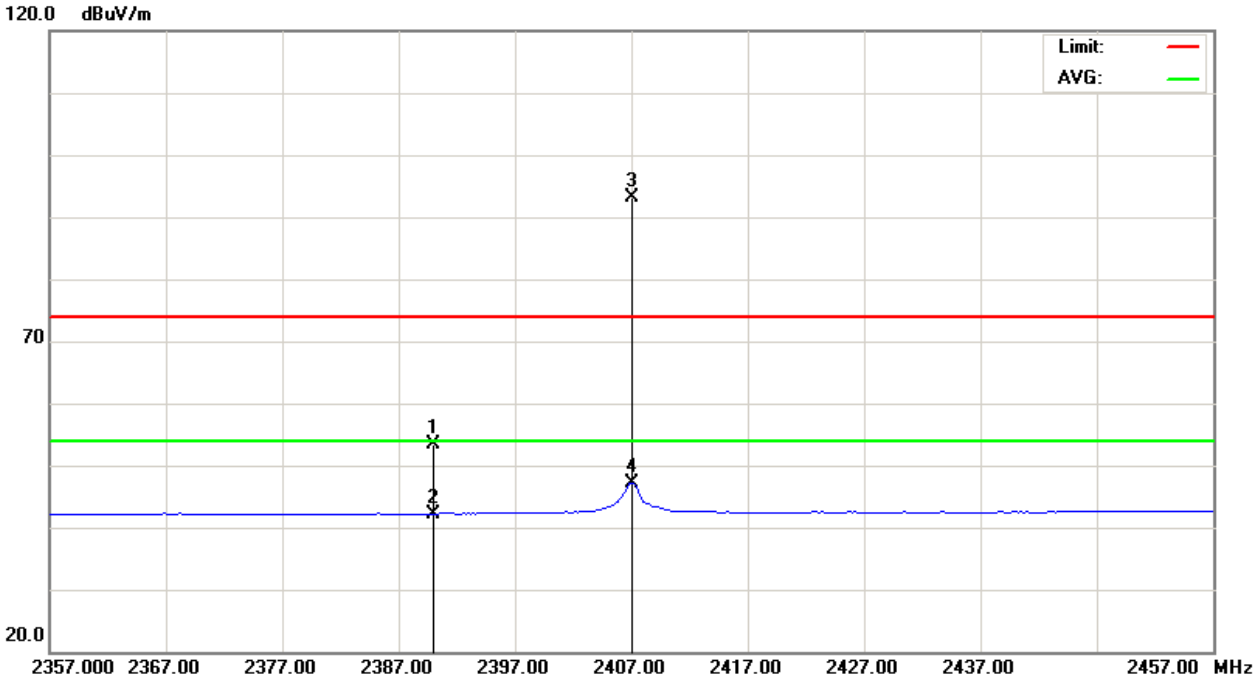
(5) Data of measurement within this frequency range shown " * " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

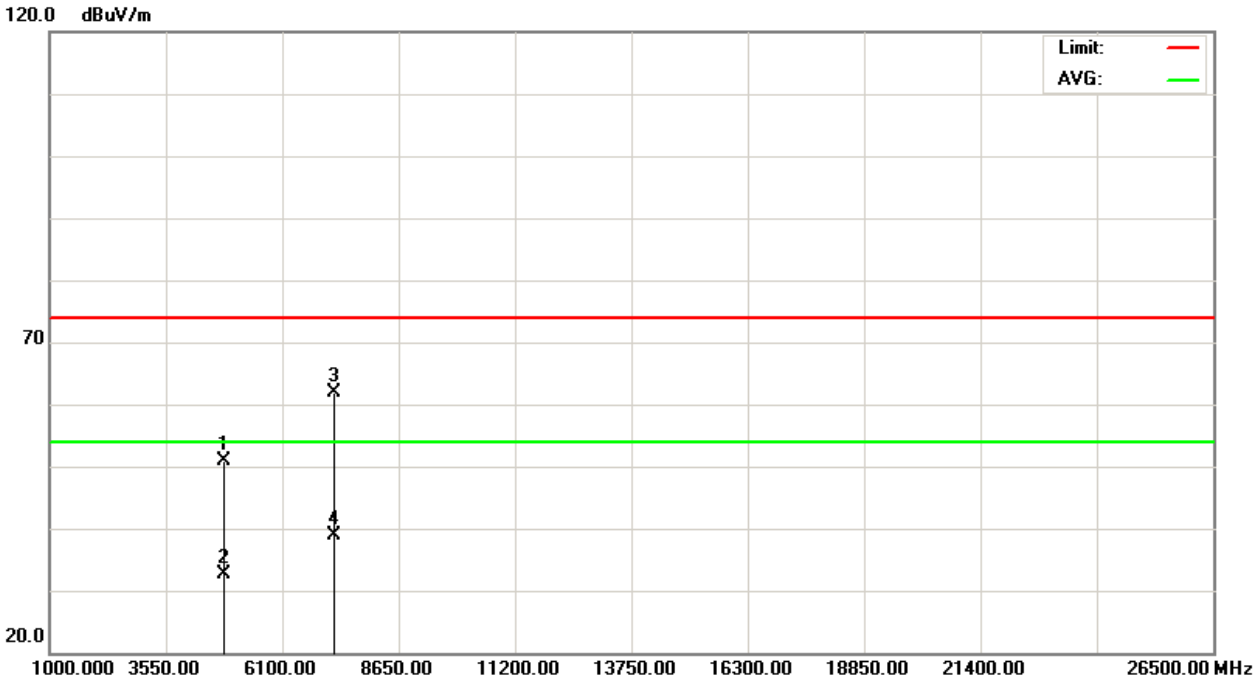
(6) A preamp and high pass filter were used for this test in order to provide sufficient measurement sensitivity.

(7) EUT Orthogonal Axes：
"X" - denotes Laid on Table；"Y" - denotes Vertical Stand；"Z" - denotes Side Stand

(8) During the measurements above 1GHz it is taken care of that the EUT is always within the 3dB cone of radiation BW of the used antenna.

Orthogonal Axes：X
2407MHz (Above 1000 MHz, Horizontal)





EUT：	2.4G RF Keyboard	Model Name ：	GR-75
Temperature：	24°C	Relative Humidity：	51%
Test Voltage：	DC 3V		
Test Mode ：	2437MHz		

Freq. (MHz)	Axis X/Y/Z	Polarization H/V	Reading Level(dBuV) Peak	Reading Level(dBuV) AV	Correct Factor(dB)	Measurement(dBuV/m) Peak	Measurement(dBuV/m) AV	Limit(dBuV/m) Peak	Limit(dBuV/m) AV	Margin (dB)	Note
2437.000	X	V	51.65	12.76	31.47	83.12	44.23	-	-	-	F
4873.720	X	V	48.92	29.94	2.94	51.86	32.88	74.00	54.00	- 21.12	AV/H
7310.360	X	V	52.49	30.29	8.54	61.03	38.83	74.00	54.00	- 12.97	Peak/H

Remark：

(1) Spectrum Setting :
QP: 30MHz – 1000MHz: RBW= 100KHz, VBW=100KHz, Sweep time = 200 ms.
Peak: 1GHz- 25GHz: RBW= 1MHz, VBW= 1MHz, Sweep time = Auto
AV: 1GHz- 25GHz: RBW= 1MHz, VBW= 10Hz, Sweep time = Auto

(2) All readings are Peak unless otherwise stated QP in column of『Note』. Peak denotes that the Peak reading compliance with the QP Limits and then QP Mode measurement didn't perform。

(3) Measuring frequency range from 30MHz to 1000MHz or the 10th harmonic of highest fundamental frequency。"F" denotes fundamental frequency; "H" denotes spurious frequency. "E" denotes band edge frequency. (This judgment method includes the Band Edge Requirement.)

(4) Radiated emissions measured in frequency range above 1000MHz were made with an instrument using Peak detector mode and AV detector mode of the emission 。

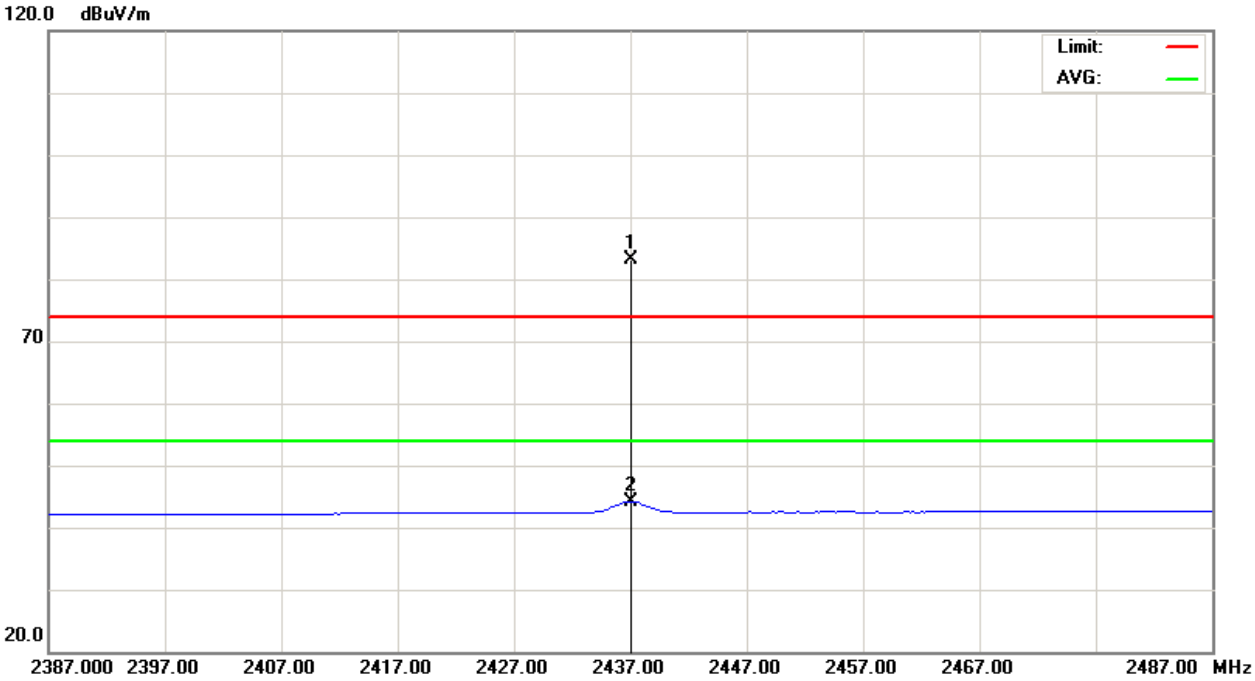
(5) Data of measurement within this frequency range shown " * " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

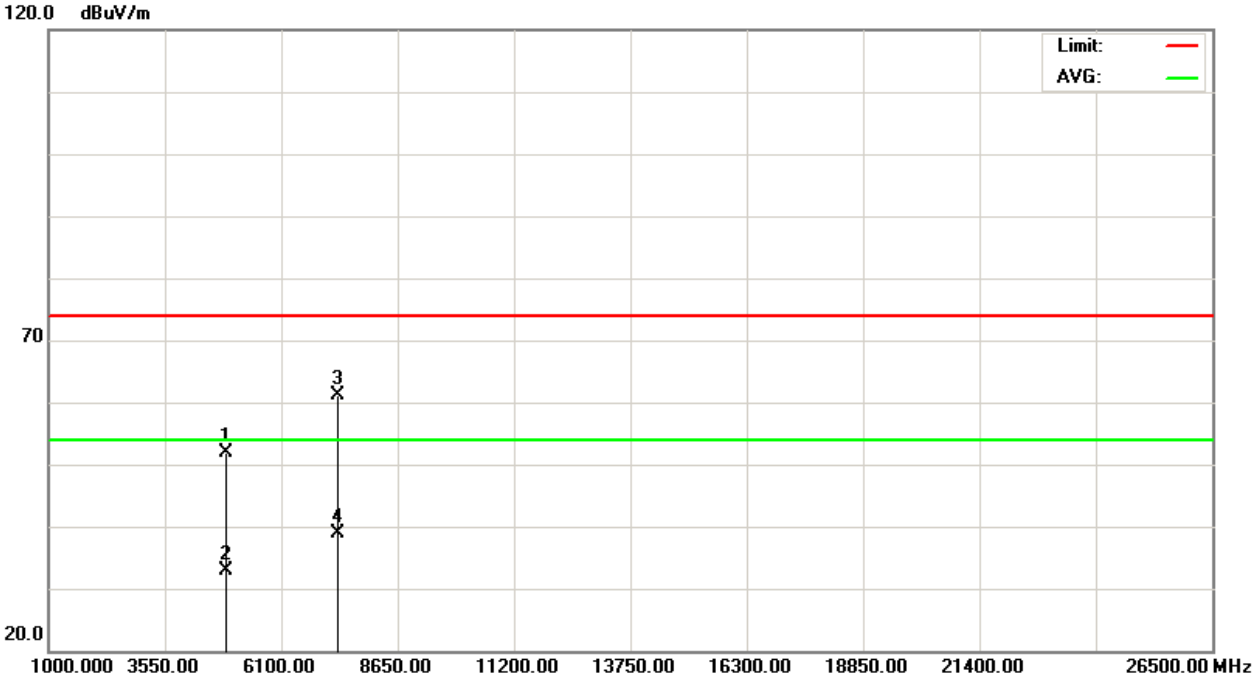
(6) A preamp and high pass filter were used for this test in order to provide sufficient measurement sensitivity.

(7) EUT Orthogonal Axes：
"X" - denotes Laid on Table；"Y" - denotes Vertical Stand；"Z" - denotes Side Stand

(8) During the measurements above 1GHz it is taken care of that the EUT is always within the 3dB cone of radiation BW of the used antenna.

Orthogonal Axes：X
2437MHz(Above 1000 MHz, Vertical)





EUT：	2.4G RF Keyboard	Model Name ：	GR-75
Temperature：	24°C	Relative Humidity：	51%
Test Voltage :	DC 3V		
Test Mode ：	2437MHz		

Freq. (MHz)	Axis X/Y/Z	Polarization H/V	Reading Level(dBuV) Peak	Reading Level(dBuV) AV	Correct Factor(dB)	Measurement(dBuV/m) Peak	Measurement(dBuV/m) AV	Limit(dBuV/m) Peak	Limit(dBuV/m) AV	Margin (dB)	Note
2437.000	X	H	62.46	16.60	31.47	93.93	48.07	-	-	-	F
4873.820	X	H	46.87	29.55	2.94	49.81	32.49	74.00	54.00	- 21.51	AV/H
7310.780	X	H	52.13	29.97	8.54	60.67	38.51	74.00	54.00	- 13.33	Peak/H

Remark：

(1) Spectrum Setting :
QP: 30MHz – 1000MHz: RBW= 100KHz, VBW=100KHz, Sweep time = 200 ms.
Peak: 1GHz- 25GHz: RBW= 1MHz, VBW= 1MHz, Sweep time = Auto
AV: 1GHz- 25GHz: RBW= 1MHz, VBW= 10Hz, Sweep time = Auto

(2) All readings are Peak unless otherwise stated QP in column of 『Note』. Peak denotes that the Peak reading compliance with the QP Limits and then QP Mode measurement didn't perform。

(3) Measuring frequency range from 30MHz to 1000MHz or the 10th harmonic of highest fundamental frequency。"F" denotes fundamental frequency; "H" denotes spurious frequency. "E" denotes band edge frequency. (This judgment method includes the Band Edge Requirement.)

(4) Radiated emissions measured in frequency range above 1000MHz were made with an instrument using Peak detector mode and AV detector mode of the emission 。

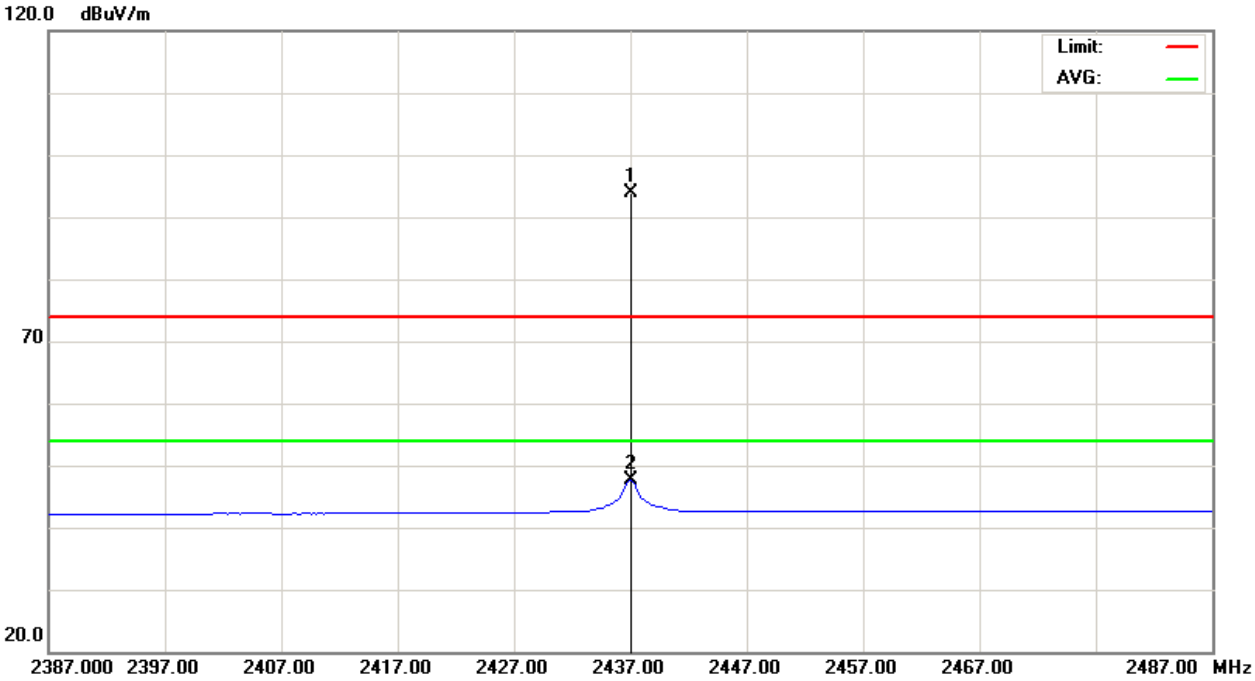
(5) Data of measurement within this frequency range shown " * " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

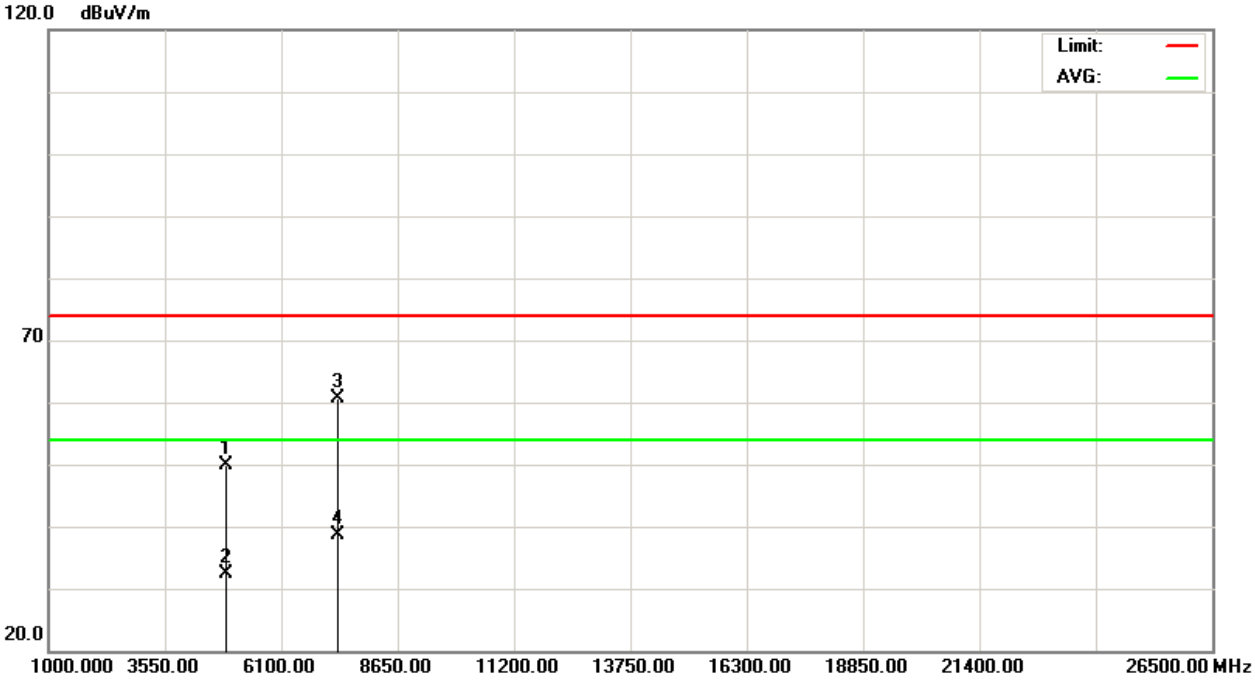
(6) A preamp and high pass filter were used for this test in order to provide sufficient measurement sensitivity.

(7) EUT Orthogonal Axes：
"X" - denotes Laid on Table；"Y" - denotes Vertical Stand；"Z" - denotes Side Stand

(8) During the measurements above 1GHz it is taken care of that the EUT is always within the 3dB cone of radiation BW of the used antenna.

Orthogonal Axes：X
2437MHz(Above 1000 MHz, Horizontal)





EUT：	2.4G RF Keyboard	Model Name ：	GR-75
Temperature：	24°C	Relative Humidity：	51%
Test Voltage :	DC 3V		
Test Mode ：	2473MHz		

Freq. (MHz)	Axis X/Y/Z	Polarization H/V	Reading Level(dBuV)		Correct Factor(dB)	Measurement(dBuV/m)		Limit(dBuV/m)		Margin (dB)	Note
			Peak	AV		Peak	AV	Peak	AV		
2472.800	X	V	52.26	12.91	31.63	83.89	44.54	-	-	-	F
2483.500	X	V	21.64	10.97	31.68	53.32	42.65	74.00	54.00	- 11.35	AV/E
4945.970	X	V	49.18	30.09	3.20	52.38	33.29	74.00	54.00	- 20.71	AV/H
7418.970	X	V	49.11	30.20	8.92	58.03	39.12	74.00	54.00	- 14.88	AV/H

Remark：

(1) Spectrum Setting :
QP: 30MHz – 1000MHz: RBW= 100KHz, VBW=100KHz, Sweep time = 200 ms.
Peak: 1GHz- 25GHz: RBW= 1MHz, VBW= 1MHz, Sweep time = Auto
AV: 1GHz- 25GHz: RBW= 1MHz, VBW= 10Hz, Sweep time = Auto

(2) All readings are Peak unless otherwise stated QP in column of『Note』. Peak denotes that the Peak reading compliance with the QP Limits and then QP Mode measurement didn't perform。

(3) Measuring frequency range from 30MHz to 1000MHz or the 10th harmonic of highest fundamental frequency。"F" denotes fundamental frequency; "H" denotes spurious frequency. "E" denotes band edge frequency. (This judgment method includes the Band Edge Requirement.)

(4) Radiated emissions measured in frequency range above 1000MHz were made with an instrument using Peak detector mode and AV detector mode of the emission 。

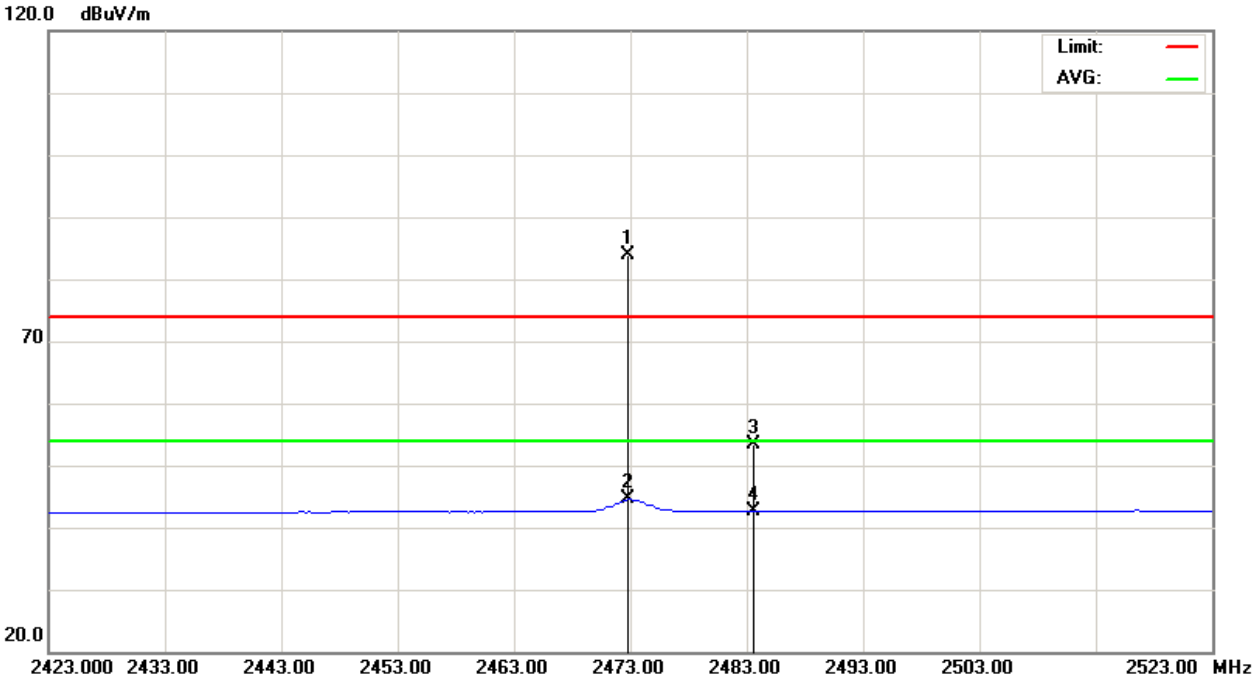
(5) Data of measurement within this frequency range shown " * " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

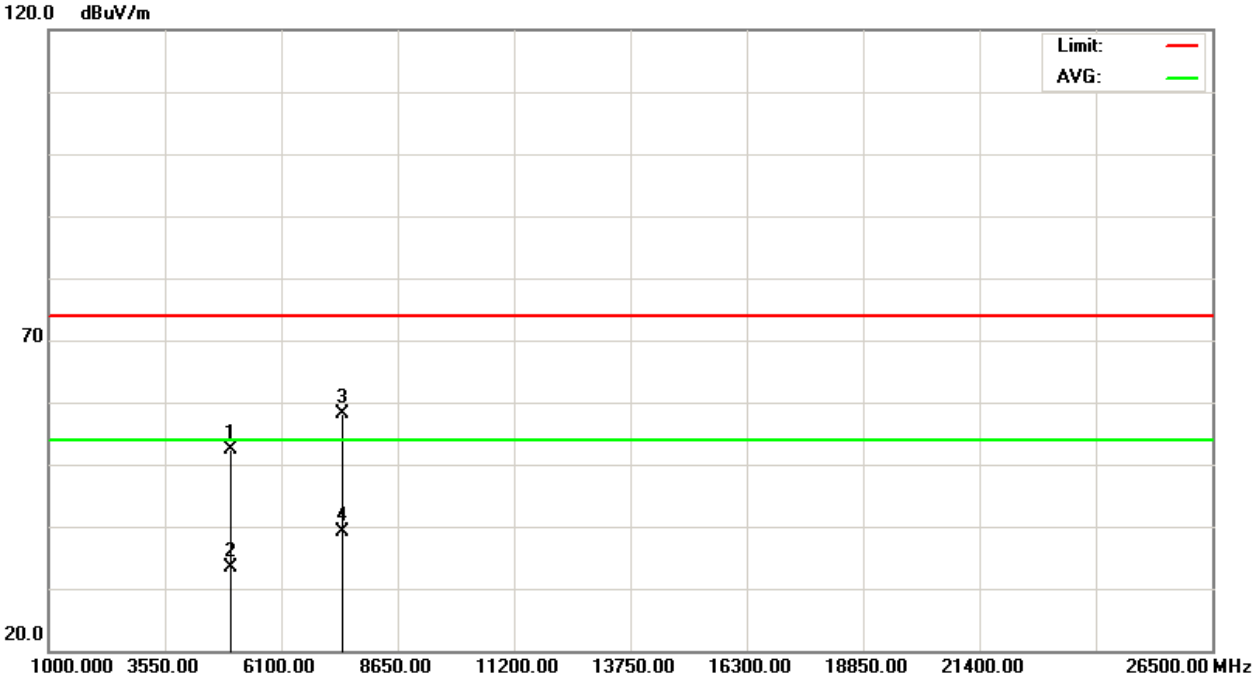
(6) A preamp and high pass filter were used for this test in order to provide sufficient measurement sensitivity.

(7) EUT Orthogonal Axes：
"X" - denotes Laid on Table；"Y" - denotes Vertical Stand；"Z" - denotes Side Stand

(8) During the measurements above 1GHz it is taken care of that the EUT is always within the 3dB cone of radiation BW of the used antenna.

Orthogonal Axes：X
2473MHz (Above 1000 MHz, Vertical)





EUT：	2.4G RF Keyboard	Model Name ：	GR-75
Temperature：	24°C	Relative Humidity：	51%
Test Voltage :	DC 3V		
Test Mode ：	2473MHz		

Freq. (MHz)	Axis X/Y/Z	Polarization H/V	Reading Level(dBuV) Peak	Reading Level(dBuV) AV	Correct Factor(dB)	Measurement(dBuV/m) Peak	Measurement(dBuV/m) AV	Limit(dBuV/m) Peak	Limit(dBuV/m) AV	Margin (dB)	Note
2473.000	X	H	63.64	16.47	31.63	95.27	48.10	-	-	-	F
2483.500	X	H	19.22	11.07	31.68	50.90	42.75	74.00	54.00	- 11.25	AV/E
4945.810	X	H	48.27	29.75	3.19	51.46	32.94	74.00	54.00	- 21.06	AV/H
7418.970	X	H	48.43	30.12	8.92	57.35	39.04	74.00	54.00	- 14.96	AV/H

Remark：

(1) Spectrum Setting :
QP: 30MHz – 1000MHz: RBW= 100KHz, VBW=100KHz, Sweep time = 200 ms.
Peak: 1GHz- 25GHz: RBW= 1MHz, VBW= 1MHz, Sweep time = Auto
AV: 1GHz- 25GHz: RBW= 1MHz, VBW= 10Hz, Sweep time = Auto

(2) All readings are Peak unless otherwise stated QP in column of『Note』. Peak denotes that the Peak reading compliance with the QP Limits and then QP Mode measurement didn't perform。

(3) Measuring frequency range from 30MHz to 1000MHz or the 10th harmonic of highest fundamental frequency。"F" denotes fundamental frequency; "H" denotes spurious frequency. "E" denotes band edge frequency. (This judgment method includes the Band Edge Requirement.)

(4) Radiated emissions measured in frequency range above 1000MHz were made with an instrument using Peak detector mode and AV detector mode of the emission 。

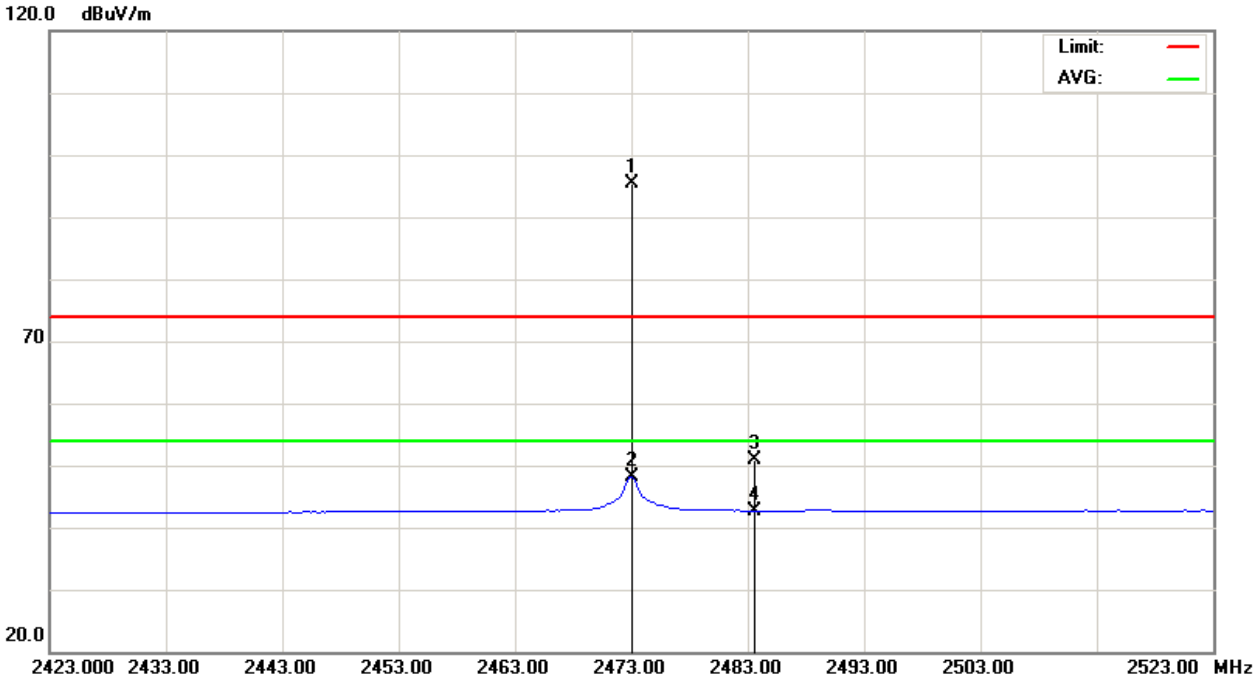
(5) Data of measurement within this frequency range shown " * " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

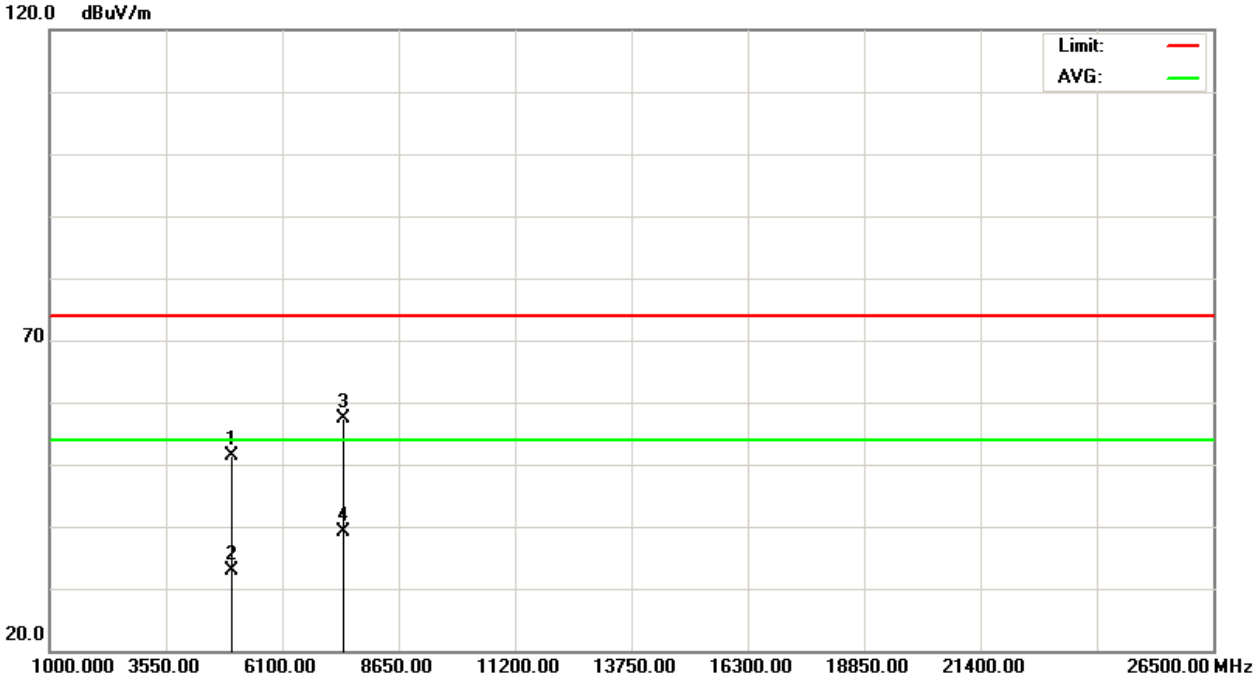
(6) A preamp and high pass filter were used for this test in order to provide sufficient measurement sensitivity.

(7) EUT Orthogonal Axes：
"X" - denotes Laid on Table；"Y" - denotes Vertical Stand；"Z" - denotes Side Stand

(8) During the measurements above 1GHz it is taken care of that the EUT is always within the 3dB cone of radiation BW of the used antenna.

Orthogonal Axes：X
2473MHz (Above 1000 MHz, Horizontal)





4.1.9 TEST RESULTS-RESTRICTED BANDS REQUIREMENTS

EUT：	2.4G RF Keyboard	Model Name ：	GR-75
Temperature：	24°C	Relative Humidity：	51%
Test Voltage：	DC 3V		
Test Mode ：	TX CH 2407MHz/2473MHz(Vertical)		
Note：	The emission of the carrier radiated field strength is measured for (Peak and AV) as following: 1. The transmitter was then configured with the worst case antenna and setup to transmit at the lowest channel (2407MHz). Then the field strength was measured at 2310-2390 MHz. 2. The transmitter was configured with the worst case antenna and setup to transmit at the highest channel (2473MHz). Then the field strength was measured at 2483.5-2500 MHz.		

Freq. (MHz)	Axis X/Y/Z	Polarization H/V	Reading Level(dBuV) Peak	Reading Level(dBuV) AV	Correct Factor(dB)	Measurement(dBuV/m) Peak	Measurement(dBuV/m) AV	Limit(dBuV/m) Peak	Limit(dBuV/m) AV	Margin (dB)	Note
2390.000	X	V	22.29	10.89	31.26	53.55	42.15	74.00	54.00	- 11.85	AV
2483.500	X	V	21.64	10.97	31.68	53.32	42.65	74.00	54.00	- 11.35	AV

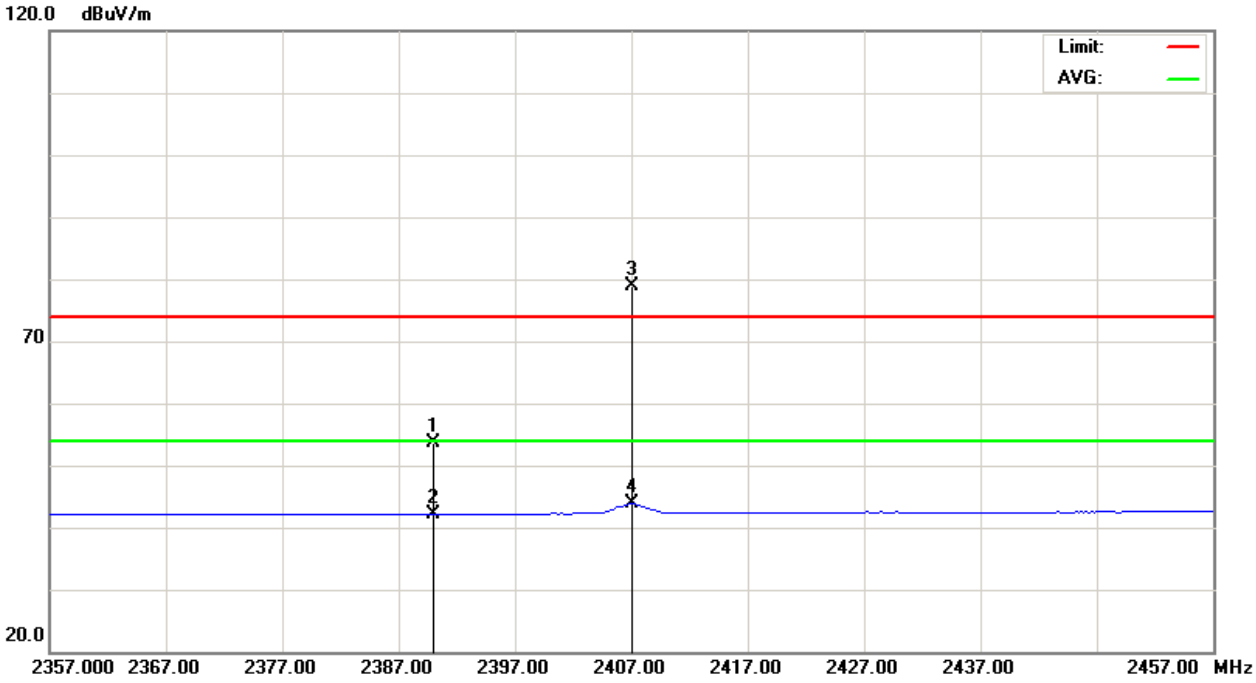
Remark：

(1) Radiated emissions measured in frequency range above 1000MHz were made with an instrument using Peak detector mode and AV detector mode of the emission 。

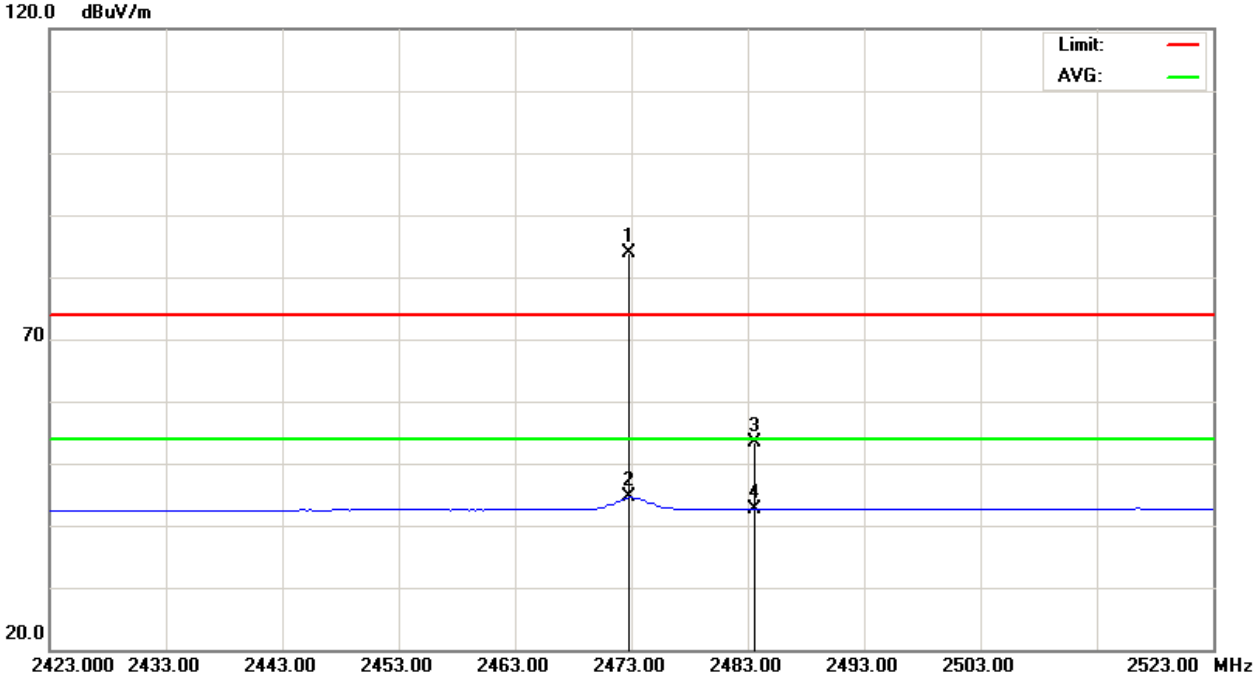
(2) EUT Orthogonal Axes：

"X" - denotes Laid on Table；"Y" - denotes Vertical Stand；"Z" - denotes Side Stand

TX 2407MHz (Restricted Bands Requirements, Vertical)



TX 2473MHz (Restricted Bands Requirements, Vertical)



EUT：	2.4G RF Keyboard	Model Name ：	GR-75
Temperature：	24°C	Relative Humidity：	51%
Test Voltage :	DC 3V		
Test Mode ：	TX CH 2407MHz/2473MHz (Horizontal)		
Note：	The emission of the carrier radiated field strength is measured for (Peak and AV) as following: 1. The transmitter was then configured with the worst case antenna and setup to transmit at the lowest channel (2407MHz). Then the field strength was measured at 2310-2390 MHz. 2. The transmitter was configured with the worst case antenna and setup to transmit at the highest channel (2473MHz). Then the field strength was measured at 2483.5-2500 MHz.		

Freq. (MHz)	Axis X/Y/Z	Polarization H/V	Reading Level(dBuV)		Correct Factor(dB)	Measurement(dBuV/m)		Limit(dBuV/m)		Margin (dB)	Note
			Peak	AV		Peak	AV	Peak	AV		
2390.000	X	H	22.08	10.94	31.26	53.34	42.20	74.00	54.00	- 11.80	AV
2483.500	X	H	19.22	11.07	31.68	50.90	42.75	74.00	54.00	- 11.25	AV

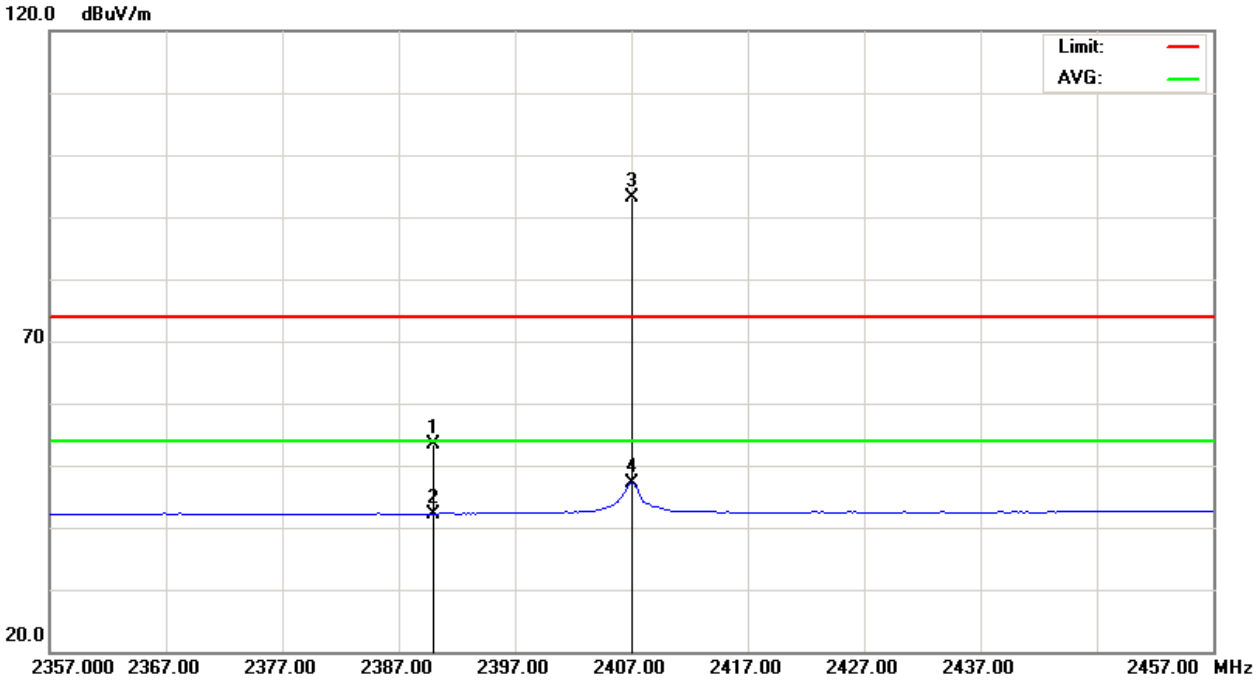
Remark：

(1) Radiated emissions measured in frequency range above 1000MHz were made with an instrument using Peak detector mode and AV detector mode of the emission 。

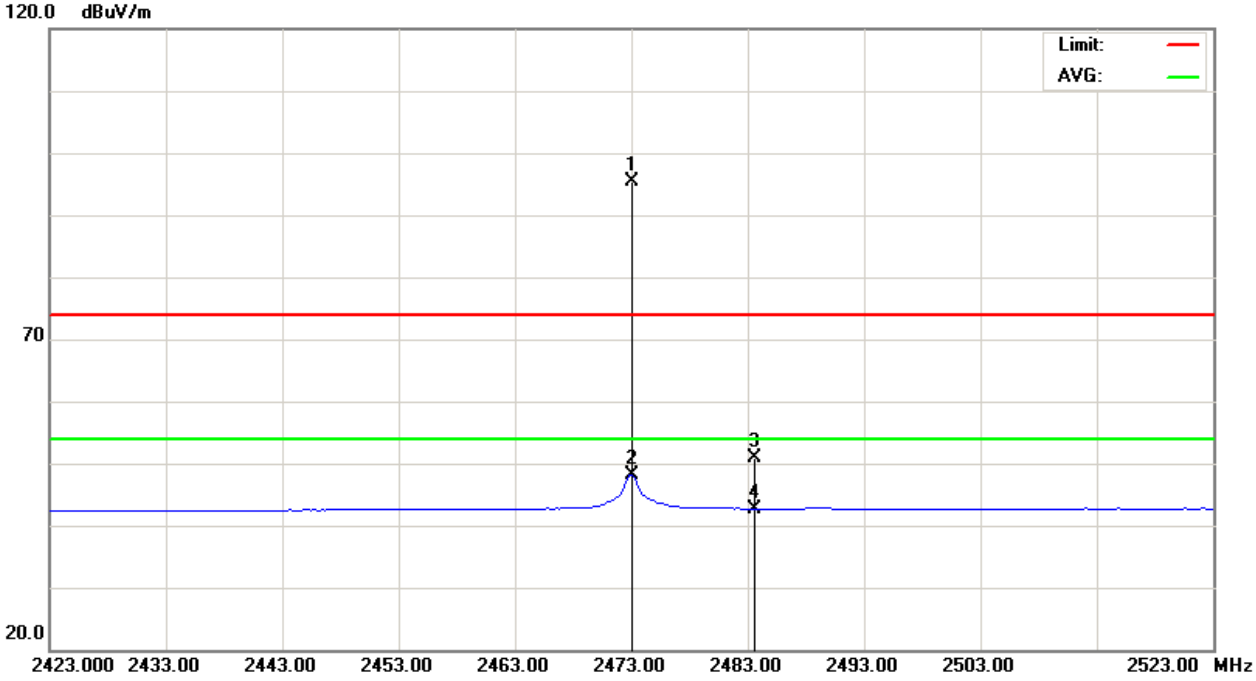
(2) EUT Orthogonal Axes：

"X" - denotes Laid on Table；"Y" - denotes Vertical Stand；"Z" - denotes Side Stand

TX 2407MHz (Restricted Bands Requirements, Horizontal)



TX 2473MHz (Restricted Bands Requirements, Horizontal)



5. BANDWIDTH TEST

5.1 APPLIED PROCEDURES / LIMIT

FCC Part15, Subpart C			
Test Item	Limit	Frequency Range (MHz)	Result
Bandwidth	>= 500KHz (6dB bandwidth)	2400-2483.5	PASS

5.1.1 MEASUREMENT INSTRUMENTS LIST

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP-40	100129	Aug. 31, 2011

Remark: ” N/A” denotes No Model Name , Serial No. or No Calibration specified.

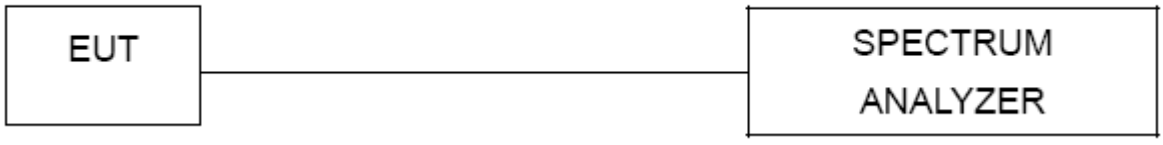
5.1.2 TEST PROCEDURE

a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,
b. Spectrum Setting : RBW= 100KHz, VBW=100KHz, Sweep time = Auto.

5.1.3 DEVIATION FROM STANDARD

No deviation.

5.1.4 TEST SETUP



5.1.5 EUT OPERATION CONDITIONS

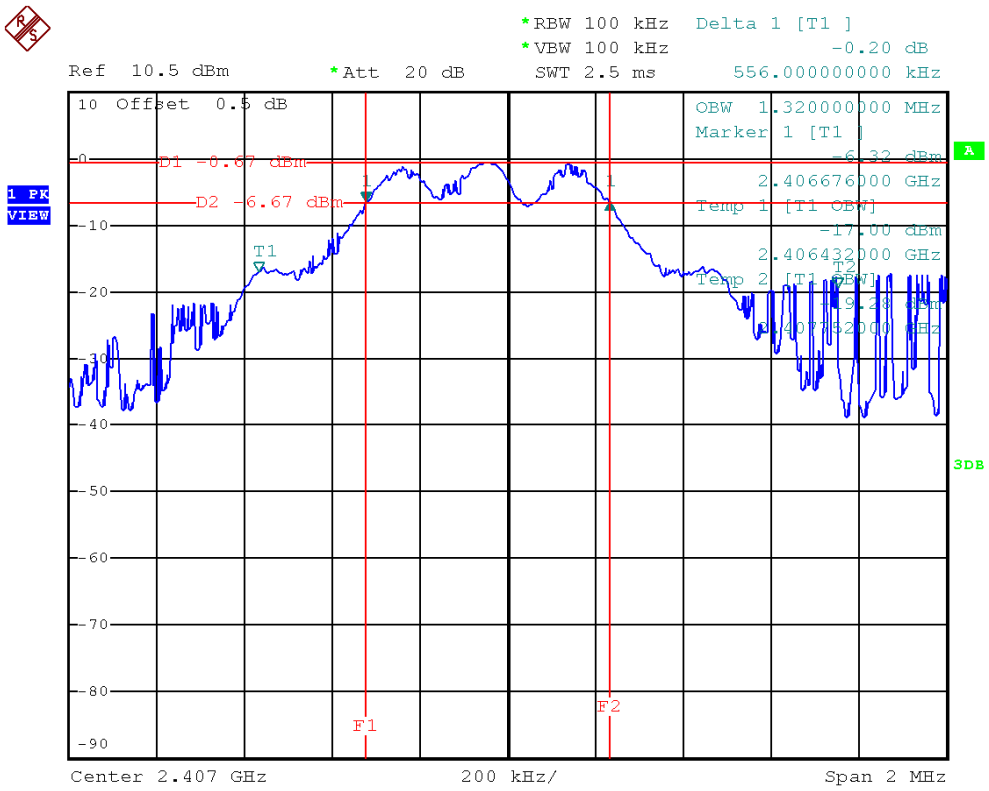
The EUT tested system was configured as the statements of 4.1.6 Unless otherwise a special operating condition is specified in the follows during the testing.

5.1.6 TEST RESULTS

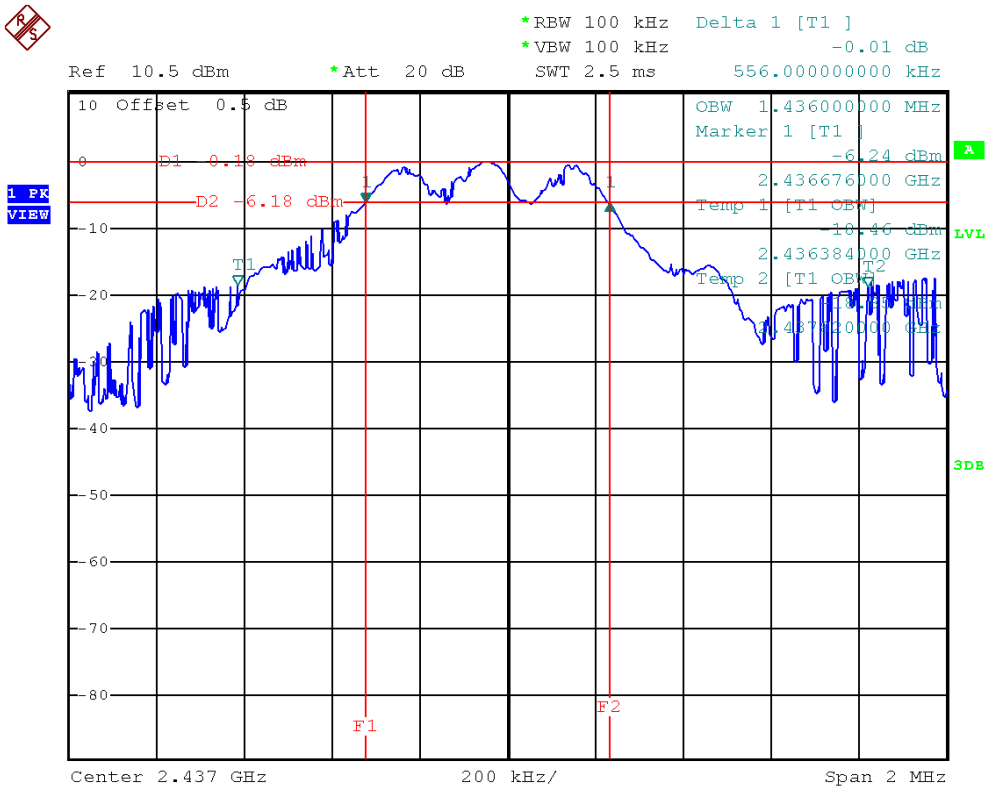
EUT：	2.4G RF Keyboard	Model Name ：	GR-75
Temperature：	24°C	Relative Humidity :	54%
Test Voltage :	DC 3V		
Test Mode ：	2407MHz/2437MHz/2473MHz		

Test Channel	Frequency (MHz)	Bandwidth (MHz)	99% Occupied BW (MHz)	LIMIT (MHz)
01	2407	0.56	1.32	>=500KHz
08	2439	0.56	1.44	>=500KHz
14	2473	0.56	1.11	>=500KHz

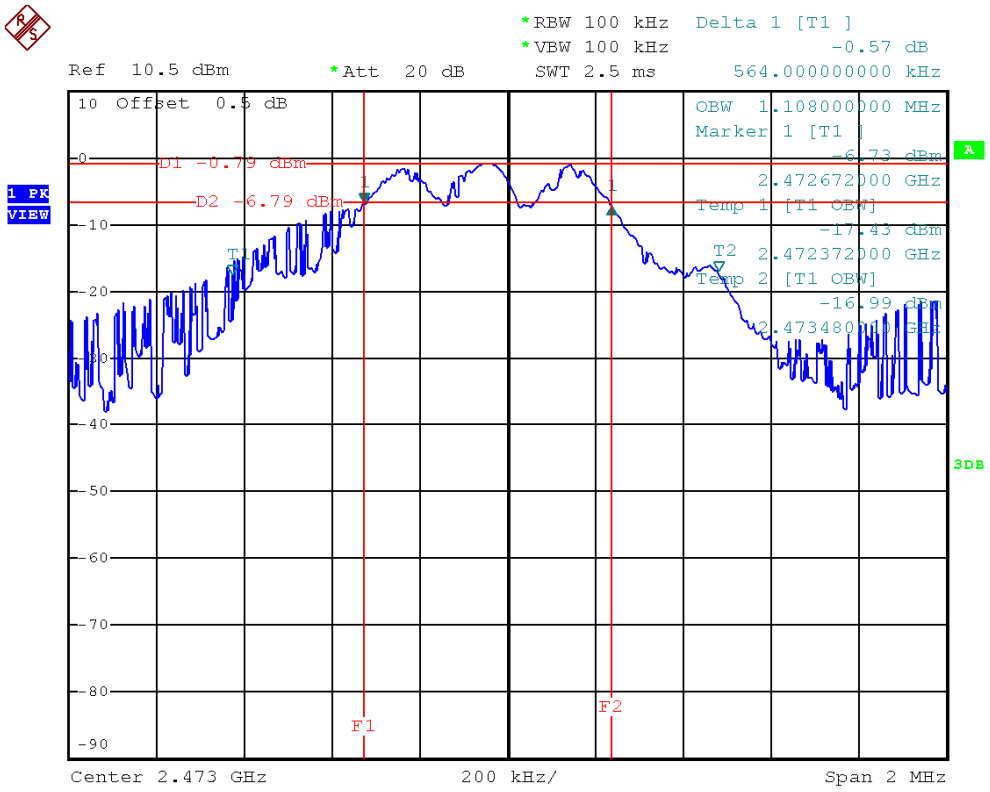
2407MHz



2437MHz



2473MHz



6. PEAK OUTPUT POWER TEST

6.1 APPLIED PROCEDURES / LIMIT

FCC Part15, Subpart C			
Test Item	Limit	Frequency Range (MHz)	Result
Peak Output Power	1 watt or 30dBm	2400-2483.5	PASS

6.1.1 MEASUREMENT INSTRUMENTS LIST

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Power Meter	Anritsu	ML2487A	6K00004714	Feb. 10, 2011
2	Power Meter Sensor	Anritsu	MA2491A	34138	Feb. 10, 2011

Remark: ” N/A” denotes No Model Name , Serial No. or No Calibration specified.

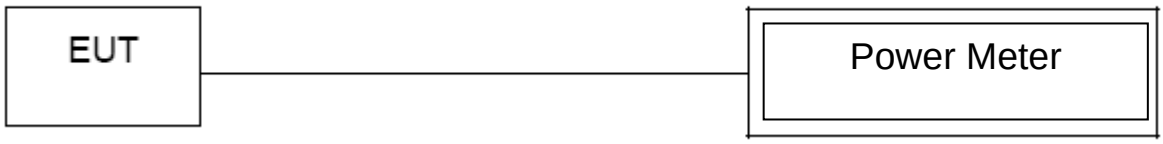
6.1.2 TEST PROCEDURE

The EUT was directly connected to the power meter and antenna output port as show in the block diagram below,

6.1.3 DEVIATION FROM STANDARD

No deviation.

6.1.4 TEST SETUP



6.1.5 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 4.1.6 Unless otherwise a special operating condition is specified in the follows during the testing.

6.1.6 TEST RESULTS

EUT：	2.4G RF Keyboard	Model Name ：	GR-75
Temperature：	24°C	Relative Humidity :	54%
Test Voltage :	DC 3V		
Test Mode ：	2407MHz/2437MHz/2473MHz		

Test Channel	Frequency (MHz)	Peak Output Power (dBm)	LIMIT (dBm)	LIMIT (W)
01	2407	1.52	30	1
08	2437	1.76	30	1
14	2473	1.36	30	1

7. ANTENNA CONDUCTED SPURIOUS EMISSION

7.1 APPLIED PROCEDURES / LIMIT

FCC Part15, Subpart C			
Test Item	Limit	Frequency Range (MHz)	Result
Antenna conducted Spurious Emission	20dB less than the peak value of fundamental frequency	30-25000	PASS

7.1.1 MEASUREMENT INSTRUMENTS LIST

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP-40	100129	Aug. 31, 2011

Remark: ” N/A” denotes No Model Name , Serial No. or No Calibration specified.

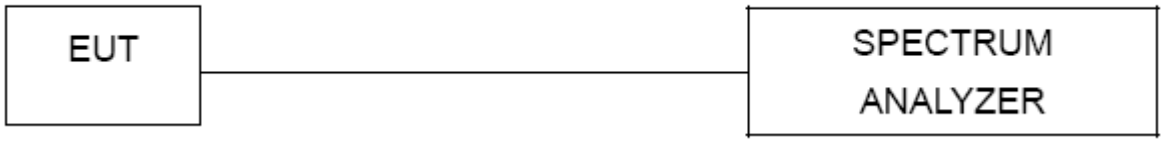
7.1.2 TEST PROCEDURE

a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,
b. Spectrum Setting : RBW= 100KHz, VBW=100KHz, Sweep time = Auto.

7.1.3 DEVIATION FROM STANDARD

No deviation.

7.1.4 TEST SETUP



7.1.5 EUT OPERATION CONDITIONS

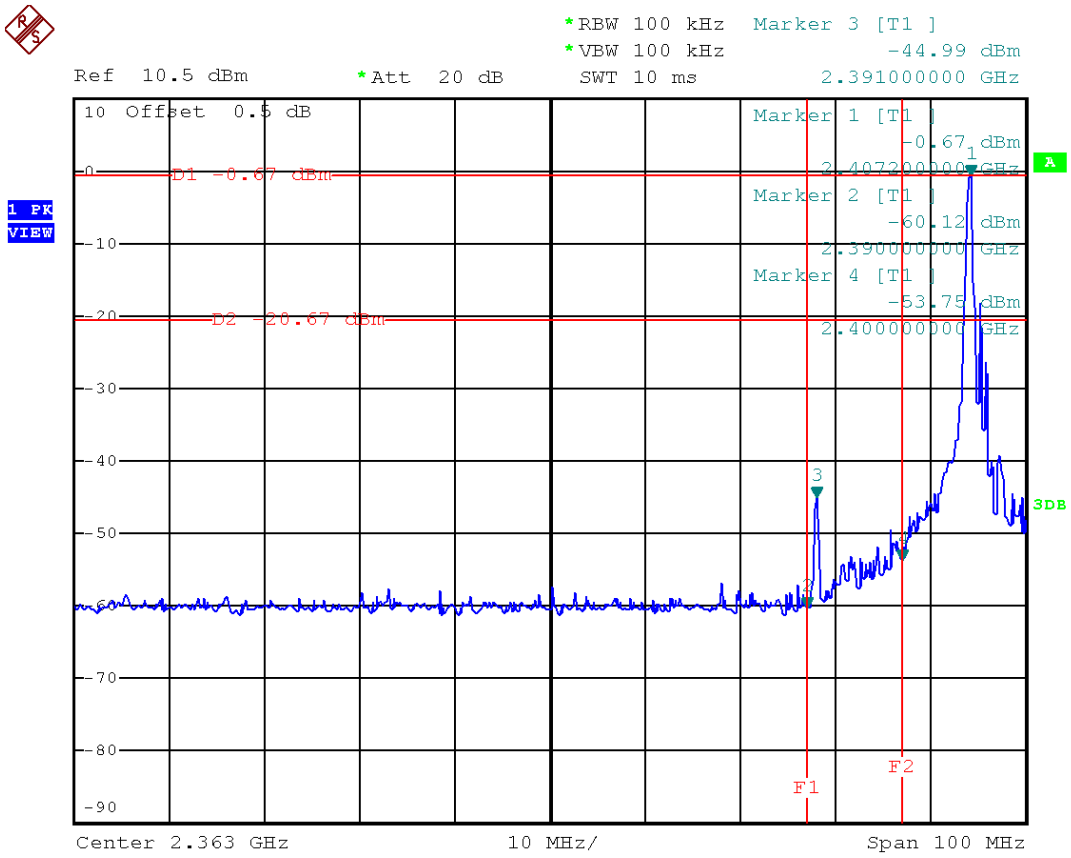
The EUT tested system was configured as the statements of 4.1.6 Unless otherwise a special operating condition is specified in the follows during the testing.

7.1.6 TEST RESULTS

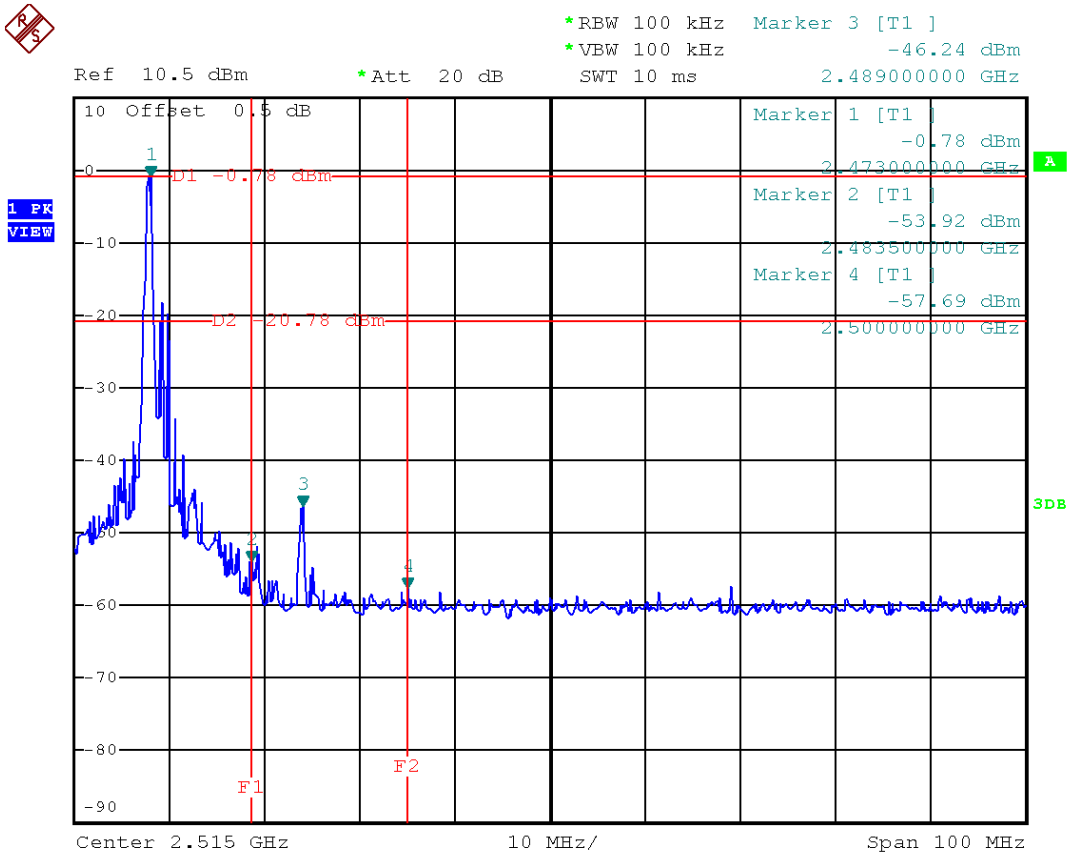
EUT：	2.4G RF Keyboard	Model Name ：	GR-75
Temperature：	24°C	Relative Humidity :	54%
Test Voltage :	DC 3V		
Test Mode ：	2407MHz/2473MHz		

Channel of Worst Data: 2407MHz,2473MHz			
The max. radio frequency power in any 100kHz bandwidth outside the frequency band		The max. radio frequency power in any 100 kHz bandwidth within the frequency band.	
FREQUENCY(MHz)	POWER(dBm)	FREQUENCY(MHz)	POWER(dBm)
2391	-44.99	2489	-46.24
Result			
In any 100kHz bandwidth outside the frequency band, the radio frequency power is at least 20dB below that in the 100kHz bandwidth within the band that contains the highest lever of the desired power.			

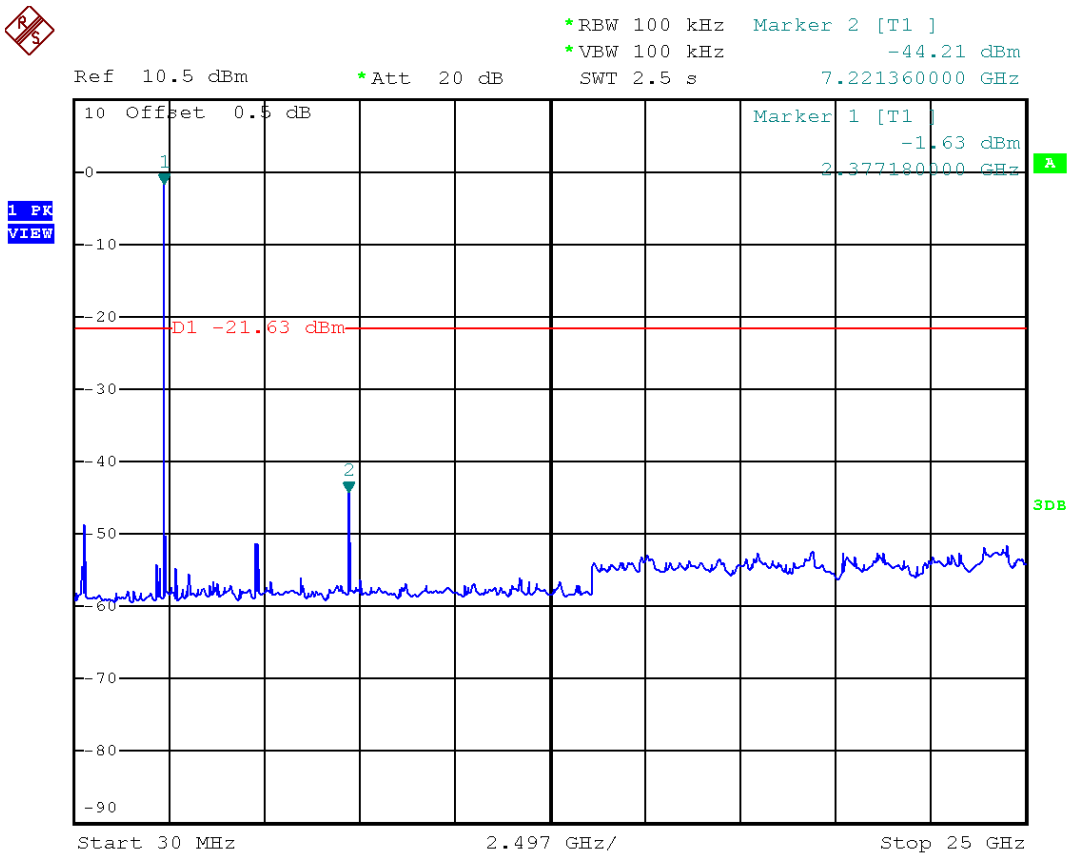
2407MHz



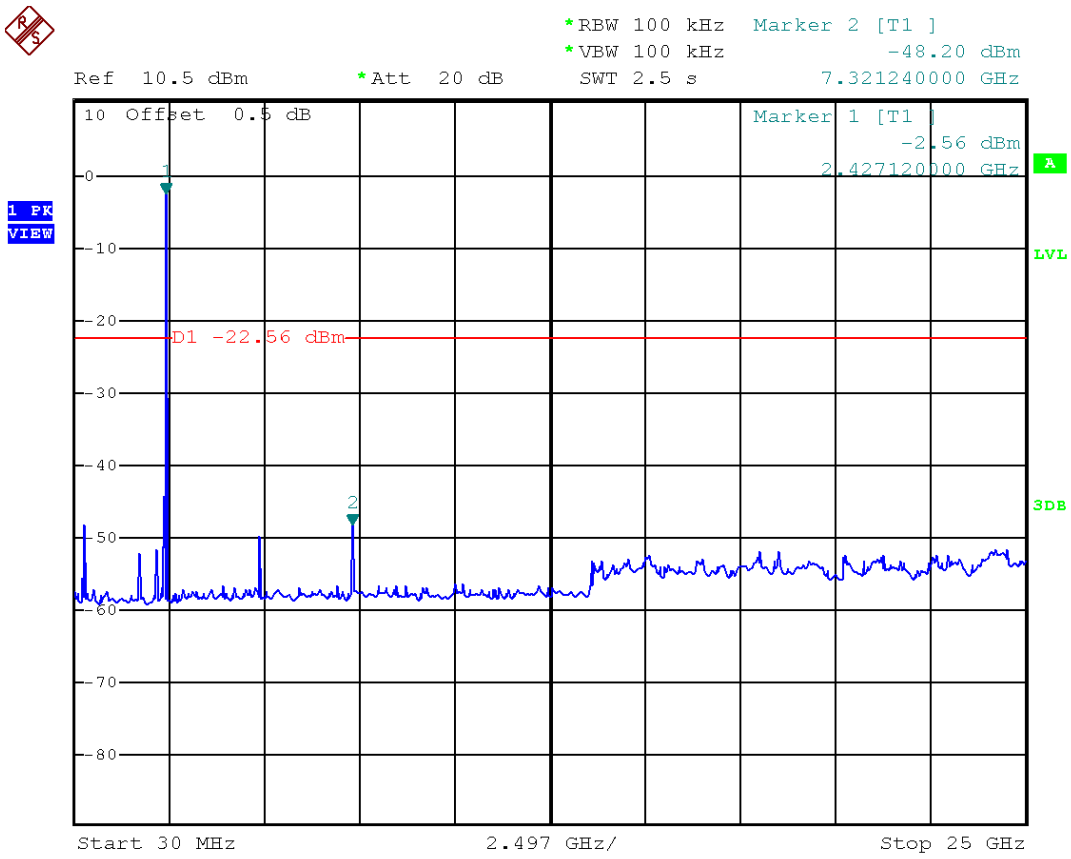
2473MHz



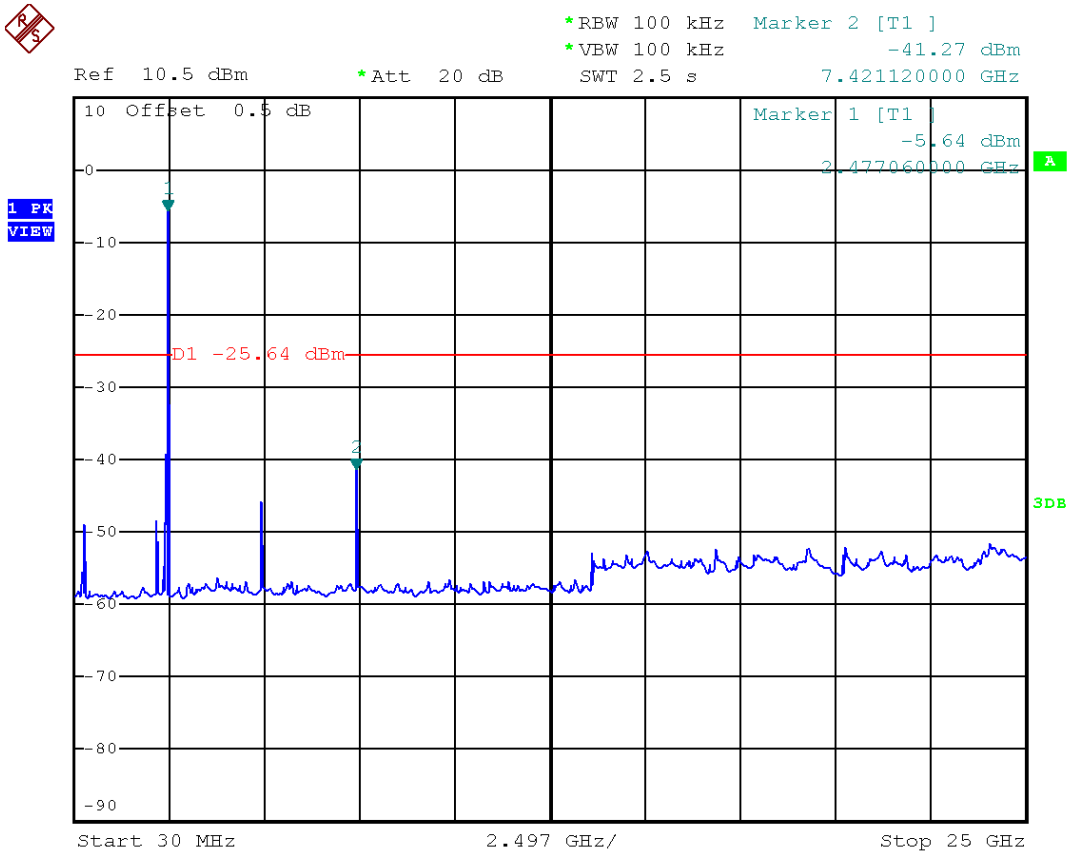
2407MHz



2437MHz



2473MHz


*RBW 100 kHz
*VBW 100 kHz
Ref 10.5 dBm
*Att 20 dB
SWT 2.5 s
Marker 2 [T1]
-41.27 dBm
7.421120000 GHz
10 Offset 0.5 dB
Marker 1 [T1]
-5.64 dBm
2.477060000 GHz
1 PK
VIEW
A
3DB
D1 -25.64 dBm
Start 30 MHz
2.497 GHz/
Stop 25 GHz

8. POWER SPECTRAL DENSITY TEST

8.1 APPLIED PROCEDURES / LIMIT

FCC Part15, Subpart C			
Test Item	Limit	Frequency Range (MHz)	Result
Power Spectral Density	8 dBm (in any 3KHz)	2400-2483.5	PASS

8.1.1 MEASUREMENT INSTRUMENTS LIST

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP-40	100129	Aug. 31, 2011

Remark: ” N/A” denotes No Model Name , Serial No. or No Calibration specified.

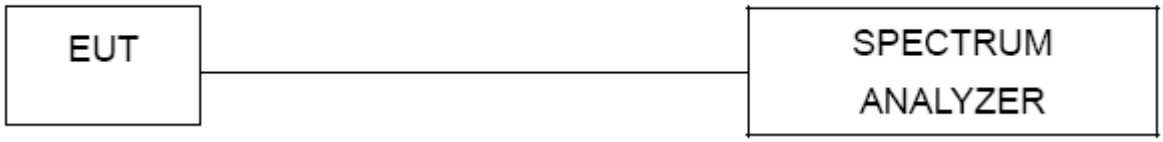
8.1.2 TEST PROCEDURE

a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,
b. Spectrum Setting : RBW=3KHz, VBW=30KHz, Sweep time = 500s.

8.1.3 DEVIATION FROM STANDARD

No deviation.

8.1.4 TEST SETUP



8.1.5 EUT OPERATION CONDITIONS

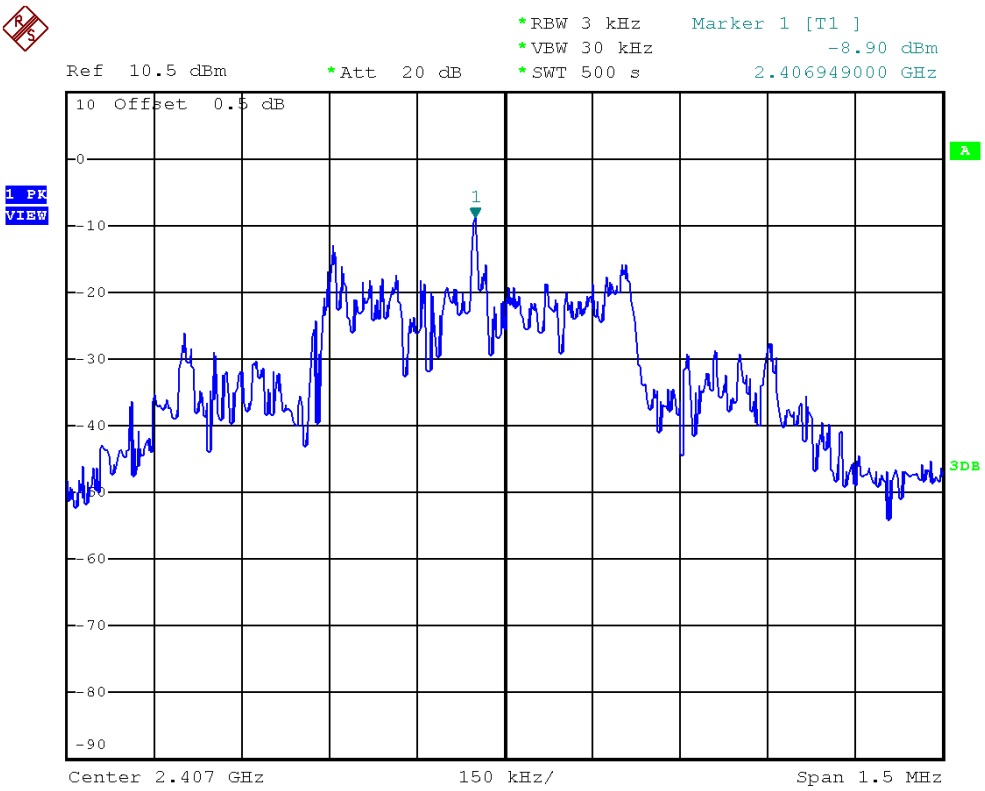
The EUT tested system was configured as the statements of 4.1.6 Unless otherwise a special operating condition is specified in the follows during the testing.

8.1.6 TEST RESULTS

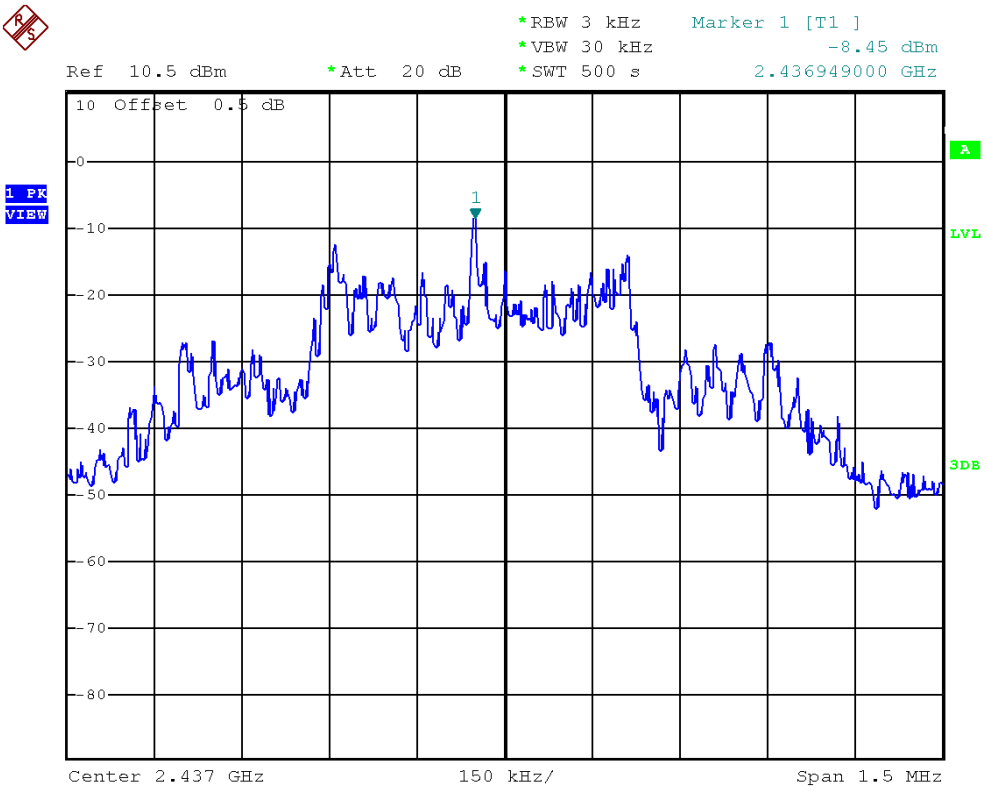
EUT：	2.4G RF Keyboard	Model Name ：	GR-75
Temperature：	24°C	Relative Humidity：	54%
Test Voltage：	DC 3V		
Test Mode ：	2407MHz/2437MHz/2473MHz		

Test Channel	Frequency (MHz)	Power Density (dBm)	LIMIT (dBm)
01	2407	-8.90	8
08	2437	-8.45	8
14	2473	-9.13	8

2407MHz



2437MHz



2473MHz