



Neutron Engineering Inc.

Radio Test Report

FCC ID: H8GGV500

This report concerns (check one) : ☒ Original Grant ☐ Class I Change

Issued Date : Jan. 02, 2012
Project No. : 1112008
Equipment : 2.4G RF Keyboard
Model Name : GV-500; H5050; H5030

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: Dec. 02, 2011

Date of Test: Dec. 02, 2011 ~ Dec. 22, 2011

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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.**

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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.



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1. CERTIFICATION

Equipment : 2.4G RF Keyboard
Brand Name : A4TECH
Model Name : GV-500; H5050; H5030
Applicant : A-FOUR TECH CO., LTD.
Date of Test : Dec. 02, 2011 ~ Dec. 22, 2011
Standards : FCC Part15, Subpart C(15.247) / ANCI C63.4: 2009

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-1-1112008) 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 applical 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; FCC DN: TW1054;
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 $y \pm U$, where expanded 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	GV-500; H5050; H5030												
OEM Brand/Model Name	G-Cube / GRX-8 Zydio / RX-8												
Model Difference	Models' differences between each other only the changes of model name and brand name which do not affect the EMI performance. The EUT has two optional sets of Boost IC+Schottky Diode: <table border="1"> <tr> <th>No.</th><th>Boost IC+Schottky Diode</th></tr> <tr> <td>1</td><td>Schottky Diode is in the Boost IC (U3) and nothing on PCB location D3.</td></tr> <tr> <td>2</td><td>Schottky Diode is not in the Boost IC (U3) but on PCB location D3.</td></tr> </table> All the above models were tested, and the model: GV-500 (No. 1) was found to be the worst case during the pre-scanning test. This model of the worst case was used for final testing and collecting test data included in this report.	No.	Boost IC+Schottky Diode	1	Schottky Diode is in the Boost IC (U3) and nothing on PCB location D3.	2	Schottky Diode is not in the Boost IC (U3) but on PCB location D3.						
No.	Boost IC+Schottky Diode												
1	Schottky Diode is in the Boost IC (U3) and nothing on PCB location D3.												
2	Schottky Diode is not in the Boost IC (U3) but on PCB location D3.												
Product Description	The EUT is a 2.4G RF Keyboard. <table border="1"> <tr> <td>Operation Frequency:</td><td>2407~2473MHz</td></tr> <tr> <td>Modulation Type:</td><td>GFSK</td></tr> <tr> <td>Number Of Channel</td><td>14CH (Note 2)</td></tr> <tr> <td>Antenna Designation:</td><td>Please refer to the Note 3.</td></tr> <tr> <td>Antenna Gain(Peak)</td><td>Please refer to the Note 3.</td></tr> <tr> <td>Output Power:</td><td>0.25dBm (Max.)</td></tr> </table> 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.	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:	0.25dBm (Max.)
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:	0.25dBm (Max.)												
Power Source	Battery supplied												
Power Rating	DC 1.5V												
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	2.69



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.

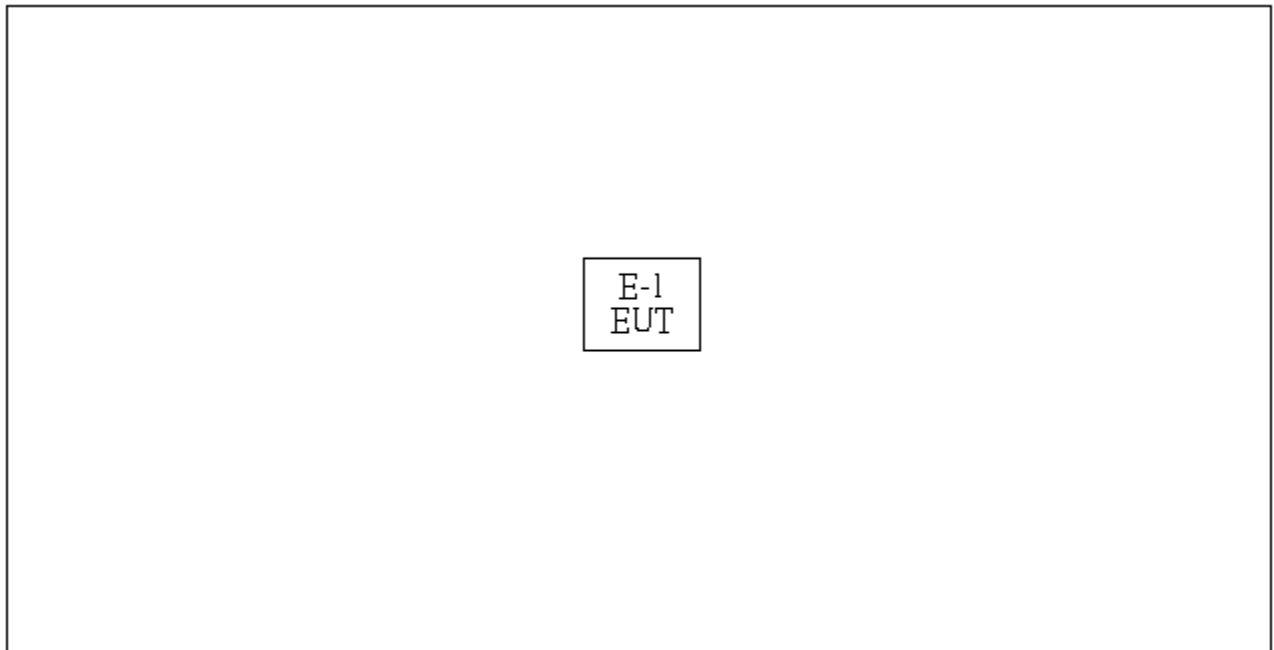
Pretest Test Mode	Description
Mode 1	2407MHz
Mode 2	2437MHz
Mode 3	2473MHz

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	GV-500	H8GGV500	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 on 15.205(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) The test result calculated as following:
 Measurement Value = Reading Level + Correct Factor
 Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain(if use)
 Margin Level = Measurement Value – Limit Value

**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	Oct. 06, 2012
2	Horn Antenna	Schwarzbeck	BBHA 9120	D-325	Dec. 07, 2012
3	Microwave Pre_amplifier	Agilent	8449B	3008A01714	Apr. 18, 2012
4	Microflex Cable	N/A	N/A	1m	May. 18, 2012
5	Microflex Cable	AISI	S104-SMAP-1	10m	Aug. 22, 2012
6	Microflex Cable	N/A	N/A	3m	Aug. 22, 2012
7	Test Cable	N/A	LMR-400	966_12m	Jun. 16, 2012
8	Test Cable	N/A	LMR-400	966_3m	Jun. 16, 2012
9	Pre-Amplifier	EMC	EMC-330	980001	Jun. 02, 2012
10	Log-Bicon Antenna	Schwarzbeck	VULB9168-352	9168-352	Jun. 16, 2012

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 or 10 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 radiated 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.
- g. A preamp and high pass filter were used for this test in order to provide sufficient measurement sensitivity.
- h. EUT Orthogonal Axis :
"X" - denotes Laid on Table ; "Y" - denotes Vertical Stand ; "Z" - denotes Side Stand
- i. During the measurements above 1 GHz it is taken care of that the EUT is always within the 3 dB cone of radiation BW of the used antenna

NOTE: (30-1000MHz)

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

NOTE: (Above 1000MHz)

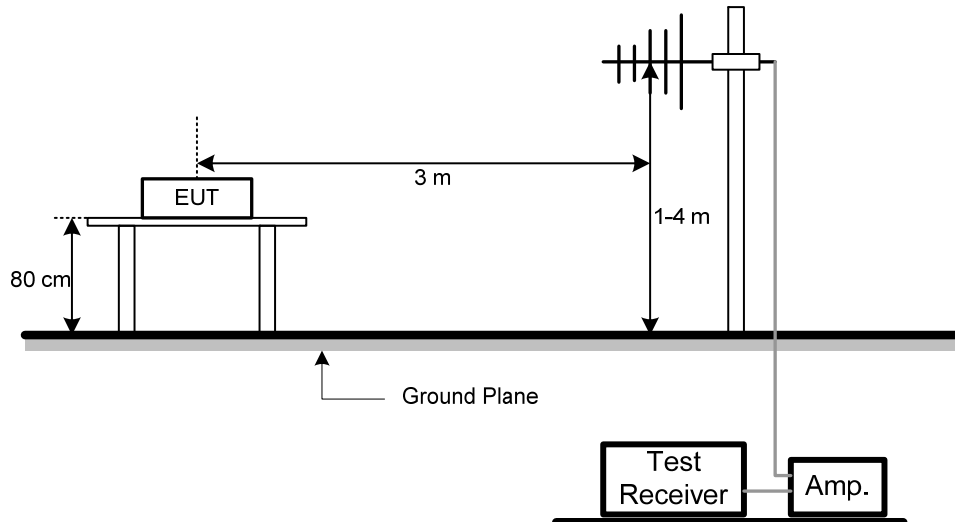
- a. Reading in which marked as Peak means measurements by using are Peak Mode with instrument setting in RBW= 1 MHz, VBW= 1 MHz, Swp. Time = Auto.
Reading in which marked as AV means measurements by using are Average Mode with instrument setting in RBW= 1 MHz, VBW= 10 Hz, Swp. Time = Auto.
- b. All readings are Peak Mode value unless otherwise stated AVG in column of Note. If the Peak Mode Measured value compliance with the Peak Limits and lower than AVG Limits, the EUT shall be deemed to meet both Peak & AVG Limits and then only Peak Mode was measured, but AVG Mode didn't perform.

4.1.4 DEVIATION FROM TEST STANDARD

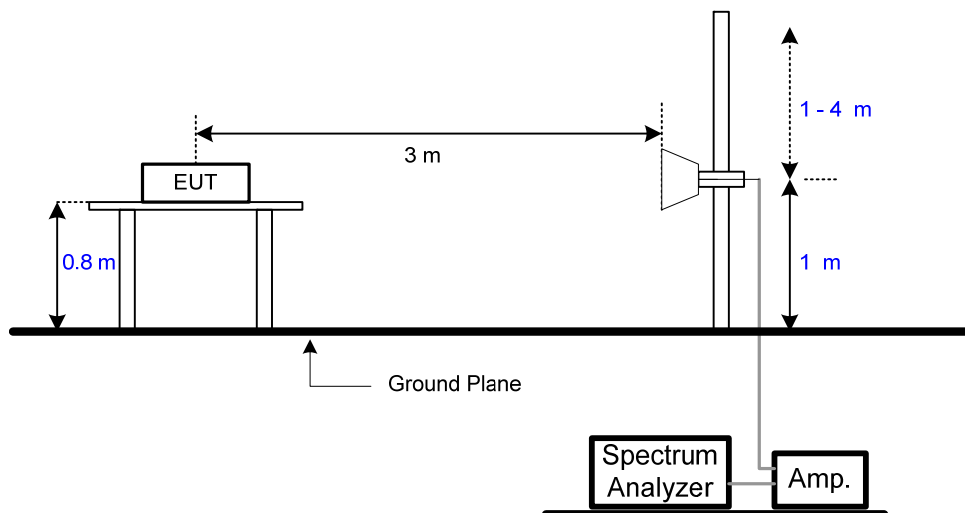
No deviation

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

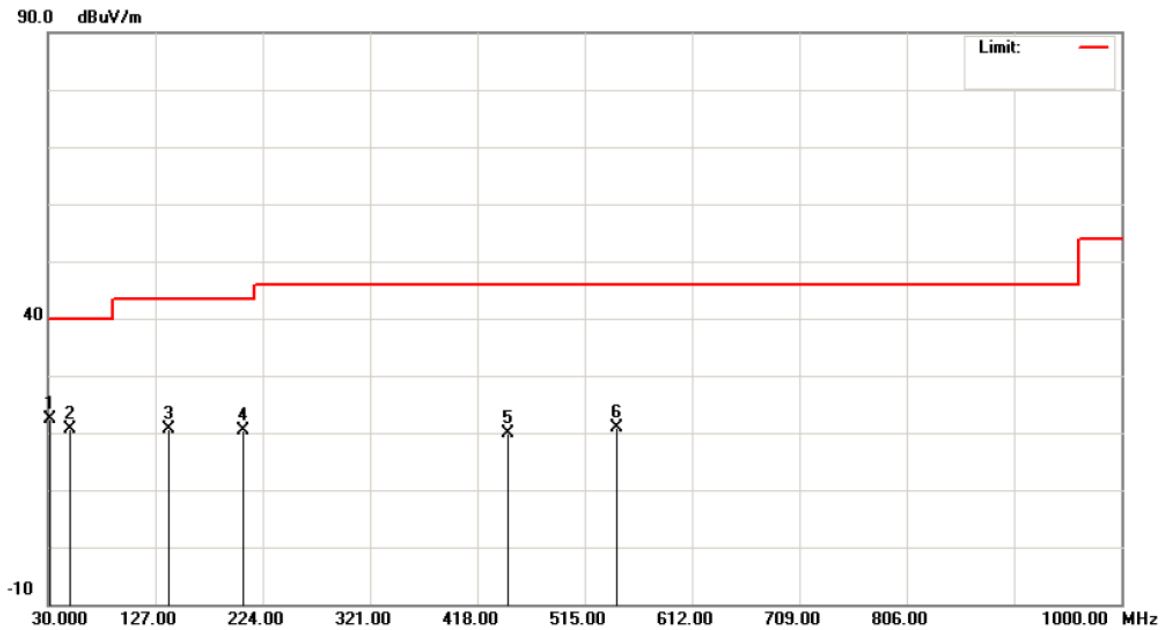
The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operation condition was tested and used to collect the included data.



4.1.7 TEST RESULTS-BETWEEN 30MHz – 1000MHz

EUT :	2.4G RF Keyboard	Model Name :	GV-500
Temperature :	26 °C	Relative Humidity :	60%
Test Voltage :	DC 1.5V		
Test Mode :	2437MHz		

Polarization: Vertical

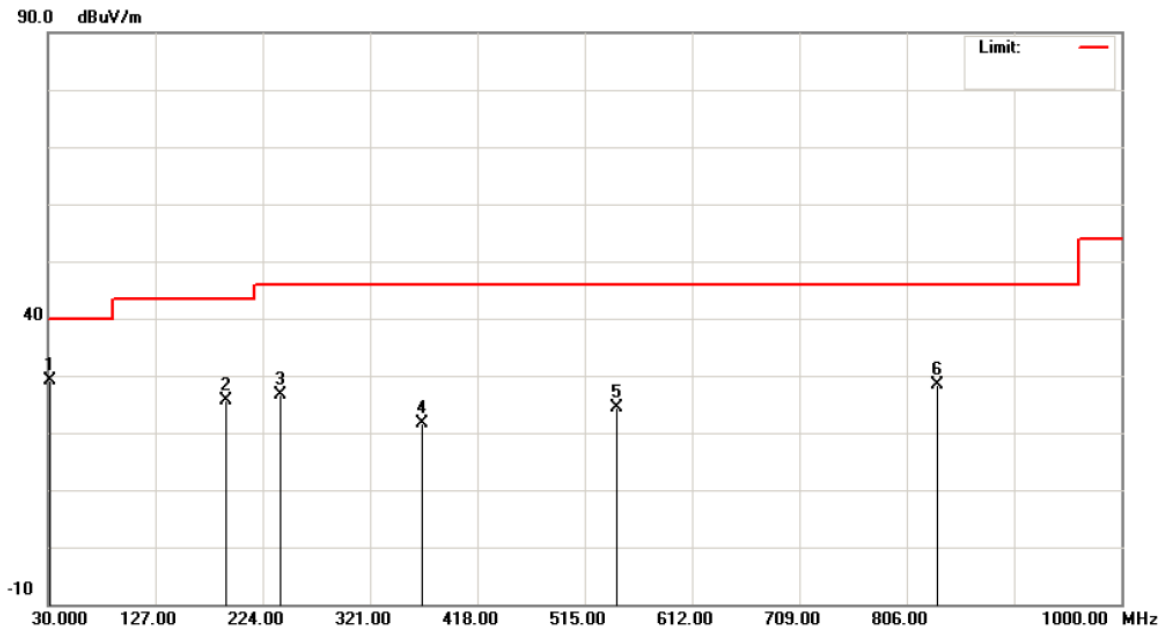


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1	*	31.9400	35.44	-13.05	22.39	40.00	-17.61	peak	
2		49.4000	32.90	-12.26	20.64	40.00	-19.36	peak	
3		138.6397	34.01	-13.49	20.52	43.50	-22.98	peak	
4		206.5399	36.34	-15.99	20.35	43.50	-23.15	peak	
5		445.1600	28.71	-8.88	19.83	46.00	-26.17	peak	
6		544.0999	28.24	-7.38	20.86	46.00	-25.14	peak	



EUT :	2.4G RF Keyboard	Model Name :	GV-500
Temperature :	26 °C	Relative Humidity :	60%
Test Voltage :	DC 1.5V		
Test Mode :	2437MHz		

Polarization: Horizontal



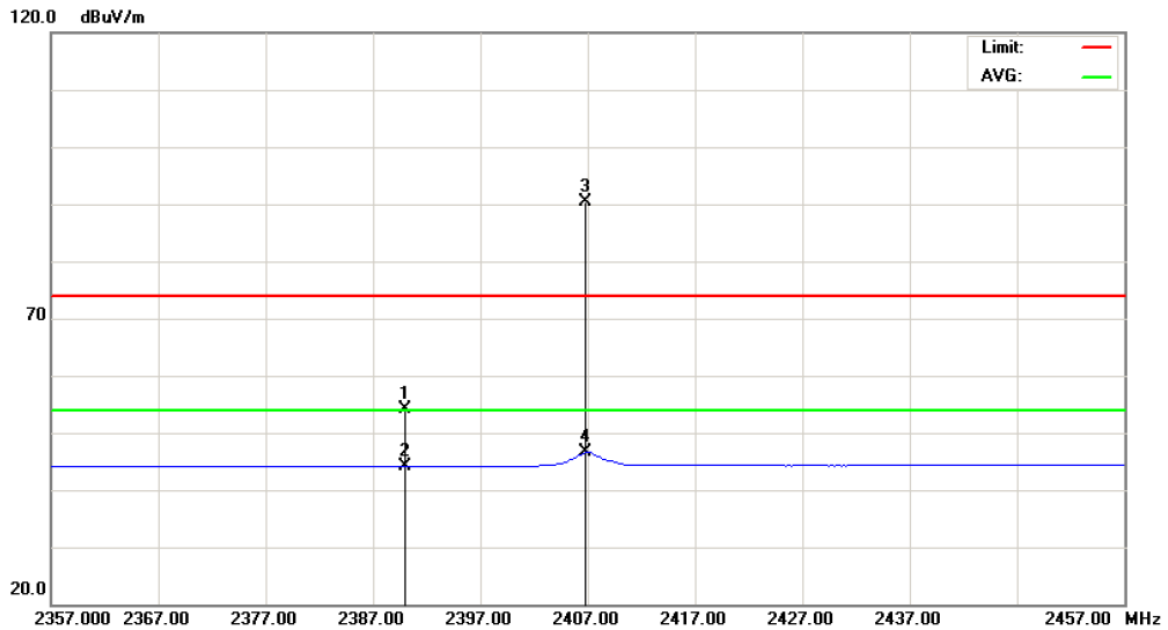
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1	*	31.9400	42.08	-13.05	29.03	40.00	-10.97	peak	
2		191.0200	41.82	-16.13	25.69	43.50	-17.81	peak	
3		239.5200	41.15	-14.42	26.73	46.00	-19.27	peak	
4		367.5599	32.47	-10.90	21.57	46.00	-24.43	peak	
5		544.0999	31.76	-7.38	24.38	46.00	-21.62	peak	
6		833.1599	31.25	-2.84	28.41	46.00	-17.59	peak	



4.1.8 TEST RESULTS-ABOVE 1000MHz

EUT :	2.4G RF Keyboard	Model Name :	GV-500
Temperature :	26 °C	Relative Humidity :	60%
Test Voltage :	DC 1.5V		
Test Mode :	2407MHz		

Polarization: Vertical

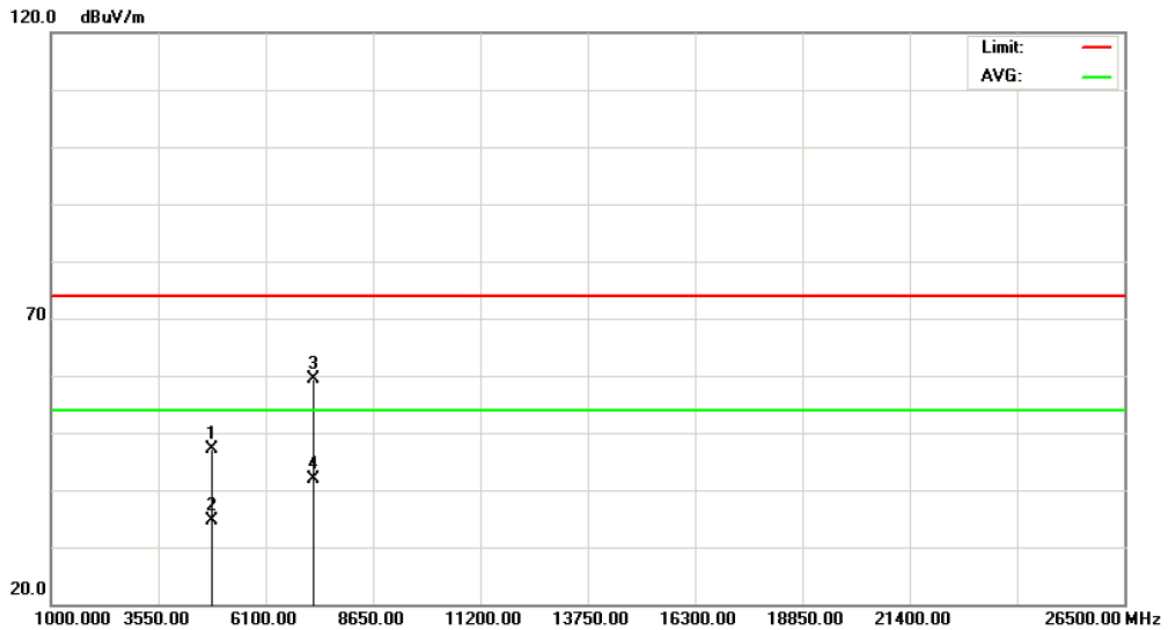


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1		2390.000	21.43	32.59	54.02	74.00	-19.98	peak	
2		2390.000	11.46	32.59	44.05	54.00	-9.95	AVG	
3	*	2406.800	57.78	32.66	90.44	74.00	16.44	peak	
4		2406.800	13.90	32.66	46.56	54.00	-7.44	AVG	



EUT :	2.4G RF Keyboard	Model Name :	GV-500
Temperature :	26 °C	Relative Humidity :	60%
Test Voltage :	DC 1.5V		
Test Mode :	2407MHz		

Polarization: Vertical

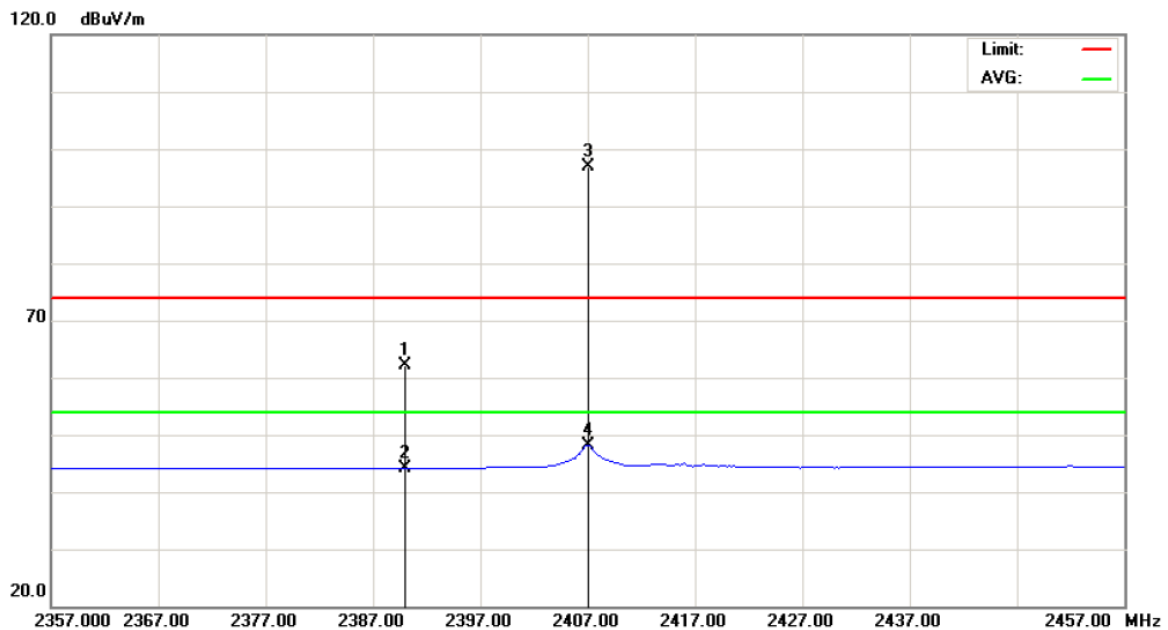


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1		4814.010	43.61	3.49	47.10	74.00	-26.90	peak	
2		4814.010	31.07	3.49	34.56	54.00	-19.44	AVG	
3		7221.010	49.43	9.97	59.40	74.00	-14.60	peak	
4	*	7221.010	31.82	9.97	41.79	54.00	-12.21	AVG	



EUT :	2.4G RF Keyboard	Model Name :	GV-500
Temperature :	26 °C	Relative Humidity :	60%
Test Voltage :	DC 1.5V		
Test Mode :	2407MHz		

Polarization: Horizontal

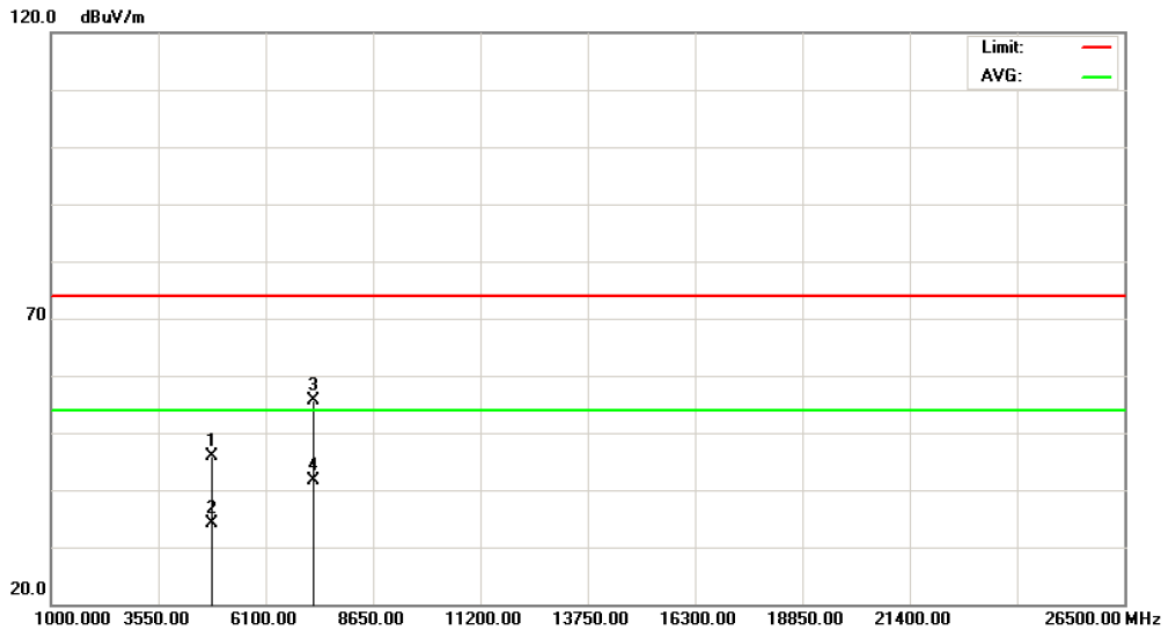


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1		2390.000	29.52	32.59	62.11	74.00	-11.89	peak	
2		2390.000	11.52	32.59	44.11	54.00	-9.89	AVG	
3	*	2407.000	64.10	32.66	96.76	74.00	22.76	peak	
4		2407.000	15.48	32.66	48.14	54.00	-5.86	AVG	



EUT :	2.4G RF Keyboard	Model Name :	GV-500
Temperature :	26 °C	Relative Humidity :	60%
Test Voltage :	DC 1.5V		
Test Mode :	2407MHz		

Polarization: Horizontal

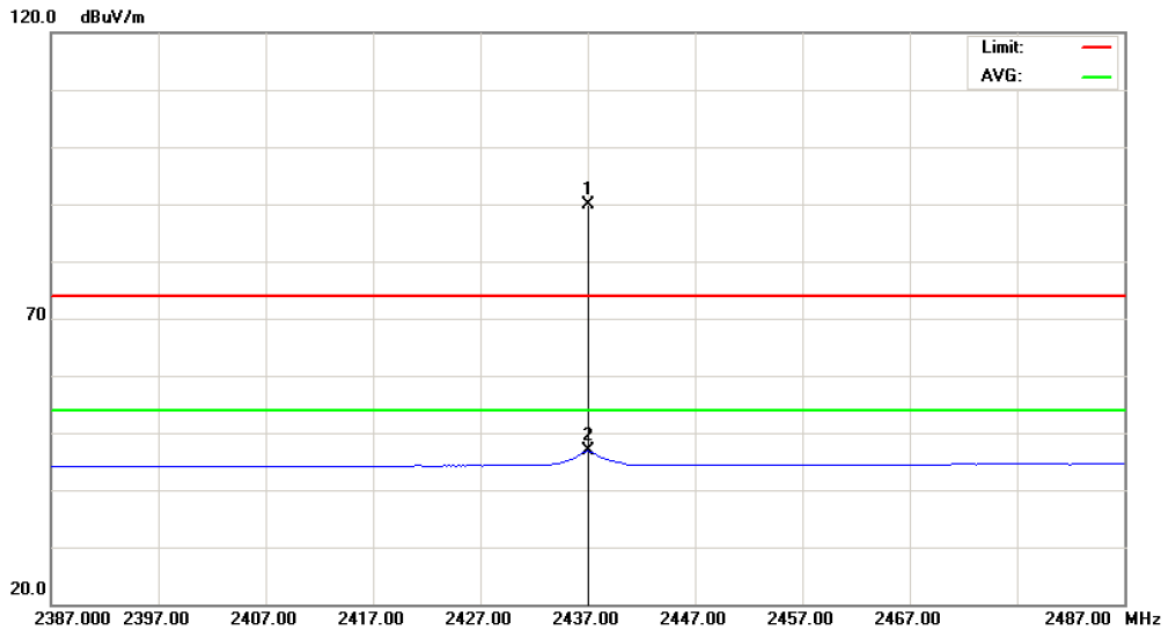


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1		4813.950	42.51	3.48	45.99	74.00	-28.01	peak	
2		4813.950	30.62	3.48	34.10	54.00	-19.90	AVG	
3		7220.710	45.56	9.97	55.53	74.00	-18.47	peak	
4	*	7220.710	31.55	9.97	41.52	54.00	-12.48	AVG	



EUT :	2.4G RF Keyboard	Model Name :	GV-500
Temperature :	26 °C	Relative Humidity :	60%
Test Voltage :	DC 1.5V		
Test Mode :	2437MHz		

Polarization: Vertical

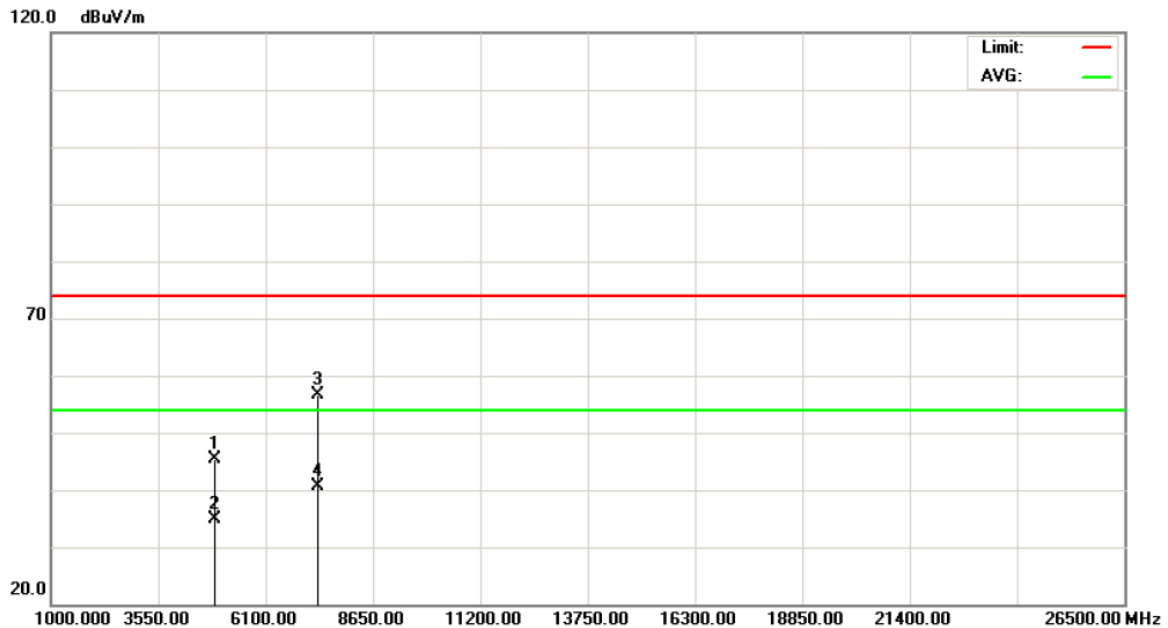


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1	*	2437.000	57.02	32.80	89.82	74.00	15.82	peak	
2		2437.000	13.99	32.80	46.79	54.00	-7.21	AVG	



EUT :	2.4G RF Keyboard	Model Name :	GV-500
Temperature :	26 °C	Relative Humidity :	60%
Test Voltage :	DC 1.5V		
Test Mode :	2437MHz		

Polarization: Vertical

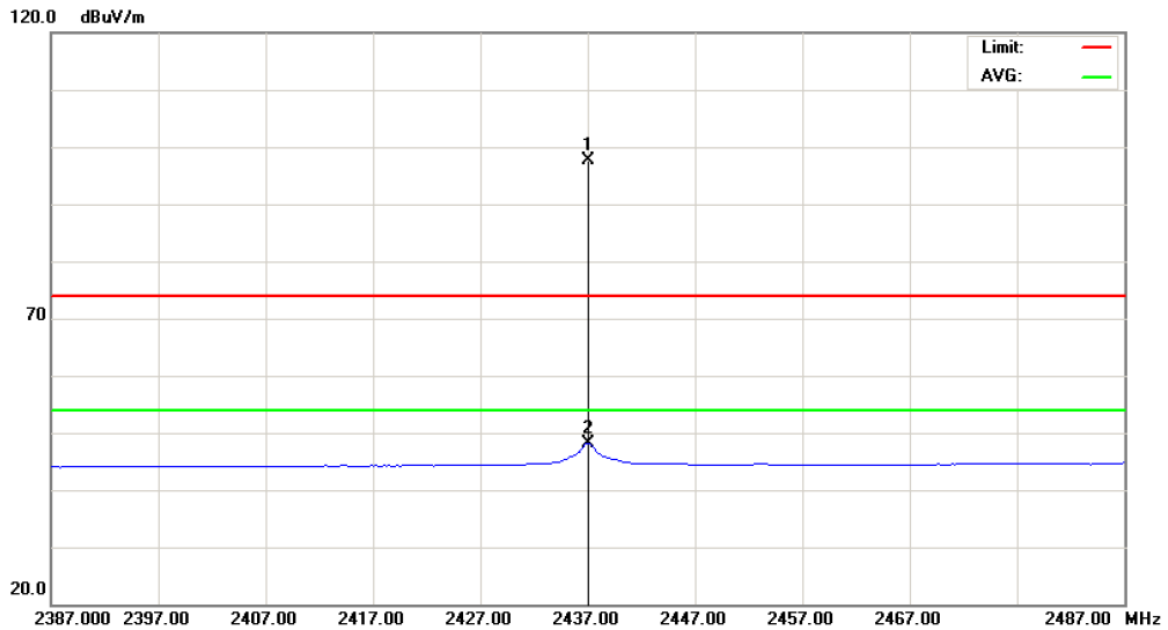


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1		4874.010	41.69	3.64	45.33	74.00	-28.67	peak	
2		4874.010	31.36	3.64	35.00	54.00	-19.00	AVG	
3		7311.040	46.51	10.09	56.60	74.00	-17.40	peak	
4	*	7311.040	30.48	10.09	40.57	54.00	-13.43	AVG	



EUT :	2.4G RF Keyboard	Model Name :	GV-500
Temperature :	26 °C	Relative Humidity :	60%
Test Voltage :	DC 1.5V		
Test Mode :	2437MHz		

Polarization: Horizontal

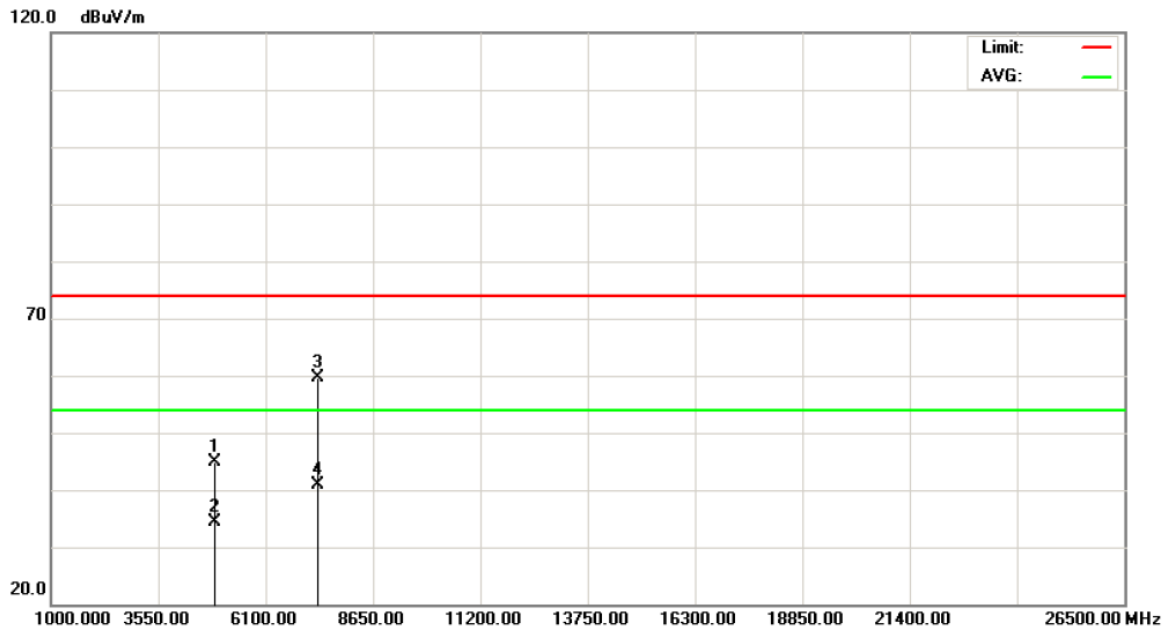


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1	*	2437.000	64.93	32.80	97.73	74.00	23.73	peak	
2		2437.000	15.45	32.80	48.25	54.00	-5.75	AVG	



EUT :	2.4G RF Keyboard	Model Name :	GV-500
Temperature :	26 °C	Relative Humidity :	60%
Test Voltage :	DC 1.5V		
Test Mode :	2437MHz		

Polarization: Horizontal

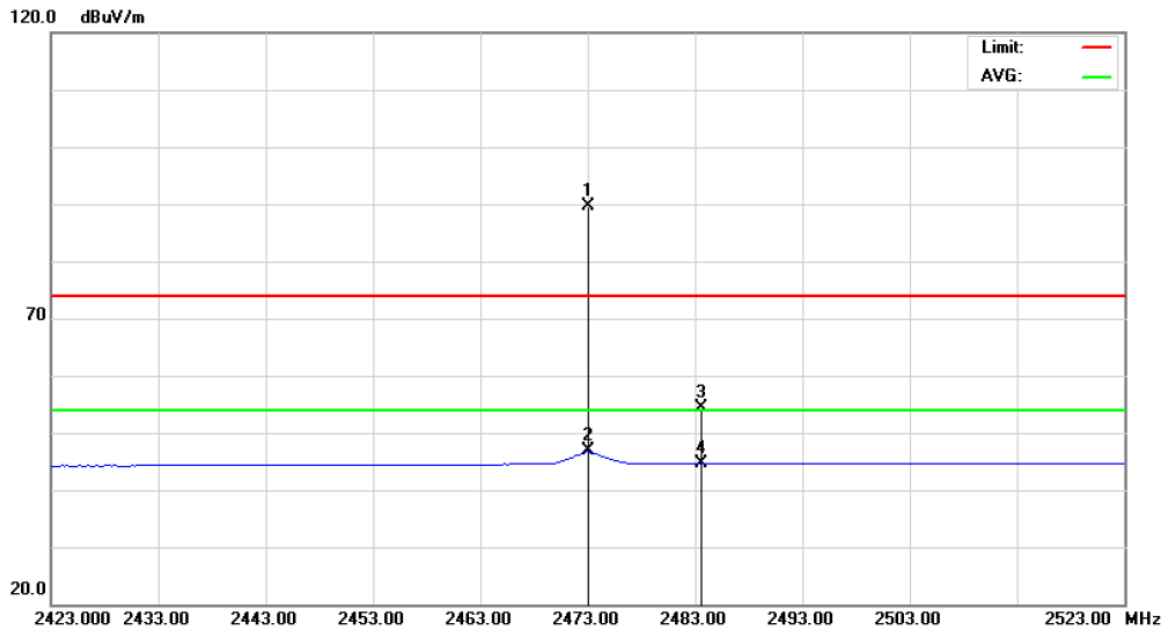


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1		4874.080	41.28	3.64	44.92	74.00	-29.08	peak	
2		4874.080	30.83	3.64	34.47	54.00	-19.53	AVG	
3		7311.040	49.57	10.09	59.66	74.00	-14.34	peak	
4	*	7311.040	30.69	10.09	40.78	54.00	-13.22	AVG	



EUT :	2.4G RF Keyboard	Model Name :	GV-500
Temperature :	26 °C	Relative Humidity :	60%
Test Voltage :	DC 1.5V		
Test Mode :	2473MHz		

Polarization: Vertical

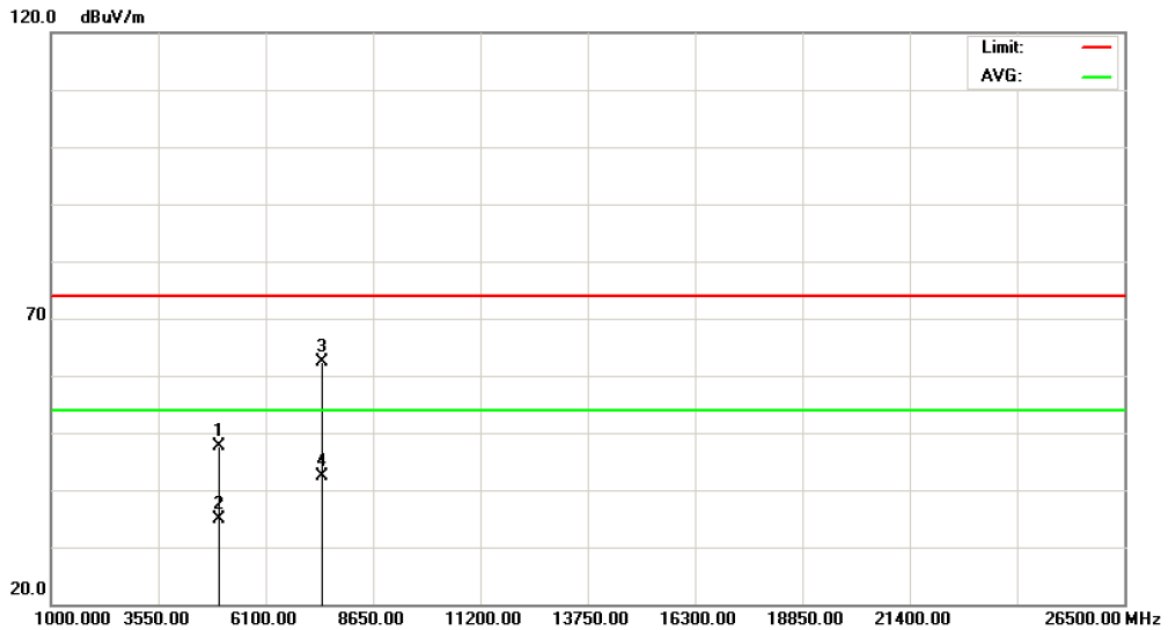


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1	*	2473.000	56.77	32.95	89.72	74.00	15.72	peak	
2		2473.000	13.81	32.95	46.76	54.00	-7.24	AVG	
3		2483.500	21.32	33.00	54.32	74.00	-19.68	peak	
4		2483.500	11.56	33.00	44.56	54.00	-9.44	AVG	



EUT :	2.4G RF Keyboard	Model Name :	GV-500
Temperature :	26 °C	Relative Humidity :	60%
Test Voltage :	DC 1.5V		
Test Mode :	2473MHz		

Polarization: Vertical

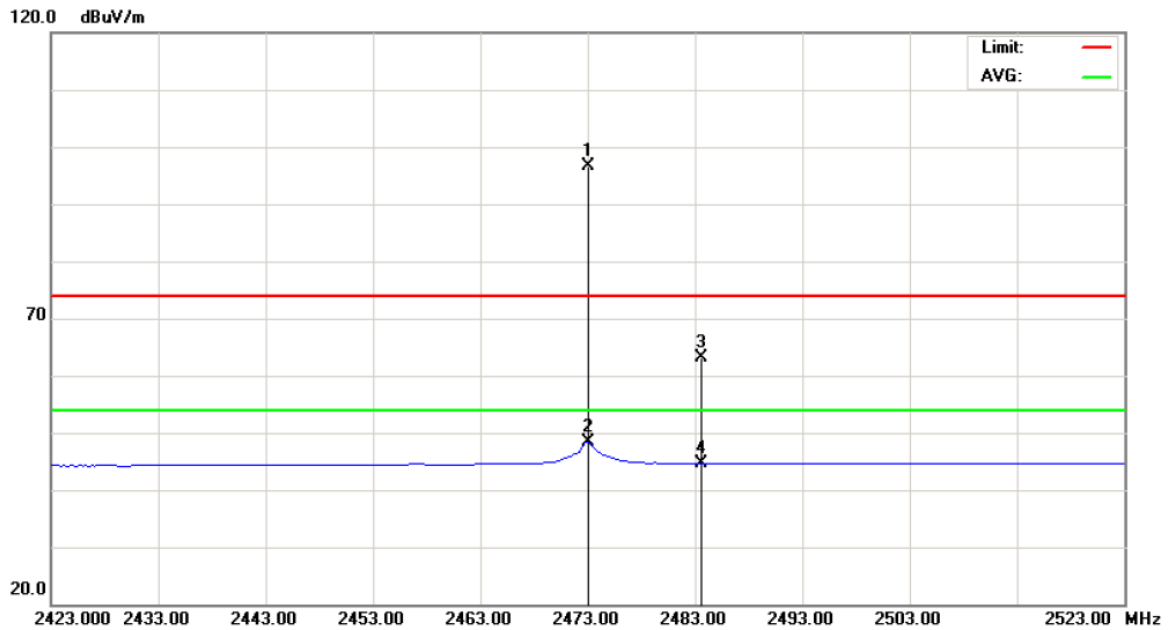


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1		4945.930	43.75	3.81	47.56	74.00	-26.44	peak	
2		4945.930	31.09	3.81	34.90	54.00	-19.10	AVG	
3	*	7419.250	52.11	10.24	62.35	74.00	-11.65	peak	
4		7419.250	32.08	10.24	42.32	54.00	-11.68	AVG	



EUT :	2.4G RF Keyboard	Model Name :	GV-500
Temperature :	26 °C	Relative Humidity :	60%
Test Voltage :	DC 1.5V		
Test Mode :	2473MHz		

Polarization: Horizontal

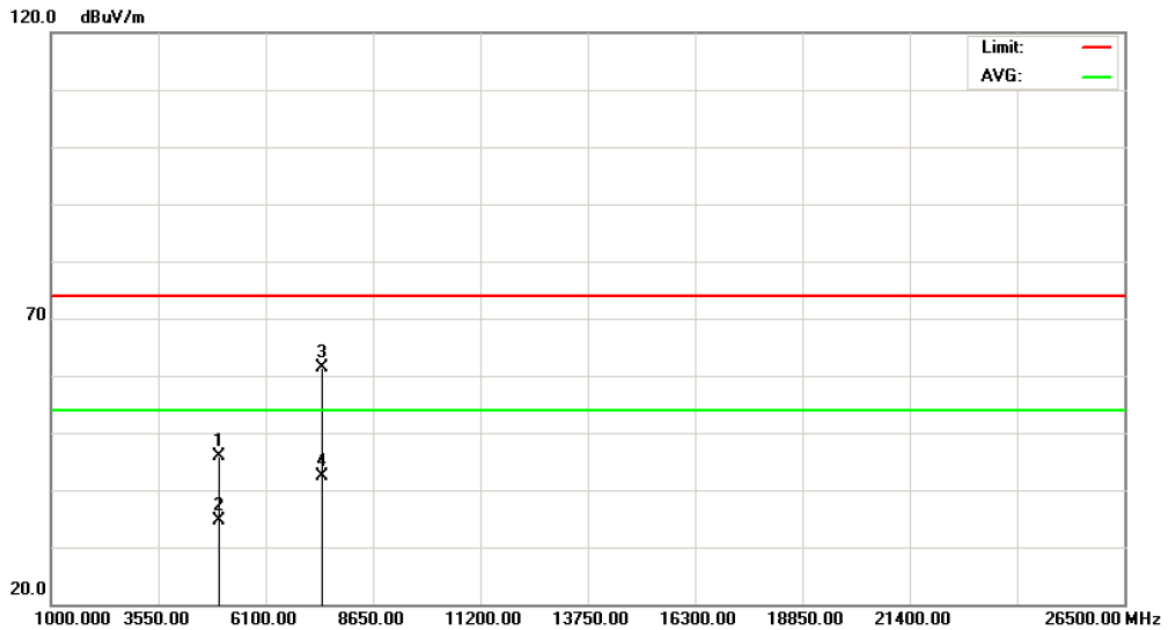


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1	*	2473.000	63.76	32.95	96.71	74.00	22.71	peak	
2		2473.000	15.44	32.95	48.39	54.00	-5.61	AVG	
3		2483.500	30.25	33.00	63.25	74.00	-10.75	peak	
4		2483.500	11.61	33.00	44.61	54.00	-9.39	AVG	



EUT :	2.4G RF Keyboard	Model Name :	GV-500
Temperature :	26 °C	Relative Humidity :	60%
Test Voltage :	DC 1.5V		
Test Mode :	2473MHz		

Polarization: Horizontal



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1		4945.930	42.05	3.81	45.86	74.00	-28.14	peak	
2		4945.930	30.77	3.81	34.58	54.00	-19.42	AVG	
3		7419.210	51.18	10.24	61.42	74.00	-12.58	peak	
4	*	7419.210	32.02	10.24	42.26	54.00	-11.74	AVG	



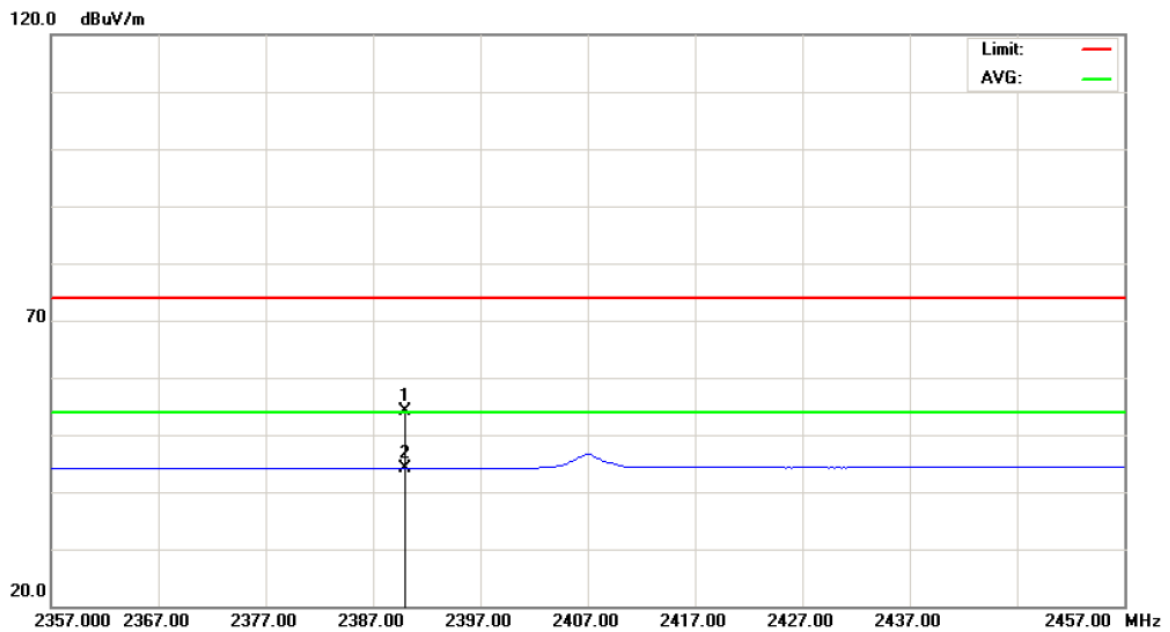
4.1.9 TEST RESULTS-RESTRICTED BANDS REQUIREMENTS

EUT :	2.4G RF Keyboard	Model Name :	GV-500
Temperature :	26 °C	Relative Humidity :	60%
Test Voltage :	DC 1.5V		
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.		



2407MHz/ Orthogonal Axes: X

Polarization: Vertical

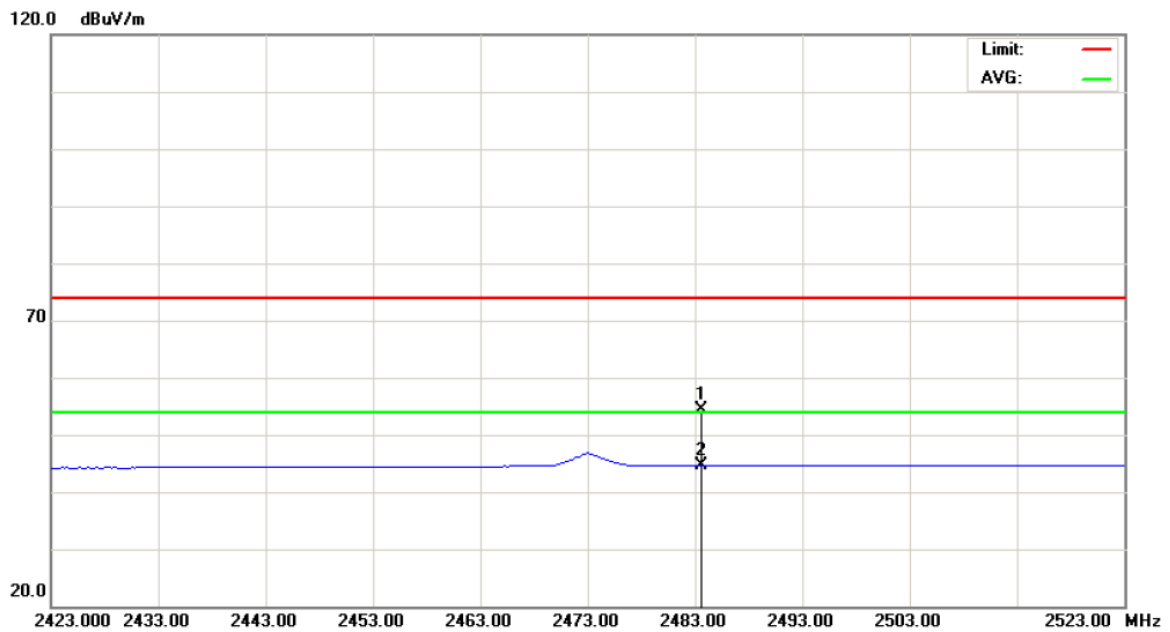


No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		2390.000	21.43	32.59	54.02	74.00	-19.98	peak	
2	*	2390.000	11.46	32.59	44.05	54.00	-9.95	AVG	



2473MHz/ Orthogonal Axes: X

Polarization: Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		2483.500	21.32	33.00	54.32	74.00	-19.68	peak	
2	*	2483.500	11.56	33.00	44.56	54.00	-9.44	AVG	

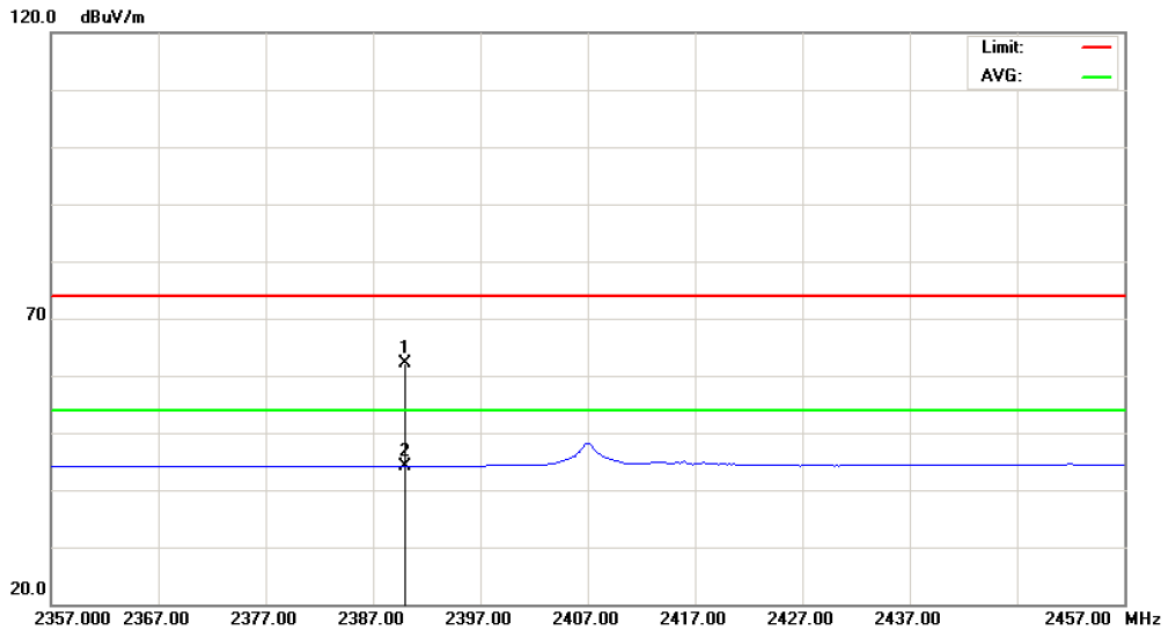


EUT :	2.4G RF Keyboard	Model Name :	GV-500
Temperature :	26 °C	Relative Humidity :	60%
Test Voltage :	DC 1.5V		
Test Mode :	TX CH 2407MHz/2473MHz (Horizontal)		
Note :	The emission of the carrier radiated field strength is measured for (Peak and AV) as following: 1. The transmitter was then configured 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.		



2407MHz/ Orthogonal Axes: X

Polarization: Horizontal

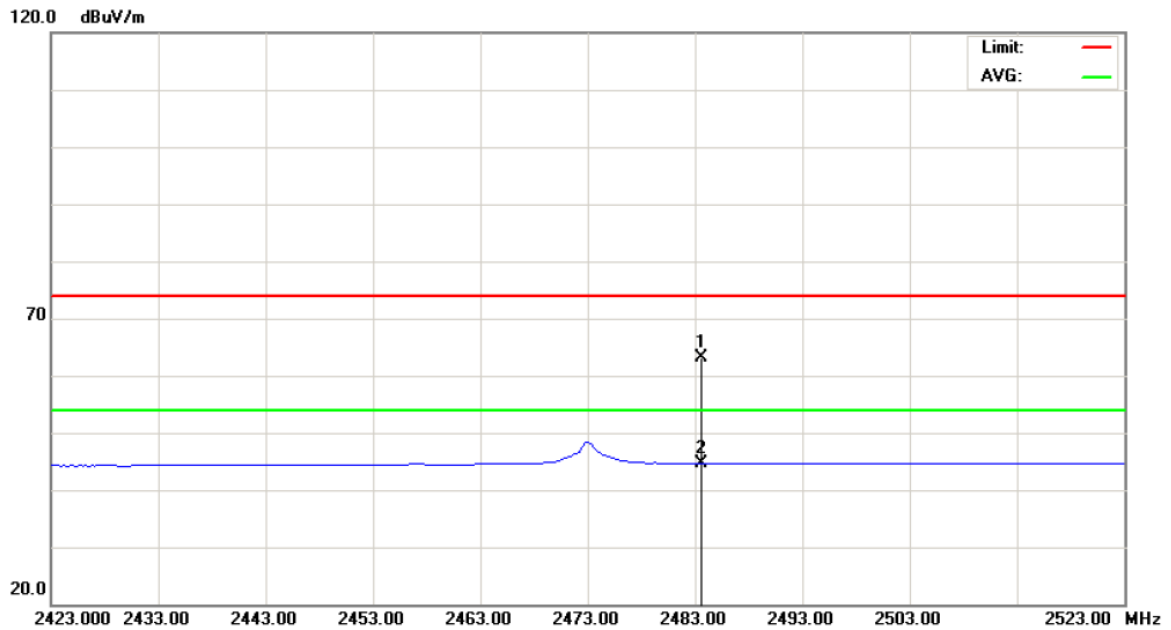


No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		2390.000	29.52	32.59	62.11	74.00	-11.89	peak	
2	*	2390.000	11.52	32.59	44.11	54.00	-9.89	AVG	



2473MHz/ Orthogonal Axes: X

Polarization: Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		2483.500	30.25	33.00	63.25	74.00	-10.75	peak	
2	*	2483.500	11.61	33.00	44.61	54.00	-9.39	AVG	



5. BANDWIDTH TEST

5.1 APPLIED PROCEDURES / LIMIT

FCC Part15, Subpart C			
Test Item	Limit	Frequency Range (MHz)	Result
Bandwidth	$\geq 500\text{KHz}$ (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	Oct. 06, 2012

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

5.1.2 TEST PROCEDURE

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

5.1.3 DEVIATION FROM STANDARD

No deviation.

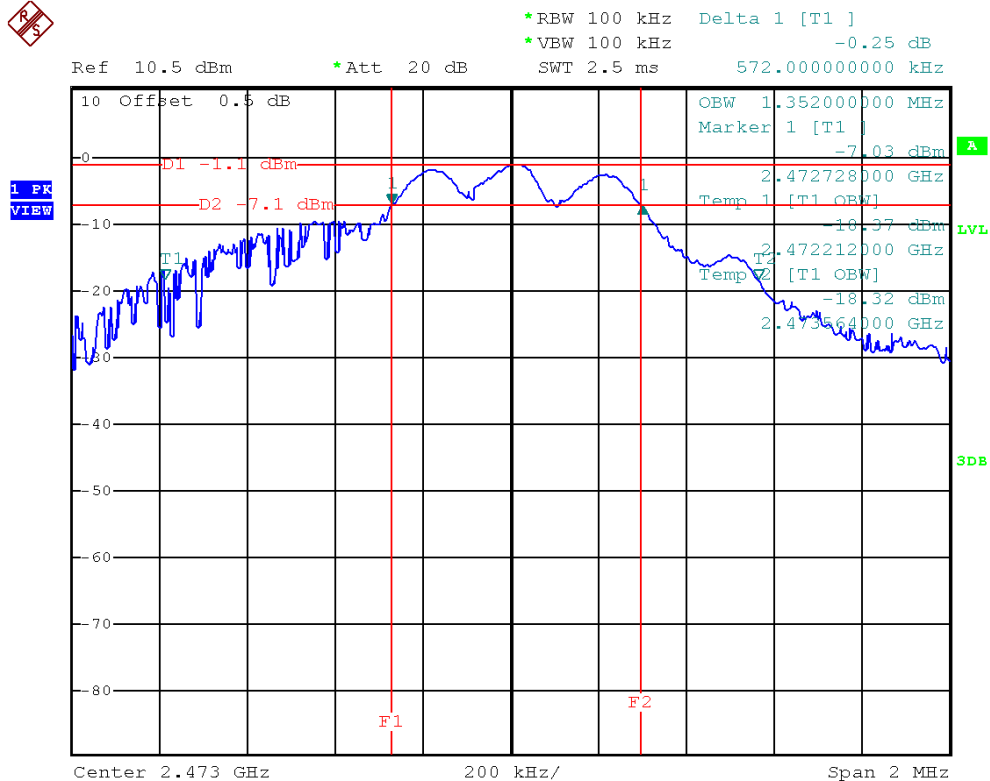
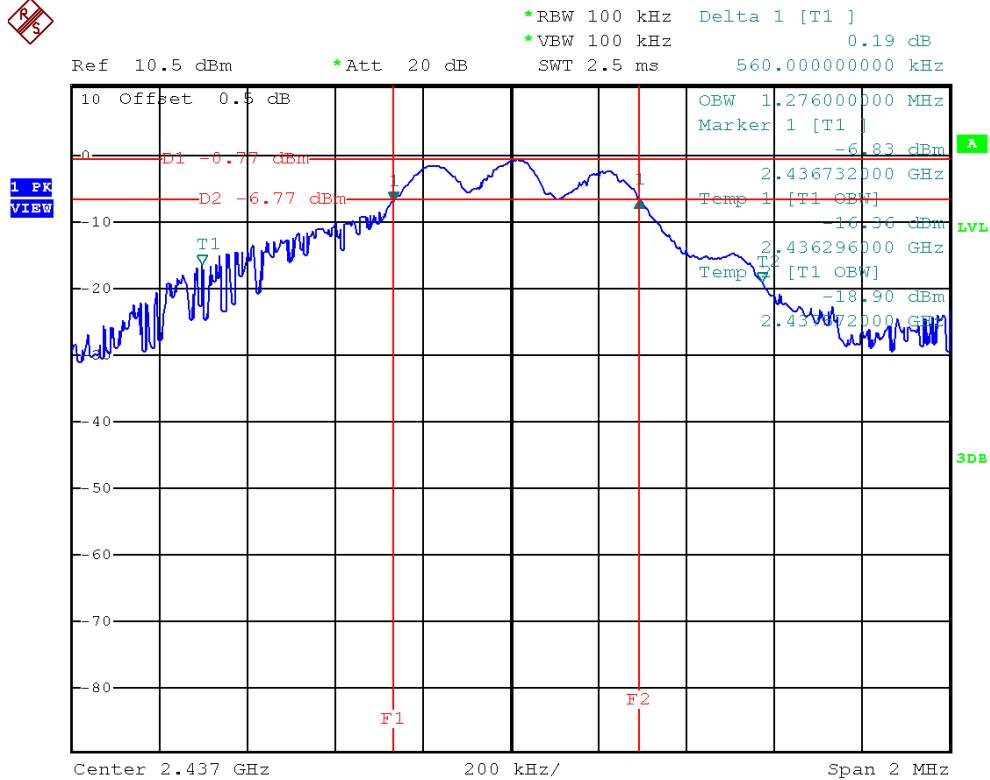
5.1.4 TEST SETUP



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.







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 Sensor	Anritsu	MA2491A	34138	Feb. 17, 2012

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

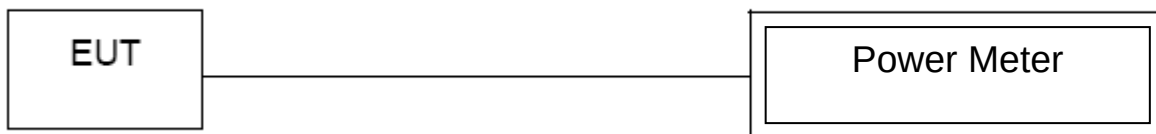
6.1.2 TEST PROCEDURE

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 :	GV-500
Temperature :	26 °C	Relative Humidity :	60%
Test Voltage :	DC 1.5V		
Test Mode :	2407MHz/2437MHz/2473MHz		

Test Channel	Frequency (MHz)	Peak Output Power (dBm)	LIMIT (dBm)	LIMIT (W)
01	2407	0.25	30	1
08	2437	-0.77	30	1
14	2473	-1.10	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	Oct. 06, 2012

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

7.1.2 TEST PROCEDURE

- The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,
- 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.



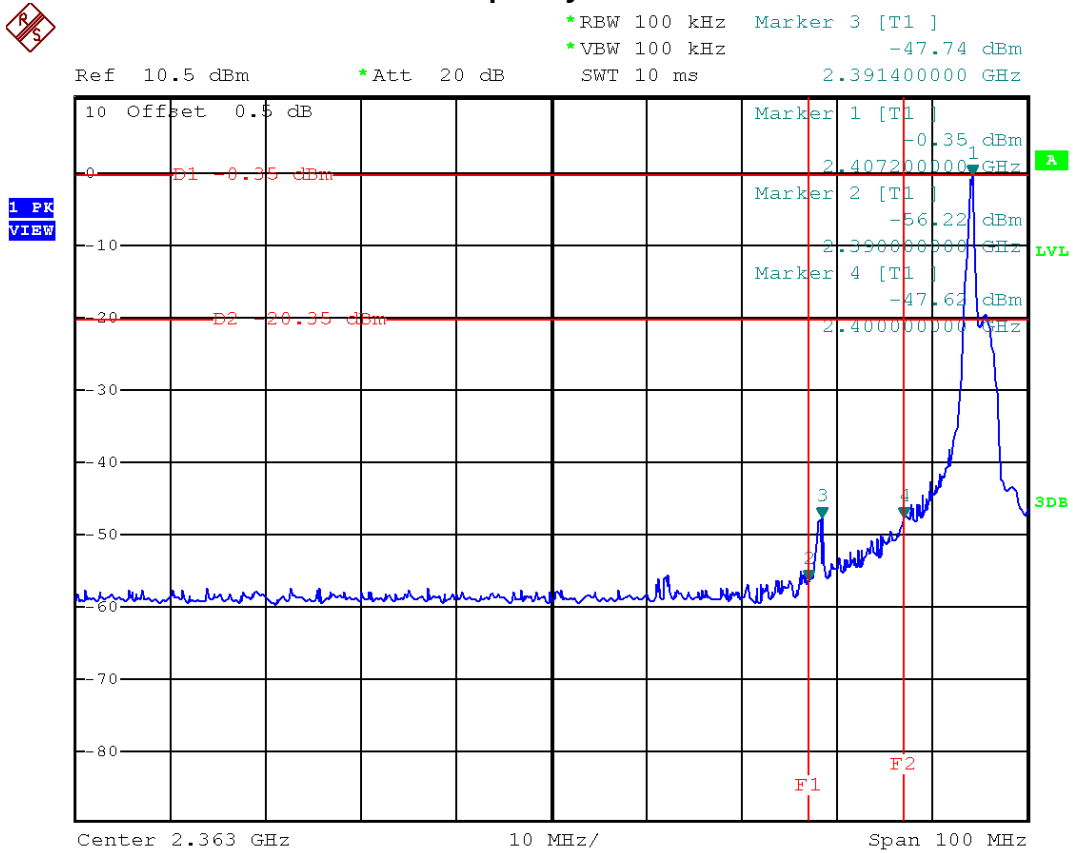
7.1.6 TEST RESULTS

EUT :	2.4G RF Keyboard	Model Name :	GV-500
Temperature :	24 °C	Relative Humidity :	54%
Test Voltage :	DC 1.5V		
Test Mode :	2407MHz/2473MHz		

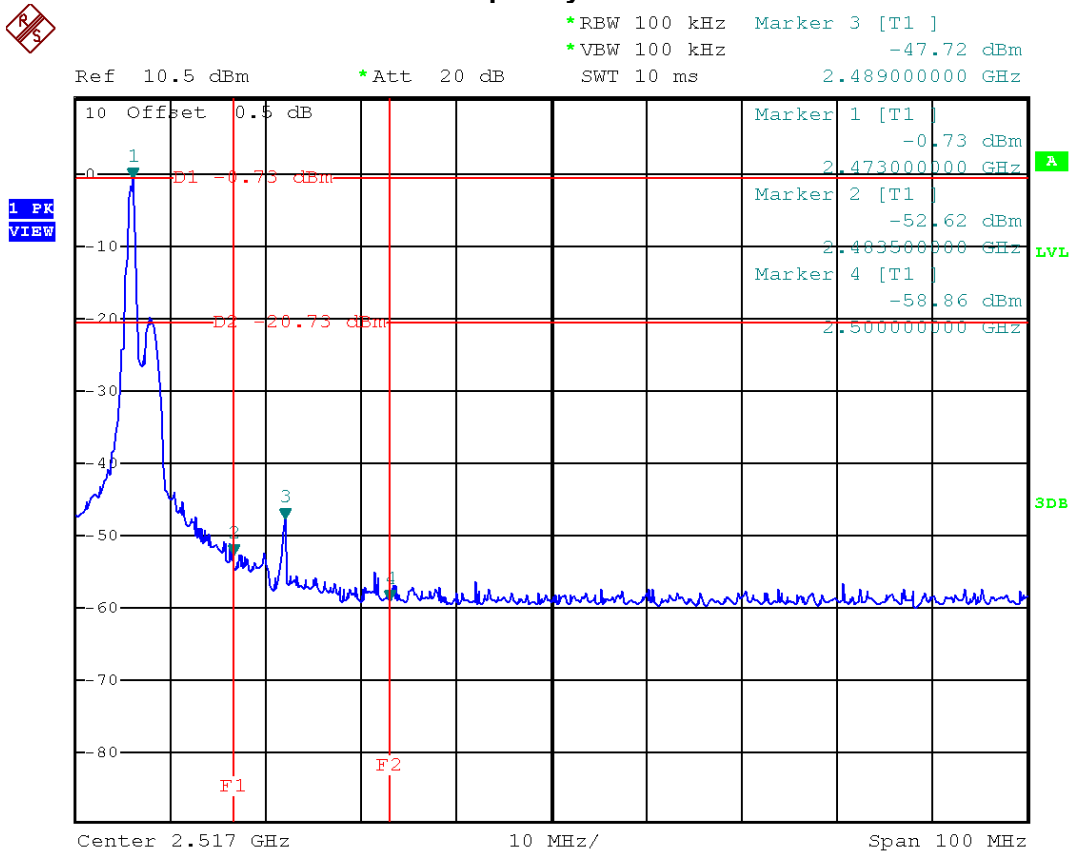
Channel of Worst Data			
The max. radio frequency power in any 100kHz bandwidth outside the frequency band		The max. radio frequency power in any 100 kHz bandwidth within the frequency band.	
FREQUENCY(MHz)	POWER(dBm)	FREQUENCY(MHz)	POWER(dBm)
2391.400	-47.74	2489.000	-47.72
Result			
In any 100kHz bandwidth 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 level of the desired power.			



2407MHz/The max. radio frequency power in any 100kHz bandwidth outside the frequency band

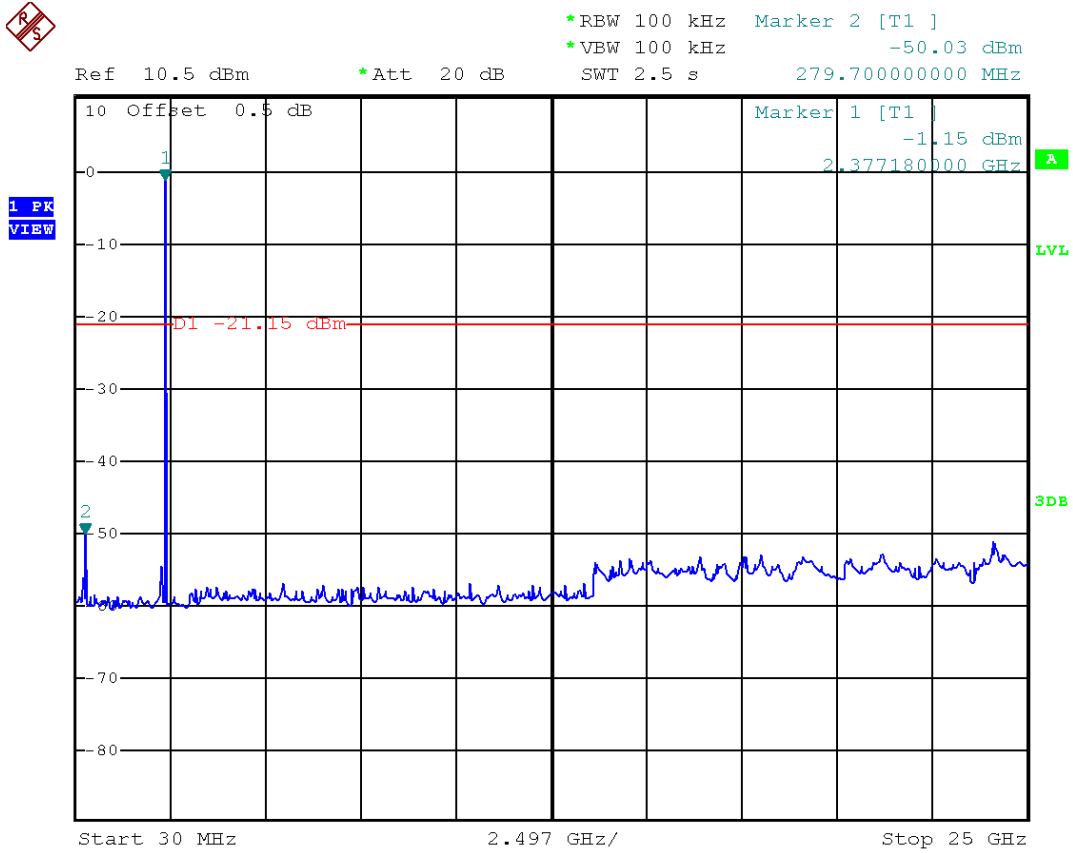


2473MHz/The max. radio frequency power in any 100 kHz bandwidth within the frequency band

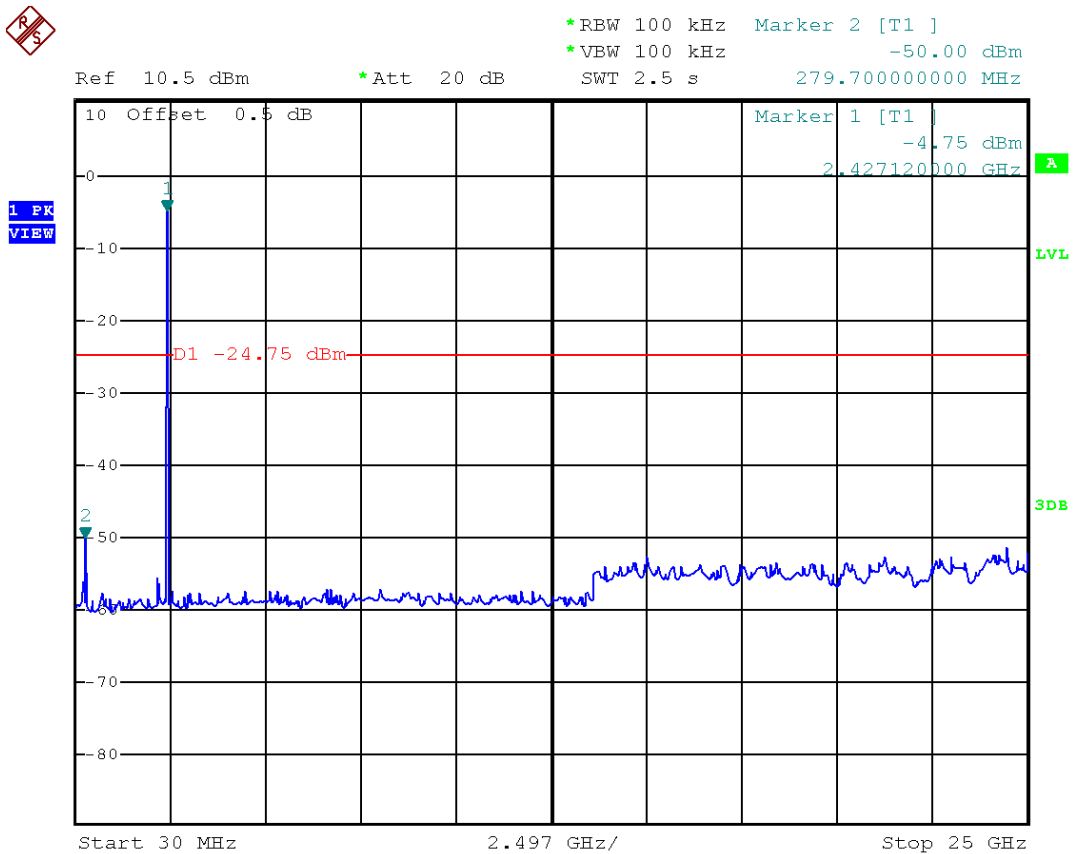




2407MHz/10 Harmonic of the frequency



2437MHz/10 Harmonic of the frequency

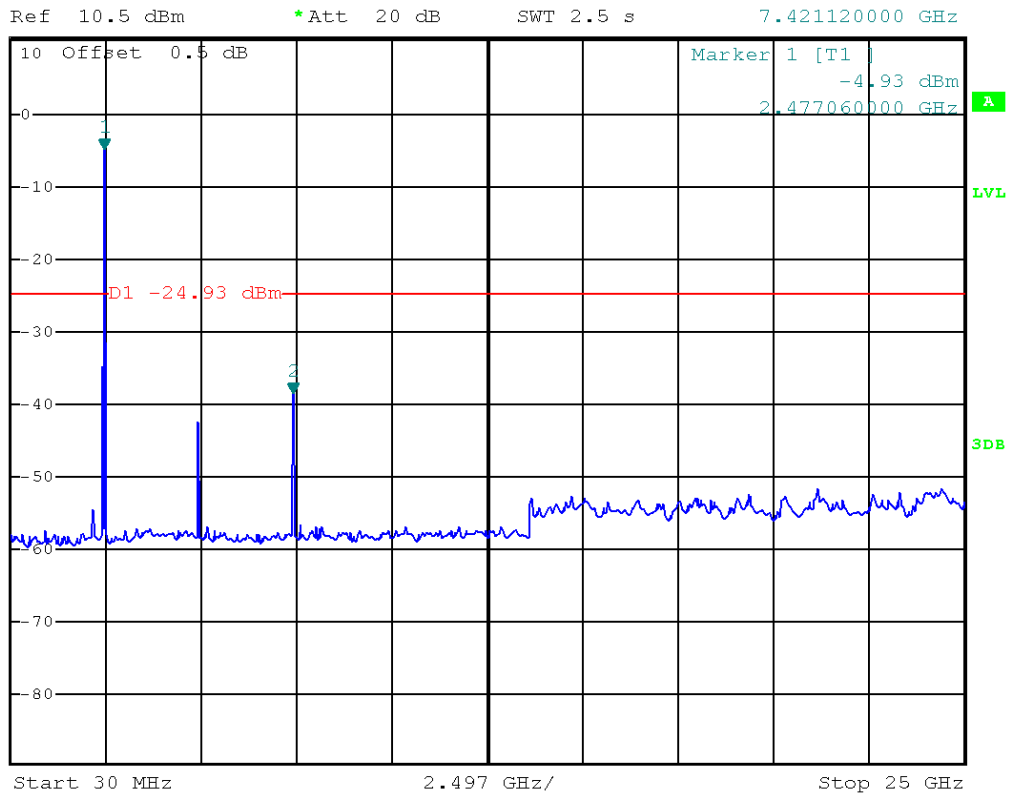




2473MHz/10 Harmonic of the frequency



*RBW 100 kHz Marker 2 [T1]
*VBW 100 kHz -38.45 dBm
SWT 2.5 s 7.421120000 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	Oct. 06, 2012

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

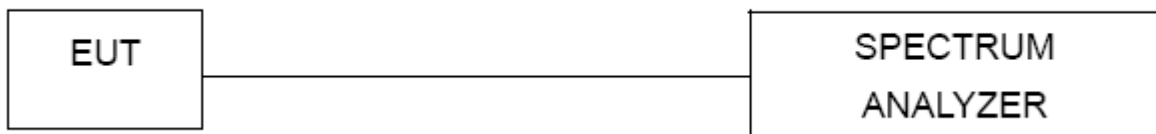
8.1.2 TEST PROCEDURE

- The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,
- 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

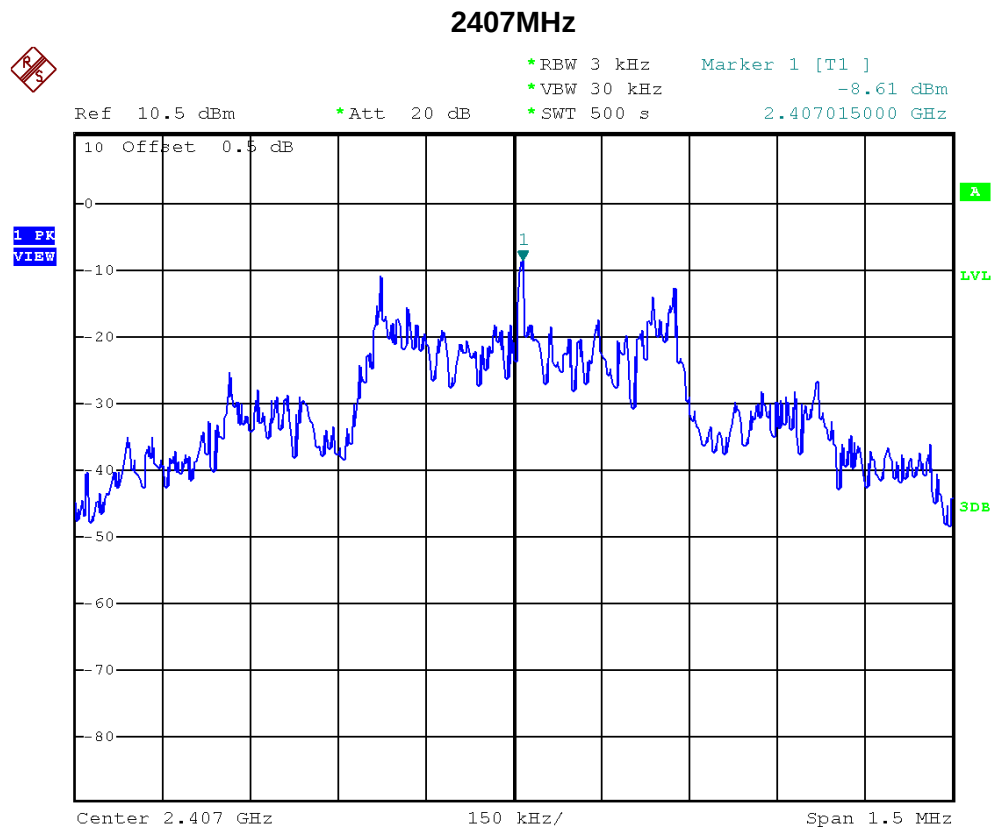
The EUT tested system was configured as the statements of 4.1.6 Unless otherwise a special operating condition is specified in the follows during the testing.



8.1.6 TEST RESULTS

EUT :	2.4G RF Keyboard	Model Name :	GV-500
Temperature :	24 °C	Relative Humidity :	54%
Test Voltage :	DC 1.5V		
Test Mode :	2407MHz/2437MHz/2473MHz		

Test Channel	Frequency (MHz)	Power Density (dBm)	LIMIT (dBm)
01	2407	-8.61	8
08	2437	-9.13	8
14	2473	-9.25	8





2437MHz

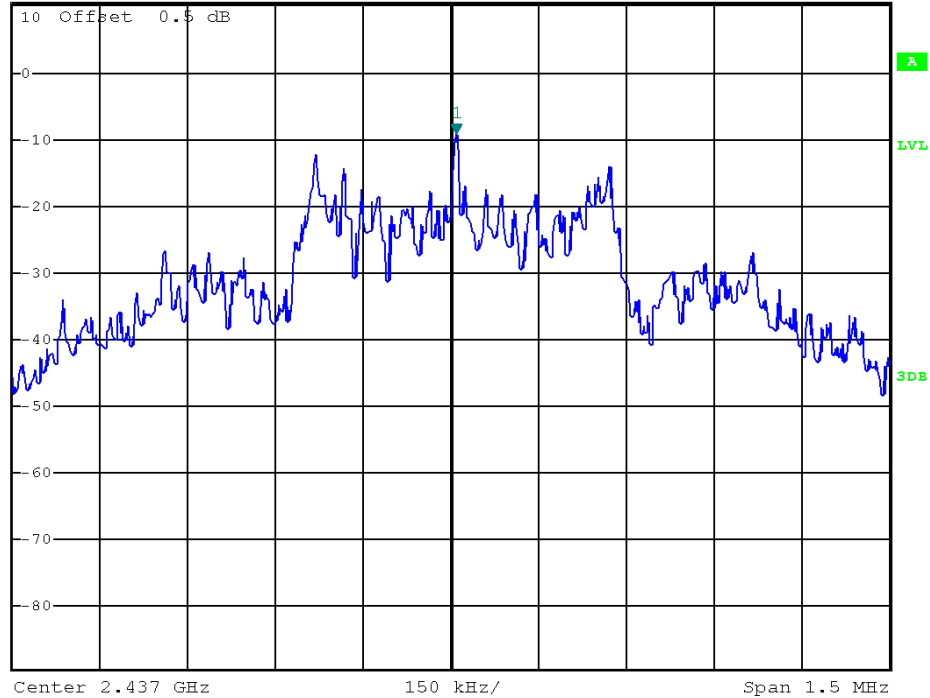


*RBW 3 kHz Marker 1 [T1]
*VBW 30 kHz -9.13 dBm
*SWT 500 s 2.437009000 GHz

Ref 10.5 dBm

*Att 20 dB

1 PK
VIEW



2473MHz

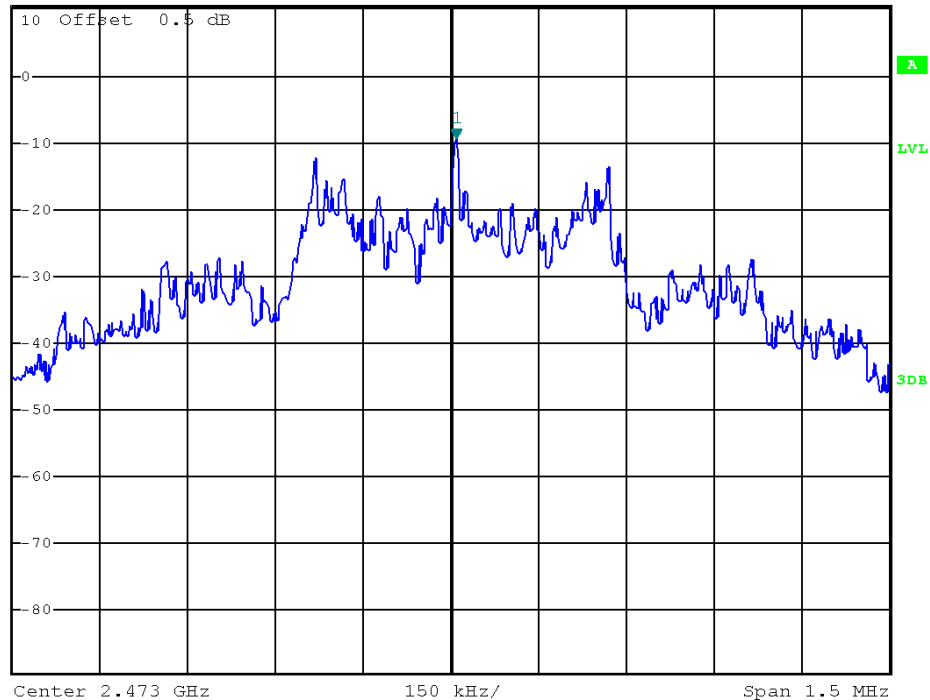


*RBW 3 kHz Marker 1 [T1]
*VBW 30 kHz -9.25 dBm
*SWT 500 s 2.473009000 GHz

Ref 10.5 dBm

*Att 20 dB

1 PK
VIEW





9. RF EXPOSURE TEST

9.1 APPLIED PROCEDURES / LIMIT

Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess limit for maximum permissible exposure.

(A) Limits for Occupational / Controlled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/ cm ²)	Averaging Time E ² , H ² or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842 / f	4.89 / f	(900 / f)*	6
30-300	61.4	0.163	1.0	6
300-1500			F/300	6
1500-100,000			5	6

(B) Limits for General Population / Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/ cm ²)	Averaging Time E ² , H ² or S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f)*	30
30-300	27.5	0.073	0.2	30
300-1500			F/1500	30
1500-100,000			1.0	30

Note: f = frequency in MHz ; *Plane-wave equivalent power density

9.1.1 MEASUREMENT INSTRUMENTS LIST

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Power Meter	Anritsu	ML2487A	6K00004714	Feb. 17, 2012
2	Power Meter Sensor	Anritsu	MA2491A	34138	Feb. 17, 2012

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

9.1.2 MPE CALCULATION METHOD & TEST RESULTS

The power is too low, so no RF calculations are needed.