



Radio Test Report

FCC ID: H8GGK300A1

This report concerns (check one) : Original Grant Class II Change

Issued Date : May 21, 2013
Project No. : 1304224
Equipment : 2.4G RF Keyboard
Model Name : GK-300A; G1000A

Applicant : A-FOUR TECH CO., LTD.
Address : 6F., No.108, Min-Chuan Rd., Xindian
Dist., New Taipei City, Taiwan R.O.C.

Tested by: Neutron Engineering Inc. EMC Laboratory

Date of Receipt: Apr. 26, 2013

Date of Test: Apr. 26, 2013 ~ May 06, 2013

Testing Engineer: Josh Lin
(Josh Lin)

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





Declaration

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REPORT ISSUED HISTORY

Revised Version No.	Description	Issued Date
-	Initial Issue.	May 21, 2013



1 CERTIFICATION

Equipment : 2.4G RF Keyboard

Brand Name : A4TECH

Model Name : GK-300A; G1000A

Applicant : A-FOUR TECH CO., LTD.

Date of Test : Apr. 26, 2013 ~ May 06, 2013

Standards : RSS-210, Issue 8, 2010

FCC Part 15, Subpart C: 2012

ANSI 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-1-1304224) 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

FCC Part 15, Subpart C: 2012		
Standard Clause	Test Item	Result
FCC Part 15, Subpart C		
15.207	Conducted Emission	PASS
15.247 (c)	Antenna conducted Spurious Emission	PASS
15.247 (a)(2)	6 dB Bandwidth	PASS
15.247 (b)	Maximum Peak Conducted Output Power	PASS
15.247 (c)	Radiated Spurious Emission	PASS
15.247 (d)(e)	Power Spectral Density	PASS
15.205	Restricted Bands	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) Portable device; SAR report is required.



2.1 TEST FACILITY

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

Radiated emission Test (Below 1 GHz):

CB08: (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.)

Radiated emission Test (Above 1 GHz):

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 measurement uncertainty is not specified by FCC/Industry Canada rules and for reference only.

The reported uncertainty of measurement $y \pm U$, 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.

A. Radiated emission test:

Test Site	Item	Measurement Frequency Range	Uncertainty	NOTE
CB08	Radiated emission at 3m	Horizontal Polarization	30 - 200MHz	3.35 dB
			200 - 1000MHz	3.11 dB
			1 - 18GHz	3.97 dB
			18 - 40GHz	4.01 dB
	Vertical Polarization	Vertical Polarization	30 - 200MHz	3.22 dB
			200 - 1000MHz	3.24 dB
			1 - 18GHz	4.05 dB
			18 - 40GHz	4.04 dB

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} .

If U_{lab} is less than or equal to U_{CISPR} , then:

- compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.

If U_{lab} is greater than U_{CISPR} , then:

- compliance is deemed to occur if no measured disturbance level, increased by $(U_{lab} - U_{CISPR})$, exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance level, increased by $(U_{lab} - U_{CISPR})$, exceeds the disturbance limit.



3 GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

Equipment	2.4G RF Keyboard													
Brand Name	A4TECH													
Model Name	GK-300A; G1000A													
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 GK-300A was used for final testing and collecting test data included in this report.													
Product Description	<p>The EUT is a 2.4G RF Keyboard.</p> <table border="1"><tr><td>Operation Frequency</td><td>2407 MHz ~2473 MHz</td></tr><tr><td>Modulation Type</td><td>GFSK</td></tr><tr><td>Number Of Channel</td><td>Please refer to the 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>Maximum Peak Conducted Output Power:</td><td>-2.69 dBm</td></tr></table> <p>More details of EUT technical specification, please refer to the User's Manual.</p>		Operation Frequency	2407 MHz ~2473 MHz	Modulation Type	GFSK	Number Of Channel	Please refer to the Note 2.	Antenna Designation	Please refer to the Note 3.	Antenna Gain(Peak)	Please refer to the Note 3.	Maximum Peak Conducted Output Power:	-2.69 dBm
Operation Frequency	2407 MHz ~2473 MHz													
Modulation Type	GFSK													
Number Of Channel	Please refer to the Note 2.													
Antenna Designation	Please refer to the Note 3.													
Antenna Gain(Peak)	Please refer to the Note 3.													
Maximum Peak Conducted Output Power:	-2.69 dBm													
Power Source	Battery supplied.													
Power Rating	I/P: DC 3V													
Connecting I/O Port(s)	Please refer to the User's Manual													
Products Covered	N/A													
EUT Modification(s)	N/A													

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 for Filed Antenna

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)
1	N/A	N/A	Ant. On PCB	N/A	-2.81



3.2 DESCRIPTION OF TEST MODES

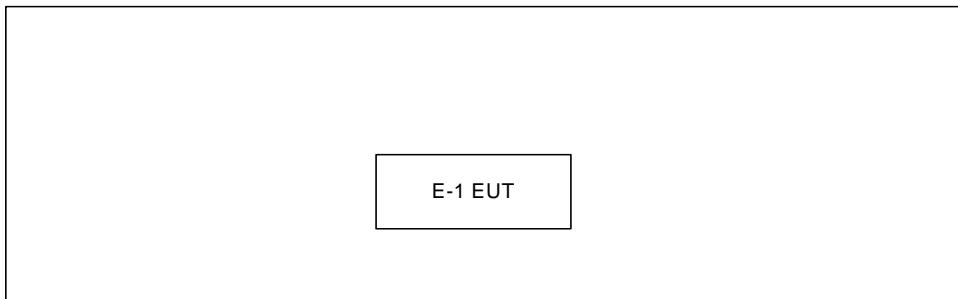
To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration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

Test Items	Mode	Data Rate	Channel	Note
Conducted Emission	GFSK	500 kbps	N/A	
Antenna conducted Spurious Emission	GFSK	500 kbps	01/08/14	
6 dB Bandwidth	GFSK	500 kbps	01/08/14	
Maximum Peak Conducted Output Power	GFSK	500 kbps	01/08/14	
Radiated Spurious Emission (30 MHz to 1 GHz)	GFSK	500 kbps	08	
Radiated Spurious Emission (above 1 GHz)	GFSK	500 kbps	01/08/14	
Restricted Bands	GFSK	500 kbps	01/08/14	
Antenna Requirement	-----	-----	-----	
RF Exposure Compliance	-----	-----	-----	

NOTE: The measurements are performed at the highest, middle, lowest available channels.



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	GK-300A	H8GGK300A1	N/A	EUT

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

NOTE: The support equipment was authorized by Declaration of Conformity (DOC).



4 ANTENNA CONDUCTED SPURIOUS EMISSION

4.1 LIMIT

Test Item	Frequency Range (MHz)	Limit
Antenna conducted Spurious Emission	30-25000	20 dB less than the peak value of fundamental frequency

4.2 MEASUREMENT INSTRUMENTS LIST

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP-40	100129	Aug. 29, 2013

NOTE: **N/A**: denotes No Model Name, No Serial No. or No Calibration specified.

4.3 TEST PROCEDURES

- 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.

4.4 TEST SETUP LAYOUT



4.5 DEVIATION FROM TEST STANDARD

No deviation

4.6 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 operating condition was tested and used to collect the included data.



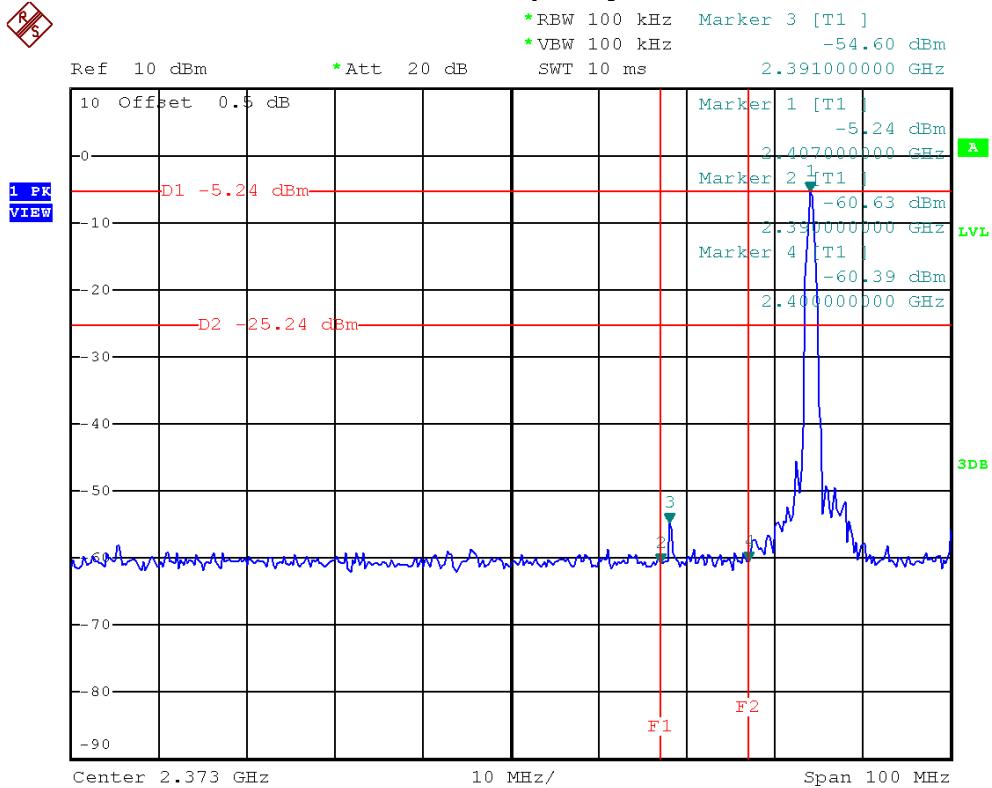
4.7 TEST RESULTS

E.U.T	2.4G RF Keyboard	Model Name	GK-300A
Temperature	26°C	Relative Humidity	46%
Test Voltage	DC 3V		
Test Mode	2407 MHz/2473 MHz		

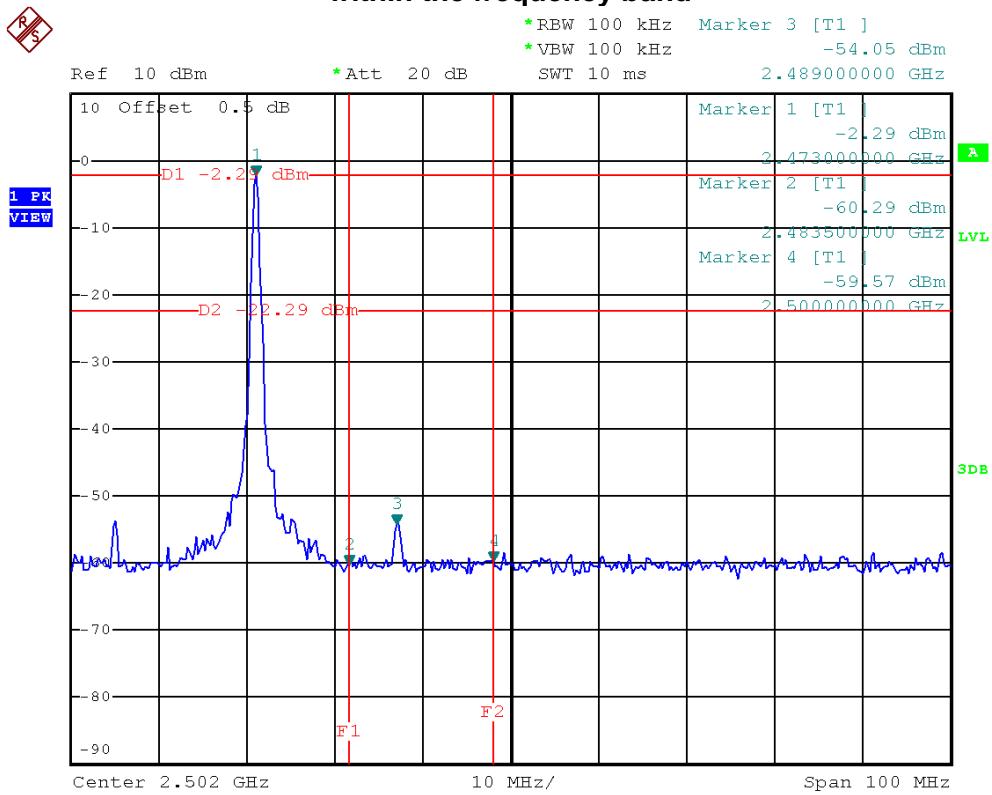
Channel of Worst Data			
The max. radio frequency power in any 100kHz bandwidth outside the frequency band		The max. radio frequency power in any 100 kHz bandwidth within the frequency band.	
FREQUENCY(MHz)	POWER(dBm)	FREQUENCY(MHz)	POWER(dBm)
2391.00	-54.60	2489.00	-54.05
Result			
In any 100kHz bandwidth 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.			



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

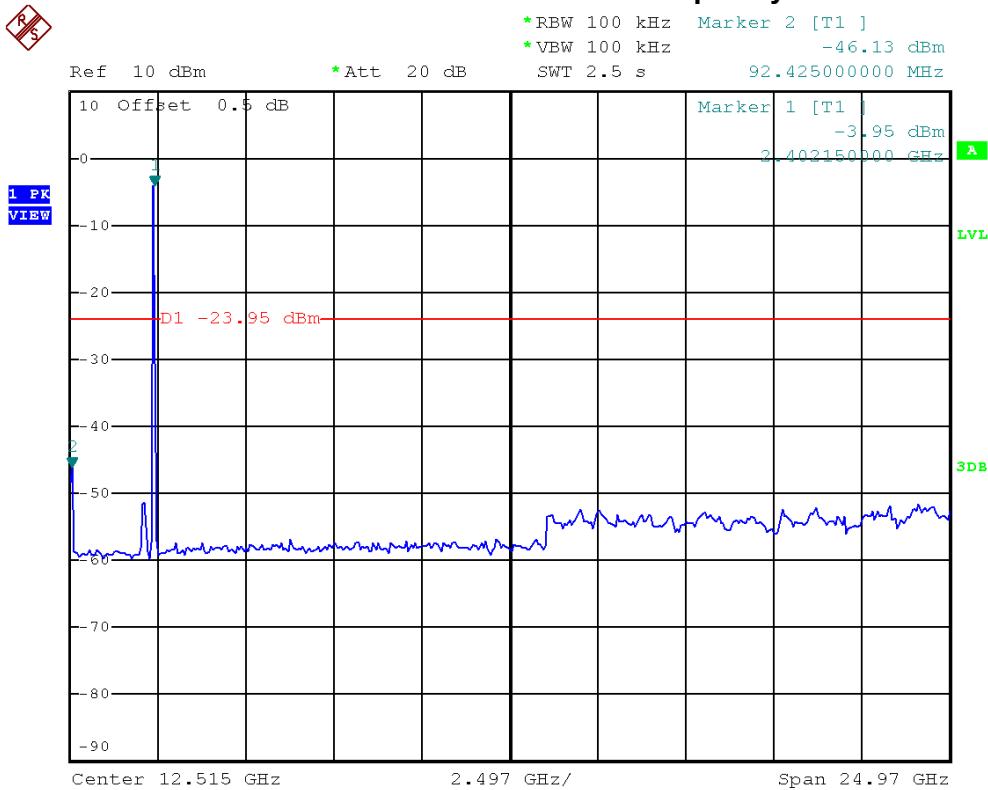


The max. radio frequency power in any 100 kHz bandwidth within the frequency band

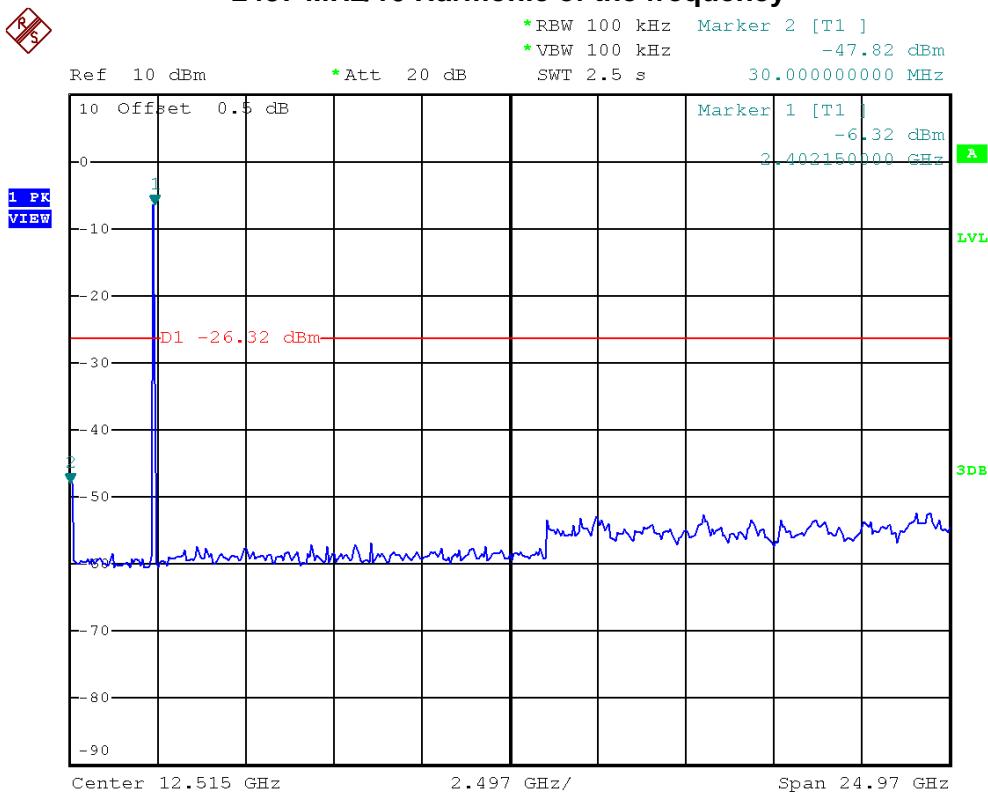




2407 MHz/10 Harmonic of the frequency

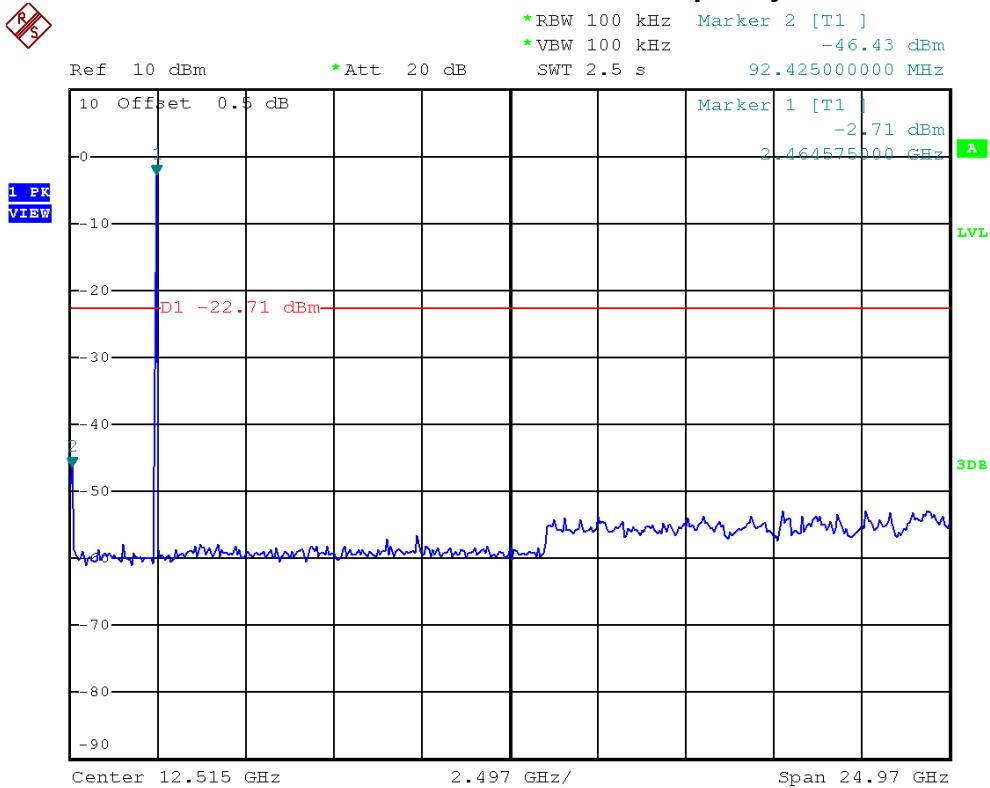


2437 MHz/10 Harmonic of the frequency





2473 MHz/10 Harmonic of the frequency





5.6 DB BANDWIDTH

5.1 LIMIT

Test Item	Frequency Range (MHz)	Limit
Bandwidth	2400-2483.5	>= 500KHz (6 dB bandwidth)

5.2 MEASUREMENT INSTRUMENTS LIST

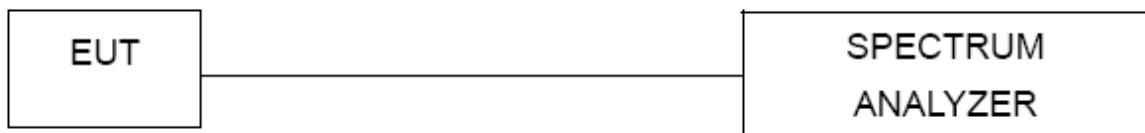
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP-40	100129	Aug. 29, 2013

NOTE: **N/A**: denotes No Model Name, No Serial No. or No Calibration specified.

5.3 TEST PROCEDURES

- 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.

5.4 TEST SETUP LAYOUT



5.5 DEVIATION FROM TEST STANDARD

No deviation

5.6 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of 4.6 Unless otherwise a special operating condition is specified in the follows during the testing.

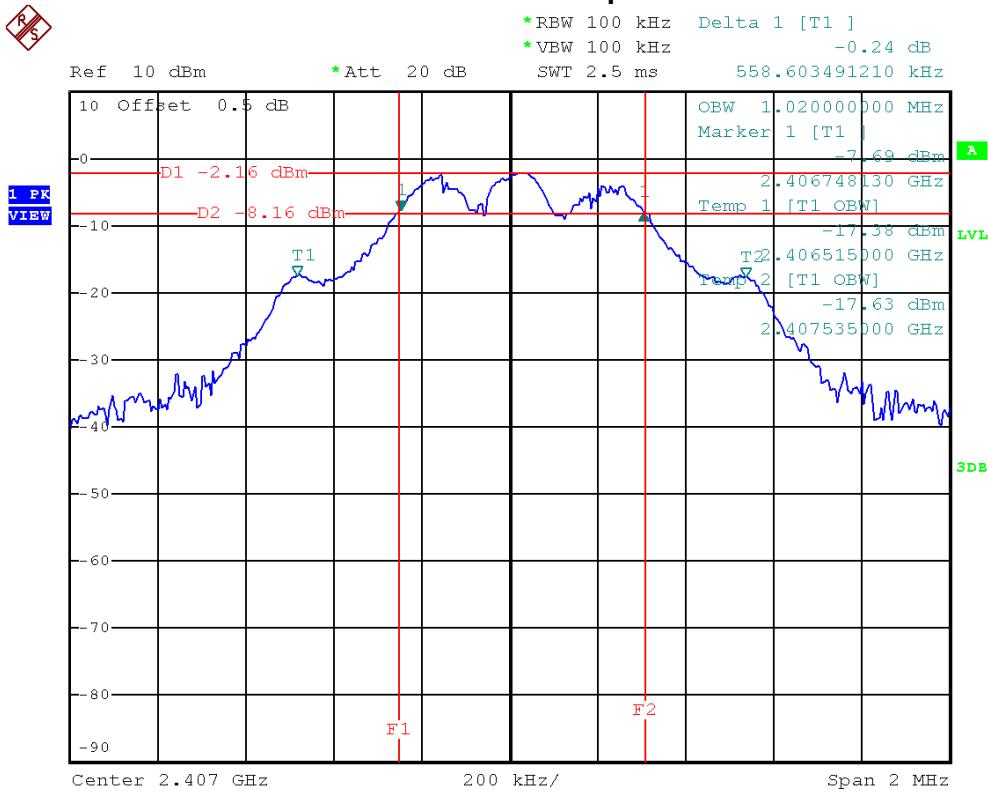


5.7 TEST RESULTS

E.U.T	2.4G RF Keyboard	Model Name	GK-300A
Temperature	26°C	Relative Humidity	46%
Test Voltage	DC 3V		
Test Mode	2407 MHz, 2437 MHz, 2473 MHz		

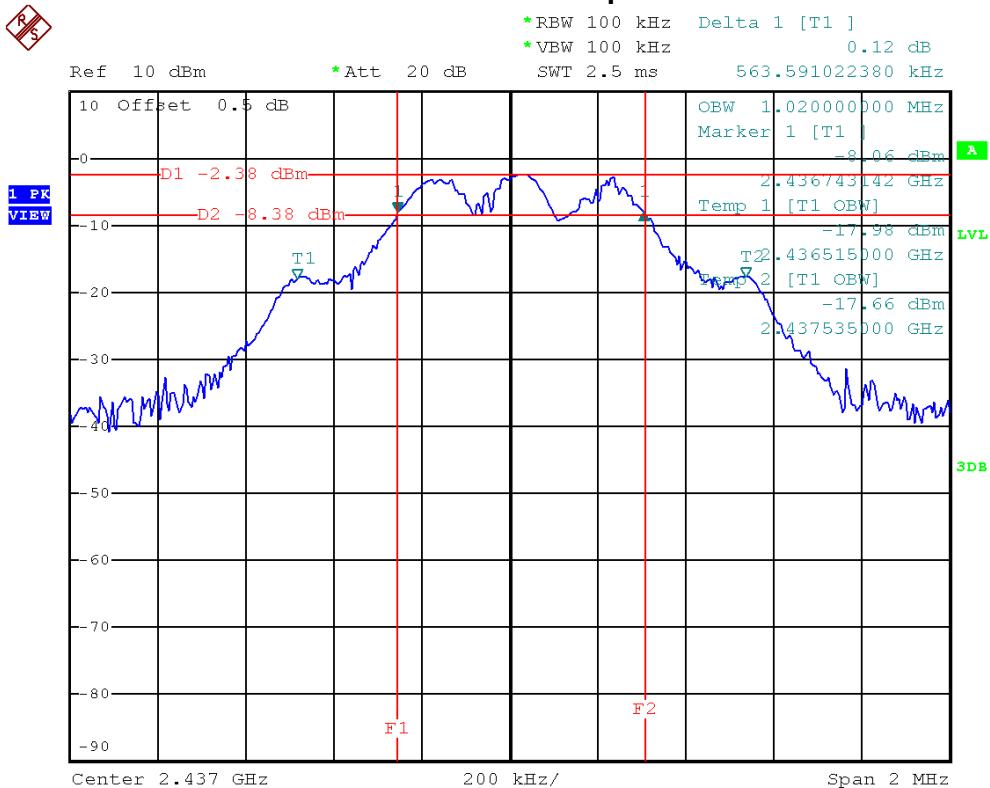
Frequency	6 dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Limit	Result
2407 MHz	0.56	1.02	>=500 kHz	PASS
2437 MHz	0.56	1.02	>=500 kHz	PASS
2473 MHz	0.56	1.03	>=500 kHz	PASS

2407 MHz/6 dB and 99% Occupied Bandwidth

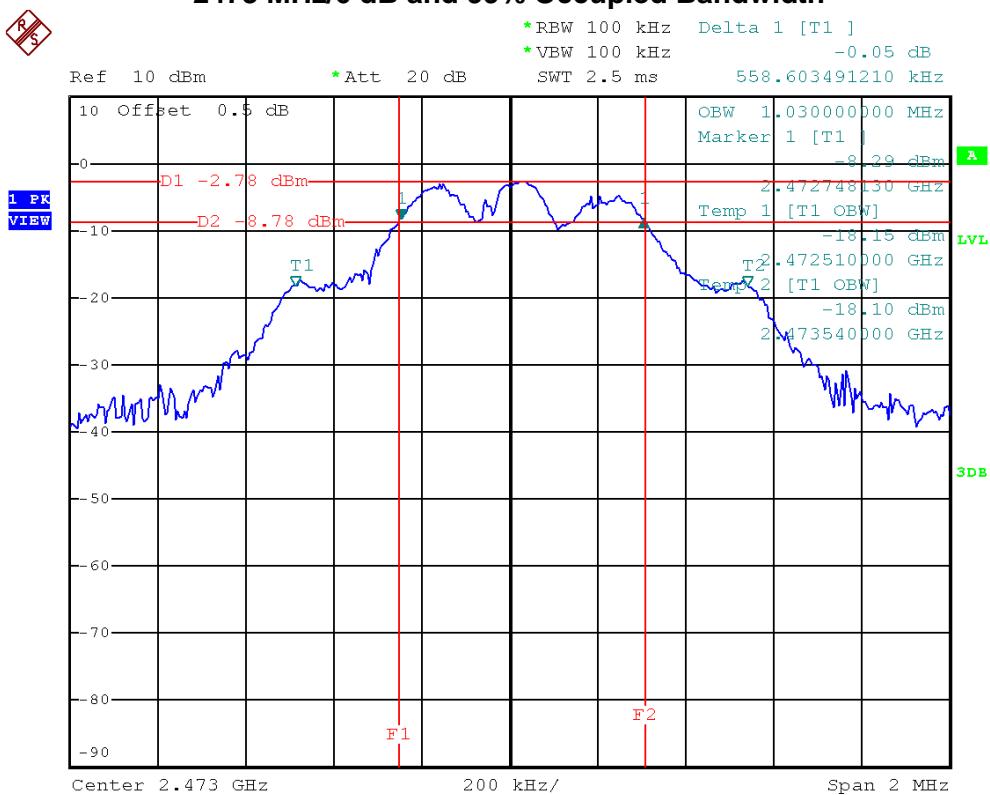




2437 MHz/6 dB and 99% Occupied Bandwidth



2473 MHz/6 dB and 99% Occupied Bandwidth





6 MAXIMUM PEAK CONDUCTED OUTPUT POWER

6.1 LIMIT

Test Item	Frequency Range (MHz)	Limit
Maximum Peak Conducted Output Power	2400-2483.5	1 watt or 30 dBm

6.2 MEASUREMENT INSTRUMENTS LIST

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Power Meter	Anritsu	ML2495A	1128008	Feb,26,2014
2	Power Meter Sensor	Anritsu	MA2411B	1126001	Feb,26,2014

NOTE: **N/A**: denotes No Model Name, No Serial No. or No Calibration specified.

6.3 TEST PROCEDURES

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

6.4 TEST SETUP LAYOUT



6.5 DEVIATION FROM TEST STANDARD

No deviation

6.6 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of 4.6 Unless otherwise a special operating condition is specified in the follows during the testing.



6.7 TEST RESULTS

E.U.T	2.4G RF Keyboard	Model Name	GK-300A
Temperature	26°C	Relative Humidity	46%
Test Voltage	DC 3V		
Test Mode	2407 MHz, 2437 MHz, 2473 MHz		

Frequency	Peak Output Power (dBm)	LIMIT (dBm)	Result
2407 MHz	-2.69	30	PASS
2437 MHz	-3.26	30	PASS
2473 MHz	-3.22	30	PASS

**7 RADIATED SPURIOUS EMISSION (9 KHZ TO 1 GHZ)****7.1 LIMIT**

20 dB 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.

Frequency Range: 9 kHz to 1 GHz		
FREQUENCY (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

Frequency Range: above 1 GHz				
FREQUENCY (MHz)	Class A (dBuV/m) (at 3m)		Class B (dBuV/m) (at 3m)	
	PEAK	AVERAGE	PEAK	AVERAGE
above 1 GHz	80	60	74	54

NOTE:

1. The limit for radiated test was performed according to FCC PART 15B.

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



7.2 MEASUREMENT INSTRUMENTS LIST

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP-40	100129	Aug. 29, 2013
2	Horn Antenna	Schwarzbeck	BBHA 9120	D-325	Apr. 15, 2014
3	Microwave Pre_amplifier	Agilent	8449B	3008A01714	Apr. 16, 2014
4	Microflex Cable	N/A	N/A	1m	May. 14, 2013
5	Microflex Cable	AISI	S104-SMAP-1	10m	May. 14, 2013
6	Microflex Cable	N/A	N/A	3m	May. 14, 2013
7	Test Cable	N/A	LMR-400	966_12m	May. 15, 2013
8	Test Cable	N/A	LMR-400	966_3m	May. 15, 2013
9	Pre-Amplifier	EMC	EMC-330	980088	Jul. 7, 2013
10	Log-Bicon Antenna	Schwarzbeck	VULB9168-352	9168-352	Jun. 12, 2013

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

7.3 MEASURING INSTRUMENTS SETTING

EMI Test Receiver	Parameter Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP



7.4 TEST PROCEDURES

- a. The measuring distance of at 3 m shall be used for measurements at frequency up to 1 GHz. For frequencies above 1 GHz, 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 Semi-anechoic chamber. 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.
- g. The testing follows the guidelines in ANSI C63.4 and FCC Public Notice DA 00-705 Measurement Guidelines. In case the emission is fail due to the used RBW/VBW is too wide, marker-delta method of FCC Public Notice DA 00-705 will be followed.

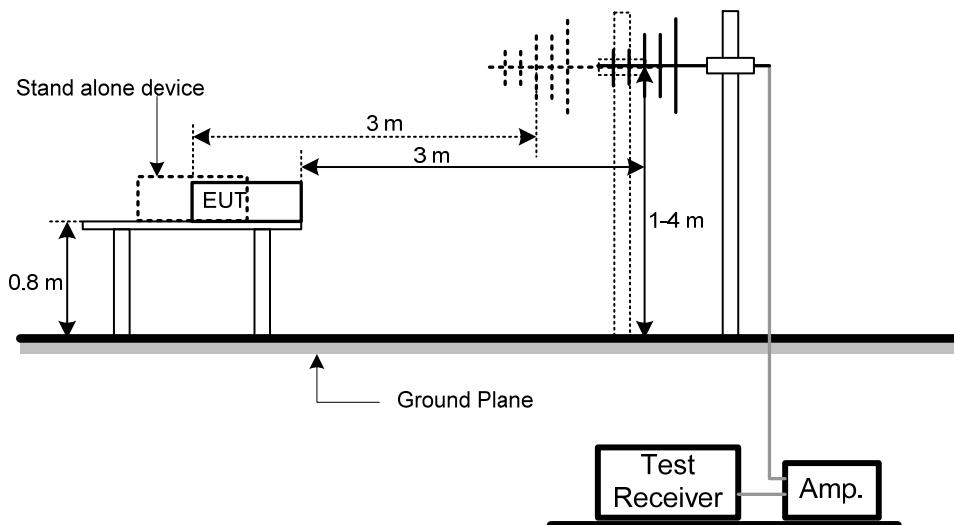
NOTE:

- 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=100 kHz, VBW =100 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.

7.5 DEVIATION FROM TEST STANDARD

No deviation

7.6 TEST SETUP LAYOUT





7.7 EUT OPERATING CONDITIONS

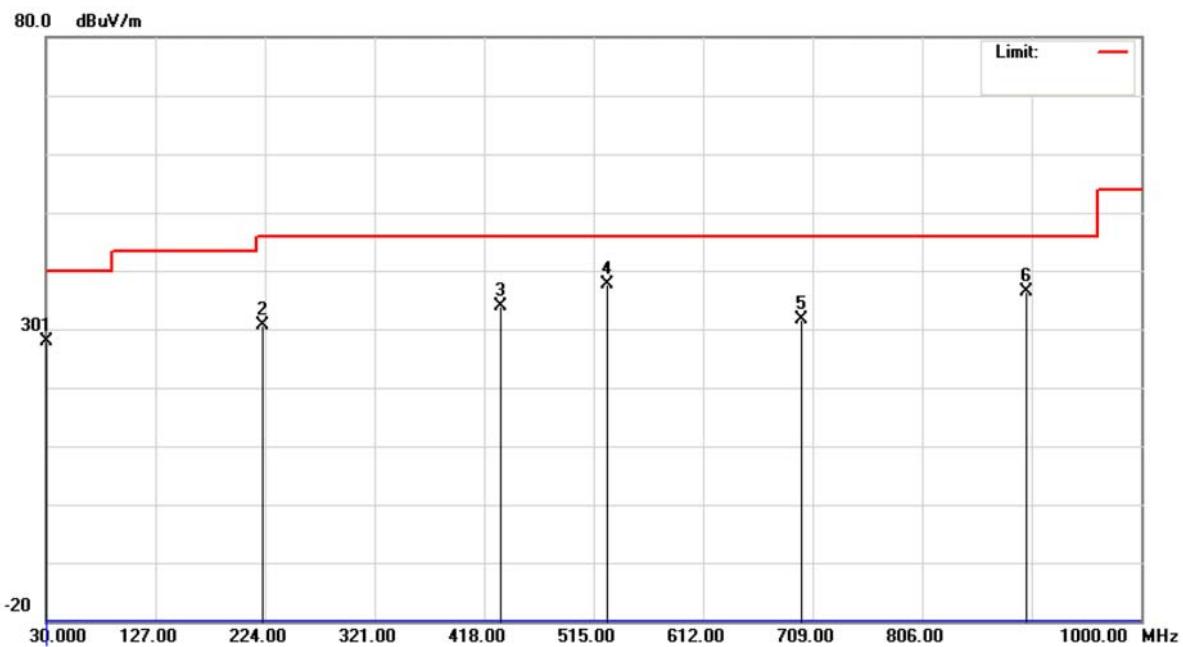
The EUT tested system was configured as the statements of 4.6 Unless otherwise a special operating condition is specified in the follows during the testing.



7.8 TEST RESULTS

E.U.T	2.4G RF Keyboard	Model Name	GK-300A
Temperature	26°C	Relative Humidity	60%
Test Voltage	DC 3V		
Test Mode	2437 MHz		

Polarization: Vertical

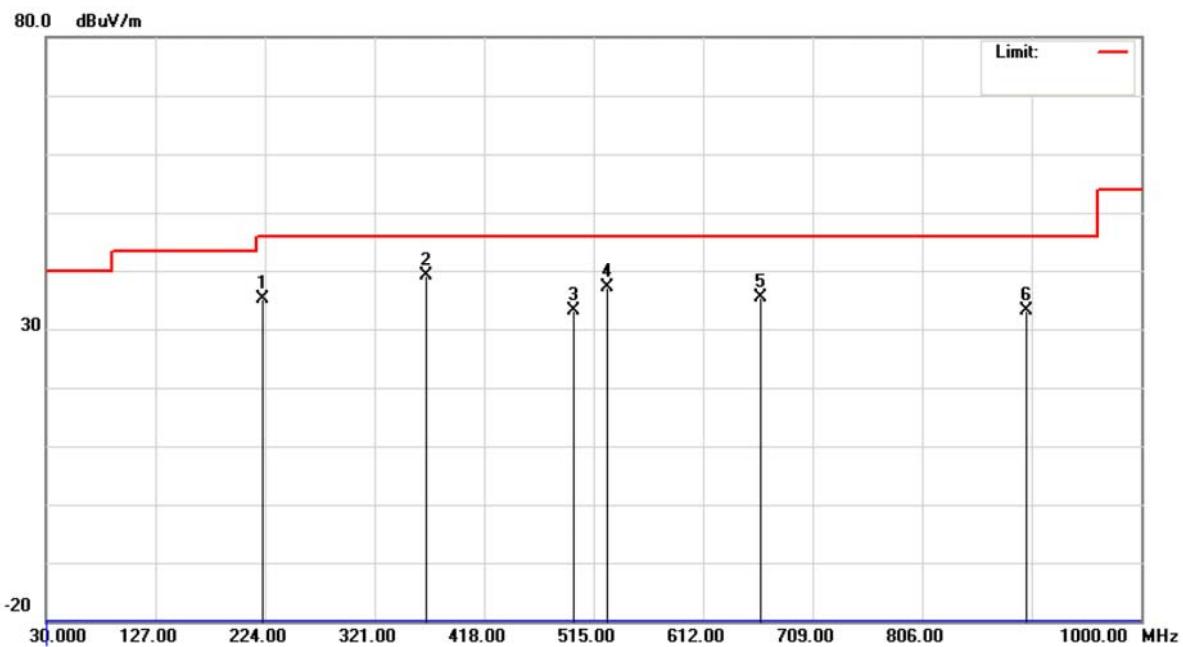


No. Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over		
						Detector	Comment	
1	30.0000	47.59	-19.79	27.80	40.00	-12.20	peak	
2	221.5749	51.99	-21.36	30.63	46.00	-15.37	peak	
3	432.5499	48.87	-14.95	33.92	46.00	-12.08	peak	
4 *	527.1250	50.61	-13.08	37.53	46.00	-8.47	peak	
5	699.2999	41.46	-9.93	31.53	46.00	-14.47	peak	
6	898.1500	43.25	-6.80	36.45	46.00	-9.55	peak	



E.U.T	2.4G RF Keyboard	Model Name	GK-300A
Temperature	26°C	Relative Humidity	60%
Test Voltage	DC 3V		
Test Mode	2437 MHz		

Polarization: Horizontal



No. Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over		
						Detector	Comment	
1	221.5749	56.37	-21.36	35.01	46.00	-10.99	peak	
2 *	367.0750	55.65	-16.64	39.01	46.00	-6.99	peak	
3	498.0249	46.65	-13.59	33.06	46.00	-12.94	peak	
4	527.1250	50.28	-13.08	37.20	46.00	-8.80	peak	
5	662.9249	45.46	-10.17	35.29	46.00	-10.71	peak	
6	898.1500	40.00	-6.80	33.20	46.00	-12.80	peak	

**8 RADIATED SPURIOUS EMISSION (ABOVE 1 GHZ)****8.1 LIMIT**

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.

Frequency Range: 9 kHz to 1 GHz		
FREQUENCY (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

Frequency Range: above 1 GHz				
FREQUENCY (MHz)	Class A (dBuV/m) (at 3m)		Class B (dBuV/m) (at 3m)	
	PEAK	AVERAGE	PEAK	AVERAGE
above 1 GHz	80	60	74	54

NOTE:

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

(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



8.2 MEASUREMENT INSTRUMENTS LIST

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP-40	100129	Aug. 29, 2013
2	Horn Antenna	Schwarzbeck	BBHA 9120	D-325	Apr. 15, 2014
3	Microwave Pre_amplifier	Agilent	8449B	3008A01714	Apr. 16, 2014
4	Microflex Cable	N/A	N/A	1m	May. 14, 2013
5	Microflex Cable	AISI	S104-SMAP-1	10m	May. 14, 2013
6	Microflex Cable	N/A	N/A	3m	May. 14, 2013
7	Test Cable	N/A	LMR-400	966_12m	May. 15, 2013
8	Test Cable	N/A	LMR-400	966_3m	May. 15, 2013
9	Pre-Amplifier	EMC	EMC-330	980088	Jul. 7, 2013
10	Log-Bicon Antenna	Schwarzbeck	VULB9168-352	9168-352	Jun. 12, 2013

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

8.3 MEASURING INSTRUMENTS SETTING

Spectrum Analyzer	Parameter Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RB / VB (emission in restricted band)	1MHz / 1MHz for Peak, 1 MHz / 10Hz for Average
RB / VB (other emission)	1MHz / 1MHz for Peak, 1 MHz / 10Hz for Average



8.4 TEST PROCEDURES

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3m Semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. 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.
- c. 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.
- d. 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.
- e. For the actual test configuration, please refer to the related Item –EUT Test Photos.
- f. The testing follows the guidelines in ANSI C63.4 and FCC Public Notice DA 00-705 Measurement Guidelines. In case the emission is fail due to the used RBW/VBW is too wide, marker-delta method of FCC Public Notice DA 00-705 will be followed.

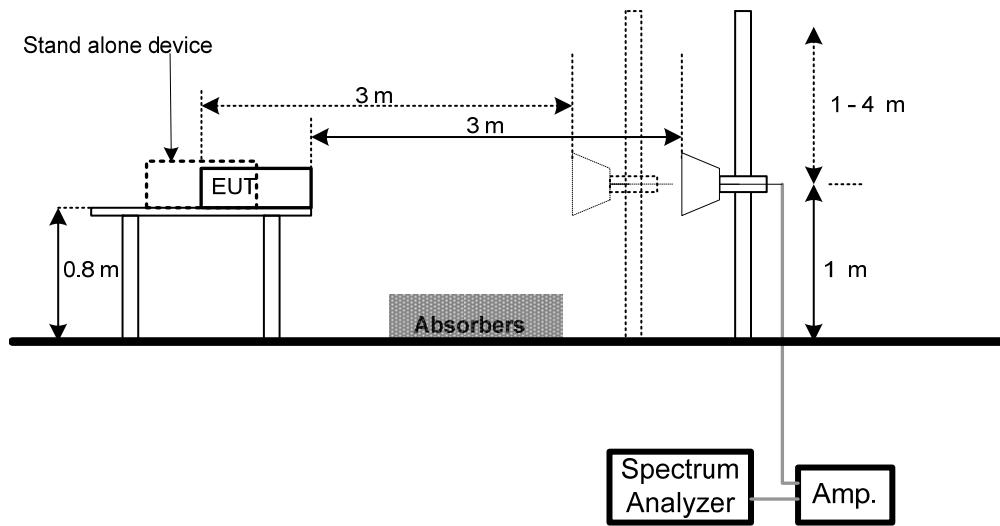
NOTE:

- 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 AVG 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.

8.5 DEVIATION FROM TEST STANDARD

No deviation

8.6 TEST SETUP LAYOUT





8.7 EUT OPERATING CONDITIONS

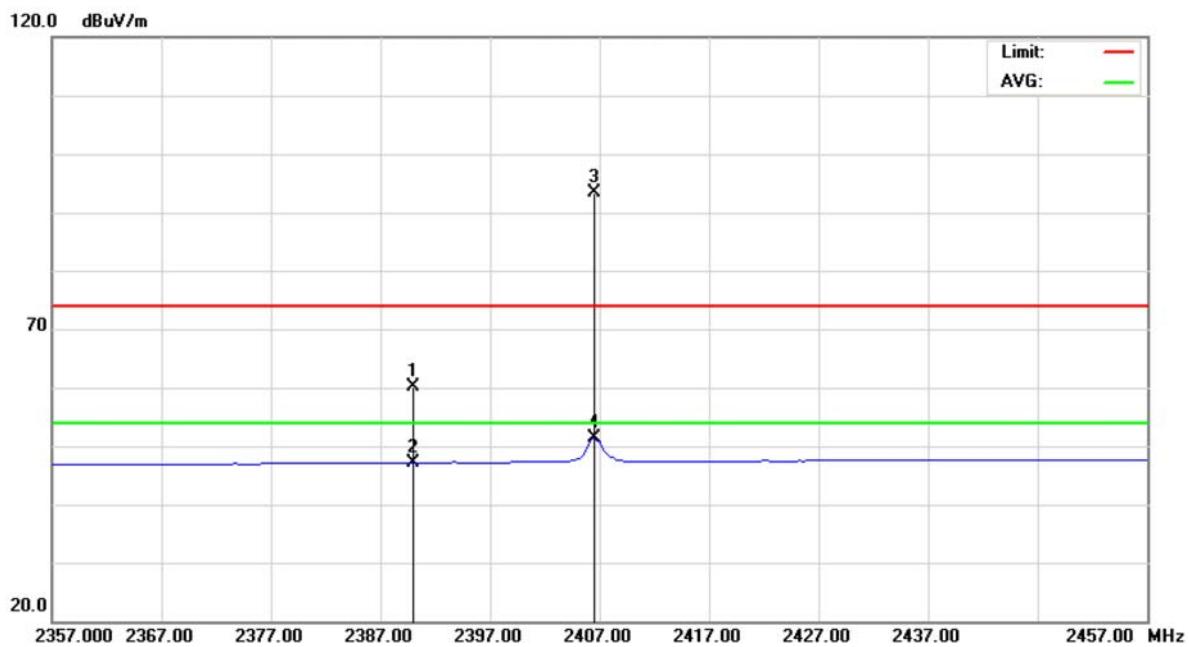
The EUT tested system was configured as the statements of 4.6 Unless otherwise a special operating condition is specified in the follows during the testing.



8.8 TEST RESULTS

E.U.T	2.4G RF Keyboard	Model Name	GK-300A
Temperature	26°C	Relative Humidity	60%
Test Voltage	DC 3V		
Test Mode	2407 MHz		

Polarization: Vertical

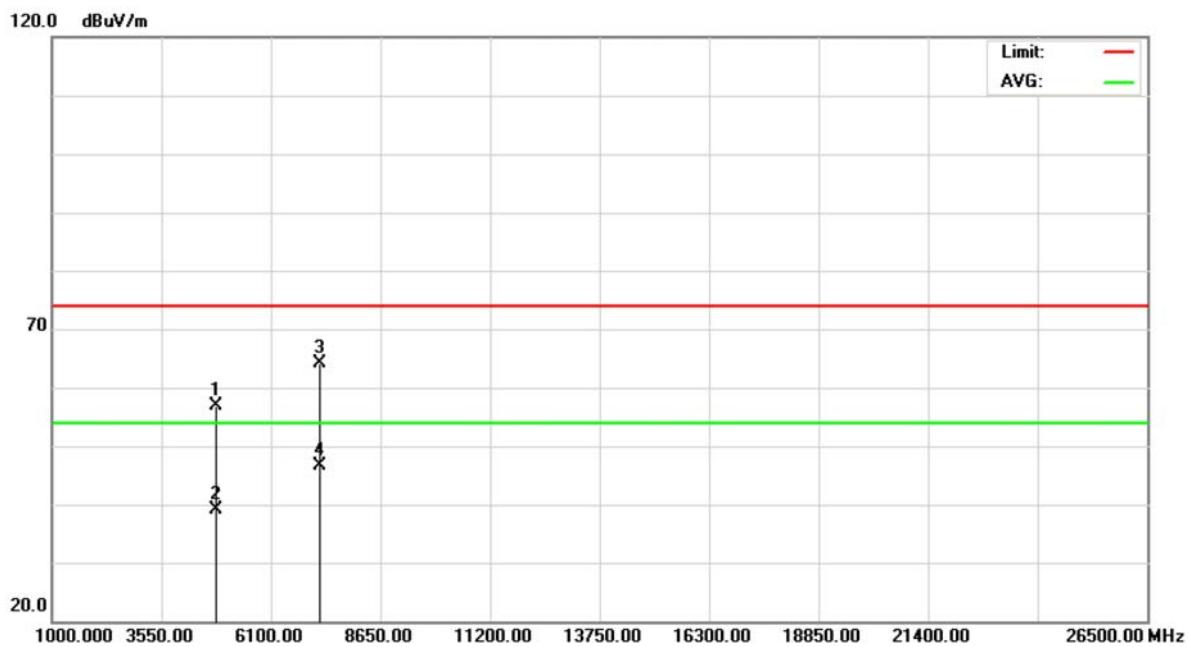


No. Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over		Comment					
						MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	2390.000	26.29	33.90	60.19	74.00	-13.81	peak						
2	2390.000	13.23	33.90	47.13	54.00	-6.87	AVG						
3 *	2406.500	59.32	33.97	93.29	74.00	19.29	peak						
4	2406.500	17.33	33.97	51.30	54.00	-2.70	AVG						



E.U.T	2.4G RF Keyboard	Model Name	GK-300A
Temperature	26°C	Relative Humidity	60%
Test Voltage	DC 3V		
Test Mode	2407 MHz		

Polarization: Vertical

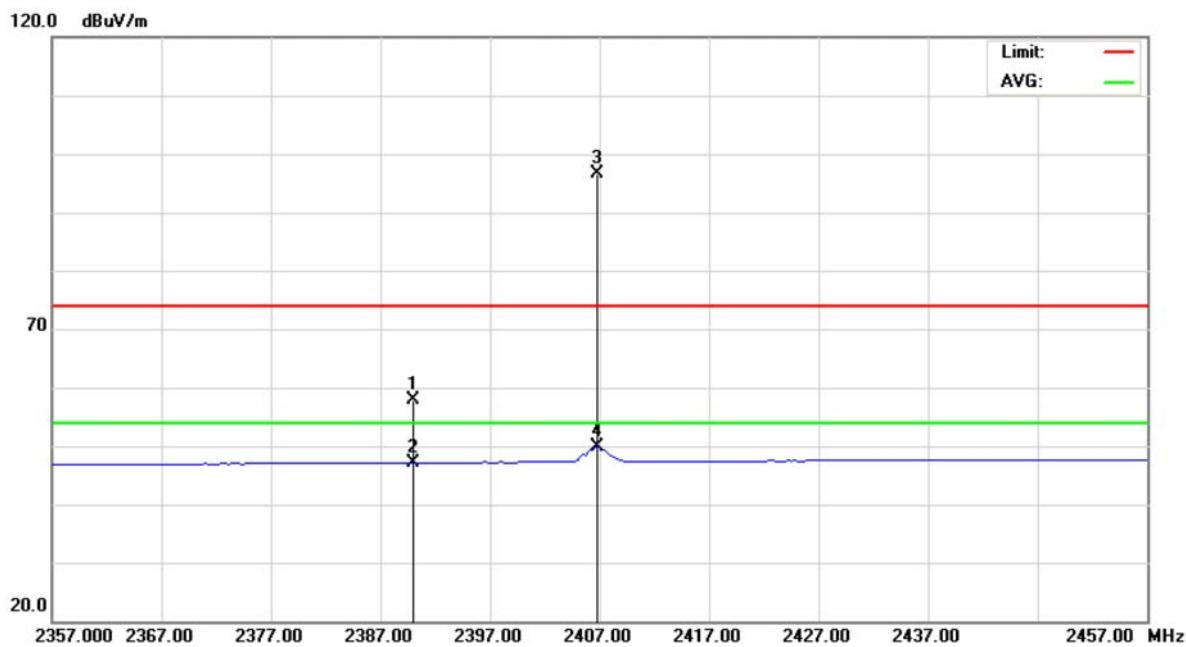


No. Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over	
						Detector	Comment
1	4812.938	48.54	8.34	56.88	74.00	-17.12	peak
2	4812.938	30.83	8.34	39.17	54.00	-14.83	AVG
3	7219.475	48.02	16.14	64.16	74.00	-9.84	peak
4 *	7219.475	30.46	16.14	46.60	54.00	-7.40	AVG



E.U.T	2.4G RF Keyboard	Model Name	GK-300A
Temperature	26°C	Relative Humidity	60%
Test Voltage	DC 3V		
Test Mode	2407 MHz		

Polarization: Horizontal

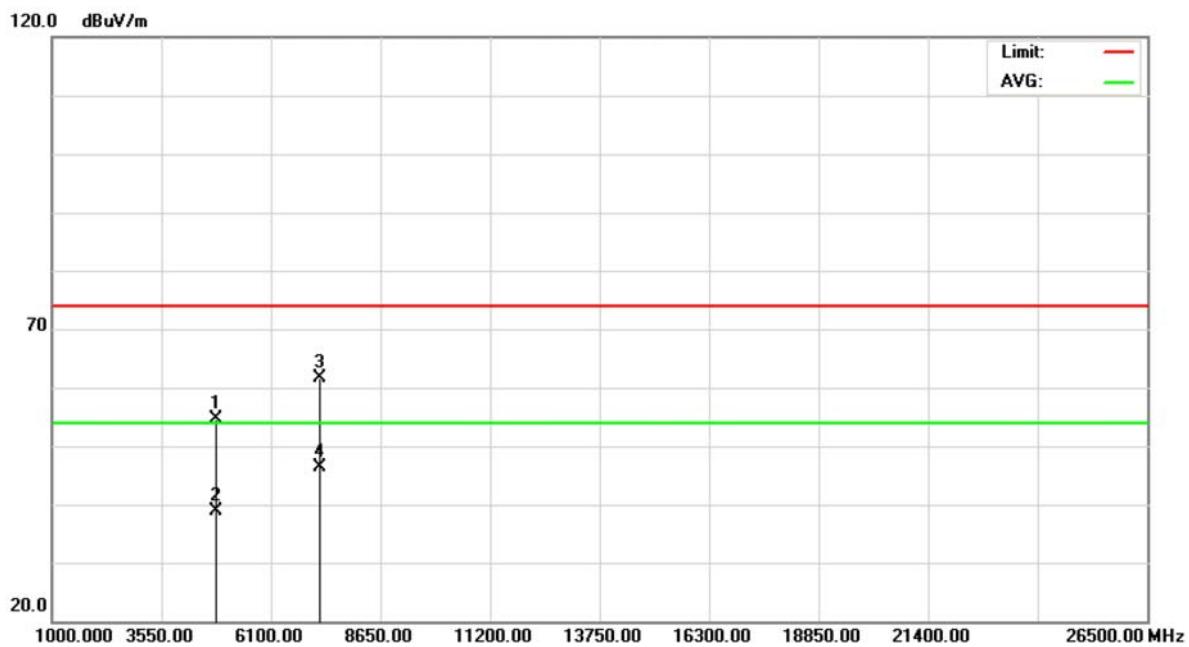


No. Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over	
						Detector	Comment
1	2390.000	24.10	33.90	58.00	74.00	-16.00	peak
2	2390.000	13.24	33.90	47.14	54.00	-6.86	AVG
3 *	2406.750	62.56	33.98	96.54	74.00	22.54	peak
4	2406.750	15.90	33.98	49.88	54.00	-4.12	AVG



E.U.T	2.4G RF Keyboard	Model Name	GK-300A
Temperature	26°C	Relative Humidity	60%
Test Voltage	DC 3V		
Test Mode	2407 MHz		

Polarization: Horizontal

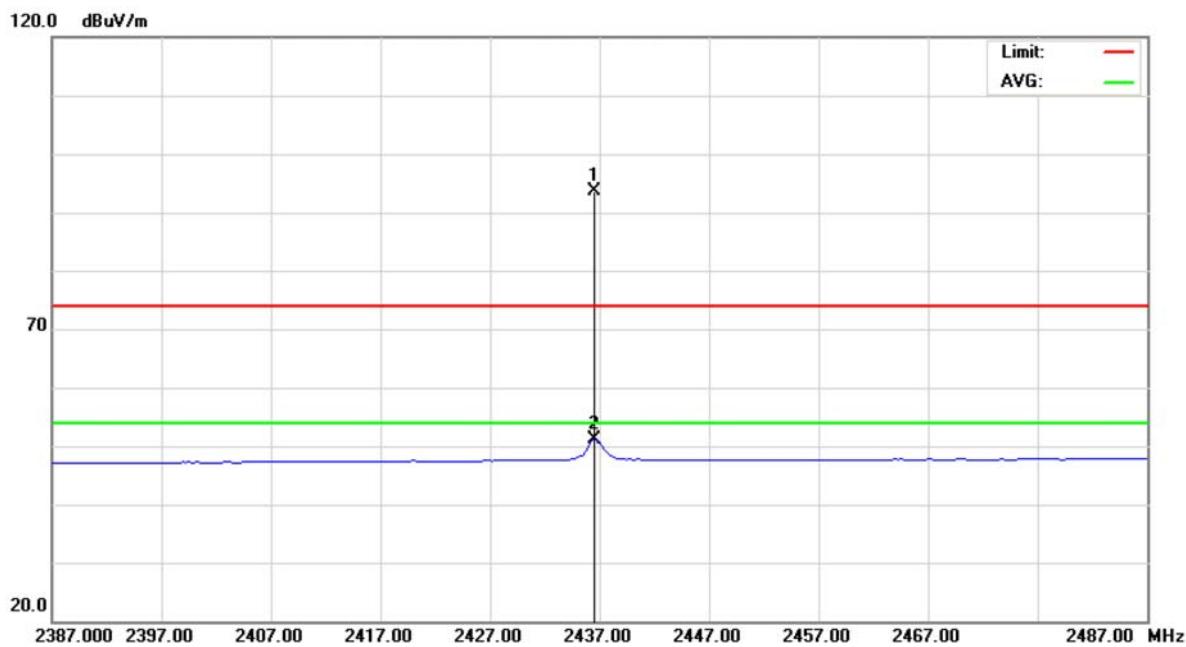


No. Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over	
						Detector	Comment
1	4812.950	46.38	8.34	54.72	74.00	-19.28	peak
2	4812.950	30.56	8.34	38.90	54.00	-15.10	AVG
3	7219.850	45.61	16.14	61.75	74.00	-12.25	peak
4 *	7219.850	30.31	16.14	46.45	54.00	-7.55	AVG



E.U.T	2.4G RF Keyboard	Model Name	GK-300A
Temperature	26°C	Relative Humidity	60%
Test Voltage	DC 3V		
Test Mode	2437 MHz		

Polarization: Vertical

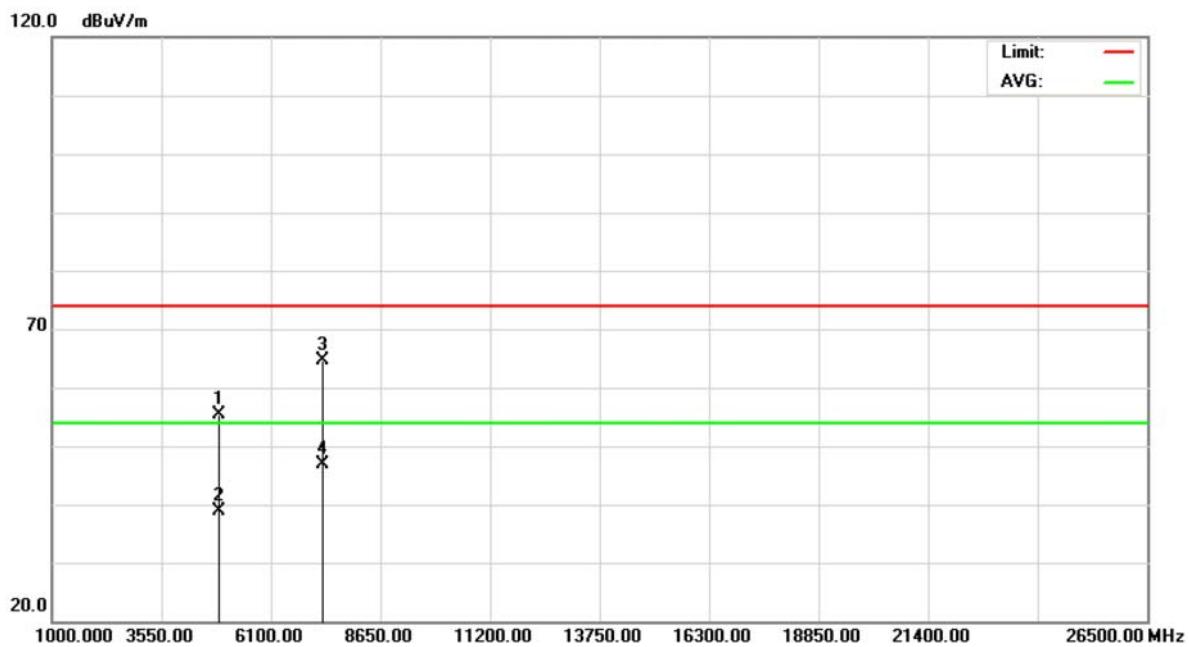


No. Mk.	Freq.	Reading	Correct	Measure-	Limit	Over	Detector	Comment
		Level	Factor	ment				
1 *	2436.500	59.64	34.11	93.75	74.00	19.75	peak	
2	2436.500	17.14	34.11	51.25	54.00	-2.75	AVG	



E.U.T	2.4G RF Keyboard	Model Name	GK-300A
Temperature	26°C	Relative Humidity	60%
Test Voltage	DC 3V		
Test Mode	2437 MHz		

Polarization: Vertical

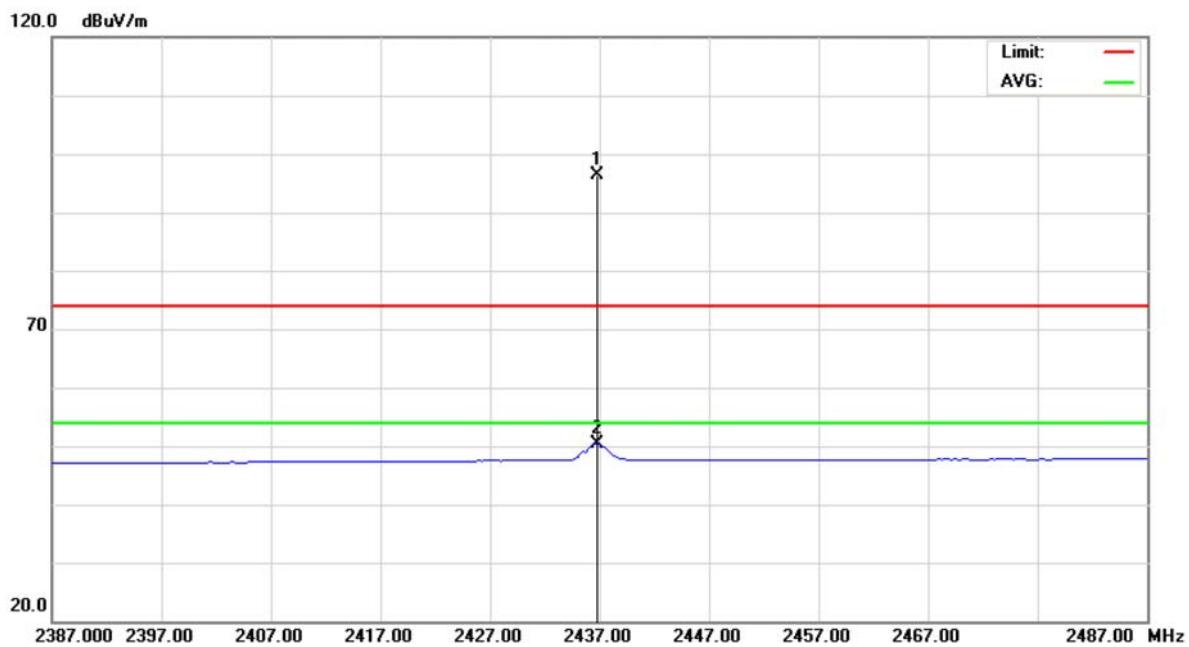


No. Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
						MHz	dBuV
1	4873.725	46.78	8.48	55.26	74.00	-18.74	peak
2	4873.725	30.37	8.48	38.85	54.00	-15.15	AVG
3	7309.500	48.08	16.50	64.58	74.00	-9.42	peak
4 *	7309.500	30.49	16.50	46.99	54.00	-7.01	AVG



E.U.T	2.4G RF Keyboard	Model Name	GK-300A
Temperature	26°C	Relative Humidity	60%
Test Voltage	DC 3V		
Test Mode	2437 MHz		

Polarization: Horizontal

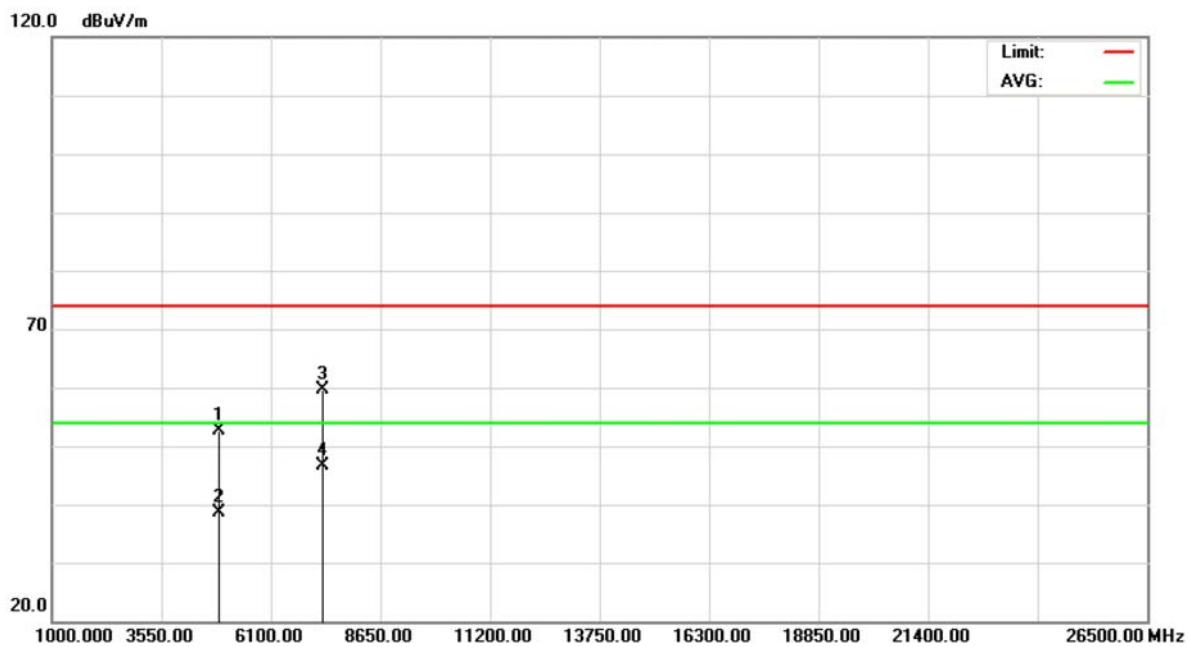


No. Mk.	Freq.	Reading	Correct	Measure-	Limit	Over	Detector	Comment
		Level	Factor	ment				
1 *	2436.750	62.22	34.11	96.33	74.00	22.33	peak	
2	2436.750	16.32	34.11	50.43	54.00	-3.57	AVG	



E.U.T	2.4G RF Keyboard	Model Name	GK-300A
Temperature	26°C	Relative Humidity	60%
Test Voltage	DC 3V		
Test Mode	2437 MHz		

Polarization: Horizontal

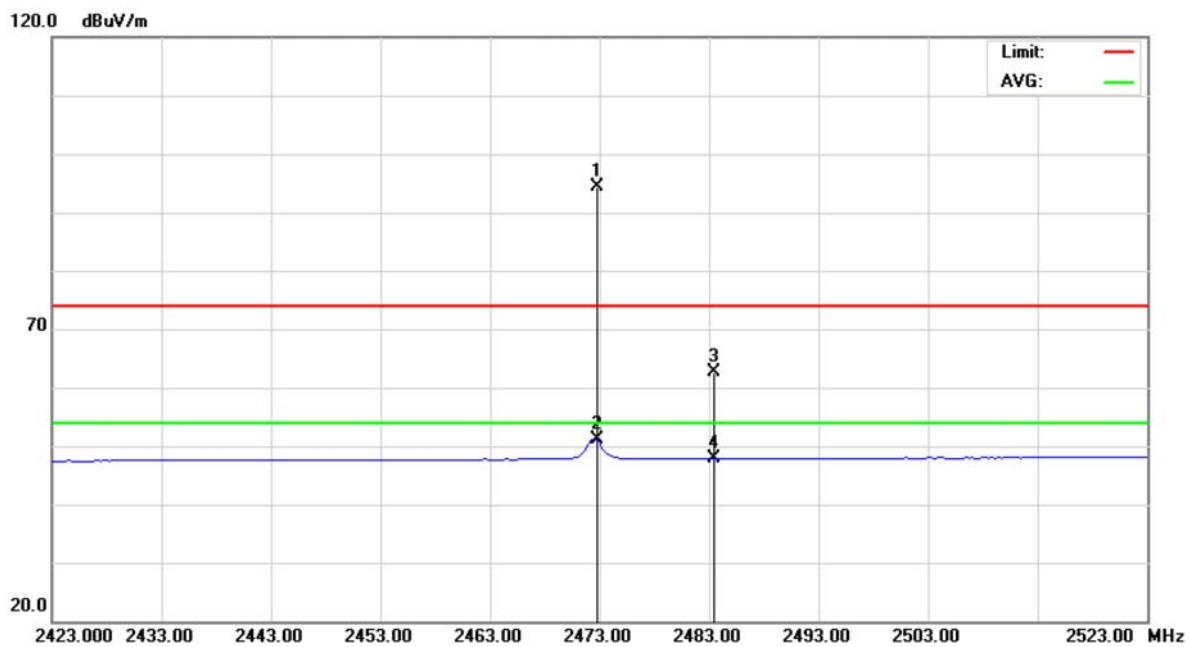


No. Mk.	Freq. MHz	Reading Level dBuV	Correct Factor	Measure- ment dBuV/m	Limit dBuV/m	Over	
						Limit dB	Detector
1	4872.425	44.06	8.47	52.53	74.00	-21.47	peak
2	4872.425	30.11	8.47	38.58	54.00	-15.42	AVG
3	7300.425	43.09	16.46	59.55	74.00	-14.45	peak
4 *	7300.425	30.22	16.46	46.68	54.00	-7.32	AVG



E.U.T	2.4G RF Keyboard	Model Name	GK-300A
Temperature	26°C	Relative Humidity	60%
Test Voltage	DC 3V		
Test Mode	2473 MHz		

Polarization: Vertical

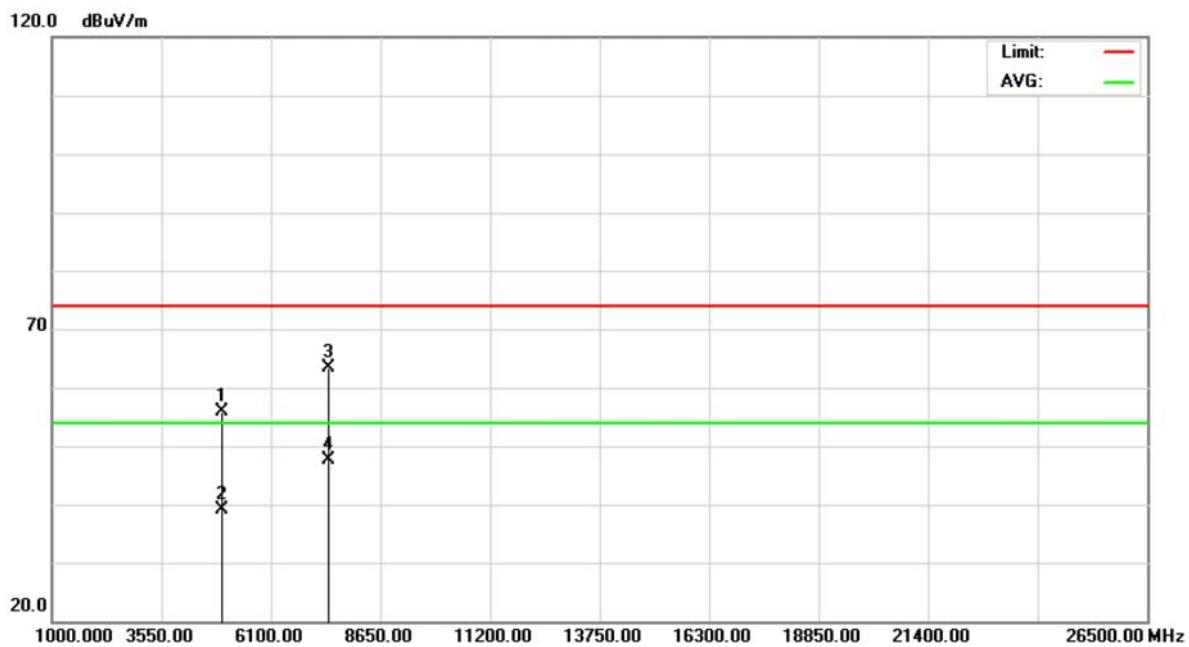


No. Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over					
						dBuV	dB	dBuV/m	dB	Detector	Comment
1 *	2472.750	60.04	34.27	94.31	74.00	20.31	20.31	peak			
2	2472.750	16.82	34.27	51.09	54.00	-2.91	-2.91	AVG			
3	2483.500	28.29	34.32	62.61	74.00	-11.39	-11.39	peak			
4	2483.500	13.51	34.32	47.83	54.00	-6.17	-6.17	AVG			



E.U.T	2.4G RF Keyboard	Model Name	GK-300A
Temperature	26°C	Relative Humidity	60%
Test Voltage	DC 3V		
Test Mode	2473 MHz		

Polarization: Vertical

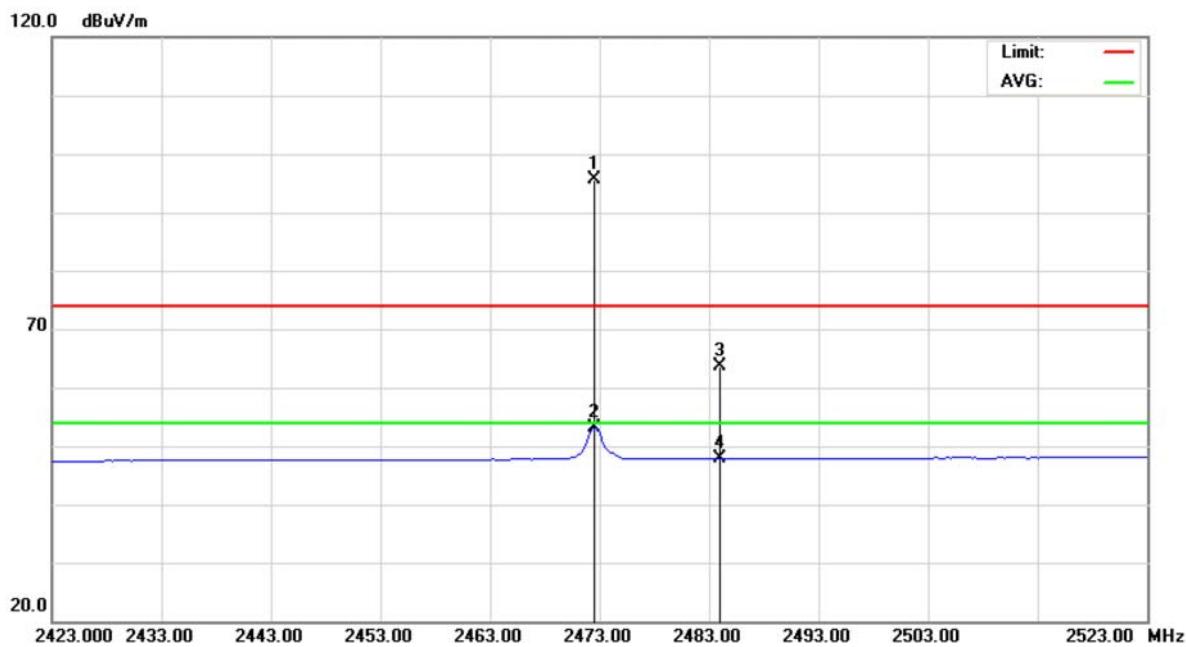


No. Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over	
						Detector	Comment
1	4947.400	47.20	8.64	55.84	74.00	-18.16	peak
2	4947.400	30.44	8.64	39.08	54.00	-14.92	AVG
3	7417.600	46.53	16.94	63.47	74.00	-10.53	peak
4 *	7417.600	30.81	16.94	47.75	54.00	-6.25	AVG



E.U.T	2.4G RF Keyboard	Model Name	GK-300A
Temperature	26°C	Relative Humidity	60%
Test Voltage	DC 3V		
Test Mode	2473 MHz		

Polarization: Horizontal

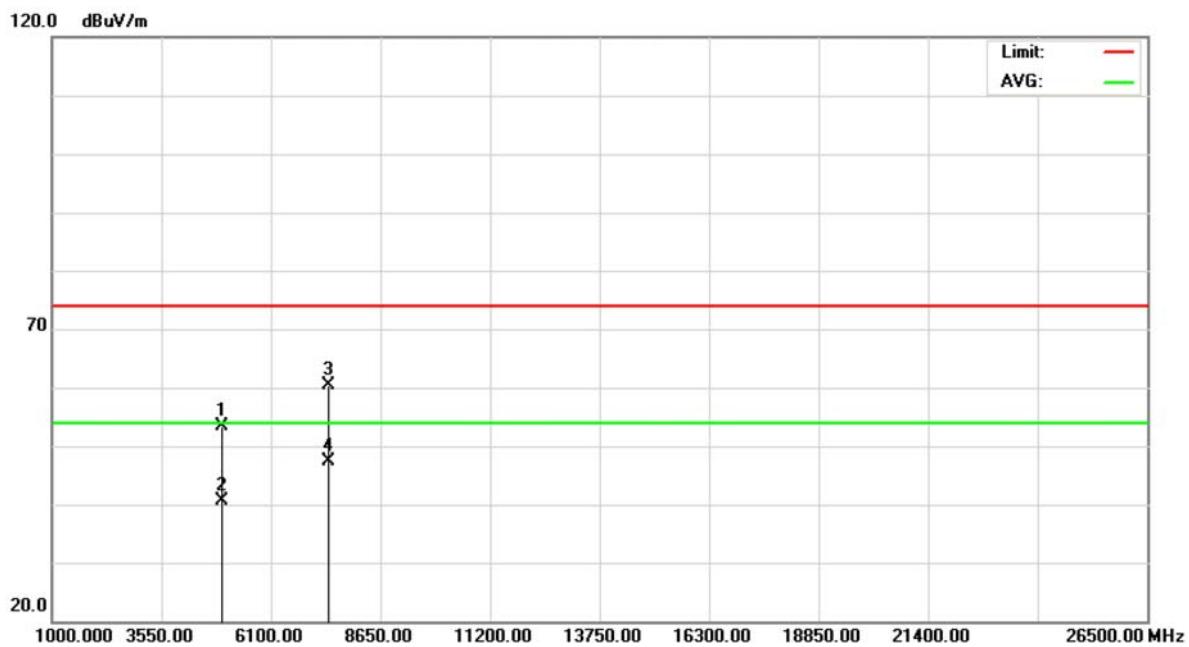


No. Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over					
						dBuV	dB	dBuV/m	dB	Detector	Comment
1 *	2472.500	61.25	34.27	95.52	74.00	21.52				peak	
2	2472.500	18.93	34.27	53.20	54.00	-0.80				AVG	
3	2484.000	29.31	34.32	63.63	74.00	-10.37				peak	
4	2484.000	13.51	34.32	47.83	54.00	-6.17				AVG	



E.U.T	2.4G RF Keyboard	Model Name	GK-300A
Temperature	26°C	Relative Humidity	60%
Test Voltage	DC 3V		
Test Mode	2473 MHz		

Polarization: Horizontal



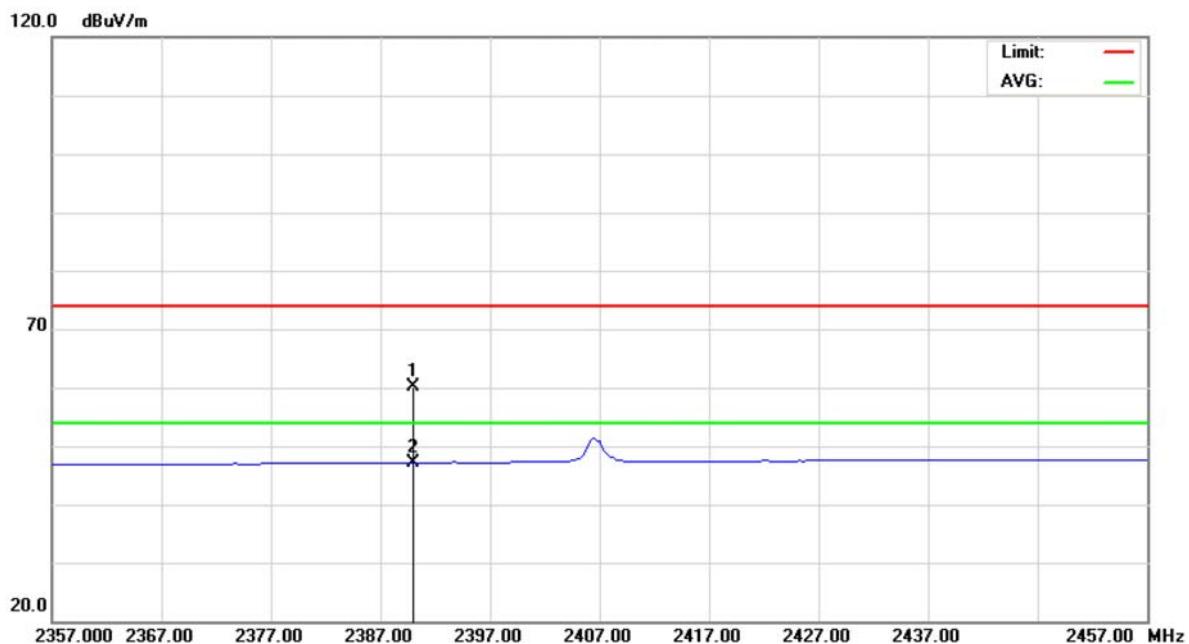
No. Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over	
						Limit dB	Detector
1	4944.750	44.69	8.64	53.33	74.00	-20.67	peak
2	4944.750	32.05	8.64	40.69	54.00	-13.31	AVG
3	7419.050	43.44	16.94	60.38	74.00	-13.62	peak
4 *	7419.050	30.46	16.94	47.40	54.00	-6.60	AVG



8.9 TEST RESULTS (RESTRICTED BANDS)

E.U.T	2.4G RF Keyboard	Model Name	GK-300A
Temperature	26°C	Relative Humidity	60%
Test Voltage	DC 3V		
Test Mode	2407 MHz		
NOTE	The transmitter was setup to transmit at the lowest channel and the field strength was measured at 2310-2390 MHz.		

Polarization: Vertical

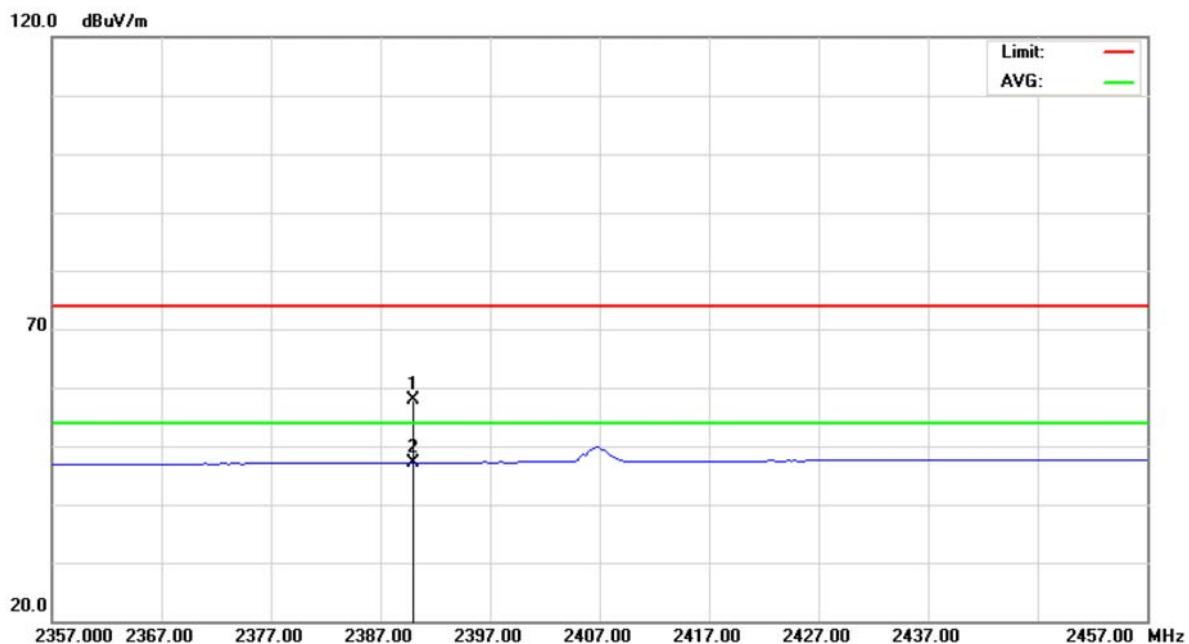


No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over	Detector	Comment
			Level	Factor	ment				
1		2390.000	26.29	33.90	60.19	74.00	-13.81	peak	
2	*	2390.000	13.23	33.90	47.13	54.00	-6.87	Avg	



E.U.T	2.4G RF Keyboard	Model Name	GK-300A
Temperature	26°C	Relative Humidity	60%
Test Voltage	DC 3V		
Test Mode	2407 MHz		
NOTE	The transmitter was setup to transmit at the lowest channel and the field strength was measured at 2310-2390 MHz.		

Polarization: Horizontal

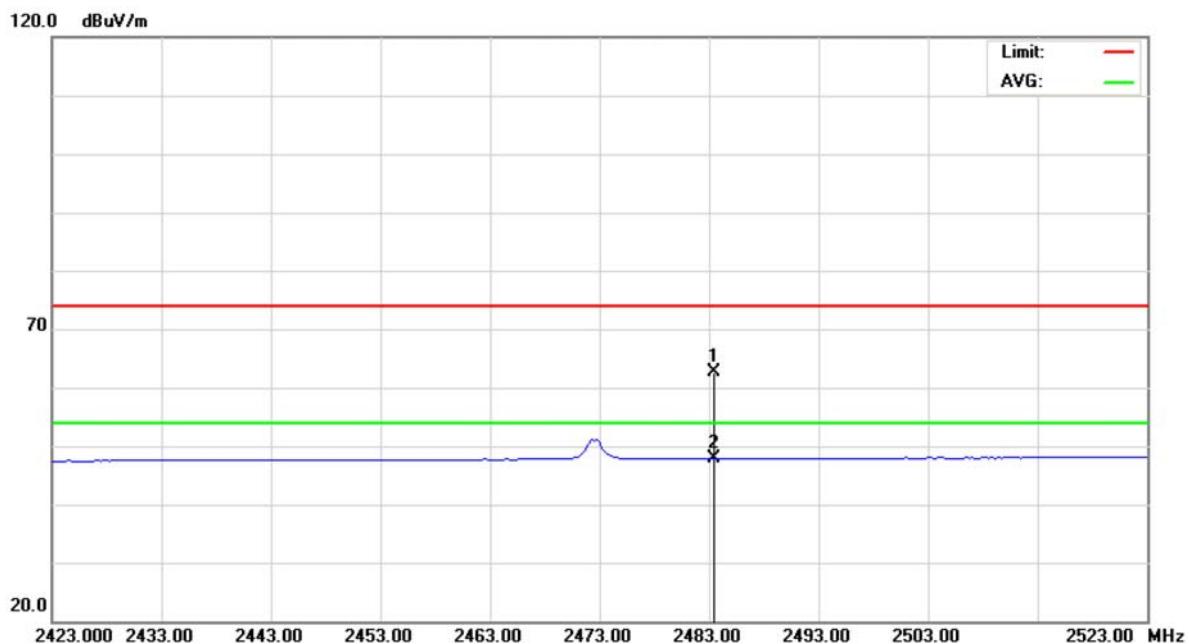


No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over	Detector	Comment
			Level	Factor	ment				
1		2390.000	24.10	33.90	58.00	74.00	-16.00	peak	
2	*	2390.000	13.24	33.90	47.14	54.00	-6.86	Avg	



E.U.T	2.4G RF Keyboard	Model Name	GK-300A
Temperature	26°C	Relative Humidity	60%
Test Voltage	DC 3V		
Test Mode	2473 MHz		
NOTE	The transmitter was setup to transmit at the highest channel and the field strength was measured at 2483.5-2500 MHz.		

Polarization: Vertical

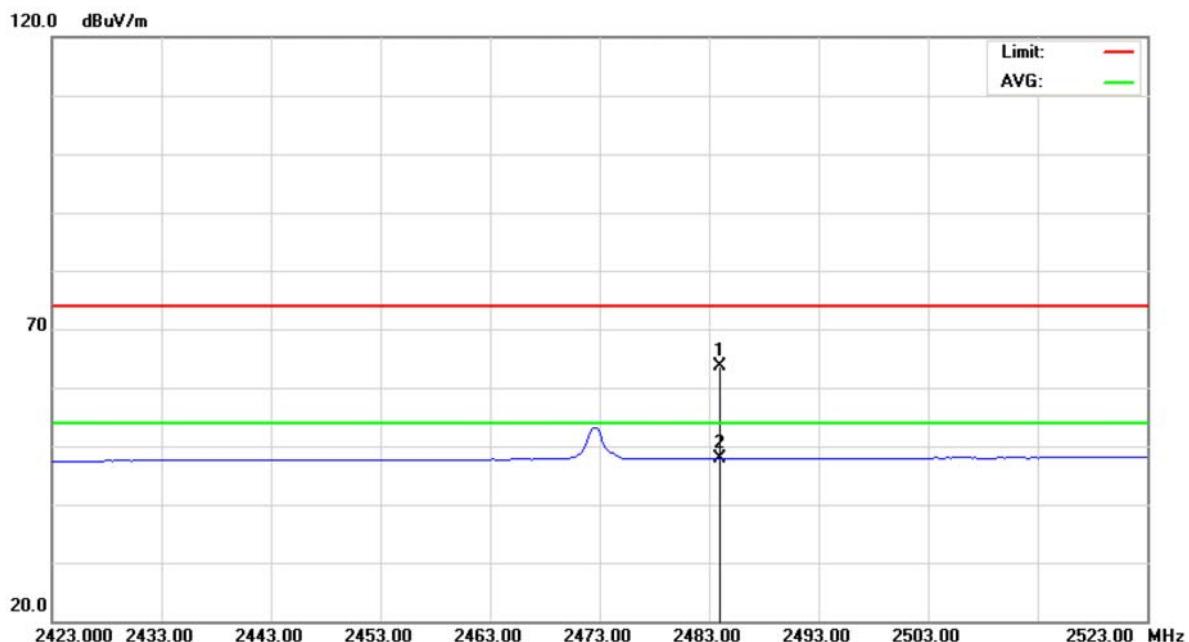


No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over	Detector	Comment
			Level	Factor	ment				
1		2483.500	28.29	34.32	62.61	74.00	-11.39	peak	
2	*	2483.500	13.51	34.32	47.83	54.00	-6.17	Avg	



E.U.T	2.4G RF Keyboard	Model Name	GK-300A
Temperature	26°C	Relative Humidity	60%
Test Voltage	DC 3V		
Test Mode	2473 MHz		
NOTE	The transmitter was setup to transmit at the highest channel and the field strength was measured at 2483.5-2500 MHz.		

Polarization: Horizontal



No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over	Detector	Comment
			Level	Factor	ment				
1		2484.000	29.31	34.32	63.63	74.00	-10.37	peak	
2	*	2484.000	13.51	34.32	47.83	54.00	-6.17	Avg	



9 POWER SPECTRAL DENSITY

9.1 LIMIT

Test Item	Frequency Range (MHz)	Limit
Power Spectral Density	2400-2483.5	8 dBm (in any 3 kHz)

9.2 MEASUREMENT INSTRUMENTS LIST

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP-40	100129	Aug. 29, 2013

NOTE: **N/A:** denotes No Model Name, No Serial No. or No Calibration specified.

9.3 TEST PROCEDURES

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

9.4 TEST SETUP LAYOUT



9.5 DEVIATION FROM TEST STANDARD

No deviation

9.6 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of 4.6 Unless otherwise a special operating condition is specified in the follows during the testing.

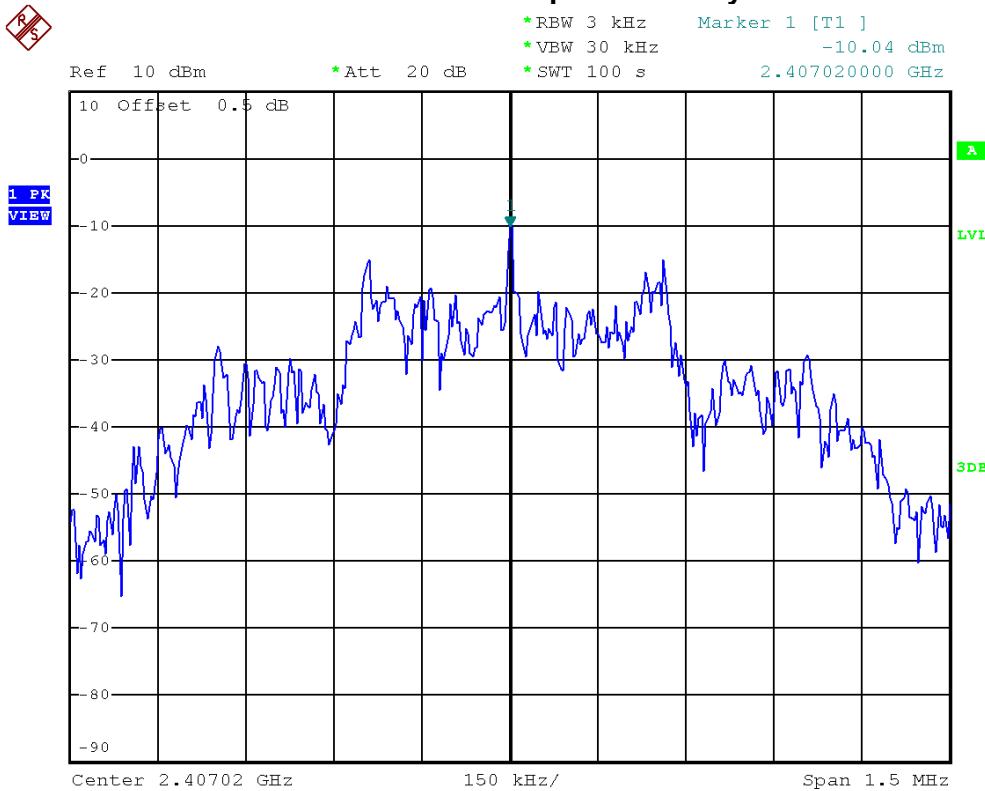


9.7 TEST RESULTS

E.U.T	2.4G RF Keyboard	Model Name	GK-300A
Temperature	26°C	Relative Humidity	60%
Test Voltage	DC 3V		
Test Mode	2407 MHz, 2437 MHz, 2473 MHz		

Frequency	Power Density (dBm)	Limit (dBm)	Result
2407 MHz	-10.04	8	PASS
2437 MHz	-10.51	8	PASS
2473 MHz	-11.59	8	PASS

2407 MHz/Power Sepctral Density

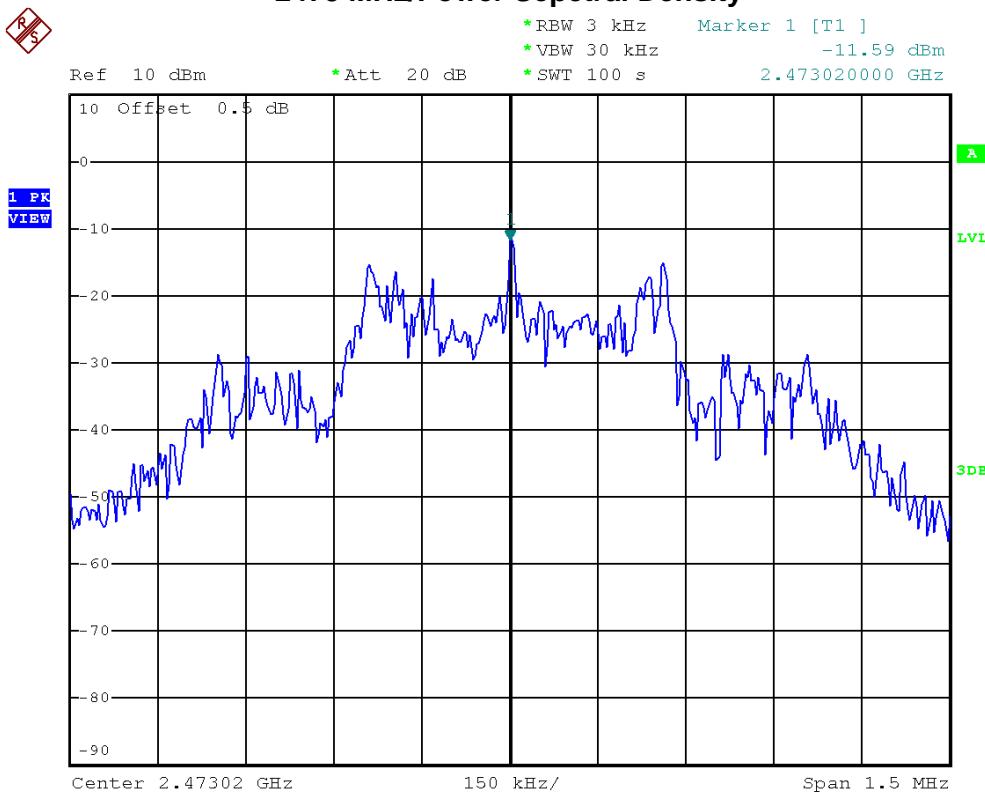




2437 MHz/Power Sepctral Density



2473 MHz/Power Sepctral Density





10 RF EXPOSURE COMPLIANCE

10.1 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. In accordance with 47 CFR FCC Part 2 Subpart J, section 2.1091 this device has been defined as a mobile device whereby a distance of 0.2 m normally can be maintained between the user and the device.

(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.

10.2 MEASUREMENT INSTRUMENTS LIST

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Power Meter	Anritsu	ML2495A	1128008	Feb,26,2014
2	Power Meter Sensor	Anritsu	MA2411B	1126001	Feb,26,2014

NOTE: **N/A**: denotes No Model Name, No Serial No. or No Calibration specified.

10.3 MPE CALCULATION METHOD

$$E \text{ (V/m)} = \frac{\sqrt{30 \times P \times G}}{d}$$

E = Electric field (V/m)

P = Peak RF output power (W)

G = EUT Antenna numeric gain (numeric)

d = Separation distance between radiator and human body (m)

The formula can be changed to

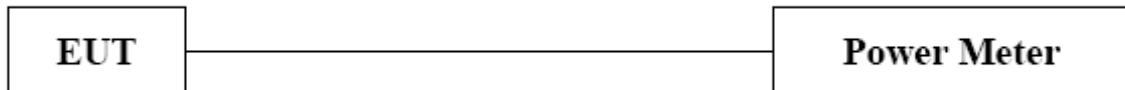
$$Pd = \frac{30 \times P \times G}{377 \times d^2}$$

$$\text{Power Density: } Pd \text{ (W/m}^2\text{)} = \frac{E^2}{377}$$

From the peak EUT RF output power, the minimum mobile separation distance, d=0.2m, as well as the gain of the used antenna, the RF power density can be obtained



10.4 TEST SETUP LAYOUT



10.5 DEVIATION FROM TEST STANDARD

No deviation

10.6 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of 4.6 Unless otherwise a special operating condition is specified in the follows during the testing.

10.7 TEST RESULTS

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