



Neutron Engineering Inc.

FCC Radio Test Report

FCC ID: VKS-KBG082X

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

Issued Date : Nov. 22, 2011

Project No. : 1111C087

Equipment : 2.4G Wireless Keyboard

Model Name : KBG0829

Applicant : Shenzhen Comtech Electronics Co., Ltd

Address : #102, Longguan Express Road, Dalang Street,
Bao'an District, Shenzhen, China

Tested by:

Neutron Engineering Inc. EMC Laboratory

Date of Receipt: Nov. 10, 2011

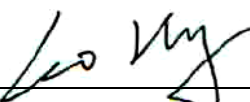
Date of Test:

Nov. 10, 2011 ~ Nov. 22, 2011


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Declaration

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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 Wireless Keyboard

Brand Name: N/A

Model Name: KBG0829

Applicant: Shenzhen Comtech Electronics Co., Ltd

Date of Test: Nov. 10, 2011 ~ Nov. 22, 2011

Test Item: ENGINEERING SAMPLE

Standards: FCC Part15, Subpart C(15.247) / ANSI 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-1-1111C087) 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 (15.247) , Subpart C			
Standard Section	Test Item	Judgment	Remark
15.207	Conducted Emission	N/A	Note(1)
15.247(d)	Antenna conducted Spurious Emission	PASS	
15.247 (a)(1)	Hopping Channel Separation	PASS	
15.247 (a)(1)	20dB Bandwidth	PASS	
15.247 (b)(1)	Peak Output Power	PASS	
15.247(d)/15.209	Radiated Spurious Emission	PASS	
15.247 (a)(1)(iii)	Number of Hopping Frequency	PASS	
15.247 (a)(1)(iii)	Dwell Time	PASS	
15.205	Restricted Bands	PASS	
15.203	Antenna Requirement	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 is **DG-C02/DG-CB03** at the location of No.3, Jinshagang 1st Road, ShiXia, Dalang Town, Dong Guan, China.523792
Neutron's test firm number is 319330

2.2 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

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 %**.

A. Conducted Measurement :

Test Site	Method	Measurement Frequency Range	U , (dB)	NOTE
DG-C02	CISPR	150 KHz ~ 30MHz	1.94	

B. Radiated Measurement :

Test Site	Method	Measurement Frequency Range	Ant. H / V	U , (dB)	NOTE
DG-CB03	CISPR	30MHz ~ 200MHz	V	3.82	
		30MHz ~ 200MHz	H	3.60	
		200MHz ~ 1,000MHz	V	3.86	
		200MHz ~ 1,000MHz	H	3.94	



3. GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

Equipment	2.4G Wireless Keyboard	
Brand Name	N/A	
Model Name	KBG0829	
OEM Brand Name	N/A	
OEM Model Name	N/A	
Model Difference	N/A	
Product Description	The EUT is a 2.4G Wireless Keyboard	
	Operation Frequency:	2405~2476 MHz
	Modulation Type:	GFSK
	Bit Rate of Transmitter	1Mbps
	Number of Channel	64 CH
	Antenna Designation:	Please see Note 3.
	Antenna Gain(Peak)	Please see Note 3.
	Output Power:	-14.26 dBm
	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.	
Channel List	Please refer to the Note 2.	
Power Source	DC Voltage supplied from 2*AAA battery	
Power Rating	DV 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.

Frequency Channel							
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
01	2405	17	2421	33	2442	49	2461
02	2406	18	2422	34	2443	50	2462
03	2407	19	2423	35	2444	51	2463
04	2408	20	2425	36	2446	52	2464
05	2409	21	2427	37	2447	53	2465
06	2410	22	2428	38	2448	54	2466
07	2411	23	2429	39	2449	55	2467
08	2412	24	2430	40	2451	56	2468
09	2413	25	2431	41	2452	57	2469
10	2414	26	2432	42	2453	58	2470
11	2415	27	2434	43	2455	59	2471
12	2416	28	2435	44	2456	60	2472
13	2417	29	2436	45	2457	61	2473
14	2418	30	2437	46	2458	62	2474
15	2419	31	2438	47	2459	63	2475
16	2420	32	2439	48	2460	64	2476

Frequency Group 1				Frequency Group 2			
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
01	2407	17	2442	01	2405	17	2443
02	2408	18	2447	02	2406	18	2444
03	2412	19	2451	03	2409	19	2446
04	2414	20	2452	04	2410	20	2448
05	2417	21	2457	05	2411	21	2449
06	2420	22	2458	06	2413	22	2453
07	2421	23	2459	07	2415	23	2455
08	2422	24	2460	08	2416	24	2456
09	2427	25	2461	09	2418	25	2462
10	2428	26	2465	10	2419	26	2463
11	2431	27	2468	11	2423	27	2464
12	2435	28	2469	12	2425	28	2466
13	2436	29	2472	13	2429	29	2467
14	2437	30	2473	14	2430	30	2470
15	2438	31	2475	15	2432	31	2471
16	2439	32	2476	16	2434	32	2474

3.

Table for Filed Antenna

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)
1	N/A	N/A	Printed	N/A	-3.16



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 possibly have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Pretest Mode	Description
Mode 1	CH01
Mode 2	CH32
Mode 3	CH64

The EUT system operated these modes were found to be the worst case during the pre-scanning test as following:

For Conducted Emission	
Final Test Mode	Description
-	"N/A" denotes test is not applicable in this Test Report.

For Radiated Emission	
Final Test Mode	Description
Mode 1	CH01
Mode 2	CH32
Mode 3	CH64

Note:

- (1) The measurements are performed at the highest, middle, lowest available channels.

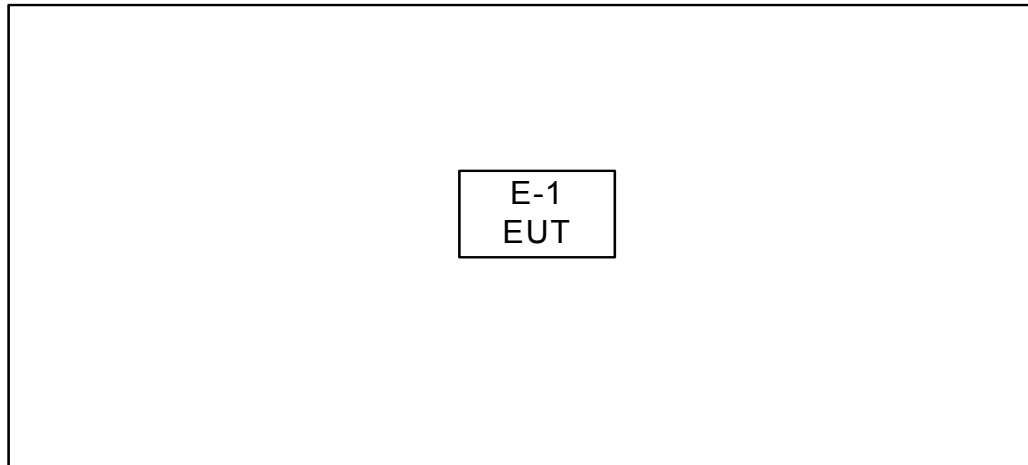
3.3 TABLE OF PARAMETERS OF TEST SOFTWARE SETTING

During testing channel & power controlling software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product power parameters of FHSS

Test software Version	Hardware control		
Frequency	2405 MHz	2439 MHz	2476 MHz
Parameters	N/A	N/A	N/A



3.4 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED





3.5 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 Wireless Keyboard	N/A	KBG0829	VKS-KBG082X	N/A	EUT

Item	Shielded Type	Ferrite Core	Length	Note

Note:

- (1) The support equipment was authorized by Declaration of Confirmation.
- (2) For detachable type I/O cable should be specified the length in cm in 『Length』 column.



4. EMC EMISSION TEST

4.1 CONDUCTED EMISSION MEASUREMENT

4.1.1 POWER LINE CONDUCTED EMISSION Limits (Frequency Range 150KHz-30MHz)

FREQUENCY (MHz)	Class A (dBuV)		lass B (dBuV)		Standard
	Quasi-peak	Average	Quasi-peak	Average	
0.15 -0.5	79.00	66.00	66 - 56 *	56 - 46 *	CISPR
0.50 -5.0	73.00	60.00	56.00	46.00	CISPR
5.0 -30.0	73.00	60.00	60.00	50.00	CISPR

0.15 -0.5	79.00	66.00	66 - 56 *	56 - 46 *	FCC
0.50 -5.0	73.00	60.00	56.00	46.00	FCC
5.0 -30.0	73.00	60.00	60.00	50.00	FCC

Note:

- (1) The tighter limit applies at the band edges.
- (2) The limit of " * " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

4.1.2 MEASUREMENT INSTRUMENTS LIST AND SETTING

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	LISN	EMCO	3816/2	00052765	May.26.2012
2	LISN	R&S	ENV216	100087	May.26.2012
3	Test Cable	N/A	C_17	N/A	Mar.30.2012
4	EMI TEST RECEIVER	R&S	ESCS30	826547/022	May.26.2012
5	50Ω Terminator	SHX	TF2-3G-A	08122902	May.26.2012

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

The following table is the setting of the receiver

Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz

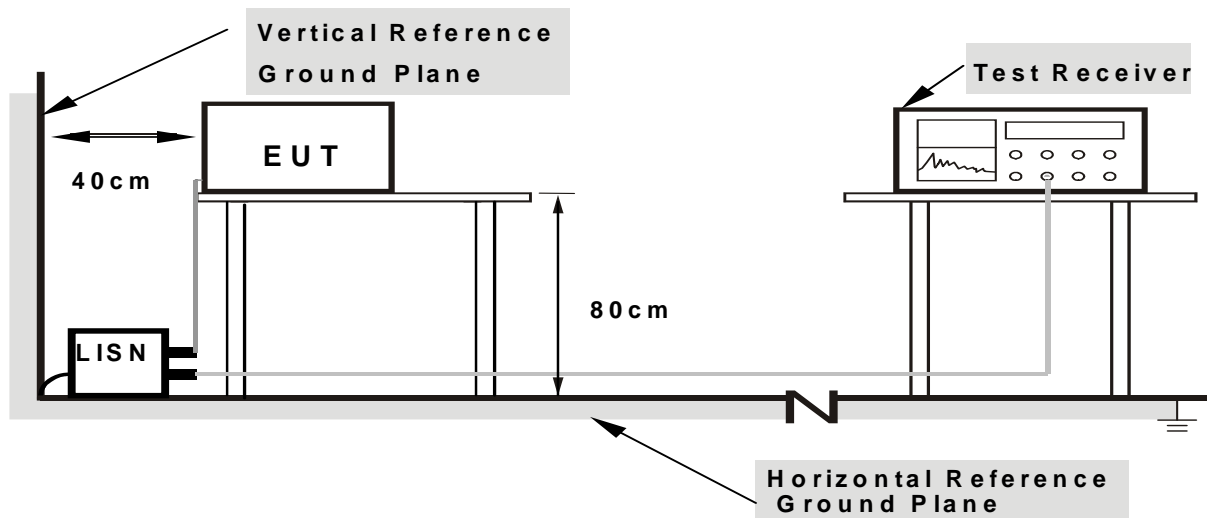
4.1.3 TEST PROCEDURE

- The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
- Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
- I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
- LISN at least 80 cm from nearest part of EUT chassis.
- 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



Note: 1. Support units were connected to second LISN.

2. Both of LISNs (AMN) are 80 cm from EUT and at least 80 cm from other units and other metal planes

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

The EUT was programmed to be in continuously transmitting /Hopping on mode.



4.1.7 TEST RESULTS

E.U.T :	2.4G Wireless Keyboard	Model Name :	KBG0829
Temperature :	--	Relative Humidity :	--
Pressure :	--	Test Voltage :	--
Test Mode :	N/A		

Note:

" N/A " denotes test is not applicable in this Test Report.

Remark

- (1) Reading in which marked as QP means measurements by using are Quasi-Peak Mode with Detector BW=9KHz; SPA setting in RBW=10KHz, VBW =10KHz, Swp. Time = 0.2 sec./MHz ◦
Reading in which marked as AV means measurements by using are Average Mode with instrument setting in RBW=10KHz, VBW=10KHz, Swp. Time =0.2 sec./MHz ◦
- (2) All readings are QP Mode value unless otherwise stated AVG in column of『Note』. If the QP Mode Measured value compliance with the QP Limits and lower than AVG Limits, the EUT shall be deemed to meet both QP & AVG Limits and then only QP Mode was measured, but AVG Mode didn't perform ◦ In this case, a " * " marked in AVG Mode column of Interference Voltage Measured ◦
- (3) Measuring frequency range from 150KHz to 30MHz ◦



4.2 RADIATED EMISSION MEASUREMENT

4.2.1 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 (microvolt/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)	(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).

FREQUENCY RANGE OF RADIATED MEASUREMENT (For unintentional radiators)

Highest frequency generated or Upper frequency of measurement used in the device or on which the device operates or tunes (MHz)	Range (MHz)
Below 1.705	30
1.705 – 108	1000
108 – 500	2000
500 – 1000	5000
Above 1000	5 th harmonic of the highest frequency or 40 GHz, whichever is lower



4.2.2 MEASUREMENT INSTRUMENTS LIST AND SETTING

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Antenna	Schwarzbeck	VULB9160	9160-3232	Jun .04.2012
2	Amplifier	HP	8447D	2944A09673	May.26.2012
3	Test Receiver	R&S	ESCI	100382	May.26.2012
4	Test Cable	N/A	C-01_CB03	N/A	Jul.01.2012
5	Controller	CT	SC100	N/A	N/A
6	Antenna	ETS	3115	00075789	May.26.2012
7	Amplifier	Agilent	8449B	3008A02274	May.26.2012
8	Spectrum	Agilent	E4408B	US39240143	Nov.26.2011
9	Test Cable	HUBER+SUHNER	C-45	N/A	May.04.2012
10	Controller	CT	SC100	N/A	N/A
11	Triple Loop Antenna	Schwarzbeck	HXYZ9170	9170-110	May.26.2012
12	Active Loop Antenna	R&S	HFH2-Z2	830749/020	May.26.2012

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

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RB / VB (emission in restricted band)	1 MHz / 1 MHz for Peak, Average=PK-dycty cycle

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



DUTY CYCLE : TX 2405MHz

Dwell time=ON/ON+OFF

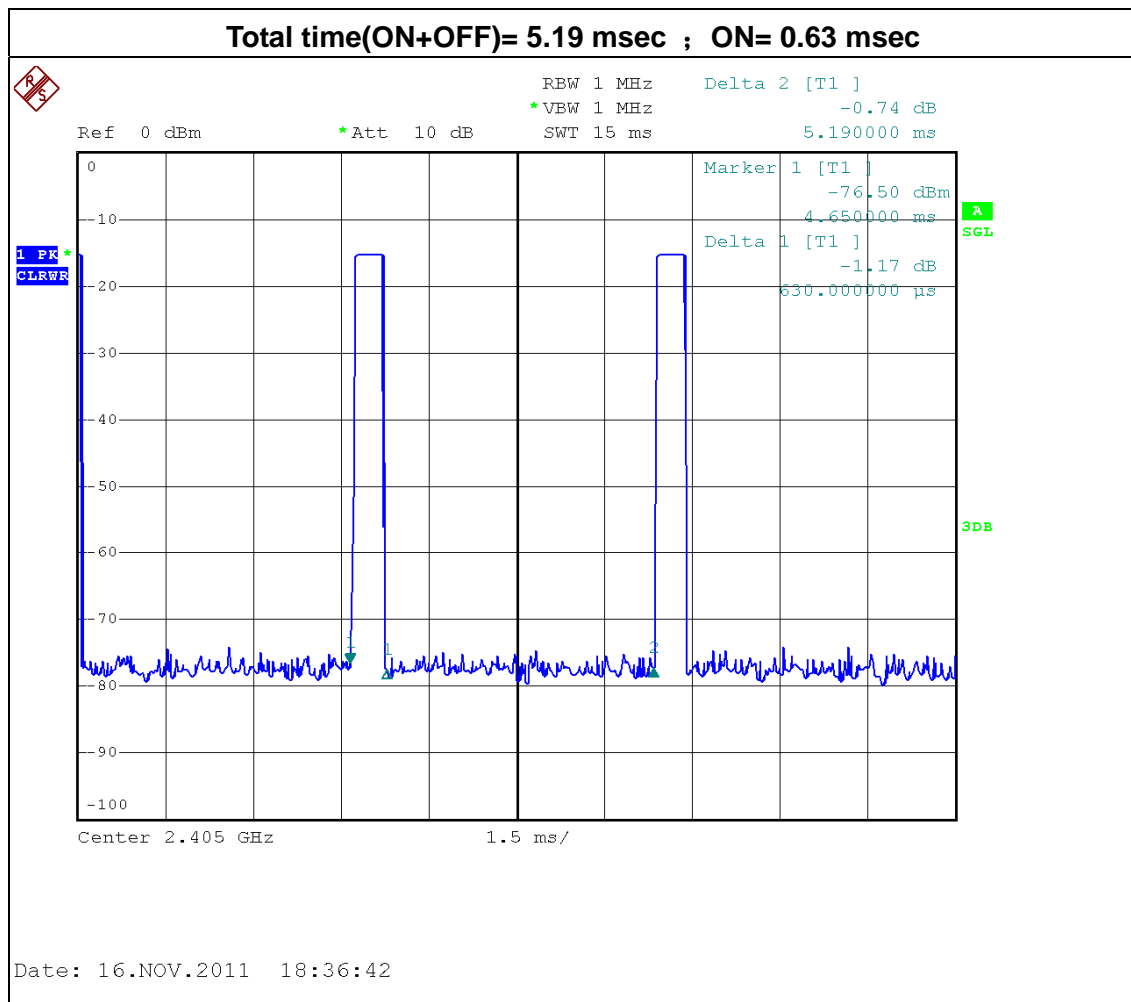
ON:0.63msec

ON+OFF:(total time):5.19msec

Dwell time:12.14%

AV=PK+20 log(Dwell time)

AV=PK-18.31





4.2.3 TEST PROCEDURE

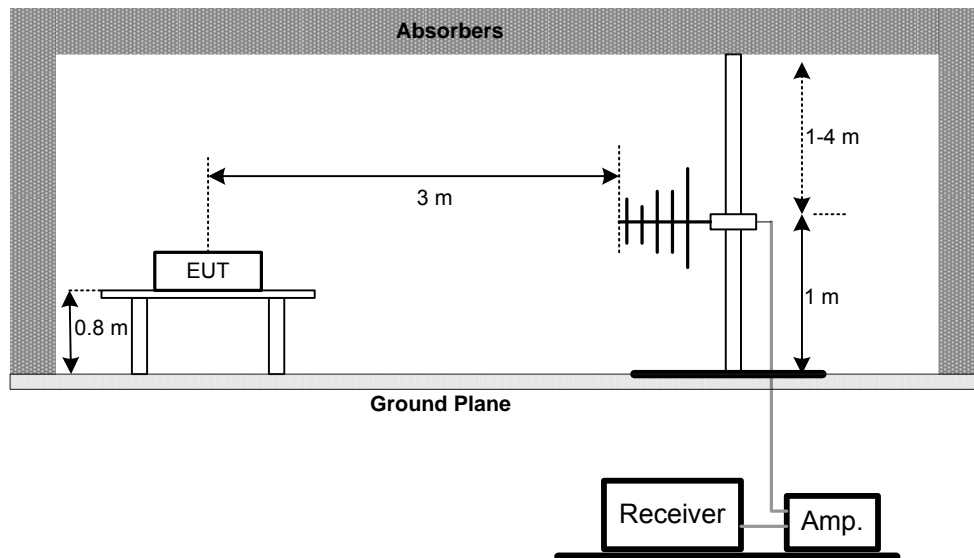
- a. The measuring distance of at 3 m shall be used for measurements at frequency up to 1GHz. For frequencies above 1GHz, any suitable measuring distance may be used.
- b. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 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.

4.2.4 DEVIATION FROM TEST STANDARD

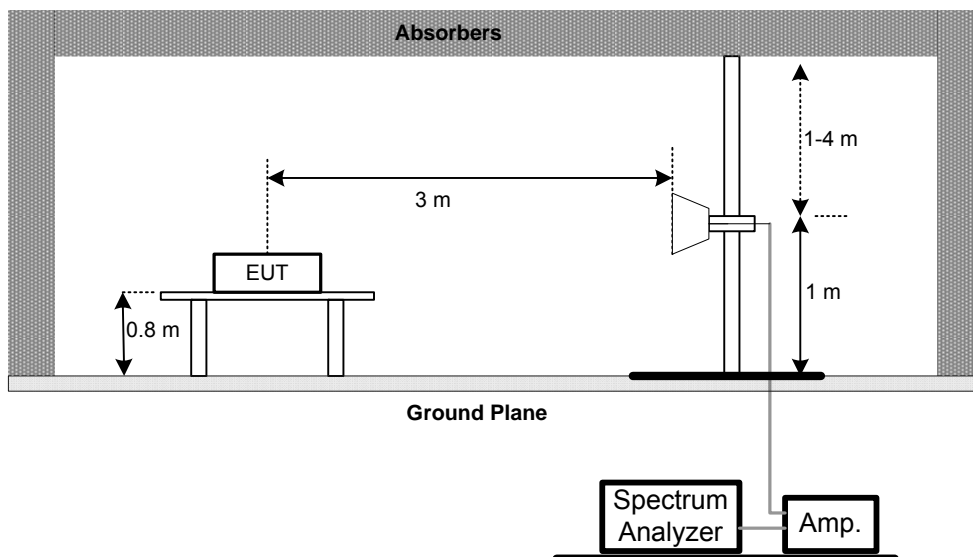
No deviation

4.2.5 TEST SETUP

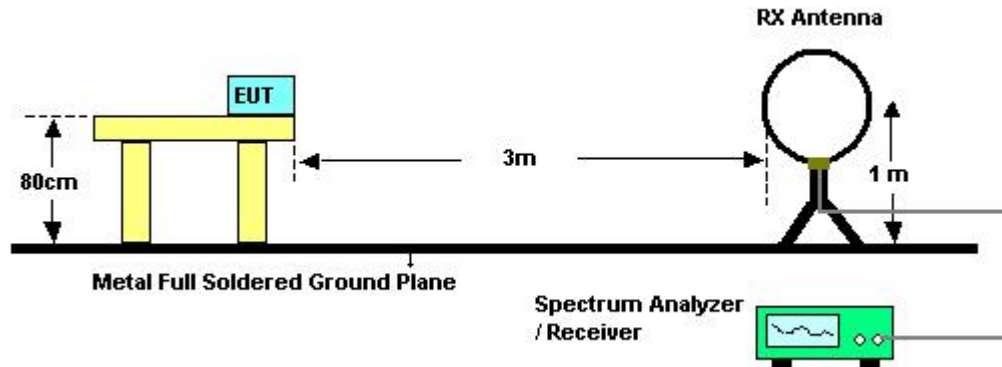
(A) Radiated Emission Test Set-Up Frequency Below 1 GHz



(B) Radiated Emission Test Set-Up Frequency Above 1 GHz



(C) For radiated emissions below 30MHz



4.2.6 EUT OPERATING 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.



4.2.7 TEST RESULTS (BELOW 30MHZ)

EUT :	2.4G Wireless Keyboard	Model Name :	KBG0829
Temperature :	--	Relative Humidity :	--
Pressure :	--	Test Voltage :	--
Test Mode :	N/A		

NOTE:

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

Remark :

- (1) The amplitude of spurious emissions which are attenuated by more than 20 dB below the permissible value has no need to be reported °
- (2) Distance extrapolation factor = $40 \log (\text{specific distance} / \text{test distance})$ (dB); °
- (3) Limit line = specific limits (dBuV) + distance extrapolation factor. °
- (4) In case the emission is lower than 30MHz, loop antenna has to be used for measurement and the recorded data should be QP measured by receiver. High – Low scan is not required in this case.

The amplitude of spurious emissions which are attenuated by more than 20 dB below the permissible value has no need to be reported.

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

Distance extrapolation factor = $40 \log (\text{specific distance} / \text{test distance})$ (dB);

Limit line = specific limits (dBuV) + distance extrapolation factor.



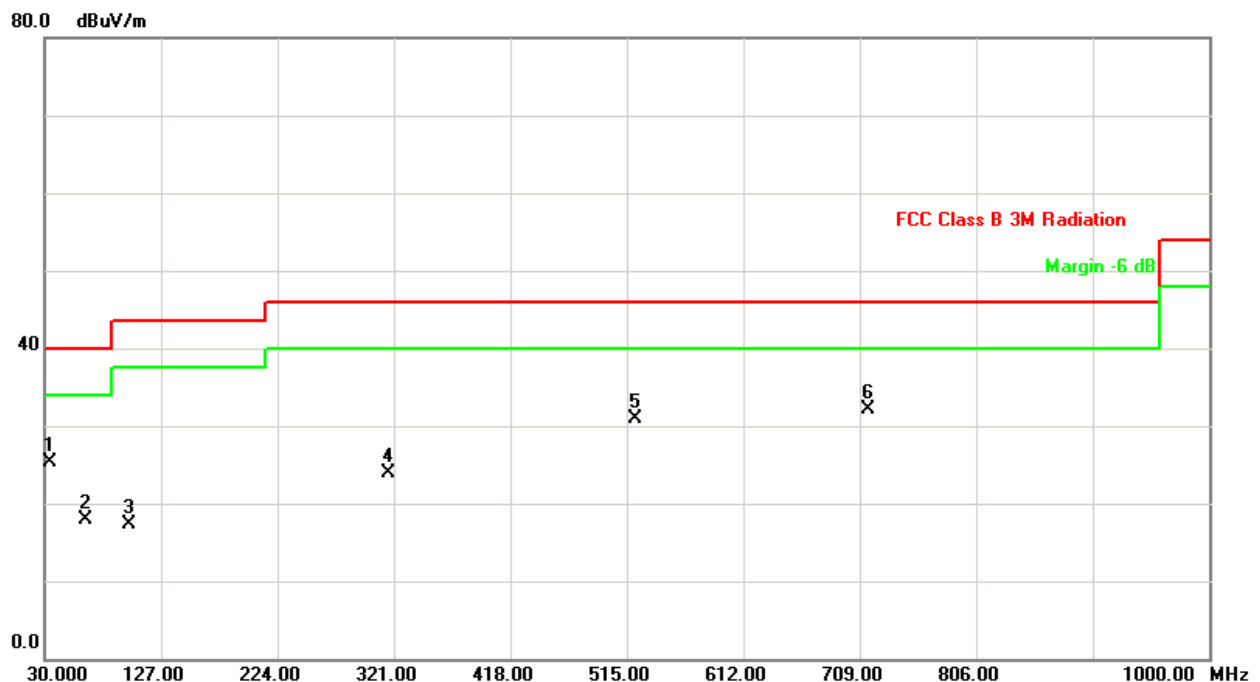
4.2.8 TEST RESULTS (BETWEEN 30 – 1000 MHZ)

EUT :	2.4G Wireless Keyboard	Model Name :	KBG0829
Temperature :	25°C	Relative Humidity :	58 %
Pressure :	1010 hPa	Test Voltage :	DC 3V
Test Mode :	TX 2405MHz –CH01		

Freq. (MHz)	Ant. H/V	Reading(RA) (dBuV)	Corr.Factor(CF) (dB)	Measured(FS) (dBuV/m)	Limits(QP) (dBuV/m)	Margin (dB)	Note
34.85	V	42.25	-16.90	25.35	40.00	- 14.65	
63.95	V	35.46	-17.58	17.88	40.00	- 22.12	
100.33	V	35.76	-18.41	17.35	43.50	- 26.15	
316.15	V	35.64	-11.68	23.96	46.00	- 22.04	
522.28	V	37.48	-6.52	30.96	46.00	- 15.04	
716.28	V	35.08	-2.98	32.10	46.00	- 13.90	

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 measurement didn't perform ◦
- (3) Measuring frequency range from 30MHz to 1000MHz ◦
- (4) If the peak scan value lower limit more than 20dB, then this signal data does not show in table ◦



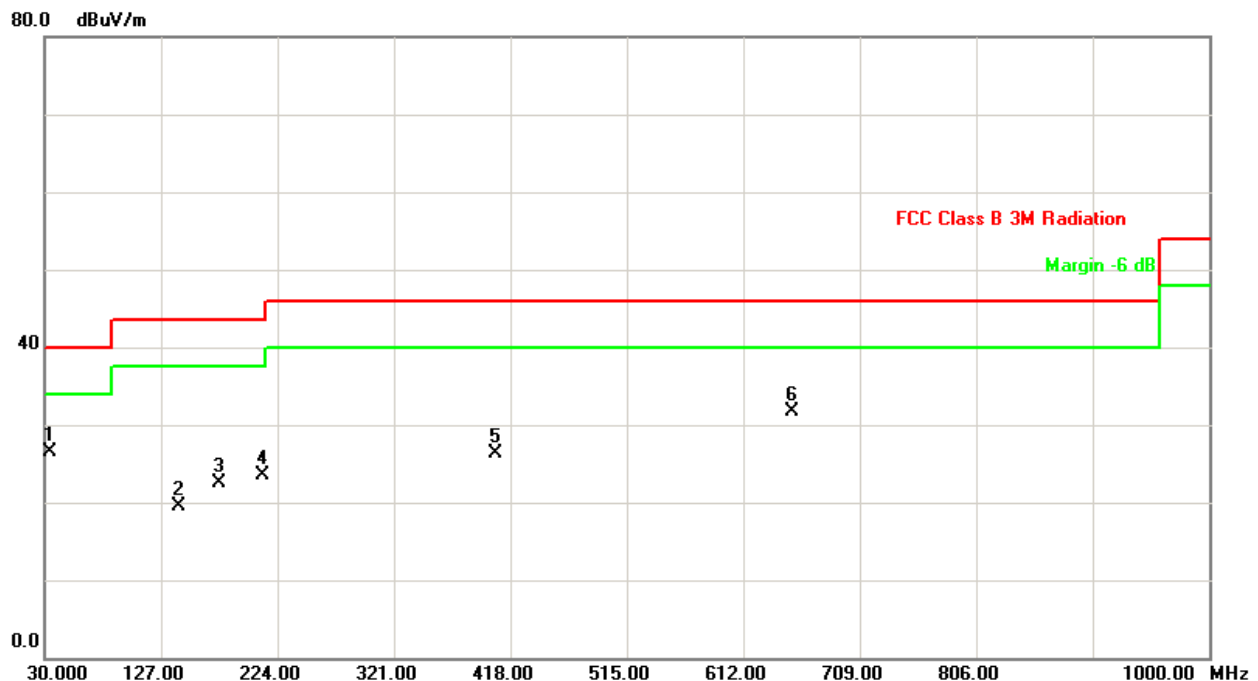


EUT :	2.4G Wireless Keyboard	Model Name :	KBG0829
Temperature :	25°C	Relative Humidity :	58 %
Pressure :	1010 hPa	Test Voltage :	DC 3V
Test Mode :	TX 2405MHz -CH01		

Freq. (MHz)	Ant. H/V	Reading(RA) (dBuV)	Corr.Factor(CF) (dB)	Measured(FS) (dBuV/m)	Limits(QP) (dBuV/m)	Margin (dB)	Note
34.85	H	43.36	-16.90	26.46	40.00	- 13.54	
141.55	H	37.14	-17.70	19.44	43.50	- 24.06	
175.50	H	39.63	-17.07	22.56	43.50	- 20.94	
211.88	H	39.63	-16.22	23.41	43.50	- 20.09	
405.88	H	35.29	-8.92	26.37	46.00	- 19.63	
653.23	H	35.13	-3.33	31.80	46.00	- 14.20	

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 measurement didn't perform ◦
- (3) Measuring frequency range from 30MHz to 1000MHz ◦
- (4) If the peak scan value lower limit more than 20dB, then this signal data does not show in table ◦





4.2.9 TEST RESULTS (ABOVE 1000 MHZ)

EUT :	2.4G Wireless Keyboard	Model Name :	KBG0829
Temperature :	25 °C	Relative Humidity :	58 %
Pressure :	1010 hPa	Test Voltage :	DC 3V
Test Mode :	TX 2405MHz – CH 01		

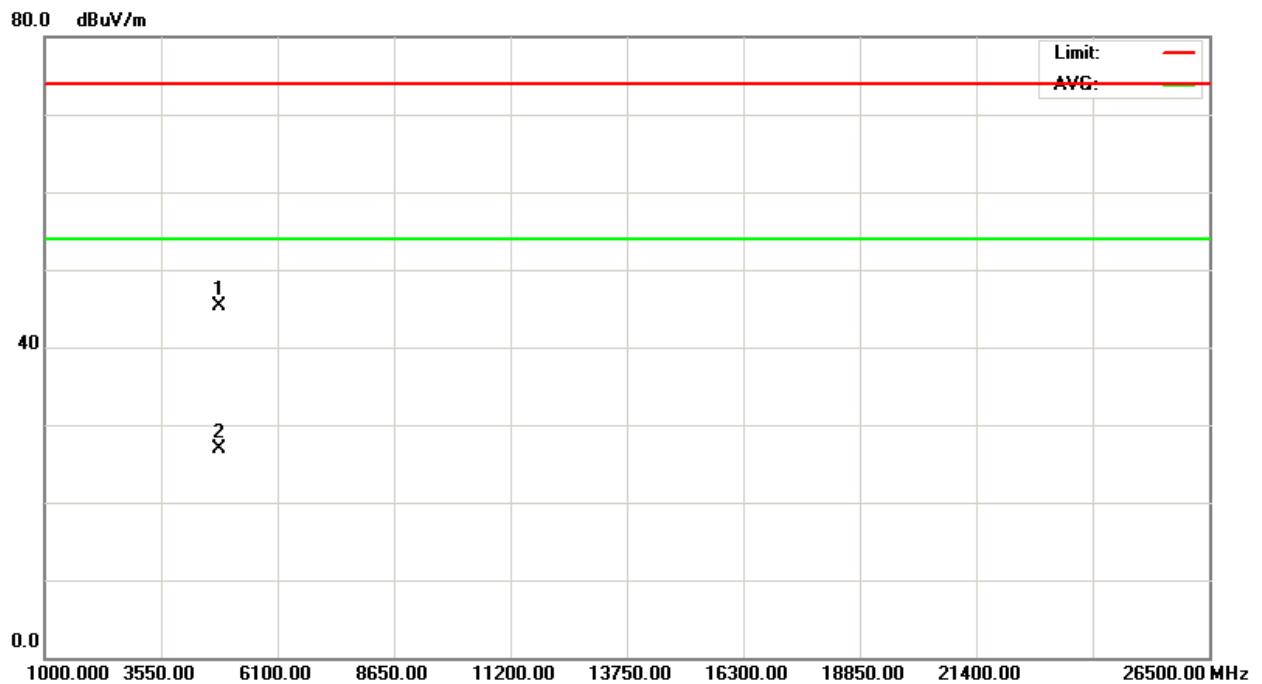
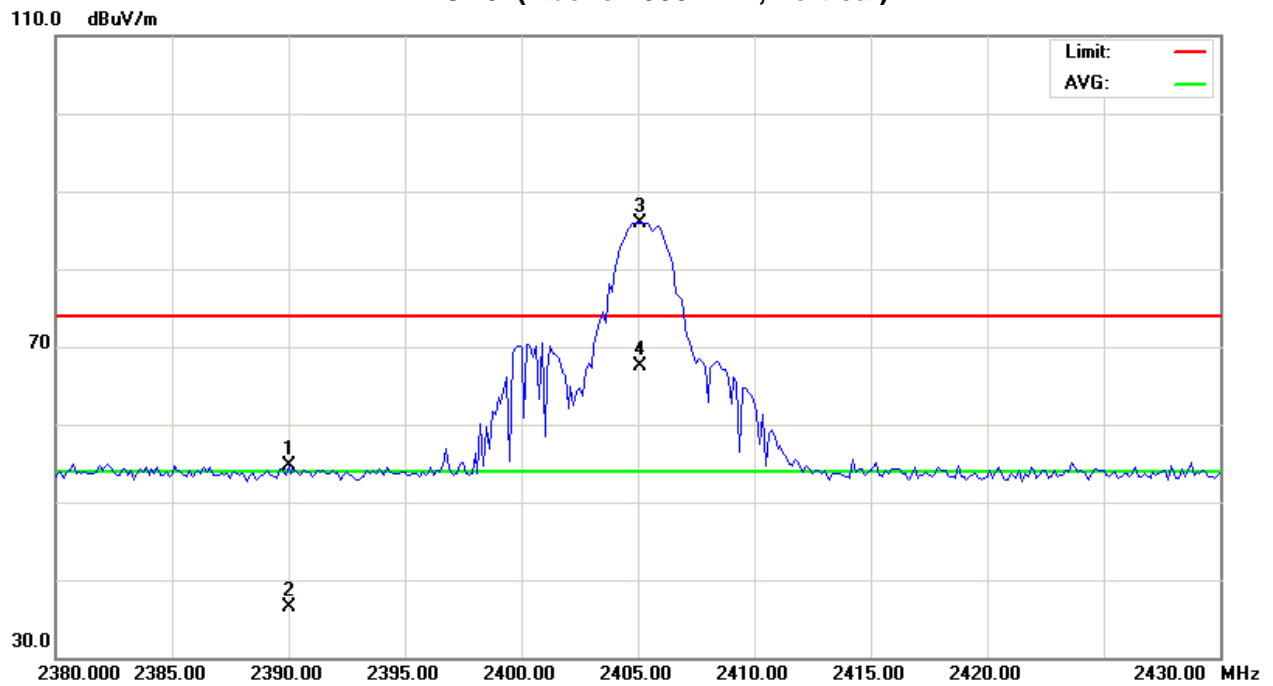
Freq. (MHz)	Ant. Pol. H/V	Reading		Ant./CF CF(dB)	Act.		Limit		Note
		Peak (dBuV)	AV (dBuV)		Peak (dBuV/m)	AV (dBuV/m)	Peak (dBuV/m)	AV (dBuV/m)	
2390.00	V	23.13	4.82	31.61	54.74	36.43	74.00	54.00	Y/E
2405.13	V	54.28	35.97	31.60	85.88	67.57			Y/F
4810.10	V	40.00	21.69	5.21	45.21	26.90	74.00	54.00	Y/H

Remark :

- (1) 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 ◦
- (2) 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.)
- (3) Radiated emissions measured in frequency range above 1000MHz were made with an instrument using Peak detector mode and AV detector mode of the emission ◦
- (4) 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.
- (5) A preamp and high pass filter were used for this test in order to provide sufficient measurement sensitivity.
- (6) EUT Orthogonal Axis :
"X" - denotes Laid on Table ; "Y" - denotes Vertical Stand ; "Z" - denotes Side Stand
- (7) 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
- (8) The average value of fundamental frequency is:
Average = Peak value + 20log(Duty cycle) ◦ Final AV=PK-18.31



TX CH01(Above 1000 MHz, Vertical)





EUT :	2.4G Wireless Keyboard	Model Name :	KBG0829
Temperature :	25 °C	Relative Humidity :	58 %
Pressure :	1010hPa	Test Voltage :	DC 3V
Test Mode :	TX 2405MHz – CH 01		

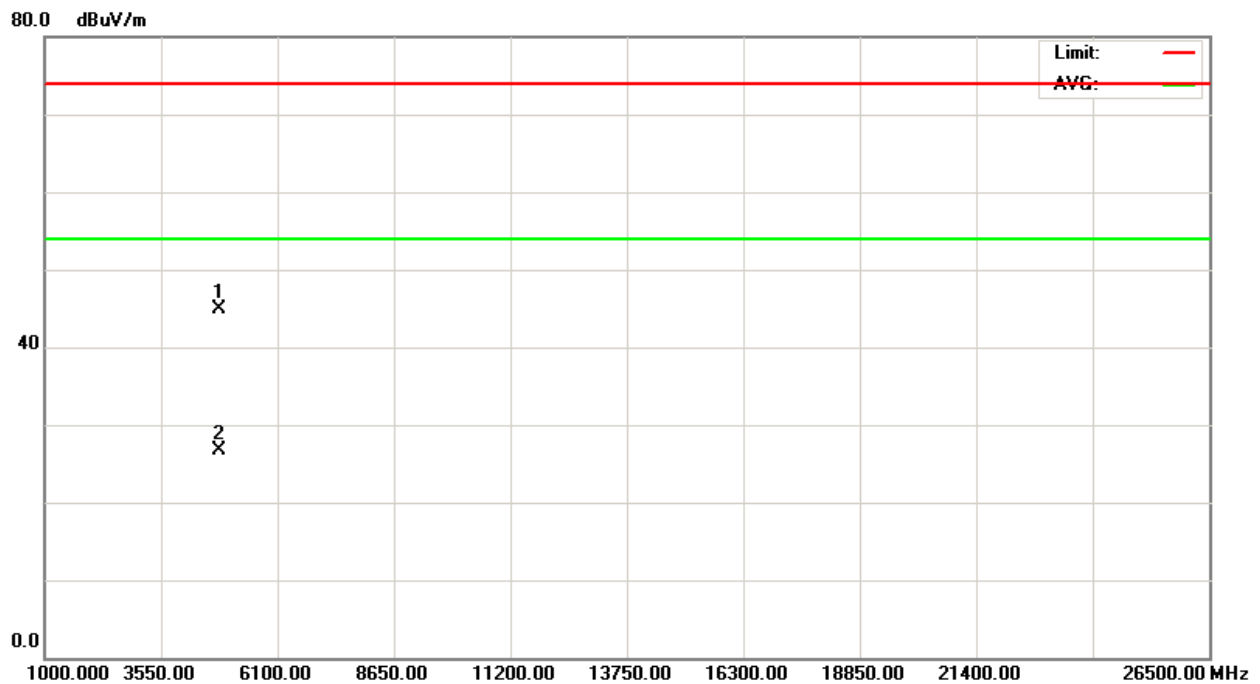
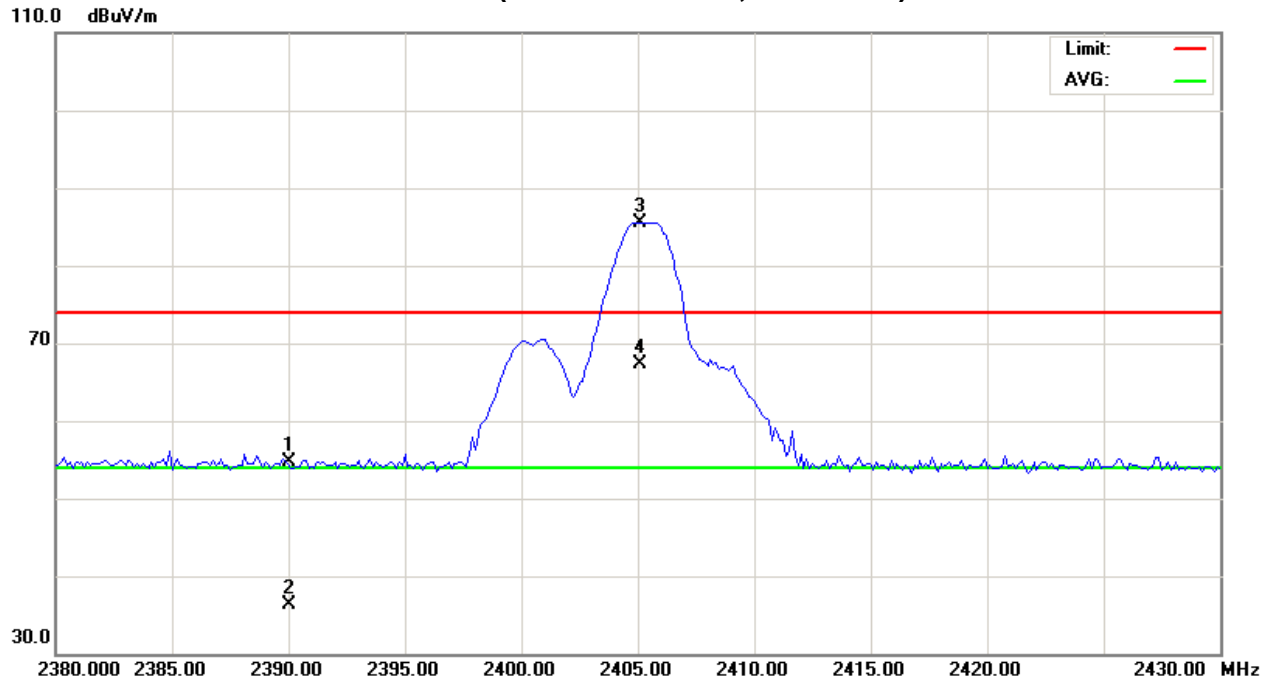
Freq. (MHz)	Ant.Pol. H/V	Reading		Ant./CF CF(dB)	Act.		Limit		Note
		Peak (dBuV)	AV (dBuV)		Peak (dBuV/m)	AV (dBuV/m)	Peak (dBuV/m)	AV (dBuV/m)	
2390.00	H	23.00	4.69	31.61	54.61	36.30	74.00	54.00	Y/E
2405.13	H	53.97	35.66	31.60	85.57	67.26			Y/F
4810.05	H	39.71	21.40	5.21	44.92	26.61	74.00	54.00	Y/H

Remark :

- (1) 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 ◦
- (2) 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.)
- (3) Radiated emissions measured in frequency range above 1000MHz were made with an instrument using Peak detector mode and AV detector mode of the emission ◦
- (4) 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.
- (5) A preamp and high pass filter were used for this test in order to provide sufficient measurement sensitivity.
- (6) EUT Orthogonal Axis :
"X" - denotes Laid on Table ; "Y" - denotes Vertical Stand ; "Z" - denotes Side Stand
- (7) 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
- (8) The average value of fundamental frequency is:
Average = Peak value + 20log(Duty cycle) , Final AV=PK-18.31



TX CH01(Above 1000 MHz, Horizontal)





EUT :	2.4G Wireless Keyboard	Model Name :	KBG0829
Temperature :	25 °C	Relative Humidity :	58 %
Pressure :	1010 hPa	Test Voltage :	DC 3V
Test Mode :	TX 2439MHz –CH32		

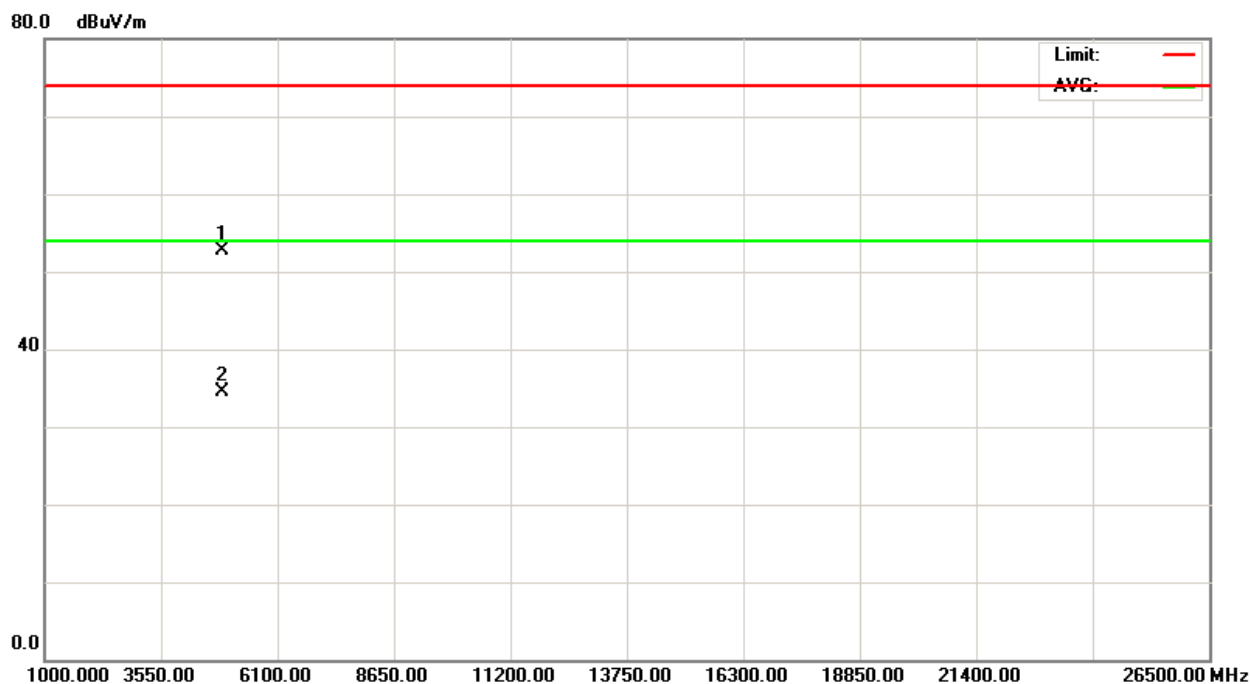
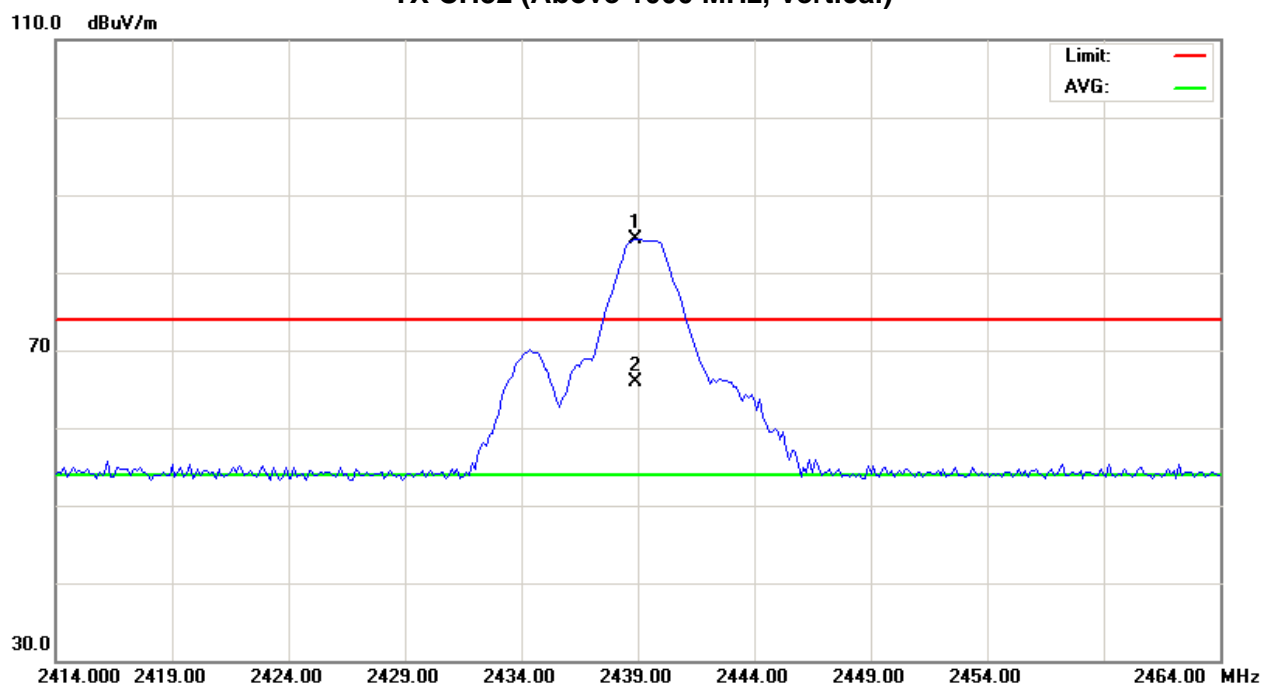
Freq.	Ant.Pol.	Reading		Ant./CF	Act.		Limit		Note
		Peak	AV		Peak	AV	Peak	AV	
(MHz)	H/V	(dBuV)	(dBuV)	CF(dB)	(dBuV/m)	(dBuV/m)	(dBuV/m)	(dBuV/m)	
2438.88	V	52.72	34.41	31.55	84.27	65.96			Y/F
4878.13	V	47.19	28.88	5.54	52.73	34.42	74.00	54.00	Y/H

Remark :

- (1) 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 ◦
- (2) 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.)
- (3) Radiated emissions measured in frequency range above 1000MHz were made with an instrument using Peak detector mode and AV detector mode of the emission ◦
- (4) 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.
- (5) A preamp and high pass filter were used for this test in order to provide sufficient measurement sensitivity.
- (6) EUT Orthogonal Axis :
 "X" - denotes Laid on Table ; "Y" - denotes Vertical Stand ; "Z" - denotes Side Stand
- (7) 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
- (8) The average value of fundamental frequency is:
 Average = Peak value + 20log(Duty cycle) , Final AV=PK-18.31



TX CH32 (Above 1000 MHz, Vertical)





EUT :	2.4G Wireless Keyboard	Model Name :	KBG0829
Temperature :	25 °C	Relative Humidity :	58 %
Pressure :	1010 hPa	Test Voltage :	DC 3V
Test Mode :	TX 2439MHz –CH32		

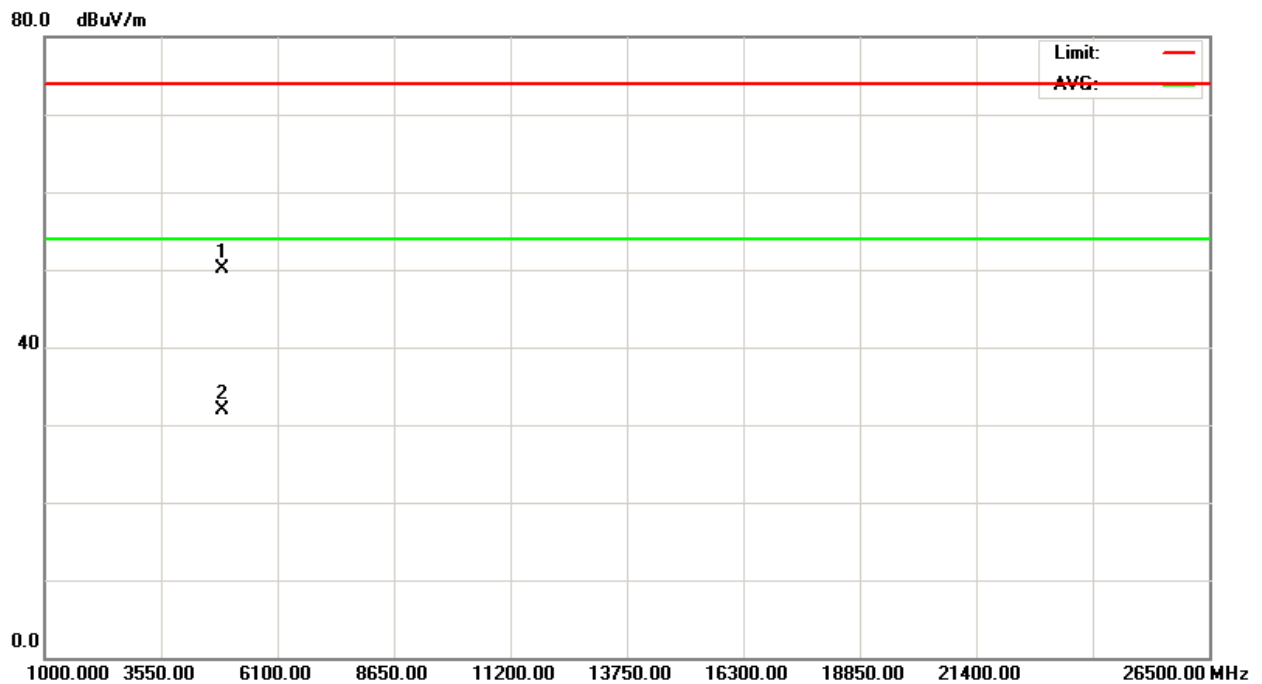
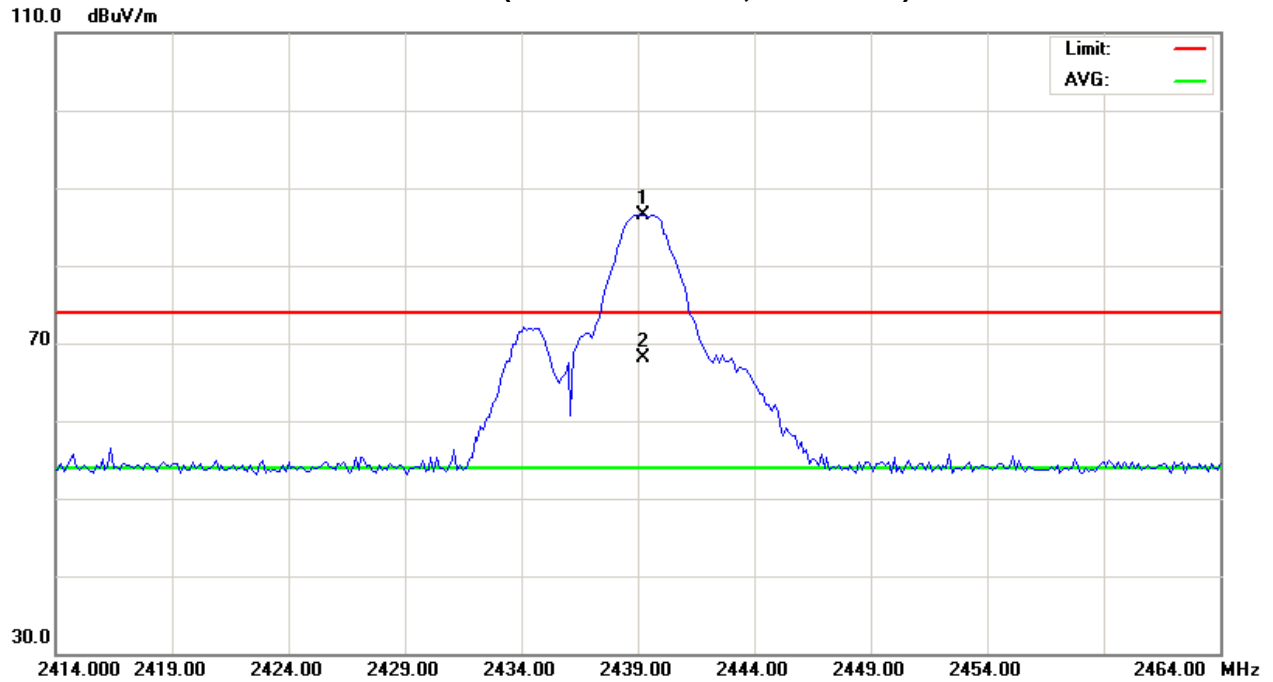
Freq.	Ant.Pol.	Reading		Ant./CF	Act.		Limit		Note
		Peak	AV		Peak	AV	Peak	AV	
(MHz)	H/V	(dBuV)	(dBuV)	CF(dB)	(dBuV/m)	(dBuV/m)	(dBuV/m)	(dBuV/m)	
2439.25	H	54.89	36.58	31.55	86.44	68.13			Y/F
4878.00	H	44.60	26.29	5.54	50.14	31.83	74.00	54.00	Y/H

Remark :

- (1) 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 ◦
- (2) 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.)
- (3) Radiated emissions measured in frequency range above 1000MHz were made with an instrument using Peak detector mode and AV detector mode of the emission ◦
- (4) 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.
- (5) A preamp and high pass filter were used for this test in order to provide sufficient measurement sensitivity.
- (6) EUT Orthogonal Axis :
"X" - denotes Laid on Table ; "Y" - denotes Vertical Stand ; "Z" - denotes Side Stand
- (7) 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
- (8) The average value of fundamental frequency is:
Average = Peak value + 20log(Duty cycle) , Final AV=PK-18.31



TX CH32 (Above 1000 MHz, Horizontal)





EUT :	2.4G Wireless Keyboard	Model Name :	KBG0829
Temperature :	25 °C	Relative Humidity :	58 %
Pressure :	1010hPa	Test Voltage :	DC 3V
Test Mode :	TX 2476MHz –CH64		

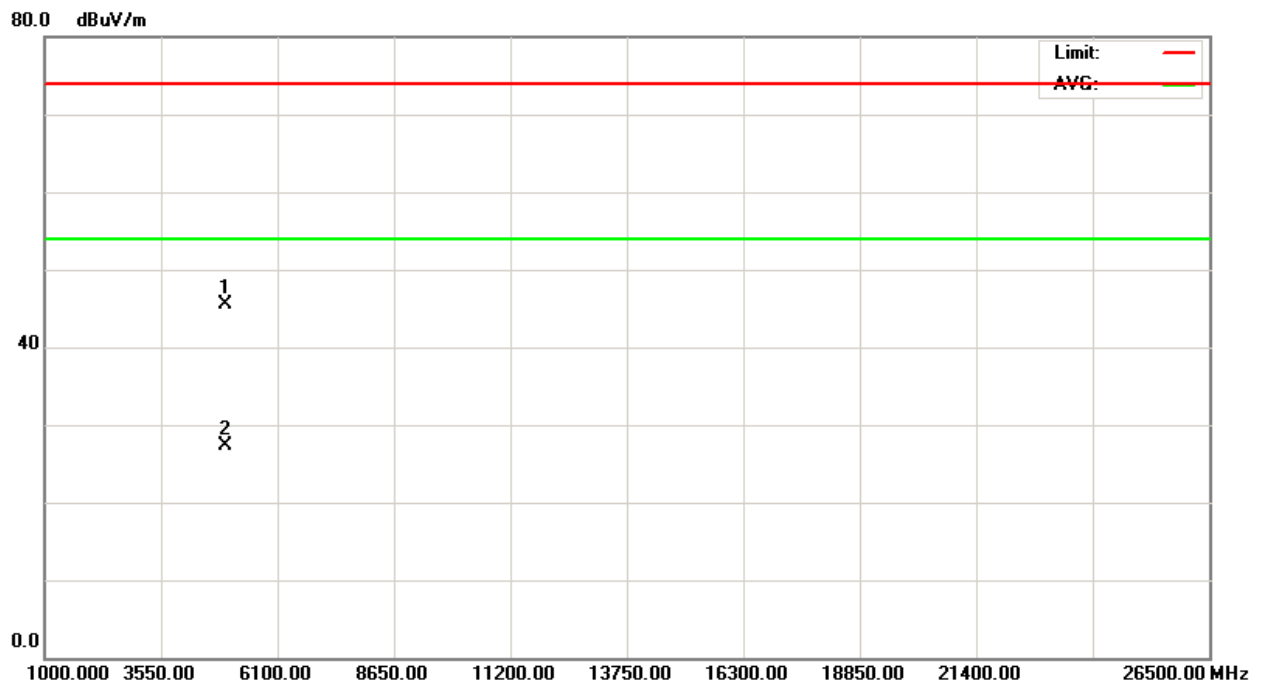
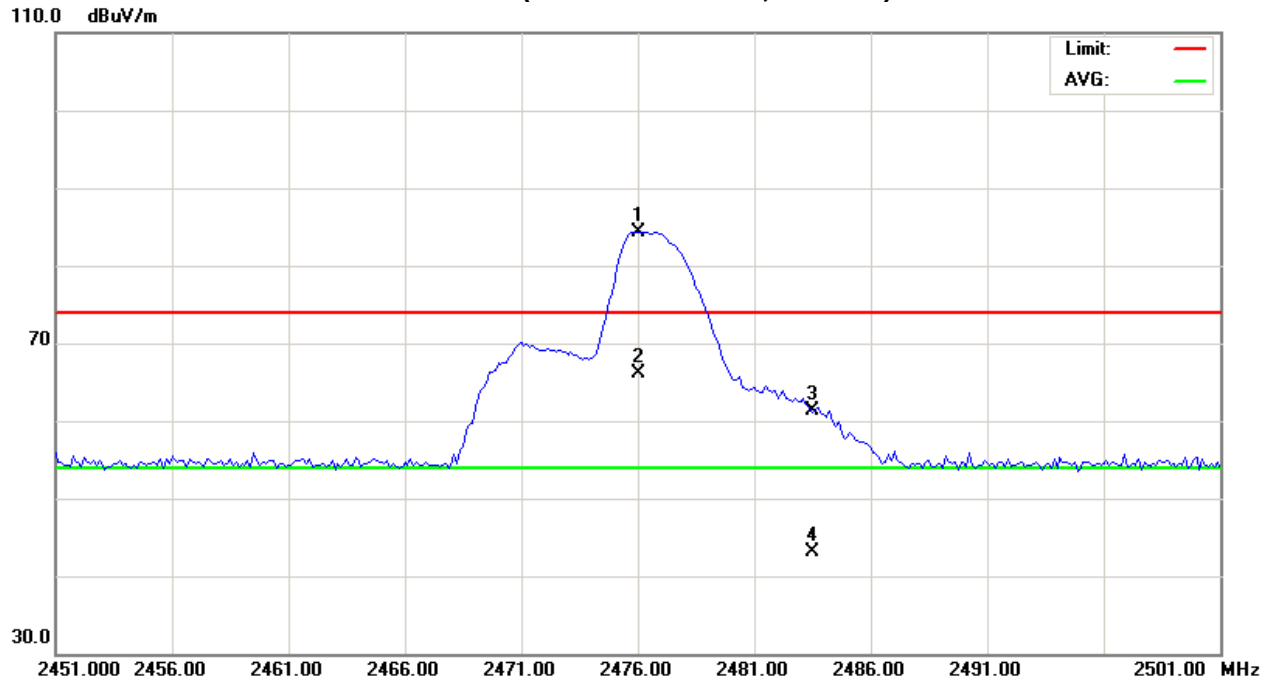
Freq.	Ant.Pol.	Reading		Ant./CF	Act.		Limit		Note
		Peak	AV		Peak	AV	Peak	AV	
(MHz)	H/V	(dBuV)	(dBuV)	CF(dB)	(dBuV/m)	(dBuV/m)	(dBuV/m)	(dBuV/m)	
2476.00	V	52.82	34.51	31.51	84.33	66.02			Y/F
2483.50	V	29.90	11.59	31.50	61.40	43.09	74.00	54.00	Y/E
4952.25	V	39.69	21.38	5.90	45.59	27.28	74.00	54.00	Y/H

Remark :

- (1) 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 ◦
- (2) 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.)
- (3) Radiated emissions measured in frequency range above 1000MHz were made with an instrument using Peak detector mode and AV detector mode of the emission ◦
- (4) 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.
- (5) A preamp and high pass filter were used for this test in order to provide sufficient measurement sensitivity.
- (6) EUT Orthogonal Axis :
"X" - denotes Laid on Table ; "Y" - denotes Vertical Stand ; "Z" - denotes Side Stand
- (7) 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
- (8) The average value of fundamental frequency is:
Average = Peak value + 20log(Duty cycle) ◦ Final AV=PK-18.31



TX CH64 (Above 1000 MHz, Vertical)





EUT :	2.4G Wireless Keyboard	Model Name :	KBG0829
Temperature :	25 °C	Relative Humidity :	58 %
Pressure :	1010 hPa	Test Voltage :	DC 3V
Test Mode :	TX 2476MHz –CH64		

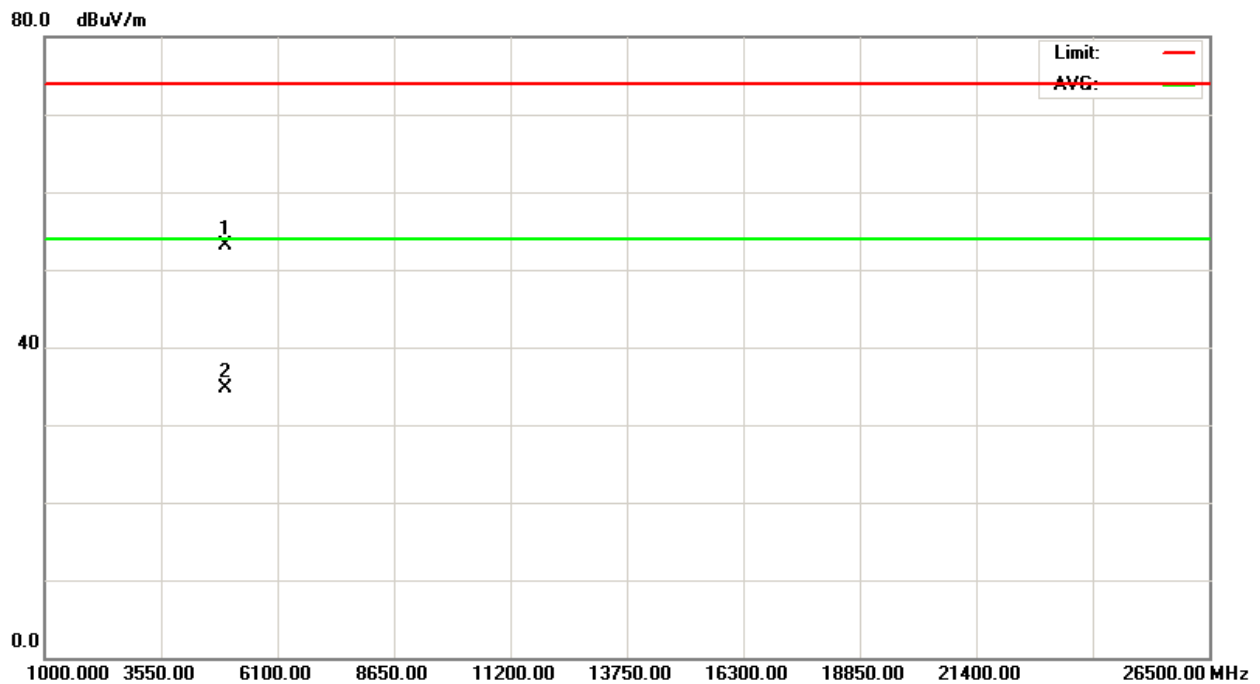
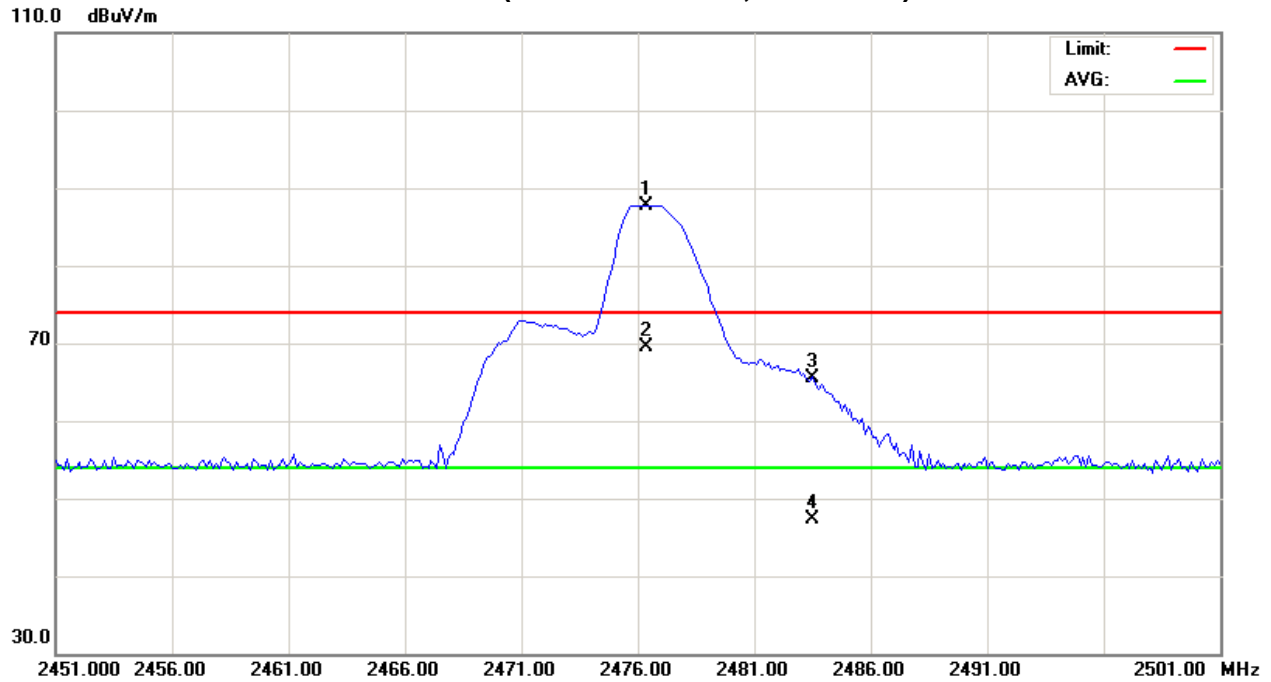
Freq.	Ant.Pol.	Reading		Ant./CF	Act.		Limit		Note
		Peak	AV		Peak	AV	Peak	AV	
(MHz)	H/V	(dBuV)	(dBuV)	CF(dB)	(dBuV/m)	(dBuV/m)	(dBuV/m)	(dBuV/m)	
2476.38	H	56.26	37.95	31.51	87.77	69.46			Y/F
2483.50	H	34.10	15.79	31.50	65.60	47.29	74.00	54.00	Y/E
4952.05	H	47.14	28.83	5.90	53.04	34.73	74.00	54.00	Y/H

Remark :

- (1) 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 ◦
- (2) 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.)
- (3) Radiated emissions measured in frequency range above 1000MHz were made with an instrument using Peak detector mode and AV detector mode of the emission ◦
- (4) 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.
- (5) A preamp and high pass filter were used for this test in order to provide sufficient measurement sensitivity.
- (6) EUT Orthogonal Axis :
"X" - denotes Laid on Table ; "Y" - denotes Vertical Stand ; "Z" - denotes Side Stand
- (7) 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
- (8) The average value of fundamental frequency is:
Average = Peak value + 20log(Duty cycle) ◦ Final AV=PK-18.31



TX CH64 (Above 1000 MHz, Horizontal)





5. NUMBER OF HOPPING CHANNEL

5.1 APPLIED PROCEDURES / LIMIT

FCC Part15 (15.247) , Subpart C			
Section	Test Item	Frequency Range (MHz)	Result
15.247 (a)(1)(iii)	Number of Hopping Channel	2400-2483.5	PASS

5.1.1 MEASUREMENT INSTRUMENTS LIST AND SETTING

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP 40	100185	Nov.26.2011

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

Spectrum Parameters	Setting
Attenuation	Auto
Span Frequency	> Operating Frequency Range
RB	100 kHz
VB	100 kHz
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

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

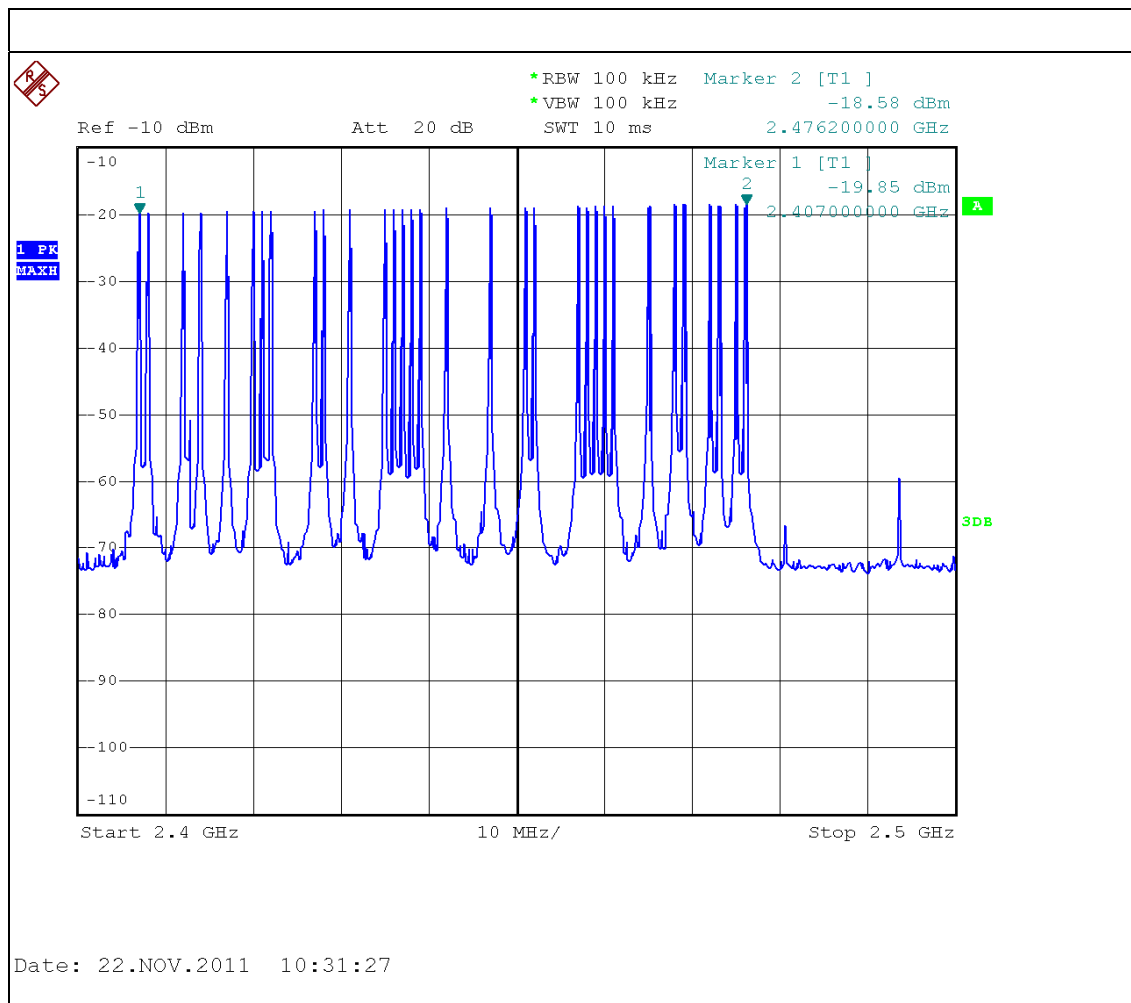
The EUT tested system was configured as the statements of 4.1.6 Unless otherwise a special operating condition is specified in the follows during the testing.



5.1.6 TEST RESULTS

EUT :	2.4G Wireless Keyboard	Model Name :	KBG0829
Temperature :	25 °C	Relative Humidity :	60 %
Pressure :	1010 hPa	Test Voltage :	DC 3V
Test Mode :	Hopping Mode		

Number of Hopping Channel	32
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6. AVERAGE TIME OF OCCUPANCY

6.1 APPLIED PROCEDURES / LIMIT

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247 (a)(1)(iii)	Average Time of Occupancy	0.4sec	2400-2483.5	PASS

6.1.1 MEASUREMENT INSTRUMENTS LIST

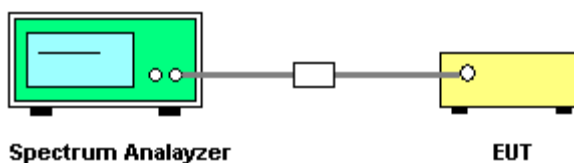
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP 40	100185	Nov.26.2011

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

6.1.2. TEST PROCEDURES

- The transmitter output (antenna port) was connected to the spectrum analyzer
- Set RBW of spectrum analyzer to 1MHz and VBW to 1MHz.
- Use a video trigger with the trigger level set to enable triggering only on full pulses.
- Sweep Time is more than once pulse time.
- Set the center frequency on any frequency would be measure and set the frequency span to zero span.
- Measure the maximum time duration of one single pulse.
- Set the EUT for packet transmitting.
- Measure the maximum time duration of one single pulse.
- Dwell time = [spreading rate/16] x duty-cycle x 0.4 seconds

6.1.3. TEST SETUP LAYOUT



6.1.4. TEST DEVIATION

There is no deviation with the original standard.

6.1.5. EUT OPERATION DURING TEST

The EUT was programmed to be in continuously transmitting/Hopping mode.



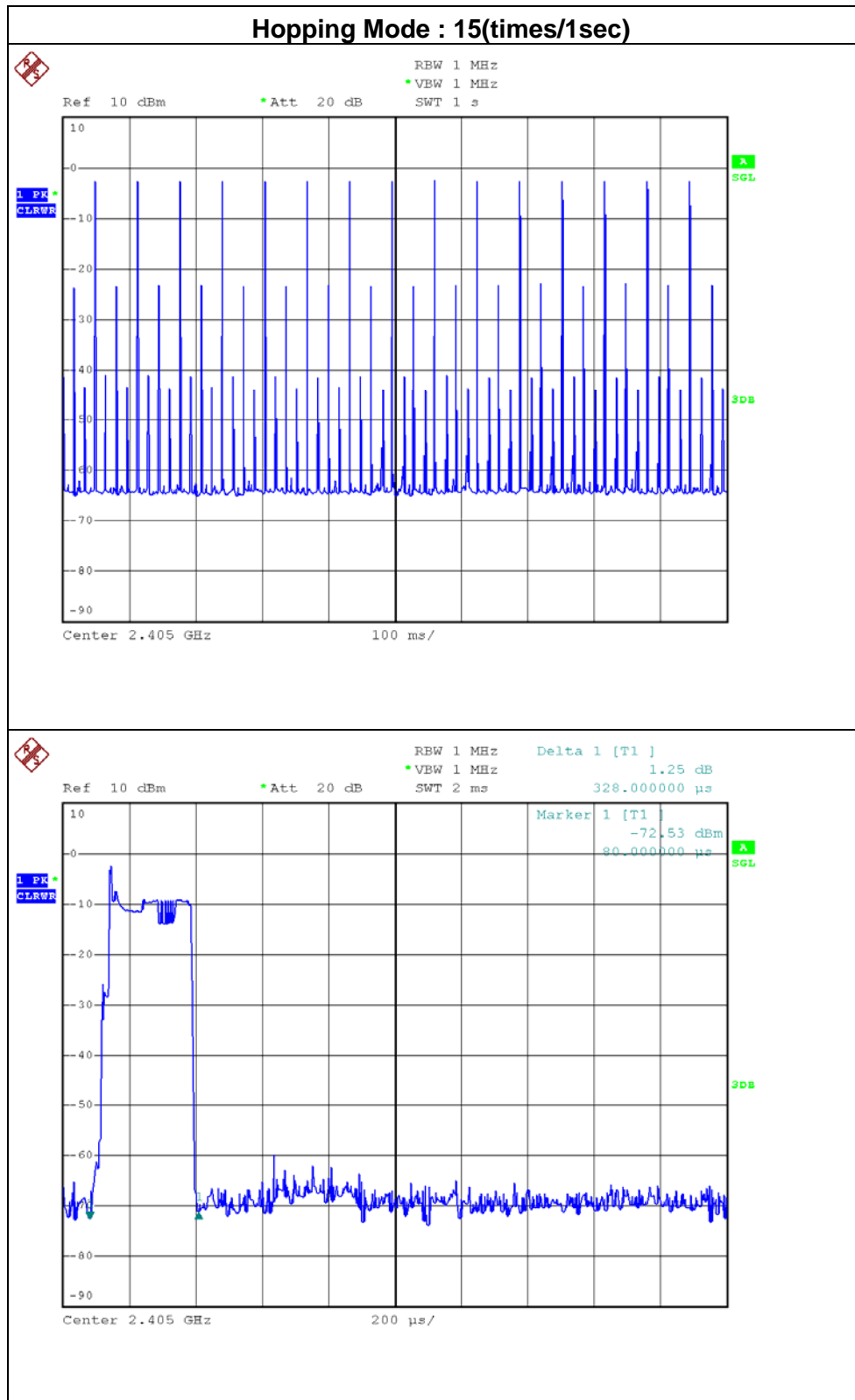
6.1.6. TEST RESULTS

EUT :	Wireless Controller for PS3	Model Name :	PL-6310
Temperature :	23 °C	Relative Humidity :	58 %
Pressure :	1015 hPa	Test Voltage :	DC 3V
Test Mode :	Hopping Mode		

Mode	Number of transmission in a 12.8(32Hopping*0.4)	Length of transmission time (msec)	Result (msec)	Limit (msec)
2405 MHz	(15/1) *12.8=192 times Note1	0.328	62.976	400

Note1: 15 times of occupied channels per 1 second

	Results
Measured cycle (sec)	32 CH*0.4=12.8
The total number of frequency-hopping per second	((15/1)*32)=480
The number of occupied channels per second	480/32=15(number/sec)
occupied time for each channel(1)	0.328ms
The total number of channels occupied within one cycle (2)	(15/1) *12.8=192 times
The average time of occupancy within one cycle(1)*(2)	62.976msec
LIMIT (msec)	400msec



7. HOPPING CHANNEL SEPARATION MEASUREMENT

7.1 APPLIED PROCEDURES / LIMIT

Frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater.

7.1.1 MEASUREMENT INSTRUMENTS LIST AND SETTING

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP 40	100185	Nov.26.2011

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

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	> Measurement Bandwidth or Channel Separation
RB	30 kHz (20dB Bandwidth) / 30 kHz (Channel Separation)
VB	100 kHz (20dB Bandwidth) / 100 kHz (Channel Separation)
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

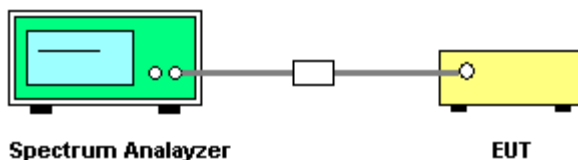
7.1.2 TEST PROCEDURE

- The transmitter output (antenna port) was connected to the spectrum analyser in peak hold mode.
- The resolution bandwidth of 30 kHz and the video bandwidth of 100 kHz were utilised for 20 dB bandwidth measurement.
- The resolution bandwidth of 30 kHz and the video bandwidth of 100 kHz were utilised for channel separation measurement.

7.1.3 DEVIATION FROM STANDARD

No deviation.

7.1.4 TEST SETUP



7.1.5 EUT OPERATION CONDITIONS

The EUT was programmed to be in Hopping on mode.

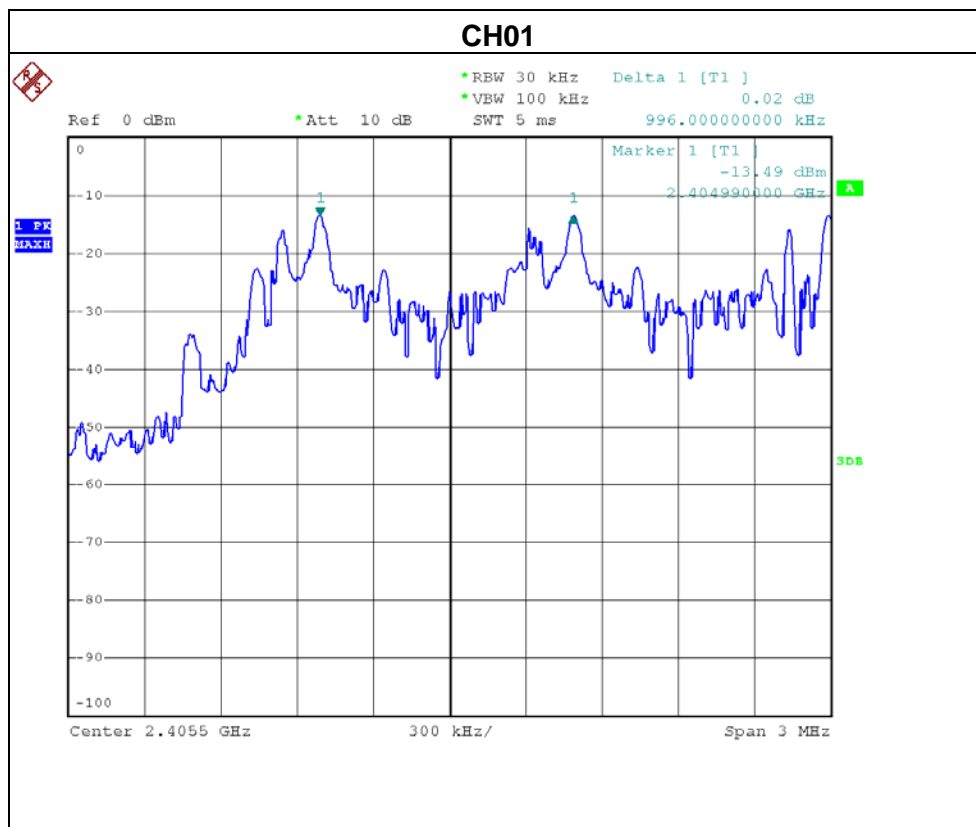


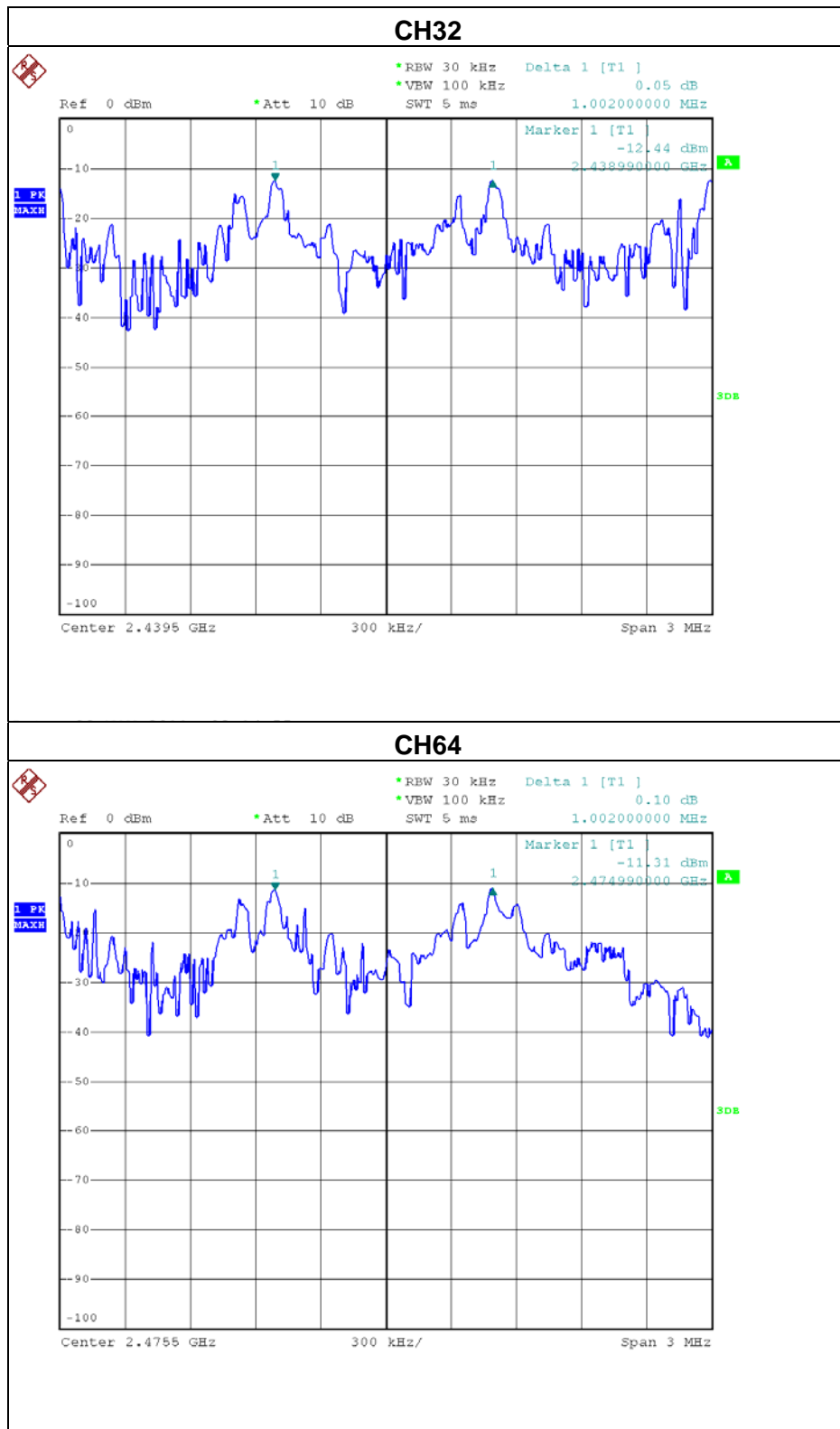
7.1.6 TEST RESULTS

EUT :	2.4G Wireless Keyboard	Model Name :	KBG0829
Temperature :	25 °C	Relative Humidity :	60 %
Pressure :	1012 hPa	Test Voltage :	DC 3V
Test Mode :	Hopping on -CH01 / CH32 /CH64		

Frequency	Ch. Separation (MHz)	20dB Bandwidth (kHz)	Result
2405 MHz	0.996	540.00	Complies
2439 MHz	1.002	540.00	Complies
2476 MHz	1.002	610.00	Complies

Ch. Separation Limits: >20dB bandwidth or >2/3 of 20dB bandwidth







8. BANDWIDTH TEST

8.1 APPLIED PROCEDURES / LIMIT

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247 (a)(1)	Bandwidth	None	2400-2483.5	PASS

8.1.1 MEASUREMENT INSTRUMENTS LIST AND SETTING

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP 40	100185	Nov.26.2011

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

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	> Measurement Bandwidth or Channel Separation
RB	30 kHz (20dB Bandwidth) / 30 kHz (Channel Separation)
VB	100 kHz (20dB Bandwidth) / 100 kHz (Channel Separation)
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

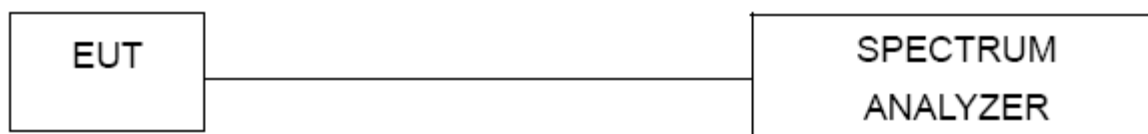
8.1.2 TEST PROCEDURE

- The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,
- Spectrum Setting : RBW= 30KHz, VBW=100KHz, Sweep time = Auto.

8.1.3 DEVIATION FROM STANDARD

No deviation.

8.1.4 TEST SETUP



8.1.5 EUT OPERATION CONDITIONS

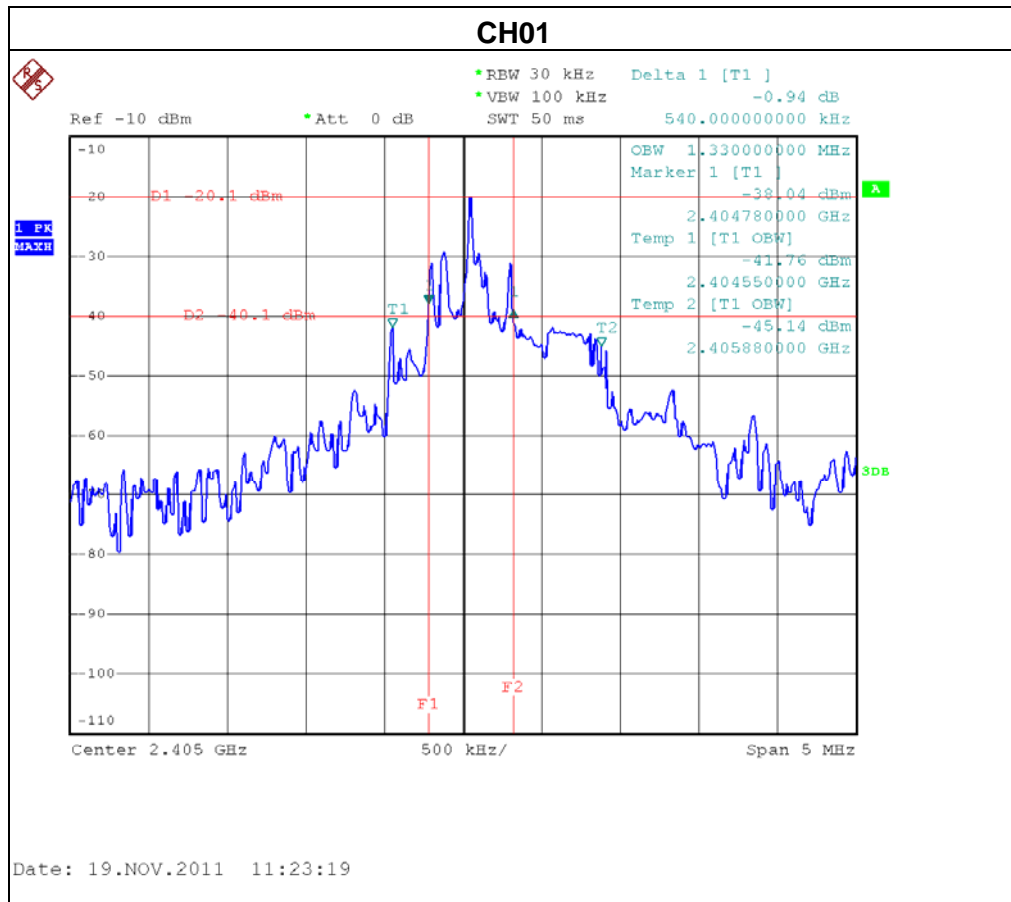
The EUT tested system was configured as the statements of 4.1.6 Unless otherwise a special operating condition is specified in the follows during the testing.

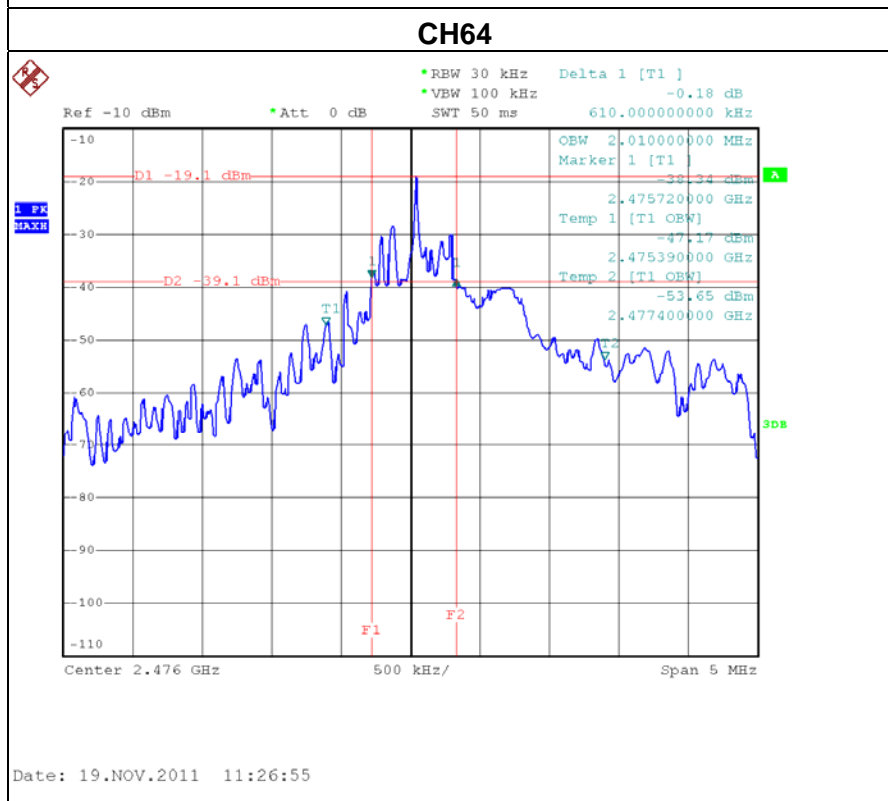
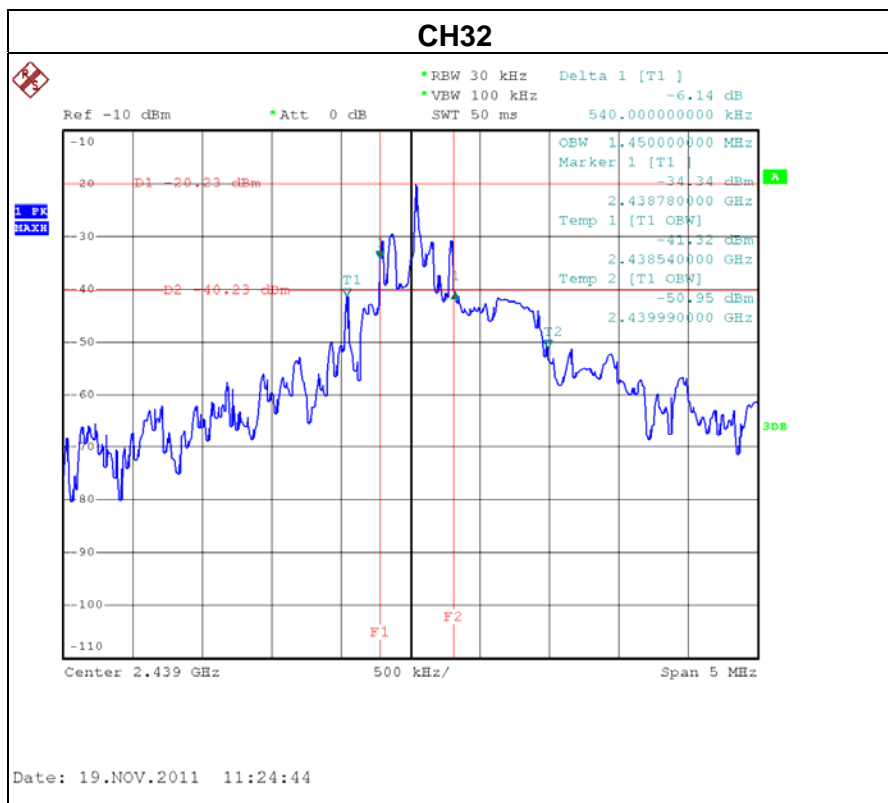


8.1.6 TEST RESULTS

EUT :	2.4G Wireless Keyboard	Model Name :	KBG0829
Temperature :	25 °C	Relative Humidity :	60 %
Pressure :	1012 hPa	Test Voltage :	DC 3V
Test Mode :	CH01 / CH32 /CH64		

Frequency	20dB Bandwidth (KHz)	Channel Separation (MHz)	Result
2405 MHz	540.00	<= 2MHz	PASS
2439 MHz	540.00	<= 2MHz	PASS
2476 MHz	610.00	<= 2MHz	PASS







9. PEAK OUTPUT POWER TEST

9.1 APPLIED PROCEDURES / LIMIT

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247 (b)(1)	Peak Output Power	0.125watt or 21dBm	2400-2483.5	PASS

9.1.1 MEASUREMENT INSTRUMENTS LIST AND SETTING

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP 40	100185	Nov.26.2011

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

9.1.2 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= 3MHz, VBW= 3MHz, Sweep time = Auto.

9.1.3 DEVIATION FROM STANDARD

No deviation.

9.1.4 TEST SETUP



9.1.5 EUT OPERATION CONDITIONS

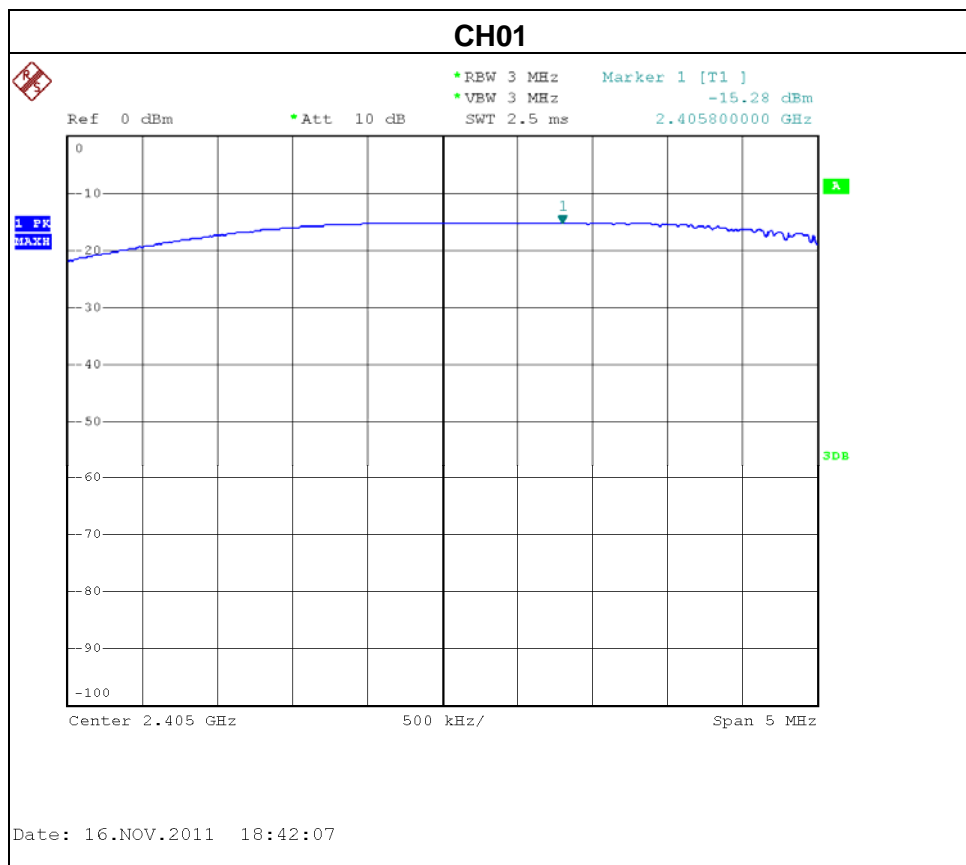
The EUT tested system was configured as the statements of 4.1.6 Unless otherwise a special operating condition is specified in the follows during the testing.

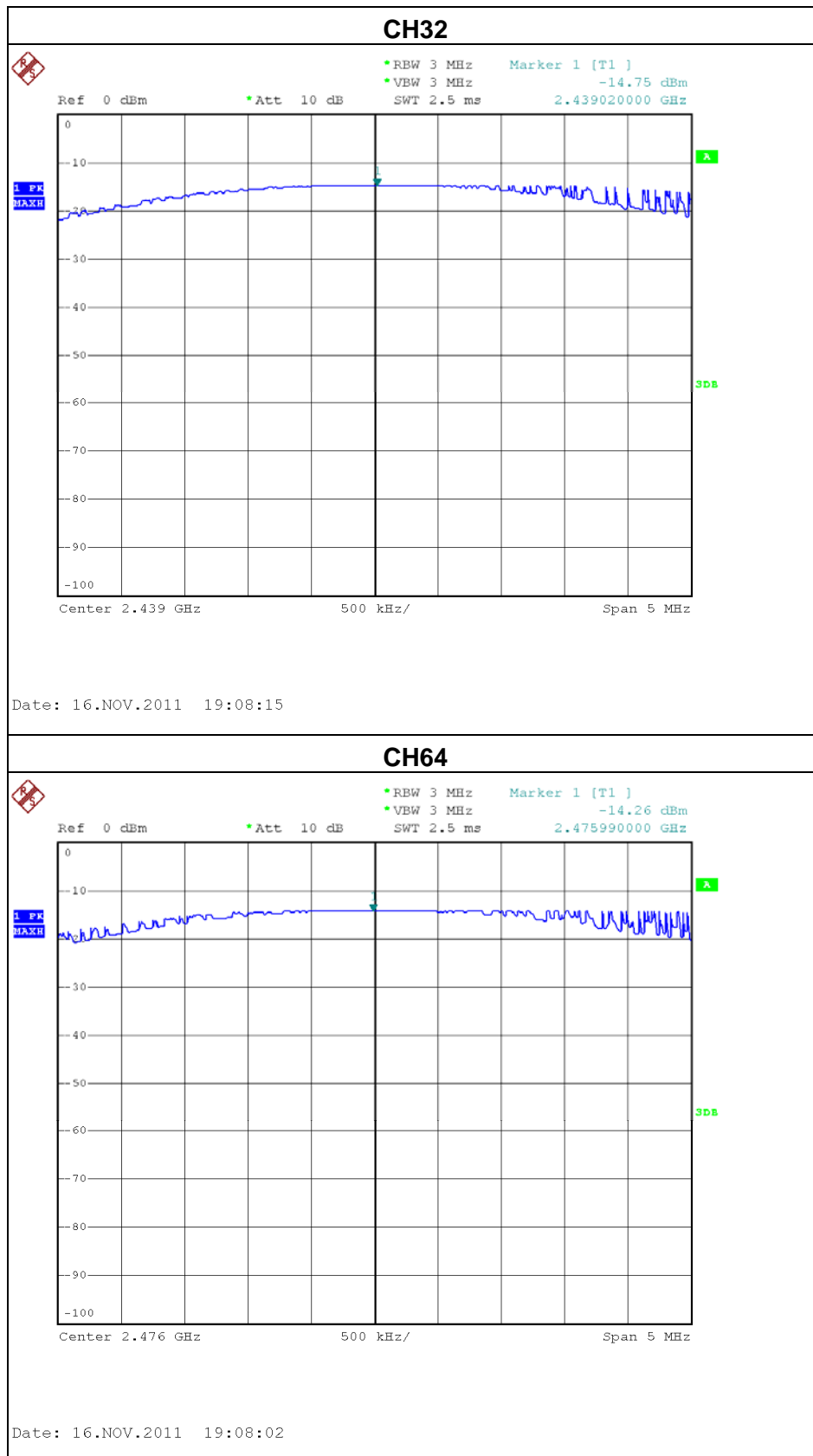


9.1.6 TEST RESULTS

EUT :	2.4G Wireless Keyboard	Model Name :	KBG0829
Temperature :	25 °C	Relative Humidity :	60 %
Pressure :	1012 hPa	Test Voltage :	DC 3V
Test Mode :	CH01/ CH32 /CH64		

Test Channel	Frequency (MHz)	Peak Output Power (dBm)	LIMIT (dBm)	LIMIT (W)
CH01	2405	-15.28	21	0.125
CH32	2439	-14.75	21	0.125
CH64	2476	-14.26	21	0.125







10. ANTENNA CONDUCTED SPURIOUS EMISSION

10.1 APPLIED PROCEDURES / 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.

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

10.1.1 MEASUREMENT INSTRUMENTS LIST AND SETTING

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP 40	100185	Nov.26.2011

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

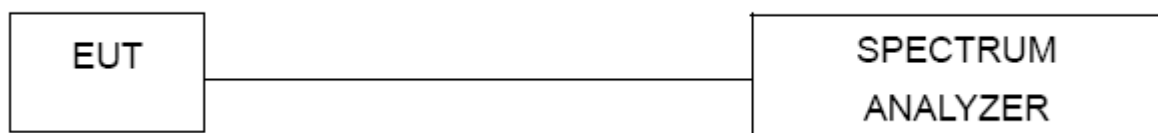
10.1.2 TEST PROCEDURE

- 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.

10.1.3 DEVIATION FROM STANDARD

No deviation.

10.1.4 TEST SETUP



10.1.5 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.



10.1.6 TEST RESULTS

EUT :	2.4G Wireless Keyboard	Model Name :	KBG0829
Temperature :	25 °C	Relative Humidity :	60 %
Pressure :	1012 hPa	Test Voltage :	DC 3V
Test Mode :	CH01 / CH32 / CH64 & Hopping on mode		

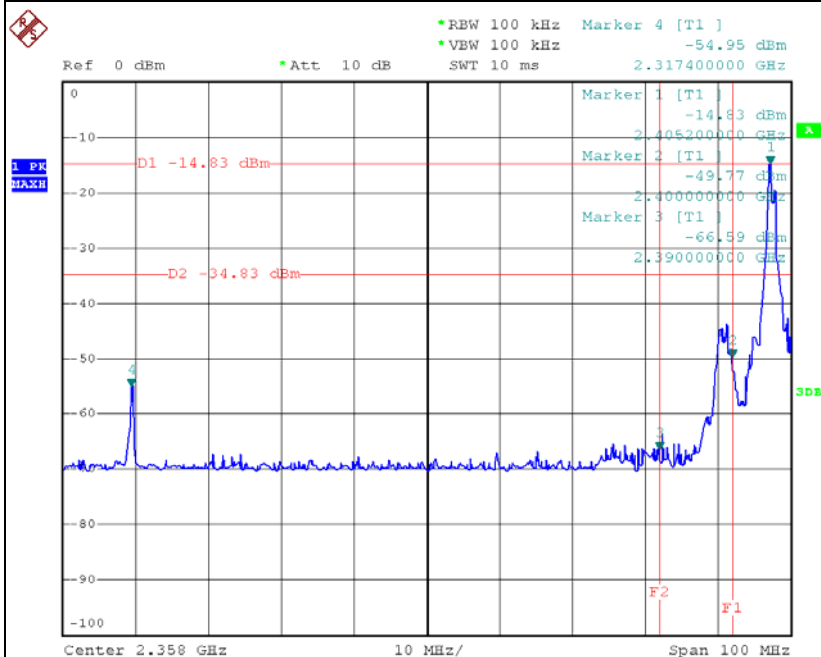
The max. radio frequency power in any 100kHz bandwidth within the frequency band		The max. radio frequency power in any 100 kHz bandwidth outside the frequency band.	
FREQUENCY(MHz)	POWER(dBm)	FREQUENCY(MHz)	POWER(dBm)
2400.00	-49.77	2485.80	-50.81

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.

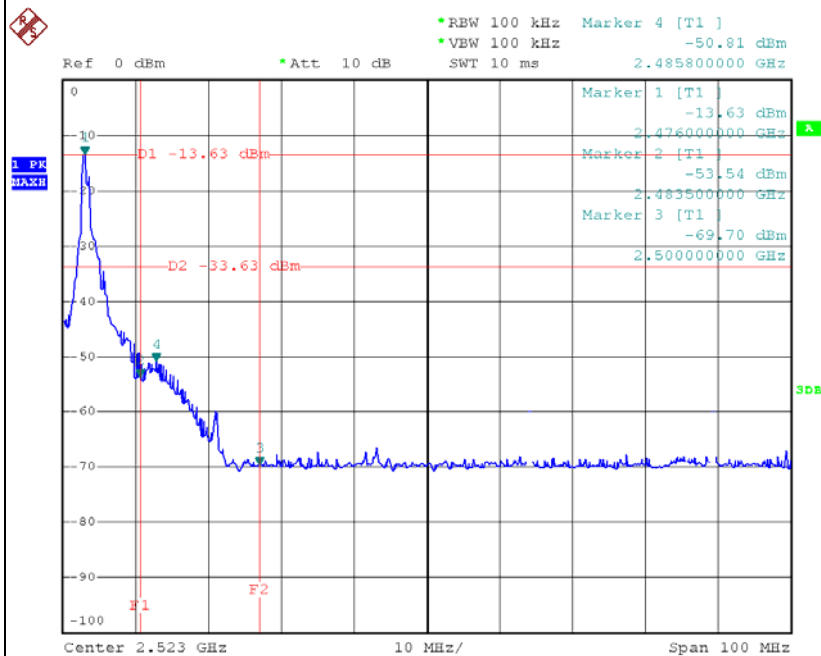


CH01 (Lower)



Date: 16.NOV.2011 18:47:47

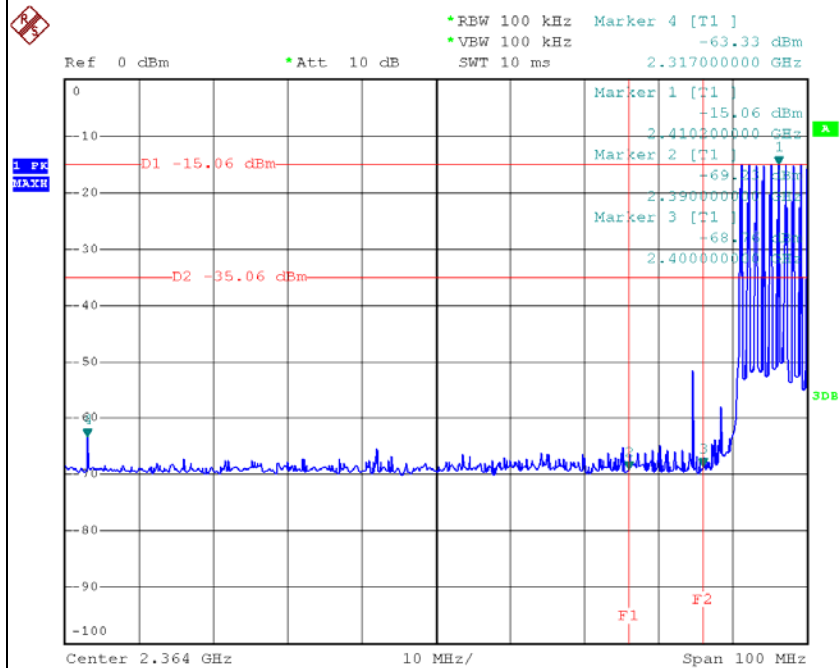
CH 78 (Upper)



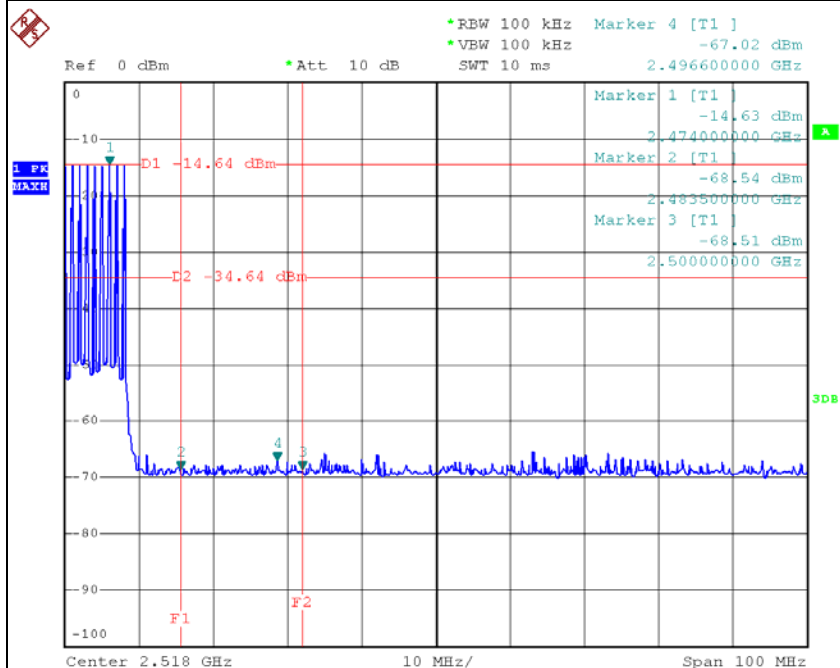
Date: 16.NOV.2011 18:54:15

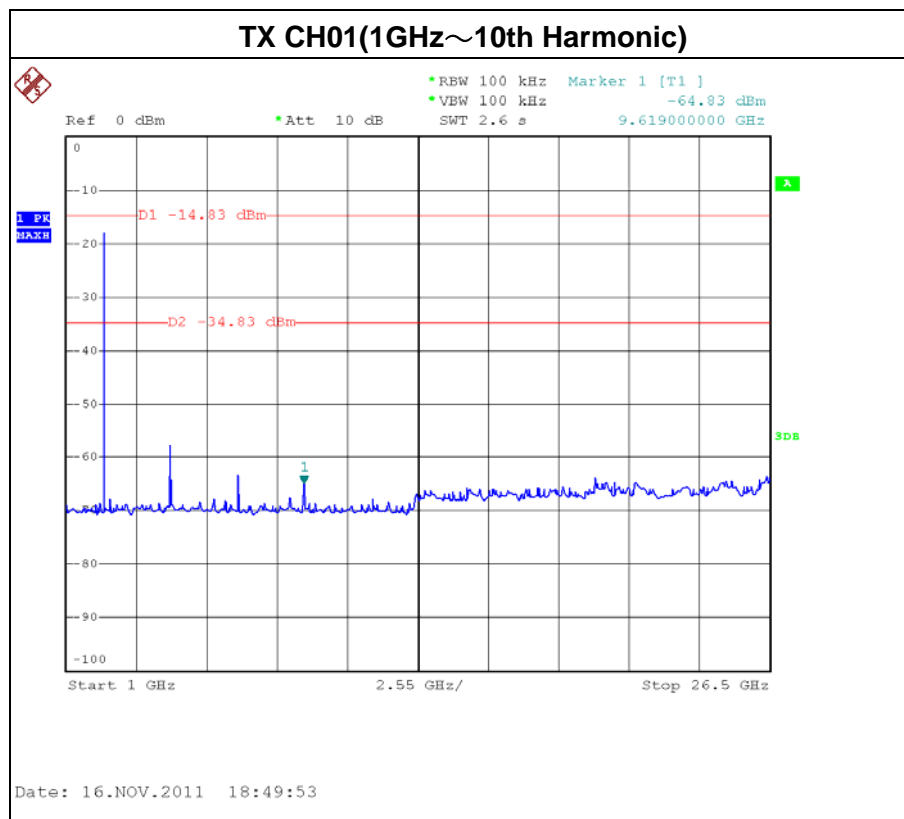
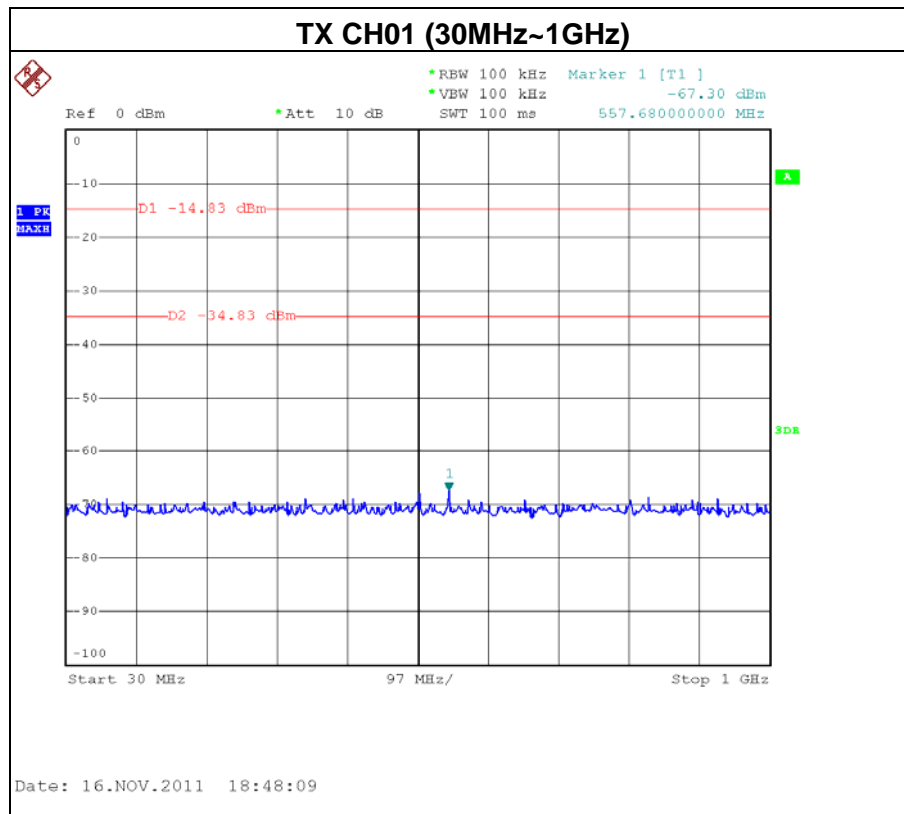


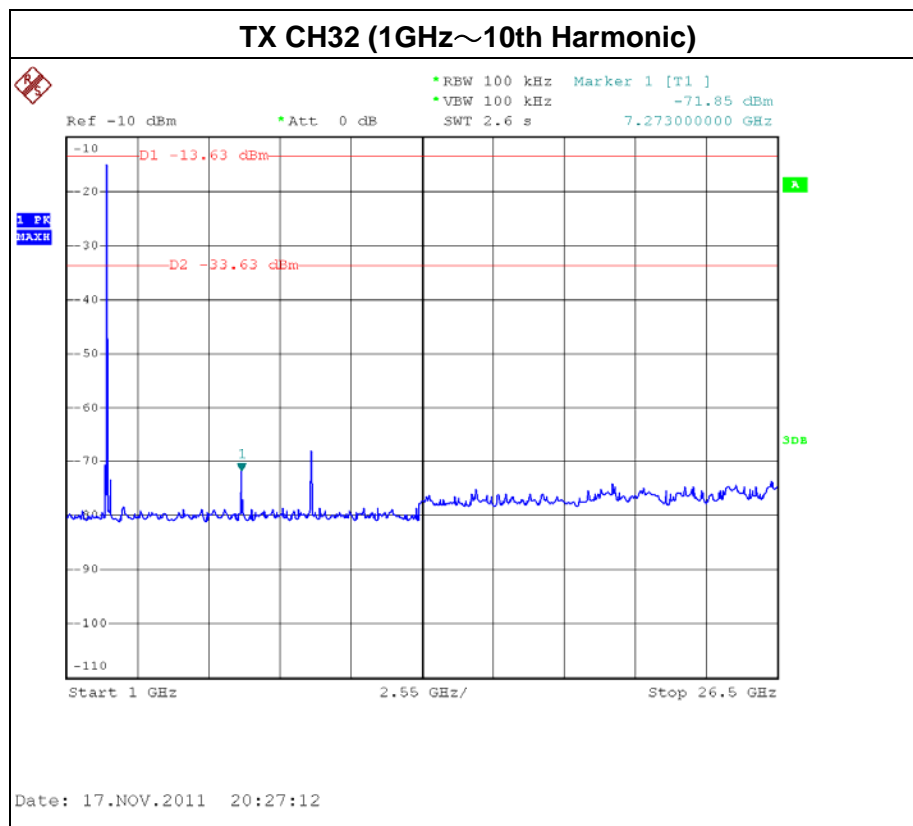
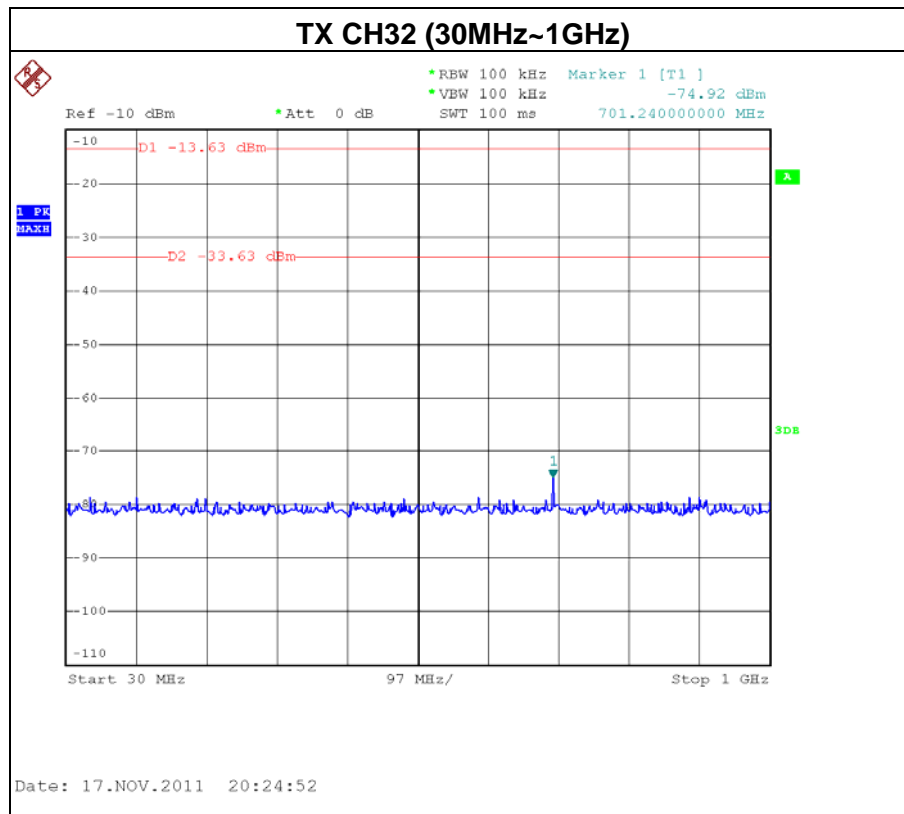
Hopping on mode (Lower)

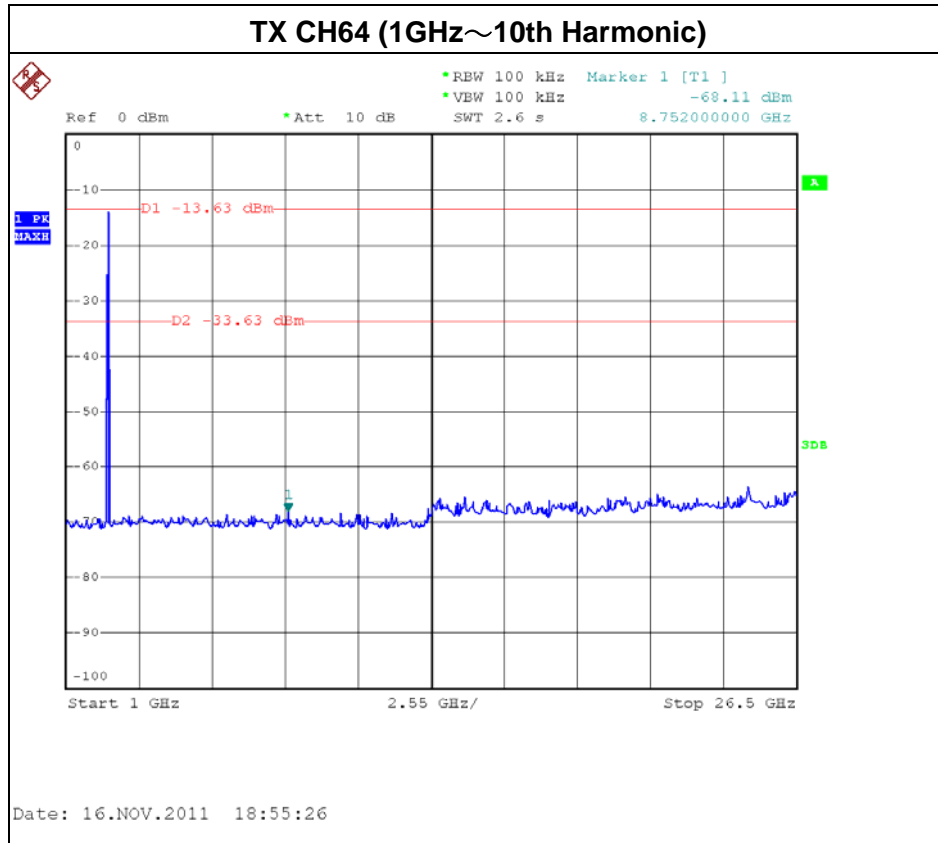
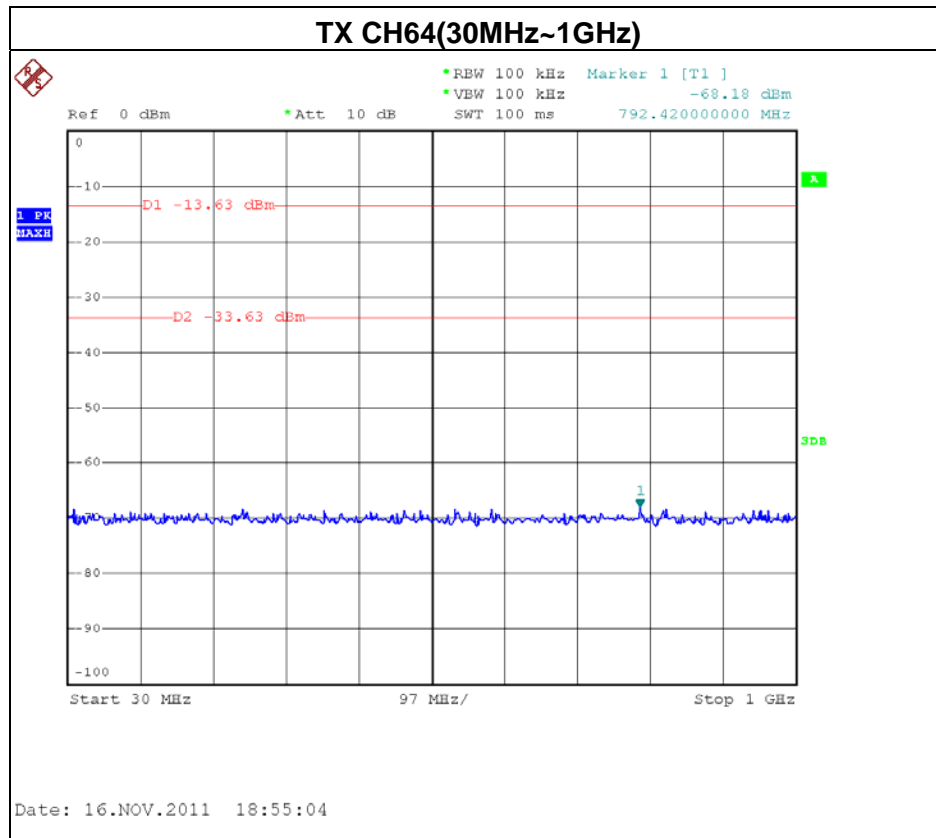


Hopping on mode (Upper)











11. EUT TEST PHOTO

Radiated Measurement Photos

