FCC Part 15
EMI TEST REPORT

of

E.U.T. : Wireless Keyboard
MODEL : AKB50
FCC ID. : OXM000073
Frequency Range : 2408MHz~2474MHz

for

APPLICANT : Targus International LLC
ADDRESS : 1211 North Miller Street Anaheim, CA 92806 USA

Test Performed by

ELECTRONICS TESTING CENTER, TAIWAN
NO. 34. LIN 5, DINGFU VIL., LINKOU DIST.,
NEW TAIPEI CITY, TAIWAN, 24442, R.O.C.
TEL : (02)26023052 FAX: (02)26010910

http：// www.etc.org.tw; e-mail：emc@etc.org.tw

Report Number : 16-12-RBF-032-02

TEST REPORT CERTIFICATION

Applicant : Targus International LLC
1211 North Miller Street Anaheim, CA 92806 USA

Manufacturer : Dong Guan You Hong plastic & electric co.,Ltd.
Zhen Hua Road,Tie Lu Keng Village,Qi Shi Town,Dong Guan City

Description of EUT

a) Type of EUT : Wireless Keyboard
b) Trade Name : Targus
c) Model No. : AKB50
d) Power Supply : Battery DC3V
f) Frequency Range : 2408MHz~2474MHz;

Regulation Applied : FCC Rules and Regulations Part 15 Subpart C

I HEREBY CERTIFY THAT: The data shown in this report were made in accordance with the procedures given in ANSI C63.10-2013, and the energy emitted by the device was founded to be within the limits applicable. I assume full responsibility for accuracy and completeness of these data.

Note: 1. The result of the testing report relate only to the item tested.
2. The testing report shall not be reproduced expect in full, without the written approval of ETC.

Summary of Tests

Test	Results
Radiated Emission	**Pass**
Conducted Emission	**N.A.**
Band Edge Requirement	**Pass**
Duty Cycle	**N.A.**
20dB Bandwidth	**Pass**

Date Test Item Received	:	*Dec. 21, 2016*
Date Test Campaign Completed	:	*May 08, 2017*
Date of Issue	:	*May 12, 2017*

Test Engineer : Brian Huang
(Brian Huang, Engineer)

Approve & Authorized Signer : S S Liou
S. S. Liou, Section Manager
EMC Dept. II of ELECTRONICS
TESTING CENTER, TAIWAN

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1 GENERAL INFORMATION

1.1 Product Description

a) Type of EUT : Wireless Keyboard
b) Trade Name : Targus
c) Model No. : AKB50
d) Power Supply : Battery DC3V
e) Frequency Range : 2408MHz~2474MHz

1.2 Characteristics of Device

The product is a wireless keyboard.

1.3 Test Methodology

Both conducted and radiated emissions were performed according to the procedures illustrated in ANSI C63.10-2013. Other required measurements were illustrated in separate sections of this test report for details.

Measurement Software

Software	Version	Note
e3	Version 6.100618b	Radiated Emission Test
e3	Version 6.100421	Conducted Emission Test

1.4 Test Facility

Location of the Test site: No.34, Lin 5, Dingfu Vil., Linkou Dist., New Taipei City, Taiwan 24442, R.O.C.
Designation Number: TW2628.

2 PROVISIONS APPLICABLE

2.1 Definition

Unintentional radiator:
A device that intentionally generates and radio frequency energy for use within the device, or that sends radio frequency signals by conduction to associated equipment via connecting wiring, but which is not intended to emit RF energy by radiation or induction.

Class A Digital Device:
A digital device which is marketed for use in commercial or business environment; exclusive of a device which is market for use by the general public, or which is intended to be used in the home.

Class B Digital Device :
A digital device which is marketed for use in a residential environment notwithstanding use in a commercial, business of industrial environment. Example of such devices that are marketed for the general public.

Note : A manufacturer may also qualify a device intended to be marketed in a commercial, business, or industrial environment as a Class B digital device, and in fact is encouraged to do so, provided the device complies with the technical specifications for a Class B Digital Device. In the event that a particular type of device has been found to repeatedly cause harmful interference to radio communications, the Commission may classify such a digital device as a Class B Digital Device, Regardless of its intended use.

Intentional radiator:
A device that intentionally generates and emits radio frequency energy by radiation or induction.

2.2 Requirement for Compliance

(1) Conducted Emission Requirement

For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150kHz to 30MHz shall not exceed the limits in the following table, as measured using a 50MH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the band edges.

Frequency MHz	Quasi Peak dBμV	Average dBμV
0.15 - 0.5	66-56	56-46
0.5 - 5.0	56	46
5.0 - 30.0	60	50

(2) Radiated Emission Requirement

For unintentional device, according to §15.109(a), except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Frequency MHz	**Distance Meters**	**Radiated dBμV/m**	**Radiated μV/m**
30 - 88	3	40.0	100
88 - 216	3	43.5	150
216 - 960	3	46.0	200
Above 960	3	54.0	500

For intentional device, according to §15.209(a), the general requirement of field strength of radiated emissions from intentional radiators at a distance of 3 meters shall not exceed the above table.

For intentional radiator device, per §15.249(a), the field strength of emissions shall comply with the following :

Frequency	Distance	Fundamental		Harmonic	
MHz	Meters	dBμV/m	mV/m	dBμV/m	μV/m
902 - 928	3	94	50	54	500
2400 - 2483.5	3	94	50	54	500
5725 - 5875	3	94	50	54	500
24000 - 24250	3	108	250	68	2500

In accordance with §15.249(e), limits shown in above table are based on average limits for frequencies above 1000 MHz, and frequencies below 1000 MHz are based on quasi peak. However, the peak field strength of any emission shall not exceed the maximum permitted average limits by more than 20 dB.

(3) Spurious in Out Band Requirement

For intentional device, according to §15.249 (d), emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of fundamental or to the general radiated emission limits in §15.209.

(4) Antenna Requirement

For intentional device, according to §15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

2.3 Restricted Bands of Operation

Only spurious emissions are permitted in any of the frequency bands listed below :

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42-16.423	399.9-410	4.5-5.25
0.495 - 0.505 **	16.69475 - 16.69525	608-614	5.35-5.46
2.1735 - 2.1905	16.80425 - 16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475 - 156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2655-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3360-4400	Above 38.6
13.36-13.41			

** : Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz

2.4 Labeling Requirement

The device shall bear the following statement in a conspicuous location on the device:

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

2.5 User Information

The users manual or instruction manual for an intentional or unintentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

For a Class B digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual.

The Federal Communications Commission Radio Frequency Interference Statement includes the following paragraph.

This equipment has been tested and found to comply with the limits for a Class B Digital Device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation.

This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction may cause harmful interference to radio communication. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

-- Reorient or relocate the receiving antenna.

-- Increase the separation between the equipment and receiver.

-- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

-- Consult the dealer or an experienced radio / TV technician for help.

3. SYSTEM TEST CONFIGURATION

3.1 Justification

For both radiated and conducted emissions, the system was configured for testing in a typical fashion as a customer would normally use it. The peripherals other than EUT, if any, were connected in normally standing by situation.

All measurement were intentional to maximum the emissions from EUT by varying the connection cables, if any, therefore, the test result is sure to meet the applicable requirement.

For portable device, the EUT was pretested in three orthogonal plans: put on table horizontally, stands vertically and side up vertically. The worst case was chosen for final test.

3.2 Devices for Tested System

Device	Manufacturer	Model / FCC ID	Description
Wireless Keyboard *	Dong Guan You Hong plastic & electric co.,Ltd.	AKB50 / OXM000073	---
Notebook PC	Lenovo	7298 RN1	1.8mUnshielded AC Power Cord

Remark "*" means equipment under test.

4 RADIATED EMISSION MEASUREMENT

4.1 Applicable Standard

For intentional radiators, according to §15.249 (a), the fundamental field strength shall not exceed 94 dBμV/m and the harmonics shall not exceed 54 dBμV/m. For out band emission except for harmonics shall be comply with §15.209 or at least attenuated by 50 dB below the level of the fundamental.

4.2 Measurement Procedure

A. Preliminary Measurement For Portable Devices

For portable devices, the following procedure was performed to determine the maximum emission axis of EUT:

1. With the receiving antenna is H polarization, rotate the EUT in turns with three orthogonal axes to determine the axis of maximum emission.
2. With the receiving antenna is V polarization, rotate the EUT in turns with three orthogonal axes to determine the axis of maximum emission.
3. Compare the results derived from above two steps. So, the axis of maximum emission from EUT was determined and the configuration was used to perform the final measurement.

B. Final Measurement

1. Setup the configuration per figure 1 and 2 for frequencies measured below and above 1 GHz respectively. Turn on EUT and make sure that it is in normal function.
2. For emission frequencies measured below 1 GHz, a pre-scan is performed in a shielded chamber to determine the accurate frequencies of higher emissions will be checked on a open test site. As the same purpose, for emission frequencies measured above 1 GHz, a pre-scan also be performed with a 1 meter measuring distance before final test.
3. For emission frequencies measured below and above 1 GHz, set the spectrum analyzer on a 100 kHz and 1 MHz resolution bandwidth respectively for each frequency measured in step 2.
4. The search antenna is to be raised and lowered over a range from 1 to 4 meters in horizontally polarized orientation. Position the highness when the highest value is indicated on spectrum analyzer, then change the orientation of EUT on test table over a range from 0 ◦ to 360 ◦ with a speed as slow as possible, and keep the azimuth that highest emission is indicated on the spectrum analyzer. Vary the antenna position again and record the highest value as a final reading. A RF test receiver is also used to confirm emissions measured.

5. Repeat step 4 until all frequencies need to be measured were complete.
6. Repeat step 5 with search antenna in vertical polarized orientations.
7. Check the three frequencies of highest emission with varying the placement of cables (if any) associated with EUT to obtain the worse case and record the result.

Figure 1 : Frequencies measured below 1 GHz configuration

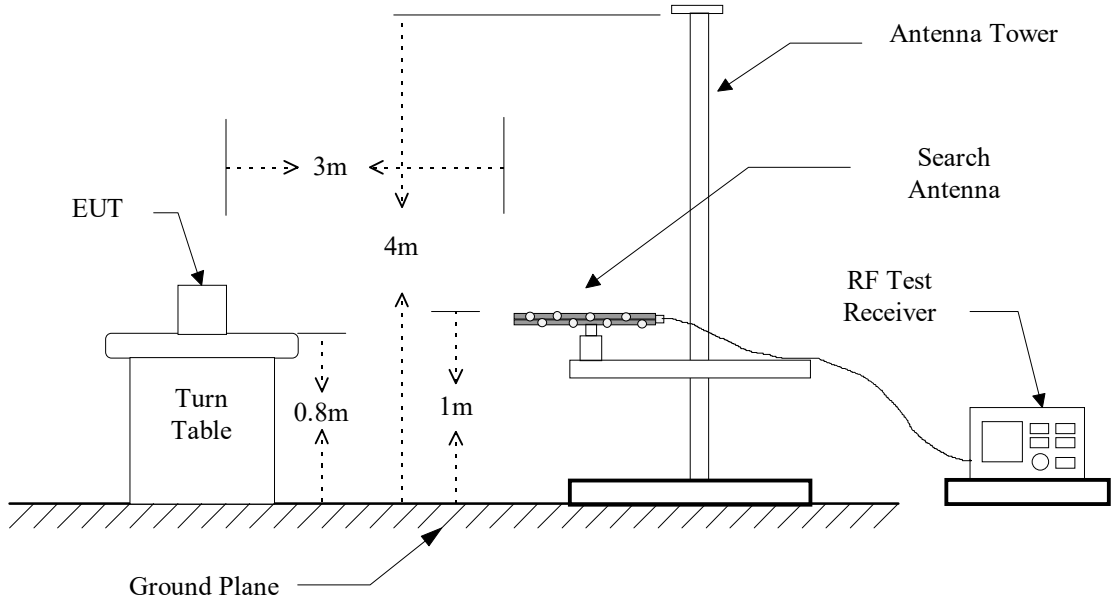
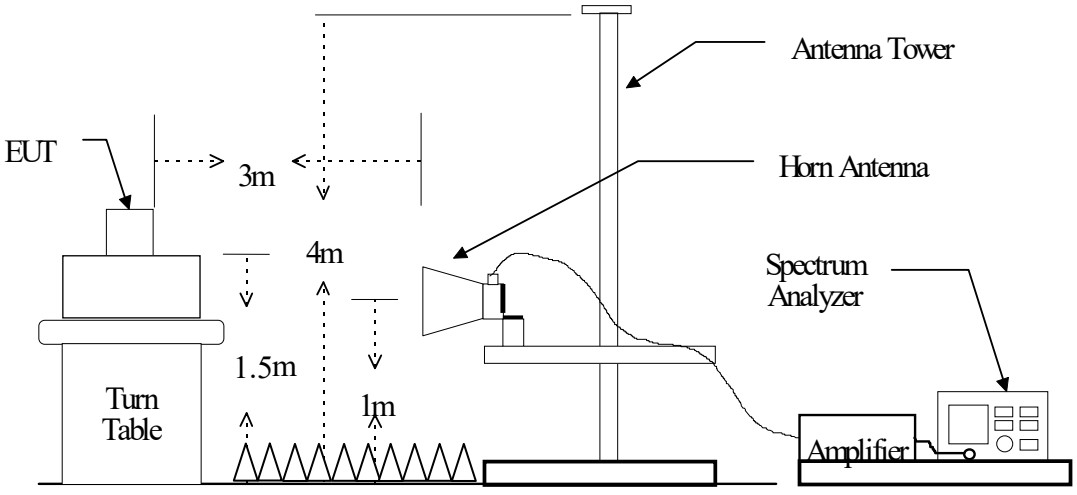


Figure 2 : Frequencies measured above 1 GHz configuration



4.3 Measuring Instrument

The following instrument are used for radiated emissions measurement:

Equipment	Manufacturer	Model No.	Calibration Date	Next Cal. Date
EMI Test Receiver	Rohde & Schwarz	ESU 40	2016/11/10	2017/11/09
Bi-Log Antenna	ETC	MCTD 2786	2016/07/15	2017/07/14
Horn Antenna	EMCO	3115	2016/10/05	2017/10/04
Horn Antenna	EMCO	3116	2016/10/05	2017/10/04
Amplifier	HP	8447D	2016/12/28	2017/12/27
Amplifier	HP	83051A	2016/07/18	2017/07/17
LOOP Antenna	EMCO	6512	2016/10/12	2017/10/11

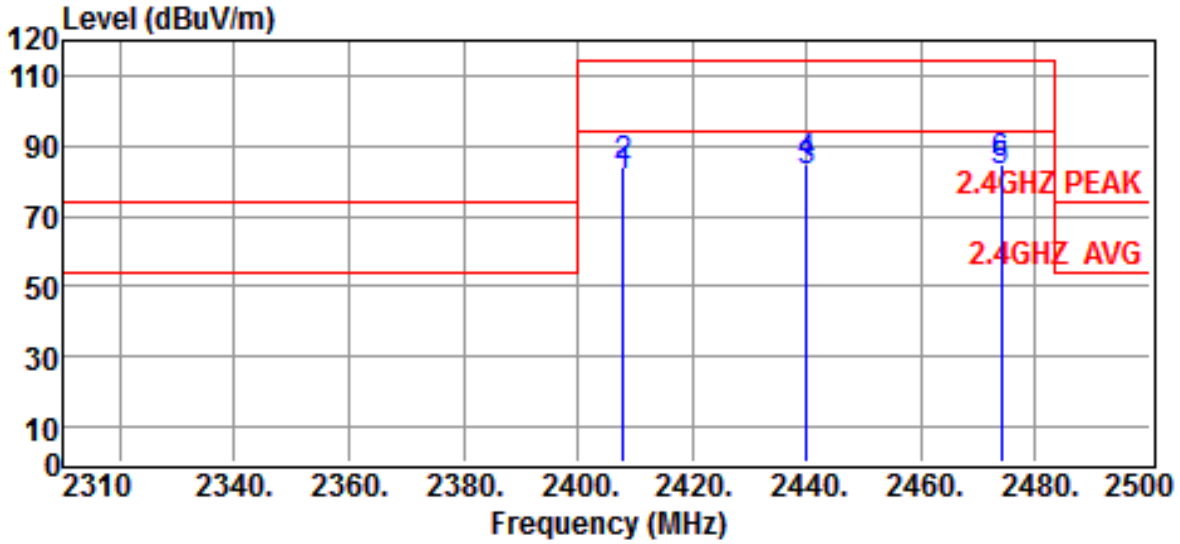
Measuring instrument setup in measured frequency band when specified detector function is used :

Frequency Band (MHz)	Instrument	Function	Resolution bandwidth	Video Bandwidth
30 to 1000	RF Test Receiver	Quasi-Peak	120 kHz	N/A
	Spectrum Analyzer	Peak	100 kHz	100 kHz
Above 1000	Spectrum Analyzer	Peak	1 MHz	1 MHz
	Spectrum Analyzer	Average	1 MHz	10 Hz or ≥ 1/T (Note 1)

Note 1:
VBW = 10 Hz, when the duty cycle is no less than 98%.
VBW ≥ 1/T, when duty cycle is less than 98% where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

4.4 Radiated Emission Data

4.4.1 RF Portion

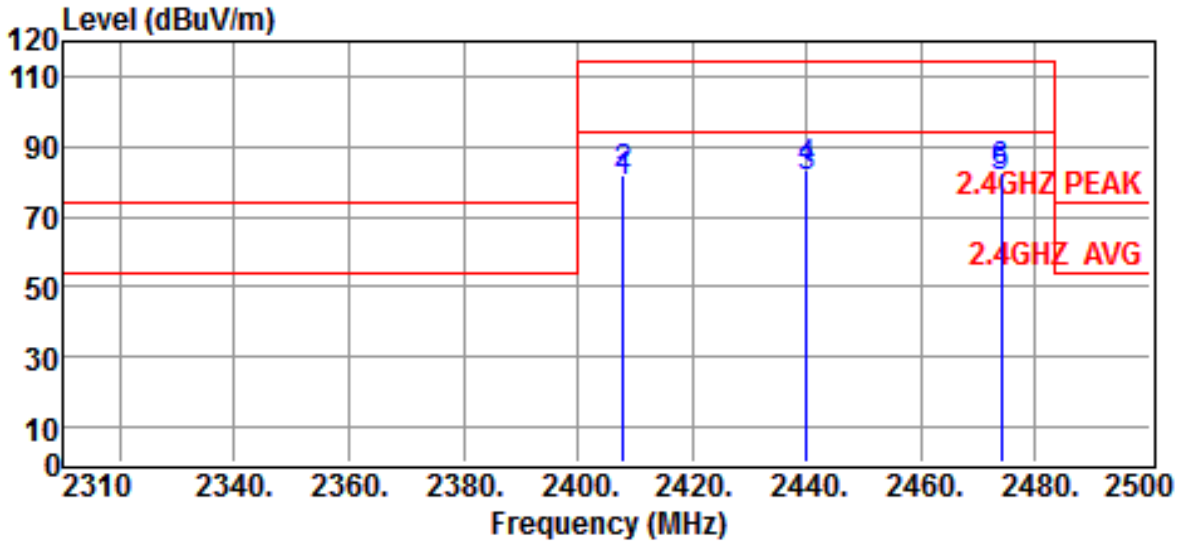


Site	:CHAMBER	Date	:2017-01-04
Limit	:2.4GHZ PEAK	Ant. Pol.	:HORIZONTAL
EUT	:Wireless Keyboard	Model	:AKB50
Power Rating	:DC 3V From Battery	Temp.	:24°C
Engineer	:Brian Huang	Humi.	:56 %
Test Mode	:TX		
Test Mode	: EUT put on table horizontally (worst case)		

Freq MHz	Reading dBµV	Correction Factor dB	Result dBµV/m	Limits dBµV/m	Over limit dB	Detector
2408.0000	87.11	-5.56	81.55	94.00	-12.45	Average
2408.0000	89.94	-5.56	84.38	114.00	-29.62	Peak
2440.0000	88.09	-5.48	82.61	94.00	-11.39	Average
2440.0000	90.28	-5.48	84.80	114.00	-29.20	Peak
2474.0000	87.93	-5.40	82.53	94.00	-11.47	Average
2474.0000	90.43	-5.40	85.03	114.00	-28.97	Peak

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit - Result

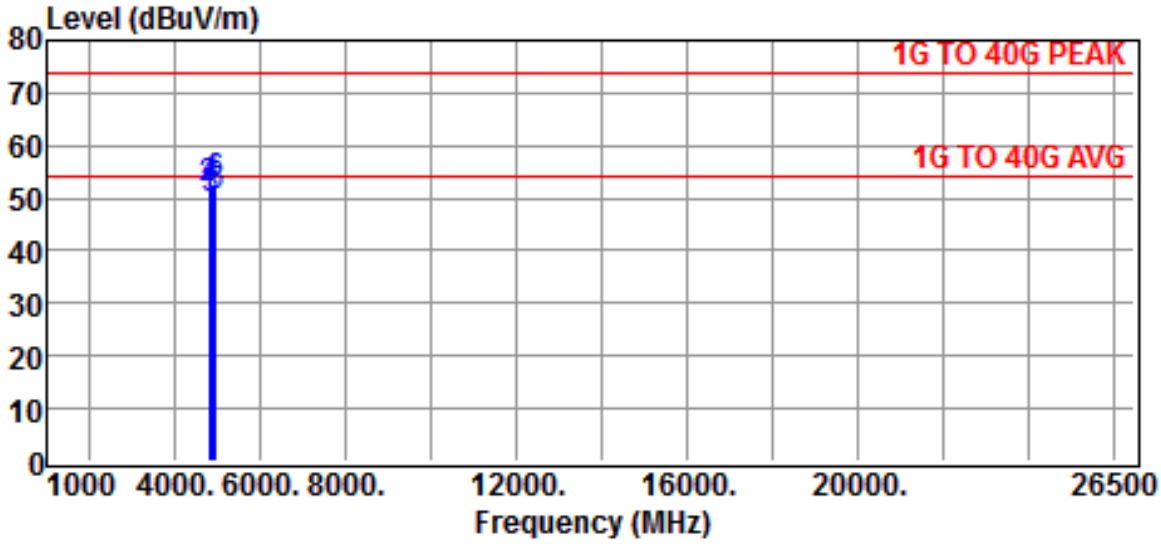


Site	:CHAMBER	Date	:2017-01-04
Limit	:2.4GHZ PEAK	Ant. Pol.	:VERTICAL
EUT	:Wireless Keyboard	Model	:AKB50
Power Rating	:DC 3V From Battery	Temp.	:24°C
Engineer	:Brian Huang	Humi.	:56 %
Test Mode	:TX		
Test Mode	: EUT put on table horizontally (worst case)		

Freq MHz	Reading dBµV	Correction Factor dB	Result dBµV/m	Limits dBµV/m	Over limit dB	Detector
2408.0000	85.66	-5.56	80.10	94.00	-13.90	Average
2408.0000	87.90	-5.56	82.34	114.00	-31.66	Peak
2440.0000	84.21	-5.48	78.73	94.00	-15.27	Average
2440.0000	86.42	-5.48	80.94	114.00	-33.06	Peak
2474.0000	84.35	-5.40	78.95	94.00	-15.05	Average
2474.0000	86.82	-5.40	81.42	114.00	-32.58	Peak

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit – Result

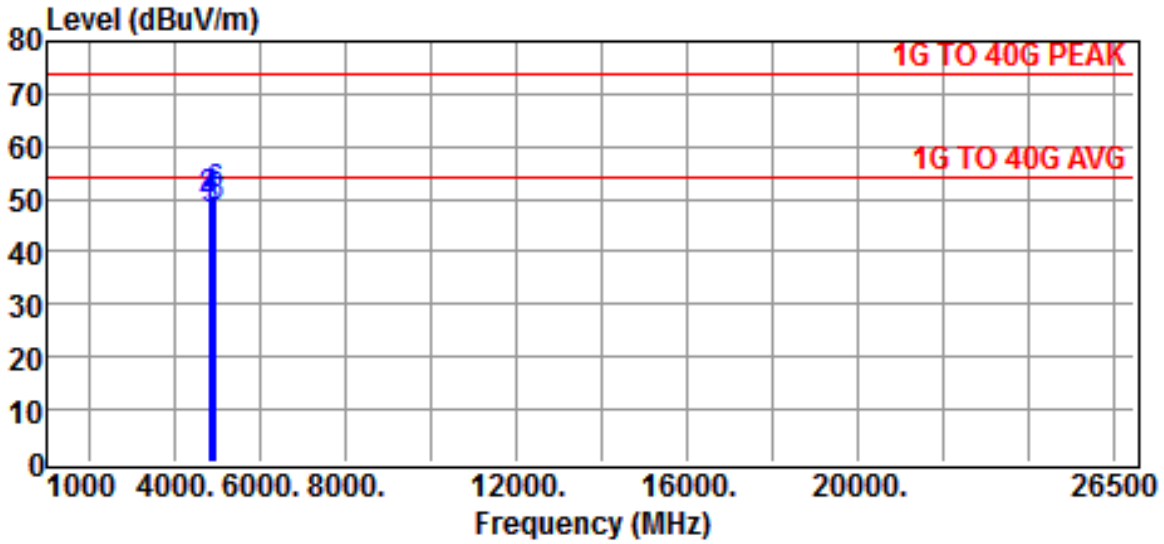


Site	:CHAMBER	Date	:2017-01-04
Limit	:1G TO 40G PEAK	Ant. Pol.	:HORIZONTAL
EUT	:Wireless Keyboard	Model	:AKB50
Power Rating	:DC 3V From Battery	Temp.	:24°C
Engineer	:Brian Huang	Humi.	:56 %
Memo	:TX		
Test Mode	: EUT put on table horizontally (worst case)		

Freq MHz	Reading dBµV	Correction Factor dB	Result dBµV/m	Limits dBµV/m	Over limit dB	Detector
4816.0000	48.33	1.24	49.57	54.00	-4.43	Average
4816.0000	50.71	1.24	51.95	74.00	-22.05	Peak
4880.0000	48.24	1.44	49.68	54.00	-4.32	Average
4880.0000	50.58	1.44	52.02	74.00	-21.98	Peak
4948.0000	48.76	1.68	50.44	54.00	-3.56	Average
4948.0000	51.19	1.68	52.87	74.00	-21.13	Peak

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit – Result



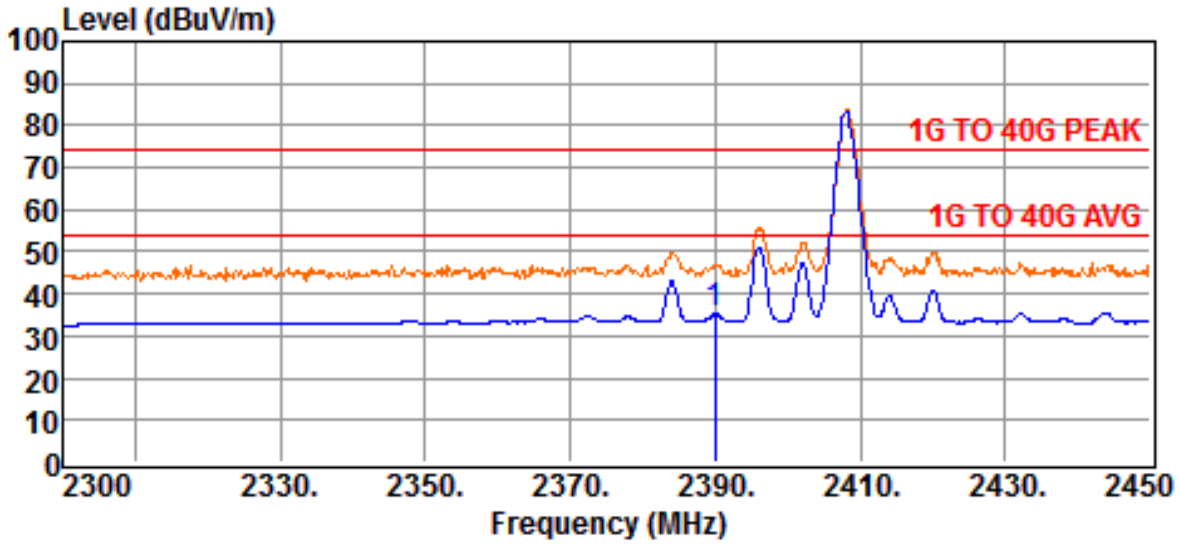
Site	:CHAMBER	Date	:2017-01-04
Limit	:1G TO 40G PEAK	Ant. Pol.	:VERTICAL
EUT	:Wireless Keyboard	Model	:AKB50
Power Rating	:DC 3V From Battery	Temp.	:24°C
Engineer	:Brian Huang	Humi.	:56 %
Memo	:TX		
Test Mode	: EUT put on table horizontally (worst case)		

Freq MHz	Reading dBµV	Correction Factor dB	Result dBµV/m	Limits dBµV/m	Over limit dB	Detector
4816.0000	46.58	1.24	47.82	54.00	-6.18	Average
4816.0000	48.66	1.24	49.90	74.00	-24.10	Peak
4880.0000	46.37	1.44	47.81	54.00	-6.19	Average
4880.0000	48.28	1.44	49.72	74.00	-24.28	Peak
4948.0000	46.76	1.68	48.44	54.00	-5.56	Average
4948.0000	48.91	1.68	50.59	74.00	-23.41	Peak

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit – Result

4.4.2 Radiated Emissions in Restricted Bands

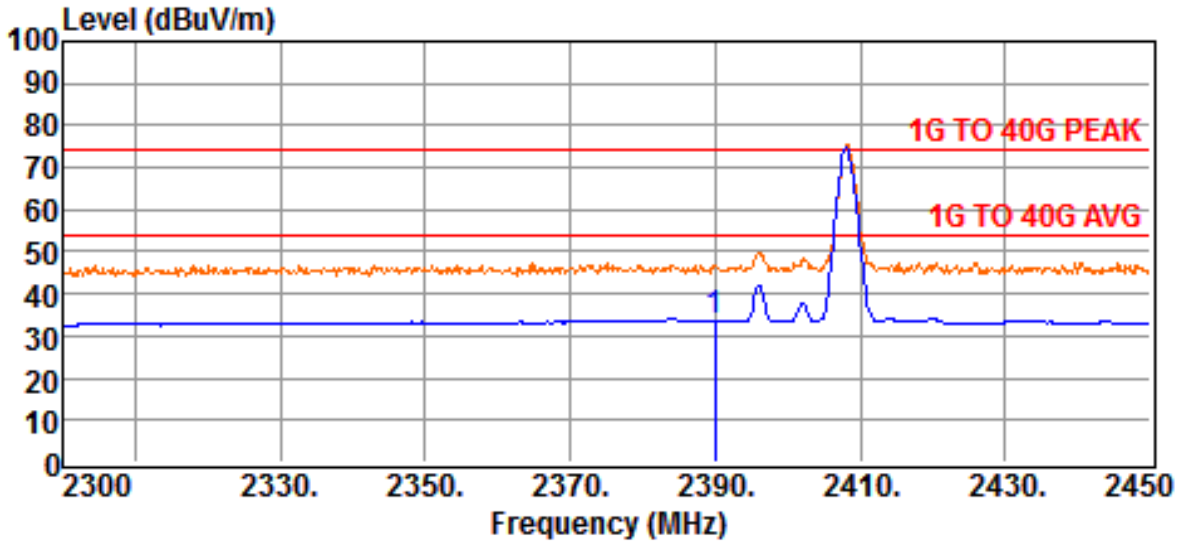


Site	:Chamber #2	Date	:2017-05-08
Limit	:1G TO 40G PEAK	Ant. Pol.	:HORIZONTAL
EUT	:Wireless Keyboard	Model	:AKB50
Power Rating	:DC 3V From Battery	Temp.	:24°C
Engineer	:Brian Huang	Humi.	:53 %
Test Mode	:Channel low		
Test Mode	: EUT put on table horizontally (worst case)		

Freq MHz	Reading dBµV	Correction Factor dB	Result dBµV/m	Limits (AVG) dBµV/m	Over limit dB	Detector
2390.0000	40.83	-5.61	35.22	54.00	-18.78	Average

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit – Result
4. Peak measurements are compared to the average limit - as peak measurements are below the average limit, they also comply with the peak limit.

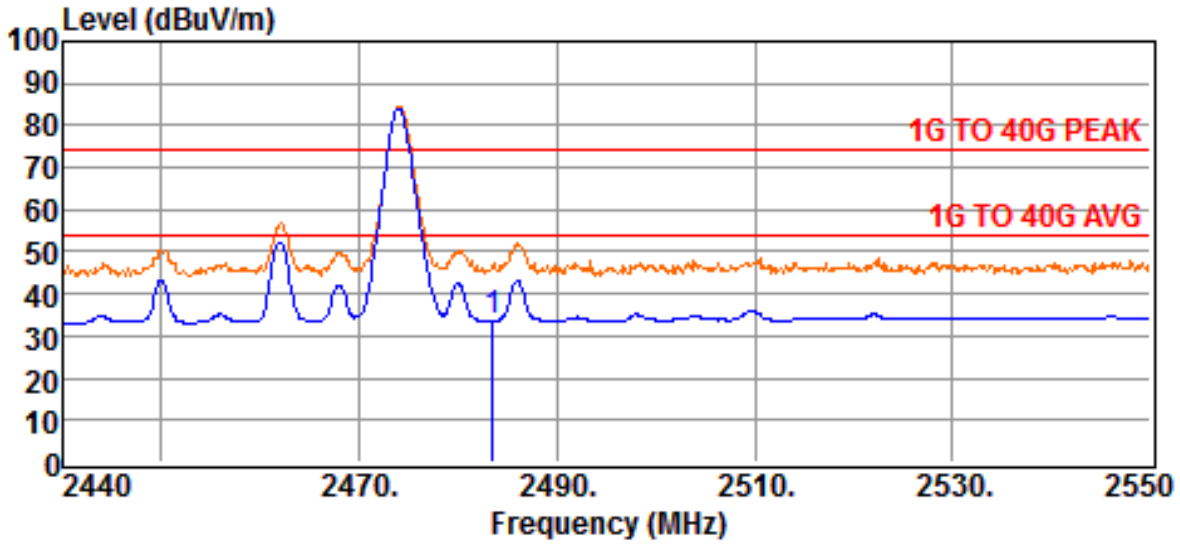


Site	:Chamber #2	Date	:2017-05-08
Limit	:1G TO 40G PEAK	Ant. Pol.	:VERTICAL
EUT	:Wireless Keyboard	Model	:AKB50
Power Rating	:DC 3V From Battery	Temp.	:24°C
Engineer	:Brian Huang	Humi.	:53 %
Test Mode	:Channel low		
Test Mode	: EUT put on table horizontally (worst case)		

Freq MHz	Reading dBµV	Correction Factor dB	Result dBµV/m	Limits (AVG) dBµV/m	Over limit dB	Detector
2390.0000	39.18	-5.61	33.57	54.00	-20.43	Average

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit – Result
4. Peak measurements are compared to the average limit - as peak measurements are below the average limit, they also comply with the peak limit.

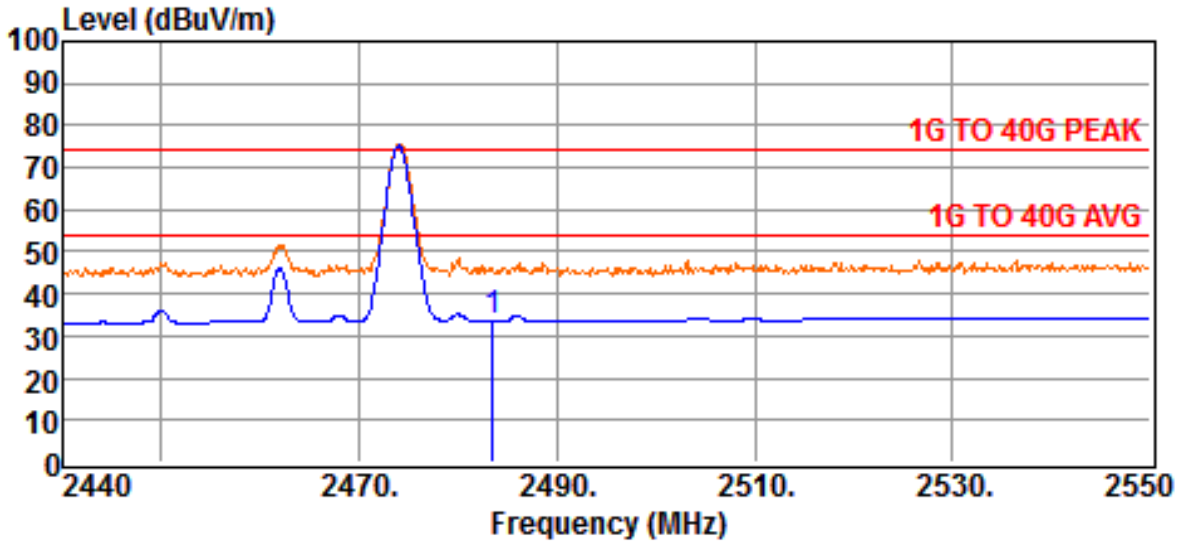


Site	:Chamber #2	Date	:2017-05-08
Limit	:1G TO 40G PEAK	Ant. Pol.	:HORIZONTAL
EUT	:Wireless Keyboard	Model	:AKB50
Power Rating	:DC 3V From Battery	Temp.	:24°C
Engineer	:Brian Huang	Humi.	:53 %
Test Mode	:Channel high		
Test Mode	: EUT put on table horizontally (worst case)		

Freq MHz	Reading dBµV	Correction Factor dB	Result dBµV/m	Limits (AVG) dBµV/m	Over limit dB	Detector
2483.5600	39.13	-5.40	33.73	54.00	-20.27	Average

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit – Result
4. Peak measurements are compared to the average limit - as peak measurements are below the average limit, they also comply with the peak limit.



Site	:Chamber #2	Date	:2017-05-08
Limit	:1G TO 40G PEAK	Ant. Pol.	:VERTICAL
EUT	:Wireless Keyboard	Model	:AKB50
Power Rating	:DC 3V From Battery	Temp.	:24°C
Engineer	:Brian Huang	Humi.	:53 %
Test Mode	:Channel high		
Test Mode	: EUT put on table horizontally (worst case)		

Freq MHz	Reading dBµV	Correction Factor dB	Result dBµV/m	Limits (AVG) dBµV/m	Over limit dB	Detector
2483.5600	38.90	-5.40	33.50	54.00	-20.50	Average

Note :

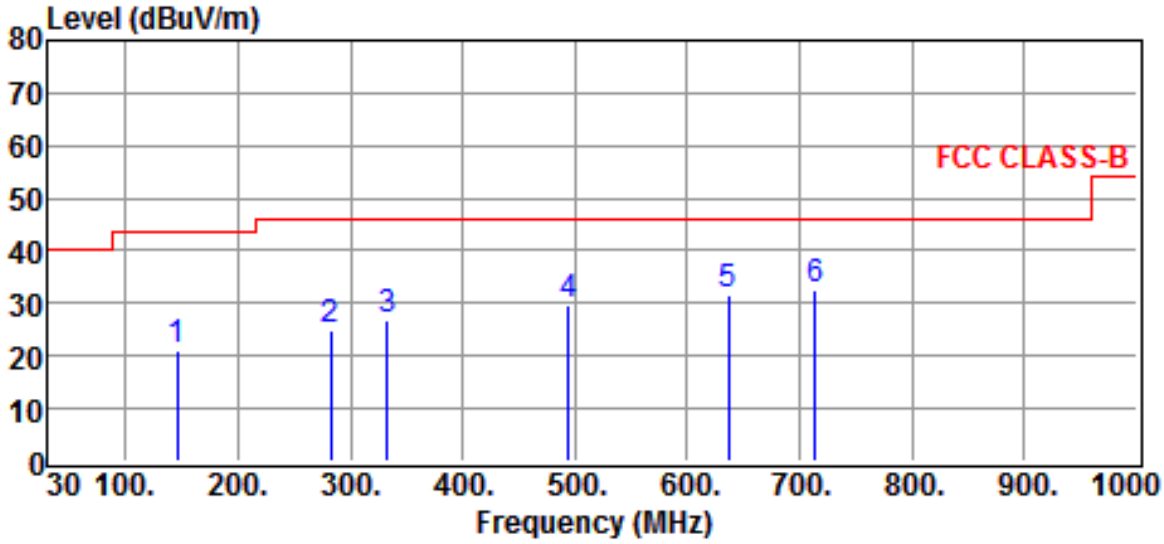
1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit – Result
4. Peak measurements are compared to the average limit - as peak measurements are below the average limit, they also comply with the peak limit.

4.4.3 Other Emissions

a) Emission frequencies below 1 GHz

Operation Mode : Operation

Test Date : Jan. 04, 2017 Temperature : 24 °C Humidity : 53 %

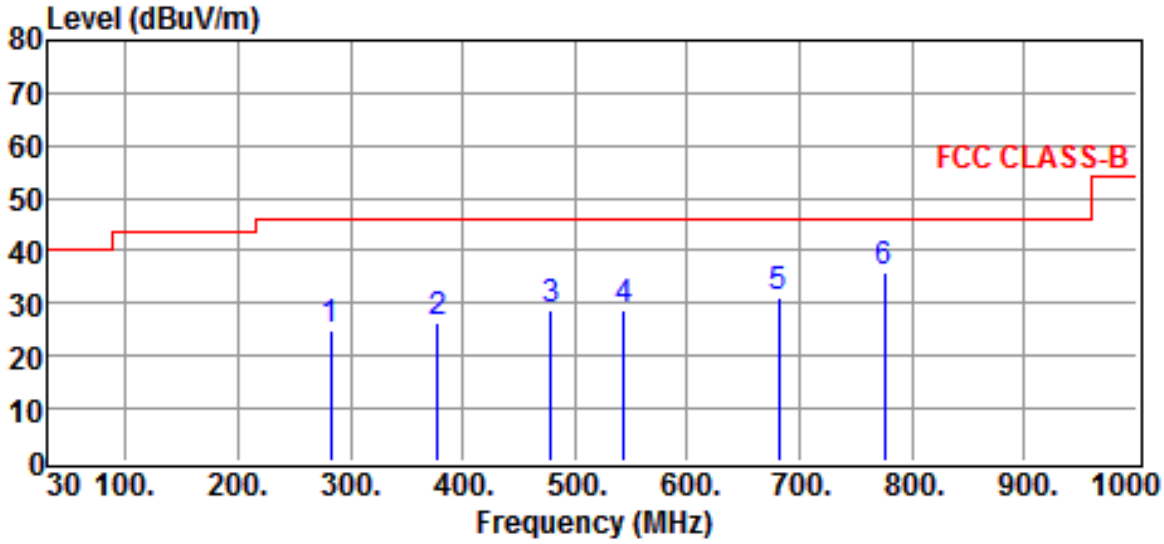


Site	:chamber	Date	:2017-01-04
Limit	:FCC CLASS-B	Ant. Pol.	:HORIZONTAL
EUT	:Wireless Keyboard	Model	:AKB50
Power Rating	:DC 3V From Battery	Temp.	:24°C
Engineer	:Brian Huang	Humi.	:53 %
Test Mode	: EUT put on table horizontally (worst case)		

Freq MHz	Reading dBμV	Correction Factor dB	Result dBm	Limits dBm	Over limit dB	Detector
146.4000	28.59	-7.27	21.32	43.50	-22.18	QP
282.2000	29.19	-4.36	24.83	46.00	-21.17	QP
332.6400	29.92	-2.87	27.05	46.00	-18.95	QP
494.6300	30.15	-0.24	29.91	46.00	-16.09	QP
636.2500	29.77	1.80	31.57	46.00	-14.43	QP
713.8500	29.79	3.01	32.80	46.00	-13.20	QP

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss
3. The margin value=Limit – Result



Site	:chamber	Date	:2017-01-04
Limit	:FCC CLASS-B	Ant. Pol.	:VERTICAL
EUT	:Wireless Keyboard	Model	:AKB50
Power Rating	:DC 3V From Battery	Temp.	:24°C
Engineer	:Brian Huang	Humi.	:53 %
Test Mode	: EUT put on table horizontally (worst case)		

Freq MHz	Reading dBµV	Correction Factor dB	Result dBm	Limits dBm	Over limit dB	Detector
282.2000	29.07	-4.36	24.71	46.00	-21.29	QP
378.2300	28.43	-1.92	26.51	46.00	-19.49	QP
478.1400	29.50	-0.55	28.95	46.00	-17.05	QP
544.1000	28.18	0.40	28.58	46.00	-17.42	QP
680.8700	28.60	2.59	31.19	46.00	-14.81	QP
775.9300	31.83	3.90	35.73	46.00	-10.27	QP

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss
3. The margin value=Limit – Result

b) Emission frequencies above 1 GHz

Radiated emission frequencies above 1 GHz to 26.5 GHz were too low to be measured with a pre-amplifier of 35 dB.

c) Emission frequencies below 30MHz (9kHz - 30MHz)

According to exploratory test no any obvious emission were detected from 9kHz to 30MHz. Although these tests were performed other than open area test site, adequate comparison measurements were confirmed against 30 m open are test site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 937606.

4.5 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor, High Pass Filter Loss(if used) and Cable Loss, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation calculation is as follows:

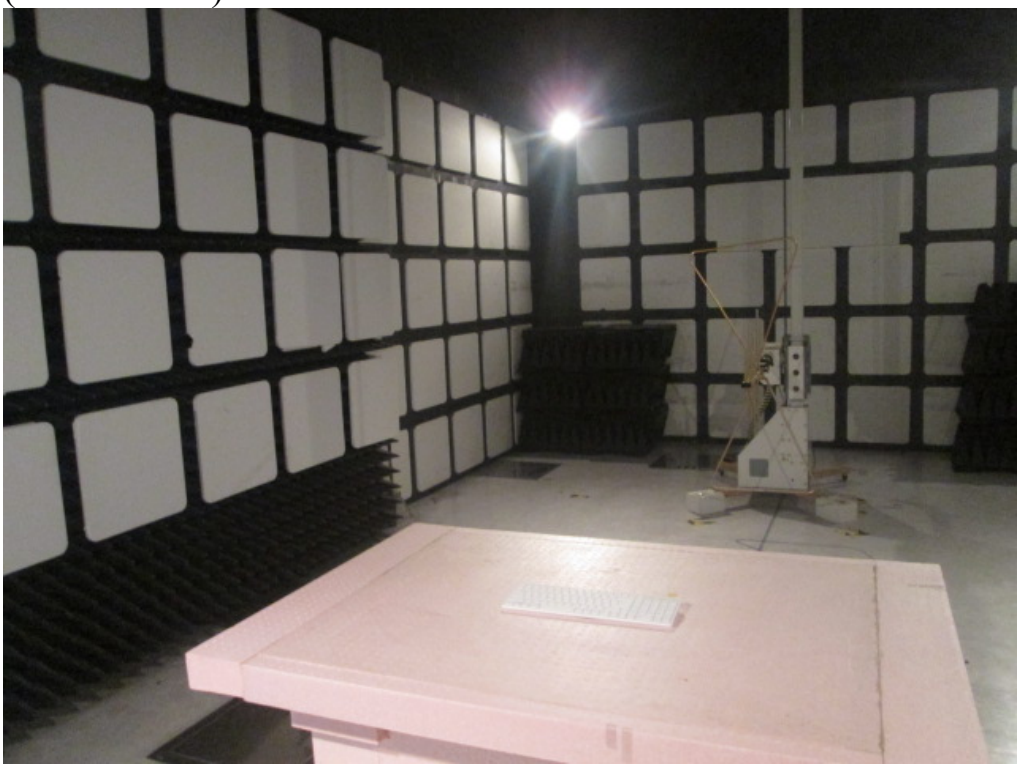
Result = Reading + Corrected Factor

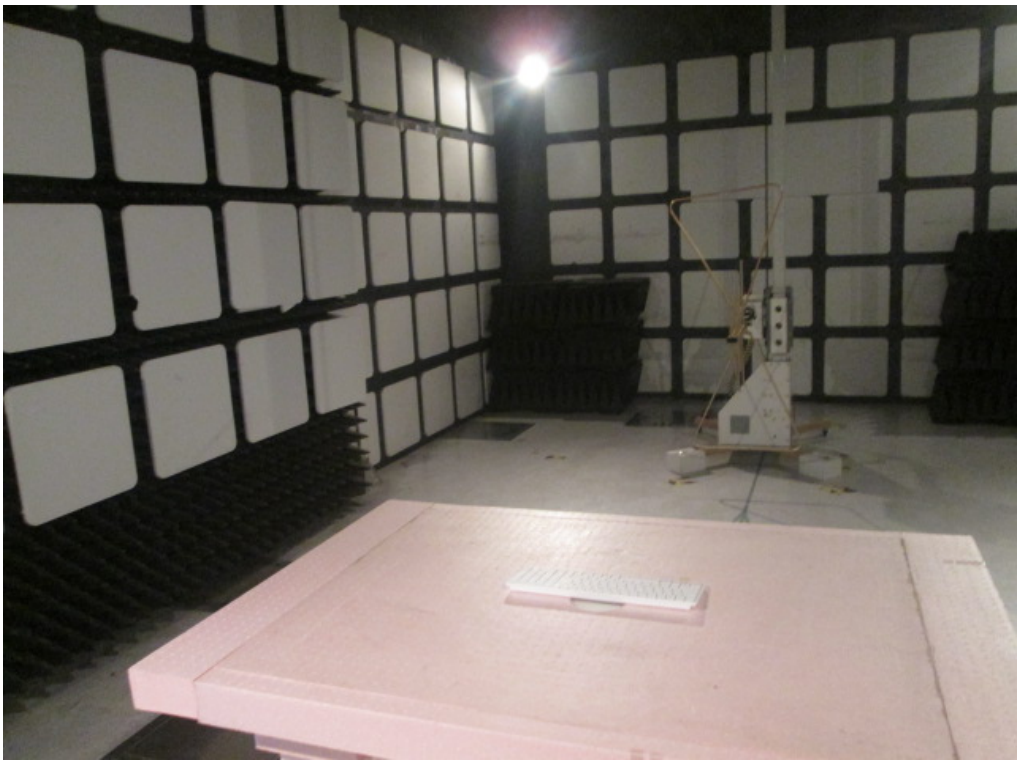
where Corrected Factor

= Antenna FACTOR + Cable Loss + High Pass Filter Loss - Amplifier Gain

4.6 Photos of Radiation Measuring Setup

(Below 1GHz)





(Above 1GHz)

5 CONDUCTED EMISSION MEASUREMENT

5.1 Standard Applicable

This EUT is excused from investigation of conducted emission, for it is powered by DC battery only. According to §15.207 (d), measurements to demonstrate compliance with the conducted limits are not required for devices which only employ battery power for operation and which do not operate from the AC power lines or contain provisions for operation while connected to the AC power lines.

6 ANTENNA REQUIREMENT

6.1 Standard Applicable

According to §15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

6.2 Antenna Construction

The antenna is integrated on the device. No consideration of replacement. Please refer to the construction Photo for details.

7 BAND EDGES MEASUREMENT

7.1 Standard Applicable

According to 15.249(d), out band emission except for harmonics shall be comply with §15.209 or at least attenuated by 50 dB below the level of the fundamental.

7.2 Measurement Procedure

A) 50 dB attenuation method

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT as shown in figure 4 without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.
3. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
4. Repeat above procedures until all measured frequencies were complete.

B) Radiated Emission method

1. Following the measurement procedures in section 4.2 with the EUT set to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.
2. Measure the highest amplitude appearing on spectral displayed.
3. Repeat above procedures until all measured frequencies were complete.

Measuring instrument setup in measured frequency band when specified detector function is used :

Frequency Band (MHz)	Instrument	Function	Resolution bandwidth	Video Bandwidth
30 to 1000	RF Test Receiver	Quasi-Peak	120 kHz	N/A
	Spectrum Analyzer	Peak	100 kHz	100 kHz
Above 1000	Spectrum Analyzer	Peak	1 MHz	1 MHz
	Spectrum Analyzer	Average	1 MHz	10 Hz or ≥ 1/T (Note 1)

Note 1:
VBW = 10 Hz, when the duty cycle is no less than 98%.
VBW ≥ 1/T, when duty cycle is less than 98% where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

7.3 Measurement Equipment

A) 50 dB attenuation method

Equipment	Manufacturer	Model No.	Calibration Date	Next Cal. Date
EMI Test Receiver	Rohde & Schwarz	ESU 40	2016/11/10	2017/11/09

B) Radiated Emission method

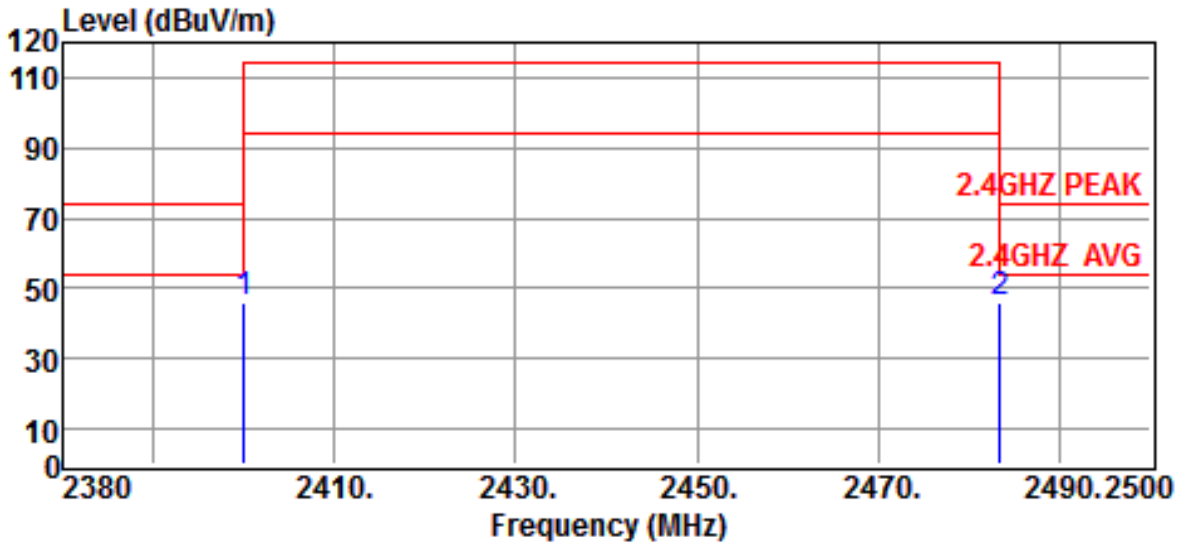
Equipment	Manufacturer	Model No.	Calibration Date	Next Cal. Date
EMI Test Receiver	Rohde & Schwarz	ESU 40	2016/11/10	2017/11/09
Bi-Log Antenna	ETC	MCTD 2786	2016/07/15	2017/07/14
Horn Antenna	EMCO	3115	2016/10/05	2017/10/04
Horn Antenna	EMCO	3116	2016/10/05	2017/10/04
Amplifier	HP	8447D	2016/12/28	2017/12/27
Amplifier	HP	83051A	2016/07/18	2017/07/17
LOOP Antenna	EMCO	6512	2016/10/12	2017/10/11

7.4 Measurement Data

Test Result: (Radiated Emission method)

The radiated emission test results of the lower and the upper band edges were comply with §15.209. Please refer to the following pages for test results.

Radiated Emission Test Results of the Band Edges

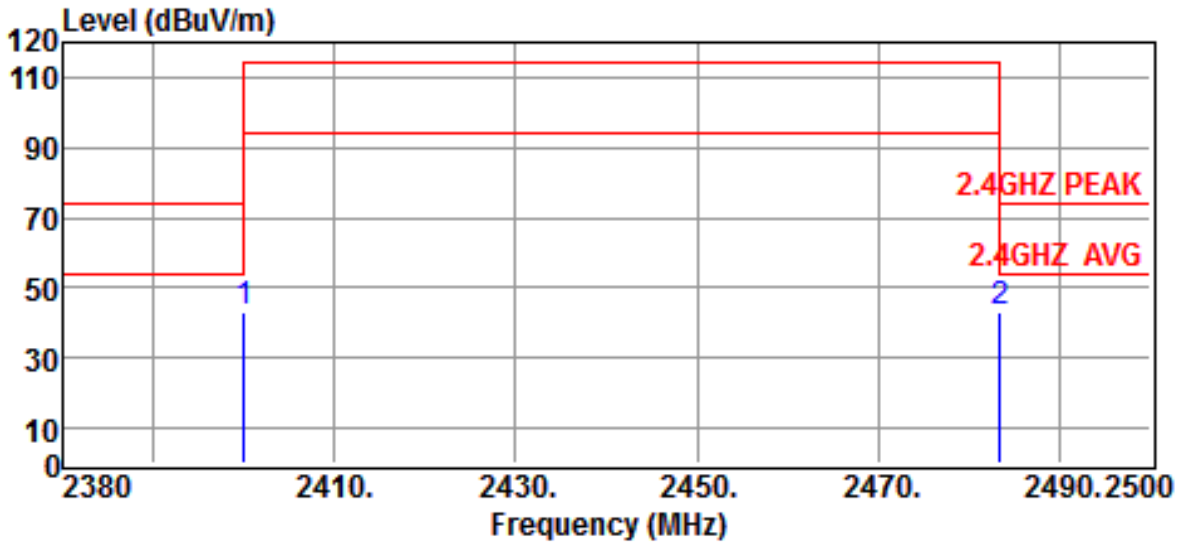


Site	:CHAMBER	Date	:2017-01-04
Limit	:2.4GHZ PEAK	Ant. Pol.	:HORIZONTAL
EUT	:Wireless Keyboard (Keyborad)	Model	:AKB50
Power Rating	:DC 3V From Battery	Temp.	:24°C
Engineer	:Brian Huang	Humi.	:56 %
Test Mode	:TX		
Test Mode	: EUT put on table horizontally (worst case)		

Freq MHz	Reading dBµV	Correction Factor dB	Result dBµV/m	Limits (AVG) dBm	Over limit dB	Detector
2400.0000	51.53	-5.61	45.92	54.00	-8.08	Peak
2483.5000	51.07	-5.40	45.67	54.00	-8.33	Peak

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit - Result
4. Peak measurements are compared to the average limit - as peak measurements are below the average limit, they also comply with the peak limit.



Site	:CHAMBER	Date	:2017-01-04
Limit	:2.4GHZ PEAK	Ant. Pol.	:VERTICAL
EUT	:Wireless Keyboard (Keyborad)	Model	:AKB50
Power Rating	:DC 3V From Battery	Temp.	:24°C
Engineer	:Brian Huang	Humi.	:56 %
Test Mode	:TX		
Test Mode	: EUT put on table horizontally (worst case)		

Freq MHz	Reading dBµV	Correction Factor dB	Result dBµV/m	Limits (AVG) dBm	Over limit dB	Detector
2400.0000	48.94	-5.61	43.33	54.00	-10.67	Peak
2483.5000	48.79	-5.40	43.39	54.00	-10.61	Peak

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit - Result
4. Peak measurements are compared to the average limit - as peak measurements are below the average limit, they also comply with the peak limit.

8. DYTY CYCLE

8.1 Standard Applicable

None. Reference only.

8.2 Measurement Equipment

Equipment	Manufacturer	Model No.	Calibration Date	Next Cal. Date
Spectrum Analyzer	Rohde & Schwarz	FSP40	2016/10/03	2017/10/02

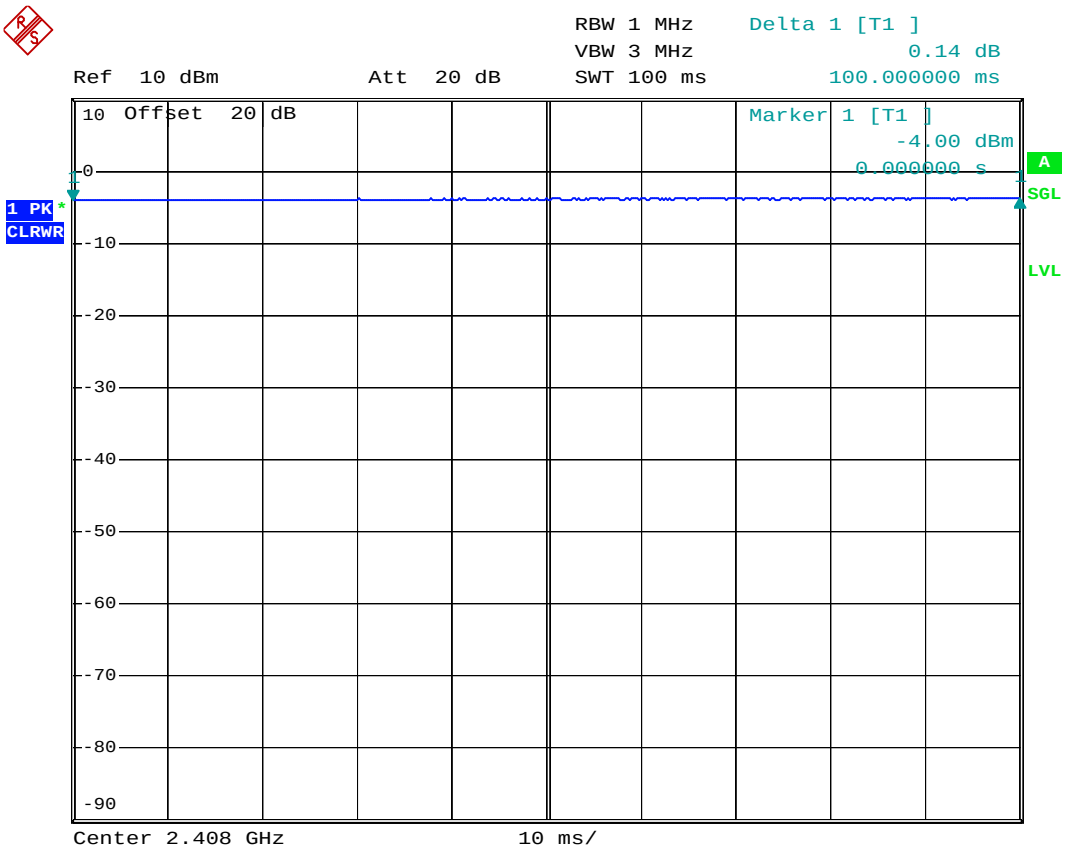
8.3 Measurement Data

Test Date : Jan. 04, 2017 Temperature : 24 °C Humidity : 56 %

Duty Cycle Calculation

The EUT set for test with the continuous transmission mode and the duty cycle >98%.

Refer to the following page for data plots.


RBW 1 MHz
VBW 3 MHz
SWT 100 ms
Delta 1 [T1]
0.14 dB
100.000000 ms
Ref 10 dBm
Att 20 dB
10 Offset 20 dB
Marker 1 [T1]
-4.00 dBm
0.000000 s
1 PK
CLRWR
A
SGL
LVL
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
Center 2.408 GHz
10 ms/

9. BANDWIDTH OF EMISSION

9.1 Applicable Standard

Per FCC rule §15.215(c), intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§15.217 through 15.257 and in subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

9.2 Measurement Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT as shown in figure 4 without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. The settings of spectrum analyzer is as followings.
   1) Set RBW in the range of 1% to 5% of the OBW.
   2) Set the video bandwidth (VBW) ≥ 3 x RBW.
   3) Detector = Peak.
   4) Trace mode = max hold.
   5) Sweep = auto couple.
   6) Allow the trace to stabilize.
   7) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 20 dB relative to the maximum level measured in the fundamental emission. Alternatively, use the -20 dB bandwidth function of the spectrum analyzer.
3. Repeat above procedures until all frequencies measured were complete.

Figure 4: Emission bandwidth measurement configuration.

9.3 Measurement Equipment

Equipment	Manufacturer	Model No.	Calibration Date	Next Cal. Date
Spectrum Analyzer	Rohde & Schwarz	FSP40	2016/10/03	2017/10/02

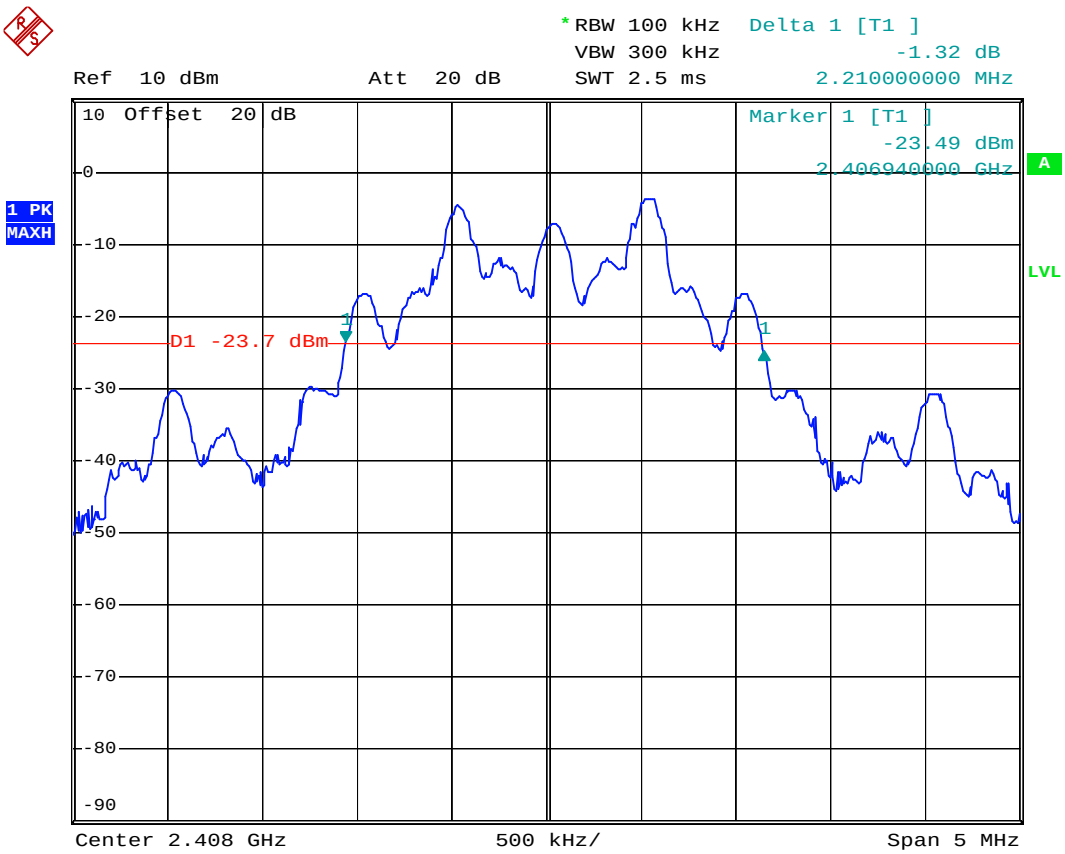
9.4 Measurement Data

Test Date : Jan. 04, 2017 Temperature : 24 °C Humidity : 56 %

a) Lower Band Edge : The 20 dB bandwidth of the emission is contained within the frequency band designated in the rule section 15.249.
b) Upper Band Edge : The 20 dB bandwidth of the emission is contained within the frequency band designated in the rule section 15.249.

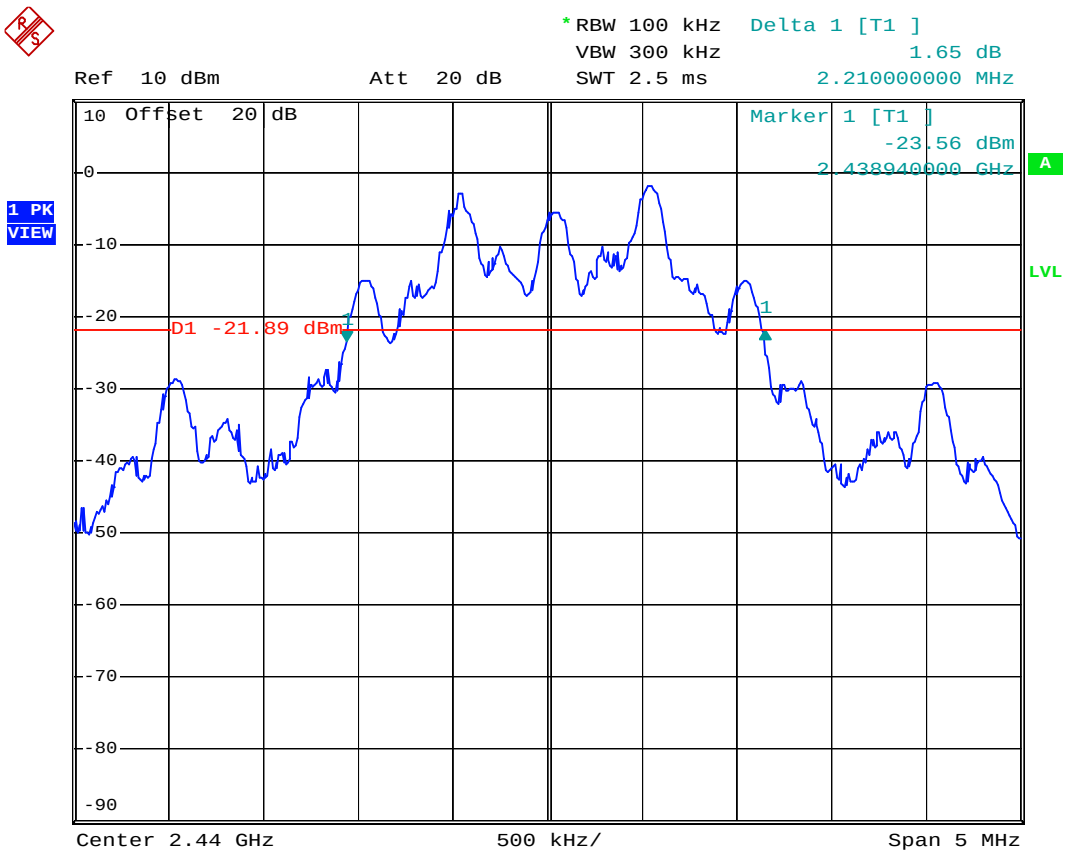
Note : The expanded uncertainty: frequency × 1.65×10^{-6} (1 GHz < f ≤ 18 GHz).

Lower band edge / -20dB BW plot of the lowest channel



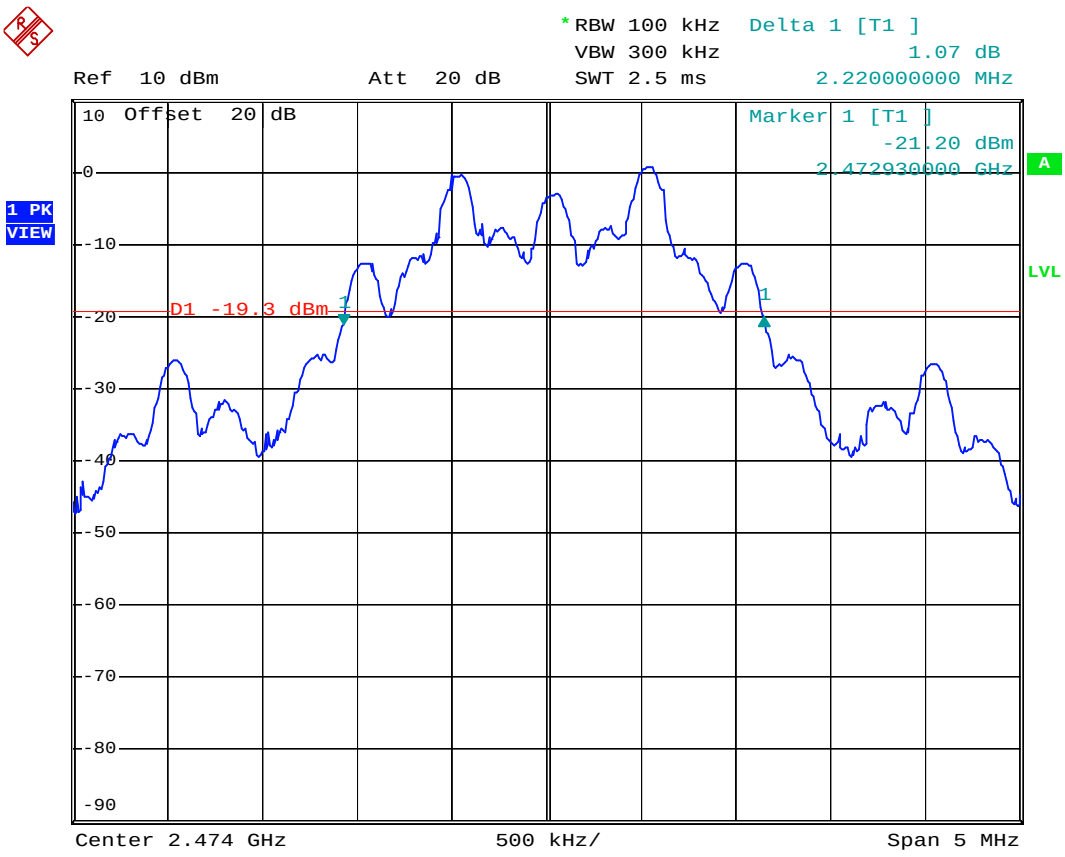
According to 15.215(c), the 20 dB bandwidth of the emission is contained within the frequency band designated in the rule section 15.249.

Band edge / -20dB BW plot of the middle channel



According to 15.215(c), the 20 dB bandwidth of the emission is contained within the frequency band designated in the rule section 15.249.

Upper band edge / -20dB BW plot of the highest channel



According to 15.215(c), the 20 dB bandwidth of the emission is contained within the frequency band designated in the rule section 15.249.