

FCC Test Report

Product Name	Detachable Keyboard
Model No.	GZ700G Mobile Dock
FCC ID	MSQ-GZ700KB

Applicant	ASUSTeK Computer Inc
Address	4F, No. 150, Li-Te Rd., Peitou, Taipei, Taiwan

Date of Receipt	Dec. 20, 2018
Issued Date	April 08, 2019
Report No.	18C0278R-RFUSP15V00
Report Version	V1.0



The test results relate only to the samples tested.

The test results shown in the test report are traceable to the national/international standard through the calibration report of the equipment and evaluated measurement uncertainty herein.

This report must not be used to claim product endorsement by TAF or any agency of the government.

The test report shall not be reproduced without the written approval of DEKRA Testing and Certification Co., Ltd.

Test Report

Issued Date: April 08, 2019

Report No.: 18C0278R-RFUSP15V00



Product Name	Detachable Keyboard
Applicant	ASUSTeK Computer Inc
Address	4F, No. 150, Li-Te Rd., Peitou, Taipei, Taiwan
Manufacturer	ASUSTeK Computer Inc
Model No.	GZ700G Mobile Dock
EUT Rated Voltage	DC 3.85V by Battery, DC 5V by USB
EUT Test Voltage	DC 5V by USB
Trade Name	ASUS
Applicable Standard	FCC CFR Title 47 Part 15 Subpart C: 2016 ANSI C63.4: 2014, ANSI C63.10: 2013
Test Result	Complied

Documented By :



(Senior Adm. Specialist / Rita Huang)

Tested By :



(Engineer / Jason Tuan)

Approved By :



(Director / Vincent Lin)

TABLE OF CONTENTS

Description	Page
1. GENERAL INFORMATION	4
1.1. EUT Description.....	4
1.2. Operational Description	6
1.3. Tested System Details.....	7
1.4. Configuration of Test System	7
1.5. EUT Exercise Software	8
1.6. Test Facility	9
1.7. List of Test Equipment	10
2. Conducted Emission	11
2.1. Test Setup	11
2.2. Limits	12
2.3. Test Procedure	12
2.4. Uncertainty	12
2.5. Test Result of Conducted Emission.....	13
3. Radiated Emission	17
3.1. Test Setup	17
3.2. Limits	19
3.3. Test Procedure	20
3.4. Uncertainty	20
3.5. Test Result of Radiated Emission.....	21
4. Band Edge	31
4.1. Test Setup	31
4.2. Limits	32
4.3. Test Procedure	32
4.4. Uncertainty	32
4.5. Test Result of Band Edge	33
5. Duty Cycle.....	37
5.1. Test Setup	37
5.2. Uncertainty	37
5.3. Test Result of Duty Cycle.....	38
6. EMI Reduction Method During Compliance Testing	39

Attachment 1: EUT Test Photographs

Attachment 2: EUT Detailed Photographs

1. GENERAL INFORMATION

1.1. EUT Description

Product Name	Detachable Keyboard
Trade Name	ASUS
Model No.	GZ700G Mobile Dock
FCC ID	MSQ-GZ700KB
Frequency Range	2402~2480MHz
Channel Control	Auto
Antenna Type	PIFA Antenna
Channel Number	40
Type of Modulation	GFSK

Antenna List

No.	Manufacturer	Part No.	ASUS No.	Antenna Type	Peak Gain
1	INPAQ	WAG-P-LA-00-012	14008-03420500	PIFA Antenna	-0.8 dBi for 2.4 GHz

Note: The antenna of EUT is conform to FCC 15.203

Center Frequency of Each Channel

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
Channel 00:	2402 MHz	Channel 01:	2404 MHz	Channel 02:	2406 MHz	Channel 03:	2408 MHz
Channel 04:	2410 MHz	Channel 05:	2412 MHz	Channel 06:	2414 MHz	Channel 07:	2416 MHz
Channel 08:	2418 MHz	Channel 09:	2420 MHz	Channel 10:	2422 MHz	Channel 11:	2424 MHz
Channel 12:	2426 MHz	Channel 13:	2428 MHz	Channel 14:	2430 MHz	Channel 15:	2432 MHz
Channel 16:	2434 MHz	Channel 17:	2436 MHz	Channel 18:	2438 MHz	Channel 19:	2440 MHz
Channel 20:	2442 MHz	Channel 21:	2444 MHz	Channel 22:	2446 MHz	Channel 23:	2448 MHz
Channel 24:	2450 MHz	Channel 25:	2452 MHz	Channel 26:	2454 MHz	Channel 27:	2456 MHz
Channel 28:	2458 MHz	Channel 29:	2460 MHz	Channel 30:	2462 MHz	Channel 31:	2464 MHz
Channel 32:	2466 MHz	Channel 33:	2468 MHz	Channel 34:	2470 MHz	Channel 35:	2472 MHz
Channel 36:	2474 MHz	Channel 37:	2476 MHz	Channel 38:	2478 MHz	Channel 39:	2480 MHz

Note:

1. The EUT is a Detachable Keyboard with a built-in 2.4GHz GFSK transceiver.
2. Regarding to the operation frequency, the lowest, middle and highest frequency are selected to perform the test.
3. These tests are conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15 Subpart C Paragraph 15.249 for spread spectrum devices.

Test Mode	Mode 1: Transmit
-----------	------------------

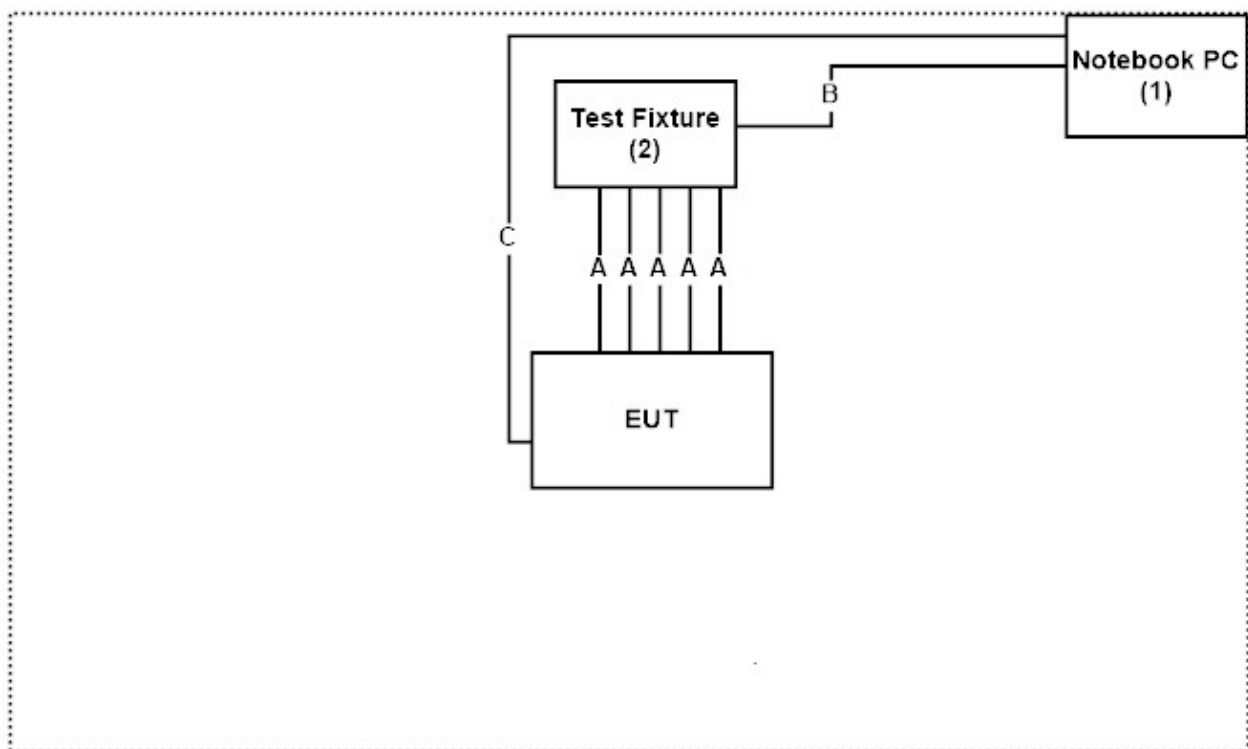
1.3. Tested System Details

The types for all equipment, plus descriptions of all cables used in the tested system (including inserted cards) are:

	Product	Manufacturer	Model No.	Serial No.	Power Cord
1	Notebook PC	DELL	Latitude 5491	1PL56S2	Non-Shielded, 0.8m
2	Test Fixture	TEXAS INSTRVMENTS	N/A	N/A	N/A

Signal Cable Type	Signal cable Description
A	Signal Cable
B	USB Cable
C	USB Cable

1.4. Configuration of Test System



1.5. EUT Exercise Software

- (1) Setup the EUT as shown in Section 1.4.
- (2) Execute “SmartRF_Studio_7-2.11.0” program on the EUT.
- (3) Configure the test mode and the test channel
- (4) start the continuous Transmit.
- (5) Verify that the EUT works properly.

1.6. Test Facility

Ambient conditions in the laboratory:

Items	Required (IEC 68-1)	Actual
Temperature (°C)	15-35	20-35
Humidity (%RH)	25-75	50-65
Barometric pressure (mbar)	860-1060	950-1000

The related certificate for our laboratories about the test site and management system can be downloaded from DEKRA Testing and Certification Co., Ltd. Web Site:

<http://www.dekra.com.tw/english/about/certificates.aspx?bval=5>

The address and introduction of DEKRA Testing and Certification Co., Ltd. laboratories can be founded in our Web site: http://www.dekra.com.tw/index_en.aspx

Site Description: Accredited by TAF
Accredited Number: 3023

Site Name: DEKRA Testing and Certification Co., Ltd
Site Address: No.5-22, Ruishukeng, Linkou Dist., New Taipei City 24451,
Taiwan, R.O.C.
TEL : 886-2-8601-3788 / FAX : 886-2-8601-3789
E-Mail : info.tw@dekra.com

FCC Accreditation Number: TW3023

1.7. List of Test Equipment

For Conducted measurements /CB3/SR8

	Equipment	Manufacturer	Model No.	Serial No.	Cali. Date	Due. Date
	Temperature Chamber	WIT GROUP	TH-1S-B	EQ-201-00146	2019/02/26	2020/02/25
X	Spectrum Analyzer	Agilent	N9010A	MY53470892	2018/09/27	2019/09/26
X	Peak Power Analyzer	Keysight	8990B	MY51000410	2018/08/01	2019/07/31
X	Wideband Power Sensor	Keysight	N1923A	MY56080003	2018/07/25	2019/07/24
X	Wideband Power Sensor	Keysight	N1923A	MY56080004	2018/07/25	2019/07/24
X	EMI Test Receiver	R&S	ESCS 30	100369	2018/11/19	2019/11/18
X	LISN	R&S	ENV216	101105	2019/03/30	2020/03/29
X	LISN	R&S	ESH3-Z5	836679/014	2019/04/02	2020/04/01
X	Coaxial Cable	DEKRA	RG 400	LC018-RG	2018/06/21	2019/06/20

For Radiated measurements /Site3/CB8

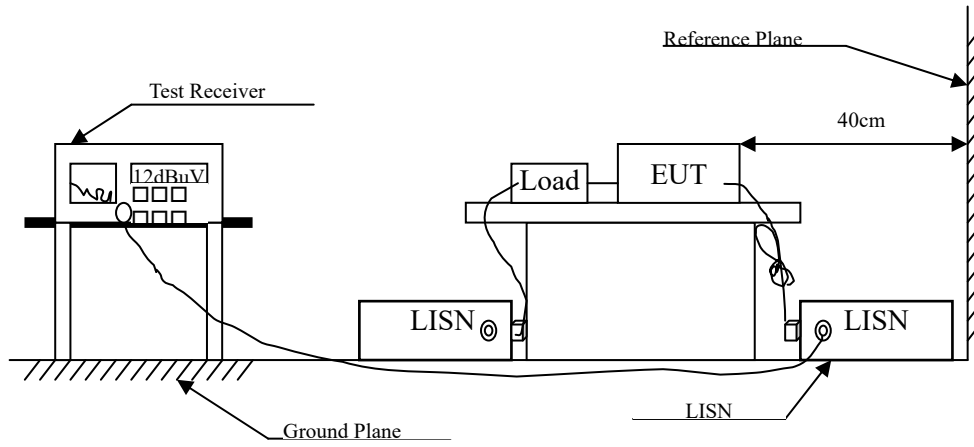
	Equipment	Manufacturer	Model No.	Serial No.	Cali. Date	Due. Date
X	Spectrum Analyzer	R&S	FSP40	100170	2019/03/12	2020/03/11
X	Loop Antenna	Teseq	HLA6121	37133	2018/10/13	2019/10/12
X	Bilog Antenna	Schaffner Chase	CBL6112B	2707	2018/06/24	2019/06/23
X	Coaxial Cable	DEKRA	RG 214	LC003-RG	2018/06/14	2019/06/13
X	Pre-Amplifier	Jet-Power	JPA-10M1G33	170101000330010	2018/06/14	2019/06/13
X	Horn Antenna	ETS-Lindgren	3117	00135205	2018/05/03	2019/05/02
X	Horn Antenna	SCHWARZBECK	9120D	576	2018/12/18	2019/12/17
X	Pre-Amplifier	EMCI	EMC012630SE	980210	2018/04/10	2019/04/09
X	Horn Antenna	Com-Power	AH-840	101043	2019/01/19	2020/01/18
X	Amplifier + Cable	EMCI	EMC184045SE	980370	2019/03/21	2020/03/20
X	Filter	MICRO-TRONICS	BRM50702	G270	2018/08/06	2019/08/05
X	Filter	MICRO-TRONICS	BRM50716	G196	2018/08/06	2019/08/05

Note:

1. All equipments are calibrated every one year.
2. The test instruments marked with "X" are used to measure the final test results.
3. Test Software version :QuiTek EMI 2.0 V2.1.113.

2. Conducted Emission

2.1. Test Setup



2.2. Limits

FCC Part 15 Subpart C Paragraph 15.207 (dBuV) Limit		
Frequency MHz	Limits	
	QP	AV
0.15 - 0.50	66-56	56-46
0.50-5.0	56	46
5.0 - 30	60	50

Remarks: In the above table, the tighter limit applies at the band edges.

2.3. Test Procedure

The EUT and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50 ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm /50uH coupling impedance with 50ohm termination. (Please refers to the block diagram of the test setup and photographs.)

Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.4: 2014 on conducted measurement.

Conducted emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9kHz.

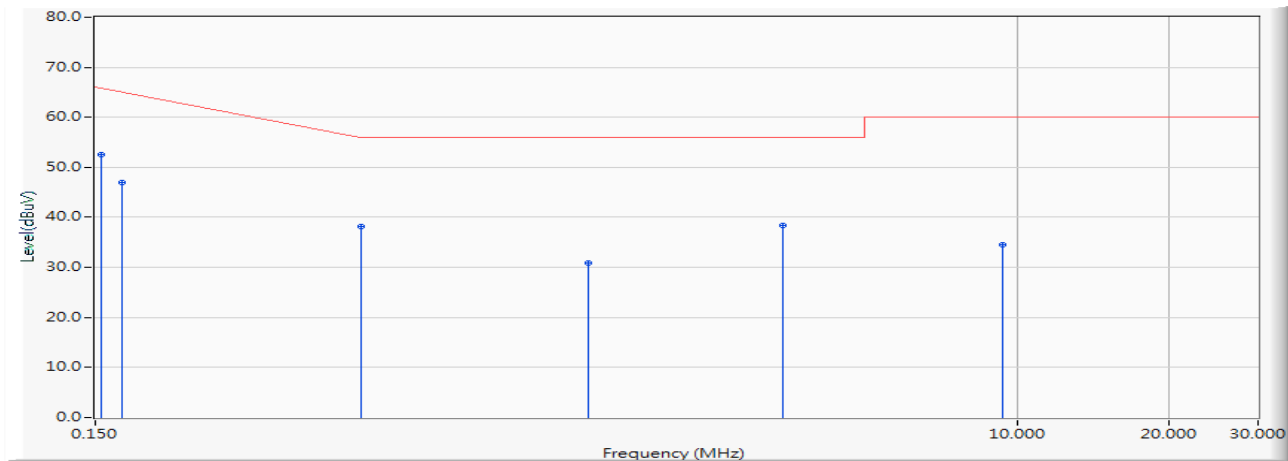
2.4. Uncertainty

± 2.26 dB

2.5. Test Result of Conducted Emission

Product : Detachable Keyboard
 Test Item : Conducted Emission Test
 Test Date : 2018/11/30
 Test Mode : Mode 1: Transmit (2440MHz)

Line 1



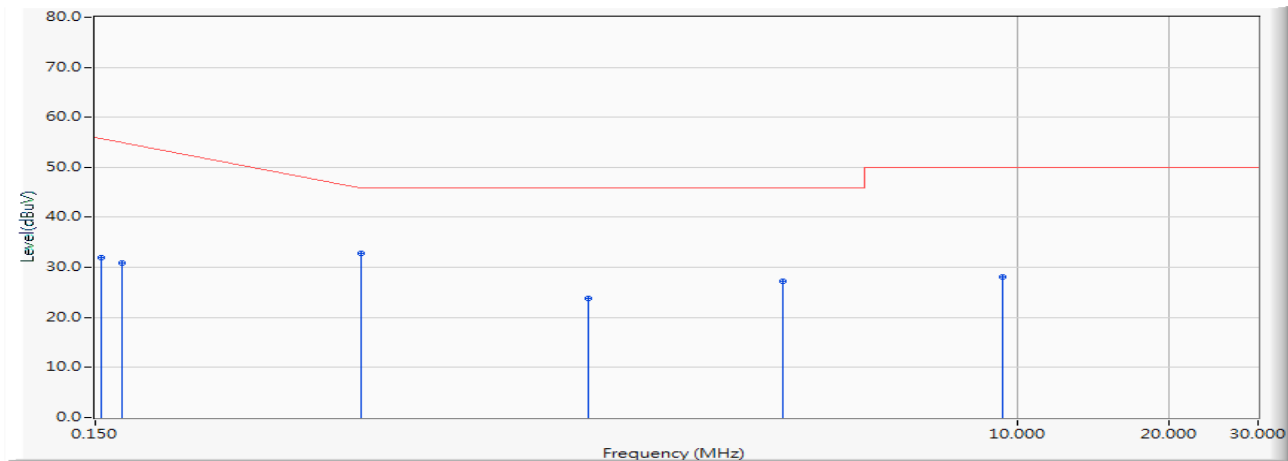
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV)	Margin (dB)	Limit (dBuV)	Detector Type
1	*	0.154	9.748	42.800	52.548	-13.338	65.886	QUASIPeAK
2		0.170	9.743	37.230	46.973	-18.456	65.429	QUASIPeAK
3		0.505	9.750	28.370	38.120	-17.880	56.000	QUASIPeAK
4		1.416	9.798	21.180	30.978	-25.022	56.000	QUASIPeAK
5		3.431	9.868	28.620	38.488	-17.512	56.000	QUASIPeAK
6		9.345	10.050	24.500	34.550	-25.450	60.000	QUASIPeAK

Note:

1. All Reading Levels are Quasi-Peak and average value.
2. " * ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

Product : Detachable Keyboard
 Test Item : Conducted Emission Test
 Test Date : 2018/11/30
 Test Mode : Mode 1: Transmit (2440MHz)

Line 1



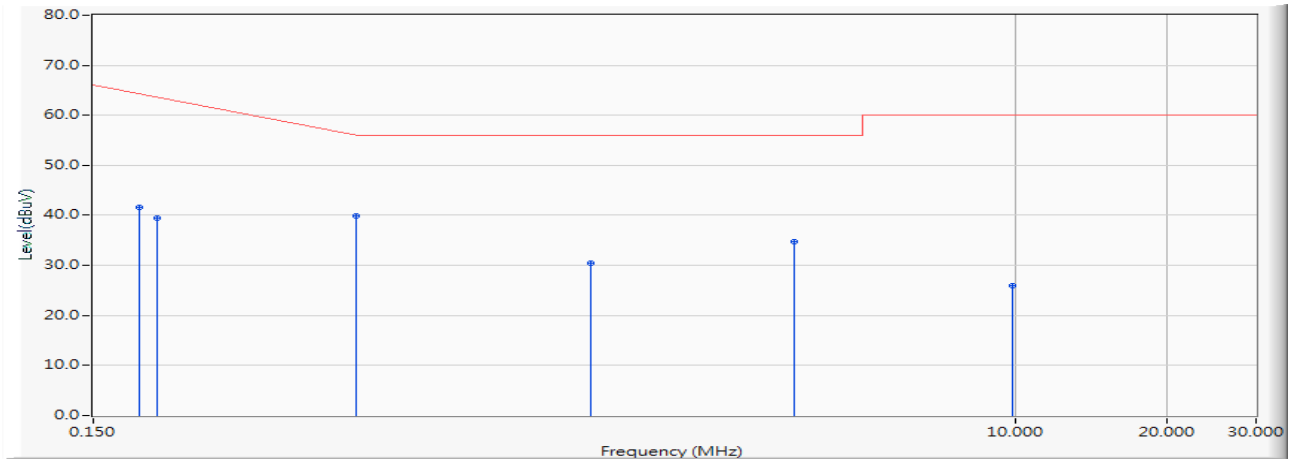
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV)	Margin (dB)	Limit (dBuV)	Detector Type
1		0.154	9.748	22.300	32.048	-23.838	55.886	AVERAGE
2		0.170	9.743	21.060	30.803	-24.626	55.429	AVERAGE
3	*	0.505	9.750	23.140	32.890	-13.110	46.000	AVERAGE
4		1.416	9.798	13.990	23.788	-22.212	46.000	AVERAGE
5		3.431	9.868	17.320	27.188	-18.812	46.000	AVERAGE
6		9.345	10.050	18.040	28.090	-21.910	50.000	AVERAGE

Note:

1. All Reading Levels are Quasi-Peak and average value.
2. " * ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

Product : Detachable Keyboard
 Test Item : Conducted Emission Test
 Test Date : 2018/11/30
 Test Mode : Mode 1: Transmit (2440MHz)

Line 2



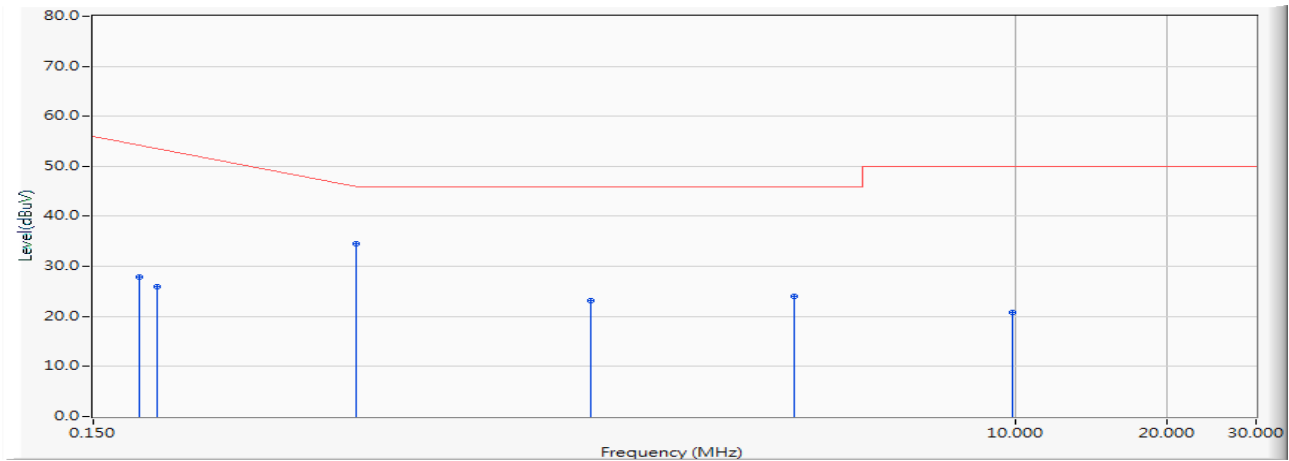
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV)	Margin (dB)	Limit (dBuV)	Detector Type
1		0.185	9.737	31.960	41.697	-23.303	65.000	QUASIPeAK
2		0.201	9.738	29.720	39.458	-25.085	64.543	QUASIPeAK
3	*	0.498	9.740	30.210	39.950	-16.107	56.057	QUASIPeAK
4		1.451	9.789	20.600	30.389	-25.611	56.000	QUASIPeAK
5		3.658	9.873	24.800	34.673	-21.327	56.000	QUASIPeAK
6		9.865	10.089	15.850	25.939	-34.061	60.000	QUASIPeAK

Note:

1. All Reading Levels are Quasi-Peak and average value.
2. " * ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

Product : Detachable Keyboard
 Test Item : Conducted Emission Test
 Test Date : 2018/11/30
 Test Mode : Mode 1: Transmit (2440MHz)

Line 2



		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV)	Margin (dB)	Limit (dBuV)	Detector Type
1		0.185	9.737	18.120	27.857	-27.143	55.000	AVERAGE
2		0.201	9.738	16.120	25.858	-28.685	54.543	AVERAGE
3	*	0.498	9.740	24.730	34.470	-11.587	46.057	AVERAGE
4		1.451	9.789	13.460	23.249	-22.751	46.000	AVERAGE
5		3.658	9.873	14.200	24.073	-21.927	46.000	AVERAGE
6		9.865	10.089	10.770	20.859	-29.141	50.000	AVERAGE

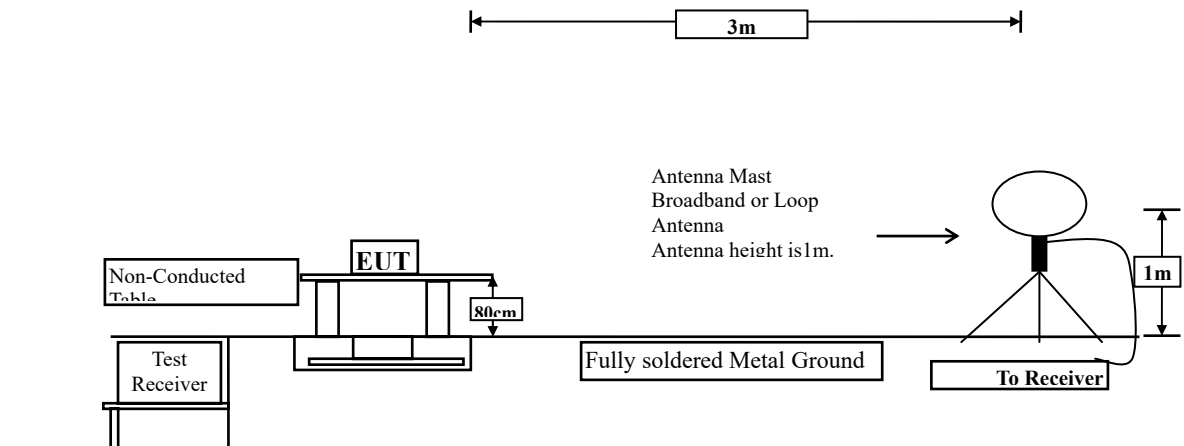
Note:

1. All Reading Levels are Quasi-Peak and average value.
2. " * ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

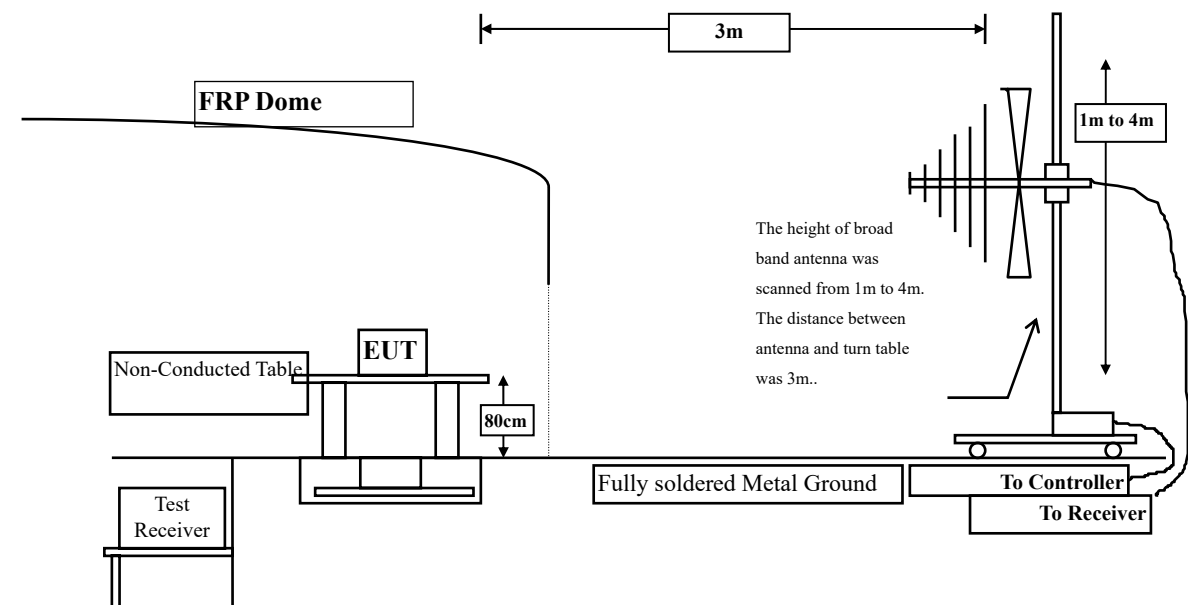
3. Radiated Emission

3.1. Test Setup

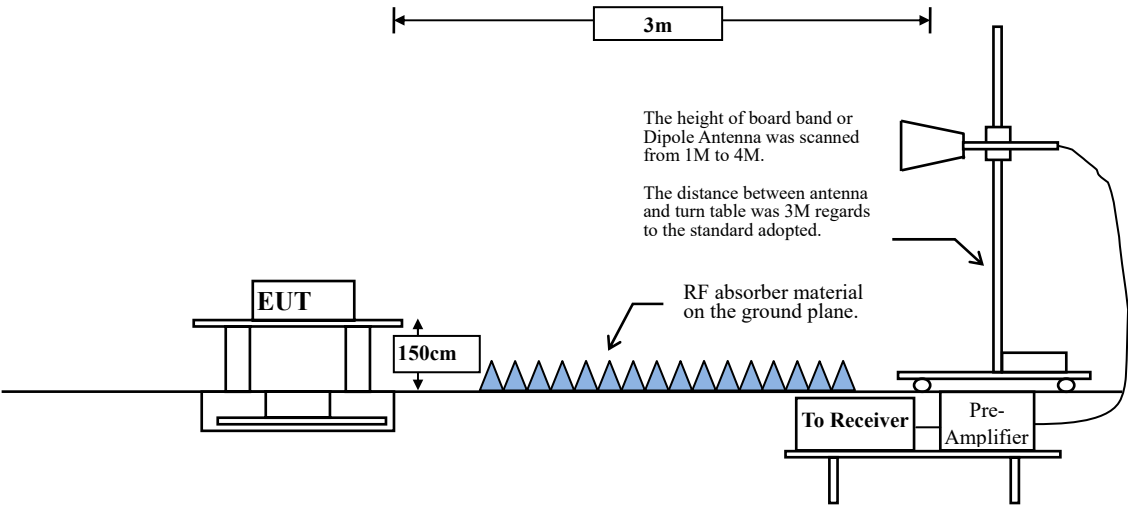
Radiated Emission Under 30MHz



Radiated Emission Below 1GHz



Radiated Emission Above 1GHz



3.2. Limits

➤ Fundamental and Harmonics Emission Limits

FCC Part 15 Subpart C Paragraph 15.249 Limits				
Frequency MHz	Field Strength of Fundamental		Field Strength of Harmonics	
	(mV/m @3m)	(dBuV/m @3m)	(uV/m @3m)	(dBuV/m @3m)
902-928	50	94	500	54
2400-2483.5	50	94	500	54
5725-5875	50	94	500	54

Remarks : 1. RF Voltage (dBuV/m) = 20 log RF Voltage (uV/m)
 2. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

➤ General Radiated Emission Limits

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50dB below the level of the fundamental or to the general radiated emission limits in paragraph 15.209, whichever is the lesser attenuation.

FCC Part 15 Subpart C Paragraph 15.209(a) Limits		
Frequency MHz	Field strength (microvolts/meter)	Measurement distance (meter)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Remarks: E field strength (dBuV/m) = 20 log E field strength (uV/m)

3.3. Test Procedure

The EUT was setup according to ANSI C63.10, 2013 and tested compliance to FCC 47CFR 15.249 requirements.

Measuring the frequency range below 1GHz, the EUT is placed on a turn table which is 0.8 meter above ground, when measuring the frequency range above 1GHz, the EUT is placed on a turn table which is 1.5 meter above ground.

The turn table is rotated 360 degrees to determine the position of the maximum emission level.

The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

The antenna is scanned between 1 meter and 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10: 2013 on radiated measurement.

The resolution bandwidth below 30MHz setting on the field strength meter is 9kHz and 30MHz~1GHz is 120kHz and above 1GHz is 1MHz.

Radiated emission measurements below 30MHz are made using Loop Antenna and 30MHz~1GHz are made using broadband Bilog antenna and above 1GHz are made using Horn Antennas.

The measurement is divided into the Preliminary Measurement and the Final Measurement.

The suspected frequencies are searched for in Preliminary Measurement with the measurement antenna kept pointed at the source of the emission both in azimuth and elevation, with the polarization of the antenna oriented for maximum response. The antenna is pointed at an angle towards the source of the emission, and the EUT is rotated in both height and polarization to maximize the measured emission. The emission is kept within the illumination area of the 3 dB bandwidth of the antenna.

The worst radiated emission is measured in the Open Area Test Site on the Final Measurement.

The measurement frequency range from 9kHz - 10th Harmonic of fundamental was investigated.

3.4. Uncertainty

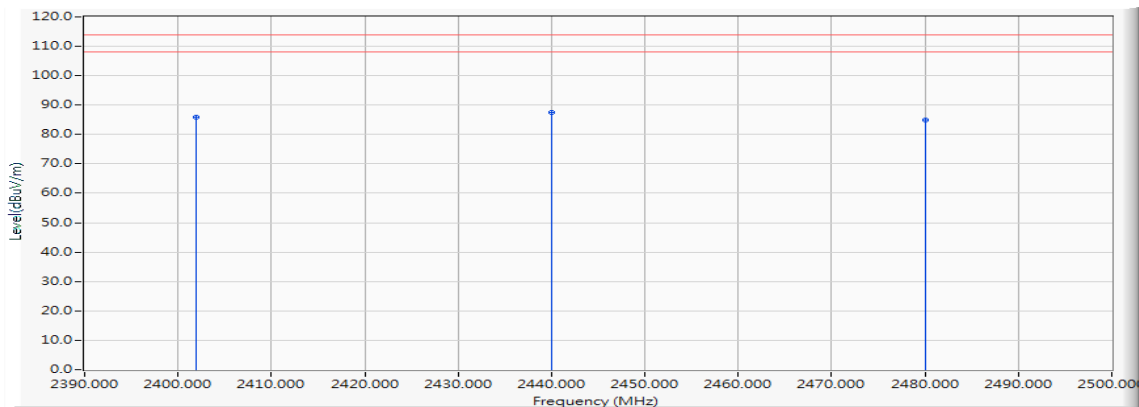
± 4.08 dB above 1GHz

± 4.22 dB below 1GHz

3.5. Test Result of Radiated Emission

Product : Detachable Keyboard
 Test Item : Fundamental Radiated Emission
 Test Site : No.3OATS
 Test Date : 2019/01/07
 Test Mode : Mode 1: Transmit

Horizontal – Peak Detector:



Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
2402.000	-2.657	88.660	86.003	-27.997	114.000
2440.000	-2.636	89.990	87.353	-26.647	114.000
2480.000	-2.605	87.670	85.065	-28.935	114.000

Note:

1. Measurement Level = Reading Level + Correct Factor.
2. Correct Factor = Antenna Factor + Cable Loss – PreAMP.
3. The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.

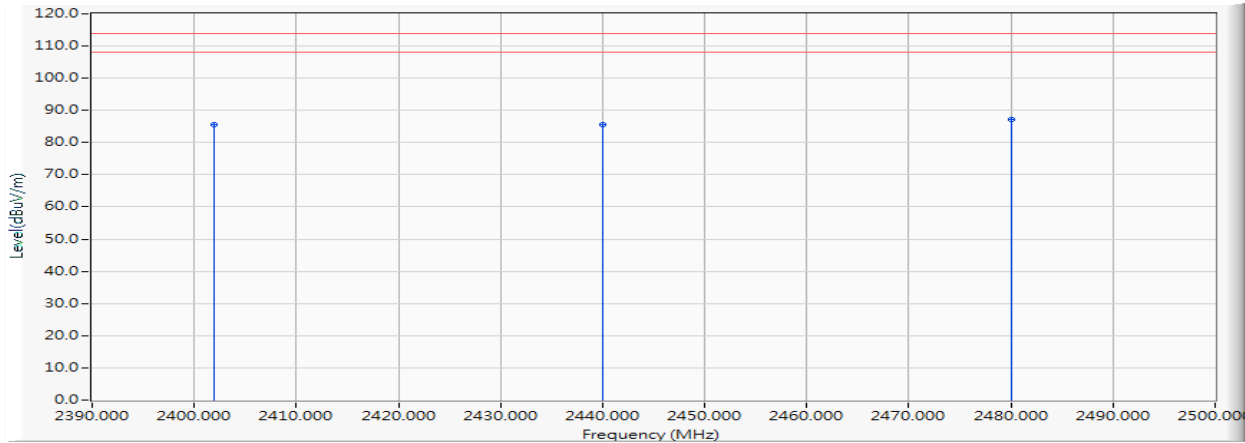
Average Detector:

Frequency MHz	Peak Measurement dBuV/m	Duty Cycle Correct Factor dB	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
Horizontal					
Average Detector:					
2402.000	86.003	-21.830	64.173	-29.827	94.000
2440.000	87.353	-21.830	65.523	-28.477	94.000
2480.000	85.065	-21.830	63.235	-30.765	94.000

Note:

1. Average Measurement=Peak Measurement + Duty Cycle Correct Factor
2. The Duty Cycle is refer to section 5.

Product : Detachable Keyboard
 Test Item : Fundamental Radiated Emission
 Test Site : No.3OATS
 Test Date : 2019/01/07
 Test Mode : Mode 1: Transmit

Vertical - Peak Detector:


Frequency	Correct	Reading	Measurement	Margin	Limit
MHz	Factor	Level	Level		
	dB	dBuV	dBuV/m	dB	dBuV/m
2402.000	-4.171	89.590	85.419	-28.581	114.000
2440.000	-4.099	89.810	85.711	-28.289	114.000
2480.000	-3.978	91.100	87.122	-26.878	114.000

Note:

1. Measurement Level = Reading Level + Correct Factor.
2. Correct Factor = Antenna Factor + Cable Loss – PreAMP.
3. The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.

Average Detector:

Frequency	Peak	Duty Cycle	Measurement	Margin	Limit
MHz	Measurement	Correct Factor	Level		
	dBuV/m	dB	dBuV/m	dB	dBuV/m

Vertical
Average Detector:

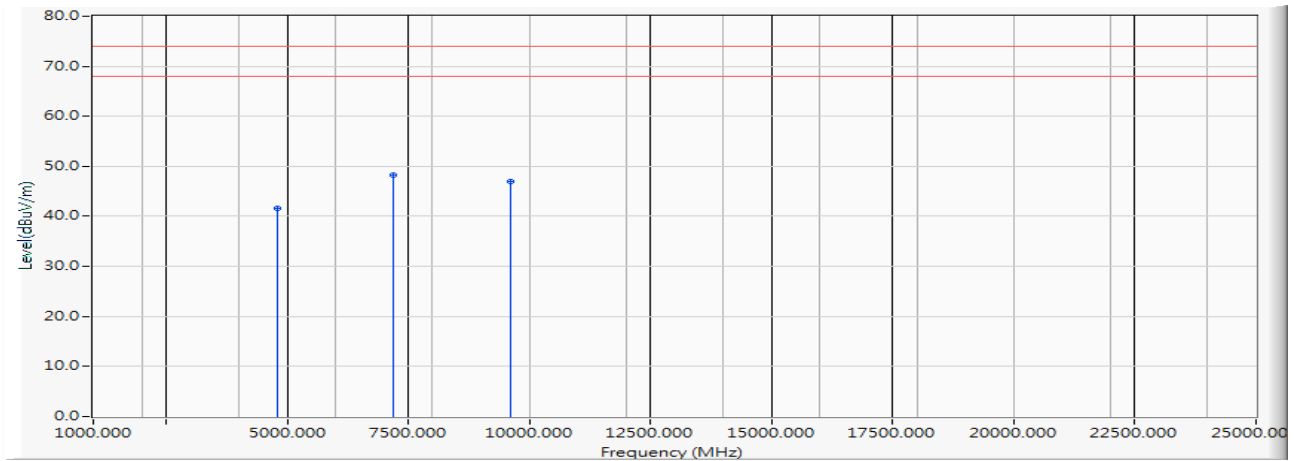
2402.000	89.59	-21.830	67.760	-26.240	94.000
2440.000	89.8	-21.830	67.970	-26.030	94.000
2480.000	91.1	-21.830	69.270	-24.730	94.000

Note:

1. Average Measurement=Peak Measurement + Duty Cycle Correct Factor
2. The Duty Cycle is refer to section 5.

Product : Detachable Keyboard
 Test Item : Harmonic Radiated Emission Data
 Test Site : No.3 OATS
 Test Date : 2018/12/24
 Test Mode : Mode 1: Transmit (2402MHz)

Horizontal



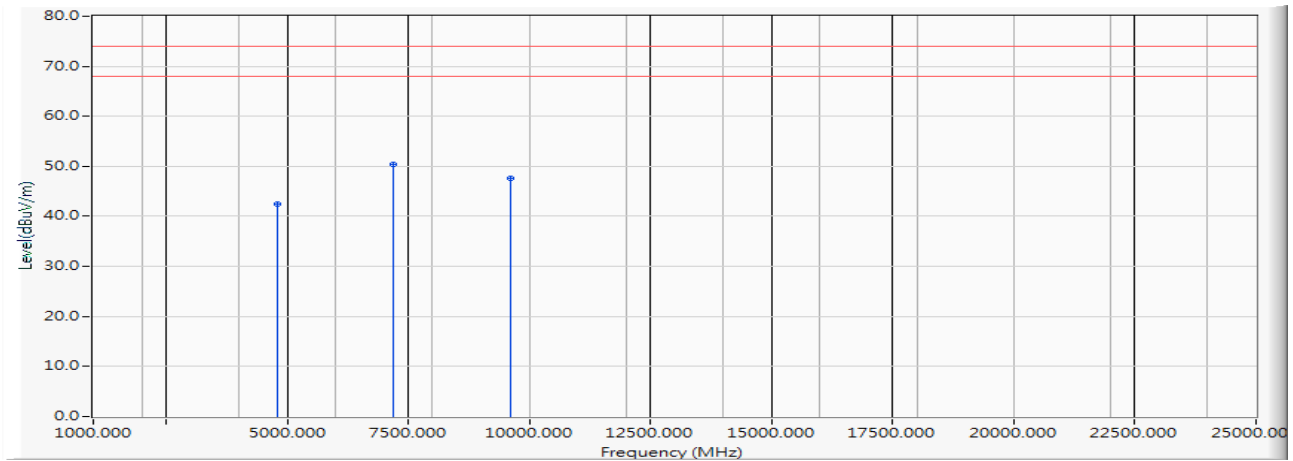
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		4804.000	2.511	39.138	41.648	-32.352	74.000	PEAK
2	*	7206.000	9.511	38.686	48.197	-25.803	74.000	PEAK
3		9608.000	10.394	36.581	46.975	-27.025	74.000	PEAK

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss – Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : Detachable Keyboard
 Test Item : Harmonic Radiated Emission Data
 Test Site : No.3 OATS
 Test Date : 2018/12/24
 Test Mode : Mode 1: Transmit (2402MHz)

Vertical



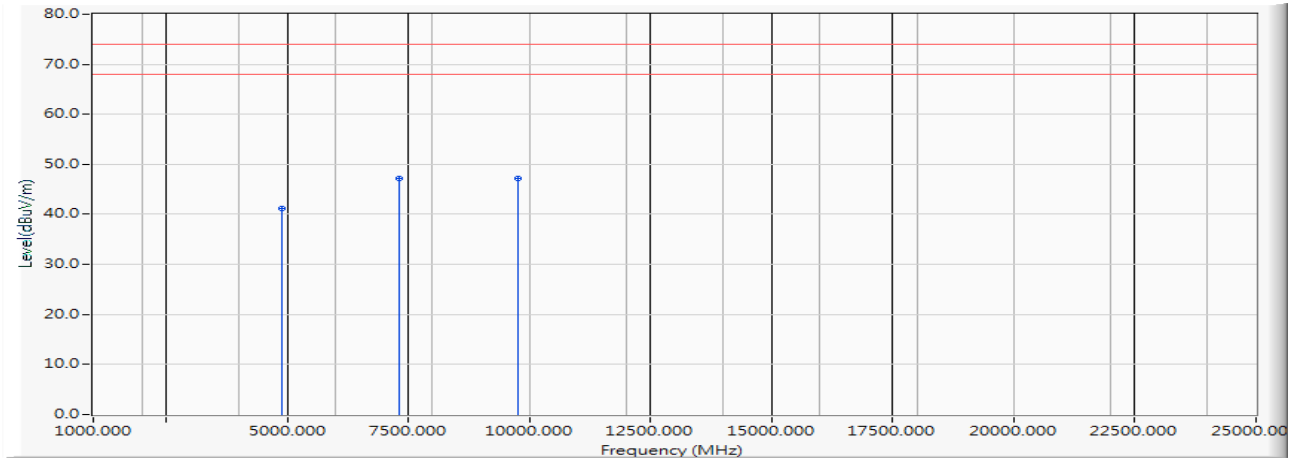
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		4804.000	2.923	39.445	42.367	-31.633	74.000	PEAK
2	*	7206.000	9.988	40.481	50.470	-23.530	74.000	PEAK
3		9608.000	10.847	36.845	47.692	-26.308	74.000	PEAK

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss – Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : Detachable Keyboard
 Test Item : Harmonic Radiated Emission Data
 Test Site : No.3 OATS
 Test Date : 2018/12/24
 Test Mode : Mode 1: Transmit (2440 MHz)

Horizontal



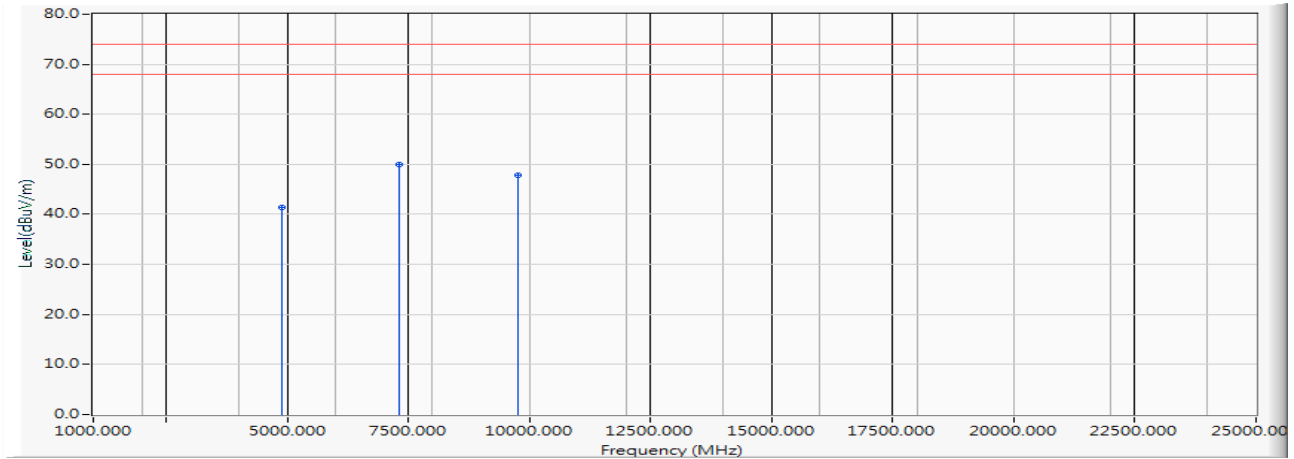
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		4880.000	2.038	39.124	41.162	-32.838	74.000	PEAK
2	*	7320.000	9.699	37.406	47.105	-26.895	74.000	PEAK
3		9760.000	9.665	37.416	47.081	-26.919	74.000	PEAK

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss – Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : Detachable Keyboard
 Test Item : Harmonic Radiated Emission Data
 Test Site : No.3 OATS
 Test Date : 2018/12/24
 Test Mode : Mode 1: Transmit (2440 MHz)

Vertical



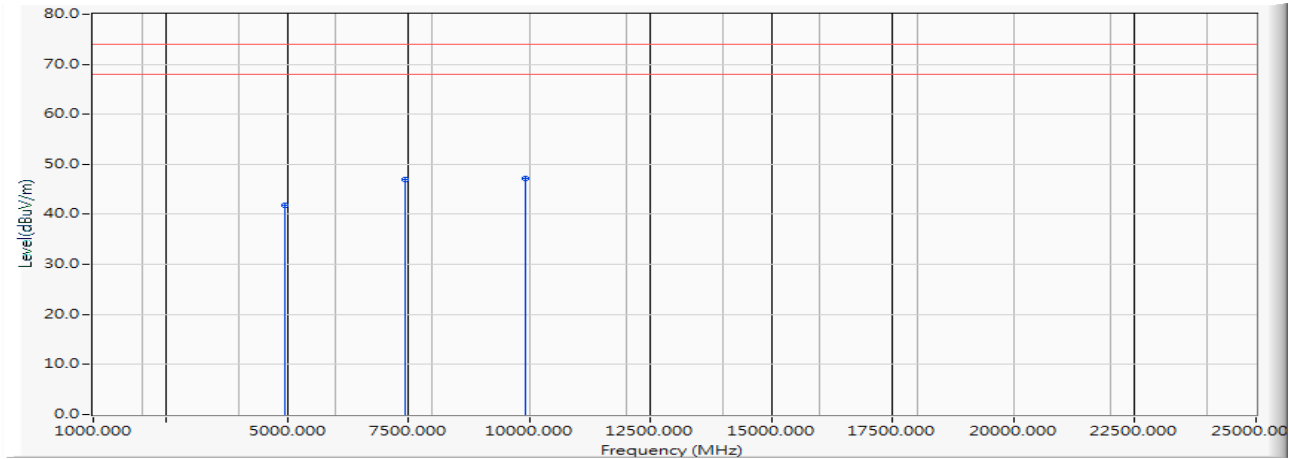
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		4880.000	2.499	38.987	41.486	-32.514	74.000	PEAK
2	*	7320.000	10.303	39.651	49.954	-24.046	74.000	PEAK
3		9760.000	10.299	37.485	47.785	-26.215	74.000	PEAK

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss – Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : Detachable Keyboard
 Test Item : Harmonic Radiated Emission Data
 Test Site : No.3 OATS
 Test Date : 2018/12/24
 Test Mode : Mode 1: Transmit (2480 MHz)

Horizontal



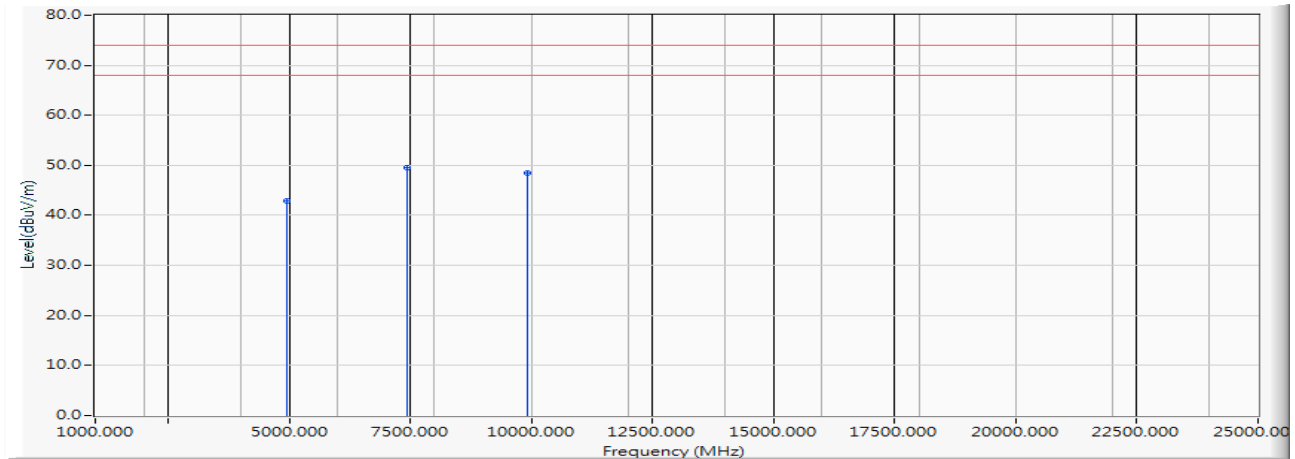
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		4960.000	2.582	39.262	41.844	-32.156	74.000	PEAK
2		7440.000	10.555	36.407	46.962	-27.038	74.000	PEAK
3	*	9920.000	10.206	37.034	47.240	-26.760	74.000	PEAK

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss – Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : Detachable Keyboard
 Test Item : Harmonic Radiated Emission Data
 Test Site : No.3 OATS
 Test Date : 2018/12/24
 Test Mode : Mode 1: Transmit (2480 MHz)

Vertical



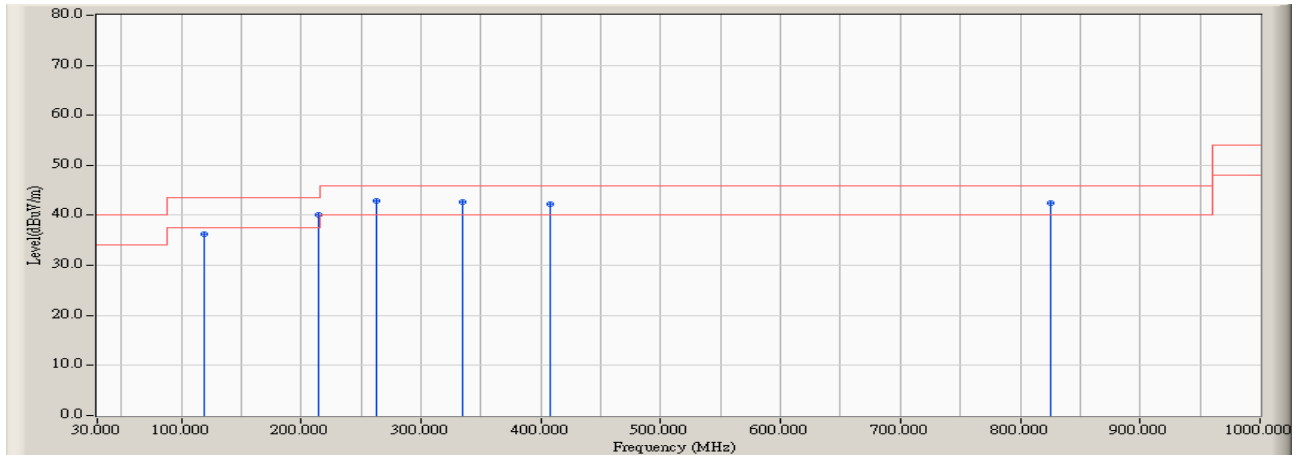
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		4960.000	3.398	39.476	42.875	-31.125	74.000	PEAK
2	*	7440.000	11.214	38.251	49.465	-24.535	74.000	PEAK
3		9920.000	11.245	37.304	48.549	-25.451	74.000	PEAK

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss – Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : Detachable Keyboard
 Test Item : General Radiated Emission Data
 Test Site : No.3 OATS
 Test Date : 2018/12/26
 Test Mode : Mode 1: Transmit (2440 MHz)

Horizontal



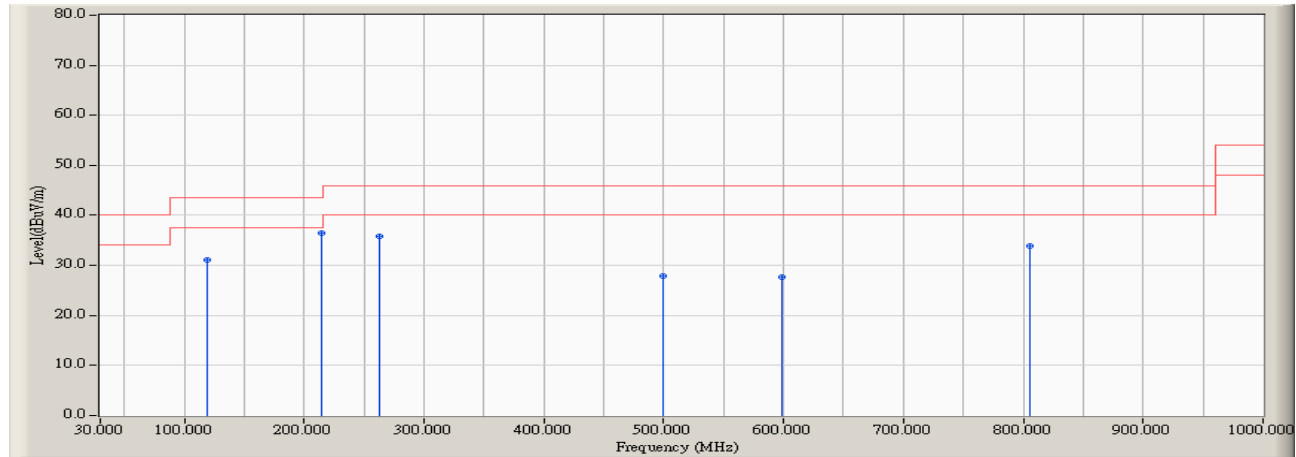
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		118.606	-8.725	44.995	36.270	-7.230	43.500	QUASIPeAK
2		214.984	-8.030	48.231	40.201	-3.299	43.500	QUASIPeAK
3	*	263.173	-5.221	48.098	42.877	-3.123	46.000	QUASIPeAK
4		334.679	-2.765	45.549	42.784	-3.216	46.000	QUASIPeAK
5		407.740	1.730	40.620	42.350	-3.650	46.000	QUASIPeAK
6		825.897	7.861	34.691	42.552	-3.448	46.000	QUASIPeAK

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss – Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.
8. No emission found between lowest internal used/generated frequency to 30MHz.

Product : Detachable Keyboard
 Test Item : General Radiated Emission Data
 Test Site : No.3 OATS
 Test Date : 2018/12/26
 Test Mode : Mode 1: Transmit (2440 MHz)

Vertical



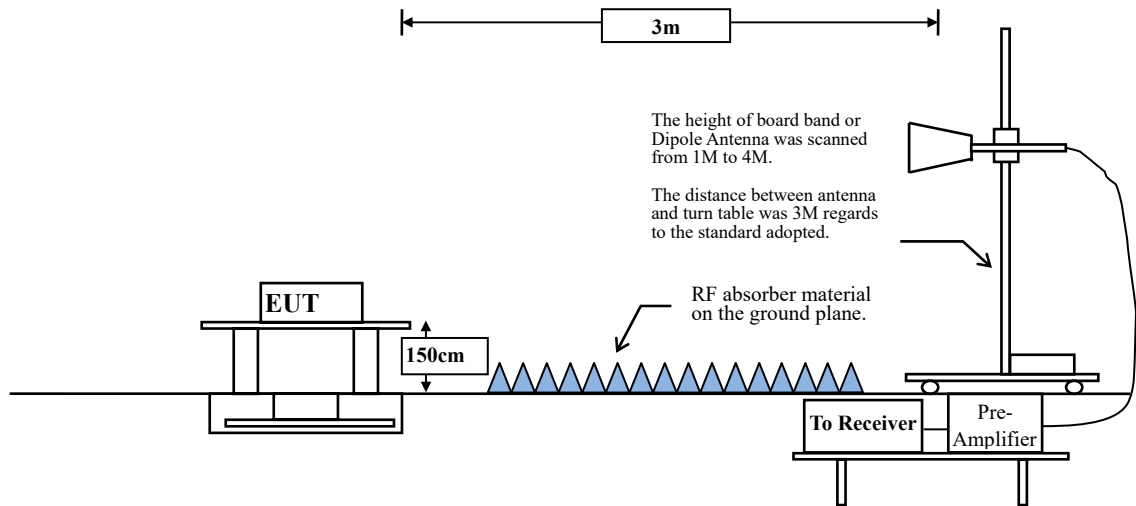
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		118.606	-6.987	37.995	31.008	-12.492	43.500	QUASIPeAK
2	*	214.984	0.127	36.372	36.498	-7.002	43.500	QUASIPeAK
3		263.173	-1.907	37.752	35.845	-10.155	46.000	QUASIPeAK
4		499.455	1.242	26.598	27.840	-18.160	46.000	QUASIPeAK
5		598.942	3.866	23.842	27.708	-18.292	46.000	QUASIPeAK
6		805.689	6.165	27.746	33.911	-12.089	46.000	QUASIPeAK

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss – Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.
8. No emission found between lowest internal used/generated frequency to 30MHz.

4. Band Edge

4.1. Test Setup



4.2. Limits

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 50 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

4.3. Test Procedure

The EUT is placed on a turn table which is 1.5 meter above ground. The turn table is rotated 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

The antenna can move up and down between 1 meter and 4 meters to find out the maximum emission level.

Both horizontal and vertical polarization of the antenna are set on measurement. In order to find the maximum emission, all of the interface cables must be manipulated according to ANSI C63.10: 2013 on radiated measurement.

The bandwidth setting below 1GHz and above 1GHz on the field strength meter is 120 kHz and 1MHz, respectively.

4.4. Uncertainty

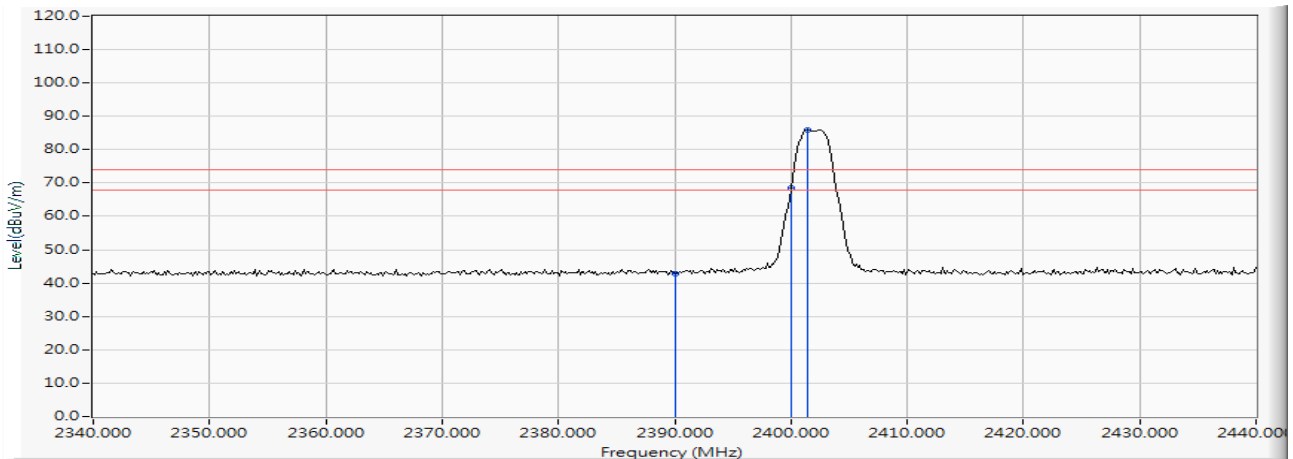
± 4.08 dB above 1GHz

± 4.22 dB below 1GHz

4.5. Test Result of Band Edge

Product : Detachable Keyboard
 Test Item : Band Edge Data
 Test Site : No.3 OATS
 Test Date : 2019/01/07
 Test Mode : Mode 1: Transmit (2402MHz)

Horizontal



		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		2390.000	-2.687	45.546	42.859	-31.141	74.000	PEAK
2		2400.000	-2.660	71.071	68.411	-5.589	74.000	PEAK
3	*	2401.449	-2.658	88.626	85.968	11.968	74.000	PEAK

Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. “ * ”, means this data is the worst emission level.
4. Measurement Level = Reading Level + Correct Factor.
5. The average measurement was not performed when the peak measured data under the limit of average detection.

Average Detector:

Frequency	Peak	Duty Cycle	Measurement	Margin	Limit	Result
MHz	Measurement	Factor	Level			Pass
	dBμV/m	dB	dBμV/m	dB	dBμV/m	

Horizontal

Average Detector:

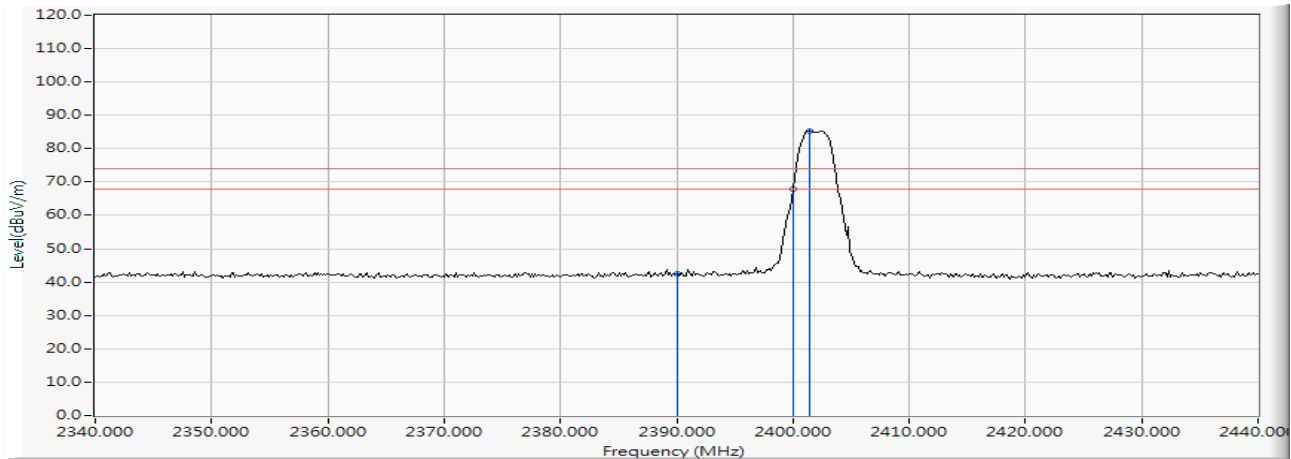
2400.000	68.411	-21.830	46.581	-7.419	54.000	Pass
----------	--------	---------	--------	--------	--------	------

Note:

1. Average Measurement=Peak Measurement + Duty Cycle Correct Factor
2. The Duty Cycle is refer to section 5.

Product : Detachable Keyboard
 Test Item : Band Edge Data
 Test Site : No.3 OATS
 Test Date : 2019/01/07
 Test Mode : Mode 1: Transmit (2402MHz)

Vertical



		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		2390.000	-4.159	46.619	42.460	-31.540	74.000	PEAK
2		2400.000	-4.171	72.200	68.029	-5.971	74.000	PEAK
3	*	2401.449	-4.171	89.437	85.266	11.266	74.000	PEAK

Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. “ * ”, means this data is the worst emission level.
4. Measurement Level = Reading Level + Correct Factor.
5. The average measurement was not performed when the peak measured data under the limit of average detection.

Average Detector:

Frequency	Peak Measurement	Duty Cycle Factor	Measurement Level	Margin	Limit	Result
MHz	dBμV/m	dB	dBμV/m	dB	dBμV/m	Pass

Vertical

Average Detector:

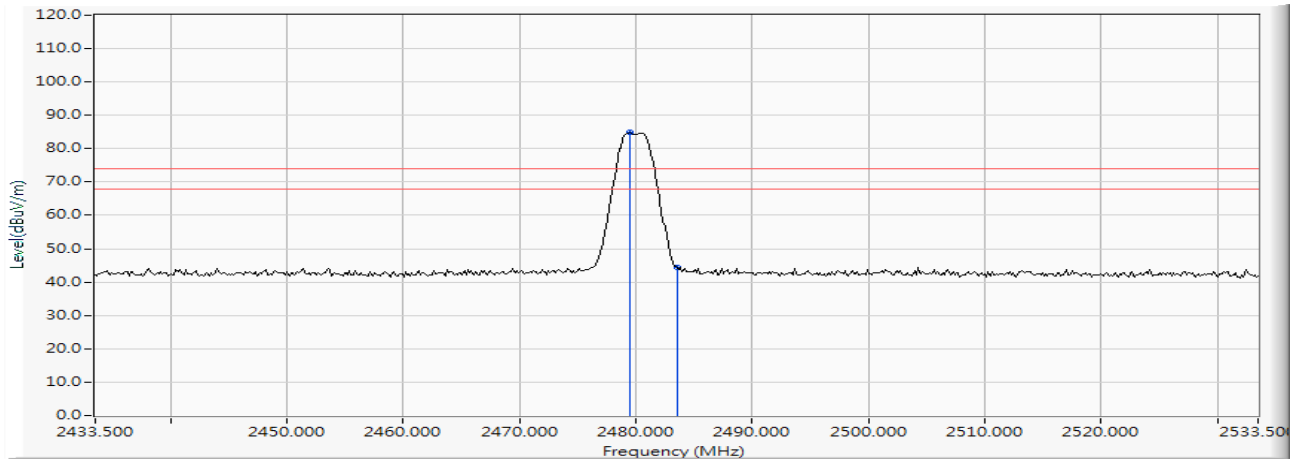
2400.000	68.029	-21.830	46.199	-7.801	54.000	Pass
----------	--------	---------	--------	--------	--------	------

Note:

1. Average Measurement=Peak Measurement + Duty Cycle Correct Factor
2. The Duty Cycle is refer to section 5.

Product : Detachable Keyboard
 Test Item : Band Edge Data
 Test Site : No.3 OATS
 Test Date : 2019/01/07
 Test Mode : Mode 1: Transmit (2480MHz)

Horizontal



		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	2479.442	-2.606	87.379	84.774	10.774	74.000	PEAK
2		2483.500	-2.601	47.031	44.429	-29.571	74.000	PEAK

Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. “ * ”, means this data is the worst emission level.
4. Measurement Level = Reading Level + Correct Factor.
5. The average measurement was not performed when the peak measured data under the limit of average detection.

Average Detector:

Frequency	Peak	Duty Cycle	Measurement	Margin	Limit	Result
MHz	Measurement dBμV/m	Factor dB	Level dBμV/m	dB	dBμV/m	Pass

Horizontal

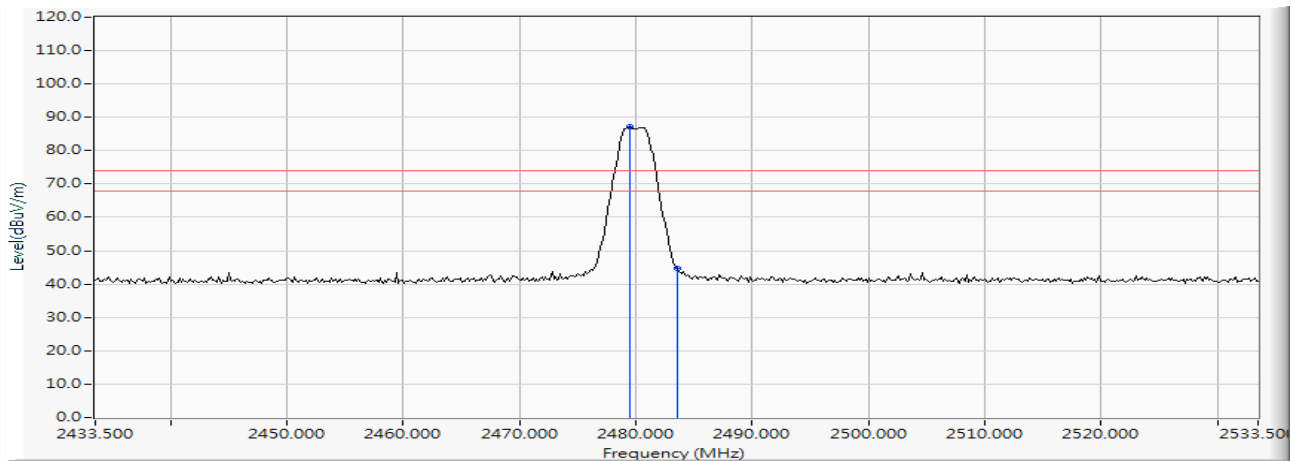
Average Detector:

2483.5	44.429	-21.830	22.599	-31.401	54.000	Pass
--------	--------	---------	--------	---------	--------	------

Note:

1. Average Measurement=Peak Measurement + Duty Cycle Correct Factor
2. The Duty Cycle is refer to section 5.

Product : Detachable Keyboard
 Test Item : Band Edge Data
 Test Site : No.3 OATS
 Test Date : 2019/01/07
 Test Mode : Mode 1: Transmit (2480MHz)

Vertical

		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	2479.442	-3.980	91.007	87.027	13.027	74.000	PEAK
2		2483.500	-3.966	48.586	44.619	-29.381	74.000	PEAK

Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. “*”, means this data is the worst emission level.
4. Measurement Level = Reading Level + Correct Factor.
5. The average measurement was not performed when the peak measured data under the limit of average detection.

Average Detector:

Frequency MHz	Peak Measurement dBμV/m	Duty Cycle Factor dB	Measurement Level dBμV/m	Margin dB	Limit dBμV/m	Result Pass
------------------	-------------------------------	----------------------------	--------------------------------	--------------	-----------------	----------------

Vertical**Average Detector:**

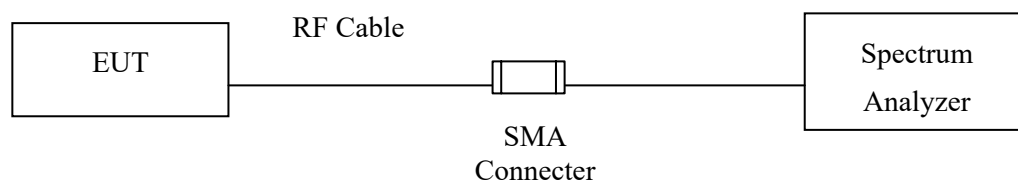
2483.5	48.586	-21.830	26.756	-27.244	54.000	Pass
--------	--------	---------	--------	---------	--------	------

Note:

1. Average Measurement=Peak Measurement + Duty Cycle Correct Factor
2. The Duty Cycle is refer to section 5.

5. Duty Cycle

5.1. Test Setup

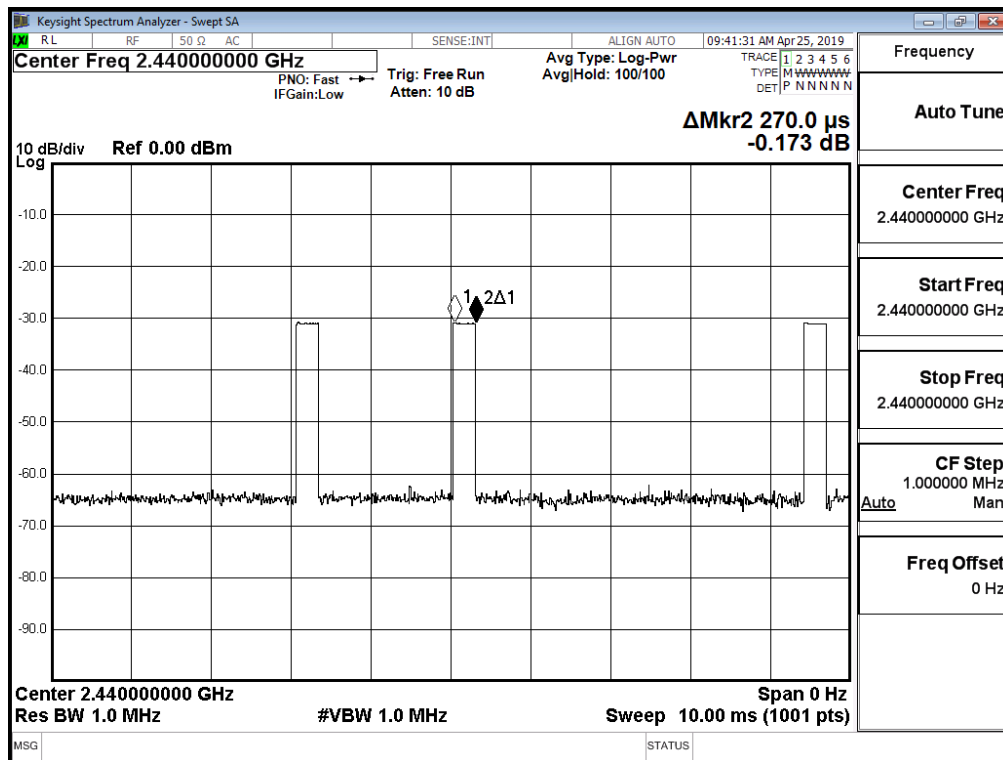


5.2. Uncertainty

$\pm 150\text{Hz}$

5.3. Test Result of Duty Cycle

Product : Detachable Keyboard
 Test Item : Duty Cycle Data
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit



Time on of 100ms= 8.1 ms

Duty Cycle= 8.1ms / 100ms= 0.081

Duty Cycle correction factor= 20 LOG 0.081= -21.83 dB

Duty Cycle correction factor	-21.83	dB
------------------------------	--------	----

6. EMI Reduction Method During Compliance Testing

No modification was made during testing.