# FCC Part 15 EMI TEST REPORT

# of

E.U.T. : Keyboard

Model : FK303QBT

Serial Model : FK3XXXXXXX- XXX (X=0-9, A-Z)

FCC ID : WKMLAPTOPPROKB

# for

APPLICANT: Matias Corporation

ADDRESS : 221 Narinia Cres, Newmarket, Ontario, L3X 2E1,

Canada

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: 12-11-RBF-002

# TEST REPORT CERTIFICATION

Applicant : Matias Corporation

221 Narinia Cres, Newmarket, Ontario, L3X 2E1, Canada

Manufacture : Dong Guan Ione Electronic Co.,Ltd.

Yong Jun 2rd Rd, Jin Qian Ling Ind. District, Jitigang, Huang Jiang Town, Dong Guan, Guang Dong Province, China (Post Code:523715)

Description of Device

a) Type of EUT : Keyboard

b) Trade Name : ---

c) Model No. : FK303QBT

d) Serial Model : FK3XXXXXX-XXX (X=0-9, A-Z)

e) Power Supply : (1)Adapter:FEF0500210A1BU

I/P:100-240Vac,50/60Hz,0.3A

O/P:5.0V,2.1A

(2)Power From PC

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 C63.4, 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	Pass
Hopping Channel Separation	Pass
Number of Hopping frequencies used	Pass
Hopping Channel Bandwidth	Pass
Dwell Time of each frequency	Pass
Output Power Requirement	Pass
100 kHz Bandwidth of Frequency Band Edges Requirement	Pass
Out-of-Band Conducted Emission Requirement	Pass

Date Test Item Received : Nov. 02, 2012
Date Test Campaign Completed : Dec. 07, 2012
Date of Issue : Dec. 12, 2012

Test Engineer

(Jiapeng Chen, Engineer)

Approve & Authorized

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 : Keyboard

b) Trade Name : ---

c) Model No. : FK303QBT

d) Serial Model : FK3XXXXXX-XXX (X=0-9, A-Z)

e) Power Supply : (1)Adapter:FEF0500210A1BU

I/P:100-240Vac,50/60Hz,0.3A

O/P:5.0V,2.1A

(2)Power From PC

f) Frequency Range : 2402MHz~2480MHz

## 1.2 Test Methodology

Both conducted and radiated emissions were performed according to the procedures illustrated in ANSI C63.4 (2003). Other required measurements were illustrated in separate sections of this test report for details.

## 1.3 Test Facility

The open area test site and conducted measurement facility used to collect the radiated data is located on the roof top of Building at NO. 34. LIN 5, DINGFU VIL., LINKOU DIST., NEW TAIPEI CITY, TAIWAN, 24442, R.O.C.

This site has been fully described in a report submitted to your office, and accepted in a letter dated Jan. 11, 2011.

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#### 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

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#### (1) Conducted Emission Requirement

Except as shown in paragraphs (b) and (c) of this section, 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 30 MHz shall not exceed the limits in the following table, as measured using a  $50\mu\text{H}/50$  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 boundary between the frequency ranges.

Frequency MHz	Quasi Peak dB μ V	Average dB μ V
0.15 - 0.5	66-56*	56-46*
0.5 - 5.0	56	46
5.0 - 30.0	60	50

<sup>\*</sup> Decreases with the logarithm of the frequency

For intentional device, according to §15.207(a) Line Conducted Emission Limits is same as above table.

#### (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 dB μ V/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.

#### (3) 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.

#### (4) Hopping Channel Separation

According to 15.247(a)(1), frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, 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, provided the systems operate with an output power no greater than 125 mW.

#### (5) Number of Hopping frequencies used

According to 15.247(a)(1)(iii), frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels.

#### (6) Hopping Channel Bandwidth

For frequency hopping system operating in the 2400–2483.5 MHz band, there is no requirement for the maximum 20dB bandwidth of the hopping channel. The measurement of the hopping channel bandwidth is for the reference of the hopping channel separation requirement.

#### (7) Dwell Time of each frequency

According to 15.247(a)(1)(iii), for frequency hopping system operating in the 2400-2483.5 band, the average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

#### (8) Output Power Requirement

According to 15.247(b)(1), for frequency hopping systems operating in the 2400–2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725–5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400–2483.5 MHz band: 0.125 watts.

#### (9) 100 kHz Bandwidth of Frequency Band Edges Requirement

According to 15.247(d), in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 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, provided the

transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required.

#### (10) Out-of-Band Conducted Emission Requirement

According to 15.247(d), in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 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, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required.

## 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	4.5-5.15
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			

<sup>\*\* :</sup> 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 below 1 GHz, the system was configured for testing in a typical fashion as a customer would normally use it. The peripherals other than EUT were connected in normally standing by situation. Measurement was performed under the condition that a computer program was exercised to simulate data communication of EUT, and the transmission rate was set to maximum allowed by EUT. Three highest emissions were verified with varying placement of the transmitting antenna connected to EUT (if applicable) to maximize the emission from EUT.

For conducted and radiated emissions, whichever RF channel is operated, the digital circuits' function identically. As the reason, measurement of emissions from digital circuits is performed with the highest, middle and the lowest channel by transmitting mode.

# 3.2 Devices for Tested System

Device	Manufacturer	Model / FCC ID	Description
* Keyboard	Matias Corporation	FK303QBT / WKMLAPTOPPROKB	1.6m Shielded USB Cable
Note Book	DELL	PP25L	1.8mUnshielded AC Power Cord
I-Pod*2	Apple	A1051	1.0m Unshielded Line

Remark "\*" means equipment under test.

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#### 4 RADIATED EMISSION MEASUREMENT

# 4.1 Applicable Standard

For unintentional radiator, the radiated emission shall comply with §15.109(a).

For intentional radiators, according to §15.247 (a), operation under this provision is limited to frequency hopping and direct sequence spread spectrum, and the out band emission shall be comply with §15.247 (c)

#### 4.2 Measurement Procedure

- 1. Setup the configuration per figure 1 and 2 for frequencies measured below and above 1 GHz respectively.
- 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 associated with EUT to obtain the worse case and record the result.

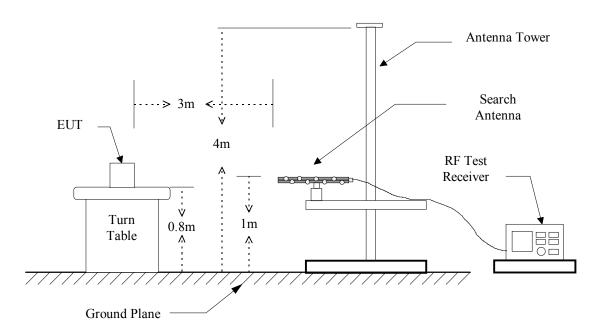
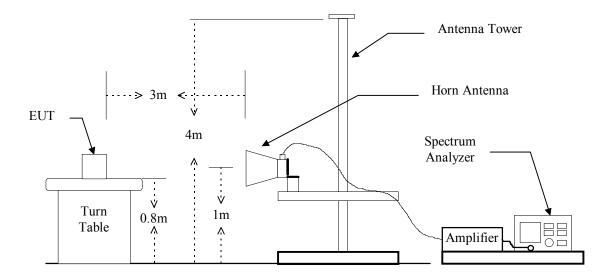


Figure 1 : Frequencies measured below 1 GHz configuration

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
Test Receiver	Rohde & Schwarz	ESVS30	2012/05/07	2013/05/07
EMI Test Receiver	Rohde & Schwarz	ESL	2012/07/30	2013/07/30
Bi-Log Antenna	ETC	MCTD 2756	2012/01/10	2013/01/09
Log-periodic Antenna	EMCO	3146	2012/10/17	2013/10/17
Biconical Antenna	EMCO	3110B	2012/11/17	2013/11/17
Double Ridged Antenna	EMCO	3115	2012/05/18	2013/05/18
Amplifier	HP	8449B	2011/12/28	2012/12/27
Amplifier	HP	83051A	2012/05/16	2013/05/16
Amplifier	HP	8447D	2012/05/16	2013/05/16
EMI Test Receiver	Rohde & Schwarz	ESU 40	2012/09/17	2013/09/17
Test Receiver	Rohde & Schwarz	ESVS30	2012/05/07	2013/05/07

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

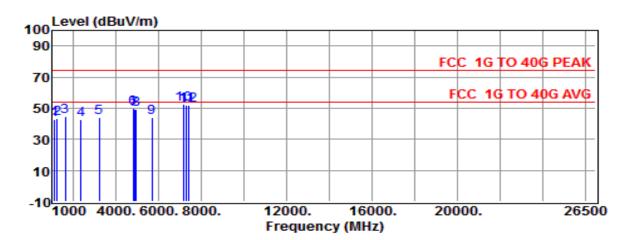
Frequency Band	Instrument	Function	Resolution	Video
(MHz)	11100101110110	1 411 410 11	bandwidth	Bandwidth
30 to 1000	RF Test Receiver	Quasi-Peak	120 kHz	N/A
30 to 1000	Spectrum Analyzer	Peak	100 kHz	100 kHz
Above 1000 Spectrum Analyzer		Peak	1 MHz	1 MHz
	Spectrum Analyzer	Average	1 MHz	10 Hz

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#### 4.4 Radiated Emission Data

#### 4.4.1 Tx Portion

Test Date : Dec 07, 2012 Temperature : 25 °C Humidity : 56 %



Site :CHAMBER #2 Date :2012-12-07

Limit :FCC 1G TO 40G PEAK Ant. Pol. :HORIZONTAL

EUT : Temp. :25°C
Power Rating :Power From PC Humi. :56%

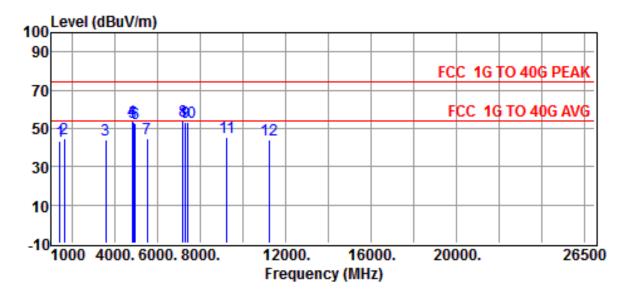
Model :FK303QBT Engineer. :Jiapeng

Test Mode :TX-CH Lo 2402MHz-MI 2441MHz-HI 2480MHz

Test Mode :Other Emissions

Freq	Reading	Correction	Result	Limits	Over limit	Detector
		Factor				
MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1125.3400	54.3	-11.7	42.6	74.0	-31.4	Peak
1239.5400	54.8	-11.2	43.6	74.0	-30.4	Peak
1628.5400	53.6	-9.2	44.4	74.0	-29.6	Peak
2379.6800	48.7	-5.9	42.8	74.0	-31.2	Peak
3236.0000	46.8	-2.9	43.9	74.0	-30.1	Peak
4804.0000	49.0	1.2	50.2	74.0	-23.8	Peak
4882.0000	48.2	1.3	49.5	74.0	-24.5	Peak
4960.0000	47.6	1.6	49.2	74.0	-24.8	Peak
5698.2400	41.2	3.0	44.2	74.0	-29.8	Peak
7206.0000	46.9	5.5	52.4	74.0	-21.6	Peak
7323.0000	46.3	5.8	52.1	74.0	-21.9	Peak
7440.0000	46.1	6.1	52.2	74.0	-21.8	Peak

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



Site :CHAMBER #2 Date :2012-12-07 Limit :FCC 1G TO 40G PEAK Ant. Pol. :VERTICAL

EUT :Keyboard Temp. :25°C

Power Rating :Power From PC Humi. :56%

Model :FK303QBT Engineer. :Jiapeng

Test Mode :TX-CH Lo 2402MHz-MI 2441MHz-HI 2480MHz

Test Mode :Other Emissions

Freq	Reading	Correction	Result	Limits	Over limit	Detector
		Factor				
MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1435.2600	53.5	-10.3	43.2	74.0	-30.8	Peak
1625.2900	53.8	-9.2	44.6	74.0	-29.4	Peak
3589.2600	45.5	-1.7	43.8	74.0	-30.2	Peak
4804.0000	52.5	1.2	53.7	74.0	-20.3	Peak
4882.0000	51.6	1.3	52.9	74.0	-21.1	Peak
4960.0000	50.7	1.6	52.3	74.0	-21.7	Peak
5528.7400	42.2	2.7	44.9	74.0	-29.1	Peak
7206.0000	48.5	5.5	54.0	74.0	-20.0	Peak
7323.0000	47.3	5.8	53.1	74.0	-20.9	Peak
7440.0000	47.2	6.1	53.3	74.0	-20.7	Peak
9258.4500	37.2	8.1	45.3	74.0	-28.7	Peak
11253.4500	32.9	11.2	44.1	74.0	-29.9	Peak

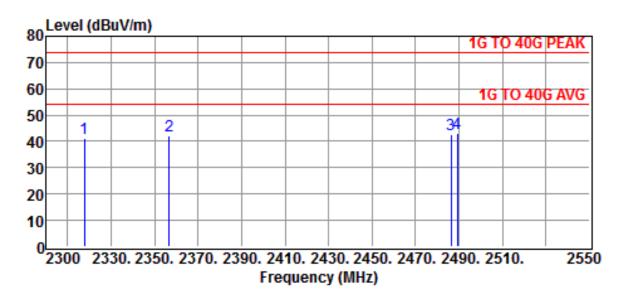
- 1. Result = Reading + Corrected Factor
- 2. Corrected Factor = Antenna Factor + Cable Loss Amplifier Gain (if any)
- 3. Peak measurements are compared to the average limit as peak measurements are below the average limit, they also comply with the peak limit.
- 4. The margin value=Limit Result

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#### **4.4.2 Radiated Emissions in Restricted Bands**

Operation Mode : <u>Receiving / Transmitting</u>

Test Date : Nov07, 2012 Temperature : 25 °C Humidity : 56 %



Site :CHAMBER #2 Date :2012-11-07 Limit :1G TO 40G PEAK Ant. Pol. :HORIZONTAL

EUT :Keyboard Temp. :25 ° C

Power Rating :Power From PC Humi. :56%

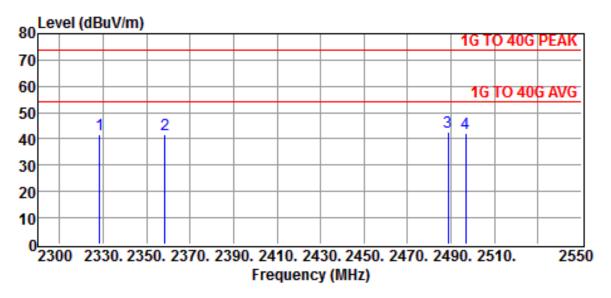
Model :FK303QBT Engineer. :Jiapeng

Test Mode :CH LO & HI - Restricted Bands Memo :

Freq	Reading	Correction	Result	Limits	Over limit	Detector
		Factor				
MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
2317.6900	47.4	-6.1	41.3	74.0	-32.7	Peak
2356.7300	48.1	-6.0	42.1	74.0	-31.9	Peak
2486.4700	48.3	-5.5	42.8	74.0	-31.2	Peak
2489.2000	48.6	-5.5	43.1	74.0	-30.9	Peak

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

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Site :CHAMBER #2 Date :2012-11-07 Limit :1G TO 40G PEAK Ant. Pol. :VERTICAL EUT :25°C :Keyboard Temp. **Power Rating** :Power From PC Humi. :56% Model :FK303QBT Engineer. :Jiapeng Test Mode :CH LO & HI - Restricted Bands Memo

Freq	Reading	Correction	Result	Limits	Over limit	Detector
		Factor				
MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
2328.3400	47.7	-6.1	41.6	74.0	-32.4	Peak
2358.4600	47.9	-6.0	41.9	74.0	-32.1	Peak
2488.6200	48.1	-5.5	42.6	74.0	-31.4	Peak
2496.7400	47.6	-5.5	42.1	74.0	-31.9	Peak

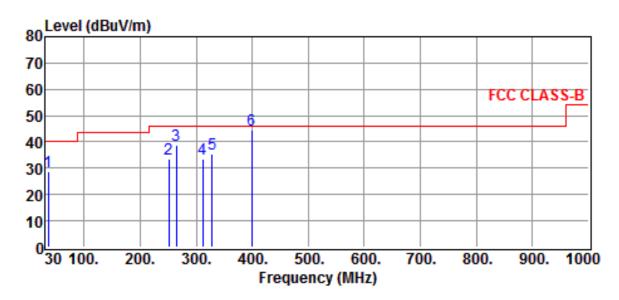
- 1. Result = Reading + Corrected Factor
- 2. Corrected Factor = Antenna Factor + Cable Loss Amplifier Gain (if any)
- 3. The margin value=Limit Result

#### **4.4.3 Other Emissions**

a) Emission frequencies below 1 GHz

Operation Mode : Charging & TX/RX(Adapter)

Test Date : Nov. 05, 2012 Temperature : 25 °C Humidity : 56 %



Site :CHAMBER #2 Date :2012-11-05
Limit :FCC CLASS-B Ant. Pol. :HORIZONTAL

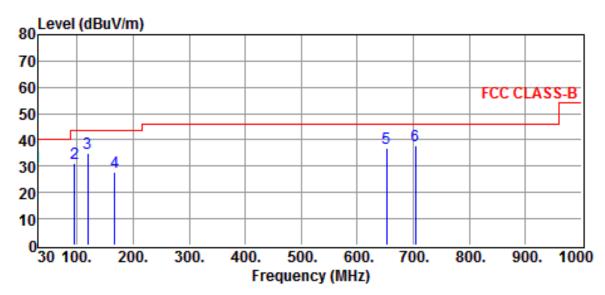
EUT :Keyboard Temp. :25°C

Power Rating :120V/60Hz Humi. :56%

Model :FK303QBT Engineer. :Jiapeng

Freq	Reading	Correction	Result	Limits	Over limit	Detector
		Factor				
MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
35.8200	14.6	14.1	28.7	40.0	-11.3	QP
251.1600	19.0	14.7	33.7	46.0	-12.3	QP
264.7400	23.6	15.4	39.0	46.0	-7.0	QP
311.3000	16.3	17.4	33.7	46.0	-12.3	QP
328.7600	17.7	17.6	35.3	46.0	-10.7	QP
398.6000	25.8	19.0	44.8	46.0	-1.2	QP

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



Site :CHAMBER #2 Date :2012-11-05 :FCC CLASS-B :VERTICAL Limit Ant. Pol. EUT :25°C :Keyboard Temp. Power Rating :120V/60Hz Humi. :56% Model :FK303QBT Engineer. :Jiapeng

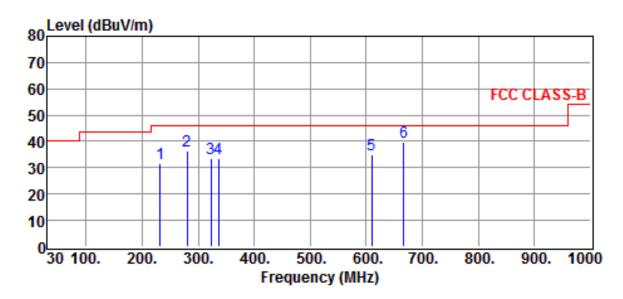
Freq	Reading	Correction	Result	Limits	Over limit	Detector
		Factor				
MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
30.0000	13.9	15.7	29.6	40.0	-10.4	QP
95.9600	20.2	11.0	31.2	43.5	-12.3	QP
119.2400	22.7	12.4	35.1	43.5	-8.4	QP
167.7400	13.6	14.4	28.0	43.5	-15.5	QP
652.7400	12.8	24.3	37.1	46.0	-8.9	QP
703.1800	12.7	25.3	38.0	46.0	-8.0	QP

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

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Operation Mode : Charging & TX/RX(Power From PC)

Test Date : Nov. 05, 2012 Temperature : 25 °C Humidity : 56 %

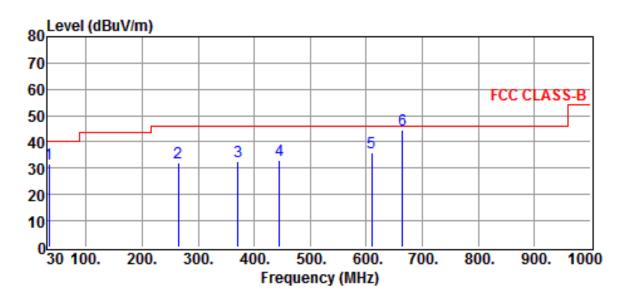


Site :Open Site Date :2012-11-04 Limit :FCC CLASS-B Ant. Pol. :HORIZONTAL

EUT :Keyboard Temp. :25
Power Rating : Power From PC Humi. :56%
Model :FK303QBT Engineer. :Jiapeng

Freq	Reading	Correction	Result	Limits	Over limit	Detector
		Factor				
MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
231.7600	17.5	13.9	31.4	46.0	-14.6	QP
280.2600	19.8	16.5	36.3	46.0	-9.7	QP
322.9400	16.0	17.6	33.6	46.0	-12.4	QP
336.5200	15.9	17.6	33.5	46.0	-12.5	QP
610.0600	11.5	23.3	34.8	46.0	-11.2	QP
666.3200	15.4	24.6	40.0	46.0	-6.0	QP

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



Site :Open Site Date :2012-11-04
Limit :FCC CLASS-B Ant. Pol. :VERTICAL

EUT :Keyboard Temp. :25
Power Rating : Power From PC Humi. :56%
Model :FK303QBT Engineer. :Jiapeng

Freq	Reading	Correction	Result	Limits	Over limit	Detector
		Factor				
MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
33.8800	17.1	14.6	31.7	40.0	-8.3	QP
264.7400	16.8	15.4	32.2	46.0	-13.8	QP
371.4400	14.2	18.3	32.5	46.0	-13.5	QP
445.1600	13.0	20.1	33.1	46.0	-12.9	QP
610.0600	12.7	23.3	36.0	46.0	-10.0	QP
664.3800	20.2	24.5	44.7	46.0	-1.3	QP

- 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 25 GHz were too low to be measured with a pre-amplifier of 35 dB.

# 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

Charging & TX/RX(Adapter)





Charging & TX/RX(Power From PC)





#### 5 CONDUCTED EMISSION MEASUREMENT

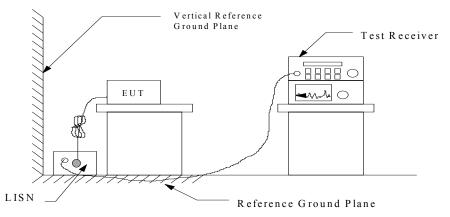
## 5.1 Standard Applicable

For unintentional and intentional device, Line Conducted Emission Limits are in accordance to § 15.107(a) and § 15.207(a) respectively. Both Limits are identical specification.

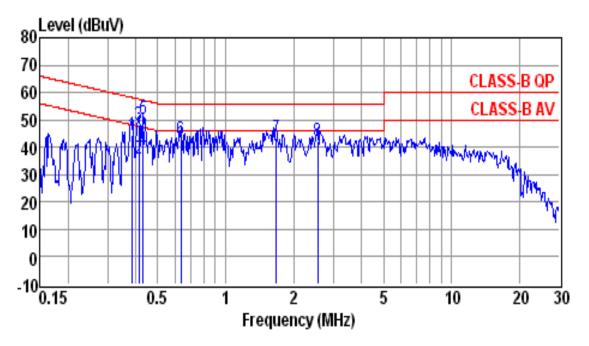
#### **5.2 Measurement Procedure**

- 1. Setup the configuration per figure 3.
- 2. A preliminary scan with a spectrum monitor is performed to identify the frequency of emission that has the highest amplitude relative to the limit by operating the EUT in selected modes of operation, typical cable positions, and with a typical system configuration.
- 3. Record the 6 or 8 highest emissions relative to the limit.
- 4. Measure each frequency obtained from step 3 by a test receiver set on quasi peak detector function, and then record the accuracy frequency and emission level. If all emissions measured in the specified band are attenuated more than 20 dB from the limit, this step would be ignored, and the peak detector function would be used.
- 5. Confirm the highest three emissions with variation of the EUT cable configuration and record the final data.
- 6. Repeat all above procedures on measuring each operation mode of EUT.

Figure 3 : Conducted emissions measurement configuration



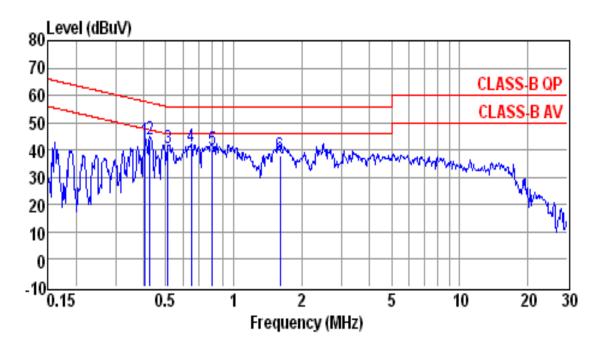
# **5.3 Conducted Emission Data**



Memo : Memo :

Freq (MHz)	Reading (dBuV)	Factor (dB)	Emission Level (dBuV)	Limit Line (dBuV)	Over Limit (dB)	Remark
0.3852	44.1	0.2	44.3	58.2	-13.9	QP
0.4127	35.8	0.2	36.0	47.6	-11.6	Average
0.4127	47.8	0.2	48.0	57.6	-9.6	QP
0.4305	39.1	0.2	39.3	47.2	-7.9	Average
0.4305	50.2	0.2	50.4	57.2	-6.8	QP
0.6338	42.7	0.2	42.9	56.0	-13.1	QP
1.6800	42.7	0.4	43.1	56.0	-12.9	QP
2.5540	41.6	0.4	42.0	56.0	-14.0	QP

- 1. Result = Reading + Factor
- 2. Factor = LISN Factor + Cable Loss



Site : conducted #1 Date : 11-05-2012

Condition : CLASS-B QP LISN : LINE

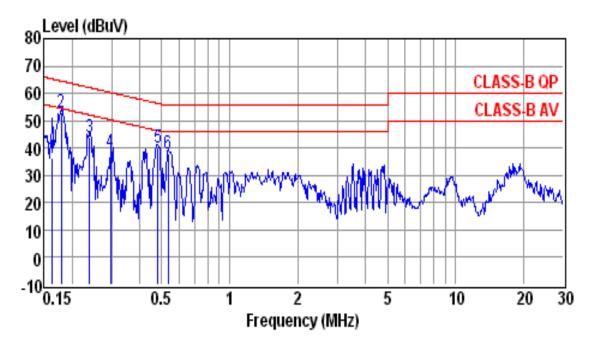
Tem / Hum : 25 °C / 56% Test Mode: Charging & TX/RX(Adapter)

EUT : FK303QBT Power Rating : 120V/60Hz

Memo : Memo :

Freq (MHz)	Reading (dBuV)	Factor (dB)	Emission Level (dBuV)	Limit Line (dBuV)	Over Limit (dB)	Remark
0.4062	42.9	0.3	43.2	57.7	-14.5	QP
0.4260	43.6	0.3	43.9	57.3	-13.4	QP
0.5101	40.3	0.3	40.6	56.0	-15.4	QP
0.6474	40.7	0.3	41.0	56.0	-15.0	QP
0.8045	40.0	0.3	40.3	56.0	-15.7	QP
1.6020	37.7	0.4	38.1	56.0	-17.9	QP

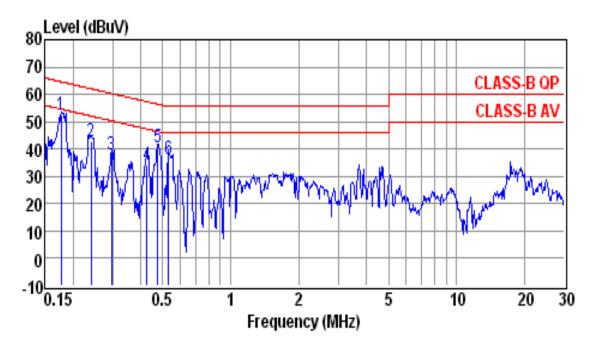
- 1. Result = Reading + Factor
- 2. Factor = LISN Factor + Cable Loss



Memo · Memo

MEIIIO	. Memo .					
Епол			Emission	Limit	Over	
Freq (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Line (dBuV)	Limit (dB)	Remark
0.1641	36.3	0.2	36.5	65.3	-28.8	QP
0.1796	52.6	0.2	52.8	64.5	-11.7	QP
0.2391	43.6	0.2	43.8	62.1	-18.3	QP
0.2971	38.5	0.2	38.7	60.3	-21.6	QP
0.4812	39.8	0.2	40.0	56.3	-16.3	QP
0.5350	37.6	0.2	37.8	56.0	-18.2	QP

- 1. Result = Reading + Factor
- 2. Factor = LISN Factor + Cable Loss



Site : conducted #1 Date : 11-04-2012

Condition : CLASS-B QP LISN : LINE

Tem / Hum :  $25 \,^{\circ}\text{C} / 56\%$  Test Mode: Charging & TX/RX

EUT : FK303QBT Power Rating : Power From PC

Memo Memo Emission Limit Over Freq Factor Reading Level Line Limit Remark (MHz) (dB) (dBuV) (dBuV) (dBuV) (dB) 0.1777 52.1 0.3 52.4 64.6 -12.2 OP 0.2417 42.6 0.3 42.9 62.0 -19.1 QP -22.2 0.2971 37.8 QP 0.3 38.1 60.3 57.3 0.4260 33.8 0.3 34.1 -23.2 QP

40.5

36.5

56.4

56.0

-15.9

-19.5

QP

QP

#### Note:

0.4761

0.5293

- 1. Result = Reading + Factor
- 2. Factor = LISN Factor + Cable Loss

40.2

36.2

0.3

0.3

#### **5.4 Result Data Calculation**

The result data is calculated by adding the LISN Factor to the measured reading. The basic equation with a sample calculation is as follows:

$$RESULT = READING + LISN FACTOR$$

Assume a receiver reading of 22.5 dB  $\mu$  V is obtained, and LISN Factor is 0.1 dB, then the total of disturbance voltage is 22.6 dB  $\mu$  V.

RESULT = 22.5 + 0.1 = 22.6 dB 
$$\mu$$
 V  
Level in  $\mu$  V = Common Antilogarithm[(22.6 dB  $\mu$  V)/20]  
= 13.48  $\mu$  V

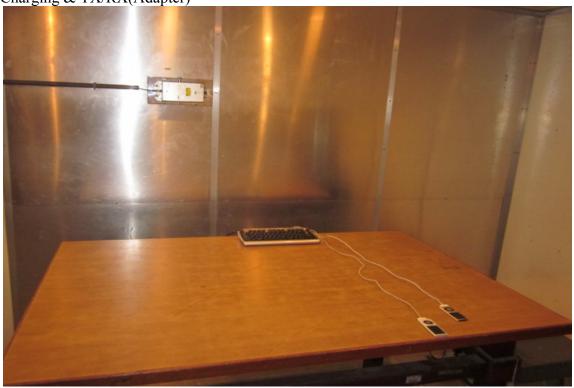
# **5.5 Conducted Measurement Equipment**

The following test equipment are used during the conducted test.

Equipment	Manufacturer	Model No.	<b>Calibration Date</b>	Next Cal. Date
EMI Test Receiver	Rohde & Schwarz	ESCI	2012/07/16	2013/07/16
LISN	EMCO	3625/2	2012/03/30	2013/04/02
LISN	Rohde & Schwarz	ESH2-Z5	2012/08/23	2013/08/23

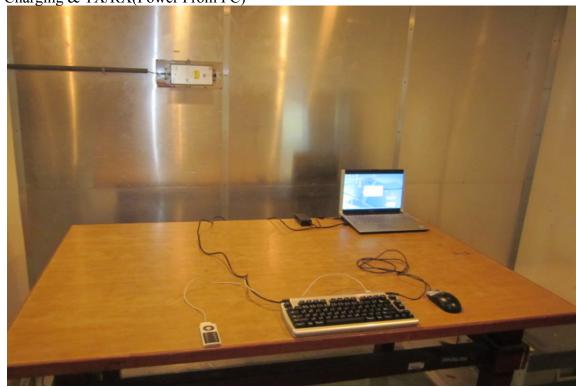
# **5.6 Photos of Conduction Measuring Setup**

Charging & TX/RX(Adapter)





Charging & TX/RX(Power From PC)





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# **6 ANTENNA REQUIREMENT**

# **6.1 Standard Applicable**

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.

#### **6.2** Antenna Construction

The antenna is permanently mounted on main PCB, no consideration of replacement. Please see photos submitted in Exhibit B.

#### 7 HOPPING CHANNEL SEPARATION

## 7.1 Standard Applicable

According to 15.247(a)(1), frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, 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, provided the systems operate with an output power no greater than 125 mW.

#### 7.2 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. The EUT must have its hopping function enabled. Then set it to any one convenient frequency within its operating range.
- 3. Use the following spectrum analyzer settings:

Span = wide enough to capture the peaks of two adjacent channels

Resolution (or IF) Bandwidth (RBW)  $\geq$  1% of the span

Video (or Average) Bandwidth (VBW) ≥ RBW

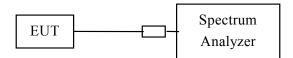
Sweep = auto

Detector function = peak

Trace = max hold

- 4. Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels. Plot the result on the screen of spectrum analyzer.
- 5. Repeat above procedures until all frequencies measured were complete.

Figure 4: Measurement configuration.



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## 7.3 Measurement Equipment

Equipment	Manufacturer	Model No.	Calibration Date	Next Cal. Date
EMI Test Receiver	Rohde & Schwarz	ESL	2012/07/30	2013/07/30
Attenuator	Weinschel	1	N/A	N/A
	Engineering			

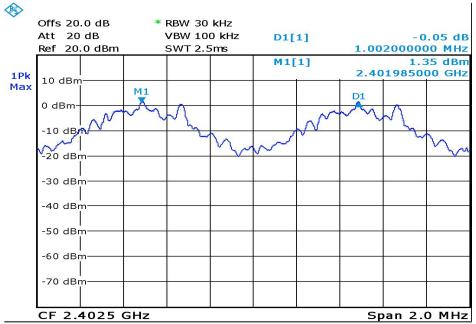
### 7.4 Measurement Data

Test Date: Dec. 07, 2012 Temperature: 25 °C Humidity: 65 %

a) Channel Low : Adjacent Hopping Channel Separation is 1.002 MHz
 b) Channel Middle : Adjacent Hopping Channel Separation is 1.002MHz
 c) Channel High : Adjacent Hopping Channel Separation is 0.998 MHz

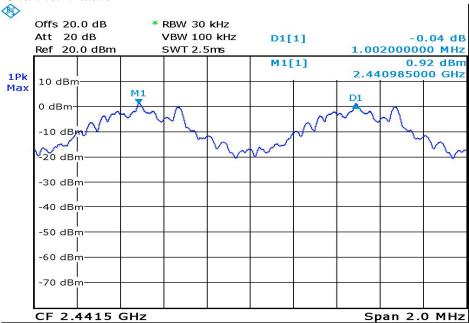
Note: The expanded uncertainty: frequency  $\times 1.65 \times 10^{-6}$  (1 GHz  $< f \le 18$  GHz).





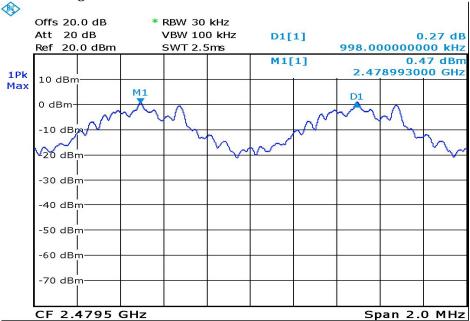
Date: 7.DEC.2012 03:38:22

#### Channel Middle



Date: 7.DEC.2012 03:39:57

### Channel High



Date: 7.DEC.2012 03:41:30

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## 8 NUMBER OF HOPPING FREQUENCY USED

### 8.1 Standard Applicable

According to 15.247(a)(1)(iii), frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels.

#### **8.2 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. The EUT must have its hopping function enabled.
- 3. Use the following spectrum analyzer settings:

Span = the frequency band of operation

RBW  $\geq$  1% of the span

 $VBW \ge RBW$ 

Sweep = auto

Detector function = peak

Trace = max hold

- 4. Allow the trace to stabilize. Plot the result on the screen of spectrum analyzer.
- 5. Repeat above procedures until all frequencies measured were complete.

## 8.3 Measurement Equipment

Equipment	Manufacturer	Model No.	<b>Calibration Date</b>	Next Cal. Date
EMI Test Receiver	Rohde & Schwarz	ESL	2012/07/30	2013/07/30
Attenuator	Weinschel	1	N/A	N/A
	Engineering			

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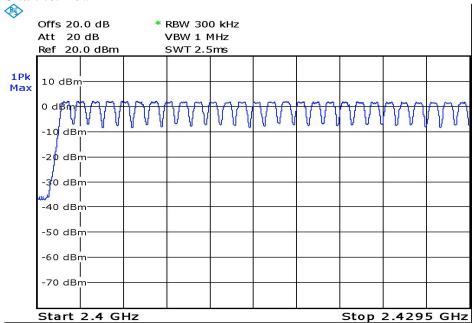
## **8.4** Measurement Data

Test Date: Dec. 07, 2012 Temperature: 25 °C Humidity: 65 %

There are 79 hopping frequencies used.

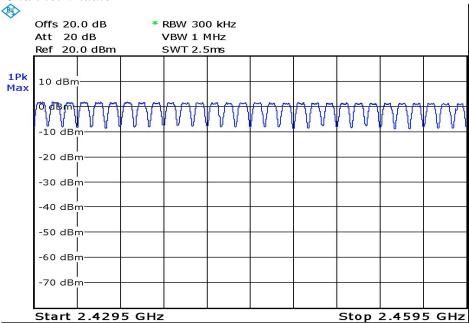
Note: The expanded uncertainty: frequency  $\times 1.65 \times 10^{-6}$  (1 GHz  $< f \le 18$  GHz).

### Channel Low



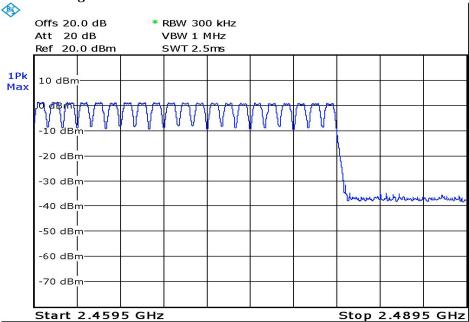
Date: 7.DEC.2012 06:40:58

#### Channel Middle



Date: 7.DEC.2012 06:42:34

### Channel High



Date: 7.DEC.2012 06:43:25

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#### 9 CHANNEL BANDWIDTH

### 9.1 Standard Applicable

For frequency hopping system operating in the 2400–2483.5 MHz band, there is no requirement for the maximum 20dB bandwidth of the hopping channel. The measurement of the hopping channel bandwidth is for the reference of the hopping channel separation requirement.

### 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.
- 3. Use the following spectrum analyzer settings:

Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel RBW  $\geq 1\%$  of the 20 dB bandwidth

 $KDW \ge 170 \text{ OI tile } 20 \text{ GB balley}$ 

VBW ≥ RBW

Sweep = auto

Detector function = peak

Trace = max hold

- 4. Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. Use the marker-delta function to measure 20 dB down one side of the emission. Reset the marker-delta function, and move the marker to the other side of the emission, until it is (as close as possible to) even with the reference marker level. The marker-delta reading at this point is the 20 dB bandwidth of the emission. Plot the result on the screen of spectrum analyzer.
- 5. Repeat above procedures until all frequencies measured were complete.

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# 9.3 Measurement Equipment

Equipment	Manufacturer	Model No.	Calibration Date	Next Cal. Date
EMI Test Receiver	Rohde & Schwarz	ESL	2012/07/30	2013/07/30
Attenuator	Weinschel	1	N/A	N/A
	Engineering			

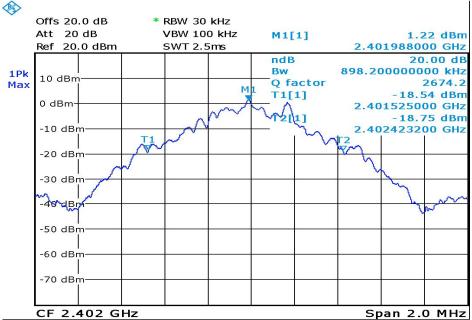
## 9.4 Measurement Data

Test Date : Dec. 07, 2012 Temperature : 25 °C Humidity : 65 %

a) Channel Low : Channel Bandwidth is 898.2 kHz
 b) Channel Middle : Channel Bandwidth is 898.2 kHz
 c) Channel High : Channel Bandwidth is 890.2 kHz

Note: The expanded uncertainty: frequency  $\times 1.65 \times 10^{-6}$  (1 GHz  $< f \le 18$  GHz).





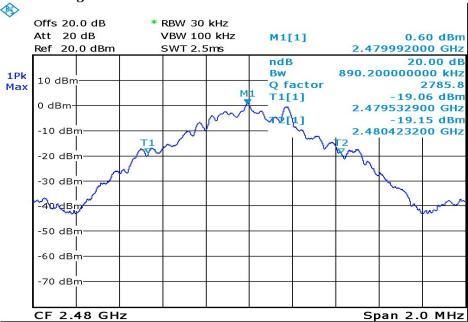
Date: 7.DEC.2012 03:43:25

#### Channel Middle



Date: 7.DEC.2012 03:47:42

### Channel High



Date: 7.DEC.2012 03:48:31

#### 10 DWELL TIME ON EACH CHANNEL

### 10.1 Standard Applicable

According to 15.247(a)(1)(iii), for frequency hopping system operating in the 2400-2483.5 band, the average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

### 10.2 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. The EUT must have its hopping function enabled.
- 3. Use the following spectrum analyzer settings:

Span = zero span, centered on a hopping channel

RBW = 1 MHz

 $VBW \ge RBW$ 

Sweep = as necessary to capture the entire dwell time per hopping channel

Detector function = peak

Trace = max hold

- 4. Use the marker-delta function to determine the dwell time. Plot the result on the screen of spectrum analyzer.
- 5. Repeat above procedures until all frequencies measured were complete.

### 10.3 Measurement Equipment

Equipment	Manufacturer	Model No.	Calibration Date	Next Cal. Date
EMI Test Receiver	Rohde & Schwarz	ESL	2012/07/30	2013/07/30
Attenuator	Weinschel	1	N/A	N/A
	Engineering			

#### 10.4 Measurement Data

Test Date: Dec. 07, 2012 Temperature: 25 °C Humidity: 65 %

#### Period = 0.4(seconds) x 79(channels) = 31.6 seconds

#### A. DH1 Mode

The Bluetooth system hops at a rate of 1600 times per second. This means there are 1600 timeslots in one second. The DH1 data rate operates on a one-slot transmission and one-slot receiving basis. Thus there are 1600/(1+1) = 800 transmissions per second. In one period for each particular channel there are  $10.13 \times 31.6 = 320.1$  times of transmissions.

```
a) Channel Low: the dwell time is 0.50 \text{ms} \times 320.1 = 0.50 ms
b) Channel Middle: the dwell time is 0.52 \text{ms} \times 320.1 = 0.52 ms
c) Channel Hi: the dwell time is 0.48 \text{ms} \times 320.1 = 0.48 ms
```

The maximum time of occupancy for a particular channel is 172.854ms in any 31.6 second period, which is less than the 400ms allowed by the rules; therefore, it meets the requirements of this section.

#### B. DH3 Mode

The Bluetooth system hops at a rate of 1600 times per second. This means there are 1600 timeslots in one second. The DH3 data rate operates on a three-slot transmission and one-slot receiving basis. Thus there are 1600/(3+1) = 400 transmissions per second. In one period for each particular channel there are  $5.06 \times 31.6 = 159.9$  times of transmissions.

```
a) Channel Low : the dwell time is 1.80 \text{ms} \times 159.9 = 1.80 \text{ms}
b) Channel Middle : the dwell time is 1.80 \text{ms} \times 159.9 = 1.80 \text{ms}
c) Channel Hi : the dwell time is 1.80 \text{ms} \times 159.9 = 1.80 \text{ms}
```

The maximum time of occupancy for a particular channel is 294.216ms in any 31.6 second period, which is less than the 400 ms allowed by the rules; therefore, it meets the requirements of this section.

#### C. DH5 Mode

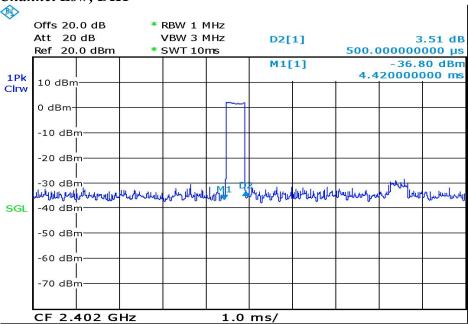
The Bluetooth system hops at a rate of 1600 times per second. This means there are 1600 timeslots in one second. The DH5 data rate operates on a five-slot transmission and one-slot receiving basis. Thus there are 1600/(5+1) = 266.7 transmissions per second. In one period for each particular channel there are  $3.38 \times 31.6 = 106.81$  times of transmissions.

```
a) Channel Low: the dwell time is 3.20ms x 106.81 = 3.20 ms
b) Channel Middle: the dwell time is 3.10ms x 106.81 = 3.10 ms
c) Channel Hi: the dwell time is 3.20ms x 106.81 = 3.20 ms
```

The maximum time of occupancy for a particular channel is 333.247ms in any 31.6 second period, which is less than the 400 ms allowed by the rules; therefore, it meets the requirements of this section.

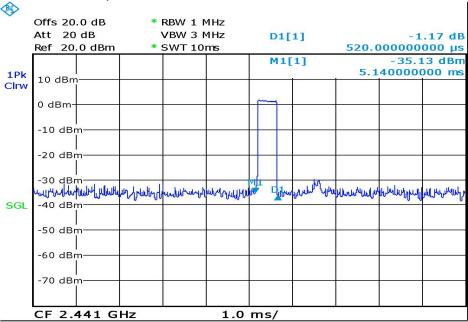
Note: The expanded uncertainty of dwell time on each channel tests is 2dB.

### Channel Low; DH1

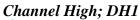


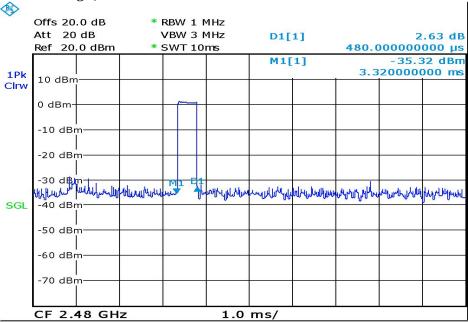
Date: 7.DEC.2012 07:05:13

### Channel Middle; DH1



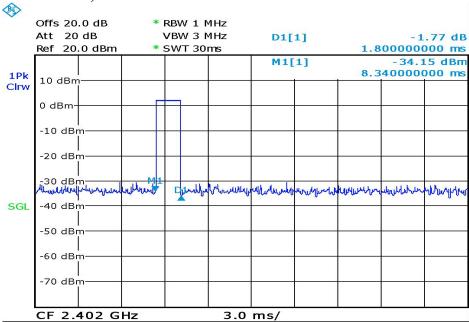
Date: 7.DEC.2012 06:48:58





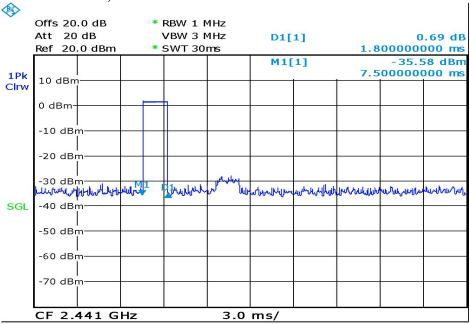
Date: 7.DEC.2012 06:49:59

### Channel Low; DH3



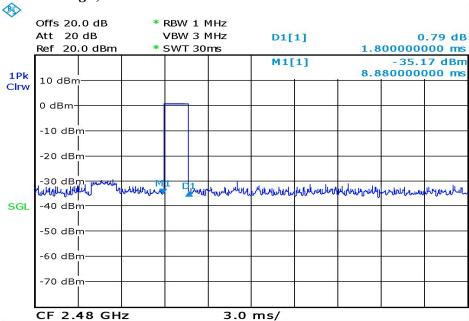
Date: 7.DEC.2012 06:51:29

### Channel Middle; DH3



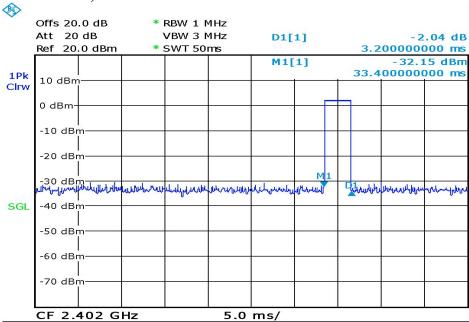
Date: 7.DEC.2012 06:55:28

## Channel High; DH3



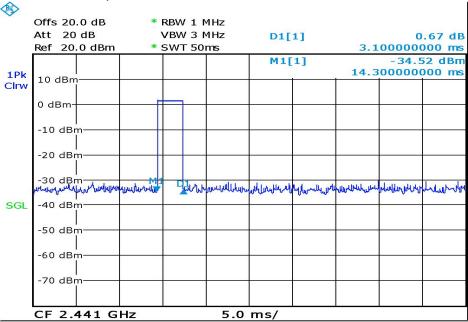
Date: 7.DEC.2012 06:56:32

### Channel Low; DH5



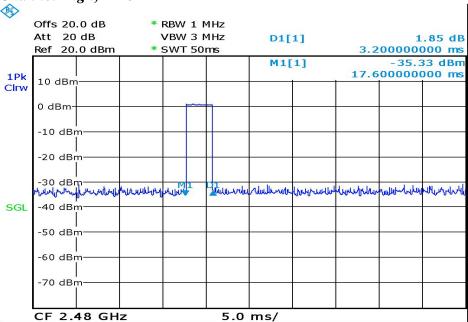
Date: 7.DEC.2012 06:58:53

### Channel Middle; DH5



Date: 7.DEC.2012 06:59:36





Date: 7.DEC.2012 07:00:29

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#### 11 OUTPUT POWER MEASUREMENT

### 11.1 Standard Applicable

According to 15.247(b)(1), for frequency hopping systems operating in the 2400–2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725–5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400–2483.5 MHz band: 0.125 watts.

#### 11.2 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 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. Use the following spectrum analyzer settings:

Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel

RBW > the 20 dB bandwidth of the emission being measured

 $VBW \ge RBW$ 

Sweep = auto

Detector function = peak

Trace = max hold

- 4. Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. The indicated level is the peak output power. Plot the result on the screen of spectrum analyzer.
- 5. Repeat above procedures until all frequencies measured were complete.

## 11.3 Measurement Equipment

Equipment	Manufacturer	Model No.	Calibration Date	Next Cal. Date
EMI Test Receiver	Rohde & Schwarz	ESL	2012/07/30	2013/07/30
Attenuator	Weinschel	1	N/A	N/A
	Engineering			

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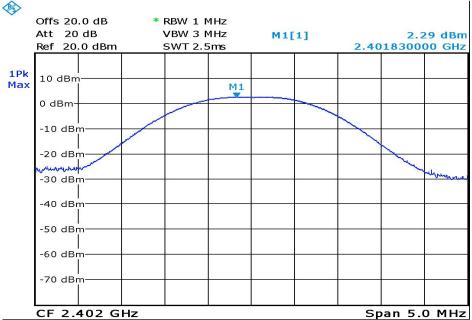
## 11.4 Measurement Data

Test Date : Dec. 07, 2012 Temperature : 25 °C Humidity : 65 %

a) Channel Low : Output Peak Power is 2.29 dBm = 1.694 mW
 b) Channel Middle : Output Peak Power is 1.92 dBm = 1.556 mW
 c) Channel High : Output Peak Power is 0.96 dBm = 1.247 mW

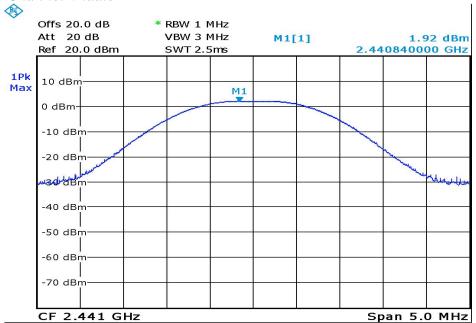
Note: The expanded uncertainty: 2dB.





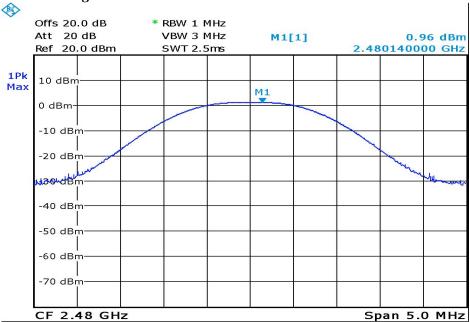
Date: 7.DEC.2012 03:28:34

#### Channel Middle



Date: 7.DEC.2012 03:29:23

### Channel High



Date: 7.DEC.2012 03:33:31

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#### 12 100 kHz BANDWIDTH OF BAND EDGES MEASUREMENT

## 12.1 Standard Applicable

According to 15.247(d), in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 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, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required.

#### 12.2 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 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. Use the following spectrum analyzer settings:
  - Span = wide enough to capture the peak level of the emission operating on the channel closest to the bandedge, as well as any modulation products which fall outside of the authorized band of operation

 $RBW \ge 1\%$  of the span

VBW ≥ RBW

Sweep = auto

Detector function = peak

Trace = max hold

- 4. Allow the trace to stabilize. Set the marker on the emission at the bandedge, or on the highest modulation product outside of the band, if this level is greater than that at the bandedge. Enable the marker-delta function, then use the marker-to-peak function to move the marker to the peak of the in-band emission. Plot the result on the screen of spectrum analyzer.
- 5. Repeat above procedures until all measured frequencies were complete.

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## 12.3 Measurement Equipment

Equipment	Manufacturer	Model No.	Calibration Date	Next Cal. Date
EMI Test Receiver	Rohde & Schwarz	ESL	2012/07/30	2013/07/30
Attenuator	Weinschel	1	N/A	N/A
	Engineering			

### 12.4 Measurement Data

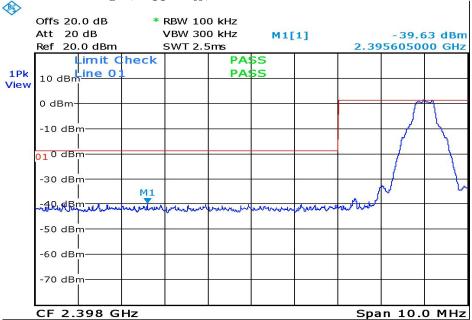
Test Date : Dec. 07, 2012 Temperature : 25 °C Humidity : 65 %

a) Lower Band Edge: All emissions in this 100kHz bandwidth are attenuated more than 20dB from the carrier.

b) Upper Band Edge: All emissions in this 100kHz bandwidth are attenuated more than 20dB from the carrier.

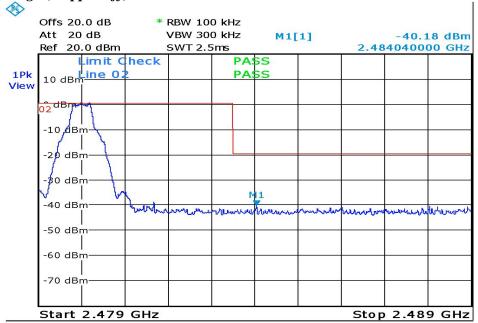
Note: The expanded uncertainty: 2dB.

## Lower Band Edge (Hoppin off)



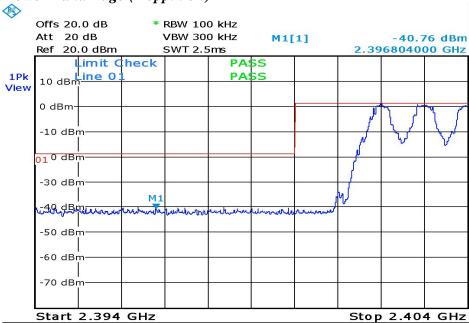
Date: 7.DEC.2012 03:53:27

### Upper Band Edge (Hoppin off)



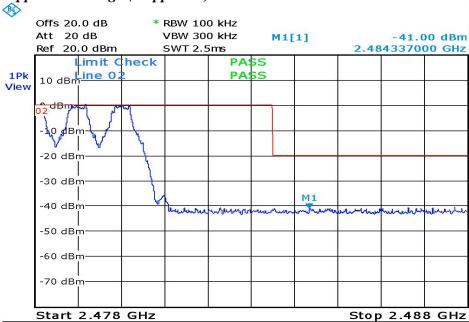
Date: 7.DEC.2012 03:55:55

### Lower Band Edge (Hoppin on)



Date: 7.DEC.2012 03:59:05





Date: 7.DEC.2012 04:01:25

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#### 13 CONDUCTED SPURIOUS EMISSION MEASUREMENT

### 13.1 Standard Applicable

According to 15.247(d), in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 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, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required.

#### 13.2 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 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. Use the following spectrum analyzer settings:
  - Span = wide enough to capture the peak level of the in-band emission and all spurious emissions (e.g., harmonics) from the lowest frequency generated in the EUT up through the 10th harmonic. Typically, several plots are required to cover this entire span.

RBW = 100 kHz

VBW ≥ RBW

Sweep = auto

Detector function = peak

Trace = max hold.

- 4. Allow the trace to stabilize. Set the marker on the peak of any spurious emission recorded. Plot the result on the screen of spectrum analyzer.
- 5. Repeat above procedures until all measured frequencies were complete.

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### 13.3 Measurement Equipment

Equipment	Manufacturer	Model No.	Calibration Date	Next Cal. Date
EMI Test Receiver	Rohde & Schwarz	ESU 40	2012/09/17	2013/09/17
Attenuator	Weinschel	1	N/A	N/A
	Engineering			

#### 13.4 Measurement Data

Test Date: Dec. 07, 2012 Temperature: 25 °C Humidity: 65 %

### **Mode: Low Channel**

- a) 1 GHz to 3 GHz frequency band: All emissions are attenuated more than 20dB from the carrier.
- b) 3 GHz to 25 GHz frequency band: All emissions are attenuated more than 20dB from the carrier.

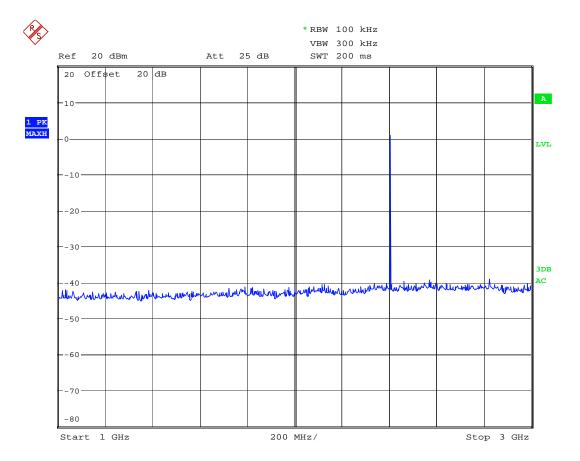
#### **Mode: Mid Channel**

- a) 1 GHz to 3 GHz frequency band: All emissions are attenuated more than 20dB from the carrier.
- b) 3 GHz to 25 GHz frequency band: All emissions are attenuated more than 20dB from the carrier.

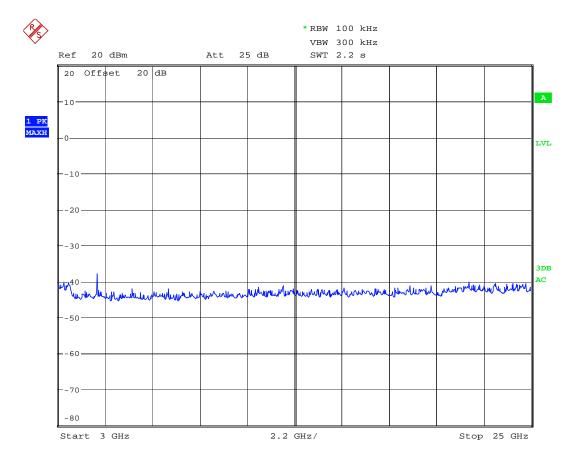
#### Mode: Hi Channel

- a) 1 GHz to 3 GHz frequency band: All emissions are attenuated more than 20dB from the carrier.
- b) 3 GHz to 25 GHz frequency band: All emissions are attenuated more than 20dB from the carrier

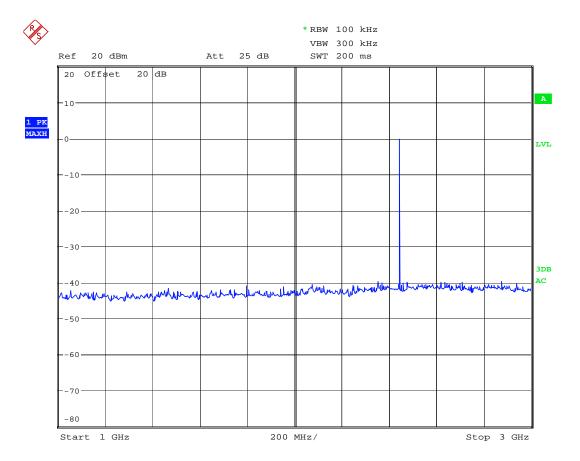
Note: The expanded uncertainty: 2dB.



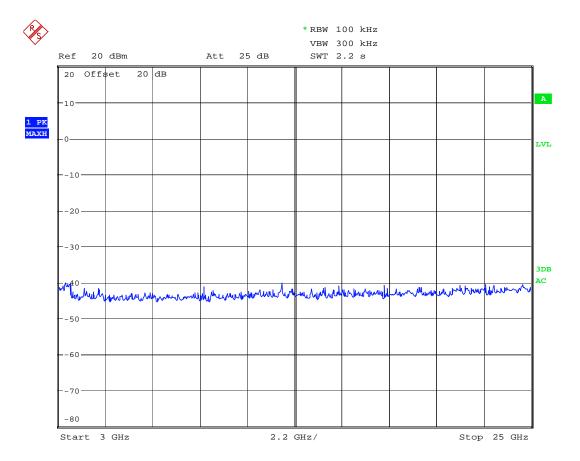
Date: 7.DEC.2012 14:02:08



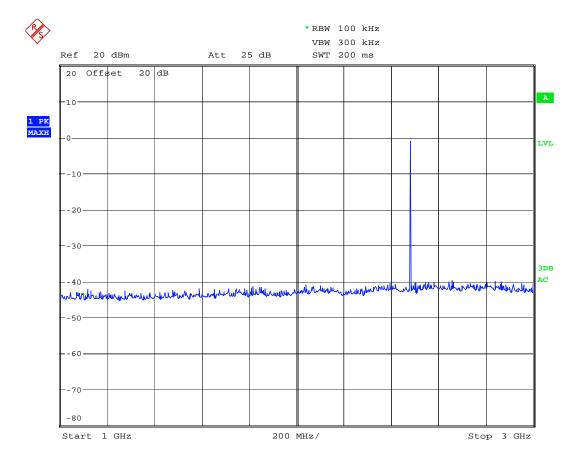
Date: 7.DEC.2012 14:02:23



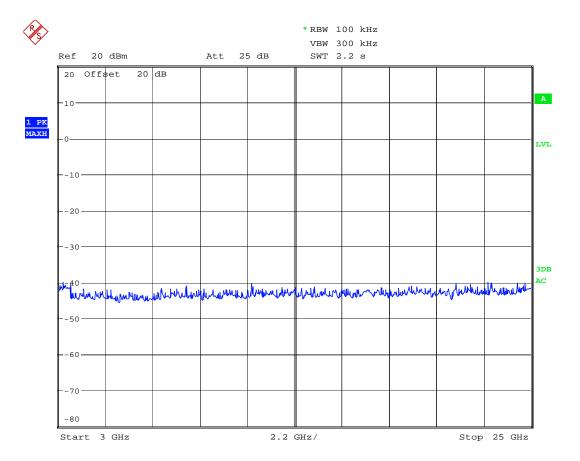
Date: 7.DEC.2012 14:04:12



Date: 7.DEC.2012 14:04:27



Date: 7.DEC.2012 14:04:51



Date: 7.DEC.2012 14:05:04