
FCC Test Report

Report No.:AGC02Y130301-2F2

FCC ID : ZDB-BRK5200

APPLICATION PURPOSE : Class II Permissive Change

PRODUCT DESIGNATION : Bluetooth Keyboard

BRAND NAME : N/A

MODEL NAME : BRK8100, ITK-800

CLIENT : Tianyu Technology Co., Ltd

DATE OF ISSUE : Mar.20,2013

STANDARD(S) : FCC Part 15 Rules

REPORT VERSION : V1.0

Attestation of Global Compliance (Shenzhen) Co., Ltd

CAUTION: This report shall not be reproduced except in full without the written permission of the test laboratory and shall not be quoted out of context.

Report Revise Record

Report Version	Revise Time	Issued Date	Valid Version	Notes
V1.0	/	Mar.20,2013	Valid	Original Report

Product Change Record

This is a variant report based on model BRK5200. The new product model is x-9Bluetooth. Two Models all the same except for PCB Components and product appearance. But Bluetooth Module no any change. The original report can be referred to AGC02Y130301-1F2. Only Radiated Emission and Band Edges were verified for the differences based on the original product.

VERIFICATION OF COMPLIANCE

Applicant	Tianyu Technology Co., Ltd. No 5, 3rd Beian Road, Huang Jiang Town, Dongguan City, China
Manufacturer	Tianyu Technology Co., Ltd. No 5, 3rd Beian Road, Huang Jiang Town, Dongguan City, China
Product Designation	Bluetooth Keyboard
Brand Name	N/A
Test Model	BRK8100,ITK-800
Model Difference	All the same except for model name.
FCC ID	ZDB-BRK5200
Report Number	AGC02Y130301-2F2
Date of Test	Mar.11,2013 to Mar.20,2013

WE HEREBY CERTIFY THAT:

The above equipment was tested by Attestation of Global Compliance (Shenzhen) Co., Ltd. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.4 (2003) and the energy emitted by the sample EUT tested as described in this report is in compliance with radiated emission limits of FCC Rules Part 15.247.

Tested By: Jane Wu
Jane Wu Mar.20,2013

Reviewed By: Forrest Lei
Forrest Lei Mar.20,2013

Approved By: Solger Zhang
Solger Zhang Mar.20,2013

TABLE OF CONTENTS

1. GENERAL INFORMATION	6
1.1 PRODUCT DESCRIPTION.....	6
1.2 TABLE OF CARRIER FREQUENCIES.....	6
1.3 RECEIVER INPUT BANDWIDTH.....	7
1.4 EXAMPLE OF A HOPPING SEQUENCE IN DATA MODE.....	8
1.5 EQUALLY AVERAGE USE OF FREQUENCIES AND BEHAVIOUR.....	8
1.6 RELATED SUBMITTAL(S) / GRANT (S).....	8
1.7 TEST METHODOLOGY.....	8
1.8 MEASUREMENT UNCERTAINTY.....	8
1.9 TEST FACILITY.....	9
1.10 SPECIAL ACCESSORIES	9
1.11 EQUIPMENT MODIFICATIONS	9
2. SYSTEM TEST CONFIGURATION	10
2.1 CONFIGURATION OF TESTED SYSTEM.....	10
2.2 EQUIPMENT USED IN EUT SYSTEM	10
3. SUMMARY OF TEST RESULTS.....	11
4. DESCRIPTION OF TEST MODES	11
5. RADIATED EMISSION	12
5.1 MEASUREMENT PROCEDURE.....	12
5.2 TEST SETUP	13
5.3 TEST EQUIPMENT LIST	14
5.4 TEST RESULT	15
6. BAND EDGES EMISSION	19
6.1 MEASUREMENT PROCEDURE.....	19
6.2 TEST SET-UP	19
6.3 TEST RESULT	19
APPENDIX I.....	23
PHOTOGRAPHS OF THE EUT.....	23
APPENDIX II.....	28
PHOTOGRAPHS OF THE TEST SETUP	30

1. GENERAL INFORMATION

1.1 PRODUCT DESCRIPTION

The EUT is a **Bluetooth Keyboard** designed as a “Communication Device”. It is designed by way of utilizing the FHSS technology to achieve the system operation.

A major technical description of EUT is described as following:

Operation Frequency	2.402 GHz to 2.480GHz
Bluetooth Version	V3.0
Modulation	GFSK, $\pi/4$ -DQPSK, 8DPSK
Number of channels	79
Antenna Designation	Integrated Antenna
Antenna Gain	0.8dBi
Hardware Version	N/A
Software Version	N/A
Power Supply	DC3.7V by Built-in Li-ion Battery

Note: BT is active when charging. The USB port only used for charging and can't be used to transfer data with PC.

1.2 TABLE OF CARRIER FREQUENCYS

Frequency Band	Channel Number	Frequency
2400~2483.5MHZ	0	2402MHZ
	1	2403MHZ
	:	:
	38	2440 MHZ
	39	2441 MHZ
	40	2442 MHZ
	:	:
	77	2479 MHZ
	78	2480 MHZ

1.3 RECEIVER INPUT BANDWIDTH

The input bandwidth of the receiver is 1.3MHz. In every connection one Bluetooth device is the master and the other one is slave. The master determines the hopping sequence. The slave follows this sequence. Both devices shift between RX and TX time slot according to the clock of the master. Additionally the type of connection (e.g. single or multisport (packet) is set up at the beginning of the connection. The master adapts its hopping frequency and its TX/RX timing according to the packet type of the connection. Also the slave of the connection will use these settings.

Repeating of a packet has no influence on the hopping sequence. The hopping sequence generated by the master of the connection will be followed in any case. That means, a repeated packet will not be send on the same frequency, it is send on the next frequency of the hopping sequence.

1.4 EXAMPLE OF A HOPPING SEQUENCY IN DATA MODE

Example of a 79 hopping sequence in data mode:

40,21,44,23,42,53,46,55,48,33,52,35,50,65,54,67
56,37,60,39,58,69,62,71,64,25,68,27,66,57,70,59
72,29,76,31,74,61,78,63,01,41,05,43,03,73,07,75
09,45,13,47,11,77,15,00,64,49,66,53,68,02,70,06
01,51,03,55,05,04

1.5 EQUALLY AVERAGE USE OF FREQUENCIES AND BEHAVIOUR

The generation of the hopping sequence in connection mode depends essentially on two input values:

1 LAP/UAP of the master of the connection

2 Internal master clock

The LAP(lower address part) are the 24 LSB's of the 48 BD_ADDRESS. The BD_ADDRESS is an unambiguous number of every Bluetooth unit. The UAP(upper address part) are the 24MSB's of the 48BD_ADDRESS

The internal clock of a Bluetooth unit is derived from a free running clock which is never adjusted and is never turned off. For synchronization with other units only offset are used. It has no relation to the time of the day. Its resolution is at least half the RX/TX slot length of 312.5us. The clock has a cycle of about One day(23h30). In most case it is implemented as 28 bit counter. For the deriving of the hopping sequence the entire.

LAP(24 bits),4LSB's(4bits)(Input 1) and the 27MSB's of the clock(Input 2) are used. With this input values different mathematical procedures(permutations, additions, XOR-operations)are performed to generate the Sequence. This will be done at the beginning of every new transmission.

Regarding short transmissions the Bluetooth system has the following behavior:

The first connection between the two devices is established, a hopping sequence was generated. For Transmitting the wanted data the complete hopping sequence was not used. The connection ended.

The second connection will be established. A new hopping sequence is generated. Due to the fact the Bluetooth clock has a different value, because the period between the two transmission is longer(and it cannot be shorter)than the minimum resolution of the clock(312.5us).The hopping sequence will always Differ from the first one.

1.6 RELATED SUBMITTAL(S) / GRANT (S)

This submittal(s) (test report) is intended for **FCC ID: ZDB-BRK5200**, filing to comply with Section 15.247 of the FCC Part 15, Subpart C Rules.

1.7 TEST METHODOLOGY

Both conducted and radiated testing was performed according to the procedures in ANSI C63.4 (2003). Radiated testing was performed at an antenna to EUT distance 3 meters.

1.8 MEASUREMENT UNCERTAINTY

The uncertainty is calculated using the methods suggested in the "Guide to the Expression of Uncertainty in Measurement" (GUM) published by ISO.

- Uncertainty of Conducted Emission, $U_c = \pm 2.75\text{dB}$
- Uncertainty of Radiated Emission, $U_c = \pm 3.2\text{dB}$

1.9 TEST FACILITY

All measurement facilities used to collect the measurement data are located at
Attestation of Global Compliance (Shenzhen) Co., Ltd.
2/F., Building 2, No.1-No.4, Chaxi Sanwei Technical Industrial Park, Gushu, Xixiang, Bao'an District, Shenzhen,
Guangdong, China
The test site is constructed and calibrated to meet the FCC requirements in documents ANSI C63.4: 2003.
FCC register No.: 259865

1.10 SPECIAL ACCESSORIES

Refer to section 2.2.

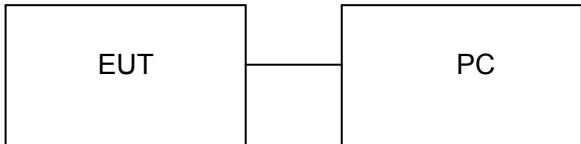
1.11 EQUIPMENT MODIFICATIONS

Not available for this EUT intended for grant.

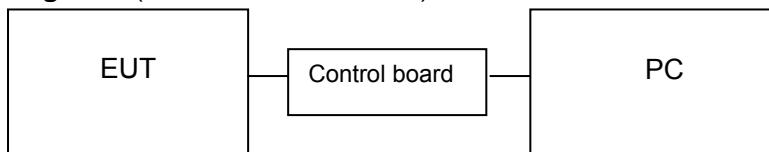
2. SYSTEM TEST CONFIGURATION

2.1 CONFIGURATION OF TESTED SYSTEM

Configure 1 (Normal hopping)



Configure 1 (Control continuous TX)



2.2 EQUIPMENT USED IN EUT SYSTEM

Item	Equipment	Mfr/Brand	Model/Type No.	Remark
1	Bluetooth Keyboard	N/A	BRK8100	EUT
2	PC	DELL	INSPIRON	A.E

3. SUMMARY OF TEST RESULTS

FCC RULES	DESCRIPTION OF TEST	RESULT
§15.209	Radiated Emission	Compliant
§15.247	Band Edges	Compliant

4. DESCRIPTION OF TEST MODES

TEST MODE DESCRIPTION	
TEST MODE DESCRIPTION	WORST
Low Channel(TX)	
Middle Channel(TX)	
High Channel(TX)	
Normal Hopping	V

Note:

1. V means EMI worst mode.
2. All the test modes can be supply by Built-in Li-ion battery and adapter, only the result of the worst case was recorded in the report, if no other cases.
3. For Radiated Emission, 3axis were chosen for testing for each applicable mode.

5. RADIATED EMISSION

5.1 MEASUREMENT PROCEDURE

1. Configure the EUT according to ANSI C63.4. The EUT was placed on the top of the turntable 0.8 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting units. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emissions field strength of both horizontal and vertical polarization.
4. For each suspected emissions, the antenna tower was scan (from 1 M to 4 M) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading.
5. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function with specified bandwidth under Maximum Hold Mode.
6. For emissions above 1GHz, use 1MHz VBW and RBW for peak reading. Then 1MHz RBW and 10Hz VBW for average reading in spectrum analyzer.
7. When the radiated emissions limits are expressed in terms of the average value of the emissions, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum values.
8. If the emissions level of the EUT in peak mode was 3 dB lower than the average limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method for below 1GHz.
9. For testing above 1GHz, the emissions level of the EUT in peak mode was lower than average limit (that means the emissions level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
10. In case the emission is lower than 30MHz, loop antenna has to be used for measurement and the recorded data should be QP measured by receiver. High - Low scan is not required in this case.

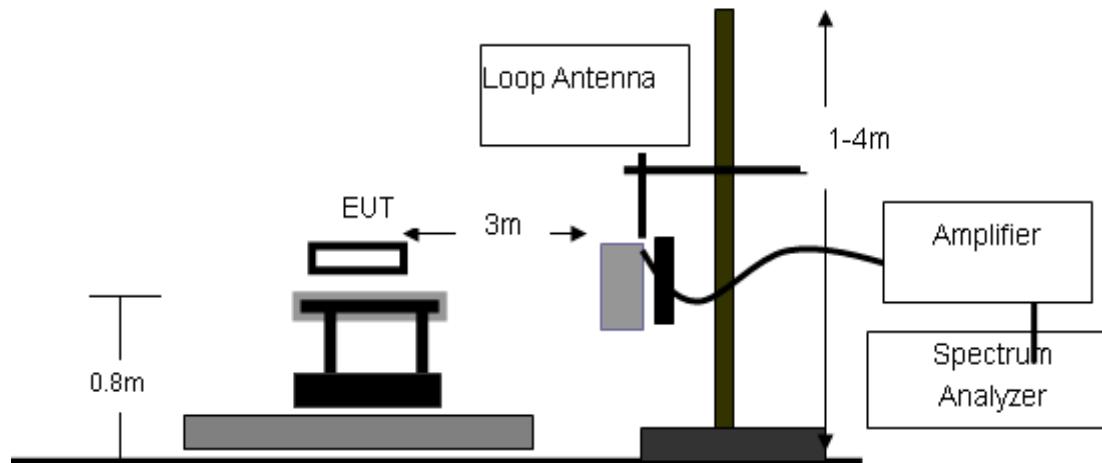
The following table is the setting of spectrum analyzer and receiver.'

Spectrum Parameter	Setting
Start Frequency	1GHz
Stop Frequency	26.5GHz
RB/VB(Emission in restricted band)	1MHz/1MHz for Peak, 1MHz/10Hz for Average
RB/VB(Emission in non-restricted band)	1MHz/1MHz for Peak

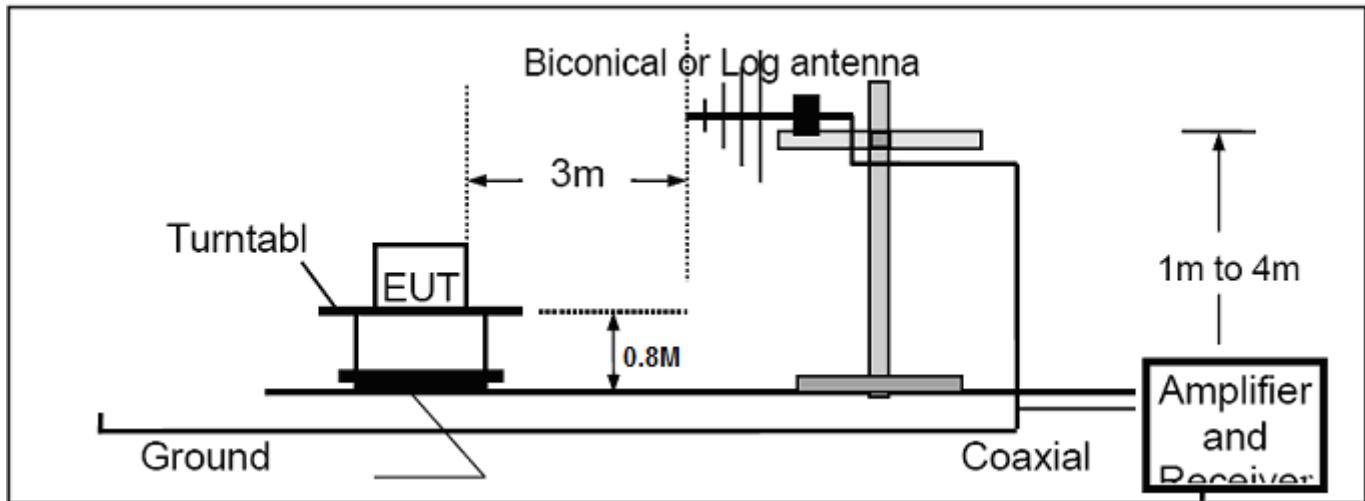
Receiver Parameter	Setting
Start ~Stop Frequency	9KHz~150KHz/RB 200Hz for QP
Start ~Stop Frequency	150KHz~30MHz/RB 9KHz for QP
Start ~Stop Frequency	30MHz~1000MHz/RB 120KHz for QP

5.2 TEST SETUP

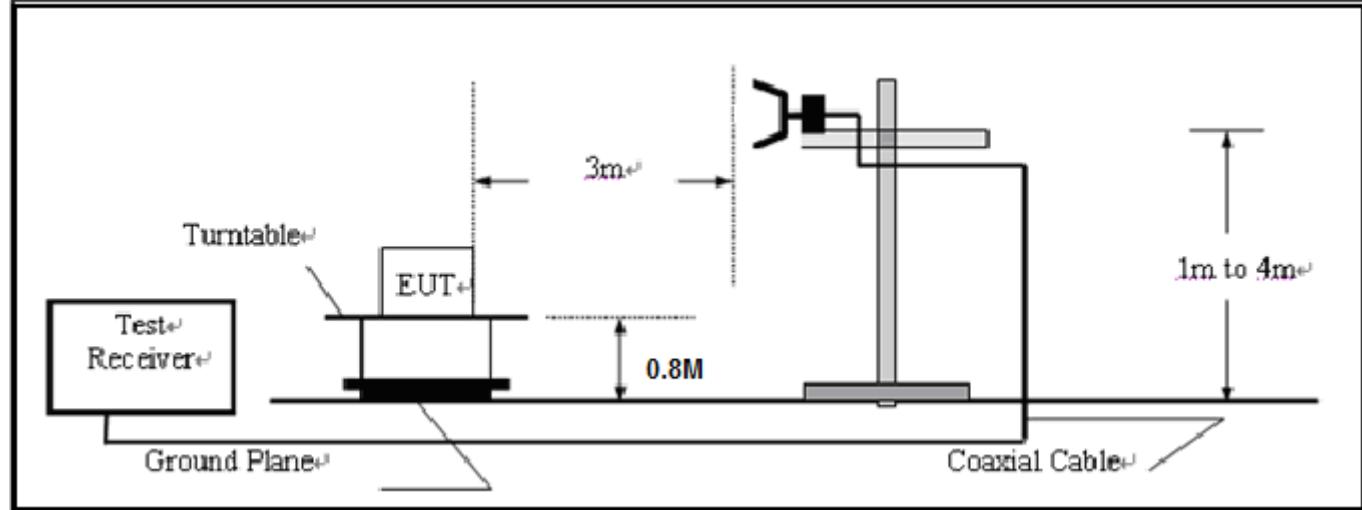
RADIATED EMISSION TEST SETUP BELOW 30MHz



RADIATED EMISSION TEST SETUP 30MHz-1000MHz



RADIATED EMISSION TEST SETUP ABOVE 1000MHz



5.3 TEST EQUIPMENT LIST

Description	Manufacturer	Model	SERIAL NUMBER	Cal. Date	Cal. Due
Spectrum Analyzer	Agilent	E4440A	N/A	07/18/2012	07/17/2013
Amplifier	EM	EM30180	0607030	02/28/2013	02/27/2014
Horn Antenna	EM	EM-AH-10180	N/A	04/21/2012	04/20/2014
EMI Test Receiver	Rohde & Schwarz	ESCI	N/A	07/18/2012	07/17/2013
Amplifier	EM	EM30180	N/A	07/18/2012	07/17/2013
Biological Antenna	A.H. Systems Inc.	SAS-521-4	N/A	06/08/2012	06/07/2013
Loop Antenna	Daze	ZN30900N	SEL0097	07/18/2012	07/17/2013
Isolation Transformer	LETEAC	LTBK	--	07/18/2012	07/17/2013

5.4 TEST RESULT

The worst case is Normal Hopping Mode.

RADIATED EMISSION BELOW 30MHZ

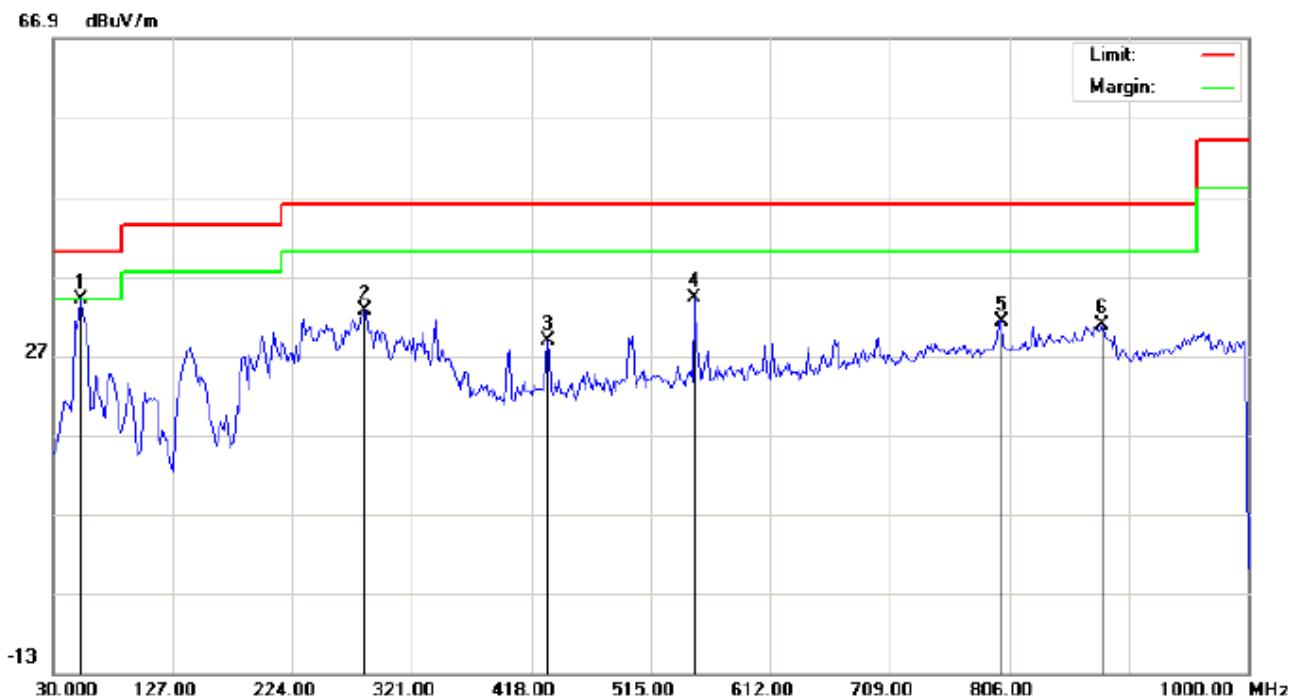
No emission found between lowest internal used/generated frequencies to 30MHz.

RADIATED EMISSION BELOW 1GHZ



Site: site #1	Polarization: <i>Horizontal</i>	Temperature: 26
Limit: FCC Class B 3M Radiation	Power:	Humidity: 60 %
EUT: Bluetooth Keyboard	Distance:	
M/N: BRK8100		
Mode: Normal hopping		
Note:		

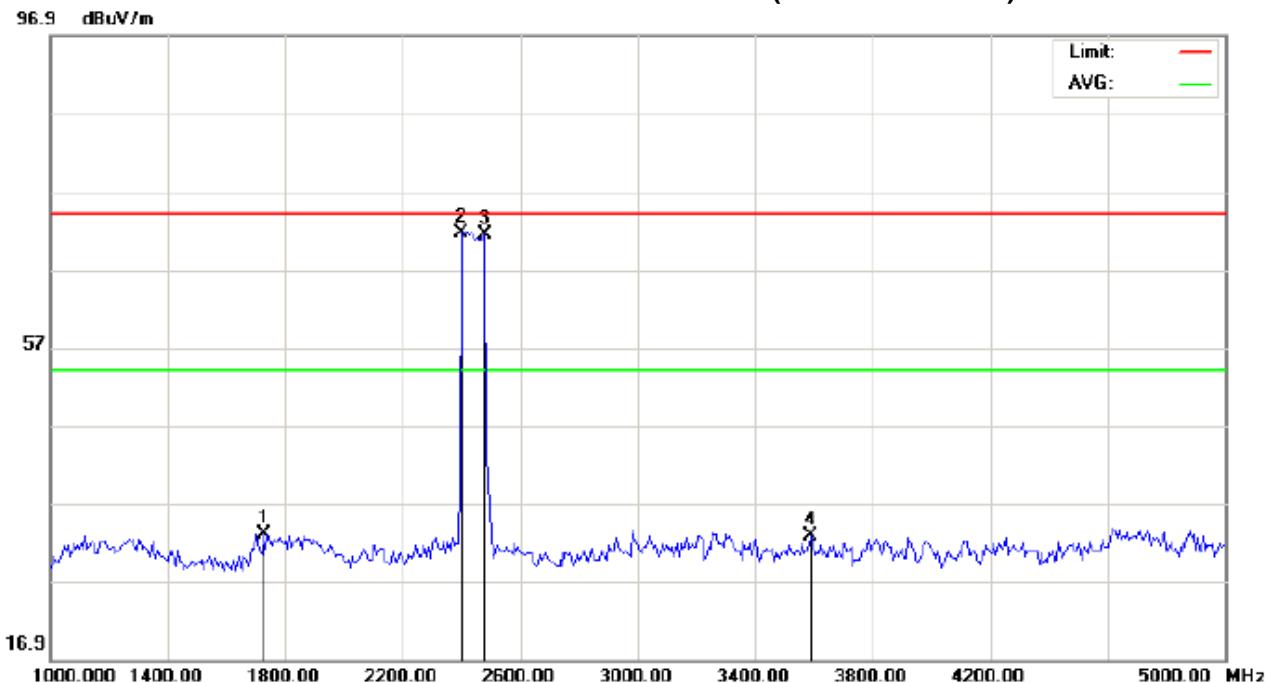
No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1		46.1667	28.66	4.70	33.36	40.00	-6.64	peak			
2	*	130.2332	25.83	14.35	40.18	43.50	-3.32	peak			
3	!	270.8833	24.90	17.22	42.12	46.00	-3.88	peak			
4	!	312.9166	22.83	17.85	40.68	46.00	-5.32	peak			
5		489.1333	9.89	22.26	32.15	46.00	-13.85	peak			
6		799.5333	4.93	28.04	32.97	46.00	-13.03	peak			



Site: site #1 Polarization: *Vertical* Temperature: 26
Limit: FCC Class B 3M Radiation Power: Humidity: 60 %
EUT: Bluetooth Keyboard Distance:
M/N: BRK8100
Mode: Normal hopping
Note:

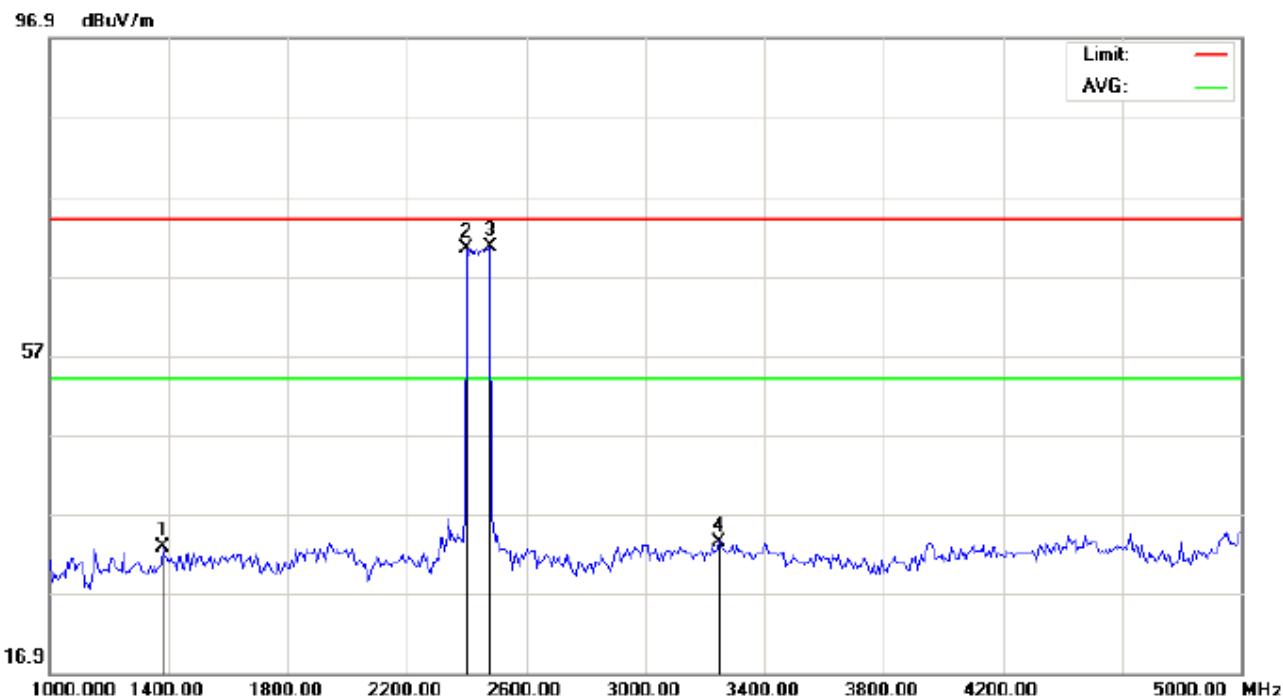
No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1	*	52.6333	29.92	3.99	33.91	40.00	-6.09	peak			
2		282.2000	15.51	17.17	32.68	46.00	-13.32	peak			
3		430.9333	7.37	21.46	28.83	46.00	-17.17	peak			
4		550.5667	10.53	23.74	34.27	46.00	-11.73	peak			
5		799.5333	3.16	28.13	31.29	46.00	-14.71	peak			
6		881.9833	0.90	29.98	30.88	46.00	-15.12	peak			

RADIATED EMISSION ABOVE 1GHZ (1-10th Harmonics)



Site: site #1 Polarization: **Horizontal** Temperature: 26
Limit: FCC Class B 3M Radiation above 1GHZ(PK) Power: Humidity: 60 %
EUT: Bluetooth keyboard Distance: 3m
M/N: BRK8100
Mode: Normal hopping
Note:

No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1		1726.667	43.34	-10.27	33.07	74.00	-40.93	peak			
2	*	2400.000	80.05	-8.40	71.65	74.00	-2.35	peak			
3		2480.000	79.39	-8.08	71.31	74.00	-2.69	peak			
4		3586.667	40.34	-7.52	32.82	74.00	-41.18	peak			



Site: site #1 Polarization: **Vertical** Temperature: 26
 Limit: FCC Class B 3M Radiation above 1GHZ(PK) Power: Humidity: 60 %
 EUT: Bluetooth keyboard Distance: 3m
 M/N: BRK8100
 Mode: Normal hopping
 Note:

No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1		1380.000	43.50	-10.76	32.74	74.00	-41.26	peak			
2		2400.000	78.81	-8.40	70.41	74.00	-3.59	peak			
3	*	2480.000	78.65	-8.08	70.57	74.00	-3.43	peak			
4		3246.667	41.68	-8.18	33.50	74.00	-40.50	peak			

Note: 5~25GHz at least have 20dB margin. No recording in the test report.

Factor=Antenna Factor+ Cable loss-Amplifier gain, Over=Measurement-Limit.

6. BAND EDGES EMISSION

6.1 MEASUREMENT PROCEDURE

- 1, Set the EUT Work on the top, the bottom operation frequency individually.
2. Set SPA Start or Stop Frequency = Operation Frequency, $RBW \geq 1\% \text{span}$, $VBW \geq RBW$
3. The band edges was measured and recorded.

6.2 TEST SET-UP

The same as described in section 8.2

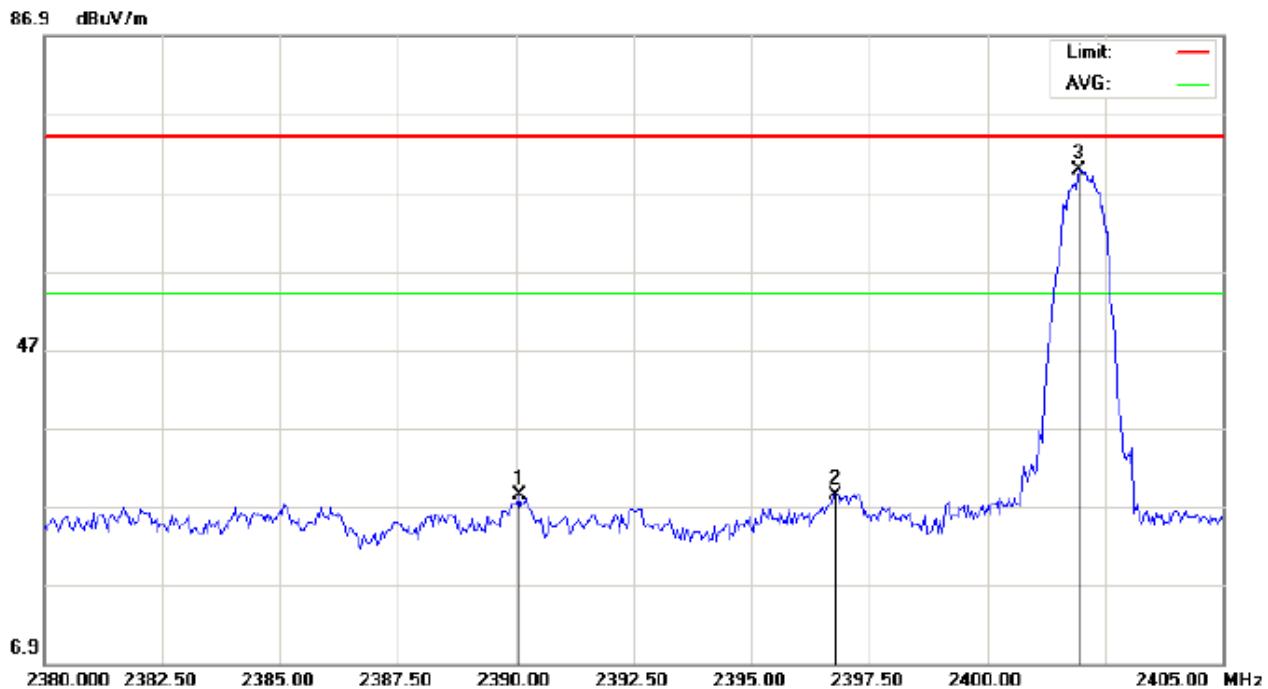
6.3 TEST RESULT

TEST PLOT OF BAND EDGE FOR LOW CHANNEL (3Mbps)



Site: site #1 Polarization: *Horizontal* Temperature: 26
Limit: FCC Class B 3M Radiation above 1GHZ(PK) Power: Humidity: 60 %
EUT: Bluetooth keyboard Distance: 3m
M/N: BRK8100
Mode: Low channel TX
Note:

No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1		2390.125	36.79	-8.44	28.35	74.00	-45.65	peak			
2		2393.625	33.88	-8.43	25.45	74.00	-48.55	peak			
3	*	2401.958	80.45	-8.39	72.06	74.00	-1.94	peak			



Site: site #1 Polarization: *Vertical* Temperature: 26
Limit: FCC Class B 3M Radiation above 1GHZ(PK) Power: Humidity: 60 %
EUT: Bluetooth keyboard Distance: 3m
M/N: BRK8100
Mode: Low channel TX
Note:

No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1		2390.083	36.78	-8.44	28.34	74.00	-45.66	peak			
2		2396.792	36.86	-8.41	28.45	74.00	-45.55	peak			
3	*	2401.958	78.23	-8.39	69.84	74.00	-4.16	peak			

TEST PLOT OF BAND EDGE FOR HIGH CHANNEL (3Mbps)



Site: site #1 Polarization: *Horizontal* Temperature: 26
Limit: FCC Class B 3M Radiation above 1GHZ(PK) Power: Humidity: 60 %
EUT: Bluetooth keyboard Distance: 3m
M/N: BRK8100
Mode: High channel TX
Note:

No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1	*	2480.163	78.54	-8.08	70.46	74.00	-3.54	peak			
2		2483.573	39.42	-8.07	31.35	74.00	-42.65	peak			
3		2489.990	38.43	-8.04	30.39	74.00	-43.61	peak			



Site: site #1 Polarization: **Vertical** Temperature: 26
Limit: FCC Class B 3M Radiation above 1GHZ(PK) Power: Humidity: 60 %
EUT: Bluetooth keyboard Distance: 3m
M/N: BRK8100
Mode: High channel TX
Note:

No.	Mk -	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1	*	2480.017	76.83	-8.08	68.75	74.00	-5.25	peak			
2		2483.463	38.69	-8.07	30.62	74.00	-43.38	peak			
3		2486.177	39.18	-8.06	31.12	74.00	-42.88	peak			

APPENDIX I
PHOTOGRAPHS OF THE EUT
WHOLE VIEW OF EUT



TOP VIEW OF EUT



BOTTOM VIEW OF EUT



LEFT VIEW OF EUT



RIGHT VIEW OF EUT



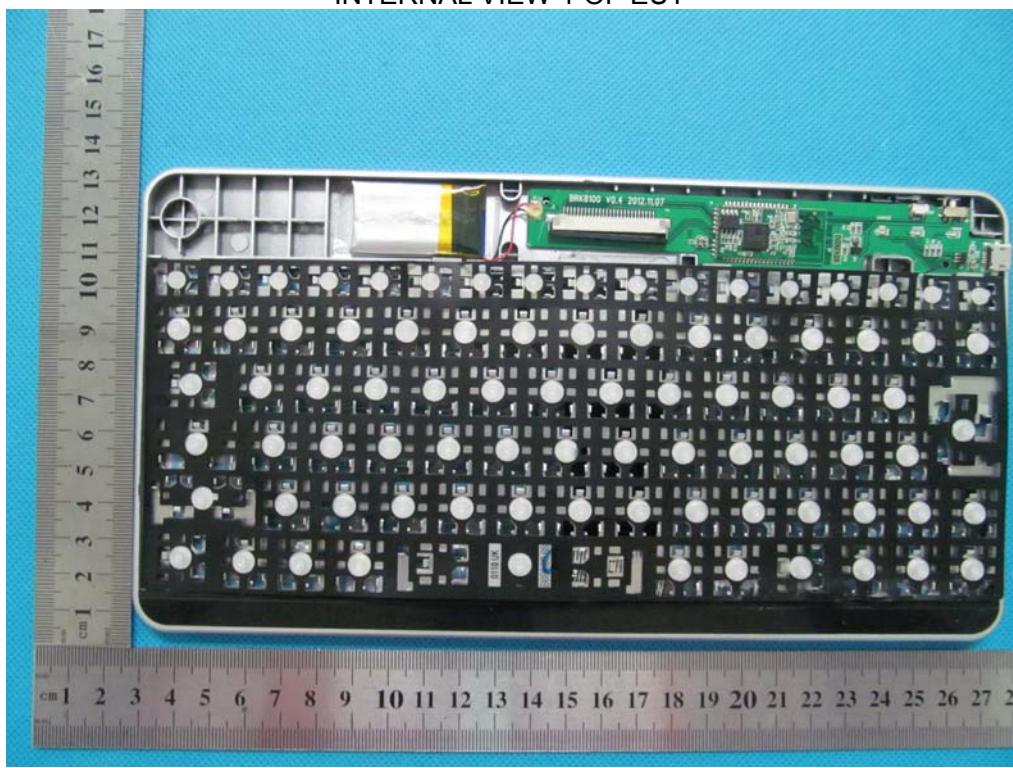
FRONT VIEW OF EUT



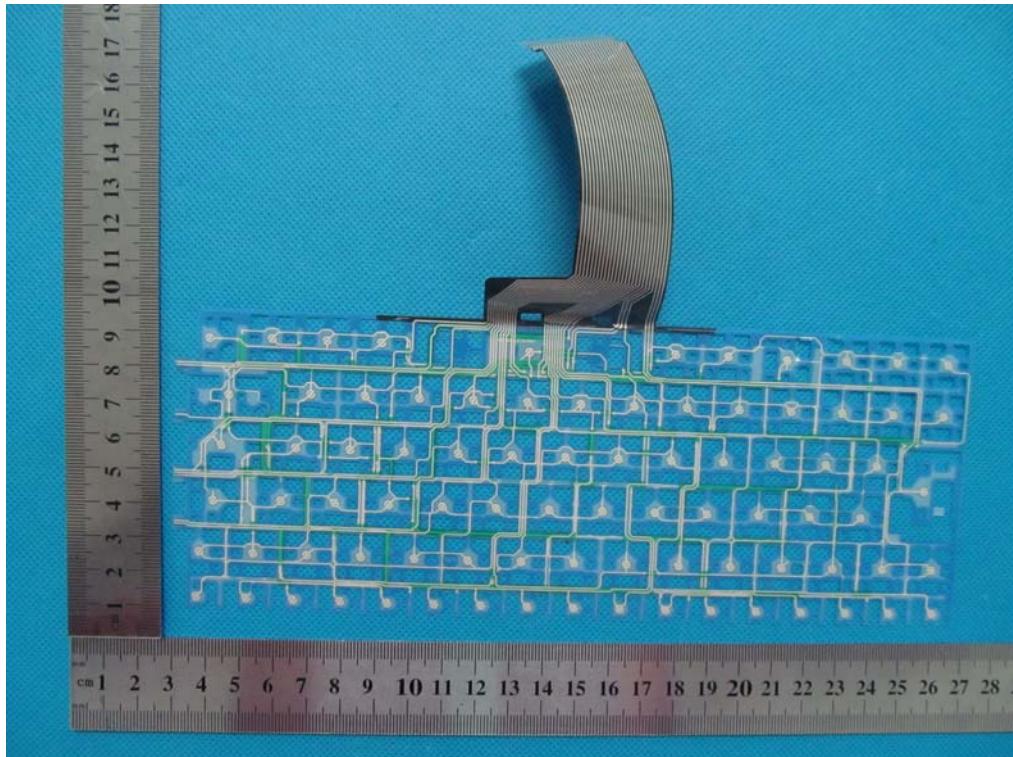
BACK VIEW OF EUT



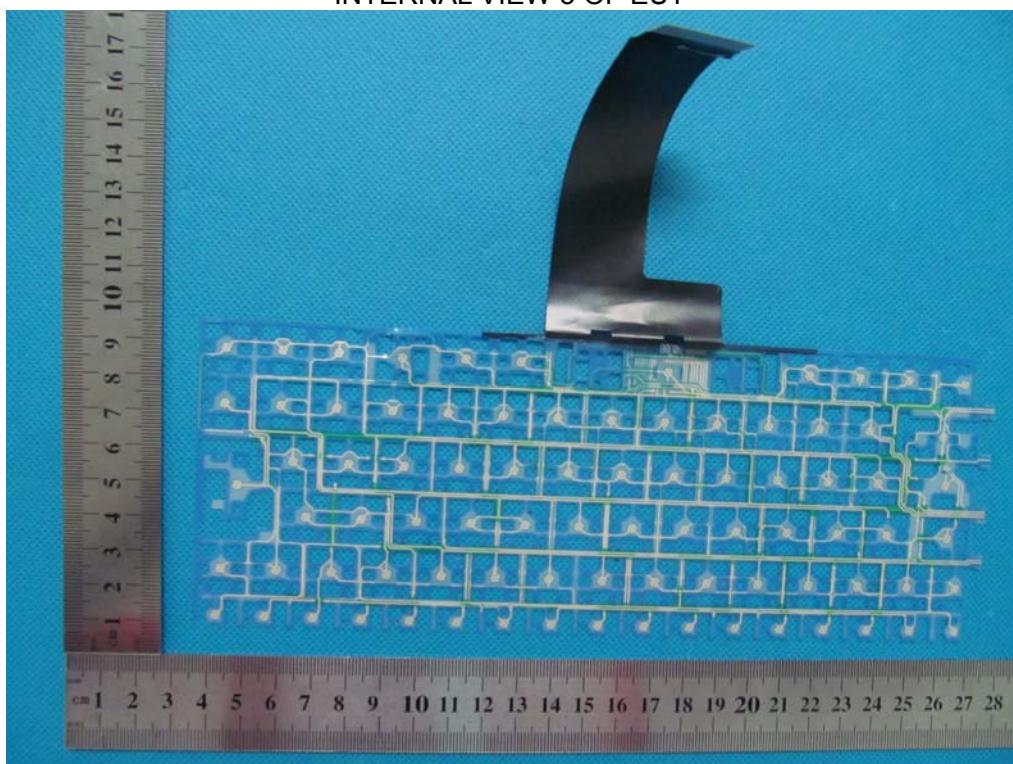
INTERNAL VIEW-1 OF EUT



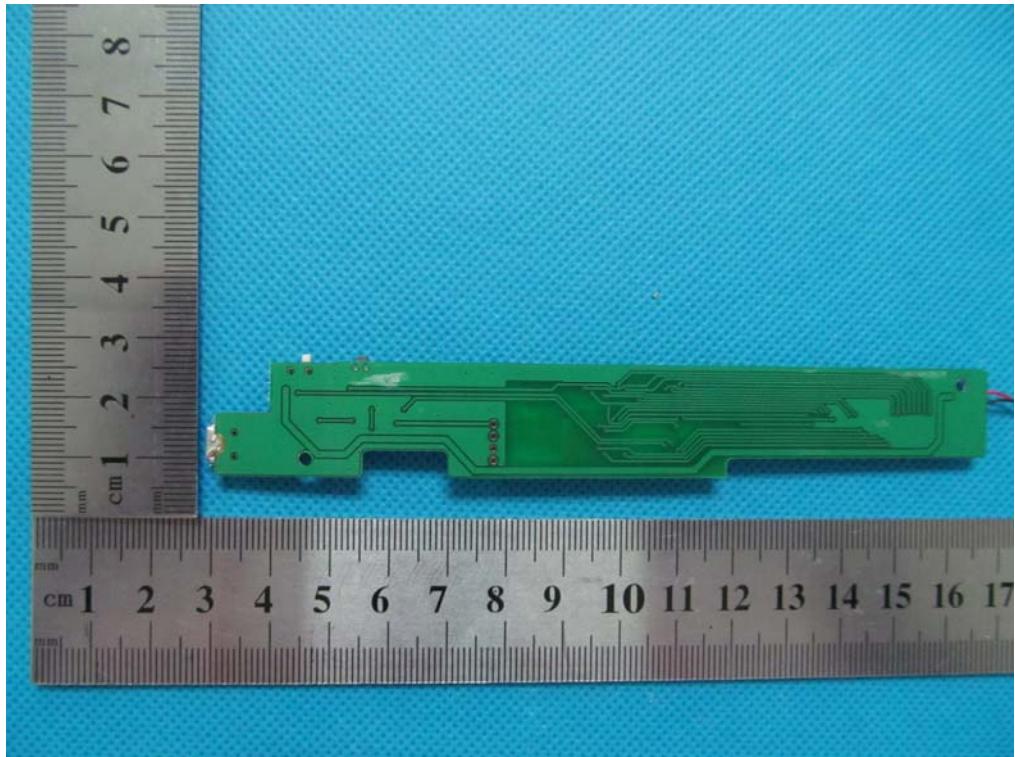
INTERNAL VIEW-2 OF EUT



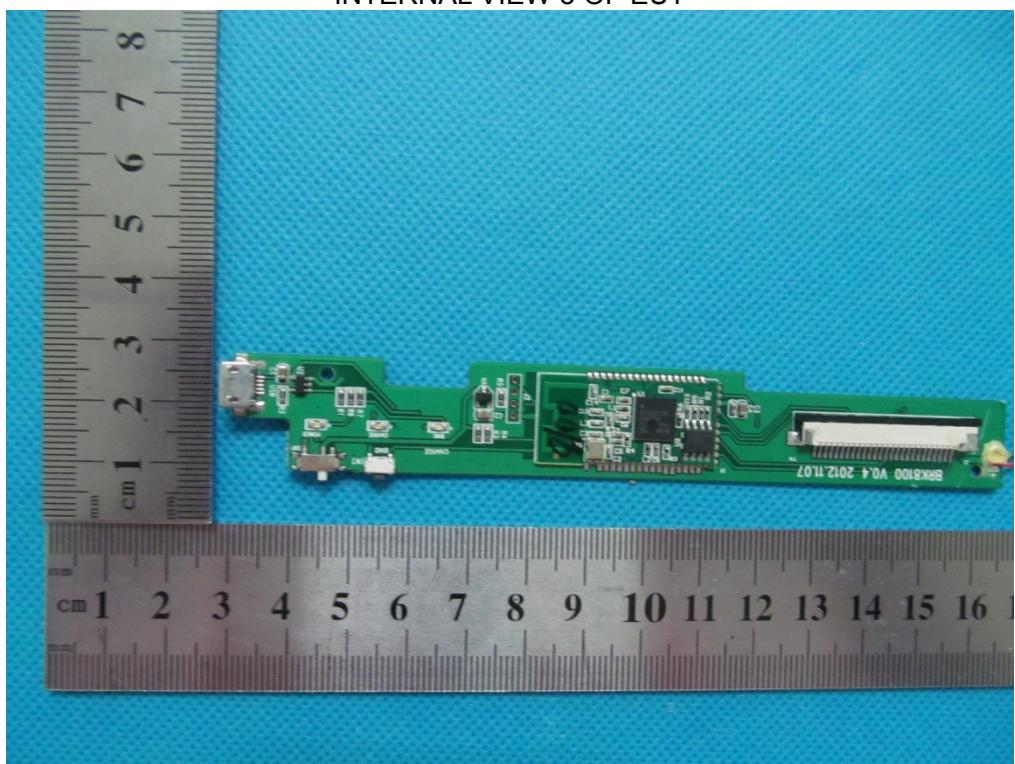
INTERNAL VIEW-3 OF EUT



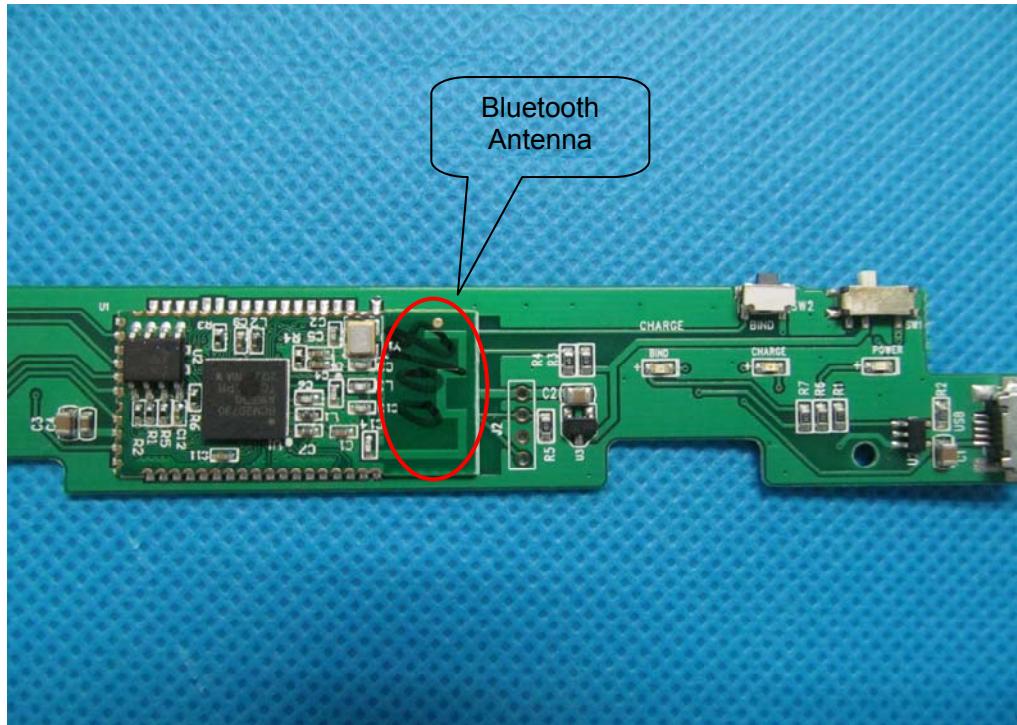
INTERNAL VIEW-4 OF EUT



INTERNAL VIEW-5 OF EUT



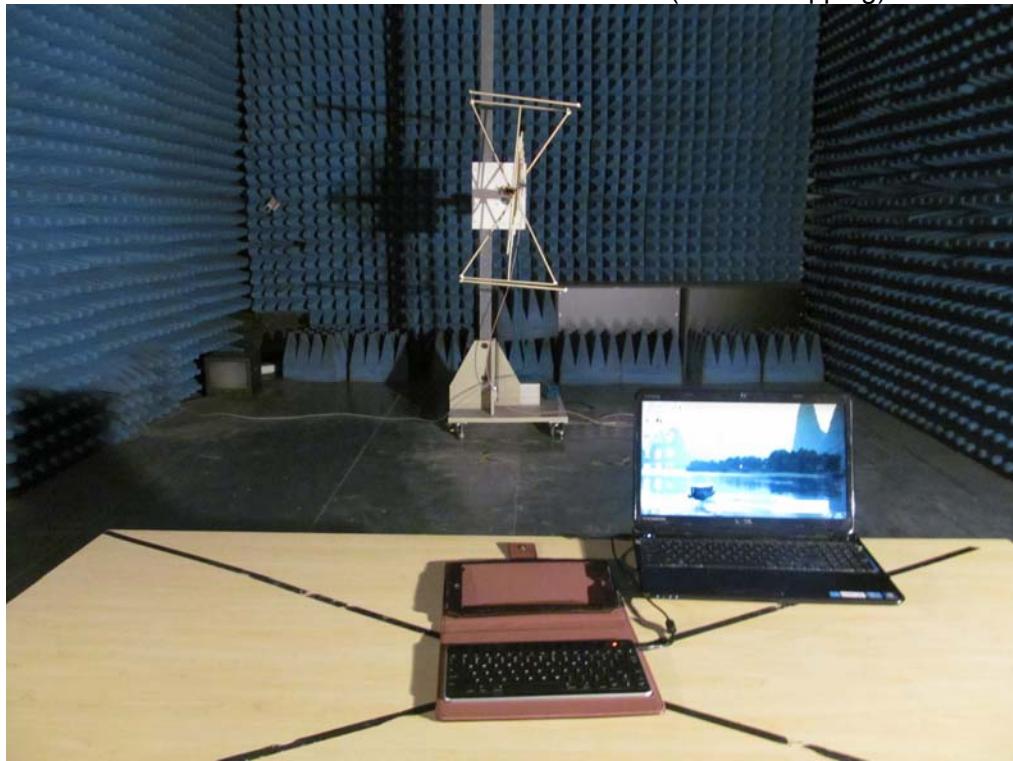
INTERNAL VIEW-6 OF EUT



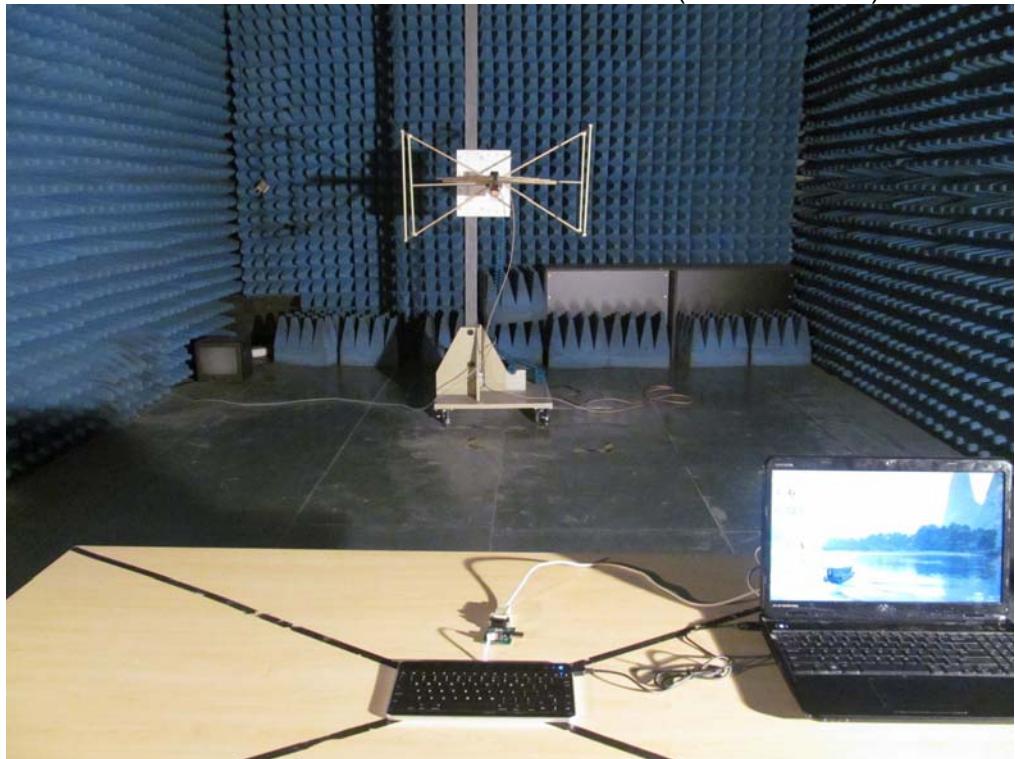
APPENDIX II
PHOTOGRAPHS OF THE TEST SETUP
CONDUCTED EMISSION



FCC RADIATED EMISSION TEST SETUP (Normal hopping)



FCC RADIATED EMISSION TEST SETUP (Continuous TX)



----END OF REPORT----