FCC Test Report

Report No.: AGC00006140304FE03

FCC ID	:	ZDB-BRK5200B
APPLICATION PURPOSE	:	Class II Permissive Change
PRODUCT DESIGNATION	:	Power Case with Bluetooth Keyboard for iPad Air
BRAND NAME	:	N/A
MODEL NAME	:	J-1AK
CLIENT	:	Tianyu Technology Co.,Ltd
DATE OF ISSUE	:	Mar.27, 2014
STANDARD(S)	:	FCC Part 15 Rules
REPORT VERSION	:	V 1.0

*A*ttestation of *G*lobal *C*ompliance (Shenzhen) Co., Ltd

Report Revise Record

Report Version	Revise Time	Issued Date	Valid Version	Notes
V1.0	/	Mar.27, 2014	Valid	Class II Permissive Change

Product Change Record

This is a variant report based on model J-2MK.
Two Models all the same except for the appearance,Size,coating and PCB Layout.
The original report can be referred to AGC00006140303FE03.
Only Radiated Emission, Band Edges were verified for the differences based on the original product.

TABLE OF CONTENTS

1. VERIFICATION OF COMPLIANCE

Applicant	Tianyu Technology Co., Ltd
Address	No 5,3rd Beian Road, HuangJiang Town, Dongguan City, China
Manufacturer	Tianyu Technology Co., Ltd
Address	No 5,3rd Beian Road, HuangJiang Town, Dongguan City, China
Product Designation	Power Case with Bluetooth Keyboard for iPad Air
Brand Name	N/A
Test Model	J-1AK
Date of test	Mar.24, 2014 to Mar.26, 2014
Deviation	None
Condition of Test Sample	Normal

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.

Prepared By

Water Huang   Mar.27, 2014

Checked By

Forrest Lei   Mar.27, 2014

Authorized By

Solger Zhang   Mar.27, 2014

2. GENERAL INFORMATION

2.1 PRODUCT DESCRIPTION

The EUT is "Power Case with Bluetooth Keyboard for iPad Air" 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	V 3.0
Modulation	GFSK
Number of channels	79
Antenna Designation	PCB Antenna
Antenna Gain	0dBi
Hardware Version	N/A
Software Version	N/A
Power Supply	DC 3.7V by Built-in Li-ion Battery

Note:
1. BT is active when charging. The USB port only used for charging and can't be used to transfer data with PC.
2. The EUT is equipped with the Bluetooth Chip BCM20730 which complies with Bluetooth V 3.0, but for this device the functionality is limited to GFSK (1MBit/s) by the firmware. End-user is not able to change the settings and enable any additional functionality by himself.
3. All the tests blow were performed base on the modulation used.

2.2 TABLE OF CARRIER FREQUENCYS

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

2.3 RECEIVER INPUT BANDWIDTH

The input bandwidth of the receiver is 1.3 MHz. 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 of 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.

2.4 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

2.5 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 te
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.

2.6 RELATED SUBMITTAL(S) / GRANT (S)

This submittal(s) (test report) is intended for **FCC ID: ZDB-BRK5200B**, filing to comply with Section 15.247 of the FCC Part 15, Subpart C Rules.

2.7 TEST METHODOLOGY

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

2.8 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, Uc = ±2.75dB
    - Uncertainty of Radiated Emission, Uc = ±3.2dB

2.9 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
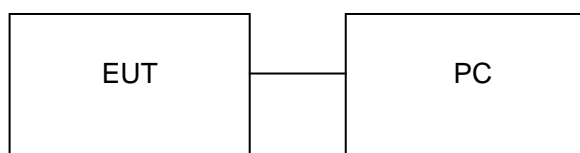
2.10 SPECIAL ACCESSORIES
Refer to section 2.2.

2.11 EQUIPMENT MODIFICATIONS
Not available for this EUT intended for grant.

3. SYSTEM TEST CONFIGURATION

3.1 CONFIGURATION OF TESTED SYSTEM

Configuration 1: (Normal Hopping)

```
┌──────────┐        ┌──────────┐
│          │        │          │
│   EUT    │────────│    PC    │
│          │        │          │
└──────────┘        └──────────┘
```

Configuration 2: (Control continuous TX)

```
┌──────────┐   ┌─────────────┐   ┌──────────┐
│          │   │             │   │          │
│   EUT    │───│ Control box │───│    PC    │
│          │   │             │   │          │
└──────────┘   └─────────────┘   └──────────┘
```
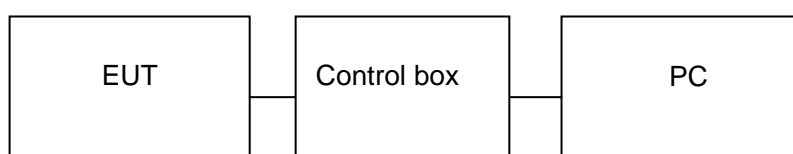
3.2 EQUIPMENT USED IN EUT SYSTEM

Item	Equipment	Mfr/Brand	Model/Type No.	Remark
1	Power Case with Bluetooth Keyboard for iPad Air	N/A	J-1AK	EUT
2	Battery	N/A	N/A	Accessory
3	PC	Dell	INSPIRON	A.E
4	Control box	N/A	N/A	A.E

3.3. TEST FACILITY

Site	Attestation of Global Compliance (Shenzhen) Co., Ltd
Location	2/F., Building 2, No.1-No.4, Chaxi Sanwei Technical Industrial Park, Gushu, Xixiang, Bao'an District, Shenzhen, Guangdong, China
Description	The test site is constructed and calibrated to meet the FCC requirements in documents ANSI C63.4:2003.

ALL TEST EQUIPMENT LIST

(For original test equipment list)

Description	Manufacturer	Model	S/N	Cal. Date	Cal. Due
Power Probe	R&S	NRP-Z23	100323	07/17/2013	07/16/2014
RF attenuator	N/A	RFA20db	68	N/A	N/A
Spectrum Analyzer	Agilent	E4440A	US41421290	07/17/2013	07/16/2014
Amplifier	EM	EM30180	0607030	02/28/2014	02/27/2015
Horn Antenna	EM	EM-AH-10180	67	04/20/2013	04/19/2014
Horn Antenna	A.H. Systems Inc.	SAS-574	--	07/17/2013	07/16/2014
EMI Test Receiver	Rohde & Schwarz	ESCI	100694	07/17/2013	07/16/2014
Bilogical Antenna	A.H. Systems Inc.	SAS-521-4	26	06/07/2013	06/06/2014
Loop Antenna	Daze	ZN30900N	SEL0097	07/17/2013	07/16/2014
Isolation Transformer	LETEAC	LTBK	--	07/17/2013	07/16/2014

(For new test equipment list)

Description	Manufacturer	Model	S/N	Cal. Date	Cal. Due
Power Probe	R&S	NRP-Z23	100323	07/17/2013	07/16/2014
RF attenuator	N/A	RFA20db	68	N/A	N/A
Spectrum Analyzer	Agilent	E4440A	US41421290	07/17/2013	07/16/2014
Amplifier	EM	EM30180	0607030	02/28/2014	02/27/2015
Horn Antenna	EM	EM-AH-10180	67	04/20/2013	04/19/2014
Horn Antenna	A.H. Systems Inc.	SAS-574	--	07/17/2013	07/16/2014
EMI Test Receiver	Rohde & Schwarz	ESCI	100694	07/17/2013	07/16/2014
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Loop Antenna	Daze	ZN30900N	SEL0097	07/17/2013	07/16/2014
Isolation Transformer	LETEAC	LTBK	--	07/17/2013	07/16/2014

4. SUMMARY OF TEST RESULTS

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

5. DESCRIPTION OF TEST MODES

TEST MODE DESCRIPTION	
NO.	**TEST MODE DESCRIPTION**
1	Low channel TX
2	Middle channel TX
3	High channel TX
4	Normal Hopping + charging

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

6. RADIATED EMISSION

6.1 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

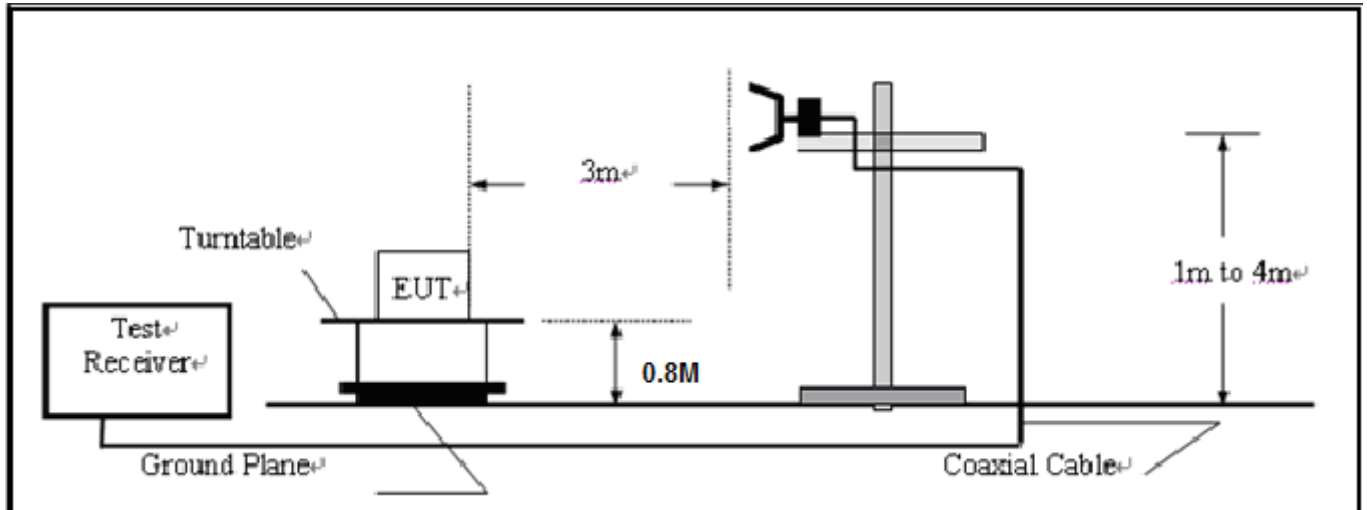| Receiver Parameter	Setting
Start ~Stop Frequency	9KHz~150KHz/RB 200Hz for QP
Start ~Stop Frequency	150KHz~30MHz/RB 9KHz for QP
Start ~Stop Frequency	30MHz~1000MHz/RB 120KHz for QP

6.2 TEST SETUP

RADIATED EMISSION TEST SETUP BELOW 30MHz
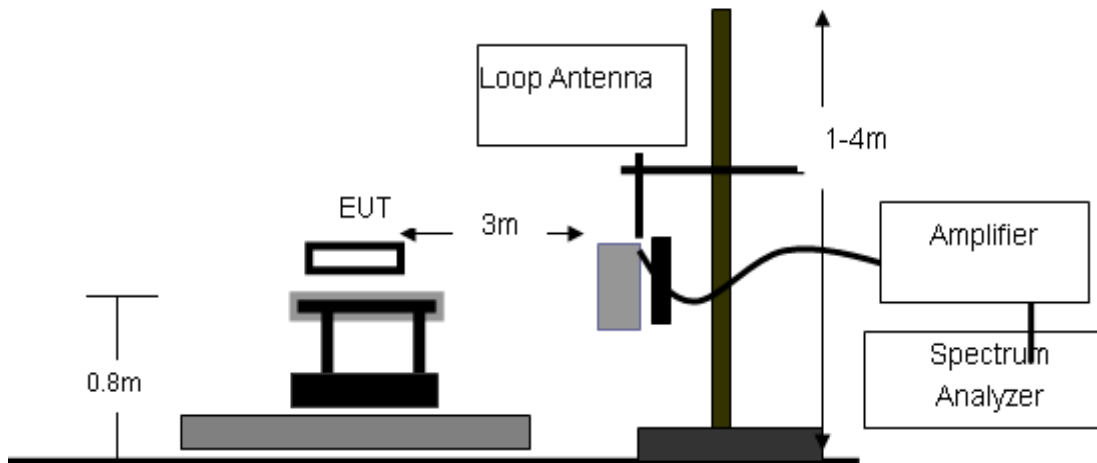
RADIATED EMISSION TEST SETUP 30MHz-1000MHz
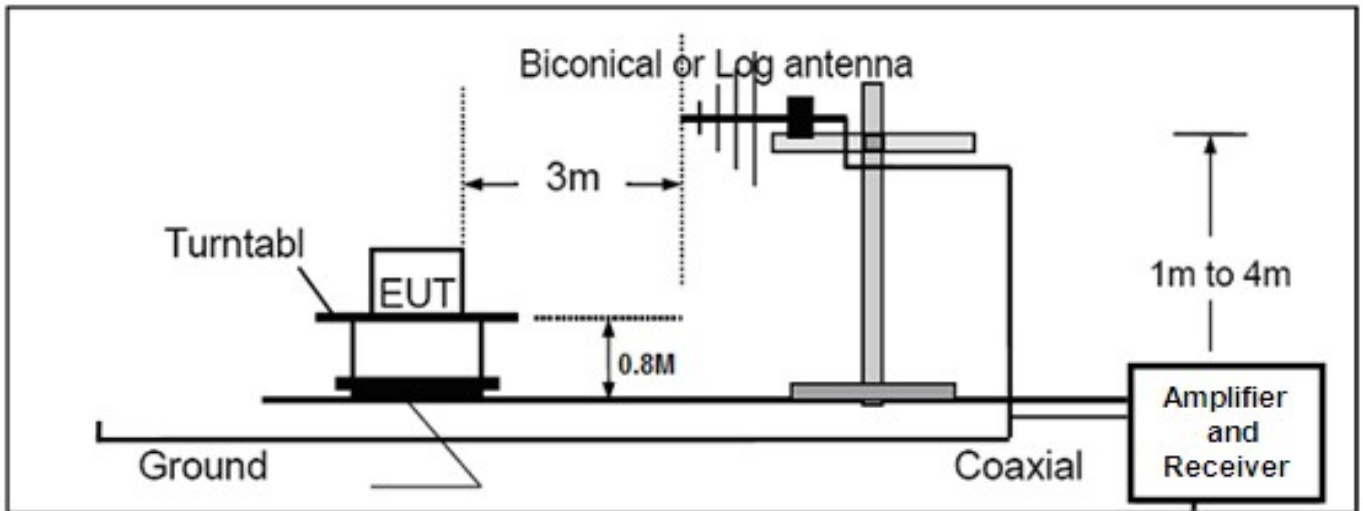
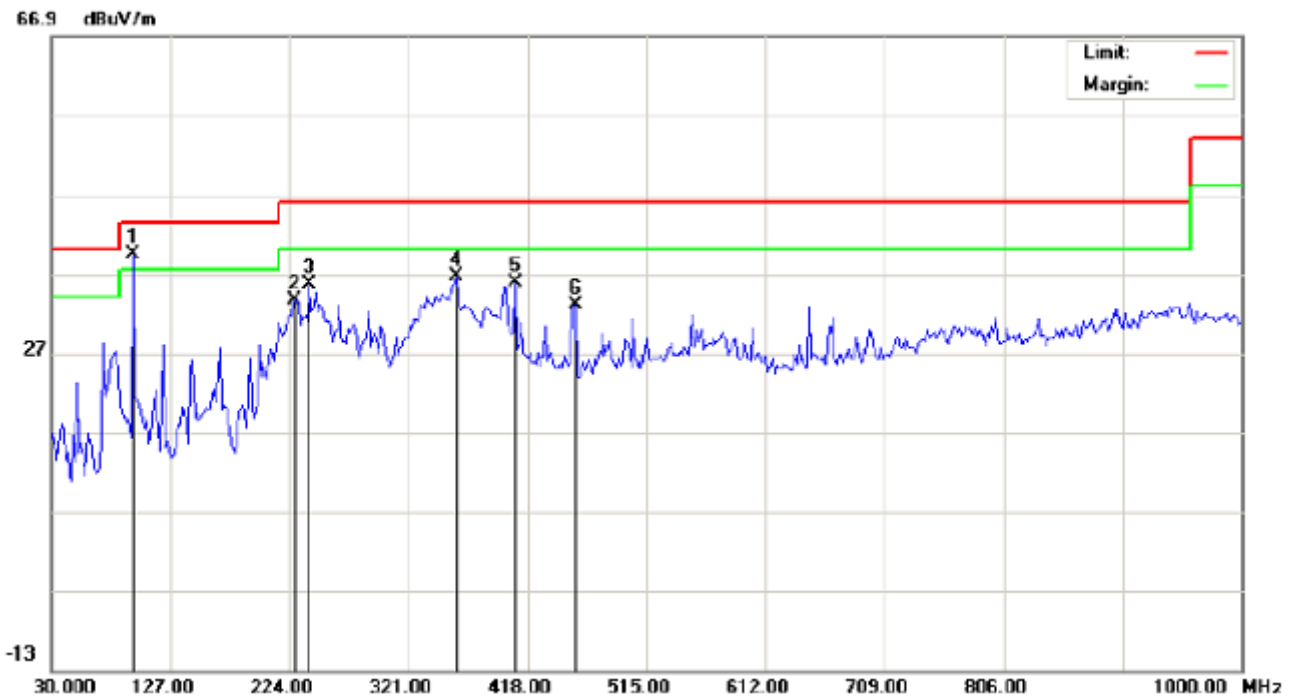RADIATED EMISSION TEST SETUP ABOVE 1000MHz

6.3 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: *Horizontal*   Temperature: 26
Limit: FCC Class B 3M Radiation   Power: Humidity: 60 %
EUT:Power Case with Bluetooth Keyboard for iPad AirDistance:
M/N:J-1AK
Mode:Low Channel TX
Note:

No.	Mk -	Freq. MHz	Reading dBuV	Factor dB/m	Measurement dBuV/m	Limit dBuV/m	Over dB	Detector	Antenna Height cm	Table Degree degree	Comment
1	*	96.2833	29.30	10.07	39.37	43.50	-4.13	peak			
2		228.8500	20.41	13.10	33.51	46.00	-12.49	peak			
3		240.1667	22.13	13.53	35.66	46.00	-10.34	peak			
4		359.8000	17.89	18.80	36.69	46.00	-9.31	peak			
5		408.3000	16.51	19.32	35.83	46.00	-10.17	peak			
6		456.8000	12.38	20.66	33.04	46.00	-12.96	peak			

Site: site #1
Limit: FCC Class B 3M Radiation
EUT:Power Case with Bluetooth Keyboard for iPad AirDistance:
M/N:J-1AK
Mode:Low Channel TX
Note:

Polarization: **Vertical**
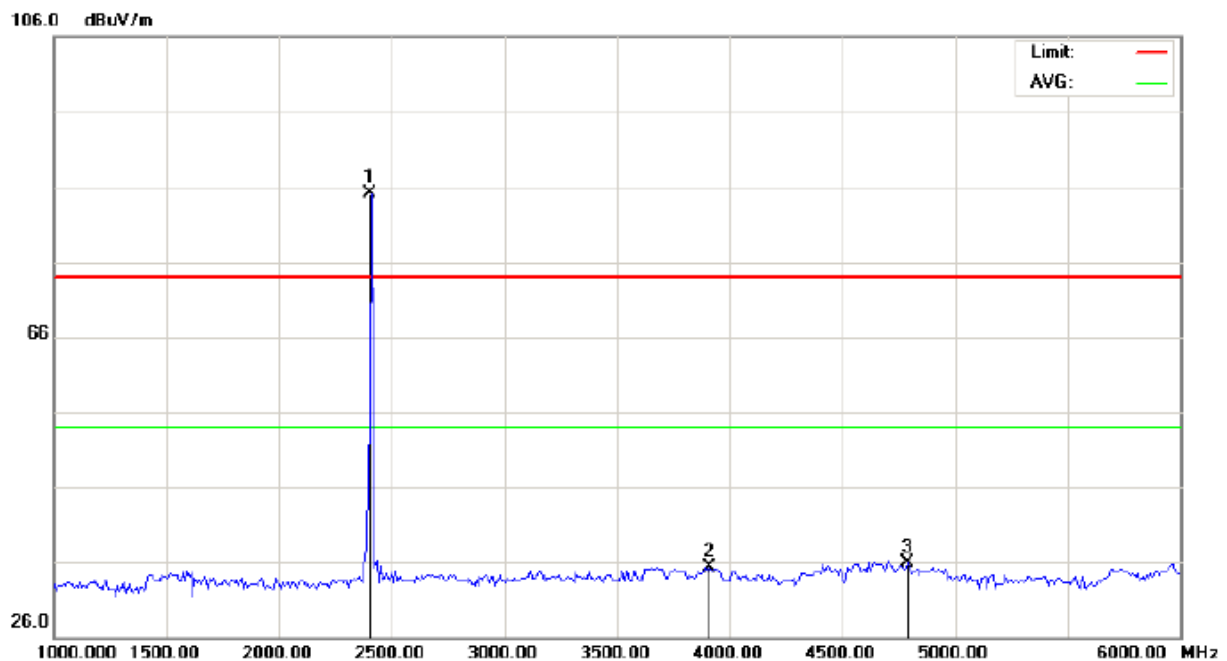Power:

Temperature: 26
Humidity: 60 %

No.	Mk -	Freq. MHz	Reading dBuV	Factor dB/m	Measurement dBuV/m	Limit dBuV/m	Over dB	Detector	Antenna Height cm	Table Degree degree	Comment
1		96.2833	29.15	0.05	29.20	43.50	-14.30	peak			
2		332.3167	12.25	17.56	29.81	46.00	-16.19	peak			
3		550.5667	10.04	22.48	32.52	46.00	-13.48	peak			
4		666.9667	7.52	24.30	31.82	46.00	-14.18	peak			
5	*	778.5167	9.75	27.02	36.77	46.00	-9.23	peak			
6		799.5333	7.58	27.31	34.89	46.00	-11.11	peak			

RESULT: PASS
Note: 1. Factor=Antenna Factor + Cable loss, Margin=Measurement-Limit.
2. The "Factor" value can be calculated automatically by software of measurement system.
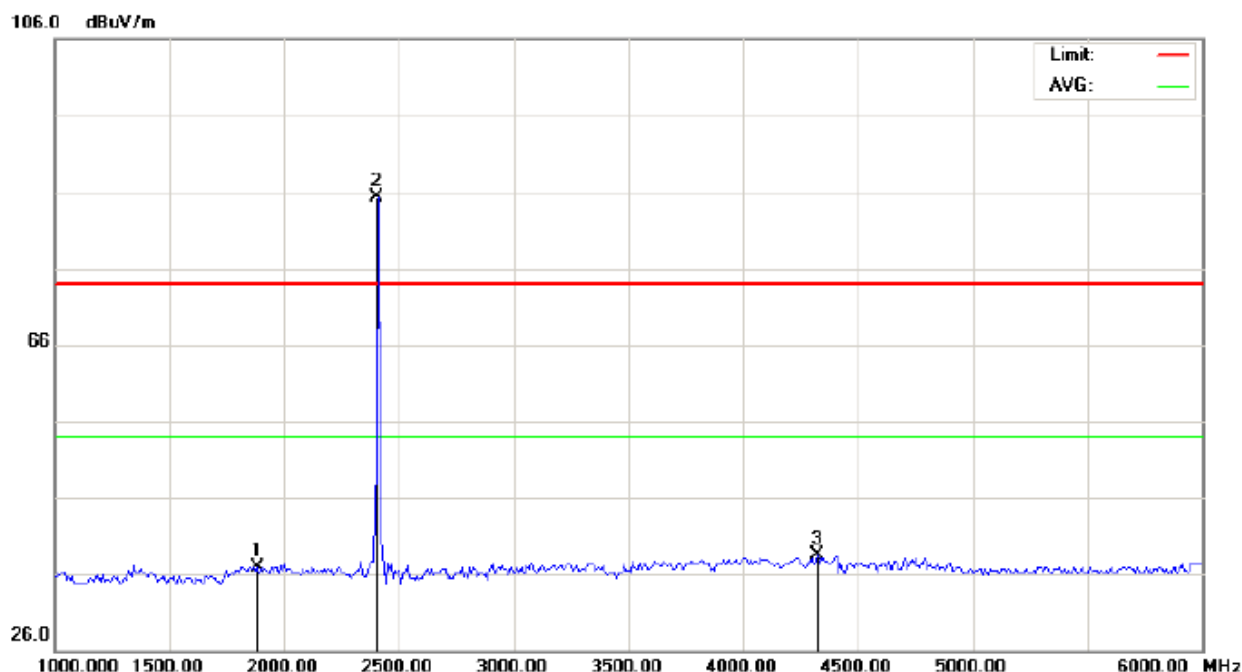
RADIATED EMISSION ABOVE 1GHZ (1-10th Harmonics)
Radiated Emission Measurement

Site: site #1	Polarization: *Horizontal*	Temperature: 26
Limit: FCC Class B 3M Radiation above 1GHZ(PK)	Power:	Humidity: 60 %

EUT: Power Case with Bluetooth Keyboard for iPad AiDistance:

M/N: J-1AK

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	*	2402.000	94.83	-9.68	85.15	74.00	11.15	peak			
2		3908.333	40.77	-5.37	35.40	74.00	-38.60	peak			
3		4791.667	38.25	-2.35	35.90	74.00	-38.10	peak			

Radiated Emission Measurement

Site: site #1
Limit: FCC Class B 3M Radiation above 1GHZ(PK)
EUT: Power Case with Bluetooth Keyboard for iPad AiDistance:
M/N: J-1AK
Mode: Low Channel TX
Note:

Polarization: **Vertical**
Power:

Temperature: 26
Humidity: 60 %

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		1883.333	48.33	-11.35	36.98	74.00	-37.02	peak			
2	*	2402.000	95.08	-9.68	85.40	74.00	11.40	peak			
3		4325.000	42.22	-3.70	38.52	74.00	-35.48	peak			

Note: 6~25GHz at least have 20dB margin. No recording in the test report.
Factor=Antenna Factor+ Cable loss-Amplifier gain, Margin=Measurement-Limit.
The "Factor" value can be calculated automatically by software of measurement system.
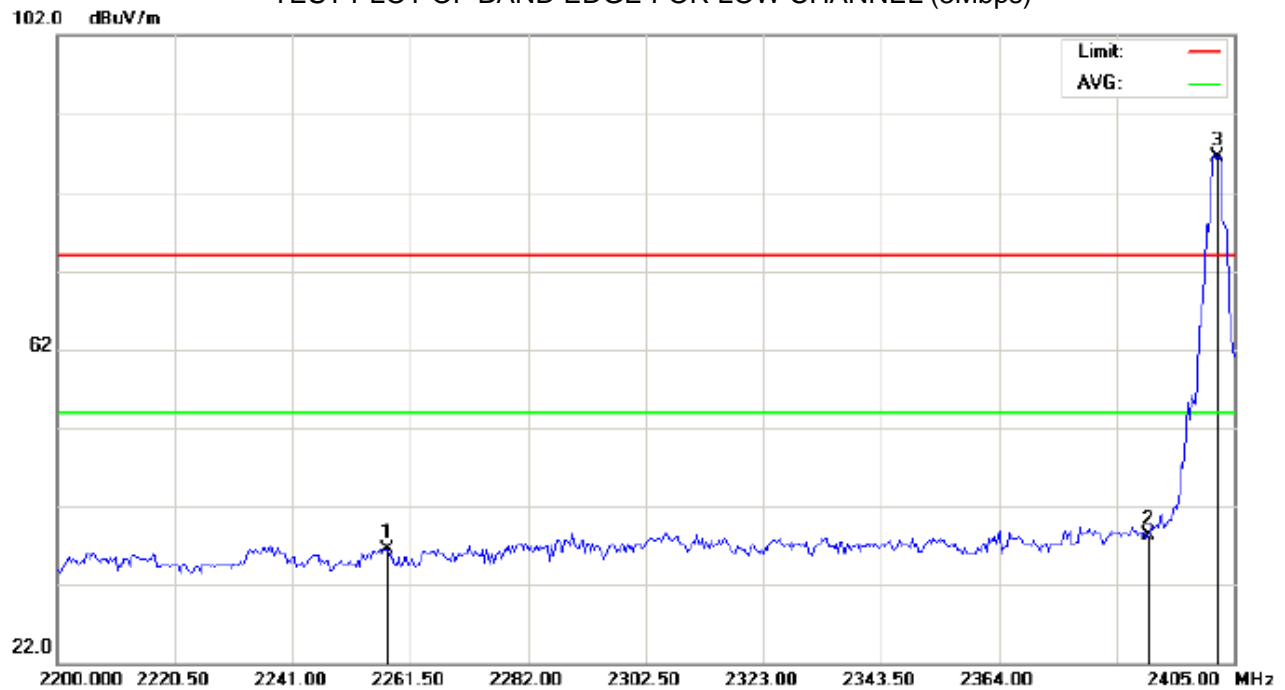
7. BAND EDGES EMISSION
7.1 MEASUREMENT PROCEDURE

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

## 7.2 TEST SET-UP

   The same as described in section 5.2

7.3 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:Power Case with Bluetooth Keyboard for iPad AirDistance:

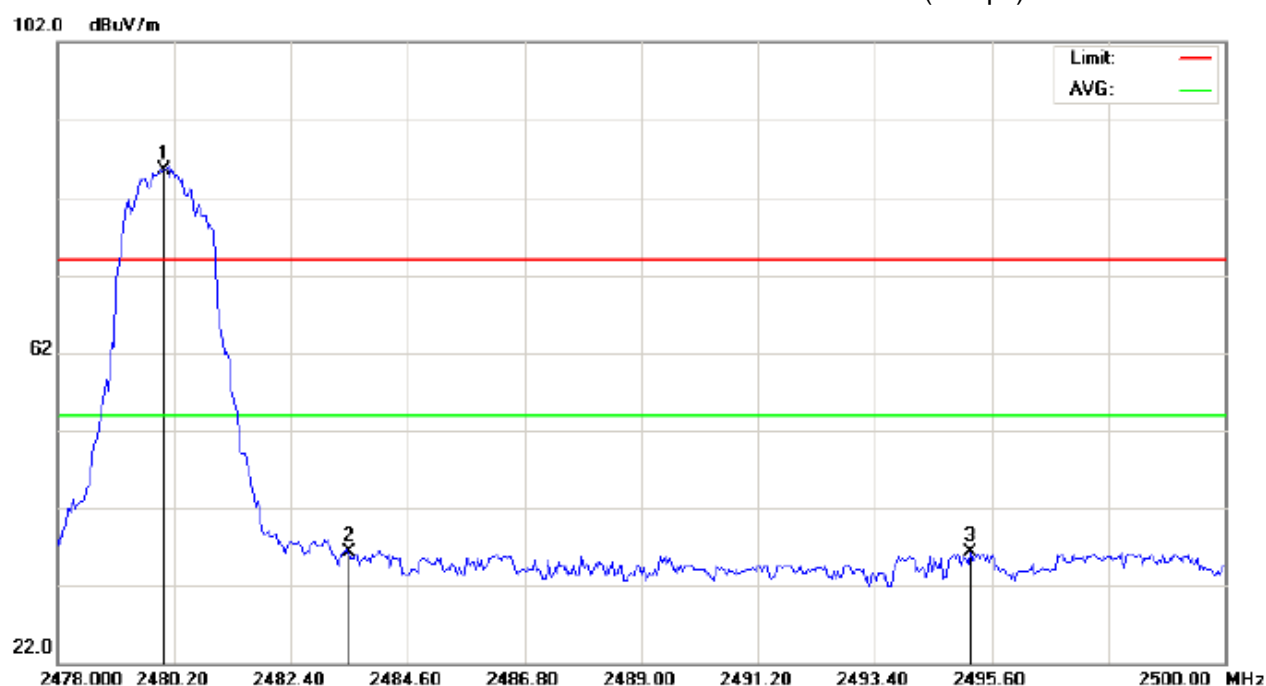M/N:J-1AK

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		2257.400	46.42	-9.84	36.58	74.00	-37.42	peak			
2		2390.000	47.94	-9.69	38.25	74.00	-35.75	peak			
3	*	2402.000	96.23	-9.68	86.55	74.00	12.55	peak			
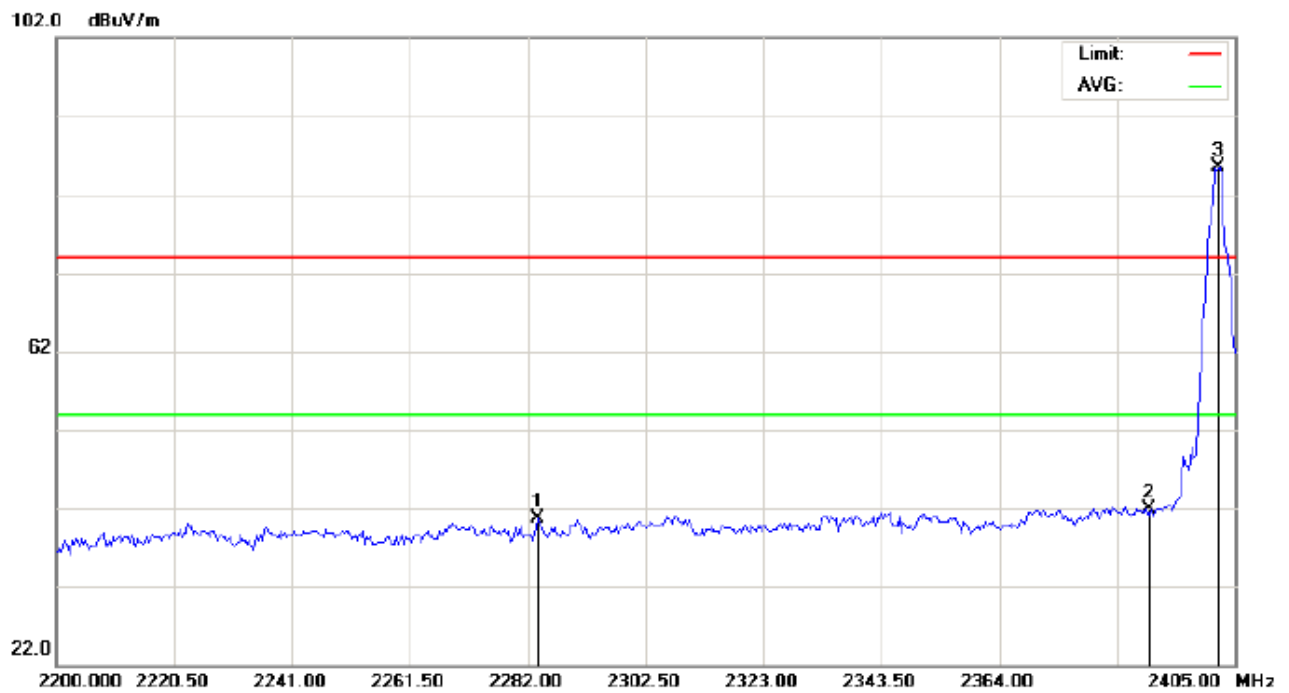
Site: site #1

Polarization: *Vertical*

Temperature: 26

Limit: FCC Class B 3M Radiation above 1GHZ(PK)   Power:

Humidity: 60 %

EUT:Power Case with Bluetooth Keyboard for iPad AirDistance:

M/N:J-1AK
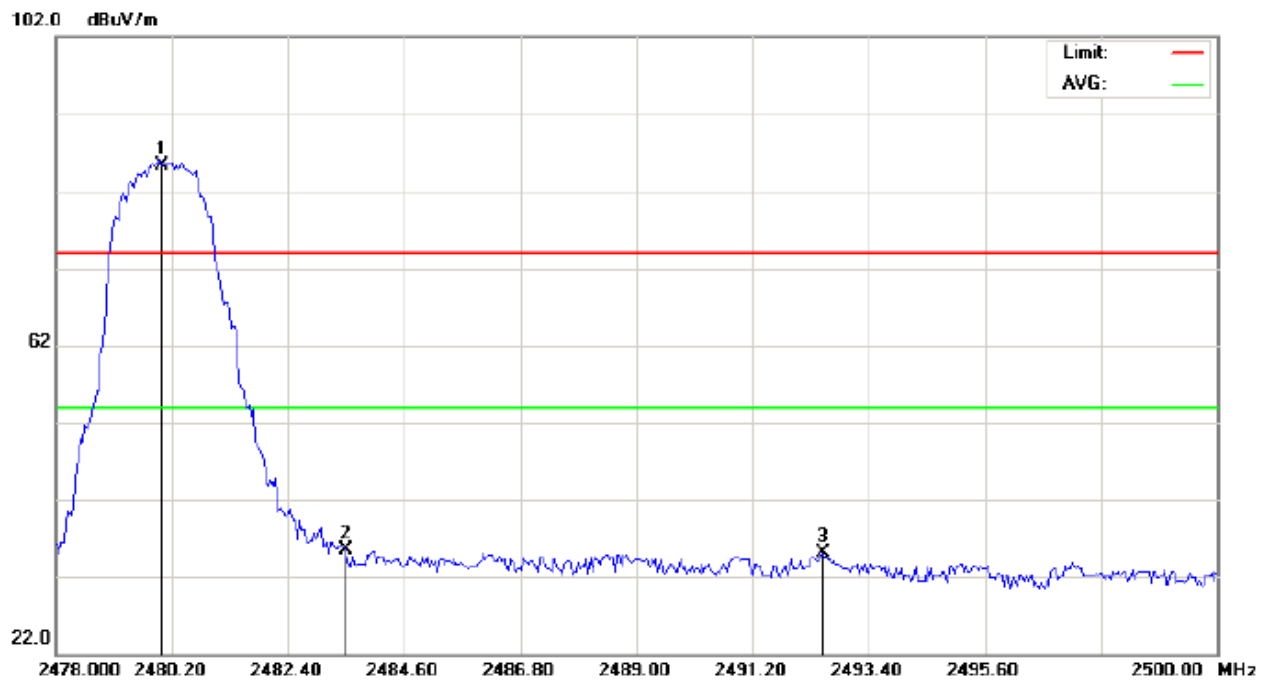
Mode: Low Channel TX

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		2283.708	50.49	-9.81	40.68	74.00	-33.32	peak			
2		2390.000	51.65	-9.69	41.96	74.00	-32.04	peak			
3	*	2402.000	95.09	-9.68	85.41	74.00	11.41	peak			

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

Site: site #1
Limit: FCC Class B 3M Radiation above 1GHZ(PK)
EUT:Power Case with Bluetooth Keyboard for iPad Air
M/N:J-1AK
Mode: High Channel TX
Note:

Polarization: *Horizontal*
Power:
Distance:

Temperature: 26
Humidity: 60 %

No.	Mk.	Freq. MHz	Reading dBuV	Factor dB/m	Measurement dBuV/m	Limit dBuV/m	Over dB	Detector	Antenna Height cm	Table Degree degree	Comment
1	*	2480.000	95.05	-9.59	85.46	74.00	11.46	peak			
2		2483.500	45.88	-9.59	36.29	74.00	-37.71	peak			
3		2495.197	45.89	-9.58	36.31	74.00	-37.69	peak			

Site: site #1
Limit: FCC Class B 3M Radiation above 1GHZ(PK)
EUT:Power Case with Bluetooth Keyboard for iPad Air
M/N:J-1AK
Mode: High Channel TX
Note:

Polarization: **Vertical**
Power:
Distance:

Temperature: 26
Humidity: 60 %

No.	Mk .	Freq. MHz	Reading dBuV	Factor dB/m	Measurement dBuV/m	Limit dBuV/m	Over dB	Detector	Antenna Height cm	Table Degree degree	Comment
1	*	2480.000	94.95	-9.59	85.36	74.00	11.36	peak			
2		2483.500	45.19	-9.59	35.60	74.00	-38.40	peak			
3		2492.520	44.69	-9.58	35.11	74.00	-38.89	peak			

APPENDIX A
PHOTOGRAPHS OF THE TEST SETUP
RADIATED EMISSION
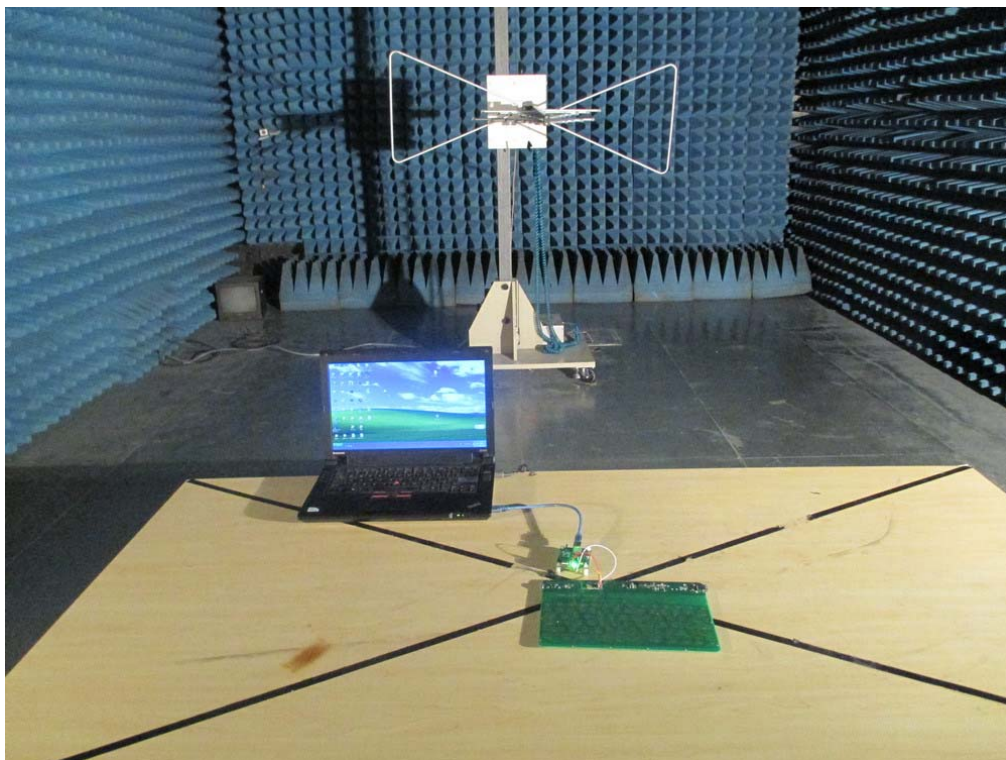
APPENDIX B: PHOTOGRAPHS OF EUT
TOP VIEW OF EUT-1

TOP VIEW OF EUT-2

TOP VIEW OF EUT-3

BOTTOM VIEW OF EUT-1

BOTTOM VIEW OF EUT-2

BOTTOM VIEW OF EUT-3

FRONT VIEW OF EUT
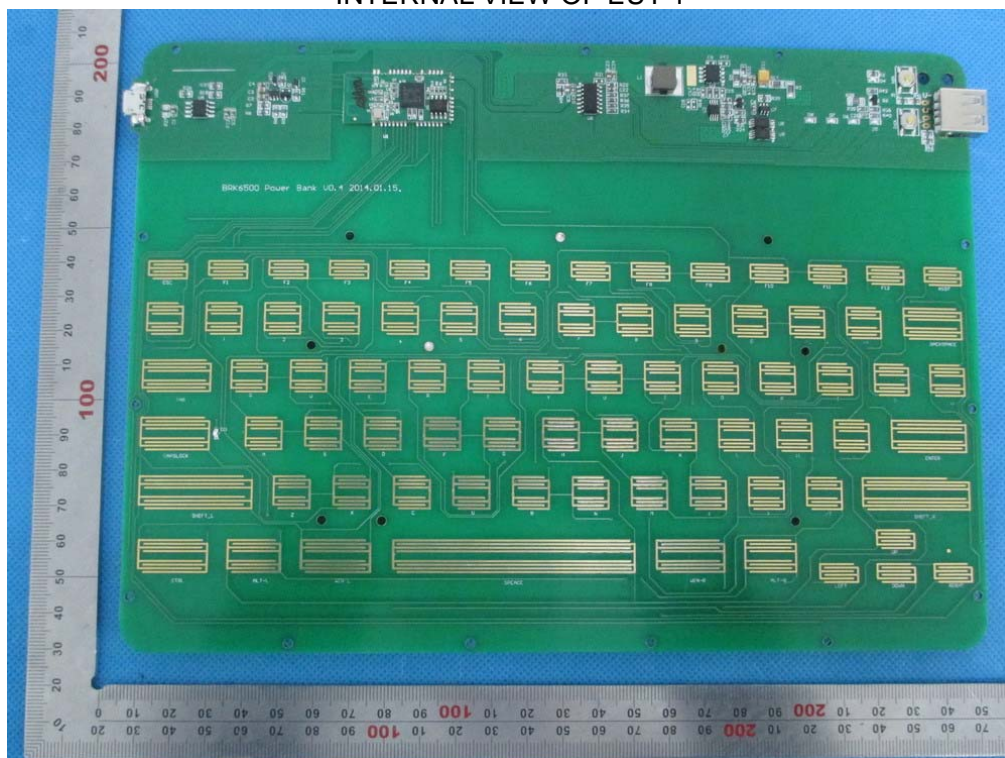

BACK VIEW OF EUT

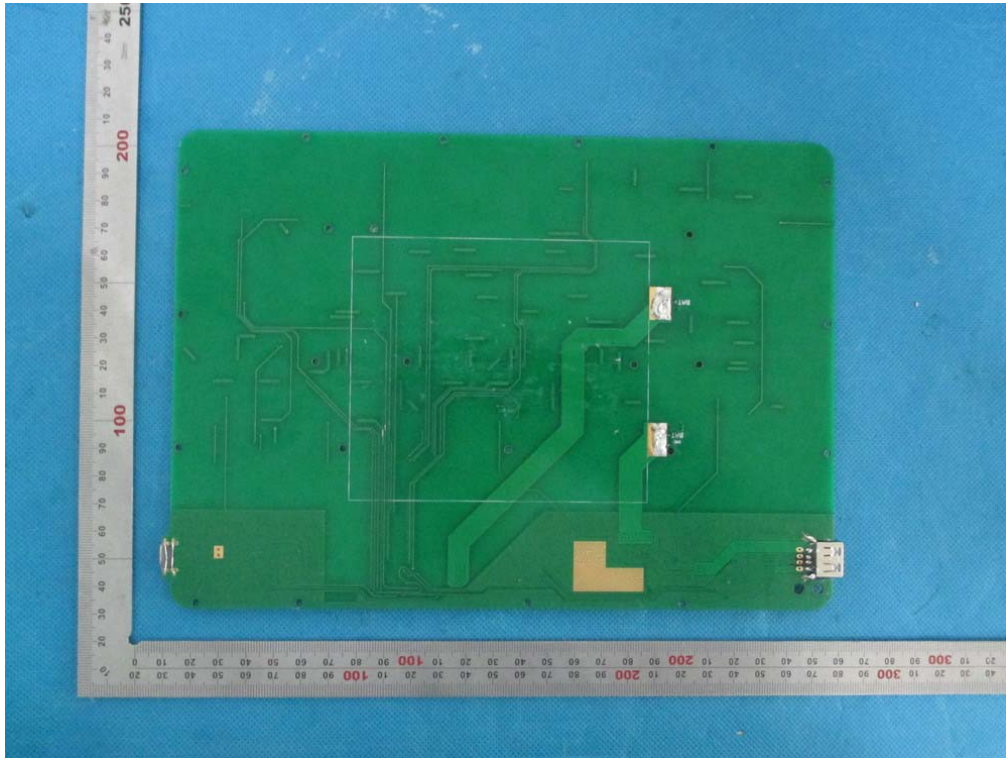LEFT VIEW OF EUT

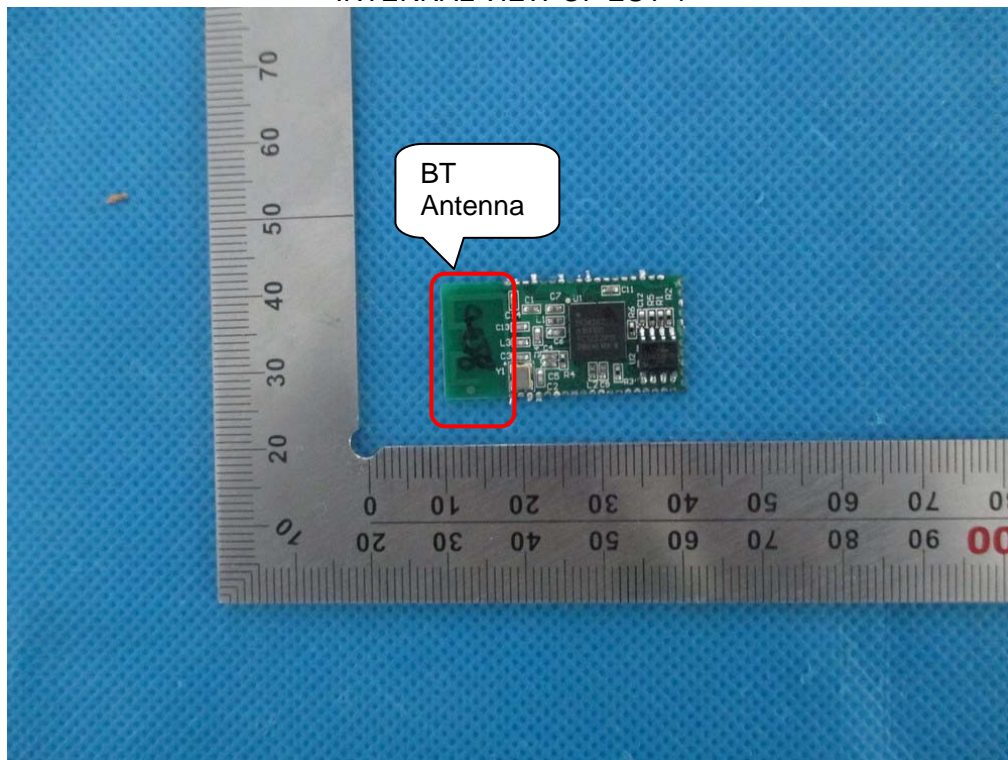RIGHT VIEW OF EUT

OPEN VIEW OF EUT
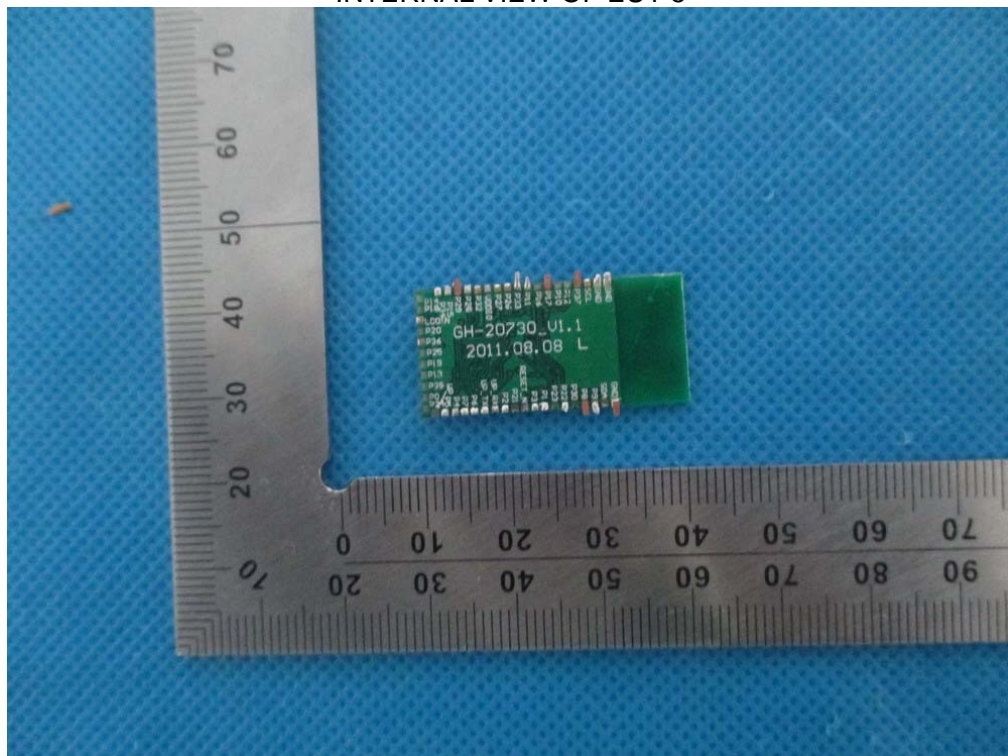

INTERNAL VIEW OF EUT-1

INTERNAL VIEW OF EUT-2

INTERNAL VIEW OF EUT-3

INTERNAL VIEW OF EUT-4

INTERNAL VIEW OF EUT-5

----END OF REPORT----