FCC Test Report

Report No.: AGC12111012SZ08F2

FCC ID	:	YW2-BK012
PRODUCT DESIGNATION	:	BLUETOOTH KEYBOARD
BRAND NAME	:	Wagons
TEST MODEL	:	Wagons BK012
CLIENT	:	Wagons Digital Co.,Ltd
DATE OF ISSUE	:	Dec.17, 2010
STANDARD(S)	:	FCC Part 15 Rules

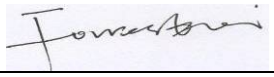
Attestation of ***G***lobal ***C***ompliance Co., Ltd.

VERIFICATION OF COMPLIANCE

Applicant	Wagons Digital Co.,Ltd
	Flat/Rm 1701 17/F Henan Building 90 Jaffe Road Wanchai Hong Kong
Manufacturer	Wagons Digital Co.,Ltd
	Building B,1st Street FuZhu,Yin Yang Industry,Zhangyang,Zhang mudou Town Guangdong,China
Product Designation	BLUETOOTH KEYBOARD
Brand Name	Wagons
Test Model	Wagons BK012
FCC ID	YW2-BK012
Report Number	AGC12111012SZ08F2
Date of Test	Dec.10, 2010 to Dec.16, 2010

WE HEREBY CERTIFY THAT:

The above equipment was tested by Attestation of Global Compliance 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.

Checked By: 

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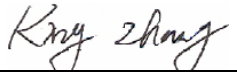
Authorized By 

King Zhang Dec.17, 2010

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1. GENERAL INFORMATION

1.1 PRODUCT DESCRIPTION

The EUT is a **BLUETOOTH KEYBOARD** designed as an “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
Rated Output Power	1.13 dBm
Modulation	GFSK
Number of channels	79
Antenna Designation	Integrated Antenna
Power Supply	DC3.7V by battery(battery charged by USB)

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 1MHZ,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 multislot 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 synchronisation 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 behaviour:
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: YW2-BK012** filing to comply with Section 15.247 of the FCC Part 15, Subpart C Rules.

1.7 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.

1.8 TEST FACILITY

All measurement facilities used to collect the measurement data are located at
Attestation of Global Compliance Co., Ltd.
1F., No.2 Building, Huafeng No.1 Technical Industrial Park, Sanwei, Xixiang, Baoan District, Shenzhen
The test site is constructed and calibrated to meet the FCC requirements in documents ANSI C63.4: 2003.
FCC register No.: 259865

1.9 SPECIAL ACCESSORIES

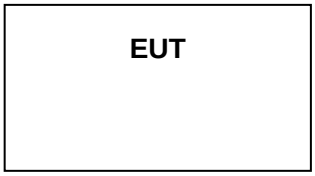
Not available for this EUT intended for grant.

1.10 EQUIPMENT MODIFICATIONS

Not available for this EUT intended for grant.

2. SYSTEM TEST CONFIGURATION

2.1 CONFIGURATION OF TESTED SYSTEM



2.2 EQUIPMENT USED IN TESTED SYSTEM

Item	Equipment	Mfr/Brand	Model/Type No.	FCC ID
1	BLUETOOTH KEYBOARD	Wagons Digital Co.,Ltd	Wagons BK012	YW2-BK012

3. SUMMARY OF TEST RESULTS

FCC RULES	DESCRIPTION OF TEST	RESULT
§15.207	Conduction Emission	Not applicable
§15.209	Radiated Emission	Compliant
§15.247	Maximum Output Power	Compliant
§15.247	20 dB Bandwidth	Compliant
§15.247	Band Edges	Compliant
§15.247	Spurious Emission	Compliant
§15.247	Frequency Separation	Compliant
§15.247	Number of Hopping Frequency	Compliant
§15.247	Time of Occupancy	Compliant

4. DESCRIPTION OF TEST MODES

1. The EUT has been set to operate continuously on the lowest,middle and highest operation frequency individually.
2. The EUT stays in continuous transmitting mode on the operation frequency being set.

5MAXIMUM OUTPUT POWER

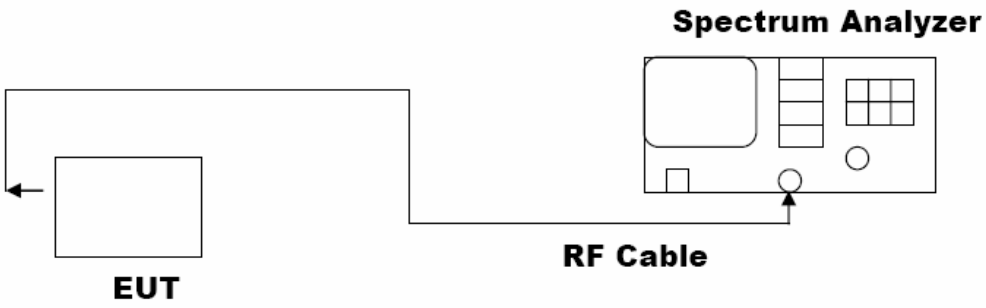
5.1 MEASUREMENT PROCEDURE

CONDUCTED METHOD
1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
3. Set the EUT Work on the top, the middle and the bottom operation frequency individually.
4. Set SPA Centre Frequency = Operation Frequency, RBW= 3 MHz,
   VBW= 3 MHz.
5. Set SPA Trace 1 Max hold, then View.

RADIATED METHOD
According to ANSI C63.4:2003

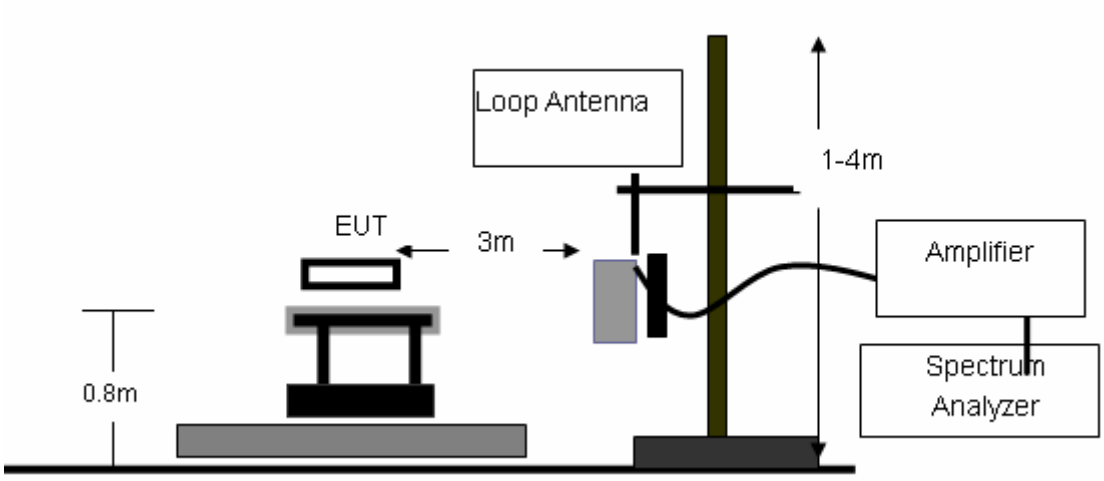
5.2 TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)

CONDUCTED METHOD

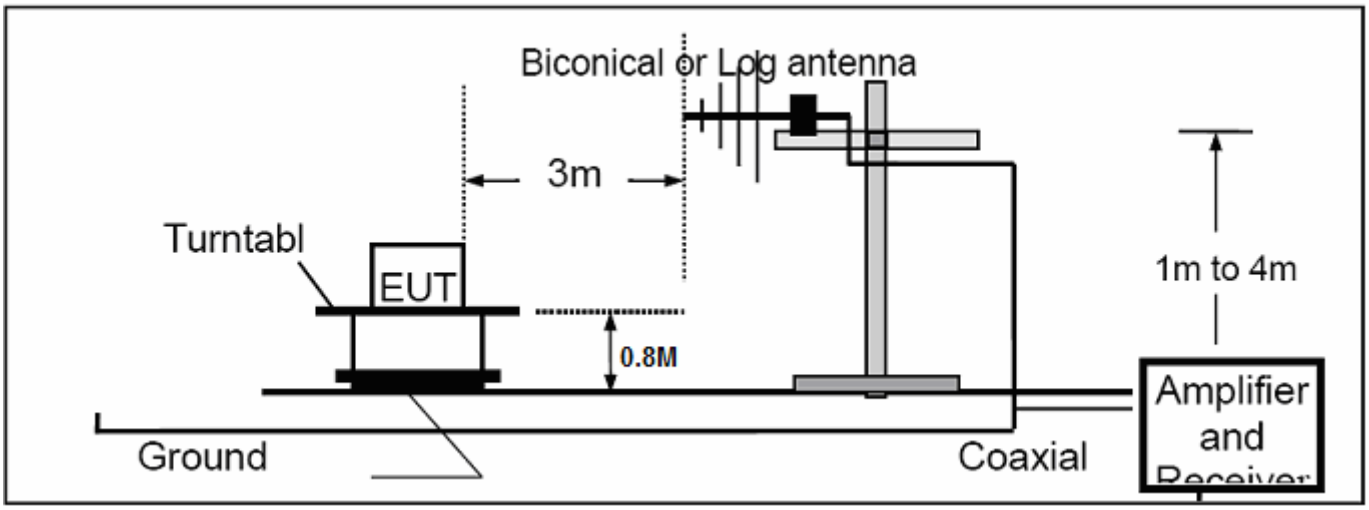


RADIATED EMISSION TEST SETUP

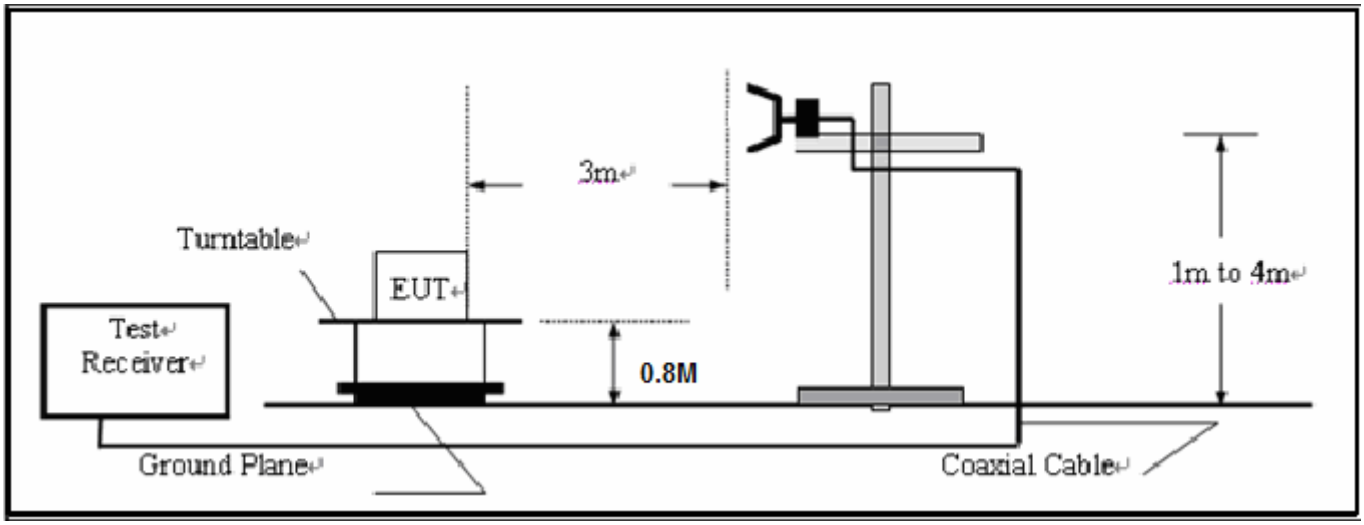
RADIATED EMISSION TEST SETUP BELOW 30MHz



RADIATED MISSION TEST SETUP 30MHz-1000MHz

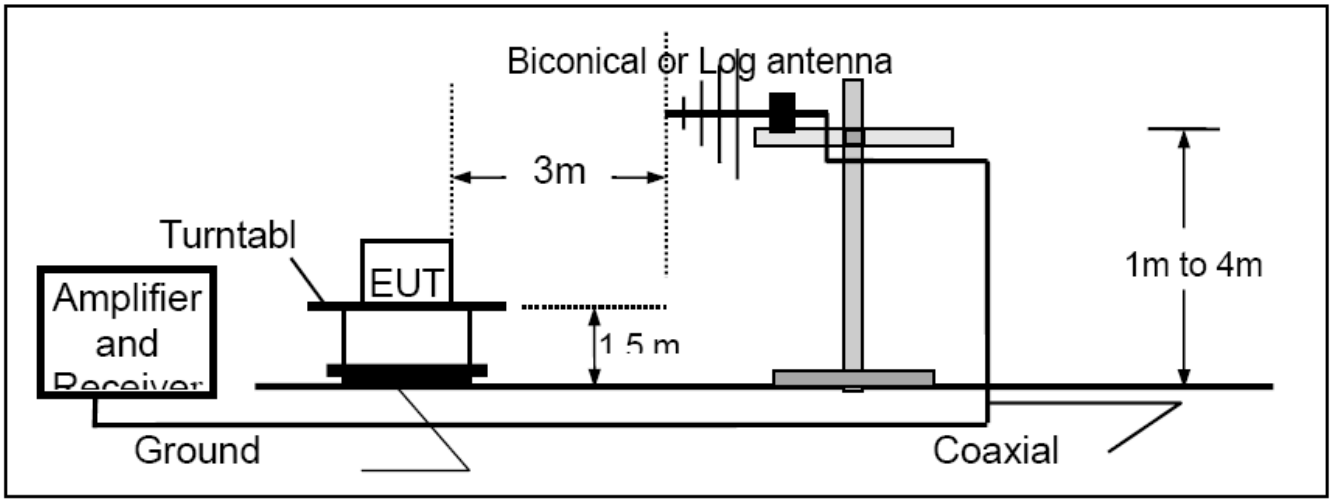


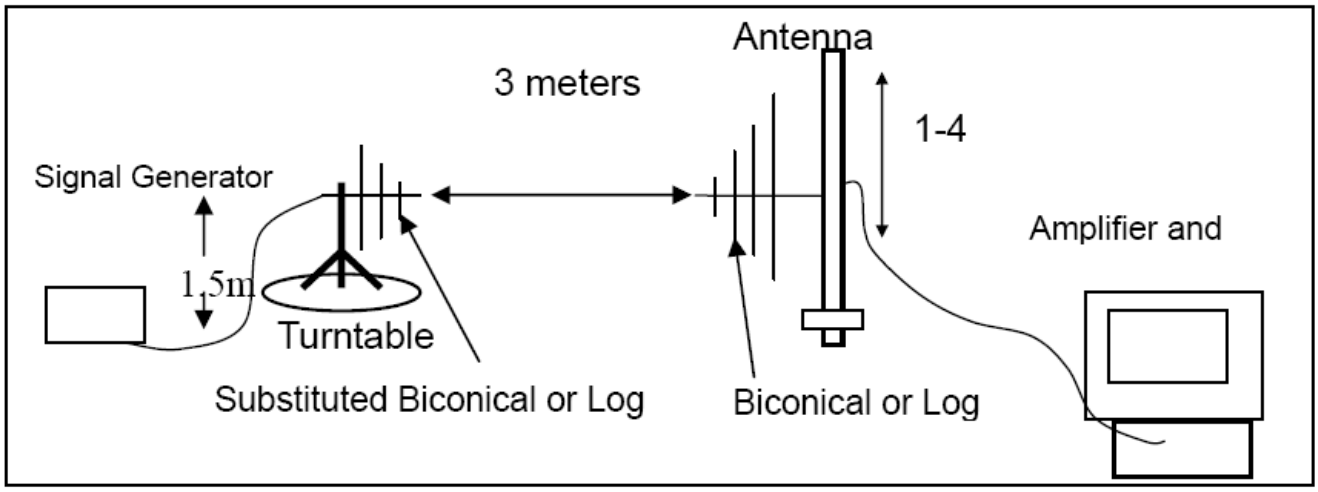
RADIATED MISSION TEST SETUP ABOVE 1000MHz



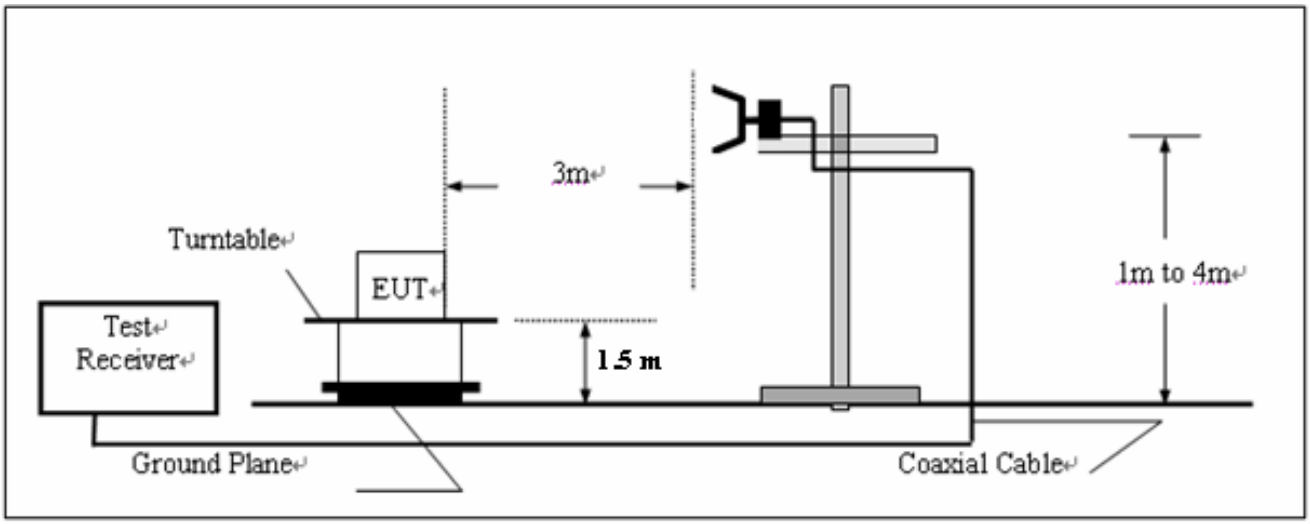
EIRP TEST SETUP

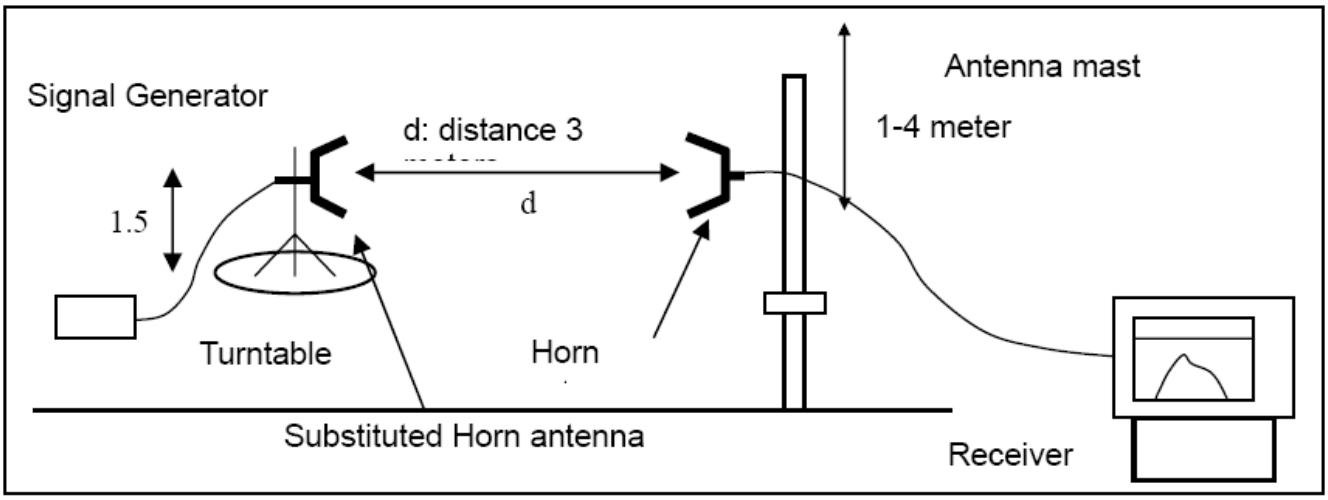
TEST SETUP BELOW 1GHZ





TEST SETUP ABOVE 1GHZ





5.3 MEASUREMENT EQUIPMENT USED

Description	Manufacturer	Model	SERIAL NUMBER	Cal. Date	Cal. Due
Spectrum Analyzer	Agilent	E4440A	N/A	06/29/2010	06/28/2011
Amplifier	EM	EM30180	0607030	06/29/2010	06/28/2011
Horn Antenna	EM	EM-AH-10180	N/A	06/29/2010	06/28/2011
EMI Test Receiver	Rohde & Schwarz	ESCI	N/A	06/29/2010	06/28/2011
Amplifier	EM	EM30180	N/A	06/29/2010	06/28/2011
Bilogical Antenna	A.H. Systems Inc.	SAS-521-4	N/A	06/29/2010	06/28/2011
Loop Antenna	Daze	ZN30900N	SEL0097	06/29/2010	06/28/2011
Isolation Transformer	LETEAC	LTBK	--	06/08/2010	06/07/2011

5.4 LIMITS AND MEASUREMENT RESULT

LIMITS AND MEASUREMENT RESULT				
Applicable Limits	Frequency	Measurement Result		
		EIRP (dBm)	Conducted (dBm)	Criteria
30 dBm	2.402GHz	1.11	-0.22	PASS
30 dBm	2.441GHz	1.08	-0.31	PASS
30 dBm	2.480GHz	1.13	-0.34	PASS

6 20 DB BANDWIDTH

6.1 MEASUREMENT PROCEDURE

1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
3, Set the EUT Work on the top, the middle and the bottom operation frequency individually.
3. Set SPA Centre Frequency = Operation Frequency, RBW= 100 KHz,
   VBW= 100 KHz.
4. Set SPA Trace 1 Max hold, then View.

6.2 TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)

The Same as described in Section 6.2

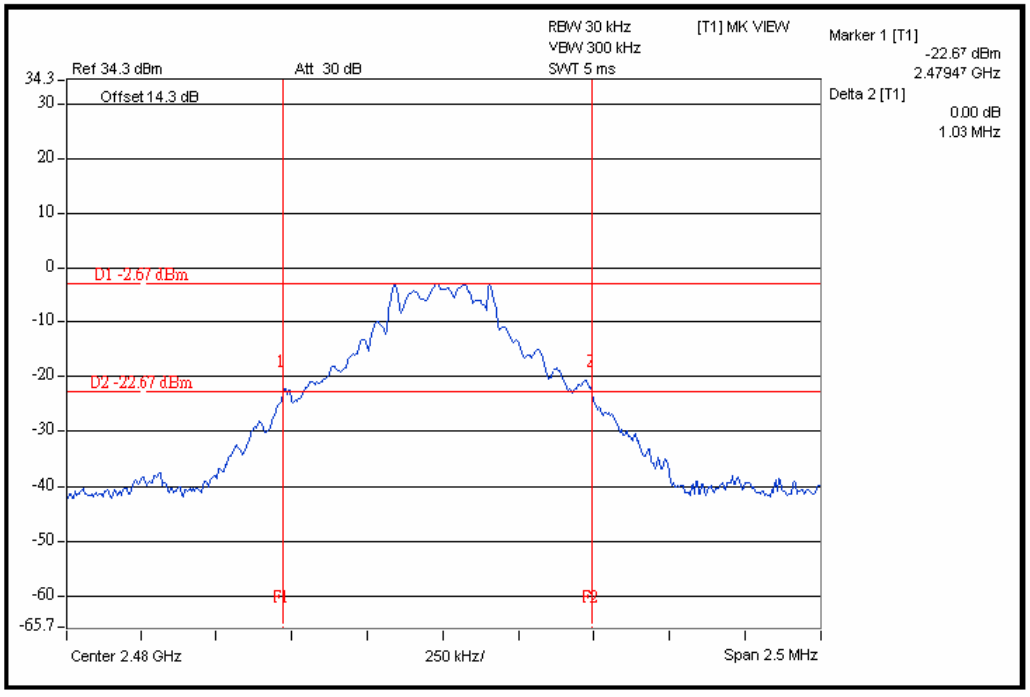
6.3 MEASUREMENT EQUIPMENT USED

The same as described in Section 6.3

6.4 LIMITS AND MEASUREMENT RESULTS

LIMITS AND MEASUREMENT RESULT			
Applicable Limits	Measurement Result		
	Test Data (MHz)		Criteria
--	Bottom Channel	1.023	PASS
	Middle Channel	1.021	PASS
	Top Channel	1.026	PASS

TEST PLOT OF BANDWIDTH FOR TOP CHANNEL

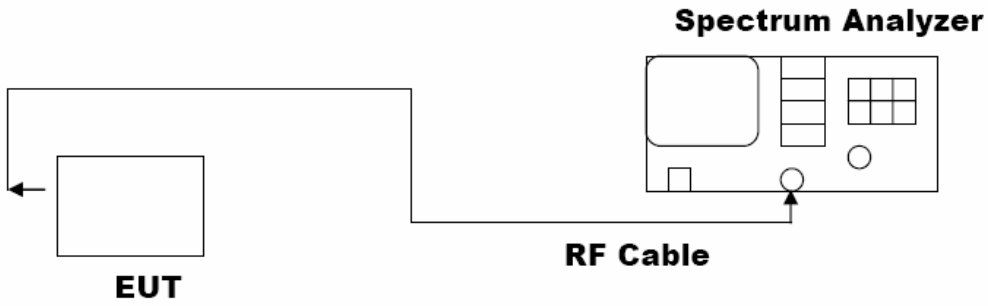


7. MAXIMUM CONDUCTED OUTPUT POWER SPECTRAL DENSITY (N/A)

7.1 MEASUREMENT PROCEDURE

(1). The EUT was placed on a turn table which is 0.8m above ground plane.
(2). Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
(3), Set the EUT Work on the top, the middle and the bottom operation frequency individually.
(4). Set SPA Centre Frequency = Operation Frequency, RBW= 3 KHz,
VBW= 10 KHz., Sweep time= Auto
(5). Set SPA Trace 1 Max hold, then View.

7.2 TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)



7.3 MEASUREMENT EQUIPMENT USED

SHIELDING ROOM					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Agilent	E4440A	N/A	06/29/2010	06/28/2011

7.4 LIMITS AND MEASUREMENT RESULT

LIMITS AND MEASUREMENT RESULT			
Applicable Limits	Measurement Result		
	Test Data (dBm/3KHz)		Criteria
8 dBm / 3KHz	Bottom Channel	--	--
	Middle Channel	--	--
	Top Channel	--	--

8. OUT OF BAND EMISSION

8.1 MEASUREMENT PROCEDURE

1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
3, Set the EUT Work on the top, the middle and the bottom operation frequency individually.
3. Set SPA Centre Frequency = Operation Frequency, RBW= 100 KHz, VBW= 100 KHz.
4. Set SPA Trace 1 Max hold, then View.

8.2 TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)

The Same as described in section 6.2

1. Conducted test setup
2. Radiated Emission test Setup below 1GHz and Above 1GHz

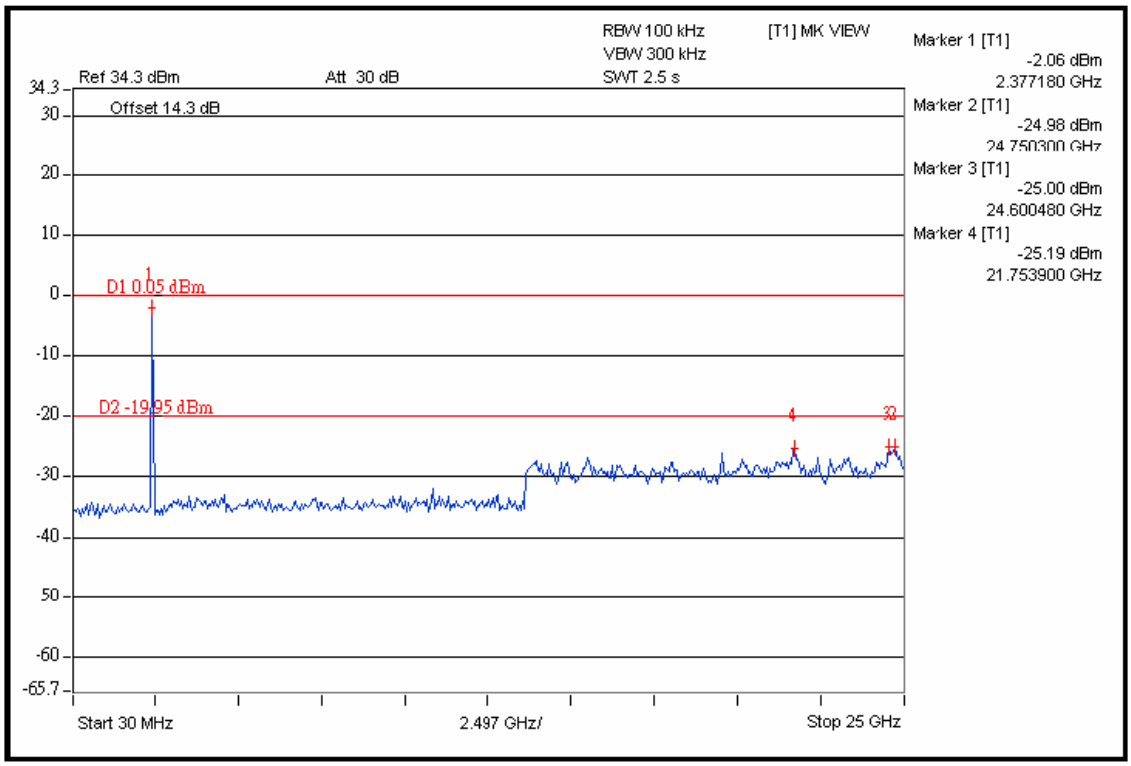
8.3 MEASUREMENT EQUIPMENT USED

The Same as described in section 6.3

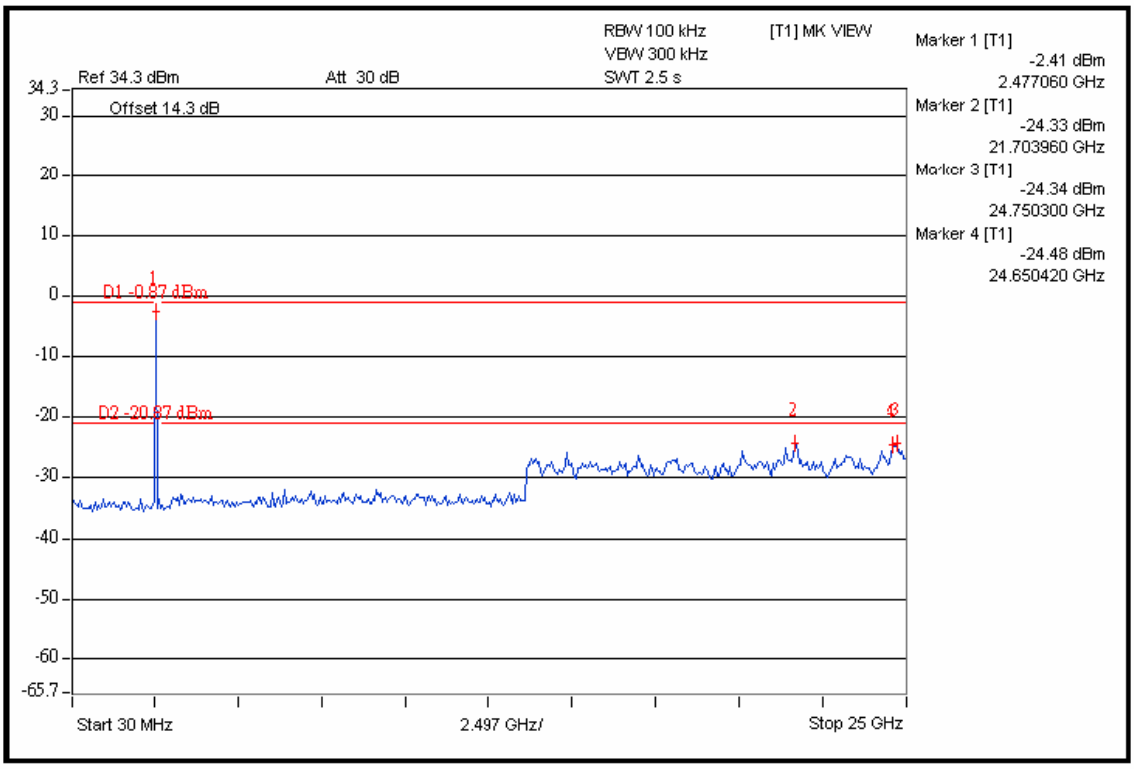
8.4 LIMITS AND MEASUREMENT RESULT

LIMITS AND MEASUREMENT RESULT		
Applicable Limits	Measurement Result	
	Test Data	Criteria
In any 100 KHz Bandwidth Outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produce by the intentional radiator shall be at least 20 dB below that in 100KHz bandwidth within the band that contains the highest level of the desired power.	At least -20dBc than the limit Specified on the BOTTOM Channel	PASS
In addition, radiation emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in§15.209(a))	At least -20dBc than the limit Specified on the TOP Channel	PASS

TEST PLOT OF OUT OF BAND EMISSIONS FOR BOTTOM CHANNEL – 1



TEST PLOT OF OUT OF BAND EMISSIONS FOR TOP CHANNEL – 1



RADIATED EMISSION BELOW 30MHZ

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

RADIATED EMISSION BELOW 1GHZ

EUT	BLUETOOTH KEYBOARD	Model Name	Wagons BK012
Temperature	25° C	Relative Humidity	55%
Pressure	960hPa	Test Voltage	DC3.7V
Test Mode	BT2402MHZ		

Freq. (MHZ)	Ant.Pol. H/V	Detector (PK/QP)	Reading (dBuV)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
32.47	H	Peak	12.35	17.47	29.82	40	-10.18
123.55	H	Peak	11.38	16.77	28.15	43.5	-15.35
184.35	H	Peak	13.16	19.42	32.58	43.5	-10.92
423.57	H	Peak	5.61	19.93	25.54	46	-20.46
733.4	H	Peak	4.57	24.88	29.45	46	-16.55
956.35	H	Peak	5.87	26.76	32.63	46	-13.37
55.39	V	Peak	17.64	9.11	26.75	40	-13.25
75.49	V	Peak	18.84	10.24	29.08	40	-10.92
125.49	V	Peak	12.76	16.93	29.69	43.5	-13.81
170.78	V	Peak	13.18	18.84	32.02	43.5	-11.48
684.75	V	Peak	5.34	25.54	30.88	46	-15.12
940.18	V	Peak	4.18	26.47	30.65	46	-15.35

EUT	BLUETOOTH KEYBOARD	Model Name	Wagons BK012
	25° C	Relative Humidity	55%
Pressure	960hPa	Test Voltage	DC3.7V
Test Mode	BT2441MHZ		

Freq. (MHZ)	Ant.Pol. H/V	Detector (PK/QP)	Reading (dBuV)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
--	H	Peak	--	--	--	--	--
--	H	Peak	--	--	--	--	--
--	V	Peak	--	--	--	--	--
--	V	Peak	--	--	--	--	--

EUT	BLUETOOTH KEYBOARD	Model Name	Wagons BK012
Temperature	25° C	Relative Humidity	55%
Pressure	960hPa	Test Voltage	DC3.7V
Test Mode	BT2480MHZ		

Freq. (MHZ)	Ant.Pol. H/V	Detector (PK/QP)	Reading (dBuV)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
--	H	Peak	--	--	--	--	--
--	H	Peak	--	--	--	--	--
--	V	Peak	--	--	--	--	--
--	V	Peak	--	--	--	--	--

Note: ”--“means the mode at least have 20dB margin.

RADIATED EMISSION ABOVE 1GHZ

EUT	BLUETOOTH KEYBOARD	Model Name	Wagons BK012
Temperature	25° C	Relative Humidity	55%
Pressure	960hPa	Test Voltage	DC3.7V
Test Mode	BT2402MHZ		

Freq. (MHZ)	Ant.Pol. H/V	Peak Reading (dBuV)	AV Reading (dBuV)	Factor (dB)	Result		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin
					Peak (dBuV/m)	AV (dBuV/m)			
1321	H	52.03	--	-10.43	41.6	--	74	54	-12.4
1564	H	49.93	--	-10.56	39.37	--	74	54	-14.63
1823	H	50.14	--	-9.57	40.57	--	74	54	-13.43
2544	H	44.38	--	-8.76	35.62	--	74	54	-18.38
--	H	--	--	--	--	--	--	--	--
1341	V	52.38	--	-10.17	42.21	--	74	54	-11.79
1755	V	53.45	--	-10.21	43.24	--	74	54	-10.76
2138	V	48.73	--	-9.84	38.89	--	74	54	-15.11
2656	V	46.28	--	-8.94	37.34	--	74	54	-16.66
--	V	--	--	--	--	--	--	--	--

EUT	BLUETOOTH KEYBOARD	Model Name	Wagons BK012
Temperature	25° C	Relative Humidity	55%
Pressure	960hPa	Test Voltage	DC3.7V
Test Mode	BT2441MHZ		

Freq. (MHZ)	Ant.Pol. H/V	Peak Reading (dBuV)	AV Reading (dBuV)	Factor (dB)	Result		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin
					Peak (dBuV/m)	AV (dBuV/m)			
--	H	--	--	--	--	--	--	--	--
--	H	--	--	--	--	--	--	--	--
--	V	--	--	--	--	--	--	--	--
--	V	--	--	--	--	--	--	--	--

EUT	BLUETOOTH KEYBOARD	Model Name	Wagons BK012
Temperature	25° C	Relative Humidity	55%
Pressure	960hPa	Test Voltage	DC3.7V
Test Mode	BT2480MHZ		

Freq. (MHZ)	Ant.Pol. H/V	Peak Reading (dBuV)	AV Reading (dBuV)	Factor (dB)	Result		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin
					Peak (dBuV/m)	AV (dBuV/m)			
--	H	--	--	--	--	--	--	--	--
--	H	--	--	--	--	--	--	--	--
--	V	--	--	--	--	--	--	--	--
--	V	--	--	--	--	--	--	--	--

Note: This Handheld EUT was tested in 3 orthogonal positions and the worst-case data was presented.
Note:"--"means the mode at least have 20dB margin.

9 BAND EDGE EMISSION

9.1 MEASUREMENT PROCEDURE

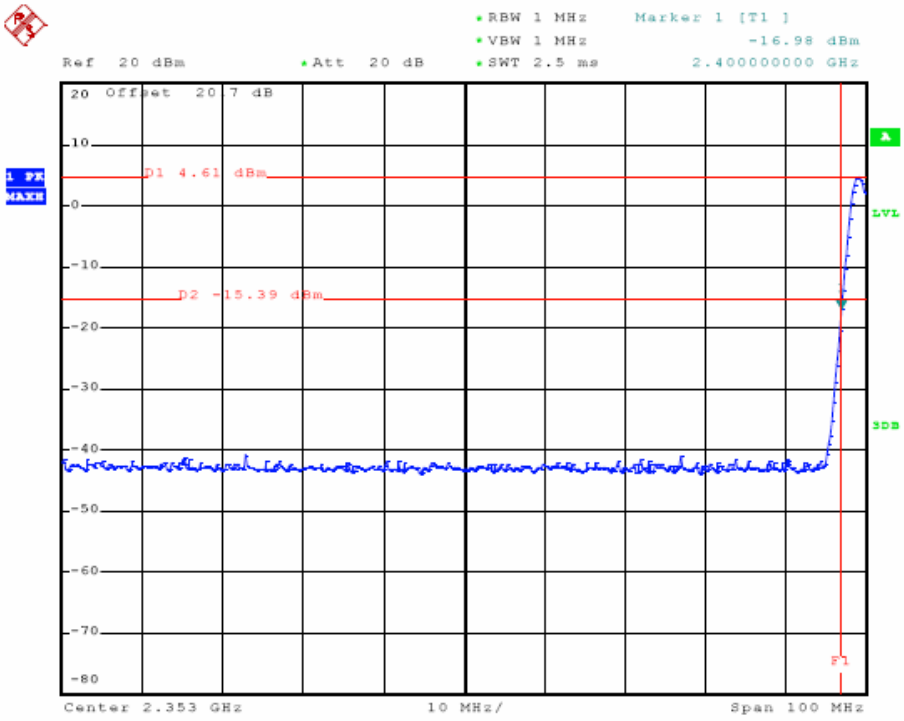
1, Set the EUT Work on the top, the bottom operation frequency individually.
2. Set SPA Start or Stop Frequency = Operation Frequency, RBW= 100 KHz, VBW= 100KHz.
3. The band edges was measured and receorded.

9.2 TEST SET-UP

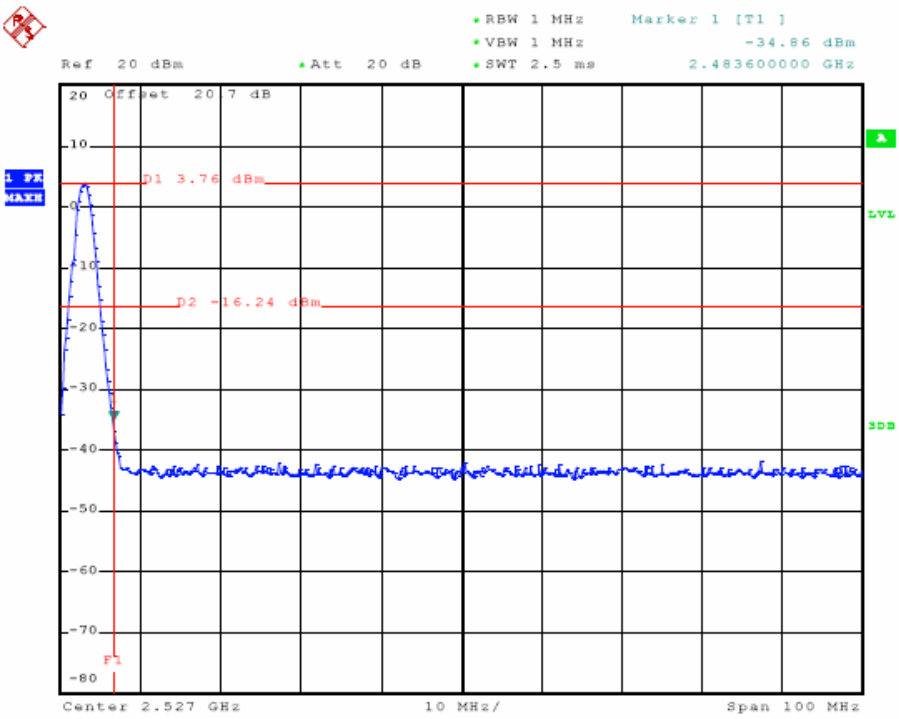
The Same as described in section 6.2

9.3 TEST RESULT

TEST PLOT OF BAND ELDG FOR BOTTOM CHANNEL



TEST PLOT OF BAND ELDG FOR TOP CHANNEL



10 NUMBER OF HOPPING FREQUENCY

10.1 MEASUREMENT PROCEDURE

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer Start = 2.4GHz Stop = 2.4835GHz
4. Set the Spectrum Analyzer as RBW = 300KHZ,VBW = 820KHz

10.2 TEST SETUP (BLOCK DIAGRAM OF CONFIGURATION)

Same as described in section 6.2
1. Conducted Method.

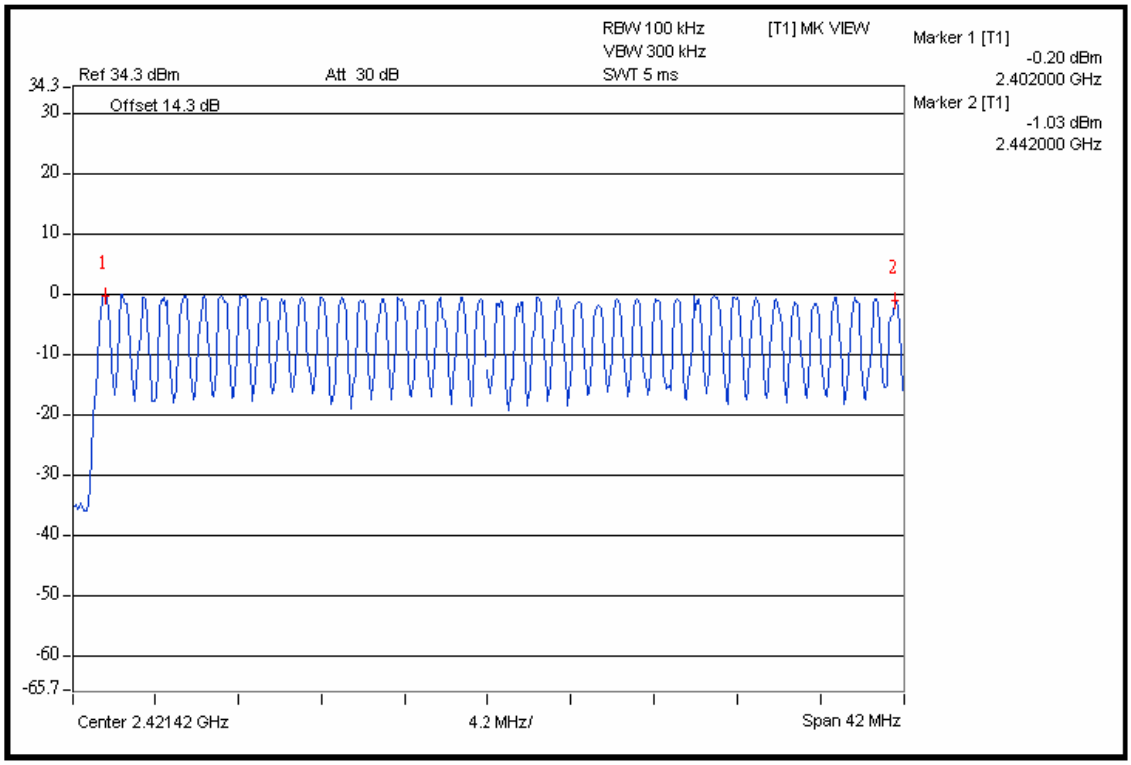
10.3 MEASUREMENT EQUIPMENT USED

The Same as described in section 6.3

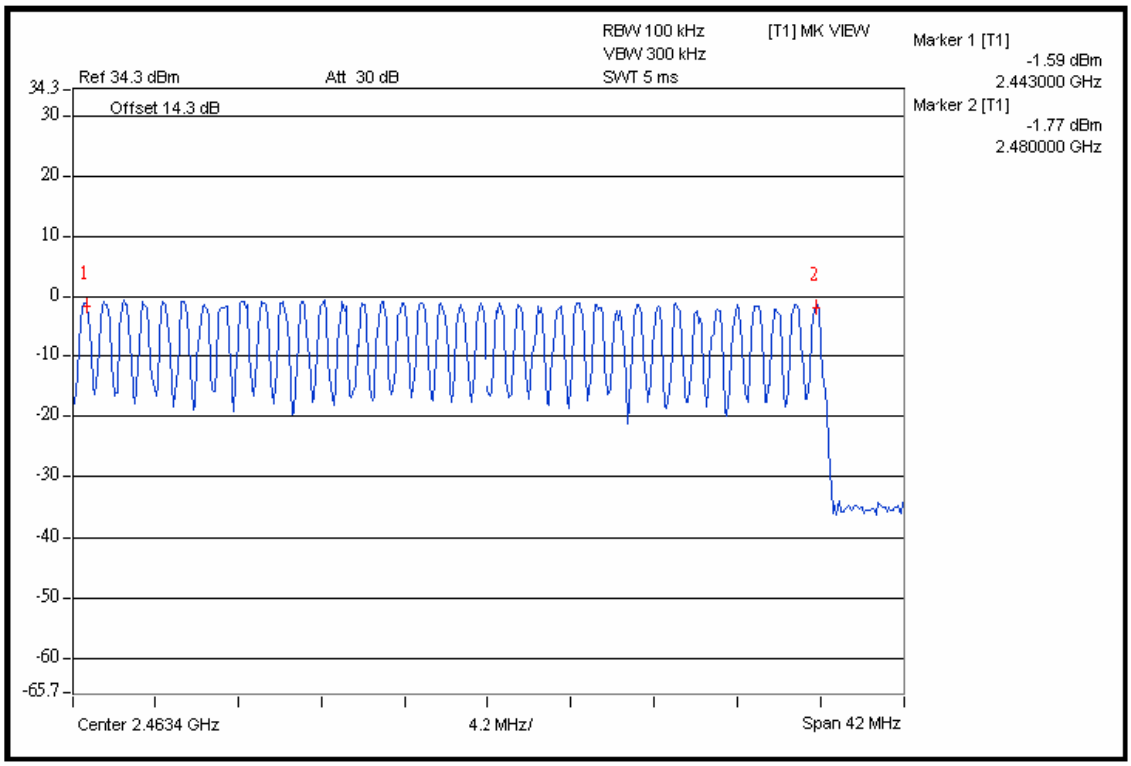
10.4 LIMITS AND MEASUREMENT RESULT

TOTAL NO. OF HOPPING CHANNEL	LIMIT (NO. OF CH)	MEASUREMENT (NO. OF CH)	RESULT
	>=15	79	PASS

TEST PLOT FOR NO. OF TOTAL CHANNELS -1



TEST PLOT FOR NO. OF TOTAL CHANNELS -2



11 TIME OF OCCUPANCY (DWELL TIME)

11.1 MEASUREMENT PROCEDURE

1. Place the EUT on the table and set it in transmitting mode
2. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum analyzer
3. Set center frequency of spectrum analyzer = Operating frequency
4. Set the spectrum analyzer as RBW, VBW=1MHz, Span = 0 Hz,

11.2 TEST SETUP (BLOCK DIAGRAM OF CONFIGURATION)

Same as described in section 6.2
Conducted Method

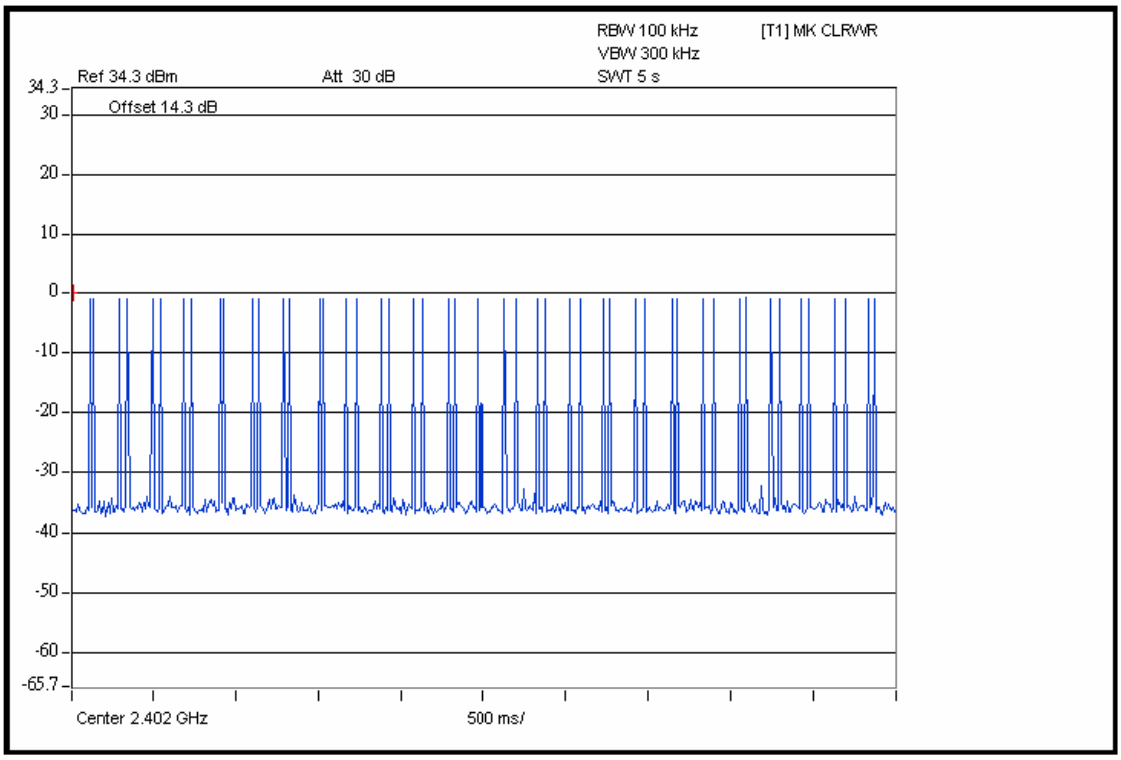
11.3 MEASUREMENT EQUIPMENT USED

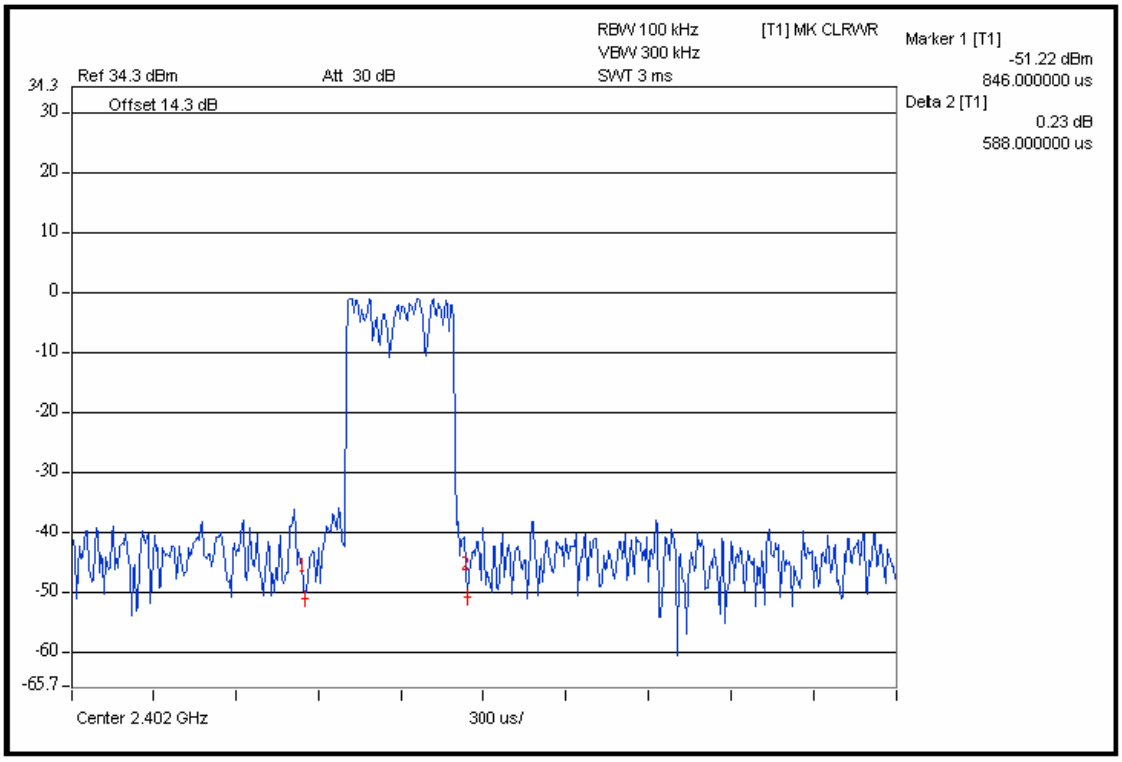
The same as described in section 6.3

11.4 LIMITS AND MEASUREMENT RESULT

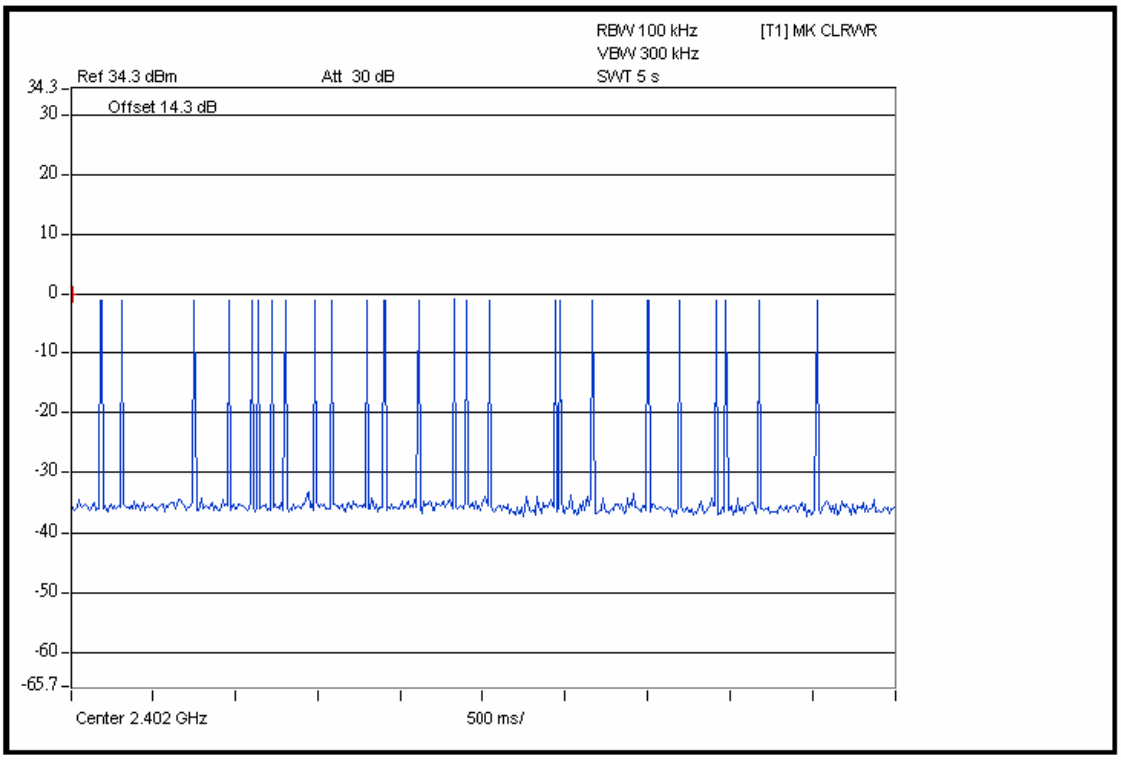
MODE	Number of transmation in 31.6(79Hopping*0.4)	Length of transmation time(msec)	Result (msec)	Limit (msec)
DH1	50(times/5s)*6.32=316times	0.588	185.808	400
DH3	25(times/5s)*6.32=158times	1.746	275.868	400
DH5	18(times/5s)*6.32=113.76times	2.970	337.867	400

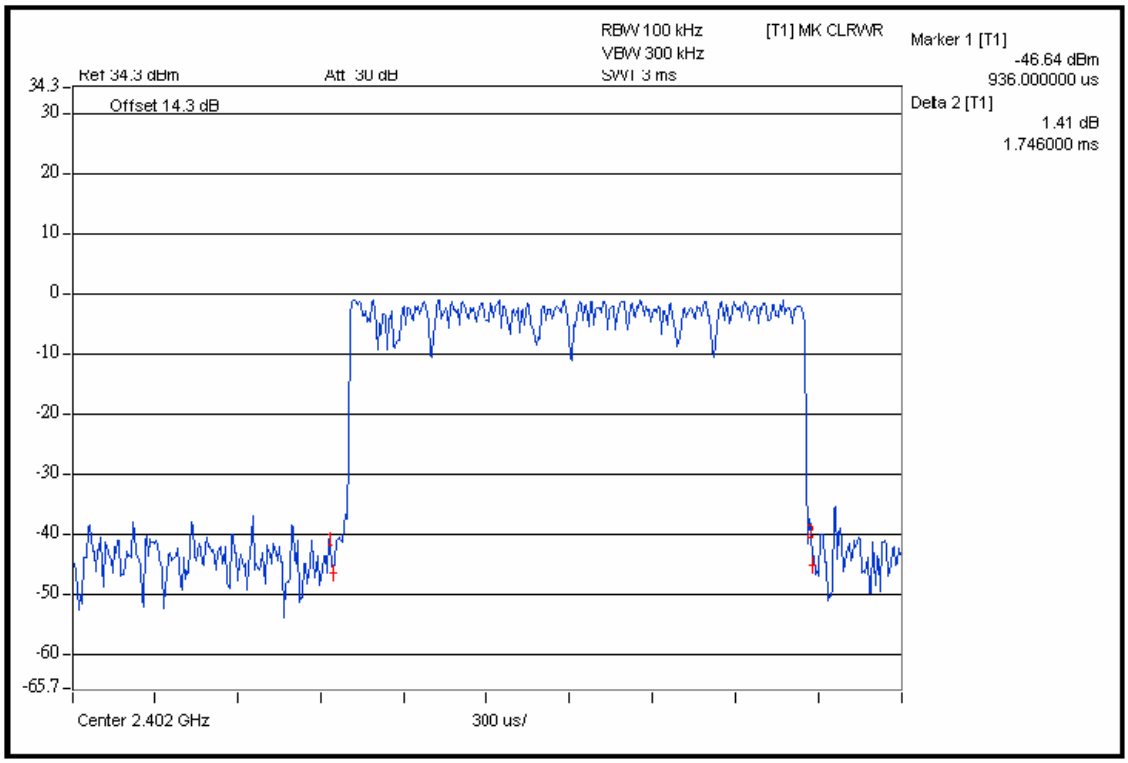
TEST PLOT DH1 MODE



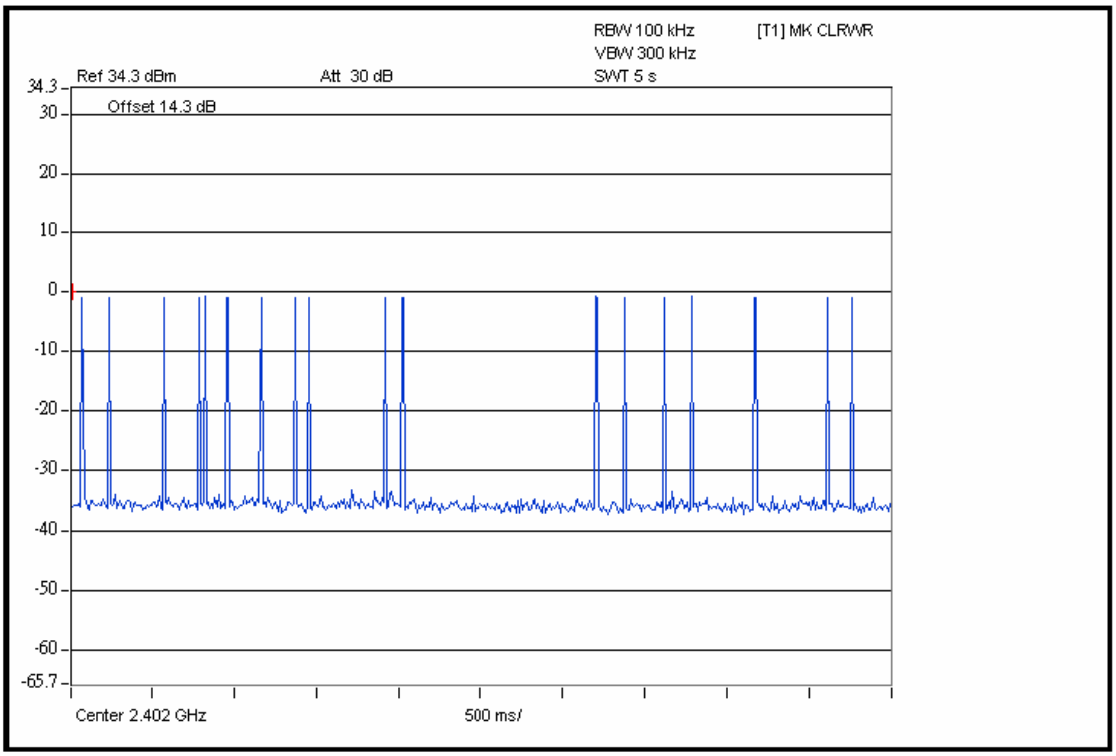


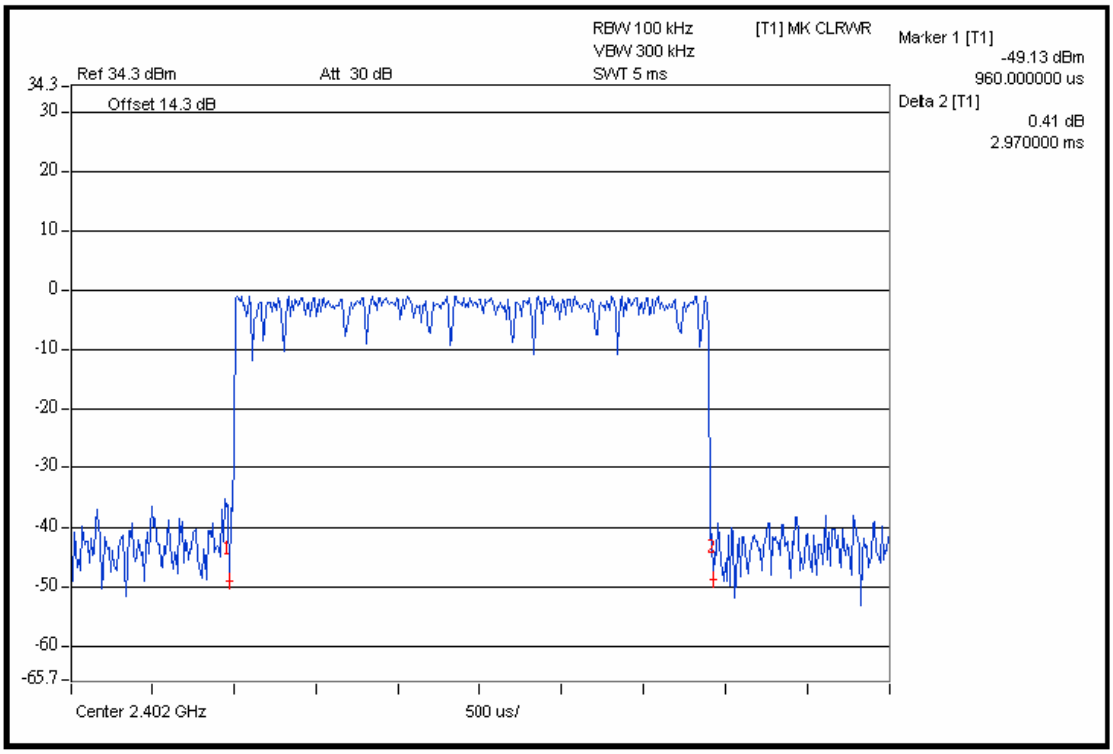
TEST PLOT DH3 MODE





TEST PLOT DH5 MODE





12. FREQUENCY SEPARATION

12.1 MEASUREMENT PROCEDURE

1. Place the EUT on the table and set it in transmitting mode
2. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum analyzer
3. Set center frequency of spectrum analyzer = Middele of Operating frequency
4. Set the spectrum analyzer as RBW, VBW=100KHz, Span = 5 MHz,

12.2 TEST SETUP (BLOCK DIAGRAM OF CONFIGURATION)

Same as described in section 6.2

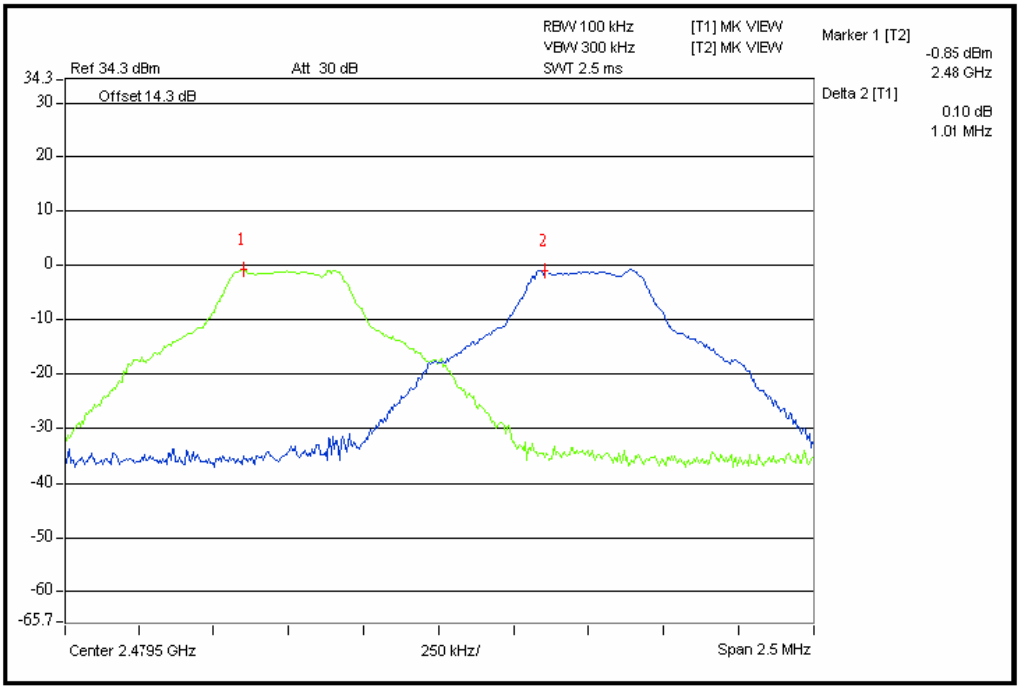
12.3 MEASUREMENT EQUIPMENT USED

The same as described in section 6.3

12.4 LIMITS AND MEASUREMENT RESULT

CHANNEL	CHANNEL SEPARATION	LIMIT	RESULT
	KHz	KHz	Pass
CH77-CH78	1010	>=25 KHz or 2/3 20 dB BW	

TEST PLOT FOR FREQUENCY SEPARATION



APPENDIX I
PHOTOGRAPHS OF THE EUT

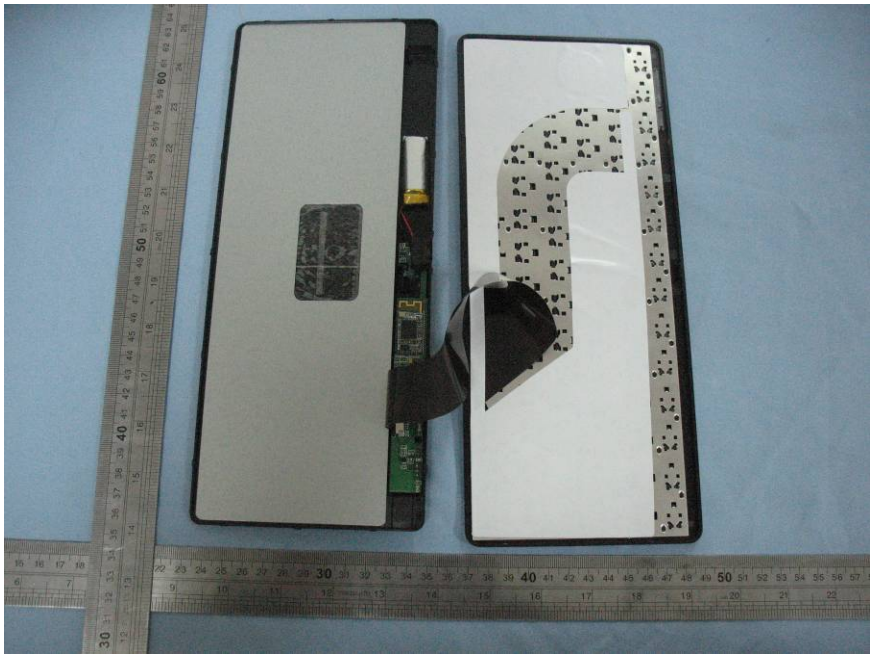
TOP VIEW OF EUT

BOTTOM VIEW OF EUT

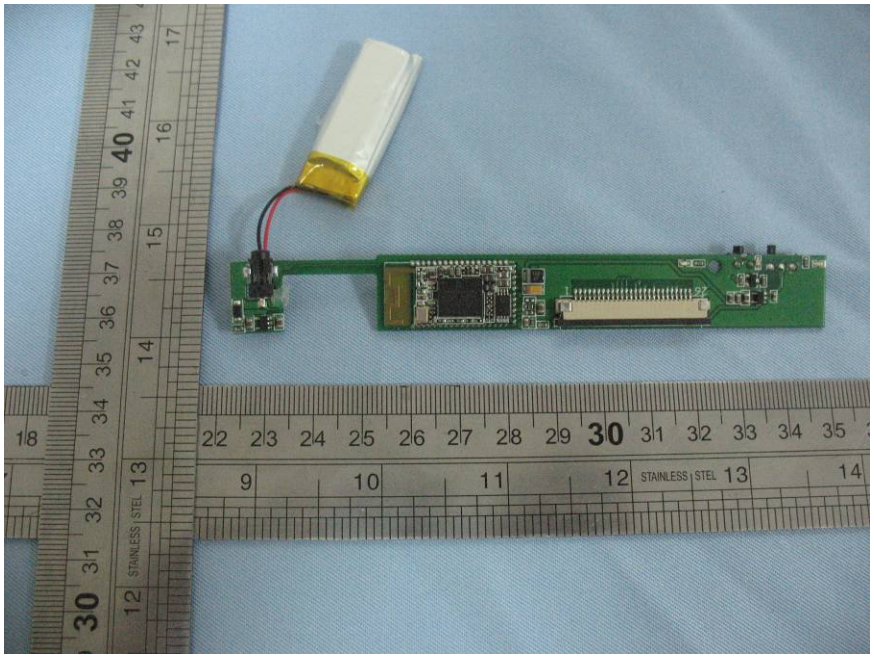
FRONT VIEW OF EUT

CABLE VIEW OF EUT

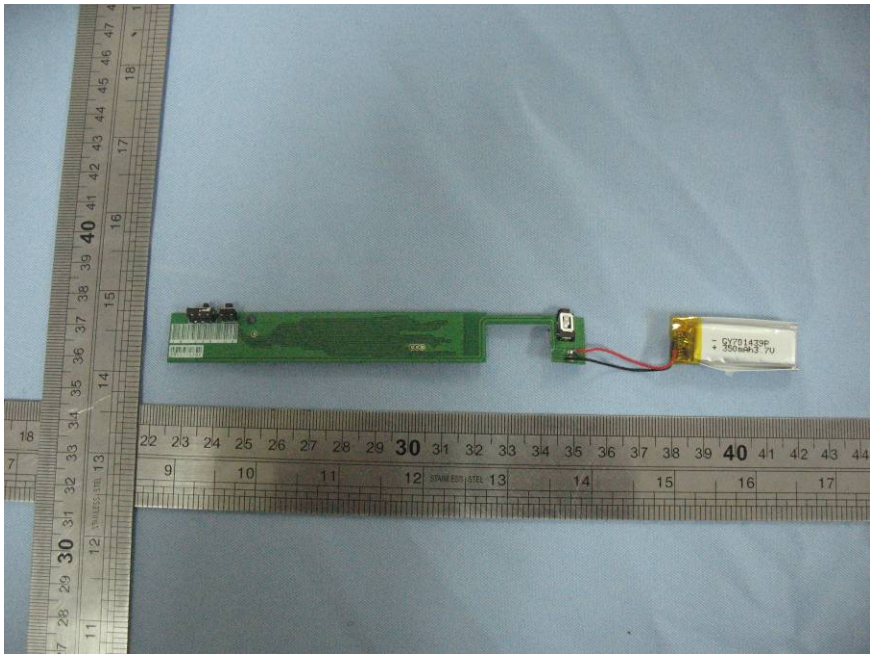
INTERNAL VIEW OF EUT-1



INTERNAL VIEW OF EUT-2



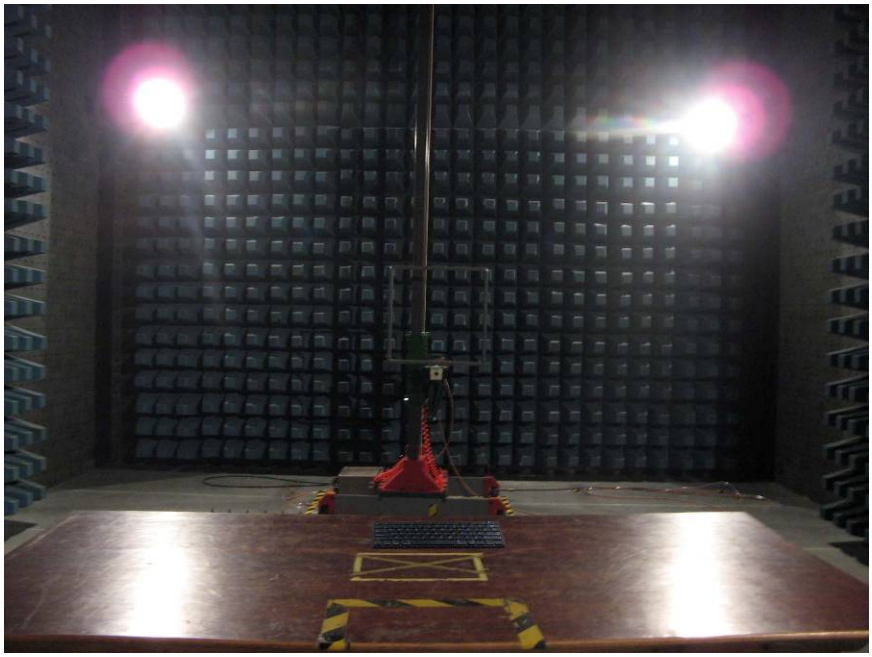
INTERNAL VIEW OF EUT-3



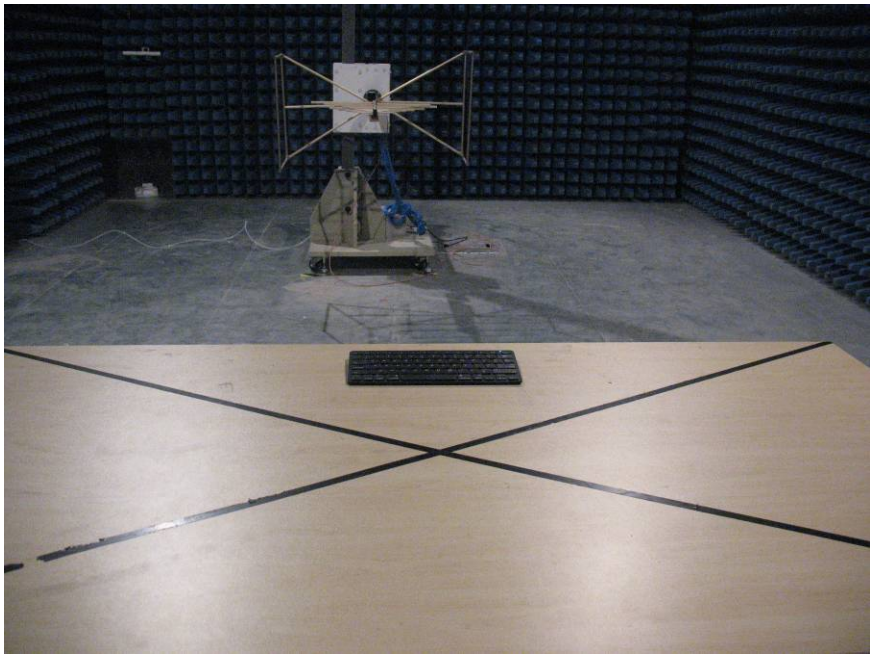
PPENDIX II

PHOTOGRAPHS OF THE TEST SETUP

9KHZ~30MHZ RADIATED EMISSION TEST SETUP



ABOVE 1MHZ RADIATED EMISSION TEST SETUP



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