FCC Test Report

Report No.: AGC04246150302FE08

FCC ID	:	NMCHBCR001
APPLICATION PURPOSE	:	Original Equipment
PRODUCT DESIGNATION	:	HBC Remote
BRAND NAME	:	UCLEAR DIGITAL
MODEL NAME	:	HBCR001
CLIENT	:	Bitwave Private Limited
DATE OF ISSUE	:	Jun.27,2015
STANDARD(S)	:	FCC Part 15 Rules
REPORT VERSION	:	V1.0

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

Report Revise Record

Report Version	Revise Time	Issued Date	Valid Version	Notes
V1.0	/	Jun.27,2015	Valid	Original Report

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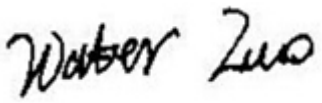
1. VERIFICATION OF COMPLIANCE

Applicant	Bitwave Private Limited
Address	11, Serangoon North Ave 5 , #05-03 Singapore 554809
Manufacturer	Bitwave Private Limited
Address	11, Serangoon North Ave 5 , #05-03 Singapore 554809
Product Designation	HBC Remote
Brand Name	UCLEAR DIGITAL
Test Model	HBCR001
Date of test	Jun.24,2015 to Jun.26,2015
Deviation	None
Condition of Test Sample	Normal
Report Template	AGCRT-US-BLE/RF (2013-03-01)

WE HEREBY CERTIFY THAT:

The above equipment was tested by Compliance Certification Service(Shenzhen) Inc. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10 (2009) and the energy emitted by the sample EUT tested as described in this report is in compliance with requirement of FCC Part 15 Rules requirement.

Prepared By 

Water Zuo Jun.27,2015

Checked By 

Forrest Lei Jun.27,2015

Authorized By 

Solger Zhang Jun.27,2015

2.GENERAL INFORMATION

2.1PRODUCT DESCRIPTION

The EUT is designed as a “HBC Remote”. 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
Max Output Power	7.55dBm
Bluetooth Version	V4.1
Modulation	GFSK
Number of channels	40 Channel(37 Hopping Channel,3 advertising Channel)
Antenna Designation	fixed antenna
Antenna Gain	4dBi
Hardware Version	1.01
Software Version	1.00
Power Supply	DC3.7V by Battery
Note: The EUT support BLE and BR function. About the test report of BR function, Please refer to test report:AGC04246150302FE03	

2.2 RELATED SUBMITTAL(S)/GRANT(S)

This submittal(s) (test report) is intended for **FCC ID: NMCHBCR001** filing to comply with Section 15.247of the FCC Part 15, Subpart C Rules.

2.3TEST METHODOLOGY

All measurements contained in this report were conducted with ANSI C63.10-2009, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.
The test has been referenced the KDB 558074 D01 DTS Meas Guidance v03r02
The equipment under test (EUT) was configured to measure its highest possible emission level. The test modes were adapted accordingly in reference to the Operating Instructions. The EUT was tested in all three orthogonal planes and the worse case was showed.

2.4 TEST FACILITY

All measurement facilities used to collect the measurement data are located at
Compliance Certification Service(Shenzhen) Inc.

No.10-1 Mingkeda Logistics Park, No.18 Huanguan South RD. Guan lan Town,Baoan Distr

FCC register No.: 441872

2.5 SPECIAL ACCESSORIES

Refer to section 2.2.

2.6 EQUIPMENT MODIFICATIONS

Not available for this EUT intended for grant.

2.7 MEASUREMENT UNCERTAINTY

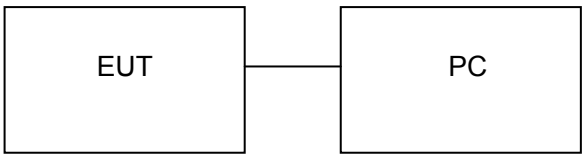
Radiation Emission:+/-3.2

Conduction Emission:+/-2.5

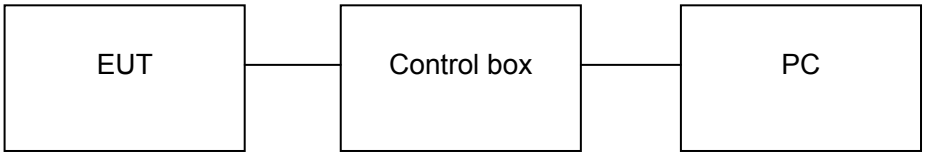
3. SYSTEM TEST CONFIGURATION

3.1 CONFIGURATION OF TESTED SYSTEM

Configuration: Normal Operating



Configuration: Continuous TX



3.2 EQUIPMENT USED IN TESTED SYSTEM

Item	Equipment	Mfr/Brand	Model/Type No.	Remark
1	HBC Remote	UCLEAR DIGITAL	HBCR001	EUT
2	PC	Dell	INSPIRON	A.E
3	Control box	N/A	N/A	A.E

3.3. SUMMARY OF TEST RESULTS

FCC RULES	DESCRIPTION OF TEST	RESULT
§ 15.203	Antenna Requirement	Compliant
§15.209 §15.247(d)	Radiated Emission	Compliant
§15.247(d)	Band Edges	Compliant
§15.247	6 dB Bandwidth	Compliant
§15.247(b)	Conducted Power	Compliant
§15.247(e)	Maximum Conducted Output Power SPECTRAL Density	Compliant
§15.207	Line Conduction Emission	Compliant

4. DESCRIPTION OF TEST MODES

The EUT has been operated in one modulation: GFSK .

NO.	TEST MODE DESCRIPTION
1	Low channel TX
2	Middle channel TX
3	High channel TX
4	Normal Operating (BT)

Note:
1. All the test modes can be supply by battery, only the result of the worst case was recorded in the report if no any records.
2. For Radiated Emission, 3axis were chosen for testing for each applicable mode.
3. Transmitting duty cycle >98%, The average correction factor is about -0.18

5. ANTENNA REQUIREMENT

5.1. STANDARD APPLICABLE

According to FCC 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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of Sections 15.211, 15.213, 15.217, 15.219, or 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with Section 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded.

5.2. TEST RESULT

This product has a permanent antenna, fulfill the requirement of this section.

6. TEST FACILITY

Site	Compliance Certification Service(Shenzhen) Inc.
Location	No.10-1 Mingkeda Logistics Park, No.18 Huanguan South RD. Guan lan Town,Baoan Distr
Description	The test site is constructed and calibrated to meet the FCC requirements in documents ANSI C63.10:2009.

ALL TEST EQUIPMENT LIST

Description	Manufacturer	Model	S/N	Cal. Date	Cal. Due
Power Probe	R&S	NRP-Z23	100323	07/16/2014	07/15/2015
RF attenuator	N/A	RFA20db	68	N/A	N/A
Spectrum Analyzer	Agilent	E4440A	US41421290	07/16/2014	07/15/2015
EXA Signal Analyzer	Agilent	N9010A	--	02/28/2015	02/27/2016
Amplifier	EM	EM30180	0607030	02/28/2015	02/27/2016
Horn Antenna	EM	EM-AH-10180	67	04/19/2015	04/18/2016
Horn Antenna	A.H. Systems Inc.	SAS-574	--	07/16/2014	07/15/2015
EMI Test Receiver	Rohde & Schwarz	ESCI	100694	07/16/2014	07/15/2015
Bilogical Antenna	A.H. Systems Inc.	SAS-521-4	26	06/06/2015	06/05/2016
LISN	R&S	ESH3-Z5	8389791009	07/16/2014	07/15/2015
Loop Antenna	Daze	ZN30900N	SEL0097	07/16/2014	07/15/2015
Isolation Transformer	LETEAC	LTBK	--	07/16/2014	07/15/2015
Radiation Cable 1	Sat	RE1	R003	06/04/2015	06/03/2016
Radiation Cable 2	Sat	RE2	R002	06/04/2015	06/03/2016
Conduction Cable	Sat	CE1	C001	06/04/2015	06/03/2016

7. RADIATED EMISSION

7.1 MEASUREMENT PROCEDURE

1. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground. EUT is placed in the middle of the desk, and opposite the horn antenna.
2. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
3. For each suspected emission, the EUT was arranged to its worst case and then tune the Antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level to comply with the guidelines.
4. Set to the maximum power setting and enable the EUT transmit continuously.
5. Use the following spectrum analyzer settings:

(1) Span shall wide enough to fully capture the emission being measured;

(2) Set RBW=100 kHz for f < 1 GHz, RBW=1MHz for f>1GHz ; VBW ≥ RBW; Sweep = auto;

Detector function = peak; Trace = max hold for peak

(3) For average measurement: use duty cycle correction factor method per 15.35(c).

Duty cycle = On time/100 milliseconds

On time = N1*L1+N2*L2+...+Nn-1*LNn-1+Nn*Ln

Where N1 is number of type 1 pulses, L1 is length of type 1 pulses, etc.

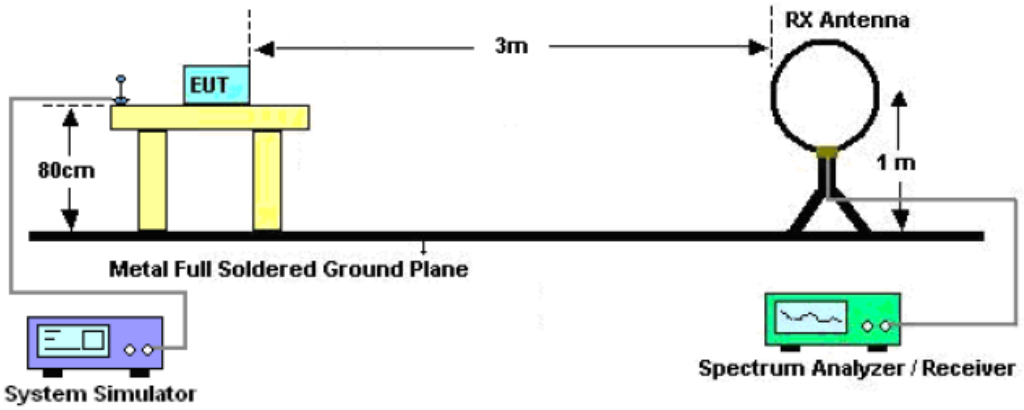
Average Emission Level = Peak Emission Level + 20*log(Duty cycle)

6. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level

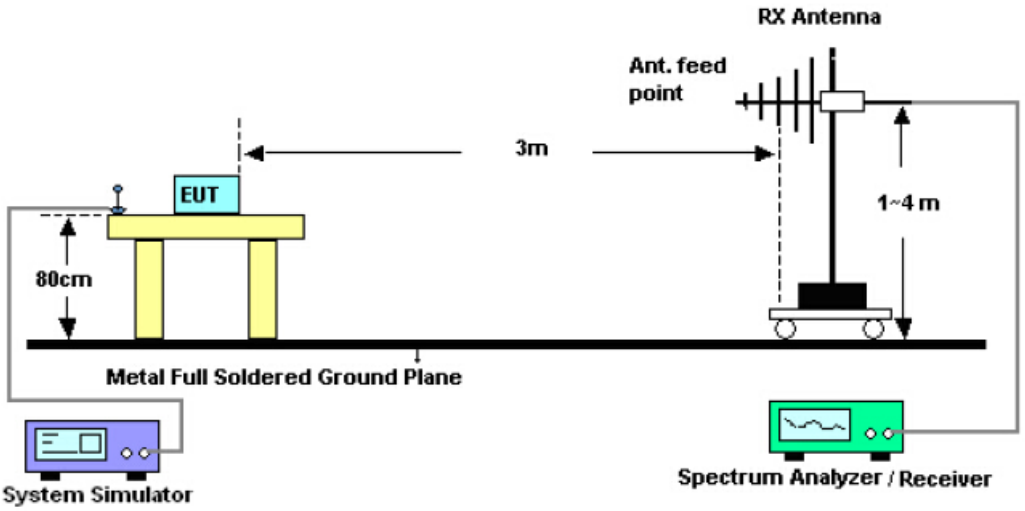
Note: The average levels were calculated from the peak level corrected with duty cycle correction factor (-24.79dB) derived from 20log (dwell time/100ms). This correction is only for signals that hop with the fundamental signal, such as band-edge and harmonic. Other spurious signals that are independent of the hopping signal would not use this correction.

7.2 TEST SETUP

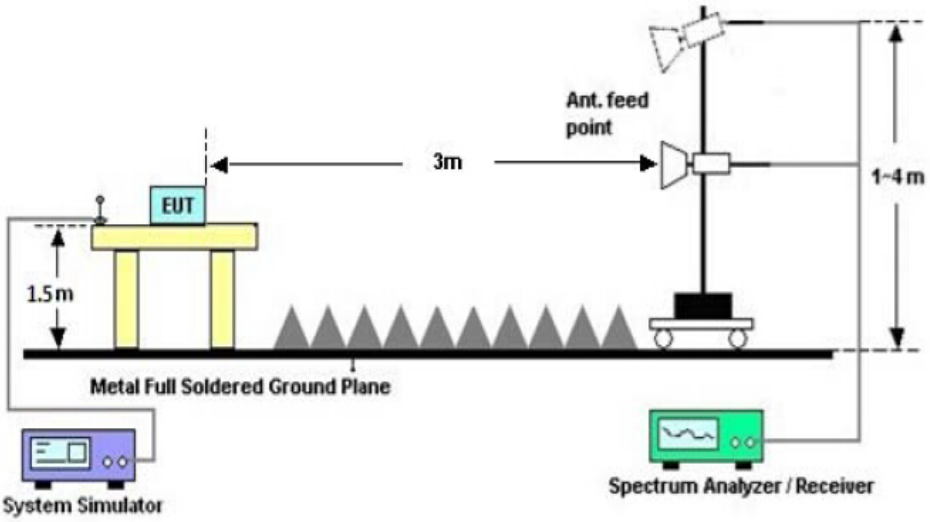
RADIATED EMISSION TEST SETUP BELOW30MHz



RADIATED EMISSION TEST SETUP 30MHz-1000MHz



RADIATED EMISSION TEST SETUP ABOVE 1000MHz



7.3 LIMITS AND MEASUREMENT RESULT

15.209 Limit in the below table has to be followed

Frequencies (MHz)	Field Strength (micorvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

Note: All modes were tested For restricted band radiated emission,
the test records reported below are the worst result compared to other modes.

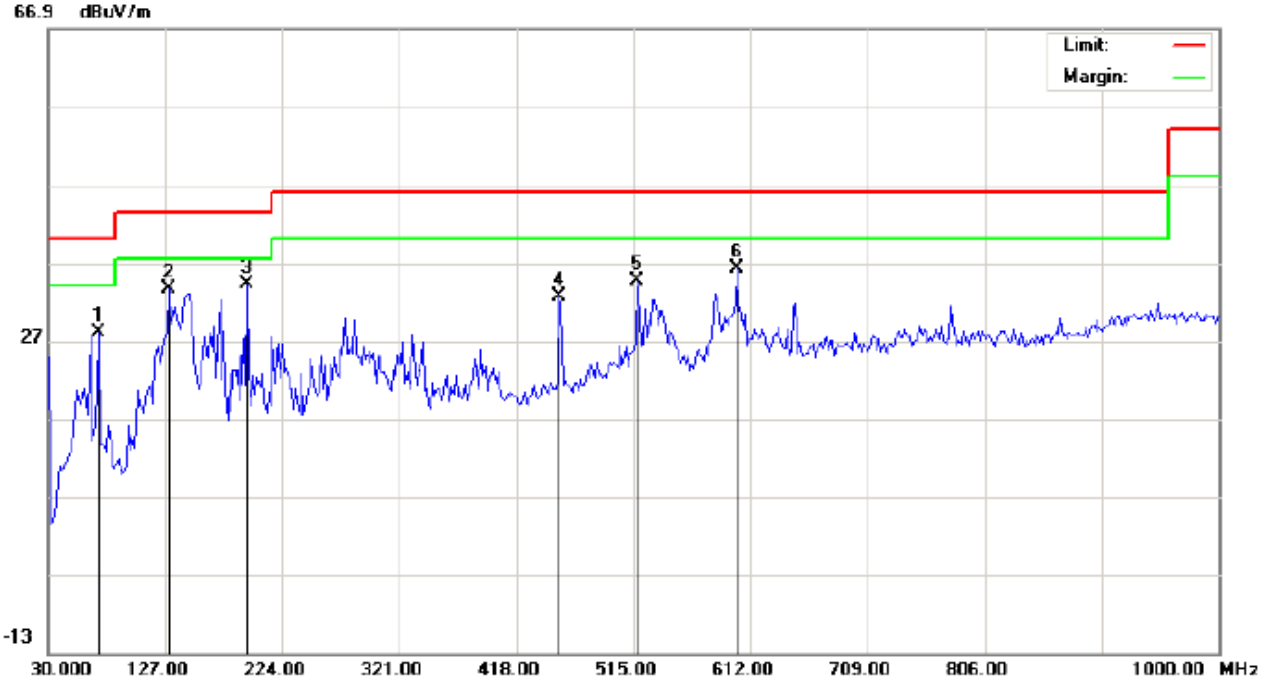
7.4 TEST RESULT (Worst Modulation: GFSK)

RADIATED EMISSION BELOW 30MHZ

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

RADIATED EMISSION BELOW 1GHZ

RADIATED EMISSION TEST- (30MHZ-1GHZ)-LOW CHANNEL-HORIZONTAL



Site: site #1
Limit: FCC Class B 3M Radiation
EUT: HBC Remote
M/N: HBCR001
Mode: Low Channel TX
Note:

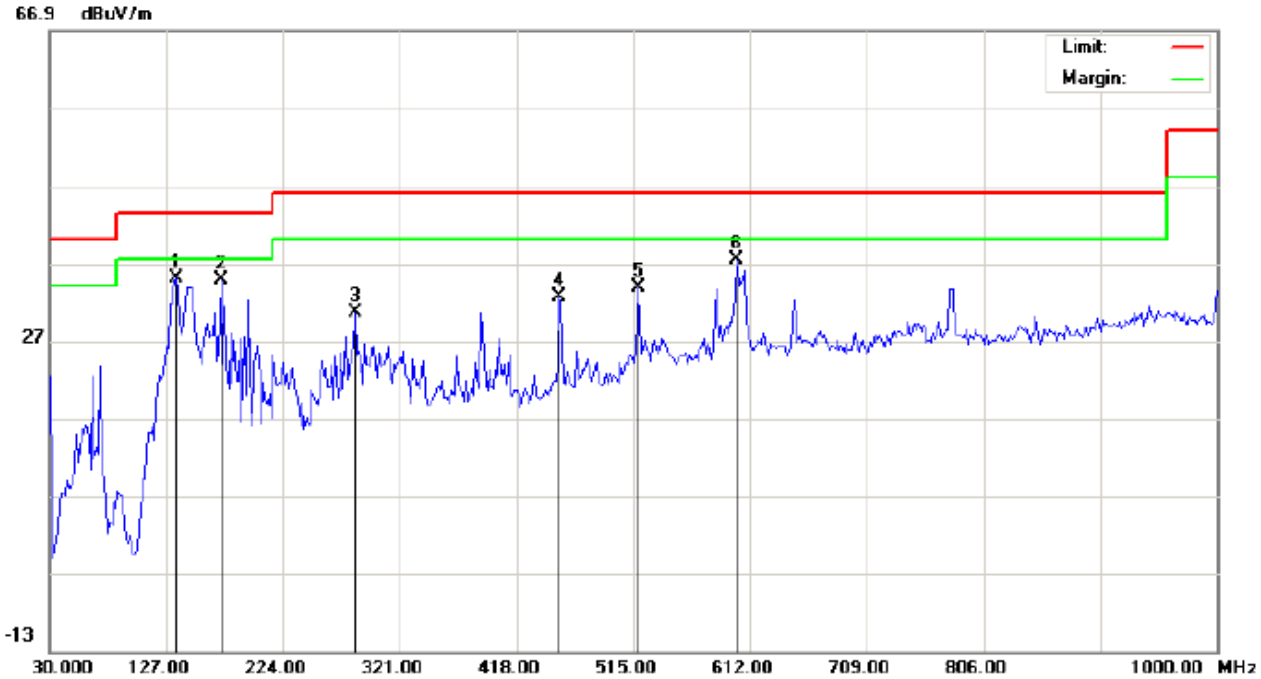
Polarization: *Horizontal*
Power:
Distance: 3m

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		72.0333	17.82	10.17	27.99	40.00	-12.01	peak			
2		130.2333	19.95	13.57	33.52	43.50	-9.98	peak			
3	*	194.9000	22.46	11.76	34.22	43.50	-9.28	peak			
4		453.5667	12.03	20.63	32.66	46.00	-13.34	peak			
5		518.2333	13.00	21.62	34.62	46.00	-11.38	peak			
6		600.6833	12.48	23.73	36.21	46.00	-9.79	peak			

RESULT: PASS

RADIATED EMISSION TEST- (30MHZ-1GHZ)-LOW CHANNEL -VERTICAL



Site: site #1
Limit: FCC Class B 3M Radiation
EUT: HBC Remote
M/N: HBCR001
Mode: Low Channel TX
Note:

Polarization: *Vertical*
Power:
Distance: 3m

Temperature: 26
Humidity: 60 %

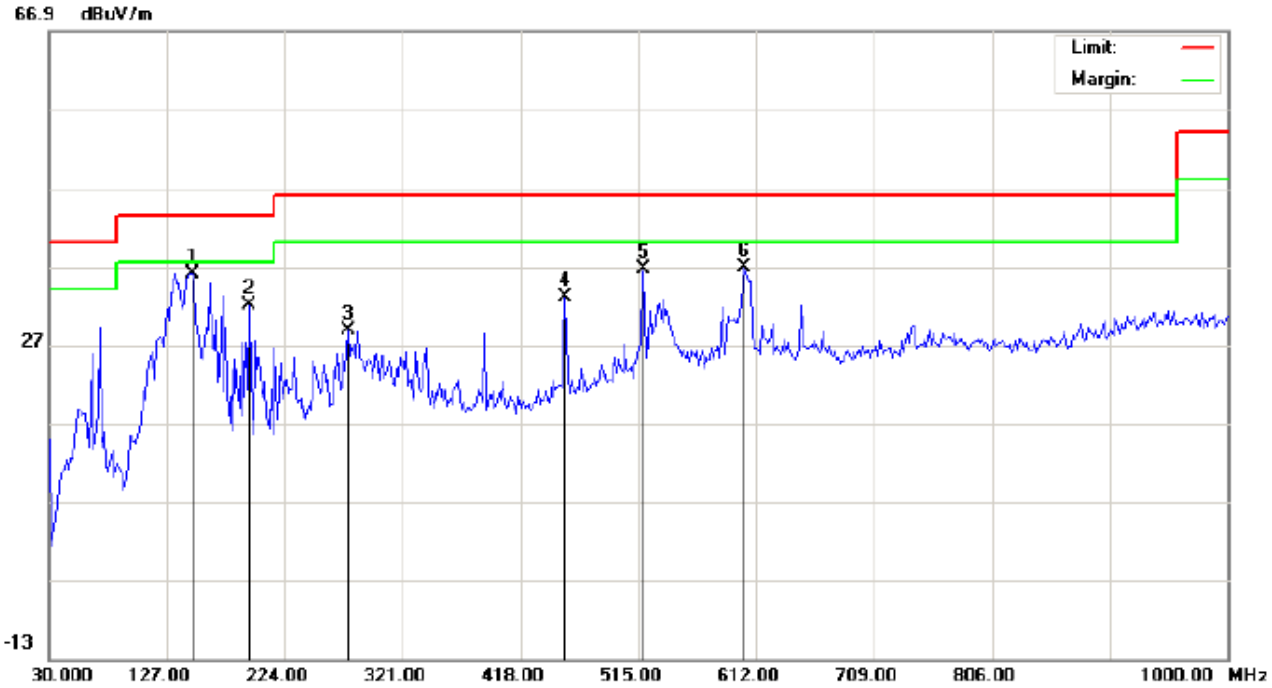
No.	Mk.	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1	*	135.0833	21.93	13.15	35.08	43.50	-8.42	peak			
2		172.2667	20.30	14.56	34.86	43.50	-8.64	peak			
3		283.8167	15.78	14.92	30.70	46.00	-15.30	peak			
4		453.5667	11.89	20.63	32.52	46.00	-13.48	peak			
5		519.8500	12.19	21.67	33.86	46.00	-12.14	peak			
6		600.6833	14.72	22.75	37.47	46.00	-8.53	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 TEST- (30MHZ-1GHZ)-MIDDLE CHANNEL-HORIZONTAL



Site: site #1
Limit: FCC Class B 3M Radiation
EUT: HBC Remote
M/N: HBCR001
Mode: Middle Channel TX
Note:

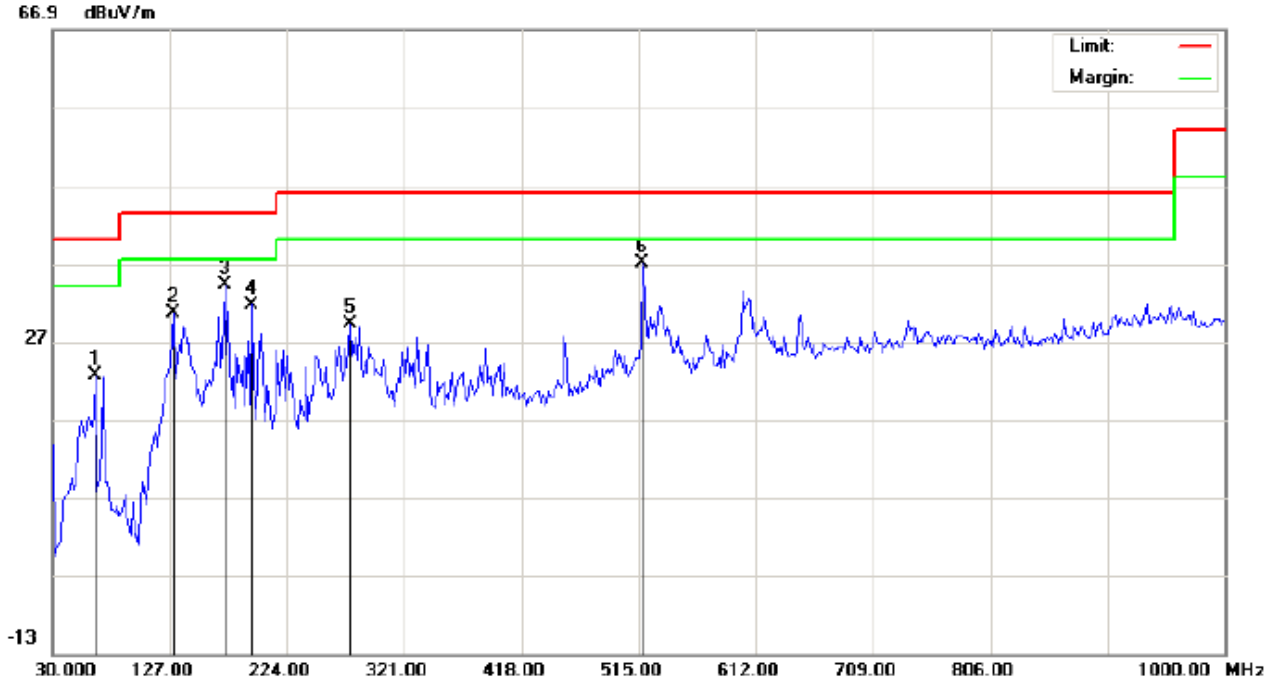
Polarization: *Horizontal*
Power:
Distance: 3m

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	*	148.0167	20.84	15.25	36.09	43.50	-7.41	peak			
2		194.9000	20.29	11.76	32.05	43.50	-11.45	peak			
3		275.7333	14.16	14.68	28.84	46.00	-17.16	peak			
4		455.1833	12.32	20.65	32.97	46.00	-13.03	peak			
5		519.8500	14.91	21.67	36.58	46.00	-9.42	peak			
6		602.3000	13.05	23.74	36.79	46.00	-9.21	peak			

RESULT: PASS

RADIATED EMISSION TEST- (30MHZ-1GHZ)- MIDDLE CHANNEL -VERTICAL



Site: site #1
Limit: FCC Class B 3M Radiation
EUT: HBC Remote
M/N: HBCR001
Mode: Middle Channel TX
Note:

Polarization: *Vertical*
Power:
Distance: 3m

Temperature: 26
Humidity: 60 %

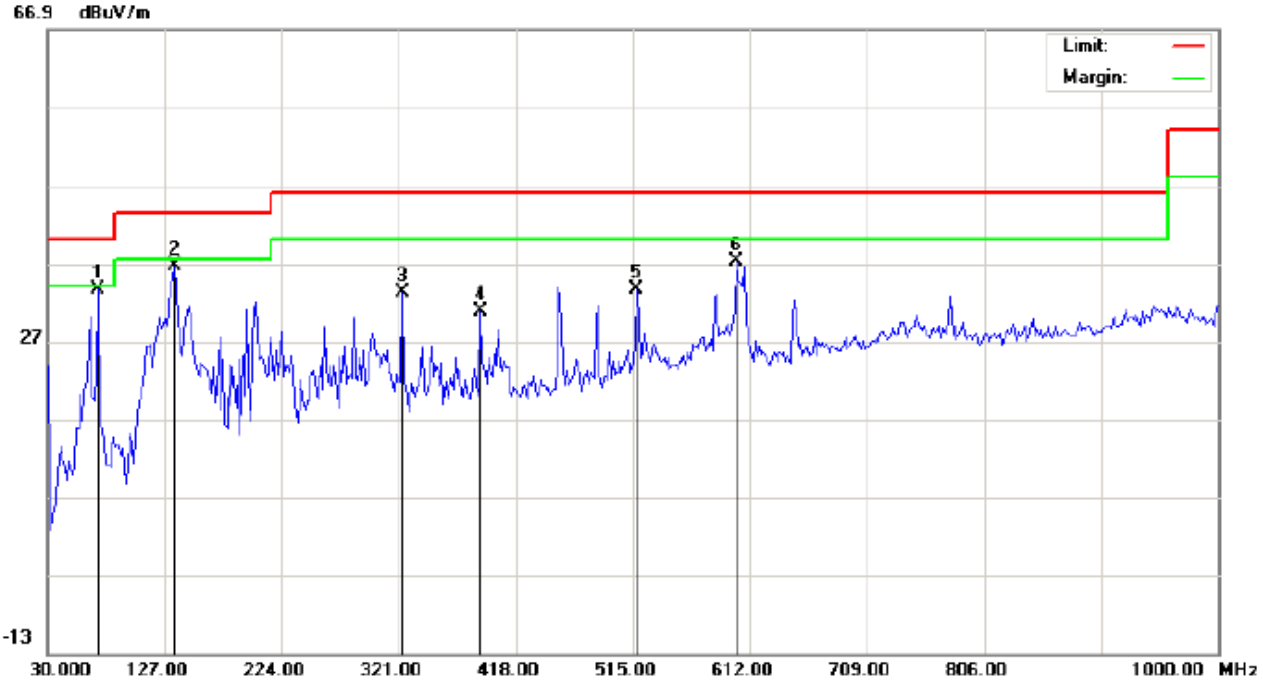
No.	Mk.	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1		65.5667	16.70	5.98	22.68	40.00	-17.32	peak			
2		130.2333	19.54	11.13	30.67	43.50	-12.83	peak			
3		172.2667	19.72	14.56	34.28	43.50	-9.22	peak			
4		194.9000	21.41	10.29	31.70	43.50	-11.80	peak			
5		275.7333	14.55	14.68	29.23	46.00	-16.77	peak			
6	*	518.2333	15.45	21.62	37.07	46.00	-8.93	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 TEST- (30MHZ-1GHZ)-HIGH CHANNEL-HORIZONTAL



Site: site #1
Limit: FCC Class B 3M Radiation
EUT: HBC Remote
M/N: HBCR001
Mode: High Channel TX
Note:

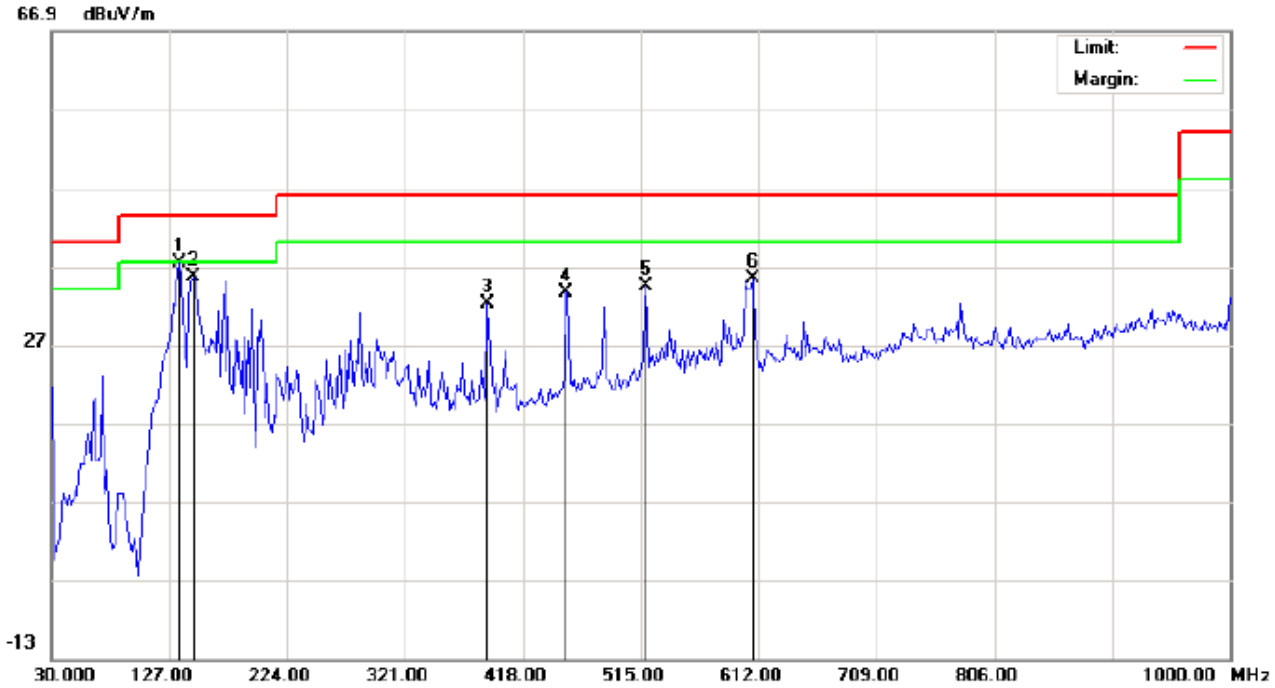
Polarization: *Horizontal*
Power:
Distance: 3m

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	*	72.0333	23.44	10.17	33.61	40.00	-6.39	peak			
2		135.0833	22.20	14.38	36.58	43.50	-6.92	peak			
3		324.2333	16.14	17.02	33.16	46.00	-12.84	peak			
4		388.9000	11.80	19.00	30.80	46.00	-15.20	peak			
5		518.2333	11.89	21.62	33.51	46.00	-12.49	peak			
6		600.6833	13.43	23.73	37.16	46.00	-8.84	peak			

RESULT: PASS

RADIATED EMISSION TEST- (30MHZ-1GHZ)-HIGH CHANNEL -VERTICAL



Site: site #1
Limit: FCC Class B 3M Radiation
EUT: HBC Remote
M/N: HBCR001
Mode: High Channel TX
Note:

Polarization: *Vertical*
Power:
Distance: 3m

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	*	135.0833	24.31	13.15	37.46	43.50	-6.04	peak			
2		146.4000	20.39	15.24	35.63	43.50	-7.87	peak			
3		388.9000	13.22	19.00	32.22	46.00	-13.78	peak			
4		453.5667	13.03	20.63	33.66	46.00	-12.34	peak			
5		519.8500	12.68	21.67	34.35	46.00	-11.65	peak			
6		607.1500	12.50	22.89	35.39	46.00	-10.61	peak			

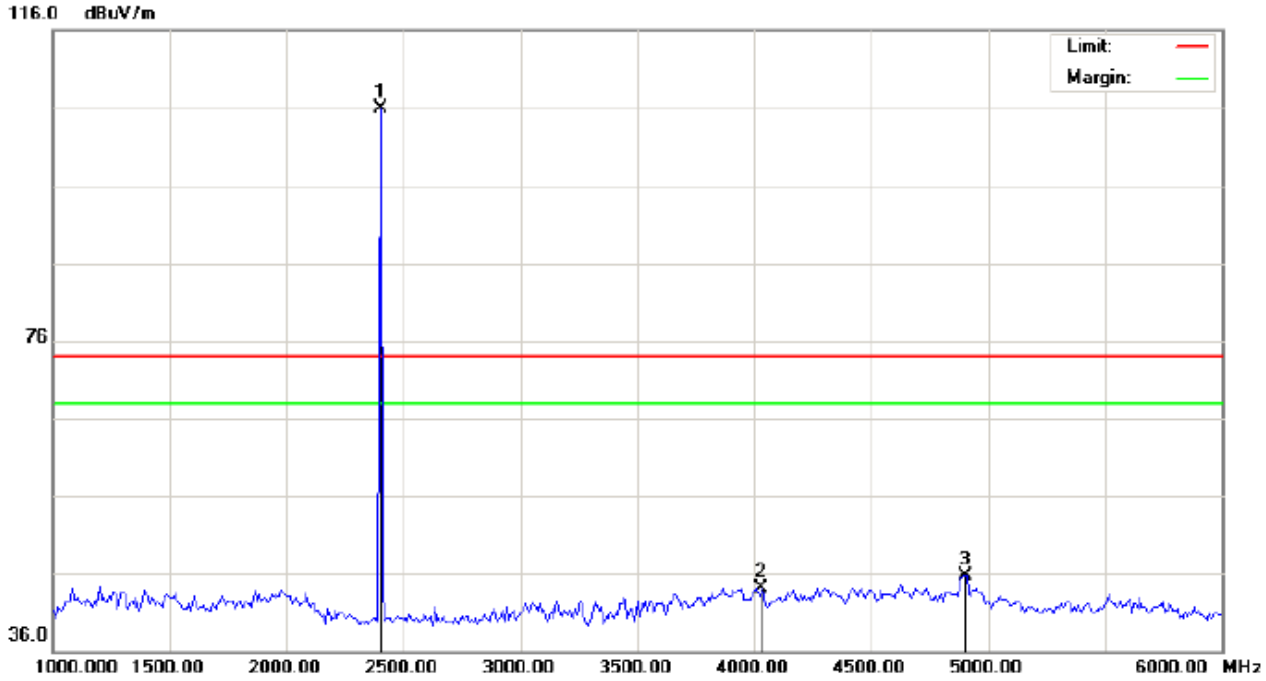
RESULT: PASS

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

RADIATED EMISSION TEST- (ABOVE 1GHZ)-LOW CHANNEL-HORIZONTAL



Site: site #1
Limit: FCC Class B 3M Radiation above 1GHZ(PK)
EUT: HBC Remote
M/N: HBCR001
Mode: Low Channel TX
Note:

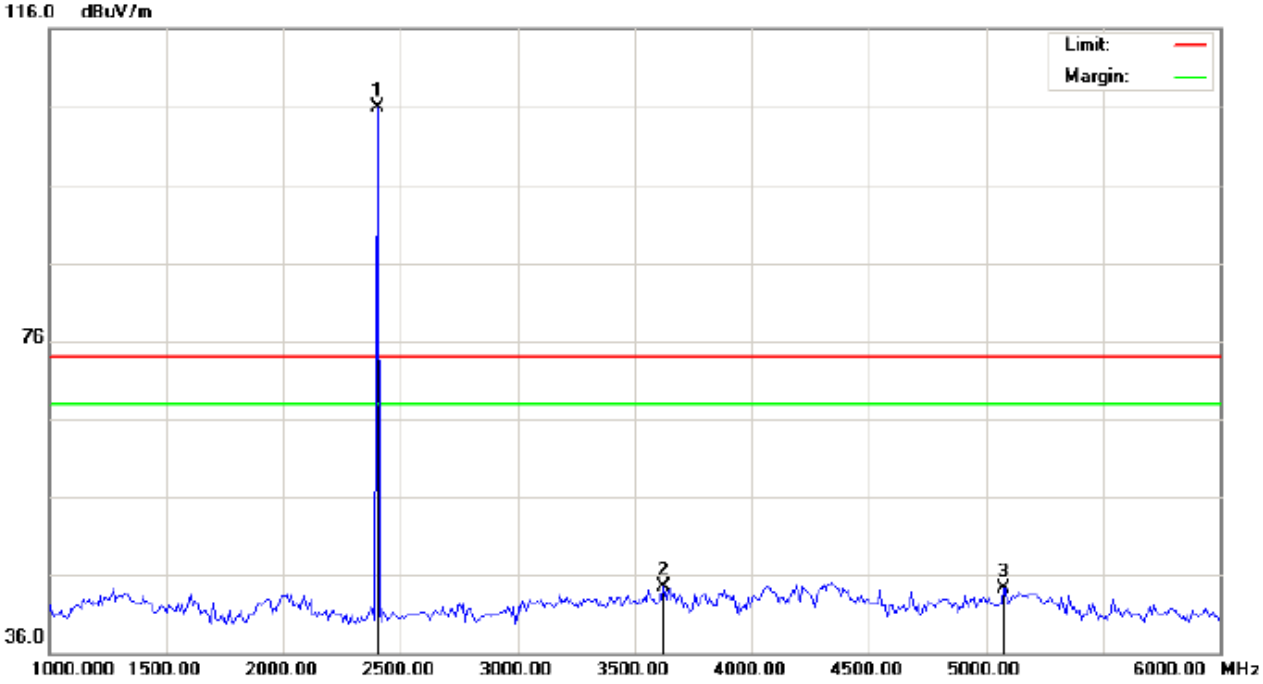
Polarization: *Horizontal*
Power:
Distance:

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	*	2402.000	95.61	10.32	105.93	74.00	31.93	peak			
2		4033.333	29.49	14.64	44.13	74.00	-29.87	peak			
3		4900.000	37.84	7.94	45.78	74.00	-28.22	peak			

RESULT: PASS

RADIATED EMISSION TEST-(ABOVE 1GHZ)-LOW CHANNEL-VERTICAL



Site: site #1
Limit: FCC Class B 3M Radiation above 1GHZ(PK)
EUT: HBC Remote
M/N: HBCR001
Mode: Low Channel TX
Note:

Polarization: *Vertical*
Power:
Distance:

Temperature: 26
Humidity: 60 %

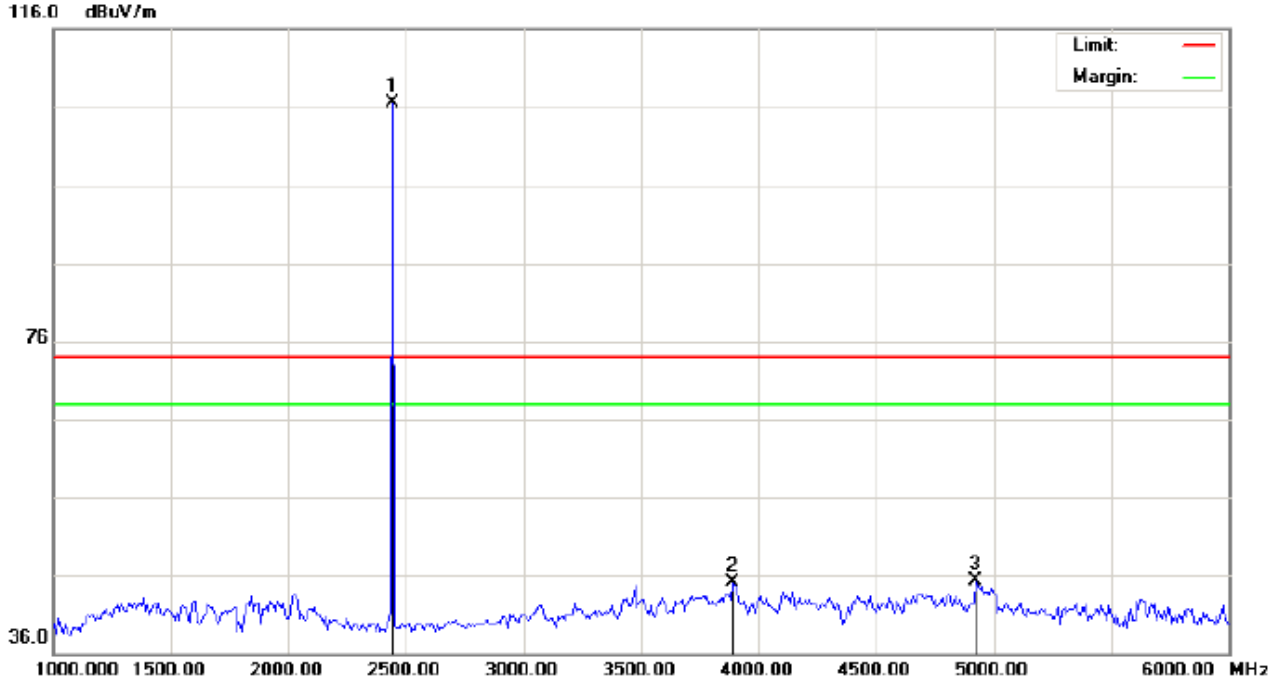
No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
	-	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1	*	2402.000	95.67	10.32	105.99	74.00	31.99	peak			
2		3625.000	31.66	12.88	44.54	74.00	-29.46	peak			
3		5075.000	37.66	6.70	44.36	74.00	-29.64	peak			

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 TEST-(ABOVE 1GHZ)-MIDDLE CHANNEL-HORIZONTAL



Site: site #1
Limit: FCC Class B 3M Radiation above 1GHZ(PK)
EUT: HBC Remote
M/N: HBCR001
Mode: Middle Channel TX
Note:

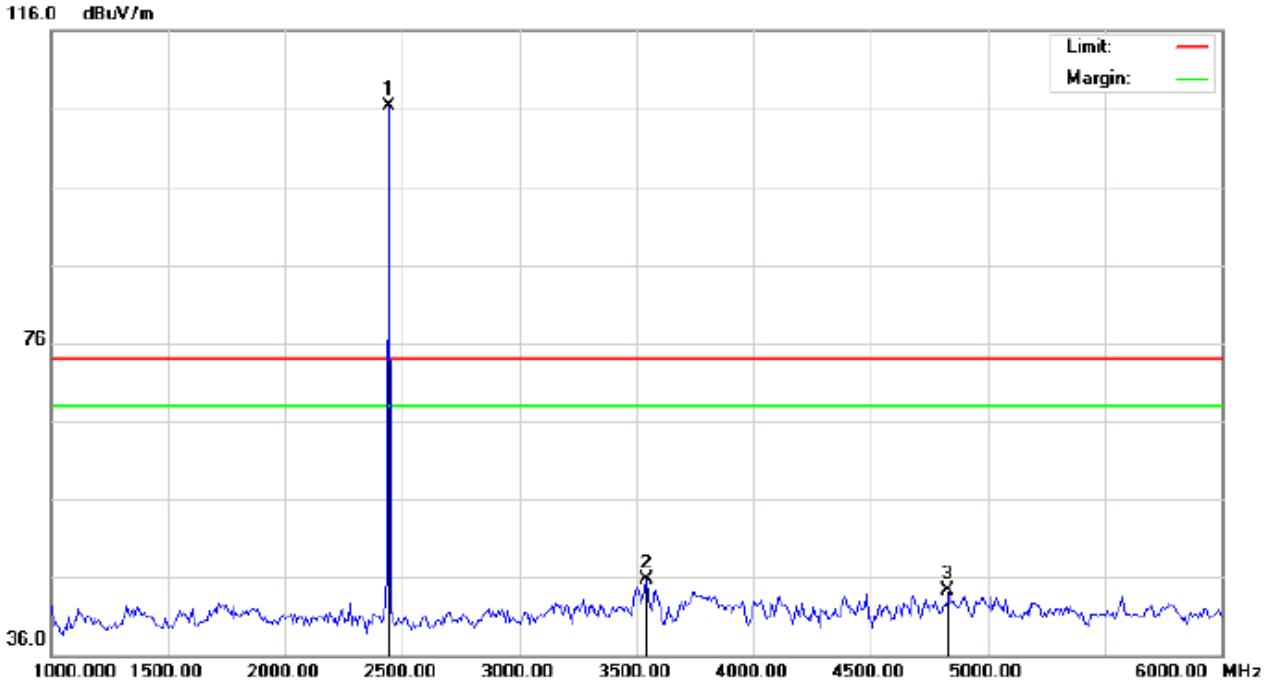
Polarization: *Horizontal*
Power:
Distance:

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	*	2440.000	96.22	10.37	106.59	74.00	32.59	peak			
2		3891.667	30.58	14.52	45.10	74.00	-28.90	peak			
3		4925.000	37.26	8.00	45.26	74.00	-28.74	peak			

RESULT: PASS

RADIATED EMISSION TEST-(ABOVE 1GHZ)-MIDDLE CHANNEL-VERTICAL



Site: site #1
Limit: FCC Class B 3M Radiation above 1GHZ(PK)
EUT: HBC Remote
M/N: HBCR001
Mode: Middle Channel TX
Note:

Polarization: *Vertical*
Power:
Distance:

Temperature: 26
Humidity: 60 %

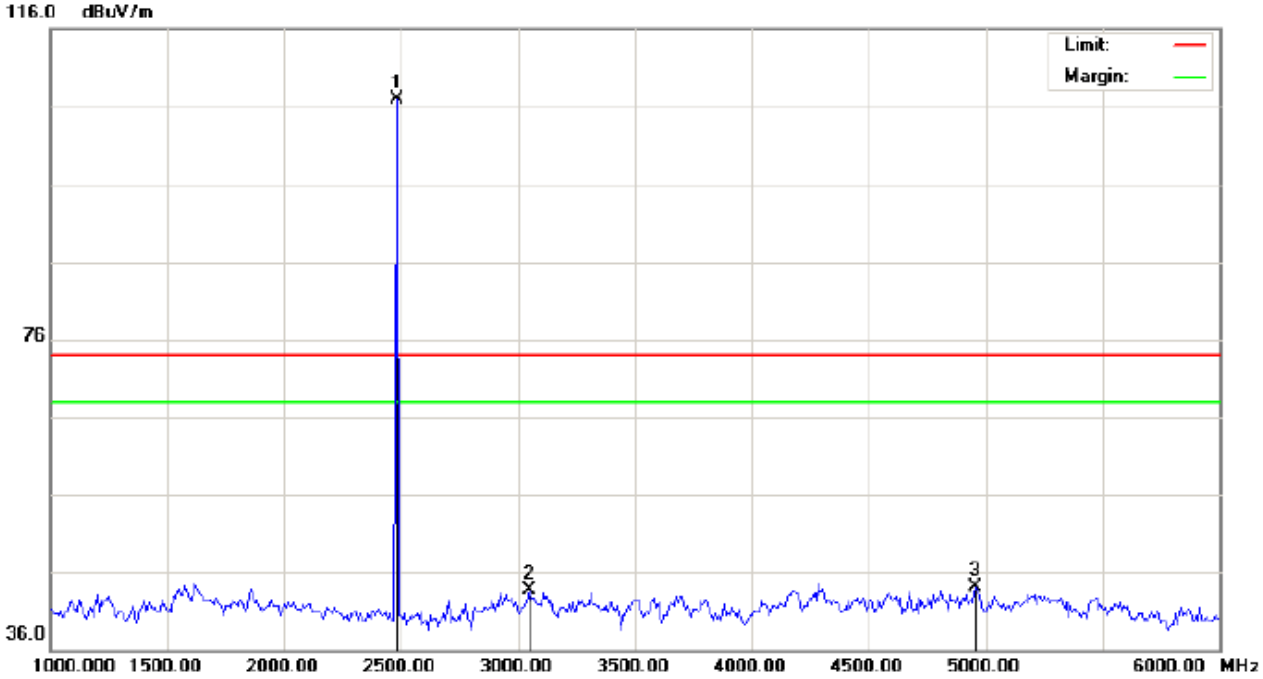
No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1	*	2440.000	95.88	10.37	106.25	74.00	32.25	peak			
2		3541.667	33.30	12.37	45.67	74.00	-28.33	peak			
3		4833.333	36.53	7.76	44.29	74.00	-29.71	peak			

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 TEST-(ABOVE 1GHZ)-HIGH CHANNEL-HORIZONTAL



Site: site #1
Limit: FCC Class B 3M Radiation above 1GHZ(PK)
EUT: HBC Remote
M/N: HBCR001
Mode: High Channel TX
Note:

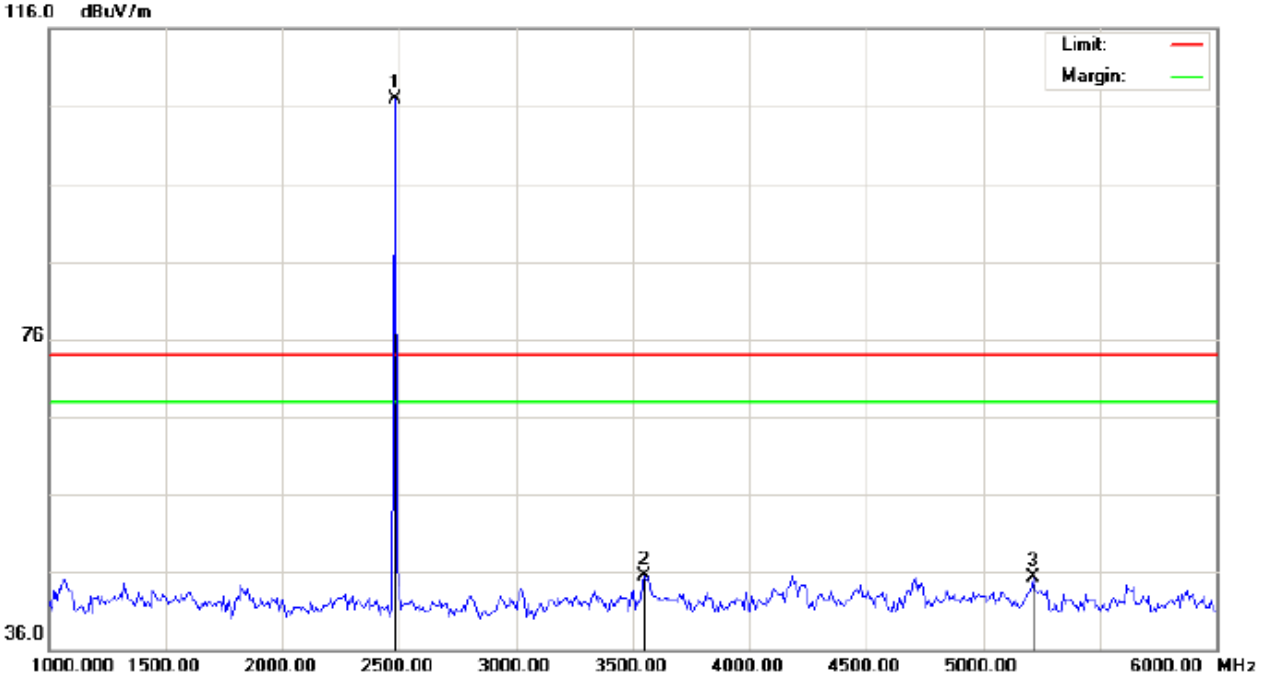
Polarization: *Horizontal*
Power:
Distance:

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	*	2480.000	96.43	10.41	106.84	74.00	32.84	peak			
2		3050.000	31.96	11.69	43.65	74.00	-30.35	peak			
3		4958.333	36.07	8.09	44.16	74.00	-29.84	peak			

RESULT: PASS

RADIATED EMISSION TEST-(ABOVE 1GHZ)-HIGH CHANNEL-VERTICAL



Site: site #1
Limit: FCC Class B 3M Radiation above 1GHZ(PK)
EUT: HBC Remote
M/N: HBCR001
Mode: High Channel TX
Note:

Polarization: *Vertical*
Power:
Distance:

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	*	2480.000	96.47	10.41	106.88	74.00	32.88	peak			
2		3550.000	33.15	12.42	45.57	74.00	-28.43	peak			
3		5216.667	41.44	3.86	45.30	74.00	-28.70	peak			

RESULT: PASS

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.

8. BAND EDGE EMISSION

8.1. MEASUREMENT PROCEDURE

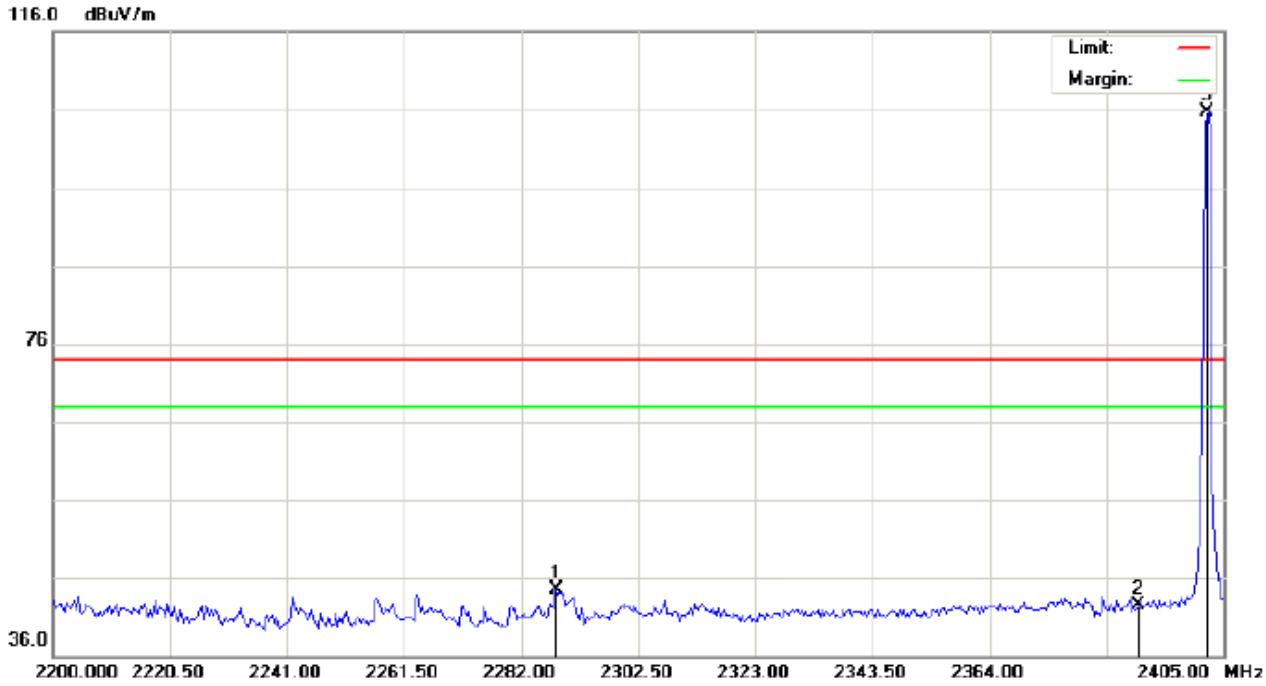
1. Set the EUT Work on the top, the bottom operation frequency individually.
2. Set SPA Start or Stop Frequency=Operation Frequency, RBW>=100kHz, VBW>=3*RBW, Center frequency =Operation frequency
3. The band edges was measured and recorded.

8.2. TEST SET-UP

Radiated same as 7.2

8.3. TEST RESULT

TEST PLOT OF BAND EDGE FOR LOW CHANNEL -Horizontal



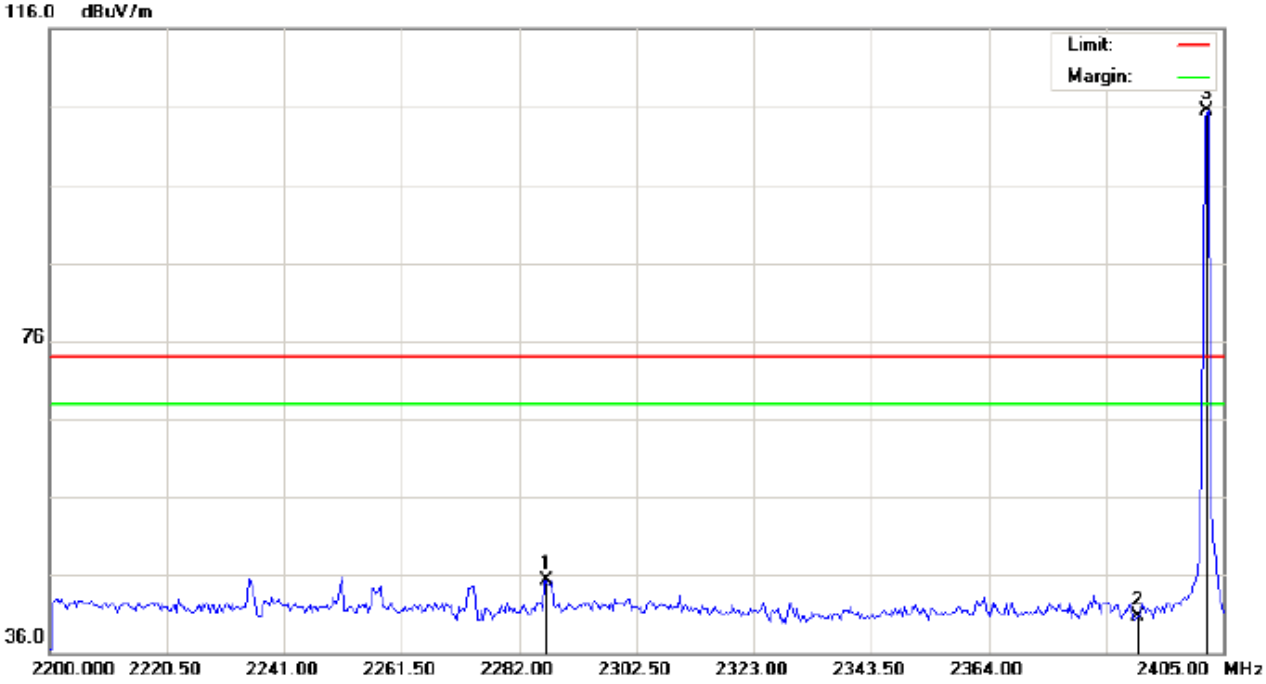
Site: site #1
Limit: FCC Class B 3M Radiation above 1GHZ(PK)
EUT: HBC Remote
M/N: HBCR001
Mode: Low Channel TX
Note:

Polarization: *Horizontal*
Power:
Distance:

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		2288.150	34.40	10.20	44.60	74.00	-29.40	peak			
2		2390.000	32.12	10.31	42.43	74.00	-31.57	peak			
3	*	2402.000	95.41	10.32	105.73	74.00	31.73	peak			

TEST PLOT OF BAND EDGE FOR LOW CHANNEL - Vertical



Site: site #1
Limit: FCC Class B 3M Radiation above 1GHZ(PK)
EUT: HBC Remote
M/N: HBCR001
Mode: Low Channel TX
Note:

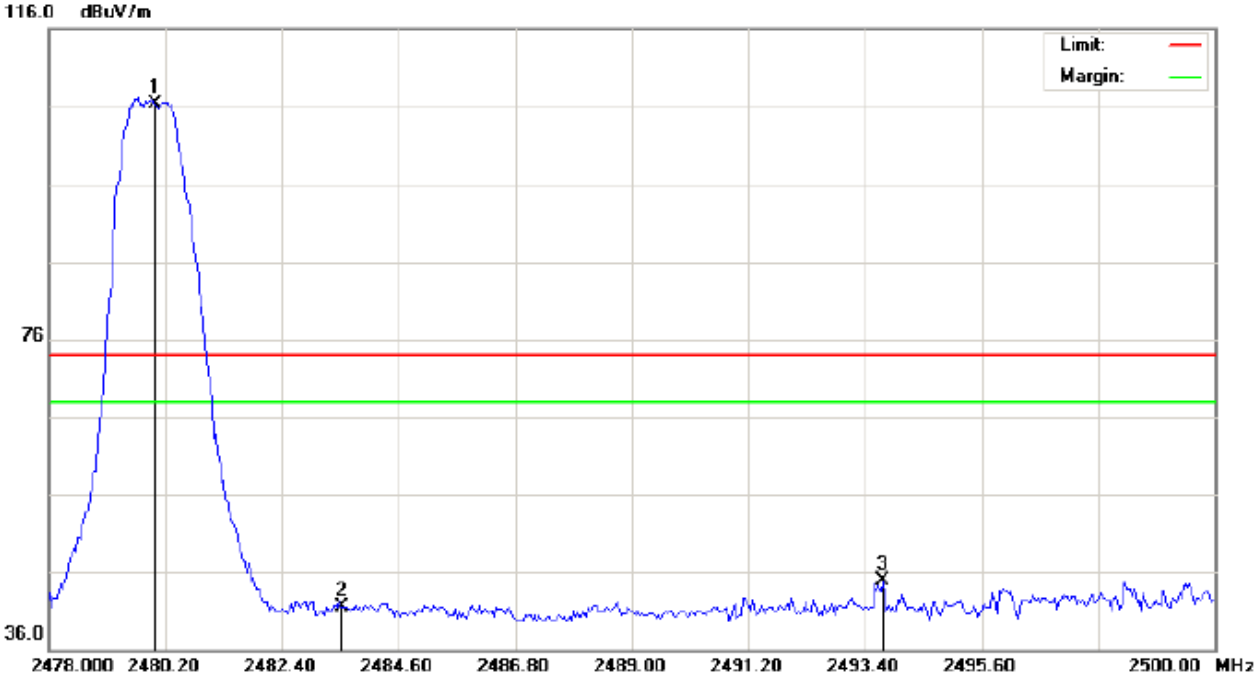
Polarization: *Vertical*
Power:
Distance:

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		2286.783	35.15	10.20	45.35	74.00	-28.65	peak			
2		2390.000	30.35	10.31	40.66	74.00	-33.34	peak			
3	*	2402.000	95.26	10.32	105.58	74.00	31.58	peak			

RESULT: PASS

TEST PLOT OF BAND EDGE FOR HIGH CHANNEL –Horizontal



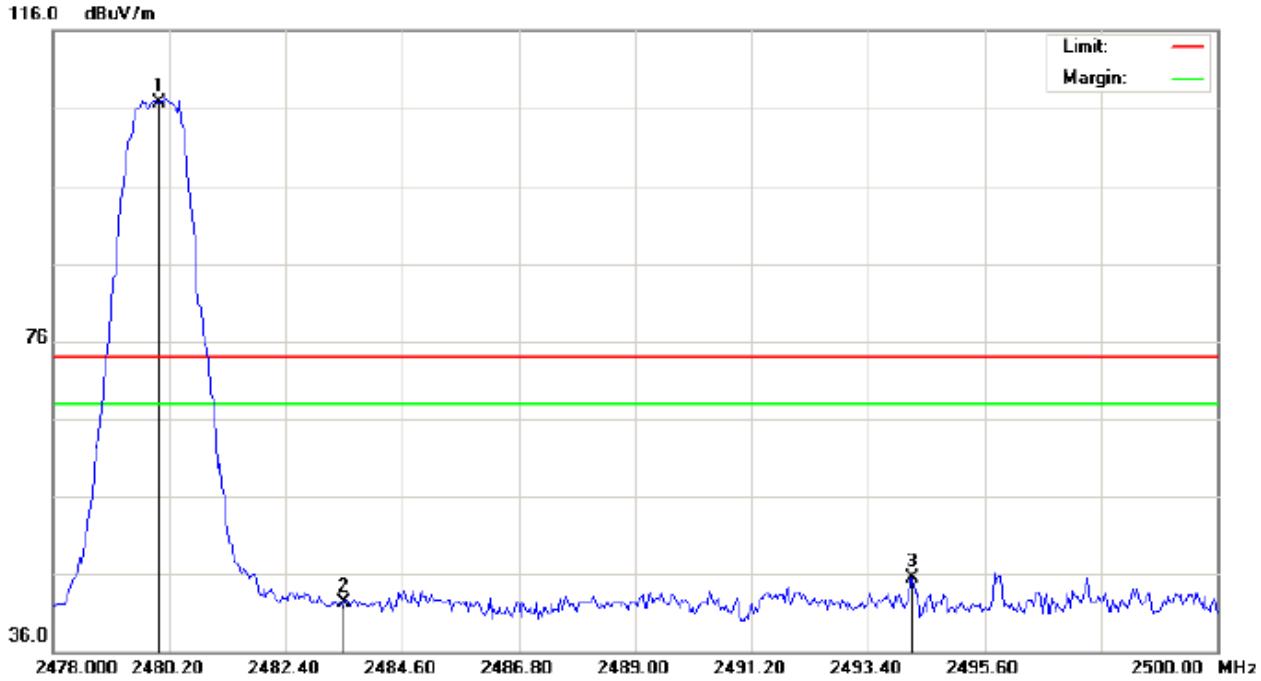
Site: site #1
Limit: FCC Class B 3M Radiation above 1GHZ(PK)
EUT: HBC Remote
M/N: HBCR001
Mode: High Channel TX
Note:

Polarization: *Horizontal*
Power:
Distance:

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	*	2480.000	95.96	10.41	106.37	74.00	32.37	peak			
2		2483.530	31.13	10.41	41.54	74.00	-32.46	peak			
3		2493.730	34.49	10.42	44.91	74.00	-29.09	peak			

TEST PLOT OF BAND EDGE FOR HIGH CHANNEL -Vertical



Site: site #1
Limit: FCC Class B 3M Radiation above 1GHZ(PK)
EUT: HBC Remote
M/N: HBCR001
Mode: High Channel TX
Note:

Polarization: *Vertical*
Power:
Distance:

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	*	2480.000	96.35	10.41	106.76	74.00	32.76	peak			
2		2483.500	31.87	10.41	42.28	74.00	-31.72	peak			
3		2494.243	35.17	10.42	45.59	74.00	-28.41	peak			

RESULT: PASS

9. 20DB BANDWIDTH

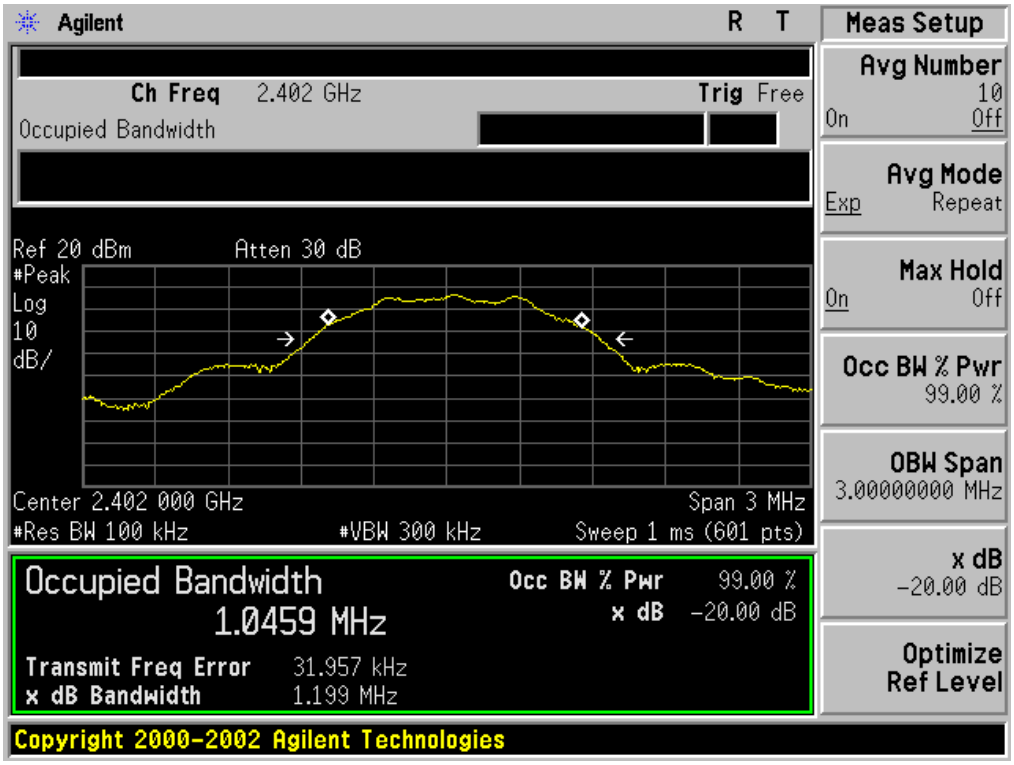
9.1. TEST PROCEDURE

1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
2. 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≥3*RBW.
4. Set SPA Trace 1 Max hold, then View.

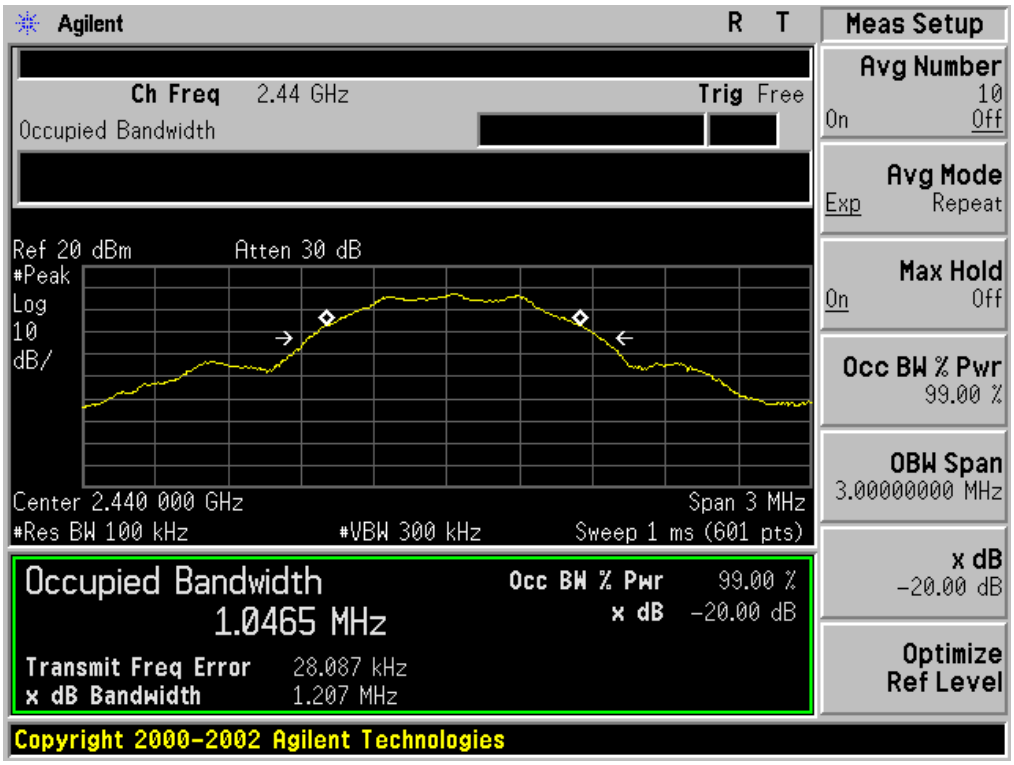
9.2. SUMMARY OF TEST RESULTS/PLOTS

Channel	20dB Bandwidth (MHz)	Minimum Limit (KHz)	Pass/Fail
Low	1.199	500KHz	Pass
Middle	1.207		Pass
High	1.209		Pass

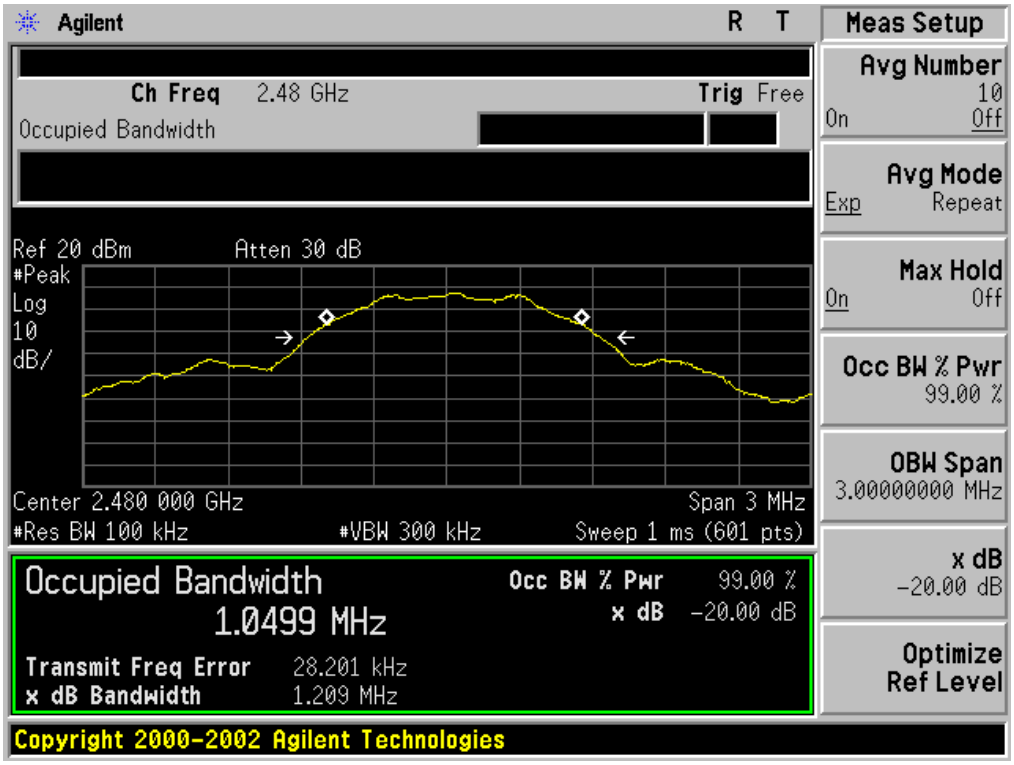
TEST PLOT OF BANDWIDTH FOR LOW CHANNEL



TEST PLOT OF BANDWIDTH FOR MIDDLE CHANNEL



TEST PLOT OF BANDWIDTH FOR HIGH CHANNEL



10. CONDUCTED OUTPUT POWER

10.1. MEASUREMENT PROCEDURE

For peak power test:

1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
2. Set the EUT Work on the top, middle and the bottom operation frequency individually.
3. Use the following spectrum analyzer settings:
   a) Set the RBW ≥ DTS bandwidth.
   b) Set VBW ≥ 3 RBW.
   c) Set span ≥ 3 x RBW
   d) Sweep time = auto couple.
   e) Detector = peak.
   f) Trace mode = max hold.
   g) Allow trace to fully stabilize.
   h) Use peak marker function to determine the peak amplitude level.
4. Allow the trace to stabilize.
5. Record the result form the Spectrum Analyzer.

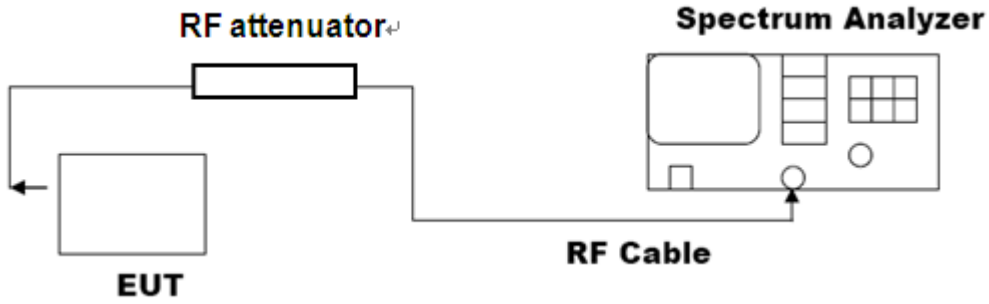
For average power test:

1. Connect EUT RF output port to power probe through an RF attenuator.
2. Connect the power probe to the PC.
3. Set the EUT Work on the top, the middle and the bottom operation frequency individually.
4. Record the maximum power from the software.
5. The maximum peak power shall be less 1W (30dBm).

Note：The EUT was tested according to KDB 558074 for compliance to FCC 47CFR 15.247 requirements

10.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)

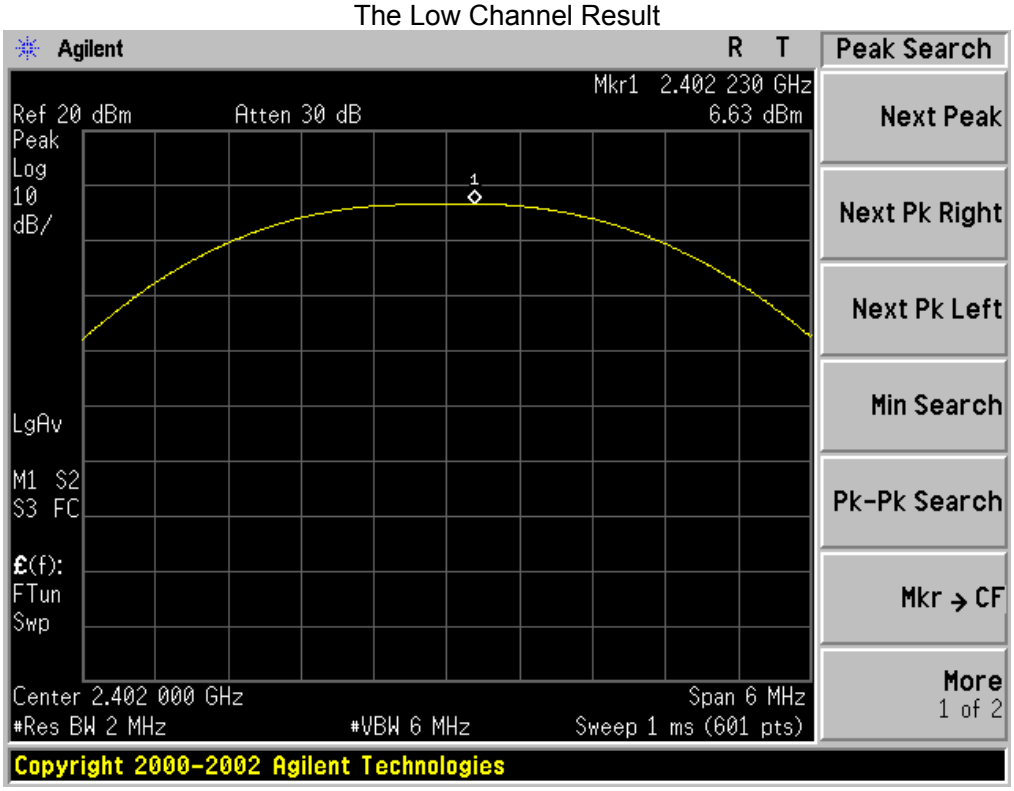
Setup Diagram for Peak Power



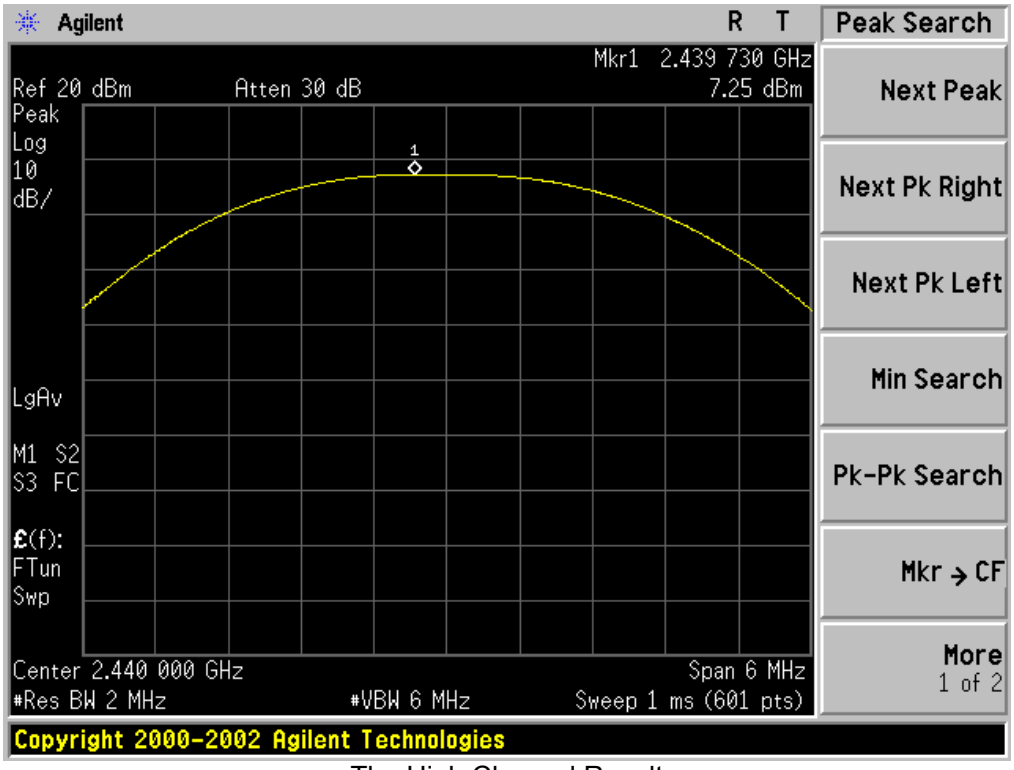
10.3. LIMITS AND MEASUREMENT RESULT

Channel	Peak Power (dBm)	Applicable Limits (dBm)	Pass/Fail
Low Channel	6.63	30	Pass
Middle Channel	7.25	30	Pass
High Channel	7.55	30	Pass

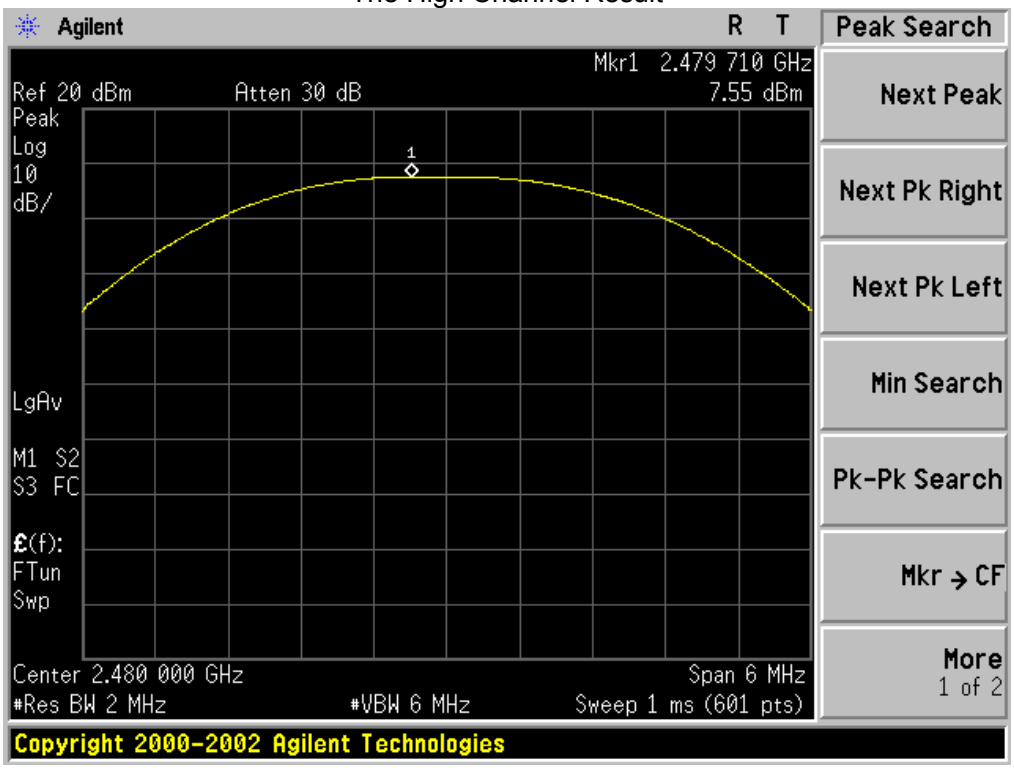
The Low Channel Result



The Middle Channel Result



The High Channel Result



11. MAXIMUM CONDUCTED OUTPUT POWER SPECTRAL DENSITY

11.1 MEASUREMENT PROCEDURE

(1). Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator

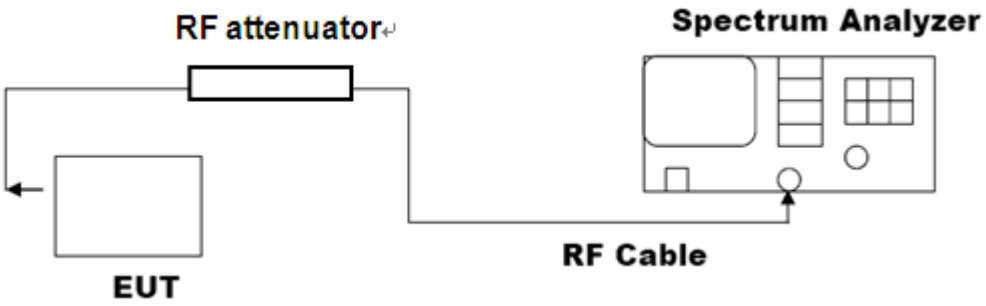
(2). Set the EUT Work on the top, the middle and the bottom operation frequency individually.

(3). Set the span to 1.5times the DTS bandwidth, RBW: 3kHz<=RBW<=100KHz, VBW>=3*RBW

4). Set SPA Trace 1 Max hold, then View.

Note: The EUT was tested according to KDB 558074 for compliance to FCC 47CFR 15.247 requirements.

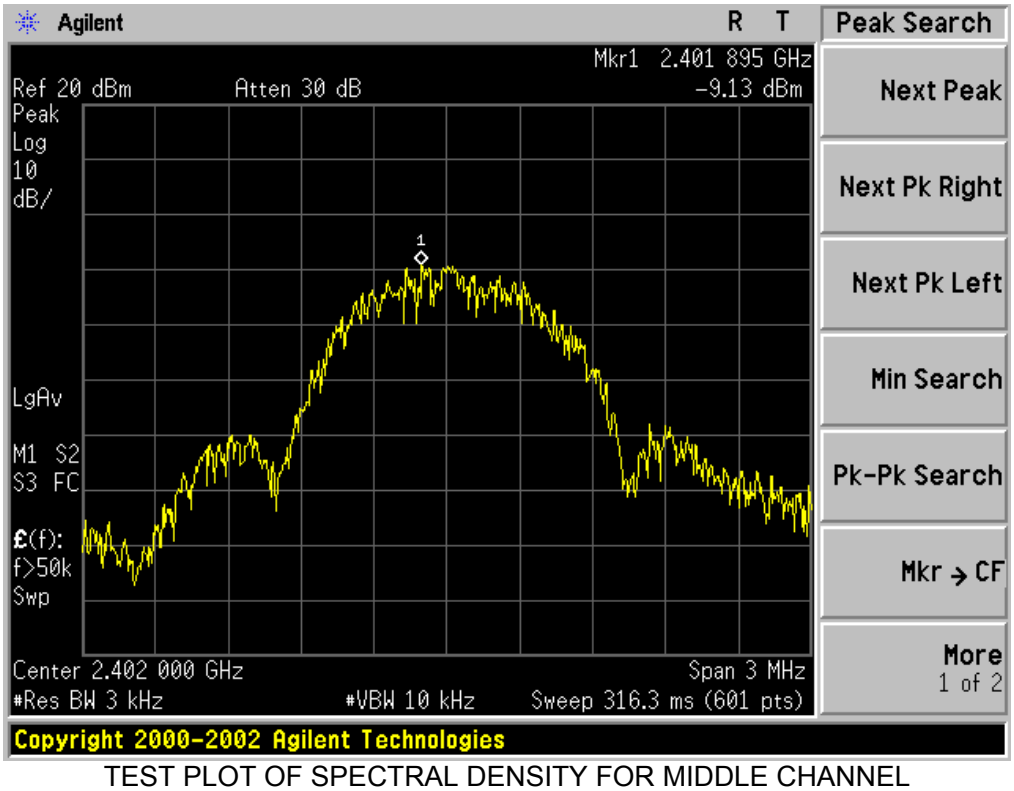
11.2 TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)



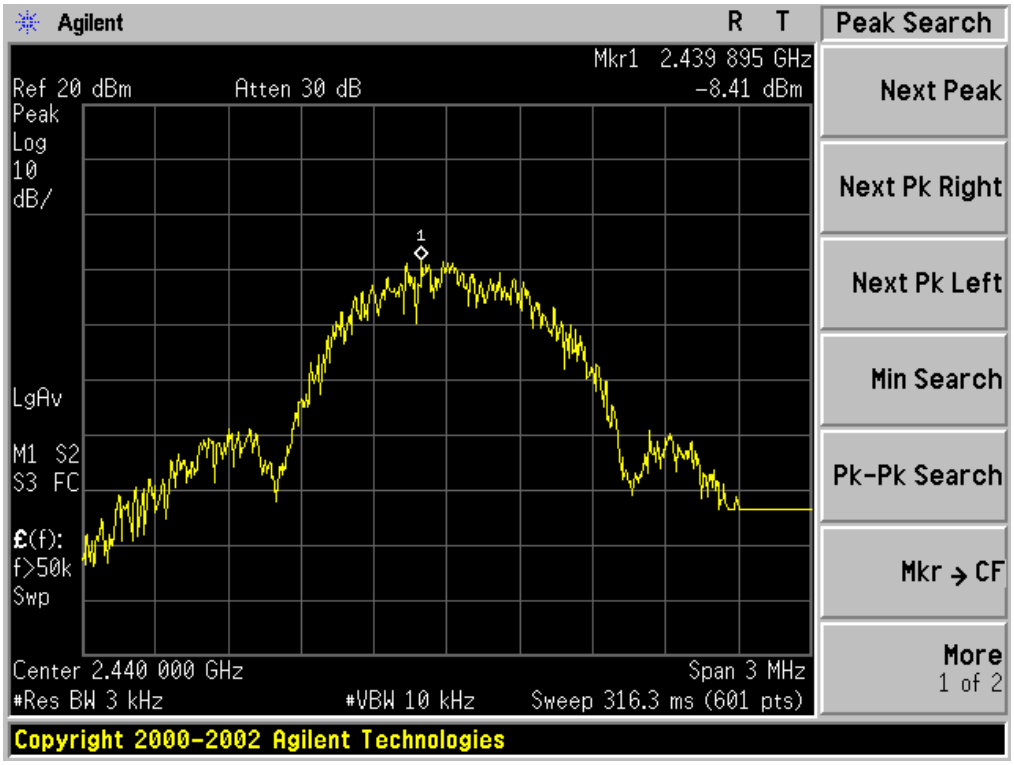
11.3 LIMITS AND MEASUREMENT RESULT

Channel No.	PSD (dBm/3KHz)	Limit (dBm/3KHz)	Result
Low Channel	-9.13	8	Pass
Middle Channel	-8.41	8	Pass
High Channel	-8.15	8	Pass

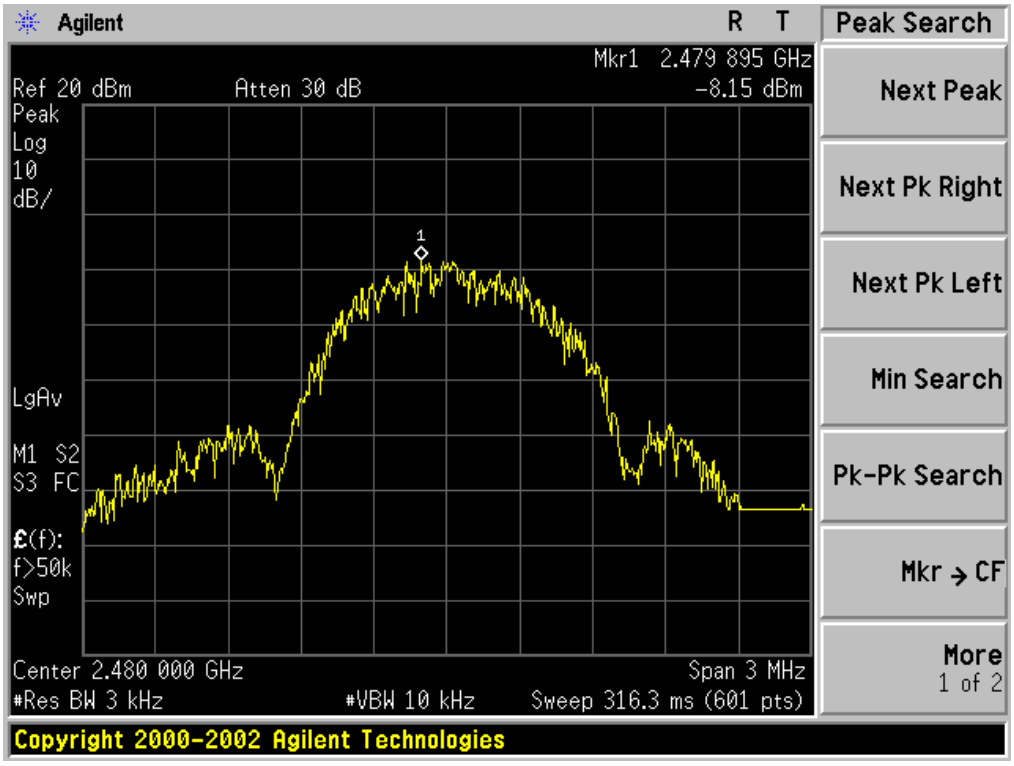
TEST PLOT OF SPECTRAL DENSITY FOR LOW CHANNEL



TEST PLOT OF SPECTRAL DENSITY FOR MIDDLE CHANNEL



TEST PLOT OF SPECTRAL DENSITY FOR HIGH CHANNEL



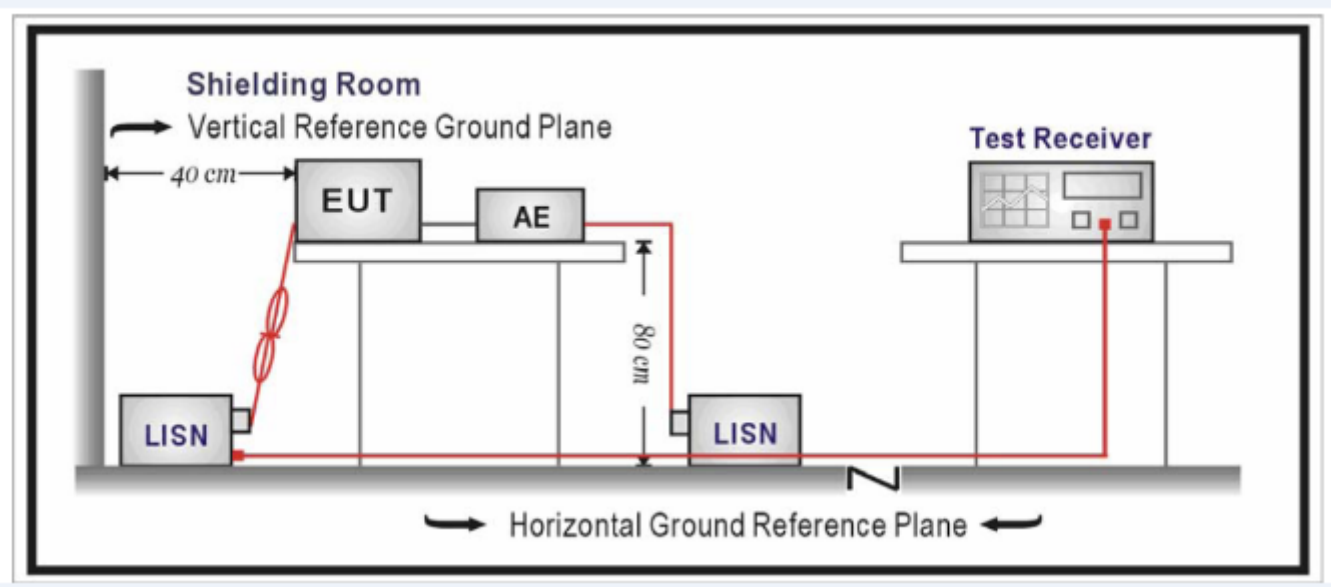
12. FCC LINE CONDUCTED EMISSION TEST

12.1 LIMITS

Frequency	Maximum RF Line Voltage	
	Q.P.(dBuV)	Average(dBuV)
150kHz~500kHz	66-56	56-46
500kHz~5MHz	56	46
5MHz~30MHz	60	50

***Note:** 1. The lower limit shall apply at the transition frequency.*
2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz

12.2 TEST SETUP



12.3 PRELIMINARY PROCEDURE

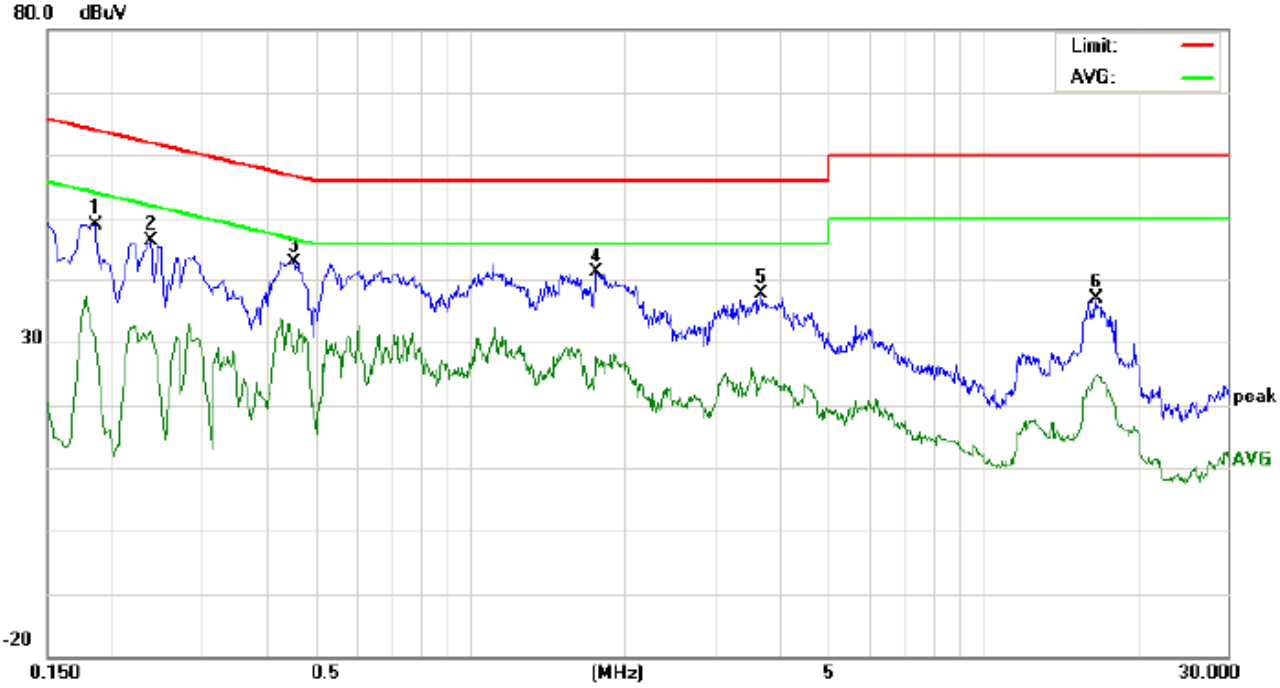
1) The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. When the EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10 (see Test Facility for the dimensions of the ground plane used). When the EUT is a floor-standing equipment, it is placed on the ground plane which has a 3-12 mm non-conductive covering to insulate the EUT from the ground plane.
2) Support equipment, if needed, was placed as per ANSI C63.10.
3) All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10.
4) All support equipments received AC120V/60Hz power from a LISN, if any.
5) The EUT received power by PC which received power by a LISN.
6) The test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
7) Analyzer / Receiver scanned from 150 kHz to 30MHz for emissions in each of the test modes.
8) During the above scans, the emissions were maximized by cable manipulation.
9) The following test mode(s) were scanned during the preliminary test.
   Then, the EUT configuration and cable configuration of the above highest emission level were recorded for reference of final testing.

12.4 FINAL TEST PROCEDURE

10) EUT and support equipment was set up on the test bench as per step 2 of the preliminary test.
11) 2) A scan was taken on both power lines, Line 1 and Line 2, recording at least the six highest emissions. Emission frequency and amplitude were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit. If EUT emission level was less –2dB to the A.V. limit in Peak mode, then the emission signal was re-checked using Q.P and Average detector.
12) 3) The test data of the worst case condition(s) was reported on the Summary Data page.

12.5 TEST RESULT OF POWER LINE

Line Conducted Emission Test Line 1-L



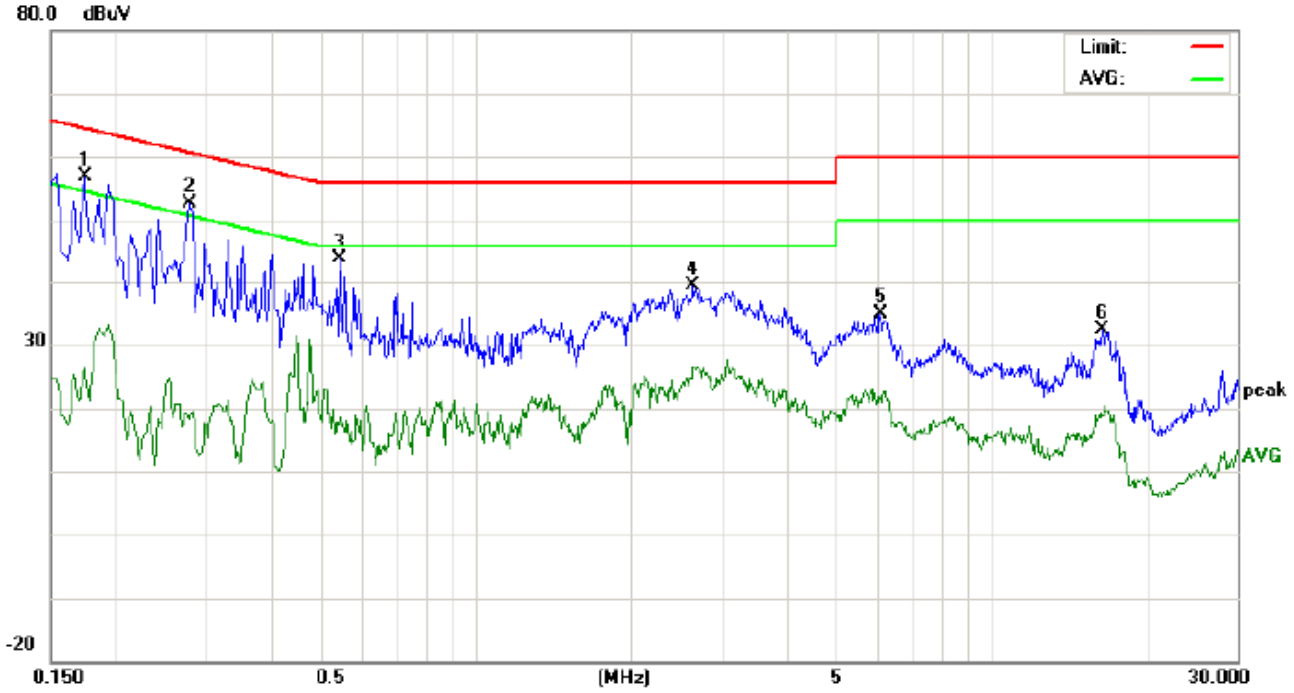
Site: Conduction
Limit: FCC Class B Conduction(QP)
EUT: HBC Remote
M/N: HBCR001
Mode: Normal operation
Note:

Phase: *L1*
Power:

Temperature: 26
Humidity: 60 %

No.	Freq. (MHz)	Reading_Level (dBuV)			Correct Factor	Measurement (dBuV)			Limit (dBuV)		Margin (dB)		P/F	Comment
		Peak	QP	AVG	dB	Peak	QP	AVG	QP	AVG	QP	AVG		
1	0.1860	38.79		20.61	10.20	48.99		30.81	64.21	54.21	-15.22	-23.40	P	
2	0.2380	36.13		21.26	10.26	46.39		31.52	62.16	52.16	-15.77	-20.64	P	
3	0.4540	32.54		18.57	10.37	42.91		28.94	56.80	46.80	-13.89	-17.86	P	
4	1.7700	30.86		17.35	10.29	41.15		27.64	56.00	46.00	-14.85	-18.36	P	
5	3.7180	27.06		12.87	10.47	37.53		23.34	56.00	46.00	-18.47	-22.66	P	
6	16.6860	26.66		14.43	10.12	36.78		24.55	60.00	50.00	-23.22	-25.45	P	

Line Conducted Emission Test Line 2-N



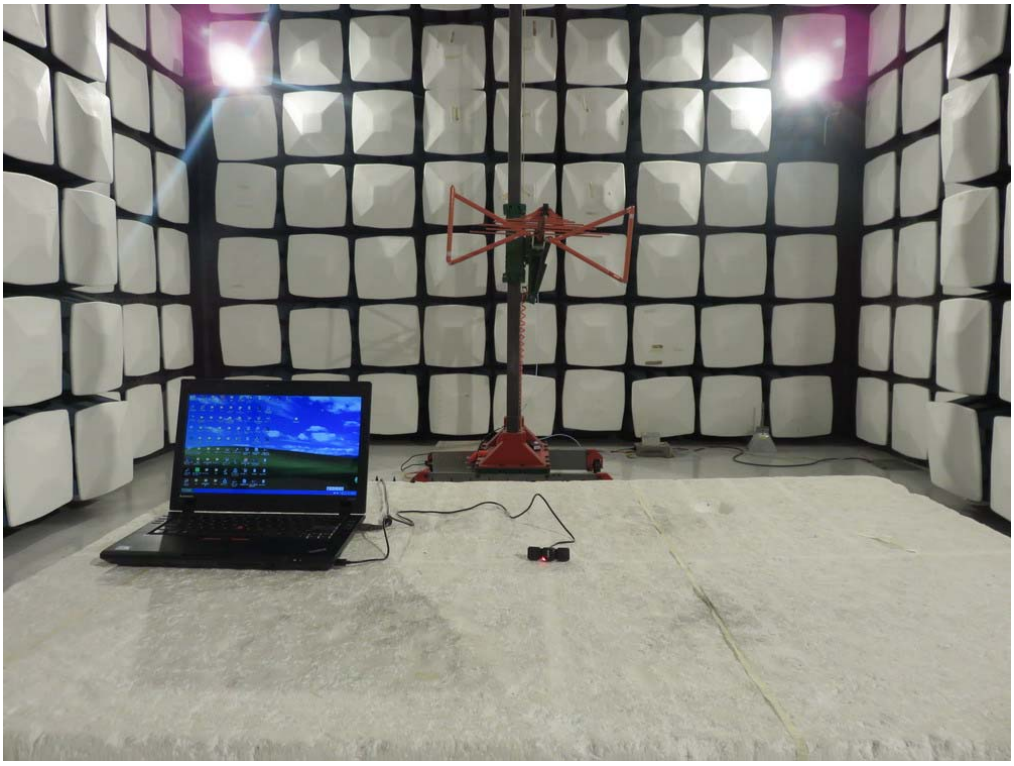
Site: Conduction
Phase: N
Temperature: 26
Limit: FCC Class B Conduction(QP)
Power:
Humidity: 60 %
EUT: HBC Remote
M/N: HBCR001
Mode: Normal operation
Note:

No.	Freq. (MHz)	Reading_Level (dBuV)			Correct Factor	Measurement (dBuV)			Limit (dBuV)		Margin (dB)		P/F	Comment
		Peak	QP	AVG	dB	Peak	QP	AVG	QP	AVG	QP	AVG		
1	0.1740	46.63		16.26	10.19	56.82		26.45	64.76	54.76	-7.94	-28.31	P	
2	0.2779	42.28		8.12	10.28	52.56		18.40	60.88	50.88	-8.32	-32.48	P	
3	0.5460	33.41		8.32	10.36	43.77		18.68	56.00	46.00	-12.23	-27.32	P	
4	2.6420	28.93		16.21	10.46	39.39		26.67	56.00	46.00	-16.61	-19.33	P	
5	6.1060	24.48		11.70	10.28	34.76		21.98	60.00	50.00	-25.24	-28.02	P	
6	16.4020	22.30		8.76	10.12	32.42		18.88	60.00	50.00	-27.58	-31.12	P	

APPENDIX A: PHOTOGRAPHS OF TEST SETUP

FCC LINE CONDUCTED EMISSION TEST SETUP

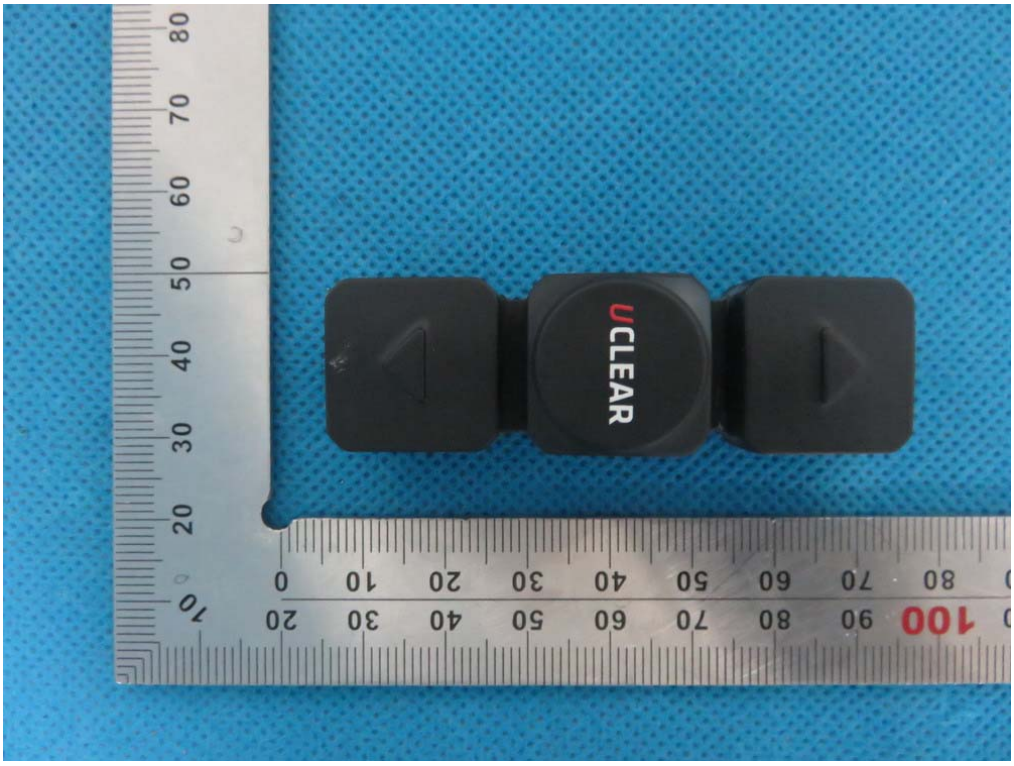
FCC RADIATED EMISSION TEST SETUP



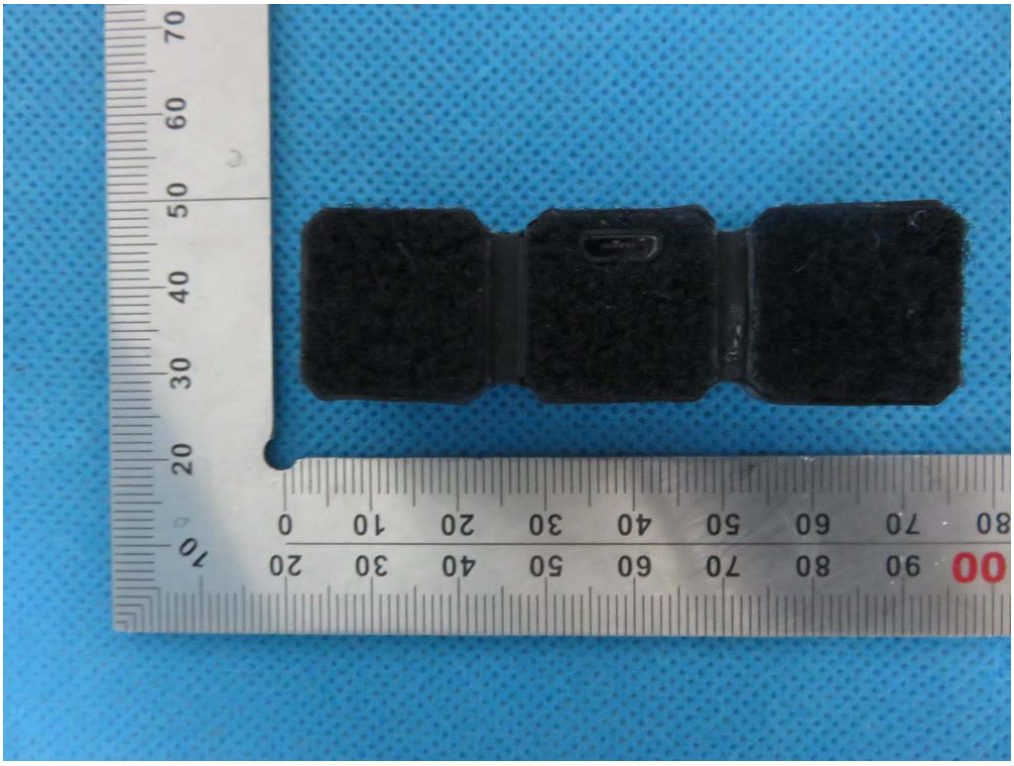
APPENDIX B: PHOTOGRAPHS OF EUT

TOTAL VIEW OF EUT

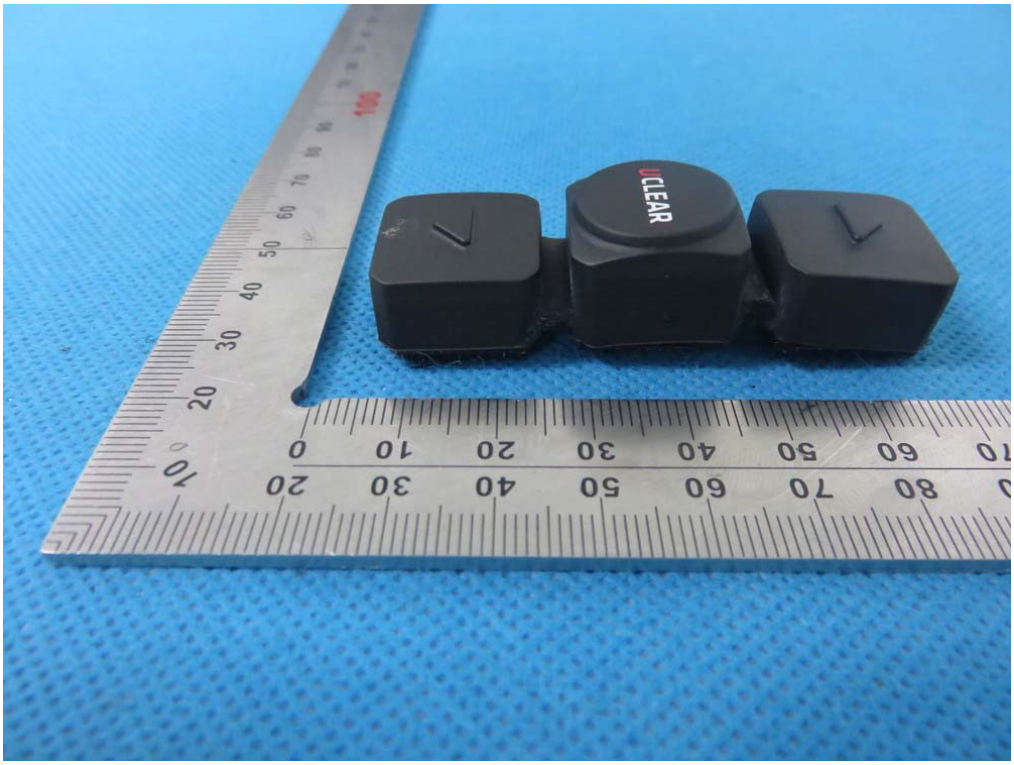
TOP VIEW OF EUT



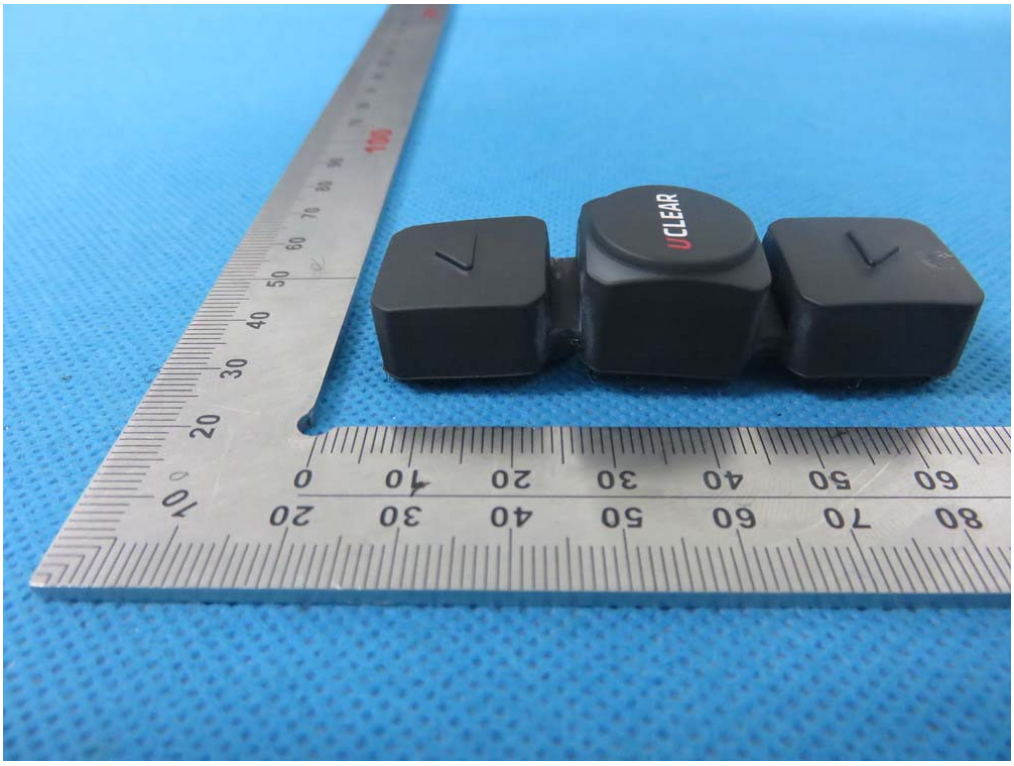
BOTTOM VIEW OF EUT



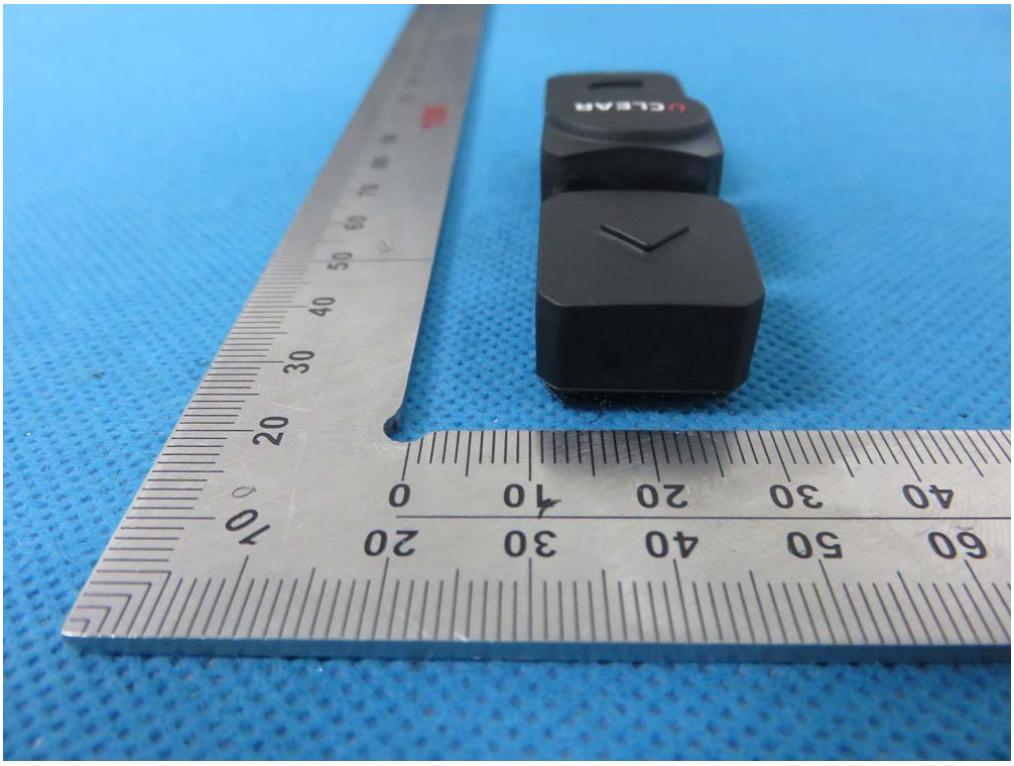
FRONT VIEW OF EUT



BACK VIEW OF EUT

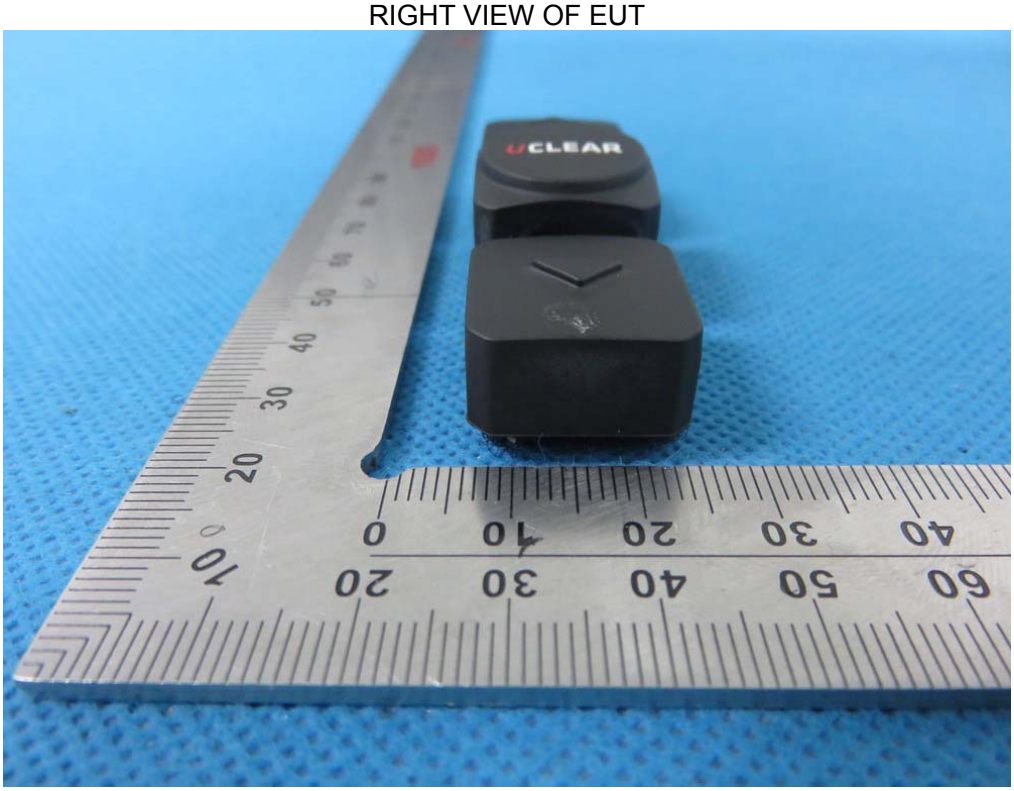


LEFT VIEW OF EUT

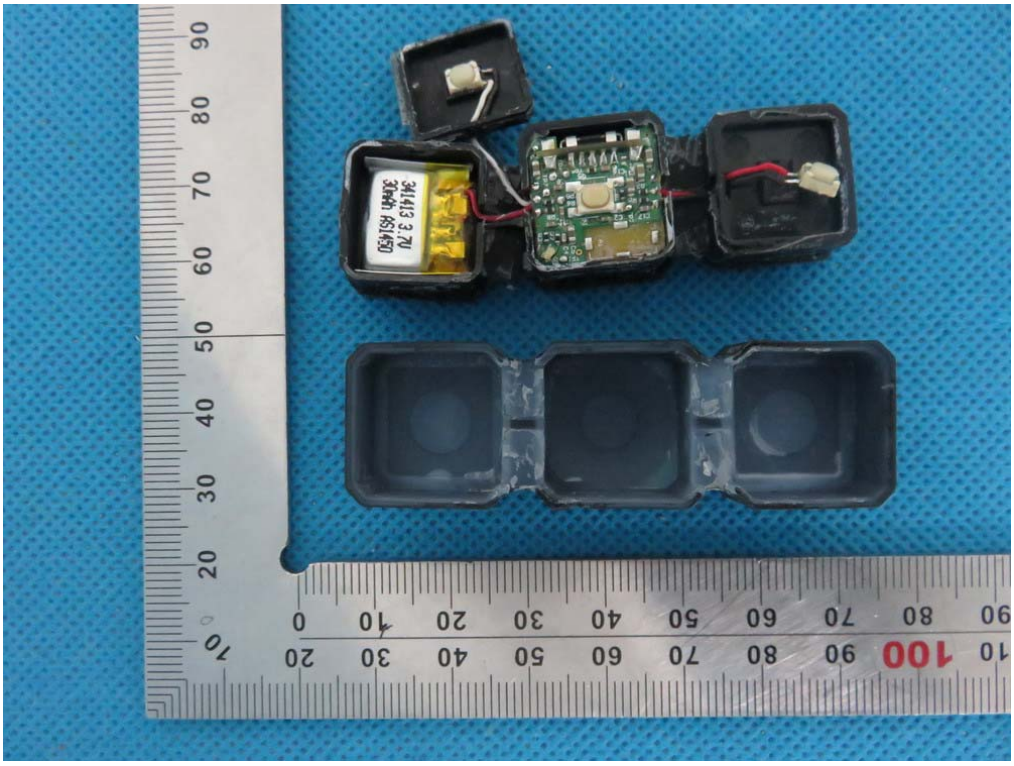


VIEW OF EUT-port

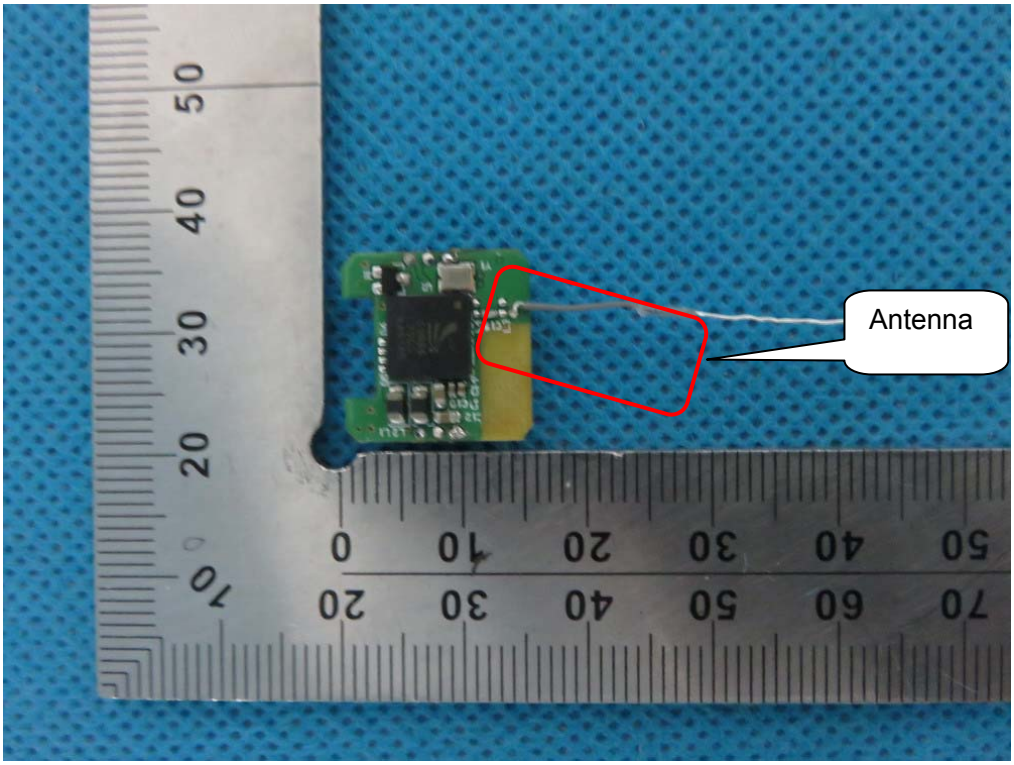
RIGHT VIEW OF EUT



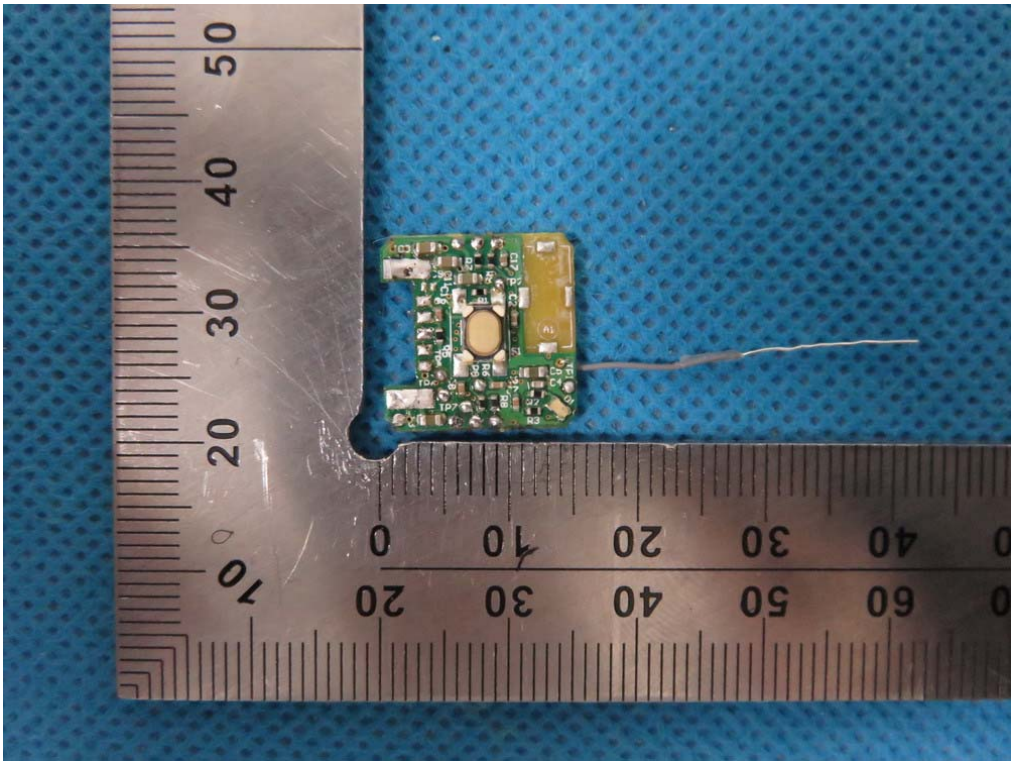
OPEN VIEW OF EUT



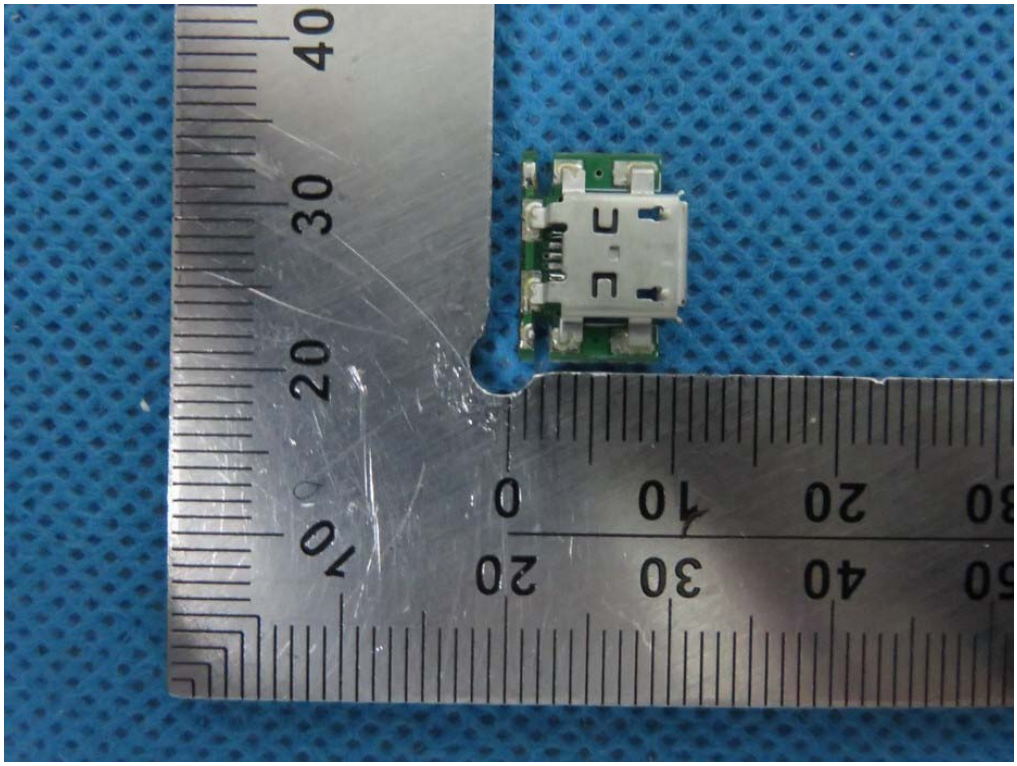
INTERNAL VIEW OF EUT-1



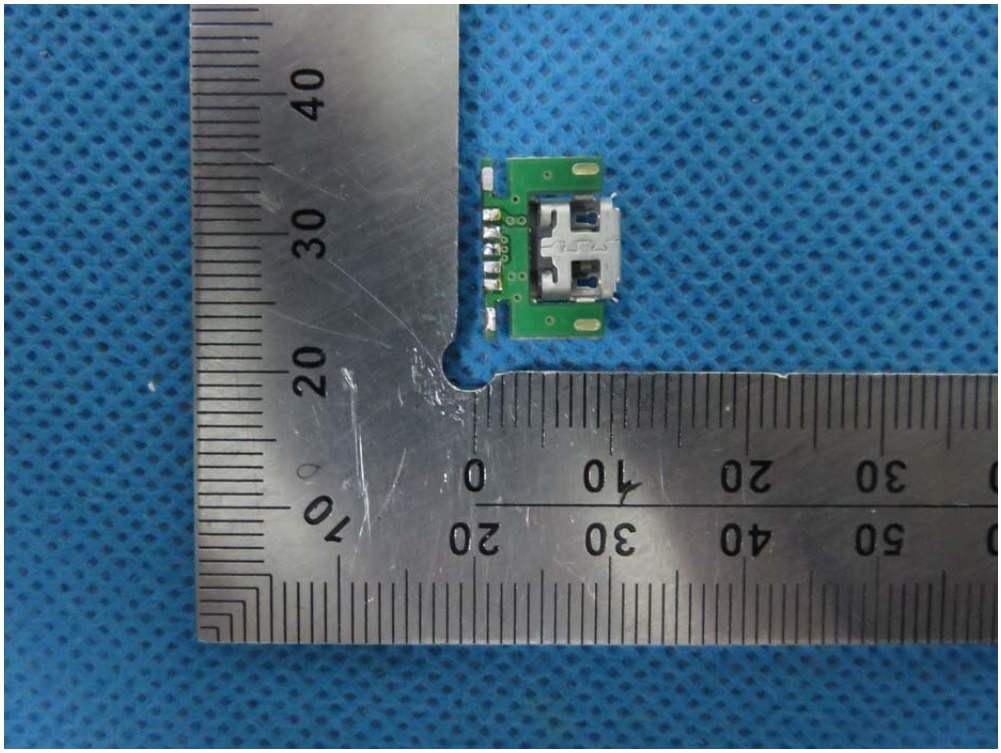
INTERNAL VIEW OF EUT-2



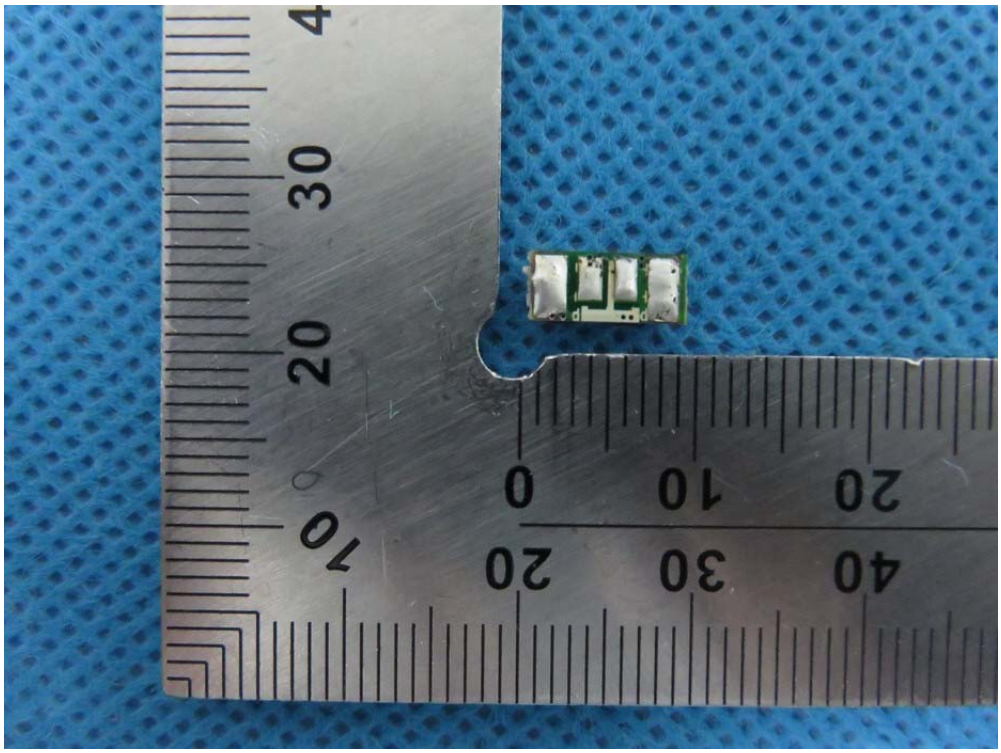
INTERNAL VIEW OF EUT-3



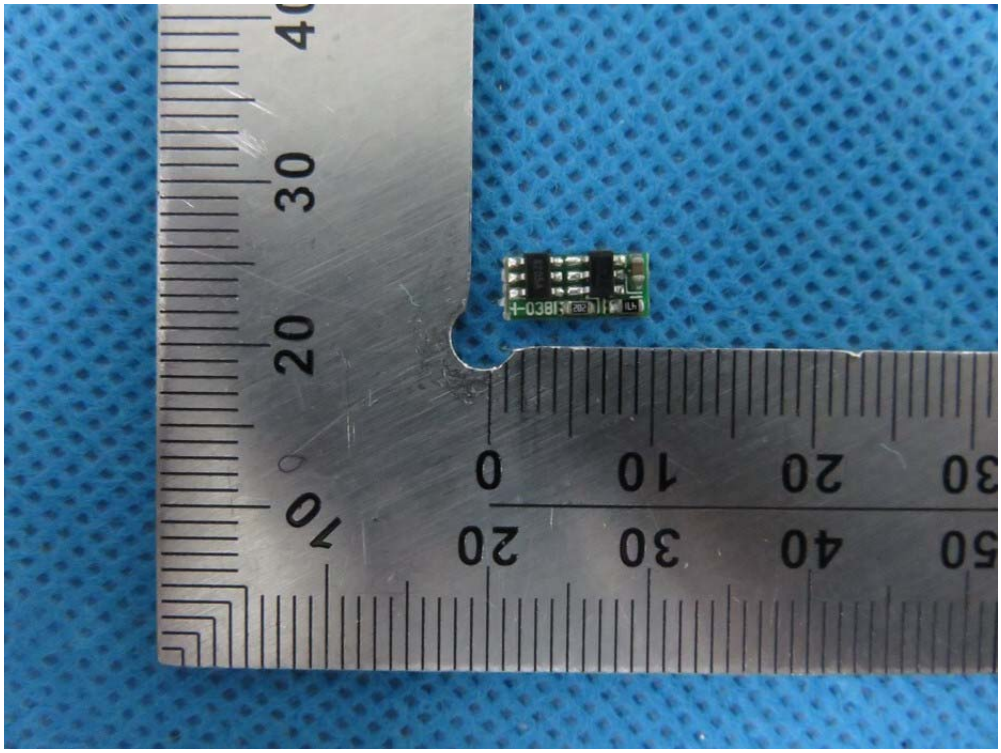
INTERNAL VIEW OF EUT-4



INTERNAL VIEW OF EUT-5



INTERNAL VIEW OF EUT-6



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