


Product Name: Bluetooth Keyboard	Report No: FCC022022-03554RF6(a)
Product Model: MK005BT	Security Classification: Open
Version: V1.0	Total Page: 47

TIRT Testing Report

Prepared By:	Checked By:	Approved By:	
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RF TEST REPORT

FCC ID: 2A7O6-MK005BT

According to

47 CFR FCC Part 15, Subpart C(Section 15.247)

ANSI C63.10:2013

Equipment : Bluetooth Keyboard
Model No. : MK005BT
Trademark : MEETION
Product No. : 20220714011133
Applicant : SHENZHEN MEETION TECH CO., LTD.
3F/2A of Third phase, Yangbei Industrial park, Huangtian,
Xixiang Street, Bao'An, Shenzhen, China

- The test result referred exclusively to the presented test model /sample.
- Without written approval of TIRT Inc. the test report shall not reproduced except in full.
- Test Date: 2022.06.24-2022.07.27
- Receipt date: 2022.06.19

Lab: Beijing TIRT Technology Service Co.,Ltd Shenzhen
Add: 101, 3 # Factory Building, Gongjin Electronics Shatin Community, Kengzi Street,
Pingshan District, Shenzhen, China
TEL: +86-0755-27087573

Table of Contents

History of this test report.....	5
1. General Information	6
1.1 Applicant.....	6
1.2 Manufacturer.....	6
1.3 Factory.....	6
1.4 Basic Description of Equipment Under Test.....	6
1.5 Special Accessories and Auxiliary Equipment.....	7
2. Summary of Test Results	8
2.1 Summary of Test Items	8
2.2 Application of Standard.....	8
2.3 Test Instruments	9
2.4 Test Mode and Channel	9
2.5 Test Condition	10
2.6 Measurement Uncertainty.....	11
2.7 Test Location.....	11
2.8 Deviation from Standards	11
2.9 Abnormalities from Standard Conditions.....	11
3. Test Procedure And Results	12
3.1 AC Power Line Conducted Emission	12
3.1.1 Limit.....	12
3.1.2 Test Procedure	12
3.1.3 Test Setup	12
3.1.4 Test Result	14
3.2 Radiated Emission and Band Edge	16
3.2.1 Limit.....	16
3.2.2 Test Procedure	16
3.2.3 Test Setup	18
3.2.4 Test Result	19
3.3 20dB Bandwidth.....	26
3.3.1 Limit.....	26

3.3.2	Test Procedure	26
3.3.3	Test Setup	27
3.3.4	Test Result.....	27
3.4	Conducted Peak Output Power	31
3.4.1	Limit.....	31
3.4.2	Test Procedure	31
3.4.3	Test Setup	31
3.4.4	Table of Parameters of Text Software Setting.....	31
3.4.5	The Result	32
3.5	Channel Separation	34
3.5.1	Limit.....	34
3.5.2	Test Procedure	34
3.5.3	Test Setup	35
3.5.4	The Result	35
3.6	Quanlity of hopping channel	36
3.6.1	Limit.....	36
3.6.2	Test Procedure	36
3.6.3	Test Setup	37
3.6.4	The Result	37
3.7	Time of Occupancy(Dwell Time)	38
3.7.1	Limit.....	38
3.7.2	Test Procedure	38
3.7.3	Test Setup	39
3.7.4	The Result	39
3.8	Band Edge.....	43
3.8.1	Limit.....	43
3.8.2	Test Procedure	43
3.8.3	Test Setup	43
3.8.4	The Result	44
3.9	Antenna Requirement	47

History of this test report

Original Report Issue Date: 2022.07.27

- ☒ No additional attachment
- ☐ Additional attachments were issued following record

Attachment No.	Issue Date	Description

1. General Information

1.1 Applicant

SHENZHEN MEETION TECH CO., LTD.

3F/2A of Third phase, Yangbei Industrial park, Huangtian, Xixiang Street, Bao'An, Shenzhen, China

1.2 Manufacturer

SHENZHEN MEETION TECH CO., LTD.

3F/2A of Third phase, Yangbei Industrial park, Huangtian, Xixiang Street, Bao'An, Shenzhen, China

1.3 Factory

SHENZHEN MEETION TECH CO., LTD.

3F/2A of Third phase, Yangbei Industrial park, Huangtian, Xixiang Street, Bao'An, Shenzhen, China

1.4 Basic Description of Equipment Under Test

Items	Description	
Equipment Name	Bluetooth Keyboard	
Model Number	MK005BT	
Trademark	MEETION	
Power Supply	DC 3.82V from battery or DC5V from USB Port	
Operating Temperature	-10~40℃	
EUT Stage	<input type="radio"/> Product Unit	<input checked="" type="radio"/> Final-Sample
Radio Type	Bluetooth: BDR	
Modulation Technique	Frequency Hopping Spread Spectrum(FHSS)	
Modulation Type	GFSK	
Frequency Range	2402-2480 MHz	
Number of Operated Channels	79	
Antenna type	Integral antenna	
Max. antenna gain	2.34dBi	

79 channels are provided for BT, 2402、2441、2480MHz are test as LCH、MCH、HCH.

Channel No.	Frequency (MHz)	Channel No.	Frequency
0	2402	40	2442
1	2403	41	2443
2	2404	42	2444
3	2405	43	2445
4	2406	44	2446
5	2407	45	2447
6	2408	46	2448
7	2409	47	2449
8	2410	48	2450
9	2411	49	2451
10	2412	50	2452
11	2413	51	2453
12	2414	52	2454
13	2415	53	2455
14	2416	54	2456
15	2417	55	2457
16	2418	56	2458
17	2419	57	2459
18	2420	58	2460
19	2421	59	2461
20	2422	60	2462
21	2423	61	2463
22	2424	62	2464
23	2425	63	2465
24	2426	64	2466
25	2427	65	2467
26	2428	66	2468
27	2429	67	2469
28	2430	68	2470
29	2431	69	2471
30	2432	70	2472
31	2433	71	2473
32	2434	72	2474
33	2435	73	2475
34	2436	74	2476
35	2437	75	2477
36	2438	76	2478
37	2439	77	2479
38	2440	78	2480
39	2441	/	/

1.5 Special Accessories and Auxiliary Equipment

Description	Manufacturer	Model	S/N
Laptop	HP	N2N15PA	N/A
Adapter	HUAWEI	HW-100225C00	N/A

2. Summary of Test Results

2.1 Summary of Test Items

47 CFR FCC Part 15, Subpart C (Section 15.247)			
Test item	FCC Clause	Results	Remarks
AC Power Conducted Emission	15.207	Pass	Meet the requirement of the limit
Radiated Emission	15.209/15.247(d)	Pass	Meet the requirement of the limit
20dB Emission Bandwidth	15.247(a)(1)	Pass	Meet the requirement of the limit
Channel Separation	15.247(a)(1)	Pass	Meet the requirement of the limit
Time of Occupancy(Dwell Time)	15.247(a)(1)	Pass	Meet the requirement of the limit
Quantity of hopping channel	15.247(a)(1)	Pass	Meet the requirement of the limit
Conducted Peak Output Power	15.247(b)	Pass	Meet the requirement of the limit
Band edge	15.205/15.247(d)	Pass	Meet the requirement of the limit
Antenna Requirements	15.203	Pass	Meet the requirement of the standard
Note: NA denotes Not Applicable in this part			

2.2 Application of Standard

47 CFR FCC Part 15, Subpart C (Section 15.247)

KDB 558074 D01 15.247 Meas Guidance v05r02

ANSI C63.10:2013

2.3 Test Instruments

No.	Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	EMI Receiver	Rohde&Schwarz	ESCI	1166.5950.03	2022/11/16
2	AMN	Rohde&Schwarz	ENV216	3560.6550.05	2022/11/09
3	AMN	Schwarzbeck	NSLK8127	#829	2022/11/09
4	ECSI RF IN RF Cable	Rohde&Schwarz	RP-X1	\	2022/11/18
5	ECSI RF IN RF Cable	Rohde&Schwarz	Sapre sm	\	2022/11/09
6	EMI Receiver	Rohde&Schwarz	ESR7	102013	2022/11/09
7	Spectrum analyzer	Rohde&Schwarz	FSV30	103741	2022/11/09
8	Spectrum analyzer	KEYSIGHT	N9010A-44	MY51440158	2022/11/09
9	Integral Antenna	Schwarzbeck	VULB 9163	VULB 9163-361	2022/11/09
10	Integral Antenna	Schwarzbeck	BBHA 9120D	BBHA 9120D 1201	2022/11/09
11	Integral Antenna	Schwarzbeck	BBHA 9170	9170#685	2022/11/09
12	Preamplifier	CD Systems Inc	PAP-03036-30	85060000	2022/11/09
13	Preamplifier	Schwarzbeck	BBV9721	9721-019	2022/11/09
14	Preamplifier	emci	EMC01264 5SE	980417	2022/11/09
15	ECSI RF IN RF Cable	Rohde&Schwarz	AP-X1	\	2022/11/09
16	Spectrum Analyzer	Agilent	N9010A	MY52221119	2022/11/09
17	Power Collection Unit	Tonscend	JS0806-2	188060134	2022/09/12
18	Tonscend Test System	Tonscend	2.6.77.0518	NA	NA
19	Temp&Humidity Recorder	Anymetre	JR900	NA	2022/11/03

2.4 Test Mode and Channel

Frequency Range : 2402-2480 MHz			
Test Items	Mode	Channel	Antenna
AC Power Conducted Emission	Charging and BT operation	/	/
Radiated Emission	BDR TX	0/39/78	1
20dB Emission Bandwidth	BDR TX	0/39/78	1
Channel Separation	BDR TX	Hopping	1

Time of Occupancy(Dwell Time)	BDR TX	Hopping	1
Quantity of hopping channel	BDR TX	Hopping	1
Conducted Peak Output Power	BDR TX	0/39/78	1
Band edge	BDR TX	0//78/ Hopping	1

2.5 Test Condition

Applicable to	Environmental conditions	Input Power	Tested by
AC Power Conducted Emission	24.6°C, 56 % RH	120Vac, 60Hz	Stone Tang
Radiated Emission	24.2°C, 55 % RH	120Vac, 60Hz	Stone Tang
20dB Emission Bandwidth	24.6°C, 56 % RH	120Vac, 60Hz	Stone Tang
Channel Separation	24.5°C, 56 % RH	120Vac, 60Hz	Stone Tang
Time of Occupancy(Dwell Time)	24.8°C, 56 % RH	120Vac, 60Hz	Stone Tang
Hopping channel number	24.7°C, 56 % RH	120Vac, 60Hz	Stone Tang
Conducted Peak Output Power	24.0°C, 56 % RH	120Vac, 60Hz	Stone Tang
Band edge	24.2°C, 55 % RH	120Vac, 60Hz	Stone Tang

The applicant declare the operating environment of EUT as below:

Normal conditions: 3.82V DC, 15~35°C

Extreme conditions: 3.4V DC~4.35V DC, -10°C ~40°C

2.6 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT.

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=2$.

Uncertainty	
Parameter	Uncertainty
Occupied Channel Bandwidth	± 142.12 kHz
RF power conducted	± 0.74 dB
RF power radiated	± 3.25 dB
Spurious emissions, conducted	± 1.78 dB
Spurious emissions, radiated (30MHz~1GHz)	± 4.6 dB
Spurious emissions, radiated (1GHz ~ 18GHz)	± 4.9 dB
Conduction Emissions(150kHz~30MHz)	± 3.1 dB
Humidity	$\pm 4.6\%$
Temperature	$\pm 0.7^{\circ}\text{C}$
Time	$\pm 1.25\%$

2.7 Test Location

Company:	Beijing TIRT Technology Service Co.,Ltd Shenzhen
Address:	101, 3 # Factory Building, Gongjin Electronics Shatin Community, Kengzi Street, Pingshan District, Shenzhen, China
CNAS Registration Number:	CNAS L14158
A2LA Test Firm Registration Number:	825524
Telephone:	+86-0755-27087573

2.8 Deviation from Standards

None

2.9 Abnormalities from Standard Conditions

None

3. Test Procedure And Results

3.1 AC Power Line Conducted Emission

3.1.1 Limit

Frequency	Maximum RF Line Voltage	
	Quasi-Peak Level dB(μ V)	Average Level dB(μ V)
150kHz ~ 500kHz	66 ~ 56*	56 ~ 46*
500kHz ~ 5MHz	56	46
5MHz ~ 30MHz	60	50

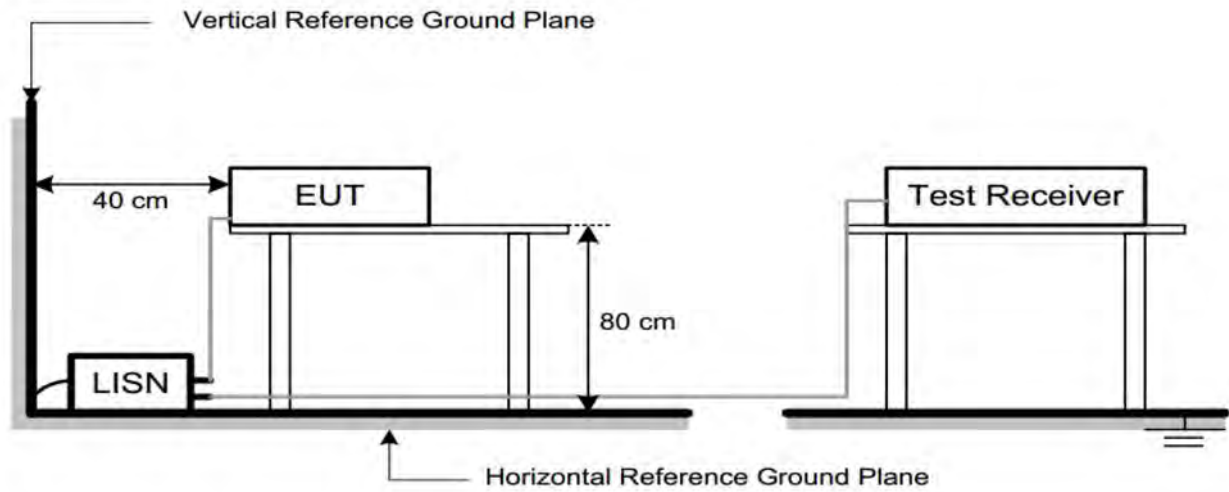
Notes: 1. * Decreasing linearly with logarithm of frequency.
2. The lower limit shall apply at the transition frequencies.

3.1.2 Test Procedure

Test Method	
<input checked="" type="radio"/> Conducted Measurement	<input type="radio"/> Radiated Measurement
Test Channels	
<input type="radio"/> Lowest, Middle and Highest Channel	<input type="radio"/> Lowest and Highest Channel
Environmental conditions	
<input checked="" type="radio"/> Normal	<input type="radio"/> Normal and Extreme
Note: <input checked="" type="radio"/> : Test <input type="radio"/> : No Test	

- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.
- Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

3.1.3 Test Setup



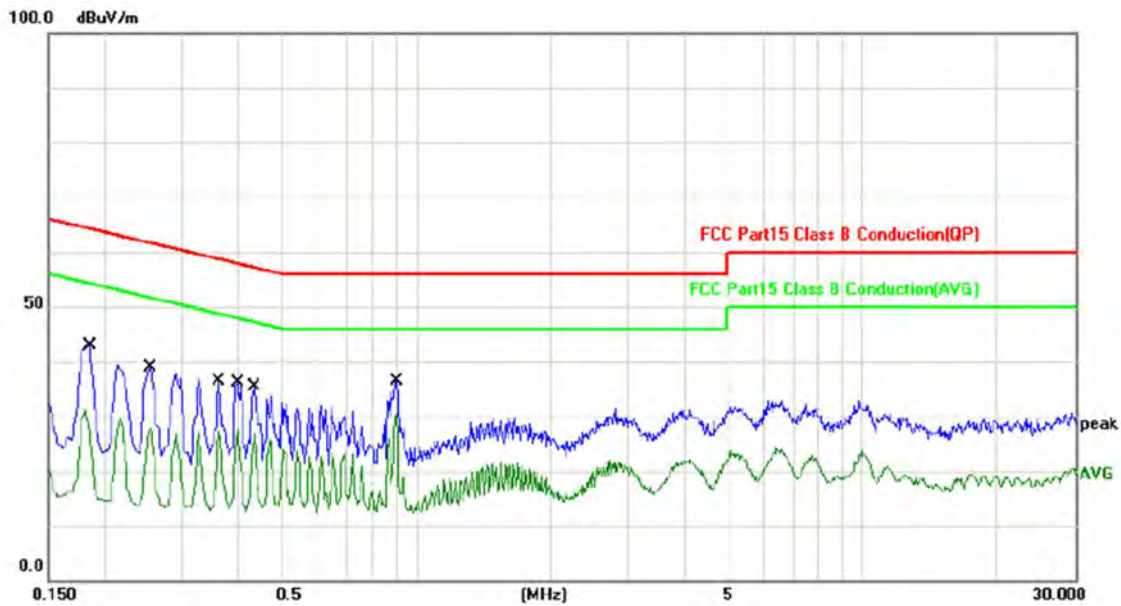
3.1.4 Test Result

Note:

1. Correct Factor = LISN Factor + Cable Loss + Pulse Limiter Factor, the value was added to Original Receiver Reading by the software automatically.
2. Measurement = Reading + Correct Factor.
3. Over = Measurement - Limit

150kHz~30MHz	Mode: Charging and BT operation
--------------	---------------------------------

Line

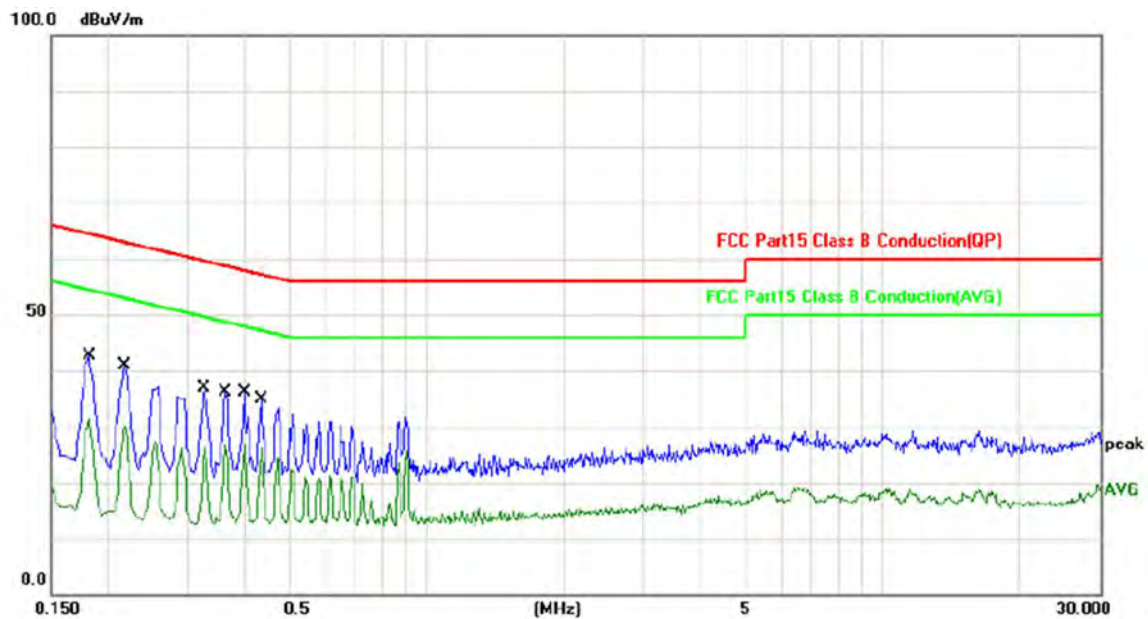


No.	Mk.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1		0.1860	14.58	19.53	34.11	64.21	-30.10	QP	
2		0.1860	4.86	19.53	24.39	54.21	-29.82	AVG	
3		0.2540	17.45	19.53	36.98	61.63	-24.65	QP	
4		0.2540	8.68	19.53	28.21	51.63	-23.42	AVG	
5		0.3620	14.26	19.52	33.78	58.68	-24.90	QP	
6		0.3620	7.00	19.52	26.52	48.68	-22.16	AVG	
7		0.3980	13.68	19.52	33.20	57.90	-24.70	QP	
8		0.3980	7.30	19.52	26.82	47.90	-21.08	AVG	
9		0.4340	12.74	19.53	32.27	57.18	-24.91	QP	
10		0.4340	7.05	19.53	26.58	47.18	-20.60	AVG	
11		0.9060	13.95	19.63	33.58	56.00	-22.42	QP	
12	*	0.9060	11.20	19.63	30.83	46.00	-15.17	AVG	

150kHz~30MHz

Charging and BT operation

Neutral



No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over		
		MHz	Level	Factor	ment			Detector	Comment
			dBuV/m	dB	dBuV/m	dBuV/m	dB		
1		0.1820	20.72	19.70	40.42	64.39	-23.97	QP	
2		0.1820	10.93	19.70	30.63	54.39	-23.76	AVG	
3		0.2180	18.99	19.70	38.69	62.89	-24.20	QP	
4		0.2180	9.66	19.70	29.36	52.89	-23.53	AVG	
5		0.3260	14.36	19.70	34.06	59.55	-25.49	QP	
6		0.3260	4.82	19.70	24.52	49.55	-25.03	AVG	
7		0.3620	13.52	19.70	33.22	58.68	-25.46	QP	
8		0.3620	5.18	19.70	24.88	48.68	-23.80	AVG	
9		0.3980	12.89	19.71	32.60	57.90	-25.30	QP	
10		0.3980	5.12	19.71	24.83	47.90	-23.07	AVG	
11		0.4340	12.03	19.73	31.76	57.18	-25.42	QP	
12 *		0.4340	4.85	19.73	24.58	47.18	-22.60	AVG	

3.2 Radiated Emission and Band Edge

3.2.1 Limit

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table. Other emissions shall be at least 20dB below the highest level of the desired power:

Frequency (MHz)	Distance Meters(m)	Field Strength Limit	
		$\mu\text{V}/\text{m}$	$\text{dB}(\mu\text{V})/\text{m}$
0.009 – 0.49	300	2400/F(kHz)	-
0.490 – 1.705	30	24000/F(kHz)	-
1.705 – 30	30	30	-
30~88	3	100	40.0
88~216	3	150	43.5
216~960	3	200	46.0
960~1000	3	500	54.0
Above 1000	3	74.0 $\text{dB}(\mu\text{V})/\text{m}$ (Peak) 54.0 $\text{dB}(\mu\text{V})/\text{m}$ (Average)	

Note: (1) Emission level $\text{dB}\mu\text{V} = 20 \log$ Emission level $\mu\text{V}/\text{m}$

(2) The smaller limit shall apply at the cross point between two frequency bands.

(3) Distance is the distance in meters between the measuring instrument, antenna and the closest point of any part of the device or system.

3.2.2 Test Procedure

Test Method	
<input type="radio"/> Conducted Measurement	<input checked="" type="radio"/> Radiated Measurement
Test Channels	
<input checked="" type="radio"/> Lowest, Middle and Highest Channel	<input type="radio"/> Lowest and Highest Channel
Environmental conditions	
<input checked="" type="radio"/> Normal	<input type="radio"/> Normal and Extreme
Note: <input checked="" type="radio"/> : Test <input type="radio"/> : No Test	

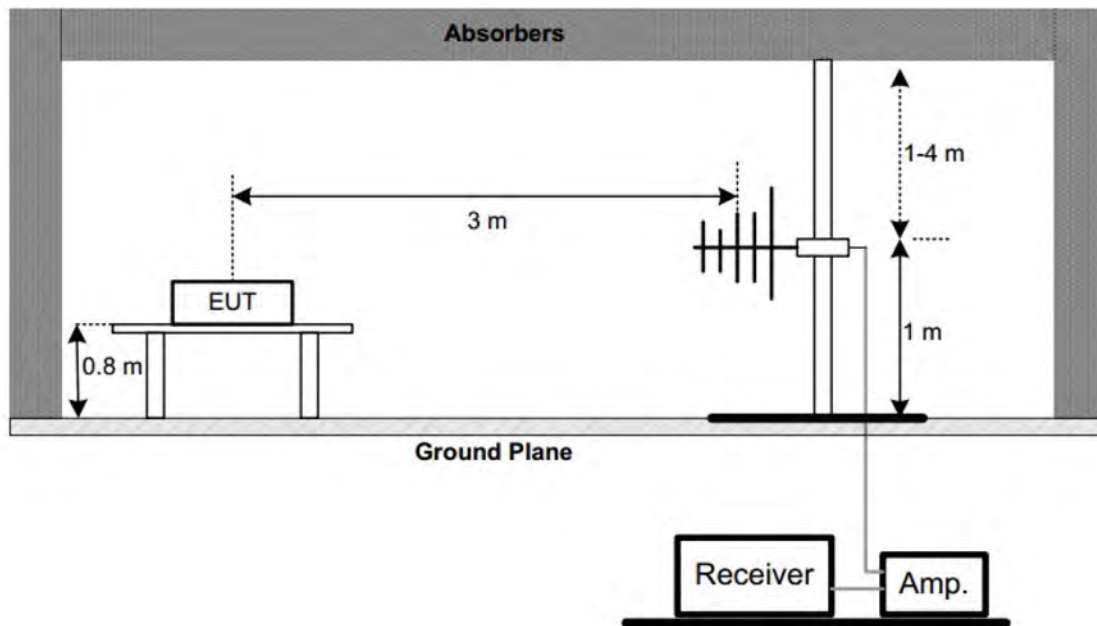
- The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 0.8 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(below 1 GHz)
- The measuring distance of 3 m or 1.5m shall be used for measurements. The EUT was placed on the top of a rotating table 1.5 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(above 1GHz)
- The height of the equipment or of the substitution antenna shall be 0.8m or 1.5m; the height of

the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

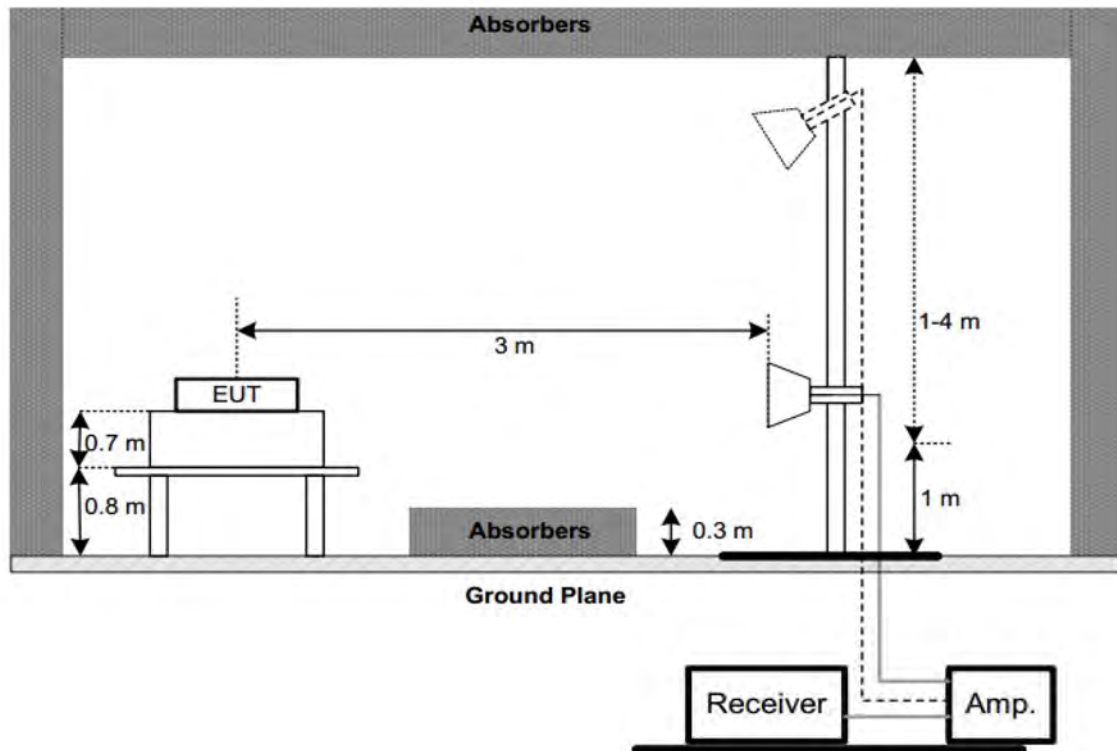
- d) For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights find the maximum reading (used Bore sight function).
- e) The receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz.
- f) The initial step in collecting radiated emission data is a receiver peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
- g) All readings are Peak unless otherwise stated QP in column of Note. Peak denotes that the Peak reading compliance with the QP Limits and then QP Mode measurement didn't perform. (below 1 GHz)
- h) All readings are Peak Mode value unless otherwise stated AVG in column of Note. If the Peak Mode Measured value compliance with the Peak Limits and lower than AVG Limits, the EUT shall be deemed to meet both Peak & AVG Limits and then only Peak Mode was measured, but AVG Mode didn't perform. (above 1 GHz)
- i) For the actual test configuration, please refer to the related Item -EUT Test Photos.

3.2.3 Test Setup

(A) Radiated Emission Test Set-Up Frequency 30 MHz-1000 MHz



(B) Radiated Emission Test Set-Up Frequency Above 1 GHz



3.2.4 Test Result

1) Radiated emission: 9KHz-30MHz

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line was not reported.

There is a comparison data of both open-field test site and semi-Anechoic chamber, and the result came out very similar.

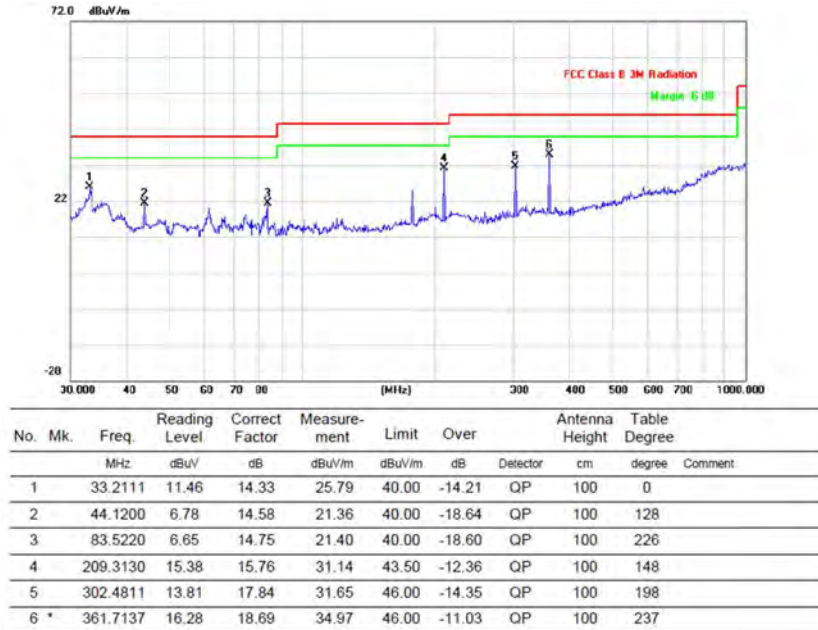
2) Radiated emission: 30MHz-1G

Note:

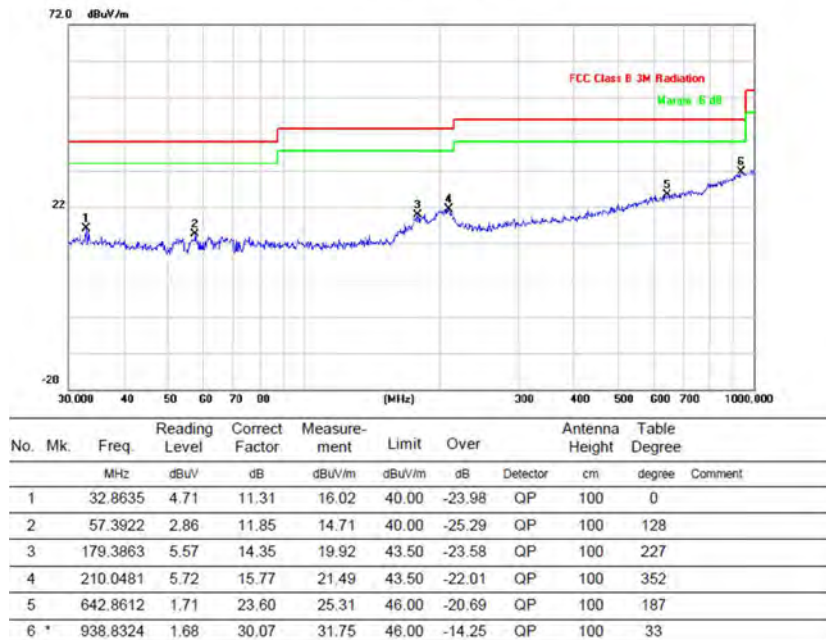
1. Measurement = Reading + Correct Factor.
2. Over = Measurement - Limit

Below 1G (30MHz~1GHz)	Worst case test mode: DH5	Test Channel: 0
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VERTICAL



HORIZONTAL



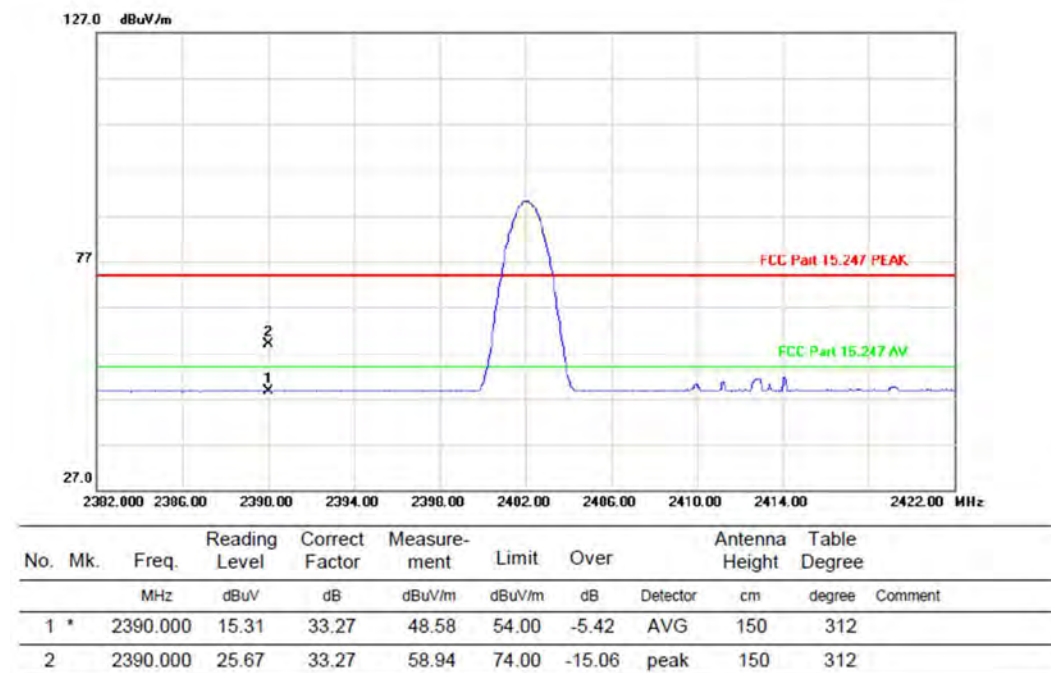
3) Radiated emission: Above 1G

Note:

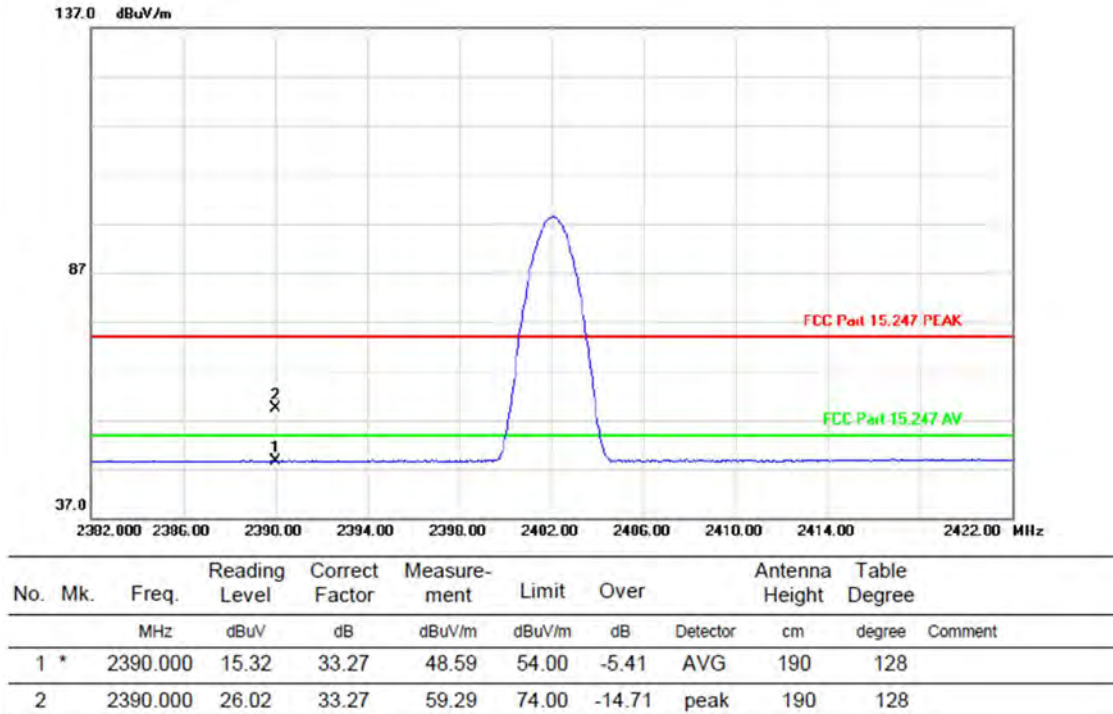
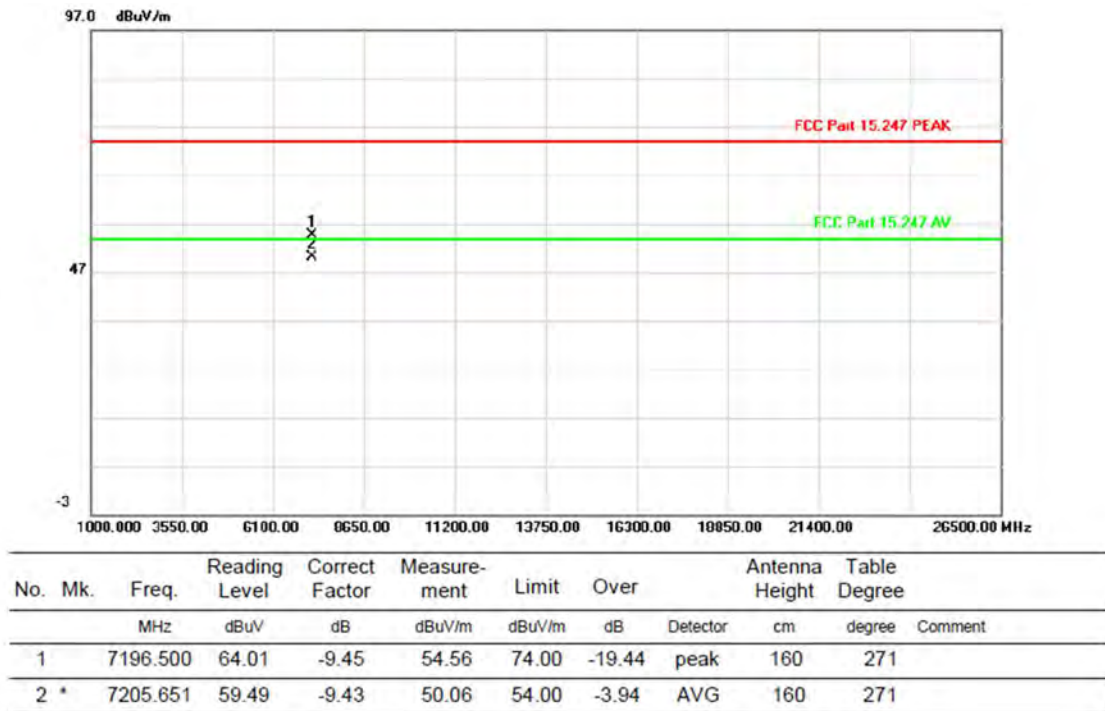
1. Measurement = Reading + Correct Factor.
2. Over = Measurement - Limit

Above 1G (1GHz~26.5GHz)	Test mode:DH5	Test Channel: 0
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VERTICAL



HORIZONTAL



Above 1G (1GHz~26.5GHz)

Test mode: DH5

Test Channel: 39

VERTICAL



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	Comment
1	*	7323.161	59.33	-9.06	50.27	54.00	-3.73	AVG	160	183
2		7324.000	60.60	-9.06	51.54	74.00	-22.46	peak	160	183

HORIZONTAL



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	Comment
1	*	7323.221	62.12	-9.06	53.06	54.00	-0.94	AVG	170	307
2		7324.000	66.85	-9.06	57.79	74.00	-16.21	peak	170	307

Above 1G (1GHz~26.5GHz)

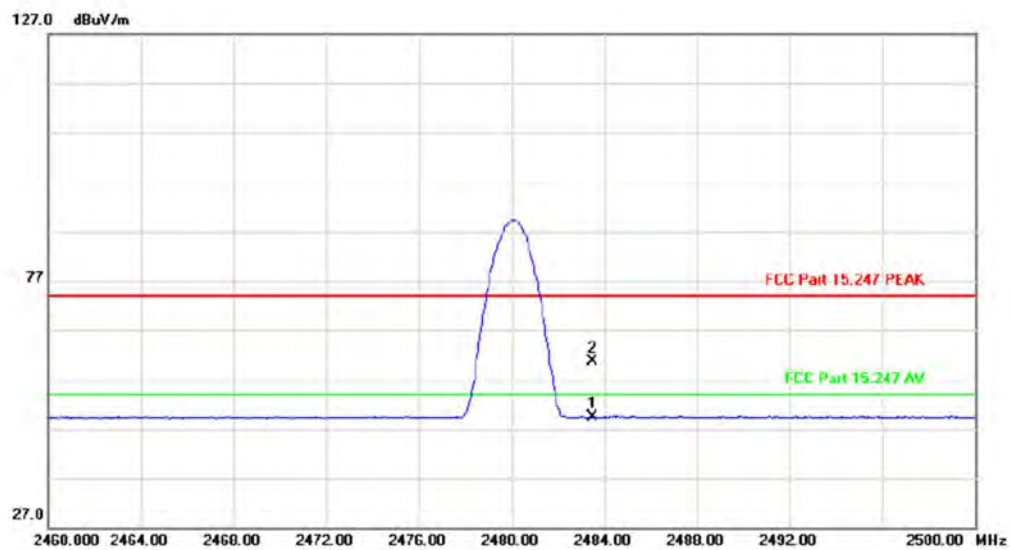
Test mode: DH5

Test Channel: 78

VERTICAL

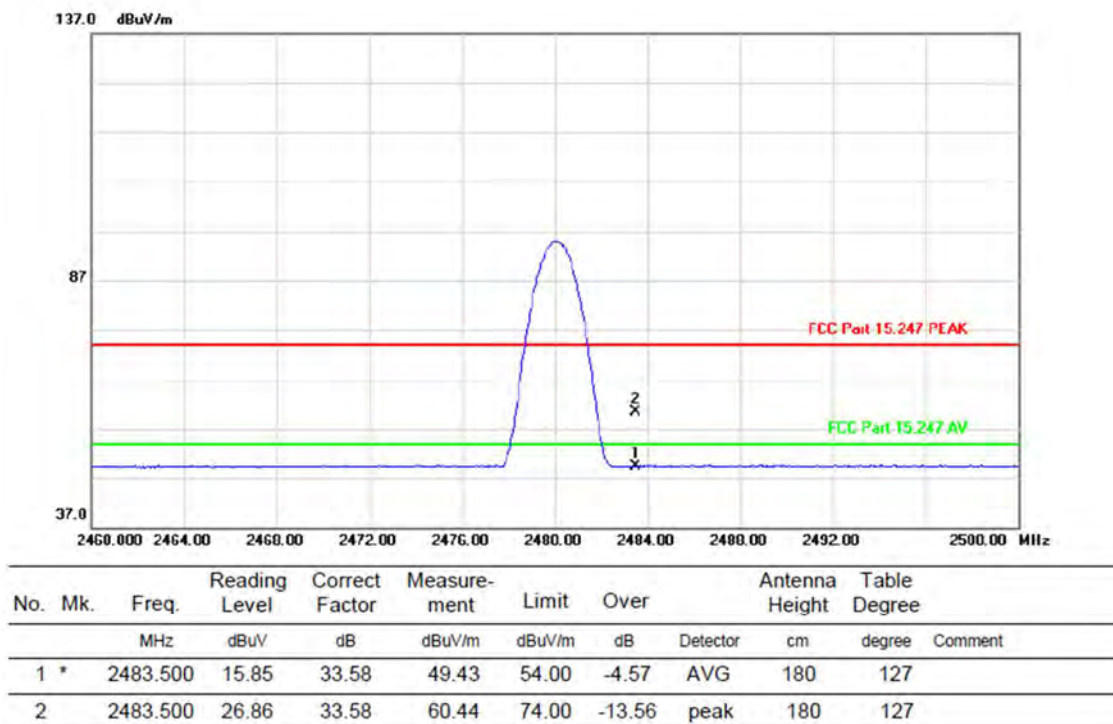


No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	Comment
1		7426.000	58.60	-8.75	49.85	74.00	-24.15	peak	200	143
2 *		7435.990	58.12	-8.72	49.40	54.00	-4.60	AVG	200	143



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	Comment
1 *		2483.500	15.84	33.58	49.42	54.00	-4.58	AVG	150	8
2		2483.500	27.03	33.58	60.61	74.00	-13.39	peak	150	8

HORIZONTALA



3.3 20dB Bandwidth

3.3.1 Limit

Alternatively, frequency hopping systems operating in the 2400–2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

3.3.2 Test Procedure

Test Method	
<input checked="" type="radio"/> Conducted Measurement	<input type="radio"/> Radiated Measurement
Test Channels	
<input checked="" type="radio"/> Lowest, Middle and Highest Channel	<input type="radio"/> Lowest and Highest Channel
Environmental conditions	
<input checked="" type="radio"/> Normal	<input type="radio"/> Normal and Extreme
Note: <input checked="" type="radio"/> : Test <input type="radio"/> : No Test	

a) The EUT shall be connected to the spectrum analyser, and the spectrum analyser is set as follow:

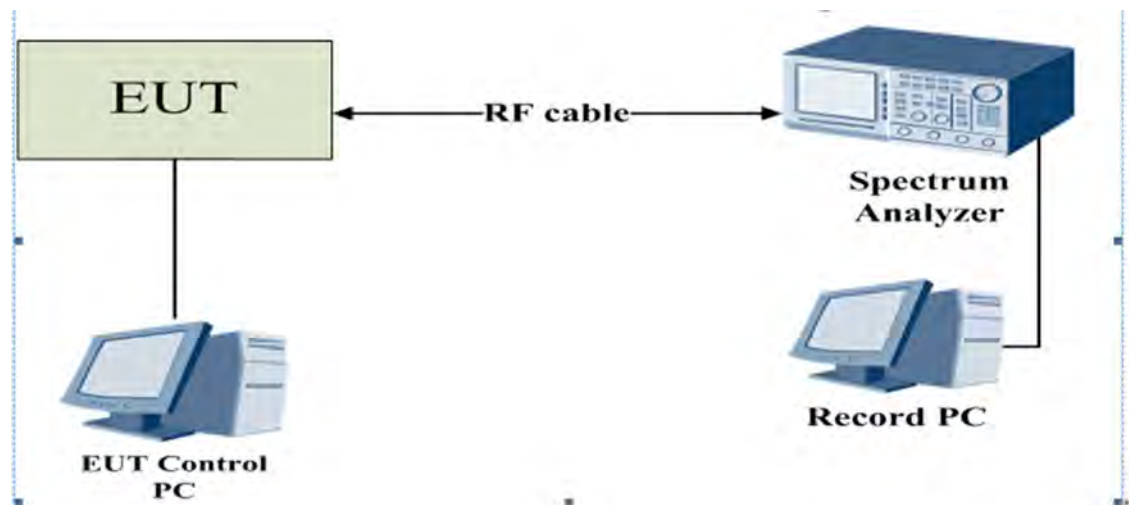
Centre Frequency	The centre frequency of the channel under test
RBW	$\geq 1\% \times \text{Nomina Channel Bandwidth}$
VBW	$\geq 3 \times \text{RBW}$
Frequency span	2 x Nominal Channel Bandwidth
Detector Mode	Peak
Trace Mode	Max Hold
Sweep Time	Auto Couple

b) Wait for the trace to stabilize then find the peak value of the trace and place the analyser marker on this peak.

c) Use the -20dB bandwidth function of the spectrum analyser to measure the 20dB Bandwidth of the EUT. This value shall be recorded.

d) Make sure that the power envelope is sufficiently above the noise floor of the analyser to avoid the noise signals left and right from the power envelope being taken into account by this measurement.

3.3.3 Test Setup



3.3.4 Test Result

20dB Bandwidth

Test Mode	Antenna	Channel	20db EBW[MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
DH5	Ant1	2402	0.975	2401.574	2402.549	---	---
		2441	0.984	2440.568	2441.552	---	---
		2480	0.966	2479.586	2480.552	---	---



DH5_Ant1_2441



DH5_Ant1_2480

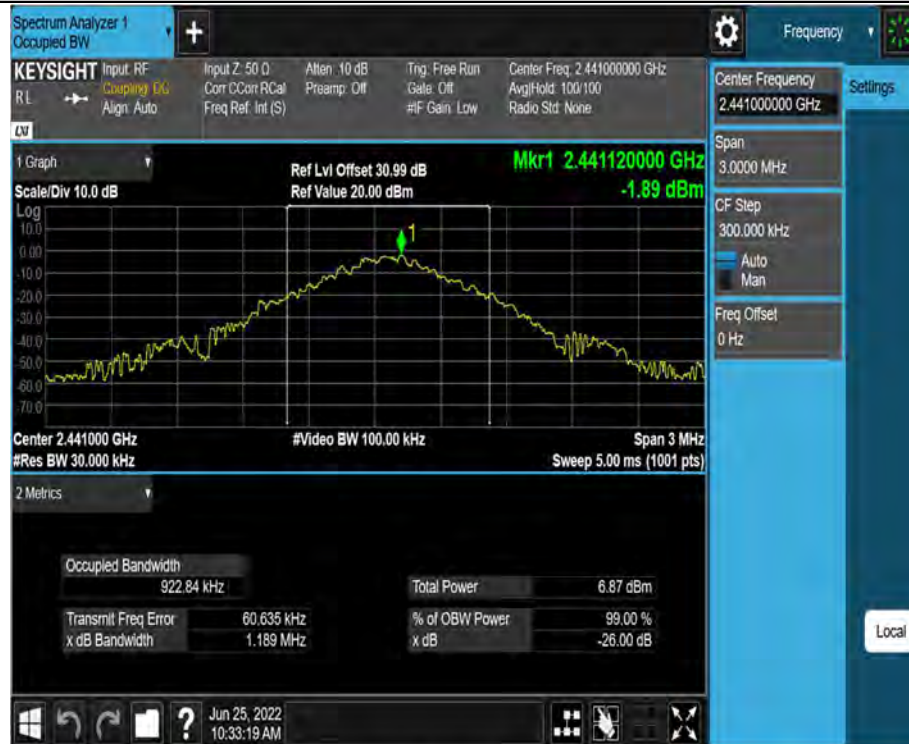


Occupied Channel Bandwidth

Test Mode	Antenna	Channel	OCB [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
DH5	Ant1	2402	0.92788	2401.595	2402.523	---	---
		2441	0.92284	2440.599	2441.522	---	---
		2480	0.91337	2479.609	2480.523	---	---



DH5_Ant1_2441



DH5_Ant1_2480



3.4 Conducted Peak Output Power

3.4.1 Limit

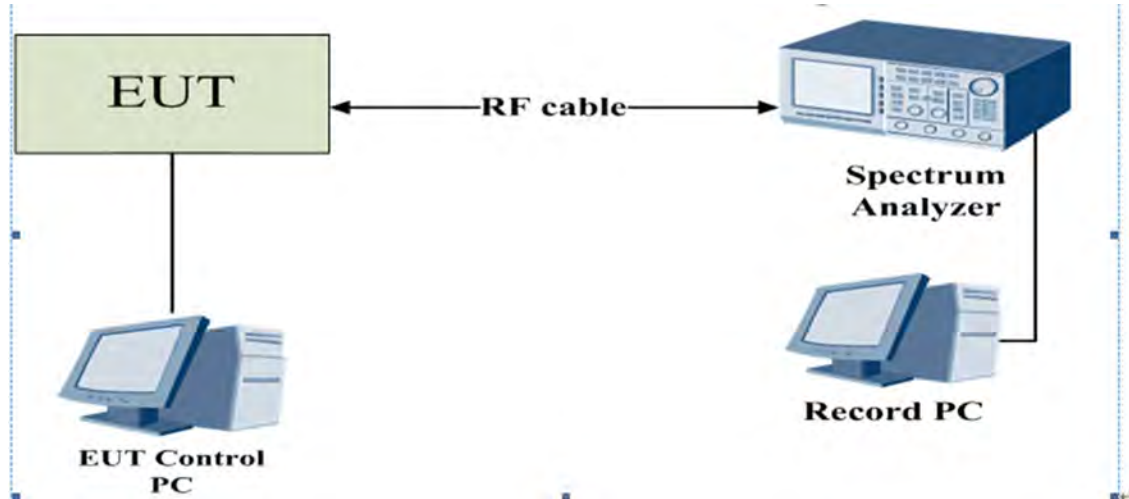
According to 15.247(b) (1), for frequency hopping systems operating in the 2400–2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. And for all other frequency hopping systems in the 2400–2483.5 MHz band: 0.125 watts.

3.4.2 Test Procedure

Test Method	
<input checked="" type="radio"/> Conducted Measurement	<input type="radio"/> Radiated Measurement
Test Channels	
<input checked="" type="radio"/> Lowest, Middle and Highest Channel	<input type="radio"/> Lowest and Highest Channel
Environmental conditions	
<input checked="" type="radio"/> Normal	<input type="radio"/> Normal and Extreme
Note: ● : Test ○ : No Test	

- The EUT was directly connected to the power meter and antenna output port as show in the block diagram below.
- The maximum output power was performed in accordance with method 11.9.2.3 of ANSI C63.10.

3.4.3 Test Setup



3.4.4 Table of Parameters of Text Software Setting

During testing channel & power controlling software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product.

3.4.5 The Result

Test Mode	Antenna	Channel	Result[dBm]	Limit[dBm]	Verdict
DH5	Ant1	2402	0.02	≤20.97	PASS
		2441	0.29	≤20.97	PASS
		2480	-0.15	≤20.97	PASS



DH5_Ant1_2441



DH5_Ant1_2480



3.5 Channel Separation

3.5.1 Limit

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25kHz or the 20dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20dB bandwidth of the hopping channel, whichever is greater provided the systems operate with an output power no greater than 125mW. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

3.5.2 Test Procedure

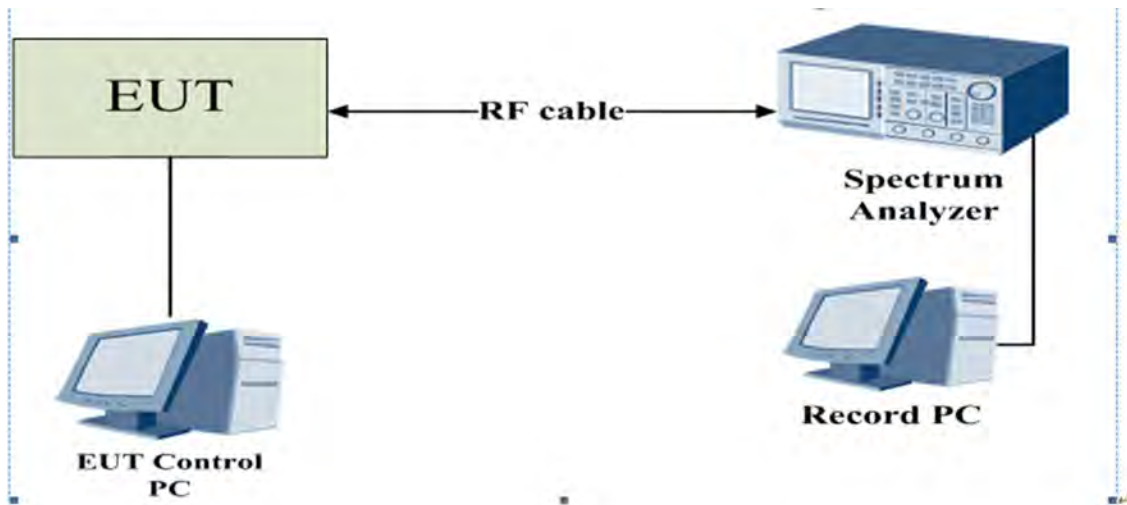
Test Method	
<input checked="" type="radio"/> Conducted Measurement	<input type="radio"/> Radiated Measurement
Test Channels	
<input checked="" type="radio"/> Middle Channel	<input type="radio"/> Lowest and Highest Channel
Environmental conditions	
<input checked="" type="radio"/> Normal	<input type="radio"/> Normal and Extreme
Note: ● : Test ○ : No Test	

a) The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below. Spectrum analyser settings as following:

RBW	300 kHz
VBW	300 kHz
Detector Mode	Peak
Trace Mode	Max Hold
Sweep Time	Auto

- b) Set the EUT in transmitting mode, maxhold the channel.
- c) Set the adjacent channel of the EUT and maxhold another trace.
- d) Measure the channel separation.

3.5.3 Test Setup



3.5.4 The Result

Test Mode	Antenna	Channel	Result[MHz]	Limit[MHz]	Verdict
DH5	Ant1	Middle	1.3	≥0.656	PASS

Note: Limit= $\frac{2}{3} \cdot 20\text{dB}$ bandwidth



3.6 Quantity of hopping channel

3.6.1 Limit

Frequency hopping systems in the 2400-2483.5 MHz shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

3.6.2 Test Procedure

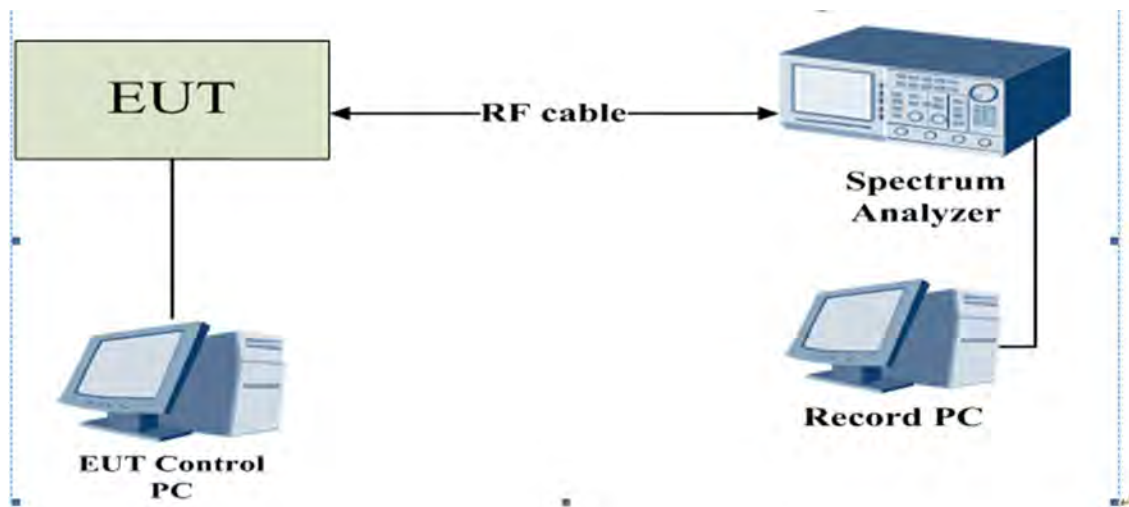
Test Method	
<input checked="" type="radio"/> Conducted Measurement	<input type="radio"/> Radiated Measurement
Test Channels	
<input type="radio"/> Lowest, Middle and Highest Channel	<input checked="" type="radio"/> Hopping Channel
Environmental conditions	
<input checked="" type="radio"/> Normal	<input type="radio"/> Normal and Extreme
Note: <input checked="" type="radio"/> : Test <input type="radio"/> : No Test	

- a) The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below. Spectrum analyser settings as following:

RBW	300 kHz
VBW	300 kHz
Detector Mode	Peak
Trace Mode	Max Hold
Sweep Time	Auto

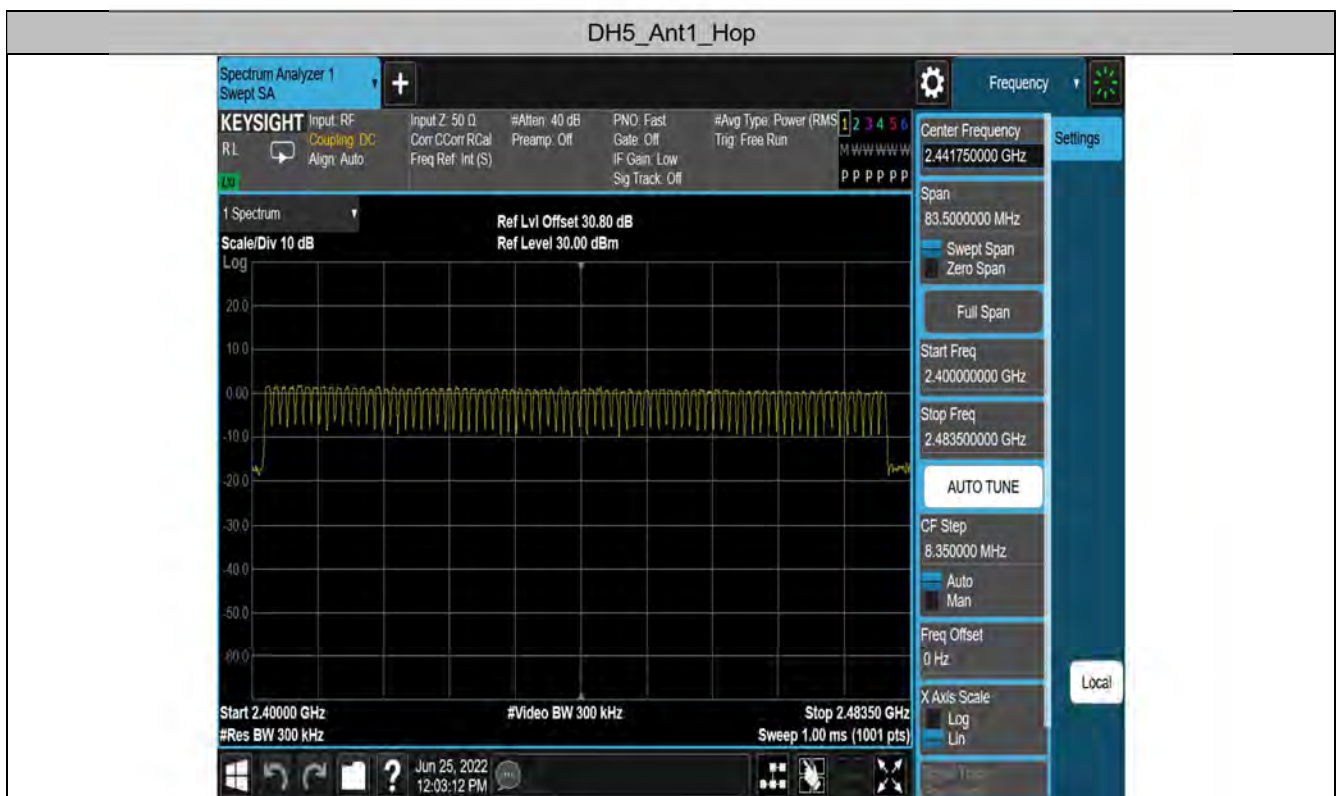
- b) Set the EUT in transmitting mode worked in channel hopping.
c) Set the span From 2400~2483.5MHz。
d) Allow trace to fully stabilize.
e) By using the max-hold function record the quantity of the channel.

3.6.3 Test Setup



3.6.4 The Result

Test Mode	Antenna	Channel	Result[Num]	Limit[Num]	Verdict
DH5	Ant1	Hop	79	≥15	PASS



3.7 Time of Occupancy(Dwell Time)

3.7.1 Limit

Frequency hopping systems in the 2400-2483.5 MHz shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

3.7.2 Test Procedure

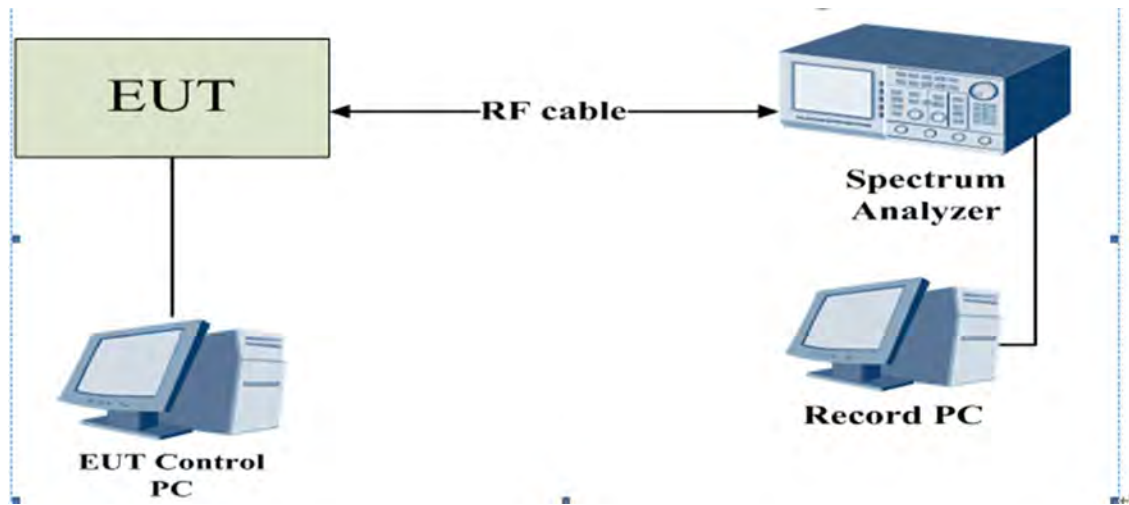
Test Method	
<input checked="" type="radio"/> Conducted Measurement	<input type="radio"/> Radiated Measurement
Test Channels	
<input checked="" type="radio"/> Lowest Channel(Worse case)	<input type="radio"/> Hopping Channel
Environmental conditions	
<input checked="" type="radio"/> Normal	<input type="radio"/> Normal and Extreme
Note: ● : Test ○ : No Test	

- g) The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below. Spectrum analyser settings as following:

RBW	510kHz
VBW	2MHz
Detector Mode	Peak
Trace Mode	Max Hold
Sweep Time	Auto

- h) Set the EUT in transmitting mode worked in channel hopping.
i) Set the span to 0Hz.
j) Allow trace to fully stabilize.
k) Recorded the time of single pulses.

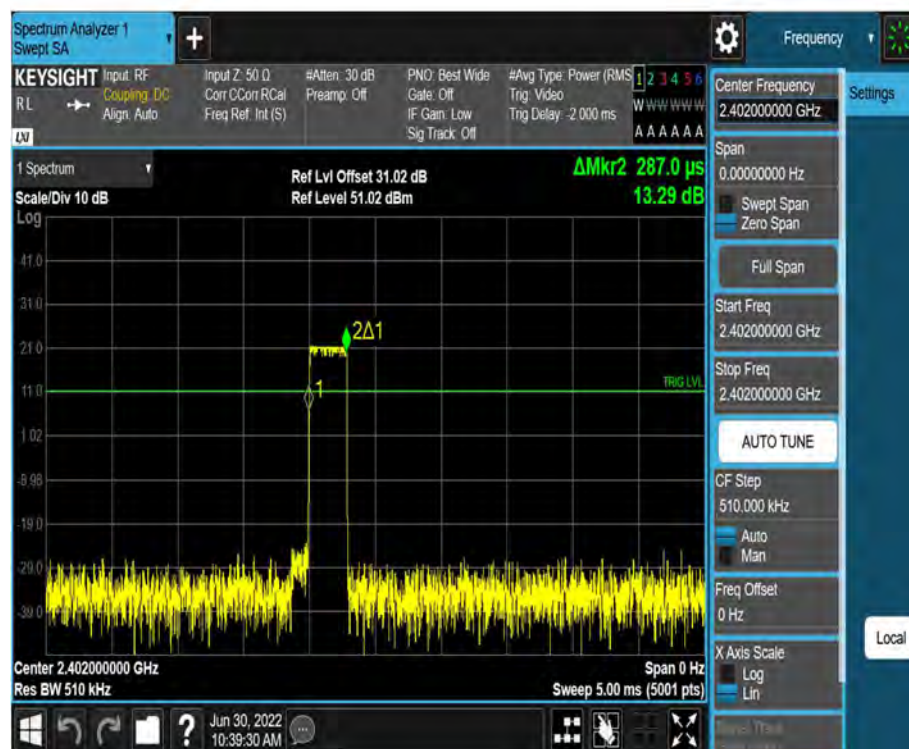
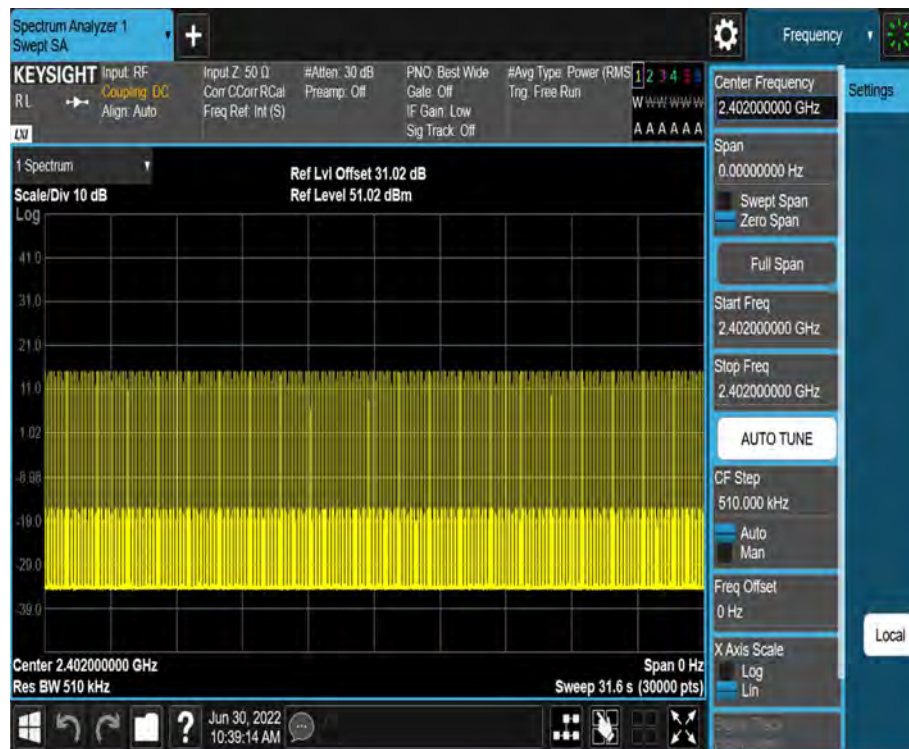
3.7.3 Test Setup



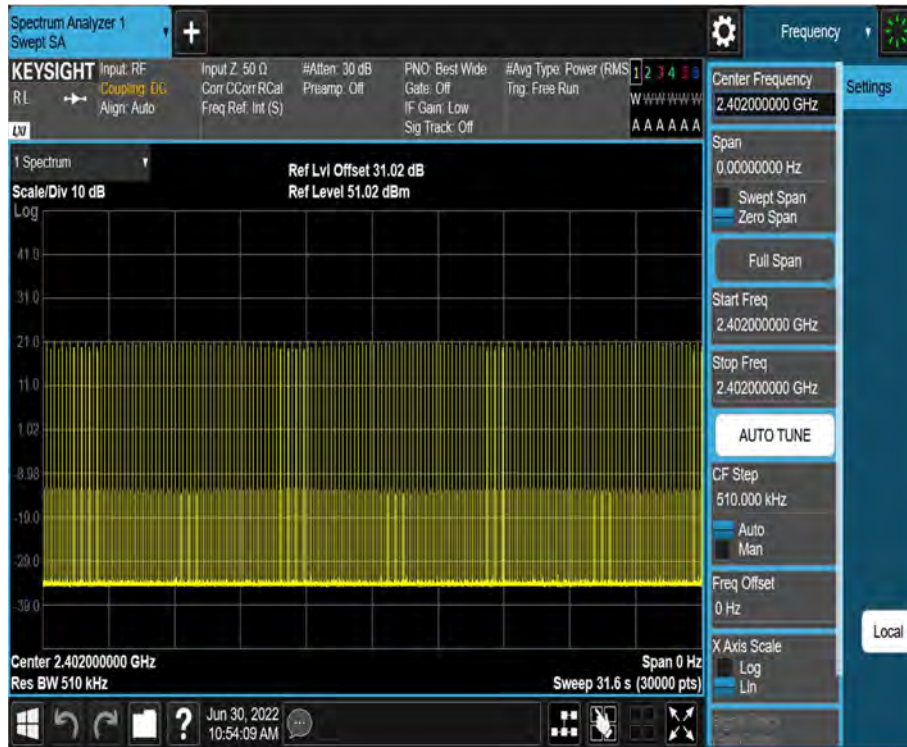
3.7.4 The Result

Test Mode	Antenna	Channel (MHz)	Burst Width [ms]	Result[s]	Limit[s]	Verdict
DH1	Ant1	2402	0.287	0.092	≤0.4	PASS
DH3	Ant1	2402	1.547	0.278	≤0.4	PASS
DH5	Ant1	2402	2.788	0.335	≤0.4	PASS

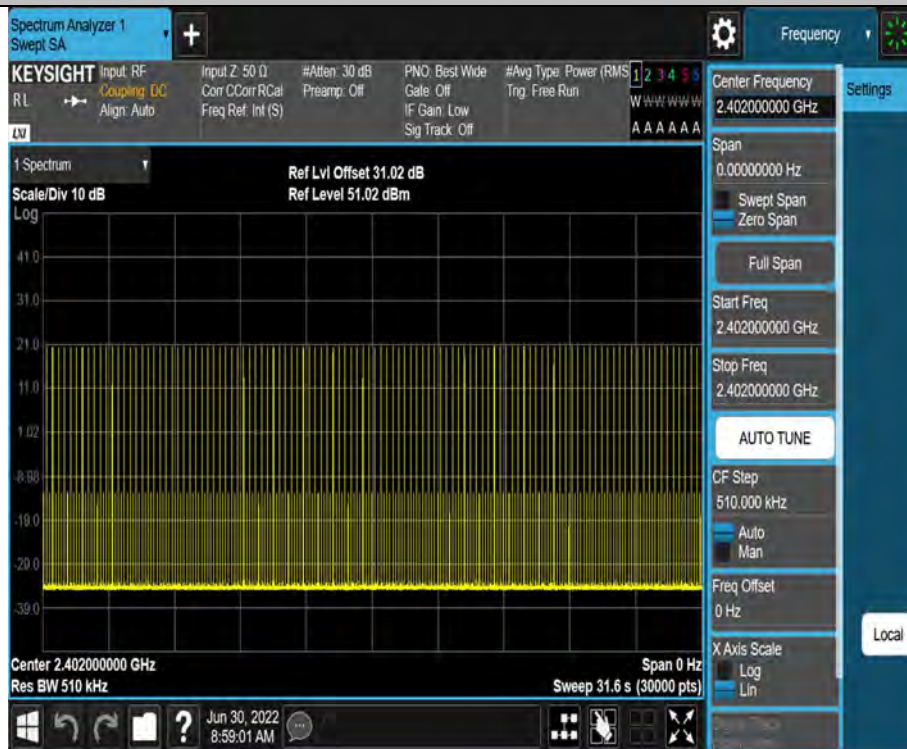
DH1_Ant1_Hop



DH3_Ant1_Hop



DH5_Ant1_Hop



3.8 Band Edge

3.8.1 Limit

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated 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) (see §15.205(c)).

3.8.2 Test Procedure

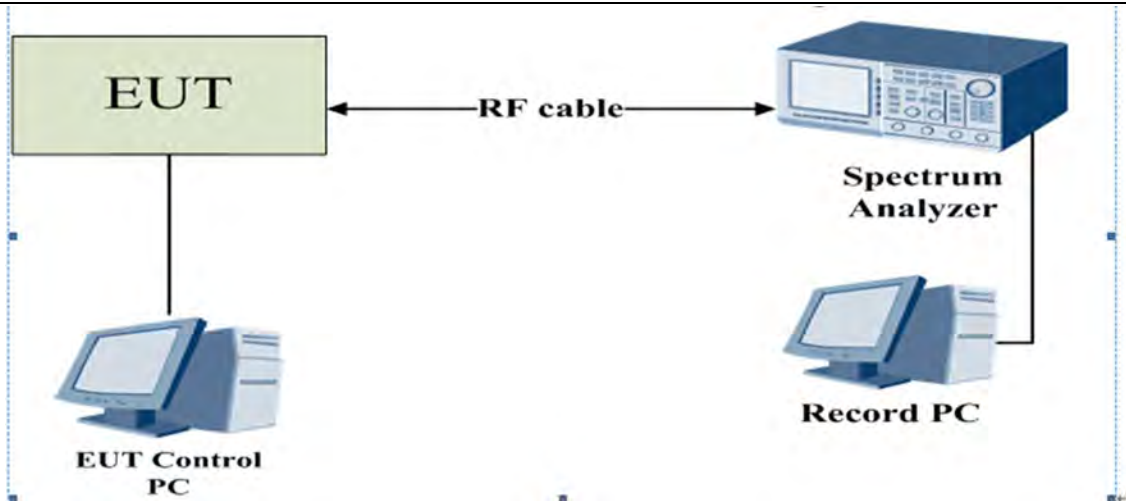
Test Method	
<input checked="" type="radio"/> Conducted Measurement	<input type="radio"/> Radiated Measurement
Test Channels	
<input type="radio"/> Lowest, Middle and Highest Channel	<input checked="" type="radio"/> Lowest and Highest Channel
Environmental conditions	
<input checked="" type="radio"/> Normal	<input type="radio"/> Normal and Extreme
Note: <input checked="" type="radio"/> : Test <input type="radio"/> : No Test	

- a) The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below. Spectrum analyser settings as following:

RBW	100 kHz
VBW	300 kHz
Detector Mode	Peak
Trace Mode	Max Hold
Sweep Time	Auto

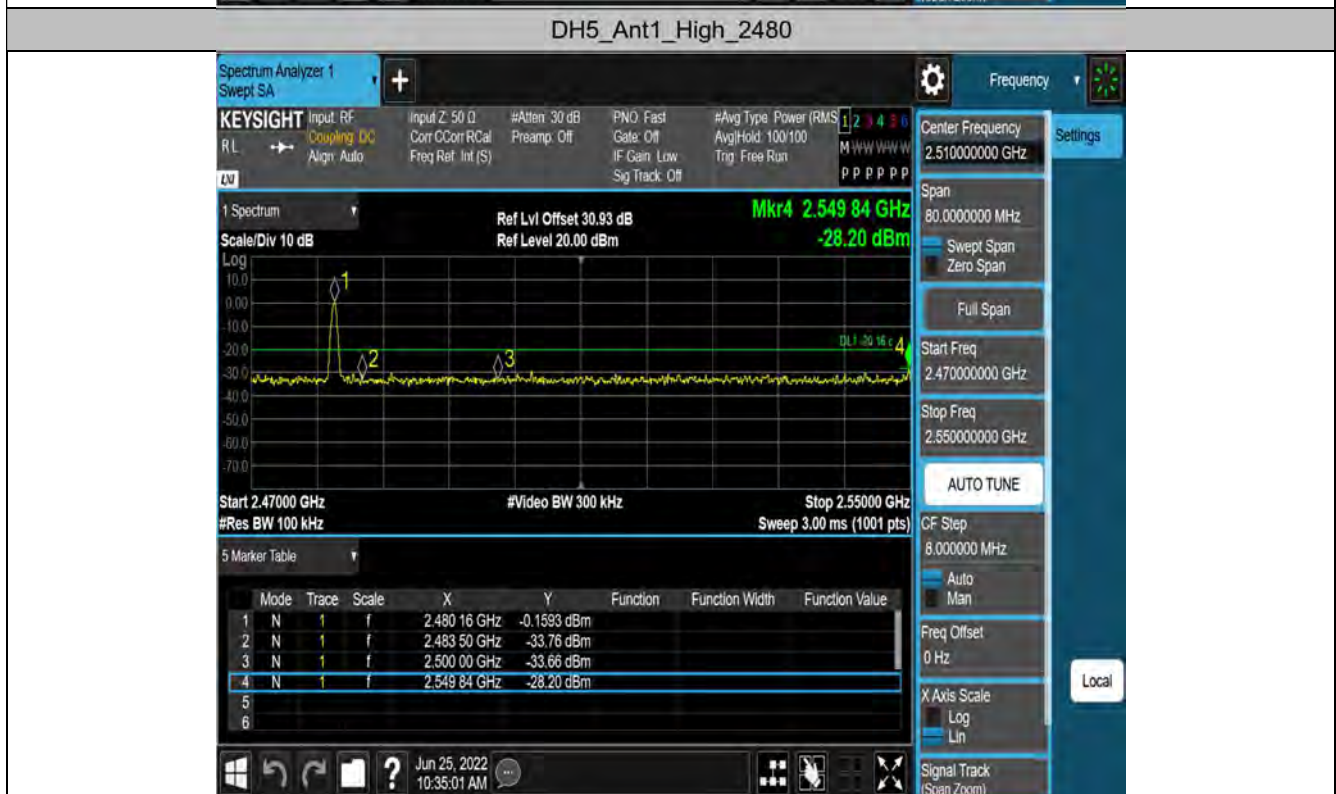
- b) Set the EUT in transmitting mode, maxhold the channel.
- c) Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
- d) Repeat above procedures until all measured frequencies were complete.

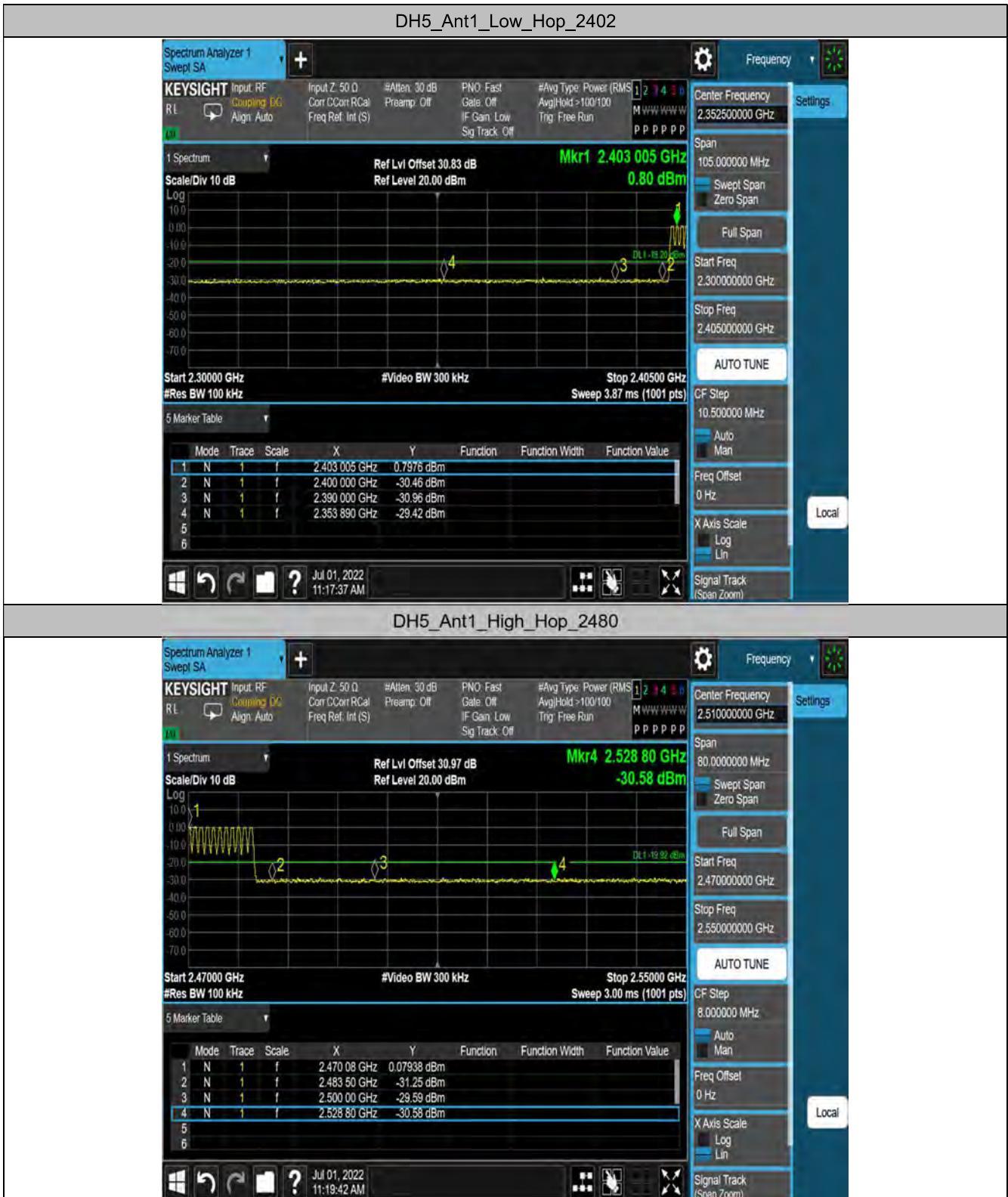
3.8.3 Test Setup



3.8.4 The Result

Test Mode	Antenna	Ch Name	Channel	RefLevel [dBm]	Result [dBm]	Limit [dBm]	Verdict
DH5	Ant1	Low	2402	0.87	-29.41	≤-19.13	PASS
		High	2480	-0.16	-28.20	≤-20.16	PASS
		Low	Hop_2402	0.80	-29.42	≤-19.71	PASS
		High	Hop_2480	0.08	-30.58	≤-21.31	PASS





3.9 Antenna Requirement

RESULT:

Pass

Test Specification

Test standard : FCC Part 15.247(b)(4) and Part 15.203

According to the manufacturer declared, the EUT has an Integral antenna, the Max. gain of antenna is 2.34 dBi, and the antenna connector is designed with permanent attachment and no consideration of replacement.

Therefore the EUT is considered sufficient to comply with the provision.

Refer to EUT Photo for further details.

(END OF REPORT)