

Product Name:Portable Bluetooth Speaker	Report No:FCC022022-1377RF6
Product Model:BTR8801 BTR8802,BTR8805,BTR8808,BTR8809, BTR8810,BTR8812,BTR8815	Security Classification: Open
Version: V1.0	Total Page:81

TIRT Testing Report

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RF TEST REPORT

FCC ID: 2A6MV-BTR8801

According to

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

ANSI C63.10:2013

Equipment : Portable Bluetooth Speaker
Model No. : BTR8801
BTR8802,BTR8805,BTR8808,BTR8809,BTR8810,BTR8812,BTR8815
Trademark : SOJBODOS
Product No. : 20220328004146
Applicant : EDUP, INC.
131-05 40th ROAD, 17J, FLUSHING, NEW YORK, United States

- 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: 2022.03.28-2022.05.29
- Receipt date: 2022.03.28

Lab:Beijing TIRT Technology Service Co.,Ltd Shenzhen
Add: 101, 3 # Factory Building, Gongjin Electronics Shatin Community, Kengzi Street,
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History of this test report

Original Report Issue Date:2022.05.29

☒ No additional attachment

☐ Additional attachments were issued following record

Attachment No.	Issue Date	Description

1. General Information

1.1 Applicant

EDUP, INC.

131-05 40th ROAD, 17J, FLUSHING, NEW YORK, United States

1.2 Manufacturer

EDUP, INC.

131-05 40th ROAD, 17J, FLUSHING, NEW YORK, United States

1.3 Factory

EDUP, INC.

131-05 40th ROAD, 17J, FLUSHING, NEW YORK, United States

1.4 Basic Description of Equipment Under Test

Items	Description	
Equipment Name	Portable Bluetooth Speaker	
Model Number	BTR8801 BTR8802,BTR8805,BTR8808,BTR8809,BTR8810,BTR8812, BTR8815	
Model Differences	Only the model name and appearance are different, the interior is unchanged. BTR8801 is the main test model.	
Trademark	SOJBODOS	
Power Supply	Input: 5V DC from Adapter or 3.70V DC from Battery Battery parameter:SD124062PE, 3.70V, 4000mAh, 14.80Wh	
Operating Temperature	0~50℃	
EUT Stage	☐ Product Unit	☒ Final-Sample
Radio Type	Bluetooth: BDR/EDR	
Modulation Technique	Frequency Hopping Spread Spectrum(FHSS)	
Modulation Type	GFSK, $\pi/4$ -DQPSK, 8DPSK	
Frequency Range	2402-2480 MHz	
Number of Operated Channels	79	
Hardware Version	V1.5	
Software Version	V16	

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 Antenna Information

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)
1	N/A	N/A	PCB	N/A	1.7

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 and Band Edge Measurement	15.205/15.209 /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 and Unwanted Emission	15.247(d)	Pass	Meet the requirement of the limit
Antenna Requirements	15.203	Compliance	The EUT has one internal antenna arrangement for BT which was permanently attached and the antenna gain is 1.7dBi, Impedance is 50Ω fulfill the requirement of this section. Please refer to the product photos.
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	Sapresm	\	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	TonscendTestSystem	Tonscend	2.6.77.0518	NA	NA
19	Temp&Humidity Recorder	Anymetre	JR900	NA	2022/11/03

2.4 TestMode and Channel

FrequencyRange :2402-2480 MHz			
Test Items	Mode	Channel	Antenna
AC Power Conducted Emission	BDR/EDR	0/39/78	1
Radiated Emission and Band Edge Measurement	BDR/EDR	0/39/78	1
20dB Emission Bandwidth	BDR/EDR	0/39/78	1
Channel Separation	BDR/EDR	Hopping	1
Time of Occupancy(Dwell Time)	BDR/EDR	0/39/78	1
Quantity of hopping channel	BDR/EDR	0/39/78	1
Conducted Peak Output Power	BDR/EDR	0/39/78	1
Band edge and Unwanted Emission	BDR/EDR	0/78	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 and Band Edge Measurement	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
Quantity of hopping channel	24.7°C, 56 % RH	120Vac, 60Hz	Stone Tang
Conducted Peak Output Power	24.0°C, 56 % RH	120Vac, 60Hz	Stone Tang
Band edge and Unwanted Emission	24.2°C, 55 % RH	120Vac, 60Hz	Stone Tang

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 (9KHz~30MHz)	± 4.2 dB
Spurious emissions, radiated (30MHz~1GHz)	± 4.6 dB
Spurious emissions, radiated (1GHz ~ 18GHz)	± 4.9 dB
Spurious emissions, radiated (18GHz ~ 40GHz)	± 5.0 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 Registration Number	6049.01
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(μV)	Average Level dB(μV)
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 Peripherals

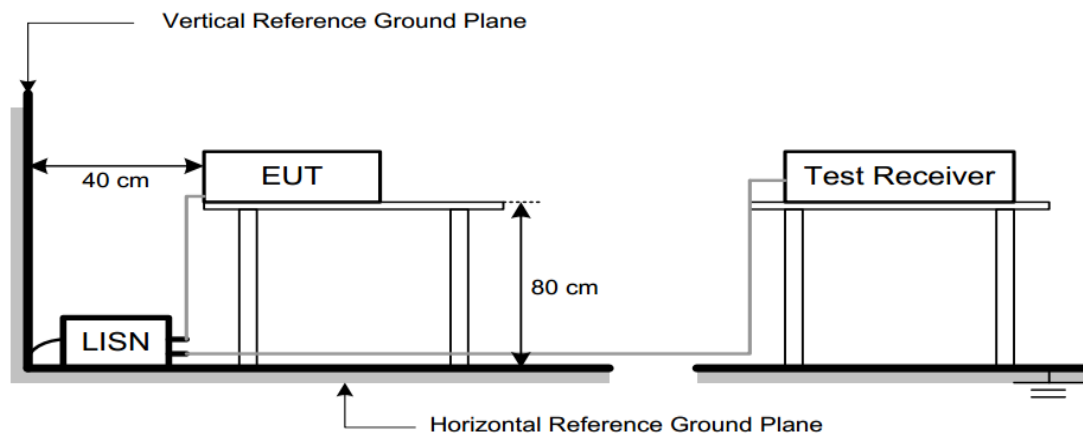
Support Equipment				
No.	Equipment	Brand Name	Model Name	Remarks
1	Type-C Cable	AWM	E101344	0.9m, No Shielding
2	Adaptor	FUSHIGANG	AS1201A-0502000 USU	NA
3	Record PC	Lenovo	M4500T	NA
4	Control PC	Lenovo	M4500T	NA

3.1.3 Test Procedure

Test Method	
☒ Conducted Measurement	☐ Radiated Measurement
Test Channels	
☐ Lowest, Middle and Highest Channel	☐ Lowest and Highest Channel
Environmental conditions	
☒ Normal	☐ Normal and Extreme
Note: ● : Test ○ : 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.

3.1.4 Test Setup



3.1.5 Test Result

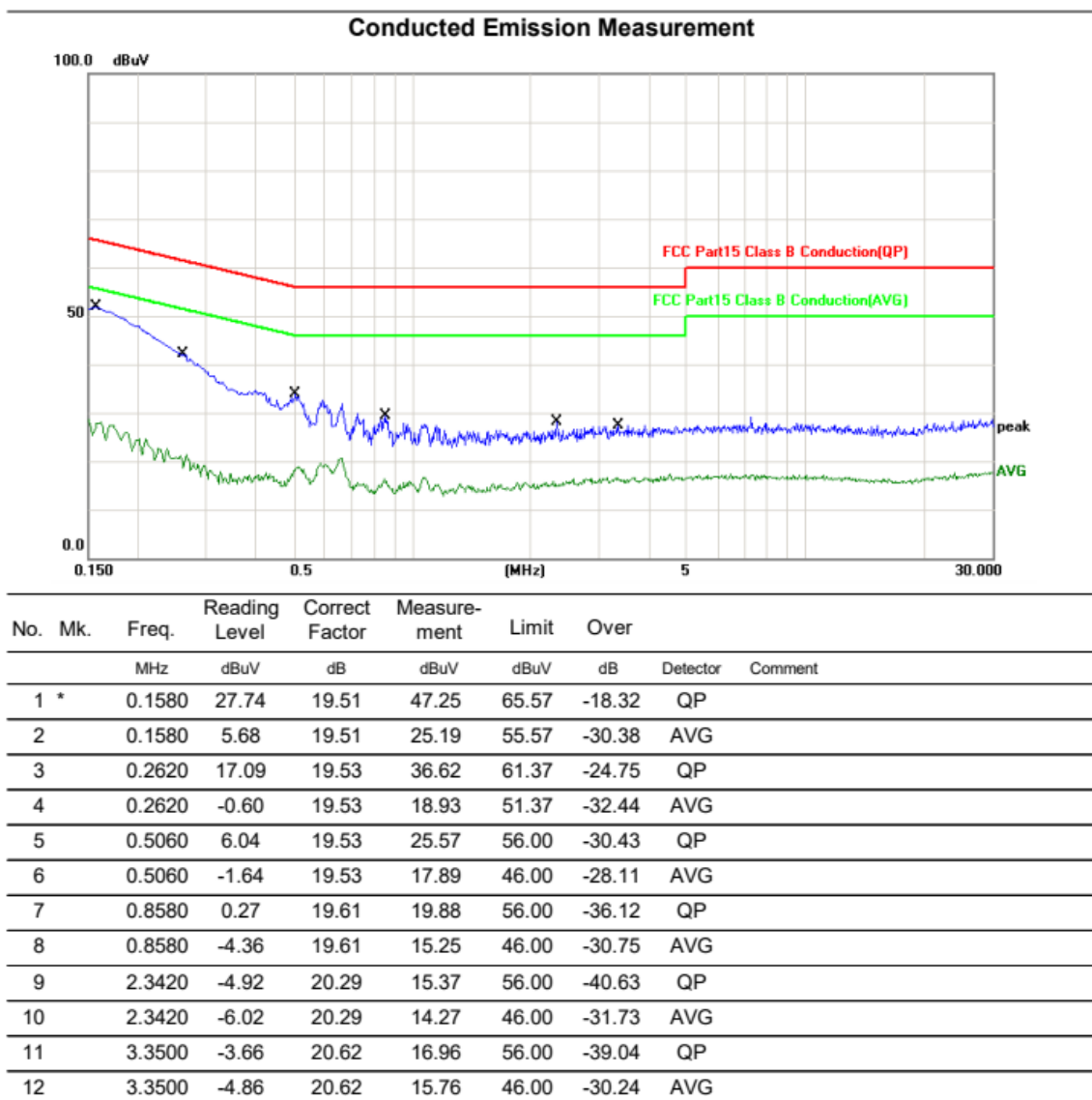
Note:

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

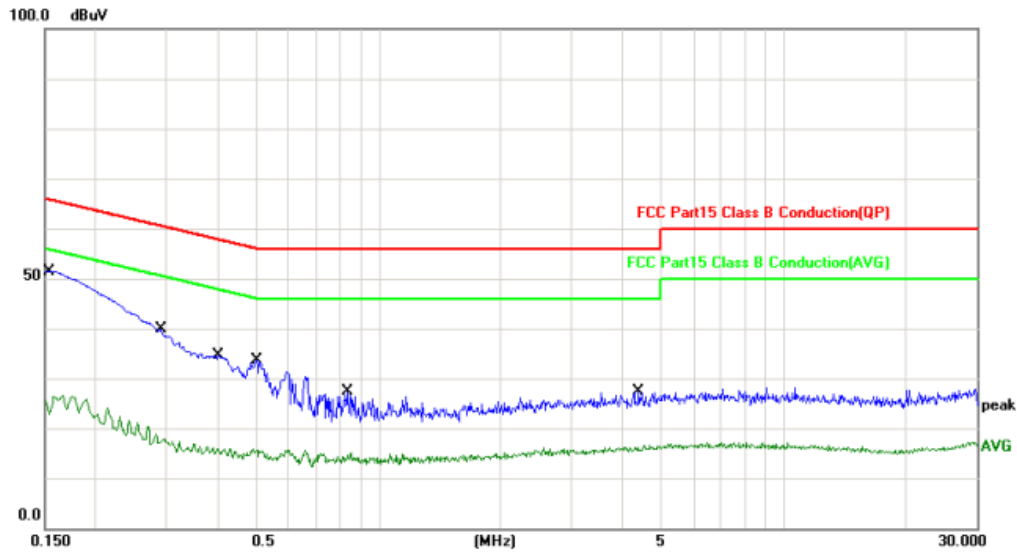
150kHz~30MHz

Worst Case Operating Mode: 3DH5

Line



Conducted Emission Measurement



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1	*	0.1540	28.03	19.70	47.73	65.78	-18.05	QP	
2		0.1540	6.53	19.70	26.23	55.78	-29.55	AVG	
3		0.2900	14.54	19.70	34.24	60.52	-26.28	QP	
4		0.2900	-2.15	19.70	17.55	50.52	-32.97	AVG	
5		0.4020	8.30	19.72	28.02	57.81	-29.79	QP	
6		0.4020	-4.45	19.72	15.27	47.81	-32.54	AVG	
7		0.5020	6.24	19.74	25.98	56.00	-30.02	QP	
8		0.5020	-4.82	19.74	14.92	46.00	-31.08	AVG	
9		0.8380	-2.35	19.82	17.47	56.00	-38.53	QP	
10		0.8380	-5.95	19.82	13.87	46.00	-32.13	AVG	
11		4.3860	-4.70	20.33	15.63	56.00	-40.37	QP	
12		4.3860	-5.04	20.33	15.29	46.00	-30.71	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	
		$\mu\text{V/m}$	$\text{dB}(\mu\text{V})/\text{m}$
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 $\mu\text{V/m}$

(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 Peripherals

Support Equipment				
No.	Equipment	Brand Name	Model Name	Remarks
1	Type-C Cable	AWM	E101344	0.9m, No Shielding
2	Adaptor	FUSHIGANG	AS1201A-0502000 USU	NA
3	Record PC	Lenovo	M4500T	NA
4	Control PC	Lenovo	M4500T	NA

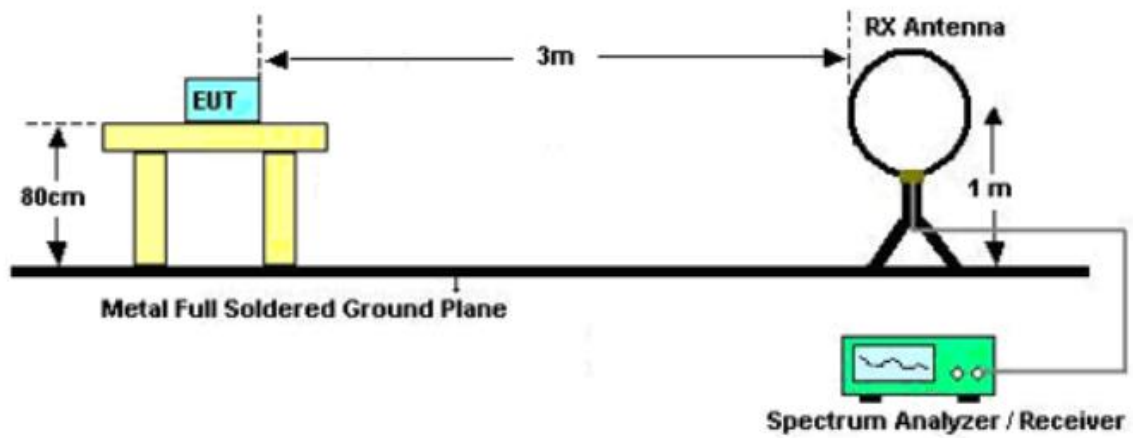
3.2.3 Test Procedure

Test Method	
☐ Conducted Measurement	☒ Radiated Measurement
Test Channels	
☒ Lowest, Middle and Highest Channel	☐ Lowest and Highest Channel
Environmental conditions	
☒ Normal	☐ Normal and Extreme
Note: ☒ : Test ☐ : No Test	

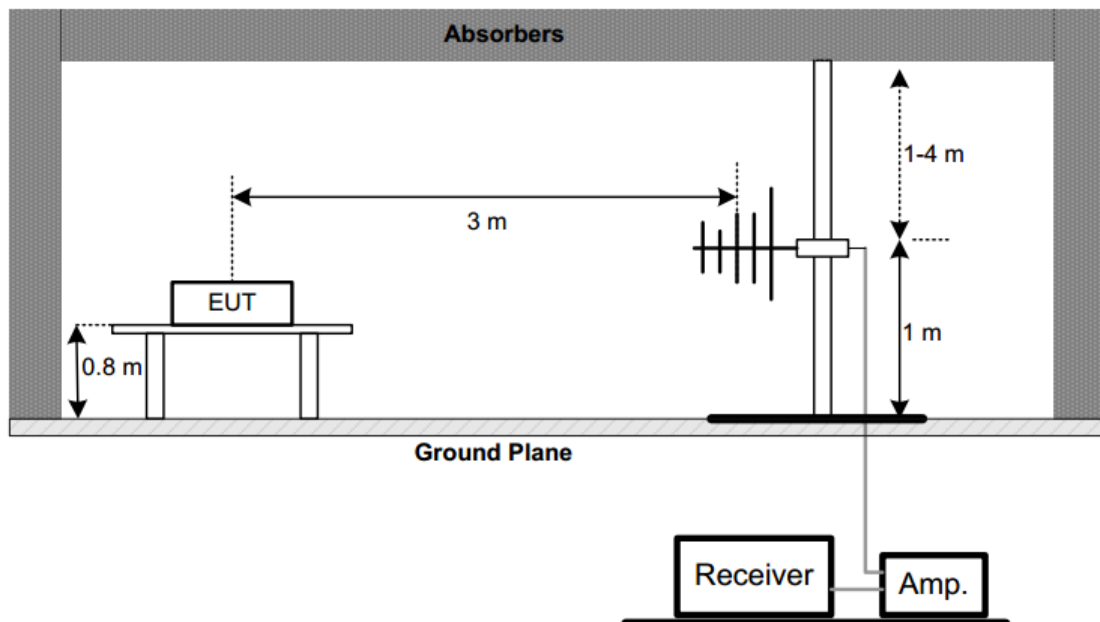
- a) The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 0.8 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(below 1 GHz)
- b) The measuring distance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

3.2.4 Test Setup

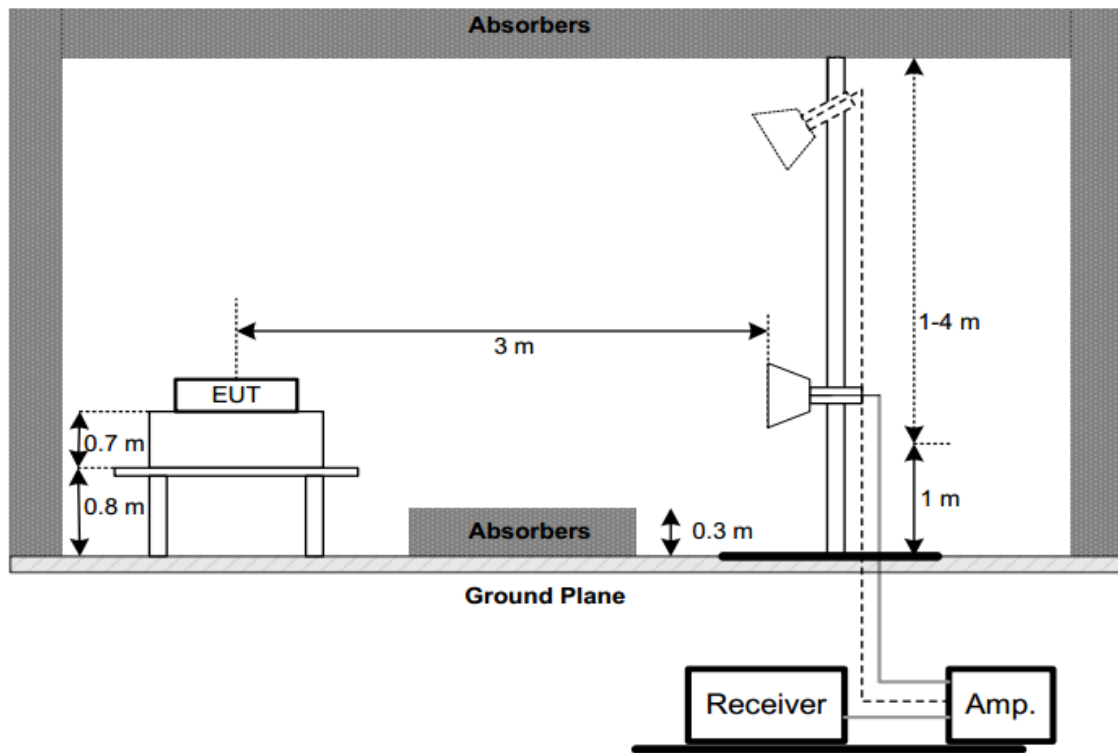
(A) Radiated Emission Test Set-Up Frequency Below 30 MHz



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



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



3.2.5 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.

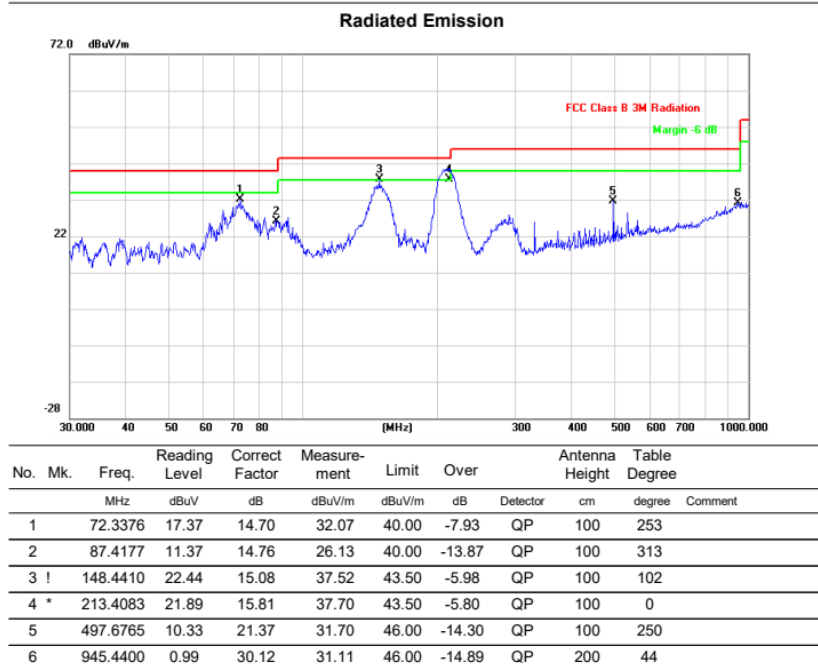
2) Radiated emission: 30MHz-1G

Note:

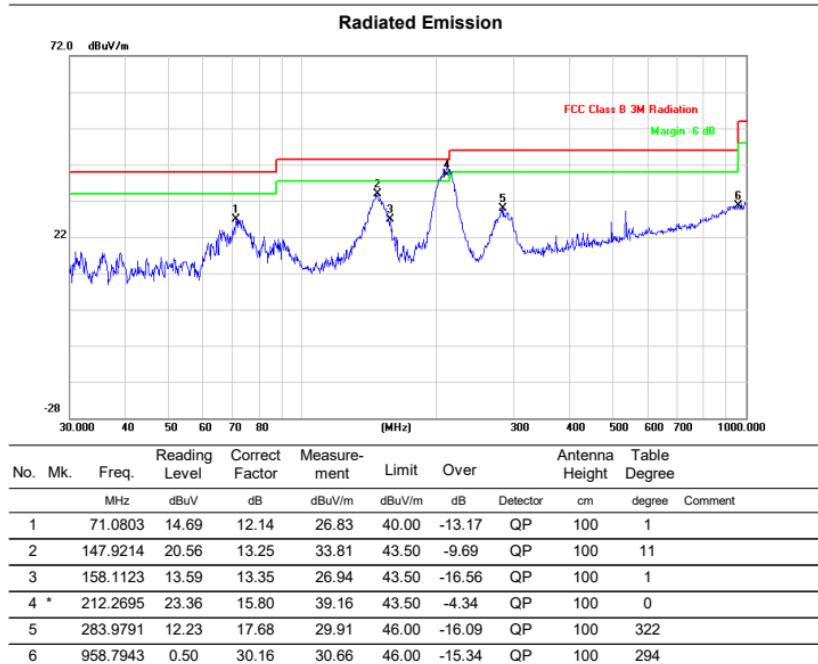
1. Measurement = Reading + Correct Factor.
2. Over = Measurement - Limit

Below 1G (30MHz~1GHz)	Test mode:3DH5	Test Channel:39
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VERTICAL



HORIZONTAL



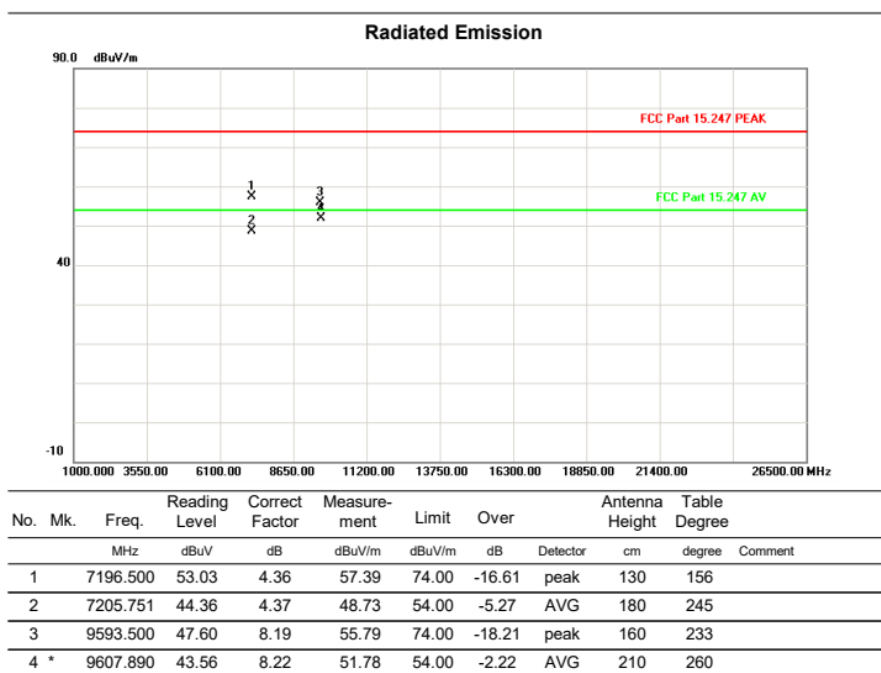
3) Radiated emission: Above 1G

Note:

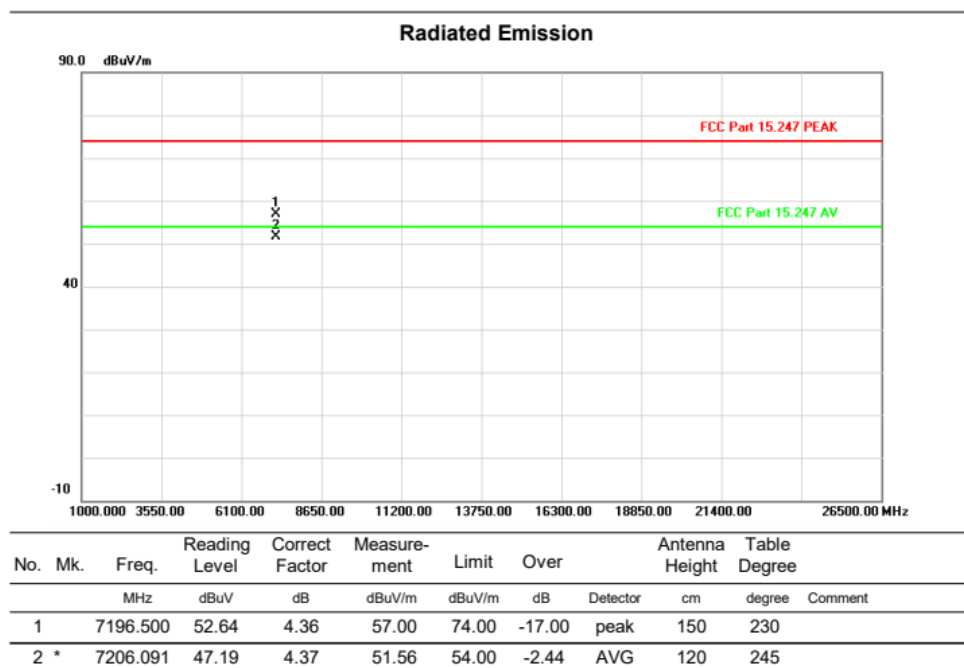
1. Measurement = Reading + Correct Factor.
2. Over = Measurement - Limit

Above 1G (1GHz~26.5GHz)	Test mode:3DH5	Test Channel:0
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VERTICAL



HORIZONTAL



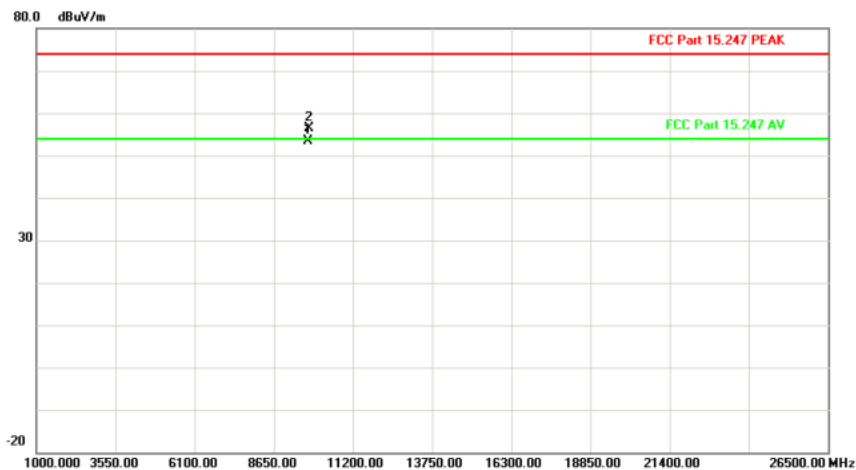
Above 1G (1GHz~26.5GHz)

Test mode: 3DH5

Test Channel:39

VERTICAL

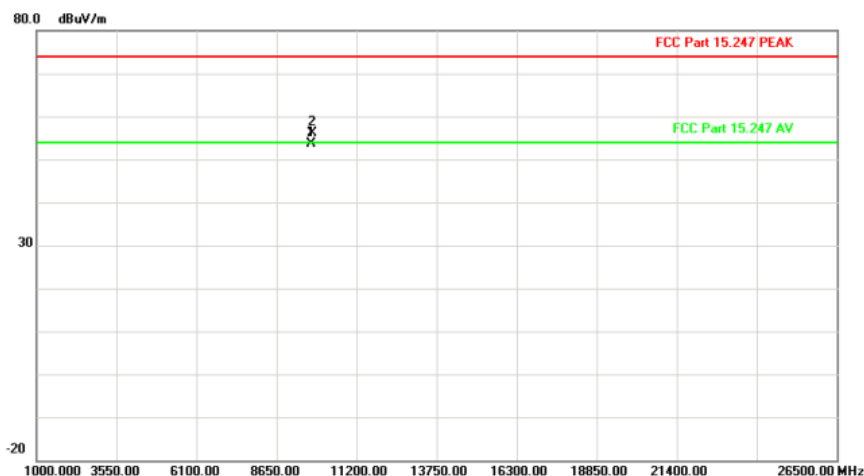
Radiated Emission



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	*	9763.868	44.83	8.51	53.34	54.00	-0.66	AVG	190	250
2		9772.000	47.86	8.53	56.39	74.00	-17.61	peak	170	221

HORIZONTAL

Radiated Emission



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	*	9763.948	45.15	8.51	53.66	54.00	-0.34	AVG	150	210
2		9772.000	47.69	8.53	56.22	74.00	-17.78	peak	170	246

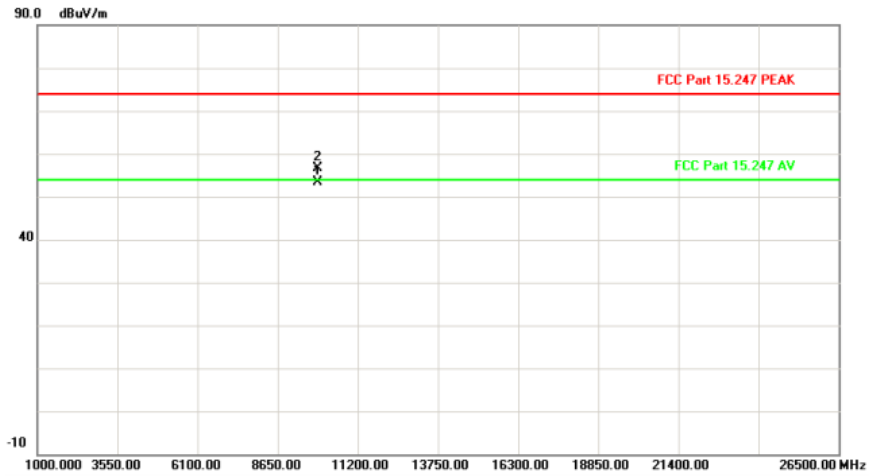
Above 1G (1GHz~26.5GHz)

Test mode: 3DH5

Test Channel:78

VERTICAL

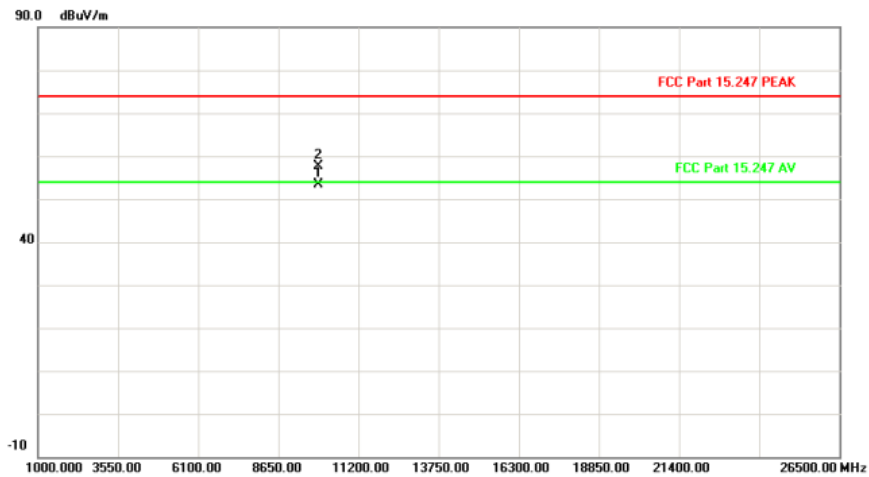
Radiated Emission



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	*	9920.005	44.47	8.80	53.27	54.00	-0.73	AVG	180	250
2		9925.000	47.91	8.81	56.72	74.00	-17.28	peak	120	220

HORIZONTAL

Radiated Emission



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	*	9920.045	44.50	8.80	53.30	54.00	-0.70	AVG	110	260
2		9925.000	48.80	8.81	57.61	74.00	-16.39	peak	140	253

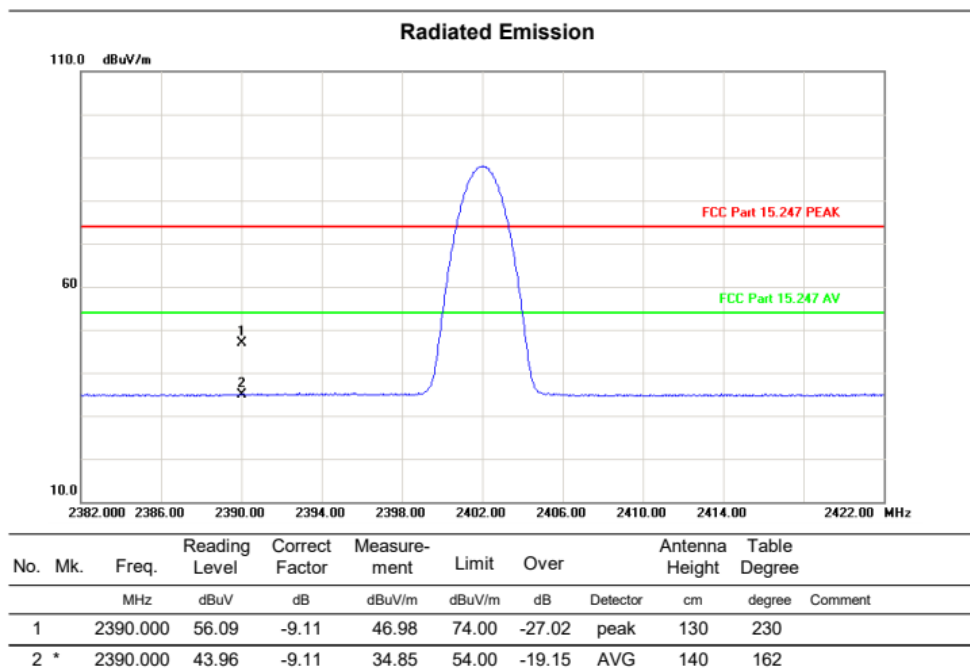
4) Band Edge

Note:

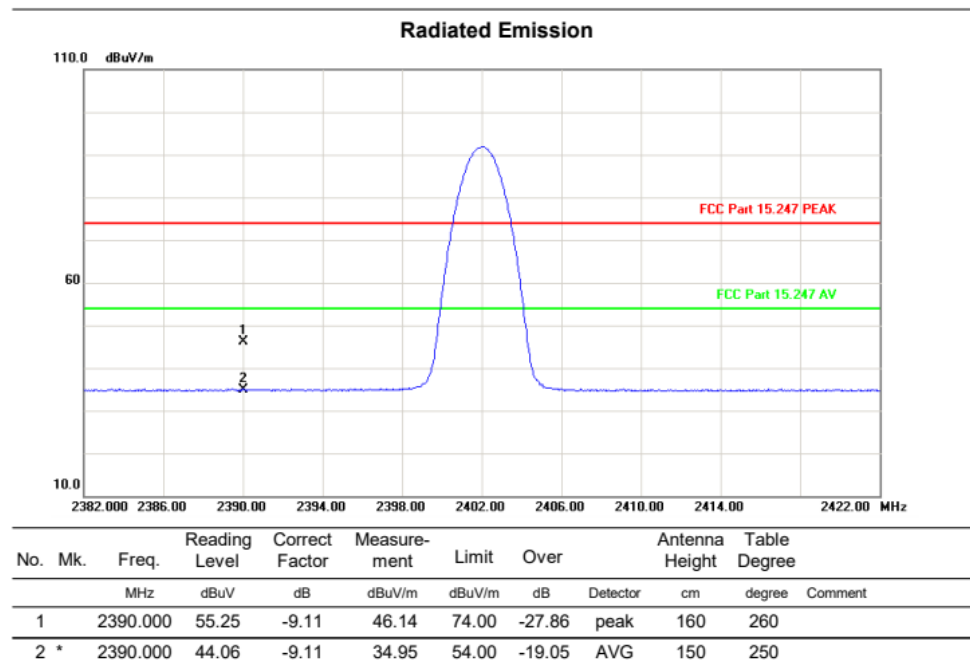
1. Measurement = Reading + Correct Factor.
2. Over = Measurement - Limit

Above 1G (1GHz~26.5GHz)	Test mode:3DH5	Test Channel:0
-------------------------	----------------	----------------

VERTICAL



HORIZONTAL

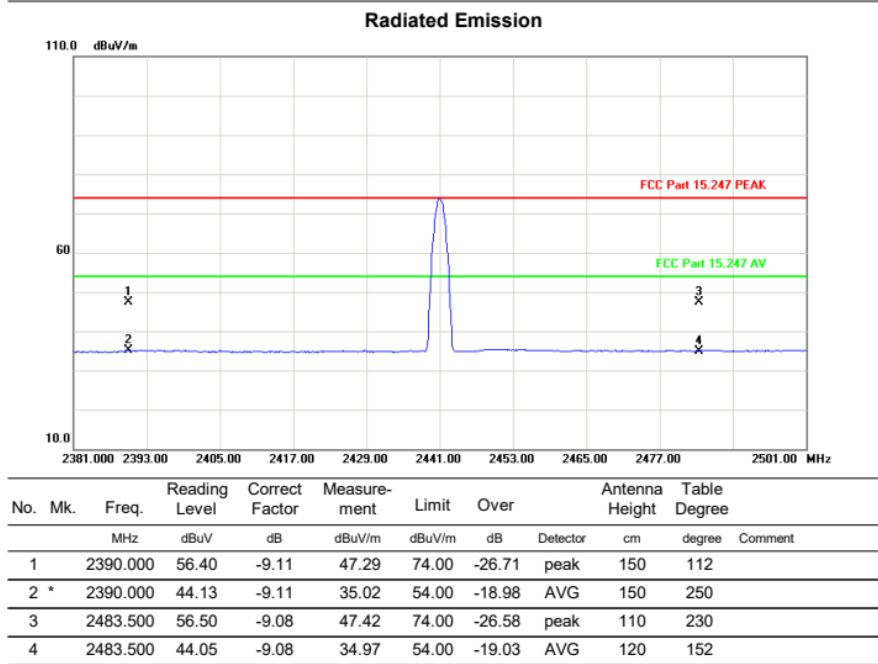


Above 1G (1GHz~26.5GHz)

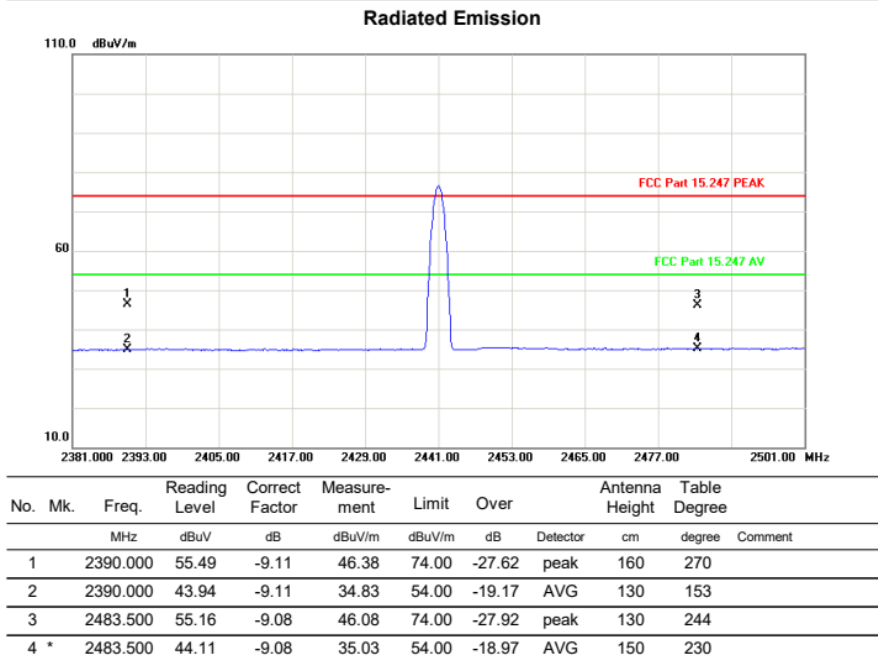
Test mode: 3DH5

Test Channel:39

VERTICAL



HORIZONTAL



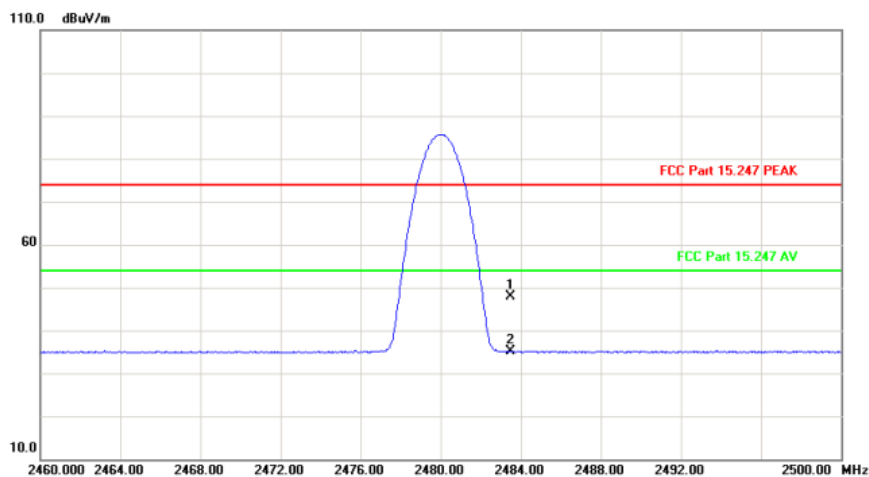
Above 1G (1GHz~26.5GHz)

Test mode: 3DH5

Test Channel:78

VERTICAL

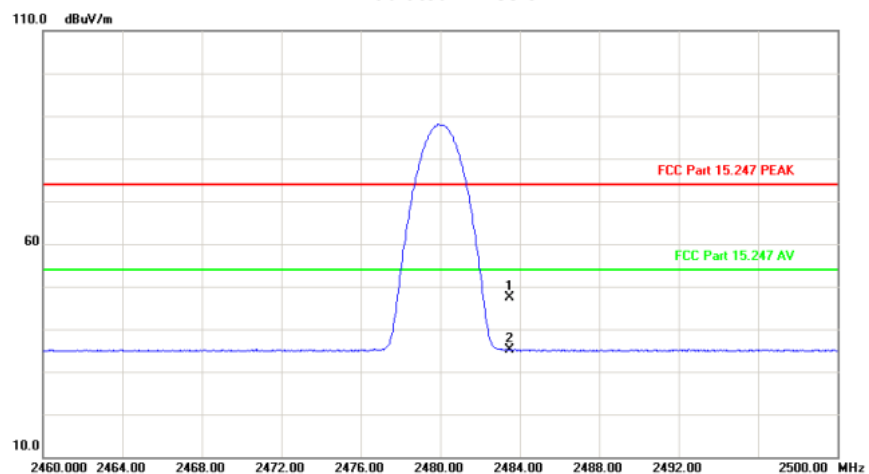
Radiated Emission



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	56.89	-9.08	47.81	74.00	-26.19	peak	130	263
2 *		2483.500	44.17	-9.08	35.09	54.00	-18.91	AVG	170	250

HORIZONTAL

Radiated Emission



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	56.49	-9.08	47.41	74.00	-26.59	peak	140	245
2 *		2483.500	44.11	-9.08	35.03	54.00	-18.97	AVG	170	233

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 Peripherals

Support Equipment				
No.	Equipment	Brand Name	Model Name	Remarks
1	Type-C Cable	AWM	E101344	0.9m, No Shielding
2	Adaptor	FUSHIGANG	AS1201A-0502000 USU	NA
3	Record PC	Lenovo	M4500T	NA
4	Control PC	Lenovo	M4500T	NA

3.3.3 Test Procedure

Test Method	
☒ Conducted Measurement	☐ Radiated Measurement
Test Channels	
☒ Lowest, Middle and Highest Channel	☐ Lowest and Highest Channel
Environmental conditions	
☒ Normal	☐ Normal and Extreme
Note: ● : Test ○ : No Test	

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

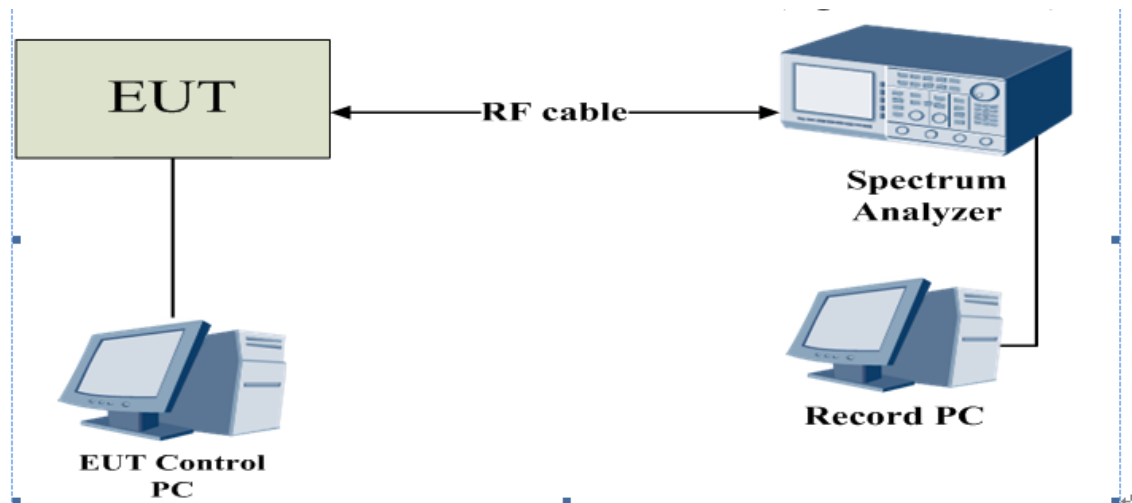
Centre Frequency	The centre frequency of the channel under test
RBW	$\geq 1\% \times \text{Nominal Channel Bandwidth}$
VBW	$\geq 3 \times \text{RBW}$
Frequency span	2x Nominal Channel Bandwidth
Detector Mode	Peak
Trace Mode	Max Hold
Sweep Time	Auto Couple

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.

3.3.4 Test Setup



3.3.5 Test Result

20dB Bandwidth

TestMode	Antenna	Channel	20db EBW[MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
DH5	Ant1	2402	0.882	2401.556	2402.438	---	---
		2441	0.879	2440.556	2441.435	---	---
		2480	0.876	2479.562	2480.438	---	---
2DH5	Ant1	2402	1.338	2401.340	2402.678	---	---
		2441	1.341	2440.337	2441.678	---	---
		2480	1.335	2479.337	2480.672	---	---
3DH5	Ant1	2402	1.332	2401.334	2402.666	---	---
		2441	1.317	2440.340	2441.657	---	---
		2480	1.332	2479.334	2480.666	---	---

DH5_Ant1_2402



DH5_Ant1_2441



DH5_Ant1_2480



2DH5_Ant1_2402



2DH5_Ant1_2441



2DH5_Ant1_2480



3DH5_Ant1_2402



3DH5_Ant1_2441



3DH5_Ant1_2480



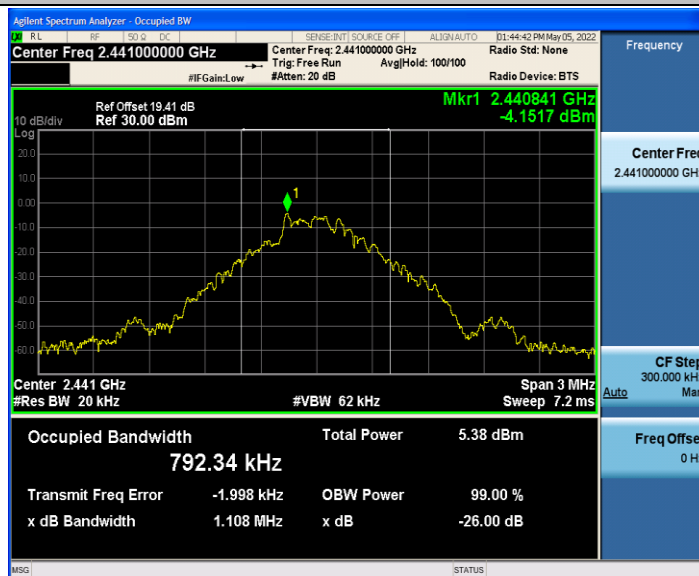
Occupied Channel Bandwidth

TestMode	Antenna	Channel	OCB [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
DH5	Ant1	2402	0.80519	2401.603	2402.408	---	---
		2441	0.79234	2440.602	2441.394	---	---
		2480	0.79453	2479.603	2480.397	---	---
2DH5	Ant1	2402	1.1905	2401.411	2402.602	---	---
		2441	1.1860	2440.411	2441.597	---	---
		2480	1.1795	2479.415	2480.594	---	---
3DH5	Ant1	2402	1.1967	2401.402	2402.599	---	---
		2441	1.1950	2440.400	2441.595	---	---
		2480	1.1959	2479.405	2480.601	---	---

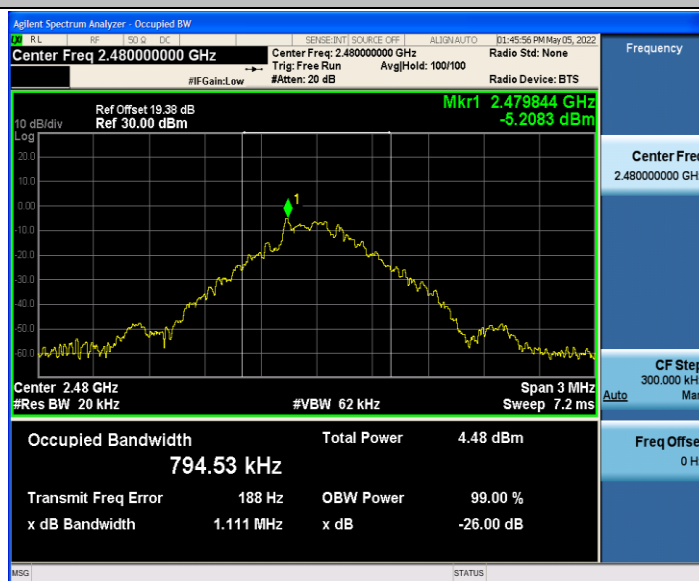
DH5_Ant1_2402



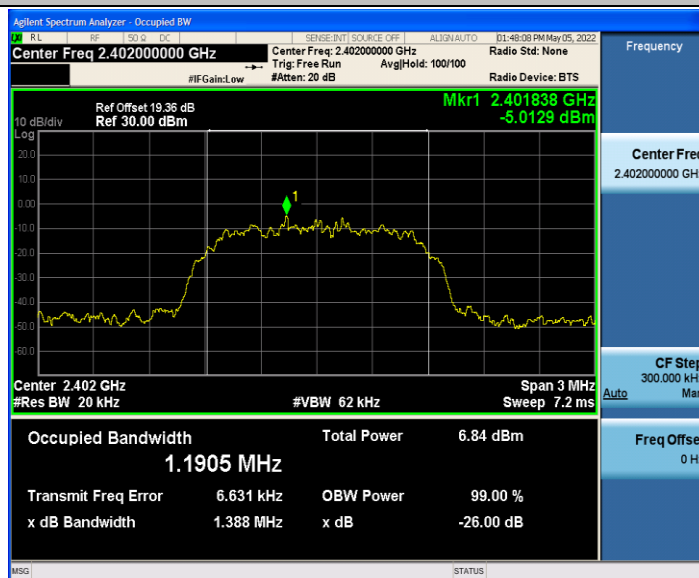
DH5_Ant1_2441



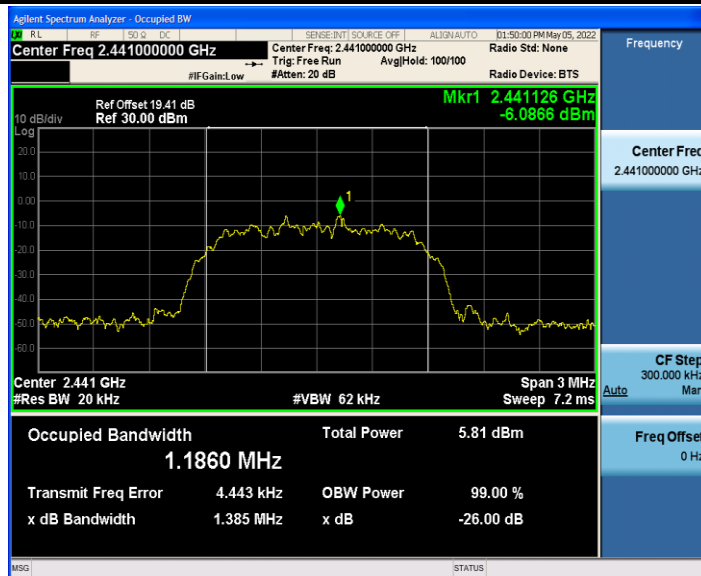
DH5_Ant1_2480



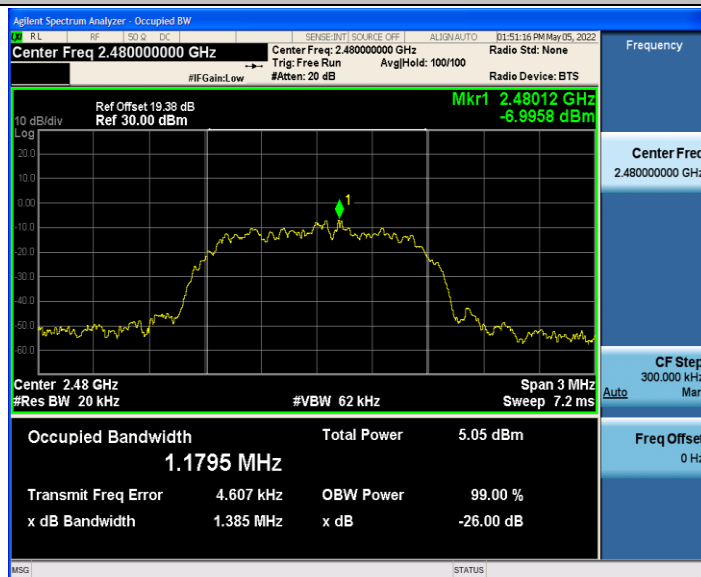
2DH5_Ant1_2402



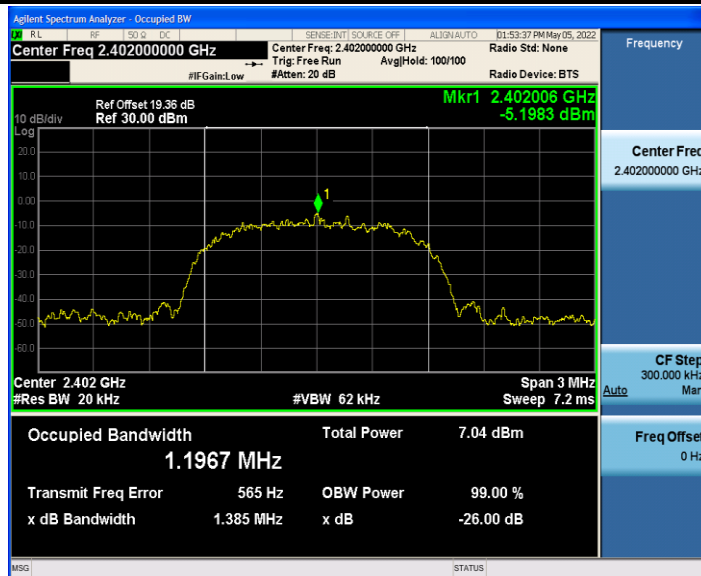
2DH5_Ant1_2441



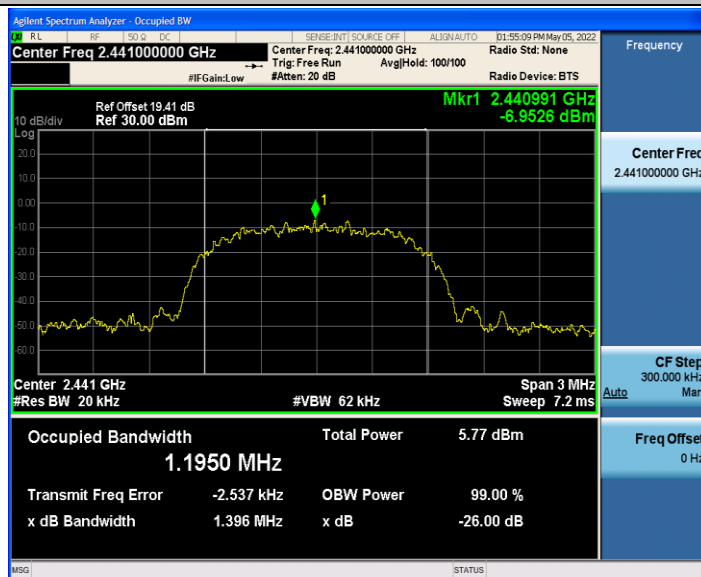
2DH5_Ant1_2480



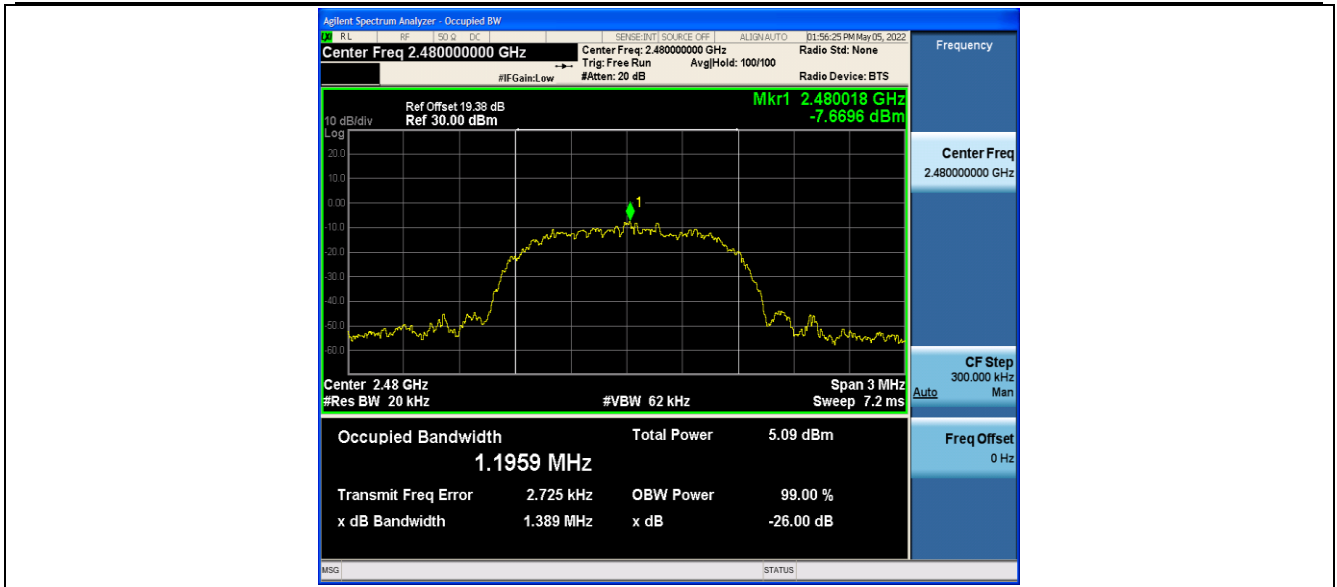
3DH5_Ant1_2402



3DH5_Ant1_2441



3DH5_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 Peripherals

Support Equipment				
No.	Equipment	Brand Name	Model Name	Remarks
1	Type-C Cable	AWM	E101344	0.9m, No Shielding
2	Adaptor	FUSHIGANG	AS1201A-0502000 USU	NA
3	Record PC	Lenovo	M4500T	NA
4	Control PC	Lenovo	M4500T	NA

3.4.3 Test Procedure

Test Method	
☒ Conducted Measurement	☐ Radiated Measurement
Test Channels	
☒ Lowest, Middle and Highest Channel	☐ Lowest and Highest Channel
Environmental conditions	
☒ Normal	☐ 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.

3.4.4 Test Setup



3.4.5 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.

For Power Setting value

Test Software Version	Command		
Frequency (MHz)	2402	2441	2480
DH5	7	7	7
2DH5	7	7	7
3DH5	7	7	7

3.4.6 The Result

TestMode	Antenna	Channel	Result[dBm]	Limit[dBm]	Verdict
DH5	Ant1	2402	-0.74	≤20.97	PASS
		2441	-0.45	≤20.97	PASS
		2480	-1.37	≤20.97	PASS
2DH5	Ant1	2402	2.57	≤20.97	PASS
		2441	1.46	≤20.97	PASS
		2480	0.65	≤20.97	PASS
3DH5	Ant1	2402	2.69	≤20.97	PASS
		2441	1.66	≤20.97	PASS
		2480	0.76	≤20.97	PASS

3.5 Channel Separation

3.5.1 Limit

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. 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. 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 Peripherals

Support Equipment				
No.	Equipment	Brand Name	Model Name	Remarks
1	Type-C Cable	AWM	E101344	0.9m, No Shielding
2	Adaptor	FUSHIGANG	AS1201A-0502000 USU	NA
3	Record PC	Lenovo	M4500T	NA
4	Control PC	Lenovo	M4500T	NA

3.5.3 Test Procedure

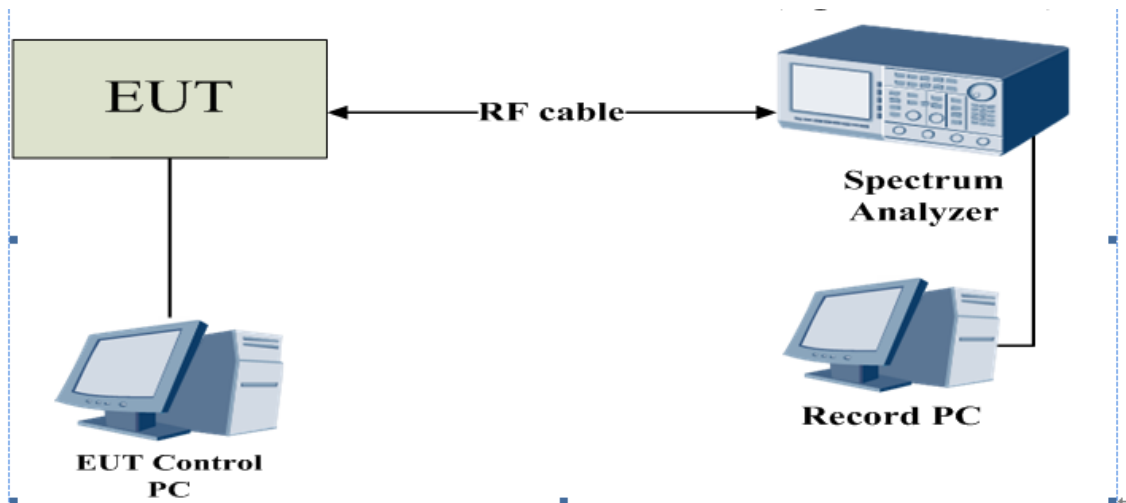
Test Method	
☒ Conducted Measurement	☐ Radiated Measurement
Test Channels	
☒ Lowest, Middle and Highest Channel	☐ Lowest and Highest Channel
Environmental conditions	
☒ Normal	☐ Normal and Extreme
Note: ● : Test ○ : No Test	

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

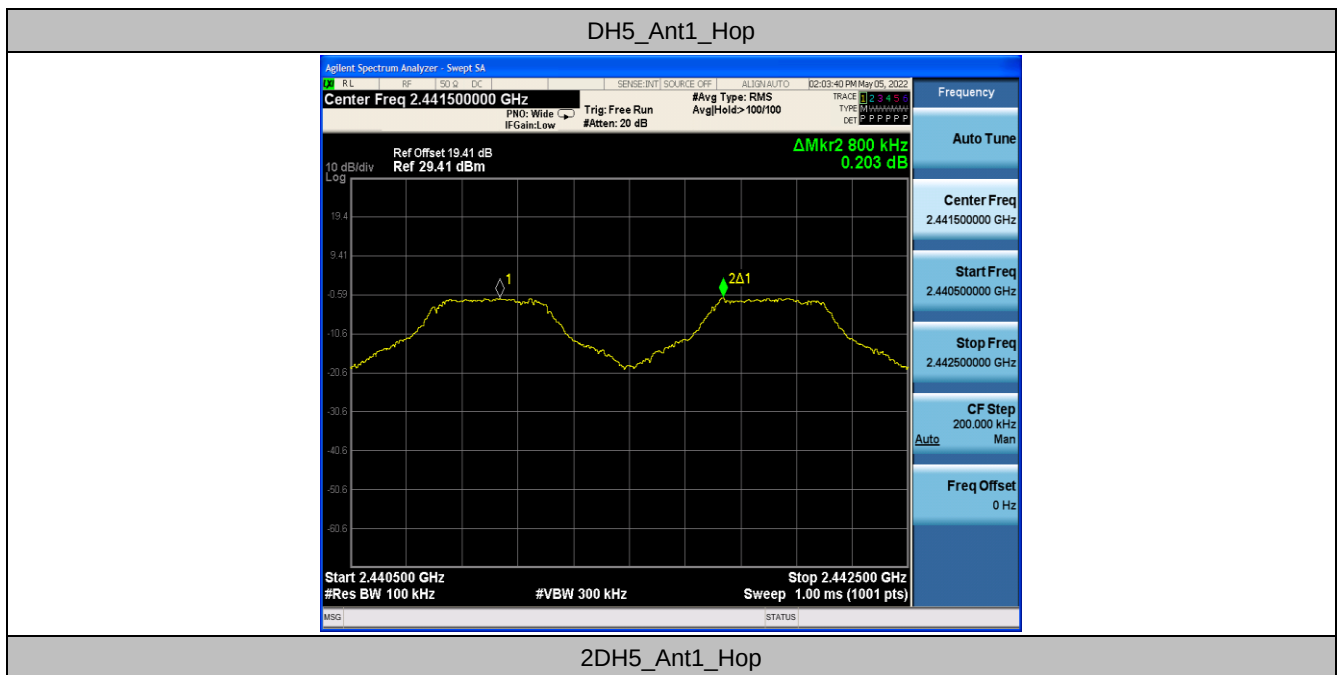
- Set the EUT in transmitting mode, maxhold the channel.
- Set the adjacent channel of the EUT and maxhold another trace.
- Measure the channel separation.

3.5.4 Test Setup



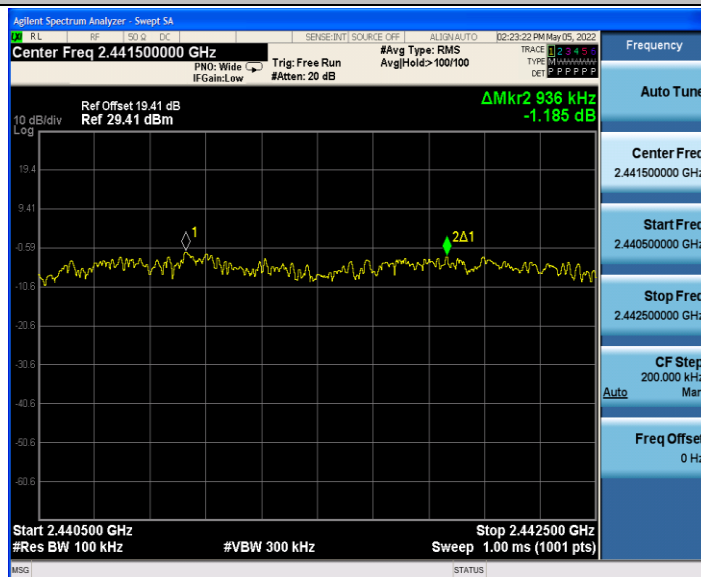
3.5.5 The Result

TestMode	Antenna	Channel	Result[dBm]	Limit[dBm]	Verdict
DH5	Ant1	Hop	0.8	≥ 0.586	PASS
2DH5	Ant1	Hop	1.014	≥ 0.894	PASS
3DH5	Ant1	Hop	0.936	≥ 0.878	PASS





3DH5_Ant1_Hop



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 Peripherals

Support Equipment				
No.	Equipment	Brand Name	Model Name	Remarks
1	Type-C Cable	AWM	E101344	0.9m,No Shielding
2	Adaptor	FUSHIGANG	AS1201A-0502000 USU	NA
3	Record PC	Lenovo	M4500T	NA
4	Control PC	Lenovo	M4500T	NA

3.6.3 Test Procedure

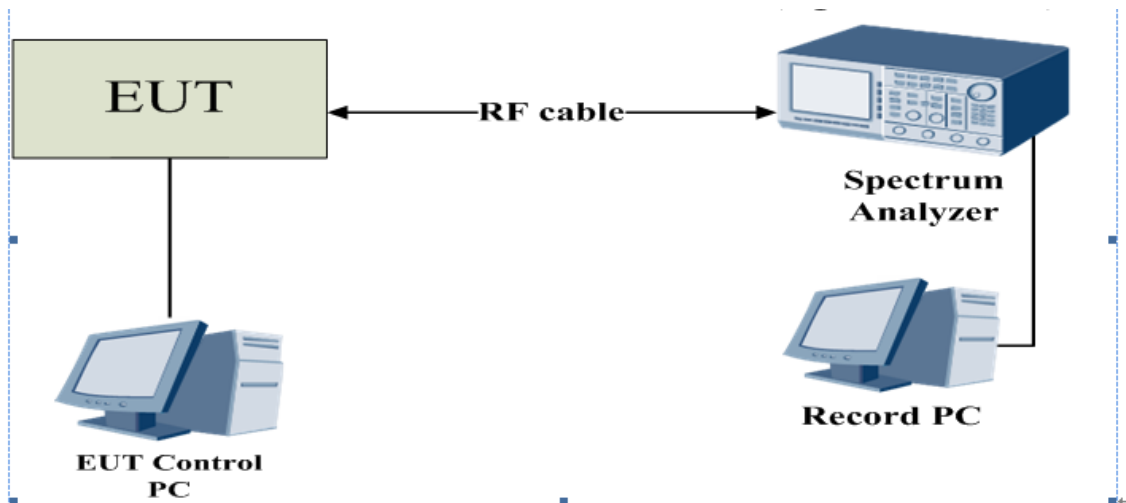
Test Method	
☒ Conducted Measurement	☐ Radiated Measurement
Test Channels	
☐ Lowest, Middle and Highest Channel	☒ Hopping Channel
Environmental conditions	
☒ Normal	☐ Normal and Extreme
Note: ☒ : Test ☐ : No Test	

- 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	100 KHz
VBW	300 KHz
Detector Mode	Peak
Trace Mode	Max Hold
Sweep Time	Auto

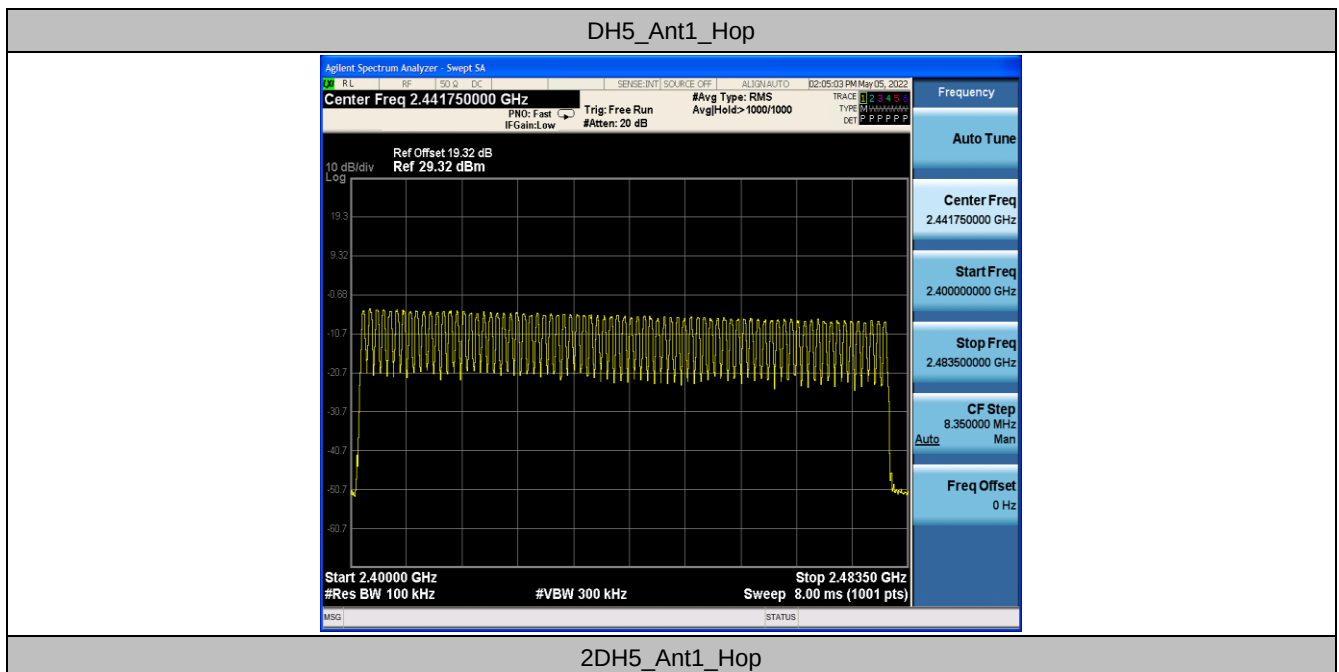
- b) Set the EUT in transmitting mode worked in channel hopping.
c) Set the span From 2400~2483.5MHz。
d) Allow trace to fully stabilize.
e) By using the max-hold function record the quantity of the channel.

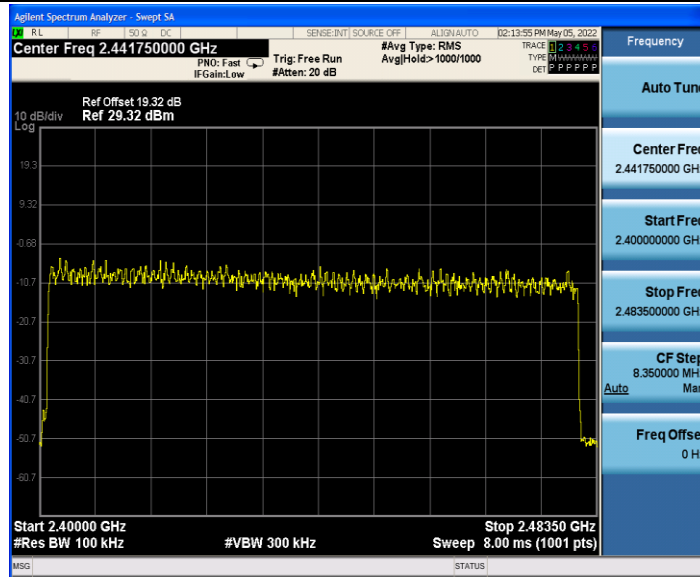
3.6.4 Test Setup



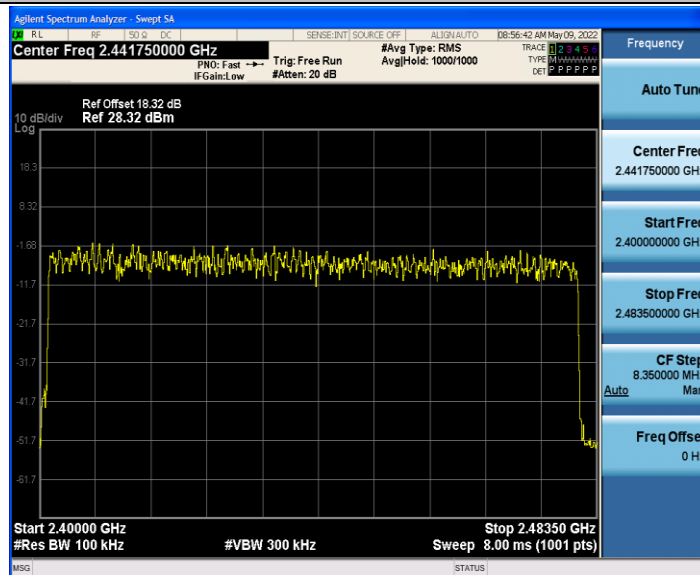
3.6.5 The Result

TestMode	Antenna	Channel	Result[Num]	Limit[Num]	Verdict
DH5	Ant1	Hop	79	≥ 15	PASS
2DH5	Ant1	Hop	79	≥ 15	PASS
3DH5	Ant1	Hop	79	≥ 15	PASS





3DH5_Ant1_Hop



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 Peripherals

Support Equipment				
No.	Equipment	Brand Name	Model Name	Remarks
1	Type-C Cable	AWM	E101344	0.9m,No Shielding
2	Adaptor	FUSHIGANG	AS1201A-0502000 USU	NA
3	Record PC	Lenovo	M4500T	NA
4	Control PC	Lenovo	M4500T	NA

3.7.3 Test Procedure

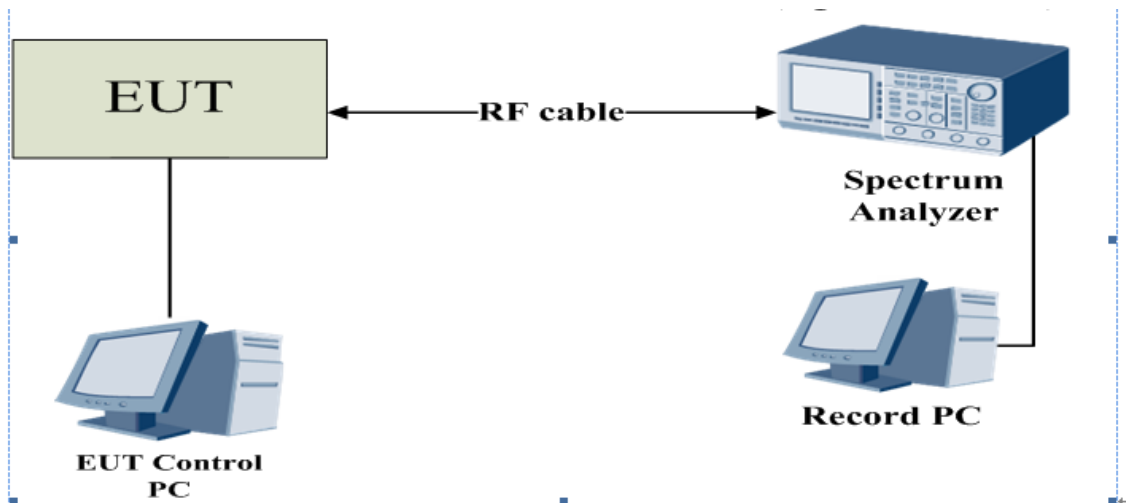
Test Method	
☒ Conducted Measurement	☐ Radiated Measurement
Test Channels	
☐ Lowest, Middle and Highest Channel	☒ Hopping Channel
Environmental conditions	
☒ Normal	☐ Normal and Extreme
Note: ☒ : Test ☐ : No Test	

- 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	1MHz
VBW	3MHz
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.

3.7.4 Test Setup



3.7.5 The Result

TestMode	Antenna	Channel	BurstWidth [ms]	TotalHops [Num]	Result[s]	Limit[s]	Verdict
DH1	Ant1	Hop	0.40	330	0.13	≤0.4	PASS
DH3	Ant1	Hop	1.65	150	0.248	≤0.4	PASS
DH5	Ant1	Hop	2.90	90	0.261	≤0.4	PASS
2DH1	Ant1	Hop	0.41	330	0.134	≤0.4	PASS
2DH3	Ant1	Hop	1.66	180	0.298	≤0.4	PASS
2DH5	Ant1	Hop	2.91	135	0.393	≤0.4	FAIL
3DH1	Ant1	Hop	0.41	310	0.126	≤0.4	PASS
3DH3	Ant1	Hop	1.66	160	2.656	≤0.4	PASS
3DH5	Ant1	Hop	2.91	120	0.349	≤0.4	PASS

Note 1: A period time=0.4s*79=31.6s, Result=BurstWidth*Totalhops

Note 2: Totalhops=Hopping Number in 3.16s*10

Note 3: Hopping Number in 3.16s=Total of highest signals in 3.16s(Second high signals were other channel)