FCC RADIO TEST REPORT
FCC ID: YILMH-816

Product：	Sport Bluetooth Earphone
Trade Name：	MAJESTY
Model Number：	MH-816
Serial Model：	MH-818, MH-819
Report No.：	POCE15072225NRR

Prepared for

SHENZHEN CHENGYAN SCIENCE & TECHNOLOGY CO., LTD
Room 1808, Shenhua Commercial Building,Jiabin Rd. Luohu district Shenzhen, P.R.China

Prepared by

BZT Testing Technology Co., Ltd.
1/F, Building E, Fenda Science Park, Sanwei Community,Xixiang Street Bao'an District, Shenzhen P.R. China

TEST RESULT CERTIFICATION

Applicant's name	SHENZHEN CHENGYAN SCIENCE & TECHNOLOGY CO., LTD
Address	Room 1808, Shenhua Commercial Building,Jiabin Rd. Luohu district Shenzhen, P.R.China
Manufacture's Name	SHEZHEN YANXI SCIENCE AND TECHNOLOGY CO.,LTD
Address	2F, East E Building, Zhong Haixin Industrial Park, Shengbao Rd, Lilang Ave, Buji Town, Longgang District, Shenzhen City, Guangdong Province, China
Product description	
Product name	Sport Bluetooth Earphone
Model and/or type reference	MH-816
Serial Model:	MH-818, MH-819
Ratings	DC 3.7V from battery
Standards	FCC Part15.247
Test procedure	ANSI C63.10-2013

This device described above has been tested by BZT, and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.

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Date of Test	
Date (s) of performance of tests	Sept. 17, 2015 ~ Oct. 10, 2015
Date of Issue	Oct. 10, 2015
Test Result	**Pass**

Testing Engineer	:	Lynn Chen
		(Lynn Chen)
Technical Manager	:	Carlen
		(Carlen Liu)
Authorized Signatory	:	Tommy Zhang
		(Tommy zhang)

The test report merely corresponds to the test sample.
It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

Contents

1. TEST STANDARDS

The tests were performed according to following standards:

FCC Rules Part 15.247: Frequency Hopping, Direct Spread Spectrum and Hybrid Systems that are in operation within the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz.

ANSI C63.10-2013: American National Standard for Testing Unlicensed Wireless Devices

FCC Public Notice DA 00-705: Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems

2. SUMMARY

2.1. Equipment Under Test

Power supply system utilised

Power supply voltage	:	○	120V / 60 Hz	○	115V / 60Hz
		○	12 V DC	○	24 V DC
		●	Other (specified in blank below)		

DC 3.7V

2.2. Short description of the Equipment under Test (EUT)

Sport Bluetooth Earphone with Bluetooth 4.1+EDR and Bluetooth 4.0LE function.

For more details, refer to the user's manual of the EUT.

Serial number: Prototype

2.3. EUT operation mode

The EUT has been tested under typical operating condition. The Applicant provides communication tools software (Bluetest 3) to control the EUT for staying in continuous transmitting and receiving mode for testing. For Bluetooth 4.1+EDR,There are 79 channels of EUT, and the test carried out at the lowest channel, middle channel and highest channel.

Frequency Range:	2402-2480MHz
Channel number:	79 channels
Modulation type:	GFSK, π/4-DQPSK, 8-DPSK
Antenna:	internal

Test Channel	Test Frequency
Low Channel	2402 MHz
Middle Channel	2441 MHz
High Channel	2480 MHz

2.4. EUT configuration

The following peripheral devices and interface cables were connected during the measurement:

○ - supplied by the manufacturer
● - supplied by the lab

●	Notebook PC	Manufacturer :	DELL
		Model No. :	PP18L
○	Test Frame	Manufacturer :	Shenzhen Bolutek Electronical Technology Co.,Ltd
		Model No. :	N01

2.5. Configuration of Tested System

Fig. 2-1 Configuration of Tested System

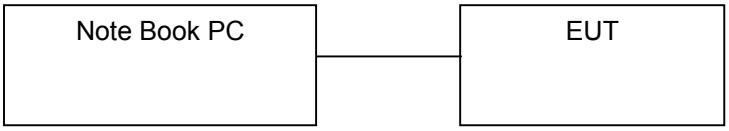


Table 2-1 Equipment Used in Tested System

No.	Product	Manufacturer	Model No.	Serial No.
1	Notebook PC	DELL	PP18L	27548966 7000262

2.6. Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for FCC ID: YILMH-816 filing to comply with Section 15.247 of the FCC Part 15, Subpart C Rules.

2.7. Modifications

No modifications were implemented to meet testing criteria.

2.8. Note

1. The EUT is a an Bluetooth Standard type device,The functions of the EUT listed as below:

	Test Standards	Reference Report
Radio	FCC Part 15 Subpart C (Section15.247)	POCE15072225NRR
	FCC Part 15 Subpart C (Section15.247)	POCE15072226NRR

2. The frequency bands used in this EUT are listed as follows:

Frequency Band(MHz)	2400-2483.5	5150-5350	5470-5725	5725-5850
Bluetooth	√	—	—	—

3. The EUT provides one completed transmitter and receiver.

Modulation Mode	TX Function
Bluetooth	1TX

2.9. Frequency Hopping System Requirements

Standard Applicable

According to FCC Part 15.247(a)(1), 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.

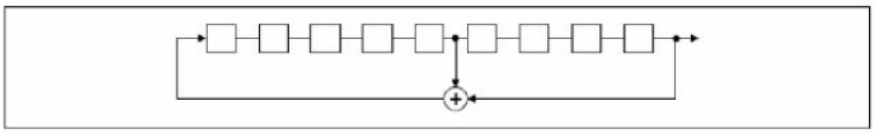
(g) Frequency hopping spread spectrum systems are not required to employ all available hopping channels during each transmission. However, the system, consisting of both the transmitter and the receiver, must be designed to comply with all of the regulations in this section should the transmitter be presented with a continuous data (or information) stream. In addition, a system employing short transmission bursts must comply with the definition of a frequency hopping system and must distribute its transmissions over the minimum number of hopping channels specified in this section.

(h) The incorporation of intelligence within a frequency hopping spread spectrum system that permits the system to recognize other users within the spectrum band so that it individually and independently chooses and adapts its hopsets to avoid hopping on occupied channels is permitted. The coordination of frequency hopping systems in any other manner for the express purpose of avoiding the simultaneous occupancy of individual hopping frequencies by multiple transmitters is not permitted.

EUT Pseudorandom Frequency Hopping Sequence

The pseudorandom sequence may be generated in a nine-stage shift register whose 5^{th} and 9^{th} stage outputs are added in a modulo-two addition stage, and the result is fed back to the input of the first stage.The sequence begins with the first ONE of 9 consecutive ONEs; i.e.the shift register is initialized with nine ones.

Number of shift register stages: 9
Length of pseudo-random sequence: 29-1=511bits
Longest sequence of zeros: 8(non-inverted signal)



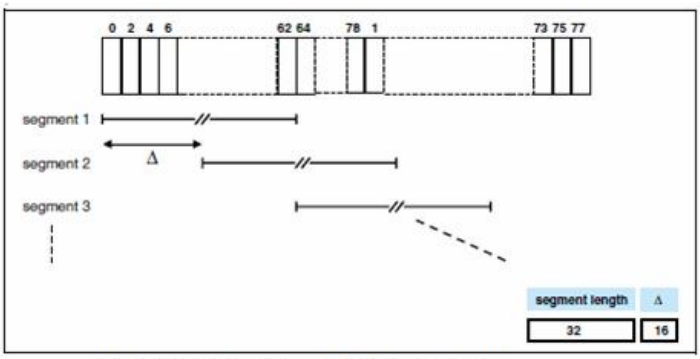
Linear Feedback Shift Register for Generation of the PRBS sequence

The frequencies allocated for the Bluetooth Module is F(MHz)=2402+1*n (0<=n<=78). The lowest, middle, highest channel numbers of the Bluetooth Module used and tested in this report are separately 0 (2402MHz), 39 (2441MHz) and 78 (2480MHz).

Each frequency used equally on the average by each transmitter.
The system receiver have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shift frequencies in synchronization with the transmitted signals.

The selection scheme chooses a segment of 32 hop frequencies spanning about 64 MHz and visits these hops in a pseudo-random order. Next, a different 32-hop segment is chosen, etc. In the page, master page response, slave page response, page scan, inquiry, inquiry response and inquiry scan hopping sequences, the same 32-hop segment is used all the time (the segment is selected by the address; different devices will have different paging segments).

When the basic channel hopping sequence is selected, the output constitutes a pseudo-random sequence that slides through the 79 hops.



Hop selection scheme in CONNECTION state.

Channels list:

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
00	2402	27	2429	54	2456
01	2403	28	2430	55	2457
02	2404	29	2431	56	2458
03	2405	30	2432	57	2459
04	2406	31	2433	58	2460
05	2407	32	2434	59	2461
06	2408	33	2435	60	2462
07	2409	34	2436	61	2463
08	2410	35	2437	62	2464
09	2411	36	2438	63	2465
10	2412	37	2439	64	2466
11	2413	38	2440	65	2467
12	2414	39	2441	66	2468
13	2415	40	2442	67	2469
14	2416	41	2443	68	2470
15	2417	42	2444	69	2471
16	2418	43	2445	70	2472
17	2419	44	2446	71	2473
18	2420	45	2447	72	2474
19	2421	46	2448	73	2475
20	2422	47	2449	74	2476
21	2423	48	2450	75	2477
22	2424	49	2451	76	2478
23	2425	50	2452	77	2479
24	2426	51	2453	78	2480
25	2427	52	2454		
26	2428	53	2455		

The pseudorandom frequency hoping sequence sample:

42,41,66,4,78,59,55,48,54,46,52,78,41,26,24,34,39,32,51,18,25,9,12,73,70,58,54,6,66,4,32,67,60,16,3,78,78, 76,47,45,47,49,14,34, etc.

Frequency Hopping System

This transmitter device is frequency hopping device, and complies with FCC part 15.247 rule.

This device uses Bluetooth radio which operates in 2400-2483.5 MHz band. Bluetooth uses a radio technology called frequency-hopping spread spectrum, which chops up the data being sent and transmits chunks of it on up to 79 channels (1 MHz separation; from 2402 to 2480 MHz) in the range 2,400-2,483.5 MHz. The transmitter switches hop frequencies 1,600 times per second to assure a high degree of data security. All Bluetooth devices participating in a given piconet are synchronized to the frequency-hopping channel for the piconet. The frequency hopping sequence is determined by the master's device address and the phase of the hopping sequence (the frequency to hop at a specific time) is determined by the master's internal clock. Therefore, all slaves in a piconet must know the master's device address and must synchronize their clocks with the master's clock.

Adaptive Frequency Hopping (AFH) was introduced in the Bluetooth specification to provide an effective way for a Bluetooth radio to counteract normal interference. AFH identifies "bad" channels, where either other wireless devices are interfering with the Bluetooth signal or the Bluetooth signal is interfering with another device. The AFH-enabled Bluetooth device will then communicate with other devices within its piconet to share details of any identified bad channels. The devices will then switch to alternative available "good" channels, away from the areas of interference, thus having no impact on the bandwidth used.

This device was tested with an bluetooth system receiver to check that the device maintained hopping synchronization, and the device complied with these requirements for DA 00-705 and FCC Part 15.247 rule.

2.10. Mode of Operation

BZT has verified the construction and function in typical operation. All the test modes were carried out with the EUT in normal operation, which was shown in this test report and defined as:

Test Mode
Mode 1: Transmitter-1Mbps(GFSK_DH5) DH5
Mode 2: Transmitter-2Mbps(Pi/4 DQPSK_DH5) 2DH5
Mode 3: Transmitter-3Mbps(8DPSK_DH5) 3DH5
Mode 4: Transmitter-Link mode

Note: The measurements are performed at the highest, middle, lowest available channels

3. TEST ENVIRONMENT

3.1. Address of the test laboratory

BZT Testing Technology Co., Ltd.
1/F, Building E, Fenda Science Park, Sanwei Community, Xixiang Street, Bao'an District, Shenzhen P.R. China
There is one 3m semi-anechoic chamber and two line conducted labs for final test. The Test Sites meet the requirements in documents ANSI C63.10 and CISPR 22/EN 55022 requirements

3.2. Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

FCC-Registration No.: 701733

BZT Testing Technology Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 701733.

3.3. Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature:	15-35 ° C
Humidity:	30-60 %
Atmospheric pressure:	950-1050mbar

3.4. Statement of the measurement uncertainty

The reported uncertainty of measurement **y** ± **U**，where expended uncertainty **U** is based on a standard uncertainty multiplied by a coverage factor of **k=2**，providing a level of confidence of approximately **95** %。

No.	Item	Uncertainty
1	Conducted Emission Test	±1.38dB
2	RF power,conducted	±0.16dB
3	Spurious emissions,conducted	±0.21dB
4	All emissions,radiated(<1G)	±4.68dB
5	All emissions,radiated(>1G)	±4.89dB
6	Temperature	±0.5°C
7	Humidity	±2%

Test Description

FCC PART 15 Subpart C		
FCC Part 15.207	AC Power Conducted Emission	PASS
FCC Part 15.247(a)	20dB Bandwidth	PASS
FCC Part 15.247(d)	Spurious Emission	PASS
FCC Part 15.247(b)	Maximum Peak Output Power	PASS
FCC Part 15.109/ 15.205/ 15.209	Radiated Emissions	PASS
FCC Part 15.247(d)	Band Edge	PASS
FCC Part 15.247(a)(1)	Frequency Separation	PASS
FCC Part 15.247(a)(1)(iii)	Number of hopping frequency	PASS
FCC Part 15.247(a)(1)(iii)	Time of Occupancy	PASS

Remark: The measurement uncertainty is not included in the test result.

3.5. Equipments Used during the Test

Radiation Test equipment

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	Agilent	E4407B	160400005	Jul. 12. 2015
2	Test Receiver	R&S	ESPI	101318	Jul. 12. 2015
3	Bilog Antenna	TESEQ	CBL6111D	31216	Oct. 17. 2014
4	50Ω Coaxial Switch	Anritsu	MP59B	6200264416	Jul. 06. 2015
5	Spectrum Analyzer	ADVANTEST	R3132	150900201	Jul. 06. 2015
6	Horn Antenna	EM	EM-AH-10180	2011071402	Oct. 17. 2014
7	Horn Ant	Schwarzbeck	BBHA 9170	9170-181	Oct. 17. 2014
8	Amplifier	EM	EM-30180	060538	Jul. 12. 2015
9	Loop Antenna	ARA	PLA-1030/B	1029	Oct. 17. 2014
10	Power Meter	R&S	NRVS	100696	Jul. 06. 2015

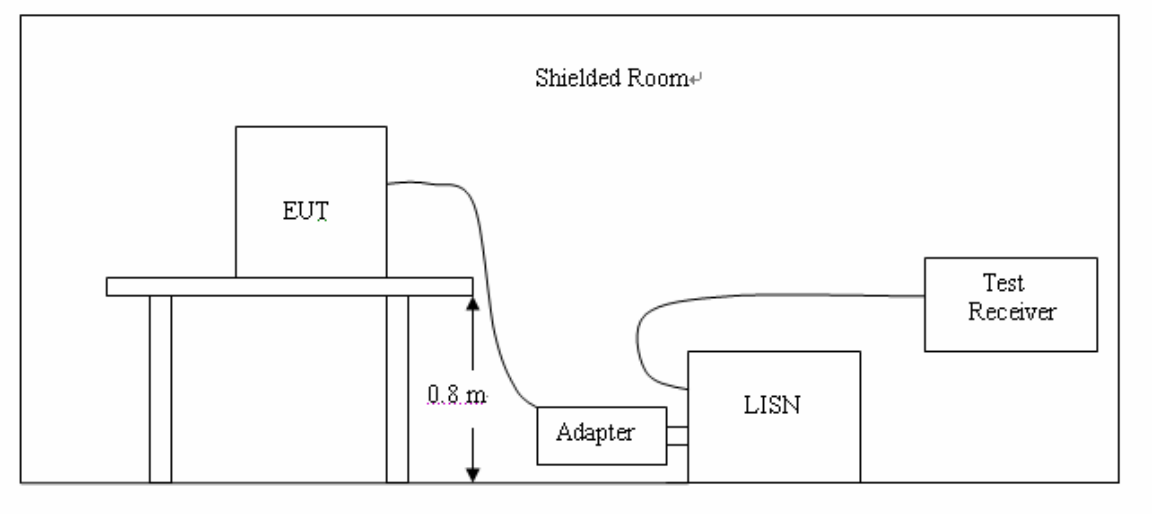
Conduction Test equipment

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Test Receiver	R&S	ESCI	101160	Jul. 12. 2015
2	LISN	R&S	ENV216	101313	Jul. 06. 2015
3	LISN	EMCO	3816/2	00042990	Jul. 06. 2015
4	50Ω Coaxial Switch	Anritsu	MP59B	6200264417	Jul. 06. 2015
5	Passive Voltage Probe	R&S	ESH2-Z3	100196	Jul. 06. 2015
6	Absorbing clamp	R&S	MOS-21	100423	Jul. 06. 2015

4. TEST CONDITIONS AND RESULTS

4.1. AC Power Conducted Emission

TEST CONFIGURATION



TEST PROCEDURE

1 The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. 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 C63.10-2013.
2 Support equipment, if needed, was placed as per ANSI C63.10-2013
3 All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10-2013
4 The EUT received DC5V power from the adapter, the adapter received AC120V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
5 All support equipments received AC power from a second LISN, if any.
6 The EUT 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.
Conducted emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9kHz.

AC Power Conducted Emission Limit

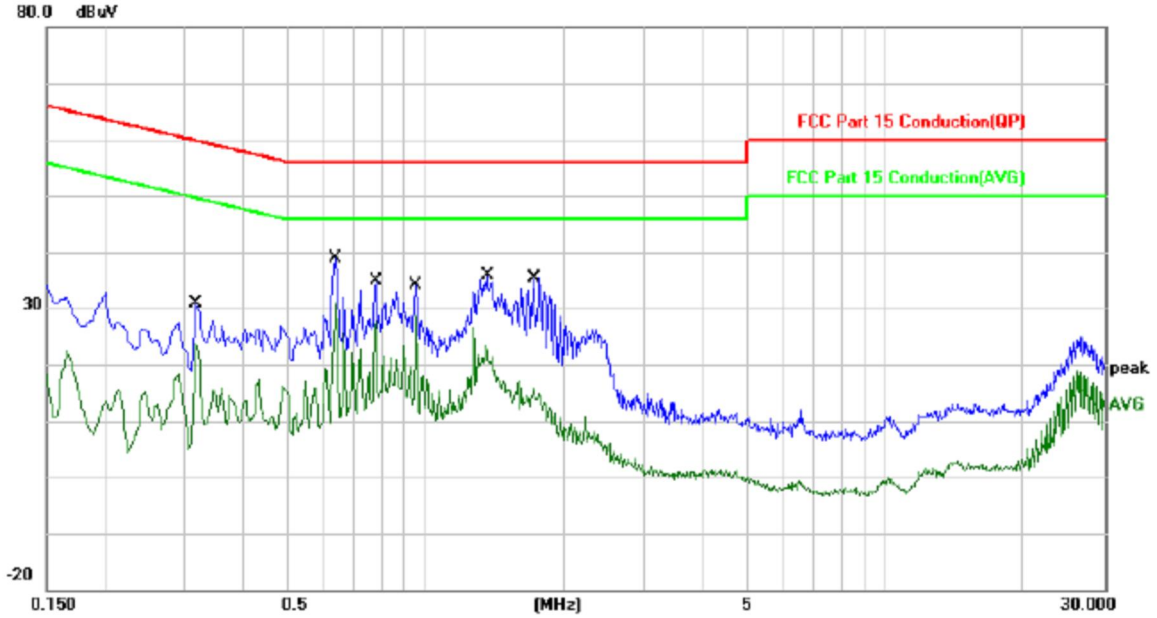
For intentional device, according to § 15.207(a) AC Power Conducted Emission Limits is as following：

Frequency (MHz)	Maximum RF Line Voltage (dBμV)			
	CLASS A		CLASS B	
	Q.P.	Ave.	Q.P.	Ave.
0.15 - 0.50	79	66	66-56*	56-46*
0.50 - 5.00	73	60	56	46
5.00 - 30.0	73	60	60	50

* Decreasing linearly with the logarithm of the frequency

TEST RESULTS

Mode 4 is the worst case as results in the report.



Site Chamber #1 Phase: *L1* Temperature: 25

Limit: FCC Part 15 Conduction(QP) Power: AC 120V/60Hz Humidity: 41 %

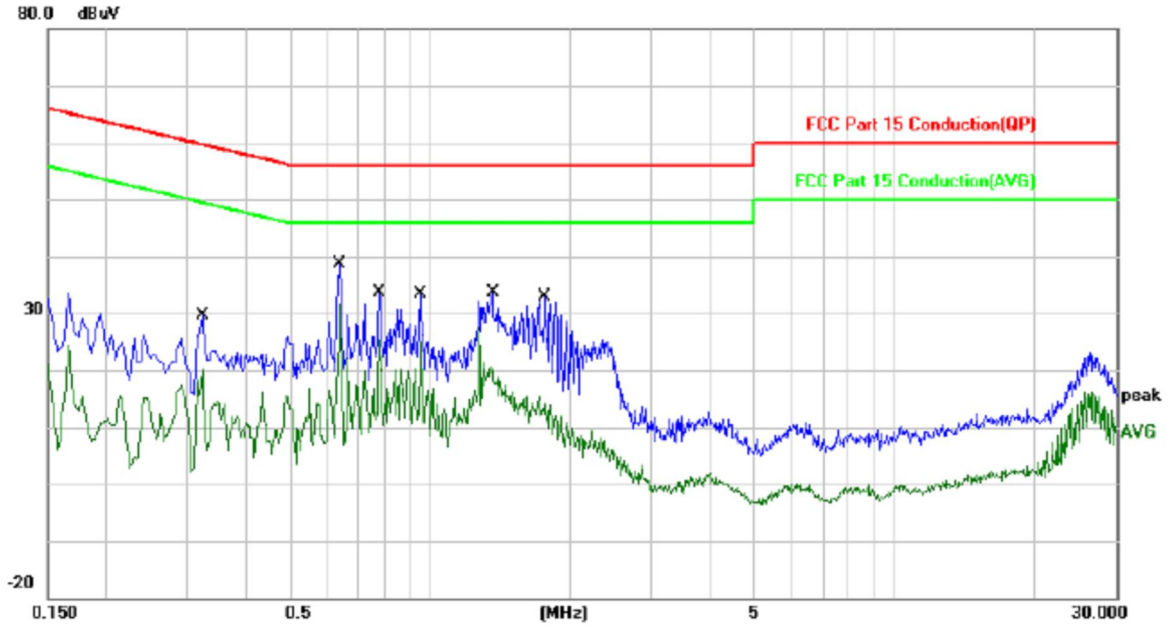
EUT:

M/N:

Mode:

Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.3191	28.69	-0.01	28.68	59.73	-31.05	QP	
2		0.3191	19.85	-0.01	19.84	49.73	-29.89	AVG	
3	*	0.6370	37.00	-0.05	36.95	56.00	-19.05	QP	
4		0.6370	26.92	-0.05	26.87	46.00	-19.13	AVG	
5		0.7821	31.58	-0.07	31.51	56.00	-24.49	QP	
6		0.7821	22.45	-0.07	22.38	46.00	-23.62	AVG	
7		0.9544	31.69	-0.11	31.58	56.00	-24.42	QP	
8		0.9544	24.15	-0.11	24.04	46.00	-21.96	AVG	
9		1.3541	27.37	-0.17	27.20	56.00	-28.80	QP	
10		1.3541	18.83	-0.17	18.66	46.00	-27.34	AVG	
11		1.7116	26.16	-0.21	25.95	56.00	-30.05	QP	
12		1.7116	12.26	-0.21	12.05	46.00	-33.95	AVG	



Site Chamber #1 Phase: N Temperature: 25

Limit: FCC Part 15 Conduction(QP) Power: AC 120V/60Hz Humidity: 41 %

EUT:

M/N:

Mode:

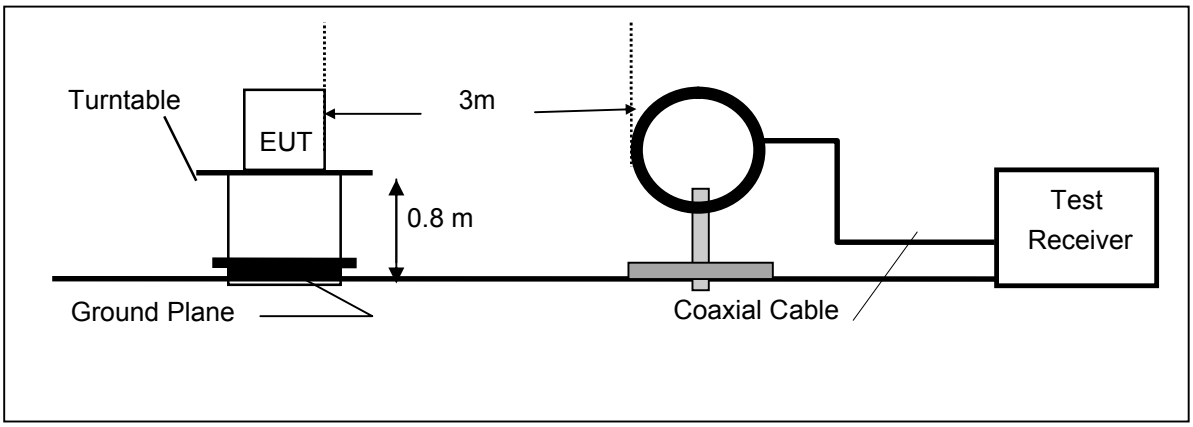
Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.3181	28.92	-0.01	28.91	59.75	-30.84	QP	
2		0.3181	20.09	-0.01	20.08	49.75	-29.67	AVG	
3		0.6367	37.23	-0.05	37.18	56.00	-18.82	QP	
4	*	0.6367	27.34	-0.05	27.29	46.00	-18.71	AVG	
5		0.7811	32.81	-0.07	32.74	56.00	-23.26	QP	
6		0.7811	23.47	-0.07	23.40	46.00	-22.60	AVG	
7		0.9541	31.82	-0.11	31.71	56.00	-24.29	QP	
8		0.9541	24.35	-0.11	24.24	46.00	-21.76	AVG	
9		1.3609	27.56	-0.17	27.39	56.00	-28.61	QP	
10		1.3609	19.77	-0.17	19.60	46.00	-26.40	AVG	
11		1.7666	29.40	-0.21	29.19	56.00	-26.81	QP	
12		1.7666	12.92	-0.21	12.71	46.00	-33.29	AVG	

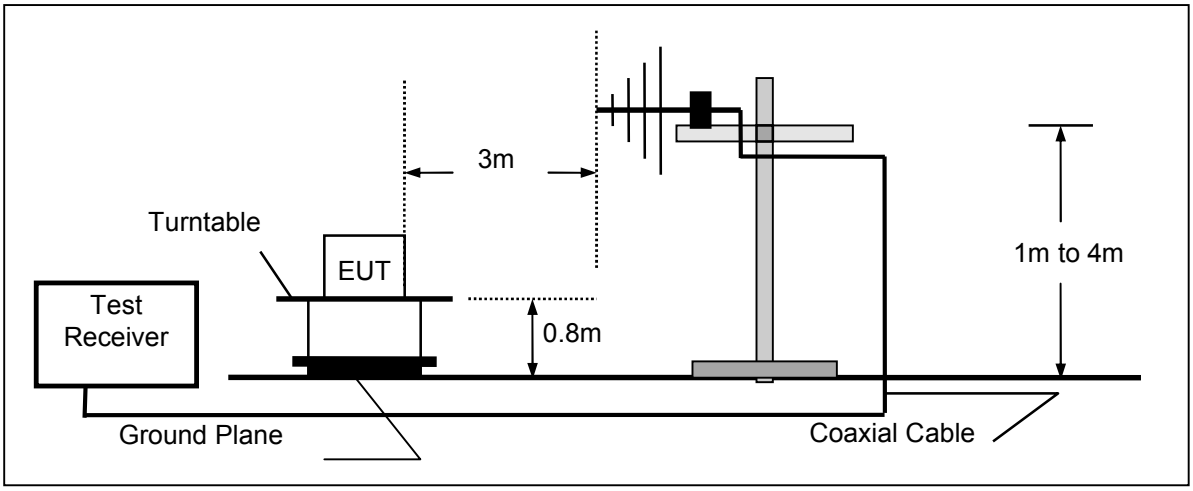
4.2. Transmitter Radiated Unwanted Emissions and Bandedge

TEST CONFIGURATION

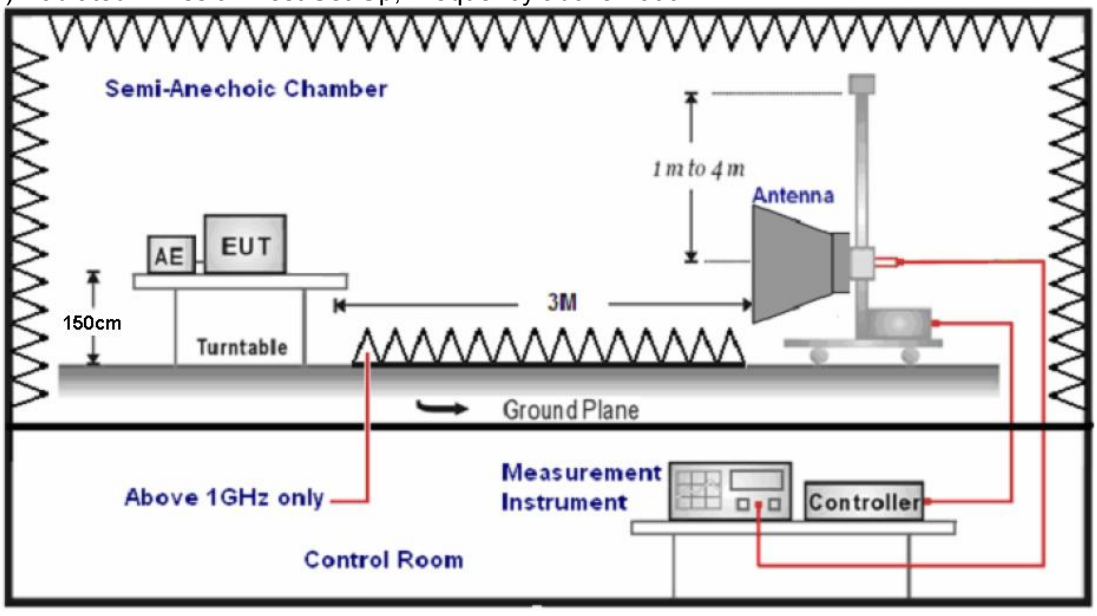
(A) Radiated Emission Test Set-Up, Frequency Below 30MHz



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



(C) Radiated Emission Test Set-Up, Frequency above 1000MHz



FIELD STRENGTH CALCULATION

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor(if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CL - AG

Where FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
RA = Reading Amplitude	AG = Amplifier Gain
AF = Antenna Factor	

RADIATION LIMIT

For unintentional device, according to § 15.209(a), except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values：

Frequency (MHz)	Distance (Meters)	Radiated (dBμV/m)	Radiated (μV/m)
30-88	3	40.0	100
88-216	3	43.5	150
216-960	3	46.0	200
Above 960	3	54.0	500

For intentional device, according to § 15.209(a), the general requirement of field strength of radiated emissions from intentional radiators at a distance of 3 meters shall not exceed the above table.

TEST PROCEDURE

1. The EUT is placed on a turntable, which is 0.8m above ground plane below 1GHz and 1.5m above ground plane above 1GHz .
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
4. For the radiated emission test above 1GHz: Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.
5. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
6. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
7. Repeat above procedures until the measurements for all frequencies are complete.
8. Based on the Frequency Generator in the device include 16MHz.The test frequency range from 9KHz to 25GHz per FCC PART 15.33(a).

Note:

Three axes are chosen for pretest, the X axis is the worst mode for final test.

For battery operated equipment, the equipment tests shall be performed using a fully-charged battery.

TEST RESULTS

All the test modes (TM1, TM2, TM3 and TM4) completed for test. The worst case of Radiated Emission is TM1; the test data of this mode was reported.

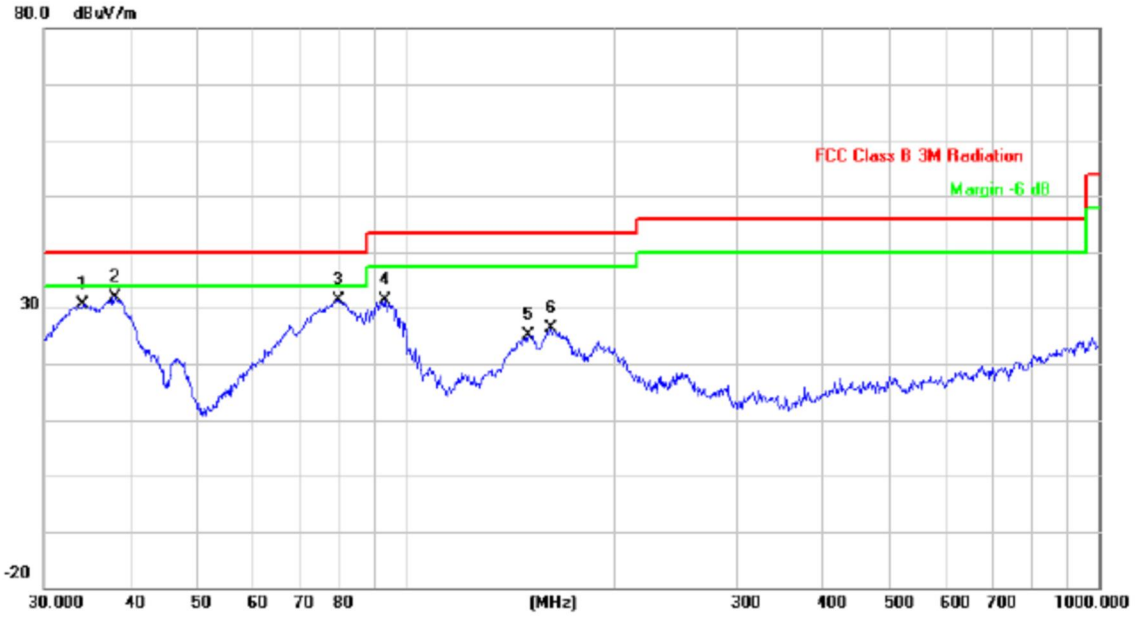
9KHz-30MHz:

Freq. (MHz)	Level (dBuV)	Over Limit (dB)	Limit Line (dBuV)	Remark
-	-	-	-	See Note

Note: The amplitude of spurious emissions that are attenuated by more than 20dB below the permissible value has no need to be reported.

Dstance extrapolation factor= 40 log (specific distance/ test distance) (dB);
Limit line= specific limits (dBuV) + distance extrapolation factor.

30-1000MHz:



Site Chamber #1
Limit: FCC Class B 3M Radiation
EUT:
M/N:
Mode:
Note:

Polarization: *Vertical*
Power:
Distance: 3m

Temperature:
Humidity: %

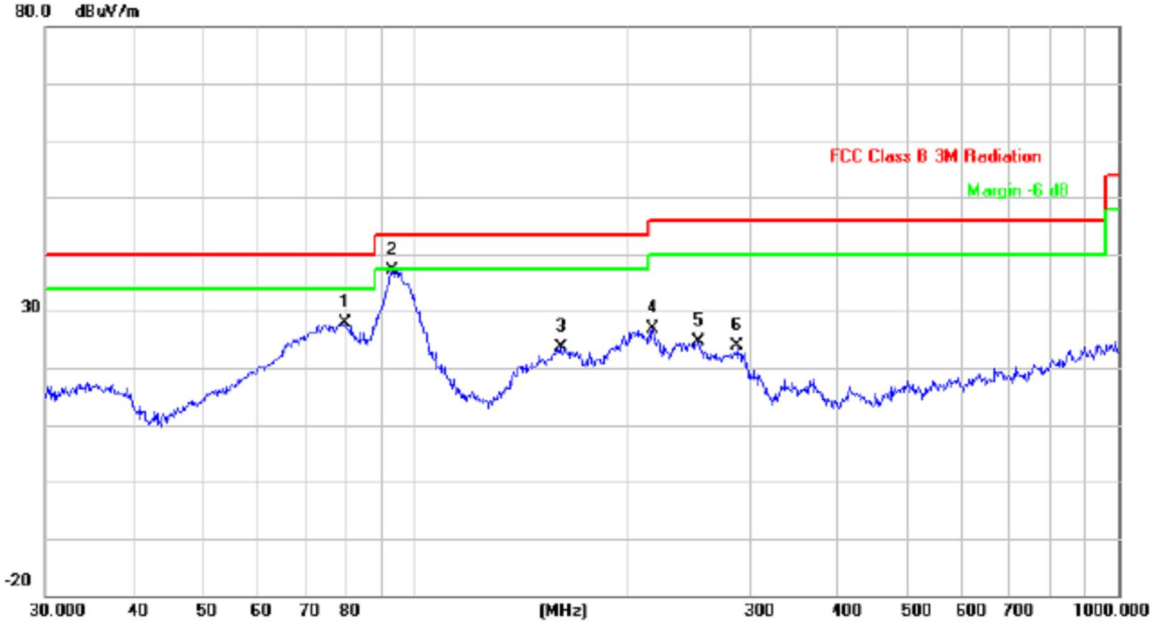
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		34.1561	40.49	-9.83	30.66	40.00	-9.34	peak			
2	*	37.9450	44.37	-12.42	31.95	40.00	-8.05	peak			
3		79.8003	52.37	-20.88	31.49	40.00	-8.51	peak			
4		93.1132	51.83	-20.48	31.35	43.50	-12.15	peak			
5		150.0108	38.81	-13.67	25.14	43.50	-18.36	peak			
6		162.0414	40.68	-14.39	26.29	43.50	-17.21	peak			

Remark：

(1) Measuring frequencies from 9 KHz to the 1 GHz, Radiated emission test from 9KHz to 30MHz was verified, and no any emission was found except system noise floor.

(2) * denotes emission frequency which appearing within the Restricted Bands specified in provision of 15.205, then the general radiated emission limits in 15.209 apply.

(3) The IF bandwidth of EMI Test Receiver between 30MHz to 1GHz was 120KHz, 1 MHz for measuring above 1 GHz, below 30MHz was 10KHz.



Site Chamber #1
Limit: FCC Class B 3M Radiation
EUT:
M/N:
Mode:
Note:

Polarization: *Horizontal*
Power:
Distance: 3m

Temperature:
Humidity: %

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		79.8003	48.84	-20.88	27.96	40.00	-12.04	peak			
2	*	93.1132	57.61	-20.48	37.13	43.50	-6.37	peak			
3		161.4742	37.95	-14.36	23.59	43.50	-19.91	peak			
4		218.3085	42.94	-16.07	26.87	46.00	-19.13	peak			
5		253.8367	39.30	-14.79	24.51	46.00	-21.49	peak			
6		287.9904	37.78	-13.78	24.00	46.00	-22.00	peak			

Remark：

(1) Measuring frequencies from 9 KHz to the 1 GHz, Radiated emission test from 9KHz to 30MHz was verified, and no any emission was found except system noise floor.

(2) * denotes emission frequency which appearing within the Restricted Bands specified in provision of 15.205, then the general radiated emission limits in 15.209 apply.

(3) The IF bandwidth of EMI Test Receiver between 30MHz to 1GHz was 120KHz, 1 MHz for measuring above 1 GHz, below 30MHz was 10KHz.

Above 1 GHz Test Results:

DH5:

CH	Antenna	Frequency (MHz)	Reading Level (dBuV/m)	Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
0	V	2402	67.5	30.8	98.3	Fundamental	/	PK
	V	3200	13.2	31.1	44.3	54(note3)	9.7	PK
	V	2390	36.9	32.2	69.1	74	4.9	PK
	V	2390	18.6	32.2	50.8	54	3.2	AV
	V	2400	36.3	32.1	68.4	74	5.6	PK
	V	2400	17.0	32.1	49.1	54	4.9	AV
	V	4804	5.7	42.6	48.3	54(note3)	5.7	PK
	V	7206	20.8	46.5	67.3	74	6.7	PK
	V	7206	-0.7	46.5	45.8	54	8.2	AV
39	V	2441	66.6	31.2	97.8	Fundamental	/	PK
	V	3200	11.0	31.1	42.1	54(note3)	11.9	PK
	V	4882	15.3	32.8	48.1	54(note3)	5.9	PK
	V	7323	20.8	46.8	67.6	74	6.4	PK
	V	7323	1.4	46.1	47.5	54	6.5	AV
78	V	2480	66.3	30.9	97.2	Fundamental	/	PK
	V	3200	15.6	31.1	46.7	54(note3)	7.3	PK
	V	2483.5	36.0	30.2	66.2	74	7.8	PK
	V	2483.5	15.7	30.2	45.9	54	8.1	AV
	V	4960	15.6	32.5	48.1	54(note3)	5.9	PK
	V	7440	21.2	46.3	67.5	74	6.5	PK
	V	7440	1.1	46.3	47.4	54	6.6	AV

Note: 1. Measure Level = Reading Level + Factor.
2. The test results which are attenuated more than 20 dB below the permissible value limit (the test frequency range: 9kHz~30MHz, 18GHz~25GHz), therefore no data appear in the report.
3. This limit applies for using average detector, if the test result on peak is lower than average limit, then a**verage meas**urement needn't be performed.
4. above 8GHz up to 25GHz was verified, and no any emission was found except system noise floor.

Remark: RBW 1MHz VBW 3MHz peak detector for PK value, RMS detector for AV value

2DH5:

CH	Antenna	Frequency (MHz)	Reading Level (dBuV/m)	Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
0	V	2402	63.5	30.8	94.3	Fundamental	/	PK
	V	3200	10.7	31.1	41.8	54(note3)	12.2	PK
	V	2390	37.9	32.2	70.1	74	3.9	PK
	V	2390	19.2	32.2	51.4	54	2.6	AV
	V	2400	37.7	32.1	69.8	74	4.2	PK
	V	2400	16.5	32.1	48.6	54	5.4	AV
	V	4804	3.5	42.6	46.1	54(note3)	7.9	PK
	V	7206	19.0	46.5	65.5	74	8.5	PK
	V	7206	-4.8	46.5	41.7	54	12.3	AV
39	V	2441	64.1	31.2	95.3	Fundamental	/	PK
	V	3200	17.6	31.1	48.7	54(note3)	5.3	PK
	V	4882	13.4	32.8	46.2	54(note3)	7.8	PK
	V	7323	23.4	46.8	70.2	74	3.8	PK
	V	7323	3.7	46.1	49.8	54	4.2	AV
78	V	2480	63.3	30.9	94.2	Fundamental	/	PK
	V	3200	9.2	31.1	40.3	54(note3)	13.7	PK
	V	2483.5	38.5	30.2	68.7	74	5.3	PK
	V	2483.5	18.9	30.2	49.1	54	4.9	AV
	V	4960	16.1	32.5	48.6	54(note3)	5.4	PK
	V	7440	21.1	46.3	67.4	74	6.6	PK
	V	7440	1.7	46.3	48.0	54	6.0	AV

Note: 1. Measure Level = Reading Level + Factor.
2. The test results which are attenuated more than 20 dB below the permissible value limit (the test frequency range: 9kHz~30MHz, 18GHz~25GHz), therefore no data appear in the report.
3. This limit applies for using average detector, if the test result on peak is lower than average limit, then a**verage meas**urement needn't be performed.
4. above 8GHz up to 25GHz was verified, and no any emission was found except system noise floor.

Remark: RBW 1MHz VBW 3MHz peak detector for PK value, RMS detector for AV value

3DH5:

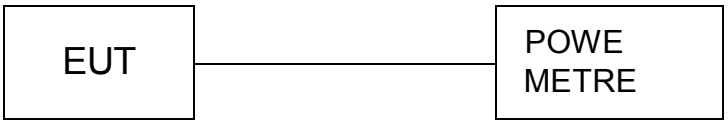
CH	Antenna	Frequency (MHz)	Reading Level (dBuV/m)	Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
0	V	2402	64.9	30.8	95.7	Fundamental	/	PK
	V	3200	12.1	31.1	43.2	54(note3)	10.8	PK
	V	2390	32.3	32.2	64.5	74	9.5	PK
	V	2390	16.7	32.2	48.9	54	5.1	AV
	V	2400	39.0	32.1	71.1	74	2.9	PK
	V	2400	18.2	32.1	50.3	54	3.7	AV
	V	4804	6.5	42.6	49.1	54(note3)	4.9	PK
	V	7206	22.9	46.5	69.4	74	4.6	PK
	V	7206	2.7	46.5	49.2	54	4.8	AV
39	V	2441	63.6	31.2	94.8	Fundamental	/	PK
	V	3200	14.4	31.1	45.5	54(note3)	8.5	PK
	V	4882	15.3	32.8	48.1	54(note3)	5.9	PK
	V	7323	22.5	46.8	69.3	74	4.7	PK
	V	7323	3.0	46.1	49.1	54	4.9	AV
78	V	2480	63.2	30.9	94.1	Fundamental	/	PK
	V	3200	16.4	31.1	47.5	54(note3)	6.5	PK
	V	2483.5	34.4	30.2	64.6	74	9.4	PK
	V	2483.5	11.4	30.2	41.6	54	12.4	AV
	V	4960	16.3	32.5	48.8	54(note3)	5.2	PK
	V	7440	21.0	46.3	67.3	74	6.7	PK
	V	7440	0.7	46.3	47.0	54	7.0	AV

Note: 1. Measure Level = Reading Level + Factor.
2. The test results which are attenuated more than 20 dB below the permissible value limit (the test frequency range: 9kHz~30MHz, 18GHz~25GHz), therefore no data appear in the report.
3. This limit applies for using average detector, if the test result on peak is lower than average limit, then a**verage meas**urement needn't be performed.
4. above 8GHz up to 25GHz was verified, and no any emission was found except system noise floor.

Remark: RBW 1MHz VBW 3MHz peak detector for PK value, RMS detector for AV value

4.3. Maximum Peak Output Power

TEST CONFIGURATION



LIMIT

1 W or 30dBm for GFSK
0.125W or 21dBm for EDR

TEST RESULTS

DH5 Mode:

Channel Frequency (MHz)	Peak Power Output (dBm)	Peak Power Limit (dBm)	Pass / Fail
2402	1.87	30	PASS
2441	2.17	30	PASS
2480	1.74	30	PASS

Note: The test results including the cable lose.

2DH5 Mode:

Channel Frequency (MHz)	Peak Power Output (dBm)	Peak Power Limit (dBm)	Pass / Fail
2402	1.80	21	PASS
2441	1.63	21	PASS
2480	1.00	21	PASS

Note: The test results including the cable lose.

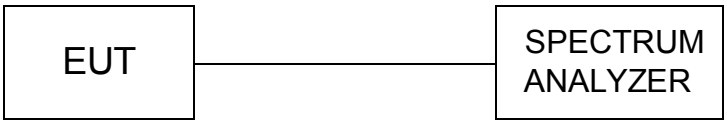
3DH5 Mode:

Channel Frequency (MHz)	Peak Power Output (dBm)	Peak Power Limit (dBm)	Pass / Fail
2402	0.76	30	PASS
2441	1.58	30	PASS
2480	0.92	30	PASS

Note: The test results including the cable lose.

4.4. 20dB Bandwidth

TEST CONFIGURATION



TEST PROCEDURE

According to ANSI C63.10: 2013.
Use the following spectrum analyzer settings:
Span = approximately 2 to 3 times the 20dB bandwidth, centered on a hopping channel
RBW ≧ 1% of the 20dB bandwidth, VBW ≧ RBW, Sweep = auto, Detector function = peak, Trace = max hold
The EUT should be transmitting at its maximum data rate. Allow the trace to stabilize.
Use the marker-to-peak function to set the marker to the peak of the emission. Use the marker-delta function to measure 20 dB down one side of the emission. Reset the marker-delta function, and move the marker to the other side of the emission, until it is (as close as possible to) even with the reference marker level. The marker-delta reading at this point is the 20 dB bandwidth of the emission. If this value varies with different modes of operation (e.g., data rate, modulation format, etc.), repeat this test for each variation.

LIMIT

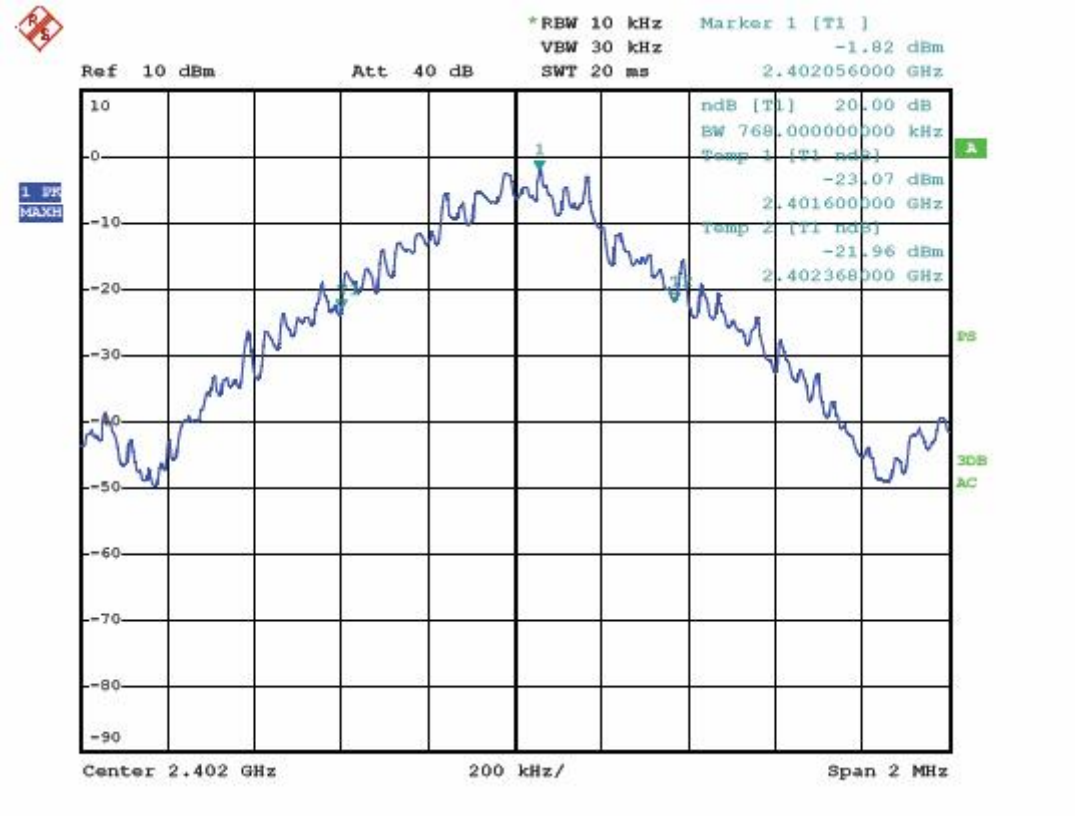
For frequency hopping systems operating in the 2400MHz-2483.5MHz no limit for 20dB bandwidth.

TEST RESULTS

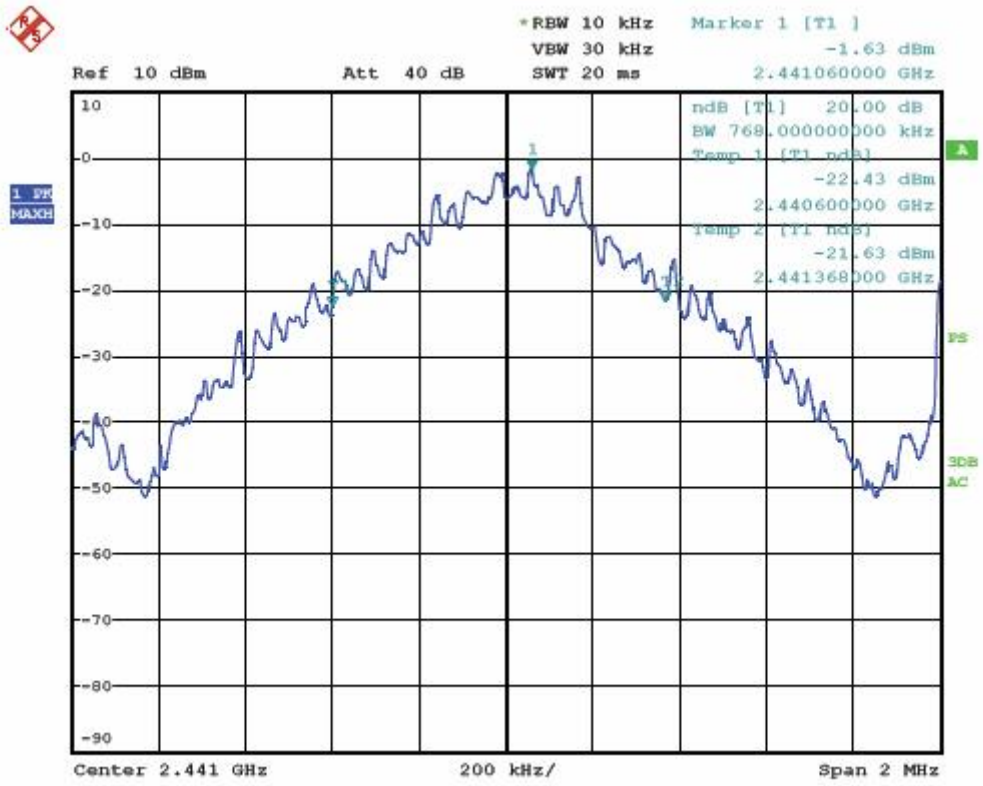
DH5 Mode:

CHANNEL FREQUENCY (MHz)	20dB BANDWIDTH (MHz)	LIMIT (MHz)	PASS/FAIL
2402	0.768	/	PASS
2441	0.768	/	PASS
2480	0.764	/	PASS

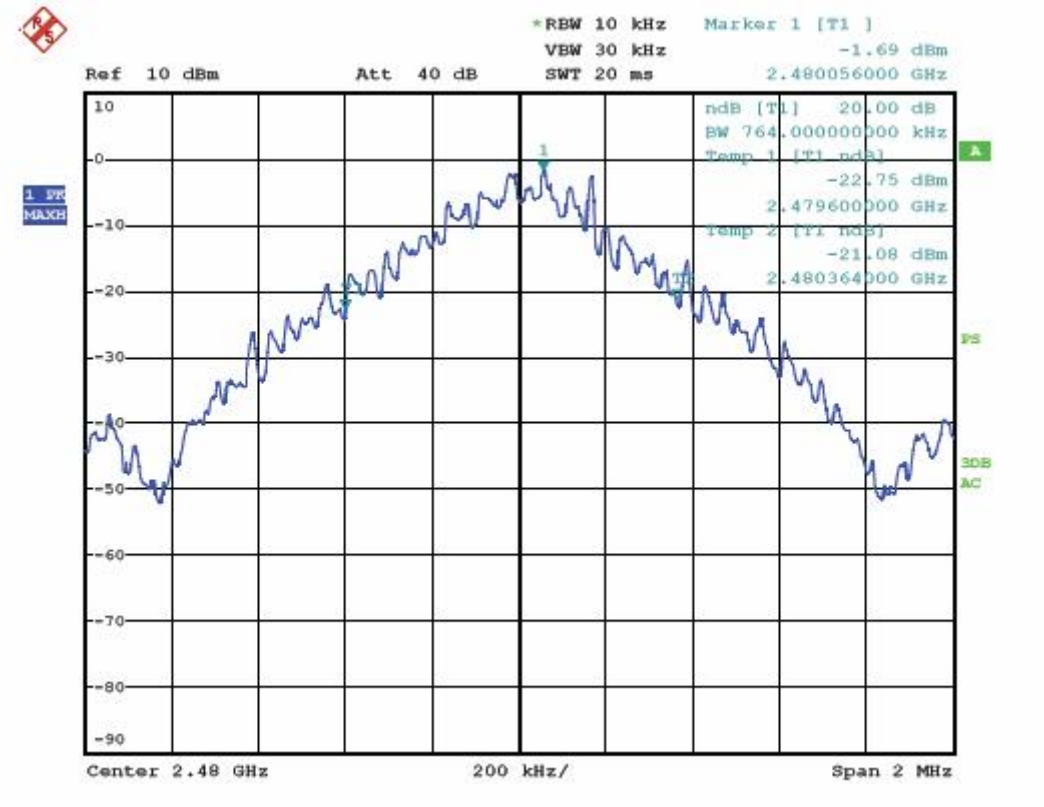
Low Channel



Middle Channel



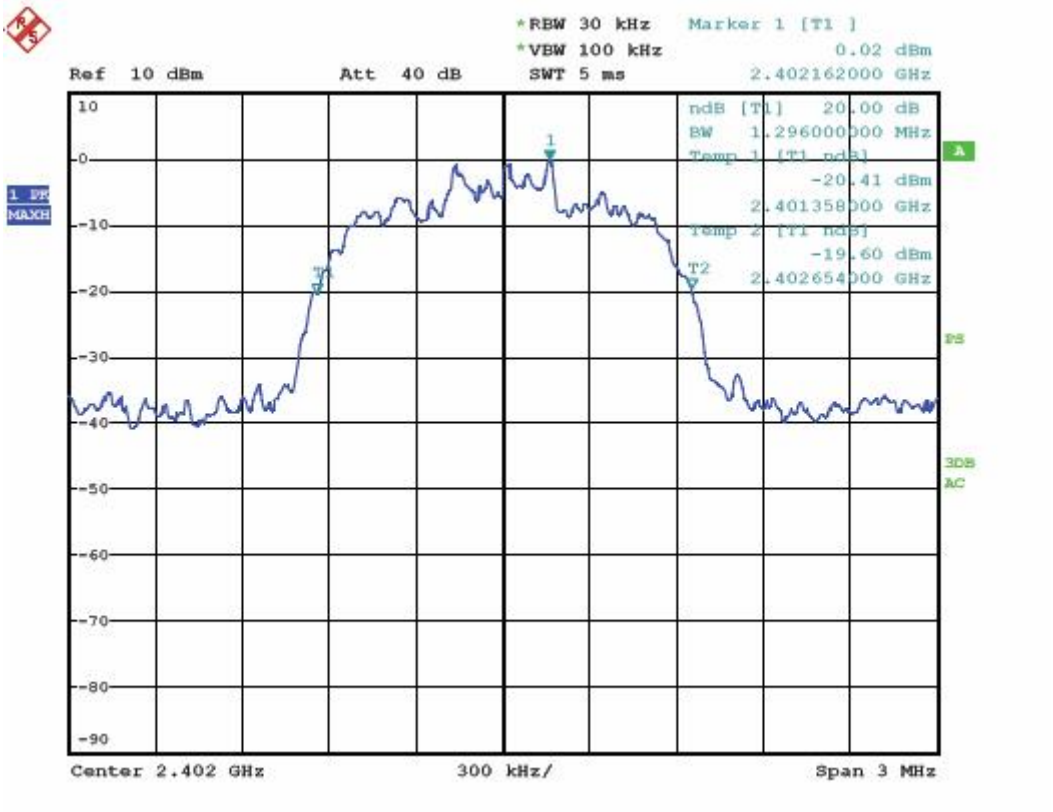
High Channel



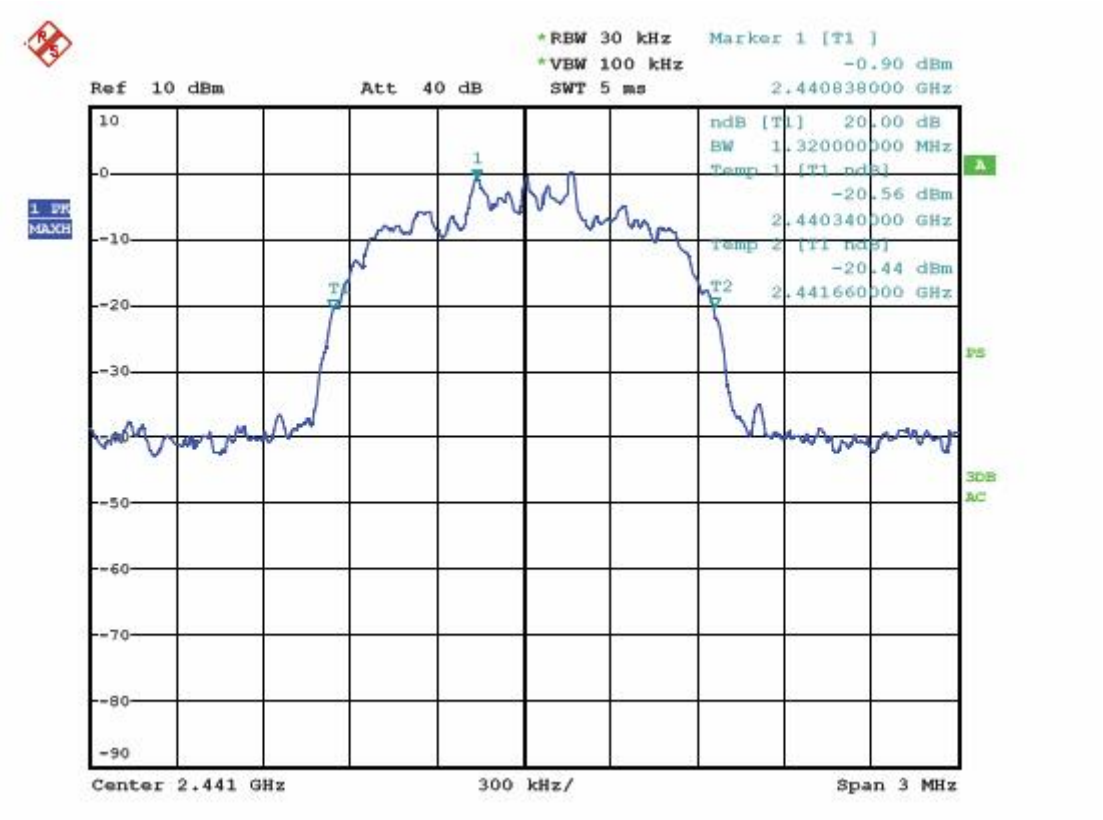
2DH5 Mode:

CHANNEL FREQUENCY (MHz)	20dB BANDWIDTH (MHz)	LIMIT (MHz)	PASS/FAIL
2402	1.296	/	PASS
2441	1.320	/	PASS
2480	1.290	/	PASS

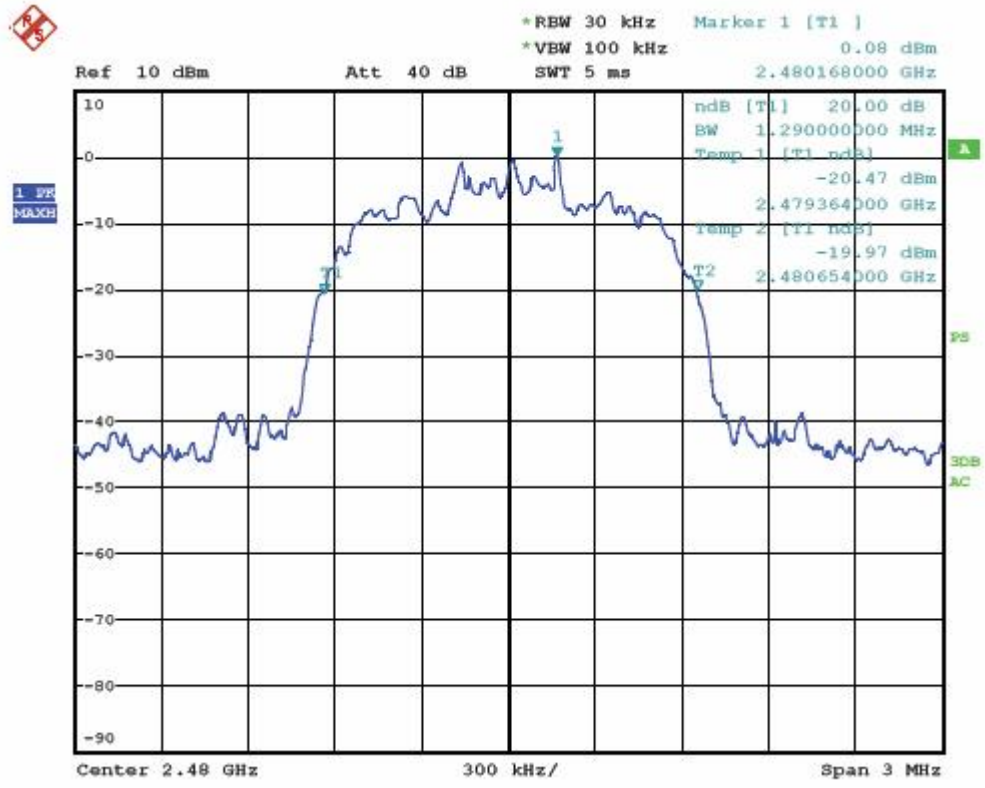
Low Channel



Middle Channel



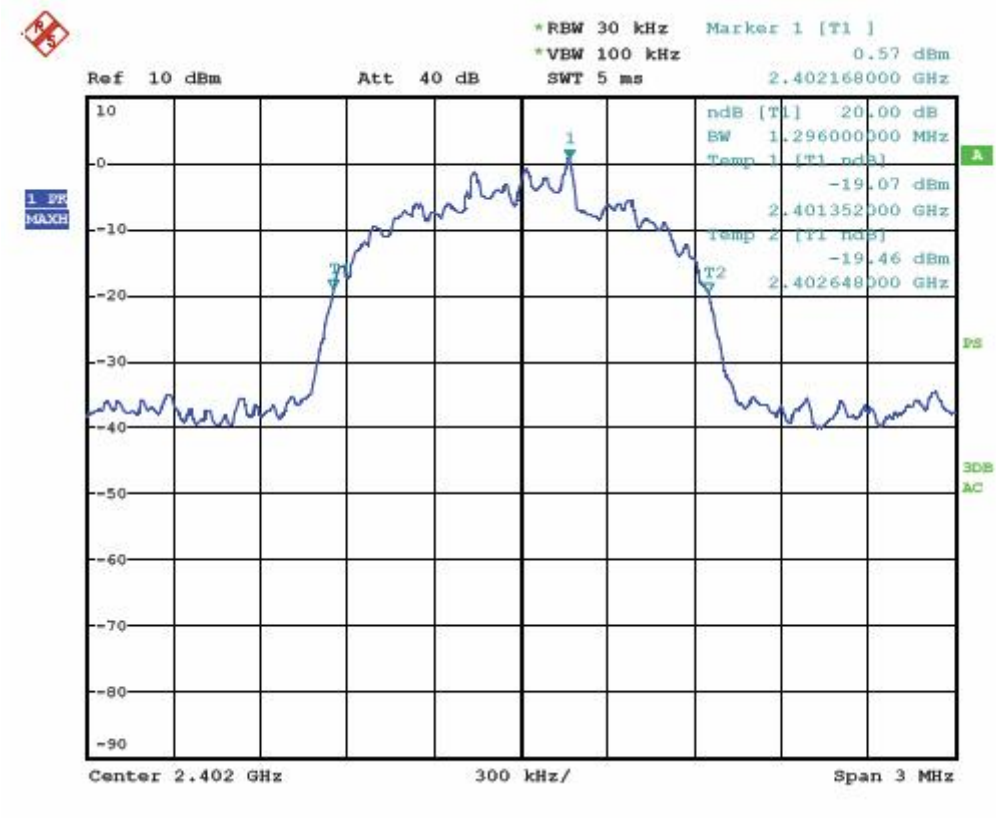
High Channel



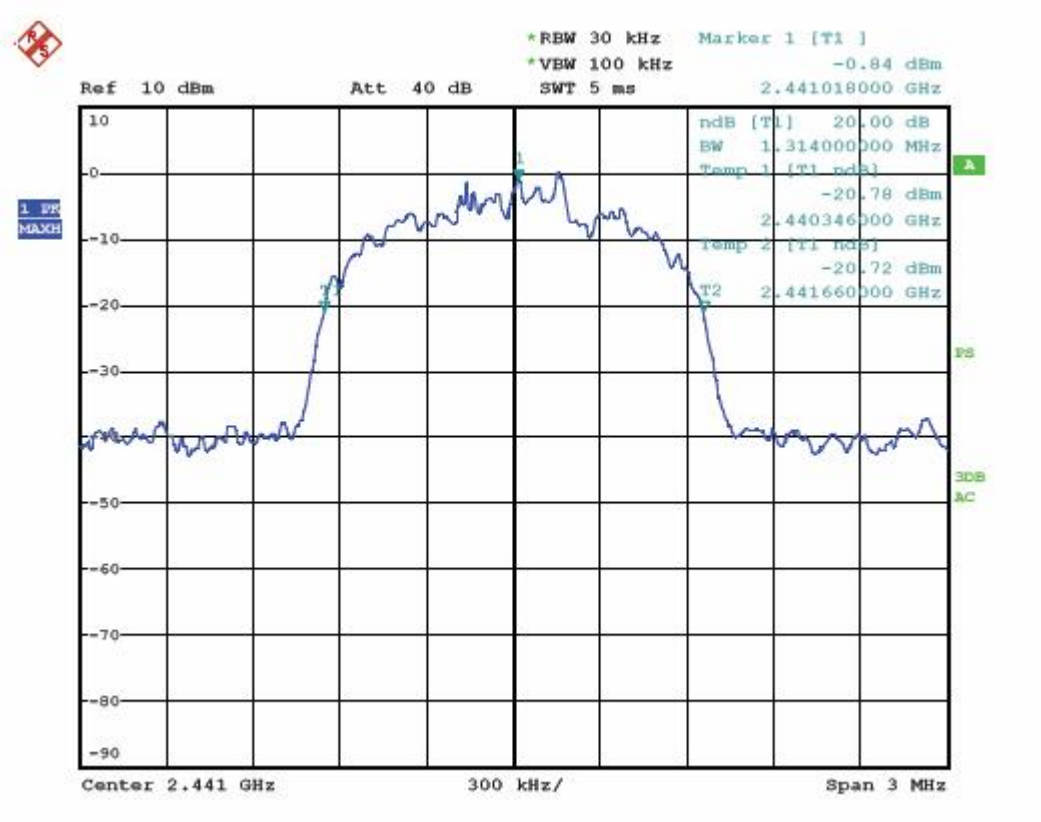
3DH5 Mode:

CHANNEL FREQUENCY (MHz)	20dB BANDWIDTH (MHz)	LIMIT (MHz)	PASS/FAIL
2402	1.296	/	PASS
2441	1.314	/	PASS
2480	1.314	/	PASS

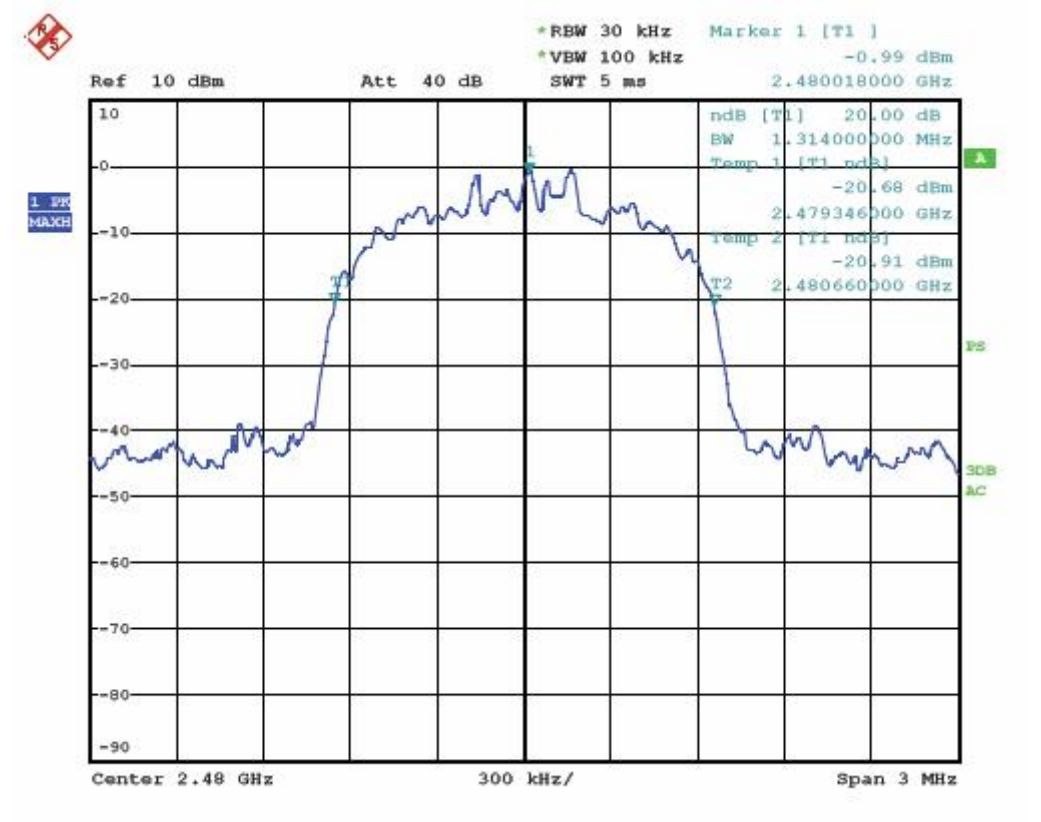
Low Channel



Middle Channel

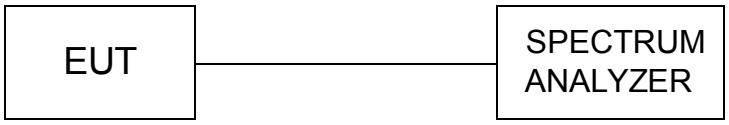


High Channel



4.5. Frequency Separation

TEST CONFIGURATION



TEST PROCEDURE

According to ANSI C63.10: 2013.
The EUT must have its hopping function enabled.
Use the following spectrum analyzer settings:
Span = wide enough to capture the peaks of two adjacent channels
Resolution (or IF) Bandwidth (RBW) ≧ 1% of the span
Video (or Average) Bandwidth VBW ≧ RBW
Sweep = auto
Detector function = peak
Trace = max hold
Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels.

LIMIT

According to 15.247(a)(1),frequency hopping systems shall have hopping channel carrier frequencies separated by minimum of 25KHz or the 2/3*20dB bandwidth of the hopping channel, whichever is greater.

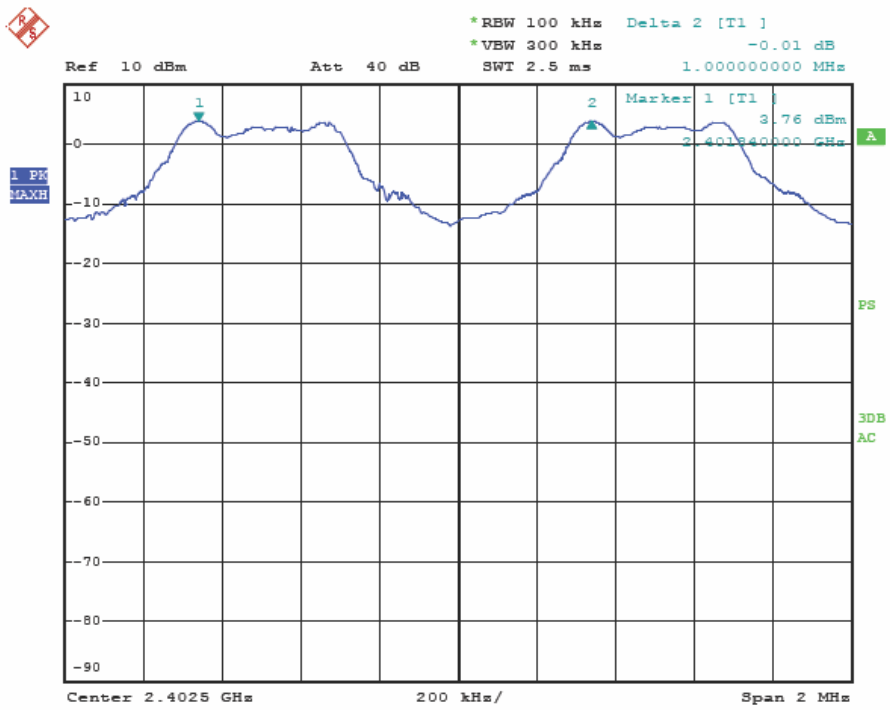
TEST RESULTS

DH5 Mode:

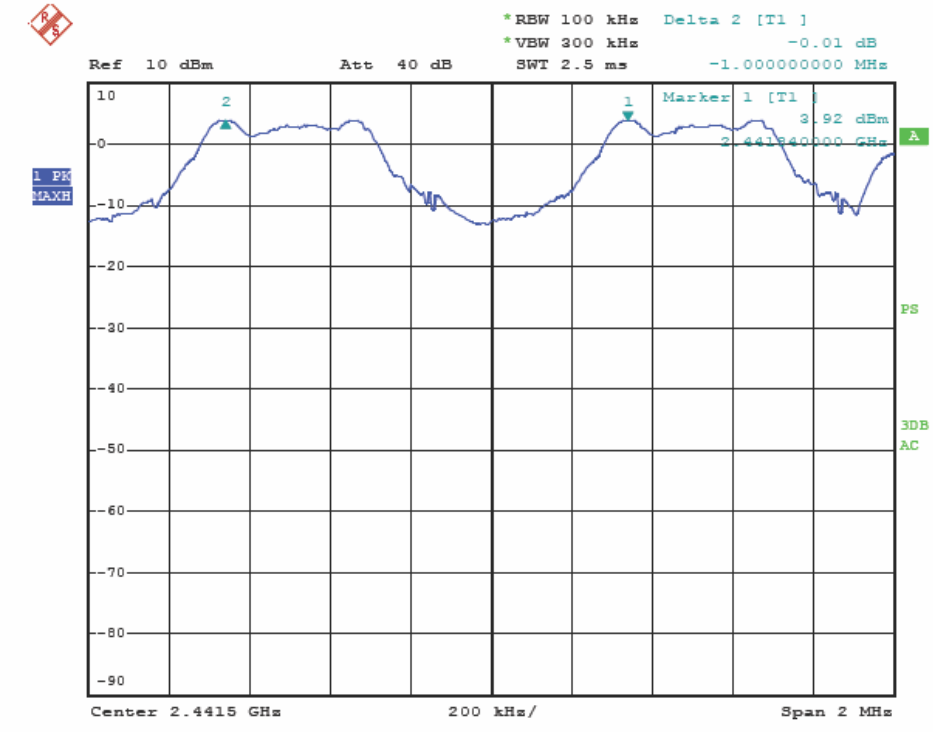
Channel	Channel Frequency (MHz)	Channel Separation (MHz)	Limit (MHz)	Result
Low Channel	2402	1.000	25KHz or 2/3*20dB bandwidth	Pass
Adjacency Channel	2403			
Mid Channel	2441	1.000	25KHz or 2/3*20dB bandwidth	Pass
Adjacency Channel	2442			
High Channel	2480	1.000	25KHz or 2/3*20dB bandwidth	Pass
Adjacency Channel	2479			

Photos of Frequency separation Measurement

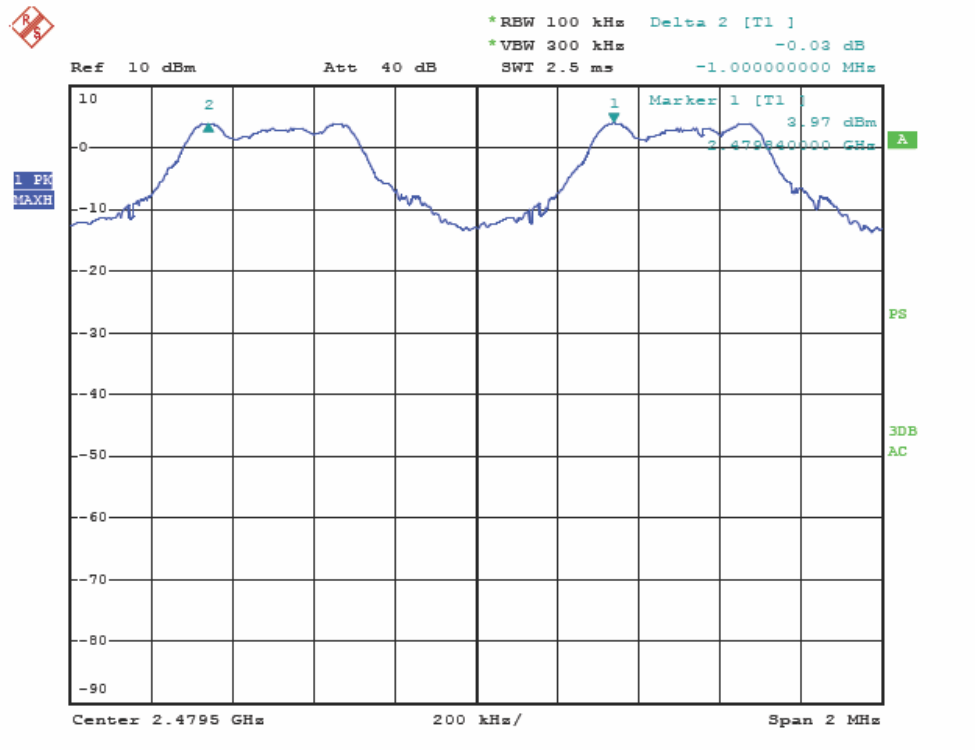
Low channel



Middle channel



High channel

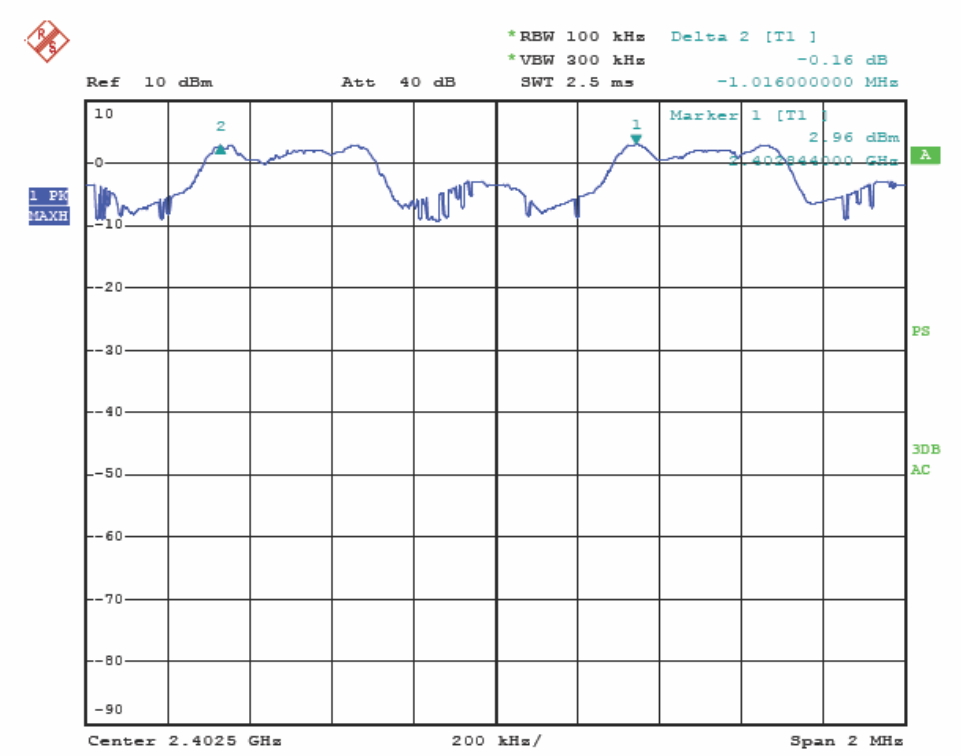


2DH5 Mode:

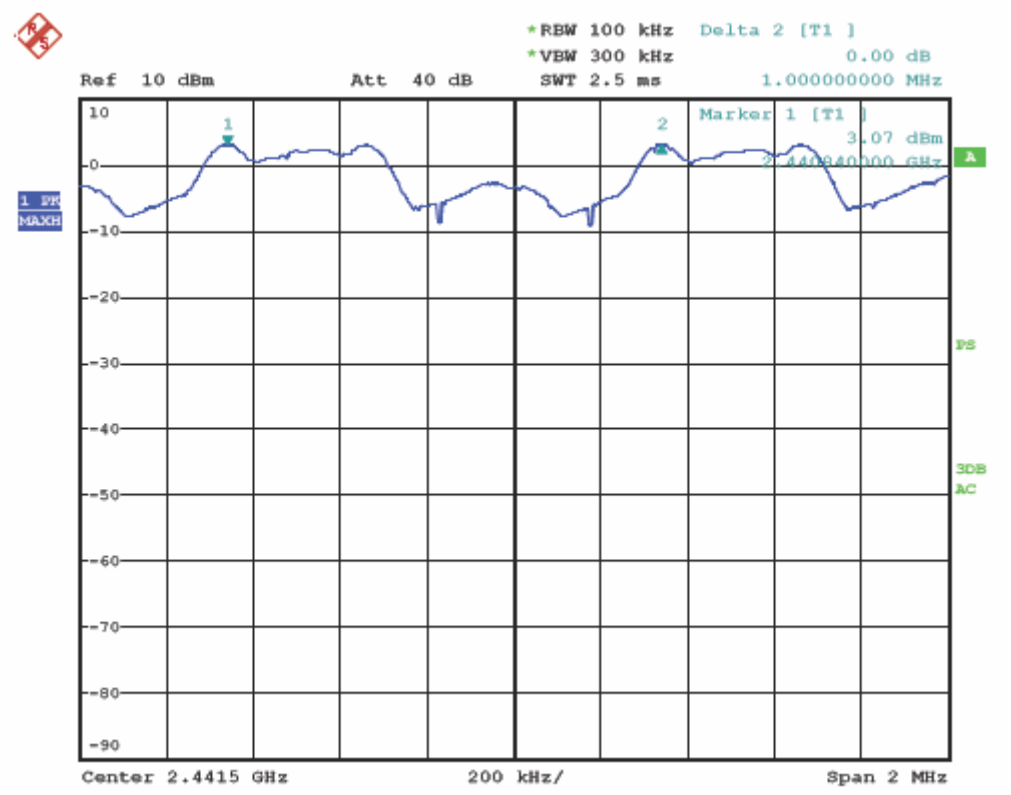
Channel	Channel Frequency (MHz)	Channel Separation (MHz)	Limit (MHz)	Result
Low Channel	2402	1.016	25KHz or 2/3*20dB bandwidth	Pass
Adjacency Channel	2403			
Mid Channel	2441	1.000	25KHz or 2/3*20dB bandwidth	Pass
Adjacency Channel	2442			
High Channel	2480	1.000	25KHz or 2/3*20dB bandwidth	Pass
Adjacency Channel	2479			

Photos of Frequency separation Measurement

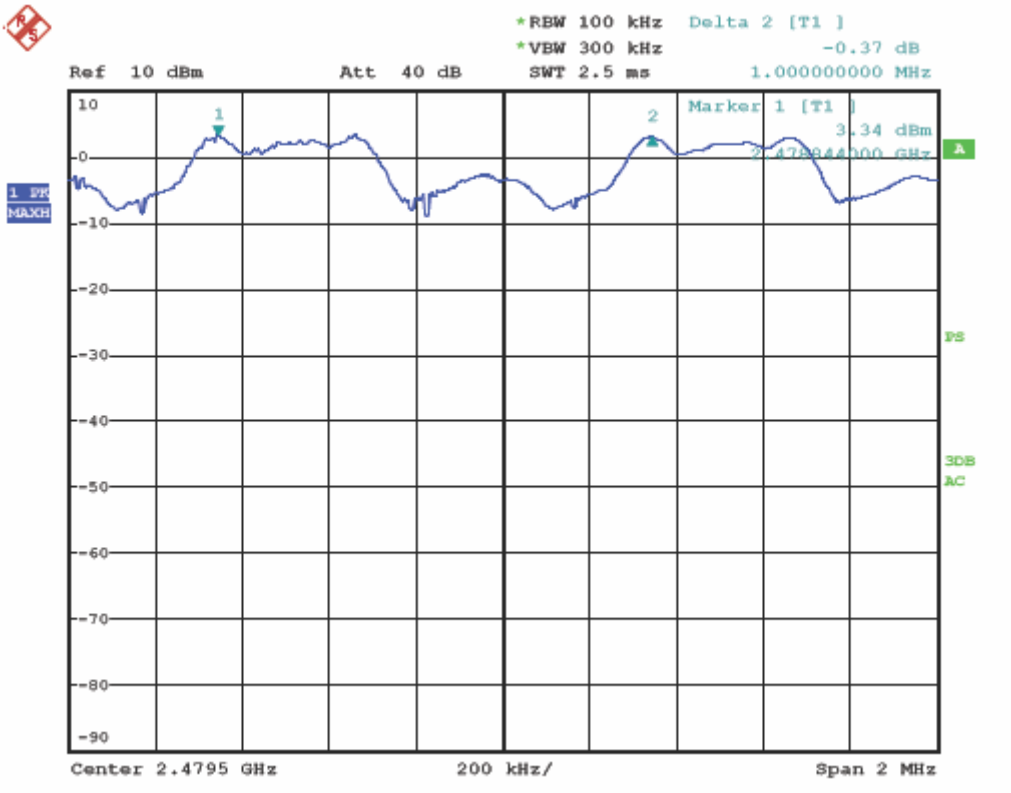
Low channel



Middle channel



High channel

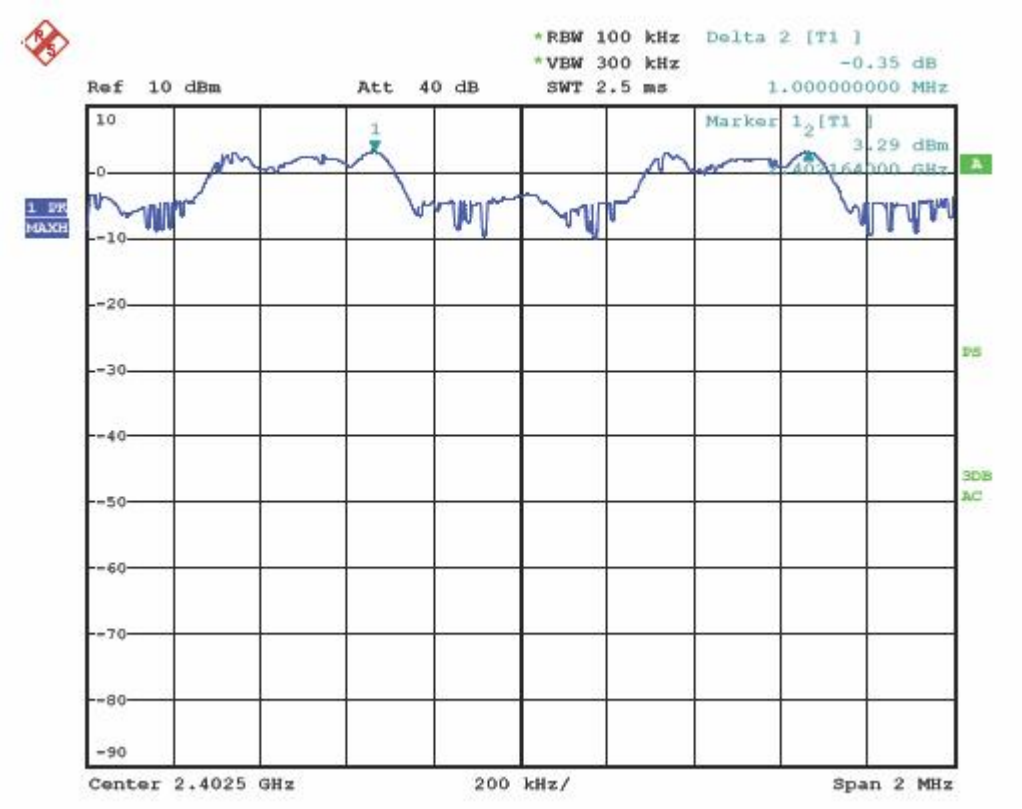


3DH5 Mode:

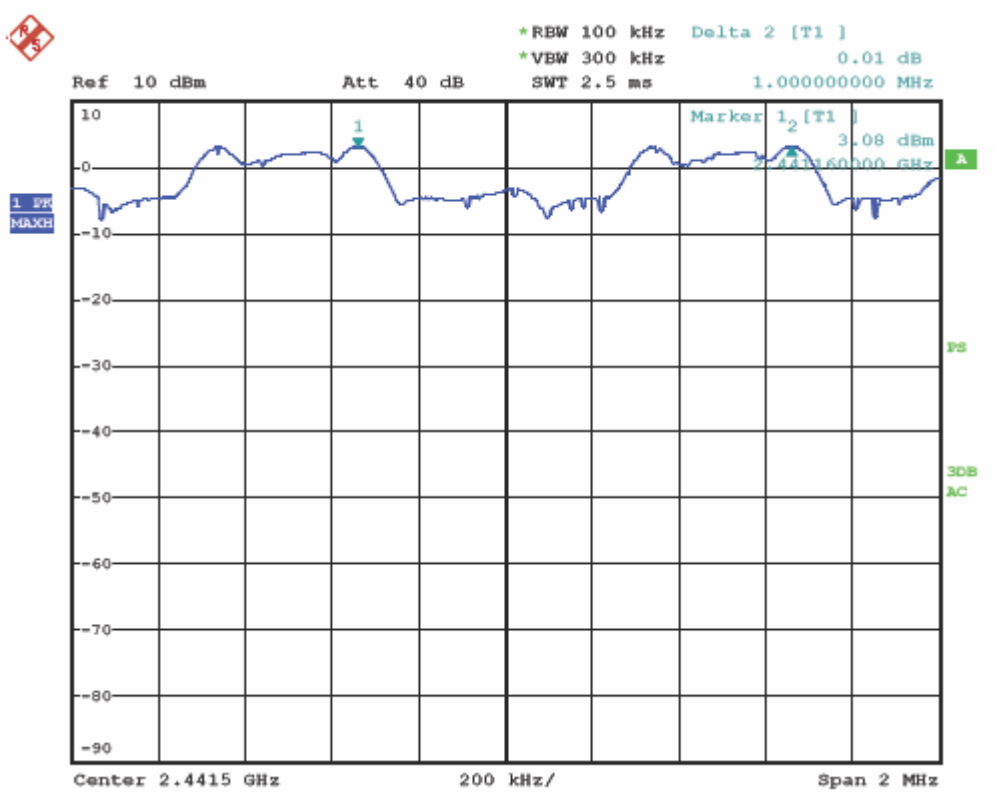
Channel	Channel Frequency (MHz)	Channel Separation (MHz)	Limit (MHz)	Result
Low Channel	2402	1.000	25KHz or 2/3*20dB bandwidth	Pass
Adjacency Channel	2403			
Mid Channel	2441	1.000	25KHz or 2/3*20dB bandwidth	Pass
Adjacency Channel	2442			
High Channel	2480	1.008	25KHz or 2/3*20dB bandwidth	Pass
Adjacency Channel	2479			

Photos of Frequency separation Measurement

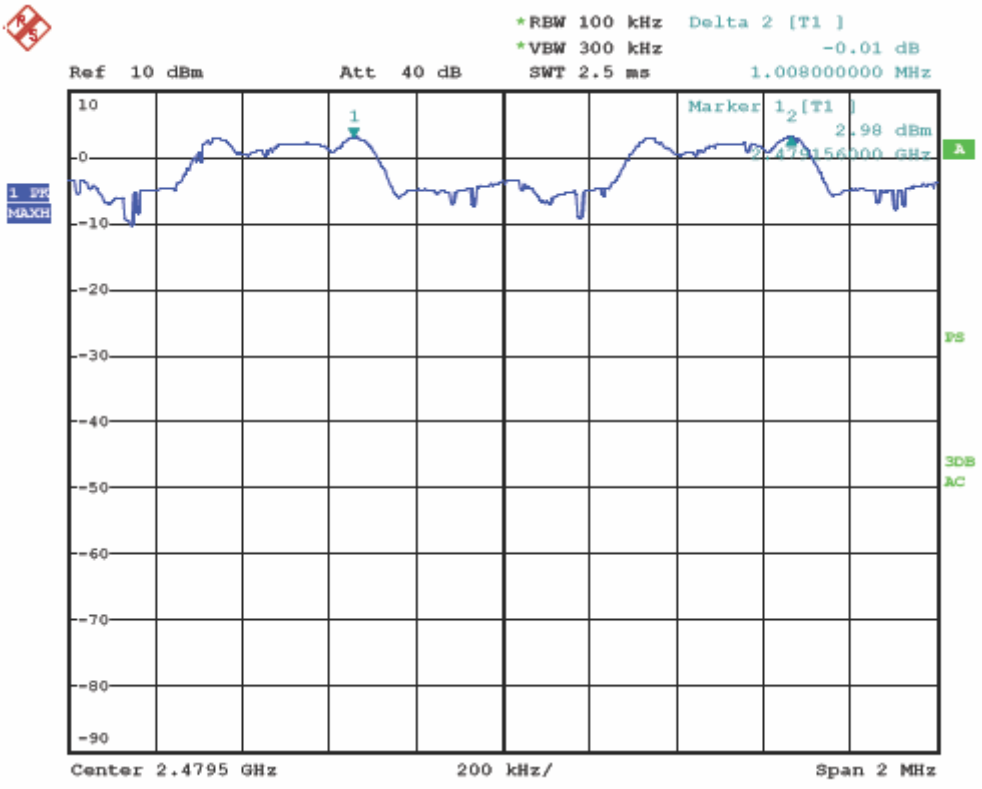
Low channel



Middle channel

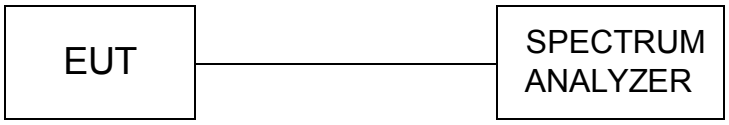


High channel



4.6. Number of hopping frequency

TEST CONFIGURATION



TEST PROCEDURE

According to ANSI C63.10: 2013.
The EUT must have its hopping function enabled.
Use the following spectrum analyzer settings:
Span = the frequency band of operation
RBW ≧ 1% of the span
VBW ≧ RBW
Sweep = auto
Detector function = peak
Trace = max hold
Allow the trace to stabilize. It may prove necessary to bread the span up to sections, in order to clearly show all of the hopping frequencies.

LIMIT

Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels.

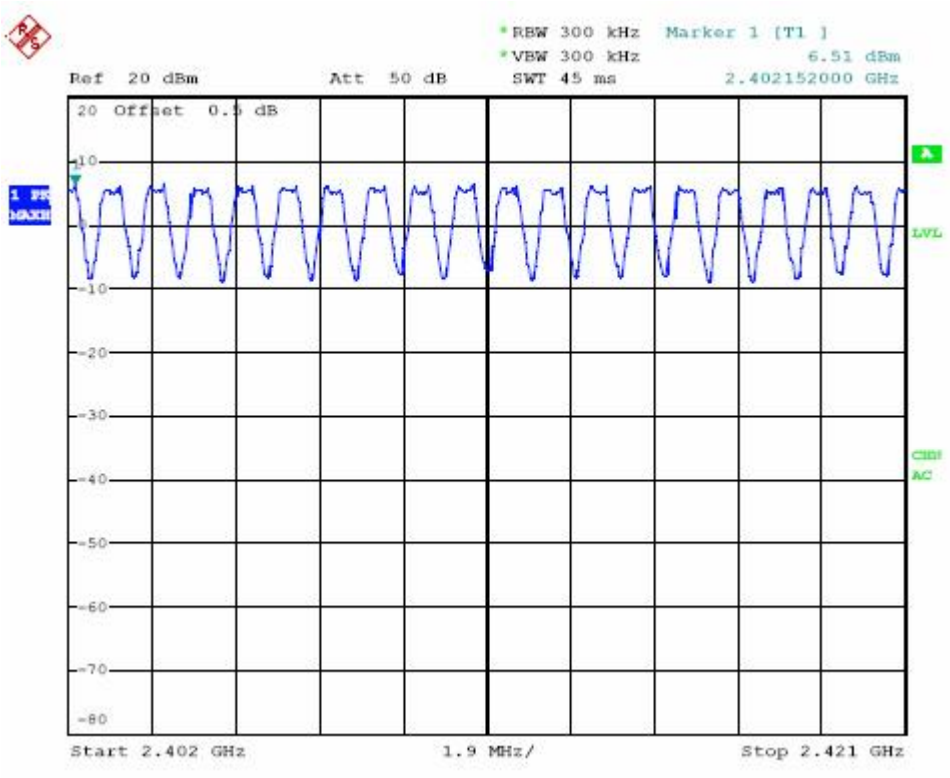
TEST RESULTS

DH5 Mode:

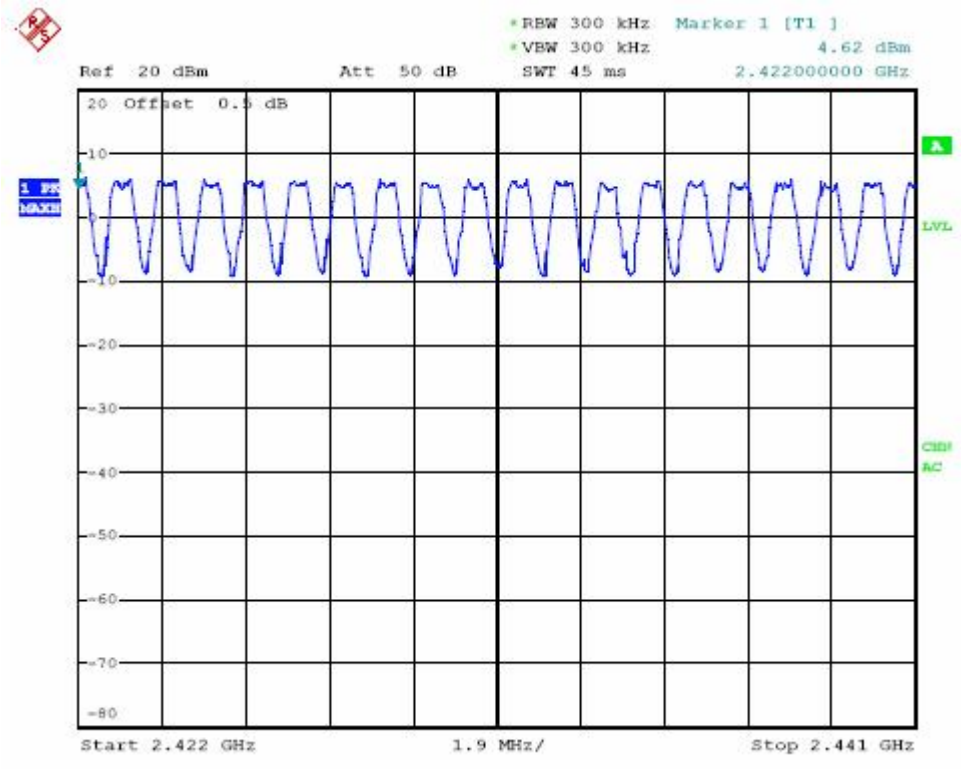
Hopping Channel Frequency Range (MHz)	Number of Hopping Channel	Limit
2400-2483.5	79	≥15

Photos of Number of hopping channel Measurement

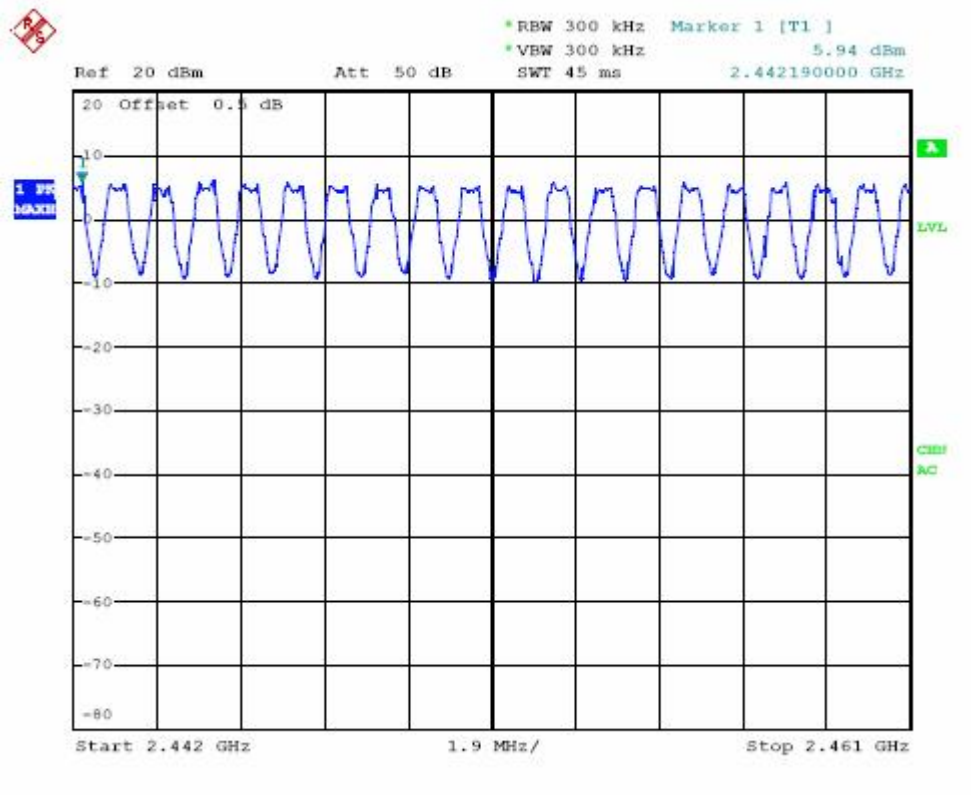
2402-2421MHz



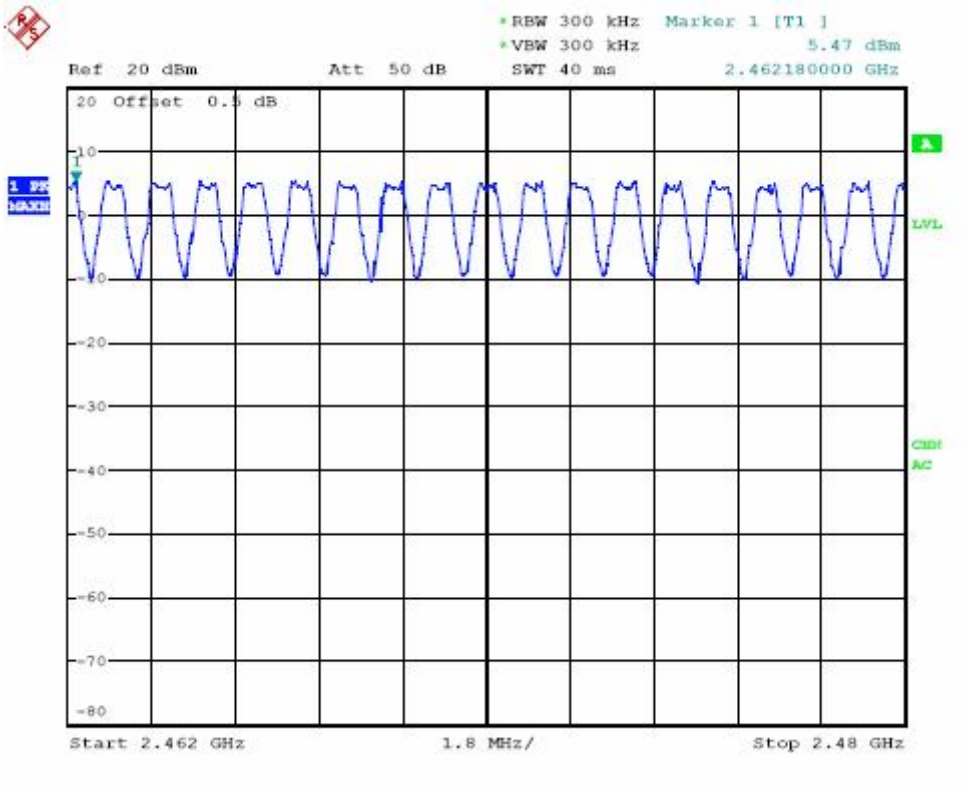
2422-2441MHz



2442-2461MHz



2462-2480MHz

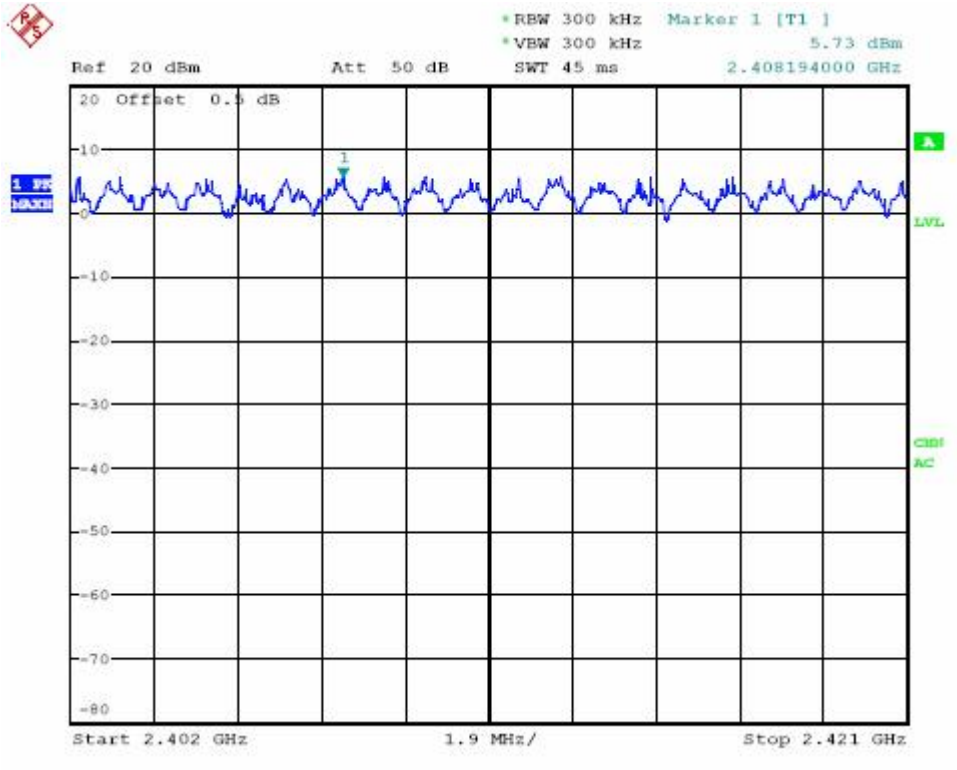


2DH5 Mode:

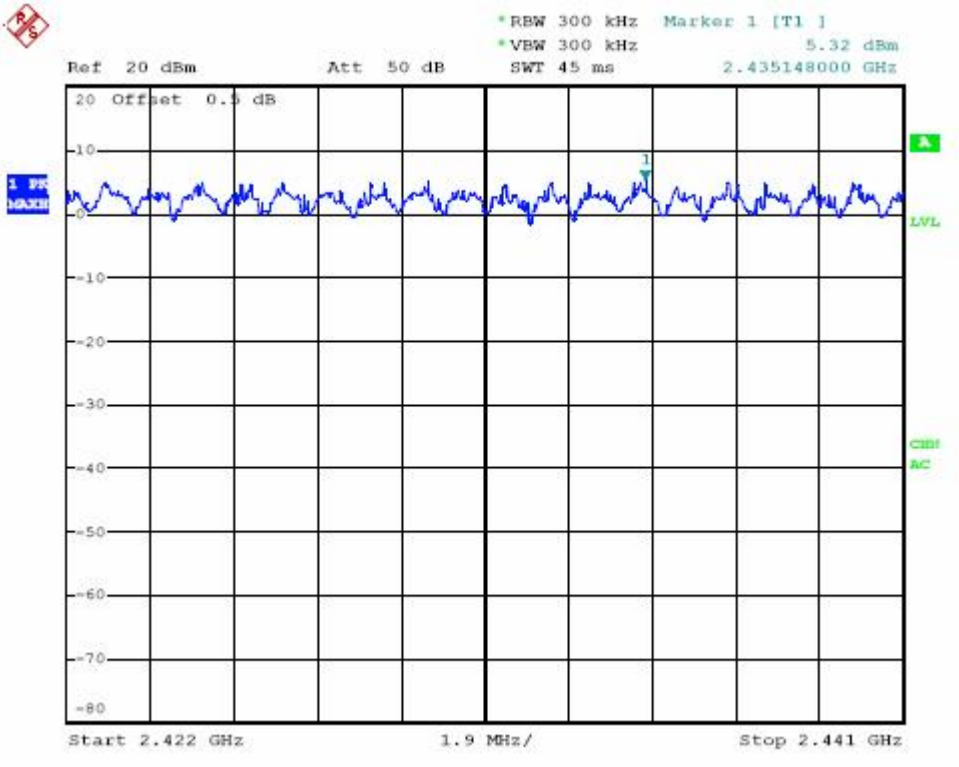
Hopping Channel Frequency Range (MHz)	Number of Hopping Channel	Limit
2400-2483.5	79	≥15

Photos of Number of hopping channel Measurement

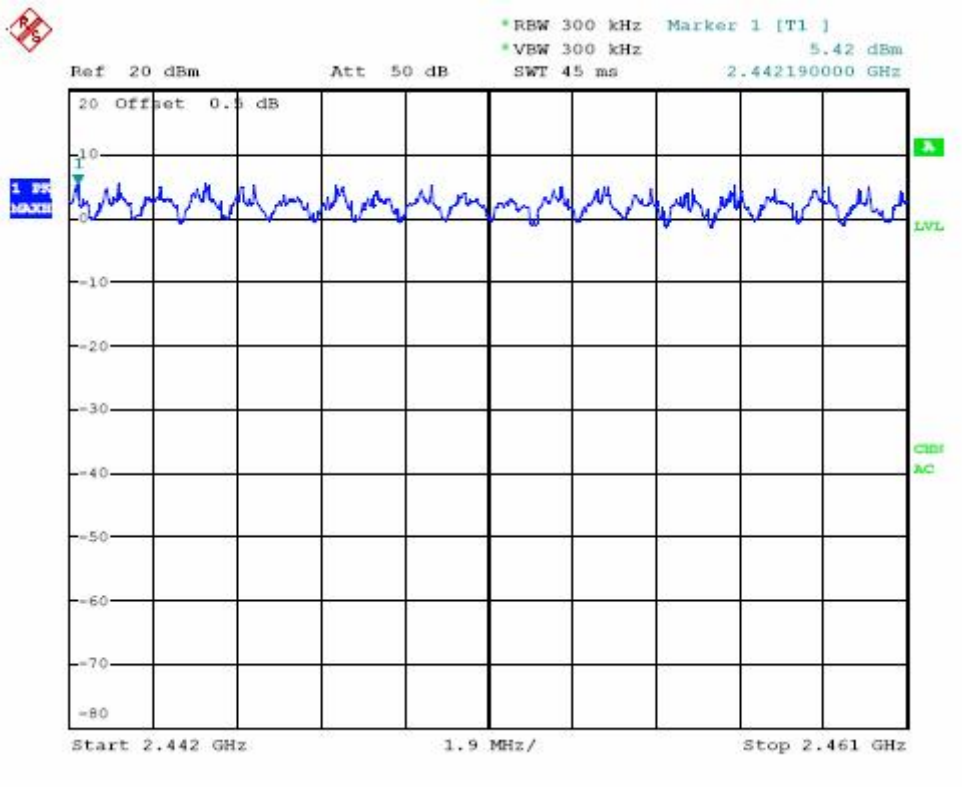
2402-2421MHz



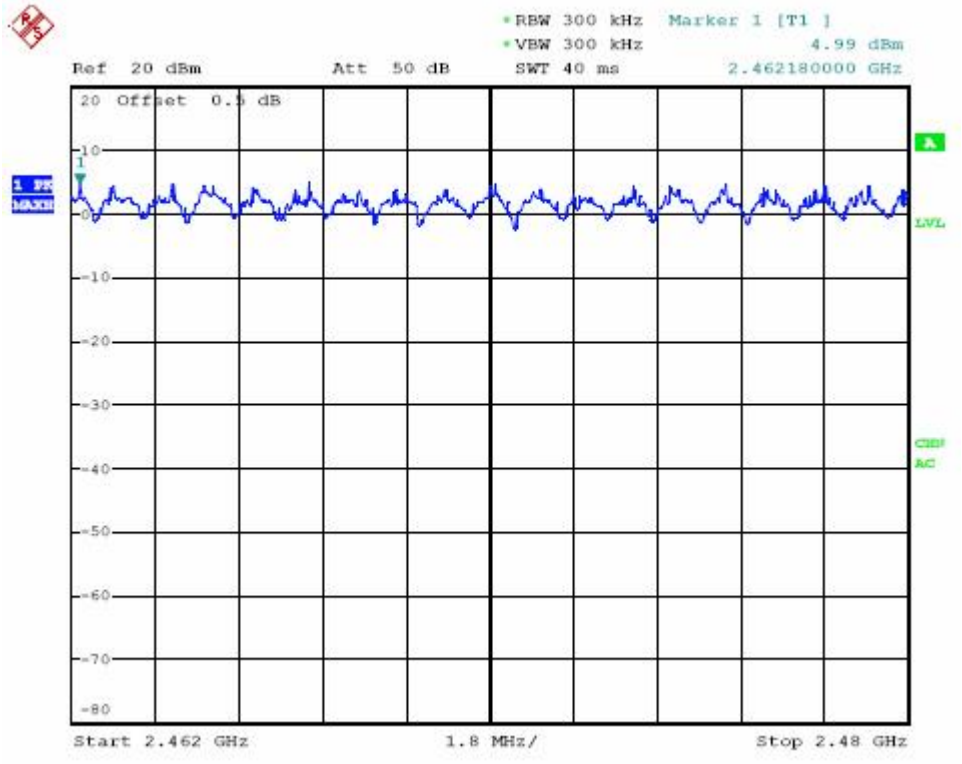
2422-2441MHz



2442-2461MHz



2462-2480MHz

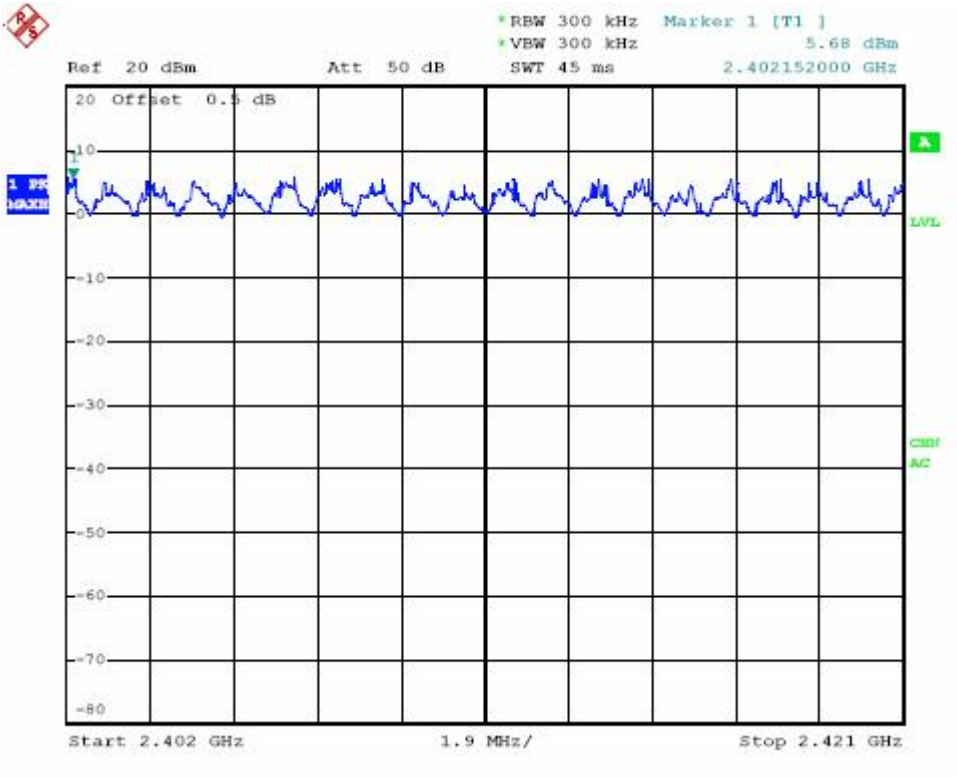


3DH5 Mode:

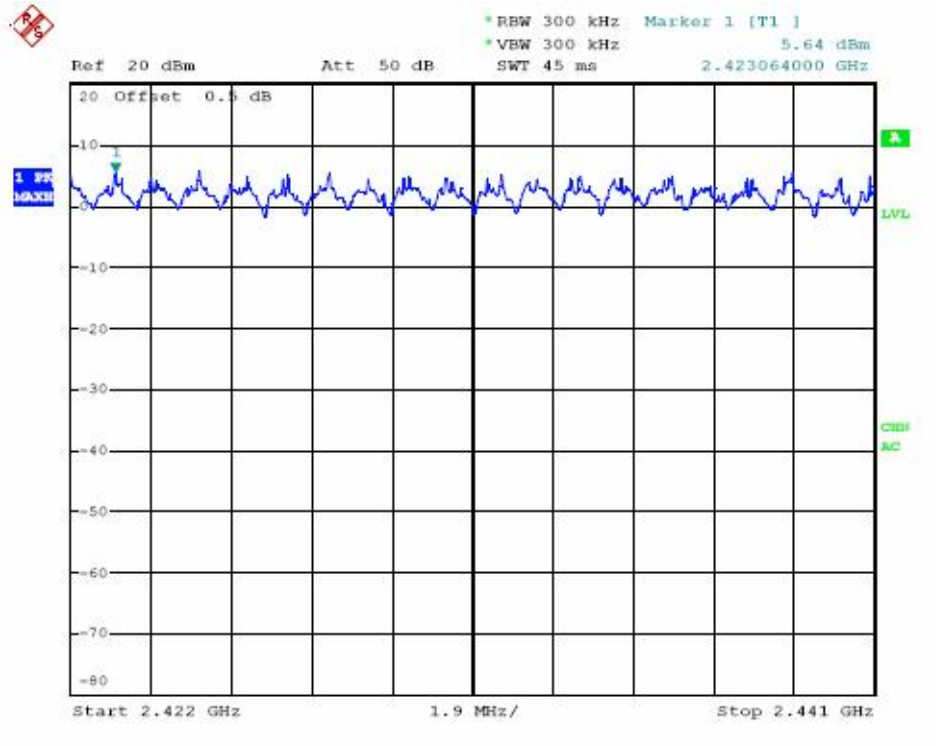
Hopping Channel Frequency Range (MHz)	Number of Hopping Channel	Limit
2400-2483.5	79	≥15

Photos of Number of hopping channel Measurement

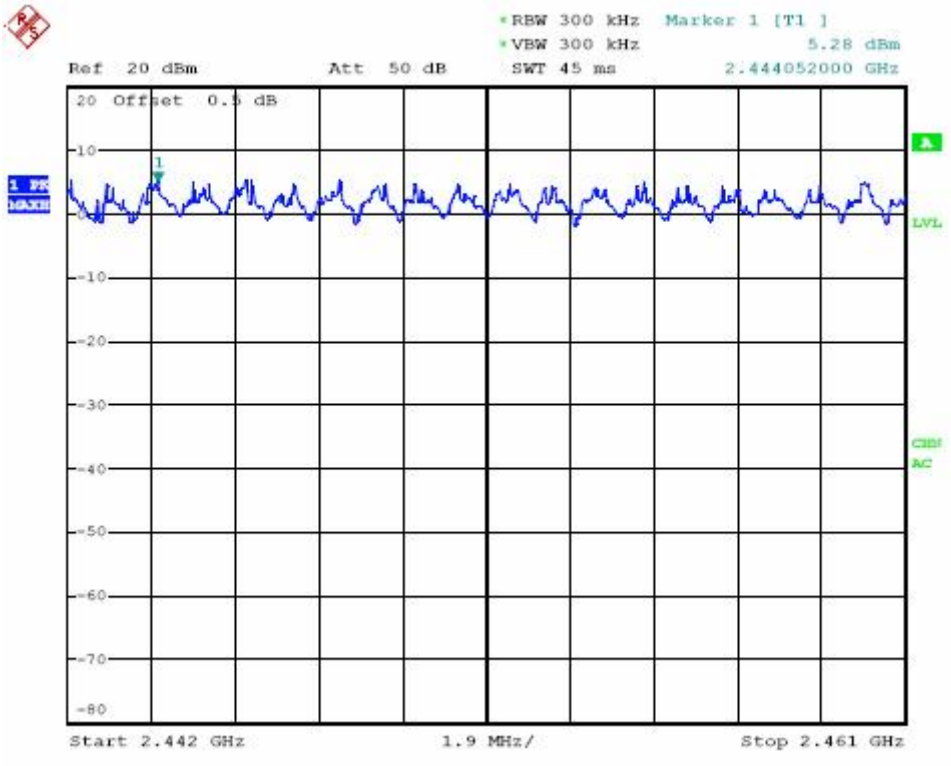
2402-2421MHz



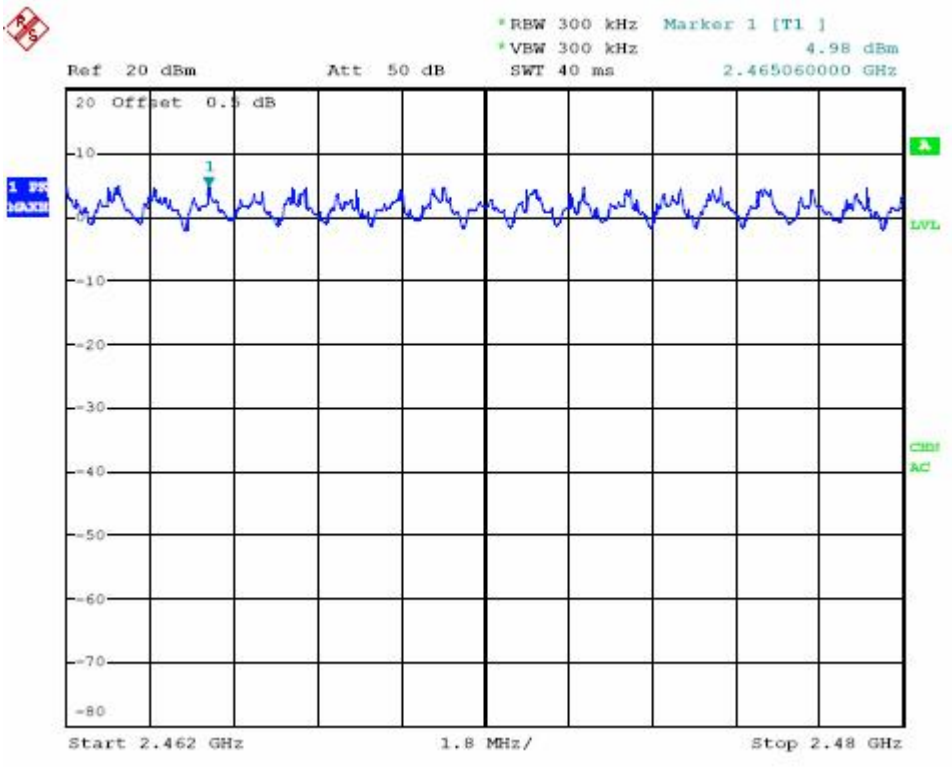
2422-2441MHz



2442-2461MHz

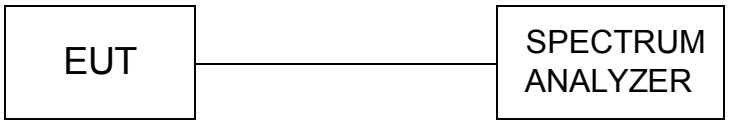


2462-2480MHz



4.7. Time Of Occupancy(Dwell Time)

TEST CONFIGURATION



TEST PROCEDURE

According to ANSI C63.10: 2013.

The EUT must have its hopping function enabled.

Use the following spectrum analyzer settings:

Span = zero span, centered on a hopping channel

RBW = 1MHz

VBW ≧ RBW

Sweep = as necessary to capture the entire dwell time per hopping channel

Detector function = peak

Trace = max hold

If possible, use the marker-delta function to determine the dwell time. If this value varies with different modes of operation (e.g., data rate, modulation format, etc.), repeat this test for each variation.

LIMIT

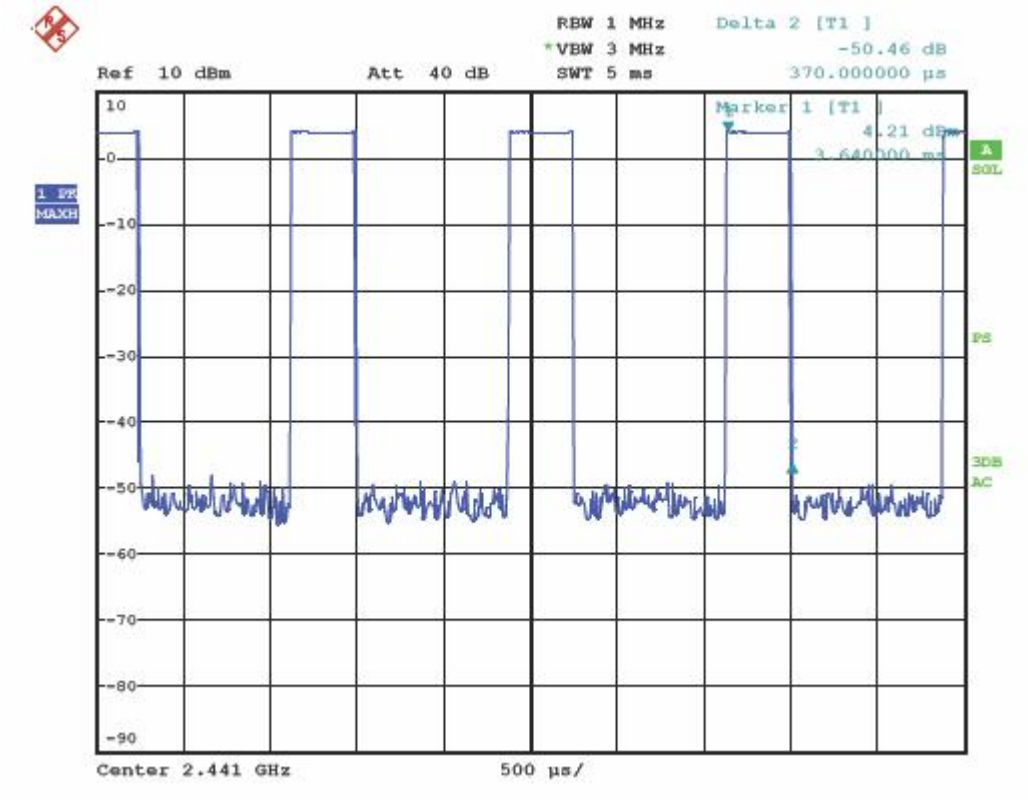
The average time of occupancy on any channel shall not be greater than 0.4 seconds within a pe-riod of 0.4 seconds multiplied by the number of hopping channels employed.

TEST RESULTS

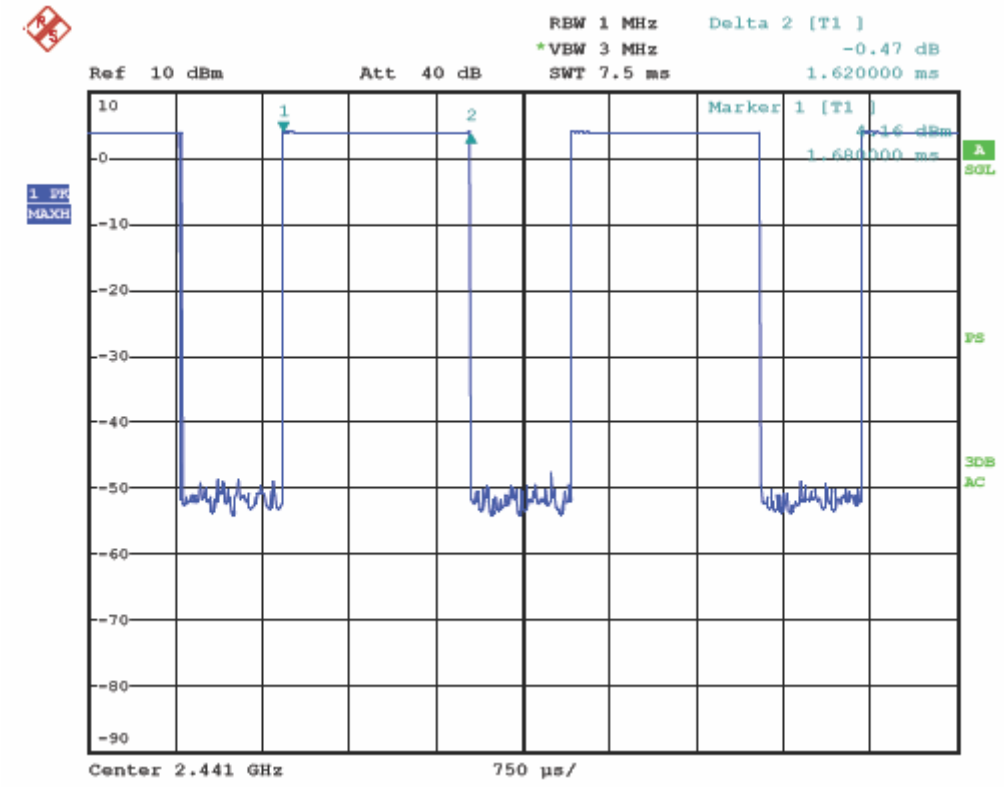
Frequency (MHz)	Mode	Pulse Width (ms)	Dwell Time (S)	Limit (S)	Result
2441	DH1/2DH1/3DH1	0.37	0.118	0.4	Pass
	DH3/2DH3/3DH3	1.62	0.259	0.4	Pass
	DH5/2DH5/3DH5	2.90	0.309	0.4	Pass
	Note: DH1/2DH1/3DH1: Dwell time=Pulse time (ms) × (1600 ÷ 2 ÷ 79) ×31.6 Second DH3/2DH3/3DH3: Dwell time=Pulse time (ms) × (1600 ÷ 4 ÷ 79) ×31.6 Second DH5/2DH5/3DH5: Dwell time=Pulse time (ms) × (1600 ÷ 6 ÷ 79) ×31.6 Second				

Photos of Dwell Time Measurement：

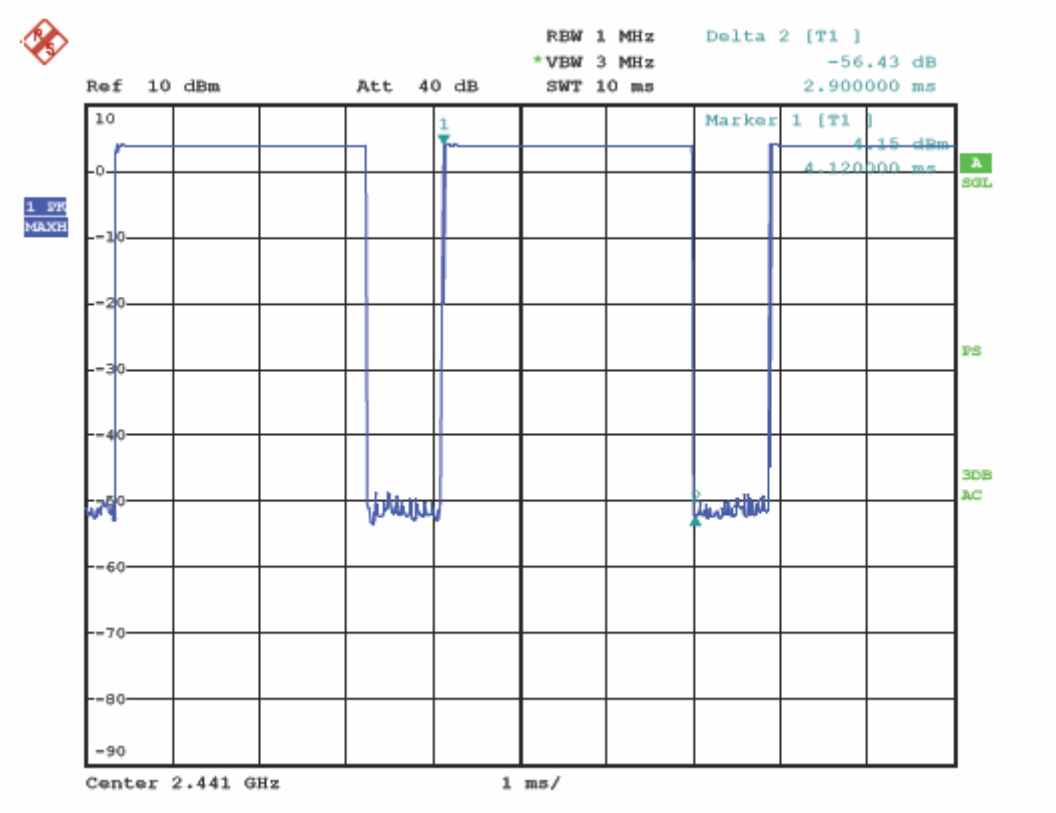
DH1



DH3

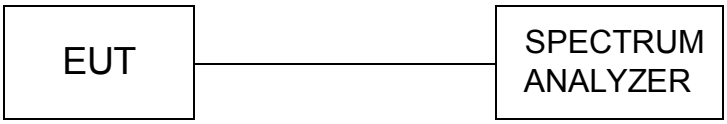


DH5


RBW 1 MHz
*VBW 3 MHz
SWT 10 ms
Delta 2 [T1]
-56.43 dB
2.900000 ms
Ref 10 dBm
Att 40 dB
Marker 1 [T1]
4.15 dBm
4.120000 ms
1 PK MAXH
A SGL
PS
3DB AC
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
Center 2.441 GHz
1 ms/

4.8. Spurious RF Conducted Emissions and bandedge

TEST CONFIGURATION



TEST PROCEDURE

According to ANSI C63.10: 2013.

The EUT must have its hopping function enabled.

Use the following spectrum analyzer settings:

Span = wide enough to capture the peak level of the in-band emission and all spurious emissions (e.g., harmonics) from the lowest frequency generated in the EUT up through the 10th harmonic. Typically, several plots are required to cover this entire span.

RBW = 100KHz, VBW ≧ RBW, Sweep =auto, Detector function = peak, Trace = max hold

Allow the trace to stabilize. Set the marker on the peak of any spurious emission recorded. The level displayed must comply with the limit specified in this section.

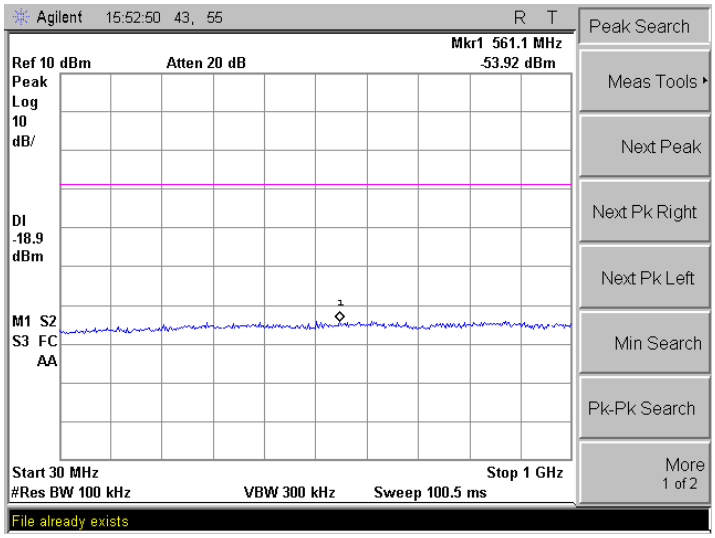
LIMIT

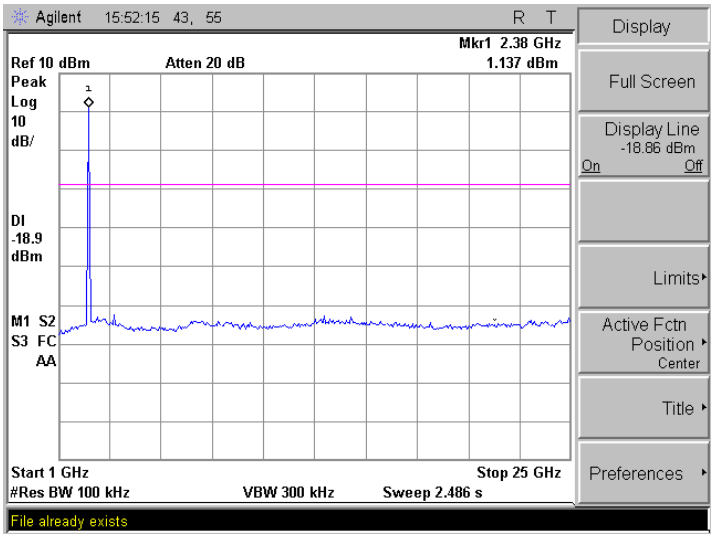
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the 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 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, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) of FCC part 15 is not required.

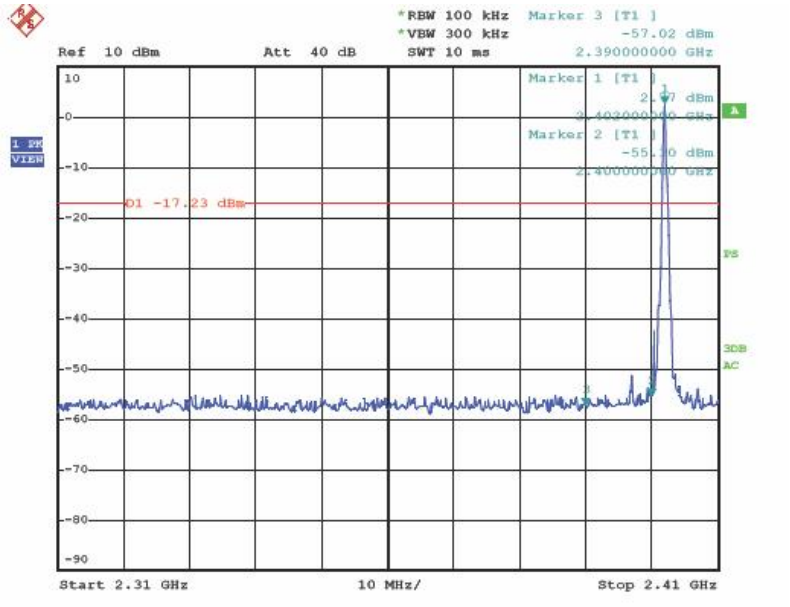
TEST RESULT

DH5 Mode:

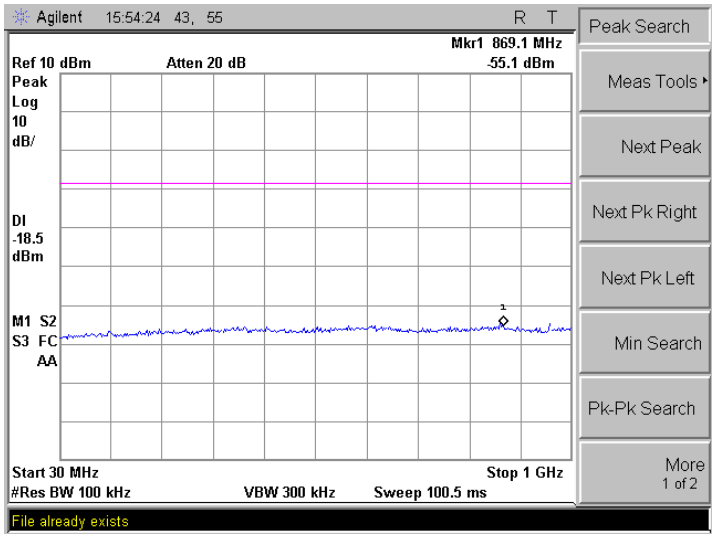
Low Channel

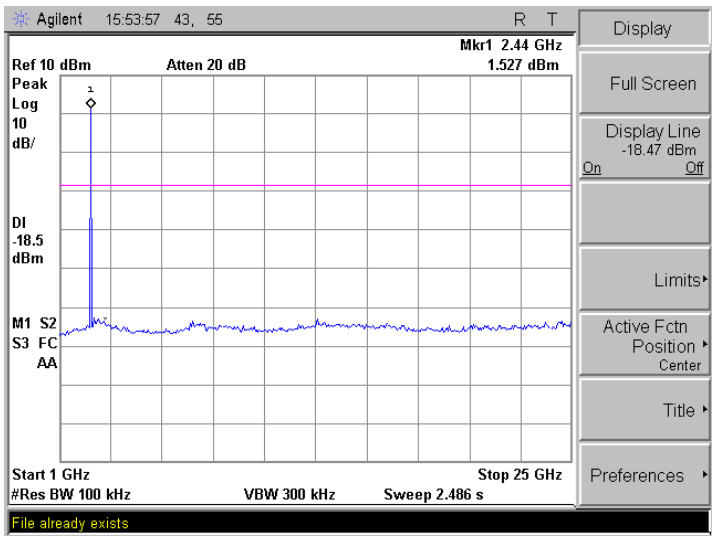



Agilent 15:52:15 43, 55
R T
Mkr1 2.38 GHz
Ref 10 dBm
Atten 20 dB
1.137 dBm
Peak
Log
10
dB/
Dl
-18.9
dBm
M1 S2
S3 FC
AA
Start 1 GHz
#Res BW 100 kHz
VBW 300 kHz
Stop 25 GHz
Sweep 2.486 s
File already exists
Display
Full Screen
Display Line
-18.86 dBm
On Off
Limits
Active Fctn
Position
Center
Title
Preferences

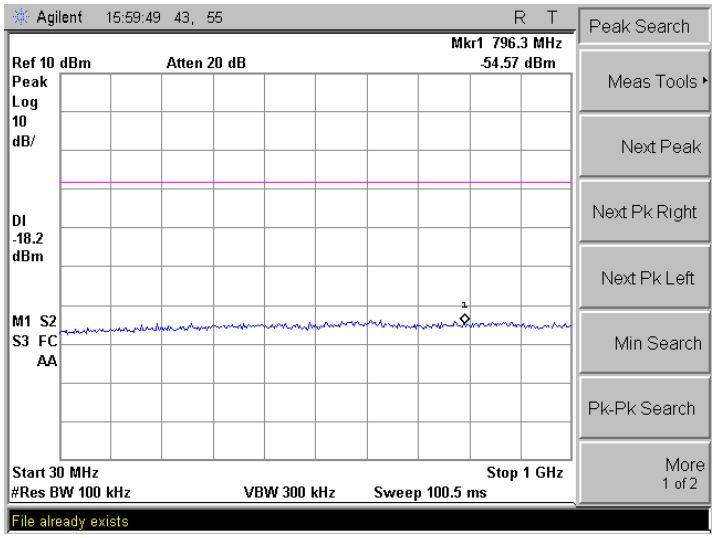

*RBW 100 kHz
*VBW 300 kHz
Marker 3 [T1]
-57.02 dBm
2.390000000 GHz
Ref 10 dBm
Att 40 dB
SWT 10 ms
Marker 1 [T1]
Marker 2 [T1]
D1 -17.23 dBm
Start 2.31 GHz
10 MHz/
Stop 2.41 GHz

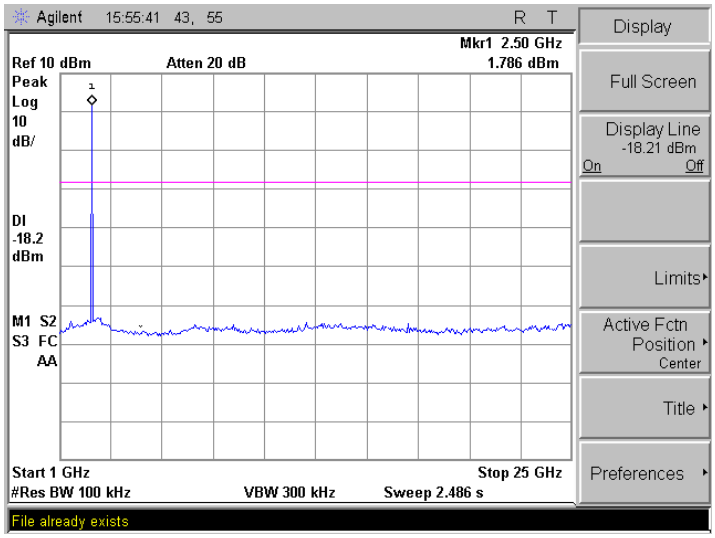
Middle Channel

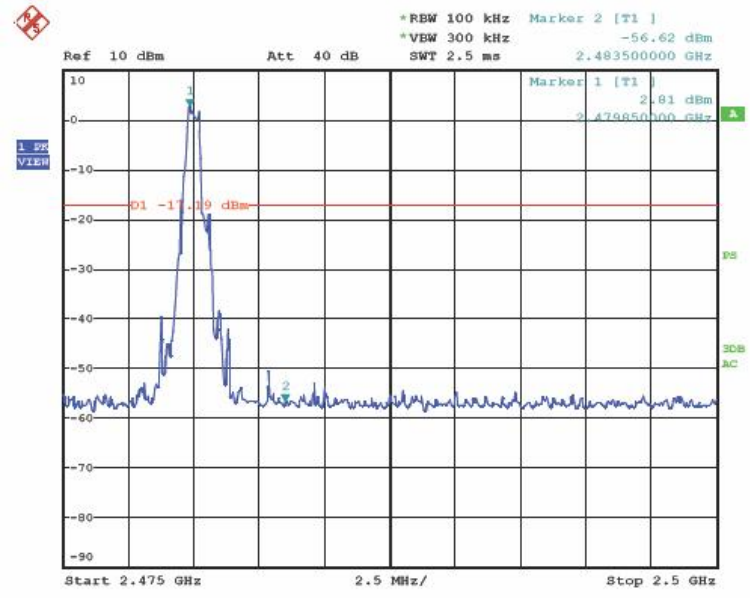




High Channel

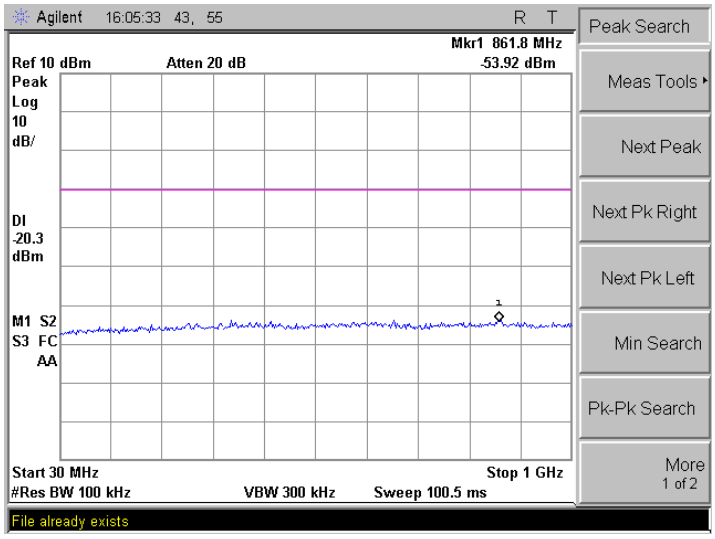


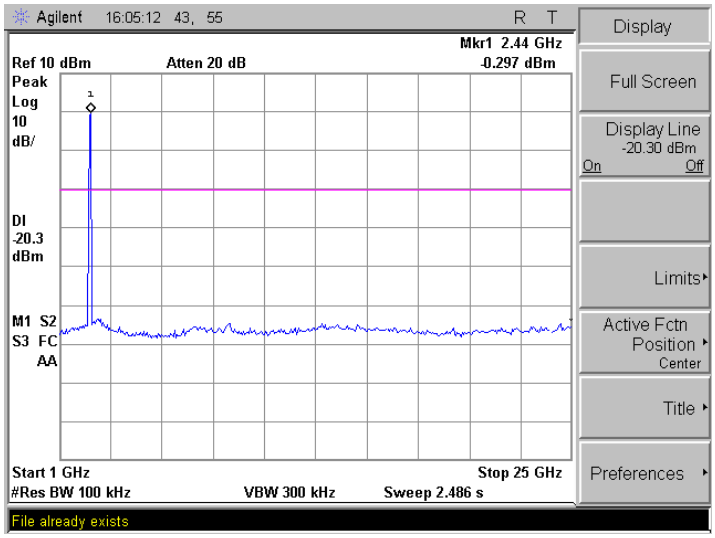


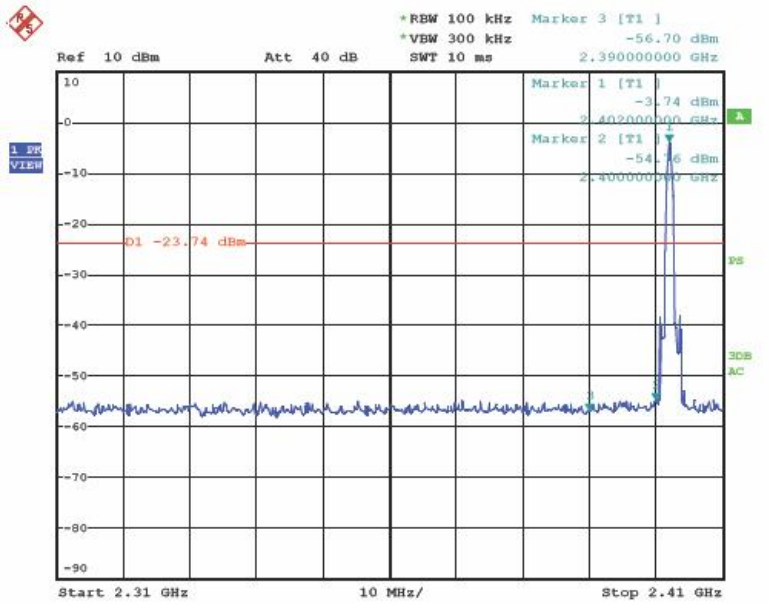


2DH5 Mode:

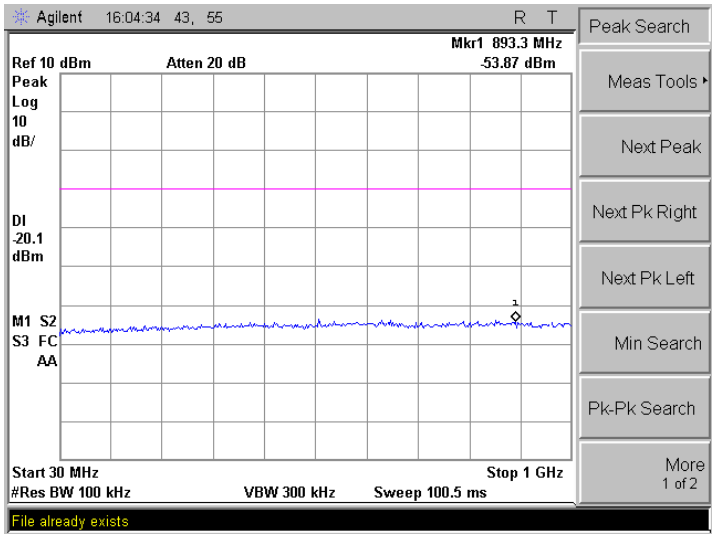
Low Channel

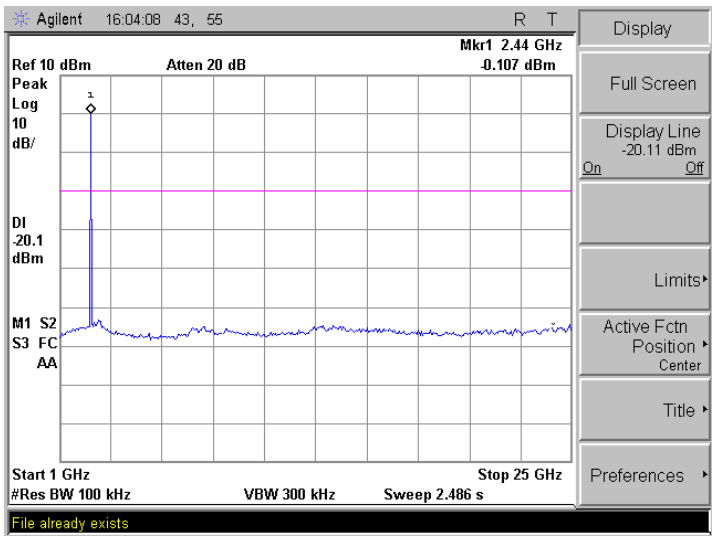




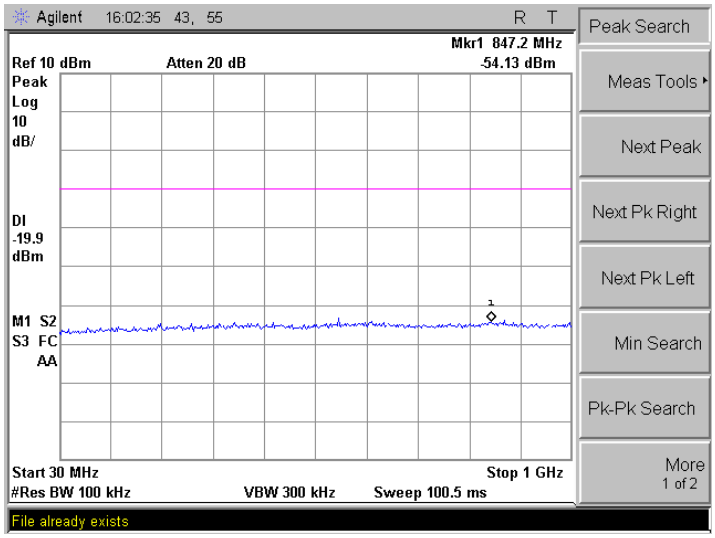


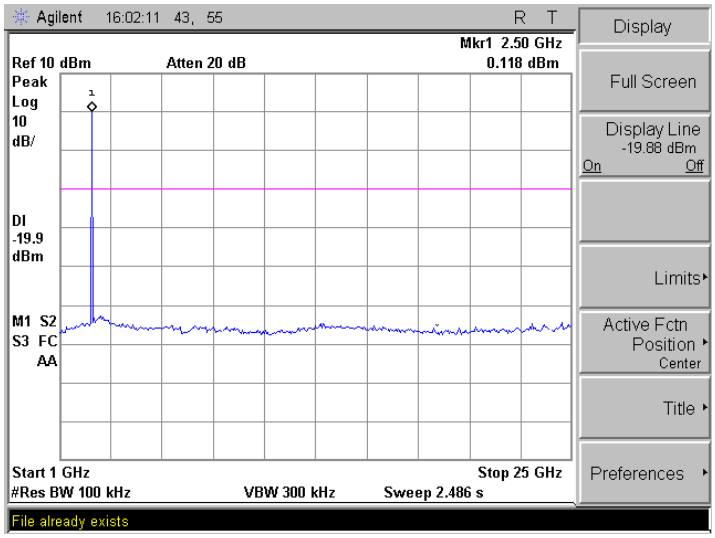
Middle Channel

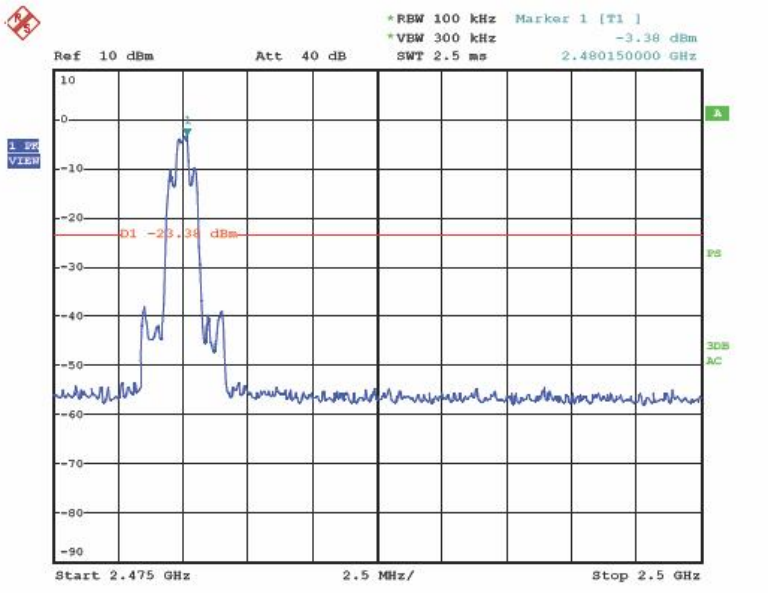




High Channel

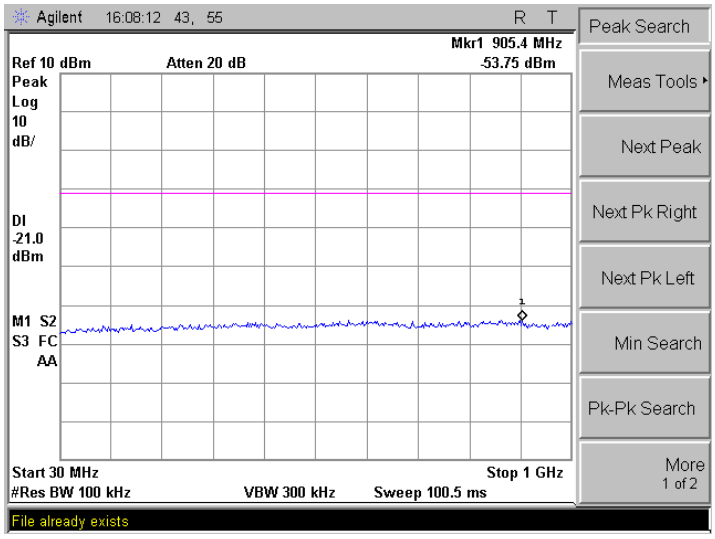


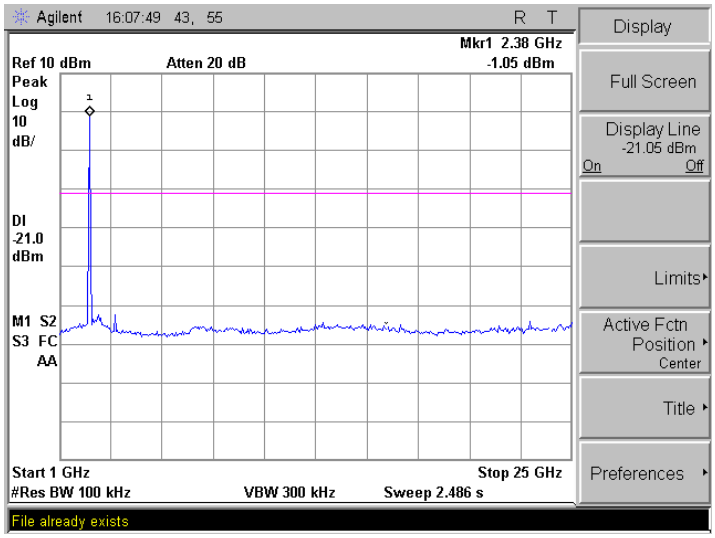


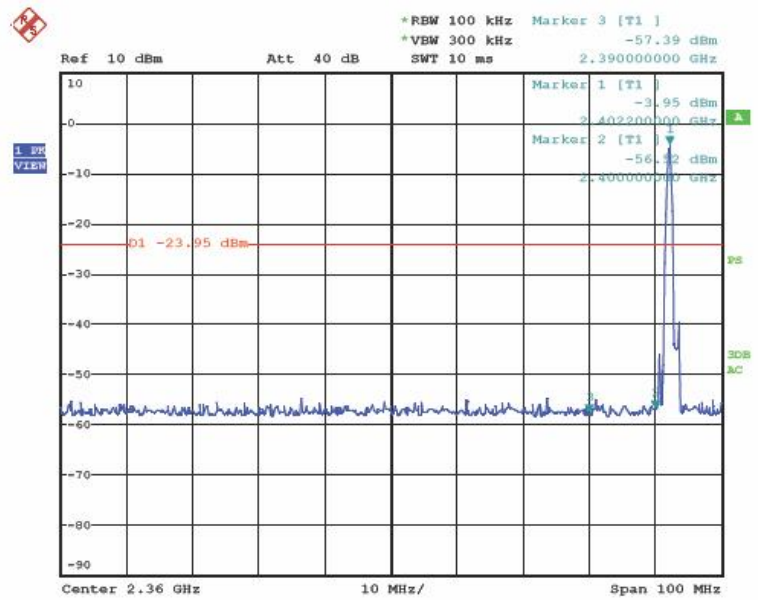


3DH5 Mode;

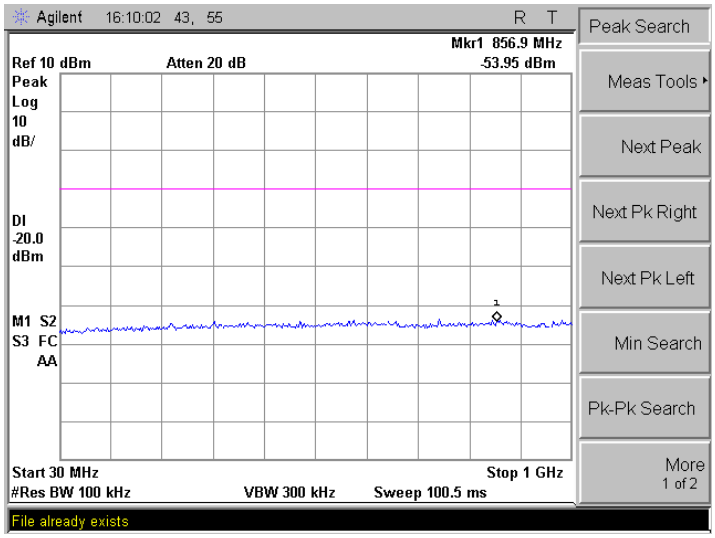
Low Channel

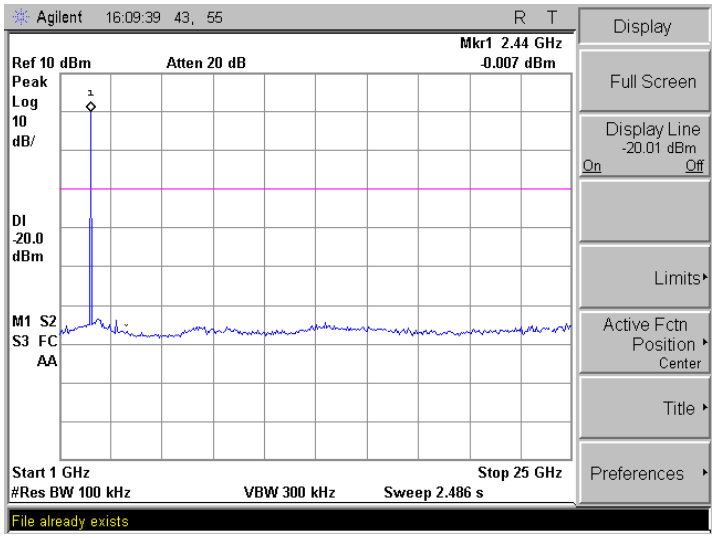




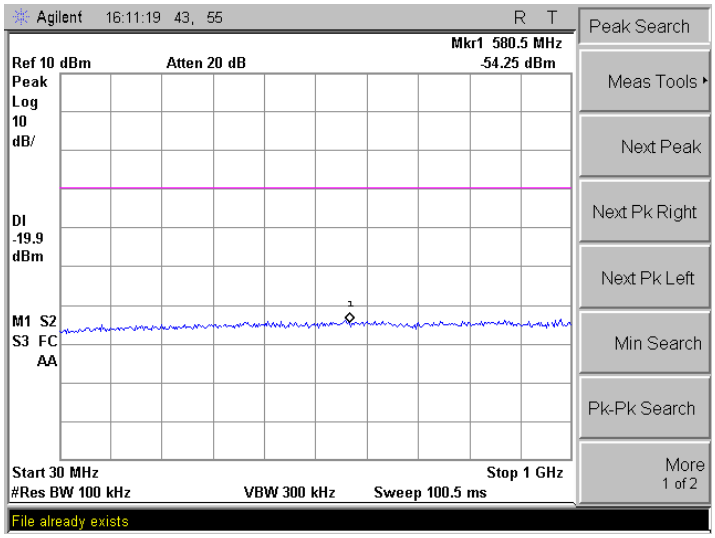


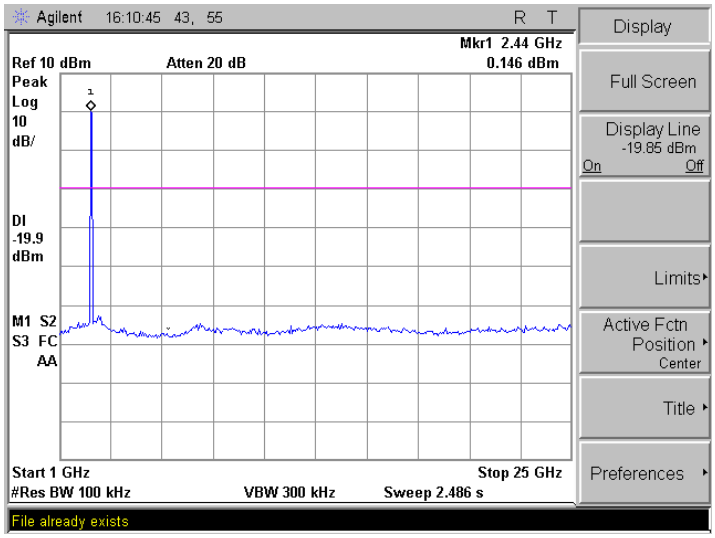
Middle Channel

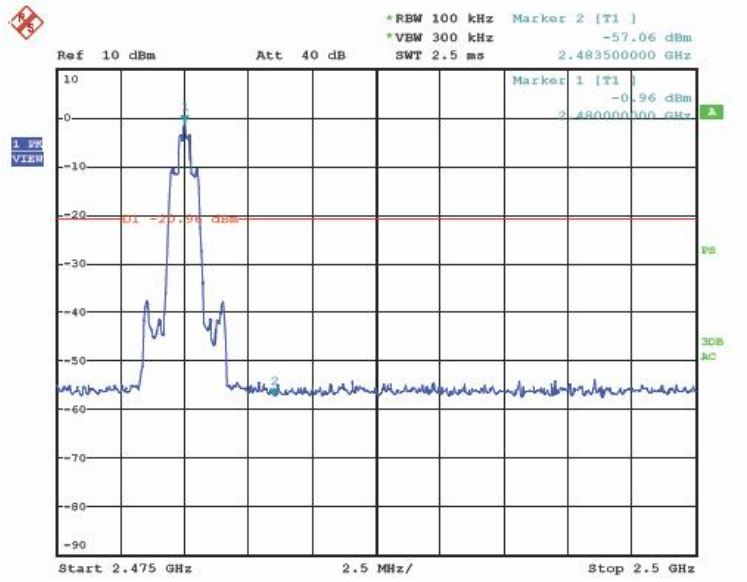




High Channel

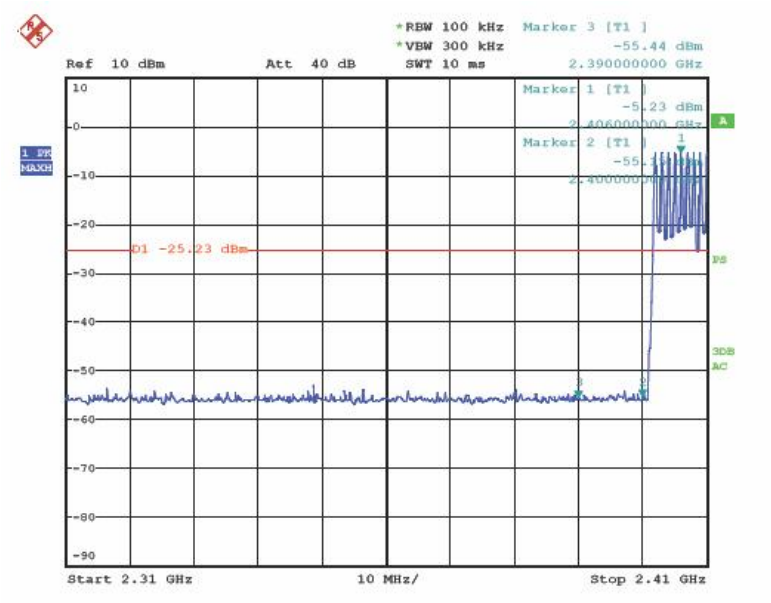




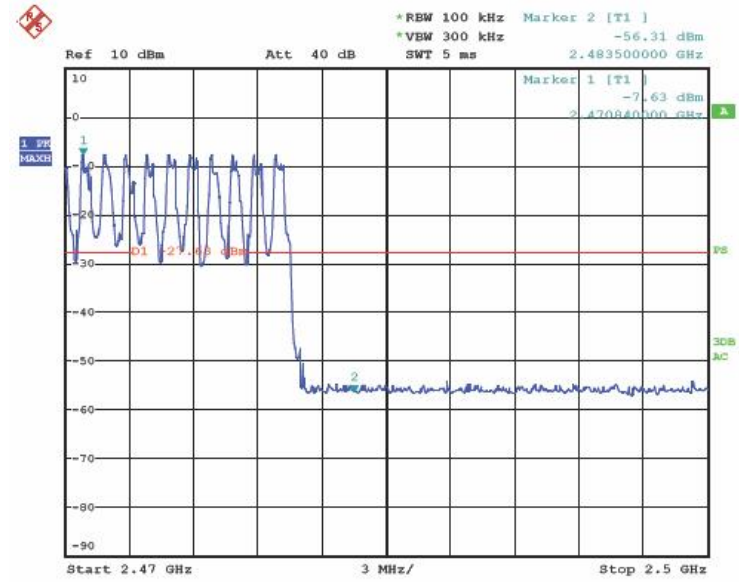


Hopping Mode;

Low Channel



High Channel



4.9. Antenna Requirement

Standard Applicable

For intentional device, according to FCC 47 CFR Section 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.

And according to FCC 47 CFR Section 15.247 (c), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

Refer to statement below for compliance.

The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited. Further, this requirement does not apply to intentional radiators that must be professionally installed.

Antenna Connected Construction

The antenna used in this product is a internal Antenna, The directional gains of antenna used for transmitting is 0 dBi.

4.10. RF Exposure

STANDARD APPLICABLE

According to § 1.1307 (b)(1), system operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of the Commission's guideline.

This is a portable device. Per KDB 447498 05r02, the device used distance is 5mm from body.

LIMIT

LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm2)	Average Time (Minutes)
(A) Limits for Occupational/ Control Exposures				
300-1500	--	--	F/300	6
1500-100,000	--	--	5	6
(B) Limits for General Population/ Uncontrolled Exposures				
300-1500	--	--	F/1500	6
1500-100,000	--	--	1	30

F= Frequency in MHz

MEASUREMENT RESULTS

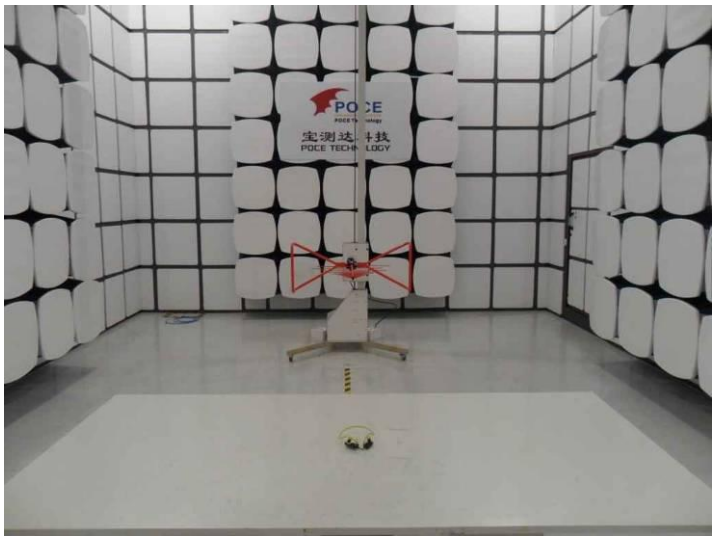
Per KDB 447498 05r02

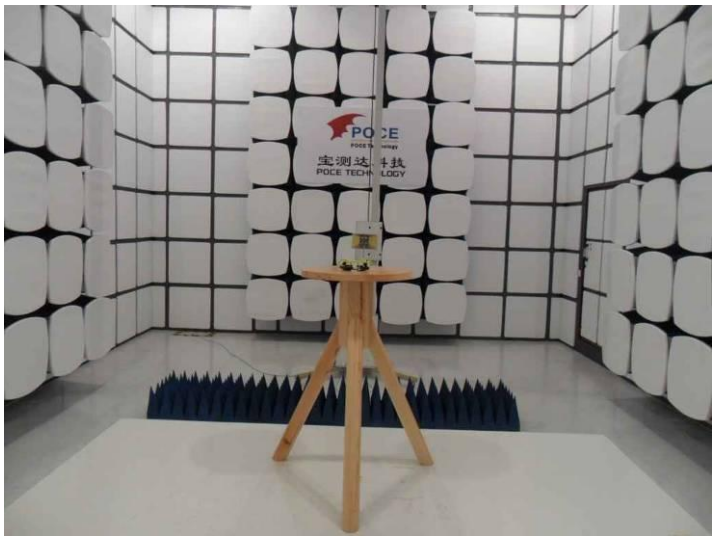
This is a Bluetooth function and the Max peak output power is 2.17dBm (1.65mW) at 2441MHz.

$1.65^* \sqrt{2.441}/5=0.516<3$

The SAR measurement is not necessary

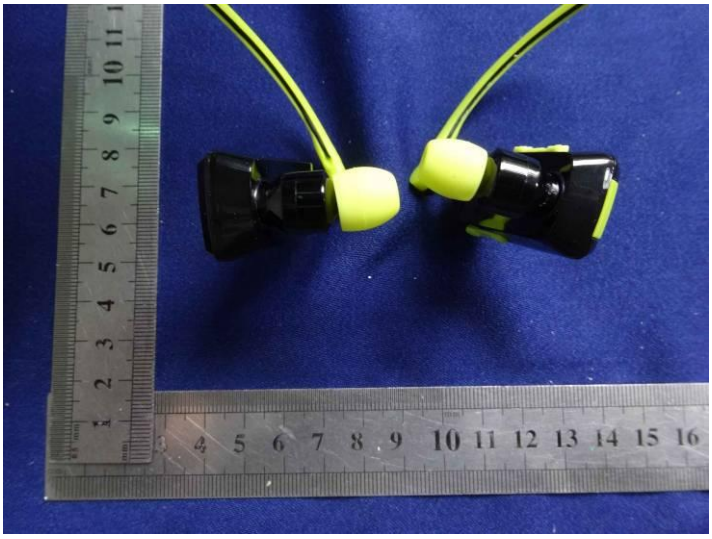
5. Test Setup Photos of the EUT



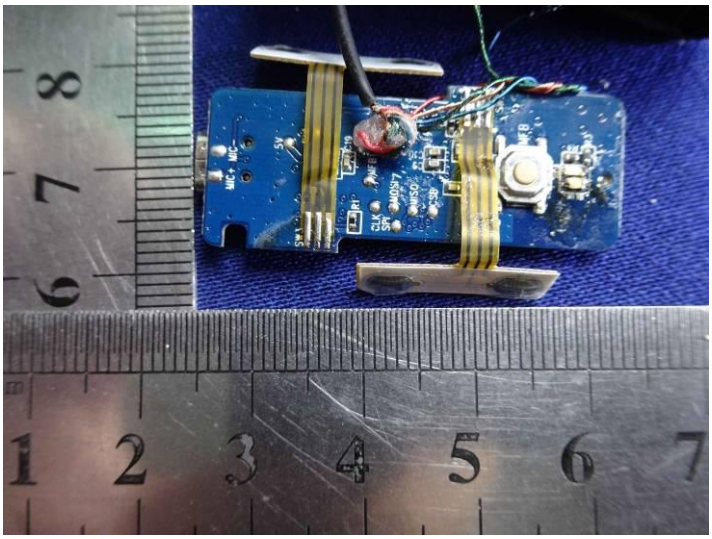


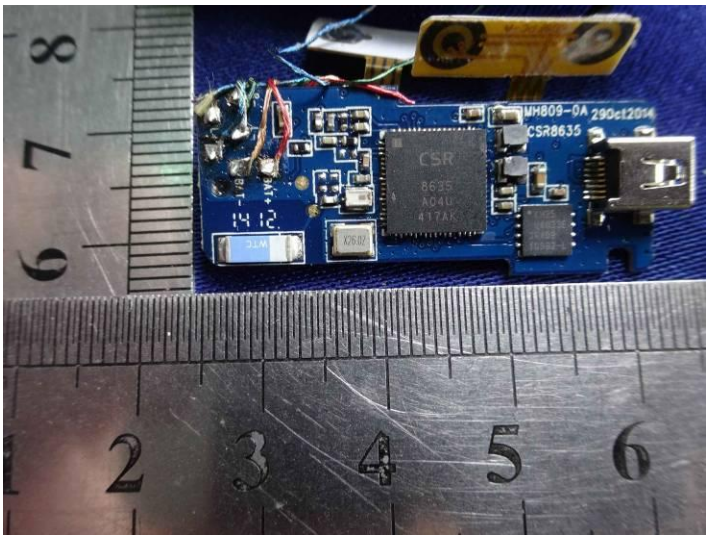
6. External and Internal Photos of the EUT

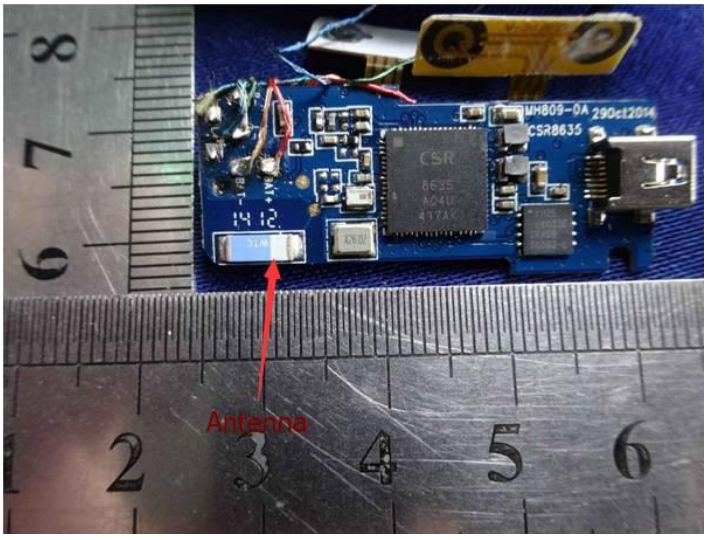
External Photos of EUT



Internal Photos of EUT







.....End of Report.....