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FCC PART 15 SUBPART C TEST REPORT

FCC Part 15.247

Report Reference No.....:	**CTL1403050326-WF**
Compiled by (position+printed name+signature)..:	File administrators Jacky Chen
Name of the organization performing the tests (position+printed name+signature)..:	Test Engineer Happy Guo
Approved by (position+printed name+signature)..:	Manager Tracy Qi
Date of issue.....:	Mar. 21, 2014
Test Firm.....:	**Shenzhen CTL Testing Technology Co., Ltd.**
Address.....:	Floor 1-A, Baisha Technology Park, No.3011, Shahexi Road, Nanshan District, Shenzhen, China 518055
Applicant's name.....:	**Shenzhen Bolutek Electronical Technology Co.,Ltd**
Address.....:	Building B, District A, Internet Industry Base, Bao'an, Shenzhen, Guangdong, China
Test specification:	
Standard .....:	FCC Part 15.247: Operation within the bands 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz.
Master TRF.....:	Dated 2011-01

Test item description ..... :	Bluetooth Module
FCC ID……..:	2AB4GSPK-6145-A
Trade Mark .....:	BOLUTEK
Model/Type reference.....:	SPK-6145-A
Work frequency .....:	2402~2480MHz
Version.....:	V3.0
Type of modulation .....:	FHSS
Data Rate.....:	1Mbps(GFSK), 2Mbps(Pi/4 DQPSK), 3Mbps(8DPSK)
Antenna Gain .....:	0 dBi
Antenna type .....:	Internal
Result.....:	**Positive**

TEST REPORT

Test Report No. :	CTL1403050326-WF	Mar. 21, 2014 Date of issue

Equipment under Test	:	Bluetooth Module
Model /Type	:	SPK-6145-A
Applicant	:	**Shenzhen Bolutek Electronical Technology Co.,Ltd**
Address	:	Building B, District A, Internet Industry Base, Bao'an, Shenzhen, Guangdong, China
Manufacturer	:	**Shenzhen Bolutek Electronical Technology Co.,Ltd**
Address	:	Building B, District A, Internet Industry Base, Bao'an, Shenzhen, Guangdong, China

Test Result according to the standards on page 4:	**Positive**

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 C63.10-2009: American National Standard for Testing Unlicensed Wireless Devices

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

ANSI C63.4-2003

All measurements contained in this report were conducted with ANSI C63.4-2003, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz. The public notice DA 00-705 for frequency hopping spread spectrum systems shall be performed also.

2. SUMMARY

2.1. General Remarks

Date of receipt of test sample	:	Mar. 10, 2014
Testing commenced on	:	Mar. 10, 2014
Testing concluded on	:	Mar. 20, 2014

2.2. 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

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

A Bluetooth Module with Bluetooth function.

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

Serial number: Prototype

2.4. 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. 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

2.5. 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. :	-------

2.6. 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.	FCC ID
1	Notebook PC	DELL	PP18L	27548966 7000262	------

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

This submittal(s) (test report) is intended for FCC ID: 2AB4GSPK-6145-A filing to comply with Section 15.247 of the FCC Part 15, Subpart C Rules.

2.8. Modifications

No modifications were implemented to meet testing criteria.

2.9. 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)	CTL1403050326-WF
RF Exposure	FCC Per 47 CFR 2.1093	CTL1403050326-WF

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

2.10. 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.

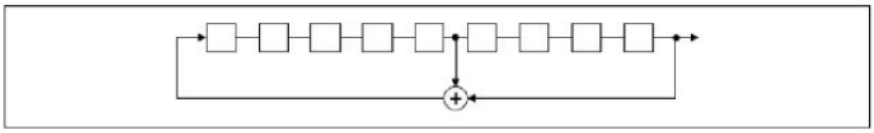
(g) Frequency hopping spread spectrum systems are not required to employ all available hopping channels during each transmission. However, the system, consisting of both the transmitter and the receiver, must be designed to comply with all of the regulations in this section should the transmitter be 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 5th and 9th 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)



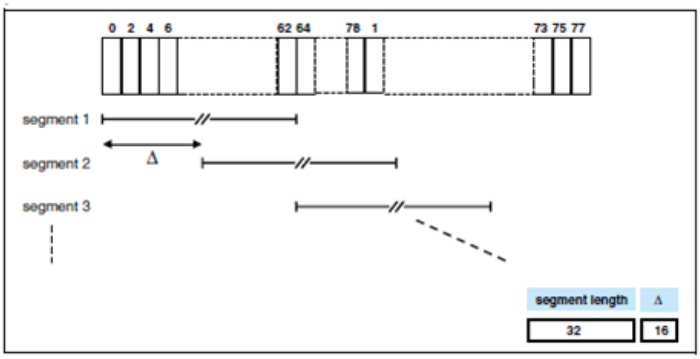
Linear Feedback Shift Register for Generation of the PRBS sequence

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.

2.11. Mode of Operation

CTL 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

3. TEST ENVIRONMENT

3.1. Address of the test laboratory

Shenzhen CTL Testing Technology Co., Ltd.
Floor 1-A, Baisha Technology Park, No.3011, Shahexi Road, Nanshan District, Shenzhen, China 518055

The sites are constructed in conformance with the requirements of ANSI C6230, ANSI C63.4 (2003) and CISPR Publication 22.

3.2. Test Facility

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

IC Registration No.: 9618B

The 3m alternate test site of Shenzhen CTL Testing Technology Co., Ltd. EMC Laboratory has been registered by Certification and Engineer Bureau of Industry Canada for the performance of with Registration No.: 9618B on November 13, 2013.

FCC-Registration No.: 970318

Shenzhen CTL 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 970318, December 19, 2013.

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 data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16 - 4 „Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements“ and is documented in the Shenzhen CTL Testing Technology Co., Ltd. quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for CTL laboratory is reported:

Test	Range	Measurement Uncertainty	Notes
Radiated Emission	30~1000MHz	4.10dB	(1)
Radiated Emission	Above 1GHz	4.32dB	(1)
Conducted Disturbance	0.15~30MHz	3.20dB	(1)

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

3.5. 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
FCC Part 15.203/15.247 (b)	Antenna Requirement	PASS

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

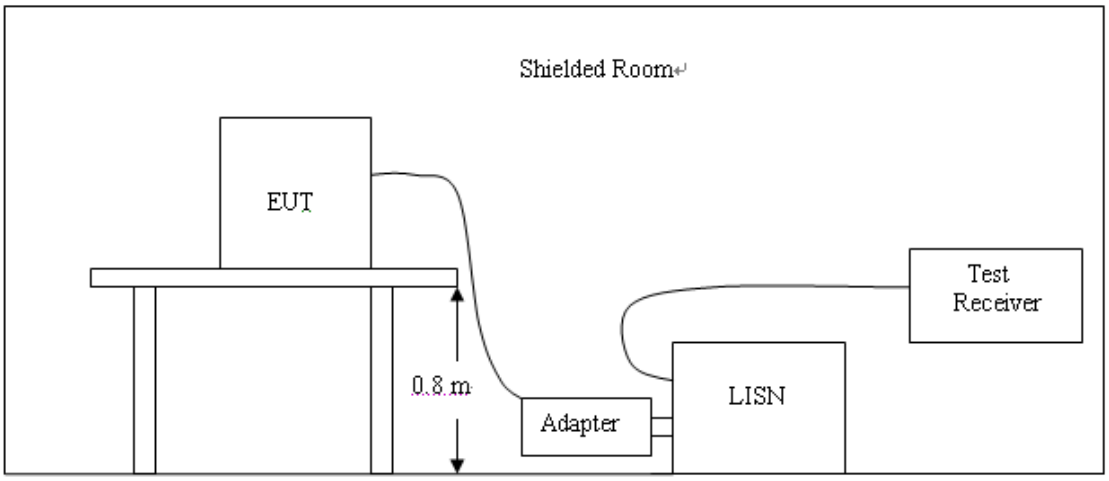
3.6. Equipments Used during the Test

Test Equipment	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Due Date
Bilog Antenna	Sunol Sciences Corp.	JB1	A061713	2013/07/12	2014/07/11
EMI Test Receiver	R&S	ESCI3	103710	2013/07/10	2014/07/09
EMI Test Receiver	R&S	ESPI	1164.6407.07	2013/07/10	2014/07/09
Spectrum Analyzer	Agilent	E4407B	MY45108355	2013/07/06	2014/07/05
Controller	EM Electronics	Controller EM 1000	N/A	2013/07/06	2014/07/05
Horn Antenna	Sunol Sciences Corp.	DRH-118	A062013	2013/07/12	2014/07/11
Horn Antenna	SCHWARZBECK	BBHA9170	1562	2013/07/12	2014/07/11
Active Loop Antenna	SCHWARZBECK	FMZB1519	1519-037	2013/07/12	2014/07/11
LISN	R&S	ENV216	101316	2013/07/10	2014/07/09
LISN	SCHWARZBECK	NSLK8127	8127687	2013/07/10	2014/07/09
Microwave Preamplifier	HP	8349B	3155A00882	2013/07/10	2014/07/09
Amplifier	HP	8447D	3113A07663	2013/07/10	2014/07/09
Transient Limiter	Com-Power	LIT-153	532226	2013/07/10	2014/07/09
Wideband Peak Power Meter	Anritsu	ML2495A	6K00003382	2013/07/10	2014/07/09

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 C63.10-2009.
2 Support equipment, if needed, was placed as per ANSI C63.10-2009
3 All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10-2009
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

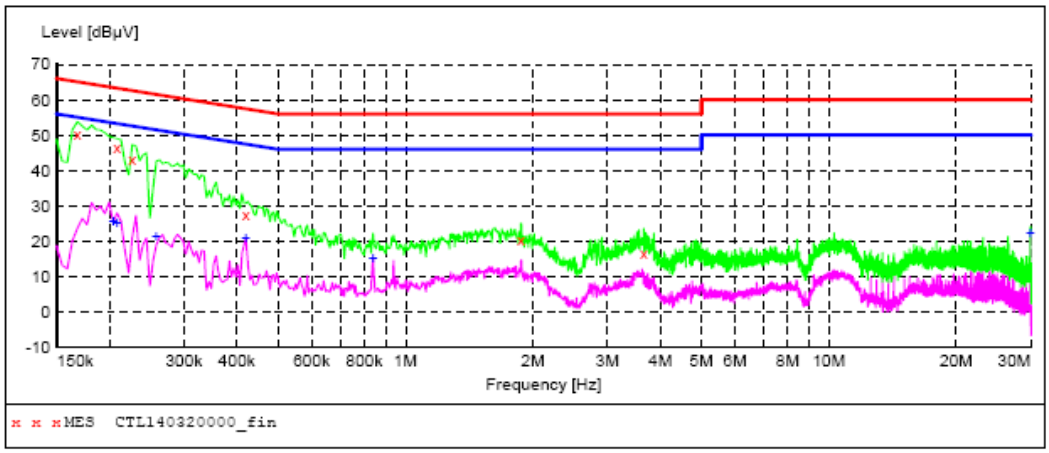
* Decreasing linearly with the logarithm of the frequency

TEST RESULTS

The 1Mbps (GFSK Modulation) is the worst case as results in the report based on the Pre-test for all modulation models.

Mode 1:

SCAN TABLE: "Voltage (9K-30M)FIN"
Short Description: 150K-30M Voltage



MEASUREMENT RESULT: "CTL140320000_fin"

3/20/2014 9:49AM

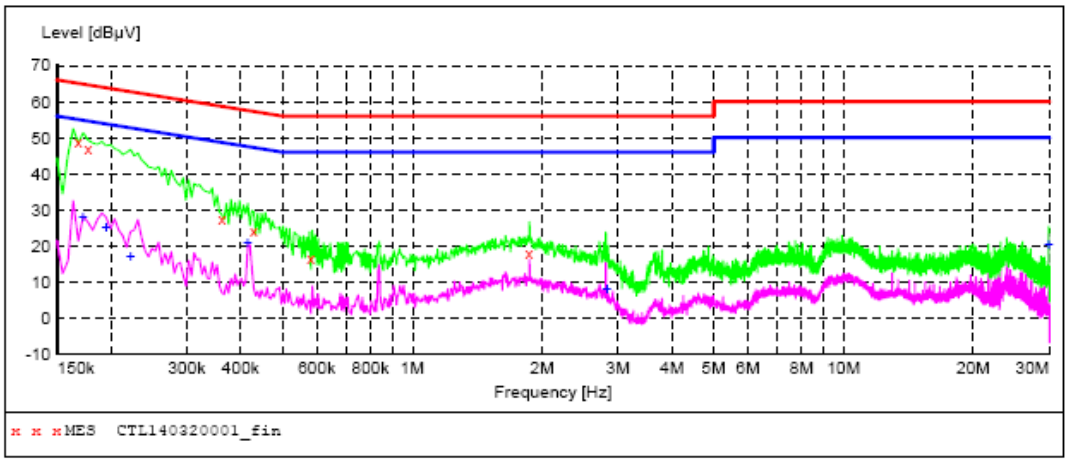
Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.168000	50.50	9.8	65	14.6	QP	N	GND
0.208500	46.50	9.8	63	16.8	QP	N	GND
0.226500	43.30	9.8	63	19.3	QP	N	GND
0.420000	27.70	9.8	57	29.7	QP	N	GND
1.873500	20.60	9.8	56	35.4	QP	N	GND
3.660000	16.70	9.9	56	39.3	QP	N	GND

MEASUREMENT RESULT: "CTL140320000_fin2"

3/20/2014 9:49AM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.204000	25.70	9.8	53	27.7	AV	N	GND
0.208500	25.20	9.8	53	28.1	AV	N	GND
0.258000	21.10	9.8	52	30.4	AV	N	GND
0.420000	20.80	9.8	47	26.6	AV	N	GND
0.838500	15.20	9.8	46	30.8	AV	N	GND
29.890500	22.40	10.5	50	27.6	AV	N	GND

SCAN TABLE: "Voltage (9K-30M)FIN"
Short Description: 150K-30M Voltage



MEASUREMENT RESULT: "CTL140320001_fin"

3/20/2014 9:53AM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.168000	48.80	9.8	65	16.3	QP	L1	GND
0.177000	46.90	9.8	65	17.7	QP	L1	GND
0.361500	27.30	9.8	59	31.4	QP	L1	GND
0.429000	24.30	9.8	57	33.0	QP	L1	GND
0.582000	16.60	9.8	56	39.4	QP	L1	GND
1.864500	18.10	9.8	56	37.9	QP	L1	GND

MEASUREMENT RESULT: "CTL140320001_fin2"

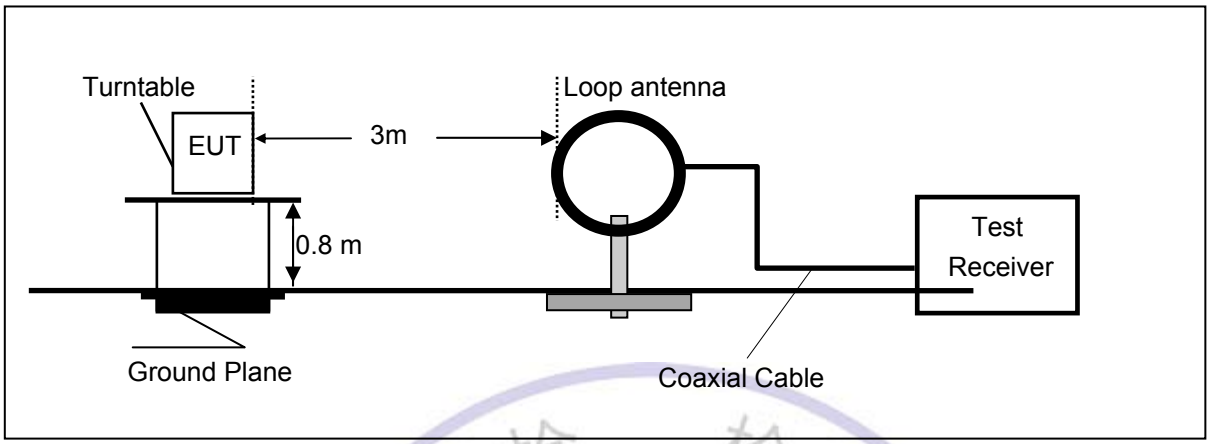
3/20/2014 9:53AM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.172500	27.90	9.8	55	26.9	AV	L1	GND
0.195000	25.10	9.8	54	28.7	AV	L1	GND
0.222000	17.20	9.8	53	35.5	AV	L1	GND
0.415500	20.80	9.8	48	26.7	AV	L1	GND
2.827500	8.00	9.9	46	38.0	AV	L1	GND
29.890500	20.40	10.5	50	29.6	AV	L1	GND

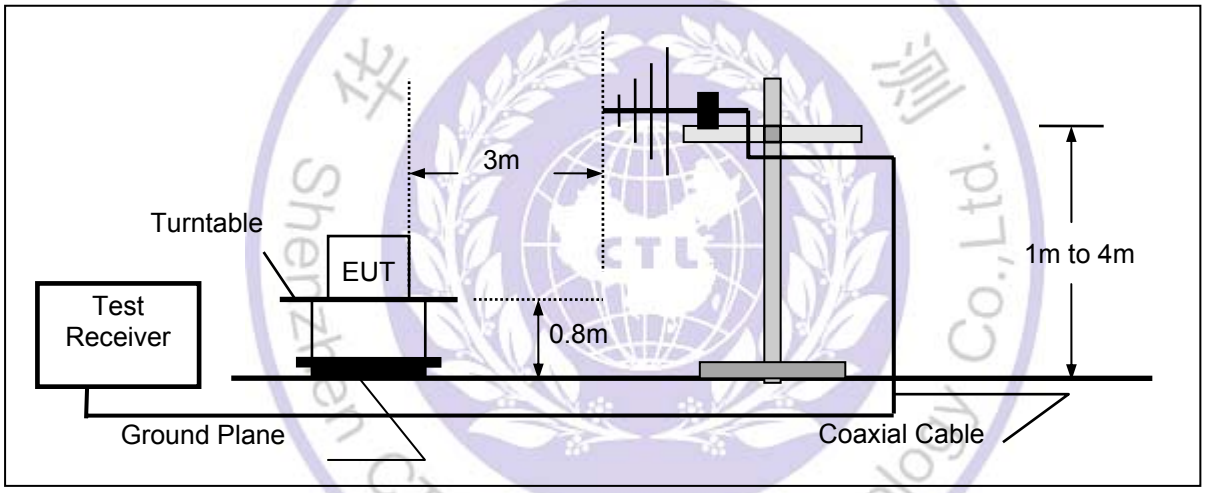
4.2. Radiated Emission

TEST CONFIGURATION

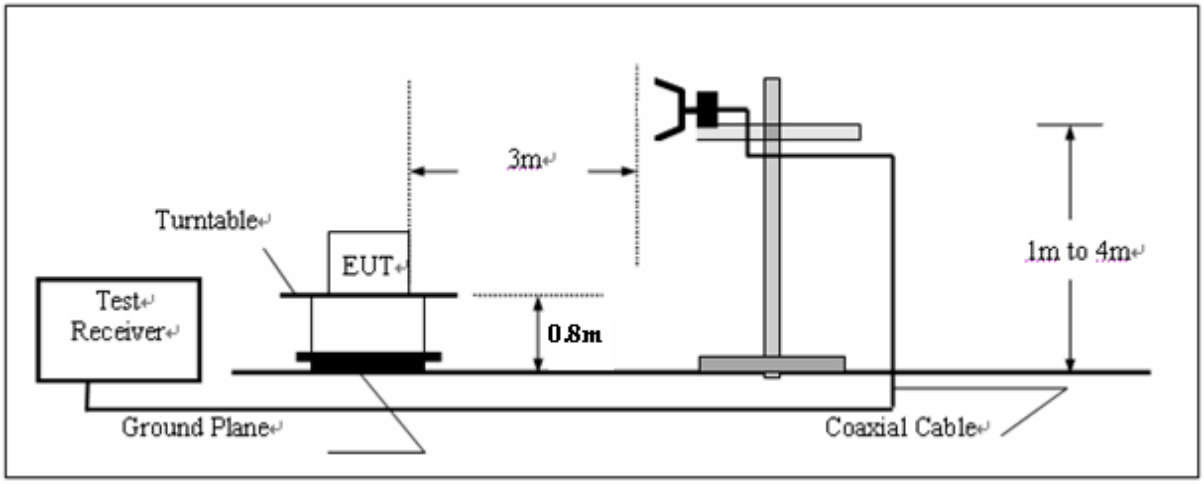
Radiated Emission Test Set-Up
Frequency range 9KHz – 30MHz



Frequency range 30MHz – 1000MHz



Frequency range above 1GHz-25GHz



TEST PROCEDURE

1 The EUT was placed on a turn table which is 0.8m above ground plane.
2 Maximum procedure was performed by raising the receiving antenna from 1m to 4m and rotating the turn table from 0℃ to 360℃ to acquire the highest emissions from EUT
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above procedures until all frequency measurements have been completed.
5. The fundamental frequency is 2400-2483.5MHz, so the radiation emissions frequency range was tested from 9KHz to 25GHz.

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	

For example

Frequency (MHz)	FS (dBμV/m)	RA (dBμV/m)	AF (dB)	CL (dB)	AG (dB)	Transd (dB)
300.00	40	58.1	12.2	1.6	31.90	-18.1

Transd=AF +CL-AG

RADIATION LIMIT

For intentional device, according to § 15.209(a), the general requirement of field strength of radiated emission from intentional radiators at a distance of 3 meters shall not exceed the following table. According to § 15.247(d), in any 100kHz bandwidth outside the frequency band in which the EUT is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the100kHz bandwidth within the band that contains the highest level of desired power.

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

Note:
Three axes are chosen for pretest, the Y axis is the worst mode for final test and reported.
For battery operated equipment, the equipment tests shall be performed using a new battery.

TEST RESULTS

Mode 1: Transmitter-1Mbps(GFSK_DH5)

CH	Antenna	Frequency (MHz)	Reading Level (dBuV/m)	Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
0	H	2402.1	62.9	31.2	94.1	Fundamental	/	PK
	H	363.1	5.8	16.4	22.2	46	-23.8	QP
	H	498.0	5.9	19.3	25.2	46	-20.8	QP
	H	3252.5	56.1	-16.0	40.1	54(Note)	-13.9	PK
	H	4884.5	56.4	-11.7	44.7	54(Note)	-9.3	PK
	H	7206.0	48.5	-3.5	45.0	54(Note)	-9.0	PK
	H	24000.0	59.1	-8.9	50.2	54(Note)	-3.8	PK
39	H	2440.9	61.4	31.2	92.6	Fundamental	/	PK
	H	468.2	6.2	18.9	25.1	46	-20.9	QP
	H	547.6	5.0	20.6	25.6	46	-20.4	QP
	H	3252.5	57.1	-16.0	41.1	54(Note)	-12.9	PK
	H	4884.5	56.3	-11.7	44.6	54(Note)	-9.4	PK
	H	7323.0	46.5	-3.0	43.5	54(Note)	-10.5	PK
	H	24000.0	59.1	-8.9	50.2	54(Note)	-3.8	PK
78	H	2480.0	60.7	31.2	91.9	Fundamental	/	PK
	H	302.9	5.1	14.7	19.8	46	-26.2	QP
	H	454.0	5.9	18.4	24.3	46	-21.7	QP
	H	3303.5	56.2	-16.2	40.0	54(Note)	-14.0	PK
	H	4961.0	55.2	-11.4	43.8	54(Note)	-10.2	PK
	H	7440.0	47.4	-2.6	44.8	54(Note)	-9.2	PK
	H	24000.0	59.1	-8.9	50.2	54(Note)	-3.8	PK

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 average measurement needn't be performed.

Mode 2: Transmitter-2Mbps(Pi/4 DQPSK_DH5)

CH	Antenna	Frequency (MHz)	Reading Level (dBuV/m)	Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
0	H	2402.1	64.1	31.2	95.3	Fundamental	/	PK
	H	363.1	5.3	16.4	21.7	46	-24.3	QP
	H	498.0	5.4	19.3	24.7	46	-21.3	QP
	H	3201.5	56.6	-15.9	40.7	54(Note)	-13.3	PK
	H	4808.0	56.2	-11.9	44.3	54(Note)	-9.7	PK
	H	7206.0	48.8	-3.5	45.3	54(Note)	-8.7	PK
	H	24000.0	59.1	-8.9	50.2	54(Note)	-3.8	PK
39	H	2441.0	62.8	31.2	94.0	Fundamental	/	PK
	H	468.2	6.3	18.9	25.2	46	-20.8	QP
	H	614.4	6.5	21.2	27.7	46	-18.3	QP
	H	3252.5	57.9	-16.0	41.9	54(Note)	-12.1	PK
	H	4884.5	56.8	-11.7	45.1	54(Note)	-8.9	PK
	H	7323.0	47.5	-3.0	44.5	54(Note)	-9.5	PK
	H	24000.0	59.1	-8.9	50.2	54(Note)	-3.8	PK
78	H	2480.0	61.9	31.2	93.1	Fundamental	/	PK
	H	320.2	4.4	15.3	19.7	46	-26.3	QP
	H	454.0	5.8	18.4	24.2	46	-21.8	QP
	H	3303.5	55.8	-16.2	39.6	54(Note)	-14.4	PK
	H	4961.0	56.3	-11.4	44.9	54(Note)	-9.1	PK
	H	7440.0	48.4	-2.6	45.8	54(Note)	-8.2	PK
	H	24000.0	59.1	-8.9	50.2	54(Note)	-3.8	PK

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 average measurement needn't be performed.

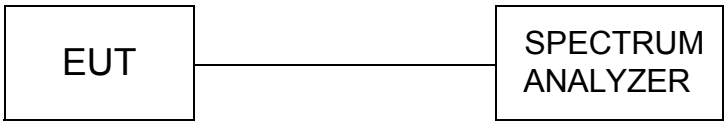
Mode 3: Transmitter-3Mbps(8DPSK_DH5)

CH	Antenna	Frequency (MHz)	Reading Level (dBuV/m)	Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
0	H	2401.9	64.2	31.2	95.4	Fundamental	/	PK
	V	571.5	6.8	20.6	27.4	46	-18.6	QP
	V	747.8	3.7	22.5	26.2	46	-19.8	QP
	H	3201.5	56.7	-15.9	40.8	54(Note)	-13.2	PK
	H	4808.0	57.4	-11.9	45.5	54(Note)	-8.5	PK
	H	7206.0	48.0	-3.5	44.5	54(Note)	-9.5	PK
	H	24000.0	59.1	-8.9	50.2	54(Note)	-3.8	PK
39	H	2441.0	63.7	31.2	94.9	Fundamental	/	PK
	H	614.4	6.2	21.2	27.4	46	-18.6	QP
	H	730.9	5.7	22.4	28.1	46	-17.9	QP
	H	3252.5	57.0	-16.0	41.0	54(Note)	-13.0	PK
	H	4884.5	56.9	-11.7	45.2	54(Note)	-8.8	PK
	H	7323.0	46.9	-3.0	43.9	54(Note)	-10.1	PK
	H	24000.0	59.1	-8.9	50.2	54(Note)	-3.8	PK
78	H	2480.0	62.8	31.2	94.0	Fundamental	/	PK
	H	320.2	4.7	15.3	20.0	46	-26.0	QP
	H	548.2	5.3	20.6	25.9	46	-20.1	QP
	H	3303.5	56.8	-16.2	40.6	54(Note)	-13.4	PK
	H	4961.0	57.1	-11.4	45.7	54(Note)	-8.3	PK
	H	7440.0	48.8	-2.6	46.2	54(Note)	-7.8	PK
	H	24000.0	59.1	-8.9	50.2	54(Note)	-3.8	PK

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 average measurement needn't be performed.

4.3. Maximum Peak Output Power

TEST CONFIGURATION



TEST PROCEDURE

According to ANSI C63.10: 2009.
Use the following spectrum analyzer settings:
Span = approximately 5 times the 20dB bandwidth, centered on a hopping channel
RBW ＞ the 20 dB bandwidth of the emission being measured.
VBW ≧ RBW, Sweep = auto, Detector function = peak, Trace = max hold
Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. The indicated level is the peak output power (don't forget added the external attenuation and cable loss).

LIMIT

The Maximum Peak Output Power Measurement limit is 30dBm.

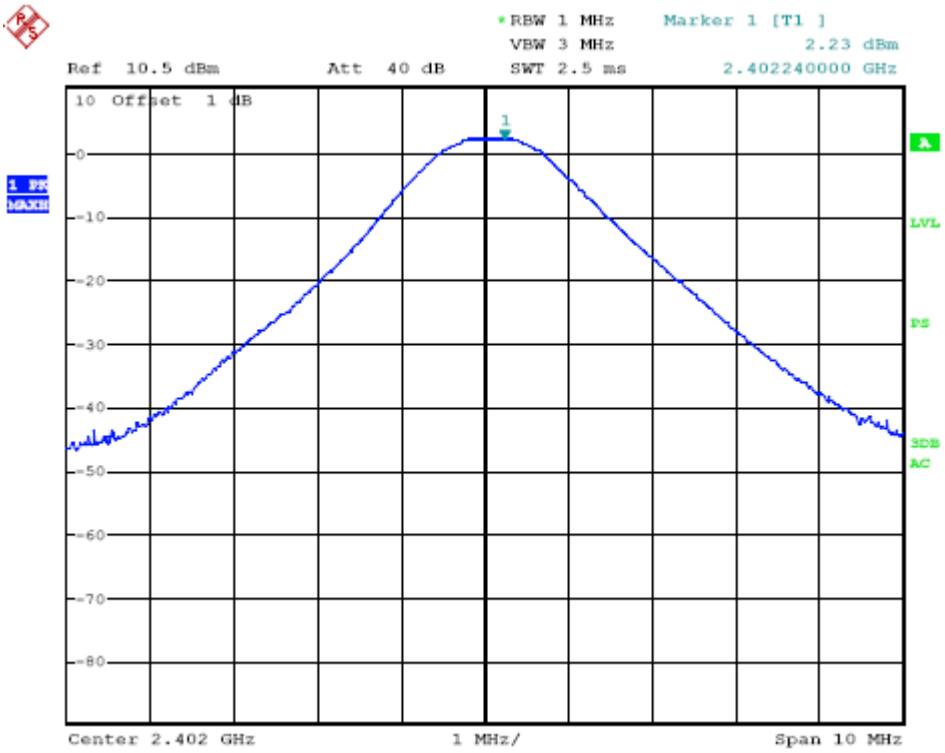
TEST RESULTS

DH5 Mode:

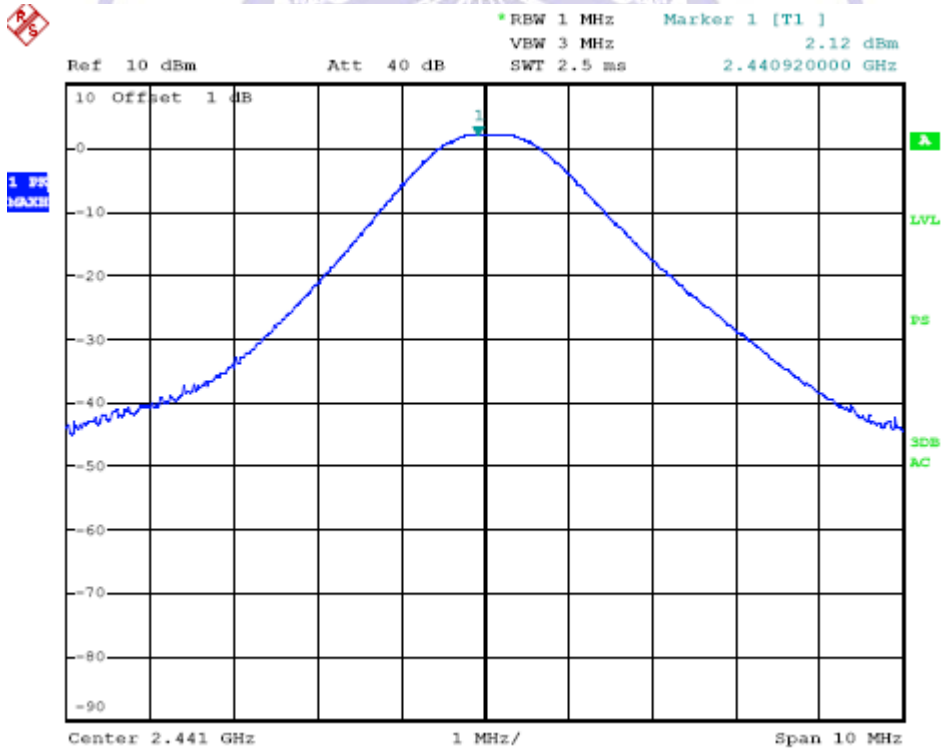
Channel Frequency (MHz)	Peak Power Output (dBm)	Peak Power Limit (dBm)	Pass / Fail
2402	2.23	30	PASS
2441	2.12	30	PASS
2480	1.74	30	PASS

Note: The test results including the cable lose.

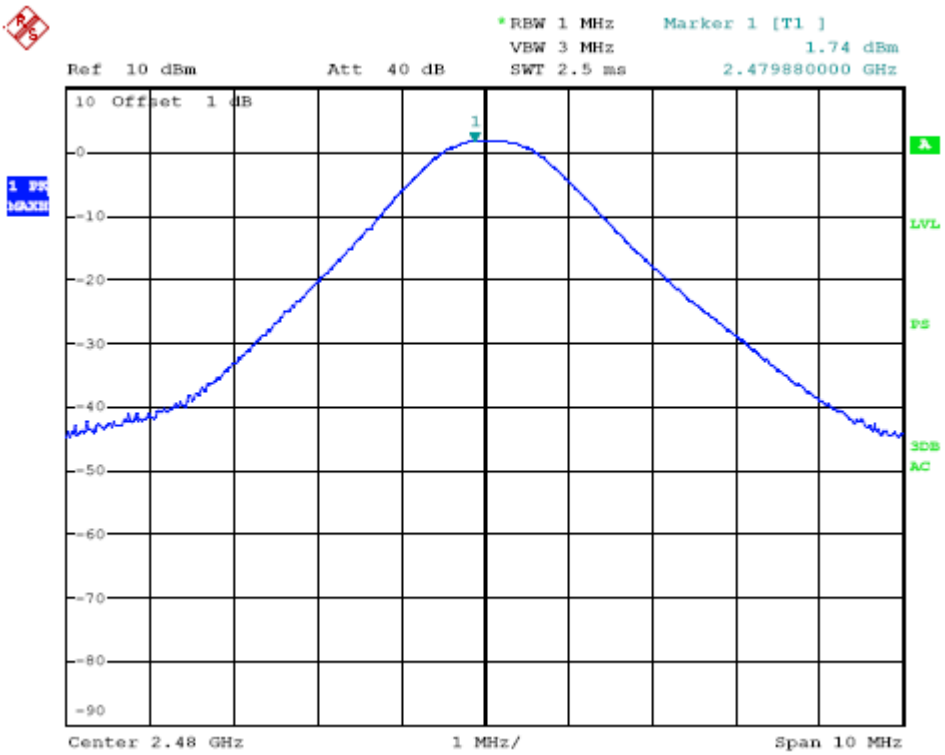
Low channel



Middle channel



High channel

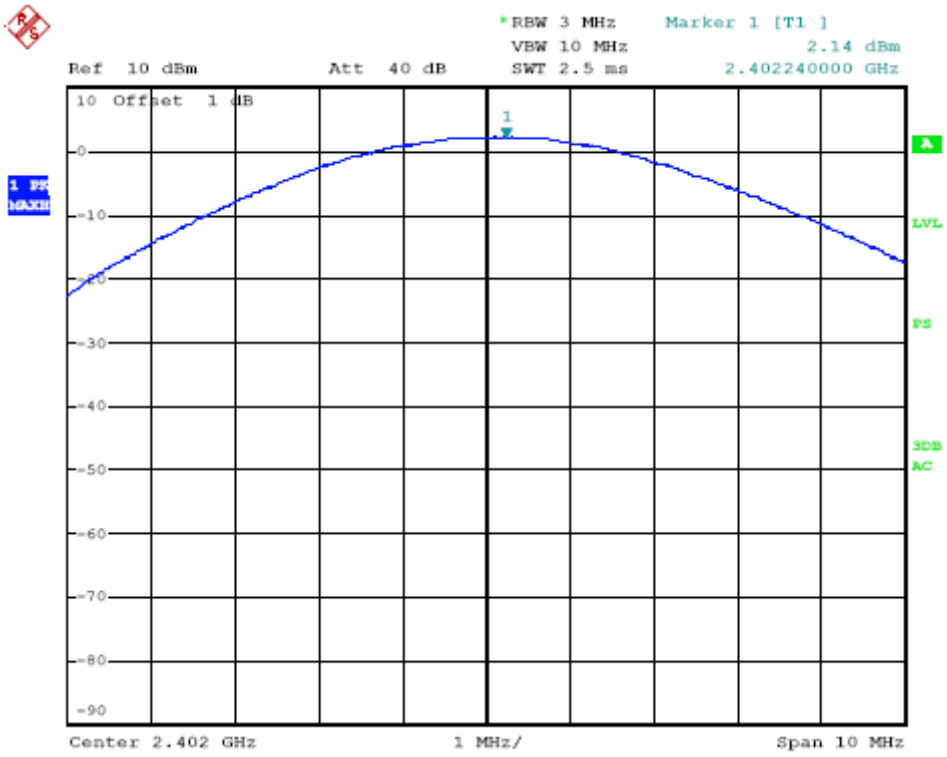


2DH5 Mode:

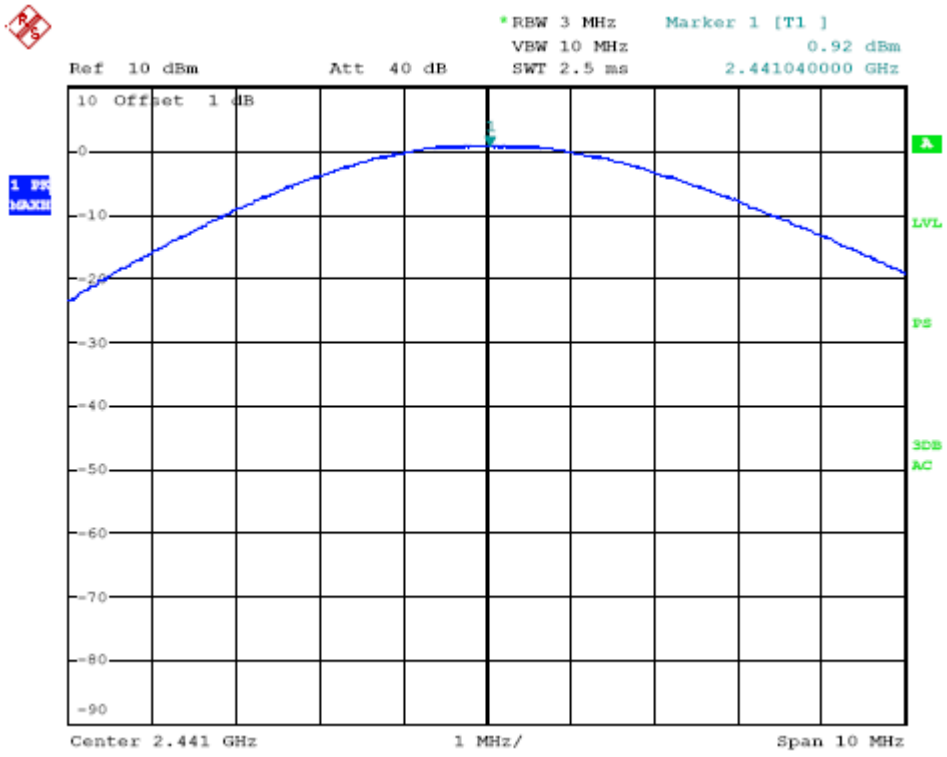
Channel Frequency (MHz)	Peak Power Output (dBm)	Peak Power Limit (dBm)	Pass / Fail
2402	2.14	30	PASS
2441	0.92	30	PASS
2480	0.03	30	PASS

Note: The test results including the cable lose.

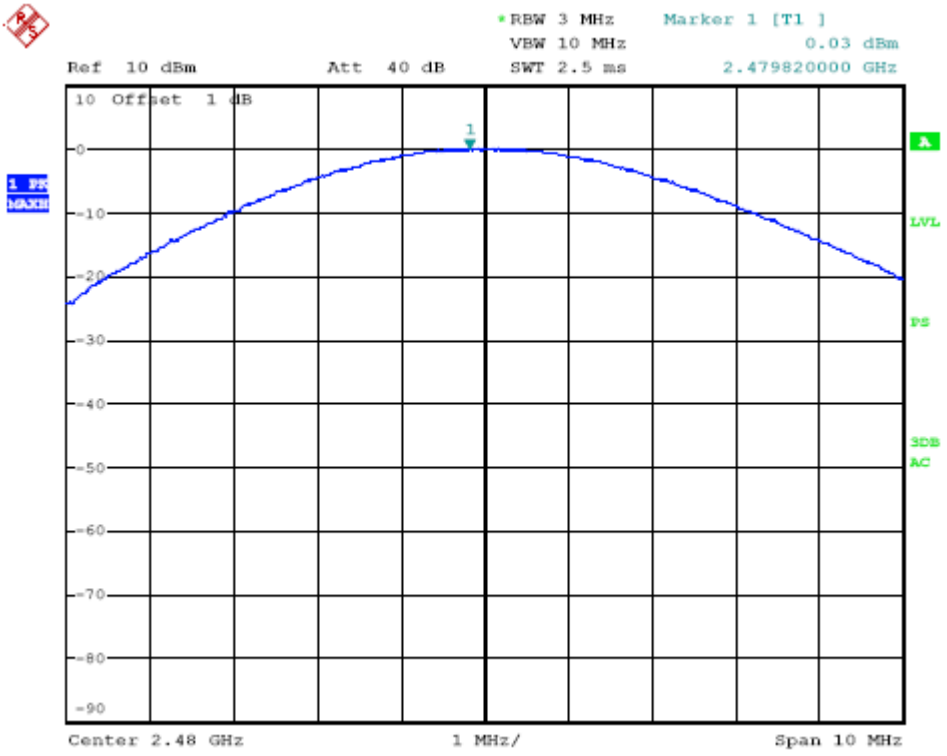
Low channel



Middle channel



High channel

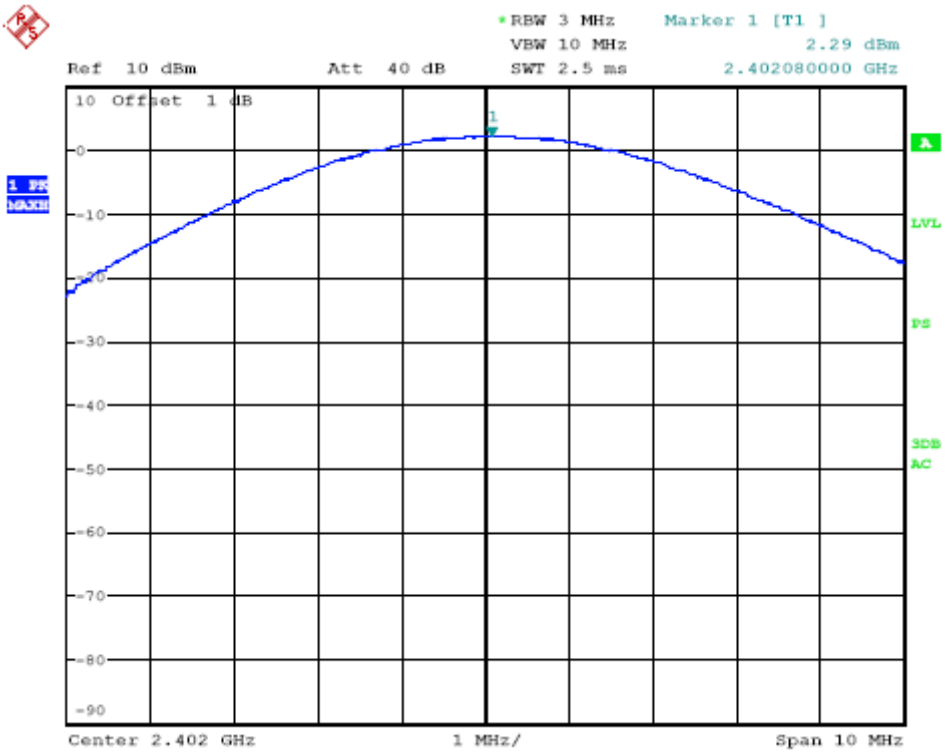


3DH5 Mode:

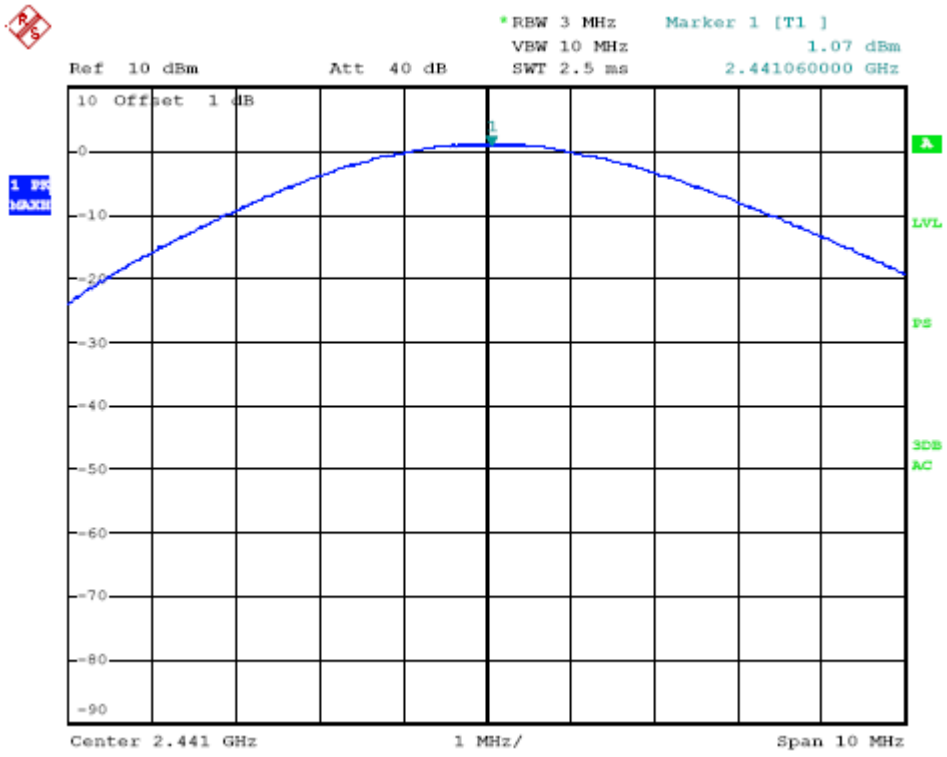
Channel Frequency (MHz)	Peak Power Output (dBm)	Peak Power Limit (dBm)	Pass / Fail
2402	2.29	30	PASS
2441	1.07	30	PASS
2480	0.37	30	PASS

Note: The test results including the cable lose.

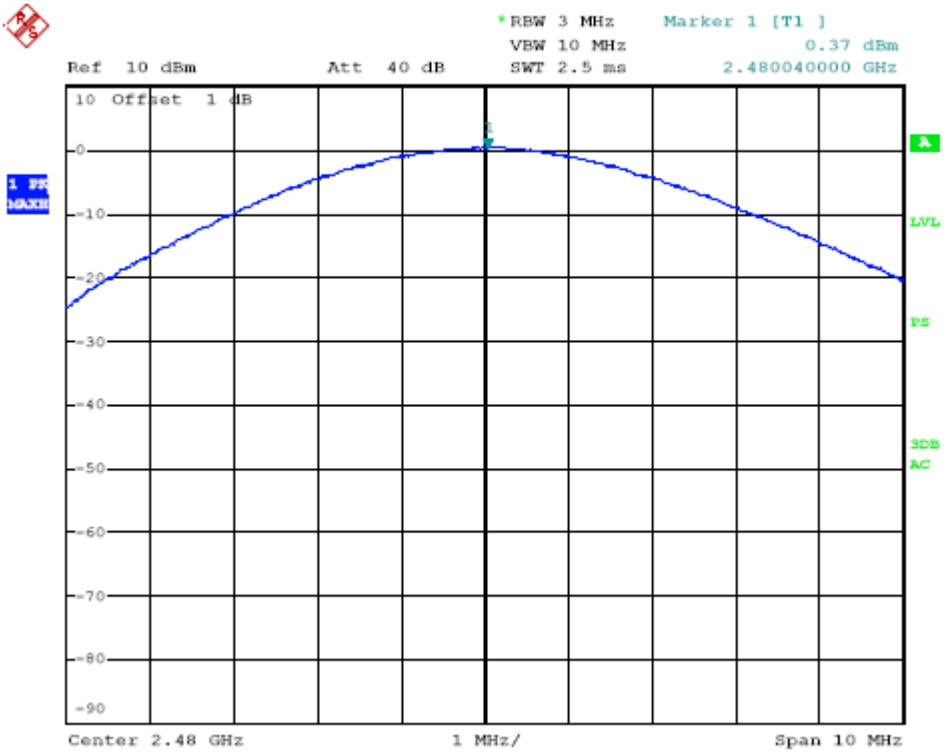
Low channel



Middle channel

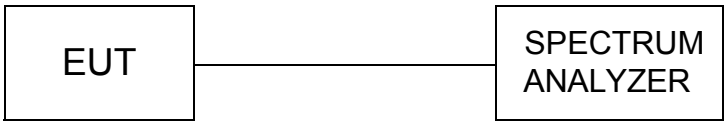


High channel



4.4. 20dB Bandwidth

TEST CONFIGURATION



TEST PROCEDURE

According to ANSI C63.10: 2009.
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

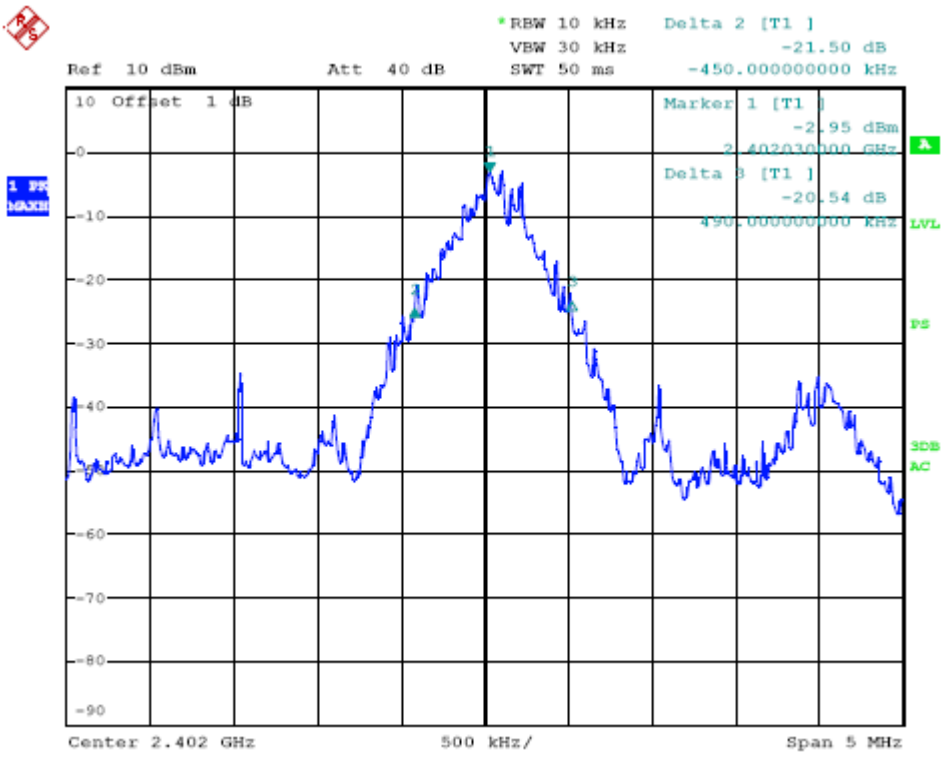
For frequency hopping systems operating in the 2400MHz-2483.5MHz no limit for 20dB bandwidth.

TEST RESULTS

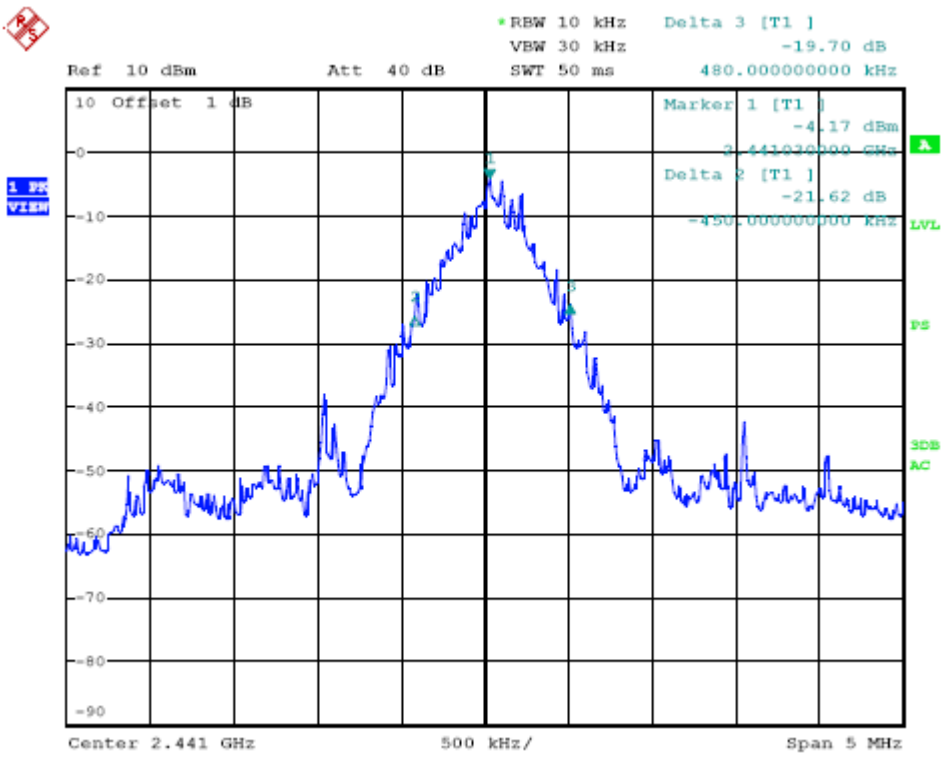
DH5 Mode:

CHANNEL FREQUENCY (MHz)	20dB BANDWIDTH (MHz)	LIMIT (MHz)	PASS/FAIL
2402	0.940	/	PASS
2441	0.930	/	PASS
2480	0.930	/	PASS

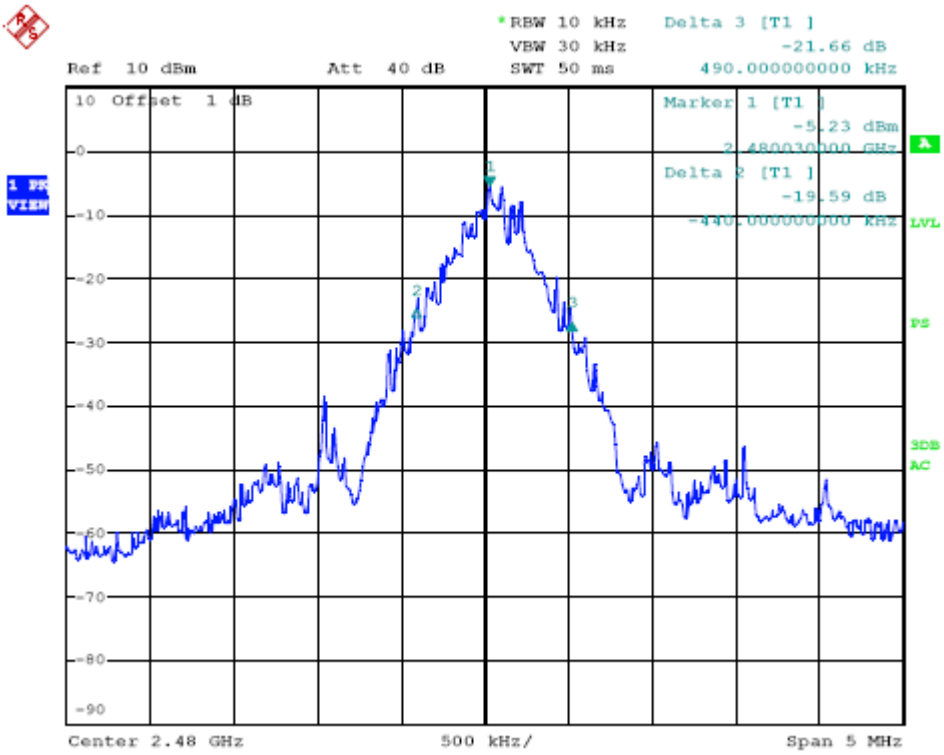
Low Channel



Middle Channel



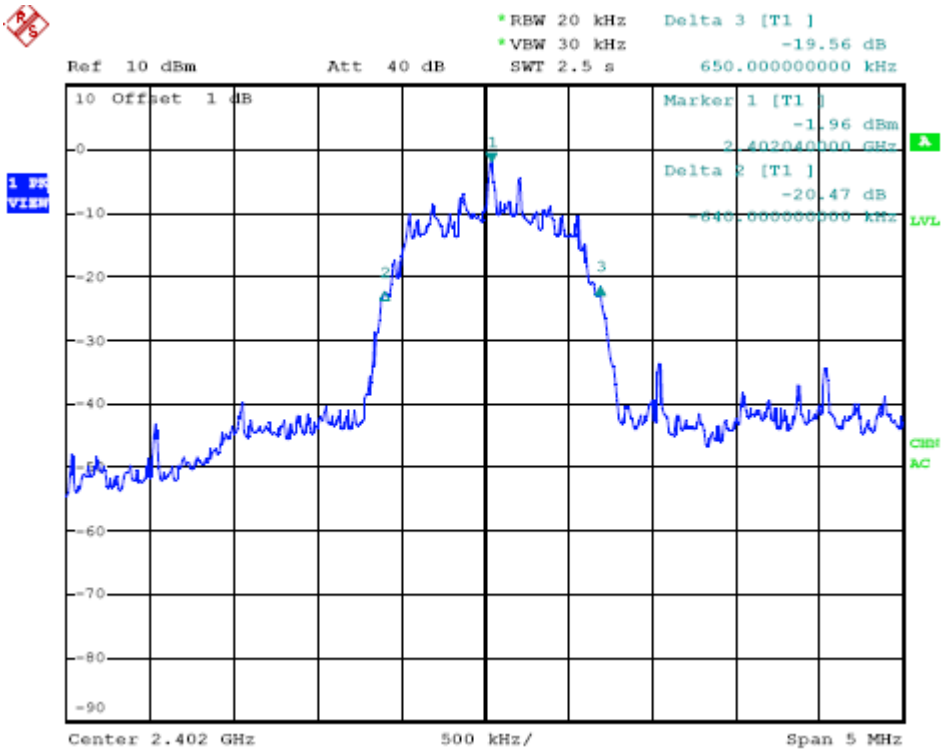
High Channel



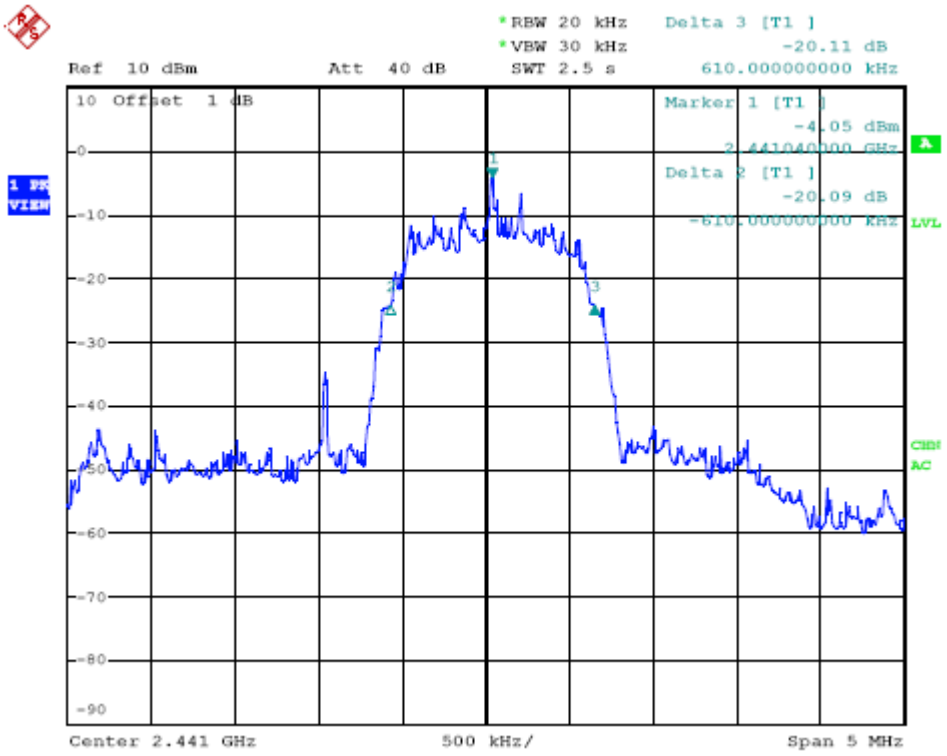
2DH5 Mode:

CHANNEL FREQUENCY (MHz)	20dB BANDWIDTH (MHz)	LIMIT (MHz)	PASS/FAIL
2402	1.290	/	PASS
2441	1.220	/	PASS
2480	1.260	/	PASS

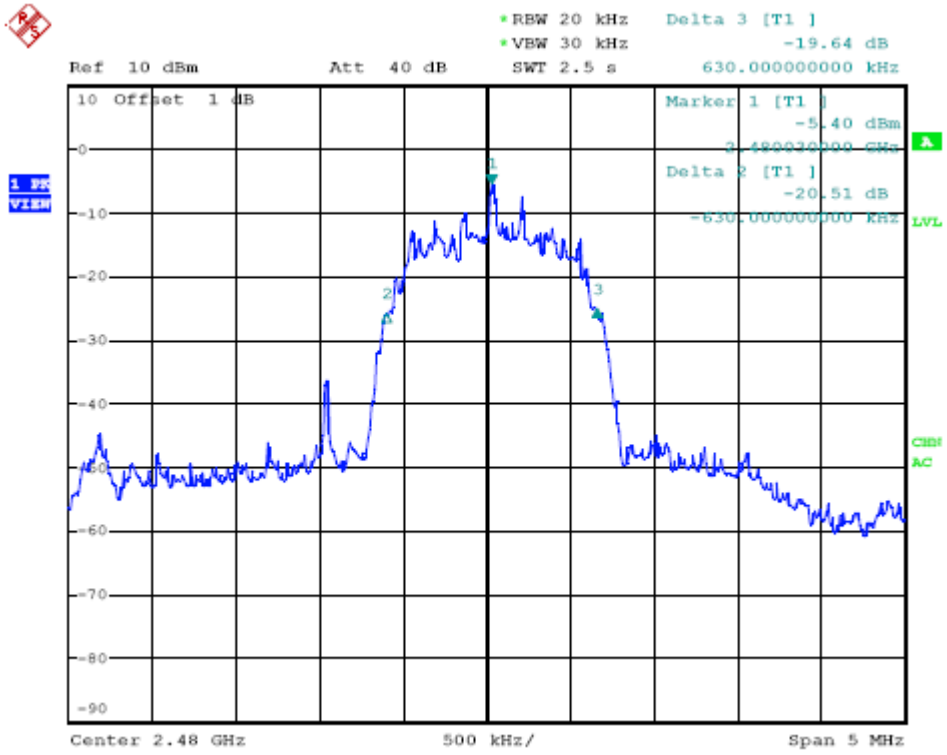
Low Channel



Middle Channel



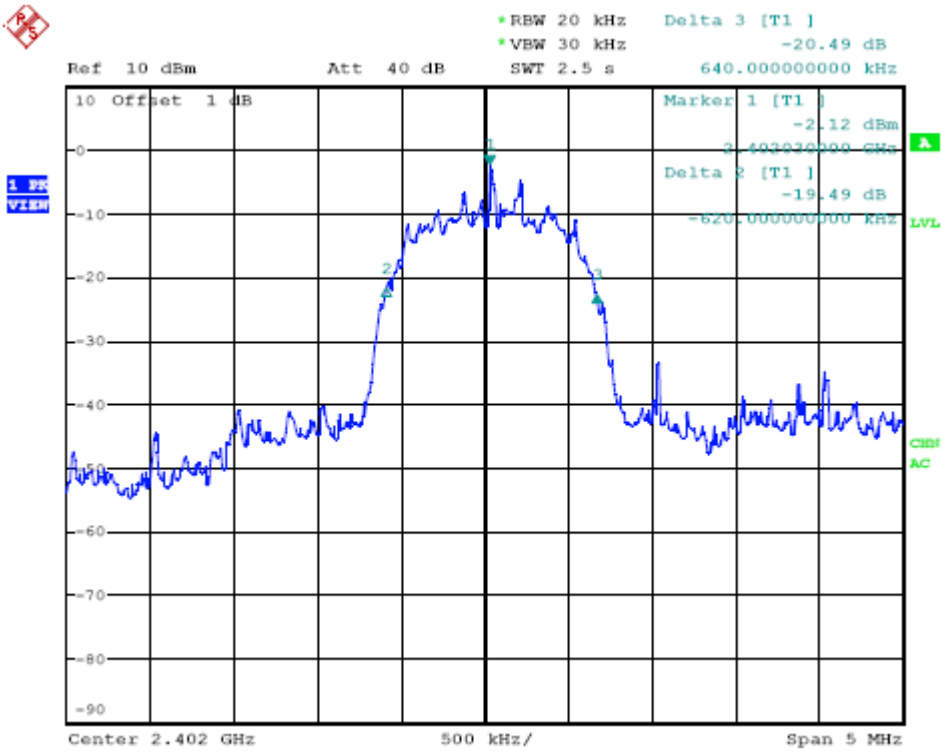
High Channel



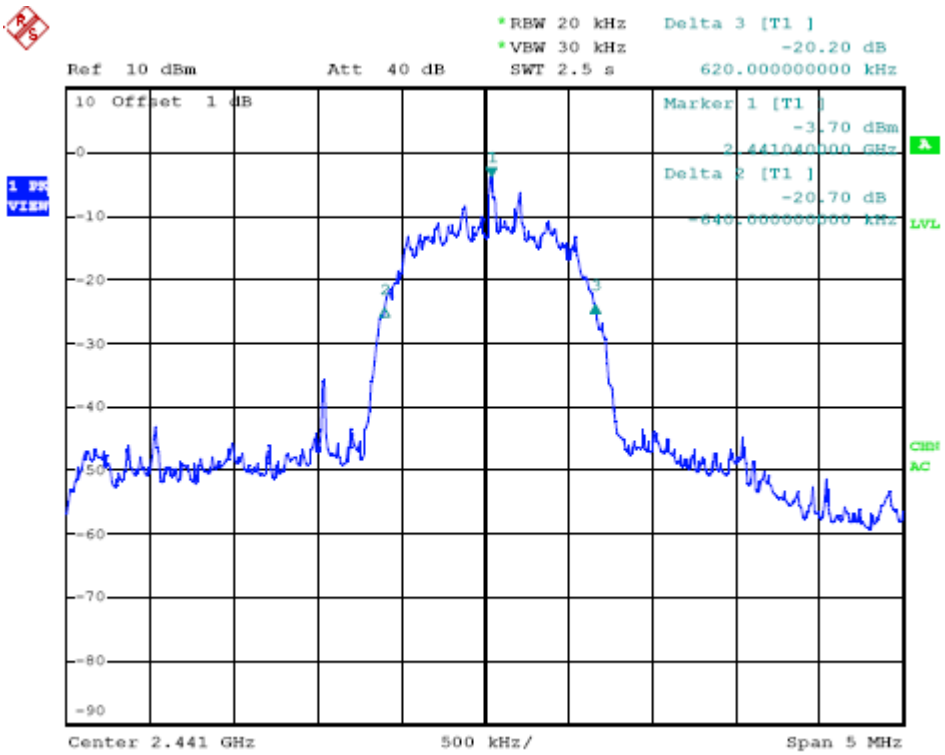
3DH5 Mode:

CHANNEL FREQUENCY (MHz)	20dB BANDWIDTH (MHz)	LIMIT (MHz)	PASS/FAIL
2402	1.260	/	PASS
2441	1.260	/	PASS
2480	1.260	/	PASS

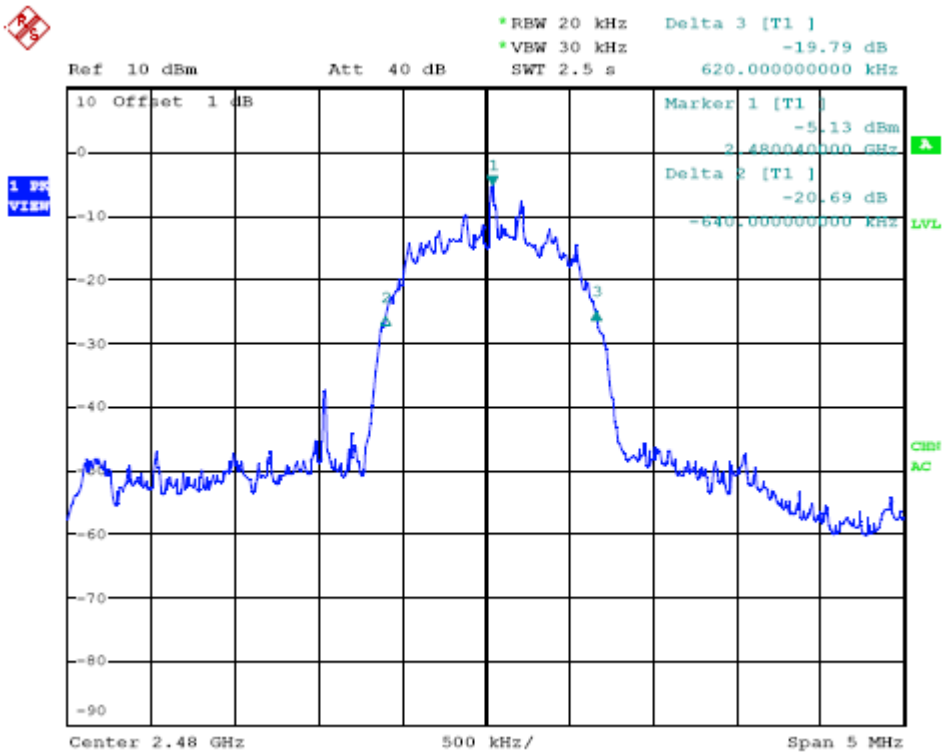
Low Channel



Middle Channel



High Channel



4.5. Band Edge

Applicable Standard

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

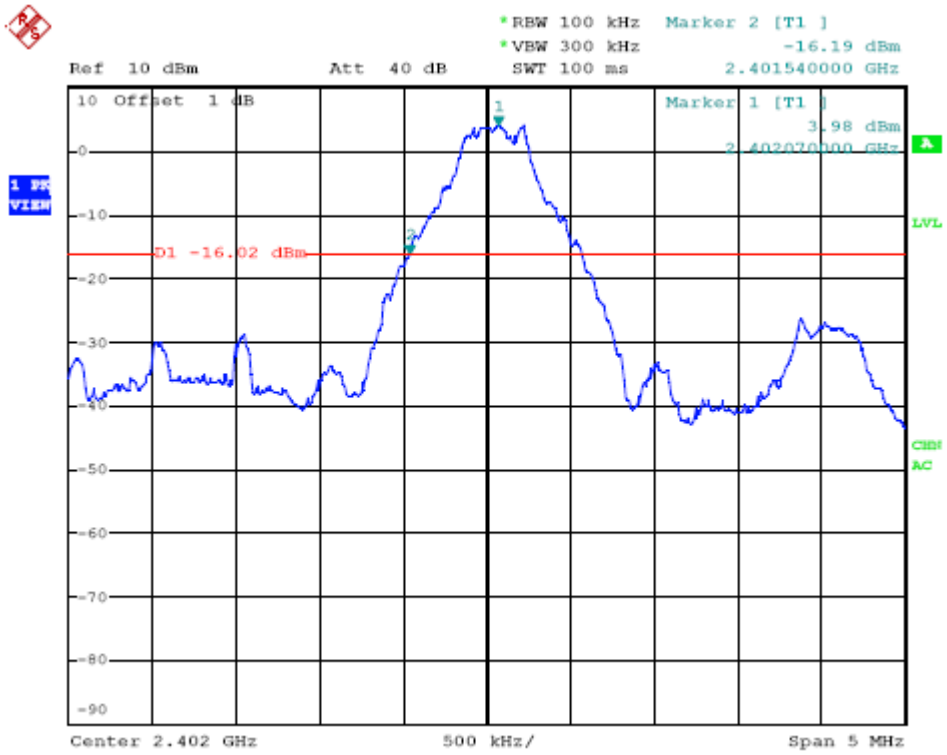
TEST PROCEDURE

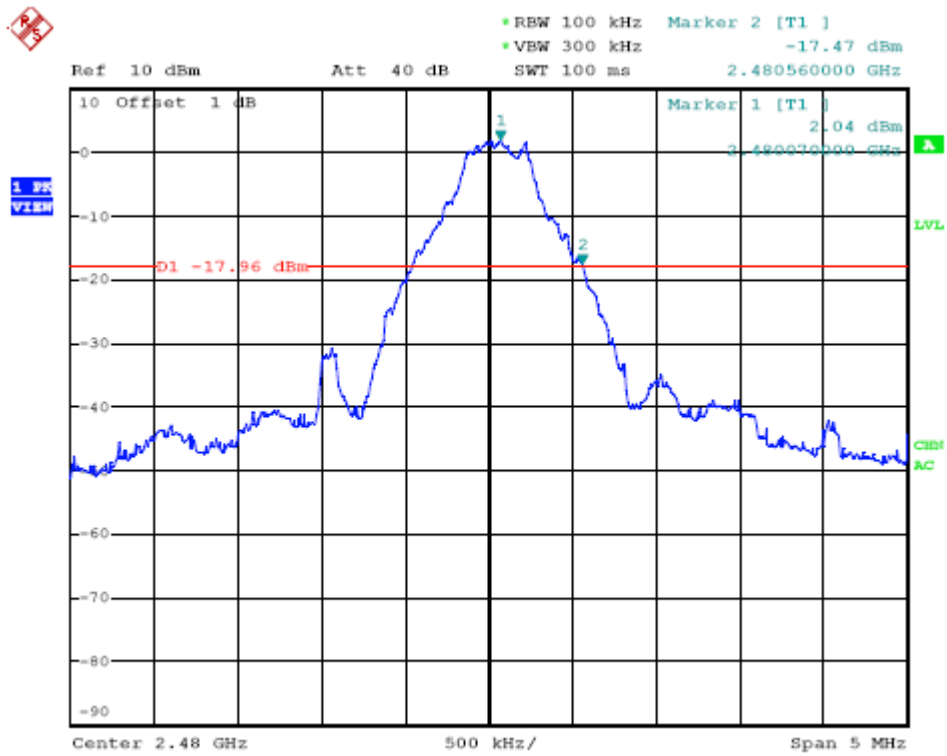
According to ANSI C63.10: 2009.
Use the following spectrum analyzer settings:
Span = wide enough to capture the peak level of the emission operating on the channel closest to the bandedge, as well as any modulation products which fall outside of the authorized band of operation.
RBW ≧ 1% of the span
VBW ≧ RBW
Sweep = auto
Detector function = peak
Trace = max hold
Allow the trace to stabilize. Set the marker on the emission at the bandedge, or on the highest modulation product outside of the band, if this level is greater than that at the bandedge. Enable the marker-delta function, then use the marker-to-peak function to move the marker to the peak of the in-band emission. The marker-delta value now displayed must comply with the limit specified in this Section.
Now, using the same instrument settings, enable the hopping function of the EUT. Allow the trace to stabilize. Follow the same procedure listed above to determine if any spurious emissions caused by the hopping function also comply with the specified limit.

TEST RESULTS

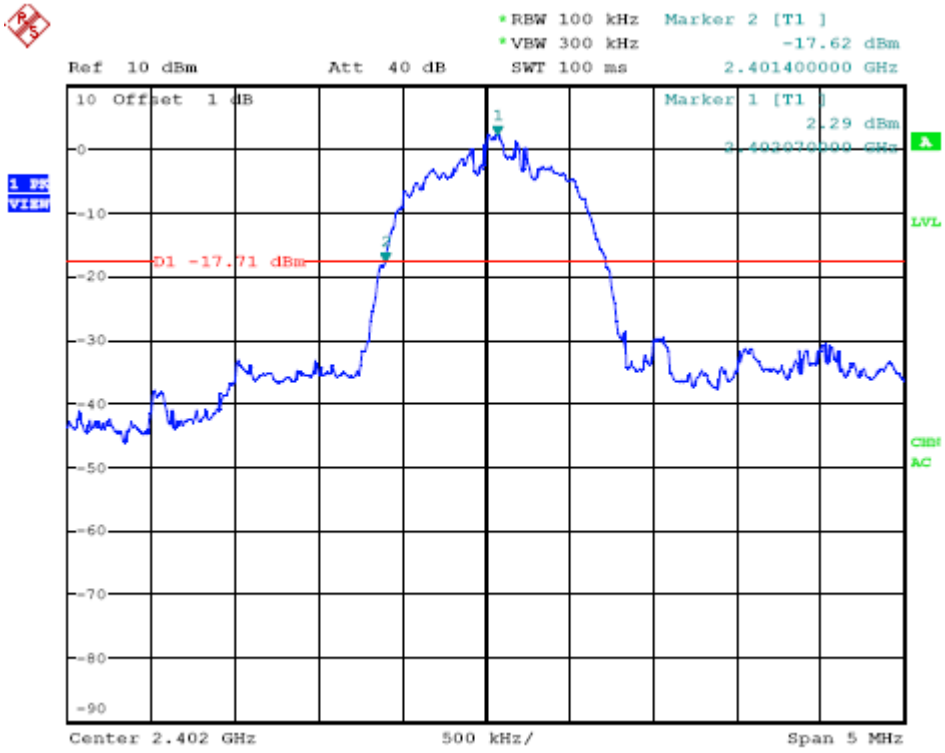
Conducted Test:

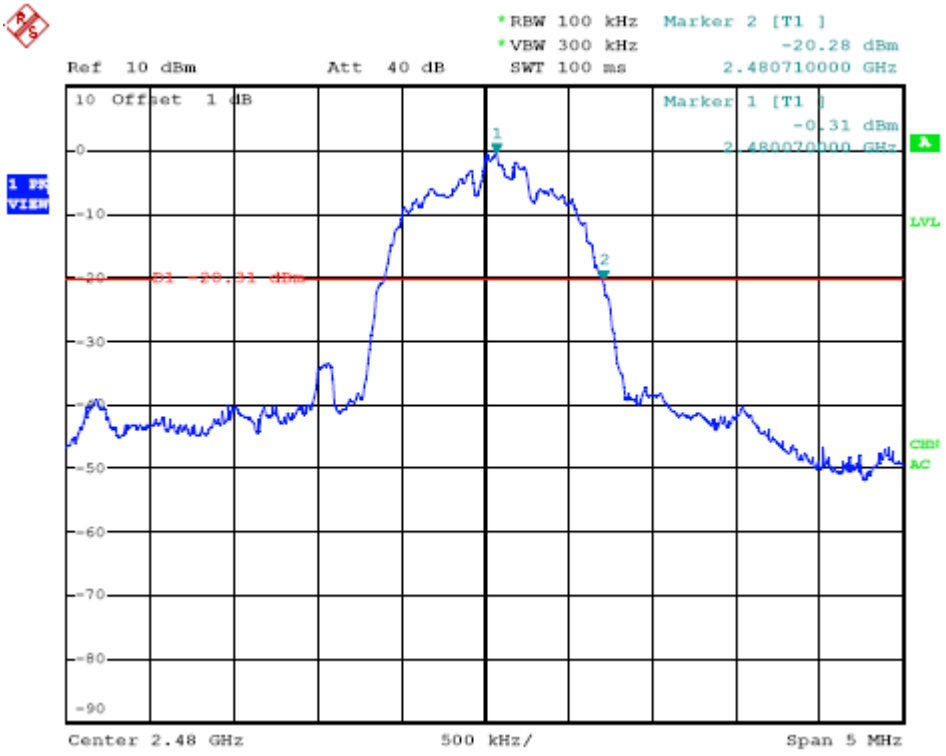
DH5 Mode



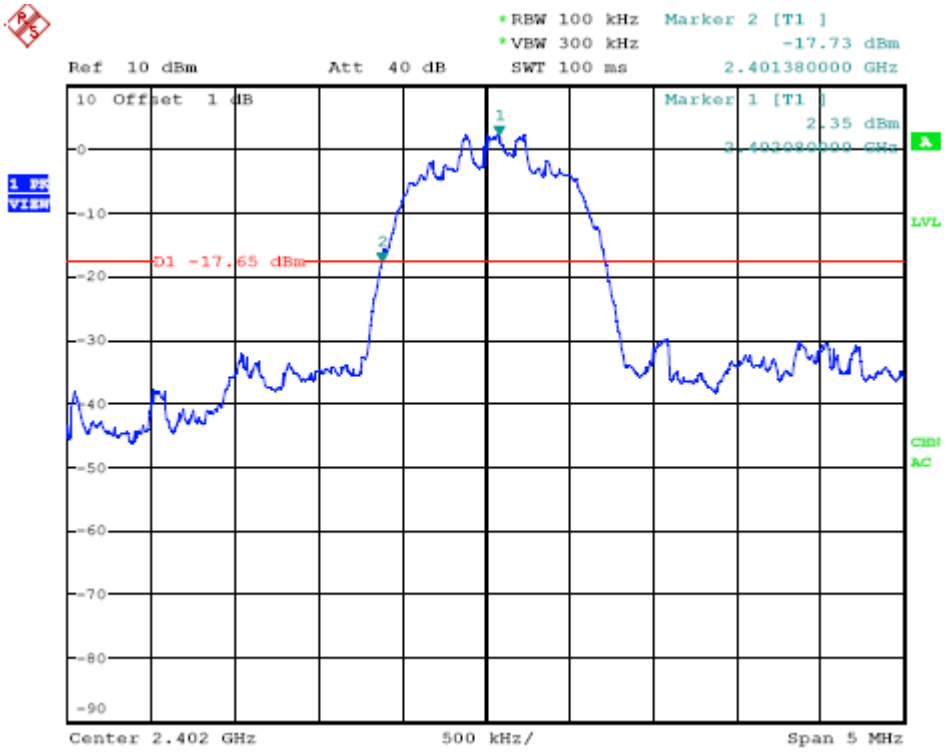


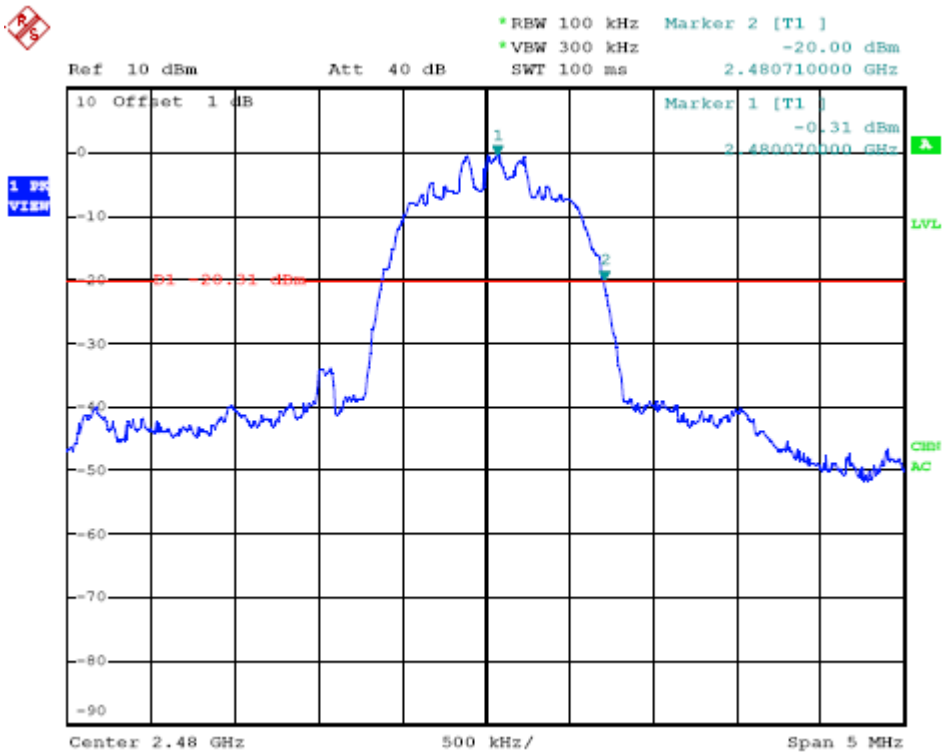
2DH5 Mode


RBW 100 kHz
VBW 300 kHz
SWT 100 ms
Marker 2 [T1]
-17.62 dBm
2.401400000 GHz
Ref 10 dBm
Att 40 dB
10 Offset 1 dB
Marker 1 [T1]
2.29 dBm
D1 -17.71 dBm
LVL
Center 2.402 GHz
500 kHz/
Span 5 MHz

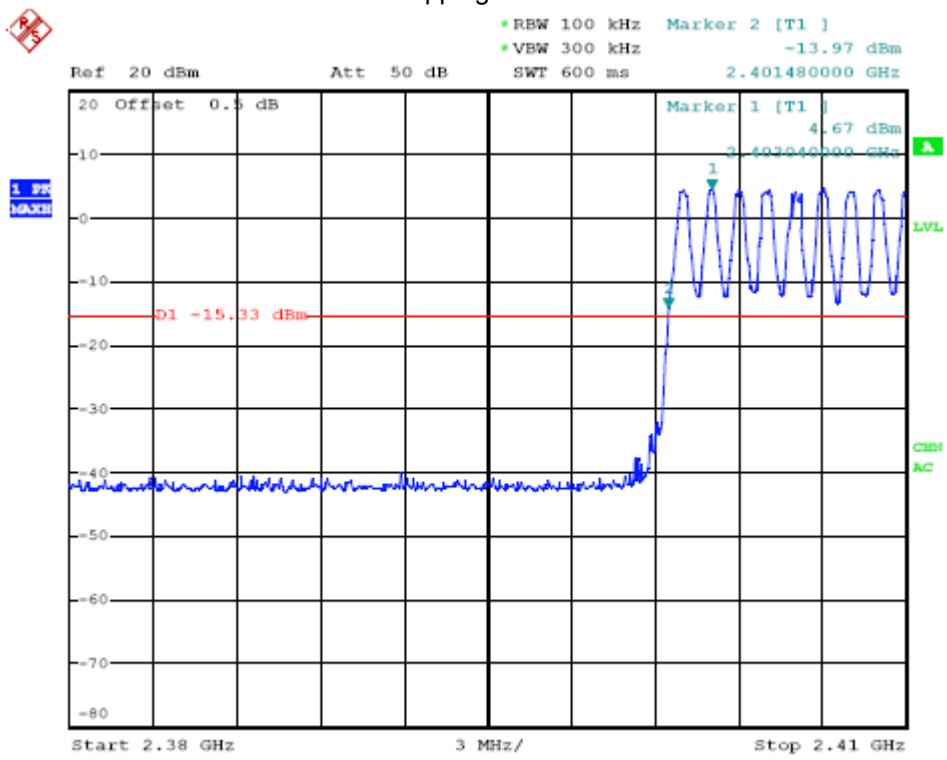

RBW 100 kHz
VBW 300 kHz
SWT 100 ms
Marker 2 [T1]
-20.28 dBm
2.480710000 GHz
Ref 10 dBm
Att 40 dB
10 Offset 1 dB
Marker 1 [T1]
-0.31 dBm
D1 -20.31 dBm
LVL
Center 2.48 GHz
500 kHz/
Span 5 MHz

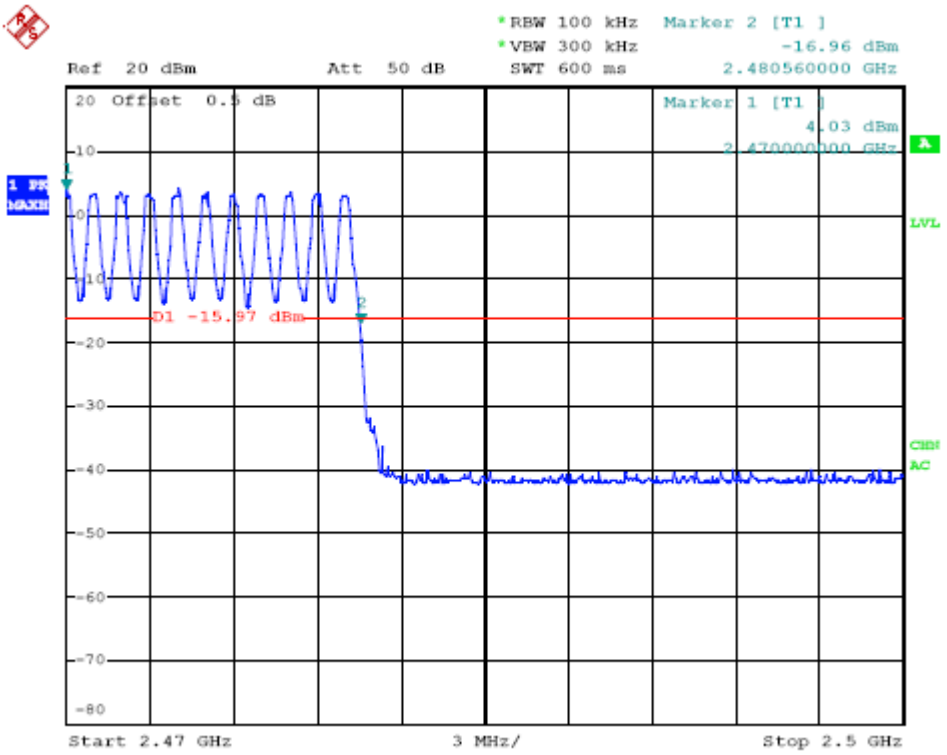
3DH5 Mode


RBW 100 kHz
VBW 300 kHz
SWT 100 ms
Marker 2 [T1]
-17.73 dBm
2.401380000 GHz
Ref 10 dBm
Att 40 dB
10 Offset 1 dB
Marker 1 [T1]
2.35 dBm
D1 -17.65 dBm
Center 2.402 GHz
500 kHz/
Span 5 MHz


RBW 100 kHz
VBW 300 kHz
SWT 100 ms
Marker 2 [T1]
-20.00 dBm
2.480710000 GHz
Ref 10 dBm
Att 40 dB
10 Offset 1 dB
Marker 1 [T1]
-0.31 dBm
Center 2.48 GHz
500 kHz/
Span 5 MHz

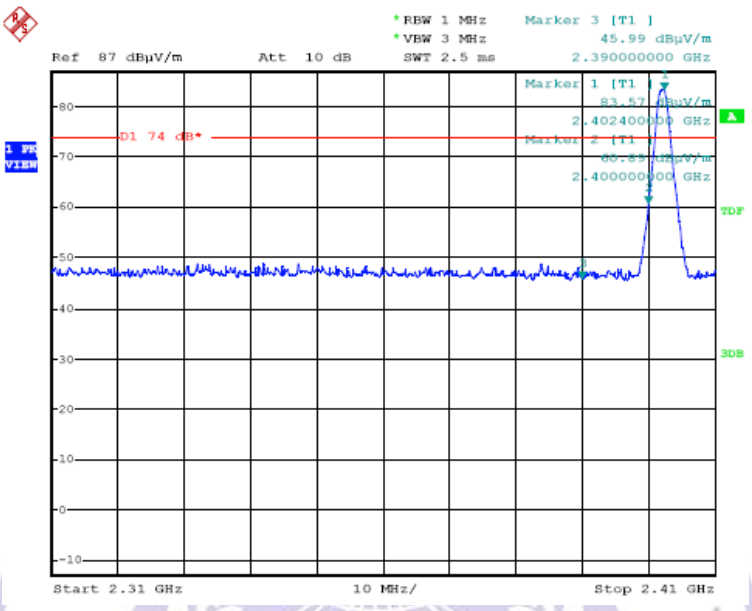
Hopping Mode



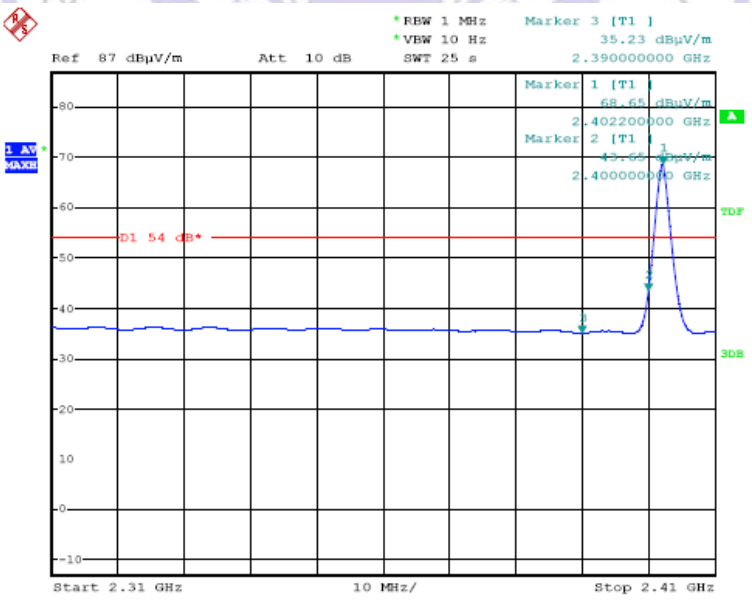


Radiated Test:

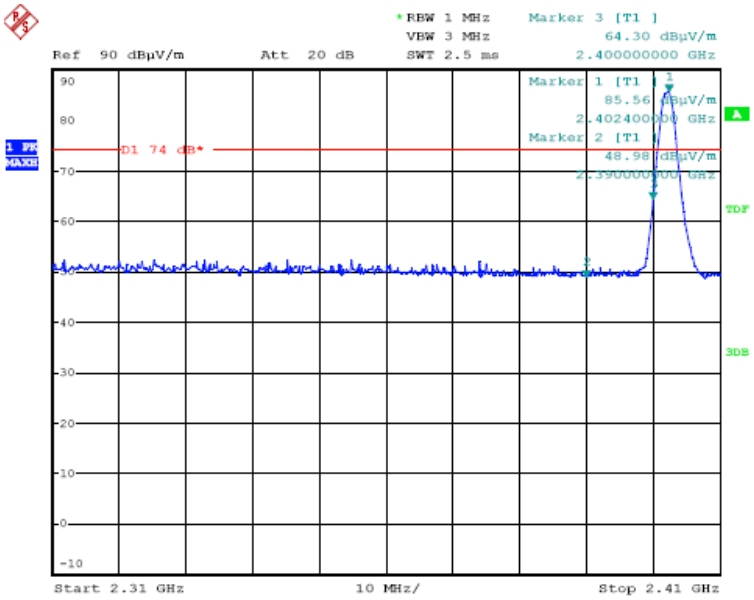
Engineer: Happy	
Site: AC5	Time: 2014/03/19
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Horizontal
EUT: Bluetooth Module	Power: By Battery
Note: Mode 1: Transmit at channel 2402MHz by DH5	



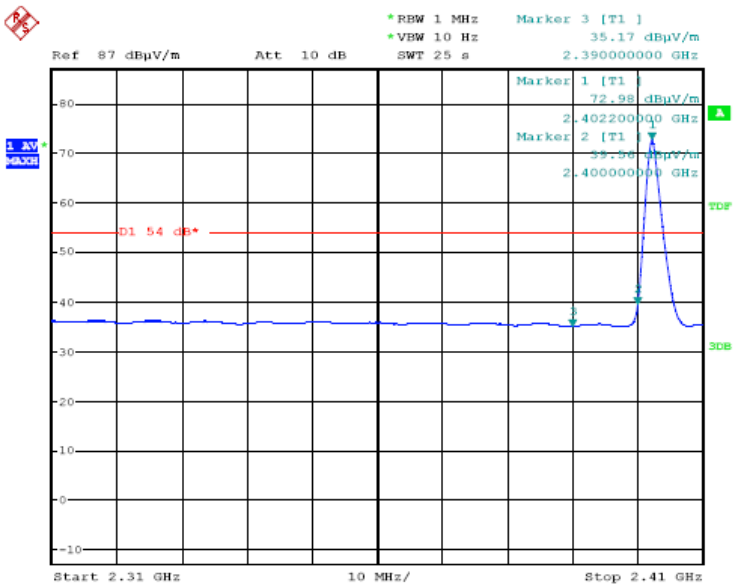
Engineer: Happy	
Site: AC5	Time: 2014/03/05
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Horizontal
EUT: Bluetooth Module	Power: By Battery
Note: Mode 1: Transmit at channel 2402MHz by DH5	



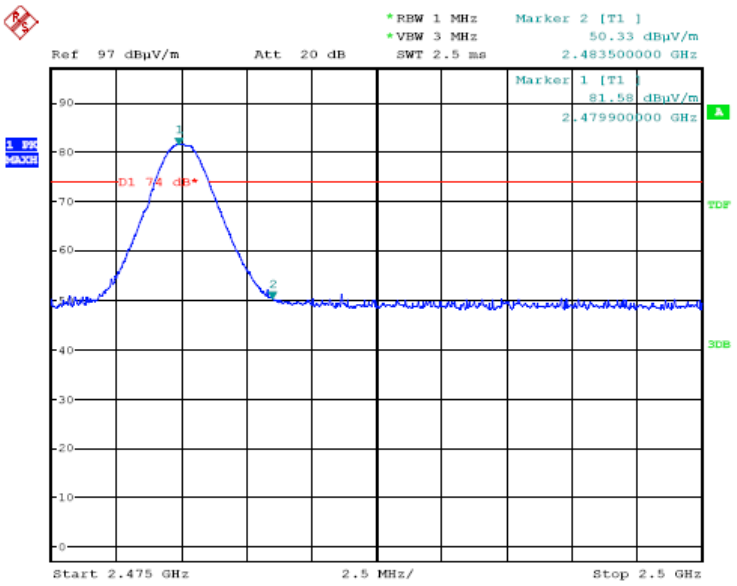
Engineer: Happy	
Site: AC5	Time: 2014/03/05
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Vertical
EUT: Bluetooth Module	Power: By Battery
Note: Mode 1: Transmit at channel 2402MHz by DH5	



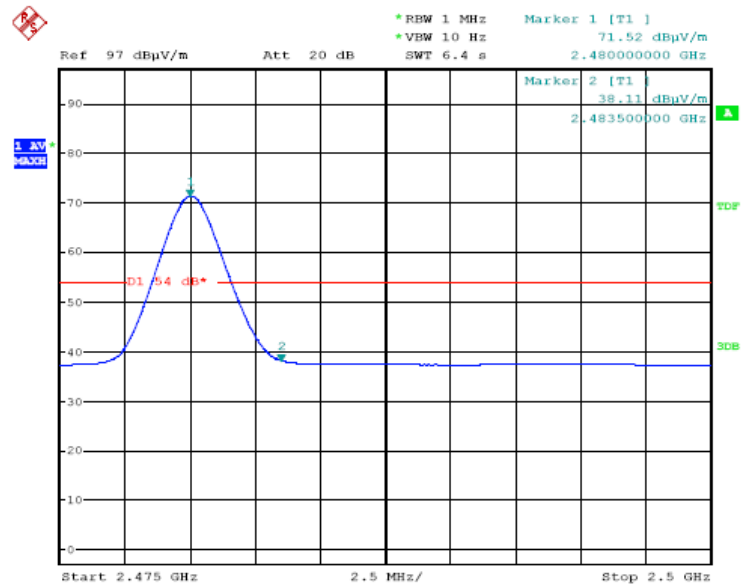
Engineer: Happy	
Site: AC5	Time: 2014/03/19
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Vertical
EUT: Bluetooth Module	Power: By Battery
Note: Mode 1: Transmit at channel 2402MHz by DH5	



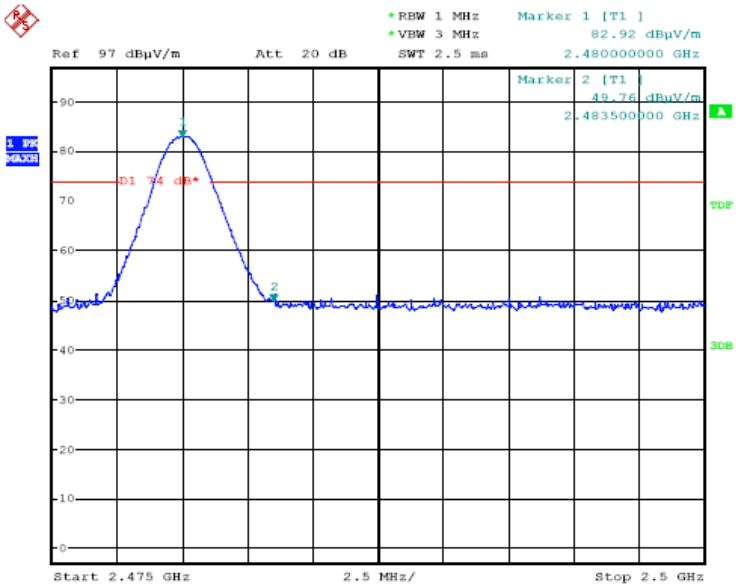
Engineer: Happy	
Site: AC5	Time: 2014/03/19
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Horizontal
EUT: Bluetooth Module	Power: By Battery
Note: Mode 1: Transmit at channel 2480MHz by DH5	



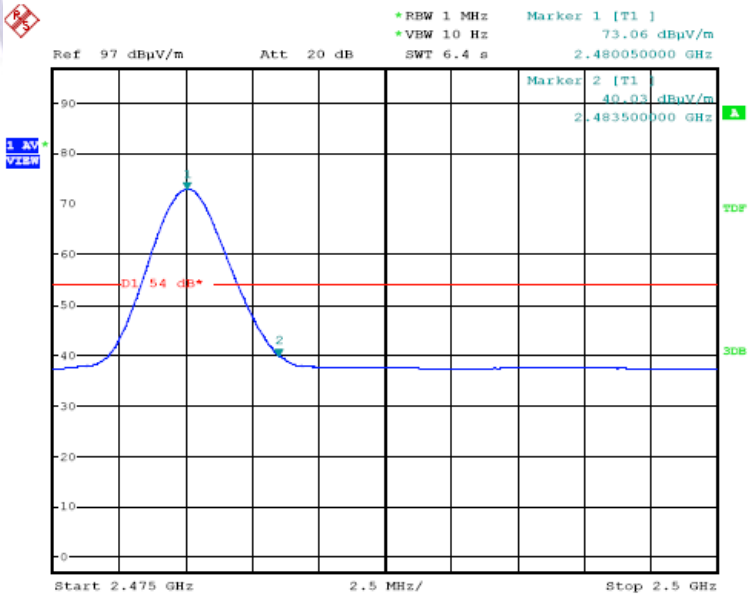
Engineer: Happy	
Site: AC5	Time: 2014/03/19
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Horizontal
EUT: Bluetooth Module	Power: By Battery
Note: Mode 1: Transmit at channel 2480MHz by DH5	



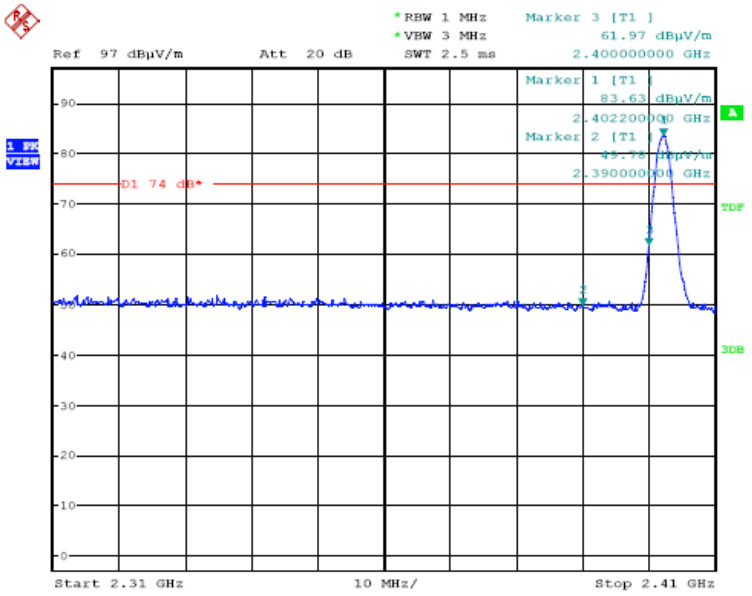
Engineer: Happy	
Site: AC5	Time: 2014/03/05
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Vertical
EUT: Bluetooth Module	Power: By Battery
Note: Mode 1: Transmit at channel 2480MHz by DH5	



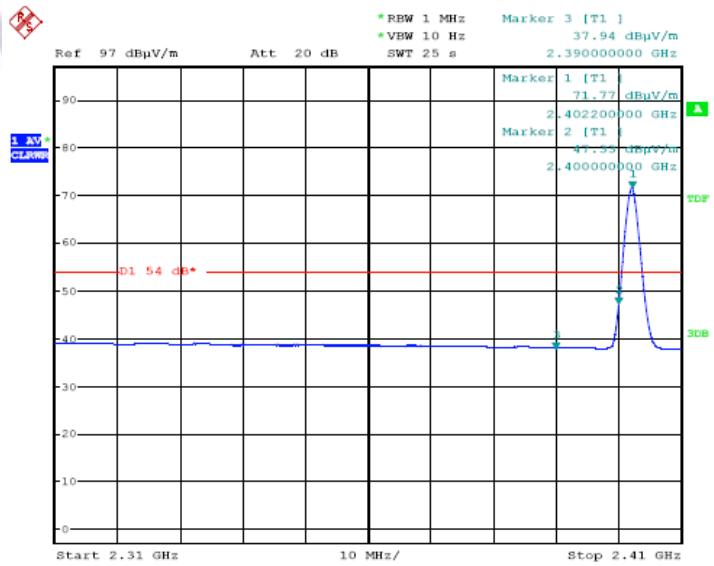
Engineer: Happy	
Site: AC5	Time: 2014/03/19
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Vertical
EUT: Bluetooth Module	Power: By Battery
Note: Mode 1: Transmit at channel 2480MHz by DH5	



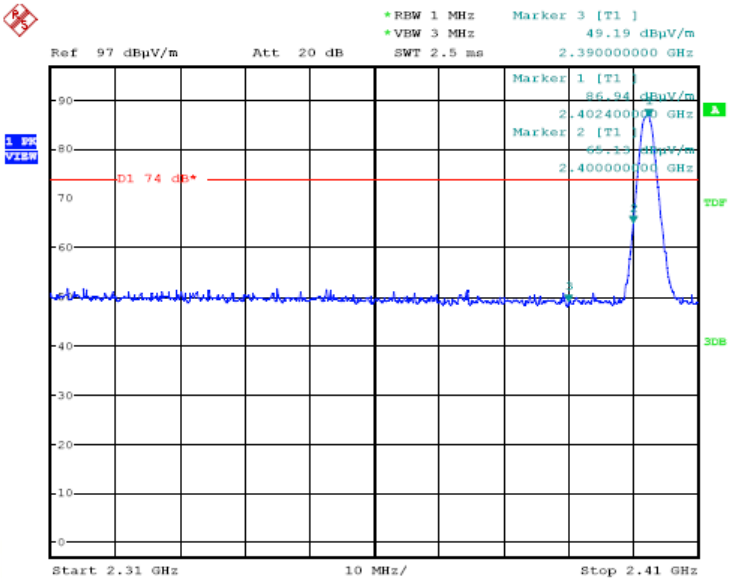
Engineer: Happy	
Site: AC5	Time: 2014/03/19
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Horizontal
EUT: Bluetooth Module	Power: By Battery
Note: Mode 2: Transmit at channel 2402MHz by 2DH5	



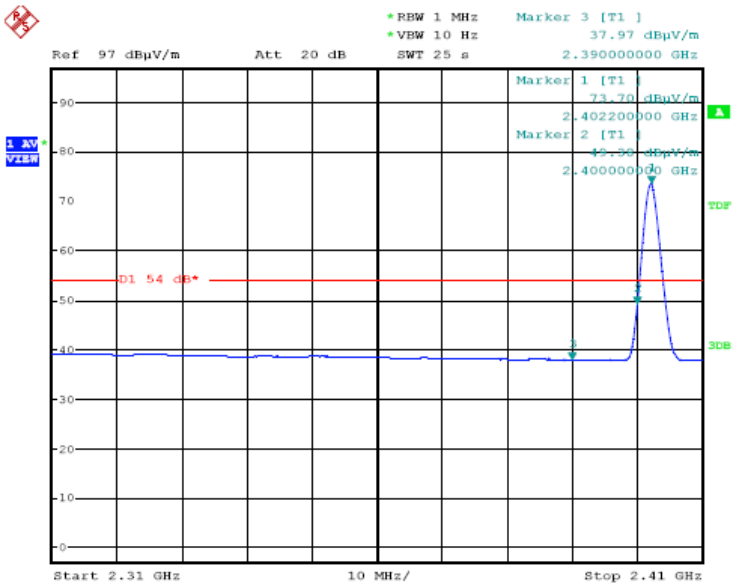
Engineer: Happy	
Site: AC5	Time: 2014/03/05
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Horizontal
EUT: Bluetooth Module	Power: By Battery
Note: Mode 2: Transmit at channel 2402MHz by 2DH5	



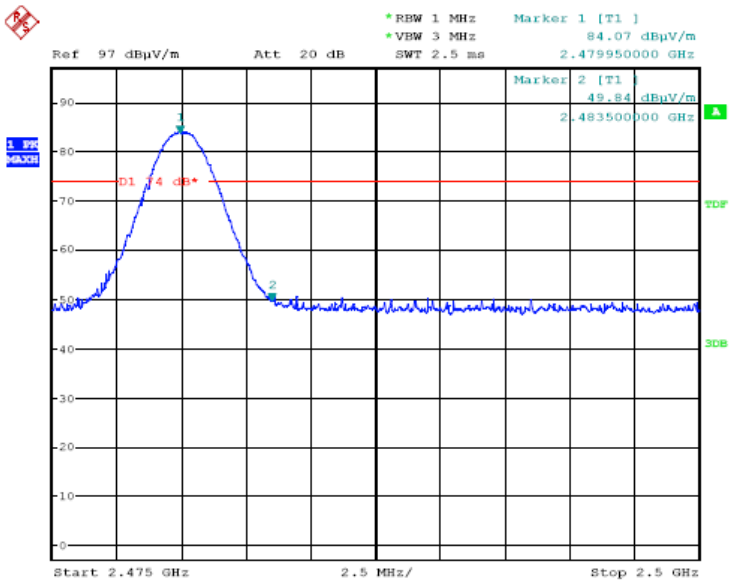
Engineer: Happy	
Site: AC5	Time: 2014/03/19
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Vertical
EUT: Bluetooth Module	Power: By Battery
Note: Mode 2: Transmit at channel 2402MHz by 2DH5	



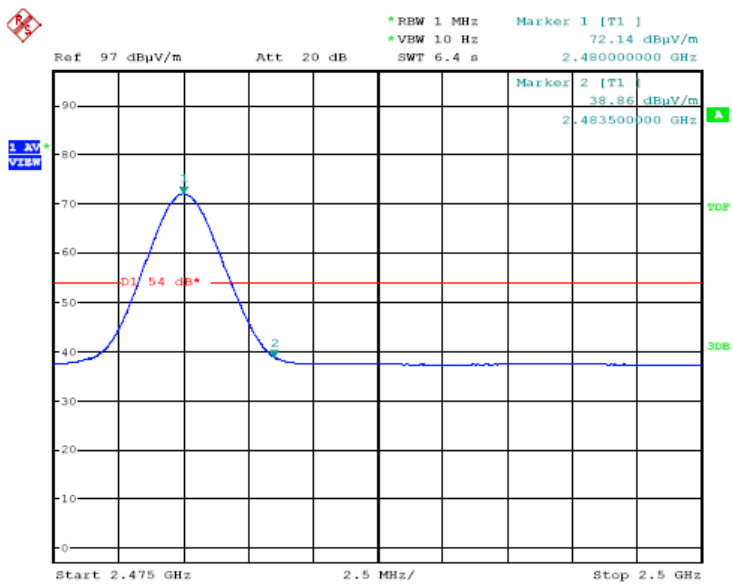
Engineer: Happy	
Site: AC5	Time: 2014/03/19
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Vertical
EUT: Bluetooth Module	Power: By Battery
Note: Mode 2: Transmit at channel 2402MHz by 2DH5	



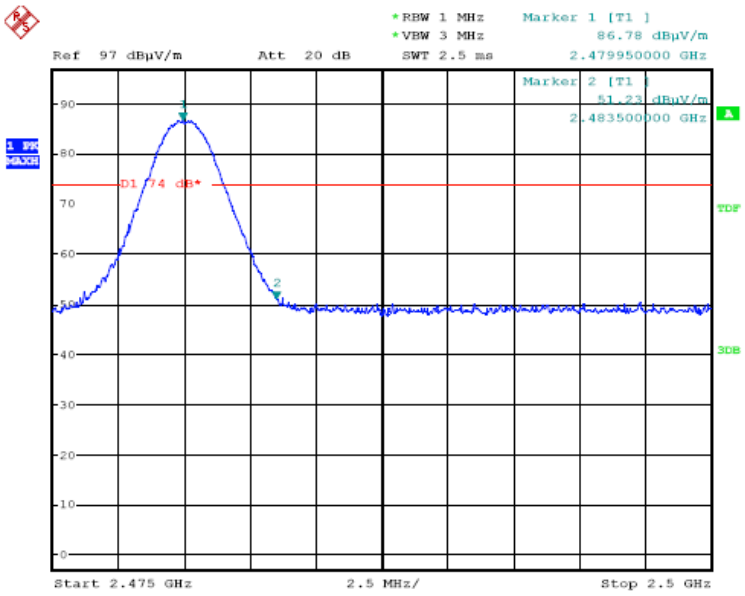
Engineer: Happy	
Site: AC5	Time: 2014/03/05
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Horizontal
EUT: Bluetooth Module	Power: By Battery
Note: Mode 2: Transmit at channel 2480MHz by 2DH5	



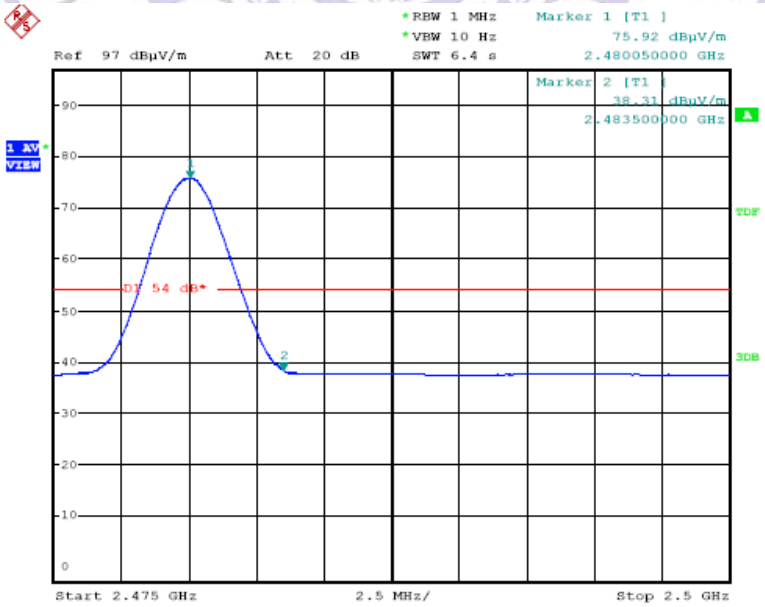
Engineer: Happy	
Site: AC5	Time: 2014/03/05
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Horizontal
EUT: Bluetooth Module	Power: By Battery
Note: Mode 2: Transmit at channel 2480MHz by 2DH5	



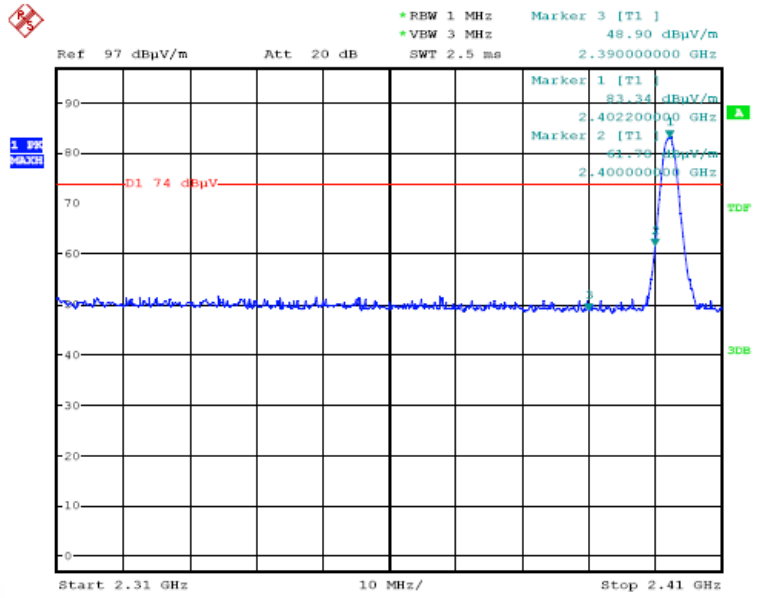
Engineer: Happy	
Site: AC5	Time: 2014/03/05
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Vertical
EUT: Bluetooth Module	Power: By Battery
Note: Mode 2: Transmit at channel 2480MHz by 2DH5	



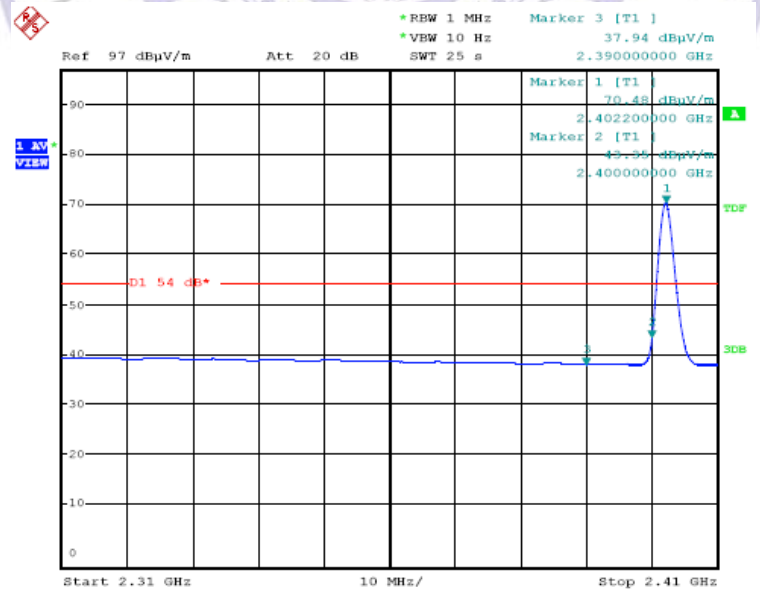
Engineer: Happy	
Site: AC5	Time: 2014/03/19
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Vertical
EUT: Bluetooth Module	Power: By Battery
Note: Mode 2: Transmit at channel 2480MHz by 2DH5	



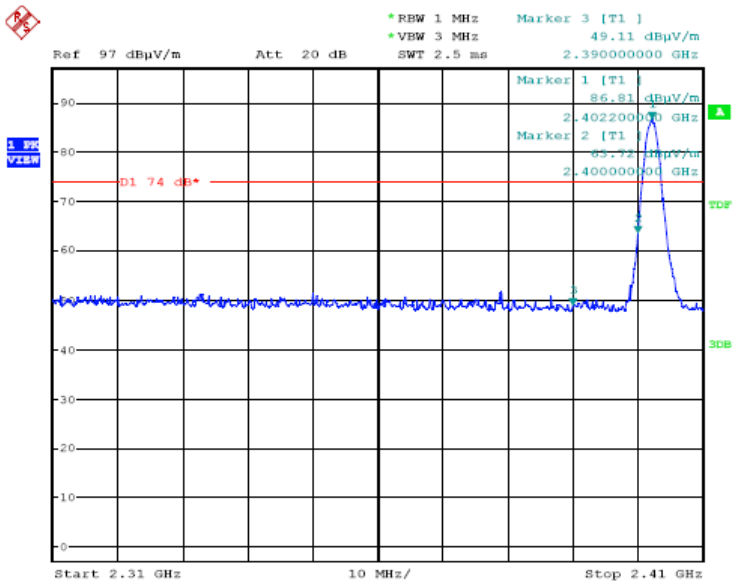
Engineer: Happy	
Site: AC5	Time: 2014/03/19
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Horizontal
EUT: Bluetooth Module	Power: By Battery
Note: Mode 3: Transmit at channel 2402MHz by 3DH5	



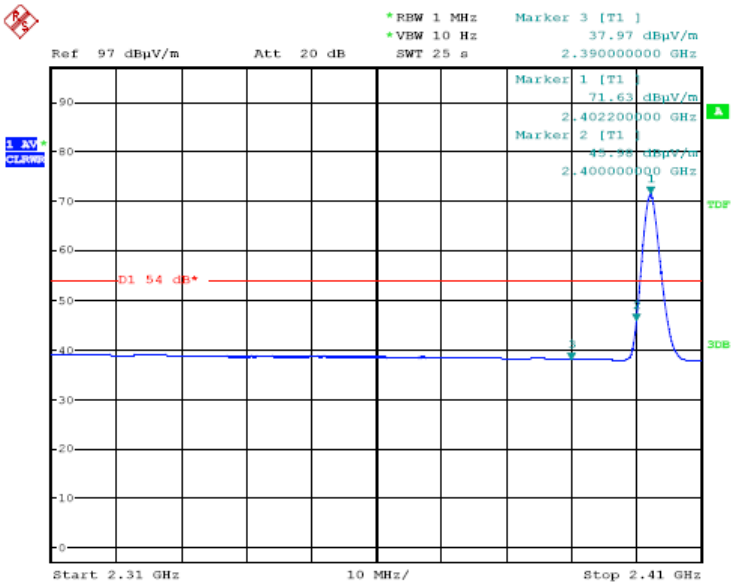
Engineer: Happy	
Site: AC5	Time: 2014/03/19
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Horizontal
EUT: Bluetooth Module	Power: By Battery
Note: Mode 3: Transmit at channel 2402MHz by 3DH5	



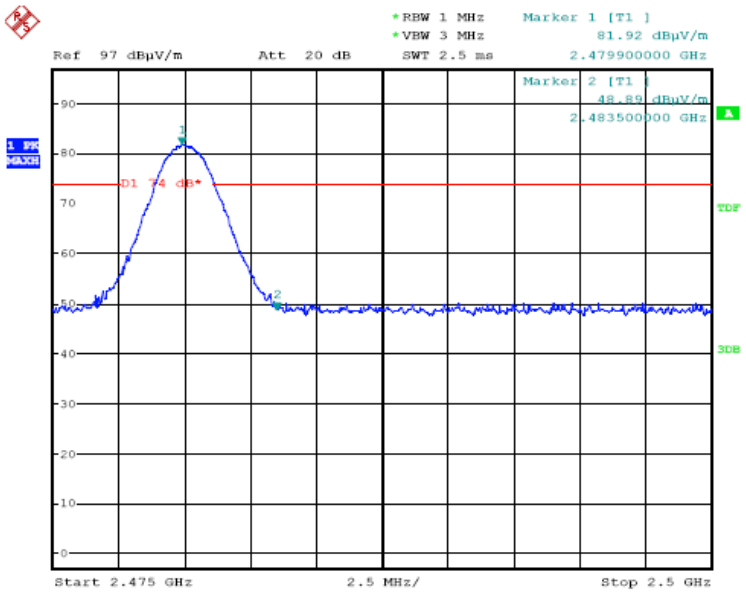
Engineer: Happy	
Site: AC5	Time: 2014/03/05
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Vertical
EUT: Bluetooth Module	Power: By Battery
Note: Mode 3: Transmit at channel 2402MHz by 3DH5	



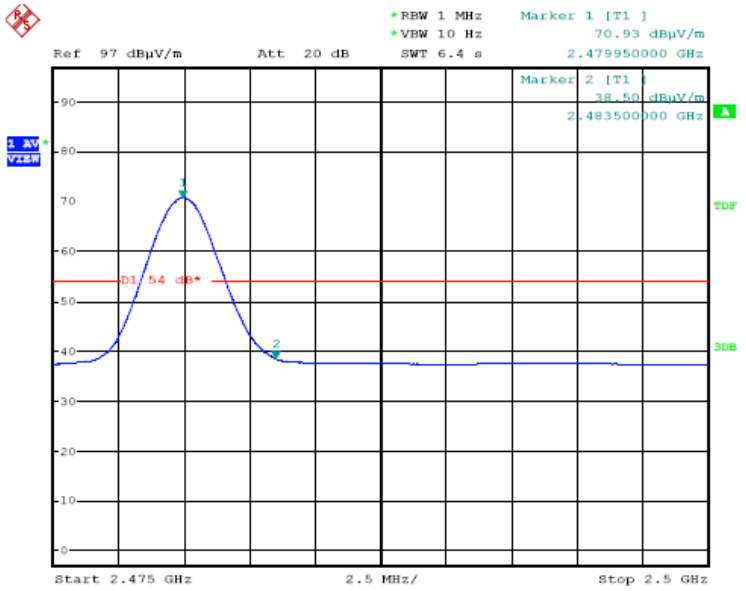
Engineer: Happy	
Site: AC5	Time: 2014/03/05
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Vertical
EUT: Bluetooth Module	Power: By Battery
Note: Mode 3: Transmit at channel 2402MHz by 3DH5	



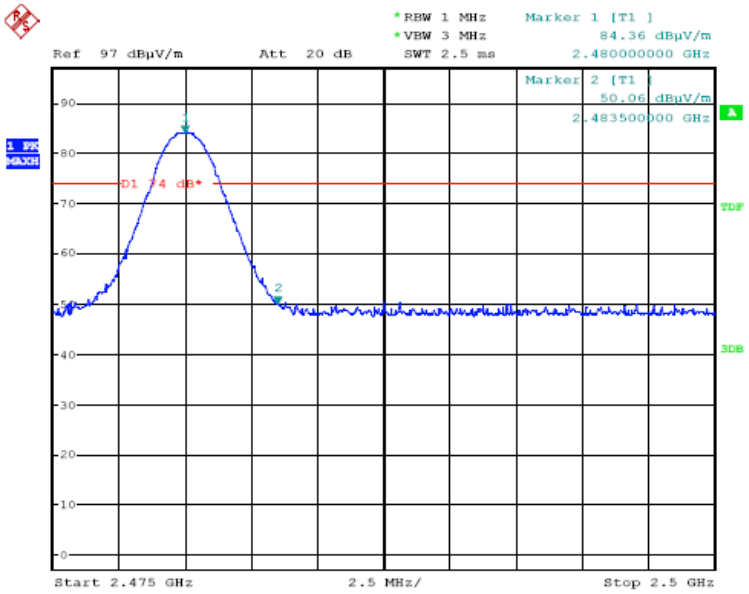
Engineer: Happy	
Site: AC5	Time: 2014/03/19
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Horizontal
EUT: Bluetooth Module	Power: By Battery
Note: Mode 3: Transmit at channel 2480MHz by 3DH5	



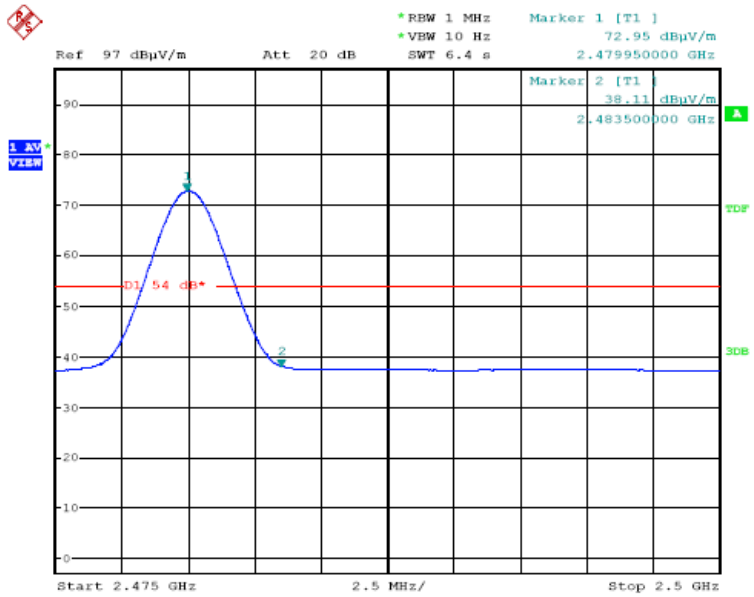
Engineer: Happy	
Site: AC5	Time: 2014/03/19
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Horizontal
EUT: Bluetooth Module	Power: By Battery
Note: Mode 3: Transmit at channel 2480MHz by 3DH5	



Engineer: Happy	
Site: AC5	Time: 2014/03/19
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Vertical
EUT: Bluetooth Module	Power: By Battery
Note: Mode 3: Transmit at channel 2480MHz by 3DH5	

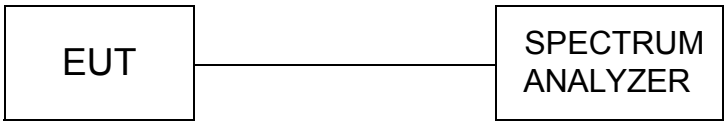


Engineer: Happy	
Site: AC5	Time: 2014/03/19
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Vertical
EUT: Bluetooth Module	Power: By Battery
Note: Mode 3: Transmit at channel 2480MHz by 3DH5	



4.6. Frequency Separation

TEST CONFIGURATION



TEST PROCEDURE

According to ANSI C63.10: 2009.
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.

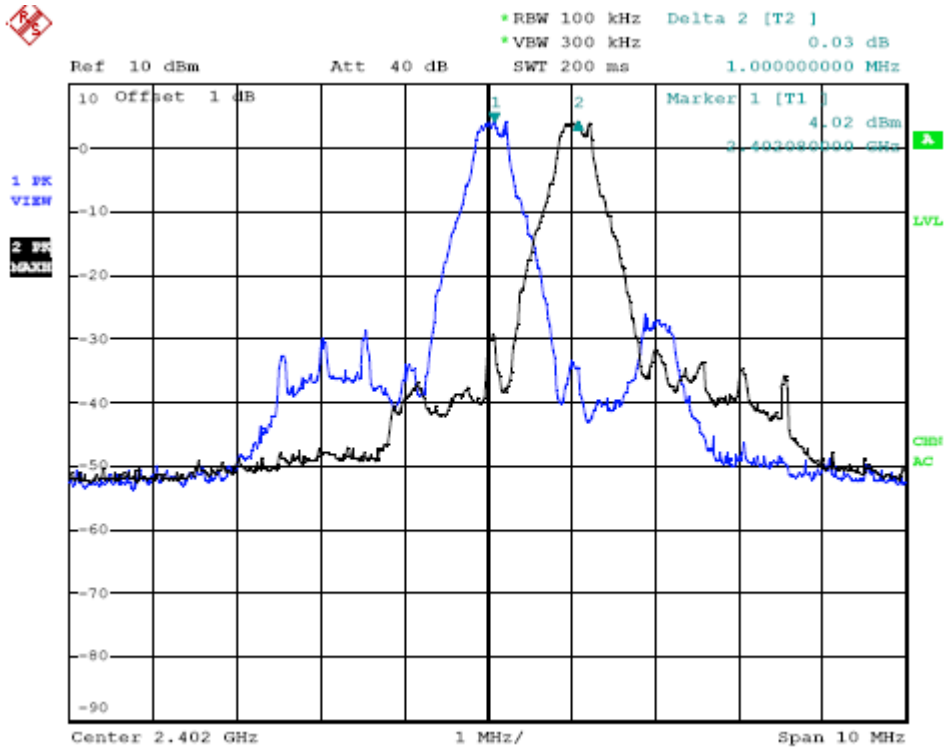
TEST RESULTS

DH5 Mode:

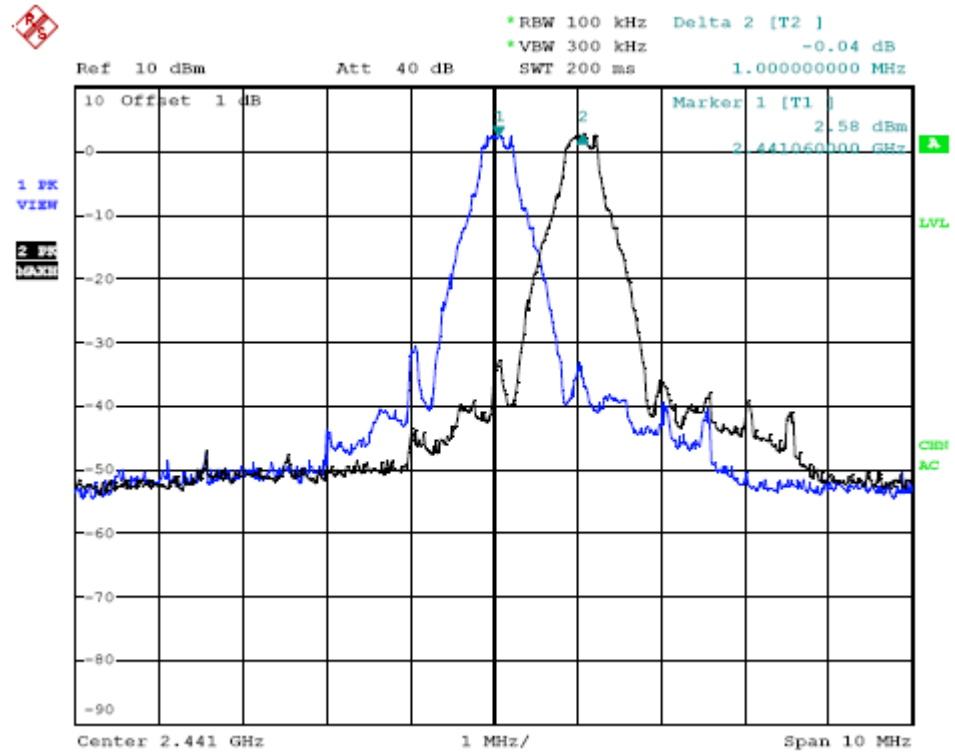
Channel	Channel Frequency (MHz)	Channel Separation (MHz)	Limit (MHz)	Result
Low Channel	2402	1.000	25KHz or 2/3*20dB bandwidth	Pass
Adjacency Channel	2403			
Mid Channel	2441	1.000	25KHz or 2/3*20dB bandwidth	Pass
Adjacency Channel	2442			
High Channel	2480	1.020	25KHz or 2/3*20dB bandwidth	Pass
Adjacency Channel	2479			

Photos of Frequency separation Measurement

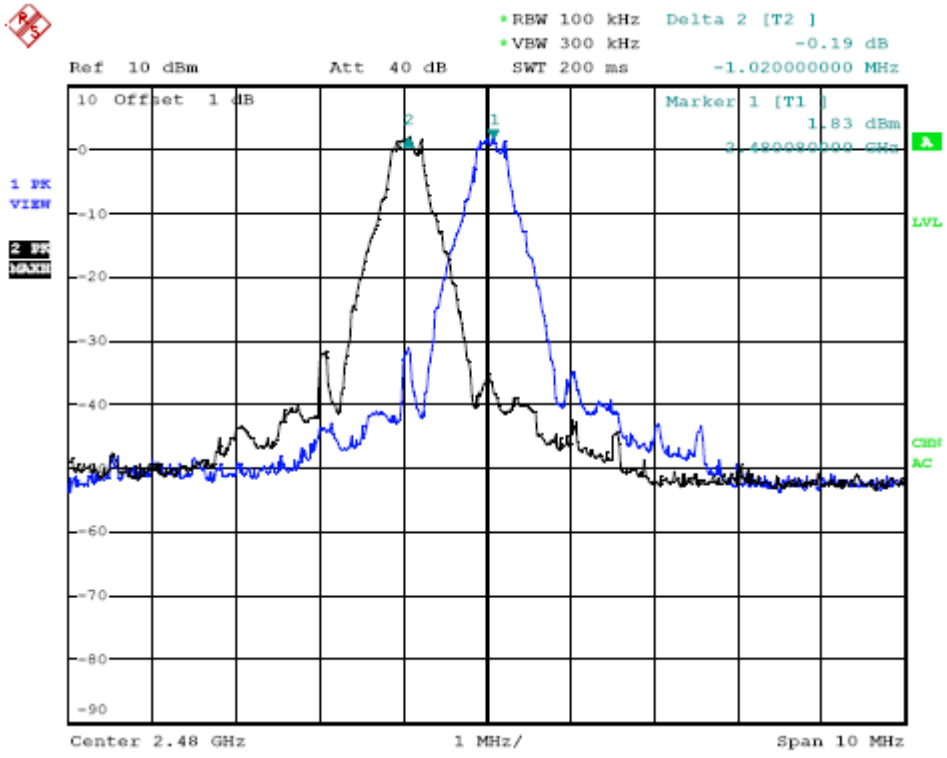
Low channel



Middle channel



High channel

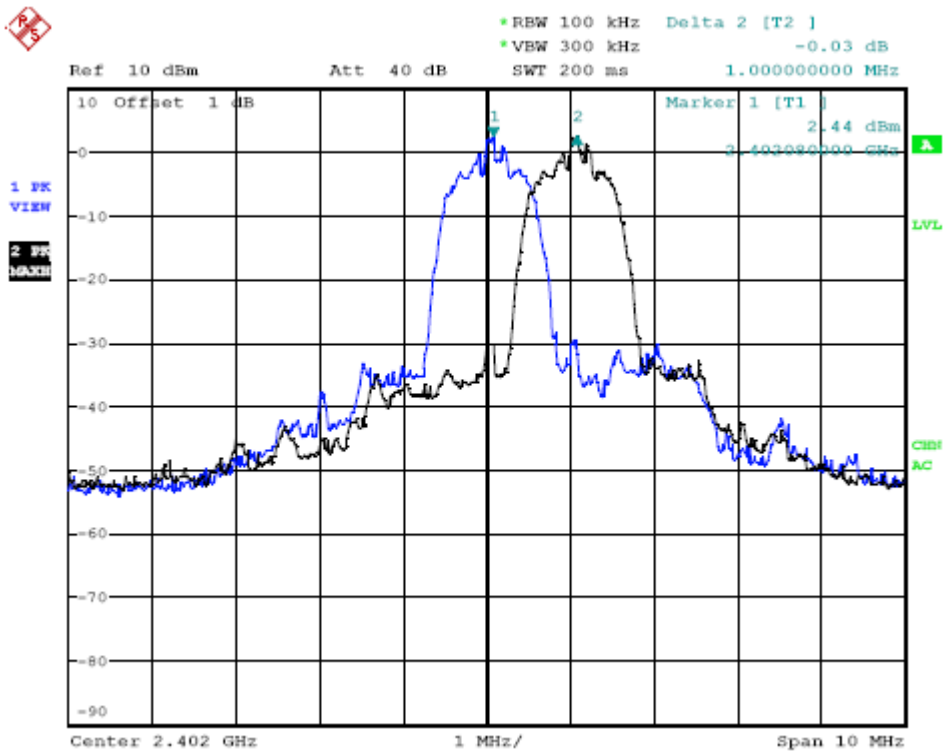


2DH5 Mode:

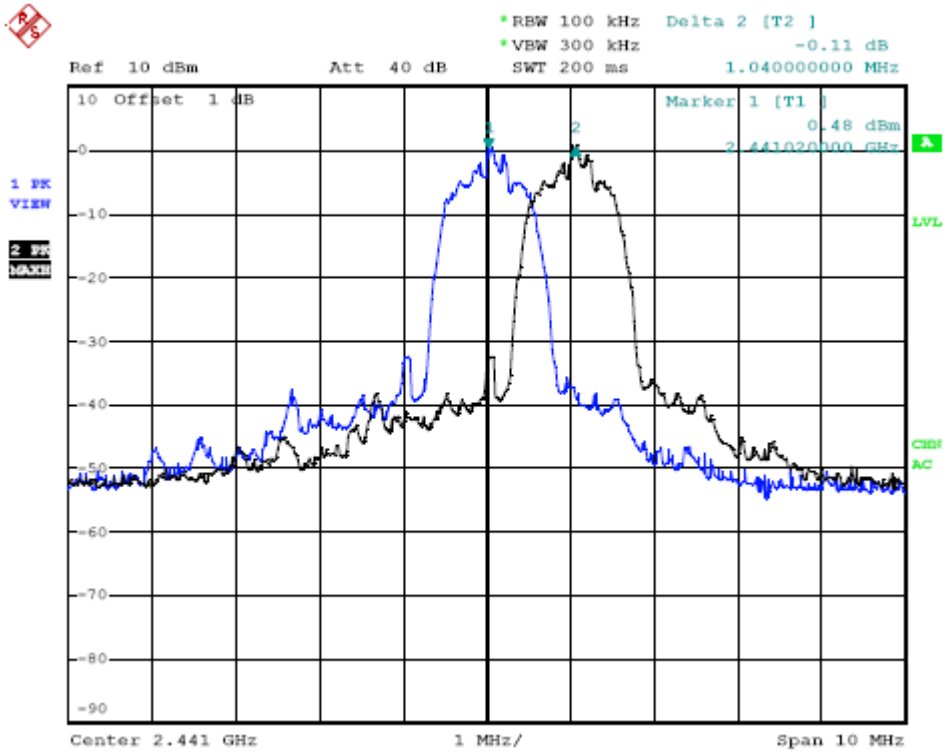
Channel	Channel Frequency (MHz)	Channel Separation (MHz)	Limit (MHz)	Result
Low Channel	2402	1.000	25KHz or 2/3*20dB bandwidth	Pass
Adjacency Channel	2403			
Mid Channel	2441	1.040	25KHz or 2/3*20dB bandwidth	Pass
Adjacency Channel	2442			
High Channel	2480	1.000	25KHz or 2/3*20dB bandwidth	Pass
Adjacency Channel	2479			

Photos of Frequency separation Measurement

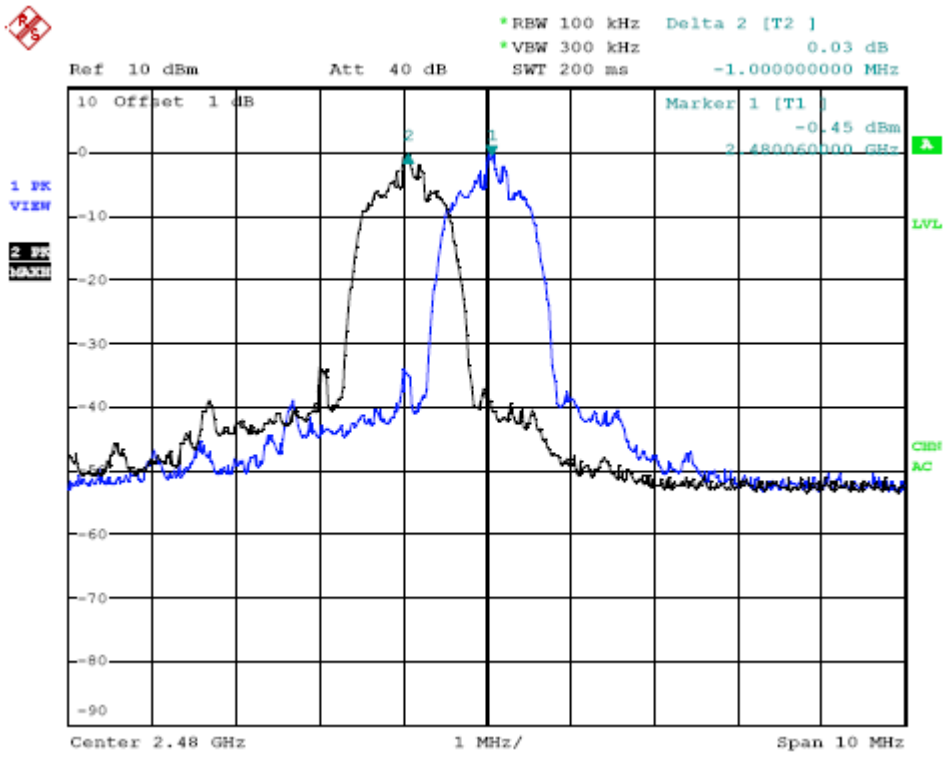
Low channel



Middle channel



High channel

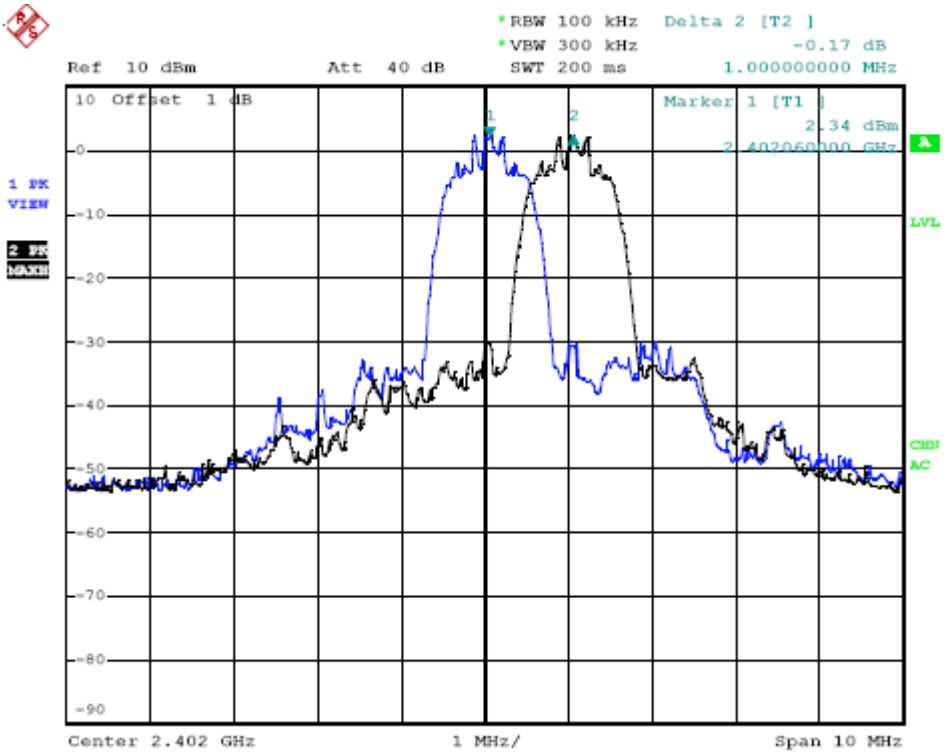


3DH5 Mode:

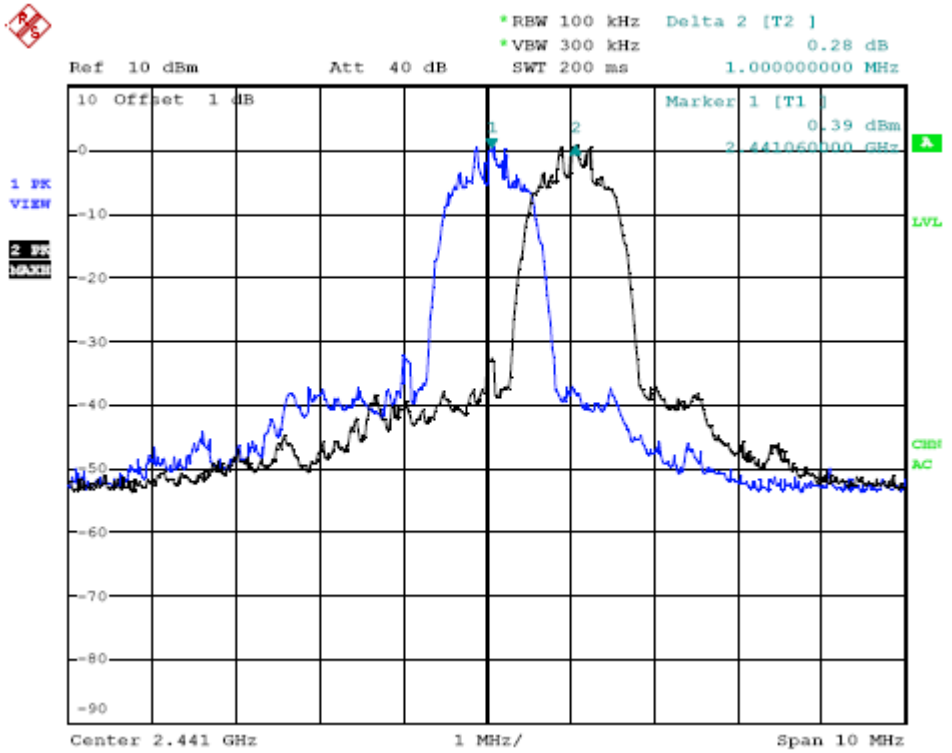
Channel	Channel Frequency (MHz)	Channel Separation (MHz)	Limit (MHz)	Result
Low Channel	2402	1.000	25KHz or 2/3*20dB bandwidth	Pass
Adjacency Channel	2403			
Mid Channel	2441	1.000	25KHz or 2/3*20dB bandwidth	Pass
Adjacency Channel	2442			
High Channel	2480	1.040	25KHz or 2/3*20dB bandwidth	Pass
Adjacency Channel	2479			

Photos of Frequency separation Measurement

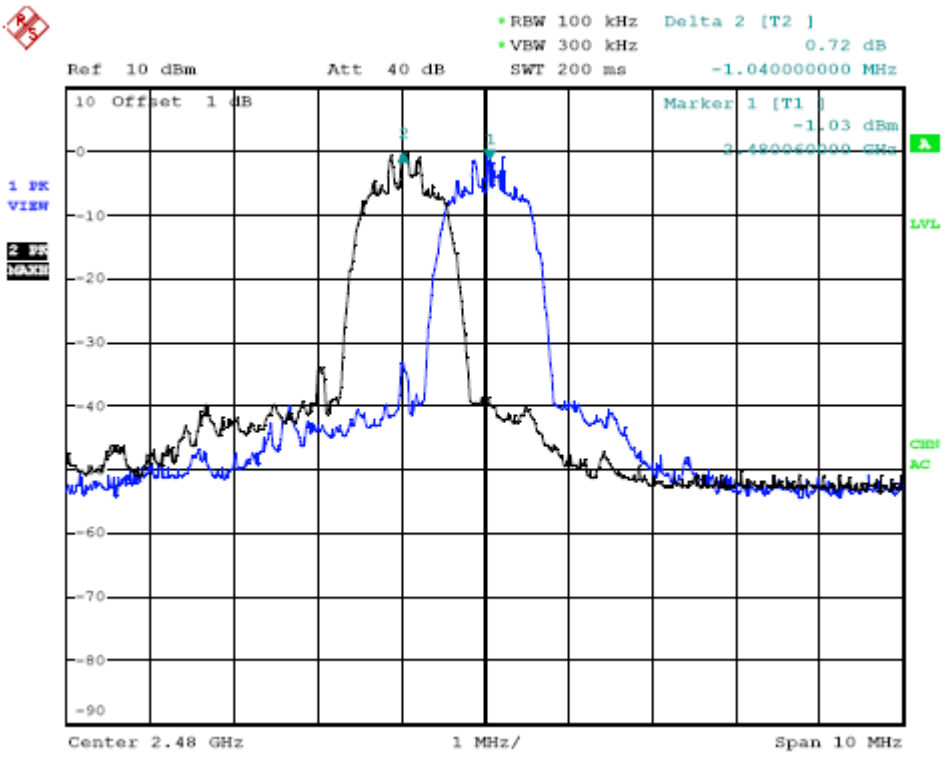
Low channel



Middle channel

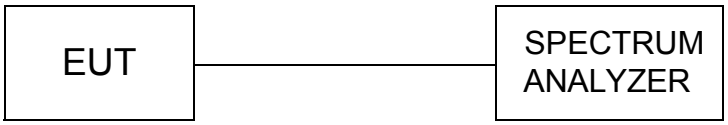


High channel



4.7. Number of hopping frequency

TEST CONFIGURATION



TEST PROCEDURE

According to ANSI C63.10: 2009.
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.

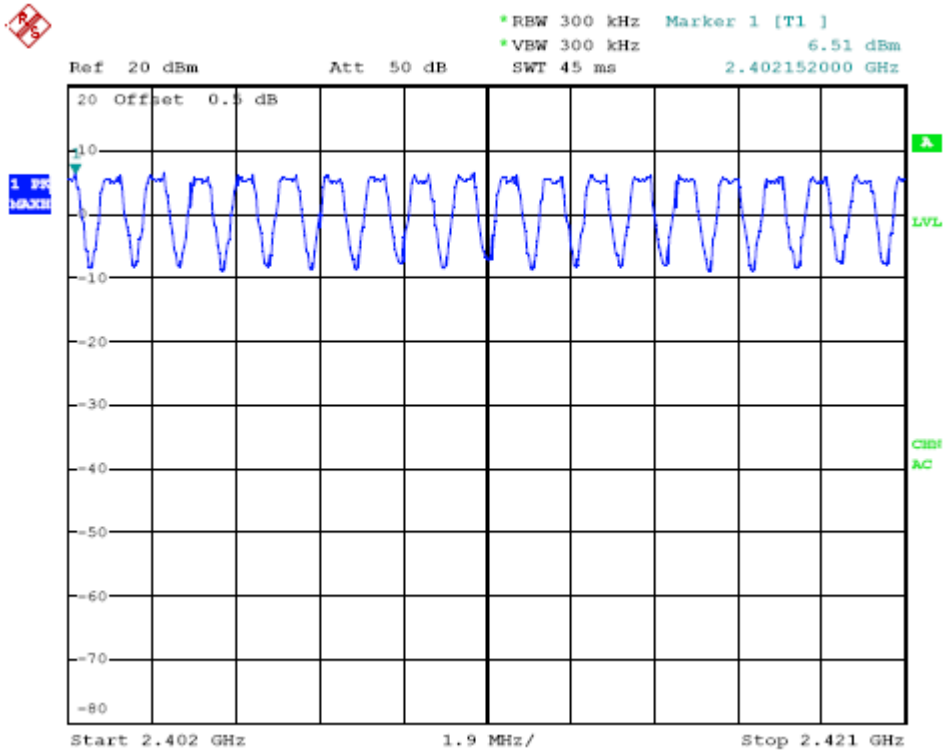
TEST RESULTS

DH5 Mode:

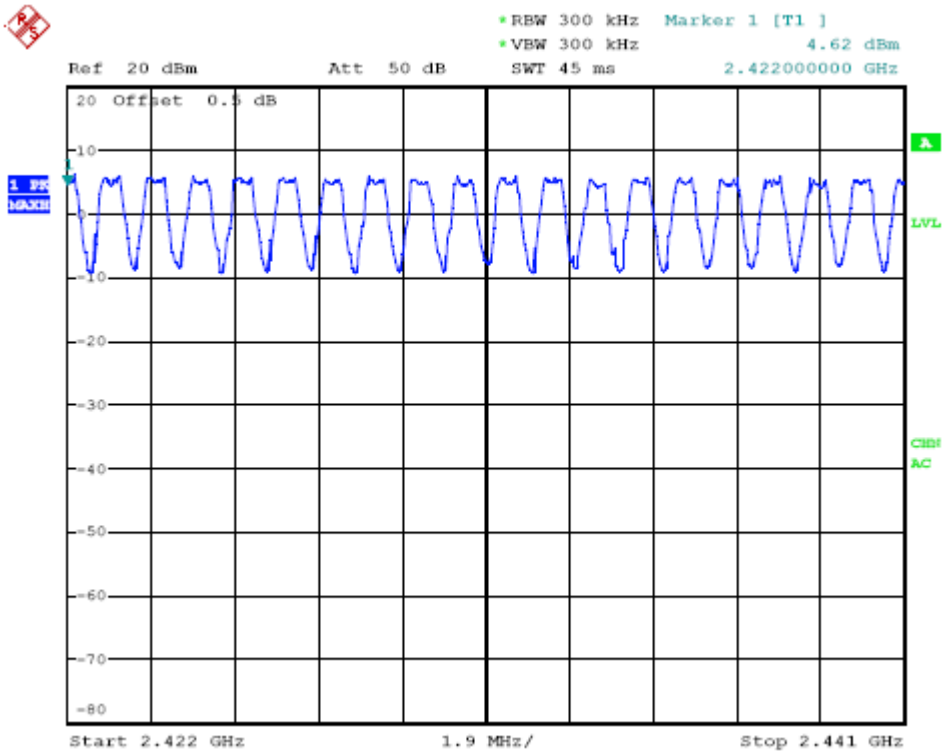
Hopping Channel Frequency Range (MHz)	Number of Hopping Channel	Limit
2400-2483.5	79	≥15

Photos of Number of hopping channel Measurement

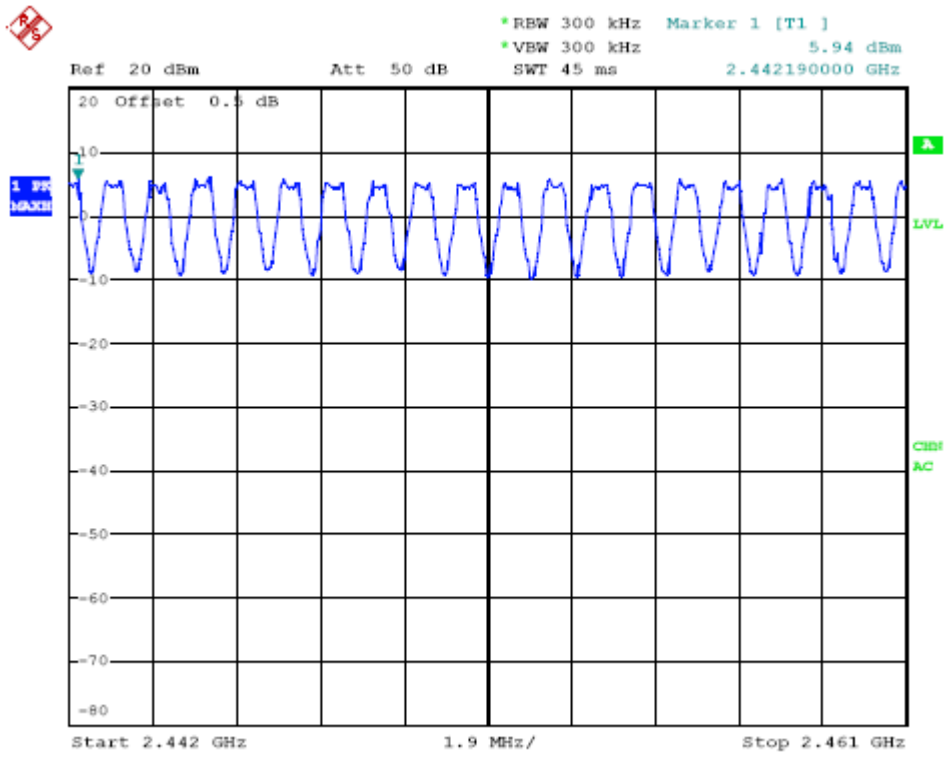
2402-2421MHz



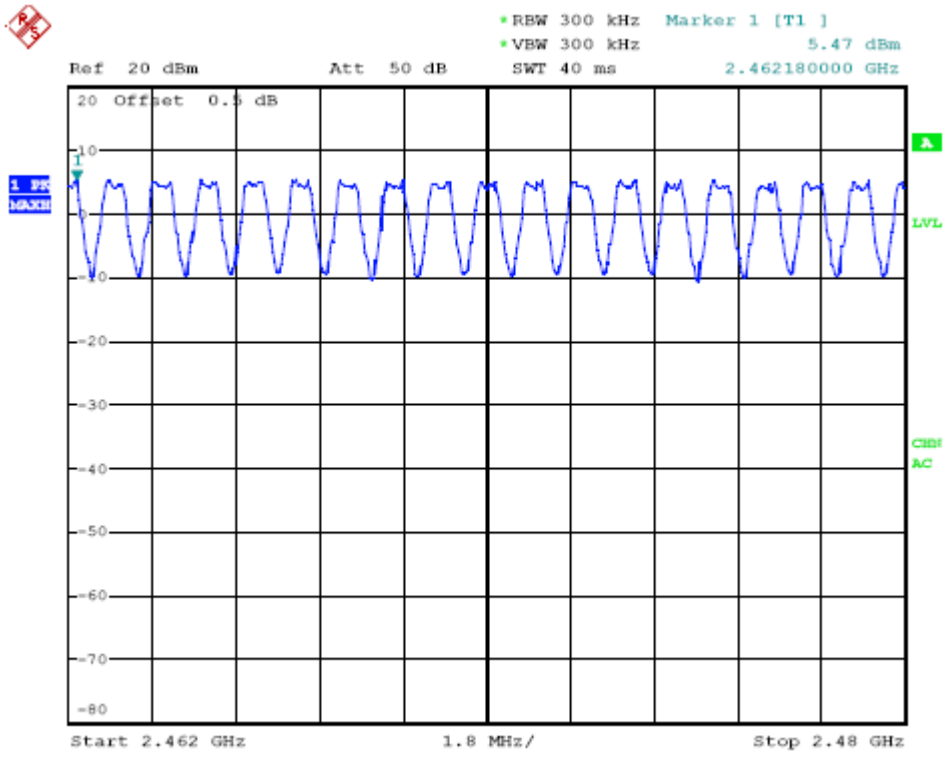
2422-2441MHz



2442-2461MHz



2462-2480MHz

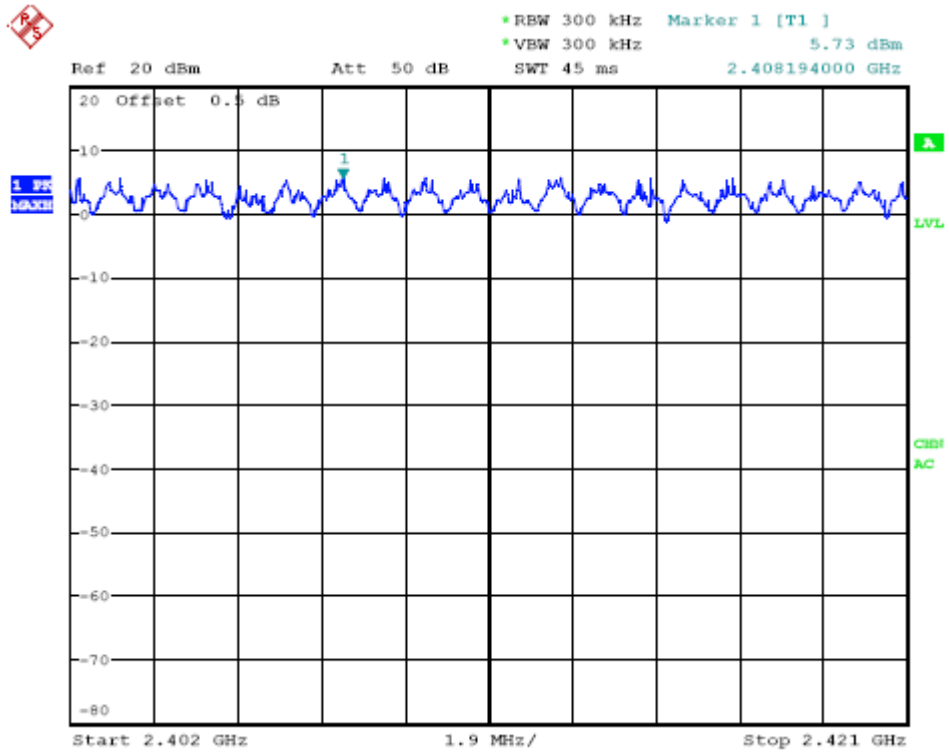


2DH5 Mode:

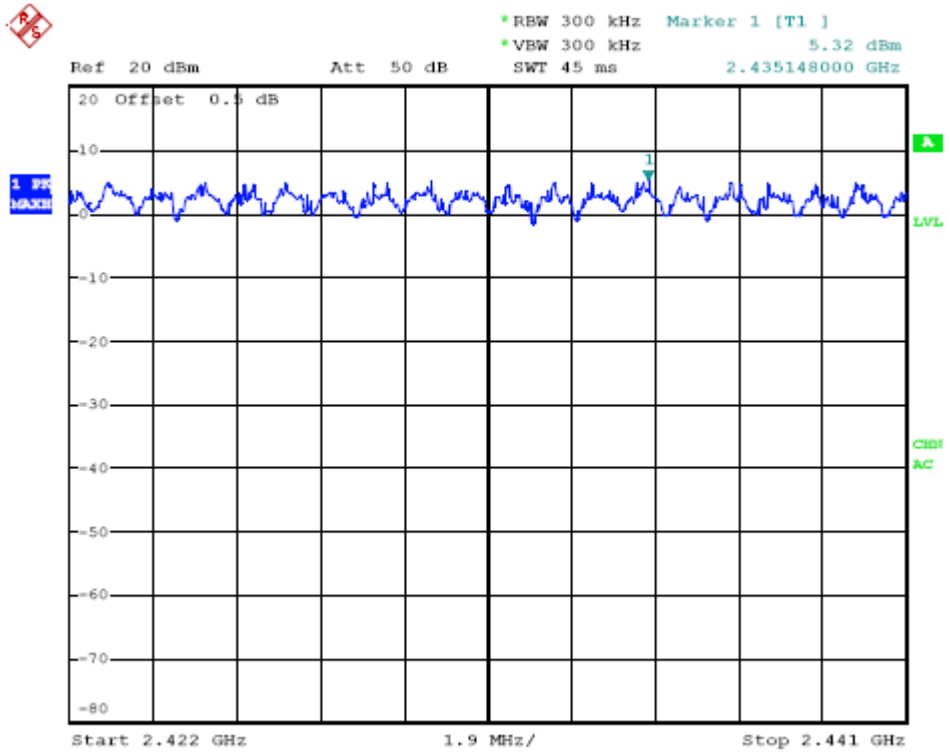
Hopping Channel Frequency Range (MHz)	Number of Hopping Channel	Limit
2400-2483.5	79	≥15

Photos of Number of hopping channel Measurement

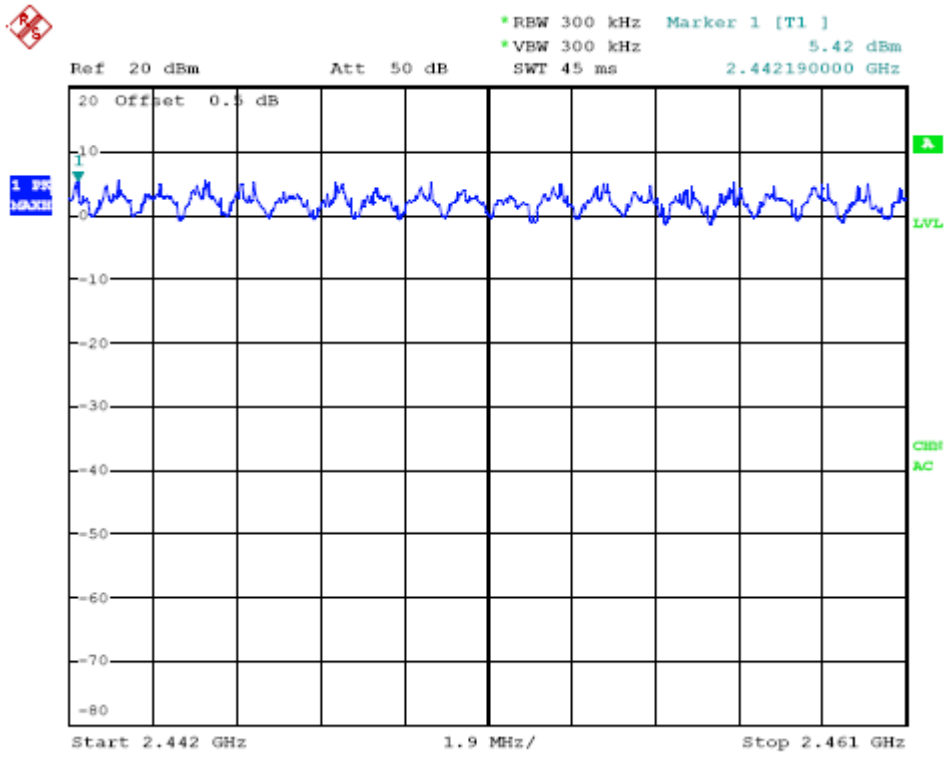
2402-2421MHz



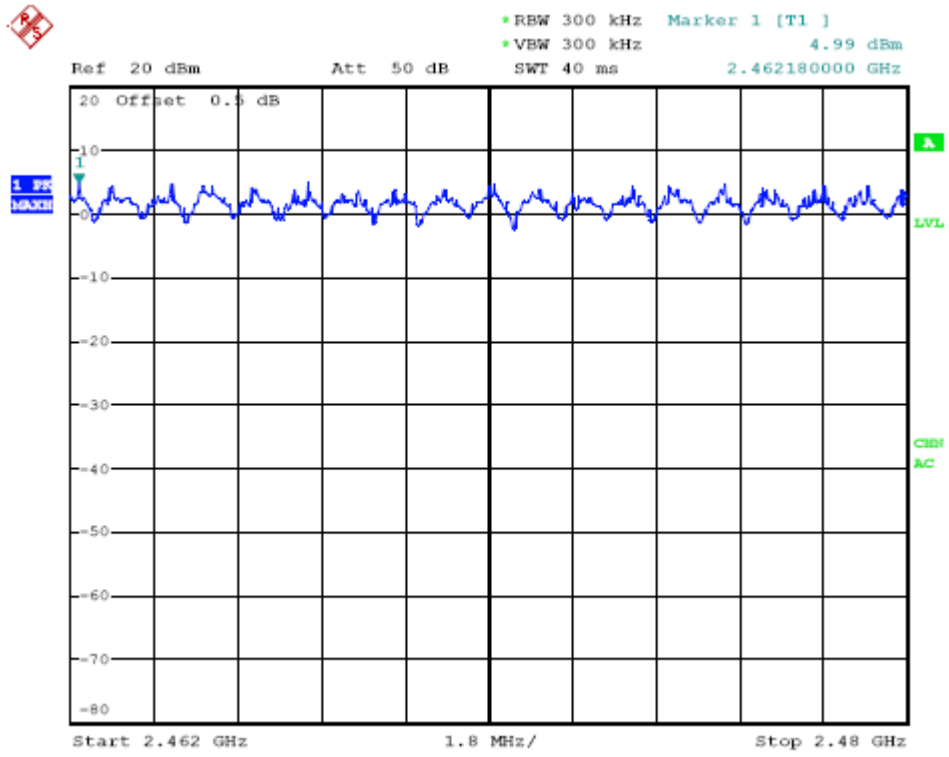
2422-2441MHz



2442-2461MHz



2462-2480MHz

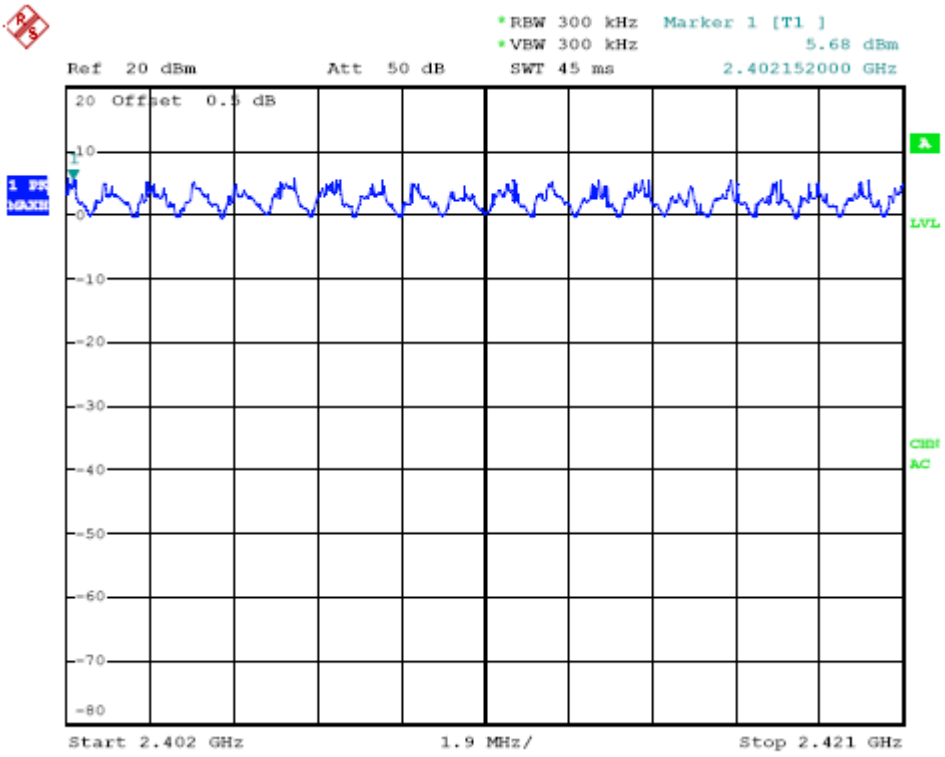


3DH5 Mode:

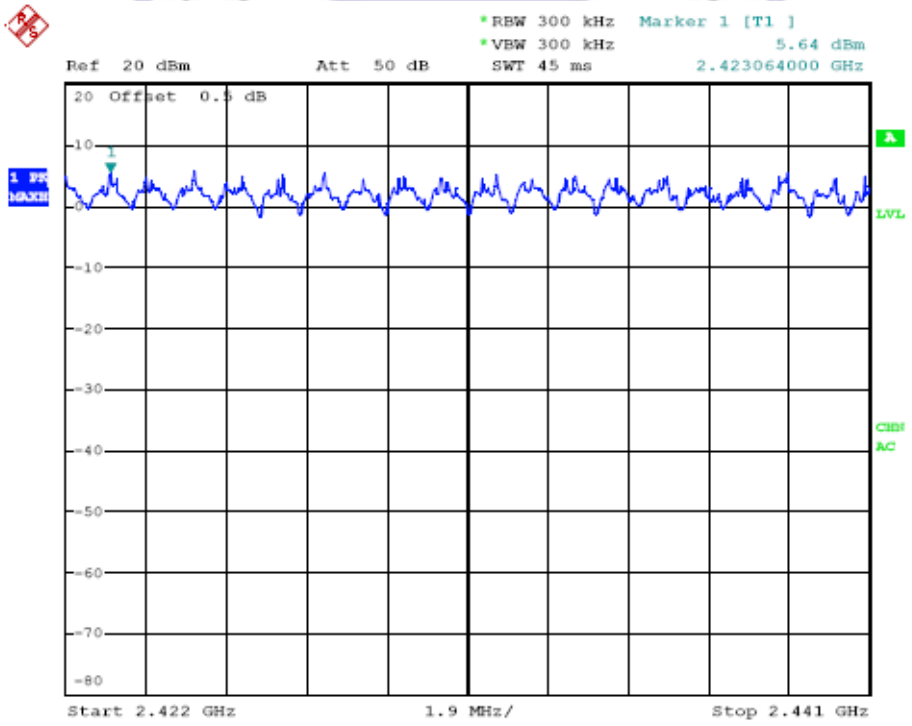
Hopping Channel Frequency Range (MHz)	Number of Hopping Channel	Limit
2400-2483.5	79	≥15

Photos of Number of hopping channel Measurement

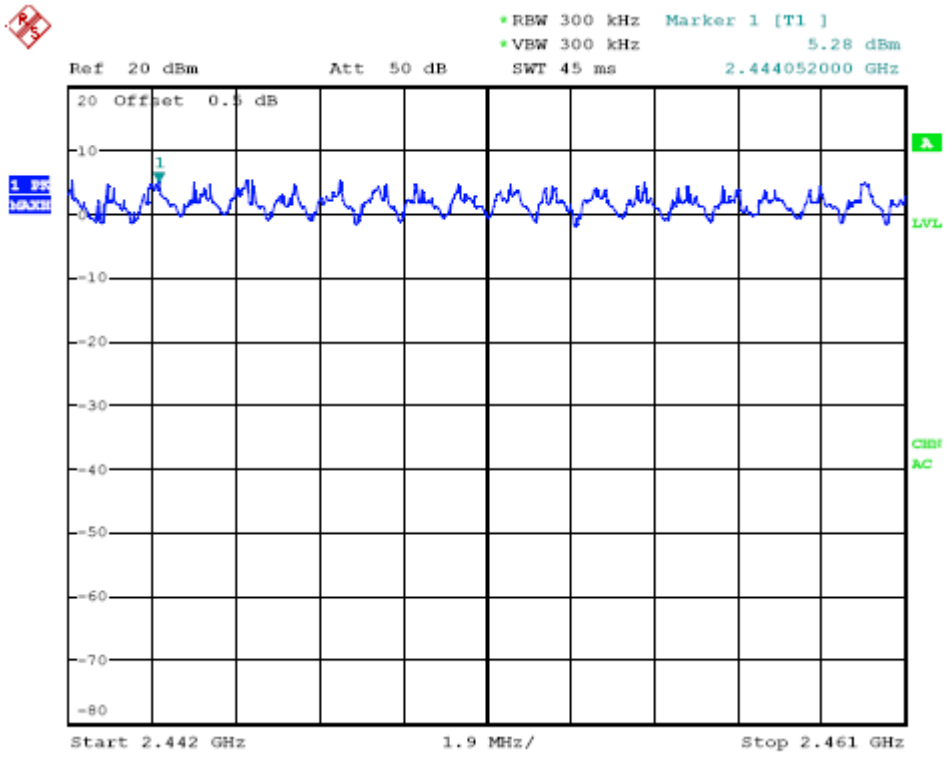
2402-2421MHz



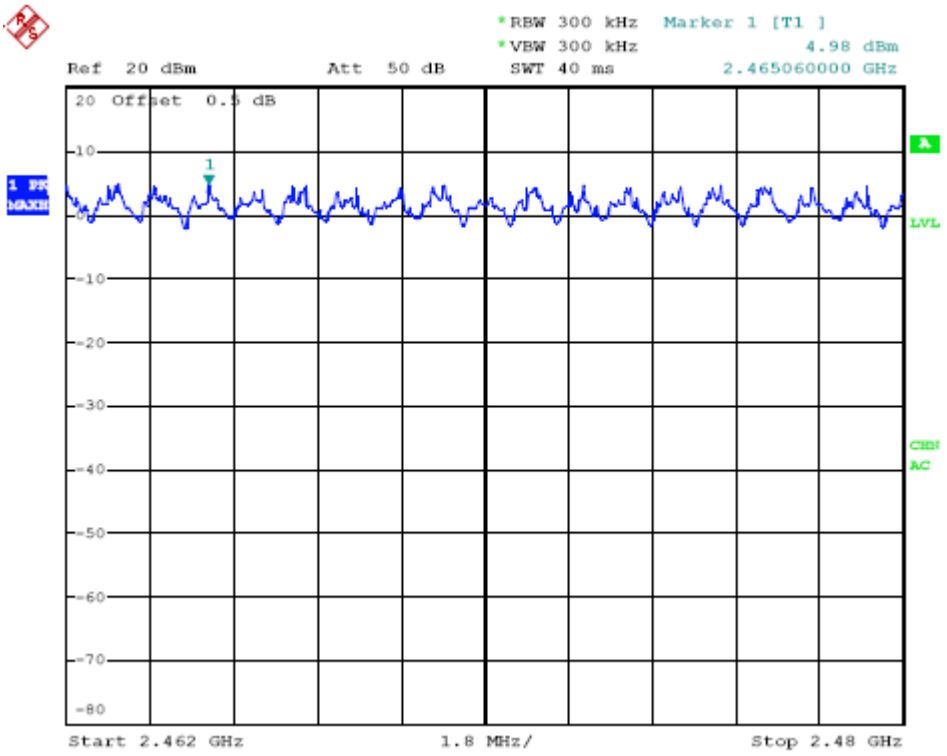
2422-2441MHz



2442-2461MHz

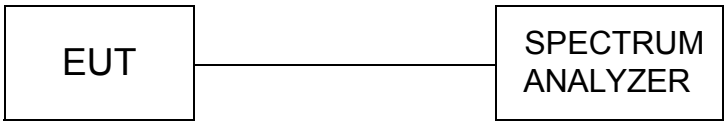


2462-2480MHz



4.8. Time Of Occupancy(Dwell Time)

TEST CONFIGURATION



TEST PROCEDURE

According to ANSI C63.10: 2009.

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

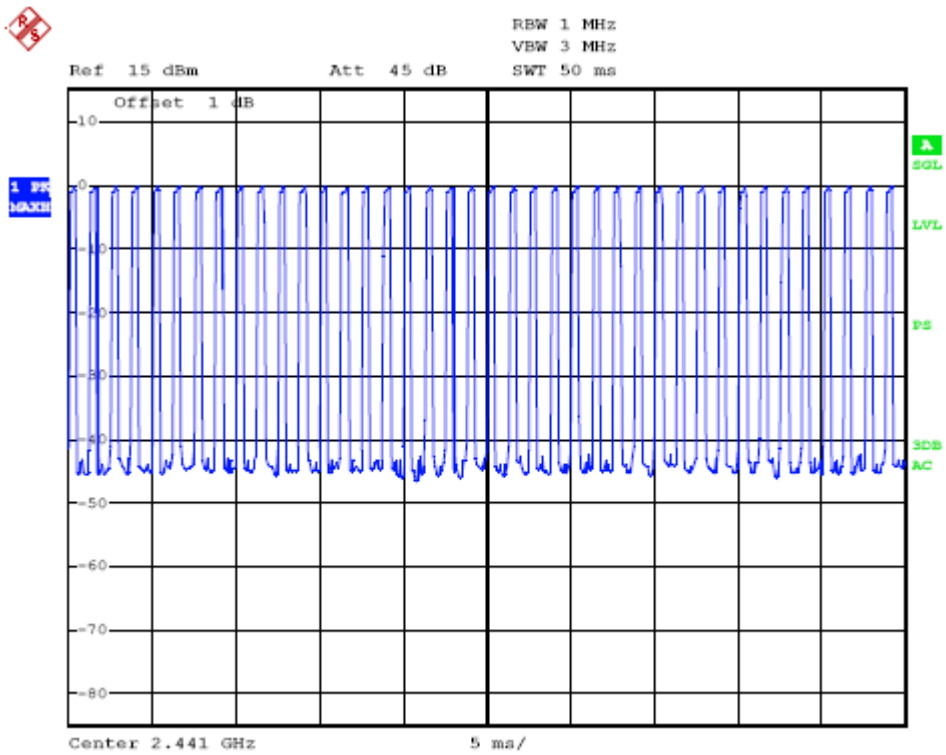
The average time of occupancy on any channel shall not be greater than 0.4 seconds within a pe-riod of 0.4 seconds multiplied by the number of hopping channels employed.

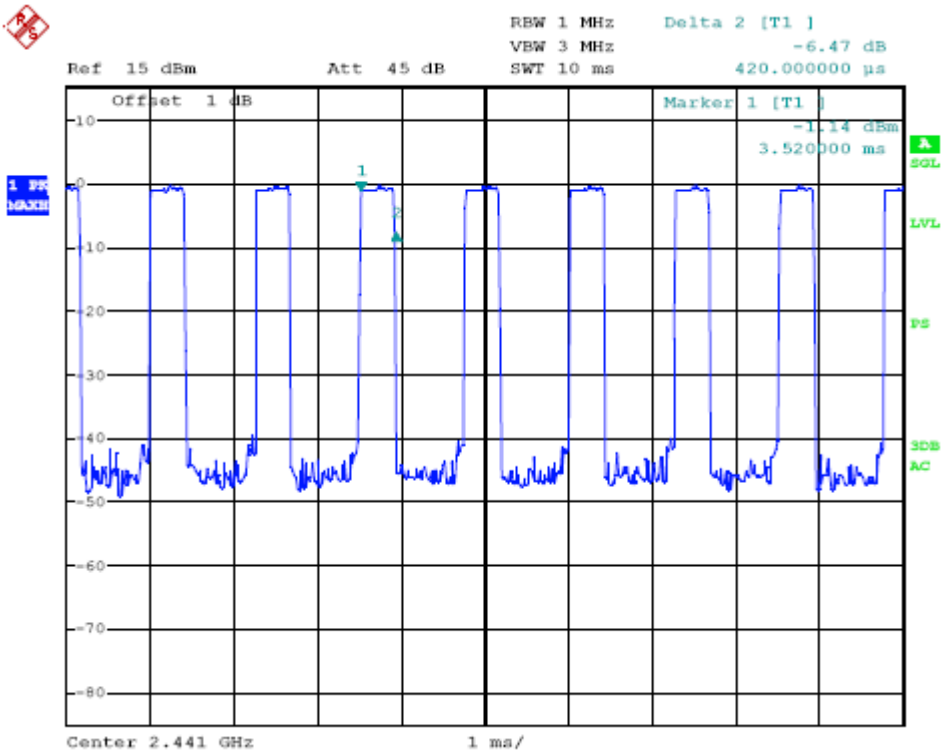
TEST RESULTS

Rate	Mode	Pulse Width (ms)	Dwell Time (S)	Limit (S)	Result
3Mbps	DH1	0.42	0.134	0.4	Pass
	DH3	1.66	0.265	0.4	Pass
	DH5	2.92	0.311	0.4	Pass
	Note: DH1: Dwell time=Pulse time (ms) × (1600 ÷ 2 ÷ 79) ×31.6 Second DH3: Dwell time=Pulse time (ms) × (1600 ÷ 4 ÷ 79) ×31.6 Second DH5: Dwell time=Pulse time (ms) × (1600 ÷ 6 ÷ 79) ×31.6 Second				

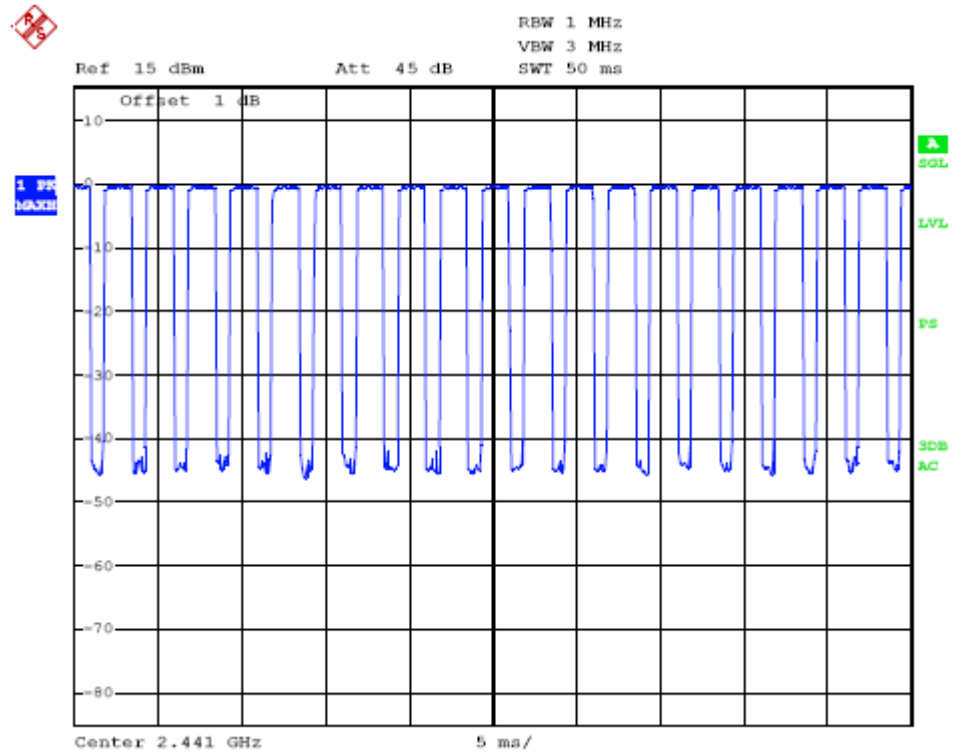
Photos of Dwell Time Measurement：

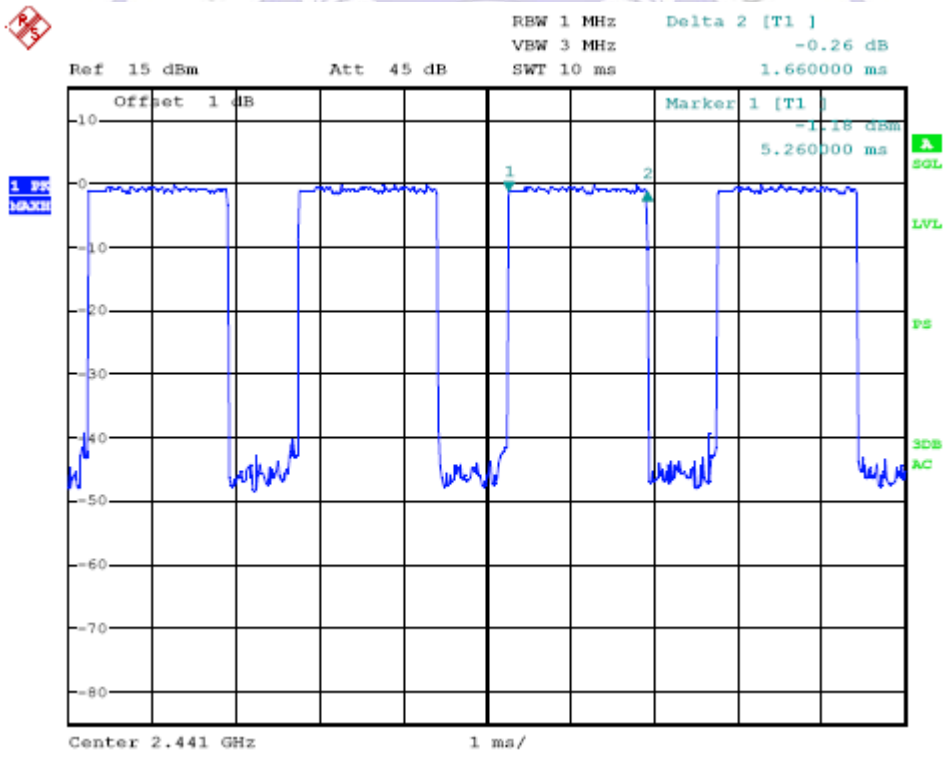
DH1



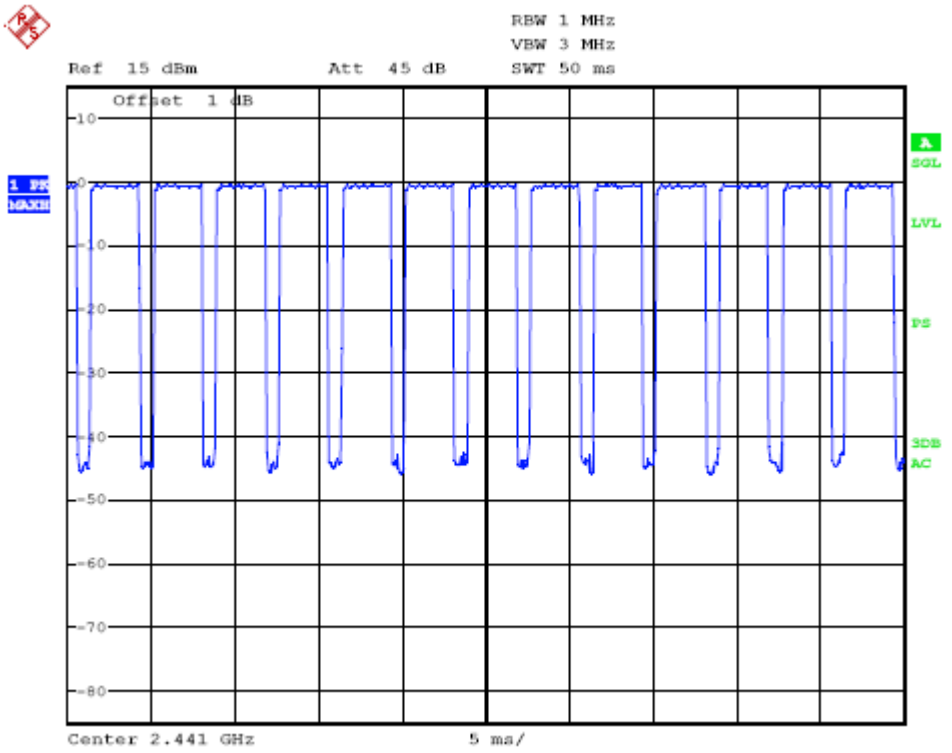


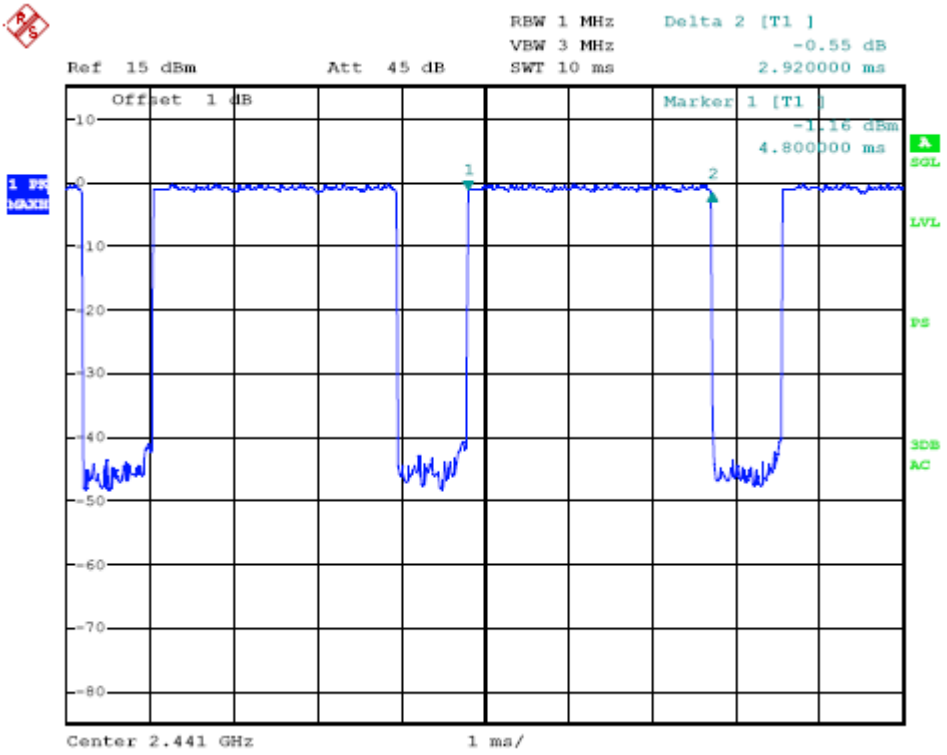
DH3


RBW 1 MHz
VBW 3 MHz
SWT 50 ms
Ref 15 dBm
Att 45 dB
Offset 1 dB
10
0
-10
-20
-30
-40
-50
-60
-70
-80
A
SGL
LVL
PS
3DB
AC
Center 2.441 GHz
5 ms/


RBW 1 MHz
VBW 3 MHz
SWT 10 ms
Delta 2 [T1]
-0.26 dB
1.660000 ms
Ref 15 dBm
Att 45 dB
Offset 1 dB
Marker 1 [T1]
5.260000 ms
1
2
10
0
-10
-20
-30
-40
-50
-60
-70
-80
A
SGL
LVL
PS
3DB
AC
Center 2.441 GHz
1 ms/

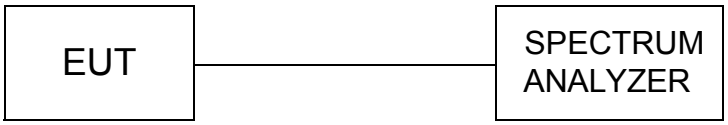
DH5


RBW 1 MHz
VBW 3 MHz
SWT 50 ms
Ref 15 dBm
Att 45 dB
Offset 1 dB
10
0
-10
-20
-30
-40
-50
-60
-70
-80
SGL
LVL
PS
3DB
AC
Center 2.441 GHz
5 ms/


RBW 1 MHz
VBW 3 MHz
SWT 10 ms
Delta 2 [T1]
-0.55 dB
2.920000 ms
Ref 15 dBm
Att 45 dB
Offset 1 dB
Marker 1 [T1]
-1.16 dBm
4.800000 ms
10
0
-10
-20
-30
-40
-50
-60
-70
-80
1
2
SGL
LVL
PS
3DB
AC
Center 2.441 GHz
1 ms/

4.9. Spurious RF Conducted Emissions

TEST CONFIGURATION



TEST PROCEDURE

According to ANSI C63.10: 2009.

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.

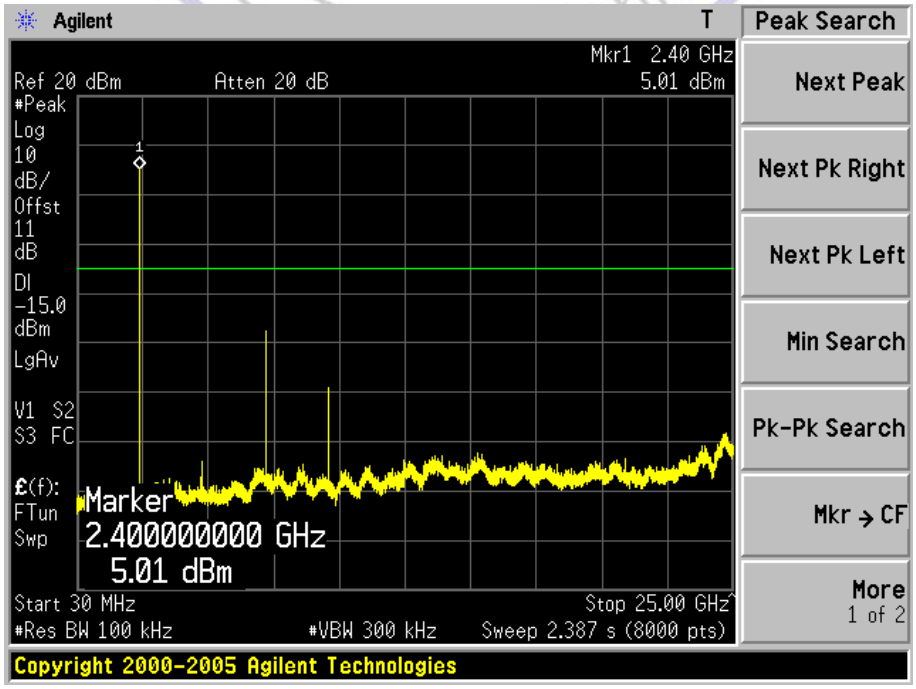
LIMIT

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.

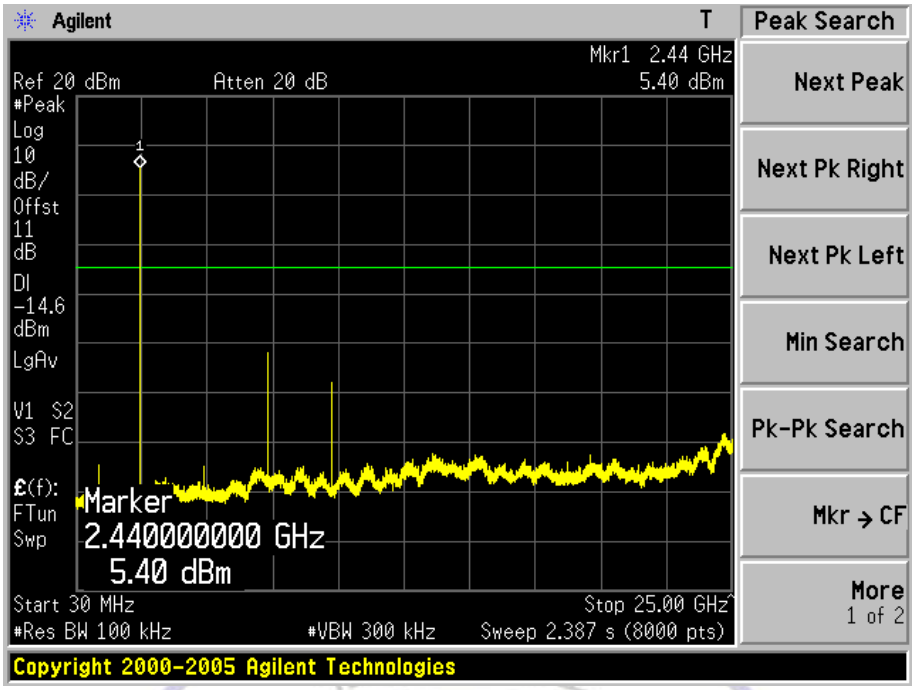
TEST RESULT

DH5 Mode:

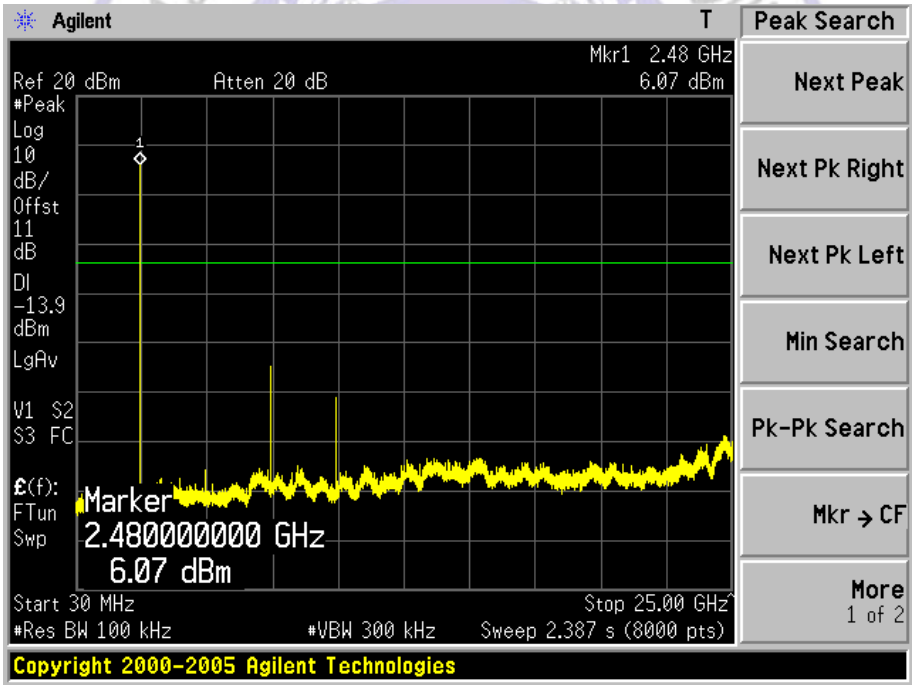
Low Channel



Middle Channel

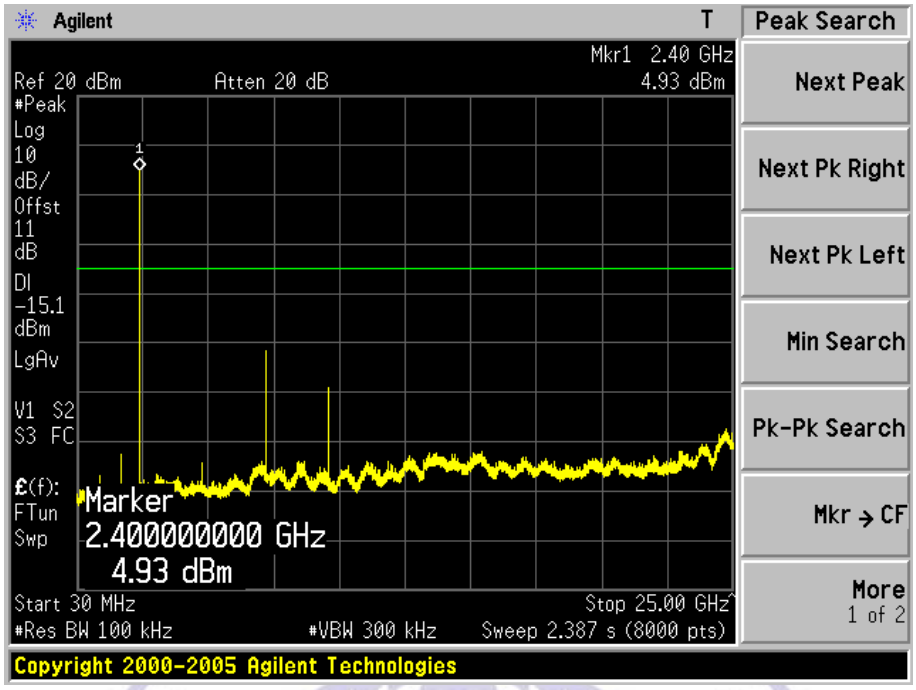


High Channel

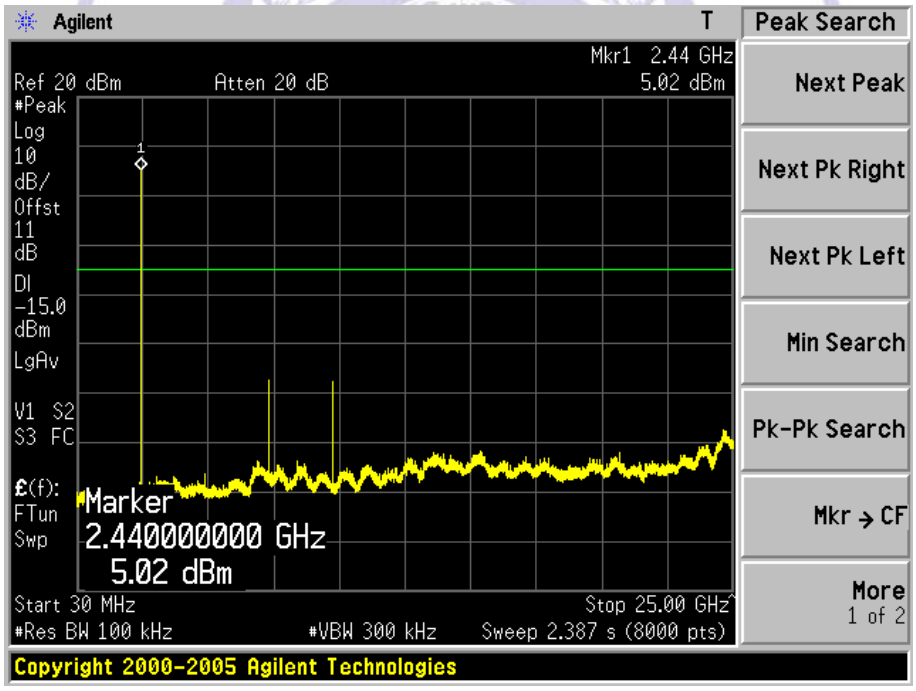


2DH5 Mode:

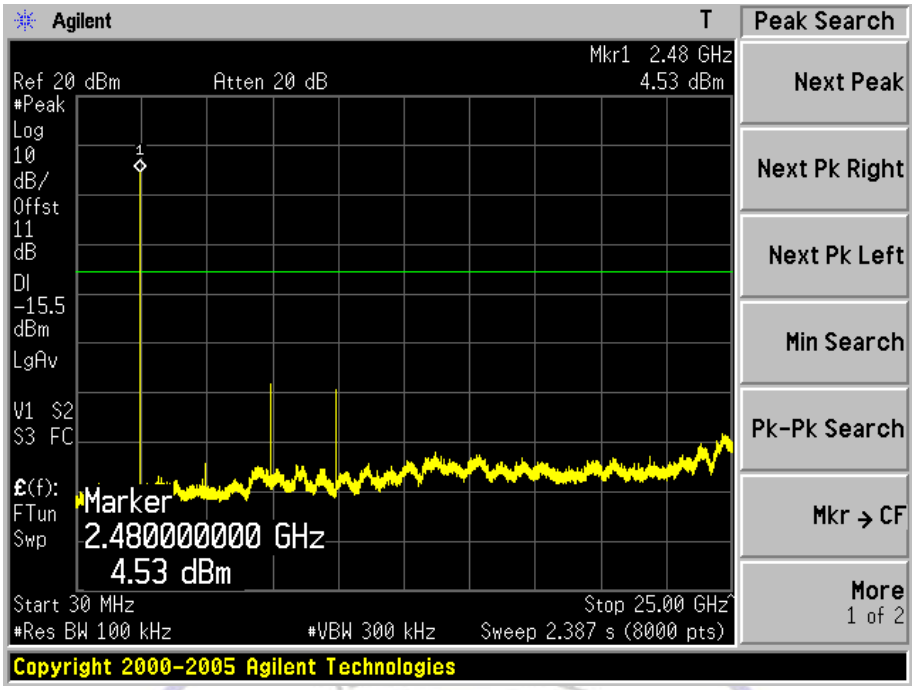
Low Channel



Middle Channel

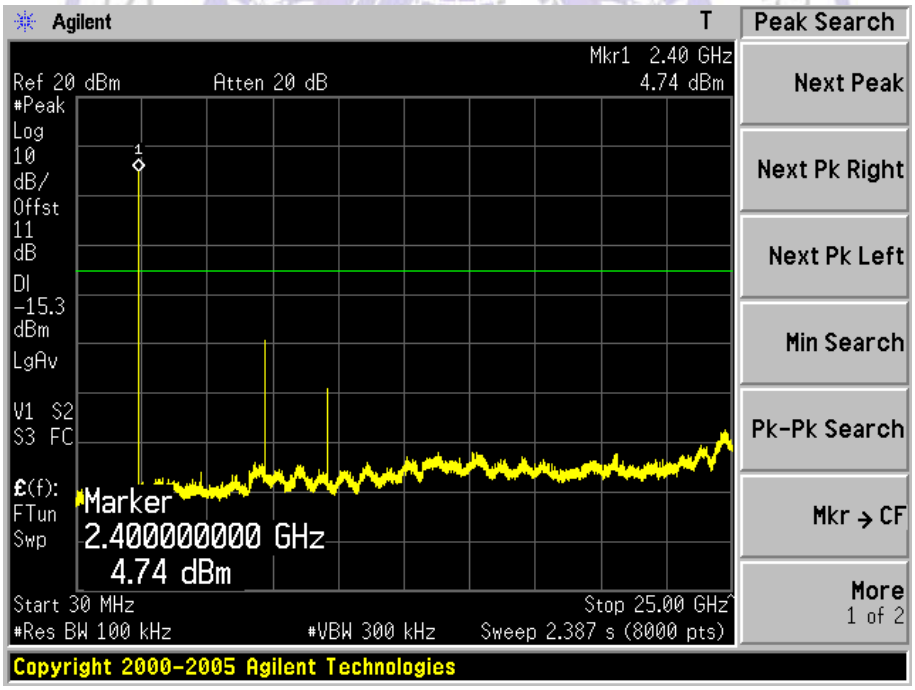


High Channel

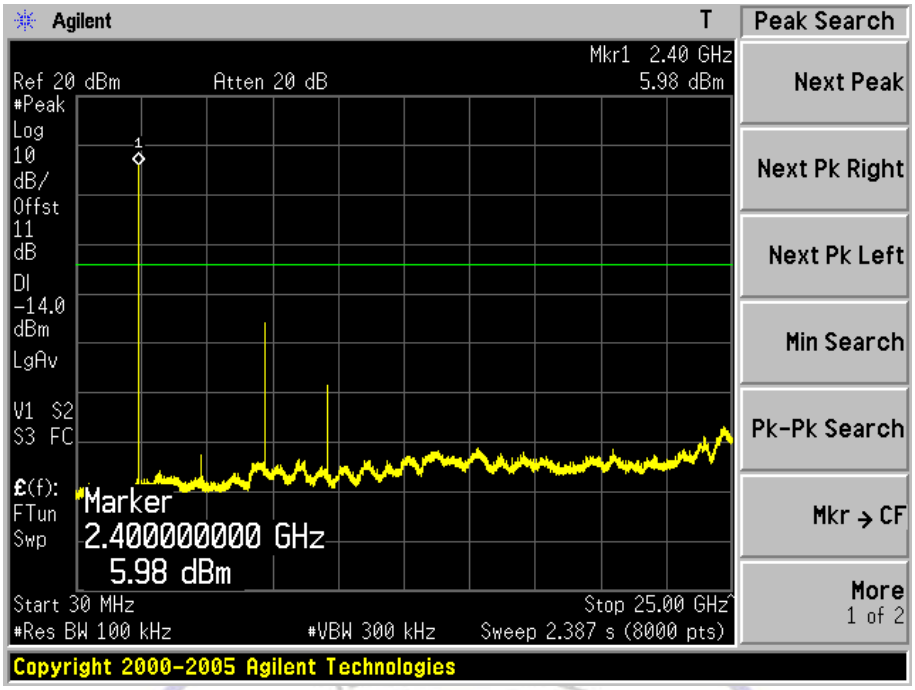


3DH5 Mode;

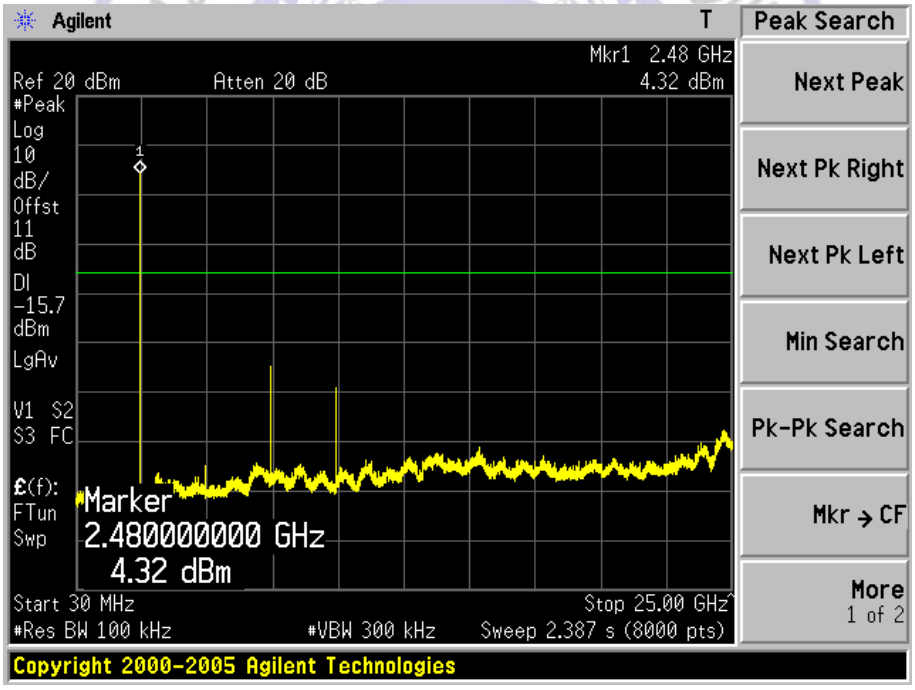
Low Channel



Middle Channel



High Channel



4.10. 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.

4.11. 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 module device with Bluetooth function.

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

MPE Calculation Method

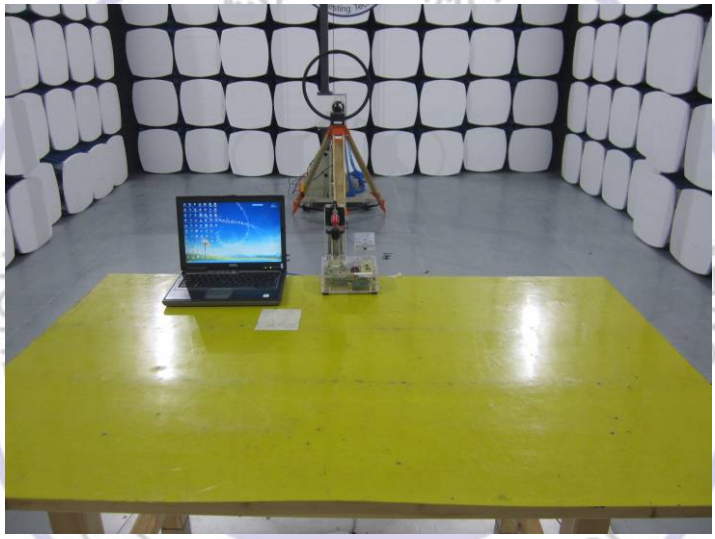
Predication of MPE limit at a given distance
Equation from page 18 of OET Bulletin 65, Edition 97-01
$S=PG/4\pi R^2$
Where: S=power density
P=power input to antenna
G=power gain of the antenna in the direction of interest relative to an isotropic radiator
R=distance to the center of radiation of the antenna
From the peak EUT RF output power, the minimum mobile separation distance, d=0.2m, as well as the gain of the used antenna is 0 dBi, the RF power density can be obtained.

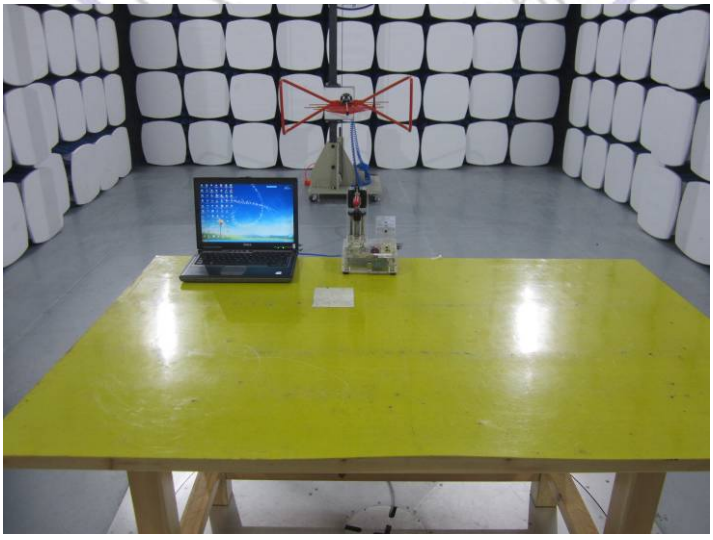
MEASUREMENT RESULTS

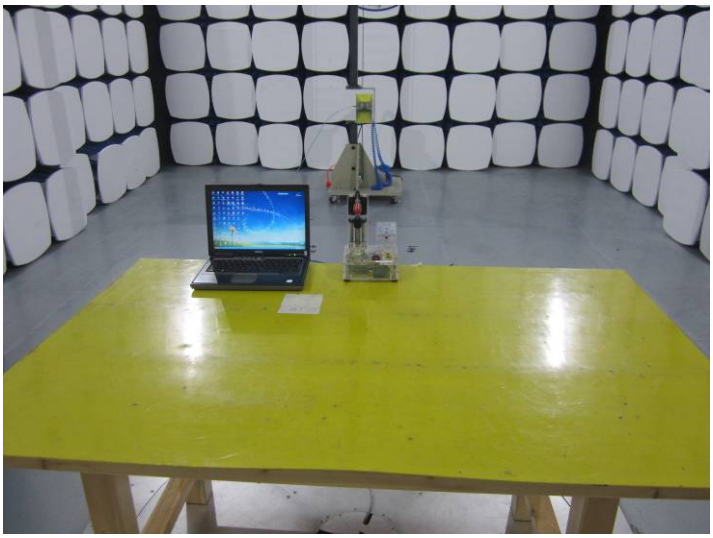
This is a bluetooth function and the Max peak output power is 2.29 dBm (1.69 mW)

Test Frequency (MHz)	Minimum Separation Distance (cm)	Output Power (dBm)	Output Power (mW)	Antenna Gain (Nemeric)	Power Density Limit (mW/cm2)	Power Density At 20 cm (mW/cm2)	Test Results
2402	20.00	2.29	1.69	1	1.000	0.00034	Pass

5. Test Setup Photos of the EUT

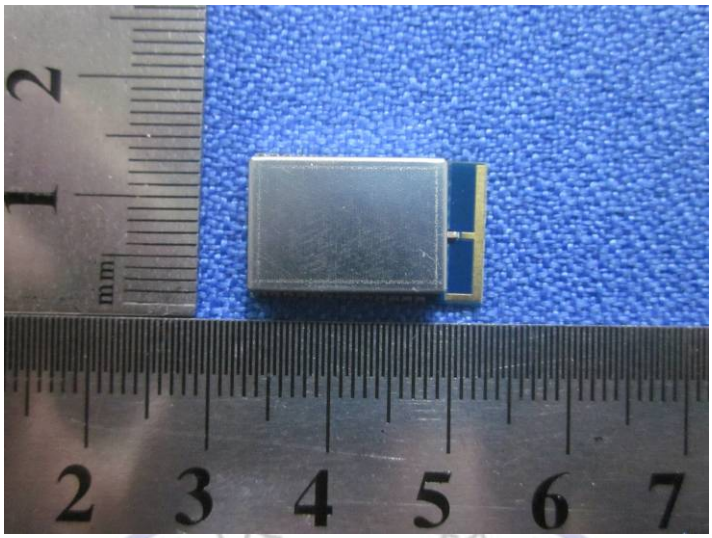


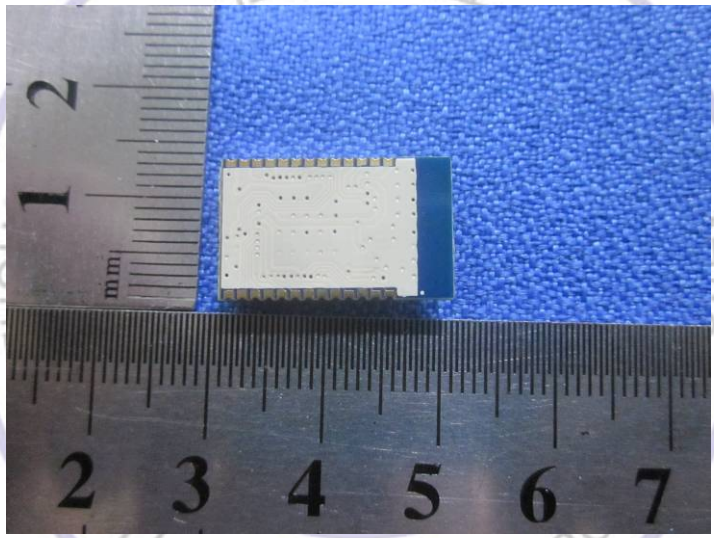


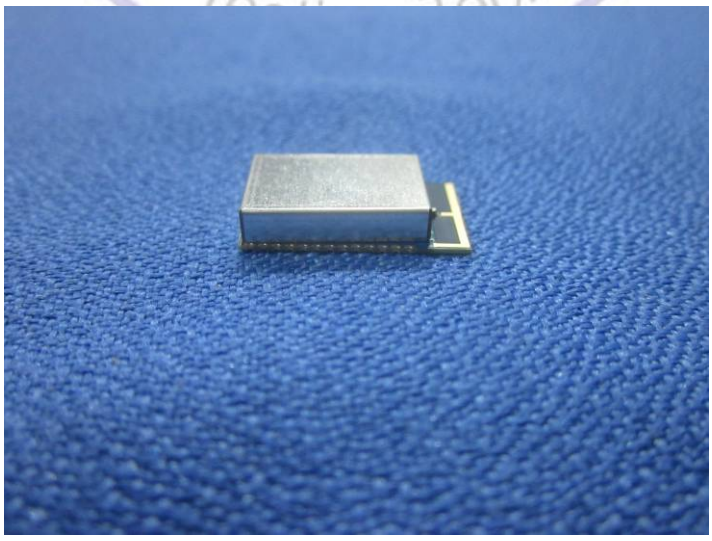


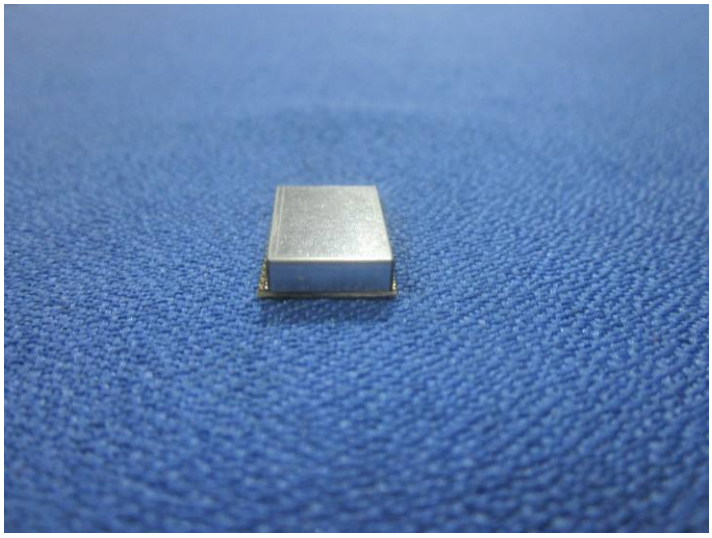
6. External and Internal Photos of the EUT

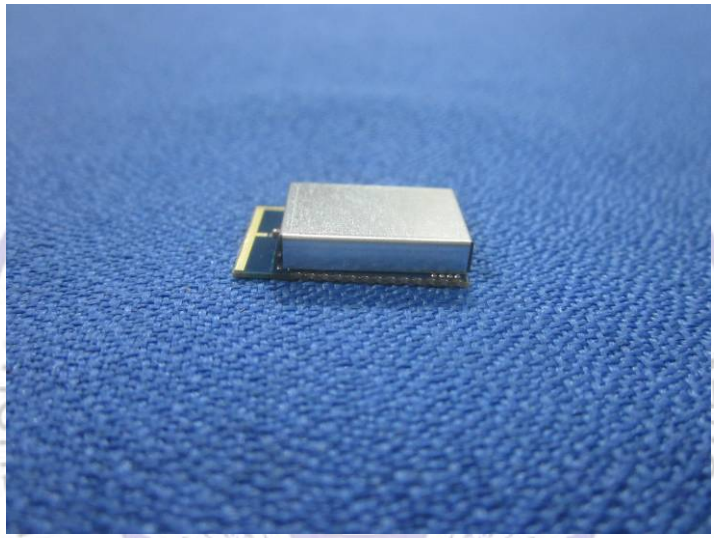
External Photos of EUT

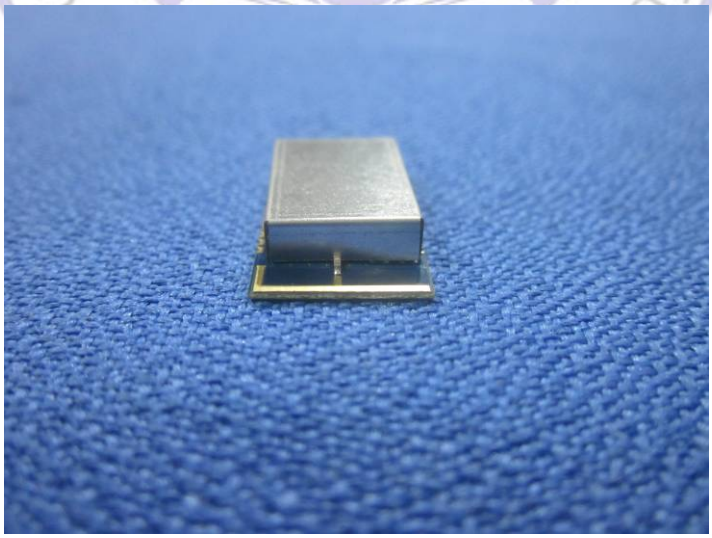




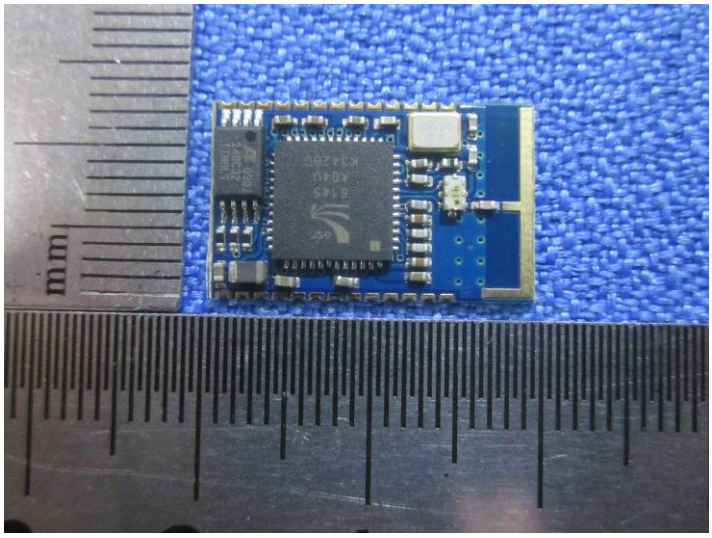


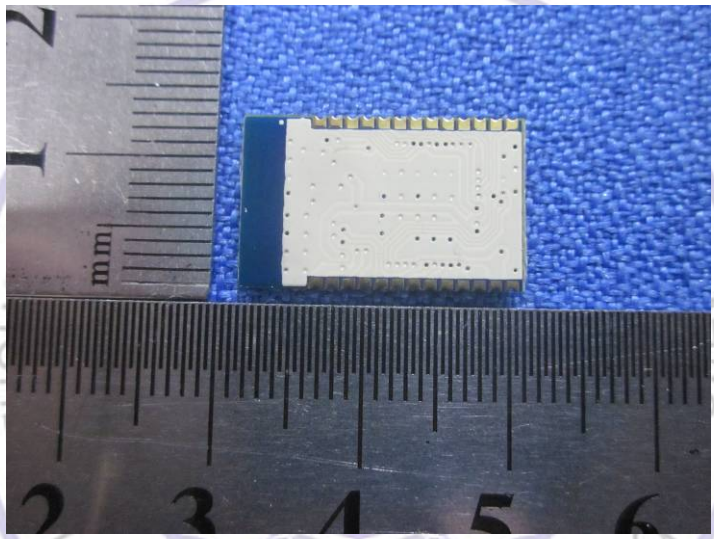






Internal Photos of EUT





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