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FCC PART 15 SUBPART C TEST REPORT

FCC Part 15.247

Report Reference No.....:	**CTL130522787-WB**
Compiled by (position+printed name+signature)..:	File administrators Jacky Chen
Name of the organization performing the tests (position+printed name+signature)..:	Test Engineer Tracy Qi
Approved by (position+printed name+signature)..:	Manager Tracy Qi
Date of issue.....:	June 20, 2013
Representative Laboratory Name .:	**Shenzhen CTL Electromagnetic Technology Co., Ltd.**
Address.....:	Zone B, 4/F, Block 20, Guangqian Industrial Park, Longzhu Road, Nanshan, Shenzhen 518055 China.
Test Firm.....:	**Bontek Compliance Testing Laboratory Ltd**
Address.....:	1/F, Block East H-3, OCT Eastern Ind. Zone, Qiaocheng East Road, Nanshan, Shenzhen, China
Applicant's name.....:	**REACH Tech (Xiamen) Co., Ltd.**
Address.....:	RM.303, #18, Guanri Road, Software Park II, Xiamen, 361008 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 ..... :	**Smartphone**
FCC ID……..:	**Z5JREACH-9788**
Trade Mark .....:	/
Model/Type reference.....:	9788
GSM/WCDMA	
Transmit .....:	2G:GSM 850: 824~849MHz, PCS 1900: 1850~1910MHz 3G:WCDMA Band II: 1850-1910MHz, WCDMA Band IV: 1710~1755MHz, WCDMA Band V: 824~849MHz
Receive .....:	2G:GSM 850: 869~894MHz, PCS 1900: 1930~1990MHz 3G:WCDMA Band II: 1930~1990MHz, WCDMA Band IV: 2110~2155MHz, WCDMA Band V: 869~894MHz

Release Version .....:	2G:R99
	3G:UMTS FDD: Rel-6
Type of modulation .....:	2G: GMSK for GSM/GPRS/EDGE
	3G: QPSK
GPRS Type .....:	Class B
GPRS Class .....:	Class 12
GPS	
work frequency .....:	1575.42MHz
Type of modulation .....:	BPSK
Bluetooth	
Work frequency .....:	2402~2480MHz
Version.....:	V3.0
Type of modulation .....:	FHSS
Data Rate.....:	1Mbps(GFSK), 2Mbps(Pi/4 DQPSK), 3Mbps(8DPSK)
Wi-Fi	
Work frequency .....:	802.11b/g/n(20MHz): 2412~2462MHz
Type of modulation .....:	802.11b DSSS, 802.11g/n: OFDM
Data Rate.....:	802.11b: 1/2/5.5/11 Mbps
	802.11g: 6/9/12/18/24/36/48/54 Mbps
	802.11n: up to 65 Mbps
Antenna Gain .....:	-1.5 dBi for GSM850 and WCDMA Band V
	-0.5 dBi for PCS1900 and WCDMA Band II
	0.5 dBi for WCDMA Band IV
	-2.5 dBi for Bluetooth and Wi-Fi
Antenna type .....:	Internal
IMEI .....:	356002031005005
Harware version .....:	SR701_V3.0
Software version.....:	E9788C_1.1.2332.0021_20130516_SHIP_TM35_HX8357C_FT6X06_ASD_QCN
Result.....:	**Positive**

TEST REPORT

Test Report No. :	CTL130522787-WB	June 20, 2013 Date of issue

Equipment under Test	:	Smartphone
Model /Type	:	9788
Listed Models	:	/
Applicant	:	**REACH Tech (Xiamen) Co., Ltd.**
Address	:	RM.303, #18, Guanri Road, Software Park II, Xiamen, 361008 China
Manufacturer	:	**REACH Tech (Xiamen) Co., Ltd.**
Address	:	RM.303, #18, Guanri Road, Software Park II, Xiamen, 361008 China

Test Result according to the standards on page 5:	**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 C63.4-2009

All measurements contained in this report were conducted with ANSI C63.4-2009, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz. The 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	:	May 22, 2013
Testing commenced on	:	May 22, 2013
Testing concluded on	:	June 10, 2013

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 from battery

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

A Smartphone (9788) with UMTS/GSM, Bluetooth, GPS and wifi 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 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:	2400-2483.5MHz
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 :	SONY Corporation
		Model No. :	PCG-41216W

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	SONY Corporation	PCG-41216W	27548966 7000262	------

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

This submittal(s) (test report) is intended for **FCC ID: Z5JREACH-9788** 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)	CTL130522787-WB
RF Exposure	FCC Per 47 CFR 2.1093	CTL130522787-WB

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.

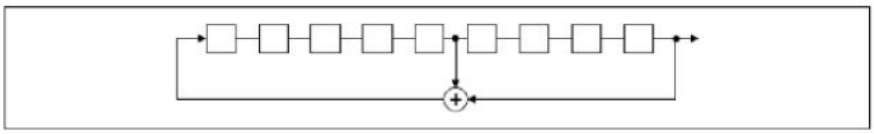
(g) Frequency hopping spread spectrum systems are not required to employ all available hopping channels during each transmission. However, the system, consisting of both the transmitter and the receiver, must be designed to comply with all of the regulations in this section should the transmitter be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



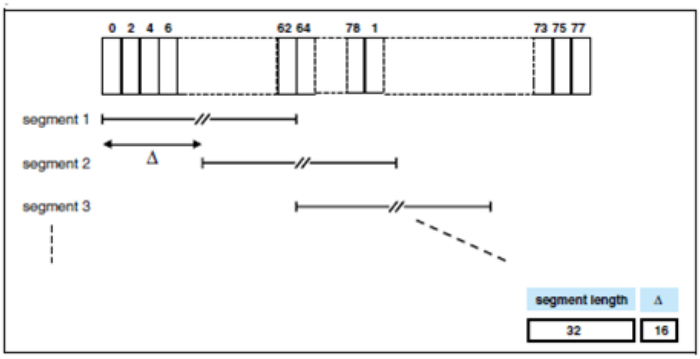
Linear Feedback Shift Register for Generation of the PRBS sequence

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.

2.11. 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

Bontek Compliance Testing Laboratory Ltd
1/F, Block East H-3, OCT Eastern Ind. Zone, Qiaocheng East Road, Nanshan, Shenzhen, China

The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 (2009) and CISPR Publication 22.

3.2. Test Facility

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

IC Registration No.: 7631A

The 3m alternate test site of Bontek Compliance Testing Laboratory Ltd EMC Laboratory has been registered by Certification and Engineer Bureau of Industry Canada for the performance of with Registration NO.: 7631A on March, 2011.

FCC-Registration No.: 338263

Bontek Compliance Testing Laboratory 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 338263, March 24, 2008.

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 Bontek Compliance Testing Laboratory 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 Bontek 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.

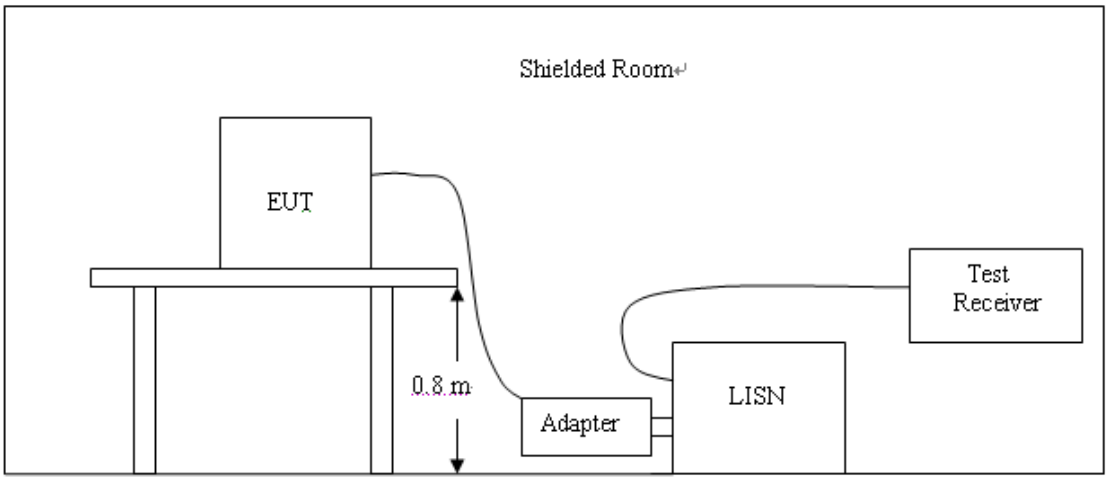
3.6. Equipments Used during the Test

Item	Test Equipment	Manufacturer	Model No.	Last Cal.	Due. Date
1	EMI Test Receiver	ROHDE & SCHWARZ	ESCI	2013/04/13	2014/04/12
2	Radio Communication Tester	ROHDE & SCHWARZ	CMU200	2013/04/13	2014/04/12
3	Dual Directional Coupler	Agilent	778D	2013/04/13	2014/04/12
4	10dB attenuator	SCHWARZBECK	MTAIMP-136	2013/04/13	2014/04/12
5	Tunable Bandreject filter	K&L	3TNF-800	2013/04/13	2014/04/12
6	Tunable Bandreject filter	K&L	5TNF-1700	2013/04/13	2014/04/12
7	High-Pass Filter	K&L	9SH10-2700/X12750-O/O	2013/04/13	2014/04/12
8	High-Pass Filter	K&L	41H10-1375/U12750-O/O	2013/04/13	2014/04/12
9	Coaxial Cable	Huber+Suhner	AC4-RF-H	2013/04/13	2014/04/12
10	AC Power Supply	IDRC	CF-500TP	2013/04/13	2014/04/12
11	DC Power Supply	IDRC	CD-035-020PR	2013/04/13	2014/04/12
12	RF Current Probe	FCC	F-33-4	2013/04/13	2014/04/12
13	Temperature /Humidity Meter	zhicheng	ZC1-2	2013/04/13	2014/04/12
14	MICROWAVE AMPLIFIER	HP	8349B	2013/04/13	2014/04/12
15	Amplifier	HP	8447D	2013/04/13	2014/04/12
16	SIGNAL GENERATOR	HP	8647A	2013/04/13	2014/04/12
17	Log Periodic Antenna	ELECTRO-METRICS	EM-6950	2013/04/13	2014/04/12
18	Horn Antenna	Schwarzbeck	BBHA9120A	2013/04/13	2014/04/12
19	EMI Test Receiver	R&S	ESPI	2013/04/13	2014/04/12
20	Loop Antenna	ZHINAN	ZN30900A	2013/04/13	2014/04/12
21	Horn Antenna	Schwarzbeck	BBHA9120D	2013/04/13	2014/04/12
22	Horn Antenna	Schwarzbeck	BBHA9170	2013/04/13	2014/04/12
23	Spectrum Analyzer	Agilent	E4446A	2013/04/13	2014/04/12
24	Wideband Peak Power Meter	Anritsu	ML2495A	2013/04/13	2014/04/12
25	Power Sensor	Anritsu	MA2411B	2013/04/13	2014/04/12

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

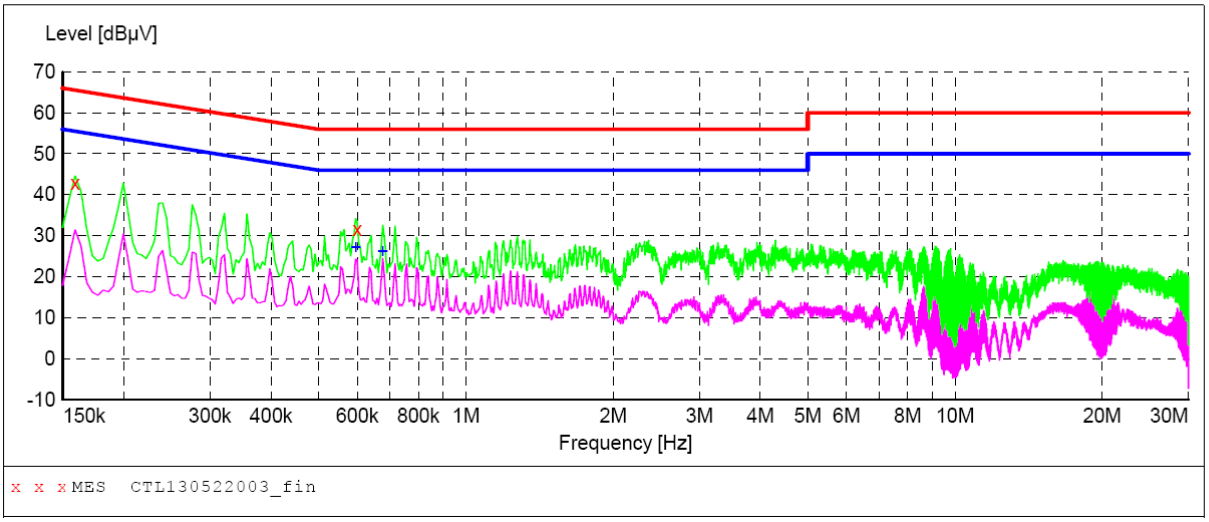
* Decreasing linearly with the logarithm of the frequency

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: "CTL130522003_fin"

5/22/2013 3:30PM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.159000	42.80	9.8	66	22.7	QP	L1	GND
0.600000	31.60	9.8	56	24.4	QP	L1	GND

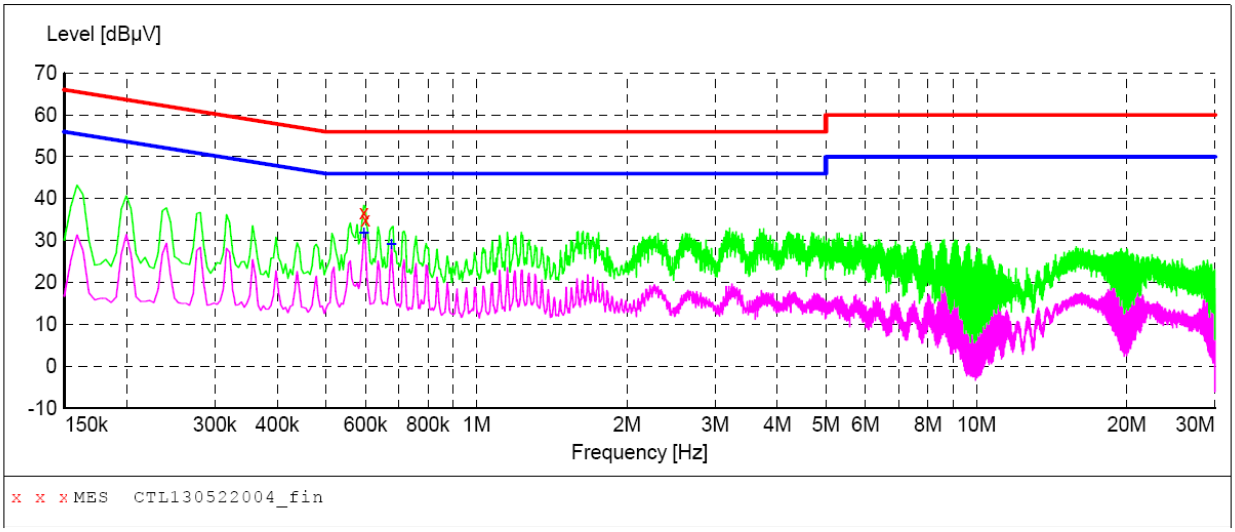
MEASUREMENT RESULT: "CTL130522003_fin2"

5/22/2013 3:30PM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.595500	27.20	9.8	46	18.8	AV	L1	GND
0.676500	26.20	9.8	46	19.8	AV	L1	GND

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

Short Description: 150K-30M Voltage



MEASUREMENT RESULT: "CTL130522004_fin"

5/22/2013 3:32PM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.595500	36.70	9.8	56	19.3	QP	N	GND
0.600000	34.90	9.8	56	21.1	QP	N	GND

MEASUREMENT RESULT: "CTL130522004_fin2"

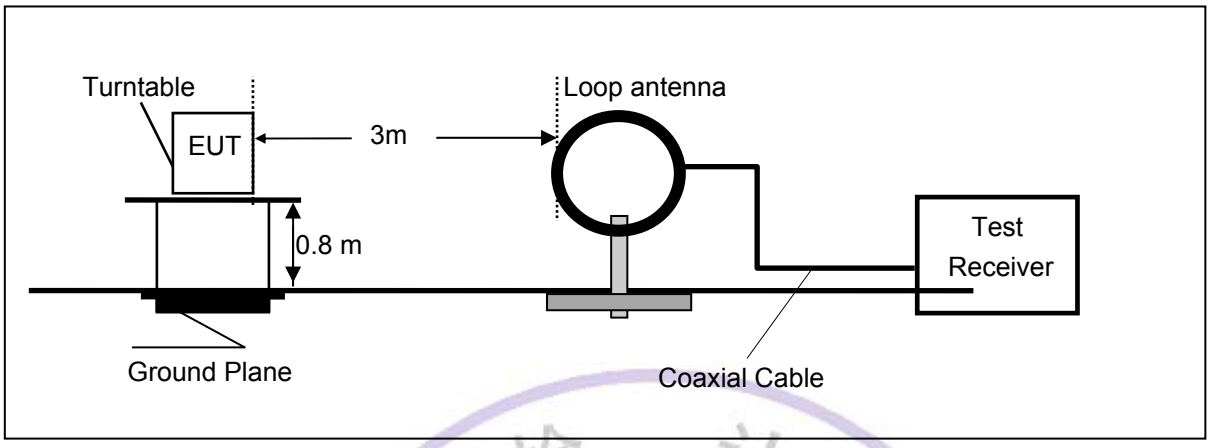
5/22/2013 3:32PM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.595500	31.80	9.8	46	14.2	AV	N	GND
0.676500	29.10	9.8	46	16.9	AV	N	GND

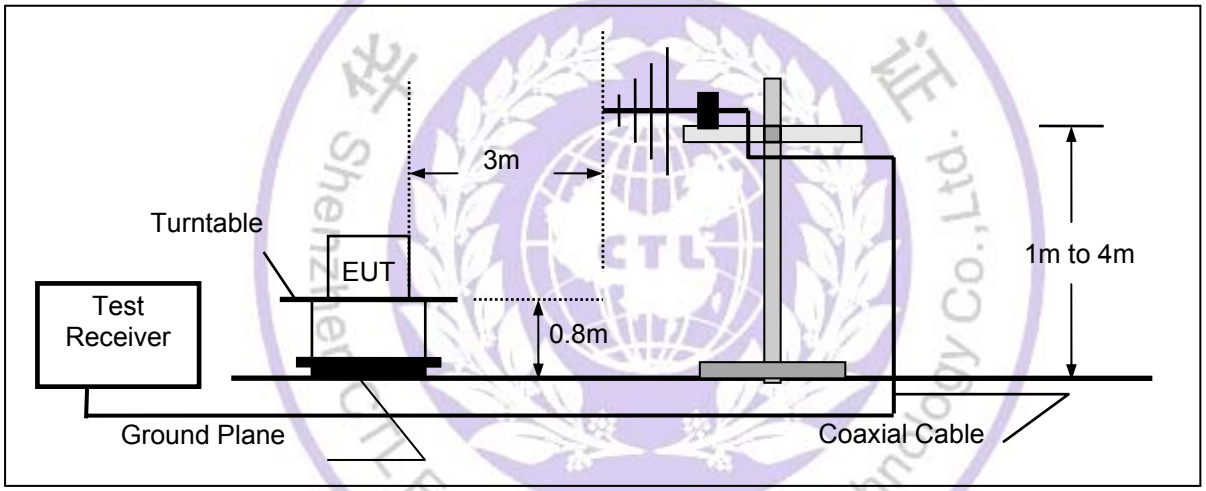
4.2. Radiated Emission

TEST CONFIGURATION

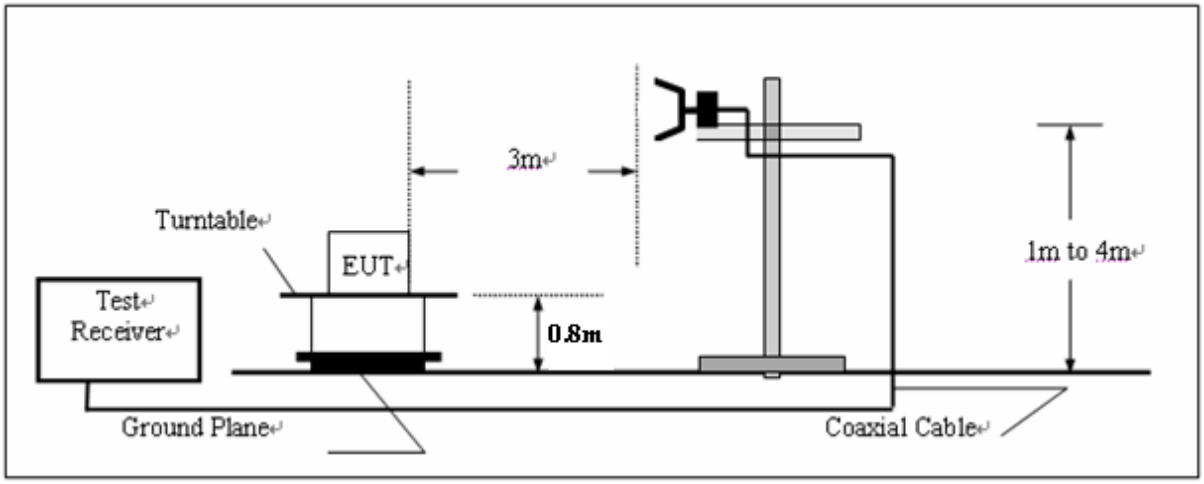
Radiated Emission Test Set-Up
Frequency range 9KHz – 30MHz



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 were 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

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	2401.8	56.5	35.7	92.2	Fundamental	/	PK
	V	354.0	6.6	16.4	23.0	46	-23.0	QP
	V	539.3	4.4	20.9	25.3	46	-20.7	QP
	H	3122.5	43.5	-1.7	41.8	54(Note)	-12.2	PK
	V	4804.0	41.9	2.3	44.2	54(Note)	-9.8	PK
	V	7213.5	55.2	8.8	64.0	72.2	-8.2	PK
	V	7209.1	47.1	8.7	55.8	62.2	-6.4	AV
	H	24000.0	59.1	-8.9	50.2	54(Note)	-3.8	PK
39	H	2440.9	59.3	36.1	95.4	Fundamental	/	PK
	V	365.1	1.8	16.7	18.5	46	-27.5	QP
	V	539.3	4.7	21.0	25.7	46	-20.3	QP
	H	3122.5	44.1	-1.7	42.4	54(Note)	-11.6	PK
	H	4882.0	41.8	2.5	44.3	54(Note)	-9.7	PK
	V	7324.0	54.1	8.7	62.8	74	-11.2	PK
	V	7326.0	44.2	8.7	52.9	54	-1.1	AV
	H	24000.0	59.1	-8.9	50.2	54(Note)	-3.8	PK
78	H	2480.0	62.6	37.1	99.7	Fundamental	/	PK
	V	439.8	3.0	18.5	21.5	46	-24.5	QP
	V	539.3	3.8	20.9	24.7	46	-21.3	QP
	H	3122.5	43.5	-1.7	41.8	54(Note)	-12.2	PK
	H	4944.0	44.8	2.9	47.7	54(Note)	-6.3	PK
	V	7434.5	52.1	8.7	60.8	74	-13.2	PK
	V	7437.0	44.3	8.6	52.9	54	-1.1	AV
	H	24000.0	59.1	-8.9	50.2	54(Note)	-3.8	PK

Note

1: The test trace is same as the ambient noise (the test frequency range: 9kHz~30MHz, 18GHz~25GHz), therefore no data appear in the report.

2: 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.

3: According to FCC Part15.247(d). Radiated emission which don't fall in the restricted bands, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below 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, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

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	2401.8	58.2	35.7	93.9	Fundamental	/	PK
	V	439.8	2.4	18.5	20.9	46	-25.1	QP
	V	539.3	4.8	21.0	25.8	46	-20.2	QP
	H	3122.5	43.6	-1.7	41.9	54(Note)	-12.1	PK
	H	4804.0	41.5	2.4	43.9	54(Note)	-10.1	PK
	V	7205.0	53.5	8.7	62.2	74	-10.0	PK
	V	7209.0	43.0	8.8	51.8	54	-10.4	AV
	H	24000.0	59.1	-8.9	50.2	54(Note)	-3.8	PK
39	H	2441.1	60.1	35.7	95.8	Fundamental	/	PK
	V	397.1	1.5	17.5	19.0	46	-27.0	QP
	V	539.3	4.2	20.9	25.1	46	-20.9	QP
	H	3122.5	43.1	-1.7	41.4	54(Note)	-12.6	PK
	H	4882.0	41.5	2.5	44.0	54(Note)	-10.0	PK
	V	7324.0	51.8	8.7	60.5	74	-13.5	PK
	V	7326.0	41.9	8.8	50.7	54	-3.3	AV
	H	24000.0	59.1	-8.9	50.2	54(Note)	-3.8	PK
78	H	2479.9	62.0	36.1	98.1	Fundamental	/	PK
	V	346.2	0.9	16.2	17.1	46	-28.9	QP
	V	539.3	4.6	20.9	25.5	46	-20.5	QP
	H	3122.5	43.6	-1.7	41.9	54(Note)	-12.1	PK
	V	7434.5	50.5	8.6	59.1	54(Note)	5.1	PK
	H	7437.0	39.4	8.7	48.1	74	-25.9	PK
	H	4944.0	44.5	2.8	47.3	54	-6.7	AV
	H	24000.0	59.1	-8.9	50.2	54(Note)	-3.8	PK

Note

1: The test trace is same as the ambient noise (the test frequency range: 9kHz~30MHz, 18GHz~25GHz), therefore no data appear in the report.

2: 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	V	2402.1	58.1	35.7	93.8	Fundamental	/	PK
	V	353.5	1.2	16.4	17.6	46	-28.4	QP
	V	539.3	4.3	20.9	25.2	46	-20.8	QP
	H	3122.5	43.5	-5.1	38.4	54(Note)	-15.6	PK
	V	4804.0	41.9	-1.9	40.0	54(Note)	-14.0	PK
	V	7205.0	56.5	3.5	60.0	74	-12.2	PK
	V	7205.9	40.2	3.5	43.7	54	-18.5	AV
	H	24000.0	59.1	-8.9	50.2	54(Note)	-3.8	PK
39	H	2441.0	60.2	36.5	96.7	Fundamental	/	PK
	V	345.7	0.8	16.2	17.0	46	-29.0	QP
	V	539.3	4.3	20.9	25.2	46	-20.8	QP
	V	3122.5	42.5	-5.1	37.4	54(Note)	-16.6	PK
	V	4882.0	40.4	-1.6	38.8	54(Note)	-15.2	PK
	V	7324.0	55.9	3.6	59.5	74	-14.5	PK
	V	7322.9	40.0	3.7	43.7	54	-10.3	AV
	H	24000.0	59.1	-8.9	50.2	54(Note)	-3.8	PK
78	H	2480.1	63.2	36.0	99.2	Fundamental	/	PK
	H	374.4	1.6	16.9	18.5	46	-27.5	QP
	H	539.3	4.5	20.9	25.4	46	-20.6	QP
	H	3122.5	43.0	-5.1	37.9	54(Note)	-16.1	PK
	H	4944.0	44.7	-1.4	43.3	54(Note)	-10.7	PK
	V	7443.0	54.6	3.6	58.2	74	-15.8	PK
	V	7439.9	38.8	3.6	42.4	54	-11.6	AV
	H	24000.0	59.1	-8.9	50.2	54(Note)	-3.8	PK

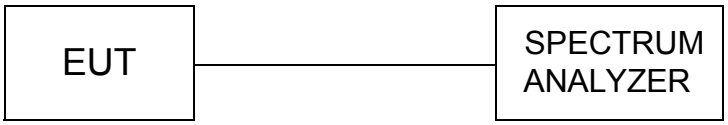
Note

1: The test trace is same as the ambient noise (the test frequency range: 9kHz~30MHz, 18GHz~25GHz), therefore no data appear in the report.

2: 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.

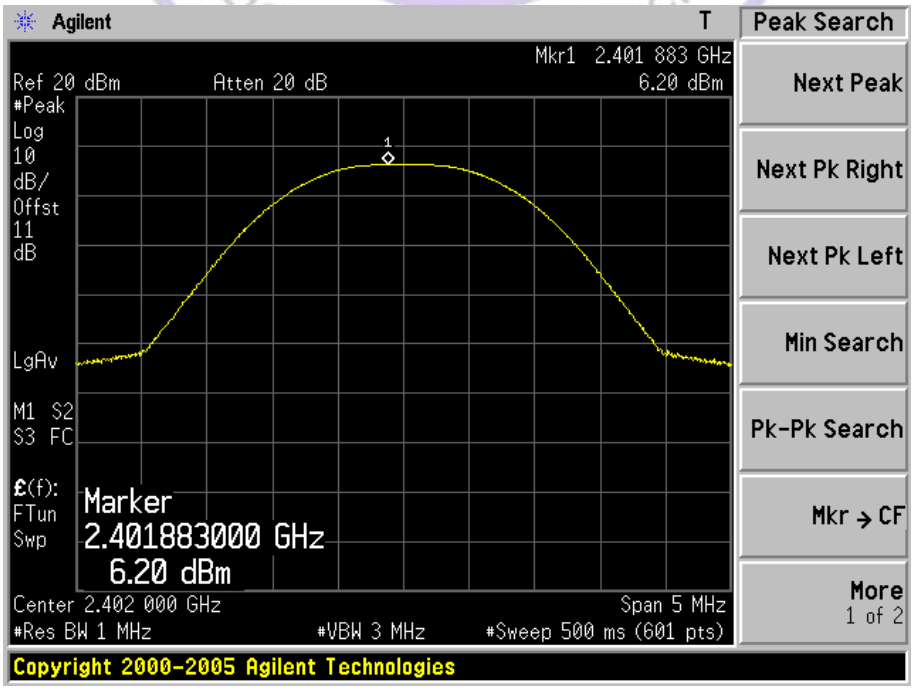
TEST RESULTS

DH5 Mode:

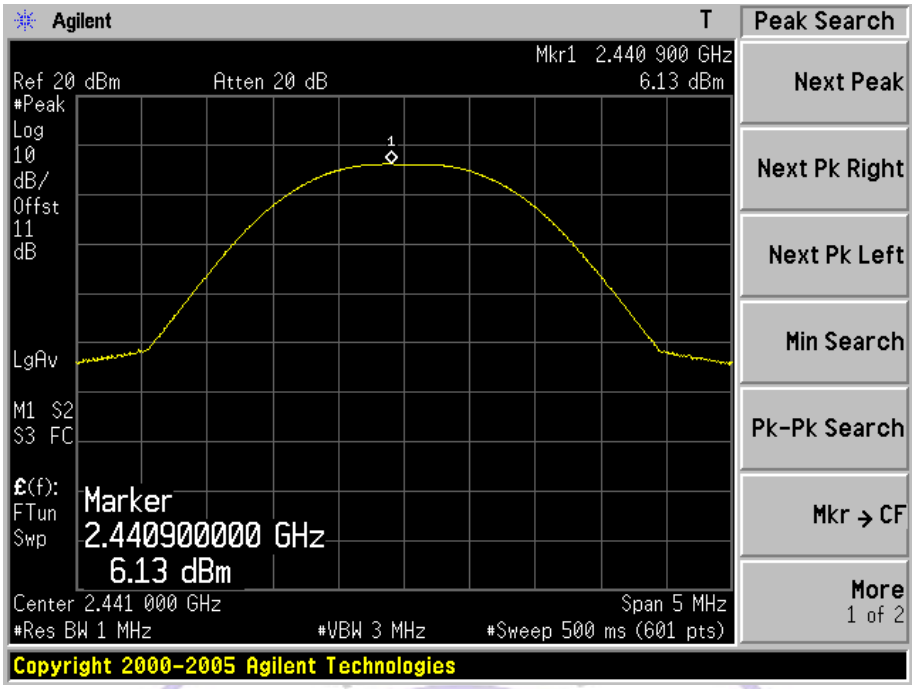
Channel Frequency (MHz)	Peak Power Output (dBm)	Peak Power Limit (dBm)	Pass / Fail
2402	6.20	30	PASS
2441	6.13	30	PASS
2480	7.36	30	PASS

Note: The test results including the cable lose.

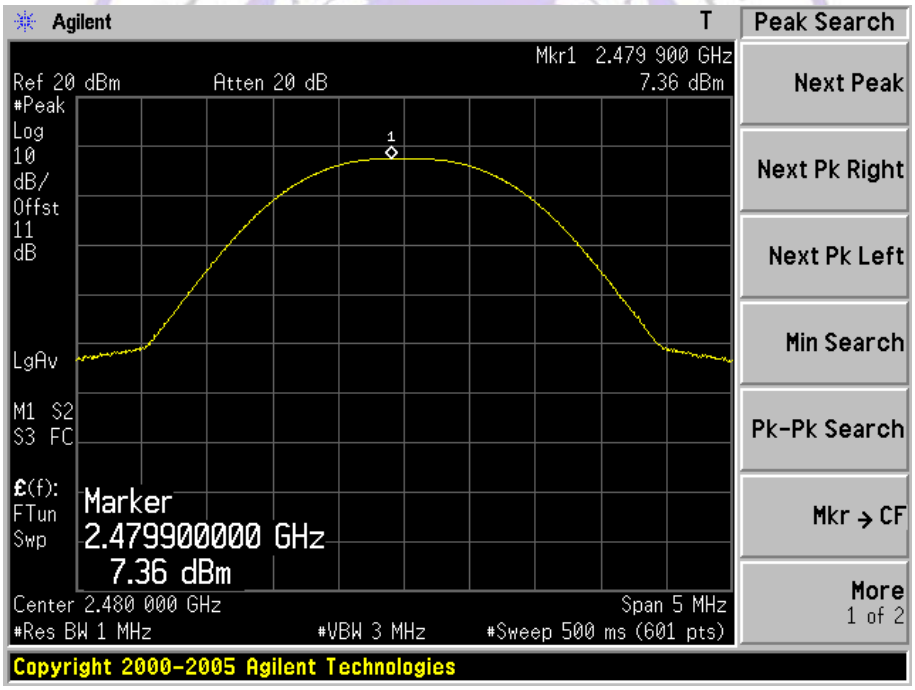
Low channel



Middle channel



High channel

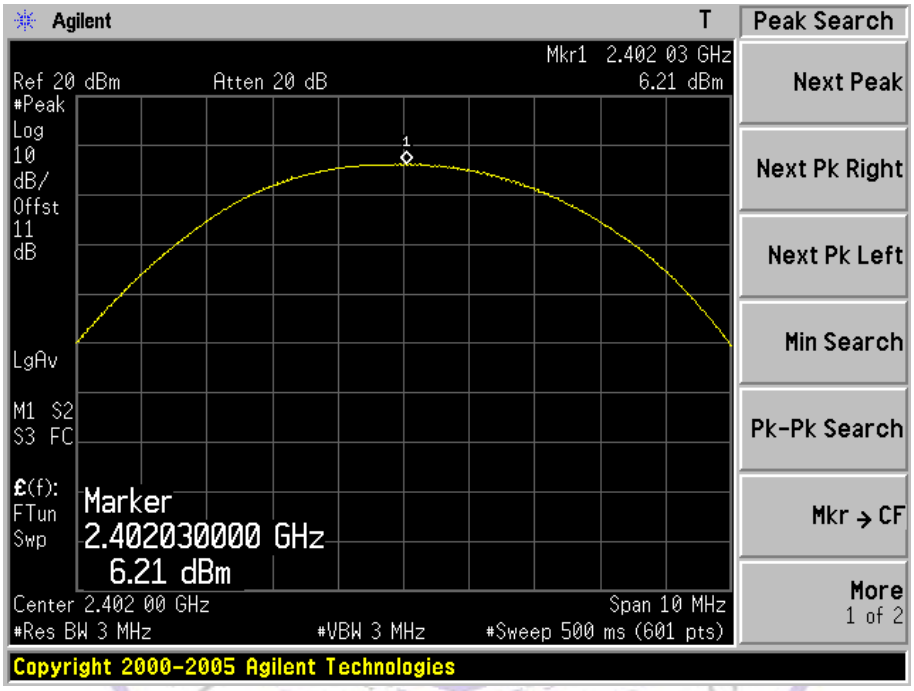


2DH5 Mode:

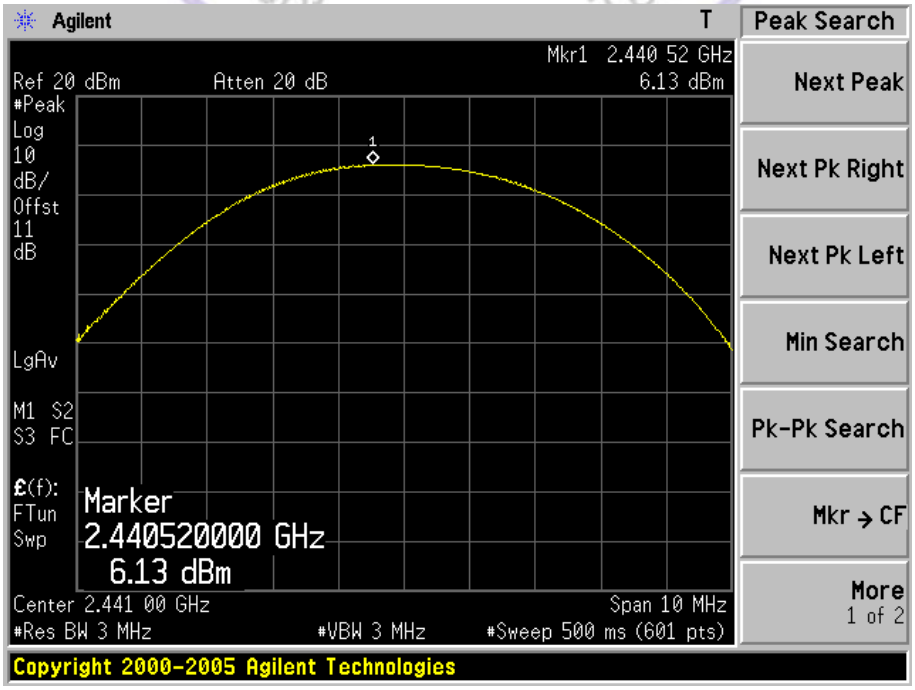
Channel Frequency (MHz)	Peak Power Output (dBm)	Peak Power Limit (dBm)	Pass / Fail
2402	6.21	30	PASS
2441	6.13	30	PASS
2480	7.17	30	PASS

Note: The test results including the cable lose.

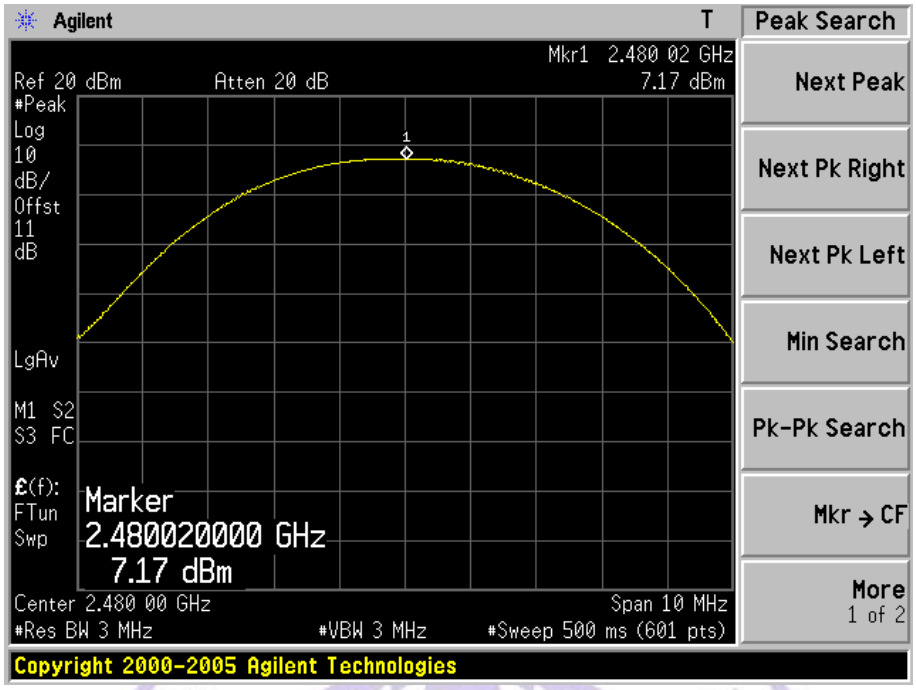
Low channel



Middle channel



High channel

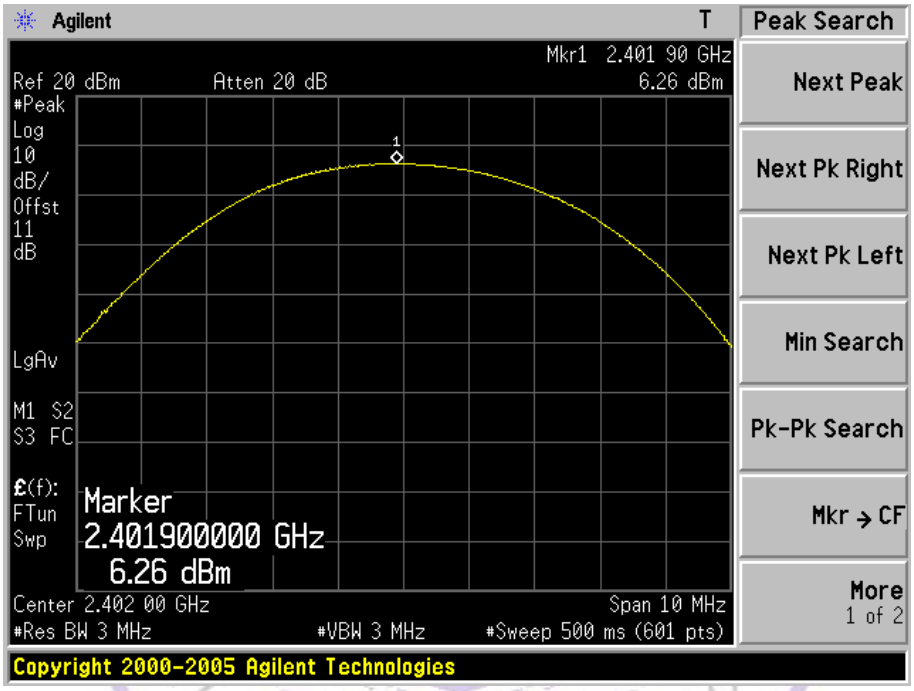


3DH5 Mode:

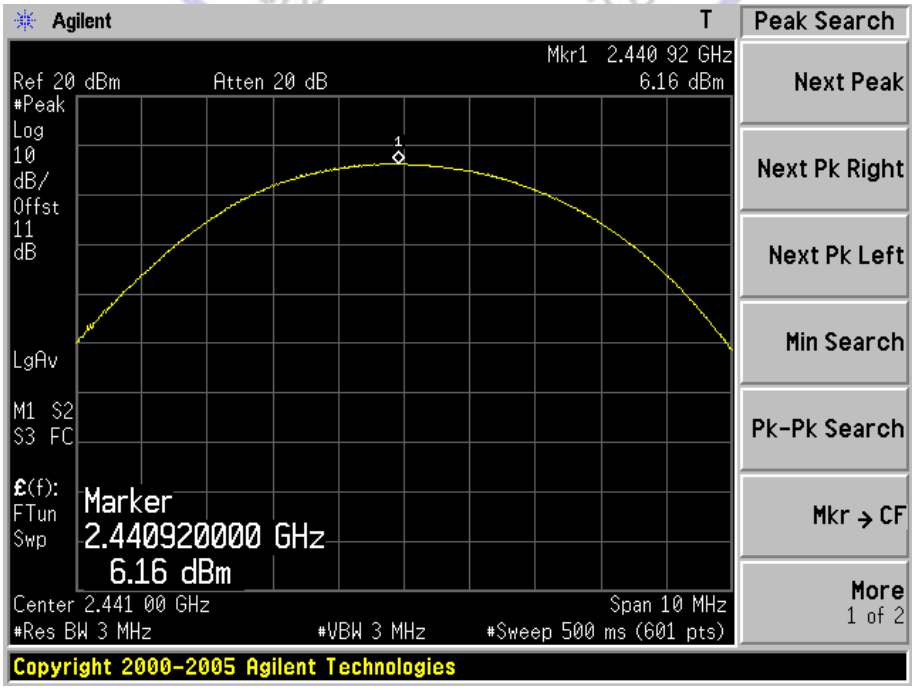
Channel Frequency (MHz)	Peak Power Output (dBm)	Peak Power Limit (dBm)	Pass / Fail
2402	6.26	30	PASS
2441	6.16	30	PASS
2480	7.39	30	PASS

Note: The test results including the cable lose.

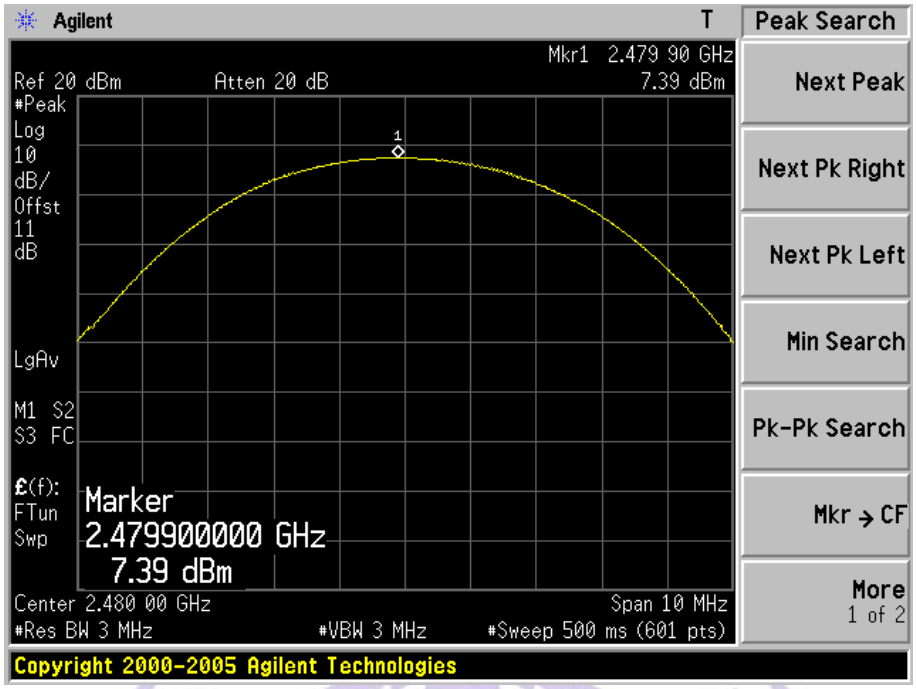
Low channel



Middle channel

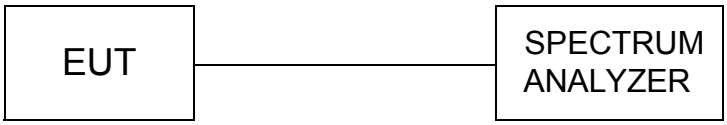


High channel



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

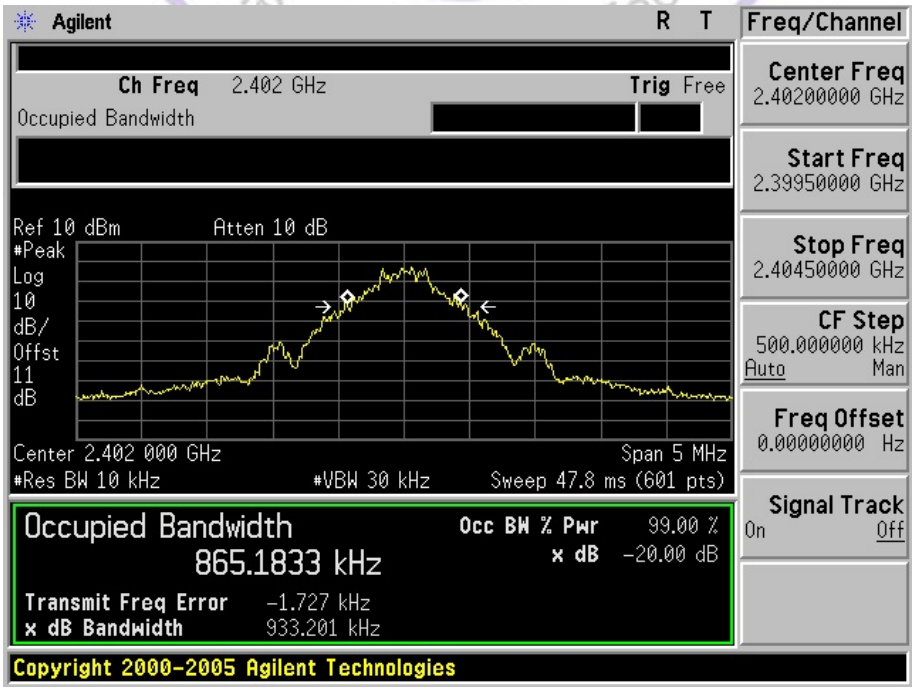
For frequency hopping systems operating in the 2400MHz-2483.5MHz no limit for 20dB bandwith.

TEST RESULTS

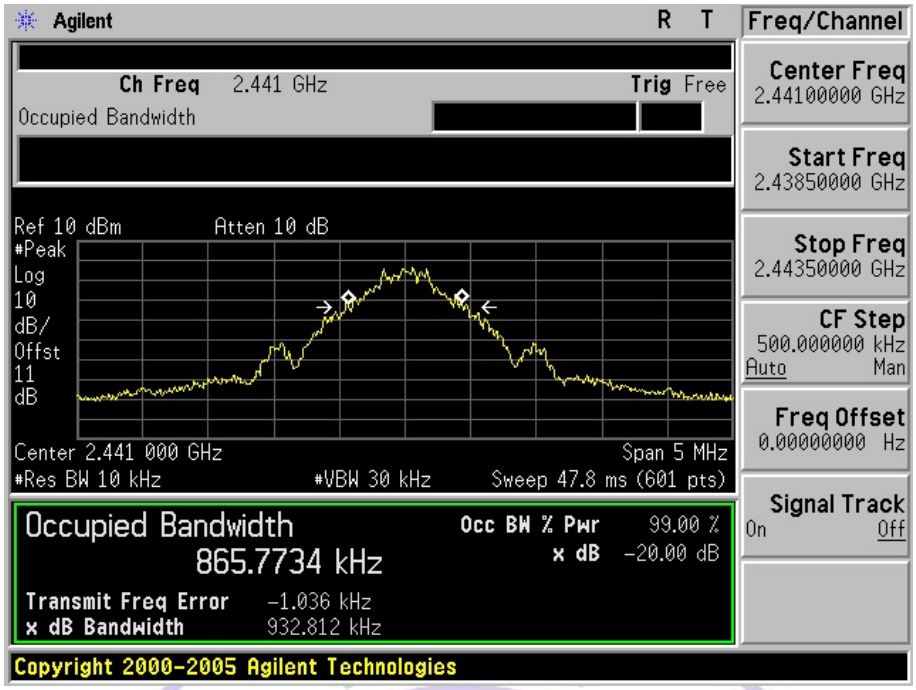
DH5 Mode:

CHANNEL FREQUENCY (MHz)	20dB BANDWIDTH (MHz)	LIMIT (MHz)	PASS/FAIL
2402	0.934	/	PASS
2441	0.933	/	PASS
2480	0.933	/	PASS

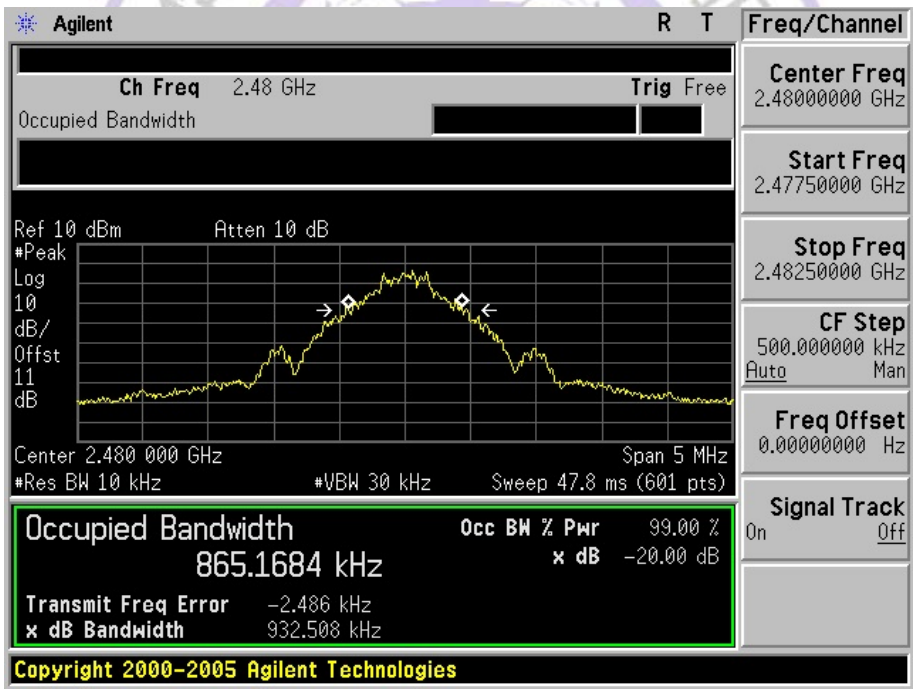
Low Channel



Middle Channel



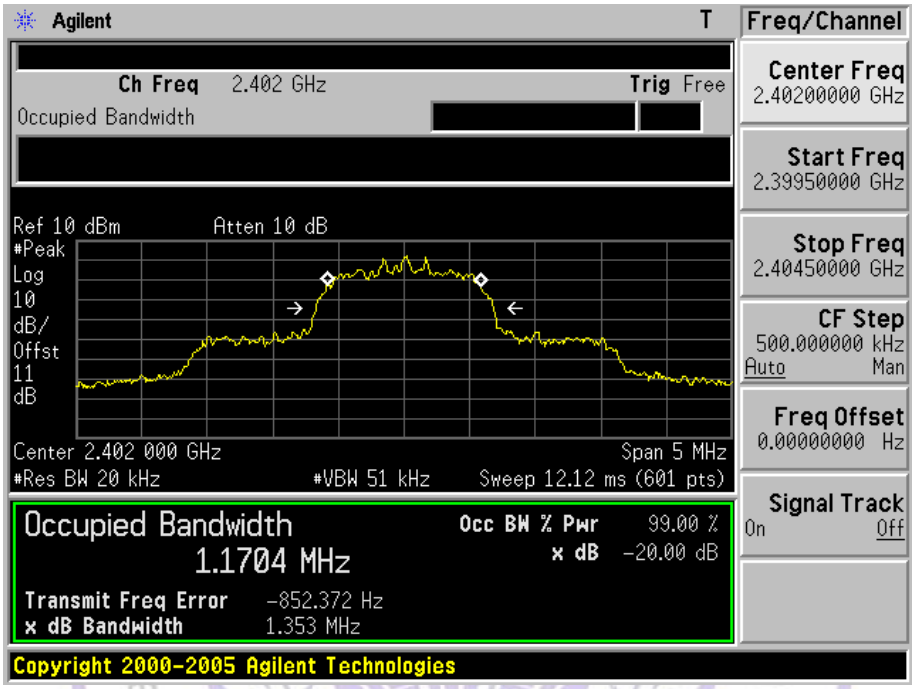
High Channel



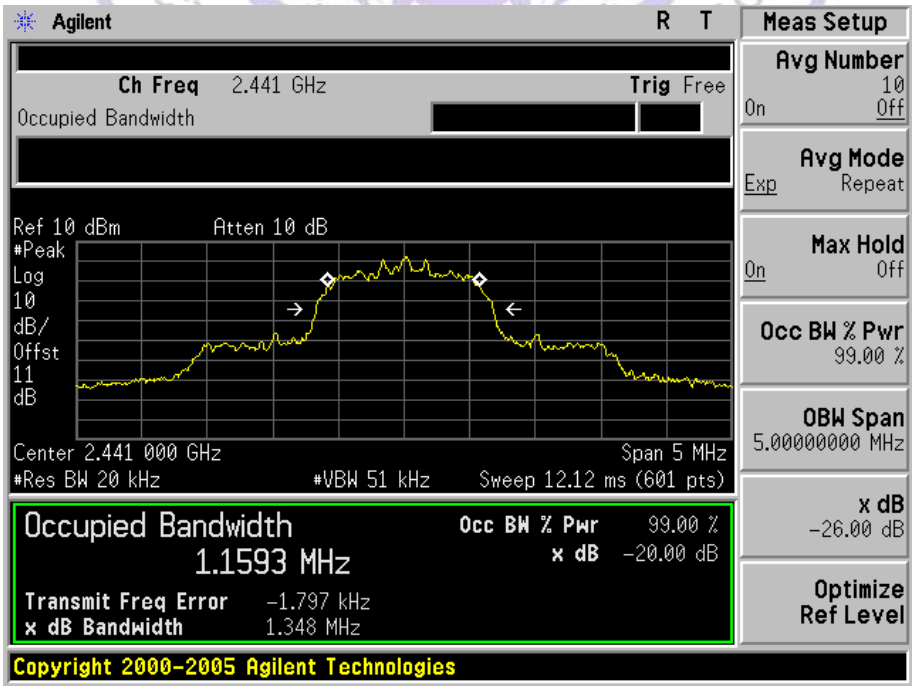
2DH5 Mode:

CHANNEL FREQUENCY (MHz)	20dB BANDWIDTH (MHz)	LIMIT (MHz)	PASS/FAIL
2402	1.353	/	PASS
2441	1.348	/	PASS
2480	1.349	/	PASS

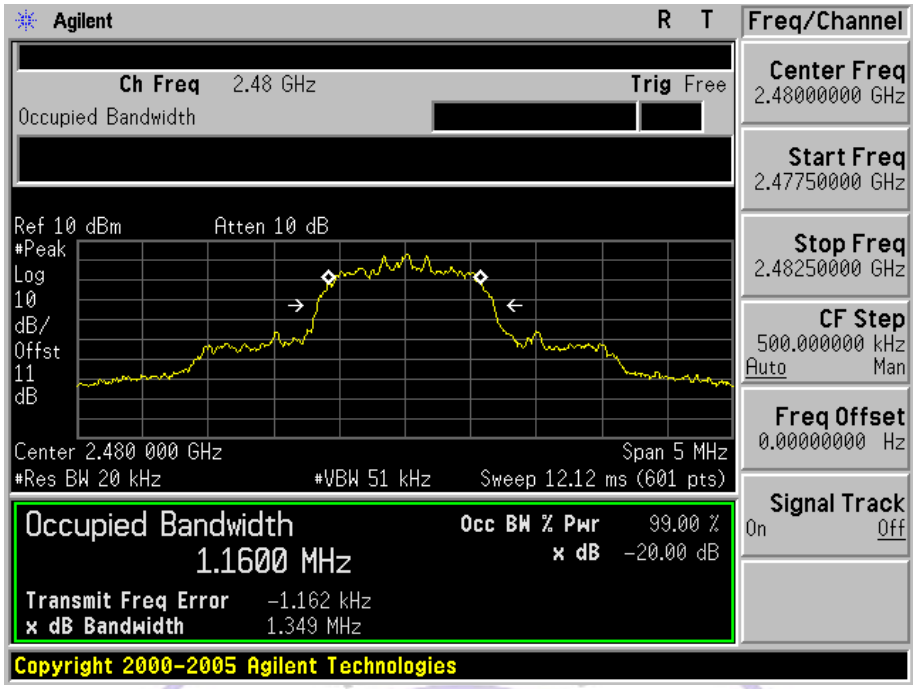
Low Channel



Middle Channel



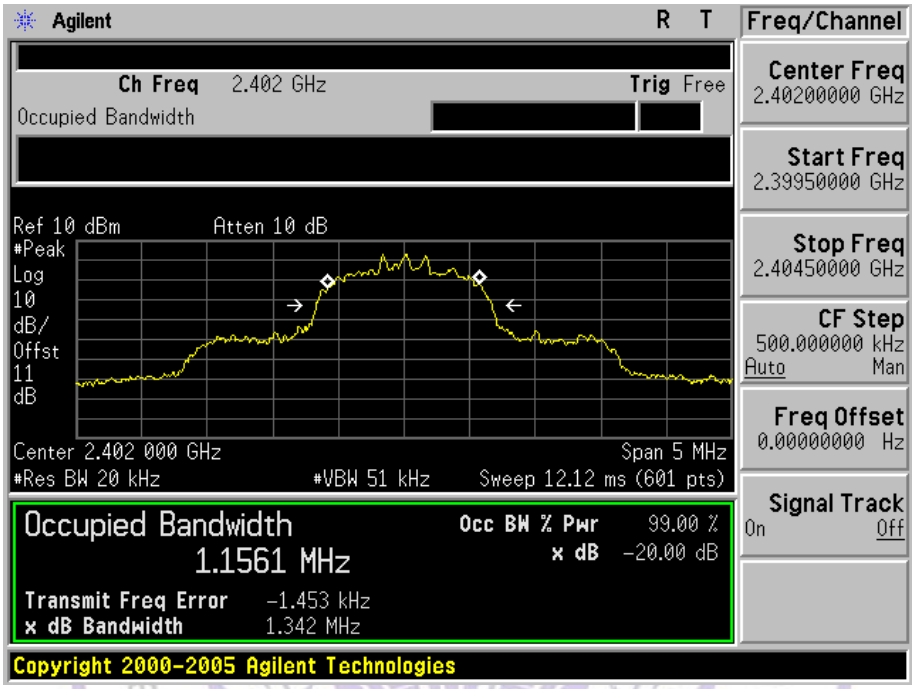
High Channel



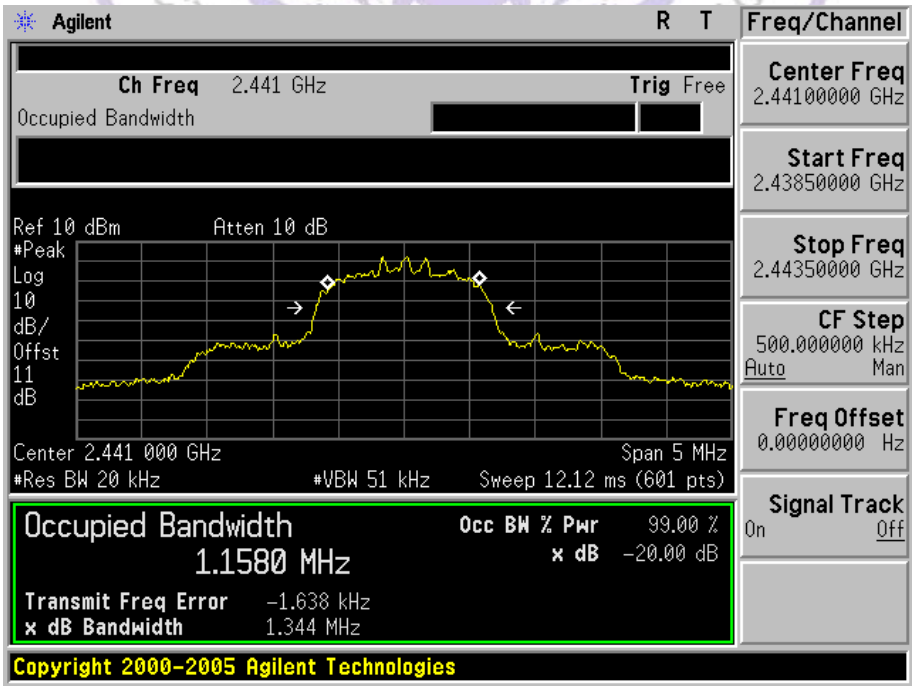
3DH5 Mode:

CHANNEL FREQUENCY (MHz)	20dB BANDWIDTH (MHz)	LIMIT (MHz)	PASS/FAIL
2402	1.342	/	PASS
2441	1.344	/	PASS
2480	1.337	/	PASS

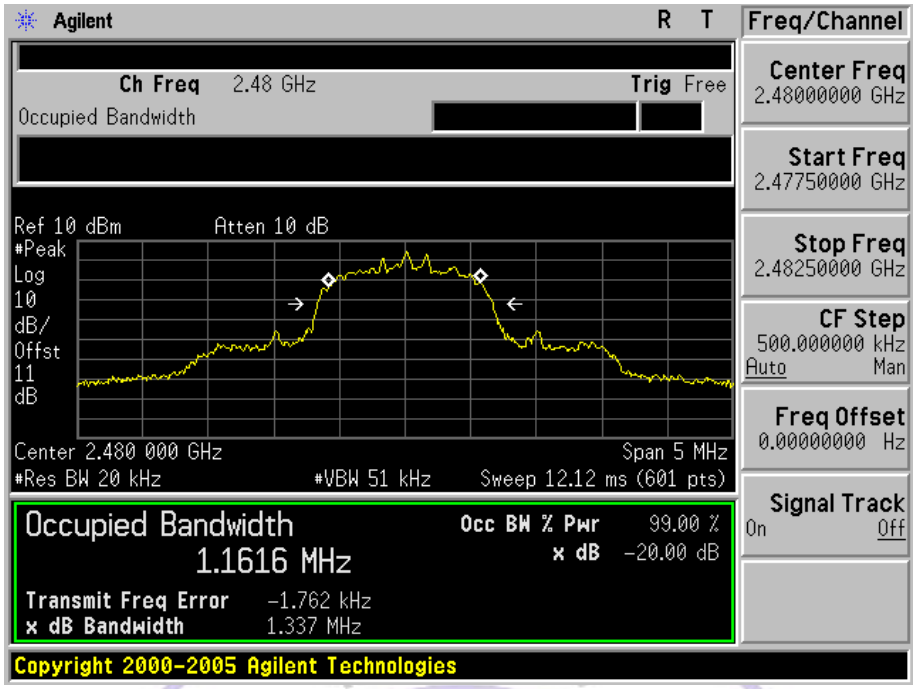
Low Channel



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)).

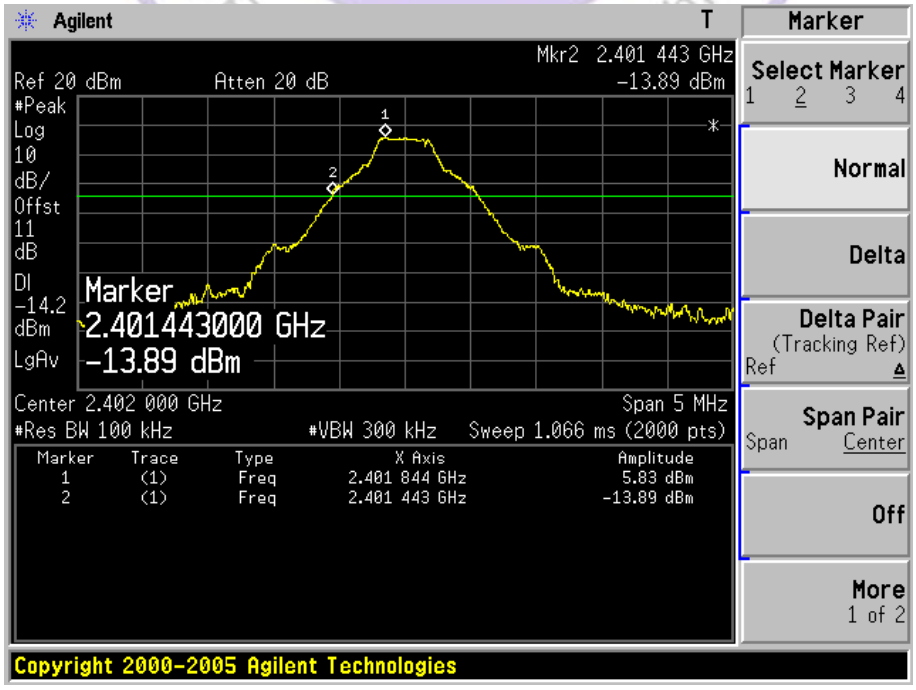
TEST PROCEDURE

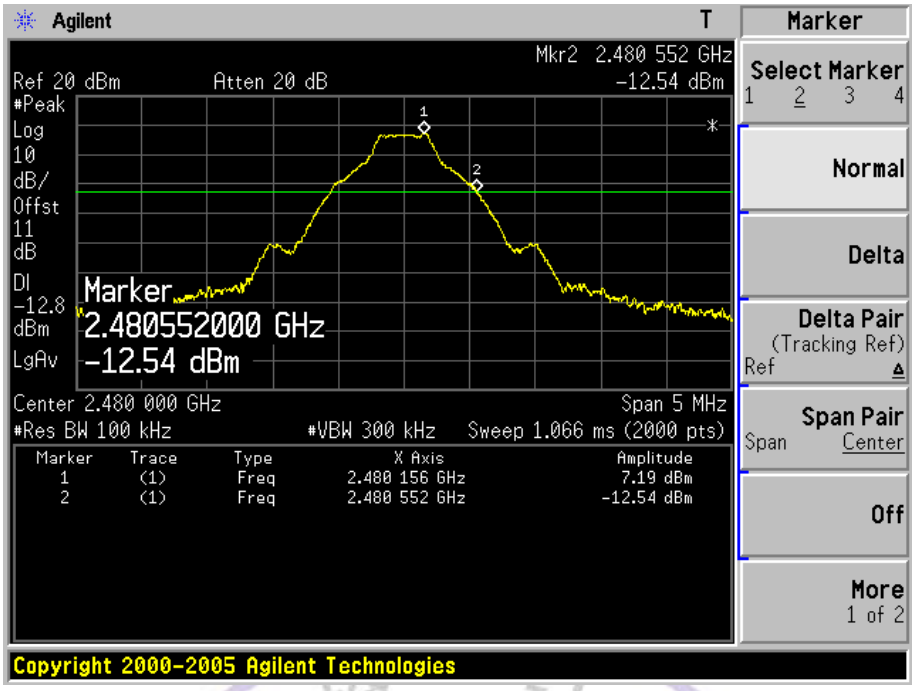
According to ANSI C63.10: 2009.
Use the following spectrum analyzer settings:
Span = wide enough to capture the peak level of the emission operating on the channel closest to the bandedge, as well as any modulation products which fall outside of the authorized band of operation.
RBW ≧ 1% of the span
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

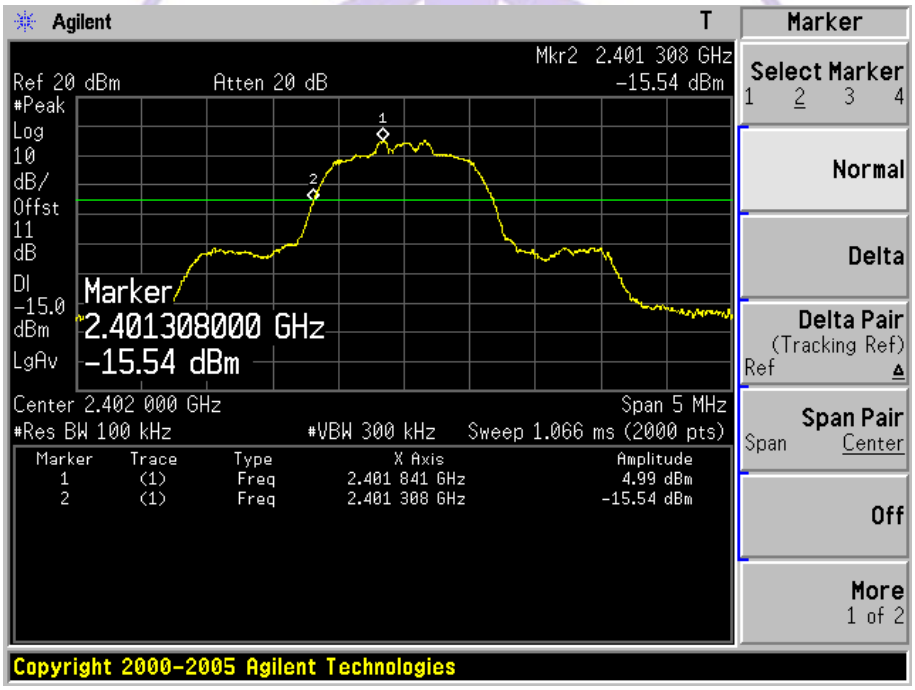
Conducted Test:

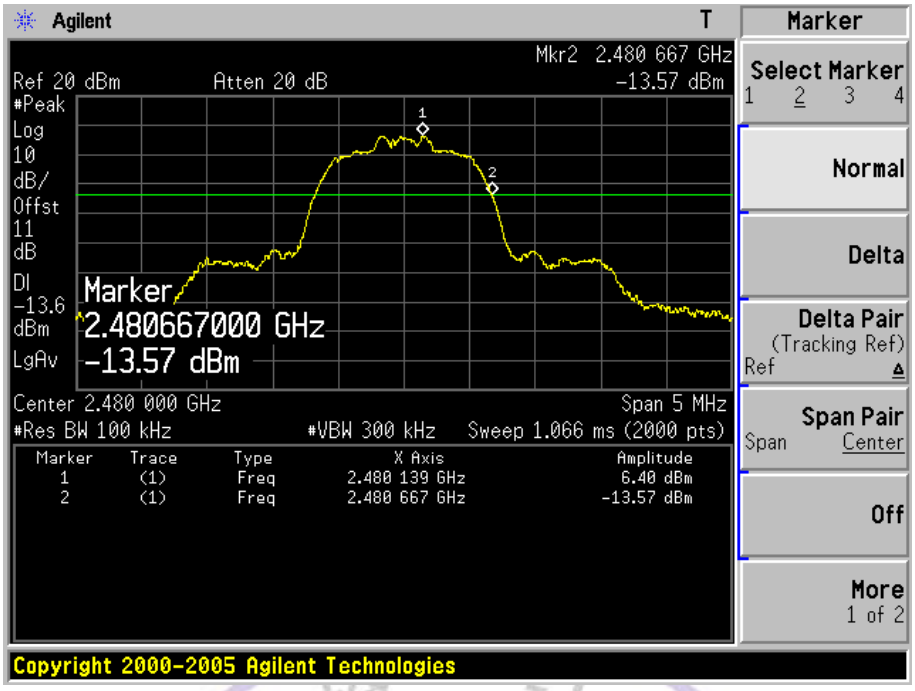
DH5 Mode



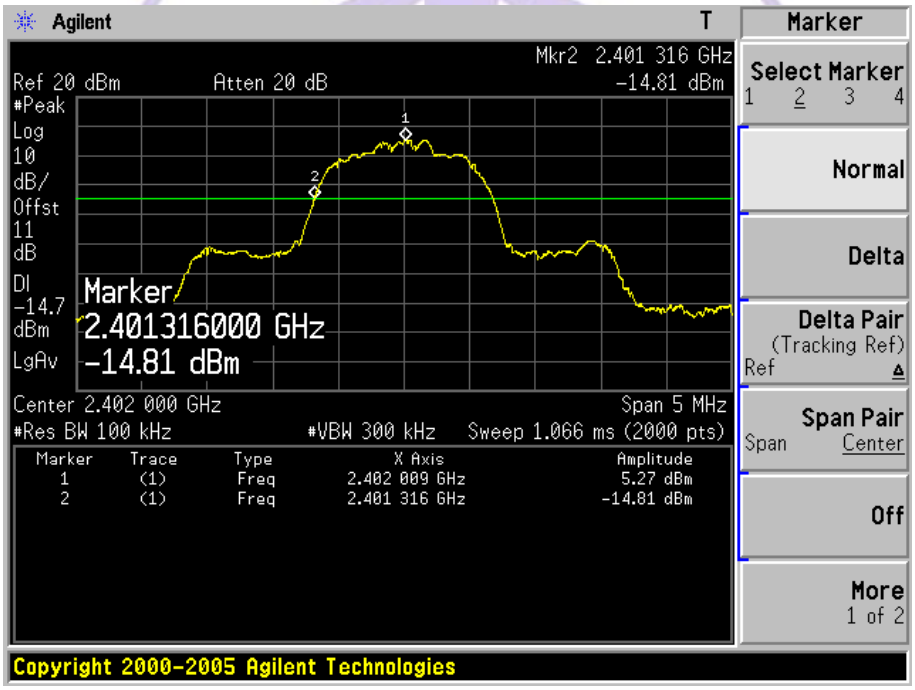

Agilent
T
Marker
Mkr2 2.480 552 GHz
Ref 20 dBm
Atten 20 dB
-12.54 dBm
#Peak
Log
10
dB/
Offst
11
dB
Dl
-12.8
dBm
LgAv
Marker
2.480552000 GHz
-12.54 dBm
Center 2.480 000 GHz
Span 5 MHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 1.066 ms (2000 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 2.480 156 GHz 7.19 dBm
2 (1) Freq 2.480 552 GHz -12.54 dBm
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref
Span Pair
Span Center
Off
More
1 of 2
Copyright 2000-2005 Agilent Technologies

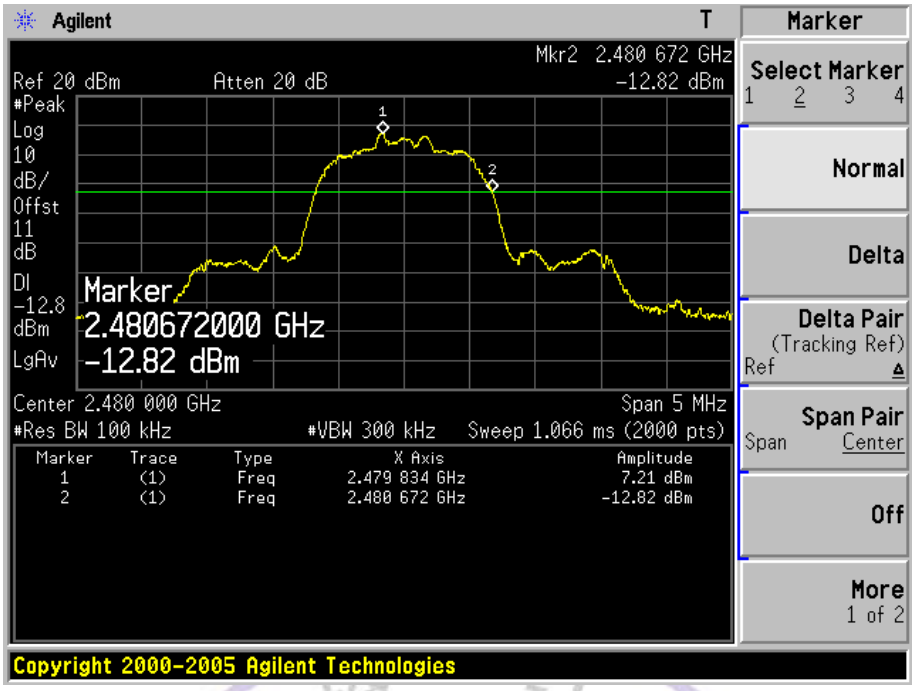
2DH5 Mode


Agilent
T
Marker
Mkr2 2.401 308 GHz
Ref 20 dBm
Atten 20 dB
-15.54 dBm
#Peak
Log
10
dB/
Offst
11
dB
Dl
-15.0
dBm
LgAv
Marker
2.401308000 GHz
-15.54 dBm
Center 2.402 000 GHz
Span 5 MHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 1.066 ms (2000 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 2.401 841 GHz 4.99 dBm
2 (1) Freq 2.401 308 GHz -15.54 dBm
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref
Span Pair
Span Center
Off
More
1 of 2
Copyright 2000-2005 Agilent Technologies

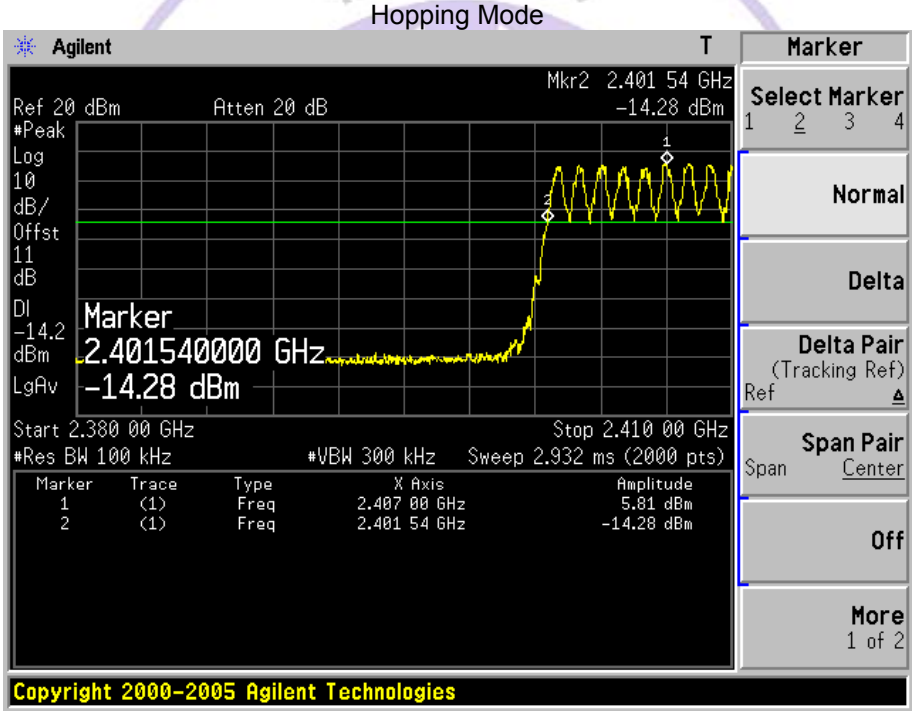

Agilent
T
Marker
Mkr2 2.480 667 GHz
Ref 20 dBm
Atten 20 dB
-13.57 dBm
#Peak
Log
10
dB/
Offst
11
dB
Dl
-13.6
dBm
LgAv
Marker
2.480667000 GHz
-13.57 dBm
Center 2.480 000 GHz
Span 5 MHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 1.066 ms (2000 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 2.480 139 GHz 6.40 dBm
2 (1) Freq 2.480 667 GHz -13.57 dBm
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref
Span Pair
Span Center
Off
More
1 of 2
Copyright 2000-2005 Agilent Technologies

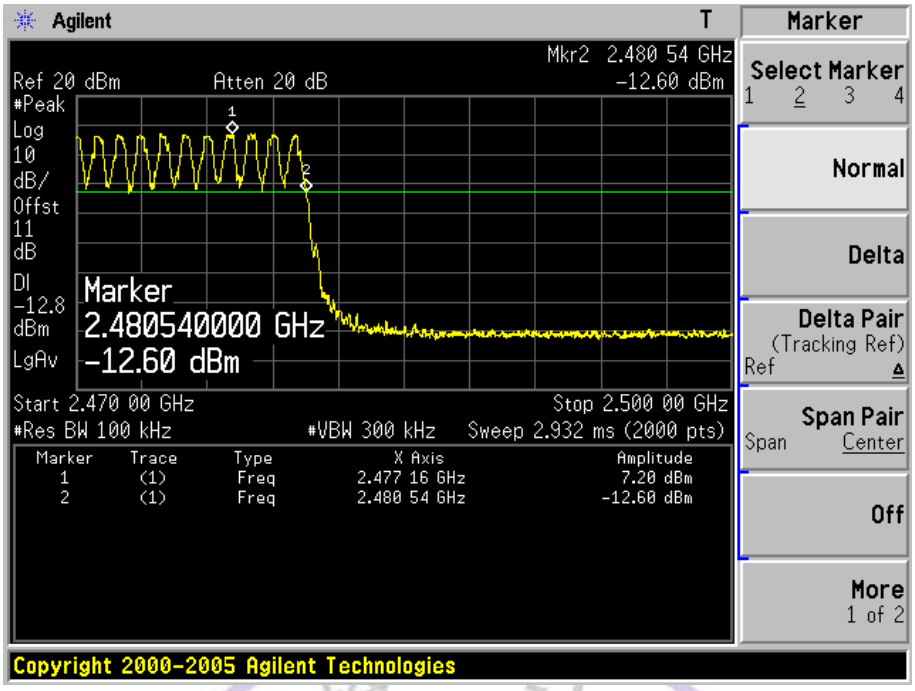
3DH5 Mode


Agilent
T
Marker
Mkr2 2.401 316 GHz
Ref 20 dBm
Atten 20 dB
-14.81 dBm
#Peak
Log
10
dB/
Offst
11
dB
Dl
-14.7
dBm
LgAv
Marker
2.401316000 GHz
-14.81 dBm
Center 2.402 000 GHz
Span 5 MHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 1.066 ms (2000 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 2.402 009 GHz 5.27 dBm
2 (1) Freq 2.401 316 GHz -14.81 dBm
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref
Span Pair
Span Center
Off
More
1 of 2
Copyright 2000-2005 Agilent Technologies



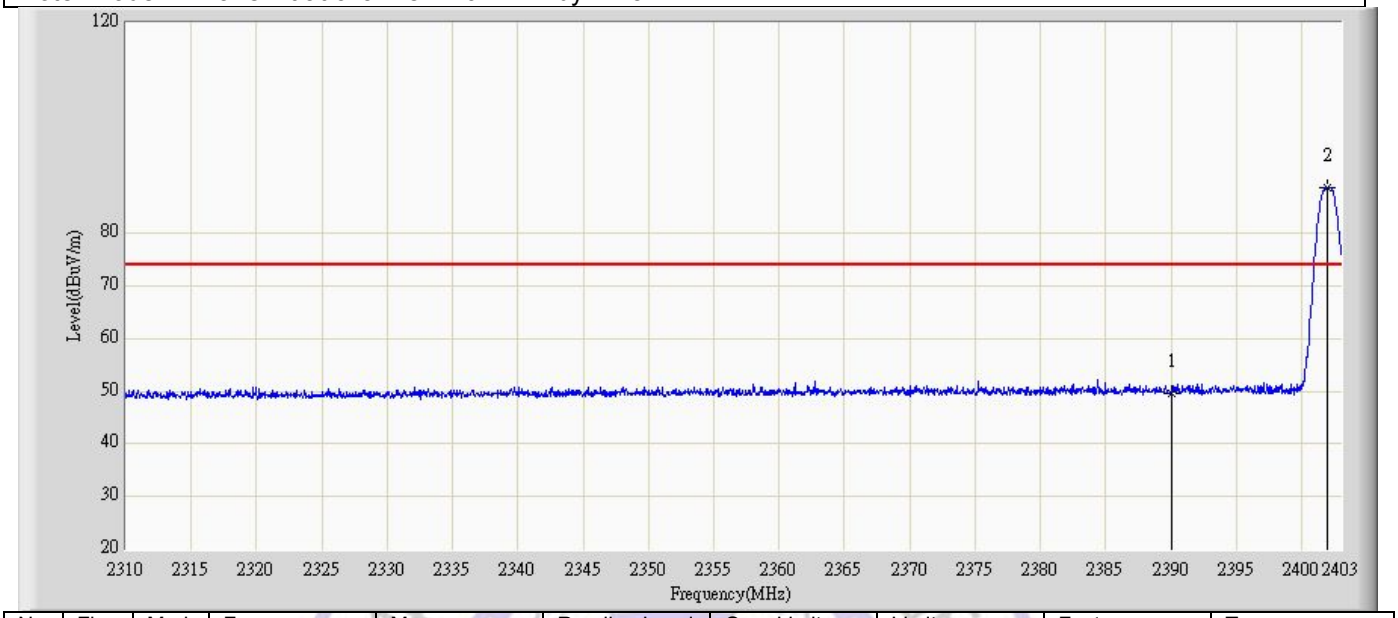
Hopping Mode





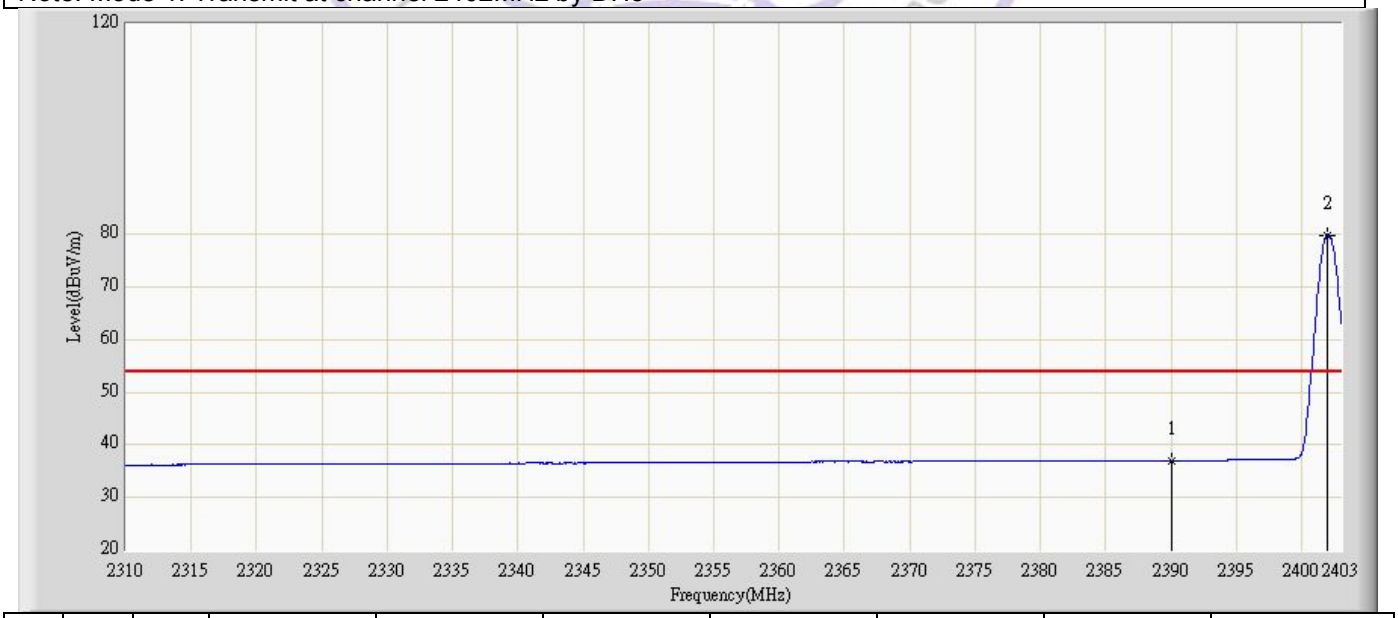
Radiated Test:

Engineer: Jack	
Site: AC5	Time: 2013/06/05 - 13:25
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Horizontal
EUT: Smartphone	Power: By Battery
Note: Mode 1: Transmit at channel 2402MHz by DH5	



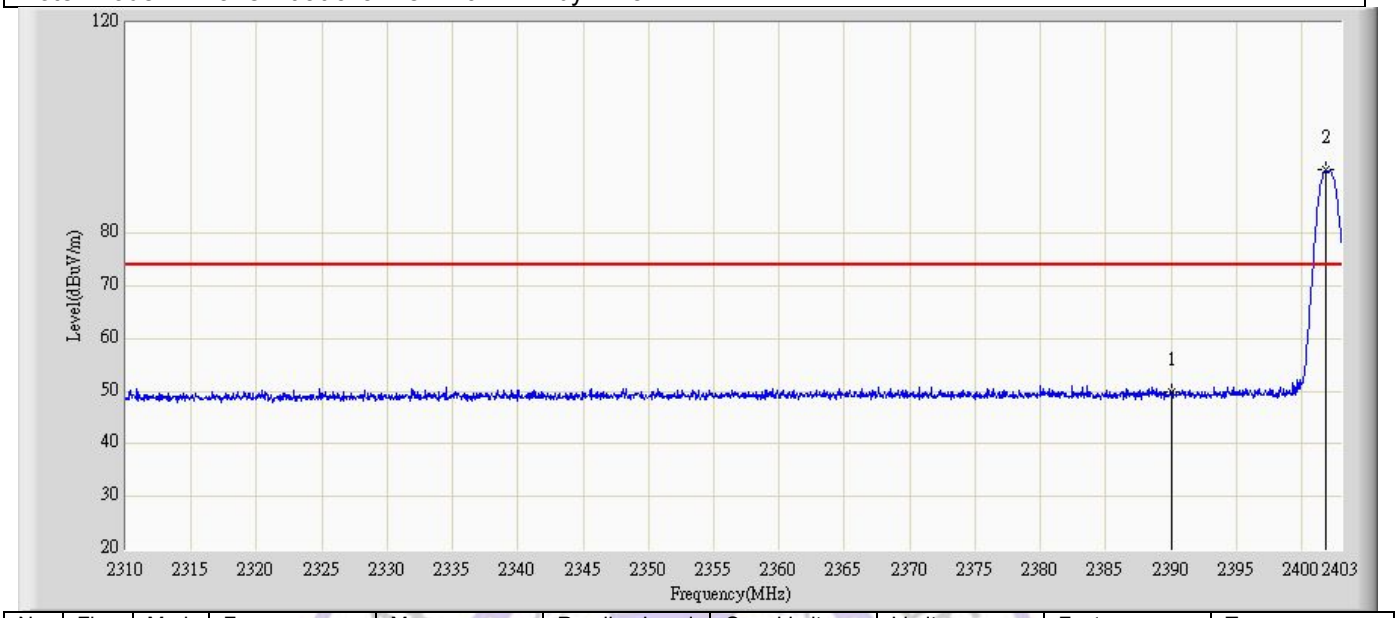
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1			2390.000	49.517	13.216	-24.483	74.000	36.302	PK
2		*	2401.930	88.628	52.229	N/A	N/A	36.400	PK

Engineer: Jack	
Site: AC5	Time: 2013/06/05 - 13:41
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Horizontal
EUT: Smartphone	Power: By Battery
Note: Mode 1: Transmit at channel 2402MHz by DH5	



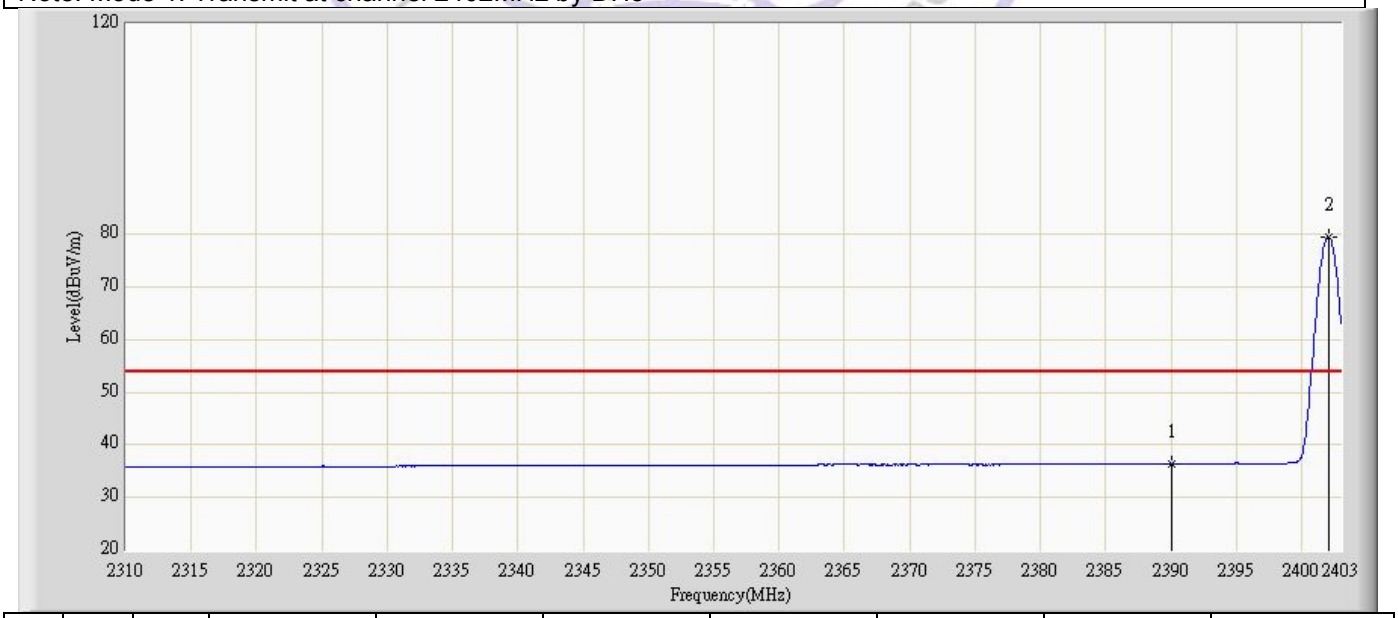
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1			2390.000	37.000	0.699	-17.000	54.000	36.302	AV
2		*	2401.930	79.837	43.438	N/A	N/A	36.400	AV

Engineer: Jack	
Site: AC5	Time: 2013/06/05 - 13:44
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Vertical
EUT: Smartphone	Power: By Battery
Note: Mode 1: Transmit at channel 2402MHz by DH5	



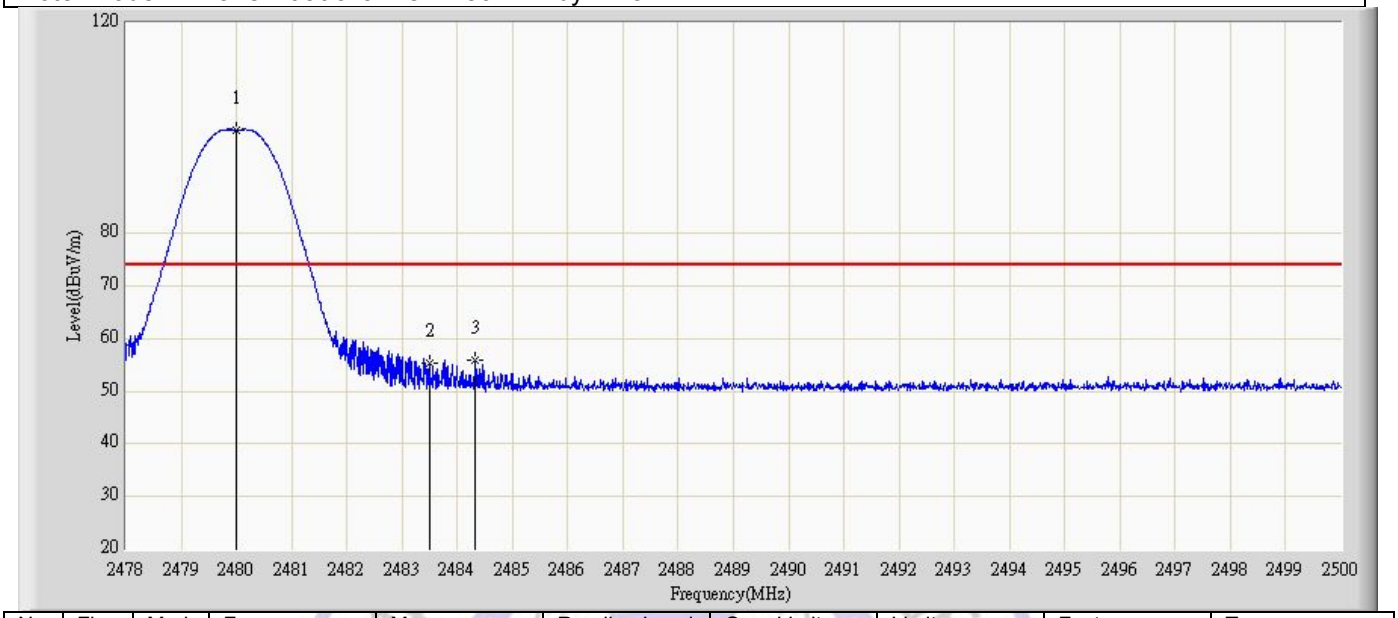
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1			2390.000	49.771	14.130	-24.229	74.000	35.642	PK
2		*	2401.837	92.187	56.496	N/A	N/A	35.692	PK

Engineer: Jack	
Site: AC5	Time: 2013/06/05 - 13:47
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Vertical
EUT: Smartphone	Power: By Battery
Note: Mode 1: Transmit at channel 2402MHz by DH5	



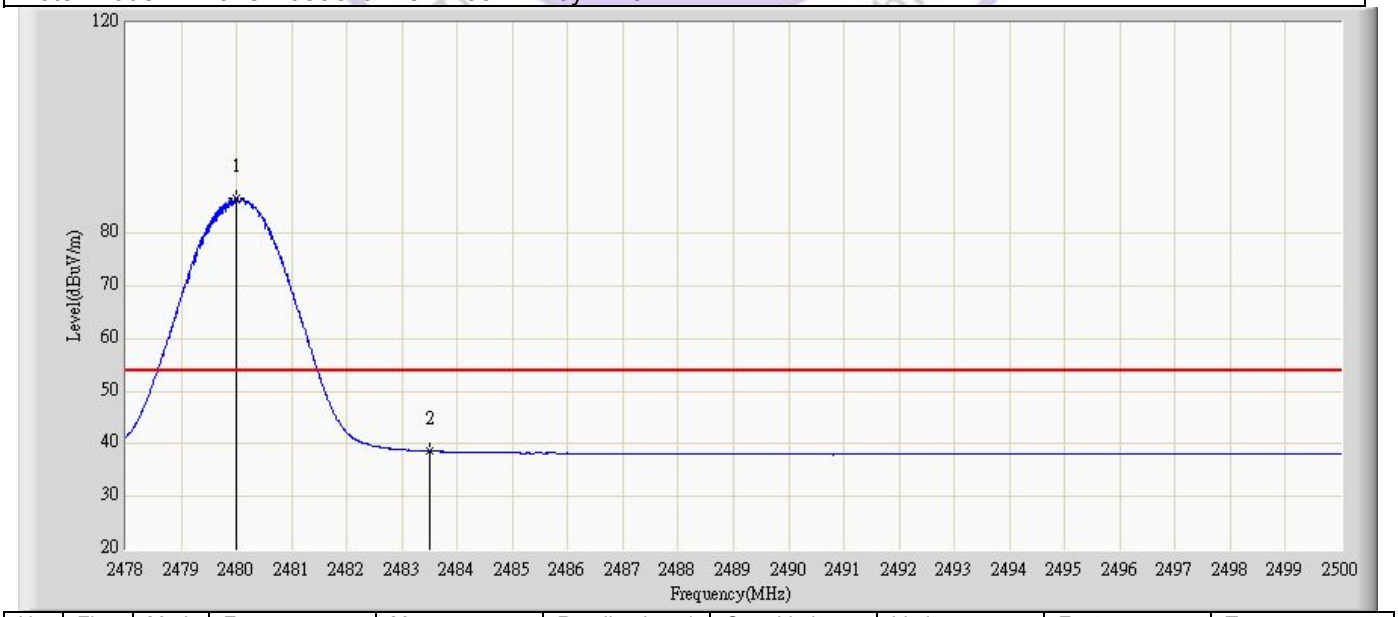
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1			2390.000	36.335	0.694	-17.665	54.000	35.642	AV
2		*	2402.070	79.603	43.911	N/A	N/A	35.692	AV

Engineer: Jack	
Site: AC5	Time: 2013/06/05 - 13:52
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Horizontal
EUT: Smartphone	Power: By Battery
Note: Mode 1: Transmit at channel 2480MHz by DH5	



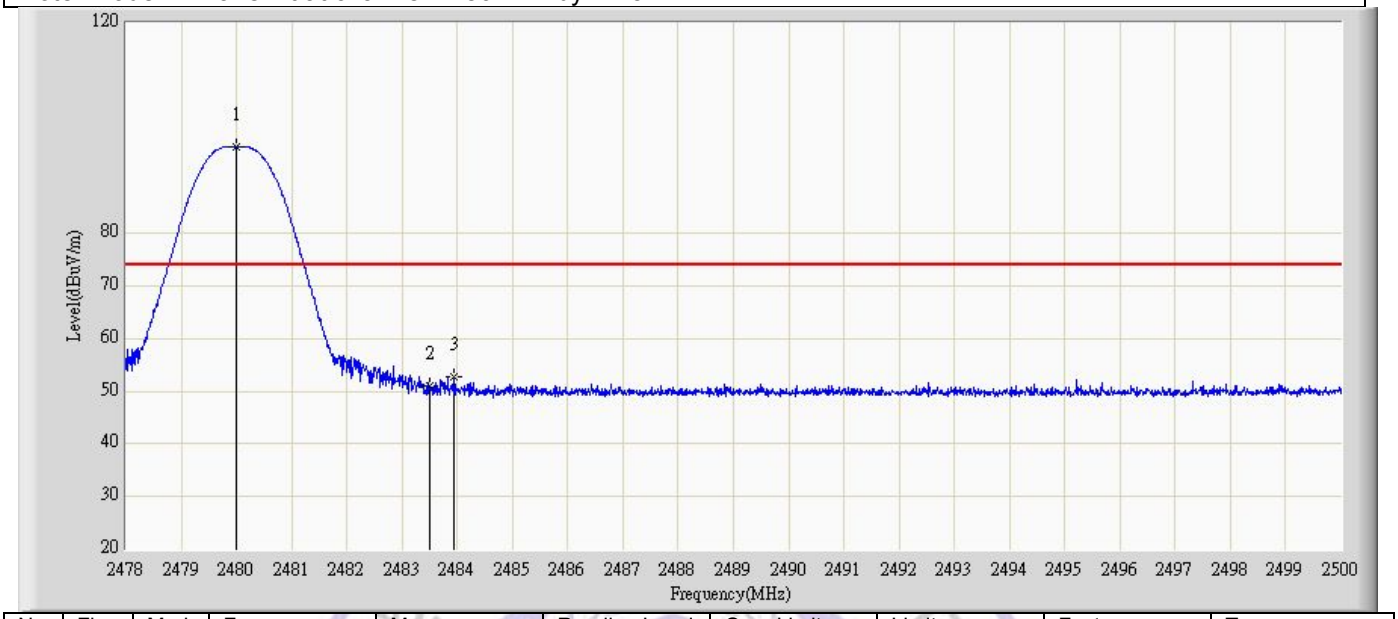
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1		*	2480.002	99.672	62.613	N/A	N/A	37.059	PK
2			2483.500	55.339	18.249	-18.661	74.000	37.089	PK
3			2484.325	55.989	18.892	-18.011	74.000	37.097	PK

Engineer: Jack	
Site: AC5	Time: 2013/06/05 - 13:57
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Horizontal
EUT: Smartphone	Power: By Battery
Note: Mode 1: Transmit at channel 2480MHz by DH5	



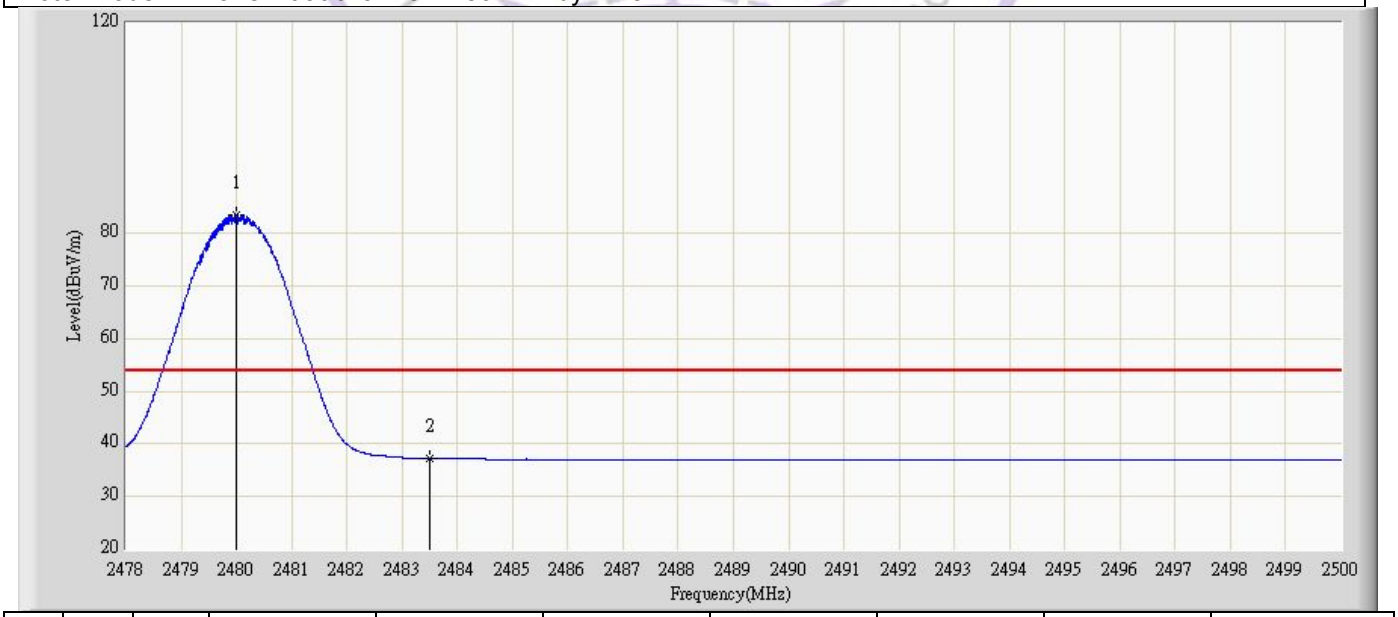
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1		*	2480.002	86.632	49.573	N/A	N/A	37.059	AV
2			2483.500	38.634	1.544	-15.366	54.000	37.089	AV

Engineer: Jack	
Site: AC5	Time: 2013/06/05 - 13:49
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Vertical
EUT: Smartphone	Power: By Battery
Note: Mode 1: Transmit at channel 2480MHz by DH5	



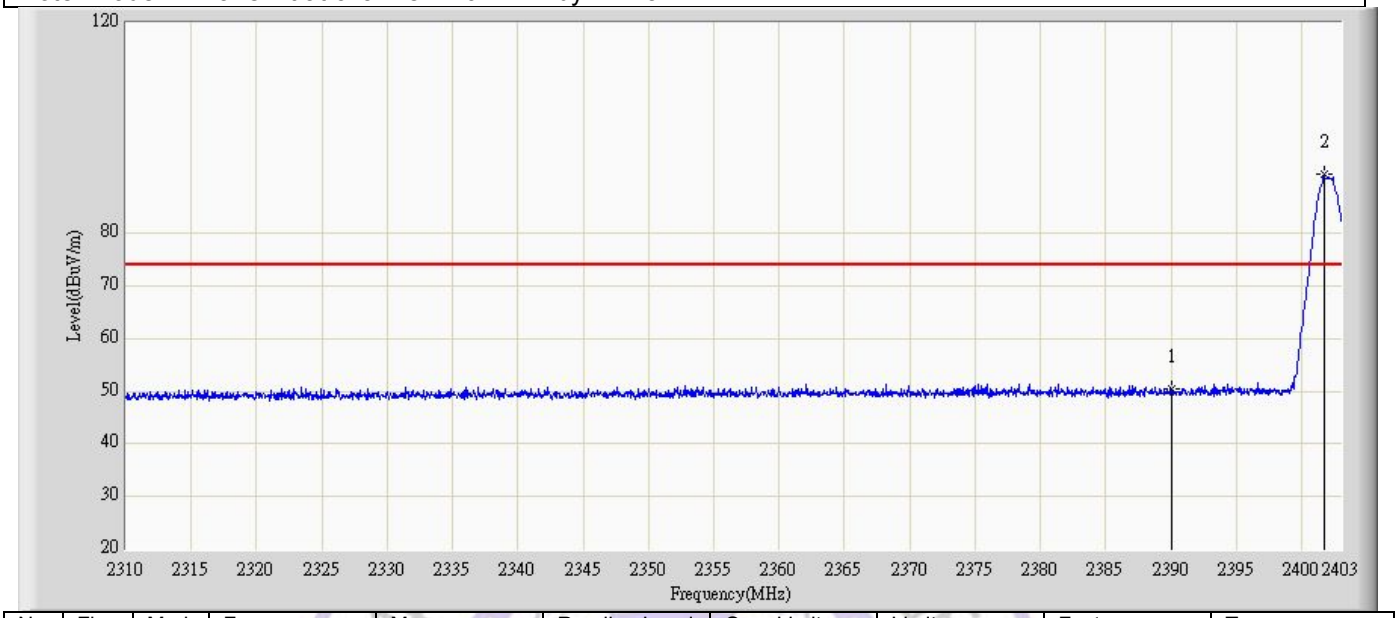
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1		*	2480.002	96.342	60.303	N/A	N/A	36.039	PK
2			2483.500	50.899	14.843	-23.101	74.000	36.055	PK
3			2483.929	52.848	16.790	-21.152	74.000	36.058	PK

Engineer: Jack	
Site: AC5	Time: 2013/06/05 - 13:52
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Vertical
EUT: Smartphone	Power: By Battery
Note: Mode 1: Transmit at channel 2480MHz by DH5	



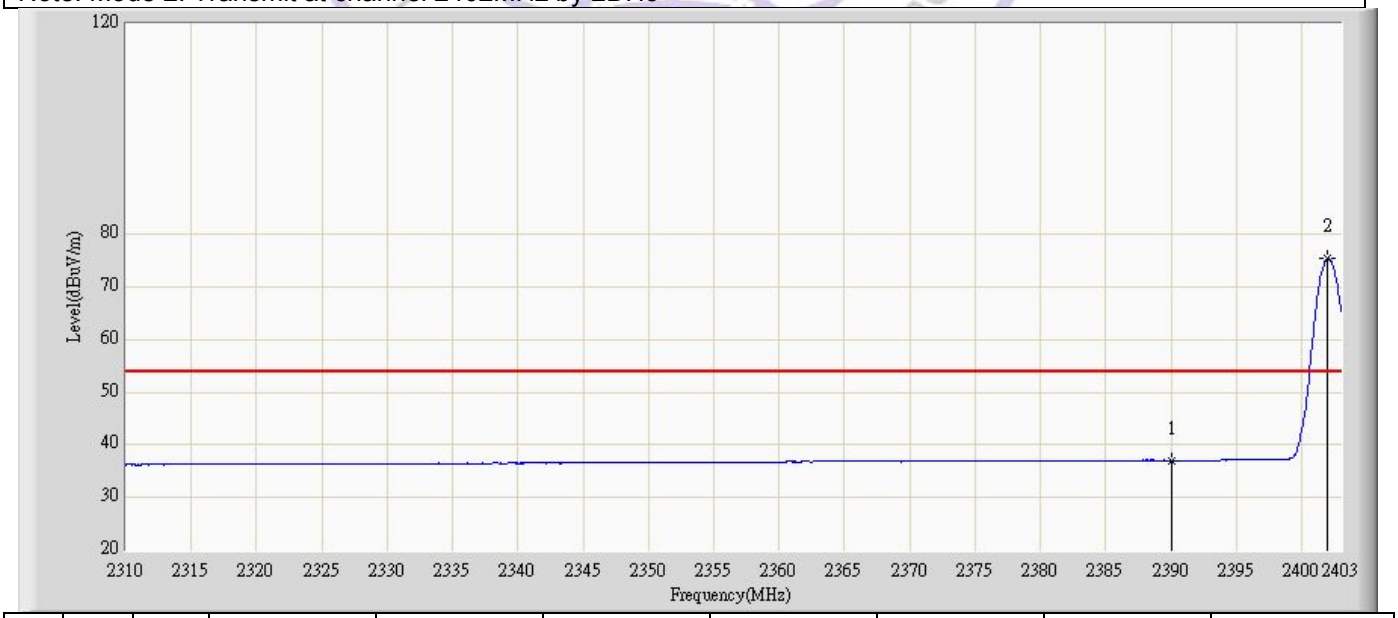
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1		*	2480.002	83.554	47.515	N/A	N/A	36.039	AV
2			2483.500	37.203	1.147	-16.797	54.000	36.055	AV

Engineer: Jack	
Site: AC5	Time: 2013/06/05 - 14:00
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Horizontal
EUT: Smartphone	Power: By Battery
Note: Mode 2: Transmit at channel 2402MHz by 2DH5	



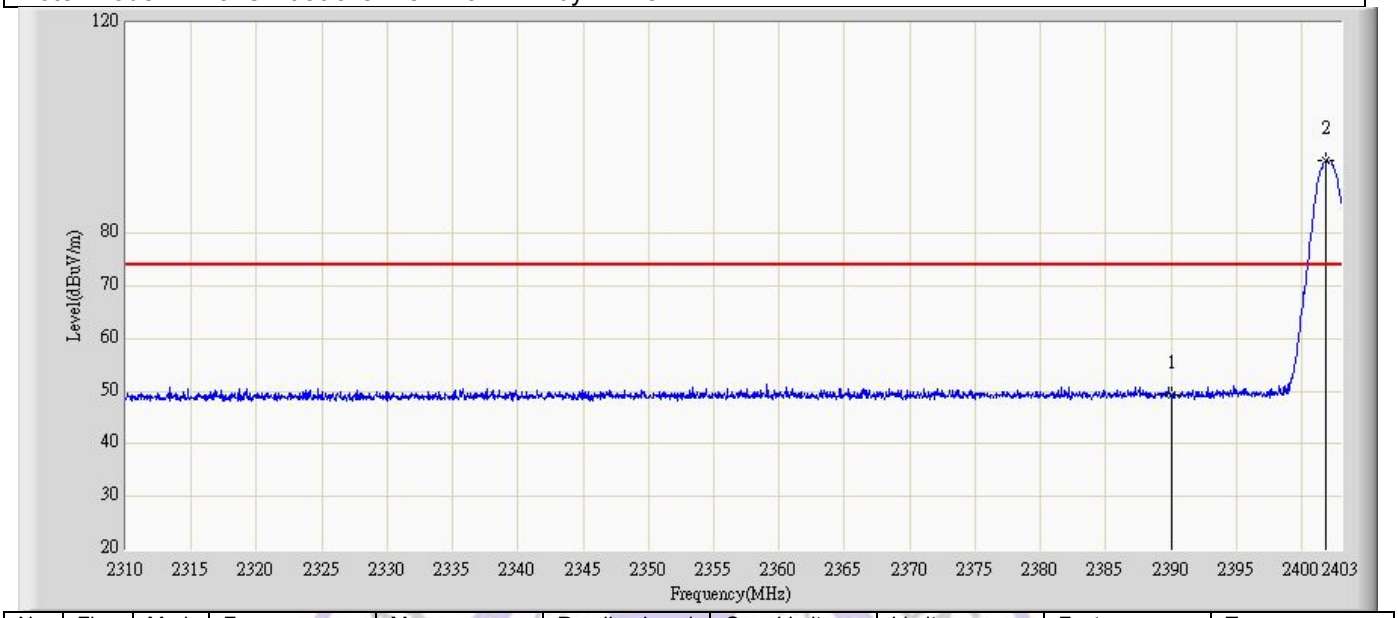
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1			2390.000	50.493	14.192	-23.507	74.000	36.302	PK
2		*	2401.698	91.333	54.936	N/A	N/A	36.398	PK

Engineer: Jack	
Site: AC5	Time: 2013/06/05 - 14:03
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Horizontal
EUT: Smartphone	Power: By Battery
Note: Mode 2: Transmit at channel 2402MHz by 2DH5	



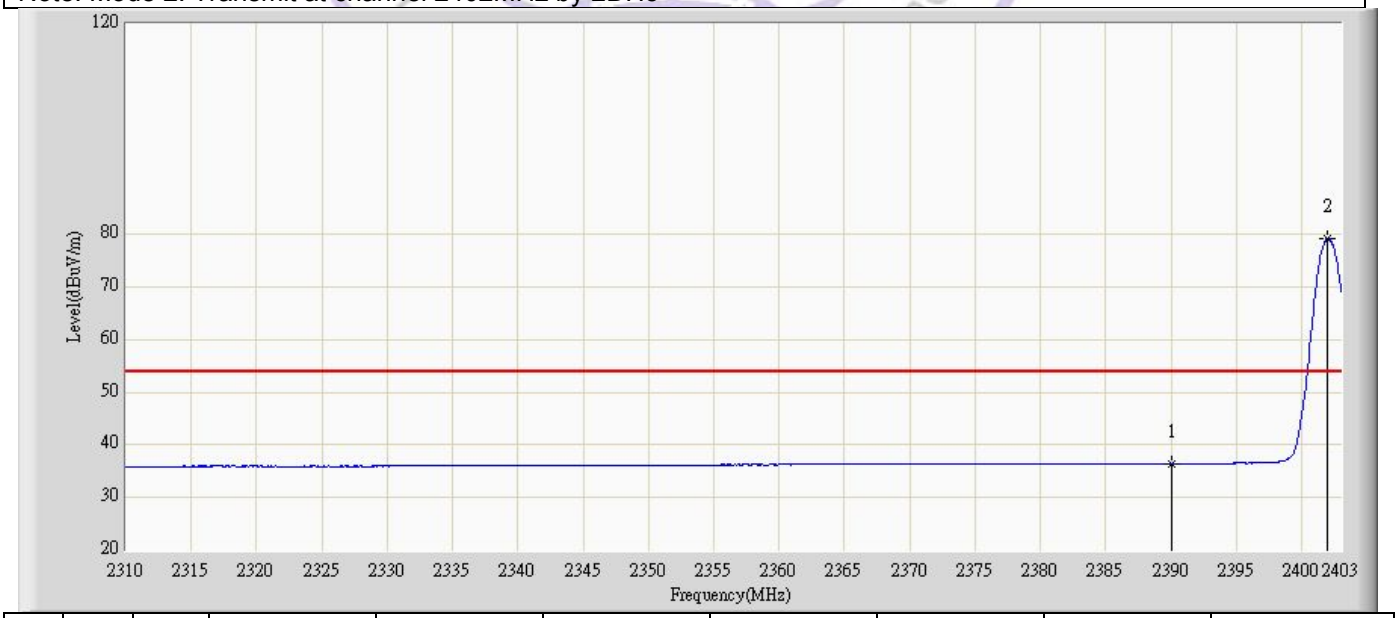
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1			2390.000	37.028	0.727	-16.972	54.000	36.302	AV
2		*	2401.930	75.319	38.920	N/A	N/A	36.400	AV

Engineer: Jack	
Site: AC5	Time: 2013/06/05 - 14:04
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Vertical
EUT: Smartphone	Power: By Battery
Note: Mode 2: Transmit at channel 2402MHz by 2DH5	



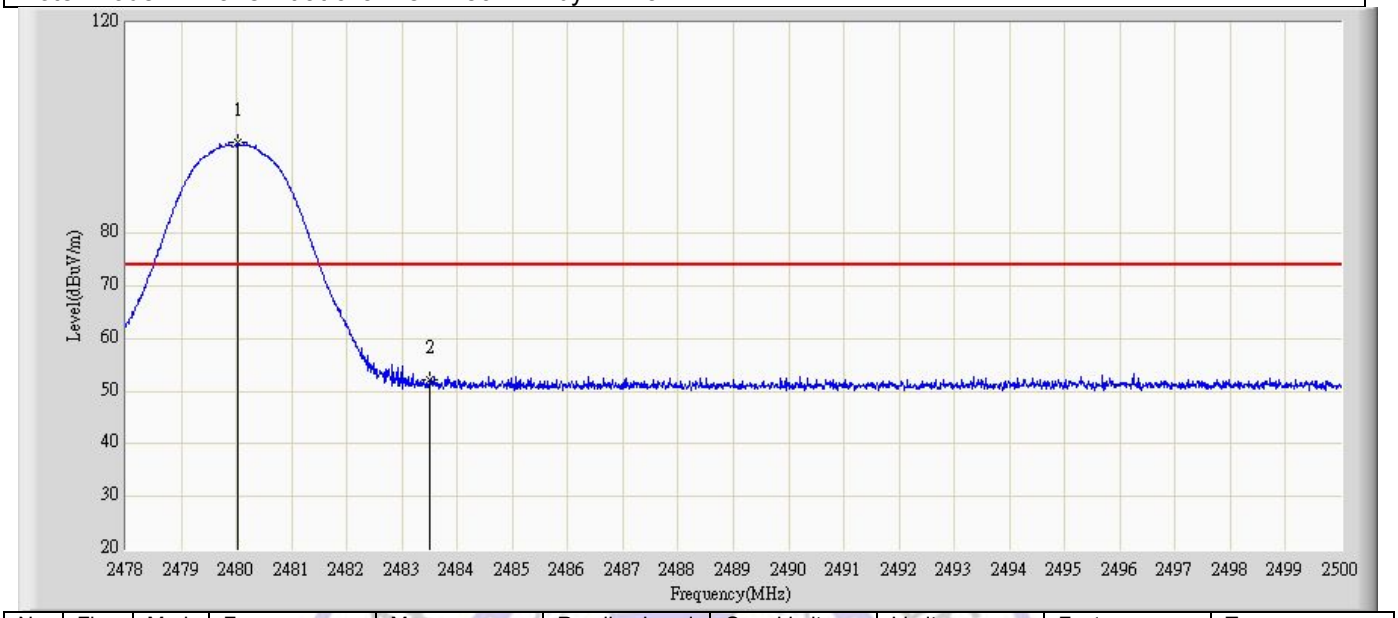
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1			2390.000	49.279	13.638	-24.721	74.000	35.642	PK
2		*	2401.791	93.878	58.187	N/A	N/A	35.691	PK

Engineer: Jack	
Site: AC5	Time: 2013/06/05 - 14:07
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Vertical
EUT: Smartphone	Power: By Battery
Note: Mode 2: Transmit at channel 2402MHz by 2DH5	



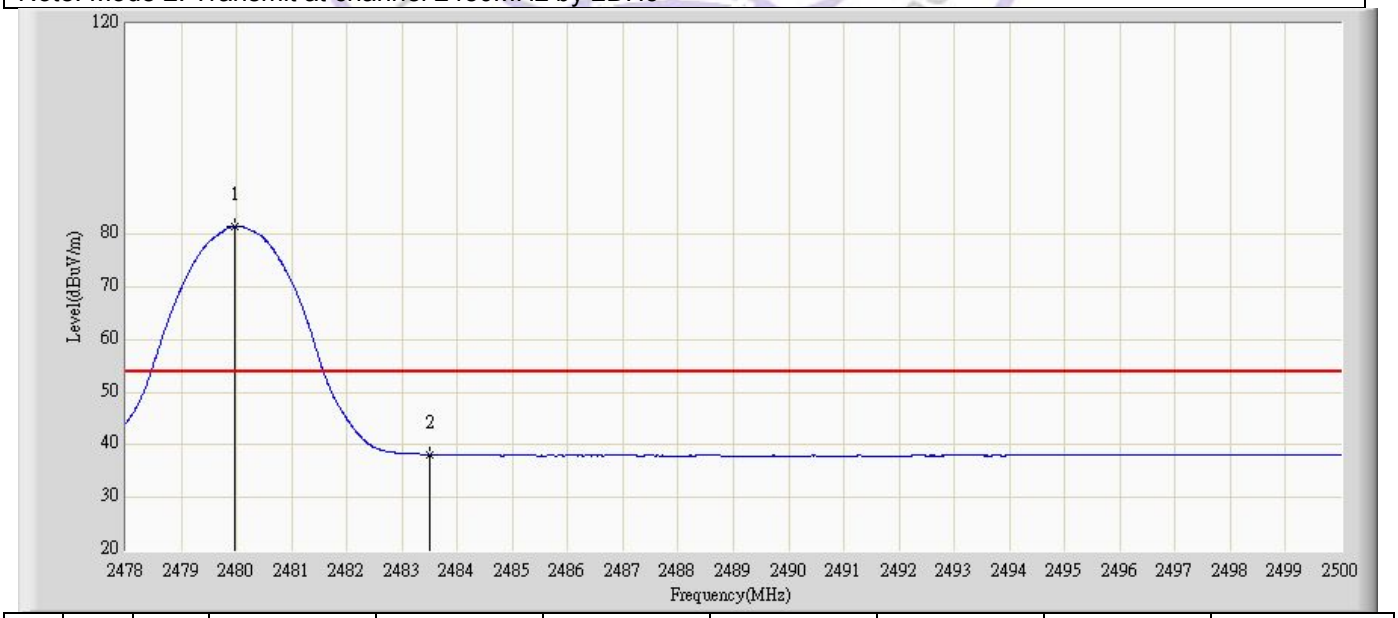
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1			2390.000	36.405	0.764	-17.595	54.000	35.642	AV
2		*	2401.930	79.243	43.551	N/A	N/A	35.692	AV

Engineer: Jack	
Site: AC5	Time: 2013/06/05 - 14:09
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Horizontal
EUT: Smartphone	Power: By Battery
Note: Mode 2: Transmit at channel 2480MHz by 2DH5	



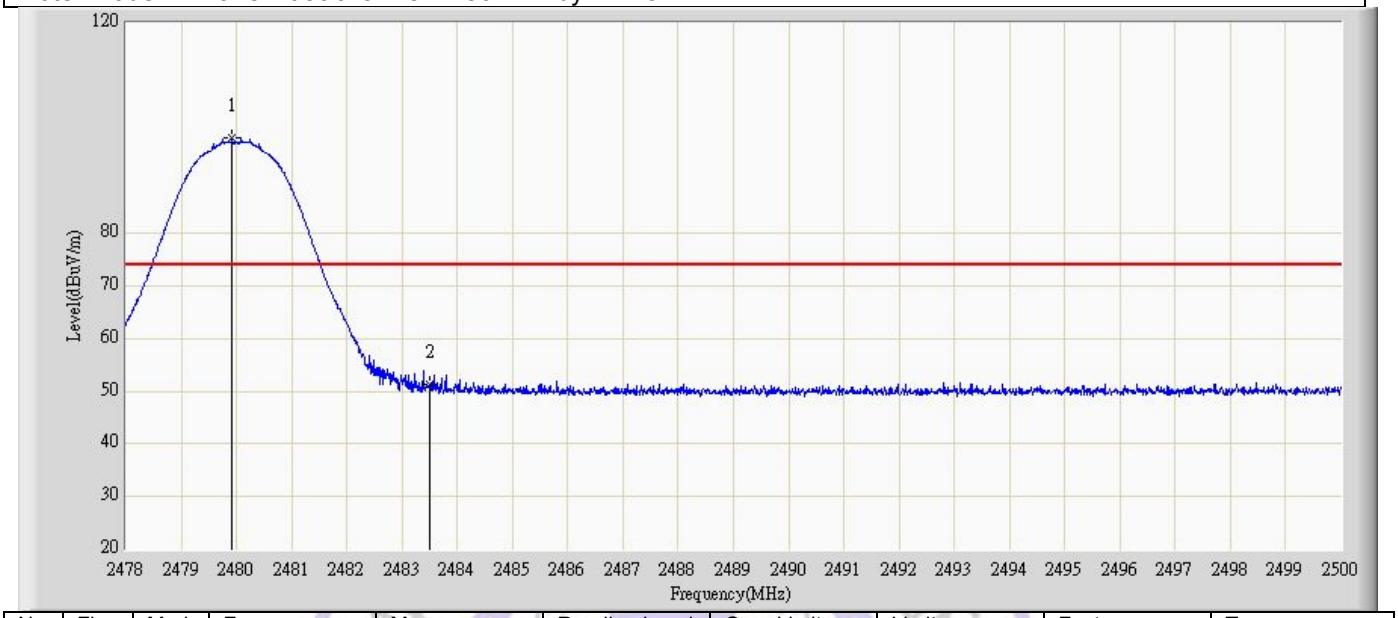
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1		*	2480.024	97.268	60.209	N/A	N/A	37.059	PK
2			2483.500	52.218	15.128	-21.782	74.000	37.089	PK

Engineer: Jack	
Site: AC5	Time: 2013/06/05 - 14:14
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Horizontal
EUT: Smartphone	Power: By Battery
Note: Mode 2: Transmit at channel 2480MHz by 2DH5	



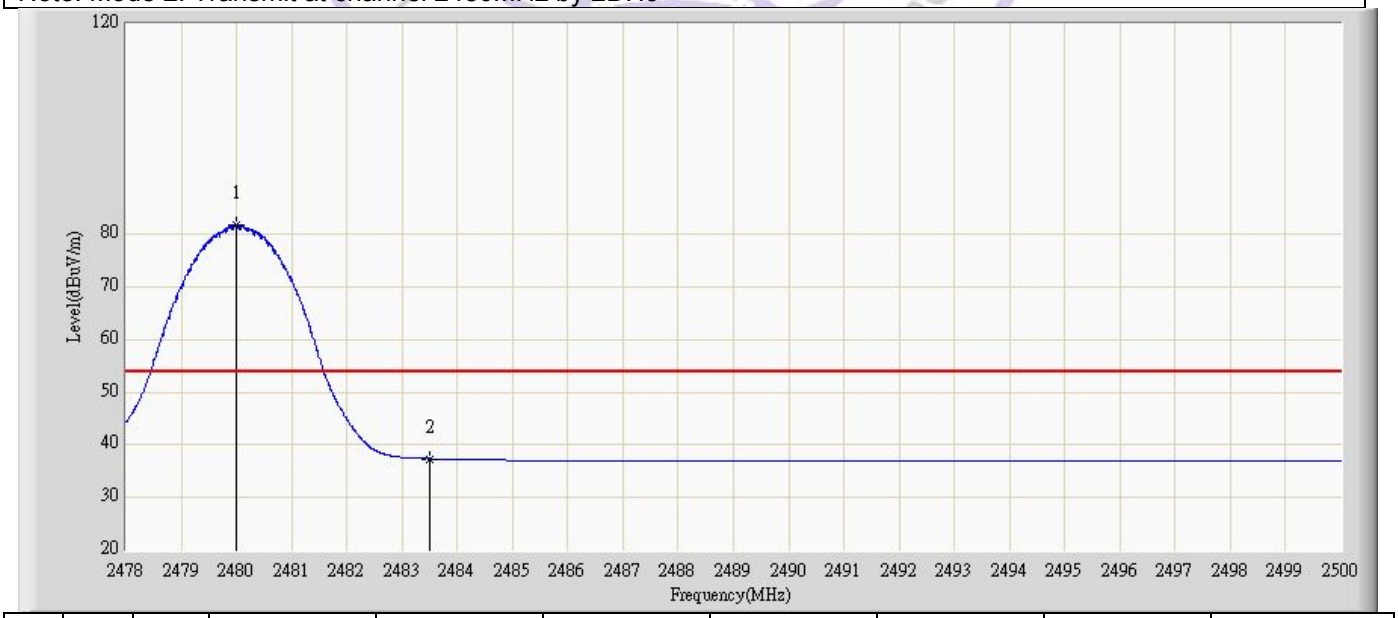
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1		*	2479.969	81.540	44.481	N/A	N/A	37.058	AV
2			2483.500	38.224	1.134	-15.776	54.000	37.089	AV

Engineer: Jack	
Site: AC5	Time: 2013/06/05 - 14:14
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Vertical
EUT: Smartphone	Power: By Battery
Note: Mode 2: Transmit at channel 2480MHz by 2DH5	



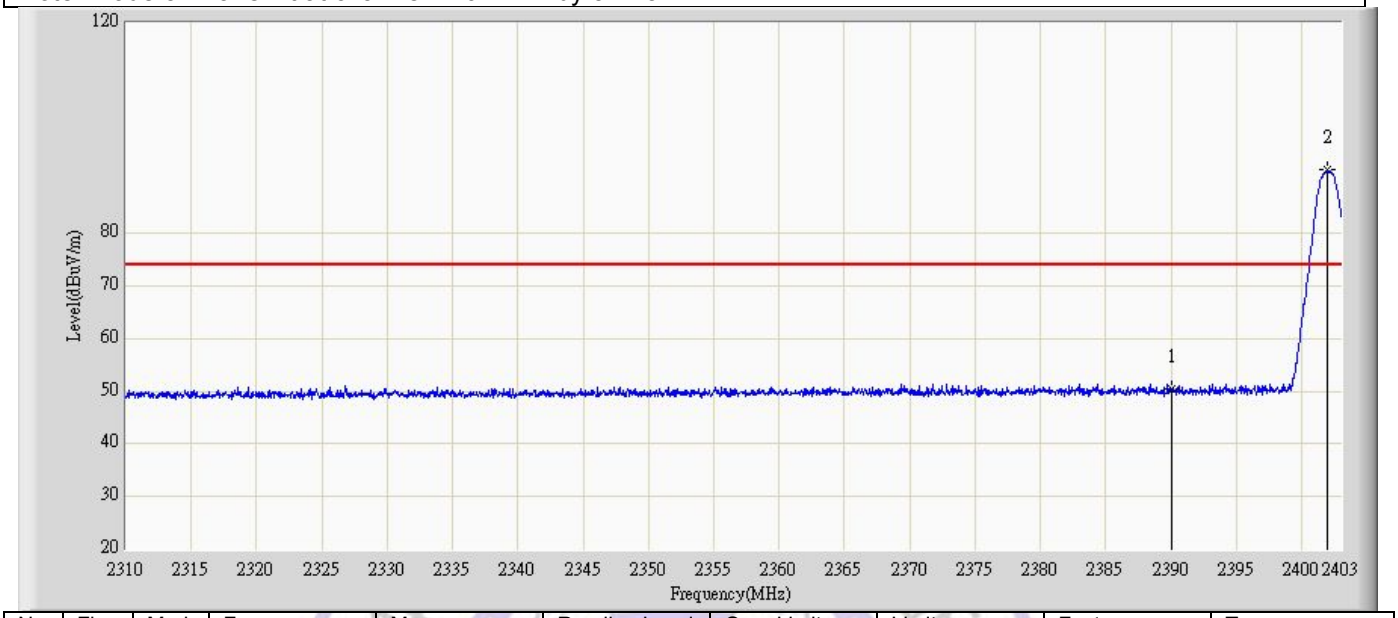
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1		*	2479.925	98.057	62.019	N/A	N/A	36.038	PK
2			2483.500	51.326	15.270	-22.674	74.000	36.055	PK

Engineer: Jack	
Site: AC5	Time: 2013/06/05 - 14:18
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Vertical
EUT: Smartphone	Power: By Battery
Note: Mode 2: Transmit at channel 2480MHz by 2DH5	



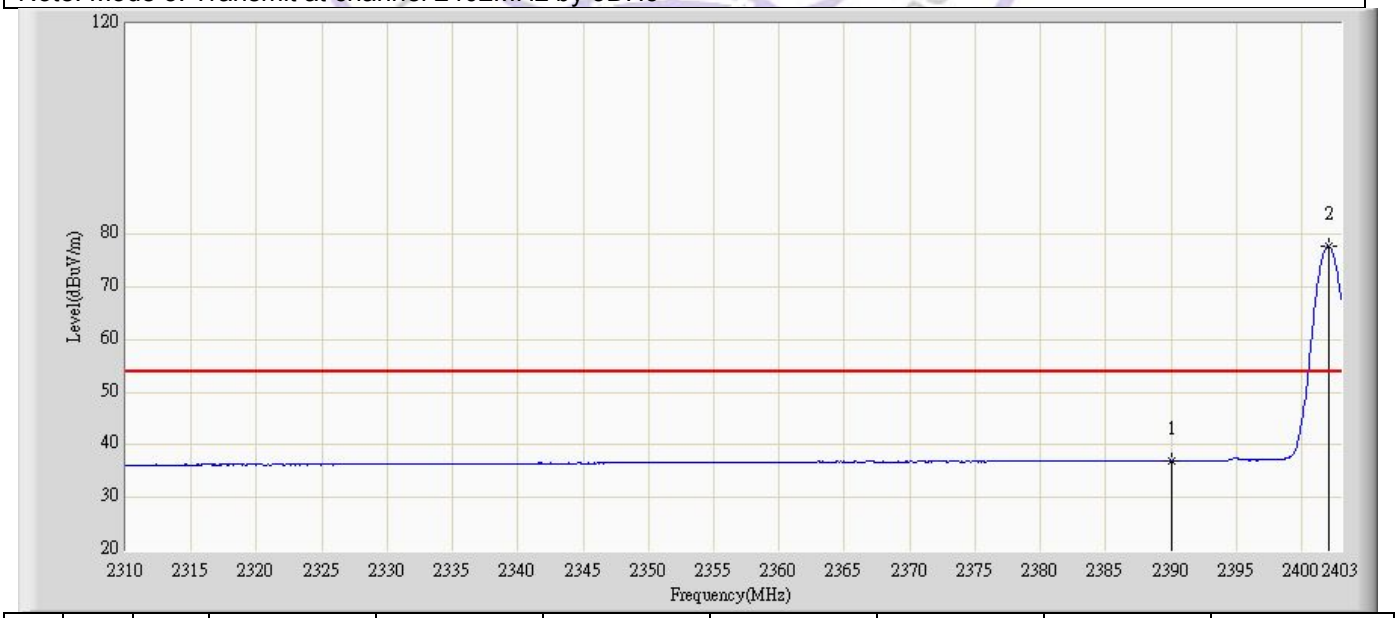
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1		*	2480.002	81.713	45.674	N/A	N/A	36.039	AV
2			2483.500	37.369	1.313	-16.631	54.000	36.055	AV

Engineer: Jack	
Site: AC5	Time: 2013/06/05 - 14:18
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Horizontal
EUT: Smartphone	Power: By Battery
Note: Mode 3: Transmit at channel 2402MHz by 3DH5	



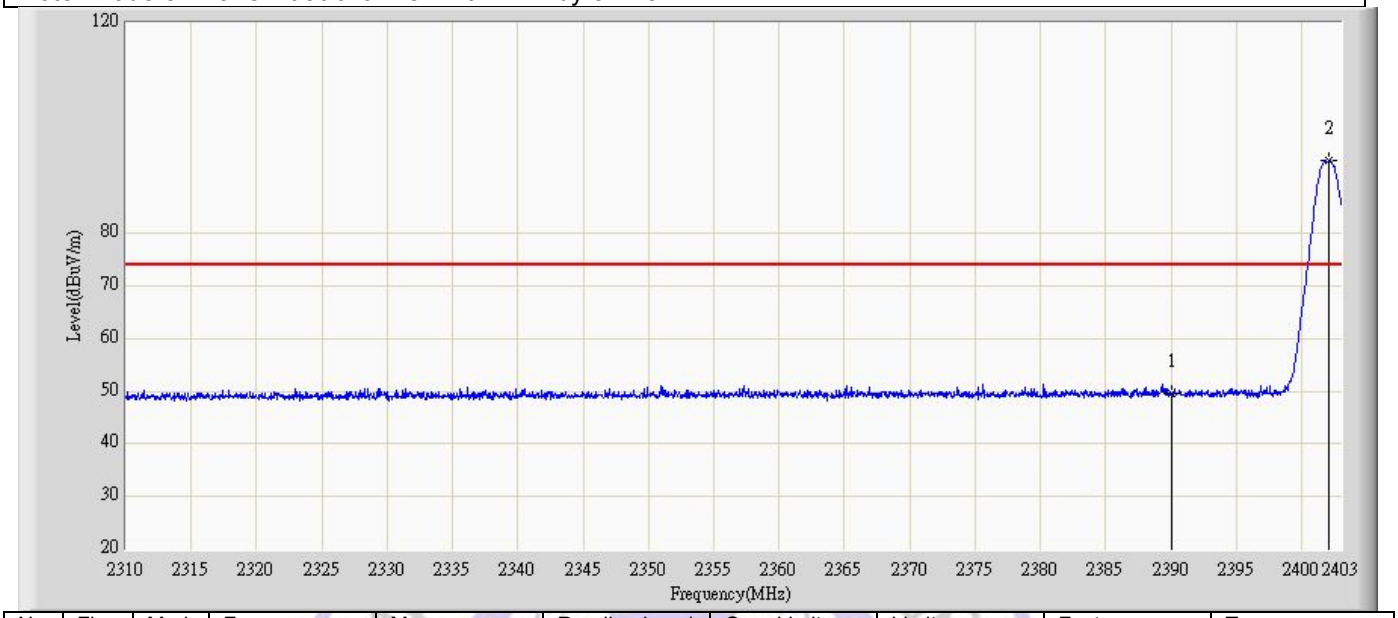
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1			2390.000	50.422	14.121	-23.578	74.000	36.302	PK
2		*	2401.930	92.256	55.857	N/A	N/A	36.400	PK

Engineer: Jack	
Site: AC5	Time: 2013/06/05 - 14:22
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Horizontal
EUT: Smartphone	Power: By Battery
Note: Mode 3: Transmit at channel 2402MHz by 3DH5	



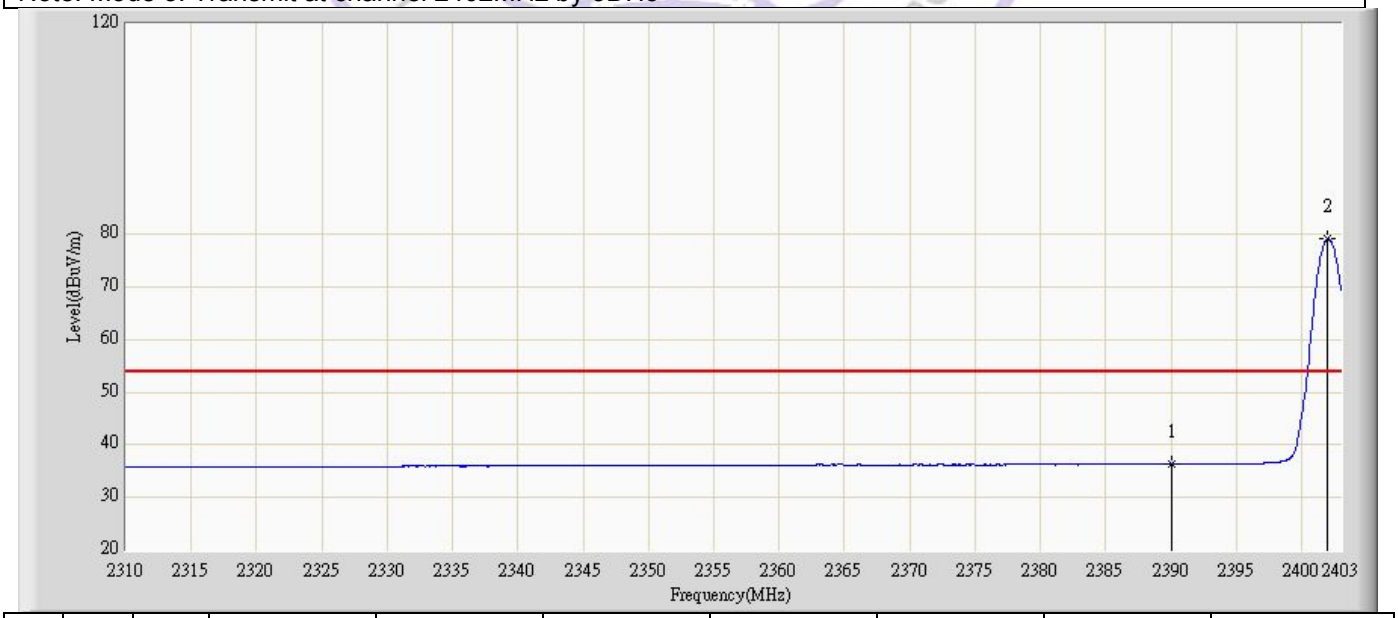
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1			2390.000	36.988	0.687	-17.012	54.000	36.302	AV
2		*	2402.070	77.722	41.322	N/A	N/A	36.401	AV

Engineer: Jack	
Site: AC5	Time: 2013/06/05 - 14:23
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Vertical
EUT: Smartphone	Power: By Battery
Note: Mode 3: Transmit at channel 2402MHz by 3DH5	



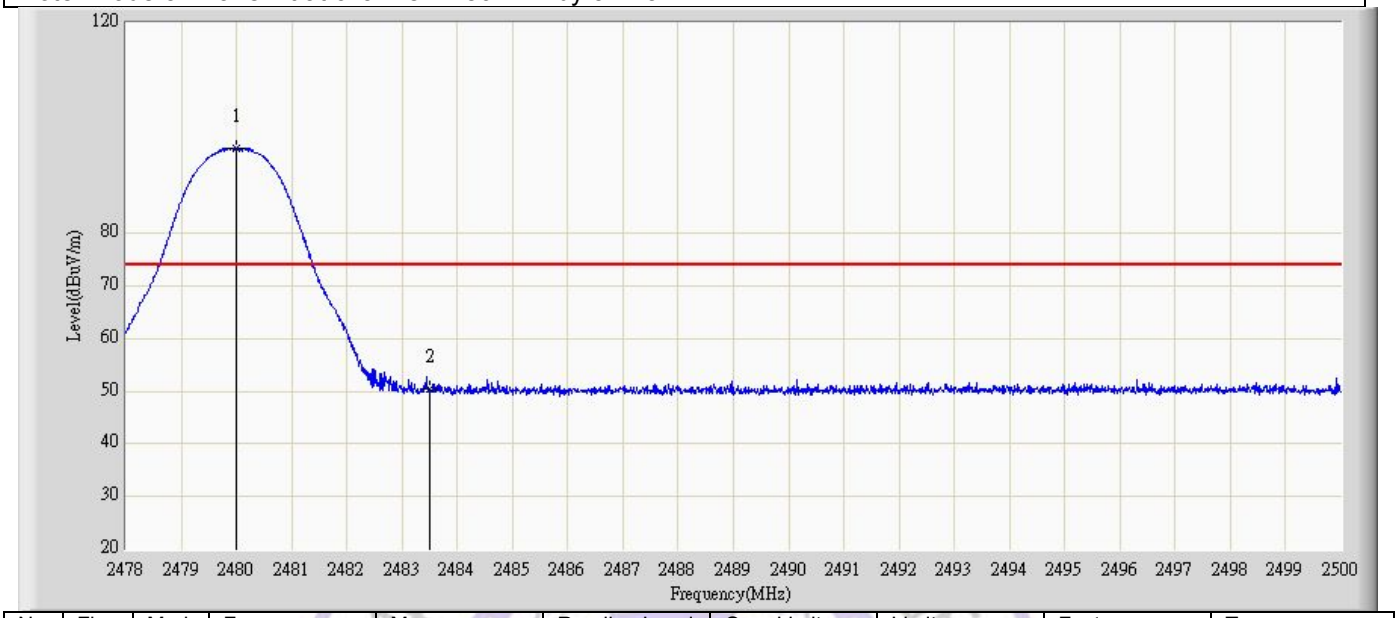
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1			2390.000	49.484	13.843	-24.516	74.000	35.642	PK
2		*	2402.070	93.778	58.086	N/A	N/A	35.692	PK

Engineer: Jack	
Site: AC5	Time: 2013/06/05 - 14:27
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Vertical
EUT: Smartphone	Power: By Battery
Note: Mode 3: Transmit at channel 2402MHz by 3DH5	



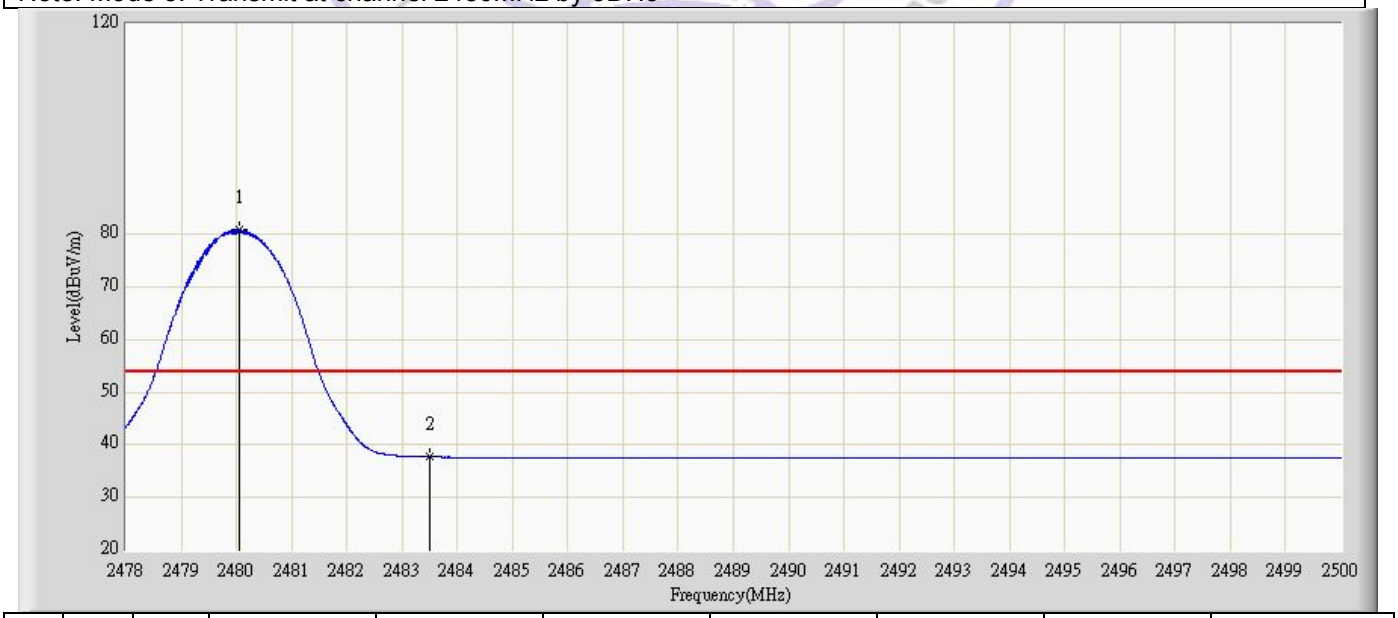
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1			2390.000	36.320	0.679	-17.680	54.000	35.642	AV
2		*	2401.977	79.167	43.475	N/A	N/A	35.692	AV

Engineer: Jack	
Site: AC5	Time: 2013/06/05 - 11:26
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Horizontal
EUT: Smartphone	Power: By Battery
Note: Mode 3: Transmit at channel 2480MHz by 3DH5	



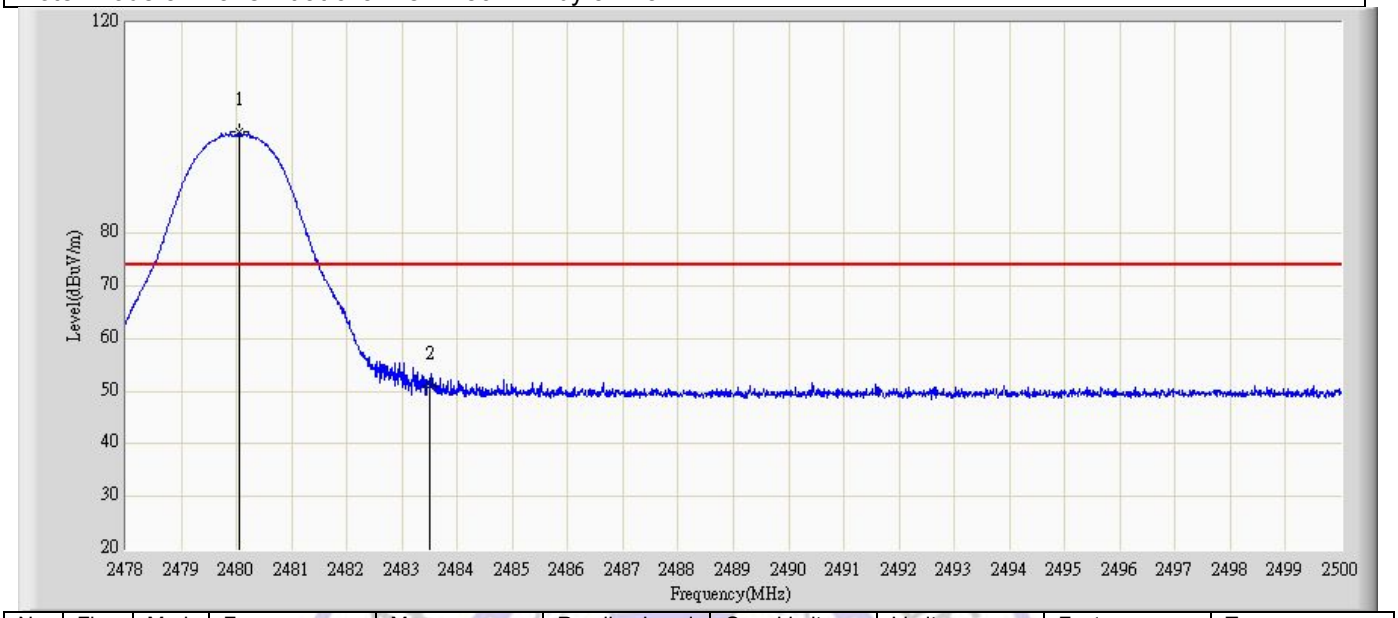
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1		*	2480.002	96.046	58.987	N/A	N/A	37.059	PK
2			2483.500	50.451	13.361	-23.549	74.000	37.089	PK

Engineer: Jack	
Site: AC5	Time: 2013/06/05 - 11:41
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Horizontal
EUT: Smartphone	Power: By Battery
Note: Mode 3: Transmit at channel 2480MHz by 3DH5	



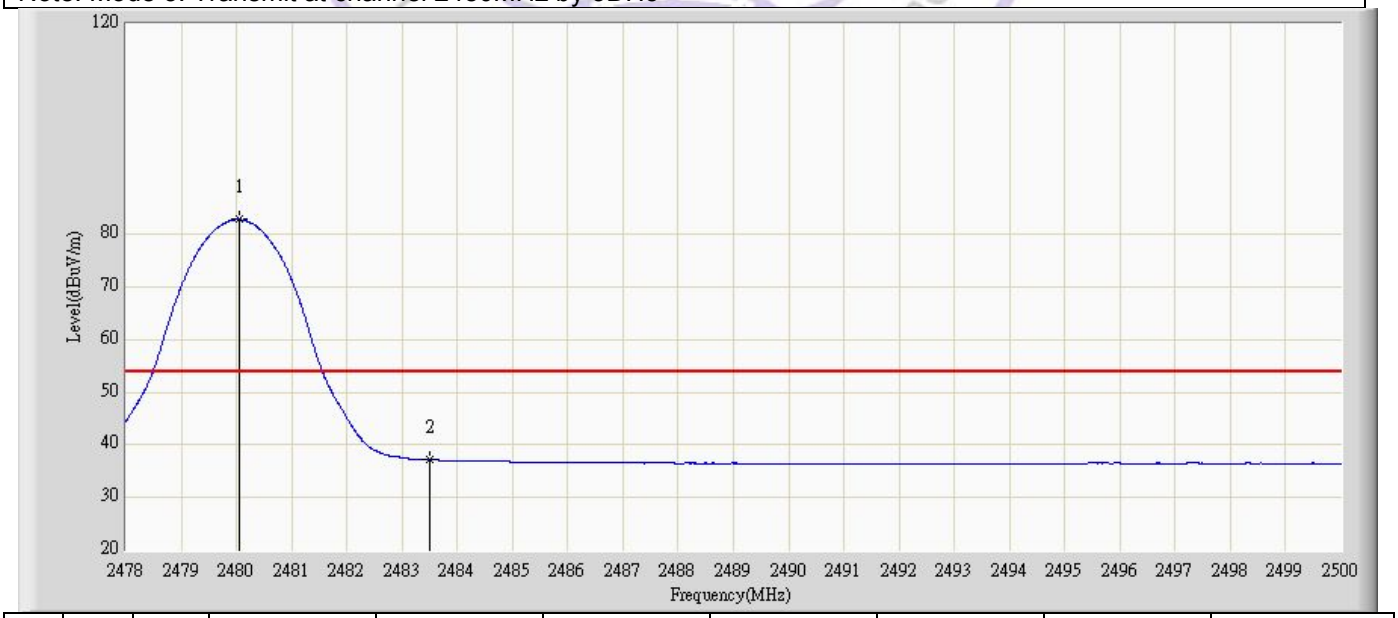
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1		*	2480.046	80.848	43.789	N/A	N/A	37.059	AV
2			2483.500	37.707	0.617	-16.293	54.000	37.089	AV

Engineer: Jack	
Site: AC5	Time: 2013/06/05 - 11:42
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Vertical
EUT: Smartphone	Power: By Battery
Note: Mode 3: Transmit at channel 2480MHz by 3DH5	



No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1		*	2480.057	99.223	63.184	N/A	N/A	36.039	PK
2			2483.500	51.114	15.058	-22.886	74.000	36.055	PK

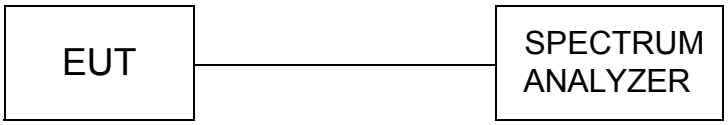
Engineer: Jack	
Site: AC5	Time: 2013/06/05 - 11:48
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Vertical
EUT: Smartphone	Power: By Battery
Note: Mode 3: Transmit at channel 2480MHz by 3DH5	



No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1		*	2480.046	82.824	46.785	N/A	N/A	36.039	AV
2			2483.500	37.211	1.155	-16.789	54.000	36.055	AV

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.

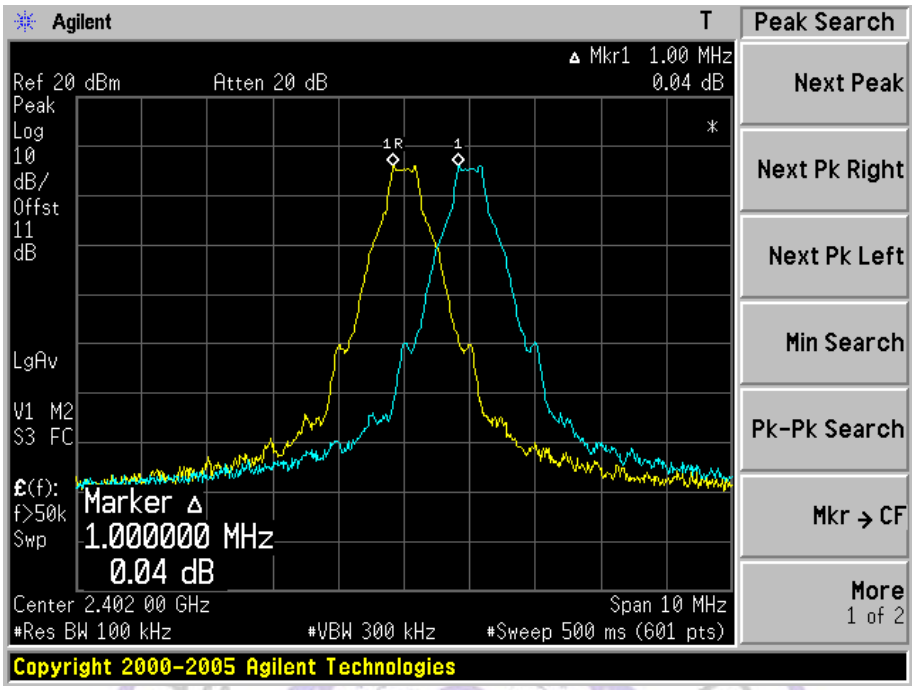
TEST RESULTS

DH5 Mode:

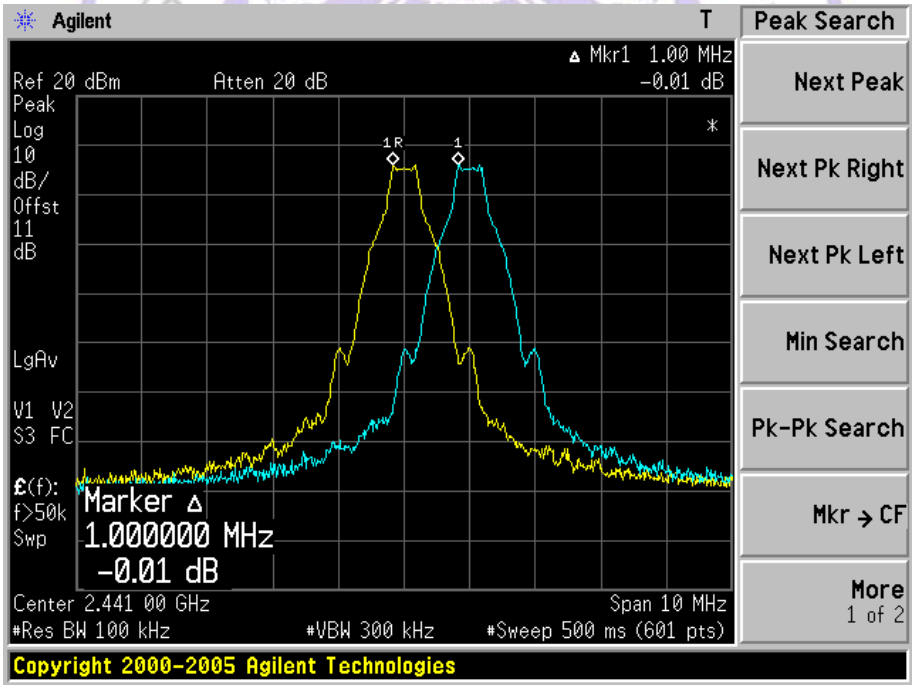
Channel	Channel Frequency (MHz)	Channel Separation (MHz)	Limit (MHz)	Result
Low Channel	2402	1.000	25KHz or 2/3*20dB bandwidth(0.623MHz)	Pass
Adjacency Channel	2403			
Mid Channel	2441	1.000	25KHz or 2/3*20dB bandwidth(0.622MHz)	Pass
Adjacency Channel	2442			
High Channel	2480	1.000	25KHz or 2/3*20dB bandwidth(0.622MHz)	Pass
Adjacency Channel	2479			

Photos of Frequency separation Measurement

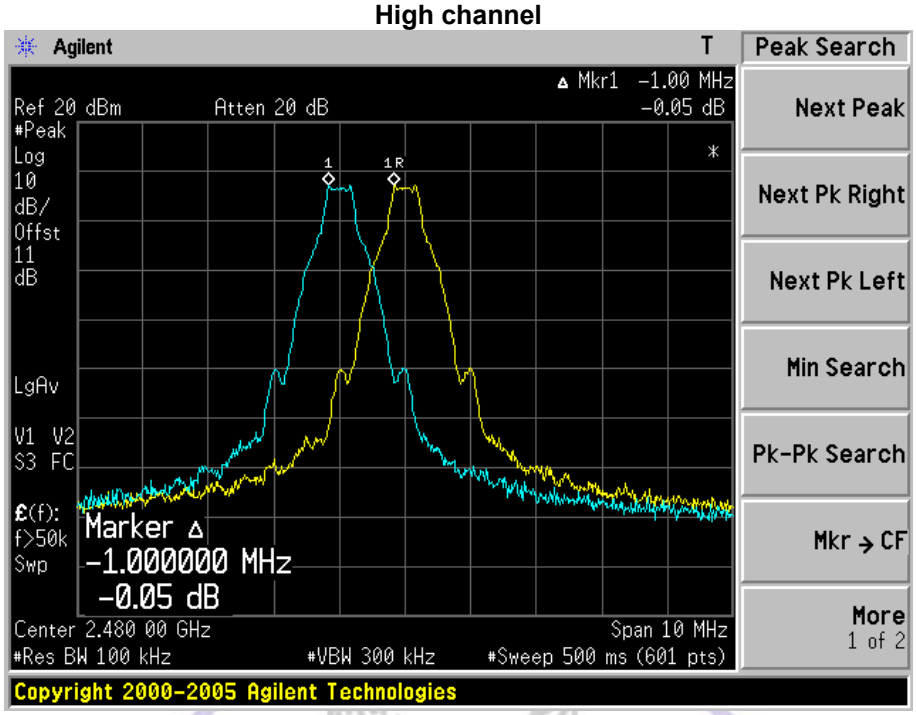
Low channel



Middle channel



High channel

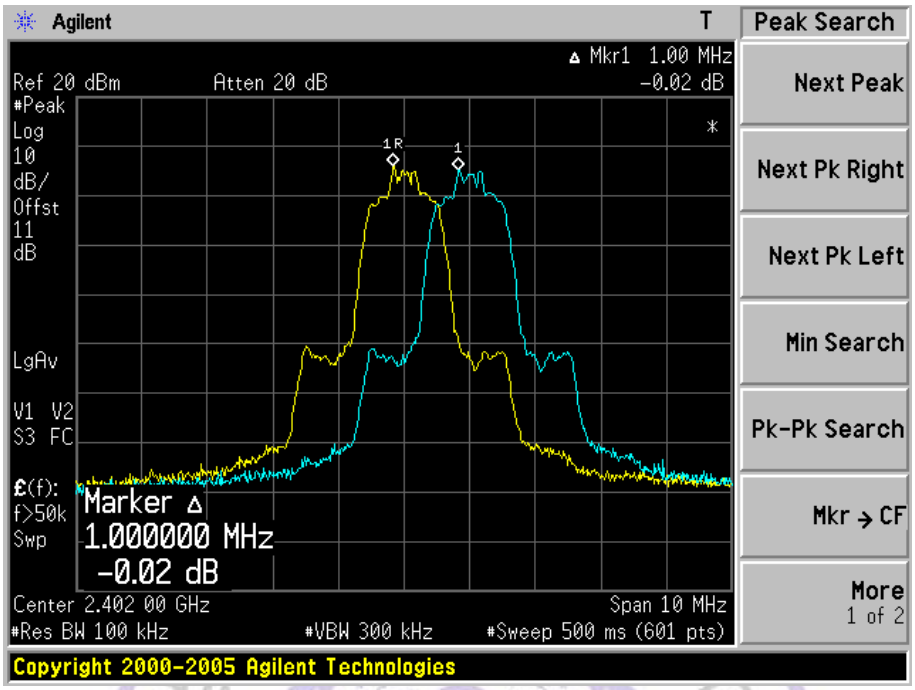


2DH5 Mode:

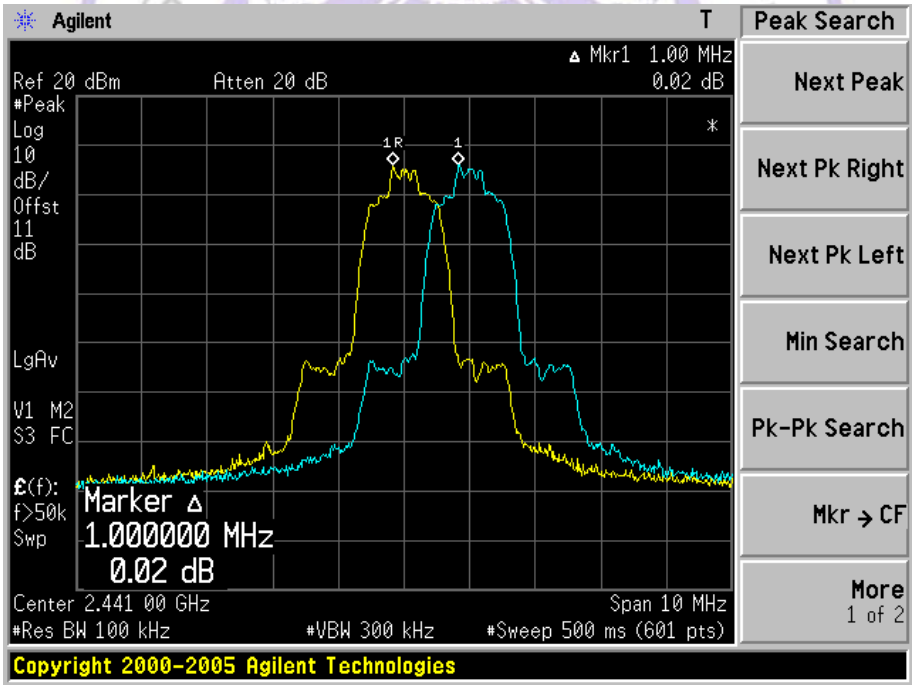
Channel	Channel Frequency (MHz)	Channel Separation (MHz)	Limit (MHz)	Result
Low Channel	2402	1.000	25KHz or 2/3*20dB bandwidth(0.902MHz)	Pass
Adjacency Channel	2403			
Mid Channel	2441	1.000	25KHz or 2/3*20dB bandwidth(0.899MHz)	Pass
Adjacency Channel	2442			
High Channel	2480	1.000	25KHz or 2/3*20dB bandwidth(0.900MHz)	Pass
Adjacency Channel	2479			

Photos of Frequency separation Measurement

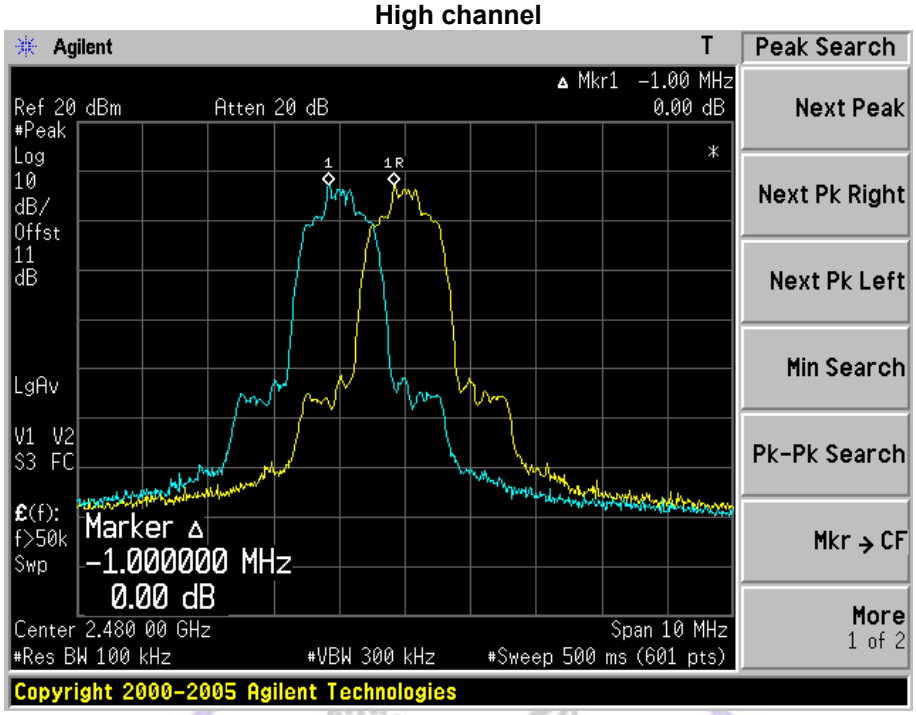
Low channel



Middle channel



High channel

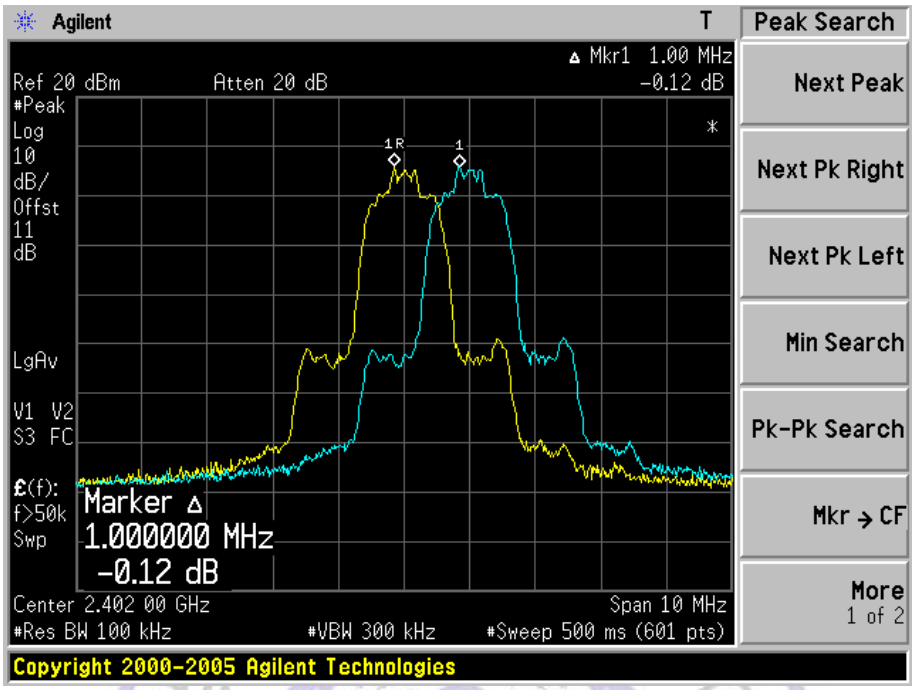


3DH5 Mode:

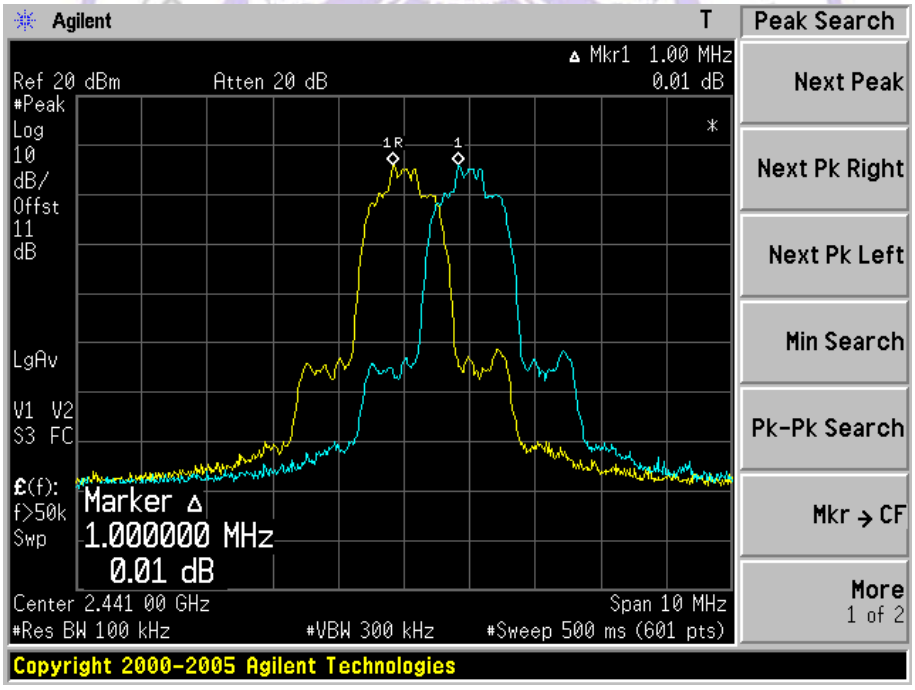
Channel	Channel Frequency (MHz)	Channel Separation (MHz)	Limit (MHz)	Result
Low Channel	2402	1.000	25KHz or 2/3*20dB bandwidth(0.895MHz)	Pass
Adjacency Channel	2403			
Mid Channel	2441	1.000	25KHz or 2/3*20dB bandwidth(0.896MHz)	Pass
Adjacency Channel	2442			
High Channel	2480	1.000	25KHz or 2/3*20dB bandwidth(0.892MHz)	Pass
Adjacency Channel	2479			

Photos of Frequency separation Measurement

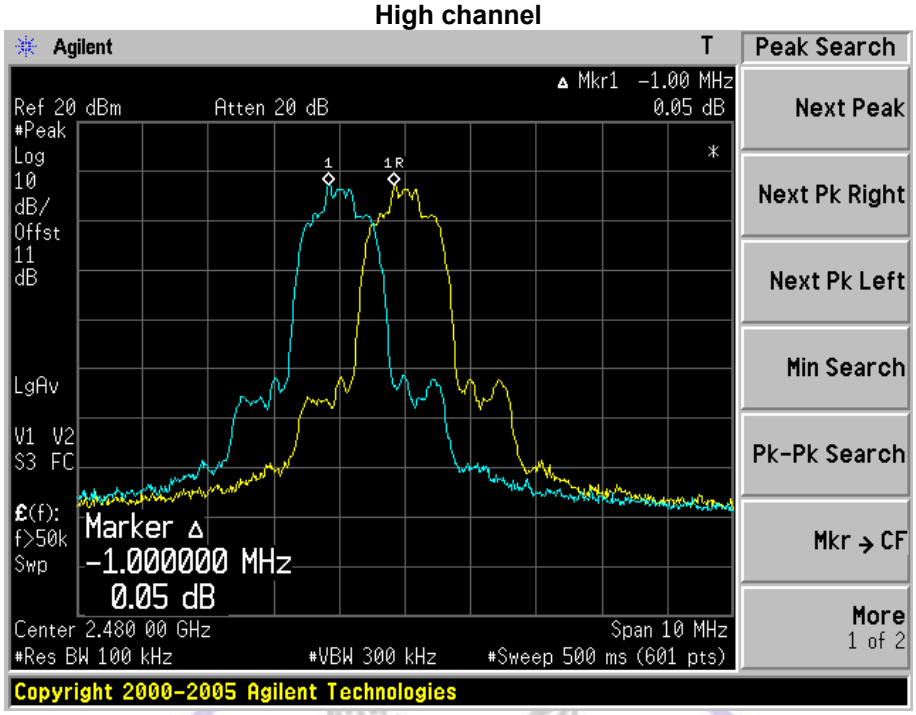
Low channel



Middle channel

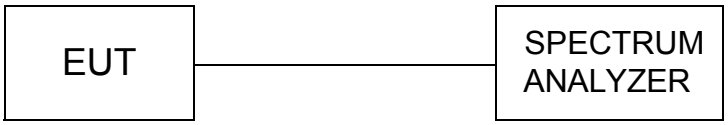


High channel



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.

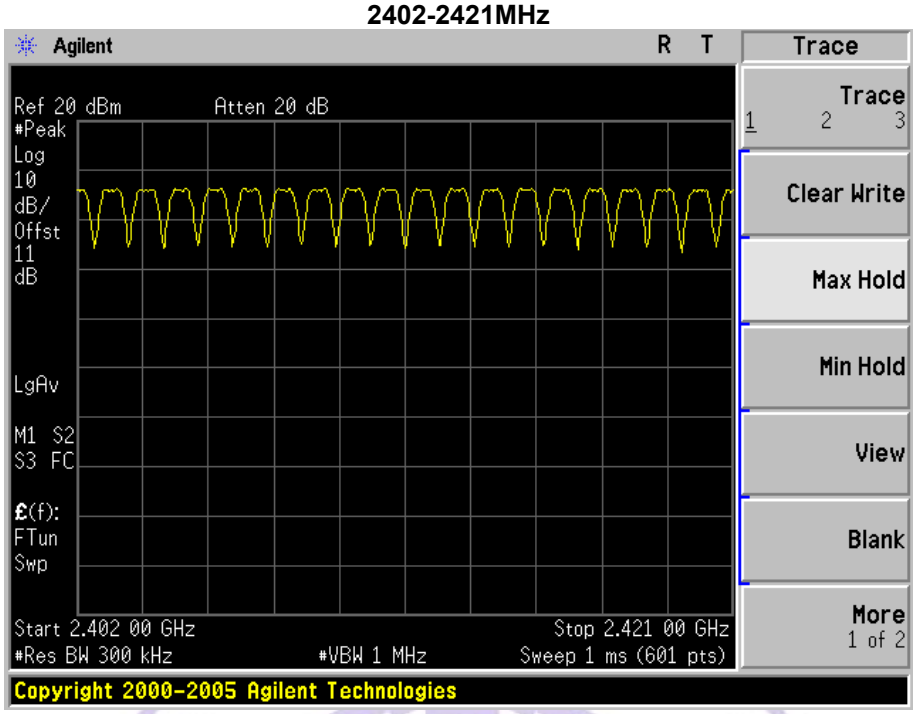
TEST RESULTS

DH5 Mode:

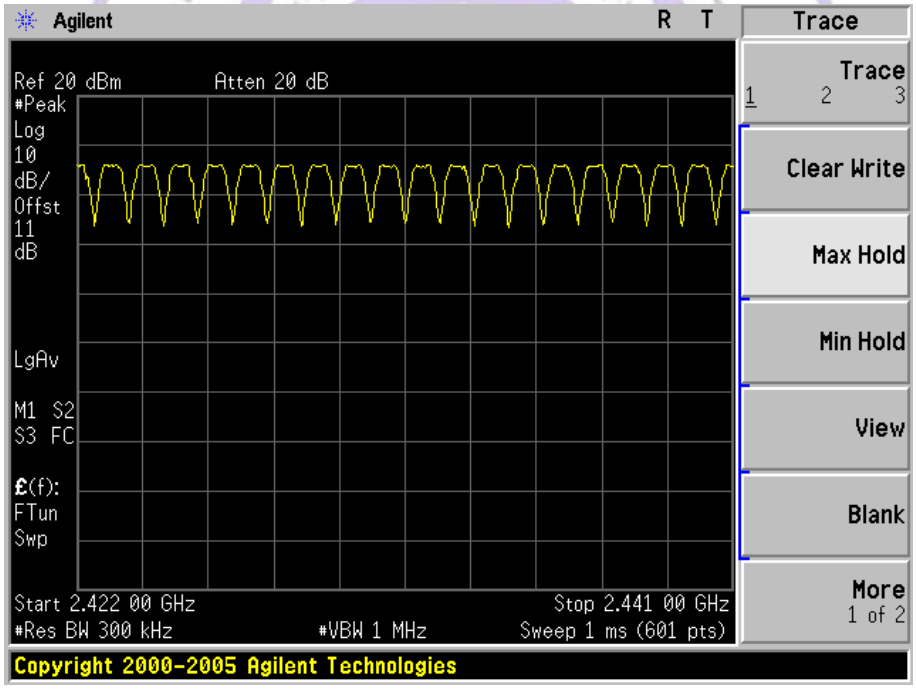
Hopping Channel Frequency Range (MHz)	Number of Hopping Channel	Limit
2400-2483.5	79	≥15

Photos of Number of hopping channel Measurement

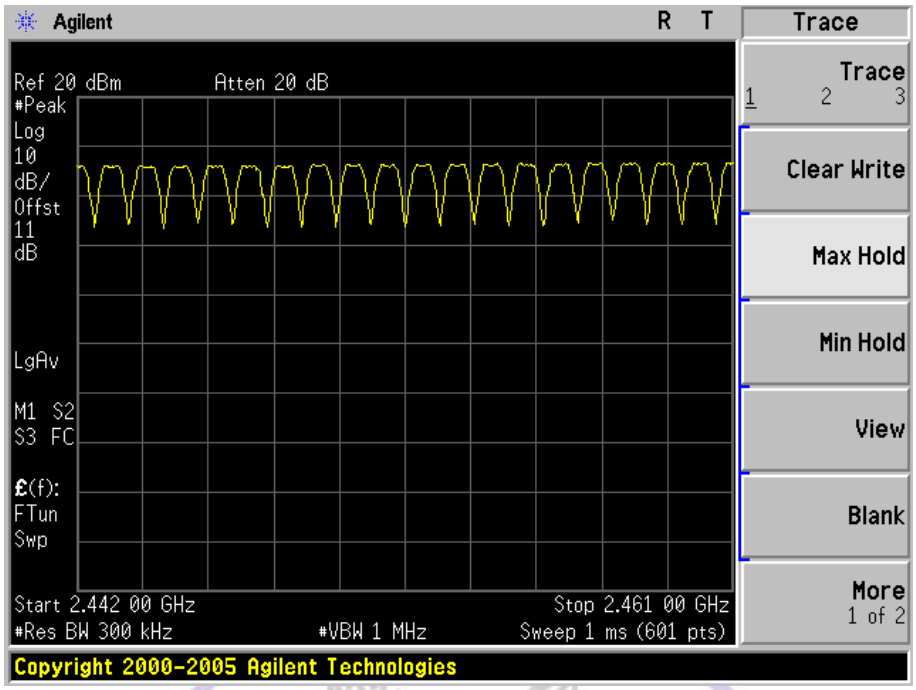
2402-2421MHz



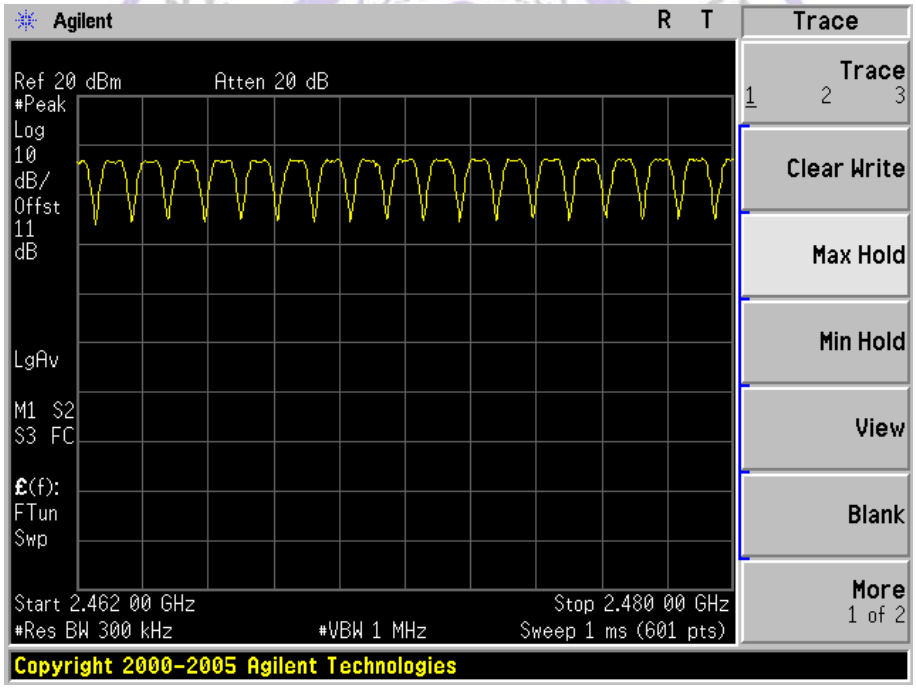
2422-2441MHz



2442-2461MHz



2462-2480MHz

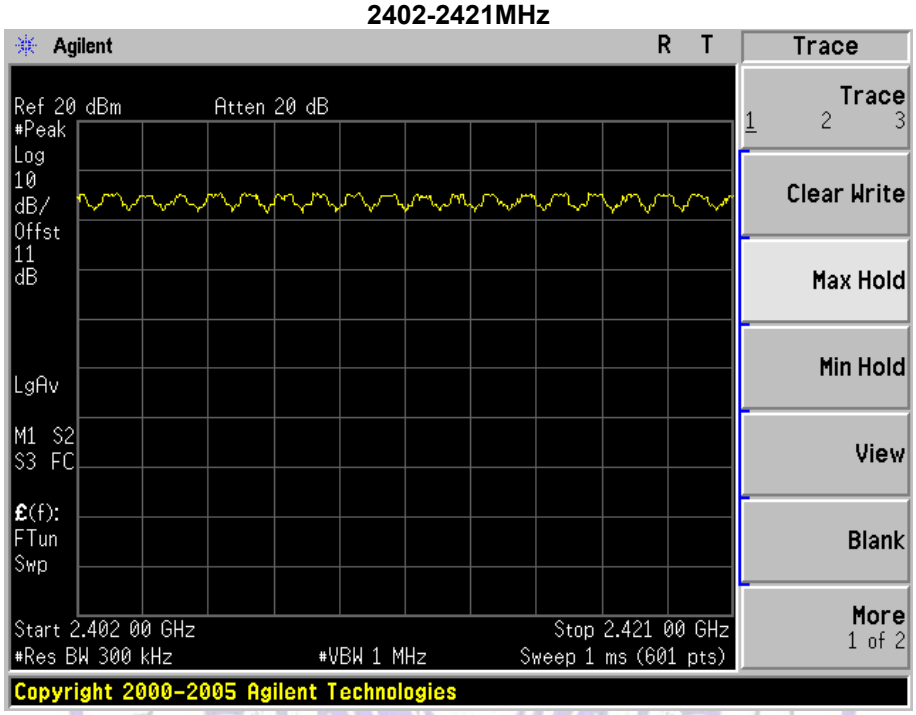


2DH5 Mode:

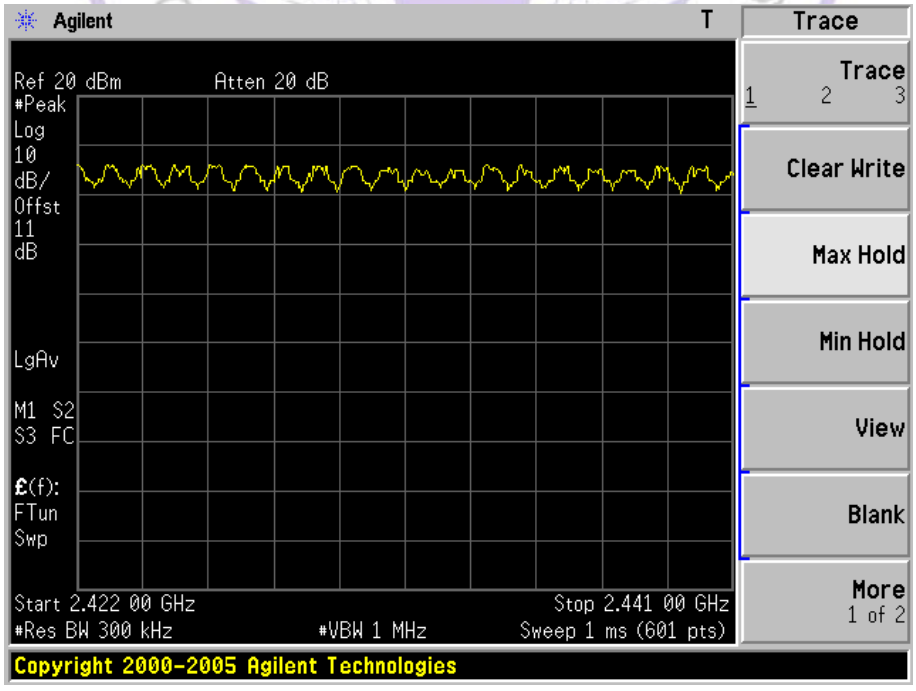
Hopping Channel Frequency Range (MHz)	Number of Hopping Channel	Limit
2400-2483.5	79	≥15

Photos of Number of hopping channel Measurement

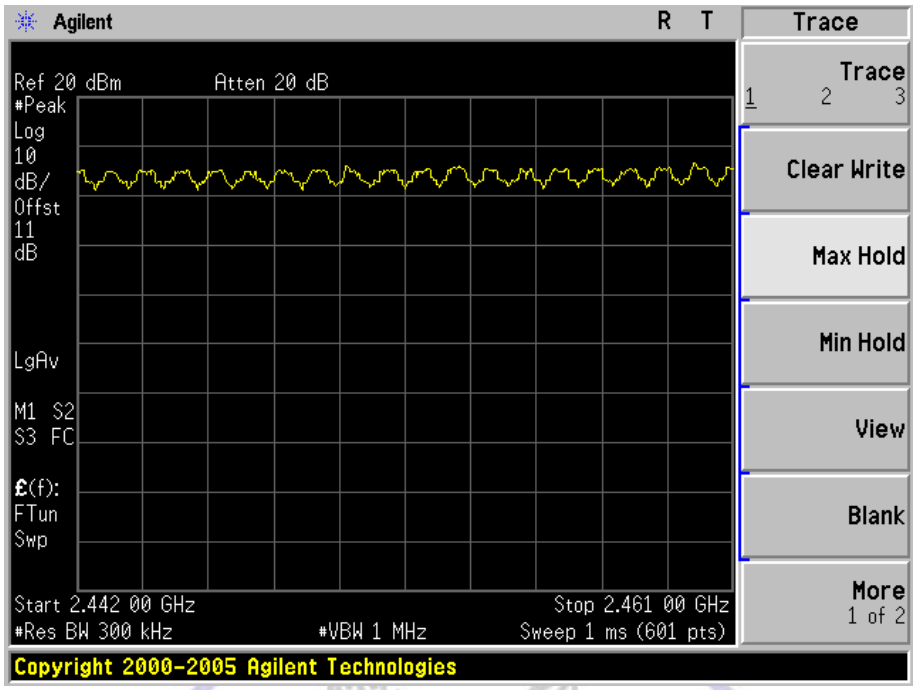
2402-2421MHz



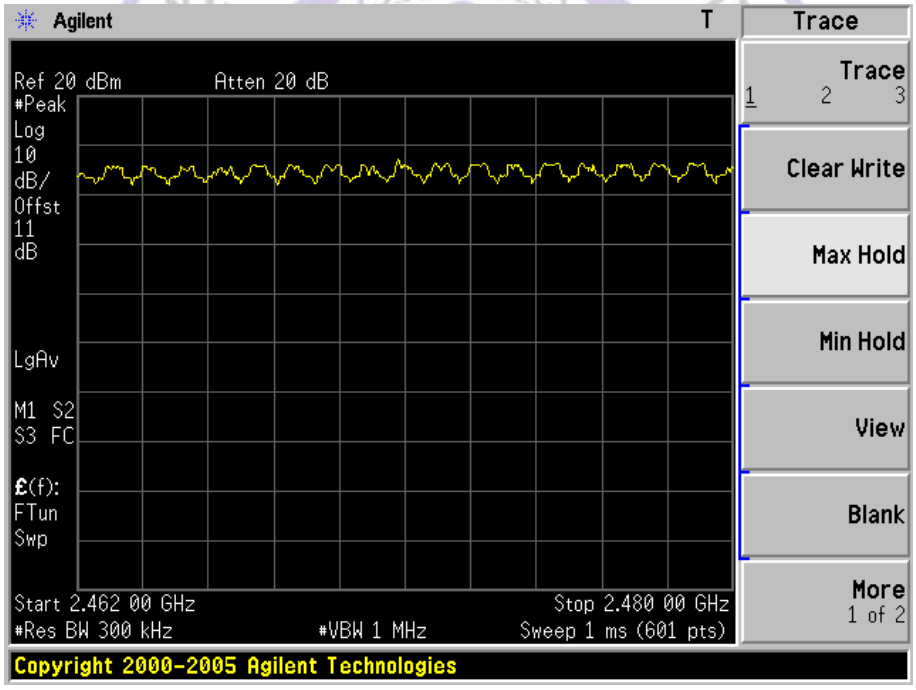
2422-2441MHz



2442-2461MHz



2462-2480MHz

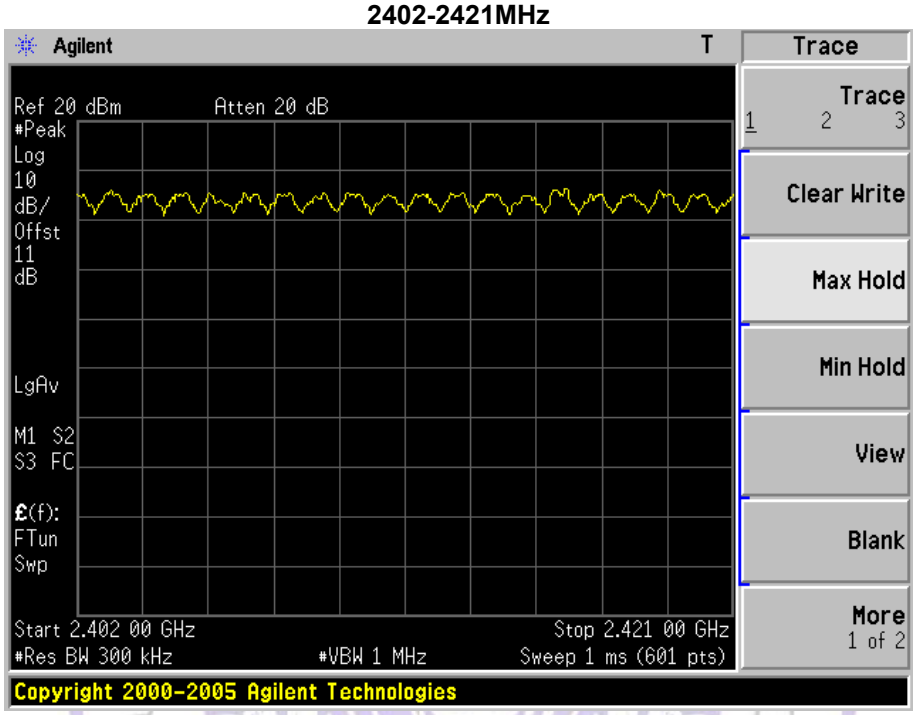


3DH5 Mode:

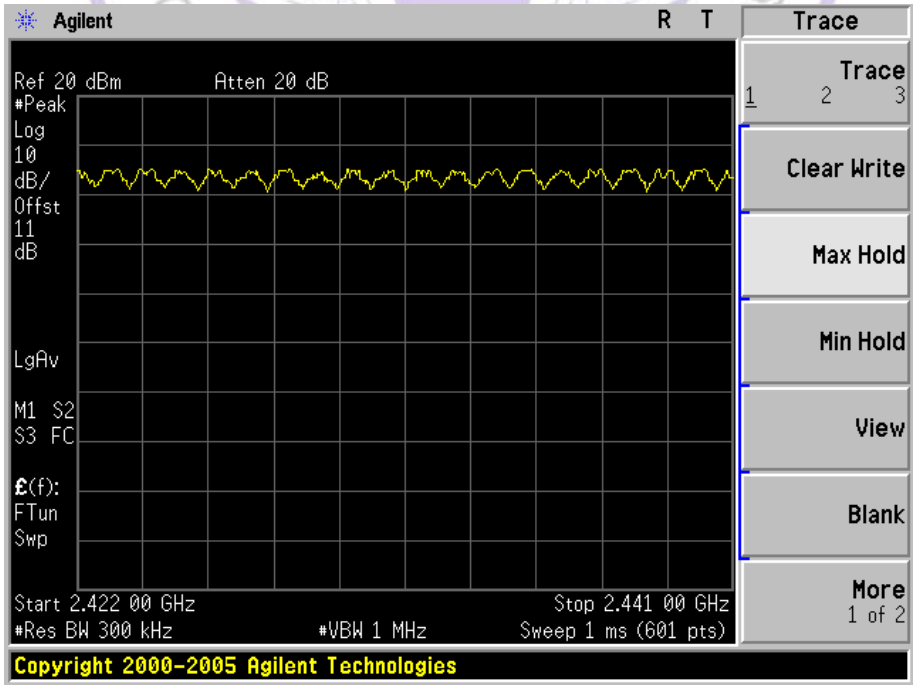
Hopping Channel Frequency Range (MHz)	Number of Hopping Channel	Limit
2400-2483.5	79	≥15

Photos of Number of hopping channel Measurement

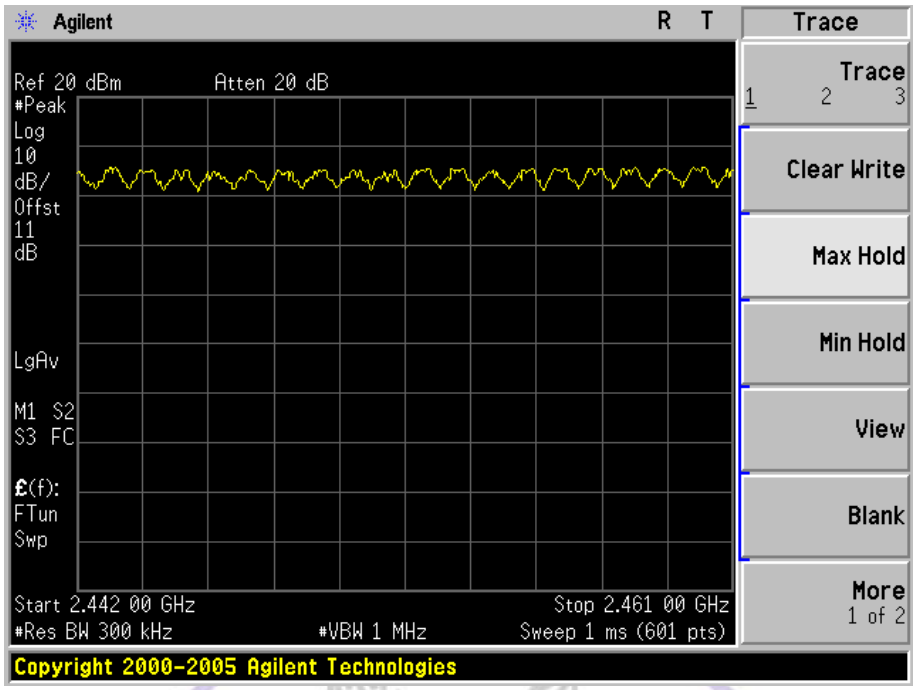
2402-2421MHz



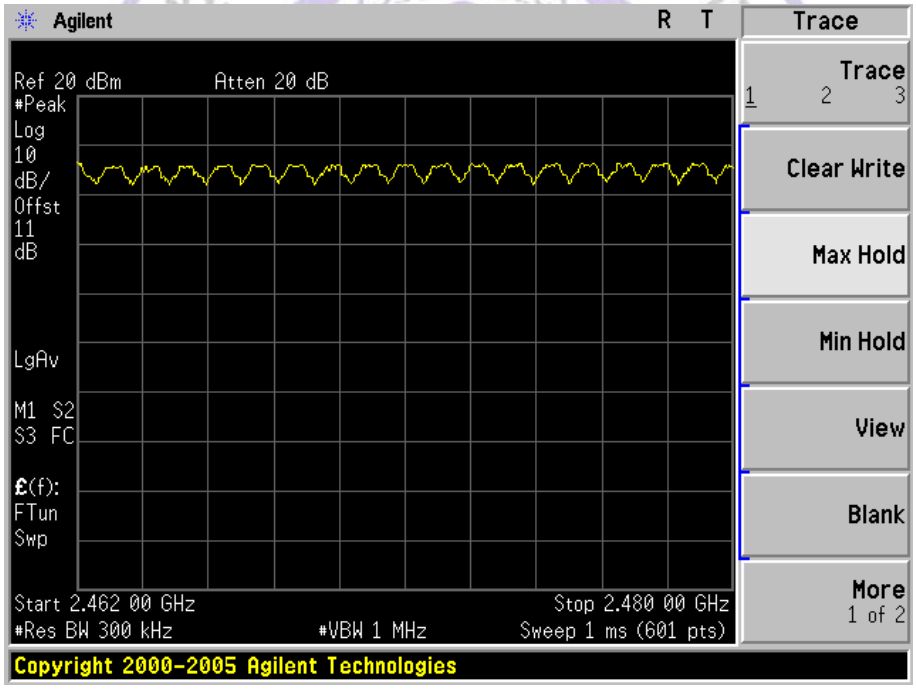
2422-2441MHz



2442-2461MHz

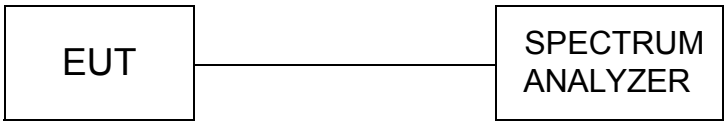


2462-2480MHz



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

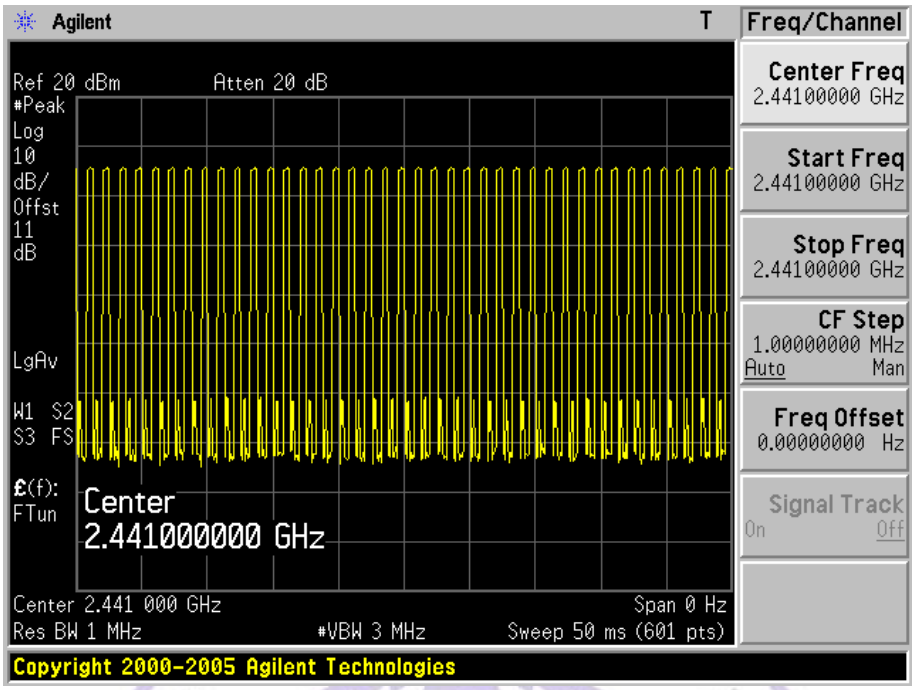
The average time of occupancy on any channel shall not be greater than 0.4 seconds within a pe-riod of 0.4 seconds multiplied by the number of hopping channels employed.

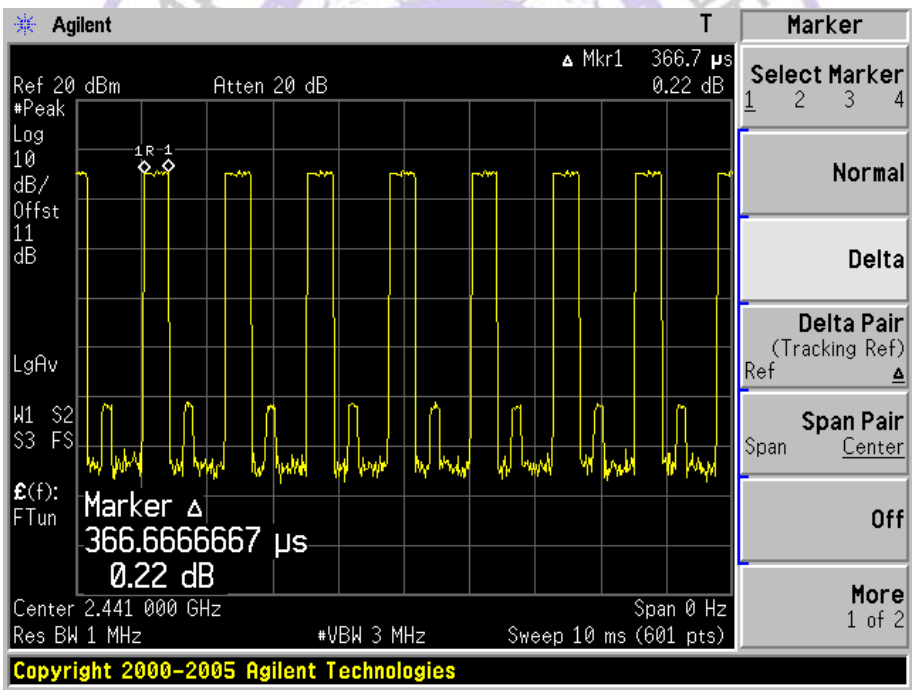
TEST RESULTS

Rate	Mode	Pulse Width (ms)	Dwell Time (S)	Limit (S)	Result
3Mbps	DH1	0.367	0.117	0.4	Pass
	DH3	1.617	0.259	0.4	Pass
	DH5	2.883	0.308	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				

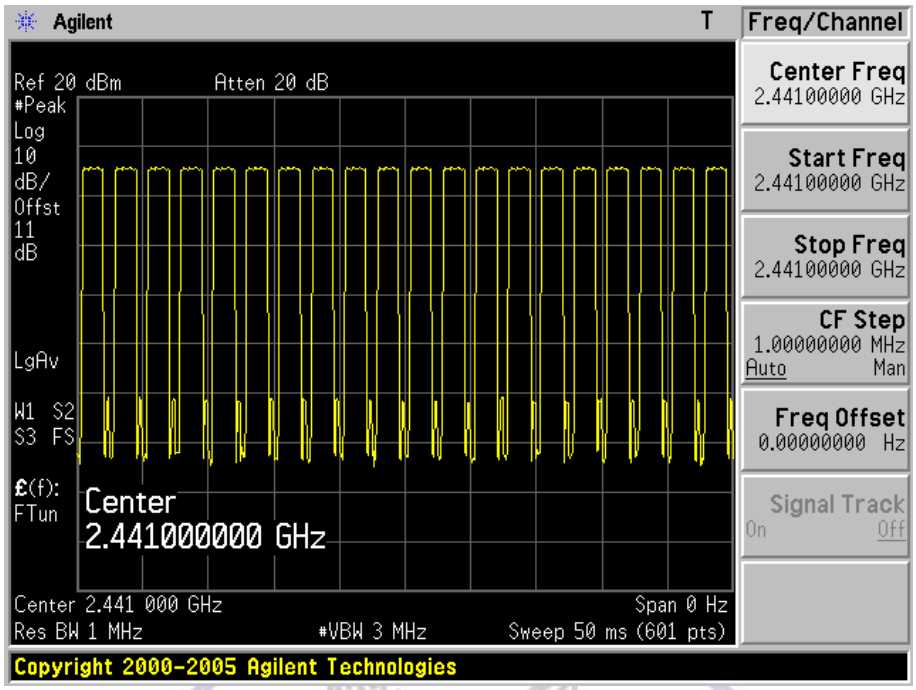
Photos of Dwell Time Measurement：

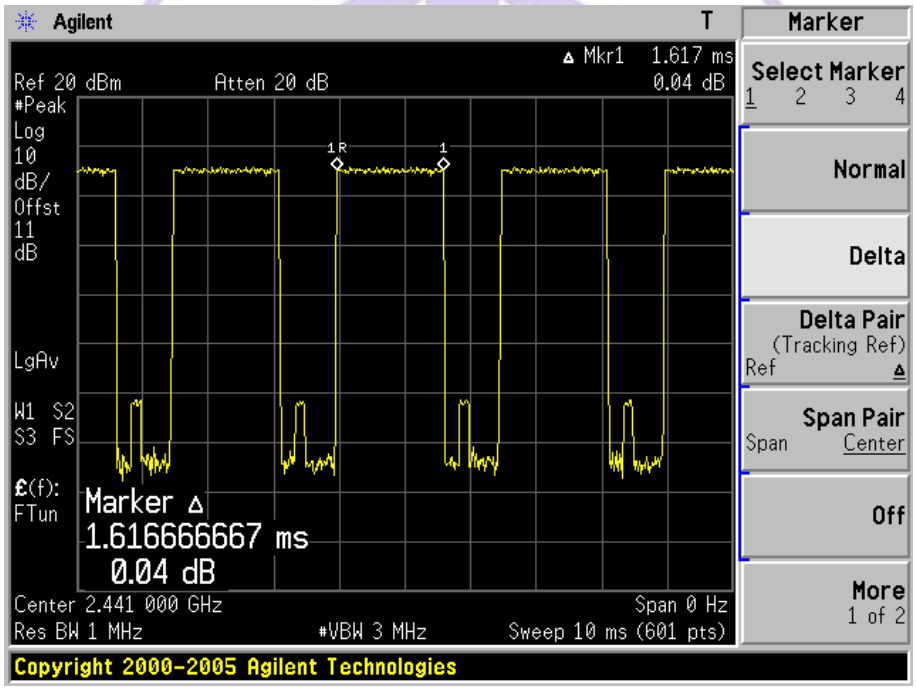
DH1



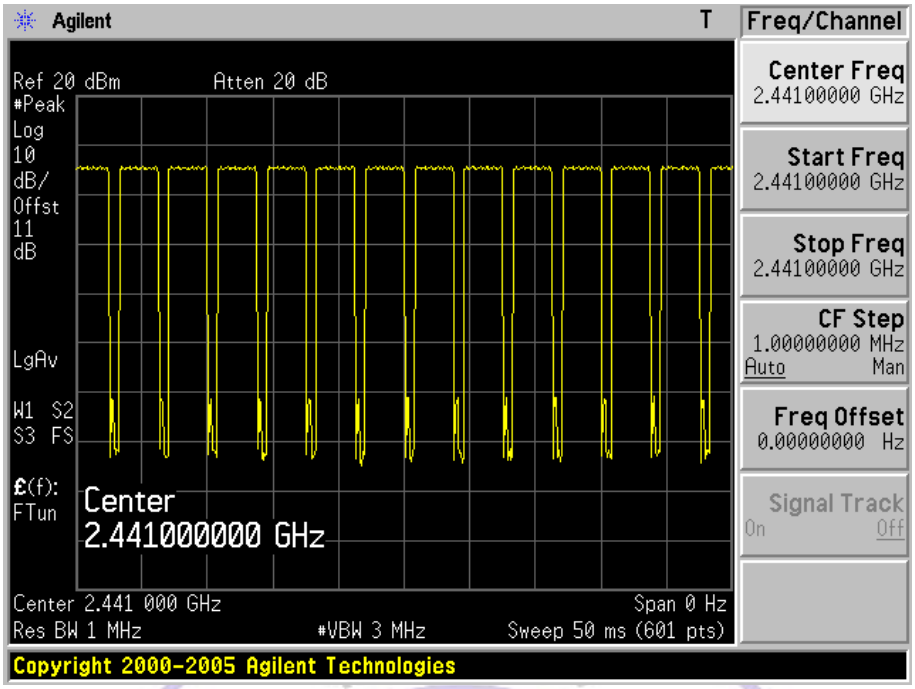


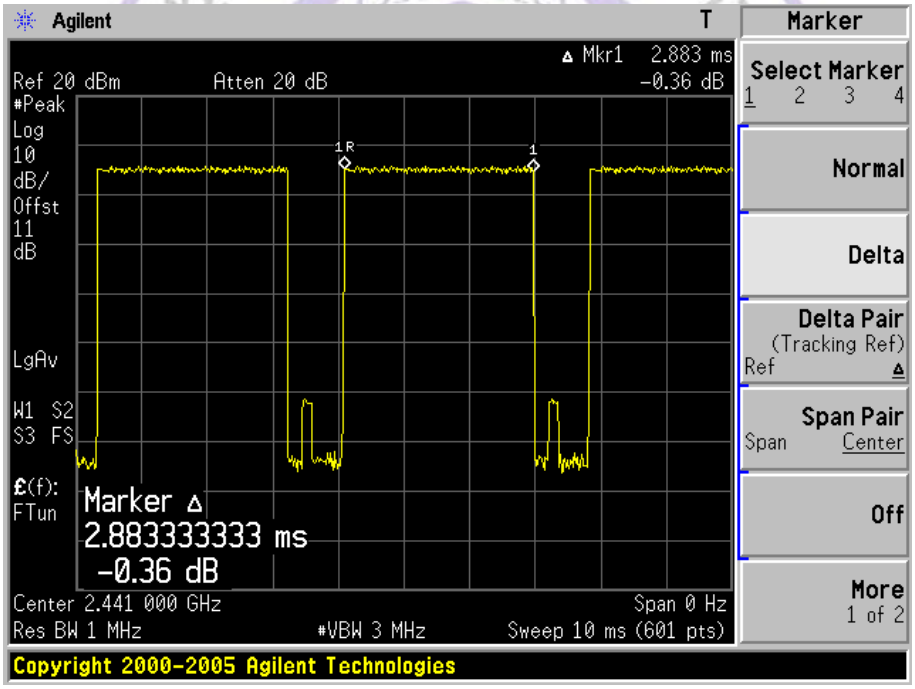
DH3


Agilent
T
Freq/Channel
Ref 20 dBm
Atten 20 dB
#Peak
Log
10
dB/
Offst
11
dB
LgAv
W1 S2
S3 FS
£(f):
FTun
Center
2.441000000 GHz
Center Freq
2.44100000 GHz
Start Freq
2.44100000 GHz
Stop Freq
2.44100000 GHz
CF Step
1.00000000 MHz
Auto Man
Freq Offset
0.00000000 Hz
Signal Track
On Off
Center 2.441 000 GHz
Res BW 1 MHz
#VBW 3 MHz
Span 0 Hz
Sweep 50 ms (601 pts)
Copyright 2000-2005 Agilent Technologies


Agilent
T
Marker
Δ Mkr1 1.617 ms
0.04 dB
Ref 20 dBm
Atten 20 dB
#Peak
Log
10
dB/
Offst
11
dB
LgAv
W1 S2
S3 FS
£(f):
FTun
1R
1
Marker Δ
1.616666667 ms
0.04 dB
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref Δ
Span Pair
Span Center
Off
More
1 of 2
Center 2.441 000 GHz
Res BW 1 MHz
#VBW 3 MHz
Span 0 Hz
Sweep 10 ms (601 pts)
Copyright 2000-2005 Agilent Technologies

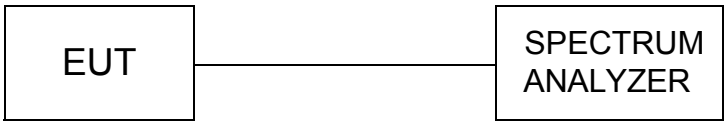
DH5


Agilent
T
Freq/Channel
Ref 20 dBm
Atten 20 dB
#Peak
Log
10
dB/
Offst
11
dB
LgAv
W1 S2
S3 FS
£(f):
FTun
Center
2.441000000 GHz
Center Freq
2.44100000 GHz
Start Freq
2.44100000 GHz
Stop Freq
2.44100000 GHz
CF Step
1.00000000 MHz
Auto Man
Freq Offset
0.00000000 Hz
Signal Track
On Off
Center 2.441 000 GHz
Res BW 1 MHz
#VBW 3 MHz
Span 0 Hz
Sweep 50 ms (601 pts)
Copyright 2000-2005 Agilent Technologies


Agilent
T
Marker
Δ Mkr1 2.883 ms
-0.36 dB
Ref 20 dBm
Atten 20 dB
#Peak
Log
10
dB/
Offst
11
dB
1R
1
LgAv
W1 S2
S3 FS
£(f):
FTun
Marker Δ
2.883333333 ms
-0.36 dB
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref Δ
Span Pair
Span Center
Off
More
1 of 2
Center 2.441 000 GHz
Res BW 1 MHz
#VBW 3 MHz
Span 0 Hz
Sweep 10 ms (601 pts)
Copyright 2000-2005 Agilent Technologies

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.

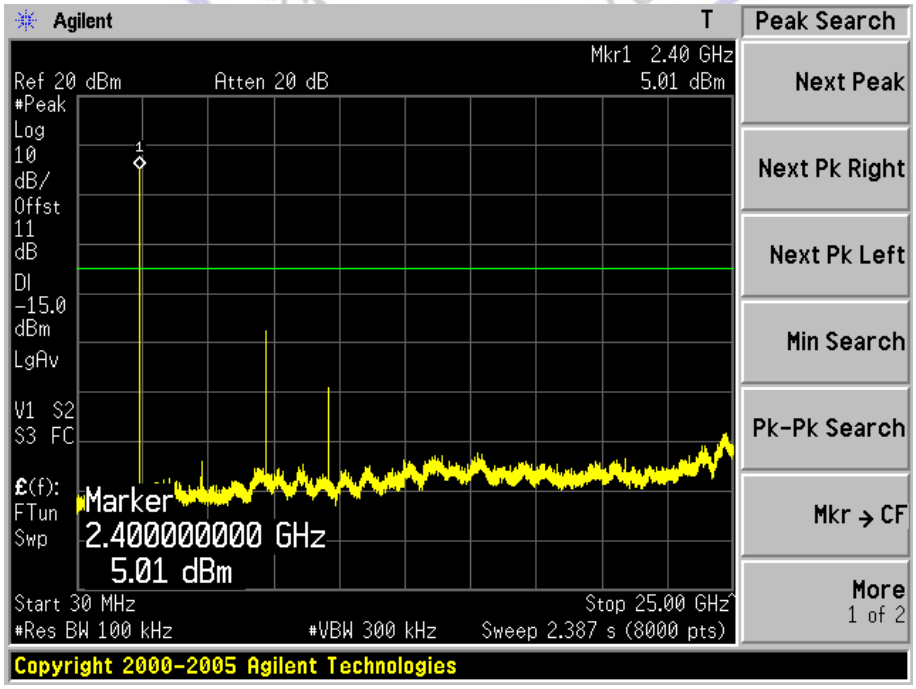
LIMIT

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.

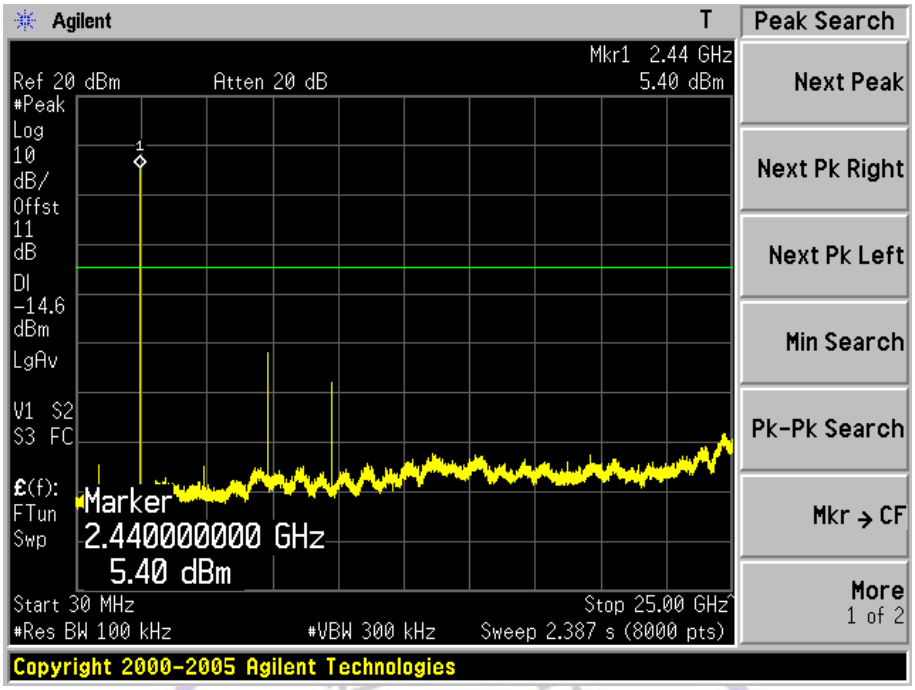
TEST RESULT

DH5 Mode:

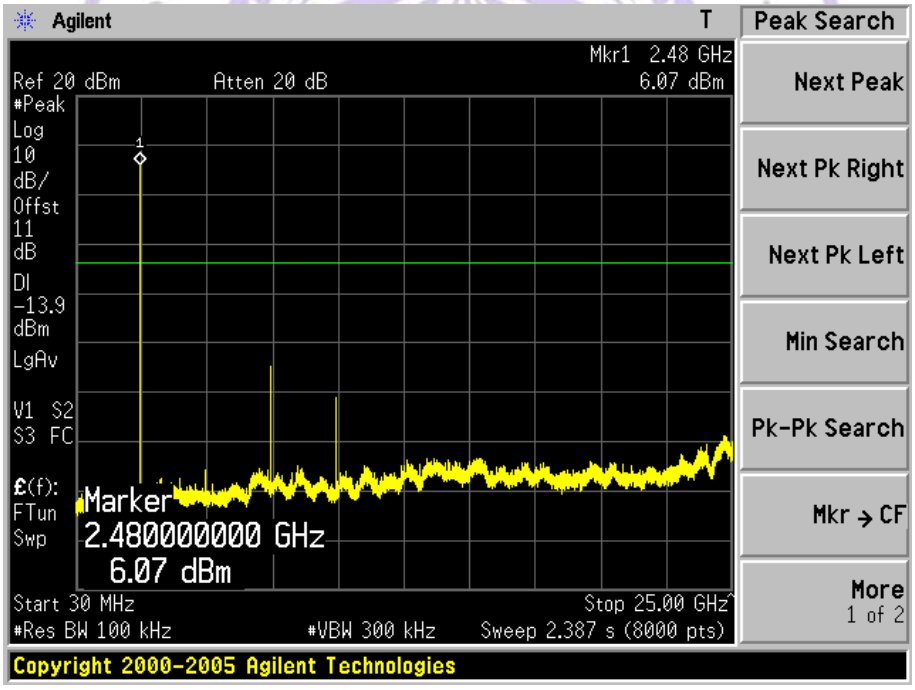
Low Channel



Middle Channel

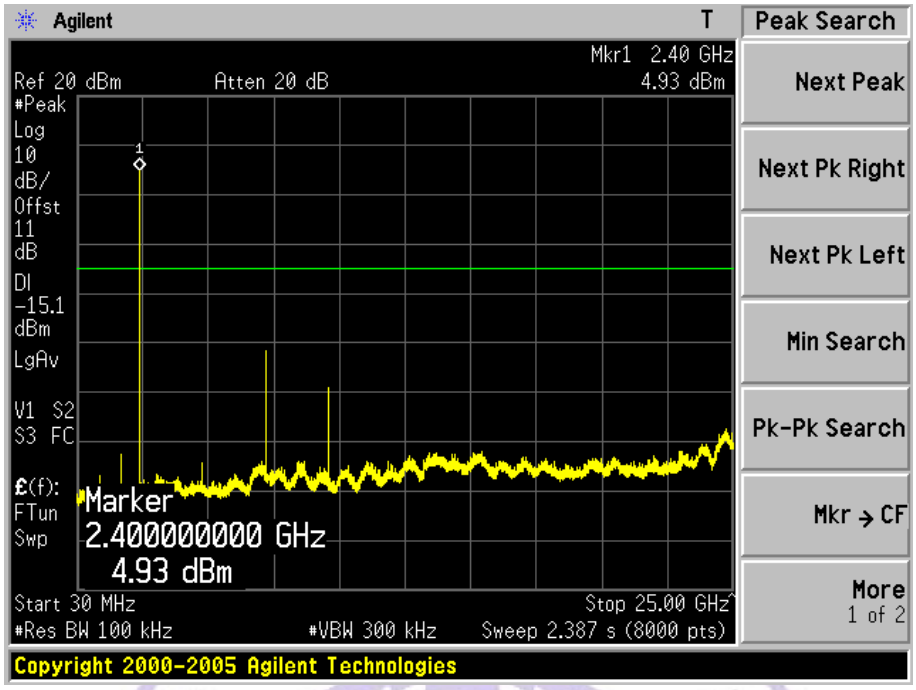


High Channel



2DH5 Mode:

Low Channel



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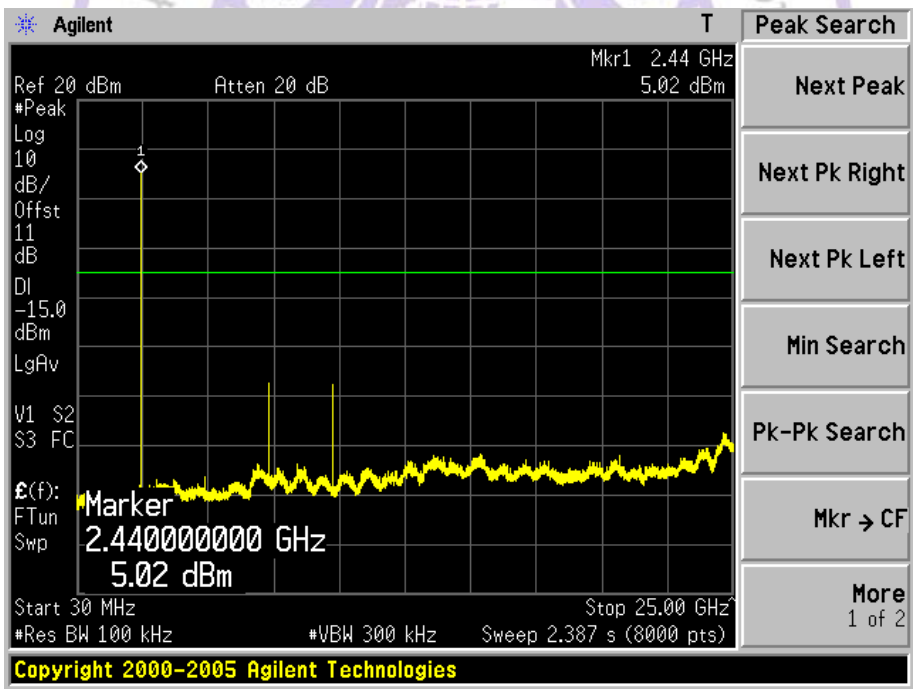
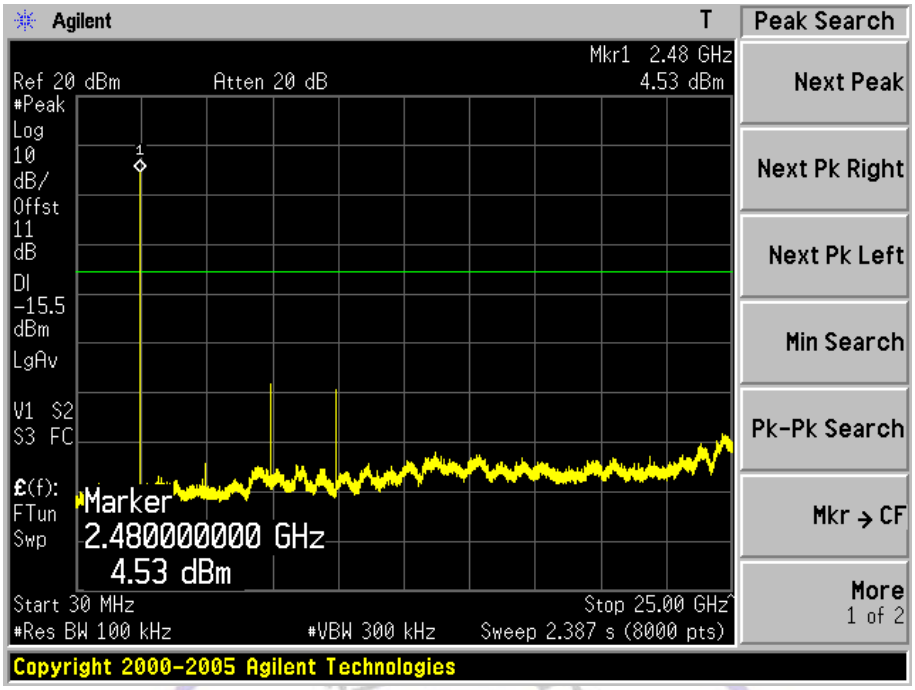


High Channel



3DH5 Mode;

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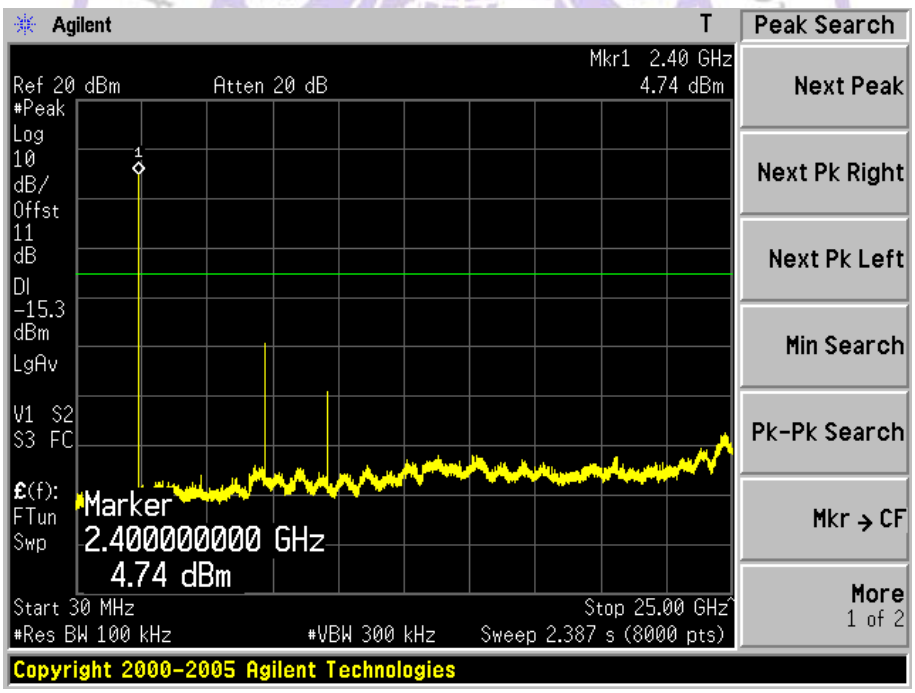
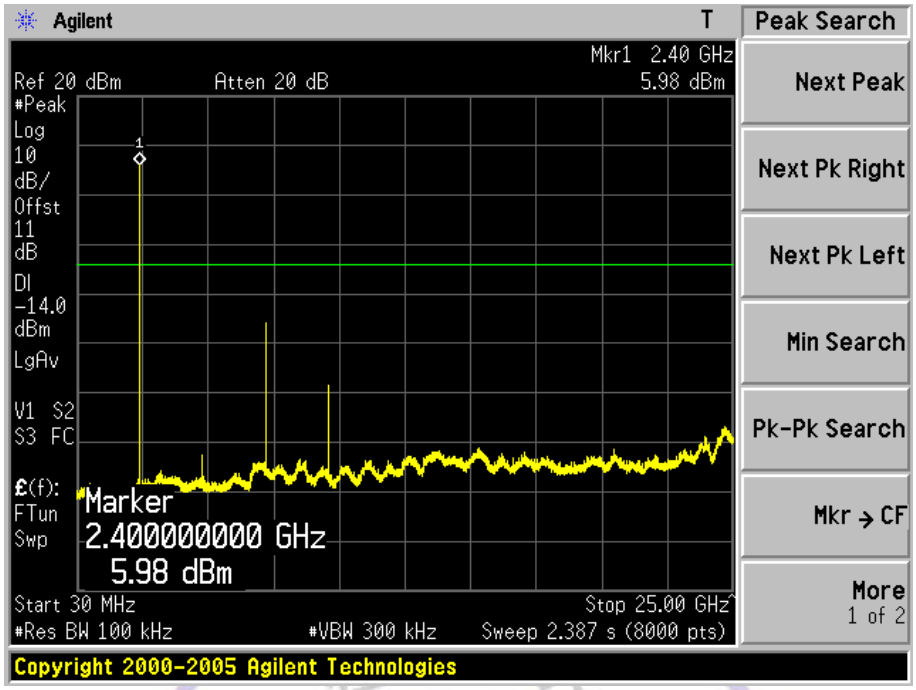
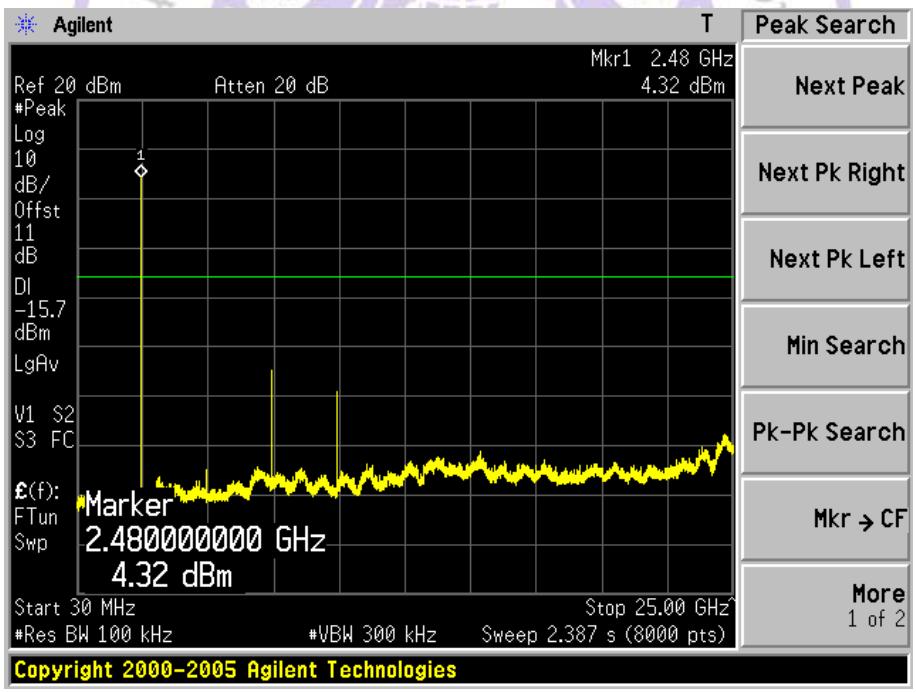


Middle Channel



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.

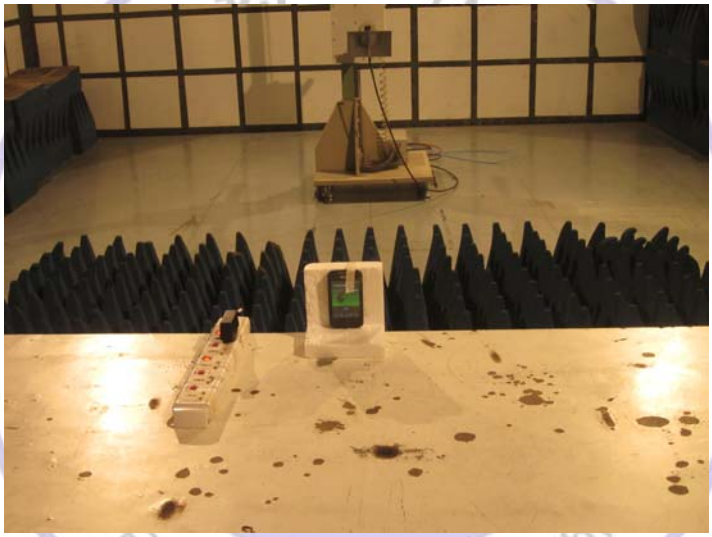
Refer to statement below for compliance.

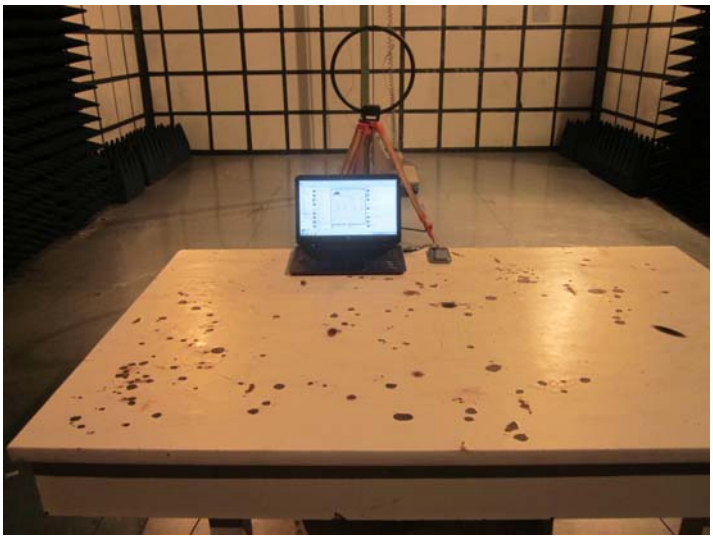
The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited. Further, this requirement does not apply to intentional radiators that must be professionally installed.

Antenna Connected Construction

The antenna used in this product is a internal Antenna, The directional gains of antenna used for transmitting is -2.5 dBi.

5. Test Setup Photos of the EUT

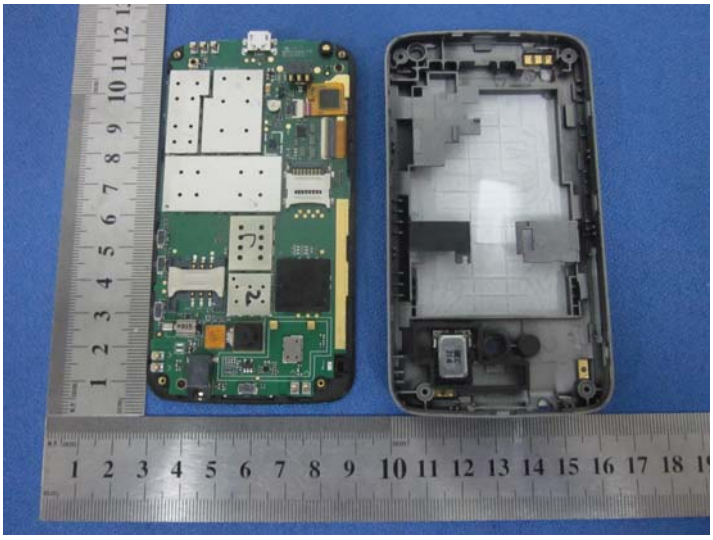


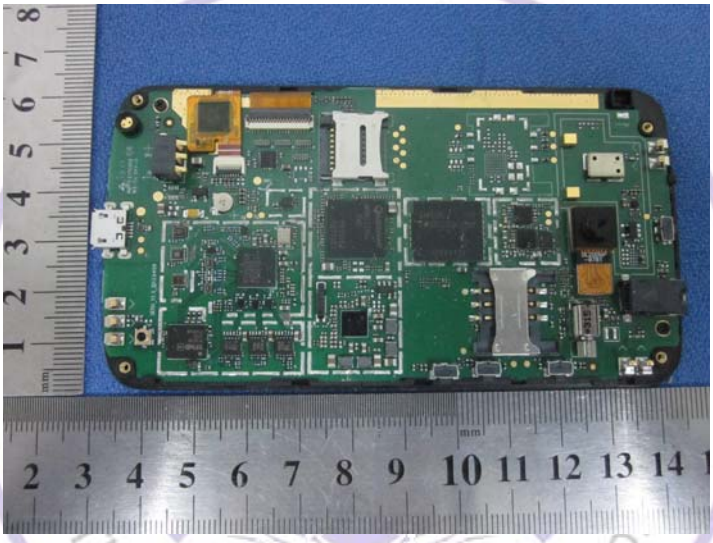


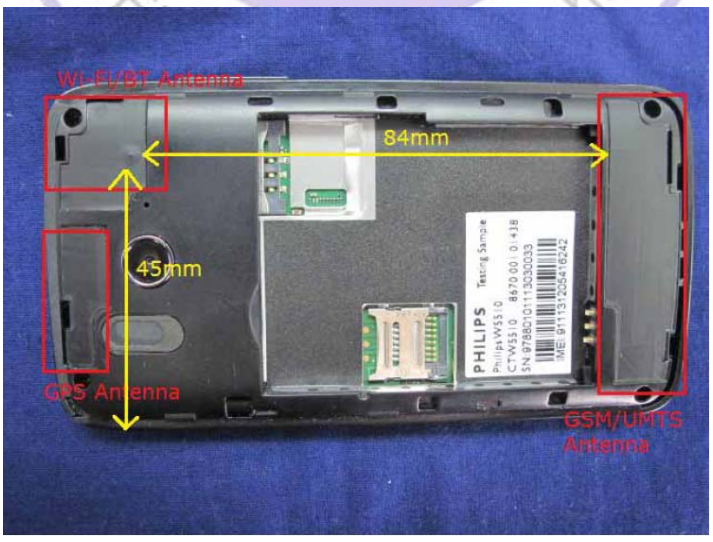
6. External and Internal Photos of the EUT

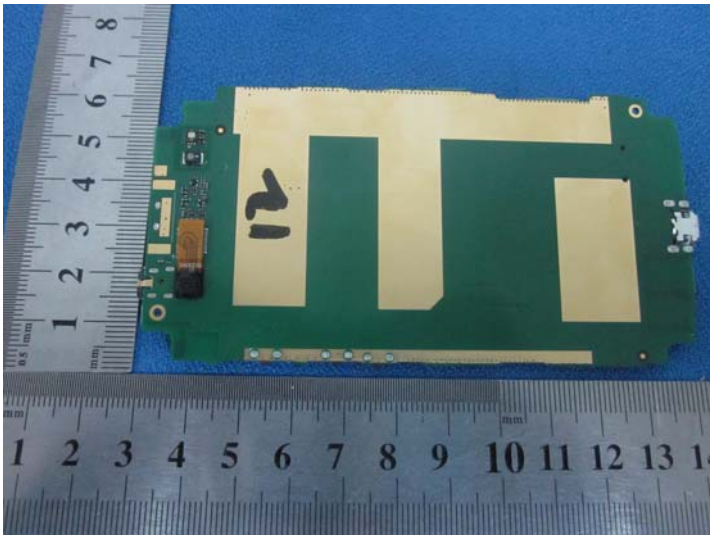
External Photos of EUT

Internal Photos of EUT









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