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FCC PART 15 SUBPART C TEST REPORT

FCC Part 15.247

Report Reference No.....:	**CTL1306281042-WB**
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Date of issue.....:	August 15, 2013
Representative Laboratory Name .:	**Shenzhen CTL Electromagnetic Technology Co., Ltd.**
Address.....:	Floor 1-A, Baisha Technology Park, No. 3011, Shahexi 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.....:	**SHENZHEN GOLD EAST ELETRONIC CO., LTD**
Address.....:	6F, Bldg #11, Yusheng Industry Area, #467 Gushu, Xixiang, Bao'an District, Shenzhen, China 518000
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

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Test item description ..... :	**Tablet PC**
FCC ID……..:	**2AANTL001-30**
Trade Mark .....:	/
Model/Type reference.....:	L001-30, L002-6, L097-5, L010-13, L011-1, L001-30S, L002-6S, L002-9S, L097-5S, L010-13S, L011-1S, L013-3S, L001-40, L001-40S, L002-10, L002-10S, L097-6, L097-6S, L010-16, L010-16S, L011-2, L011-2S
GSM/WCDMA	
Transmit .....:	2G:GSM 850: 824~849MHz, PCS 1900: 1850~1910MHz 3G:WCDMA Band II: 1850-1910MHz, WCDMA Band V: 824~849MHz

Receive .....:	2G:GSM 850: 869~894MHz, PCS 1900: 1930~1990MHz
	3G:WCDMA Band II: 1930~1990MHz,
	WCDMA Band V: 869~894MHz
Release Version .....:	2G:R99
	3G:UMTS FDD: Rel-5
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
	802.11n(40MHz):2422~2452
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 150 Mbps
Antenna Gain .....:	-0.5 dBi for GSM850 and WCDMA Band V
	-1.0 dBi for PCS1900 and WCDMA Band II
	-2.0 dBi for Bluetooth and Wi-Fi
Antenna type .....:	Internal
IMEI .....:	357619049208958
Result.....:	**Positive**

TEST REPORT

Test Report No. :	CTL1306281042-WB	August 15, 2013 Date of issue

Equipment under Test	:	Tablet PC
Model /Type	:	L001-30
Listed Models	:	L002-6, L097-5, L010-13, L011-1, L001-30S, L002-6S, L002-9S, L097-5S, L010-13S, L011-1S, L013-3S, L001-40, L001-40S, L002-10, L002-10S, L097-6, L097-6S, L010-16, L010-16S, L011-2, L011-2S
Difference Description		**Only the model's name is different.**
Applicant	:	**SHENZHEN GOLD EAST ELETRONIC CO., LTD**
Address	:	6F, Bldg #11, Yusheng Industry Area, #467 Gushu, Xixiang, Bao'an District, Shenzhen, China 518000
Manufacturer	:	**SHENZHEN GOLD EAST ELETRONIC CO., LTD**
Address	:	6F, Bldg #11, Yusheng Industry Area, #467 Gushu, Xixiang, Bao'an District, Shenzhen, China 518000

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.

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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	:	July 22, 2013
Testing commenced on	:	July 22, 2013
Testing concluded on	:	August 15, 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)		

_____

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

A Tablet PC (L001-30) 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 :	lenovo
		Model No. :	E43L
●	TV	Manufacturer :	SHARP
		Model No. :	LCD-26Z100A

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	lenovo	E43L	EB14896577	------

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

This submittal(s) (test report) is intended for **FCC ID: 2AANTL001-30** 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)	CTL1306281042-WB
RF Exposure	FCC Per 47 CFR 2.1093	CTL1306281042-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.

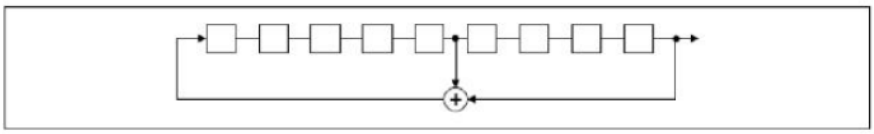
(g) Frequency hopping spread spectrum systems are not required to employ all available hopping channels during each transmission. However, the system, consisting of both the transmitter and the receiver, must be designed to comply with all of the regulations in this section should the transmitter be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



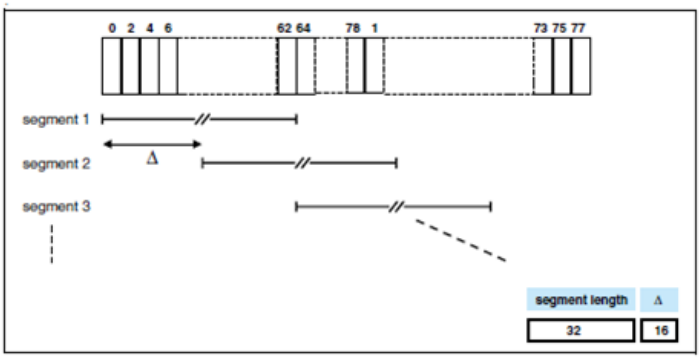
Linear Feedback Shift Register for Generation of the PRBS sequence

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:

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

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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 (2003) 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.

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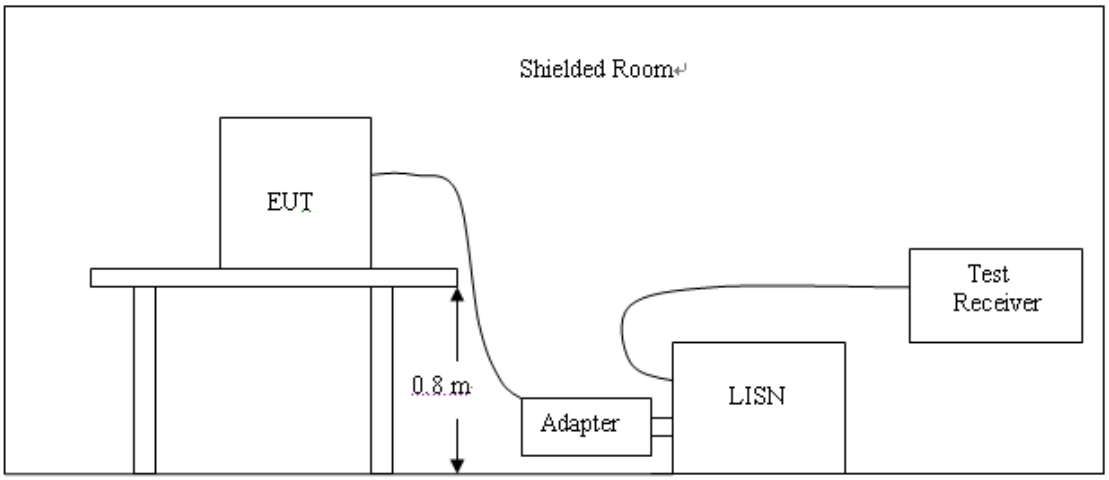
3.6. Equipments Used during the Test

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

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

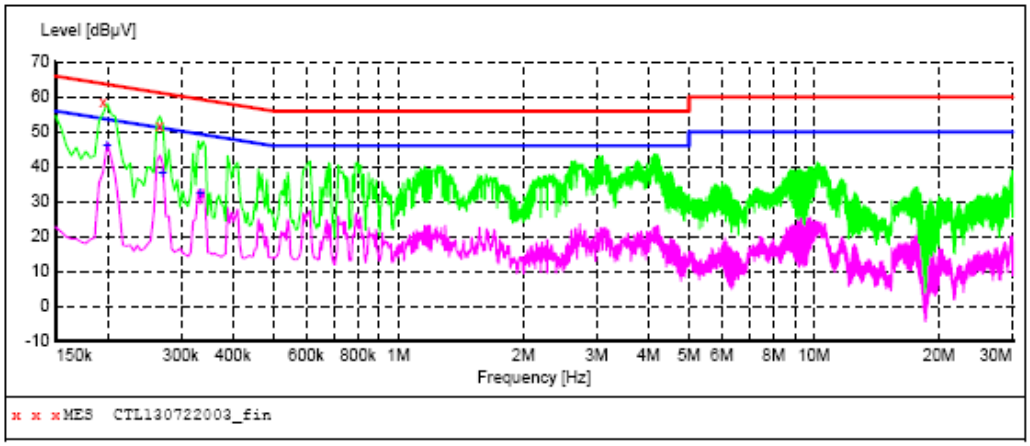
* Decreasing linearly with the logarithm of the frequency

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: "CTL130722003_fin"

7/22/2013 2:31PM

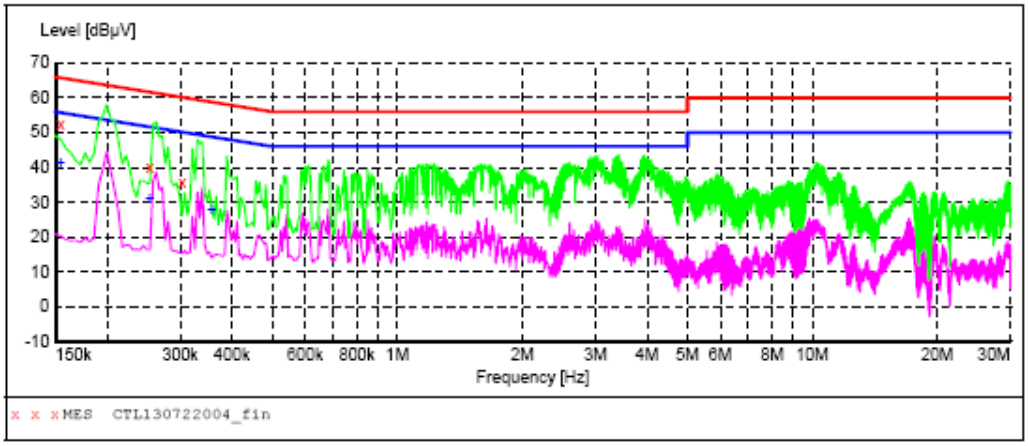
Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.195000	58.40	9.8	64	5.4	QP	N	GND
0.267000	51.70	9.8	61	9.5	QP	N	GND

MEASUREMENT RESULT: "CTL130722003_fin2"

7/22/2013 2:31PM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.199500	46.70	9.8	54	6.9	AV	N	GND
0.271500	38.60	9.8	51	12.5	AV	N	GND
0.334500	33.00	9.8	49	16.3	AV	N	GND

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



MEASUREMENT RESULT: "CTL130722004_fin"

7/22/2013 2:41PM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.154500	52.60	9.8	66	13.2	QP	L1	GND
0.253500	40.10	9.8	62	21.5	QP	L1	GND
0.303000	35.60	9.8	60	24.6	QP	L1	GND

MEASUREMENT RESULT: "CTL130722004_fin2"

7/22/2013 2:41PM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.154500	41.80	9.8	56	14.0	AV	L1	GND
0.253500	31.30	9.8	52	20.3	AV	L1	GND
0.357000	28.40	9.8	49	20.4	AV	L1	GND

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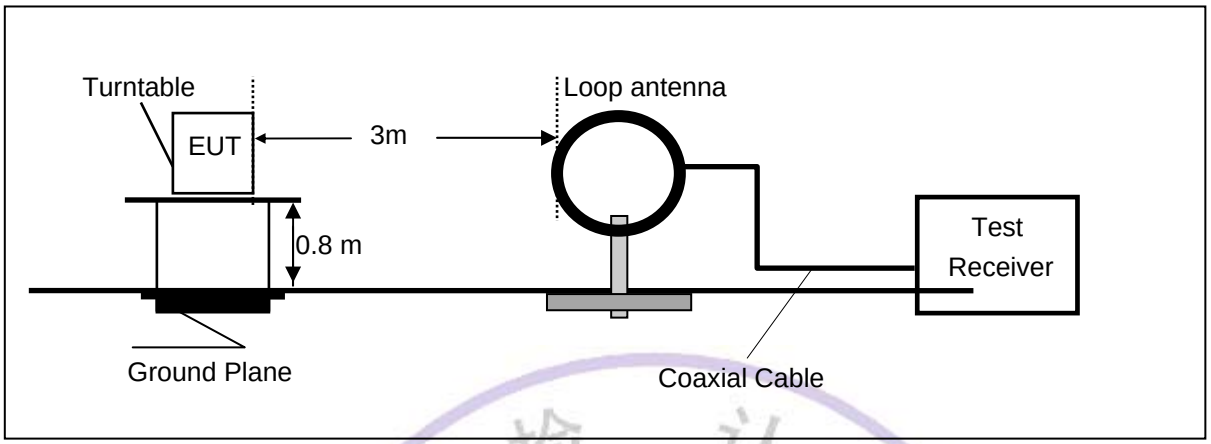
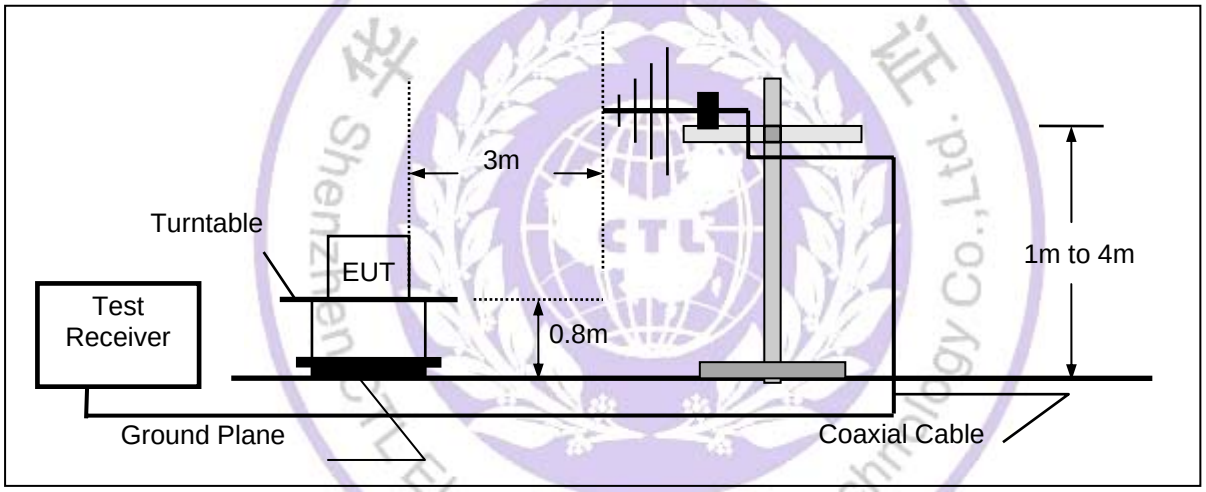
4.2. Radiated Emission

TEST CONFIGURATION

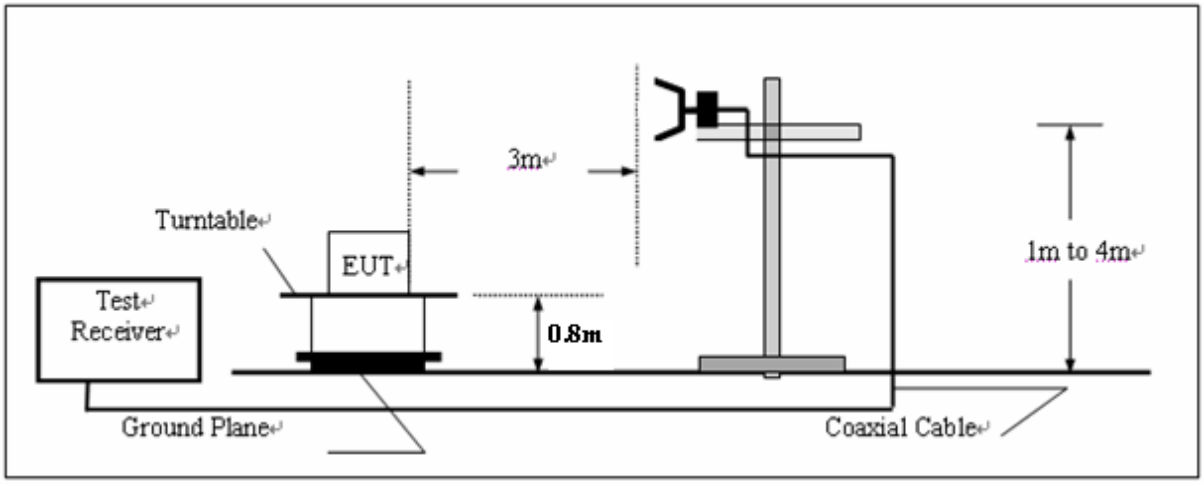
Radiated Emission Test Set-Up
Frequency range 9KHz – 30MHz



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	4804.0	48.3	-2.6	45.7	54(Note2)	-8.3	PK
	V	4804.0	47.0	-2.6	44.4	54(Note2)	-9.6	PK
	H	7206.0	39.8	2.6	42.4	54(Note2)	-11.6	PK
	V	7206.0	39.7	2.6	42.3	54(Note2)	-11.7	PK
	H	9608.0	40.5	4.8	45.3	54(Note2)	-8.7	PK
	V	9608.0	40.8	4.8	45.6	54(Note2)	-8.4	PK
39	H	4882.0	45.8	-2.3	43.5	54(Note2)	-10.5	PK
	V	4882.0	44.6	-2.3	42.3	54(Note2)	-11.7	PK
	H	7323.0	40.4	2.7	43.1	54(Note2)	-10.9	PK
	V	7323.0	40.5	2.7	43.2	54(Note2)	-10.8	PK
	H	9764.0	40.9	4.7	45.6	54(Note2)	-8.4	PK
	V	9764.0	40.7	4.7	45.4	54(Note2)	-8.6	PK
78	H	4960.0	40.8	-2.0	38.8	54(Note2)	-15.2	PK
	V	4960.0	41.8	-2.0	39.8	54(Note2)	-14.2	PK
	H	7440.0	40.7	2.7	43.4	54(Note2)	-10.6	PK
	V	7440.0	40.6	2.7	43.3	54(Note2)	-10.7	PK
	H	9920.0	40.9	5.0	45.9	54(Note2)	-8.1	PK
	V	9920.0	41.1	5.0	46.1	54(Note2)	-7.9	PK

Note 1: Measure Level = Reading Level + Factor.

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.

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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	4804.0	41.0	-2.6	38.4	54(Note2)	-15.6	PK
	V	4804.0	41.4	-2.6	38.8	54(Note2)	-15.2	PK
	H	7206.0	40.1	2.6	42.7	54(Note2)	-11.3	PK
	V	7206.0	39.6	2.6	42.2	54(Note2)	-11.8	PK
	H	9608.0	40.6	4.8	45.4	54(Note2)	-8.6	PK
	V	9608.0	40.3	4.8	45.1	54(Note2)	-8.9	PK
39	H	4882.0	44.9	-2.3	42.6	54(Note2)	-11.4	PK
	V	4882.0	44.6	-2.3	42.3	54(Note2)	-11.7	PK
	H	7323.0	41.2	2.7	43.9	54(Note2)	-10.1	PK
	V	7323.0	40.3	2.7	43.0	54(Note2)	-11.0	PK
	H	9764.0	40.9	4.7	45.6	54(Note2)	-8.4	PK
	V	9764.0	41.9	4.7	46.6	54(Note2)	-7.4	PK
78	H	4960.0	40.5	-2.0	38.5	54(Note2)	-15.5	PK
	V	4960.0	40.6	-2.0	38.6	54(Note2)	-15.4	PK
	H	7440.0	40.9	2.7	43.6	54(Note2)	-10.4	PK
	V	7440.0	41.0	2.7	43.7	54(Note2)	-10.3	PK
	H	9920.0	40.7	5.0	45.7	54(Note2)	-8.3	PK
	V	9920.0	40.8	5.0	45.8	54(Note2)	-8.2	PK

Note 1: Measure Level = Reading Level + Factor.

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.

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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	4804.0	41.8	-2.6	39.2	54(Note2)	-14.8	PK
	V	4804.0	41.7	-2.6	39.1	54(Note2)	-14.9	PK
	H	7206.0	40.7	2.6	43.3	54(Note2)	-10.7	PK
	V	7206.0	40.3	2.6	42.9	54(Note2)	-11.1	PK
	H	9608.0	39.9	4.8	44.7	54(Note2)	-9.3	PK
	V	9608.0	40.3	4.8	45.1	54(Note2)	-8.9	PK
39	H	4882.0	45.8	-2.3	43.5	54(Note2)	-10.5	PK
	V	4882.0	44.5	-2.3	42.2	54(Note2)	-11.8	PK
	H	7323.0	40.0	2.7	42.7	54(Note2)	-11.3	PK
	V	7323.0	40.7	2.7	43.4	54(Note2)	-10.6	PK
	H	9764.0	41.3	4.7	46.0	54(Note2)	-8.0	PK
	V	9764.0	40.4	4.7	45.1	54(Note2)	-8.9	PK
78	H	4960.0	43.1	-2.0	41.1	54(Note2)	-12.9	PK
	V	4960.0	43.2	-2.0	41.2	54(Note2)	-12.8	PK
	H	7440.0	40.7	2.7	43.4	54(Note2)	-10.6	PK
	V	7440.0	40.6	2.7	43.3	54(Note2)	-10.7	PK
	H	9920.0	40.9	5.0	45.9	54(Note2)	-8.1	PK
	V	9920.0	41.3	5.0	46.3	54(Note2)	-7.7	PK

Note 1: Measure Level = Reading Level + Factor.

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.

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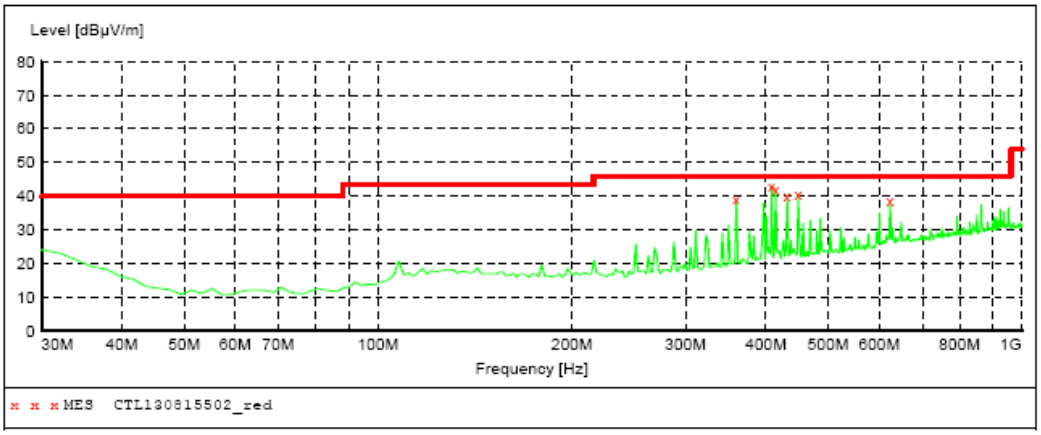
The 1Mbps (GFSK Modulation) is the worst case as results in the report based on the Pre-test for all modulation models.

The worst case(Mode 1) of Radiated Emission below 1GHz:

SWEEP TABLE: "test (30M-1G)"

Short Description:			Field Strength		
Start Frequency	Stop Frequency	Detector	Meas. Time	IF Bandw.	Transducer
30.0 MHz	1.0 GHz	MaxPeak	300.0 ms	120 kHz	JB1



MEASUREMENT RESULT: "CTL130815502_red"

8/15/2013 9:40AM

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
359.800000	39.10	17.3	46.0	6.9	---	0.0	0.00	HORIZONTAL
408.300000	43.20	18.4	46.0	2.8	---	0.0	0.00	HORIZONTAL
414.120000	42.10	18.6	46.0	3.9	---	0.0	0.00	HORIZONTAL
431.580000	40.20	18.9	46.0	5.8	---	0.0	0.00	HORIZONTAL
449.040000	40.60	19.2	46.0	5.4	---	0.0	0.00	HORIZONTAL
623.640000	38.70	22.3	46.0	7.3	---	0.0	0.00	HORIZONTAL

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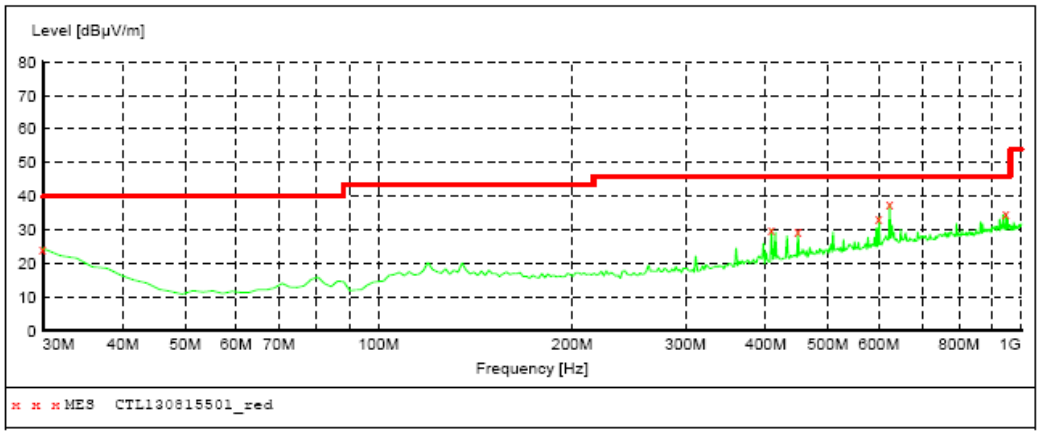
SWEEP TABLE: "test (30M-1G)"

Short Description:			Field Strength		
Start Frequency	Stop Frequency	Detector	Meas. Time	IF Bandw.	Transducer
30.0 MHz	1.0 GHz	MaxPeak	300.0 ms	120 kHz	JB1



MEASUREMENT RESULT: "CTL130815501_red"

8/15/2013 9:37AM

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
30.000000	24.50	21.1	40.0	15.5	---	0.0	0.00	VERTICAL
408.300000	30.10	18.4	46.0	15.9	---	0.0	0.00	VERTICAL
449.040000	29.40	19.2	46.0	16.6	---	0.0	0.00	VERTICAL
600.360000	33.60	21.8	46.0	12.4	---	0.0	0.00	VERTICAL
623.640000	37.70	22.3	46.0	8.3	---	0.0	0.00	VERTICAL
945.680000	34.80	26.6	46.0	11.2	---	0.0	0.00	VERTICAL

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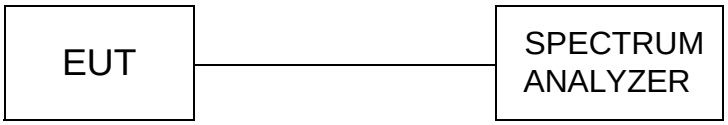
4.3. Maximum Peak Output Power

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

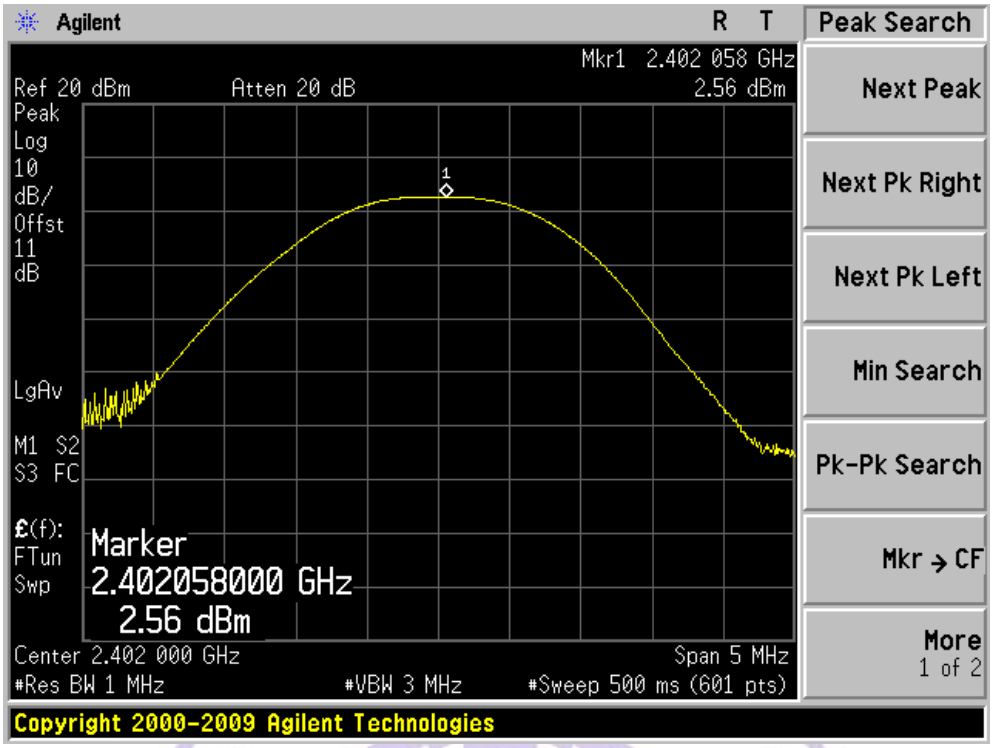
The Maximum Peak Output Power Measurement limit is 30dBm.

TEST RESULTS

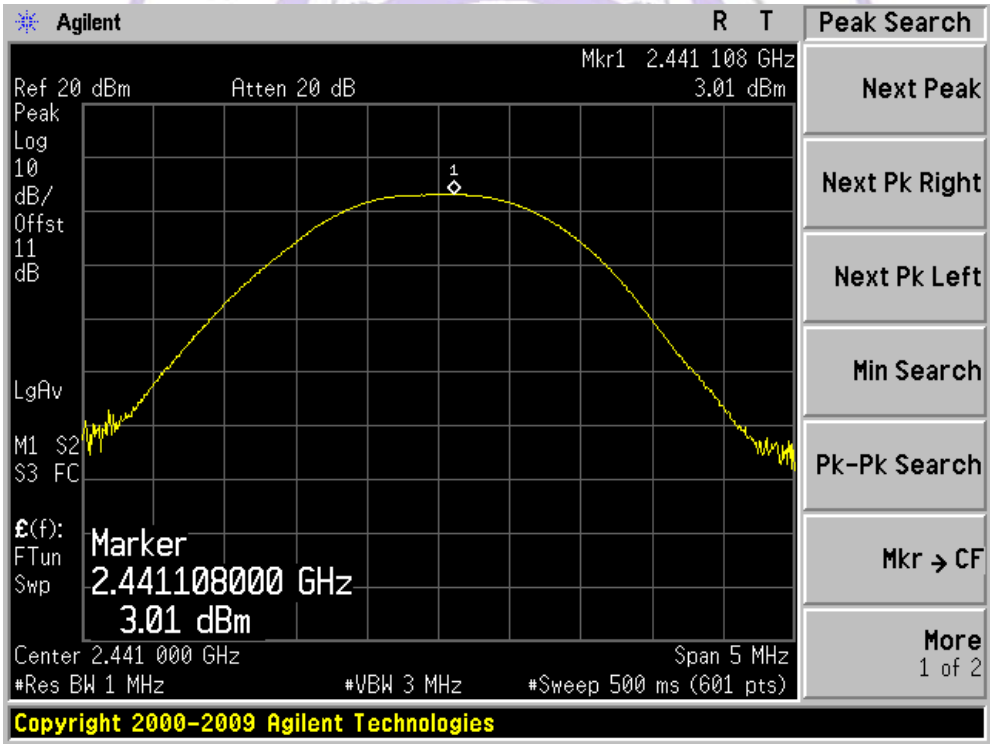
Product	:	**Tablet PC**
Test Item	:	Power Output
Test Mode	:	Mode 1: Transmitter-1Mbps(GFSK_DH5)

Channel No.	Frequency (MHz)	Measurement Power Output (dBm)	Limit (dBm)	Result
0	2402	2.56	30.00	Pass
39	2441	3.01	30.00	Pass
78	2480	3.63	30.00	Pass

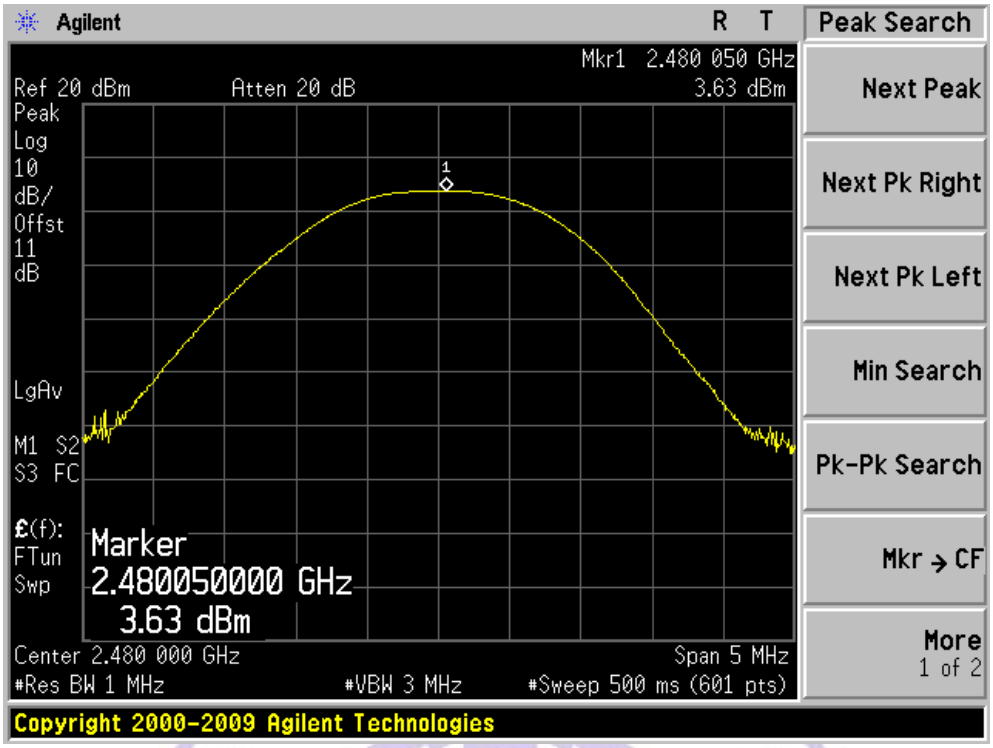
DH5 2402MHz



DH5 2441MHz



DH5 2480MHz



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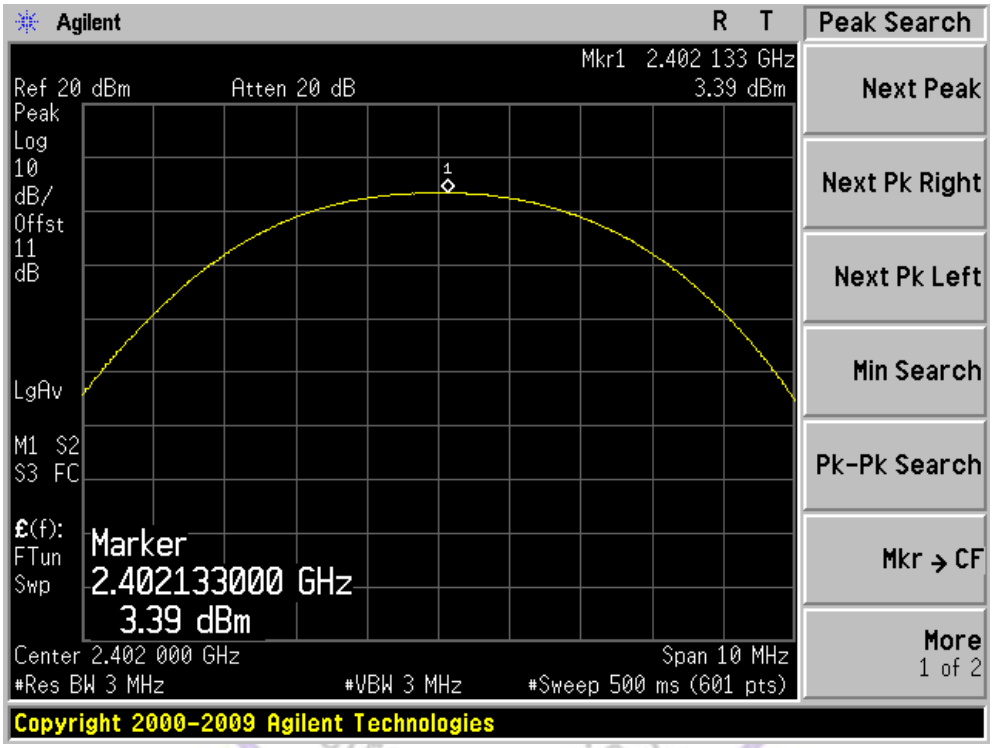
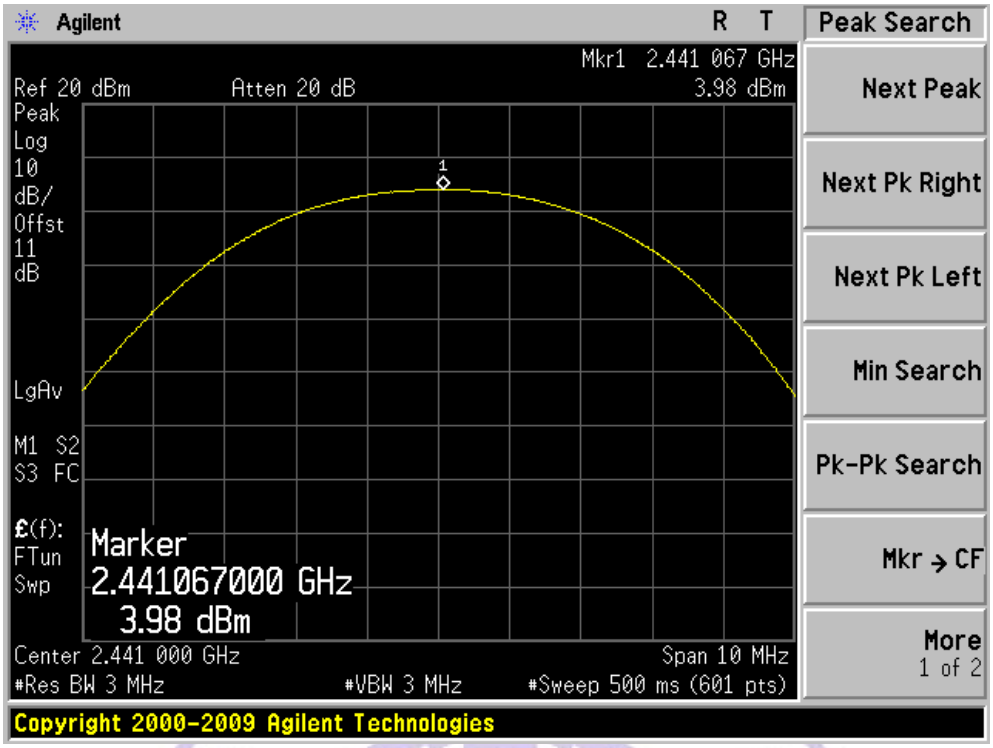
Product	:	**Tablet PC**
Test Item	:	Power Output
Test Mode	:	Mode 2: Transmitter-2Mbps(Pi/4 DQPSK_DH5)

Channel No.	Frequency (MHz)	Measurement Power Output (dBm)	Limit (dBm)	Result
0	2402	3.39	30.00	Pass
39	2441	3.98	30.00	Pass
78	2480	4.63	30.00	Pass

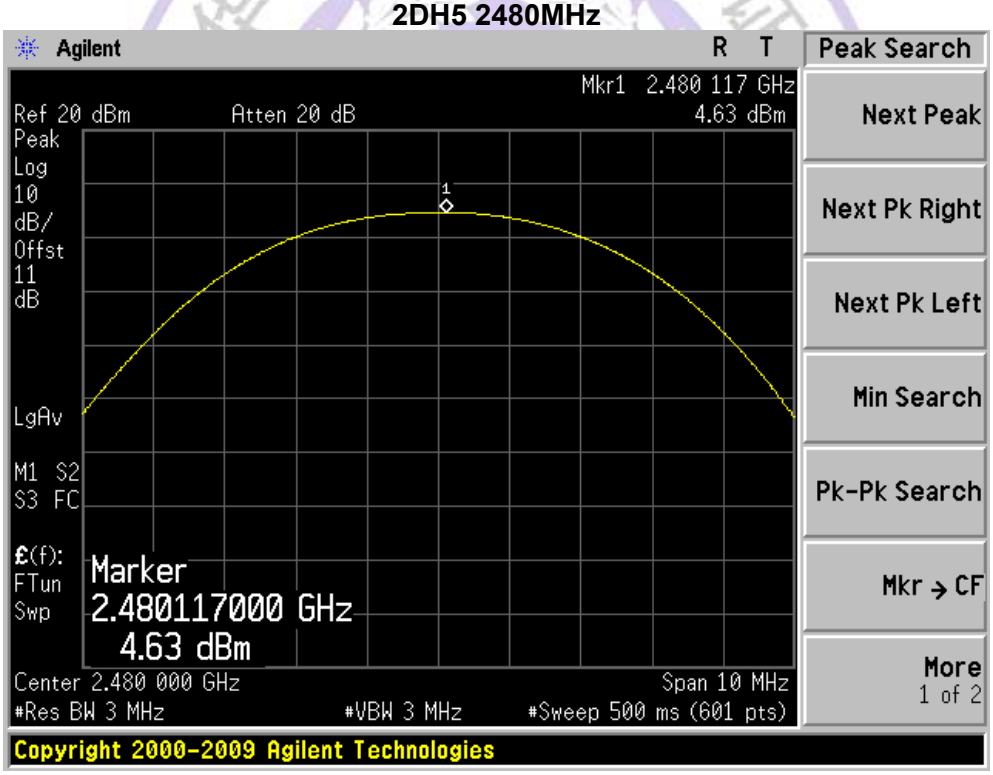
2DH5 2402MHz



2DH5 2441MHz



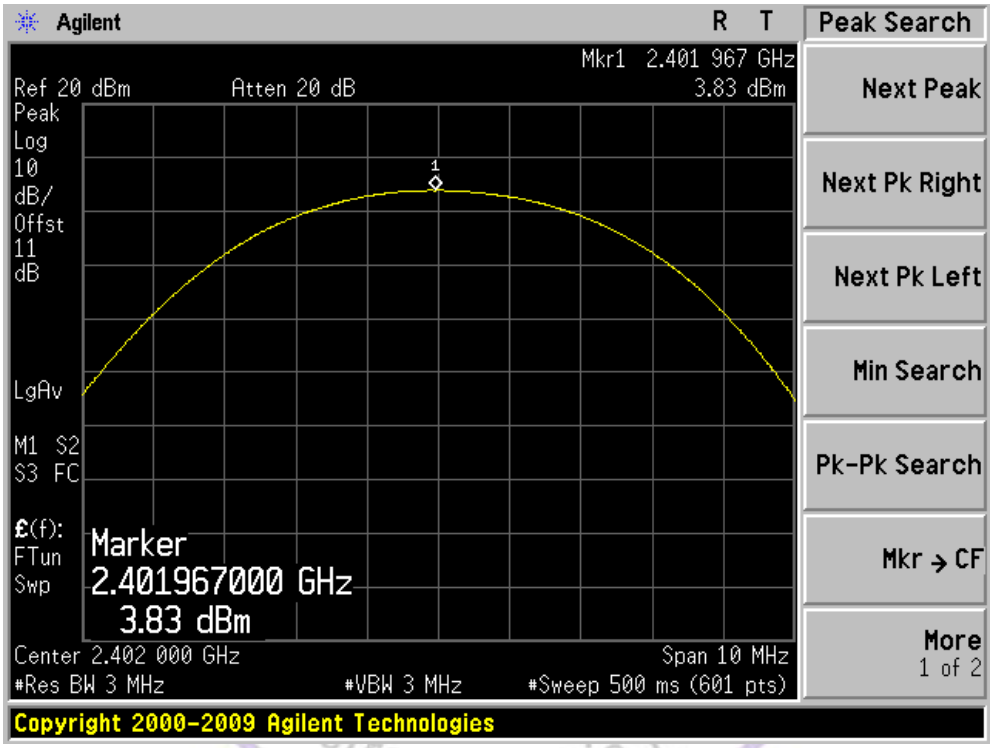
2DH5 2480MHz



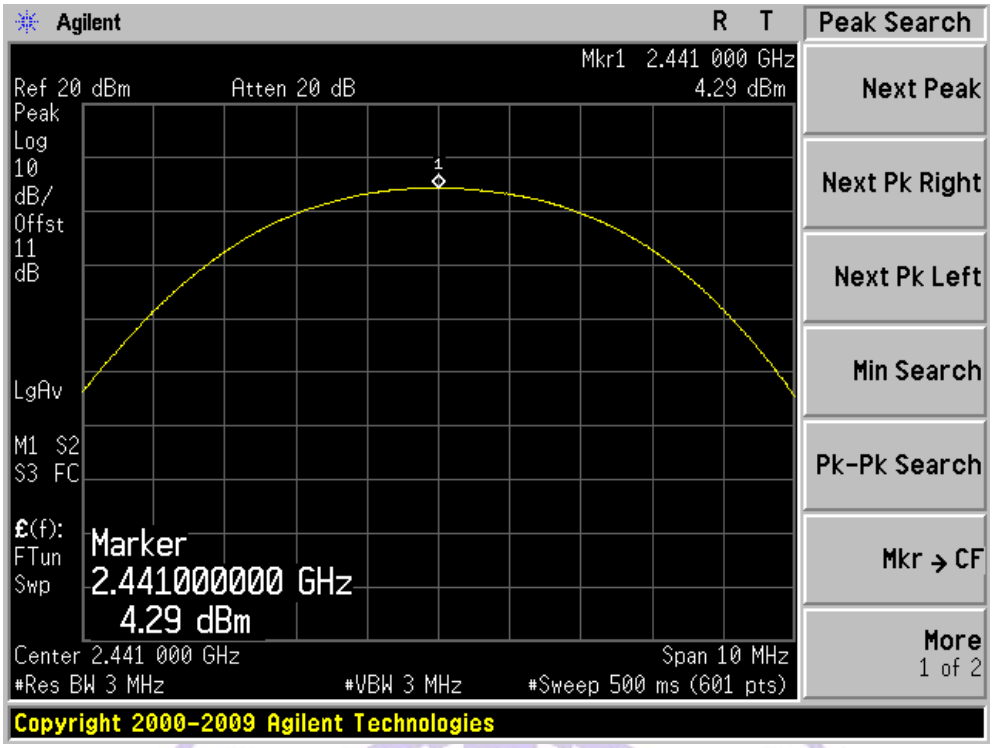
Product	:	**Tablet PC**
Test Item	:	Power Output
Test Mode	:	Mode 3: Transmitter-3Mbps(8DPSK_DH5)

Channel No.	Frequency (MHz)	Measurement Power Output (dBm)	Limit (dBm)	Result
0	2402	3.83	30.00	Pass
39	2441	4.29	30.00	Pass
78	2480	4.81	30.00	Pass

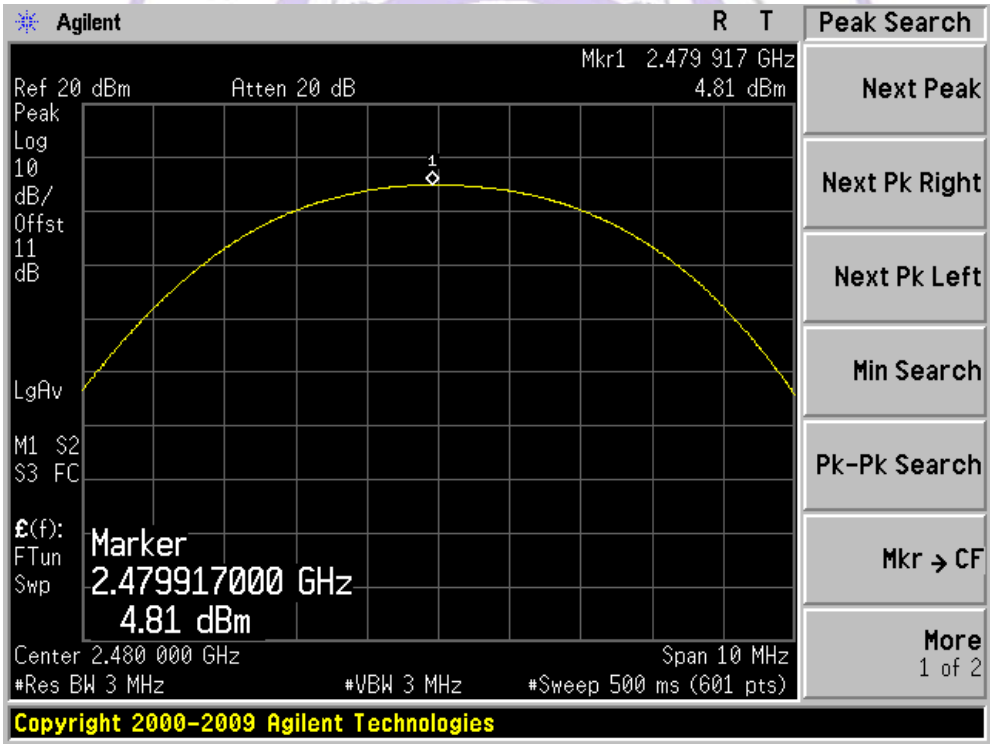
3DH5 2402MHz



3DH5 2441MHz

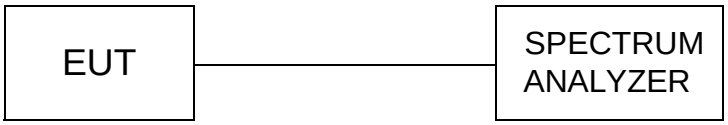


3DH5 2480MHz



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

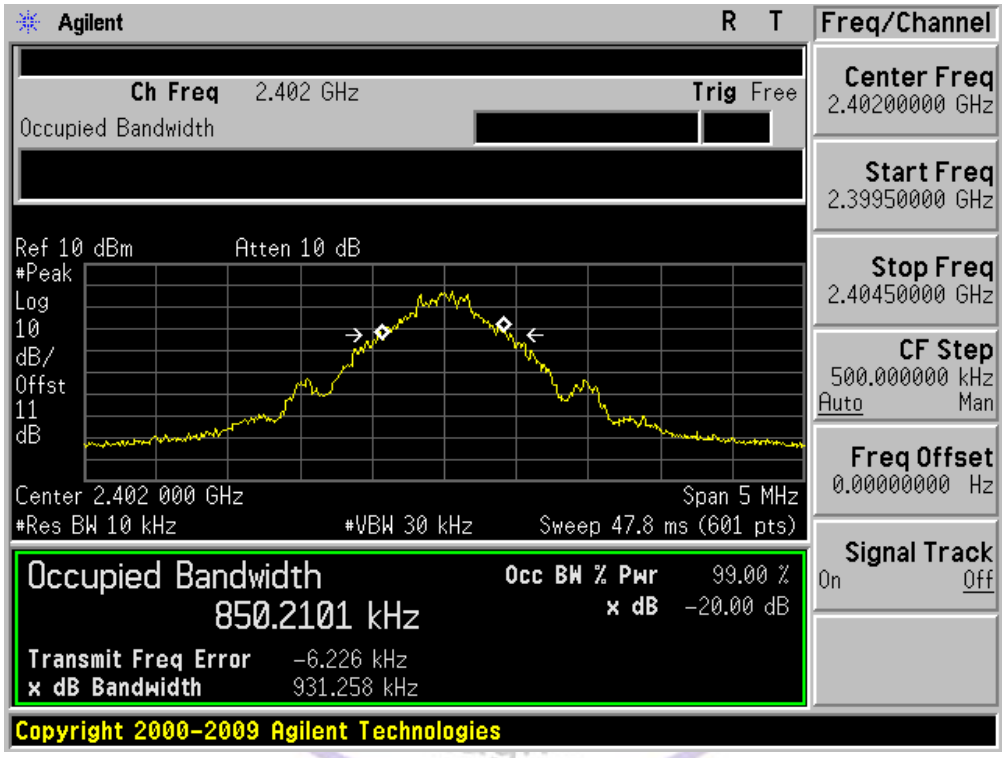
For frequency hopping systems operating in the 2400MHz-2483.5MHz no limit for 20dB bandwith.

TEST RESULTS

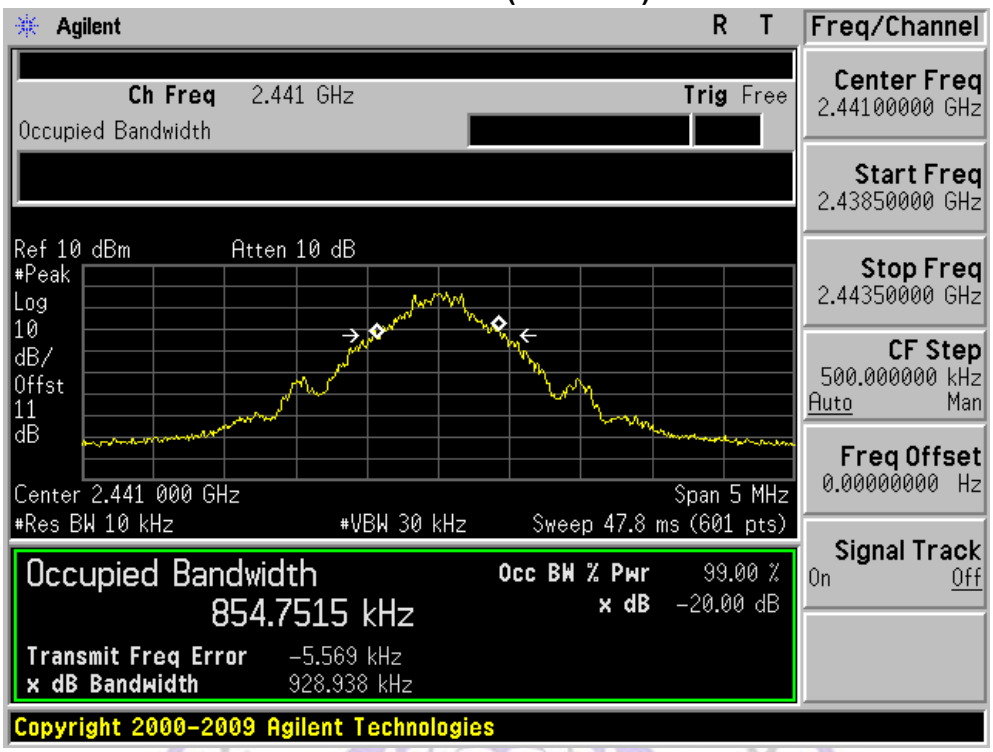
Product	:	**Tablet PC**
Test Item	:	Occupied Bandwidth
Test Site	:	TR-8
Test Mode	:	Mode 1: Transmitter-1Mbps(GFSK_DH5)

Channel No.	Frequency (MHz)	20dB Bandwidth (kHz)	99% Bandwidth (kHz)
00	2402	931.3	850.2
39	2441	928.9	854.8
78	2480	927.3	852.9

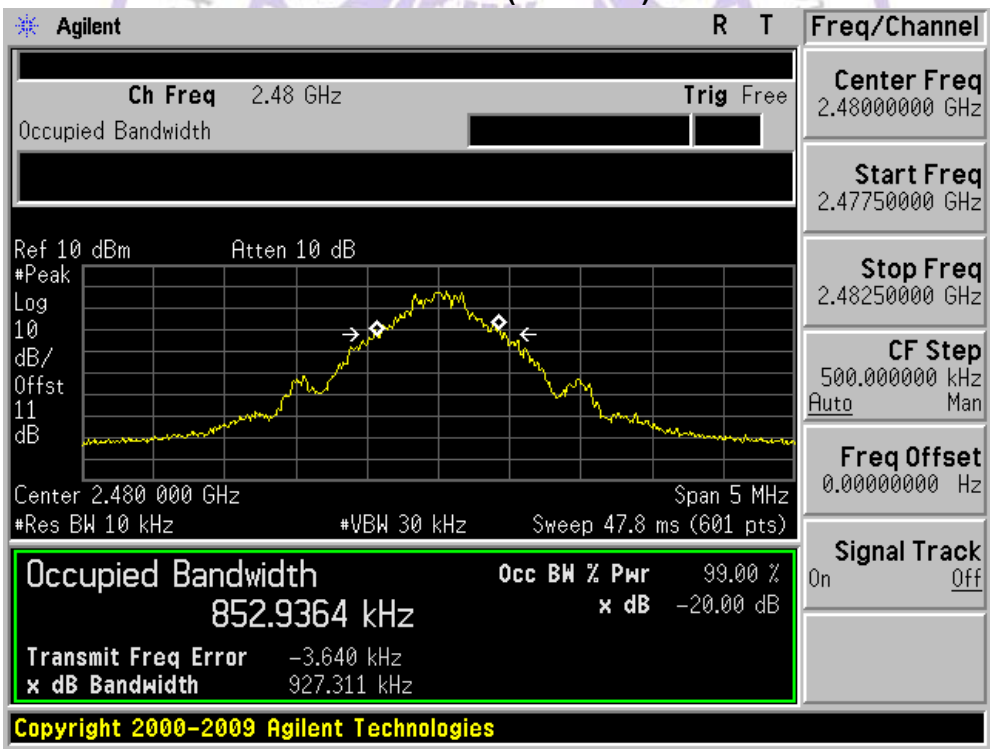
Channel 00 (2402MHz)



Channel 39 (2441MHz)



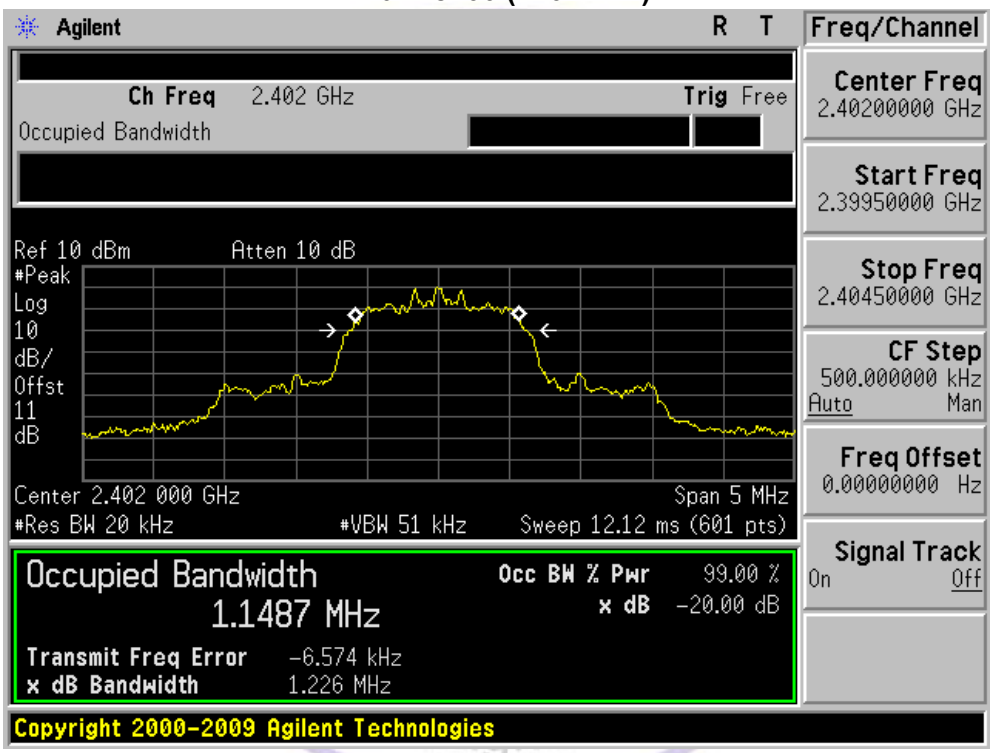
Channel 78 (2480MHz)



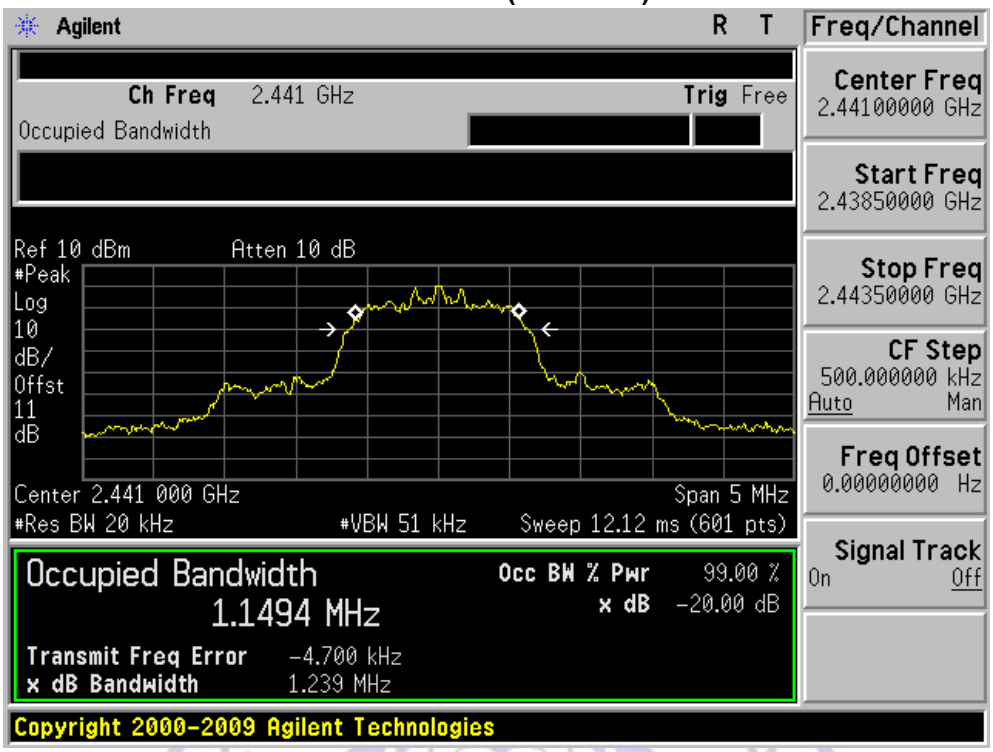
Product	:	**Tablet PC**
Test Item	:	Occupied Bandwidth
Test Site	:	TR-8
Test Mode	:	Mode 2: Transmitter-2Mbps(Pi/4 DQPSK_DH5)

Channel No.	Frequency (MHz)	20dB Bandwidth (kHz)	99% Bandwidth (kHz)
00	2402	1226.0	1148.7
39	2441	1239.0	1149.4
78	2480	1222.0	1147.8

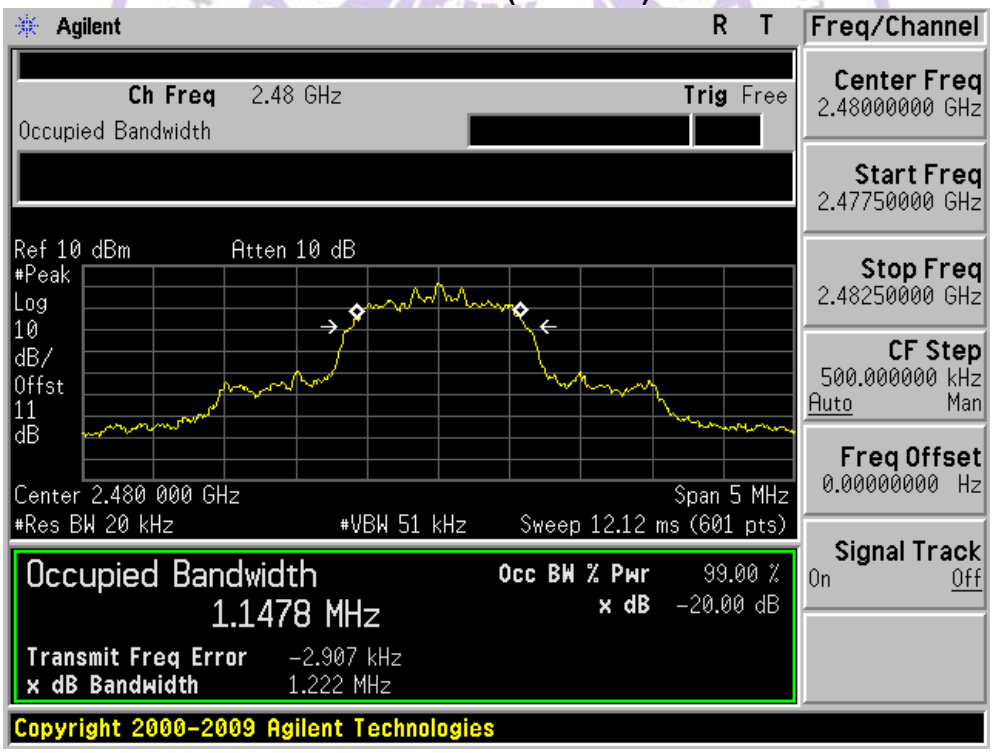
Channel 00 (2402MHz)



Channel 39 (2441MHz)



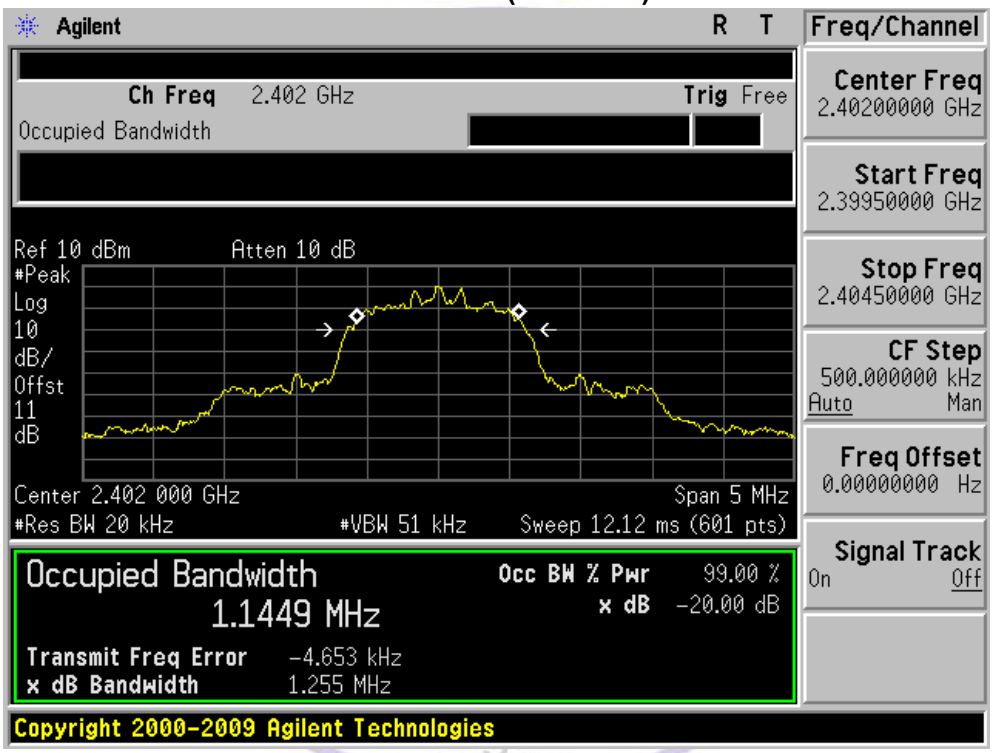
Channel 78 (2480MHz)



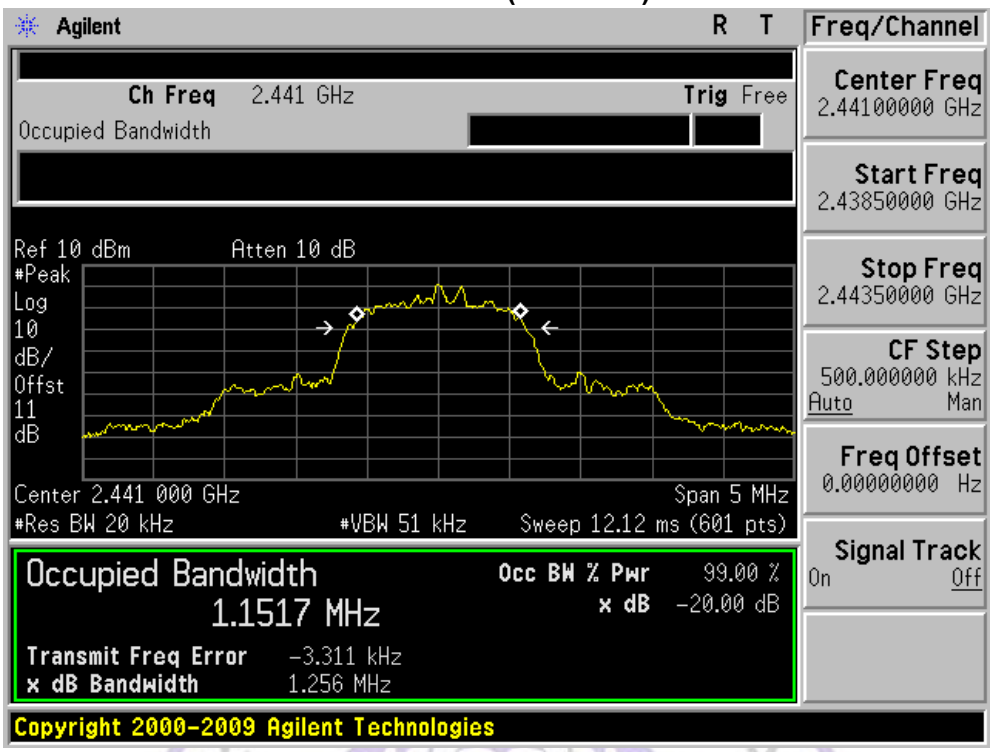
Product	:	**Tablet PC**
Test Item	:	Occupied Bandwidth
Test Site	:	TR-8
Test Mode	:	Mode 3: Transmitter-3Mbps(8DPSK_DH5)

Channel No.	Frequency (MHz)	20dB Bandwidth (kHz)	99% Bandwidth (kHz)
00	2402	1255.0	1144.9
39	2441	1256.0	1151.7
78	2480	1256.0	1164.3

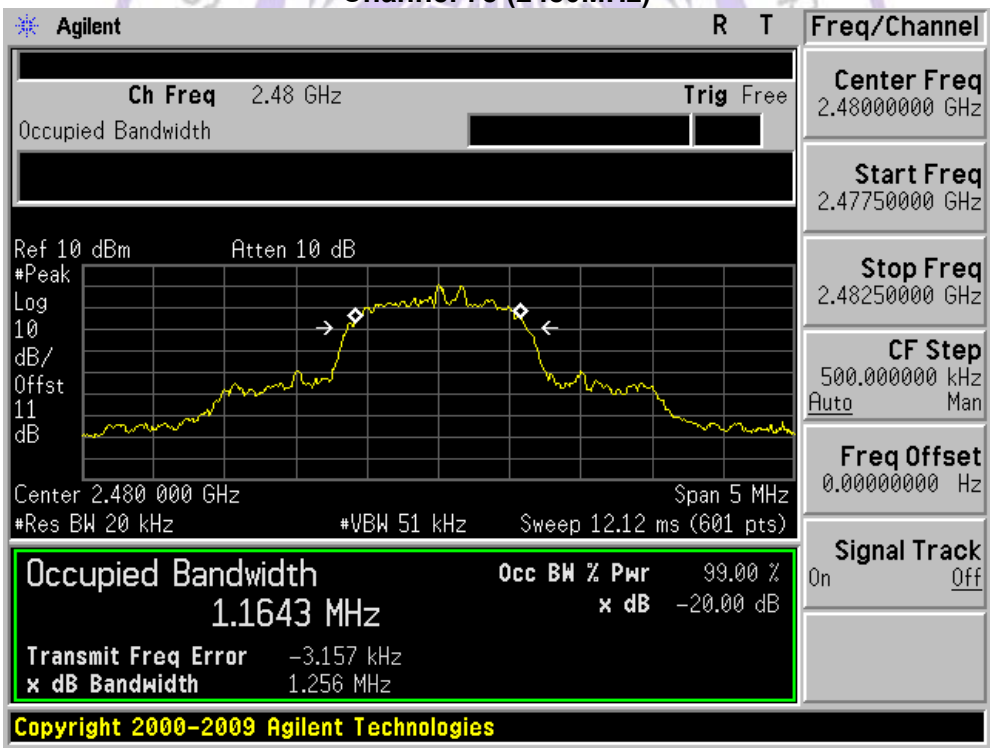
Channel 00 (2402MHz)



Channel 39 (2441MHz)



Channel 78 (2480MHz)



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)).

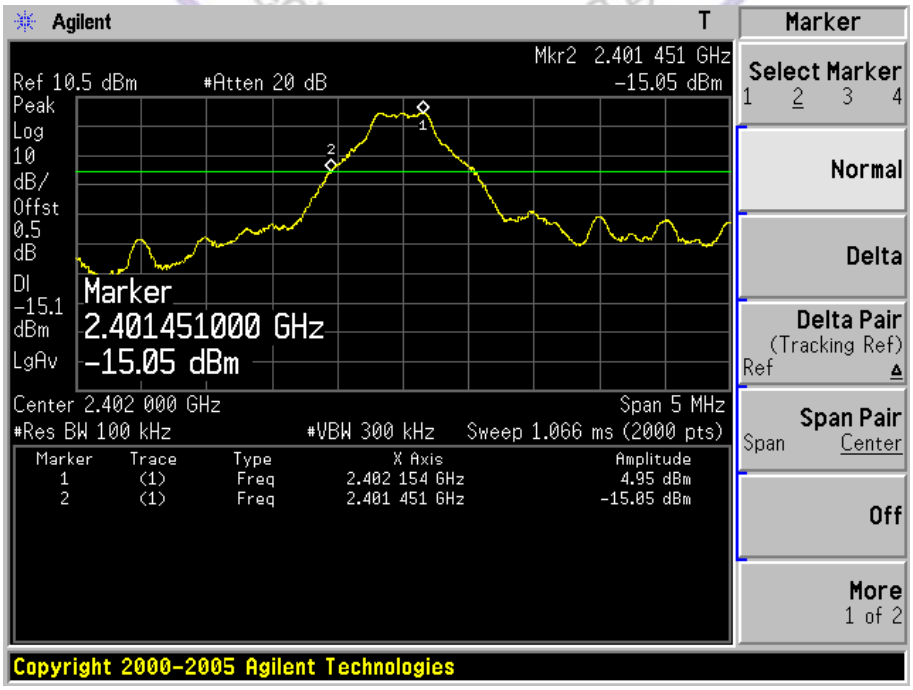
TEST PROCEDURE

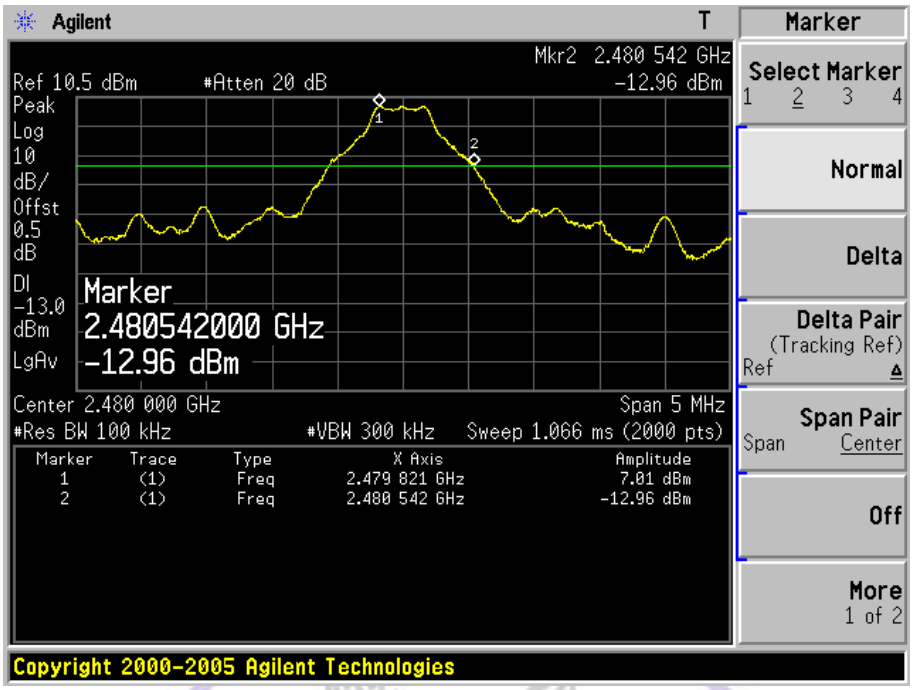
According to ANSI C63.10: 2009.
Use the following spectrum analyzer settings:
Span = wide enough to capture the peak level of the emission operating on the channel closest to the bandedge, as well as any modulation products which fall outside of the authorized band of operation.
RBW ≧ 1% of the span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

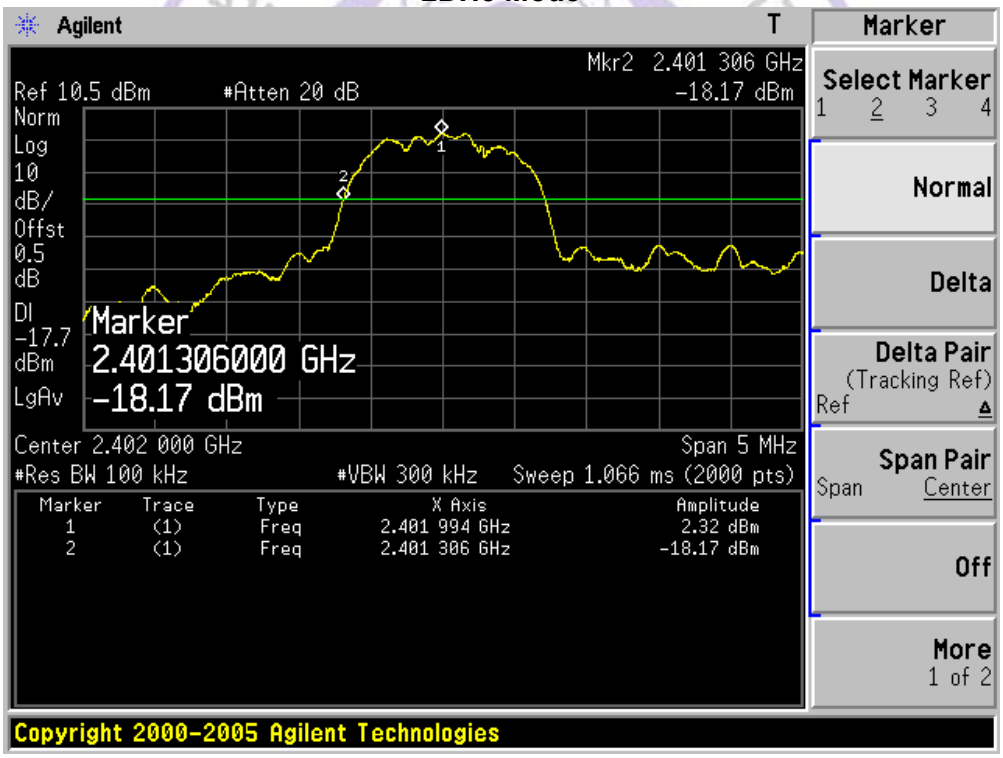
Conducted Test:

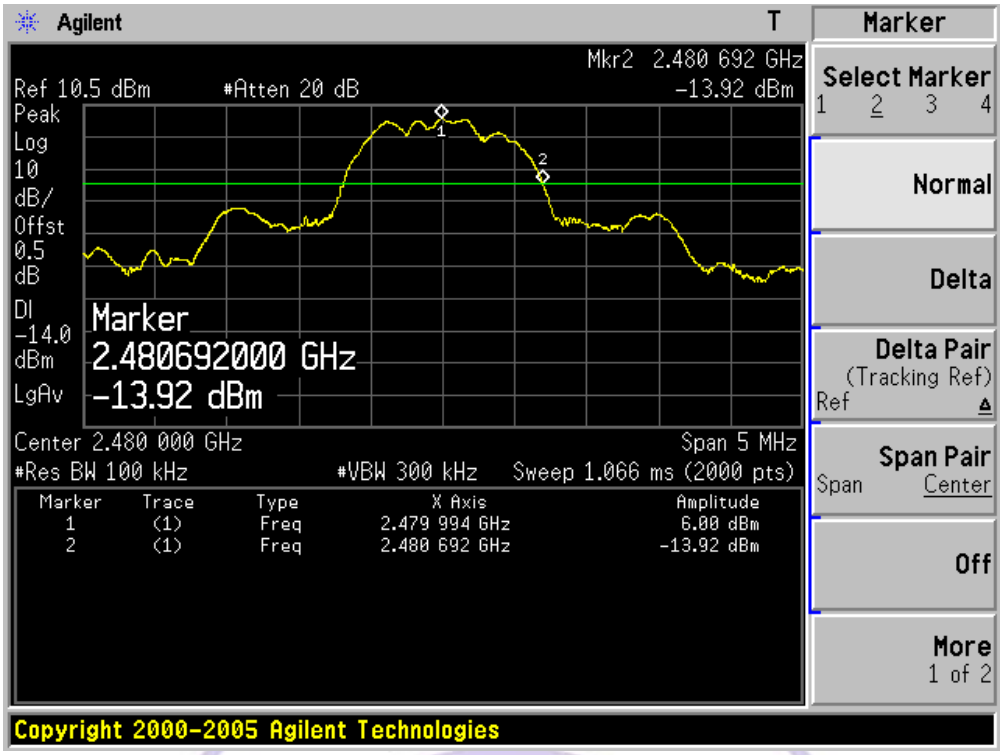
DH5 Mode



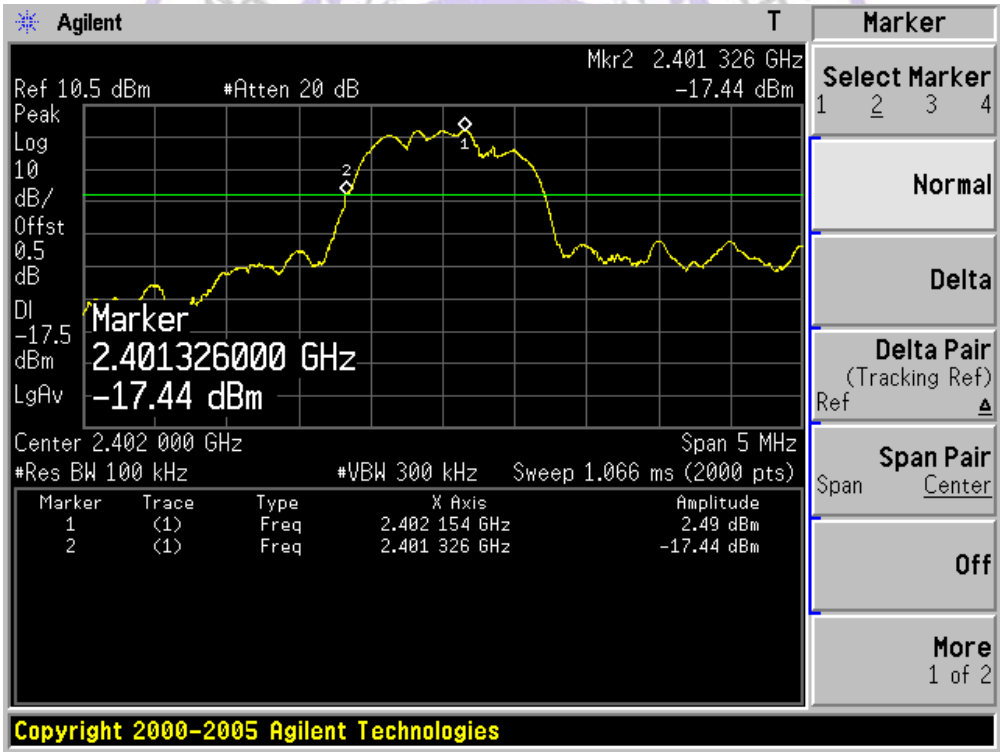

Agilent
T
Marker
Mkr2 2.480 542 GHz
Ref 10.5 dBm
#Atten 20 dB
-12.96 dBm
Peak
Log
10
dB/
Offst
0.5
dB
Dl
-13.0
dBm
LgAv
Marker
2.480542000 GHz
-12.96 dBm
Center 2.480 000 GHz
Span 5 MHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 1.066 ms (2000 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 2.479 821 GHz 7.81 dBm
2 (1) Freq 2.480 542 GHz -12.96 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

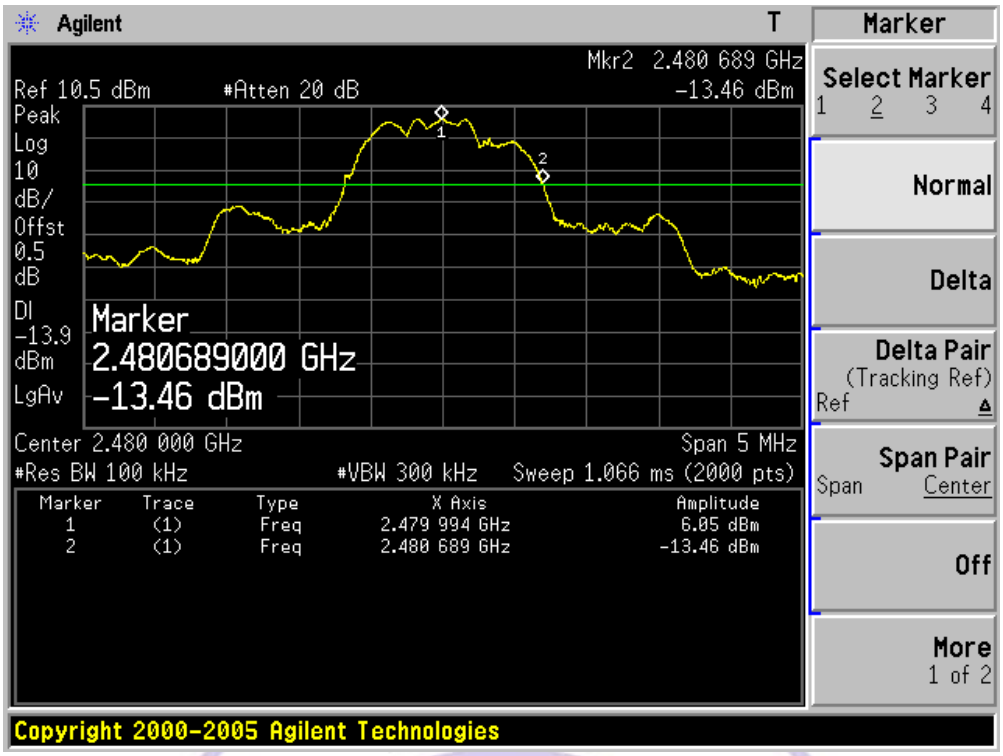
2DH5 Mode


Agilent
T
Marker
Mkr2 2.401 306 GHz
Ref 10.5 dBm
#Atten 20 dB
-18.17 dBm
Norm
Log
10
dB/
Offst
0.5
dB
Dl
-17.7
dBm
LgAv
Marker
2.401306000 GHz
-18.17 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 2.401 994 GHz 2.32 dBm
2 (1) Freq 2.401 306 GHz -18.17 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 2.480 692 GHz
Ref 10.5 dBm
#Atten 20 dB
-13.92 dBm
Peak
Log
10
dB/
Offst
0.5
dB
Dl
-14.0
dBm
LgAv
Marker
2.480692000 GHz
-13.92 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 2.479 994 GHz 6.00 dBm
2 (1) Freq 2.480 692 GHz -13.92 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

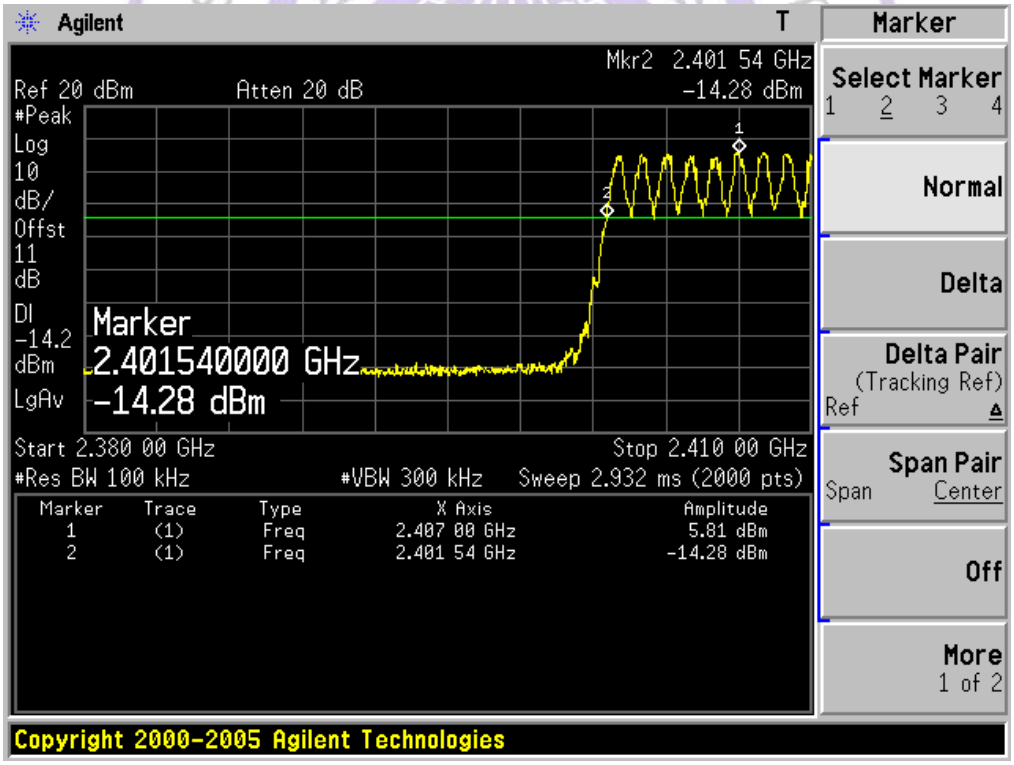
3DH5 Mode

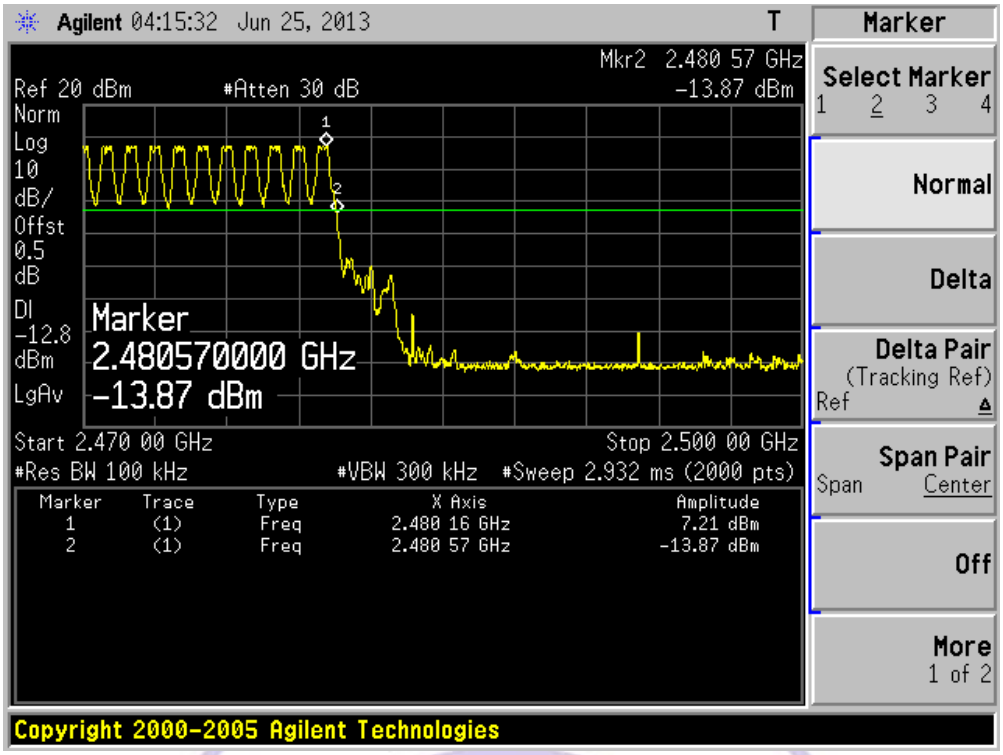

Agilent
T
Marker
Mkr2 2.401 326 GHz
Ref 10.5 dBm
#Atten 20 dB
-17.44 dBm
Peak
Log
10
dB/
Offst
0.5
dB
Dl
-17.5
dBm
LgAv
Marker
2.401326000 GHz
-17.44 dBm
Center 2.402 000 GHz
Span 5 MHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 1.066 ms (2000 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 2.402 154 GHz 2.49 dBm
2 (1) Freq 2.401 326 GHz -17.44 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



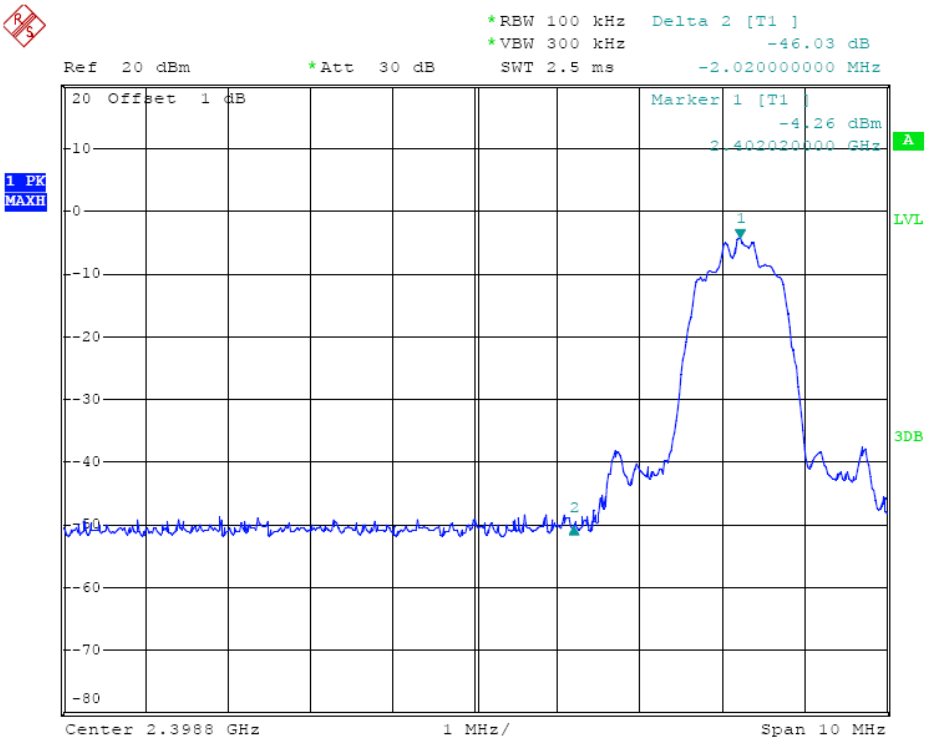
Hopping Mode

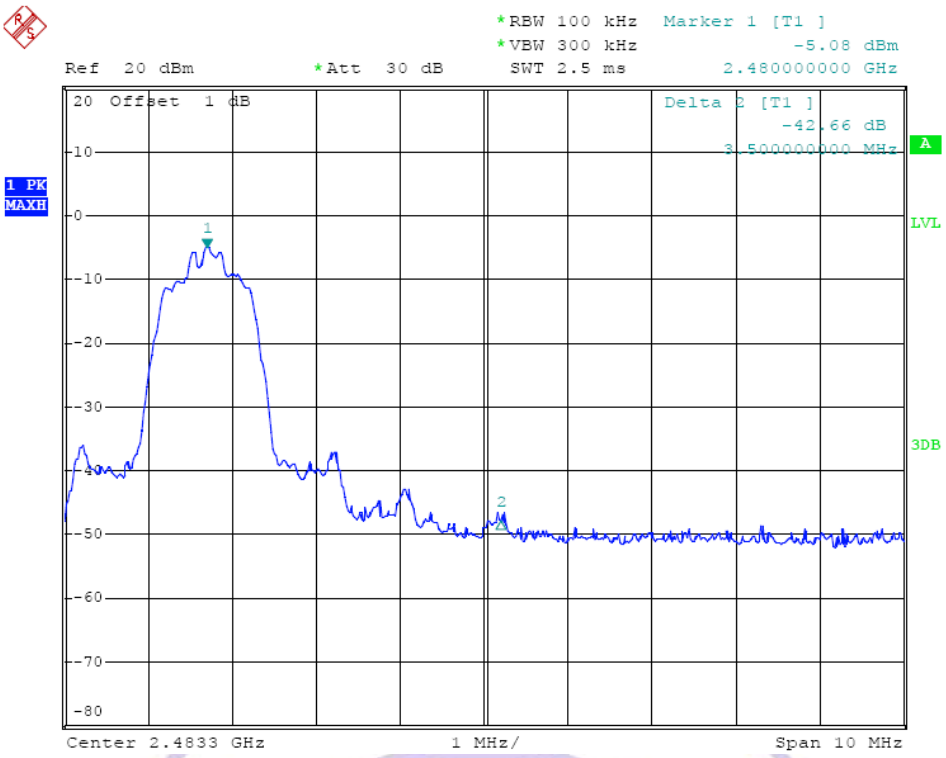
DH5



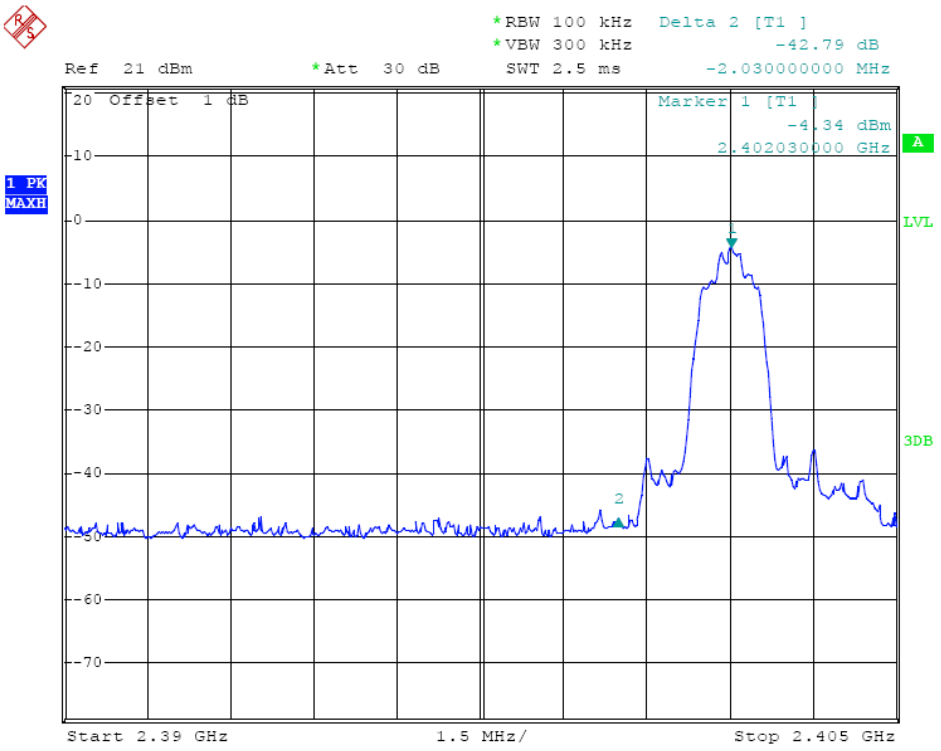

Agilent 04:15:32 Jun 25, 2013
T
Marker
Mkr2 2.480 57 GHz
Ref 20 dBm
#Atten 30 dB
-13.87 dBm
Norm
Log
10
dB/
Offst
0.5
dB
Dl
-12.8
dBm
LgAv
Marker
2.480570000 GHz
-13.87 dBm
Start 2.470 00 GHz
Stop 2.500 00 GHz
#Res BW 100 kHz
#VBW 300 kHz
#Sweep 2.932 ms (2000 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 2.480 16 GHz 7.21 dBm
2 (1) Freq 2.480 57 GHz -13.87 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

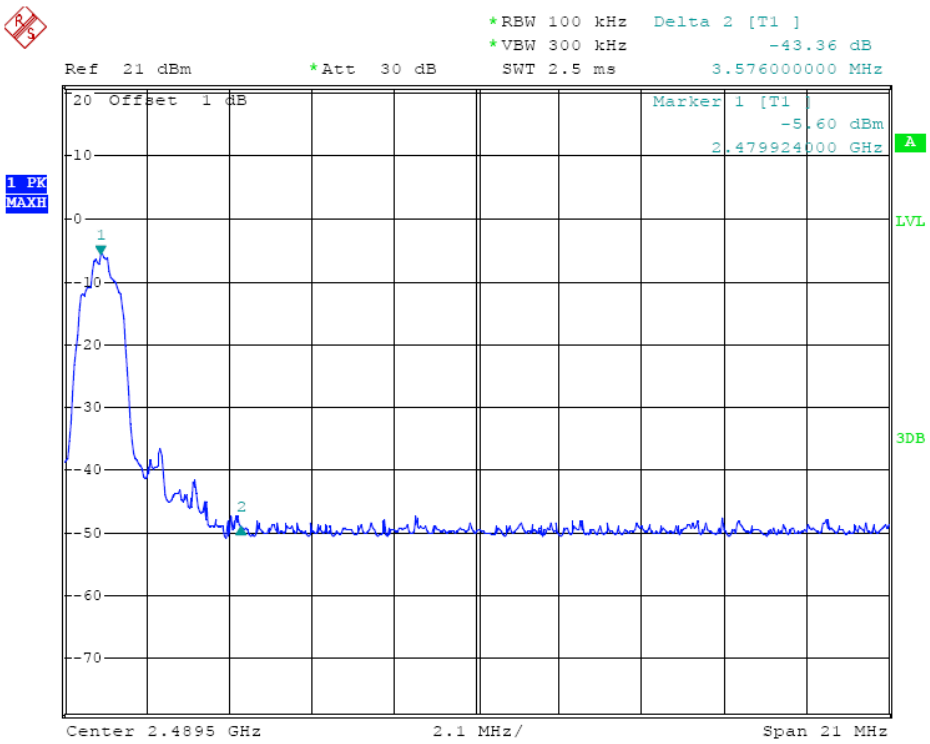
2DH5


*RBW 100 kHz
Delta 2 [T1]
*VBW 300 kHz
-46.03 dB
Ref 20 dBm
*Att 30 dB
SWT 2.5 ms
-2.020000000 MHz
20 Offset 1 dB
Marker 1 [T1]
-4.26 dBm
2.402020000 GHz
1 PK
MAXH
A
LVL
3DB
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Center 2.3988 GHz
1 MHz/
Span 10 MHz


*RBW 100 kHz
*VBW 300 kHz
Ref 20 dBm
*Att 30 dB
SWT 2.5 ms
Marker 1 [T1]
-5.08 dBm
2.480000000 GHz
20 Offset 1 dB
Delta 2 [T1]
-42.66 dB
3.500000000 MHz
1 PK
MAXH
A
LVL
3DB
Center 2.4833 GHz
1 MHz/
Span 10 MHz

3DH5

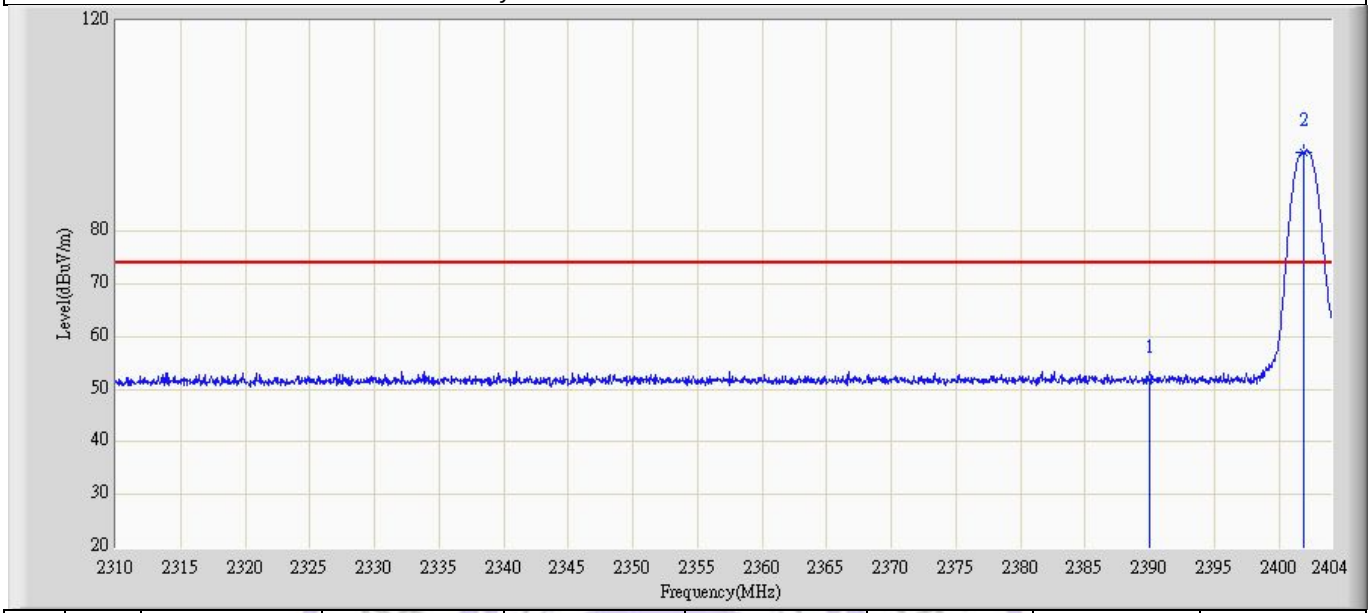

*RBW 100 kHz
*VBW 300 kHz
Ref 21 dBm
*Att 30 dB
SWT 2.5 ms
Delta 2 [T1]
-42.79 dB
-2.030000000 MHz
Marker 1 [T1]
-4.34 dBm
2.402030000 GHz
20 Offset 1 dB
1 PK
MAXH
A
LVL
3DB
Start 2.39 GHz
1.5 MHz/
Stop 2.405 GHz



Shenzhen CTL Electromagnetic Technology Co., Ltd.

Radiated Test:

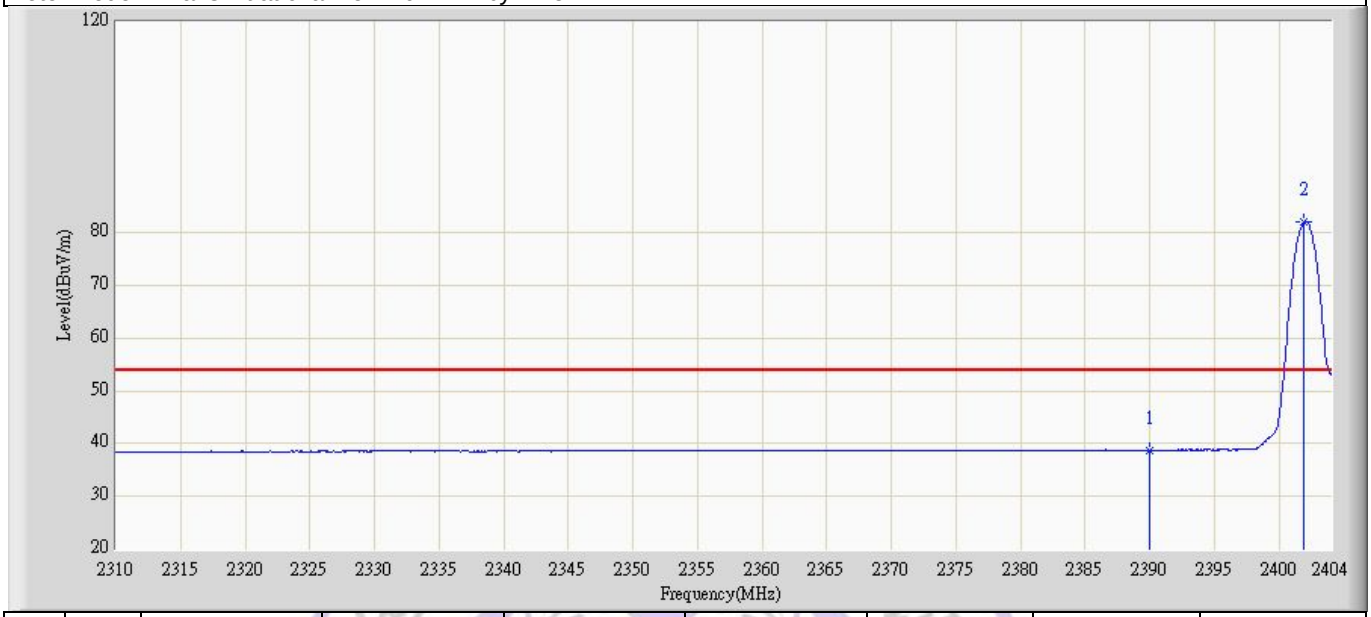
Engineer: Toms	
Site: AC5	Time:2013/07/22 - 10:49
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA9120D-737(1-18GHz)	Polarity: Horizontal
EUT: Tablet PC	Power: DC 3.7V
Note: Mode1: Transmit at channel 2402MHz by DH5	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		2390.000	51.811	24.129	-22.189	74.000	27.682	PK
2	*	2401.885	95.034	67.305	N/A	N/A	27.729	PK

Shenzhen CTL Electromagnetic Technology Co., Ltd.

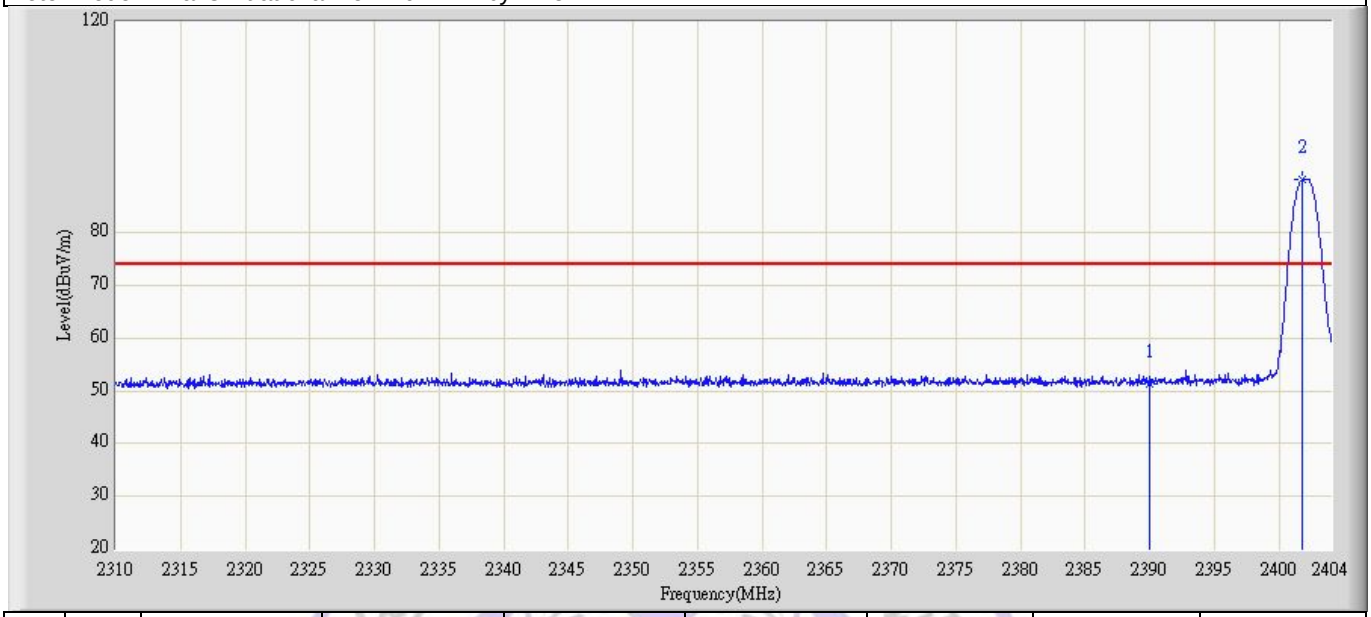
Engineer: Toms	
Site: AC5	Time:2013/07/22 - 10:56
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA9120D-737(1-18GHz)	Polarity: Horizontal
EUT: Tablet PC	Power: DC 3.7V
Note: Mode1: Transmit at channel 2402MHz by DH5	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		2390.000	38.733	11.051	-15.267	54.000	27.682	AV
2	*	2401.885	82.021	54.292	N/A	N/A	27.729	AV

Shenzhen CTL Electromagnetic Technology Co., Ltd.

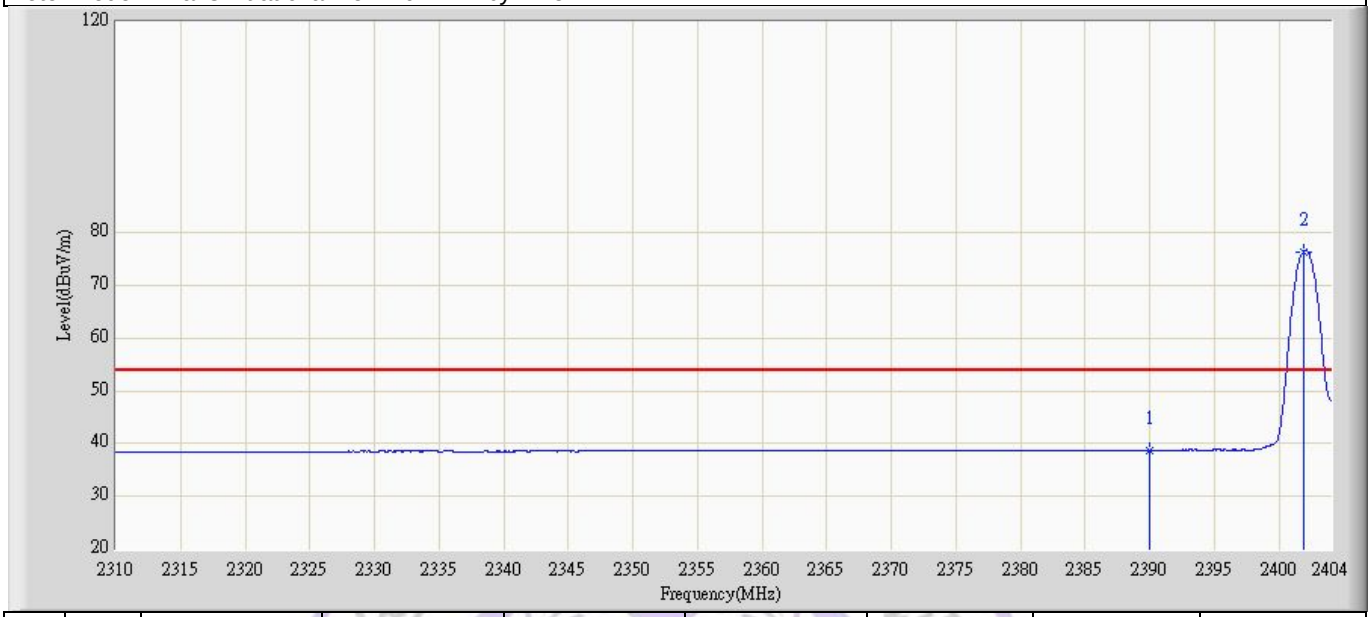
Engineer: Toms	
Site: AC5	Time:2013/07/22 - 10:56
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA9120D-737(1-18GHz)	Polarity: Vertical
EUT: Tablet PC	Power: DC 3.7V
Note: Mode1: Transmit at channel 2402MHz by DH5	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		2390.000	51.437	23.755	-22.563	74.000	27.682	PK
2	*	2401.791	90.044	62.315	N/A	N/A	27.729	PK

Shenzhen CTL Electromagnetic Technology Co., Ltd.

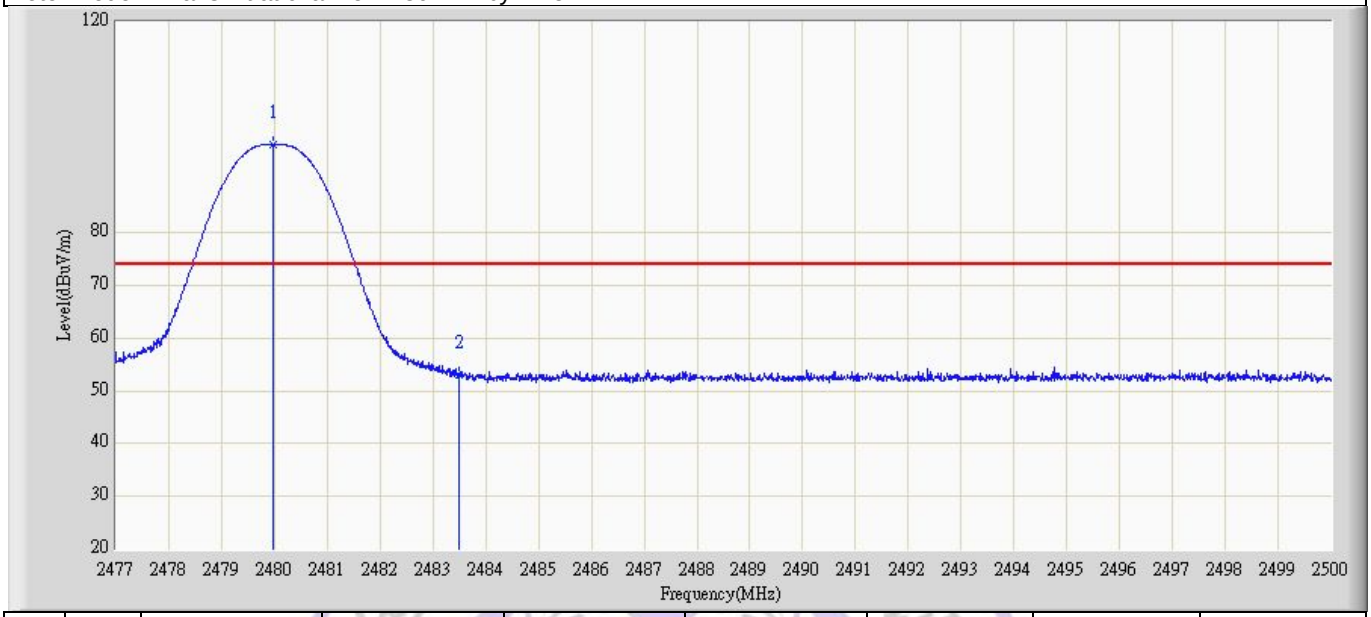
Engineer: Toms	
Site: AC5	Time:2013/07/22 - 10:59
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA9120D-737(1-18GHz)	Polarity: Vertical
EUT: Tablet PC	Power: DC 3.7V
Note: Mode1: Transmit at channel 2402MHz by DH5	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		2390.000	38.688	11.006	-15.312	54.000	27.682	AV
2	*	2401.885	76.395	48.666	N/A	N/A	27.729	AV

Shenzhen CTL Electromagnetic Technology Co., Ltd.

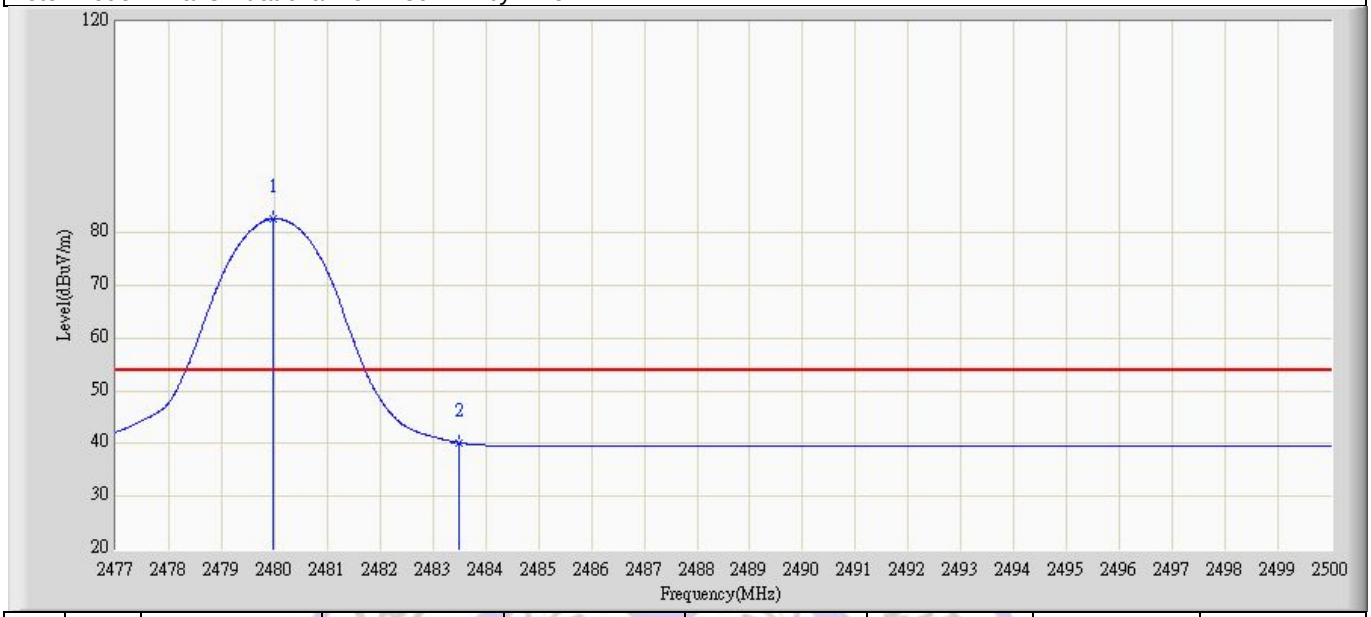
Engineer: Toms	
Site: AC5	Time:2013/07/22 - 11:00
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA9120D-737(1-18GHz)	Polarity: Horizontal
EUT: Tablet PC	Power: DC 3.7V
Note: Mode1: Transmit at channel 2480MHz by DH5	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	2479.979	96.645	68.601	N/A	N/A	28.044	PK
2		2483.500	53.171	25.114	-20.829	74.000	28.057	PK

Shenzhen CTL Electromagnetic Technology Co., Ltd.

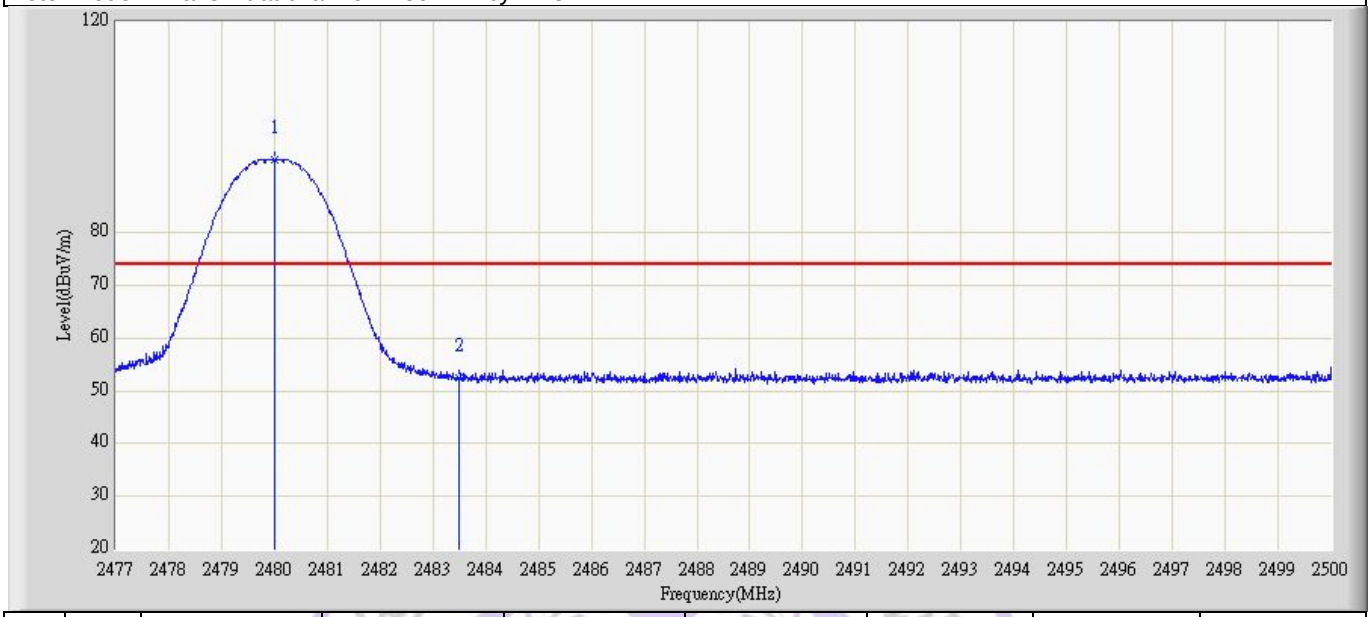
Engineer: Toms	
Site: AC5	Time:2013/07/22 - 11:04
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA9120D-737(1-18GHz)	Polarity: Horizontal
EUT: Tablet PC	Power: DC 3.7V
Note: Mode1: Transmit at channel 2480MHz by DH5	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	2479.967	82.612	54.568	N/A	N/A	28.044	AV
2		2483.500	40.179	12.122	-13.821	54.000	28.057	AV

Shenzhen CTL Electromagnetic Technology Co., Ltd.

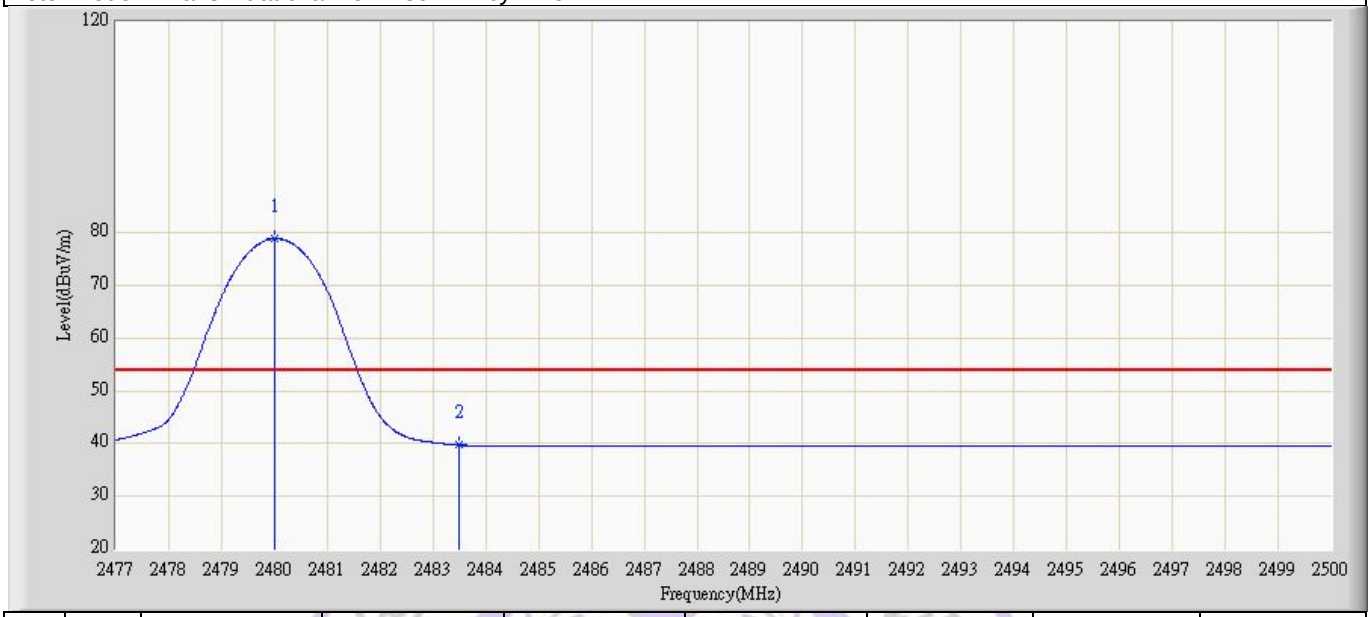
Engineer: Toms	
Site: AC5	Time:2013/07/22 - 11:04
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA9120D-737(1-18GHz)	Polarity: Vertical
EUT: Tablet PC	Power: DC 3.7V
Note: Mode1: Transmit at channel 2480MHz by DH5	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	2480.013	93.833	65.789	N/A	N/A	28.044	PK
2		2483.500	52.417	24.360	-21.583	74.000	28.057	PK

Shenzhen CTL Electromagnetic Technology Co., Ltd.

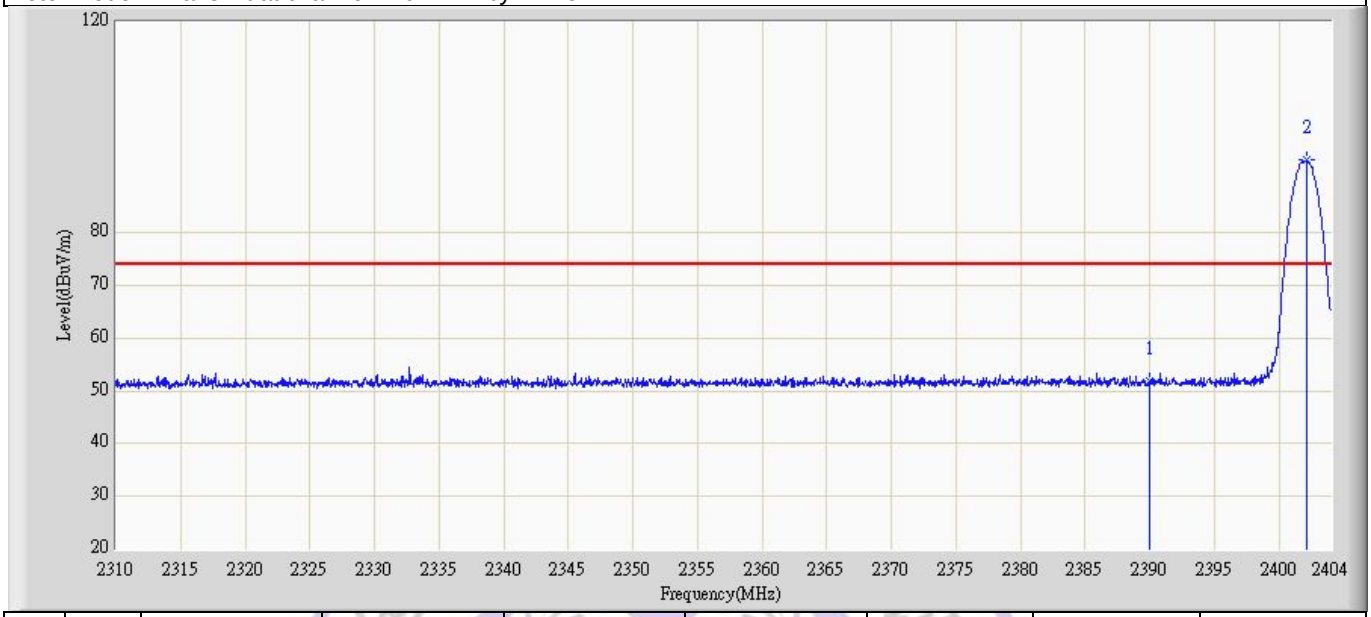
Engineer: Toms	
Site: AC5	Time:2013/07/22 - 11:07
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA9120D-737(1-18GHz)	Polarity: Vertical
EUT: Tablet PC	Power: DC 3.7V
Note: Mode1: Transmit at channel 2480MHz by DH5	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	2480.013	78.859	50.815	N/A	N/A	28.044	AV
2		2483.500	39.720	11.663	-14.280	54.000	28.057	AV

Shenzhen CTL Electromagnetic Technology Co., Ltd.

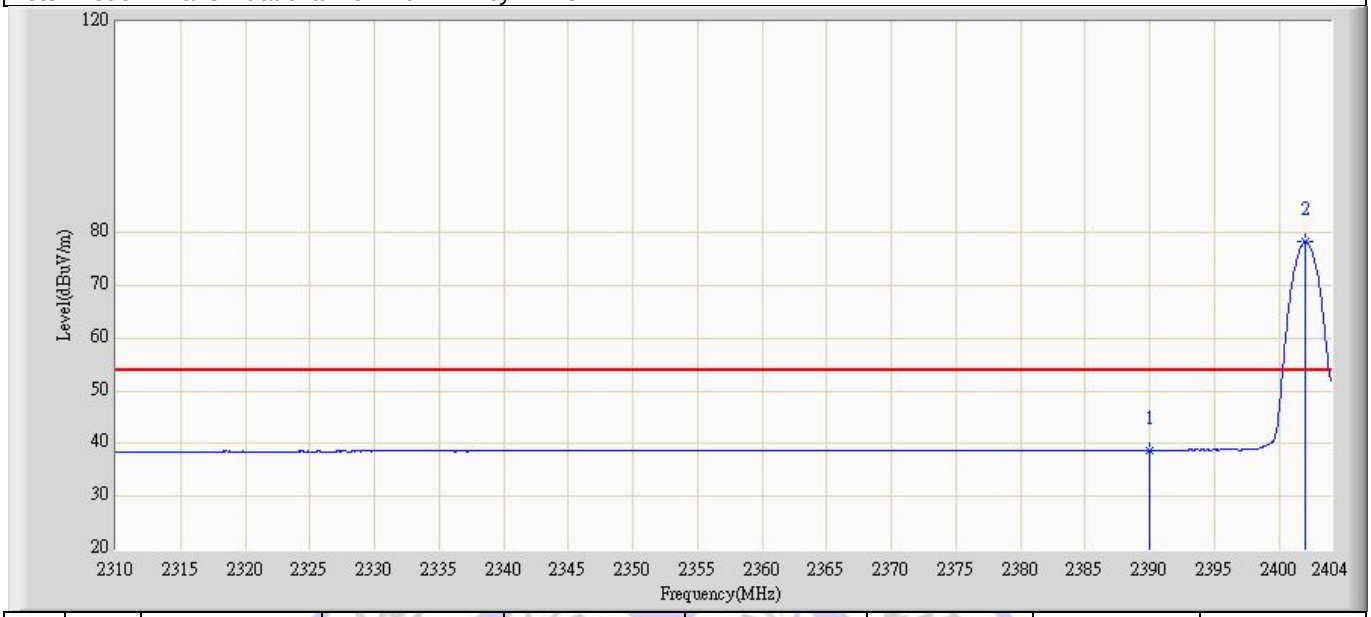
Engineer: Toms	
Site: AC5	Time:2013/07/22 - 11:09
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA9120D-737(1-18GHz)	Polarity: Horizontal
EUT: Tablet PC	Power: DC 3.7V
Note: Mode2: Transmit at channel 2402MHz by 2DH5	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		2390.000	51.862	24.180	-22.138	74.000	27.682	PK
2	*	2402.120	93.793	66.063	N/A	N/A	27.730	PK

Shenzhen CTL Electromagnetic Technology Co., Ltd.

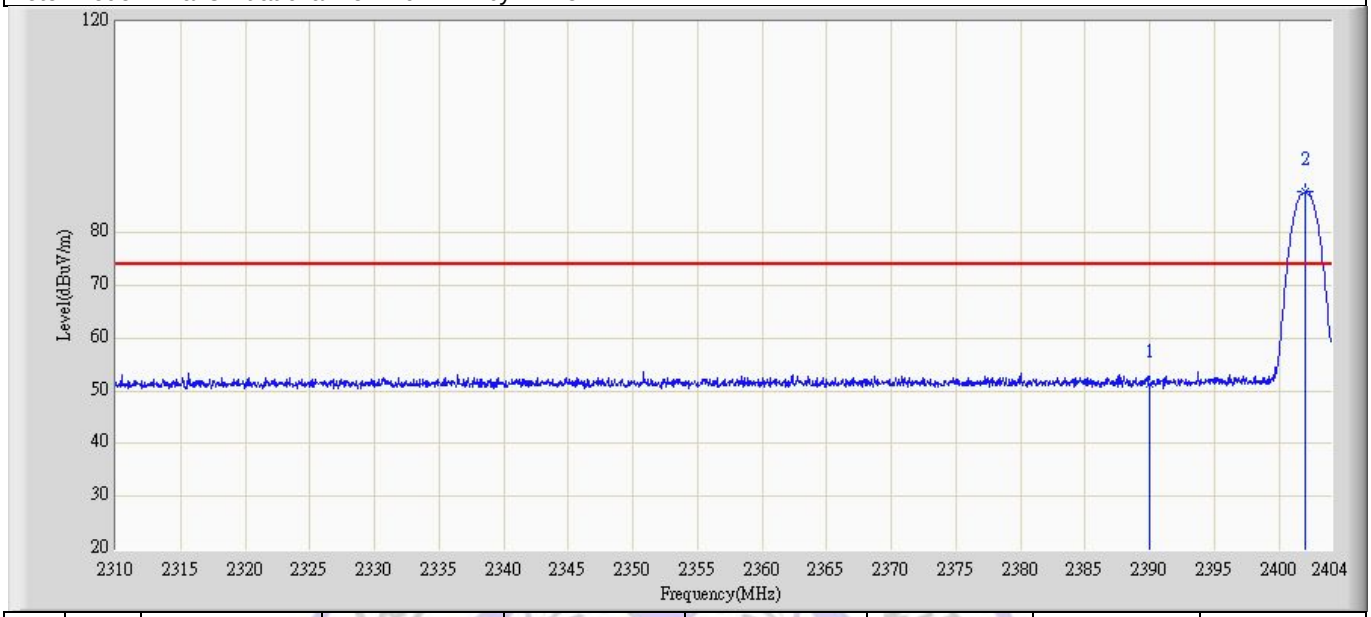
Engineer: Toms	
Site: AC5	Time:2013/07/22 - 11:16
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA9120D-737(1-18GHz)	Polarity: Horizontal
EUT: Tablet PC	Power: DC 3.7V
Note: Mode2: Transmit at channel 2402MHz by 2DH5	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		2390.000	38.751	11.069	-15.249	54.000	27.682	AV
2	*	2402.026	78.264	50.534	N/A	N/A	27.730	AV

Shenzhen CTL Electromagnetic Technology Co., Ltd.

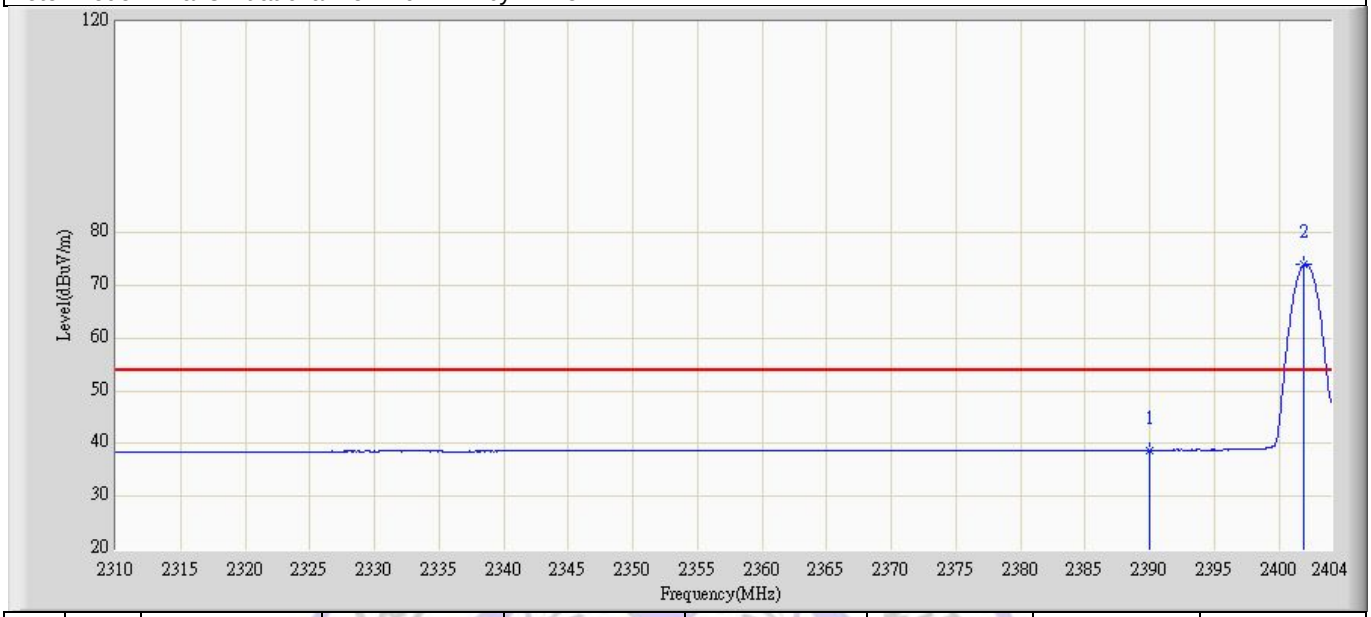
Engineer: Toms	
Site: AC5	Time:2013/07/22 - 11:19
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA9120D-737(1-18GHz)	Polarity: Vertical
EUT: Tablet PC	Power: DC 3.7V
Note: Mode2: Transmit at channel 2402MHz by 2DH5	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		2390.000	51.362	23.680	-22.638	74.000	27.682	PK
2	*	2402.026	87.723	59.993	N/A	N/A	27.730	PK

Shenzhen CTL Electromagnetic Technology Co., Ltd.

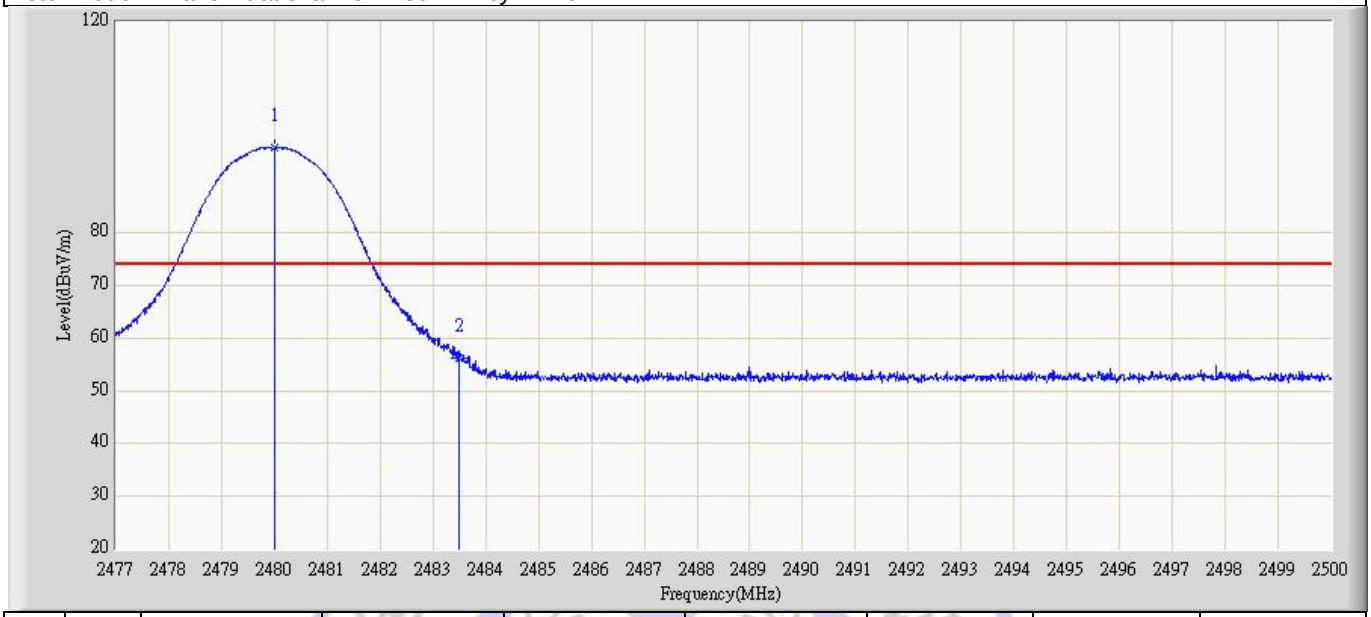
Engineer: Toms	
Site: AC5	Time:2013/07/22 - 11:21
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA9120D-737(1-18GHz)	Polarity: Vertical
EUT: Tablet PC	Power: DC 3.7V
Note: Mode2: Transmit at channel 2402MHz by 2DH5	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		2390.000	38.745	11.063	-15.255	54.000	27.682	AV
2	*	2401.885	73.924	46.195	N/A	N/A	27.729	AV

Shenzhen CTL Electromagnetic Technology Co., Ltd.

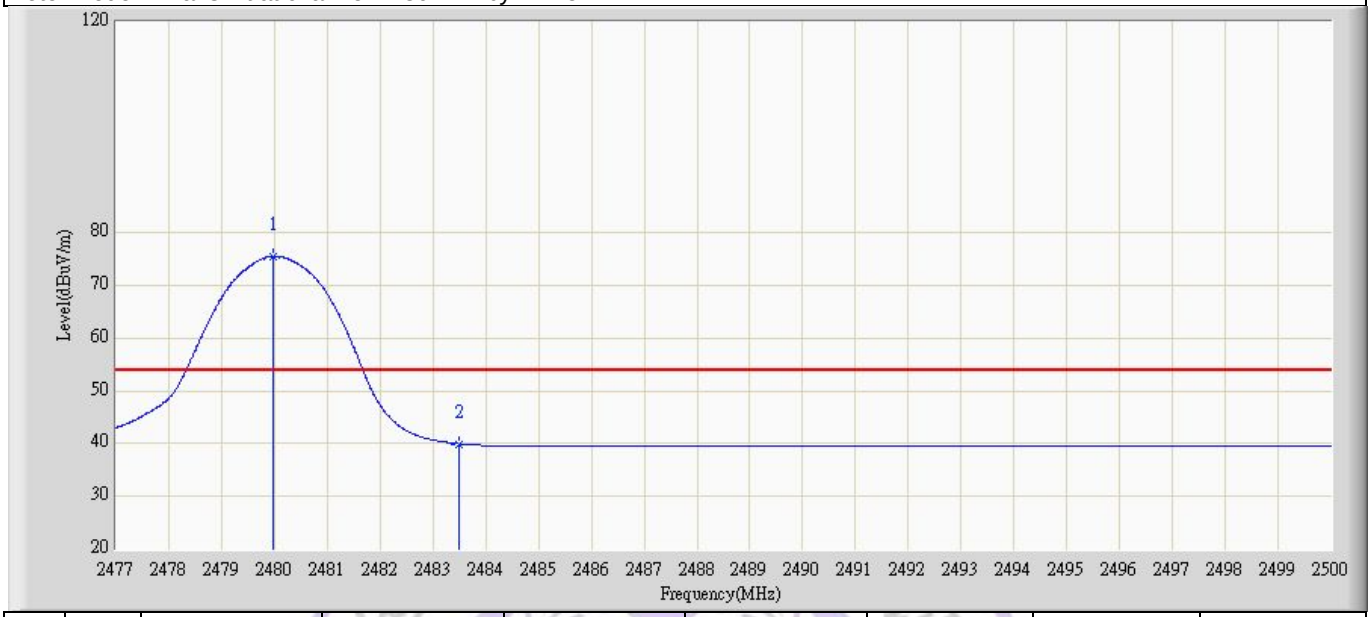
Engineer: Toms	
Site: AC5	Time:2013/07/22 - 11:22
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA9120D-737(1-18GHz)	Polarity: Horizontal
EUT: Tablet PC	Power: DC 3.7V
Note: Mode2: Transmit at channel 2480MHz by 2DH5	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	2480.013	96.039	67.995	N/A	N/A	28.044	PK
2		2483.500	56.275	28.218	-17.725	74.000	28.057	PK

Shenzhen CTL Electromagnetic Technology Co., Ltd.

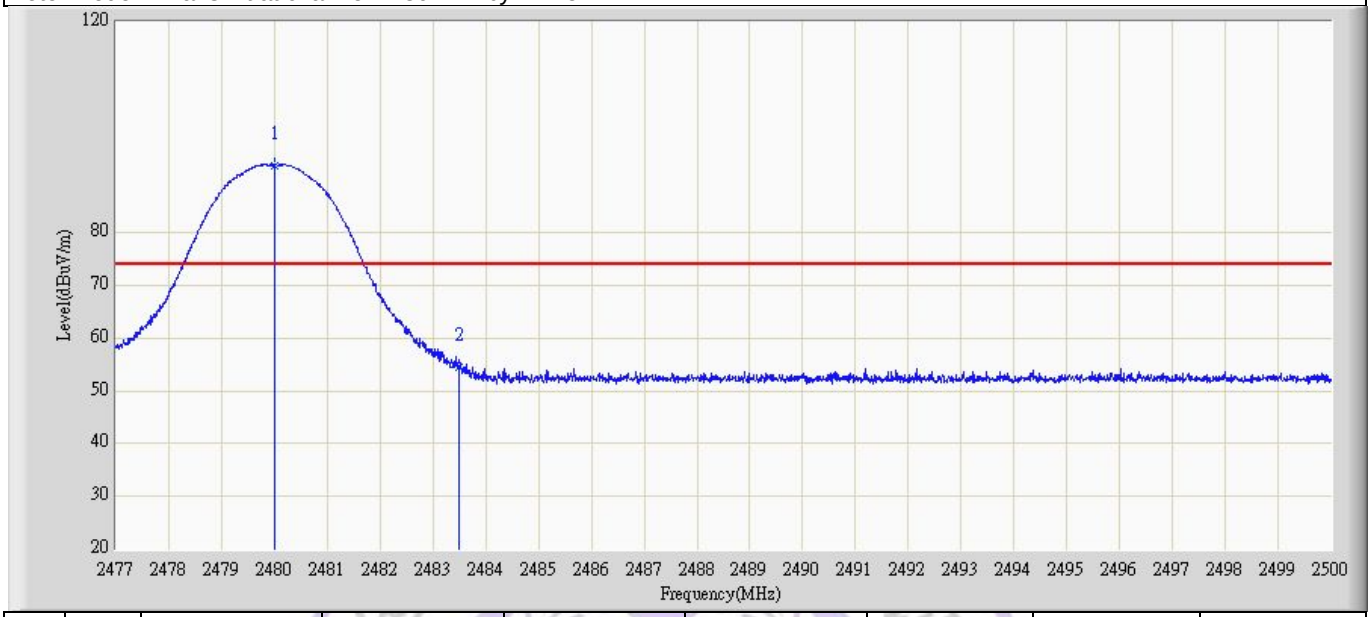
Engineer: Toms	
Site: AC5	Time:2013/07/22 - 11:27
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA9120D-737(1-18GHz)	Polarity: Horizontal
EUT: Tablet PC	Power: DC 3.7V
Note: Mode2: Transmit at channel 2480MHz by 2DH5	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	2479.979	75.545	47.501	N/A	N/A	28.044	AV
2		2483.500	39.950	11.893	-14.050	54.000	28.057	AV

Shenzhen CTL Electromagnetic Technology Co., Ltd.

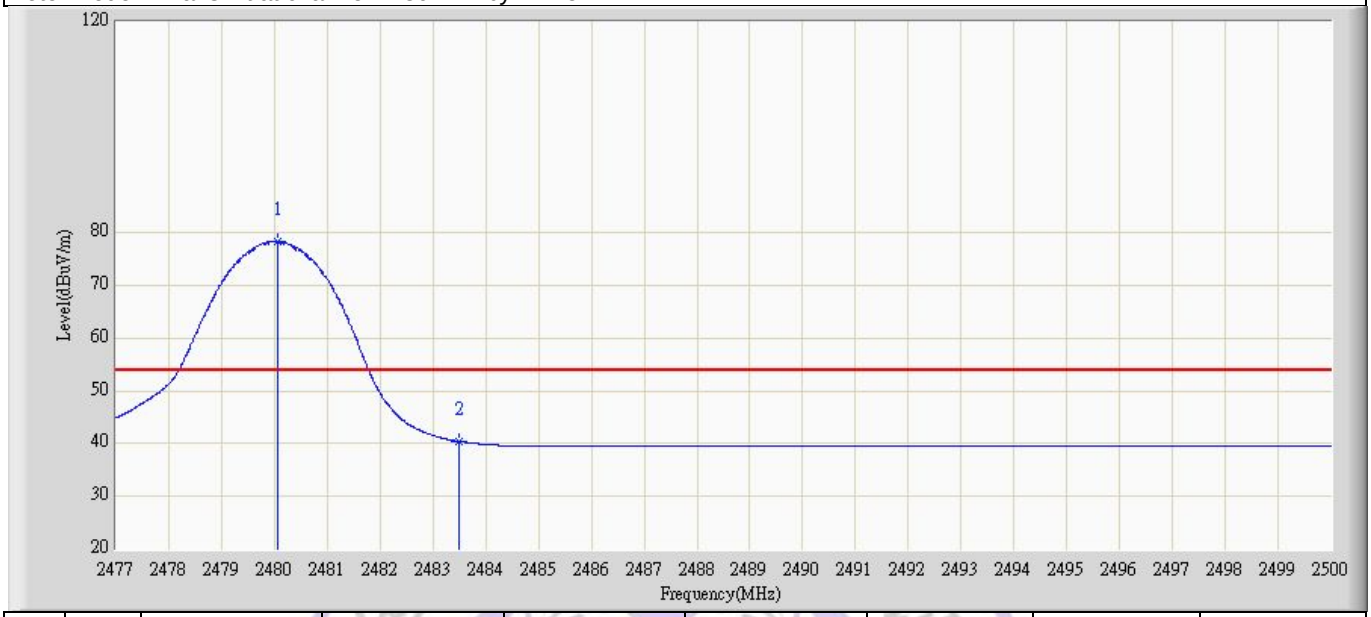
Engineer: Toms	
Site: AC5	Time:2013/07/22 - 11:27
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA9120D-737(1-18GHz)	Polarity: Vertical
EUT: Tablet PC	Power: DC 3.7V
Note: Mode2: Transmit at channel 2480MHz by 2DH5	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	2480.001	92.831	64.787	N/A	N/A	28.044	PK
2		2483.500	54.361	26.304	-19.639	74.000	28.057	PK

Shenzhen CTL Electromagnetic Technology Co., Ltd.

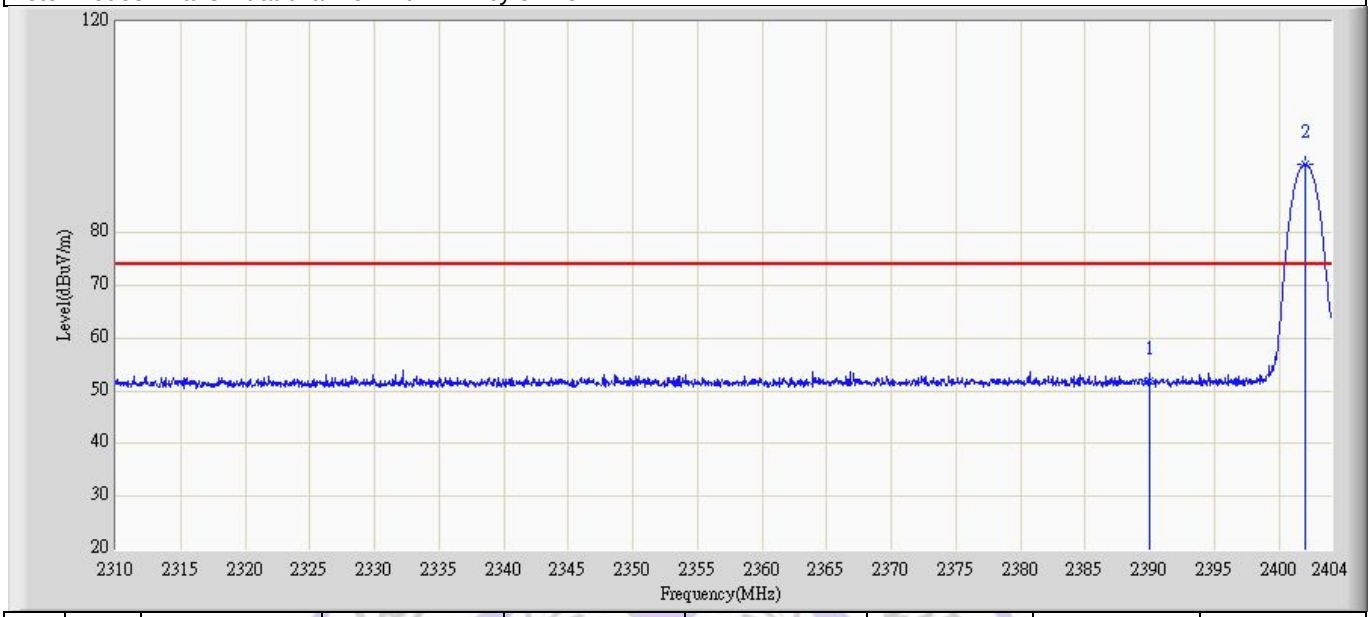
Engineer: Toms	
Site: AC5	Time:2013/07/22 - 11:30
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA9120D-737(1-18GHz)	Polarity: Vertical
EUT: Tablet PC	Power: DC 3.7V
Note: Mode2: Transmit at channel 2480MHz by 2DH5	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	2480.048	78.440	50.396	N/A	N/A	28.044	AV
2		2483.500	40.402	12.345	-13.598	54.000	28.057	AV

Shenzhen CTL Electromagnetic Technology Co., Ltd.

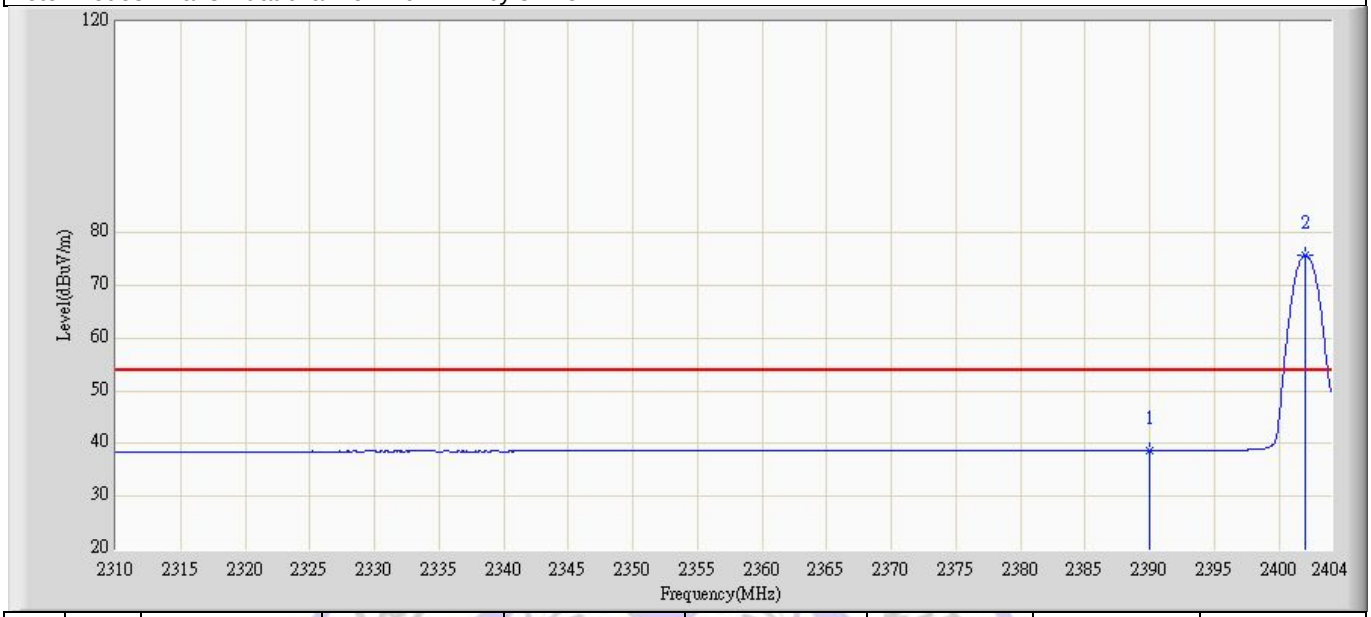
Engineer: Toms	
Site: AC5	Time:2013/07/22 - 11:31
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA9120D-737(1-18GHz)	Polarity: Horizontal
EUT: Tablet PC	Power: DC 3.7V
Note: Mode3: Transmit at channel 2402MHz by 3DH5	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		2390.000	52.000	24.318	-22.000	74.000	27.682	PK
2	*	2402.026	92.955	65.225	N/A	N/A	27.730	PK

Shenzhen CTL Electromagnetic Technology Co., Ltd.

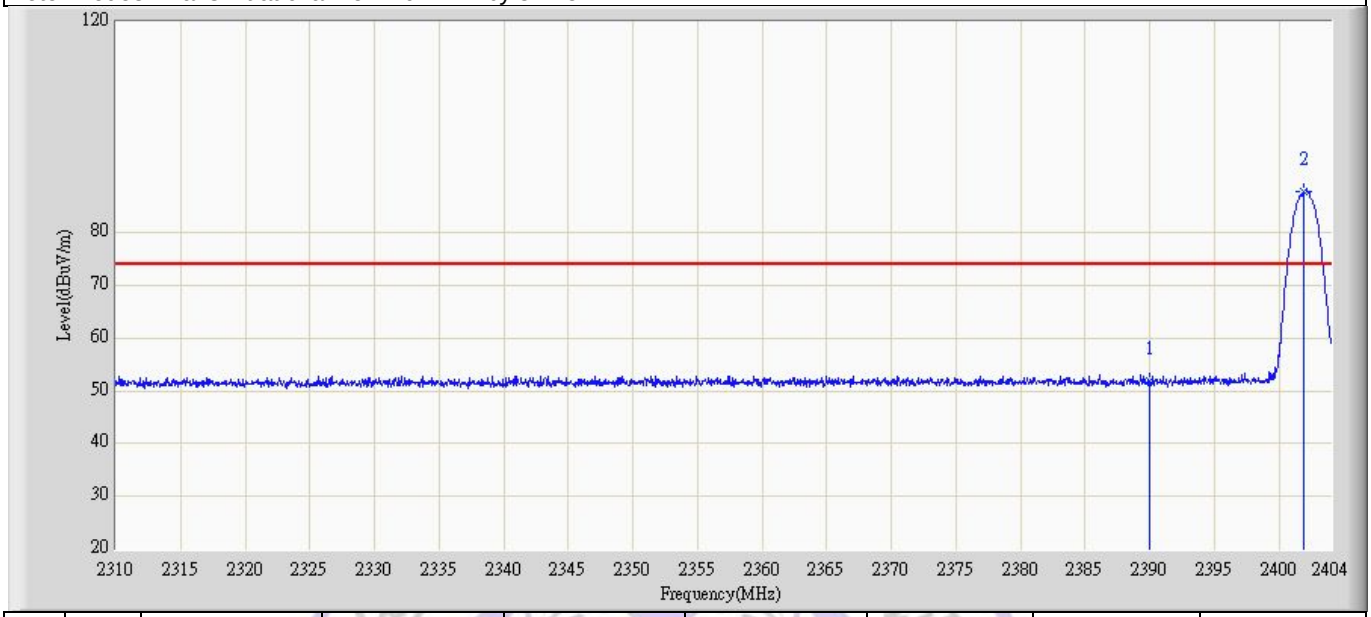
Engineer: Toms	
Site: AC5	Time:2013/07/22 - 11:36
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA9120D-737(1-18GHz)	Polarity: Horizontal
EUT: Tablet PC	Power: DC 3.7V
Note: Mode3: Transmit at channel 2402MHz by 3DH5	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		2390.000	38.721	11.039	-15.279	54.000	27.682	AV
2	*	2402.026	75.752	48.022	N/A	N/A	27.730	AV

Shenzhen CTL Electromagnetic Technology Co., Ltd.

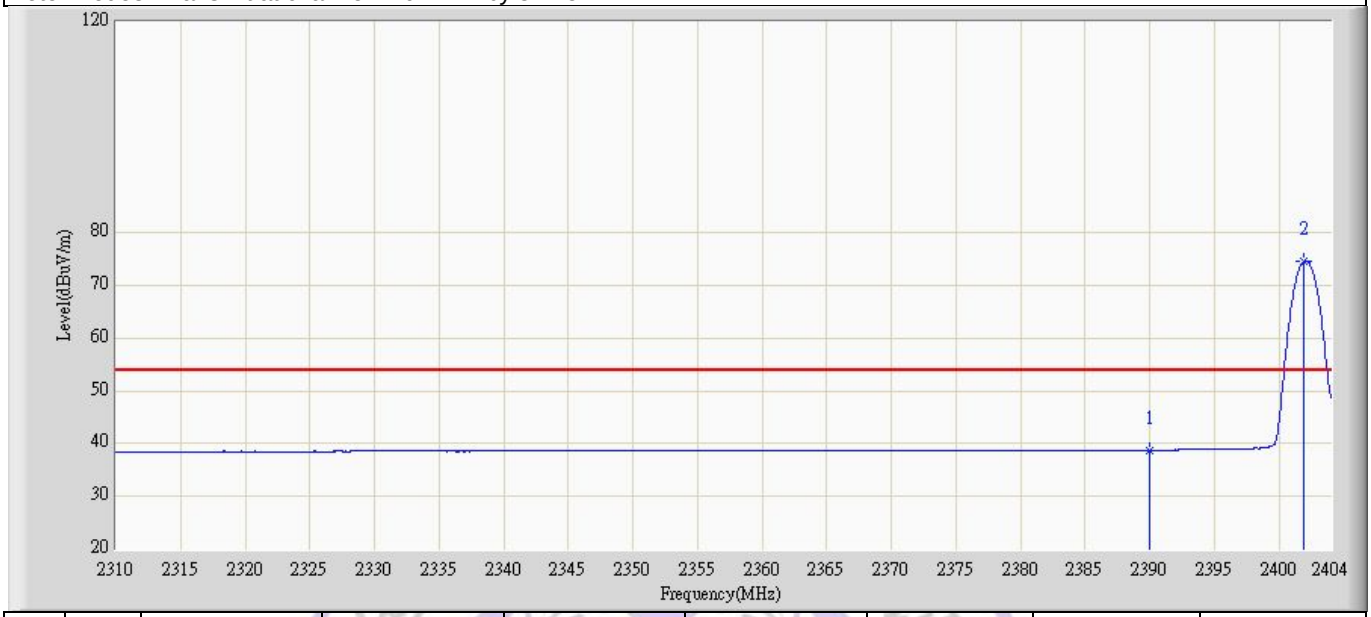
Engineer: Toms	
Site: AC5	Time:2013/07/22 - 11:36
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA9120D-737(1-18GHz)	Polarity: Vertical
EUT: Tablet PC	Power: DC 3.7V
Note: Mode3: Transmit at channel 2402MHz by 3DH5	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		2390.000	51.903	24.221	-22.097	74.000	27.682	PK
2	*	2401.885	87.952	60.223	N/A	N/A	27.729	PK

Shenzhen CTL Electromagnetic Technology Co., Ltd.

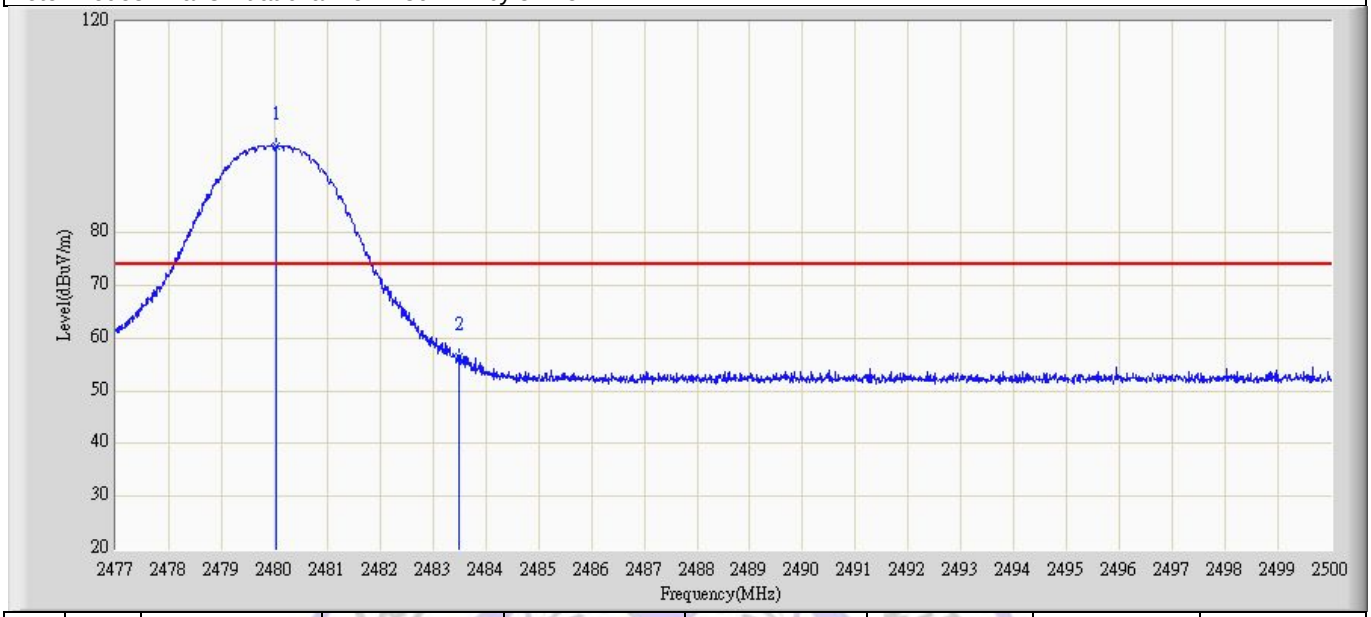
Engineer: Toms	
Site: AC5	Time:2013/07/22 - 11:39
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA9120D-737(1-18GHz)	Polarity: Vertical
EUT: Tablet PC	Power: DC 3.7V
Note: Mode3: Transmit at channel 2402MHz by 3DH5	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		2390.000	38.749	11.067	-15.251	54.000	27.682	AV
2	*	2401.885	74.519	46.790	N/A	N/A	27.729	AV

Shenzhen CTL Electromagnetic Technology Co., Ltd.

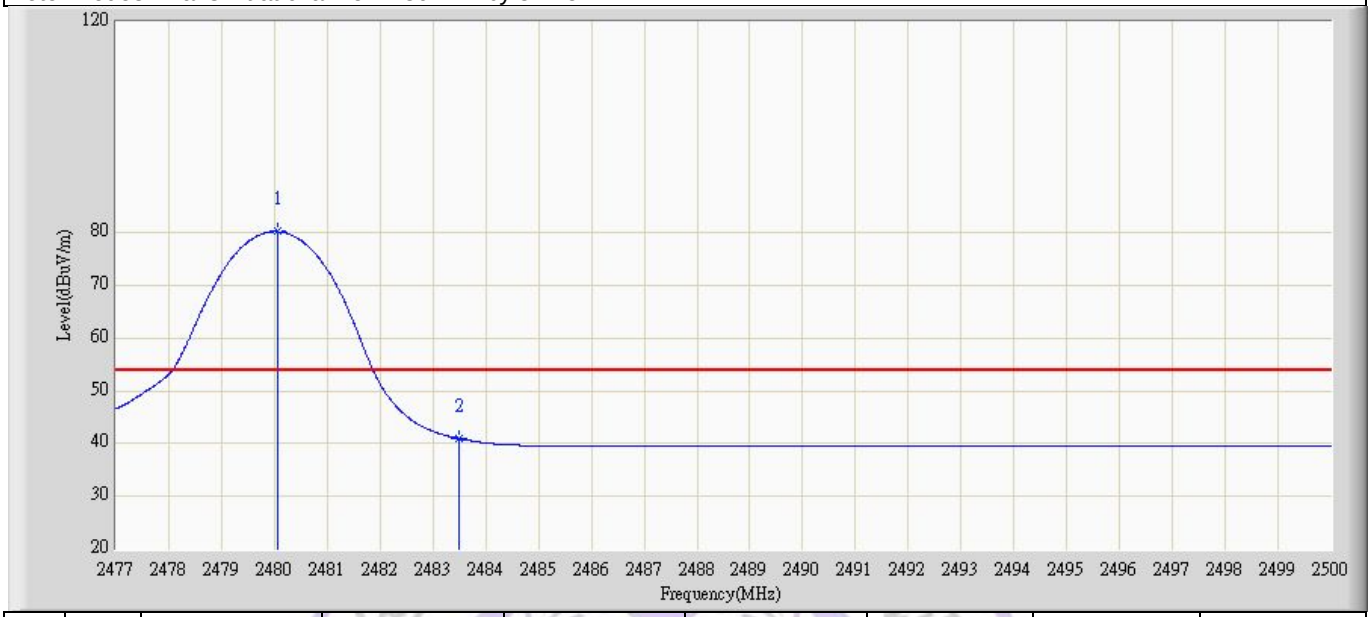
Engineer: Toms	
Site: AC5	Time:2013/07/22 - 11:40
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA9120D-737(1-18GHz)	Polarity: Horizontal
EUT: Tablet PC	Power: DC 3.7V
Note: Mode3: Transmit at channel 2480MHz by 3DH5	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	2480.024	96.580	68.536	N/A	N/A	28.044	PK
2		2483.500	56.459	28.402	-17.541	74.000	28.057	PK

Shenzhen CTL Electromagnetic Technology Co., Ltd.

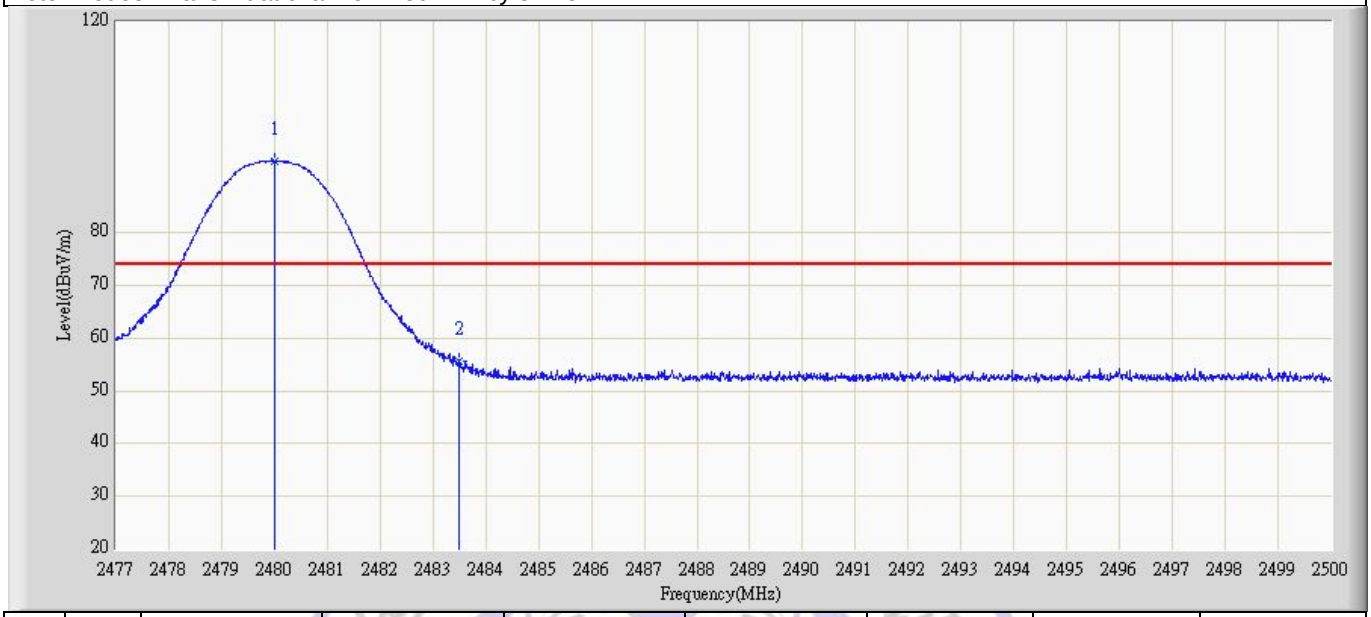
Engineer: Toms	
Site: AC5	Time:2013/07/22 - 11:43
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA9120D-737(1-18GHz)	Polarity: Horizontal
EUT: Tablet PC	Power: DC 3.7V
Note: Mode3: Transmit at channel 2480MHz by 3DH5	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	2480.048	80.221	52.177	N/A	N/A	28.044	AV
2		2483.500	40.902	12.845	-13.098	54.000	28.057	AV

Shenzhen CTL Electromagnetic Technology Co., Ltd.

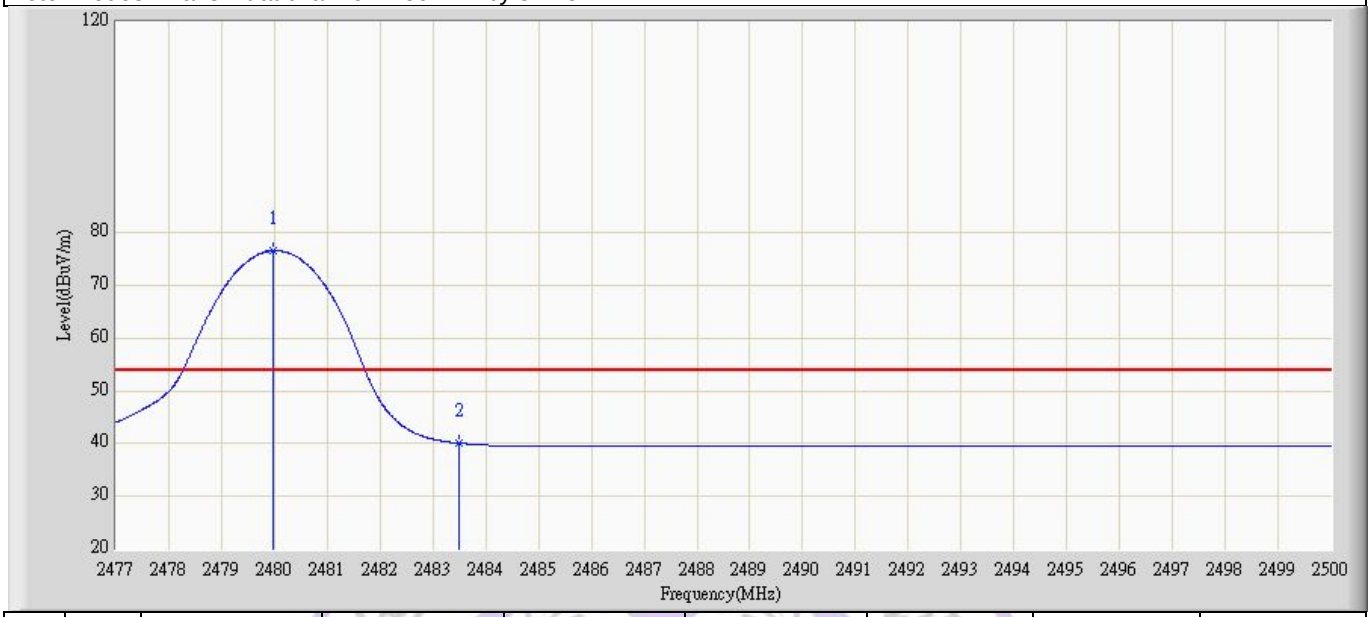
Engineer: Toms	
Site: AC5	Time:2013/07/22 - 11:44
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA9120D-737(1-18GHz)	Polarity: Vertical
EUT: Tablet PC	Power: DC 3.7V
Note: Mode3: Transmit at channel 2480MHz by 3DH5	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	2480.013	93.559	65.515	N/A	N/A	28.044	PK
2		2483.500	55.593	27.536	-18.407	74.000	28.057	PK

Shenzhen CTL Electromagnetic Technology Co., Ltd.

Engineer: Toms	
Site: AC5	Time:2013/07/22 - 11:48
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA9120D-737(1-18GHz)	Polarity: Vertical
EUT: Tablet PC	Power: DC 3.7V
Note: Mode3: Transmit at channel 2480MHz by 3DH5	

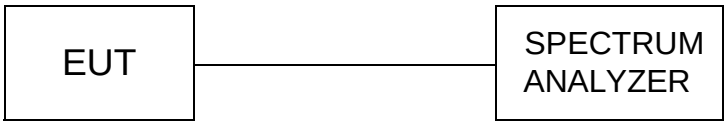


No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	2479.979	76.555	48.511	N/A	N/A	28.044	AV
2		2483.500	40.085	12.028	-13.915	54.000	28.057	AV

Shenzhen CTL Electromagnetic Technology Co., Ltd.

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

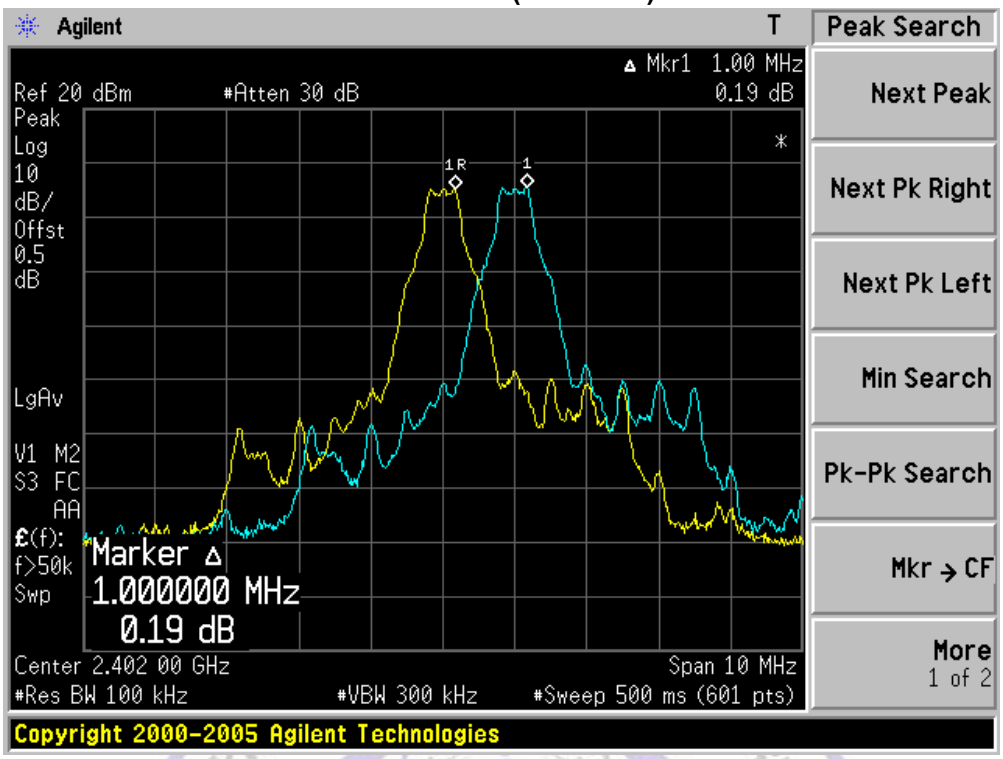
According to 15.247(a)(1),frequency hopping systems shall have hopping channel carrier frequencies separated by minimum of 25KHz or the 2/3*20dB bandwidth of the hopping channel, whichever is greater.

TEST RESULTS

Product	**Tablet PC**
Test Item	Carrier Frequency Separation
Test Mode	Mode 1: Transmitter-1Mbps (GFSK_DH5)

Channel No.	Frequency (MHz)	Carrier Frequency Separation (kHz)	Limit (kHz)	Result
00	2402	1000	>25 kHz or 2/3 of 20 dB BW	Pass
39	2441	1000	>25 kHz or 2/3 of 20 dB BW	Pass
78	2480	1000	>25 kHz or 2/3 of 20 dB BW	Pass

Channel 00 (2402MHz)



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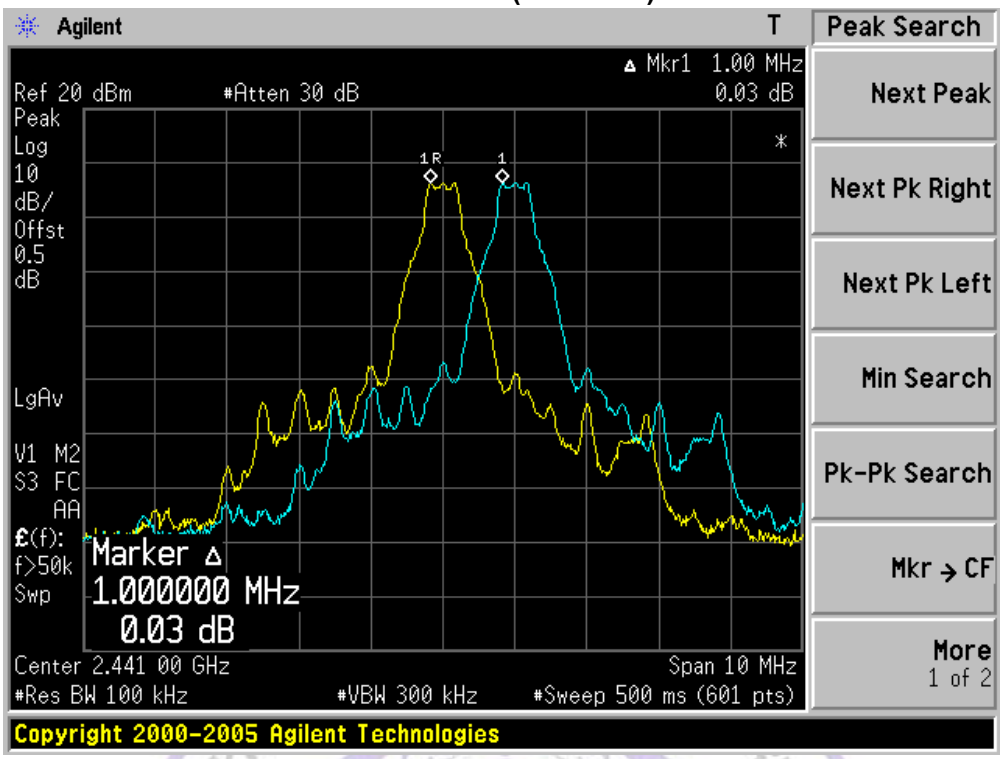
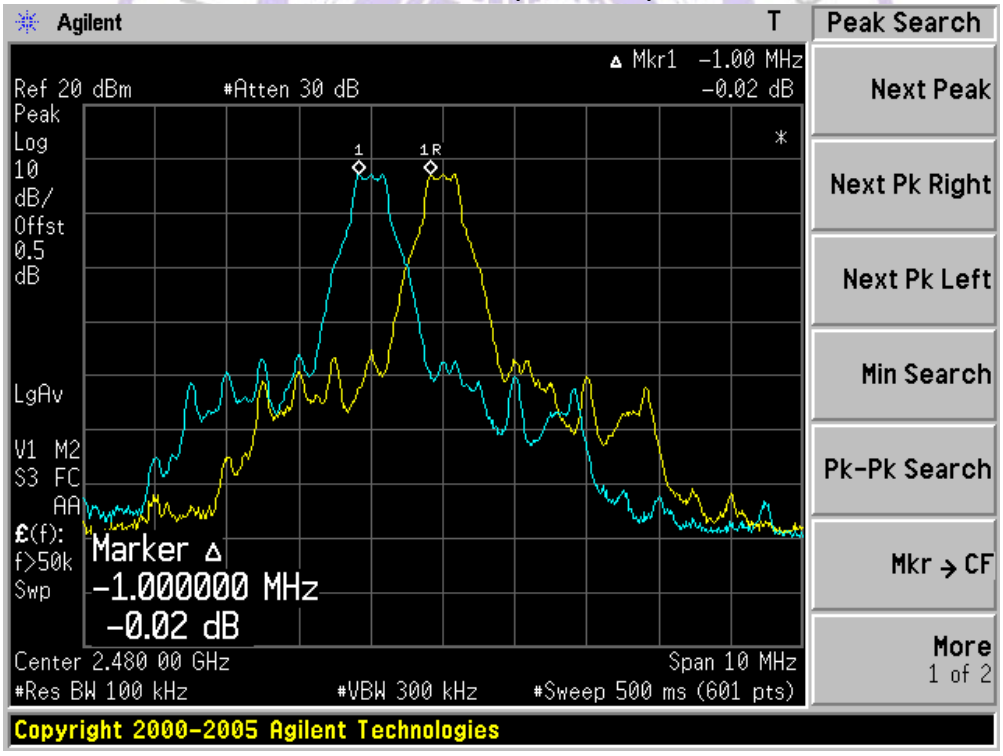
Channel 39 (2441MHz)



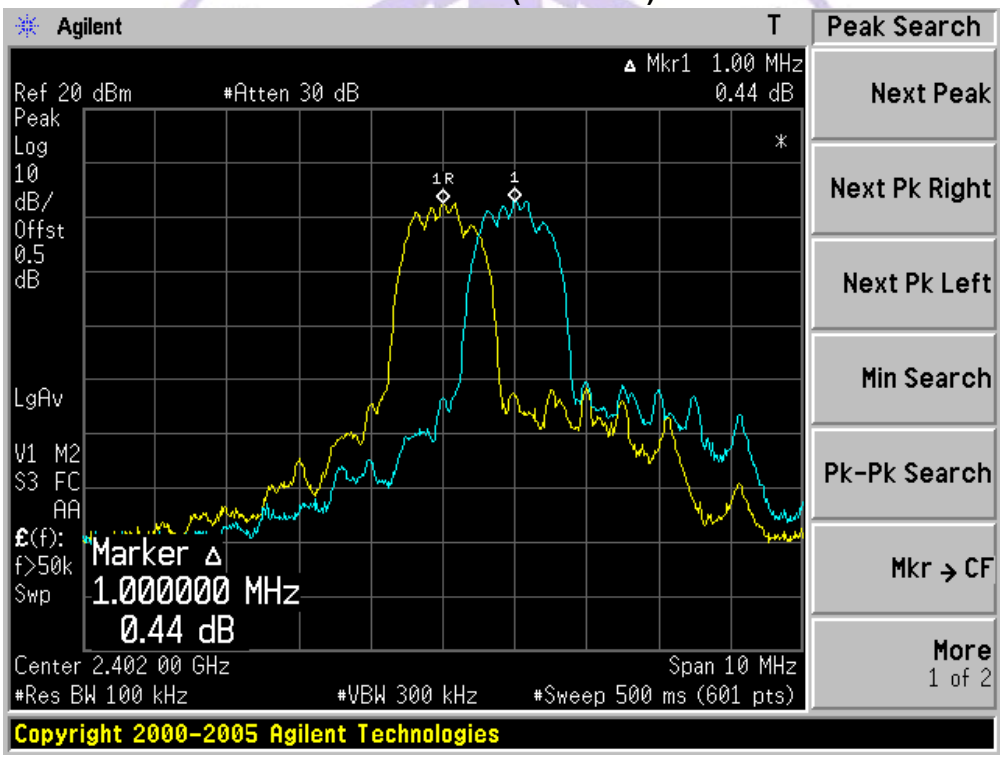
Channel 78 (2480MHz)



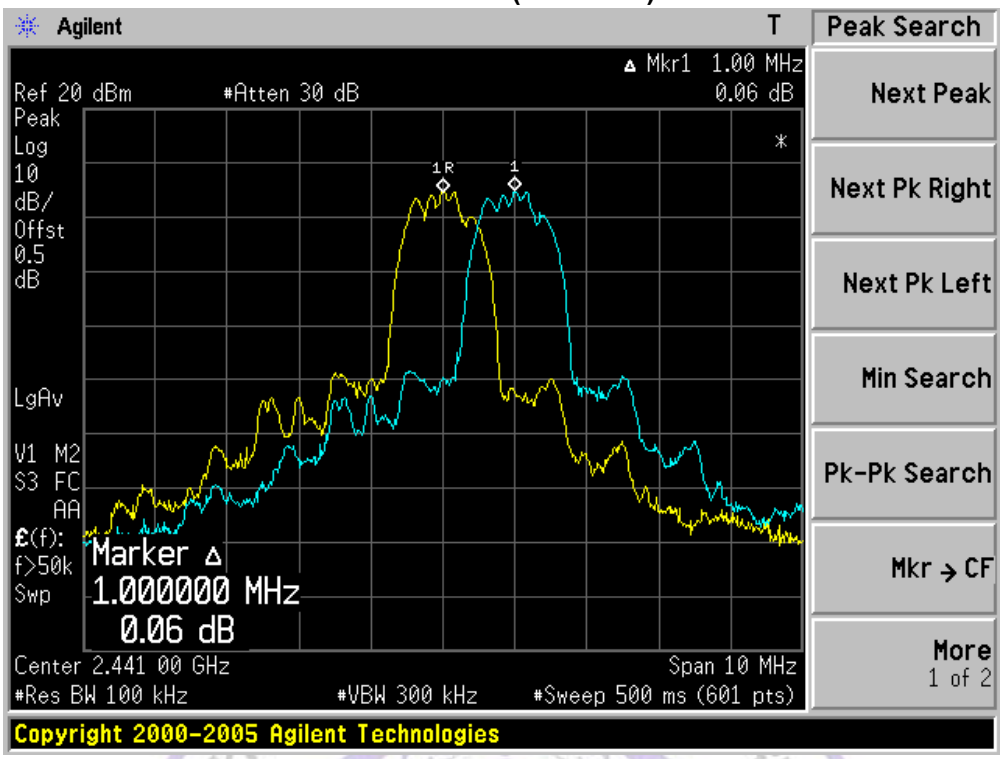
Product	**Tablet PC**
Test Item	Carrier Frequency Separation
Test Mode	Mode 2: Transmitter-2Mbps (Pi/4 DQPSK_DH5)

Channel No.	Frequency (MHz)	Carrier Frequency Separation (kHz)	Limit (kHz)	Result
00	2402	1000	>25 kHz or 2/3 of 20 dB BW	Pass
39	2441	1000	>25 kHz or 2/3 of 20 dB BW	Pass
78	2480	1000	>25 kHz or 2/3 of 20 dB BW	Pass

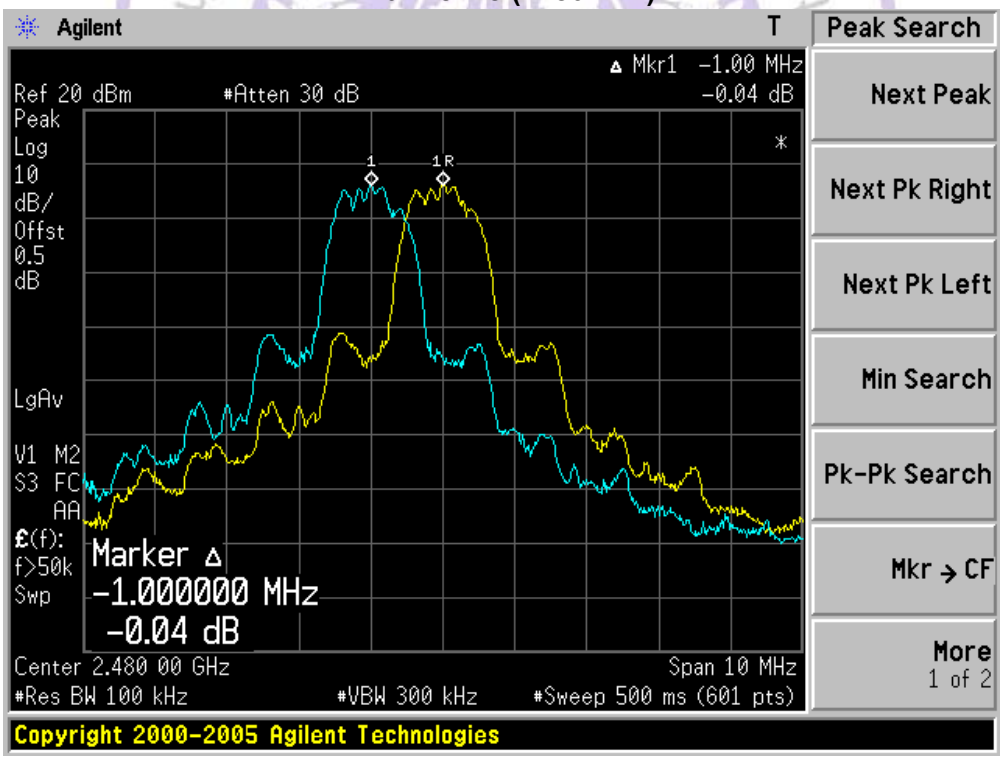
Channel 00 (2402MHz)



Channel 39 (2441MHz)



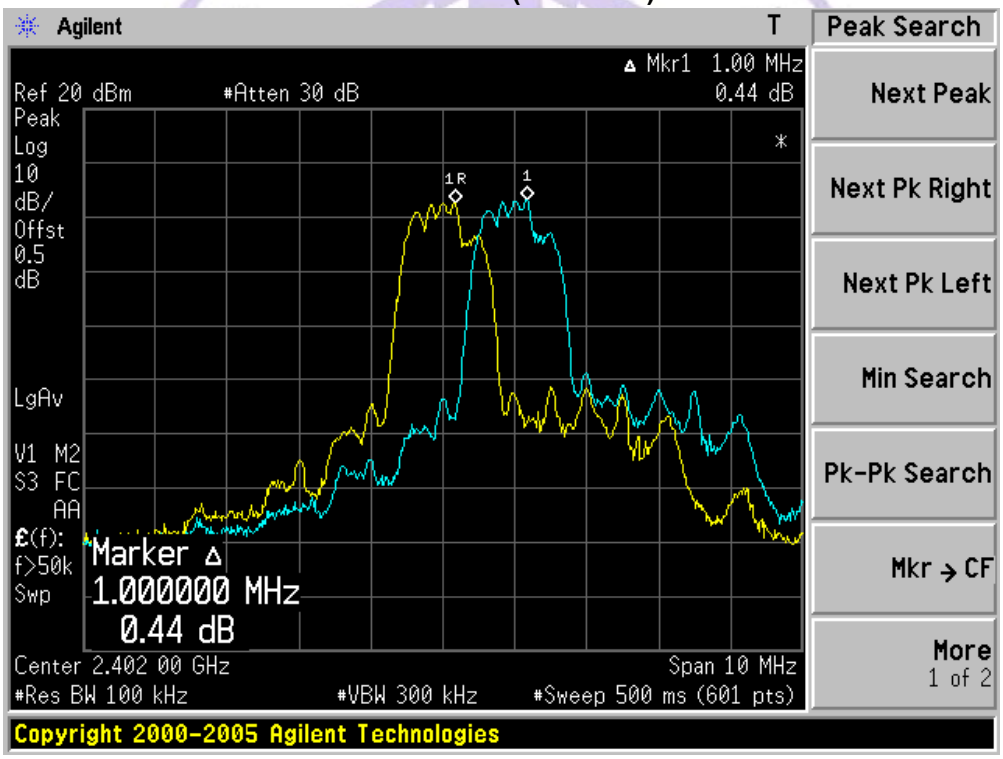
Channel 78 (2480MHz)



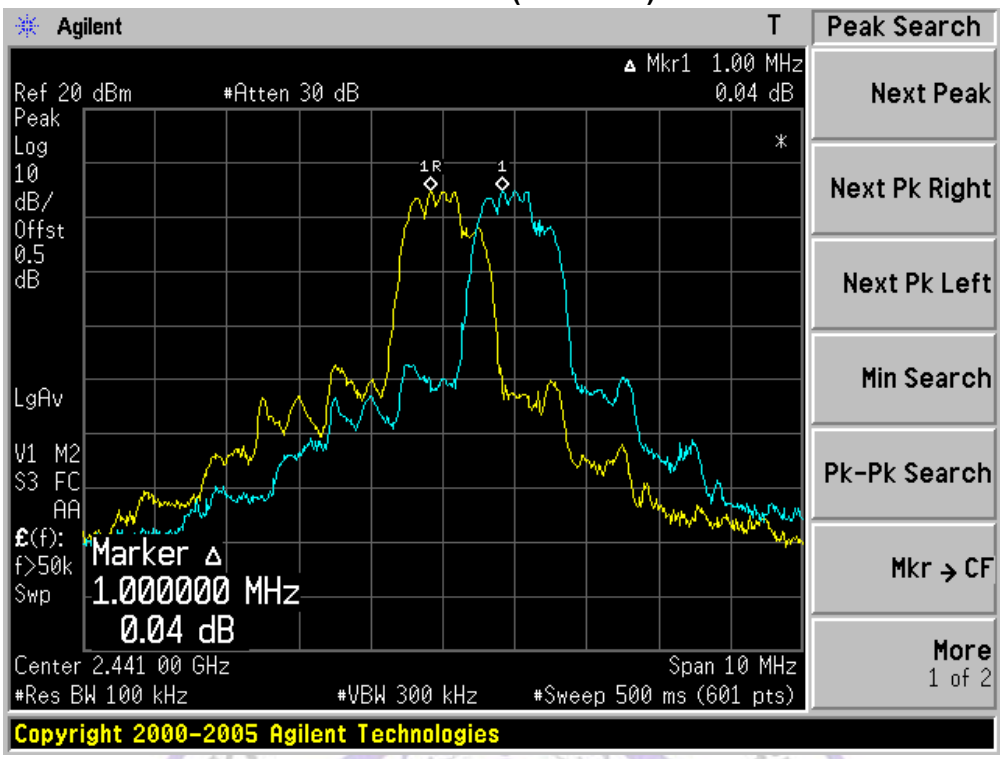
Product	**Tablet PC**
Test Item	Carrier Frequency Separation
Test Mode	Mode 3: Transmitter-3Mbps (8DPSK_DH5)

Channel No.	Frequency (MHz)	Carrier Frequency Separation (kHz)	Limit (kHz)	Result
00	2402	1000	>25 kHz or 2/3 of 20 dB BW	Pass
39	2441	1000	>25 kHz or 2/3 of 20 dB BW	Pass
78	2480	1000	>25 kHz or 2/3 of 20 dB BW	Pass

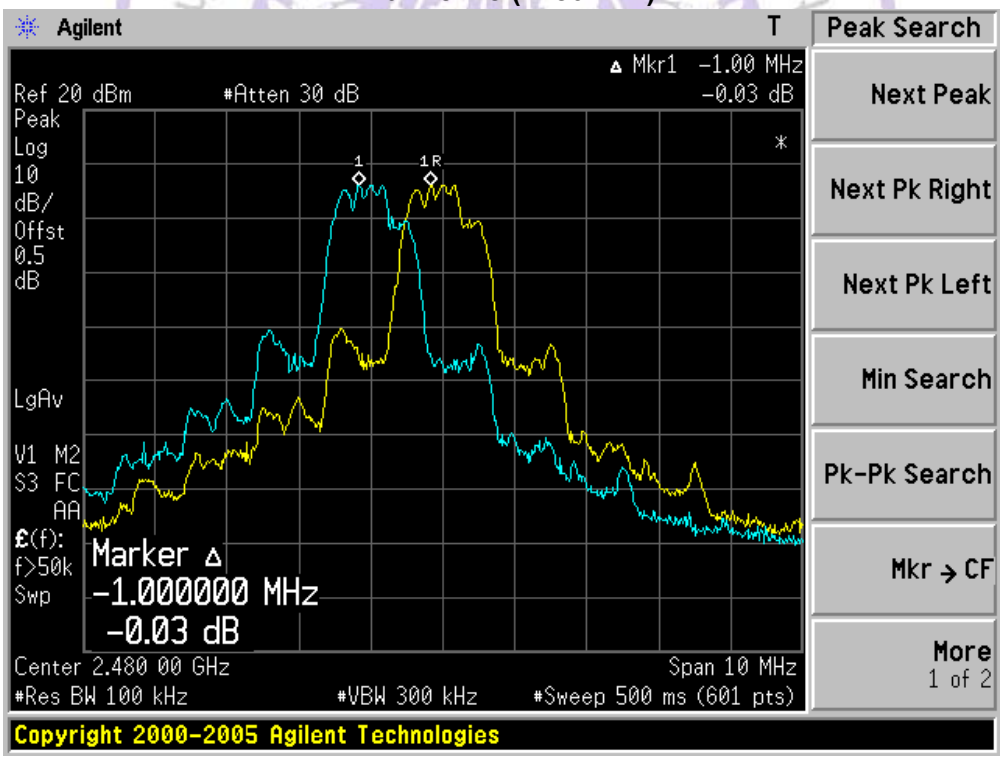
Channel 00 (2402MHz)



Channel 39 (2441MHz)

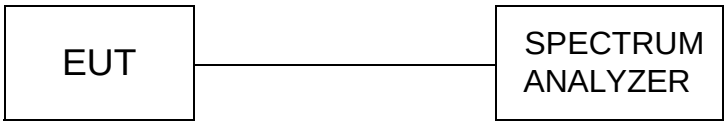


Channel 78 (2480MHz)



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

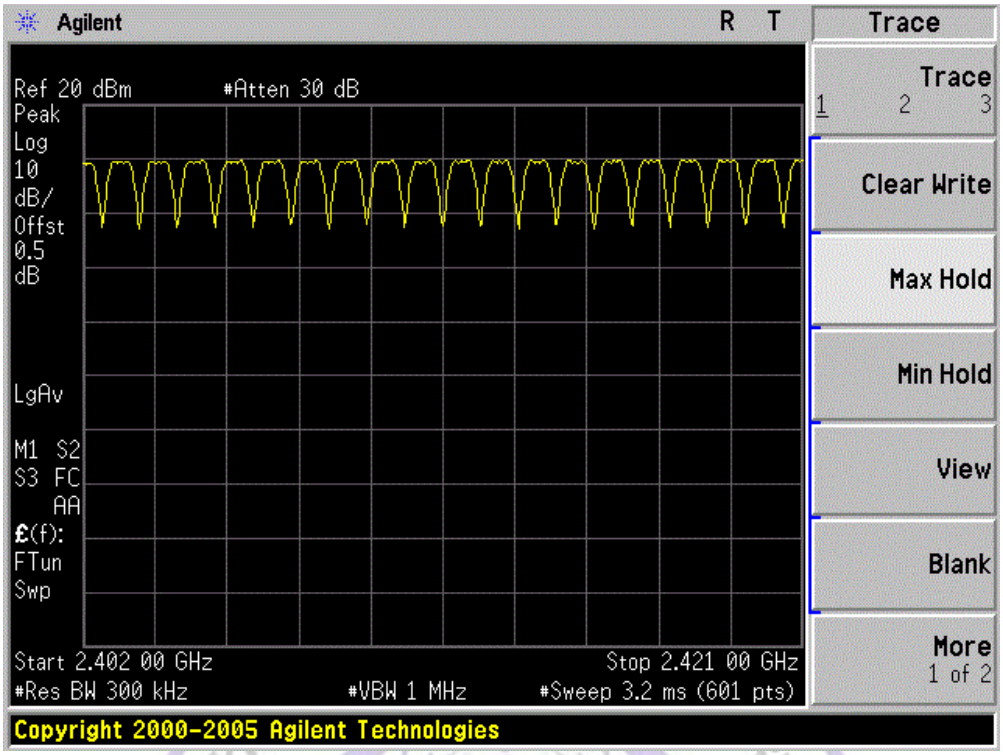
Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels.

TEST RESULTS

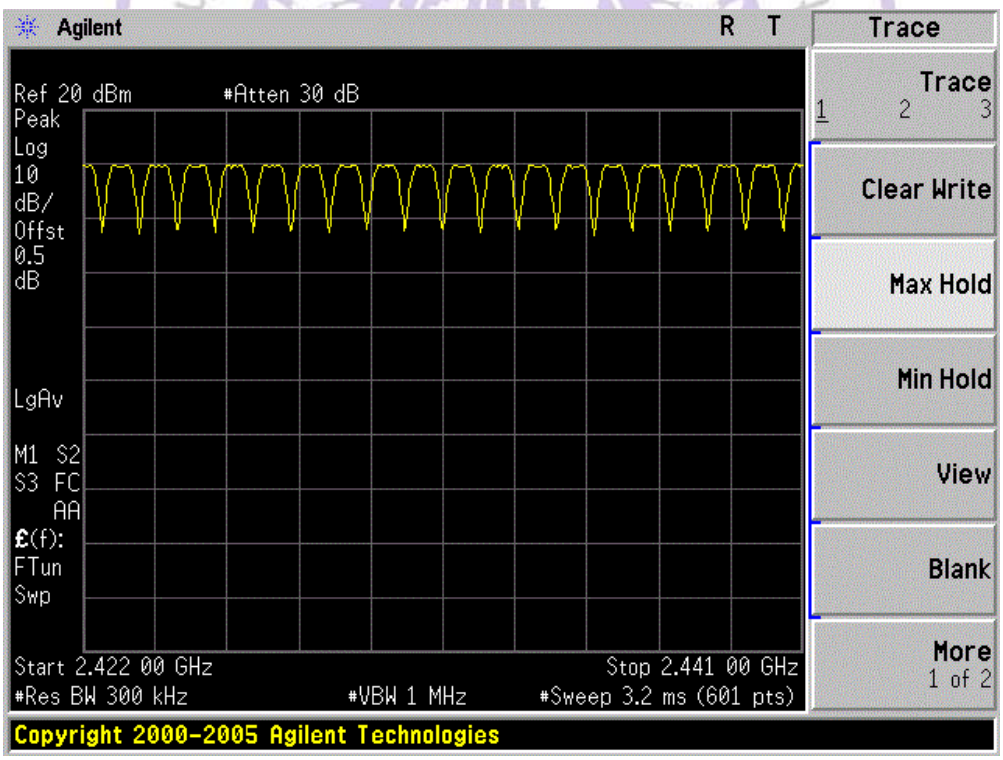
Product	**Tablet PC**
Test Item	Number of Hopping Frequencies
Test Mode	Mode 1: Transmitter-1Mbps (GFSK_DH5)

Frequency Band (MHz)	Number of Hopping Frequencies	Limit	Result
2400 - 2483.5	79	>15	Pass

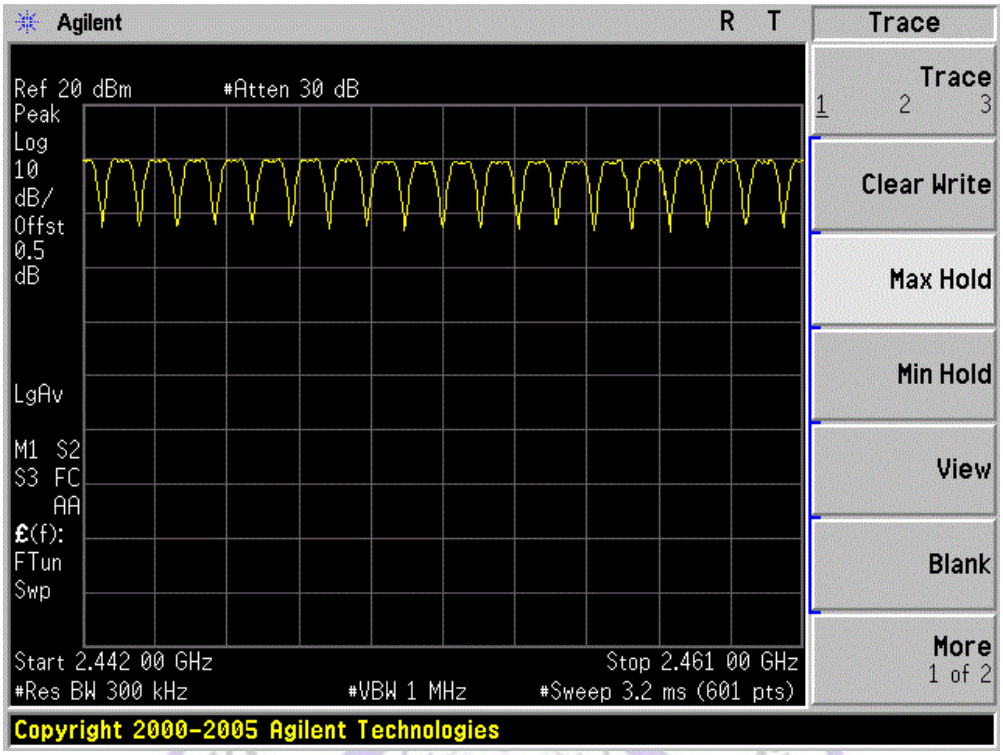
2402 - 2421 MHz



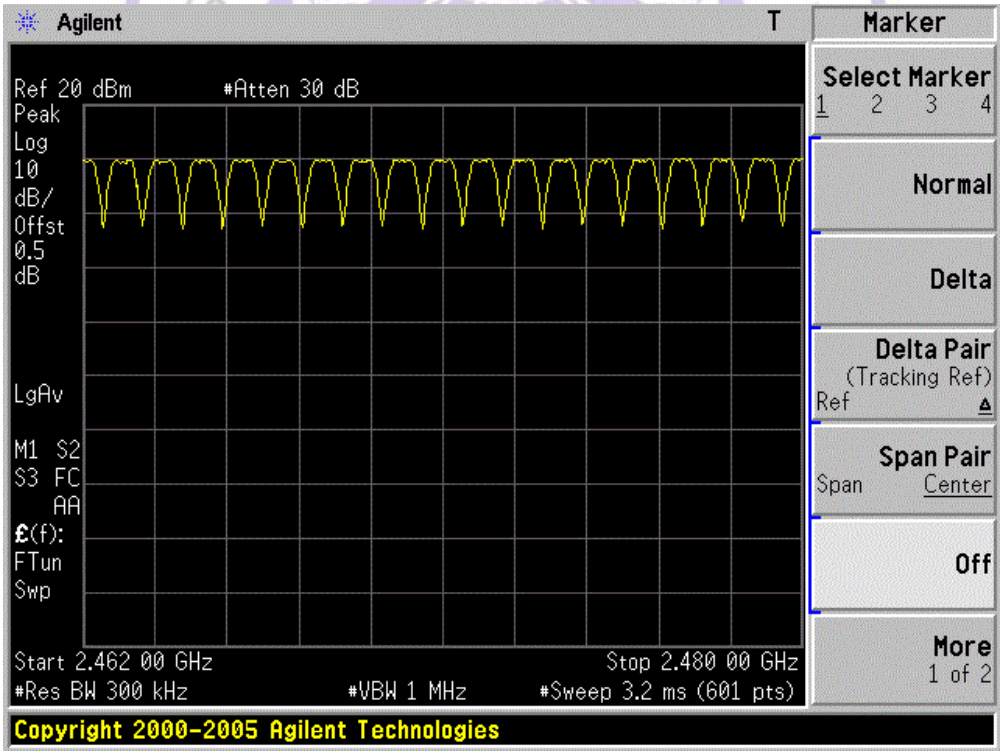
2422 - 2441 MHz



2442 - 2461 MHz



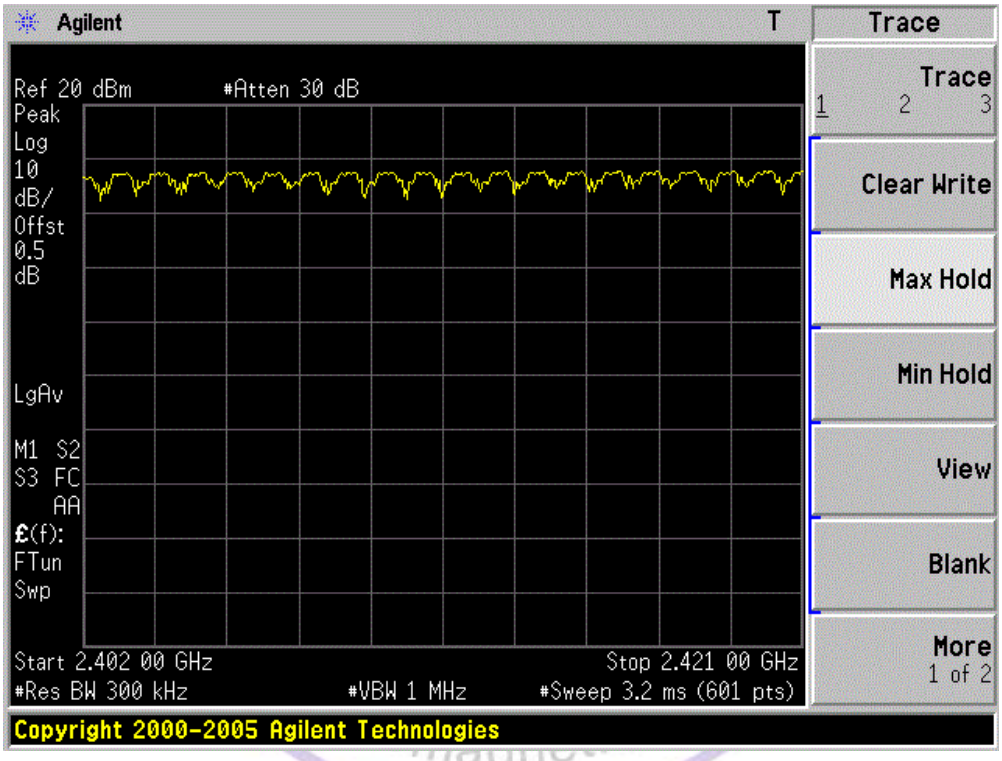
2462 - 2480 MHz



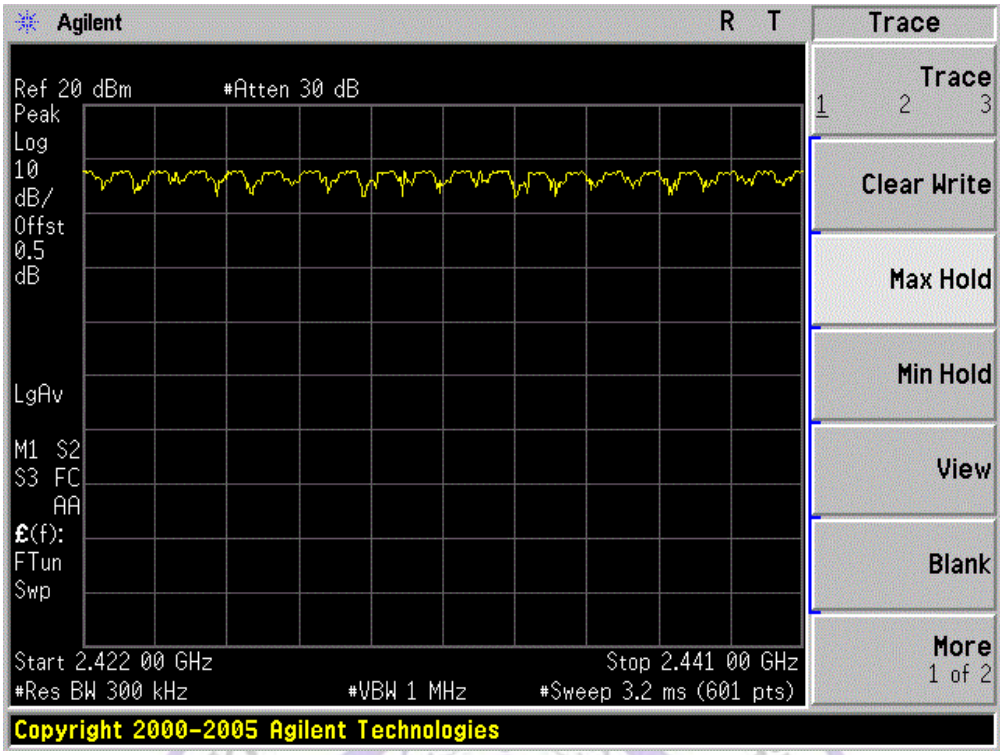
Product	**Tablet PC**
Test Item	Number of Hopping Frequencies
Test Mode	Mode 2: Transmitter-2Mbps (Pi/4 DQPSK_DH5)

Frequency Band (MHz)	Number of Hopping Frequencies	Limit	Result
2400 - 2483.5	79	>15	Pass

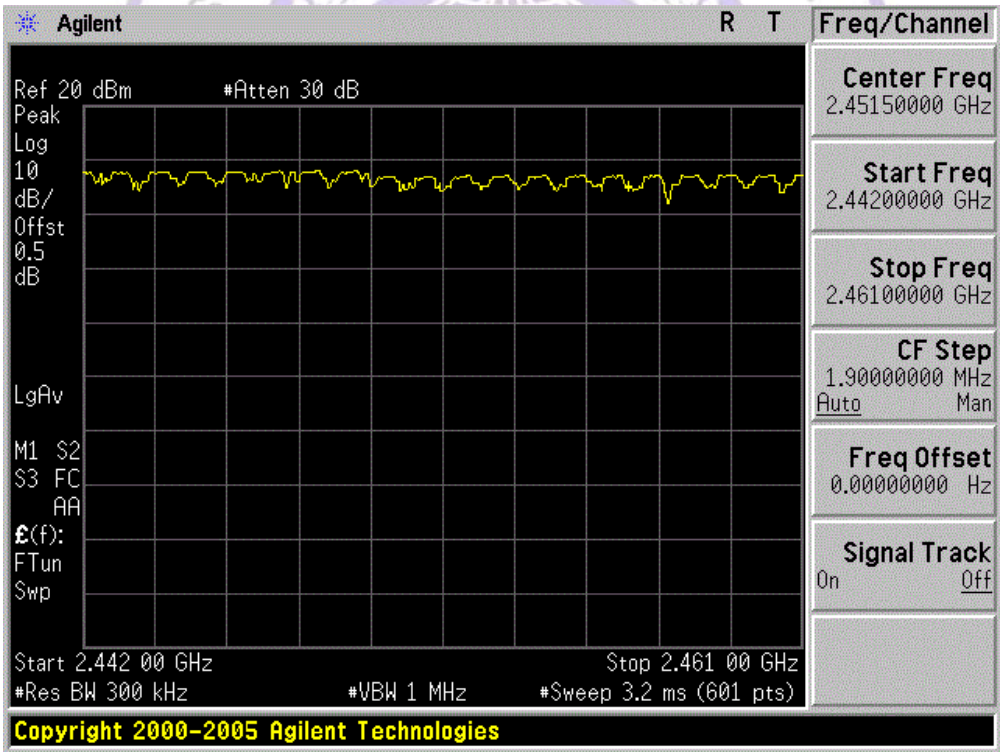
2402 - 2421 MHz



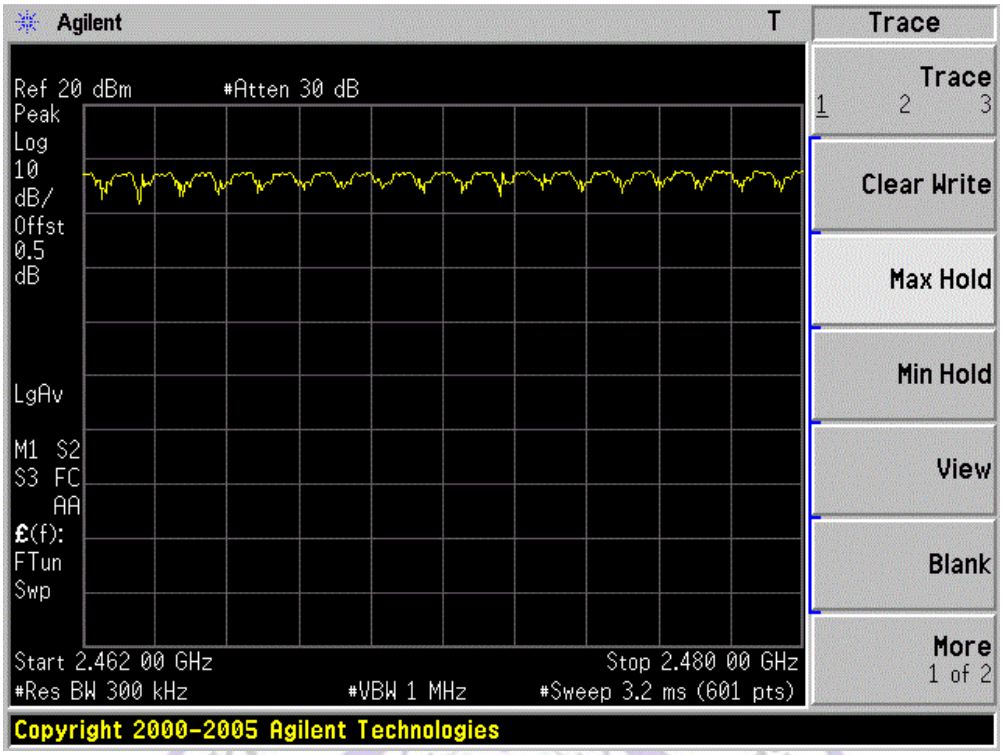
2422 - 2441 MHz



2442 - 2461 MHz



2462 - 2480 MHz



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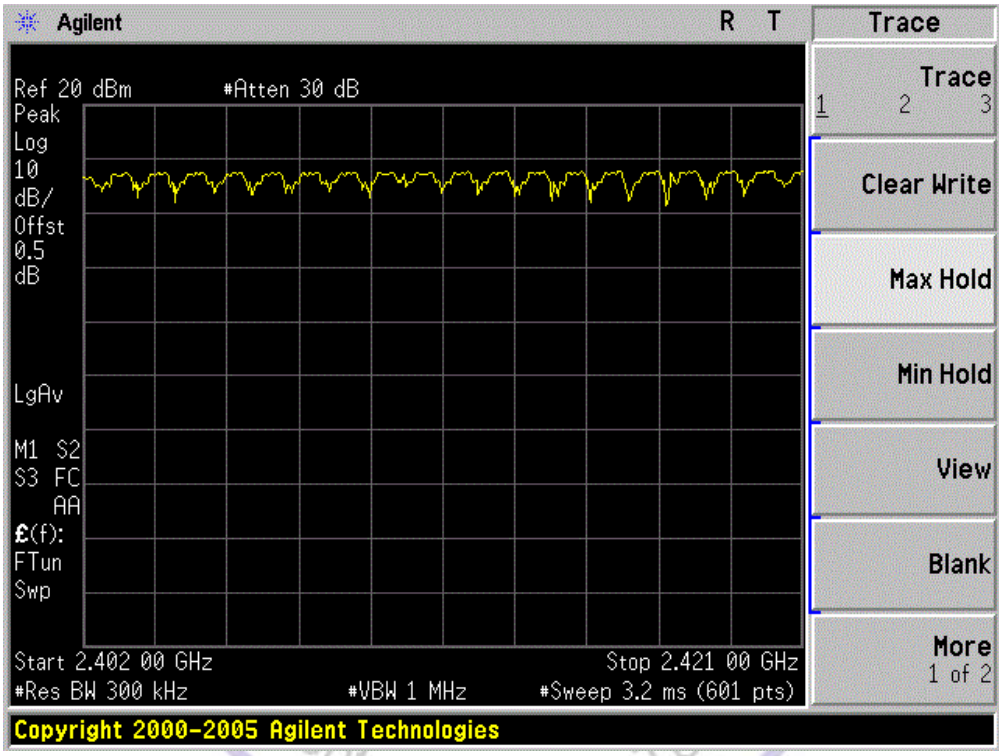
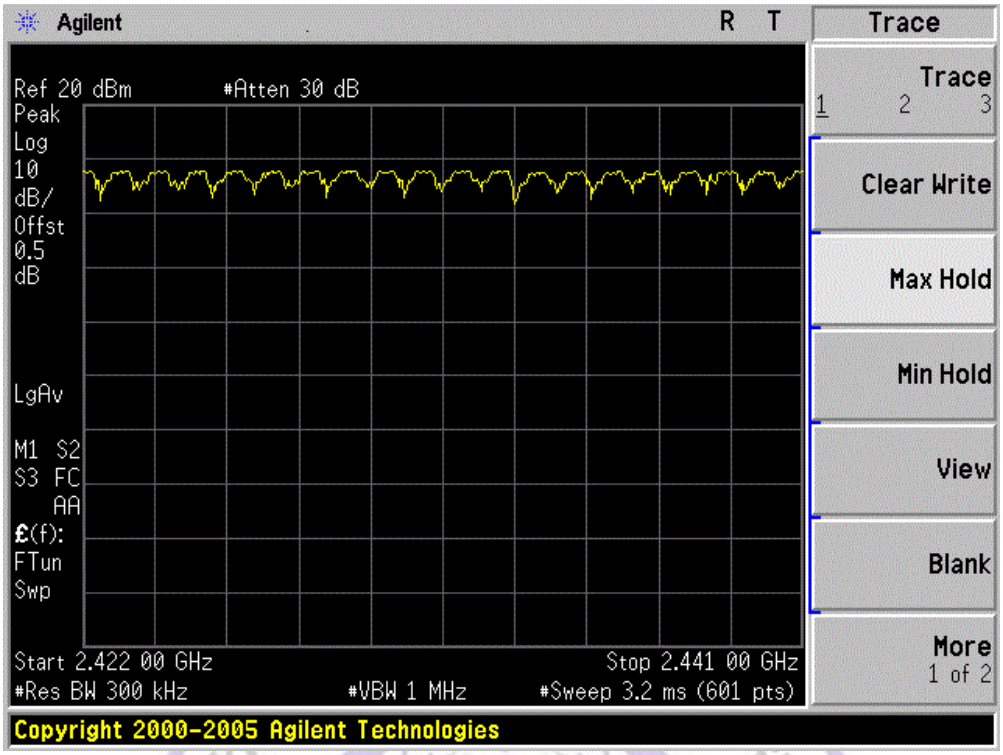
Product	**Tablet PC**
Test Item	Number of Hopping Frequencies
Test Mode	Mode 3: Transmitter-3Mbps (8DPSK_DH5)

Frequency Band (MHz)	Number of Hopping Frequencies	Limit	Result
2400 - 2483.5	79	>15	Pass

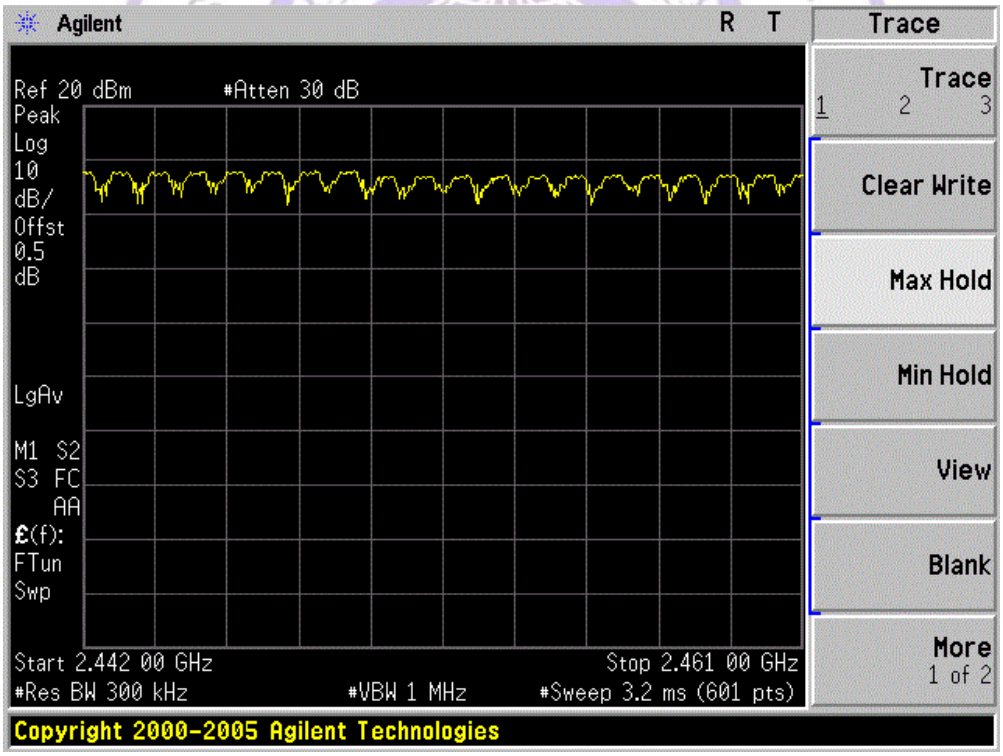
2402 - 2421 MHz



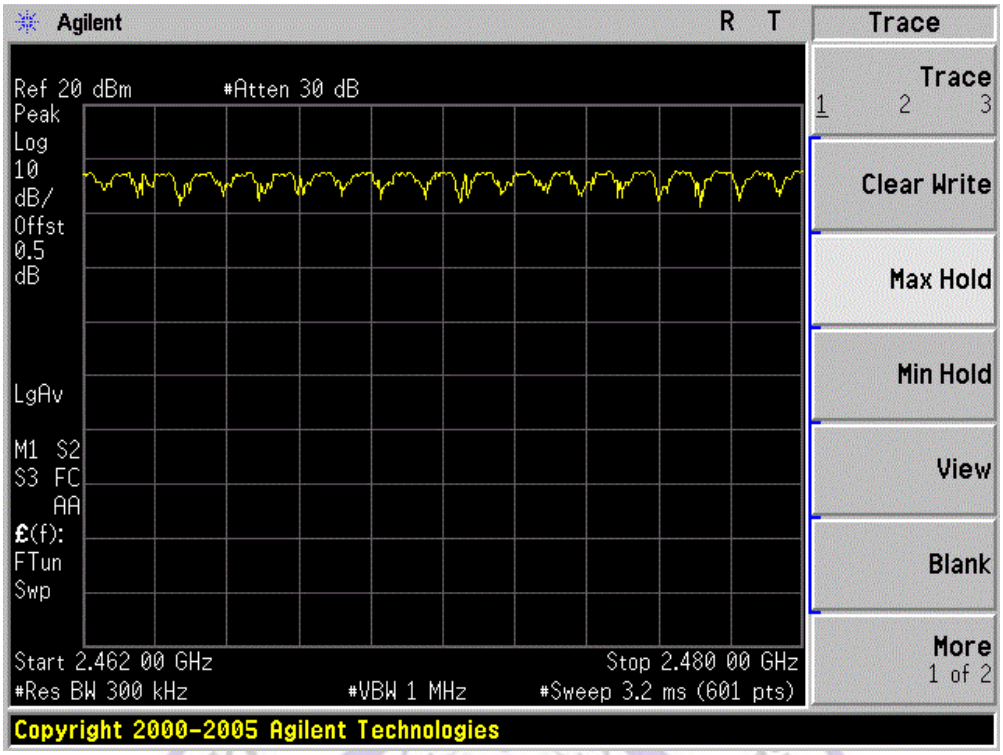
2422 - 2441 MHz



2442 - 2461 MHz



2462 - 2480 MHz



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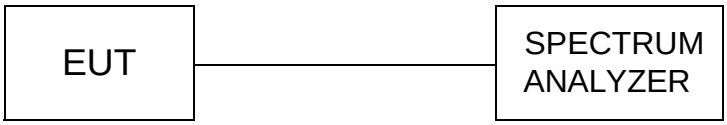
4.8. Time Of Occupancy(Dwell Time)

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.

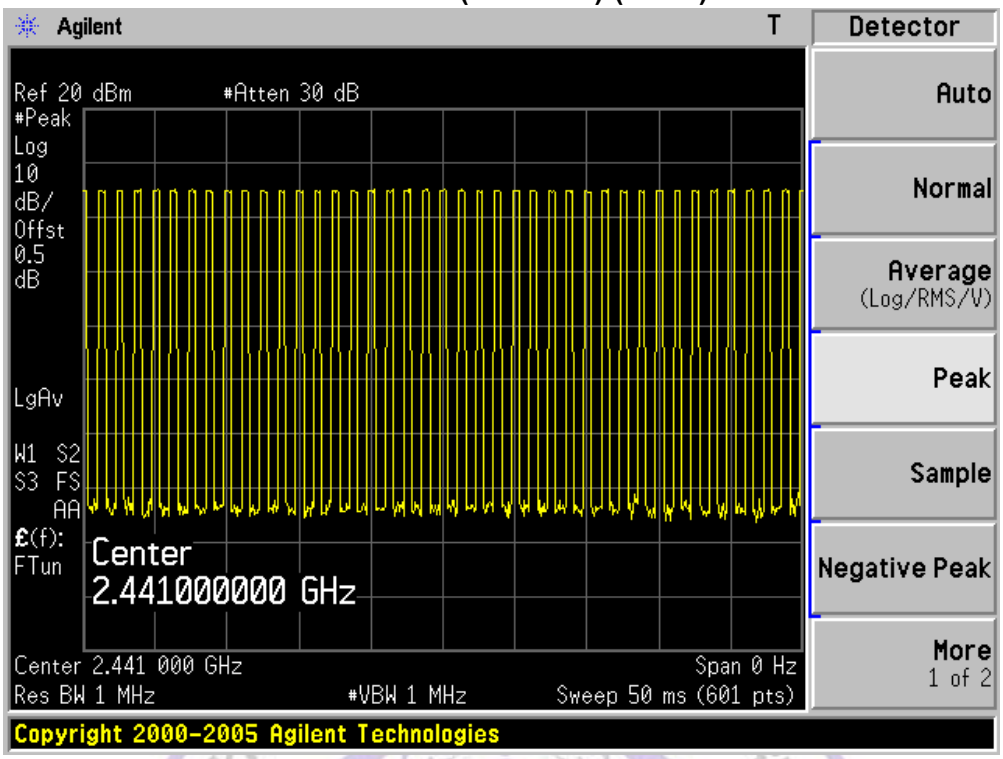
TEST RESULTS

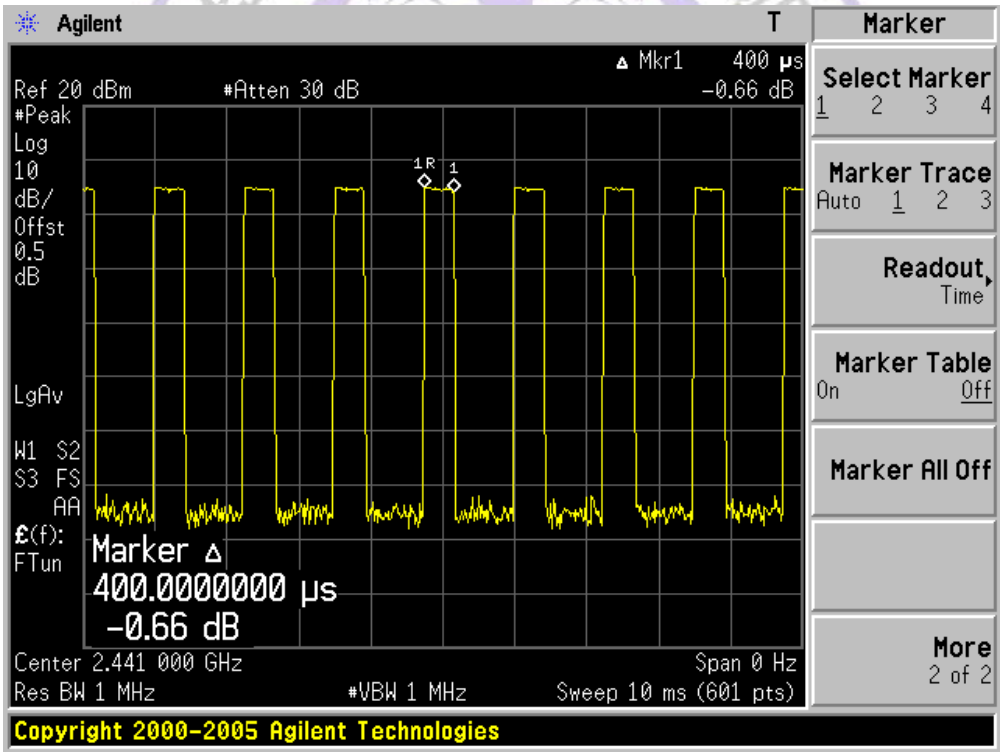
Product	**Tablet PC**
Test Item	Time of Occupancy (Dwell Time)
Test Mode	Transmitter-3Mbps (8DPSK_DH1)

Channel No.	Frequency (MHz)	Time of Occupancy (ms)	Limit (ms)	Result
39	2441	128.0	< 400	Pass

DH1: Dwell time=Pulse time (0.4 ms) × (1600 ÷ 2 ÷ 79) ×31.6 Second

Channel 39 (2441MHz)-(3DH1)



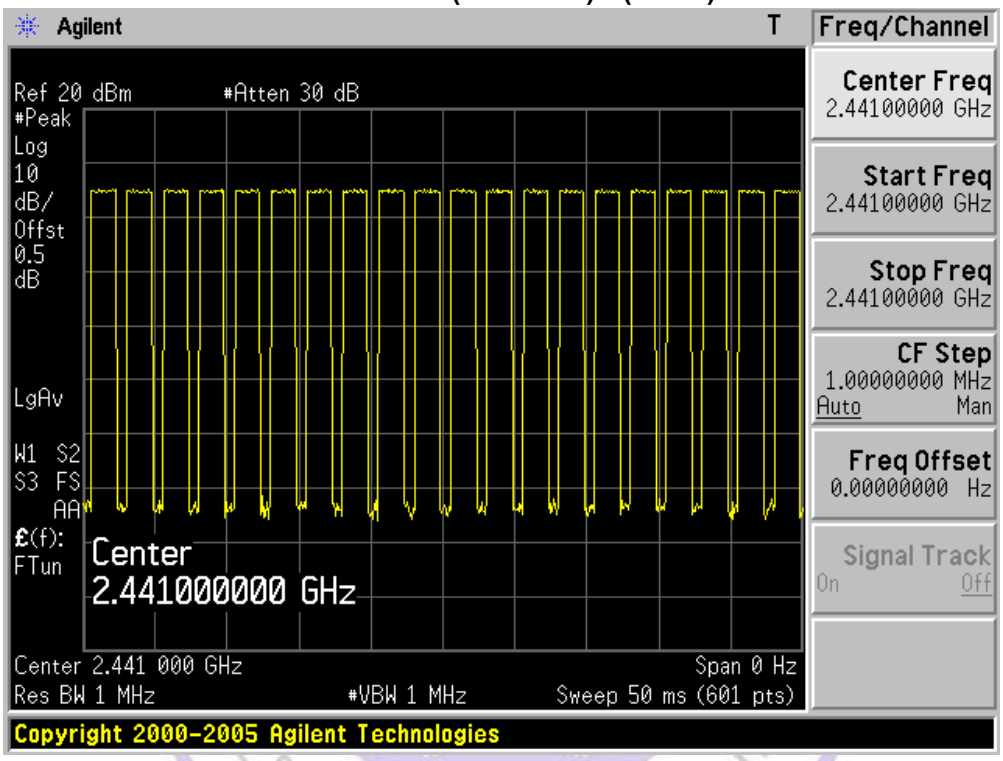


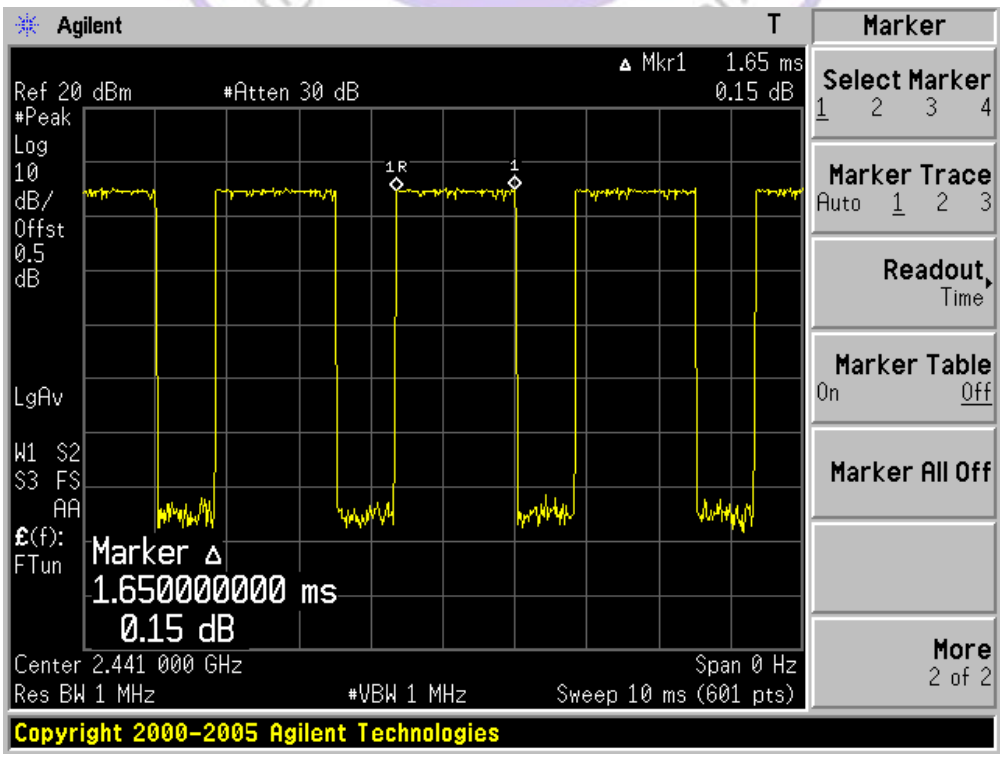
Product	**Tablet PC**
Test Item	Time of Occupancy (Dwell Time)
Test Mode	Transmitter-3Mbps (8DPSK_DH3)

Channel No.	Frequency (MHz)	Time of Occupancy (ms)	Limit (ms)	Result
39	2441	264.0	< 400	Pass

DH3: Dwell time=Pulse time (1.65 ms) × (1600 ÷ 4 ÷ 79) ×31.6 Second

Channel 39 (2441MHz) - (3DH3)



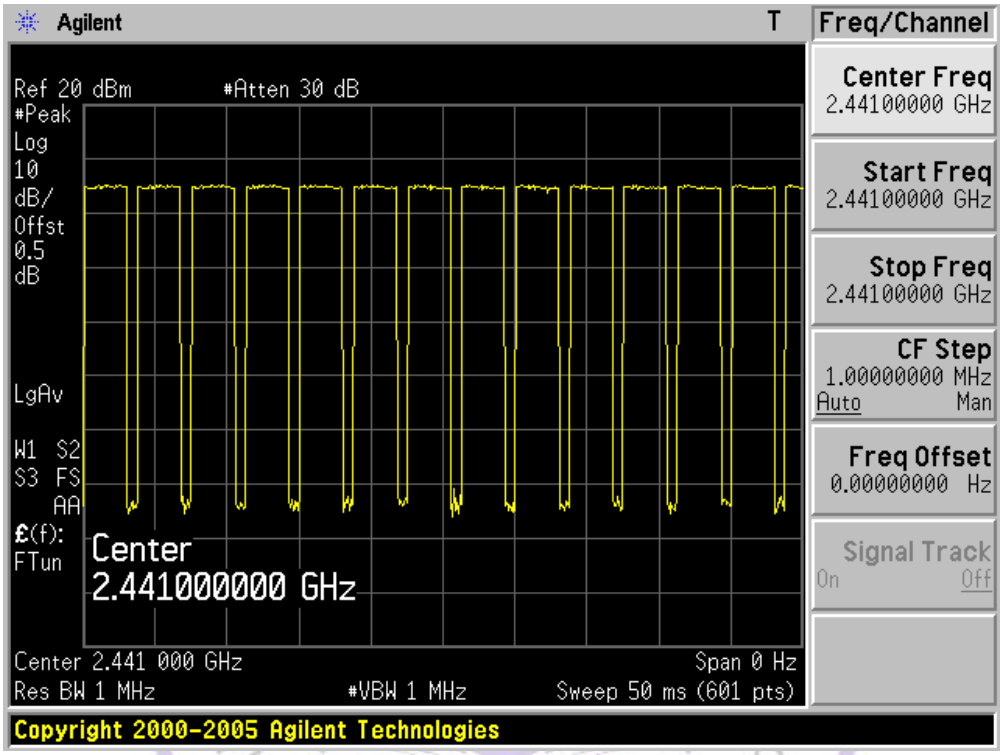


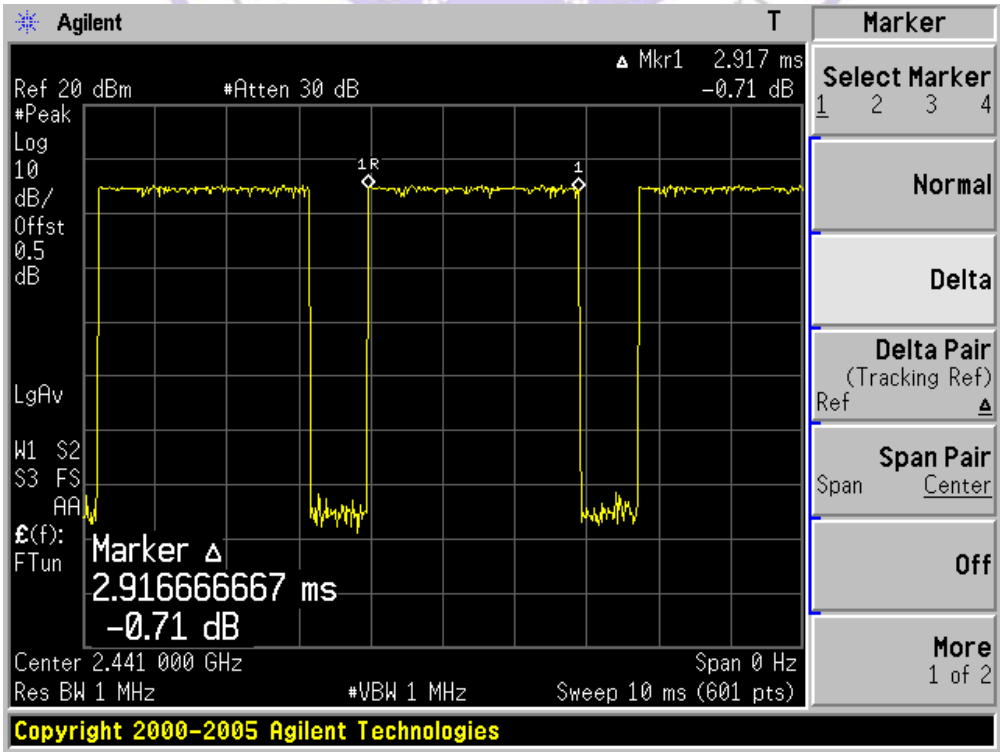
Product	**Tablet PC**
Test Item	Time of Occupancy (Dwell Time)
Test Mode	Transmitter-3Mbps (8DPSK_DH5)

Channel No.	Frequency (MHz)	Time of Occupancy (ms)	Limit (ms)	Result
39	2441	327.0	< 400	Pass

DH5: Dwell time=Pulse time (2.917 ms) × (1600 ÷ 6 ÷ 79) ×31.6 Second

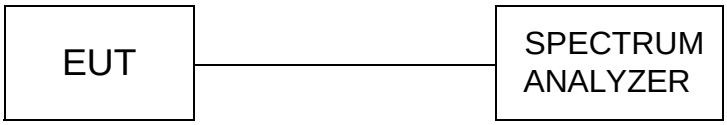
Channel 39 (2441MHz) - (3DH5)





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.

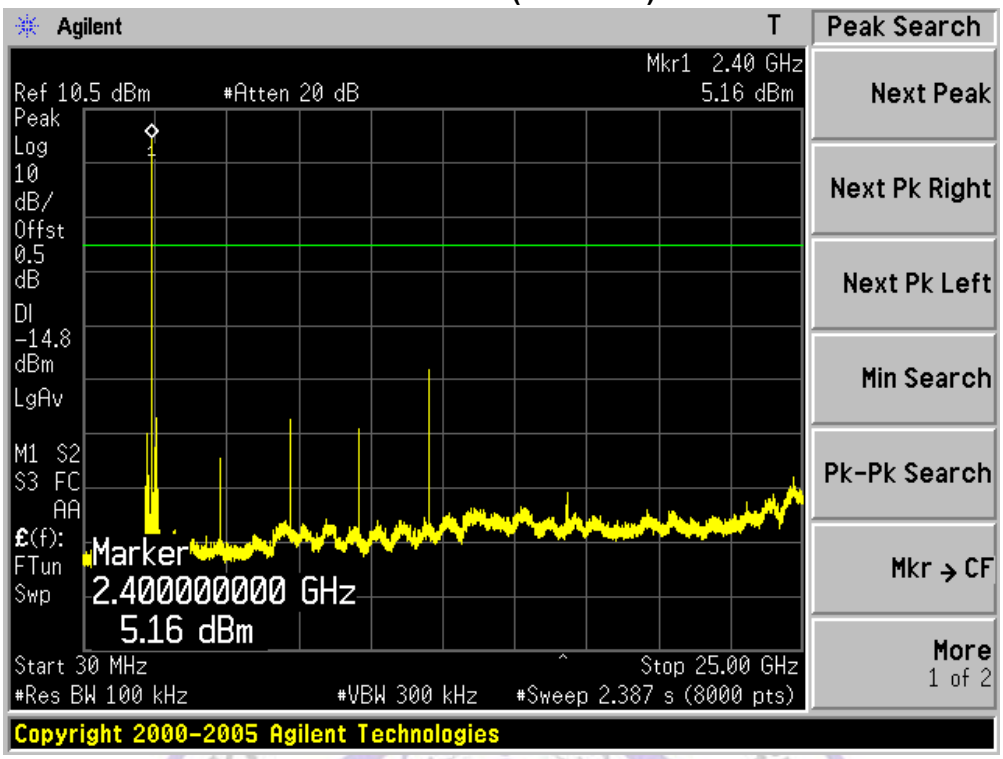
LIMIT

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

Product	**Tablet PC**
Test Item	Spurious RF Conducted Emissions
Test Mode	Mode 1: Transmitter-1Mbps (GFSK_DH5)

Channel 00 (2402MHz)



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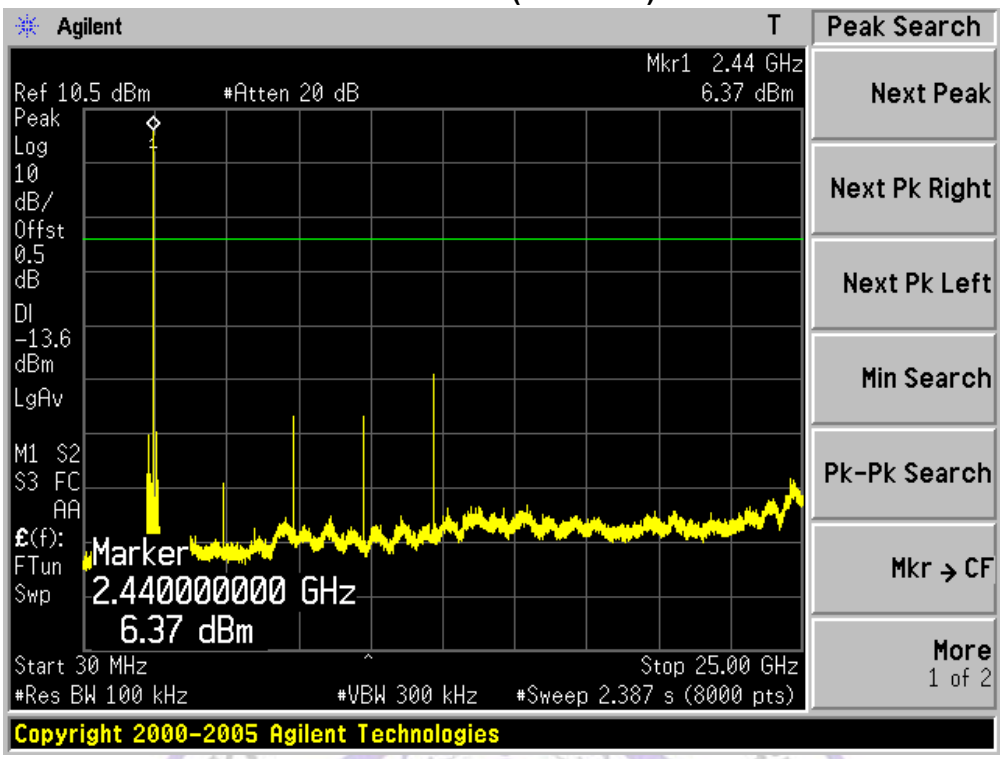
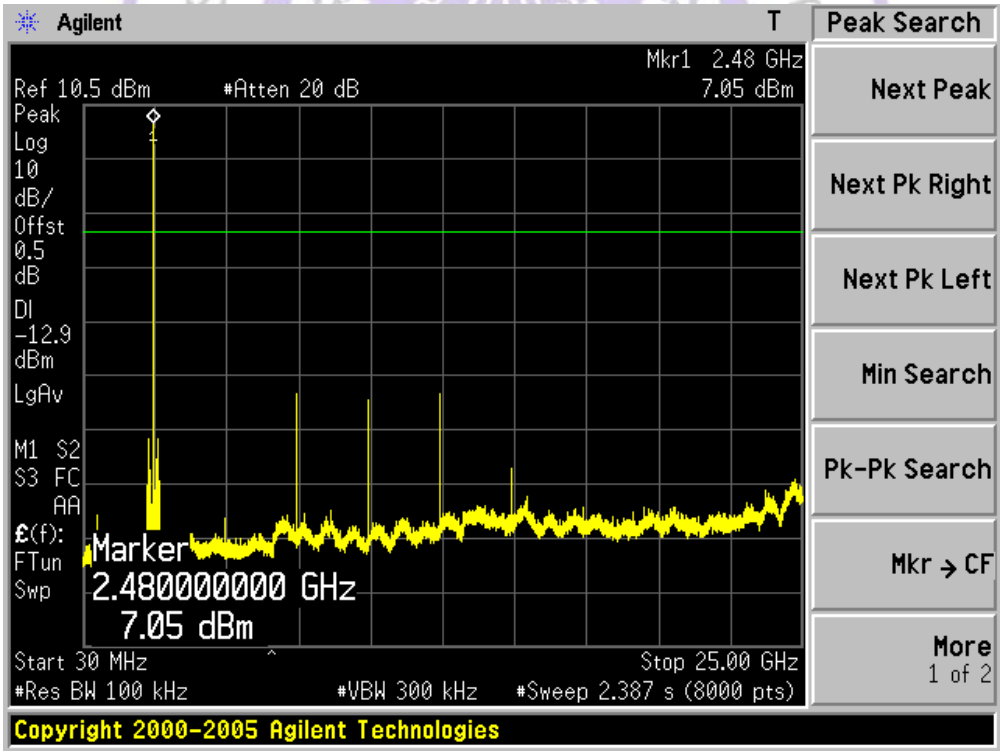
Channel 39 (2441MHz)

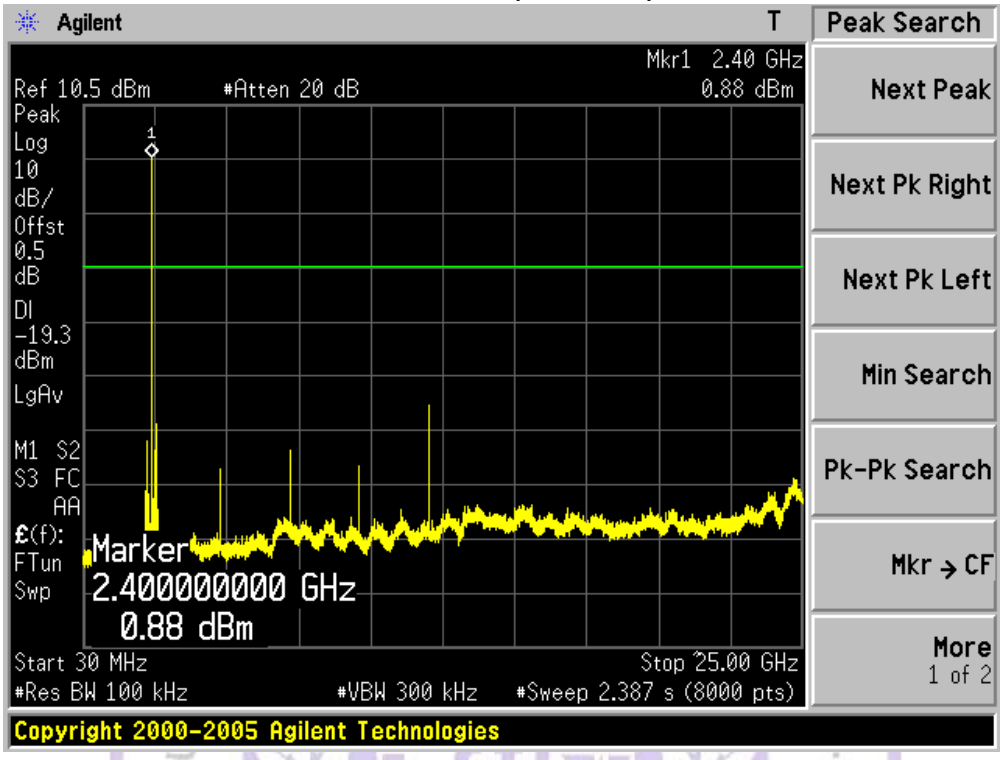


Channel 78 (2480MHz)

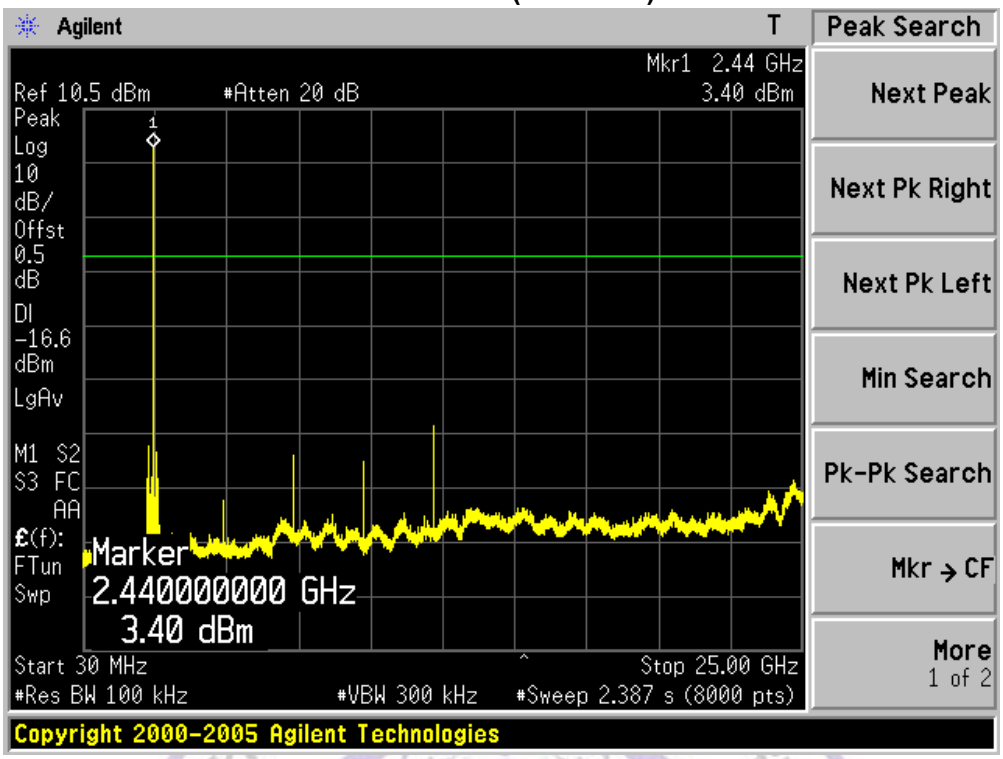


Product	**Tablet PC**
Test Item	Spurious RF Conducted Emissions
Test Mode	Mode 2: Transmitter-2Mbps (Pi/4 DQPSK_DH5)

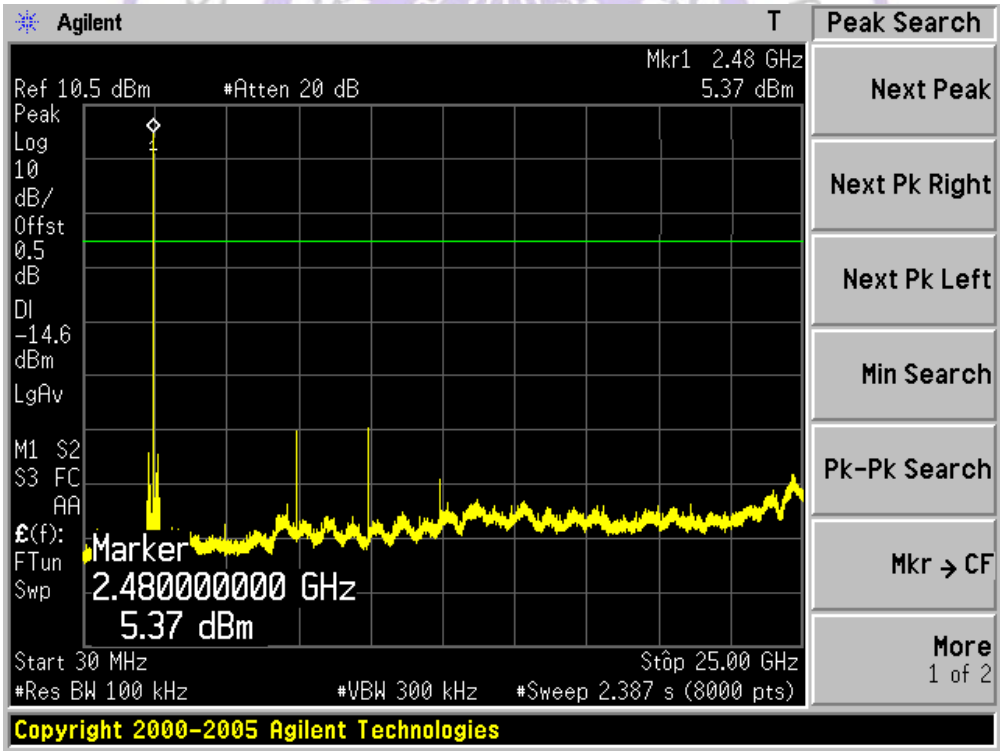
Channel 00 (2402MHz)



Channel 39 (2441MHz)

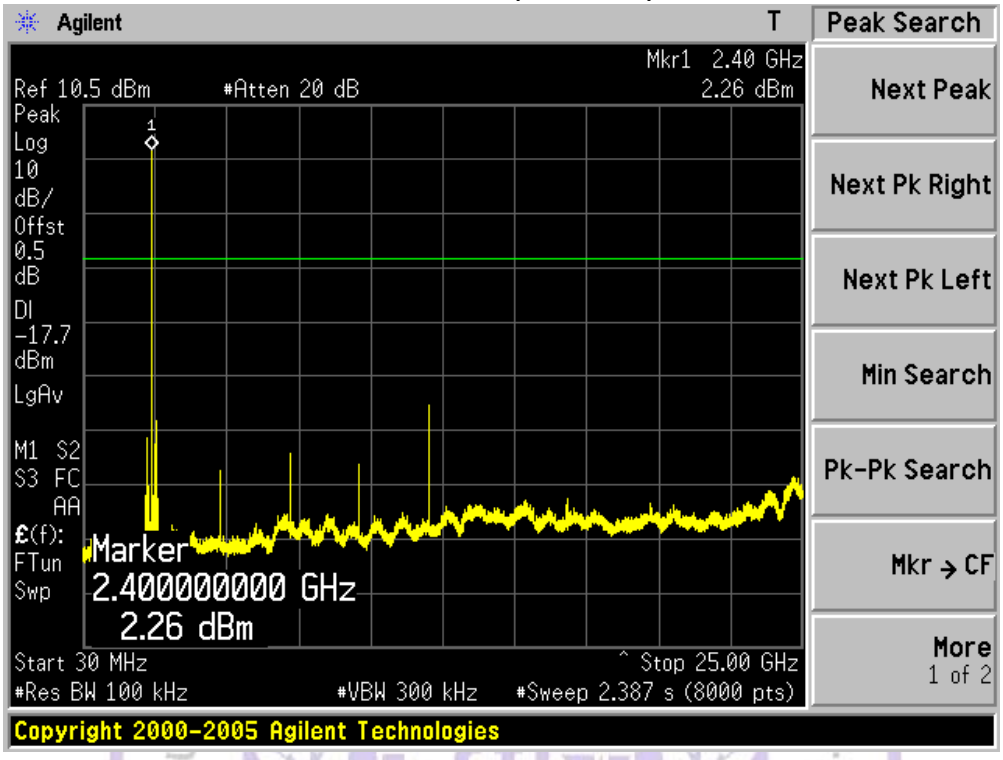


Channel 78 (2480MHz)



Product	**Tablet PC**
Test Item	Spurious RF Conducted Emissions
Test Mode	Mode 3: Transmitter-3Mbps (8DPSK_DH5)

Channel 00 (2402MHz)



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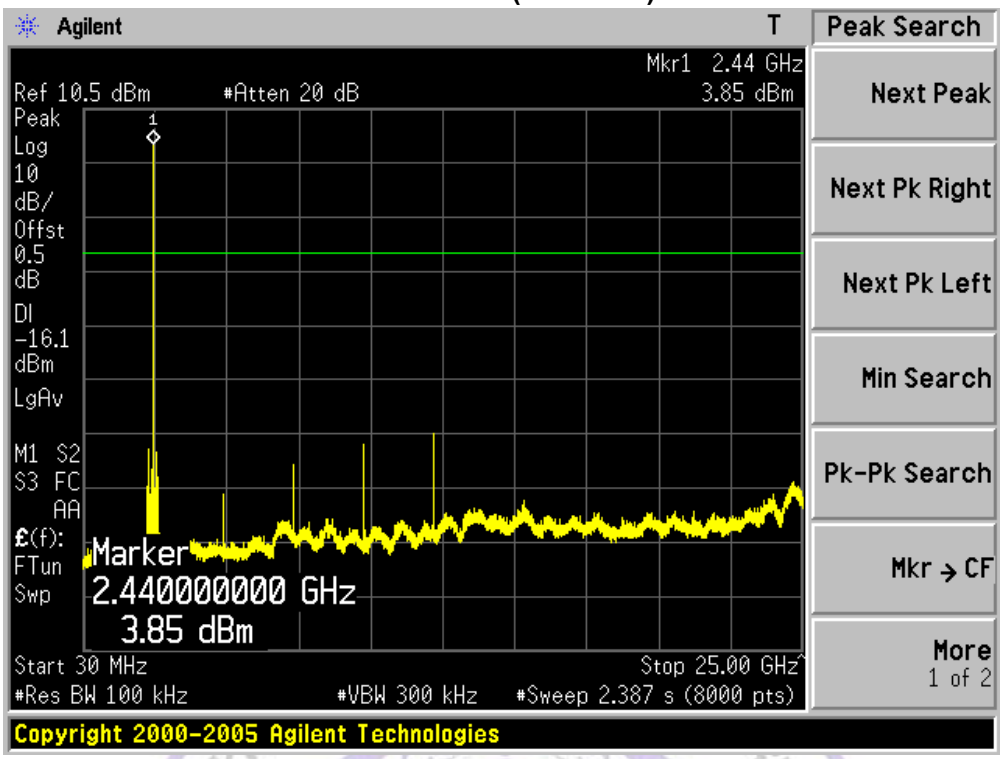
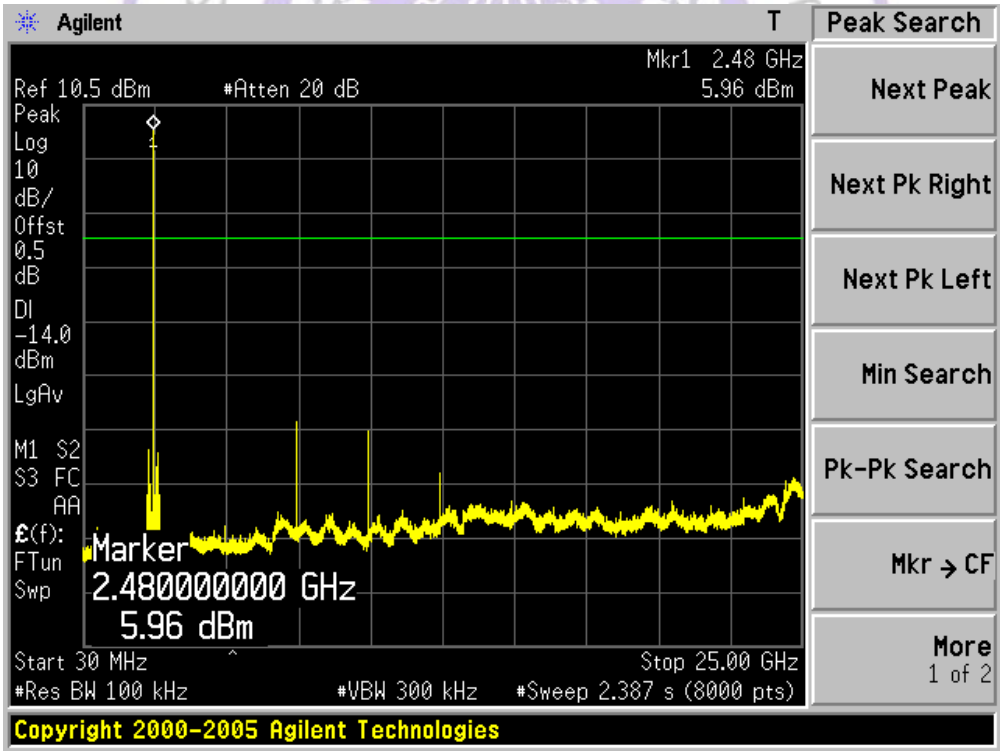
Channel 39 (2441MHz)



Channel 78 (2480MHz)



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 dBi.

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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 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

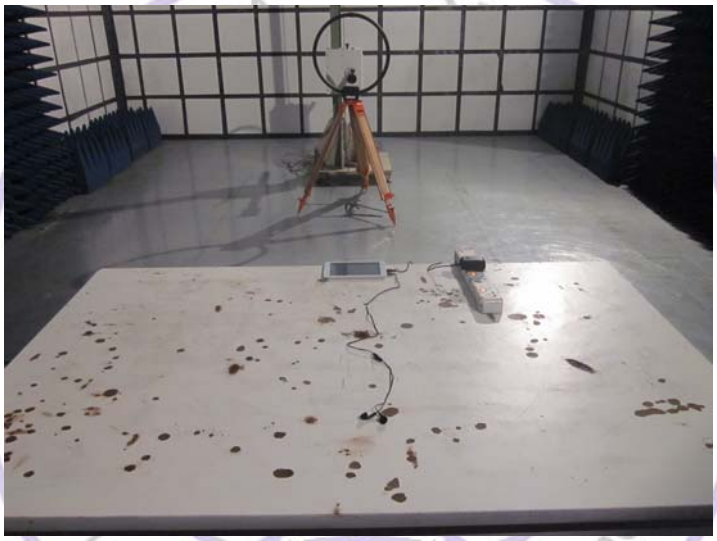
MEASUREMENT RESULTS

Per KDB 447498 D01 V05

This is a bluetooth function and the Max peak output power is 4.81dBm (3.03 mW) lower than low threshold 10 mW in general population category.

The SAR measurement is not necessary.

5. Test Setup Photos of the EUT



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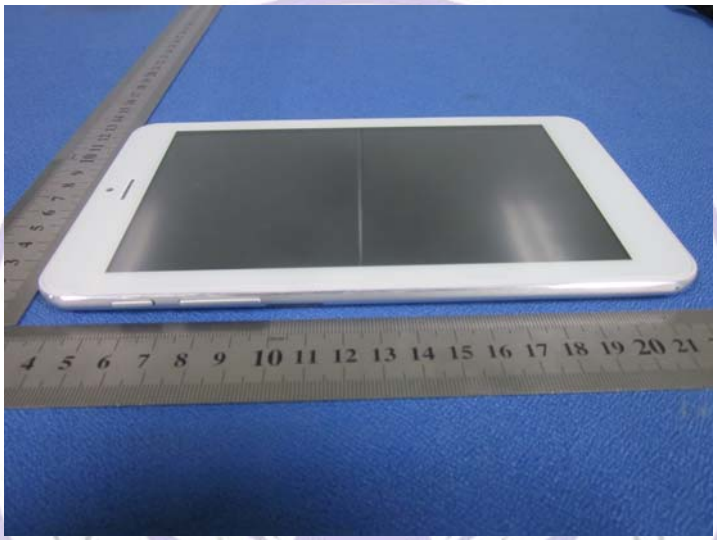
CTL

6. External and Internal Photos of the EUT

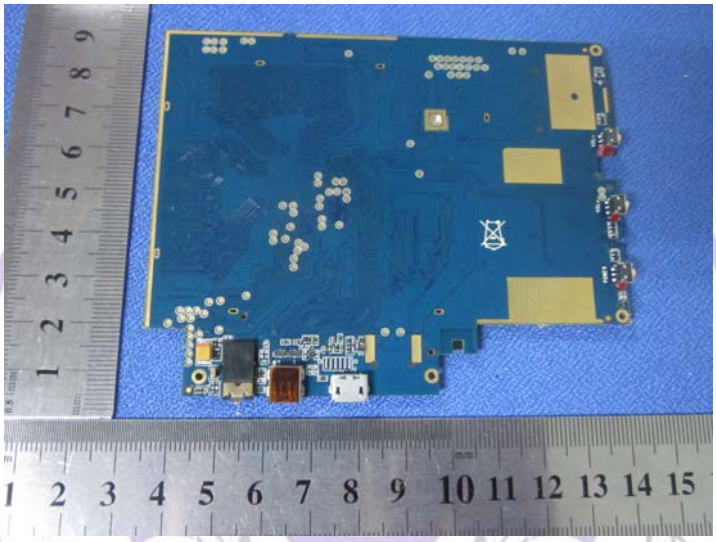
External Photos of EUT

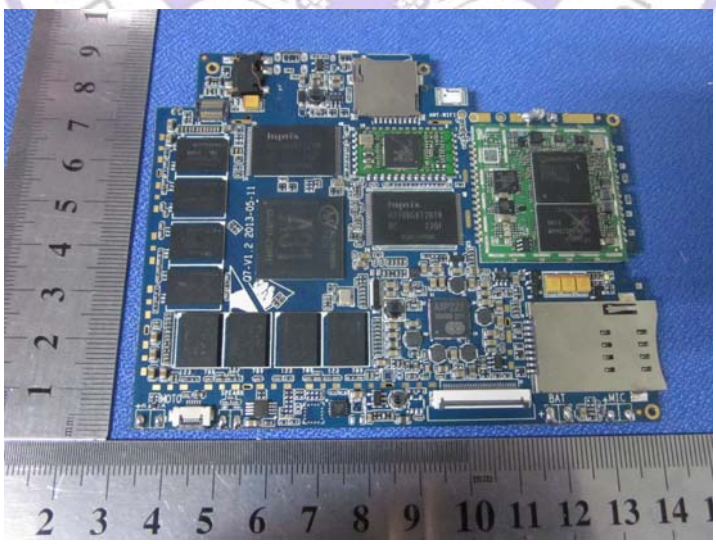


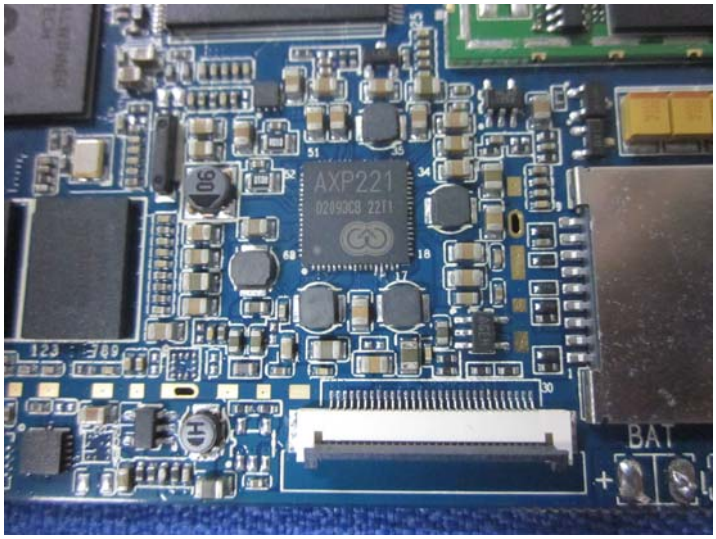
4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21

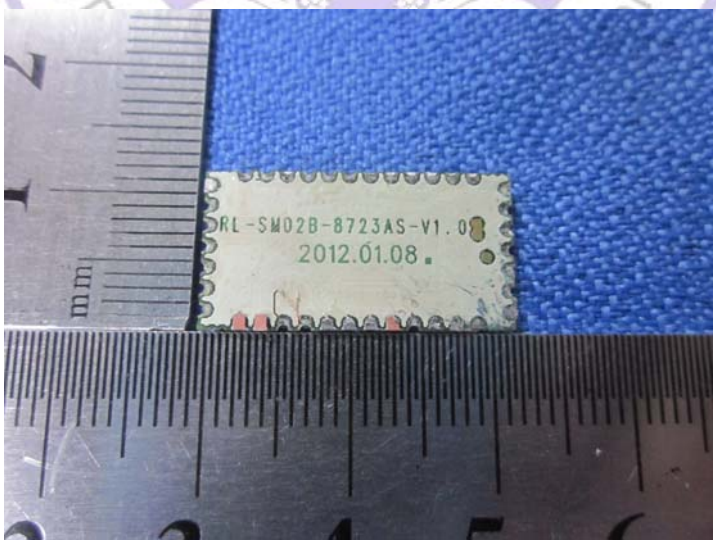
Internal Photos of EUT

HWM620
SW VER:C1B2106






AXP221
BAT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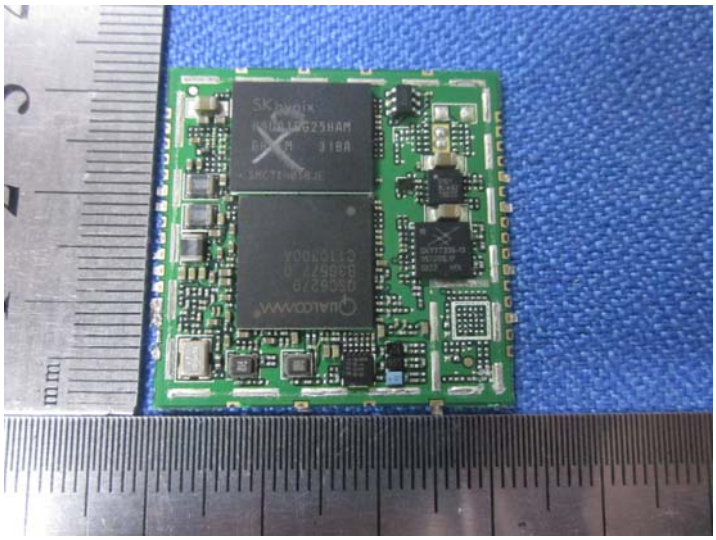
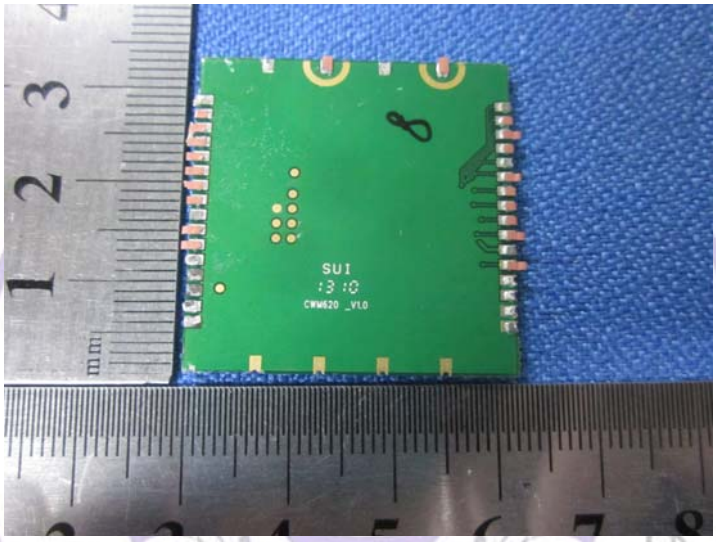
2012.01.08.





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