

Test Report

Industry Canada RSS-Gen Issue 3/RSS-210 Issue 8
FCC Part15 Subpart C

Product Name : IP-STB
Model No. : 3000X, 3050X, 3100X
FCC ID : TC23100X
IC : 5959A-3100X

Applicant : Roku Inc.

Address : 12980 Saratoga Ave, Suite D Saratoga, CA 95070

Date of Receipt : 20/05/2011
Test Date : 20/05/2011~ 30/05/2011
Issued Date : 30/05/2011
Report No. : 115S035R-HP-US-P06V01
Report Version : V 2.0

The test results relate only to the samples tested.

The test results shown in the test report are traceable to the national/international standard through the calibration of the equipment and evaluated measurement uncertainty herein.

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Test Report Certification

Issued Date : 30/05/2011

Report No. : 115S035R-RF-US-P06V01



Product Name : IP-STB

Applicant : Roku Inc.

Address : 12980 Saratoga Ave, Suite D Saratoga, CA 95070

Manufacturer : Ambit MircoSystems (Shanghai) LTD.

Address : 1925, Nanle Road, Songjiang Export Processing Zone,
Shanghai, China 201613

Model No. : 3000X, 3050X, 3100X

FCC ID : TC23100X

IC : 5959A-3100X

EUT Voltage : 100-240Vac +/-10%

Trade Name : Roku

Applicable Standard : FCC CFR Title 47 Part 15 Subpart C: 2008
ANSI C63.4: 2009; ANSI C63.10: 2009
RSS-Gen Issue 3/RSS-210 Issue 8

Test Result : Complied

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Laboratory Information

We, **Quietek Corporation**, are an independent EMC and safety consultancy that was established the whole facility in our laboratories. The test facility has been accredited/accepted(audited or listed) by the following related bodies in compliance with ISO 17025, EN 45001 and specified testing scope:

Taiwan R.O.C.	: BSMI, NCC, TAF
Germany	: TUV Rheinland
Norway	: Nemko, DNV
USA	: FCC, NVLAP
Japan	: VCCI

The related certificate for our laboratories about the test site and management system can be downloaded from Quietek Corporation's Web Site : <http://www.quietek.com/tw/ctg/cts/accreditations.htm>
 The address and introduction of Quietek Corporation's laboratories can be founded in our Web site : <http://www.quietek.com/>
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1. General Information

1.1. EUT Description

Product Name	IP-STB
Trade Name	Roku
Model No.	3000X, 3050X, 3100X
Working Voltage	100-240Vac +/-10%
Frequency Range	2402 - 2480 MHz
Channel Number	79
Type of Modulation	FHSS
Data Rate	1Mbps(GFSK), 2Mbps(Pi/4 DQPSK), 3Mbps (8DPSK)
Channel Control	Auto
Antenna Type	Chip Antenna
Peak Antenna Gain	3.48dBi

Note: The EUT includes three models 3000X , 3050X, 3100X.

Component	
AC Adapter #1	Manufacturer: Ampower Technology Co., Ltd M/N: AAL-00 Input: 100-240V~50/60Hz 0.25A Output: 5Vdc, 1.5A
AC Adapter #2	Manufacturer: Foxlink M/N: FA-0521500SUA Input: 100-240V~50/60Hz 0.25A Output: 5Vdc, 1.5A
AC Adapter #3	Manufacturer: Ampower Technology Co., Ltd M/N: AAL-01 Input: 100-240V~50/60Hz 0.25A Output: 5Vdc, 1A
AC Adapter #4	Manufacturer: Foxlink M/N: FA-0521000SUA Input: 100-240V~50/60Hz 0.15A Output: 5Vdc, 1.0A

Note1: AC Adapter #1 are used for 3100X, AC Adapter #3 are used for 3000X/3050X.

Note2: In this report, we choose 3100X with AC Adapter #1 for all RF testing.

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

Bluetooth Antenna List

Antenna	Manufacturer	Model No.	Peak Gain
Chip Antenna	YAGEO	CAN4311712112453K	2.4GHz: 3.48dBi

1.2. Mode of Operation

Quietek 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)
Mode 2: Transmitter-2Mbps(Pi/4 DQPSK_DH5)
Mode 3: Transmitter-3Mbps(8DPSK_DH5)

Note:

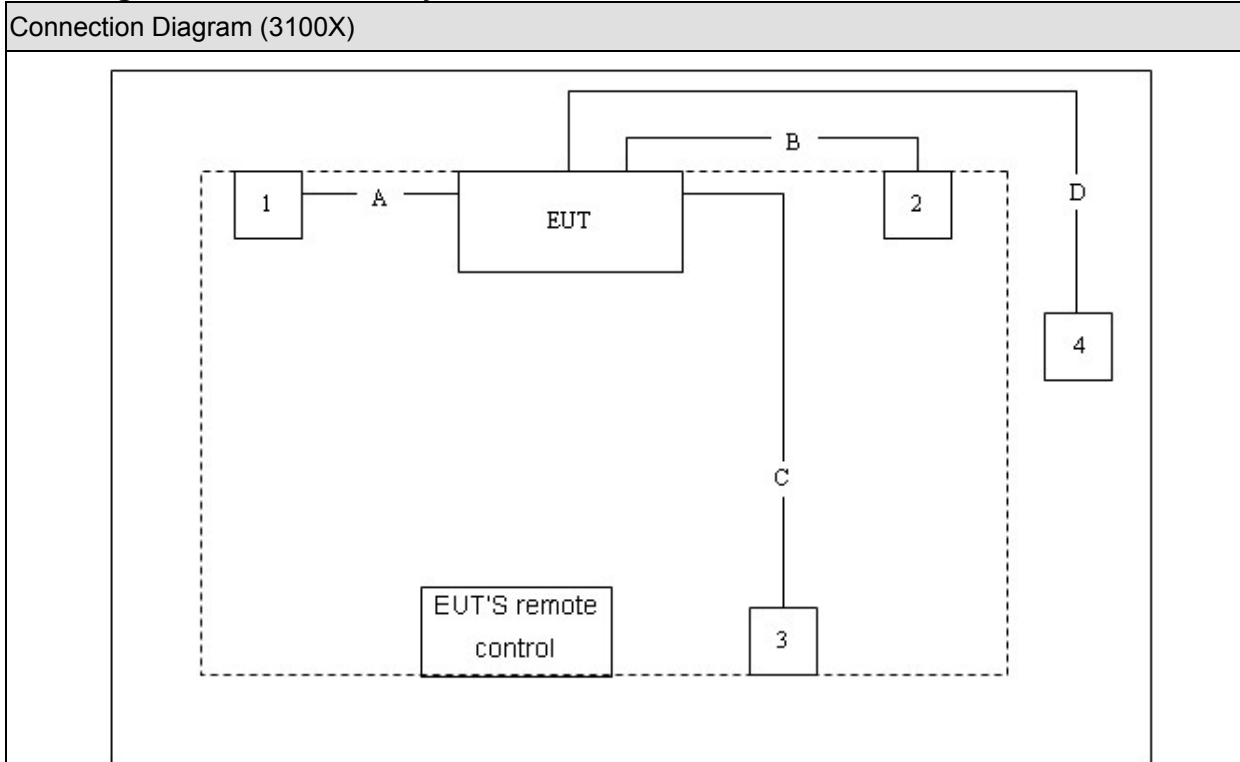
1. DH5 is for GFSK modulation, and 3DH5 is for 8DPSK.
2. Regards to the frequency band operation: the lowest, middle and highest frequency of channel were selected to perform the test, then shown on this report.
3. For portable device, radiated spurious emission was verified over X, Y, Z axis, and shown the worst case on this report.
4. This device is a composite device in accordance with Part 15 Subpart B regulations. The report number is 115S035R-RF-CE-P01V02.

1.3. Tested System Details

The types for all equipments, plus descriptions of all cables used in the tested system (including inserted cards) are:

Product	Manufacturer	Model No.	Serial No.	Power Cord
1 LCD Monitor	Lenovo	L2361PWA	3M03896A0520853	Non-Shielded, 1.8m
2 TV	TCL	1475S	01000481106AG1855	Non-Shielded, 1.8m
3 iPod	Apple	A1199	6U715YETVQ5	Power by PC
4 Notebook	Think Pad	R400	N/A	Power by adapter

1.4. Configuration of Tested System



Signal Cable Type		Signal cable Description
A	HDMI Cable	Shielded, 1.5m
B	AV Cable	Shielded, 1.8m
C	USB Cable	Shielded, 1.0m
D	LAN Cable	Non-Shielded, >10m

1.5. EUT Exercise Software

1	Setup the EUT and simulators as shown on above.
2	Turn on the power of all equipment.
3	Input some commands in DOS window [Notebook(4)]
4	Select the transmission mode and test channel, then start test.

2. Technical Test

2.1. Summary of Test Result

No deviations from the test standards

Deviations from the test standards as below description:

Performed Test Item	Normative References	Test Performed	Deviation
Conducted Emission	FCC CFR Title 47 Part 15 Subpart C: 2008 Section 15.207 RSS-Gen Issue 3 December 2010 Section 7.2.2	Yes	No
Radiated Emission	FCC CFR Title 47 Part 15 Subpart C: 2008 Section 15.209 RSS-210 Issue 8 December 2010 Section 2.7 Table 2 and Table 3	Yes	No
20dB Bandwidth	FCC CFR Title 47 Part 15 Subpart C: 2008 Section 15.247(a)(1) RSS-210 Issue 8 December 2010 Section A8.1	Yes	No
99% Occupied Bandwidth	RSS-Gen Issue 3 June 2007 Section 4.6.1	Yes	No
Carrier Frequency Separation	FCC CFR Title 47 Part 15 Subpart C: 2008 Section 15.247(a)(1) RSS-210 Issue 8 December 2010 Section A8.1	Yes	No
Number of Hopping Frequencies	FCC CFR Title 47 Part 15 Subpart C: 2008 Section 15.247(a)(1)(iii) RSS-210 Issue 8 December 2010 Section A8.1	Yes	No
Time of Occupancy (Dwell Time)	FCC CFR Title 47 Part 15 Subpart C: 2008 Section 15.247(a)(1)(iii) RSS-210 Issue 8 December 2010 Section A8.1	Yes	No
Peak Output Power	FCC CFR Title 47 Part 15 Subpart C: 2008 Section 15.247(b)(1) RSS-210 Issue 8 December 2010 Section A8.4	Yes	No
Band-edge Compliance of RF Conducted Emissions	FCC CFR Title 47 Part 15 Subpart C: 2008 Section 15.215(c), 15.247(d)	Yes	No
Spurious RF Conducted Emissions	FCC CFR Title 47 Part 15 Subpart C: 2008 15.247(d) RSS-210 Issue 8 December 2010 Section A8.5	Yes	No
Radiated Emission Band Edge	FCC CFR Title 47 Part 15 Subpart C: 2008 15.247(d) RSS-210 Issue 8 December 2010 Section A8.5	Yes	No

2.2. Test Environment

Items	Required (IEC 68-1)	Actual
Temperature (°C)	15-35	21
Humidity (%RH)	25-75	50
Barometric pressure (mbar)	860-1060	950-1000

3. Conducted Emission

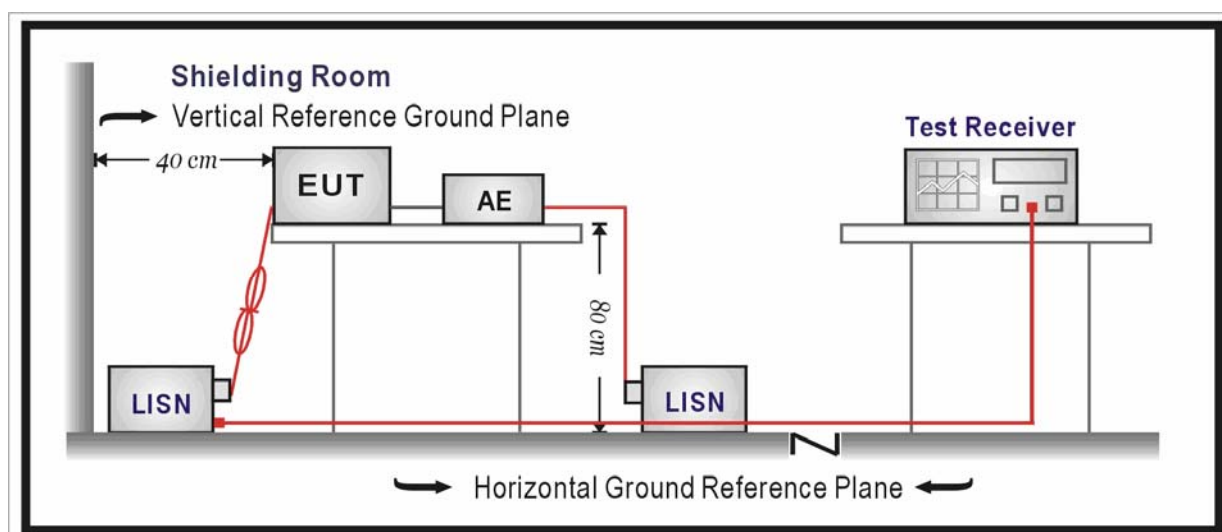
3.1. Test Equipment

Conducted Emission / TR-1

Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
EMI Test Receiver	R&S	ESCI	100726	2012.04.23
Two-Line V-Network	R&S	ENV216	100043	2011.06.18
Two-Line V-Network	R&S	ENV216	100044	2011.09.07
50ohm Coaxial Switch	Anritsu	MP59B	6200464462	2012.05.05
50ohm Termination	SHX	TF2	07081401	2011.09.27
Temperature/Humidity Meter	zhicheng	ZC1-2	TR1-TH	2012.01.14

Note: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

3.2. Test Setup



3.3. Limit

FCC Part 15 Subpart C Paragraph 15.207 Limits		
Frequency (MHz)	QP (dBuV)	AV (dBuV)
0.15 - 0.50	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30	60	50

Note 1: The lower limit shall apply at the transition frequencies.

Note 2: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.

3.4. Test Procedure

According to FCC ANSI C63.4: 2009 & ANSI C63.10: 2009.

The EUT was placed on a platform of nominal size, 1 m by 1.5 m, raised 80 cm above the conducting ground plane. The vertical conducting plane was located 40 cm to the rear of the EUT. All other surfaces of EUT were at least 80 cm from any other grounded conducting surface. The EUT and simulators are connected to the main power through a line impedance stabilization network (LISN). The LISN provides a 50 ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN. (Please refer to the block diagram of the test setup and photographs)

Each current-carrying conductor of the EUT power cord, except the ground (safety) conductor, was individually connected through a LISN to the input power source.

The excess length of the power cord between the EUT and the LISN receptacle were folded back and forth at the center of the lead to form a bundle not exceeding 40 cm in length.

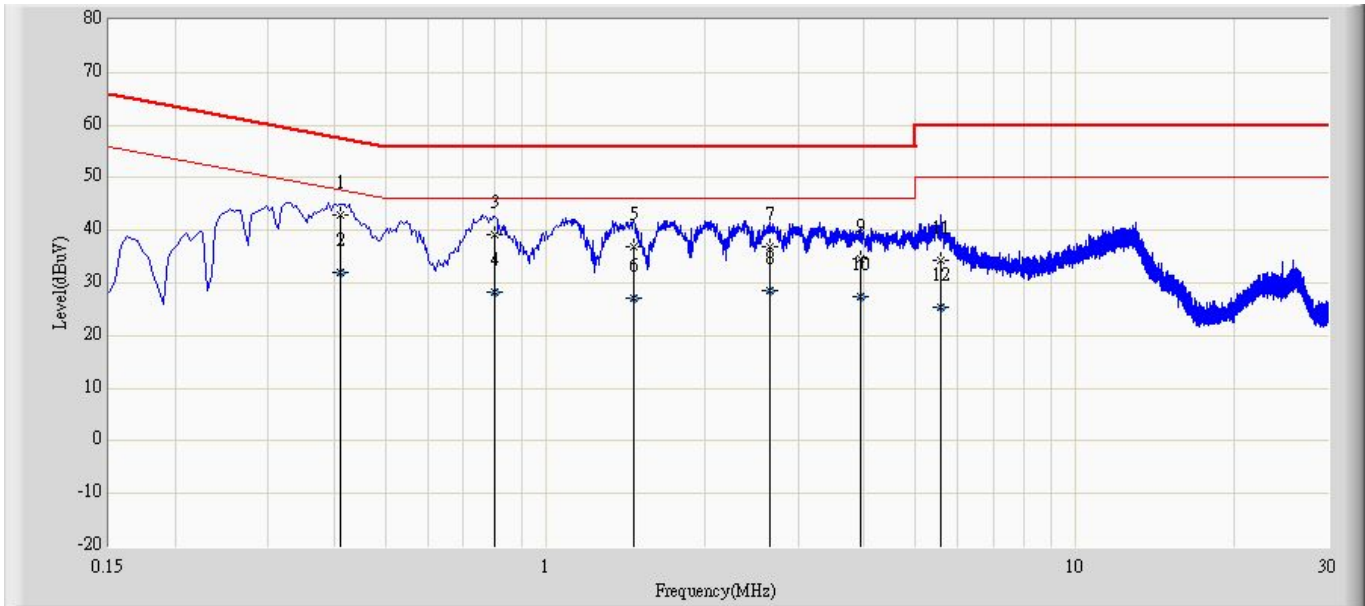
Conducted emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9kHz.

3.5. Uncertainty

The measurement uncertainty is defined as ± 2.02 dB

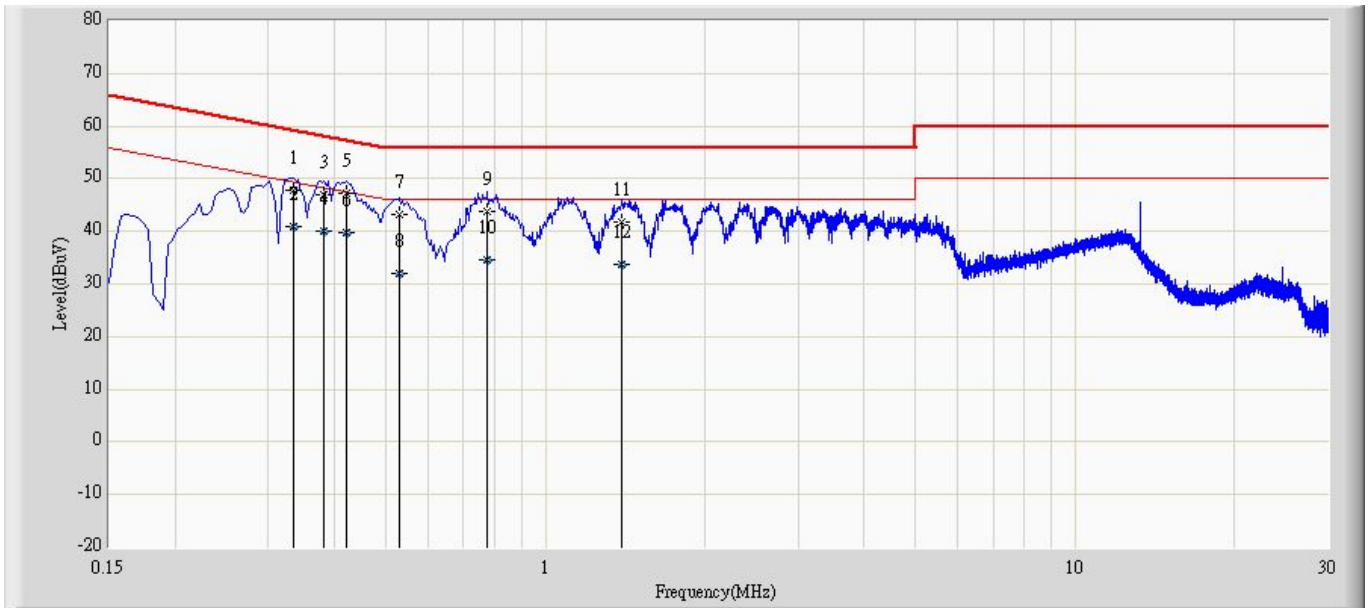
3.6. Test Result

Profile: 115S035R	Page No.: 1
Engineer: Jack	
Site: TR1	Time: 2011/05/26 - 10:33
Limit: FCC_Part15.207_CE_AC Power_ClassB	Margin: 0
Probe: ENV216_101044(0.009-30MHz)	Polarity: Line
EUT: IP-STB	Power: AC 120V/60Hz
Note: Mode 1	



No	Mark	Frequency (MHz)	Measure Level (dBuV)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV)	Factor (dB)	Type
1	*	0.410	42.905	33.233	-14.744	57.648	9.671	QP
2		0.410	31.976	22.305	-15.672	47.648	9.671	AV
3		0.802	39.100	29.410	-16.900	56.000	9.690	QP
4		0.802	28.325	18.635	-17.675	46.000	9.690	AV
5		1.470	36.997	27.287	-19.003	56.000	9.710	QP
6		1.470	27.075	17.365	-18.925	46.000	9.710	AV
7		2.646	36.871	27.130	-19.129	56.000	9.741	QP
8		2.646	28.531	18.790	-17.469	46.000	9.741	AV
9		3.930	34.738	24.945	-21.262	56.000	9.792	QP
10		3.930	27.325	17.533	-18.675	46.000	9.792	AV
11		5.573	34.315	24.466	-25.685	60.000	9.849	QP
12		5.573	25.420	15.571	-24.580	50.000	9.849	AV

Profile: 115S035R	Page No.: 2
Engineer: Jack	
Site: TR1	Time: 2011/05/26 - 10:42
Limit: FCC_Part15.207_CE_AC Power_ClassB	Margin: 0
Probe: ENV216_101044(0.009-30MHz)	Polarity: Neutral
EUT: IP-STB	Power: AC 120V/60Hz
Note: Mode 1	



No	Mark	Frequency (MHz)	Measure Level (dBuV)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV)	Factor (dB)	Type
1		0.334	47.878	38.177	-11.474	59.351	9.701	QP
2		0.334	40.850	31.149	-8.502	49.351	9.701	AV
3		0.382	46.974	37.277	-11.261	58.236	9.698	QP
4		0.382	40.172	30.474	-8.064	48.236	9.698	AV
5		0.422	47.349	37.644	-10.060	57.409	9.705	QP
6	*	0.422	39.731	30.026	-7.677	47.409	9.705	AV
7		0.530	43.279	33.579	-12.721	56.000	9.700	QP
8		0.530	32.149	22.449	-13.851	46.000	9.700	AV
9		0.778	43.926	34.226	-12.074	56.000	9.700	QP
10		0.778	34.678	24.978	-11.322	46.000	9.700	AV
11		1.394	41.795	32.075	-14.205	56.000	9.720	QP
12		1.394	33.862	24.142	-12.138	46.000	9.720	AV

4. Radiated Emission

4.1. Test Equipment

Radiated Emission / AC-2

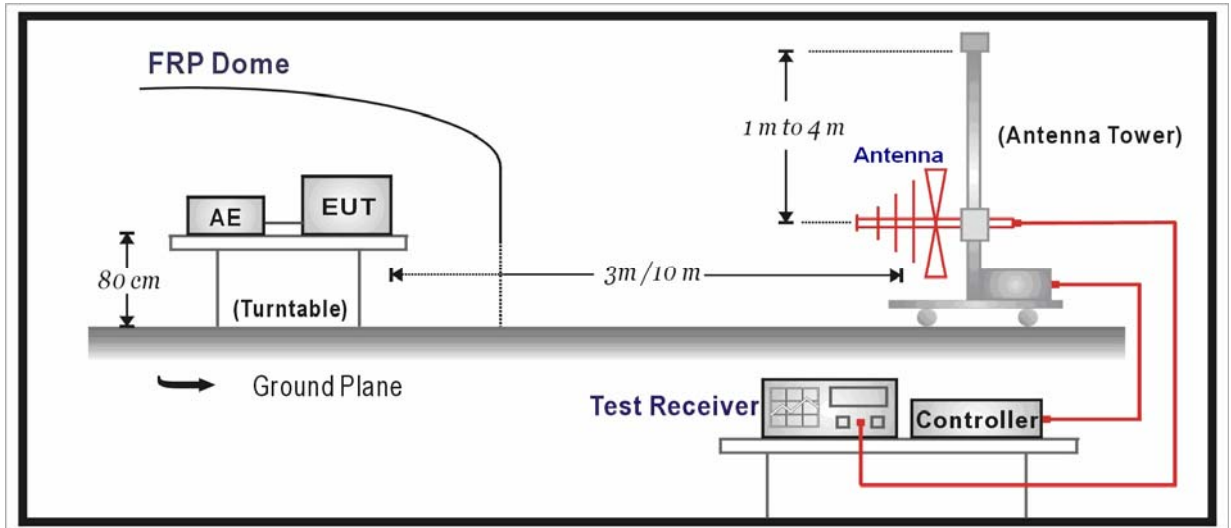
Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
EMI Test Receiver	R&S	ESCI	100573	2012/04/23
Bilog Antenna	Teseq GmbH	CBL6112D	27611	2011/10/18
Coaxial Cable	Huber+Suhner	SUCOFLEX 106	AC2-C	2012/05/05
Temperature/Humidity Meter	Zhicheng	ZC1-2	AC2-TH	2012/01/14

Radiated Emission / AC-5

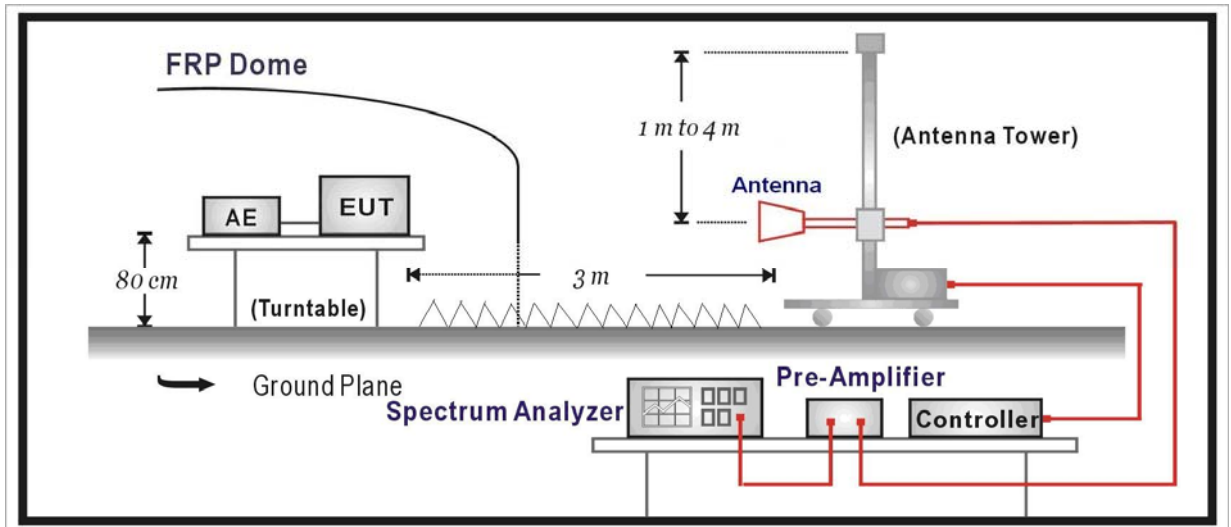
Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
Spectrum Analyzer	Agilent	N9010A	MY48030494	2012.04.23
EMI Test Receiver	R&S	ESCI	100573	2012.04.23
Preamplifier	Quietek	AP-025C	CHM-0511006	2012.05.05
Preamplifier	Quietek	AP-180C	CHM-0602013	2012.05.05
Bilog Type Antenna	Schaffner	CBL6112B	2932	2011.11.21
Broad-Band Horn Antenna	Schwarzbeck	BBHA9120D	499	2011.06.11
High-Pass Filter	Wainwright	WHKX2.8/18G-12SS	SN1	2012.03.03
Band Reject Filter	Wainwright	WRCG2400/2485-2375 /2510-60/11SS	SN9	2012.03.03
High-Pass Filter	Wainwright	WHKX7.0/18G-8SS	SN16	2012.03.03
Low-Pass Filter	Wainwright	WLKS4500-9SS	SN2	2012.03.03
50ohm Coaxial Switch	Anritsu	MP59B	6200464462	2012.05.05
Temperature/Humidity Meter	zhicheng	ZC1-2	AC5-TH	2012.01.14

4.2. Test Setup

Below 1GHz Test Setup:



Above 1GHz Test Setup:



4.3. Limit

FCC Part 15 Subpart C Paragraph 15.209		
Frequency (MHz)	Distance (m)	Level (dBuV/m)
30 - 88	3	40
88 - 216	3	43.5
216 - 960	3	46
Above 960	3	54

Note 1: The lower limit shall apply at the transition frequency.

Note 2: Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

Note 3: E field strength (dBuV/m) = 20 log E field strength (uV/m)

4.4. Test Procedure

According to ANSI C63.10: 2009.

The EUT is placed on a turn table which is 0.8 meter above ground. The turn table is rotated 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

The antenna is scanned from 1 meter to 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.4: 2009 on radiated measurement.

The resolution bandwidth below 1GHz setting on the field strength meter is 120 kHz and above 1GHz is 1MHz.

The frequency range from 30MHz to 10th harmonic is checked.

Note: When doing emission measurement above 1GHz, the horn antenna will be bended down a little (as horn antenna has the narrow beamwidth) in order to keeping the antenna in the "cone of radiation" of EUT. The 3dB beamwidth is 60~10 degrees for H-plane and 90~10 degrees for E-plane.

4.5. Uncertainty

The measurement uncertainty above 1G is defined as ± 3.9 dB
 below 1G is defined as ± 3.8 dB

4.6. Test Result

All of the test result shown indicates the worst case, and spectrum analyzer parameters setting as shown below:

Peak detector: RBW = 1MHz, VBW = 3MHz, sweep time = 200ms;

Average detector: RBW = 1MHz, VBW = 10Hz, sweep time = auto.

Measure Level = Reading Level + Cable Loss + Antenna Factor – Preamplifier Gain

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	2412.0	78.9	30.4	109.3	Fundamental	/	PK
	V	36.9	13.9	14.7	28.6	40.0	-11.4	QP
	H	319.7	11.1	15.4	26.5	46.0	-19.5	QP
	H	3021.5	41.4	-5.0	36.4	54(Note)	-17.6	PK
	H	4804.0	36.0	-0.5	35.5	54(Note)	-18.5	PK
	V	7205.0	36.7	7.4	44.1	54(Note)	-9.9	PK
	H	24000.0	59.1	-8.9	50.2	54(Note)	-3.8	PK
39	H	2437.0	78.7	30.4	109.1	Fundamental	/	PK
	V	38.7	13.8	13.7	27.5	40.0	-12.5	QP
	H	500.0	7.8	19.4	27.2	46.0	-18.8	QP
	H	3252.5	38.4	-5.4	33.0	54(Note)	-21	PK
	V	4882.0	35.0	-0.4	34.6	54(Note)	-19.4	PK
	H	7323.0	34.8	6.9	41.7	54(Note)	-12.3	PK
	H	24000.0	59.1	-8.9	50.2	54(Note)	-3.8	PK
78	H	2462.0	78.8	30.4	109.2	Fundamental	/	PK
	V	51.1	18.6	7.9	26.5	40.0	-13.5	QP
	H	749.0	5.9	22.6	28.5	46.0	-17.5	QP
	H	3575.5	39.7	-4.5	35.2	54(Note)	-18.8	PK
	H	4960.0	36.1	-0.3	35.8	54(Note)	-18.2	PK
	H	7440.0	35.9	6.3	42.2	54(Note)	-11.8	PK
	H	24000.0	59.1	-8.9	50.2	54(Note)	-3.8	PK

Note : This limit applies for using average detector, if the test result on peak is lower than average limit, then average measurement needn't be performed.

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

CH	Antenna	Frequency (MHz)	Reading Level (dBuV/m)	Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
0	H	2412.0	78.1	30.3	108.4	Fundamental	/	PK
	V	36.8	14.3	14.9	29.2	40.0	-10.8	QP
	H	321.6	9.8	15.4	25.2	46.0	-20.8	QP
	H	3021.5	40.8	-5.1	35.7	54(Note)	-18.3	PK
	V	4804.0	35.5	-0.5	35.0	54(Note)	-19.0	PK
	H	7206.0	35.3	7.4	42.7	54(Note)	-11.3	PK
	H	24000.0	59.1	-8.9	50.2	54(Note)	-3.8	PK
39	H	2436.9	76.5	31.0	107.5	Fundamental	/	PK
	V	54.1	19.9	7.0	26.9	40.0	-13.1	QP
	H	347.2	9.3	16.0	25.3	46.0	-20.7	QP
	H	3252.5	37.8	-5.4	32.4	54(Note)	-21.6	PK
	H	4882.0	35.4	-0.4	35.0	54(Note)	-19.0	PK
	V	7323.0	35.3	7.0	42.3	54(Note)	-11.7	PK
	H	24000.0	59.1	-8.9	50.2	54(Note)	-3.8	PK
78	H	2462.0	75.5	30.4	105.9	Fundamental	/	PK
	V	538.5	6.3	20.2	26.5	46	-19.5	QP
	H	714.2	6.9	22.0	28.9	46	-17.1	QP
	H	3303.5	38.5	-5.6	32.9	54(Note)	-21.1	PK
	H	4960.0	35.9	-0.4	35.5	54(Note)	-18.5	PK
	H	7440.0	34.9	6.3	41.2	54(Note)	-12.8	PK
	H	24000.0	59.1	-8.9	50.2	54(Note)	-3.8	PK

Note : This limit applies for using average detector, if the test result on peak is lower than average limit, then average measurement needn't be performed.

Mode 3: Transmitter-3Mbps(8DPSK_DH5)

CH	Antenna	Frequency (MHz)	Reading Level (dBuV/m)	Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
0	H	2412.0	76.4	30.3	106.7	Fundamental	/	PK
	V	36.9	13.4	14.7	28.1	40.0	-11.9	QP
	H	310.7	10.4	15.1	25.5	46.0	-20.5	QP
	H	3021.5	40.3	-5.1	35.2	54(Note)	-18.8	PK
	V	4804.0	36.0	-0.5	35.5	54(Note)	-18.5	PK
	H	7206.0	35.6	7.4	43.0	54(Note)	-11.0	PK
	H	24000.0	59.1	-8.9	50.2	54(Note)	-3.8	PK
39	H	2436.9	76.3	30.5	106.8	Fundamental	/	PK
	V	51.0	18.2	8.0	26.2	40.0	-13.8	QP
	H	347.1	9.1	16.1	25.2	46.0	-20.8	QP
	H	3252.5	38.4	-5.4	33.0	54(Note)	-21	PK
	H	4882.0	35.2	-0.4	34.8	54(Note)	-19.2	PK
	V	7323.0	35.3	6.9	42.2	54(Note)	-11.8	PK
	H	24000.0	59.1	-8.9	50.2	54(Note)	-3.8	PK
78	H	2462.1	76.2	30.4	106.6	Fundamental	/	PK
	V	36.9	13.4	14.7	28.1	40.0	-11.9	QP
	H	310.7	10.4	15.1	25.5	46.0	-20.5	QP
	H	3022.5	36.5	-5.4	31.1	54(Note)	-22.9	PK
	H	4960.0	35.6	-0.3	35.3	54(Note)	-18.7	PK
	H	7440.0	35.1	6.4	41.5	54(Note)	-12.5	PK
	H	24000.0	59.1	-8.9	50.2	54(Note)	-3.8	PK

Note : 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.

5. 20dB Bandwidth

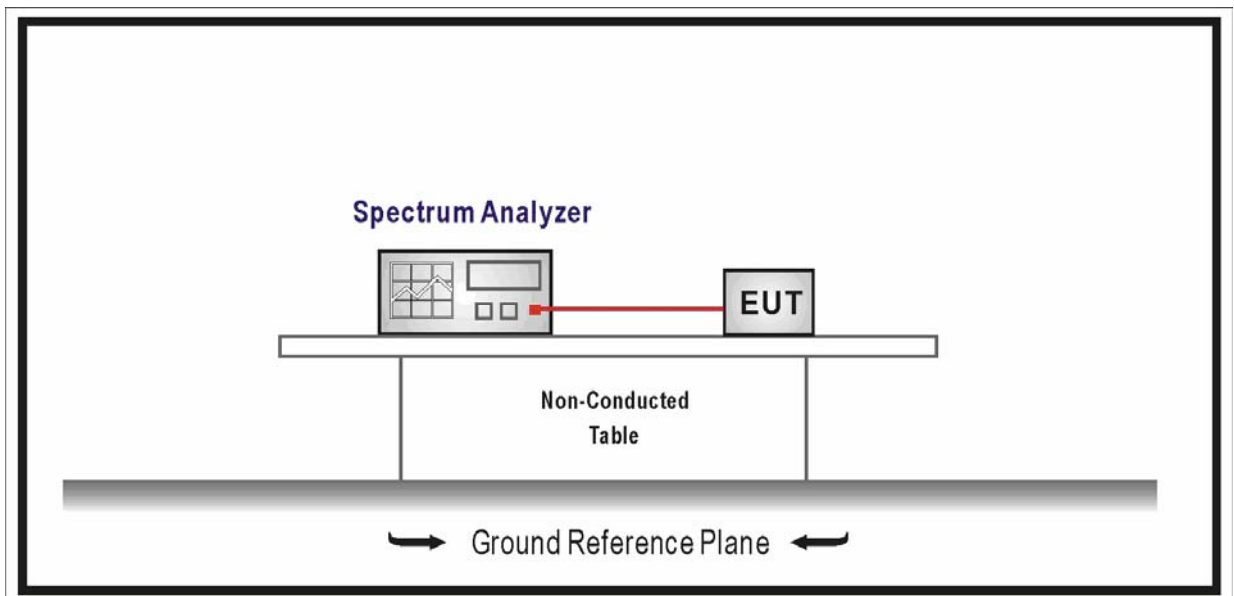
5.1. Test Equipment

20dB Bandwidth / TR8

Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
Spectrum Analyzer	Agilent	E4446A	MY45300103	2012.04.29
Temperature/Humidity Meter	Zhicheng	ZC1-2	TR8-TH	2012.05.04

Note: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

5.2. Test Setup



5.3. Limit

- For frequency hopping systems operating in 2400-2483.5 MHz band, no limitation.
- For frequency hopping systems operating in 902-928 MHz band, the maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.
- For frequency hopping systems operating in 5725-5850 MHz band, the maximum 20 dB bandwidth of the hopping channel is 1 MHz.

5.4. 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 \geq 1% of the 20dB bandwidth

VBW \geq 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.

5.5. Uncertainty

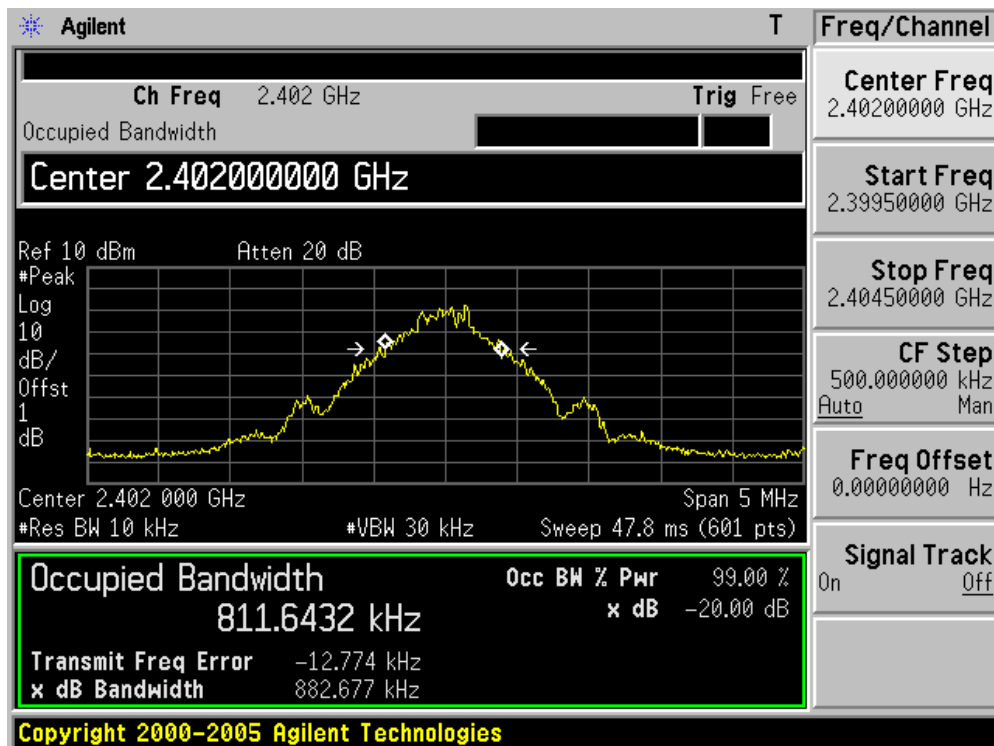
The measurement uncertainty is defined as ± 1 kHz

5.6. Test Result

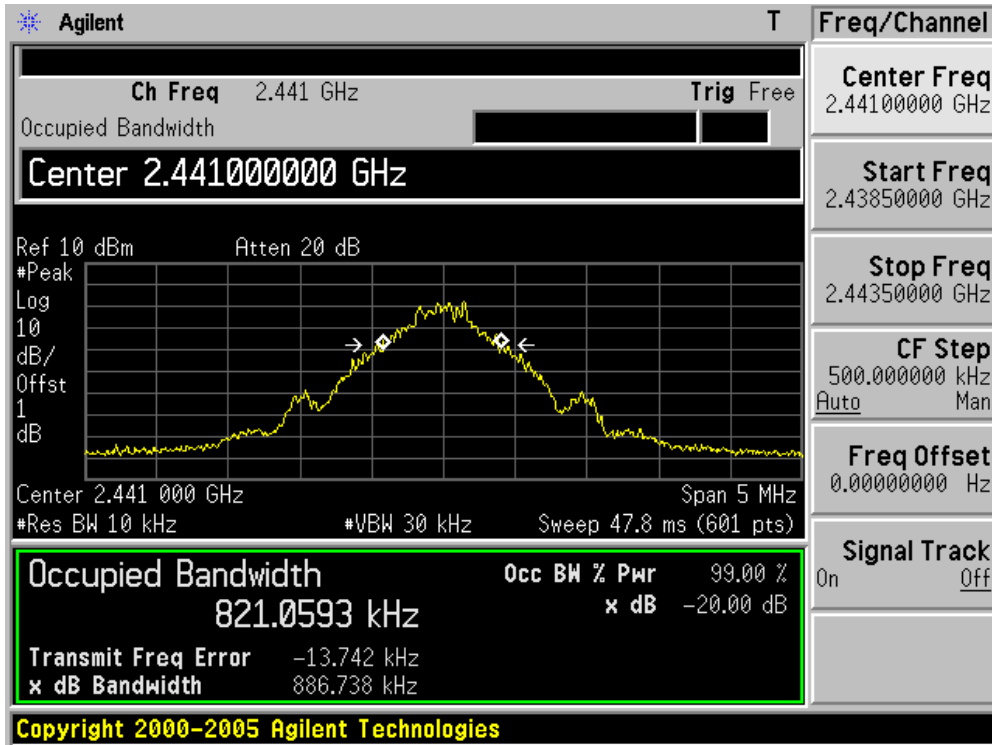
Product	:	IP-STB
Test Item	:	Occupied Bandwidth
Test Site	:	TR-8
Test Mode	:	Mode 1: Transmitter-1Mbps(GFSK_DH5)

Channel No.	Frequency (MHz)	20dB Bandwidth (kHz)	99% Bandwidth (kHz)
00	2402	882.68	811.64
39	2441	886.74	821.06
78	2480	885.22	817.41

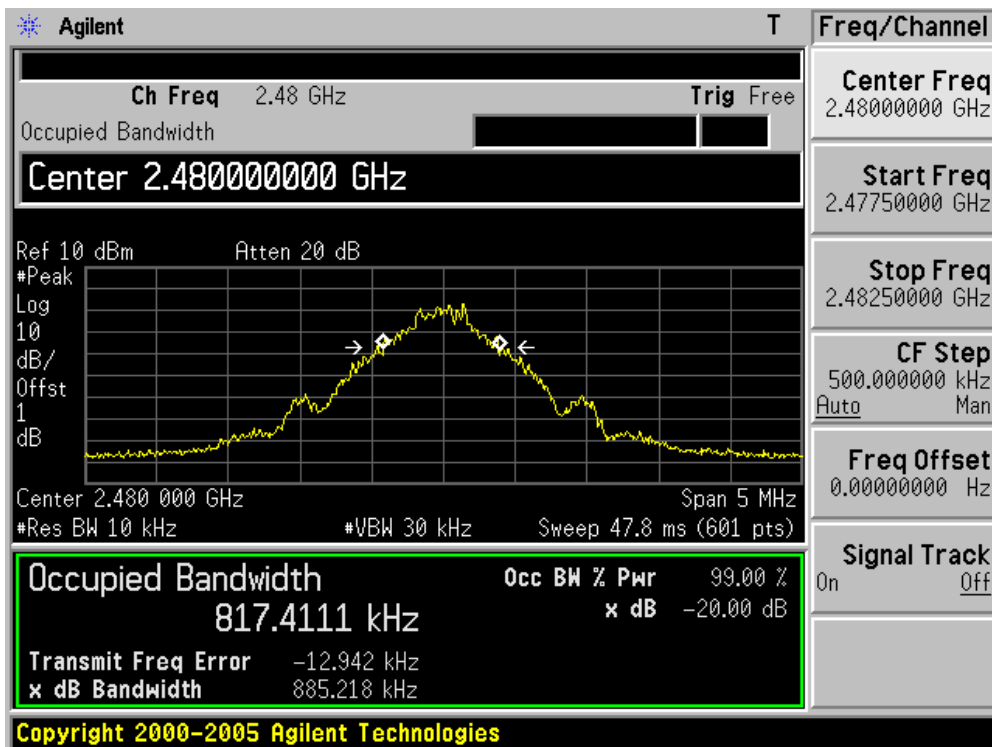
Channel 00 (2402MHz)



Channel 39 (2441MHz)



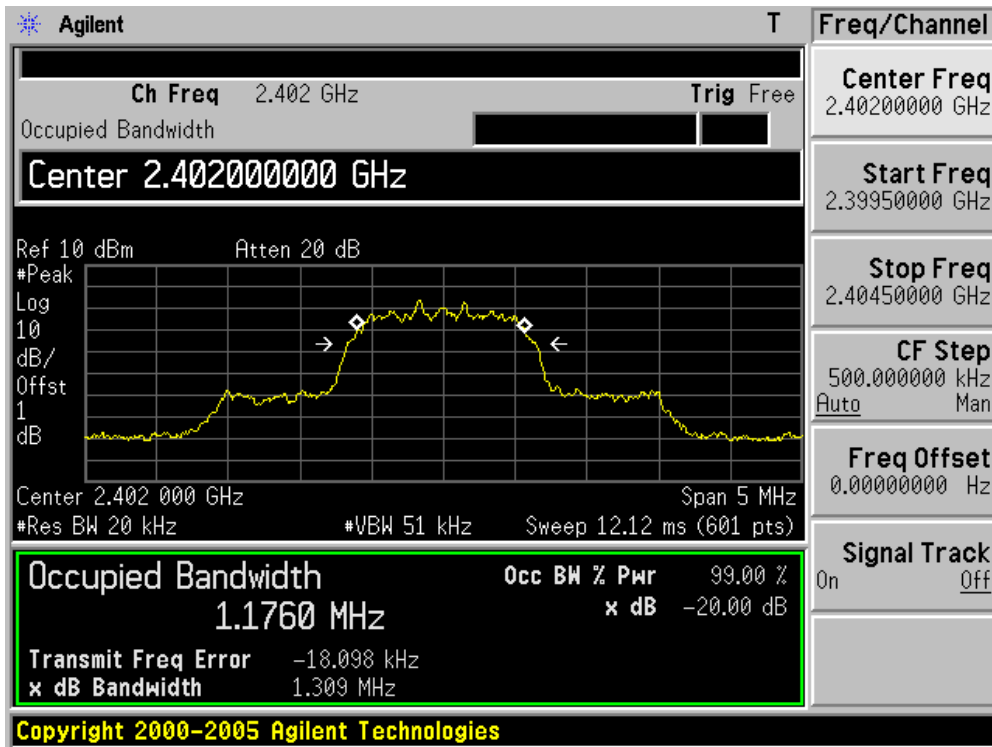
Channel 78 (2480MHz)



Product	:	IP-STB
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	1309.0	1176.0
39	2441	1299.0	1777.7
78	2480	1314.0	1175.7

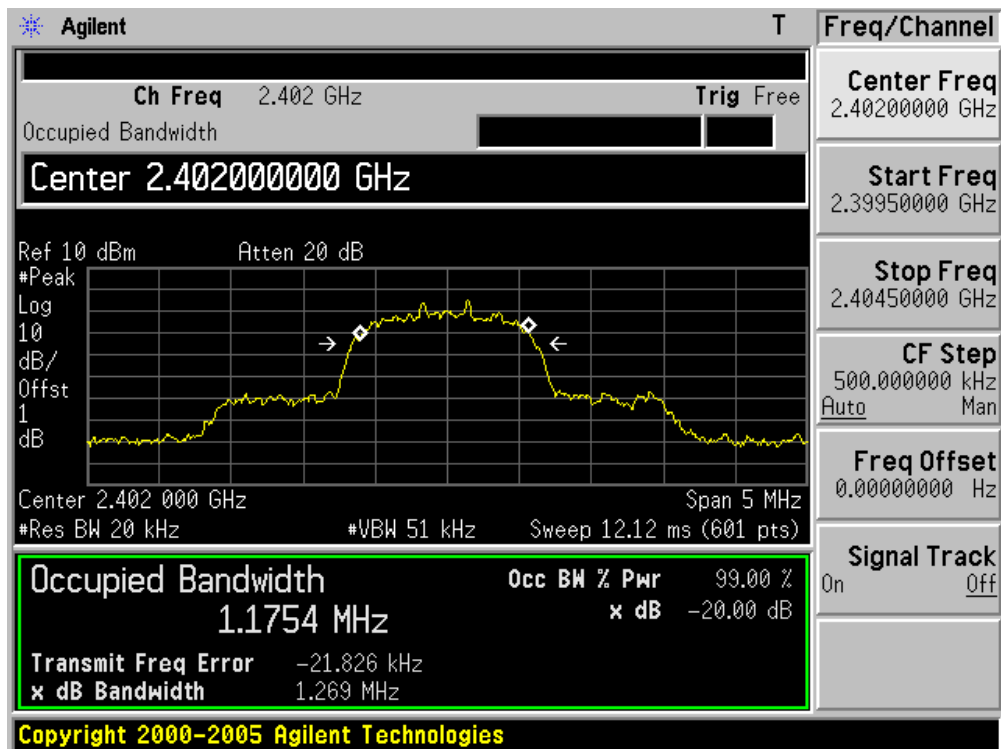
Channel 00 (2402MHz)



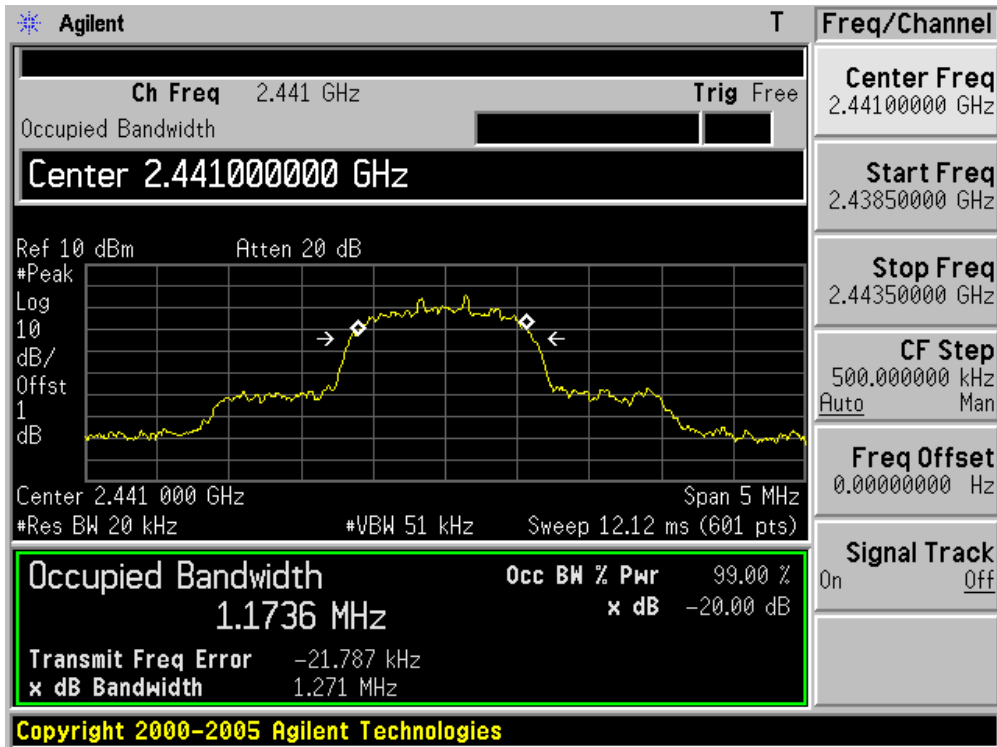
Product	:	IP-STB
Test Item	:	Occupied Bandwidth
Test Site	:	TR-8
Test Mode	:	Mode 3: Transmitter-3Mbps(8DPSK_DH5)

Channel No.	Frequency (MHz)	20dB Bandwidth (kHz)	99% Bandwidth (kHz)
00	2402	1269.0	1175.4
39	2441	1271.0	1173.6
78	2480	1275.0	1175.2

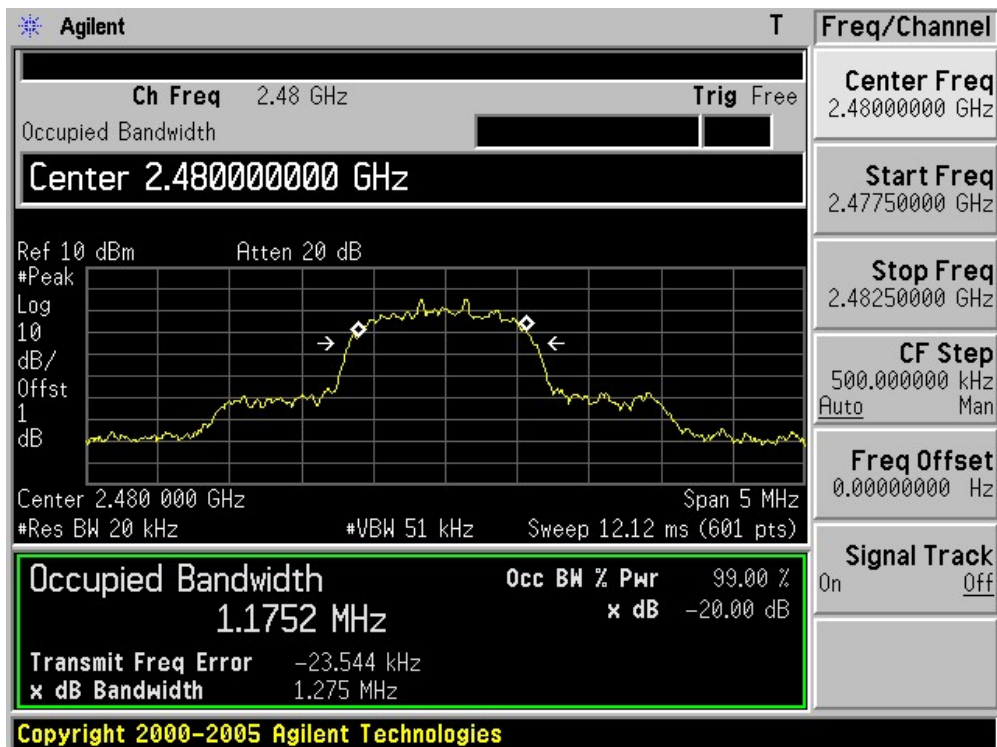
Channel 00 (2402MHz)



Channel 39 (2441MHz)



Channel 39 (2441MHz)



6. Carrier Frequency Separation

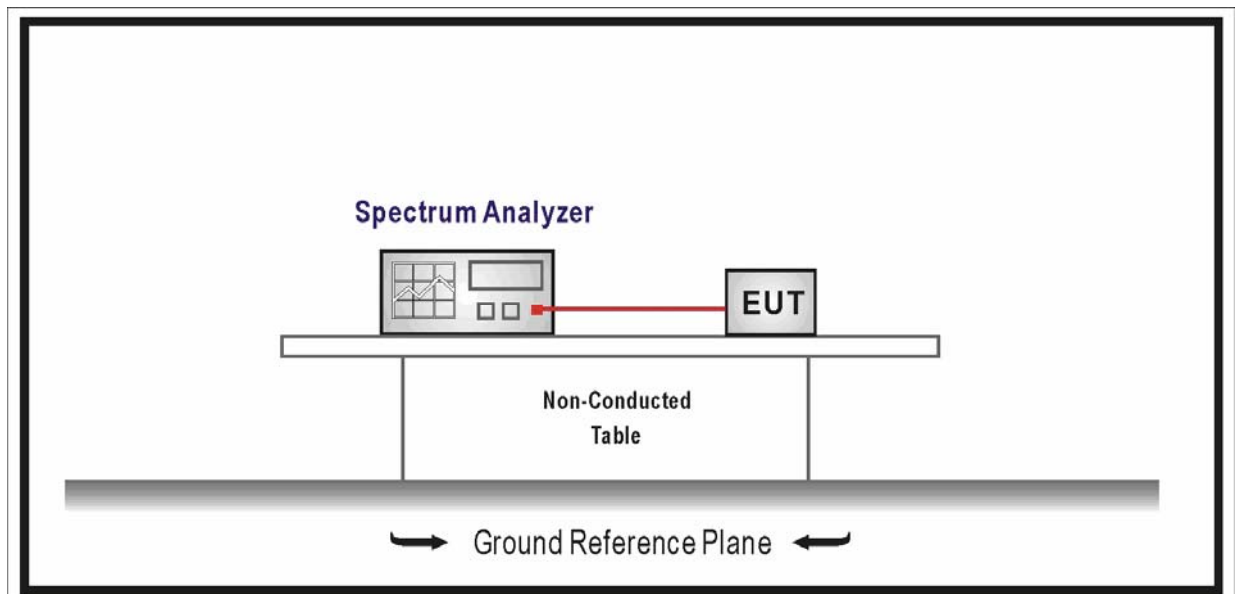
6.1. Test Equipment

Carrier Frequency Separation / TR-8

Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
Spectrum Analyzer	Agilent	E4446A	MY45300103	2012.04.29
Temperature/Humidity Meter	Zhicheng	ZC1-2	TR8-TH	2012.05.04

Note: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

6.2. Test Setup



6.3. Limit

- Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125mW. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudorandomly 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.

- For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; If the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.
- Frequency hopping systems operating in the 5725-5850 MHz band shall use at least 75 hopping frequencies. The maximum 20 dB bandwidth of the hopping channel is 1 MHz. The average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 30 second period.

6.4. 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) \geq 1% of the span

Video (or Average) Bandwidth VBW \geq 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.

6.5. Uncertainty

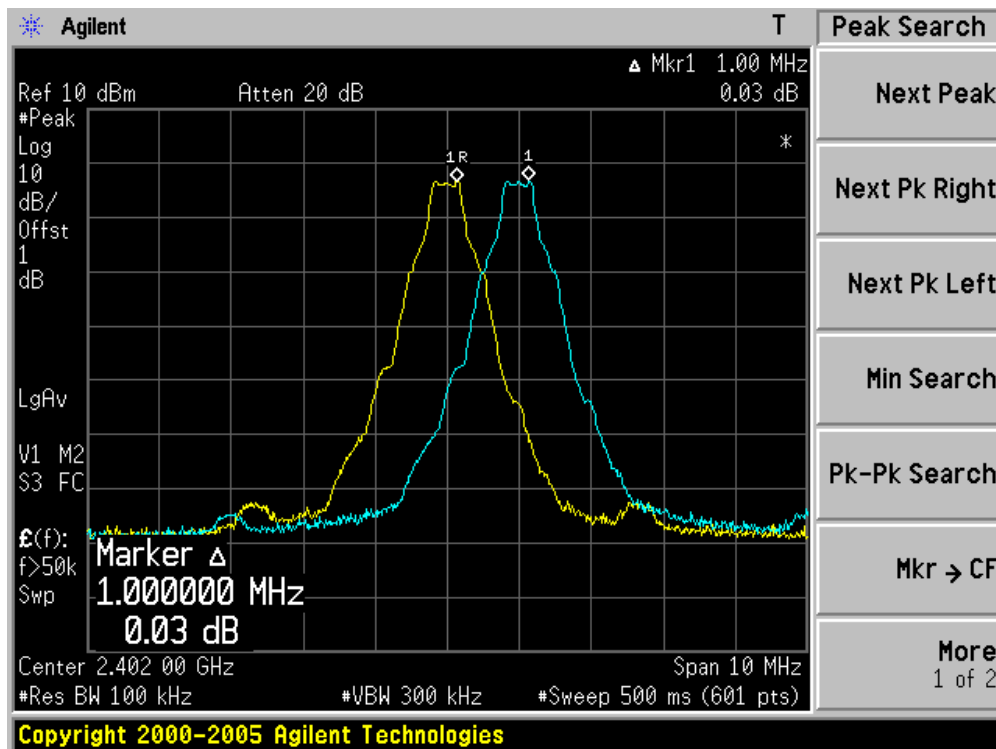
The measurement uncertainty is defined as \pm 1 kHz

6.6. Test Result

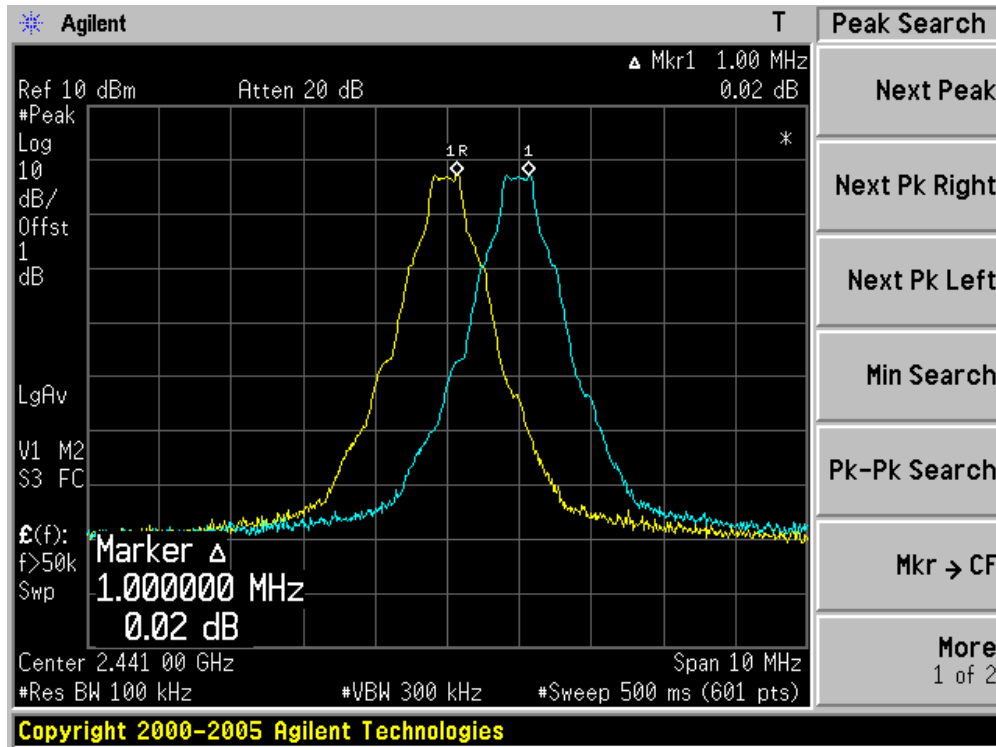
Product	:	IP-STB
Test Item	:	Carrier Frequency Separation
Test Site	:	TR-8
Test Mode	:	Mode 1: Transmitter-1Mbps(GFSK_DH5)

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

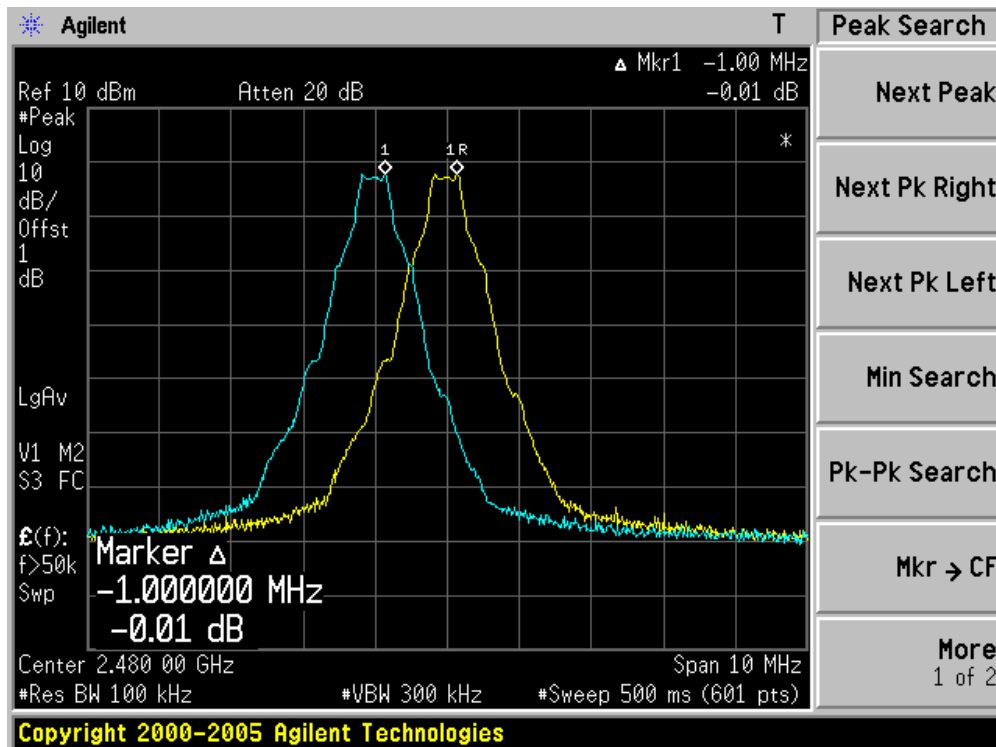
Channel 00 (2402MHz)



Channel 39 (2441MHz)



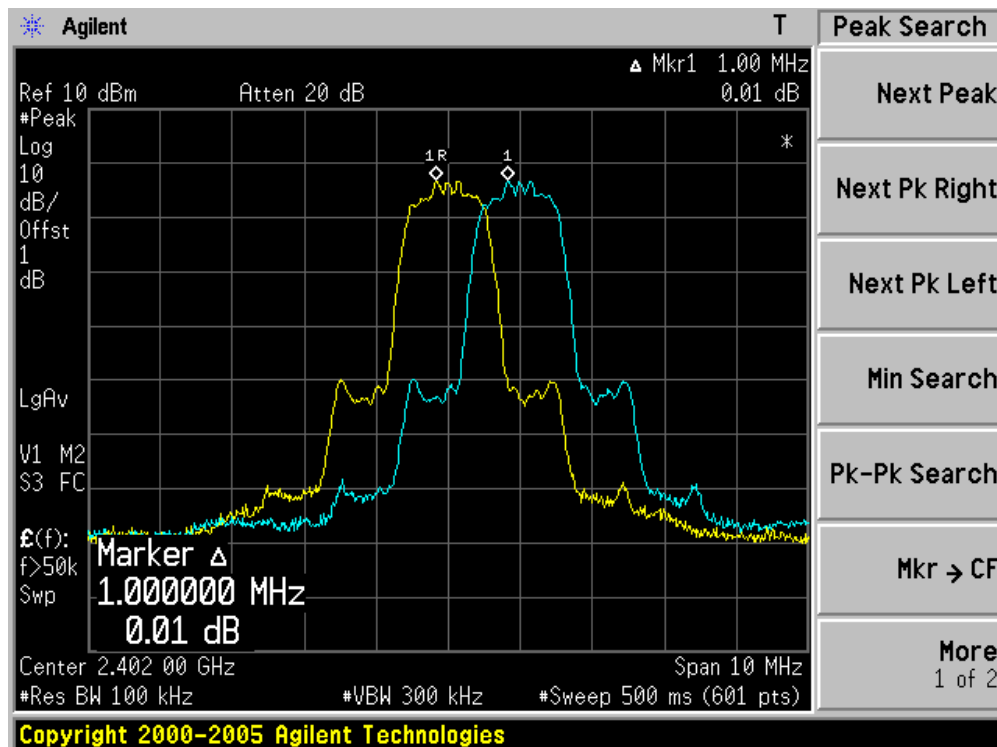
Channel 78 (2480MHz)



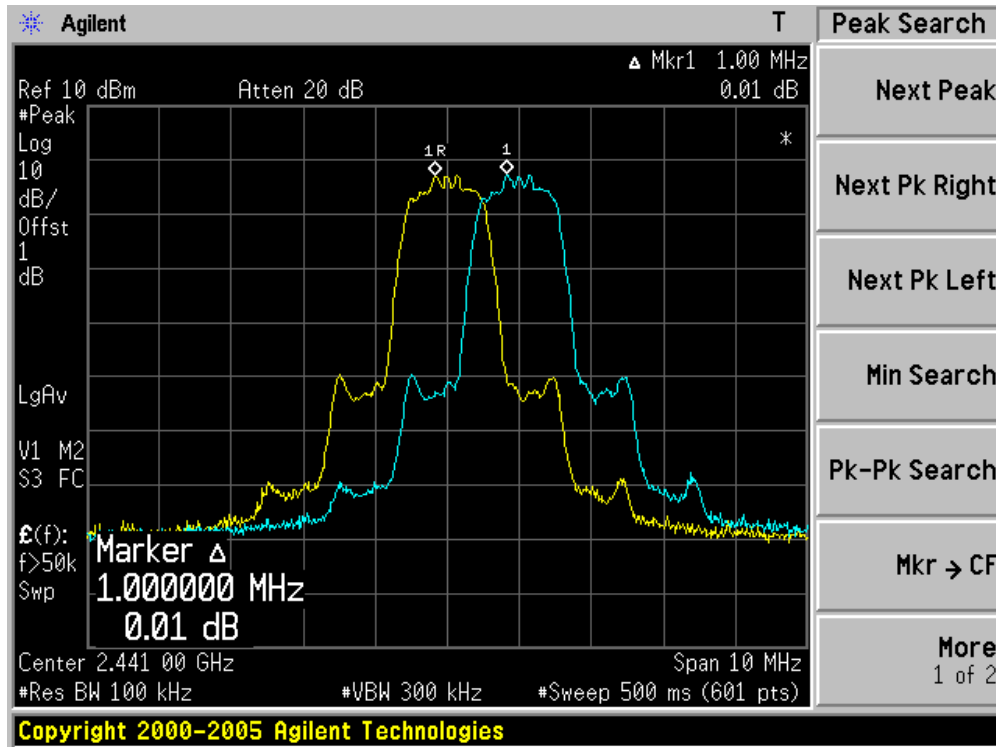
Product	: IP-STB
Test Item	: Carrier Frequency Separation
Test Site	: TR-8
Test Mode	: Mode 2: Transmitter-2Mbps(Pi/4 DQPSK_DH5)

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

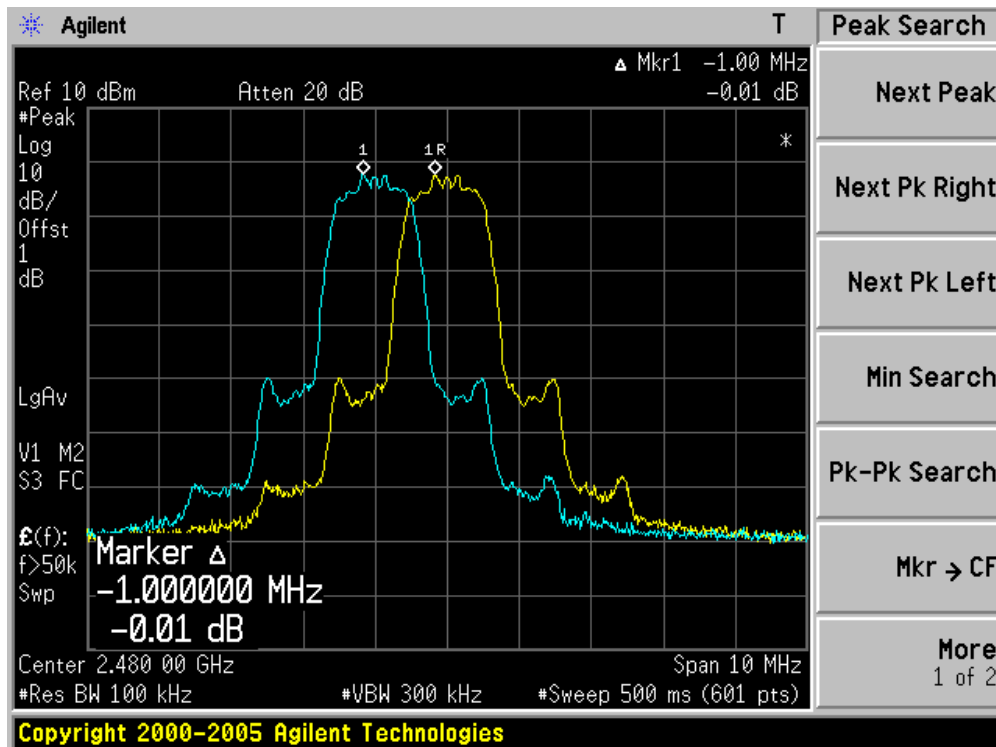
Channel 00 (2402MHz)



Channel 39 (2441MHz)



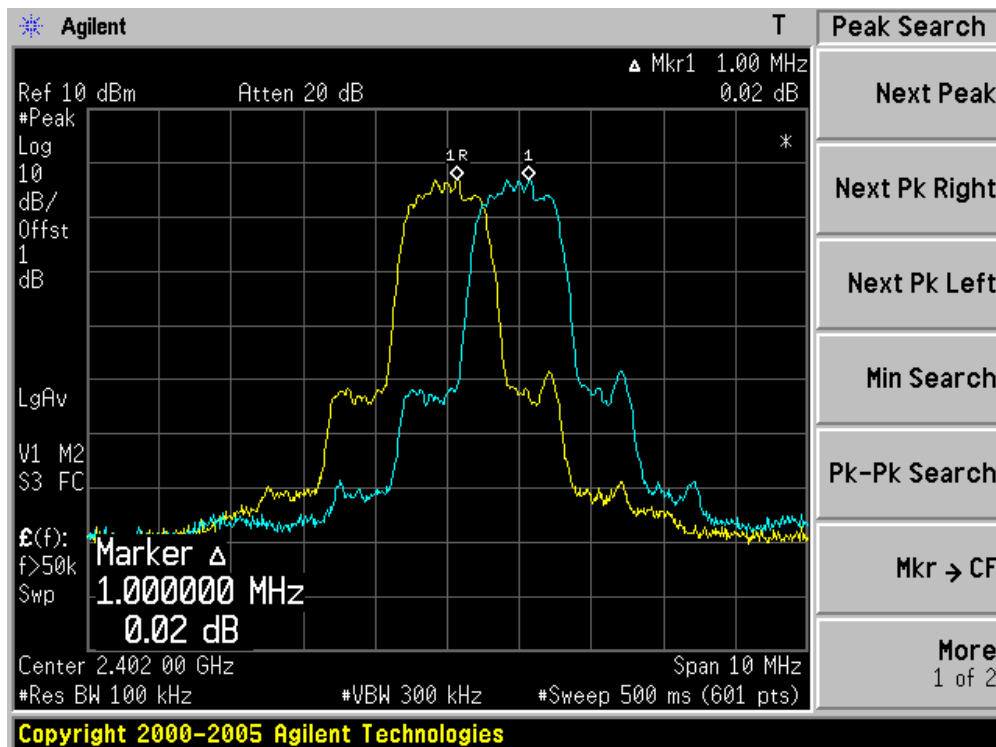
Channel 78 (2480MHz)



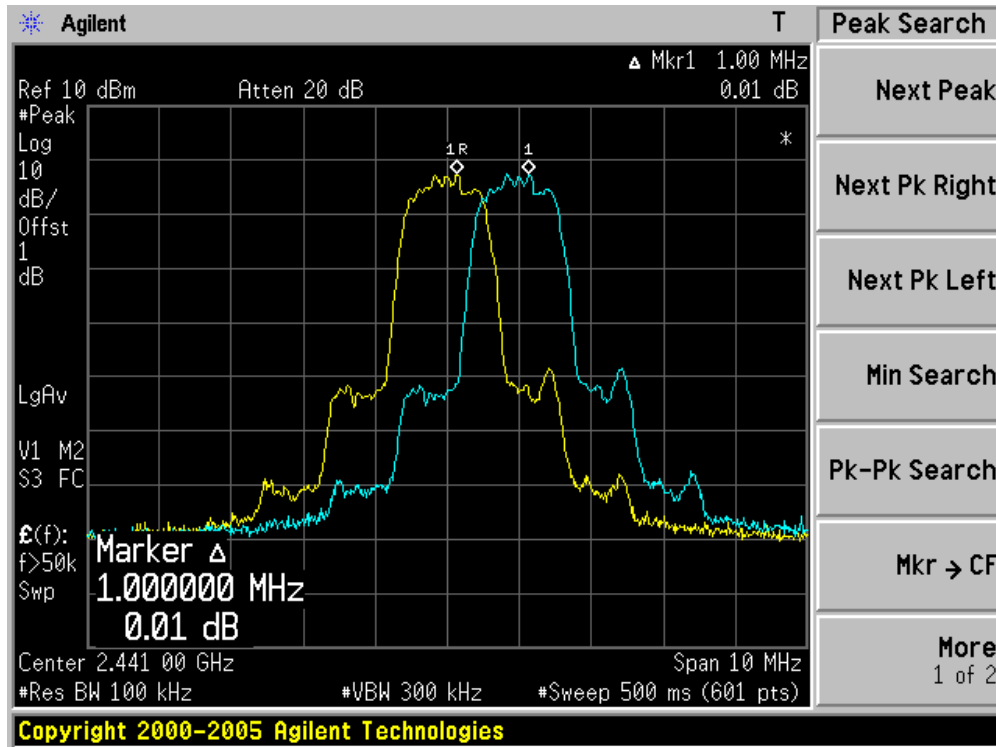
Product	:	IP-STB
Test Item	:	Carrier Frequency Separation
Test Site	:	TR-8
Test Mode	:	Mode 3: Transmitter-3Mbps(8DPSK_DH5)

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

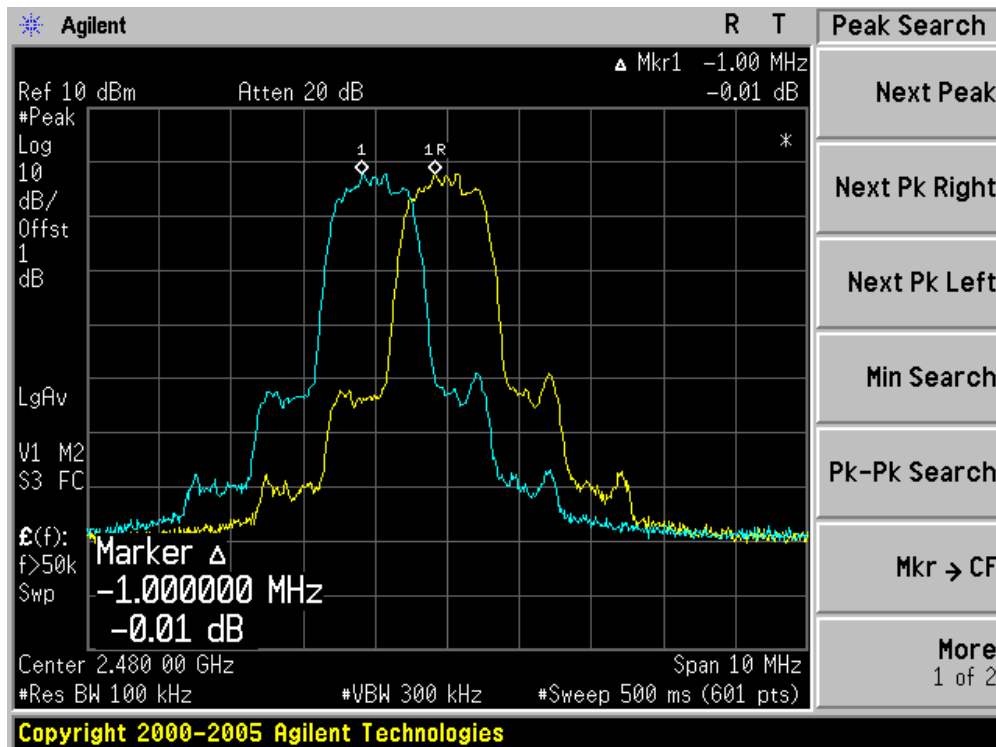
Channel 00 (2402MHz)



Channel 39 (2441MHz)



Channel 78 (2480MHz)



7. Number of Hopping Frequencies

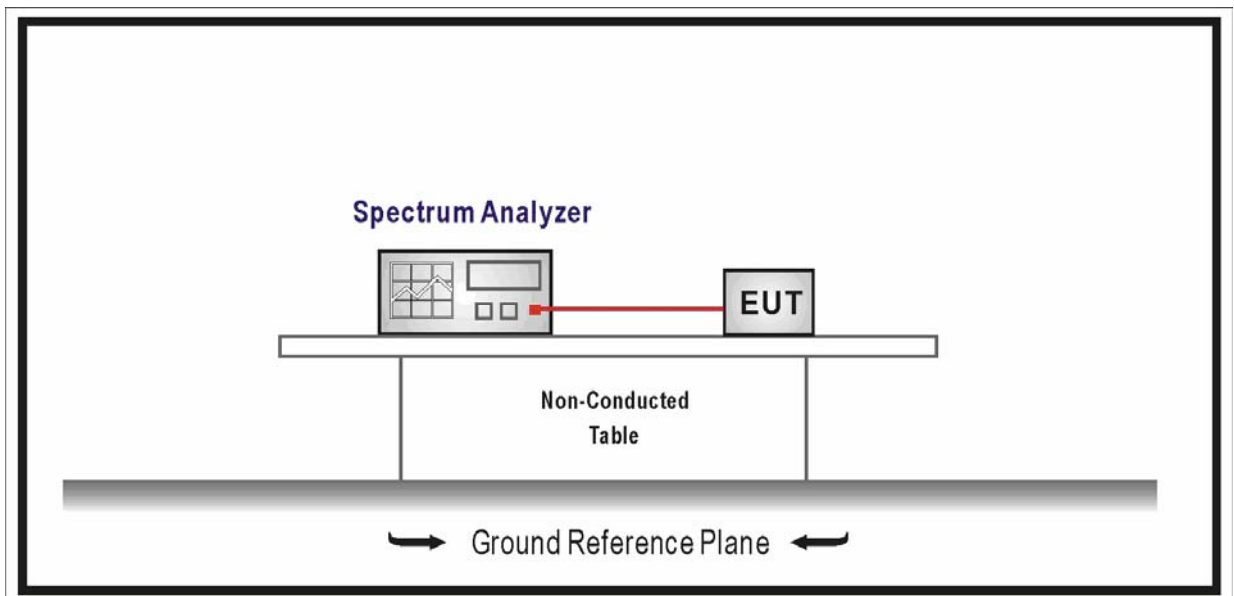
7.1. Test Equipment

Number of Hopping Frequencies / TR-8

Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
Spectrum Analyzer	Agilent	E4446A	MY45300103	2012.04.29
Temperature/Humidity Meter	Zhicheng	ZC1-2	TR8-TH	2012.05.04

Note: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

7.2. Test Setup



7.3. Limit

- For frequency hopping systems operating in the 2400-2483.5 MHz band shall use at least 15 hopping frequencies.
- For frequency hopping systems operating in 902-928 MHz band shall use at least 50 hopping frequencies.
- For frequency hopping systems operating in the 5725-5850 MHz band shall use at least 75 hopping frequencies.

7.4. 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 \geq 1% of the span

VBW \geq 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.

7.5. Uncertainty

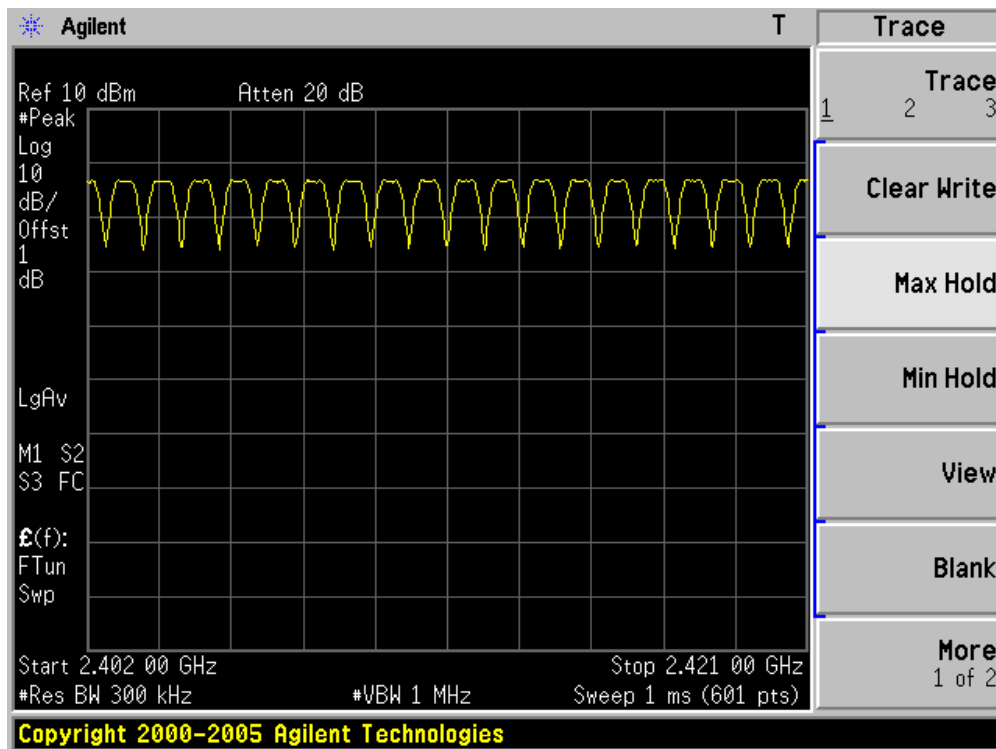
The measurement uncertainty is defined as ± 1 kHz

7.6. Test Result

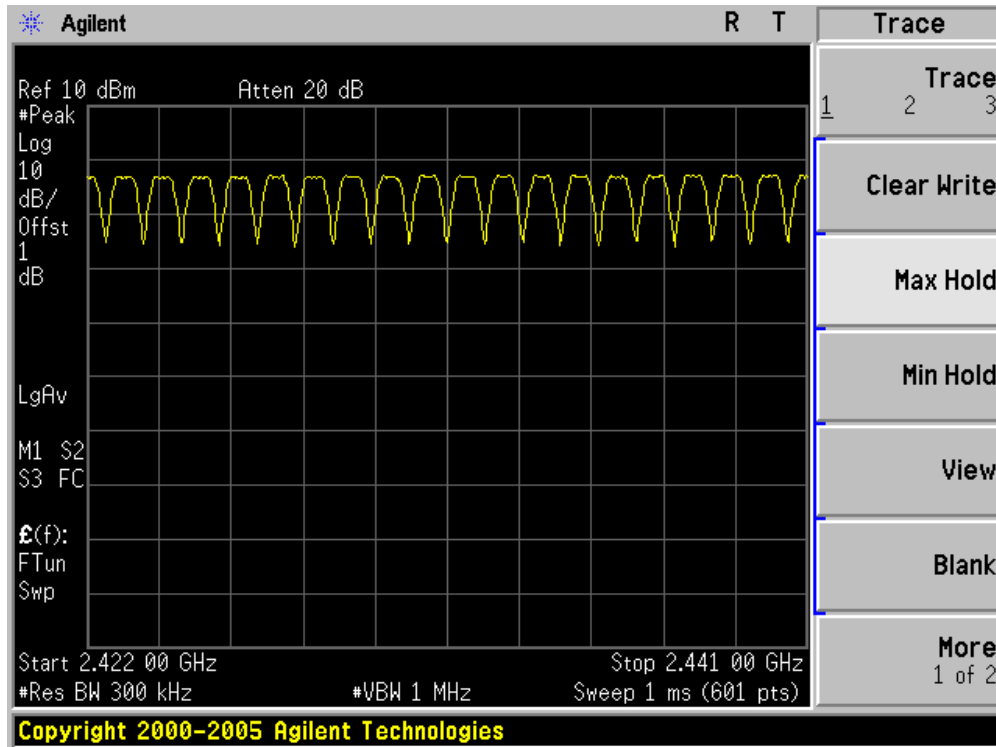
Product	:	IP-STB
Test Item	:	Number of Hopping Frequencies
Test Site	:	TR-8
Test Mode	:	Mode 1: Transmitter-1Mbps(GFSK_DH5)

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

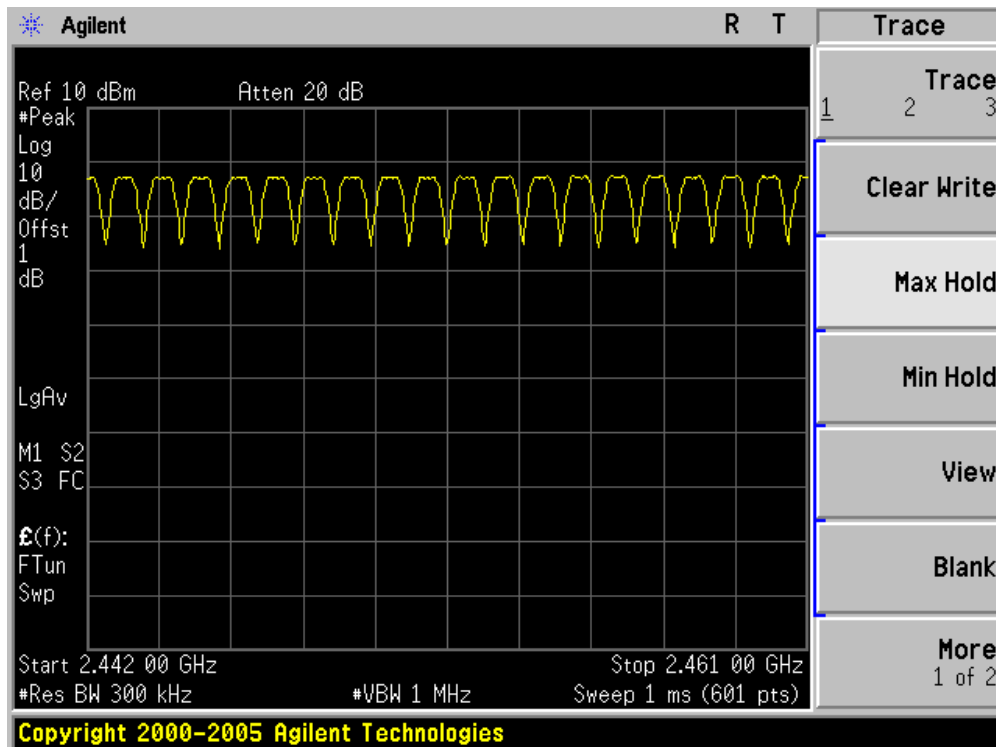
2402 - 2421 MHz



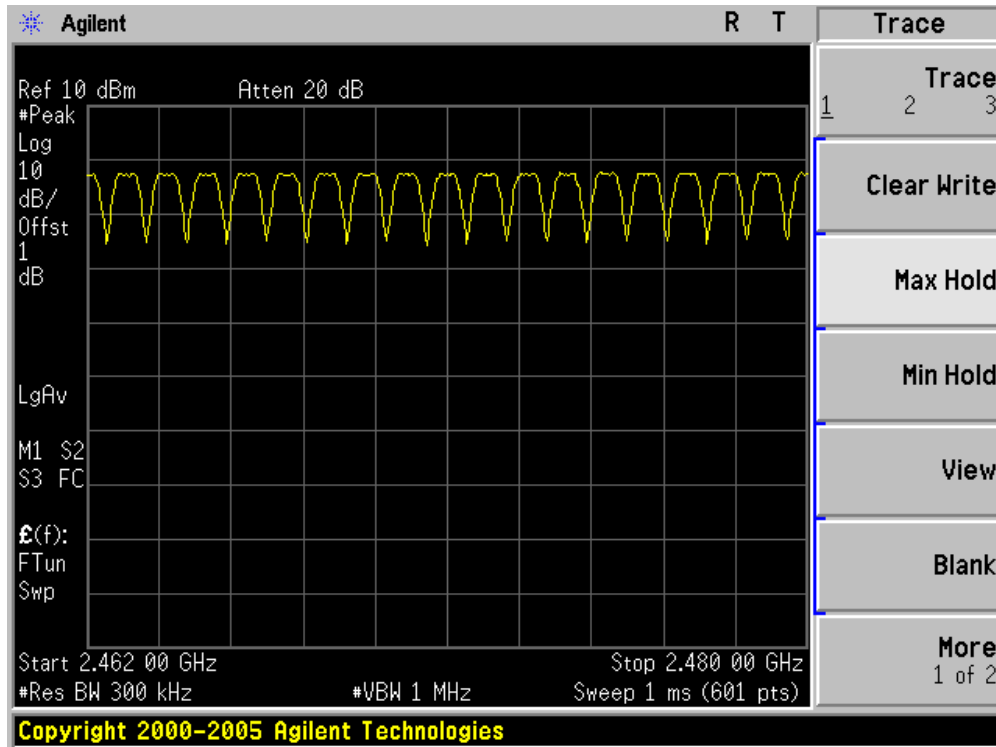
2422 - 2441 MHz



2442 - 2461 MHz



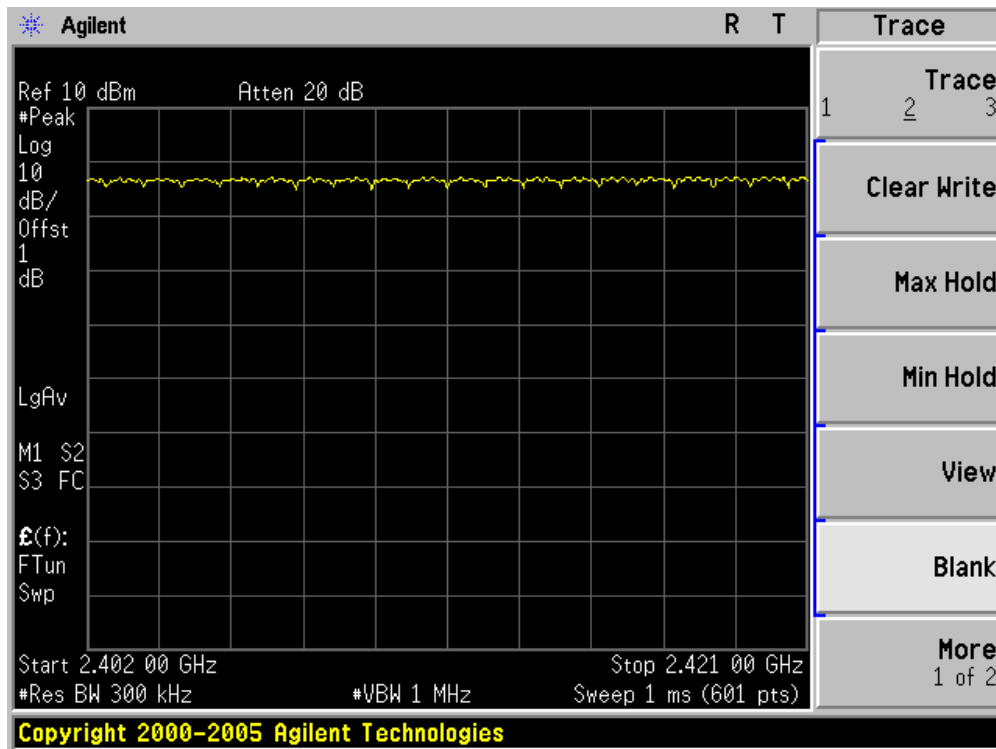
2462 - 2480 MHz



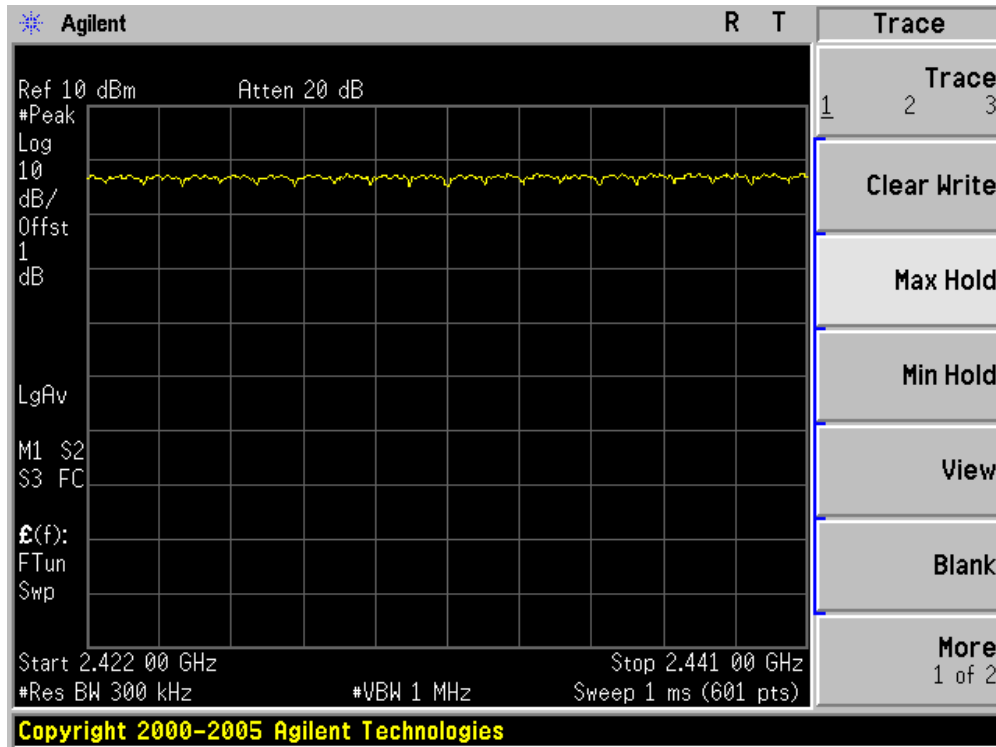
Product	:	IP-STB
Test Item	:	Number of Hopping Frequencies
Test Site	:	TR-8
Test Mode	:	Mode 2: Transmitter-2Mbps(Pi/4 DQPSK_DH5)

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

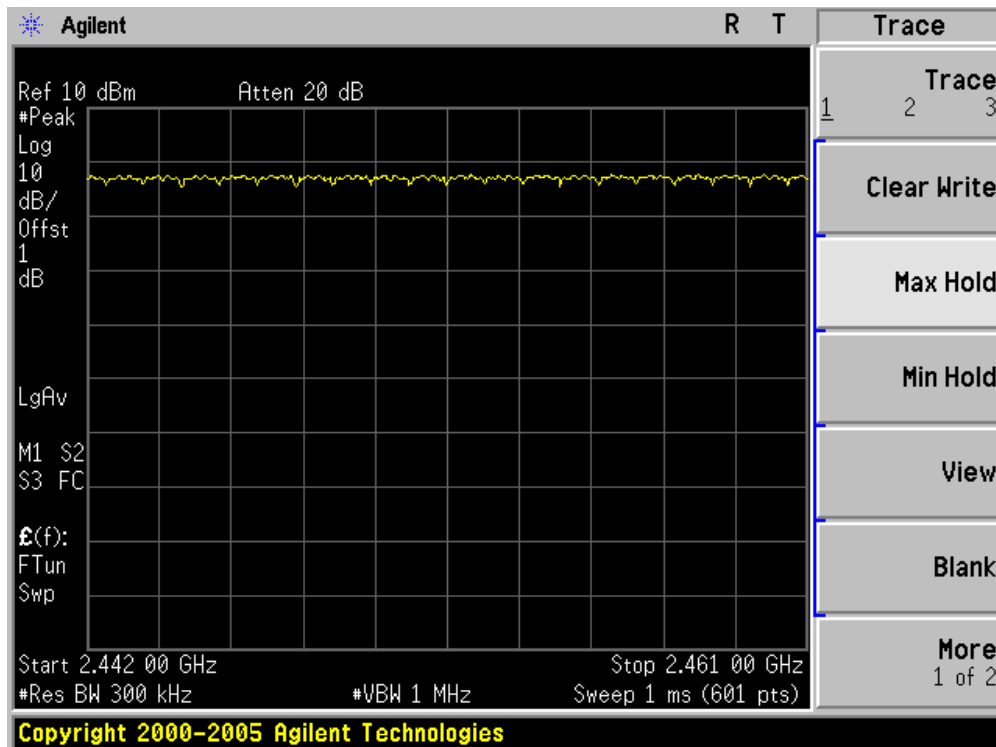
2402 - 2421 MHz



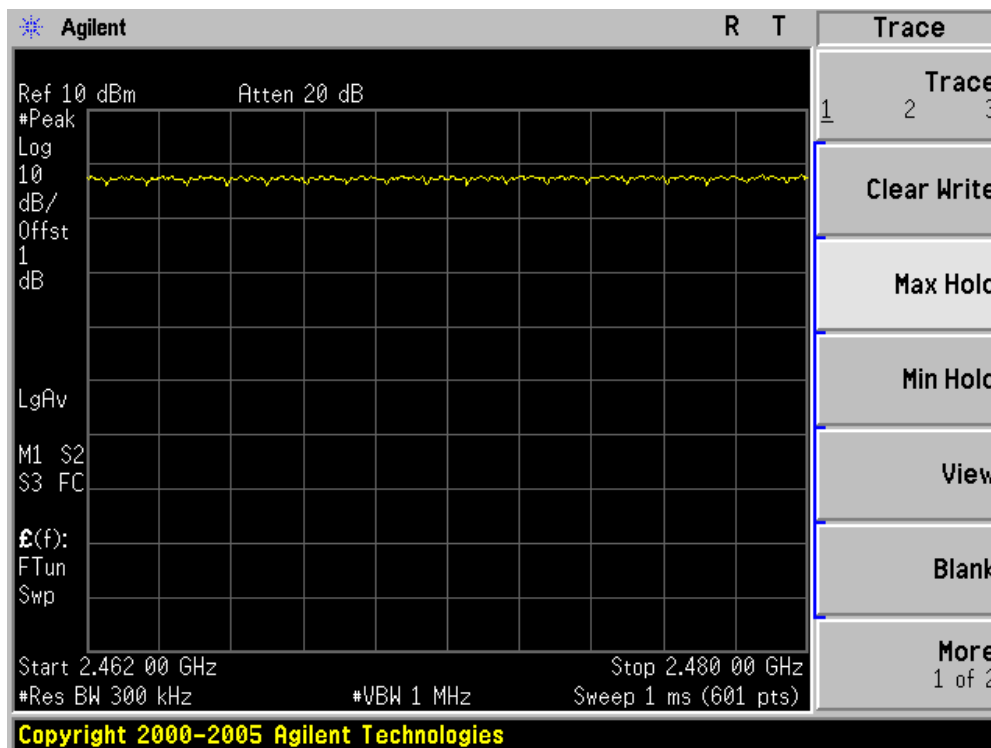
2422 - 2441 MHz



2442 - 2461 MHz



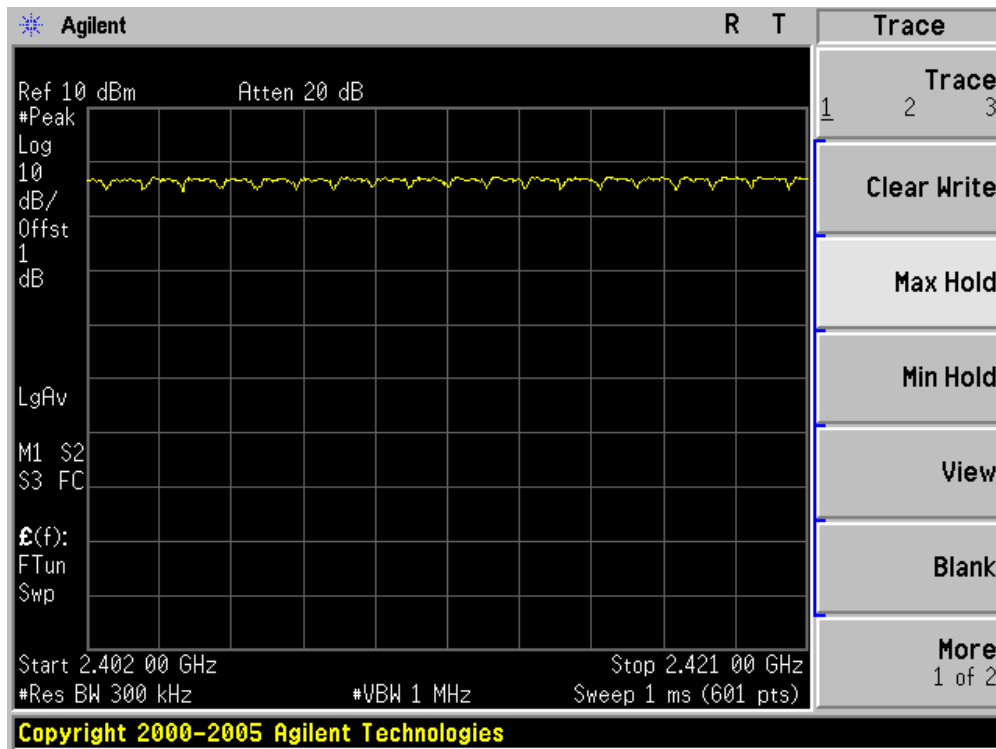
2462 - 2480 MHz



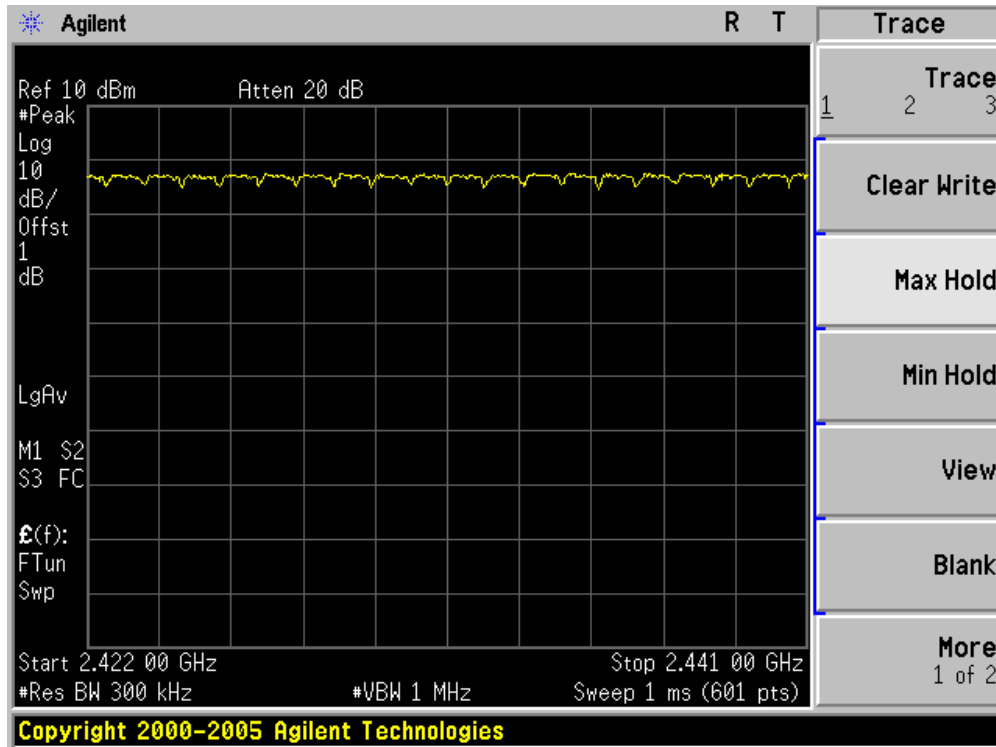
Product	:	IP-STB
Test Item	:	Number of Hopping Frequencies
Test Site	:	TR-8
Test Mode	:	Mode 3: Transmitter-3Mbps(8DPSK_DH5)

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

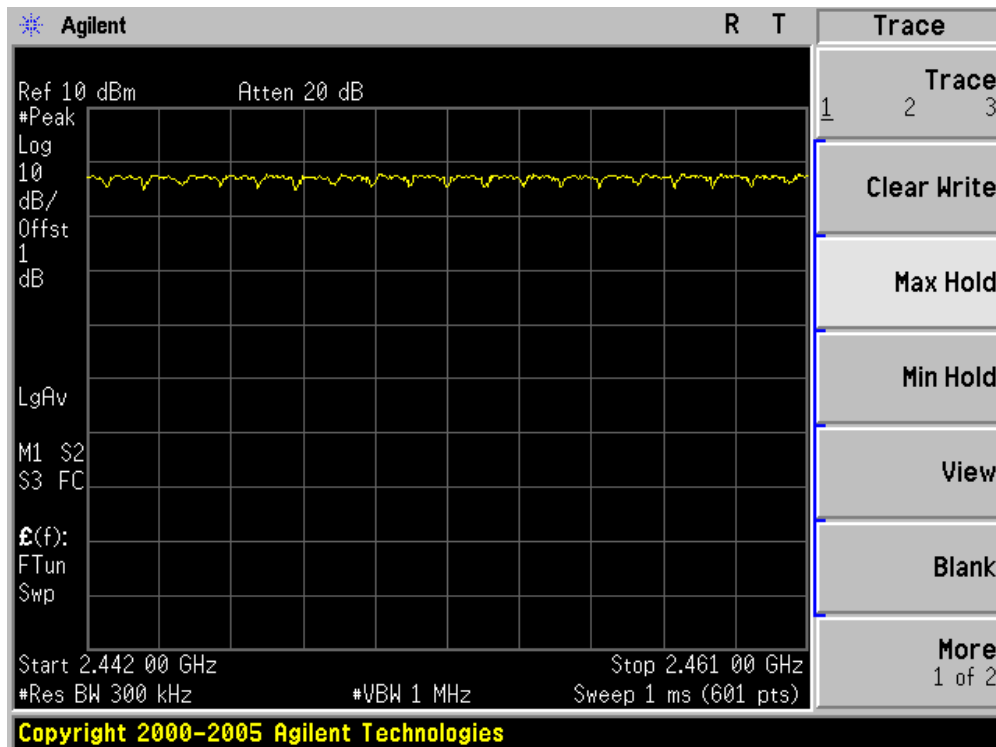
2402 - 2421 MHz



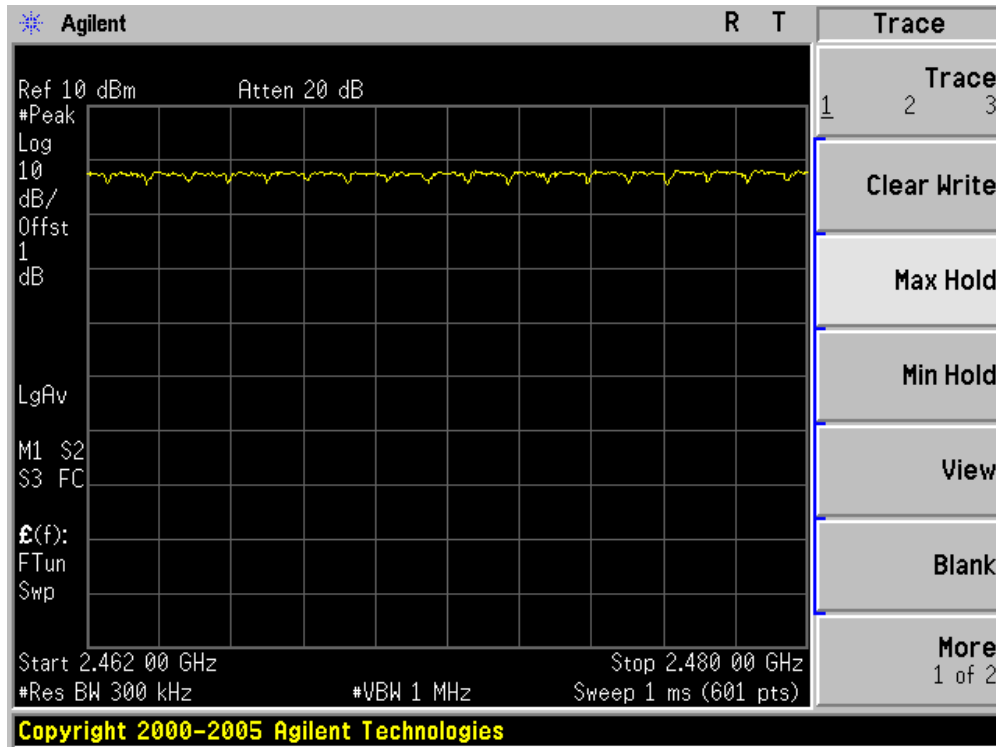
2422 - 2441 MHz



2442 - 2461 MHz



2462 - 2480 MHz



8. Time of Occupancy (Dwell Time)

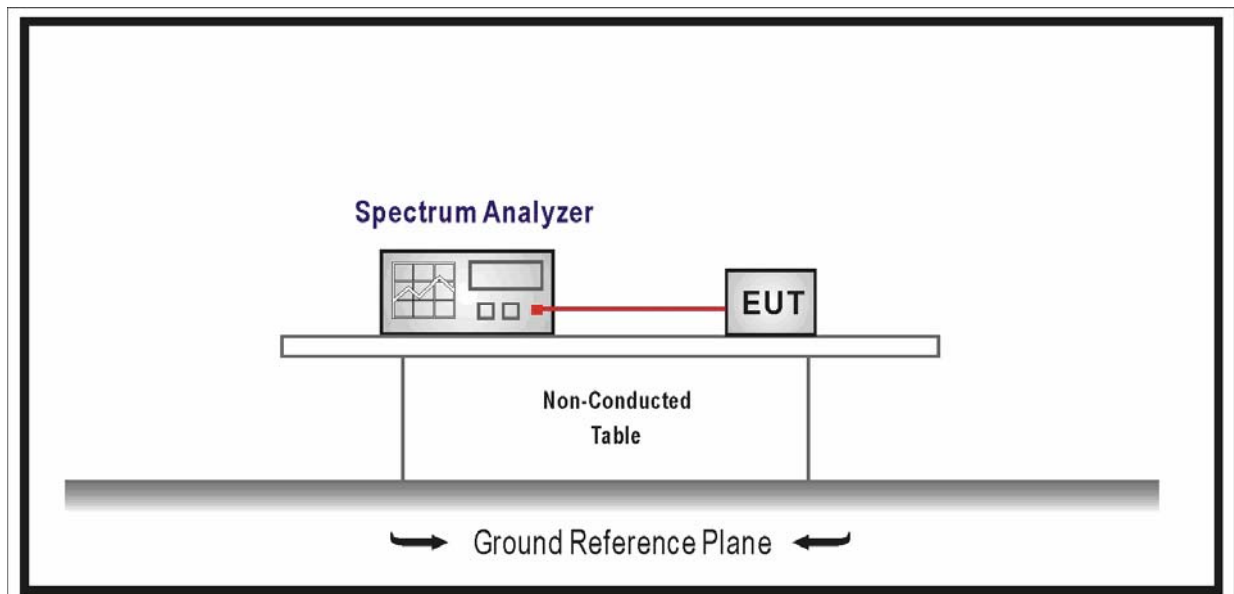
8.1. Test Equipment

Time of Occupancy (Dwell Time) / TR-8

Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
Spectrum Analyzer	Agilent	E4446A	MY45300103	2012.04.29
Temperature/Humidity Meter	Zhicheng	ZC1-2	TR8-TH	2012.05.04

Note: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

8.2. Test Setup



8.3. Limit

- For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; If the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.
- Frequency hopping systems operating in the 5725-5850 MHz band shall use at least 75

hopping frequencies. The maximum 20 dB bandwidth of the hopping channel is 1 MHz. The average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 30 second period.

- Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

8.4. 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 \geq 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.

8.5. Uncertainty

The measurement uncertainty is defined as ± 0.1 us

8.6. Test Result

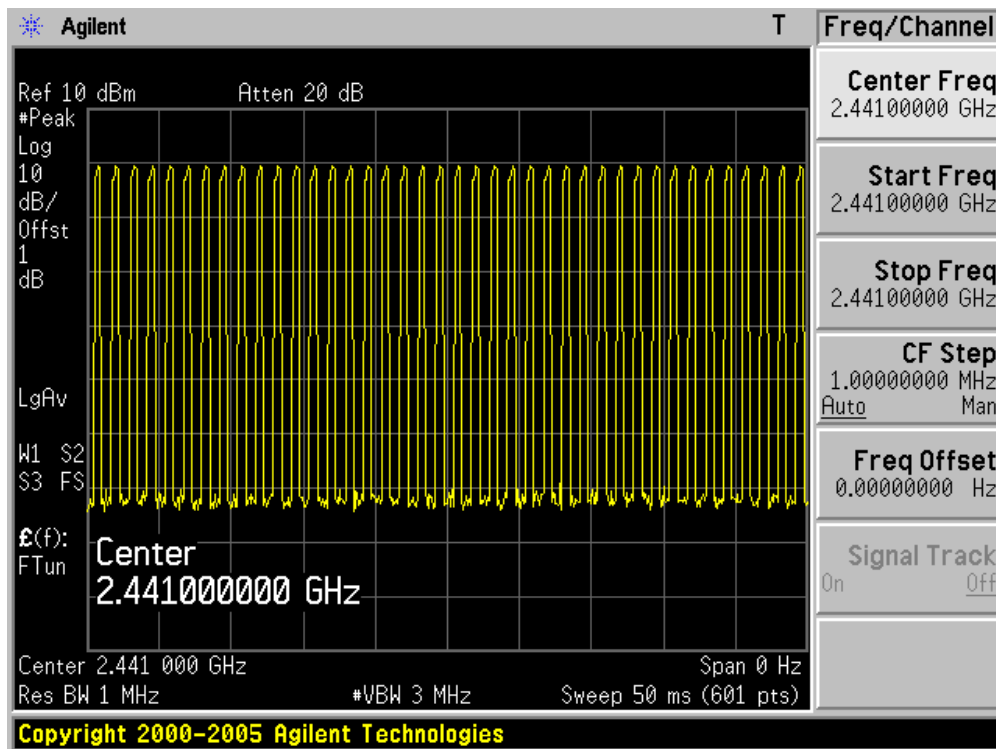
Product	:	IP-STB
Test Item	:	Time of Occupancy (Dwell Time)
Test Site	:	TR-8
Test Mode	:	Transmitter-3Mbps(8DPSK_DH1)

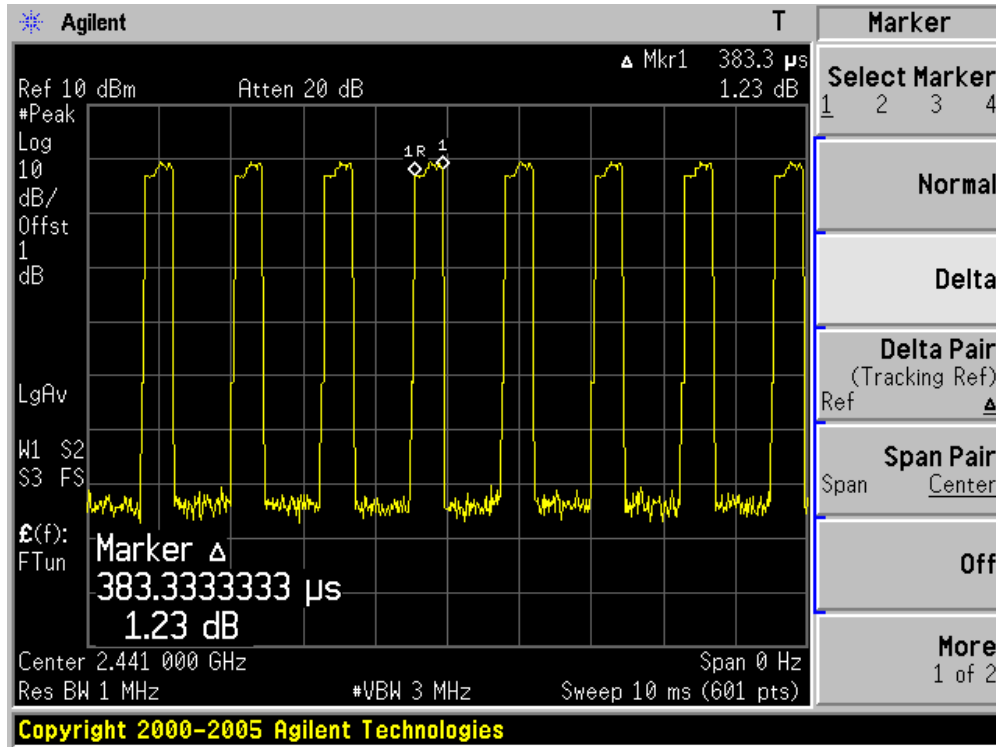
Channel No.	Frequency (MHz)	Time of Occupancy (ms)	Limit (ms)	Result
39	2441	122.656	< 400	Pass

Test Time Period: $0.4 * 79 = 31.6$ sec, Hopping Times Within 1sec: $40/50$ msec= 800 hops/sec.

- 2441MHz, The Maximum Occupancy Time Within 31.6sec: $[(383.3 \mu s * 800) / 79] * 31.6 = 122.656$ msec

Channel 39 (2441MHz)-(3DH1)





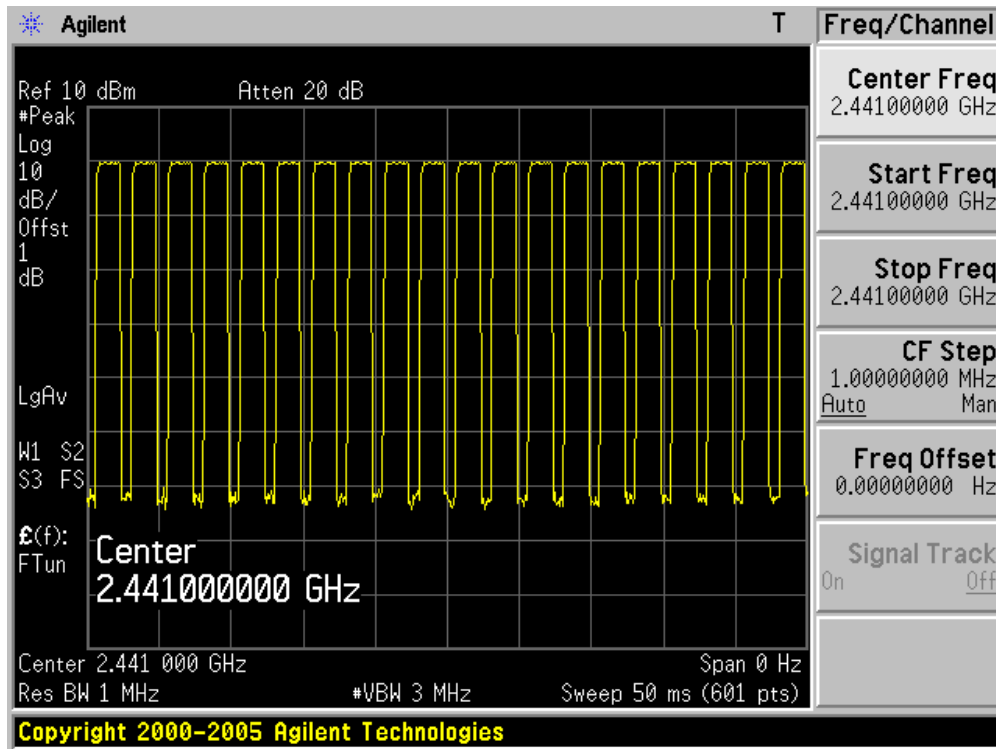
Product	: IP-STB
Test Item	: Time of Occupancy (Dwell Time)
Test Site	: TR-8
Test Mode	: Transmitter-3Mbps(8DPSK_DH3)

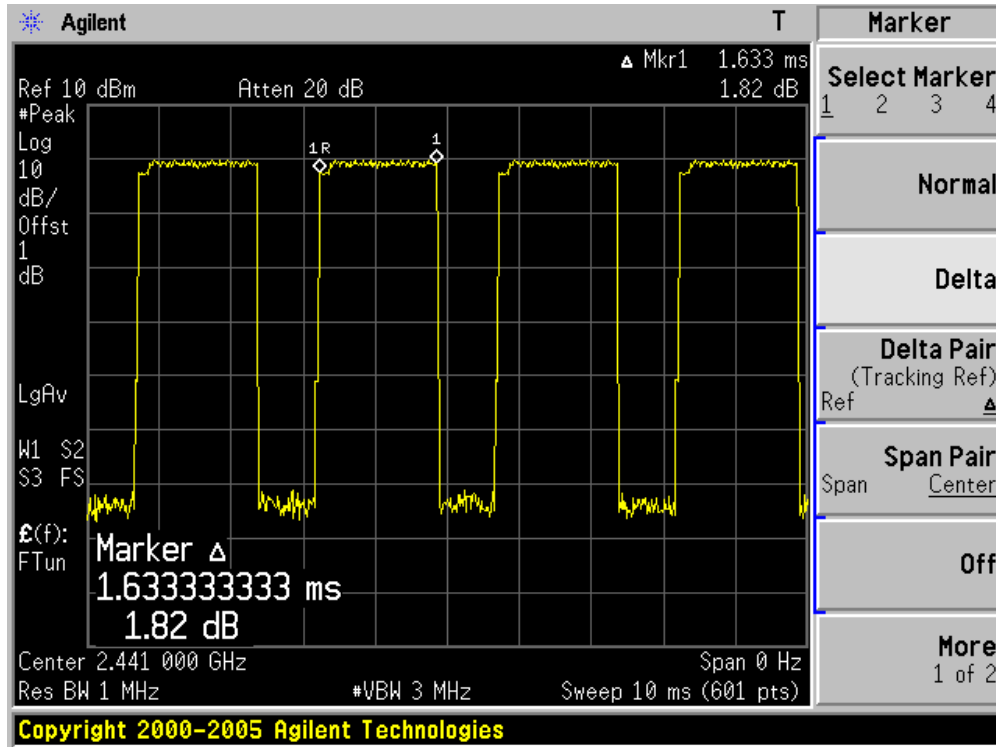
Channel No.	Frequency (MHz)	Time of Occupancy (ms)	Limit (ms)	Result
39	2441	261.28	< 400	Pass

Test Time Period: $0.4 \times 79 = 31.6$ sec, Hopping Times Within 1sec: $20/50$ msec= 400 hops/sec.

- 2441MHz, The Maximum Occupancy Time Within 31.6sec: $[(1.633 \text{ ms} \times 400)/79] \times 31.6 = 261.28$ msec

Channel 39 (2441MHz) - (3DH3)





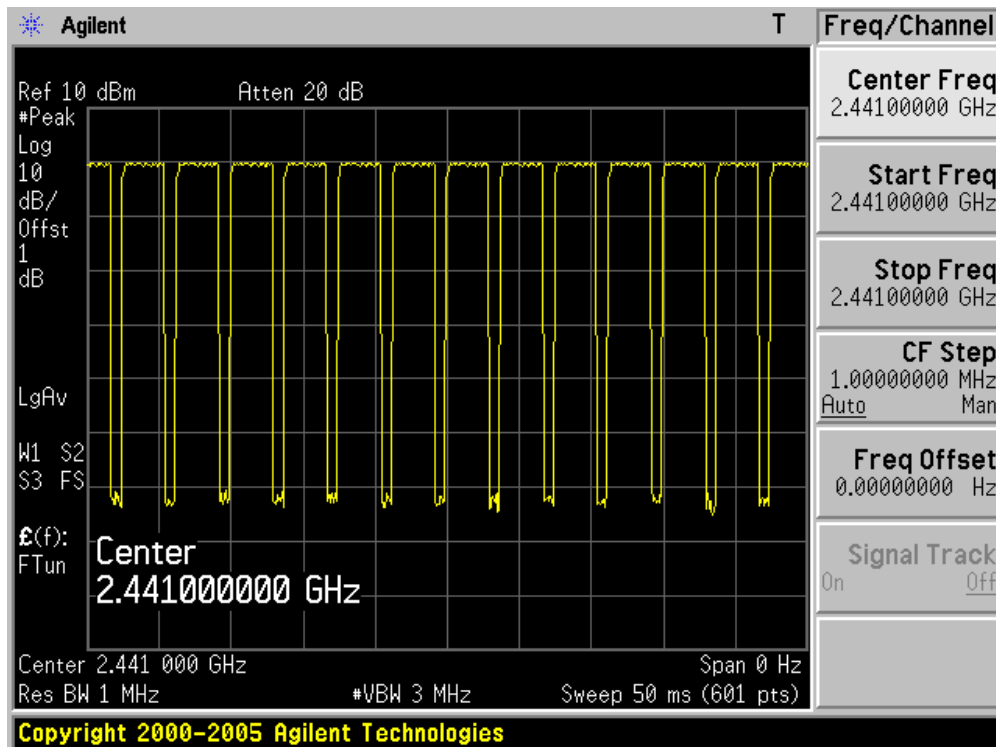
Product	:	IP-STB
Test Item	:	Time of Occupancy (Dwell Time)
Test Site	:	TR-8
Test Mode	:	Transmitter-3Mbps(8DPSK_DH5)

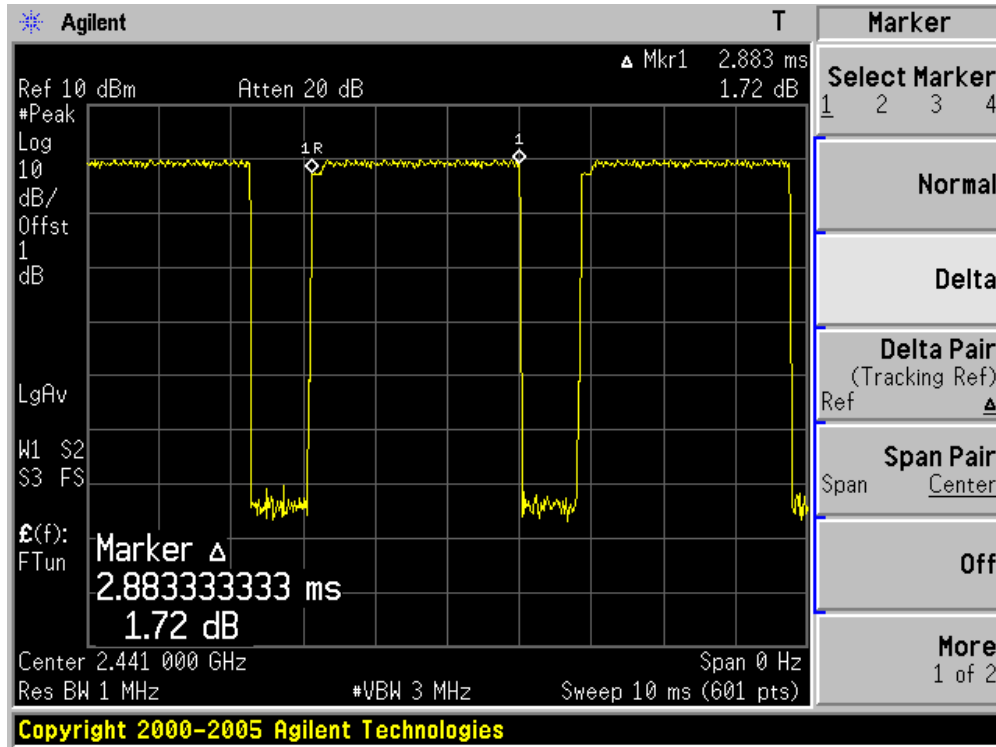
Channel No.	Frequency (MHz)	Time of Occupancy (ms)	Limit (ms)	Result
39	2441	322.896	< 400	Pass

Test Time Period: $0.4 * 79 = 31.6 \text{sec}$, Hopping Times Within 1sec: $14/50 \text{msec} = 280 \text{hops/sec}$.

- 2441MHz, The Maximum Occupancy Time Within 31.6sec: $[(2.883 \text{ ms} * 280) / 79] * 31.6 = 322.896 \text{msec}$

Channel 39 (2441MHz) - (3DH5)





9. Peak Output Power

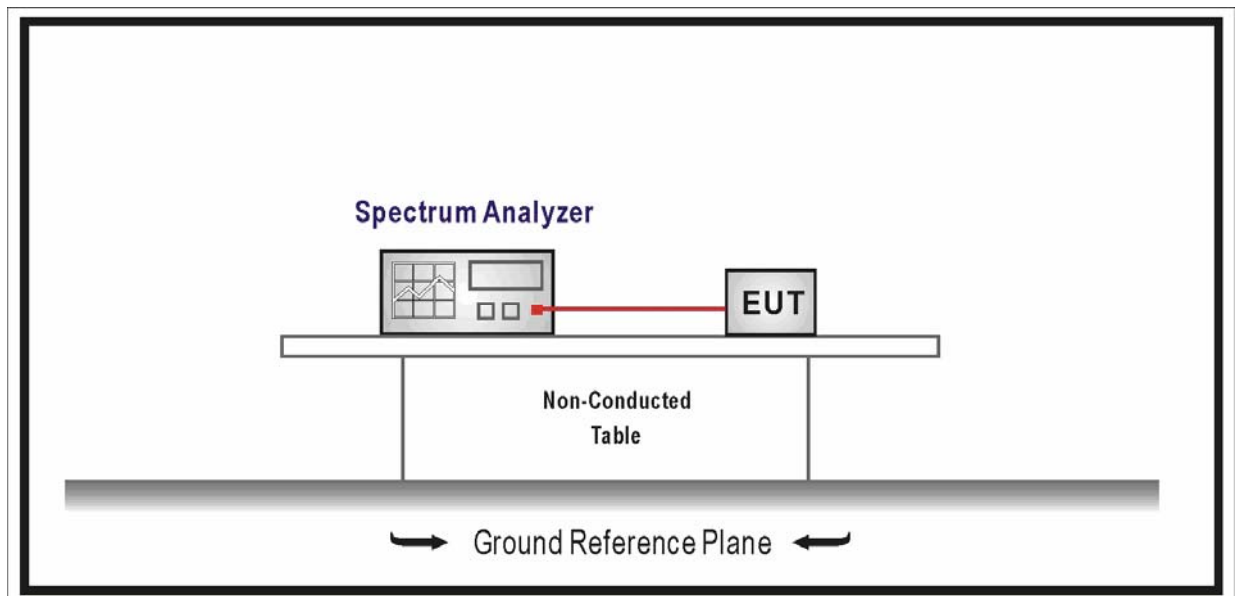
9.1. Test Equipment

Peak Output Power / TR-8

Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
Spectrum Analyzer	Agilent	E4446A	MY45300103	2012.04.29
Temperature/Humidity Meter	Zhicheng	ZC1-2	TR8-TH	2012.05.04

Note: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

9.2. Test Setup



9.3. Limit

- For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.
- For frequency hopping systems operating in the 902-928 MHz band: 1 watt for systems employing at least 50 hopping channels; and, 0.25 watts for systems employing less than 50 hopping channels, but at least 25 hopping channels.

Note: the conducted output power limit specified above is based on the use the antennas with

directional gains that do not exceed 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values above, as appropriate, by the amount in dB that the directional gain of antenna exceeds 6 dBi.

9.4. 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 \geq 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).

9.5. Uncertainty

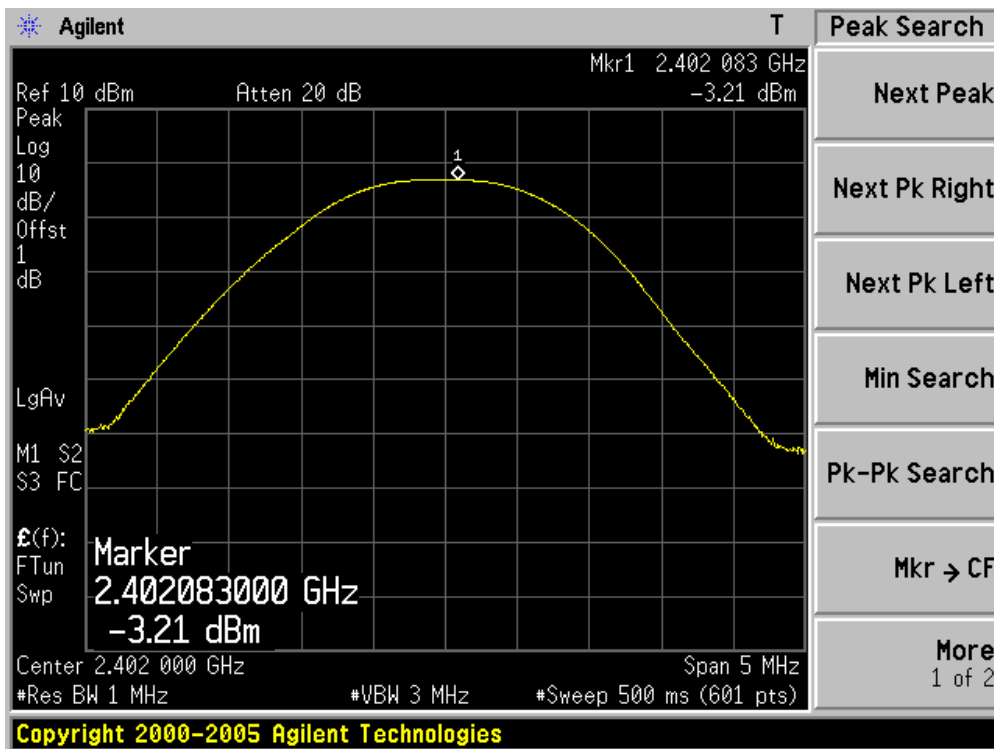
The measurement uncertainty is defined as ± 1.0 dB

9.6. Test Result

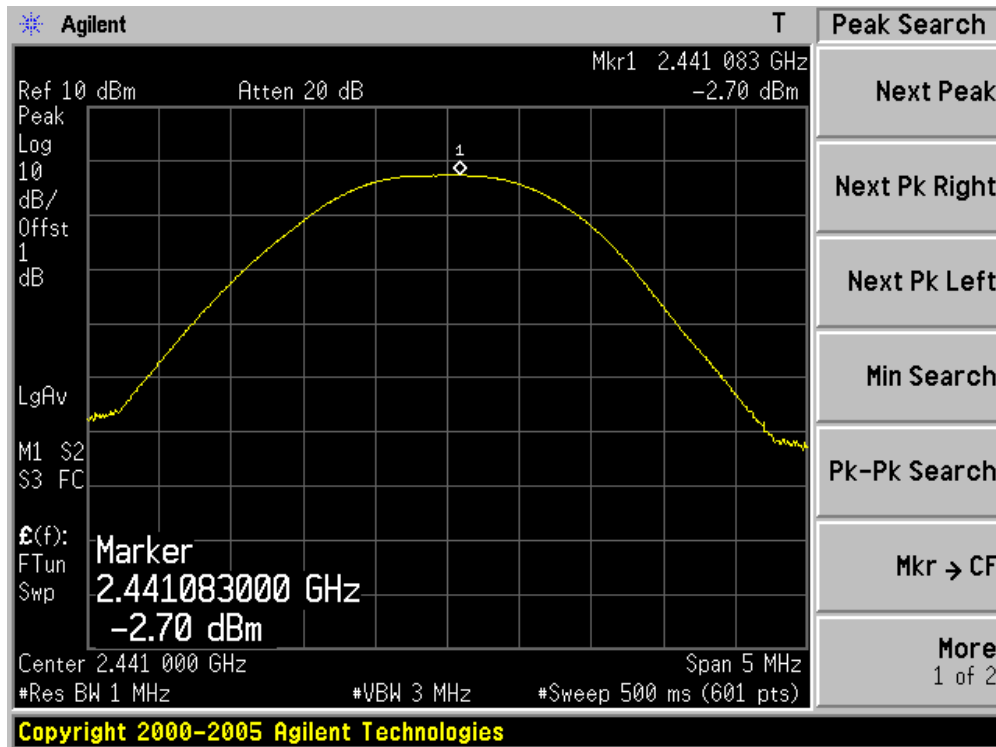
Product	:	IP-STB
Test Item	:	Power Output
Test Site	:	TR-8
Test Mode	:	Mode 1: Transmitter-1Mbps(GFSK_DH5)

Channel No.	Frequency (MHz)	Measurement Power Output (dBm)	Limit (dBm)	Result
0	2402	-3.21	30.00	Pass
39	2441	-2.70	30.00	Pass
78	2480	-2.28	30.00	Pass

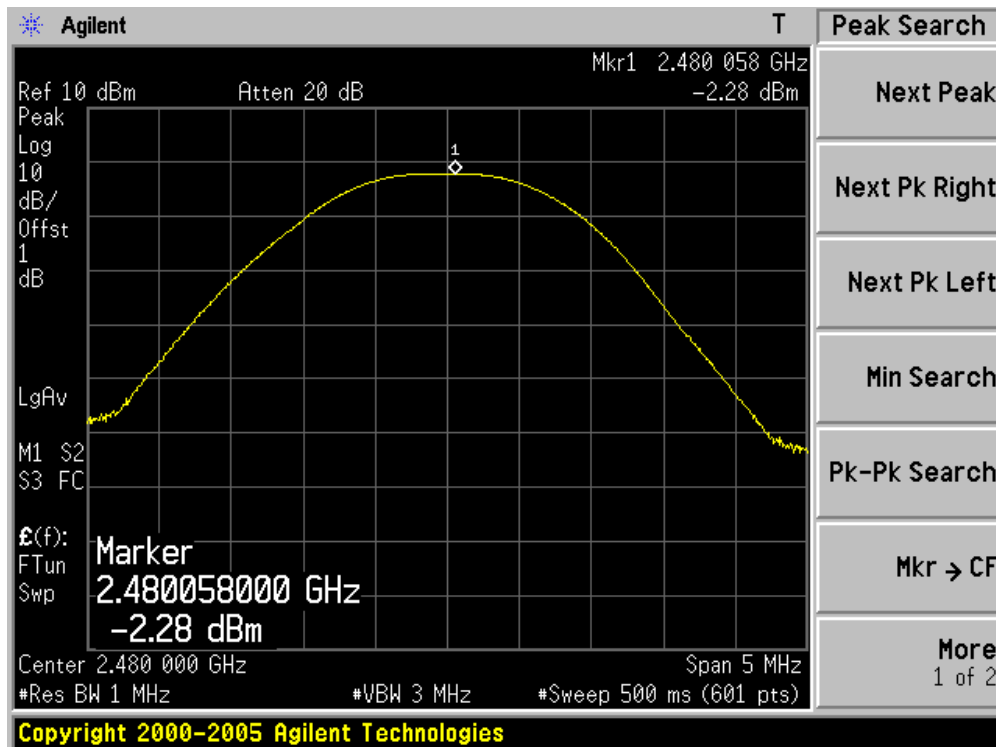
DH5 2402MHz



DH5 2441MHz



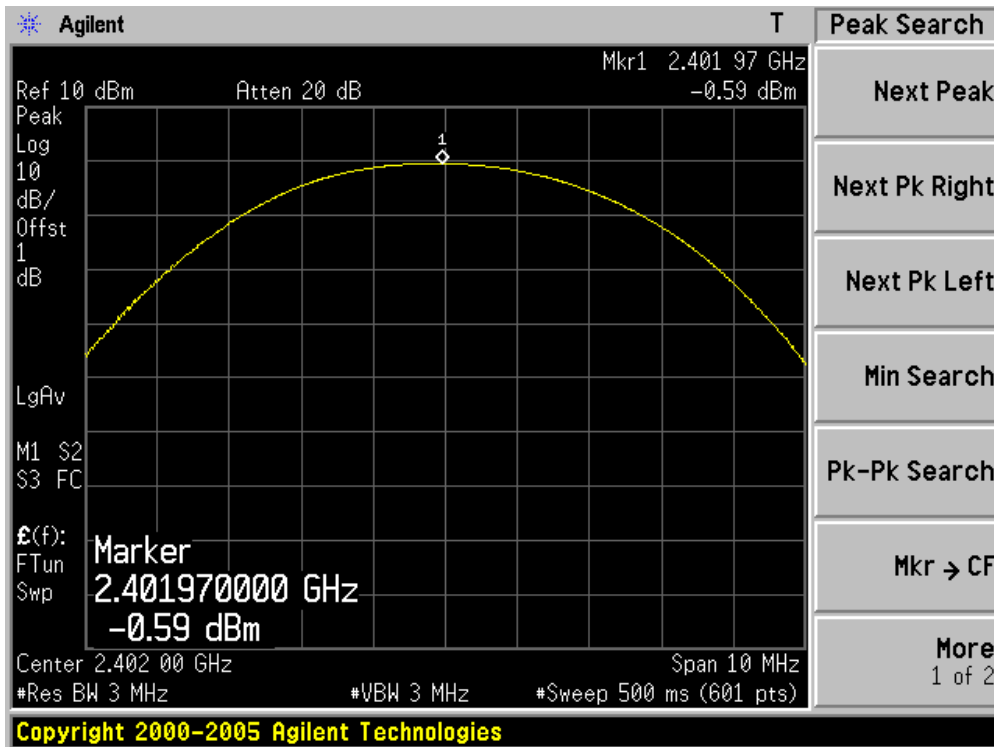
DH5 2480MHz



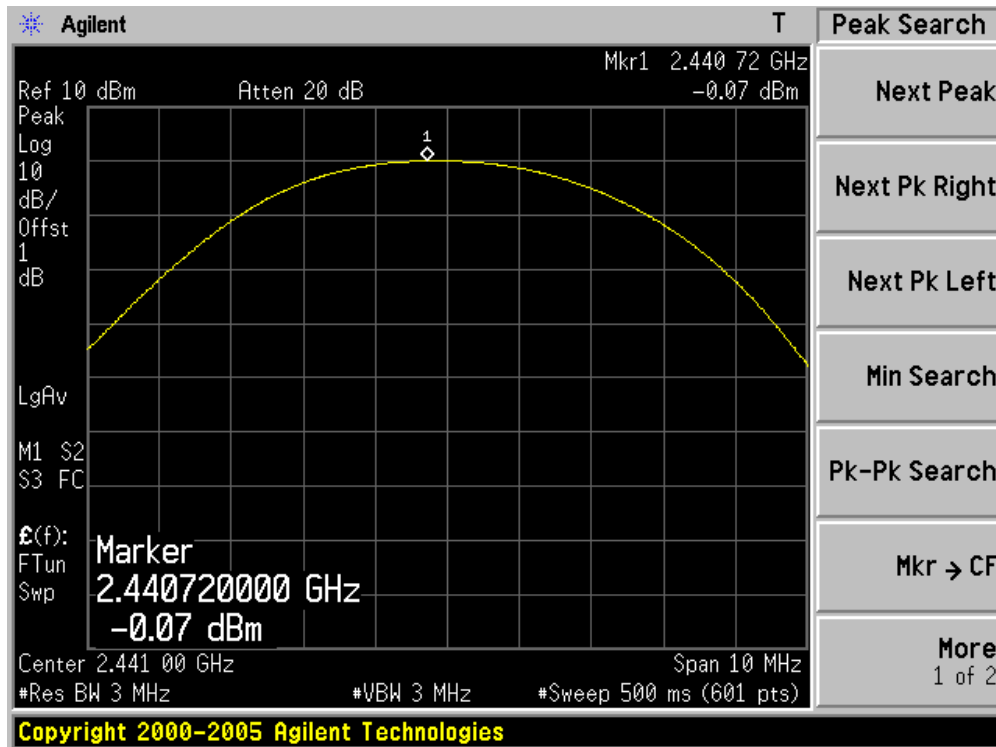
Product	:	IP-STB
Test Item	:	Power Output
Test Site	:	TR-8
Test Mode	:	Mode 2: Transmitter-2Mbps(Pi/4 DQPSK_DH5)

Channel No.	Frequency (MHz)	Measurement Power Output (dBm)	Limit (dBm)	Result
0	2402	-0.59	30.00	Pass
39	2441	-0.07	30.00	Pass
78	2480	0.40	30.00	Pass

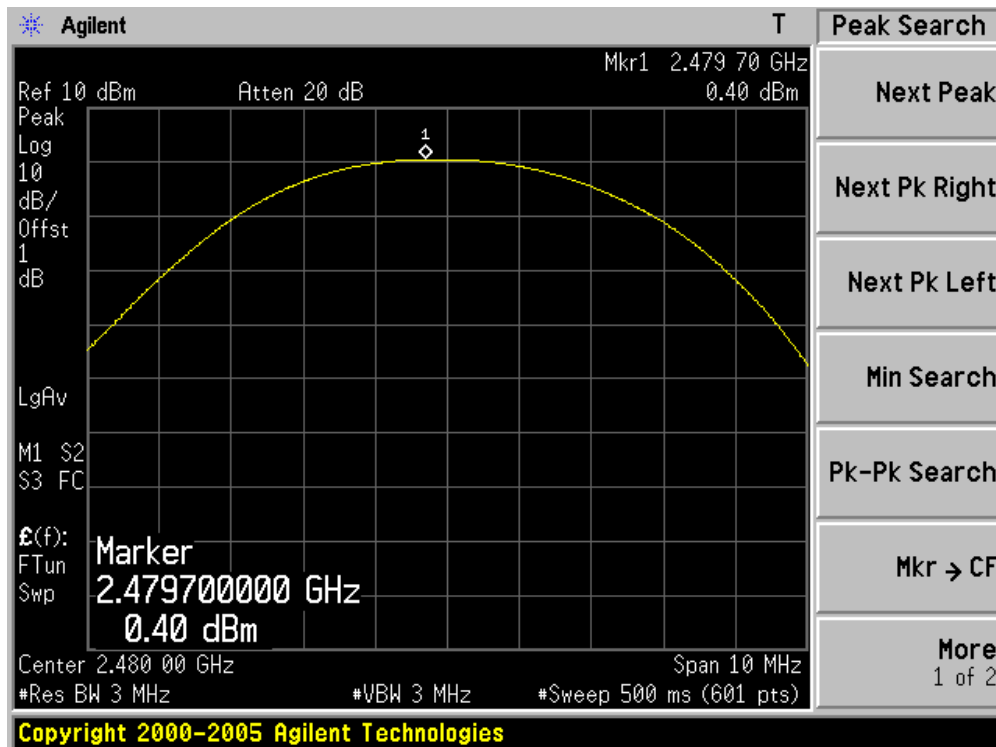
2DH5 2402MHz



2DH5 2441MHz



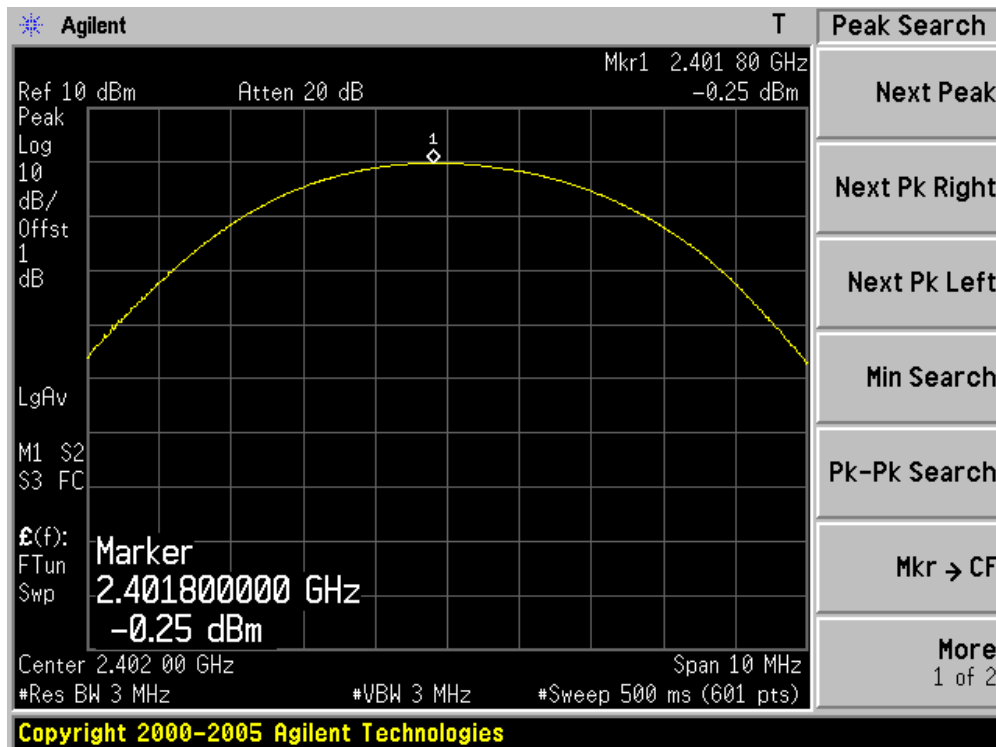
2DH5 2480MHz



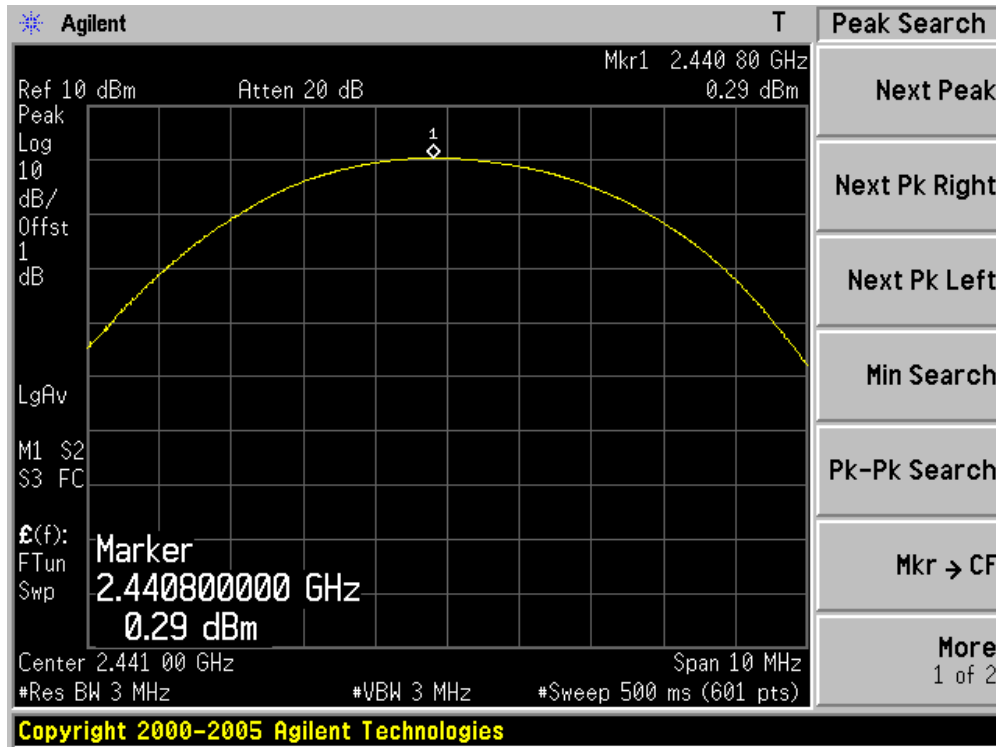
Product	: IP-STB
Test Item	: Power Output
Test Site	: TR-8
Test Mode	: Mode 3: Transmitter-3Mbps(8DPSK_DH5)

Channel No.	Frequency (MHz)	Measurement Power Output (dBm)	Limit (dBm)	Result
0	2402	-0.25	30.00	Pass
39	2441	0.29	30.00	Pass
78	2480	0.77	30.00	Pass

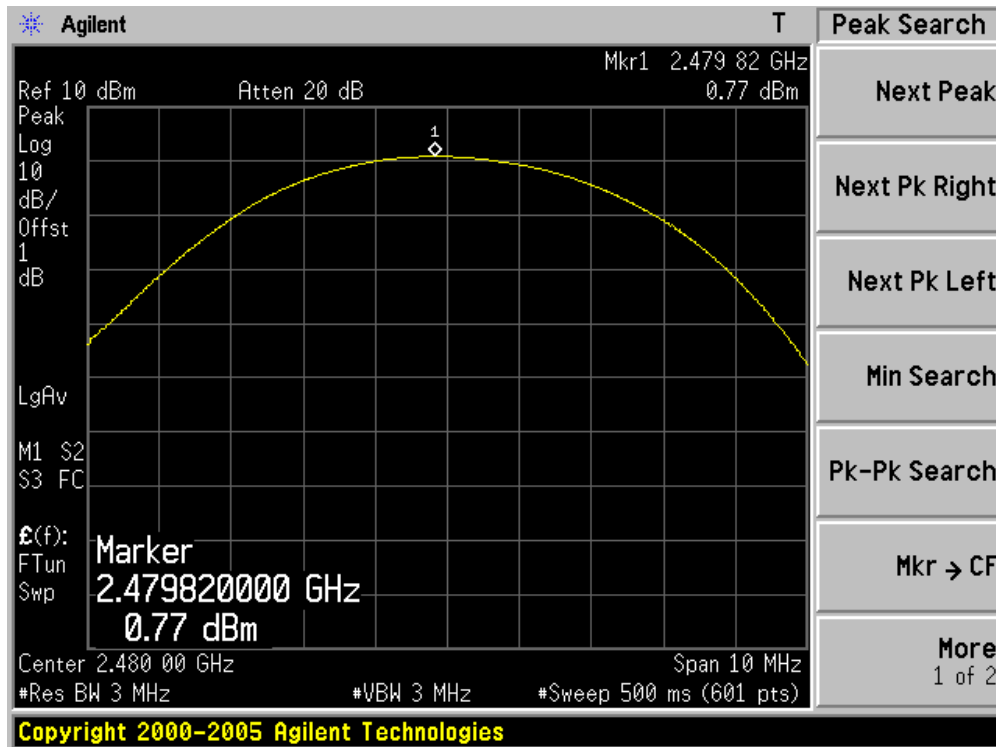
3DH5 2402MHz



3DH5 2441MHz



3DH5 2480MHz



10. Band-edge Compliance of RF Conducted Emissions

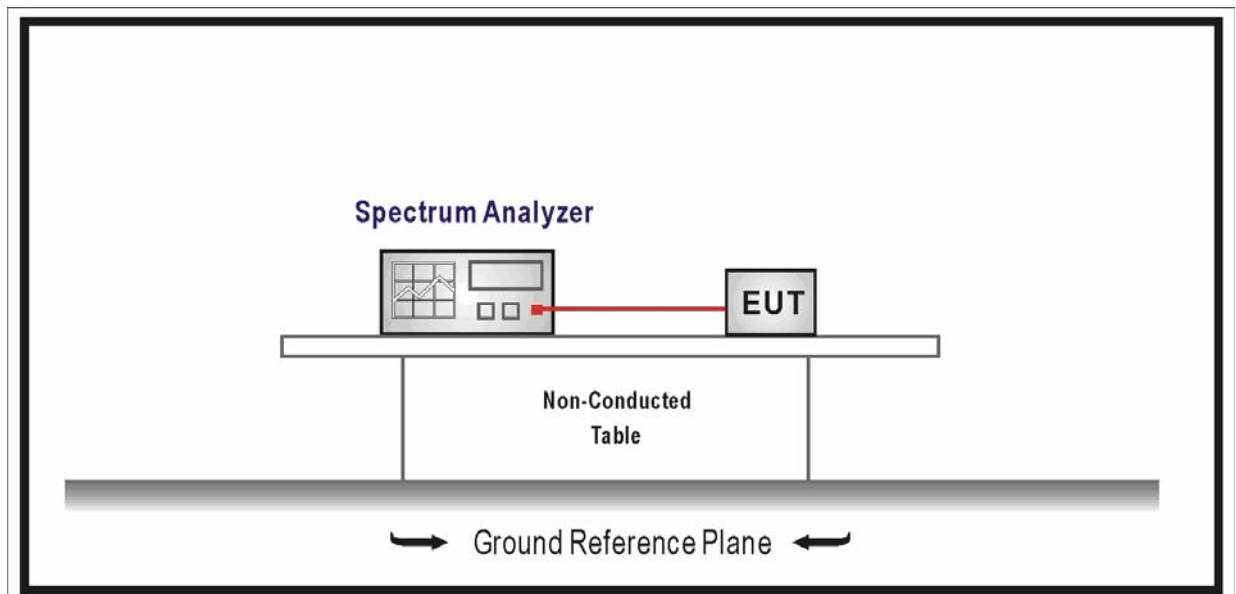
10.1. Test Equipment

Band-edge Compliance of RF Conducted Emissions / TR-8

Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
Spectrum Analyzer	Agilent	E4446A	MY45300103	2012.04.29
Temperature/Humidity Meter	Zhicheng	ZC1-2	TR8-TH	2012.05.04

Note: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

10.2. Test Setup



10.3. Limit

- Intentional radiators operating under the alternative provisions to the general emission limits as contained in 15.217 through 15.257 and in Subpart E of FCC part 15, must be designed to ensure that 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.
- 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.

10.4. 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 \geq 1% of the span

VBW \geq 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.

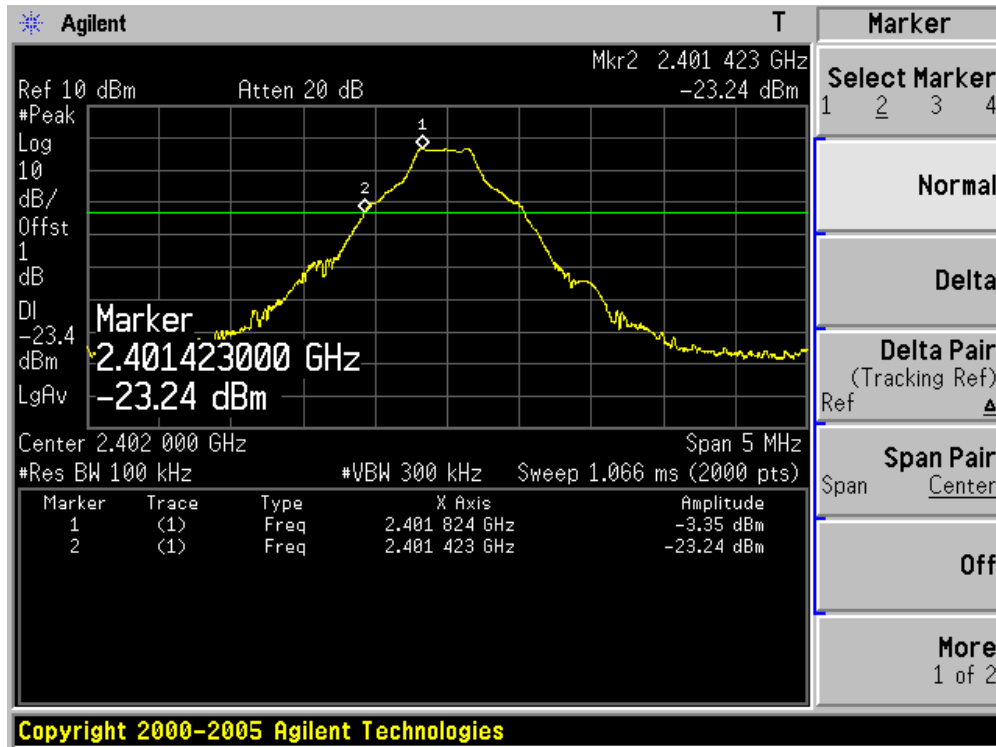
10.5. Uncertainty

The measurement uncertainty is defined as ± 1.0 dB

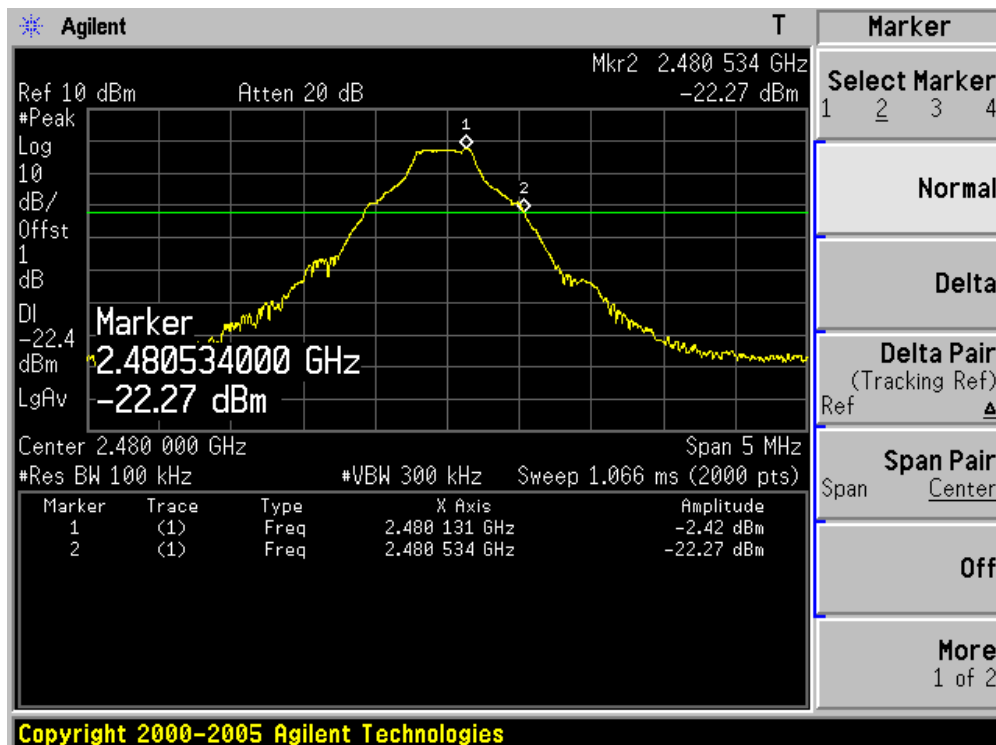
10.6. Test Result

Product	:	IP-STB
Test Item	:	Band-edge Compliance of RF Conducted Emissions
Test Site	:	TR-8
Test Mode	:	Mode 1: Transmitter-1Mbps(GFSK_DH5)

Channel 00 (2402MHz)

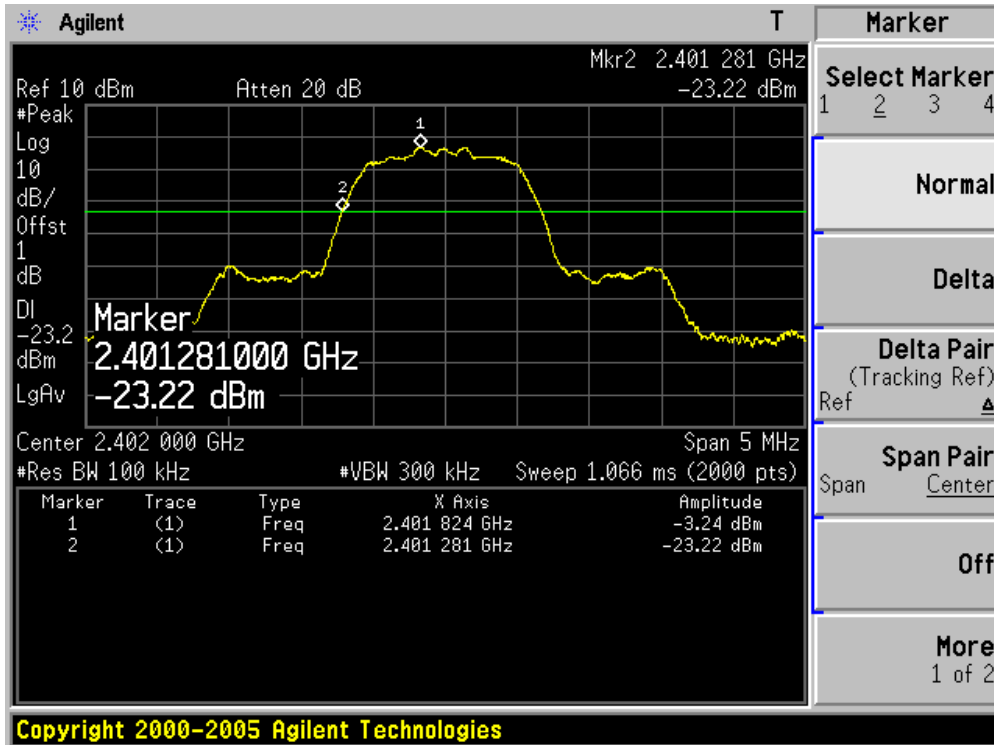


Channel 78 (2480MHz)

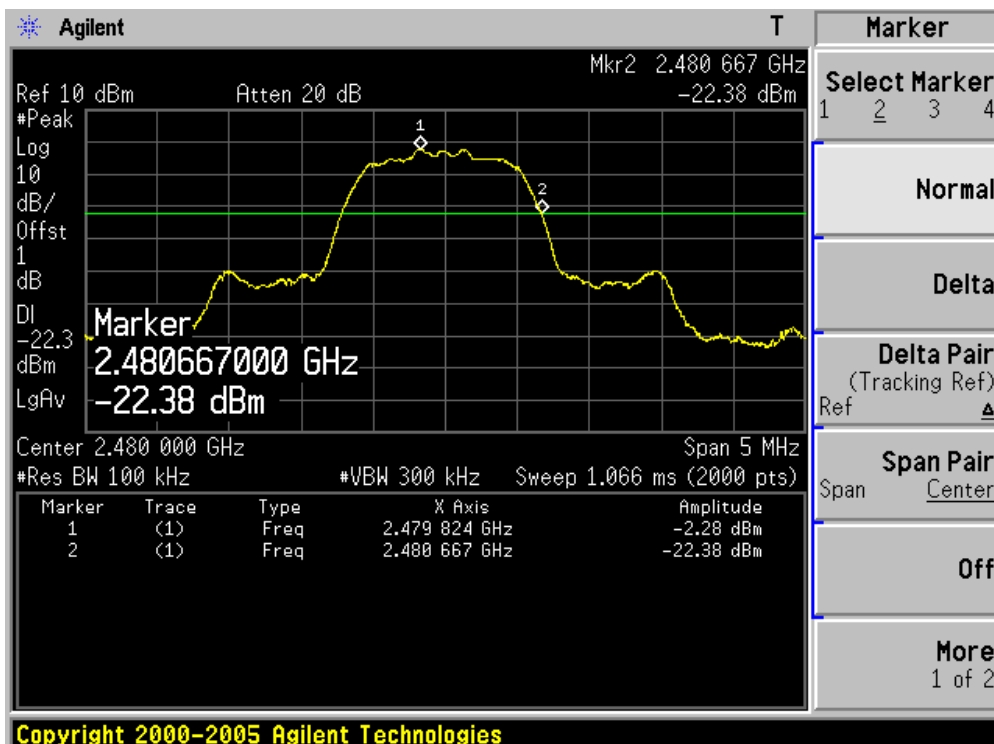


Product	: IP-STB
Test Item	: Band-edge Compliance of RF Conducted Emissions
Test Site	: TR-8
Test Mode	: Mode 2: Transmitter-2Mbps(Pi/4 DQPSK_DH5)

Channel 00 (2402MHz)

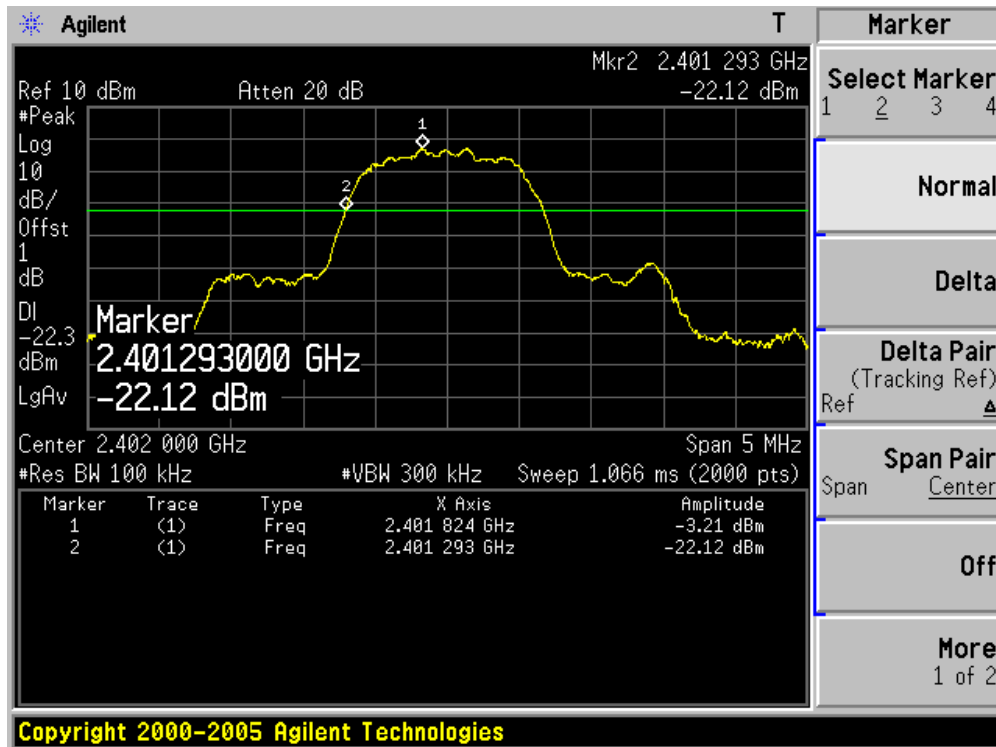


Channel 78 (2480MHz)

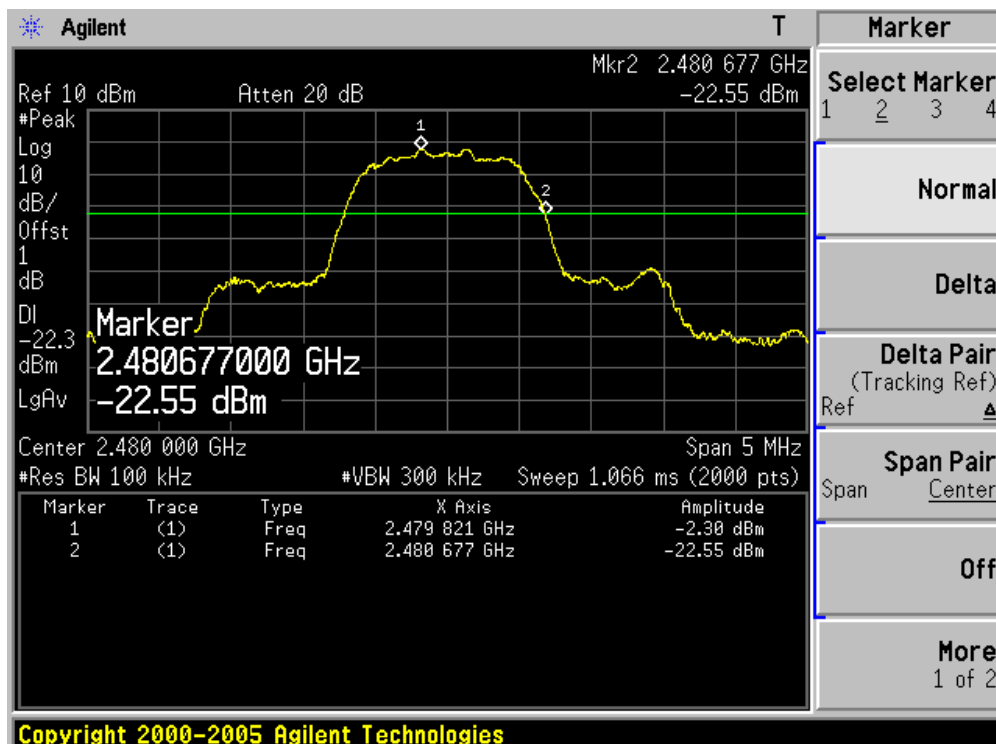


Product	: IP-STB
Test Item	: Band-edge Compliance of RF Conducted Emissions
Test Site	: TR-8
Test Mode	: Mode 3: Transmitter-3Mbps(8DPSK_DH5)

Channel 00 (2402MHz)

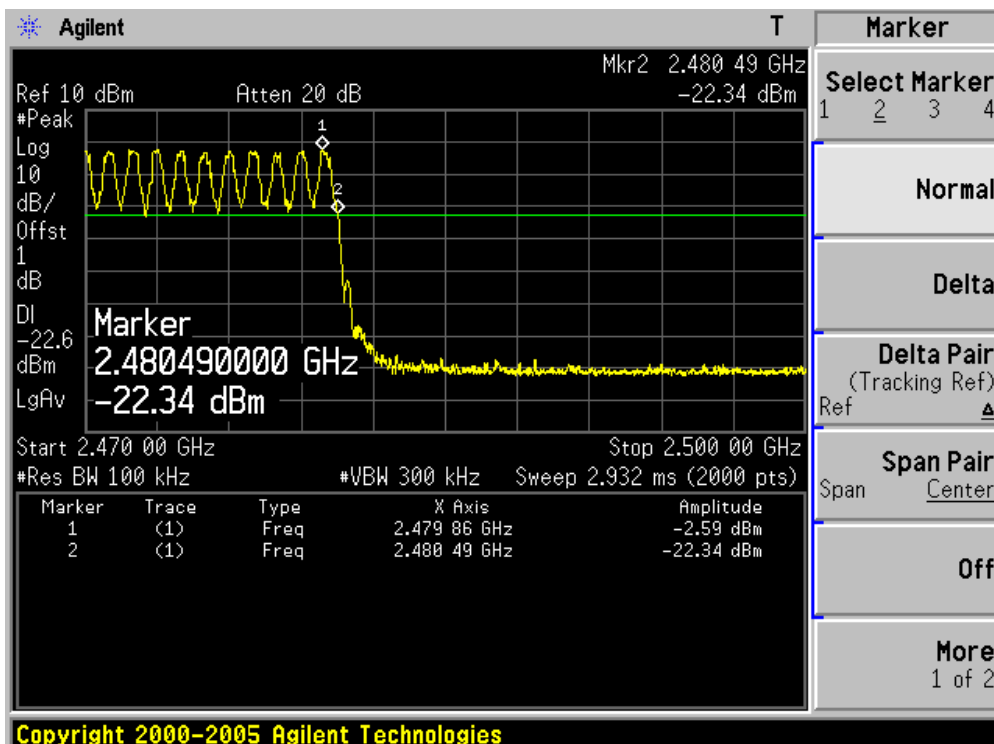
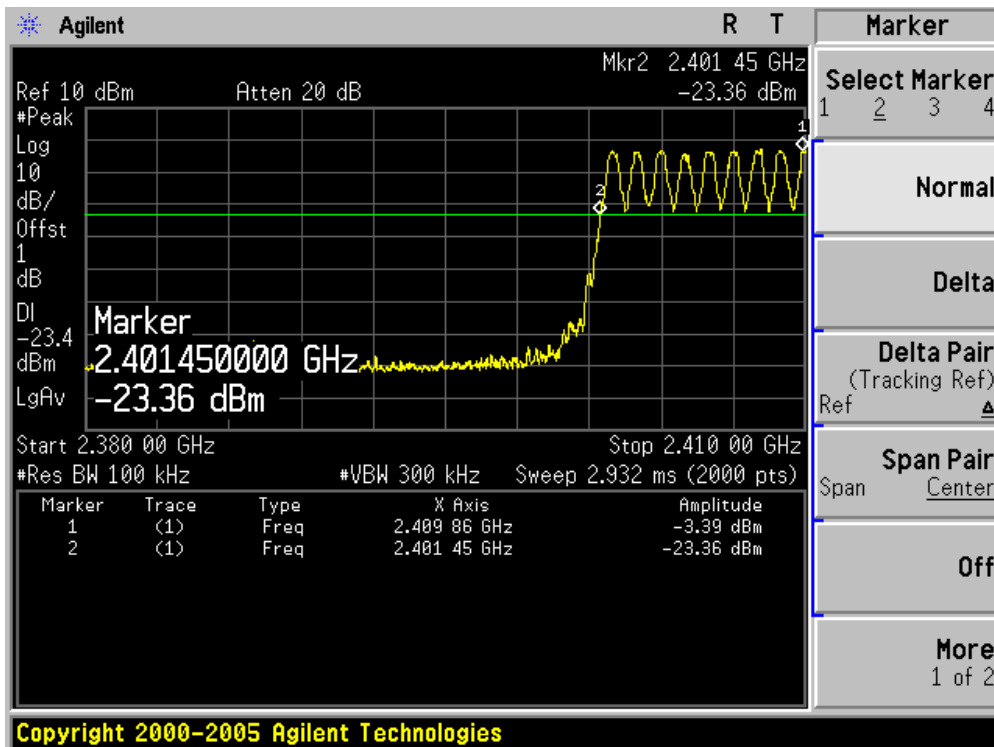


Channel 78 (2480MHz)



Product	: IP-STB
Test Item	: Band-edge Compliance of RF Conducted Emissions
Test Site	: TR-8
Test Mode	: Mode: Hopping On

Hopping Mode



11. Spurious RF Conducted Emissions

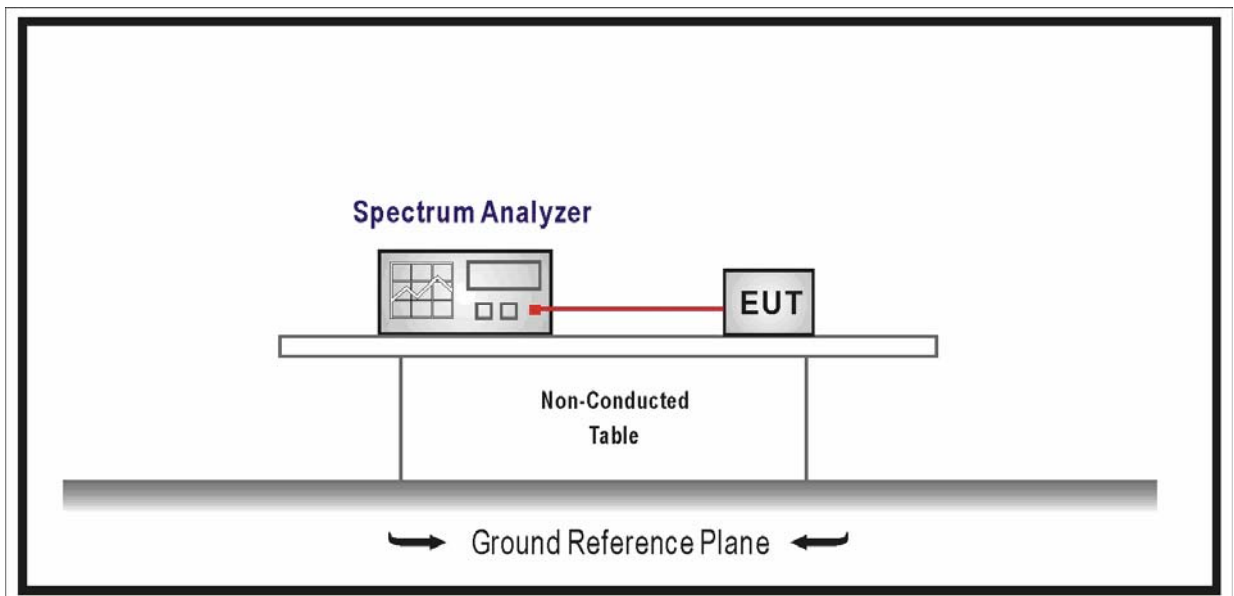
11.1. Test Equipment

Spurious RF Conducted Emissions / TR-8

Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
Spectrum Analyzer	Agilent	E4446A	MY45300103	2012.04.29
Temperature/Humidity Meter	Zhicheng	ZC1-2	TR8-TH	2012.05.04

Note: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

11.2. Test Setup



11.3. 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.

11.4. Test Procedure

According to ANSI C63.10: 2009.

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 = 100 kHz

VBW \geq 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.

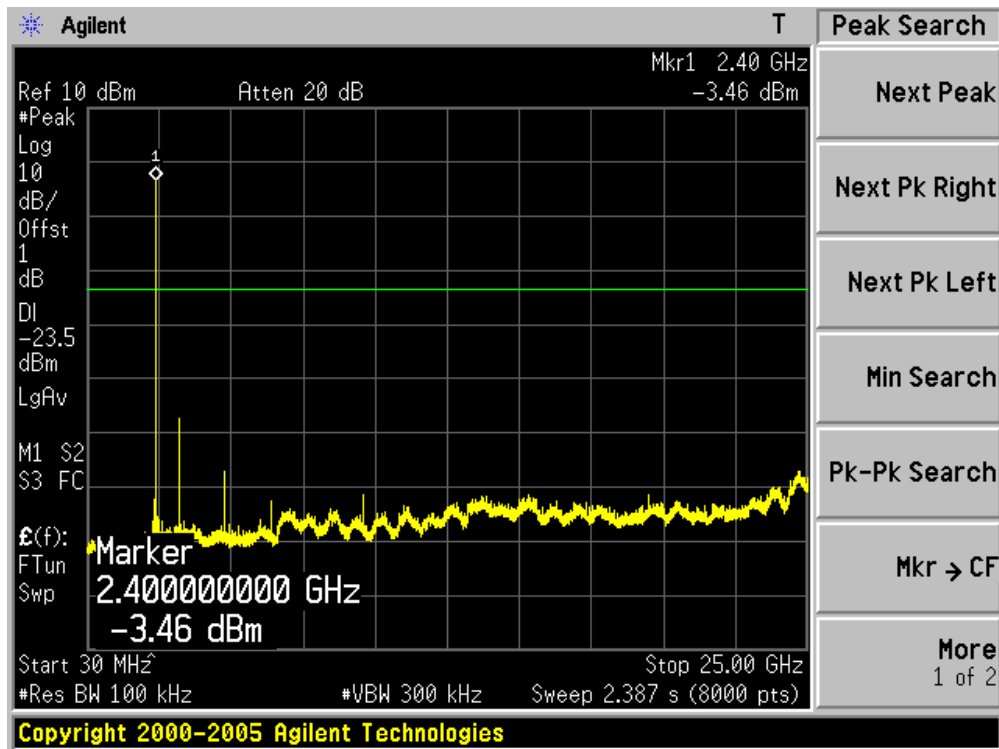
11.5. Uncertainty

The measurement uncertainty is defined as ± 1.0 dB

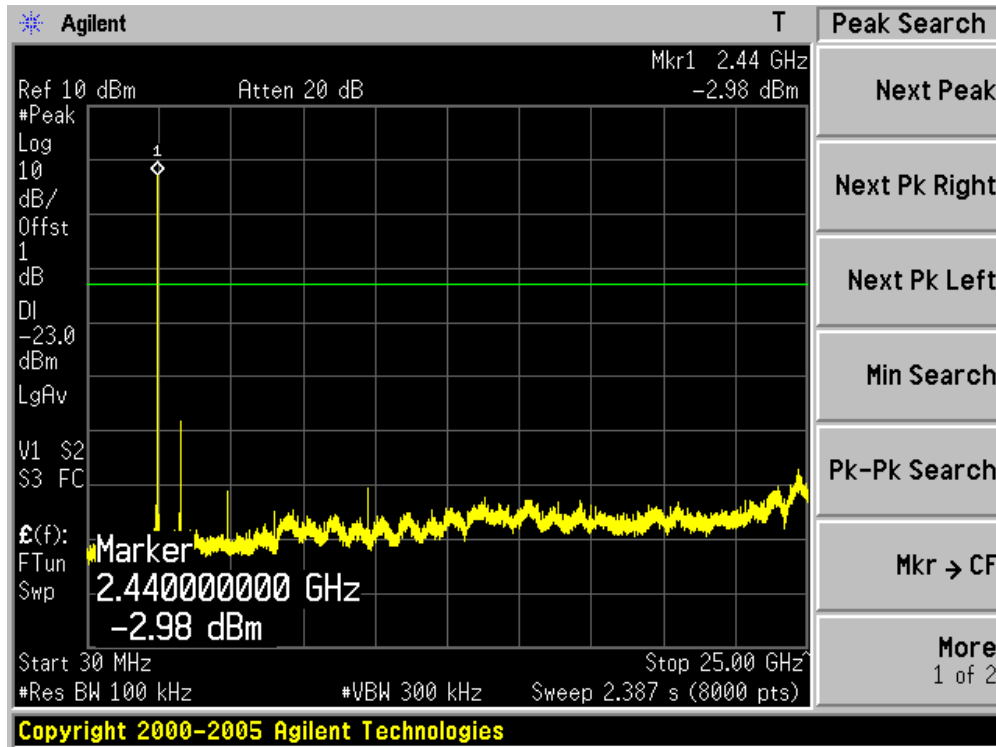
11.6. Test Result

Product	:	IP-STB
Test Item	:	Spurious RF Conducted Emissions
Test Site	:	TR-8
Test Mode	:	Mode 1: Transmitter-1Mbps(GFSK_DH5)

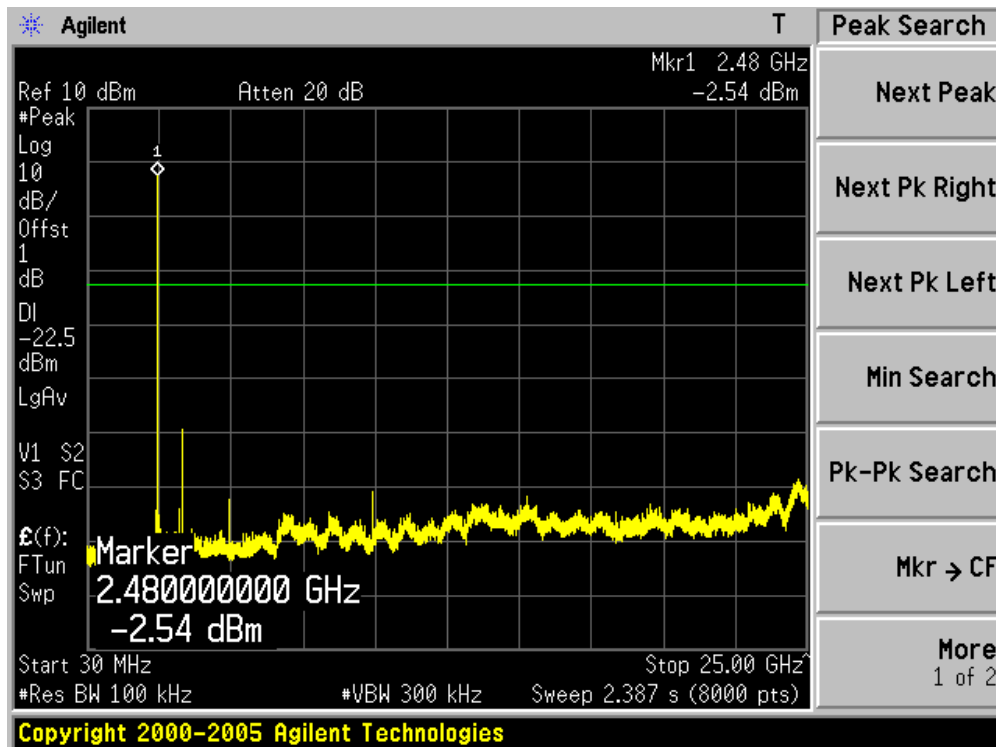
Channel 00 (2402MHz)



Channel 39 (2441MHz)

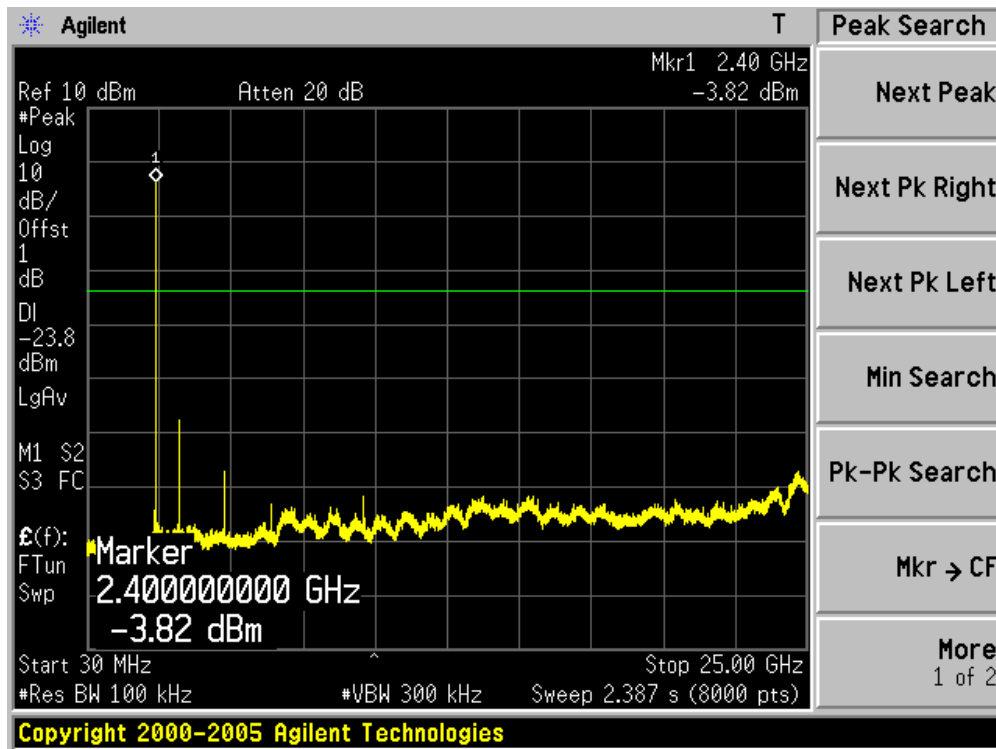


Channel 78 (2480MHz)

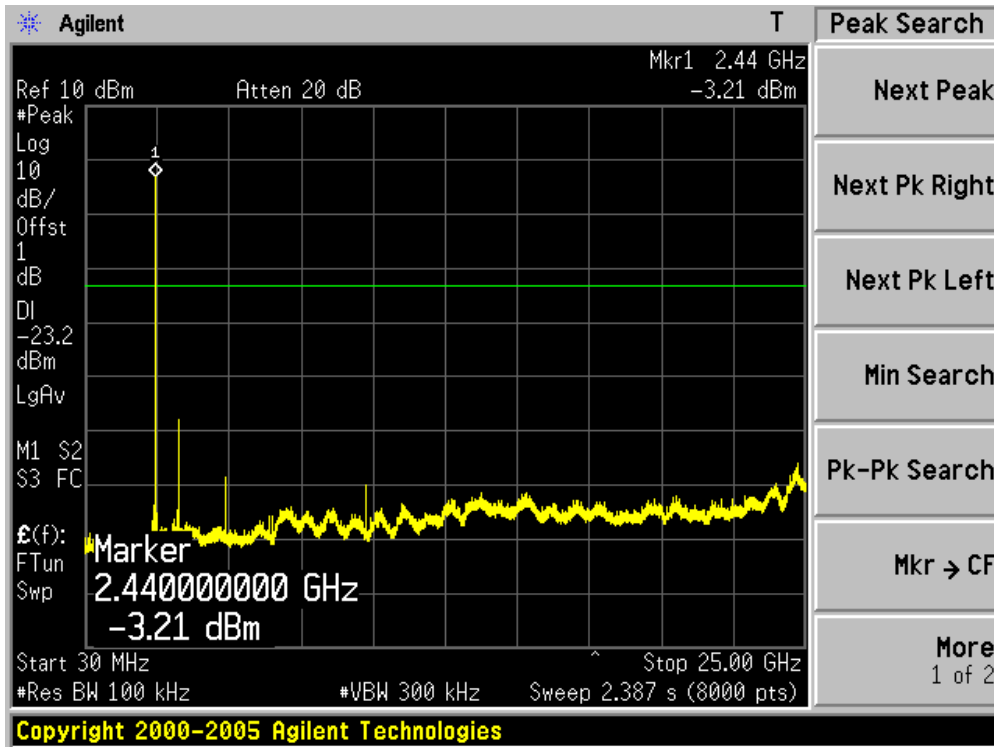


Product	: IP-STB
Test Item	: Spurious RF Conducted Emissions
Test Site	: TR-8
Test Mode	: Mode 2: Transmitter-2Mbps(Pi/4 DQPSK_DH5)

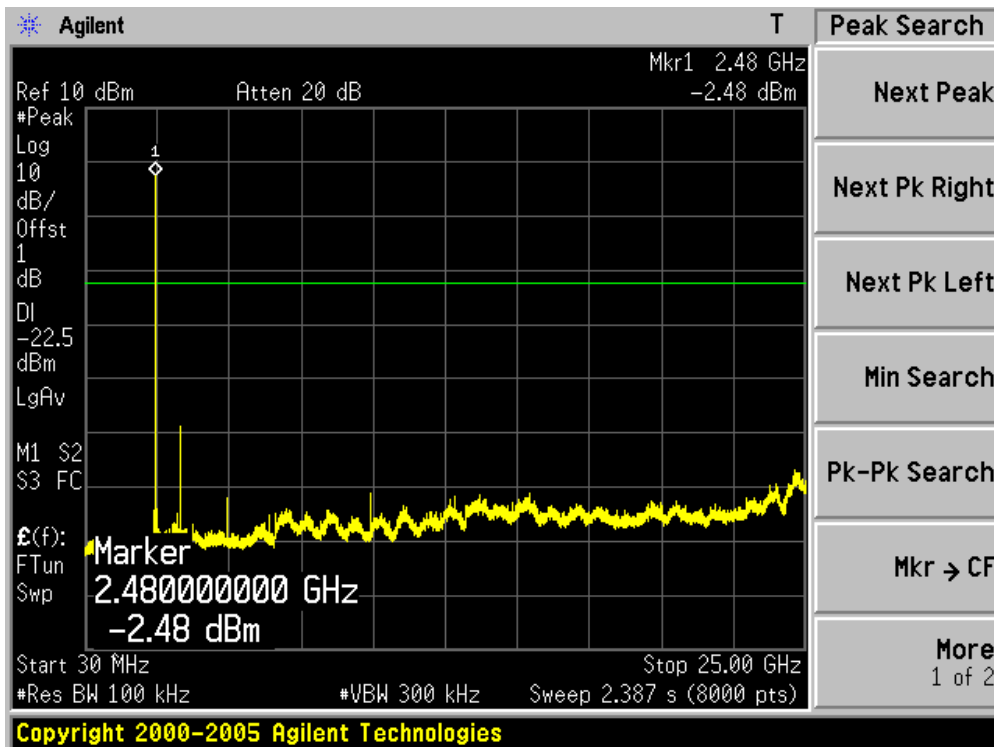
Channel 00 (2402MHz)



Channel 39 (2441MHz)

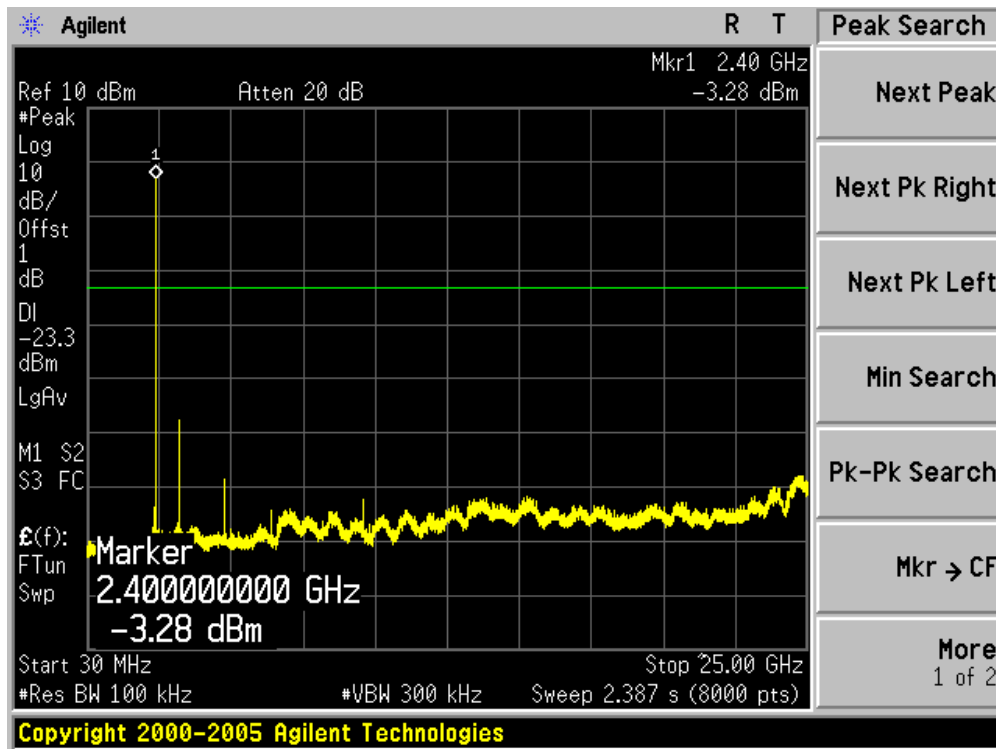


Channel 78 (2480MHz)

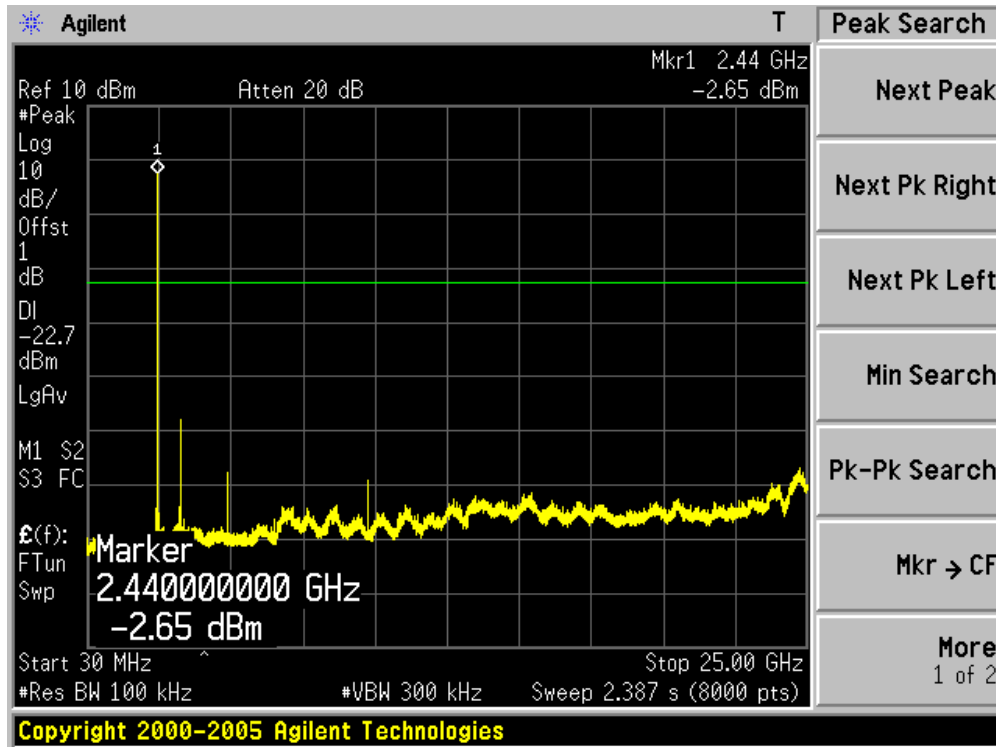


Product	: IP-STB
Test Item	: Spurious RF Conducted Emissions
Test Site	: TR-8
Test Mode	: Mode 3: Transmitter-3Mbps(8DPSK_DH5)

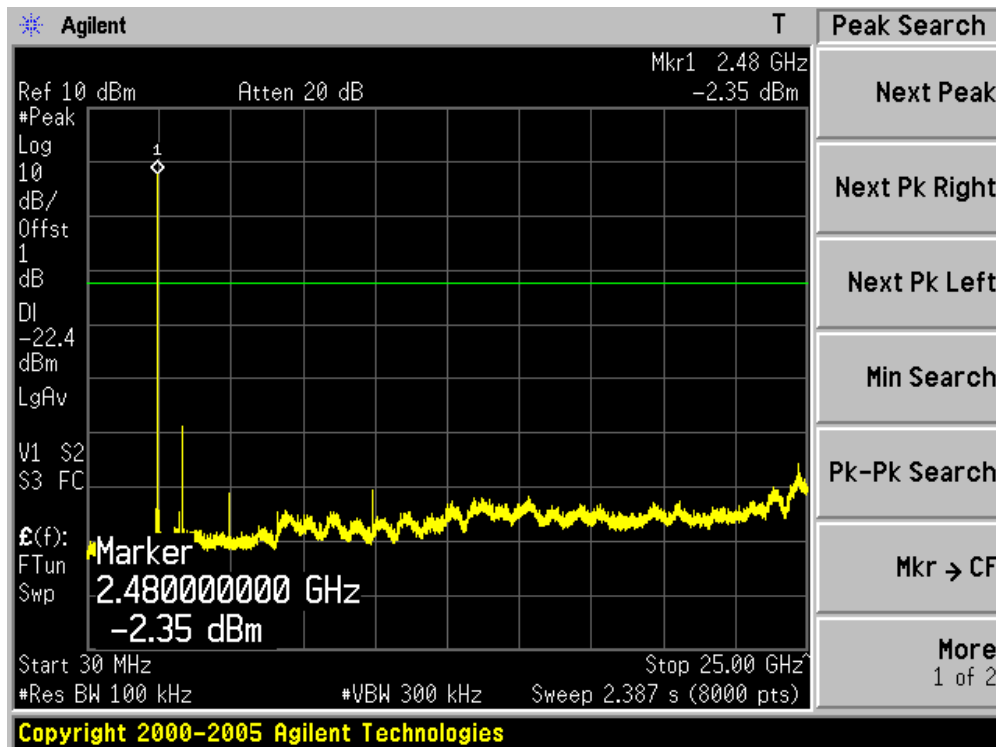
Channel 00 (2402MHz)



Channel 39 (2441MHz)



Channel 78 (2480MHz)



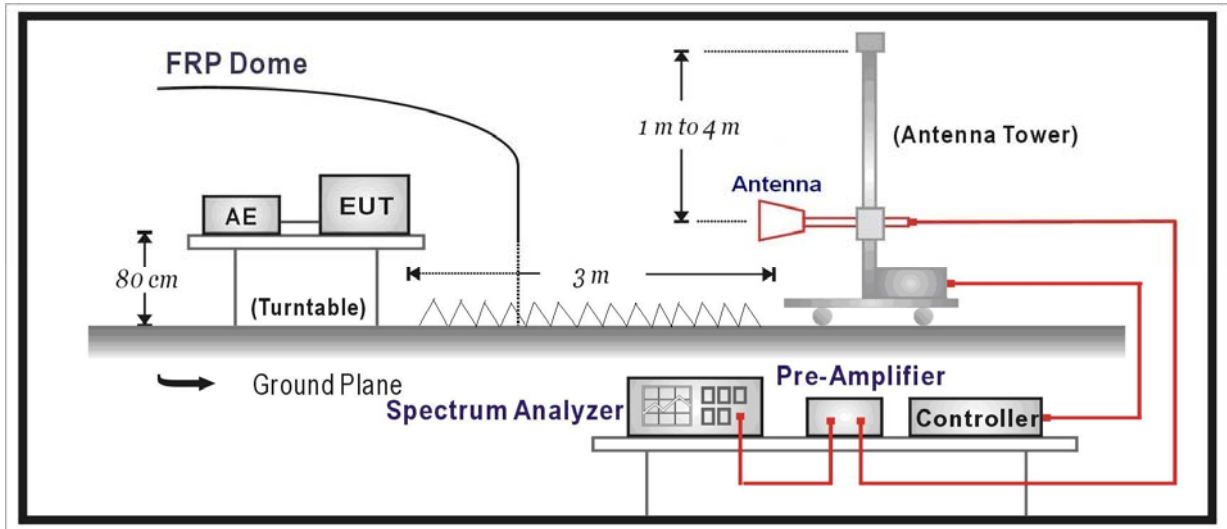
12. Radiated Emission Band Edge

12.1. Test Equipment

Radiated Emission Band Edge / AC-5

Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
Spectrum Analyzer	Agilent	N9010A	MY48030494	2012.04.23
EMI Test Receiver	R&S	ESCI	100573	2012.04.23
Preamplifier	Quietek	AP-025C	CHM-0511006	2012.05.05
Preamplifier	Quietek	AP-180C	CHM-0602013	2012.05.05
Bilog Type Antenna	Schaffner	CBL6112B	2932	2011.11.21
Broad-Band Horn Antenna	Schwarzbeck	BBHA9120D	499	2011.06.11
50ohm Coaxial Switch	Anritsu	MP59B	6200464462	2012.05.05
Temperature/Humidity Meter	zhicheng	ZC1-2	AC5-TH	2012.01.14

12.2. Test Setup



12.3. Limit

Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a) of FCC part 15, must also comply with the radiated emission limits specified in Section 15.209(a) of FCC part 15.

12.4. Test Procedure

According to ANSI C63.10: 2009.

This test is required for any spurious emission or modulation product that falls in a Restricted Band, as defined in Section 15.205 of FCC part 15. It must be performed with the highest gain of each type of antenna proposed for use with the EUT. Use the following spectrum analyzer settings:

Span = wide enough to fully capture the emission being measured

RBW = 1 MHz for $f \geq 1$ GHz, 100 kHz for $f < 1$ GHz

VBW \geq RBW

Sweep = auto

Detector function = peak

Trace = max hold

Follow the guidelines in ANSI C63.4 with respect to maximizing the emission by rotating the EUT, measuring the emission while the EUT is situated in three orthogonal planes (if appropriate), adjusting the measurement antenna height and polarization, etc. A pre-amp and a high pass filter are required for this test, in order to provide the measuring system with sufficient sensitivity. Allow the trace to stabilize. The peak reading of the emission, after being

corrected by the antenna factor, cable loss, pre-amp gain, etc., is the peak field strength, which must comply with the limit specified in Section 15.35(b) of FCC part 15.

Now set the VBW to 10 Hz, while maintaining all of the other instrument settings. This peak level, once corrected, must comply with the limit specified in Section 15.209 of FCC Part 15. If the dwell time per channel of the hopping signal is less than 100 ms, then the reading obtained with the 10 Hz VBW may be further adjusted by a “duty cycle correction factor”, derived from $20\log(\text{dwell time}/100 \text{ ms})$, in an effort to demonstrate compliance with the 15.209 limit of FCC part 15.

If the emission on which a radiated measurement must be made is located at the edge of the authorized band of operation, then the alternative “marker-delta” method may be employed.

12.5. Uncertainty

The measurement uncertainty above 1G is defined as $\pm 3.9 \text{ dB}$

below 1G is defined as $\pm 3.8 \text{ dB}$

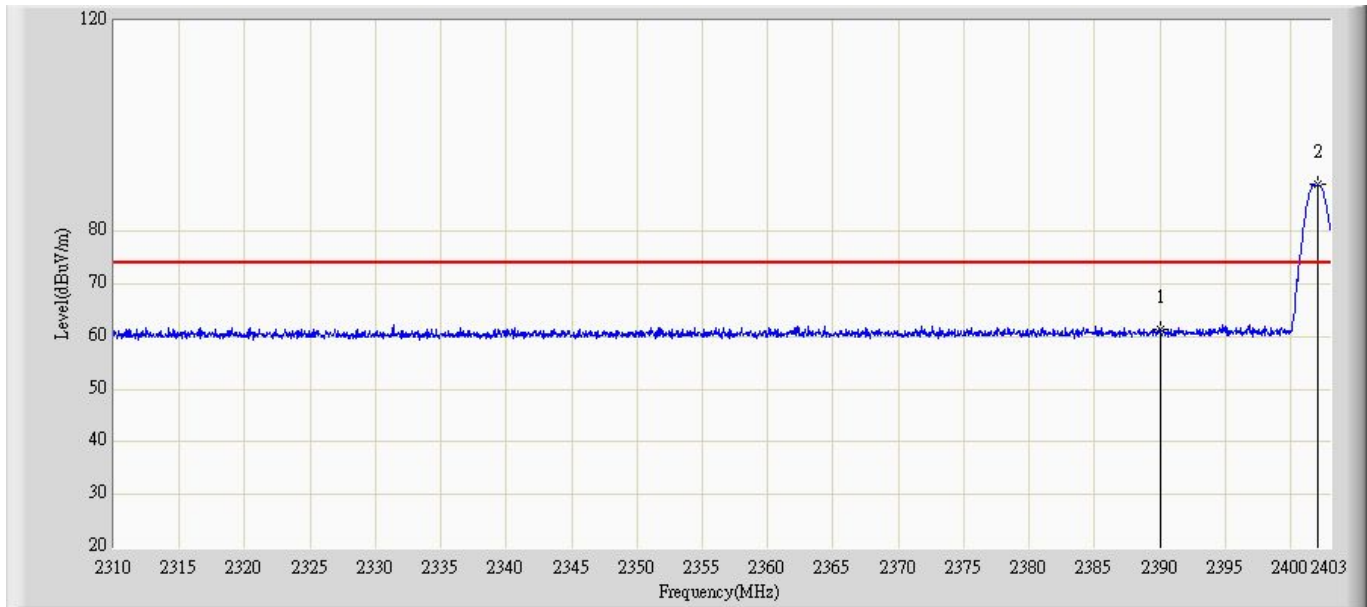
12.6. Test Result

All of the test result shown indicates the worst case, and spectrum analyzer parameters setting as shown below:

Peak detector: RBW = 1MHz, VBW = 3MHz, sweep time = 200ms;

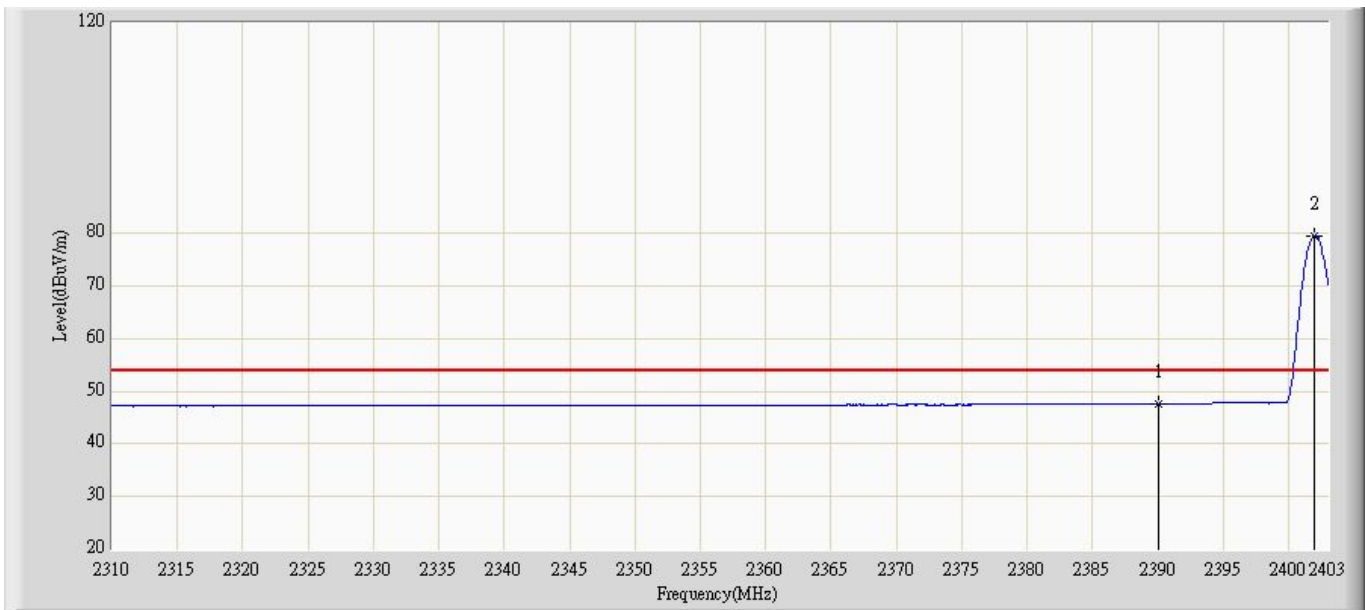
Average detector: RBW = 1MHz, VBW = 10Hz, sweep time = auto.

Profile: 115S035R	Page No.: 43
Engineer: Jack	
Site: AC5	Time: 2011/05/25 - 15:55
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA9120D_499(1-18GHz)	Polarity: Horizontal
EUT: IP-STB	Power: AC 120V/60Hz
Note: Mode 1: Transmit at channel 2402MHz by DH5	



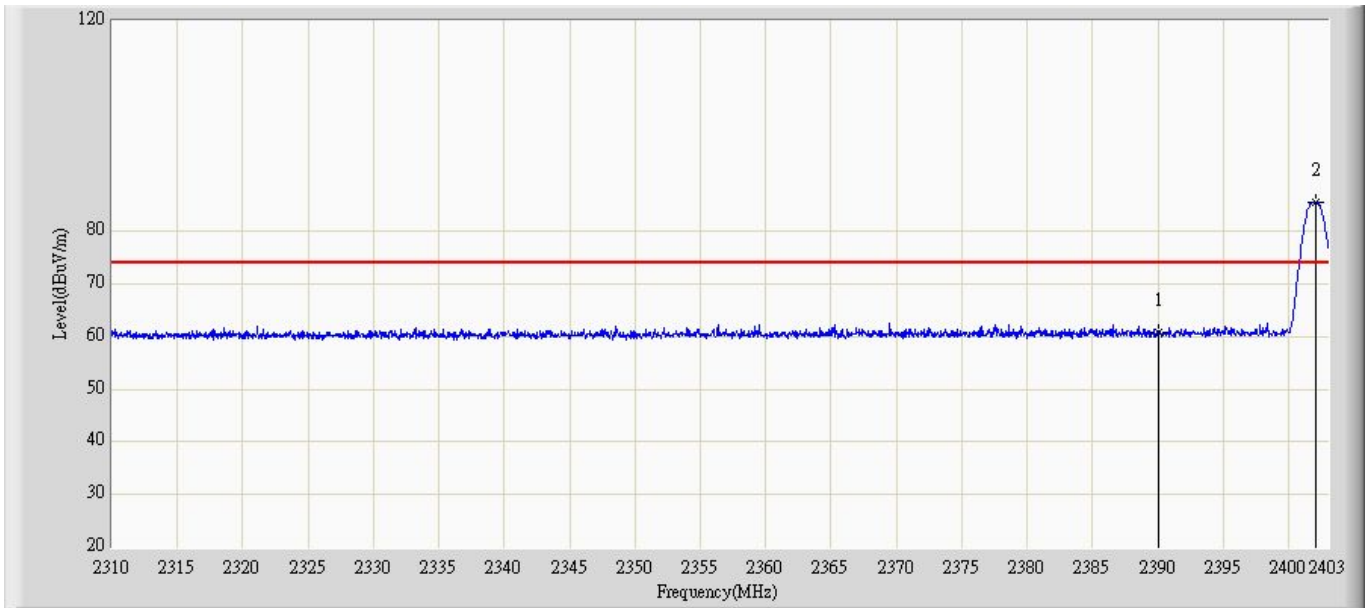
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1			2390.000	61.303	30.903	-12.697	74.000	30.400 PK	
2		*	2402.070	88.832	58.446	N/A	N/A 30.386		PK

Profile: 115S035R	Page No.: 44
Engineer: Jack	
Site: AC5	Time: 2011/05/25 - 16:00
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA9120D_499(1-18GHz)	Polarity: Horizontal
EUT: IP-STB	Power: AC 120V/60Hz
Note: Mode 1: Transmit at channel 2402MHz by DH5	



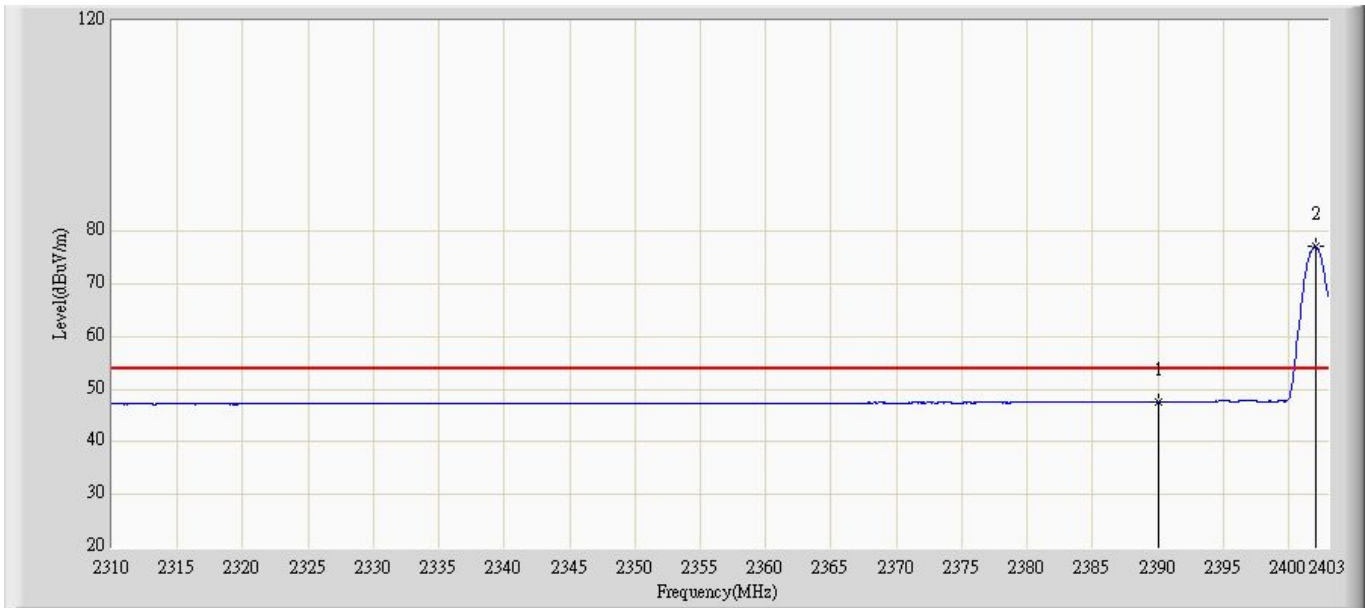
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1			2390.000	47.550	17.150	-6.450	54.000	30.400 A	V
2		*	2401.930	79.551	49.165	N/A	N/A 30.386		AV

Profile: 115S035R	Page No.: 45
Engineer: Jack	
Site: AC5	Time: 2011/05/25 - 16:00
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA9120D_499(1-18GHz)	Polarity: Vertical
EUT: IP-STB	Power: AC 120V/60Hz
Note: Mode 1: Transmit at channel 2402MHz by DH5	



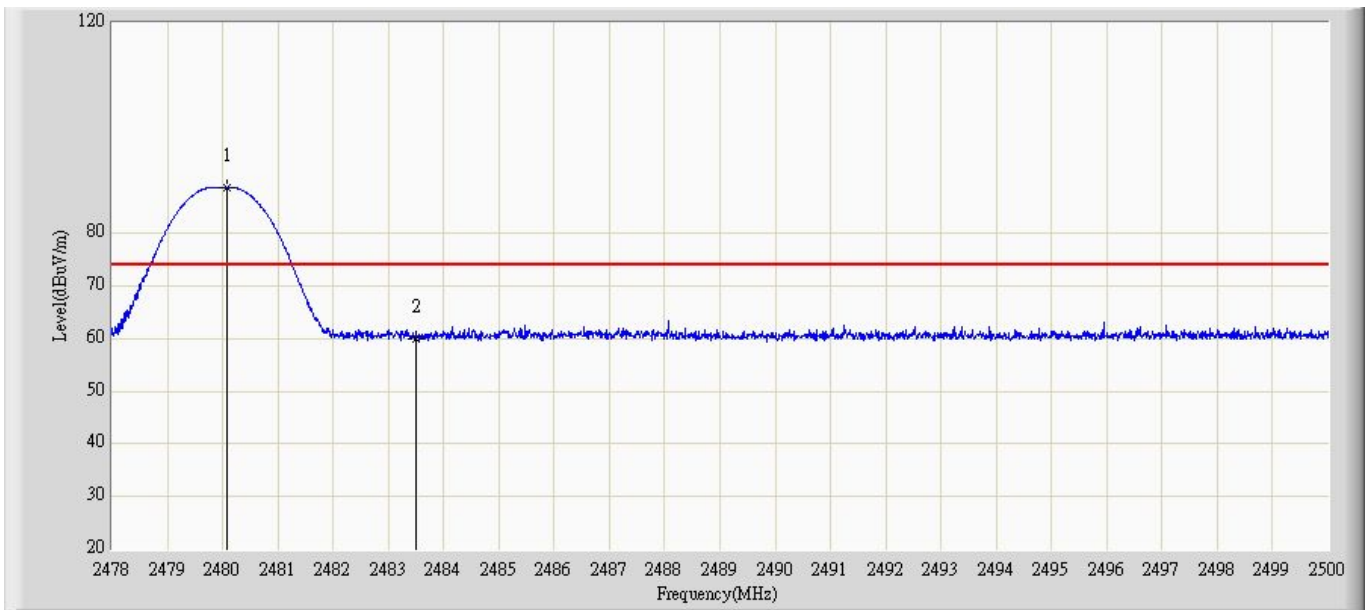
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1			2390.000	60.726	30.326	-13.274	74.000	30.400 PK	
2		*	2402.070	85.560	55.174	N/A	N/A 30.386		PK

Profile: 115S035R		Page No.: 46	
Engineer: Jack			
Site: AC5		Time: 2011/05/25 - 16:03	
Limit: FCC_Part15.209_RE(3m)		Margin: 0	
Probe: BBHA9120D_499(1-18GHz)		Polarity: Vertical	
EUT: IP-STB		Power: AC 120V/60Hz	
Note: Mode 1: Transmit at channel 2402MHz by DH5			



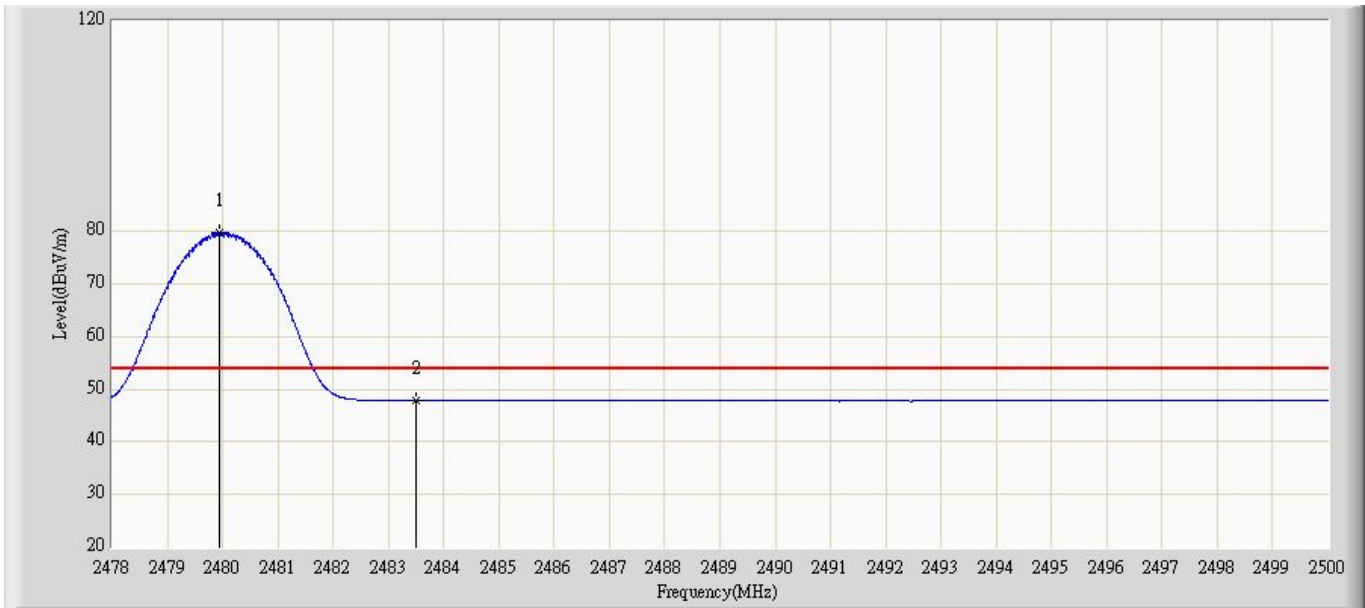
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1			2390.000	47.550	17.150	-6.450	54.000	30.400 A	V
2		*	2402.070	77.055	46.669	N/A	N/A 30.386		AV

Profile: 115S035R	Page No.: 47
Engineer: Jack	
Site: AC5	Time: 2011/05/25 - 16:04
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA9120D_499(1-18GHz)	Polarity: Horizontal
EUT: IP-STB	Power: AC 120V/60Hz
Note: Mode 1: Transmit at channel 2480MHz by DH5	



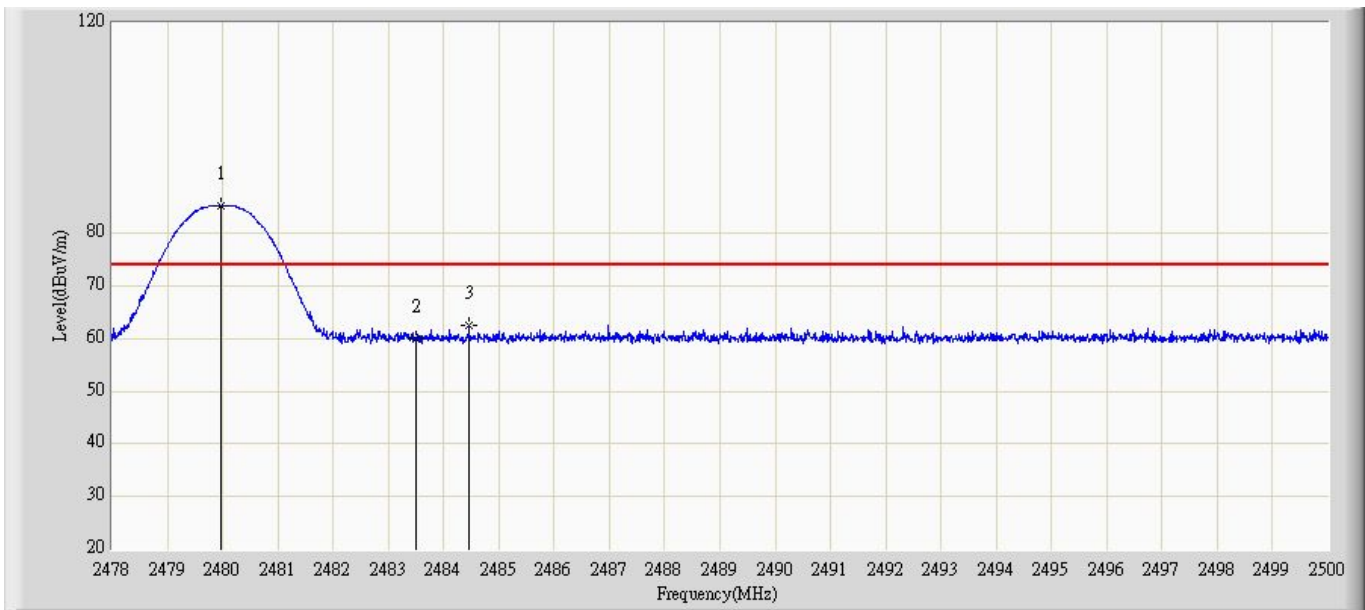
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1		*	2480.090	88.811	58.383	N/A	N/A 30.428		PK
2			2483.500	60.008	29.586	-13.992	74.000	30.422 PK	

Profile: 115S035R	Page No.: 48
Engineer: Jack	
Site: AC5	Time: 2011/05/25 - 16:07
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA9120D_499(1-18GHz)	Polarity: Horizontal
EUT: IP-STB	Power: AC 120V/60Hz
Note: Mode 1: Transmit at channel 2480MHz by DH5	



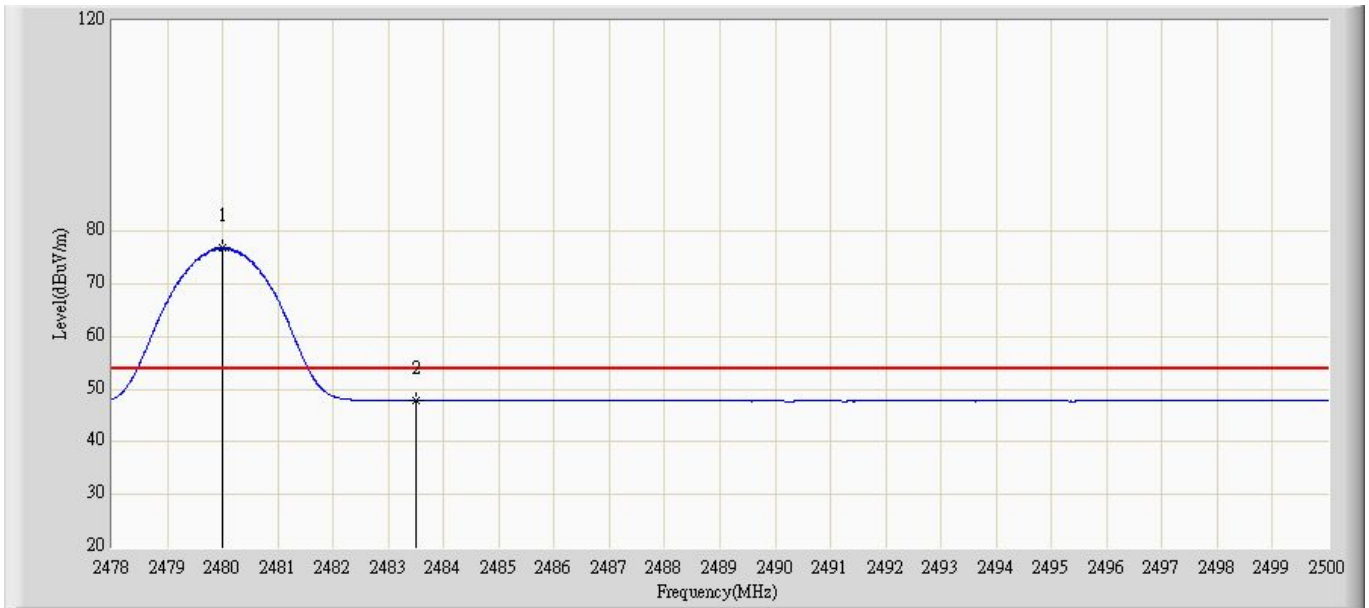
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1		*	2479.936	79.723	49.295	N/A	N/A 30.428		AV
2			2483.500	47.865	17.443	-6.135	54.000	30.422 A	V

Profile: 115S035R	Page No.: 49
Engineer: Jack	
Site: AC5	Time: 2011/05/25 - 16:08
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA9120D_499(1-18GHz)	Polarity: Vertical
EUT: IP-STB	Power: AC 120V/60Hz
Note: Mode 1: Transmit at channel 2480MHz by DH5	



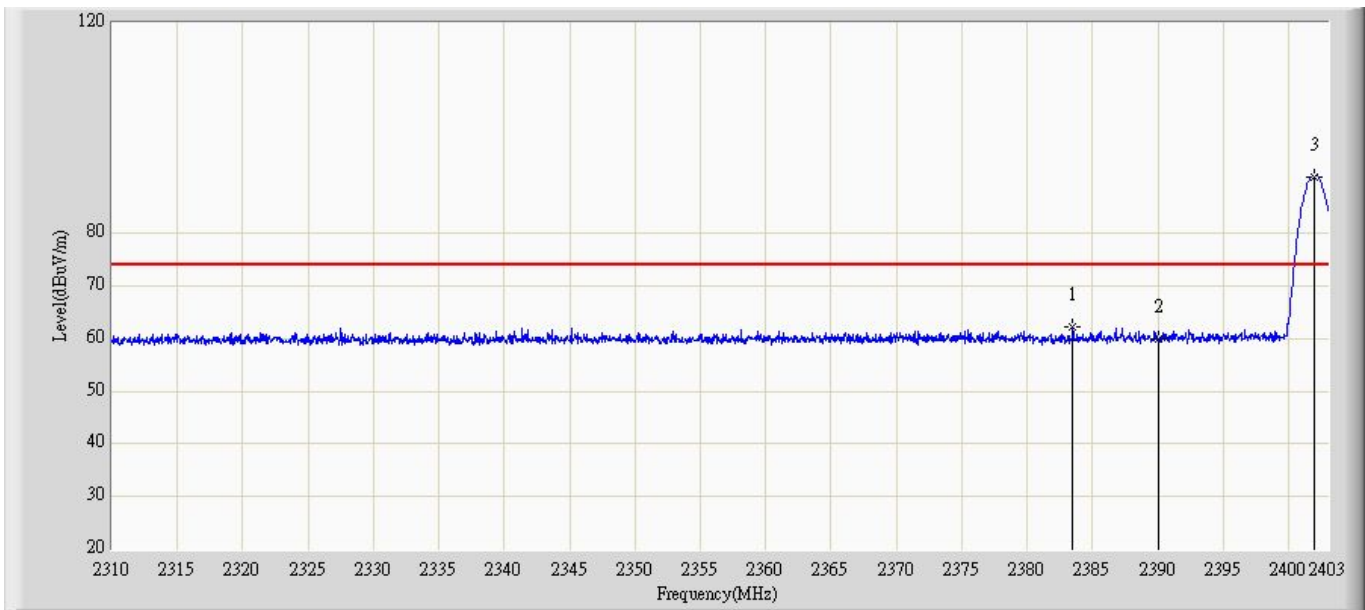
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1		*	2479.969	85.155	54.727	N/A	N/A 30.428		PK
2			2483.500	59.849	29.427	-14.151	74.000	30.422 PK	
3			2484.457	62.547	32.127	-11.453	74.000	30.421 PK	

Profile: 115S035R	Page No.: 50
Engineer: Jack	
Site: AC5	Time: 2011/05/25 - 16:09
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA9120D_499(1-18GHz)	Polarity: Vertical
EUT: IP-STB	Power: AC 120V/60Hz
Note: Mode 1: Transmit at channel 2480MHz by DH5	



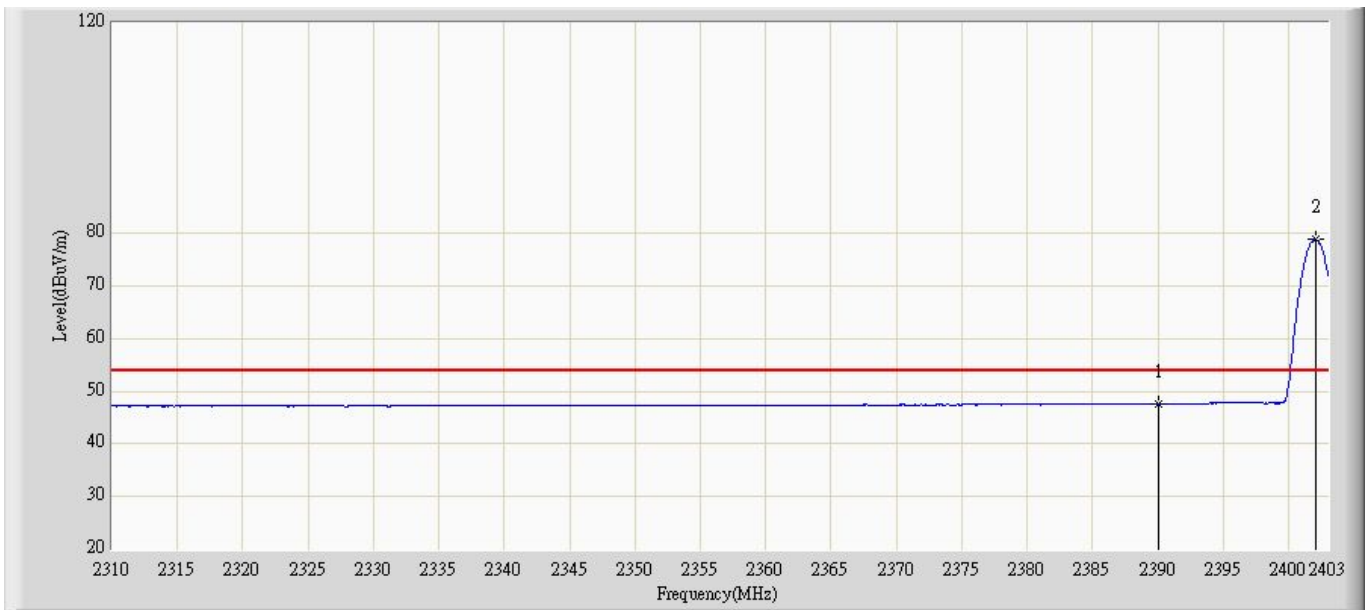
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1		*	2480.002	76.842	46.414	N/A	N/A 30.428		AV
2			2483.500	47.886	17.464	-6.114	54.000	30.422 A	V

Profile: 115S035R	Page No.: 51
Engineer: Jack	
Site: AC5	Time: 2011/05/25 - 16:09
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA9120D_499(1-18GHz)	Polarity: Horizontal
EUT: IP-STB	Power: AC 120V/60Hz
Note: Mode 2: Transmit at channel 2402MHz by 2DH5	



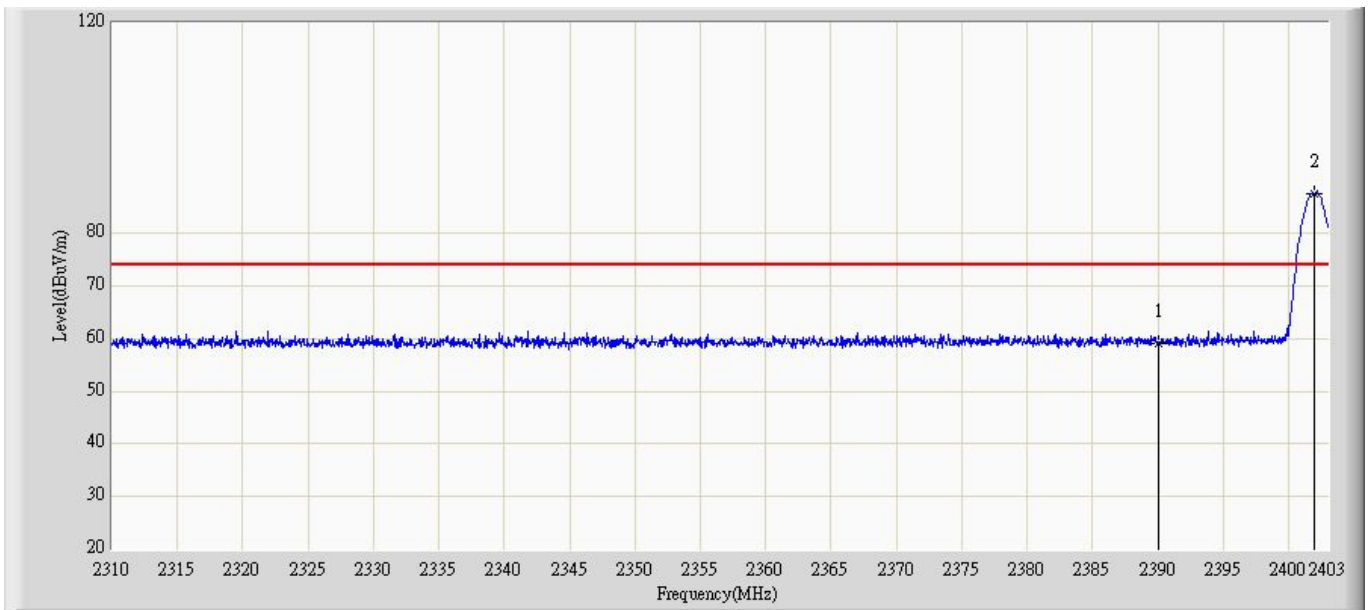
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1			2383.470	62.121	31.721	-11.879	74.000	30.400 PK	
2			2390.000	59.933	29.533	-14.067	74.000	30.400 PK	
3		*	2401.930	90.808	60.422	N/A	N/A 30.386		PK

Profile: 115S035R	Page No.: 52
Engineer: Jack	
Site: AC5	Time: 2011/05/25 - 16:11
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA9120D_499(1-18GHz)	Polarity: Horizontal
EUT: IP-STB	Power: AC 120V/60Hz
Note: Mode 2: Transmit at channel 2402MHz by 2DH5	



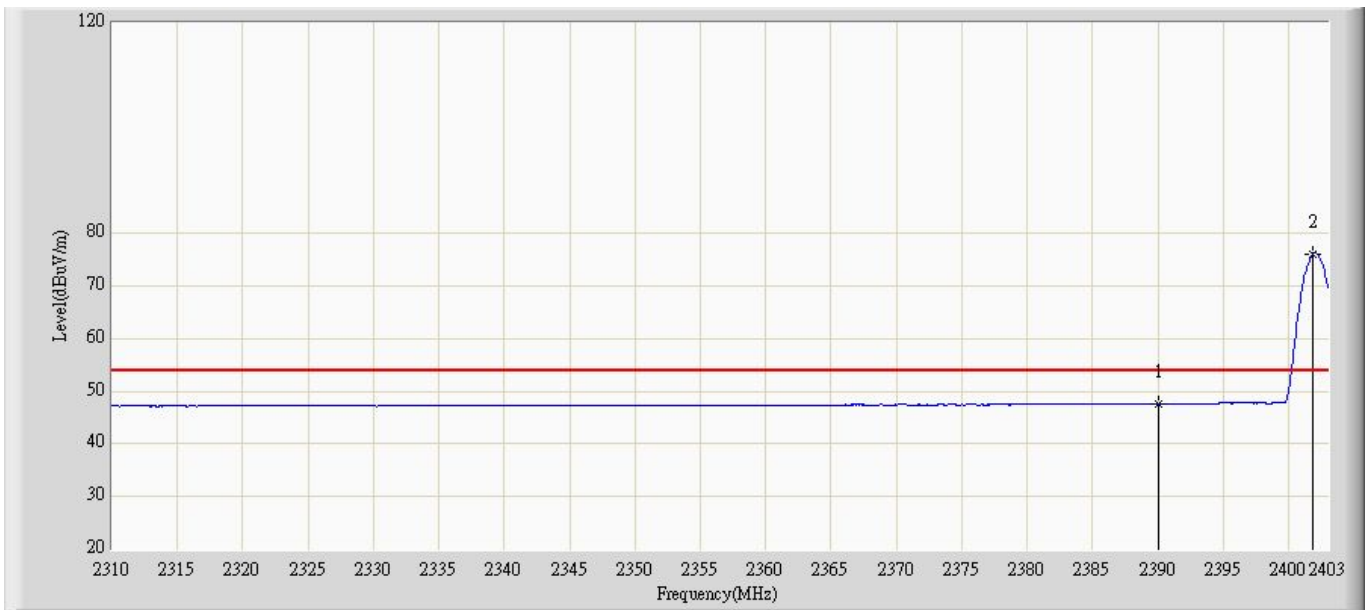
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1			2390.000	47.549	17.149	-6.451	54.000	30.400 A	V
2		*	2402.070	78.930	48.544	N/A	N/A 30.386		AV

Profile: 115S035R	Page No.: 53
Engineer: Jack	
Site: AC5	Time: 2011/05/25 - 16:12
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA9120D_499(1-18GHz)	Polarity: Vertical
EUT: IP-STB	Power: AC 120V/60Hz
Note: Mode 2: Transmit at channel 2402MHz by 2DH5	



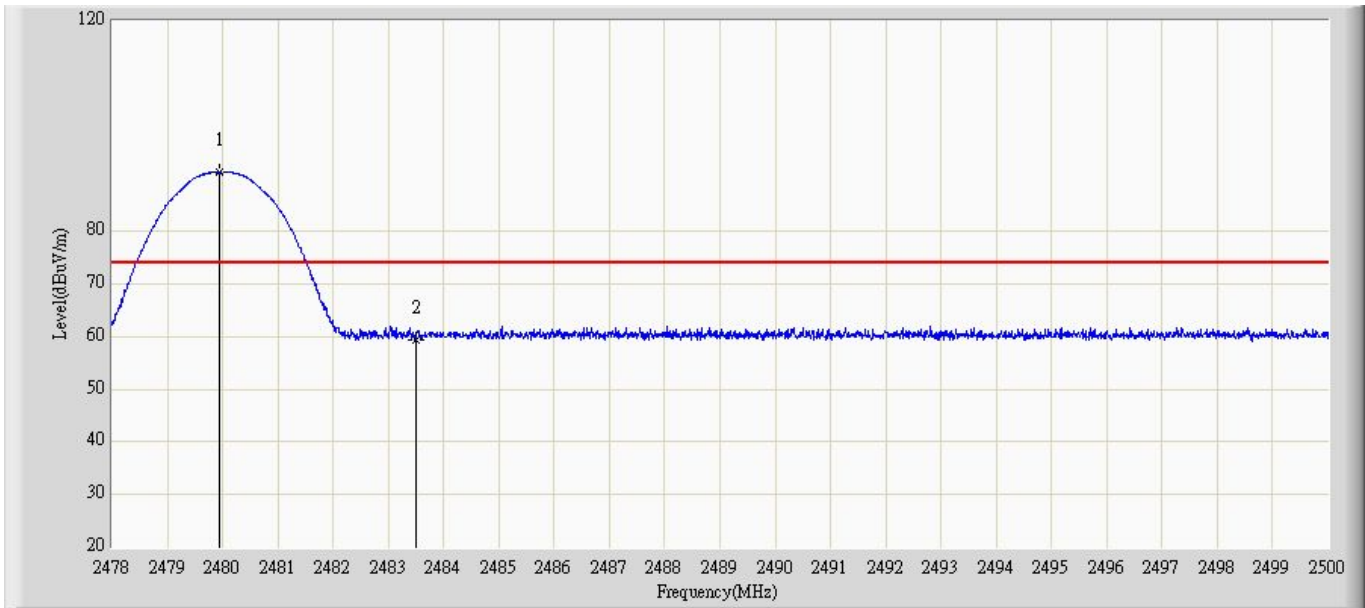
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1			2390.000	59.208	28.808	-14.792	74.000	30.400 PK	
2		*	2401.977	87.615	57.229	N/A	N/A 30.386		PK

Profile: 115S035R	Page No.: 54
Engineer: Jack	
Site: AC5	Time: 2011/05/25 - 16:13
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA9120D_499(1-18GHz)	Polarity: Vertical
EUT: IP-STB	Power: AC 120V/60Hz
Note: Mode 2: Transmit at channel 2402MHz by 2DH5	



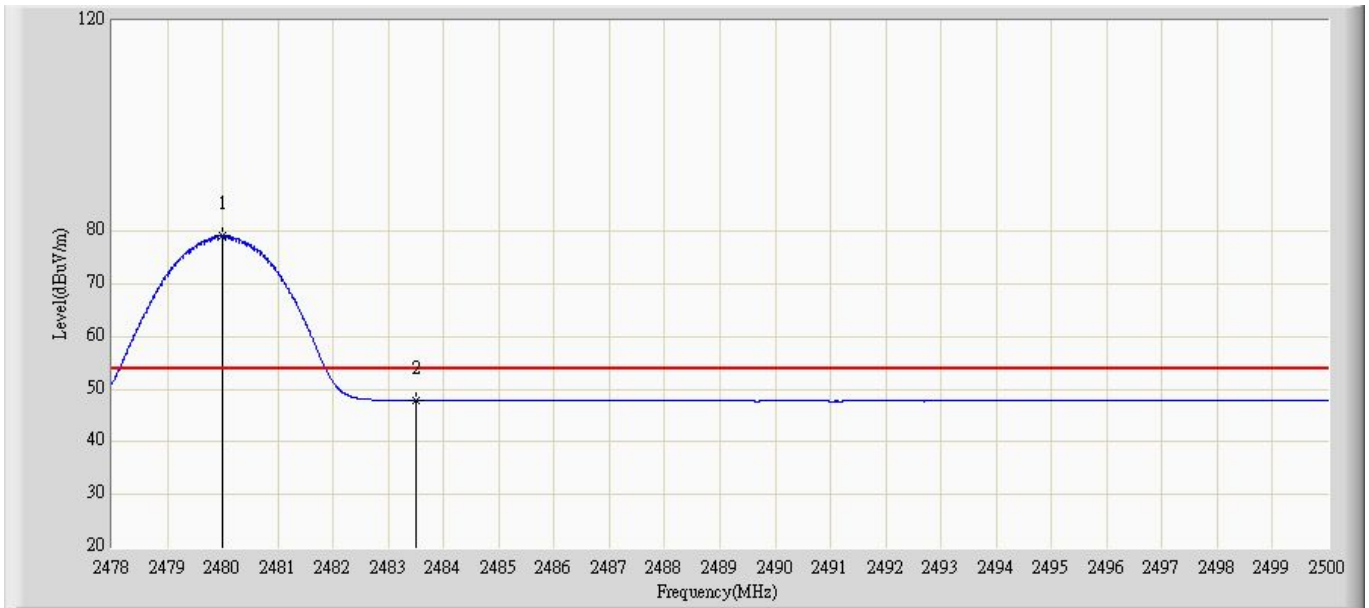
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1			2390.000	47.557	17.157	-6.443	54.000	30.400 A	V
2		*	2401.837	76.128	45.742	N/A	N/A 30.386		AV

Profile: 115S035R	Page No.: 55
Engineer: Jack	
Site: AC5	Time: 2011/05/25 - 16:14
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA9120D_499(1-18GHz)	Polarity: Horizontal
EUT: IP-STB	Power: AC 120V/60Hz
Note: Mode 2: Transmit at channel 2480MHz by 2DH5	



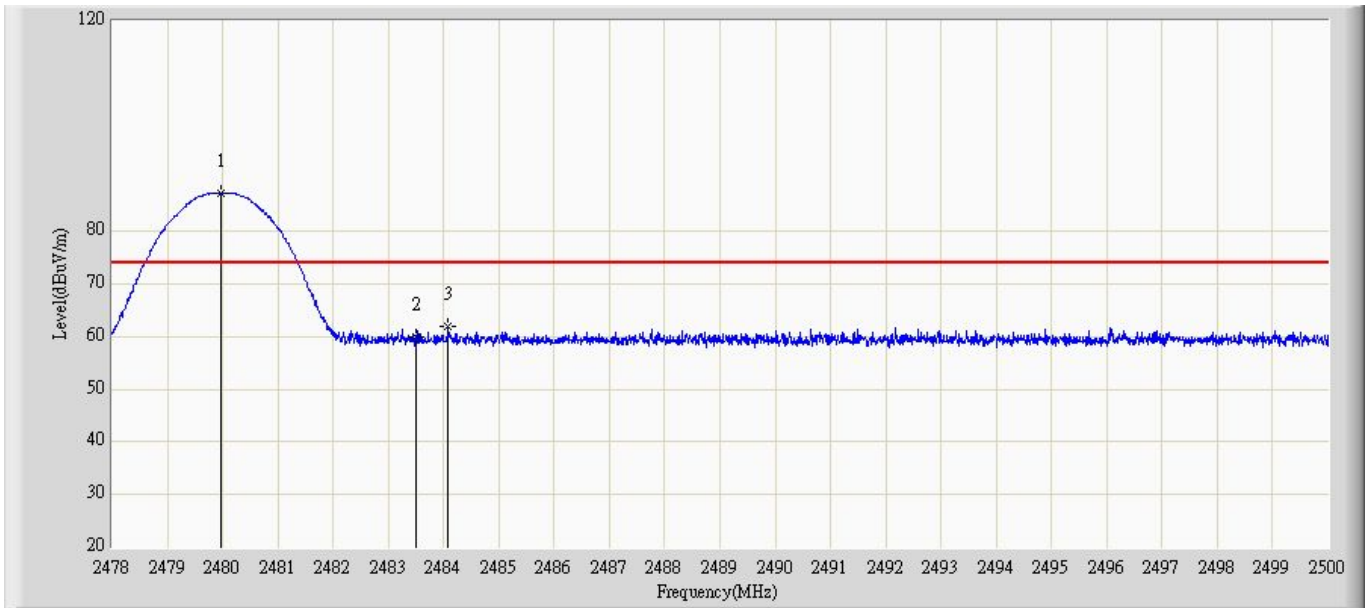
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1		*	2479.936	91.137	60.709	N/A	N/A 30.428		PK
2			2483.500	59.346	28.924	-14.654	74.000	30.422 PK	

Profile: 115S035R	Page No.: 56
Engineer: Jack	
Site: AC5	Time: 2011/05/25 - 16:15
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA9120D_499(1-18GHz)	Polarity: Horizontal
EUT: IP-STB	Power: AC 120V/60Hz
Note: Mode 2: Transmit at channel 2480MHz by 2DH5	



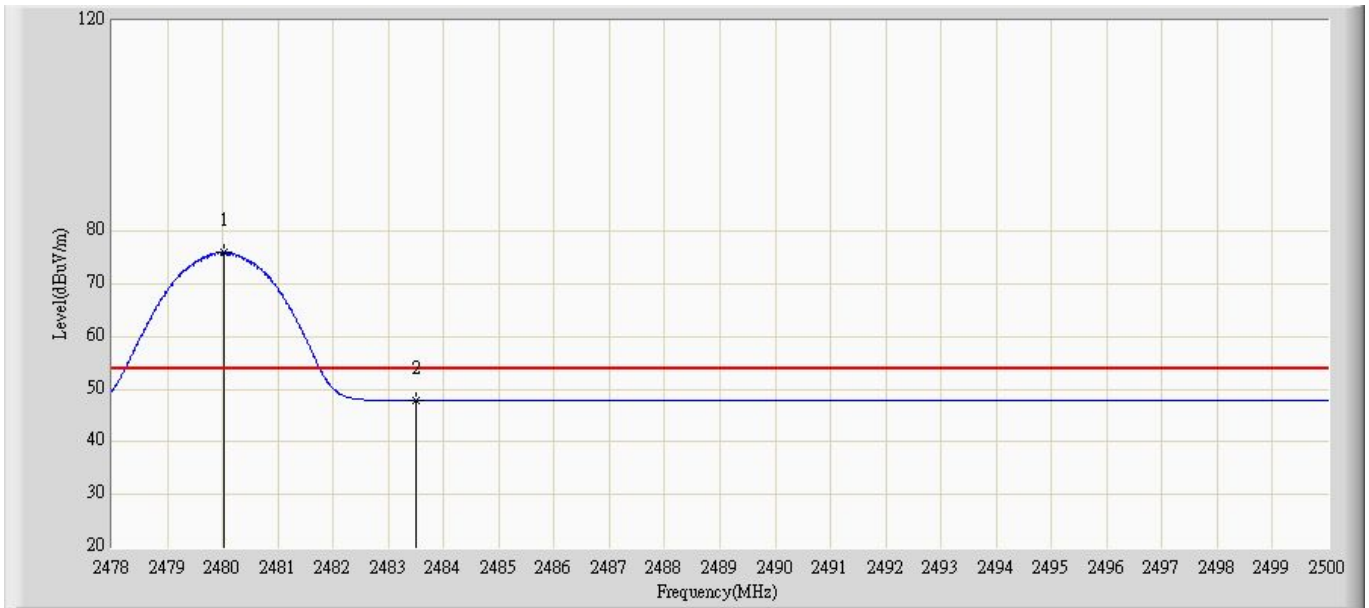
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1		*	2480.002	79.178	48.750	N/A	N/A 30.428		AV
2			2483.500	47.857	17.435	-6.143	54.000	30.422 A	V

Profile: 115S035R	Page No.: 57
Engineer: Jack	
Site: AC5	Time: 2011/05/25 - 16:17
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA9120D_499(1-18GHz)	Polarity: Vertical
EUT: IP-STB	Power: AC 120V/60Hz
Note: Mode 2: Transmit at channel 2480MHz by 2DH5	



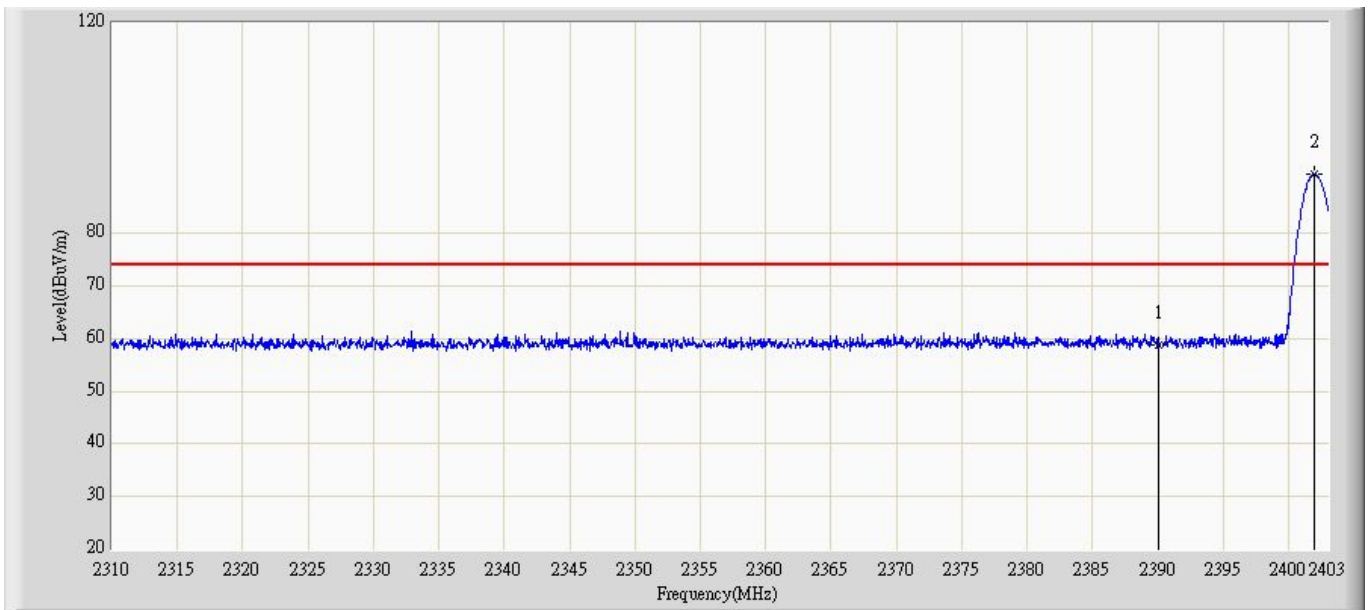
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1		*	2479.969	87.250	56.822	N/A	N/A 30.428		PK
2			2483.500	59.897	29.475	-14.103	74.000	30.422 PK	
3			2484.083	61.921	31.500	-12.079	74.000	30.421 PK	

Profile: 115S035R	Page No.: 58
Engineer: Jack	
Site: AC5	Time: 2011/05/25 - 16:18
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA9120D_499(1-18GHz)	Polarity: Vertical
EUT: IP-STB	Power: AC 120V/60Hz
Note: Mode 2: Transmit at channel 2480MHz by 2DH5	



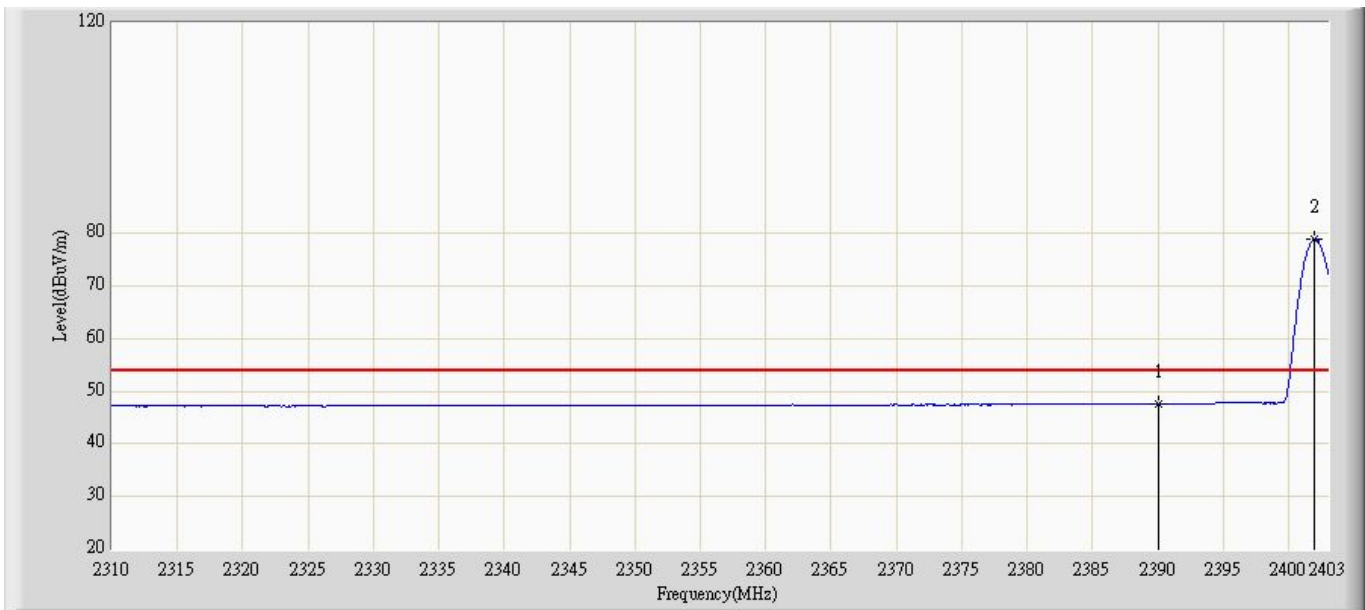
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1		*	2480.013	75.996	45.568	N/A	N/A 30.428		AV
2			2483.500	47.844	17.422	-6.156	54.000	30.422 A	V

Profile: 115S035R	Page No.: 59
Engineer: Jack	
Site: AC5	Time: 2011/05/25 - 16:19
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA9120D_499(1-18GHz)	Polarity: Horizontal
EUT: IP-STB	Power: AC 120V/60Hz
Note: Mode 3: Transmit at channel 2402MHz by 3DH5	



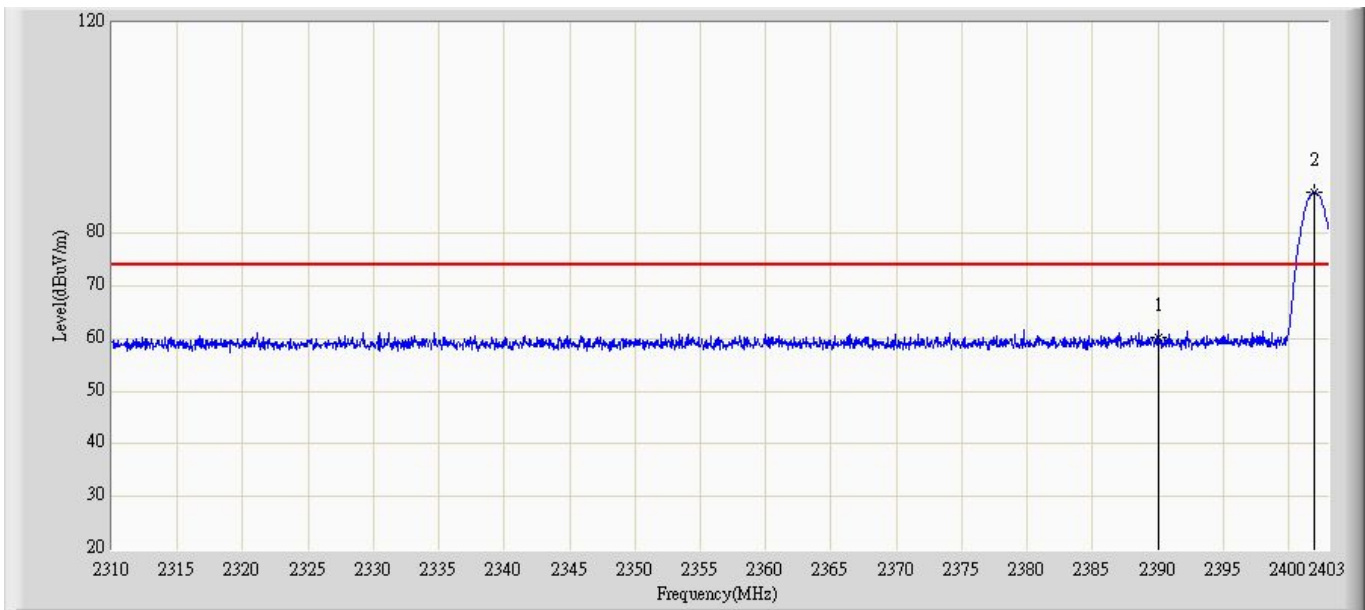
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1			2390.000	58.774	28.374	-15.226	74.000	30.400 PK	
2		*	2401.930	91.171	60.785	N/A	N/A 30.386		PK

Profile: 115S035R	Page No.: 60
Engineer: Jack	
Site: AC5	Time: 2011/05/25 - 16:21
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA9120D_499(1-18GHz)	Polarity: Horizontal
EUT: IP-STB	Power: AC 120V/60Hz
Note: Mode 3: Transmit at channel 2402MHz by 3DH5	



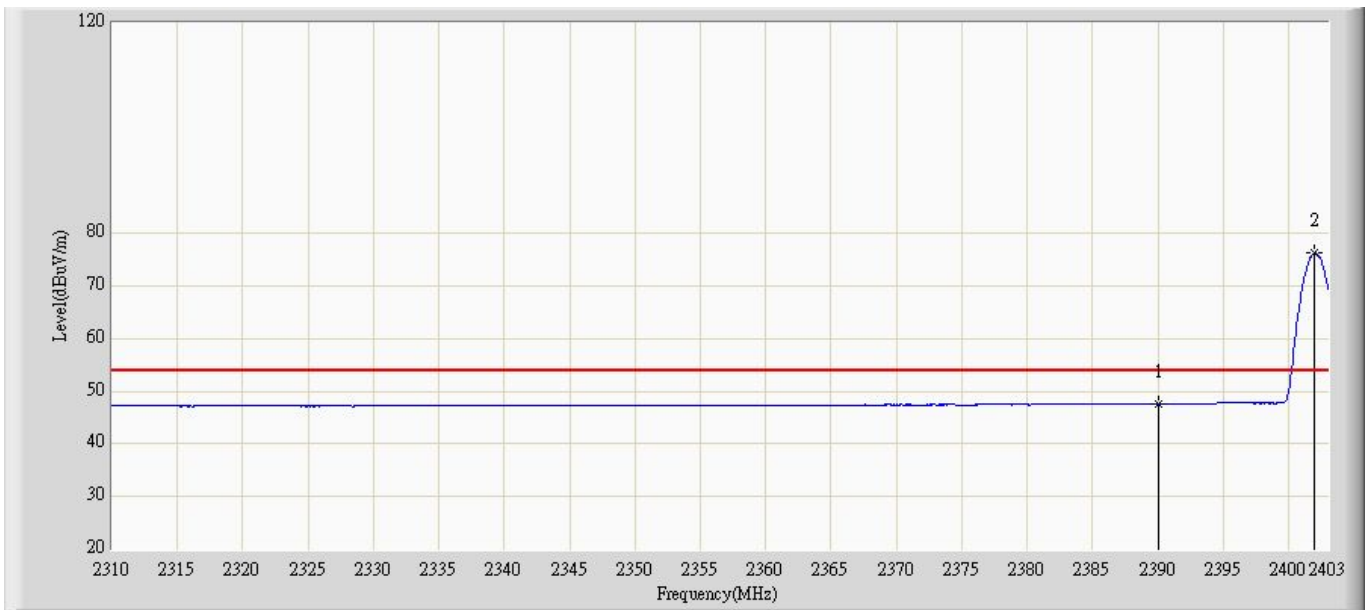
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1			2390.000	47.549	17.149	-6.451	54.000	30.400 A	V
2		*	2401.930	78.887	48.501	N/A	N/A 30.386		AV

Profile: 115S035R	Page No.: 61
Engineer: Jack	
Site: AC5	Time: 2011/05/25 - 16:21
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA9120D_499(1-18GHz)	Polarity: Vertical
EUT: IP-STB	Power: AC 120V/60Hz
Note: Mode 3: Transmit at channel 2402MHz by 3DH5	



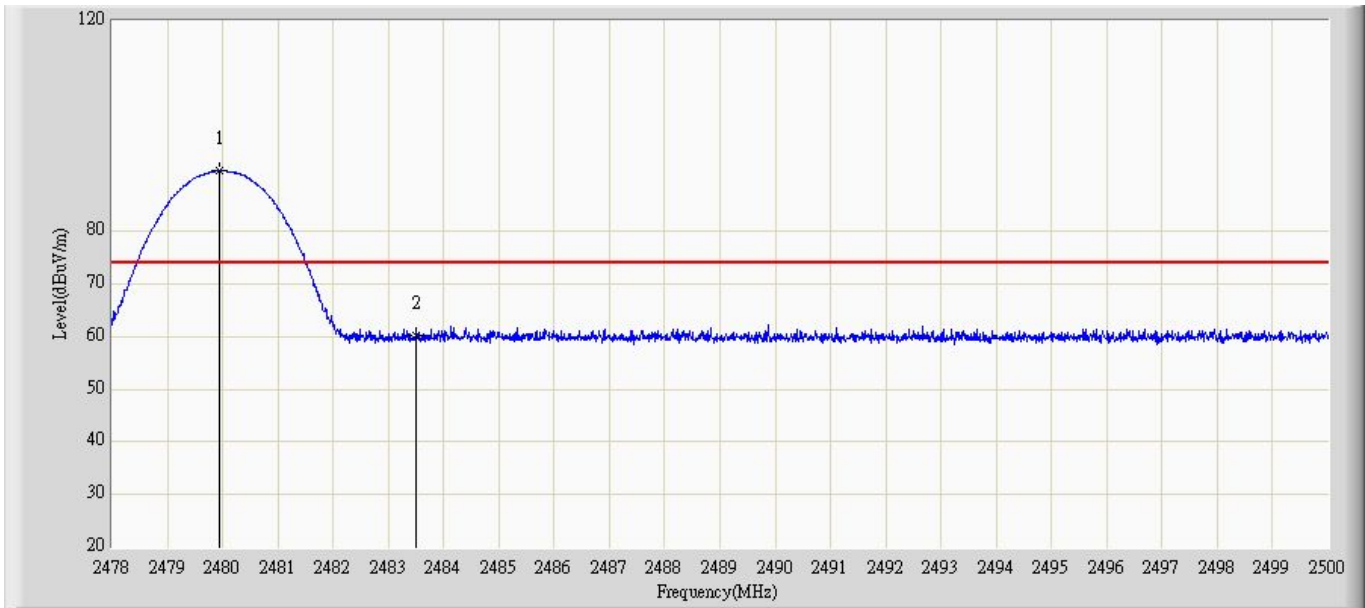
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1			2390.000	60.261	29.861	-13.739	74.000	30.400 PK	
2		*	2401.930	87.900	57.514	N/A	N/A 30.386		PK

Profile: 115S035R	Page No.: 62
Engineer: Jack	
Site: AC5	Time: 2011/05/25 - 16:22
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA9120D_499(1-18GHz)	Polarity: Vertical
EUT: IP-STB	Power: AC 120V/60Hz
Note: Mode 3: Transmit at channel 2402MHz by 3DH5	



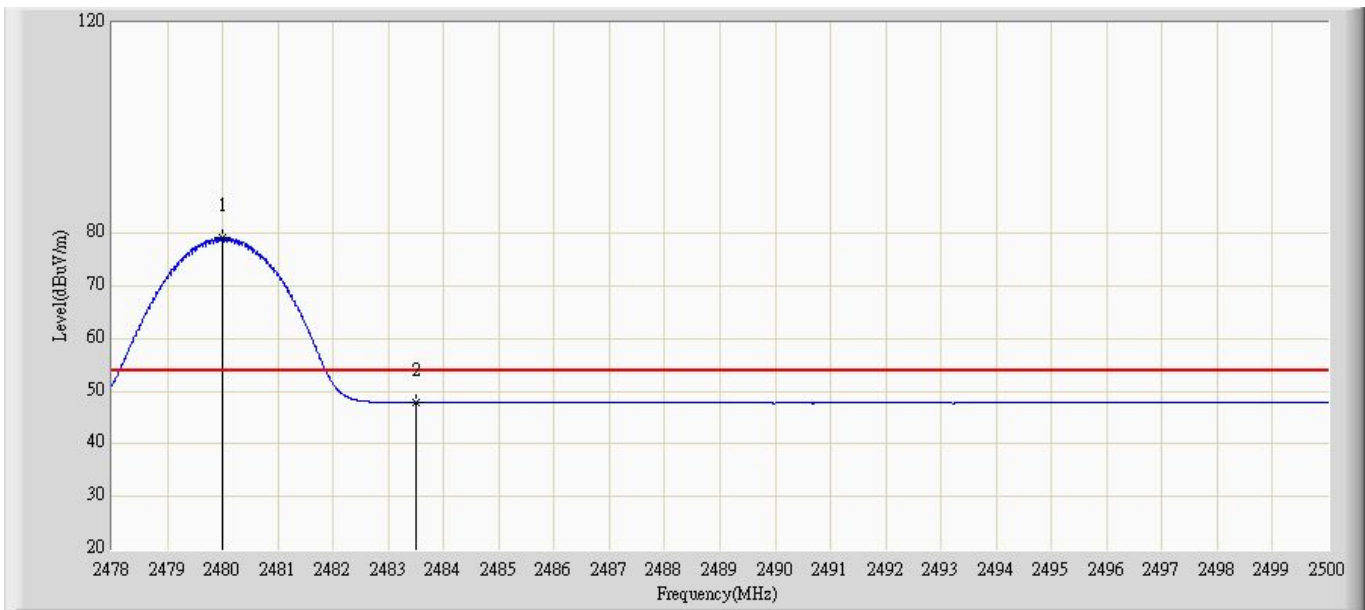
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1			2390.000	47.550	17.150	-6.450	54.000	30.400 A	V
2		*	2401.930	76.216	45.830	N/A	N/A 30.386		AV

Profile: 115S035R	Page No.: 63
Engineer: Jack	
Site: AC5	Time: 2011/05/25 - 16:23
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA9120D_499(1-18GHz)	Polarity: Horizontal
EUT: IP-STB	Power: AC 120V/60Hz
Note: Mode 3: Transmit at channel 2480MHz by 3DH5	



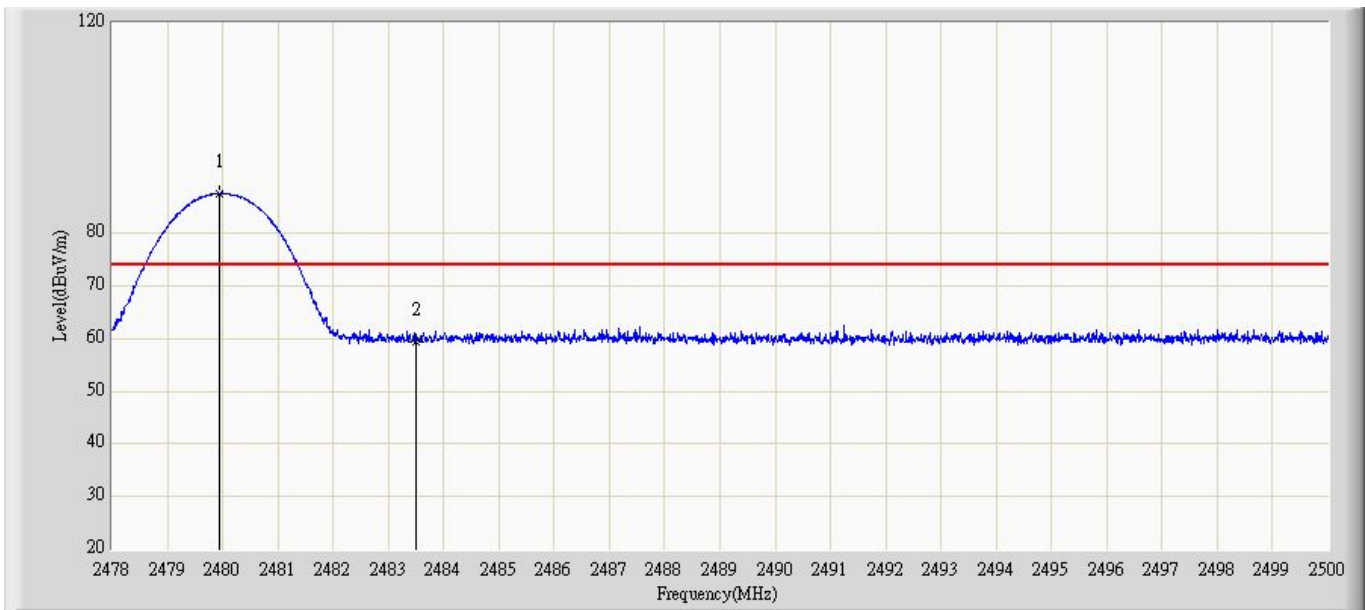
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1		*	2479.936	91.609	61.181	N/A	N/A 30.428		PK
2			2483.500	60.369	29.947	-13.631	74.000	30.422 PK	

Profile: 115S035R	Page No.: 64
Engineer: Jack	
Site: AC5	Time: 2011/05/25 - 16:25
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA9120D_499(1-18GHz)	Polarity: Horizontal
EUT: IP-STB	Power: AC 120V/60Hz
Note: Mode 3: Transmit at channel 2480MHz by 3DH5	



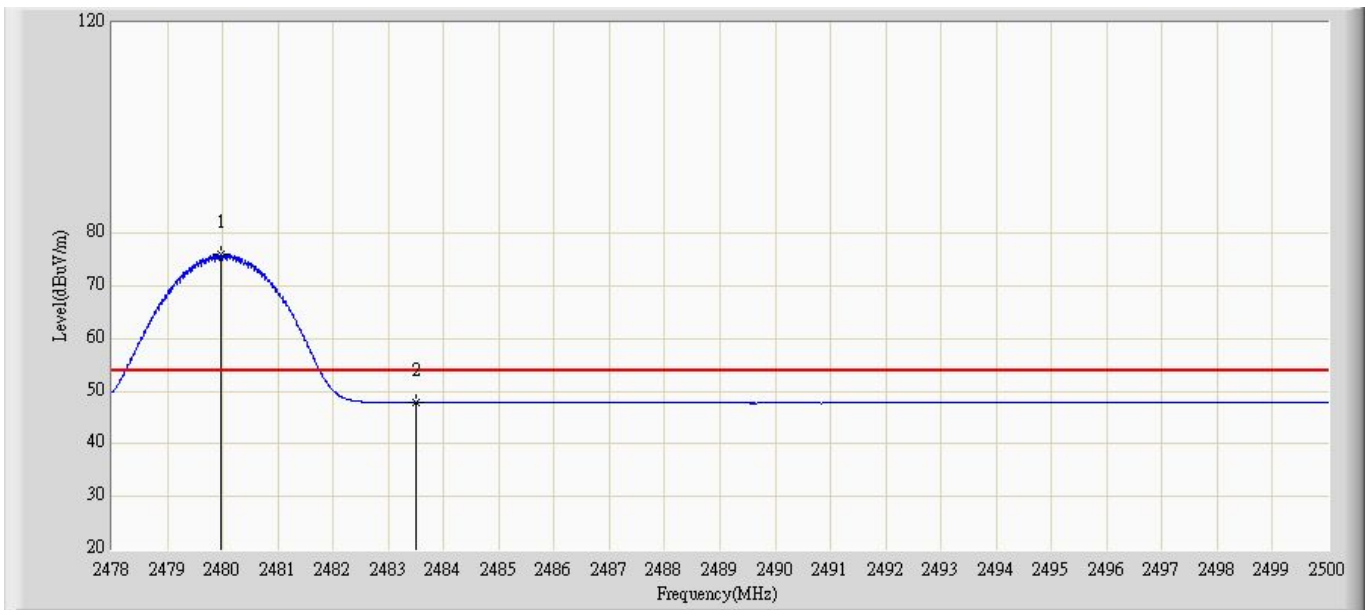
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1		*	2479.991	79.086	48.658	N/A	N/A 30.428		AV
2			2483.500	47.847	17.425	-6.153	54.000	30.422 A	V

Profile: 115S035R	Page No.: 65
Engineer: Jack	
Site: AC5	Time: 2011/05/25 - 16:25
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA9120D_499(1-18GHz)	Polarity: Vertical
EUT: IP-STB	Power: AC 120V/60Hz
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		*	2479.936	87.656	57.228	N/A	N/A 30.428		PK
2			2483.500	59.463	29.041	-14.537	74.000	30.422 PK	

Profile: 115S035R	Page No.: 66
Engineer: Jack	
Site: AC5	Time: 2011/05/25 - 16:26
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA9120D_499(1-18GHz)	Polarity: Vertical
EUT: IP-STB	Power: AC 120V/60Hz
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		*	2479.969	75.897	45.469	N/A	N/A 30.428		AV
2			2483.500	47.868	17.446	-6.132	54.000	30.422 A	V

13. Receiver Spurious Emission for Industry Canada RSS-Gen Requirement

14. Test Equipment

Radiated Emission / AC-2

Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
EMI Test Receiver	R&S	ESCI	100573	2012/04/23
Bilog Antenna	Teseq GmbH	CBL6112D	27611	2011/10/18
Coaxial Cable	Huber+Suhner	SUCOFLEX 106	AC2-C	2012/05/05
Temperature/Humidity Meter	Zhicheng	ZC1-2	AC2-TH	2012/01/14

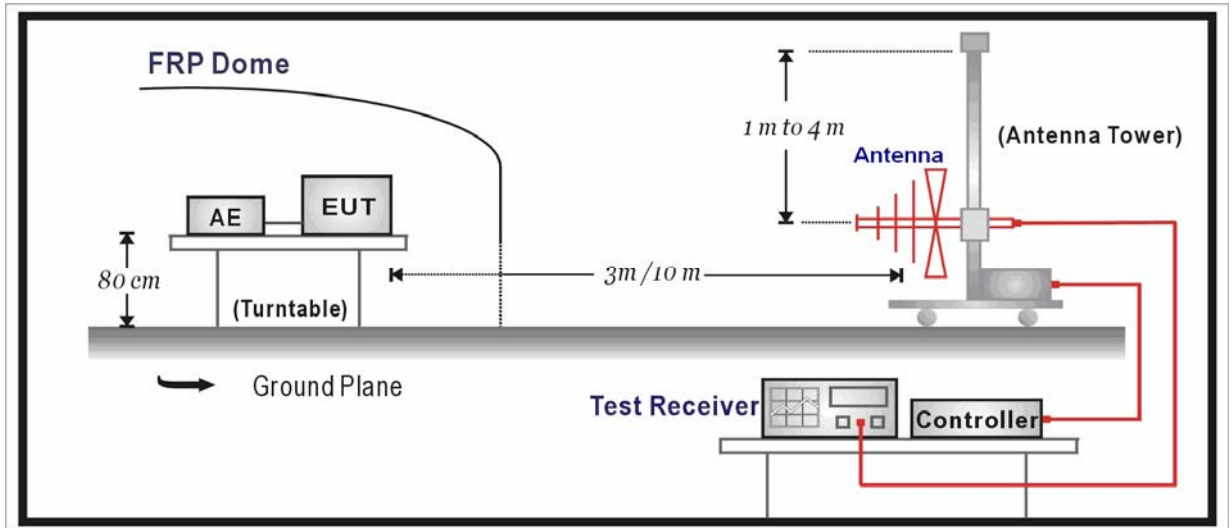
Radiated Emission / AC-5

Instrument	Manufacturer	Type No.	Serial No.	Cal. Date
Spectrum Analyzer	Agilent	N9010A	MY48030494	2012.04.23
EMI Test Receiver	R&S	ESCI	100906	2012.01.15
Preamplifier	Quietek	AP-180C	CHM-0602013	2012.03.07
Preamplifier	Quietek	AP-040G	CHM-0906001	2012.05.05
Bilog Antenna	Teseq GmbH	CBL6112D	27612	2011.10.18
Broad-Band Antenna	Horn Schwarzbeck	BBHA9120D	499	2012.06.11
High-Pass Filter	Wainwright	WHKX2.8/18G-12SS	SN1	2012.03.03
High-Pass Filter	Wainwright	WHKX7.0/18G-8SS	SN16	2012.03.03
Lowpass Filter	Wainwright	WLKS4500-9SS	SN2	2012.03.03
Temperature/Humidity Meter	Zhicheng	ZC1-2	AC5-TH	2012.01.14

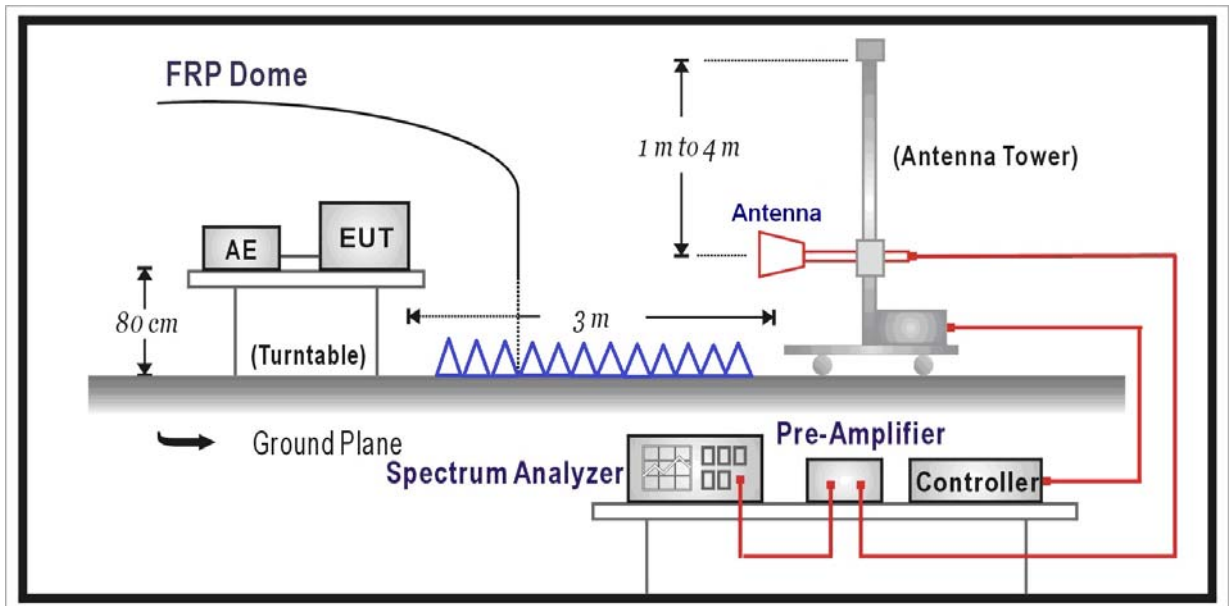
Note 1: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

15. Test Setup

Below 1GHz Test Setup:



Above 1GHz Test Setup:



16. Limit

FCC Part 15 Subpart B Paragraph 15.109 & RSS-GEN		
Frequency (MHz)	Distance (m)	Level (dBuV/m)
30 - 88	3	40
88 - 216	3	43.5
216 - 960	3	46
Above 960	3	54

Note 1: The lower limit shall apply at the transition frequency.

Note 2: Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

Note 3: E field strength (dBuV/m) = 20 log E field strength (uV/m)

17. Test Procedure

The EUT was setup according to ANSI C63.4, 2009.

The EUT is placed on a turn table which is 0.8 meter above ground. The turn table is rotated 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

The antenna is scanned from 1 meter to 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.4:2009 on radiated measurement.

The resolution bandwidth below 1GHz setting on the field strength meter is 120 kHz and above 1GHz is 1MHz.

The frequency range from 30MHz to 10th harmonic is checked.

Note: When doing emission measurement above 1GHz, the horn antenna will be bended down a little (as horn antenna has the narrow beamwidth) in order to keeping the antenna in the "cone of radiation" of EUT. The 3dB beamwidth is 60~10 degrees for H-plane and 90~10 degrees for E-plane.

18. Uncertainty

The measurement uncertainty above 1G is defined as ± 3.9 dB
 below 1G is defined as ± 3.8 dB

19. Test Result

All of the test result shown indicates the worst case, and spectrum analyzer parameters setting as shown below:

Peak detector: RBW = 1MHz, VBW = 3MHz, sweep time = 200ms;

Average detector: RBW = 1MHz, VBW = 10Hz, sweep time = auto.

Measure Level = Reading Level + Cable Loss + Antenna Factor - Preamplifier Gain

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	311.5	9.4	15.2	24.6	46.0	-21.4	QP
	V	144.7	13.5	11.5	25.0	43.5	-18.5	QP
	H	1085.0	37.9	-10.8	27.1	54(Note1)	-26.9	PK
	V	1127.5	38.9	-10.7	28.2	54(Note1)	-25.8	PK
39	H	347.1	9.0	16.0	25.0	46.0	-21.0	QP
	V	173.4	15.0	9.9	24.9	43.5	-18.6	QP
	H	1280.5	37.3	-9.9	27.4	54(Note1)	-26.6	PK
	V	1204.0	38.1	-10.5	27.6	54(Note1)	-26.4	PK
78	H	500.0	7.1	19.5	26.6	46	-19.4	QP
	V	249.9	12.4	13.6	26.0	46	-20.0	QP
	H	1442.0	39.7	-9.6	30.1	54(Note1)	-23.9	PK
	V	1289.0	37.3	-9.9	27.4	54(Note1)	-26.6	PK

Note1: This limit applies for using average detector, if the test result on peak is lower than average limit, then average measurement needn't be performed.

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

CH	Antenna	Frequency (MHz)	Reading Level (dBuV/m)	Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
0	H	319.7	10.3	15.4	25.7	46.0	-20.3	QP
	V	173.3	15.6	9.9	25.5	43.5	-18.0	QP
	H	1076.5	38.2	-10.8	27.4	54(Note1)	-26.6	PK
	V	1178.5	53.6	-10.7	42.9	54(Note1)	-11.1	PK
39	H	500.1	7.3	19.4	26.7	46	-19.3	QP
	V	249.9	13.2	13.7	26.9	46	-19.1	QP
	H	1178.5	37.9	-10.6	27.3	54(Note1)	-26.7	PK
	V	1272.0	37.1	-10.0	27.1	54(Note1)	-26.9	PK
78	H	750.0	6.5	22.6	29.1	46	-16.9	QP
	V	455.1	16.8	18.4	35.2	46	-10.8	QP
	H	1289.0	38.0	-9.9	28.1	54(Note1)	-25.9	PK
	V	1365.5	37.1	-9.6	27.5	54(Note1)	-26.5	PK

Note1: This limit applies for using average detector, if the test result on peak is lower than average limit, then average measurement needn't be performed.

Mode 3: Transmitter-3Mbps(8DPSK_DH5)

CH	Antenna	Frequency (MHz)	Reading Level (dBuV/m)	Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
0	H	318.5	9.7	15.3	25.0	46.0	-21.0	QP
	V	143.2	13.2	11.6	24.8	43.5	-18.7	QP
	H	1093.5	37.5	-10.8	26.7	54(Note1)	-27.3	PK
	V	1280.5	37.5	-10.0	27.5	54(Note1)	-26.5	PK
39	H	338.7	9.5	15.7	25.2	46.0	-20.8	QP
	V	176.0	14.0	9.7	23.7	43.5	-19.8	QP
	H	1178.5	37.8	-10.7	27.1	54(Note1)	-26.9	PK
	V	1442.0	36.6	-9.5	27.1	54(Note1)	-26.9	PK
78	H	455.1	9.0	18.4	27.4	46.0	-18.6	QP
	V	249.9	12.9	13.6	26.5	46.0	-19.5	QP
	H	1280.5	37.1	-10.0	27.1	54(Note1)	-26.9	PK
	V	1544.0	51.3	-9.6	41.7	54(Note1)	-12.3	PK

Note1: 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.