



Test Report

FCC Part15 Subpart C

Product Name : SM1
Model No. : SM1
FCC ID : IHDT6PD1

Applicant : Motorola Mobility, LLC.

Address : 8000 W. Sunrise Blvd, Suite A Plantation, FL
33322, USA

Date of Receipt : 17/07/2013
Test Date : 18/07/2013~14/08/2013
Issued Date : 15/08/2013
Report No. : 137S071R-RF-US-P06V01
Report Version : V 1.0

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 : 15/08/2013

Report No. : 137S071R-RF-US-P06V01



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Manufacturer : Motorola Mobility, LLC.

Address : 8000 W. Sunrise Blvd, Suite A Plantation, FL 33322, USA

Model No. : SM1

FCC ID : IHDT6PD1

EUT Voltage : DC: 3.8V

Trade Name : Motorola

Applicable Standard : FCC CFR Title 47 Part 15 Subpart C: 2012
ANSI C63.4: 2009; ANSI C63.10: 2009

Test Result : Complied

Performed Location : Suzhou EMC Laboratory
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TEL: +86-512-6251-5088 / FAX: +86-512-6251-5098
FCC Registration Number: 800392

Documented By : Alice Li

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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
Japan	:	VCCI
China	:	CNAS

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	SM1
Brand Name	Motorola
Model No.	SM1
Working Voltage	DC 3.8V
NFC	
NFC Mode	Passive
NFC Function	13.56MHz
Antenna Type	Loop Antenna
Bluetooth	
Bluetooth Specification	Version 3.0 + EDR
Frequency Range	2402- 2480 MHz
Channel Number	79
Channel Separation	1MHz
Type of Modulation	FHSS
Data Rate	1Mbps(GFSK), 2Mbps(Pi/4 DQPSK), 3Mbps (8DPSK)
Antenna Type	Reference to Antenna List
Peak Antenna Gain	Reference to Antenna List
Component	
AC Adapter	Manufacturer: Ten Pao Industrial Co., Ltd M/N: S006ABD0500115 Input: 100-240V~50/60Hz 0.2A Output: 5Vdc, 1150mA

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	Peak Gain
Monopole Antenna	Goertek	2.4GHz: 4.5dBi

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)
Mode 4: Receiver-1Mbps(GFSK_DH5)
Mode 5: Receiver-2Mbps(Pi/4 DQPSK_DH5)
Mode 6: Receiver -3Mbps(8DPSK_DH5)

Note:

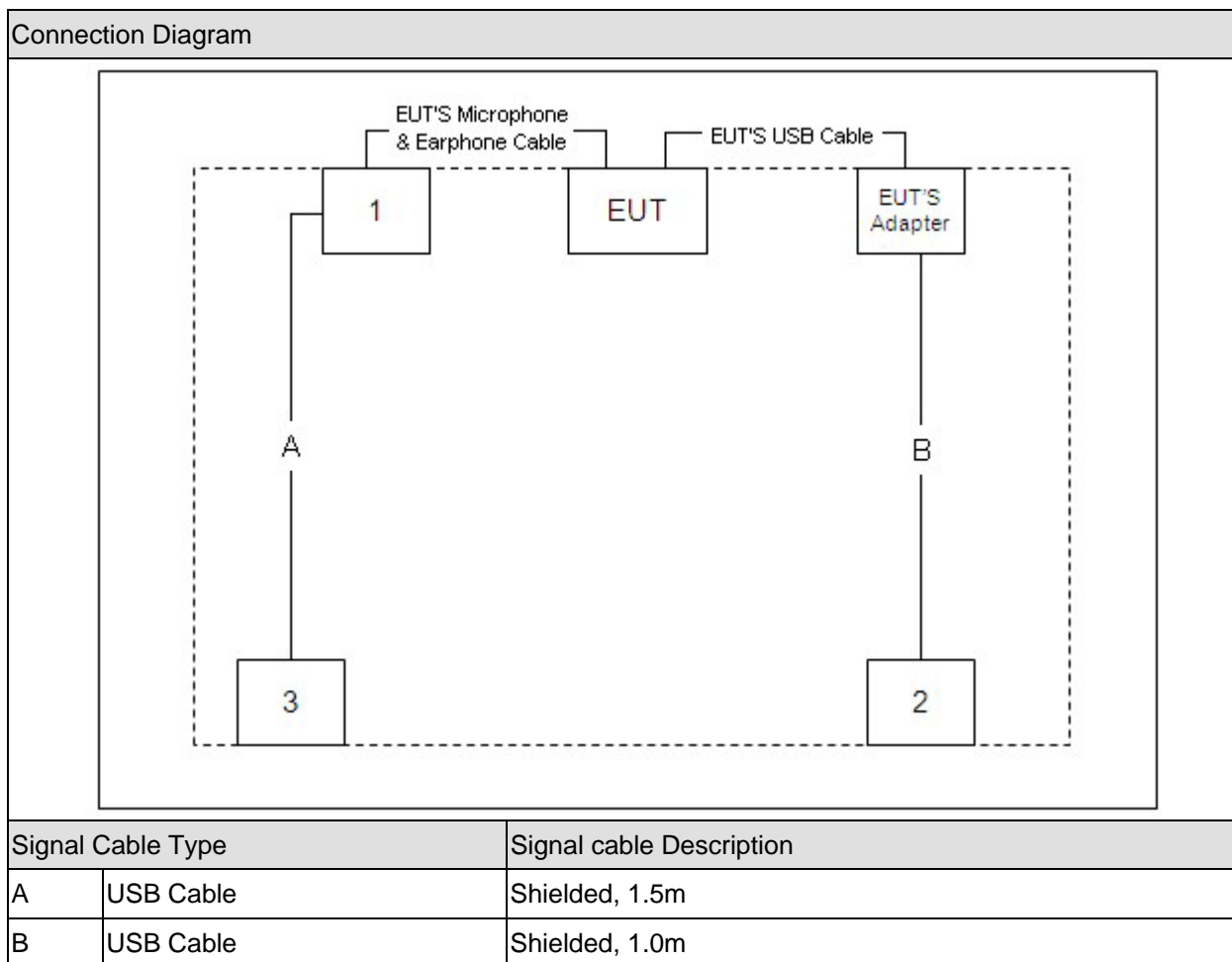
1. Regards to the frequency band operation: the lowest, middle and highest frequency of channel were selected to perform the test, then shown on this report.
2. For portable device, radiated spurious emission was verified over X, Y, Z Axis, and shown the worst case on this report.

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 Notebook	Asus	N80V	8BN0AS226971468	N/A
2 iPod	Apple	A1199	7J71085BVQ5	Power by EUT
3 USB Mouse	DELL	MOC5UO	10D00JL	N/A

1.4. Configuration of Tested System



1.5. EUT Exercise Software

1	Setup the EUT and simulators as shown on above.
2	Turn on the power of equipment.
3	Run the software "BlueTest3", then select test mode and channel to 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: 2012 Section 15.207	Yes	No
Radiated Emission	FCC CFR Title 47 Part 15 Subpart C: 2012 Section 15.209	Yes	No
20dB Bandwidth	FCC CFR Title 47 Part 15 Subpart C: 2012 Section 15.247(a)(1)	Yes	No
99% Occupied Bandwidth	RSS-Gen Issue 3 June 2010 Section 4.6.1	Yes	No
Carrier Frequency Separation	FCC CFR Title 47 Part 15 Subpart C: 2012 Section 15.247(a)(1)	Yes	No
Number of Hopping Frequencies	FCC CFR Title 47 Part 15 Subpart C: 2012 Section 15.247(a)(1)(iii)	Yes	No
Time of Occupancy (Dwell Time)	FCC CFR Title 47 Part 15 Subpart C: 2012 Section 15.247(a)(1)(iii)	Yes	No
Peak Output Power	FCC CFR Title 47 Part 15 Subpart C: 2012 Section 15.247(b)(1)	Yes	No
Band-edge Compliance of RF Conducted Emissions	FCC CFR Title 47 Part 15 Subpart C: 2012 Section 15.215(c), 15.247(d)	Yes	No
Spurious RF Conducted Emissions	FCC CFR Title 47 Part 15 Subpart C: 2012 15.247(d)	Yes	No
Radiated Emission Band Edge	FCC CFR Title 47 Part 15 Subpart C: 2012 15.247(d)	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

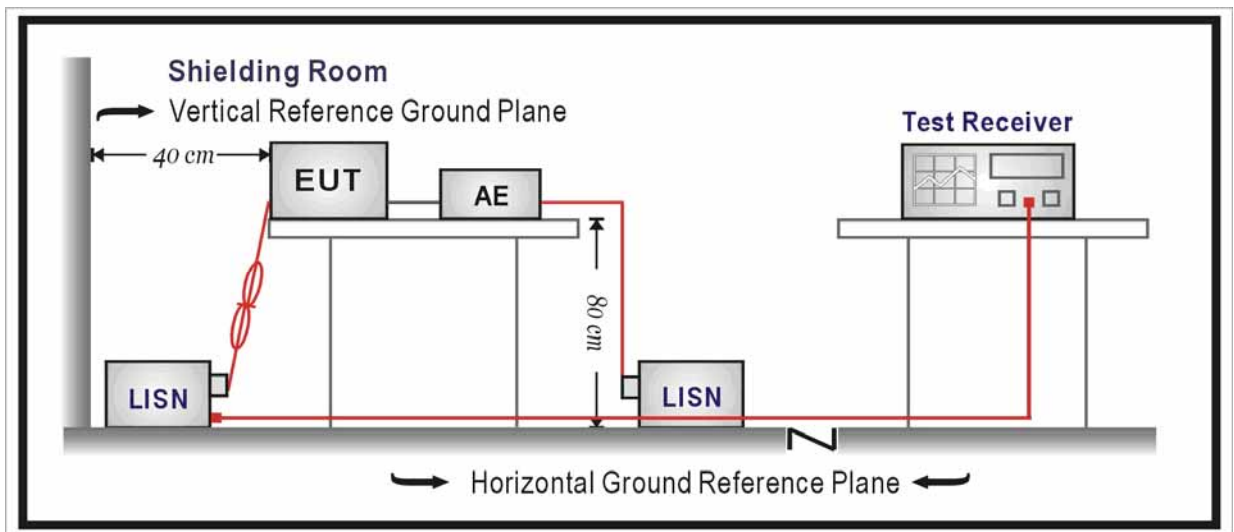
3.1. Test Equipment

Conducted Emission / TR-1

Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
EMI Test Receiver	R&S	ESCI	100726	2014.03.30
Two-Line V-Network	R&S	ENV216	100043	2014.03.30
Two-Line V-Network	R&S	ENV216	100044	2013.09.17
50ohm Coaxial Switch	Anritsu	MP59B	6200464462	2014.03.01
50ohm Termination	SHX	TF2	07081401	2013.09.17
Temperature/Humidity Meter	zhicheng	ZC1-2	TR1-TH	2014.01.10

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.

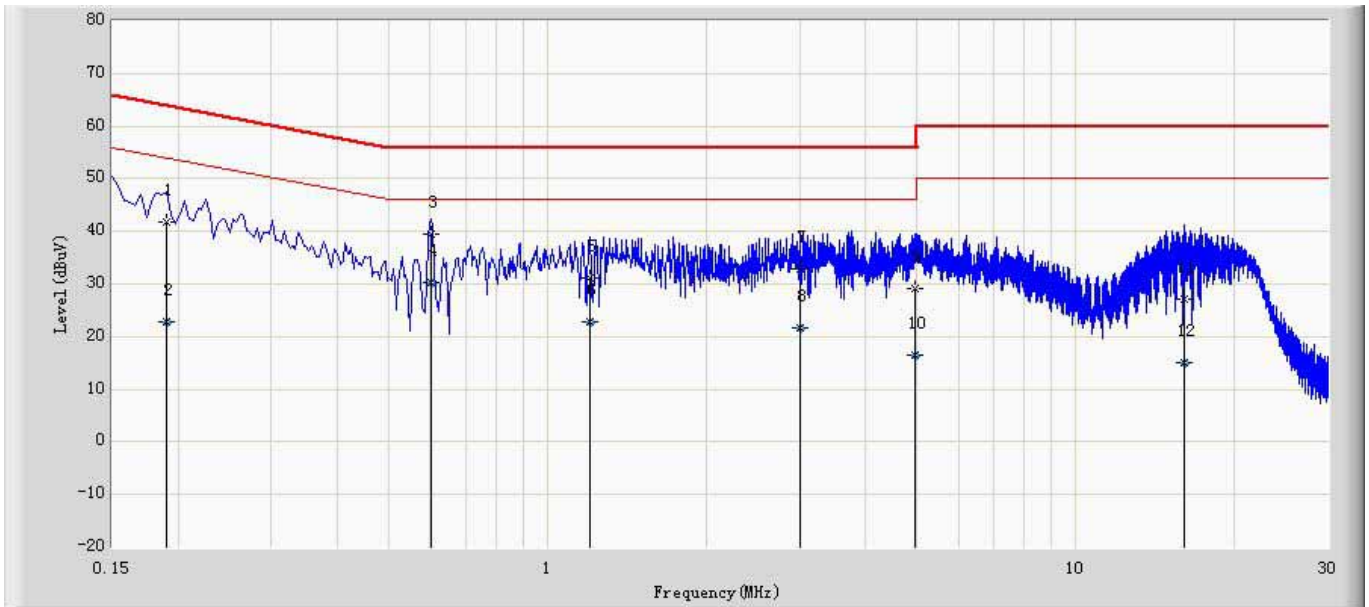
Conducted emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9kHz.

3.5. Uncertainty

The measurement uncertainty is defined as ± 2.02 dB

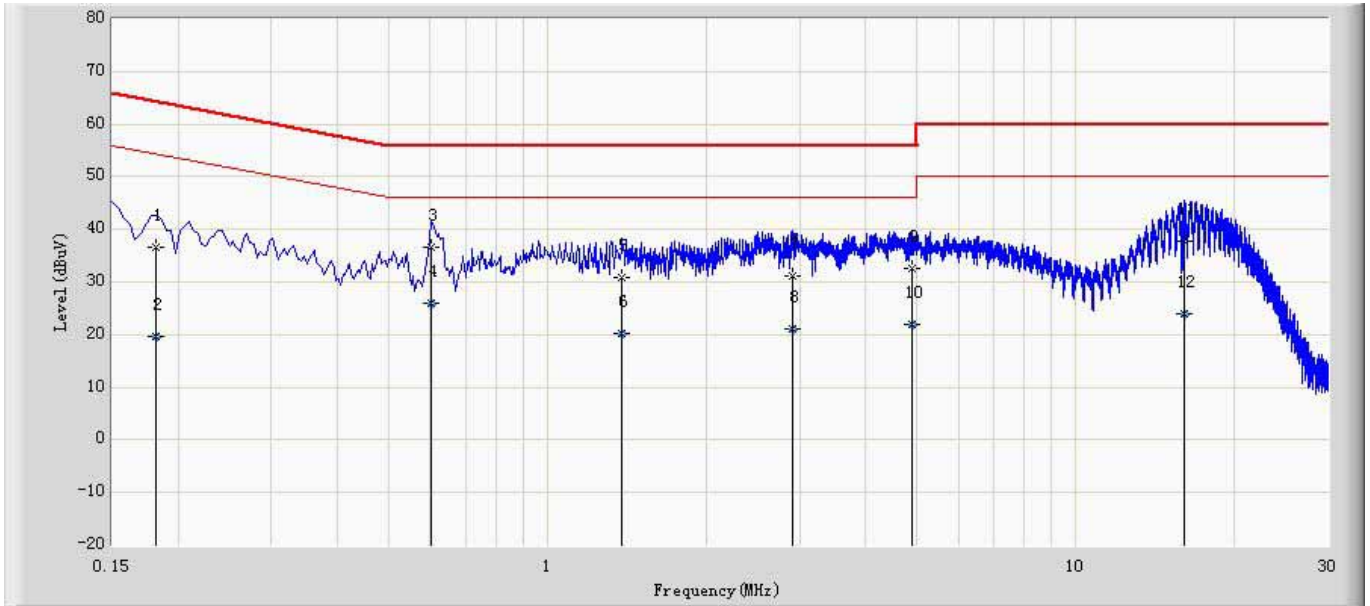
3.6. Test Result

Engineer: Milo	
Site: TR1	Time: 2013/08/14 - 19:18
Limit: FCC_Part15.107_CE_AC Power_ClassB	Margin: 0
Probe: ENV216_101044(0.009-30MHz)	Polarity: Line
EUT: SM1	Power: AC 120V/60Hz
Note: Mode1	



No	Mark	Frequency (MHz)	Measure Level (dBuV)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV)	Factor (dB)	Type
1		0.190	41.717	31.791	-22.319	64.037	9.926	QP
2		0.190	22.767	12.841	-31.270	54.037	9.926	AV
3		0.602	39.433	29.465	-16.567	56.000	9.968	QP
4	*	0.602	30.205	20.237	-15.795	46.000	9.968	AV
5		1.202	31.199	21.182	-24.801	56.000	10.018	QP
6		1.202	22.957	12.940	-23.043	46.000	10.018	AV
7		3.010	32.780	22.780	-23.220	56.000	10.000	QP
8		3.010	21.602	11.602	-24.398	46.000	10.000	AV
9		4.950	29.215	19.117	-26.785	56.000	10.099	QP
10		4.950	16.459	6.360	-29.541	46.000	10.099	AV
11		16.030	27.046	16.828	-32.954	60.000	10.218	QP
12		16.030	15.115	4.897	-34.885	50.000	10.218	AV

Engineer: Milo	
Site: TR1	Time: 2013/08/14 - 19:23
Limit: FCC_Part15.107_CE_AC Power_ClassB	Margin: 0
Probe: ENV216_101044(0.009-30MHz)	Polarity: Neutral
EUT: SM1	Power: AC 120V/60Hz
Note: Mode1	



No	Mark	Frequency (MHz)	Measure Level (dBuV)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV)	Factor (dB)	Type
1		0.182	36.673	26.816	-27.721	64.394	9.857	QP
2		0.182	19.695	9.838	-34.699	54.394	9.857	AV
3	*	0.602	36.593	26.719	-19.407	56.000	9.874	QP
4		0.602	25.911	16.037	-20.089	46.000	9.874	AV
5		1.382	30.953	21.149	-25.047	56.000	9.804	QP
6		1.382	20.324	10.519	-25.676	46.000	9.804	AV
7		2.918	31.107	21.294	-24.893	56.000	9.813	QP
8		2.918	21.220	11.407	-24.780	46.000	9.813	AV
9		4.914	32.459	22.599	-23.541	56.000	9.860	QP
10		4.914	21.939	12.079	-24.061	46.000	9.860	AV
11		16.070	37.687	27.457	-22.313	60.000	10.230	QP
12		16.070	24.075	13.845	-25.925	50.000	10.230	AV

4. Radiated Emission

4.1. Test Equipment

Radiated Emission / AC-2

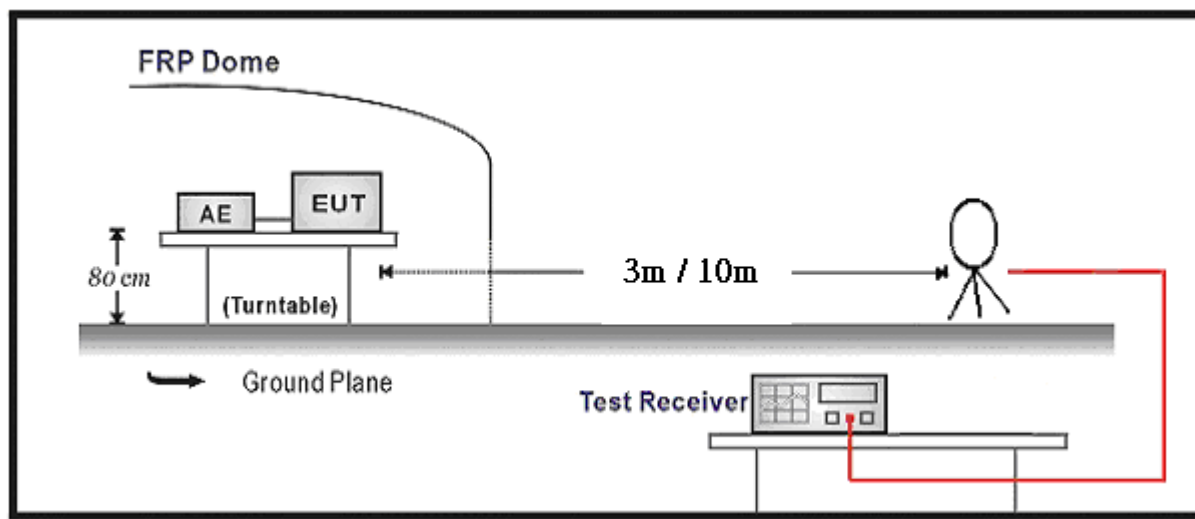
Instrument	Manufacturer	Type No.	Serial No.	Cal. Date
EMI Test Receiver	R&S	ESCI	100573	2014.04.30
Loop Antenna	R&S	HFH2-Z2	833799/003	2013.11.17
Bilog Antenna	Teseq GmbH	CBL6112D	27611	2013.10.15
Coaxial Cable	Huber+Suhner	SUCOFLEX 106	AC2-C	2014.03.01
Temperature/Humidity Meter	Zhicheng	ZC1-2	AC2-TH	2014.05.08

Radiated Emission / AC-5

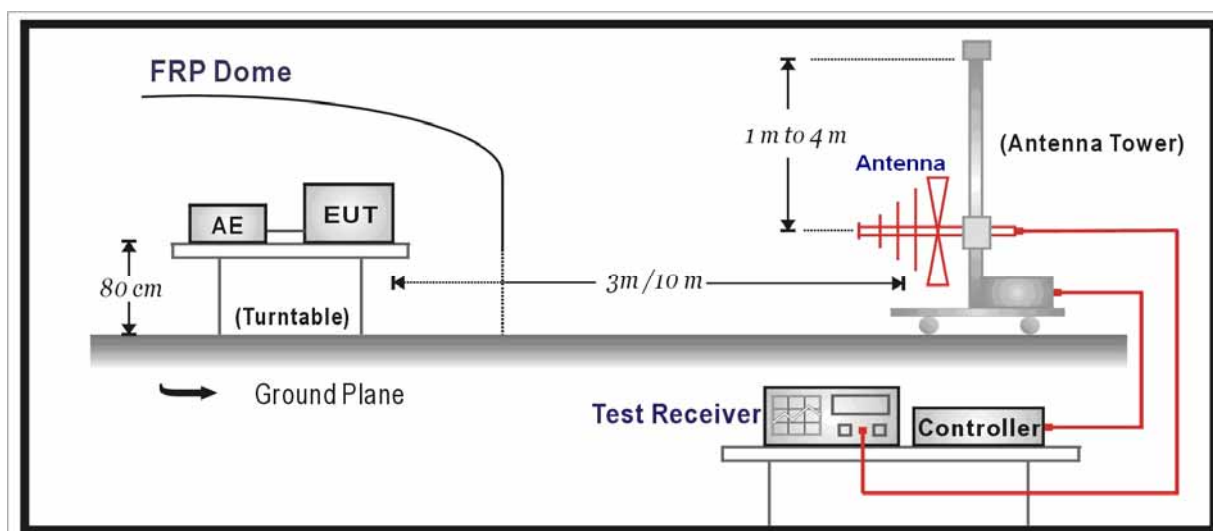
Instrument	Manufacturer	Type No.	Serial No.	Cal. Date
Spectrum Analyzer	Agilent	N9010A	MY48030494	2014.03.30
Preamplifier	Miteq	NSP1800-25	1364185	2014.05.03
Preamplifier	Quietek	AP-040G	CHM-0906001	2014.05.03
Bilog Antenna	Teseq GmbH	CBL6112D	27612	2013.10.15
Broad-Band Horn Antenna	Schwarzbeck	BBHA9120D	499	2014.06.08
Broad-Band Horn Antenna	Schwarzbeck	BBHA9170	294	2013.11.24
Coaxial Cable	Huber+Suhner	SUCOFLEX 106	AC5-C1	2014.03.01
Coaxial Cable	Huber+Suhner	SUCOFLEX 106	AC5-C2	2014.03.01
Coaxial Cable	Huber+Suhner	SUCOFLEX 102	AC5-C3	2014.03.01
Temperature/Humidity Meter	Zhicheng	ZC1-2	AC5-TH	2014.01.11

4.2. Test Setup

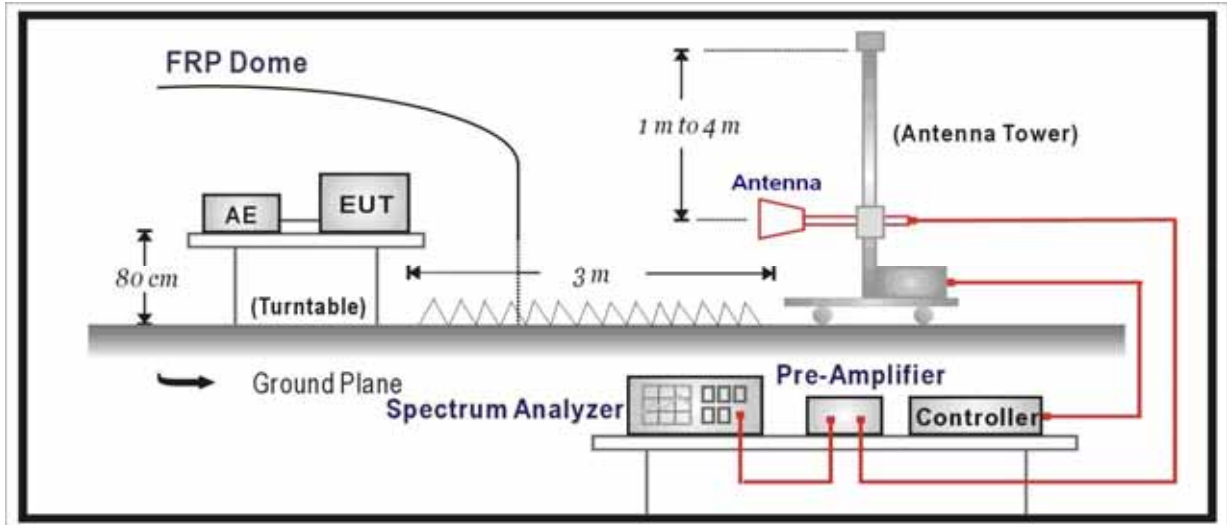
Below 30MHz Test Setup:



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	4799.5	52.7	-8.3	44.4	54(Note2)	-9.6	PK
	V	4808.0	53.7	-8.4	45.3	54(Note2)	-8.7	PK
	H	7205.0	46.9	-3.5	43.4	54(Note2)	-10.6	PK
	V	7205.0	44.3	-3.5	40.8	54(Note2)	-13.2	PK
	H	9608.0	38.3	2.5	40.8	54(Note2)	-13.2	PK
	V	9608.0	37.7	2.6	40.3	54(Note2)	-13.7	PK
39	H	4884.5	53.6	-8.3	45.3	54(Note2)	-8.7	PK
	V	4884.5	53.7	-8.3	45.4	54(Note2)	-8.6	PK
	H	7324.0	46.4	-3.3	43.1	54(Note2)	-10.9	PK
	V	7206.0	42.5	-3.5	39.0	54(Note2)	-15.0	PK
	H	9764.0	38.2	2.7	40.9	54(Note2)	-13.1	PK
	V	9764.0	37.3	2.8	40.1	54(Note2)	-13.9	PK
78	H	4961.0	55.9	-8.3	47.6	54(Note2)	-6.4	PK
	V	4961.0	54.6	-8.2	46.4	54(Note2)	-7.6	PK
	H	7443.0	45.8	-2.9	42.9	54(Note2)	-11.1	PK
	V	7443.0	44.1	-2.9	41.2	54(Note2)	-12.8	PK
	H	9920.0	37.0	3.3	40.3	54(Note2)	-13.7	PK
	V	9920.0	36.2	3.4	39.6	54(Note2)	-14.4	PK

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

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

Mode 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	4808.0	50.1	-8.3	41.8	54(Note2)	-12.2	PK
	V	4808.0	52.0	-8.4	43.6	54(Note2)	-10.4	PK
	H	7206.0	43.7	-3.5	40.2	54(Note2)	-13.8	PK
	V	7206.0	43.3	-3.5	39.8	54(Note2)	-14.2	PK
	H	9608.0	38.1	2.5	40.6	54(Note2)	-13.4	PK
	V	9608.0	38.0	2.6	40.6	54(Note2)	-13.4	PK
39	H	4884.5	51.1	-8.3	42.8	54(Note2)	-11.2	PK
	V	4884.5	52.0	-8.3	43.7	54(Note2)	-10.3	PK
	H	7323.0	43.3	-3.3	40.0	54(Note2)	-14.0	PK
	V	7323.0	42.2	-3.3	38.9	54(Note2)	-15.1	PK
	H	9764.0	37.3	2.7	40.0	54(Note2)	-14.0	PK
	V	9764.0	38.2	2.8	41.0	54(Note2)	-13.0	PK
78	H	4961.0	52.3	-8.3	44.0	54(Note2)	-10.0	PK
	V	4961.0	51.8	-8.2	43.6	54(Note2)	-10.4	PK
	H	7440.0	42.5	-2.9	39.6	54(Note2)	-14.4	PK
	V	7440.0	42.0	-2.9	39.1	54(Note2)	-14.9	PK
	H	9920.0	37.1	3.3	40.4	54(Note2)	-13.6	PK
	V	9920.0	37.0	3.4	40.4	54(Note2)	-13.6	PK

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

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

Mode 3: Transmitter-3Mbps(8DPSK_DH5)

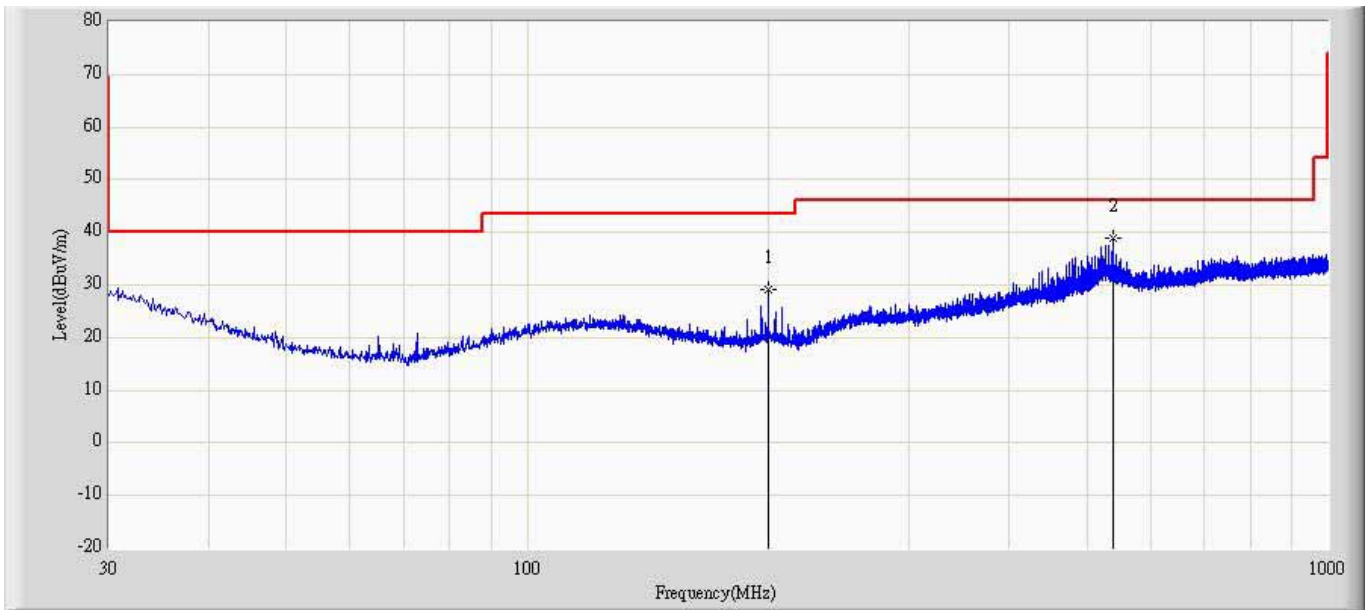
CH	Antenna	Frequency (MHz)	Reading Level (dBuV/m)	Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
0	H	4799.5	50.1	-8.3	41.8	54(Note2)	-12.2	PK
	V	4799.5	52.6	-8.4	44.2	54(Note2)	-9.8	PK
	H	7206.0	43.2	-3.5	39.7	54(Note2)	-14.3	PK
	V	7206.0	42.7	-3.5	39.2	54(Note2)	-14.8	PK
	H	9608.0	38.2	2.5	40.7	54(Note2)	-13.3	PK
	V	9608.0	37.9	2.6	40.5	54(Note2)	-13.5	PK
39	H	4884.5	52.7	-8.3	44.4	54(Note2)	-9.6	PK
	V	4884.5	52.6	-8.3	44.3	54(Note2)	-9.7	PK
	H	7323.0	44.2	-3.3	40.9	54(Note2)	-13.1	PK
	V	7323.0	42.7	-3.3	39.4	54(Note2)	-14.6	PK
	H	9764.0	37.3	2.7	40	54(Note2)	-14.0	PK
	V	9764.0	38.3	2.8	41.1	54(Note2)	-12.9	PK
78	H	4961.0	54.0	-8.3	45.7	54(Note2)	-8.3	PK
	V	4961.0	52.1	-8.2	43.9	54(Note2)	-10.1	PK
	H	7440.0	42.2	-2.9	39.3	54(Note2)	-14.7	PK
	V	7440.0	43.0	-2.9	40.1	54(Note2)	-13.9	PK
	H	9920.0	37.2	3.3	40.5	54(Note2)	-13.5	PK
	V	9920.0	37.3	3.4	40.7	54(Note2)	-13.3	PK

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

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

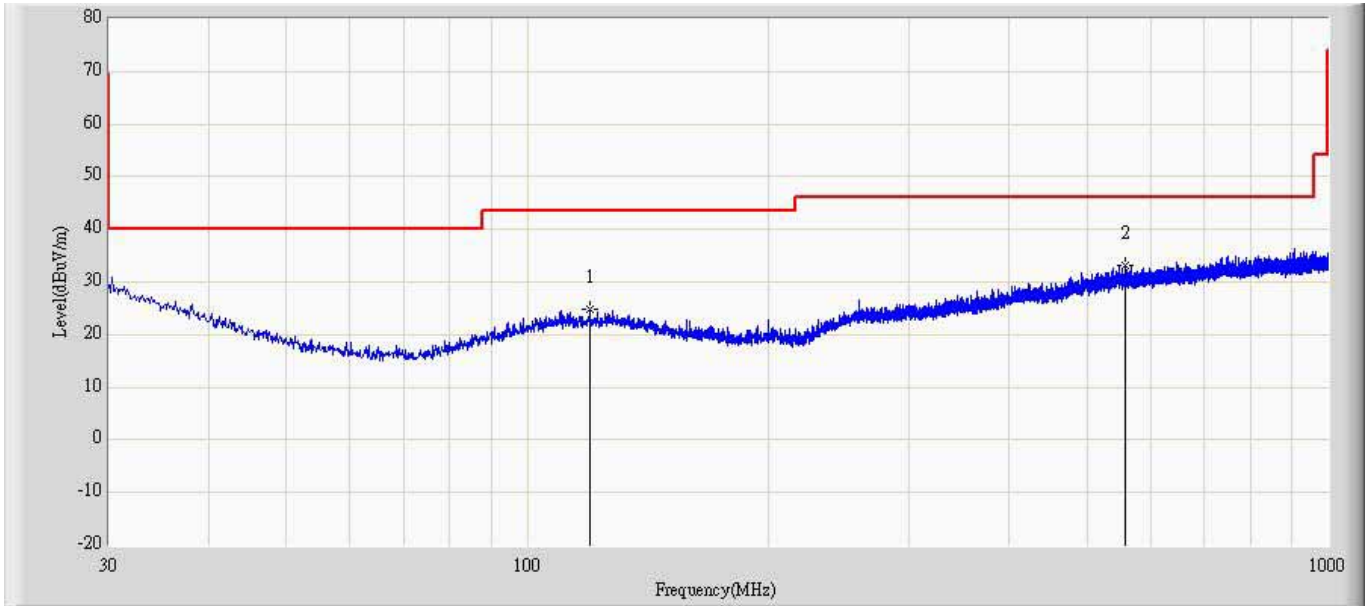
The worst case of Radiated Emission below 1GHz:

Engineer: Toms	
Site: AC2	Time: 2013/07/20 - 11:03
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: CBL6112D_27611(30-1000MHz)	Polarity: Horizontal
EUT: SM1	Power: AC 120V/60Hz
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		199.992	28.998	12.750	-14.502	43.500	16.247	QP
2	*	539.977	38.944	12.452	-7.056	46.000	26.492	QP

Engineer: Toms	
Site: AC2	Time: 2013/07/20 - 11:04
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: CBL6112D_27611(30-1000MHz)	Polarity: Vertical
EUT: SM1	Power: AC 120V/60Hz
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		119.604	24.786	6.055	-18.714	43.500	18.732	QP
2	*	558.286	33.115	6.325	-12.885	46.000	26.790	QP

5. 20dB Bandwidth

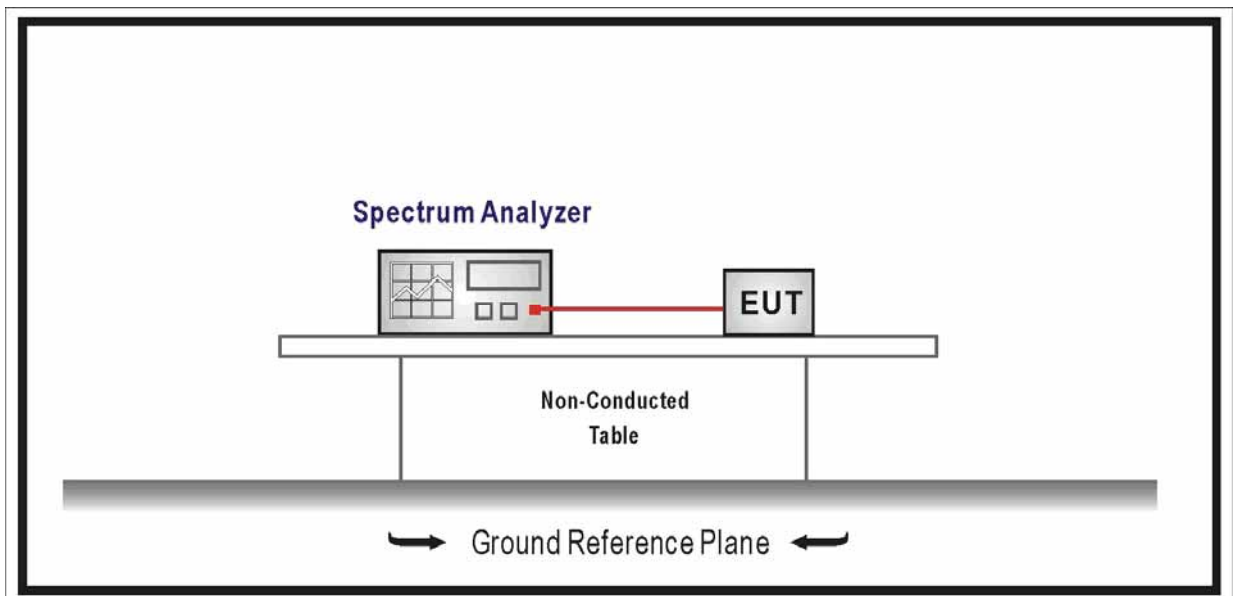
5.1 Test Equipment

20dB Bandwidth / TR8

Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
Spectrum Analyzer	Agilent	E4446A	MY45300103	2014.01.21
Temperature/Humidity Meter	Zhicheng	ZC1-2	TR8-TH	2014.05.08

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 \cong 1% of the 20dB bandwidth

VBW \cong 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

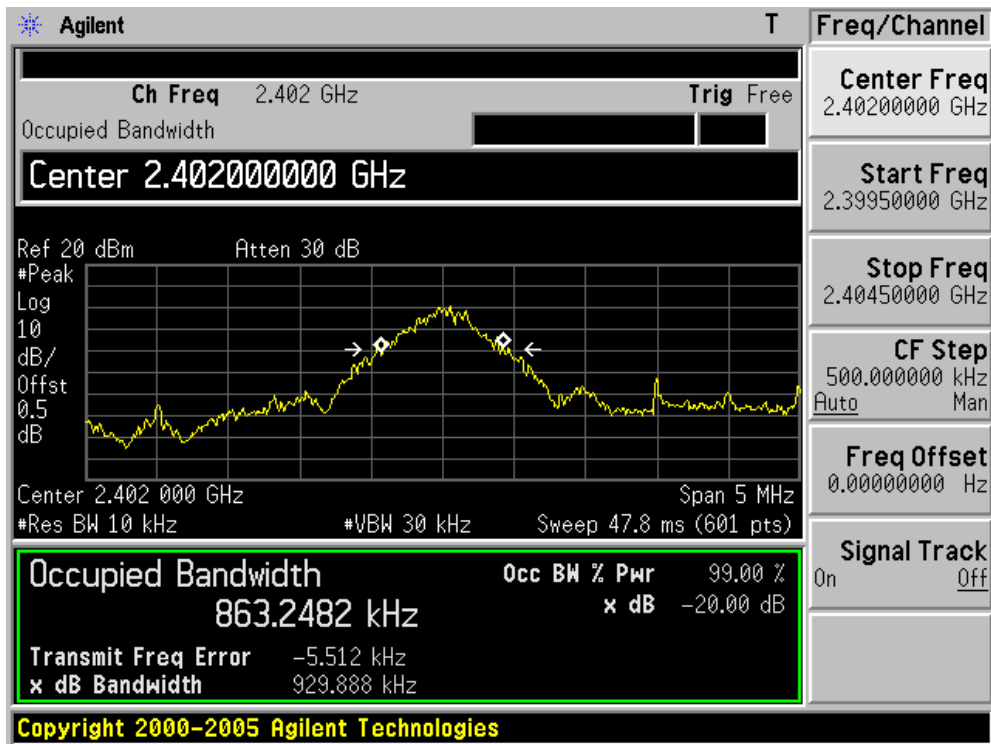
The measurement uncertainty is defined as ± 1 kHz

5.6 Test Result

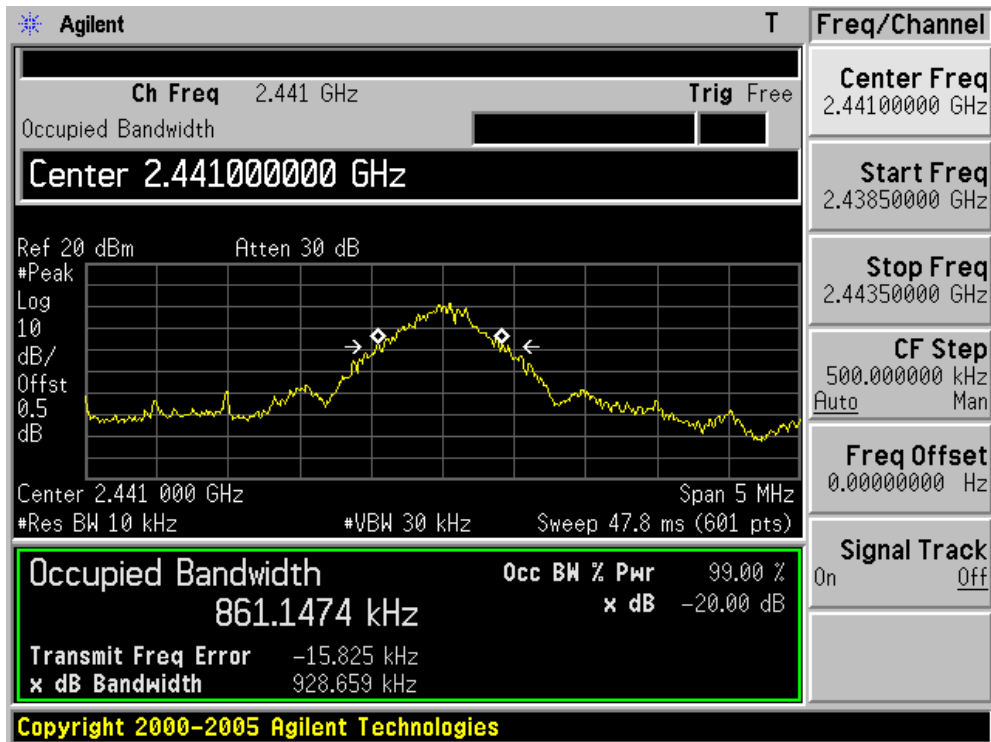
Product	:	SM1
Test Item	:	Occupied Bandwidth
Test Site	:	TR-8
Test Mode	:	Mode 1: Transmitter-1Mbps (GFSK_DH5)

Channel No.	Frequency (MHz)	20dB Bandwidth (kHz)	99% Bandwidth (kHz)
00	2402	929.9	863.2
39	2441	928.7	861.1
78	2480	931.0	864.4

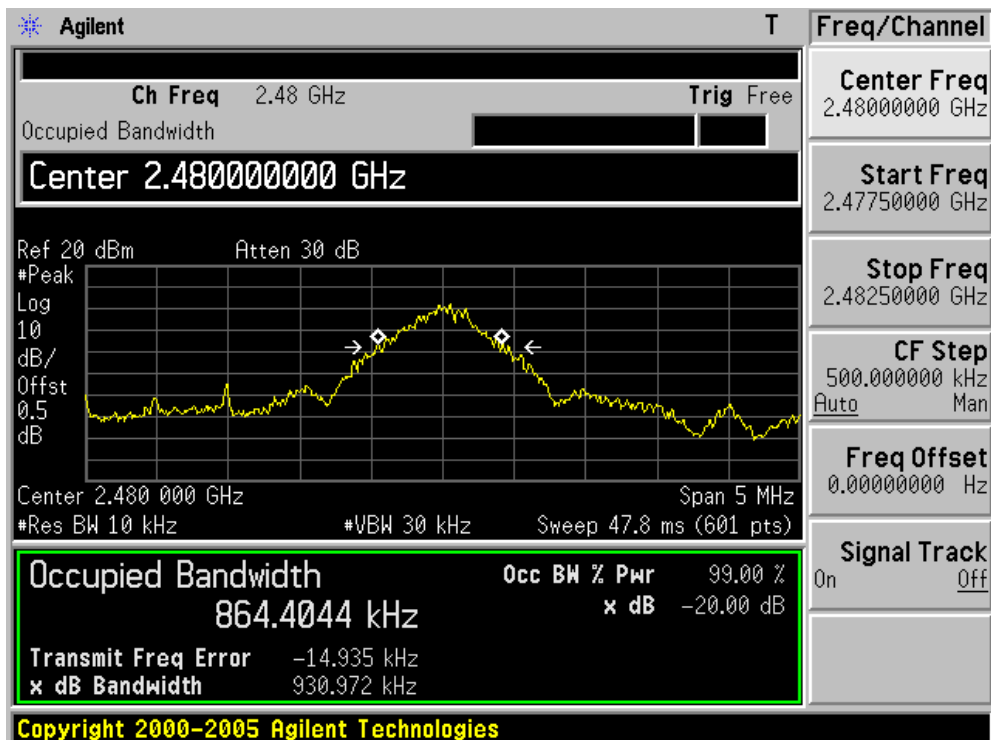
Channel 00 (2402MHz)



Channel 39 (2441MHz)



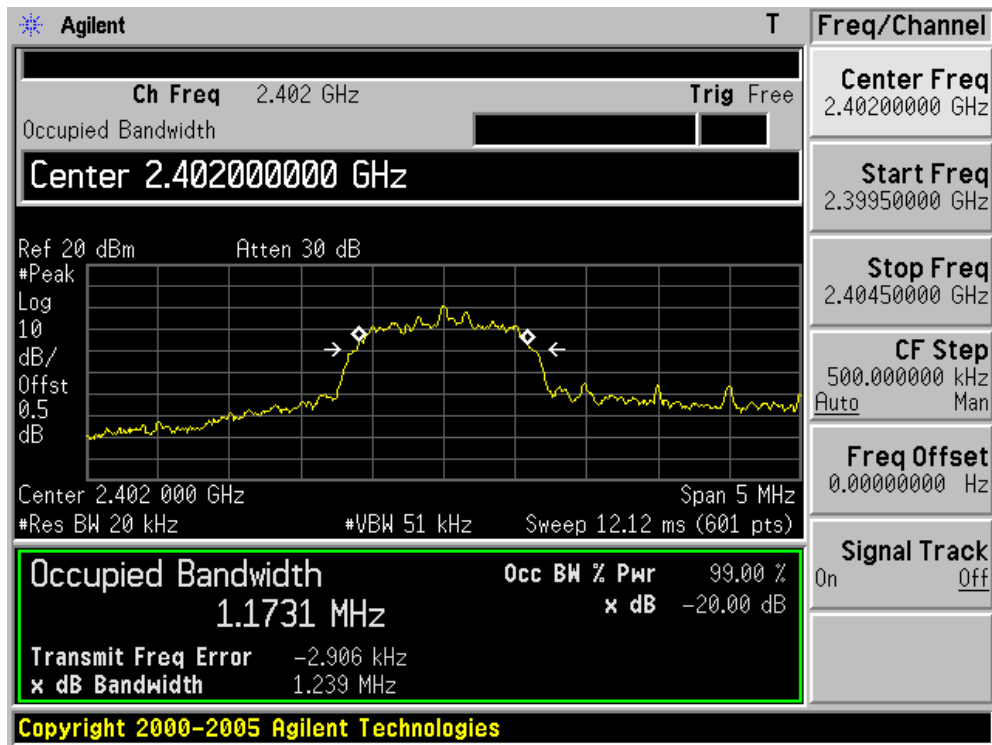
Channel 78 (2480MHz)



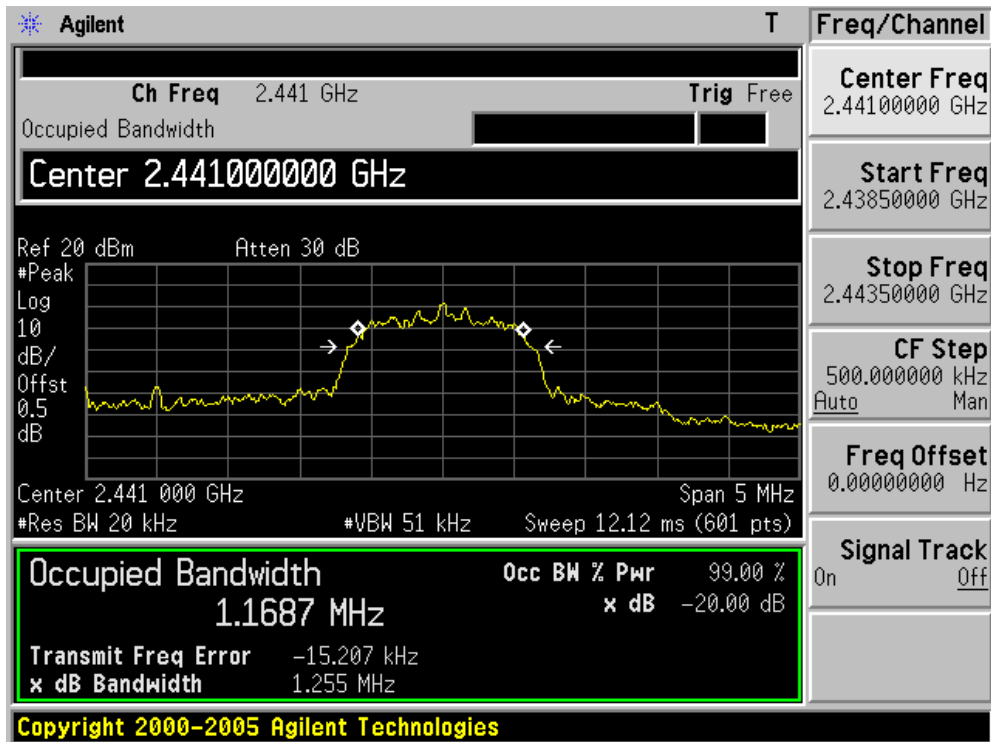
Product	:	SM1
Test Item	:	Occupied Bandwidth
Test Site	:	TR-8
Test Mode	:	Mode 2: Transmitter-2Mbps (Pi/4 DQPSK_DH5)

Channel No.	Frequency (MHz)	20dB Bandwidth (kHz)	99% Bandwidth (kHz)
00	2402	1239.0	1173.1
39	2441	1255.0	1168.7
78	2480	1245.0	1172.6

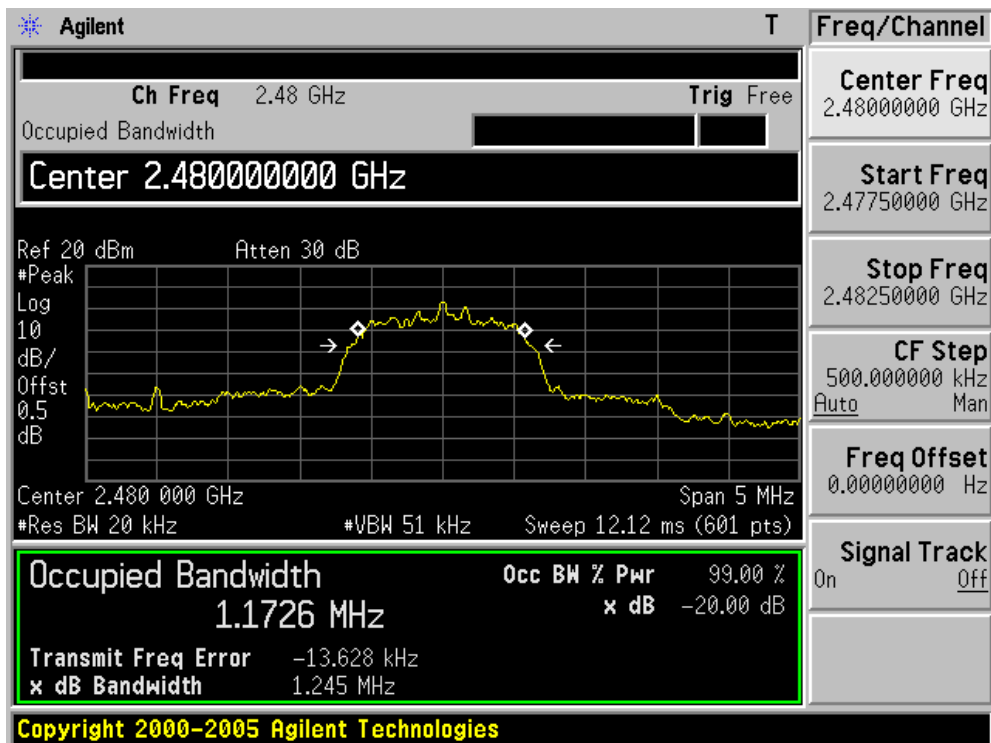
Channel 00 (2402MHz)



Channel 39 (2441MHz)



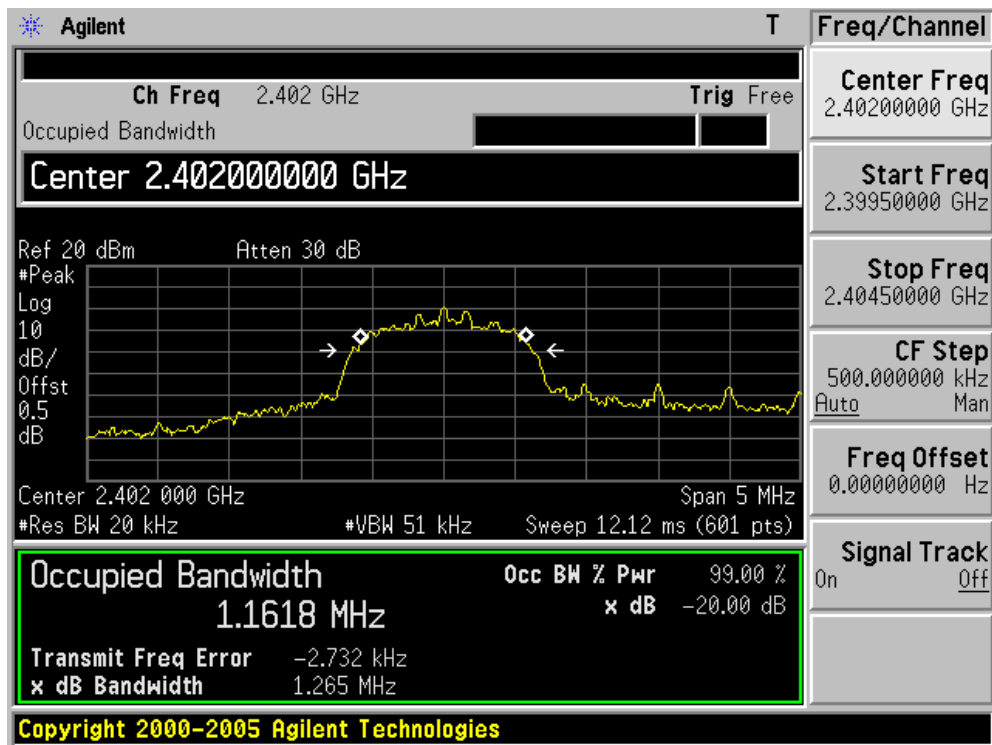
Channel 78 (2480MHz)



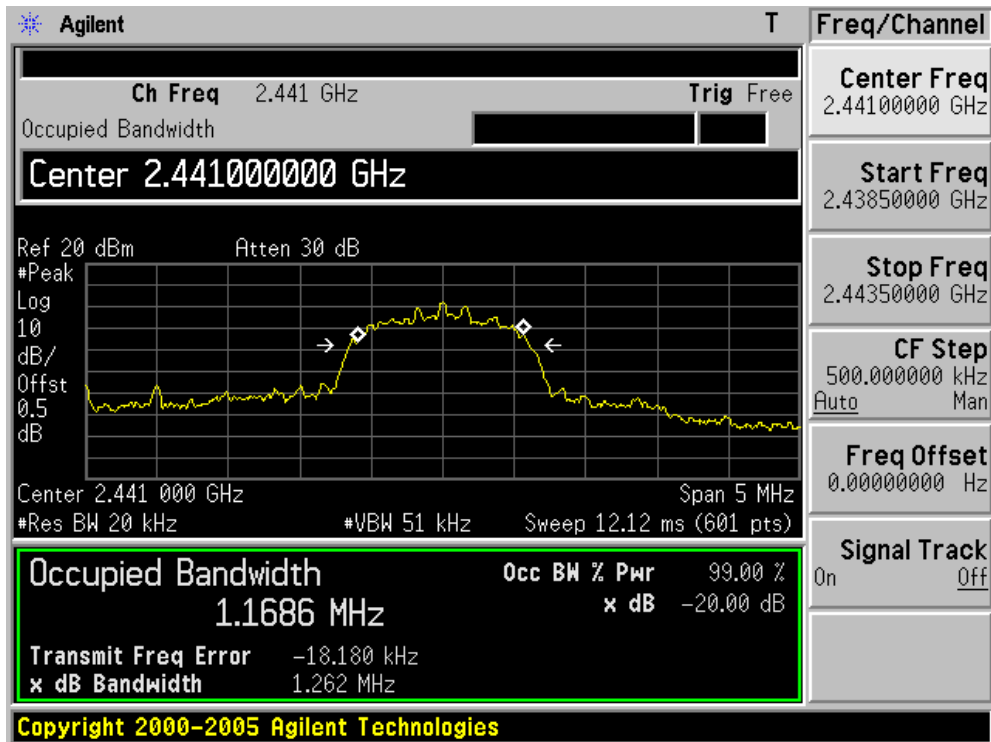
Product	:	SM1
Test Item	:	Occupied Bandwidth
Test Site	:	TR-8
Test Mode	:	Mode 3: Transmitter-3Mbps (8DPSK_DH5)

Channel No.	Frequency (MHz)	20dB Bandwidth (kHz)	99% Bandwidth (kHz)
00	2402	1265.0	1161.8
39	2441	1262.0	1168.6
78	2480	1266.0	1176.8

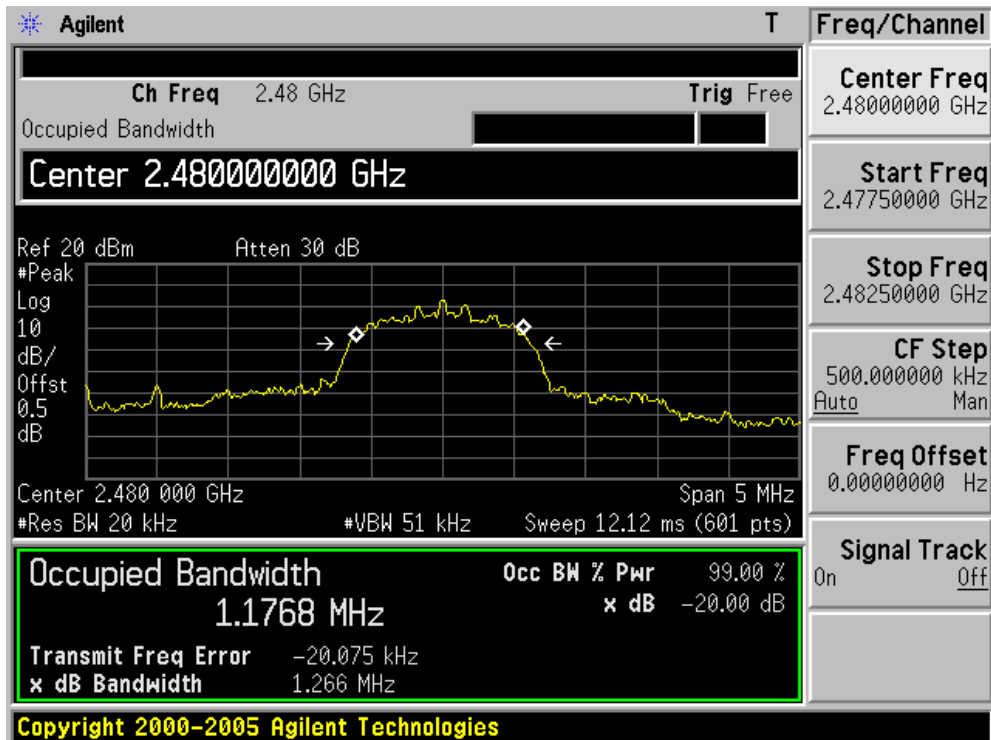
Channel 00 (2402MHz)



Channel 39 (2441MHz)



Channel 78 (2480MHz)



6. Carrier Frequency Separation

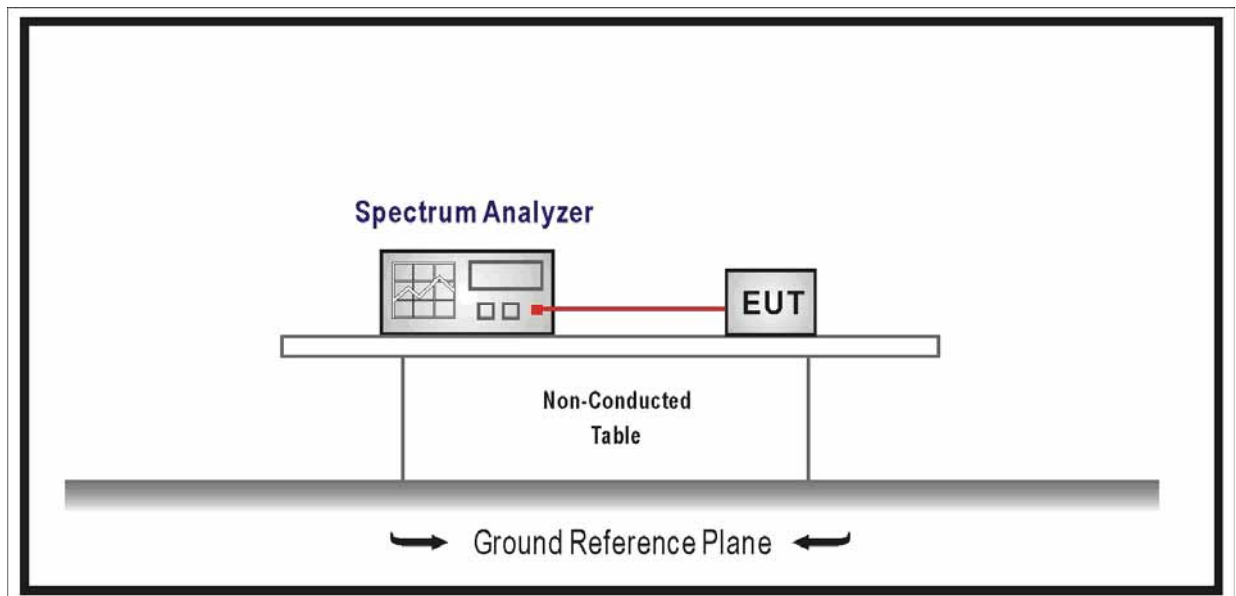
6.1. Test Equipment

Carrier Frequency Separation / TR-8

Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
Spectrum Analyzer	Agilent	E4446A	MY45300103	2014.01.21
Temperature/Humidity Meter	Zhicheng	ZC1-2	TR8-TH	2014.05.08

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) \cong 1% of the span

Video (or Average) Bandwidth VBW \cong 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

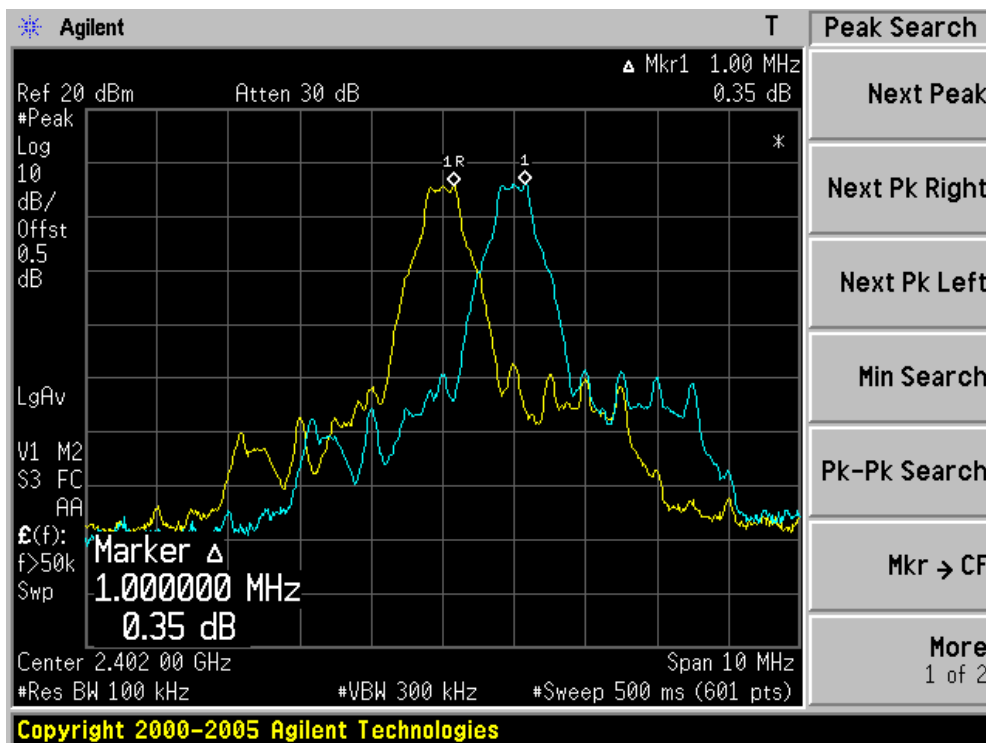
The measurement uncertainty is defined as \pm 1 kHz

6.6. Test Result

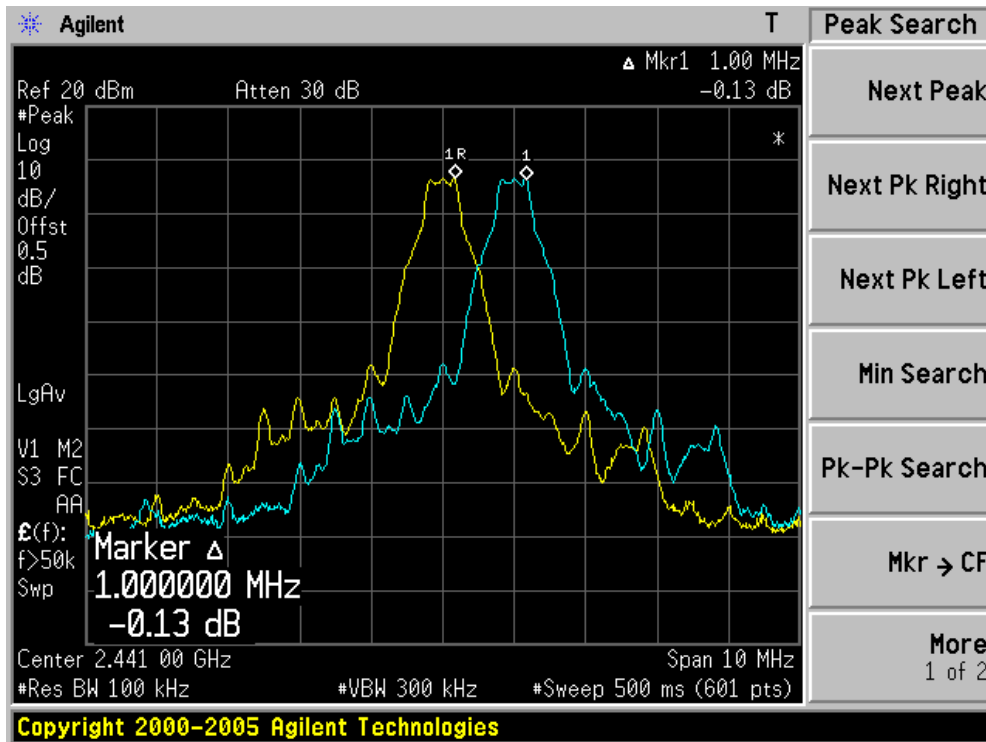
Product	:	SM1
Test Item	:	Carrier Frequency Separation
Test Site	:	TR-8
Test Mode	:	Mode 1: Transmitter-1Mbps (GFSK_DH5)

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

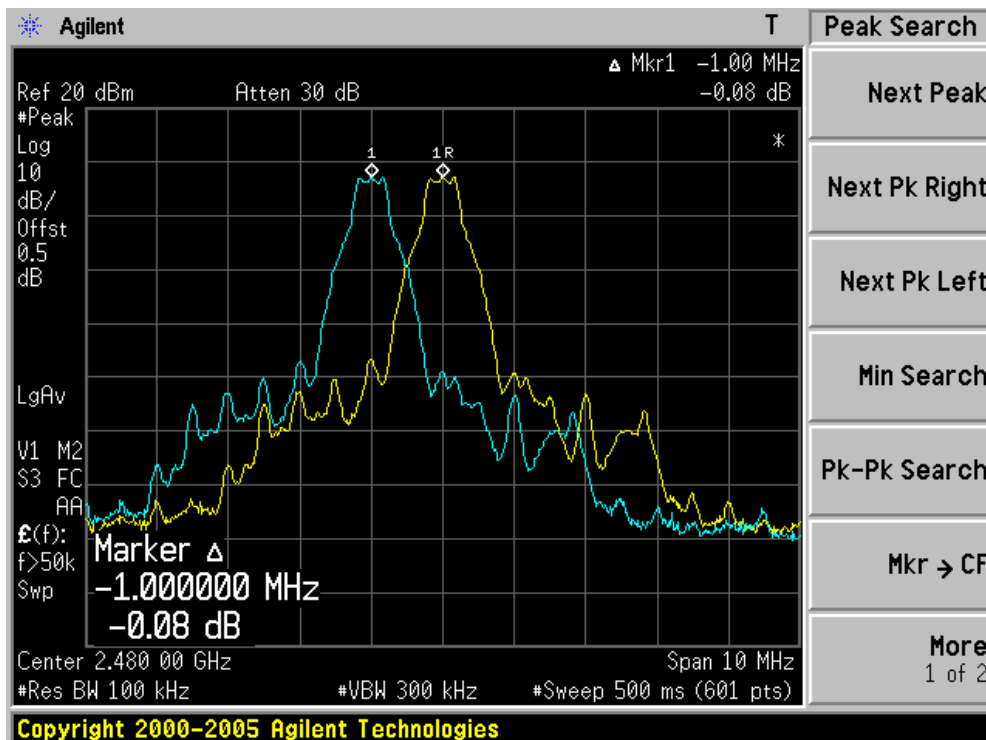
Channel 00 (2402MHz)



Channel 39 (2441MHz)



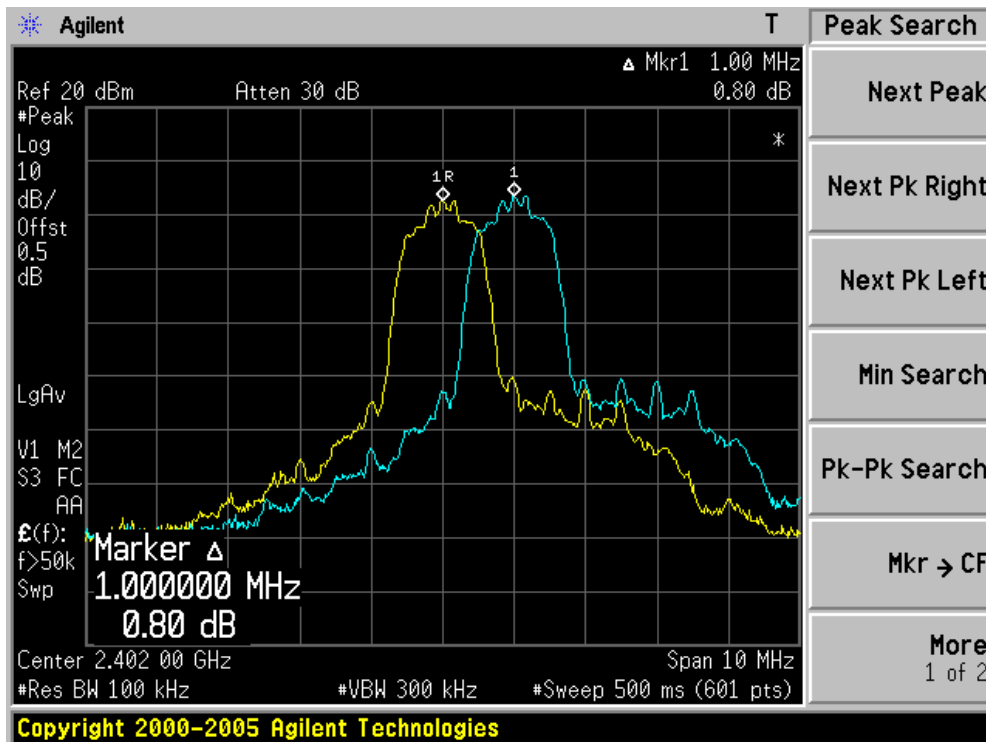
Channel 78 (2480MHz)



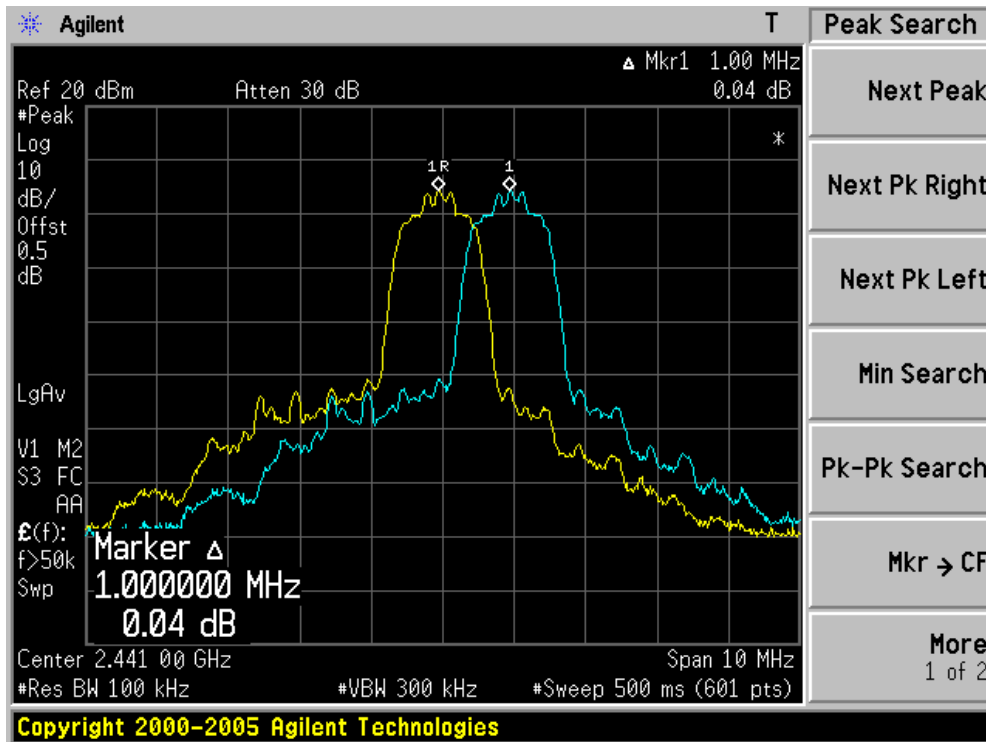
Product	:	SM1
Test Item	:	Carrier Frequency Separation
Test Site	:	TR-8
Test Mode	:	Mode 2: Transmitter-2Mbps (Pi/4 DQPSK_DH5)

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

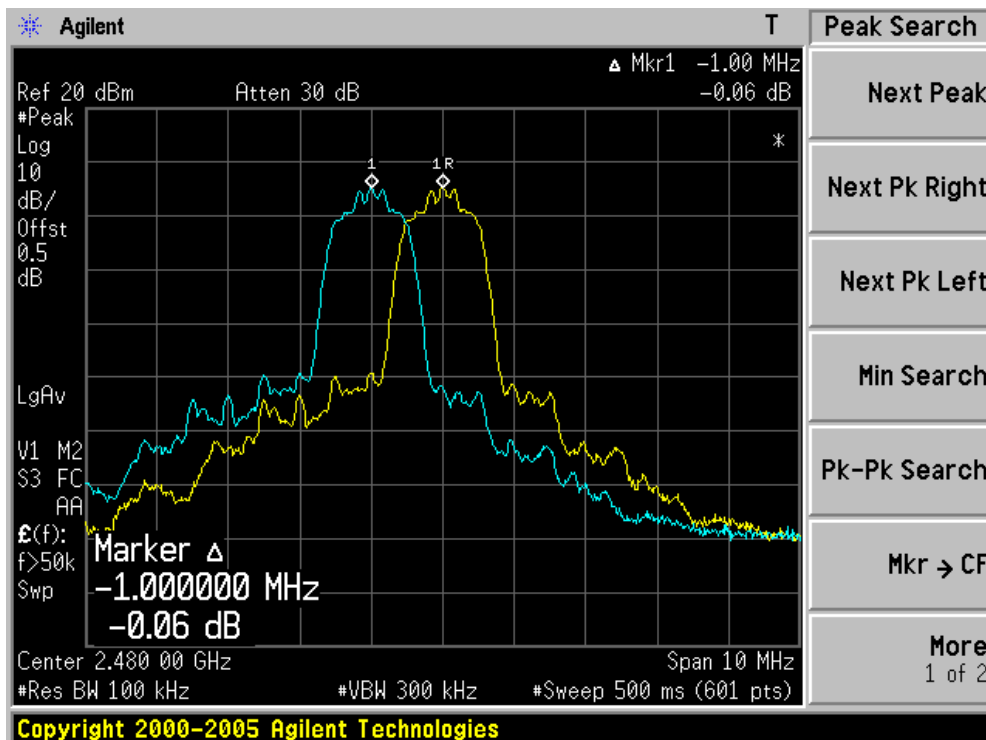
Channel 00 (2402MHz)



Channel 39 (2441MHz)



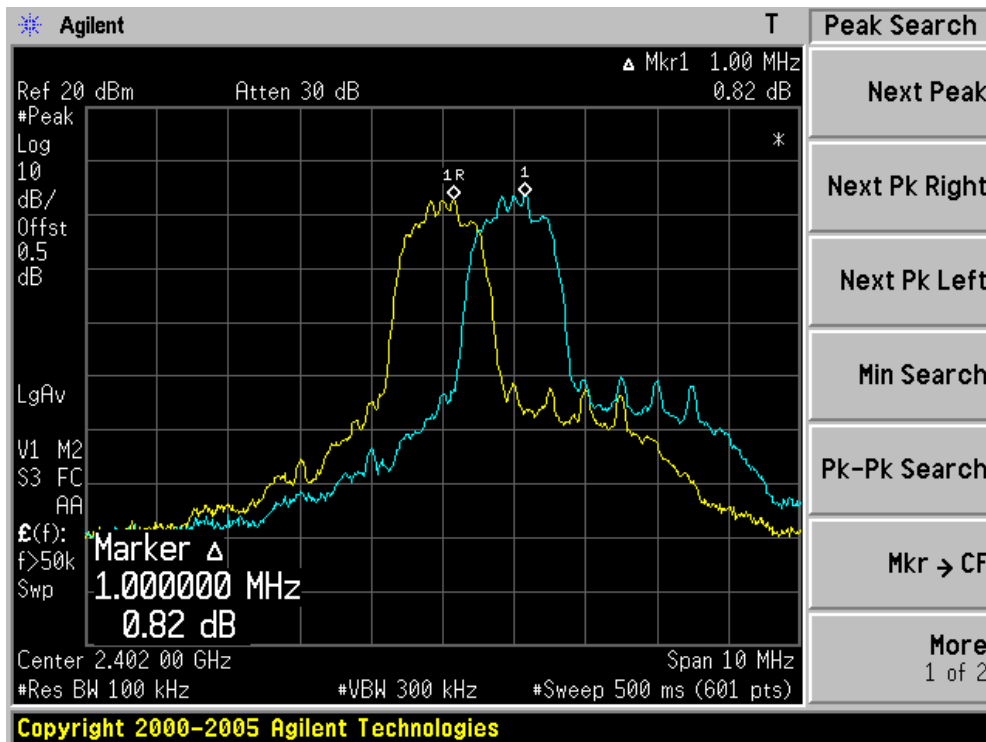
Channel 78 (2480MHz)



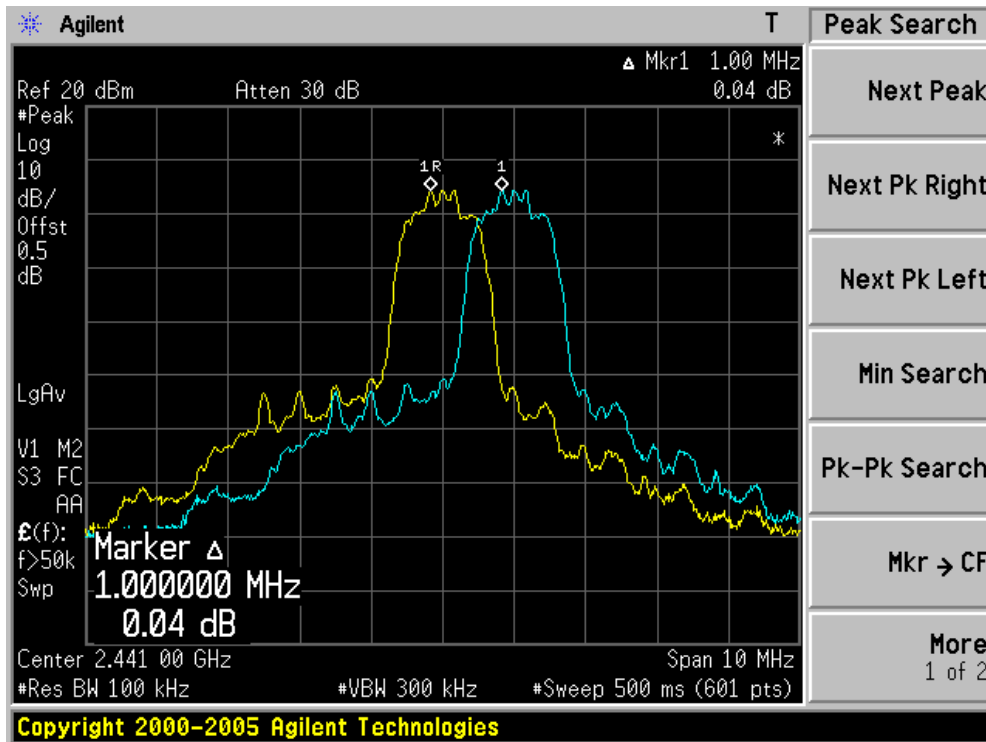
Product	:	SM1
Test Item	:	Carrier Frequency Separation
Test Site	:	TR-8
Test Mode	:	Mode 3: Transmitter-3Mbps (8DPSK_DH5)

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

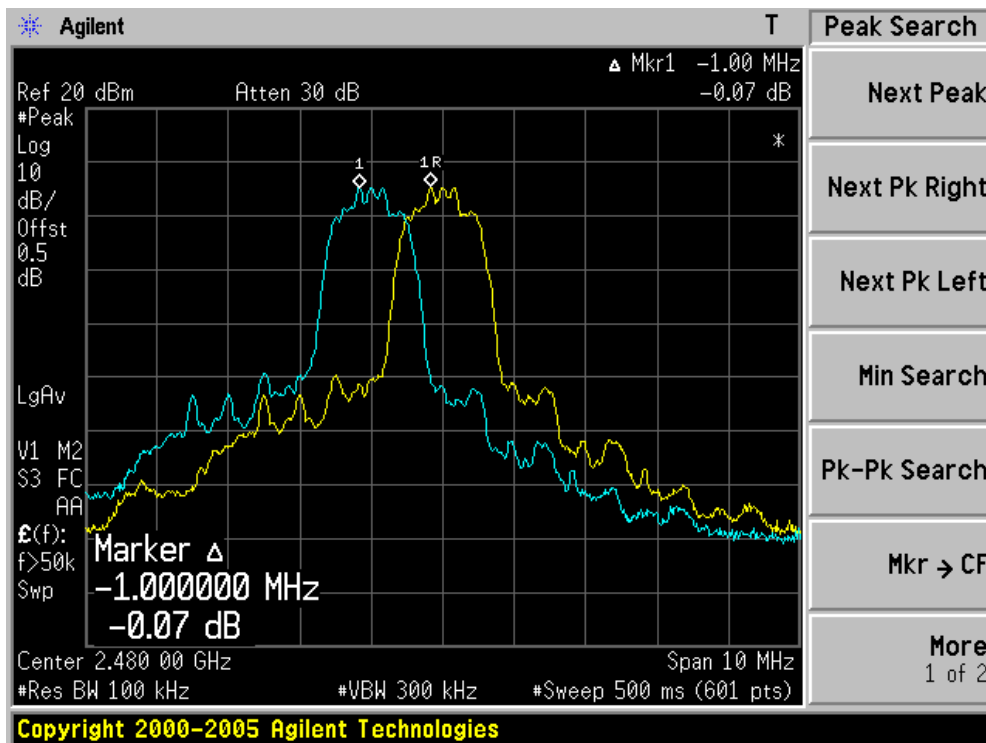
Channel 00 (2402MHz)



Channel 39 (2441MHz)



Channel 78 (2480MHz)



7. Number of Hopping Frequencies

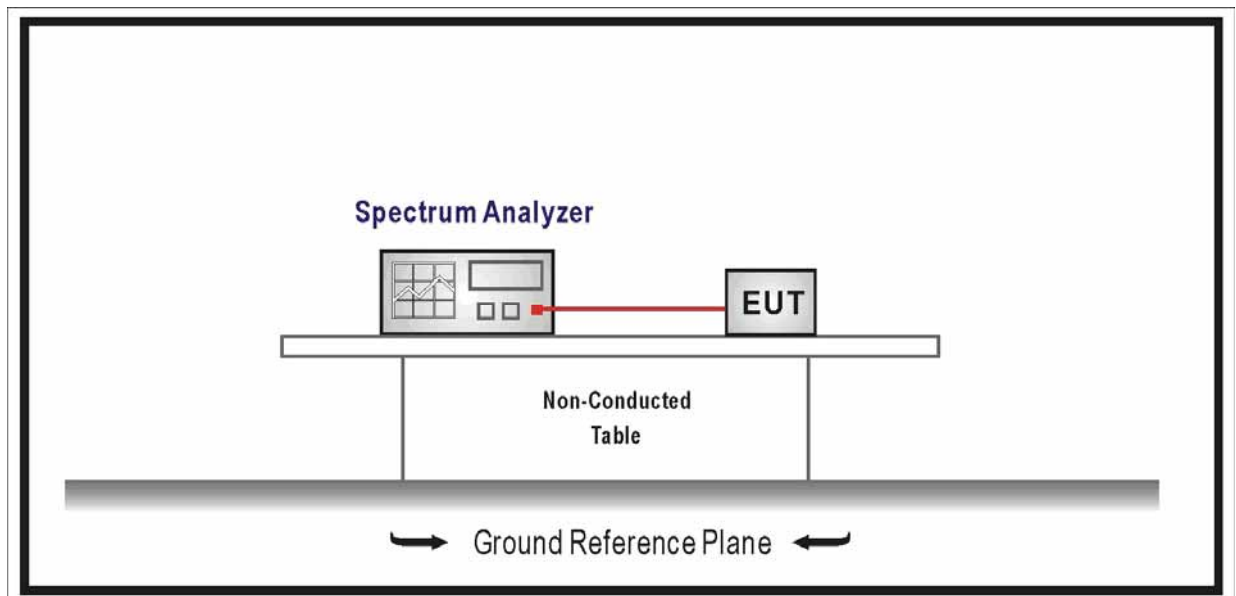
7.1. Test Equipment

Number of Hopping Frequencies / TR-8

Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
Spectrum Analyzer	Agilent	E4446A	MY45300103	2014.01.21
Temperature/Humidity Meter	Zhicheng	ZC1-2	TR8-TH	2014.05.08

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 \cong 1% of the span

VBW \cong 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

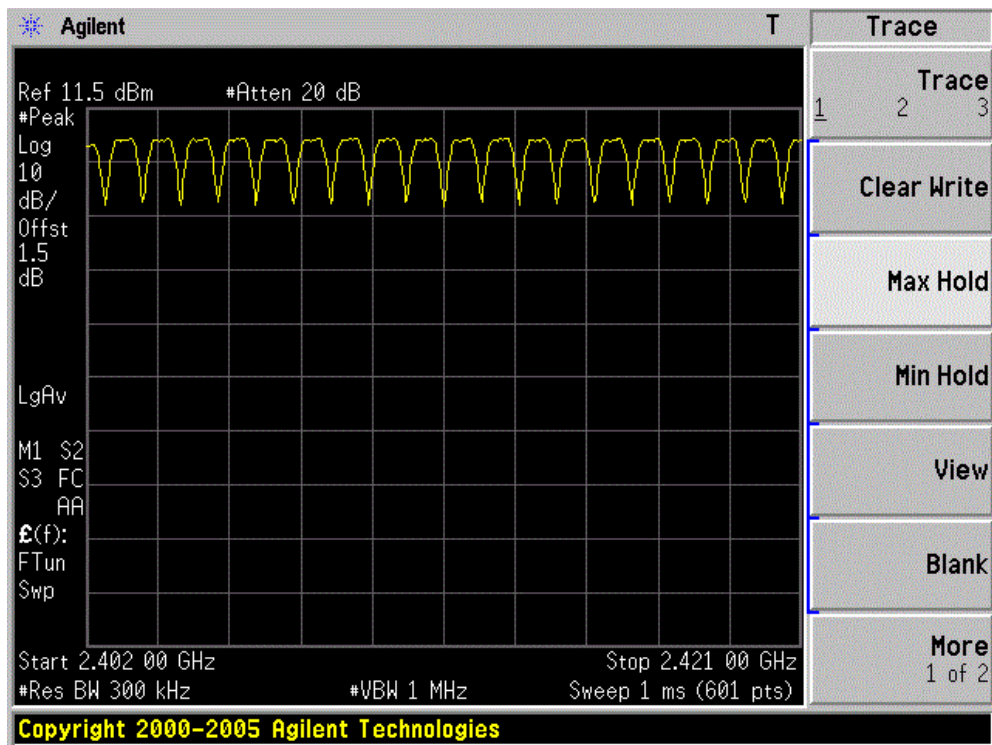
The measurement uncertainty is defined as ± 1 kHz

7.6. Test Result

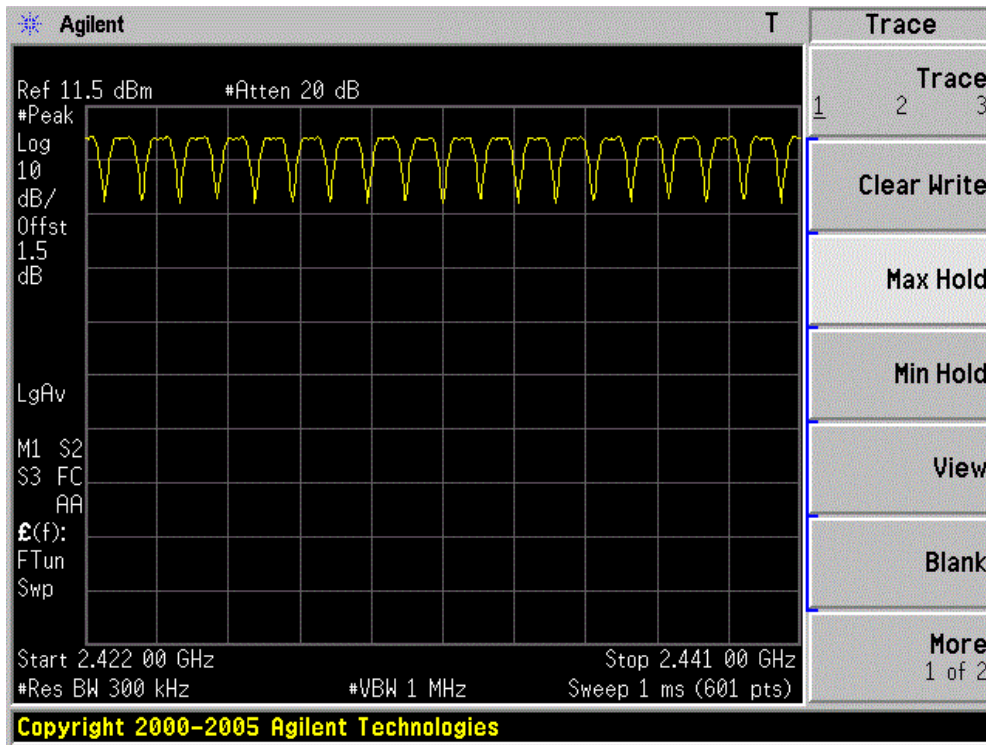
Product	:	SM1
Test Item	:	Number of Hopping Frequencies
Test Site	:	TR-8
Test Mode	:	Mode 1: Transmitter-1Mbps (GFSK_DH5)

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

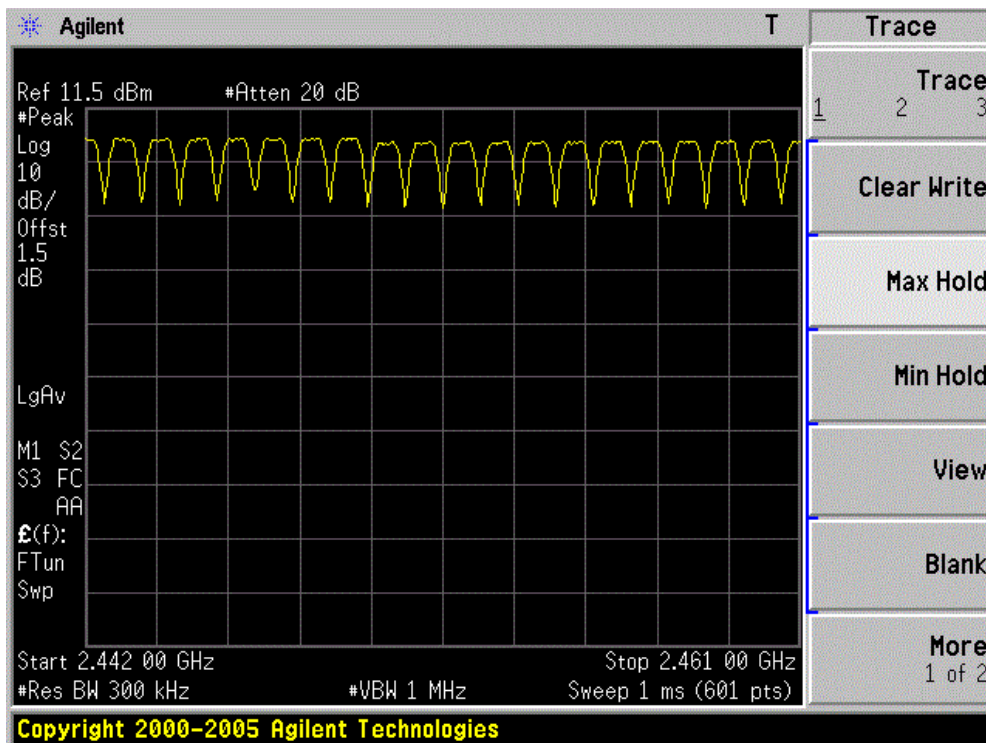
2402 - 2421 MHz



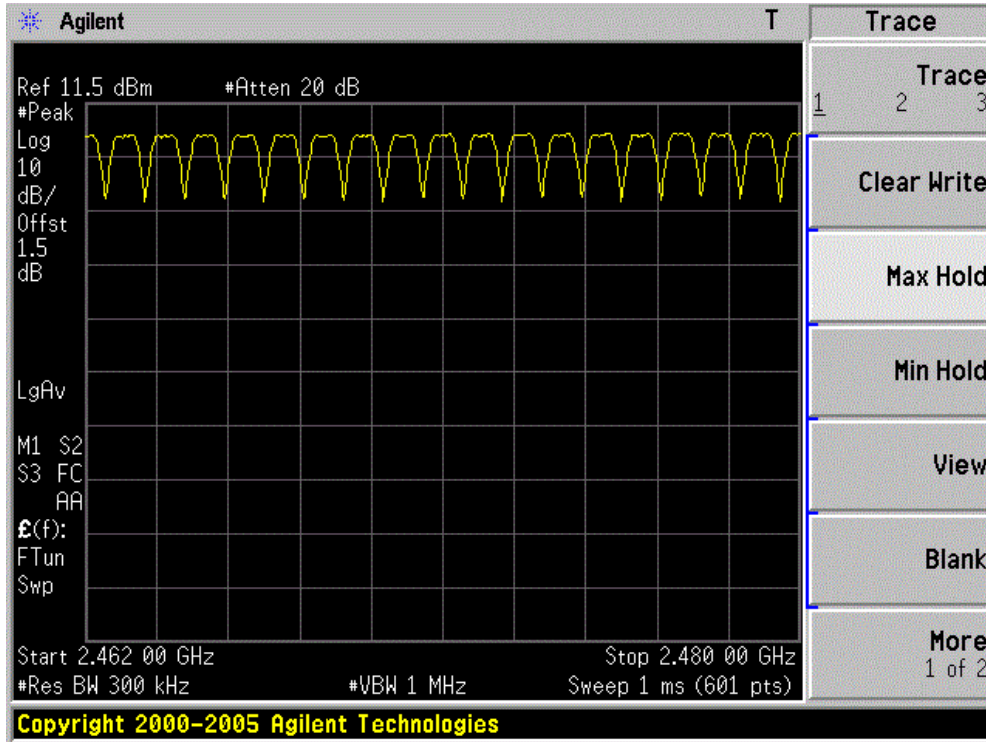
2422 - 2441 MHz



2442 - 2461 MHz



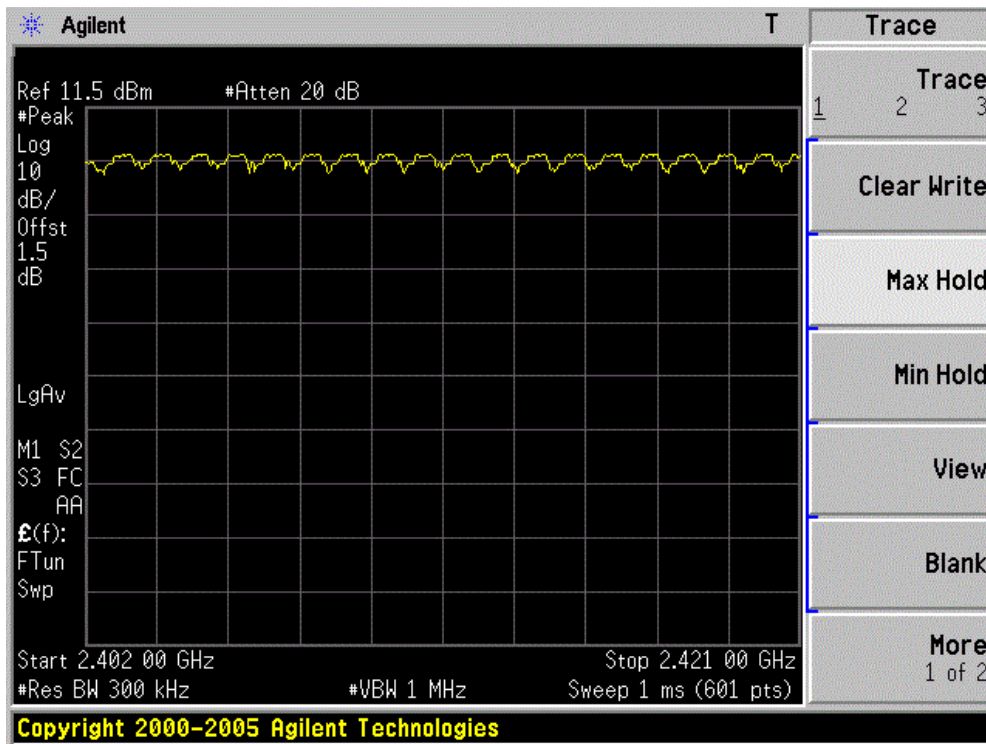
2462 - 2480 MHz



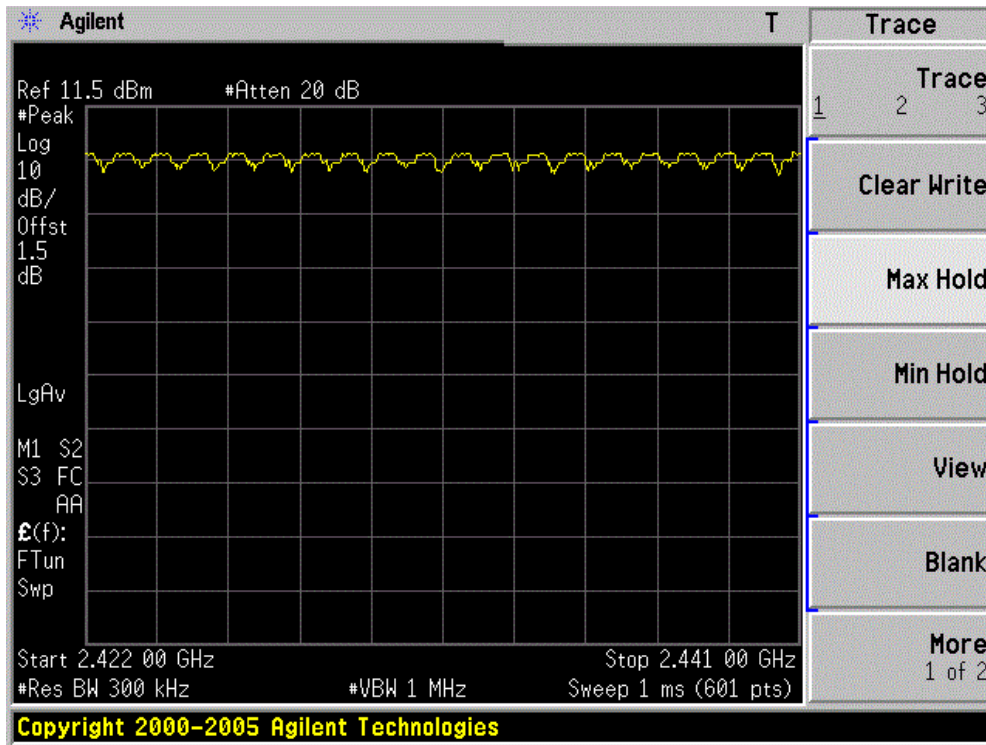
Product	:	SM1
Test Item	:	Number of Hopping Frequencies
Test Site	:	TR-8
Test Mode	:	Mode 2: Transmitter-2Mbps (Pi/4 DQPSK_DH5)

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

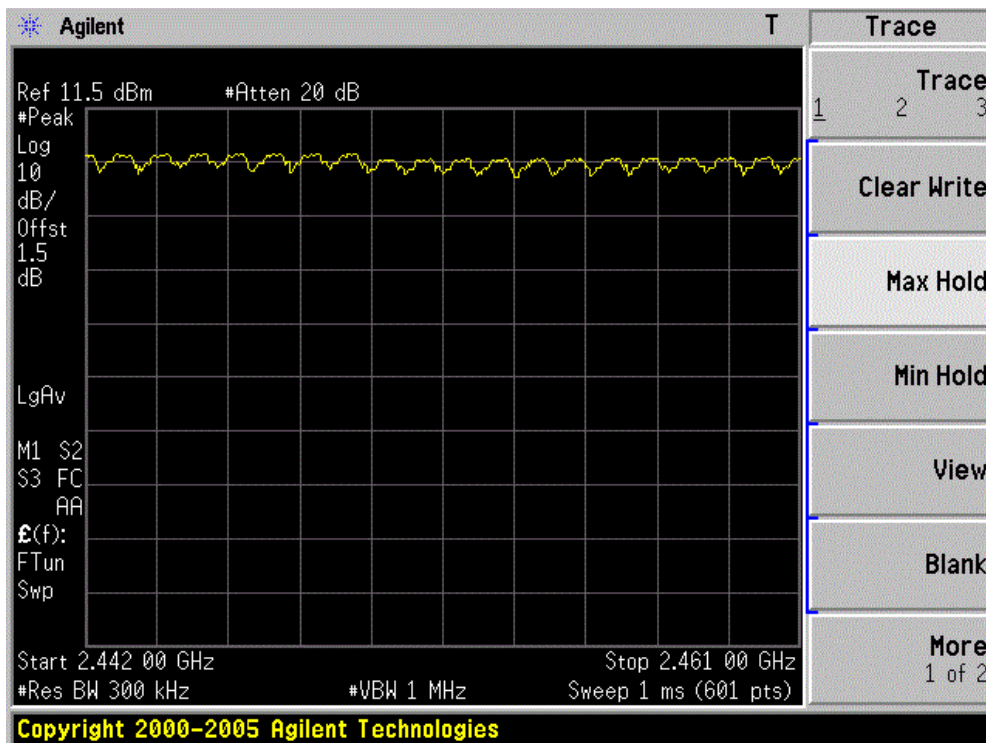
2402 - 2421 MHz



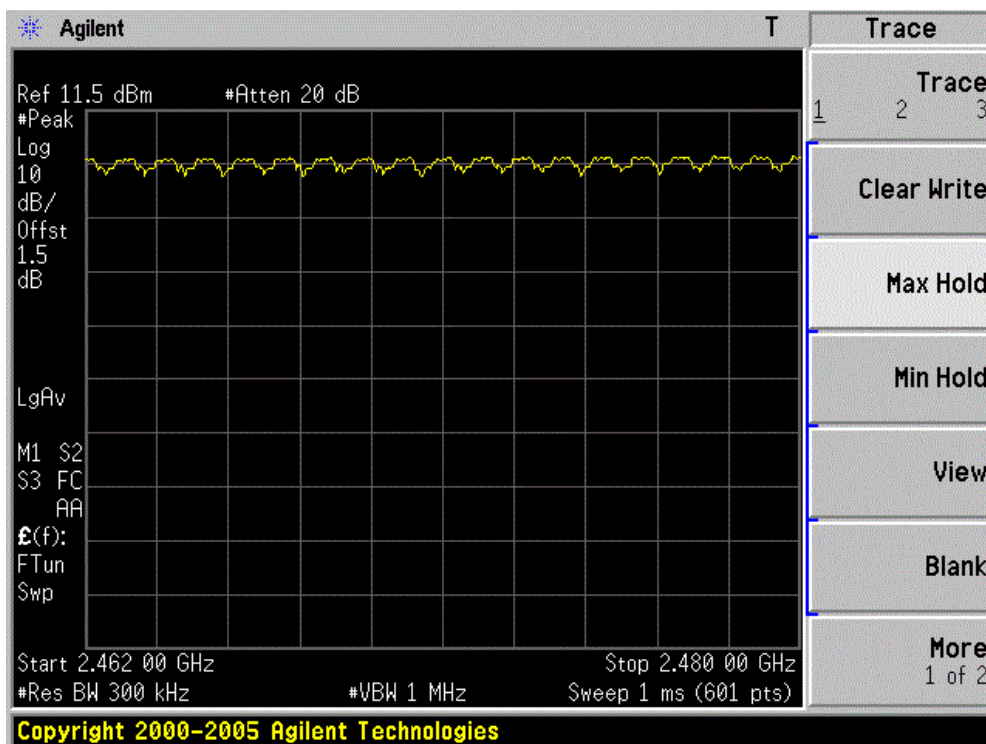
2422 - 2441 MHz



2442 - 2461 MHz



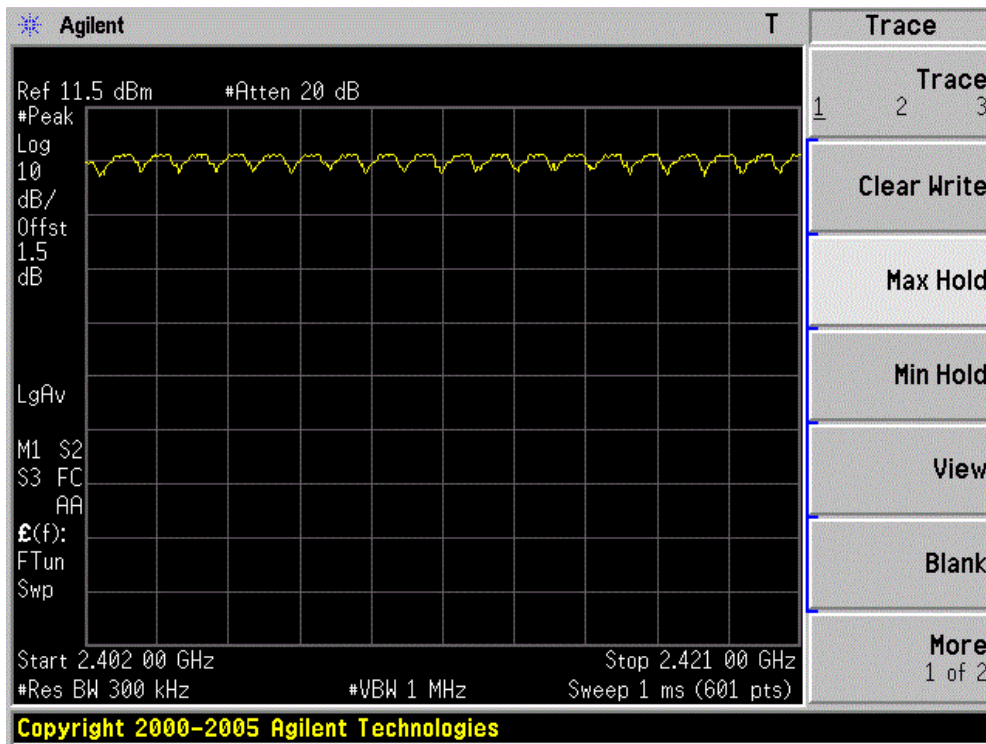
2462 - 2480 MHz



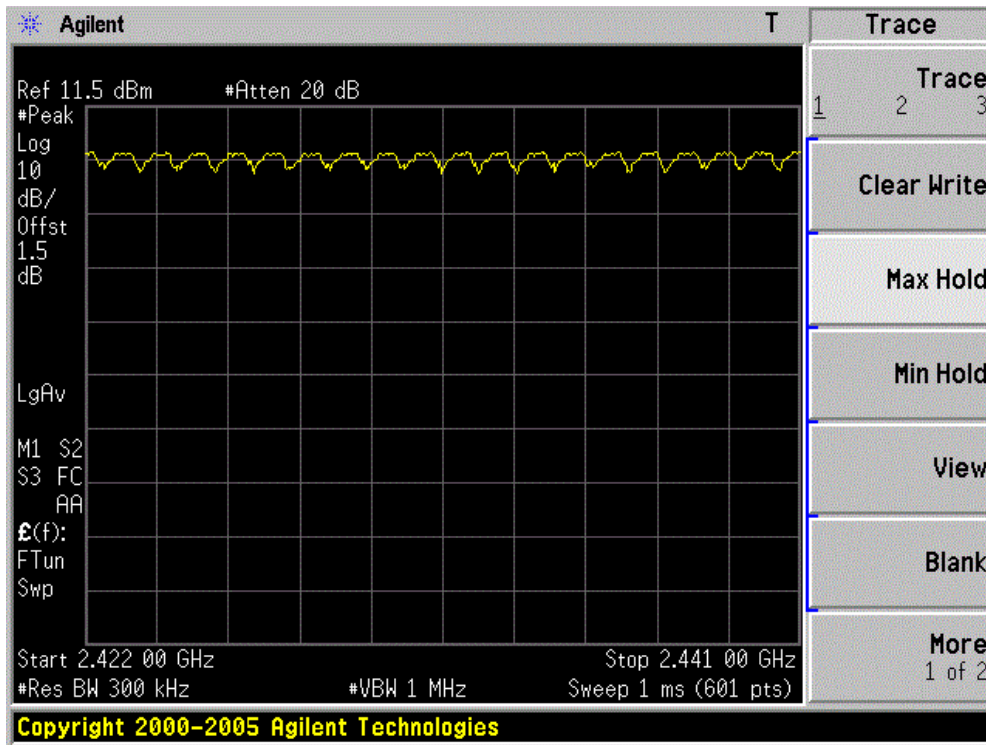
Product	:	SM1
Test Item	:	Number of Hopping Frequencies
Test Site	:	TR-8
Test Mode	:	Mode 3: Transmitter-3Mbps (8DPSK_DH5)

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

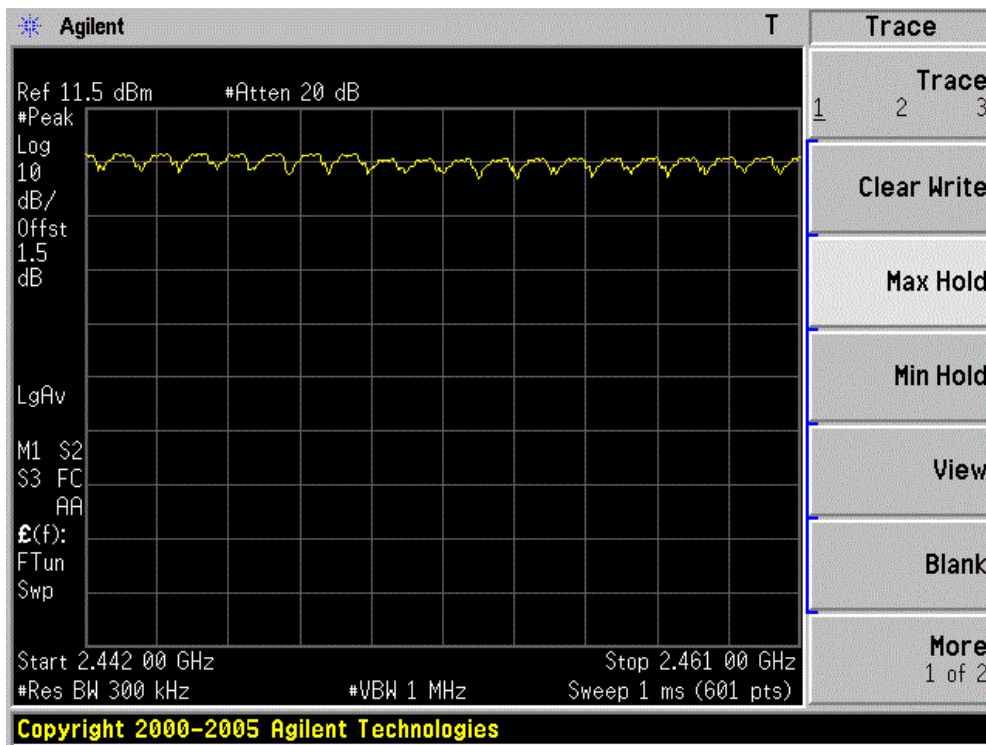
2402 - 2421 MHz



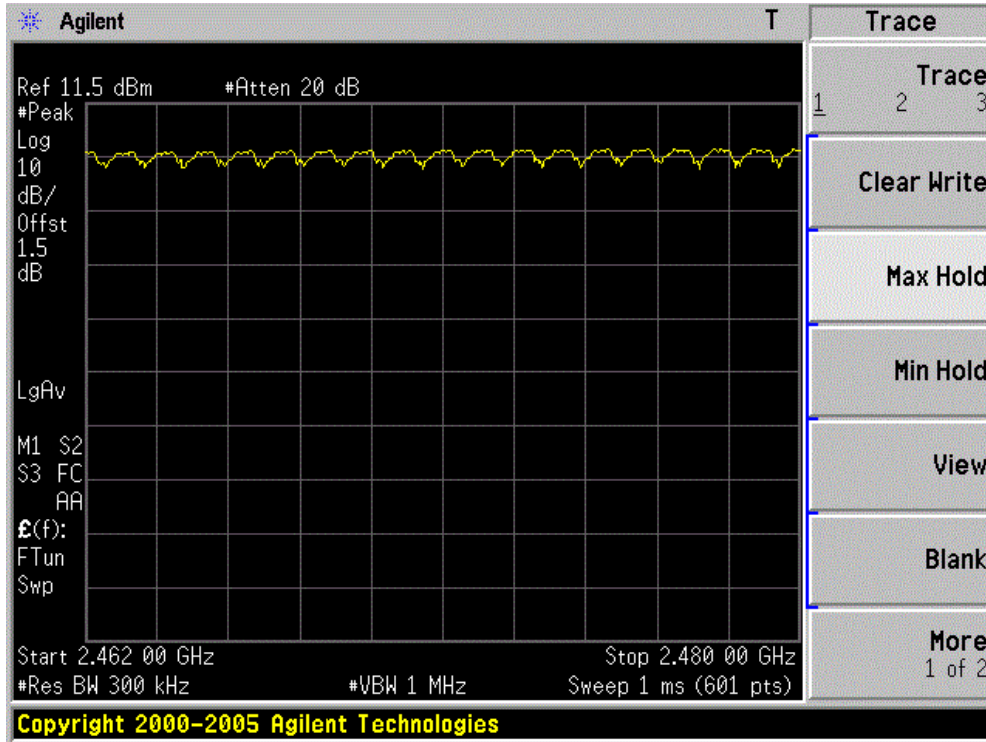
2422 - 2441 MHz



2442 - 2461 MHz



2462 - 2480 MHz



8. Time of Occupancy (Dwell Time)

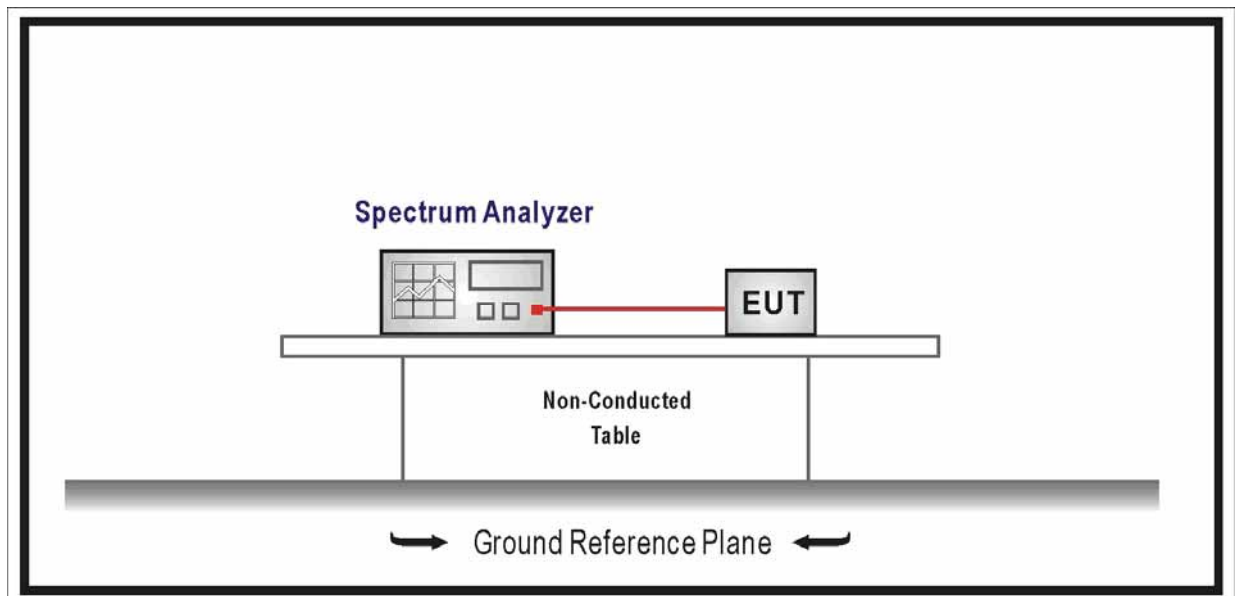
8.1. Test Equipment

Time of Occupancy (Dwell Time) / TR-8

Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
Spectrum Analyzer	Agilent	E4446A	MY45300103	2014.01.21
Temperature/Humidity Meter	Zhicheng	ZC1-2	TR8-TH	2014.05.08

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 \cong 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

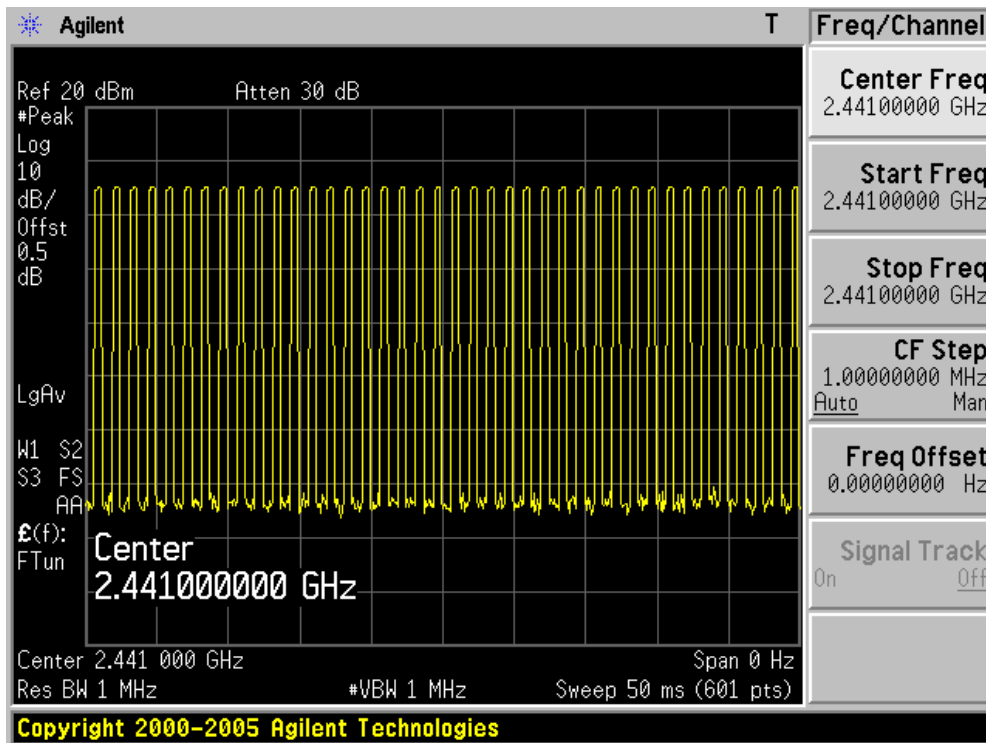
Product	:	SM1
Test Item	:	Time of Occupancy (Dwell Time)
Test Site	:	TR-8
Test Mode	:	Transmitter-3Mbps (8DPSK_DH1)

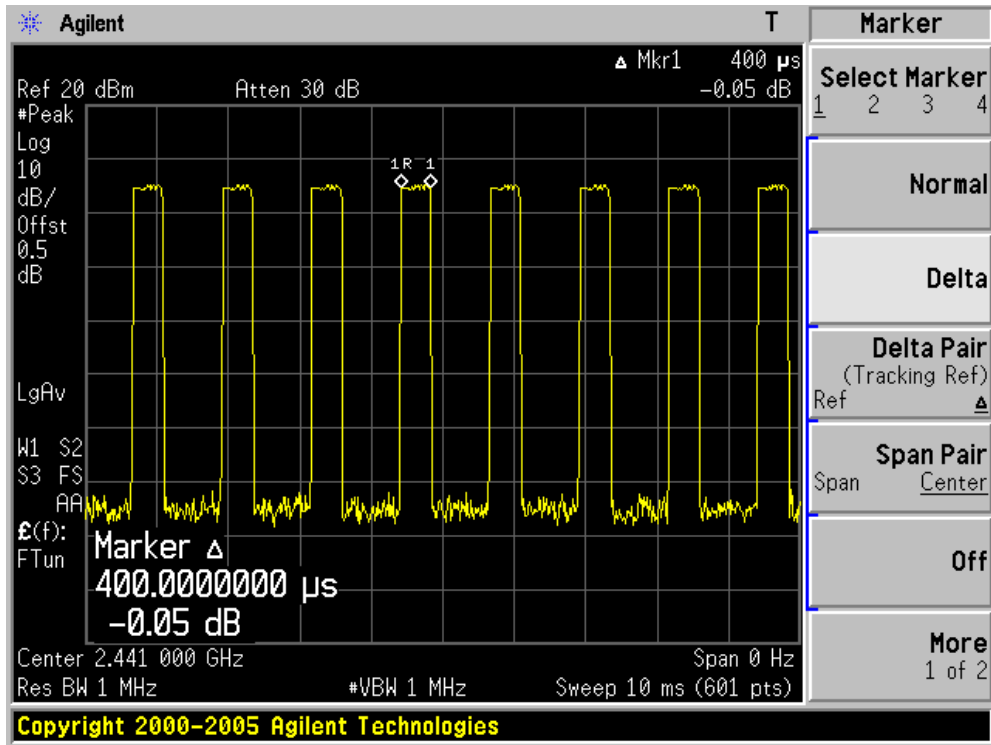
Channel No.	Frequency (MHz)	Time of Occupancy (ms)	Limit (ms)	Result
39	2441	128.00	< 400	Pass

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: $[(0.4\text{ms} * 800) / 79] * 31.6 = 128.00$ msec

Channel 39 (2441MHz)-(3DH1)





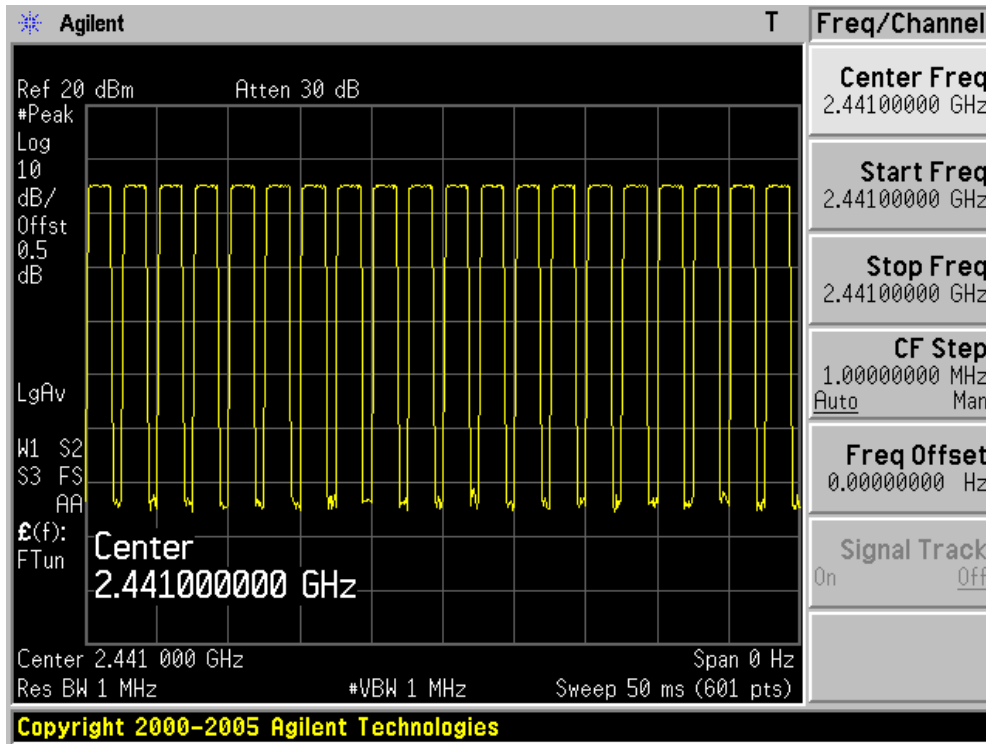
Product	:	SM1
Test Item	:	Time of Occupancy (Dwell Time)
Test Site	:	TR-8
Test Mode	:	Transmitter-3Mbps (8DPSK_DH3)

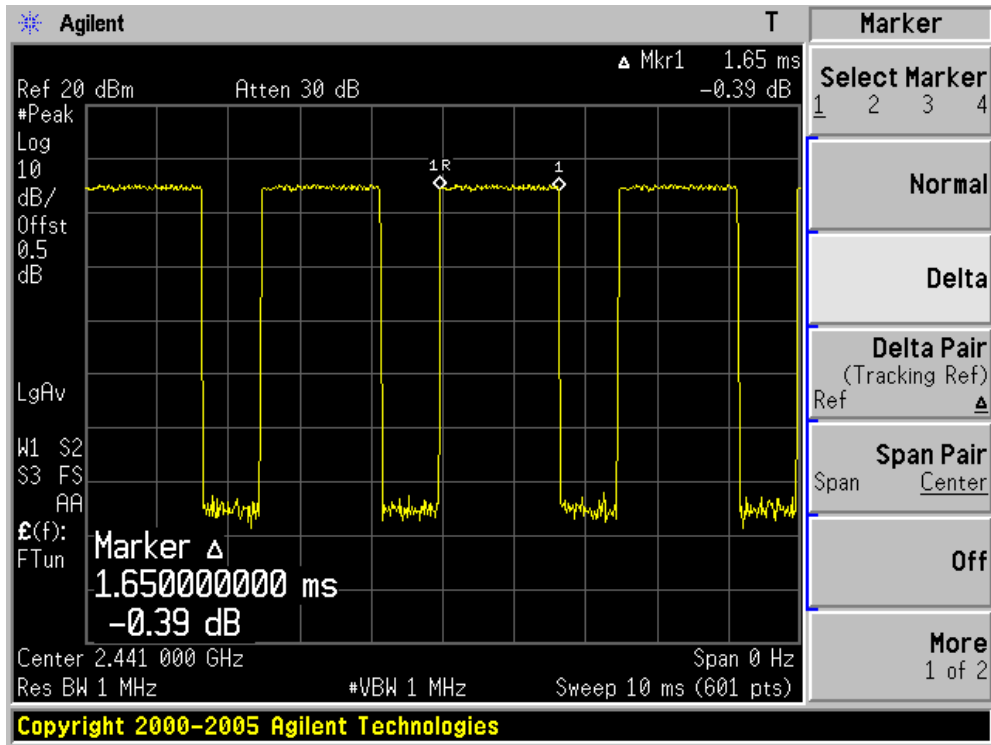
Channel No.	Frequency (MHz)	Time of Occupancy (ms)	Limit (ms)	Result
39	2441	264.00	< 400	Pass

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: $[(1.65\text{ms} \times 400)/79] \times 31.6 = 264.00$ msec

Channel 39 (2441MHz) - (3DH3)





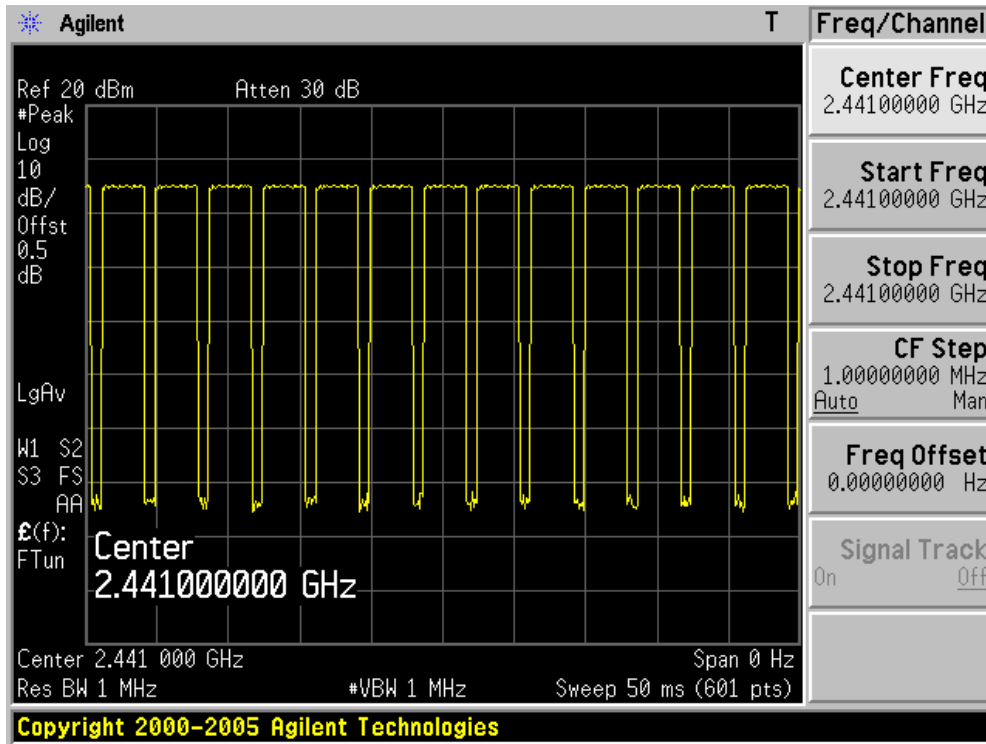
Product	:	SM1
Test Item	:	Time of Occupancy (Dwell Time)
Test Site	:	TR-8
Test Mode	:	Transmitter-3Mbps (8DPSK_DH5)

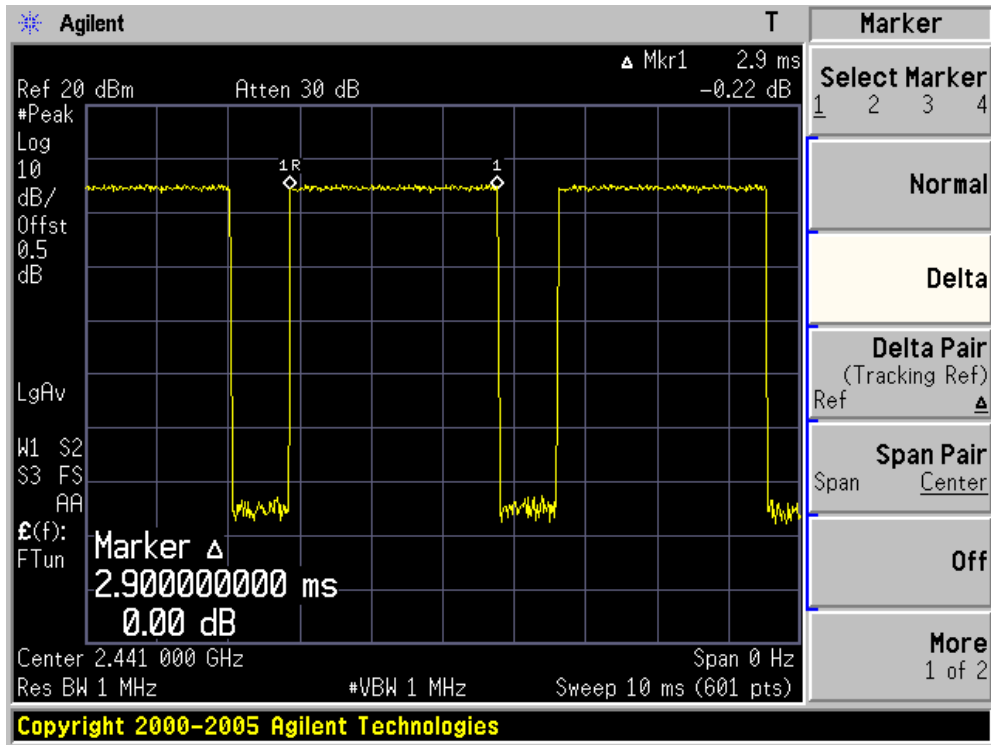
Channel No.	Frequency (MHz)	Time of Occupancy (ms)	Limit (ms)	Result
39	2441	302.03	< 400	Pass

Test Time Period: $0.4 * 79 = 31.6 \text{sec}$, Hopping Times Within 1sec: $13/50 \text{msec} = 260 \text{hops/sec}$.

- 2441MHz, The Maximum Occupancy Time Within 31.6sec: $[(2.900 \text{ ms} * 260) / 79] * 31.6 = 302.03 \text{msec}$

Channel 39 (2441MHz) - (3DH5)





9. Peak Output Power

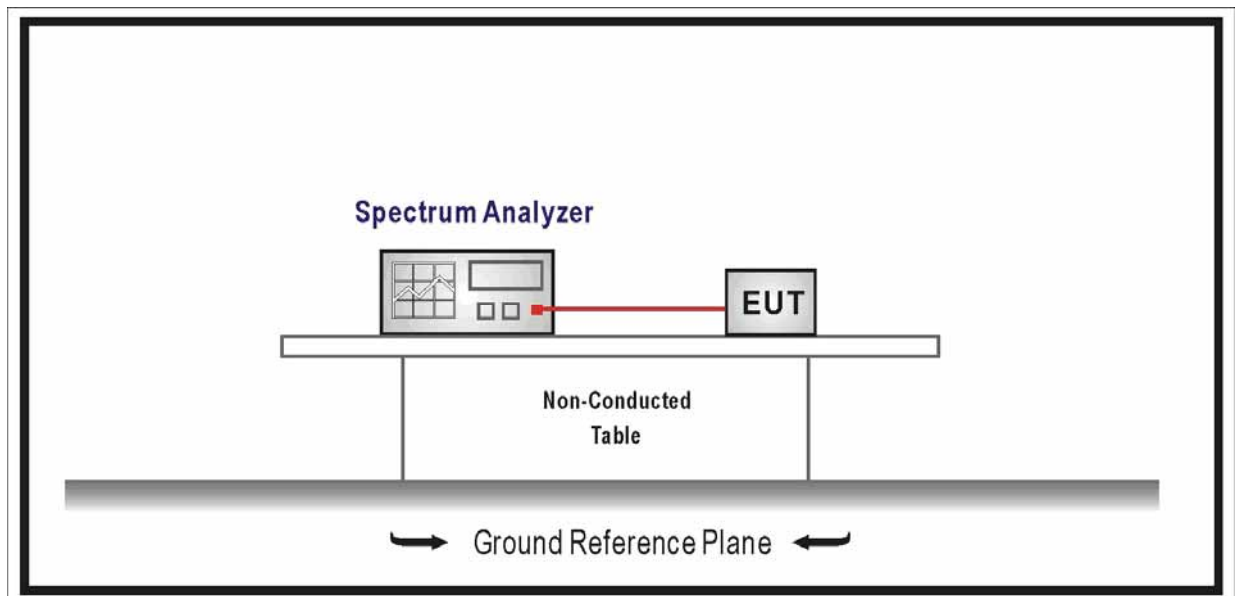
9.1. Test Equipment

Peak Output Power / TR-8

Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
Spectrum Analyzer	Agilent	E4446A	MY45300103	2014.01.21
Temperature/Humidity Meter	Zhicheng	ZC1-2	TR8-TH	2014.05.08

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 \cong 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

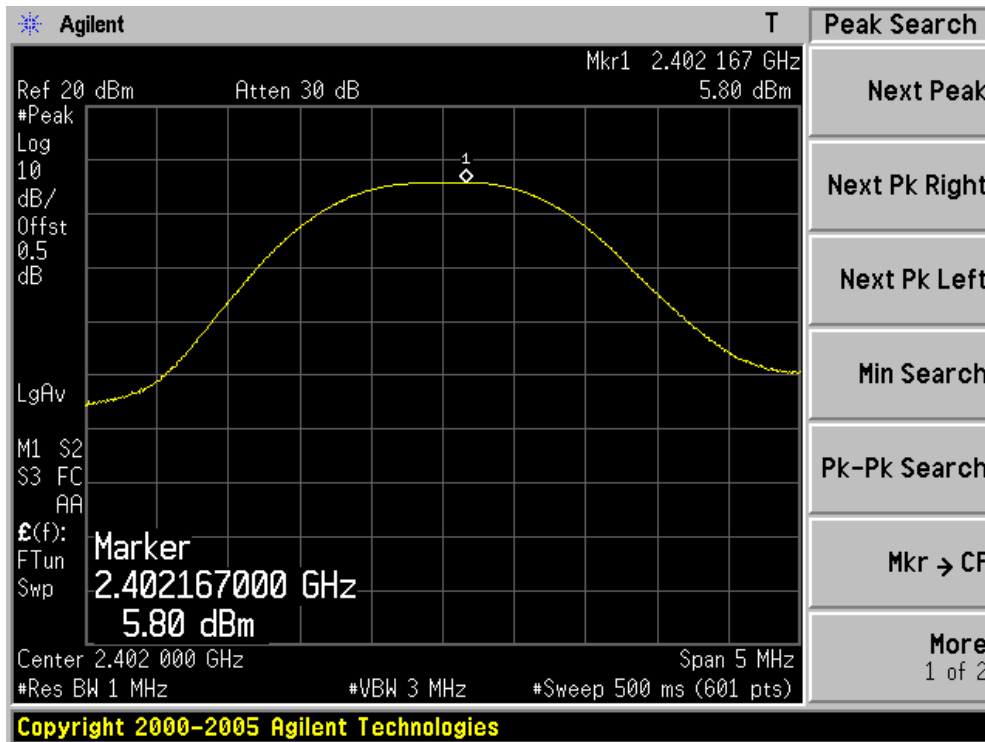
The measurement uncertainty is defined as ± 1.0 dB

9.6. Test Result

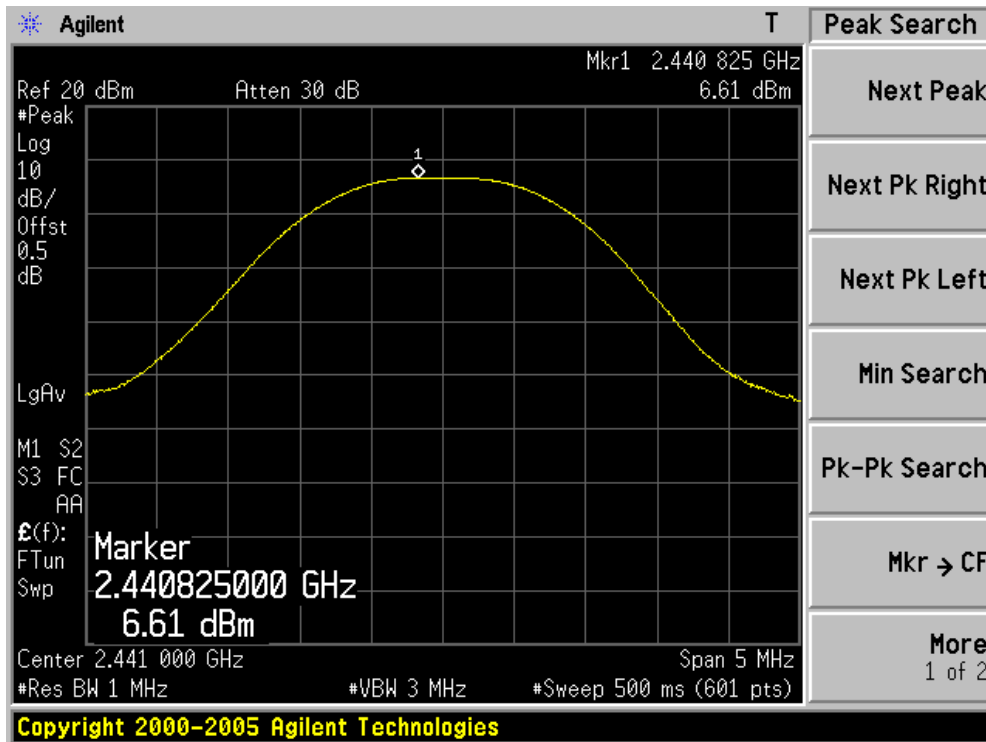
Product	:	SM1
Test Item	:	Power Output
Test Mode	:	Mode 1: Transmitter-1Mbps (GFSK_DH5)

Channel No.	Frequency (MHz)	Measurement Power Output (dBm)	Limit (dBm)	Result
0	2402	5.80	30.00	Pass
39	2441	6.61	30.00	Pass
78	2480	7.23	30.00	Pass

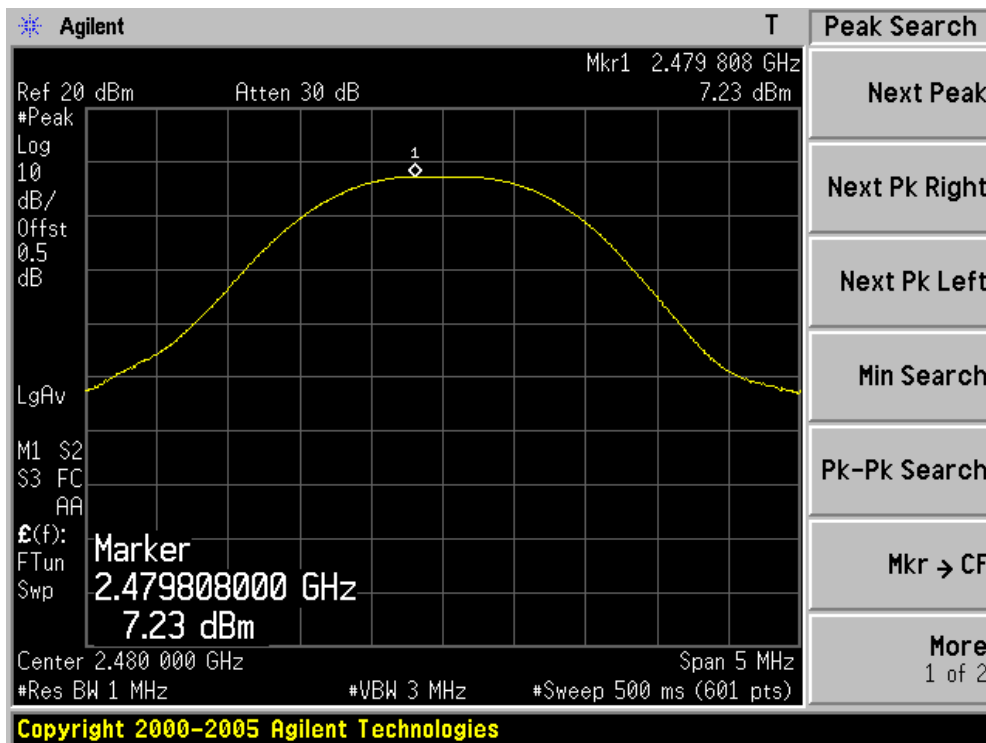
Channel 00 (2402MHz)



Channel 39 (2441MHz)



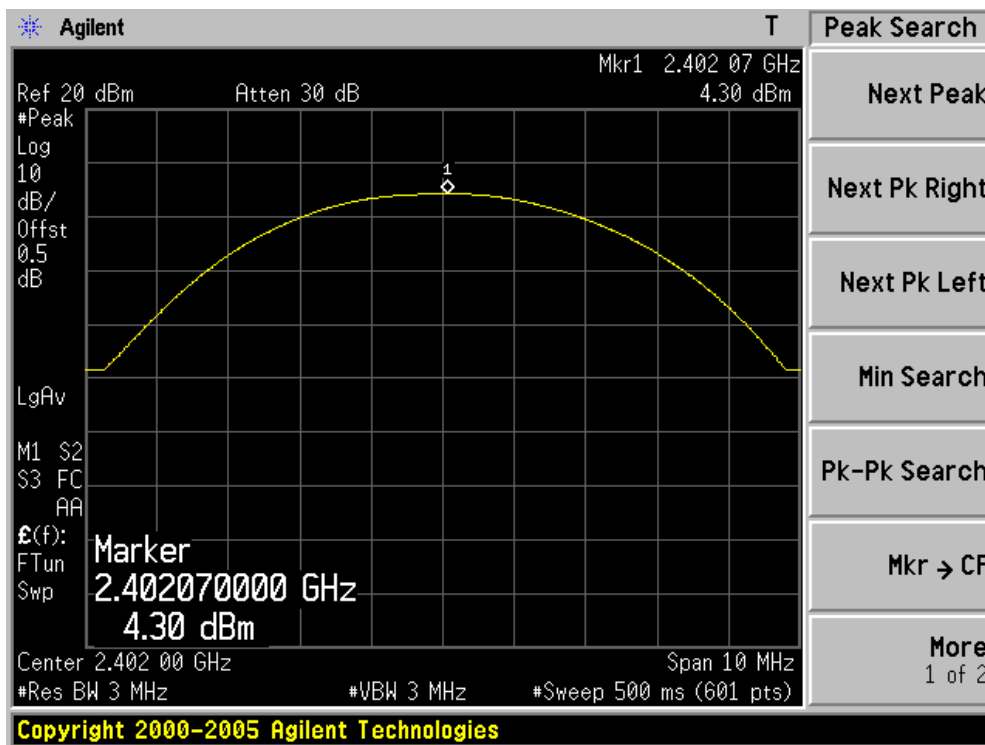
Channel 78 (2480MHz)



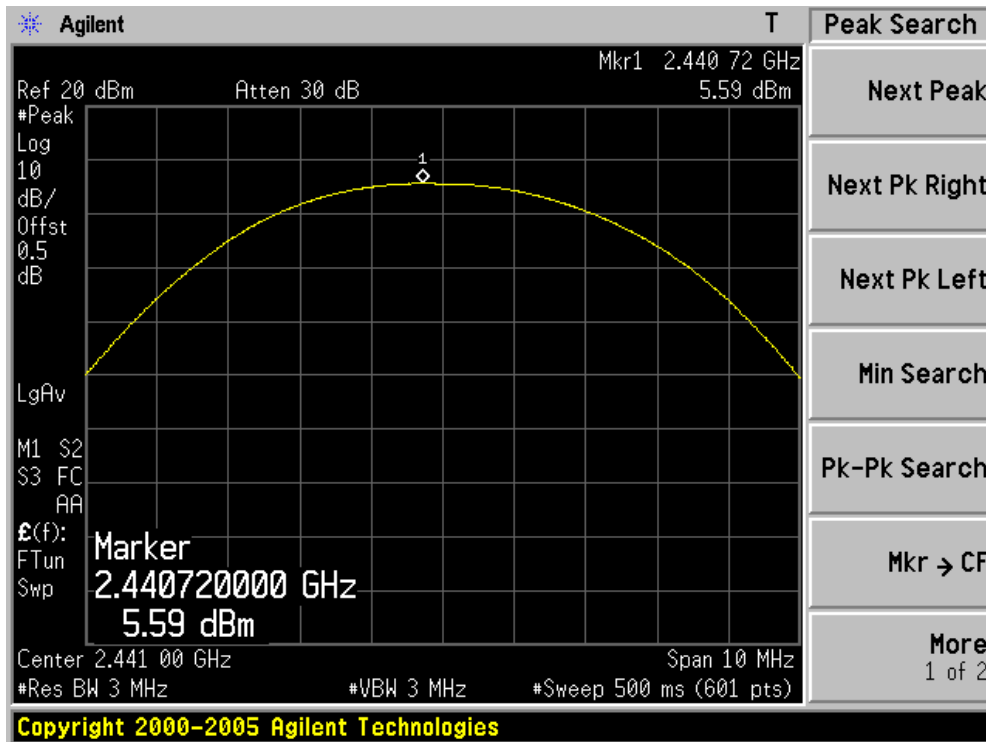
Product	:	SM1
Test Item	:	Power Output
Test Mode	:	Mode 2: Transmitter-2Mbps (Pi/4 DQPSK_DH5)

Channel No.	Frequency (MHz)	Measurement Power Output (dBm)	Limit (dBm)	Result
0	2402	4.30	30.00	Pass
39	2441	5.59	30.00	Pass
78	2480	6.34	30.00	Pass

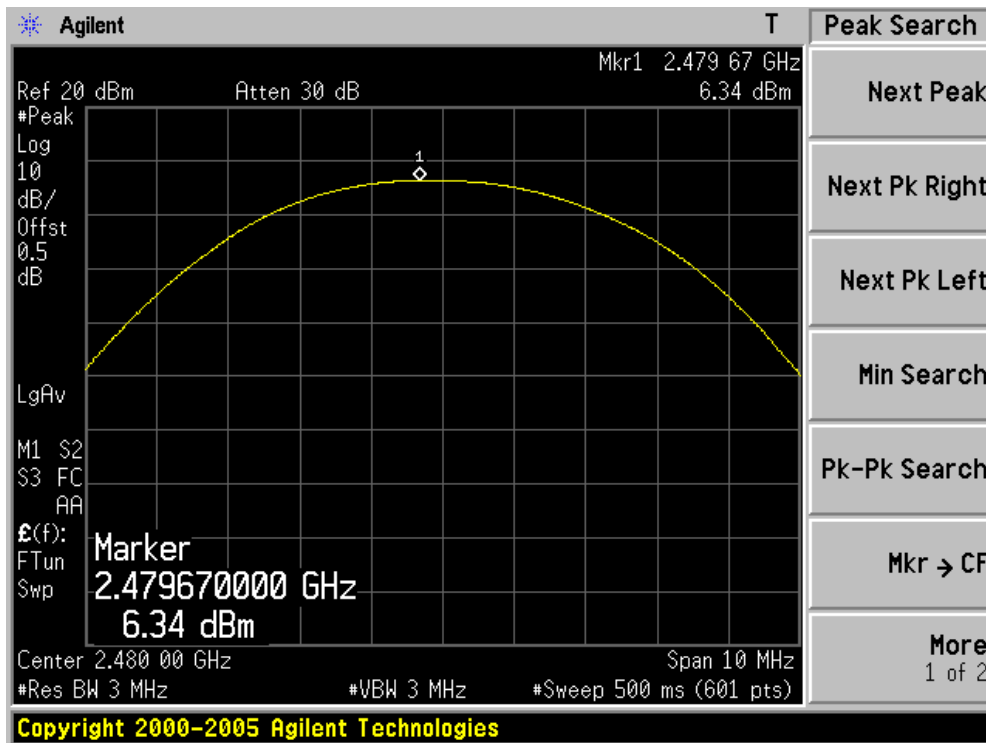
Channel 00 (2402MHz)



Channel 39 (2441MHz)



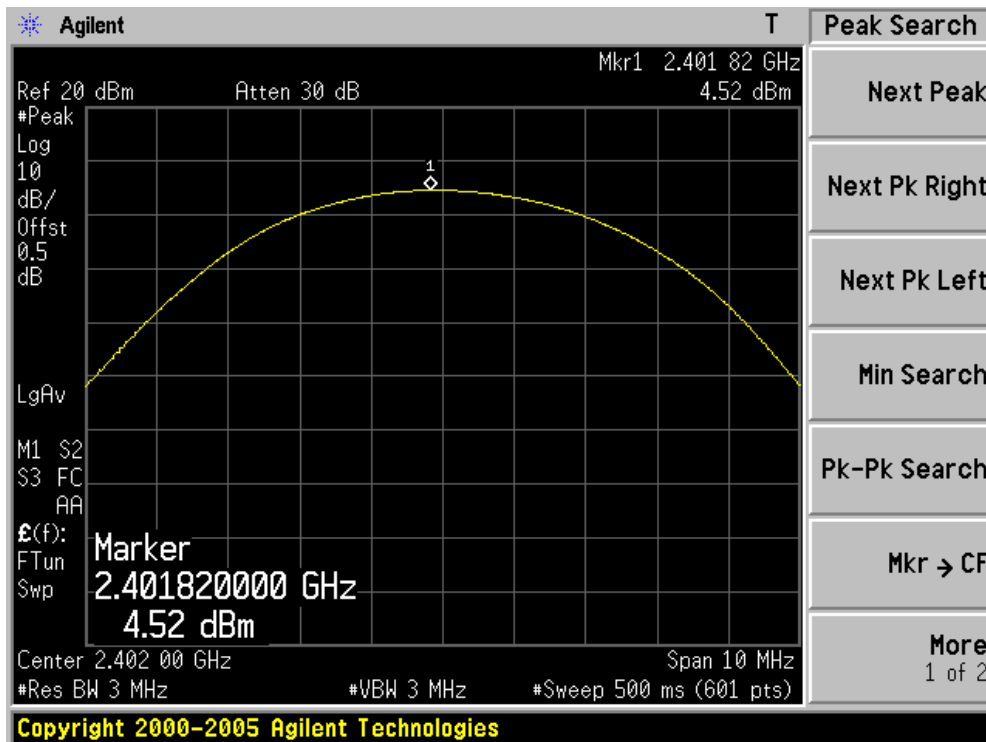
Channel 78 (2480MHz)



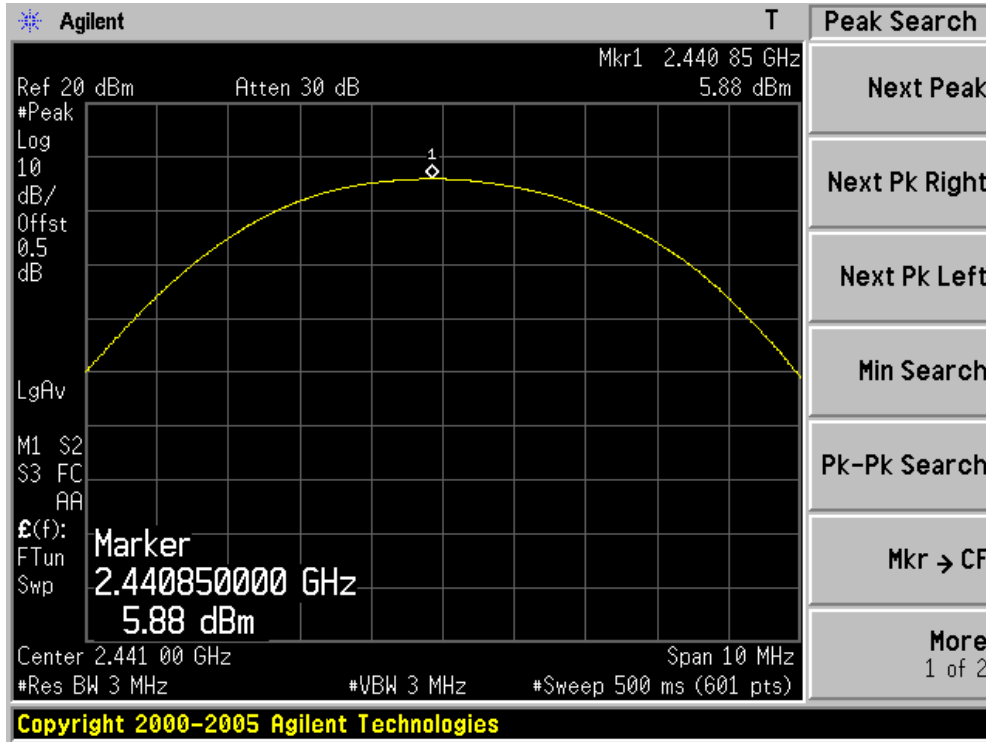
Product	: SM1
Test Item	: Power Output
Test Mode	: Mode 3: Transmitter-3Mbps (8DPSK_DH5)

Channel No.	Frequency (MHz)	Measurement Power Output (dBm)	Limit (dBm)	Result
0	2402	4.52	30.00	Pass
39	2441	5.88	30.00	Pass
78	2480	6.58	30.00	Pass

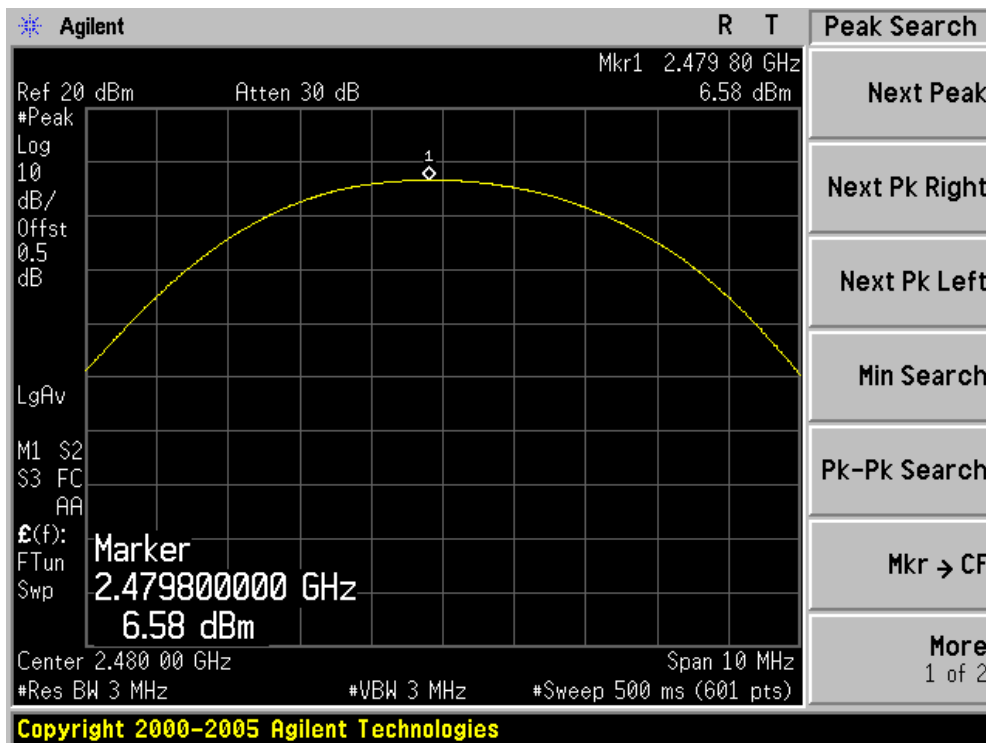
Channel 00 (2402MHz)



Channel 39 (2441MHz)



Channel 78 (2480MHz)



10. Band-edge Compliance of RF Conducted Emissions

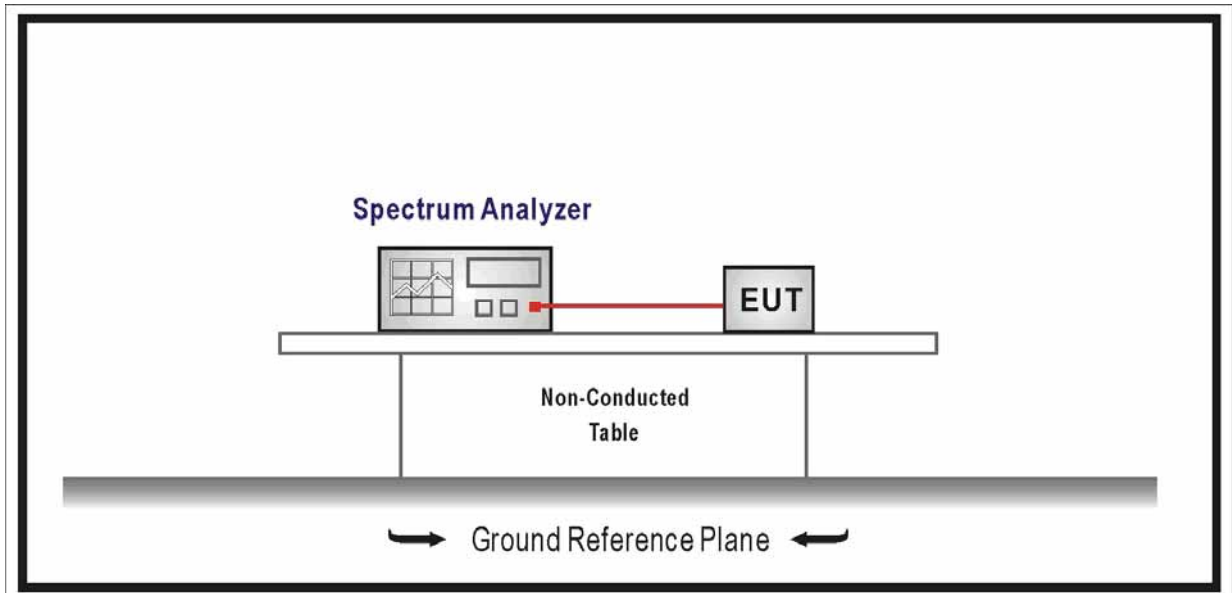
10.1. Test Equipment

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

Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
Spectrum Analyzer	Agilent	E4446A	MY45300103	2014.01.21
Temperature/Humidity Meter	Zhicheng	ZC1-2	TR8-TH	2014.05.08

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 \cong 1% of the span

VBW \cong 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.

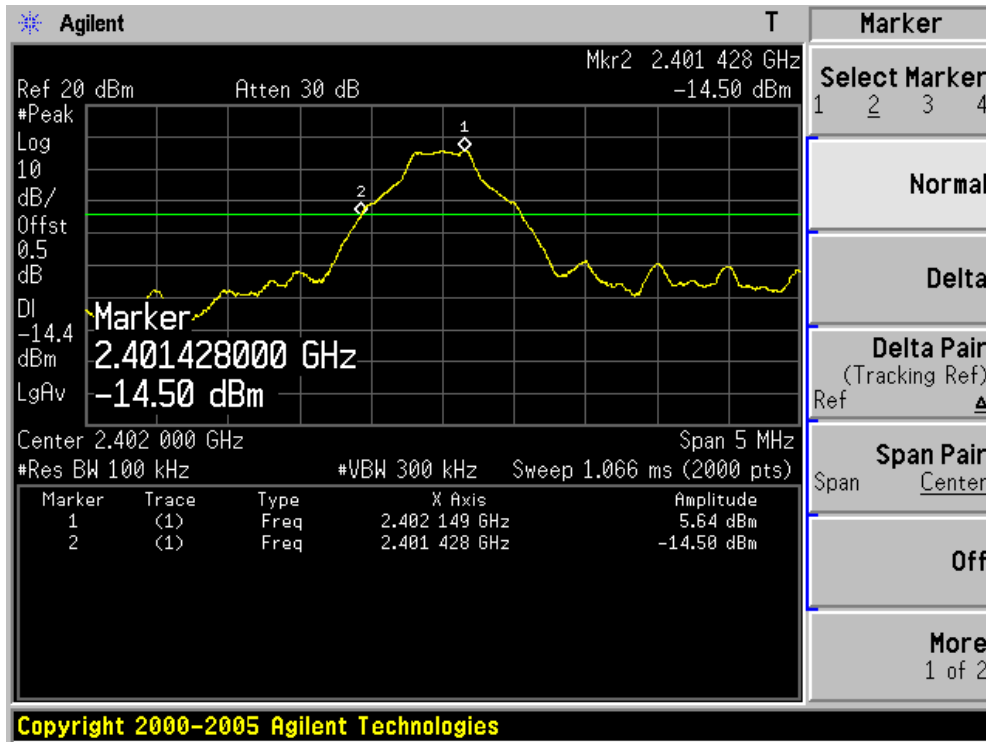
10.5. Uncertainty

The measurement uncertainty is defined as ± 1.0 dB

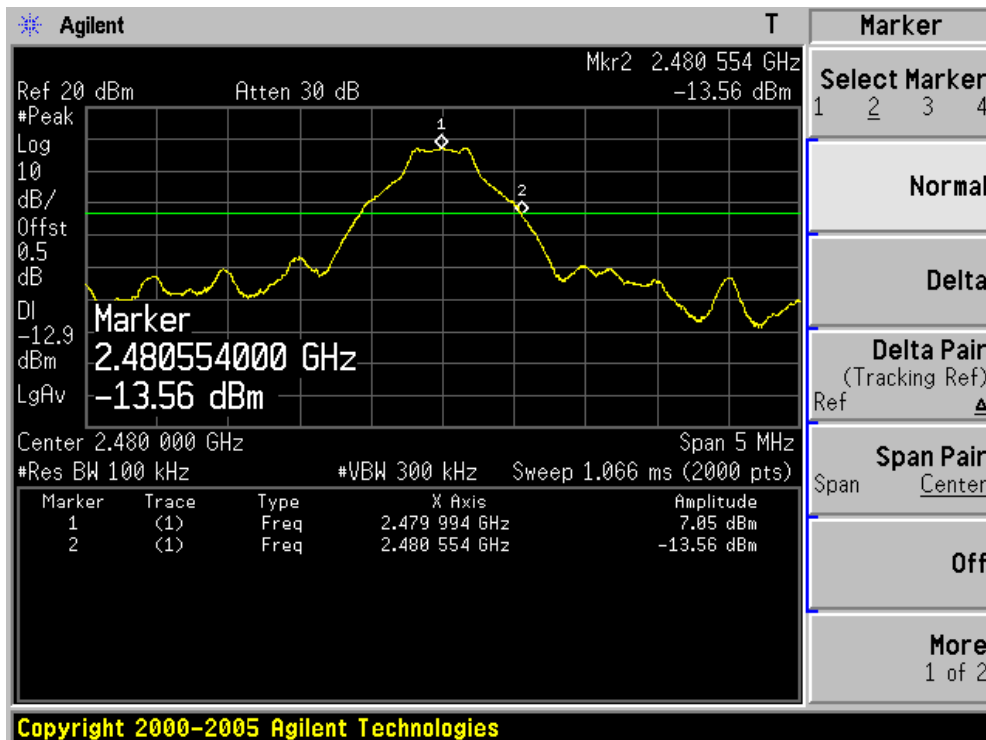
10.6. Test Result

Product	:	SM1
Test Item	:	Band-edge Compliance of RF Conducted Emissions
Test Mode	:	Mode 1: Transmitter-1Mbps (GFSK_DH5)

Channel 00 (2402MHz)

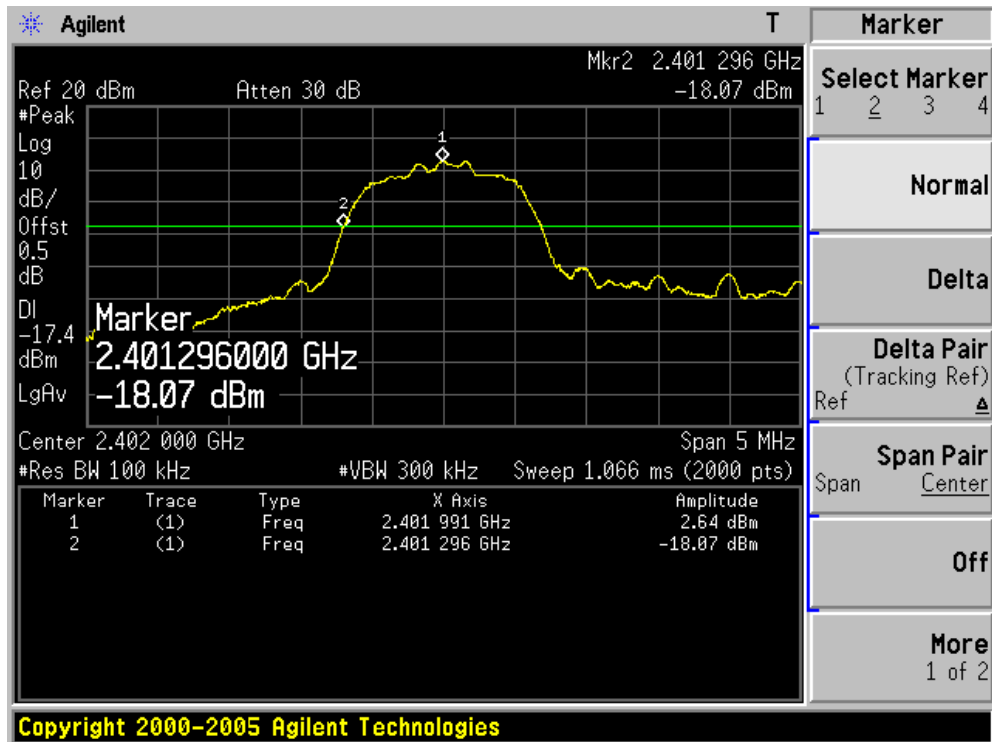


Channel 78 (2480MHz)

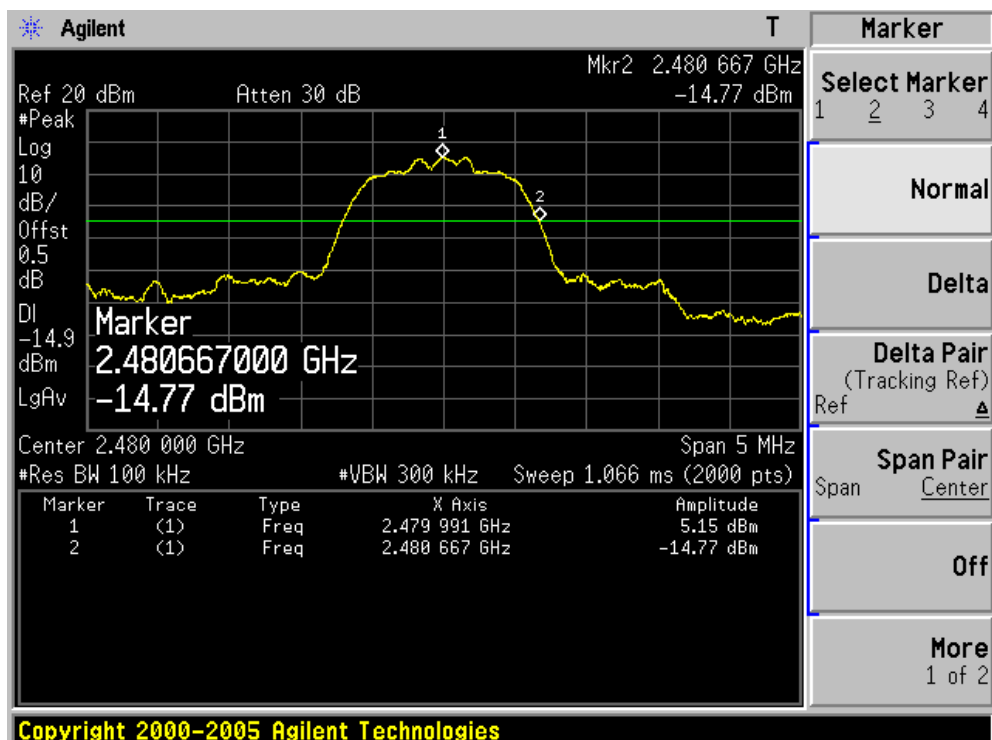


Product	:	SM1
Test Item	:	Band-edge Compliance of RF Conducted Emissions
Test Mode	:	Mode 2: Transmitter-2Mbps (Pi/4 DQPSK_DH5)

Channel 00 (2402MHz)

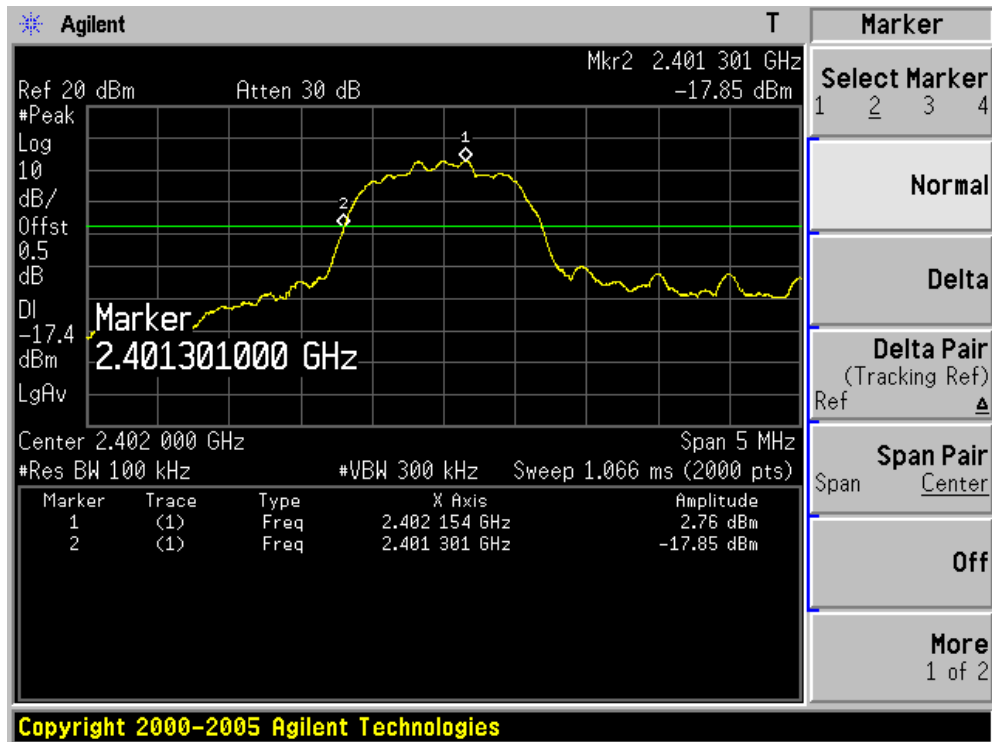


Channel 78 (2480MHz)

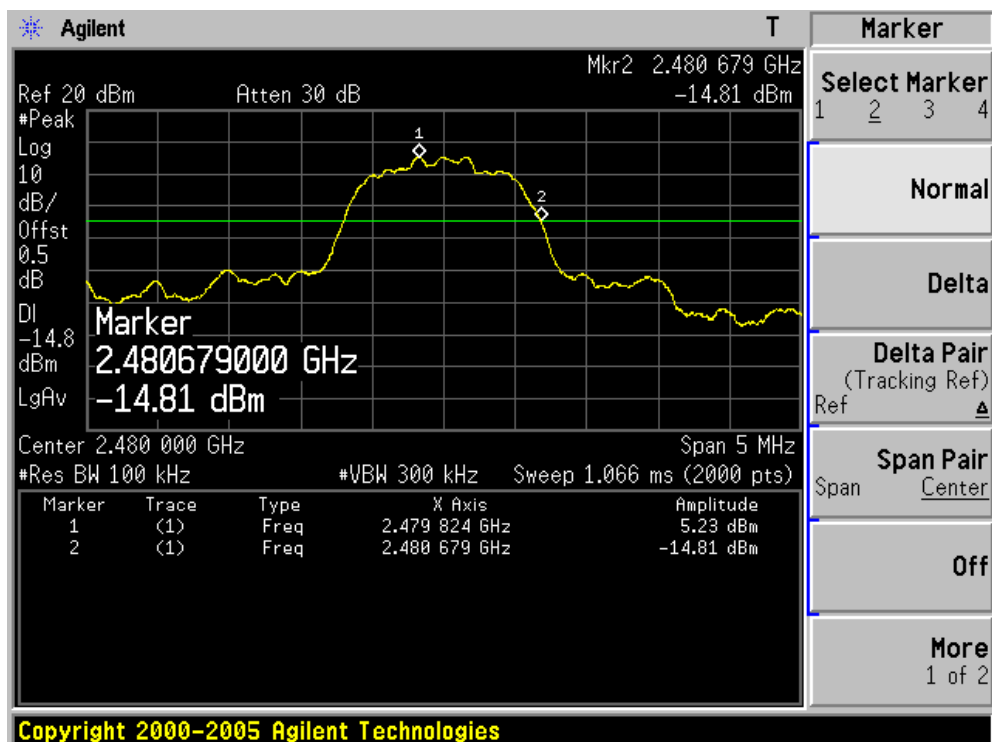


Product	:	SM1
Test Item	:	Band-edge Compliance of RF Conducted Emissions
Test Mode	:	Mode 3: Transmitter-3Mbps (8DPSK_DH5)

Channel 00 (2402MHz)

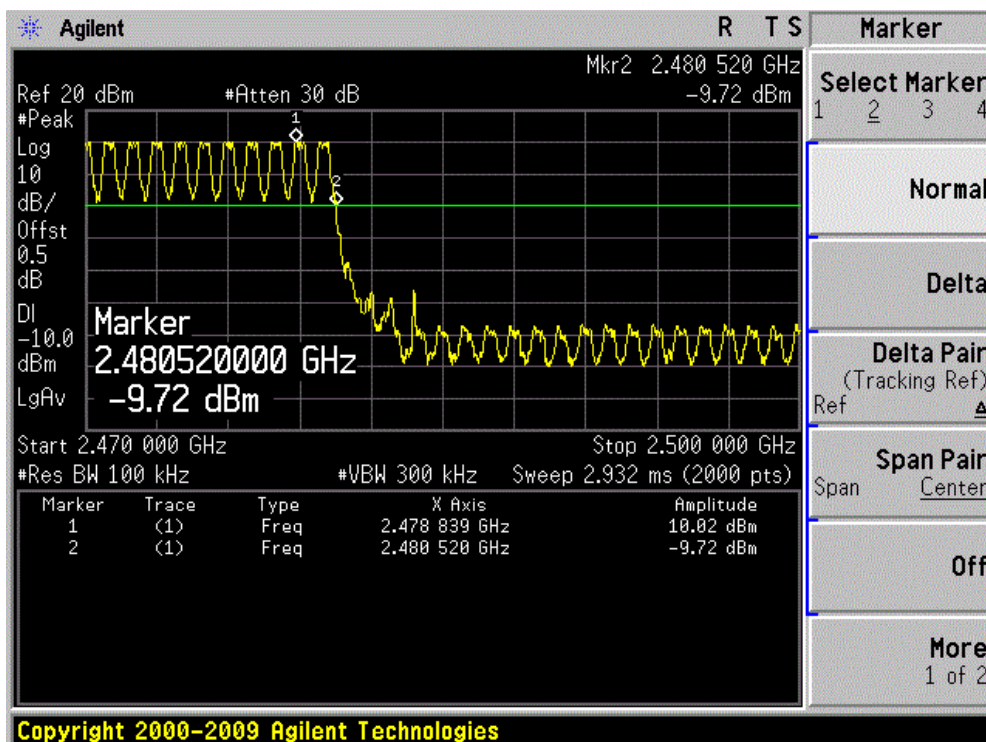
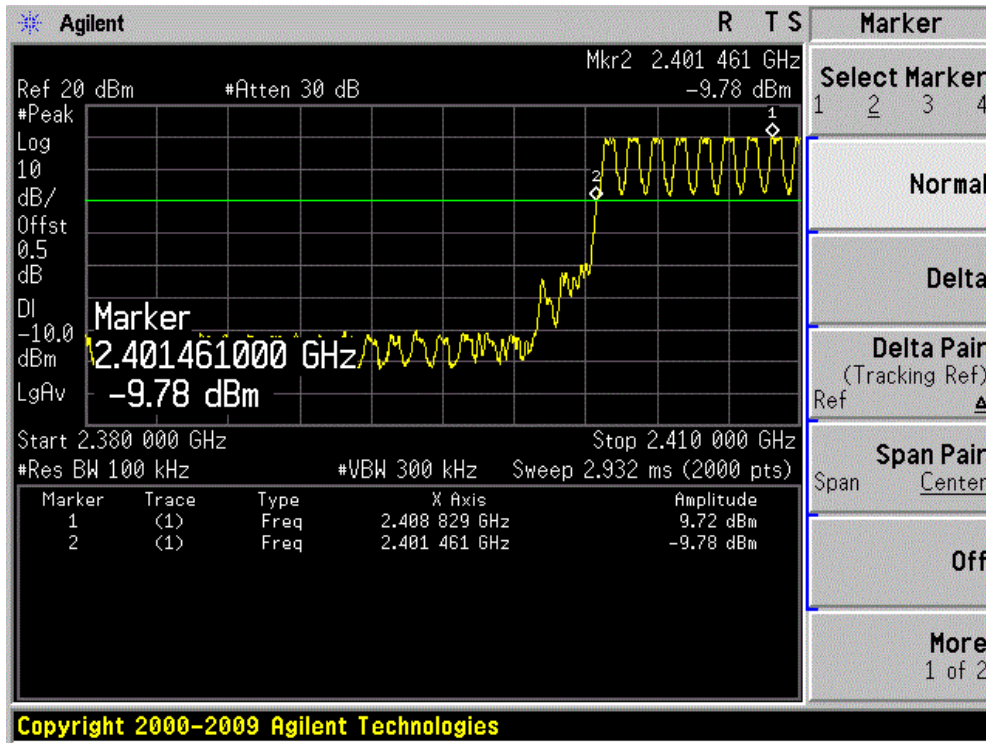


Channel 78 (2480MHz)



Product	: SM1
Test Item	: Band-edge Compliance of RF Conducted Emissions
Test Mode	: Mode 1: Hopping Mode

Hopping Mode



11. Spurious RF Conducted Emissions

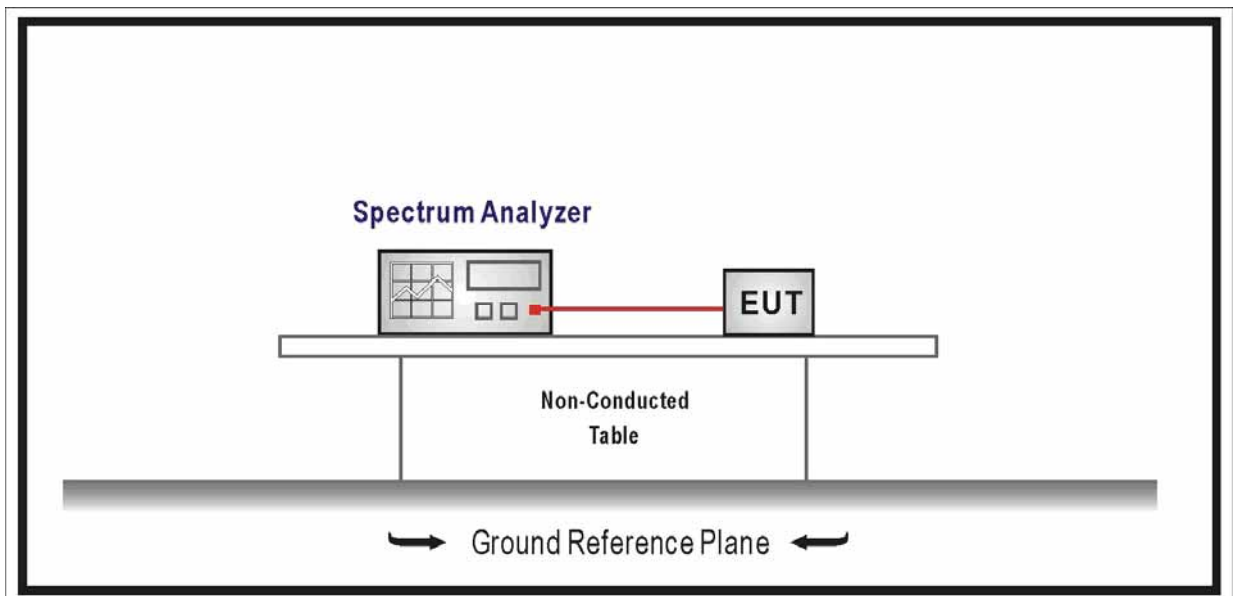
11.1. Test Equipment

Spurious RF Conducted Emissions / TR-8

Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
Spectrum Analyzer	Agilent	E4446A	MY45300103	2014.01.21
Temperature/Humidity Meter	Zhicheng	ZC1-2	TR8-TH	2014.05.08

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 \cong 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.

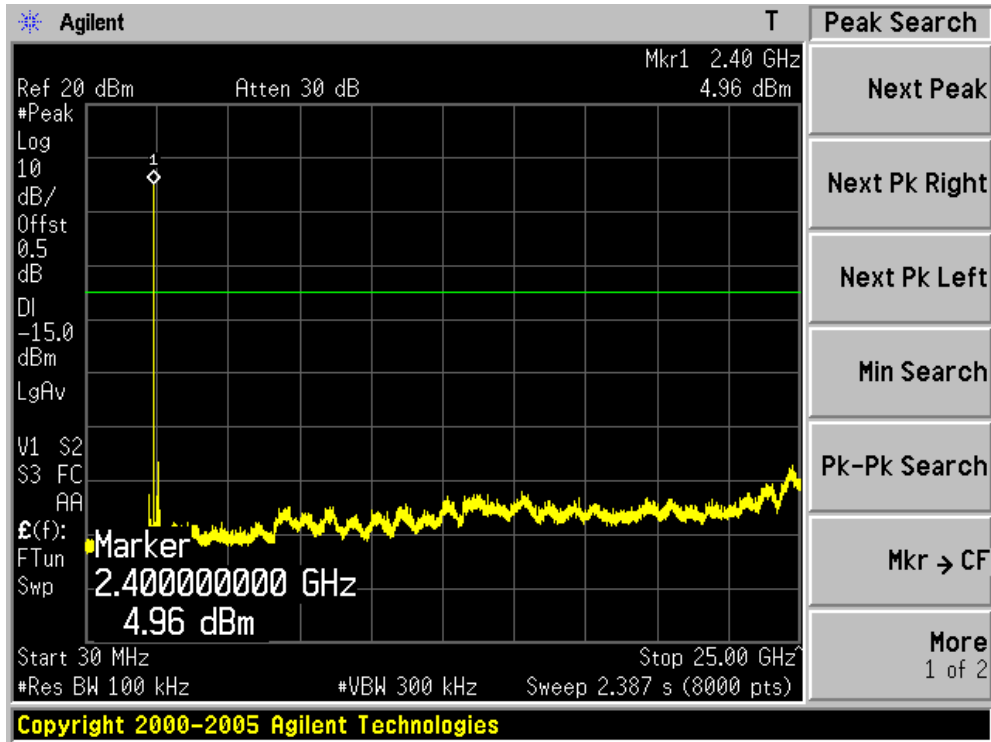
11.5. Uncertainty

The measurement uncertainty is defined as ± 1.0 dB

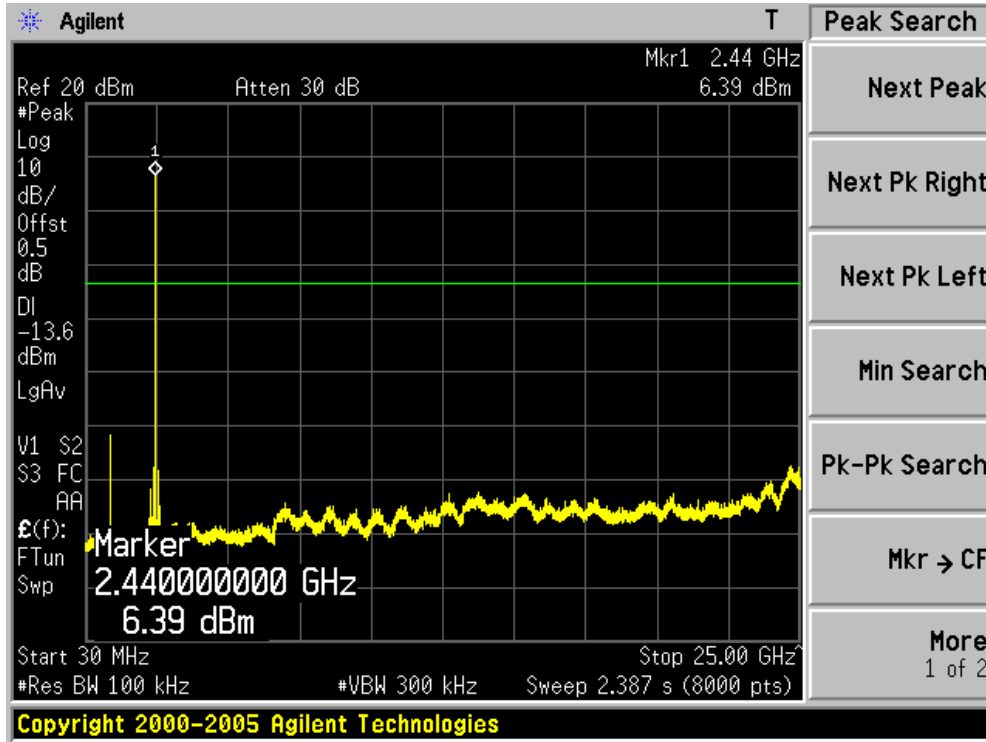
11.6. Test Result

Product	:	SM1
Test Item	:	Spurious RF Conducted Emissions
Test Mode	:	Mode 1: Transmitter-1Mbps (GFSK_DH5)

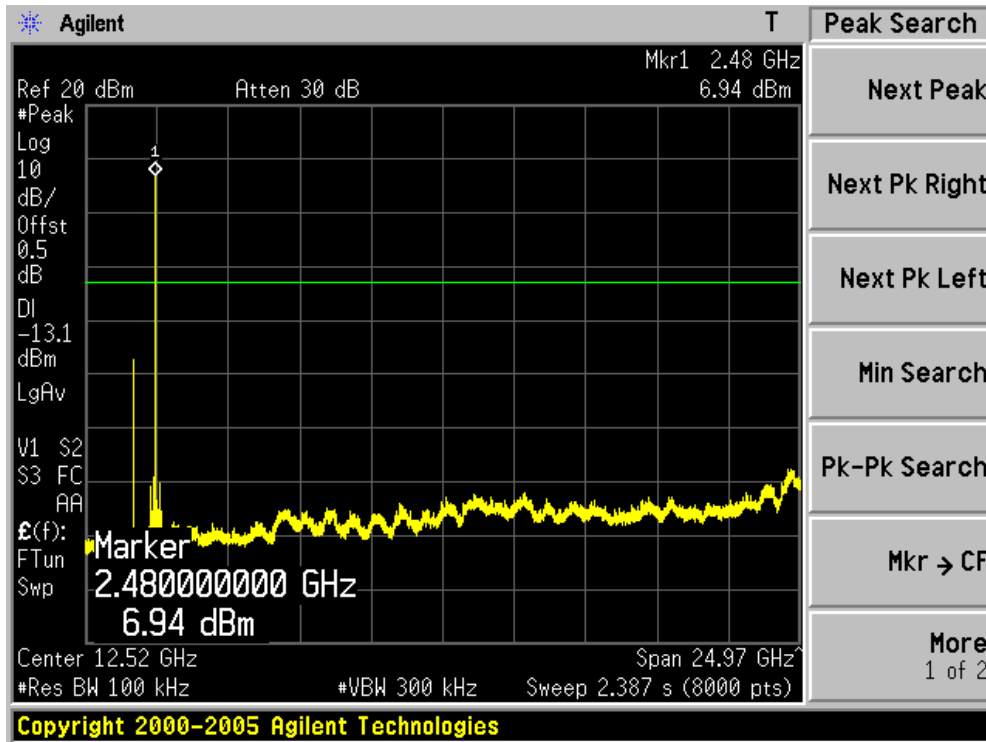
Channel 00 (2402MHz)



Channel 39 (2441MHz)

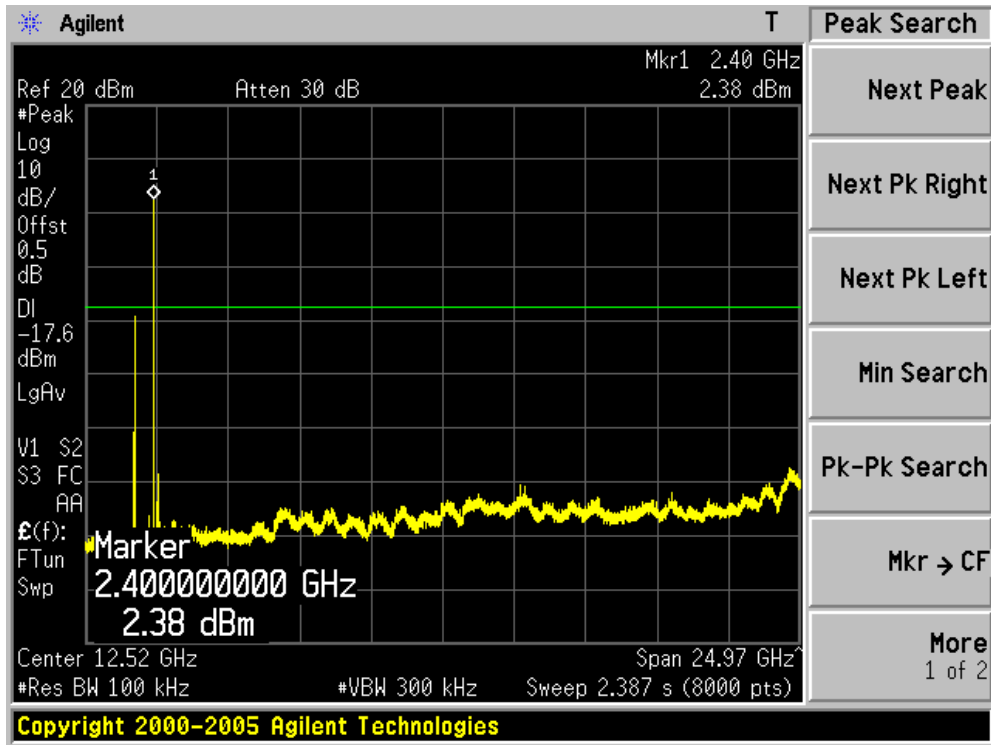


Channel 78 (2480MHz)

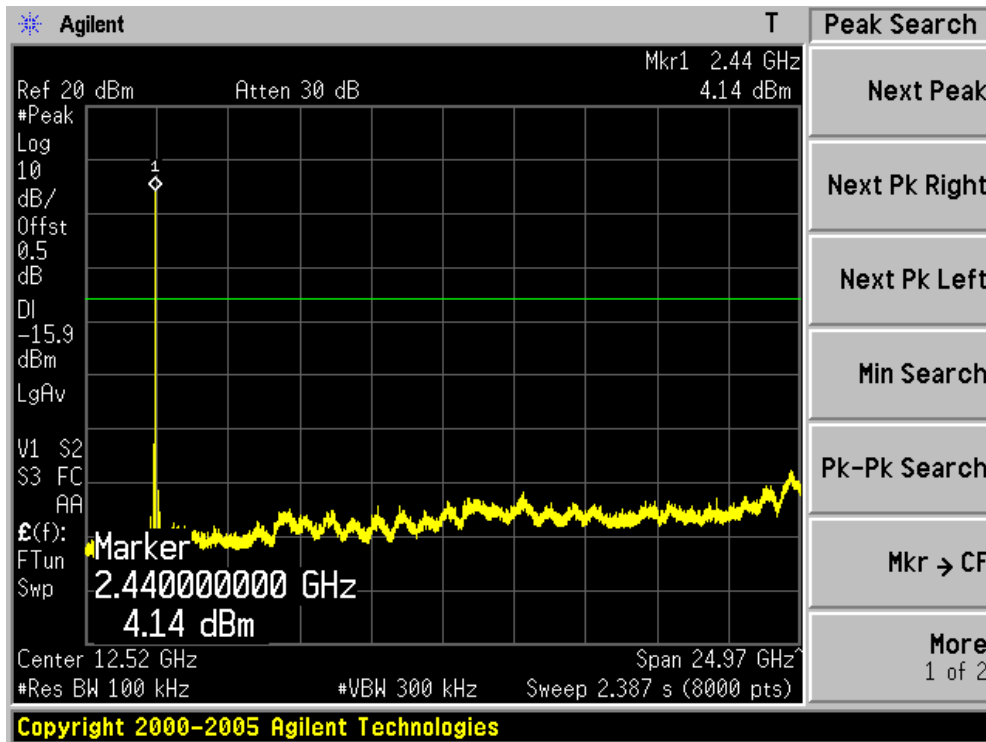


Product	:	SM1
Test Item	:	Spurious RF Conducted Emissions
Test Mode	:	Mode 2: Transmitter-2Mbps (Pi/4 DQPSK_DH5)

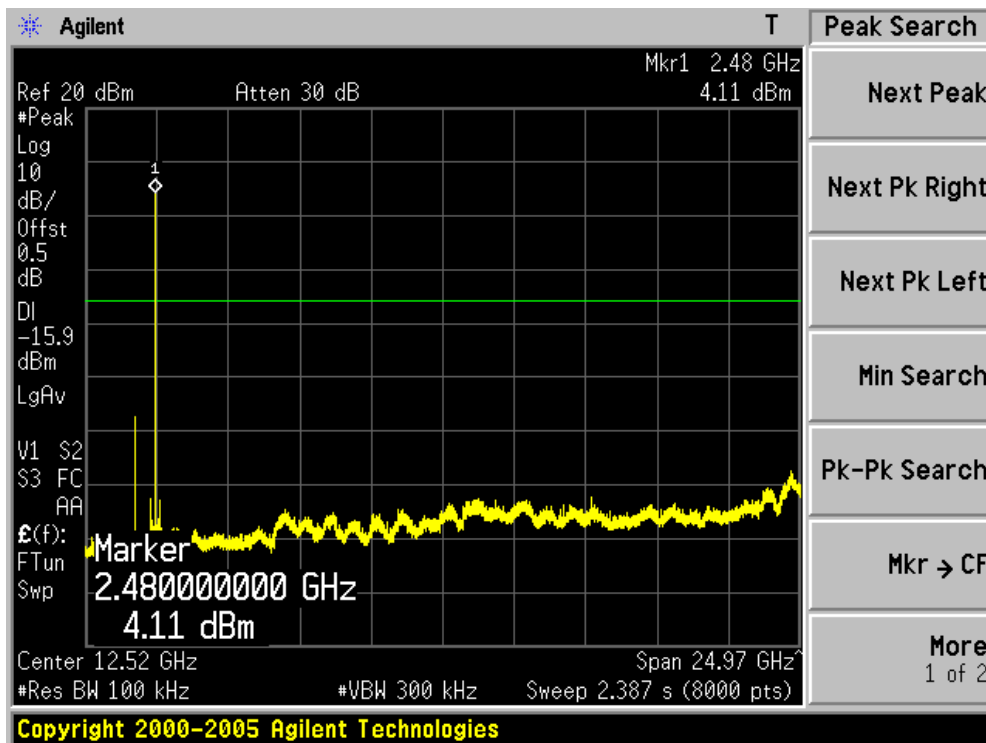
Channel 00 (2402MHz)



Channel 39 (2441MHz)

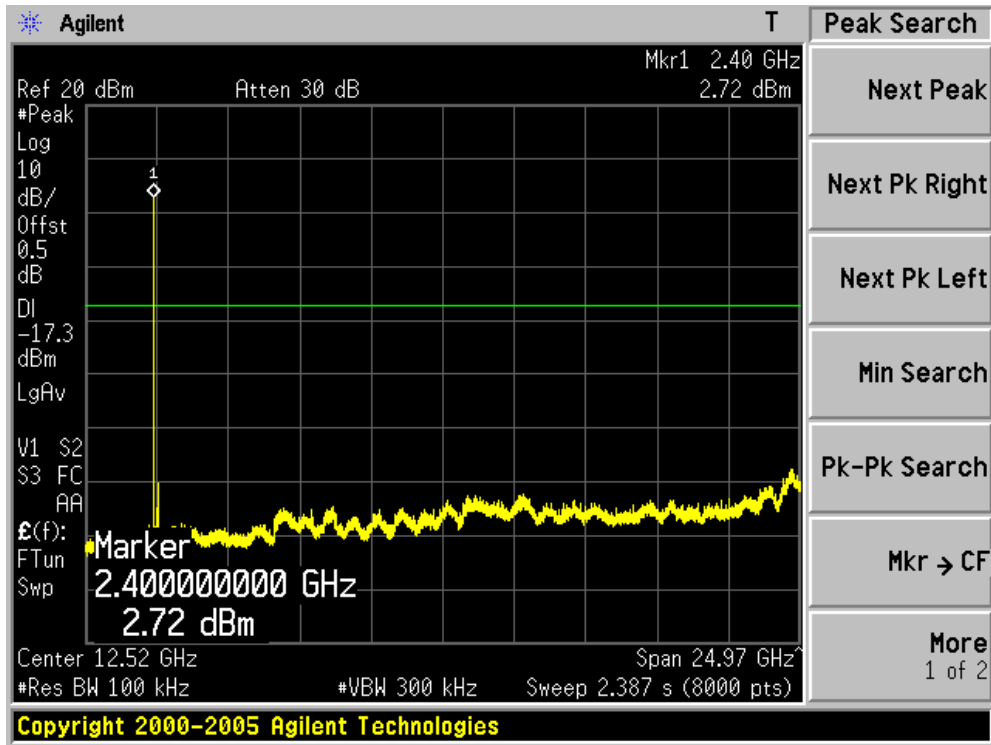


Channel 78 (2480MHz)

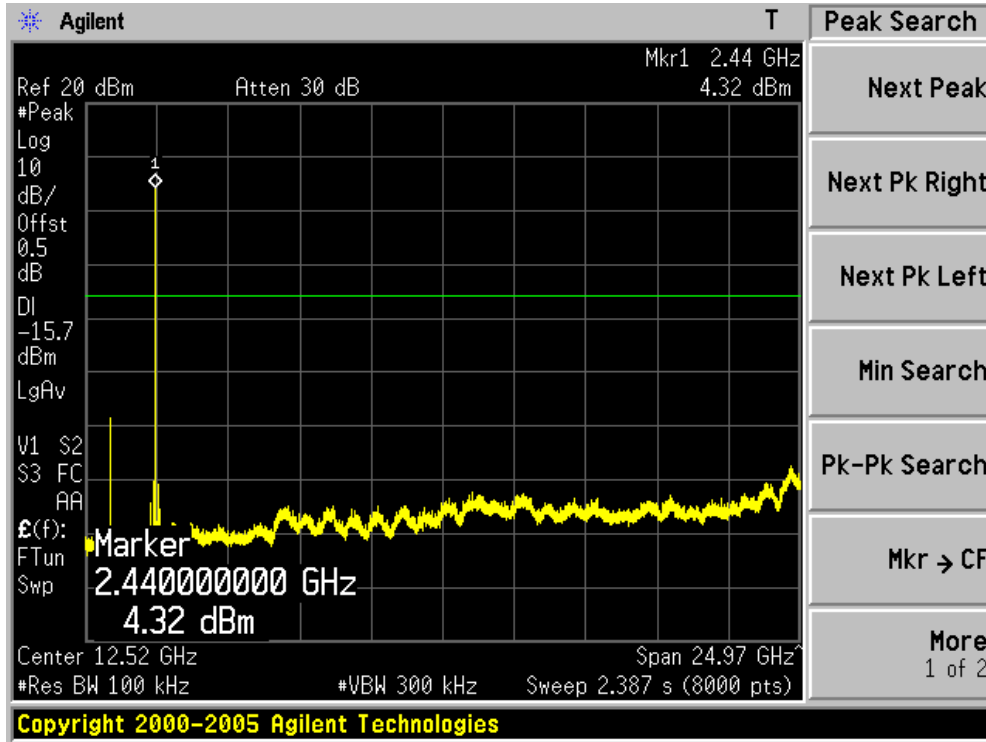


Product	:	SM1
Test Item	:	Spurious RF Conducted Emissions
Test Mode	:	Mode 3: Transmitter-3Mbps (8DPSK_DH5)

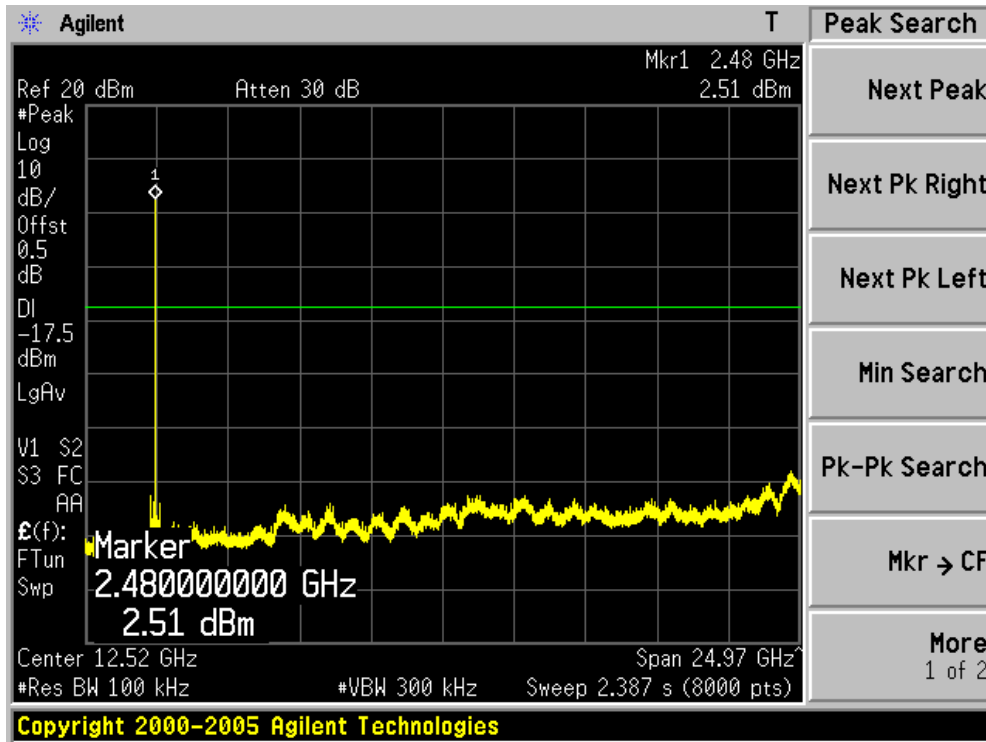
Channel 00 (2402MHz)



Channel 39 (2441MHz)



Channel 78 (2480MHz)



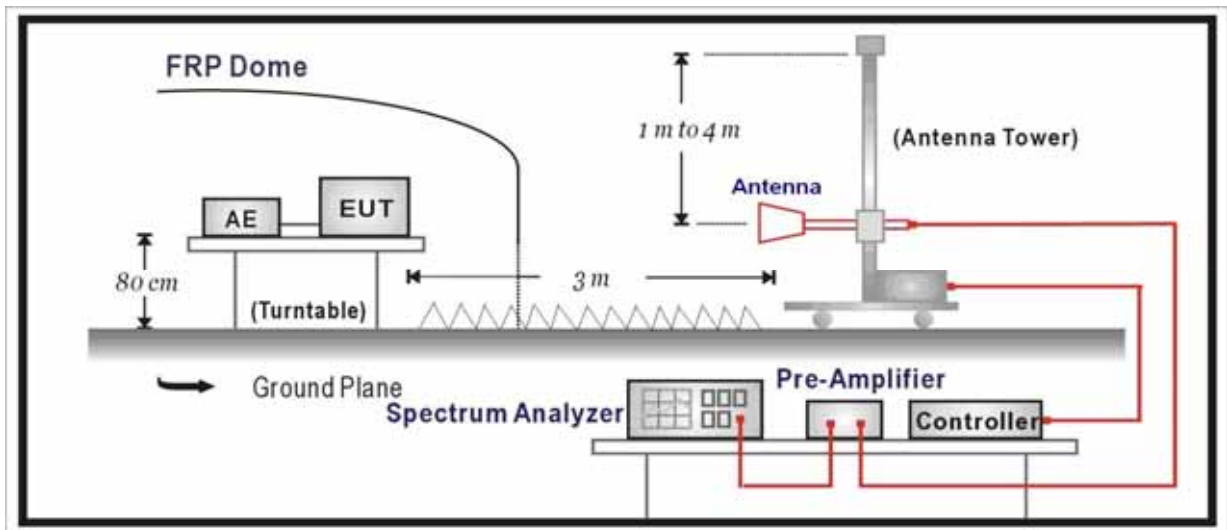
11.7. Radiated Emission Band Edge

12.1. Test Equipment

Radiated Emission Band Edge / AC-5

Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
Spectrum Analyzer	Agilent	N9010A	MY48030494	2014.03.30
EMI Test Receiver	R&S	ESCI	100573	2014.03.30
Preamplifier	Miteq	NSP1800-25	1364185	2014.05.03
Preamplifier	QuieTek	AP-040G	CHM-0906001	2014.05.03
Bilog Antenna	Teseq GmbH	CBL6112D	27612	2013.10.15
Broad-Band Horn Antenna	Schwarzbeck	BBHA9120D	499	2014.06.08
50ohm Coaxial Switch	Anritsu	MP59B	6200464462	2014.03.01
Temperature/Humidity Meter	zhicheng	ZC1-2	AC5-TH	2014.01.11

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 $\pm 3.8 \text{ dB}$

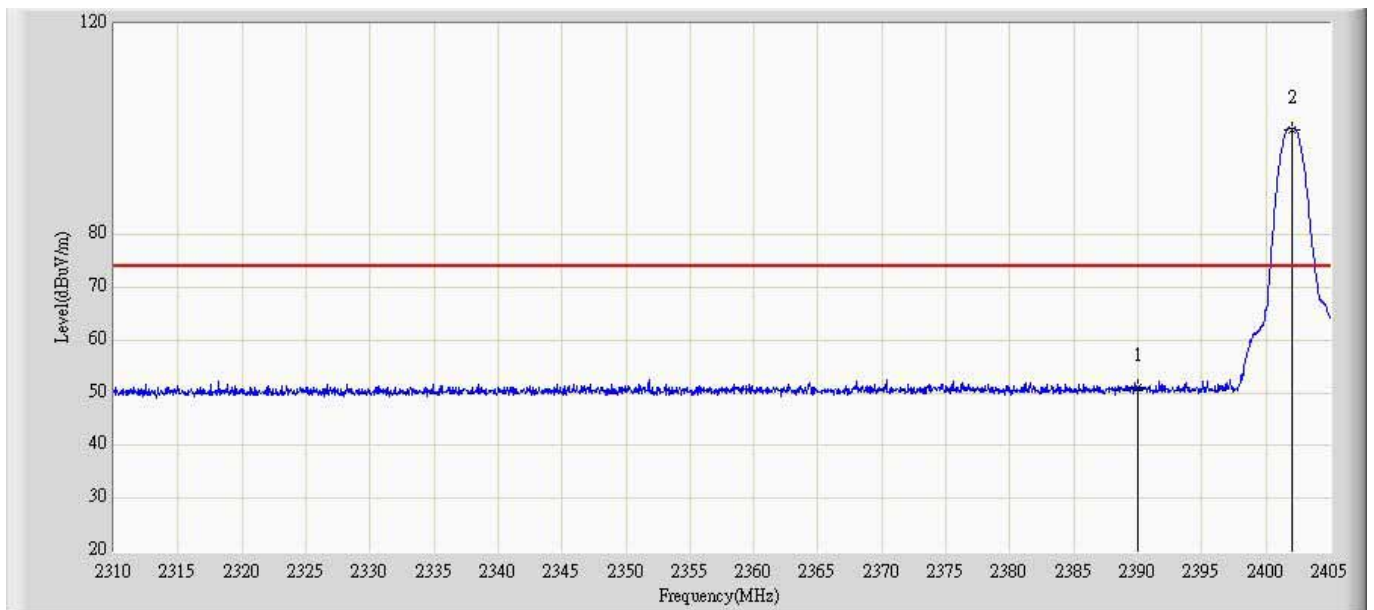
12.6. Test Result

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;

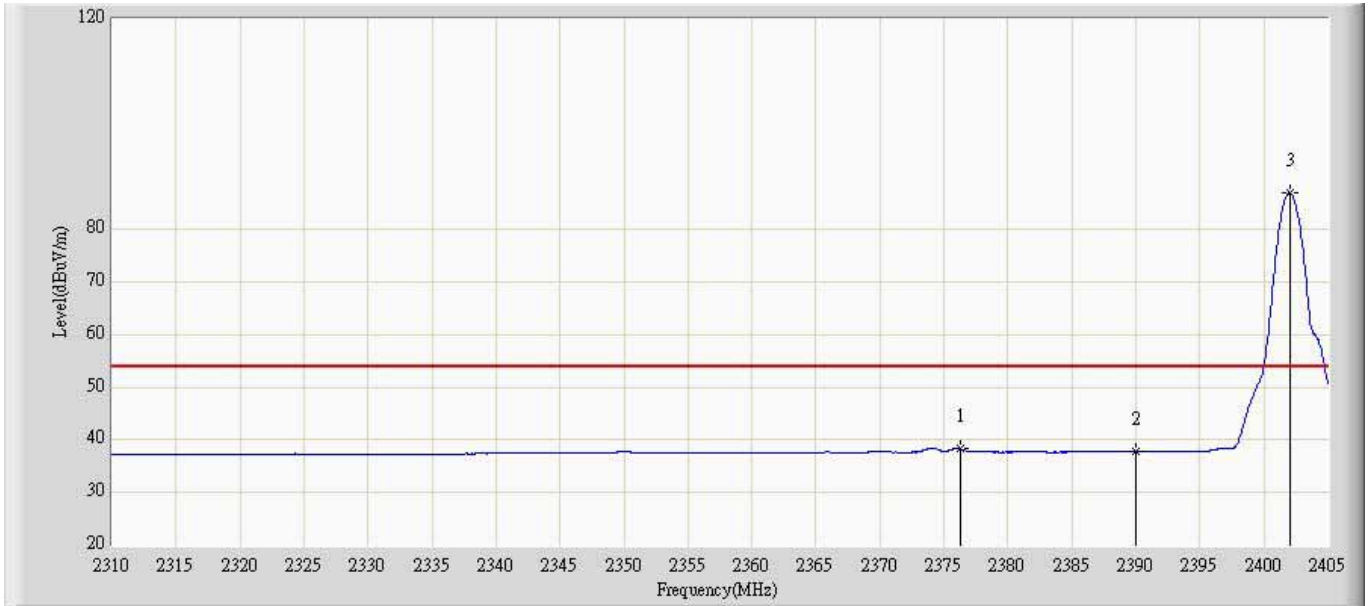
Average detector: RBW = 1MHz, VBW = 10Hz, sweep time = auto.

Engineer: Toms	
Site: AC5	Time: 2013/07/23 - 16:10
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Vertical
EUT: SM1	Power: AC 120V/60Hz
Note: Mode1: Transmit at channel 2402MHz by DH5	



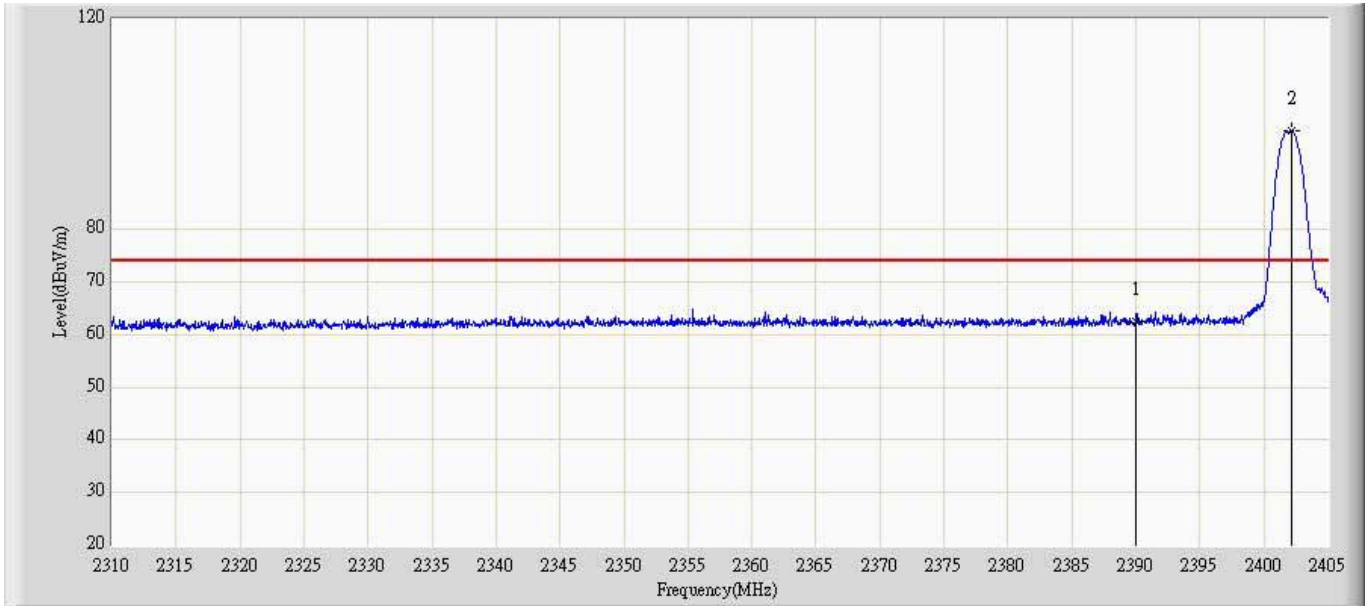
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1			2390.000	50.927	15.286	-23.073	74.000	35.642	PK
2		*	2402.008	100.001	64.309	N/A	N/A	35.692	PK

Engineer: Toms	
Site: AC5	Time: 2013/07/23 - 16:13
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Vertical
EUT: SM1	Power: AC 120V/60Hz
Note: Mode1: Transmit at channel 2402MHz by DH5	



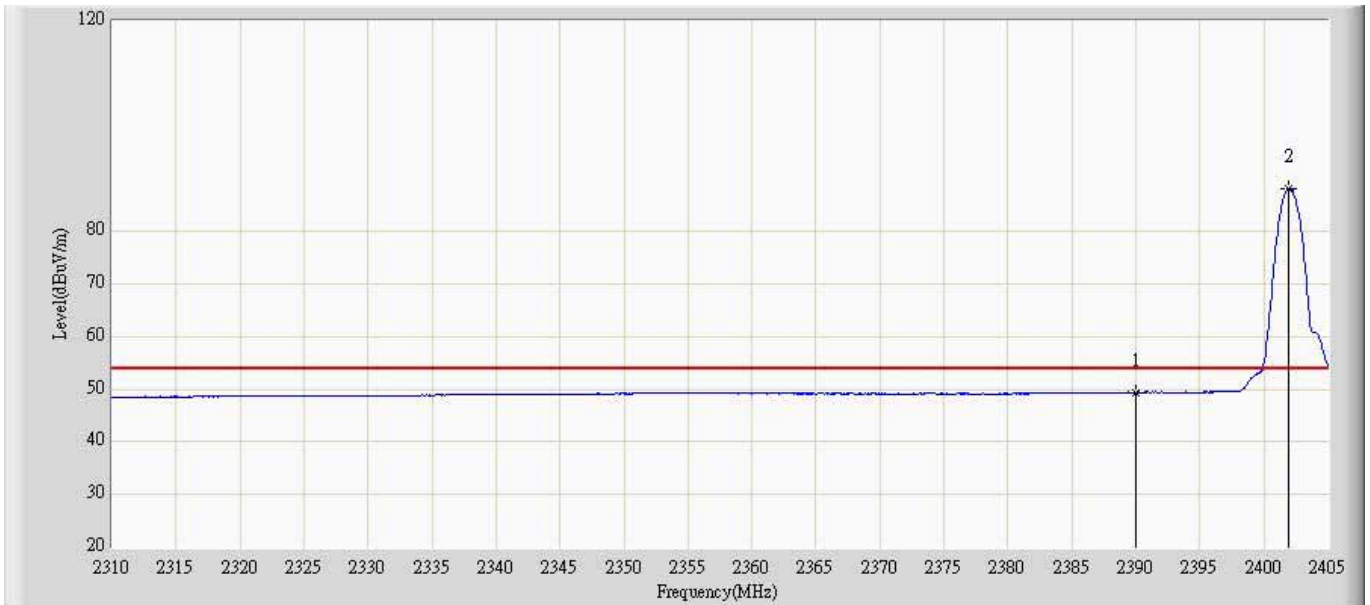
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1			2376.310	38.284	2.700	-15.716	54.000	35.584	AV
2			2390.000	37.905	2.264	-16.095	54.000	35.642	AV
3		*	2402.008	86.958	51.266	N/A	N/A	35.692	AV

Engineer: Toms	
Site: AC5	Time: 2013/07/23 - 16:13
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Horizontal
EUT: SM1	Power: AC 120V/60Hz
Note: Mode1: Transmit at channel 2402MHz by DH5	



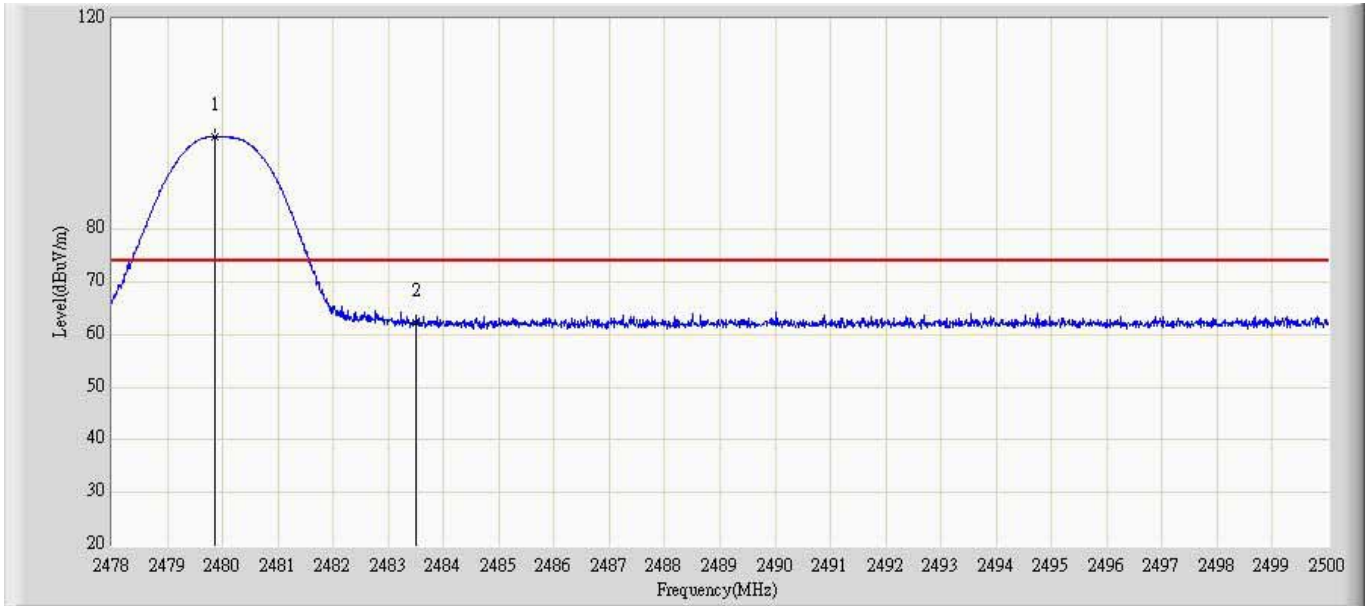
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1			2390.000	62.483	26.182	-11.517	74.000	36.302	PK
2		*	2402.150	98.740	62.339	N/A	N/A	36.401	PK

Engineer: Toms	
Site: AC5	Time: 2013/07/23 - 16:16
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Horizontal
EUT: SM1	Power: AC 120V/60Hz
Note: Mode1: Transmit at channel 2402MHz by DH5	



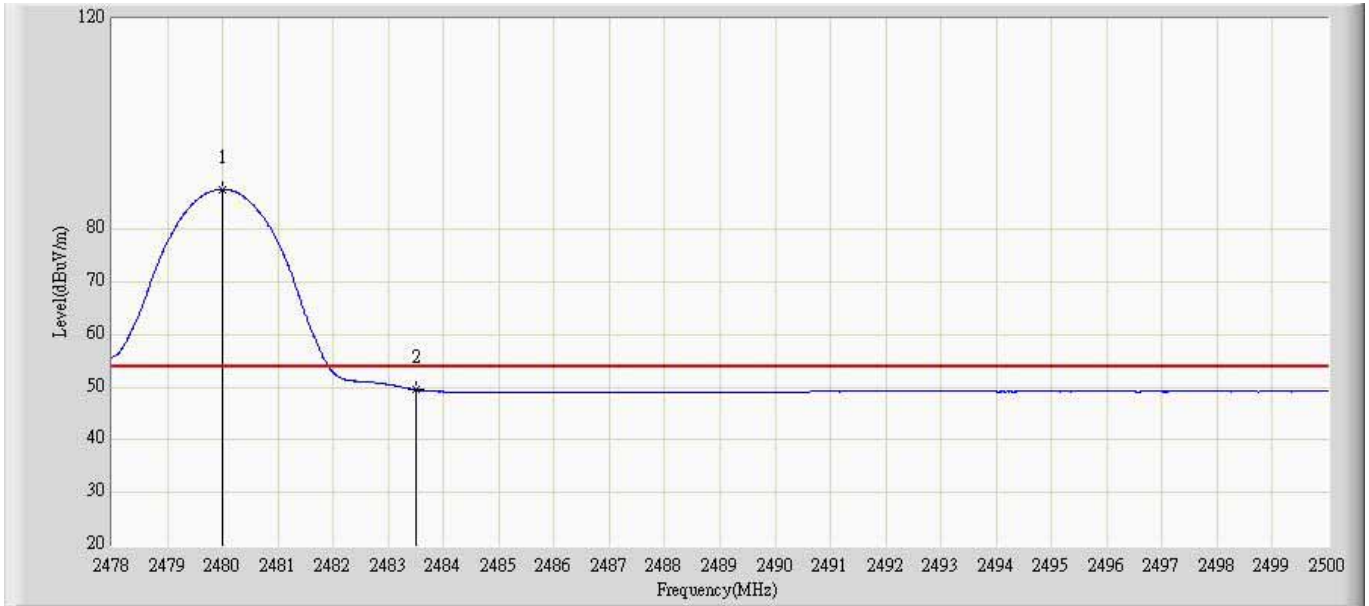
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1			2390.000	49.426	13.125	-4.574	54.000	36.302	AV
2		*	2401.960	88.200	51.800	N/A	N/A	36.400	AV

Engineer: Toms	
Site: AC5	Time: 2013/07/23 - 16:16
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Vertical
EUT: SM1	Power: AC 120V/60Hz
Note: Mode1: Transmit at channel 2480MHz by DH5	



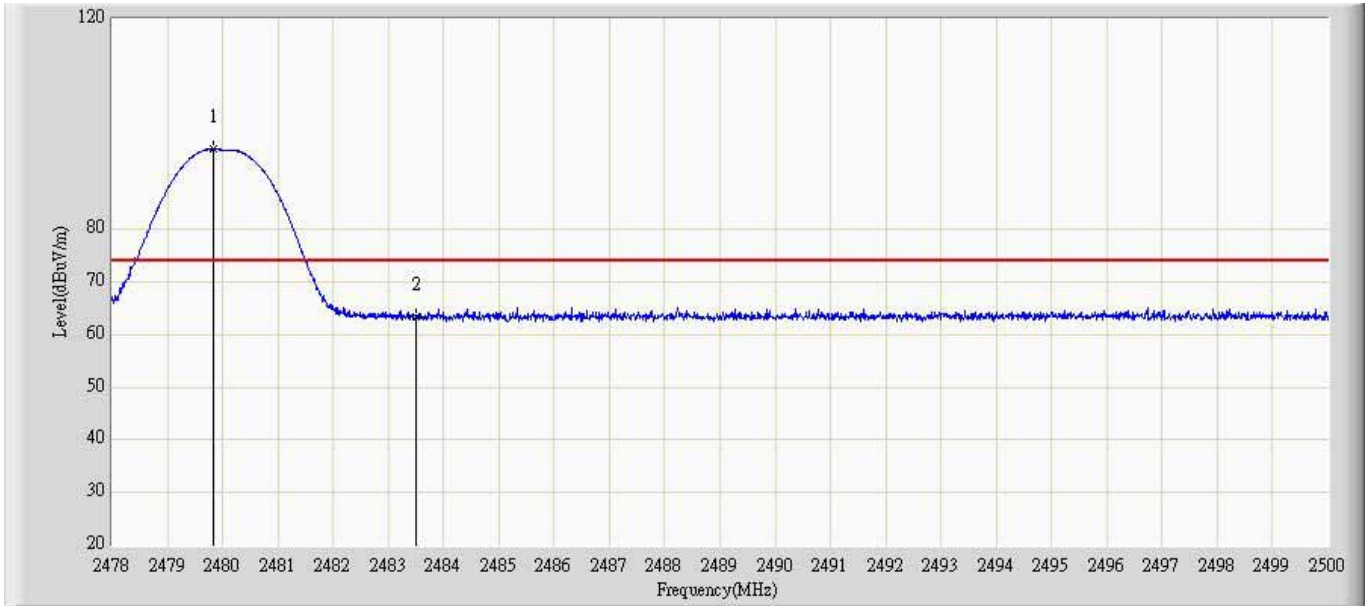
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1		*	2479.870	97.585	61.547	N/A	N/A	36.038	PK
2			2483.500	62.121	26.065	-11.879	74.000	36.055	PK

Engineer: Toms	
Site: AC5	Time: 2013/07/23 - 16:19
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Vertical
EUT: SM1	Power: AC 120V/60Hz
Note: Mode1: Transmit at channel 2480MHz by DH5	



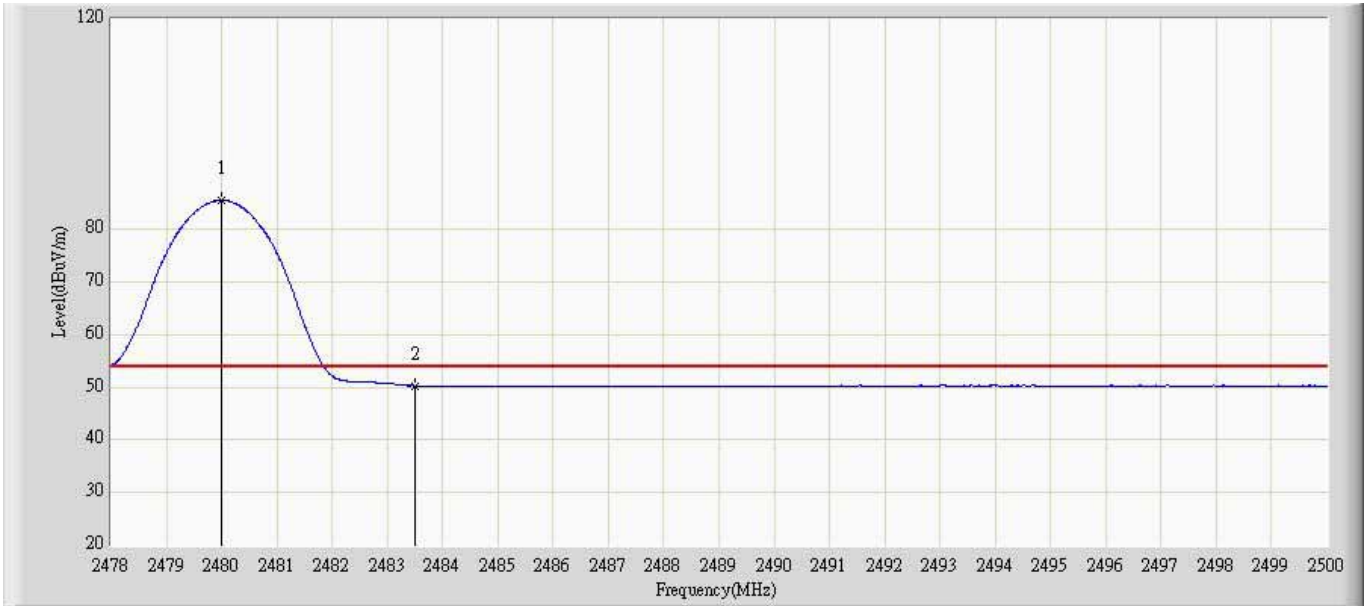
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1		*	2480.002	87.623	51.584	N/A	N/A	36.039	AV
2			2483.500	49.502	13.446	-4.498	54.000	36.055	AV

Engineer: Toms	
Site: AC5	Time: 2013/07/23 - 16:19
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Horizontal
EUT: SM1	Power: AC 120V/60Hz
Note: Mode1: Transmit at channel 2480MHz by DH5	



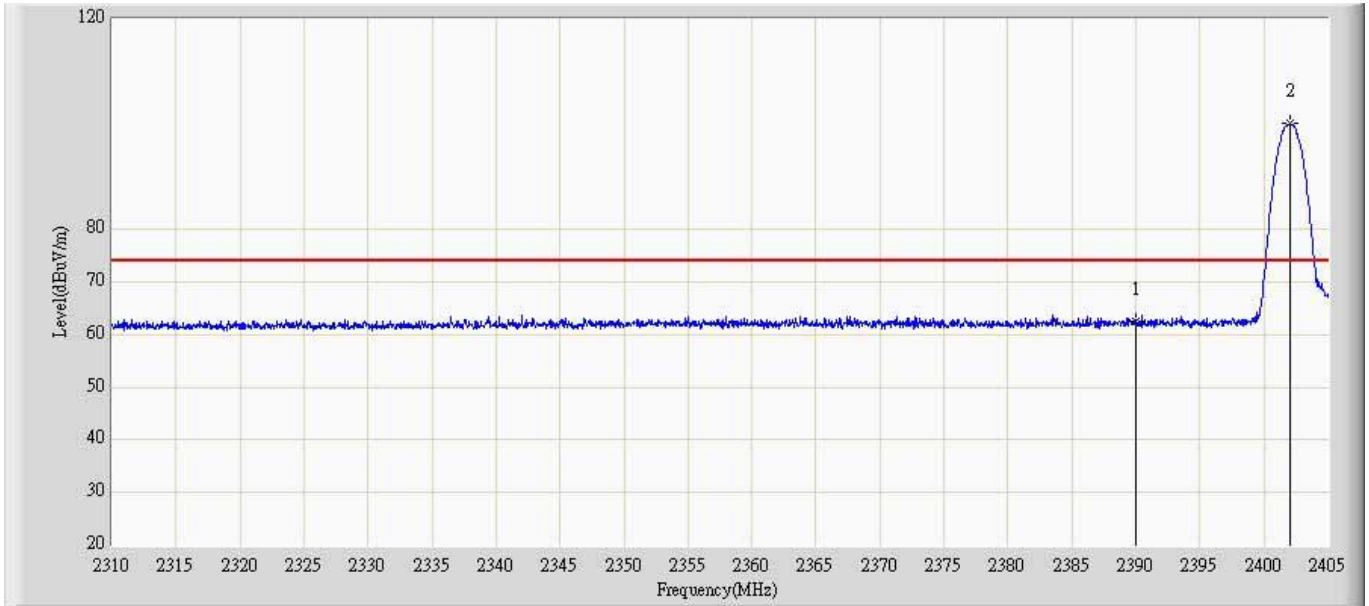
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1		*	2479.837	95.218	58.161	N/A	N/A	37.057	PK
2			2483.500	63.359	26.269	-10.641	74.000	37.089	PK

Engineer: Toms	
Site: AC5	Time: 2013/07/23 - 16:21
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Horizontal
EUT: SM1	Power: AC 120V/60Hz
Note: Mode1: Transmit at channel 2480MHz by DH5	



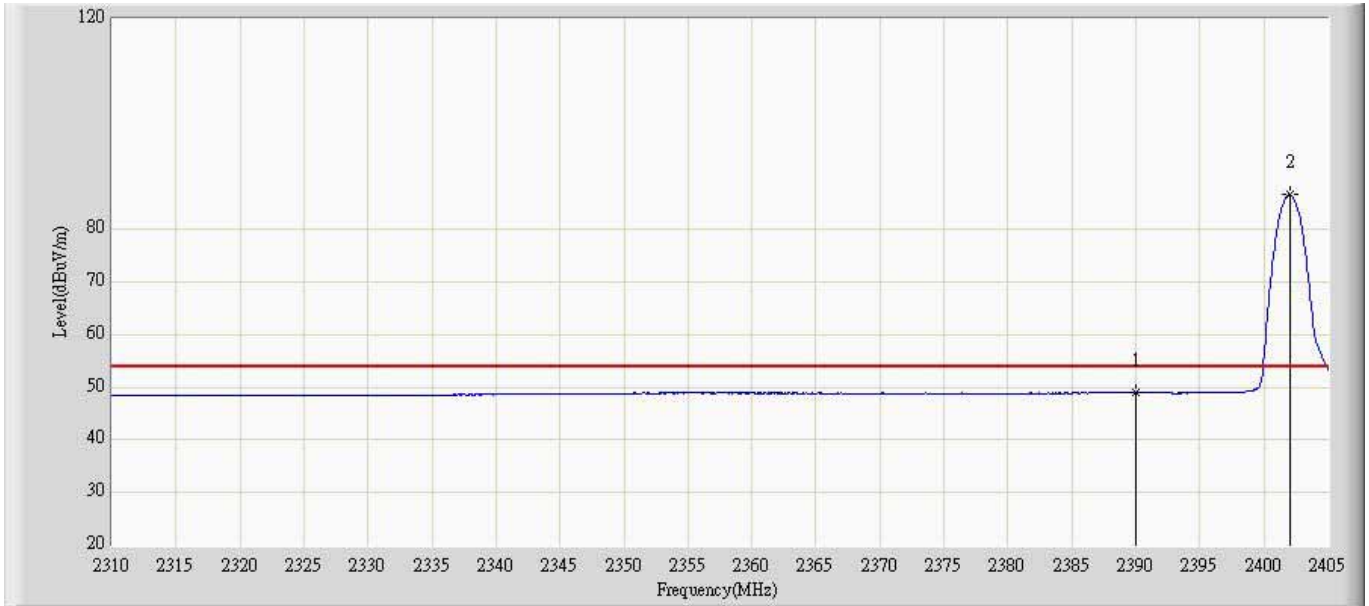
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1		*	2480.002	85.492	48.433	N/A	N/A	37.059	AV
2			2483.500	50.302	13.212	-3.698	54.000	37.089	AV

Engineer: Toms	
Site: AC5	Time: 2013/07/23 - 16:21
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Vertical
EUT: SM1	Power: AC 120V/60Hz
Note: Mode2: Transmit at channel 2402MHz by 2DH5	



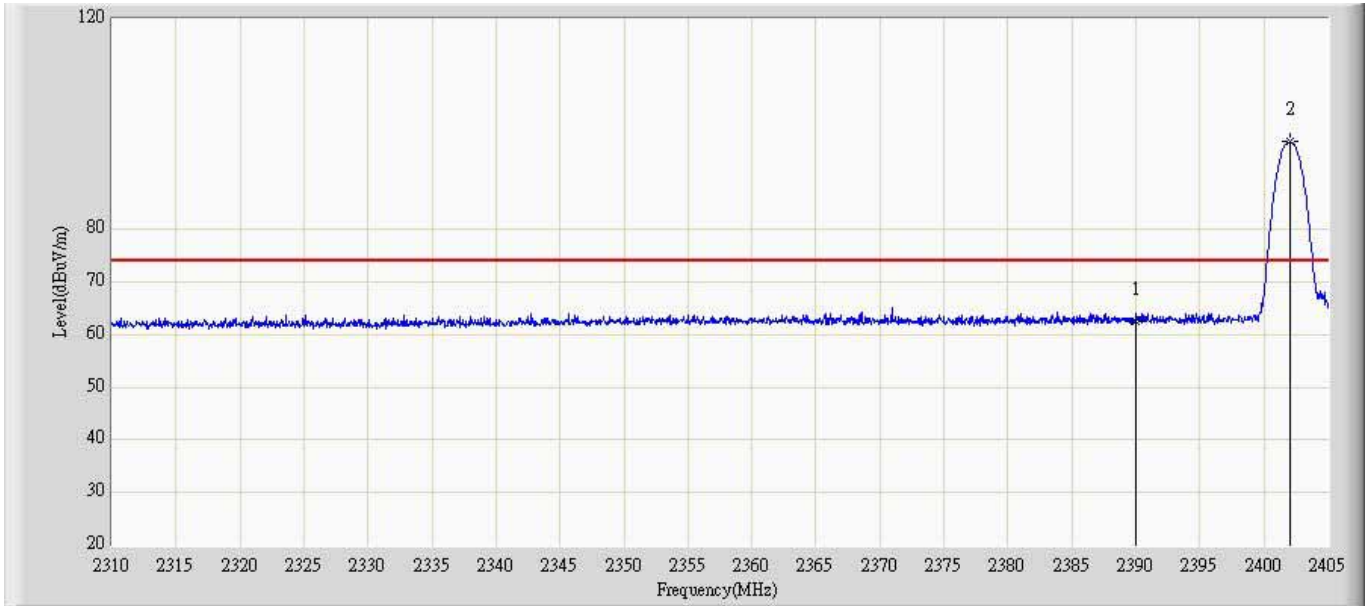
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1			2390.000	62.528	26.887	-11.472	74.000	35.642	PK
2		*	2402.103	100.039	64.347	N/A	N/A	35.693	PK

Engineer: Toms	
Site: AC5	Time: 2013/07/23 - 16:23
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Vertical
EUT: SM1	Power: AC 120V/60Hz
Note: Mode2: Transmit at channel 2402MHz by 2DH5	



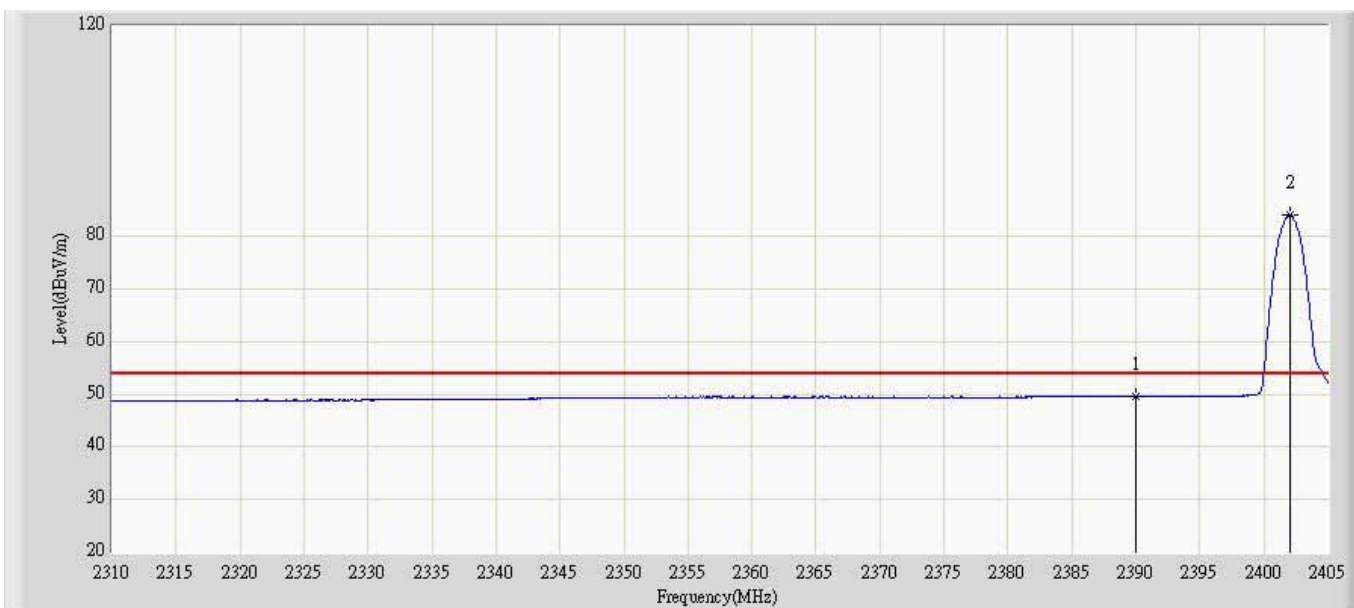
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1			2390.000	48.982	13.341	-5.018	54.000	35.642	AV
2		*	2402.008	86.635	50.943	N/A	N/A	35.692	AV

Engineer: Toms	
Site: AC5	Time: 2013/07/23 - 16:24
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Horizontal
EUT: SM1	Power: AC 120V/60Hz
Note: Mode2: Transmit at channel 2402MHz by 2DH5	



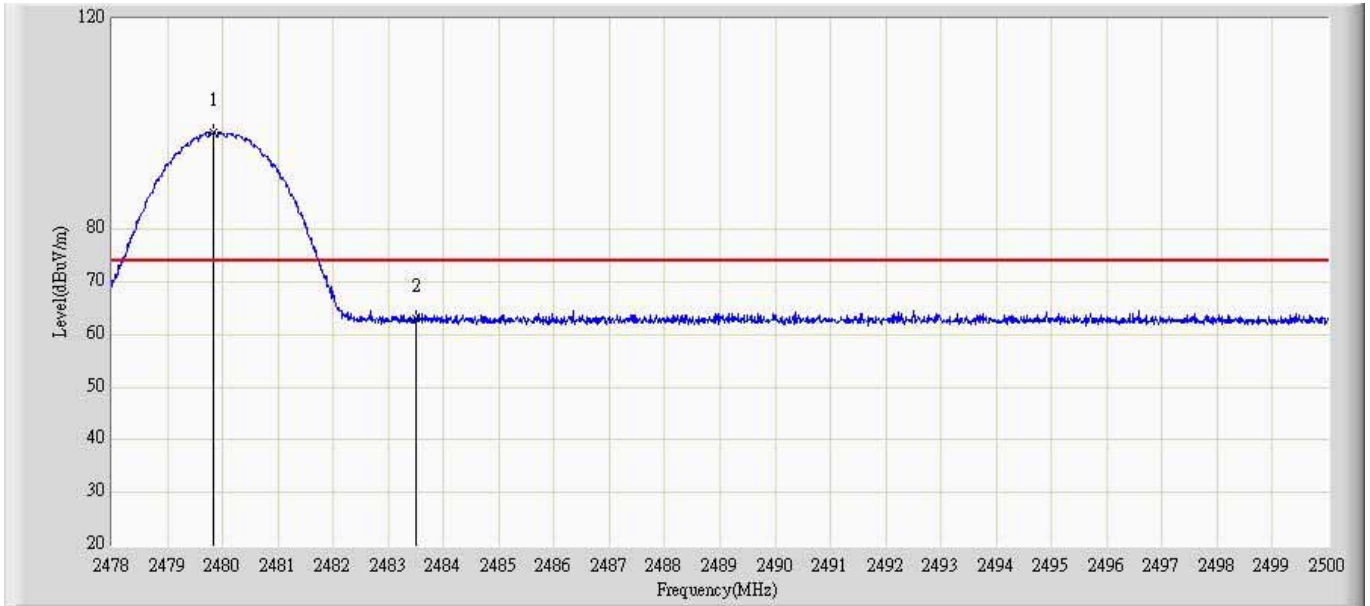
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1			2390.000	62.571	26.270	-11.429	74.000	36.302	PK
2		*	2402.103	96.746	60.345	N/A	N/A	36.401	PK

Engineer: Toms	
Site: AC5	Time: 2013/07/23 - 16:25
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Horizontal
EUT: SM1	Power: AC 120V/60Hz
Note: Mode2: Transmit at channel 2402MHz by 2DH5	



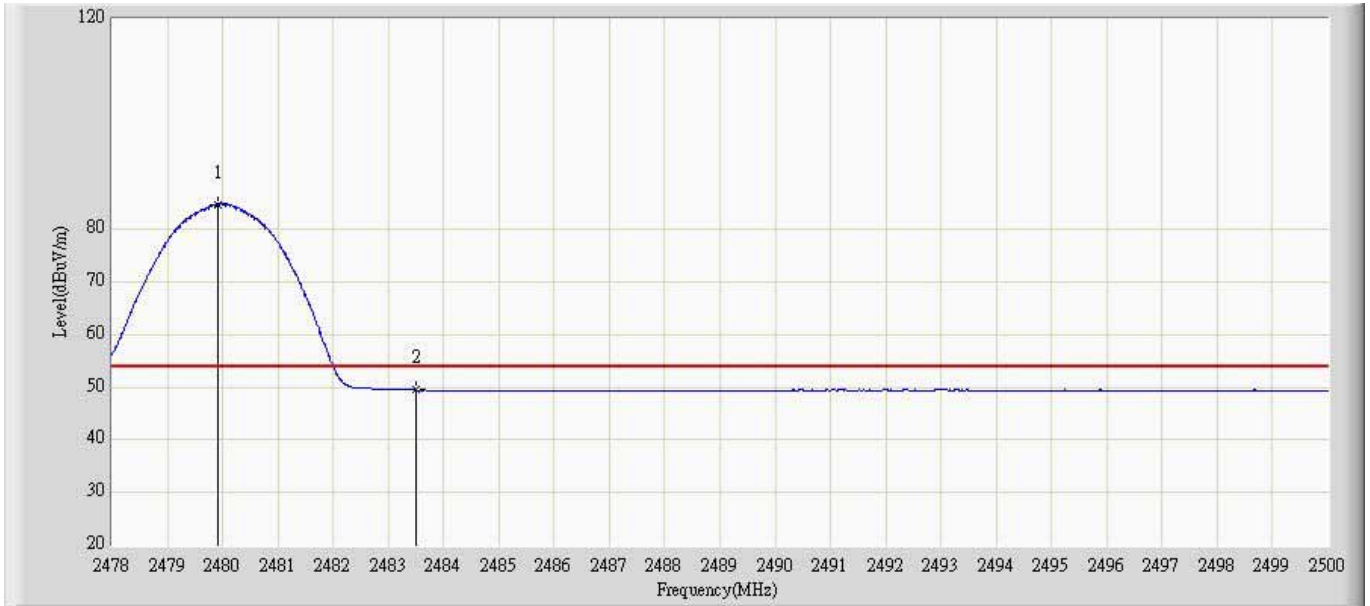
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1			2390.000	49.635	13.334	-4.365	54.000	36.302	AV
2		*	2402.008	84.224	47.824	N/A	N/A	36.400	AV

Engineer: Toms	
Site: AC5	Time: 2013/07/23 - 16:26
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Vertical
EUT: SM1	Power: AC 120V/60Hz
Note: Mode2: Transmit at channel 2480MHz by 2DH5	



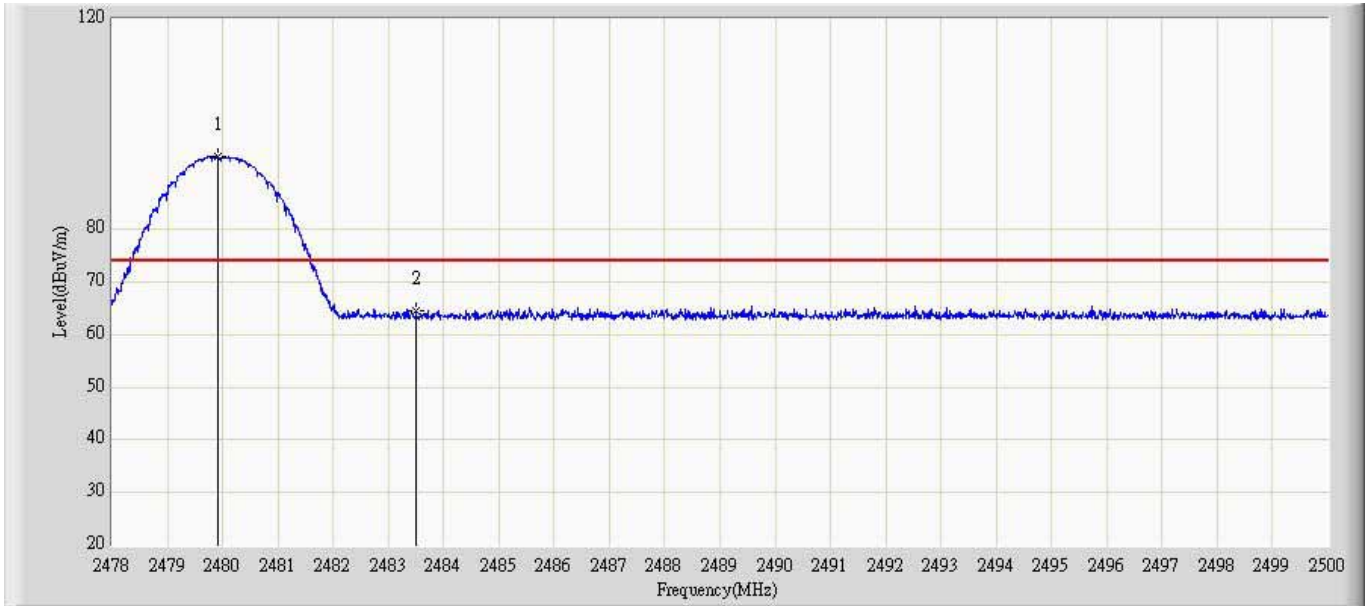
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1		*	2479.837	98.453	62.415	N/A	N/A	36.038	PK
2			2483.500	63.003	26.947	-10.997	74.000	36.055	PK

Engineer: Toms	
Site: AC5	Time: 2013/07/23 - 16:29
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Vertical
EUT: SM1	Power: AC 120V/60Hz
Note: Mode2: Transmit at channel 2480MHz by 2DH5	



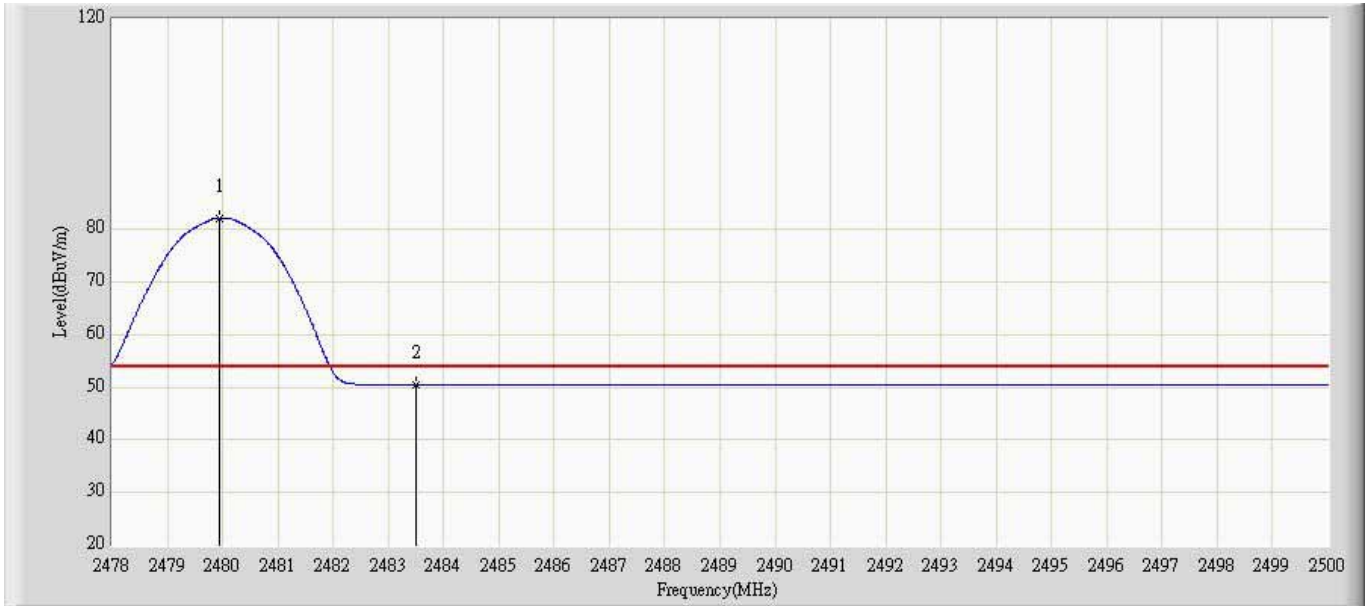
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1		*	2479.903	84.769	48.731	N/A	N/A	36.038	AV
2			2483.500	49.458	13.402	-4.542	54.000	36.055	AV

Engineer: Toms	
Site: AC5	Time: 2013/07/23 - 16:29
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Horizontal
EUT: SM1	Power: AC 120V/60Hz
Note: Mode2: Transmit at channel 2480MHz by 2DH5	



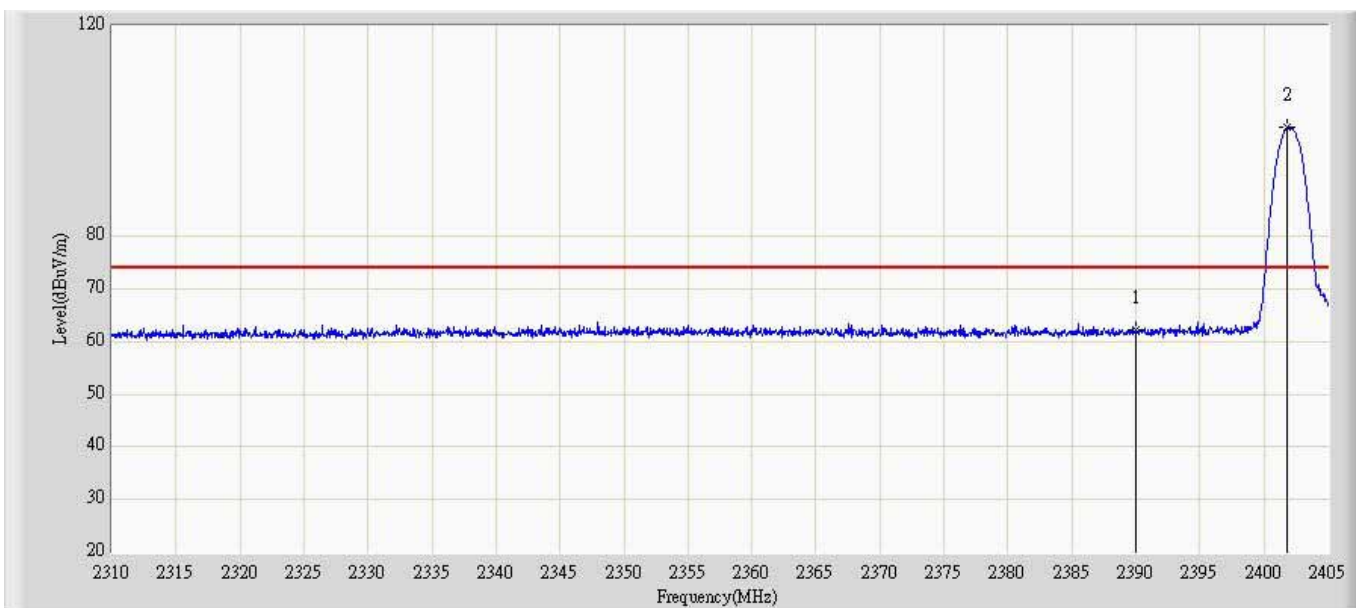
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1		*	2479.903	93.901	56.843	N/A	N/A	37.058	PK
2			2483.500	64.439	27.349	-9.561	74.000	37.089	PK

Engineer: Toms	
Site: AC5	Time: 2013/07/23 - 16:31
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Horizontal
EUT: SM1	Power: AC 120V/60Hz
Note: Mode2: Transmit at channel 2480MHz by 2DH5	



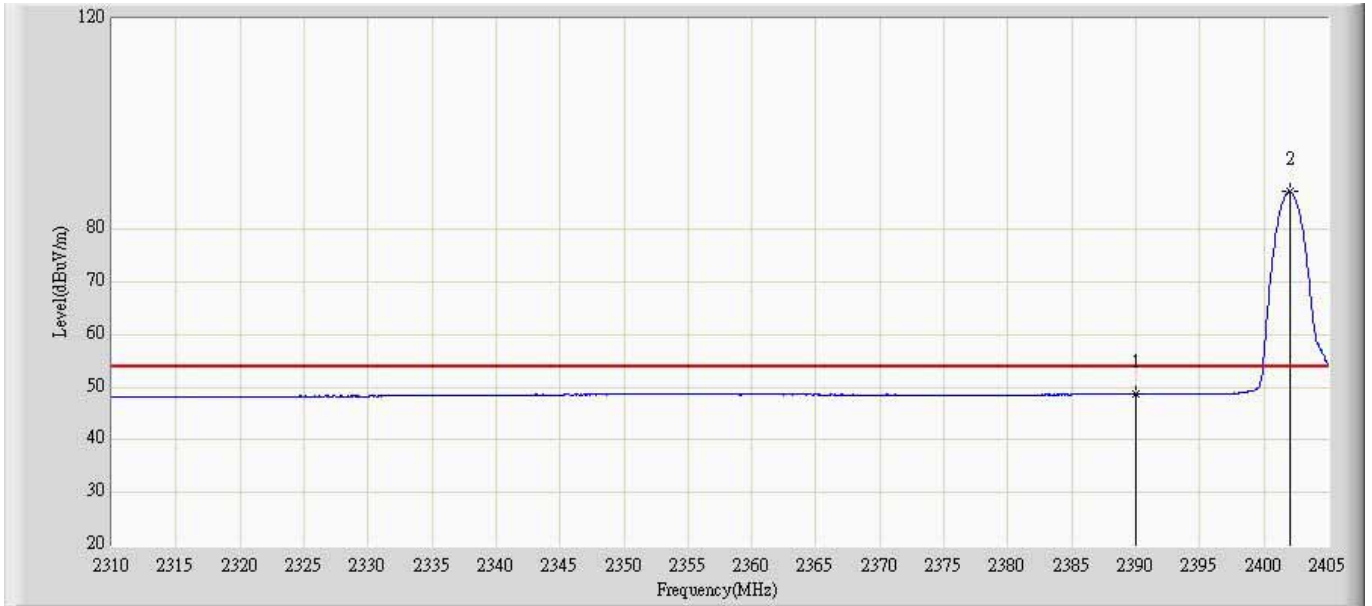
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1		*	2479.936	82.171	45.113	N/A	N/A	37.058	AV
2			2483.500	50.418	13.328	-3.582	54.000	37.089	AV

Engineer: Toms	
Site: AC5	Time: 2013/07/23 - 16:31
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Vertical
EUT: SM1	Power: AC 120V/60Hz
Note: Mode3: Transmit at channel 2402MHz by 3DH5	



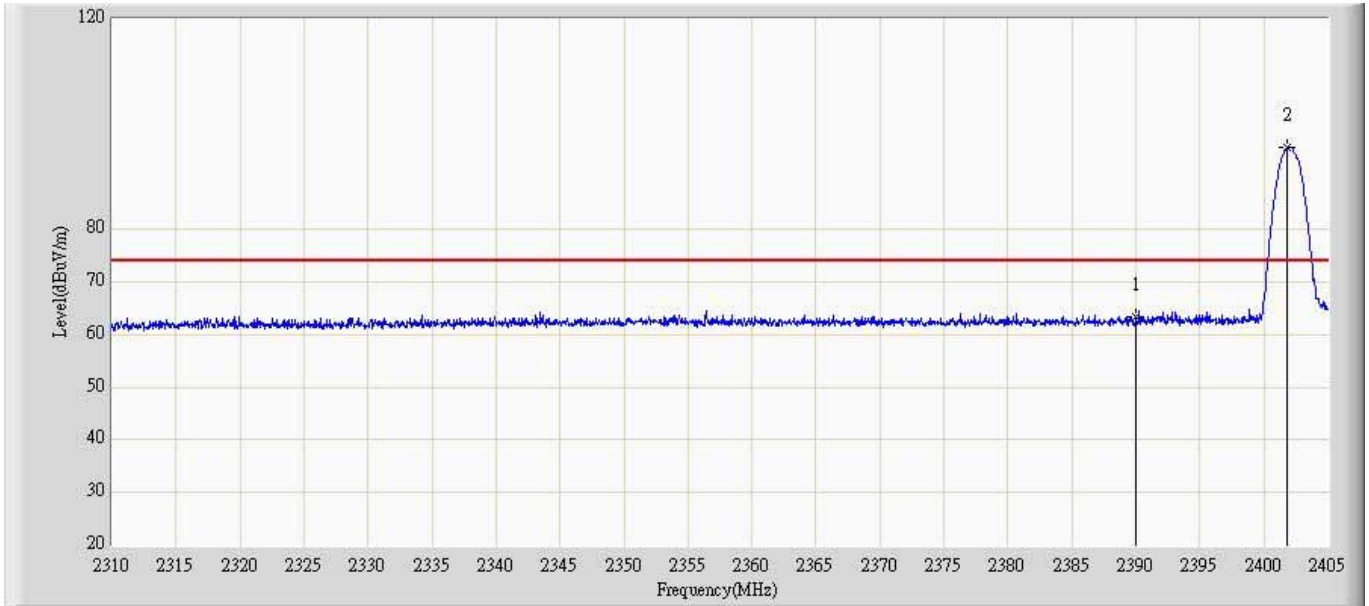
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1			2390.000	62.132	26.491	-11.868	74.000	35.642	PK
2		*	2401.865	100.604	64.913	N/A	N/A	35.692	PK

Engineer: Toms	
Site: AC5	Time: 2013/07/23 - 16:33
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Vertical
EUT: SM1	Power: AC 120V/60Hz
Note: Mode3: Transmit at channel 2402MHz by 3DH5	



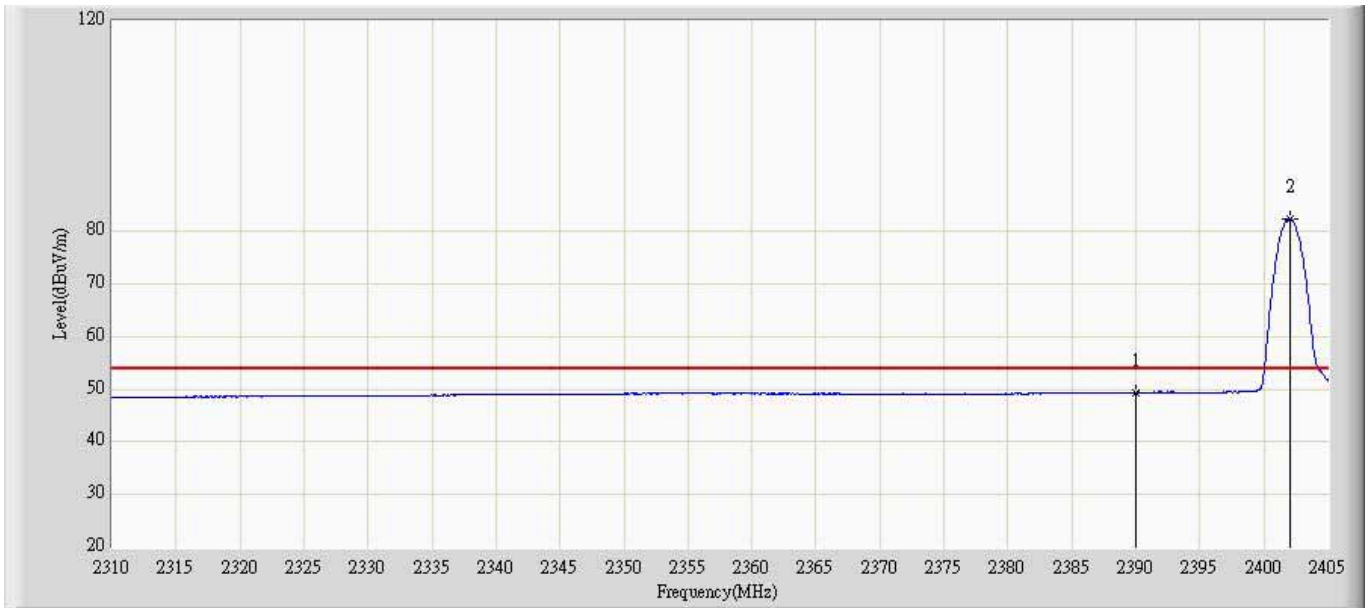
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1			2390.000	48.735	13.094	-5.265	54.000	35.642	AV
2		*	2402.008	87.113	51.421	N/A	N/A	35.692	AV

Engineer: Toms	
Site: AC5	Time: 2013/07/23 - 16:34
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Horizontal
EUT: SM1	Power: AC 120V/60Hz
Note: Mode3: Transmit at channel 2402MHz by 3DH5	



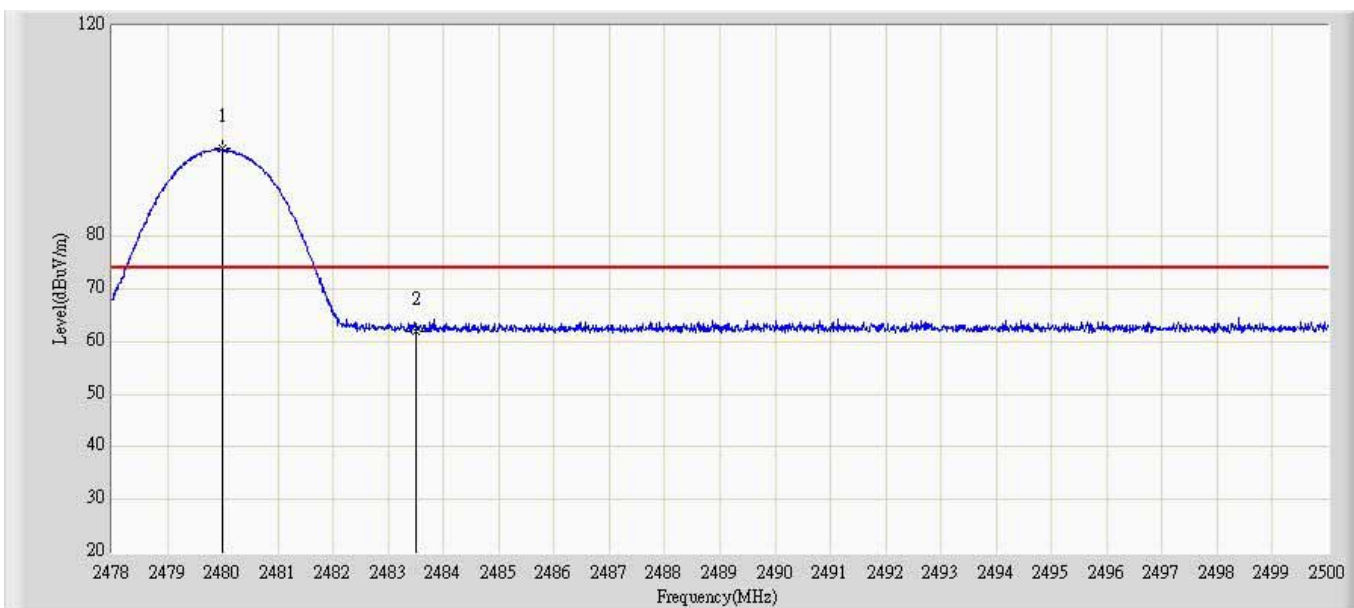
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1			2390.000	63.272	26.971	-10.728	74.000	36.302	PK
2		*	2401.865	95.645	59.246	N/A	N/A	36.399	PK

Engineer: Toms	
Site: AC5	Time: 2013/07/23 - 16:35
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Horizontal
EUT: SM1	Power: AC 120V/60Hz
Note: Mode3: Transmit at channel 2402MHz by 3DH5	



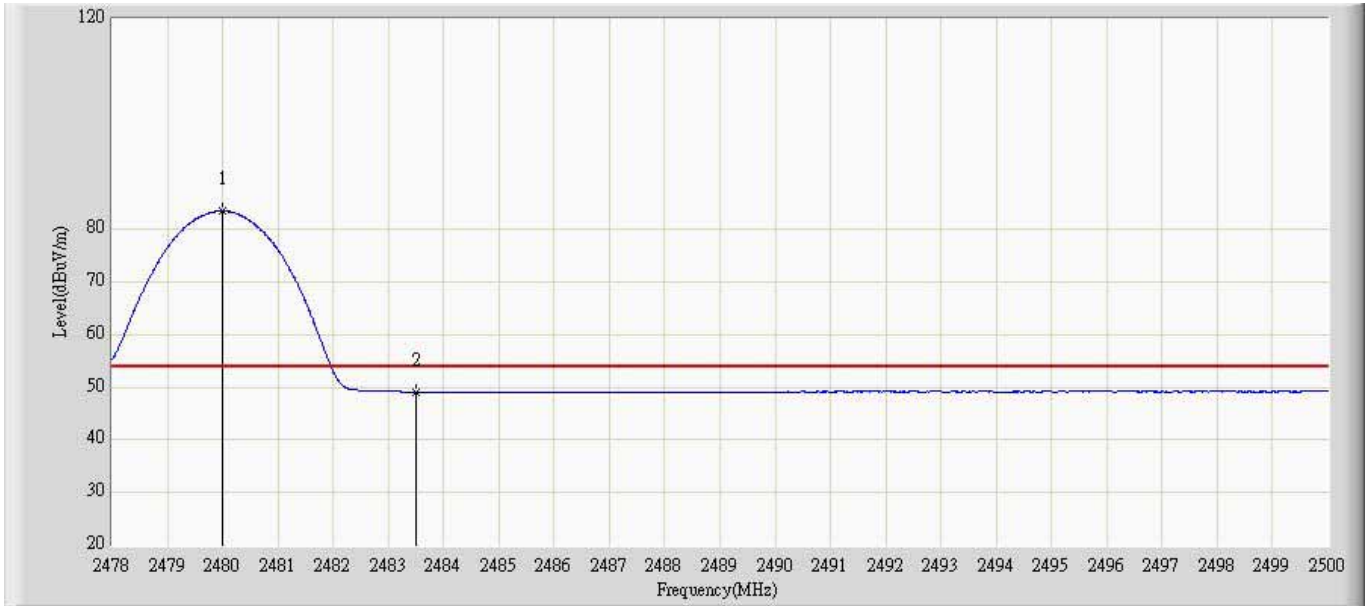
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1			2390.000	49.398	13.097	-4.602	54.000	36.302	AV
2		*	2402.008	82.424	46.024	N/A	N/A	36.400	AV

Engineer: Toms	
Site: AC5	Time: 2013/07/23 - 16:36
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Vertical
EUT: SM1	Power: AC 120V/60Hz
Note: Mode3: Transmit at channel 2480MHz by 3DH5	



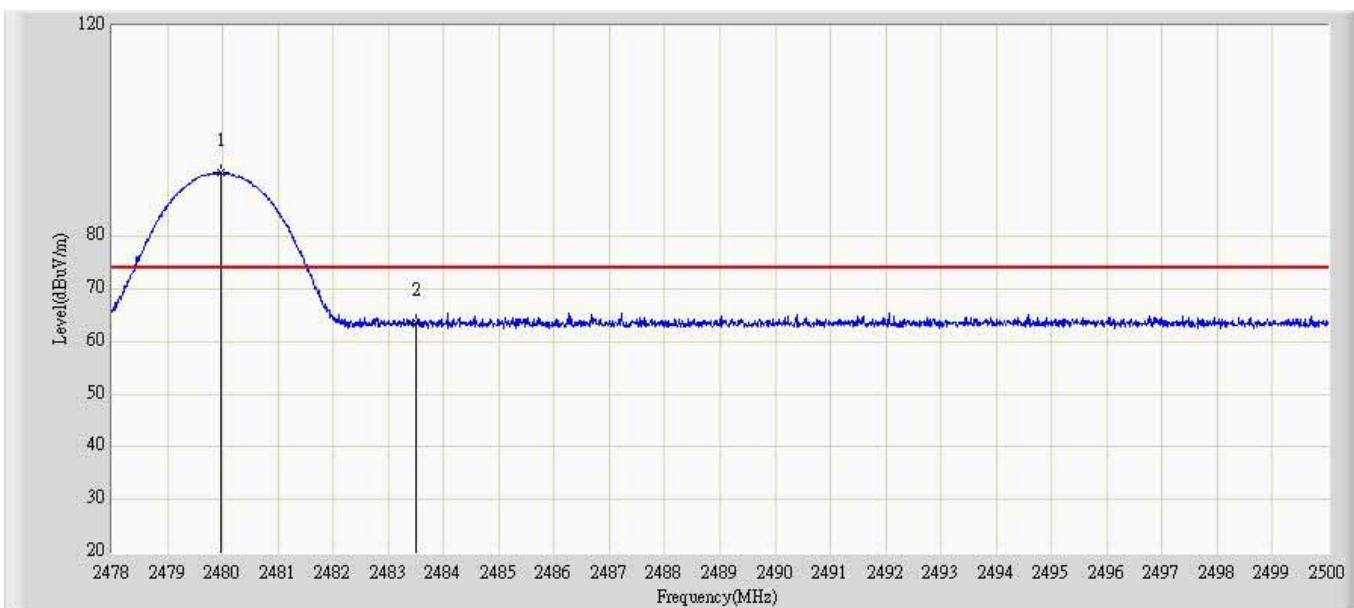
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1		*	2479.991	96.593	60.554	N/A	N/A	36.039	PK
2			2483.500	61.813	25.757	-12.187	74.000	36.055	PK

Engineer: Toms	
Site: AC5	Time: 2013/07/23 - 16:39
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Vertical
EUT: SM1	Power: AC 120V/60Hz
Note: Mode3: Transmit at channel 2480MHz by 3DH5	



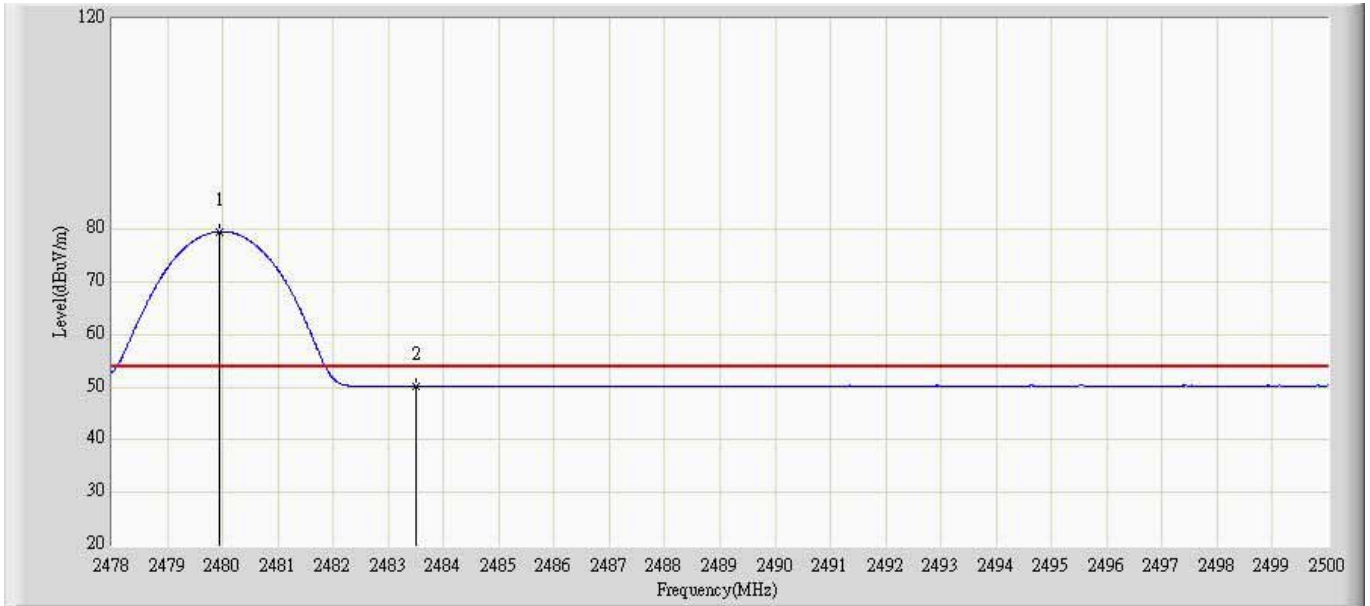
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type
1		*	2480.002	83.451	47.412	N/A	N/A	36.039	AV
2			2483.500	49.100	13.044	-4.900	54.000	36.055	AV

Engineer: Toms	
Site: AC5	Time: 2013/07/23 - 16:40
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Horizontal
EUT: SM1	Power: AC 120V/60Hz
Note: Mode3: 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	92.068	55.009	N/A	N/A	37.058	PK
2			2483.500	63.712	26.622	-10.288	74.000	37.089	PK

Engineer: Toms	
Site: AC5	Time: 2013/07/23 - 16:41
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_988(1-18GHz)	Polarity: Horizontal
EUT: SM1	Power: AC 120V/60Hz
Note: Mode3: 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	79.572	42.514	N/A	N/A	37.058	AV
2			2483.500	50.137	13.047	-3.863	54.000	37.089	AV

_____ The End _____