EMC Test Report for FCC

On Behalf of

Xiamen Xinglian Electronics Co., Ltd.

Summary

The test report is to certify that the tested equipment properly complies with the requirements of:

FCC Rules and Regulations: 47CFR Part 15: Radio Frequency Devices: 2005

ANSIC63.4 (2003): American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz

Description

The appliances were tested by Quitek Corp. and found compliance with relevant requirements described in FCC Part 15: Radio Frequency Devices.

Test results are contained in this test report and Intertek Testing Services ETL SEMKO Shanghai Limited is assumed full responsibility for the accuracy and completeness of these measurements.

Date of Issue: April 5,2006

Prepared by:

Ada Zou (Project Engineer)

Report Approved by:

Steve Li (Reviewer)

Description of Test Facility

Name	Quitek Corp. EMC lab
Address	716# Yi Shan Road, Shanghai, P.R. China
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Website	http://www.simt.com.cn
Lab accreditation	FCC Registration Number: 142171
	NVLAP Lab Code: 200632-0
	CNAL Certification Number: L0134
	VCCI Registration No.: R-1897

Test Equipments Information:

Equipment	Type	Manu.	Internal no.	Cal. Date	Due date
Test Receiver	ESCS 30	R&S	EC 2107	2006-2-9	2007-2-8
Test Receiver	ESIB 26	R&S	EC 3045	2005-7-1	2006-6-30
Voltage Probe	ESH2-Z3	R&S	EC 2107-1	2006-2-9	2007-2-8
A.M.N.	ESH2-Z5	R&S	EC 3119	2006-2-9	2007-2-8
A.M.N.	ESH3-Z5	R&S	EC 2109	2006-2-9	2007-2-8
I.S.N.	ENY 22	R&S	EC 3218	2006-2-9	2007-2-2
I.S.N.	ENY 41	R&S	EC 3220	2006-2-9	2007-2-8
Current probe	EZ-17	R&S	EC 3221	2006-2-9	2007-2-8
Absorbing clamp	MDS 21	R&S	EC 2108	2006-2-9	2007-2-8
Click meter	CL55C	AFJ	EC 2253	2005-8-22	2006-8-21
Harmonic-flicker system	5001ix-PACS-1	CI	EC 2110	2006-2-9	2007-2-8
Conduct immunity system	UCS 500M6B	EM TEST	EC 2958	2006-2-9	2007-2-8
Automatic transformer	MV2616	EM TEST	EC 2957	Not required	Not required
Capacity clamp	HFK	EM TEST	EC 2959	Not required	Not required
ESD generator	ditto	EM TEST	EC 2956	2006-2-10	2007-2-9
Surge generator	TSS 500M4	EM TEST	EC 2961	2006-2-9	2007-2-8
Surge generator	TSS 500M2F	EM TEST	EC 2960	2006-2-9	2007-2-8
Surge Coupling network	CNV 504M	EM TEST	EC 2958-2	2006-2-9	2007-2-8
Surge Coupling network	CNV 504S1	EM TEST	EC 2958-1	2006-2-9	2007-2-8
Induction coil/generator	INA 701	Schaffner	EC 2114	2004-7-18	2006-7-17
Signal generator	SML 01	R&S	EC 2338	2006-2-9	2007-2-8
Power amplifier	75A250	AR	EC 3043-1	2005-8-22	2006-8-21
CDN	CDN M216	Schaffner	EC 2113-2	2005-3-24	2007-3-23
CDN	CDN M316	Schaffner	EC 2113-1	2005-3-24	2007-3-23
CDN	CDN T2	EM TEST	EC 3043-2	2006-2-9	2007-2-8
CDN	CDN T4	EM TEST	EC 3043-4	2006-2-9	2007-2-8
EM clamp	EM 101	EM TEST	EC 3043-6	2005-8-22	2006-8-21
Power meter	PM2002	AR	EC3043-7	2006-2-9	2007-2-8
Power sensor	PH2000	AR	EC3043-8	2006-2-9	2007-2-8
Attenuator	ATT6/75	EM TEST	EC 3043-3	2006-2-9	2007-2-8
Attenuator	68-6-44	Weinschel	EC 3043-9	2006-3-3	2007-3-2
DDC	DC 2600	AR	EC 3043-5	2006-2-13	2007-2-12
DDC	DC 6180A	AR	EC 3044-5	2006-2-13	2007-2-12
DDC	DC 7144A	AR	EC 3044-6	2006-2-13	2007-2-12
Calibration Impedance	50	AR	EC 3043-12	2006-2-9	2007-2-8
Calibration Impedance	R100	AR	EC 3043-10	2006-2-9	2007-2-8
Calibration Impedance	R100	AR	EC 3043-11	2006-2-9	2007-2-8
Calibration Impedance	CAL U100A	Schaffner	EC 2113-3	2005-3-24	2007-3-23

Calibration Impedance	TRA U150	Schaffner	EC 2113-4	2005-3-24	2007-3-23
Ultra-broadband antenna	HL 562	R&S	EC 3046-1	2005-7-1	2006-6-30
Horn antenna	HF 906	R&S	EC 3049	2005-7-1	2006-6-30
Pre-amplifier	Pre-amp 18	R&S	EC 3222	2005-7-1	2006-6-30
Log-period antenna	AT 1080	AR	EC 3044-7	2005-8-22	2006-8-21
Horn antenna	AT 4002	AR	EC 3044-8	2005-8-22	2006-8-21
Signal generator	SMR 20	R&S	EC 3044-1	2005-8-22	2006-8-21
Power amplifier	150W1000	AR	EC 3044-2	2005-8-22	2006-8-21
Power amplifier	25S1G4	AR	EC 3044-4	2005-8-22	2006-8-21
Field meter	FM 5004	AR	EC 3044-3	2005-8-22	2006-8-21
Field sensor	FP 6001	AR	EC 3044-9	2005-8-22	2006-8-21
Semi-anechoic chamber	-	Albatross project	EC 3048	2005-6-27	2006-6-26
Fully-anechoic chamber	-	Albatross project	EC 3047	2005-6-27	2006-6-26
Spectrum analyzer	E7402A	Agilent	EC 2254	2005-8-2	2006-8-1
Digital illuminance meter	TES 1332	TES	EC 2451	2005-6-16	2006-6-15
Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 3323	2005-12-28	2006-12-27
Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 3324	2006-2-14	2007-2-13
Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 3325	2005-12-28	2006-12-27
Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 3326	2005-12-28	2006-12-27
Pressure meter	YM3	Shanghai Mengde	EC 3320	2006-2-17	2008-2-16
Isolation transformer	-	Intertek	EC 2100	Not required	Not required
Stable power source	APS 11020	APC	EC 3209	Not required	Not required
Freq. Variable power source	AFC 11010	APC	EC 3210	Not required	Not required
Freq. Variable power source	AFC 33020	APC	EC 3211	Not required	Not required
Multi-meter	179	FLUKE	EC 3326	2005-8-3	2006-8-2
Shielded room	-	Zhongyu	EC 2838	2004-2-3	2009-2-2
Shielded room	-	Zhongyu	EC 2839	2004-2-3	2009-2-2

CONTENTS

1. Applicant Information

Applicant:	Xingtel Xiamen Electronics Co., Ltd. Xingtel Building, Chuangxin Road, Torch Hi-Tech Industrial District, Xiamen, 361006, China
Manufacturer:	Xingtel Xiamen Electronics Co., Ltd. Xingtel Building, Chuangxin Road, Torch Hi-Tech Industrial District, Xiamen, 361006, China
Country of origin:	China
Name of contact:	Mr. Judy Chen
Tel:	+86 0592 6036442
Fax:	+86 0592 6037860

2. Information of Equipment under Test (EUT)

2.1 Identification of the EUT

EUT	:	Bluetooth Carkit
Description of EUT	:	The product covered by this report is a Bluetooth wireless product. The product is designed for installation in motor vehicles to enable handsfree operation of the mobile phone.
Model number	:	BT-202
Rating	:	Power by 12V DC
Transmit Power	:	-1.67 dBm E.I.R.P
Frequency Range	:	2.402GHz-2.480GHz
Modulation Technique	:	Frequency Hopping Spread Spectrum (FHSS) (GFSK)
Number of Channels	:	79
Dwell Time	:	≤0.4s
Operating Mode	:	Point-to-Point
Data Rate	:	741 Kbps (Highest Mode)
Antenna Type	:	Chip Antenna
Antenna Gain	:	-1.76 dBi
Mains lead	:	none
Data cable	:	none
Sample received date	:	April 5, 2006
Date of test	:	April 5, 2006

Internal clock frequencies or other used frequencies: none

2.2 Representative tested models

The EUT configuration for testing is installed on RF field strength measurement to meet the commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

The EUT (Transmitter) was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements.

2.3 Additional information about the EUT

The EUT has been tested under operating condition. Test program used to control the EUT for staying in continuous transmitting and receiving mode is programmed. Channel low (2402MHz)、mid (2441MHz) and high (2480MHz) with 741k highest data rate are chosen for full testing with AC/DC power adaptor, which was the worse condition.

2.4 SUMMARY OF TEST RESULTS

FCC Rules	Description Of Test	Result
15.207	Conducted Emission	NA
15.247 b (1)	Peak Output Power	Pass
15.247 a	20dB Bandwidth	Pass
15.247 c	100 KHz Bandwidth Of Frequency Band Edges	Pass
15.209 a f	Spurious Emission	Pass
15.247 a (1)	Frequency Separation	Pass
15.247 a (1)(iii)	Number of hopping frequency	Pass
15.247 a (1)(iii)	Time of Occupancy	Pass
15.247	Peak Power Density	Pass
15.203, 15.247 b (4)(i)	Antenna Requirement	Pass
1.1310	RF Exposure	Pass

3. TEST SETUP AND OPERATION MODES

3.1 Test Configuration of the EUT system

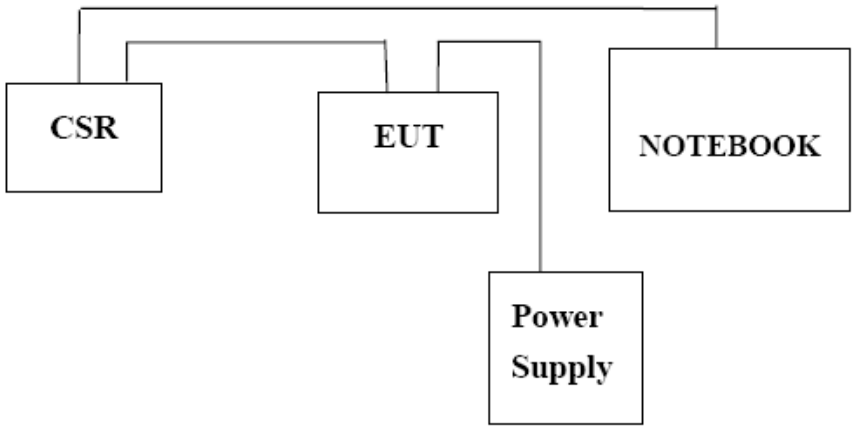
3.3.1 Conducted Emissions

The EUT is a placed on as turn table which is 0.8 m above ground plane. According to the requirements in Section 7 & 13 of ANSI C63.4-2003.Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-Peak and Average detector mode.

3.3.2 Radiated Emissions

The EUT is a placed on as turn table which is 0.8 m above ground plane. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this hand-held transmitter(EUT) was rotated through three orthogonal axes according to the requirements in Section 8 & 13 of ANSI C63.4-2003.

3.2 EUT Test Setup Block Diagram



3.3 Test Peripherals

Name	Manu	Model	Series Number	FCC	Data Cable	Power Cord
Notebook	IBM	T2367	99GLD64	DOC	N/A	Un-shield
BT development kit	CSR/ CASIRA	BCES301199	7383-07-04-03	DOC	N/A	Un-shield
DC Power Supply	Topward	3303A	N/A	715844	N/A	Un-shield

4. Conducted Emission Test

4.1 Conducted Emission Limit

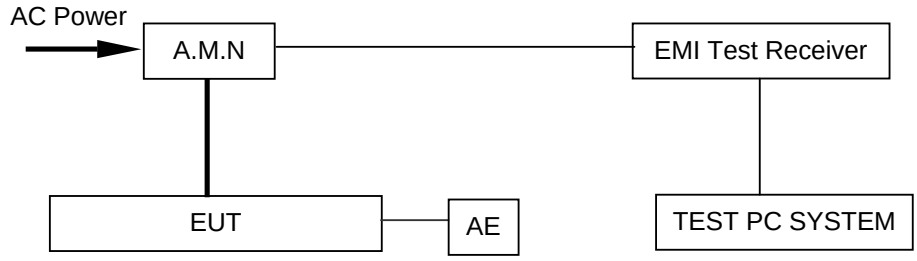
Conducted limits:

The test is performed according to FCC PART 15, section 15.107 (b), for class B device

Frequency (MHz)	Conducted Limit	
	Quasi-peak dB(μV)	Average dB(μV)
0.15 – 0.50	66 to 56	56 to 46
0.50-5	56	46
5-30	60	50

For a class B digital device that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is connected back onto the AC power line on any frequency or frequencies within the band 150kHz to 30MHz shall not exceed the limits in the above table, as measured using a 50μH/50 ohms LISN. The lower limit applies at the boundary between the frequency ranges.

4.2 Test Setup



Note: ——— means “power line”
——— means “signal line”

4.3 Test Condition Description

The Conducted Power line Measurement was proceeded in a shielded room.

The EUT was connected to AC power source through an Artificial Mains Network (A.M.N.). which provides a 50 ohm, standardized RF impedance for the measuring equipment, and fed by standard audio and video signal for operation.

The EUT was placed 40 centimeters from the wall of the earthed shielded room, which was considered as Ground Reference Plane (GRP), and kept at least 80 centimeters from any other earthed conducting surface.

The EUT was placed at a distance of 80 centimeters from the AMN, and connected thereto by an unshielded lead of 1.8 meter in length. The length exceeded 0.8m was bundled 0.3-0.4m in the

center.

In order to find the maximum emission, the relative positions of equipment and all of the interface cables were changed or manipulated according to MP-5/1986 during measurement.

The frequency range from 150 kHz to 30 MHz was checked.

The bandwidth of Test Receiver ESCS 30 was set at 10 kHz.

During measurement, EUT was set at full function modes described in clause 5.3 of Appendix D: Customer Test Plan.

4.4 Test Results

☐ Pass ☐ Fail ■ N/A

4.4.1 Measurement environment

Temperature: °C Relative Humidity: %

4.4.2 Test Records

none

4.4.3 Test Photos

none

4.4.4 Measurement Uncertainty

Measurement uncertainty is calculated in accordance with CISPR 16-4-2: 2003.
Measurement uncertainty on mains terminal disturbance voltage: ± 3.6dB
(The measurement uncertainty is given with a confidence of 95%, K=2)
Measurement uncertainty on telecommunication lines: unconsideration according to CISPR 16-4-2: 2003

5. Radiated Emission Test

5.1 Radiated Emission Limit

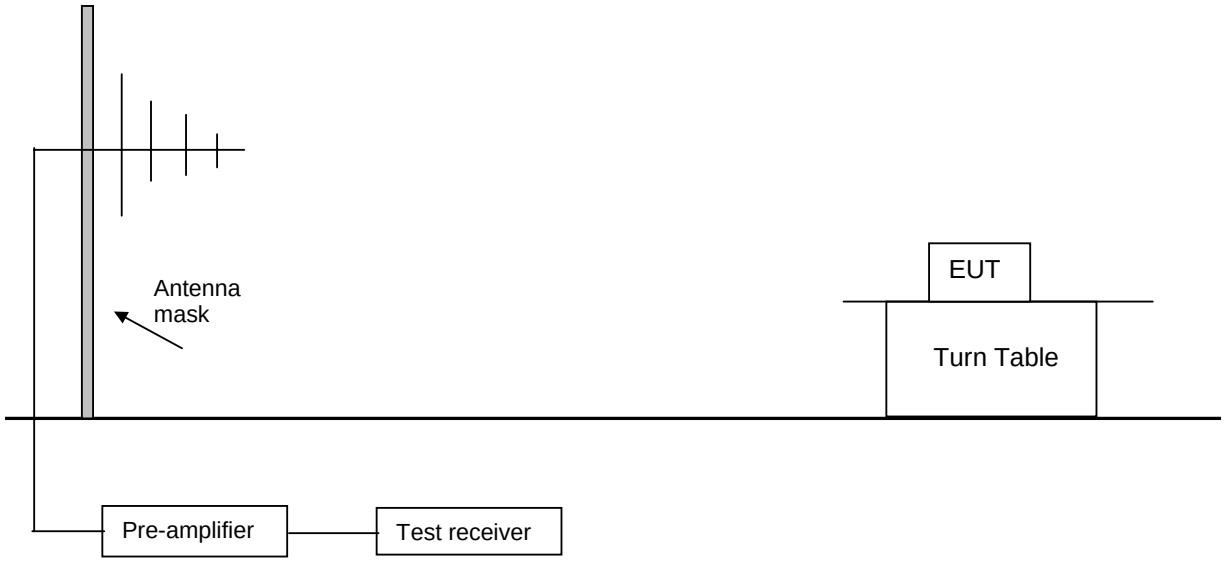
Radiated Emission Limits:

The test is performed according to FCC PART 15, section 15.109 (b), for class B device. The below limit is for testing in a semi-anechoic chamber, 10m test distance.

Frequency (MHz)	Maximum RF Field limit
	dB(μV)
30-88	40
88-216	43.5
216-960	46
Above 960	53

Note:
1. The test is performed in a 10m semi-anechoic chamber. Therefore 10dB is deduct from limit.
2. In the emission limits tables above, the tight limit applies at the band edges.

5.2 Test Setup



5.3 Test Condition Description

The Radiated emission Measurement was conducted in a semi-anechoic chamber, the distance between the EUT boundary and the antenna was 3 meters.

The EUT was placed on a 1.5 by 0.8m wooden table and operated at standard operation modes as per clause 5.3 of the Appendix D: Customer Test Plan.

The turntable rotating from 0 to 360 degree, and the receiving antenna varying from 100cm to 400cm during the test for the maximum emission, and the cables of the EUT was varied to get the maximum emission level.

Both Horizontal and Vertical polarization was scanned.

The frequency range from 30MHz to 1000 MHz was checked.

The bandwidth of Test Receiver ESCS 30 was set at 120 kHz.

5.4 Test Results

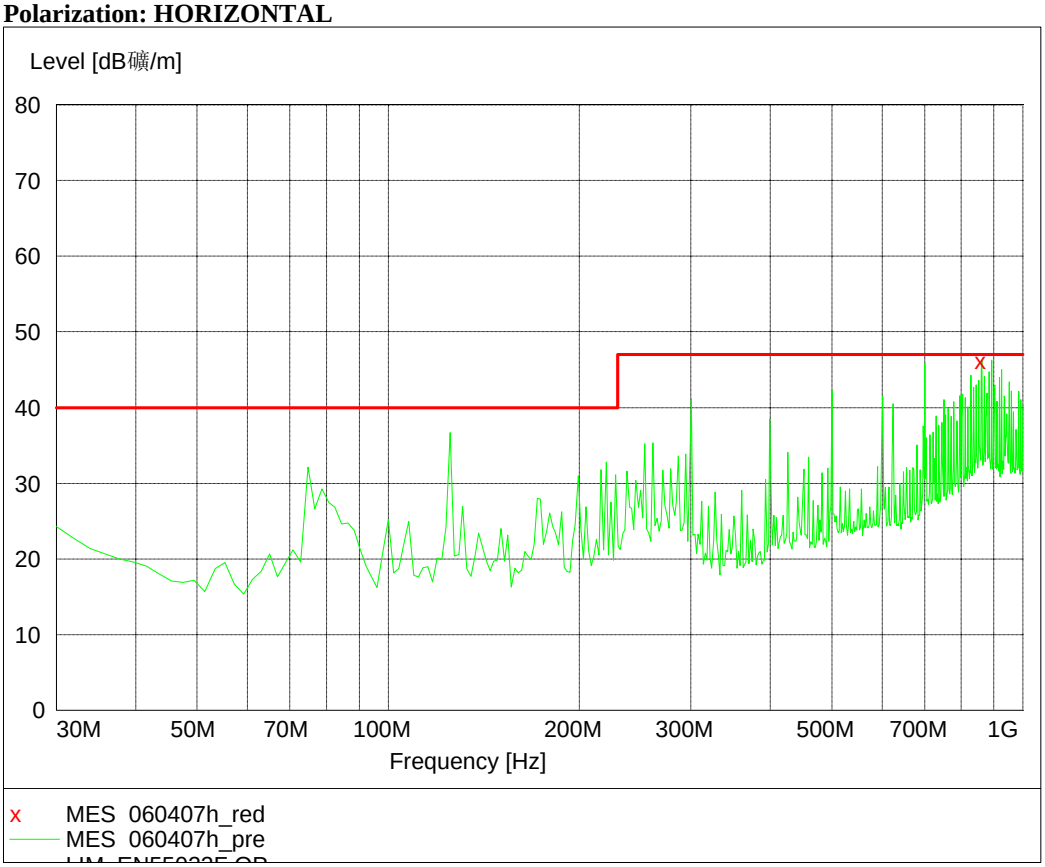
■ Pass ☐ Fail

5.4.1 Measurement environment

Temperature: 25 °C Relative Humidity: 58 %

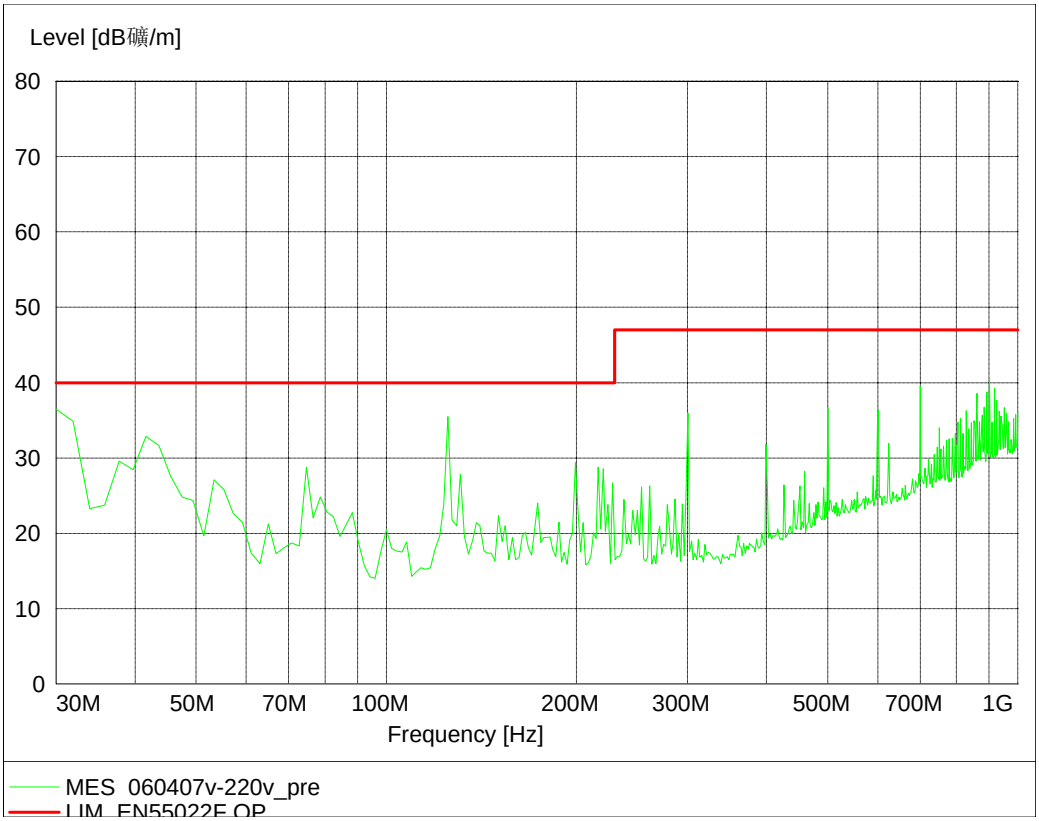
5.4.2 Test Record

Polarization: HORIZONTAL



Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
860.180361	46.14	23.7	47.0	0.9	---	100.0	180.00	---

Polarization: VERTICAL



5.4.3 Measurement Uncertainty

Measurement uncertainty is calculated in accordance with CISPR 16-4-2: 2003.
Measurement uncertainty of radiated emission disturbance voltage: ± 5.2dB
(The measurement uncertainty is given with a confidence of 95%, K=2)

6. PEAK OUTPUT POWER MEASUREMENT

6.1 Standard Applicable

According to §15.247(b)(1), for frequency hopping systems in the 240-2483.5 MHz band employing at least 75 hoping 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 Watt.

6.2 Measurement Procedure

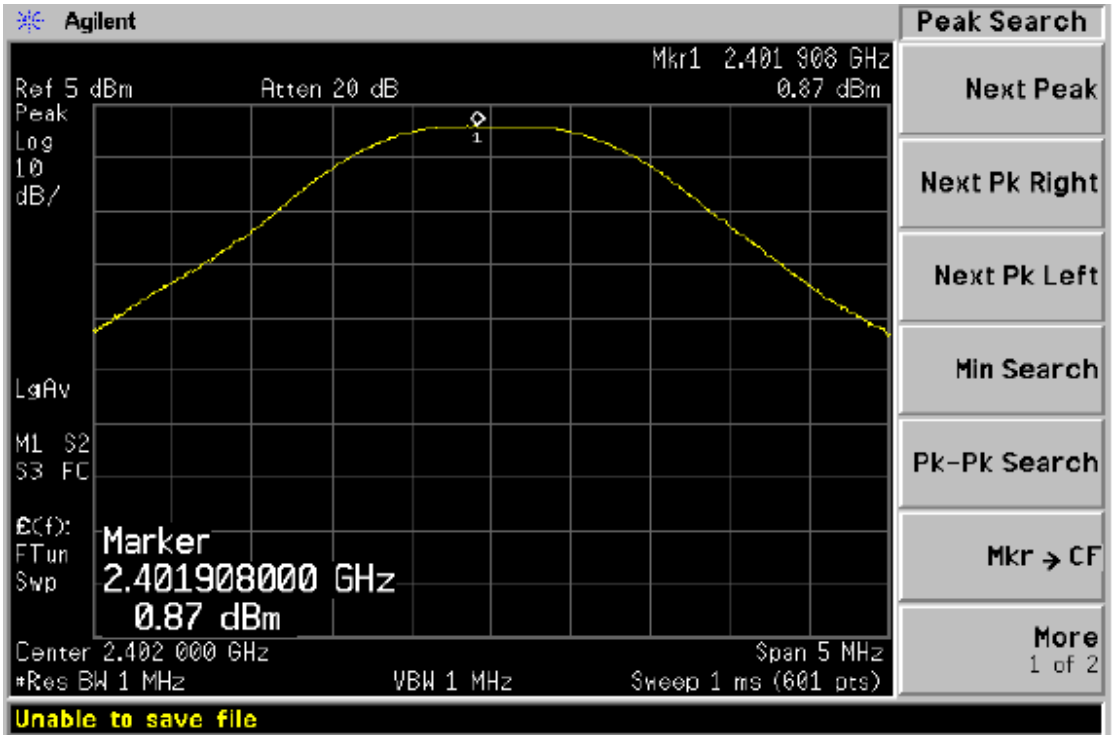
1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the power meter or spectrum. (Channel power function, RBW, VBW = 1MHz)
3. Record the max. reading.
4. Repeat above procedures until all frequency measured were complete.

6.3 Measurement Result

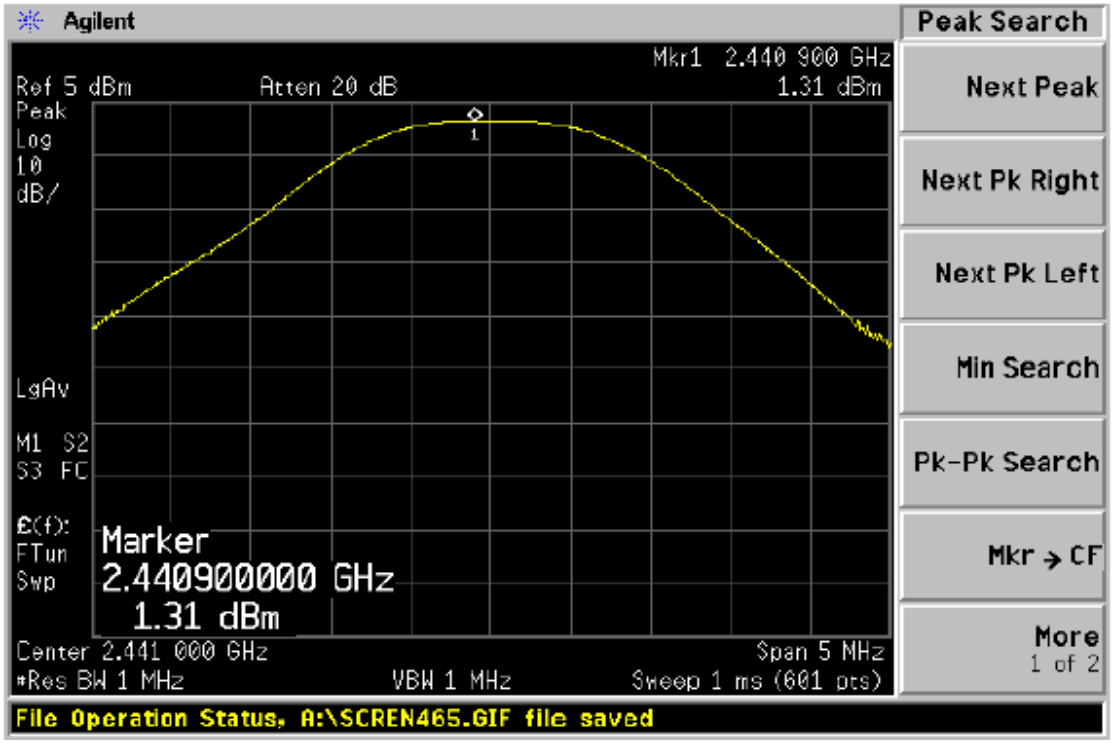
CH	Frequency (MHz)	Reading Power (dBm)	Cable Loss	Output Power	Output Power (W)	Limit (W)
Low	2402.00	0.87	0.20	1.07	0.00128	1
Mid	2441.00	1.31	0.20	1.51	0.00142	1
High	2480.00	1.63	0.20	1.83	0.00152	1

6.4 Peak Power Output Data Plot

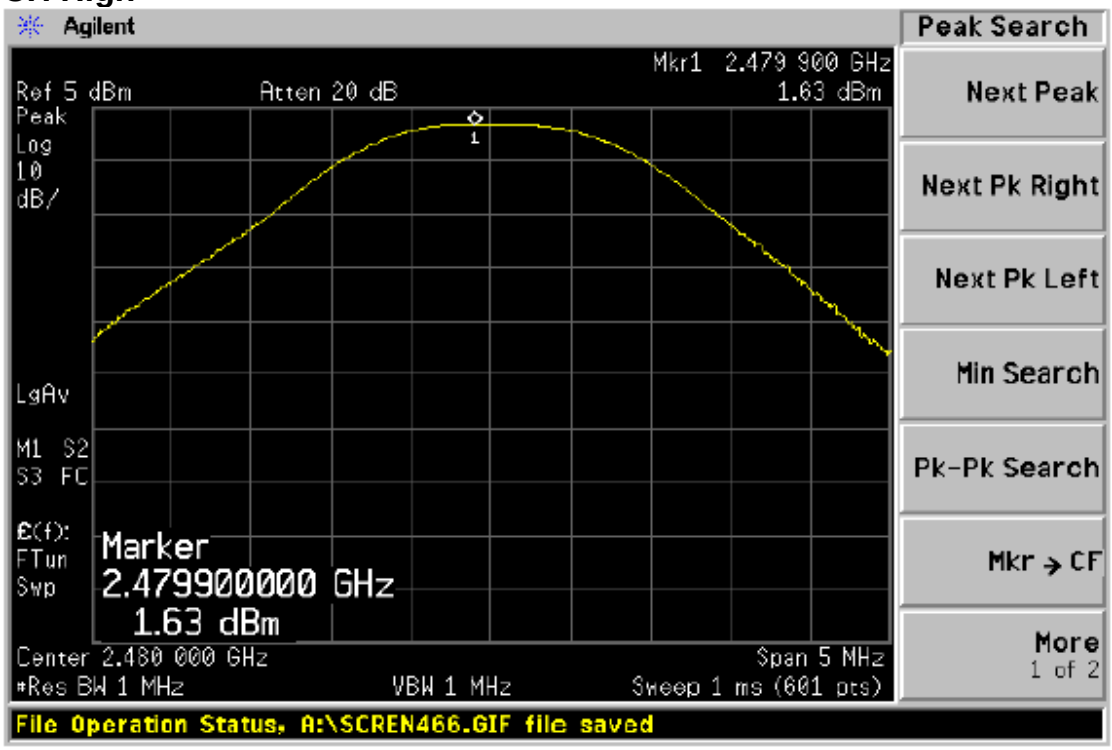
CH Low



CH Mid



CH High


Agilent
Peak Search
Mkr1 2.479 900 GHz
1.63 dBm
Ref 5 dBm
Atten 20 dB
Peak
Log
10
dB/
LgAv
M1 S2
S3 FC
£(f):
FTun
Swp
Marker
2.479900000 GHz
1.63 dBm
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
Mkr → CF
More
1 of 2
Center 2.480 000 GHz
Span 5 MHz
#Res BW 1 MHz
VBW 1 MHz
Sweep 1 ms (601 pts)
File Operation Status, A:\SCREN466.GIF file saved

7. 20dB BAND WIDTH

7.1 Standard Applicable

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

7.2 Measurement Procedure

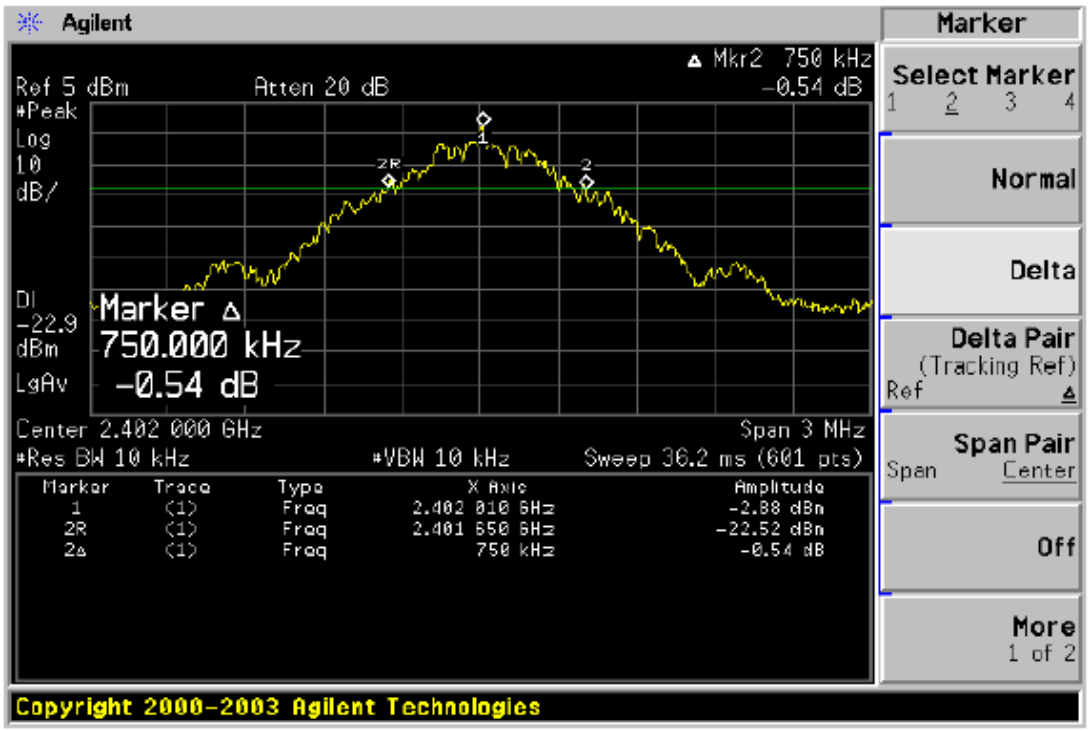
1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port
to the spectrum analyzer.
3. Set the spectrum analyzer as RBW=10KHz (1 % of Bandwidth.), Span= 2MHz, Sweep=auto
4. Mark the peak frequency and –20dB (upper and lower) frequency.
5. Repeat above procedures until all frequency measured were complete.

7.3 Measurement Result

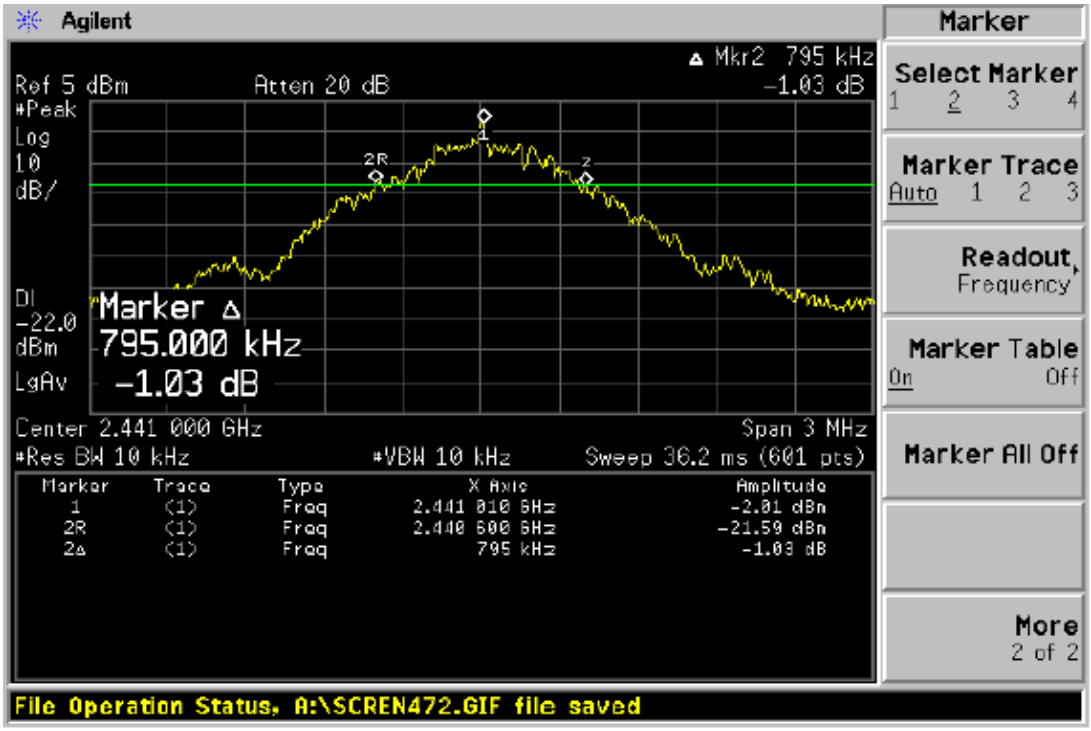
CH	Bandwidth (MHz)
Low	0.750
Mid	0.795
High	0.950

7.4 20dB Band Width Test Data Plot

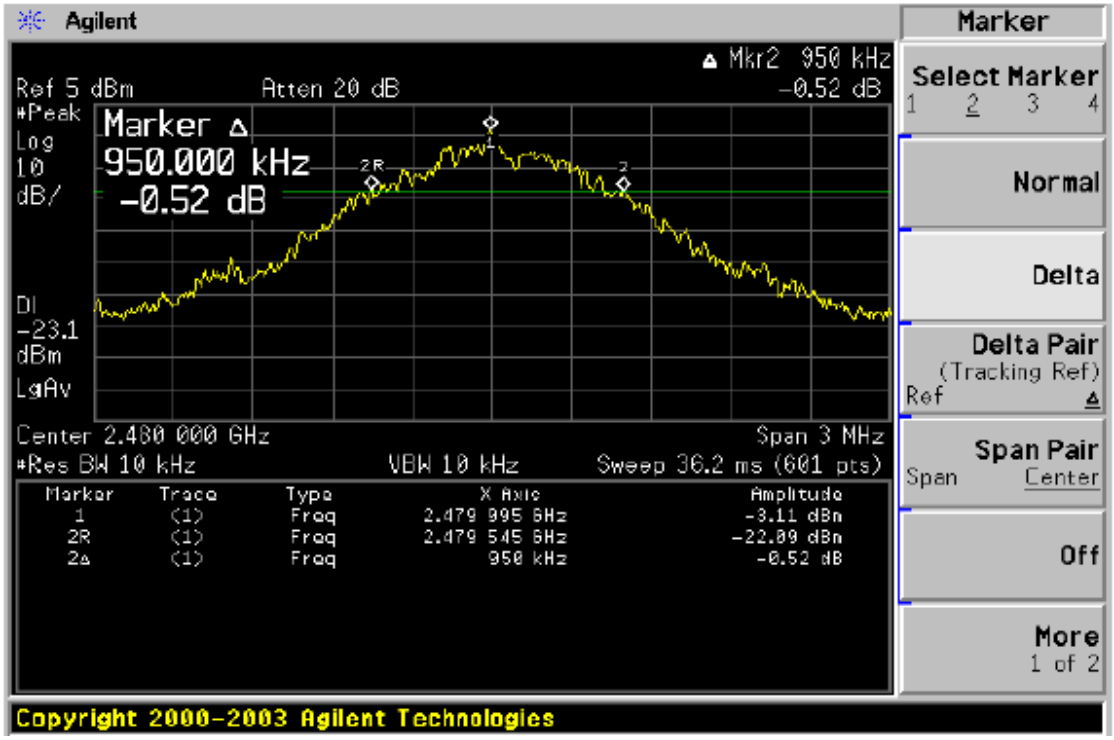
CH-Low



CH-Mid



CH-High


Agilent
Marker
Mkr2 950 kHz
-0.52 dB
Ref 5 dBm
Atten 20 dB
#Peak
Log
10
dB/
Marker Δ
950.000 kHz
-0.52 dB
2R
2
Dl
-23.1
dBm
LgAv
Center 2.480 000 GHz
Span 3 MHz
#Res BW 10 kHz
VBW 10 kHz
Sweep 36.2 ms (601 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 2.479 995 6Hz -3.11 dBm
2R (1) Freq 2.479 545 6Hz -22.09 dBm
2Δ (1) Freq 950 kHz -0.52 dB
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref
Span Pair
Span Center
Off
More
1 of 2
Copyright 2000-2003 Agilent Technologies

8. 100KHz BANDWIDTH OF BAND EDGES MEASUREMENT

8.1 Standard Applicable

According to §15.247(c), in any 100 KHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator in operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100KHz bandwidth within the band that contains the highest level of the desired power, In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in15.209(a).

8.2 Measurement Procedure

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set center frequency of spectrum analyzer = operating frequency.
4. Set the spectrum analyzer as RBW, VBW=100KHz, Span=30MHz, Sweep = auto
5. Mark Peak, 2.390GHz and 2.488GHz and record the max. level.
6. Repeat above procedures until all frequency measured were complete.
7. Radiated Emission refer to section 9.

8.3 Measurement Result

8.3.1 Radiated Emission

Temperature: 25 °C Humidity: 65%

Freq. (MHz)	CH	Fund Freq. (MHz)	Pol.	Peak Reading (dBuV)	AV Actual FS (dBuV/m)	Peak Limit (dBuV/m)	AV Limit (dBuV/m)
2385.96	Low	2402	Ver	-	-	74.00	54.00
2385.96			Hor.	-	-	74.00	54.00
2483.56	High	2480	Ver	-	-	74.00	54.00
2483.56			Hor.	-	-	74.00	54.00

Remark：

(1) Datas of measurement within this frequency range shown " - " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

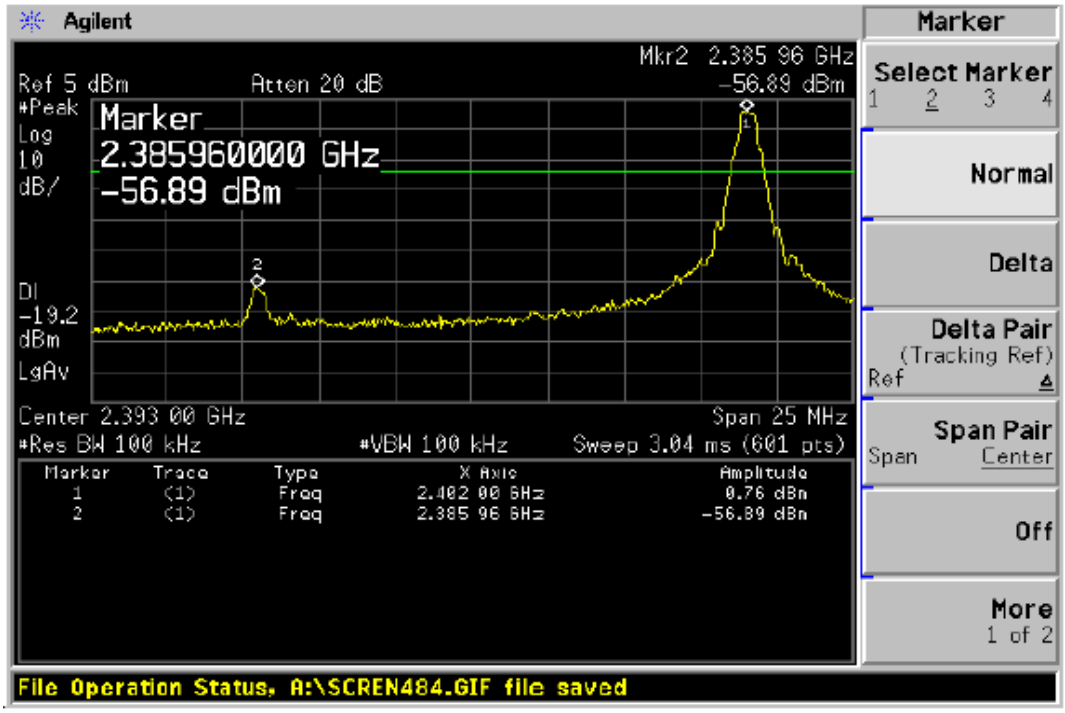
(2) Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column。

(3) Spectrum Peak Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 1MHz, Sweep time= 200ms.

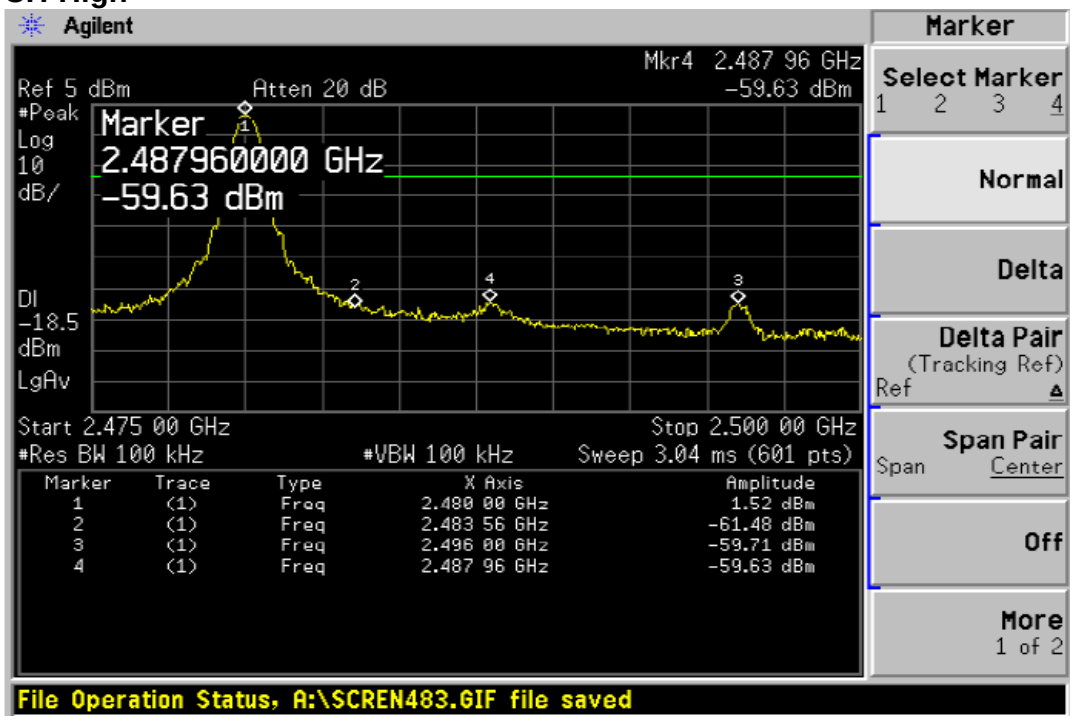
(4) Spectrum AV Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200ms.

8.3.2 Conducted Emission Test Data Plot

CH-Low



CH-High



9. SPURIOUS RADIATED EMISSION TEST

9.1 Standard Applicable

According to §15.247(c), all other emissions outside these bands shall not exceed the general radiated emission limits specified in §15.209(a). And according to §15.33(a)(1), for an intentional radiator operates below 10GHz, the frequency range of measurements: to the tenth harmonic of the highest fundamental frequency or to 40GHz, whichever is lower.

9.2 EUT Setup

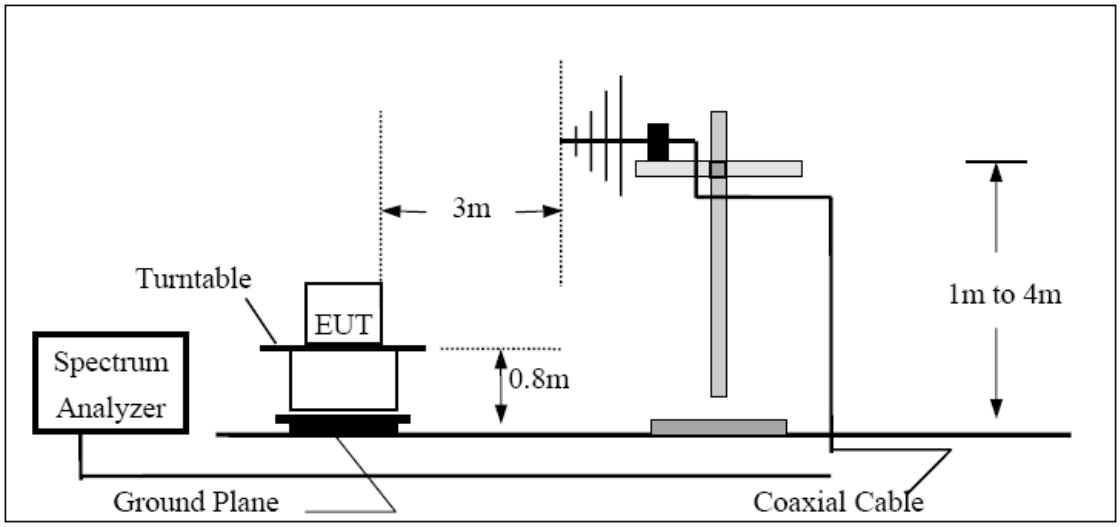
1. The radiated emission tests were performed in the 3 meter open-test site, using the setup in accordance with the ANSI C63.4-2003 section 6.1.4. Figure 11a.
2. The EUT was put in the front of the test table.
3. The PC system was connected with 110Vac/60Hz power source.

9.3 Measurement Procedure

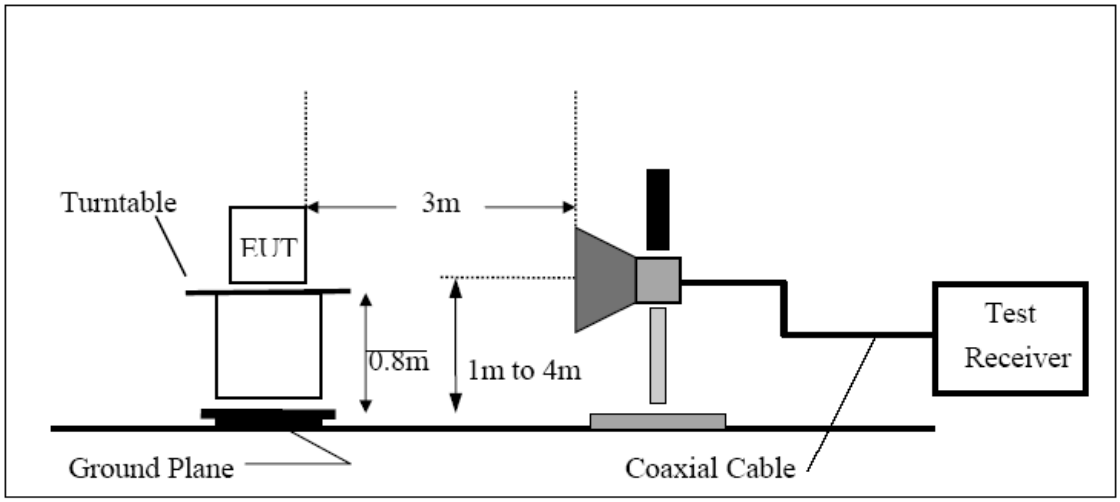
1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. The turn table shall rotate 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Repeat above procedures until all frequency measured were complete.

9.4 Test SET-UP (Block Diagram of Configuration)

(A) Radiated Emission Test Set-Up, Frequency Below 1000MHz



(B) Radiated Emission Test Set-UP Frequency Over 1 GHz



9.6 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CL - AG

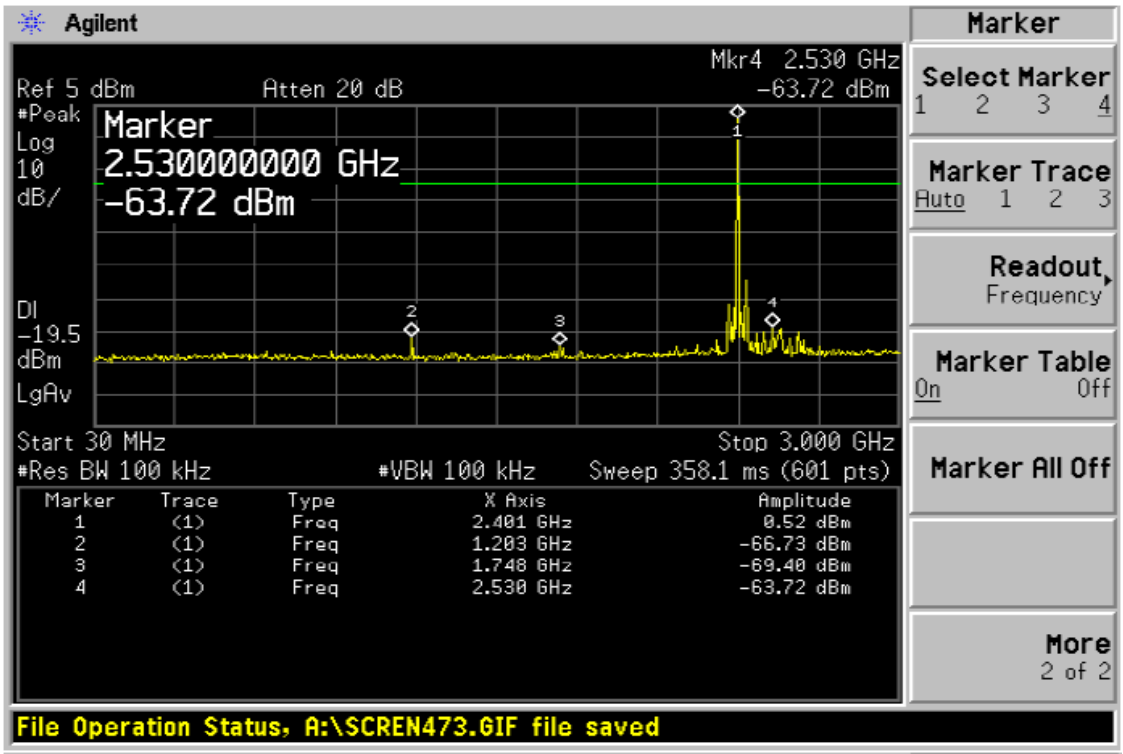
FS = Field Strength
CL = Cable Attenuation Factor (Cable Loss)
RA = Reading Amplitude
AG = Amplifier Gain
AF = Antenna Factor

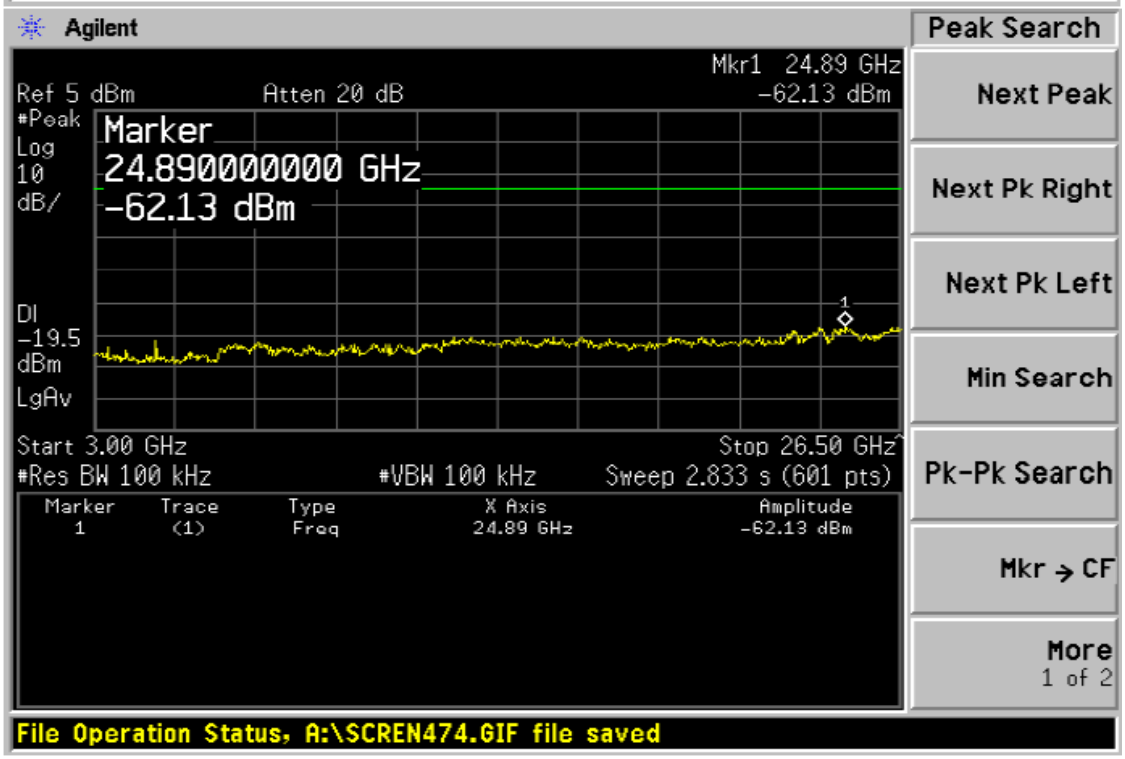
9.7 Measurement Result

Refer to attach tabular data sheets.

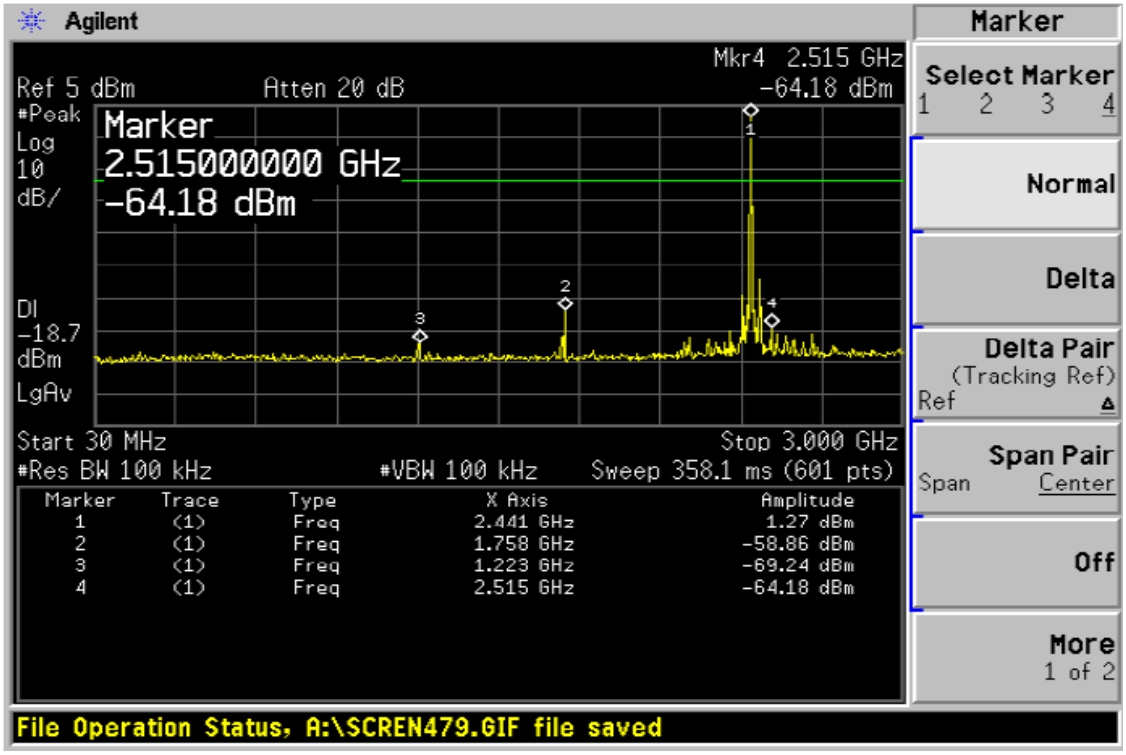
9.7.1 Conducted Emission Test Data Plot

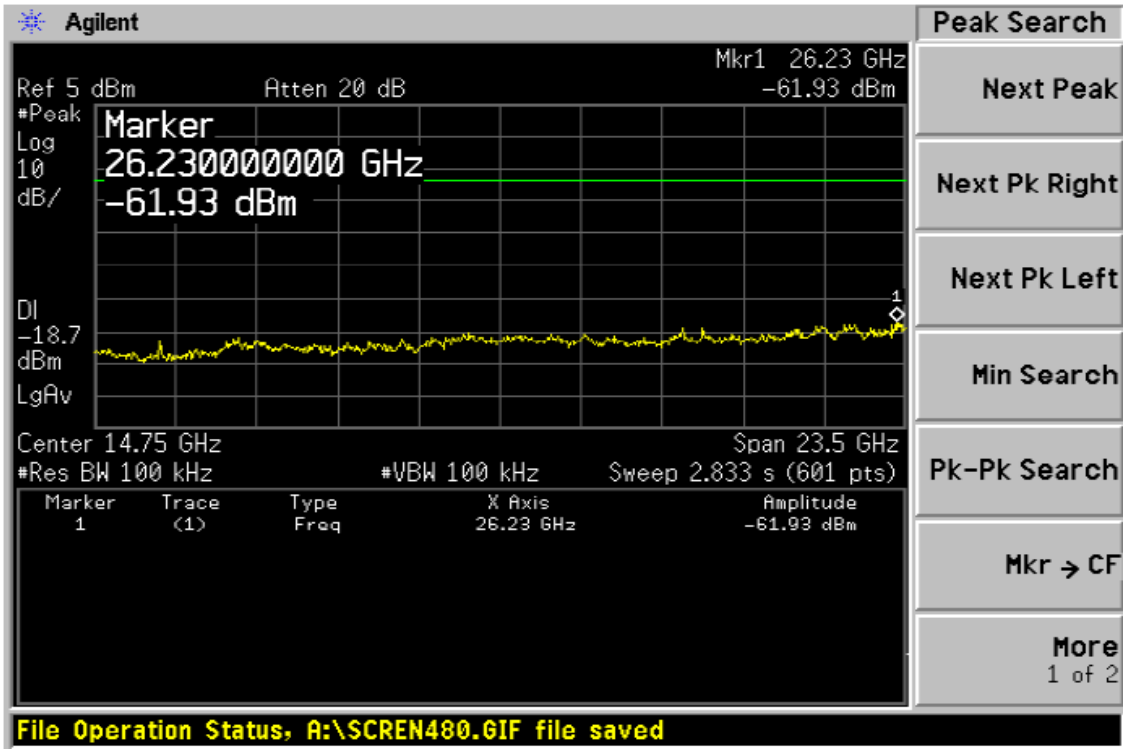
CH Low 30MHz – 26.5GHz



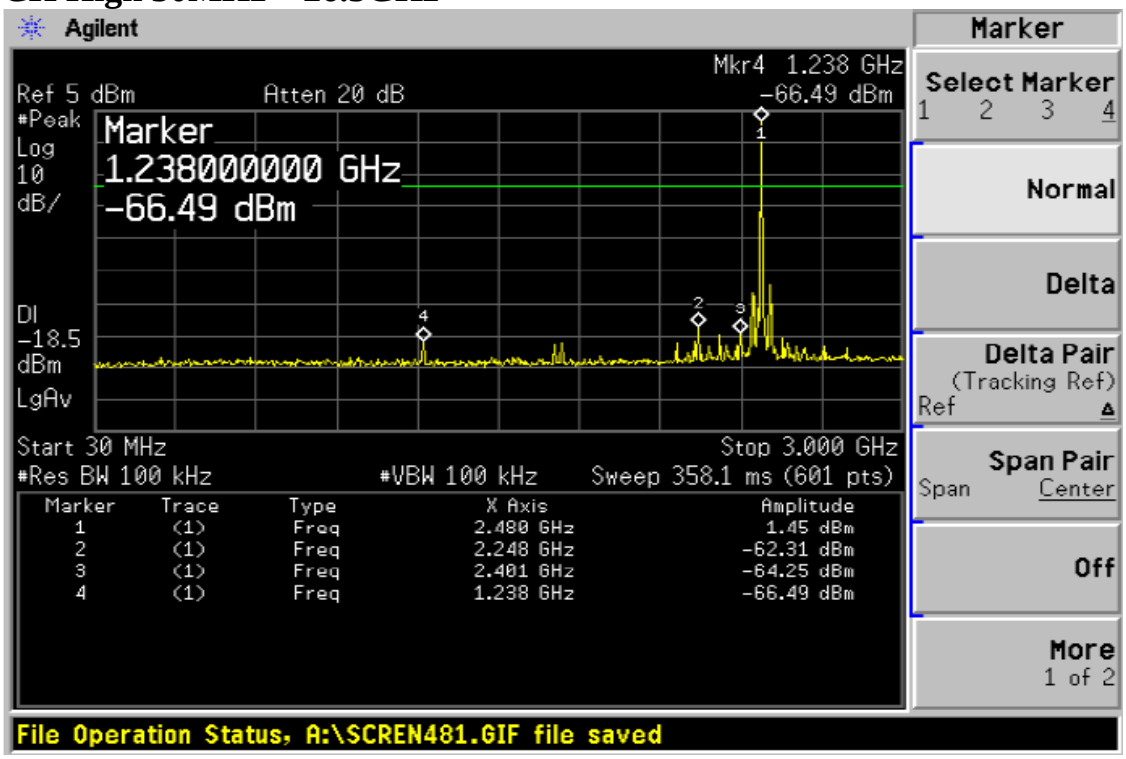


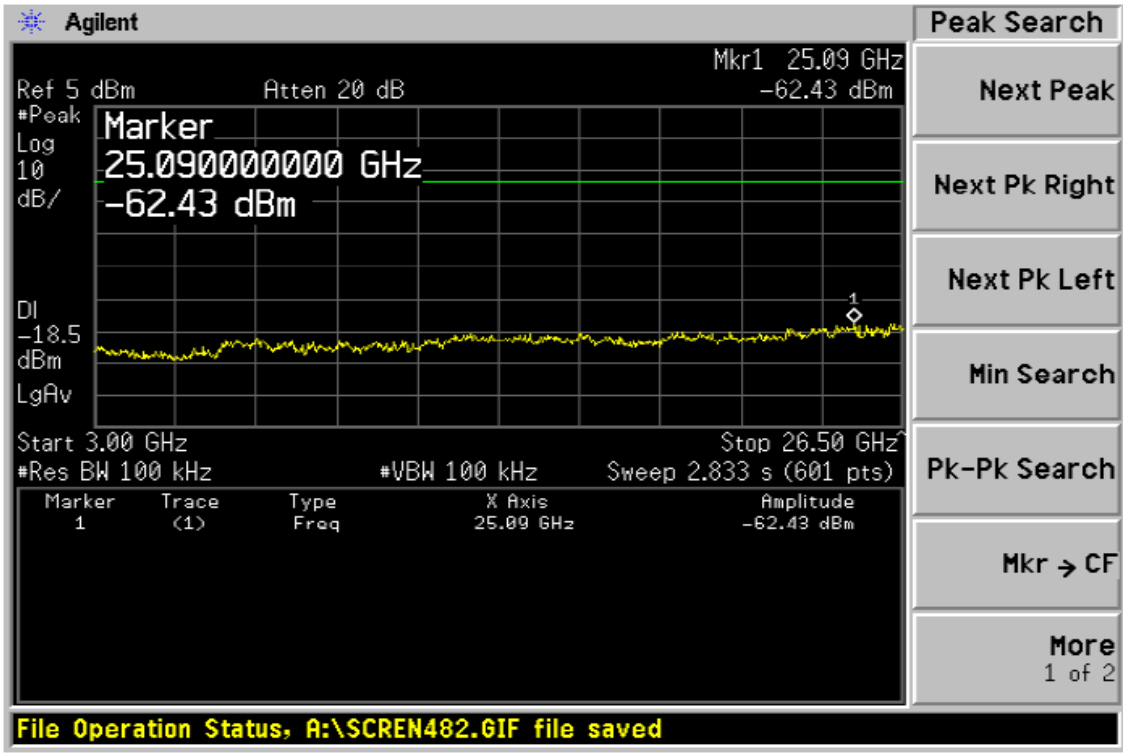
CH Mid 30MHz – 26.5GHz





CH High 30MHz – 26.5GHz





9.7.2 Radiated Spurious Emission Measurement Result (below 1GHz)

Temperature: 25 ℃ Humidity: 65 %

Test Mode	Freq. (MHz)	SPA. Reading (dBuV)	Ant. Pol.	Detector Mode (PK/QP)	Factor (dB)	Actual FS	Limit (dBm)	Margin (dBm)
TX CH Low	96.93	50.60	V	Peak	-14.91	35.69	43.50	-7.81
	167.74	46.44	V	Peak	-17.07	29.37	43.50	-14.13
	300.63	45.74	V	Peak	-16.00	29.74	46.00	-16.26
	499.48	42.76	V	Peak	-14.12	28.64	46.00	-17.36
	567.38	42.09	V	Peak	-14.77	27.32	46.00	-18.68
	701.24	37.38	V	Peak	-10.58	26.80	46.00	-19.20
	97.90	52.40	H	Peak	-14.91	37.49	43.50	-6.01
	300.63	46.39	H	Peak	-16.00	30.39	46.00	-15.61
	500.45	44.04	H	Peak	-14.12	29.92	46.00	-16.08
	599.39	41.44	H	Peak	-14.69	26.75	46.00	-19.25
	749.74	37.30	H	Peak	-10.58	26.72	46.00	-19.28
	865.17	37.80	H	Peak	-9.50	28.30	46.00	-17.70
TX CH Mid	64.92	48.41	V	Peak	-14.6	33.74	40.00	-6.26
	128.94	48.71	V	Peak	-14.91	33.80	43.50	-9.70
	300.63	45.74	V	Peak	-17.07	28.67	46.00	-17.33
	499.48	41.71	V	Peak	-16.00	25.71	46.00	-20.29
	533.43	39.53	V	Peak	-14.12	25.41	46.00	-20.59
	567.38	37.51	V	Peak	-10.66	26.85	46.00	-19.15
	128.94	48.68	H	Peak	-14.91	33.77	43.50	-9.73
	300.63	46.73	H	Peak	-16.00	30.73	46.00	-15.27
	465.53	42.72	H	Peak	-14.12	28.60	46.00	-17.40
	533.43	43.56	H	Peak	-14.77	28.79	46.00	-17.21
	600.36	40.88	H	Peak	-10.58	30.30	46.00	-15.70
	866.14	39.56	H	Peak	-9.50	30.06	46.00	-15.94
TX CH High	65.89	48.41	V	Peak	-14.67	33.74	40.00	-6.26
	128.94	49.17	V	Peak	-14.91	34.26	43.50	-9.24
	300.63	45.76	V	Peak	-16.00	29.76	46.00	-16.24
	499.48	41.15	V	Peak	-14.12	27.03	46.00	-18.97
	533.43	39.48	V	Peak	-14.77	24.71	46.00	-21.09
	567.38	38.64	V	Peak	-10.58	28.06	46.00	-17.94
	99.84	52.33	H	Peak	-14.91	37.42	43.50	-6.08
	300.63	46.88	H	Peak	-16.00	30.88	46.00	-15.12
	533.43	42.74	H	Peak	-14.12	28.62	46.00	-17.38
	600.36	40.73	H	Peak	-16.49	24.24	46.00	-21.76
	749.74	38.17	H	Peak	-14.77	23.40	46.00	-22.60
	900.09	36.60	H	Peak	-10.58	26.02	46.00	-19.98

Remark：

(1) Measuring frequencies from 30 MHz to the 1GHz。

(2) Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using Peak/QP detector mode.

(3) Datas of measurement within this frequency range shown " - " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

(4) The IF bandwidth of SPA between 30MHz to 1GHz was 100KHz.

9.7.3 Radiated Spurious Emission Measurement Result (above 1GHz)

Temperature: 25 ℃ Humidity: 65 %

Freq. (MHz)	CH	Fund Freq. (MHz)	Pol.	Peak Reading (dBuV)	Factor (dB)	Peak Actual FS (dBuV/m)	Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)
1598.00	Low	2402	V	42.72	-6.81	35.91	74.00	54.00	-18.09
4796.00			V	42.76	2.95	45.71	74.00	54.00	-8.29
7194.00			V	41.86	9.25	51.11	74.00	54.00	-2.89
1598.00			H	42.72	-6.81	35.91	74.00	54.00	-18.09
4796.00			H	42.73	2.95	45.68	74.00	54.00	-8.32
7194.50			H	43.60	9.25	-52.85	74.00	54.00	-1.15
1598.00	Mid	2441	V	41.49	-6.81	34.68	74.00	54.00	-19.32
4880.50			V	38.61	3.18	41.79	74.00	54.00	-12.21
7305.0			V	40.57	9.44	50.01	74.00	54.00	-3.99
1598.00			H	44.70	-6.81	37.89	74.00	54.00	-16.11
4880.50			H	39.37	3.18	42.55	74.00	54.00	-11.45
7324.05			H	42.09	9.47	51.56	74.00	54.00	-2.44
1500.5	High	2480	V	39.81	-7.17	32.64	74.00	54.00	-21.36
1598.0			V	42.93	-6.81	36.12	74.00	54.00	-17.88
1500.5			H	44.81	-7.17	37.64	74.00	54.00	-16.36
1598.0			H	44.62	-6.81	37.81	74.00	54.00	-16.19
2605.5			H	41.77	-2.76	39.01	74.00	54.00	-14.99

Remark：

(1) Measuring frequencies from 1GHz to the 10th harmonic of highest fundamental frequency.
(2) Datas of measurement within this frequency range shown " - " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
(3) Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
(4) Spectrum Peak Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 1MHz, Sweep time= 200ms.
(5) Spectrum AV Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200ms.

10. FREQUENCY SEPARATION

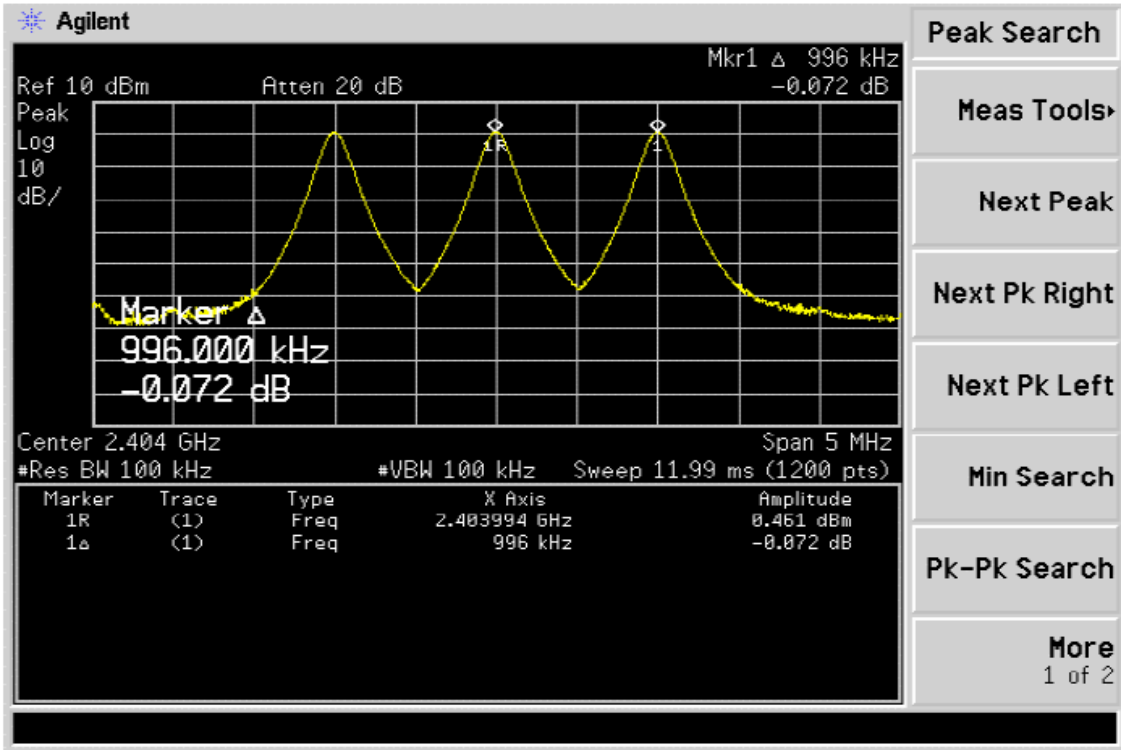
10.1 Standard Applicable

According to §15.247(a), Frequency hopping systems shall have hopping channel carrier frequencies separated by minimum of 25KHz or the 20dB bandwidth of the hopping channel, whichever is greater.

10.2 Measurement Procedure

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set center frequency of spectrum analyzer = middle of hopping channel .
4. Set the spectrum analyzer as RBW,VBW=100KHz, Adjust Span to 5 MHz, Sweep = auto.
5. Max hold. Mark 3 Peaks of hopping channel and record the 3 peaks frequency.

10.3 Frequency Separation Test Data Plot



11. NUMBER OF HOPPING FREQUENCY

11.1 Standard Applicable

According to §15.247(a)(1)(iii), Frequency hopping systems operating in the 2400MHz-2483.5 MHz bands shall use at least 15 hopping frequencies.

11.2 Measurement Procedure

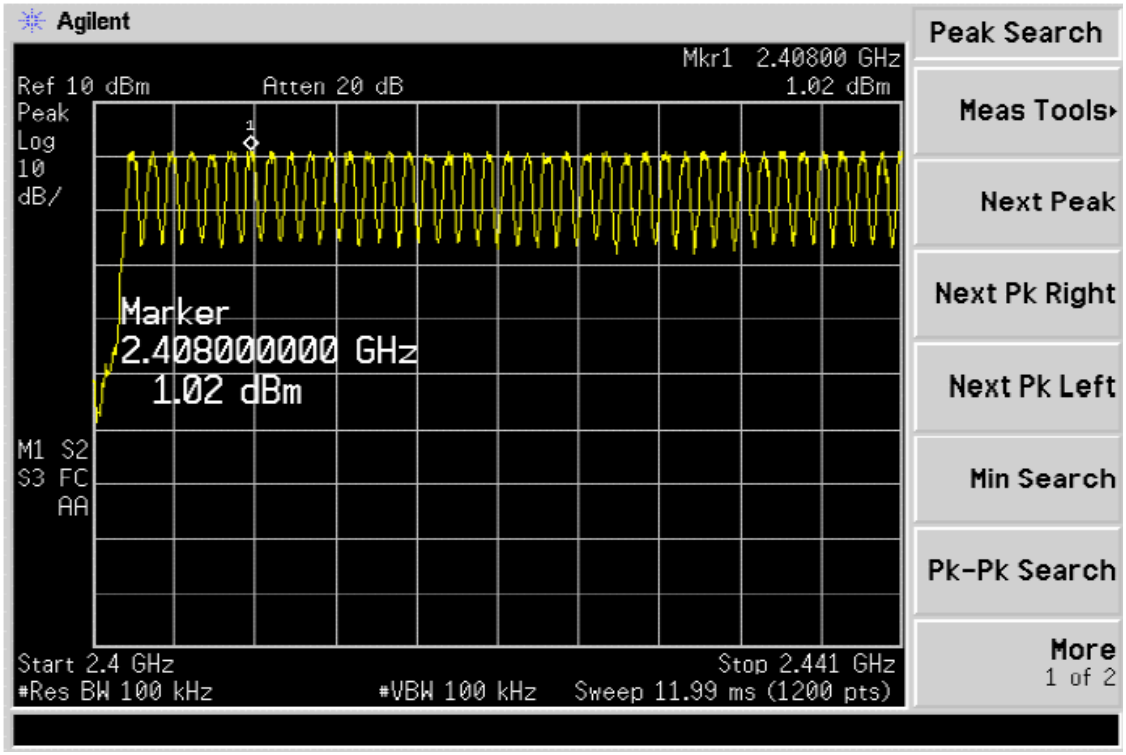
1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set spectrum analyzer Start=2400MHz, Stop = 2483.5MHz, Sweep = auto.
4. Set the spectrum analyzer as RBW, VBW=100KHz,
5. Max hold, view and count how many channel in the band.

11.3 Measurement Result

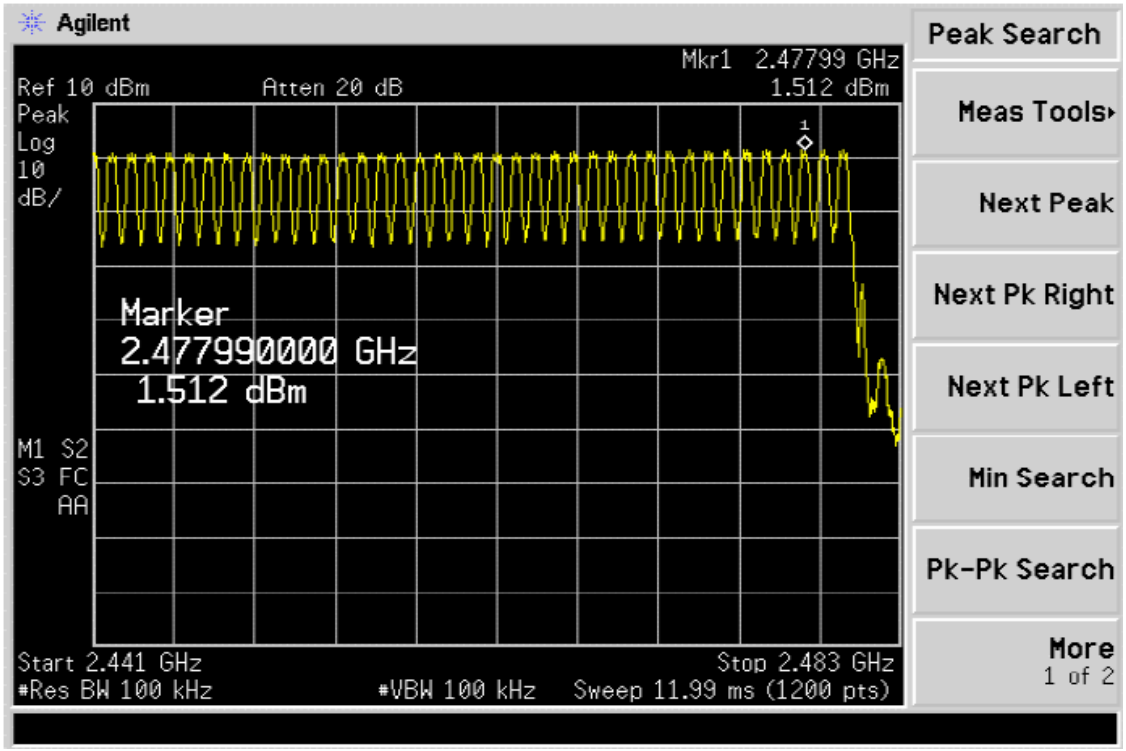
Total No of hopping channel	Limit (CH)	Measurement result (CH)	Result
	15	79	Pass

11.4 Channel Number Test Data Plot

2.4 GHz – 2.441GHz



2.441 GHz – 2.4835GHz



12. TIME OF OCCUPANCY (DWELL TIME)

12.1 Standard Applicable

According to §15.247(a)(1)(iii), Frequency hopping systems operating in the 2400MHz-2483.5 MHz.The average time of occupancy on any frequency shall not greater than 0.4 s within period of 0.4 seconds multiplied by the number of hopping channel employed.

12.2 Measurement Procedure

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set center frequency of spectrum analyzer = operating frequency.
4. Set the spectrum analyzer as RBW, VBW=100KHz, Span = 0Hz, Adjust Sweep = 30s.
5. Repeat above procedures until all frequency measured were complete.

12.3 Measurement Result

A period time = 0.4 (ms) * 79 = 31.6 (s)

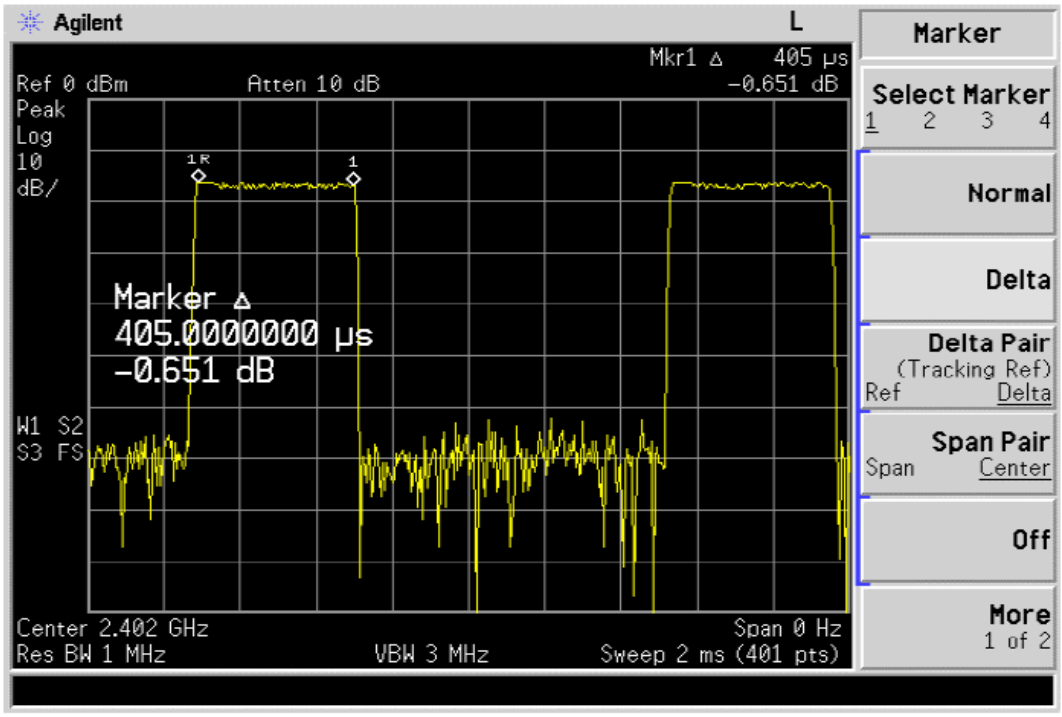
CH Low:
DH1 time slot = 0.405 (ms) * (1600/(2*79)) * 31.6 = 129.6 (ms)
DH3 time slot = 1.675 (ms) * (1600/(4*79)) * 31.6 = 268 (ms)
DH5 time slot = 2.295 (ms) * (1600/(6*79)) * 31.6 = 312 (ms)

CH Mid:
DH1 time slot = 0.405 (ms) * (1600/(2*79)) * 31.6 = 129.6 (ms)
DH3 time slot = 1.675 (ms) * (1600/(4*79)) * 31.6 = 268 (ms)
DH5 time slot = 2.906 (ms) * (1600/(6*79)) * 31.6 = 309.97 (ms)

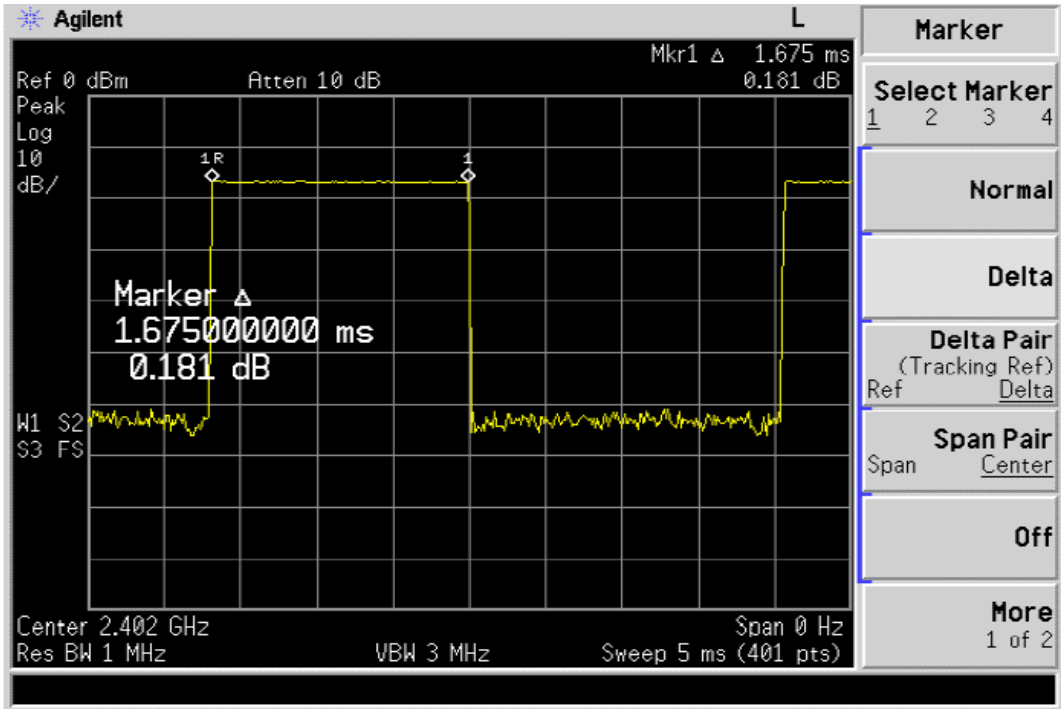
CH High:
DH1 time slot = 0.416 (ms) * (1600/(2*79)) * 31.6 = 129.6 (ms)
DH3 time slot = 1.662 (ms) * (1600/(4*79)) * 31.6 = 265.92 (ms)
DH5 time slot = 2.906 (ms) * (1600/(6*79)) * 31.6 = 309.97 (ms)

12.4 Dwell Time Test Data Plot

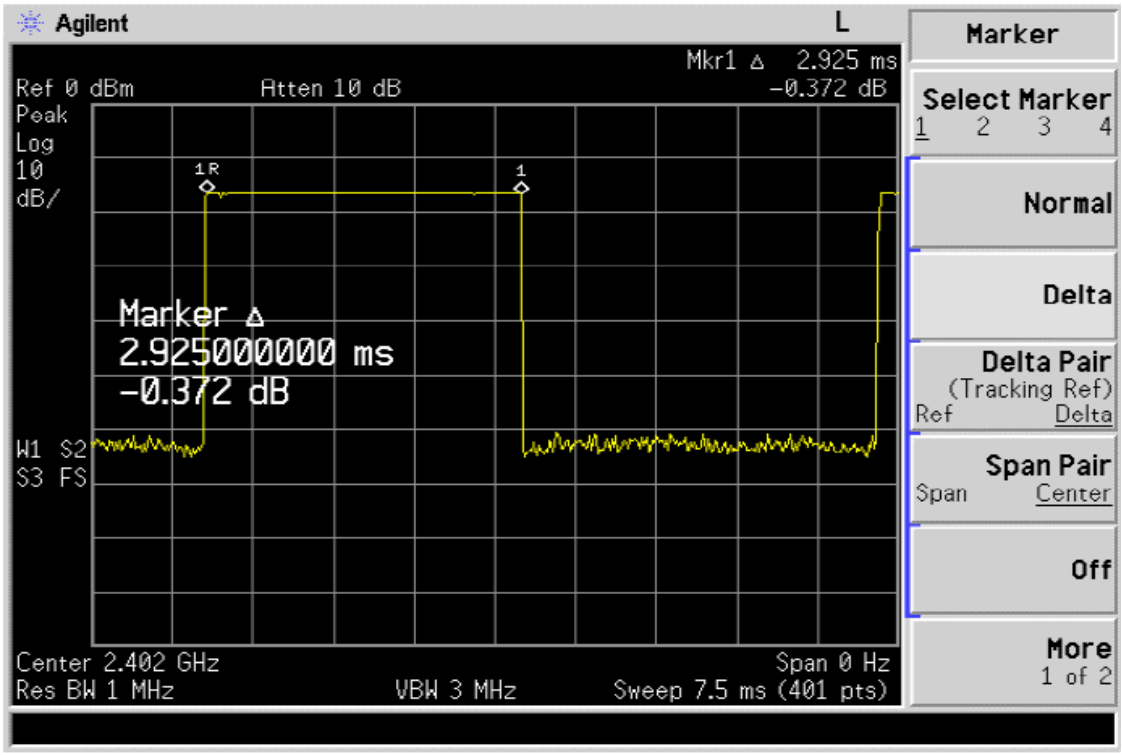
CH-Low
DH1



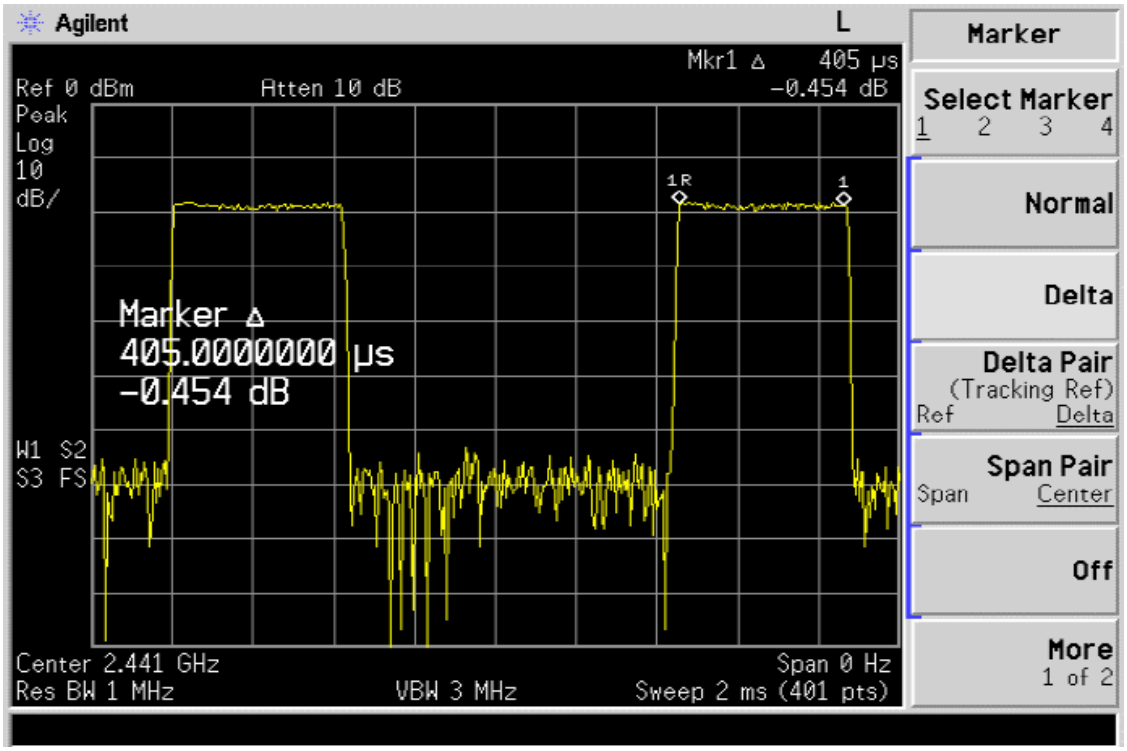
DH3



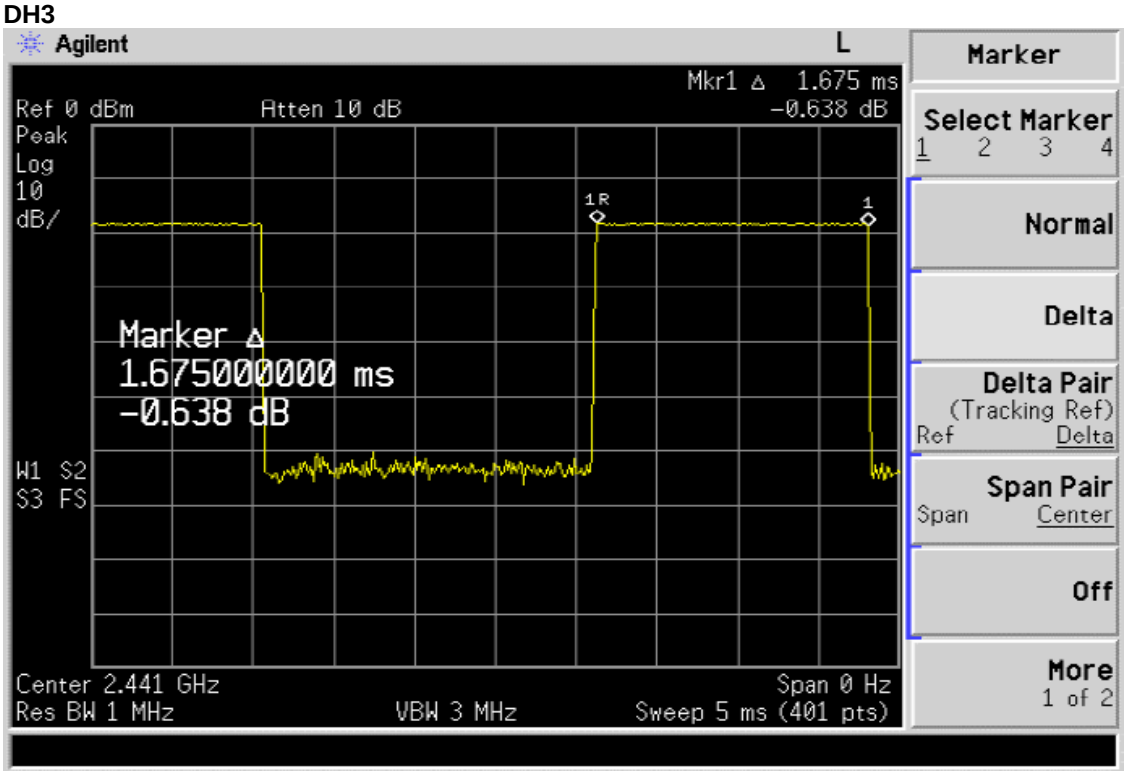
DH5


Agilent
L
Mkr1 Δ 2.925 ms
Ref 0 dBm
Atten 10 dB
−0.372 dB
Peak
Log
10
dB/
1R
1
Marker Δ
2.925000000 ms
−0.372 dB
W1 S2
S3 FS
Center 2.402 GHz
Res BW 1 MHz
VBW 3 MHz
Span 0 Hz
Sweep 7.5 ms (401 pts)
Marker
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref Delta
Span Pair
Span Center
Off
More
1 of 2

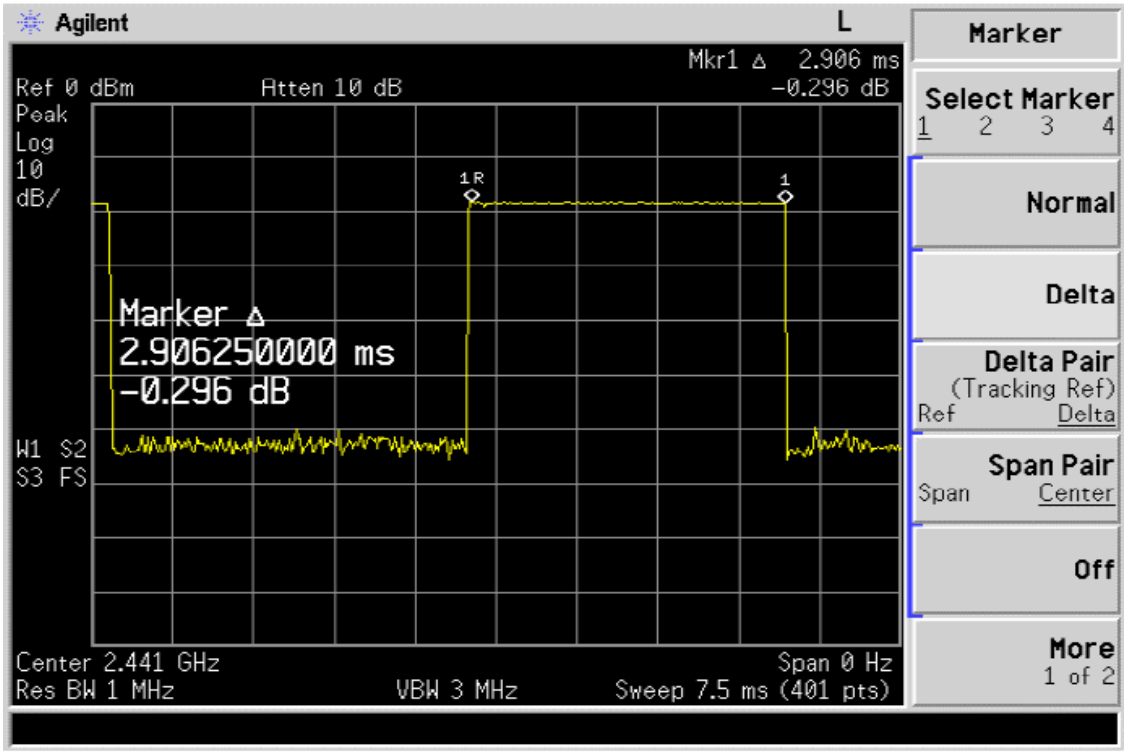
CH-Mid
DH1



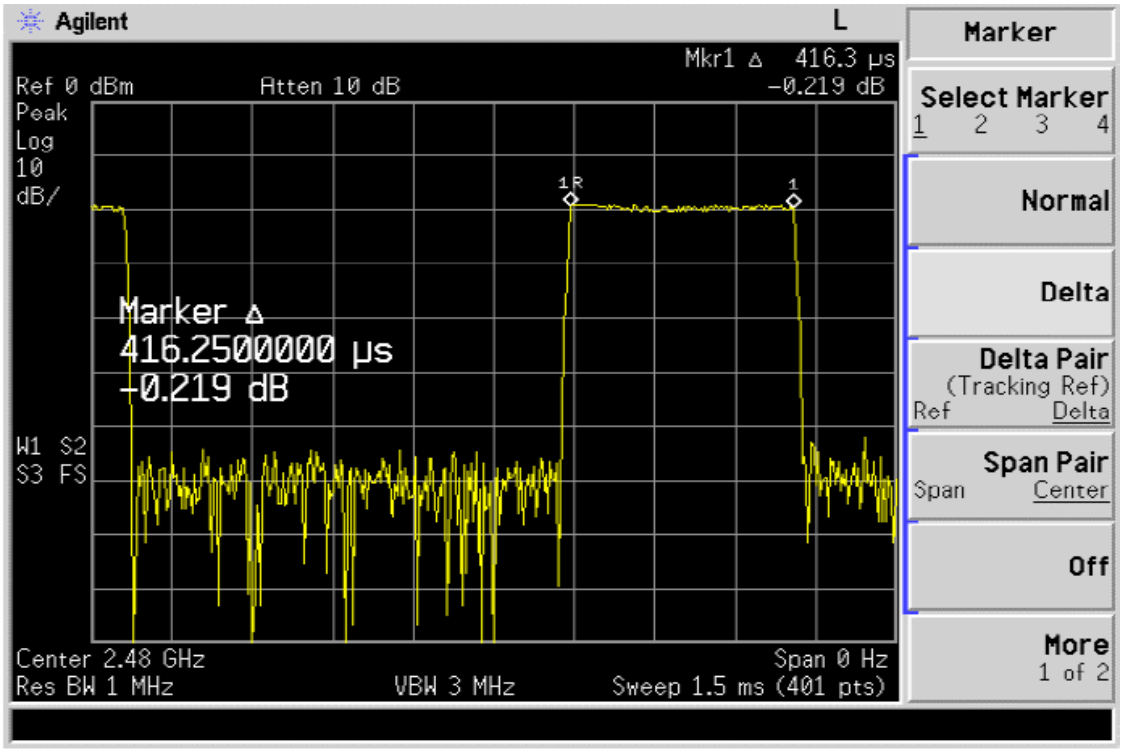
DH3



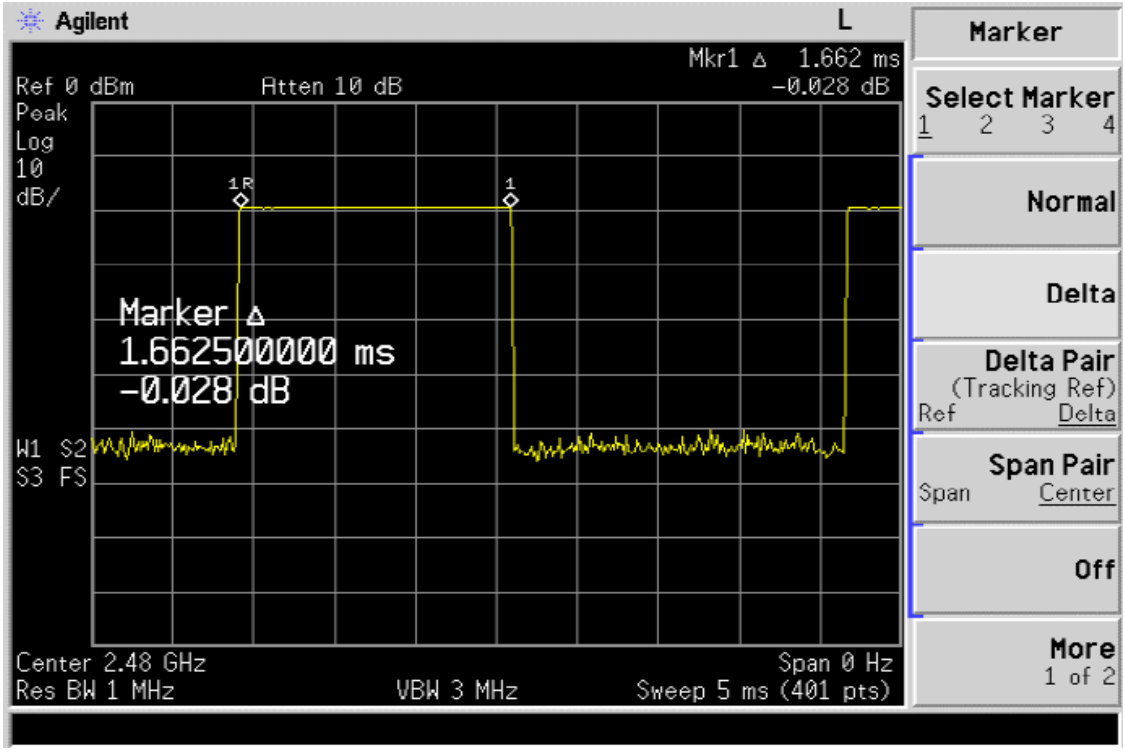
DH5


Agilent
L
Mkr1 Δ 2.906 ms
Ref 0 dBm
Atten 10 dB
−0.296 dB
Peak
Log
10
dB/
1R
1
Marker Δ
2.906250000 ms
−0.296 dB
W1 S2
S3 FS
Center 2.441 GHz
Res BW 1 MHz
VBW 3 MHz
Span 0 Hz
Sweep 7.5 ms (401 pts)
Marker
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref Delta
Span Pair
Span Center
Off
More
1 of 2

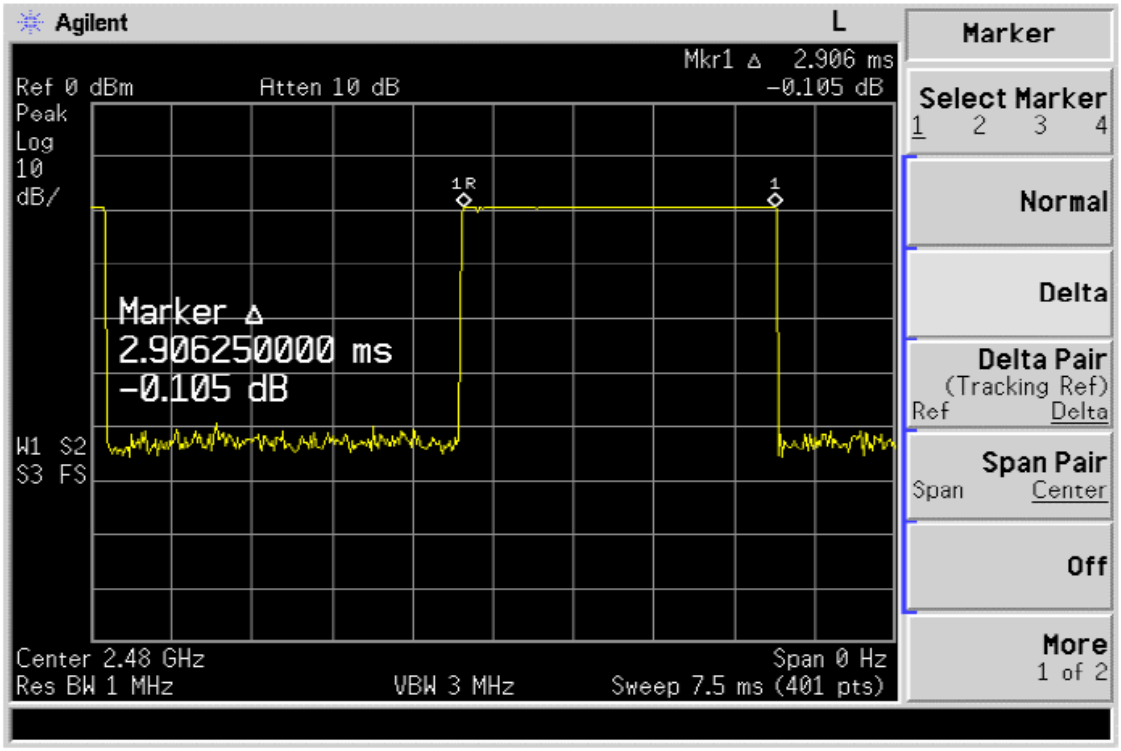
CH-High
DH1



DH3



DH5


Agilent
L
Mkr1 Δ 2.906 ms
Ref 0 dBm
Atten 10 dB
−0.105 dB
Peak
Log
10
dB/
1R
1
Marker Δ
2.906250000 ms
−0.105 dB
W1 S2
S3 FS
Center 2.48 GHz
Res BW 1 MHz
VBW 3 MHz
Span 0 Hz
Sweep 7.5 ms (401 pts)
Marker
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref Delta
Span Pair
Span Center
Off
More
1 of 2

13. Peak Power Spectral Density

13.1 Standard Applicable

According to §15.247(d), for direct sequence systems, the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3kHz band during any time interval of continuous transmission.

13.2 Measurement Procedure

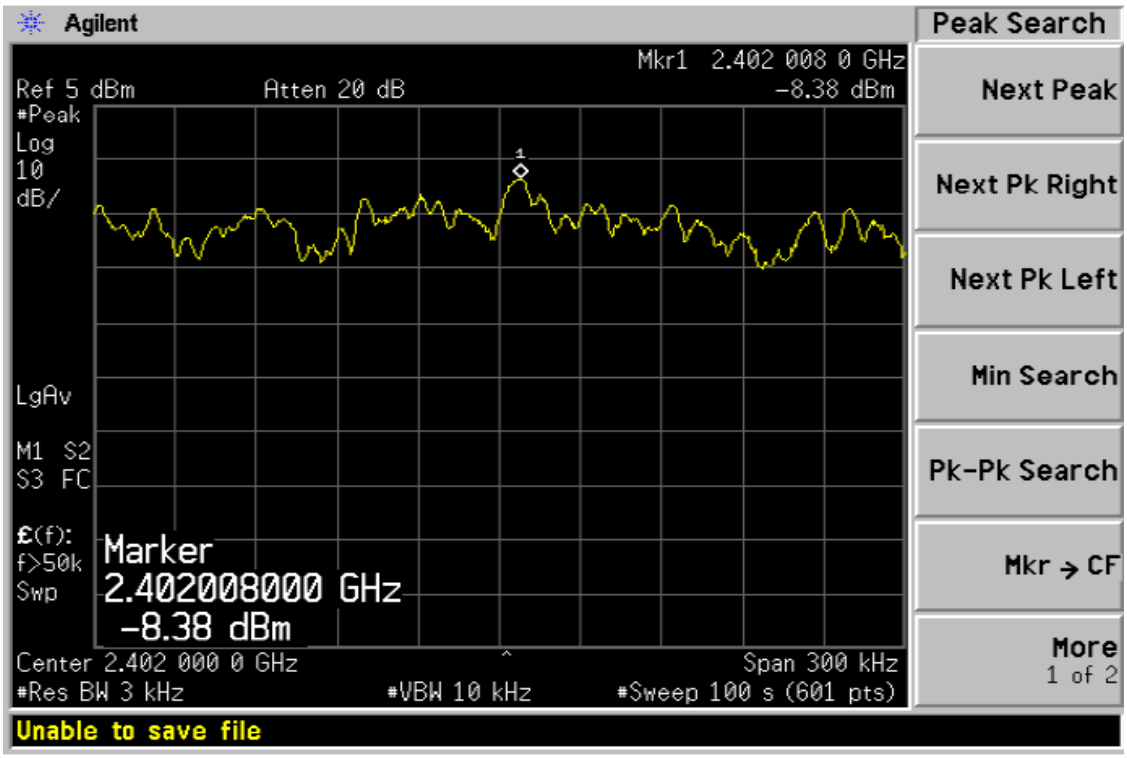
1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as RBW = 3KHz, VBW = 3KHz, Span = 300KHz, Sweep=100s
4. Record the max. reading.
5. Repeat above procedures until all frequency measured were complete.

13.3 Measurement Result

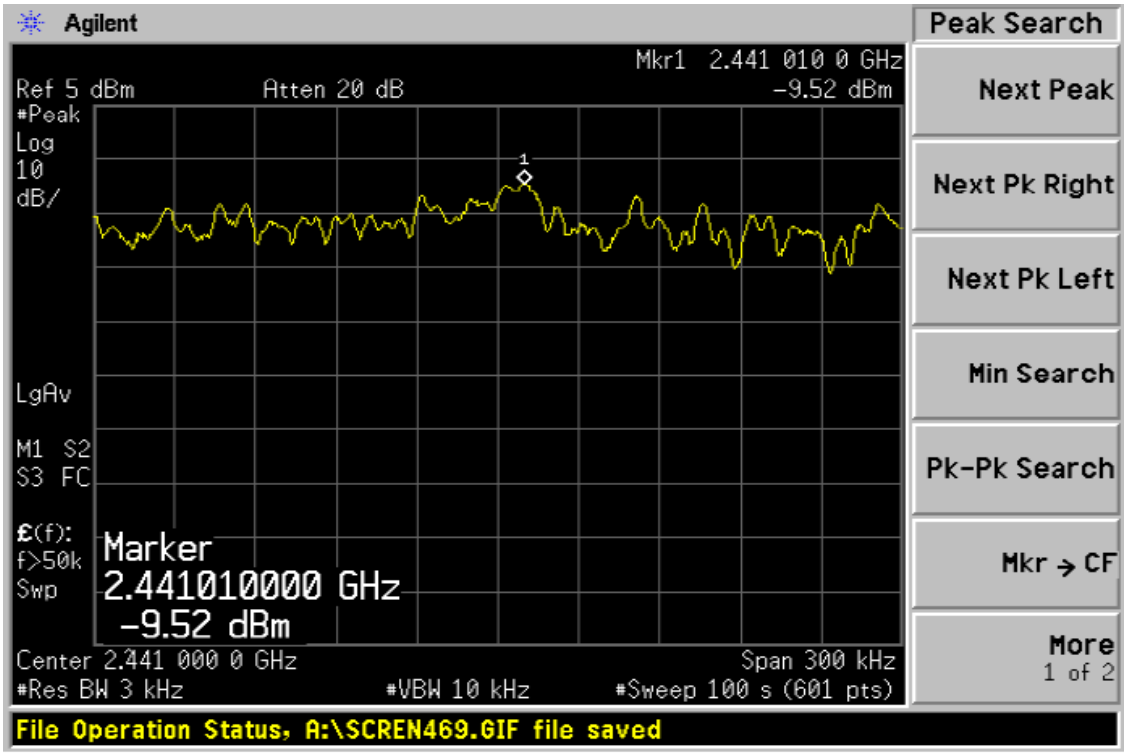
CH	RF Power Density Reading (dBm)	Cable loss (dB)	RF Power Density Level (dBm)	Maximum Limit (dBm)
Low	-8.38	0.20	-8.18	8
Mid	-9.52	0.20	-9.32	8
High	-9.43	0.20	-9.23	8

13.3 Power Spectral Density Test Plot

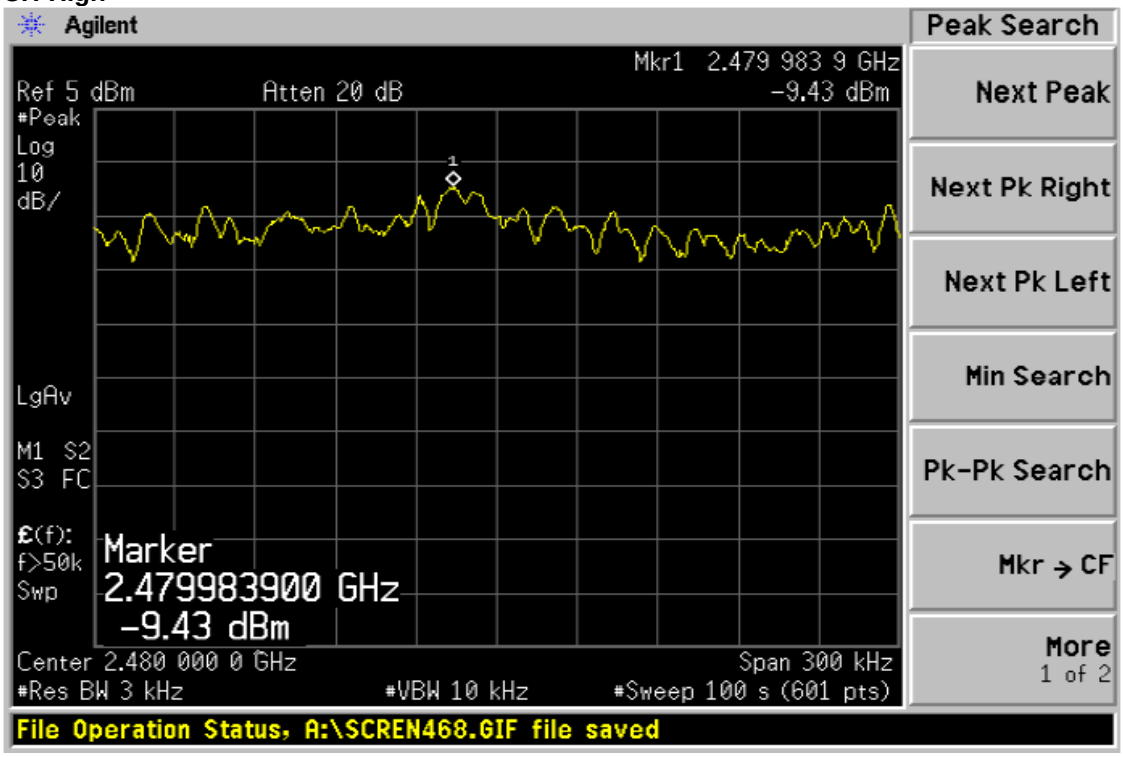
CH-Low


Agilent
Peak Search
Mkr1 2.402 008 0 GHz
Ref 5 dBm
Atten 20 dB
-8.38 dBm
#Peak
Log
10
dB/
LgAv
M1 S2
S3 FC
£(f):
f>50k
Swp
Marker
2.402008000 GHz
-8.38 dBm
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
Mkr → CF
More
1 of 2
Center 2.402 000 0 GHz
Span 300 kHz
#Res BW 3 kHz
#VBW 10 kHz
#Sweep 100 s (601 pts)
Unable to save file

CH-Mid


Agilent
Peak Search
Mkr1 2.441 010 0 GHz
Ref 5 dBm
Atten 20 dB
-9.52 dBm
#Peak
Log
10
dB/
LgAv
M1 S2
S3 FC
£(f):
f>50k
Swp
Marker
2.441010000 GHz
-9.52 dBm
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
Mkr → CF
More
1 of 2
Center 2.441 000 0 GHz
Span 300 kHz
#Res BW 3 kHz
#VBW 10 kHz
#Sweep 100 s (601 pts)
File Operation Status, A:\SCREN469.GIF file saved

CH-High


Agilent
Peak Search
Mkr1 2.479 983 9 GHz
Ref 5 dBm
Atten 20 dB
-9.43 dBm
#Peak
Log
10
dB/
Next Peak
Next Pk Right
Next Pk Left
Min Search
LgAv
M1 S2
S3 FC
Pk-Pk Search
£(f):
f>50k
Swp
Marker
2.479983900 GHz
-9.43 dBm
Mkr → CF
More
1 of 2
Center 2.480 000 0 GHz
Span 300 kHz
#Res BW 3 kHz
#VBW 10 kHz
#Sweep 100 s (601 pts)
File Operation Status, A:\SCREN468.GIF file saved

14. ANTENNA REQUIREMENT

14.1 Standard Applicable

For intentional device, according to §15.203, an intentional radiator shall be designed to ensure that no antenna other than furnished by the responsible party shall be used with the device. And according to §15.247(4)(1), system operating in the 2400-2483.5MHz bands that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum peak output power of the intentional radiator is reduced by 1dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

14.2 Antenna Connected Construction

The directional gins of antenna used for transmitting is 0.21dBi, and the antenna connector is designed with permanent attachment and no consideration of replacement. Please see EUT photo for details.

15. RF EXPOSURE

15.1 Standard Applicable

According to §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of the Commission's guideline.
This is a Mobile device, the MPE is required.

According to §1.1310 and §2.1093 RF exposure is calculated.

Limits for Maximum Permissive Exposure (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm^2)	Averaging Time (minute)
Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*($180/f^2$)	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	F/1500	30
1500-15000	/	/	1.0	30

F = frequency in MHz
* = Plane-wave equipment power density

MPE Prediction

Prediction of MPE limit at a given distance
Equation from page 18 of OET Bulletin 65, Edition 97-01
$S=PG/4\pi R2$

Where:
S = Power density
P = Power input to antenna
G = Power gain of the antenna in the direction of interest relative to an isotropic radiator
R = Distance to the center of radiation of the antenna

Maximum peak output power at antenna input terminal:	1.83 (dBm)
Maximum peak output power at antenna input terminal:	1.524053 (mW)
Antenna gain (typical):	2 (dBi)
Maximum antenna gain:	1.584893 (numeric)
Prediction distance:	20 (cm)
Prediction frequency:	2402 (MHz)
MPE limit for uncontrolled exposure at prediction	1 (mW/cm2)
Power density at predication frequency at 20 (cm)	0.000481 (mW/cm^2)

Measurement Result:	
The predicted power density level at 20 cm is	0.000481 (mW/cm^2)
This is below the uncontrolled exposure limit of 1 mW/cm	2402 MHz

15.2 Measurement Result:

The predicted power density level at 20 cm 0.000481 mW/cm2. This is below the uncontrolled exposure limit of 1 mW/cm2 at 2402MHz