

FCC ID: NM8SPRM2

Report No.: EH/2009/80005 Issue Date: Aug. 21, 2009 Page: 1 of 66

# **ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT**

# INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART C REQUIREMENT

OF

Product Name:	PDA Phone
Brand Name:	НТС
Model Name:	SAPP310
Model Difference:	N/A
FCC ID:	NM8SPRM2
Report No.:	EH/2009/80005
Issue Date:	Aug. 21, 2009
FCC Rule Part:	§15.247, Cat: DSS
Prepared for:	HTC Corporation
	No. 23 Xinghua Rd., Taoyuan City, Taoyuan County 330, Taiwan, ROC
Prepared by:	SGS Taiwan Ltd.
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	Zone, Taipei County, Taiwan



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# **VERIFICATION OF COMPLIANCE**

Applicant:	HTC Corporation No. 23 Xinghua Rd., Taoyuan City, Taoyuan County 330, Taiwan,
	ROC
<b>Equipment Under Test:</b>	PDA Phone
Brand Name:	HTC
Model No.:	SAPP310
Model Difference:	N/A
FCC ID:	NM8SPRM2
File Number:	EH/2009/80005
Date of test:	Aug. 10, 2009 ~ Aug. 17, 2009
Date of EUT Received:	Aug. 10, 2009

# We hereby certify that:

The above equipment was tested by SGS Taiwan Ltd. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.4:2003 and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits of FCC Rules Part 15.247.

The test results of this report relate only to the tested sample identified in this report.

Test By:	Jazz	Huang	Date:	Aug. 21, 2009
	Jazz Huai	ng / Engineer		
Prepared By:	Alex	Hsieh	Date:	Aug. 21, 2009
	Alex Hsieh	/ Sr. Engineer		
Approved By:	Time	nt du	Date:	Aug. 21, 2009
	Vincent S	Su / Manager		

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## Version

Version No.	Date	Description
00	Aug. 21, 2009	Initial creation of document

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# 1. GENERAL INFORMATION

#### General:

Product Name	PDA Phone			
Brand Name	HTC			
Model Name	SAPP310			
Model Difference	N/A			
Data Cable (USB)	Model No.: I	DC U210, Supplier: MEC		
Simple Hands-free (SHF)	Model No.: I	Model No.: HS U120, Supplier: COTRON		
Pouch	Model No.: PO S430, Supplier: Xigma			
LCM	<ul><li>(1) 1ST:Model No.: L5F30949, Supplier: SHARP</li><li>(2) 2ND:Model No.: 990000353, Supplier: TOPPOLY</li></ul>			
Camera	<ul> <li>(1) 1ST :Model No.: CMHT-3AM01D ; Supplier: Premier</li> <li>(2) 2ND:Model No.: 07PM12B ; Supplier: LITEON</li> </ul>			
	3.7 Vdc re-chargeable battery or 5Vdc by AC/DC power adapter			
Power Supply	Battery:	<ol> <li>Model: SAPP160, Supplier: Total Wireless Solution(TWS)</li> <li>Model No.: SAPP160, Supplier: WELLDONE</li> </ol>		
	Adapter:	Model No.: TC P310, Supplier: Foxlink		

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#### GSM and WCDMA:

	Operating Frequency		Rated Power	
	GSM/GPRS/EDGE 850 Class 10	1 X 24 2 MHZ X X MHZ 1		
	GSM/GPRS/EDGE 900 Class 10	880.2MHz - 914.8MHz	33 dBm	
	GSM/GPRS/EDGE 1800 Class 10	1710.2MHz – 1784.8MHz	30 dBm	
Cellular Phone Standards Frequency Range and Power	GSM/GPRS/EDGE 1900 Class 10	1850.2MHz – 1909.8MHz	30 dBm	
	WCDMA/HSUPA/HSDPA Band I	PA/HSDPA 1922.4MHz – 1977.6MHz		
	WCDMA/HSUPA/HSDPA Band IV	1712.4MHz -1752.6MHz	24 dBm	
	HSUPA data rate: uplink up to 2Mbps HSDPA data rate: downlink up to 7.2Mbps			
Type of Emission	GSM 850: 250KGXW, GSM 1900 :257KGXW EDGE 850: 248KG7W, EDGE 1900:260KG7W WCDMA Band IV: 4M18F9W			
IMEI	356221030010252			

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WLAN:

WLAN.	
Frequency Range:	2412 – 2462 MHz
Channel number:	11 channels
Max. Output Power:	802.11 b: 17.06 dBm (Peak) 802.11 g: 13.11dBm (Peak)
Modulation Technology:	DSSS, OFDM
Modulation type:	CCK, DQPSK, DBPSK for DSSS 64QAM. 16QAM, QPSK, BPSK for OFDM
Transition Rate:	802.11 b: 1/2/5.5/11 Mbps; 802.11 g: 6/9/12/18/24/36/48/54 Mbps
Antenna Designation:	PIFA Antenna / 1.2dBi.
Type of Emission	16M5M5D

The EUT is compliance with IEEE 802.11 b/g Standard.

Bluetooth:

Bluetooth Version	$ □ V1.1 (GFSK)  □ V1.2 (GFSK)  □ V2.0 (GFSK)  ∨ 2.0 + EDR (GFSK + \pi/4DQPSK + 8DPSK)□ V2.1 + EDR (GFSK + \pi/4DQPSK + 8DPSK)$		
Frequency Range	2402 – 2480MHz		
Channel number	79 channels max.		
Rated Power	0.25 dBm (Peak)		
Modulation type	Frequency Hopping Spread Spectrum		
Antenna Designation	PIFA Antenna / 1.2dBi.		
Type of Emission	1M37F7D		

The EUT is compliance with Bluetooth 2.0 + EDR Standard.

This report applies for Bluetooth

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#### 1.1. Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for FCC ID: <u>NM8SPRM2</u> filing to comply with Section 15.247 of the FCC Part 15, Subpart C Rules. The composite system (digital device) is compliance with Subpart B is authorized under a Doc procedure.

#### **1.2.** Test Methodology

Both conducted and radiated testing were performed according to the procedures in ANSI C63.4: 2003. Radiated testing was performed at an antenna to EUT distance 3 meters.

#### **1.3.** Test Facility

The measurement facilities used to collect the 3m Radiated Emission and AC power line conducted data are located on the address of SGS Taiwan Ltd. Electronics & Communication Laboratory No. 134, Wu Kung Rd., Wuku Industrial Zone, Taipei Country, Taiwan which are constructed and calibrated to meet the FCC requirements in documents ANSI C63.4: 2003. FCC Registration Number are: 990257 and 236194, Canada Registration Number: 4620A-1

The 10 m Open Area Test Sites located on the address of SGS Taiwan Ltd. Electronics & Communication Laboratory No. 29, Pau-Tou-Tsuo Valley Chia-Pau Tsuen, Linkou Hsiang, Taipei county, which is constructed and calibrated to meet the CISPR 22/EN 55022 requirements. SGS Site No. 1(3 &10 meters) and FCC Registration Number: 94644.

#### **1.4.** Special Accessories

Not available for this EUT intended for grant.

#### **1.5.** Equipment Modifications

Not available for this EUT intended for grant.



# 2. SYSTEM TEST CONFIGURATION

#### 2.1. EUT Configuration

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.

#### 2.2. EUT Exercise

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

#### 2.3. Test Procedure

#### 2.3.1 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 and 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.

#### 2.3.2 Radiated Emissions

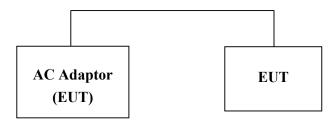
The EUT is a placed on as turn table which is 0.8 m above ground plane. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to 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 and measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made "while keeping the antenna in the 'cone of radiation' from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response." is still within the 3dB illumination BW of the measurement antenna. according to the requirements in Section 8 and 13 and Subclause 8.3.1.2 of ANSI C63.4: 2003.

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# 2.4. Configuration of Tested System

### Fig. 2-1 AC Power line and Radiated Emission Configuration



#### Table 2-1 Equipment Used in Tested System

Iten	n Equipment	Mfr/Brand	Model/ Type No.	Series No.	Data Cable	Power Cord
1	N/A					

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# 3. SUMMARY OF TEST RESULTS

FCC Rules	Description Of Test	Result
§15.207(a)	Conducted Emission	Compliant
§15.247(b)(1)	Peak Output Power	Compliant
§15.247(a)	20dB Bandwidth	No Limit
§15.247I	100 KHz Bandwidth Of Fre-	Compliant
	quency Band Edges	
§15.209(a) (f)	Spurious Emission	Compliant
§15.247(a)(1)	Frequency Separation	Compliant
§15.247(a)(1)(iii)	Number of hopping frequency	Compliant
§15.247(a)(1)(iii)	Time of Occupancy	Compliant
§15.203,	Antenna Requirement	Compliant
§15.247(b)(4)(i)		

# 4. DESCRIPTION OF TEST MODES

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, Mid and High with highest rated data rate were chosen for full testing.

The field strength of spurious radiation emission was measured as EUT stand-up position (H mode) and lie down position (E1, E2 mode) for Bluetooth Transmitter for channel Low, Mid and High the worst case H position was reported.

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# 5. CONDUCTED EMISSION TEST

#### 5.1. Standard Applicable

According to §15.207. frequency within 150KHz to 30MHz shall not exceed the limit table as below.

	Limits				
Frequency range	dB(uV)				
MHz	Quasi-peak	Average			
0.15 to 0.50	66 to 56	56 to 46			
0.50 to 5	56	46			
5 to 30	60	50			
Note					

1. The lower limit shall apply at the transition frequencies

2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

#### 5.2. EUT Setup

- 1. The conducted emission tests were performed in the test site, using the setup in accordance with the ANSI C63.4: 2003.
- 2. The EUT was plug-in the AC/DC Power adapter. The host system was placed on the center of the back edge on the test table. The peripherals was placed on the side of the host PC system. The rear of the EUT and peripherals were placed flushed with the rear of the tabletop.
- 3. The spacing between the peripherals was 10 centimeters.
- 4. External I/O cables were draped along the edge of the test table and bundle when necessary.
- 5. The host system was connected with 120Vac/60Hz power source.

#### 5.3. Measurement Procedure

- 1. The EUT was placed on a table which is 0.8m above ground plane.
- 2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
- 3. Repeat above procedures until all frequency measured were complete.

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## 5.4. Measurement Equipment Used:

Conducted Emission Test Site							
EQUIPMENT	MFR	MODEL	SERIAL	LAST	CAL DUE.		
ТҮРЕ		NUMBER	NUMBER	CAL.			
EMI Test Receiver	R&S	ESCS30	828985/004	09/16/2008	09/15/2009		
LISN	Rolf-Heine	NNB-2/16Z	99012	02/02/2009	02/01/2010		
LISN	FCC	FCC-LISN-50/250-25-2-01	04034	02/02/2009	02/01/2010		
Coaxial Cables	N/A	WK CE Cable	N/A	10/30/2008	10/29/2009		

#### 5.5. Measurement Result

The initial step in collecting conducted data is a spectrum analyzer peak scan of the measurement range. Significant peaks are then marked as shown on the following data page, and these signals are then quasi-peaked.

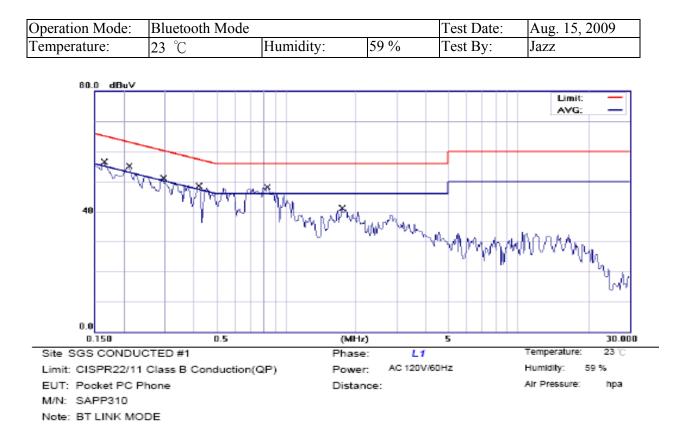
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# AC POWER LINE CONDUCTED EMISSION TEST DATA

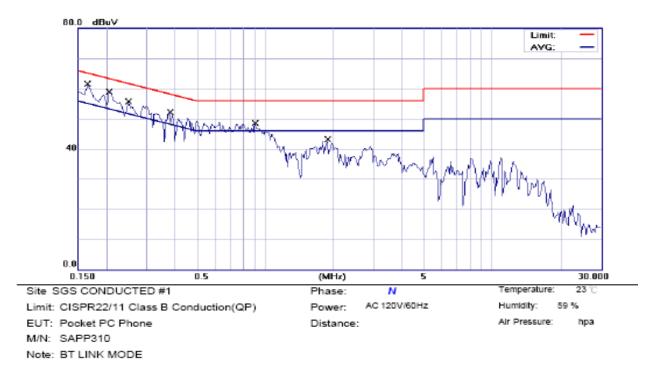


No. Mk.	Freq.	Reading Level	Factor	Measure- ment	Limit	Over		
	MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1	0.1650	52.90	0.16	53.06	65.21	-12.15	QP	
2	0.1650	36.70	0.16	36.86	55.21	-18.35	AVG	
3 ×	0.2100	51.10	0.12	51.22	63.21	-11.99	QP	
4	0.2100	34.10	0.12	34.22	53.21	-18.99	AVG	
5	0.2950	46.80	0.10	46.90	60.38	-13.48	QP	
6	0.2950	32.70	0.10	32.80	50.38	-17.58	AVG	
7	0.4200	43.90	0.08	43.98	57.45	-13.47	QP	
8	0.4200	30.50	0.08	30.58	47.45	-16.87	AVG	
9	0.8300	42.20	0.08	42.28	56.00	-13.72	QP	
10	0.8300	32.20	0.08	32.28	46.00	-13.72	AVG	
11	1.7400	35.30	0.12	35.42	56.00	-20.58	QP	
12	1.7400	27.40	0.12	27.52	46.00	-18.48	AVG	

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No. Mk	Freq.	Reading Level	Factor	Measure- ment	Limit	Over		
	MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1	0.1650	53.20	0.18	53.38	65.21	-11.83	QP	
2	0.1650	38.50	0.18	38.68	55.21	-16.53	AVG	
3 ×	0.2050	53.70	0.14	53.84	63.41	-9.57	QP	
4	0.2050	36.90	0.14	37.04	53.41	-16.37	AVG	
5	0.2500	50.00	0.13	50.13	61.76	-11.63	QP	
6	0.2500	34.10	0.13	34.23	51.76	-17.53	AVG	
7	0.3800	48.10	0.11	48.21	58.28	-10.07	QP	
8	0.3800	37.30	0.11	37.41	48.28	-10.87	AVG	
9	0.9000	41.40	0.12	41.52	56.00	-14.48	QP	
10	0.9000	28.30	0.12	28.42	46.00	-17.58	AVG	
11	1.8800	36.70	0.15	36.85	56.00	-19.15	QP	
12	1.8800	23.80	0.15	23.95	46.00	-22.05	AVG	

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# 6. PEAK OUTPUT POWER MEASUREMENT

#### 6.1. Standard Applicable

For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 hopping channels, and all frequency hopping systems in the 5725-5850MHz band: 1Watt. For all other frequency hopping systems in the 2400 - 2483.5MHz band: 0.125 Watts.

Conducted Emission Test Site							
EQUIPMENT	MFR	MODEL	SERIAL	LAST	CAL DUE.		
ТҮРЕ		NUMBER	NUMBER	CAL.			
Spectrum Analyzer	Agilent	E4446A	MY43360126	04/19/2008	04/18/2010		
Spectrum Analyzer	Agilent	E4440A	MY45304525	01/23/2008	01/22/2010		
DC Block	Agilent	BLK-18	155452	07/05/2009	07/04/2010		
Low Loss Cable	HUBER+SUHNER	SUCOFLEX 104PEA	N/A	01/05/2009	01/04/2010		
Attenuator	Mini-Circuit	BW-S6W5	001	07/05/2009	07/04/2010		
Attenuator	Mini-Circuit	BW-S10W5	001	07/05/2009	07/04/2010		
Attenuator	Mini-Circuit	BW-S20W5	001	07/05/2009	07/04/2010		
Splitter	Agilent	11636B	N/A	07/05/2009	07/04/2010		

#### 6.2. Measurement Equipment Used

#### 6.3. .Test Set-up:



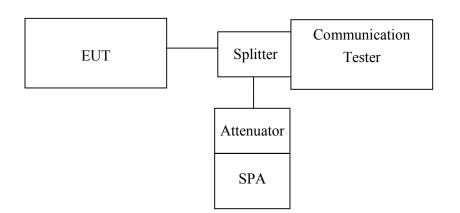
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#### 6.4. Measurement Procedure:

- 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. (Max peak function, RBW, VBW = 1MHz)
- 3. Record the max. reading.
- 4. Repeat above procedures until all frequency measured were complete.

### 6.5. Measurement Result

Frequency (MHz)	Reading Power (dBm)	Cable Loss	Output Power (dBm)	Output Power (W)	Limit (W)
2402.00	0.25	0.00	0.25	0.00106	1
2441.00	0.17	0.00	0.17	0.00104	1
2480.00	-0.40	0.00	-0.40	0.00091	1

BDR mode:

#### EDR mode:

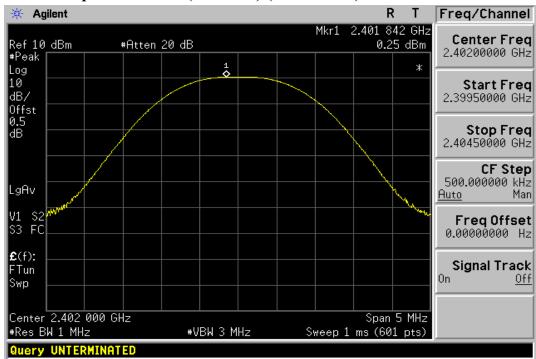
Frequency (MHz)	Reading Power (dBm)	Cable Loss	Output Power (dBm)	Output Power (W)	Limit (W)
2402.00	0.11	0.00	0.11	0.00103	1
2441.00	-0.12	0.00	-0.12	0.00097	1
2480.00	-0.64	0.00	-0.64	0.00086	1

### NOTE: offset: 0.5dB

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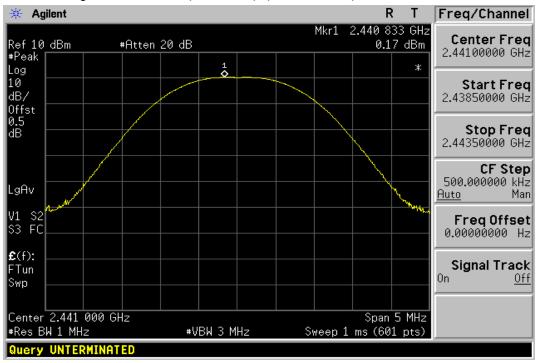


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# Peak Power Output Data Plot (CH Low) (BDR mode)

Peak Power Output Data Plot (CH Mid) (BDR mode)



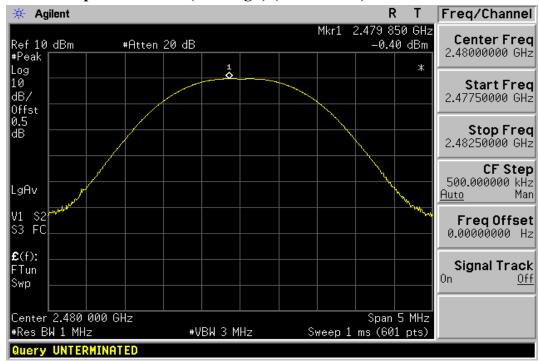
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## Peak Power Output Data Plot (CH High) (BDR mode)

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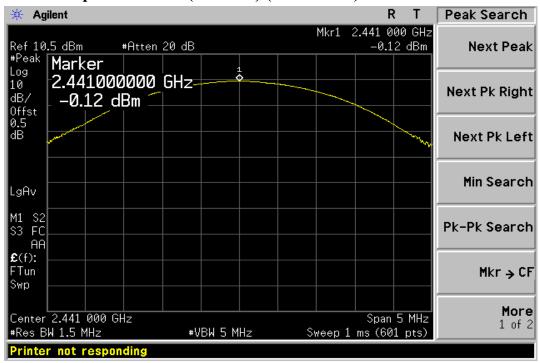


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🔆 Agilent		RT	Peak Search
Ref 10.5 dBm #Atten #Peak	20 dB	Mkr1 2.402 008 GHz 0.11 dBm	
Log 10 dB/ Offst			Next Pk Right
dB			Next Pk Left
LgAv			Min Search
M1 S2 S3 FC AA			Pk-Pk Search
£(f): FTun Swp			Mkr → CF
Center 2.402 000 GHz #Res BW 1.5 MHz	#VBW 5 MHz	Span 5 MHz Sweep 1 ms (601 pts)	More 1 of 2
#Res BW 1.5 MHz Printer not responding	₩VBW 5 MHz		1 of

## Peak Power Output Data Plot (CH Low) (EDR mode)

### Peak Power Output Data Plot (CH Mid) (EDR mode)



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# Peak Power Output Data Plot (CH High) (EDR mode)

🔆 Agilent			RT	Peak Search
Ref 10.5 dBm #Atten 20 dB <sup>#Peak</sup> Marker			000 GHz 64 dBm	Next Peak
Log 10 2.480000000 GHz dB/ Offst -0.64 dBm				Next Pk Right
0.5 dB				Next Pk Left
LgAv				Min Search
M1 S2 S3 FC AA				Pk-Pk Search
<b>£</b> (f): FTun Swp				Mkr → CF
Center 2.480 000 GHz #Res BW 1.5 MHz #V	/BW 5 MHz	Spa Sweep 1 ms (6	n 5 MHz 01 pts)	More 1 of 2
Printer not responding				

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# 7. 20dB BAND WIDTH

### 7.1. Standard Applicable

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

## 7.2. Measurement Equipment Used

Refer to section 6.2 for details.

### 7.3. Test Set-up

Refer to section 6.3 for details.

#### 7.4. 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= 3MHz, Sweep=auto
- 4. Mark the peak frequency and –20dB (upper and lower) frequency.
- 5. Repeat above procedures until all frequency measured were complete.

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#### 7.5. Measurement Result:

BDR mode:

СН	Bandwidth
	(kHz)
Lower	921.051
Mid	921.827
Higher	922.945

EDR mode:

СН	Bandwidth	2/3 Bandwidth
	(MHz)	(MHz)
Lower	1.366	0.911
Mid	1.360	0.907
Higher	1.364	0.909

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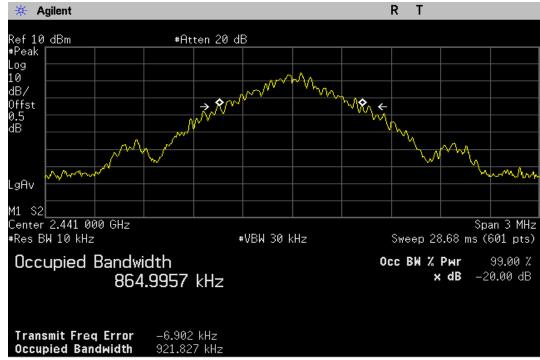


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🔆 Agilent R Т Ref 10 dBm #Atten 20 dB #Peak Log 10 Mm ~~~ dB/ NON C Offst 2 Rm 0.5 ďВ NWMM. .gAv M1 S2 Center 2.402 000 GHz Span 3 MHz #Res BW 10 kHz ₩VBW 30 kHz Sweep 28.68 ms (601 pts) Occupied Bandwidth Occ BW % Pwr 99.00 % x dB -20.00 dB 860.4586 kHz Transmit Freq Error Occupied Bandwidth -6.675 kHz 921.051 kHz



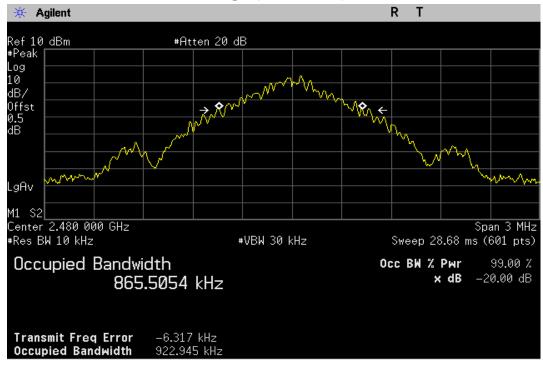


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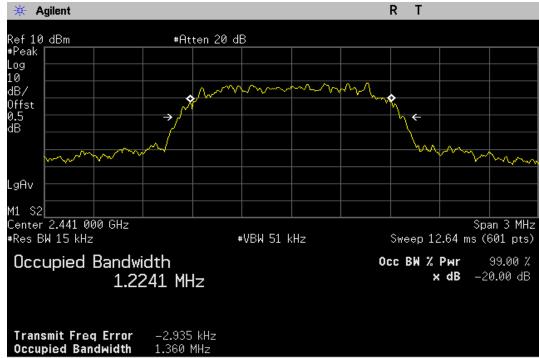


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🔆 Agilent R Т Ref 10 dBm #Atten 20 dB #Peak Log 10 dB/ Offst 0.5 dB ÷ .gAv M1 S2 Center 2.402 000 GHz Span 3 MHz #Res BW 15 kHz ₩VBW 51 kHz Sweep 12.64 ms (601 pts) Occupied Bandwidth Occ BW % Pwr 99.00 % x dB -20.00 dB 1.2249 MHz Transmit Freq Error Occupied Bandwidth -3.045 kHz 1.366 MHz



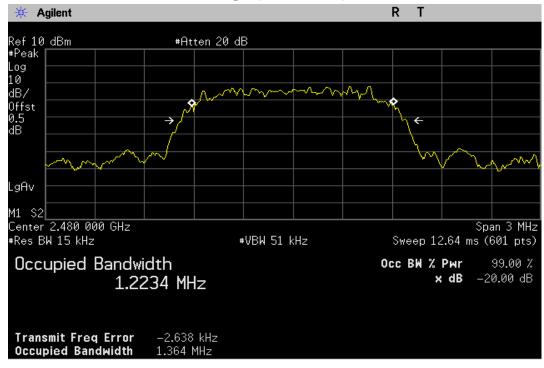


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# 8. 100KHz BANDWIDTH OF BAND EDGES MEASUREMENT

#### 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 Equipment Used

#### 8.2.1. Conducted Emission at antenna port:

Refer to section 6.2 for details.

#### 8.2.2. Radiated emission:

966 Chamber							
EQUIPMENT	MFR	MODEL	SERIAL	LAST	CAL DUE.		
ТҮРЕ		NUMBER	NUMBER	CAL.			
Spectrum Analyzer	R&S	FSP 40	100034	02/12/2009	02/11/2010		
Loop antenna	MESSTEC	FLA30	03/10086	07/08/2009	07/07/2011		
Bilog Antenna	SCHWAZBECK	VULB9160	9160-3136	11/15/2008	11/14/2009		
Horn antenna	SCHWAZBECK	BBHA 9120D	9120D-673	05/09/2008	05/08/2010		
Pre-Amplifier	Agilent	8447D	1937A02834	11/30/2008	11/29/2009		
Pre-Amplifier	Agilent	8449B	3008A01973	01/05/2009	01/04/2010		
Turn Table	HD	DT420	N/A	N.C.R	N.C.R		
Antenna Tower	HD	MA240-N	240/657	N.C.R	N.C.R		
Controller	HD	HD100	N/A	N.C.R	N.C.R		
Low Loss Cable	HUBER+SUHNER	SUCOFLEX 104PEA-10M	10m	01/05/2009	01/04/2010		
Low Loss Cable	HUBER+SUHNER	SUCOFLEX 104PEA-3M	3m	01/05/2009	01/04/2010		
3m Site	SGS	966 chamber	N/A	11/08/2008	11/09/2009		

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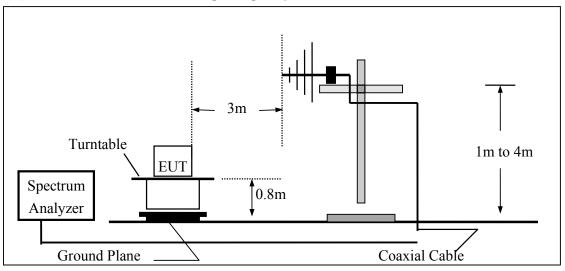
### 8.3. Test SET-UP:

### **8.3.1.** Conducted Emission at antenna port:

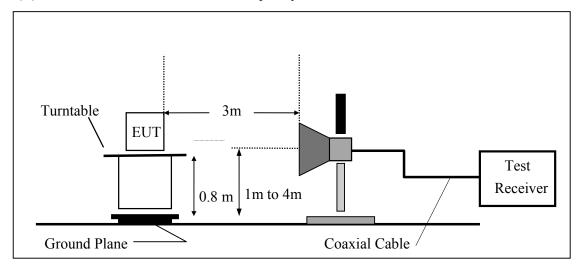
Refer to section 6.3 for details.

#### 8.3.2. Radiated emission:

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



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



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#### 8.4. 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=25MHz, Sweep = auto
- 5. Mark Peak, 2.390GHz and 2.4835GHz and record the max. level.
- 6. Repeat above procedures until all frequency measured were complete.
- 7. Radiated Emission refer to section 9.

#### 8.5. Field Strength Calculation

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

## FS = RA + AF + CL - AG

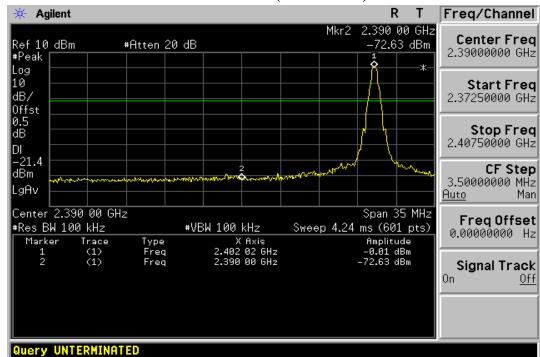
Where	FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
	RA = Reading Amplitude	AG = Amplifier Gain
	AF = Antenna Factor	

#### 8.6. Measurement Result

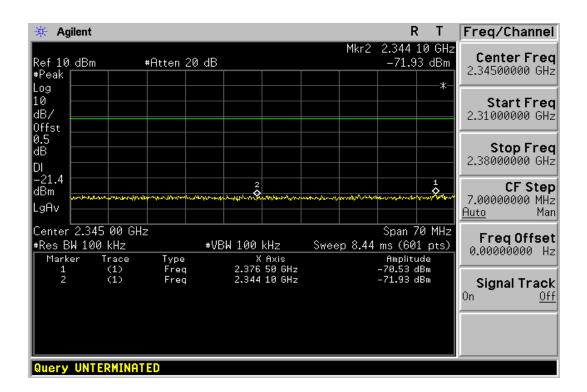
Note: Refer to next page spectrum analyzer data chart and tabular data sheets.



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# Conducted Emission: Test Data CH-Low (BDR mode)

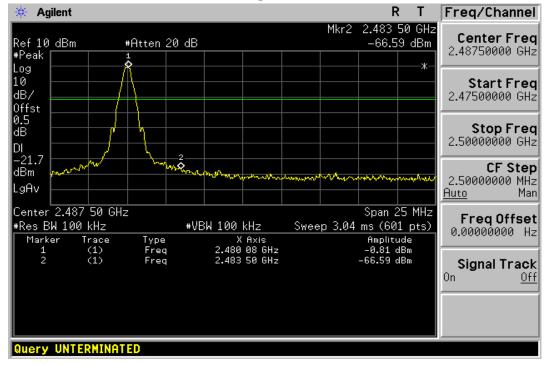


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# **Conducted Emission: Test Data CH-High**



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## Radiated Emission: (BDR mode)

Operation Mode Fundamental Frequency	TX CH Low 2402 MHz	Test Date Test By	Aug. 16, 2009 Jazz
Temperature	25 °C	Pol	Ver.
Humidity	65 %		

	Peak	AV		Actu	al FS	Peak	AV		
Freq.	Reading	Reading	Ant./CL	Peak	AV	Limit	Limit	Margin	<b>Rem ark</b>
(MHz)	(dBuV)	(dBuV)	CF(dB)	(dBuV/m)	(dBuV/m)	(dBuV/m)	(dBuV/n	n) (dB)	
2390.00	39.02		-1.39	37.63		74.00	54.00	-16.37	Peak
Operation Mode TX CH Low						Test	Date	Aug. 16, 2	009
Fundamen	tal Frequei	ncy 2402	MHz			Test	By	Jazz	
Temperatu	re	25 °C				Pol		Hor.	
Humidity		65 %							
	Peak	AV		Actu	al FS	Peak	AV		
Freq. (MHz)	Reading (dBuV)	Reading (dBuV)		Peak (dBuV/m)	AV (dBuV/m)	Limit (dBuV/m)	Limit (dBuV/n	0	<b>Rem</b> ark

28.22

Remark:

38.98

-10.76

2390.00

(1) Data 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.

74.00

54.00

-25.78

Peak

- (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= 3MHz, Sweep time= 200 ms.
- (4) Spectrum AV Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

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### Radiated Emission: (BDR mode)

Operation Mode	TX CH High	Test Date	Aug. 16, 2009
Fundamental Frequency	2480 MHz	Test By	Jazz
Temperature Humidity	25 °C 65 %	Pol	Ver.

	Peak	AV		Actu	al FS	Peak	AV		
Freq.	Reading	Reading	Ant./CL	Peak	AV	Limit	Limit	Margin	<b>Rem</b> ark
(MHz)	(dBuV)	(dBuV)	CF(dB)	(dBuV/m)	(dBuV/m)	(dBuV/m)	(dBuV/n	n) (dB)	
2483.56	45.65		-0.92	44.73		74.00	54.00	-9.27	Peak
Operation Fundamen Temperatu Humidity	tal Freque					Test Test Pol	By	Aug. 16, 2 Jazz Hor.	009
	Peak	AV		Actu	al FS	Peak	AV		
Freq.	Reading	Reading	Ant./CL	Peak	AV	Limit	Limit	Margin	Remark
(MHz)	(dBuV)	(dBuV)	CF(dB)	(dBuV/m)	(dBuV/m)	(dBuV/m)	(dBuV/n	n) (dB)	
2483.56	44.45		-0.92	43.53		74.00	54.00	-10.47	Peak

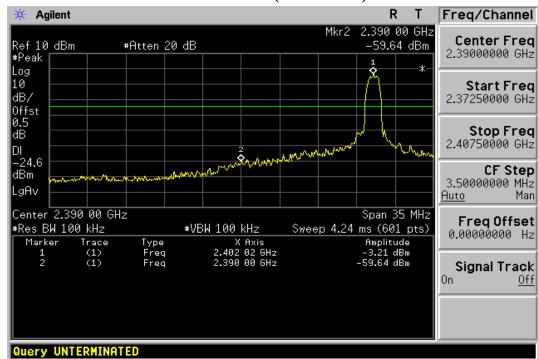
Remark:

- (1) Data 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  $\circ$
- (3) Spectrum Peak Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 3MHz, Sweep time= 200 ms.
- (4) Spectrum AV Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

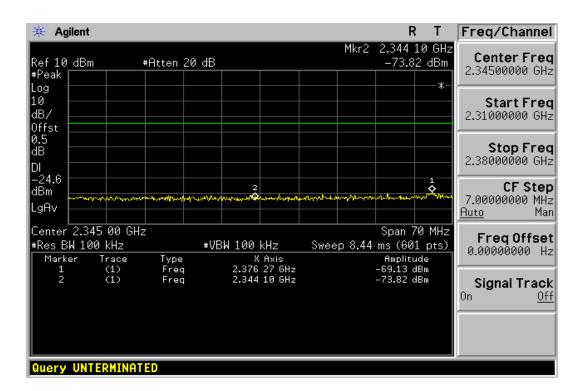
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# Conducted Emission: Test Data CH-Low (EDR mode)

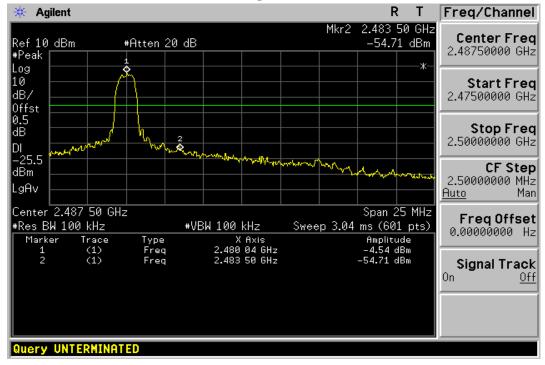


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# **Conducted Emission: Test Data CH-High**



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-12.80

54.00

Peak

# Radiated Emission: (EDR mode)

1	TX CH Low		Aug. 16, 2009
Fundamental Frequency Temperature	2402 MHZ 25 °C	Test By Pol	Jazz Ver.
Humidity	65 %		

	Peak	AV		Actu	al FS	Peak	AV		
Freq.	Reading	Reading	Ant./CL	Peak	AV	Limit	Limit	Margin	<b>Rem ark</b>
(MHz)	(dBuV)	(dBuV)	CF(dB)	(dBuV/m)	(dBuV/m)	(dBuV/m)	(dBuV/m	) ( <b>dB</b> )	
2390.00	48.70		-1.39	47.31		74.00	54.00	-6.69	Peak
Operation	Mode	ТХ С	CH Low			Test	Date	Aug. 16, 2	009
Fundamen	tal Frequei	ncy 2402	MHz			Test	By	Jazz	
Temperatu	re	25 °C				Pol		Hor.	
Humidity		65 %							
	Peak	AV		Actu	al FS	Peak	AV		
Freq.	Reading	Reading	Ant./CL	Peak	AV	Limit	Limit	Margin	<b>Rem</b> ark
(MHz)	(dBuV)	(dBuV)	CF(dB)	(dBuV/m)	(dBuV/m)	(dBuV/m)	(dBuV/m	) (dB)	

41.20

Remark :

42.59

-1.39

2390.00

(1) Data 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.

74.00

- (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= 3MHz, Sweep time= 200 ms.
- (4) Spectrum AV Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.



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# Radiated Emission: (EDR mode)

1	TX CH High		Aug. 16, 2009
Fundamental Frequency Temperature	2480 MHZ 25 °C	Test By Pol	Jazz Ver
Humidity	65 %	1.01	V 01.

	Peak	AV		Actu	al FS	Peak	AV		
Freq.	Reading	Reading	Ant./CL	Peak	AV	Limit	Limit	Margin	<b>Rem ark</b>
(MHz)	(dBuV)	(dBuV)	CF(dB)	(dBuV/m)	(dBuV/m)	(dBuV/m)	(dBuV/m	) <b>(dB)</b>	
2483.56	53.01		-0.92	52.09		74.00	54.00	-1.91	Peak
Operation Fundamen Temperatu Humidity	tal Freque					Test Test Pol	By	Aug. 16, 2 Jazz Hor.	009
	Peak	AV		Actu	al FS	Peak	AV		
Freq.	Reading	Reading	Ant./CL	Peak	AV	Limit	Limit	Margin	<b>Rem ark</b>
(MHz)	(dBuV)	(dBuV)	CF(dB)	(dBuV/m)	(dBuV/m)	(dBuV/m)	(dBuV/m	) (dB)	
2483.56	47.69		-0.92	46.77		74.00	54.00	-7.23	Peak

Remark:

- (1) Data 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  $\circ$
- (3) Spectrum Peak Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 3MHz, Sweep time= 200 ms.
- (4) Spectrum AV Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.



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# 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. Measurement Equipment Used:

- **9.2.1.** Conducted Emission at antenna port: Refer to section 6.2 for details.
- 9.2.2. Radiated emission:

Refer to section 7.2 for details.

# 9.3. Test SET-UP:

9.3.1. Conducted Emission at antenna port:

Refer to section 6.3 for details.

9.3.2. Radiated emission:

Refer to section 7.3 for details.

# 9.4. 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. When measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made "while keeping the antenna in the 'cone of radiation' from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response." is still within the 3dB illumination BW of the measurement antenna.
- 5. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
- 6. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
- 7. Repeat above procedures until all frequency measured were complete.

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#### 9.5. Field Strength Calculation

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

#### FS = RA + AF + CL - AG

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

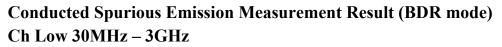
#### 9.6. Measurement Result:

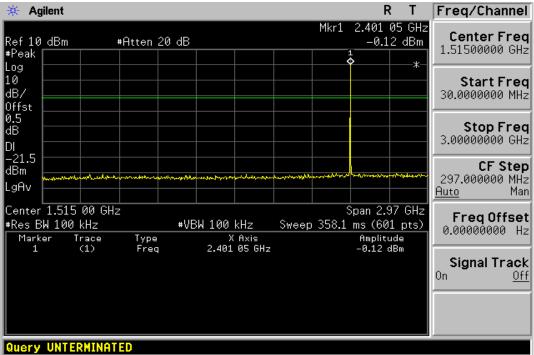
Note: Refer to next page spectrum analyzer data chart and tabular data sheets.

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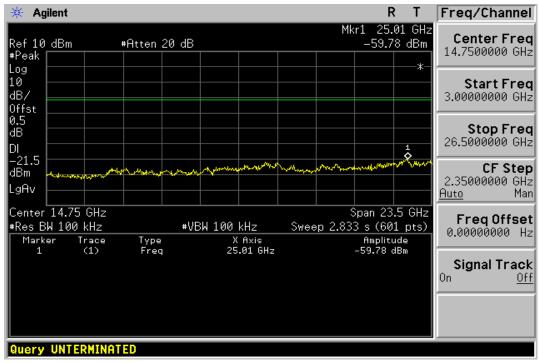


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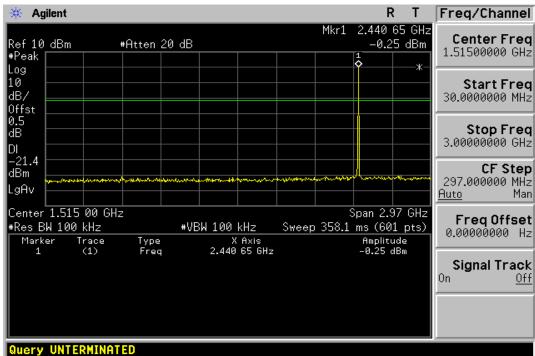


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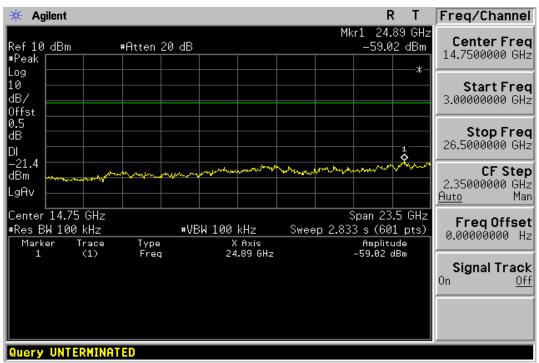


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# Ch Mid 30MHz – 3GHz





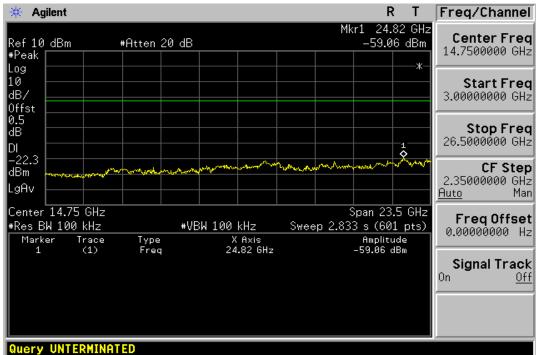


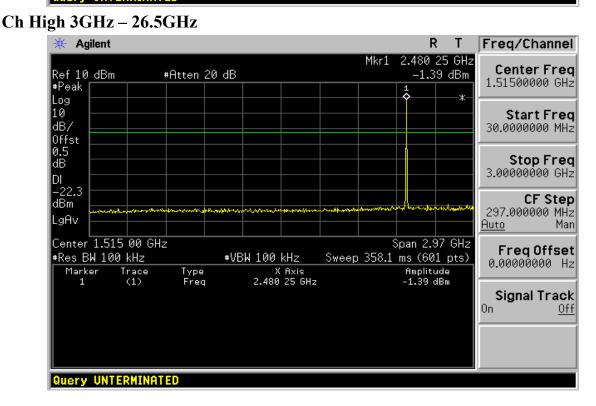
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# Ch High 30MHz – 3GHz





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#### Radiated Spurious Emission Measurement Result (below 1GHz) (BDR mode)

Operation Mode	TX CH Low	Test Date	Aug. 16, 2009
Fundamental Frequency	2402MHz	Test By	Jazz
Temperature	25 °C	Pol	Ver./Hor.
Humidity	65 %		

Freq.	Ant.Pol.	Detector Mode	Reading	Factor	Actual FS	Limit3m	Safe Margin
(MHz)	H/V	(PK/QP)	(dBuV)	( <b>dB</b> )	(dBuV/m)	(dBuV/m)	(dB)
70.74	V	Peak	50.48	-16.27	34.21	40.00	-5.79
94.99	V	Peak	44.57	-17.26	27.31	43.50	-16.19
153.19	V	Peak	33.87	-13.00	20.87	43.50	-22.63
70.74	Н	Peak	48.36	-16.27	32.09	40.00	-7.91
96.93	Н	Peak	41.37	-17.16	24.21	43.50	-19.29
347.19	Н	Peak	33.94	-11.86	22.08	46.00	-23.92

Remark :

- 1 Measuring frequencies from 30 MHz to the 1GHz  $\circ$
- 2 Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using Peak/QP detector mode.
- 3 Data 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.



Operation Mode	TX CH Mid	Test Date	Aug. 16, 2009
Fundamental Frequency	2441MHz	Test By	Jazz
Temperature	25 °C	Pol	Ver./Hor.
Humidity	65 %		

Freq.	Ant.Pol.	Detector Mode	Reading	Factor	Actual FS	Limit3m	Safe Margin
(MHz)	H/V	(PK/QP)	(dBuV)	( <b>dB</b> )	(dBuV/m)	(dBuV/m)	( <b>dB</b> )
94.90	V	Peak	44.62	-17.26	27.36	43.50	-16.14
162.89	V	Peak	33.88	-13.57	20.31	43.50	-23.19
329.73	V	Peak	32.59	-12.24	20.35	46.00	-25.65
72.68	Н	Peak	47.65	-16.62	31.03	40.00	-8.97
90.14	Н	Peak	24.96	-17.62	7.34	43.50	-36.16
218.18	Н	Peak	34.21	-14.99	19.22	46.00	-26.78

Remark :

- 1 Measuring frequencies from 30 MHz to the 1GHz  $\circ$
- 2 Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using Peak/QP detector mode.
- 3 Data 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.



Operation Mode	TX CH High	Test Date	Aug. 16, 2009
Fundamental Frequency	2480MHz	Test By	Jazz
Temperature	25 °C	Pol	Ver./Hor.
Humidity	65 %		

Freq.	Ant.Pol.	Detector Mode	Reading	Factor	Actual FS	Limit3m	Safe Margin
(MHz)	H/V	(PK/QP)	(dBuV)	(dB)	(dBuV/m)	(dBuV/m)	( <b>dB</b> )
94.99	V	Peak	44.39	-17.26	27.13	43.50	-16.37
153.19	V	Peak	33.25	-13.00	20.25	43.50	-23.25
318.09	V	Peak	32.86	-12.59	20.27	46.00	-25.73
104.69	Н	Peak	41.44	-16.63	24.81	43.50	-18.69
133.79	Н	Peak	33.23	-14.18	19.05	43.50	-24.45
261.83	Н	Peak	32.90	-13.63	19.27	46.00	-26.73

Remark :

1 Measuring frequencies from 30 MHz to the 1GHz  $\circ$ 

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



Operation Mode	TX CH Low	Test Date	Aug. 16, 2009
Fundamental Frequency	2402 MHz	Test By	Jazz
Temperature	25 °C	Pol	Ver.
Humidity	65 %		

	Peak	AV		Actu	al FS	Peak	AV	
Freq.	Reading	Reading	Ant./CL	Peak	AV	Limit	Limit	Margin
(MHz)	(dBuV)	(dBuV)	CF(dB)	(dBuV/m)	(dBuV/m)	(dBuV/m)	(dBuV/m)	(dB)
4804.0	38.70		6.04	44.74		74.00	54.00	-9.26
7206.0						74.00	54.00	
9608.0						74.00	54.00	
12010.0						74.00	54.00	
14412.0						74.00	54.00	
16814.0						74.00	54.00	
19216.0						74.00	54.00	
21618.0						74.00	54.00	
24020.0						74.00	54.00	

Remark:

- (1) Measuring frequencies from 1GHz to the 10th harmonic of highest fundamental frequency.
- (2) Data 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= 3MHz, Sweep time= 200 ms.
- (5) Spectrum AV Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.



Operation Mode	TX CH Low	Test Date	Aug. 16, 2009
Fundamental Frequency	2402 MHz	Test By	Jazz
Temperature	25 °C	Pol	Hor.
Humidity	65 %		

	Peak	AV		Actu	al FS	Peak	AV	
Freq.	Reading	Reading	Ant./CL	Peak	AV	Limit	Limit	Margin
(MHz)	(dBuV)	(dBuV)	CF(dB)	(dBuV/m)	(dBuV/m)	(dBuV/m)	(dBuV/m)	(dB)
4804.0	38.86		6.04	44.90		74.00	54.00	-9.10
7206.0						74.00	54.00	
9608.0						74.00	54.00	
12010.0						74.00	54.00	
14412.0						74.00	54.00	
16814.0						74.00	54.00	
19216.0						74.00	54.00	
21618.0						74.00	54.00	
24020.0						74.00	54.00	

#### Remark:

- (1) Measuring frequencies from 1GHz to the 10th harmonic of highest fundamental frequency.
- (2) Data 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= 3MHz, Sweep time= 200 ms.
- (5) Spectrum AV Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.



Operation Mode	TX CH Mid	Test Date	Aug. 16, 2009
Fundamental Frequency	2441 MHz	Test By	Jazz
Temperature	25 °C	Pol	Ver.
Humidity	65 %		

	Peak	AV		Actu	al FS	Peak	AV	
Freq.	Reading	Reading	Ant./CL	Peak	AV	Limit	Limit	Margin
(MHz)	(dBuV)	(dBuV)	CF(dB)	(dBuV/m)	(dBuV/m)	(dBuV/m)	(dBuV/m)	(dB)
4882.0	38.12		6.20	44.32		74.00	54.00	-9.68
7323.0						74.00	54.00	
9764.0						74.00	54.00	
12205.0						74.00	54.00	
14646.0						74.00	54.00	
17087.0						74.00	54.00	
19528.0						74.00	54.00	
21969.0						74.00	54.00	
24410.0						74.00	54.00	

#### Remark:

- (1) Measuring frequencies from 1GHz to the 10th harmonic of highest fundamental frequency.
- (2) Data 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= 3MHz, Sweep time= 200 ms.
- (5) Spectrum AV Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.



Operation Mode	TX CH Mid	Test Date	Aug. 16, 2009
Fundamental Frequency	2441 MHz	Test By	Jazz
Temperature	25 °C	Pol	Hor.
Humidity	65 %		

	Peak	AV		Actu	al FS	Peak	AV	
Freq.	Reading	Reading	Ant./CL	Peak	AV	Limit	Limit	Margin
(MHz)	(dBuV)	(dBuV)	CF(dB)	(dBuV/m)	(dBuV/m)	(dBuV/m)	(dBuV/m)	(dB)
4882.0	37.98		6.20	44.18		74.00	54.00	-9.82
7323.0						74.00	54.00	
9764.0						74.00	54.00	
12205.0						74.00	54.00	
14646.0						74.00	54.00	
17087.0						74.00	54.00	
19528.0						74.00	54.00	
21969.0						74.00	54.00	
24410.0						74.00	54.00	

#### Remark:

- (1) Measuring frequencies from 1GHz to the 10th harmonic of highest fundamental frequency.
- (2) Data 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= 3MHz, Sweep time= 200 ms.
- (5) Spectrum AV Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.



Operation Mode	TX CH High	Test Date	Aug. 16, 2009
Fundamental Frequency	2480 MHz	Test By	Jazz
Temperature	25 °C	Pol	Ver.
Humidity	65 %		

	Peak	AV		Actu	al FS	Peak	AV	
Freq.	Reading	Reading	Ant./CL	Peak	AV	Limit	Limit	Margin
(MHz)	(dBuV)	(dBuV)	CF(dB)	(dBuV/m)	(dBuV/m)	(dBuV/m)	(dBuV/m)	( <b>dB</b> )
4960.0	38.62		6.36	44.98		74.00	54.00	-9.02
7440.0						74.00	54.00	
9920.0						74.00	54.00	
12400.0						74.00	54.00	
14880.0						74.00	54.00	
17360.0						74.00	54.00	
19840.0						74.00	54.00	
22320.0						74.00	54.00	
24800.0						74.00	54.00	

#### Remark:

- (1) Measuring frequencies from 1GHz to the 10th harmonic of highest fundamental frequency.
- (2) Data 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= 3MHz, Sweep time= 200 ms.
- (5) Spectrum AV Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.



Operation Mode	TX CH High	Test Date	Aug. 16, 2009
Fundamental Frequency	2480 MHz	Test By	Jazz
Temperature	25 °C	Pol	Hor.
Humidity	65 %		

	Peak	AV		Actu	al FS	Peak	AV	
Freq.	Reading	Reading	Ant./CL	Peak	AV	Limit	Limit	Margin
(MHz)	(dBuV)	(dBuV)	CF(dB)	(dBuV/m)	(dBuV/m)	(dBuV/m)	(dBuV/m)	(dB)
4960.0	38.00		6.36	44.36		74.00	54.00	-9.64
7440.0						74.00	54.00	
9920.0						74.00	54.00	
12400.0						74.00	54.00	
14880.0						74.00	54.00	
17360.0						74.00	54.00	
19840.0						74.00	54.00	
22320.0						74.00	54.00	
24800.0						74.00	54.00	

#### Remark:

- (1) Measuring frequencies from 1GHz to the 10th harmonic of highest fundamental frequency.
- (2) Data 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= 3MHz, Sweep time= 200 ms.
- (5) Spectrum AV Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.



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# **10. FREQUENCY SEPARATION**

#### **10.1. Standard Applicable**

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

#### **10.2. Measurement Equipment Used:**

Refer to section 6.2 for details.

#### 10.3. Test Set-up:

Refer to section 6.3 for details.

#### **10.4. 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 3.0 MHz, Sweep = auto.
- 5. Max hold. Mark 3 Peaks of hopping channel and record the 3 peaks frequency.

# 10.5. Measurement Result:

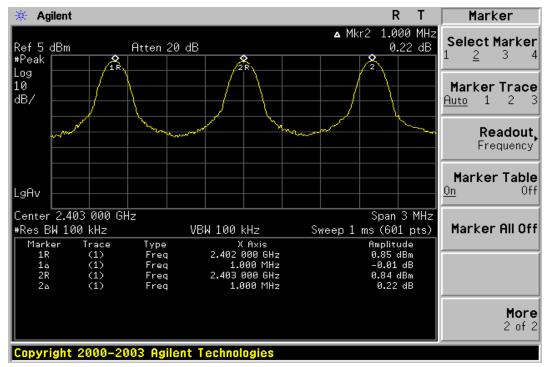
Channel separation (MHz)	1 Limit	Result
1	>=25KHz or 2/3 times 20dB bandwidth	PASS

Note: Refer to next page for plots.



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# **Frequency Separation Test Data**



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# **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 Equipment Used:**

Refer to section 6.2 for details.

#### 11.3. Test Set-up:

Refer to section 6.3 for details.

#### **11.4. 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=430KHz,, VBW=1MHz.
- 5. Max hold, view and count how many channel in the band.

# 11.5. Measurement Result:

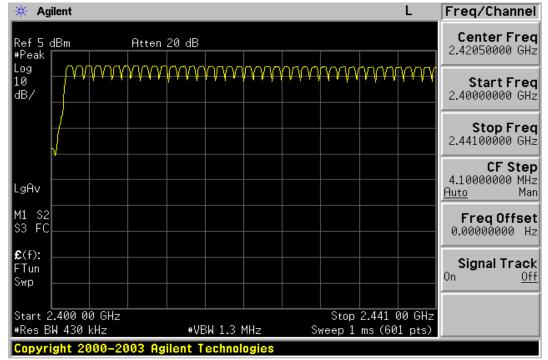
Note: Refer to next page for plots.



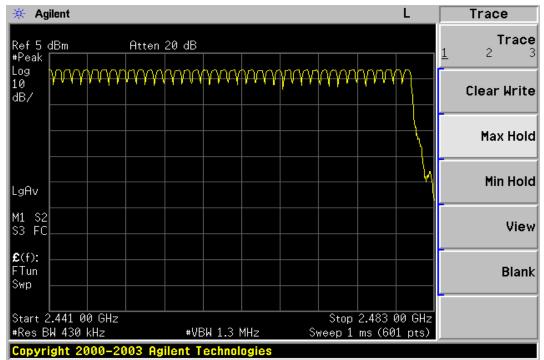
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# **Channel Number**

2.4 GHz – 2.441GHz



#### 2.441 GHz – 2.4835GHz



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# **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 Equipment Used:

Refer to section 6.2 for details.

# 12.3. Test Set-up:

Refer to section 6.3 for details.

# 12.4. 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.

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#### 12.5. Measurement Result

A period time = $0.4 \text{ (ms)} * 79 = 31.6 \text{ (s)}$	
CH Low:	DH1 time slot = $0.405 \text{ (ms)} * (1600/(1*79)) * 31.6 = 259.2 \text{ (ms)}$
	DH3 time slot = $1.675 \text{ (ms)} * (1600/(3*79)) * 31.6 = 357.3 \text{ (ms)}$
	DH5 time slot = 2.925 (ms) * (1600/(5*79)) * 31.6 = 374.4 (ms)
CH Mid:	DH1 time slot = $0.405 \text{ (ms)} * (1600/(1*79)) * 31.6 = 259.2 \text{ (ms)}$
	DH3 time slot = 1.675 (ms) * (1600/(3*79)) * 31.6 = 357.3 (ms)
	DH5 time slot = 2.906 (ms) * (1600/(5*79)) * 31.6 = 371.9 (ms)
CH High:	DH1 time slot = $0.416 \text{ (ms)} * (1600/(1*79)) * 31.6 = 266.2 \text{ (ms)}$
	DH3 time slot = $1.662 \text{ (ms)} * (1600/(3*79)) * 31.6 = 354.5 \text{ (ms)}$
	DH5 time slot = 2.906 (ms) * (1600/(5*79)) * 31.6 = 371.9 (ms)

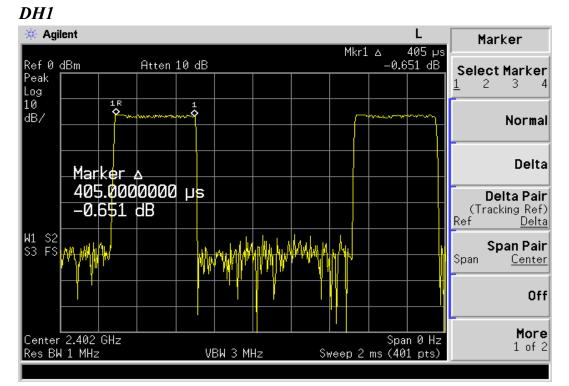
Note: Refer to next page for plots.

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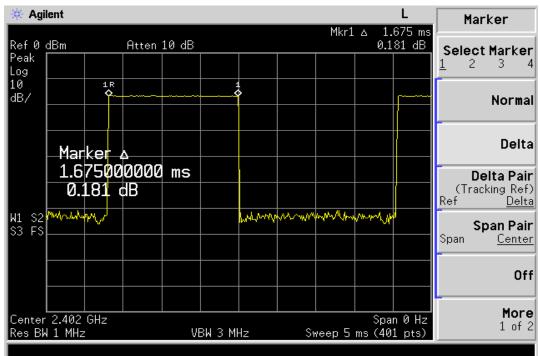


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CH-Low



#### DH3

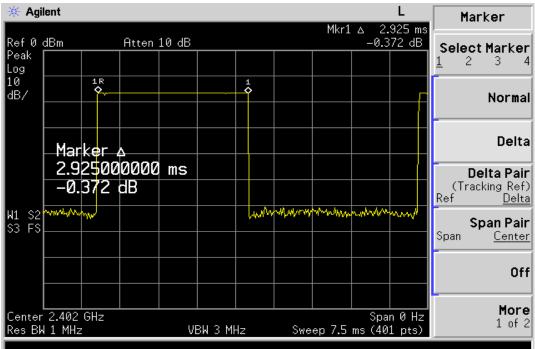


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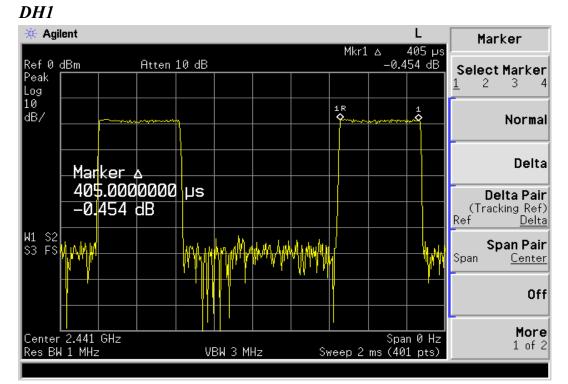


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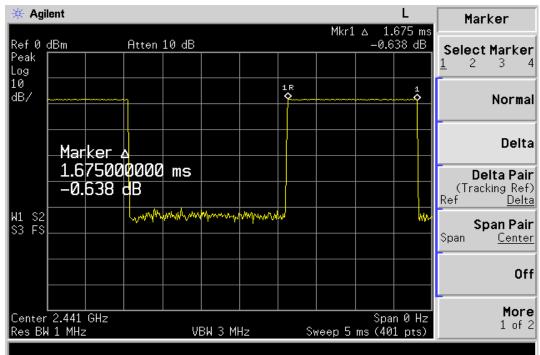


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CH-Mid



# DH3



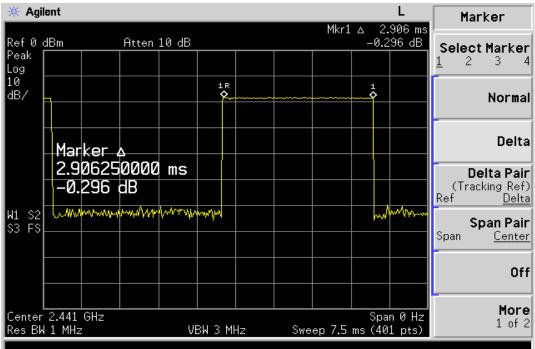
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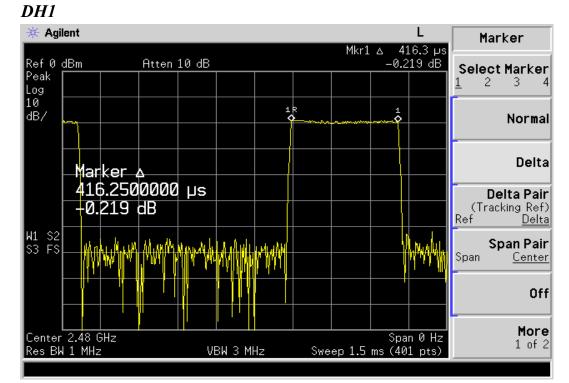
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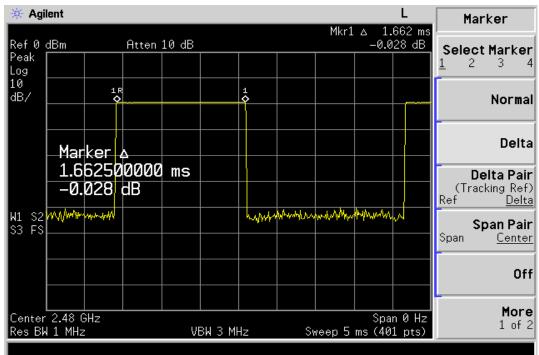


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CH-High



# DH3



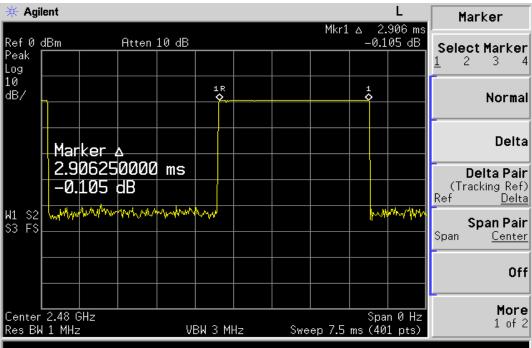
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# **13. ANTENNA REQUIREMENT**

#### **13.1. 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 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

# 13.2. Antenna Connected Construction

The directional gains of antenna used for transmitting is 1.2dBi, and the antenna connector is designed with permanent attachment and no consideration of replacement. Please see EUT photo for details.