

# ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

## INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART C REQUIREMENT AND INDUSTRY CANADA RSS-210

OF

**Product Name:** GPS Navigation System

**Brand Name:** TomTom

**Model Name:** 4ER50

**Model Difference:** N/A

**FCC ID:** S4L4ER50  
**IC:** 5767A-4ER50

**Report No.:** EH/2011/60002-01

**Issue Date:** Aug. 15, 2011

**Rule Part:** §15.247, Cat: DSS  
RSS-210 issue 8:2010, Annex 8

**Prepared for:** TomTom International BV  
Rembrandtplein 35 1017 CT Amsterdam The Netherlands  
SGS Taiwan Ltd.

**Prepared by:** Electronics & Communication Laboratory  
No. 134, Wu Kung Rd., Wuku Industrial Zone,  
Taipei County, Taiwan.



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**CERTIFICATION OF COMPLIANCE**

**Applicant:** TomTom International BV  
Rembrandtplein 35 1017 CT Amsterdam The Netherlands

**Product Description:** GPS Navigation System

**FCC ID:** S4L4ER50  
**IC:** 5767A-4ER50

**Brand Name:** TomTom

**Model No.:** 4ER50

**Model Difference:** N/A

**File Number:** EH/2011/60002-01

**Date of test:** Jun 01, 2011 ~ Jun 13, 2011

**Date of EUT Received:** Jun 01, 2011

**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 RSS-Gen. issue 3:2010, 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 15C:2007, §15.247 and RSS-210 issue 8: 2010 Annex 8.

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

**Test By:**

Jazz Huang

**Date:**

Aug. 15, 2011

---

Jazz Huang / Engineer**Prepared By:**

Alex Hsieh

**Date:**

Aug. 15, 2011

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Alex Hsieh / Sr. Engineer**Approved By:**

Jim Chang

**Date:**

Aug. 15, 2011

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Jim Chang / Supervisor

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## Version

Version No.	Date	Description
00	Aug. 15, 2011	Initial creation of document

Please be noted that the report EH/2011/60002-01(V.00) will replace the previous EH/2011/60002(V.00) as the new version. Also be pay attention that EH/2011/60002(V.00) is ineffective anymore from now on.

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## 1. GENERAL INFORMATION

### 1.1. Product Description

General:

Product Name:	GPS Navigation System	
Brand Name:	TOMTOM	
Model Name:	4ER50	
Model Difference:	N/A	
USB Cable:	D1: One provide, Model Name: 4UUC.001.04B / Brand: TomTom	
Micro USB to mini USB adapter:	U1: One provide, Model Name: 4UUC.001.08 / Brand: TomTom	
Car Charger:	C1: Model No: 4UUC5B / Brand: TomTom	
	C2: Model No: 4UUC3Z / Brand: TomTom	
	C3: Model No. 4UUC3Z / Brand: TomTom	
	C4: Model No. 4UUC1B / Brand: TomTom (mini U)	
	C5: Model No: 4UUC5 / Brand: TomTom (Micro U)	
	C6: Model No: 4UUC2 / Brand: TomTom (mini U)	
	C7: Model No: 9UUC.000.00 / Brand: TomTom (mini U)	
	C8: Model No. 4UUC9 / Brand: TomTom	
Dock 2:	Dock 1: Model No: 4UCB3 / Brand: TomTom	
Dock 3 with cable:	Dock 2: Model No: 4UEB3 / Brand: TomTom	
Power Supply:	3.7Vdc, 1100mAh (Max.) re-chargeable battery or 5Vdc from Adapter	
	Battery:	Model: VF6M / Brand: TomTom / Supplier: Formosa (TAIN YU), Foxlink
	Adapter:	A1: Model: A05T2-05MU / Brand: TomTom A2: Model: PSB05R-050Q / Brand: TomTom A3: Model: 4UUC6B / Brand: TomTom A4: Model: 4UUC6 / Brand: TomTom

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## Bluetooth:

Frequency Range:	2402 – 2480MHz
Bluetooth Version:	V2.0 + EDR (GFSK + $\pi/4$ DQPSK + 8DPSK)
Channel number:	79 channels
Modulation type:	Frequency Hopping Spread Spectrum
Transmit Power:	4.19dBm (Peak)
Dwell Time:	$\leq 0.4s$
Operating Mode:	Point-to-Point
Antenna Designation:	MONOPOLE Chip Antenna, 0dBi.

This test report applies for Bluetooth function.

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

This submittal(s) (test report) is intended for **FCC ID: S4L4ER50** filing to comply with Section 15.247 of the FCC Part 15C, Subpart C Rules. And **IC: 5767A-4ER50** filing to comply with Industry Canada RSS-210 issue 8: 2010 Annex 8.

## 1.3. Test Methodology

Both conducted and radiated testing were performed according to the procedures in ANSI C63.4 (2003) and RSS-Gen: 2010. Radiated testing was performed at an antenna to EUT distance 3 meters.

Tested in accordance with FCC Public Notice DA 00-705

## 1.4. 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. 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-4.

The 10 m Open Area Test Sites located on the address of SGS Taiwan Ltd. 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.

## 1.5. Special Accessories

Not available for this EUT intended for grant.

## 1.6. Equipment Modifications

Not available for this EUT intended for grant.

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## 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 tested with a test program to fix the Tx/RX frequency that was for the purpose of the measurements. For more information please see test data and APPENDIX 1 for set-up photographs.

### 2.3. Test Procedure

#### 2.3.1 Conducted Emissions

The EUT is placed on a turn table which is 0.8 m above ground plane. According to the requirements in Section 7, 13 of ANSI C63.4-2003 and RSS-Gen:2010, conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30 MHz using CISPR Quasi-Peak and Average detector mode.

#### 2.3.2 Radiated Emissions

The EUT is placed on a 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 of ANSI C63.4-2003 and DA 00-705..

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## 2.4. Configuration of Tested System

Fig. 2-1 Configuration of Tested System

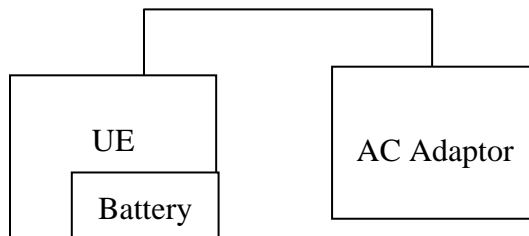


Table 2-1 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Data Cable	Power Cord
1.	Test soft ware	N/A	PuTTY	N/A	N/A	N/A

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### 3. SUMMARY OF TEST RESULTS

FCC Rules	Description Of Test	Result
§15.207(a)/ RSS-Gen §7.2.4	AC Power line Conducted Emission	Compliant
§15.247(b)(1)/ RSS-210 issue 8, §A8.4(2)	Peak Output Power	Compliant
§15.247(d) RSS-210 issue 8, §A8.5	100 KHz Bandwidth Of Frequency Band Edges	Compliant
§15.247(c) RSS-Gen §7.2.5 RSS-210 issue 8, §A2.9	TX/RX Spurious Emission	Compliant
§15.247(a)(1)/ RSS-210 issue 8, §A8.1(b)	Frequency Separation	Compliant
§15.247(a)(1)(iii)/ RSS-210 issue 8, §A8.1(d)	Number of hopping frequency	Compliant
§15.247(a)(1)(ii)/ RSS-210 issue 8, §A8.1(d)	Time of Occupancy	Compliant
§15.247(a)(1) RSS210 issue , §A8.1(b)	20dB Bandwidth & 99% Power Bandwidth	Compliant
§15.203, §15.247(c)/ RSS- Gen issue §7.1.2	Antenna Requirement	Compliant

### 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 (2402MHz) 、mid (2441MHz) and high (2480MHz) with worst case EDR mode and DH5 highest data rate are chosen for full testing.

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## 5. AC POWER LINE CONDUCTED EMISSION TEST

### 5.1. Standard Applicable:

According to §15.207 and RSS-Gen §7.2.4, frequency range within 150KHz to 30MHz shall not exceed the Limit table as below.

Frequency range MHz	Limits dB(uV)	
	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. Measurement Equipment Used:

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
EMI Test Receiver	R&S	ESCS30	828985/004	09/23/2010	09/22/2011
LISN	Rolf-Heine	NNB-2/16Z	99012	02/02/2011	02/01/2012
LISN	FCC	FCC-LISN-50/250-25-2-01	04034	02/02/2011	02/01/2012
Coaxial Cables	N/A	WK CE Cable	N/A	11/28/2010	11/27/2011

### 5.3. 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 AC/DC Power adaptor of EUT was plug-in LISN. The EUT was placed flushed with the rear of the table.
3. The LISN was connected with 120Vac/60Hz power source.

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#### 5.4. 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.

#### 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.

Note: Refer to next page for measurement data and plots.

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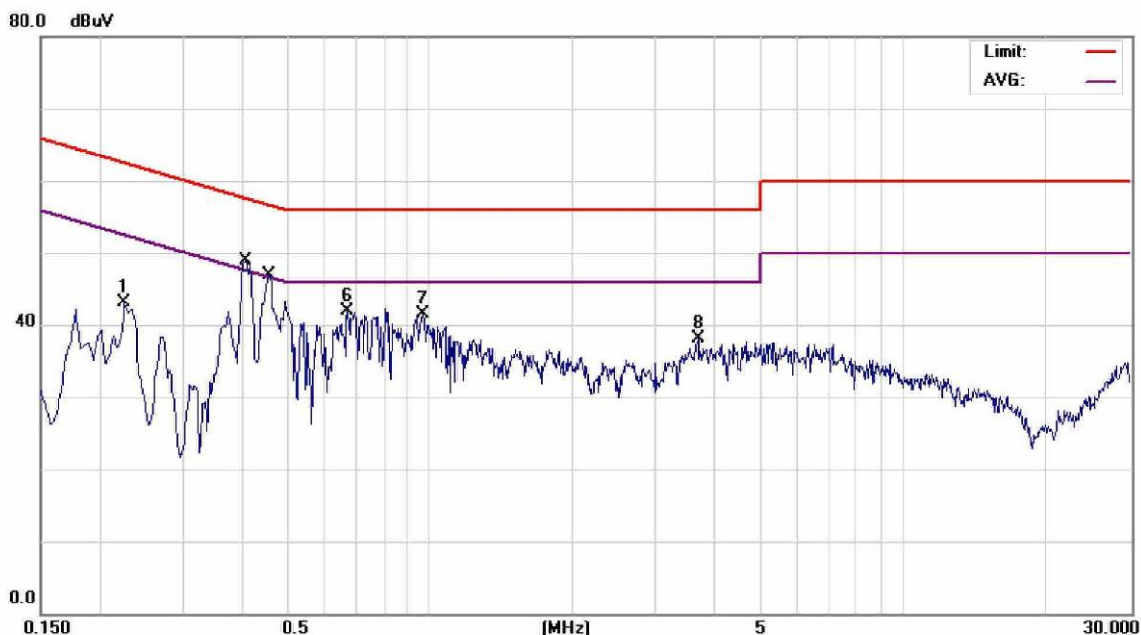
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## AC POWER LINE CONDUCTED EMISSION TEST DATA

Operation Mode:	BT mode		Test Date:	Jun. 14, 2011	
Temperature:	23 °C	Humidity:	59%	Test By:	Jazz



Site	SGS CONDUCTED #1		Phase:	L1	Temperature:	23 °C
Limit:	FCC Class B Conduction(QP)		Power:		Humidity:	59%
EUT:	GPS Navigation System		Distance:		Air Pressure:	hpa
M/N:	4ER50					
Note:	BT mode					

No.	Mk.	Freq.	Reading Level	Factor	Measure-ment	Limit	Over	Detector	Comment
		MHz	dBuV	dB	dBuV	dBuV	dB		
1		0.2260	42.89	0.12	43.01	62.60	-19.59	peak	
2		0.4082	27.19	0.12	27.31	57.68	-30.37	QP	
3	*	0.4082	40.12	0.12	40.24	47.68	-7.44	AVG	
4		0.4562	45.79	0.12	45.91	56.76	-10.85	QP	
5		0.4562	38.70	0.12	38.82	46.76	-7.94	AVG	
6		0.6700	41.76	0.12	41.88	56.00	-14.12	peak	
7		0.9660	41.31	0.11	41.42	56.00	-14.58	peak	
8		3.6980	37.86	0.17	38.03	56.00	-17.97	peak	

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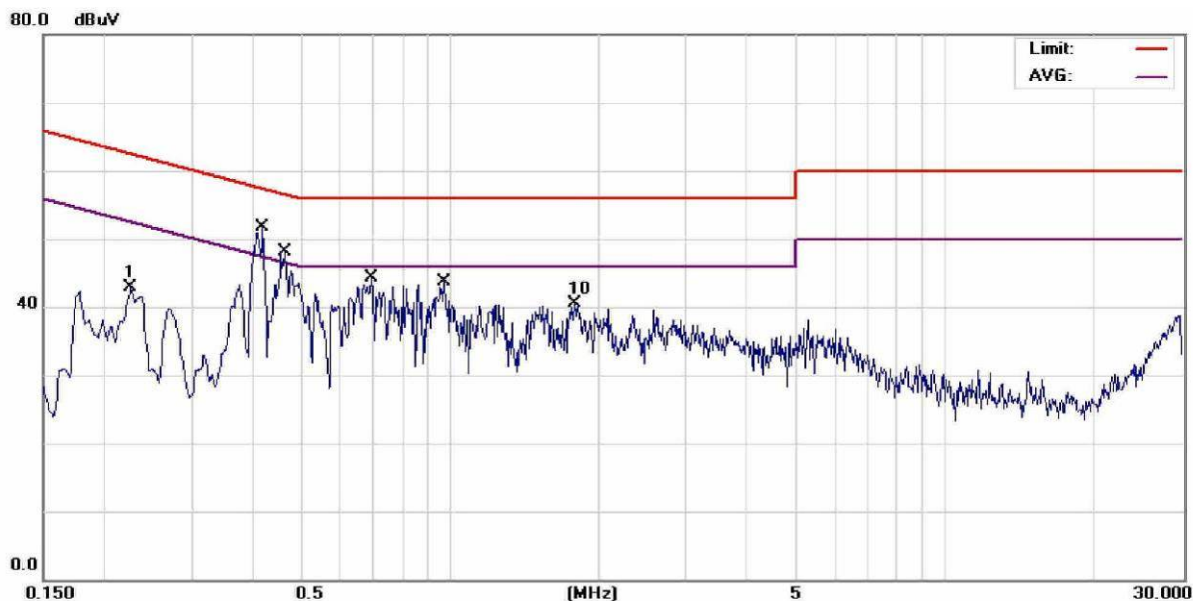
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Site SGS CONDUCTED #1

Limit: FCC Class B Conduction(QP)

EUT: GPS Navigation System

M/N: 4ER50

Note: BT mode

Phase: **N**

Power:

Distance:

Temperature: 23 °C

Humidity: 59%

Air Pressure: hpa

No.	Mk.	Freq.	Reading Level	Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.2260	42.65	0.16	42.81	62.60	-19.79	peak	
2	*	0.4174	49.49	0.16	49.65	57.50	-7.85	QP	
3		0.4174	36.42	0.16	36.58	47.50	-10.92	AVG	
4		0.4599	46.34	0.16	46.50	56.69	-10.19	QP	
5		0.4599	35.84	0.16	36.00	46.69	-10.69	AVG	
6		0.6894	42.49	0.16	42.65	56.00	-13.35	QP	
7		0.6894	30.41	0.16	30.57	46.00	-15.43	AVG	
8		0.9704	40.80	0.15	40.95	56.00	-15.05	QP	
9		0.9704	28.48	0.15	28.63	46.00	-17.37	AVG	
10		1.7900	40.31	0.17	40.48	56.00	-15.52	peak	

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## 6. PEAK OUTPUT POWER MEASUREMENT

### 6.1. Standard Applicable:

According to §15.247(b)(1), 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.

According to RSS-210 issue 8,§A8.4(2), For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 hopping channels, the maximum conducted output power shall not exceed 1 W. For all other frequency hopping systems, the maximum peak conducted output power shall not exceed 0.125 W.

### 6.2. Measurement Equipment Used:

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Agilent	E4446A	MY43360126	04/19/2010	04/18/2012
Spectrum Analyzer	Agilent	E4440A	MY45304525	01/25/2011	01/24/2012
DC Block	Agilent	BLK-18	155452	07/05/2010	07/04/2011
Low Loss Cable	HUBER+SUHNER	SUCOFLEX 104PEA	N/A	01/05/2011	01/04/2012
Attenuator	Mini-Circuit	BW-S6W5	001	07/05/2010	07/04/2011
Attenuator	Mini-Circuit	BW-S10W5	001	07/05/2010	07/04/2011
Attenuator	Mini-Circuit	BW-S20W5	001	07/05/2010	07/04/2011
Splitter	Agilent	11636B	N/A	07/05/2010	07/04/2011

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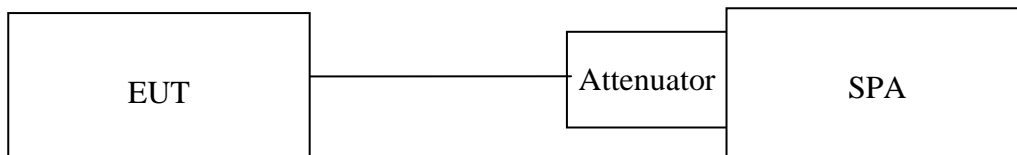
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### 6.3. Test Set-up:



### 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 >20dB bandwidth, VBW>RBW)
3. Record the max. reading.
4. Repeat above procedures until all frequency measured were complete.

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## 6.5. Measurement Result:

### BDR mode:

Frequency (MHz)	Reading Power (dBm)	Output Power (dBm)	Output Power (W)	Limit (W)
2402.00	1.55	1.55	0.00143	1
2441.00	2.47	2.47	0.00177	1
2480.00	1.72	1.72	0.00149	1

### EDR mode:

Frequency (MHz)	Reading Power (dBm)	Output Power (dBm)	Output Power (W)	Limit (W)
2402.00	3.84	3.84	0.00242	1
2441.00	4.19	4.19	0.00262	1
2480.00	3.56	3.56	0.00227	1

*\*Note: offset 6dB*

Note: Refer to next page for plots.

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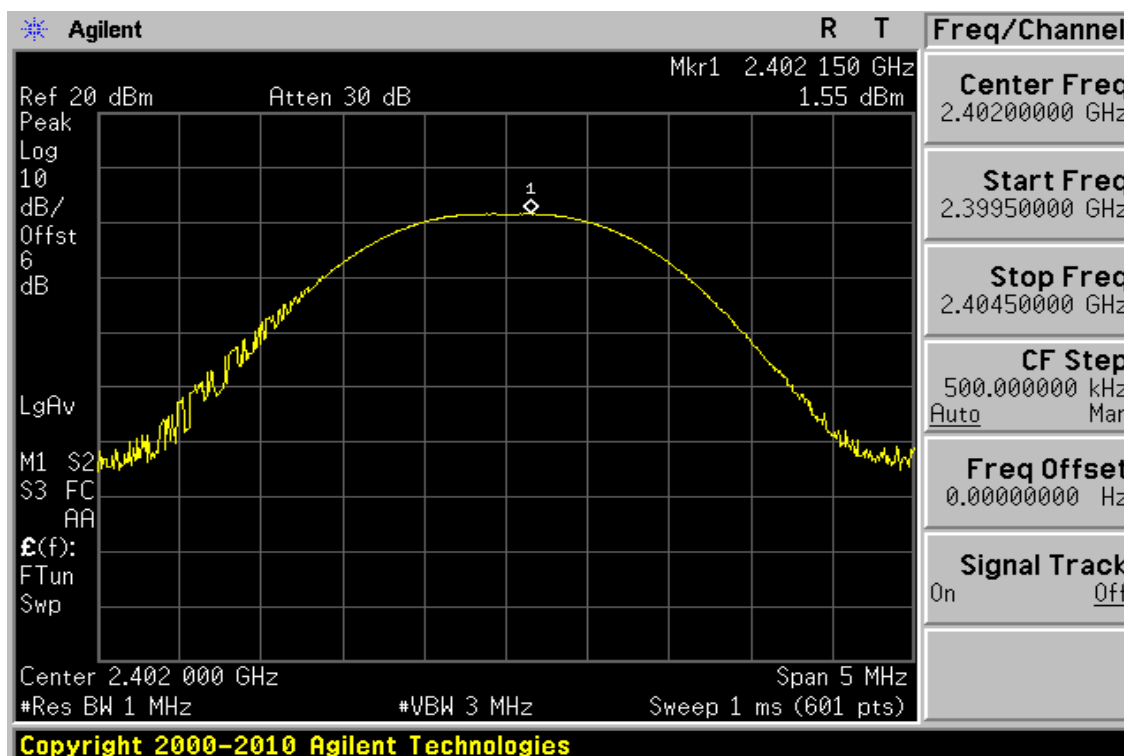
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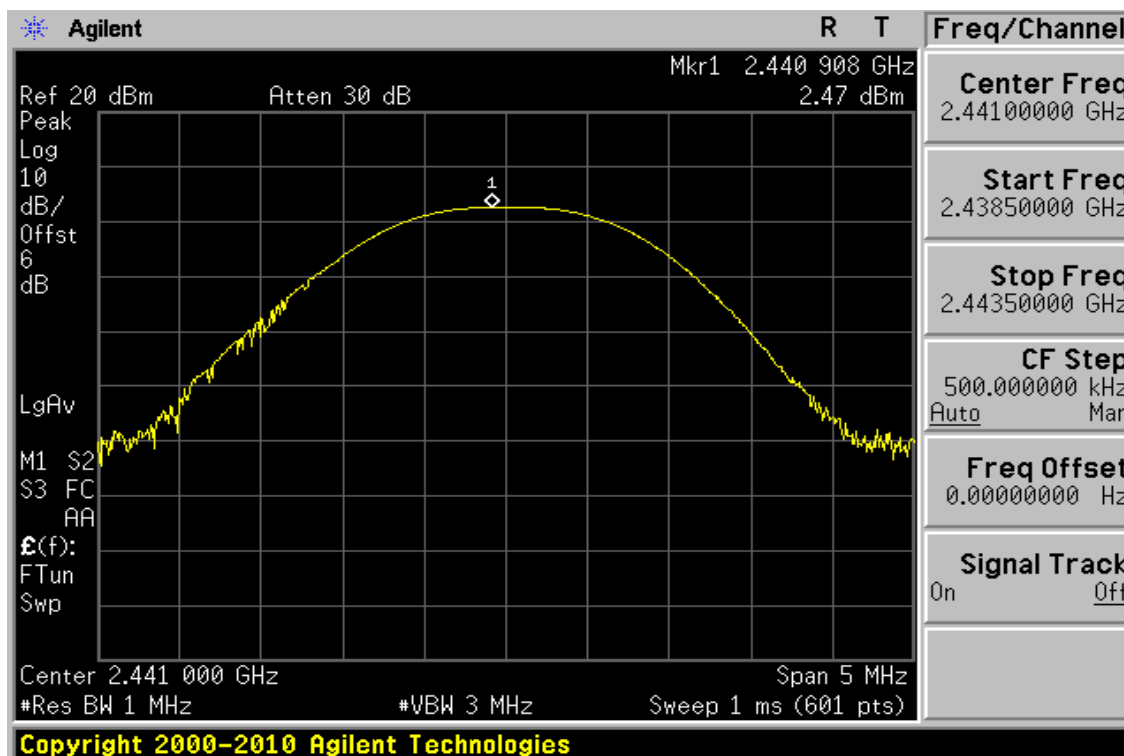
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## Peak Power Output Data Plot (CH Low) (BDR mode)



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



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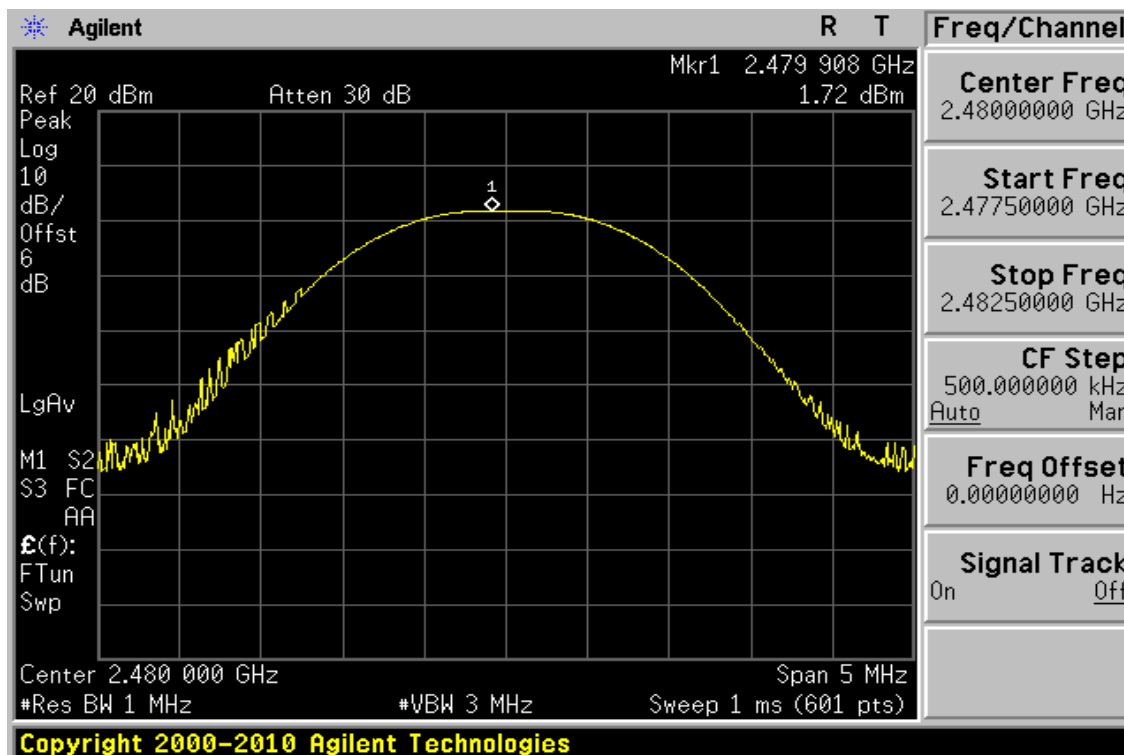
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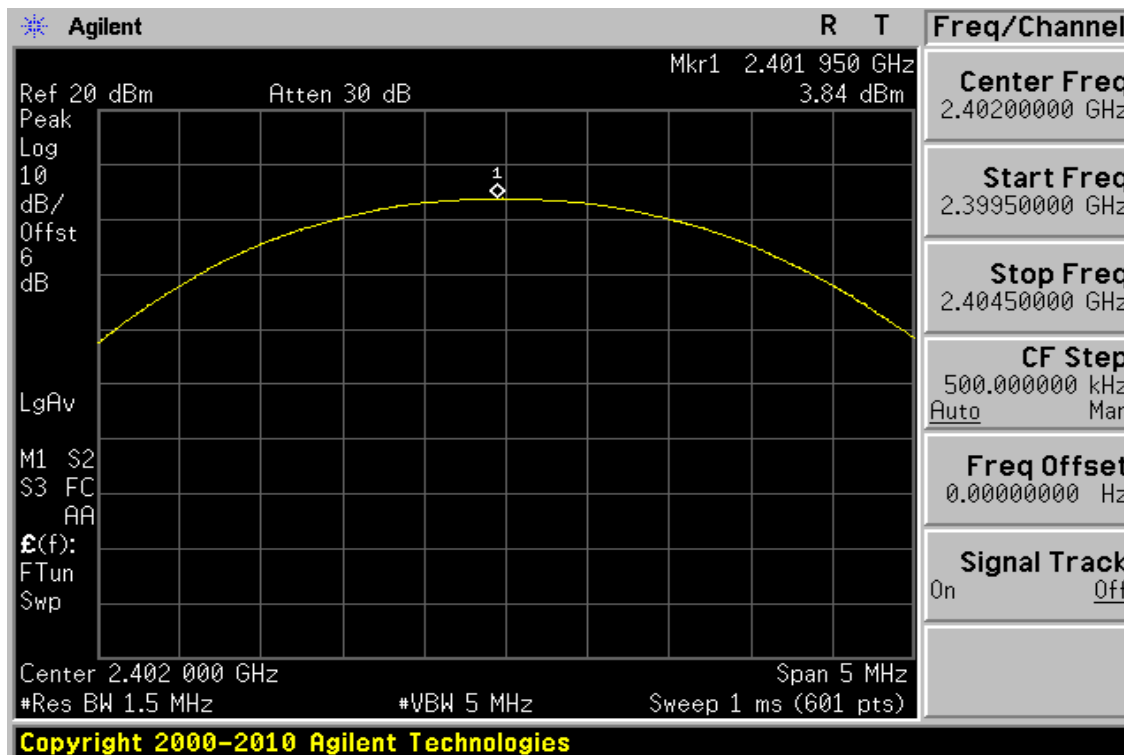
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## Peak Power Output Data Plot (CH High) (BDR mode)



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



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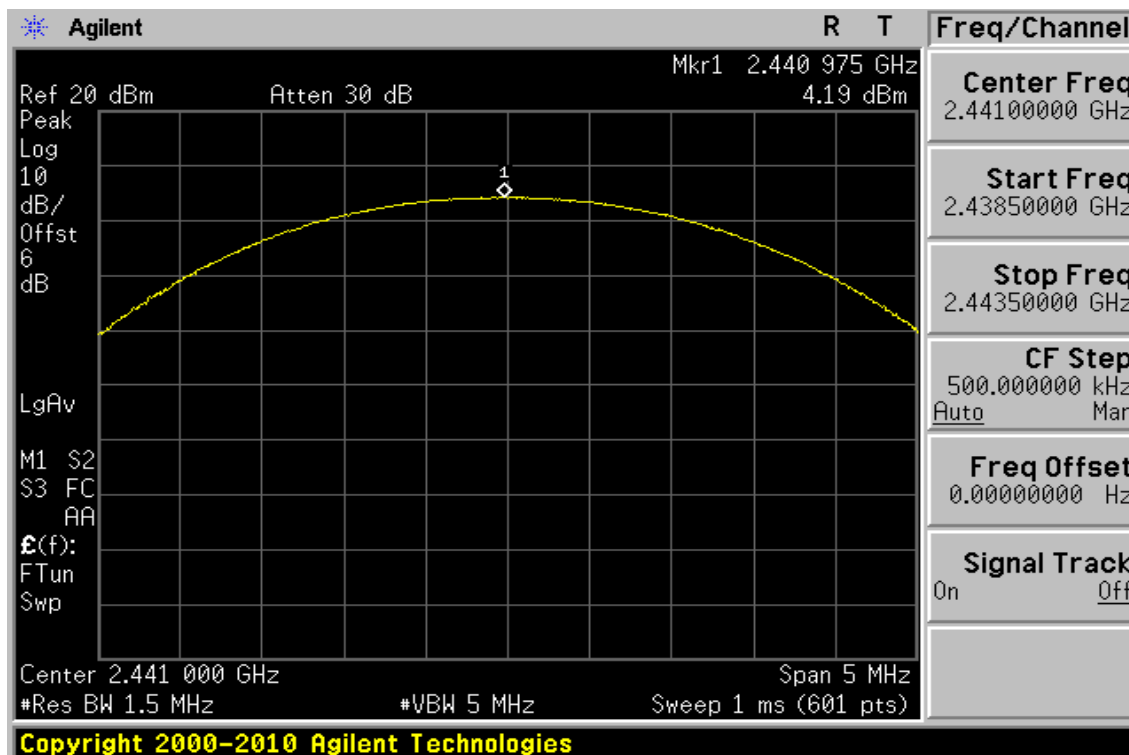
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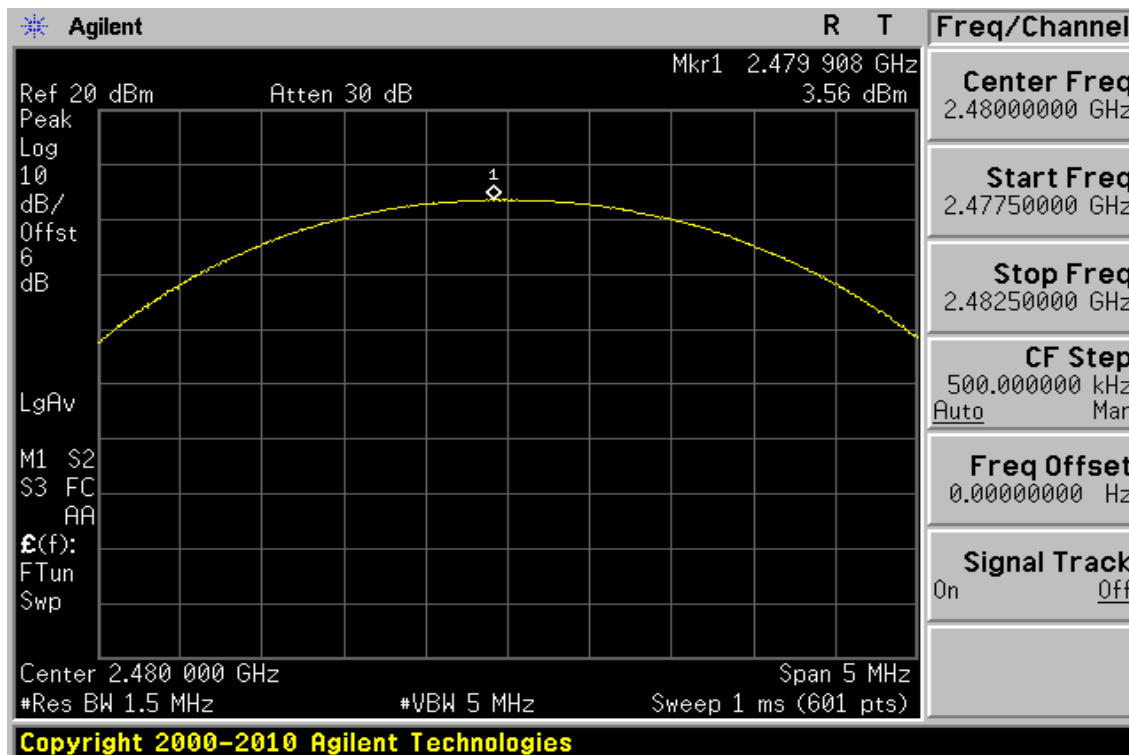
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## Peak Power Output Data Plot (CH Mid) (EDR mode)



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



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## 7. 100KHz BANDWIDTH OF BAND EDGES MEASUREMENT

### 7.1. Standard Applicable:

According to §15.247(d), in any 100 KHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator is 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 in §15.209(a).

According to RSS-210 issue 8, §A8.5, In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the radio frequency power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under section A8.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Tables 2 and 3 is not required. In addition, radiated emissions which fall in the restricted bands of Table 1 must also comply with the radiated emission limits specified in Tables 2 and 3.

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## 7.2. Measurement Equipment Used:

### 7.2.1. Conducted Emission at antenna port:

Refer to section 6.2 for details.

### 7.2.2. Radiated emission:

966 Chamber					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	R&S	FSP 40	100034	02/12/2011	02/11/2012
Loop antenna	MESSTEC	FLA30	03/10086	07/08/2010	07/07/2011
Bilog Antenna	SCHWAZBECK	VULB9160	3136	11/19/2010	11/18/2011
Horn antenna	SCHWAZBECK	BBHA 9120D	9120D-673	05/09/2011	05/08/2012
Pre-Amplifier	Agilent	8447D	1937A02834	11/28/2010	11/27/2011
Pre-Amplifier	Agilent	8449B	3008A01973	01/05/2011	01/04/2012
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	01/05/2011	01/04/2012
Low Loss Cable	HUBER+SUHNER	SUCOFLEX 104PEA-3M	3m	01/05/2011	01/04/2012
3m Site	SGS	966 chamber	N/A	09/06/2010	09/05/2011

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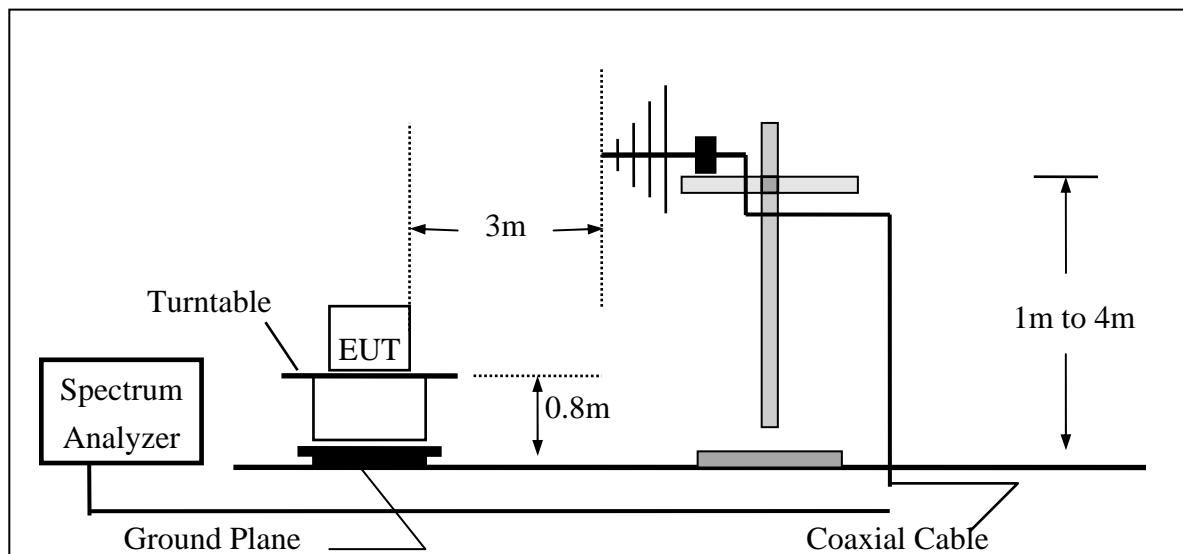
### 7.3. Test SET-UP:

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

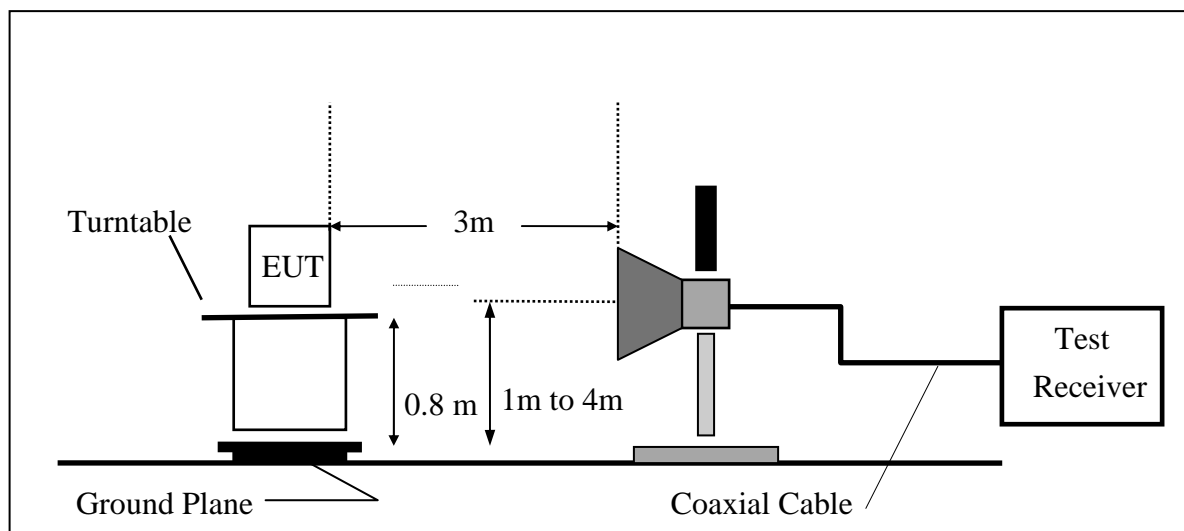
Refer to section 6.3 for details.

#### 7.3.2. 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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#### 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 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.

#### 7.5. 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	

#### 7.6. Measurement Result:

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

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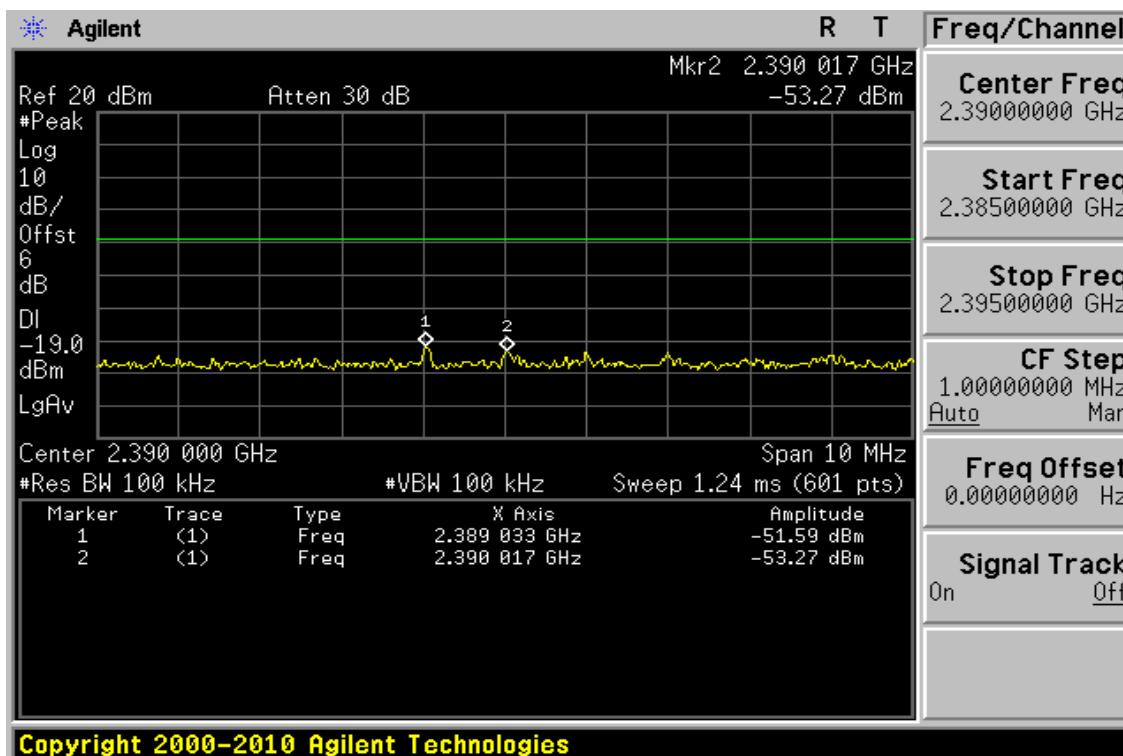
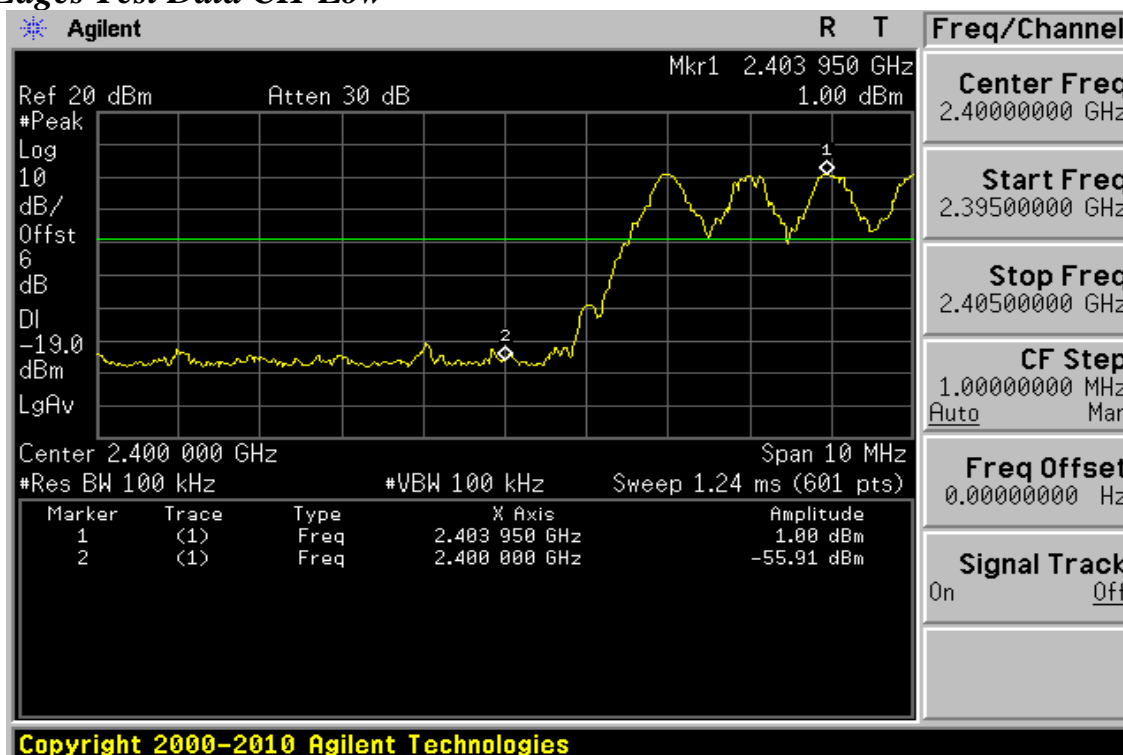
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## BDR Mode

### Band Edges Test Data CH-Low



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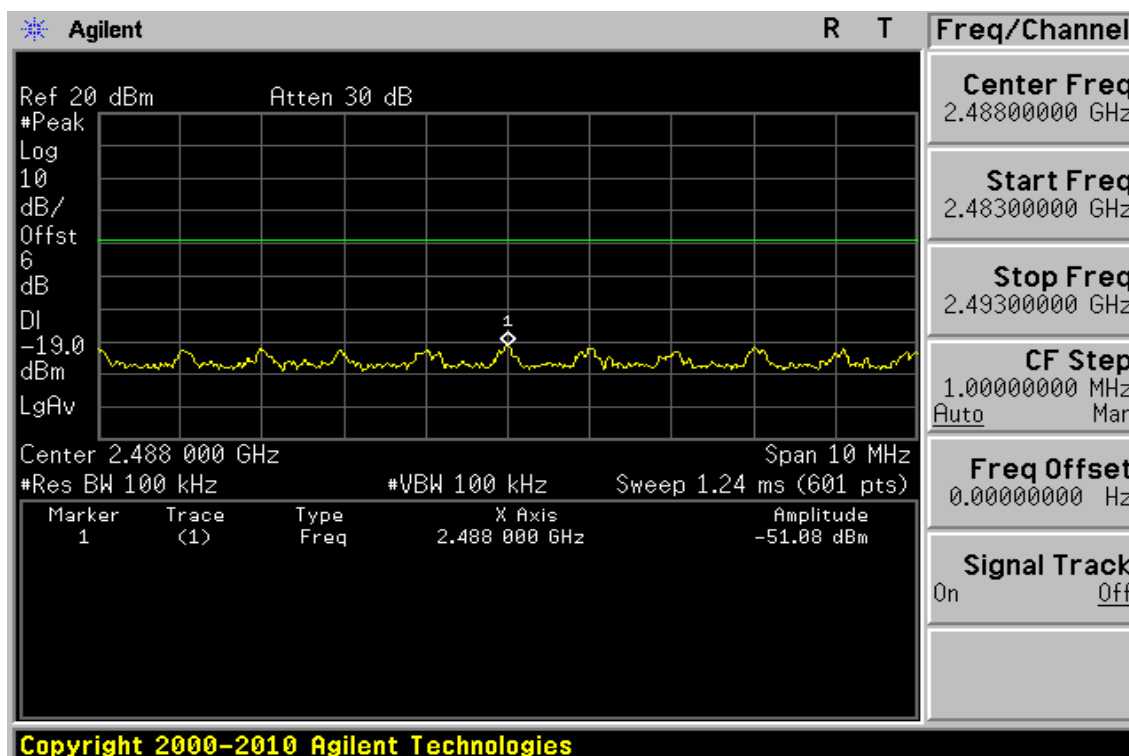
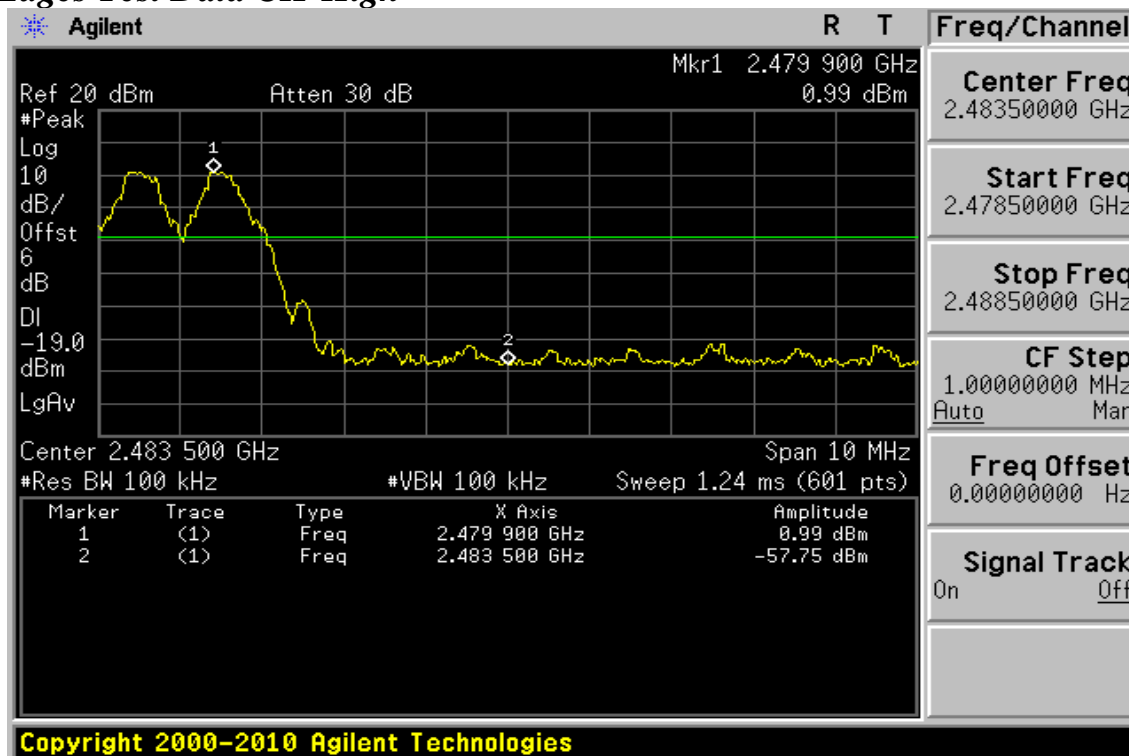
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## Band Edges Test Data CH-High



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**Radiated Emission: (BDR mode)**

Operation Mode TX CH Low  
Fundamental Frequency 2402 MHz  
Temperature 25 °C  
Humidity 65 %

Test Date Jun 14, 2011  
Test By Jazz  
Pol Ver.

Freq. (MHz)	Peak	AV	Ant./CL CF(dB)	Actual FS		Peak	AV	Margin (dB)	Remark
	Reading (dBuV)	Reading (dBuV)		Peak (dBuV/m)	AV (dBuV/m)	Limit (dBuV/m)	Limit (dBuV/m)		
2390.00	45.49	---	-0.67	44.82	---	74.00	54.00	-29.18	Peak

Operation Mode TX CH Low  
Fundamental Frequency 2402 MHz  
Temperature 25 °C  
Humidity 65 %

Test Date Jun 14, 2011  
Test By Jazz  
Pol Hor.

Freq. (MHz)	Peak	AV	Ant./CL CF(dB)	Actual FS		Peak	AV	Margin (dB)	Remark
	Reading (dBuV)	Reading (dBuV)		Peak (dBuV/m)	AV (dBuV/m)	Limit (dBuV/m)	Limit (dBuV/m)		
2390.00	44.57	---	-0.67	43.90	---	74.00	54.00	-30.10	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 .
- (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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Operation Mode TX CH High  
Fundamental Frequency 2480 MHz  
Temperature 25 °C  
Humidity 65 %

Test Date Jun 14, 2011  
Test By Jazz  
Pol Ver.

Freq. (MHz)	Peak Reading	AV Reading	Ant./CL CF(dB)	Actual FS		Peak Limit	AV Limit	Margin (dB)	Remark
	(dBuV)	(dBuV)		Peak (dBuV/m)	AV (dBuV/m)	(dBuV/m)	(dBuV/m)		
2483.50	44.41	---	-0.52	43.89	---	74.00	54.00	-30.11	Peak

Operation Mode TX CH High  
Fundamental Frequency 2480 MHz  
Temperature 25 °C  
Humidity 65 %

Test Date Jun 14, 2011  
Test By Jazz  
Pol Hor.

Freq. (MHz)	Peak Reading	AV Reading	Ant./CL CF(dB)	Actual FS		Peak Limit	AV Limit	Margin (dB)	Remark
	(dBuV)	(dBuV)		Peak (dBuV/m)	AV (dBuV/m)	(dBuV/m)	(dBuV/m)		
2483.50	44.85	---	-0.52	44.33	---	74.00	54.00	-29.67	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 .
- (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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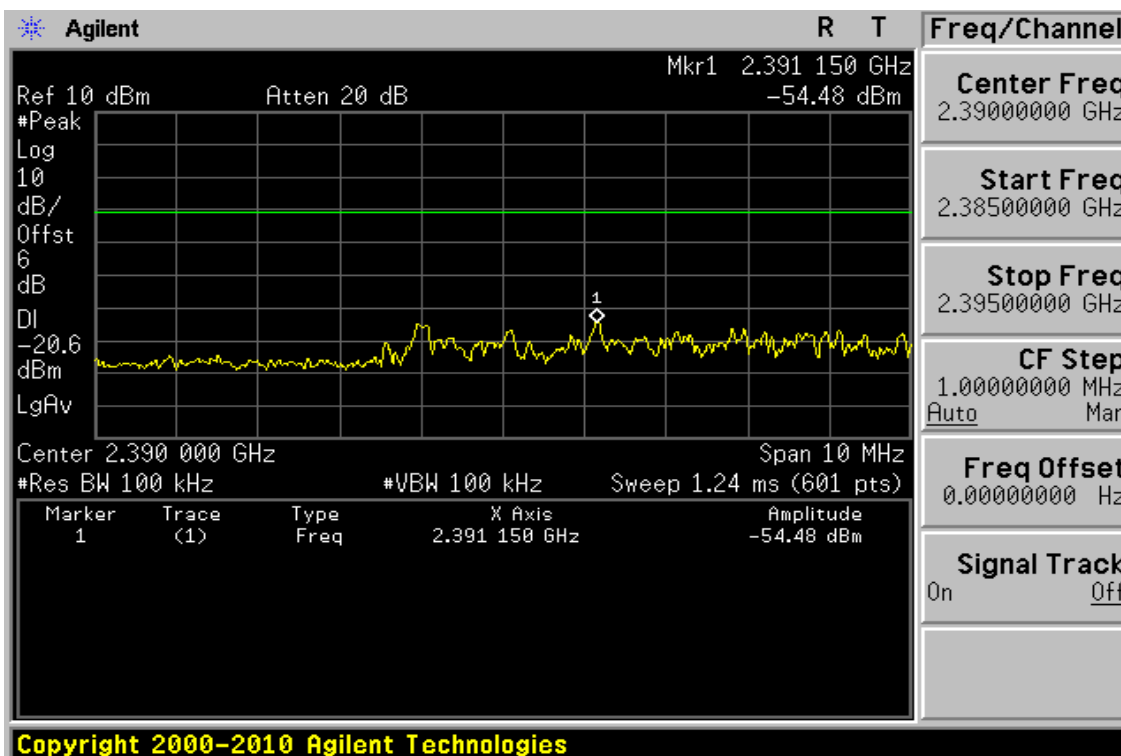
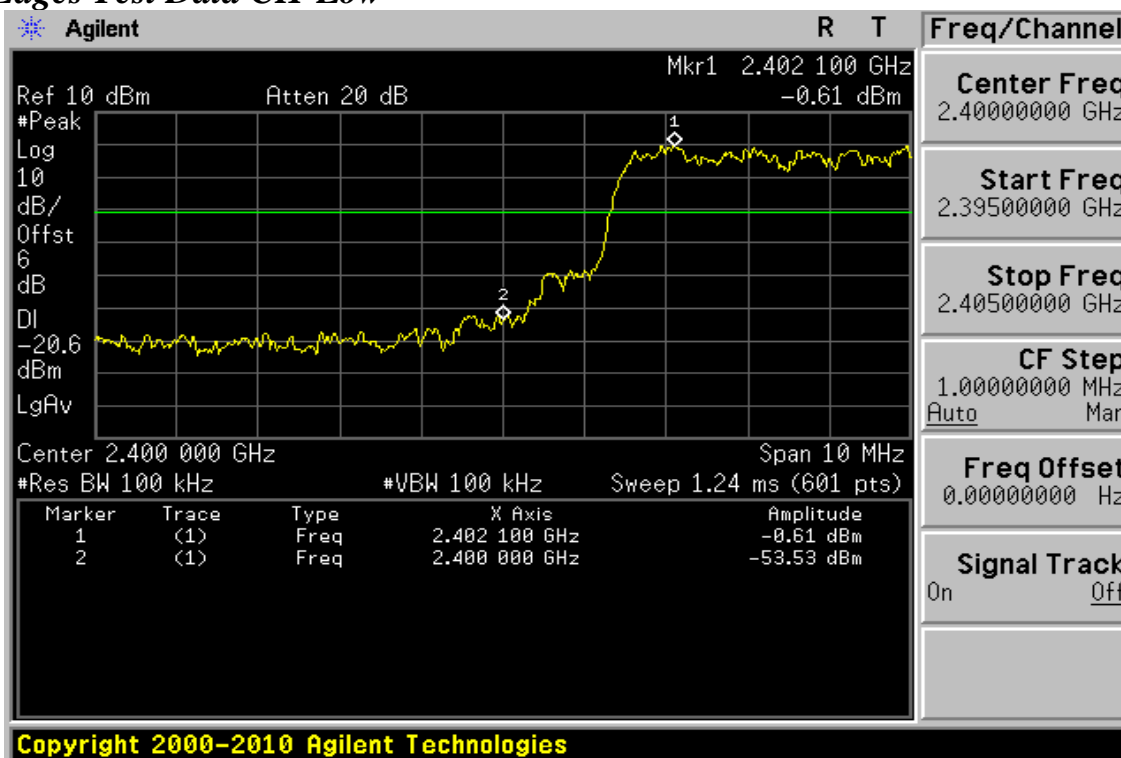
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## EDR Mode

### Band Edges Test Data CH-Low



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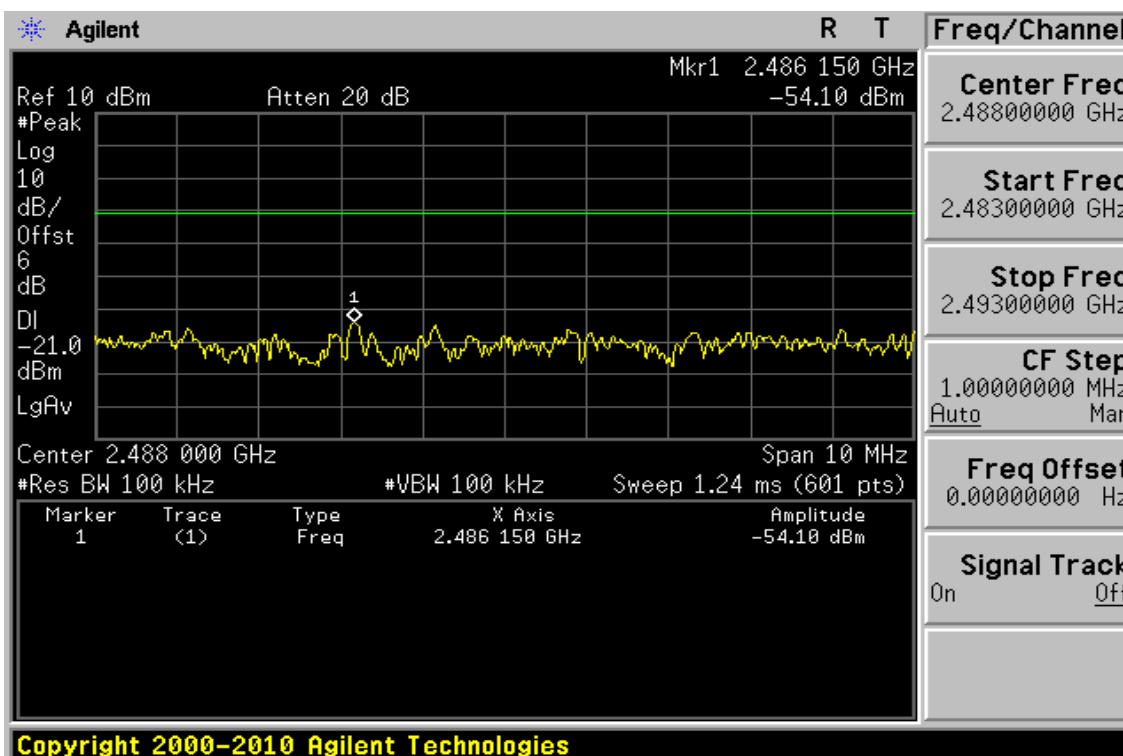
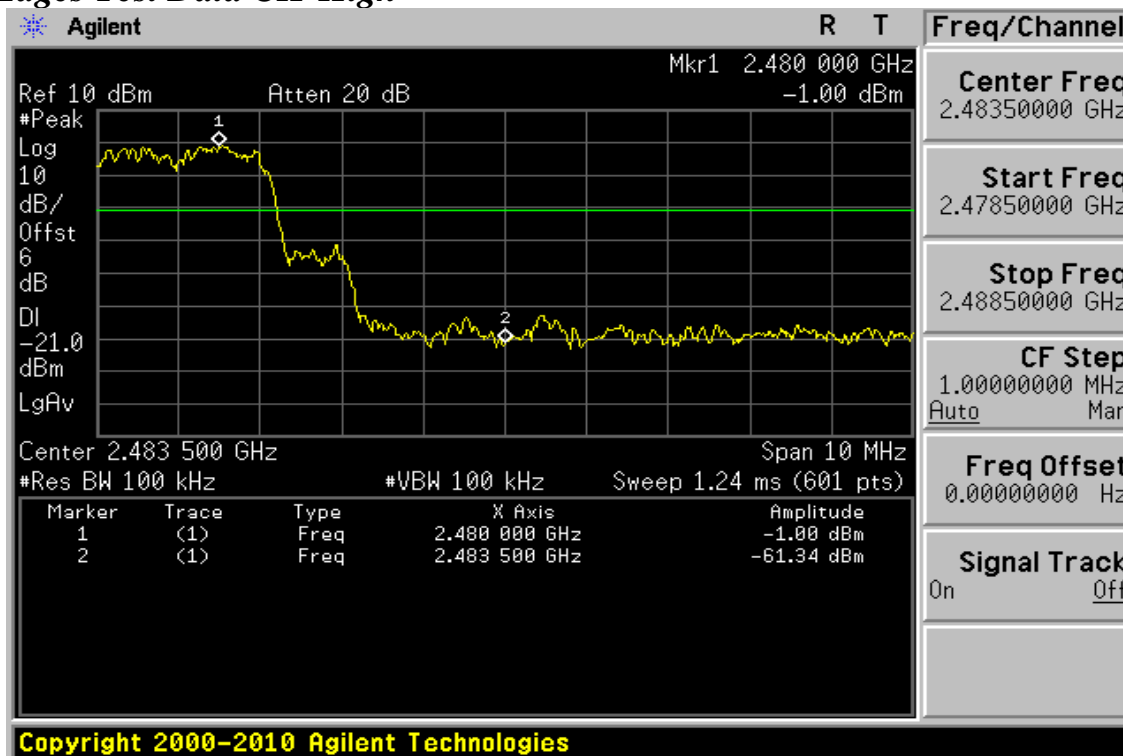
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## Band Edges Test Data CH-High



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**Radiated Emission: (EDR mode)**

Operation Mode TX CH Low  
Fundamental Frequency 2402 MHz  
Temperature 25 °C  
Humidity 65 %

Test Date Jun 14, 2011  
Test By Jazz  
Pol Ver.

Freq. (MHz)	Peak	AV	Ant./CL CF(dB)	Actual FS		Peak	AV	Margin (dB)	Remark
	Reading (dBuV)	Reading (dBuV)		Peak (dBuV/m)	AV (dBuV/m)	Limit (dBuV/m)	Limit (dBuV/m)		
2390.00	45.38	---	-0.67	44.71	---	74.00	54.00	-29.29	Peak

Operation Mode TX CH Low  
Fundamental Frequency 2402 MHz  
Temperature 25 °C  
Humidity 65 %

Test Date Jun 14, 2011  
Test By Jazz  
Pol Hor.

Freq. (MHz)	Peak	AV	Ant./CL CF(dB)	Actual FS		Peak	AV	Margin (dB)	Remark
	Reading (dBuV)	Reading (dBuV)		Peak (dBuV/m)	AV (dBuV/m)	Limit (dBuV/m)	Limit (dBuV/m)		
2390.00	45.08	---	-0.67	44.41	---	74.00	54.00	-29.59	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 .
- (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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Operation Mode TX CH High  
Fundamental Frequency 2480 MHz  
Temperature 25 °C  
Humidity 65 %

Test Date Jun 14, 2011  
Test By Jazz  
Pol Ver.

	Peak	AV		Actual 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/m)	(dB)	
2483.50	46.87	---	-0.52	46.35	---	74.00	54.00	-27.65	Peak

Operation Mode TX CH High  
Fundamental Frequency 2480 MHz  
Temperature 25 °C  
Humidity 65 %

Test Date Jun 14, 2011  
Test By Jazz  
Pol Hor.

	Peak	AV		Actual 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/m)	(dB)	
2483.50	45.83	---	-0.52	45.31	---	74.00	54.00	-28.69	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 .
- (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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## 8. SPURIOUS EMISSION TEST

### 8.1. 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.

According to RSS-Gen §7.2.5 and RSS-210 issue 8, §A2.9, In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the radio frequency power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under section A8.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Tables 2 and 3 is not required. In addition, radiated emissions which fall in the restricted bands of Table 1 must also comply with the radiated emission limits specified in Tables 2 and 3.

### 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:

Refer to section 7.2 for details.

### 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:

Refer to section 7.3 for details.

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#### 8.4. 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.

#### 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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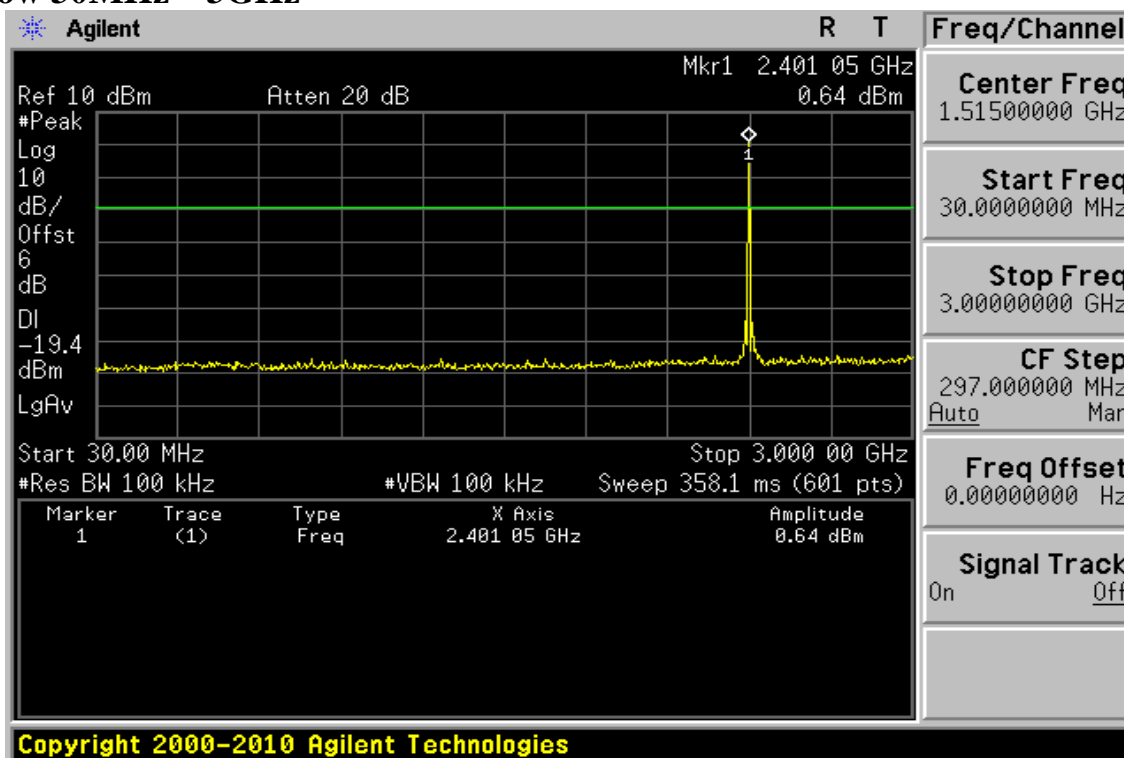
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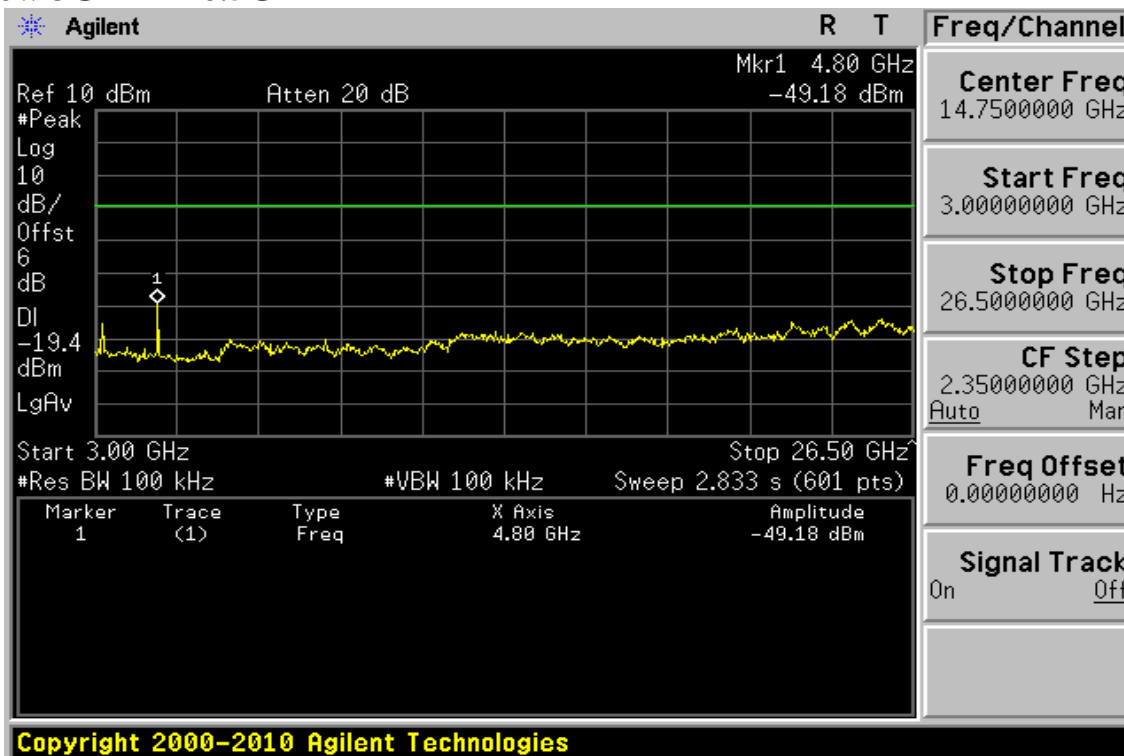
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## EDR Mode Conducted Spurious Emission Measurement Result Ch Low 30MHz – 3GHz



## Ch Low 3GHz – 26.5GHz



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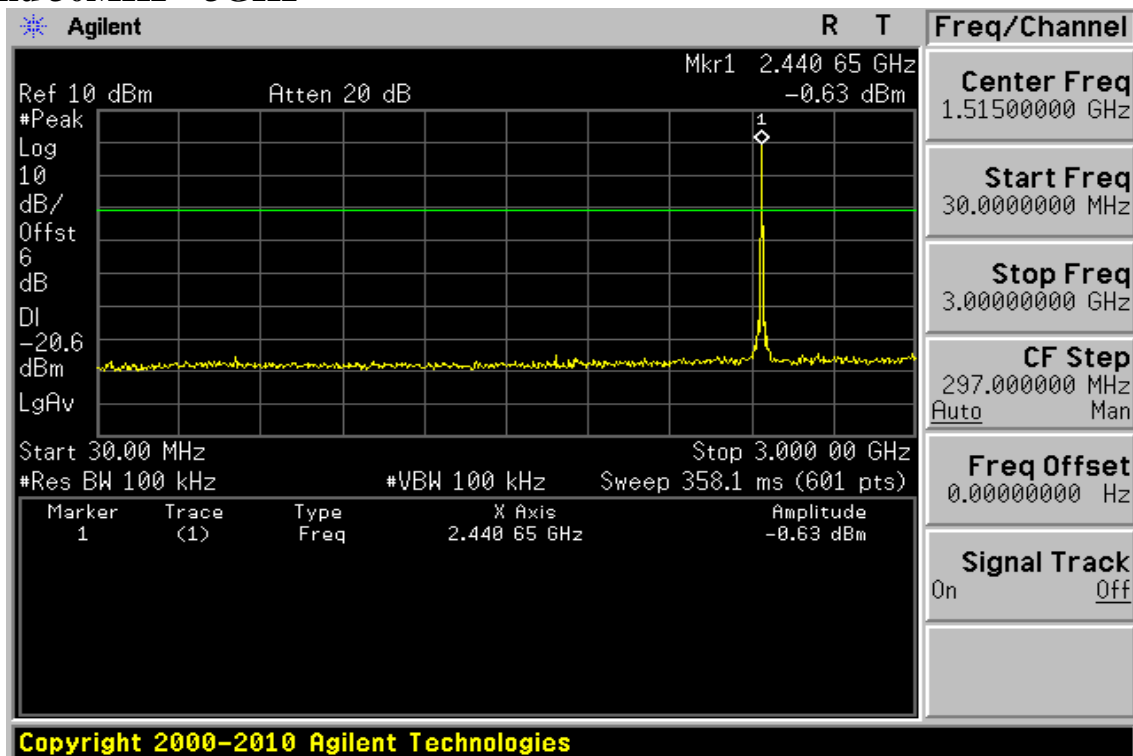
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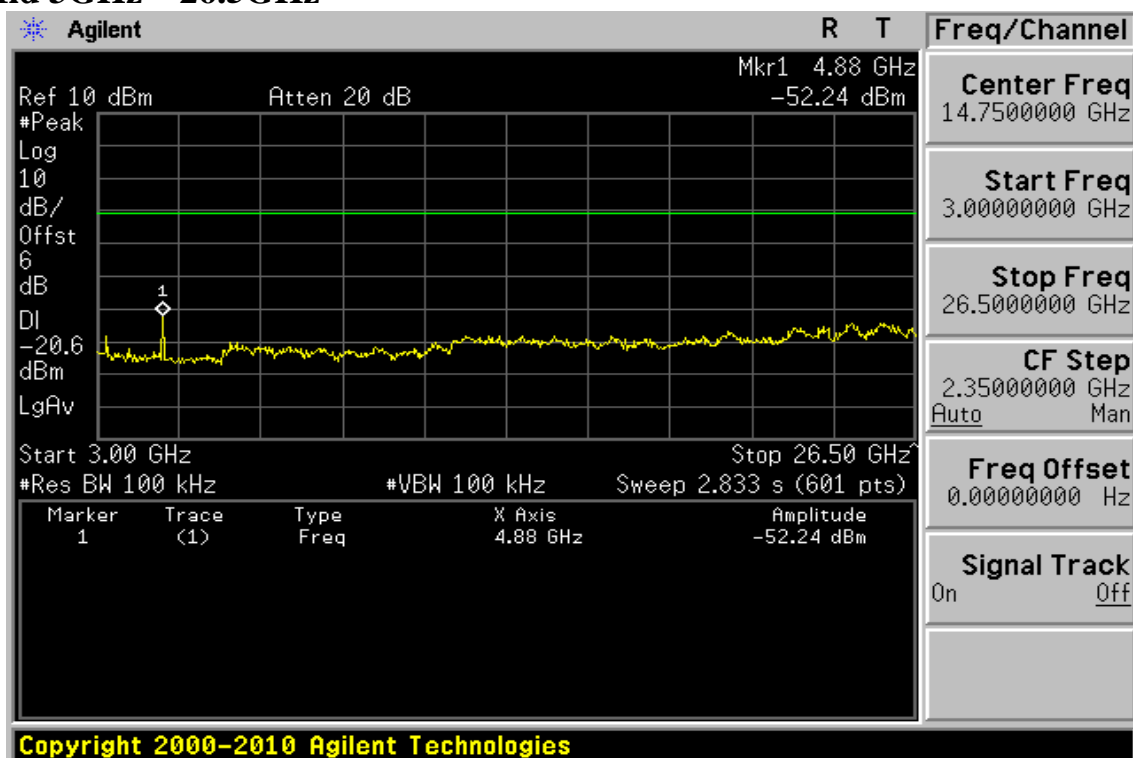
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## Ch Mid 30MHz – 3GHz



## Ch Mid 3GHz – 26.5GHz



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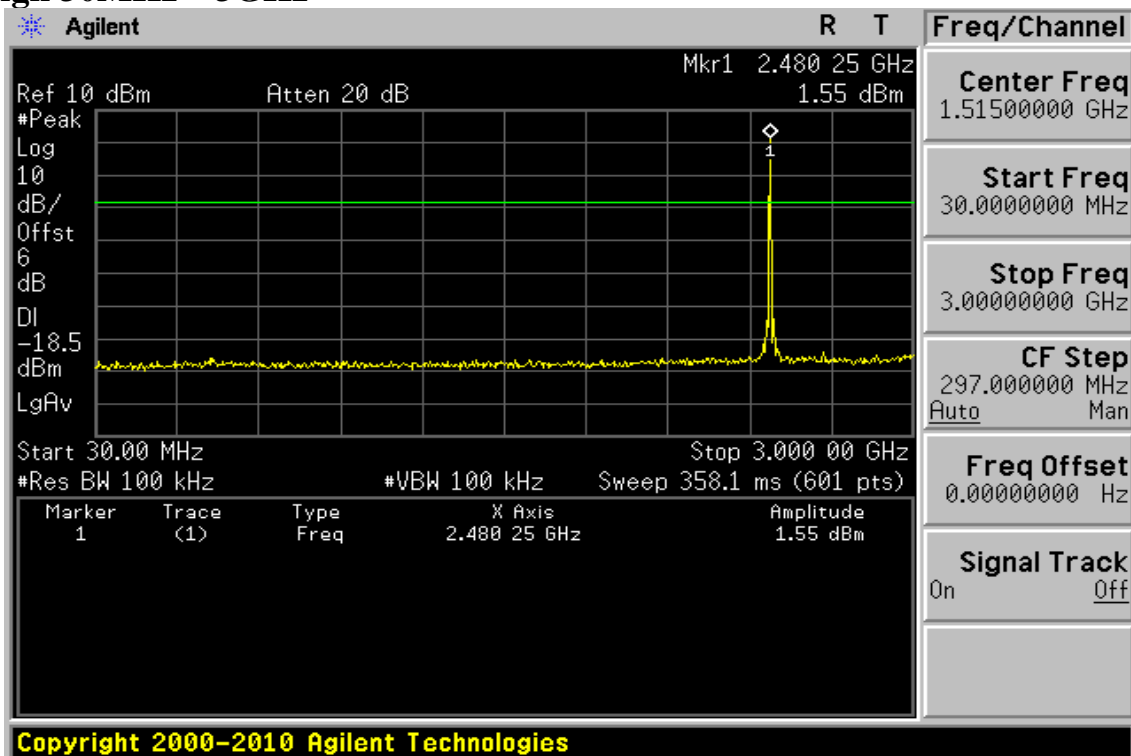
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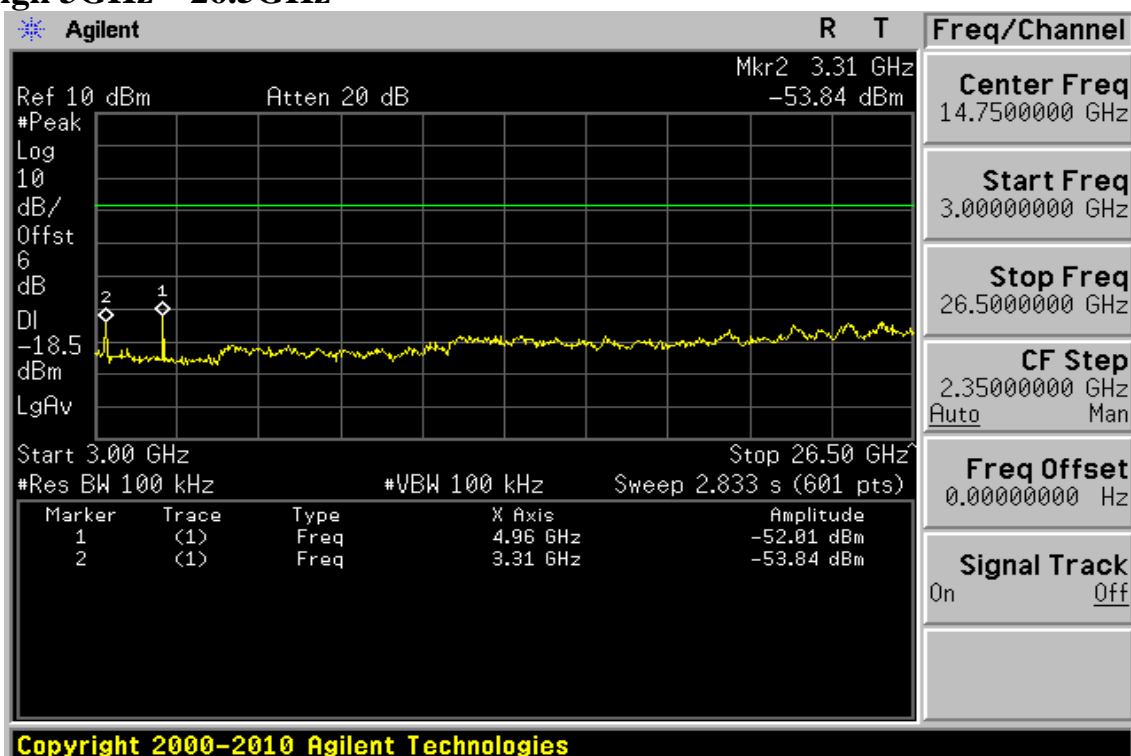
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## Ch High 30MHz – 3GHz



## Ch High 3GHz – 26.5GHz



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**Radiated Spurious Emission Measurement Result (below 1GHz) (Worst EDR mode)**

Operation Mode	TX CH Low	Test Date	Jun 14, 2011
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)	(dB)	(dBuV/m)	(dBuV/m)	(dB)
60.07	V	Peak	50.71	-14.52	36.19	40.00	-3.81
146.40	V	Peak	49.58	-12.51	37.07	43.50	-6.43
226.91	V	Peak	38.76	-14.69	24.07	46.00	-21.93
352.04	V	Peak	37.34	-11.52	25.82	46.00	-20.18
438.37	V	Peak	36.49	-10.08	26.41	46.00	-19.59
886.51	V	Peak	29.99	-2.61	27.38	46.00	-18.62
63.95	H	Peak	40.42	-15.26	25.16	40.00	-14.84
138.64	H	Peak	47.54	-13.10	34.44	43.50	-9.06
225.94	H	Peak	41.32	-14.70	26.62	46.00	-19.38
301.60	H	Peak	45.02	-12.41	32.61	46.00	-13.39
409.27	H	Peak	38.12	-10.70	27.42	46.00	-18.58
832.19	H	Peak	29.19	-3.37	25.82	46.00	-20.18

**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 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.

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Member of SGS Group

Operation Mode TX CH Mid  
Fundamental Frequency 2441MHz  
Temperature 25 °C  
Humidity 65 %

Test Date Jun 14, 2011  
Test By Jazz  
Pol Ver./Hor.

Freq.	Ant.Pol.	Detector Mode	Reading	Factor	Actual FS	Limit3m	Safe Margin
(MHz)	H/V	(PK/QP)	(dBuV)	(dB)	(dBuV/m)	(dBuV/m)	(dB)
59.10	V	Peak	50.72	-14.52	36.20	40.00	-3.80
445.43	V	Peak	49.54	-12.65	36.89	46.00	-9.11
225.94	V	Peak	39.15	-14.70	24.45	46.00	-21.55
345.25	V	Peak	37.71	-11.60	26.11	46.00	-19.89
434.49	V	Peak	37.40	-10.17	27.23	46.00	-18.77
888.45	V	Peak	28.89	-2.57	26.32	46.00	-19.68
62.01	H	Peak	39.98	-14.89	25.09	40.00	-14.91
141.55	H	Peak	47.65	-12.95	34.70	43.50	-8.80
226.91	H	Peak	39.93	-14.69	25.24	46.00	-20.76
302.57	H	Peak	45.12	-12.36	32.76	46.00	-13.24
412.18	H	Peak	38.38	-10.66	27.72	46.00	-18.28
891.36	H	Peak	28.92	-2.53	26.39	46.00	-19.61

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 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.

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Operation Mode TX CH High  
Fundamental Frequency 2480MHz  
Temperature 25 °C  
Humidity 65 %

Test Date Jun 14, 2011  
Test By Jazz  
Pol Ver./Hor.

Freq.	Ant.Pol.	Detector Mode	Reading	Factor	Actual FS	Limit3m	Safe Margin
(MHz)	H/V	(PK/QP)	(dBuV)	(dB)	(dBuV/m)	(dBuV/m)	(dB)
59.10	V	Peak	50.51	-14.52	35.99	40.00	-4.01
141.55	V	Peak	50.71	-12.95	37.76	43.50	-5.74
224.00	V	Peak	38.61	-14.82	23.79	46.00	-22.21
356.89	V	Peak	37.94	-11.48	26.46	46.00	-19.54
437.40	V	Peak	37.38	-10.08	27.30	46.00	-18.70
896.21	V	Peak	28.27	-2.42	25.85	46.00	-20.15
62.01	H	Peak	39.91	-14.89	25.02	40.00	-14.98
141.55	H	Peak	47.20	-12.95	34.25	43.50	-9.25
224.97	H	Peak	40.73	-14.71	26.02	46.00	-19.98
304.51	H	Peak	44.22	-12.32	31.90	46.00	-14.10
418.97	H	Peak	37.74	-10.50	27.24	46.00	-18.76
893.30	H	Peak	27.95	-2.49	25.46	46.00	-20.54

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 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.

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# **Radiated Spurious Emission Measurement Result (above 1GHz) (Worst BDR mode)**

Operation Mode	TX CH Low	Test Date	Jun 14, 2011
Fundamental Frequency	2402 MHz	Test By	Jazz
Temperature	25 °C	Pol	Ver.
Humidity	65 %		

Freq. (MHz)	Peak Reading	AV Reading	Ant./CL CF(dB)	Actual FS		Peak Limit	AV Limit	Margin (dB)	Remark
	(dBuV)	(dBuV)		Peak (dBuV/m)	AV (dBuV/m)	(dBuV/m)	(dBuV/m)		
4804.0	23.36	---	5.25	28.61	---	74.00	54.00	-45.39	Peak
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.

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Operation Mode TX CH Low  
Fundamental Frequency 2402 MHz  
Temperature 25 °C  
Humidity 65 %

Test Date Jun 14, 2011  
Test By Jazz  
Pol Hor.

Freq. (MHz)	Peak Reading	AV Reading	Ant./CL CF(dB)	Actual FS		Peak Limit	AV Limit	Margin (dB)	Remark
	(dBuV)	(dBuV)		Peak (dBuV/m)	AV (dBuV/m)	(dBuV/m)	(dBuV/m)		
4804.0	28.69	---	5.25	33.94	---	74.00	54.00	-40.06	Peak
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.

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Operation Mode TX CH Mid  
Fundamental Frequency 2441 MHz  
Temperature 25 °C  
Humidity 65 %

Test Date Jun 14, 2011  
Test By Jazz  
Pol Ver.

Freq. (MHz)	Peak Reading	AV Reading	Ant./CL CF(dB)	Actual FS		Peak Limit	AV Limit	Margin (dB)	Remark
	(dBuV)	(dBuV)		Peak (dBuV/m)	AV (dBuV/m)	(dBuV/m)	(dBuV/m)		
4882.0	31.10	---	5.43	36.53	---	74.00	54.00	-37.47	Peak
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.

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Operation Mode TX CH Mid  
Fundamental Frequency 2441 MHz  
Temperature 25 °C  
Humidity 65 %

Test Date Jun 14, 2011  
Test By Jazz  
Pol Hor.

Freq. (MHz)	Peak Reading	AV Reading	Ant./CL CF(dB)	Actual FS		Peak Limit	AV Limit	Margin (dB)	Remark
	(dBuV)	(dBuV)		Peak (dBuV/m)	AV (dBuV/m)	(dBuV/m)	(dBuV/m)		
4882.0	31.70	---	5.43	37.13	---	74.00	54.00	-36.87	Peak
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.

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Operation Mode TX CH High  
Fundamental Frequency 2480 MHz  
Temperature 25 °C  
Humidity 65 %

Test Date Jun 14, 2011  
Test By Jazz  
Pol Ver.

Freq. (MHz)	Peak Reading	AV Reading	Ant./CL CF(dB)	Actual FS		Peak Limit	AV Limit	Margin (dB)	Remark
	(dBuV)	(dBuV)		Peak (dBuV/m)	AV (dBuV/m)	(dBuV/m)	(dBuV/m)		
4960.0	35.38	---	5.62	41.00	---	74.00	54.00	-33.00	Peak
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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Operation Mode	TX CH High	Test Date	Jun 14, 2011
Fundamental Frequency	2480 MHz	Test By	Jazz
Temperature	25 °C	Pol	Hor.
Humidity	65 %		

Freq. (MHz)	Peak Reading	AV Reading	Ant./CL CF(dB)	Actual FS		Peak Limit	AV Limit	Margin (dB)	Remark
	(dBuV)	(dBuV)		Peak (dBuV/m)	AV (dBuV/m)	(dBuV/m)	(dBuV/m)		
4960.0	34.96	---	5.62	40.58	---	74.00	54.00	-33.42	Peak
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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### Radiated Spurious Emission Measurement Result (below 1GHz) (Worst EDR mode)

Operation Mode	RX CH Low	Test Date	Jun 14, 2011
Fundamental Frequency	2402MHz	Test By	Jazz
Temperature	25 °C	Pol	Ver./Hor
Humidity	65 %		

Freq. (MHz)	Ant.Pol. H/V	Detector Mode (PK/QP)	Reading (dBuV)	Factor (dB)	Actual FS (dBuV/m)	Limit3m (dBuV/m)	Safe Margin (dB)
59.10	V	Peak	50.51	-14.52	35.99	40.00	-4.01
144.46	V	Peak	49.40	-12.66	36.74	43.50	-6.76
226.91	V	Peak	39.08	-14.69	24.39	46.00	-21.61
351.07	V	Peak	37.42	-11.55	25.87	46.00	-20.13
443.22	V	Peak	36.39	-9.96	26.43	46.00	-19.57
883.60	V	Peak	28.46	-2.66	25.80	46.00	-20.20
62.01	H	Peak	39.94	-14.89	25.05	40.00	-14.95
138.64	H	Peak	47.29	-13.10	34.19	43.50	-9.31
224.97	H	Peak	41.03	-14.71	26.32	46.00	-19.69
301.60	H	Peak	44.75	-12.41	32.34	46.00	-13.66
418.00	H	Peak	39.89	-10.54	29.35	46.00	-16.65
888.45	H	Peak	28.09	-2.57	25.52	46.00	-20.48

#### 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 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.

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Operation Mode RX CH Mid  
Fundamental Frequency 2441MHz  
Temperature 25°C  
Humidity 65 %

Test Date Jun 14, 2011  
Test By Jazz  
Pol Ver./Hor

Freq. (MHz)	Ant.Pol. H/V	Detector Mode (PK/QP)	Reading (dBuV)	Factor (dB)	Actual FS (dBuV/m)	Limit3m (dBuV/m)	Safe Margin (dB)
59.10	V	Peak	50.97	-14.52	36.45	40.00	-3.55
141.55	V	Peak	49.73	-12.95	36.78	43.50	-6.72
225.94	V	Peak	40.24	-14.70	25.54	46.00	-20.46
356.89	V	Peak	38.06	-11.48	26.58	46.00	-19.42
433.52	V	Peak	36.05	-10.16	25.89	46.00	-20.11
824.43	V	Peak	29.66	-3.39	26.27	46.00	-19.73
63.95	H	Peak	40.20	-15.26	24.94	40.00	-15.06
145.43	H	Peak	47.00	-12.65	34.35	43.50	-9.15
225.94	H	Peak	40.89	-14.70	26.19	46.00	-19.81
303.54	H	Peak	43.80	-12.37	31.43	46.00	-14.57
430.61	H	Peak	38.77	-10.25	28.52	46.00	-17.48
888.45	H	Peak	28.57	-2.57	26.00	46.00	-20.00

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 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.

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Operation Mode RX CH High  
Fundamental Frequency 2480MHz  
Temperature 25 °C  
Humidity 65%

Test Date Jun 14, 2011  
Test By Jazz  
Pol Ver./Hor

Freq. (MHz)	Ant.Pol. H/V	Detector Mode (PK/QP)	Reading (dBuV)	Factor (dB)	Actual FS (dBuV/m)	Limit3m (dBuV/m)	Safe Margin (dB)
60.07	V	Peak	50.63	-14.52	36.11	40.00	-3.89
145.43	V	Peak	49.48	-12.65	36.83	43.50	-6.67
225.94	V	Peak	38.95	-14.70	24.25	46.00	-21.75
355.92	V	Peak	37.84	-11.47	26.37	46.00	-19.63
445.16	V	Peak	37.61	-9.92	27.69	46.00	-18.31
835.10	V	Peak	29.43	-3.35	26.08	46.00	-19.92
60.07	H	Peak	39.55	-14.52	25.03	40.00	-14.97
136.70	H	Peak	47.98	-13.26	34.72	43.50	-8.78
225.94	H	Peak	40.37	-14.70	25.67	46.00	-20.33
301.60	H	Peak	44.63	-12.41	32.22	46.00	-13.78
128.67	H	Peak	38.33	-10.30	28.03	43.50	-15.47
898.15	H	Peak	27.98	-2.33	25.65	46.00	-20.35

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 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.

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### Radiated Spurious Emission Measurement Result (above 1GHz) (Worst EDR mode)

Operation Mode	RX CH Low	Test Date	Jun 14, 2011
Fundamental Frequency	2402 MHz	Test By	Jazz
Temperature	25°C	Pol	Ver.
Humidity	65 %		

Freq. (MHz)	Peak Reading (dBuV)	AV Reading (dBuV)	Ant./CL CF(dB)	Actual FS		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
				Peak (dBuV/m)	AV (dBuV/m)				
4776.5	24.14	---	5.10	29.24	---	74.00	54.00	-44.76	Peak
4804.0	----					74.00	54.00		
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 scanned 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- 40GHz, RBW= 1MHz, VBW= 3MHz, Sweep time= 200 ms.
- (5) Spectrum AV Setting : 1GHz- 40GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

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Operation Mode RX CH Low  
Fundamental Frequency 2402 MHz  
Temperature 25 °C  
Humidity 65 %

Test Date Jun 14, 2011  
Test By Jazz  
Pol Hor

Freq. (MHz)	Peak Reading (dBuV)	AV Reading (dBuV)	Ant./CL CF(dB)	Actual FS		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
				Peak (dBuV/m)	AV (dBuV/m)				
4804.0	----					74.00	54.00		
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 scanned 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- 40GHz, RBW= 1MHz, VBW= 3MHz, Sweep time= 200 ms.
- (5) Spectrum AV Setting : 1GHz- 40GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

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Operation Mode RX CH Mid  
Fundamental Frequency 2441 MHz  
Temperature 25 °C  
Humidity 65 %

Test Date Jun 14, 2011  
Test By Jazz  
Pol Ver

Freq. (MHz)	Peak Reading (dBuV)	AV Reading (dBuV)	Ant./CL CF(dB)	Actual FS		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
				Peak (dBuV/m)	AV (dBuV/m)				
4882.0	----					74.00	54.00		
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 scanned 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- 40GHz, RBW= 1MHz, VBW= 3MHz, Sweep time= 200 ms.
- (5) Spectrum AV Setting : 1GHz- 40GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

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Operation Mode RX CH Mid  
Fundamental Frequency 2441 MHz  
Temperature 25 °C  
Humidity 65%

Test Date Jun 14, 2011  
Test By Jazz  
Pol Hor

Freq. (MHz)	Peak Reading	AV Reading	Ant./CL CF(dB)	Actual FS		Peak Limit	AV Limit	Margin (dB)	Remark
	(dBuV)	(dBuV)		Peak (dBuV/m)	AV (dBuV/m)	(dBuV/m)	(dBuV/m)		
4882.0	----					74.00	54.00		
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 scanned 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- 40GHz, RBW= 1MHz, VBW= 3MHz, Sweep time= 200 ms.
- (5) Spectrum AV Setting : 1GHz- 40GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

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Operation Mode RX CH High  
Fundamental Frequency 2480 MHz  
Temperature 25 °C  
Humidity 65 %

Test Date Jun 14, 2011  
Test By Jazz  
Pol Ver

Freq. (MHz)	Peak Reading (dBuV)	AV Reading (dBuV)	Ant./CL CF(dB)	Actual FS		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
				Peak (dBuV/m)	AV (dBuV/m)				
4960.0	----					74.00	54.00		
4978.0	23.29	---	5.66	28.95	---	74.00	54.00	-45.05	Peak
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 scanned 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- 40GHz, RBW= 1MHz, VBW= 3MHz, Sweep time= 200 ms.
- (5) Spectrum AV Setting : 1GHz- 40GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

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Operation Mode RX CH High  
Fundamental Frequency 2480 MHz  
Temperature 25 °C  
Humidity 65 %

Test Date Jun 14, 2011  
Test By Jazz  
Pol Hor

Freq. (MHz)	Peak Reading (dBuV)	AV Reading (dBuV)	Ant./CL CF(dB)	Actual FS		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
				Peak (dBuV/m)	AV (dBuV/m)				
4960.0	----					74.00	54.00		
4906.5	24.27	---	5.47	29.74	---	74.00	54.00	-44.26	Peak
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 scanned 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- 40GHz, RBW= 1MHz, VBW= 3MHz, Sweep time= 200 ms.
- (5) Spectrum AV Setting : 1GHz- 40GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

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## 9. FREQUENCY SEPARATION

### 9.1. Standard Applicable:

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

According to RSS 210 issue 8, A8.1(b), frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater.

### 9.2. Measurement Equipment Used:

Refer to section 6.2 for details.

### 9.3. Test Set-up:

Refer to section 6.3 for details.

### 9.4. 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=3KHz, Adjust Span to 3.0 MHz, Sweep = auto.
5. Max hold. Mark 3 Peaks of hopping channel and record the 3 peaks frequency.

### 9.5. Measurement Result:

Channel separation (MHz)	Limit	Result
1	$\geq 25\text{KHz}$ or 2/3 times 20dB bandwidth	PASS

Note: Refer to next page for plots.

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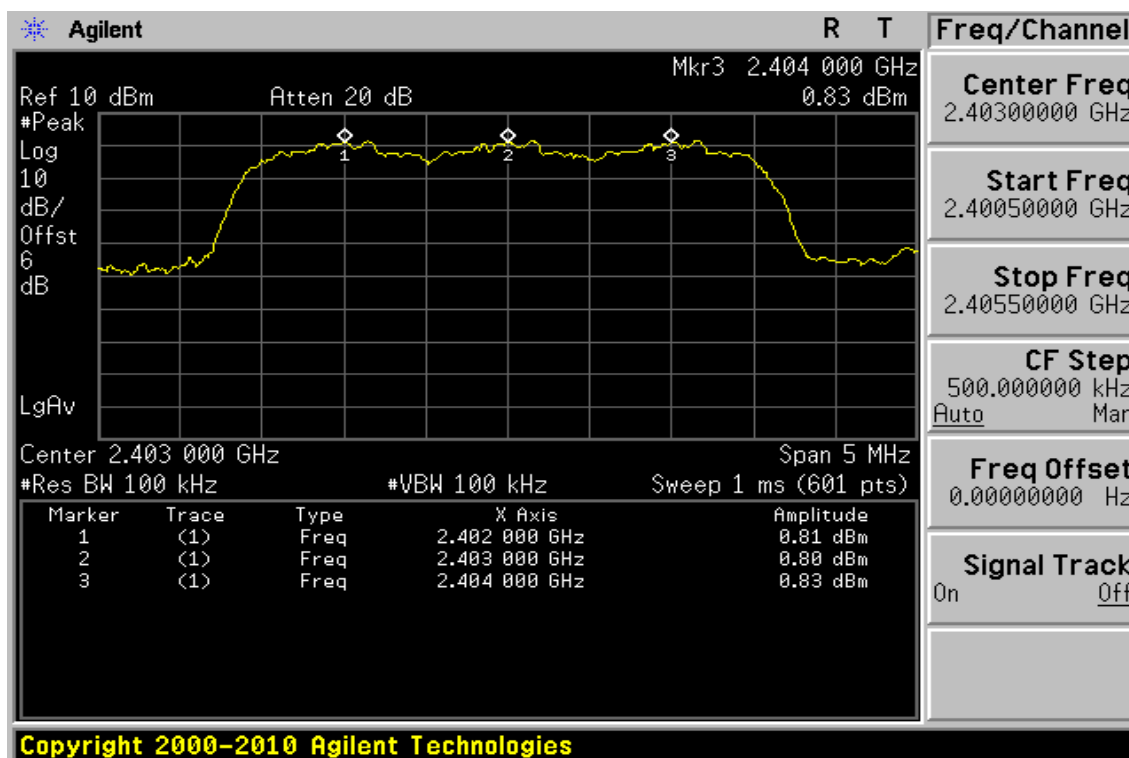
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## Frequency Separation Test Data



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## 10. NUMBER OF HOPPING FREQUENCY

### 10.1. 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.

According to RSS-210 issue 8, §A8.1(d), For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 hopping channels, the maximum conducted output power shall not exceed 1 W. For all other frequency hopping systems, the maximum peak conducted output power shall not exceed 0.125 W.

### 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 spectrum analyzer Start=2400MHz, Stop = 2483.5MHz, Sweep = auto.
4. Set the spectrum analyzer as RBW=430KHz, VBW=100MHz,
5. Max hold, view and count how many channel in the band.

### 10.5. Measurement Result:

Note: Refer to next page for plots.

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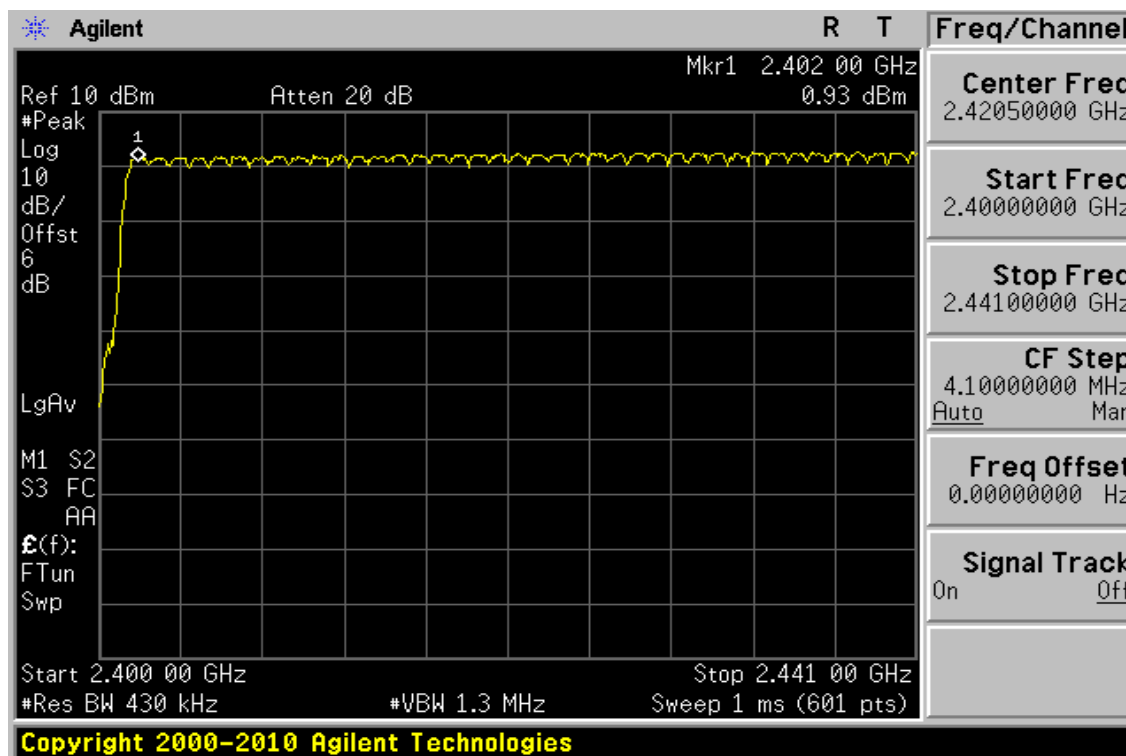
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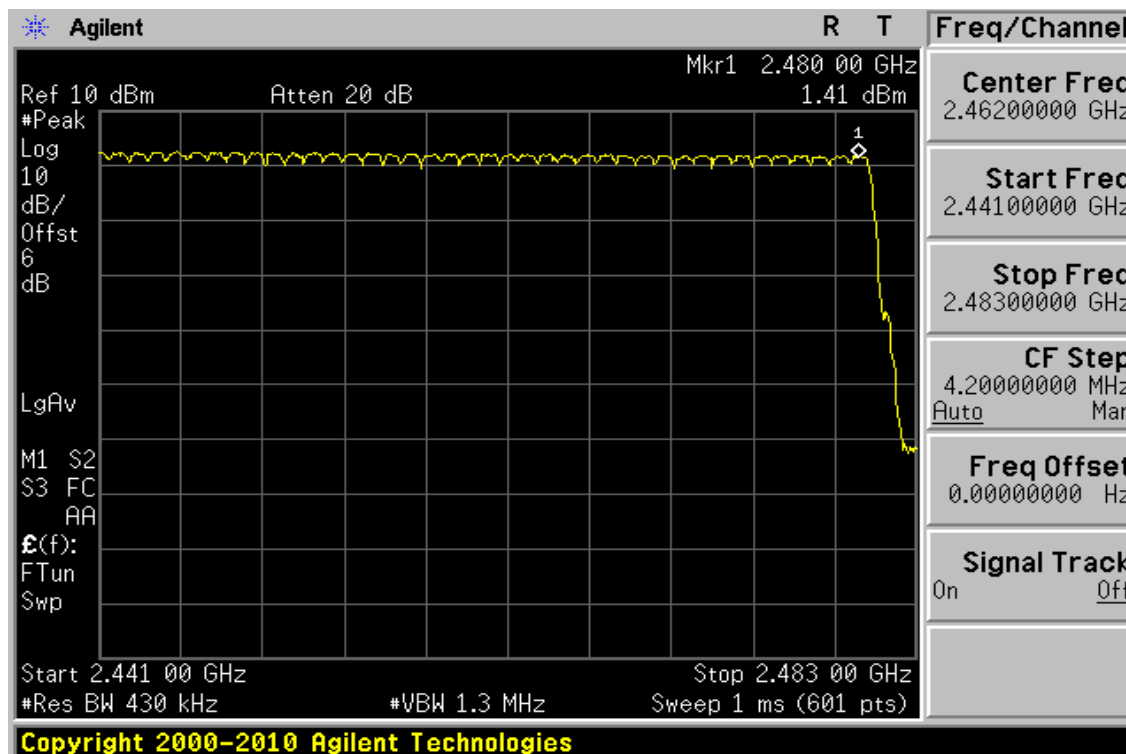
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## Channel Number 2.4 GHz – 2.441GHz



## 2.441 GHz – 2.4835GHz



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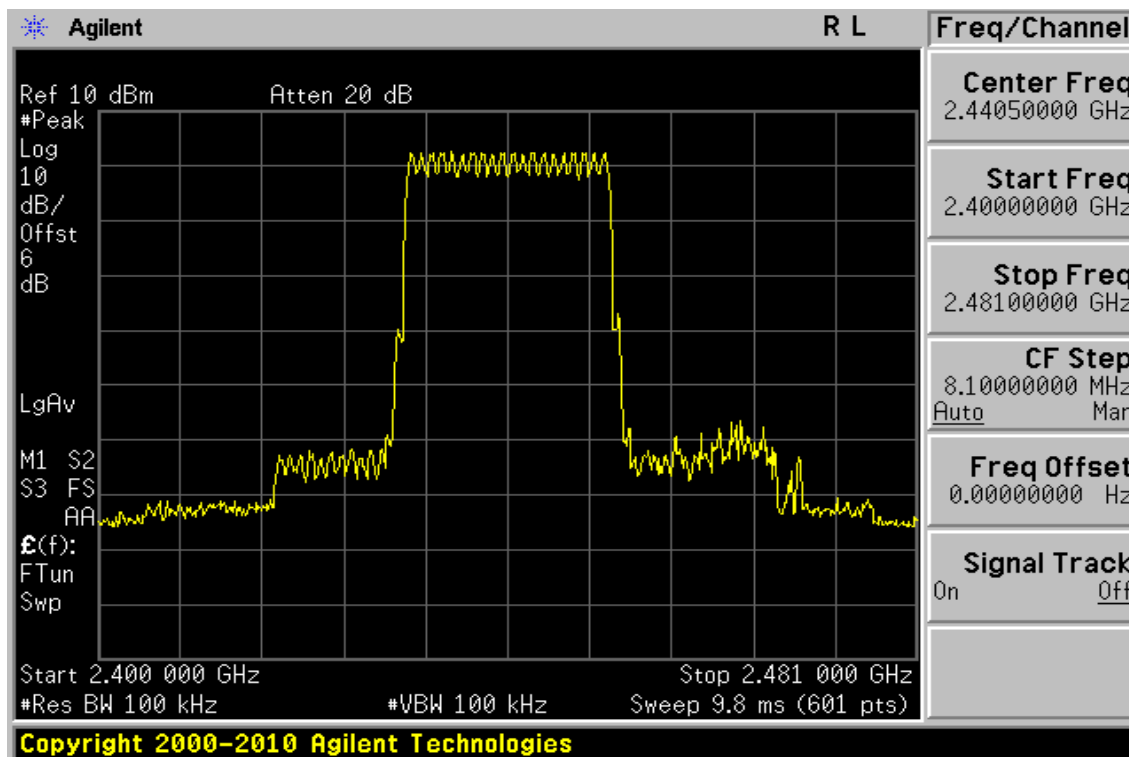
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AFH



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## 11. TIME OF OCCUPANCY (DWELL TIME)

### 11.1. 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.

According to RSS-210 issue 8, §A8.1(d), Frequency hopping systems operating in the 2400-2483.5 MHz band shall use at least 15 hopping channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Transmissions on particular hopping frequencies may be avoided or suppressed provided that a minimum of 15 hopping channels are used.

### 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 center frequency of spectrum analyzer = operating frequency.
4. Set the spectrum analyzer as RBW, VBW=1 MHz /3MHz, Span = 0Hz , Adjust Sweep = 30s.
5. Repeat above procedures until all frequency measured were complete.

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### 11.5. Measurement Result:

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

CH Low: DH1 time slot = 0.3833 (ms) \* (1600/(2\*79)) \* 31.6 = 124.80 (ms)

DH3 time slot = 1.633 (ms) \* (1600/(4\*79)) \* 31.6 = 264.00 (ms)

DH5 time slot = 2.895 (ms) \* (1600/(6\*79)) \* 31.6 = 308.80 (ms)

CH Mid: DH1 time slot = 0.3833 (ms) \* (1600/(2\*79)) \* 31.6 = 124.80 (ms)

DH3 time slot = 1.625 (ms) \* (1600/(4\*79)) \* 31.6 = 259.90 (ms)

DH5 time slot = 2.895 (ms) \* (1600/(6\*79)) \* 31.6 = 308.80 (ms)

CH High: DH1 time slot = 0.3833 (ms) \* (1600/(2\*79)) \* 31.6 = 124.80 (ms)

DH3 time slot = 1.633 (ms) \* (1600/(4\*79)) \* 31.6 = 264.00 (ms)

DH5 time slot = 2.895 (ms) \* (1600/(6\*79)) \* 31.6 = 308.80 (ms)

Note: Refer to next page for plots.

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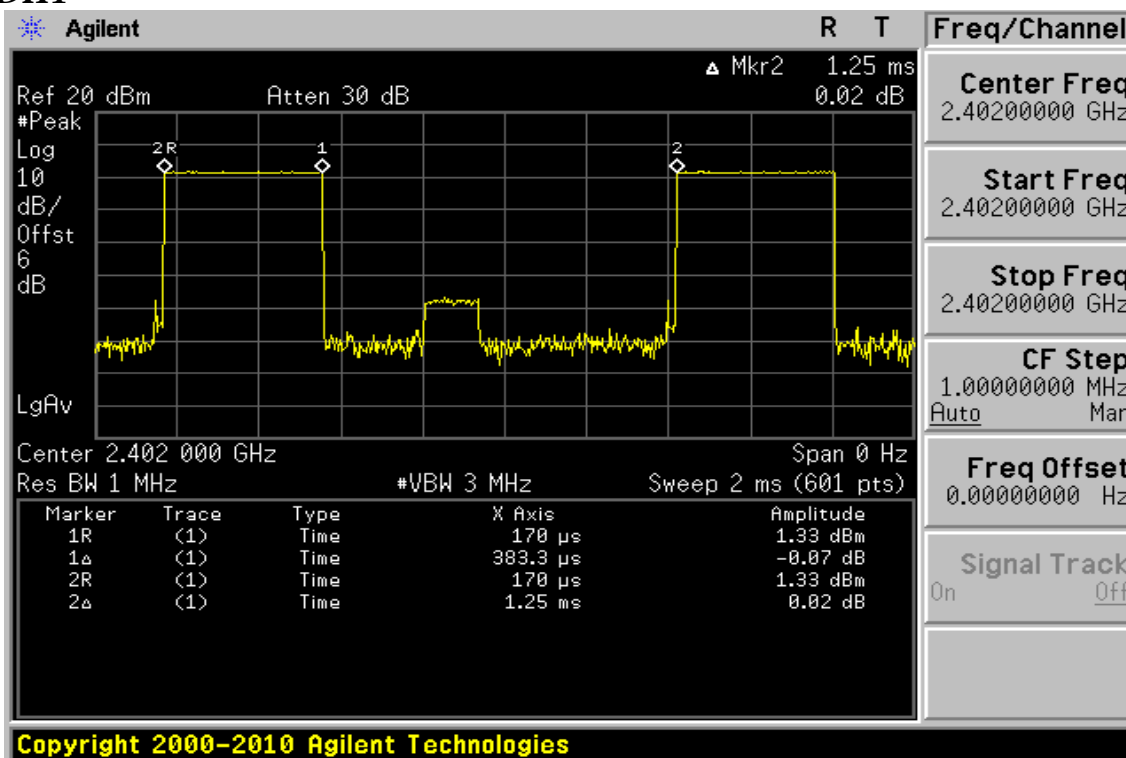
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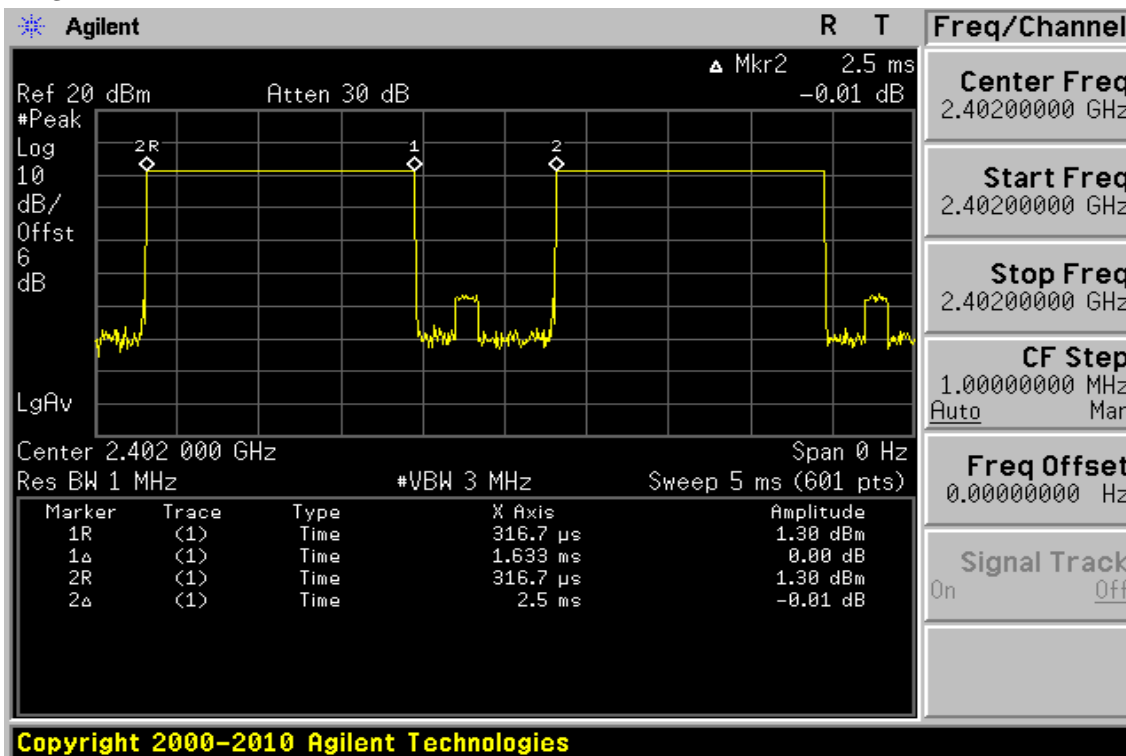
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## CH-Low

### DH1



### DH3



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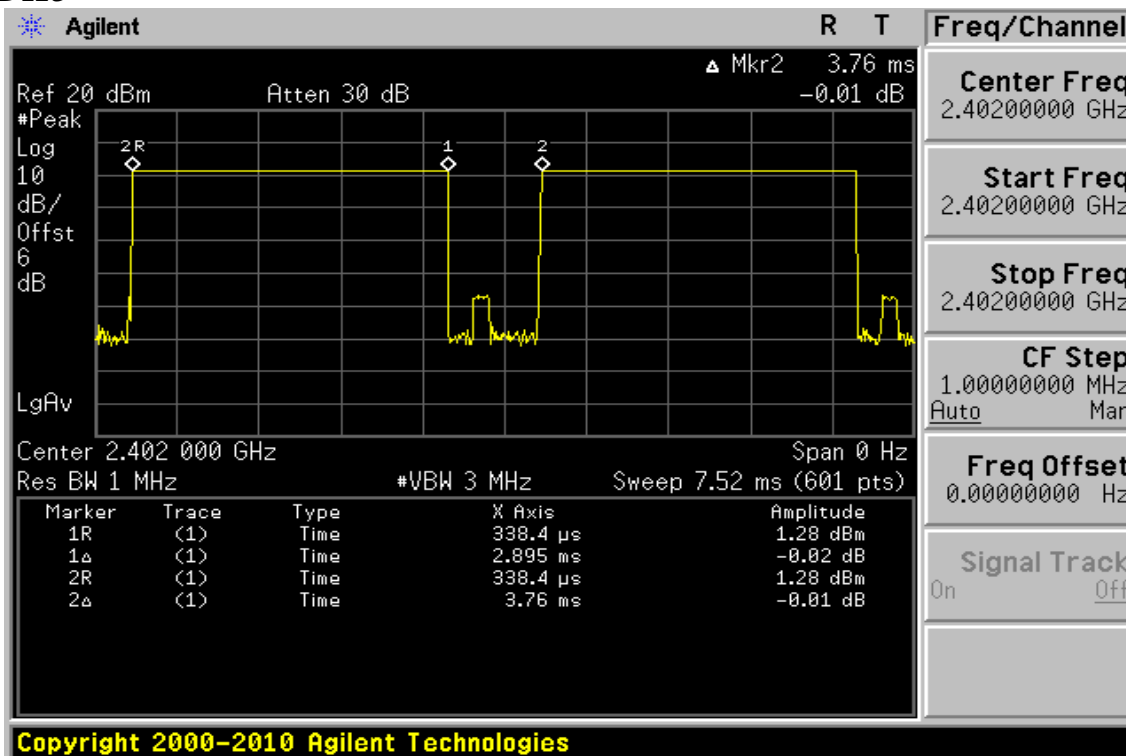
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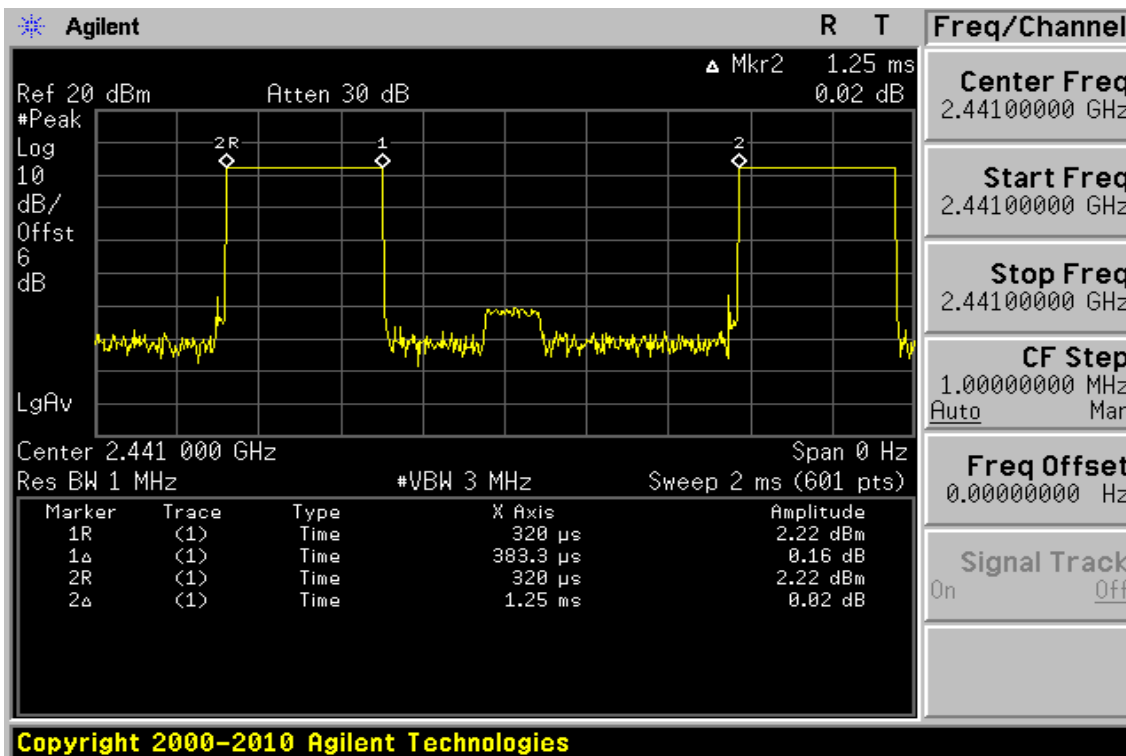


## DH5



## CH-Mid

## DH1



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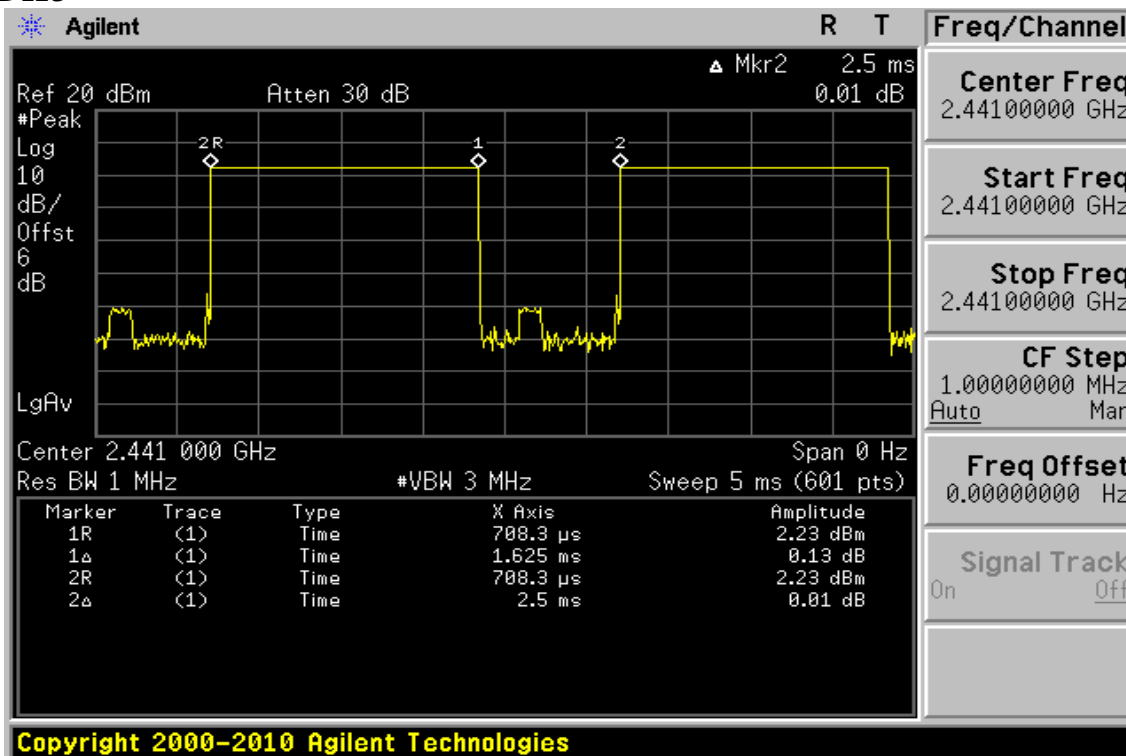
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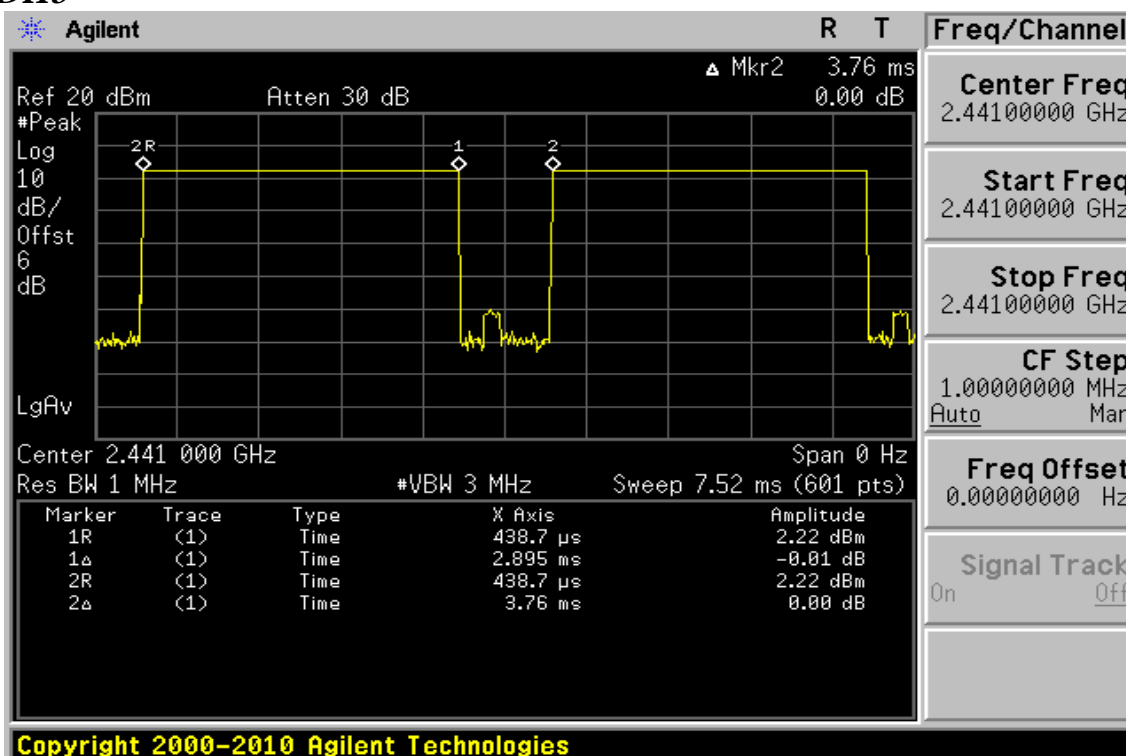
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## DH3



## DH5



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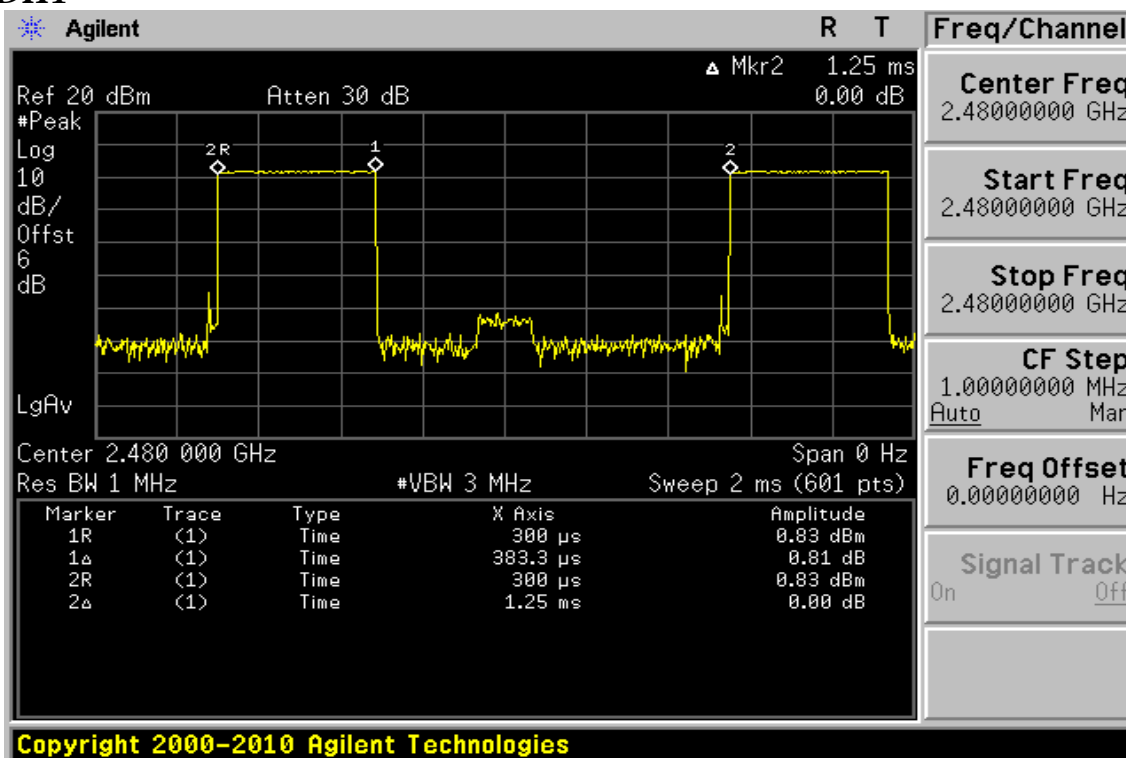
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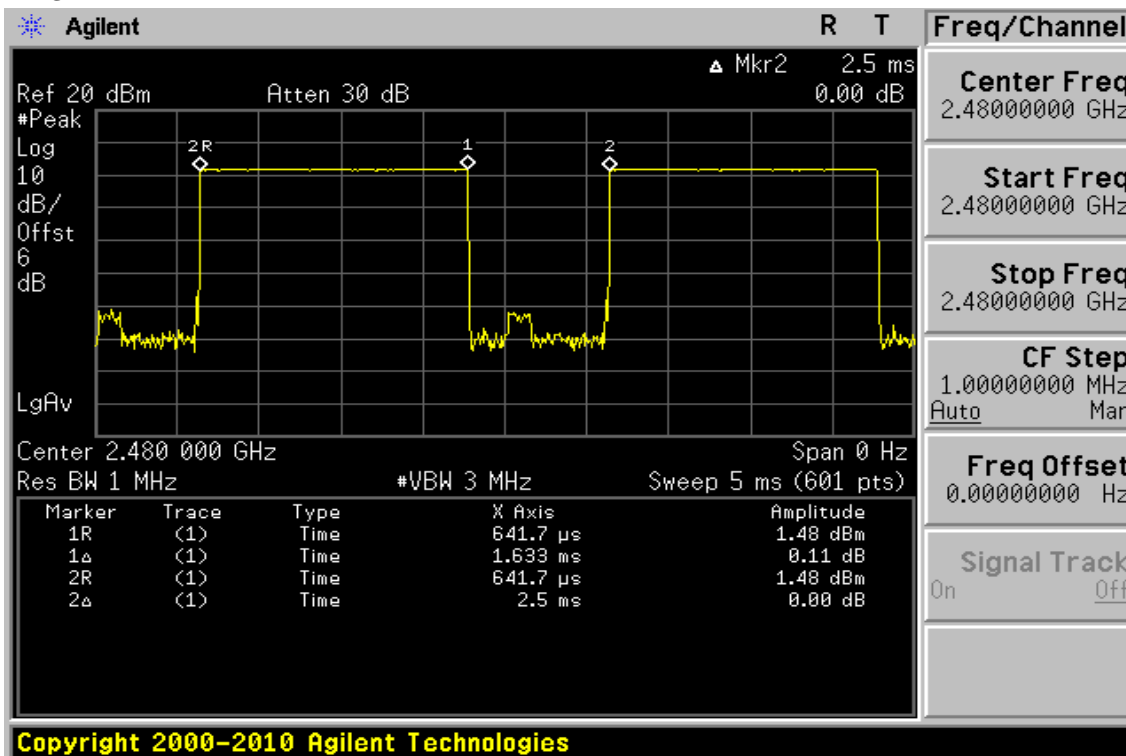
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## CH-High DH1



## DH3



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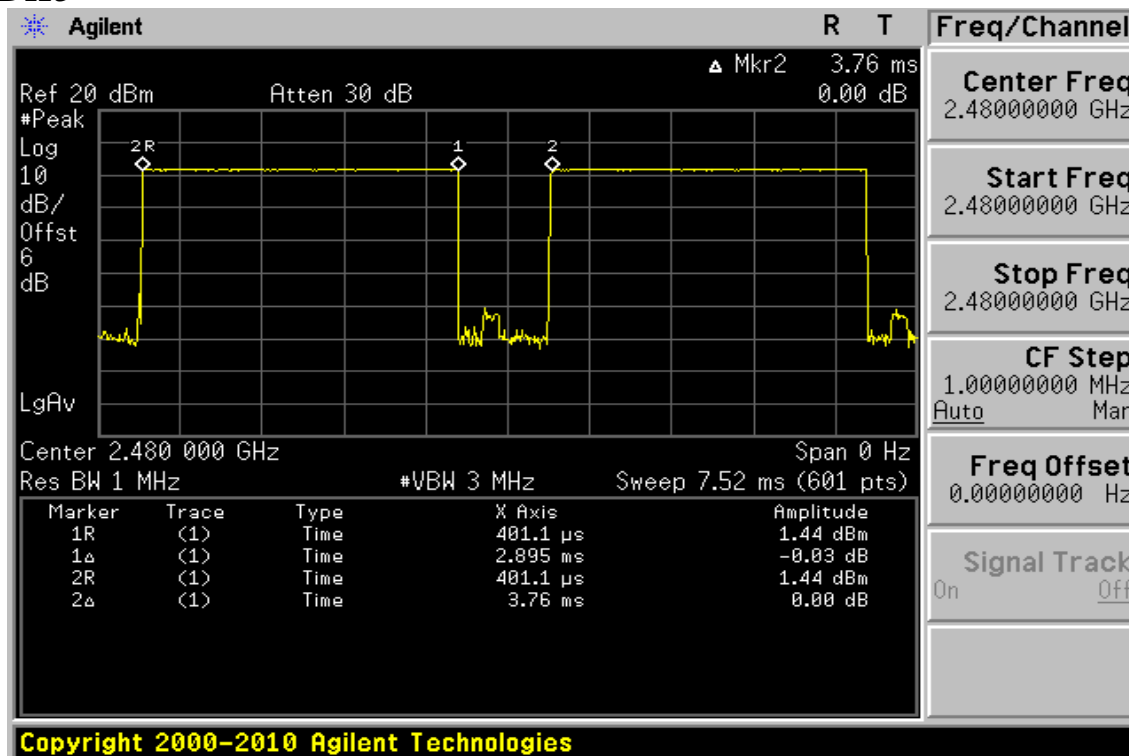
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## DH5



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## 12. 20dB Bandwidth & 99% Bandwidth

### 12.1. Standard Applicable:

According to §15.247(a)(1), and RSS210 A8.1(b) for frequency hopping systems operating in the 2400MHz-2483.5 MHz no limit for 20dB bandwidth.

### 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 the spectrum analyzer as  $RBW \geq 1\%$  of Band width.  $VBW \geq RBW$ , 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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## 12.5. Measurement Result:

### 20dB Bandwidth : BDR mode

CH	Bandwidth (kHz)
Lower	918.809
Mid	886.908
Higher	920.049

### 20dB Bandwidth : EDR mode

CH	Bandwidth (MHz)	2/3 Bandwidth (MHz)
Lower	1.276	0.851
Mid	1.288	0.859
Higher	1.280	0.853

### 99% Bandwidth : BDR Mode

CH	Bandwidth (kHz)
Lower	869.0327
Mid	866.5902
Higher	868.8311

### 99% Bandwidth : EDR Mode

CH	Bandwidth (MHz)
Lower	1.1804
Mid	1.2008
Higher	1.1965

Note: Refer to next page for plots.

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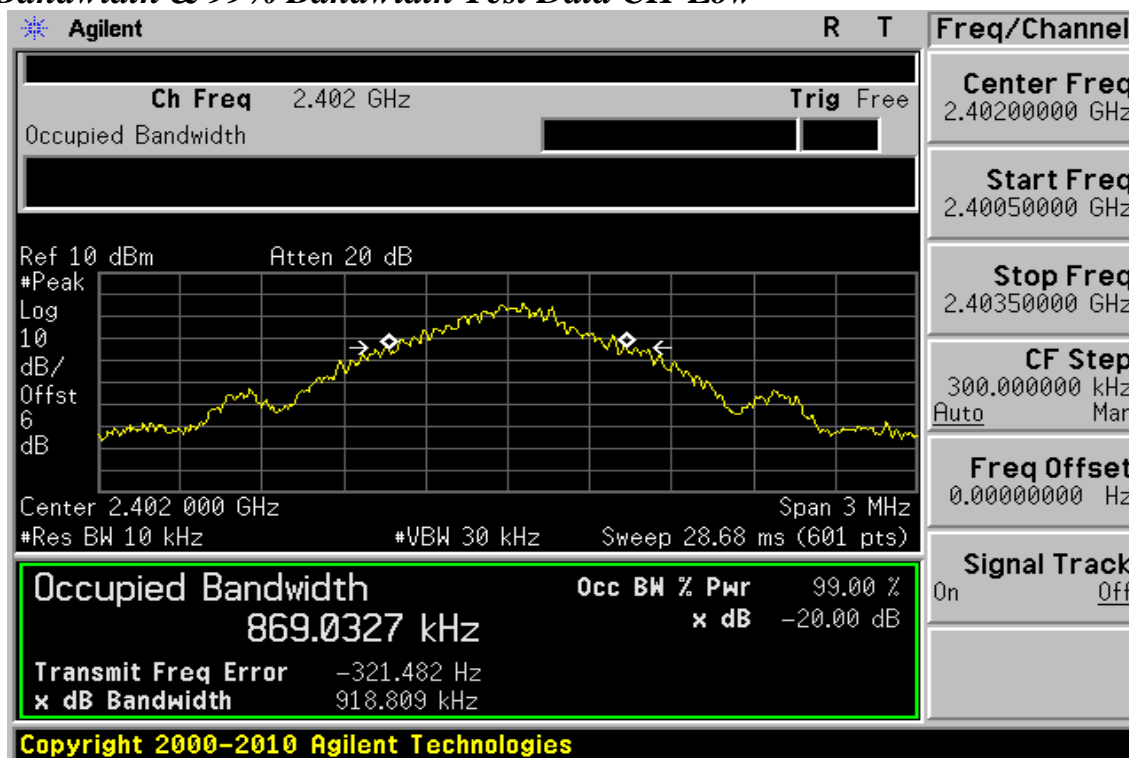
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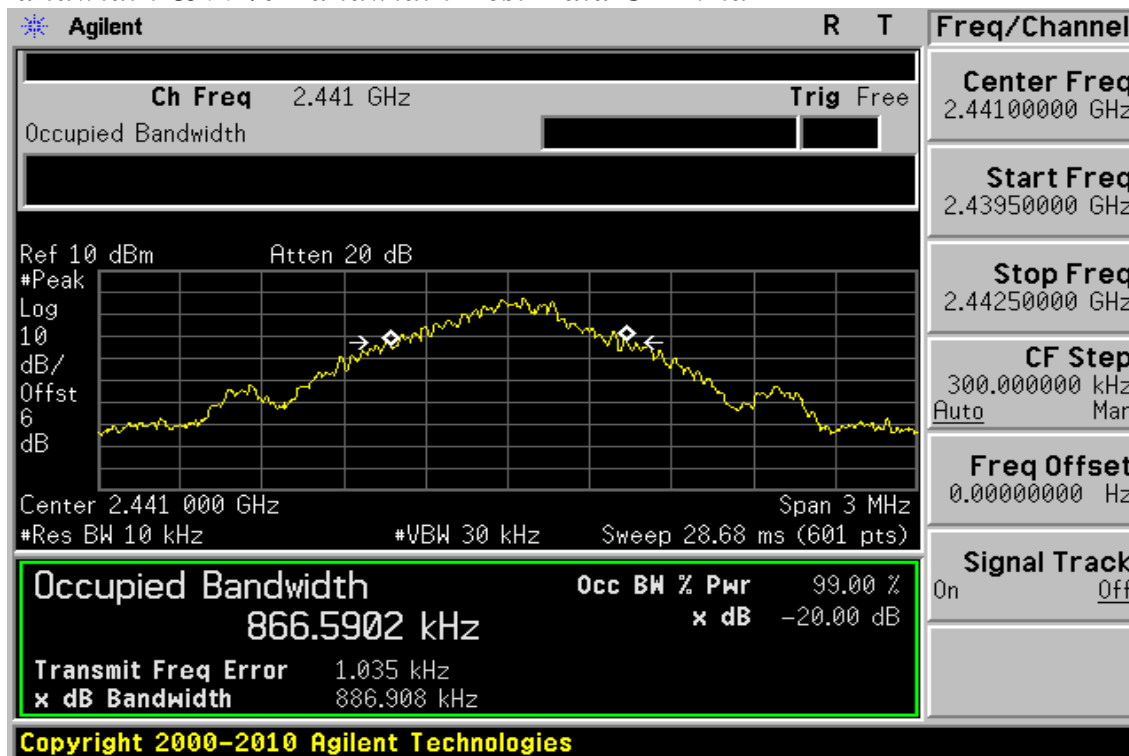
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## BDR Mode

### 20dB Bandwidth & 99% Bandwidth Test Data CH-Low



### 20dB Bandwidth & 99% Bandwidth Test Data CH-Mid



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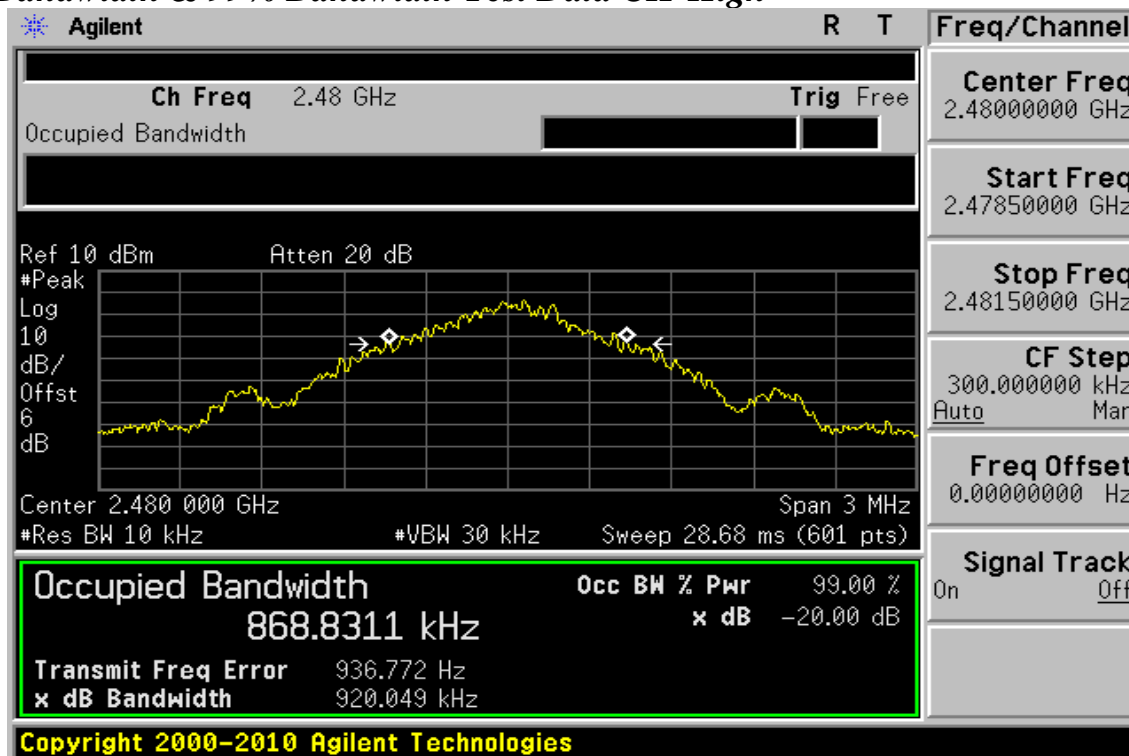
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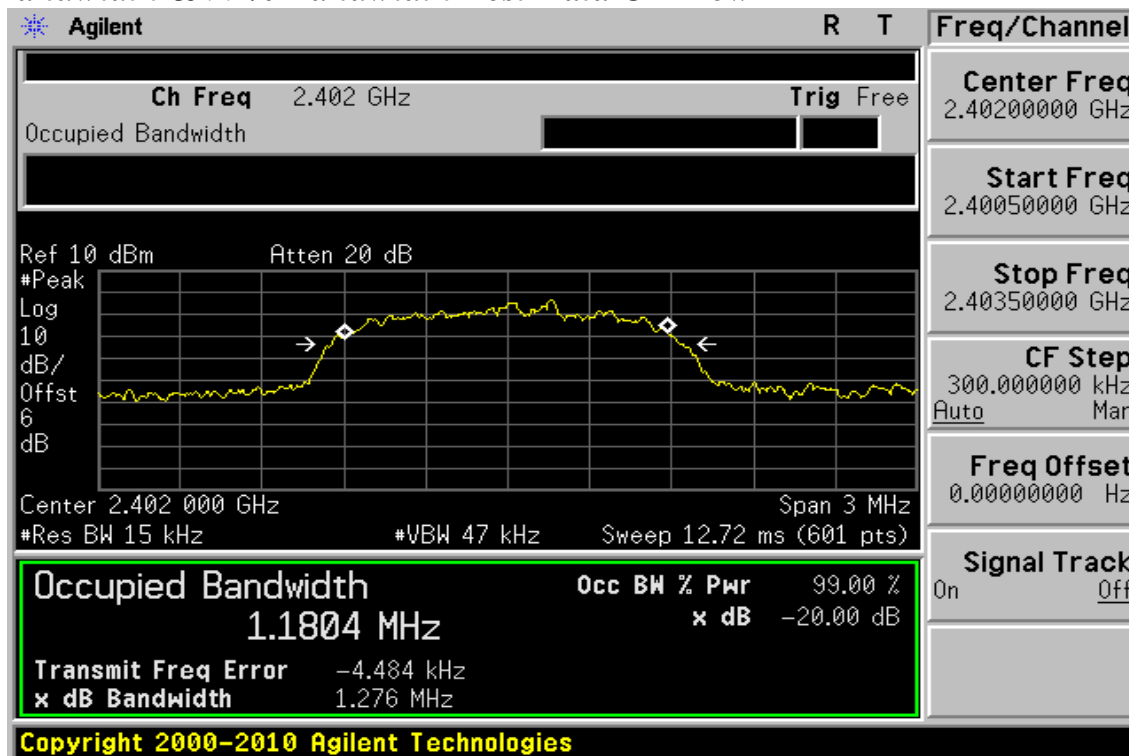
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## 20dB Bandwidth & 99% Bandwidth Test Data CH-High



## EDR Mode

## 20dB Bandwidth & 99% Bandwidth Test Data CH-Low



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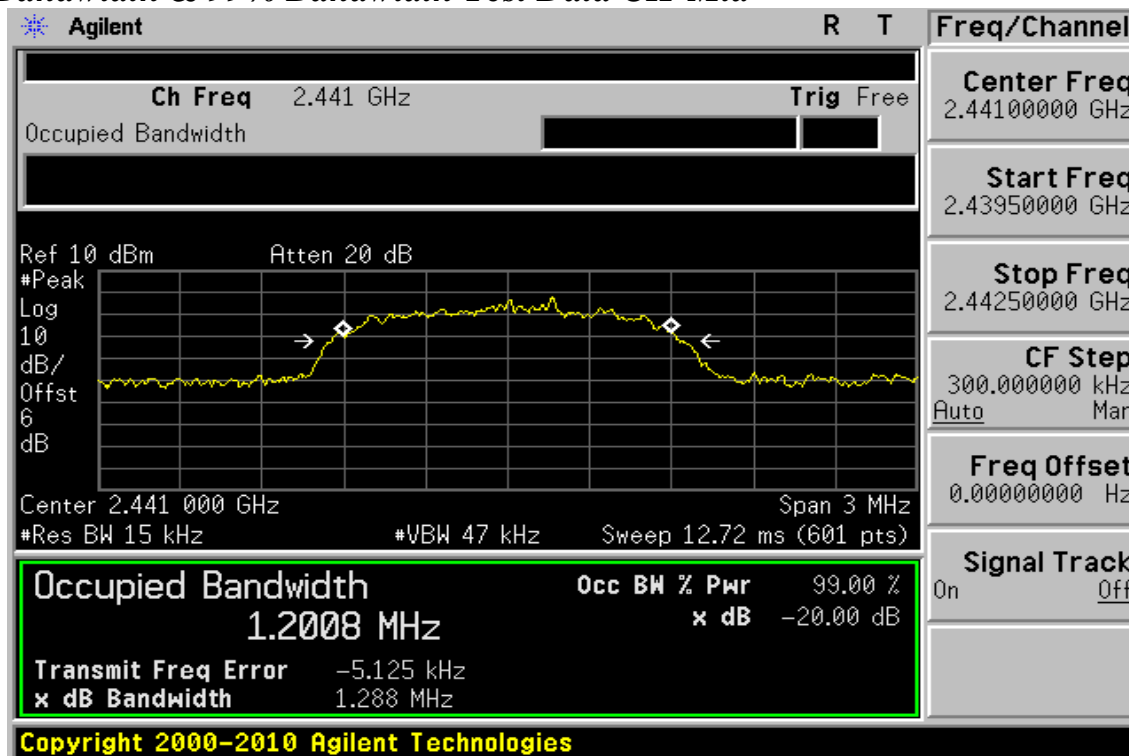
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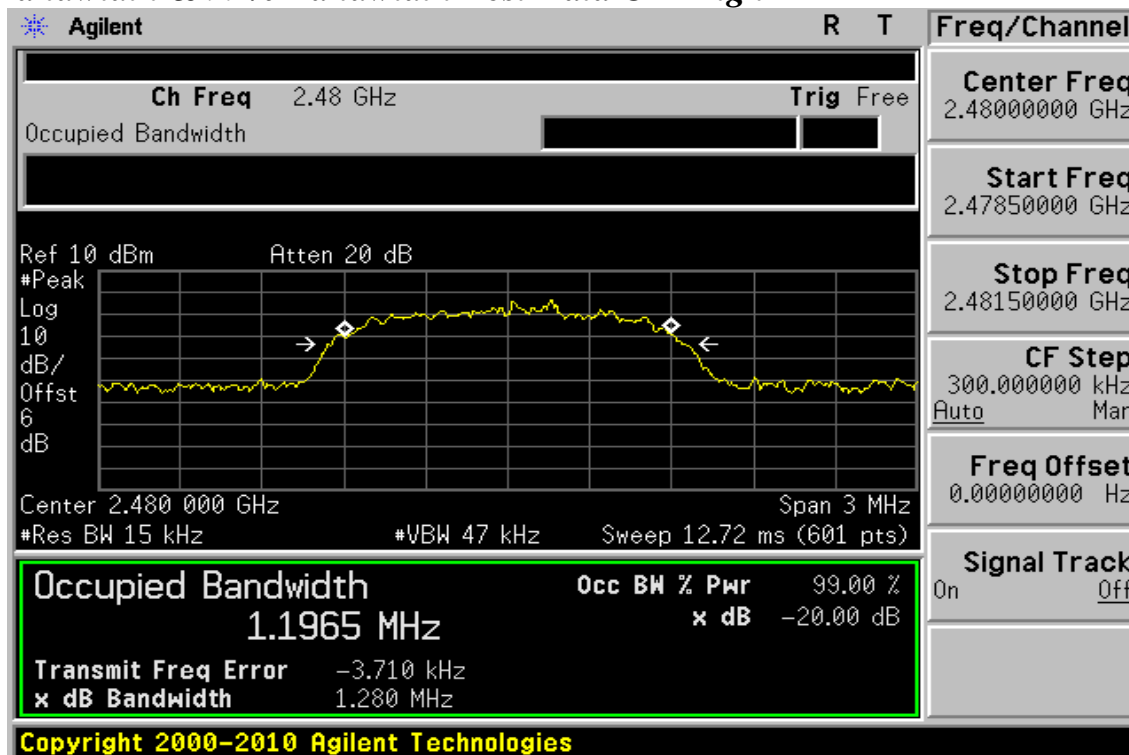
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## 20dB Bandwidth & 99% Bandwidth Test Data CH-Mid



## 20dB Bandwidth & 99% Bandwidth Test Data CH-High



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## 13. ANTENNA REQUIREMENT

### 13.1. Standard Applicable:

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 §15.246(1), if transmitting antennas of directional gain greater than 6dBi are used the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

According to RSS-GEN 7.1.2, a transmitter can only be sold or operated with antennas with which it was certified. A transmitter may be certified with multiple antenna types. An antenna type comprises antennas having similar in-band and out-of-band radiation patterns. Testing shall be performed using the highest-gain antenna of each combination of transmitter and antenna type for which certification is being sought, with the transmitter output power set at the maximum level. Any antenna of the same type and having equal or lesser gain as an antenna that had been successfully tested for certification with the transmitter, will also be considered certified with the transmitter, and may be used and marketed with the transmitter. The manufacturer shall include with the application for certification a list of acceptable antenna types to be used with the transmitter.

When a measurement at the antenna connector is used to determine RF output power, the effective gain of the device's antenna shall be stated, based on measurement or on data from the antenna manufacturer. Any antenna gain in excess of 6 dBi (6 dB above isotropic gain) shall be added to the measured RF output power before using the power limits specified in RSS-210 or RSS-310 for devices of RF output powers of 10 milliwatts or less. For devices of output powers greater than 10 milliwatts, except devices subject to RSS-210 Annex 8 (Frequency Hopping and Digital Modulation Systems Operating in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz Bands) or RSS-210 Annex 9 (Local Area Network Devices), the total antenna gain shall be added to the measured RF output power before using the specified power limits. For devices subject to RSS-210 Annex 8 or Annex 9, the antenna gain shall not be added.

### 13.2. Antenna Connected Construction:

The directional gains of antenna used for transmitting is 0dBi, and the antenna connector is designed with permanent attachment and no consideration of replacement. Please see EUT photo for details.

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