

**ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT****INTENTIONAL RADIATOR CERTIFICATION TO  
FCC PART 15 SUBPART C REQUIREMENT  
AND INDUSTRY CANADA RSS 210***OF*

<b>Product Name:</b>	<b>Mobile Phone</b>
<b>Brand Name:</b>	<b>Sony</b>
<b>Marketing Name:</b>	<b>ST23a</b>
<b>Model No.:</b>	<b>PM-0190-BV</b>
<b>Model Difference:</b>	<b>N/A</b>
<b>FCC ID:</b>	<b>PY7PM-0190</b>
<b>IC:</b>	<b>4170B-PM0190</b>
<b>Report No.:</b>	<b>EH/2012/40018</b>
<b>Issue Date:</b>	<b>May. 18, 2012</b>
<b>FCC Rule Part:</b>	<b>§15.247, Cat: DSS</b>
<b>IC Rule Part:</b>	<b>RSS-210 issue 8 :2010, Annex 8</b>
<b>Prepared for:</b>	<b>Sony Mobile Communications AB Nya Vattentornet 22188 Lund/SWEDEN SGS Taiwan Ltd.</b>
<b>Prepared by:</b>	<b>Electronics &amp; Communication Laboratory No. 134, Wu Kung Rd., Wuku Industrial Zone, Taipei County, Taiwan</b>



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## VERIFICATION OF COMPLIANCE

**Applicant:** Sony Mobile Communications AB  
Nya Vattentornet 22188 Lund/SWEDEN

**Product Name:** Mobile Phone

**Brand Name:** Sony

**Marketing Name:** ST23a

**Model No.:** PM-0190-BV

**Model Difference:** N/A

**FCC ID:** PY7PM-0190

**IC:** 4170B-PM0190

**File Number:** EH/2012/40018

**Date of test:** Apr. 17, 2012 ~ May. 18, 2012

**Date of EUT Received:** Apr. 17, 2012

### We hereby certify that:

The above equipment was tested by SGS Taiwan Ltd. Electronics & Communication Laboratory 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 & ANSI 63.10:2009 and RSS-Gen. issue 3 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 and IC 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:**

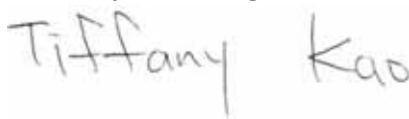


**Date:**

May. 18, 2012

*Jay Lin / Engineer*

**Prepared By:**

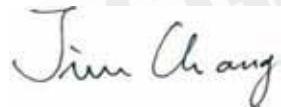


**Date:**

May. 18, 2012

*Tiffany Kao / Clerk*

**Approved By:**



**Date:**

May. 18, 2012

*Jim Chang / Supervisor*

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**Version**

<b>Version No.</b>	<b>Date</b>	<b>Description</b>
00	May. 18, 2012	Initial creation of document

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## 1. GENERAL INFORMATION

### General:

Product Name:	Mobile Phone	
Brand Name:	Sony	
Marketing Name:	ST23a	
Model No.:	PM-0190-BV	
Model difference:	N/A	
Data Cable (USB):	Model No.: EC450, Supplier: K-one, Part No.: 1242-6715	
Simple Hands-free (SHF):	Model No.: MH410C, Supplier: Foster Electric Type No.: CCA-0004017	
Car Charger:	Model No.: AN400, Supplier: Salcomp, Type No.: CAA-0003013	
Hardware Version:	A	
Software Version:	2.3.J.3.8_userdebug	
Power Supply:	3.7Vdc form Li-Ion battery or 5Vdc form adapter.	
	Battery:	1. Model No.: BA700, Supplier: LG Type No.: CBA-0002025 2. Model No.: BA700, Supplier: Samsung Type No.: CBA-0002026
	Adapter :	1. Model No.: EP800, Supplier: Salcomp Type No.: CAA-0002016-US, CAA-0002016-BV 2. Model No.: EP800, Supplier: EMERSON Type No.: CAA-0002022-US, CAA-0002022-BV

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**Bluetooth:**

Bluetooth Version:	V2.1 + EDR (GFSK + $\pi/4$ DQPSK + 8DPSK)
Channel number:	79 channels
Modulation type:	Frequency Hopping Spread Spectrum
Transmit Power:	10.17dBm
Frequency Range:	2.402GHz – 2.480GHz
Dwell Time:	<= 0.4s
Operating Mode:	Point-to-Point
Antenna Designation:	PIFA Antenna, -0.27dBi.
Type of Emission:	1M23F1D

The test report compliance for Bluetooth function.

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

This submittal(s) (test report) is intended for **FCC ID: PY7PM-0190** filing to comply with Section 15.247 of the FCC Part 15, Subpart C Rules and **IC: 4170B-PM0190** filing to comply with Industry Canada RSS-210 issue 8: 2010 Annex 8. 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 was performed according to the procedures in ANSI C63.4: 2003 and ANSI 63.10:2009. Radiated testing was performed at an antenna to EUT distance 3 meters.

Tested in accordance with FCC Public Notice DA 00-705

## 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. & ANSI 63.10:2009. 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. 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.

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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 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 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 & ANSI 63.10:2009. 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

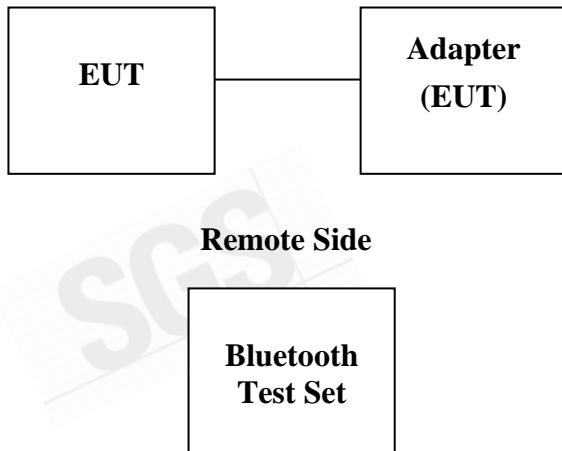
The EUT is placed on as turn table which is 0.8 m above ground plane. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to 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, ANSI 63.10:2009 and DA 00-705.

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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**

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Data Cable	Power Cord
1.	Adapter	Salcomp / EMERSON	EP800	N/A	shielded	Un-shielded
2.	Bluetooth Test Set	Anritsu	MT8852B	6k00001436	N/A	N/A

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### 3. SUMMARY OF TEST RESULTS

<b>FCC Rules</b>	<b>Description Of Test</b>	<b>Result</b>
§15.207(a) RSS-Gen §7.2.4	Conducted Emission	Compliant
§15.247(b)(1) RSS-210 issue 8,§A8.4(2)	Peak Output Power	Compliant
§15.247(a)(1) RSS-210 issue ,§A8.1(b) RSS-Gen §4.6.1	20dB Bandwidth & 99% Power Bandwidth	Compliant
§15.247(d) RSS-210 issue 8,§A8.5	100 KHz Bandwidth Of Frequency Band Edges	Compliant
§15.209(a) (f) RSS-Gen §7.2.5 RSS-210 issue 8,§A2.9	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)(iii) RSS-210 issue 8,§A8.1(d)	Time of Occupancy	Compliant
§15.203, §15.247(b)(4)(i) RSS- Gen issue §7.1.2	Antenna Requirement	Compliant

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## 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 lowest rated data rate were chosen as worst case 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 E2 position was reported.

In comparison with BDR and EDR mode, emission carried out by EDR is chosen as the most representative measurement to perform measurement of every test item pursuant to Part 15C.

## 5. MEASUREMENT UNCERTAINTY FOR FIELD STRENGTH OF SPURIOUS RADIATION

Measurement uncertainty (Polarization : <b>Vertical</b> )	30MHz - 180MHz: 3.37dB
	180MHz -417MHz: 3.19dB
	0.417GHz-1GHz: 3.19dB
	1GHz - 18GHz: 4.04dB
	18GHz - 40GHz: 4.04dB

Measurement uncertainty (Polarization : <b>Horizontal</b> )	30MHz - 167MHz: 4.22dB
	167MHz -500MHz: 3.44dB
	0.5GHz-1GHz: 3.39dB
	1GHz - 18GHz: 4.08dB
	18GHz - 40GHz: 4.08dB

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## 6. CONDUCTED EMISSION TEST

### 6.1 Standard Applicable

According to §15.207 and RSS-Gen §7.2.4, frequency 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.

### 6.3 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 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.

### 6.3 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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## 6.4 Measurement Equipment Used:

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
EMI Test Receiver	R&S	ESCI7	100759	05/20/2011	05/19/2013
EMI Receiver	R&S	ESCS 30	828985/004	09/23/2011	09/22/2012
LISN	Rolf-Heine	NNB-2/16Z	99012	03/23/2012	03/22/2013
LISN	FCC	FCC-LISN-50/250-2 5-2-01	04034	03/23/2012	03/22/2013
Coaxial Cables	N/A	WK CE Cable	N/A	01/05/2012	01/04/2013

## 6.5 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.

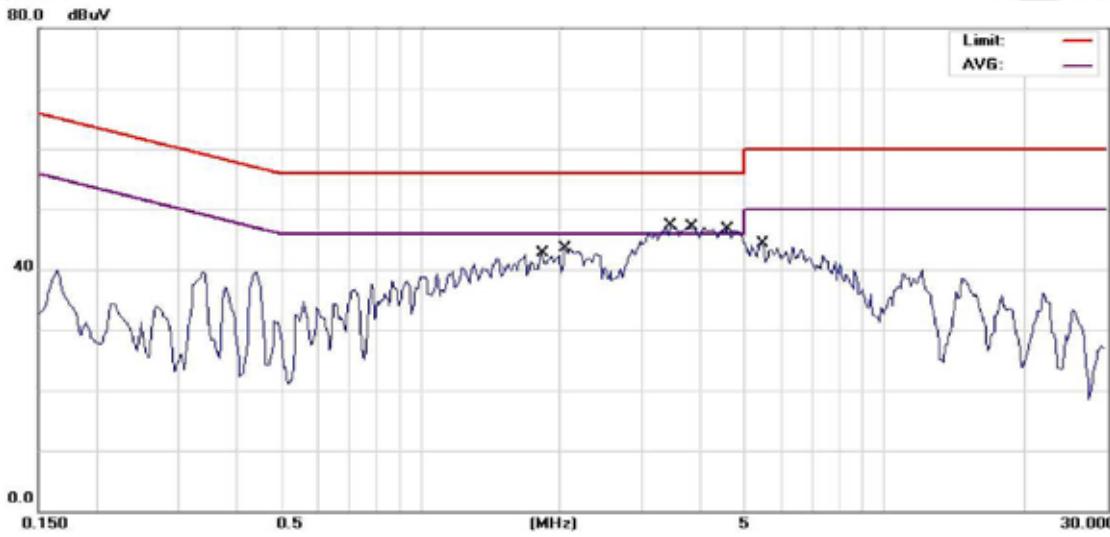
Note: Refer to next page for measurement data and plots.

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**AC POWER LINE CONDUCTED EMISSION TEST DATA**

Operation Mode:	Operation	Test Date:	May. 18, 2012
Temperature:	24	Humidity:	59 %

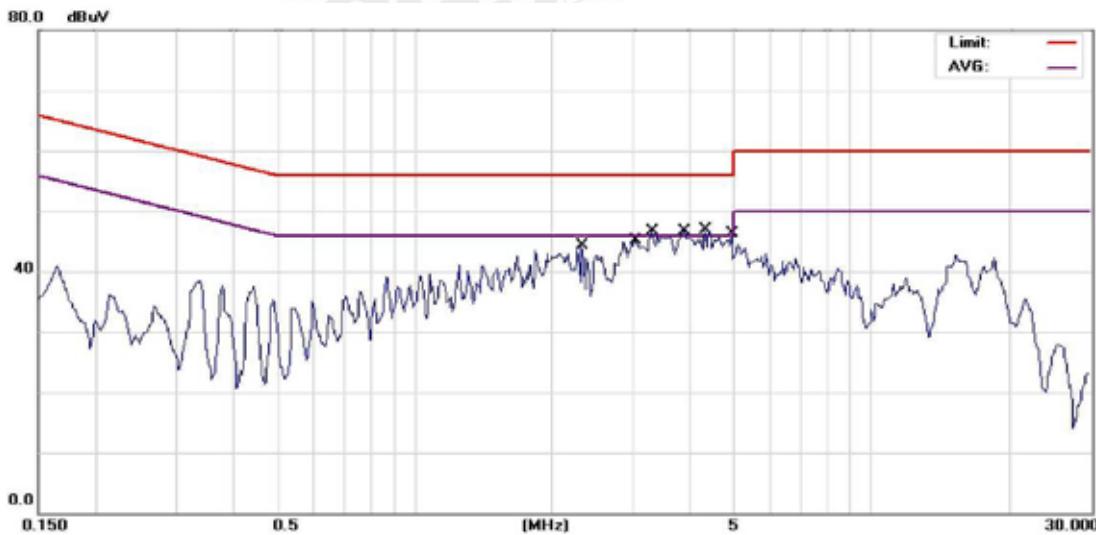


Site: site#1 Phase: **L1** Temperature: 26 °C  
Limit: FCC Class B Conduction(QP) Power: AC 120V/60Hz Humidity: 60%  
EUT: MobilePhone Distance:  
M/N: ST23a  
Note: Operation mode

No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over	Detector	Comment
			Level						
MHz		dBuV	dB	dBuV	dBuV	dB			
1	1.8200	36.60	0.24	36.84	56.00	-19.16	QP		
2	1.8200	27.60	0.24	27.84	46.00	-18.16	AVG		
3	2.0500	37.80	0.25	38.05	56.00	-17.95	QP		
4	2.0500	28.60	0.25	28.85	46.00	-17.15	AVG		
5	3.4700	41.70	0.29	41.99	56.00	-14.01	QP		
6 *	3.4700	33.20	0.29	33.49	46.00	-12.51	AVG		
7	3.8300	42.00	0.30	42.30	56.00	-13.70	QP		
8	3.8300	33.10	0.30	33.40	46.00	-12.60	AVG		
9	4.5800	41.20	0.32	41.52	56.00	-14.48	QP		
10	4.5800	32.60	0.32	32.92	46.00	-13.08	AVG		
11	5.4600	39.80	0.34	40.14	60.00	-19.86	QP		
12	5.4600	31.20	0.34	31.54	50.00	-18.46	AVG		

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Site: site#1 Phase: **N** Temperature: 26 °C  
Limit: FCC Class B Conduction(QP) Power: AC 120V/60Hz Humidity: 60%  
EUT: MobilePhone Distance:  
M/N: ST23a  
Note: Operation mode

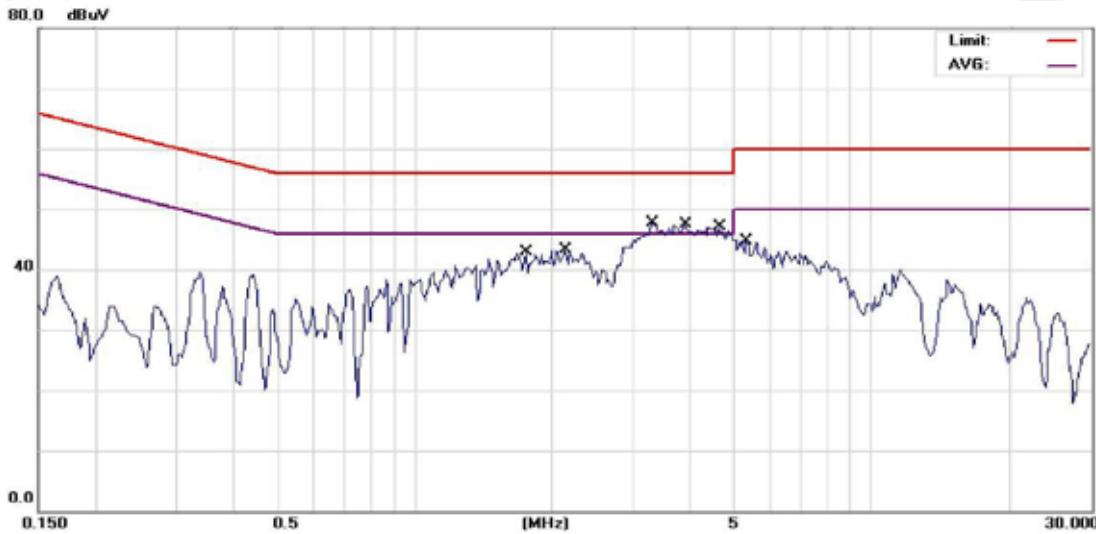
No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over	Detector	Comment
			Level	Factor	ment				
		MHz	dBuV	dB	dBuV	dB			
1		2.3352	40.20	0.33	40.53	56.00	-15.47	QP	
2		2.3352	28.60	0.33	28.93	46.00	-17.07	AVG	
3		3.0400	40.70	0.34	41.04	56.00	-14.96	QP	
4		3.0400	31.40	0.34	31.74	46.00	-14.26	AVG	
5		3.3000	40.10	0.34	40.44	56.00	-15.56	QP	
6		3.3000	31.70	0.34	32.04	46.00	-13.96	AVG	
7		3.9000	40.30	0.35	40.65	56.00	-15.35	QP	
8 *		3.9000	31.70	0.35	32.05	46.00	-13.95	AVG	
9		4.3200	39.60	0.36	39.96	56.00	-16.04	QP	
10		4.3200	31.10	0.36	31.46	46.00	-14.54	AVG	
11		4.9700	39.00	0.37	39.37	56.00	-16.63	QP	
12		4.9700	30.20	0.37	30.57	46.00	-15.43	AVG	

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**AC POWER LINE CONDUCTED EMISSION TEST DATA**

Operation Mode:	Operation	Test Date:	May. 18, 2012
Temperature:	24	Humidity:	59 %

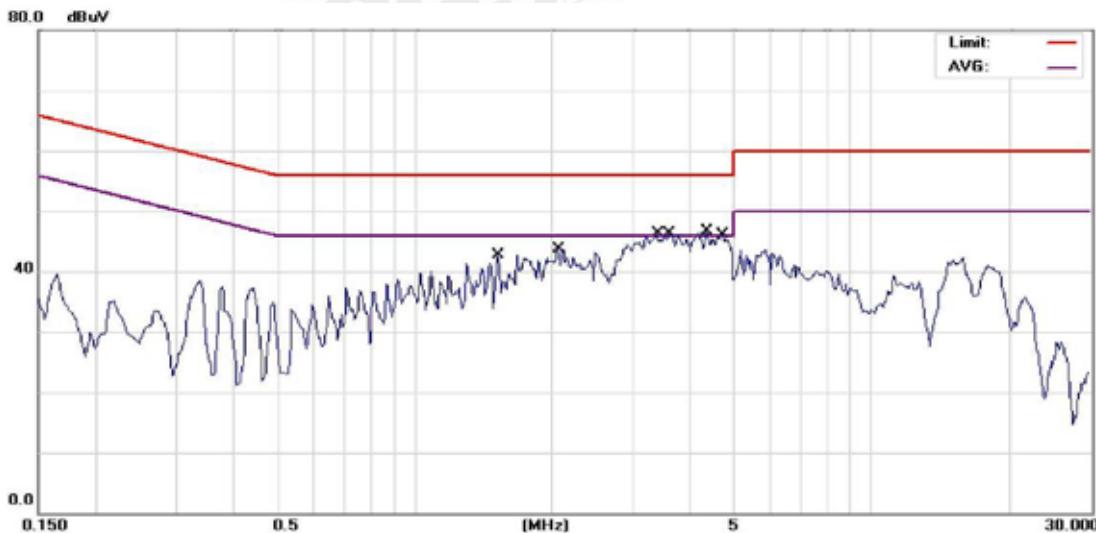


Site: site#1 Phase: **L1** Temperature: 26 °C  
 Limit: FCC Class B Conduction(QP) Power: AC 120V/60Hz Humidity: 60%  
 EUT: MobilePhone Distance:  
 M/N: ST23a  
 Note: Operation mode

No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over	Detector	Comment
			Level	Factor	ment				
		MHz	dBuV	dB	dBuV	dBuV	dB		
1		1.7600	37.00	0.24	37.24	56.00	-18.76	QP	
2		1.7600	27.60	0.24	27.84	46.00	-18.16	AVG	
3		2.1400	38.70	0.25	38.95	56.00	-17.05	QP	
4		2.1400	29.60	0.25	29.85	46.00	-16.15	AVG	
5		3.3100	42.40	0.28	42.68	56.00	-13.32	QP	
6 *		3.3100	33.60	0.28	33.88	46.00	-12.12	AVG	
7		3.9100	41.90	0.30	42.20	56.00	-13.80	QP	
8		3.9100	33.10	0.30	33.40	46.00	-12.60	AVG	
9		4.6500	41.20	0.32	41.52	56.00	-14.48	QP	
10		4.6500	32.60	0.32	32.92	46.00	-13.08	AVG	
11		5.3200	39.90	0.33	40.23	60.00	-19.77	QP	
12		5.3200	31.50	0.33	31.83	50.00	-18.17	AVG	

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Site: site#1 Phase: **N** Temperature: 26 °C  
Limit: FCC Class B Conduction(QP) Power: AC 120V/60Hz Humidity: 60%  
EUT: MobilePhone Distance:  
M/N: ST23a  
Note: Operation mode

No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over	Detector	Comment
			Level	Factor	ment				
		MHz	dBuV	dB	dBuV	dBuV	dB		
1		1.5200	38.80	0.32	39.12	56.00	-16.88	QP	
2		1.5200	27.90	0.32	28.22	46.00	-17.78	AVG	
3		2.0600	38.90	0.33	39.23	56.00	-16.77	QP	
4		2.0600	28.30	0.33	28.63	46.00	-17.37	AVG	
5		3.4100	40.20	0.34	40.54	56.00	-15.46	QP	
6	*	3.4100	31.70	0.34	32.04	46.00	-13.96	AVG	
7		3.6200	40.20	0.35	40.55	56.00	-15.45	QP	
8		3.6200	31.60	0.35	31.95	46.00	-14.05	AVG	
9		4.3500	40.00	0.36	40.36	56.00	-15.64	QP	
10		4.3500	31.20	0.36	31.56	46.00	-14.44	AVG	
11		4.7200	39.60	0.37	39.97	56.00	-16.03	QP	
12		4.7200	30.80	0.37	31.17	46.00	-14.83	AVG	

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## 7. PEAK OUTPUT POWER MEASUREMENT

### 7.1 Standard Applicable

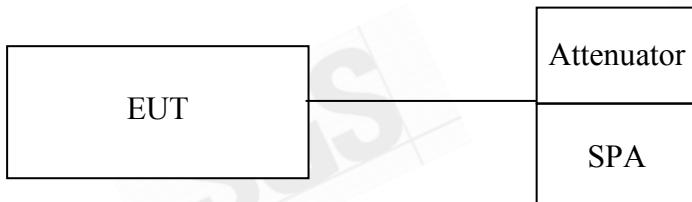
According to §15.247(b)(1),, for frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 hopping channels, and all frequency hopping systems in the 5725-5850MHz band: 1Watt. For all other frequency hopping systems in the 2400 – 2483.5MHz band: 0.125 Watts.

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.

### 7.2 Measurement Equipment Used

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Power Sensor	Anritsu	ML2495A	1005007	02/08/2012	02/07/2014
Power Meter	Anritsu	MA2411B	917032	02/08/2012	02/07/2014
Spectrum Analyzer	Agilent	E4446A	MY51100003	04/15/2011	04/14/2013
Spectrum Analyzer	Agilent	E4440A	MY45304525	03/17/2012	03/16/2014
DC Block	Mini-Circuits	BLK-18-S+	1	02/28/2012	02/27/2013
Low Loss Cable	HUBER+SUHNER	SUCOFLEX 104PEA	N/A	01/05/2012	01/04/2013
Attenuator	Mini-Circuit	BW-S10W2+	002	02/28/2012	02/27/2013
Splitter	Agilent	11636B	N/A	02/28/2012	02/27/2013

### 7.3 Test Set-up:



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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 power meter or spectrum. (Max peak function, >20dB bandwidth, >=RBW)
3. Record the max. reading.
4. Repeat above procedures until all frequency measured were complete.

**7.5 Measurement Result**

BDR mode:

Frequency (MHz)	Reading Power (dBm)	Output Power (dBm)	Output Power (W)	Limit (W)
2402.00	9.70	9.70	0.00933	1
2441.00	9.46	9.46	0.00883	1
2480.00	9.26	9.26	0.00843	1

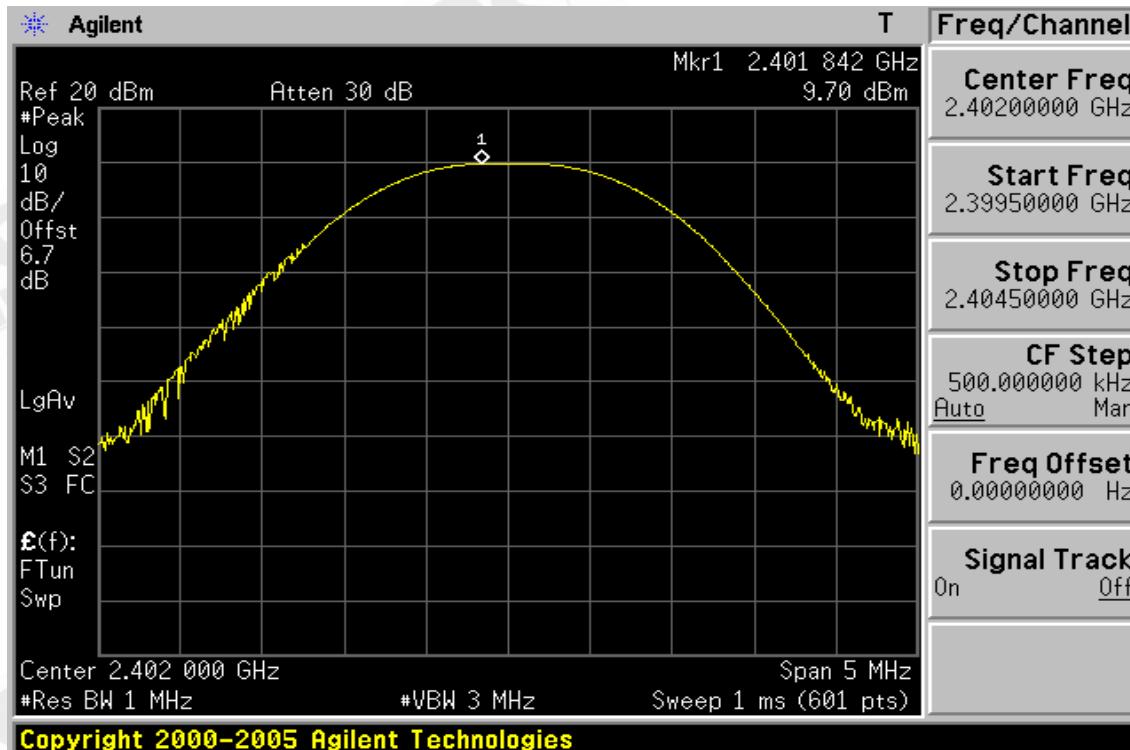
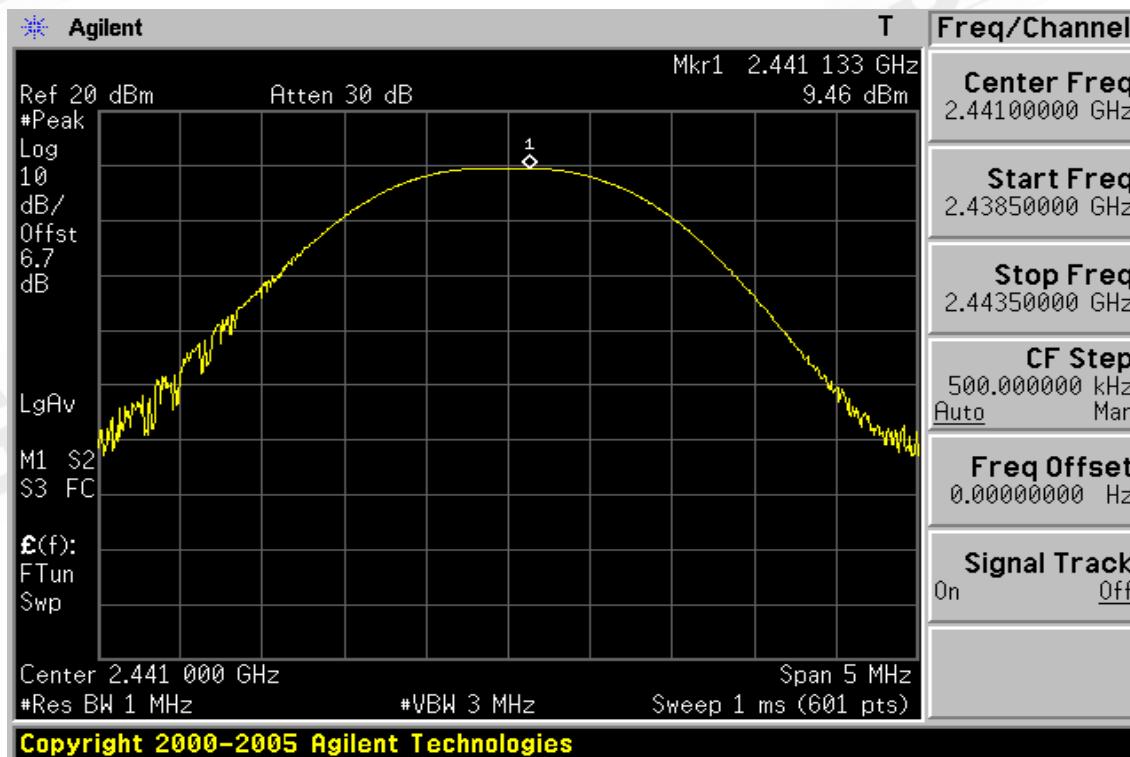
EDR mode:

Frequency (MHz)	Reading Power (dBm)	Output Power (dBm)	Output Power (W)	Limit (W)
2402.00	10.17	10.17	0.01040	0.125
2441.00	10.03	10.03	0.01007	0.125
2480.00	9.30	9.30	0.00851	0.125

*NOTE: offset: 6.7dB*

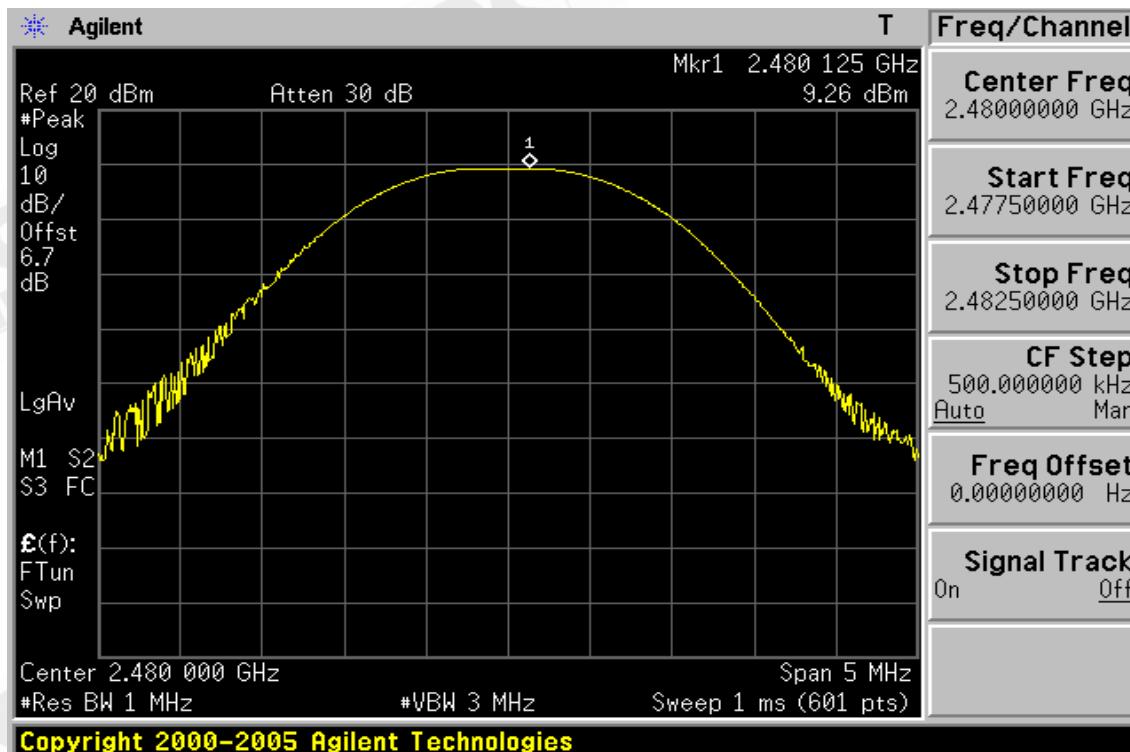
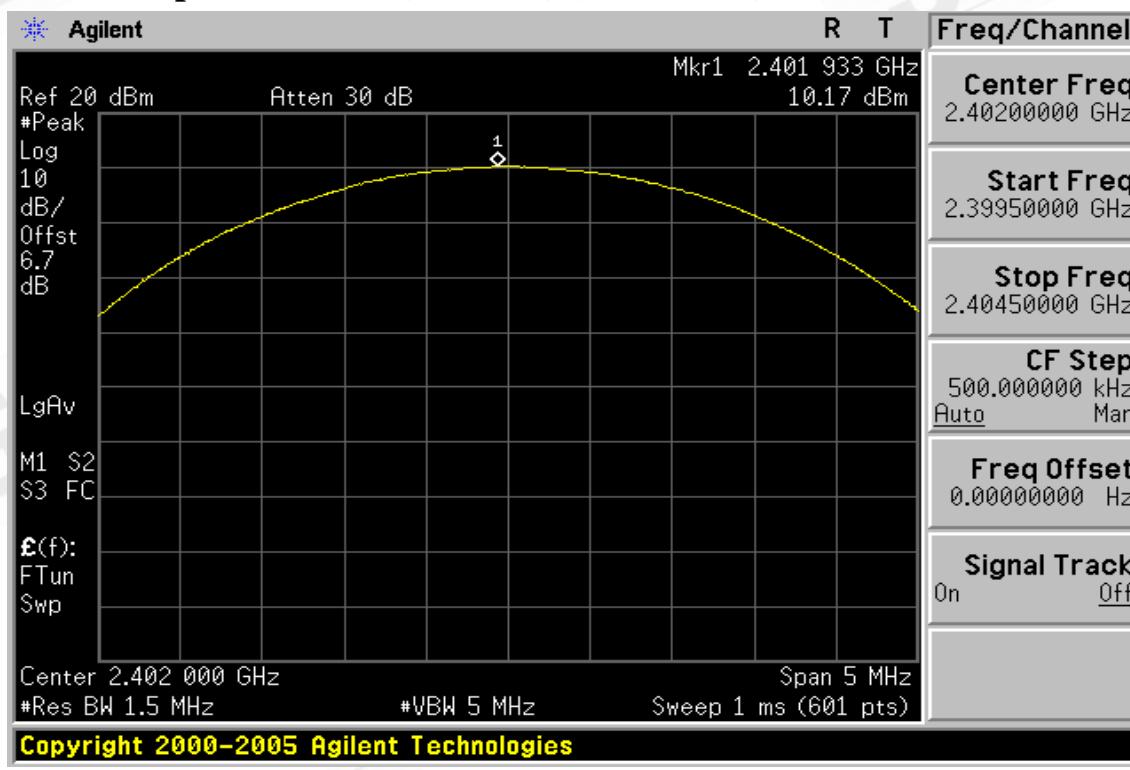
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**Peak Power Output Data Plot (CH Low) (BDR mode)****Peak Power Output Data Plot (CH Mid) (BDR mode)**

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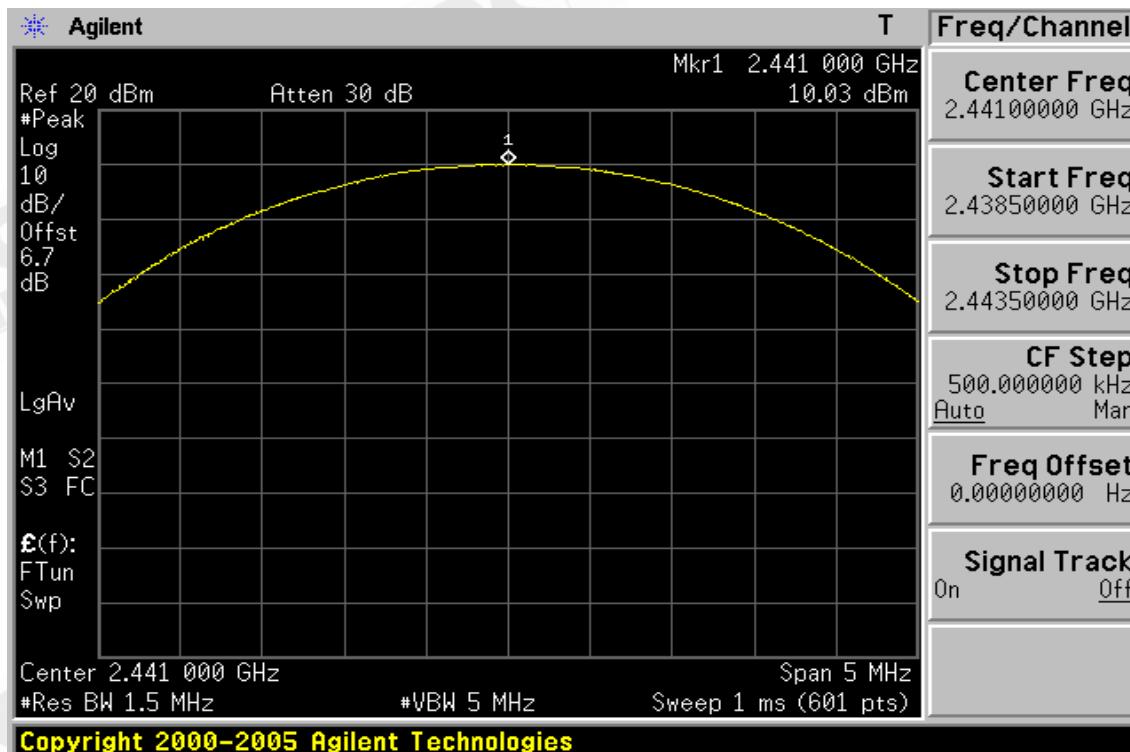
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**Peak Power Output Data Plot (CH High) (BDR mode)****Peak Power Output Data Plot (CH Low) (EDR mode)**

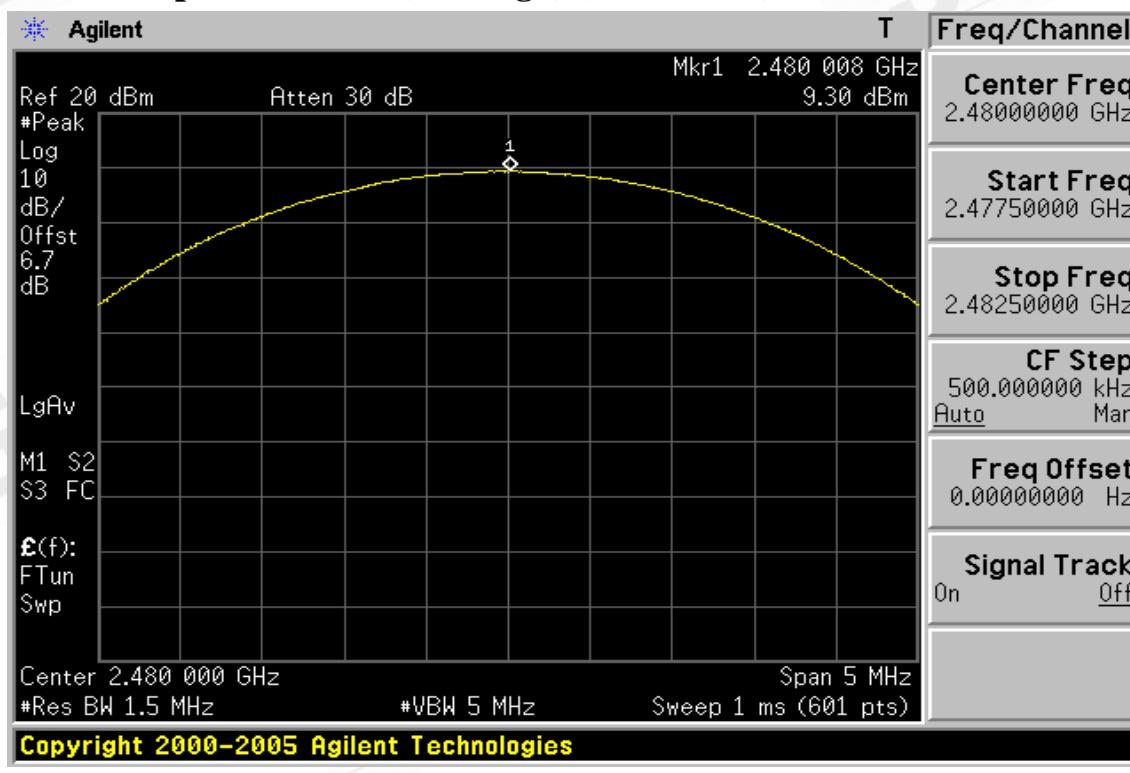
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### Peak Power Output Data Plot (CH Mid) (EDR mode)



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



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## 8. 20dB BANDWIDTH & 99% BANDWIDTH

### 8.1 Standard Applicable

For 20dB Bandwidth

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.

For 99% Bandwidth

RSS-Gen §4.6.1, the transmitter shall be operated at its maximum carrier power measured under normal test conditions. The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts. The resolution bandwidth shall be set to as close to 1% of the selected span as is possible without being below 1%. The video bandwidth shall be set to 3 times the resolution bandwidth. Video averaging is not permitted. Where practical, a sampling detector shall be used since a peak or, peak hold, may produce a wider bandwidth than actual.

The trace data points are recovered and are directly summed in linear terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached and that frequency recorded. The process is repeated for the highest frequency data points. This frequency is recorded.

The span between the two recorded frequencies is the occupied bandwidth.

### 8.2 Measurement Equipment Used

Refer to section 7.2 for details.

### 8.3 Test Set-up

Refer to section 7.3 for details.

### 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 the spectrum analyzer as RBW=30KHz (1 % of Bandwidth.), Span= 3MHz, Sweep=auto for 99% Bandwidth test.
4. Mark the peak frequency and -20dB (upper and lower) frequency and Turn on the 20dB bandwidth function, max reading.
5. Repeat above procedures until all frequency measured were complete.

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**8.5 Measurement Result:****20dB Bandwidth:**

BDR mode:

<b>CH</b>	<b>Bandwidth (KHz)</b>
Lower	921.605
Mid	921.477
Higher	921.006

EDR mode:

<b>CH</b>	<b>Bandwidth (MHz)</b>	<b>2/3 Bandwidth (MHz)</b>
Lower	1.364	0.909
Mid	1.342	0.895
Higher	1.340	0.893

**99% Bandwidth:**

BDR mode:

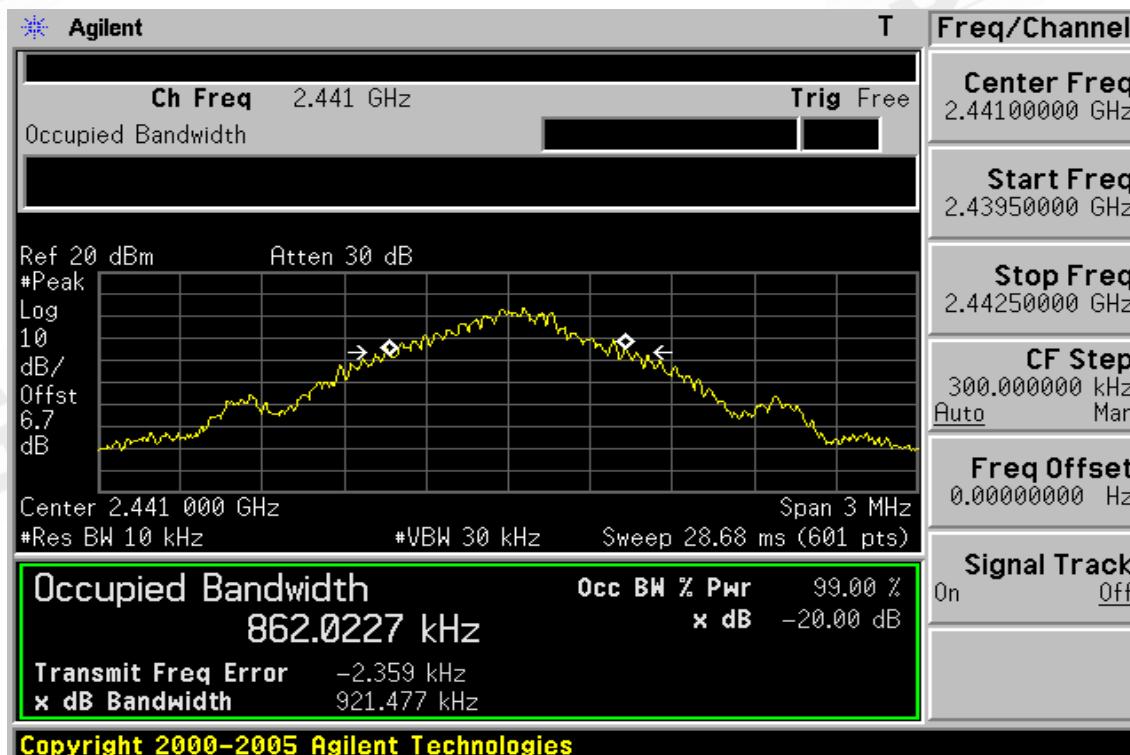
<b>CH</b>	<b>99% Bandwidth (KHz)</b>
Lower	898.8834
Mid	887.2318
Higher	889.0083

EDR mode:

<b>CH</b>	<b>99% Bandwidth (MHz)</b>
Lower	1.2096
Mid	1.2182
Higher	1.2255

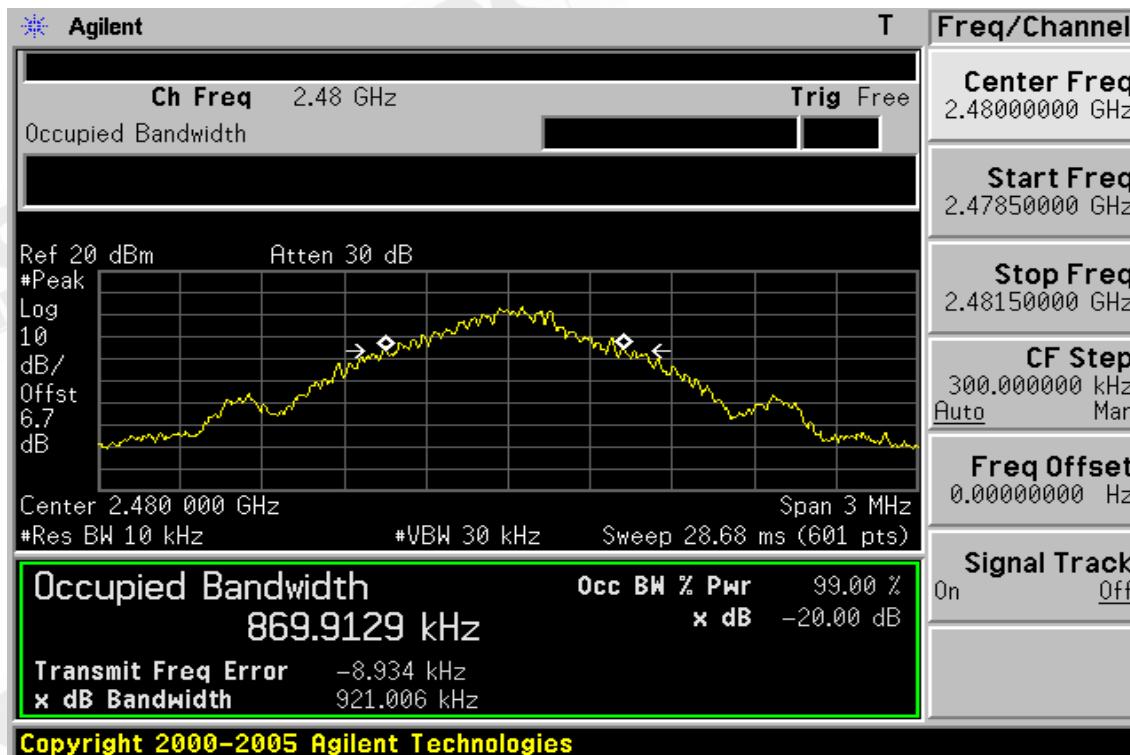
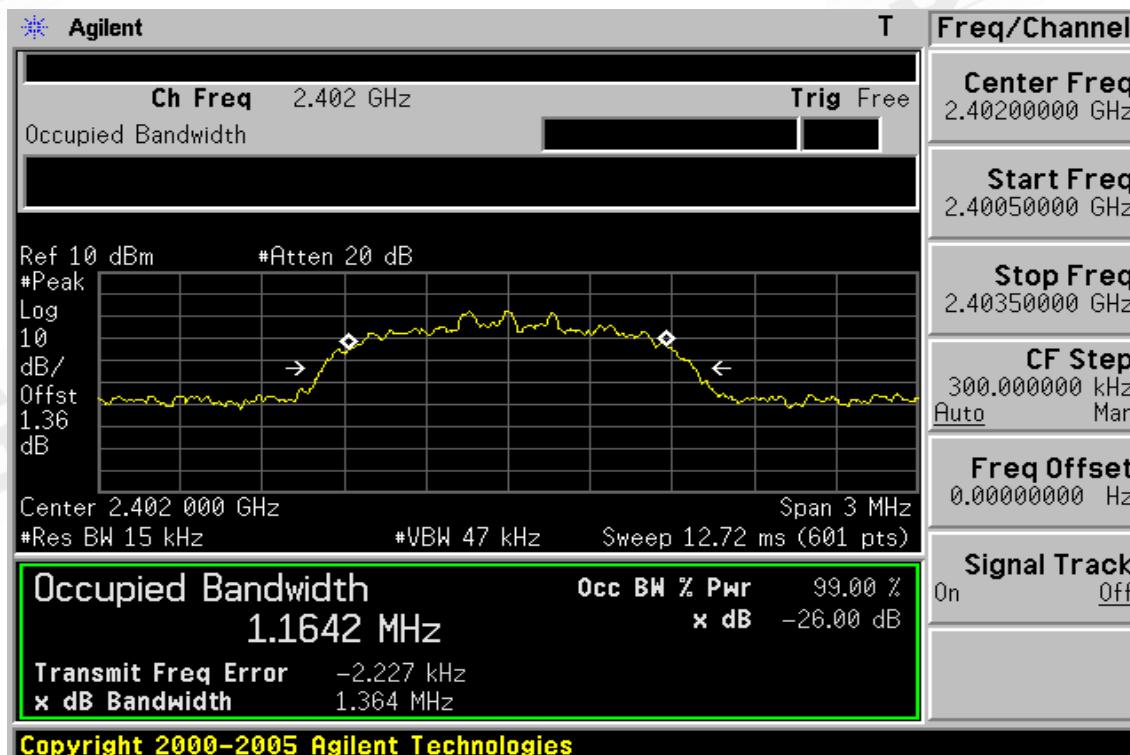
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**20dB Band Width Test Data CH-Low (BDR mode)****20dB Band Width Test Data CH-Mid (BDR mode)**

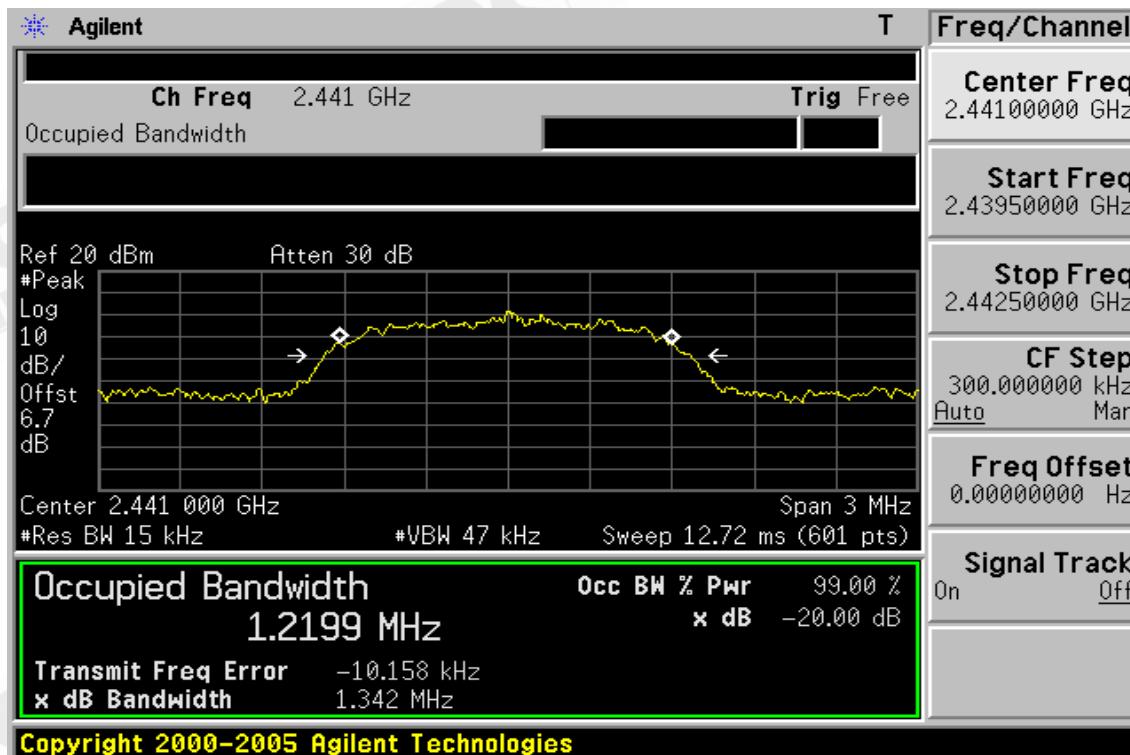
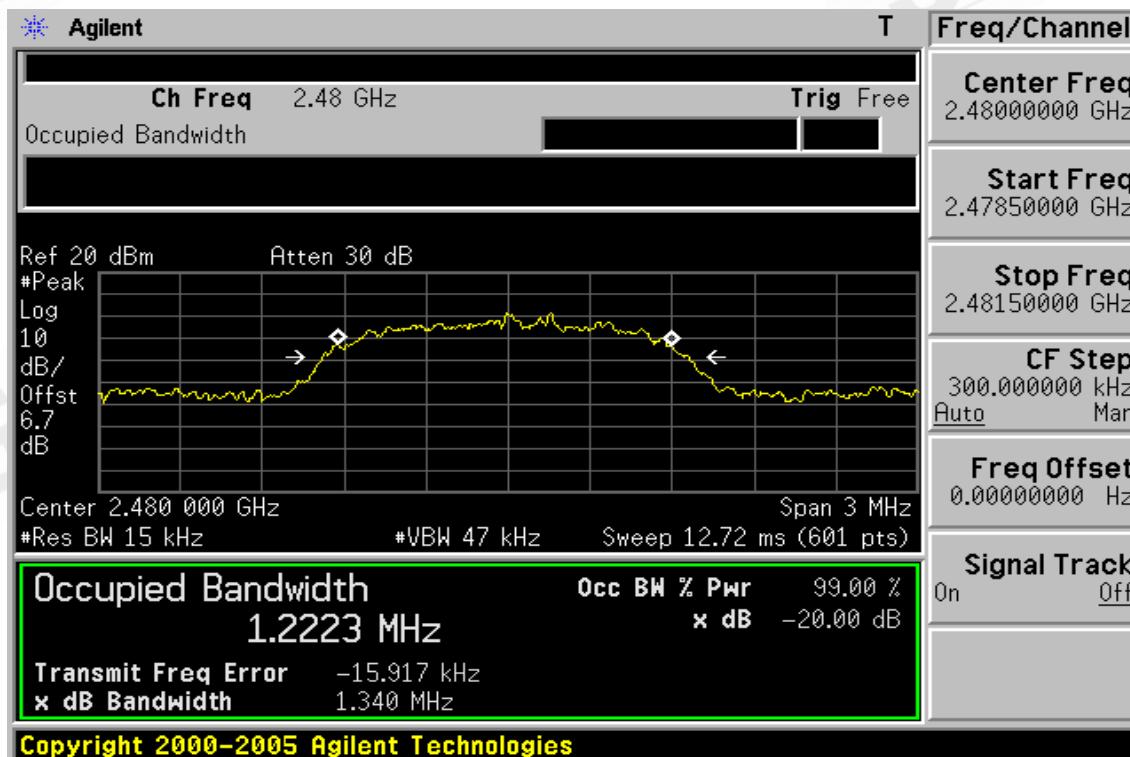
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**20dB Band Width Test Data CH-High (BDR mode)****20dB Band Width Test Data CH-Low (EDR mode)**

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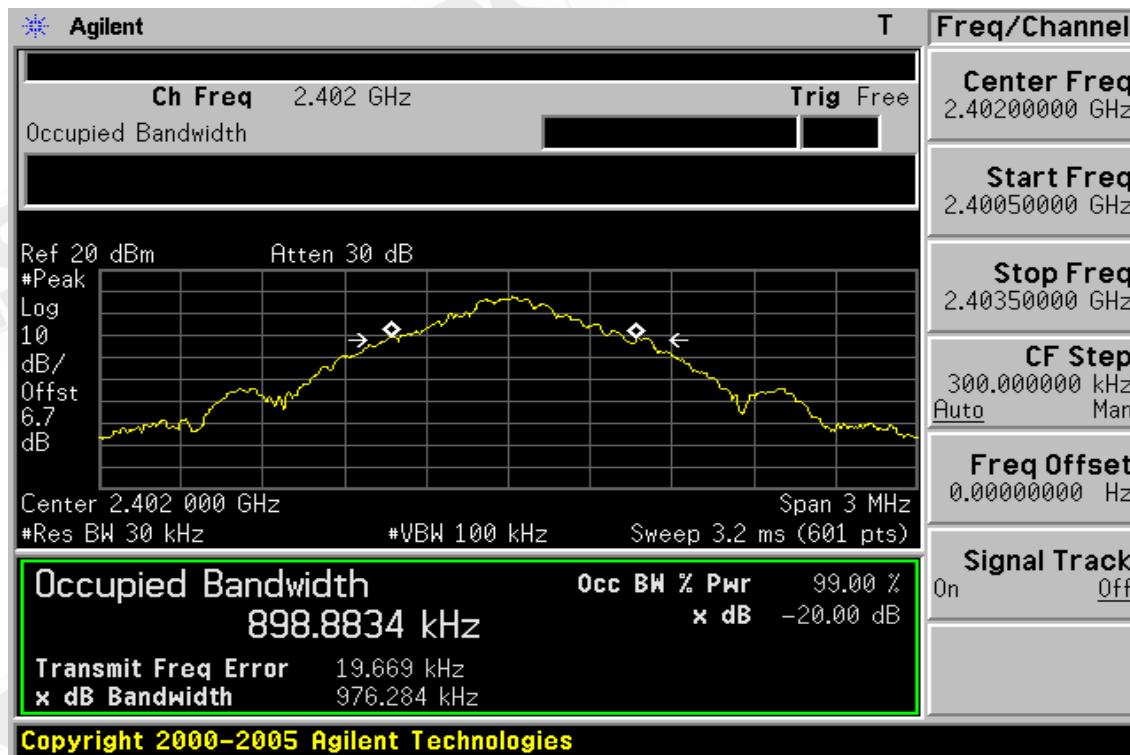
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**20dB Band Width Test Data CH-Mid (EDR mode)****20dB Band Width Test Data CH-High (EDR mode)**

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## 99% Band Width Test Data CH-Low (BDR mode)

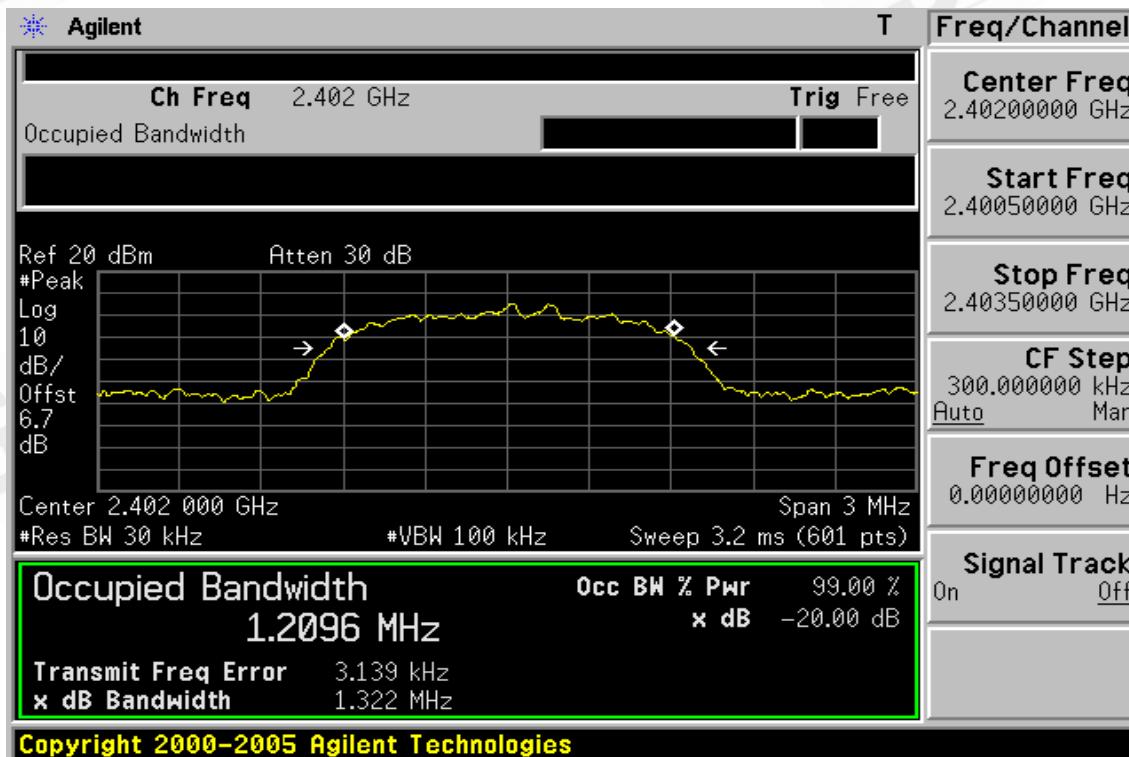


## 99% Band Width Test Data CH-Mid (BDR mode)



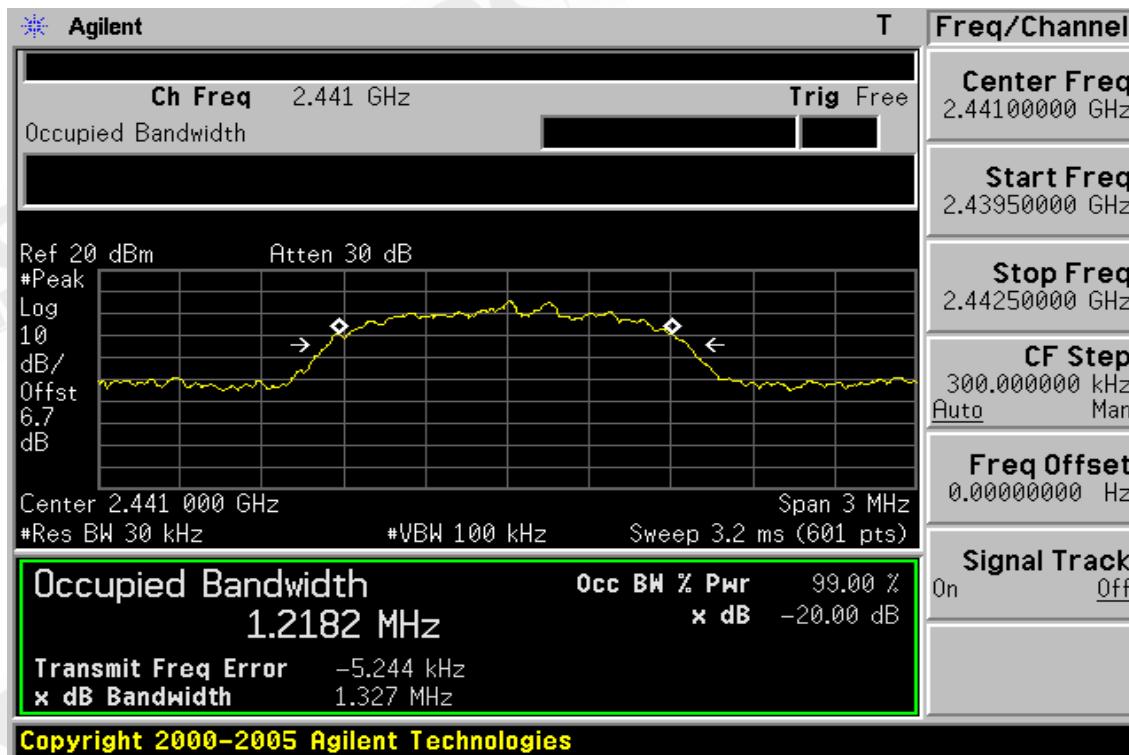
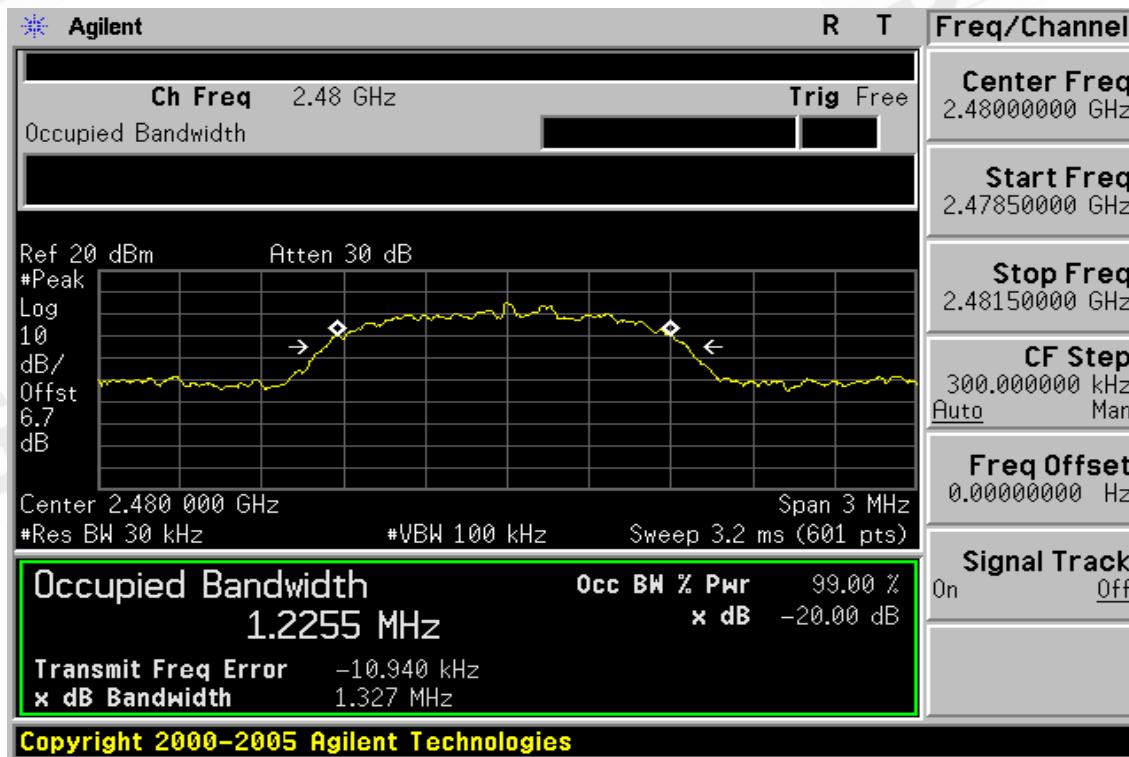
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**99% Band Width Test Data CH-High (BDR mode)****99% Band Width Test Data CH-Low (EDR mode)**

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**99% Band Width Test Data CH-Mid (EDR mode)****99% Band Width Test Data CH-High (EDR mode)**

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## **9. 100KHz BANDWIDTH OF BAND EDGES and Out-Of-Band EMISSION MEASUREMENT**

### **9.1 Standard Applicable**

According to §15.247(c), 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-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 5 and 6 is not required. In addition, radiated emissions which fall in the restricted bands of Table 3 must also comply with the radiated emission limits specified in Tables 5 and 6 of RSS-GEN.

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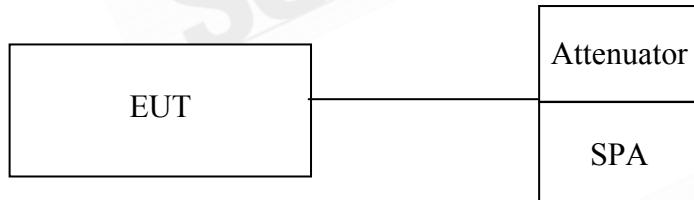
## 9.2 Measurement Equipment Used

### 9.2.1 Conducted Emission at antenna port:

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Agilent	E4446A	MY51100003	04/15/2011	04/14/2013
Spectrum Analyzer	Agilent	E4440A	MY45304525	03/17/2012	03/16/2014
DC Block	Mini-Circuits	BLK-18-S+	1	02/28/2012	02/27/2013
Low Loss Cable	HUBER+SUHNER	SUCOFLEX 104PEA	N/A	01/05/2012	01/04/2013
Attenuator	Mini-Circuit	BW-S10W2+	002	02/28/2012	02/27/2013

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**9.3 Test SET-UP:****9.3.1 Conducted Emission at antenna port:****9.4 Measurement Procedure****100KHz BANDWIDTH OF BAND EDGES:**

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, 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.

**Out-Of-Band EMISSION**

1. To connect Antenna Port of EUT to Spectrum.
2. Set RBW = 100K & VBW = 100K on Spectrum.
3. Sweep the frequency to determine spurious emission as seen on spectrum from span of 30 to 3G, 3G to 8G, 8G to 13G, 13G to 18G and 18G to 26.5GHz
4. Via Software, combine 5 spans of frequency range into one plot

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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:

$$\mathbf{FS = RA + AF - CL - AG}$$

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

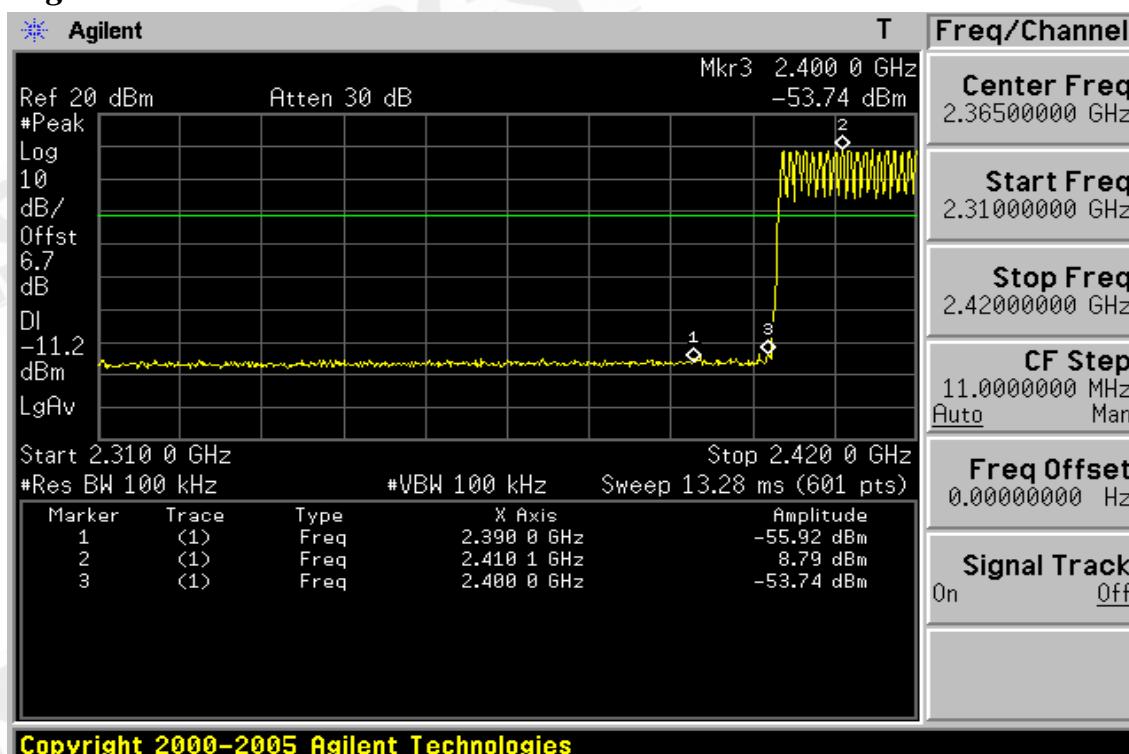
## 9.6 Measurement Result

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

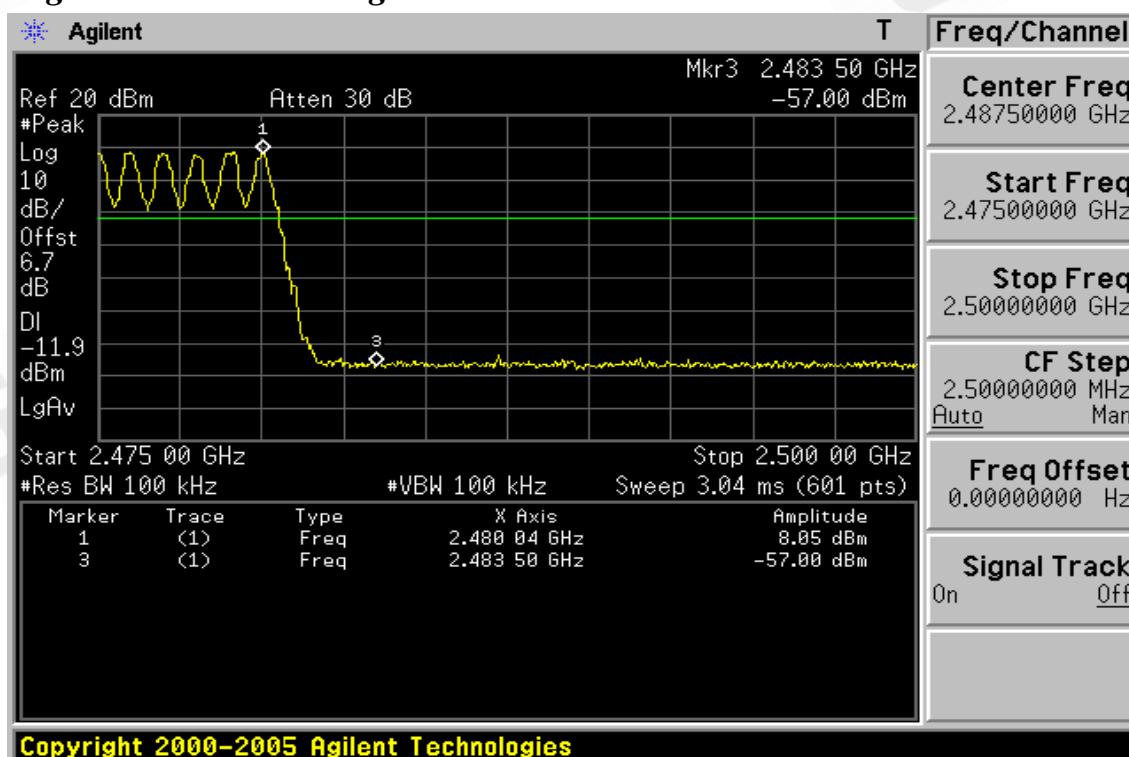
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**BDR Mode**  
**Band Edges Test Data CH-Low**



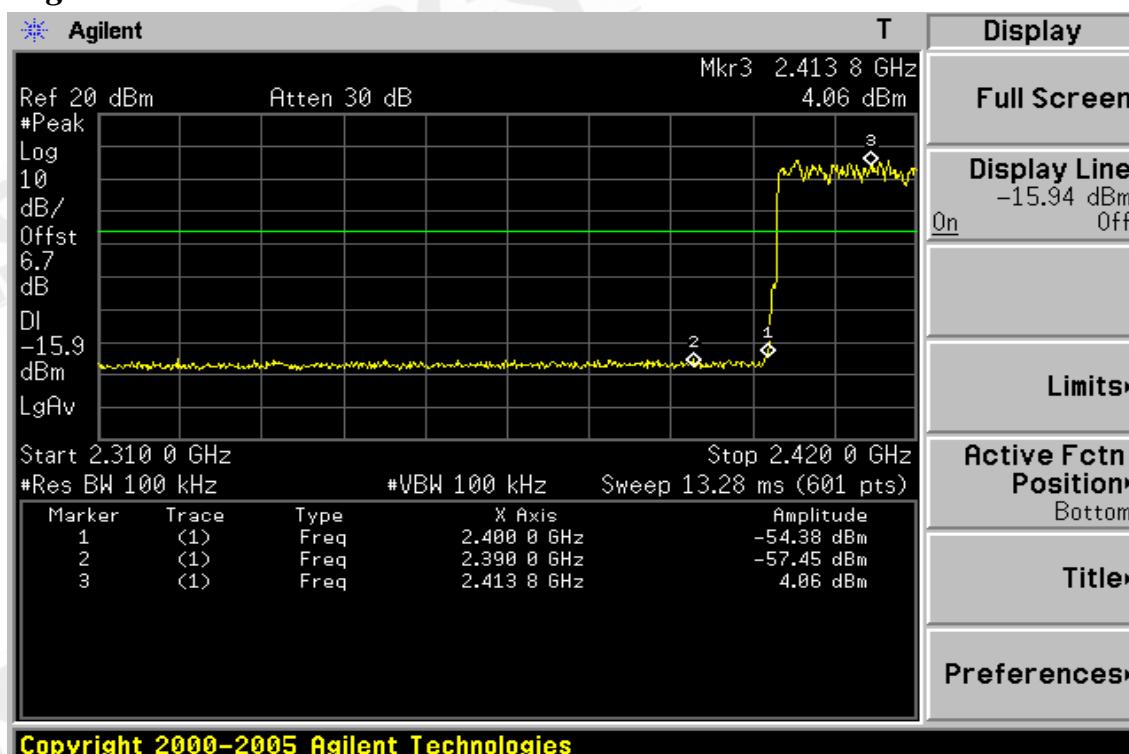
**Band Edges Test Data CH-High**



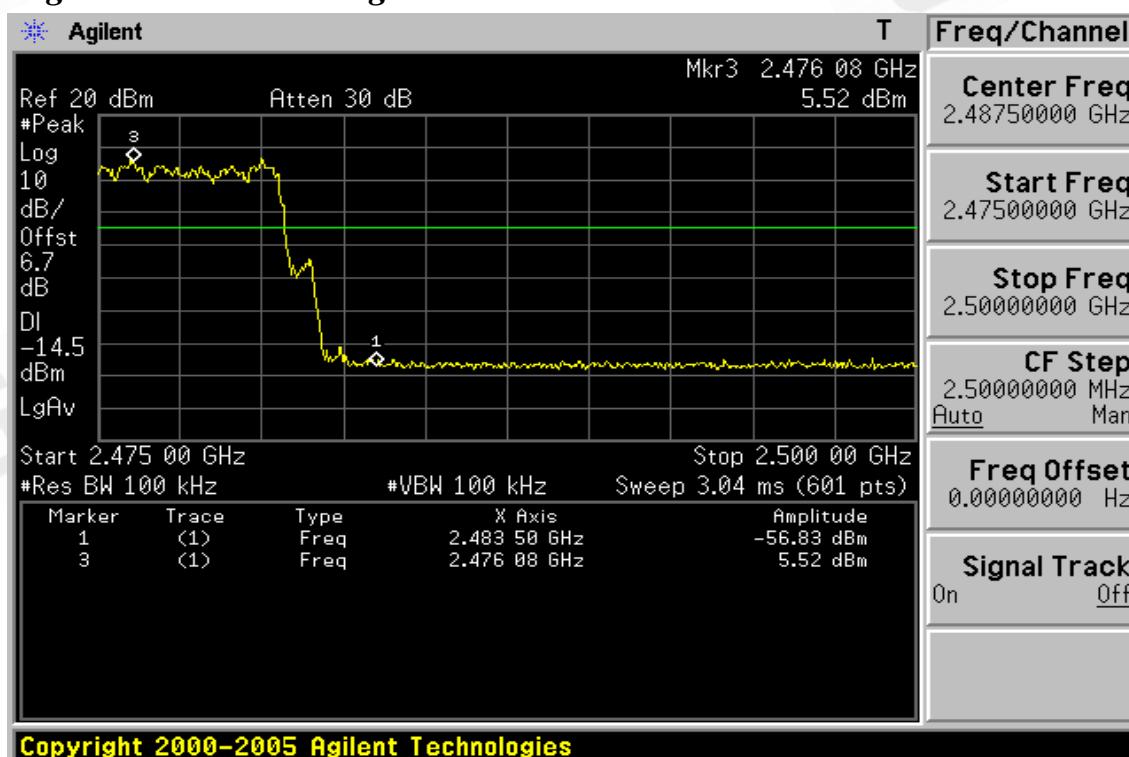
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**EDR Mode**  
**Band Edges Test Data CH-Low**

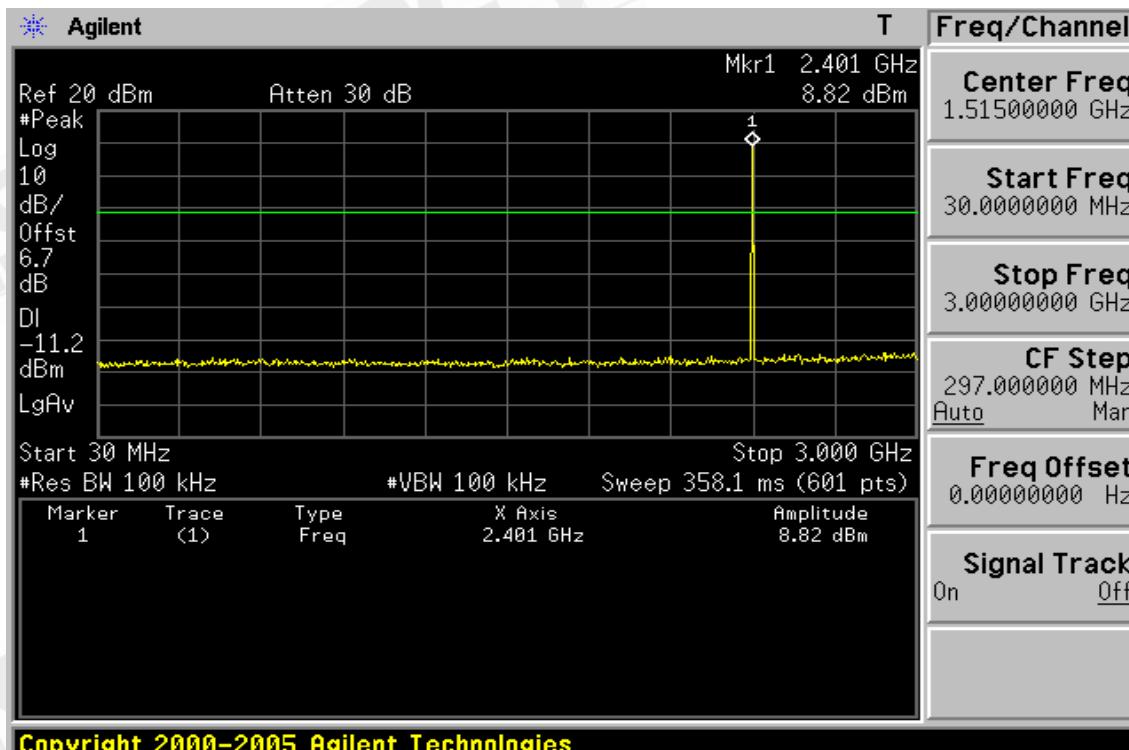
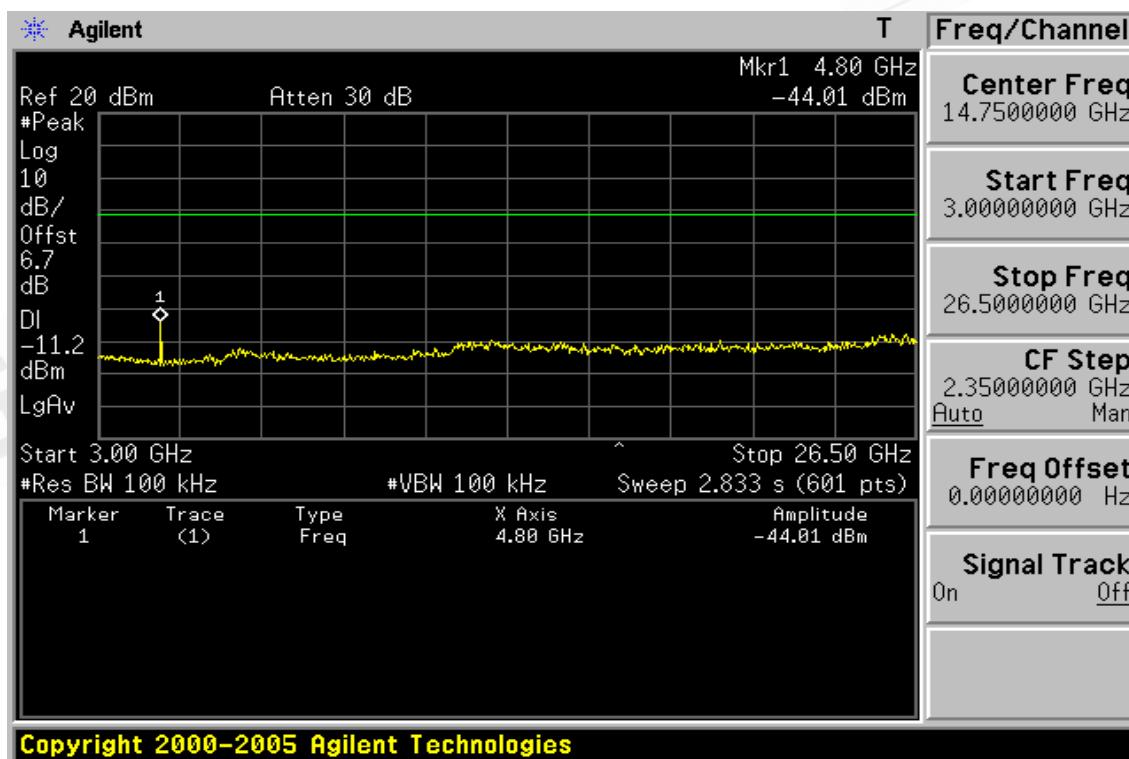


**Band Edges Test Data CH-High**



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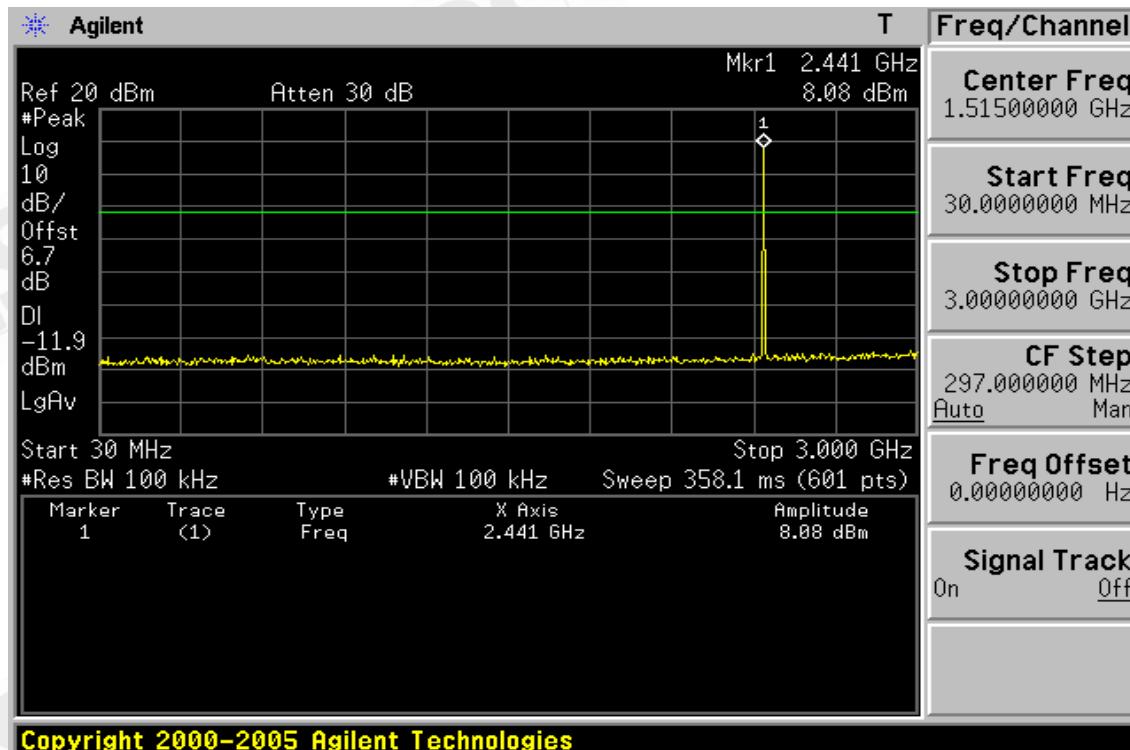
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**BDR Mode Conducted Spurious Emission Measurement Result**  
**Ch Low 30MHz – 3GHz****Ch Low 3GHz – 26.5GHz**

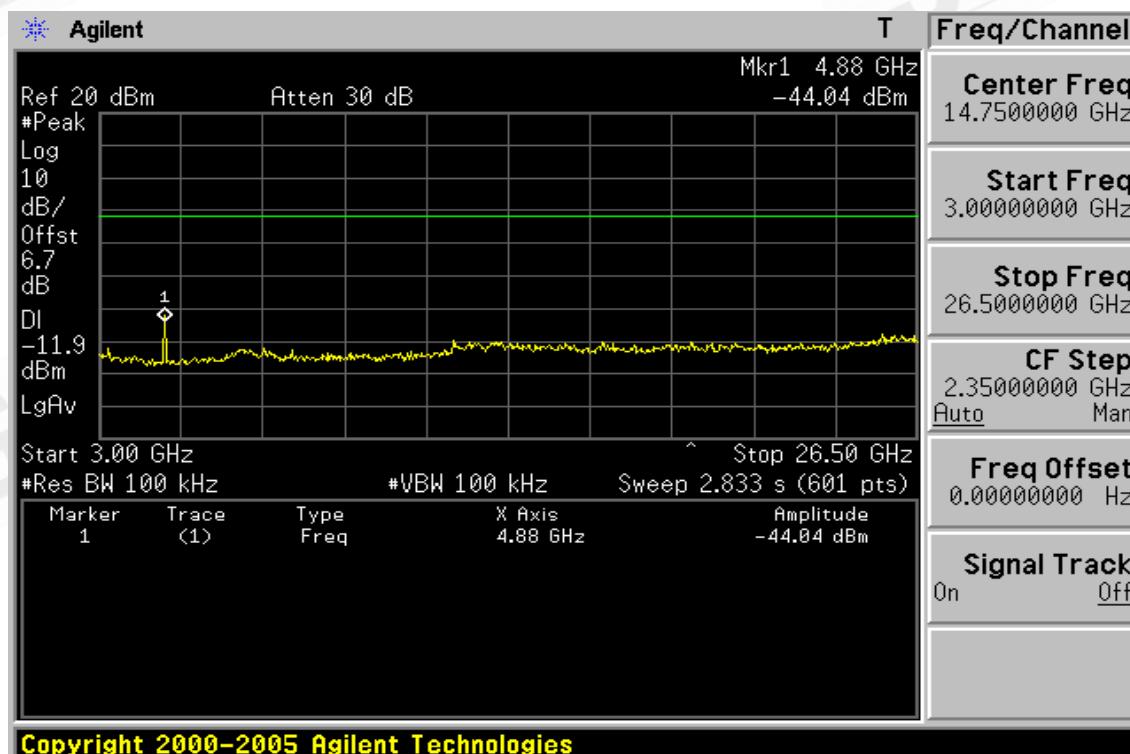
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## Ch Mid 30MHz – 3GHz

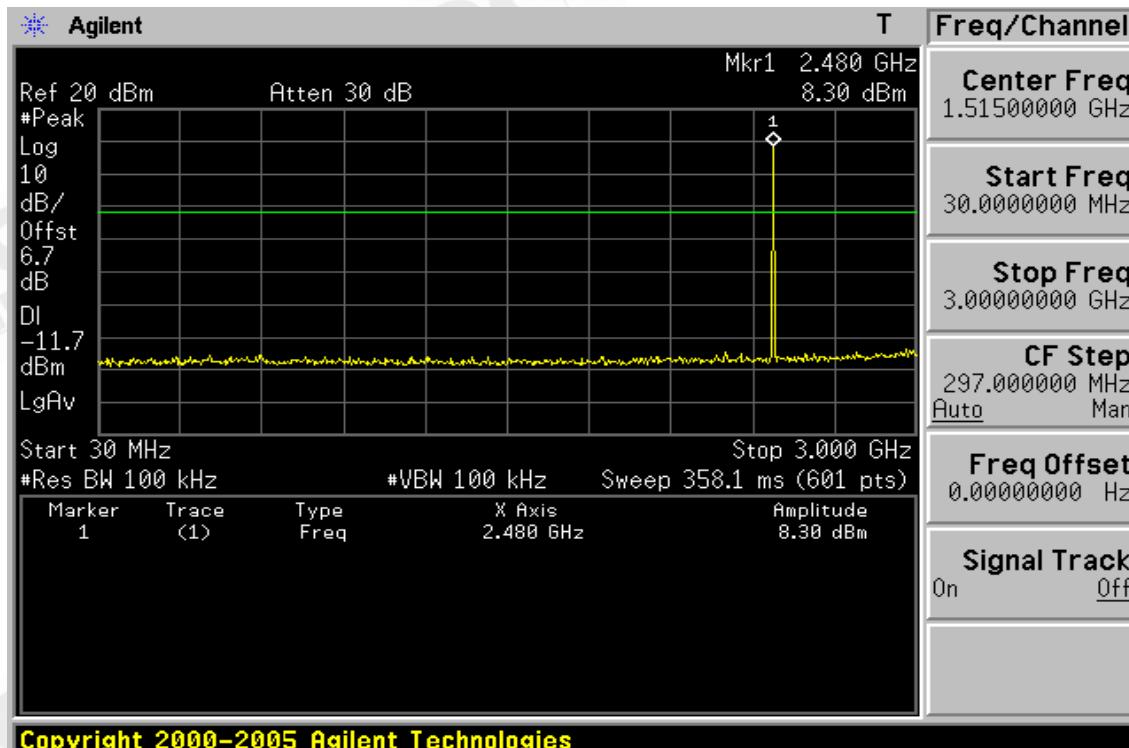
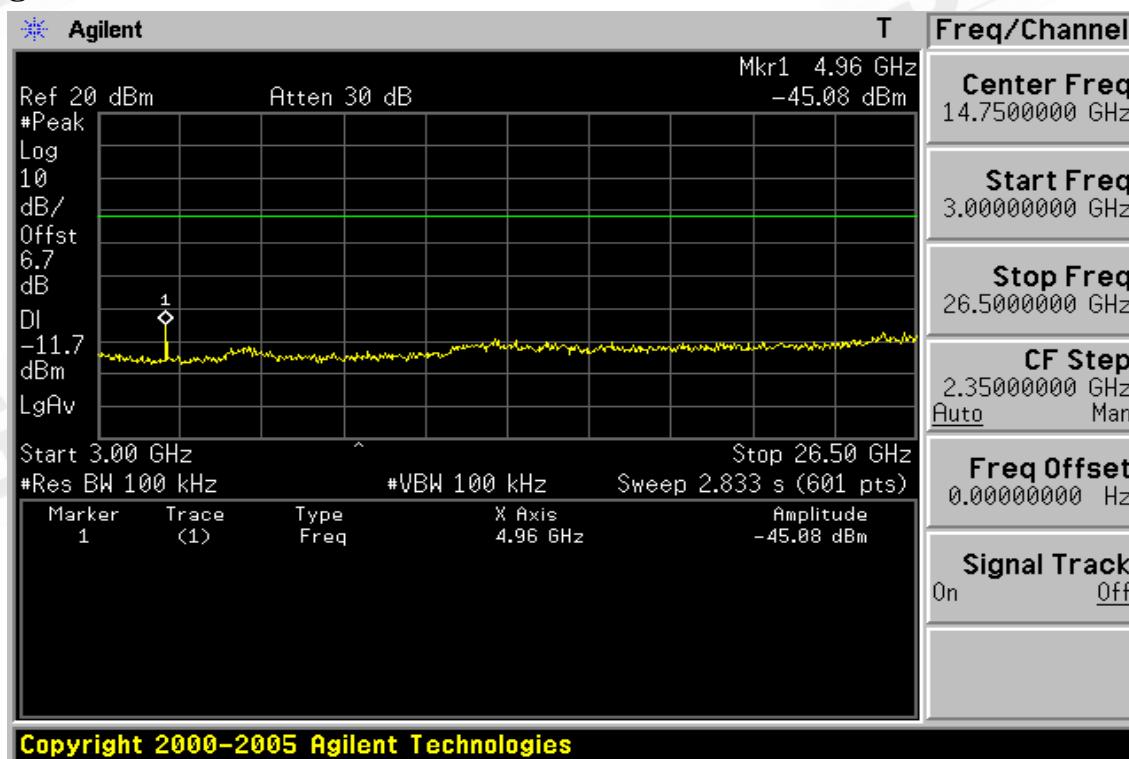


## Ch Mid 3GHz – 26.5GHz



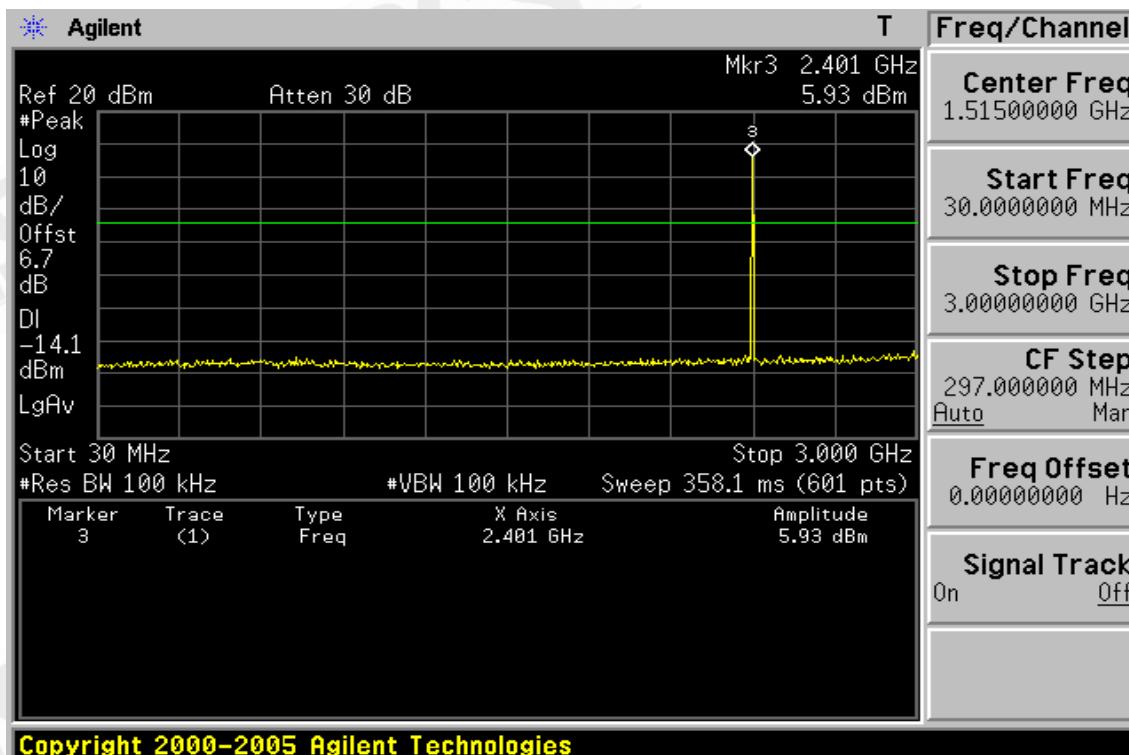
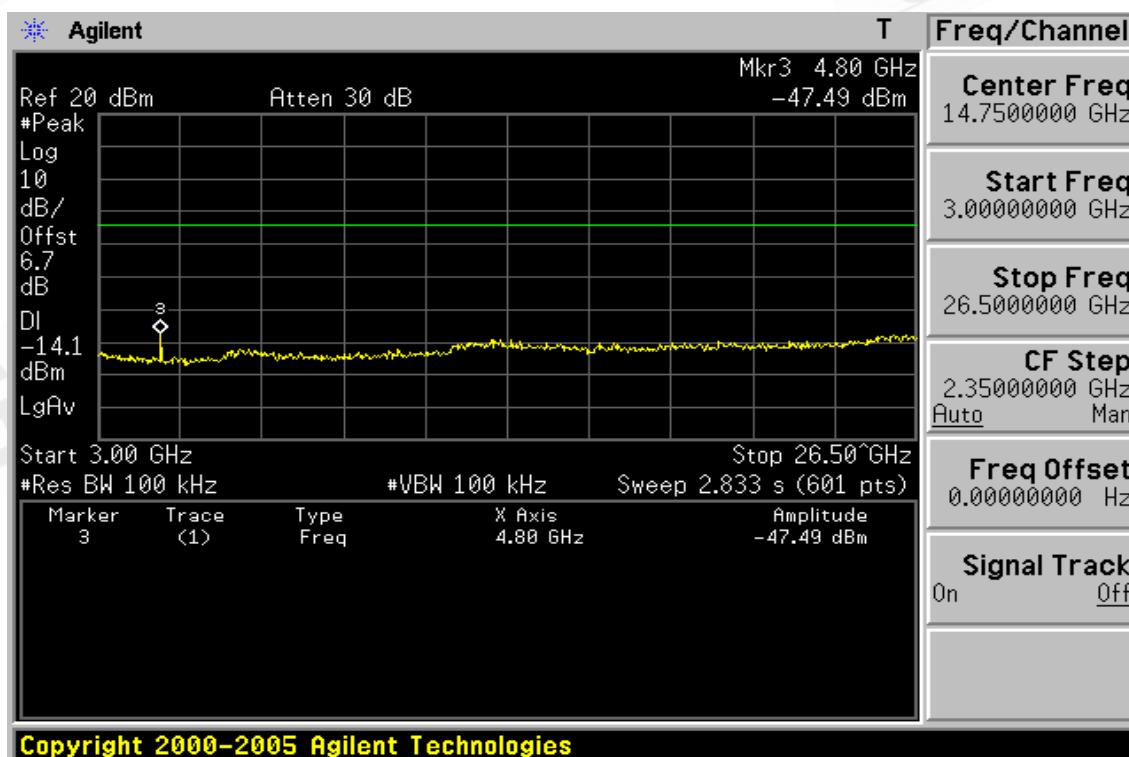
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**Ch High 30MHz – 3GHz****Ch High 3GHz – 26.5GHz**

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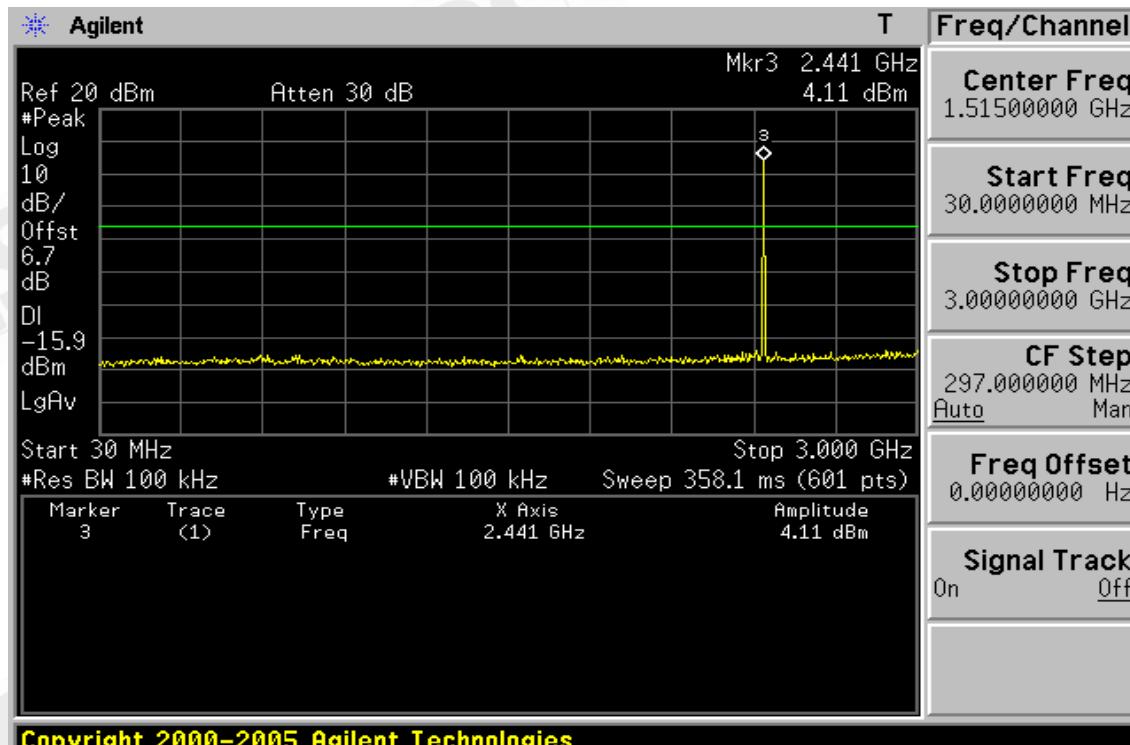
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**Conducted Spurious Emission Measurement Result (EDR mode)**  
**Ch Low 30MHz – 3GHz****Ch Low 3GHz – 26.5GHz**

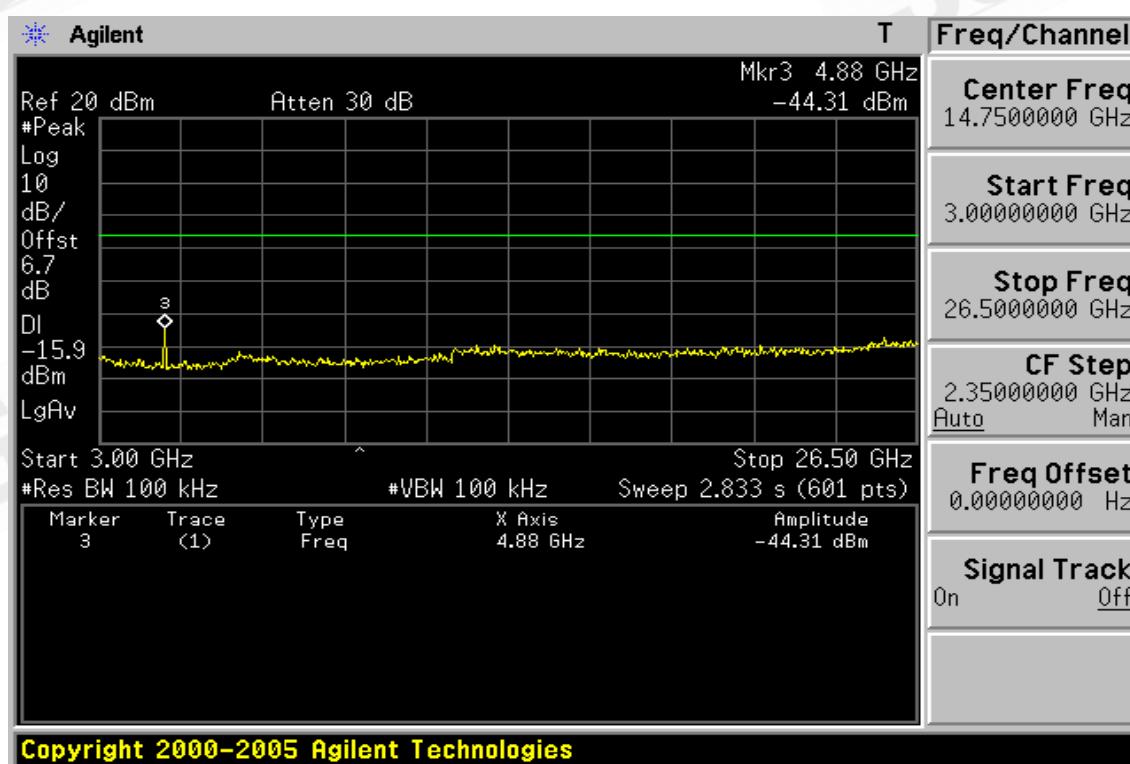
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## Ch Mid 30MHz – 3GHz

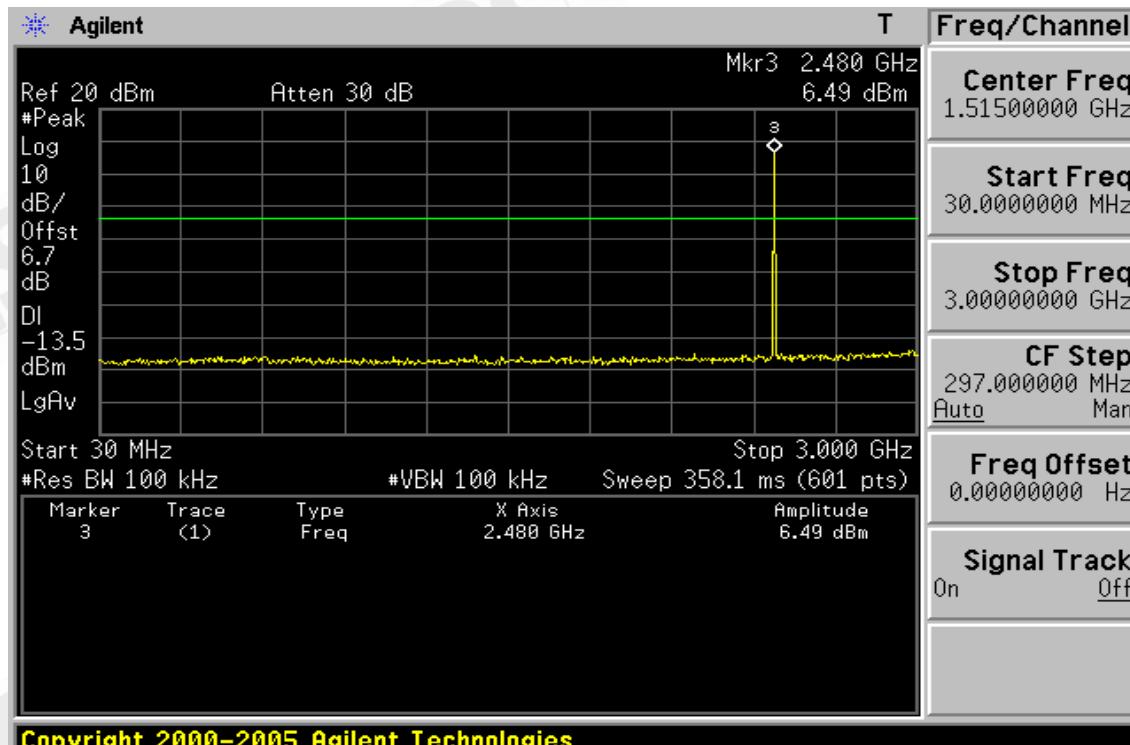
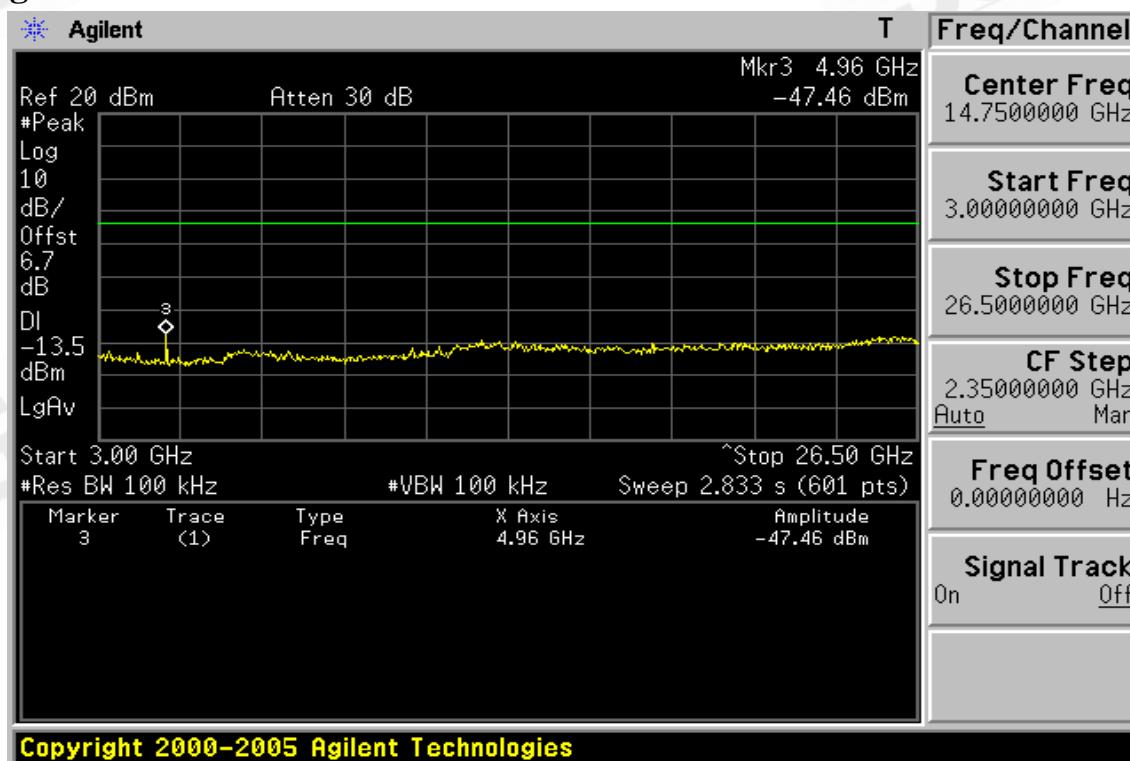


## Ch Mid 3GHz – 26.5GHz



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**Ch High 30MHz – 3GHz****Ch High 3GHz – 26.5GHz**

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## 10. SPURIOUS RADIATED EMISSION TEST

### 10.1 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 5 and 6 is not required. In addition, radiated emissions which fall in the restricted bands of Table 3 must also comply with the radiated emission limits specified in Tables 5 and 6 of RSS-GEN.

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**10.2 Measurement Equipment Used:****10.2.1 Radiated emission:**

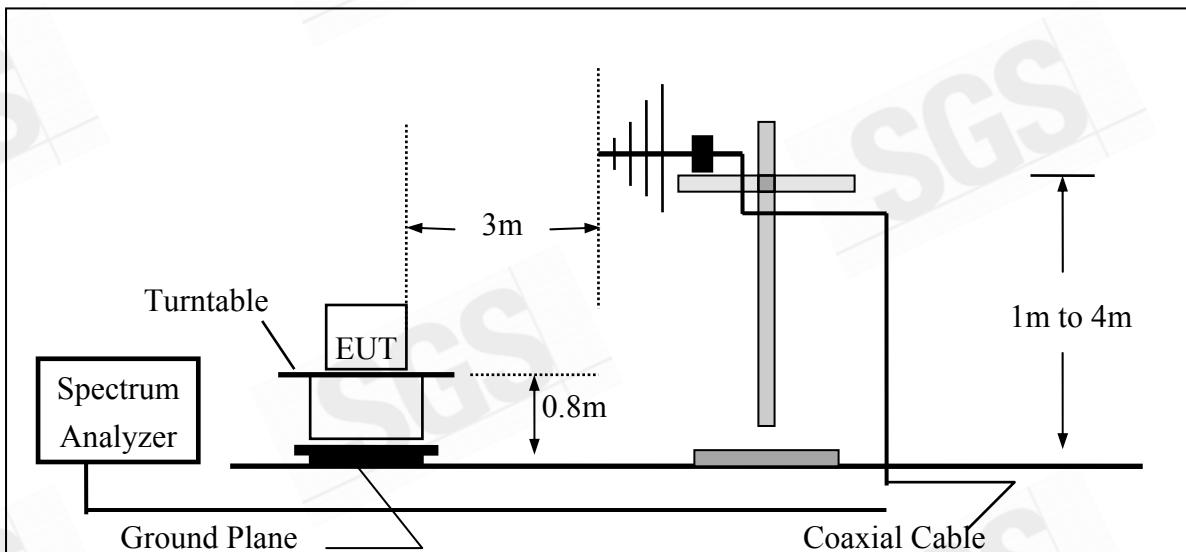
<b>966 Chamber</b>					
<b>EQUIPMENT TYPE</b>	<b>MFR</b>	<b>MODEL NUMBER</b>	<b>SERIAL NUMBER</b>	<b>LAST CAL.</b>	<b>CAL DUE.</b>
EMI Test Receiver	R&S	ESCI7	100759	05/20/2011	05/19/2012
Spectrum Analyzer	Agilent	E4446A	MY51100003	04/15/2011	04/14/2013
EXA Spectrum Analyzer	Agilent	N9010A	MY50420195	02/15/2011	02/14/2013
Spectrum Analyzer	R&S	FSV-30	101398	10/18/2011	10/17/2013
Bilog Antenna	SCHWAZBECK	VULB9168	378	01/10/2012	01/09/2014
Horn antenna	ETS.LINDGREN	3117	123995	05/19/2011	05/18/2013
Horn Antenna	Schwarzbeck	BBHA9170	185	07/11/2011	07/10/2013
Pre-Amplifier	Agilent	8447D	2944A07676	01/04/2012	01/03/2013
Pre-Amplifier	EMC Instruments Corp.	EMC0126530	980038	01/04/2012	01/03/2013
Filter 2400-2483.5 MHz	EWT	EWT-14-0166	M2	05/25/2011	05/24/2012
Attenuator	Mini-Circuit	BW-S10W2+	004	02/28/2012	02/27/2013
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	966_Rx	9	01/04/2012	01/03/2013
3m Site NSA	SGS	966 chamber	N/A	07/15/2011	07/14/2012

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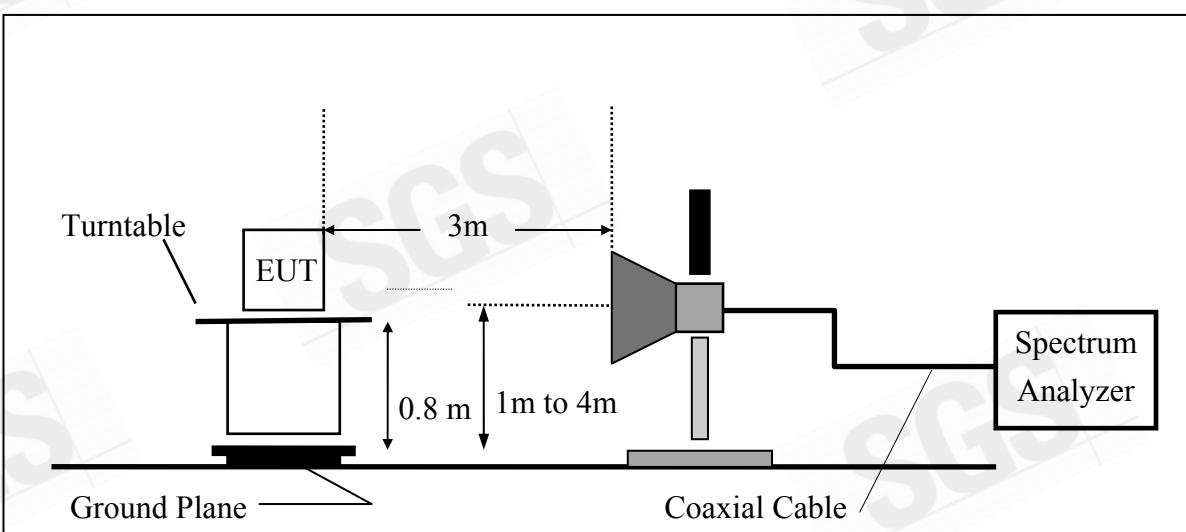
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**10.3. Test SET-UP:****10.3.1 Radiated emission::**

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



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



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## 10.4 Measurement Procedure:

### Radiated Emission:

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.

## 10.5 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:

$$\mathbf{FS = RA + AF + CL - AG}$$

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

## 10.6 Measurement Result:

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

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**Radiated Emission: (BDR mode)**

Operation Mode TX CH Low  
Fundamental Frequency 2402 MHz  
Temperature 24  
Humidity 61 %

Test Date May. 15, 2012  
Test By Jay  
Pol Ver.

Freq. (MHz)	Peak	AV	Actual FS		Peak	AV	Margin (dB)	Remark
	Reading (dBuV)	Reading (dBuV)	Ant./CL CF(dB)	Peak (dBuV/m)	AV (dBuV/m)			
2390.00	45.03	32.62	4.68	49.71	37.30	74.00	54.00	-16.70 AV

Operation Mode TX CH Low  
Fundamental Frequency 2402 MHz  
Temperature 24  
Humidity 61 %

Test Date May. 15, 2012  
Test By Jay  
Pol Hor.

Freq. (MHz)	Peak	AV	Actual FS		Peak	AV	Margin (dB)	Remark
	Reading (dBuV)	Reading (dBuV)	Ant./CL CF(dB)	Peak (dBuV/m)	AV (dBuV/m)			
2390.00	45.52	32.24	5.30	50.82	37.54	74.00	54.00	-16.46 AV

**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.

*For measurement plot of radiation revealing the compliance of 15.205, please refer to Appendix I.*

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**Radiated Emission:**

Operation Mode TX CH High  
Fundamental Frequency 2480 MHz  
Temperature 24  
Humidity 61 %

Test Date May. 15, 2012  
Test By Jay  
Pol Ver.

Freq. (MHz)	Peak	AV	Actual FS			Peak	AV	Margin (dB)	Remark
	Reading (dBuV)	Reading (dBuV)	Ant./CL CF(dB)	Peak (dBuV/m)	AV (dBuV/m)	Limit (dBuV/m)	Limit (dBuV/m)		
2483.50	45.11	32.42	5.26	50.37	37.68	74.00	54.00	-16.32	AV

Operation Mode TX CH High  
Fundamental Frequency 2480 MHz  
Temperature 24  
Humidity 61 %

Test Date May. 15, 2012  
Test By Jay  
Pol Hor.

Freq. (MHz)	Peak	AV	Actual FS			Peak	AV	Margin (dB)	Remark
	Reading (dBuV)	Reading (dBuV)	Ant./CL CF(dB)	Peak (dBuV/m)	AV (dBuV/m)	Limit (dBuV/m)	Limit (dBuV/m)		
2483.50	45.27	32.19	6.29	51.56	38.48	74.00	54.00	-15.52	AV

**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.

*For measurement plot of radiation revealing the compliance of 15.205, please refer to Appendix I.*

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**Radiated Emission: (EDR mode)**

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

Test Date May. 15, 2012  
Test By Jay  
Pol Ver.

Freq. (MHz)	Peak	AV	Actual FS		Peak	AV	Margin (dB)	Remark
	Reading (dBuV)	Reading (dBuV)	Ant./CL CF(dB)	Peak (dBuV/m)	AV (dBuV/m)			
2390.00	45.49	31.48	4.68	50.17	36.16	74.00	54.00	-17.84 AV

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

Test Date May. 15, 2012  
Test By Jay  
Pol Hor.

Freq. (MHz)	Peak	AV	Actual FS		Peak	AV	Margin (dB)	Remark
	Reading (dBuV)	Reading (dBuV)	Ant./CL CF(dB)	Peak (dBuV/m)	AV (dBuV/m)			
2390.00	45.58	31.72	5.30	50.88	37.02	74.00	54.00	-16.98 AV

**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.

*For measurement plot of radiation revealing the compliance of 15.205, please refer to Appendix I.*

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

Test Date May. 15, 2012  
Test By Jay  
Pol Ver.

Freq. (MHz)	Peak			AV			Actual FS			Peak			AV		
	Reading (dBuV)	Reading (dBuV)	Ant./CL CF(dB)	Peak (dBuV/m)	AV (dBuV/m)	Limit (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark						
2483.50	45.19	31.24	5.26	50.45	36.50	74.00	54.00	-17.50	AV						

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

Test Date May. 15, 2012  
Test By Jay  
Pol Hor.

Freq. (MHz)	Peak			AV			Actual FS			Peak			AV		
	Reading (dBuV)	Reading (dBuV)	Ant./CL CF(dB)	Peak (dBuV/m)	AV (dBuV/m)	Limit (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark						
2483.50	46.44	32.49	6.29	52.73	38.78	74.00	54.00	-15.22	AV						

**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.

*For measurement plot of radiation revealing the compliance of 15.205, please refer to Appendix I.*

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**Radiated Spurious Emission Measurement Result (worst case EDR mode)**

Operation Band :EDR Test Date :2012-05-07  
Fundamental Frequency :2402 MHz Temp./Humi. :23.6 deg\_C / 67 RH  
Operation Mode :TX Engineer :Jay  
EUT Pol. :E2 plan Measurement Antenna Pol. :VERTICAL

Actual FS(dB $\mu$ V/m) = SPA. Reading level(dB $\mu$ V) + Factor(dB)

Factor(dB) = Antenna Factor(dB $\mu$ V/m) + Cable Loss(dB) - Pre\_Amplifier Gain(dB)

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.

"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.

"---" : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode	Spectrum		Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Safe Margin dB
			PK/QP/AV	Reading Level dB $\mu$ V				
41.64	S	Peak	44.80	-13.56	31.24	40.00	-8.76	
243.40	S	Peak	27.30	-14.13	13.17	46.00	-32.83	
342.34	S	Peak	26.96	-11.78	15.18	46.00	-30.82	
446.13	S	Peak	28.04	-10.09	17.95	46.00	-28.05	
585.81	S	Peak	28.66	-7.86	20.80	46.00	-25.20	
792.42	S	Peak	26.99	-4.29	22.70	46.00	-23.30	
4804.00	H	Peak	36.59	9.65	46.24	74.00	-27.76	
7206.00	H	---						
9608.00	H	---						
12010.00	H	---						
14412.00	H	---						
16814.00	H	---						
19216.00	H	---						
21618.00	H	---						
24020.00	H	---						

For measurement plot of radiation revealing the compliance of 15.205, please refer to Appendix I.

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Operation Band	:EDR	Test Date	:2012-05-07
Fundamental Frequency	:2402 MHz	Temp./Humi.	:23.6 deg_C / 67 RH
Operation Mode	:TX	Engineer	:Jay
EUT Pol.	:E2 plan	Measurement Antenna Pol.	:HORIZONTAL

Actual FS(dB $\mu$ V/m) = SPA. Reading level(dB $\mu$ V) + Factor(dB)

Factor(dB) = Antenna Factor(dB $\mu$ V/m) + Cable Loss(dB) - Pre\_Amplifier Gain(dB)

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.

"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.

"---" : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode	Spectrum		Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Safe Margin dB
			PK/QP/AV	Reading Level dB $\mu$ V				
39.70	S	Peak		34.29	-13.47	20.82	40.00	-19.18
111.48	S	Peak		29.98	-15.56	14.42	43.50	-29.08
286.08	S	Peak		29.73	-12.89	16.84	46.00	-29.16
438.37	S	Peak		27.75	-10.25	17.50	46.00	-28.50
561.56	S	Peak		28.16	-8.34	19.82	46.00	-26.18
760.41	S	Peak		27.25	-4.80	22.45	46.00	-23.55
4804.00	H	Peak		38.83	9.69	48.52	74.00	-25.48
7206.00	H	---						
9608.00	H	---						
12010.00	H	---						
14412.00	H	---						
16814.00	H	---						
19216.00	H	---						
21618.00	H	---						
24020.00	H	---						

For measurement plot of radiation revealing the compliance of 15.205, please refer to Appendix I.

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Operation Band	:EDR	Test Date	:2012-05-07
Fundamental Frequency	:2441 MHz	Temp./Humi.	:23.6 deg_C / 67 RH
Operation Mode	:TX	Engineer	:Jay
EUT Pol.	:E2 plan	Measurement Antenna Pol.	:VERTICAL

Actual FS(dB $\mu$ V/m) = SPA. Reading level(dB $\mu$ V) + Factor(dB)

Factor(dB) = Antenna Factor(dB $\mu$ V/m) + Cable Loss(dB) - Pre\_Amplifier Gain(dB)

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.

"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.

"---" : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode	Spectrum Reading Level	Factor dB	Actual FS	Limit @3m	Safe Margin
			dB $\mu$ V		dB $\mu$ V/m	dB $\mu$ V/m	dB
41.64	S	Peak	44.78	-13.56	31.22	40.00	-8.78
114.39	S	Peak	33.70	-15.22	18.48	43.50	-25.02
349.13	S	Peak	27.52	-11.71	15.81	46.00	-30.19
524.70	S	Peak	27.58	-9.11	18.47	46.00	-27.53
669.23	S	Peak	27.50	-6.21	21.29	46.00	-24.71
791.45	S	Peak	26.95	-4.31	22.64	46.00	-23.36
4882.00	H	Peak	35.20	10.16	45.36	74.00	-28.64
7323.00	H	---					
9764.00	H	---					
12205.00	H	---					
14646.00	H	---					
17087.00	H	---					
19528.00	H	---					
21969.00	H	---					
24410.00	H	---					

For measurement plot of radiation revealing the compliance of 15.205, please refer to Appendix I.

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Operation Band	:EDR	Test Date	:2012-05-07
Fundamental Frequency	:2441 MHz	Temp./Humi.	:23.6 deg_C / 67 RH
Operation Mode	:TX	Engineer	:Jay
EUT Pol.	:E2 plan	Measurement Antenna Pol.	:HORIZONTAL

Actual FS(dB $\mu$ V/m) = SPA. Reading level(dB $\mu$ V) + Factor(dB)

Factor(dB) = Antenna Factor(dB $\mu$ V/m) + Cable Loss(dB) - Pre\_Amplifier Gain(dB)

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.

"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.

"---" : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode	Spectrum Reading Level	Factor dB	Actual FS	Limit @3m	Safe Margin
			dB $\mu$ V		dB $\mu$ V/m	dB $\mu$ V/m	dB
31.94	S	Peak	33.67	-14.30	19.37	40.00	-20.63
151.25	S	Peak	26.96	-12.34	14.62	43.50	-28.88
286.08	S	Peak	29.14	-12.89	16.25	46.00	-29.75
392.78	S	Peak	26.98	-11.14	15.84	46.00	-30.16
575.14	S	Peak	27.86	-8.09	19.77	46.00	-26.23
761.38	S	Peak	27.99	-4.78	23.21	46.00	-22.79
4882.00	H	Peak	35.99	10.11	46.10	74.00	-27.90
7323.00	H	---					
9764.00	H	---					
12205.00	H	---					
14646.00	H	---					
17087.00	H	---					
19528.00	H	---					
21969.00	H	---					
24410.00	H	---					

For measurement plot of radiation revealing the compliance of 15.205, please refer to Appendix I.

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Operation Band :EDR  
Fundamental Frequency :2480 MHz  
Operation Mode :TX  
EUT Pol. :E2 plan

Test Date :2012-05-07  
Temp./Humi. :23.6 deg\_C / 67 RH  
Engineer :Jay  
Measurement Antenna Pol. :VERTICAL

Actual FS(dB $\mu$ V/m) = SPA. Reading level(dB $\mu$ V) + Factor(dB)

Factor(dB) = Antenna Factor(dB $\mu$ V/m) + Cable Loss(dB) - Pre\_Amplifier Gain(dB)

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.

"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.

"---" : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode	Spectrum Reading Level	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Safe Margin dB
41.64	S	Peak	44.64	-13.56	31.08	40.00	-8.92
115.36	S	Peak	33.17	-15.08	18.09	43.50	-25.41
286.08	S	Peak	26.50	-12.89	13.61	46.00	-32.39
448.07	S	Peak	27.25	-10.06	17.19	46.00	-28.81
552.83	S	Peak	28.68	-8.53	20.15	46.00	-25.85
792.42	S	Peak	28.51	-4.29	24.22	46.00	-21.78
4960.00	H	Peak	35.52	10.03	45.55	74.00	-28.45
7440.00	H	---					
9920.00	H	---					
12400.00	H	---					
14880.00	H	---					
17360.00	H	---					
19840.00	H	---					
22320.00	H	---					
24800.00	H	---					

For measurement plot of radiation revealing the compliance of 15.205, please refer to Appendix I.

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Operation Band	:EDR	Test Date	:2012-05-07
Fundamental Frequency	:2480 MHz	Temp./Humi.	:23.6 deg_C / 67 RH
Operation Mode	:TX	Engineer	:Jay
EUT Pol.	:E2 plan	Measurement Antenna Pol.	:HORIZONTAL

Actual FS(dB $\mu$ V/m) = SPA. Reading level(dB $\mu$ V) + Factor(dB)

Factor(dB) = Antenna Factor(dB $\mu$ V/m) + Cable Loss(dB) - Pre\_Amplifier Gain(dB)

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.

"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.

"---" : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode	Spectrum Reading Level	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Safe Margin dB
						dB $\mu$ V/m	dB
41.64	S	Peak	33.49	-13.56	19.93	40.00	-20.07
107.60	S	Peak	30.98	-16.01	14.97	43.50	-28.53
286.08	S	Peak	29.38	-12.89	16.49	46.00	-29.51
457.77	S	Peak	29.06	-9.99	19.07	46.00	-26.93
655.65	S	Peak	28.45	-6.47	21.98	46.00	-24.02
883.60	S	Peak	27.63	-3.14	24.49	46.00	-21.51
4960.00	H	Peak	35.62	9.88	45.50	74.00	-28.50
7440.00	H	---					
9920.00	H	---					
12400.00	H	---					
14880.00	H	---					
17360.00	H	---					
19840.00	H	---					
22320.00	H	---					
24800.00	H	---					

For measurement plot of radiation revealing the compliance of 15.205, please refer to Appendix I.

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## 11. FREQUENCY SEPARATION

### 11.1 Standard Applicable

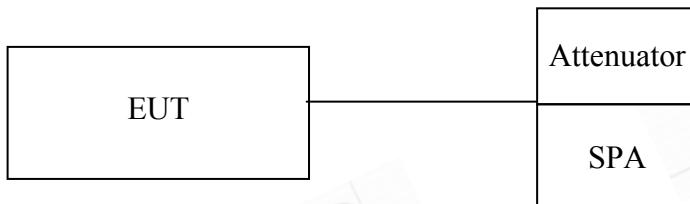
According to §15.247(a)(1), Frequency hopping systems shall have hopping channel carrier frequencies separated by minimum of 25KHz or the 2/3\*20dB bandwidth of the hopping channel, whichever is greater.

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.

### 11.2 Measurement Equipment Used:

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Agilent	E4446A	MY51100003	04/15/2011	04/14/2013
Spectrum Analyzer	Agilent	E4440A	MY45304525	03/17/2012	03/16/2014
DC Block	Mini-Circuits	BLK-18-S+	1	02/28/2012	02/27/2013
Low Loss Cable	HUBER+SUHNER	SUCOFLEX 104PEA	N/A	01/05/2012	01/04/2013
Attenuator	Mini-Circuit	BW-S10W2+	002	02/28/2012	02/27/2013

### 11.3 Test Set-up:



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**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 = middle of hopping channel .
4. Set the spectrum analyzer as RBW, VBW=100KHz, Adjust Span to 5MHz, Sweep = auto.
5. Max hold. Mark 3 Peaks of hopping channel and record the 3 peaks frequency.

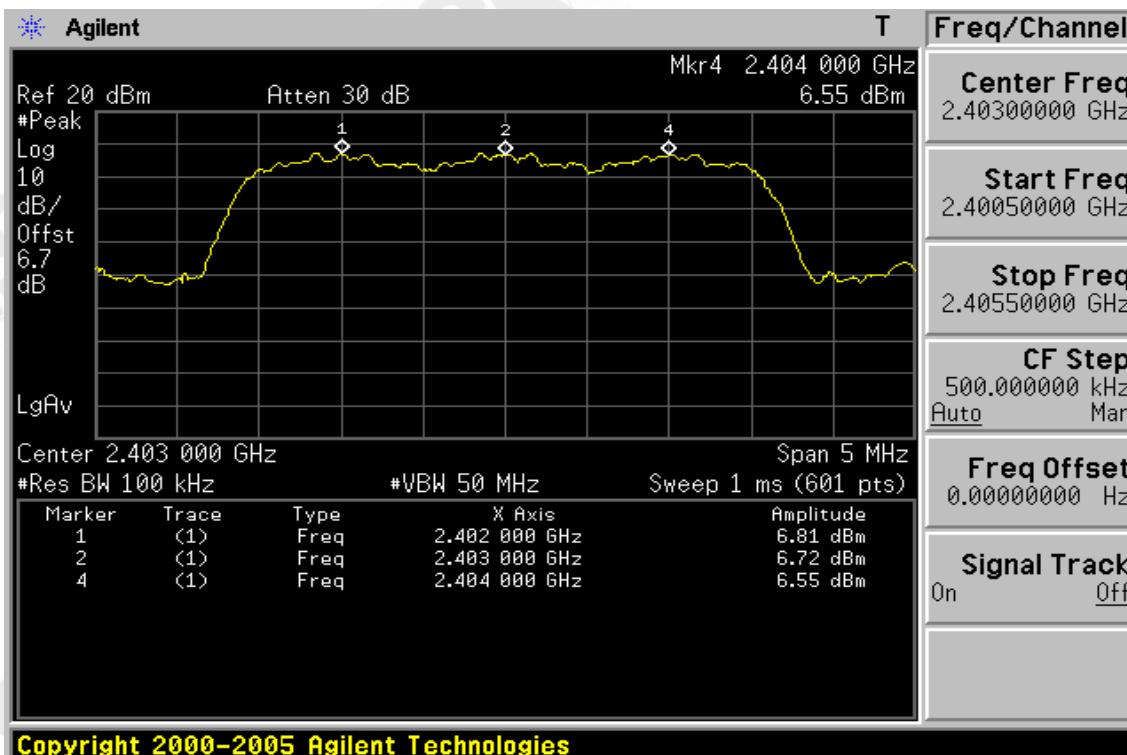
**11.5 Measurement Result:**

Channel separation (MHz)	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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## 12. NUMBER OF HOPPING FREQUENCY

### 12.1 Standard Applicable

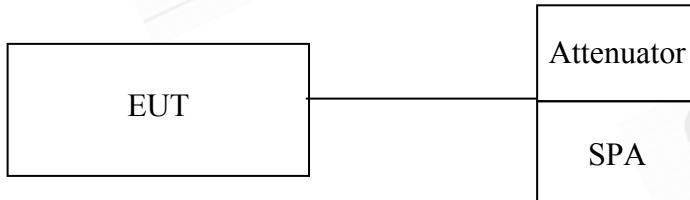
According to §15.247(a)(1)(iii), Frequency hopping systems operating in the 2400MHz-2483.5 MHz bands shall use at least 15 hopping frequencies.

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.

### 12.2 Measurement Equipment Used:

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Agilent	E4446A	MY51100003	04/15/2011	04/14/2013
Spectrum Analyzer	Agilent	E4440A	MY45304525	03/17/2012	03/16/2014
DC Block	Mini-Circuits	BLK-18-S+	1	02/28/2012	02/27/2013
Low Loss Cable	HUBER+SUHNER	SUCOFLEX 104PEA	N/A	01/05/2012	01/04/2013
Attenuator	Mini-Circuit	BW-S10W2+	002	02/28/2012	02/27/2013

### 12.3 Test Set-up:



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**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 spectrum analyzer Start=2400MHz, Stop = 2483.5MHz, Sweep = auto.
4. Set the spectrum analyzer as RBW=430KHz, VBW=1.5MHz.
5. Max hold, view and count how many channel in the band.

**12.5 Measurement Result:**

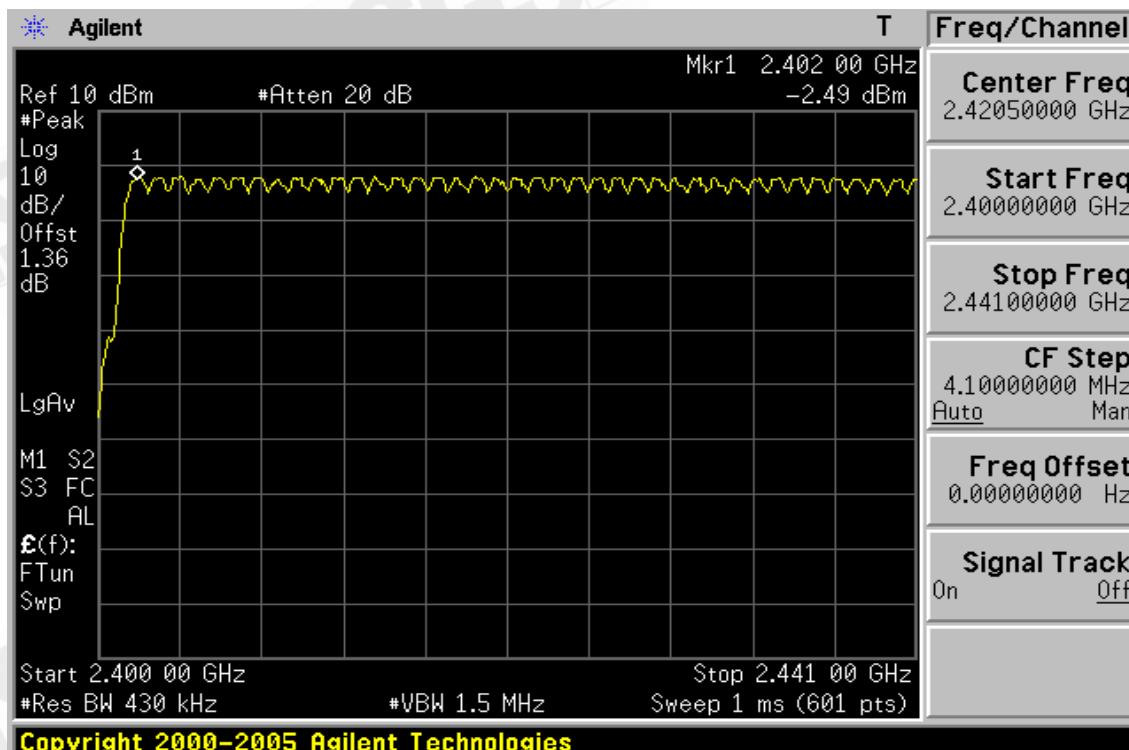
Note: Refer to next page for plots.

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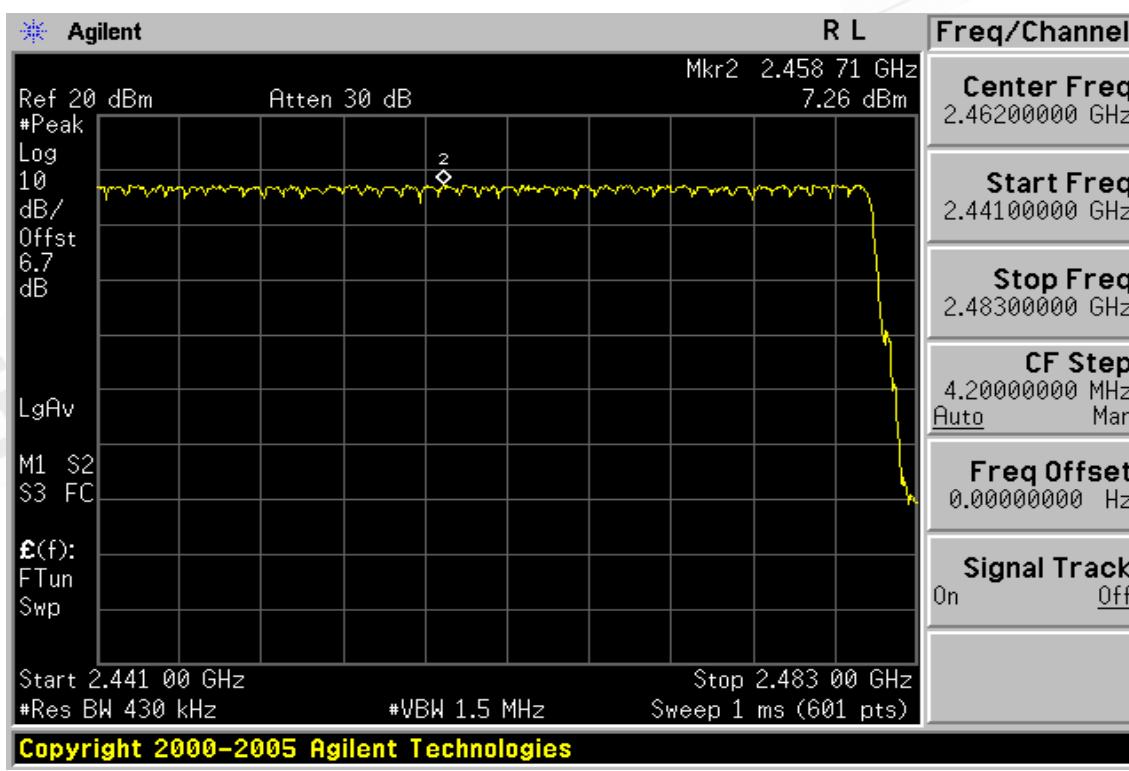
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## Channel Number

2.4 GHz – 2.441GHz



2.441 GHz – 2.4835GHz



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**Tabular Data of Total Channel Number:**

	<i>Channel Number</i>
<b>2.4 GHz - 2.441GHz</b>	<b>40</b>
<b>2.441 GHz - 2.4835GHz</b>	<b>39</b>
<b>2.4GHz ~2.4835GHz</b>	<b>79 (40 + 39)</b>

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## 13. TIME OF OCCUPANCY (DWELL TIME)

### 13.1 Standard Applicable

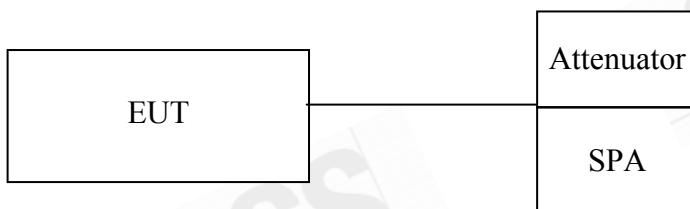
According to §15.247(a)(1)(iii), Frequency hopping systems operating in the 2400MHz-2483.5 MHz. The average time of occupancy on any frequency shall not greater than 0.4 s within period of 0.4 seconds multiplied by the number of hopping channel employed.

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.

### 13.2 Measurement Equipment Used:

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Agilent	E4446A	MY51100003	04/15/2011	04/14/2013
Spectrum Analyzer	Agilent	E4440A	MY45304525	03/17/2012	03/16/2014
DC Block	Mini-Circuits	BLK-18-S+	1	02/28/2012	02/27/2013
Low Loss Cable	HUBER+SUHNER	SUCOFLEX 104PEA	N/A	01/05/2012	01/04/2013
Attenuator	Mini-Circuit	BW-S10W2+	002	02/28/2012	02/27/2013

### 13.3 Test Set-up:



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### 13.4 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=1MHz, 3MHz, Span = 0Hz , Adjust Sweep = 2~7ms.
5. Repeat above procedures until all frequency measured were complete.

## 13.5 Measurement Result

$$\text{A period time} = 0.4 \text{ (s)} * 79 = 31.6 \text{ (s)}$$

$$\text{CH Low DH1 time slot} = 0.380 \text{ (ms)} * (1600/2/79) * 31.6 = 121.60 \text{ (ms)}$$

$$\text{DH3 time slot} = 1.642 \text{ (ms)} * (1600/4/79) * 31.6 = 262.72 \text{ (ms)}$$

$$\text{DH5 time slot} = 2.883 \text{ (ms)} * (1600/6/79) * 31.6 = 307.52 \text{ (ms)}$$

$$\text{CH Mid DH1 time slot} = 0.380 \text{ (ms)} * (1600/2/79) * 31.6 = 121.60 \text{ (ms)}$$

$$\text{DH3 time slot} = 1.642 \text{ (ms)} * (1600/4/79) * 31.6 = 262.72 \text{ (ms)}$$

$$\text{DH5 time slot} = 2.883 \text{ (ms)} * (1600/6/79) * 31.6 = 307.52 \text{ (ms)}$$

$$\text{CH High DH1 time slot} = 0.380 \text{ (ms)} * (1600/2/79) * 31.6 = 121.60 \text{ (ms)}$$

$$\text{DH3 time slot} = 1642 \text{ (ms)} * (1600/4/79) * 31.6 = 262.72 \text{ (ms)}$$

$$\text{DH5 time slot} \equiv 2.883 \text{ (ms)} * (1600/6/79) * 31.6 \equiv 307.52 \text{ (ms)}$$

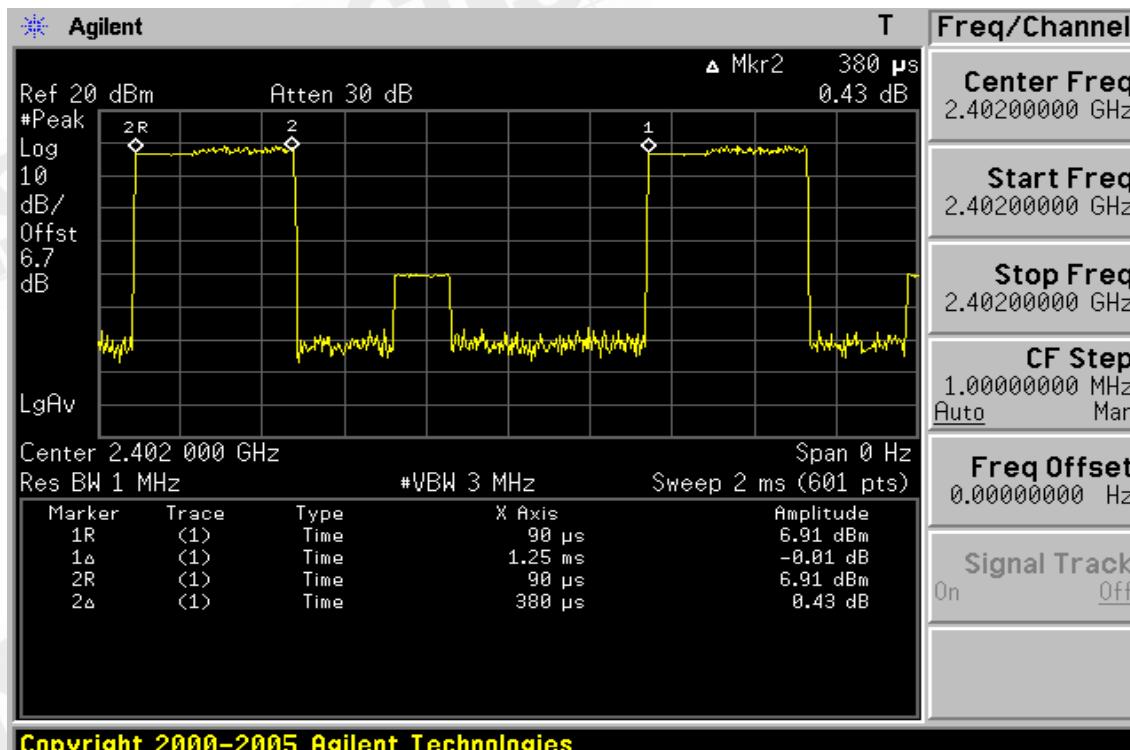
Note: Refer to next page for plots.

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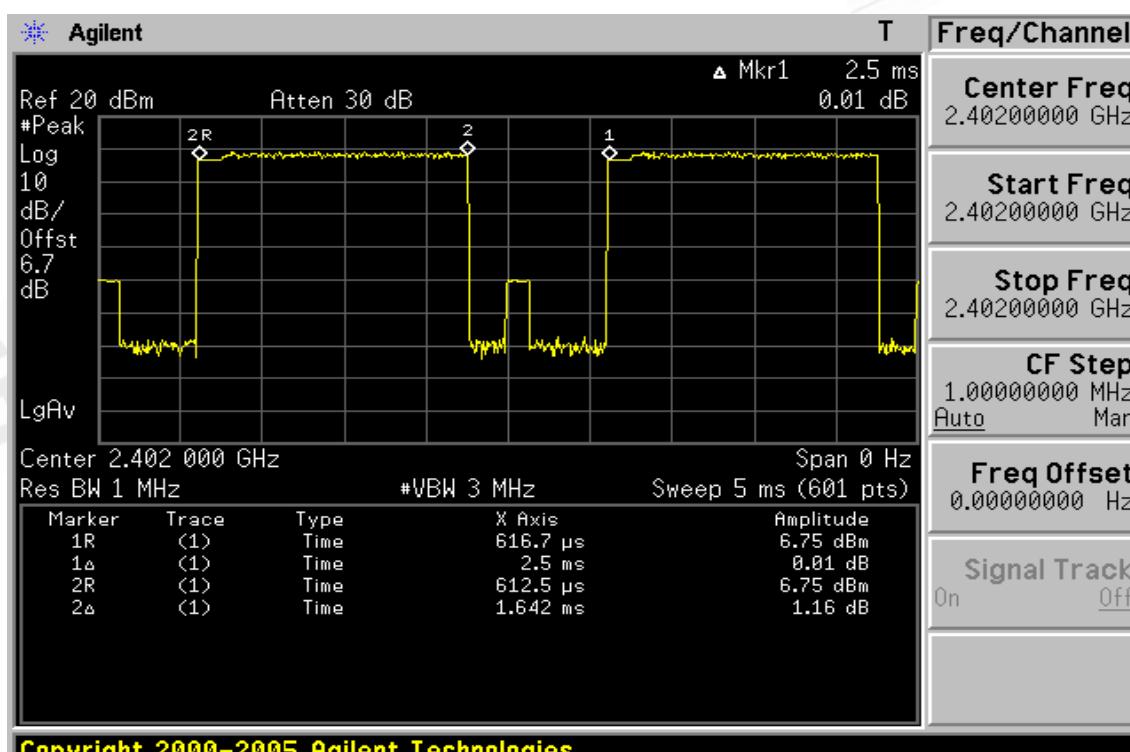
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CH-Low

DH1

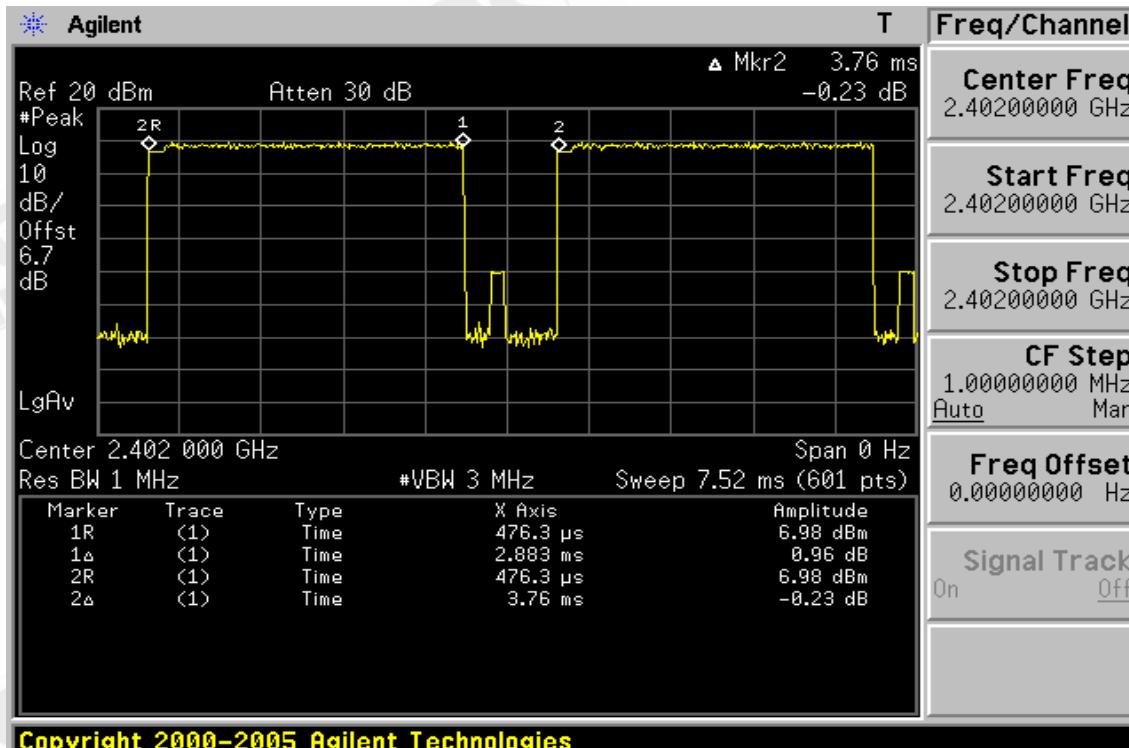


DH3

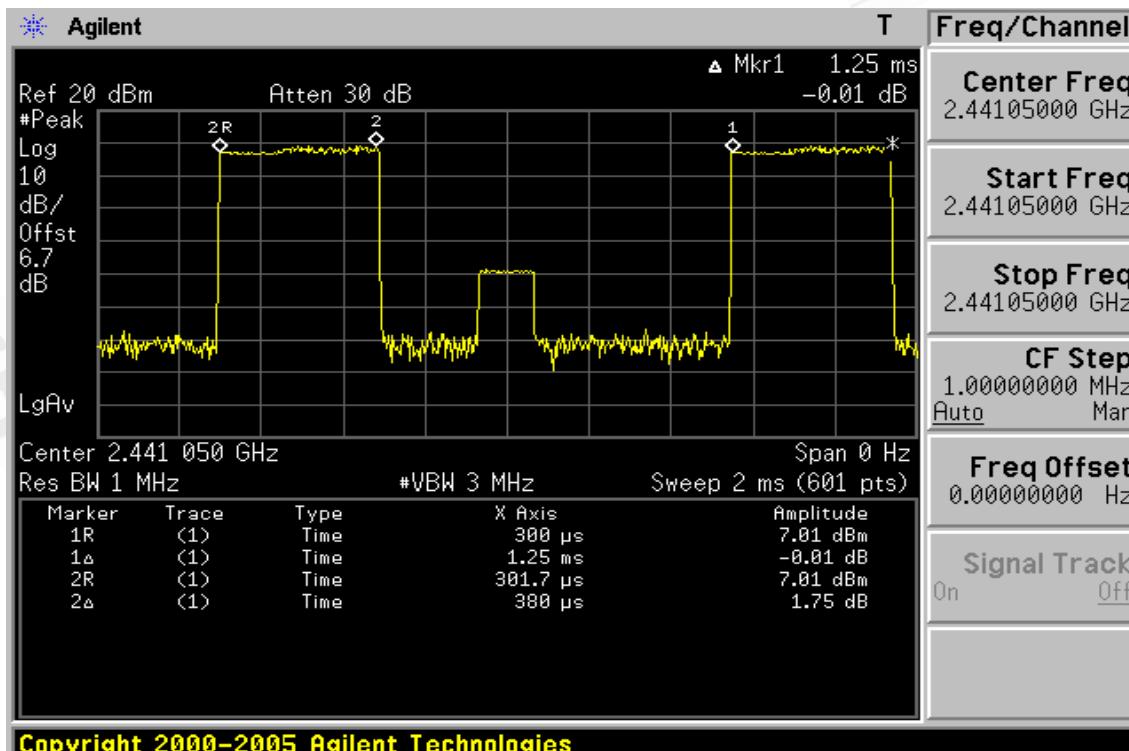


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**DH5**

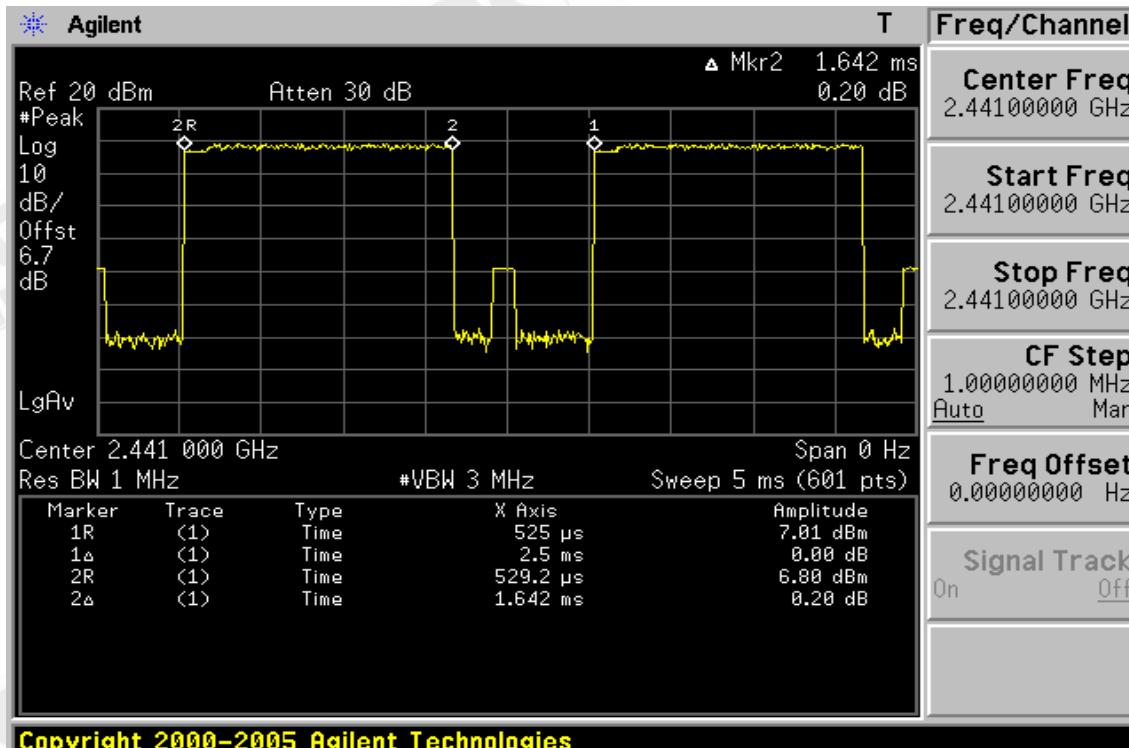
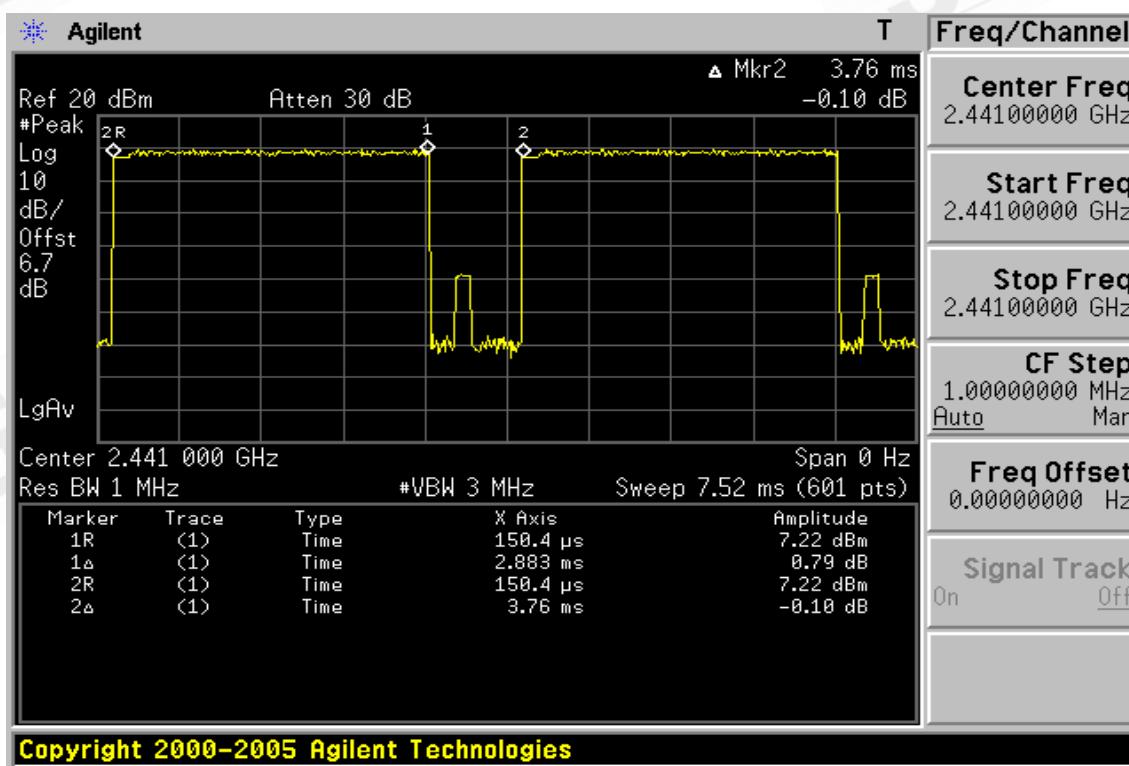
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**CH-Mid****DH1**

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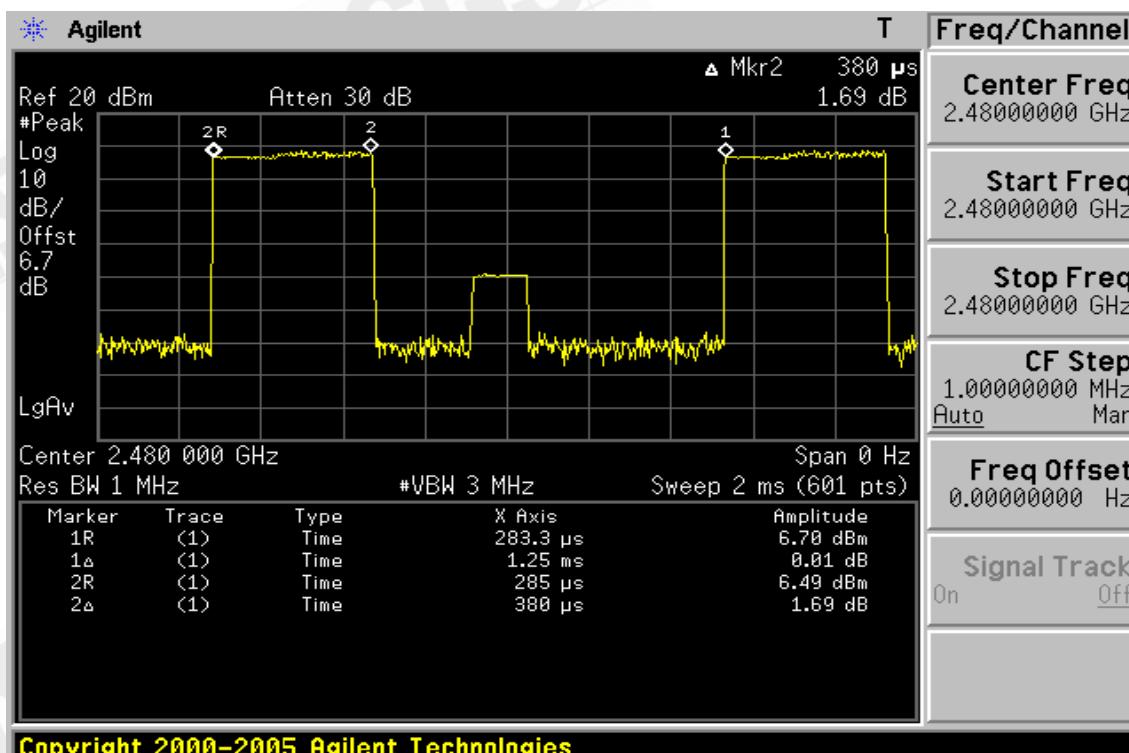
**DH3****DH5**

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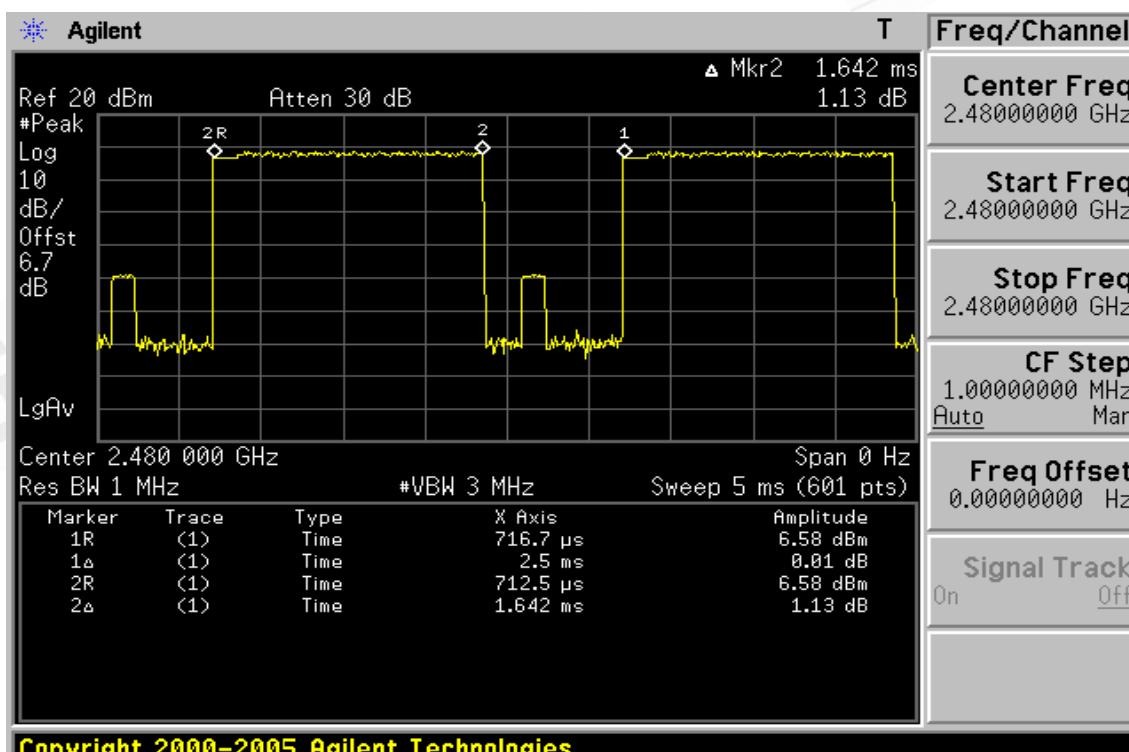
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### *CH-High*

DH1



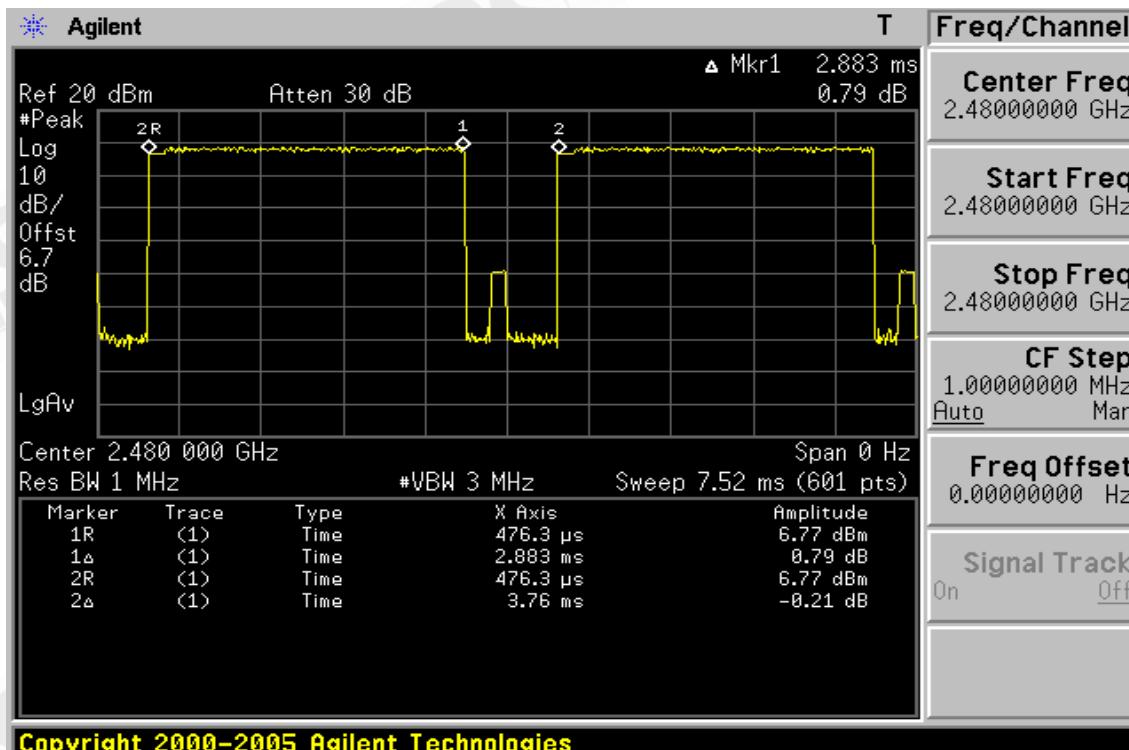
DH3



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DH5



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## 14. ANTENNA REQUIREMENT

### 14.1 Standard Applicable

For intentional device, according to §15.203, an intentional radiator shall be designed to ensure that no antenna other than furnished by the responsible party shall be used with the device.

And according to §15.247(4)(1), system operating in the 2400-2483.5MHz bands that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum peak output power of the intentional radiator is reduced by 1 dB for every 3 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.

### 14.2 Antenna Connected Construction

The directional gains of antenna used for transmitting is -0.27 dBi, and the antenna connector is designed with permanent attachment and no consideration of replacement. Please see EUT photo for details.

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## **APPENDIX 1**

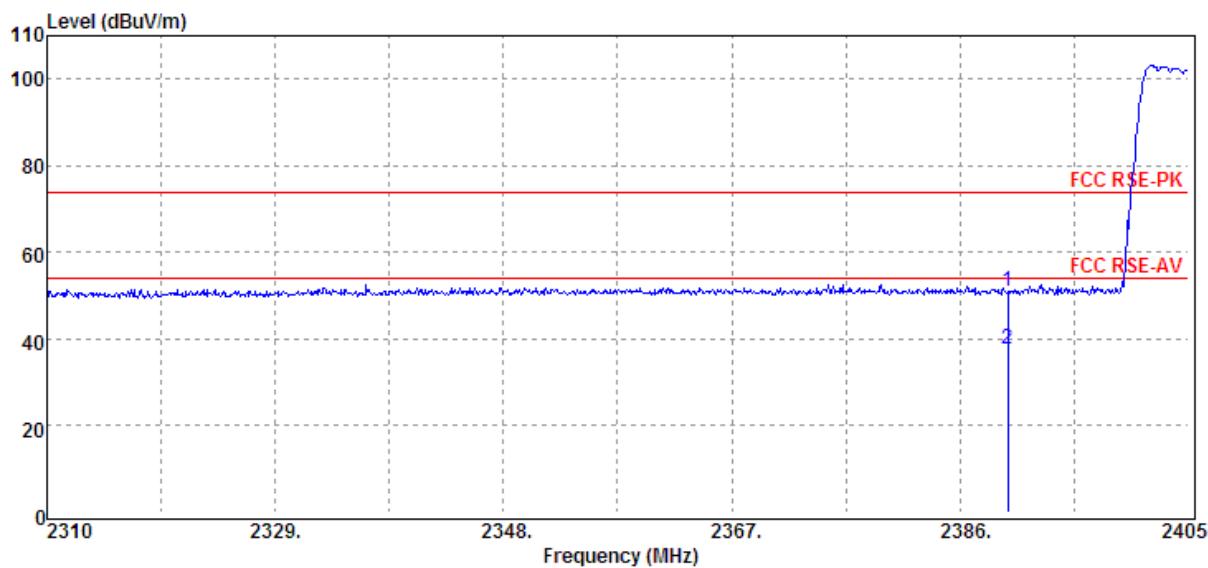
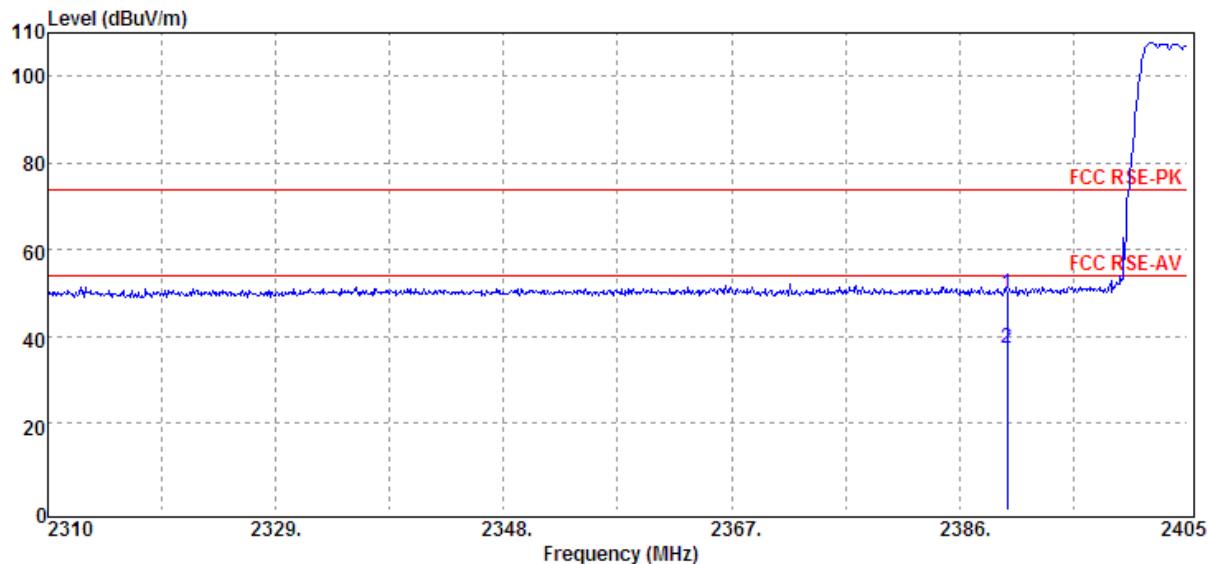
# **MEASUREMENT PLOT OF RADIATED SPURIOUS EMISSION**

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**Band Edges Radiated Emission:**

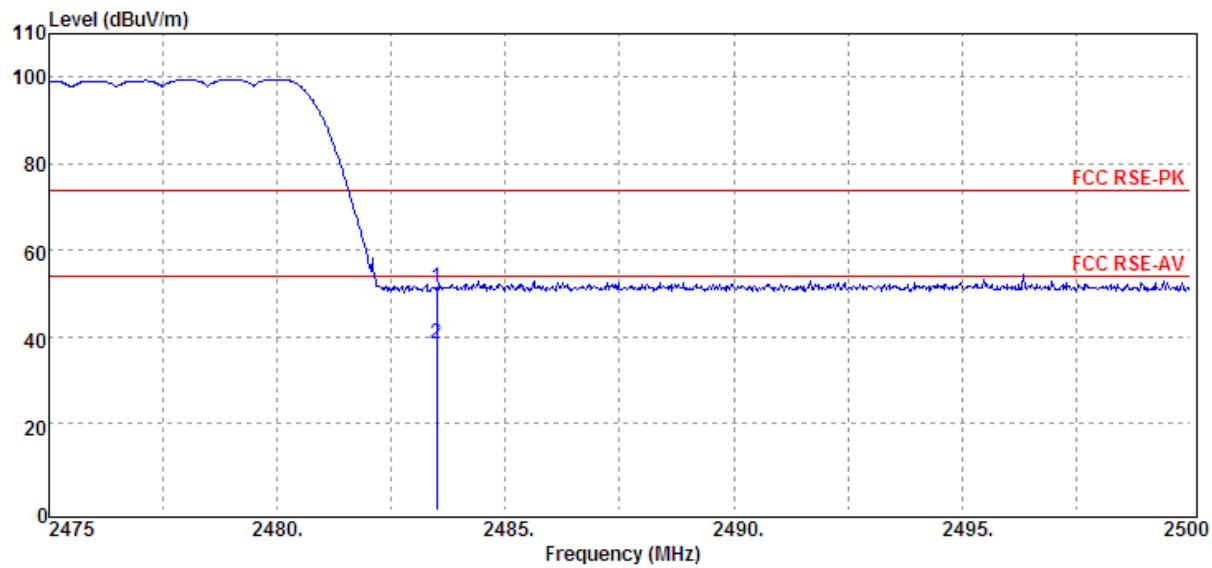
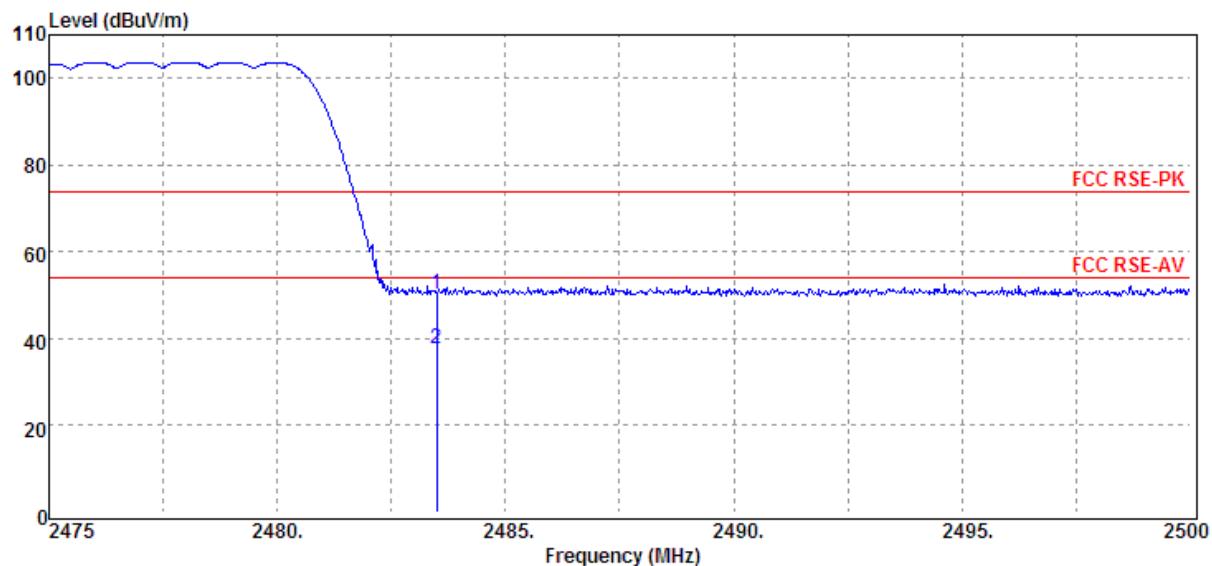
Operation Band	:BDR	Test Date	:2012-05-15
Fundamental Frequency	:2402 MHz	Temp./Humi.	:23.6 deg_C / 67 RH
Operation Mode	:Bandedge	Engineer	:Jay
EUT Pol.	:E2 Plan	Measurement Antenna Pol.	:Ver. / Hor.



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Operation Band	:BDR	Test Date	:2012-05-15
Fundamental Frequency	:2480MHz	Temp./Humi.	:23.6 deg_C / 67 RH
Operation Mode	:Bandedge	Engineer	:Jay
EUT Pol.	:E2 Plan	Measurement Antenna Pol.	:Ver. / Hor.

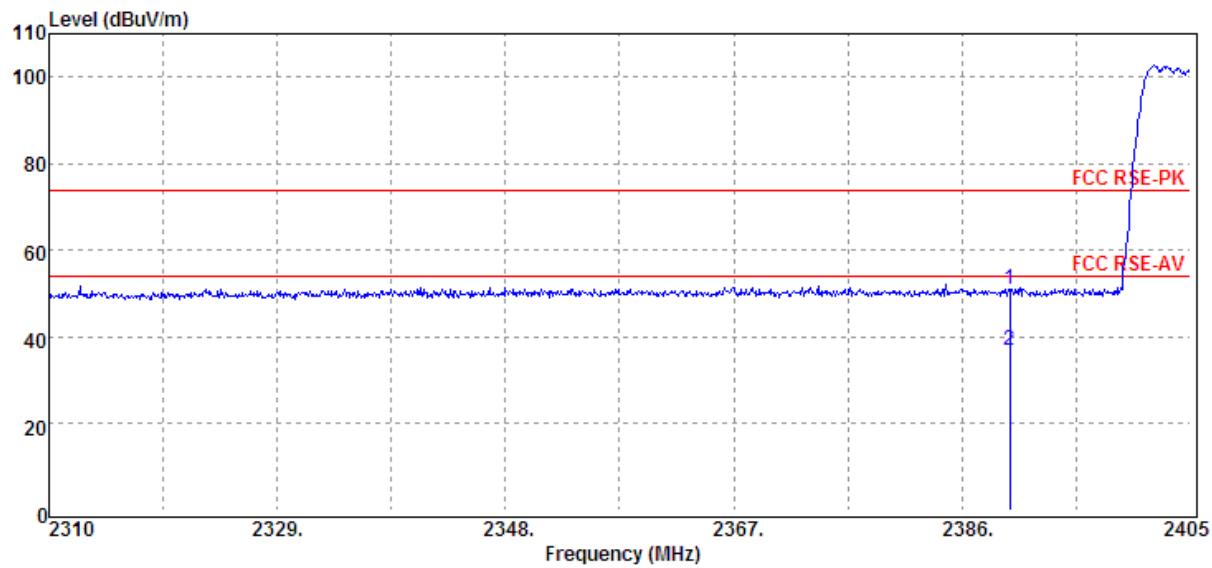
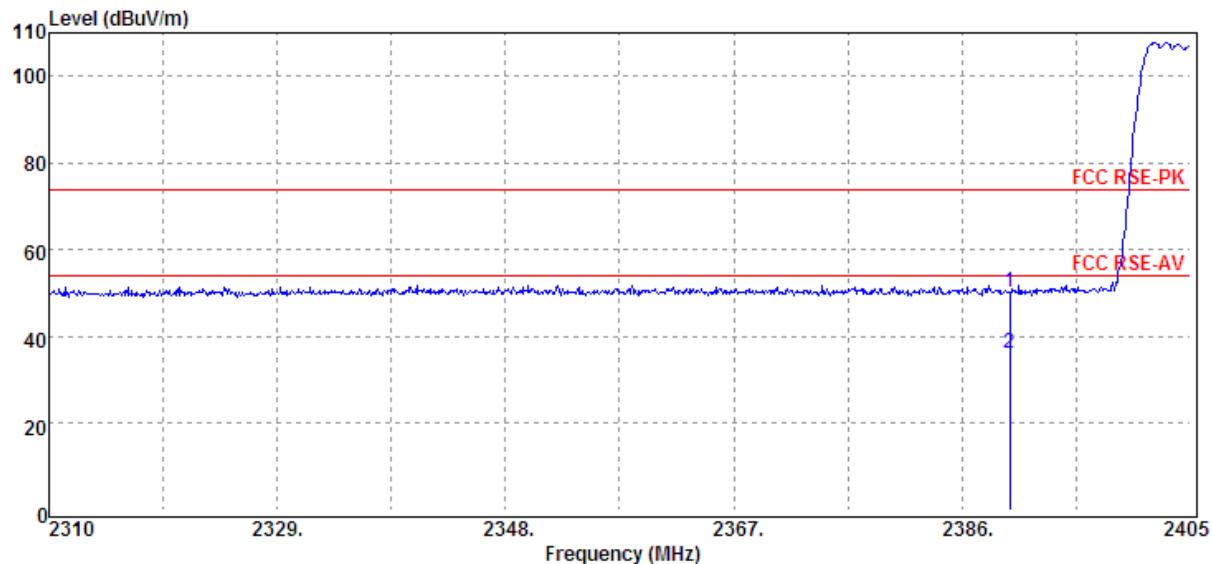


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**Band Edges Radiated Emission:**

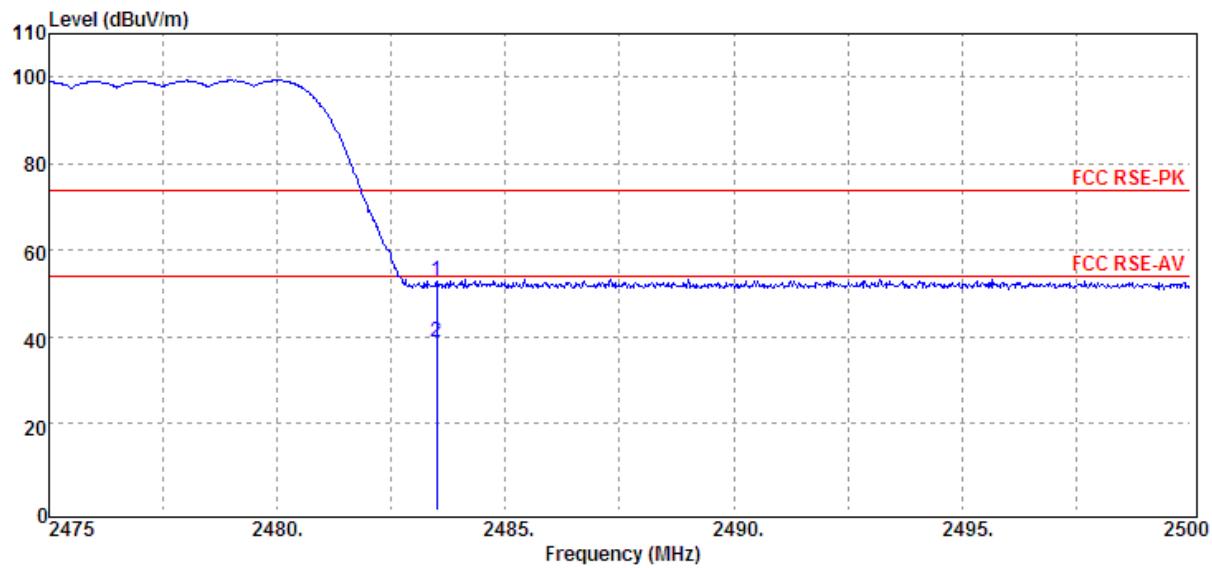
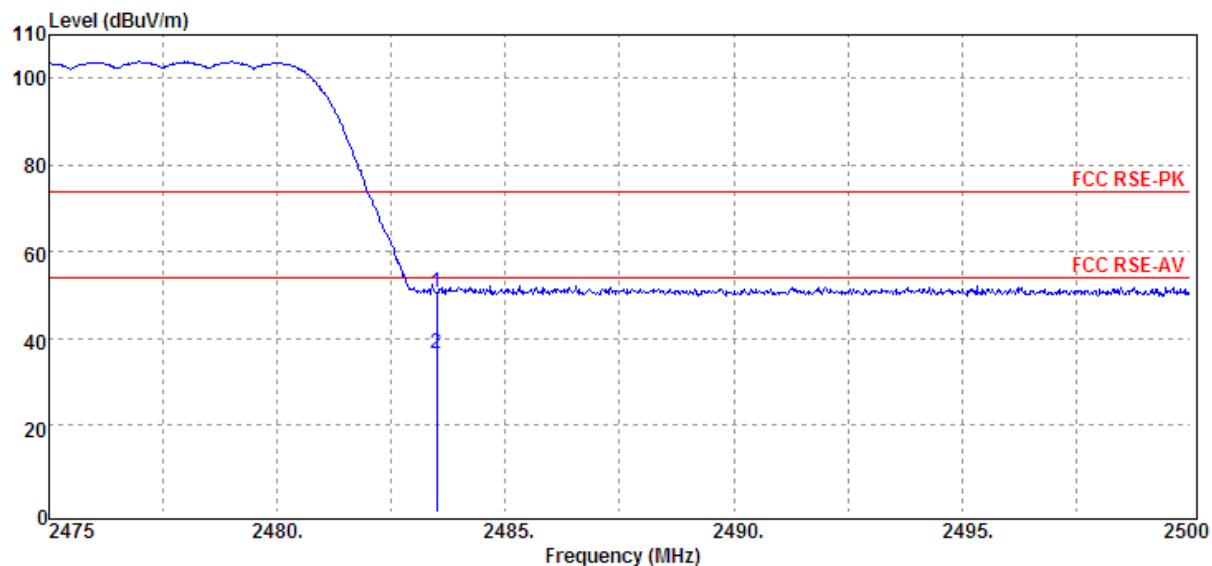
Operation Band	:EDR	Test Date	:2012-05-15
Fundamental Frequency	:2402 MHz	Temp./Humi.	:23.6 deg_C / 67 RH
Operation Mode	:Bandedge	Engineer	:Jay
EUT Pol.	:E2 Plan	Measurement Antenna Pol.	:Ver. / Hor.



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Operation Band	:EDR	Test Date	:2012-05-15
Fundamental Frequency	:2480 MHz	Temp./Humi.	:23.6 deg_C / 67 RH
Operation Mode	:Bandedge	Engineer	:Jay
EUT Pol.	:E2 Plan	Measurement Antenna Pol.	:Ver. / Hor.

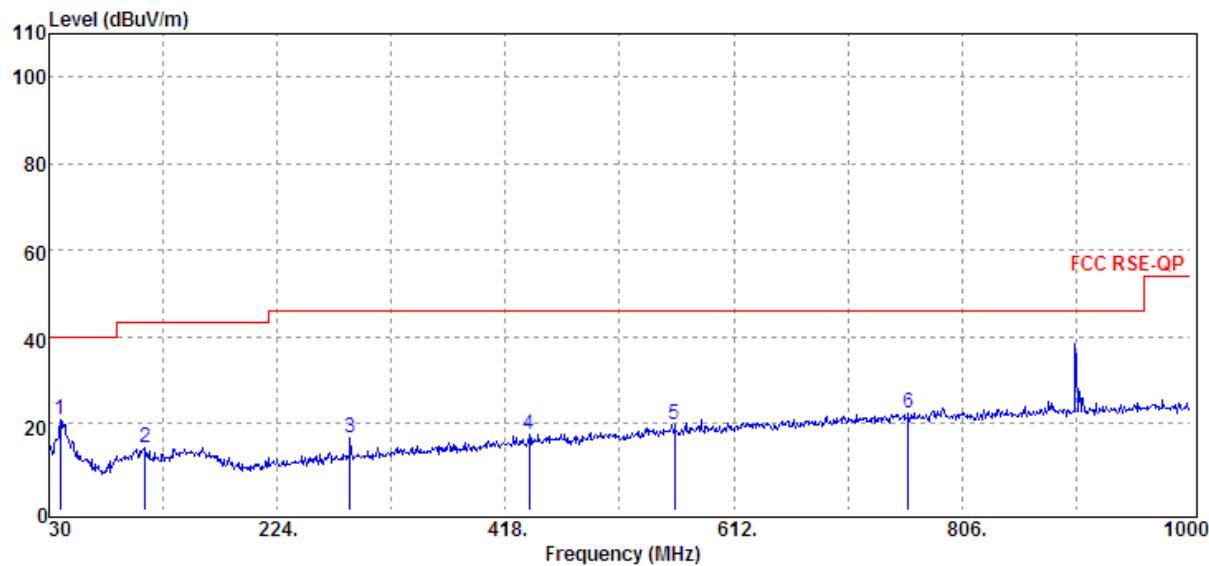
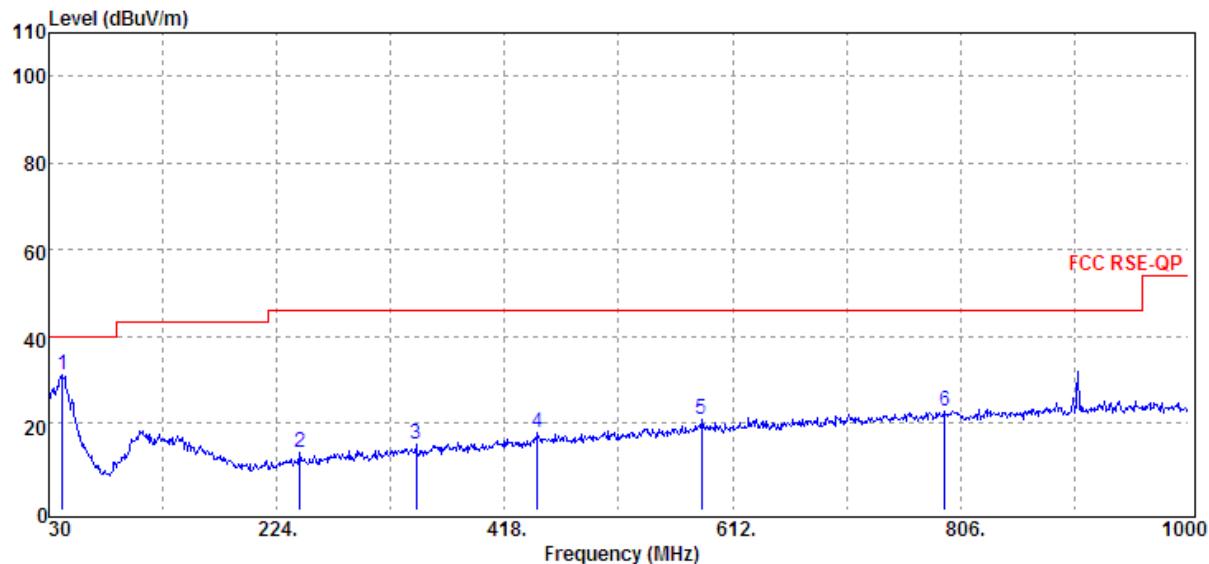


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**Radiated Spurious Emission Measurement photos Result (below 1GHz)**

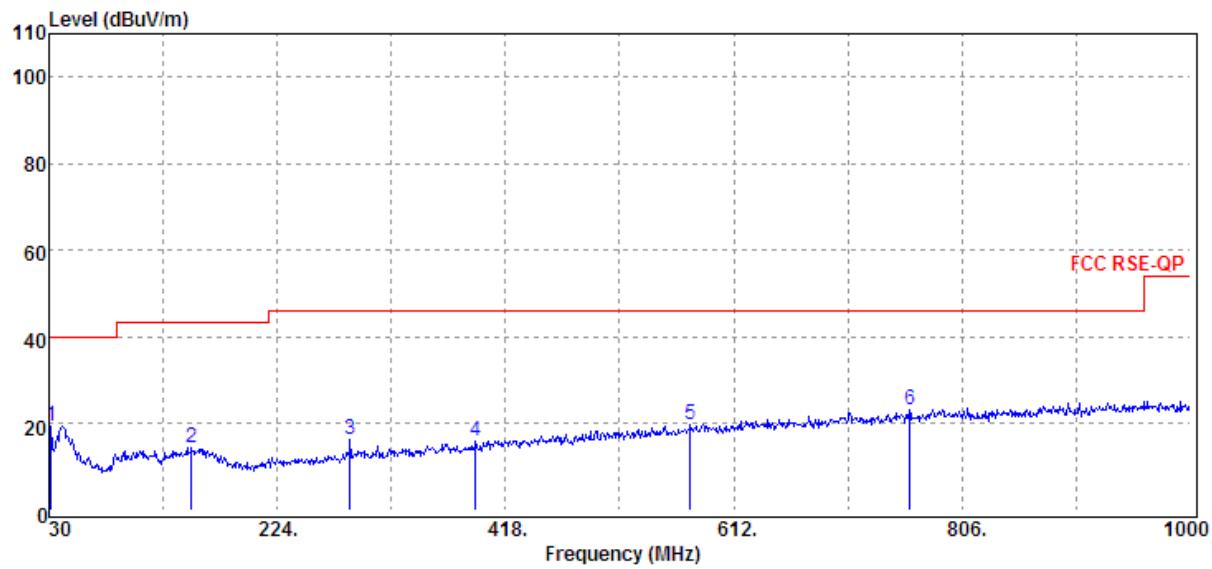
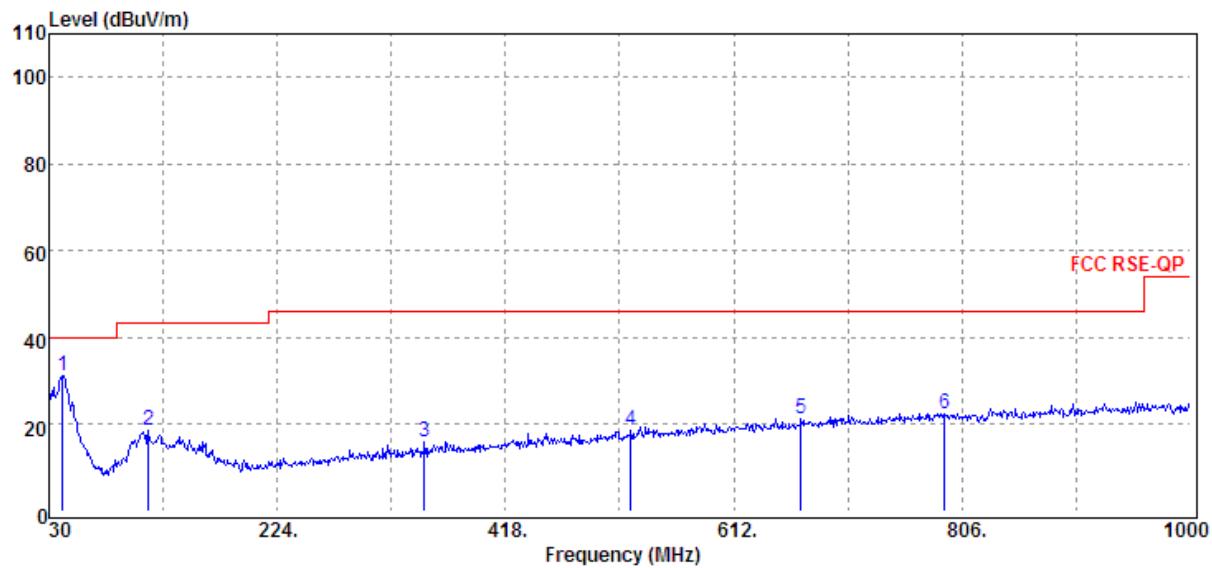
Operation Band	:EDR	Test Date	:2012-05-07
Fundamental Frequency	:2402 MHz	Temp./Humi.	:23.6 deg_C / 67 RH
Operation Mode	:TX	Engineer	:Jay
EUT Pol.	:E2 Plan	Measurement Antenna Pol.	:Ver. / Hor.



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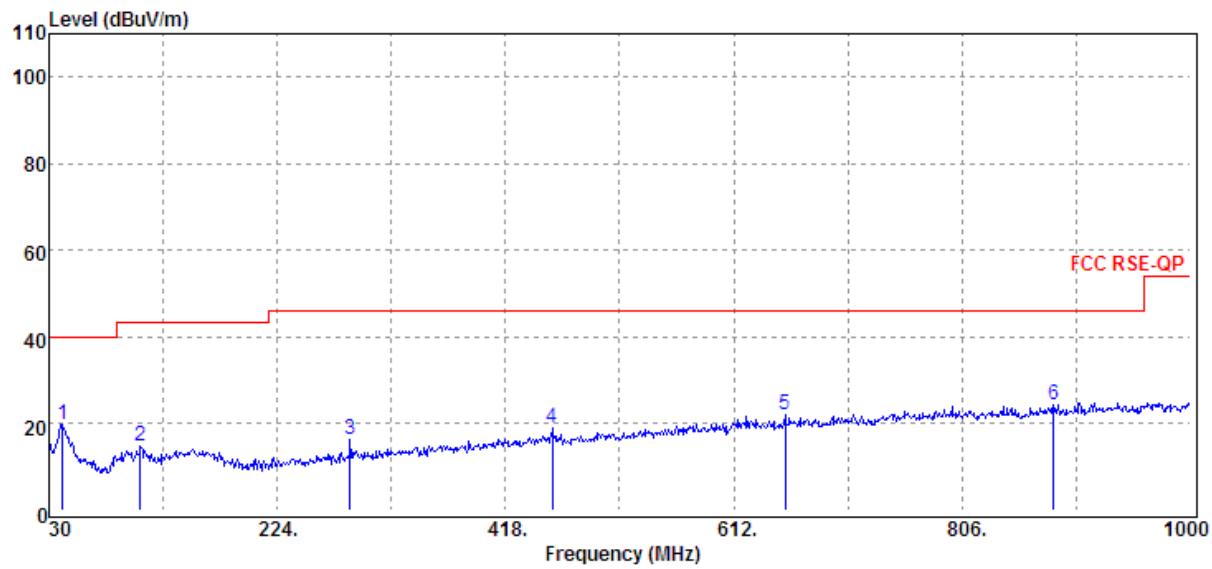
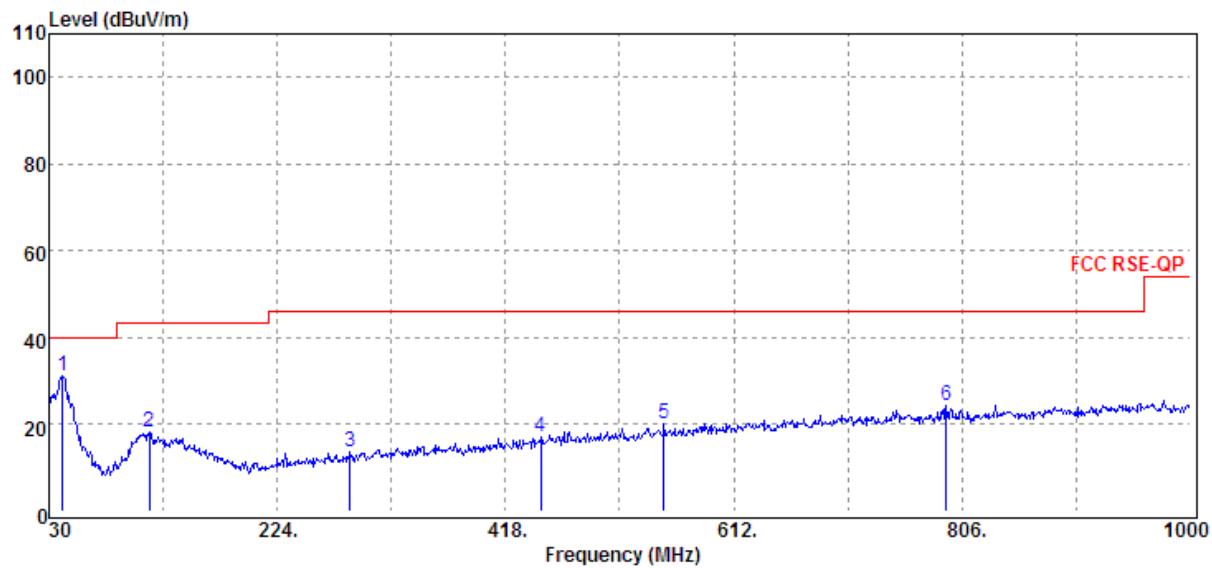
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Fundamental Frequency	:2441 MHz	Temp./Humi.	:23.6 deg_C / 67 RH
Operation Mode	:TX	Engineer	:Jay
EUT Pol.	:E2 Plan	Measurement Antenna Pol.	:Ver. / Hor.



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Operation Band	:EDR	Test Date	:2012-05-07
Fundamental Frequency	:2480 MHz	Temp./Humi.	:23.6 deg_C / 67 RH
Operation Mode	:TX	Engineer	:Jay
EUT Pol.	:E2 Plan	Measurement Antenna Pol.	:Ver. / Hor.

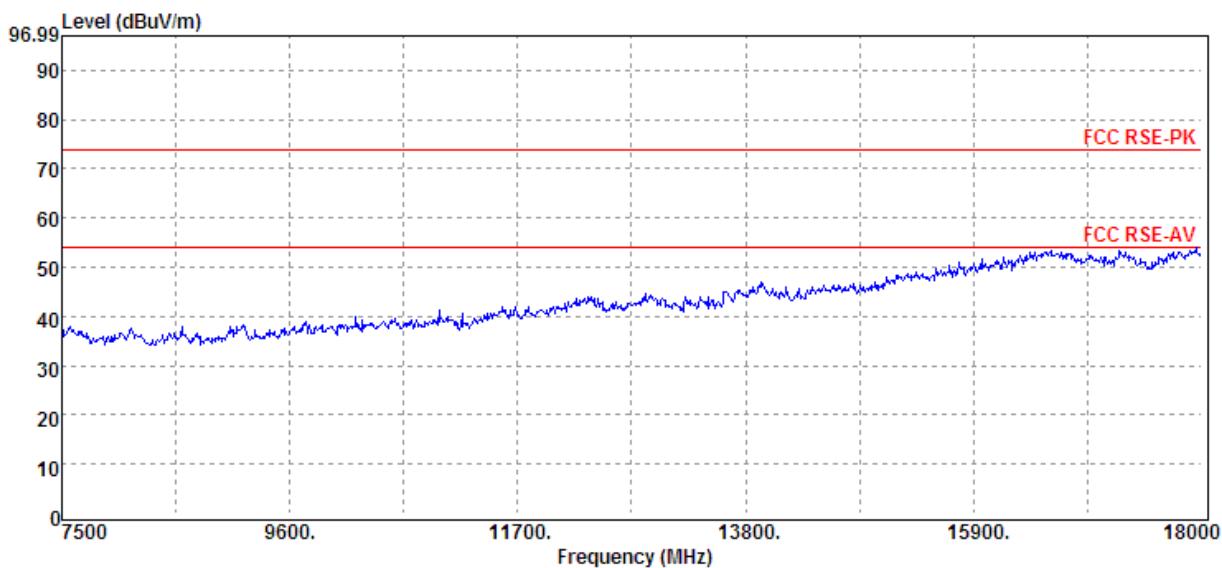
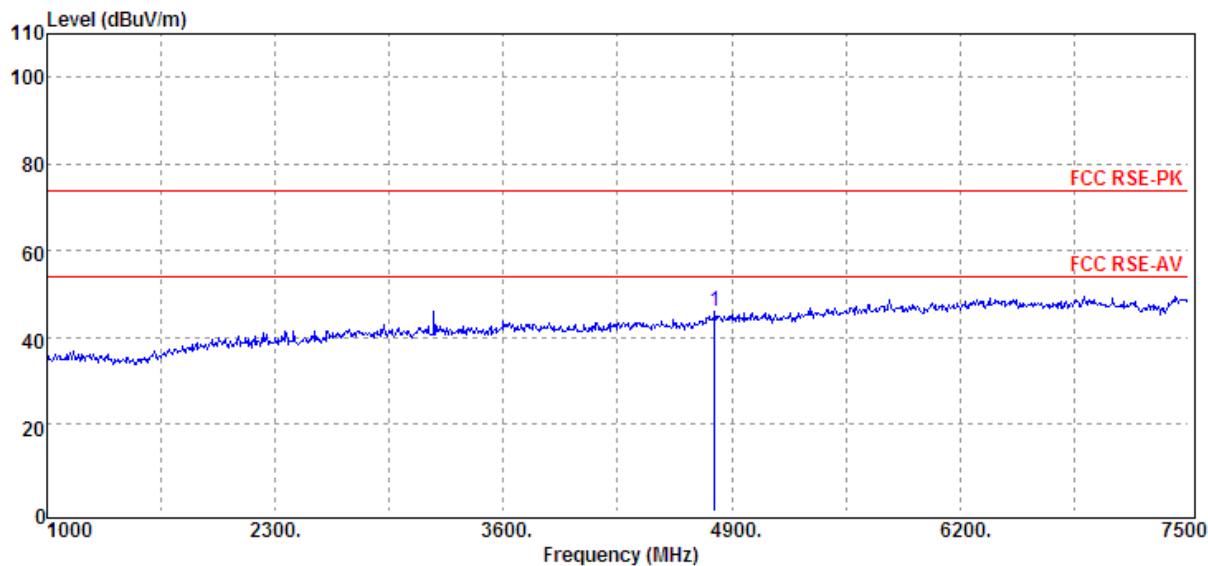


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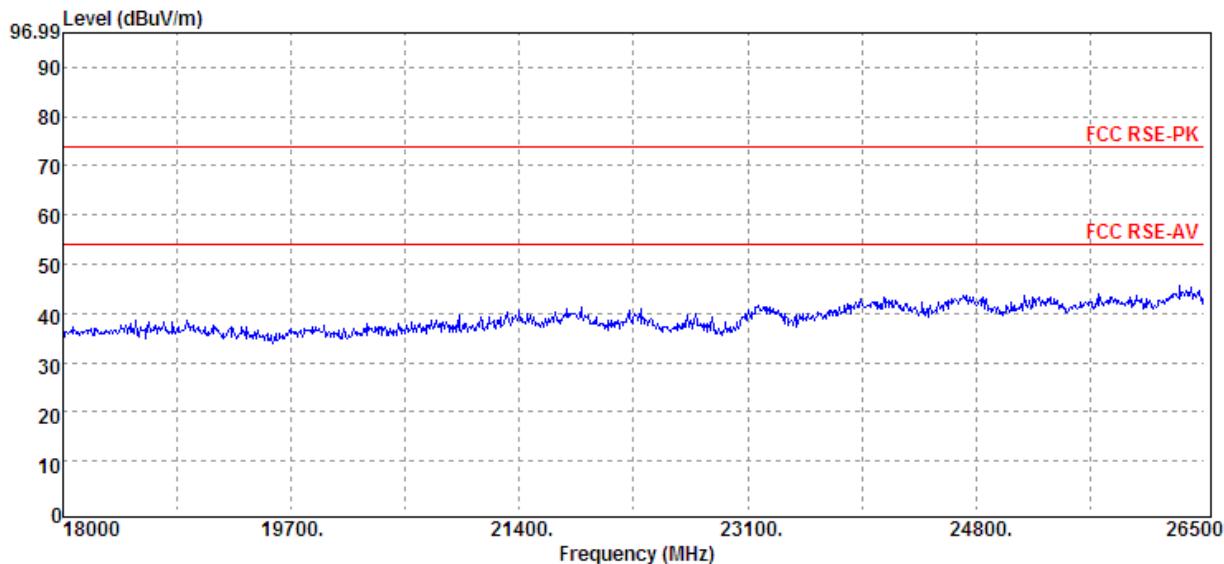
**Radiated Spurious Emission Measurement photos Result (above 1GHz)**

Operation Band	:EDR	Test Date	:2012-05-07
Fundamental Frequency	:2402 MHz	Temp./Humi.	:23.6 deg_C / 67 RH
Operation Mode	:TX	Engineer	:Jay
EUT Pol.	:E2 Plan	Measurement Antenna Pol.	:VERTICAL



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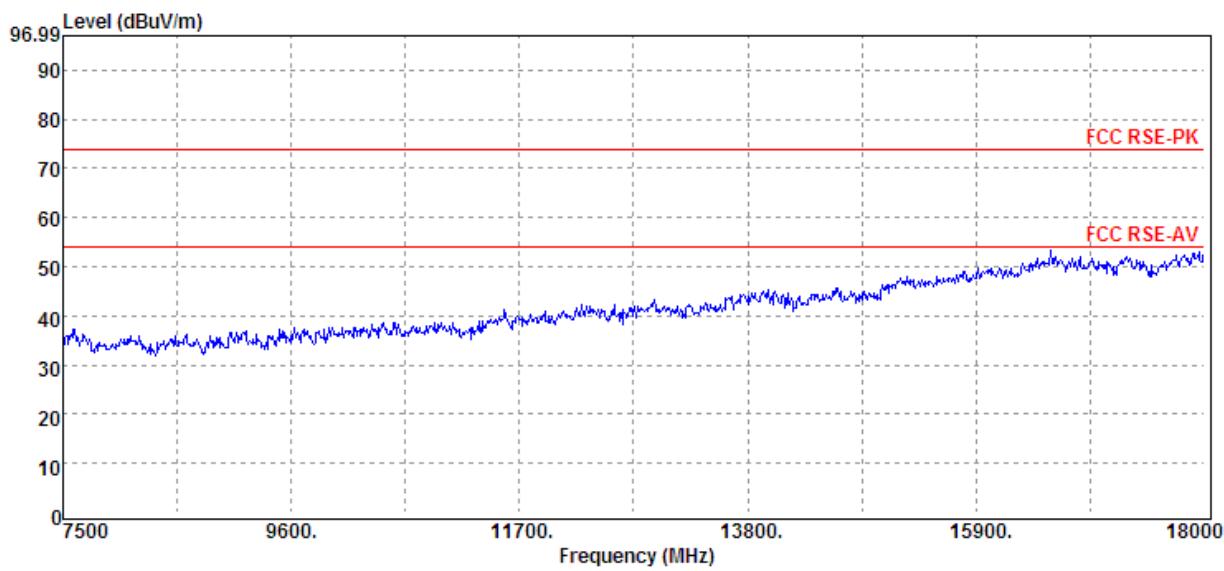
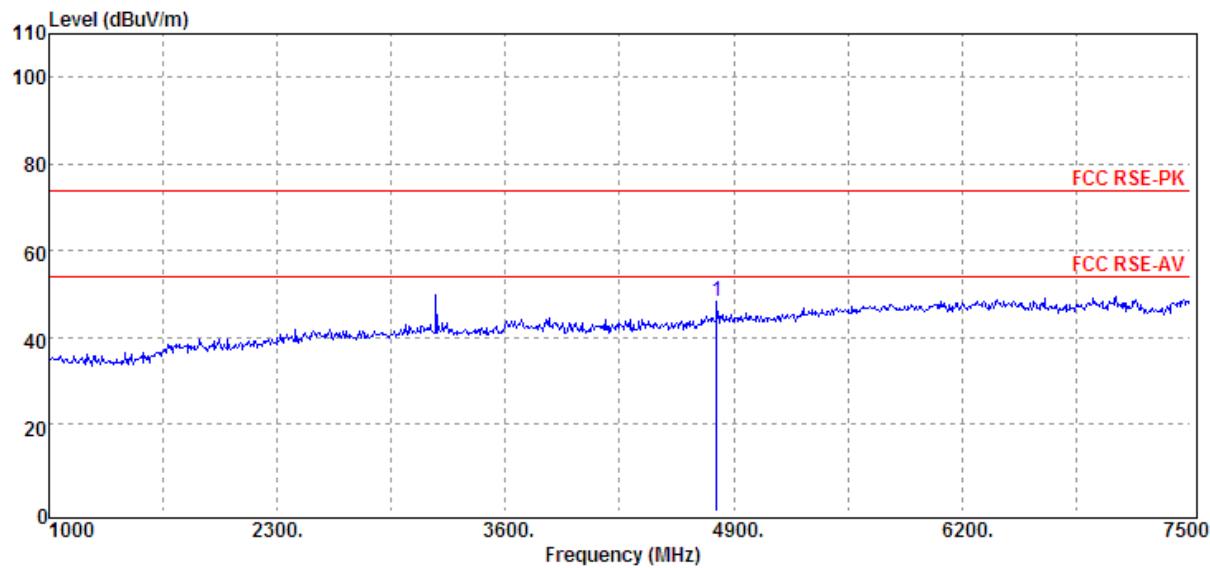
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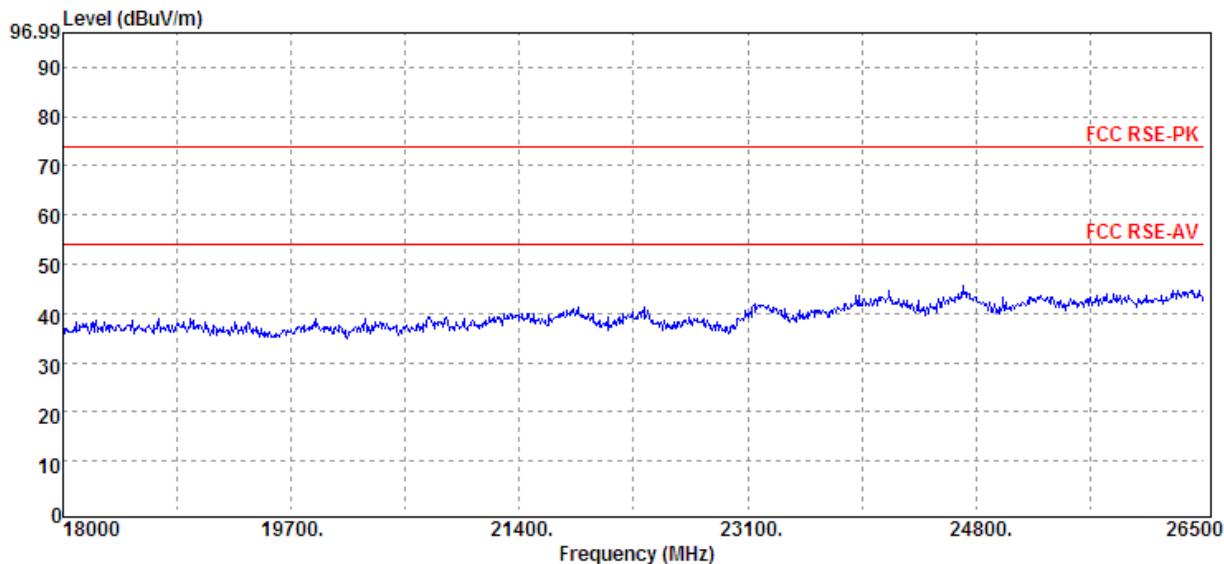
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Operation Band	:EDR	Test Date	:2012-05-07
Fundamental Frequency	:2402 MHz	Temp./Humi.	:23.6 deg_C / 67 RH
Operation Mode	:TX	Engineer	:Jay
EUT Pol.	:E2 Plan	Measurement Antenna Pol.	:HORIZONTAL



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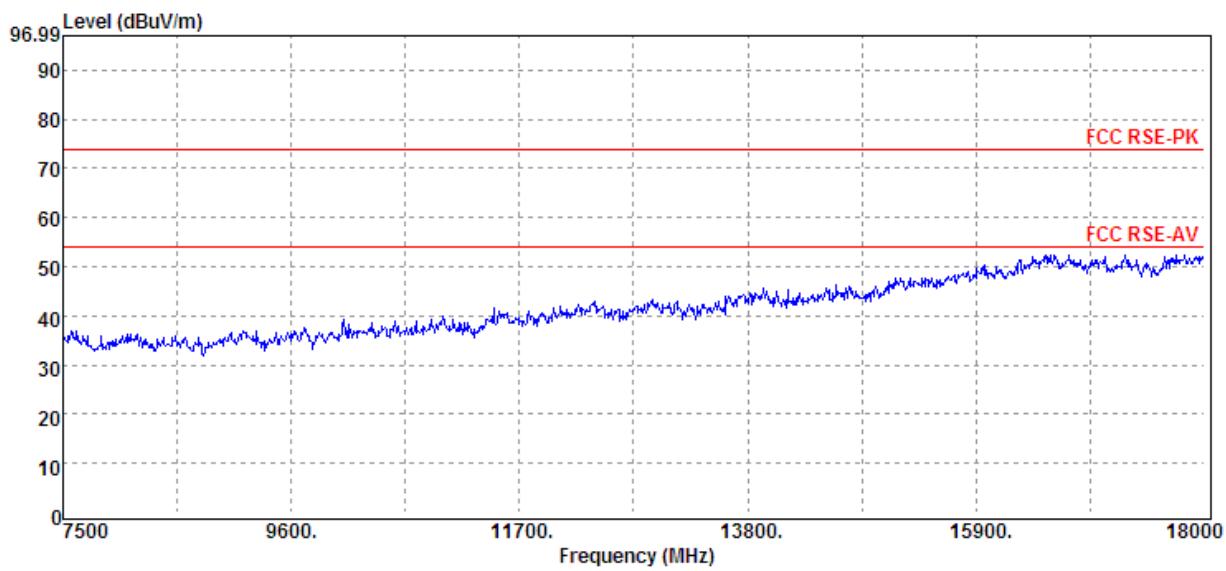
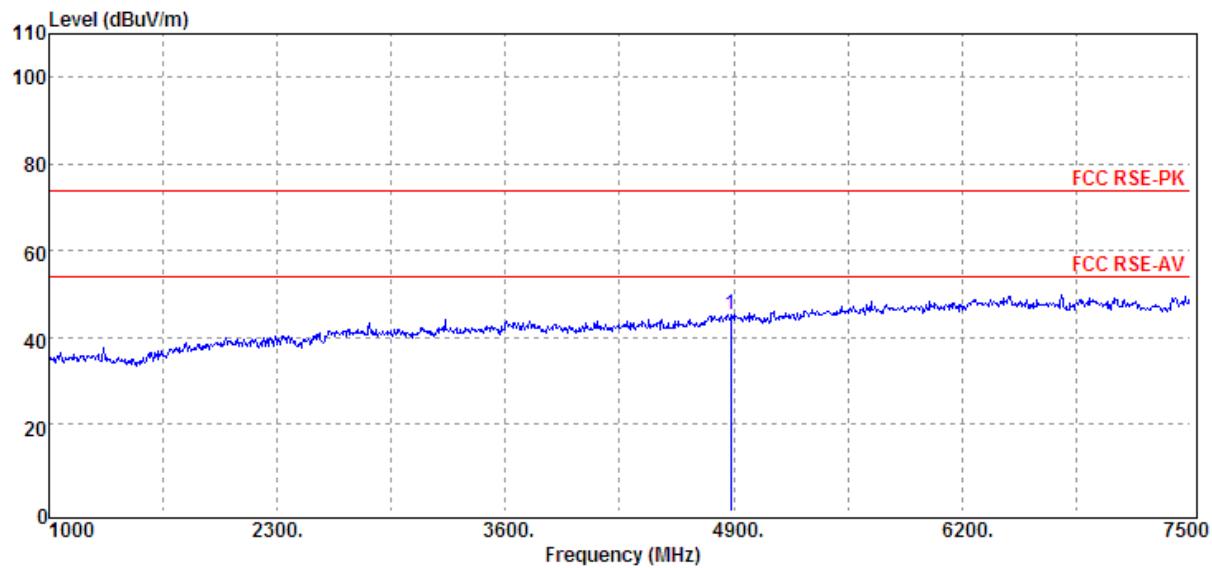
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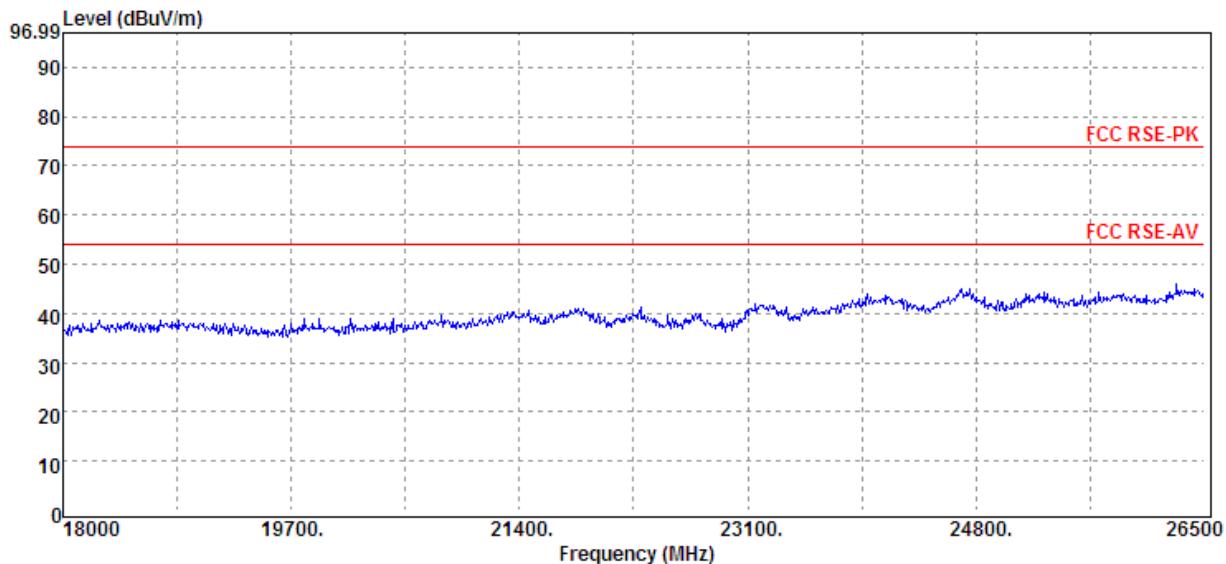
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Operation Band	:EDR	Test Date	:2012-05-07
Fundamental Frequency	:2441 MHz	Temp./Humi.	:23.6 deg_C / 67 RH
Operation Mode	:TX	Engineer	:Jay
EUT Pol.	:E2 Plan	Measurement Antenna Pol.	:VERTICAL



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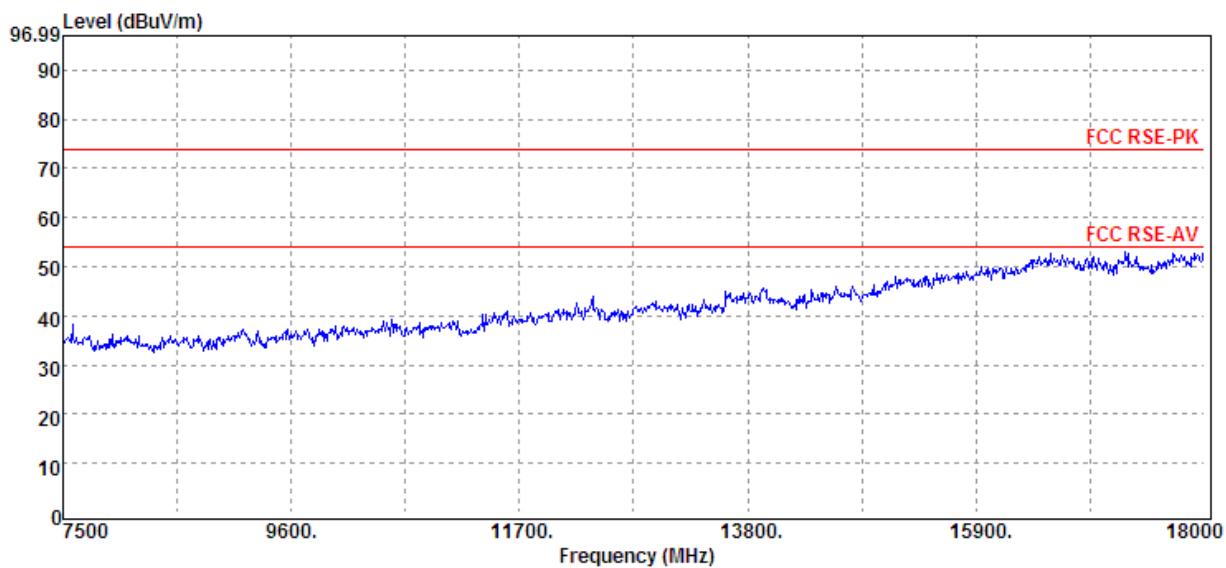
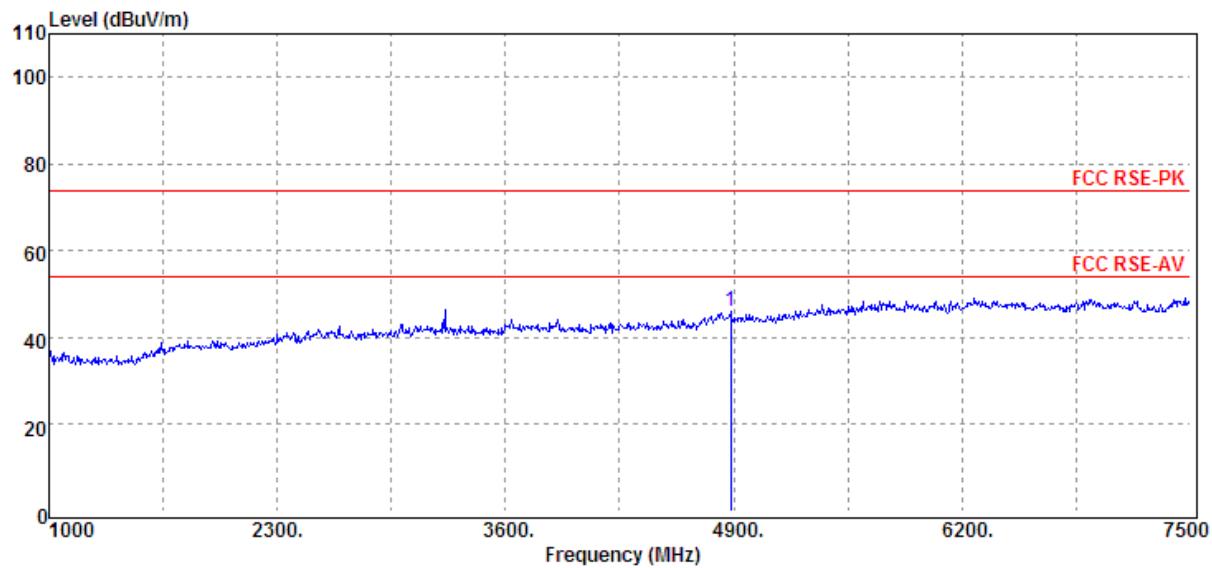
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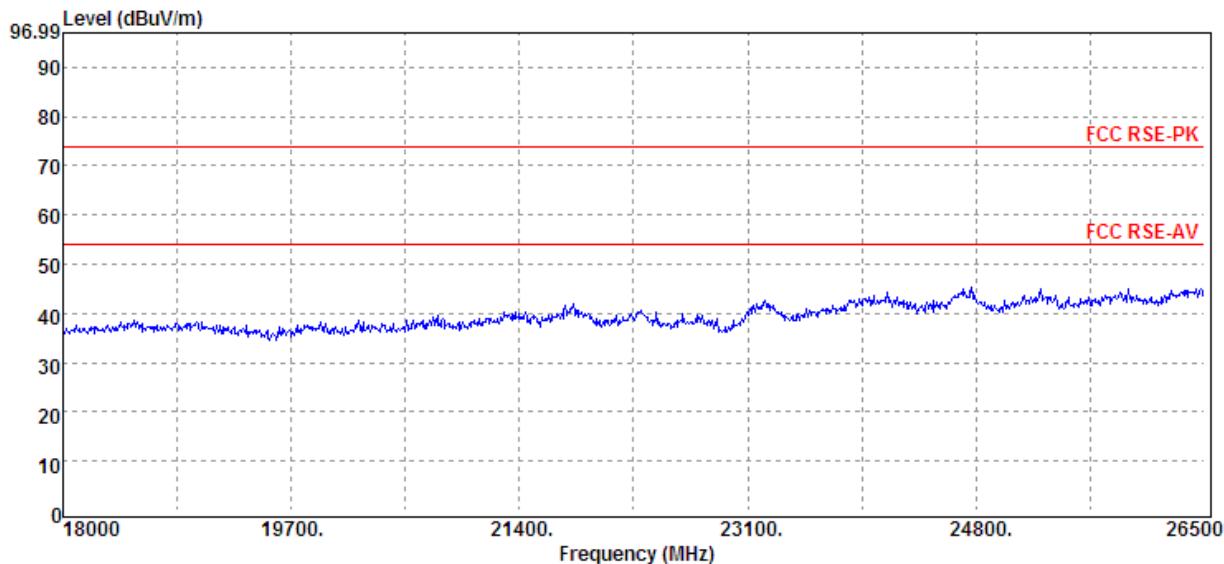
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Operation Band	:EDR	Test Date	:2012-05-07
Fundamental Frequency	:2441 MHz	Temp./Humi.	:23.6 deg_C / 67 RH
Operation Mode	:TX	Engineer	:Jay
EUT Pol.	:E2 Plan	Measurement Antenna Pol.	:HORIZONTAL



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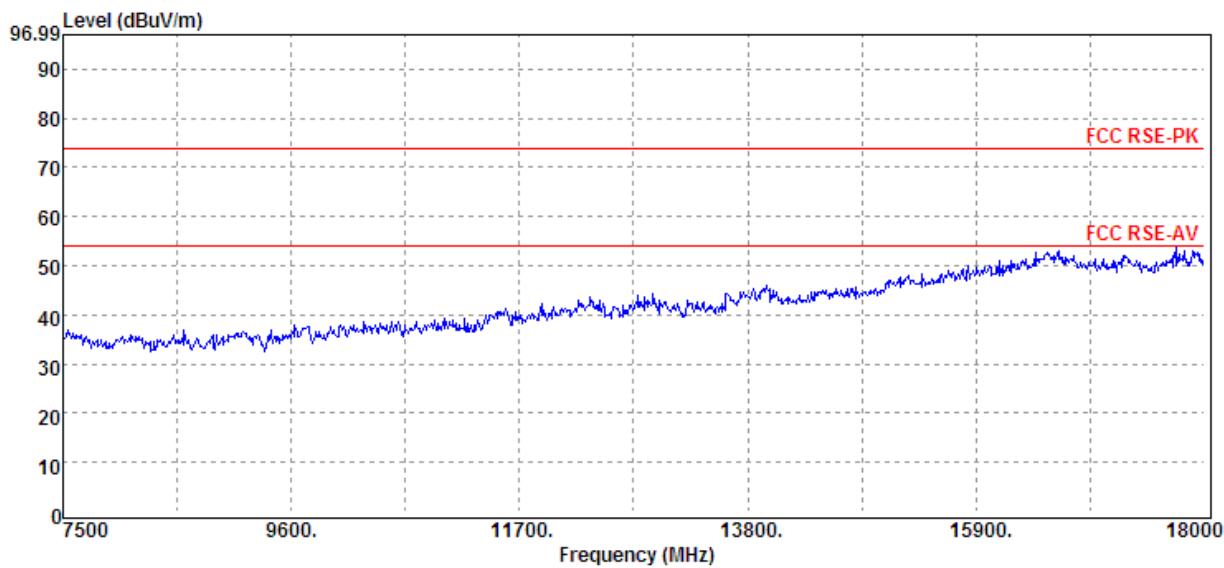
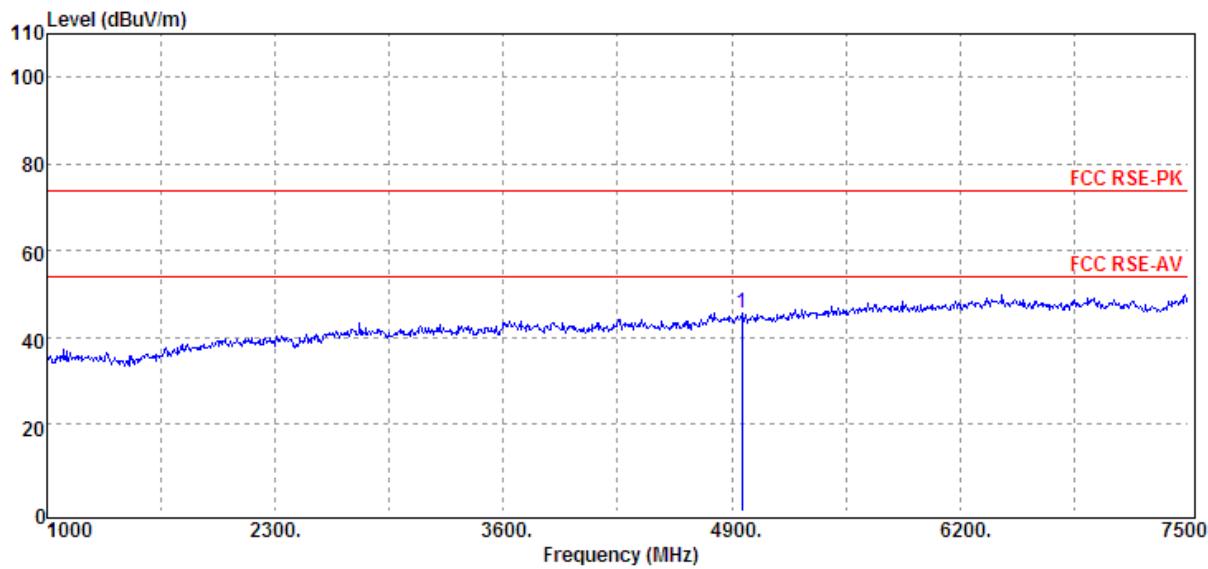
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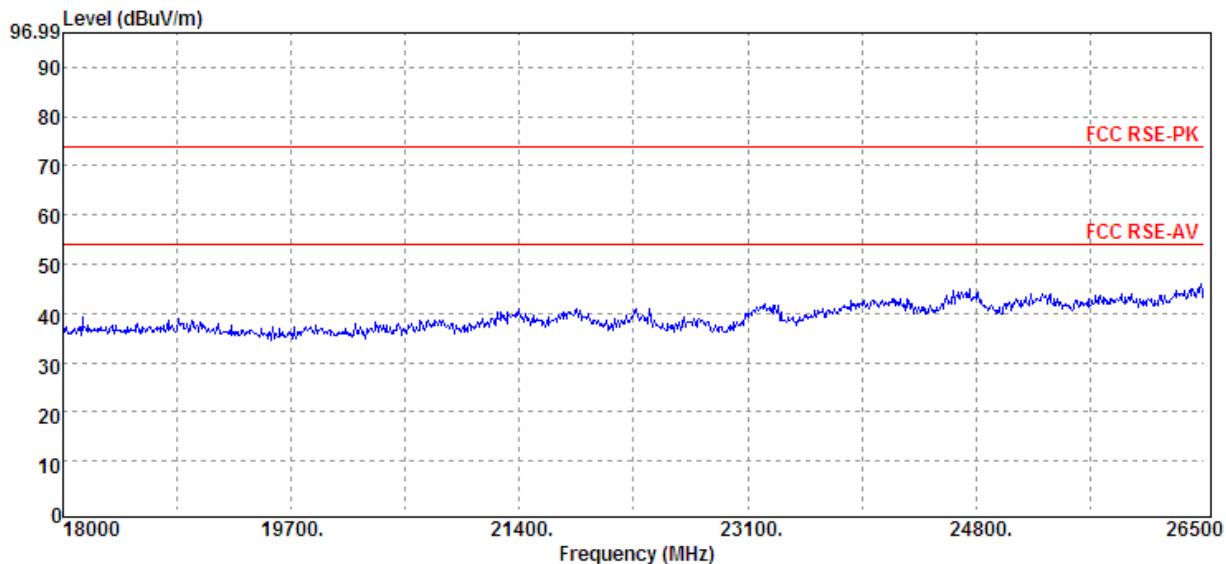
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Operation Band	:EDR	Test Date	:2012-05-07
Fundamental Frequency	:2480 MHz	Temp./Humi.	:23.6 deg_C / 67 RH
Operation Mode	:TX	Engineer	:Jay
EUT Pol.	:E2 Plan	Measurement Antenna Pol.	:VERTICAL



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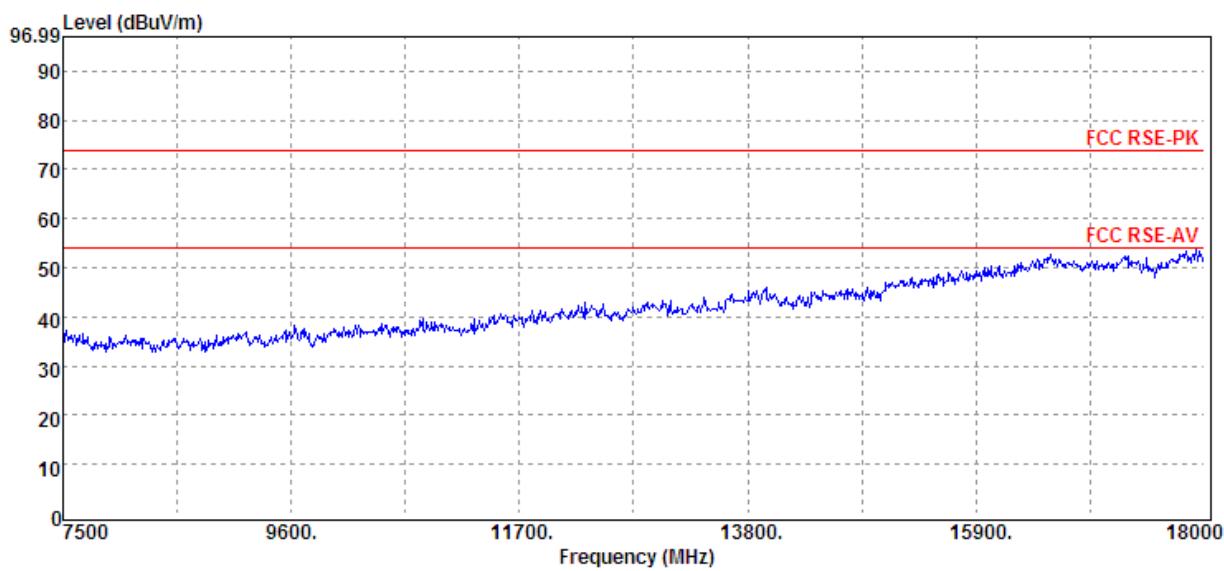
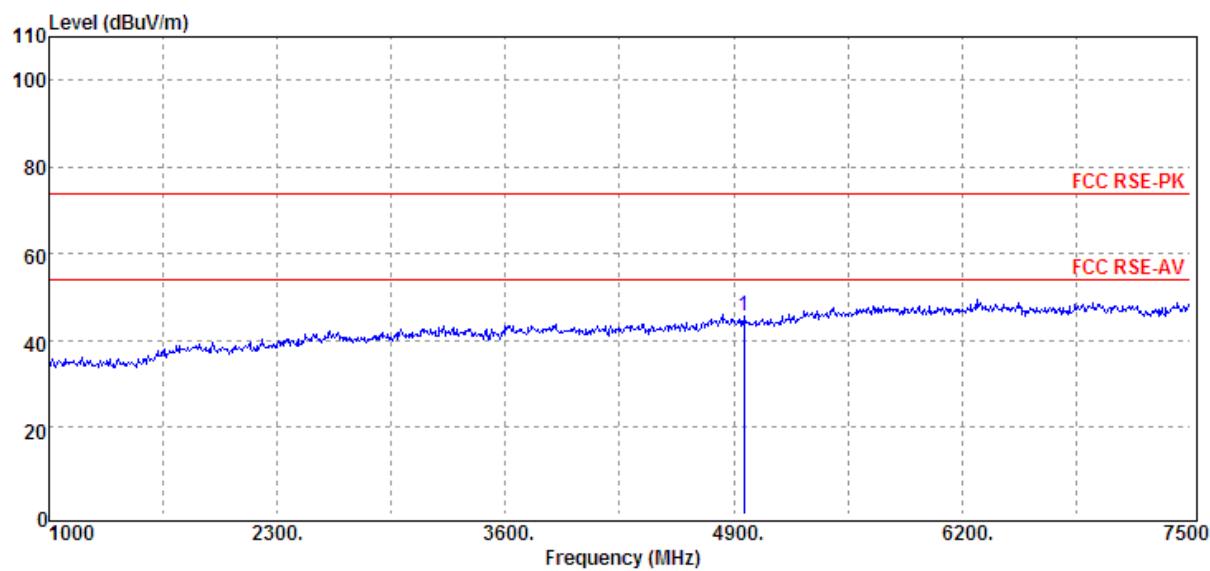
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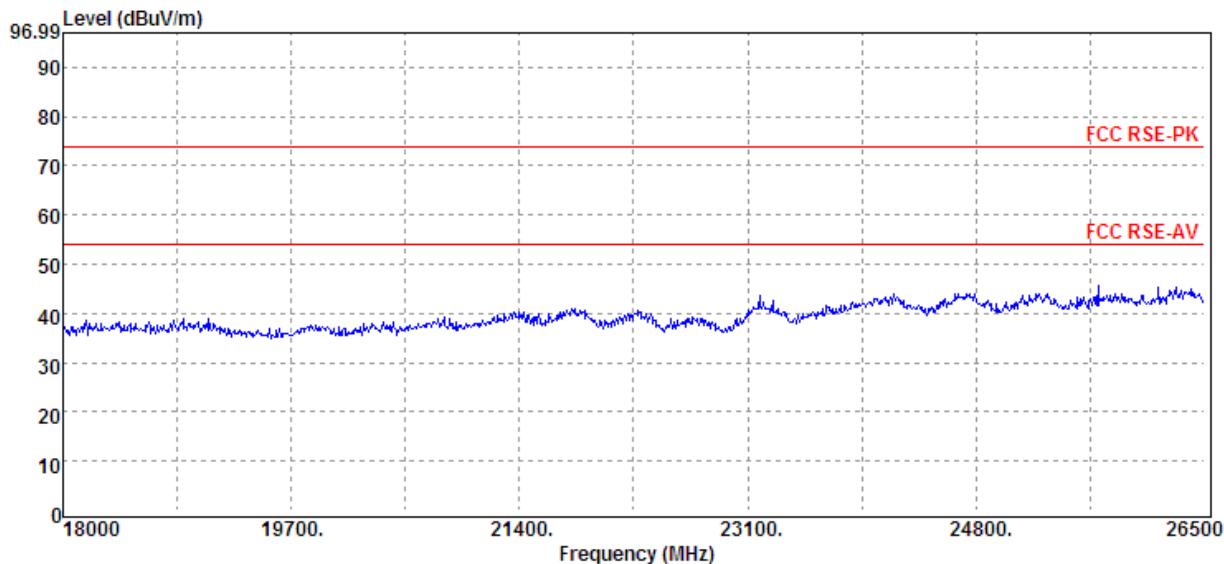
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Operation Band	:EDR	Test Date	:2012-05-07
Fundamental Frequency	:2480 MHz	Temp./Humi.	:23.6 deg_C / 67 RH
Operation Mode	:TX	Engineer	:Jay
EUT Pol.	:E2 Plan	Measurement Antenna Pol.	:HORIZONTAL



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