

# ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

## INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART C REQUIREMENT

OF

**Product Name:** VTC6110-ATT4

**Brand Name:** N/A

**Model No.:** VTC6110-ATT4

**Model Difference:** N/A

**FCC ID:** YHI-VTC6110ATT4

**Report No.:** EH/2012/70044

**Issue Date:** Aug. 21, 2012

**FCC Rule Part:** §15.247, Cat: DSS

**Prepared for:** NEXCOM international Co., LTD  
15F, No. 920, Chung-Cheng Road Zhonghe Dist.,  
New Taipei City Taiwan 235, R.O.C

**Prepared by:** SGS Taiwan Ltd.  
Electronics & Communication Laboratory  
No. 134, Wu Kung Road, New Taipei Industrial  
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24803



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## VERIFICATION OF COMPLIANCE

**Applicant:** NEXCOM international Co., LTD  
15F, No. 920, Chung-Cheng Road Zhonghe Dist., New Taipei City Taiwan 235, R.O.C

**Product Name:** VTC6110-ATT4

**Brand Name:** N/A

**FCC ID:** YHI-VTC6110ATT4

**Model No.:** VTC6110-ATT4

**Model Difference:** N/A

**File Number:** EH/2012/70044

**Date of test:** Jul. 13, 2012 ~ Aug. 21, 2012

**Date of EUT Received:** Jul. 13, 2012

**We hereby certify that:**

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

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

**Test By:**

Marcus Tseng

**Date:**

Aug. 21, 2012

\_\_\_\_\_  
**Marcus Tseng / Engineer****Prepared By:**

Tiffany Kao

**Date:**

Aug. 21, 2012

\_\_\_\_\_  
**Tiffany Kao / Clerk****Approved By:**

Jim Chang

**Date:**

Aug. 21, 2012

\_\_\_\_\_  
**Jim Chang / Supervisor**

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## Version

Version No.	Date	Description
00	Aug. 21, 2012	Initial creation of document

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## 1. GENERAL INFORMATION

### General:

Product Name:	VTC6110-ATT4
Brand Name:	N/A
Model No.:	VTC6110-ATT4
Model Difference:	N/A
Hardware Version:	N/A
Software Version:	N/A
Power Supply:	19Vdc from adapter

### Bluetooth:

Frequency Range:	2402 – 2480MHz
Bluetooth Version:	V2.1 + EDR (GFSK + $\pi/4$ DQPSK + 8DPSK)
Channel number:	79 channels
Modulation type:	GFSK+ $\pi/4$ DQPSK+8DPSK
Transmit Power:	1.97 dBm (Peak)
Dwell Time:	$\leq 0.4s$
Operating Mode:	Point-to-Point
Antenna Designation:	Printed antenna, -0.68dBi

This test report applies for Bluetooth function.

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

This submittal(s) (test report) is intended for **FCC ID: YHI-VTC6110ATT4** filing to comply with Section 15.247 of the FCC Part 15, Subpart C Rules. The composite system (digital device) is compliance with Subpart B is authorized under a Doc procedure.

### 1.2. Test Methodology

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

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

#### 2.3.2 Radiated Emissions

The EUT is a placed on as turn table which is 0.8 m above ground plane. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this hand-held transmitter (EUT) was rotated through three orthogonal axes and measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made “while keeping the antenna in the ‘cone of radiation’ from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response.” is still within the 3dB illumination BW of the measurement antenna. according to the requirements in Section 8 and 13 and Subclause 8.3.1.2 of ANSI C63.4: 2003.

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## 2.4. Configuration of Tested System

Fig. 2-1 Configuration of Tested System

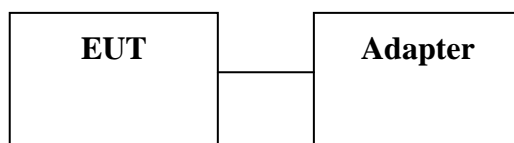


Table 2-1 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Data Cable	Power Cord
1.	BT Software	BlueSuite 1.22	CSR	Version1.22	N/A	N/A
2.	Adapter	FSP Group INC.	FSP120-AAB	N/A	Shielded	Un-shielded

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### 3. SUMMARY OF TEST RESULTS

FCC Rules	Description Of Test	Result
§15.207(a)	Conducted Emission	Compliant
§15.247(b)(1)	Peak Output Power	Compliant
§15.247(a)	20dB Bandwidth	Compliant
§15.247I	100 KHz Bandwidth Of Frequency Band Edges	Compliant
§15.209(a) (f)	Spurious Emission	Compliant
§15.247(a)(1)	Frequency Separation	Compliant
§15.247(a)(1)(iii)	Number of hopping frequency	Compliant
§15.247(a)(1)(iii)	Time of Occupancy	Compliant
§15.203, §15.247(b)(4)(i)	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 is chosen for full testing.

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## 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. 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.		

### 6.2. EUT Setup

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

### 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-50/250-25-2-01	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.

**Test Result:** Refer to next page for measurement data and plots.

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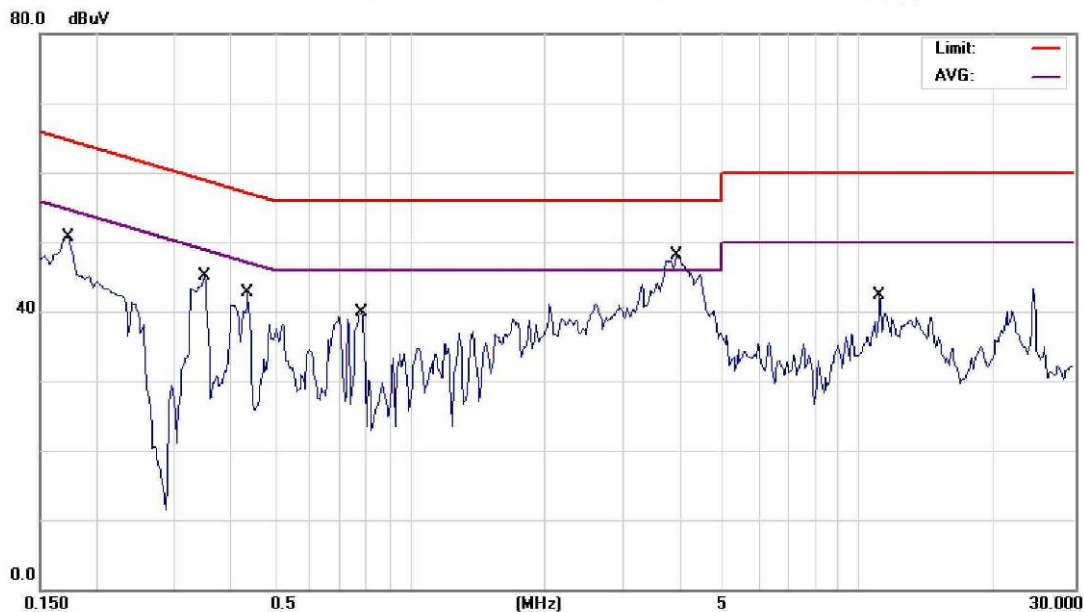
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## AC POWER LINE CONDUCTED EMISSION TEST DATA

Operation Mode:	Operation Mode			Test Date:	Aug. 21, 2012
Temperature:	26 °C	Humidity:	59 %	Test By:	Marcus



Site: ConductionRoom Phase: L1 Temperature: 26 °C  
Limit: FCC Class B Conduction(QP) Power: AC 120V/60Hz Humidity: 60%  
EUT: VTC6110-ATT4 Distance:  
M/N: VTC6110-ATT4  
Mode: Operationmode  
Note:

No.	Mk.	Freq. MHz	Reading Level dBμV	Correct Factor dB	Measure- ment dBμV	Limit dBμV	Over dB	Detector	Comment
1		0.1735	50.50	0.23	50.73	64.79	-14.06	QP	
2		0.3494	44.95	0.21	45.16	58.98	-13.82	QP	
3		0.4354	42.56	0.22	42.78	57.15	-14.37	QP	
4		0.7815	39.61	0.22	39.83	56.00	-16.17	QP	
5		3.9369	42.50	0.30	42.80	56.00	-13.20	QP	
6	*	3.9369	33.40	0.30	33.70	46.00	-12.30	AVG	
7		11.1934	41.84	0.48	42.32	60.00	-17.68	QP	

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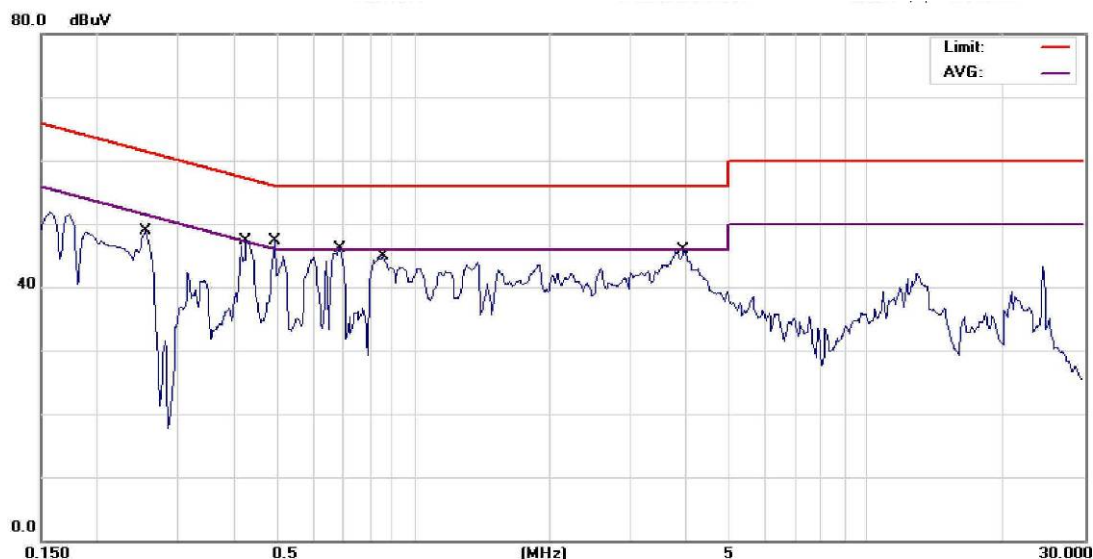
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Site: ConductionRoom

Limit: FCC Class B Conduction(QP)

EUT: VTC6110-ATT4

M/N: VTC6110-ATT4

Mode: Operationmode

Note:

Phase: N

Power: AC 120V/60Hz

Distance:

Temperature: 26 °C

Humidity: 60%

No.	Mk.	Freq. MHz	Reading Level dBμV	Correct Factor dB	Measure- ment dBμV	Limit dBμV	Over dB	Detector	Comment
1		0.2556	48.62	0.32	48.94	61.57	-12.63	QP	
2		0.4276	44.30	0.34	44.64	57.30	-12.66	QP	
3	*	0.4276	38.20	0.34	38.54	47.30	-8.76	AVG	
4		0.4941	38.50	0.34	38.84	56.10	-17.26	QP	
5		0.4941	25.80	0.34	26.14	46.10	-19.96	AVG	
6		0.6877	43.50	0.33	43.83	56.00	-12.17	QP	
7		0.6877	36.90	0.33	37.23	46.00	-8.77	AVG	
8		0.8558	44.66	0.32	44.98	56.00	-11.02	QP	
9		3.9564	32.10	0.35	32.45	56.00	-23.55	QP	
10		3.9564	40.50	0.35	40.85	56.00	-15.15	QP	

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## 7. PEAK OUTPUT POWER MEASUREMENT

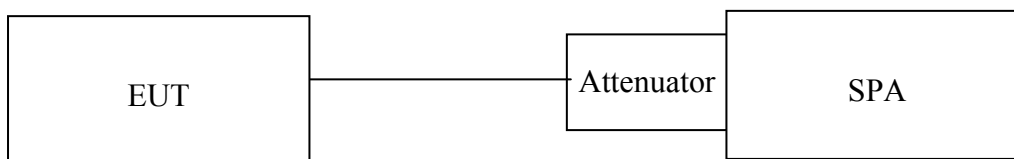
### 7.1. Standard Applicable

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

### 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	0.79	0.79	0.00120	0.125
2441.00	1.87	1.87	0.00154	0.125
2480.00	1.85	1.85	0.00153	0.125

##### EDR mode:

Frequency (MHz)	Reading Power (dBm)	Output Power (dBm)	Output Power (W)	Limit (W)
2402.00	-0.27	-0.27	0.00094	0.125
2441.00	1.97	1.97	0.00157	0.125
2480.00	1.95	1.95	0.00157	0.125

*\*Note: offset 0.56dB*

Note: Refer to next page for plots.

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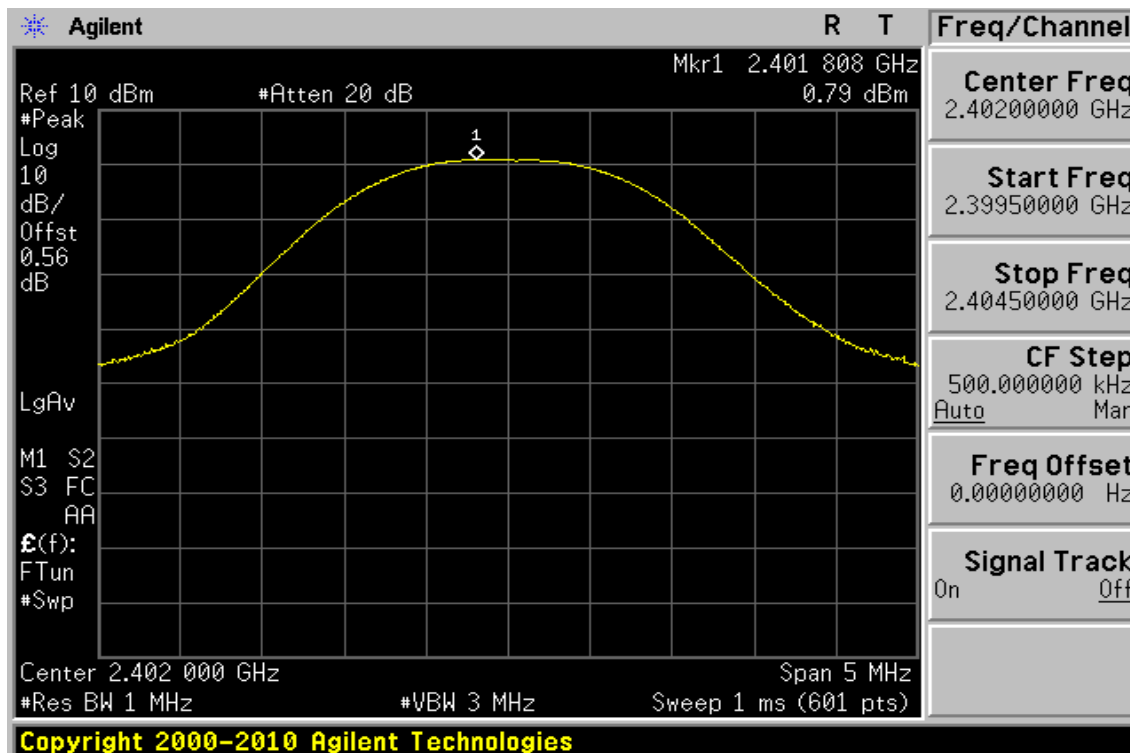
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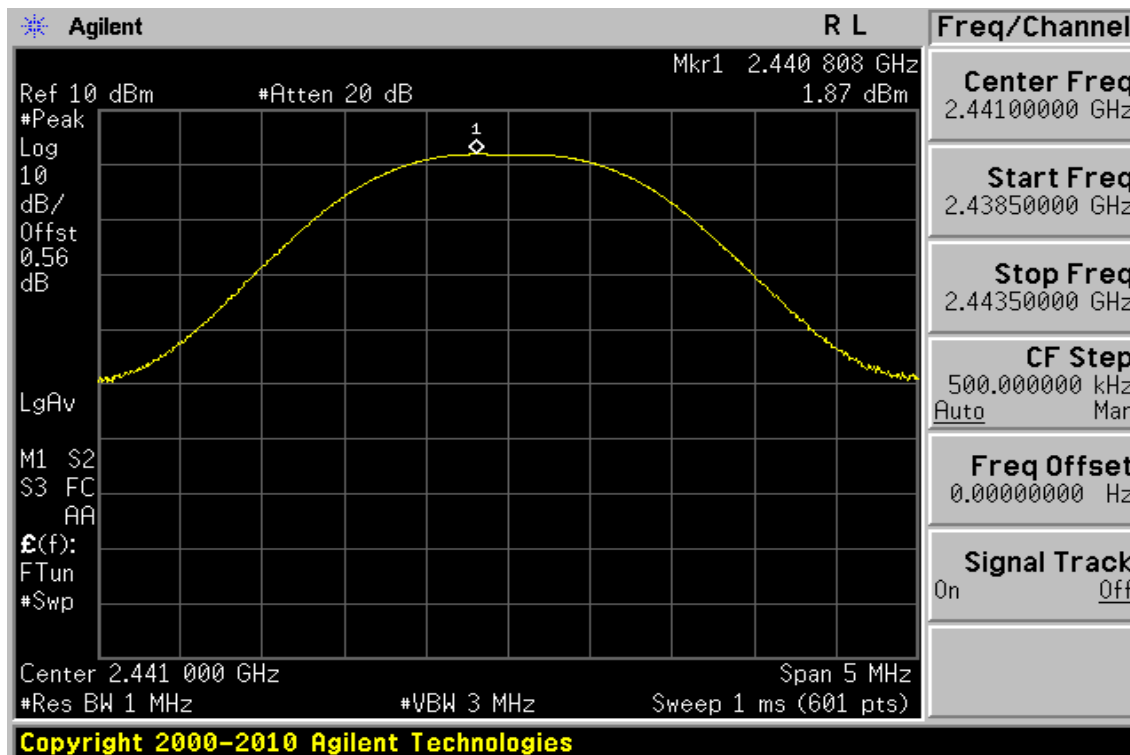
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## Peak Power Output Data Plot (CH Low) (BDR mode)



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



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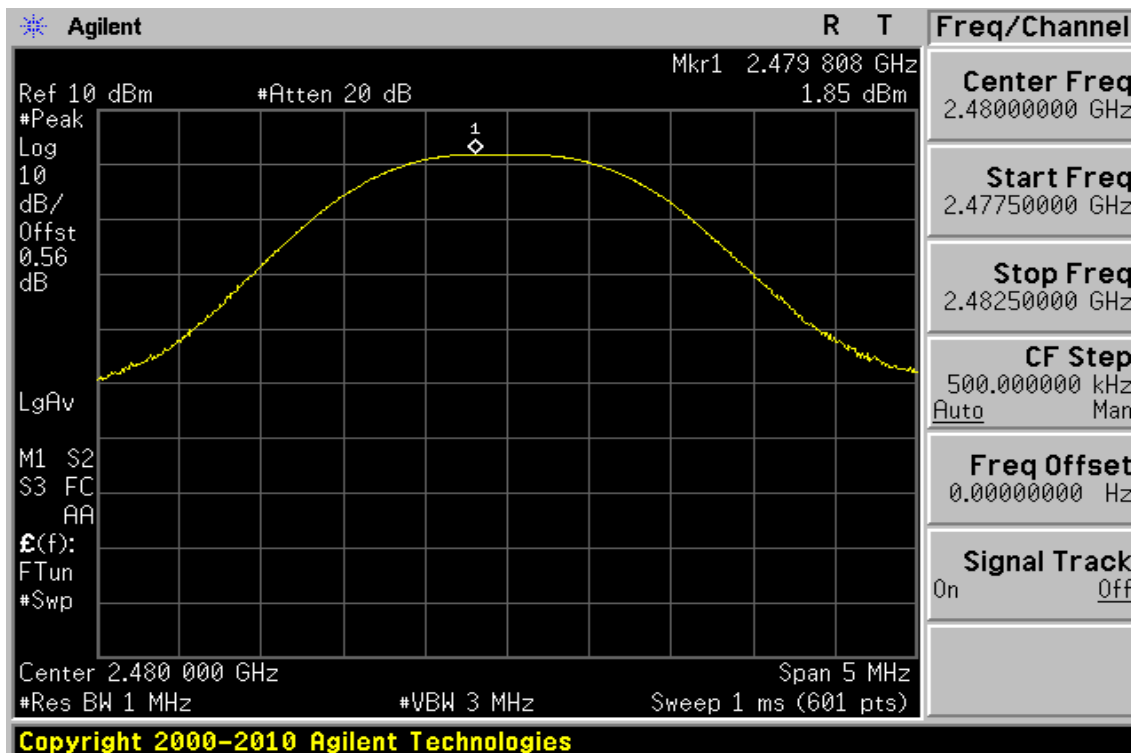
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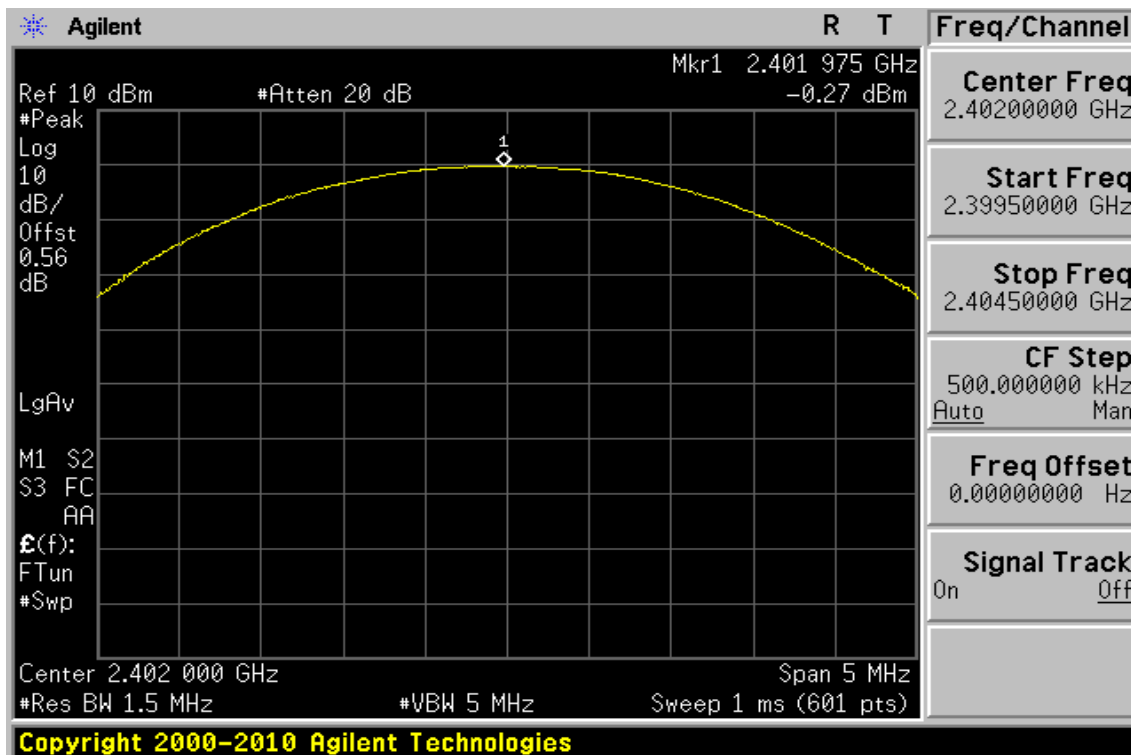
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## Peak Power Output Data Plot (CH High) (BDR mode)



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



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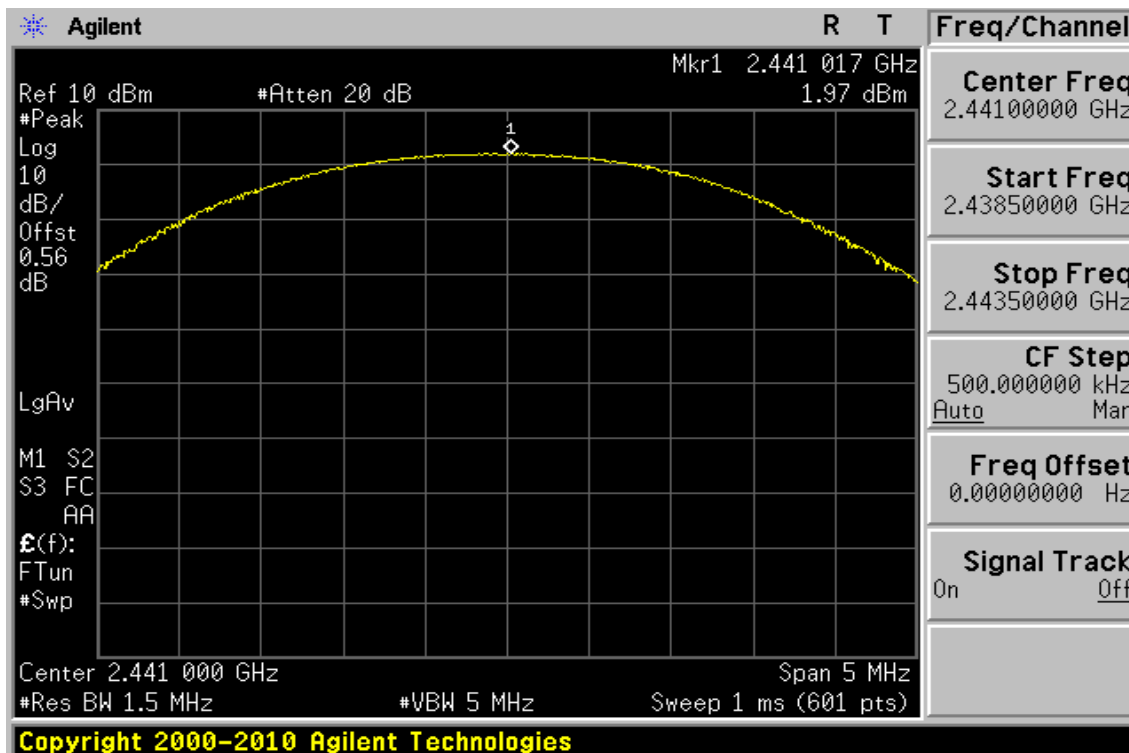
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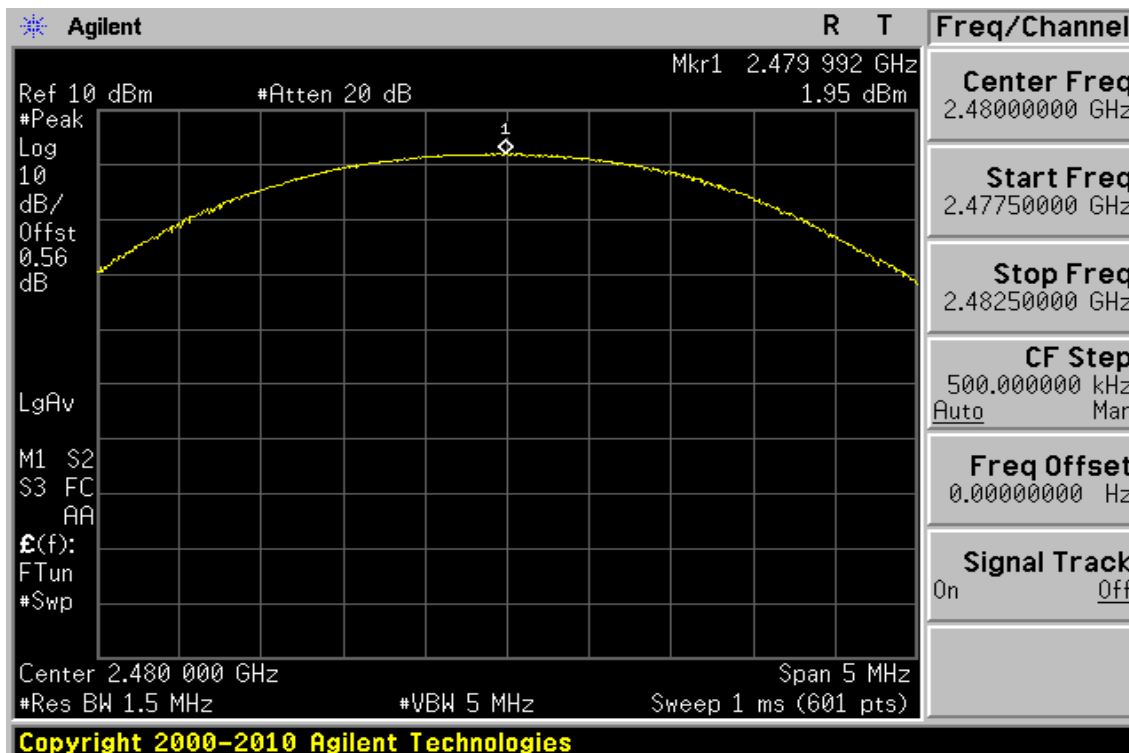
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## Peak Power Output Data Plot (CH Mid) (EDR mode)



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



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## 8. 20dB BAND WIDTH

### 8.1. Standard Applicable

For frequency hopping systems operating in the 2400MHz-2483.5 MHz no limit for 20dB 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=10KHz (1 % of Bandwidth.), Span= 3MHz, Sweep=auto
4. Mark the peak frequency and -20dB (upper and lower) frequency.
5. Repeat above procedures until all frequency measured were complete.

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## 8.5. Measurement Result:

### BDR mode

CH	Bandwidth (kHz)
Lower	935.538
Mid	930.211
Higher	931.999

### EDR mode

CH	Bandwidth (MHz)	2/3 Bandwidth (MHz)
Lower	1.253	0.835
Mid	1.260	0.840
Higher	1.269	0.846

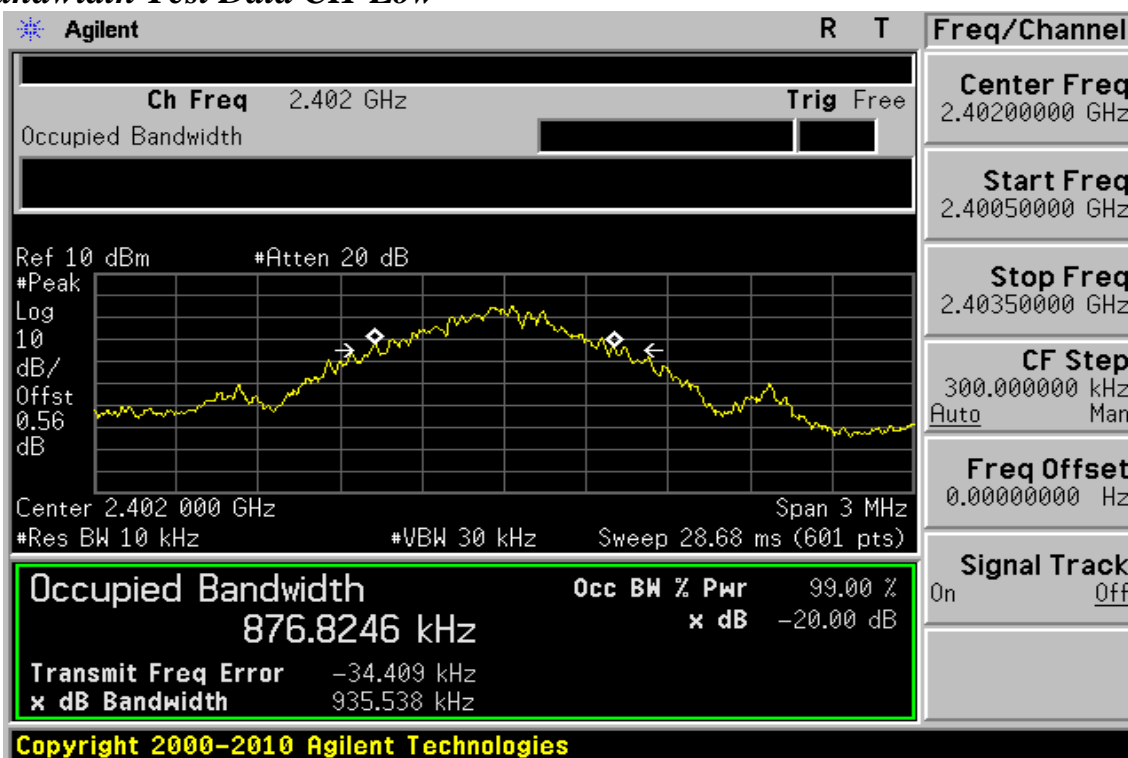
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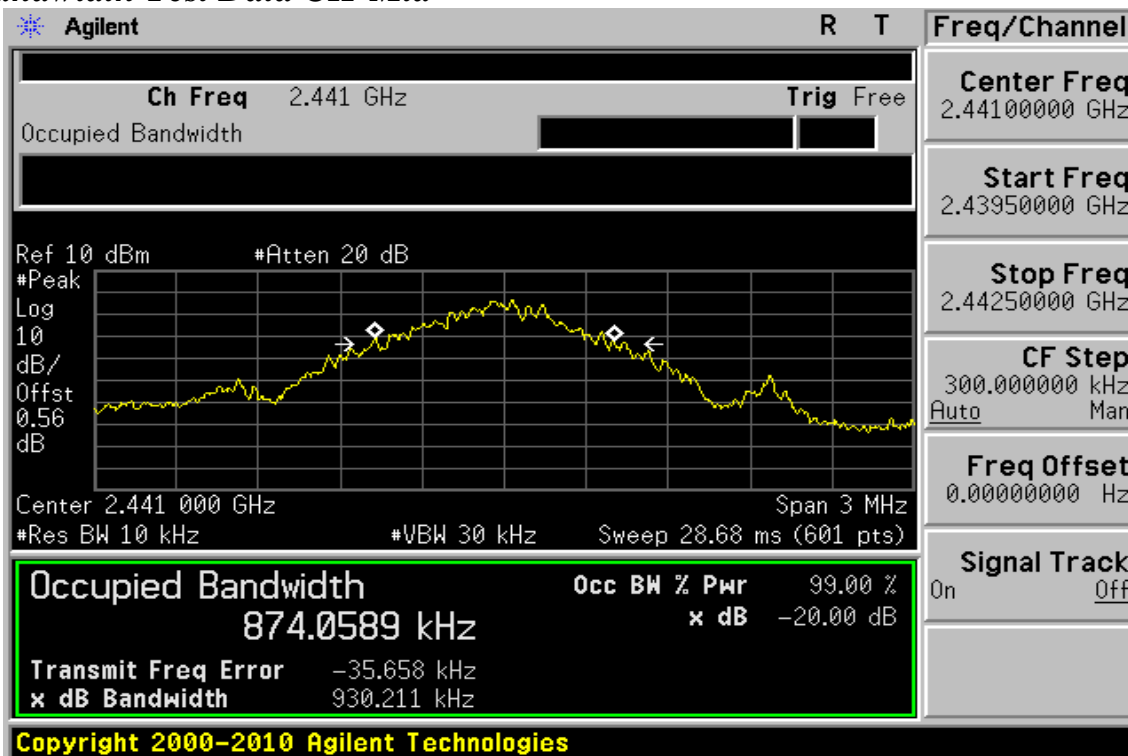
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## BDR Mode

### 20dB Bandwidth Test Data CH-Low



### 20dB Bandwidth Test Data CH-Mid



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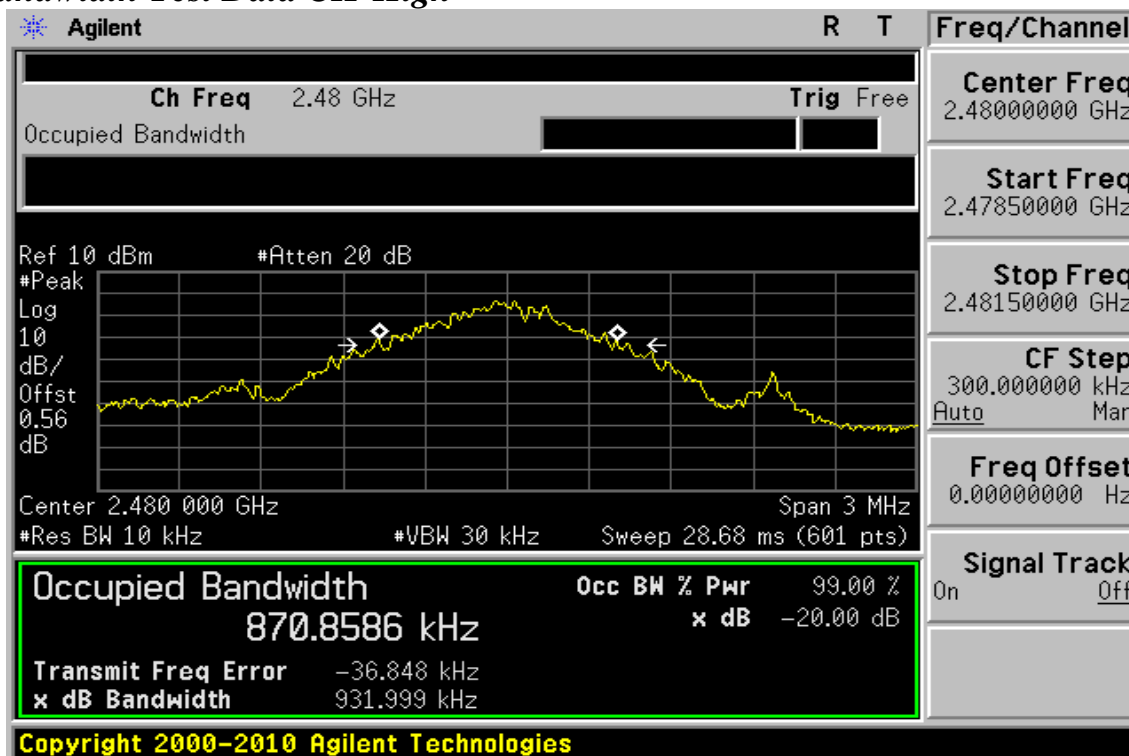
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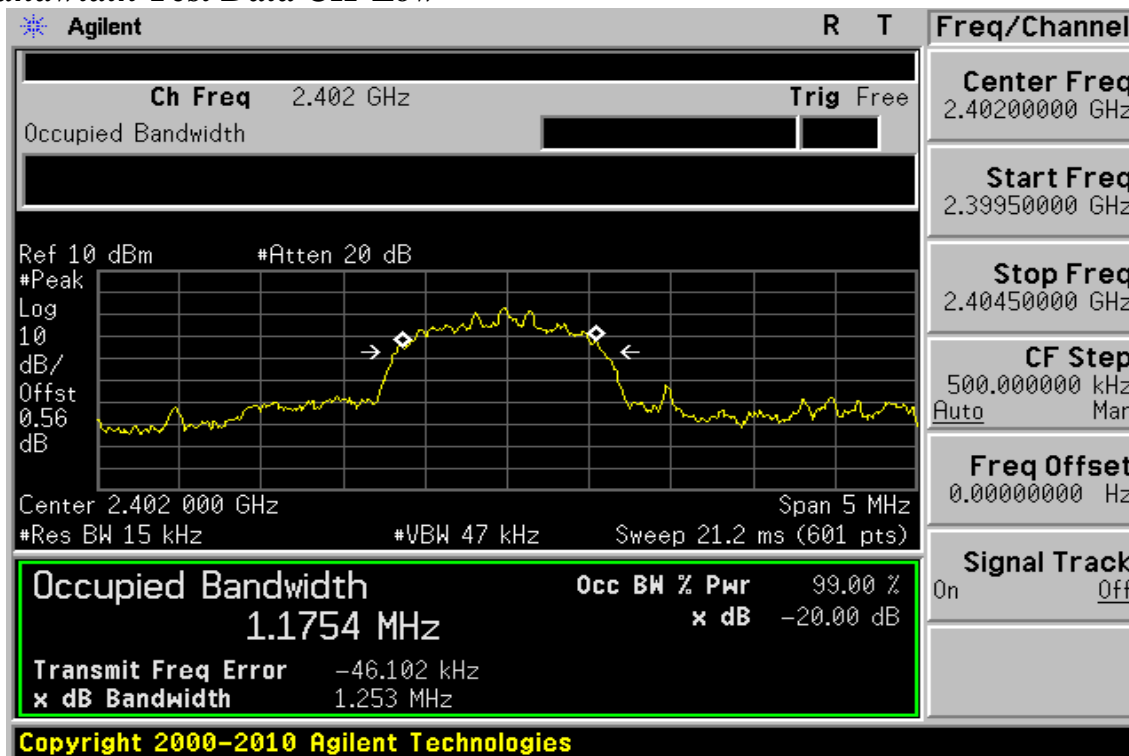


## 20dB Bandwidth Test Data CH-High



## EDR Mode

## 20dB Bandwidth Test Data CH-Low



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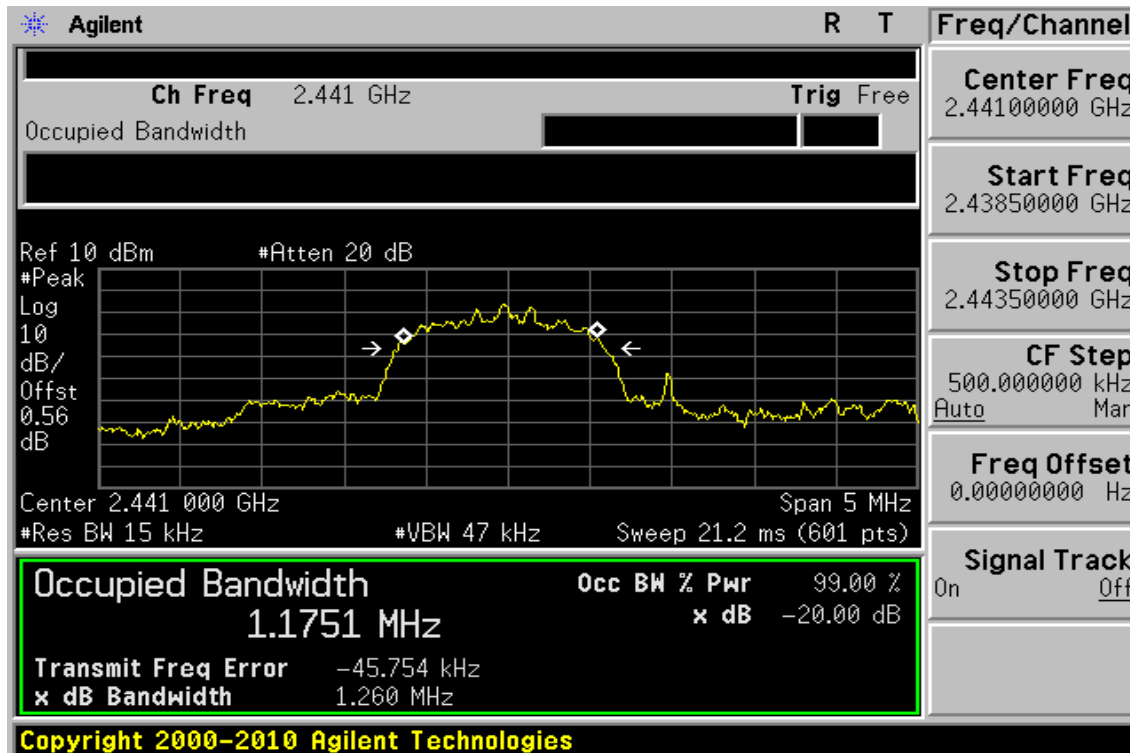
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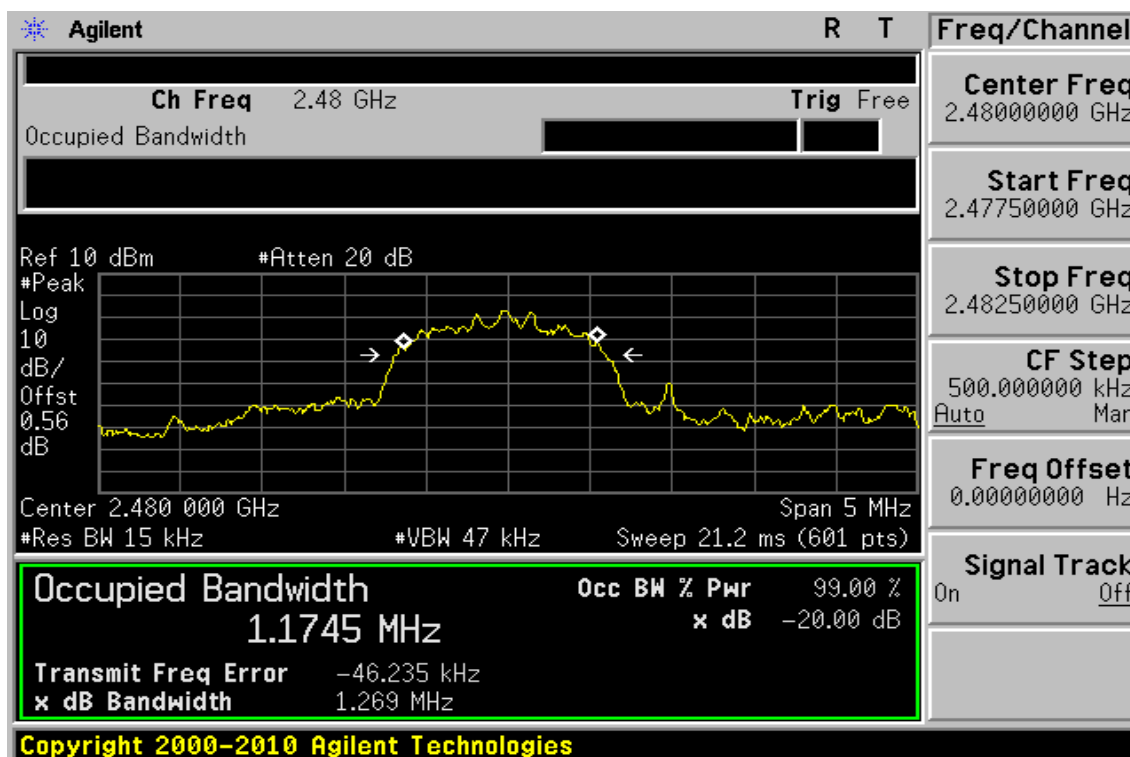
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## 20dB Bandwidth Test Data CH-Mid



## 20dB Bandwidth Test Data CH-High



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## 9. 100KHz BANDWIDTH OF BAND EDGES 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).

### 9.2. Measurement Equipment Used

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

Refer to section 7.2 for details.

#### 9.2.2. Radiated emission:

966 Chamber					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
EMI Test Receiver	R&S	ESCI7	100759	05/20/2011	05/19/2013
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	02/28/2012	02/28/2013
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	07/15/2012	07/14/2013

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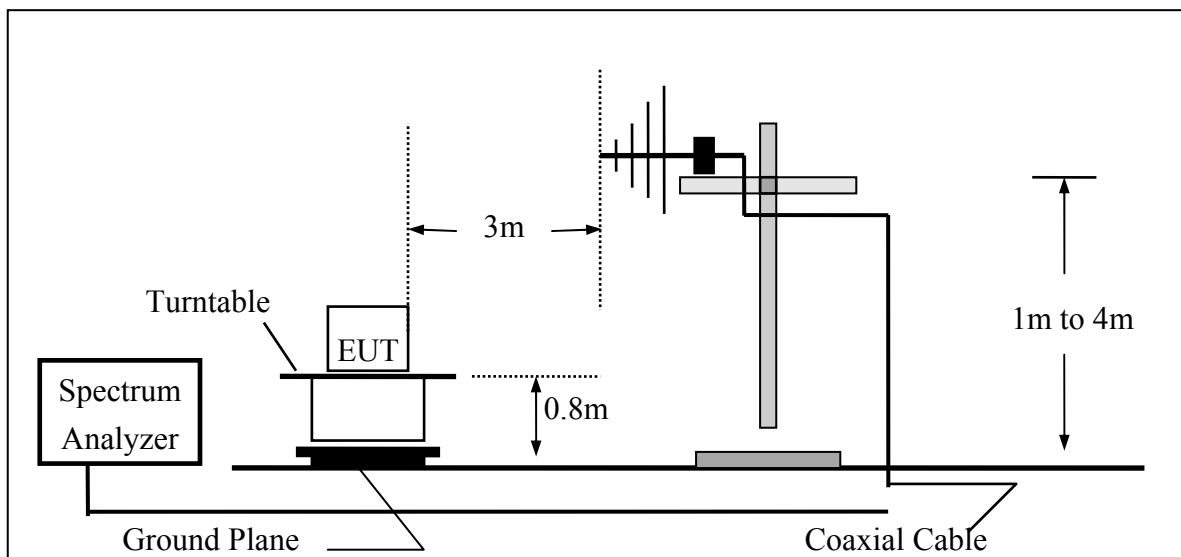
### 9.3. Test SET-UP:

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

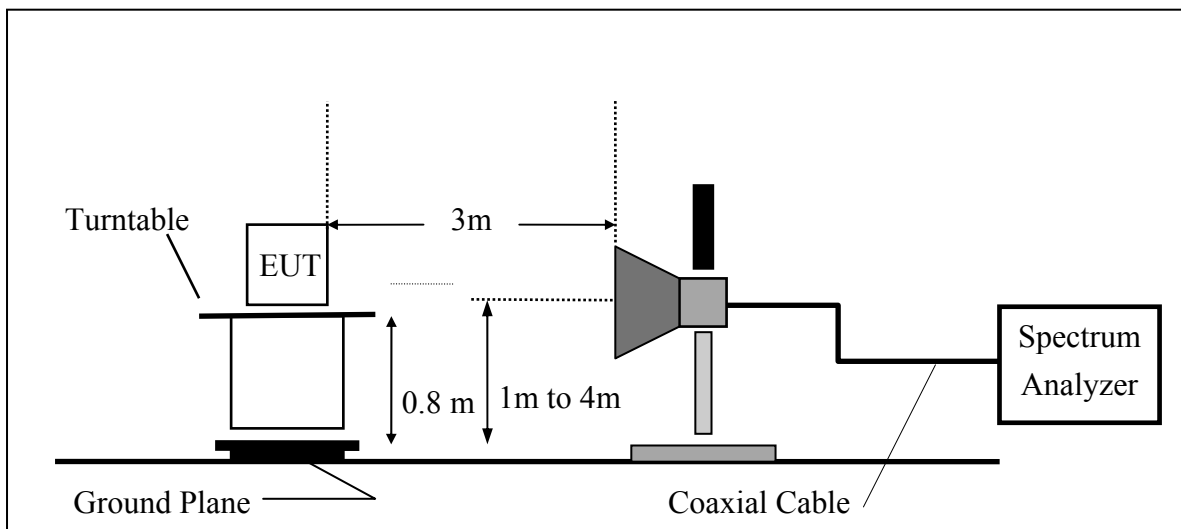
Refer to section 7.3 for details.

#### 9.3.2. 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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#### 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 = operating frequency.
4. Set the spectrum analyzer as RBW, VBW=100KHz, Span=25MHz, Sweep = auto
5. Mark Peak, 2.390GHz and 2.4835GHz and record the max. level.
6. Repeat above procedures until all frequency measured were complete.
7. Radiated Emission refer to section 9.

#### 9.5. Field Strength Calculation

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

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

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

#### 9.6. Measurement Result

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

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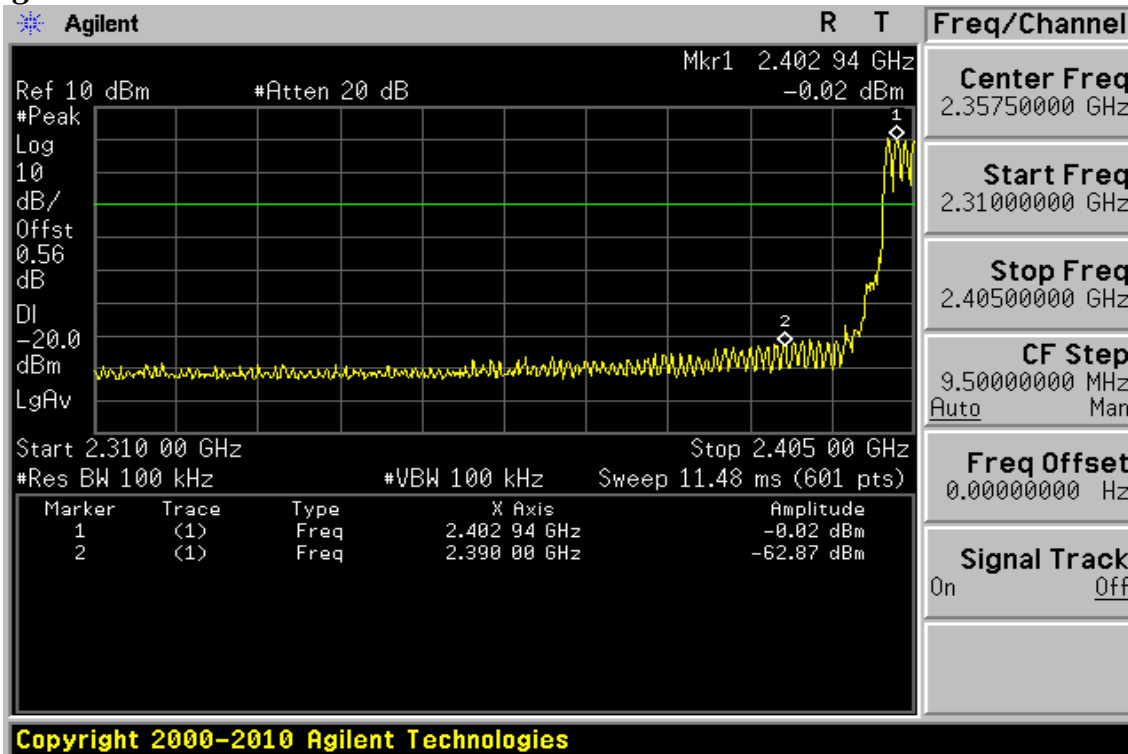
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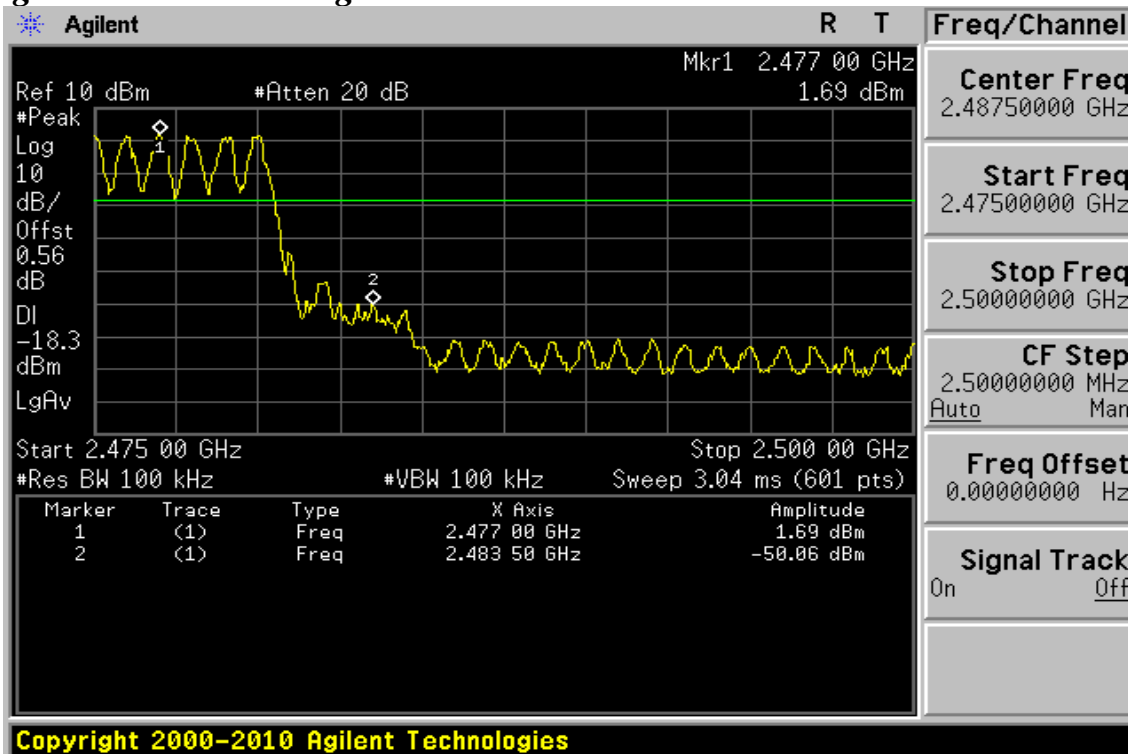
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## BDR Mode

### Band Edges Test Data CH-Low



### Band Edges Test Data CH-High



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**Radiated Emission: (BDR mode)**

Operation Band	:BDR	Test Date	:2012-08-10
Fundamental Frequency	:2402 MHz	Temp./Humi.	:29 deg_C / 67 RH
Operation Mode	:TX LOW Bandedge DH5	Engineer	:Marcus
EUT Pol.	:E2 Plan	Measurement Antenna Pol.	:VERTICAL

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/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.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2390.00	E	Peak	34.48	4.68	39.16	74.00	-34.84

Operation Band	:BDR	Test Date	:2012-07-24
Fundamental Frequency	:2402 MHz	Temp./Humi.	:29 deg_C / 67 RH
Operation Mode	:TX LOW Bandedge DH5	Engineer	:Marcus
EUT Pol.	:E2 Plan	Measurement Antenna Pol.	:HORIZONTAL

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/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.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2390.00	E	Peak	34.03	5.30	39.33	74.00	-34.67

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Operation Band	:BDR	Test Date	:2012-08-10
Fundamental Frequency	:2480 MHz	Temp./Humi.	:29 deg_C / 67 RH
Operation Mode	:TX HIGH Bandedge DH5	Engineer	:Marcus
EUT Pol.	:E2 Plan	Measurement Antenna Pol.	:VERTICAL

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/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.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2483.50	E	Peak	34.35	5.26	39.61	74.00	-34.39

Operation Band	:BDR	Test Date	:2012-07-24
Fundamental Frequency	:2480 MHz	Temp./Humi.	:29 deg_C / 67 RH
Operation Mode	:TX HIGH Bandedge DH5	Engineer	:Marcus
EUT Pol.	:E2 Plan	Measurement Antenna Pol.	:HORIZONTAL

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/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.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2483.50	E	Peak	33.56	6.29	39.85	74.00	-34.15

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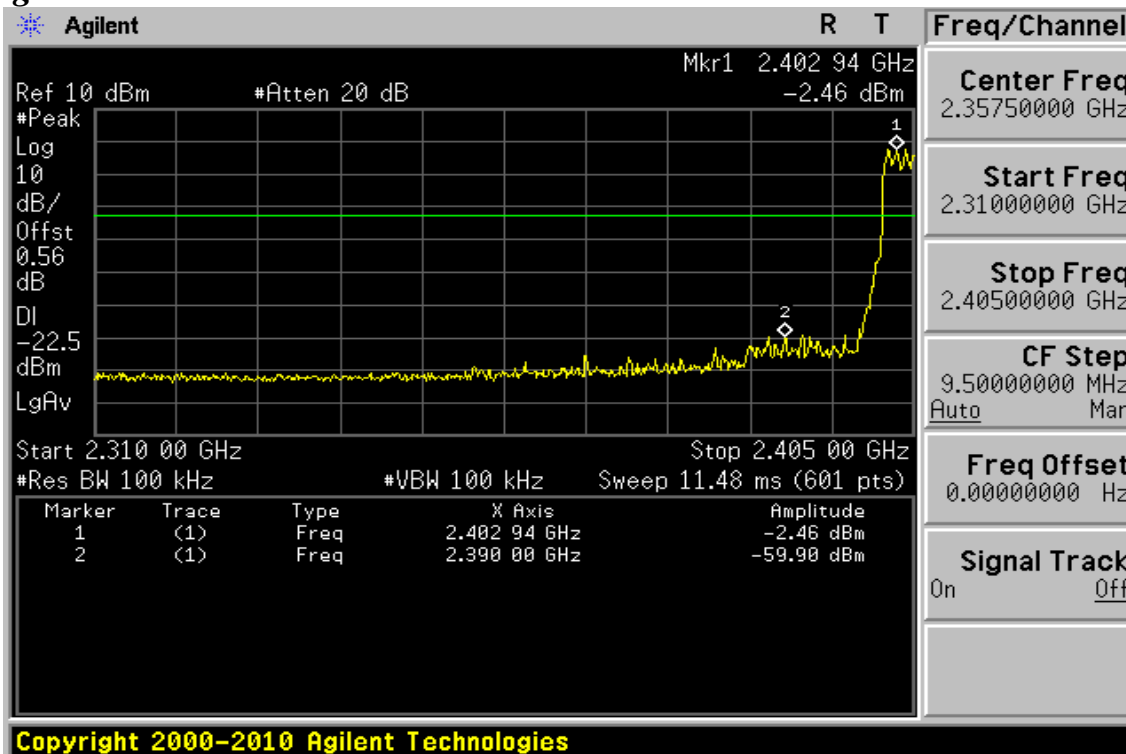
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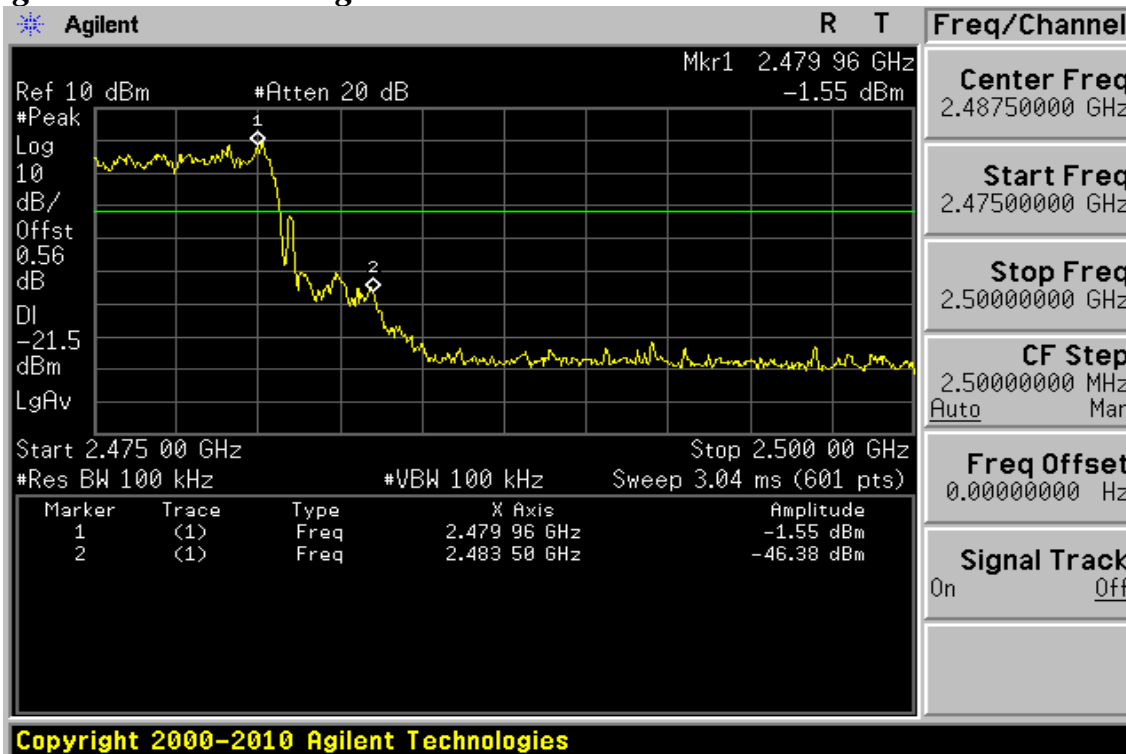


## EDR Mode

### Band Edges Test Data CH-Low



### Band Edges Test Data CH-High



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**Radiated Emission: (EDR mode)**

Operation Band	:EDR	Test Date	:2012-08-10
Fundamental Frequency	:2402 MHz	Temp./Humi.	:29 deg_C / 67 RH
Operation Mode	:TX LOW Bandedge	Engineer	:Marcus
EUT Pol.	:E2 Plan	Measurement Antenna Pol.	:VERTICAL

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/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.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2390.00	E	Peak	34.59	4.68	39.27	74.00	-34.73

Operation Band	:EDR	Test Date	:2012-08-10
Fundamental Frequency	:2402 MHz	Temp./Humi.	:29 deg_C / 67 RH
Operation Mode	:TX LOW Bandedge	Engineer	:Marcus
EUT Pol.	:E2 Plan	Measurement Antenna Pol.	:HORIZONTAL

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/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.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2390.00	E	Peak	33.86	5.30	39.16	74.00	-34.84

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Operation Band	:EDR	Test Date	:2012-08-10
Fundamental Frequency	:2480 MHz	Temp./Humi.	:29 deg_C / 67 RH
Operation Mode	:TX HIGH Bandedge	Engineer	:Marcus
EUT Pol.	:E2 Plan	Measurement Antenna Pol.	:VERTICAL

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/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.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2483.50	E	Peak	34.37	5.26	39.63	74.00	-34.37

Operation Band	:EDR	Test Date	:2012-07-24
Fundamental Frequency	:2480 MHz	Temp./Humi.	:29 deg_C / 67 RH
Operation Mode	:TX HIGH Bandedge	Engineer	:Marcus
EUT Pol.	:E2 Plan	Measurement Antenna Pol.	:HORIZONTAL

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/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.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2483.50	E	Peak	34.49	6.29	40.78	74.00	-33.22

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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.

### 10.2. Measurement Equipment Used:

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

Refer to section 7.2 for details.

#### 10.2.2. Radiated emission:

Refer to section 9.2.2 for details.

### 10.3. Test SET-UP:

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

Refer to section 7.3 for details.

#### 10.3.2. Radiated emission:

Refer to section 9.3.2 for details.

### 10.4. Measurement Procedure:

1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. The turn table shall rotate 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emissions.
4. When measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made “while keeping the antenna in the ‘cone of radiation’ from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response.” is still within the 3dB illumination BW of the measurement antenna.
5. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
6. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
7. Repeat above procedures until all frequency measured were complete.

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**Conducted 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

**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:

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

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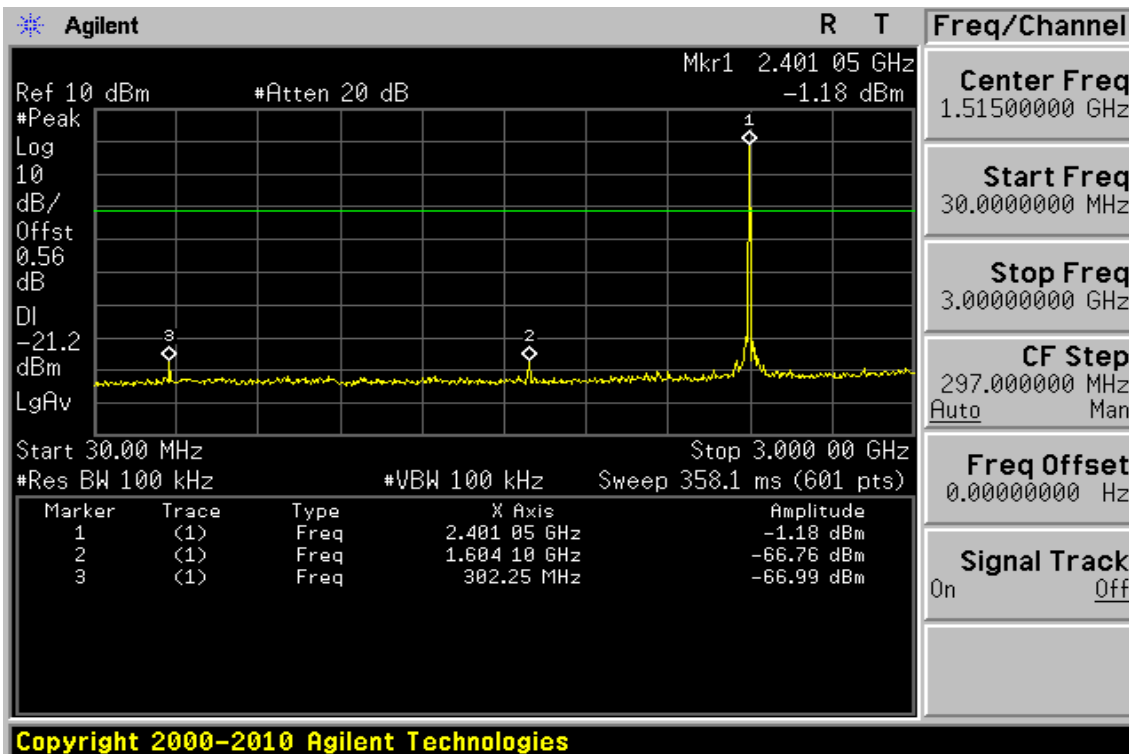
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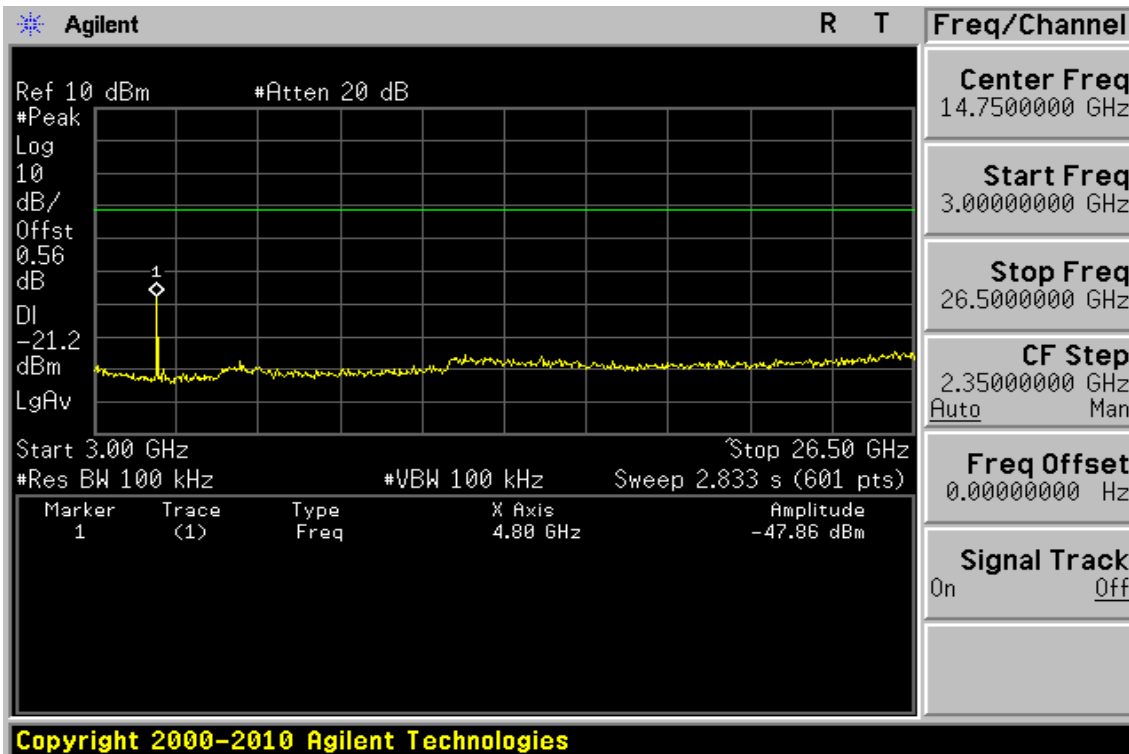
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## Conducted Spurious Emission Measurement Result(Worst EDR Mode) Ch Low 30MHz – 3GHz



## Ch Low 3GHz –26.5GHz



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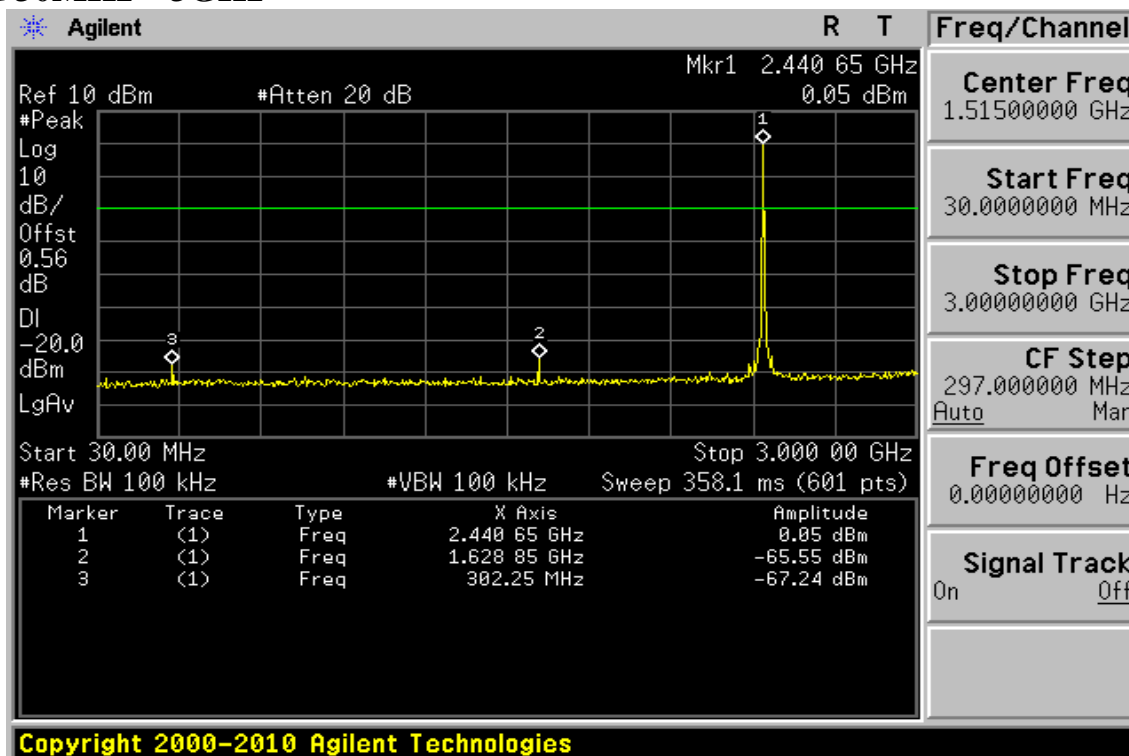
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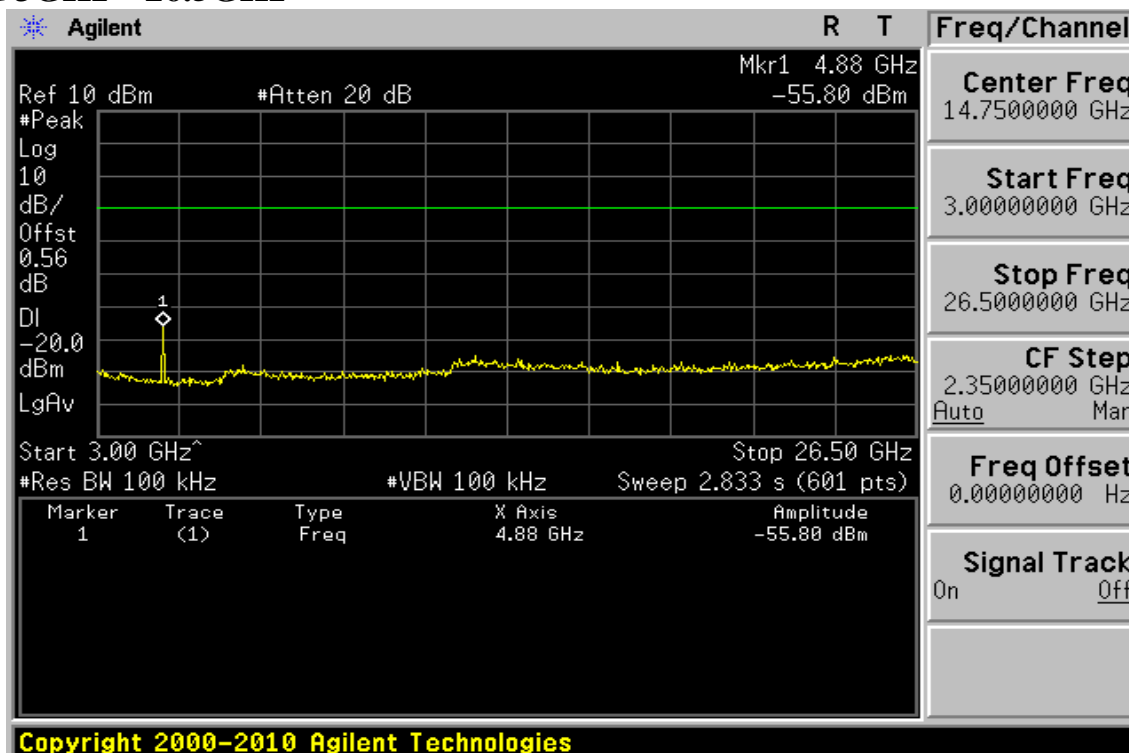
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## Ch Mid 30MHz – 3GHz



## Ch Mid 3GHz – 26.5GHz



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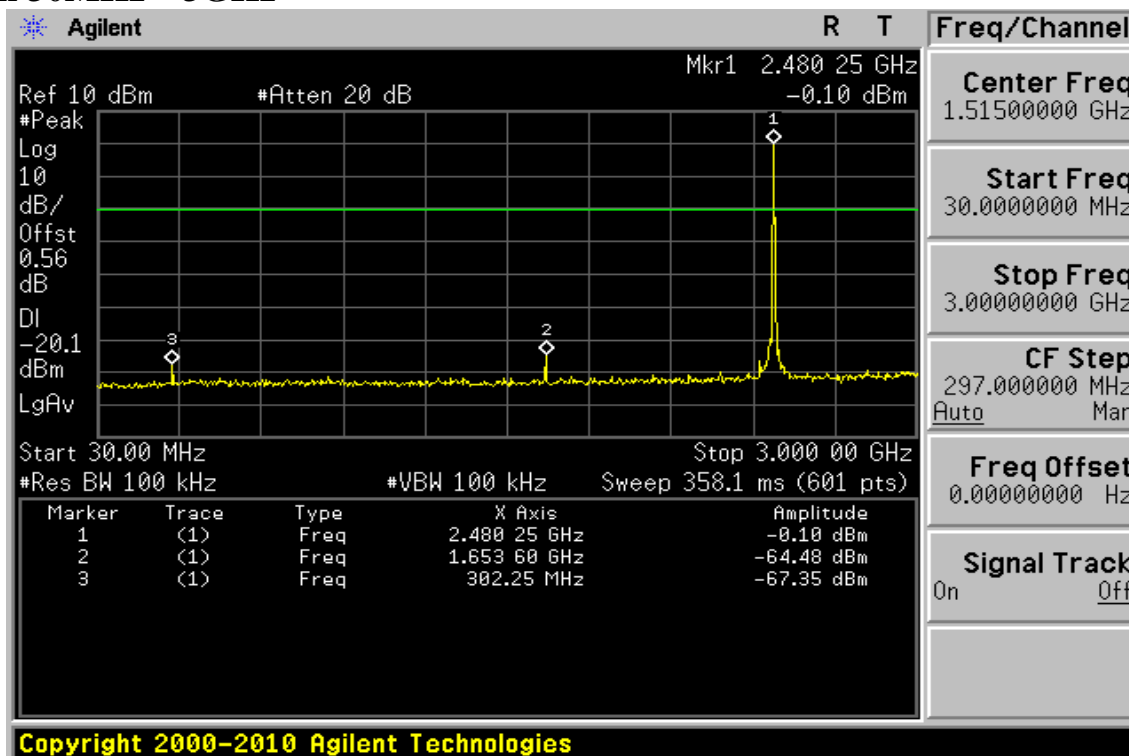
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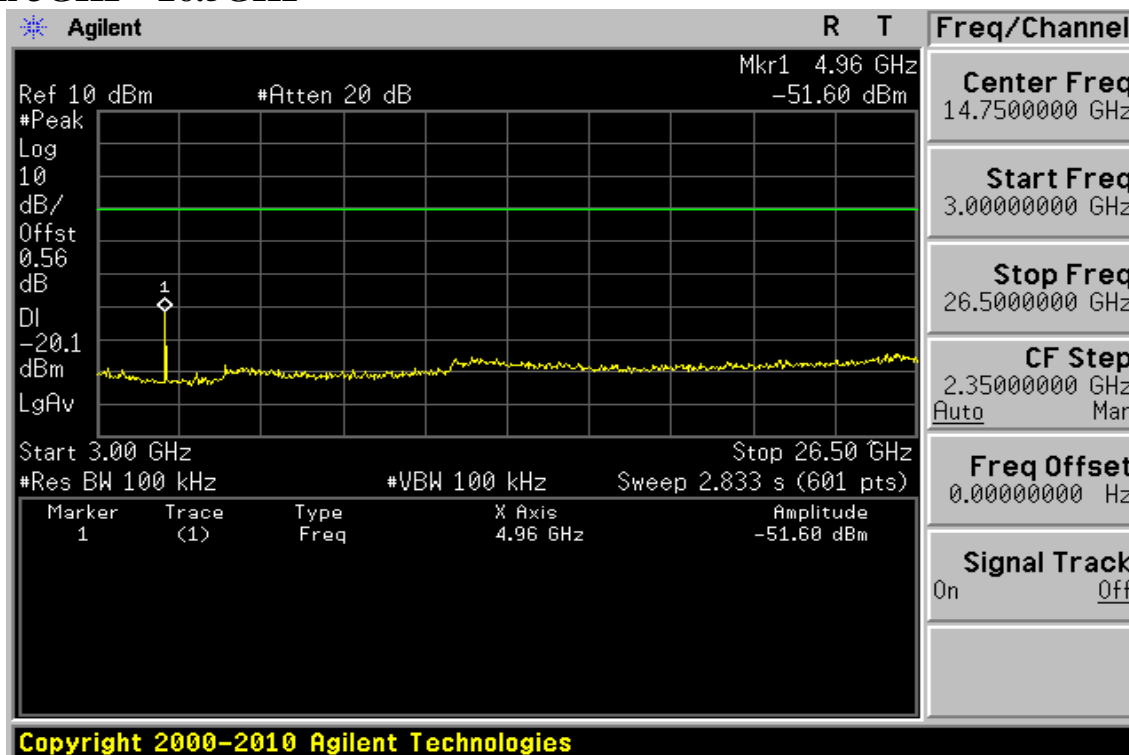
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## Ch High 30MHz – 3GHz



## Ch High 3GHz – 26.5GHz



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## Radiated Spurious Emission Measurement Result (Worst EDR mode)

Operation Band	:EDR	Test Date	:2012-07-25
Fundamental Frequency	:2402 MHz	Temp./Humi.	:29 deg_C / 67 RH
Operation Mode	:TX LOW	Engineer	:Marcus
EUT Pol.	:E2 Plan	Measurement Antenna Pol.	:VERTICAL

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/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.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
124.09	S	Peak	55.21	-14.28	40.93	43.50	-2.57
175.50	S	Peak	52.95	-13.90	39.05	43.50	-4.45
214.30	S	Peak	55.16	-15.55	39.61	43.50	-3.89
330.70	S	Peak	43.80	-11.92	31.88	46.00	-14.12
525.67	S	Peak	45.08	-9.09	35.99	46.00	-10.01
972.84	S	Peak	34.02	-2.01	32.01	54.00	-21.99
4804.00	H	Peak	36.73	9.66	46.39	74.00	-27.61
4997.00	S	Peak	38.12	10.28	48.40	74.00	-25.60
7206.00	H	---					
9608.00	H	---					
12010.00	H	---					
14412.00	H	---					
16814.00	H	---					
19216.00	H	---					
21618.00	H	---					
24020.00	H	---					

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Operation Band	:EDR	Test Date	:2012-07-25
Fundamental Frequency	:2402 MHz	Temp./Humi.	:29 deg_C / 67 RH
Operation Mode	:TX LOW	Engineer	:Marcus
EUT Pol.	:E2 Plan	Measurement Antenna Pol.	:HORIZONTAL

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/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.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
109.54	S	Peak	56.15	-15.81	40.34	43.50	-3.16
175.50	S	Peak	54.67	-13.90	40.77	43.50	-2.73
291.90	S	Peak	45.94	-12.76	33.18	46.00	-12.82
409.27	S	Peak	43.39	-10.87	32.52	46.00	-13.48
525.67	S	Peak	43.98	-9.09	34.89	46.00	-11.11
817.64	S	Peak	38.01	-4.00	34.01	46.00	-11.99
4804.00	H	Peak	35.59	9.70	45.29	74.00	-28.71
4997.00	S	Peak	36.95	10.08	47.03	74.00	-26.97
7206.00	H	---					
9608.00	H	---					
12010.00	H	---					
14412.00	H	---					
16814.00	H	---					
19216.00	H	---					
21618.00	H	---					
24020.00	H	---					

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Operation Band	:EDR	Test Date	:2012-07-25
Fundamental Frequency	:2441 MHz	Temp./Humi.	:29 deg_C / 67 RH
Operation Mode	:TX MID	Engineer	:Marcus
EUT Pol.	:E2 Plan	Measurement Antenna Pol.	:VERTICAL

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/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.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
136.70	S	Peak	53.32	-13.36	39.96	43.50	-3.54
214.30	S	Peak	55.45	-15.55	39.90	43.50	-3.60
369.50	S	Peak	45.92	-11.44	34.48	46.00	-11.52
486.87	S	Peak	44.94	-9.74	35.20	46.00	-10.80
603.27	S	Peak	41.40	-7.49	33.91	46.00	-12.09
953.44	S	Peak	33.64	-2.09	31.55	46.00	-14.45
4882.00	H	Peak	34.36	10.15	44.51	74.00	-29.49
4997.00	S	Peak	39.62	10.28	49.90	74.00	-24.10
7323.00	H	---					
9764.00	H	---					
12205.00	H	---					
14646.00	H	---					
17087.00	H	---					
19528.00	H	---					
21969.00	H	---					
24410.00	H	---					

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Operation Band	:EDR	Test Date	:2012-07-25
Fundamental Frequency	:2441 MHz	Temp./Humi.	:29 deg_C / 67 RH
Operation Mode	:TX MID	Engineer	:Marcus
EUT Pol.	:E2 Plan	Measurement Antenna Pol.	:HORIZONTAL

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/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.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
136.70	S	Peak	53.30	-13.36	39.94	43.50	-3.56
175.50	S	Peak	53.82	-13.90	39.92	43.50	-3.58
214.30	S	Peak	55.14	-15.55	39.59	43.50	-3.91
369.50	S	Peak	44.84	-11.44	33.40	46.00	-12.60
525.67	S	Peak	44.26	-9.09	35.17	46.00	-10.83
817.64	S	Peak	38.24	-4.00	34.24	46.00	-11.76
4882.00	H	Peak	35.22	10.09	45.31	74.00	-28.69
4997.00	S	Peak	37.46	10.08	47.54	74.00	-26.46
7323.00	H	---					
9764.00	H	---					
12205.00	H	---					
14646.00	H	---					
17087.00	H	---					
19528.00	H	---					
21969.00	H	---					
24410.00	H	---					

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Operation Band	:EDR	Test Date	:2012-07-25
Fundamental Frequency	:2480 MHz	Temp./Humi.	:29 deg_C / 67 RH
Operation Mode	:TX HIGH	Engineer	:Marcus
EUT Pol.	:E2 Plan	Measurement Antenna Pol.	:VERTICAL

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/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.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
109.54	S	Peak	55.57	-15.81	39.76	43.50	-3.74
135.73	S	Peak	53.80	-13.44	40.36	43.50	-3.14
214.30	S	Peak	53.71	-15.55	38.16	43.50	-5.34
448.07	S	Peak	44.38	-10.06	34.32	46.00	-11.68
525.67	S	Peak	44.33	-9.09	35.24	46.00	-10.76
934.04	S	Peak	33.58	-2.25	31.33	46.00	-14.67
4960.00	H	Peak	34.73	10.05	44.78	74.00	-29.22
4997.00	S	Peak	39.30	10.28	49.58	74.00	-24.42
7440.00	H	---					
9920.00	H	---					
12400.00	H	---					
14880.00	H	---					
17360.00	H	---					
19840.00	H	---					
22320.00	H	---					
24800.00	H	---					

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Operation Band	:EDR	Test Date	:2012-07-25
Fundamental Frequency	:2480 MHz	Temp./Humi.	:29 deg_C / 67 RH
Operation Mode	:TX HIGH	Engineer	:Marcus
EUT Pol.	:E2 Plan	Measurement Antenna Pol.	:HORIZONTAL

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/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.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
135.73	S	Peak	53.04	-13.44	39.60	43.50	-3.90
175.50	S	Peak	51.51	-13.90	37.61	43.50	-5.89
214.30	S	Peak	55.07	-15.55	39.52	43.50	-3.98
369.50	S	Peak	45.31	-11.44	33.87	46.00	-12.13
564.47	S	Peak	41.45	-8.28	33.17	46.00	-12.83
817.64	S	Peak	37.85	-4.00	33.85	46.00	-12.15
4960.00	H	Peak	34.18	9.90	44.08	74.00	-29.92
4997.00	S	Peak	37.42	10.08	47.50	74.00	-26.50
7440.00	H	---					
9920.00	H	---					
12400.00	H	---					
14880.00	H	---					
17360.00	H	---					
19840.00	H	---					
22320.00	H	---					
24800.00	H	---					

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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  $2/3 \times 20\text{dB}$  bandwidth of the hopping channel, whichever is greater.

### 11.2. Measurement Equipment Used:

Refer to section 7.2 for details.

### 11.3. Test Set-up:

Refer to section 7.3 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 = middle of hopping channel .
4. Set the spectrum analyzer as RBW,VBW=100KHz, Adjust Span to 3.0 MHz, Sweep = auto.
5. Max hold. Mark 3 Peaks of hopping channel and record the 3 peaks frequency.

### 11.5. 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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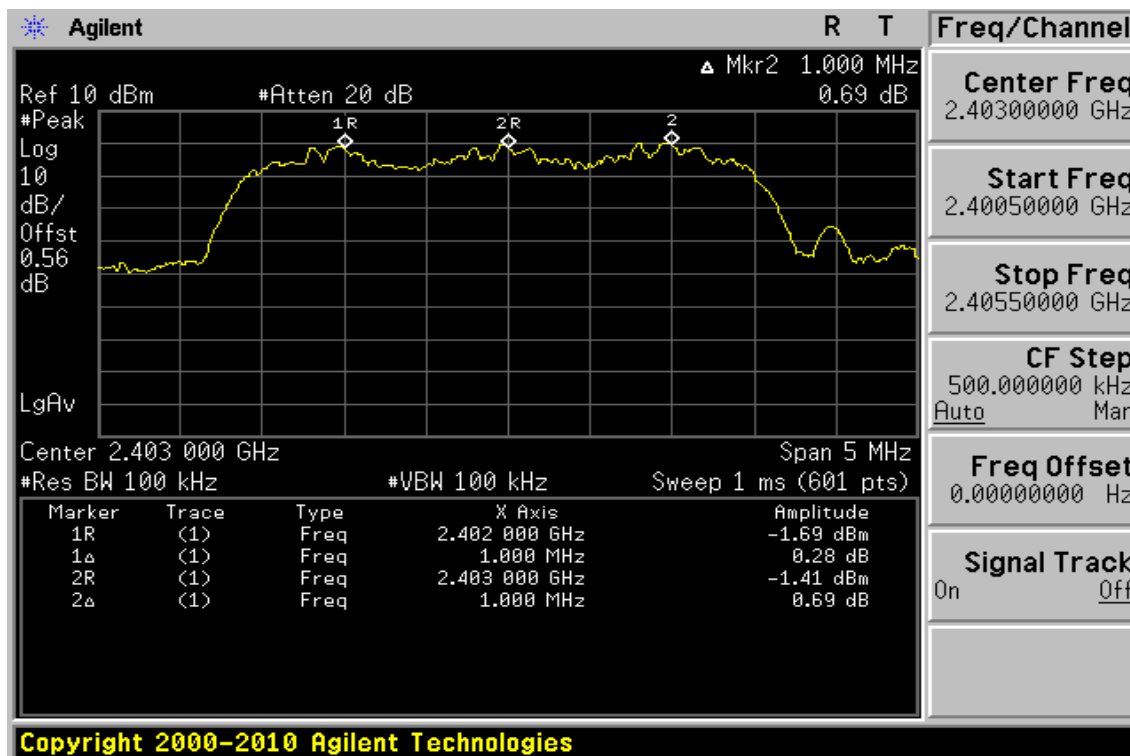
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## Frequency Separation Test Data



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## 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.

### 12.2. Measurement Equipment Used:

Refer to section 7.2 for details.

### 12.3. Test Set-up:

Refer to section 7.3 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 spectrum analyzer Start=2400MHz, Stop = 2483.5MHz, Sweep = auto.
4. Set the spectrum analyzer as RBW=430KHz,, VBW=1MHz.
5. Max hold, view and count how many channel in the band.

### 12.5. Measurement Result:

Note: Refer to next page for plots.

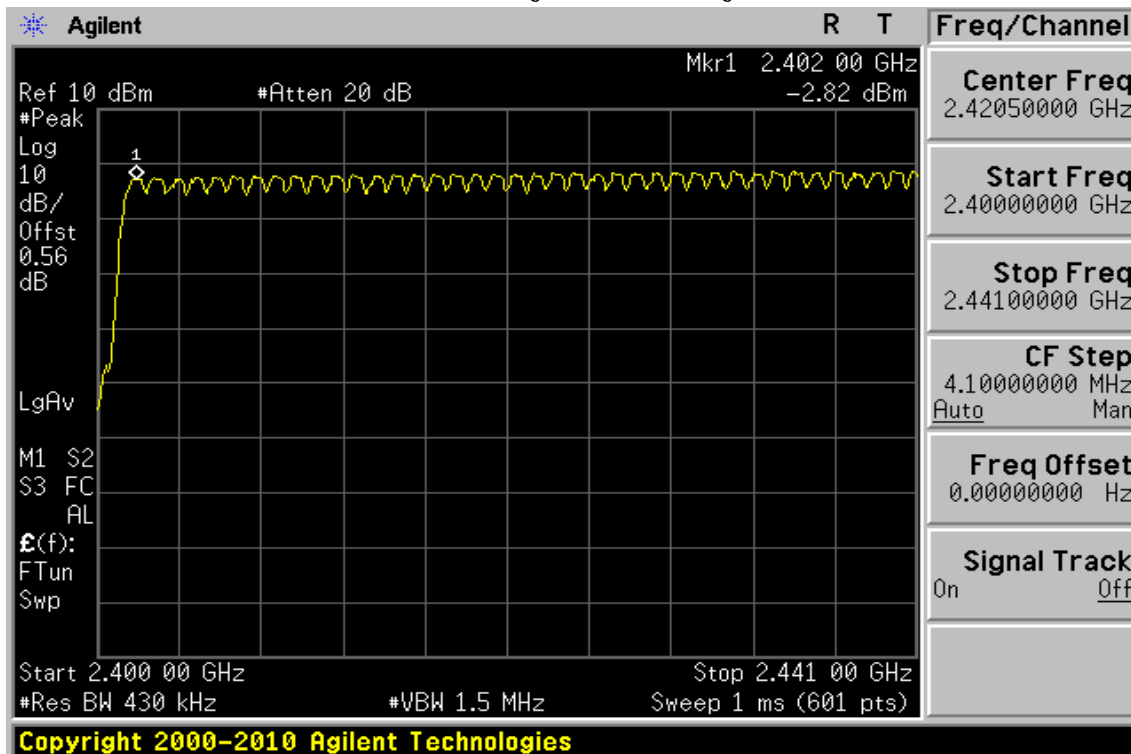
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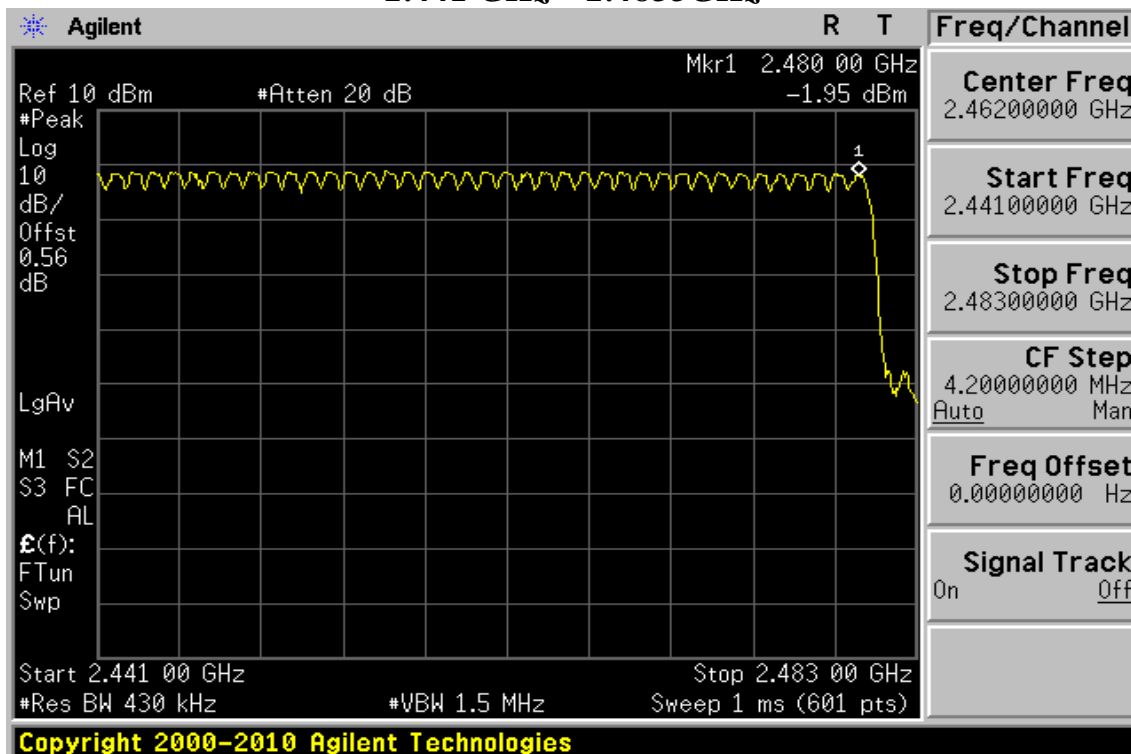
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## Channel Number

### 2.4 GHz – 2.441GHz



### 2.441 GHz – 2.4835GHz



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## 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.

### 13.2. Measurement Equipment Used:

Refer to section 7.2 for details.

### 13.3. Test Set-up:

Refer to section 7.3 for details.

### 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=100KHz, Span = 0Hz , Adjust Sweep = 2~7ms.
5. Repeat above procedures until all frequency measured were complete.

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### 13.5. Measurement Result

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

CH Low: DH1 time slot = 0.403 (ms) \* (1600/(2\*79)) \* 31.6 = 128.96(ms)

DH3 time slot = 1.65 (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 = 0.403 (ms) \* (1600/(2\*79)) \* 31.6 = 128.96 (ms)

DH3 time slot = 1.65 (ms) \* (1600/(4\*79)) \* 31.6 = 264.00 (ms)

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

CH High: DH1 time slot = 0.403 (ms) \* (1600/(2\*79)) \* 31.6 = 128.96 (ms)

DH3 time slot = 1.65 (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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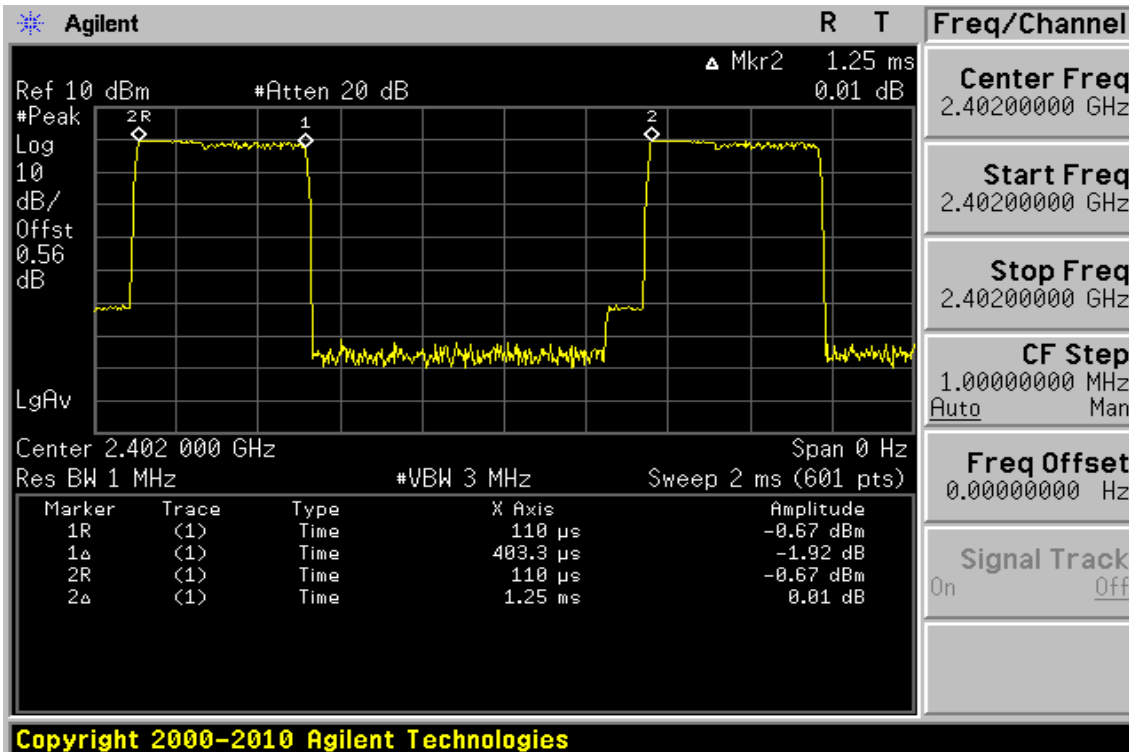
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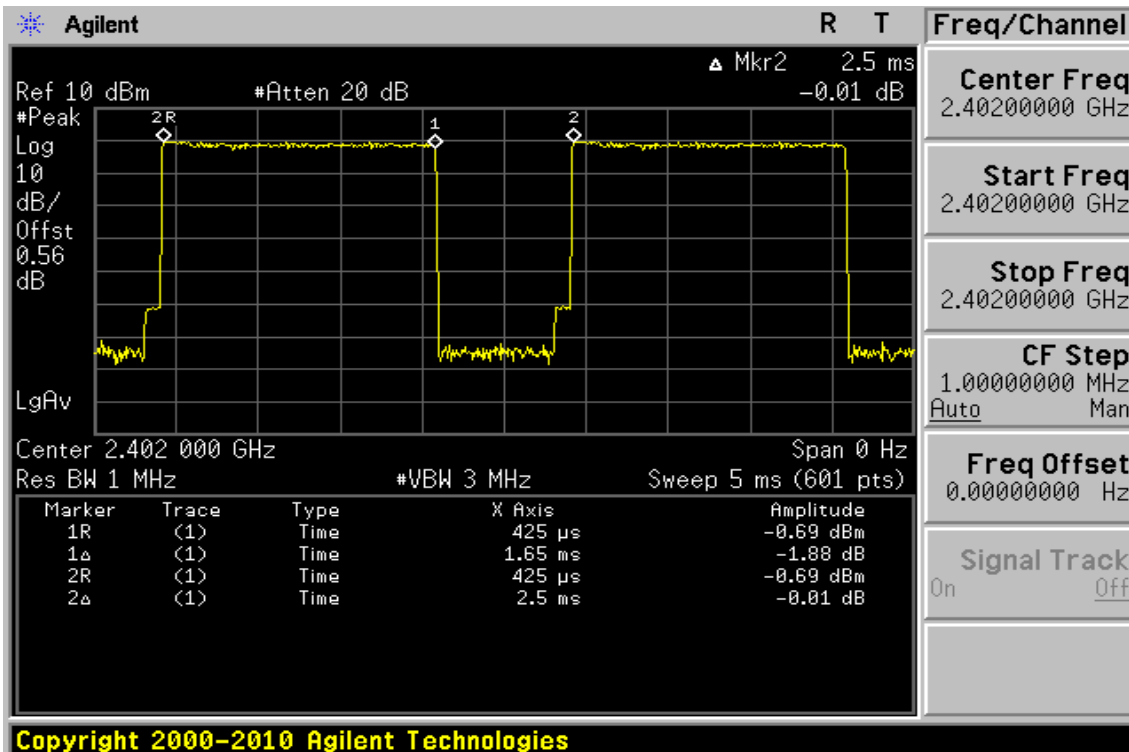
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## CH-Low

### DH1



### DH3



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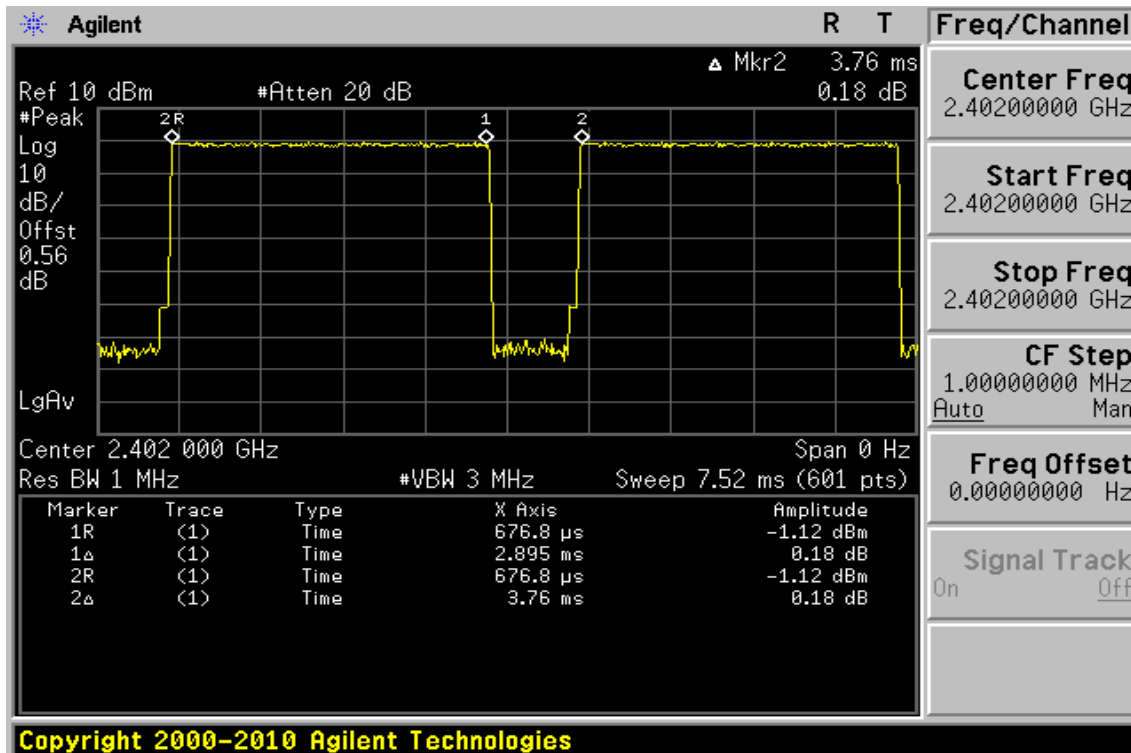
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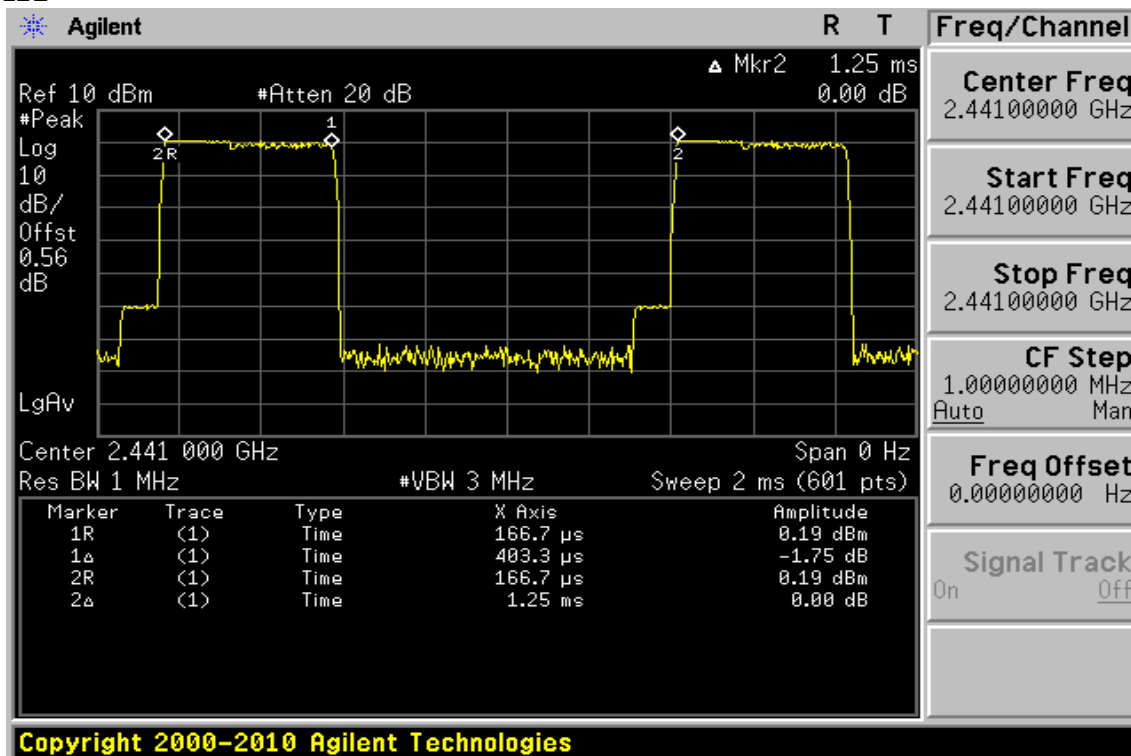
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## DH5



## CH-Mid

## DH1



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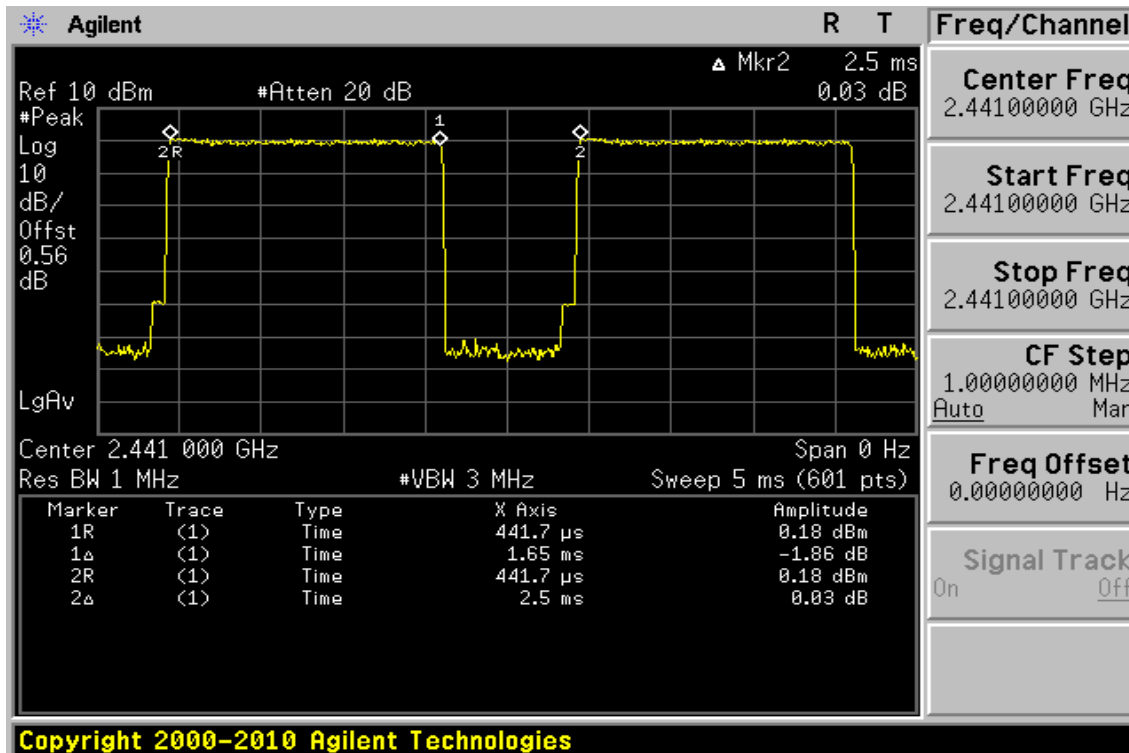
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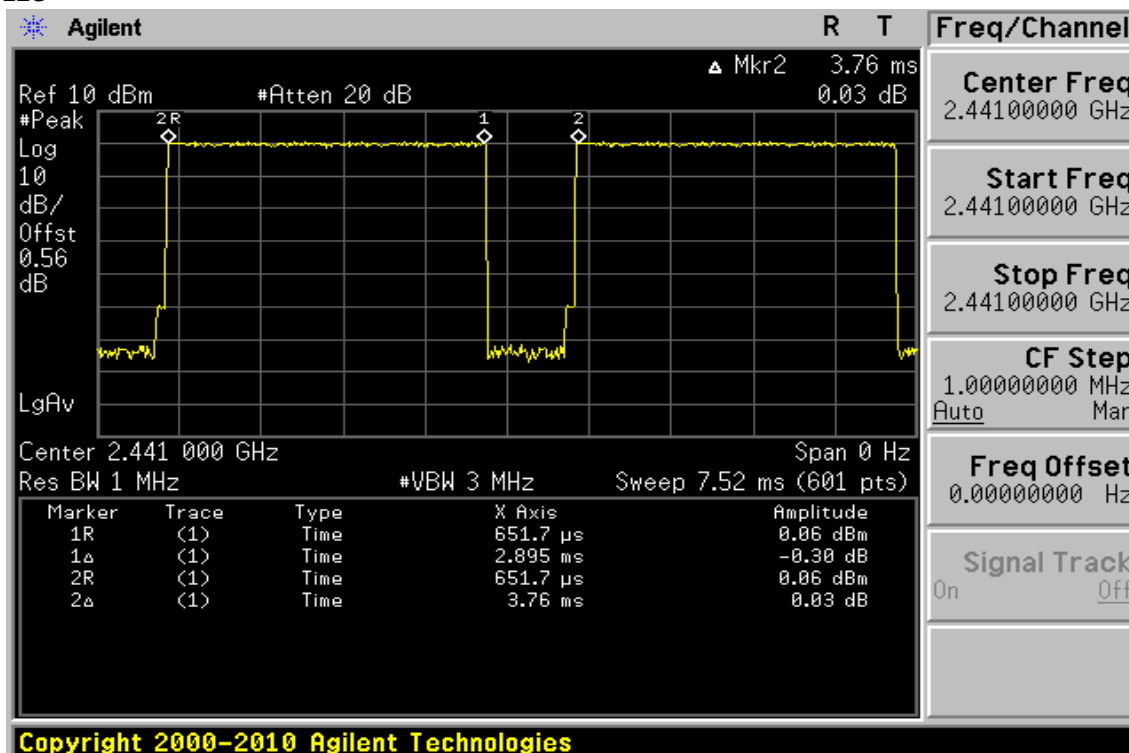
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## DH3



## DH5



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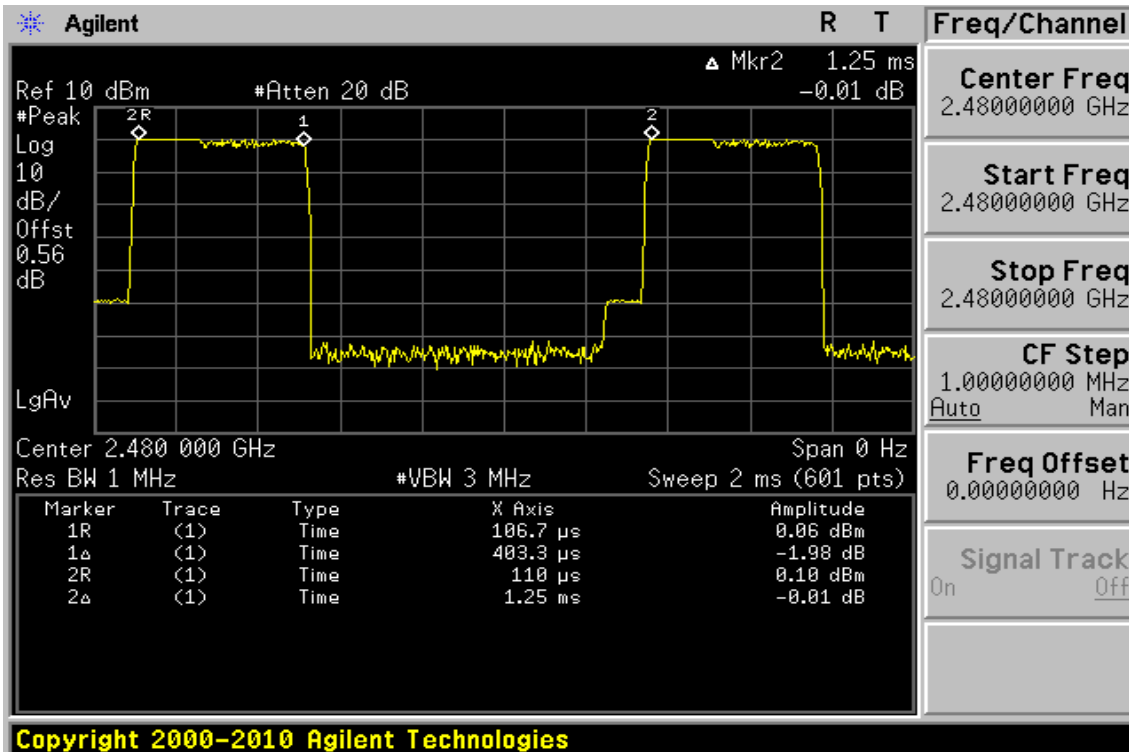
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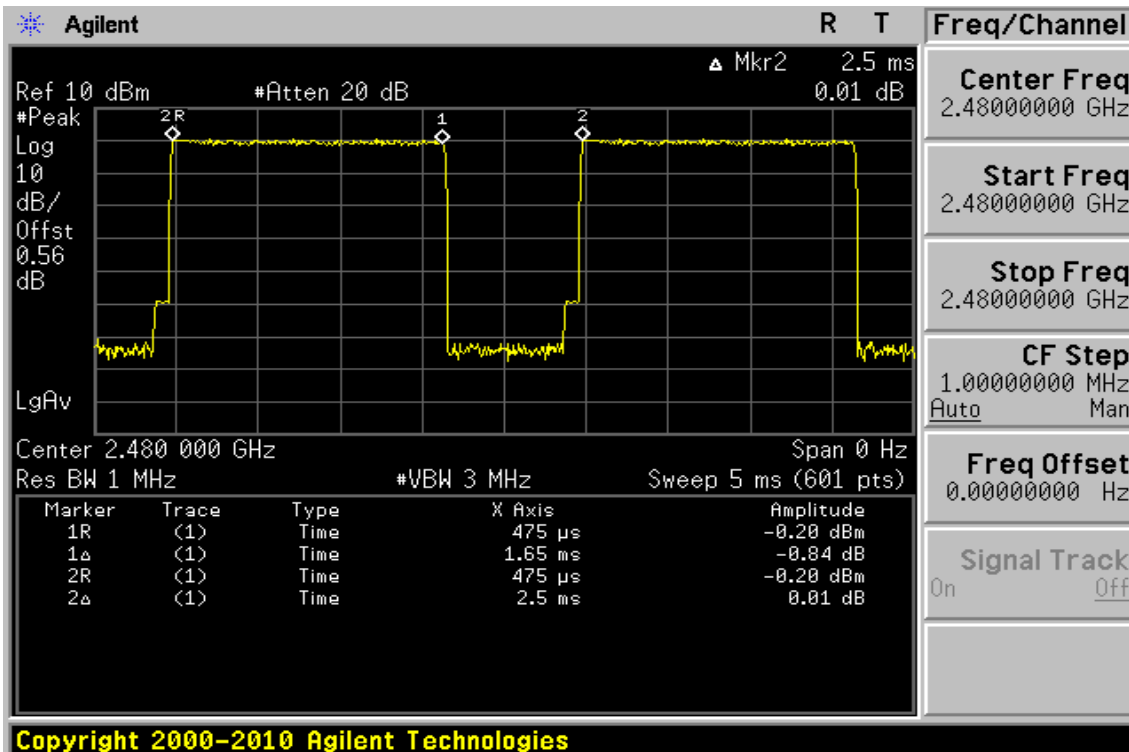
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## CH-High DH1



## DH3



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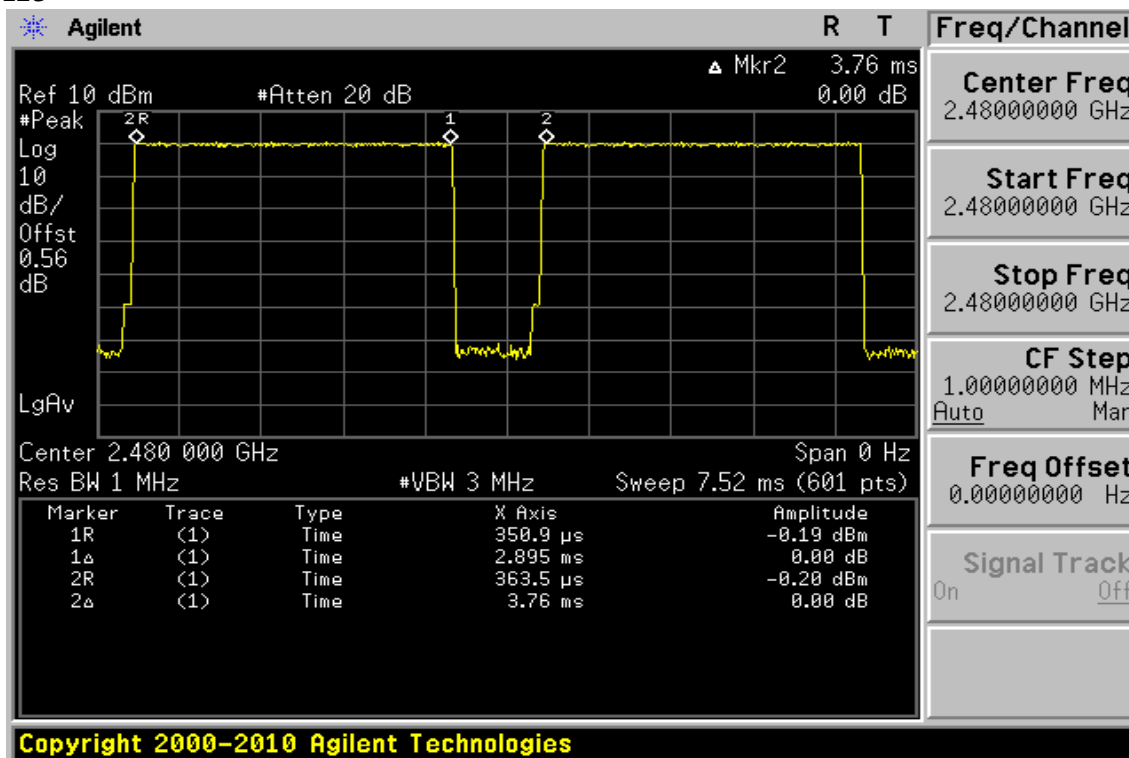
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## 14. ANTENNA REQUIREMENT

### 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.

### 14.2. Antenna Connected Construction

The directional gains of antenna used for transmitting is 1.5 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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## 15. Maximum Permissible Exposure (MPE)

### 15.1. Standard Applicable

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

This is a Mobile device, the MPE is required.

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

Limits for Maximum Permissive Exposure (MPE)

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

F = frequency in MHz

\* = Plane-wave equipment power density

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## 15.2. Maximum Permissible Exposure (MPE) Evaluation

### BDR Mode

Frequency (MHz)	Reading Power (dBm)	Output Power (dBm)	Output Power (W)	Limit (W)
2402.00	0.79	0.79	0.00120	1
2441.00	1.87	1.87	0.00154	1
2480.00	1.85	1.85	0.00153	1

### EDR Mode

Frequency (MHz)	Reading Power (dBm)	Output Power (dBm)	Output Power (W)	Limit (W)
2402.00	-0.27	-0.27	0.00094	1
2441.00	1.97	1.97	0.00157	1
2480.00	1.95	1.95	0.00157	1

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### 15.3. MPE Prediction (EDR Mode)

Prediction of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

$$S = PG / 4 \pi R^2$$

Where: S = Power density

P = Power input to antenna

G = Power gain of the antenna in the direction of interest relative to an isotropic radiator

R = Distance to the center of radiation of the antenna

Maximum peak output power at antenna input terminal:	1.97	(dBm)
Maximum peak output power at antenna input terminal:	1.573982864	(mW)
Duty cycle:	77	(%)
Maximum Pav :	1.211966806	(mW)
Antenna gain (typical):	1.5	(dBi)
Maximum antenna gain:	1.412537545	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	2441	(MHz)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm <sup>2</sup> )
Power density at predication frequency at 20 (cm)	0.0003408	(mW/cm <sup>2</sup> )

### Measurement Result

The predicted power density level at 20 cm is 0.00034 mW/cm<sup>2</sup>. This is below the uncontrolled exposure limit of 1 mW/cm<sup>2</sup> at 2441MHz.

*Note: In comparison with BDR, and EDR, EDR results highest emission of power, and further produces higher value of Maximum Permissible Exposure at 20cm. Hence, only the derivation of MPR on the basis of EDR mode is present in this given test report.*

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