

ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

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

OF

Product Name: Car StereoClip (AUX)
Brand Name: HTC
Model No.: CAR A100
Model Difference: N/A
FCC ID: NM8CARA100
IC: 4115B-CARA100
Report No.: EF/2012/10012-05
Issue Date: Mar. 20, 2012
Rule Part: §15.247, Cat: DSS
RSS-210 issue 8:2010, Annex 8
Prepared for: HTC Corporation
No. 23 Xinghua Rd. Taoyuan City 330 Taiwan
Prepared by: SGS Taiwan Ltd.
Electronics & Communication Laboratory
No. 134, Wu Kung Rd., Wuku Industrial Zone,
Taipei County, Taiwan.



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VERIFICATION OF COMPLIANCE

Applicant: HTC Corporation
No. 23 Xinghua Rd. Taoyuan City 330 Taiwan

Product Name: Car StereoClip (AUX)

FCC ID: NM8CARA100

Brand Name: HTC

Model No.: CAR A100

Model Difference: N/A

FCC ID: NM8CARA100

IC: 4115B-CARA100

File Number: EF/2012/10012-05

Date of test: Jan. 20, 2012 ~ Feb. 20, 2012

Date of EUT Received: Jan. 20, 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) 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:

Lion Wang

Date:

Mar. 20, 2012

Lion Wang / Engineer

Prepared By:

Tiffany Kao

Date:

Mar. 20, 2012

Tiffany Kao / Clerk

Approved By:

Jim Chang

Date:

Mar. 20, 2012

Jim Chang / Supervisor

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Version

Version No.	Date	Description
00	Mar. 20, 2012	Initial creation of document

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Table of Contents

1. GENERAL INFORMATION	7
1.1. Product Description	7
1.2. Related Submittal(s) / Grant (s)	8
1.3. Test Methodology	8
1.4. Test Facility	8
1.5. Special Accessories	8
1.6. Equipment Modifications	8
2. SYSTEM TEST CONFIGURATION	9
2.1. EUT Configuration	9
2.2. EUT Exercise	9
2.3. Test Procedure	9
2.4. Configuration of Tested System	10
3. SUMMARY OF TEST RESULTS	11
4. DESCRIPTION OF TEST MODES	11
5. CONDUCTED EMISSION TEST	12
5.1. Standard Applicable	12
5.2. EUT Setup	12
5.3. Measurement Procedure	12
5.4. Measurement Equipment Used:	13
5.5. Measurement Result	13
6. PEAK OUTPUT POWER MEASUREMENT	14
6.1. Standard Applicable	14
6.2. Measurement Equipment Used	14
6.3. Test Set-up:	14
6.4. Measurement Procedure:	15
6.5. Measurement Result	16
7. 20dB BAND WIDTH & 99% BANDWIDTH	20
7.1. Standard Applicable	20
7.2. Measurement Equipment Used	20
7.3. Test Set-up	20
7.4. Measurement Procedure:	20
7.5. Measurement Result:	21

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8. 100KHz BANDWIDTH OF BAND EDGES MEASUREMENT.....	28
8.1. Standard Applicable	28
8.2. Measurement Equipment Used	29
8.3. Test SET-UP:.....	30
8.4. Measurement Procedure.....	31
8.5. Field Strength Calculation	31
8.6. Measurement Result.....	31
9. SPURIOUS RADIATED EMISSION TEST.....	38
9.1. Standard Applicable	38
9.2. Measurement Equipment Used:.....	38
9.3. Test SET-UP:.....	38
9.4. Measurement Procedure:	39
9.5. Field Strength Calculation	39
9.6. Measurement Result:	39
10. FREQUENCY SEPARATION	49
10.1. Standard Applicable	49
10.2. Measurement Equipment Used:.....	49
10.3. Test Set-up:	49
10.4. Measurement Procedure:	49
10.5. Measurement Result:	49
11. NUMBER OF HOPPING FREQUENCY	51
11.1. Standard Applicable	51
11.2. Measurement Equipment Used:.....	51
11.3. Test Set-up:	51
11.4. Measurement Procedure:	51
11.5. Measurement Result:	51
12. TIME OF OCCUPANCY (DWELL TIME)	54
12.1. Standard Applicable	54
12.2. Measurement Equipment Used:.....	54
12.3. Test Set-up:	54
12.4. Measurement Procedure:	54
12.5. Measurement Result.....	55

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13. ANTENNA REQUIREMENT	62
13.1. Standard Applicable	62
13.2. Antenna Connected Construction	62
14. MAXIMUM PERMISSIBLE EXPOSURE (MPE)	63
14.1. Standard Applicable	63
14.2. Maximum Permissible Exposure (MPE) Evaluation	64

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1. GENERAL INFORMATION

1.1. Product Description

General:

Product Name:	Car StereoClip (AUX)	
Brand Name:	HTC	
Model No.:	CAR A100	
Model Difference:	N/A	
Hardware Version:	CSR 8670C	
Software Version:	V0.6	
Power Supply:	3.7Vdc from re- rechargeable lithium-ion polymer battery	
	Battery:	Model NO.:BL38100, Supplier: WELL Tech Energy Inc.

Bluetooth:

Frequency Range:	2402 – 2480MHz
Bluetooth Version:	V2.1 + EDR (GFSK + $\pi/4$ DQPSK + 8DPSK)
Channel number:	79 channels
Transmit Power:	4.36 dBm (Peak)
Modulation type:	Frequency Hopping Spread Spectrum
Antenna Designation:	Chip Antenna, 2.5dBi

The EUT is compliance with Bluetooth 2.1.

This report applies for Bluetooth 2.1

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

This submittal(s) (test report) is intended for **FCC ID: NM8CARA100** filing to comply with Section 15.247 of the FCC Part 15, Subpart C Rules and **IC: 4115B-CARA100** filing to comply with Industry Canada RSS-210 issue 8: 2010 Annex 8. The composite system (digital device) is compliance with Subpart B add ICES-003 is authorized under a Doc procedure.

1.3. 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

1.4. Test Facility

The measurement facilities used to collect the 3m Radiated Emission and AC power line conducted data are located on the address of SGS Taiwan Ltd. 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.

1.5. Special Accessories

Not available for this EUT intended for grant.

1.6. Equipment Modifications

Not available for this EUT intended for grant.

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2. SYSTEM TEST CONFIGURATION

2.1. EUT Configuration

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

2.2. EUT Exercise

The EUT (Transmitter) was 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 a 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 30 MHz using CISPR Quasi-Peak and Average detector mode.

2.3.2 Radiated Emissions

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

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2.4. Configuration of Tested System

Fig. 2-1 Conducted Emission Configuration

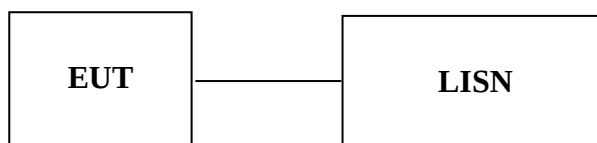


Fig. 2-2 Radiated Emission Configuration

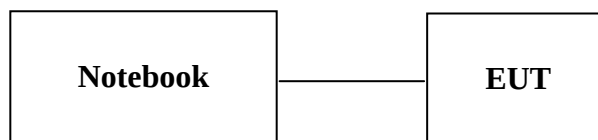


Table 2-1 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/ Type No.	Series No.	Data Cable	Power Cord
1.	Notebook	HP	ProBook 4411s	CNU9316V4C	Un-shield	Un-shield
2.	Software	BlueSuite 1.22	CSR	Version1.22	N/A	N/A

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3. SUMMARY OF TEST RESULTS

FCC Rules	Description Of Test	Result
§15.207(a) RSS-Gen §7.2.4	Conducted Emission	Compliant
§15.247(b)(1) RSS-210 issue 8,§A8.4(2)	Peak Output Power	Compliant
§15.247(a) RSS210 issue ,§A8.1(b) RSS-Gen §4.6.1	20dB Bandwidth & 99% Power Bandwidth	Compliant
§15.247I 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

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 mode is programmed.

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

The field strength of spurious radiation emission was measured as EUT stand-up position (H mode) and lie down position (E1, E2 mode) for Bluetooth Transmitter for channel Low, Mid and High the worst case H position was reported and BDR mode and DH5 data rate will be worst case.

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5. CONDUCTED EMISSION TEST

5.1. 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.		

5.2. EUT Setup

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

5.3. Measurement Procedure

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

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5.4. Measurement Equipment Used:

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
EMI Test Receiver	R&S	ESCI7	100759	05/20/2011	05/19/2013
LISN	Rolf-Heine	NNB-2/16Z	99012	03/31/2011	03/30/2012
LISN	FCC	FCC-LISN-50/250-2 5-2-01	04034	03/31/2011	03/30/2012
Coaxial Cables	N/A	WK CE Cable	N/A	01/04/2011	01/05/2013

5.5. Measurement Result

N/A, EUT powered from 3.7V rechargeable battery.

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6. PEAK OUTPUT POWER MEASUREMENT

6.1. Standard Applicable

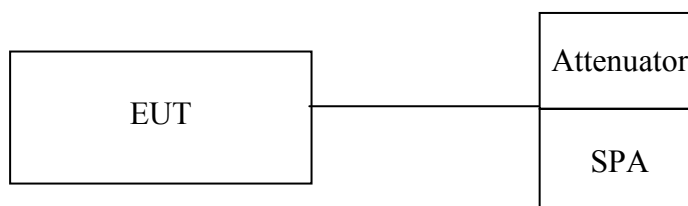
For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 hopping channels, and all frequency hopping systems in the 5725-5850MHz band: 1Watt. For all other frequency hopping systems in the 2400 – 2483.5MHz band: 0.125 Watts.

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

6.2. Measurement Equipment Used

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
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	01/25/2011	01/24/2013
DC Block	Agilent	BLK-18	155452	07/05/2012	07/04/2013
Low Loss Cable	HUBER+SUHNER	SUCOFLEX 104PEA	N/A	01/05/2012	01/04/2013
Attenuator	Mini-Circuit	BW-S6W5	001	01/05/2012	01/04/2013
Attenuator	Mini-Circuit	BW-S10W5	001	01/05/2012	01/04/2013
Attenuator	Mini-Circuit	BW-S20W5	001	01/05/2012	01/04/2013
Splitter	Agilent	11636B	N/A	01/05/2012	01/04/2013

6.3. Test Set-up:



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6.4. Measurement Procedure:

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the power meter or spectrum. (BDR model: max peak RBW = 1MHz VBW = 3MHz, EDR model: max peak RBW = 1.5MHz VBW = 5MHz)
3. Record the max. reading.
4. Repeat above procedures until all frequency measured were complete.

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6.5. Measurement Result

BDR mode:

Frequency (MHz)	Reading Power (dBm)	Output Power (dBm)	Output Power (W)	Limit (W)
2402.00	4.33	4.33	0.00271	1
2441.00	4.28	4.28	0.00268	1
2480.00	4.36	4.36	0.00273	1

EDR mode:

Frequency (MHz)	Reading Power (dBm)	Output Power (dBm)	Output Power (W)	Limit (W)
2402.00	3.58	3.58	0.00228	1
2441.00	3.59	3.59	0.00229	1
2480.00	3.98	3.98	0.00250	1

**Note: offset 1.0dB*

Refer to next page for plots.

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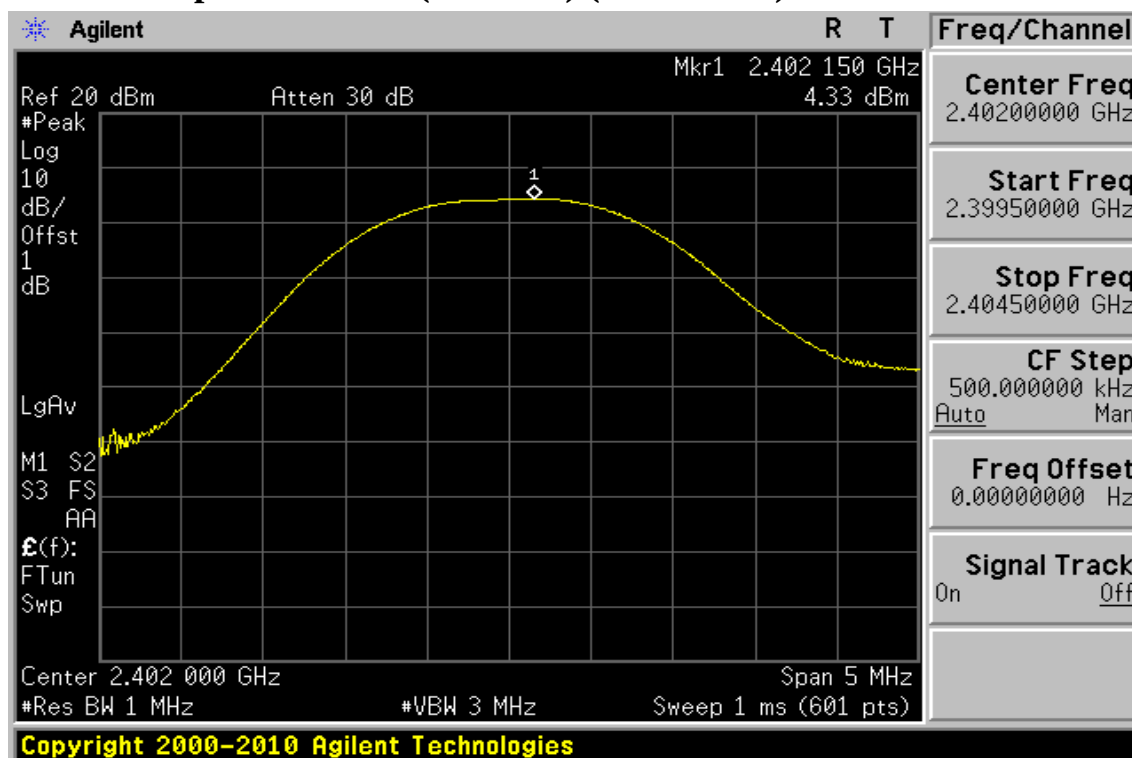
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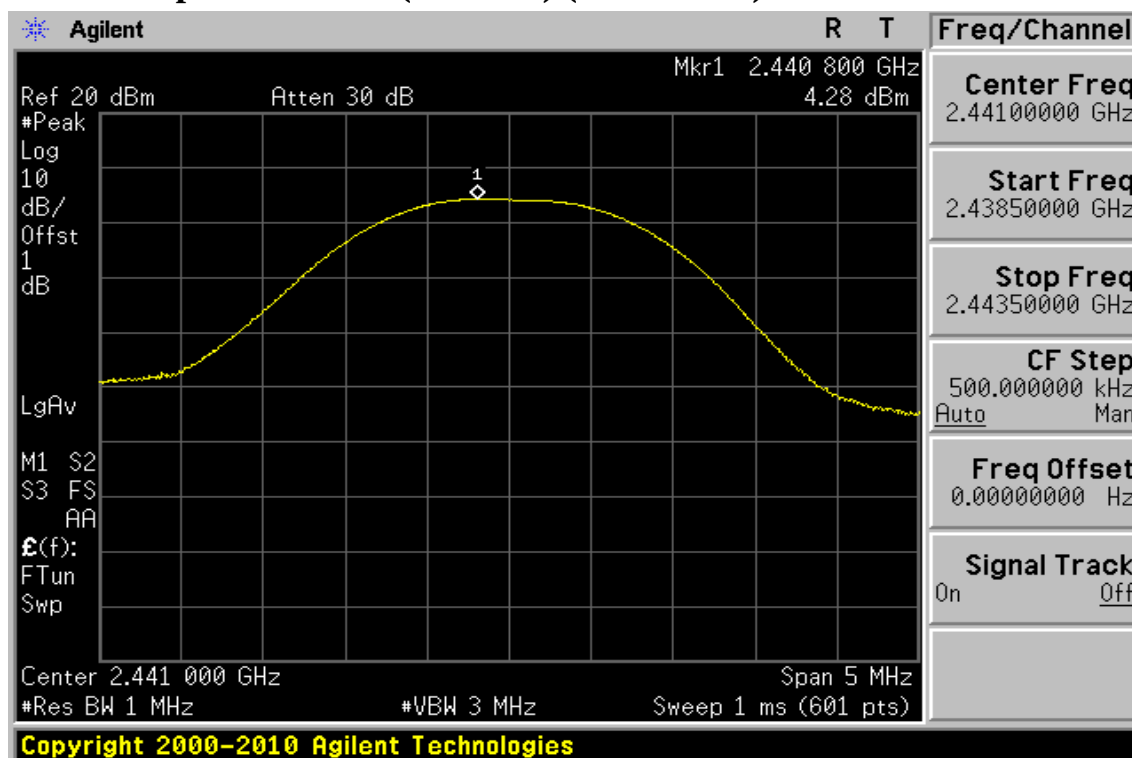
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Peak Power Output Data Plot (CH Low) (BDR mode)



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



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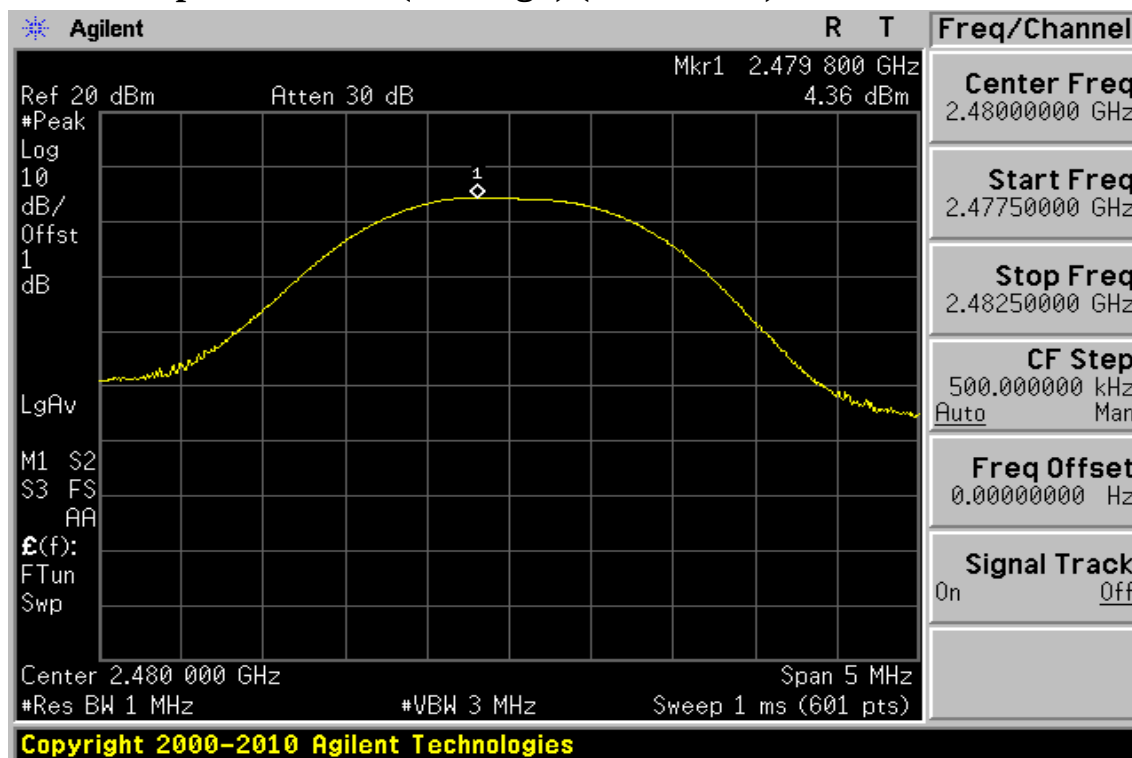
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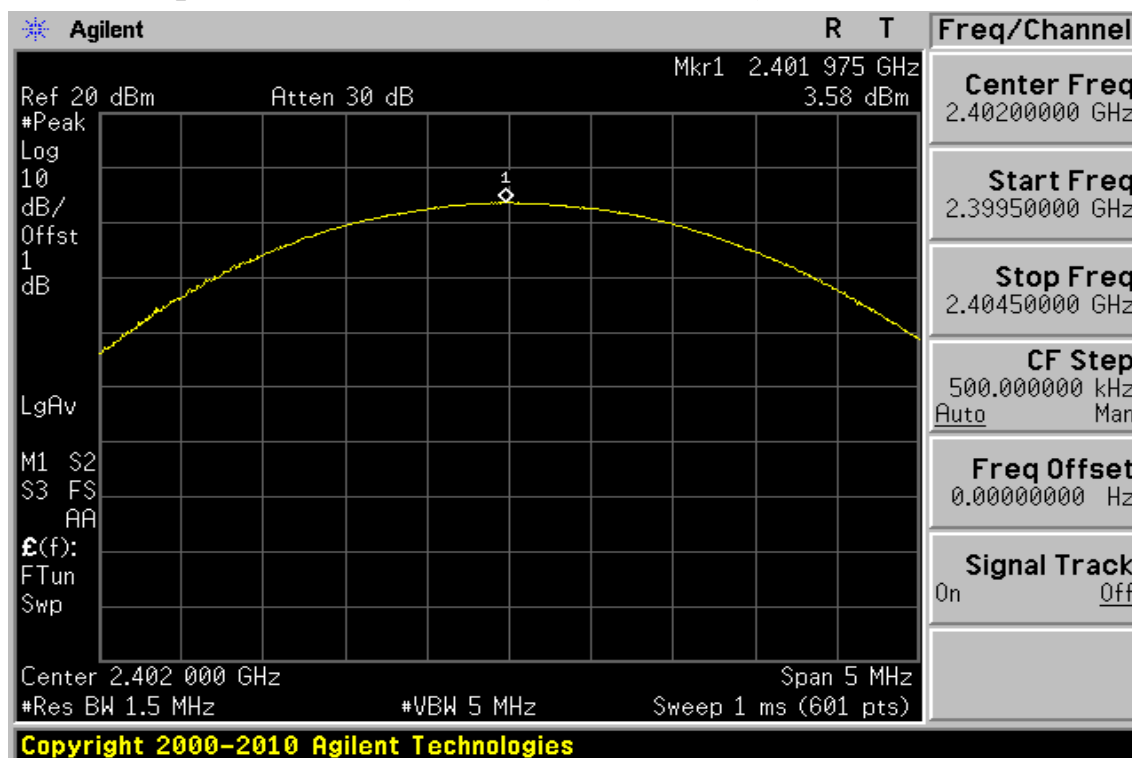
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Peak Power Output Data Plot (CH High) (BDR mode)



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



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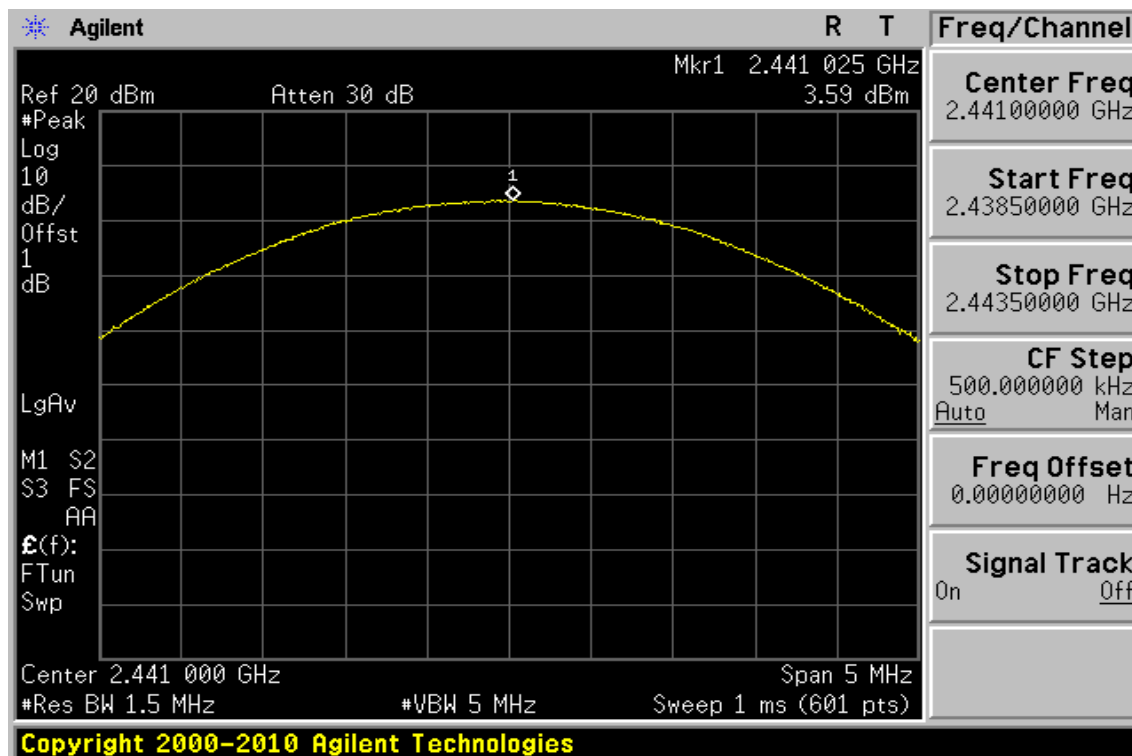
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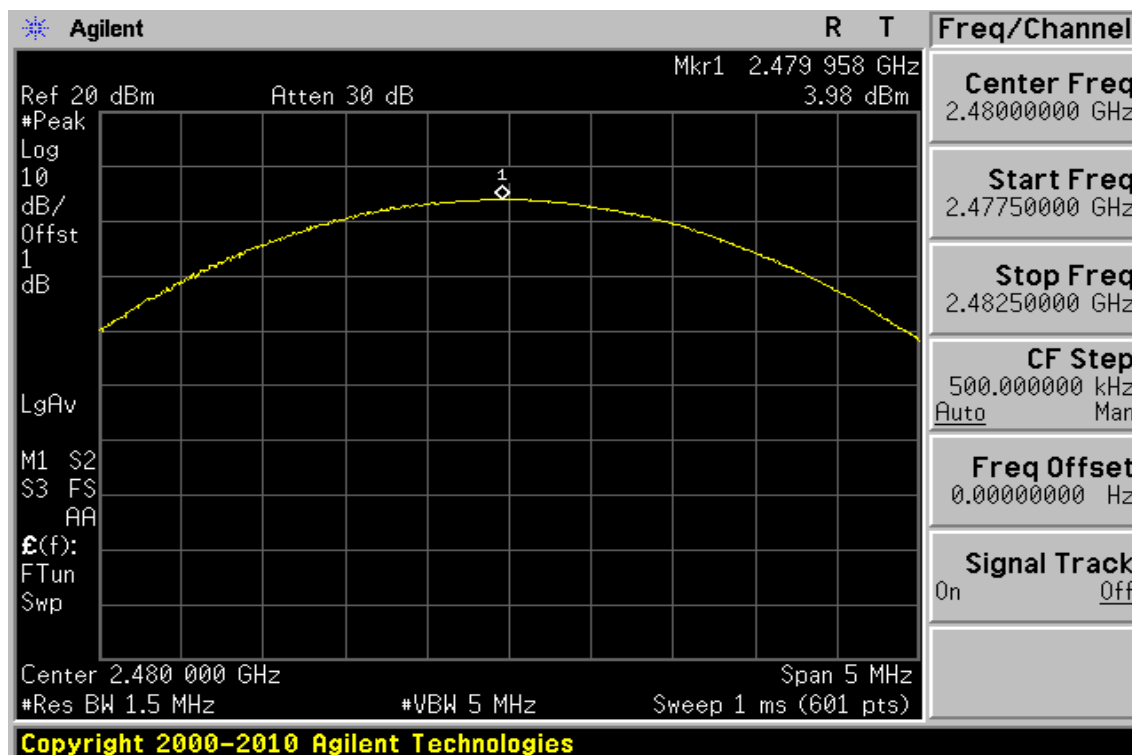
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Peak Power Output Data Plot (CH Mid) (EDR mode)



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



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7. 20dB BAND WIDTH & 99% BANDWIDTH

7.1. 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.

7.2. Measurement Equipment Used

Refer to section 6.2 for details.

7.3. Test Set-up

Refer to section 6.3 for details.

7.4. Measurement Procedure:

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as RBW=10KHz (1 % of Bandwidth.), Span= 3MHz, Sweep=auto for 20dB Bandwidth test; Set the spectrum analyzer as RBW=30KHz (1 % of Span), Span= 3MHz, Sweep=auto for 99% Bandwidth test
4. Mark the peak frequency and -20dB (upper and lower) frequency.
5. Repeat above procedures until all frequency measured were complete.

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7.5. Measurement Result:

20dB Bandwidth

:BDR Mode

CH	Bandwidth (kHz)
Lower	925.717
Mid	926.873
Higher	925.709

EDR Mode

CH	Bandwidth (MHz)	2/3 Bandwidth (MHz)
Lower	1.261	0.667
Mid	1.246	0.831
Higher	1.260	0.840

99% Bandwidth:

BDR mode:

CH	99% Bandwidth (KHz)
Lower	871.7657
Mid	865.4742
Higher	865.8325

EDR mode:

CH	99% Bandwidth (MHz)
Lower	1.1598
Mid	1.1648
Higher	1.1707

Note: Offset: 1.0dB

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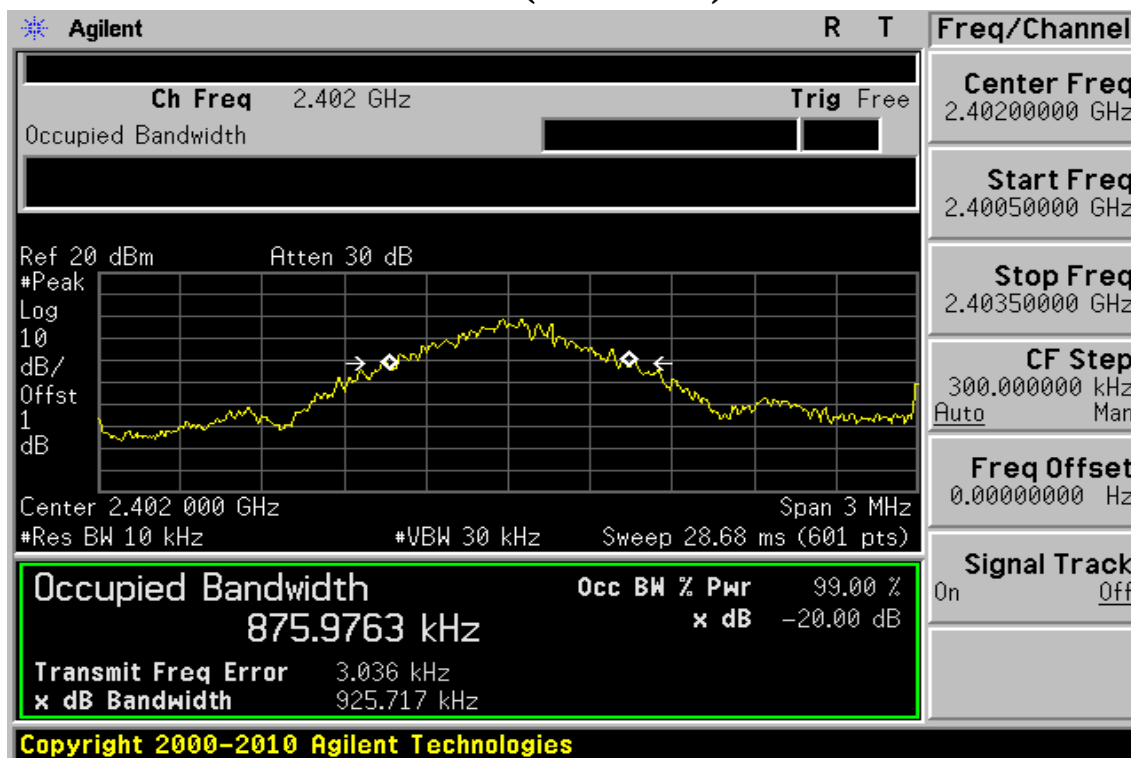
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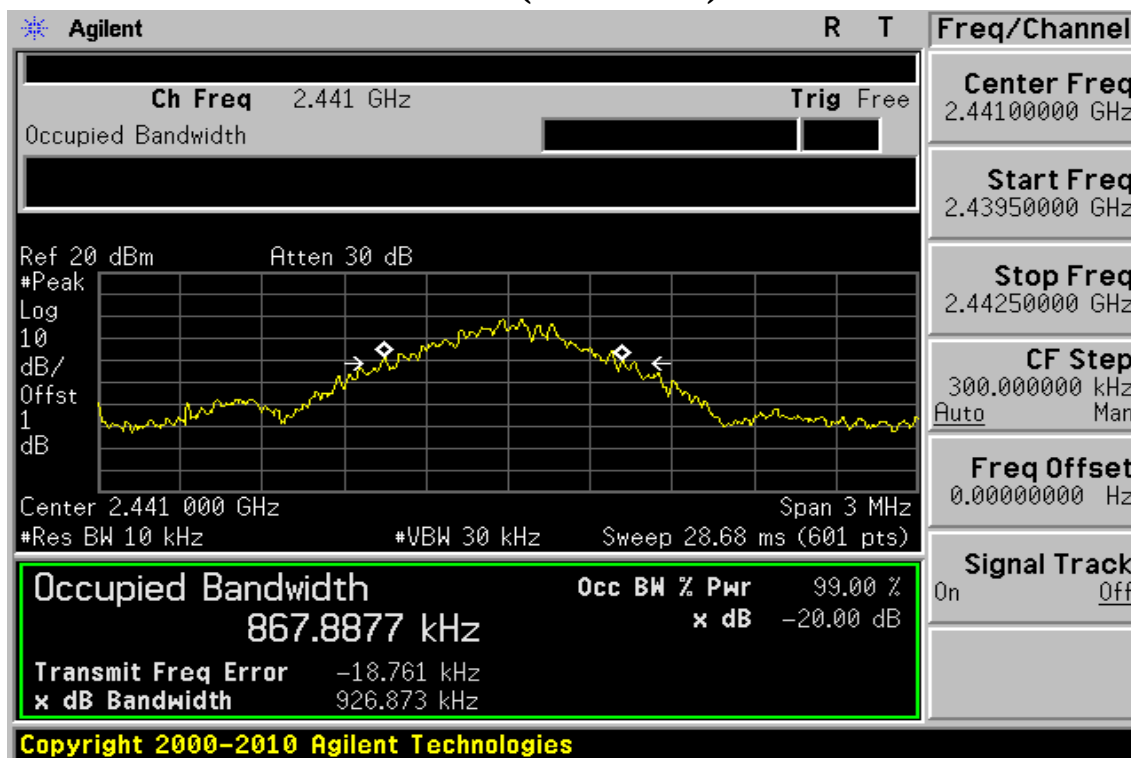
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20dB Band Width Test Data CH-Low (BDR mode)



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



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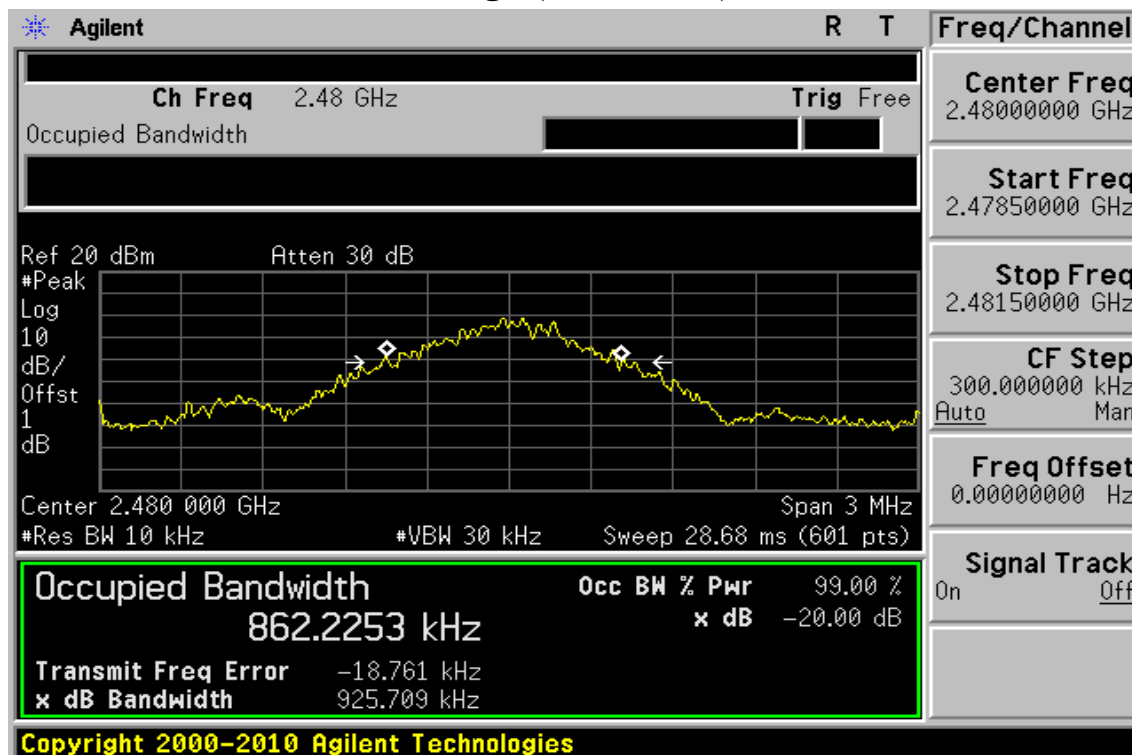
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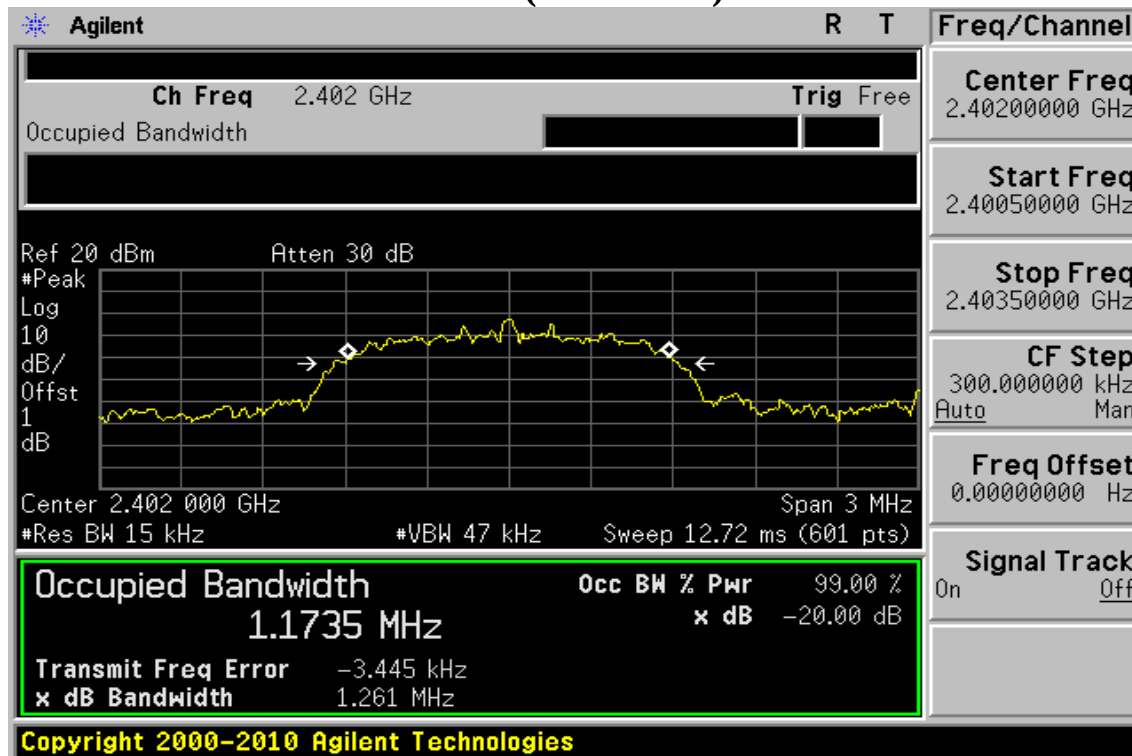
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20dB Band Width Test Data CH-High (BDR mode)



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



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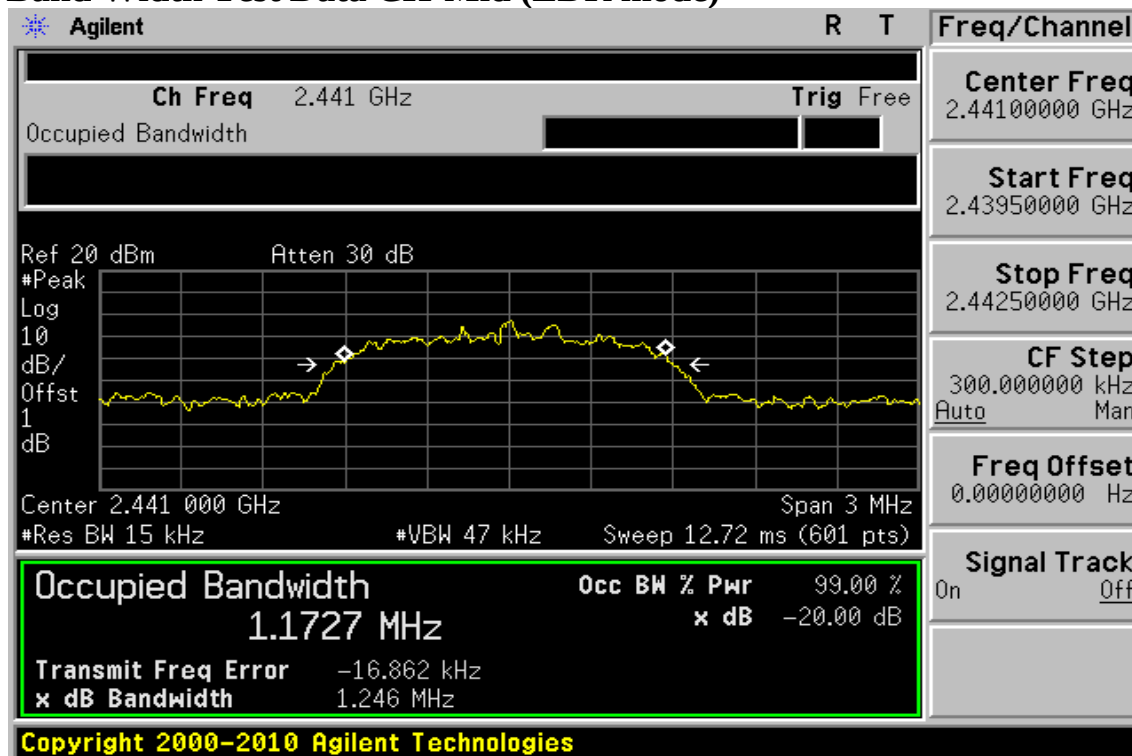
t (886-2) 2299-3279

f (886-2) 2298-0488

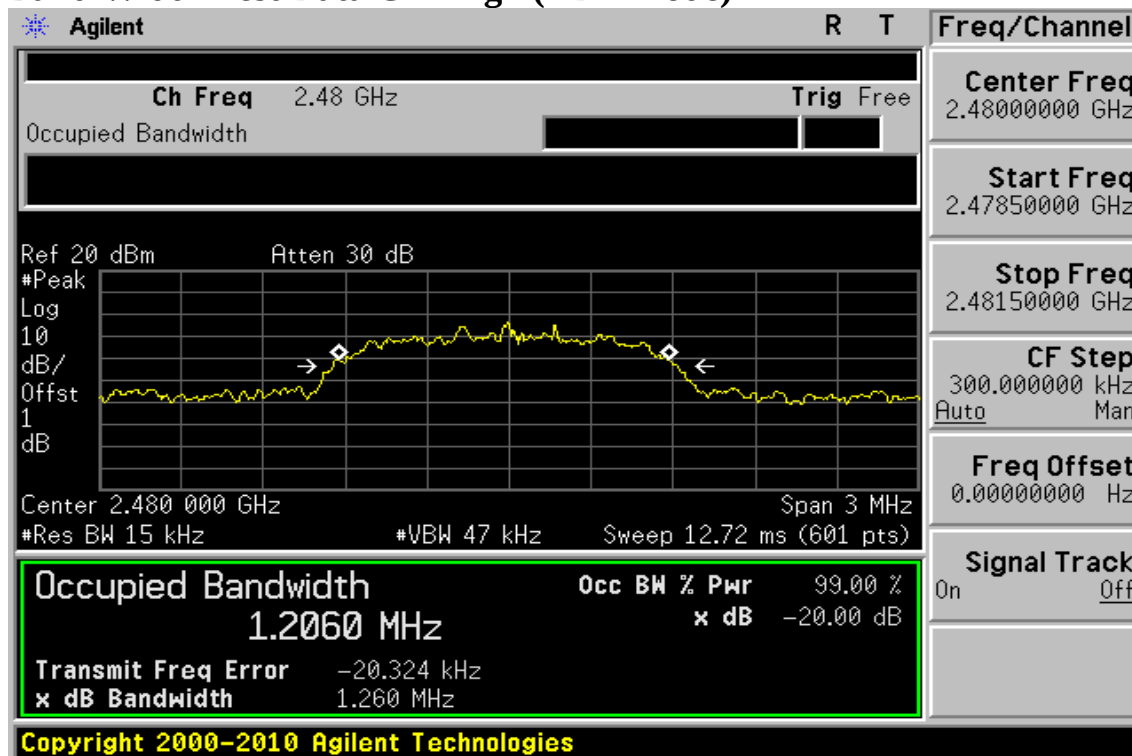
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20dB Band Width Test Data CH-Mid (EDR mode)



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



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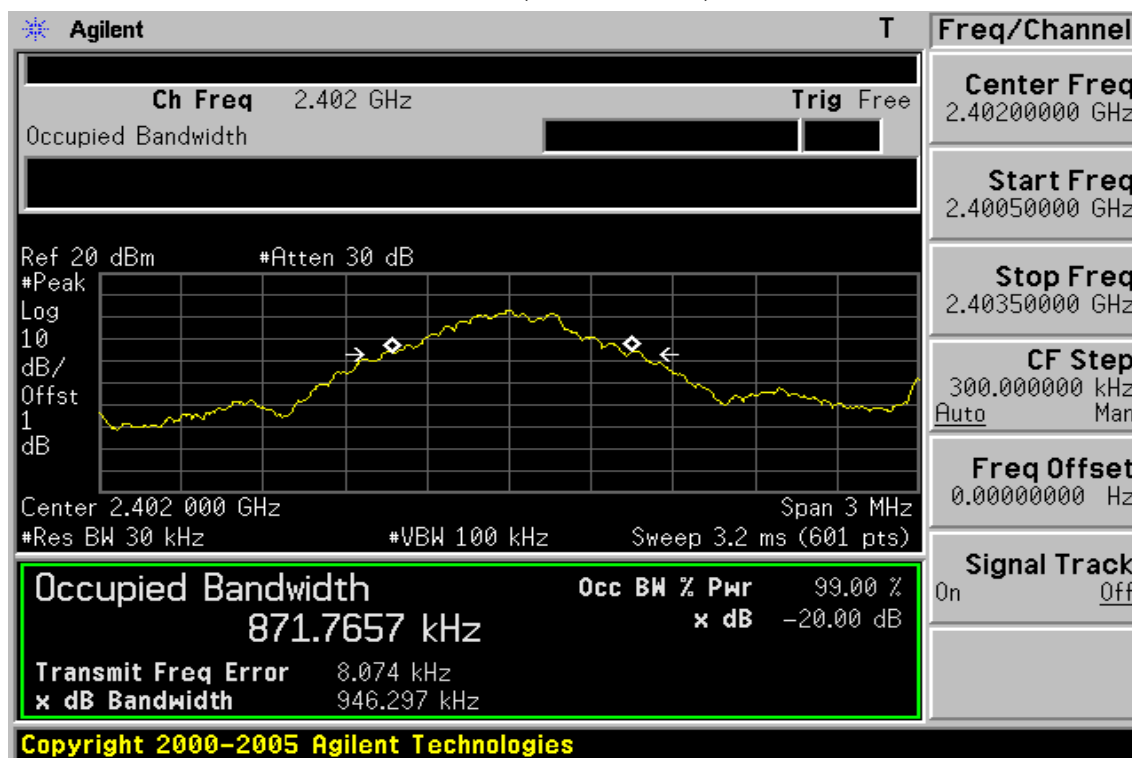
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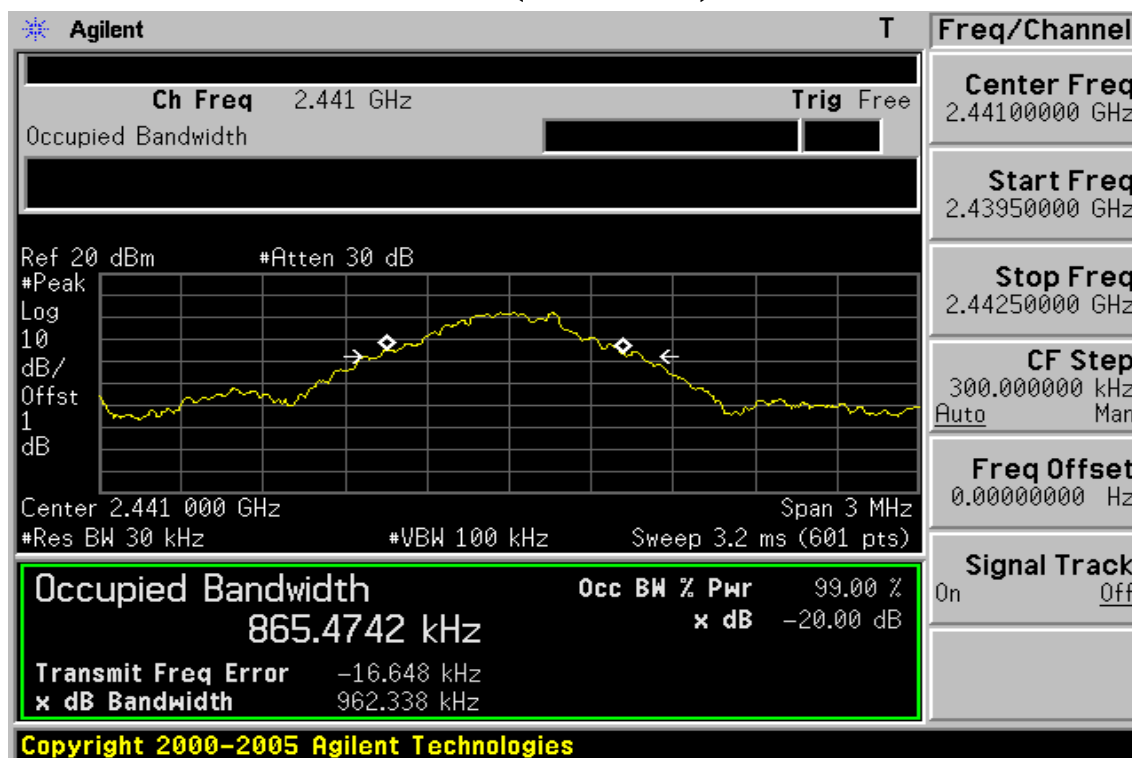
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99% Band Width Test Data CH-Low (BDR mode)



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



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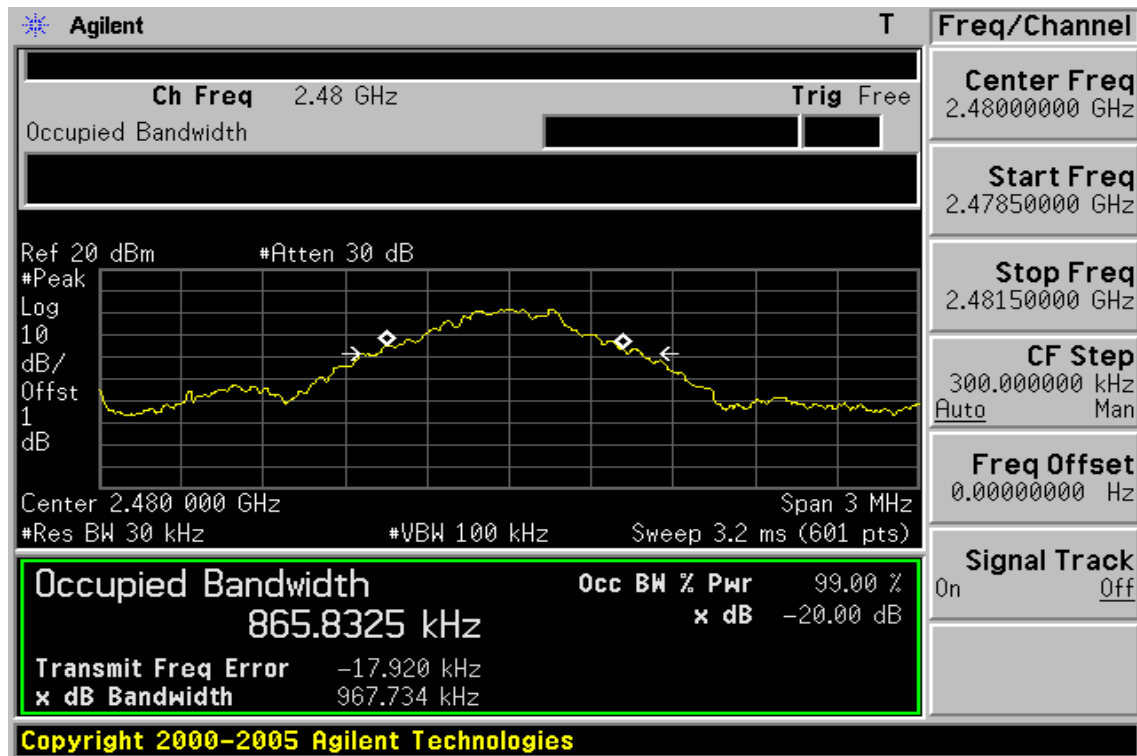
t (886-2) 2299-3279

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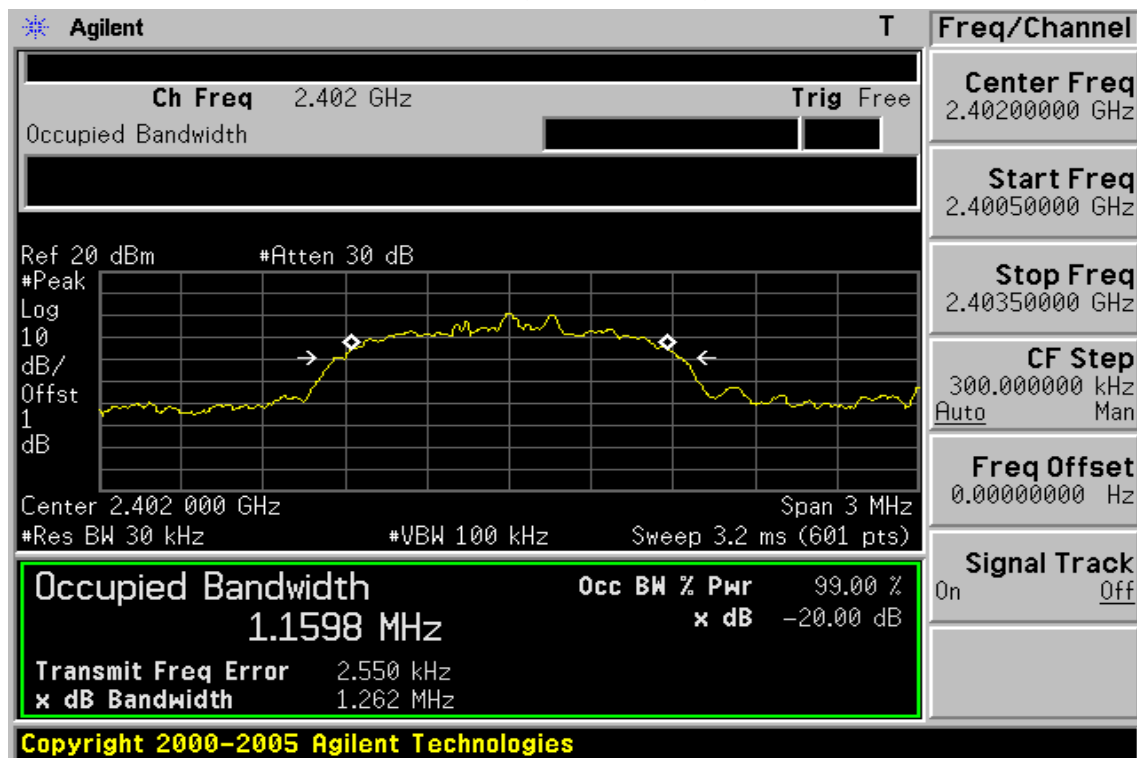
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99% Band Width Test Data CH-High (BDR mode)



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



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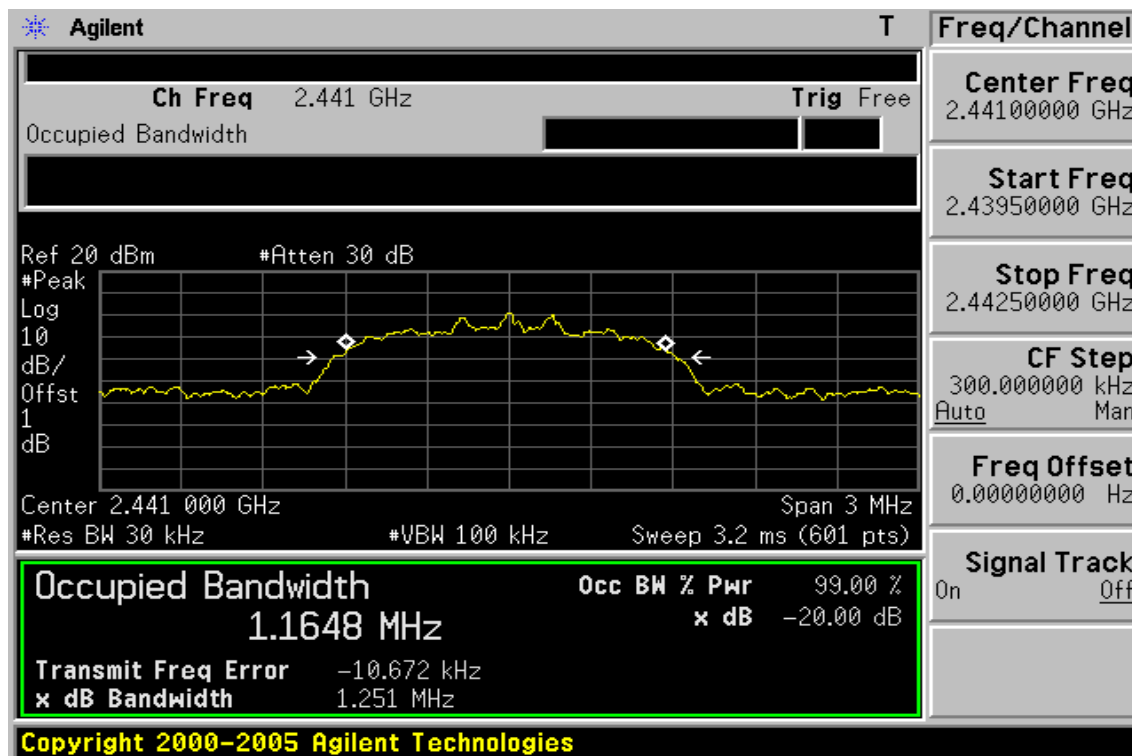
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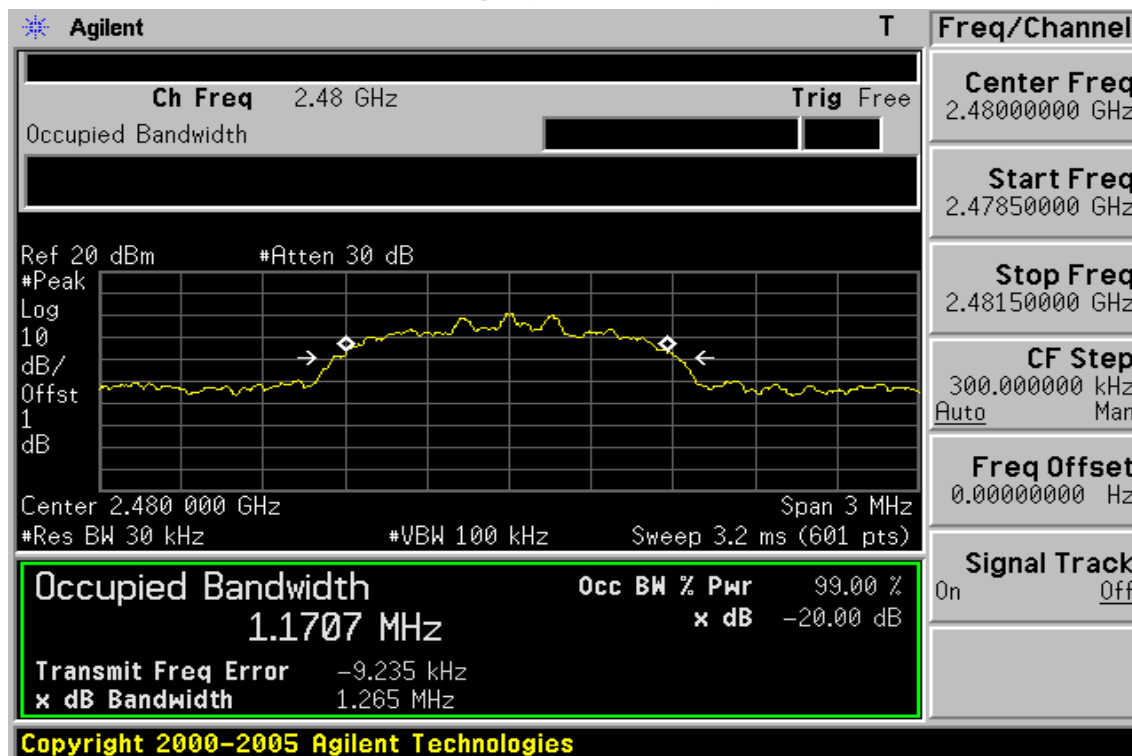
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99% Band Width Test Data CH-Mid (EDR mode)



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



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8. 100KHz BANDWIDTH OF BAND EDGES MEASUREMENT

8.1. Standard Applicable

According to §15.247(c), in any 100 KHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100KHz bandwidth within the band that contains the highest level of the desired power. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a).

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

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8.2. Measurement Equipment Used

8.2.1. Conducted Emission at antenna port:

Refer to section 6.2 for details.

8.2.2. Radiated emission:

966 Chamber					
EQUIPMENT 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
Bilog Antenna	SCHWAZBECK	VULB9168	378	01/10/2012	01/09/2014
Horn antenna	ETS.LINDGREN	3117	123995	03/19/2011	03/18/2013
Pre-Amplifier	Agilent	8447D	1937A02834	01/05/2012	01/04/2013
Pre-Amplifier	Agilent	8449B	3008A01973	01/05/2012	01/04/2013
Pre-Amplifier	EMC Instruments Corp.	EMC0126530	980038	01/05/2012	01/04/2013
Radio Communication Analyzer	R & S	CMU200	102189	08/12/2010	08/11/2012
DC Block	Agilent	BLK-18	155452	01/05/2012	01/04/2013
Low Loss Cable	HUBER+SUHNER	SUCOFLEX 104PEA-10M	10m	01/05/2012	01/04/2013
Low Loss Cable	HUBER+SUHNER	SUCOFLEX 104PEA-3M	3m	01/05/2012	01/04/2013
3m Site	SGS	966 chamber	N/A	07/15/2011	07/14/2012

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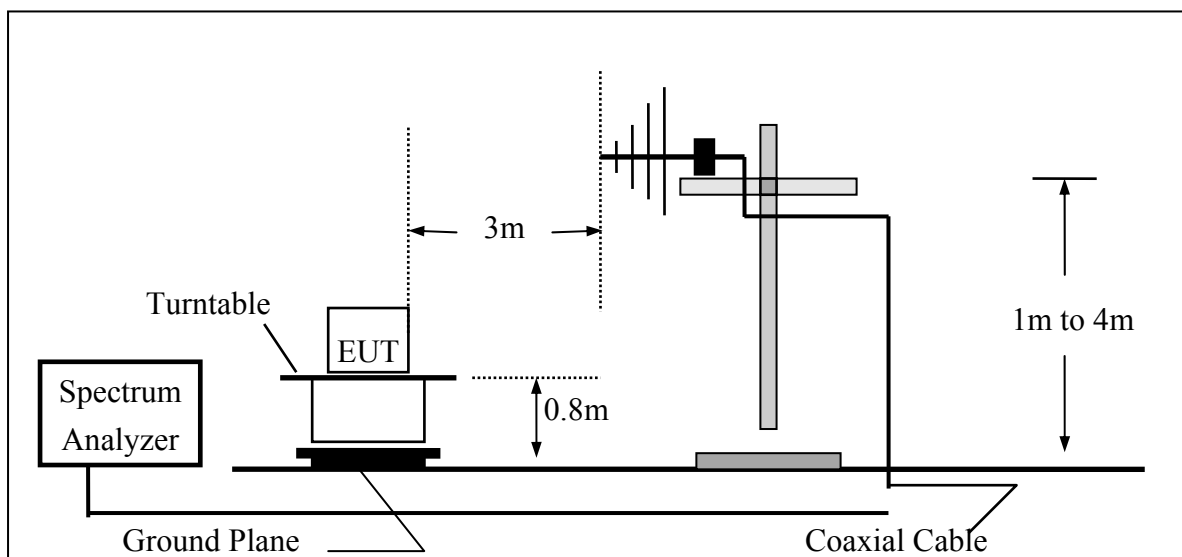
8.3. Test SET-UP:

8.3.1. Conducted Emission at antenna port:

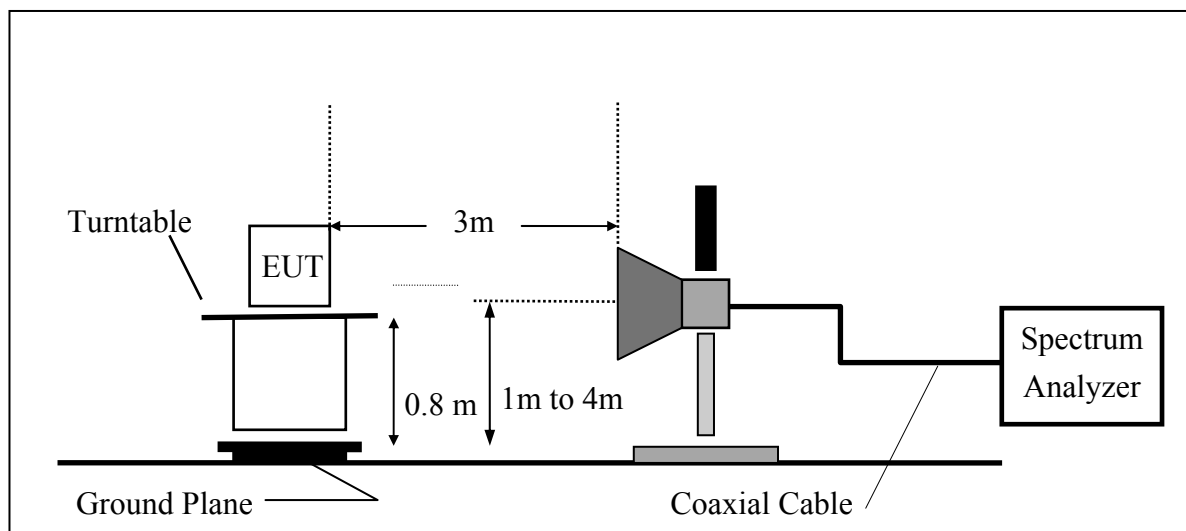
Refer to section 6.3 for details.

8.3.2. Radiated emission:

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



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



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8.4. Measurement Procedure

Conducted Emission:

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.

Radiated Emission:

1. Place the EUT on the table and set it in transmitting mode.
2. Referring to Annex E of ANSI 63.4 to determine the configuration that generates the highest emission.
3. Set center frequency of spectrum analyzer= operating frequency.
4. Set the spectrum using the following setting.
5. Span = wide enough to fully capture the emission being measured
6. RBW = 1 MHz for $f \geq 1$ GHz, 100 kHz for $f < 1$ GHz
7. VBW $\geq$ RBW
8. Sweep = auto
9. Mark peak detection
10. Repeat above procedures until all frequency measured (30MHz to 10th harmonic of EUT's operating frequency) were complete.

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8.5. Field Strength Calculation

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

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

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

8.6. Measurement Result

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

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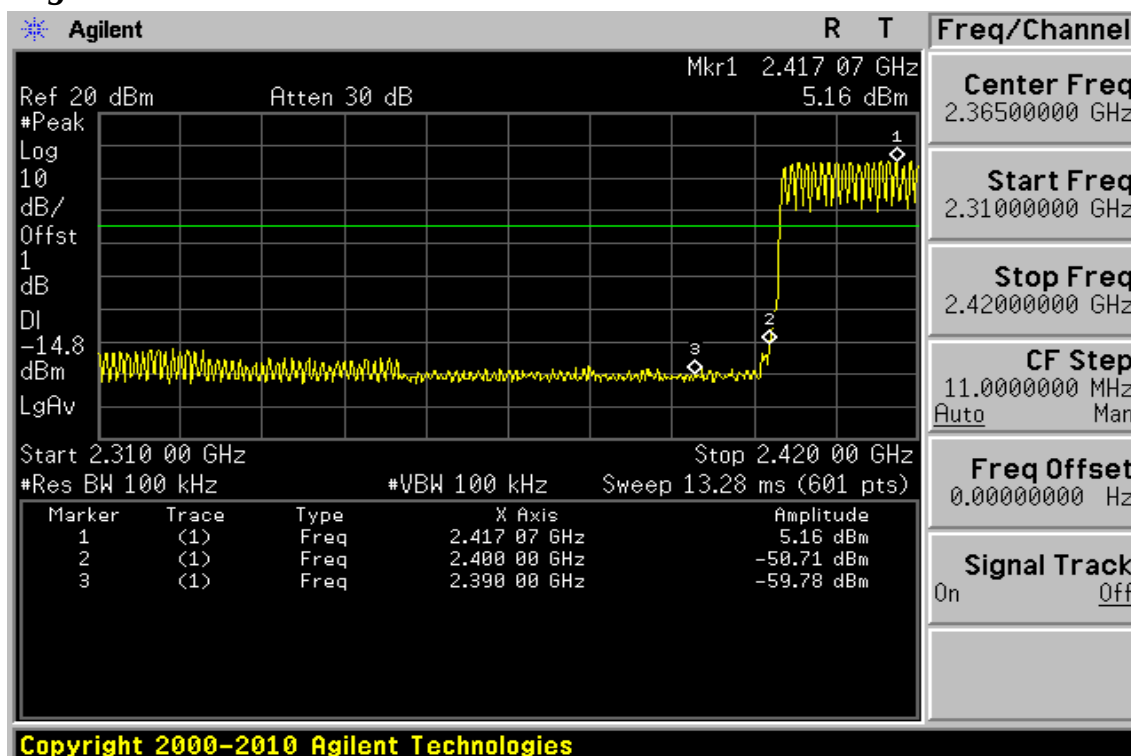
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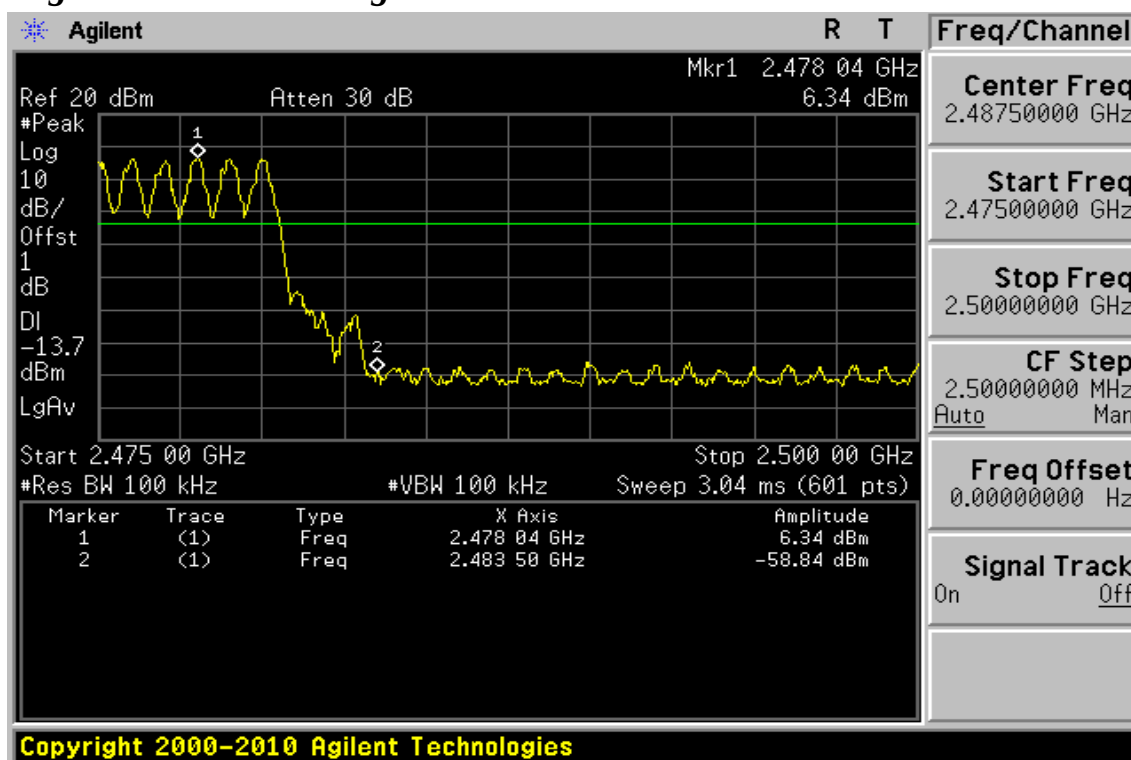
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BDR Mode (GFSK)

Band Edges Test Data CH-Low



Band Edges Test Data CH-High



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Radiated Emission: (BDR mode) (GFSK)

Operation Band	:BDR	Test Date	:2012-02-17
Fundamental Frequency	:2402 MHz	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:BADN EDGE	Engineer	:Lion
EUT Pol.	:H 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	Safe
MHz	F/H/E/S	Mode	Reading Level	dB	FS	@3m	Margin
		PK/QP/AV	dBμV		dBμV/m	dBμV/m	dB
2390.00	E	Average	38.71	5.17	43.88	54.00	-10.12
2390.00	E	Peak	50.53	5.17	55.70	74.00	-18.30

Operation Band	:BDR	Test Date	:2012-02-17
Fundamental Frequency	:2402 MHz	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:BADN EDGE	Engineer	:Lion
EUT Pol.	:H 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	Safe
MHz	F/H/E/S	Mode	Reading Level	dB	FS	@3m	Margin
		PK/QP/AV	dBμV		dBμV/m	dBμV/m	dB
2390.00	E	Average	38.67	5.79	44.46	54.00	-9.54
2390.00	E	Peak	51.07	5.79	56.86	74.00	-17.14

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Radiated Emission:

Operation Band	:BDR	Test Date	:2012-02-17
Fundamental Frequency	:2480 MHz	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:BADN EDGE	Engineer	:Lion
EUT Pol.	:H 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	Safe Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2483.50	E	Average	38.95	5.69	44.64	54.00	-9.36
2483.50	E	Peak	50.29	5.69	55.98	74.00	-18.02

Operation Band	:BDR	Test Date	:2012-02-17
Fundamental Frequency	:2480 MHz	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:BADN EDGE	Engineer	:Lion
EUT Pol.	:H 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	Safe Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2483.50	E	Average	38.72	6.72	45.44	54.00	-8.56
2483.50	E	Peak	50.90	6.72	57.62	74.00	-16.38

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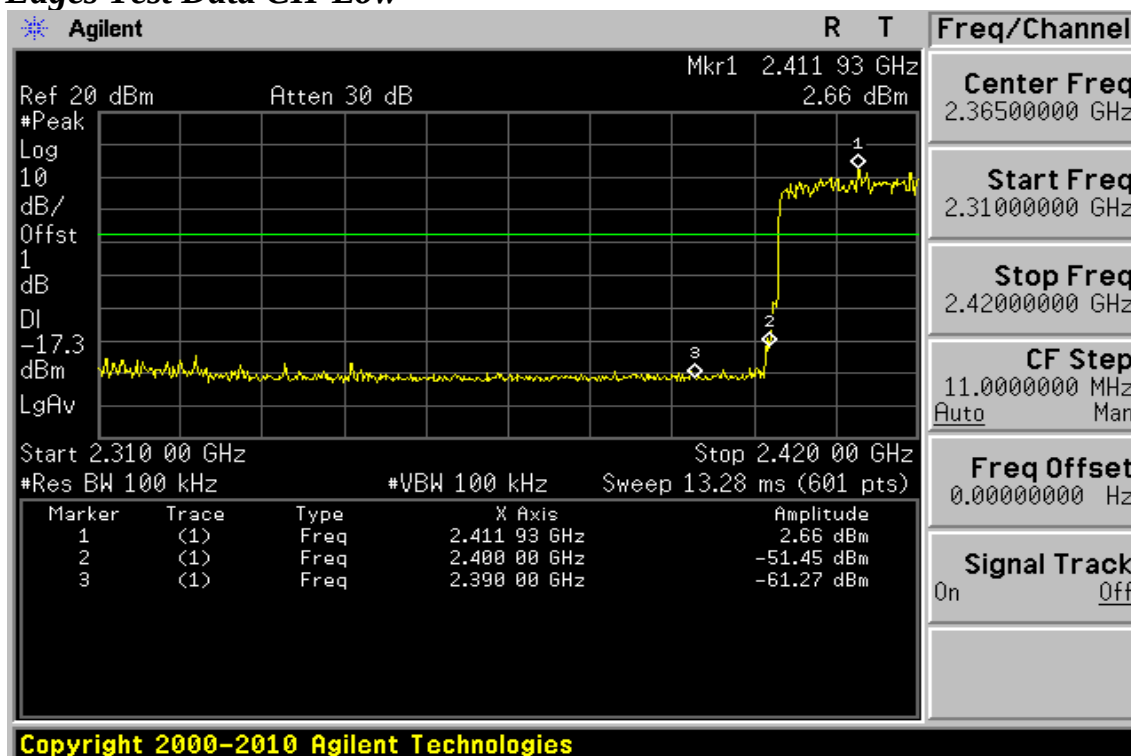
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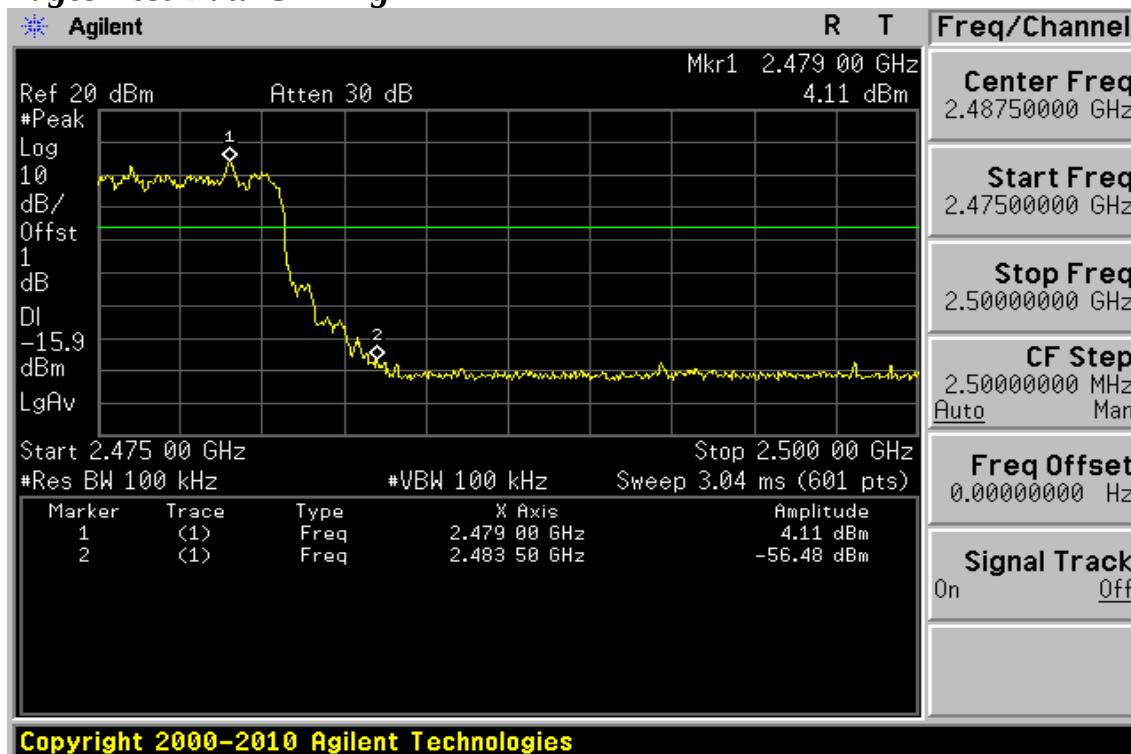
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EDR Mode

Band Edges Test Data CH-Low



Band Edges Test Data CH-High



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Radiated Emission:

Operation Band	:EDR	Test Date	:2012-02-17
Fundamental Frequency	:2402 MHz	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:BADN EDGE	Engineer	:Lion
EUT Pol.	:H 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	Safe
MHz	F/H/E/S	Mode	Reading Level	dB	FS	@3m	Margin
		PK/QP/AV	dBμV		dBμV/m	dBμV/m	dB
2390.00	E	Average	38.69	5.17	43.86	54.00	-10.14
2390.00	E	Peak	50.87	5.17	56.04	74.00	-17.96

Operation Band	:EDR	Test Date	:2012-02-17
Fundamental Frequency	:2402 MHz	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:BADN EDGE	Engineer	:Lion
EUT Pol.	:H 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	Safe
MHz	F/H/E/S	Mode	Reading Level	dB	FS	@3m	Margin
		PK/QP/AV	dBμV		dBμV/m	dBμV/m	dB
2390.00	E	Average	38.67	5.79	44.46	54.00	-9.54
2390.00	E	Peak	50.94	5.79	56.73	74.00	-17.27

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Radiated Emission:

Operation Band	:EDR	Test Date	:2012-02-17
Fundamental Frequency	:2480 MHz	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:BADN EDGE	Engineer	:Lion
EUT Pol.	:H 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	Safe
MHz	F/H/E/S	Mode	Reading Level	dB	FS	@3m	Margin
		PK/QP/AV	dBμV		dBμV/m	dBμV/m	dB
2483.50	E	Average	38.72	5.69	44.41	54.00	-9.59
2483.50	E	Peak	52.25	5.69	57.94	74.00	-16.06

Operation Band	:EDR	Test Date	:2012-02-17
Fundamental Frequency	:2480 MHz	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:BADN EDGE	Engineer	:Lion
EUT Pol.	:H 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	Safe
MHz	F/H/E/S	Mode	Reading Level	dB	FS	@3m	Margin
		PK/QP/AV	dBμV		dBμV/m	dBμV/m	dB
2483.50	E	Average	38.71	6.72	45.43	54.00	-8.57
2483.50	E	Peak	50.41	6.72	57.13	74.00	-16.87

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9. SPURIOUS RADIATED EMISSION TEST

9.1. Standard Applicable

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

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

9.2. Measurement Equipment Used:

9.2.1. Conducted Emission at antenna port:

Refer to section 6.2 for details.

9.2.2. Radiated emission:

Refer to section 8.2 for details.

9.3. Test SET-UP:

9.3.1. Conducted Emission at antenna port:

Refer to section 6.3 for details.

9.3.2. Radiated emission:

Refer to section 8.3 for details.

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9.4. Measurement Procedure:

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

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

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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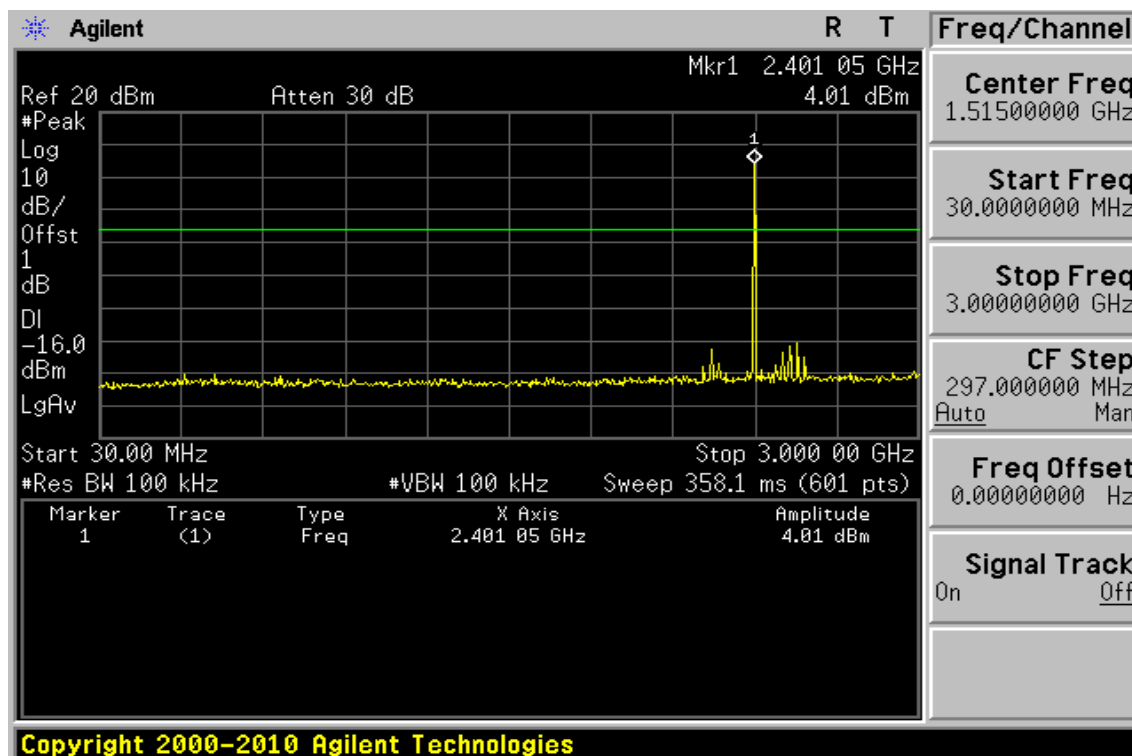
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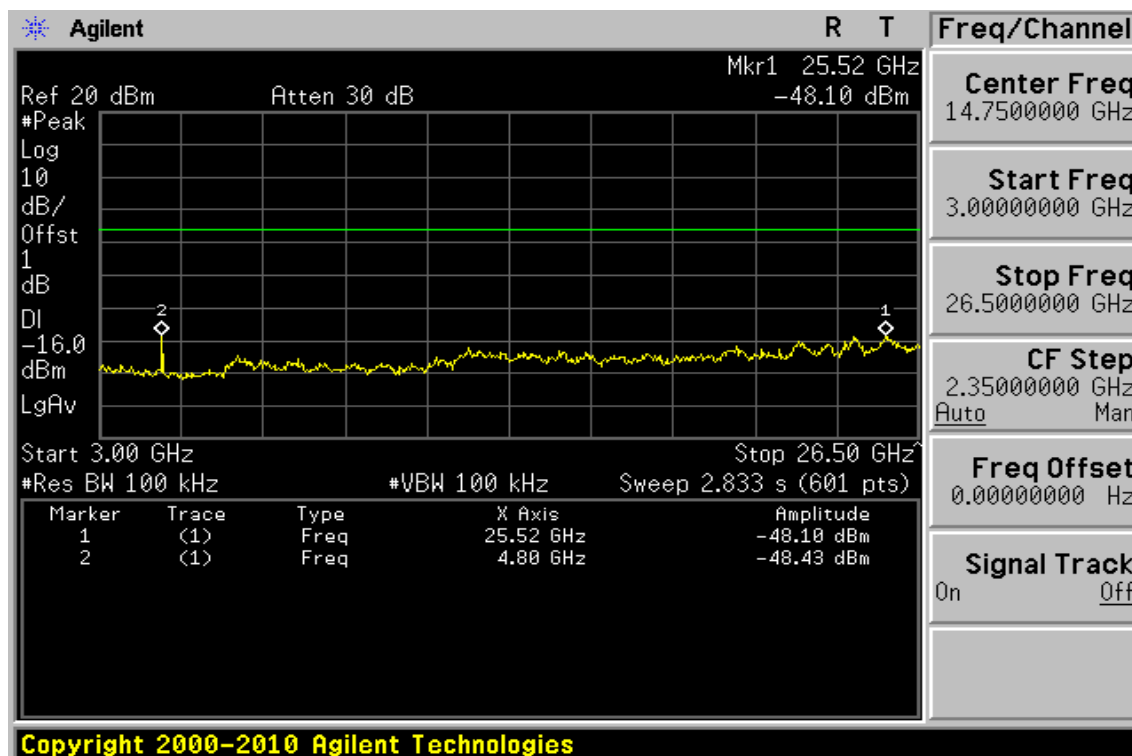
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Conducted Spurious Emission Measurement Result (Worst: BDR mode) Ch Low 30MHz – 3GHz



Ch Low 3GHz – 26.5GHz



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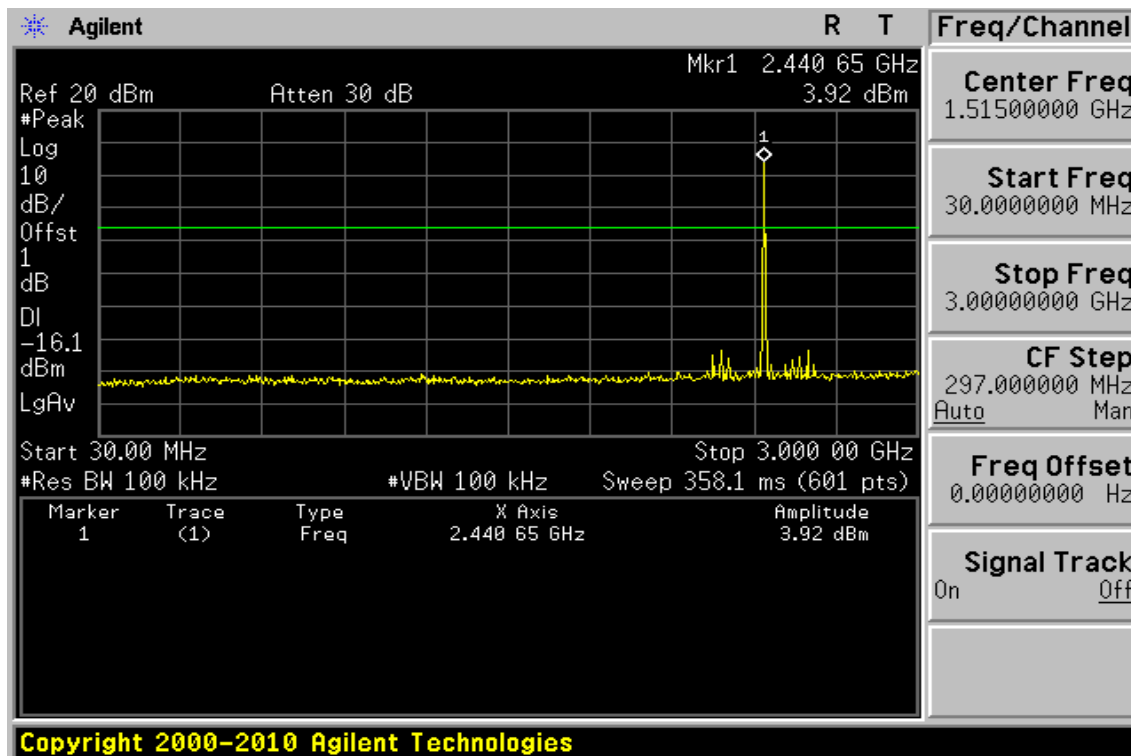
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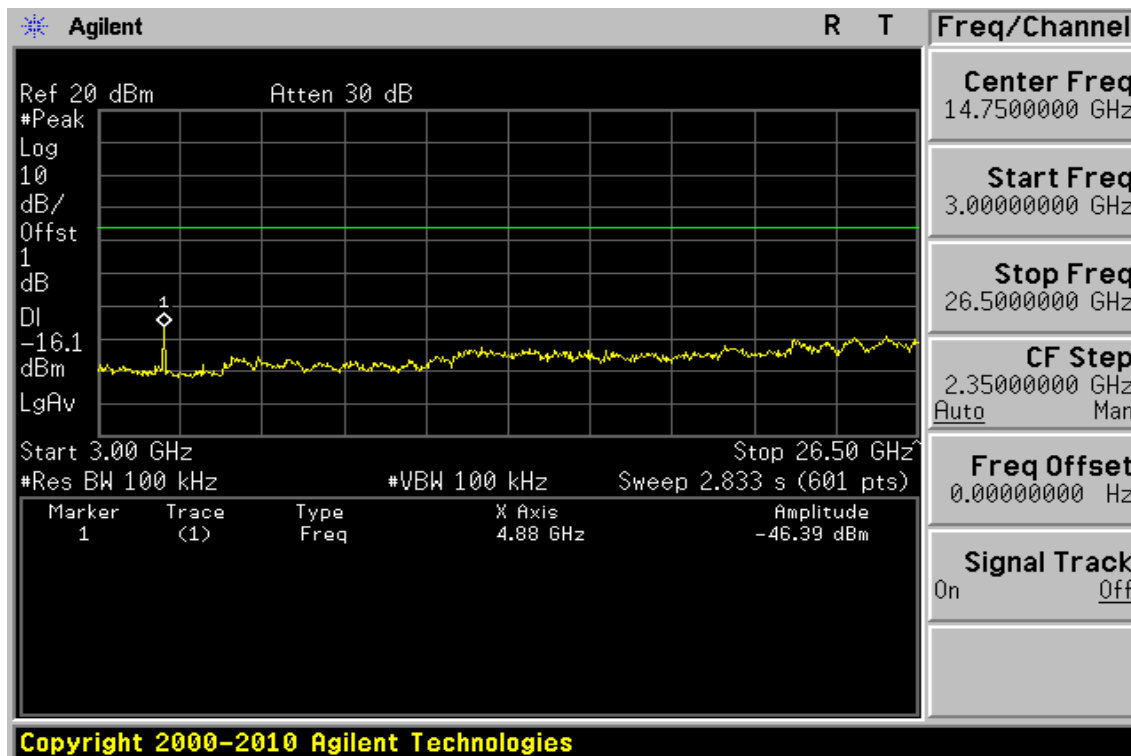
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Ch Mid 30MHz – 3GHz



Ch Mid 3GHz – 26.5GHz



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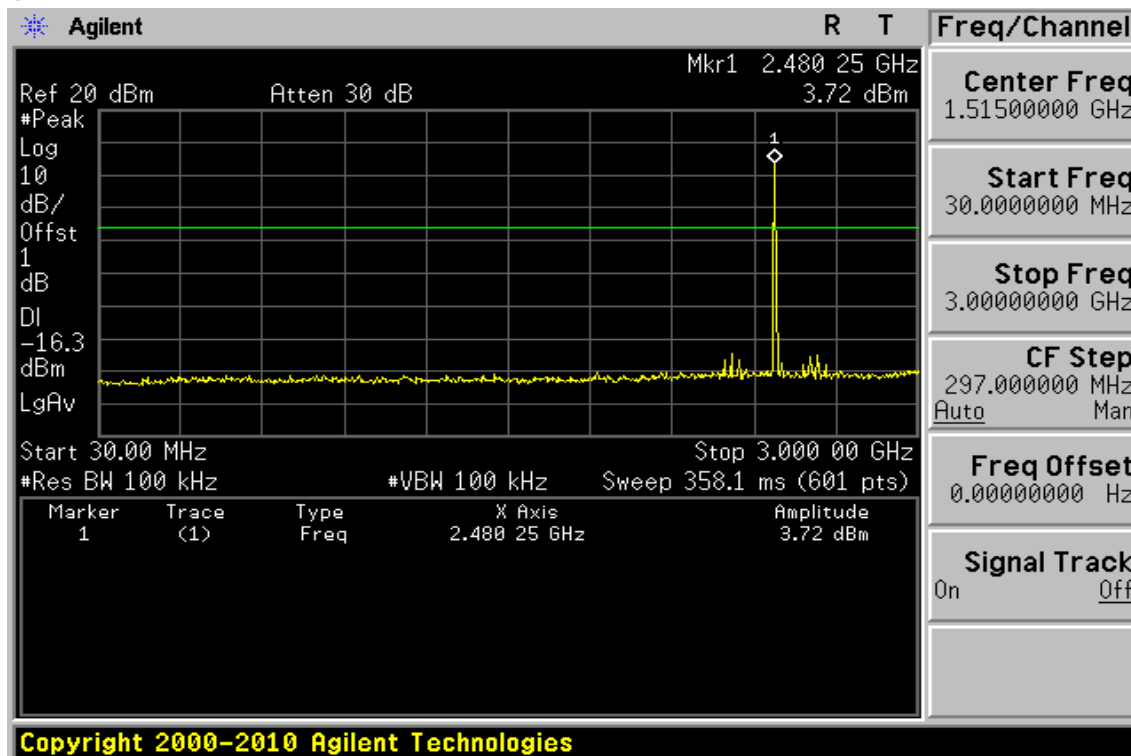
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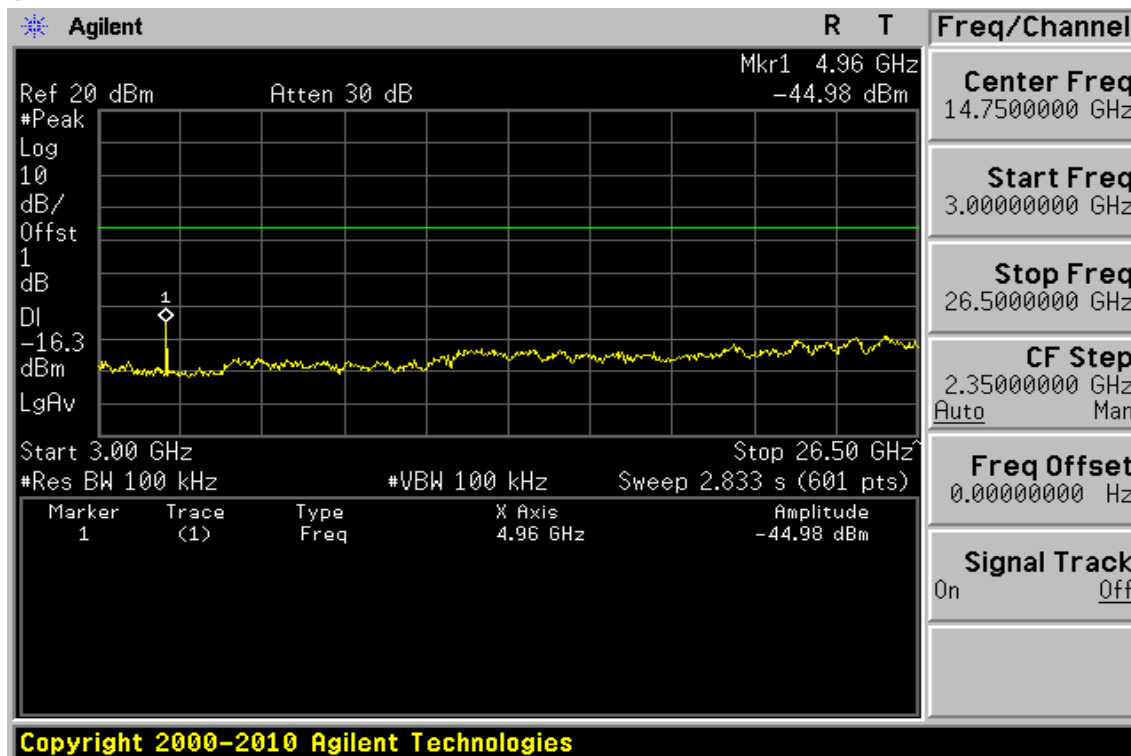
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Ch High 30MHz – 3GHz



Ch High 3GHz – 26.5GHz



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Radiated Spurious Emission Measurement Result (Worst Case: BDR Mode)

Operation Band	:BDR	Test Date	:2012-02-17
Fundamental Frequency	:2402 MHz	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX LOW	Engineer	:Lion
EUT Pol.	:H 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	Safe
MHz	F/H/E/S	Mode	Reading Level	dB	FS	@3m	Margin
		PK/QP/AV	dBμV		dBμV/m	dBμV/m	dB
66.86	S	Peak	50.07	-15.91	34.16	40.00	-5.84
125.06	S	Peak	44.33	-13.52	30.81	43.50	-12.69
260.86	S	Peak	41.75	-13.04	28.71	46.00	-17.29
399.57	S	Peak	30.53	-10.50	20.03	46.00	-25.97
497.54	S	Peak	28.62	-8.91	19.71	46.00	-26.29
780.78	S	Peak	32.58	-3.77	28.81	46.00	-17.19
4804.00	H	Average	35.79	9.71	45.50	54.00	-8.50
4804.00	H	Peak	43.21	9.71	52.92	74.00	-21.08
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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Radiated Spurious Emission Measurement Result

Operation Band	:BDR	Test Date	:2012-02-16
Fundamental Frequency	:2402 MHz	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX LOW	Engineer	:Lion
EUT Pol.	:H 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	Safe
MHz	F/H/E/S	Mode	Reading Level	dB	FS	@3m	Margin
		PK/QP/AV	dBμV		dBμV/m	dBμV/m	dB
66.86	S	Peak	48.42	-15.91	32.51	40.00	-7.49
132.82	S	Peak	39.67	-13.01	26.66	43.50	-16.84
261.83	S	Peak	52.02	-13.01	39.01	46.00	-6.99
348.16	S	Peak	38.75	-11.07	27.68	46.00	-18.32
473.29	S	Peak	30.42	-9.22	21.20	46.00	-24.80
780.78	S	Peak	32.63	-3.77	28.86	46.00	-17.14
4804.00	H	Average	37.94	9.75	47.69	54.00	-6.31
4804.00	H	Peak	44.03	9.75	53.78	74.00	-20.22
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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Radiated Spurious Emission Measurement Result

Operation Band	:BDR	Test Date	:2012-02-17
Fundamental Frequency	:2441 MHz	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX MID	Engineer	:Lion
EUT Pol.	:H 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. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Safe Margin dB
78.50	S	Peak	52.27	-17.71	34.56	40.00	-5.44
132.82	S	Peak	44.24	-13.01	31.23	43.50	-12.27
258.92	S	Peak	40.71	-13.13	27.58	46.00	-18.42
398.60	S	Peak	29.81	-10.44	19.37	46.00	-26.63
663.41	S	Peak	29.98	-5.72	24.26	46.00	-21.74
780.78	S	Peak	33.49	-3.77	29.72	46.00	-16.28
4882.00	H	Average	39.65	10.01	49.66	54.00	-4.34
4882.00	H	Peak	45.32	10.01	55.33	74.00	-18.67
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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Radiated Spurious Emission Measurement Result

Operation Band	:BDR	Test Date	:2012-02-16
Fundamental Frequency	:2441 MHz	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX MID	Engineer	:Lion
EUT Pol.	:H 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. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Safe Margin dB
65.89	S	Peak	48.23	-15.80	32.43	40.00	-7.57
132.82	S	Peak	39.77	-13.01	26.76	43.50	-16.74
264.74	S	Peak	52.37	-12.91	39.46	46.00	-6.54
348.16	S	Peak	38.46	-11.07	27.39	46.00	-18.61
436.43	S	Peak	30.68	-9.65	21.03	46.00	-24.97
780.78	S	Peak	32.34	-3.77	28.57	46.00	-17.43
4882.00	H	Average	38.13	9.95	48.08	54.00	-5.92
4882.00	H	Peak	44.15	9.95	54.10	74.00	-19.90
7323.00	H	---					
9764.00	H	---					
12205.00	H	---					
14646.00	H	---					
17087.00	H	---					
19528.00	H	---					
21969.00	H	---					
24410.00	H	---					

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Radiated Spurious Emission Measurement Result

Operation Band	:BDR	Test Date	:2012-02-17
Fundamental Frequency	:2480 MHz	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX HIGH	Engineer	:Lion
EUT Pol.	:H 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. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Safe Margin dB
66.86	S	Peak	50.25	-15.91	34.34	40.00	-5.66
132.82	S	Peak	44.90	-13.01	31.89	43.50	-11.61
255.04	S	Peak	41.72	-13.25	28.47	46.00	-17.53
399.57	S	Peak	28.42	-10.50	17.92	46.00	-28.08
498.51	S	Peak	28.47	-8.90	19.57	46.00	-26.43
780.78	S	Peak	33.29	-3.77	29.52	46.00	-16.48
4960.00	H	Average	38.25	10.49	48.74	54.00	-5.26
4960.00	H	Peak	44.54	10.49	55.03	74.00	-18.97
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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Radiated Spurious Emission Measurement Result

Operation Band	:BDR	Test Date	:2012-02-16
Fundamental Frequency	:2480 MHz	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX HIGH	Engineer	:Lion
EUT Pol.	:H 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. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Safe Margin dB
65.89	S	Peak	48.86	-15.80	33.06	40.00	-6.94
88.20	S	Peak	46.67	-16.94	29.73	43.50	-13.77
167.74	S	Peak	40.12	-12.33	27.79	43.50	-15.71
262.80	S	Peak	51.76	-12.97	38.79	46.00	-7.21
355.92	S	Peak	38.73	-10.99	27.74	46.00	-18.26
780.78	S	Peak	33.01	-3.77	29.24	46.00	-16.76
4960.00	H	Average	33.12	10.34	43.46	54.00	-10.54
4960.00	H	Peak	38.77	10.34	49.11	74.00	-24.89
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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10. FREQUENCY SEPARATION

10.1. Standard Applicable

According to §15.247(a)(1), Frequency hopping systems shall have hopping channel carrier frequencies separated by minimum of 25KHz or the $\frac{2}{3} \times 20\text{dB}$ 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.

10.2. Measurement Equipment Used:

Refer to section 6.2 for details.

10.3. Test Set-up:

Refer to section 6.3 for details.

10.4. Measurement Procedure:

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set center frequency of spectrum analyzer = middle of hopping channel .
4. Set the spectrum analyzer as RBW,VBW=100KHz/100KHz, Adjust Span to 5.0 MHz, Sweep = auto.
5. Max hold. Mark 3 Peaks of hopping channel and record the 3 peaks frequency.

10.5. Measurement Result:

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

Note: Refer to next page for plots.

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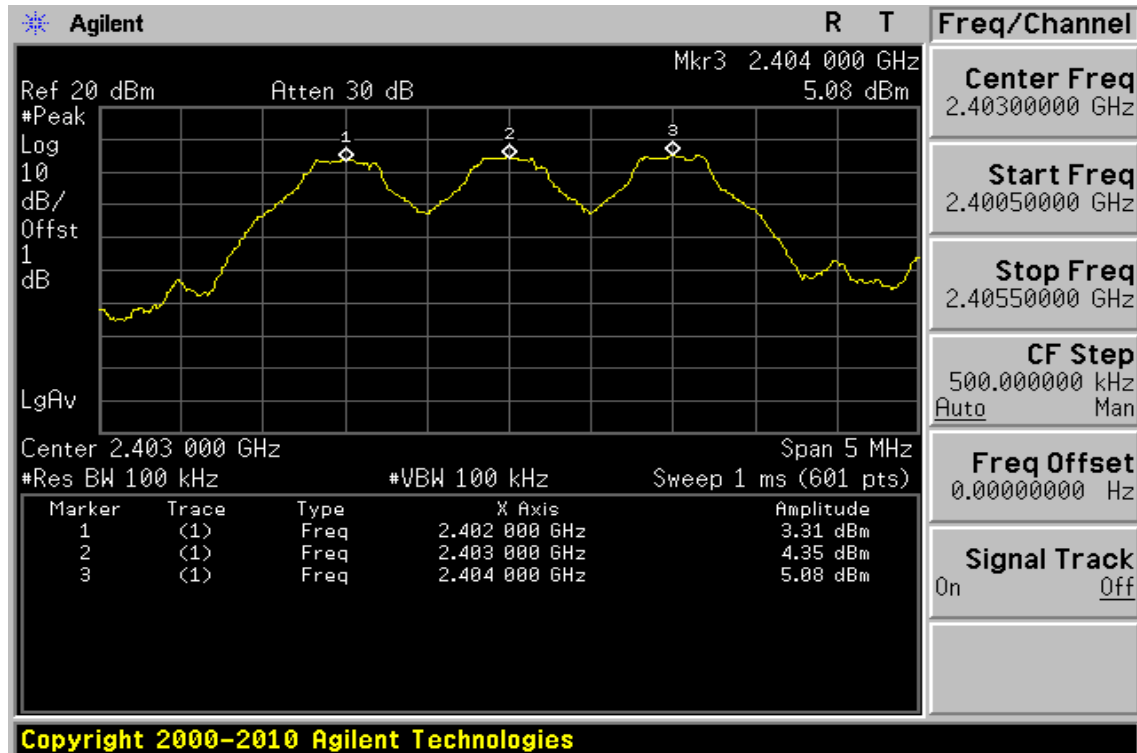
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Frequency Separation Test Data



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11. NUMBER OF HOPPING FREQUENCY

11.1. Standard Applicable

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

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.

11.2. Measurement Equipment Used:

Refer to section 6.2 for details.

11.3. Test Set-up:

Refer to section 6.3 for details.

11.4. Measurement Procedure:

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set spectrum analyzer Start=2400MHz, Stop = 2483.5MHz, Sweep = auto.
4. Set the spectrum analyzer as RBW, VBW=430KHz/1.5MHz,
5. Max hold, view and count how many channel in the band.

11.5. Measurement Result:

Note: Refer to next page for plots.

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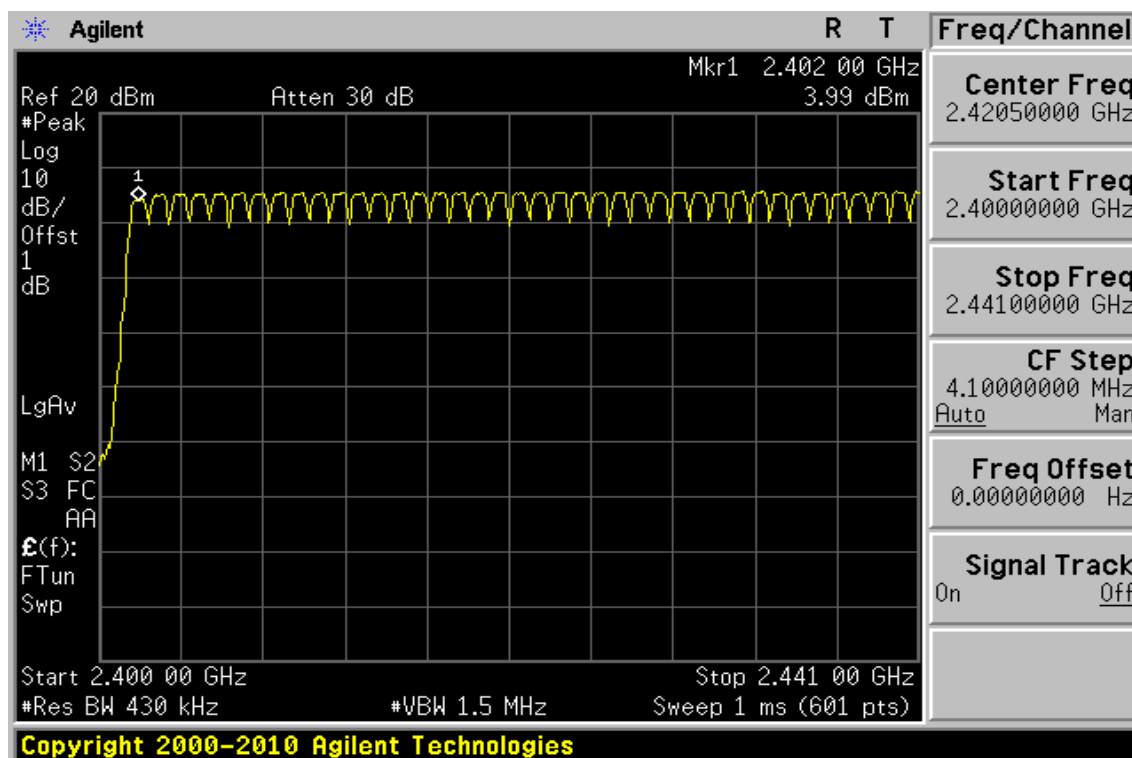
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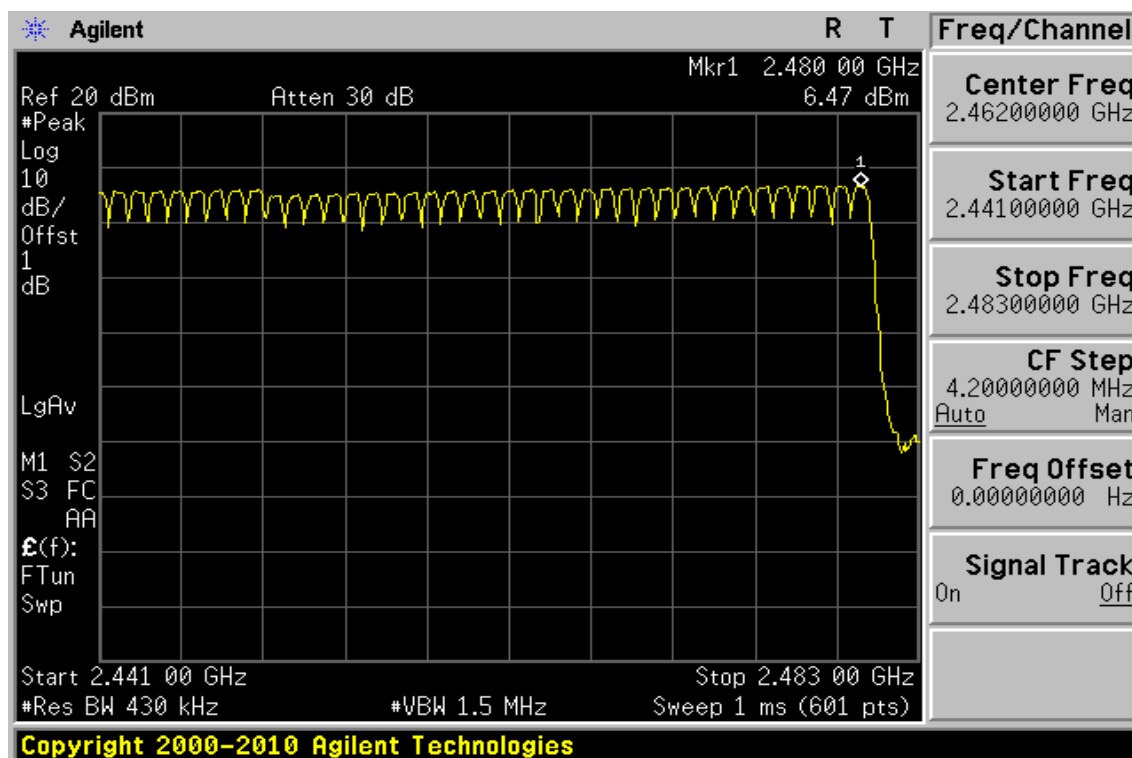
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Channel Number

2.4 GHz – 2.441GHz



2.441 GHz – 2.4835GHz



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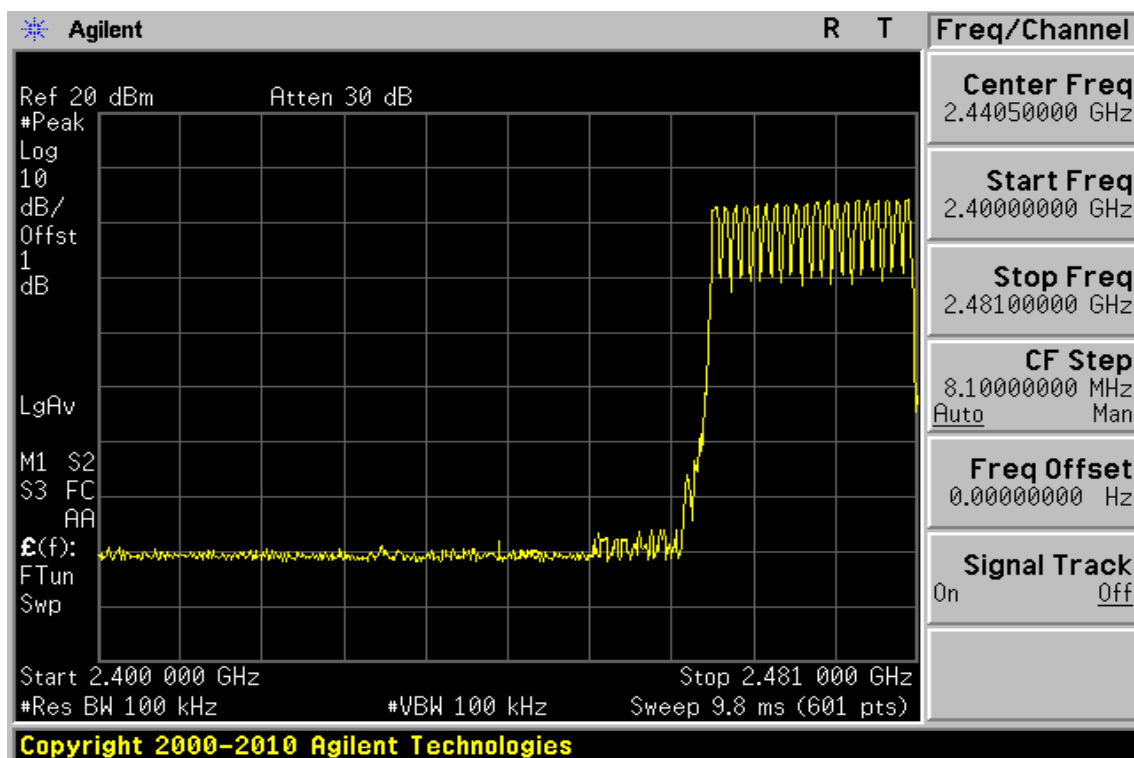
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AFH Mode



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12. TIME OF OCCUPANCY (DWELL TIME)

12.1. Standard Applicable

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

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.

12.2. Measurement Equipment Used:

Refer to section 6.2 for details.

12.3. Test Set-up:

Refer to section 6.3 for details.

12.4. Measurement Procedure:

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

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12.5. Measurement Result

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

CH Low DH1 time slot = 0.3867 (ms) * (1600/2/79) * 31.6 = 123.74 (ms)
 DH3 time slot = 1.642 (ms) * (1600/4/79) * 31.6 = 262.72 (ms)
 DH5 time slot = 2.883 (ms) * (1600/6/79) * 31.6 = 307.52 (ms)

CH Mid DH1 time slot = 0.3833 (ms) * (1600/2/79) * 31.6 = 122.66 (ms)
 DH3 time slot = 1.642 (ms) * (1600/4/79) * 31.6 = 262.72 (ms)
 DH5 time slot = 2.895 (ms) * (1600/6/79) * 31.6 = 308.80 (ms)

CH High DH1 time slot = 0.3833 (ms) * (1600/2/79) * 31.6 = 122.66 (ms)
 DH3 time slot = 1.642 (ms) * (1600/4/79) * 31.6 = 262.72 (ms)
 DH5 time slot = 2.883 (ms) * (1600/6/79) * 31.6 = 307.52 (ms)

Note: Refer to next page for plots.

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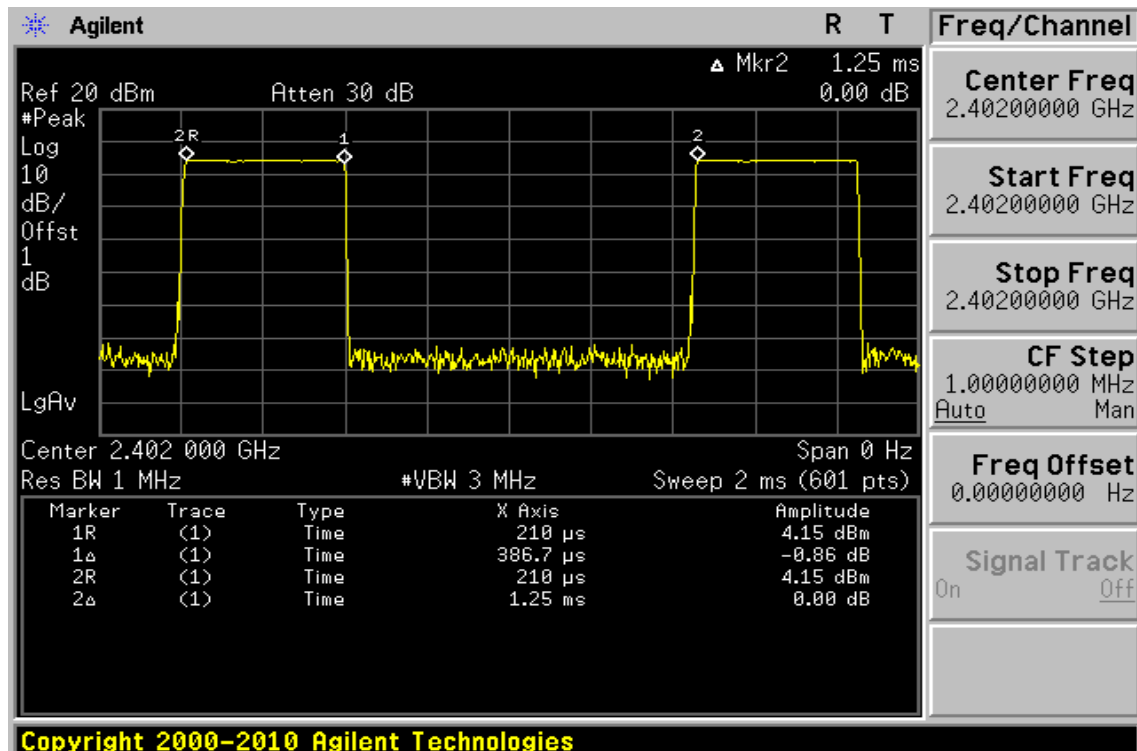
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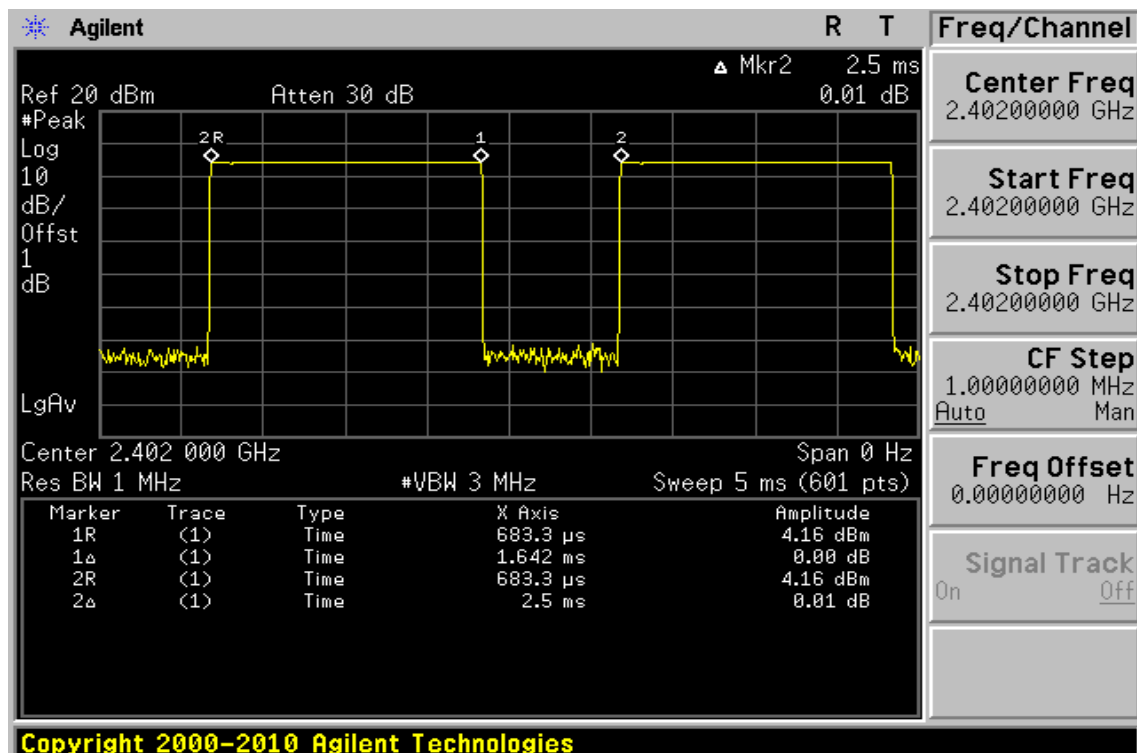
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CH-Low

DH1



DH3



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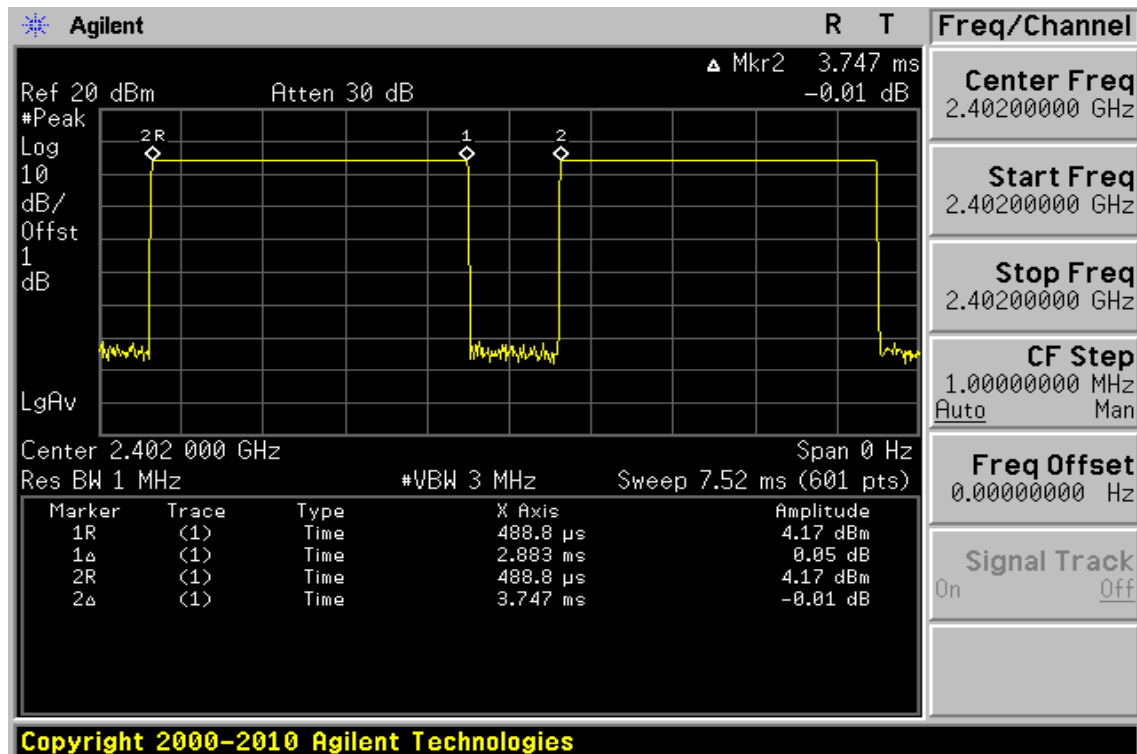
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DH5



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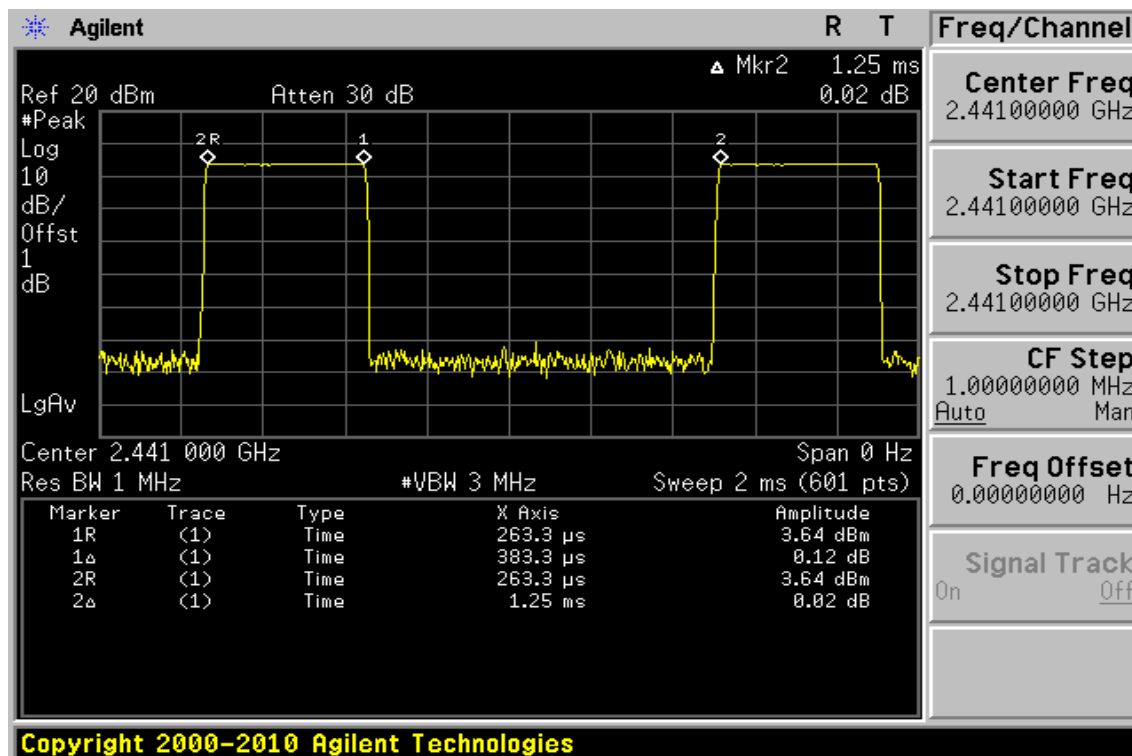
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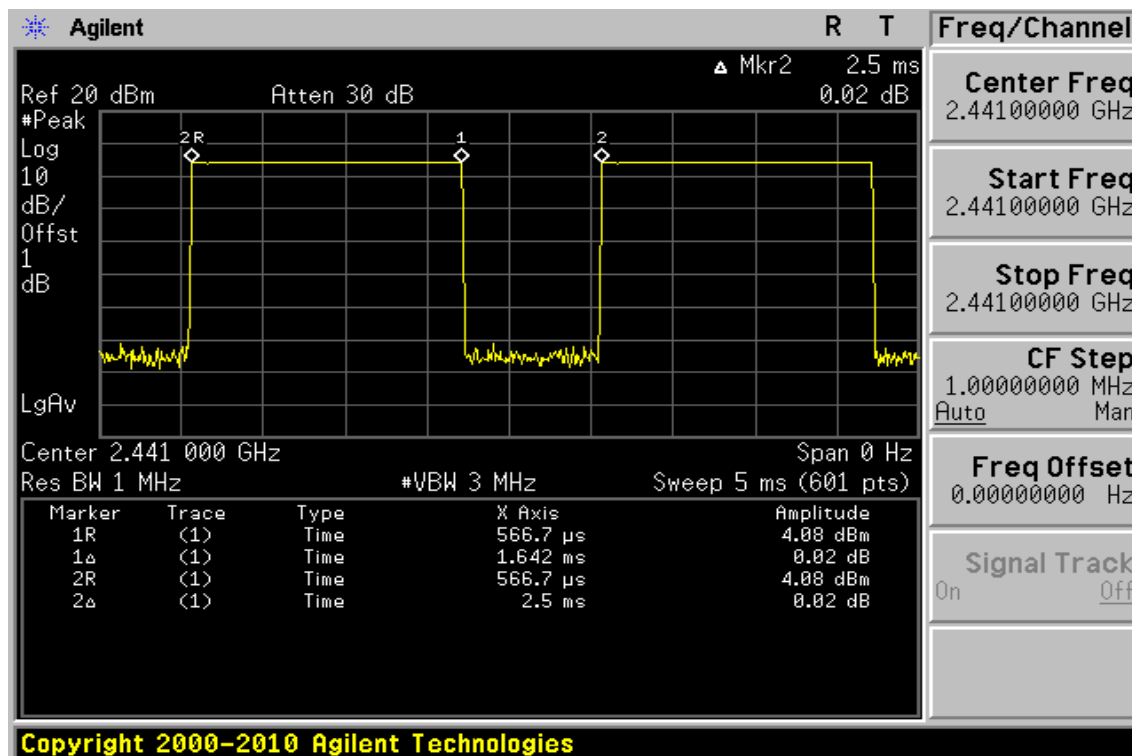
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CH-Mid

DH1



DH3



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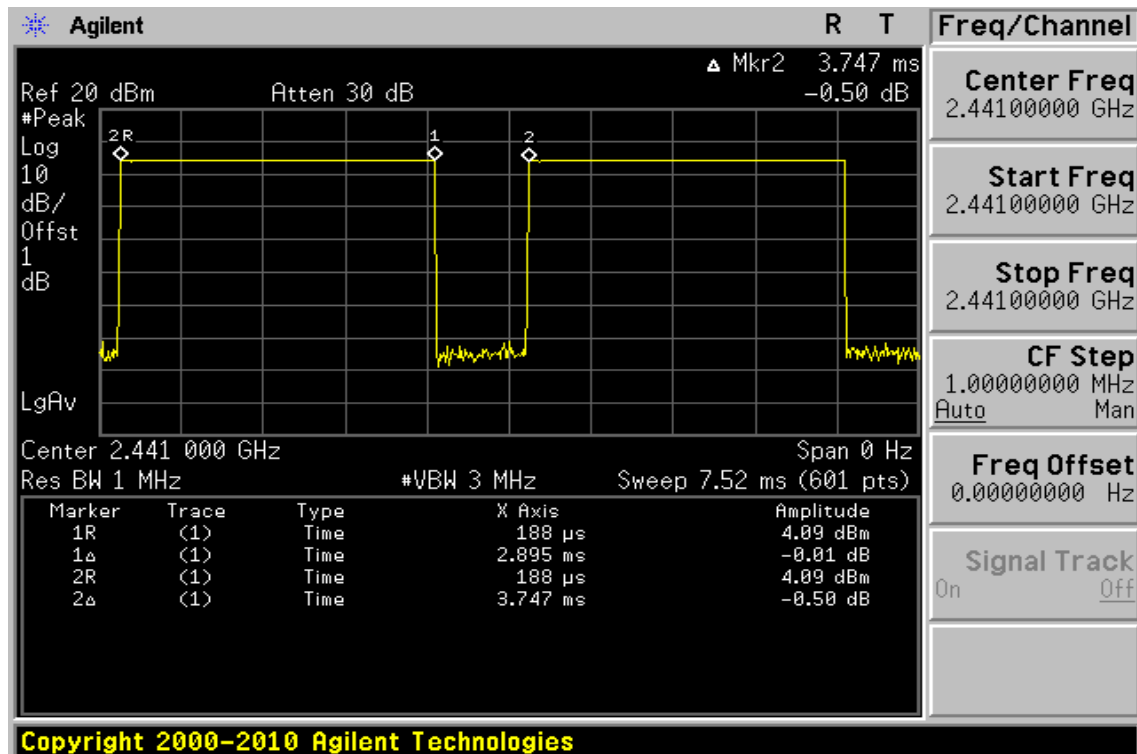
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DH5



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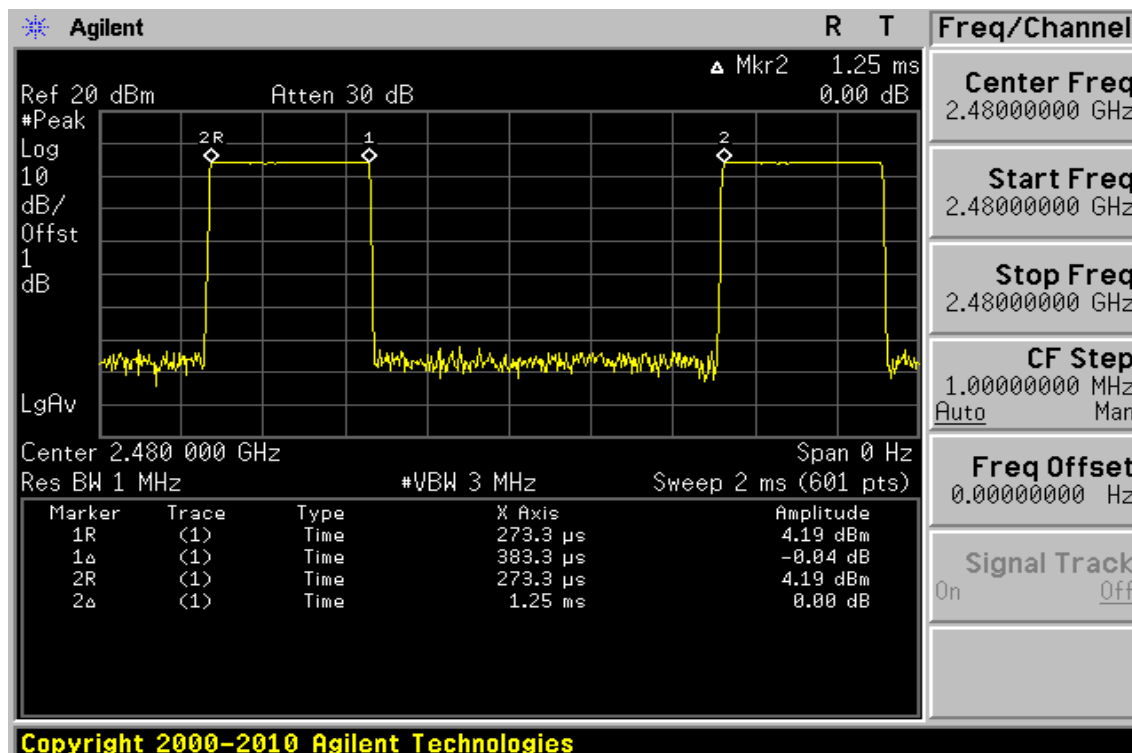
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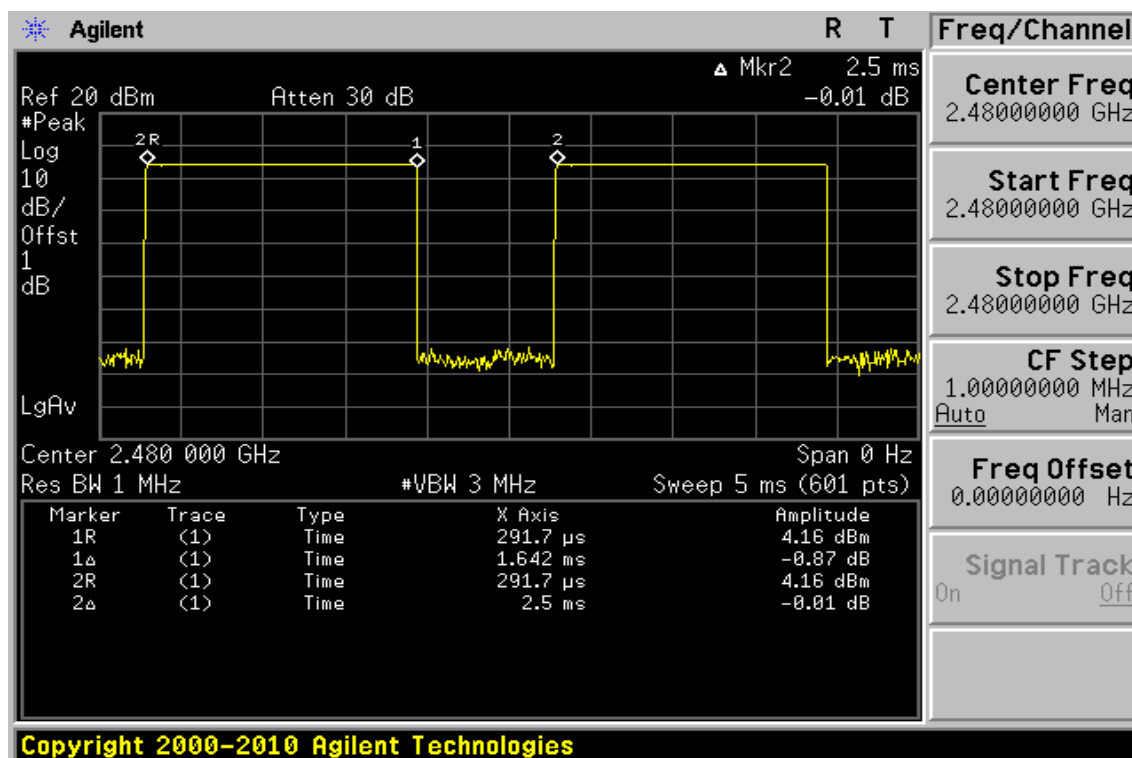
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CH-High

DH1



DH3



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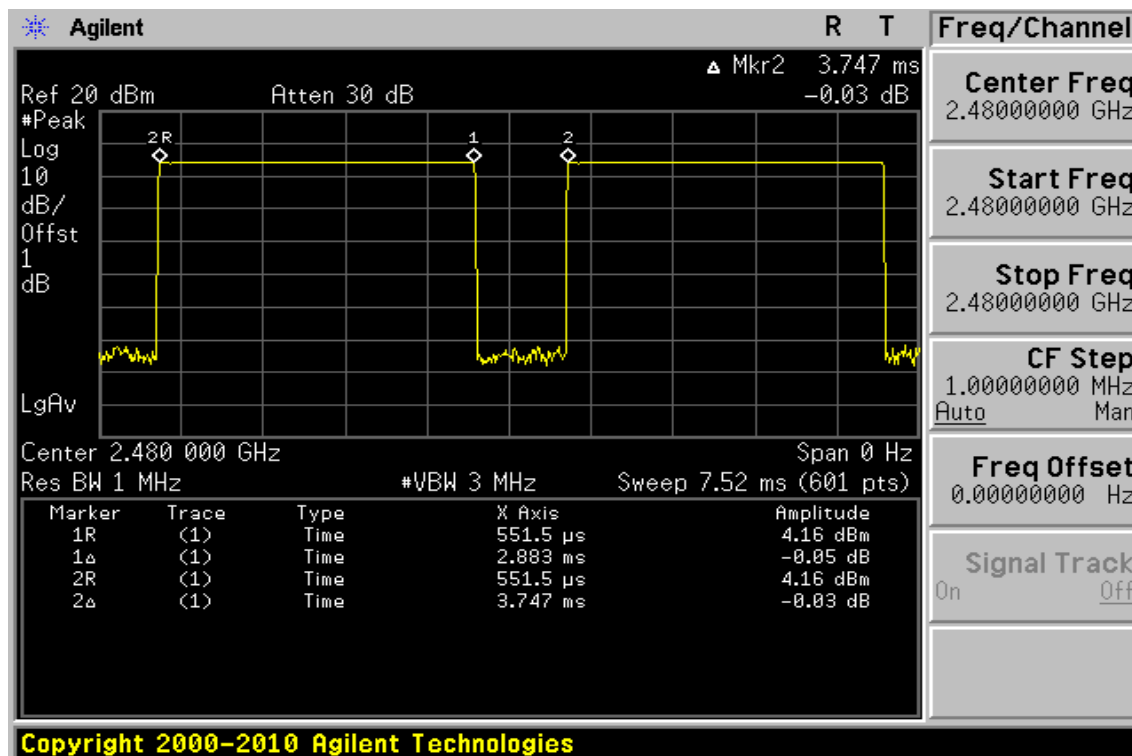
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13. ANTENNA REQUIREMENT

13.1. Standard Applicable

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

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

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

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

13.2. Antenna Connected Construction

The directional gains of antenna used for transmitting is 2.5dBi, and the antenna connector is designed with permanent attachment and no consideration of replacement. Please see EUT photo for details.

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14. MAXIMUM PERMISSIBLE EXPOSURE (MPE)

14.1. Standard Applicable

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

This is a Mobile device, the MPE is required.

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

Limits for Maximum Permissive Exposure (MPE)

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

F = frequency in MHz

* = Plane-wave equipment power density

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14.2. Maximum Permissible Exposure (MPE) Evaluation**BDR mode:**

Frequency (MHz)	Reading Power (dBm)	Output Power (dBm)	Output Power (W)	Limit (W)
2402.00	4.33	4.33	0.00271	1
2441.00	4.28	4.28	0.00268	1
2480.00	4.36	4.36	0.00273	1

EDR mode:

Frequency (MHz)	Reading Power (dBm)	Output Power (dBm)	Output Power (W)	Limit (W)
2402.00	3.58	3.58	0.00228	1
2441.00	3.59	3.59	0.00229	1
2480.00	3.98	3.98	0.00250	1

MPE Prediction (Bluetooth)

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

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

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Maximum peak output power at antenna input terminal:	4.36	(dBm)
Maximum peak output power at antenna input terminal:	2.728977783	(mW)
Duty cycle:	77.3	(%)
Maximum Pav :	2.109499826	(mW)
Antenna gain (typical):	2.5	(dBi)
Maximum antenna gain:	1.77827941	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	2480	(MHz)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm ²)
Power density at predication frequency at 20 (cm)	0.0007467	(mW/cm ²)
Power density at predication frequency at 20 (cm)	0.0074667	(W/m ²)

Measurement Result

The predicted power density level at 20 cm is 0.0007467 mW/cm². This is below the uncontrolled exposure limit of 1 mW/cm² at 2480MHz.

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