

ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART C REQUIREMENT

	OF
Product Name:	Smart Display
Marketing Name:	N/A
Brand Name:	BenQ
Model No.:	CT2200
Model Difference:	N/A
FCC ID:	JVPCT2200
Report No.:	EF/2013/40002
Issue Date:	Apr. 30, 2013
Rule Part:	§15.247, Cat: DSS
Prepared for:	BenQ Corporation
	16 Jihu Road, Neihu, Taipei 114, Taiwan
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	24803



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Report No.: EF/2013/40002 Issue Date: Apr. 30, 2013 Page: 2 of 72

CERTIFICATION OF COMPLIANCE

Applicant:	BenQ Corporation
	16 Jihu Road, Neihu, Taipei 114, Taiwan
Product Name:	Smart Display
Marketing Name:	N/A
Brand Name:	BenQ
FCC ID:	JVPCT2200
Model No.:	CT2200
Model Difference:	N/A
File Number:	EF/2013/40002
Date of test:	Apr. 09, 2013 ~ Apr. 30, 2013
Date of EUT Received:	Apr. 09, 2013

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 (2009) 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 15C:2007, §15.247. The test results of this report relate only to the tested sample identified in this report.

Test By:	Marcus Tseng	Date:	Apr. 30, 2013
Prepared By:	Marcus Tseng/Engineer Julia Chang	Date:	Apr. 30, 2013
Approved By:	Julia Chang / Clerk Tim Ch ang	Date:	Apr. 30, 2013

Jim Chang / Supervisor

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Version

Version No.	Date	Description
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GENERAL INFORMATION 1.

1.1. Product Description

General:

Product Name:	Smart Display	
Marketing Name:	N/A	
Brand Name:	BenQ	
Model No.:	CT2200	
Model Difference:	N/A	
Hardware Version:	N/A	
Software Version:	N/A	
Data Cable:	Model No.: N/A, Supplier: N/A	
HDMI Cable:	Model No.: N/A, Supplier: N/A	
	100-240V by AC/DC power adapter	
Power Supply:	Adapter:1. Model: ADP-40PH BB, Supplier: Delta2. Model: CPA09-002A, Supplier:Chicony	

Bluetooth:

Bluetooth Version: $ \begin{array}{ c c c c c c c c c c c c c c c c c c c$		
Frequency Range:	2402 – 2480MHz	
Channel number:	79 channels max.	
Rated Power:	4.31 dBm (Peak)	
Modulation type:	Frequency Hopping Spread Spectrum	
Antenna Designation:	(1) PIFA Antenna, Model No.: UI2A, Gain: 2.88 dBi(2) PIFA Antenna, Model No.: UI2, Gain: 2.73 dBi	

The EUT is compliance with Bluetooth V2.1 + EDR (GFSK + $\pi/4DQPSK$ + 8DPSK) standard.

This test report applies for Bluetooth function.

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

This submittal(s) (test report) is intended for **FCC ID:** <u>JVPCT2200</u> filing to comply with Section 15.247 of the FCC Part 15C, Subpart C Rules. The composite system (digital device) is compliance with Subpart B 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 (2009). Radiated testing was performed at an antenna to EUT distance 3 meters.

Tested in accordance with FCC Public Notice DA 00-705

1.4. Test Facility

The measurement facilities used to collect the 3m Radiated Emission and AC power line conducted data are located on the address of SGS Taiwan Ltd. No. 134, Wu Kung Rd., Wuku Industrial Zone, Taipei Country, Taiwan which are constructed and calibrated to meet the FCC requirements in documents ANSI C63.4: 2009. FCC Registration Number are: 990257 and 236194, Canada Registration Number: 4620A-4.

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

1.5. Special Accessories

Not available for this EUT intended for grant.

1.6. Equipment Modifications

Not available for this EUT intended for grant.

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2. SYSTEM TEST CONFIGURATION

2.1. EUT Configuration

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

2.2. EUT Exercise

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

2.3. Test Procedure

2.3.1 Conducted Emissions

The EUT is a placed on as turn table which is 0.8 m above ground plane. According to the requirements in Section 7, 13 of ANSI C63.4-2009.Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-Peak and Average detector mode.

2.3.2 Radiated Emissions

The EUT is 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 of ANSI C63.4-2009 and DA 00-705.

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2.4. Configuration of Tested System

Fig. 2-1 Configuration of Tested System

Radiated Emission

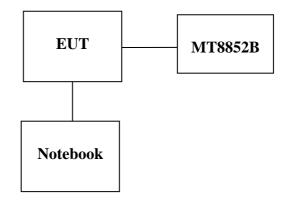


Table 2-1 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/ Type No.	Series No.
1.	Bluetooth Test Set	Anritsu	MT8852B	6k00006107
2.	Notebook	Lenovo	L412	LR-957X7

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3. SUMMARY OF TEST RESULTS

FCC Rules	Description Of Test	Result
§15.207(a)	AC Power line Conducted Emission	Compliant
§15.247(b)(1)	Peak Output Power	Compliant
§15.247(d)	100 KHz Bandwidth Of Frequency Band Edges	Compliant
§15.247(c)	TX/RX Spurious Emission	Compliant
§15.247(a)(1)	Frequency Separation	Compliant
§15.247(a)(1)(iii)	Number of hopping frequency	Compliant
§15.247(a)(1)(ii)	Time of Occupancy	Compliant
§15.247	Peak Power Density	Compliant
§15.247(a)(1)	20dB Bandwidth	Compliant
§15.203, §15.247(c)	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) \cdot mid (2441MHz) and high (2480MHz) with worst case EDR mode is chosen for full testing.

Pre-scanned was done on antenna: UI2A and antenna UI2, and antenna UI2A results higher emission. Therefore, the completed set of measurement was done on antenna: UI2A, and presented on this test report.

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5. MEASUREMENT UNCERTAINTY FOR FIELD STRENGTH OF SPURIOUS RADIATION

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

Measurement uncertainty (Polarization : Horizontal)	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. AC POWER LINE CONDUCTED EMISSION TEST

6.1. Standard Applicable:

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

Frequency range	Limits dB(uV)						
MHz	Quasi-peak	Average					
0.15 to 0.50	66 to 56	56 to 46					
0.50 to 5	56	46					
5 to 30	60	50					
Note							
1. The lower limit shall apply at the transition frequencies							

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

6.2. Measurement Equipment Used:

Conducted Emission Test Site									
EQUIPMENT	MFR	MODEL	SERIAL	LAST	CAL DUE.				
TYPE		NUMBER	NUMBER	CAL.					
EMI Test Receiver	R&S	ESCI7	100759	05/20/2011	05/19/2013				
EMI Receiver	R&S	ESCS 30	828985/004	09/23/2012	09/22/2013				
LISN	Rolf-Heine	NNB-2/16Z	99012	03/23/2013	03/22/2014				
LISN	FCC	FCC-LISN-50/250-25-2-01	04034	03/23/2013	03/22/2014				
Coaxial Cables	N/A	WK CE Cable	N/A	01/05/2013	01/04/2014				

6.3. EUT Setup:

- 1. The conducted emission tests were performed in the test site, using the setup in accordance with the ANSI C63.4-2009.
- 2. The AC/DC Power adaptor of EUT was plug-in LISN. The EUT was placed flushed with the rear of the table.
- 3. The LISN was connected with 120Vac/60Hz power source.

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</p>

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6.4. Measurement Procedure:

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

6.5. Measurement Result:

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

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

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AC POWER LINE CONDUCTED EMISSION TEST DATA

peration Mode:	Bluetoot	h Mode			Test Date:	Apr.09, 2013
mperature:	26 °C	Hui	nidity:	60 %	Test By:	Marucs
M/N: CT2200 Note: Operatio	ass B Conductio 板電腦(Smar	tDisplay)	Pha Pow Dist Mod	ver: AC 120 ance:		Temperature: 26 C Humidity: 60%
			Conducted	Emission	1	
	013-40001 Display	_CT Data:#1		Date: 2	2013/4/9 Tin	ne:下午 06:17:39
80.0 dBu\						
						Section 1 and
				_	FCC Class E	Conduction(QP)
NX X					FCC Class B	Conduction(AVG)
1.0	×					
40	WENDY	paparan	mmun	marin	mummul	and have
0.0		0.5	(MHz)		5	30.000
	Reading eq. Level	Correct Mea	asure- ent Limit	Over	-	
М	Hz dBuV	dB dE	uV dBuV	dB [Detector Comment	
1 0.16	95 47.02	0.34 47	.36 64.98	-17.62	QP	
2 0.16	95 22.84	0.34 23	.18 54.98	-31.80	AVG	
3 * 0.19	30 51.56	0.32 51	.88 63.91	-12.03	QP	
4 0.19	30 33.15	0.32 33	.47 53.91	-20.44	AVG	
5 0.25	94 45.60	0.34 45	.94 61.45	-15.51	QP	
6 0.20	42.52	0.34 42	.86 59.56	-16.70	QP	
6 0.32	.00 42.02		.00	10.70	3	

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0.61

39.86

14.9961

8

39.25

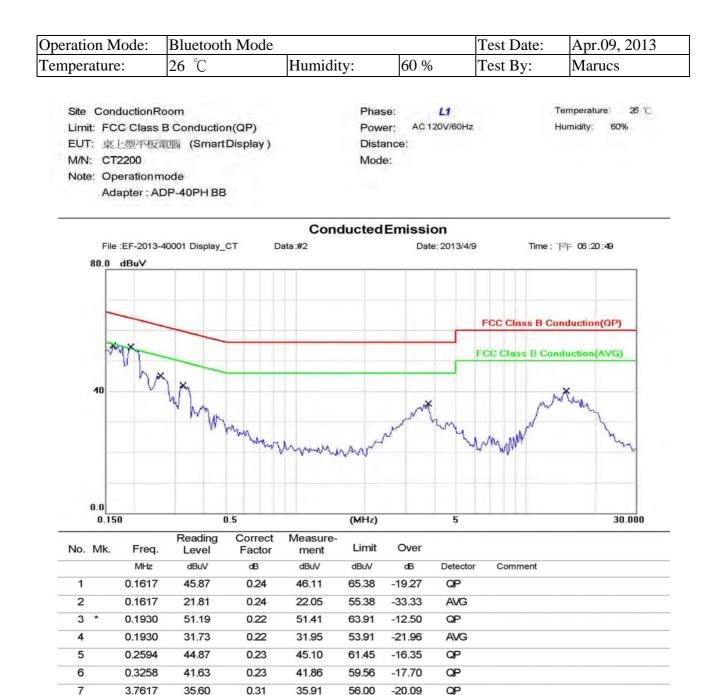
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60.00

-20.14

QP





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0.65

40.12

8

14.9180

39.47

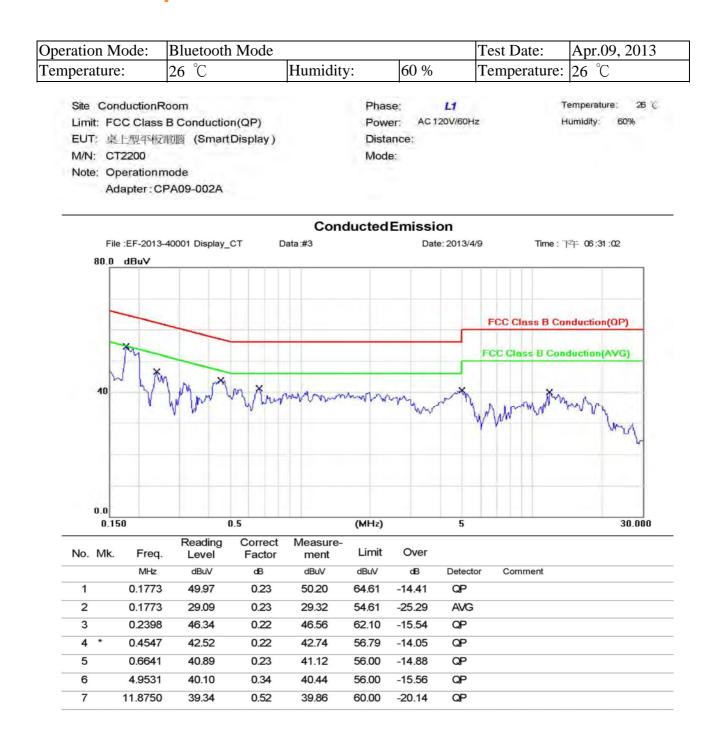
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60.00

-19.88

QP

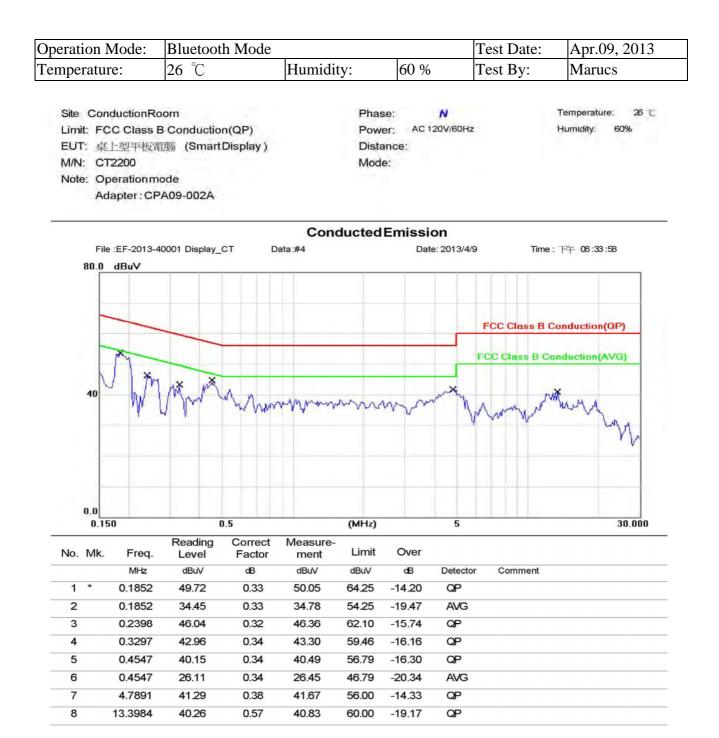




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7. PEAK OUTPUT POWER MEASUREMENT

7.1. Standard Applicable:

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

7.2. Measurement Equipment Used:

Conducted Emission Test Site										
EQUIPMENT	MFR	MODEL	SERIAL	LAST	CAL DUE.					
TYPE		NUMBER	NUMBER	CAL.						
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	04/15/2013	04/14/2014					
Spectrum Analyzer	Agilent	E4440A	MY45304525	03/15/2013	03/14/2014					
DC Block	Mini-Circuits	BLK-18-S+	1	02/28/2013	02/27/2014					
Low Loss Cable	HUBER+SUHNER	SUCOFLEX 104PEA	N/A	01/05/2013	01/04/2014					
Attenuator	Mini-Circuit	BW-S10W2+	002	02/28/2013	02/27/2014					
Splitter	Agilent	11636B	N/A	02/28/2013	02/27/2014					

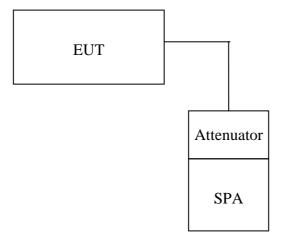
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7.3. .Test Set-up:



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

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7.5. Measurement Result:

BDR mode (GFSK):

Frequency (MHz)	Reading Power (dBm)	Output Power (dBm)	Output Power (W)	Limit (W)
2402.00	3.45	3.45	0.00221	1
2441.00	3.01	3.01	0.00200	1
2480.00	2.98	2.98	0.00199	1

EDR mode (π /4DQPSK):

Frequency (MHz)	Reading Power (dBm)	Output Power (dBm)	Output Power (W)	Limit (W)
2402.00	3.77	3.77	0.00238	0.125
2441.00	3.43	3.43	0.00220	0.125
2480.00	3.53	3.53	0.00225	0.125

EDR mode (8DPSK):

Frequency (MHz)	Reading Power (dBm)	Output Power (dBm)	Output Power (W)	Limit (W)
2402.00	4.31	4.31	0.00270	0.125
2441.00	4.02	4.02	0.00252	0.125
2480.00	4.16	4.16	0.00261	0.125

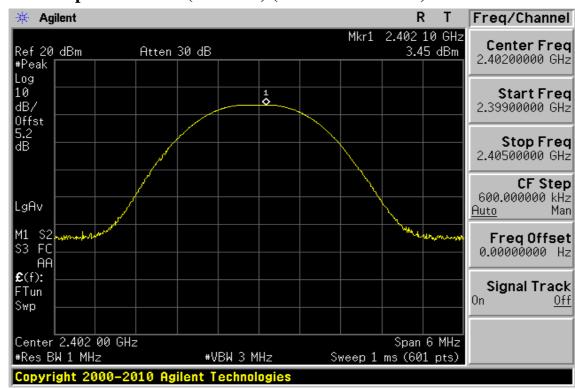
Offset: 5.2dB

Note: Refer to next page for plots.

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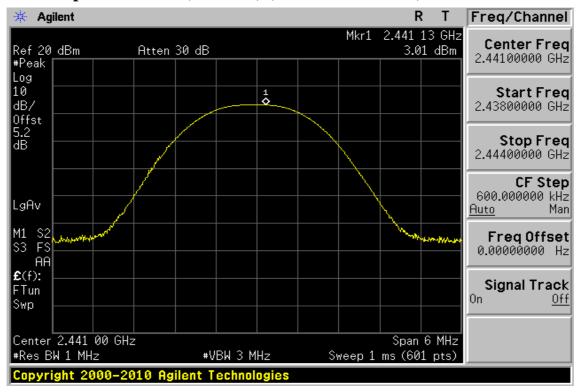
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Peak Power Output Data Plot (CH Low) (BDR mode GFSK)

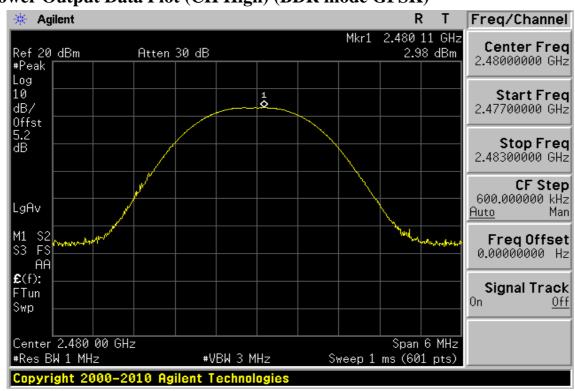
Peak Power Output Data Plot (CH Mid) (BDR mode GFSK)



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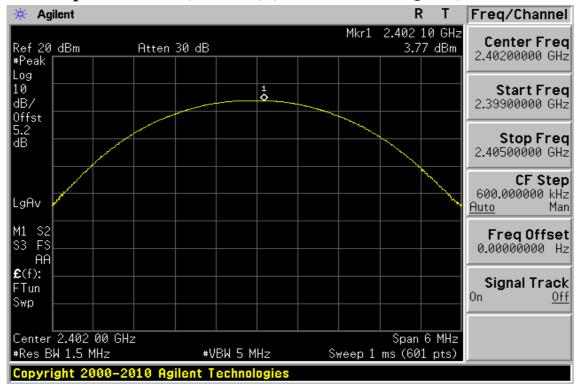
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Peak Power Output Data Plot (CH High) (BDR mode GFSK)

Peak Power Output Data Plot (CH Low) (EDR mode $\pi/4DQPSK$)



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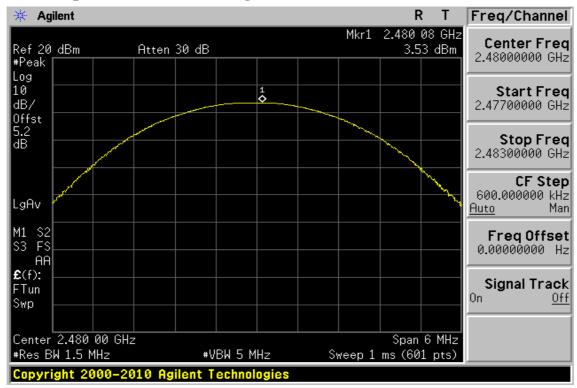
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Agilent R Т Freg/Channel Mkr1 2.440 79 GHz Center Frea 3.43 dBm Ref 20 dBm Atten 30 dB 2.44100000 GHz #Peak Log 10 Start Freq 1 dB/ 2.43800000 GHz Offst 5.2 dB Stop Freq 2.44400000 GHz CF Step 600.000000 kHz LgAv <u>Auto</u> Man Μ1 S2 Freq Offset S3 FS 0.00000000 Hz AA £(f): Signal Track FTun 0n Off Swp Stop 2.444 00 GHz Start 2.438 00 GHz #Res BW 1.5 MHz ₩VBW 5 MHz Sweep 1 ms (601 pts) Copyright 2000-2010 Agilent Technologies

Peak Power Output Data Plot (CH Mid) (EDR mode $\pi/4DQPSK$)

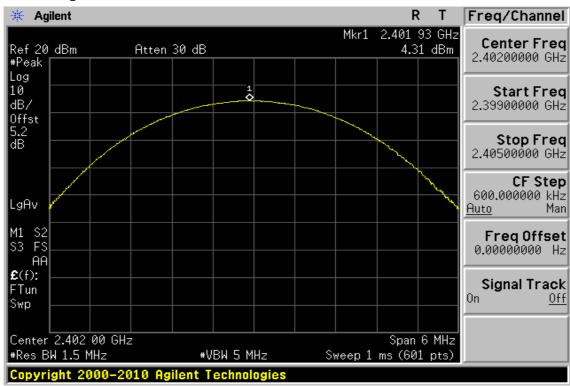
Peak Power Output Data Plot (CH High) (EDR mode $\pi/4DQPSK$)



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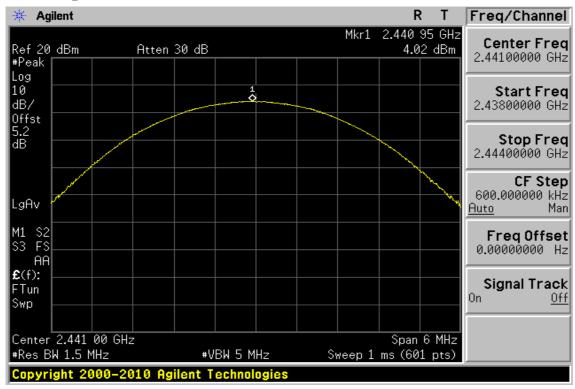
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Peak Power Output Data Plot (CH Low) (EDR mode 8DPSK)

Peak Power Output Data Plot (CH Mid) (EDR mode 8DPSK)



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* Agilent R Т Freq/Channel Mkr1 2.479 98 GHz Center Frea Ref 20 dBm Atten 30 dB 4.16 dBm 2.48000000 GHz #Peak Log 10 Start Freq Ó dB/ 2.47700000 GHz Offst 5.2 dB Stop Freq 2.48300000 GHz CF Step 600.000000 kHz LgAv <u>Auto</u> Man Μ1 S2 Freq Offset S3 FS 0.00000000 Hz AΑ £(f): Signal Track FTun 0n Off Swp Center 2.480 00 GHz Span 6 MHz Sweep 1 ms (601 pts) #Res BW 1.5 MHz ₩VBW 5 MHz Copyright 2000-2010 Agilent Technologies

Peak Power Output Data Plot (CH High) (EDR mode 8DPSK)

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8. 100KHz BANDWIDTH OF BAND EDGES MEASUREMENT

8.1. Standard Applicable:

According to \$15.247(d), in any 100 KHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator in operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100KHz bandwidth within the band that contains the highest level of the desired power, In addition, radiated emissions which fall in the restricted bands, as defined in \$15.205(a), must also comply with the radiated emission limits specified in15.209(a).

8.2. Measurement Equipment Used:

8.2.1. Conducted Emission at antenna port:

Refer to section 7.2 for details.

8.2.2. Radiated emission:

966 Chamber									
EQUIPMENT	MFR MODEL		SERIAL	LAST	CAL DUE.				
ТҮРЕ		NUMBER	NUMBER	CAL.					
EMI Test Receiver	R&S	ESCI7	100759	05/20/2011	05/19/2013				
Spectrum Analyzer	Agilent	E4446A	MY51100003	04/15/2013	04/14/2014				
EXA Spectrum Analyzer	Agilent	N9010A	MY50420195	02/06/2013	02/07/2014				
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	01/04/2013	01/03/2014				
Pre-Amplifier	EMC Instruments Corp.	EMC0126530	980038	01/04/2013	01/03/2014				
Filter 2400-2483.5 MHz	EWT	EWT-14-0166	M2	02/28/2013	02/28/2014				
Attenuator	Mini-Circuit	BW-S10W2+	004	02/28/2013	02/27/2014				
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	01/04/2013	01/03/2014				
3m Site NSA	SGS	966 chamber	N/A	07/15/2012	07/14/2013				

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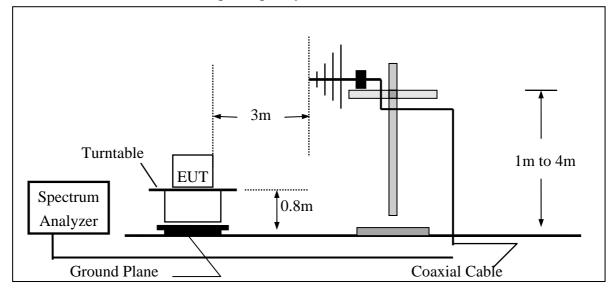
8.3. Test SET-UP:

8.3.1. Conducted Emission at antenna port:

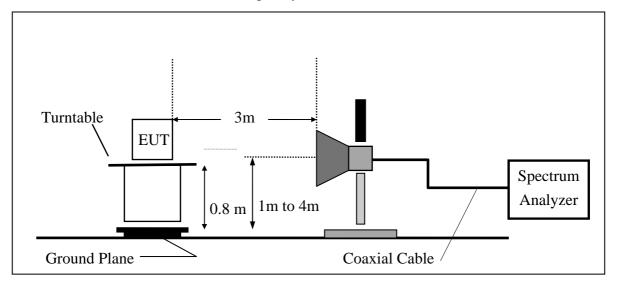
Refer to section 7.3 for details.

8.3.2. Radiated emission:

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



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



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8.4. Measurement Procedure:

- 1. Place the EUT on the table and set it in transmitting mode.
- 2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
- 3. Set center frequency of spectrum analyzer = operating frequency.
- 4. Set the spectrum analyzer as RBW, VBW=100KHz, Span=25MHz, Sweep = auto
- 5. Mark Peak, 2.390GHz and 2.4835GHz and record the max. level.
- 6. Repeat above procedures until all frequency measured were complete.

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:

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

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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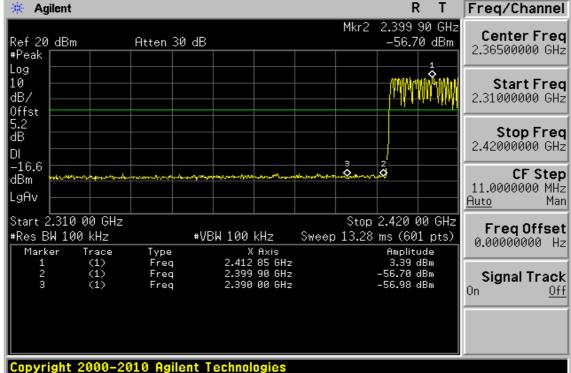
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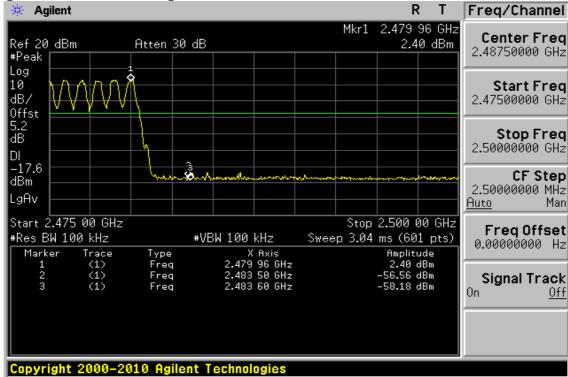


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BDR Mode Band Edges Test Data CH-Low







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Radiated Emission: (BDR mode)

Operation Band Fundamental Frequency Operation Mode EUT Pol.		:BDR :2402 MHz :Bandedge LOW :H PLAN		Test Date Temp./Humi. Engineer Measurement Antenna Pol.		:2013-04-10 :27 deg_C / 66 RH :Nick :VERTICAL		
	Freq.	Note	Detector Mode	Spectrum Reading Lev		Actual FS	Limit @3m	Margin
	MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBµV/m	dBµV/m	dB
2	2390.00	E	Average	30.52	2.12	32.64	54.00	-21.36
2	2390.00	E	Peak	43.28	2.12	45.40	74.00	-28.60
Operation Band:BDRFundamental Frequency:2402 MHzOperation Mode:Bandedge LOWEUT Pol.:H PLAN		W	Test Date Temp./Humi. Engineer Measurement Antenna Pol.			:2013-04-10 :27 deg_C / 66 RH :Nick :HORIZONTAL		
	Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
			Mode	Reading Lev	vel	FS	@3m	
	MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2	2390.00	Е	Average	29.85	2.74	32.59	54.00	-21.41
2	2390.00	Е	Peak	45.15	2.74	47.89	74.00	-26.11

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

Factor(dB) = Antenna Factor($dB\mu V/m$) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

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

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

"---": denotes Noise Floor.

The trace on RE(radiation emission) plot is as colored blue, and the detection manner we've employed is peak detector.

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Operation Band Fundamental Frequency Operation Mode EUT Pol.		:BDR :2480 MHz :Bandedge HIGH :H PLAN		Test Date Temp./Humi. Engineer Measurement Antenna Pol.		:2013-04-10 :27 deg_C / 66 RH :Nick :VERTICAL		
	Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
			Mode	Reading Lev	vel	FS	@3m	
	MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
	2483.50	Е	Average	29.63	2.53	32.16	54.00	-21.84
	2483.50	Е	Peak	45.44	2.53	47.97	74.00	-26.03
Operation Band:BDRFundamental Frequency:2480 MHzOperation Mode:Bandedge HIGHEUT Pol.:H PLAN		Test Date Temp./Humi. Engineer Measurement A	ntenna Pol.	:Nick	04-10 g_C / 66 RH ZONTAL			
	Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
			Mode	Reading Lev	vel	FS	@3m	
	MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
	2483.50	Е	Average	29.44	3.56	33.00	54.00	-21.00
	2483.50	Е	Peak	44.93	3.56	48.49	74.00	-25.51

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

Factor(dB) = Antenna Factor($dB\mu V/m$) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

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

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

"---": denotes Noise Floor.

The trace on RE(radiation emission) plot is as colored blue, and the detection manner we've employed is peak detector.

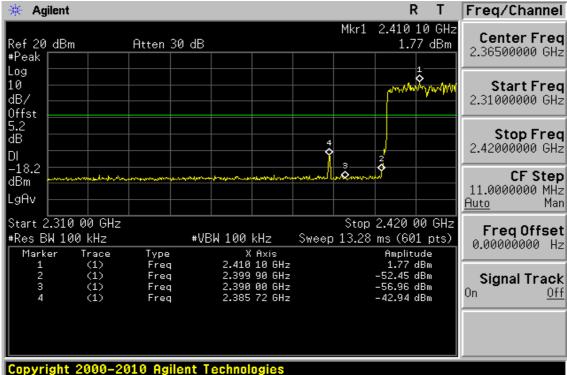
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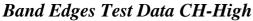
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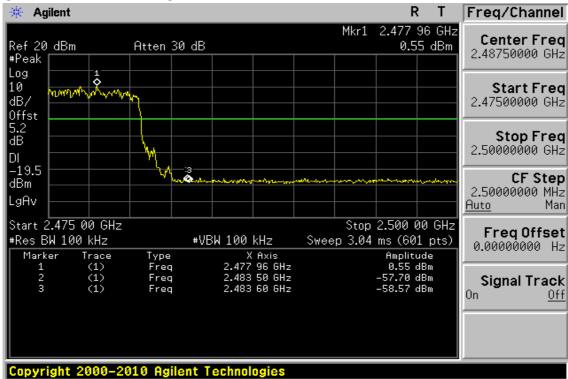




EDR Mode Band Edges Test Data CH-Low







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Radiated Emission: (EDR mode)

Operation Band Fundamental Frequency Operation Mode			:EDR :2402 MHz :Bandedge LOW		Test Date Temp./Humi. Engineer		:2013-04-10 :27 deg_C / 66 RH :Nick		
EUT Pol.		:H PLAN		Measurement A	ntenna Pol.	:VERTICAL			
	Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin	
		Mode Reading Leve		vel FS		@3m			
-	MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB	
	2390.00	Е	Average	29.99	2.12	32.11	54.00	-21.89	
	2390.00	Е	Peak	44.51	2.12	46.63	74.00	-27.37	
Operation Band Fundamental Frequency Operation Mode EUT Pol.		uency	:2402 MHz Ten :Bandedge LOW Eng		Test Date Temp./Humi. Engineer Measurement A	np./Humi.		:2013-04-10 :27 deg_C / 66 RH :Nick :HORIZONTAL	
	Freq.	Note	Detector Mode	Spectrum Reading Lev		Actual FS	Limit @3m	Margin	
	MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBµV/m	dBµV/m	dB	
	2390.00	Е	Average	32.32	2.74	35.06	54.00	-18.94	
	2390.00	Е	Peak	48.27	2.74	51.01	74.00	-22.99	

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

Factor(dB) = Antenna Factor($dB\mu V/m$) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

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

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

"---": denotes Noise Floor.

The trace on RE(radiation emission) plot is as colored blue, and the detection manner we've employed is peak detector.

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Operation Band Fundamental Frequency Operation Mode EUT Pol.			:EDR :2480 MHz :Bandedge HIGH :H PLAN		Test Date Temp./Humi. Engineer Measurement Antenna Pol.		:2013-04-10 :27 deg_C / 66 RH :Nick :VERTICAL	
	Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
			Mode	Reading Lev	vel	FS	@3m	
	MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
	2483.50	Е	Average	29.77	2.53	32.30	54.00	-21.70
	2483.50	Е	Peak	51.19	2.53	53.72	74.00	-20.28
Operation Band Fundamental Frequency Operation Mode EUT Pol.		:2480 MHz T :Bandedge HIGH E		Test Date Temp./Humi. Engineer Measurement Antenna Pol.		:2013-04-10 :27 deg_C / 66 RH :Nick :HORIZONTAL		
	Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
			Mode	Reading Lev	vel	FS	@3m	
	MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
	2483.50	Е	Average	29.71	3.56	33.27	54.00	-20.73
	2483.50	Е	Peak	51.50	3.56	55.06	74.00	-18.94

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

Factor(dB) = Antenna Factor($dB\mu V/m$) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

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

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

"---": denotes Noise Floor.

The trace on RE(radiation emission) plot is as colored blue, and the detection manner we've employed is peak detector.

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9. SPURIOUS EMISSION TEST

9.1. Standard Applicable:

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

9.2. Measurement Equipment Used:

9.2.1. Conducted Emission at antenna port:

Refer to section 7.2 for details.

9.2.2. Radiated emission:

Refer to section 8.2.2 for details.

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:

Refer to section 8.3.2 for details.

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9.4. Measurement Procedure: Radiated Emission:

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

Conducted Emission:

- 1. To connect Antenna Port of EUT to Spectrum.
- 2. Set RBW = 100K & VBW = 300K 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:

	$\mathbf{F}\mathbf{S} = \mathbf{K}\mathbf{A} + \mathbf{A}\mathbf{F} + \mathbf{C}\mathbf{L} - \mathbf{A}\mathbf{G}$	
Where	FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
	RA = Reading Amplitude	AG = Amplifier Gain
	AF = Antenna Factor	

$\mathbf{FS} =$	RA	+	AF	+	CL	- AG
FO –	INA	т		Т	\mathbf{U}	- AU

9.6. Measurement Result:

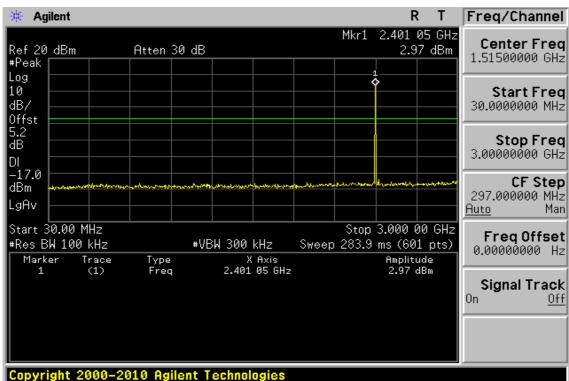
Note: Refer to next page spectrum analyzer data chart and tabular data sheets.

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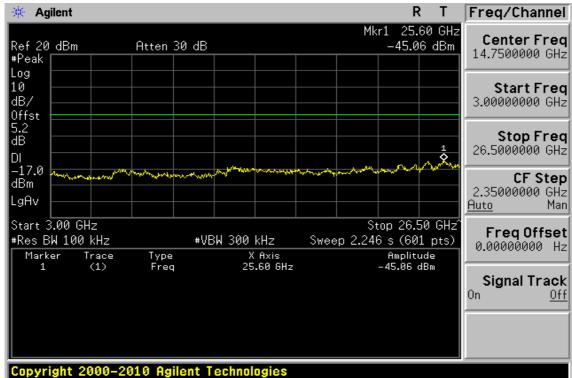
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Conducted Spurious Emission Measurement Result (BDR mode) Ch Low 30MHz – 3GHz



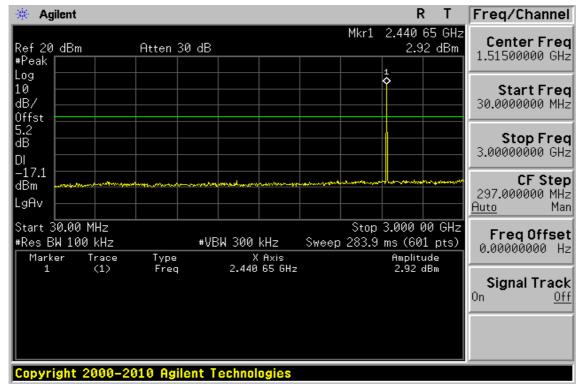


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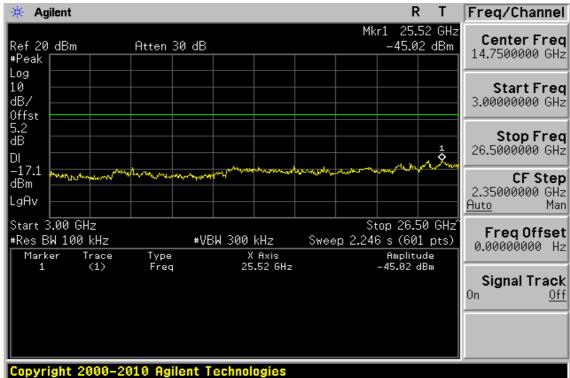
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Ch Mid 30MHz - 3GHz



Ch Mid 3GHz – 26.5GHz

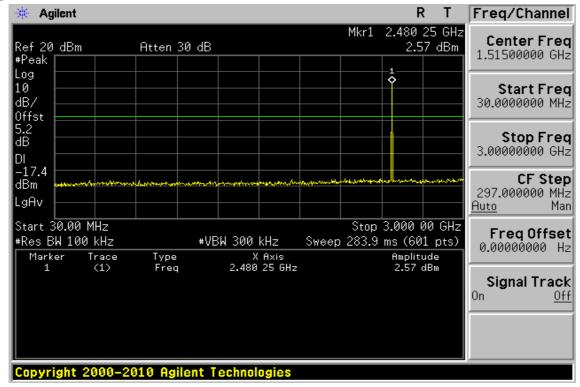


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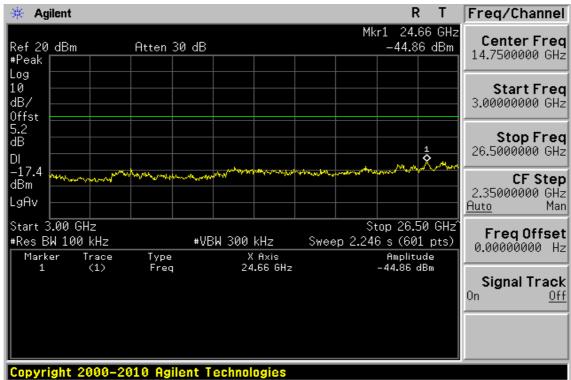
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Ch High 30MHz – 3GHz



Ch High 3GHz – 26.5GHz



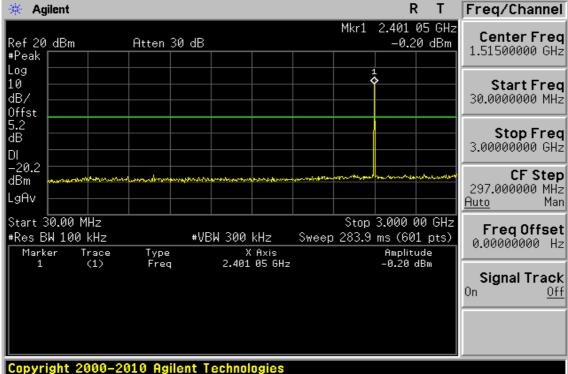
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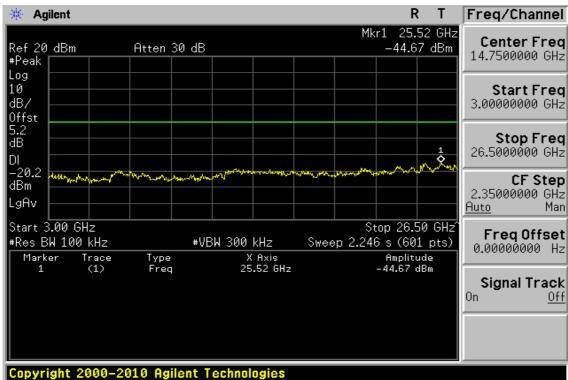


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Ch Low 3GHz – 26.5GHz

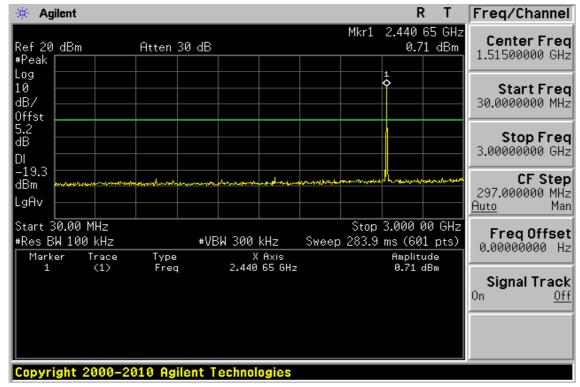


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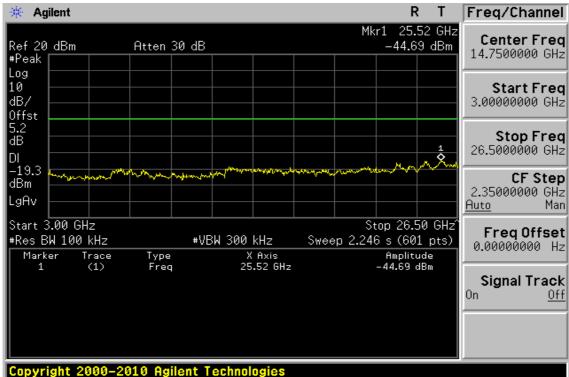
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Ch Mid 30MHz – 3GHz



Ch Mid 3GHz – 26.5GHz

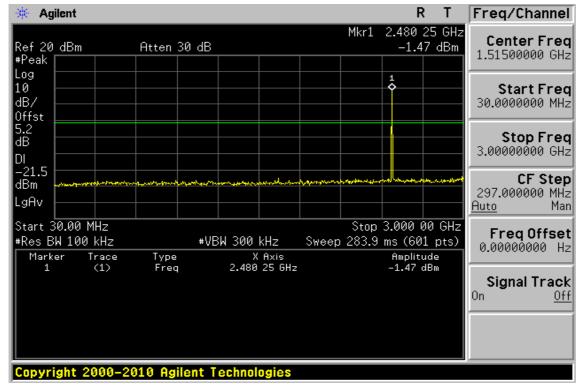


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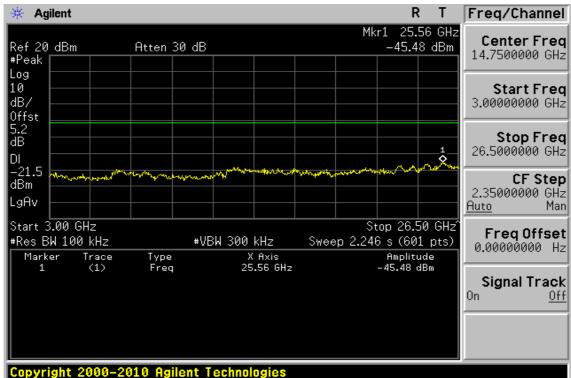
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Ch High 30MHz - 3GHz



Ch High 3GHz - 26.5GHz



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Radiated Spurious Emission Measurement Result (Worst case EDR mode)

Operation Band	:EDR	Test Date	:2013-04-10
Fundamental Frequency	:2402 MHz	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX LOW	Engineer	:Nick
EUT Pol.	:H PLAN	Measurement Antenna Pol.	:VERTICAL

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

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

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

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

"---": denotes Noise Floor.

Freq.	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
110.51	S	Peak	47.66	-15.69	31.97	43.50	-11.53
232.73	S	Peak	48.67	-14.42	34.25	46.00	-11.75
419.94	S	Peak	38.17	-10.65	27.52	46.00	-18.48
630.43	S	Peak	36.51	-6.92	29.59	46.00	-16.41
716.76	S	Peak	36.57	-5.48	31.09	46.00	-14.91
800.18	S	Peak	37.04	-4.19	32.85	46.00	-13.15
4804.00	Н	Average	28.96	6.99	35.95	54.00	-18.05
4804.00	Н	Peak	38.03	6.99	45.02	74.00	-28.98
7206.00	Н						
9608.00	Н						
12010.00	Н						
14412.00	Н						
16814.00	Н						
19216.00	Н						
21618.00	Н						

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Operation Band	:EDR	Test Date	:2013-04-10
Fundamental Frequency	:2402 MHz	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX LOW	Engineer	:Nick
EUT Pol.	:H PLAN	Measurement Antenna Pol.	:HORIZONTAL

Actual FS($dB\mu V/m$) = SPA. Reading level($dB\mu V$) + Factor(dB) $Factor(dB) = Antenna Factor(dB\mu V/m) + Cable Loss(dB) - Pre_Amplifier Gain(dB)$ "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency. Note : "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
163.86	S	Peak	48.31	-12.61	35.70	43.50	-7.80
243.40	S	Peak	53.74	-14.13	39.61	46.00	-6.39
360.77	S	Peak	38.12	-11.53	26.59	46.00	-19.41
530.52	S	Peak	32.66	-8.98	23.68	46.00	-22.32
713.85	S	Peak	36.15	-5.53	30.62	46.00	-15.38
800.18	S	Peak	36.24	-4.19	32.05	46.00	-13.95
4804.00	Н	Average	29.36	7.03	36.39	54.00	-17.61
4804.00	Н	Peak	40.41	7.03	47.44	74.00	-26.56
7206.00	Н						
9608.00	Н						
12010.00	Н						
14412.00	Н						
16814.00	Н						
19216.00	Н						
21618.00	Н						
24020.00	Н						

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Operation Band	:EDR	Test Date	:2013-04-10
Fundamental Frequency	:2441 MHz	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX MID	Engineer	:Nick
EUT Pol.	:H PLAN	Measurement Antenna Pol.	:VERTICAL

Actual FS($dB\mu V/m$) = SPA. Reading level($dB\mu V$) + Factor(dB) $Factor(dB) = Antenna Factor(dB\mu V/m) + Cable Loss(dB) - Pre_Amplifier Gain(dB)$ "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency. Note : "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
107.60	S	Peak	48.05	-16.01	32.04	43.50	-11.46
233.70	S	Peak	48.78	-14.40	34.38	46.00	-11.62
419.94	S	Peak	37.61	-10.65	26.96	46.00	-19.04
533.43	S	Peak	37.84	-8.92	28.92	46.00	-17.08
630.43	S	Peak	37.07	-6.92	30.15	46.00	-15.85
800.18	S	Peak	36.66	-4.19	32.47	46.00	-13.53
4882.00	Н	Average	28.31	7.16	35.47	54.00	-18.53
4882.00	Н	Peak	37.83	7.16	44.99	74.00	-29.01
7323.00	Н						
9764.00	Н						
12205.00	Н						
14646.00	Н						
17087.00	Н						
19528.00	Н						
21969.00	Н						
24410.00	Н						

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Operation Band	:EDR	Test Date	:2013-04-10
Fundamental Frequency	:2441 MHz	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX MID	Engineer	:Nick
EUT Pol.	:H PLAN	Measurement Antenna Pol.	:HORIZONTAL

Actual FS($dB\mu V/m$) = SPA. Reading level($dB\mu V$) + Factor(dB) $Factor(dB) = Antenna Factor(dB\mu V/m) + Cable Loss(dB) - Pre_Amplifier Gain(dB)$ "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency. Note : "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
164.83	S	Peak	48.32	-12.69	35.63	43.50	-7.87
243.40	S	Peak	53.41	-14.13	39.28	46.00	-6.72
359.80	S	Peak	39.53	-11.54	27.99	46.00	-18.01
533.43	S	Peak	35.33	-8.92	26.41	46.00	-19.59
715.79	S	Peak	36.91	-5.50	31.41	46.00	-14.59
800.18	S	Peak	36.86	-4.19	32.67	46.00	-13.33
4882.00	Н	Average	29.62	7.10	36.72	54.00	-17.28
4882.00	Н	Peak	41.24	7.10	48.34	74.00	-25.66
7323.00	Н						
9764.00	Н						
12205.00	Н						
14646.00	Н						
17087.00	Н						
19528.00	Н						
21969.00	Н						
24410.00	Н						

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Operation Band	:EDR	Test Date	:2013-04-10
Fundamental Frequency	:2480 MHz	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX HIGH	Engineer	:Nick
EUT Pol.	:H PLAN	Measurement Antenna Pol.	:VERTICAL

Actual FS($dB\mu V/m$) = SPA. Reading level($dB\mu V$) + Factor(dB) $Factor(dB) = Antenna Factor(dB\mu V/m) + Cable Loss(dB) - Pre_Amplifier Gain(dB)$ "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency. Note : "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
243.40	S	Peak	48.62	-14.13	34.49	46.00	-11.51
419.94	S	Peak	37.58	-10.65	26.93	46.00	-19.07
530.52	S	Peak	37.12	-8.98	28.14	46.00	-17.86
630.43	S	Peak	36.42	-6.92	29.50	46.00	-16.50
715.79	S	Peak	37.44	-5.50	31.94	46.00	-14.06
800.18	S	Peak	34.87	-4.19	30.68	46.00	-15.32
4960.00	S	Average	35.62	7.17	42.79	54.00	-11.21
4960.00	S	Peak	45.64	7.17	52.81	74.00	-21.19
7440.00	Н						
9920.00	Н						
12400.00	Н						
14880.00	Н						
17360.00	Н						
19840.00	Н						
22320.00	Н						
24800.00	Н						

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Operation Band	:EDR	Test Date	:2013-04-10
Fundamental Frequency	:2480 MHz	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX HIGH	Engineer	:Nick
EUT Pol.	:H PLAN	Measurement Antenna Pol.	:HORIZONTAL

Actual FS($dB\mu V/m$) = SPA. Reading level($dB\mu V$) + Factor(dB) Factor(dB) = Antenna Factor($dB\mu V/m$) + Cable Loss(dB) – Pre_Amplifier Gain(dB) "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency. Note : "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
165.80	S	Peak	48.22	-12.77	35.45	43.50	-8.05
243.40	S	Peak	53.39	-14.13	39.26	46.00	-6.74
362.71	S	Peak	38.80	-11.51	27.29	46.00	-18.71
530.52	S	Peak	32.87	-8.98	23.89	46.00	-22.11
717.73	S	Peak	36.89	-5.46	31.43	46.00	-14.57
800.18	S	Peak	35.53	-4.19	31.34	46.00	-14.66
4960.00	S	Average	32.26	7.02	39.28	54.00	-14.72
4960.00	S	Peak	45.19	7.02	52.21	74.00	-21.79
7440.00	Н						
9920.00	Н						
12400.00	Н						
14880.00	Н						
17360.00	Н						
19840.00	Н						
22320.00	Н						
24800.00	Н						

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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 20dB bandwidth of the hopping channel, whichever is greater.

10.2. Measurement Equipment Used:

Refer to section 7.2 for details.

10.3. Test Set-up:

Refer to section 7.3 for details.

10.4. Measurement Procedure:

- 1. Place the EUT on the table and set it in transmitting mode.
- 2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
- 3. Set center frequency of spectrum analyzer = middle of hopping channel.
- 4. Set the spectrum analyzer as RBW, VBW=100KHz, Adjust Span to 3.0 MHz, Sweep = auto.
- 5. Max hold. Mark 3 Peaks of hopping channel and record the 3 peaks frequency.

10.5. Measurement Result:

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

Note: Refer to next page for plots.

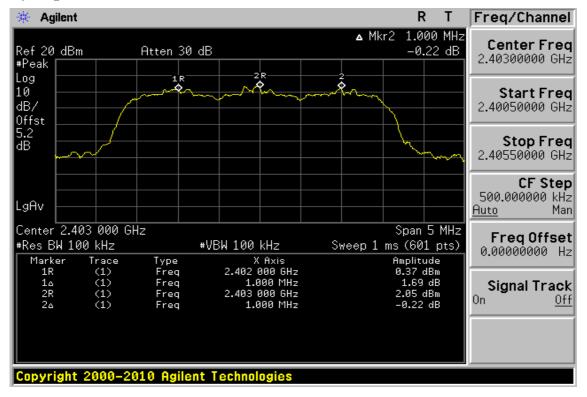
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Frequency Separation Test Data



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11. NUMBER OF HOPPING FREQUENCY

11.1. Standard Applicable:

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

11.2. Measurement Equipment Used:

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

11.5. Measurement Result:

Note: Refer to next page for plots.

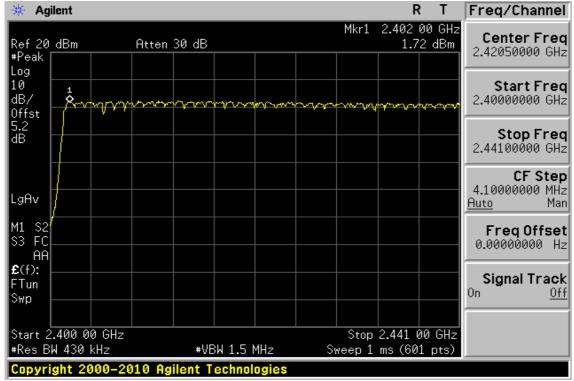
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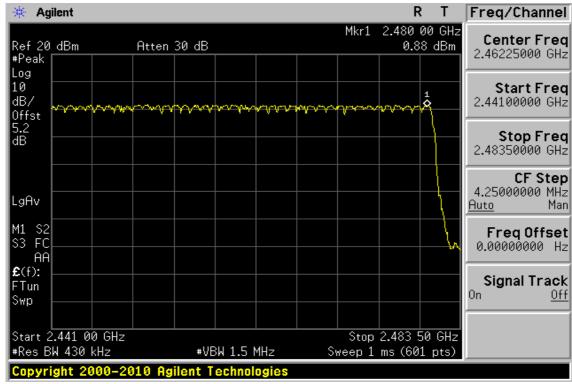


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Channel Number 2.4 GHz – 2.441GHz



2.441 GHz – 2.4835GHz



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12. TIME OF OCCUPANCY (DWELL TIME)

12.1. Standard Applicable:

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

12.2. Measurement Equipment Used:

Refer to section 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 center frequency of spectrum analyzer = operating frequency.
- 4. Set the spectrum analyzer as RBW=1MHz,VBW=3MHz, Span = 0Hz, Adjust Sweep = 15ms.
- 5. Repeat above procedures until all frequency measured were complete.

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12.5. Measurement Result:

A period time = $0.4 \text{ (ms)} * 79 = 31.6 \text{ (s)}$					
CH Low:	3DH1 time slot = 0.397 (ms) * (1600/(2*79)) * 31.6 = 127.04 (ms)				
	3DH3 time slot = 1.633 (ms) * (1600/(4*79)) * 31.6 = 261.28 (ms)				
	3DH5 time slot = 2.883 (ms) * (1600/(6*79)) * 31.6 = 307.52 (ms)				
CH Mid:	3DH1 time slot = 0.397 (ms) * (1600/(2*79)) * 31.6 = 127.04 (ms)				
	3DH3 time slot = 1.633 (ms) * (1600/(4*79)) * 31.6 = 261.28 (ms)				
	3DH5 time slot = 2.883 (ms) * (1600/(6*79)) * 31.6 = 307.52 (ms)				
CH High:	3DH1 time slot = $0.397 \text{ (ms)} * (1600/(2*79)) * 31.6 = 127.04 \text{ (ms)}$				
	3DH3 time slot = 1.633 (ms) * (1600/(4*79)) * 31.6 = 261.28 (ms)				
	3DH5 time slot = 2.883 (ms) * (1600/(6*79)) * 31.6 = 307.52 (ms)				

Note: Refer to next page for plots.

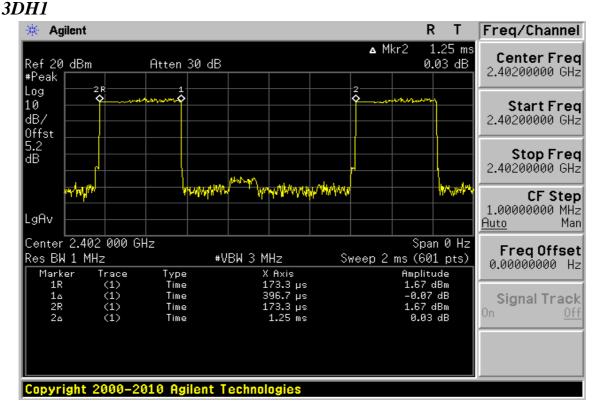
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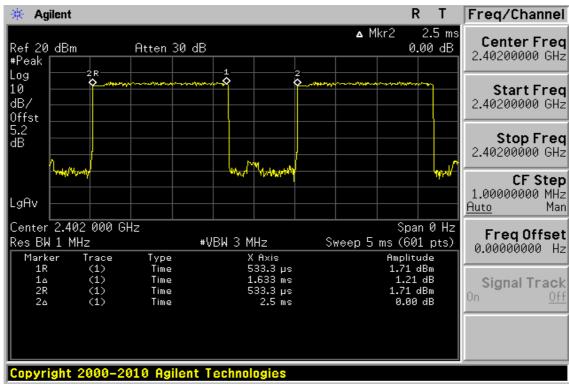


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CH-Low



3DH3

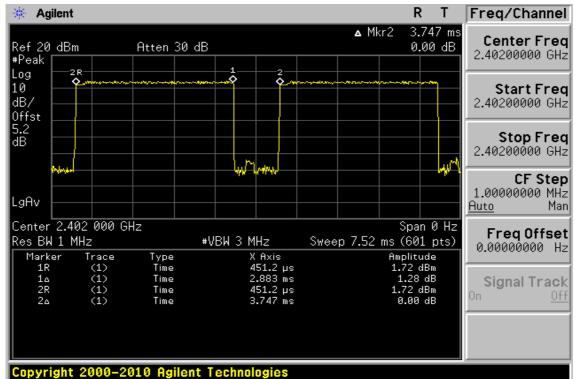


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3DH5



CH-Mid

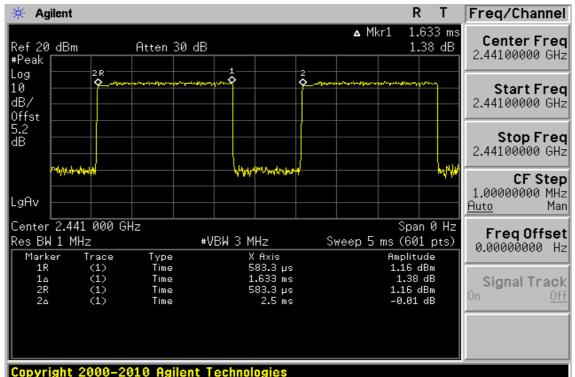
3DH1 楽・ R Freq/Channel Agilent т ▲ Mkr2 1.25 ms Center Freq Ref 20 dBm Atten 30 dB 0.00 dB 2.44100000 GHz #Peak Log 2 R Ô 0 10 Start Freq dB/ 2.44100000 GHz Offst 5.2 dB Stop Freq 2.44100000 GHz nternanter (hallingh dwely? **CF** Step 1.00000000 MHz LgAv Man <u>Auto</u> Center 2.441 000 GHz Span 0 Hz Freq Offset 0.00000000 Hz Res BW 1 MHz #VBW 3 MHz Sweep 2 ms (601 pts) Type Time Marker Amplitude Trace X Axis 136.7 µs 396.7 µs 136.7 µs 1R (1)1.15 dBm 1∆ 2R (1)Time -0.14 dB Signal Track 1.15 dBm (1)Time 2۵ (1)1.25 ms 0.00 dB Time Copyright 2000-2010 Agilent Technologies

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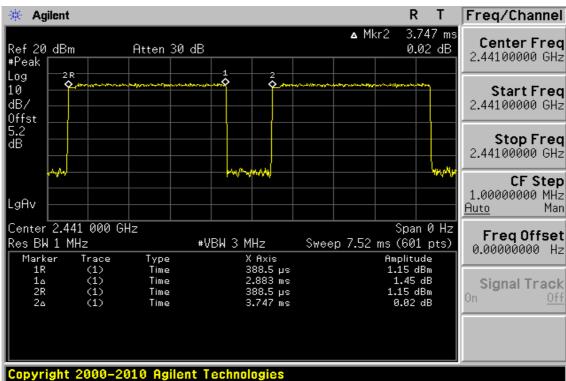
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3DH3



3DH5



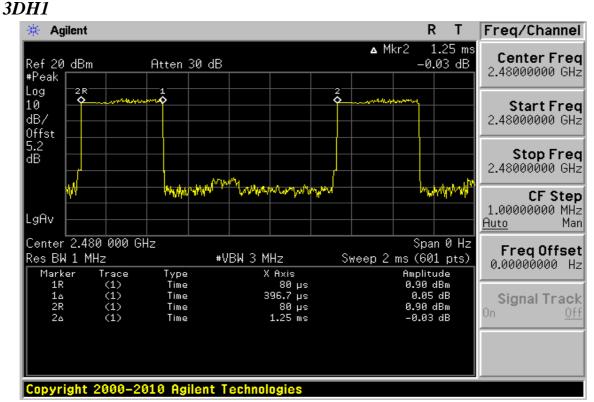
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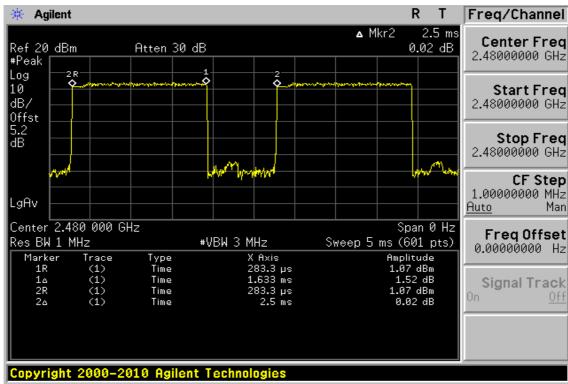


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CH-High



3DH3

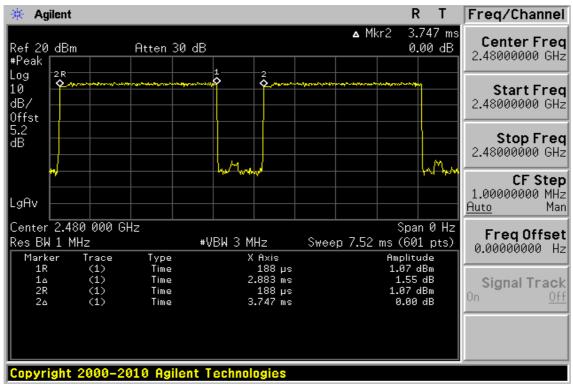


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3DH5



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13. 20dB Bandwidth

13.1. Standard Applicable:

According to \$15.247(a)(1), for frequency hopping systems operating in the 2400MHz-2483.5 MHz no limit for 20dB bandwidth.

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 the spectrum analyzer as $RBW \ge 1\%$ of Bandwidth. VBW $\ge RBW$, Span= 3MHz, Sweep=auto
- 4. Mark the peak frequency and –20dB (upper and lower) frequency.
- 5. Repeat above procedures until all frequency measured were complete.

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13.5. Measurement Result:

20dB Bandwidth:

BDR mode (GFSK):

СН	Bandwidth	
	(kHz)	
Lower	886.722	
Mid	919.604	
Higher	886.745	

EDR mode ($\pi/4DQPSK$):

СН	Bandwidth	2/3 Bandwidth
	(MHz)	(MHz)
Lower	1.327	0.885
Mid	1.325	0.883
Higher	1.239	0.826

EDR mode (8DPSK):

СН	Bandwidth	2/3 Bandwidth
	(MHz)	(MHz)
Lower	1.311	0.874
Mid	1.309	0.873
Higher	1.323	0.882

Note: Refer to next page for plots.

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BDR Mode (GFSK) 20dB Bandwidth Test Data CH-Low



20dB Bandwidth Test Data CH-Mid

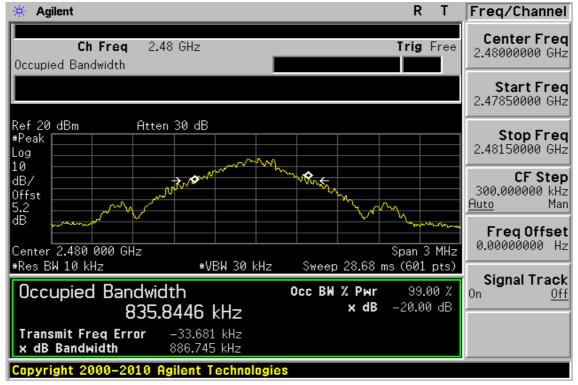


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20dB Bandwidth Test Data CH-High

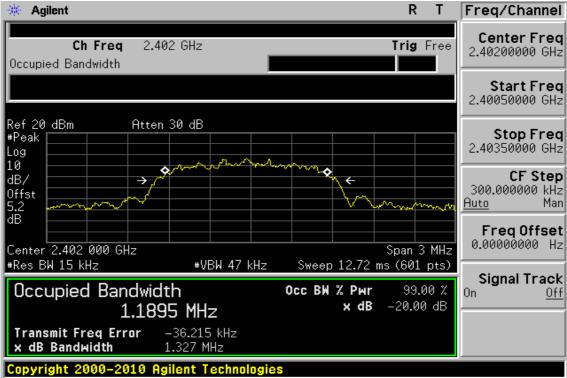


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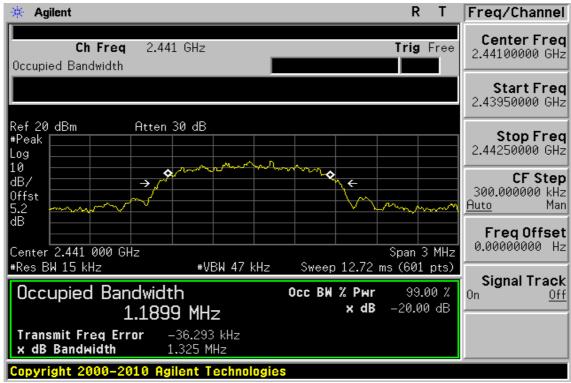
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EDR Mode (π/4DQPSK) 20dB Bandwidth Test Data CH-Low



20dB Bandwidth Test Data CH-Mid



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20dB Bandwidth Test Data CH-High

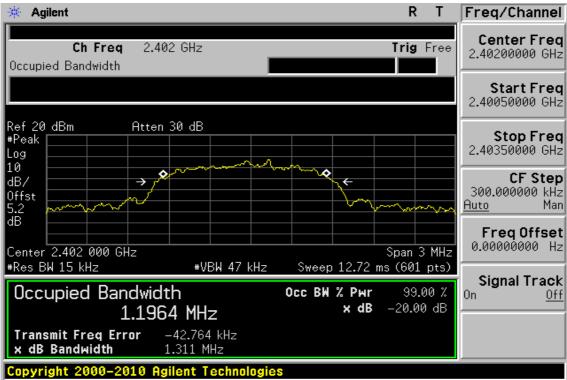


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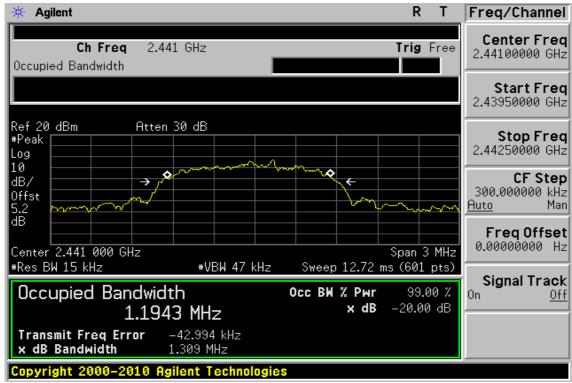
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EDR Mode (8DPSK) 20dB Bandwidth Test Data CH-Low



20dB Bandwidth Test Data CH-Mid

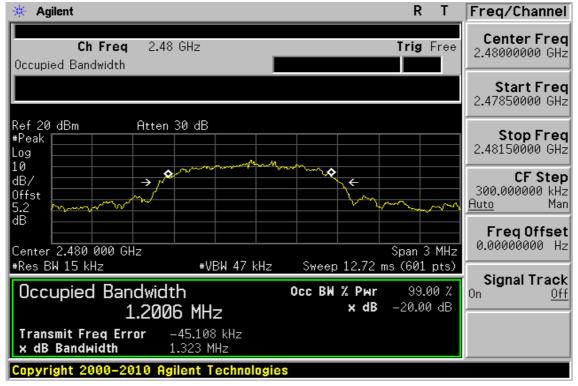


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20dB Bandwidth Test Data CH-High



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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 2.88dBi, 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	Electric Field	Magnetic Field	Power Density	Averaging Time	
(MHz)	Strength (V/m)	Strength (A/m)	(mW/cm^2)	(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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15.2. Maximum Permissible Exposure (MPE) Evaluation:

BDR mode (GFSK):

Frequency (MHz)	Reading Power (dBm)	Output Power (dBm)	Output Power (W)	Limit (W)
2402.00	3.45	3.45	0.00221	1
2441.00	3.01	3.01	0.00200	1
2480.00	2.98	2.98	0.00199	1

EDR mode (π /4DQPSK):

Frequency (MHz)	Reading Power (dBm)	Output Power (dBm)	Output Power (W)	Limit (W)
2402.00	3.77	3.77	0.00238	0.125
2441.00	3.43	3.43	0.00220	0.125
2480.00	3.53	3.53	0.00225	0.125

EDR mode (8DPSK):

Frequency (MHz)	Reading Power (dBm)	Output Power (dBm)	Output Power (W)	Limit (W)
2402.00	4.31	4.31	0.00270	0.125
2441.00	4.02	4.02	0.00252	0.125
2480.00	4.16	4.16	0.00261	0.125

Offset: 5.2dB

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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 π R² 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:	4.31	(dBm)
Maximum peak output power at antenna input terminal:	2.697739432	(mW)
Duty cycle:	77	(%)
Maximum Pav :	2.077259363	(mW)
Antenna gain (typical):	2.88	(dBi)
Maximum antenna gain:	1.940885878	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	2402	(MHz)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm2)
Power density at predication frequency at 20 (cm)	0.0008025	(mW/cm^2)

Measurement Result

The predicted power density level at 20 cm is $0.0008025 \text{ mW/cm}^2$. This is below the uncontrolled exposure limit of 1 mW/cm² at 2402MHz.

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.

- End of Report -

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