

ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART C REQUIREMENT

OF

Product Name: EDA (Enterprise Digital Assistant)
Brand Name: N/A
Model Name: SP500
Model Difference: N/A
FCC ID: PU5-SP500
Report No.: EH/2008/50027
Issue Date: Jun. 23, 2008
FCC Rule Part: §15.247
Prepared for: Wistron Corporation
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Prepared by: SGS Taiwan Ltd.
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VERIFICATION OF COMPLIANCE

Applicant: Wistron Corporation
21F,88,Sec.1,Hsin Tai Wu Rd., Hsichih, Taipei Hsien 221,Taiwan
R.O.C.

Equipment Under Test: EDA (Enterprise Digital Assistant)

Brand Name: N/A

Model No.: SP500

Model Difference: N/A

FCC ID: PU5-SP500

File Number: EH/2008/50027

Date of test: Jun. 05, 2008 ~ Jun. 18, 2008

Date of EUT Received: Jun. 05, 2008

We hereby certify that:

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

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

Test By:		Date	Jun. 23, 2008
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	Sky Wang/Asst. Supervisor		
Prepared By:		Date	Jun. 23, 2008
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	Elisa Chen/Asst. Supervisor		
Approved By:		Date	Jun. 23, 2008
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	Vincent Su / Manager		

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Version

Version No.	Date
00	Jun. 23, 2008

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1. GENERAL INFORMATION

Product Name:	EDA (Enterprise Digital Assistant)	
Brand Name:	N/A	
Model Name:	SP500	
Model Difference:	N/A	
Data Cable (USB):	One provided, Model: N/A	
Power Supply	3.7 Vdc re-chargeable battery or 5Vdc by AC/DC power adapter	
	Battery:	Model: SP500; Supplier: SAY
	Adapter:	Model: KWT05A12CN5773

GSM:

Cellular Phone Standards Frequency Range and Power	GSM/GPRS 850, class 12	824 MHz– 849MHz	33 dBm
	EDGE 850	824 MHz– 849MHz	27 dBm
	GSM 900	880 MHz– 915MHz	33 dBm
	GSM 1800	1710MHz-1785MHz	30 dBm
	GSM/GPRS 1900, class 12	1850MHz – 1910MHz	30 dBm
	EDGE 1900	1850MHz – 1910MHz	26 dBm
final amplifier voltage and current information		DC voltage (V)	DC current (mA)
	GSM 850	5Vdc	470
	GSM 1900	5Vdc	460
Type of Emission	GSM: 300KGXW EDGE: 300KG7W		
IMEI	011441000010000		

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WLAN:

Frequency Range	2412 – 2462 MHz
Channel number	11 channels
Rated Power	802.11 b: 15.45 dBm (Peak) 802.11 g: 12.94 dBm (Peak)
Modulation Technology	DSSS, OFDM
Modulation type	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM
Transition Rate:	802.11 b: 1/2/5.5/11 Mbps; 802.11 g: 6/9/12/18/24/36/48/54 Mbps
Antenna Designation	Metal Antenna, 1.35 dBi
Type of Emission	16M5M7D

The EUT is compliance with IEEE 802.11 b/g Standard.

Bluetooth:

Frequency Range	2402 – 2480MHz
Channel number	79 channels
Rated Power	2.13Bm (Peak)
Modulation type	Frequency Hopping Spread Spectrum (FHSS) (GFSK)
Antenna Designation	Metal Antenna, 2.08dBi
Type of Emission	872KF1D

The EUT is compliance with Bluetooth 2.0 Standard.

This report applies for Bluetooth.

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

This submittal(s) (test report) is intended for FCC ID: **PU5-SP500** filing to comply with Section 15.247 of the FCC Part 15, Subpart C Rules. The composite system (digital device) is compliance with Subpart B is authorized under a Doc procedure.

1.2. Test Methodology

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

1.3. Test Facility

The measurement facilities used to collect the 3m Radiated Emission and AC power line conducted data are located on the address of SGS Taiwan Ltd. 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-1

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.

1.4. Special Accessories

Not available for this EUT intended for grant.

1.5. Equipment Modifications

Not available for this EUT intended for grant.

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 according to the requirements in Section 8 and 13 of ANSI C63.4-2003.

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2.4. Configuration of Tested System

Fig. 2-1 AC Power line and Radiated Emission Configuration

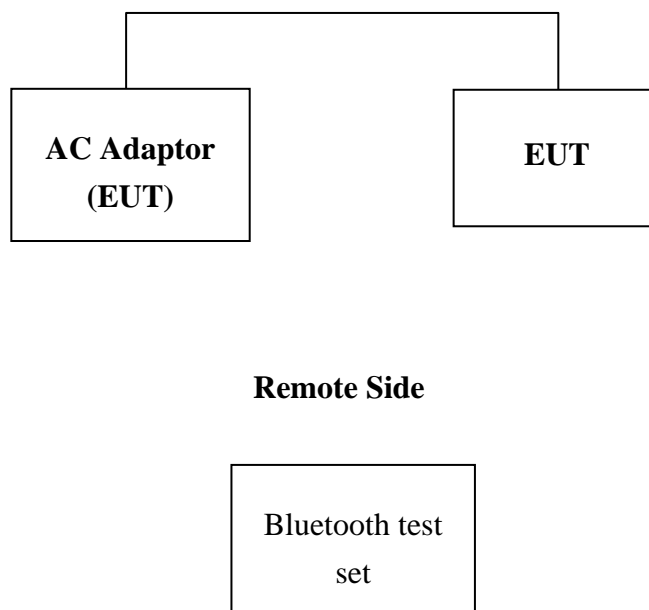


Table 2-1 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/ Type No.	Series No.	Data Cable	Power Cord
1	Bluetooth test set	Anritsu	MT8852A	6K00001436	shielded	Un-shielded

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3. SUMMARY OF TEST RESULTS

FCC Rules	Description Of Test	Result
§15.207(a)	Conducted Emission	Compliant
§15.247(b)(1)	Peak Output Power	Compliant
§15.247(a)	20dB Bandwidth	No Limit
§15.247I	100 KHz Bandwidth Of Frequency Band Edges	Compliant
§15.209(a) (f)	Spurious Emission	Compliant
§15.247(a)(1)	Frequency Separation	Compliant
§15.247(a)(1)(iii)	Number of hopping frequency	Compliant
§15.247(a)(1)(iii)	Time of Occupancy	Compliant
§15.247	Peak Power Density	Compliant
§15.203, §15.247(b)(4)(i)	Antenna Requirement	Compliant

4. DESCRIPTION OF TEST MODES

The EUT has been tested under operating condition.

Test program used to control the EUT for staying in continuous transmitting and receiving mode is programmed.

Channel Low, 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.

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5. CONDUCTED EMISSION TEST

5.1. Standard Applicable

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

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

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 110Vac/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.
EMC Analyzer	HP	8594EM	3624A00203	09/02/2007	09/03/2008
EMI Test Receiver	R&S	ESCS30	828985/004	06/09/2008	06/10/2009
Transient Limiter	HP	11947A	3107A02062	09/02/2007	09/03/2008
LISN	Rolf-Heine	NNB-2/16Z	99012	12/31/2007	12/30/2008
LISN	Rolf-Heine	NNB-2/16Z	99013	01/10/2008	01/09/2009
Coaxial Cables	FCC	FCC-LISN-50/250-25-2-01	04034	01/11/2008	01/10/2009

5.5. Measurement Result

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

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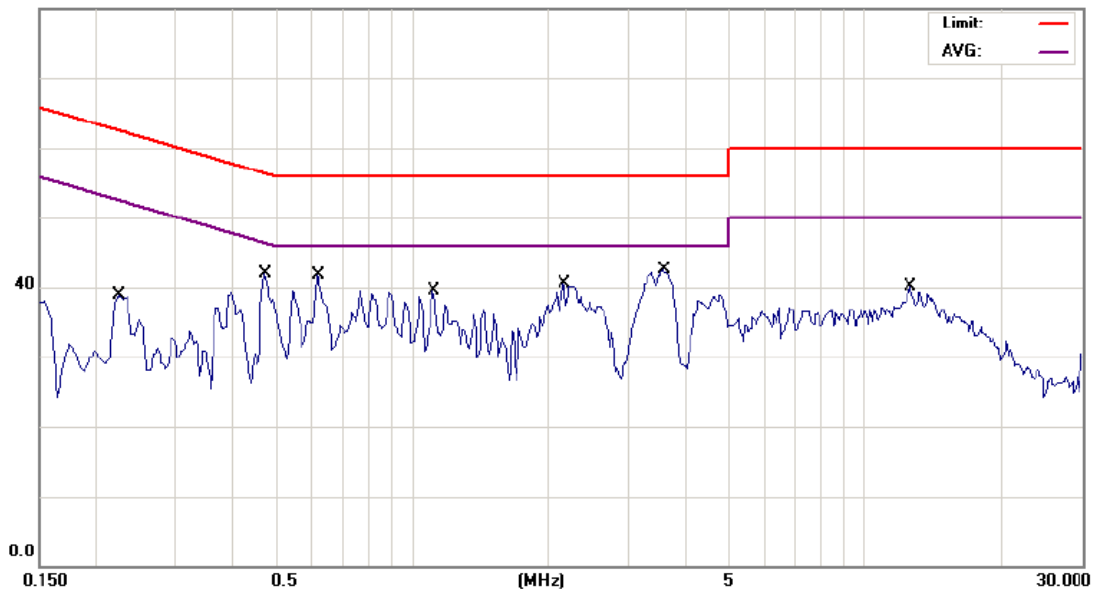
AC POWER LINE CONDUCTED EMISSION TEST DATA

Operation Mode:	Bluetooth Operating			Test Date:	Jun. 08, 2008
Temperature:	26 °C	Humidity:	58%	Test By:	Sky

Conducted Emission Measurement

Time: 下午 03:22:59

80.0 dBuV



Site SGS CONDUCTED #1

Phase: L1

Temperature: 26 °C

Limit: CISPR22 Class B Conduction(QP)

Power: AC 120V/60Hz

Humidity: 58 %

EUT: Mobile Phone

Distance:

Air Pressure: hpa

M/N: SP500

Note: Bluetooth operation +Charger mode

No.	Mk.	Freq. MHz	Reading Level dBuV	Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.2250	38.72	0.15	38.87	62.63	-23.76	QP	
2		0.4750	41.79	0.07	41.86	56.43	-14.57	QP	
3		0.6200	41.61	0.06	41.67	56.00	-14.33	QP	
4		1.1150	39.53	0.04	39.57	56.00	-16.43	QP	
5		2.1650	40.47	0.04	40.51	56.00	-15.49	QP	
6	*	3.5900	42.47	0.05	42.52	56.00	-13.48	QP	
7		12.6200	40.00	0.12	40.12	60.00	-19.88	QP	

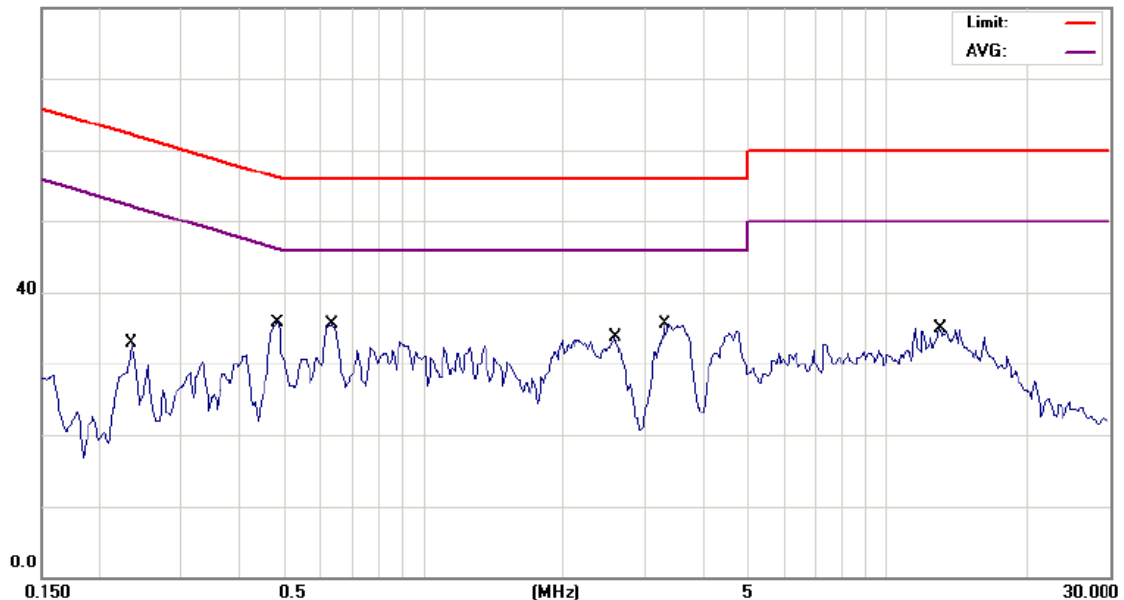
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Conducted Emission Measurement

下午 03:26:21

80.0 dBuV



Site SGS CONDUCTED #1

Phase: N

Temperature: 26 °C

Limit: CISPR22 Class B Conduction(QP)

Power: AC 120V/60Hz

Humidity: 58 %

EUT: Mobile Phone

Distance:

Air Pressure: hpa

M/N: SP500

Note: Bluetooth operation +Charger mode

No.	Mk.	Freq. MHz	Reading Level dBuV	Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.2350	32.82	0.13	32.95	62.27	-29.32	QP	
2	*	0.4850	35.74	0.05	35.79	56.25	-20.46	QP	
3		0.6350	35.48	0.04	35.52	56.00	-20.48	QP	
4		2.5850	33.74	0.03	33.77	56.00	-22.23	QP	
5		3.3200	35.49	0.04	35.53	56.00	-20.47	QP	
6		13.0000	34.77	0.22	34.99	60.00	-25.01	QP	

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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.

6.2. 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. (Channel power function, RBW, VBW = 1MHz)
3. Record the max. reading.
4. Repeat above procedures until all frequency measured were complete.

6.3. Measurement Result

Frequency (MHz)	Reading Power (dBm)	Cable Loss	Output Power (dBm)	Output Power (W)	Limit (W)
2402.00	1.93	0.20	2.13	0.00163	1
2441.00	0.42	0.20	0.62	0.00115	1
2480.00	-1.02	0.20	-0.82	0.00083	1

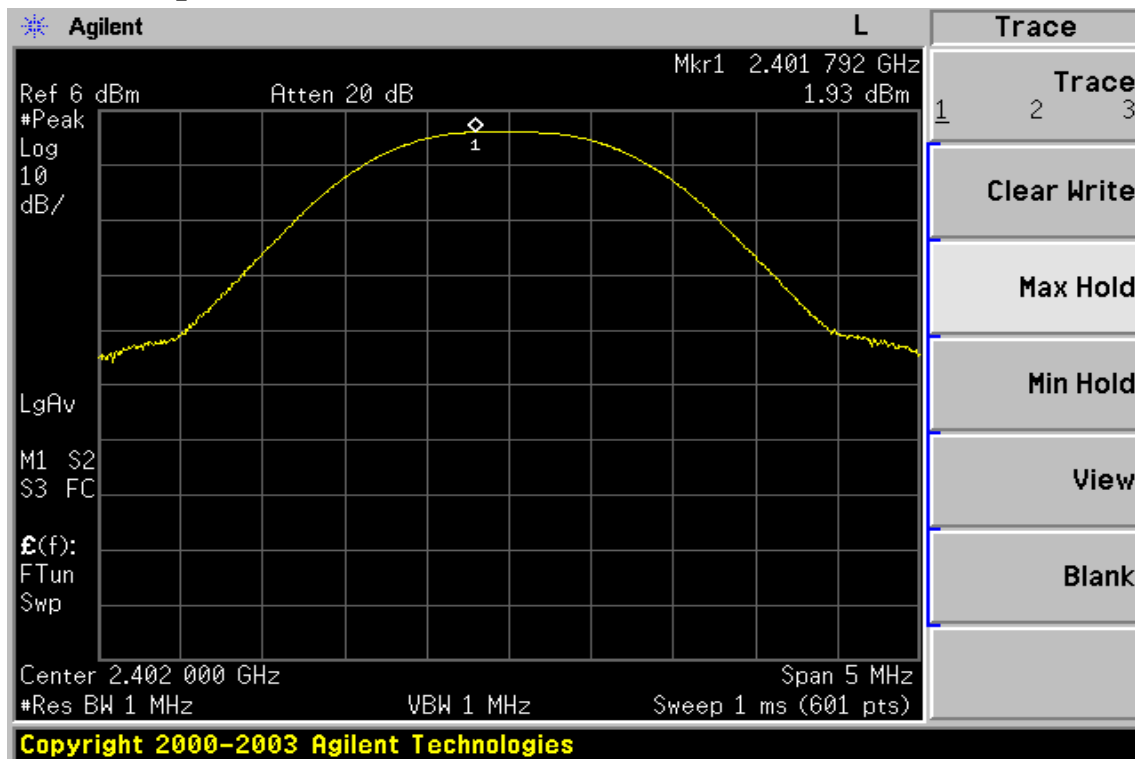
6.4. Measurement Equipment Used:

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Agilent	E4446A	MY43360126	04/27/2008	04/27/2009
Spectrum Analyzer	Agilent	E7405A	US41160416	07/04/2007	07/03/2008
Low Loss Cable	HUBER+SUHNER	SUCOFLEX 104PEA	N/A	N/A	N/A
Attenuator	Mini-Circuit	BW-S6W5	N/A	01/05/2008	01/04/2009

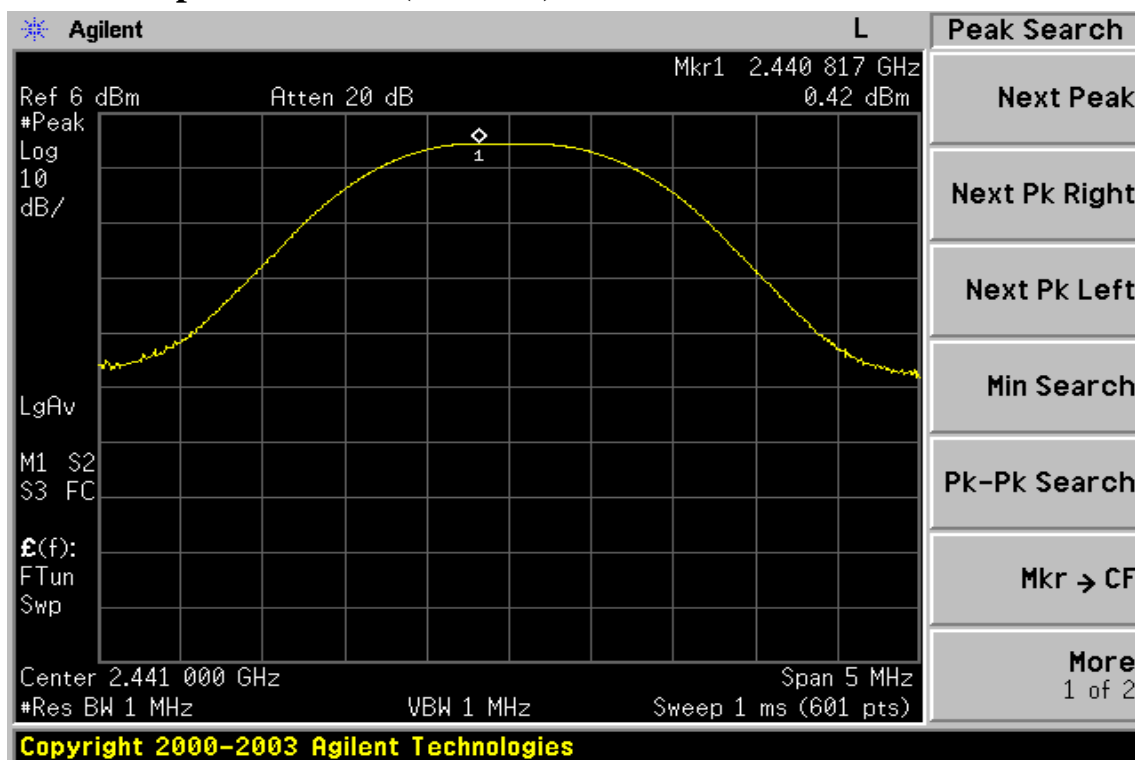
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Peak Power Output Data Plot (CH Low)



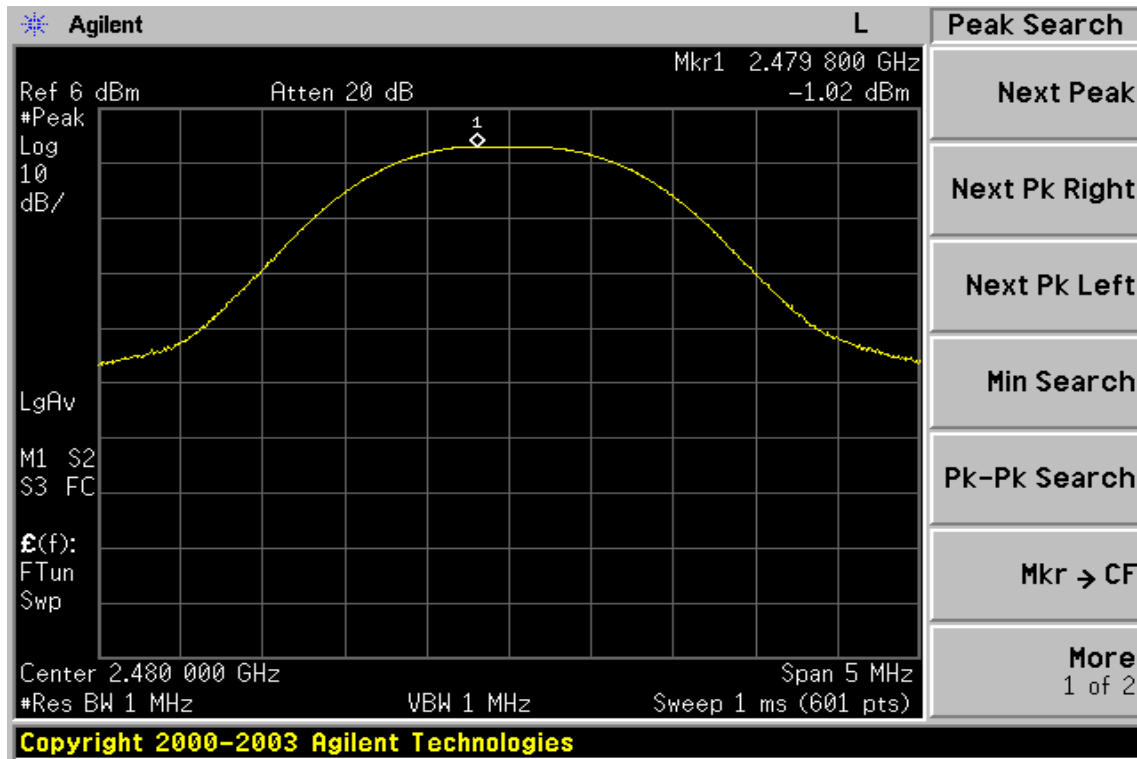
Peak Power Output Data Plot (CH Mid)



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Peak Power Output Data Plot (CH High)



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7. 20dB BAND WIDTH

7.1. Standard Applicable

For frequency hopping systems operating in the 2400MHz-2483.5 MHz no limit for 20dB bandwidth.

7.2. Measurement Procedure

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

7.3. Measurement Result

CH	Bandwidth (kHz)
Lower	935.370
Mid	939.692
Higher	938.093

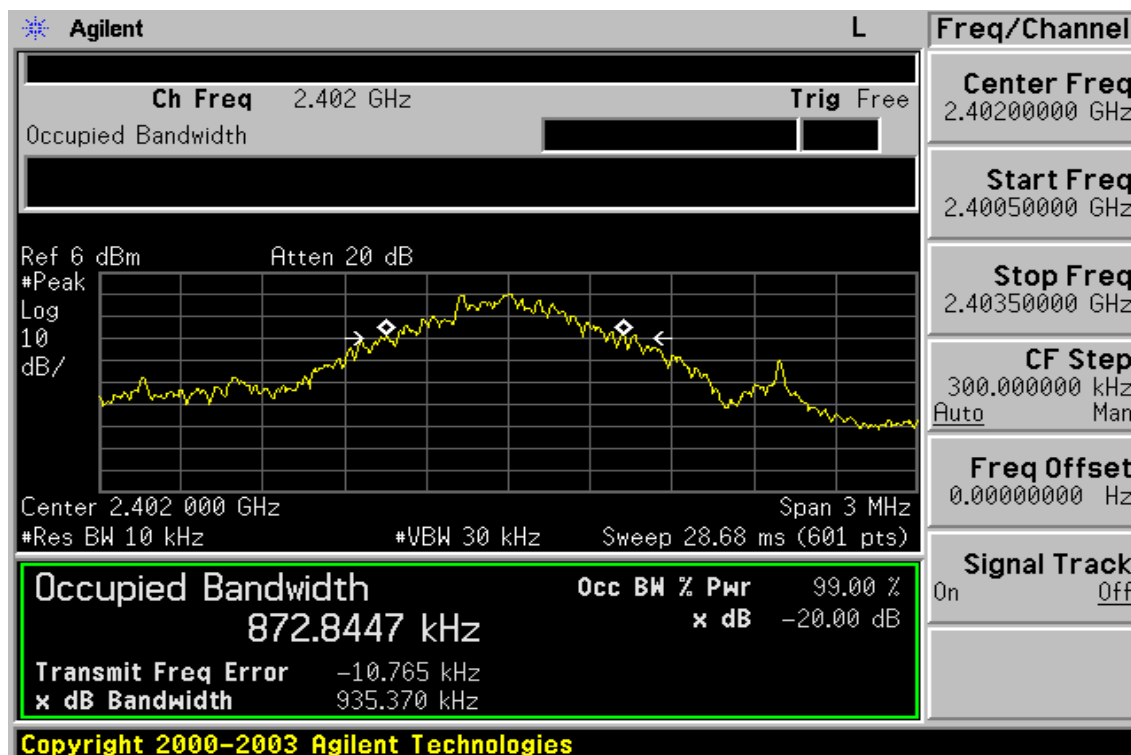
7.4. Measurement Equipment Used:

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Agilent	E4446A	MY43360126	04/27/2008	04/27/2009
Spectrum Analyzer	Agilent	E7405A	US41160416	07/04/2007	07/03/2008
Low Loss Cable	HUBER+SUHNER	SUCOFLEX 104PEA	N/A	N/A	N/A
Attenuator	Mini-Circuit	BW-S6W5	N/A	01/05/2008	01/04/2009

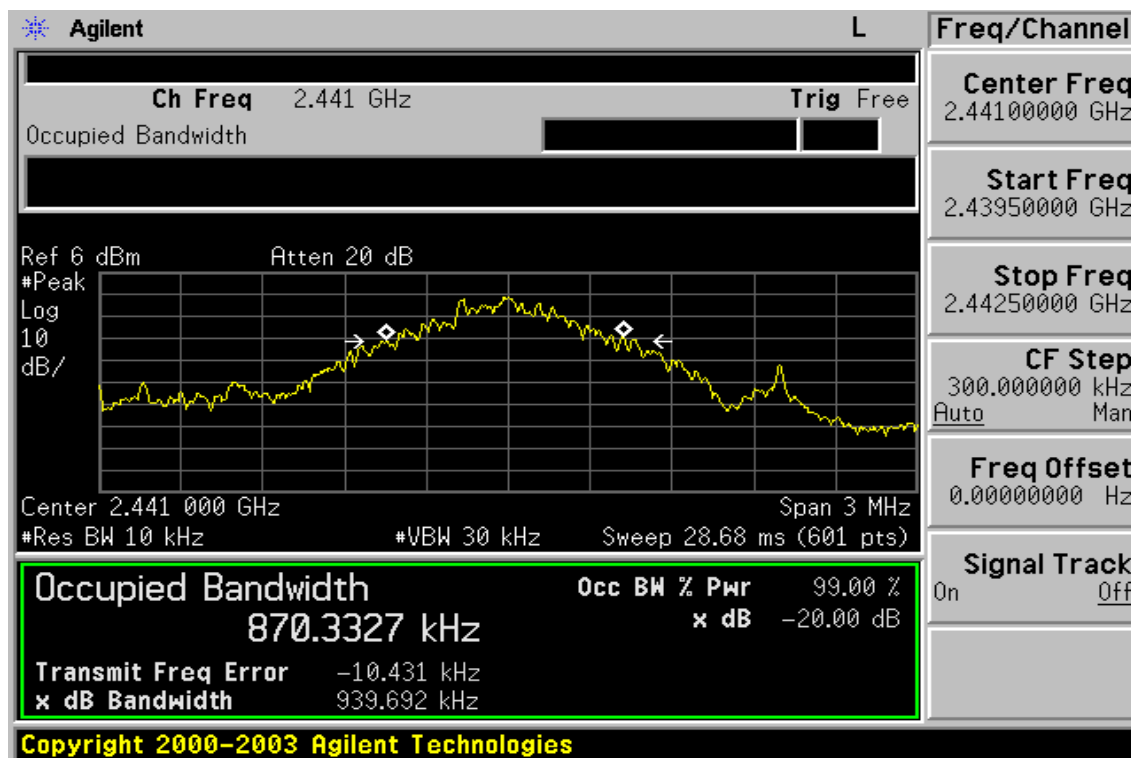
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20dB Band Width Test Data CH-Low



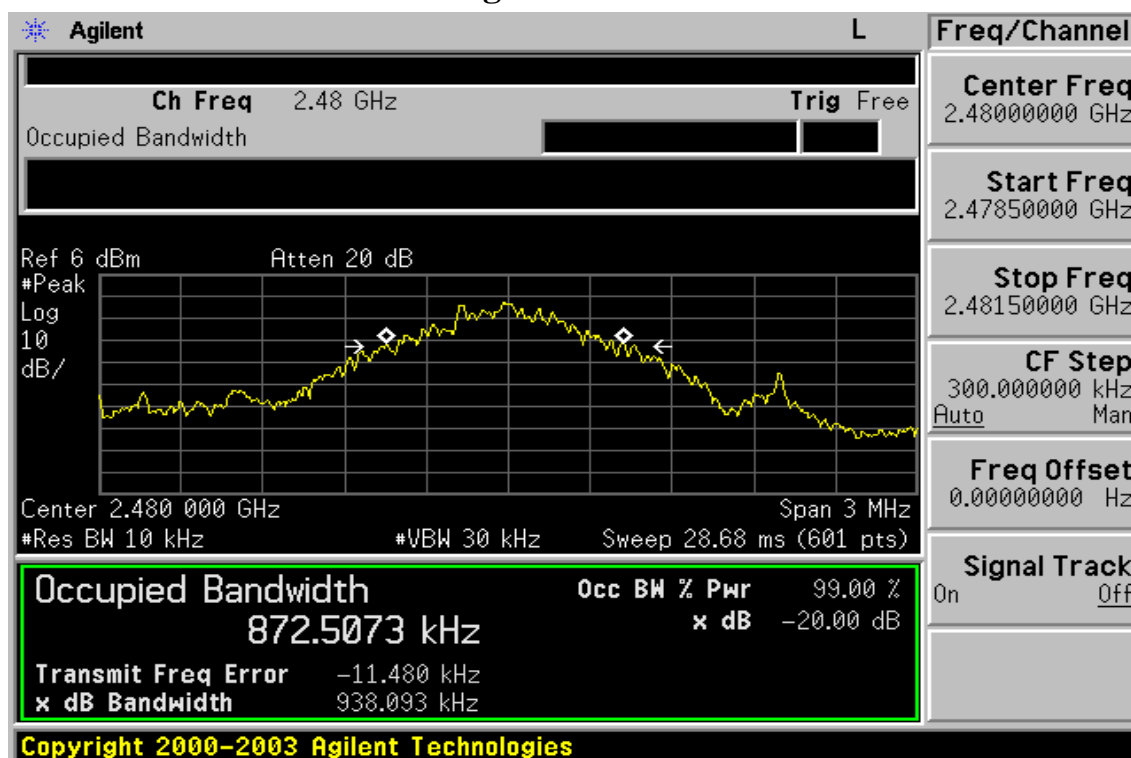
20dB Band Width Test Data CH-Mid



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20dB Band Width Test Data CH-High



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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).

8.2. Measurement Procedure

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set center frequency of spectrum analyzer = operating frequency.
4. Set the spectrum analyzer as RBW, VBW=100KHz, Span=25MHz, Sweep = auto
5. Mark Peak, 2.390GHz and 2.4835GHz and record the max. level.
6. Repeat above procedures until all frequency measured were complete.
7. Radiated Emission refer to section 9.

8.3. Measurement Result

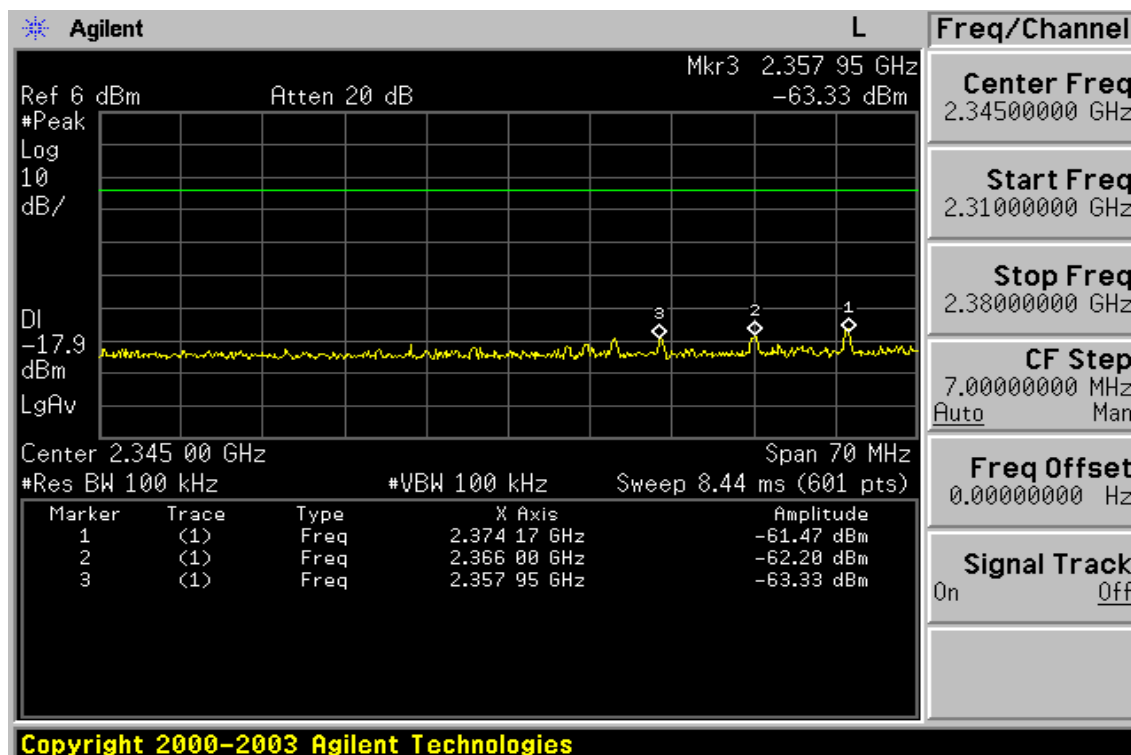
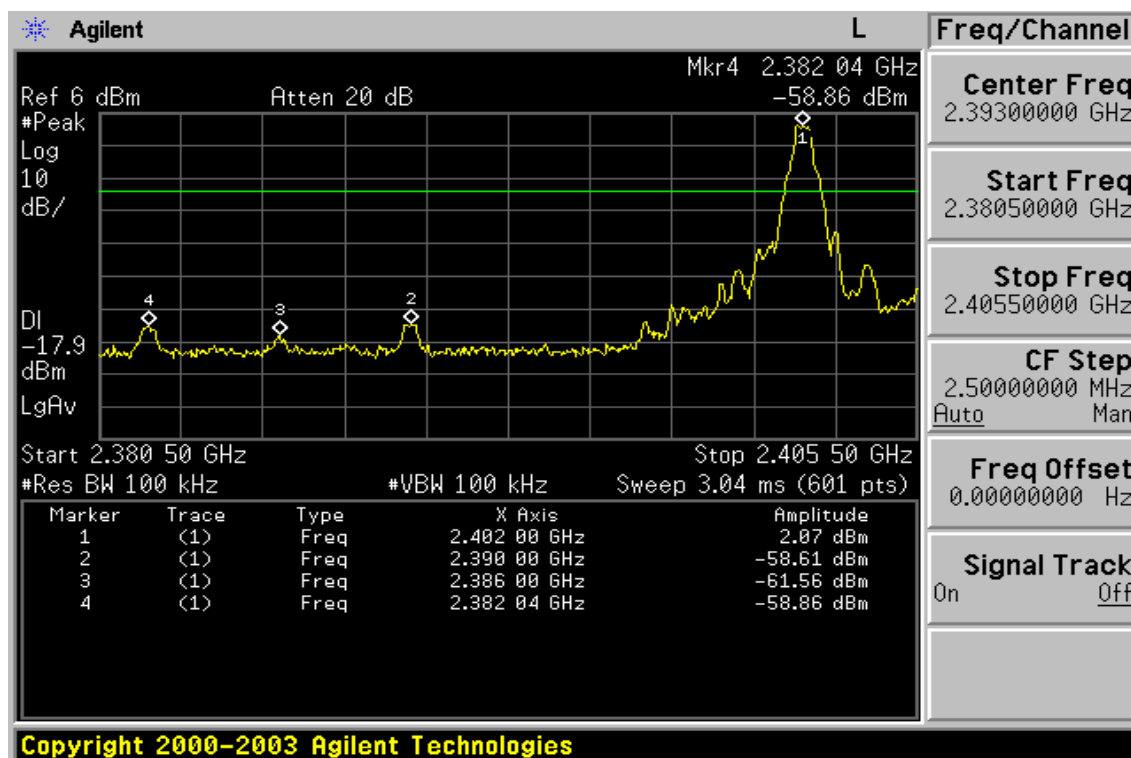
Refer to attach spectrum analyzer data chart.

8.4. Measurement Equipment Used:

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Agilent	E4446A	MY43360126	04/27/2008	04/27/2009
Spectrum Analyzer	Agilent	E7405A	US41160416	07/04/2007	07/03/2008
Low Loss Cable	HUBER+SUHNER	SUCOFLEX 104PEA	N/A	N/A	N/A
Attenuator	Mini-Circuit	BW-S6W5	N/A	01/05/2008	01/04/2009

Note: Measurement Equipment for radiated emission refers to section 9.

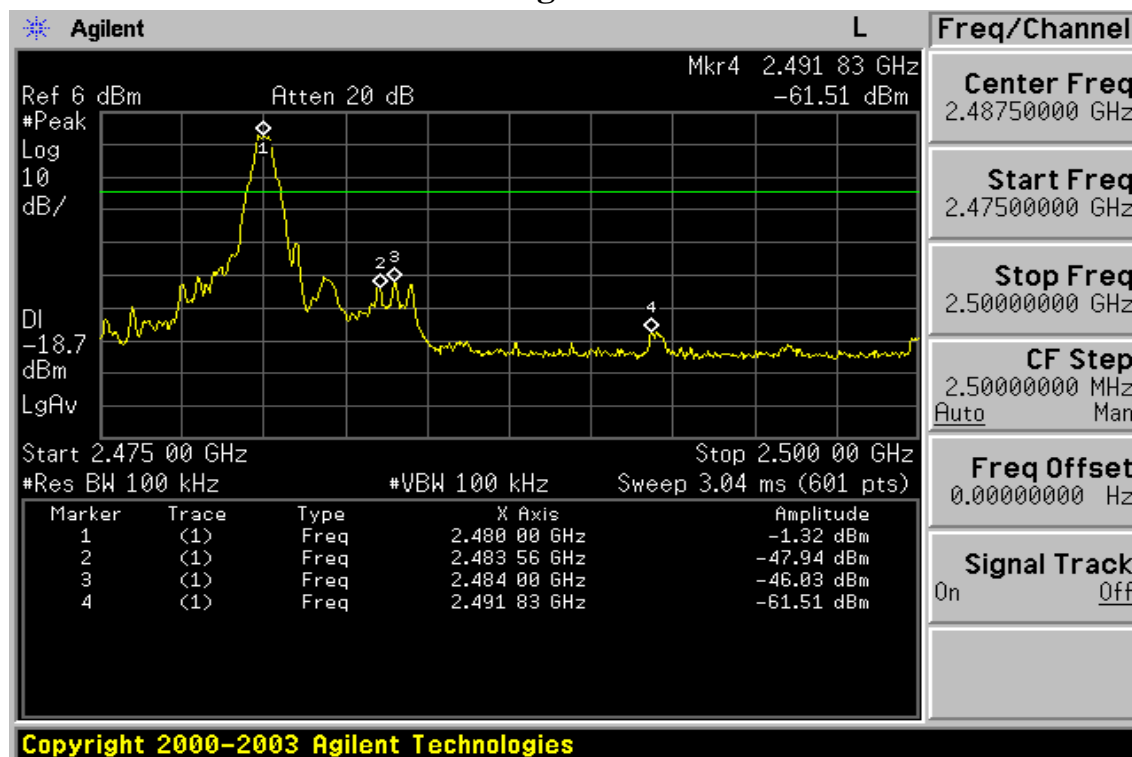
Conducted Emission: Test Data CH-Low



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Conducted Emission: Test Data CH-High



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Radiated Emission:

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

Test Date Jun. 10, 2008
 Test By Sky
 Pol Ver.

Freq. (MHz)	Peak Reading	AV Reading	Ant./CL CF(dB)	Actual FS		Peak Limit	AV Limit	Margin (dB)	Remark
	(dBuV)	(dBuV)		Peak (dBuV/m)	AV (dBuV/m)	(dBuV/m)	(dBuV/m)		
2386.00	34.56	---	-1.40	33.16	---	74.00	54.00	-20.84	Peak
2390.00	34.29	---	-1.39	32.90	---	74.00	54.00	-21.10	Peak

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

Test Date Jun. 10, 2008
 Test By Sky
 Pol Hor.

Freq. (MHz)	Peak Reading	AV Reading	Ant./CL CF(dB)	Actual FS		Peak Limit	AV Limit	Margin (dB)	Remark
	(dBuV)	(dBuV)		Peak (dBuV/m)	AV (dBuV/m)	(dBuV/m)	(dBuV/m)		
2386.00	38.24	---	-1.40	36.84	---	74.00	54.00	-17.16	Peak
2390.00	37.29	---	-1.39	35.90	---	74.00	54.00	-18.10	Peak

Remark :

- (1) Data of measurement within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (2) Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column ◦
- (3) Spectrum Peak Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 3MHz, Sweep time= 200 ms.
- (4) Spectrum AV Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

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Radiated Emission:

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

Test Date Jun. 10, 2008
 Test By Sky
 Pol Ver.

Freq. (MHz)	Peak Reading (dBuV)	AV Reading (dBuV)	Ant./CL CF(dB)	Actual FS Peak (dBuV/m)	AV (dBuV/m)	Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
2483.56	41.55	---	-0.92	40.63	---	74.00	54.00	-13.37	Peak

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

Test Date Jun. 10, 2008
 Test By Sky
 Pol Hor.

Freq. (MHz)	Peak Reading (dBuV)	AV Reading (dBuV)	Ant./CL CF(dB)	Actual FS Peak (dBuV/m)	AV (dBuV/m)	Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
2483.56	43.68	---	-0.92	42.76	---	74.00	54.00	-11.24	Peak

Remark :

- (1) Data of measurement within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (2) Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column °
- (3) Spectrum Peak Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 3MHz, Sweep time= 200 ms.
- (4) Spectrum AV Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

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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.

9.2. EUT Setup

1. The radiated emission tests were performed in the 3 meter open-test site, using the setup in accordance with the ANSI C63.4-2003.
2. The EUT was put in the front of the test table. The peripherals was placed on the side of the host 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 PC system was connected with 110Vac/60Hz power source.

9.3. Measurement Procedure

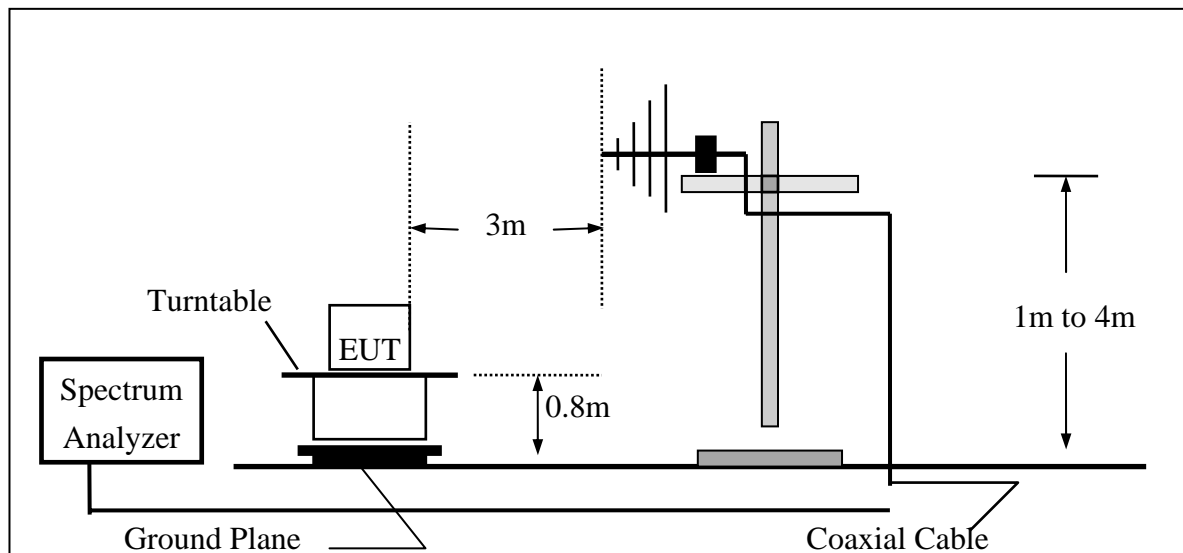
1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. The turn table shall rotate 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Repeat above procedures until all frequency measured were complete.

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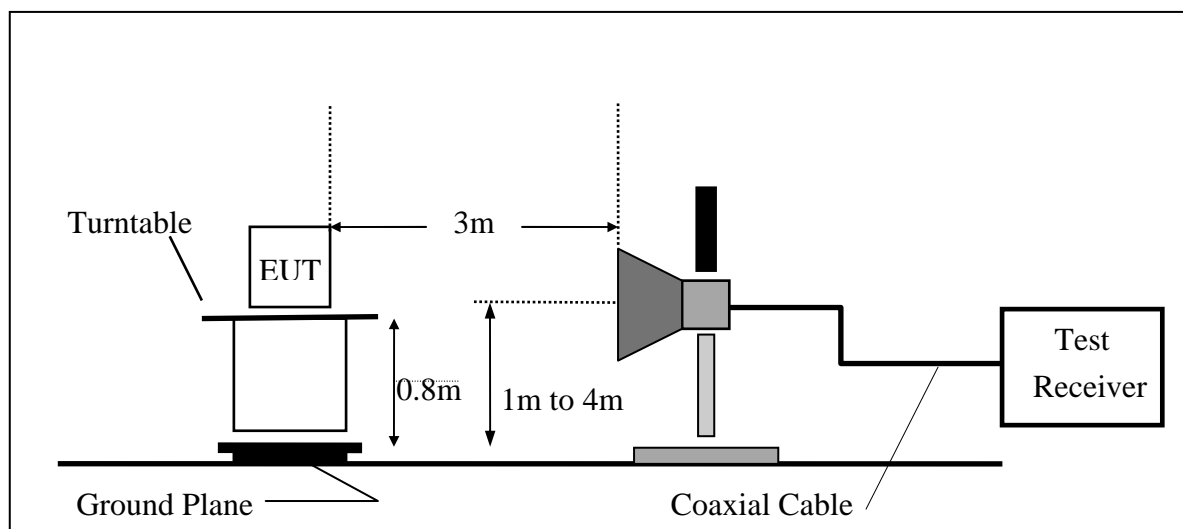
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9.4. Test SET-UP (Block Diagram of Configuration)

(A) Radiated Emission Test Set-Up, Frequency Below 1GHz



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



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9.5. Measurement Equipment Used:

966 Chamber					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Agilent	E4446A	MY43360126	04/27/2008	04/27/2009
Spectrum Analyzer	Agilent	E7405A	US41160416	07/04/2007	07/03/2008
Bi-log Antenna	SCHWAZBECK	VULB9160	3224	11/14/2007	11/13/2008
Horn antenna	SCHWAZBECK	BBHA 9120D	309/320	12/14/2007	12/13/2008
Horn antenna	SCHWAZBECK	BBHA 9170	184/185	12/13/2007	12/12/2008
Pre-Amplifier	HP	8447D	2944A09469	07/19/2007	07/18/2008
Pre-Amplifier	HP	8494B	3008A00578	02/26/2008	02/25/2009
Turn Table	HD	DT420	N/A	N.C.R	N.C.R
Antenna Tower	HD	MA240-N	240/657	N.C.R	N.C.R
Controller	HD	HD100	N/A	N.C.R	N.C.R
Low Loss Cable	HUBER+SUHNER	SUCOFLEX 104PEA-10M	10m	10/09/2007	10/08/2008
Low Loss Cable	HUBER+SUHNER	SUCOFLEX 104PEA-3M	3m	10/09/2007	10/08/2008
Site NSA	SGS	966 chamber	N/A	11/17/2007	11/16/2008

9.6. 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:

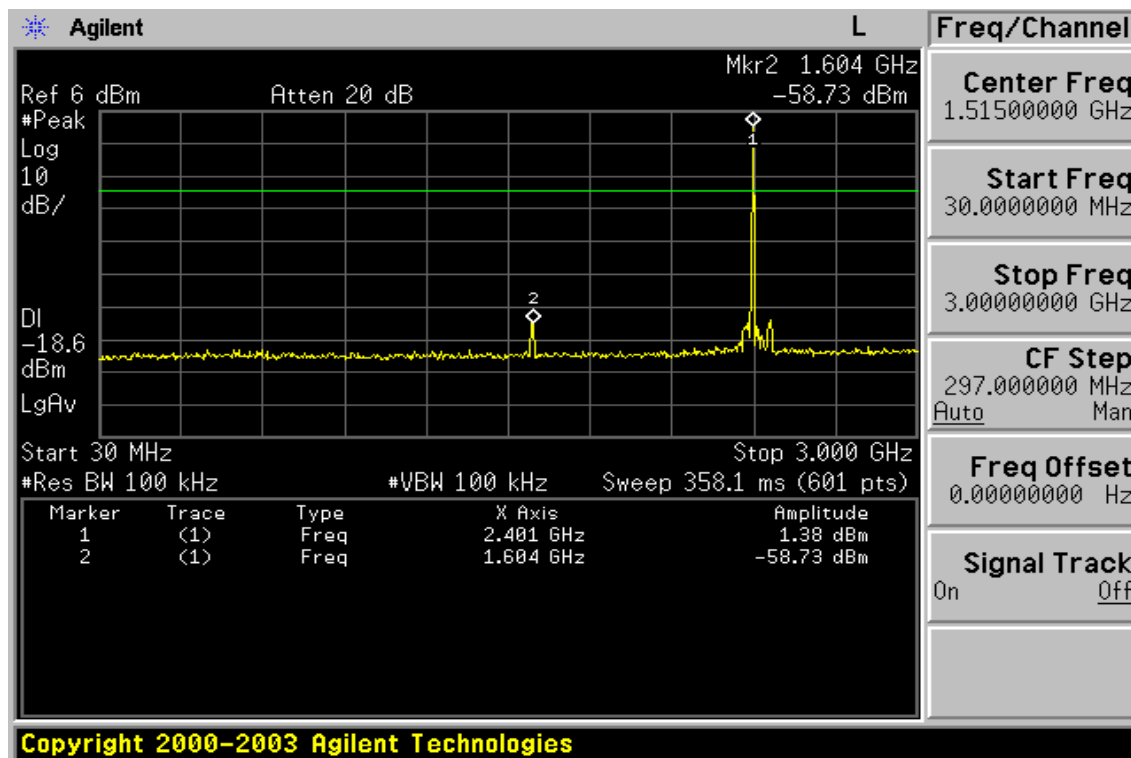
$$FS = RA + AF + CL - AG$$

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

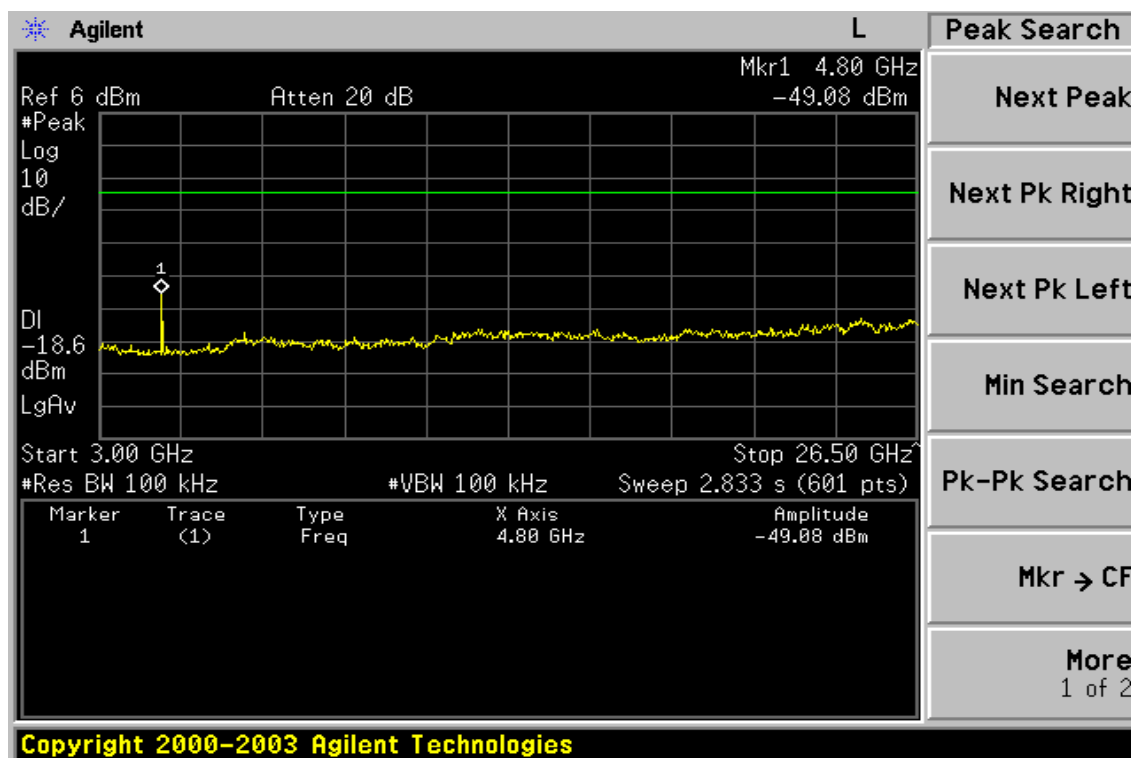
9.7. Measurement Result

Refer to attach tabular data sheets.

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



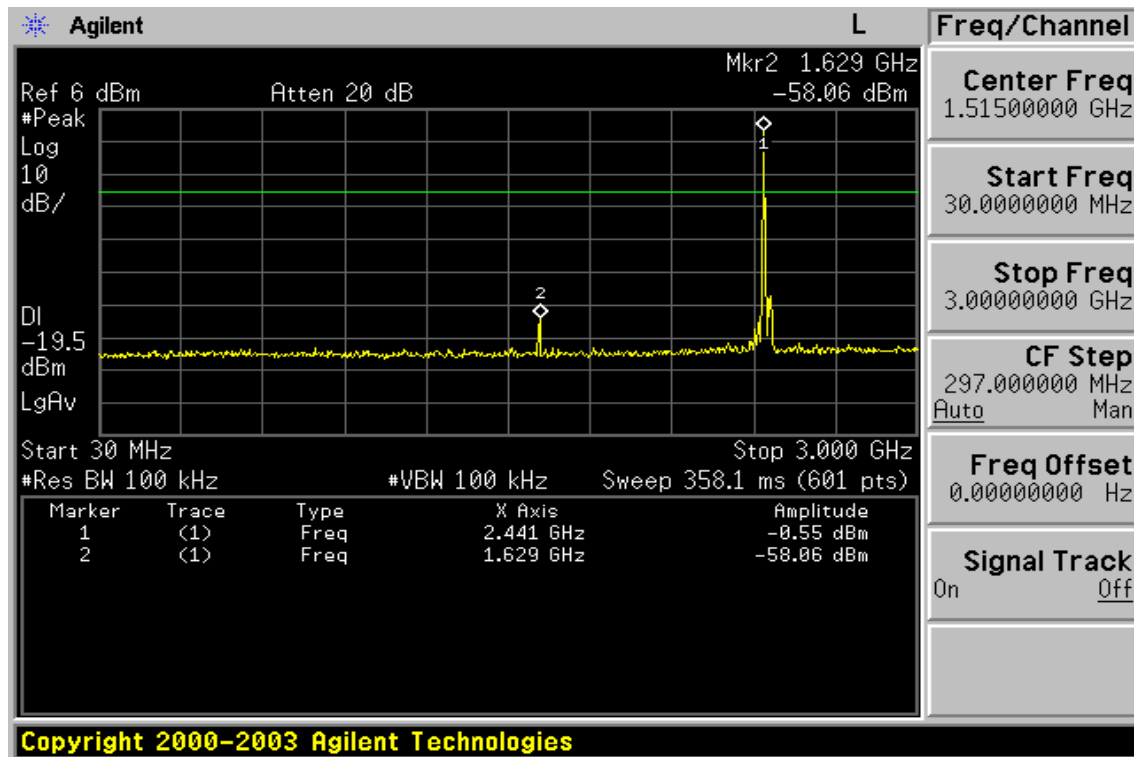
Ch Low 3GHz – 26.5GHz



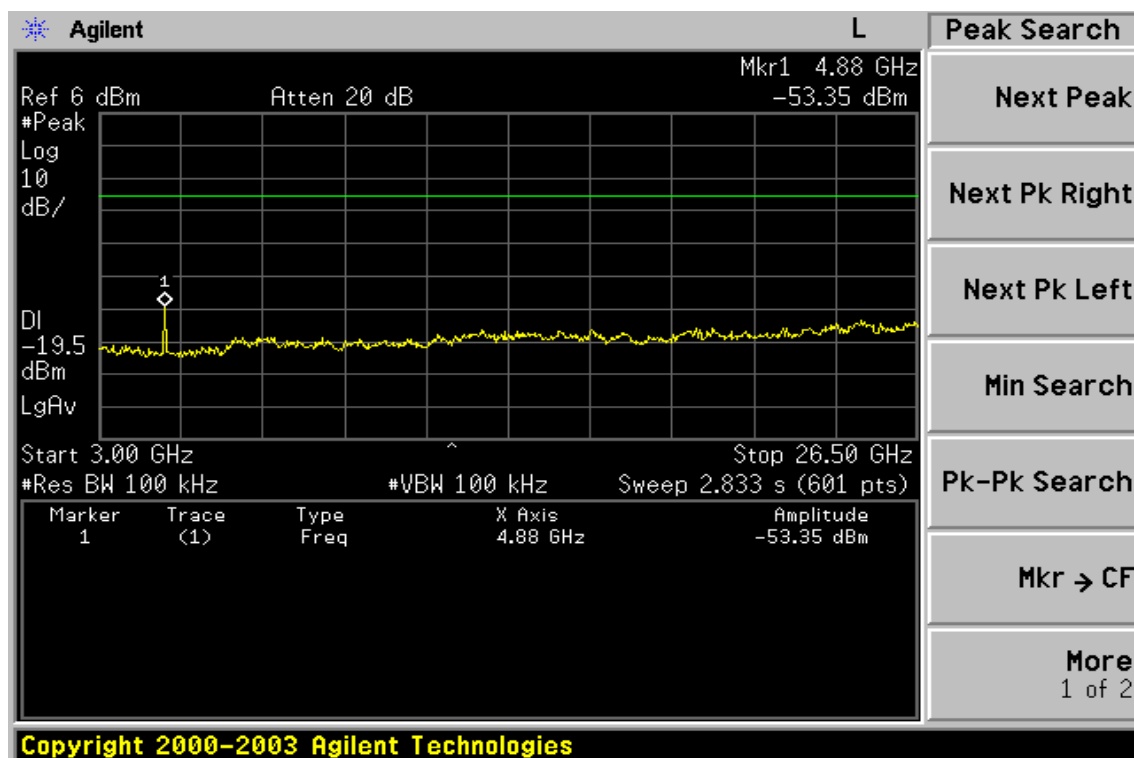
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Ch Mid 30MHz – 3GHz



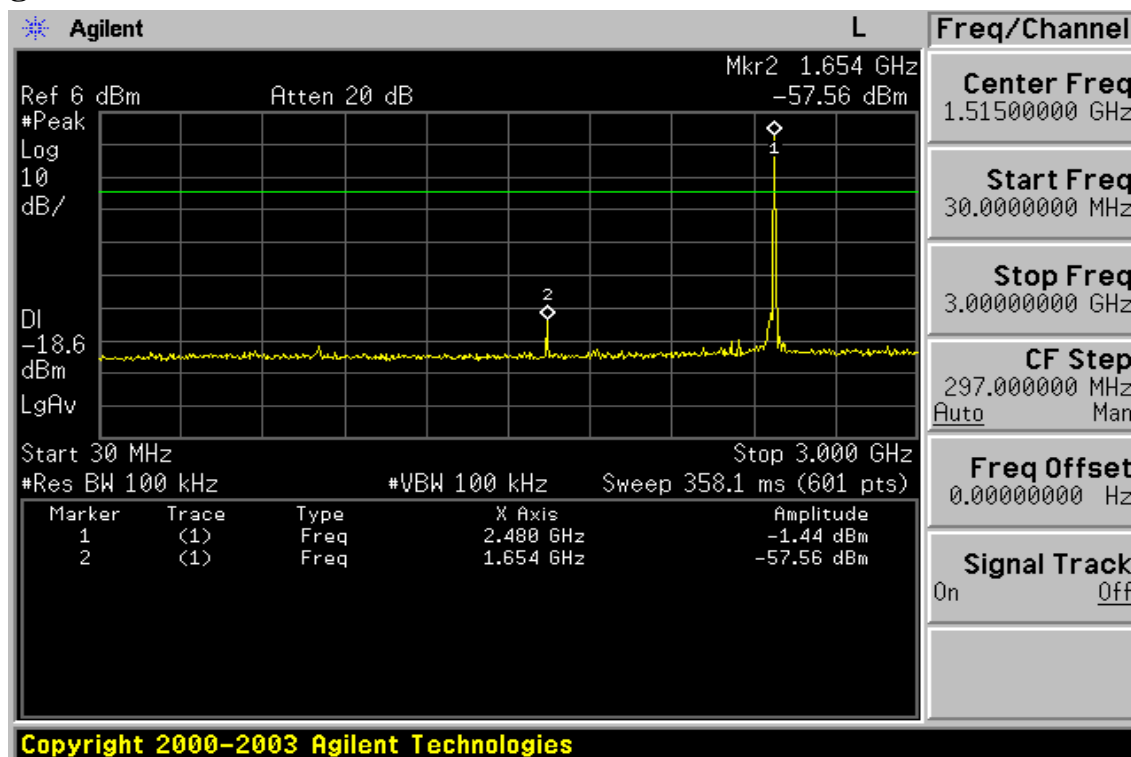
Ch Mid 3GHz – 26.5GHz



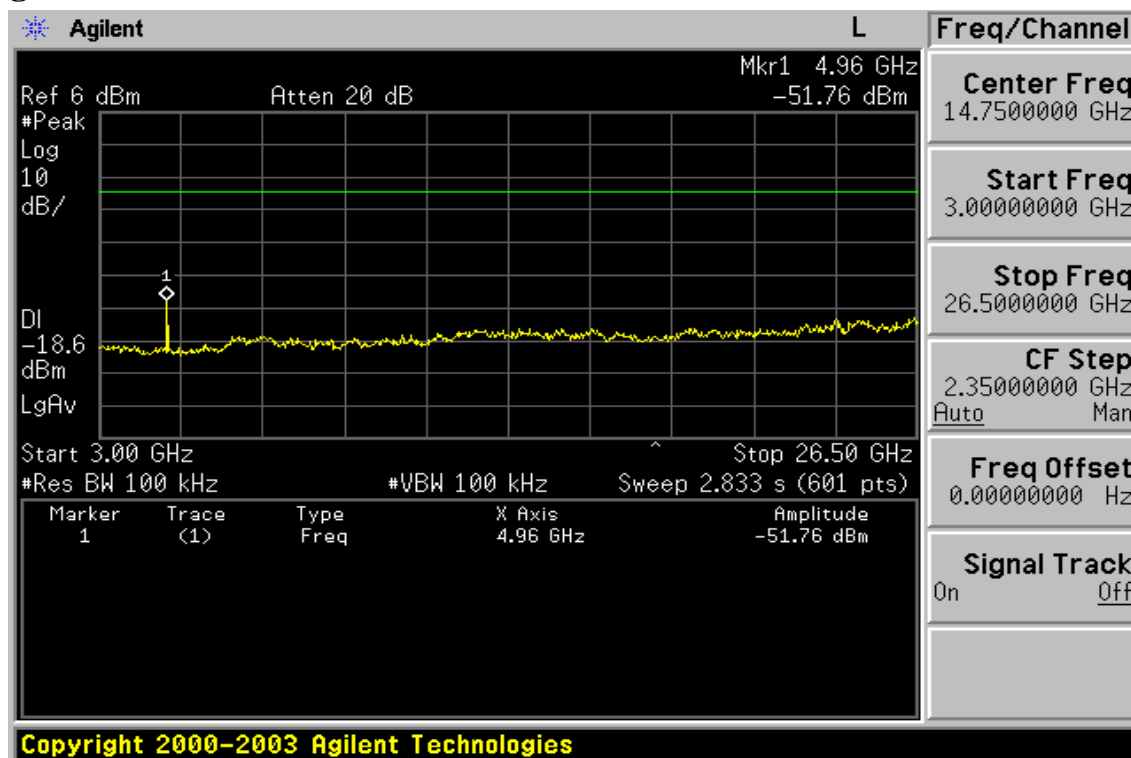
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Ch High 30MHz – 3GHz



Ch High 3GHz – 26.5GHz



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Radiated Spurious Emission Measurement Result (below 1GHz)

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

Test Date Jun. 10, 2008
 Test By Sky
 Pol Ver./Hor.

Freq. (MHz)	Ant.Pol. H/V	Detector Mode (PK/QP)	Reading (dBuV)	Factor (dB)	Actual FS (dBuV/m)	Limit3m (dBuV/m)	Safe Margin (dB)
51.34	V	Peak	41.51	-14.19	27.32	40.00	-12.68
67.83	V	Peak	42.33	-15.60	26.73	40.00	-13.27
140.58	V	Peak	38.92	-13.65	25.27	43.50	-18.23
51.34	H	Peak	42.22	-14.19	28.03	40.00	-11.97
150.28	H	Peak	36.59	-12.83	23.76	43.50	-19.74
604.24	H	Peak	34.51	-5.92	28.59	46.00	-17.41

Remark :

- 1 Measuring frequencies from 30 MHz to the 1GHz .
- 2 Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using Peak/QP detector mode.
- 3 Data of measurement within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- 4 The IF bandwidth of SPA between 30MHz to 1GHz was 100KHz.

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Radiated Spurious Emission Measurement Result (below 1GHz)

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

Test Date Jun. 10, 2008
 Test By Sky
 Pol Ver./Hor.

Freq. (MHz)	Ant.Pol. H/V	Detector Mode (PK/QP)	Reading (dBuV)	Factor (dB)	Actual FS (dBuV/m)	Limit3m (dBuV/m)	Safe Margin (dB)
51.34	V	Peak	41.26	-14.19	27.07	40.00	-12.93
67.83	V	Peak	42.17	-15.60	26.57	40.00	-13.43
150.28	V	Peak	37.58	-12.83	24.75	43.50	-18.75
51.34	H	Peak	42.48	-14.19	28.29	40.00	-11.71
140.58	H	Peak	38.38	-13.65	24.73	43.50	-18.77
604.24	H	Peak	34.30	-5.92	28.38	46.00	-17.62

Remark :

- 1 Measuring frequencies from 30 MHz to the 1GHz .
- 2 Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using Peak/QP detector mode.
- 3 Data of measurement within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- 4 The IF bandwidth of SPA between 30MHz to 1GHz was 100KHz.

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Radiated Spurious Emission Measurement Result (below 1GHz)

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

Test Date Jun. 10, 2008
 Test By Sky
 Pol Ver./Hor.

Freq. (MHz)	Ant.Pol. H/V	Detector Mode (PK/QP)	Reading (dBuV)	Factor (dB)	Actual FS (dBuV/m)	Limit3m (dBuV/m)	Safe Margin (dB)
51.34	V	Peak	41.22	-14.19	27.03	40.00	-12.97
67.83	V	Peak	41.24	-15.60	25.64	40.00	-14.36
140.58	V	Peak	38.47	-13.65	24.82	43.50	-18.68
51.34	H	Peak	42.00	-14.19	27.81	40.00	-12.19
140.58	H	Peak	38.52	-13.65	24.87	43.50	-18.63
647.89	H	Peak	33.00	-4.99	28.01	46.00	-17.99

Remark :

- 1 Measuring frequencies from 30 MHz to the 1GHz .
- 2 Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using Peak/QP detector mode.
- 3 Data of measurement within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- 4 The IF bandwidth of SPA between 30MHz to 1GHz was 100KHz.

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Radiated Spurious Emission Measurement Result (above 1GHz)

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

Test Date Jun. 10, 2008
 Test By Sky
 Pol Ver.

Freq. (MHz)	Peak Reading	AV Reading	Ant./CL CF(dB)	Actual FS		Peak Limit	AV Margin	Margin (dB)	
	(dBuV)	(dBuV)		Peak (dBuV/m)	AV (dBuV/m)	(dBuV/m)	(dB)		
4804.0	34.30	---	5.99	40.29	---	74.00	54.00	-13.71	Peak
7206.0	----					74.00	54.00		
9608.0	----					74.00	54.00		
12010.0	----					74.00	54.00		
14412.0	----					74.00	54.00		
16814.0	----					74.00	54.00		
19216.0	----					74.00	54.00		
21618.0	----					74.00	54.00		
24020.0	----					74.00	54.00		

Remark :

- (1) Measuring frequencies from 1GHz to the 10th harmonic of highest fundamental frequency °
- (2) Data of measurement within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (3) Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column °
- (4) Spectrum Peak Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 3MHz, Sweep time= 200 ms.
- (5) Spectrum AV Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

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Radiated Spurious Emission Measurement Result (above 1GHz)

Operation Mode	TX CH Low	Test Date	Jun. 10, 2008
Fundamental Frequency	2402 MHz	Test By	Sky
Temperature	25 °C	Pol	Hor.
Humidity	65 %		

Freq. (MHz)	Peak Reading	AV Reading	Ant./CL CF(dB)	Actual FS		Peak Limit	AV Limit	Margin (dB)	
	(dBuV)	(dBuV)		Peak (dBuV/m)	AV (dBuV/m)	(dBuV/m)	(dBuV/m)		
4804.0	42.40	---	5.99	48.39	---	74.00	54.00	-5.61	Peak
7206.0	----					74.00	54.00		
9608.0	----					74.00	54.00		
12010.0	----					74.00	54.00		
14412.0	----					74.00	54.00		
16814.0	----					74.00	54.00		
19216.0	----					74.00	54.00		
21618.0	----					74.00	54.00		
24020.0	----					74.00	54.00		

Remark :

- (1) Measuring frequencies from 1GHz to the 10th harmonic of highest fundamental frequency °
- (2) Data of measurement within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (3) Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column °
- (4) Spectrum Peak Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 3MHz, Sweep time= 200 ms.
- (5) Spectrum AV Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

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Radiated Spurious Emission Measurement Result (above 1GHz)

Operation Mode	TX CH Mid	Test Date	Jun. 10, 2008
Fundamental Frequency	2441 MHz	Test By	Sky
Temperature	25 °C	Pol	Ver.
Humidity	65 %		

Freq. (MHz)	Peak Reading	AV Reading	Ant./CL CF(dB)	Actual FS		Peak Limit	AV Limit	Margin (dB)	
	(dBuV)	(dBuV)		Peak (dBuV/m)	AV (dBuV/m)	(dBuV/m)	(dBuV/m)		
4882.0	33.67	---	6.17	39.84	---	74.00	54.00	-14.16	Peak
7323.0	----					74.00	54.00		
9764.0	----					74.00	54.00		
12205.0	----					74.00	54.00		
14646.0	----					74.00	54.00		
17087.0	----					74.00	54.00		
19528.0	----					74.00	54.00		
21969.0	----					74.00	54.00		
24410.0	----					74.00	54.00		

Remark :

- (1) Measuring frequencies from 1GHz to the 10th harmonic of highest fundamental frequency °
- (2) Data of measurement within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (3) Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column °
- (4) Spectrum Peak Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 3MHz, Sweep time= 200 ms.
- (5) Spectrum AV Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

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Radiated Spurious Emission Measurement Result (above 1GHz)

Operation Mode	TX CH Mid	Test Date	Jun. 10, 2008
Fundamental Frequency	2441 MHz	Test By	Sky
Temperature	25 °C	Pol	Hor.
Humidity	65 %		

Freq. (MHz)	Peak Reading	AV Reading	Ant./CL CF(dB)	Actual FS		Peak Limit	AV Limit	Margin (dB)	
	(dBuV)	(dBuV)		Peak (dBuV/m)	AV (dBuV/m)	(dBuV/m)	(dBuV/m)		
4882.0	40.84	---	6.17	47.01	---	74.00	54.00	-6.99	Peak
7323.0	----					74.00	54.00		
9764.0	----					74.00	54.00		
12205.0	----					74.00	54.00		
14646.0	----					74.00	54.00		
17087.0	----					74.00	54.00		
19528.0	----					74.00	54.00		
21969.0	----					74.00	54.00		
24410.0	----					74.00	54.00		

Remark :

- (1) Measuring frequencies from 1GHz to the 10th harmonic of highest fundamental frequency °
- (2) Data of measurement within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (3) Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column °
- (4) Spectrum Peak Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 3MHz, Sweep time= 200 ms.
- (5) Spectrum AV Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

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Radiated Spurious Emission Measurement Result (above 1GHz)

Operation Mode	TX CH High	Test Date	Jun. 10, 2008
Fundamental Frequency	2480 MHz	Test By	Sky
Temperature	25 °C	Pol	Ver.
Humidity	65 %		

Freq. (MHz)	Peak Reading	AV Reading	Ant./CL CF(dB)	Actual FS		Peak Limit	AV Limit	Margin (dB)	
	(dBuV)	(dBuV)		Peak (dBuV/m)	AV (dBuV/m)	(dBuV/m)	(dBuV/m)		
4960.0	32.90	---	6.36	39.26	---	74.00	54.00	-14.74	Peak
7440.0	----					74.00	54.00		
9920.0	----					74.00	54.00		
12400.0	----					74.00	54.00		
14880.0	----					74.00	54.00		
17360.0	----					74.00	54.00		
19840.0	----					74.00	54.00		
22320.0	----					74.00	54.00		
24800.0	----					74.00	54.00		

Remark :

- (1) Measuring frequencies from 1GHz to the 10th harmonic of highest fundamental frequency °
- (2) Data of measurement within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (3) Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column °
- (4) Spectrum Peak Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 3MHz, Sweep time= 200 ms.
- (5) Spectrum AV Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

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Radiated Spurious Emission Measurement Result (above 1GHz)

Operation Mode	TX CH High	Test Date	Jun. 10, 2008
Fundamental Frequency	2480 MHz	Test By	Sky
Temperature	25 °C	Pol	Hor.
Humidity	65 %		

Freq. (MHz)	Peak Reading	AV Reading	Ant./CL CF(dB)	Actual FS		Peak Limit	AV Limit	Margin (dB)	
	(dBuV)	(dBuV)		Peak (dBuV/m)	AV (dBuV/m)	(dBuV/m)	(dBuV/m)		
4960.0	41.89	---	6.36	48.25	---	74.00	54.00	-5.75	Peak
7440.0	----					74.00	54.00		
9920.0	----					74.00	54.00		
12400.0	----					74.00	54.00		
14880.0	----					74.00	54.00		
17360.0	----					74.00	54.00		
19840.0	----					74.00	54.00		
22320.0	----					74.00	54.00		
24800.0	----					74.00	54.00		

Remark :

- (1) Measuring frequencies from 1GHz to the 10th harmonic of highest fundamental frequency °
- (2) Data of measurement within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (3) Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column °
- (4) Spectrum Peak Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 3MHz, Sweep time= 200 ms.
- (5) Spectrum AV Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

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

10.2. 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 5 MHz, Sweep = auto.
5. Max hold. Mark 3 Peaks of hopping channel and record the 3 peaks frequency.

10.3. Measurement Result

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

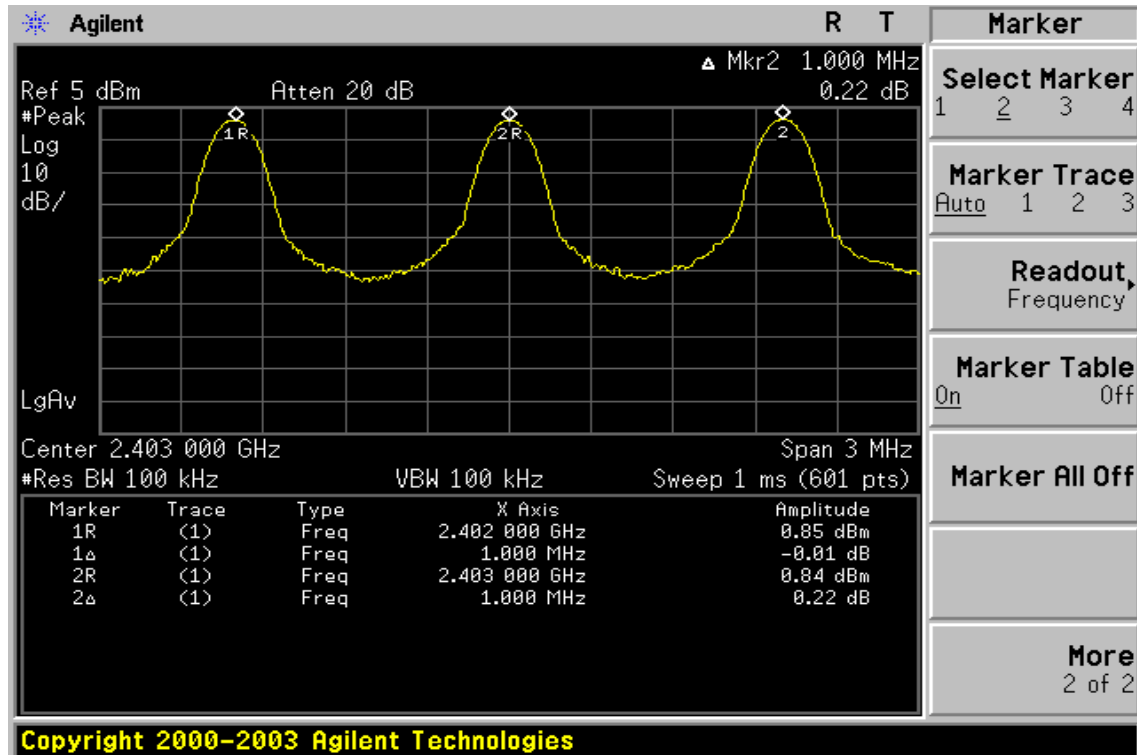
10.4. Measurement Equipment Used:

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Agilent	E4446A	MY43360126	04/27/2008	04/27/2009
Spectrum Analyzer	Agilent	E7405A	US41160416	07/04/2007	07/03/2008
Low Loss Cable	HUBER+SUHNER	SUCOFLEX 104PEA	N/A	N/A	N/A
Attenuator	Mini-Circuit	BW-S6W5	N/A	01/05/2008	01/04/2009

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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 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=100KHz,
5. Max hold, view and count how many channel in the band.

11.3. Measurement Result

Total No of hopping channel	Limit (CH)	Measurement result (CH)	Result
	15	79	Pass

11.4. Measurement Equipment Used:

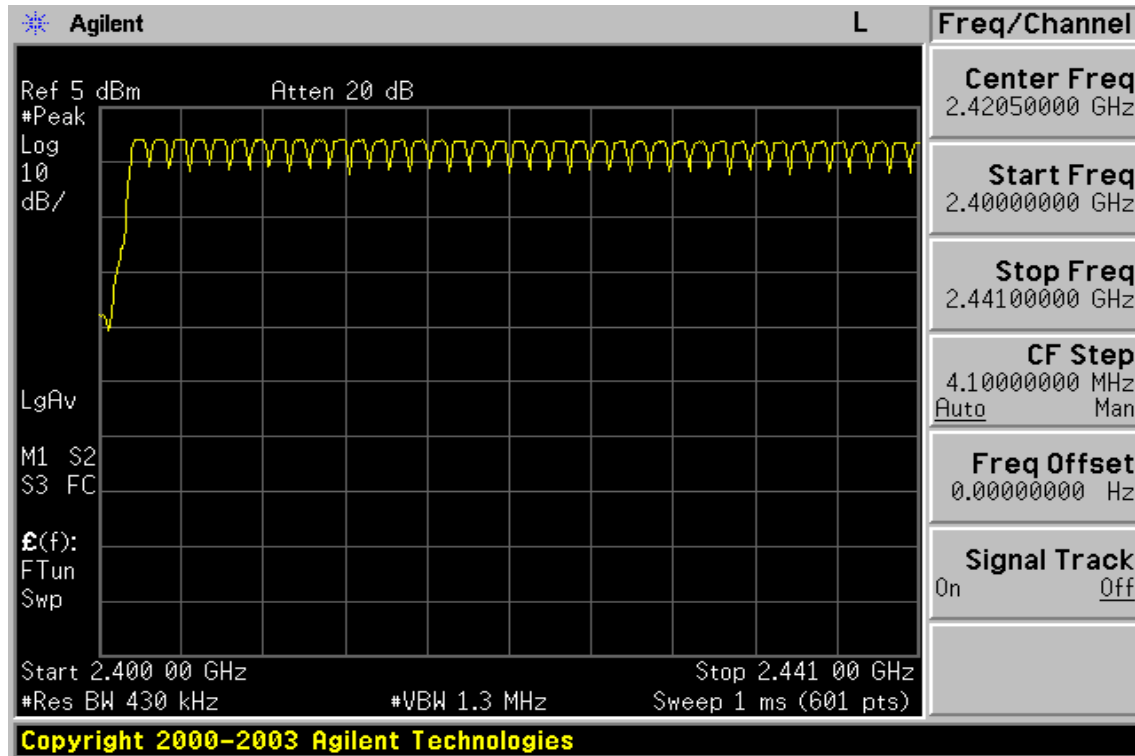
Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Agilent	E4446A	MY43360126	04/27/2008	04/27/2009
Spectrum Analyzer	Agilent	E7405A	US41160416	07/04/2007	07/03/2008
Low Loss Cable	HUBER+SUHNER	SUCOFLEX 104PEA	N/A	N/A	N/A
Attenuator	Mini-Circuit	BW-S6W5	N/A	01/05/2008	01/04/2009

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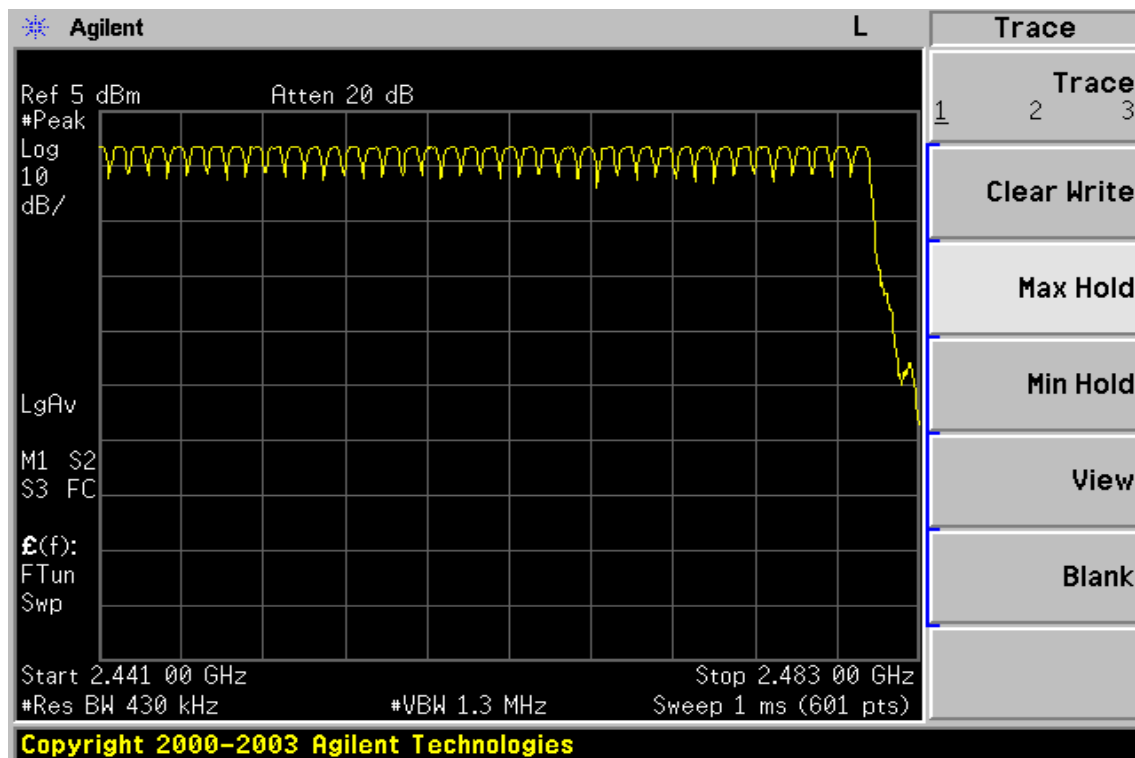
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Channel Number

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 Procedure

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set center frequency of spectrum analyzer = operating frequency.
4. Set the spectrum analyzer as RBW,VBW=100KHz, Span = 0Hz , Adjust Sweep = 30s.
5. Repeat above procedures until all frequency measured were complete.

12.3. Measurement Result

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

CH Low: DH1 time slot = 0.405 (ms) * (1600/(1*79)) * 31.6 = 259.2 (ms)

DH3 time slot = 1.675 (ms) * (1600/(3*79)) * 31.6 = 357.3 (ms)

DH5 time slot = 2.925 (ms) * (1600/(5*79)) * 31.6 = 374.4 (ms)

CH Mid: DH1 time slot = 0.405 (ms) * (1600/(1*79)) * 31.6 = 259.2 (ms)

DH3 time slot = 1.675 (ms) * (1600/(3*79)) * 31.6 = 357.3 (ms)

DH5 time slot = 2.906 (ms) * (1600/(5*79)) * 31.6 = 371.9 (ms)

CH High: DH1 time slot = 0.405 (ms) * (1600/(1*79)) * 31.6 = 259.2 (ms)

DH3 time slot = 1.662 (ms) * (1600/(3*79)) * 31.6 = 354.5 (ms)

DH5 time slot = 2.906 (ms) * (1600/(5*79)) * 31.6 = 371.9 (ms)

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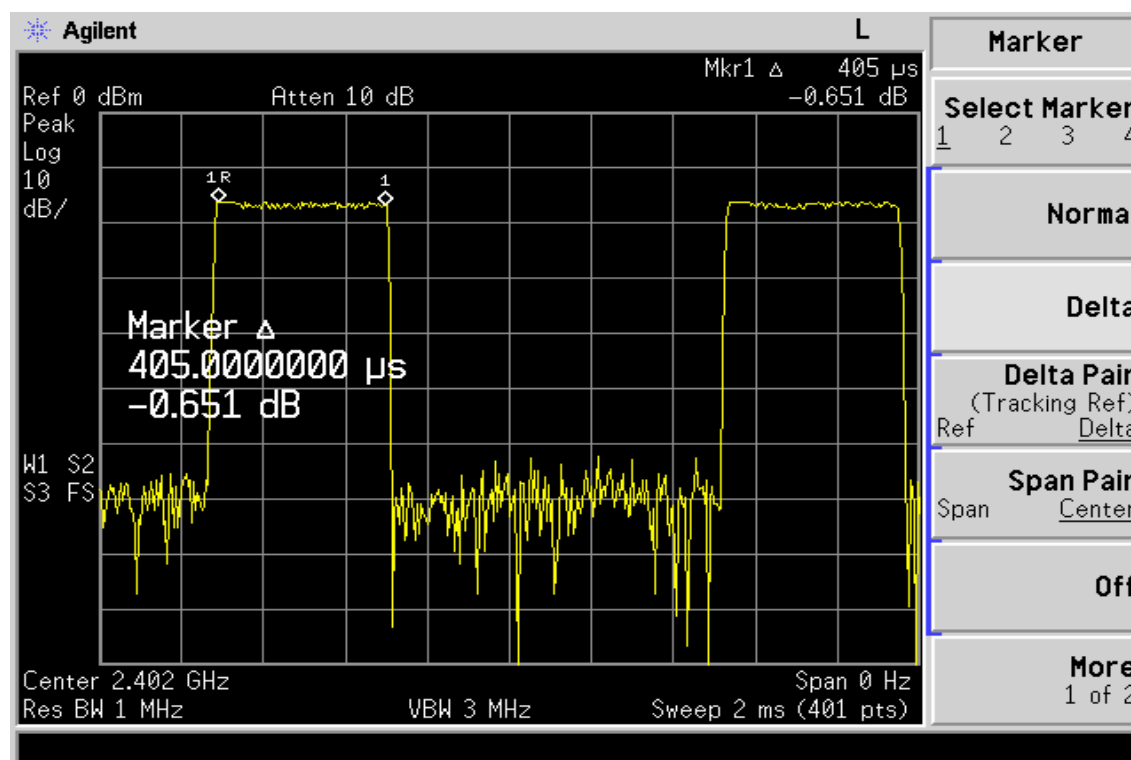
12.4. Measurement Equipment Used:

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Agilent	E4446A	MY43360126	04/27/2008	04/27/2009
Spectrum Analyzer	Agilent	E7405A	US41160416	07/04/2007	07/03/2008
Low Loss Cable	HUBER+SUHNER	SUCOFLEX 104PEA	N/A	N/A	N/A
Attenuator	Mini-Circuit	BW-S6W5	N/A	01/05/2008	01/04/2009

Dwell Time Test Data

CH-Low

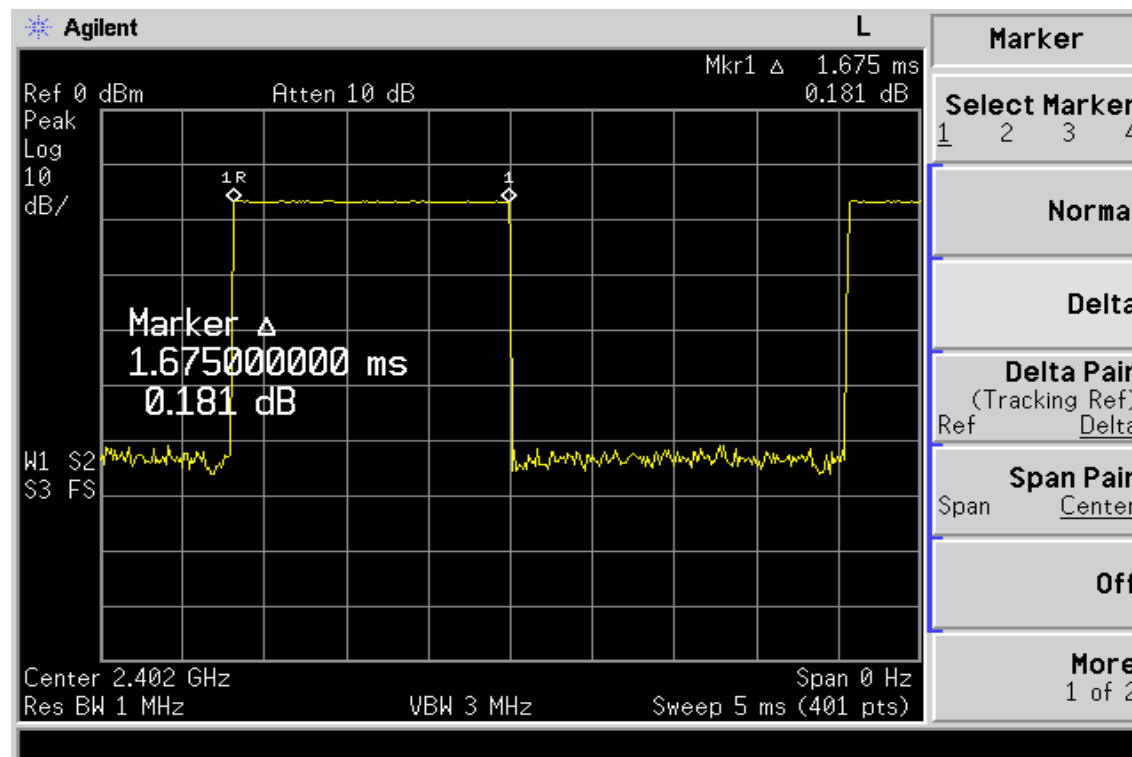
DH1



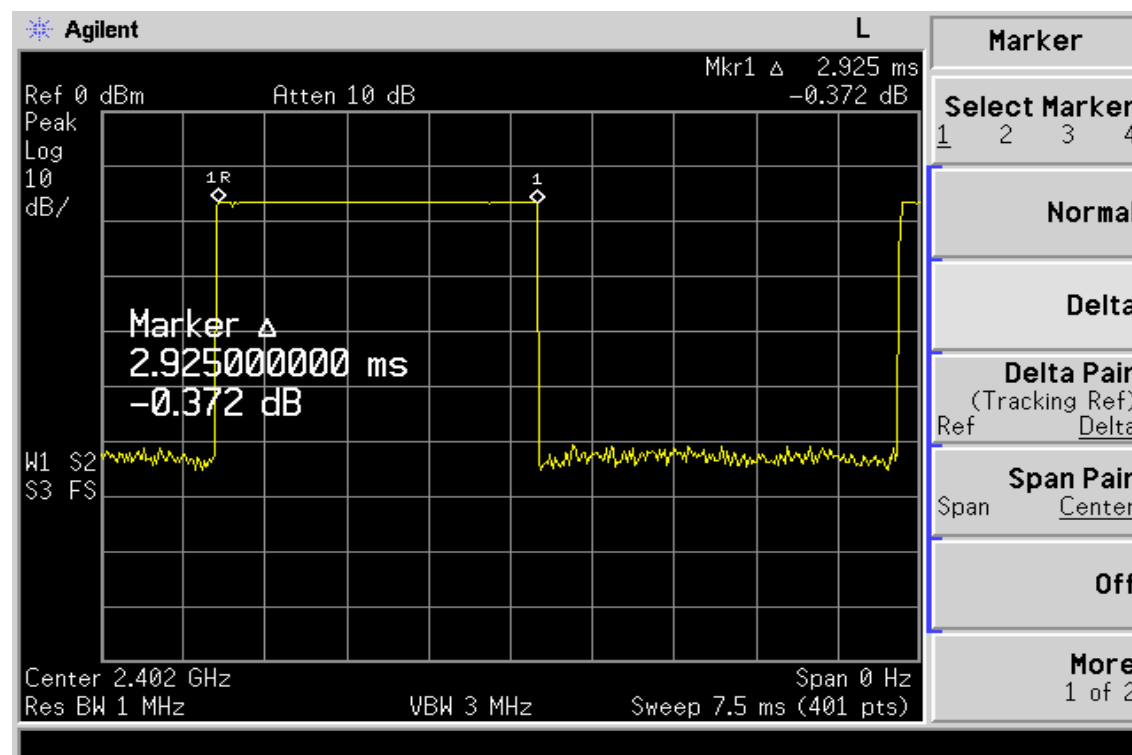
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DH3



DH5

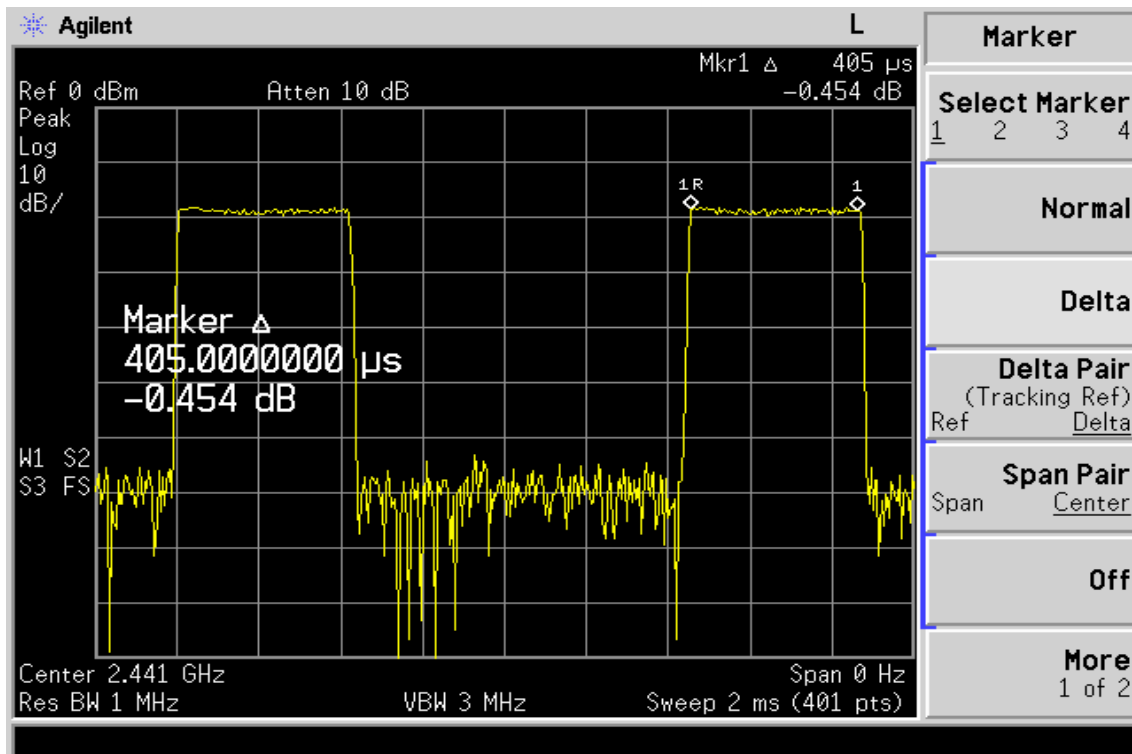


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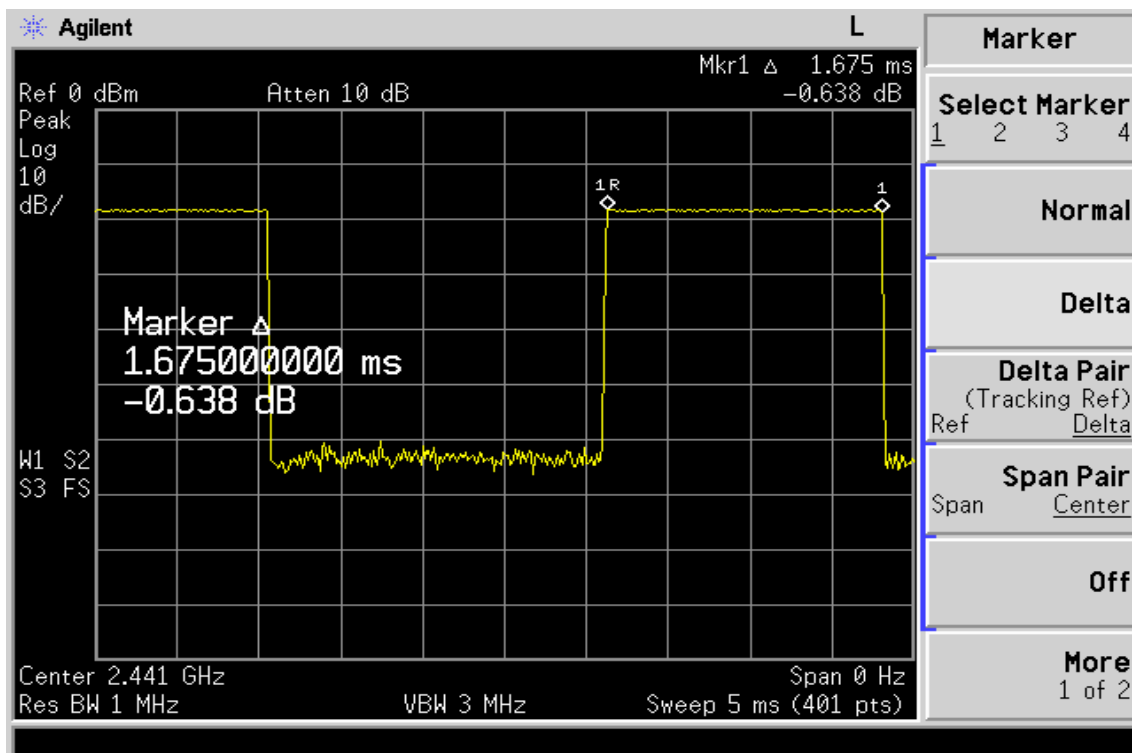
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CH-Mid

DH1



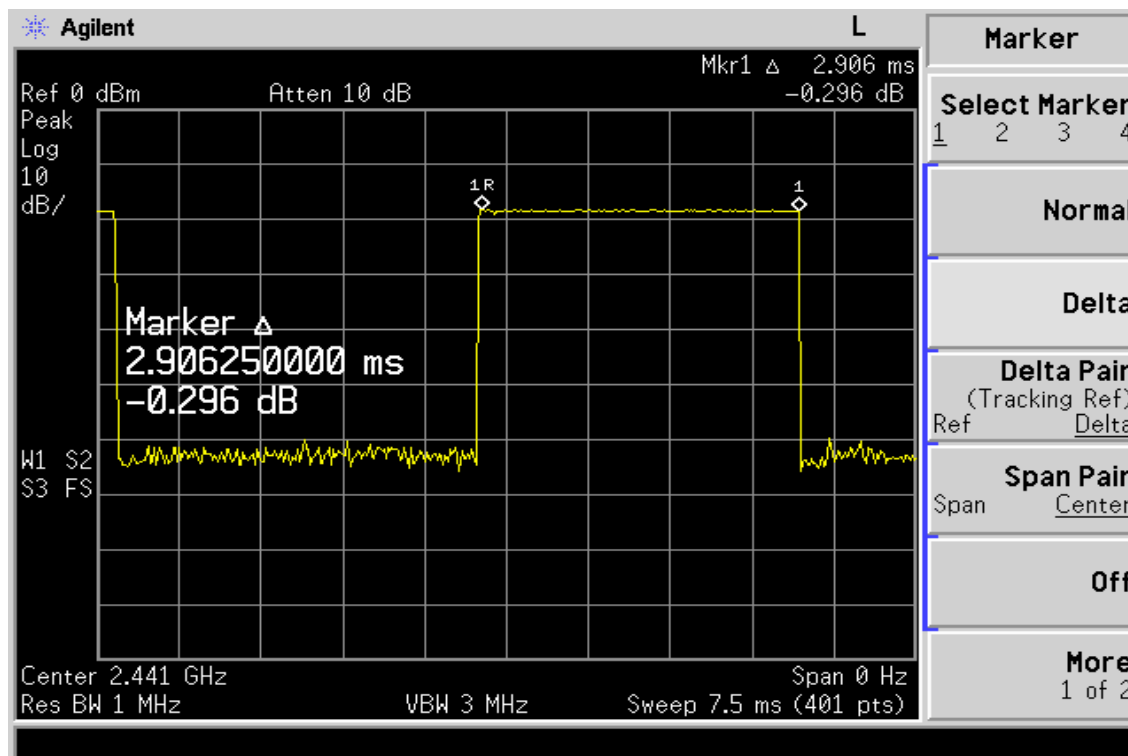
DH3



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DH5

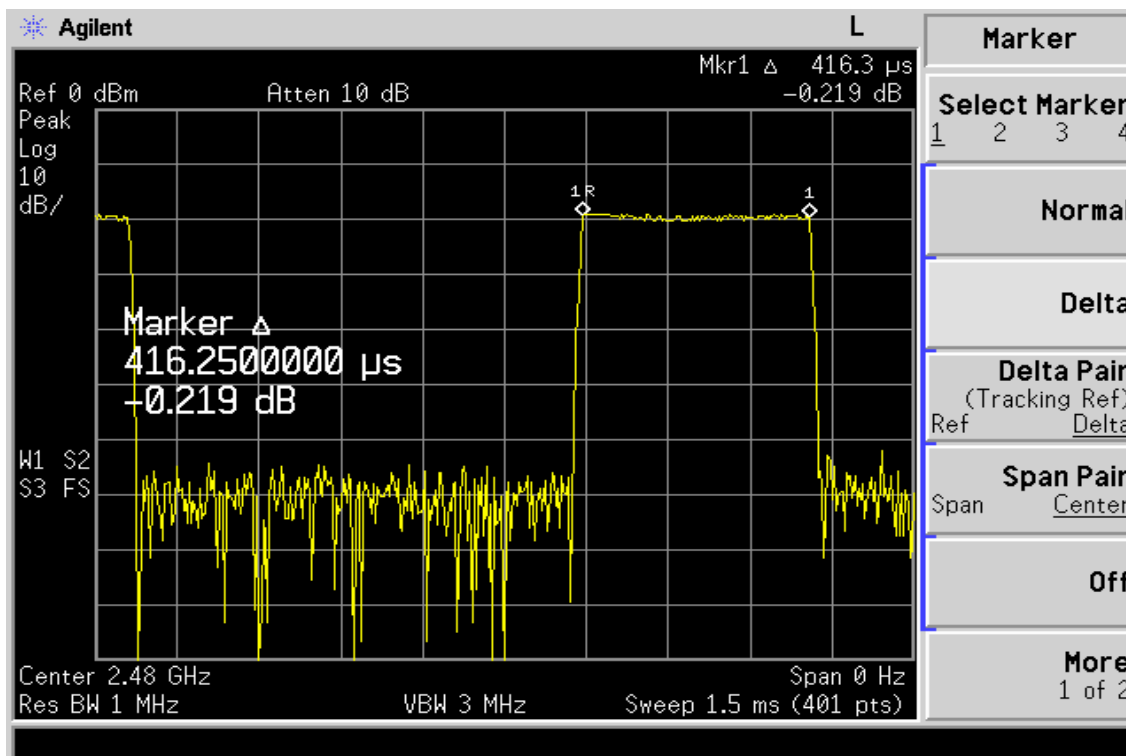


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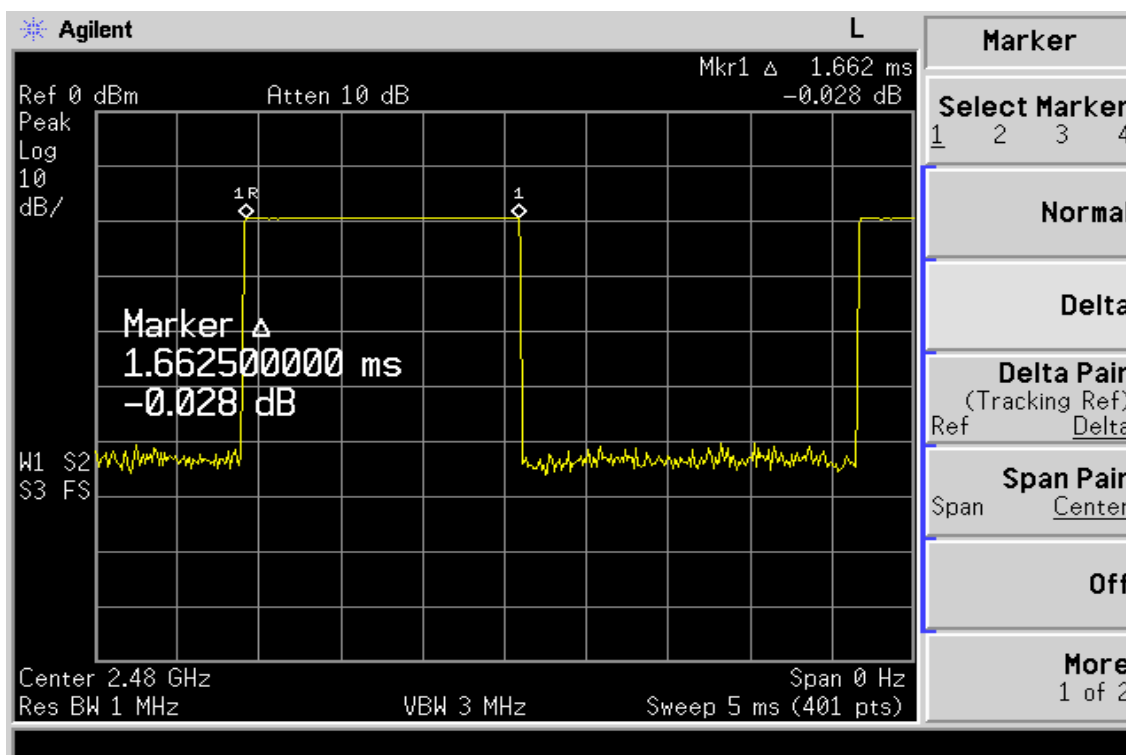
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CH-High

DH1



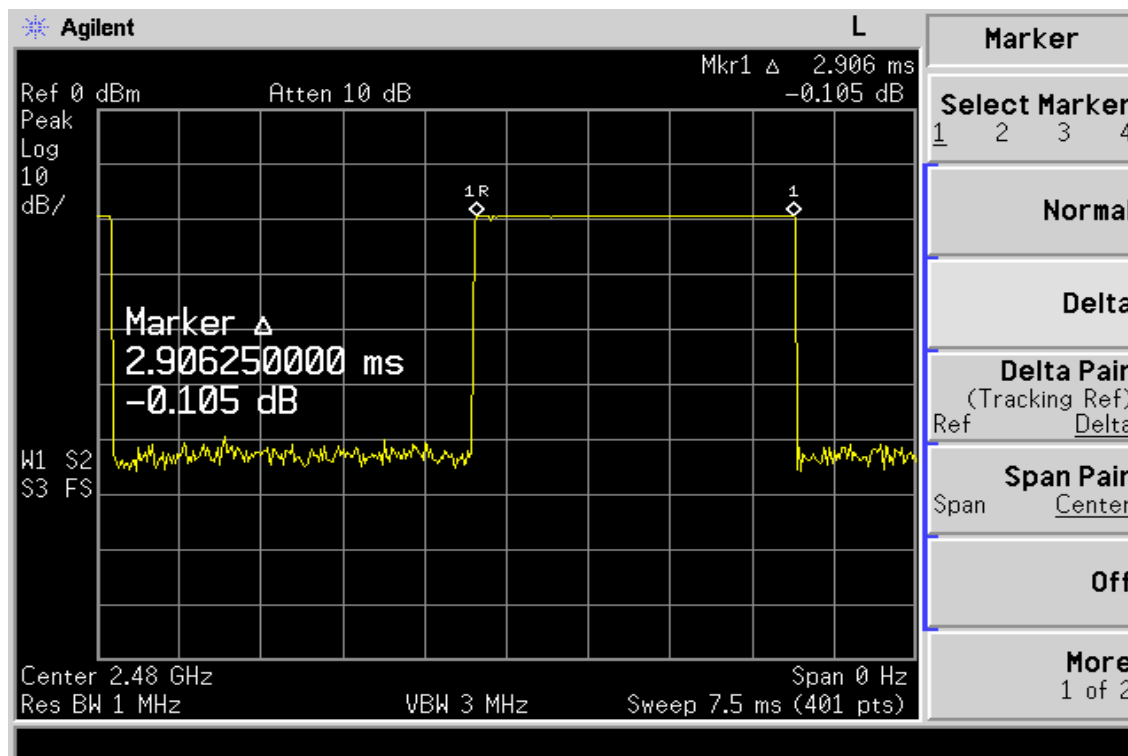
DH3



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DH5



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13. Peak Power Spectral Density

13.1. Standard Applicable

According to §15.247(d), for direct sequence systems, the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3kHz band during any time interval of continuous transmission.

13.2. 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 = 3KHz, VBW = 10KHz, Span = 300KHz, Sweep=100s
4. Record the max. reading.
5. Repeat above procedures until all frequency measured were complete.

13.3. Measurement Result

CH	RF Power Density Reading (dBm)	Cable loss (dB)	RF Power Density Level (dBm)	Maximum Limit (dBm)
Low	-9.99	0.20	-9.79	8
Mid	-11.15	0.20	-10.95	8
High	-12.59	0.20	-12.39	8

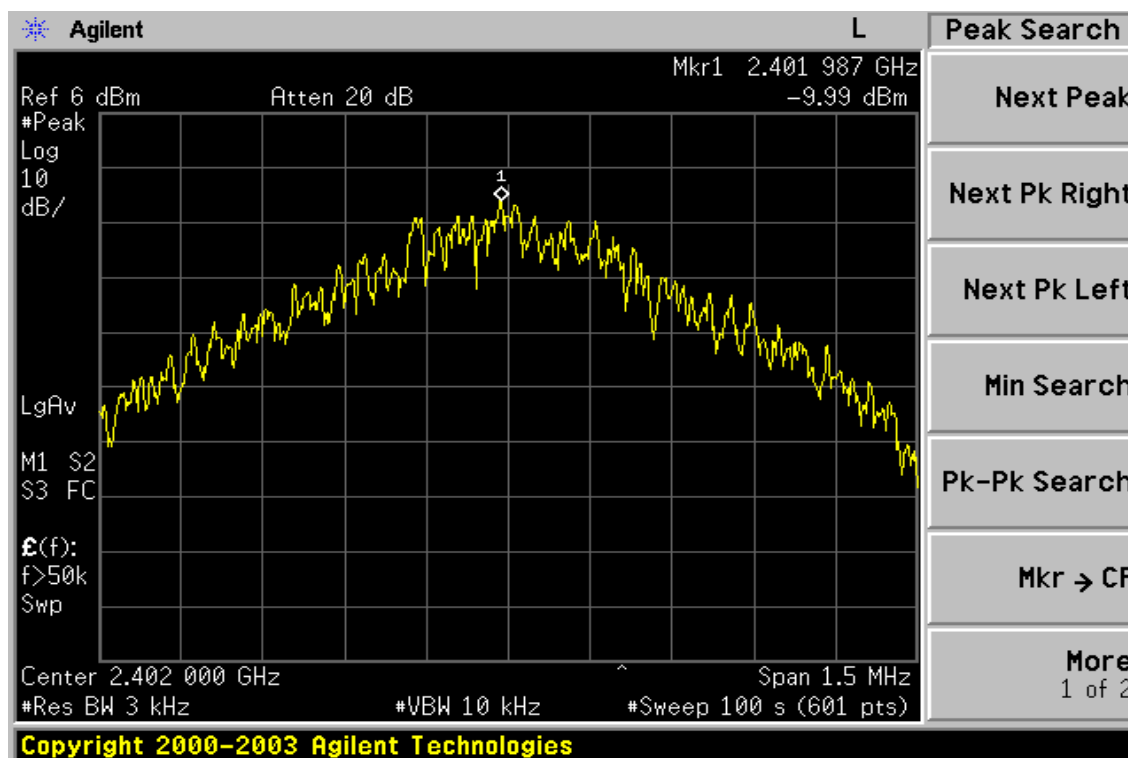
13.4. Measurement Equipment Used:

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Agilent	E4446A	MY43360126	04/27/2008	04/27/2009
Spectrum Analyzer	Agilent	E7405A	US41160416	07/04/2007	07/03/2008
Low Loss Cable	HUBER+SUHNER	SUCOFLEX 104PEA	N/A	N/A	N/A
Attenuator	Mini-Circuit	BW-S6W5	N/A	01/05/2008	01/04/2009

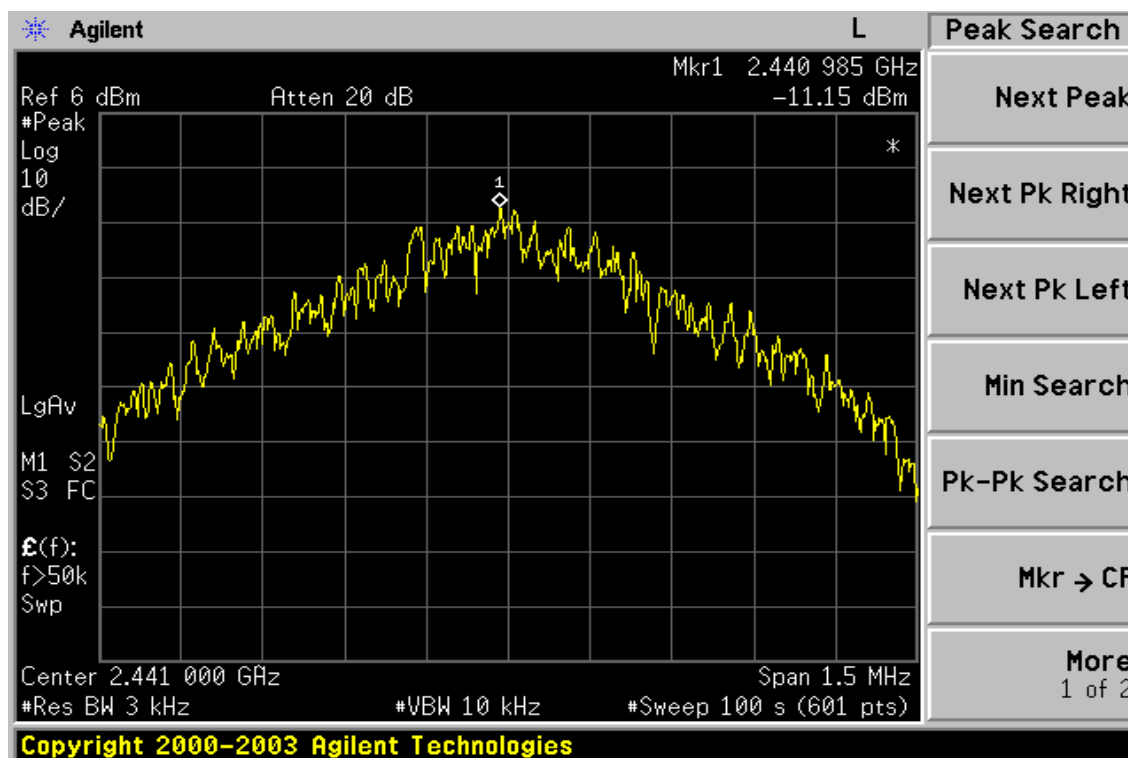
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Power Spectral Density Test Plot (CH-Low)



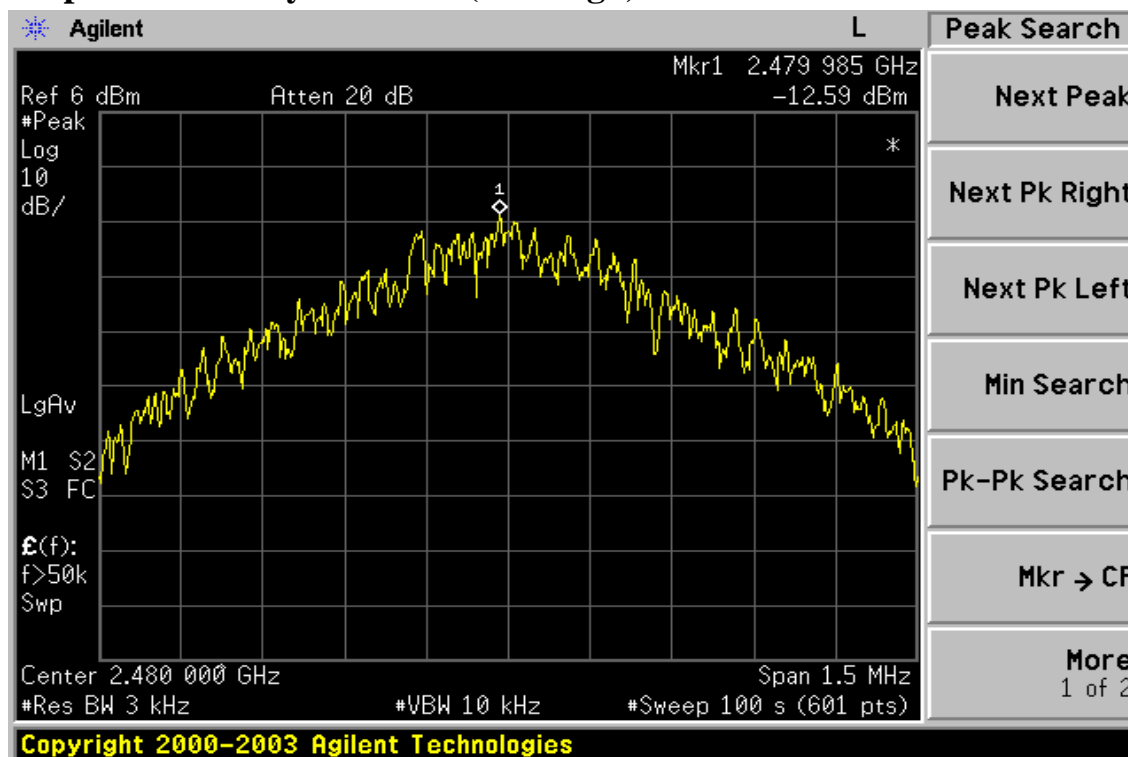
Power Spectral Density Test Plot (CH-Mid)



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Power Spectral Density Test Plot (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 2.08dBi, and the antenna connector is designed with permanent attachment and no consideration of replacement. Please see EUT photo for details.

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