ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

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

OF

Product Name:	**Sound Blaster Tactic3D Rage Wireless**
Brand Name:	**CREATIVE LABS**
System Model No.:	**GH0220**
Model No.:	**GH0220B**
Model Different:	**N/A**
FCC ID:	**IBAAVPGH0220B**
IC ID:	**2315A-AVPGH0220B**
Report No.:	**ER/2012/70027**
Issue Date:	**Aug. 20, 2012**
FCC Rule Part:	**§15.247, Cat: DTS**
IC Rule Part:	**RSS-210 issue 8 :2010, Annex 8**
Prepared for:	**Creative Labs Inc.** **1901 McCarthy Blvd, Milpitas, California 95035, United States**
Prepared by:	**SGS Taiwan Ltd.** **Electronics & Communication Laboratory** **No.134, Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803**

Testing Laboratory 0513

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VERIFICATION OF COMPLIANCE

Applicant:	Creative Labs Inc. 1901 McCarthy Blvd, Milpitas, California 95035, United States
Product Name:	Sound Blaster Tactic3D Rage Wireless
Brand Name:	CREATIVE LABS
FCC ID:	IBAAVPGH0220B
IC ID:	2315A-AVPGH0220B
System Model No.:	GH0220
Model No.:	GH0220B
Model Difference:	N/A
File Number:	ER/2012/70027
Date of test:	Aug. 06, 2012 ~ Aug. 20, 2012
Date of EUT Received:	Aug. 06, 2012

We hereby certify that:

The above equipment was tested by SGS Taiwan Ltd. Electronics & Communication Laboratory The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.4 (2003) and RSS-Gen. issue 3 the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits of FCC Rules Part 15.247 and IC RSS 210 issue 8: 2010 Annex 8.
The test results of this report relate only to the tested sample identified in this report.

Test By:	Marcus Tseng	***Date***	Aug. 20, 2012
	Marcus Tseng / Engineer		
Prepared By:	Cherry Chen	***Date***	Aug. 20, 2012
	Cherry Chen / Clerk.		
Approved By:	Jim Chang	***Date***	Aug. 20, 2012
	Jim Chang / Supervisor		

Version

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

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1 GENERAL INFORMATION

1.1 Product Description

General:

Product Name:	Sound Blaster Tactic3D Rage Wireless	
Brand Name:	CREATIVE LABS	
System Model No.:	GH0220	
Model No.:	GH0220B	
Model Difference:	N/A	
USB Cable:	Model: N/A, Supplier: N/A	
Power Supply:	3.7Vdc from Polymer Li-ion rechargeable battery	
	Battery:	Model: FT603048P, Supplier: Future Power

2.4GHz:

Frequency Range:	2405.35MHz~2477.35MHz
Channel Number:	37 channels 2405.35, 2407.35, 2409.35, 2411.35, 2413.35, 2415.35, 2417.35, 2419.35, 2421.35, 2423.35, 2425.35, 2427.35, 2429.35, 2431.35, 2433.35, 2435.35, 2437.35, 2439.35, 2441.35, 2443.35, 2445.35, 2447.35, 2449.35, 2451.35, 2453.35, 2455.35, 2457.35, 2459.35, 2461.35, 2463.35, 2465.35, 2467.35, 2469.35, 2471.35, 2473.35, 2475.35, 2477.35.
Modulation type:	π/4 DQPSK
Rated Power:	4.26 dBm
Antenna Designation:	PCB antenna, -1.58dBi
Type of Emission:	1M92GXD

This report applies for frequency bands: 2405.35MHz – 2477.35MHz.

1.2 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for **FCC ID: IBAAVPGH0220B** filing to comply with Section 15.247 of the FCC Part 15, Subpart C Rules and **IC: 2315A-AVPGH0220B** filing to comply with Industry Canada RSS-210 issue 8: 2010 Annex 8. The composite system (digital device) is compliance with Subpart B is authorized under a DoC procedure.

1.3 Test Methodology

Both conducted and radiated testing were performed according to the procedures in ANSI C63.4 (2003) and RSS-Gen: 2010. Radiated testing was performed at an antenna to EUT distance 3 meters.

1.4 Test Facility

The measurement facilities used to collect the 3m Radiated Emission and AC power line conducted data are located on the address of SGS Taiwan Ltd. Electronics & Communication Laboratory No. 134, Wu Kung Rd., Wuku Industrial Zone, Taipei Country, Taiwan which are constructed and calibrated to meet the FCC requirements in documents ANSI C63.4: 2003. FCC Registration Number are: 990257 and 236194, Canada Registration Number: 4620A-4.

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

1.5 Special Accessories

Not available for this EUT intended for grant.

1.6 Equipment Modifications

Not available for this EUT intended for grant.

2 SYSTEM TEST CONFIGURATION

2.1 EUT Configuration

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

2.2 EUT Exercise

The EUT (Transmitter) was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements.

2.3 Test Procedure

2.3.1 Conducted Emissions

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

2.3.2 Radiated Emissions

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

2.4 Configuration of Tested System

Fig. 2-1 Radiated Emission Configuration

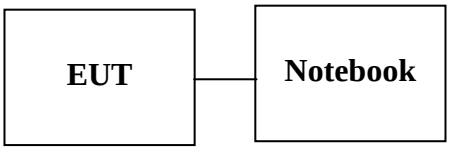


Fig. 2-2 Conducted Emission Configuration

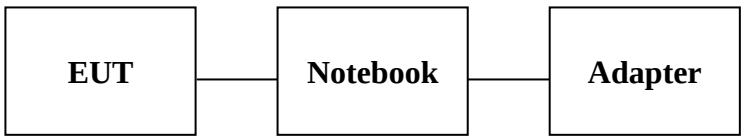


Table 2-1 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/ Type No.	Series No.
1.	Notebook	Dell	E5400	3704625136
2.	Test software	N/A	N/A	N/A

3 SUMMARY OF TEST RESULTS

FCC Rules	Description Of Test	Result
§15.207(a)/ RSS-Gen §7.2.4	AC Power Line Conducted Emission	Compliant
§15.247(b)/ RSS-210 §A8.4(4)	Peak Output Power	Compliant
§15.247(b)/ RSS-210 §A8.4(4)	6dB Bandwidth	Compliant
§15.247(c)/ RSS-210 §A8.4(4)	100 KHz Bandwidth Of Frequency Band Edges	Compliant
§15.247(c)/ RSS-210 §A8.4(4)	Spurious Emission	Compliant
§15.247/ RSS-210 §A8.2(b)	Peak Power Density	Compliant
§15.203/ RSS-GEN §7.1.2,	Antenna Requirement	Compliant
RSS-Gen §4.6.1	99% Power Bandwidth	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.

2.4GHz mode: Channel low (2405.35MHz)、mid (2441.35MHz) and high (2477.35MHz) with the worst case E2 plain are chosen for full testing.

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

6 CONDUCTED EMISSION TEST

6.1. Standard Applicable:

According to §15.207 and RSS-Gen §7.2.4, frequency range within 150KHz to 30MHz shall not exceed the Limit table as below.

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

6.2. Measurement Equipment Used:

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

6.3. EUT Setup:

1. The conducted emission tests were performed in the test site, using the setup in accordance with the ANSI C63.4-2003.
2. The 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.

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.

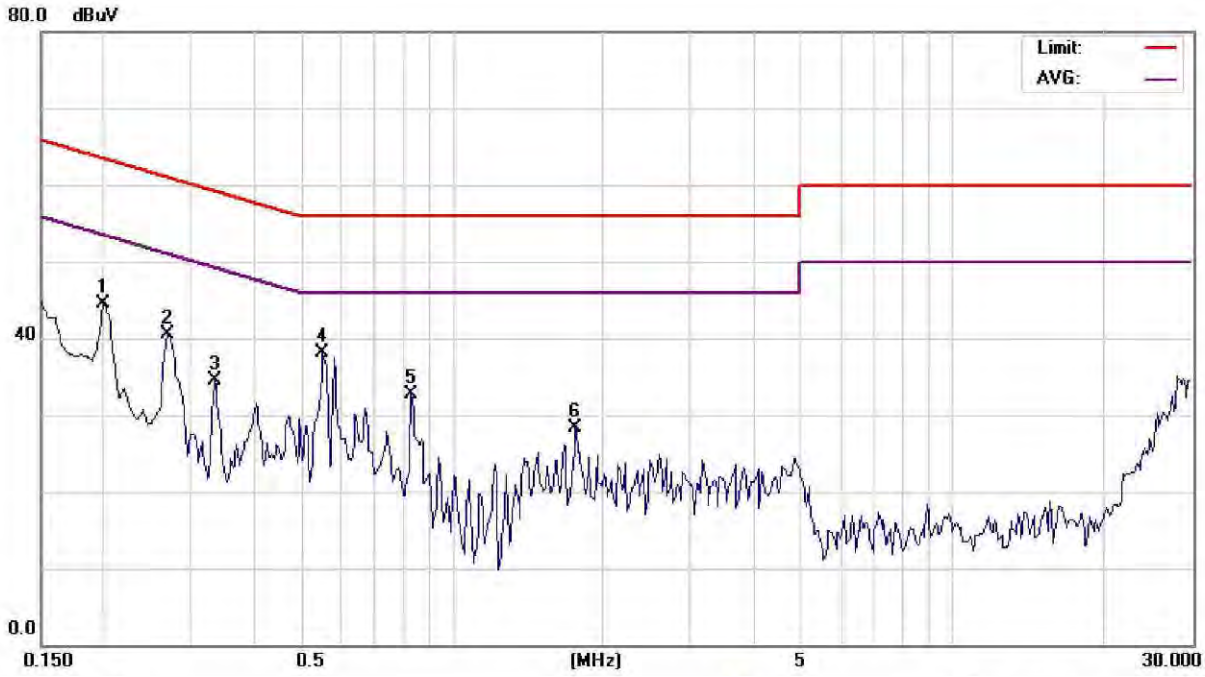
6.5. Measurement Result:

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.

AC POWER LINE CONDUCTED EMISSION TEST DATA

Operation Mode:	Operation Link			Test Date:	Aug. 17, 2012
Temperature:	24 ℃	Humidity:	60 %	Test By:	Marcus

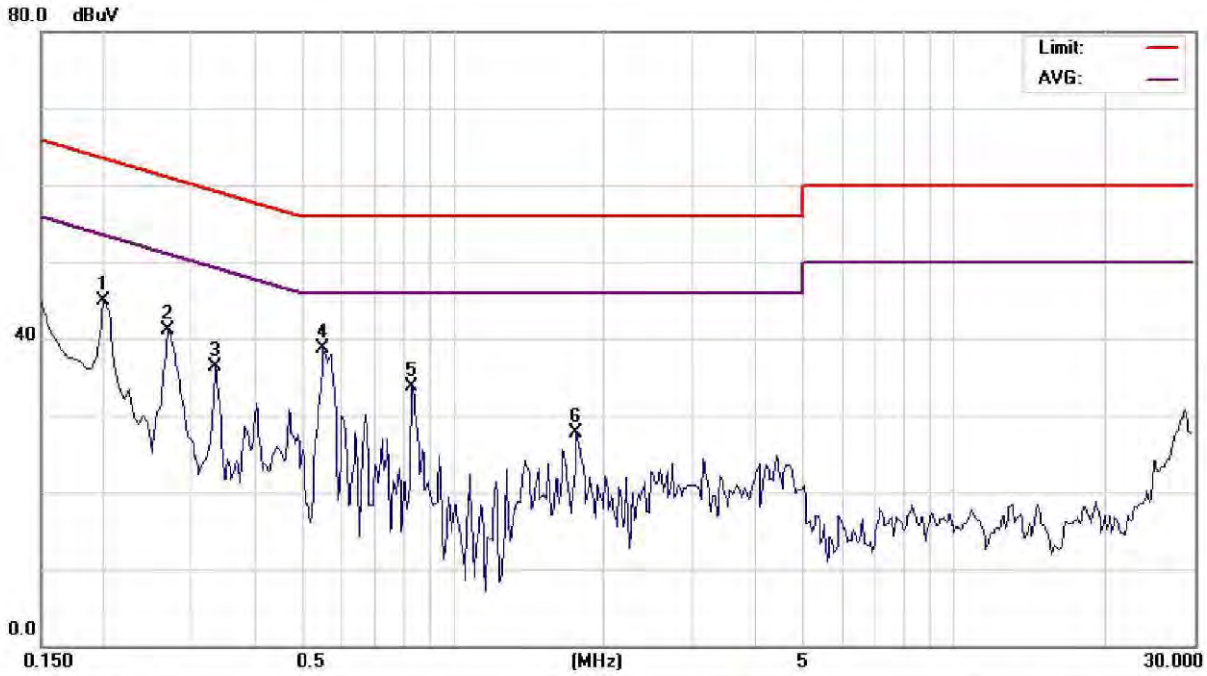


Site ConductionRoom
Limit: FCC Class B Conduction(QP)
EUT: Sound Blaster Tactic3D Rage Wireless
M/N: GH0220B
Mode: Operationmode
Note:

Phase: L1
Power: AC 120V/60Hz
Distance:

Temperature: 24 ℃
Humidity: 60%

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.2000	44.41	0.12	44.53	63.61	-19.08	peak	
2		0.2700	40.38	0.12	40.50	61.12	-20.62	peak	
3		0.3350	34.45	0.12	34.57	59.33	-24.76	peak	
4	*	0.5500	37.90	0.12	38.02	56.00	-17.98	peak	
5		0.8300	32.51	0.12	32.63	56.00	-23.37	peak	
6		1.7700	28.18	0.15	28.33	56.00	-27.67	peak	



Site ConductionRoom
Limit: FCC Class B Conduction(QP)
EUT: Sound Blaster Tactic3D Rage Wireless
M/N: GH0220B
Mode: Operationmode
Note:

Phase: N
Power: AC 120V/60Hz
Distance:

Temperature: 24 ℃
Humidity: 60%

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.2000	44.81	0.13	44.94	63.61	-18.67	peak	
2		0.2700	40.91	0.13	41.04	61.12	-20.08	peak	
3		0.3350	36.09	0.12	36.21	59.33	-23.12	peak	
4	*	0.5500	38.63	0.12	38.75	56.00	-17.25	peak	
5		0.8300	33.50	0.13	33.63	56.00	-22.37	peak	
6		1.7700	27.62	0.15	27.77	56.00	-28.23	peak	

7 PEAK OUTPUT POWER MEASUREMENT

7.1 Standard Applicable:

According to §15.247(a)(2), (b)

(3) For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

(4) The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(c) Operation with directional antenna gains greater than 6 dBi.

(1) Fixed point-to-point operation:

(i) Systems operating in the 2400-2483.5 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum conducted 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.

(ii) Systems operating in the 5725-5850 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted output power.

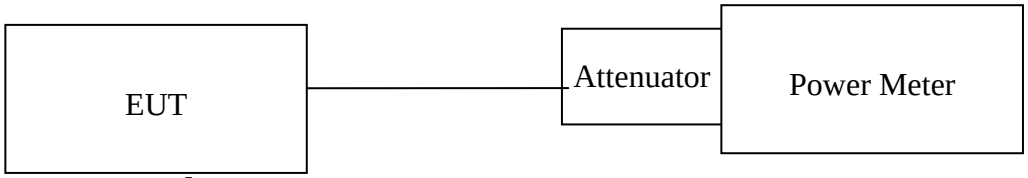
According to RSS-210 issue 8,§A8.4(4), for systems employing digital modulation techniques operating in the bands 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz, the maximum peak conducted output power shall not exceed 1 W. Except as provided in Section A8.4 (5), the e.i.r.p. shall not exceed 4 W.

As an alternative to a peak power measurement, compliance can be based on a measurement of the maximum conducted output power. The maximum conducted output power is the total transmit power delivered to all antennas and antenna elements, averaged across all symbols in the signalling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or transmitting at a reduced power level. If multiple modes of operation are implemented, the maximum conducted output power is the highest total transmit power occurring in any mode.

7.2 Measurement Equipment Used:

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

7.3 .Test Set-up:



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.
3. Record the max. reading.
4. Repeat above procedures until all frequency measured were complete.

7.5 Measurement Result:

CH	Frequency (MHz)	Peak Power Output(dBm)	Required Limit
2	2405.35	4.26	1 Watt = 30 dBm
20	2441.35	3.41	1 Watt = 30 dBm
38	2477.35	2.34	1 Watt = 30 dBm

CH	Frequency (MHz)	Average Power Output (dBm)	Required Limit
2	2405.35	2.13	1 Watt = 30 dBm
20	2441.35	1.18	1 Watt = 30 dBm
38	2477.35	0.04	1 Watt = 30 dBm

**Note: Measured by Power Meter*

Offset: 0.5 dB

**Read Power = Output Power + Cable Loss*

8 6dB Bandwidth

8.1 Standard Applicable:

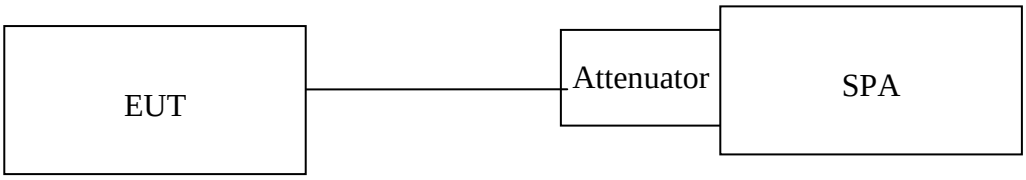
According to §15.247(a)(2), Systems using digital modulation techniques may operate in the 902 - 928 MHz,2400 - 2483.5 MHz, and 5725 - 5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500kHz.

According to RSS 210 issue 8: 2010Annex 8.2. Systems employing digital modulation techniques (which includes direct sequence) can now be certified under RSS-210 provided they comply with the following requirements: The minimum 6 dB bandwidth shall be at least 500 kHz.

8.2 Measurement Equipment Used:

Refer to section 7.2 for details.

8.3 Test Set-up:



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 3.antenna port to the spectrum analyzer.

3.Set the spectrum analyzer as RBW=100KHz, VBW = 3*RBW, Span= 30M/60MHz, Sweep=auto

4. Mark the peak frequency and –6dB (upper and lower) frequency.

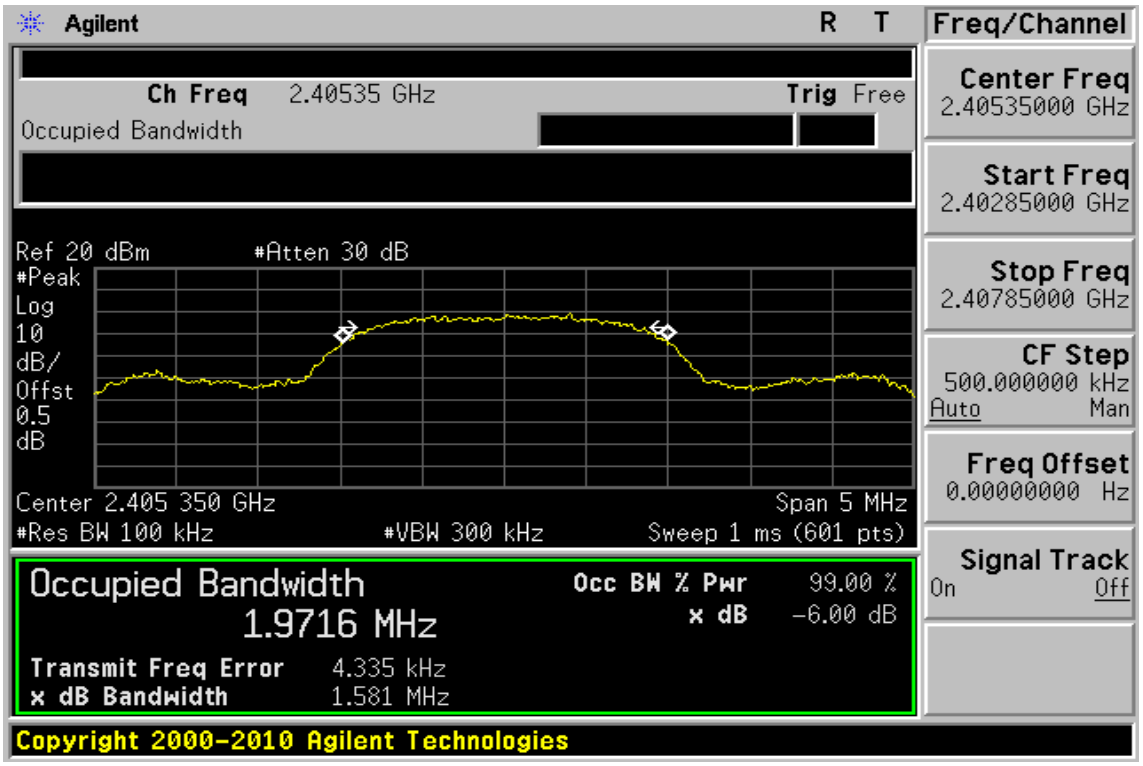
5. Repeat above procedures until all frequency measured were complete.

8.5 Measurement Result:

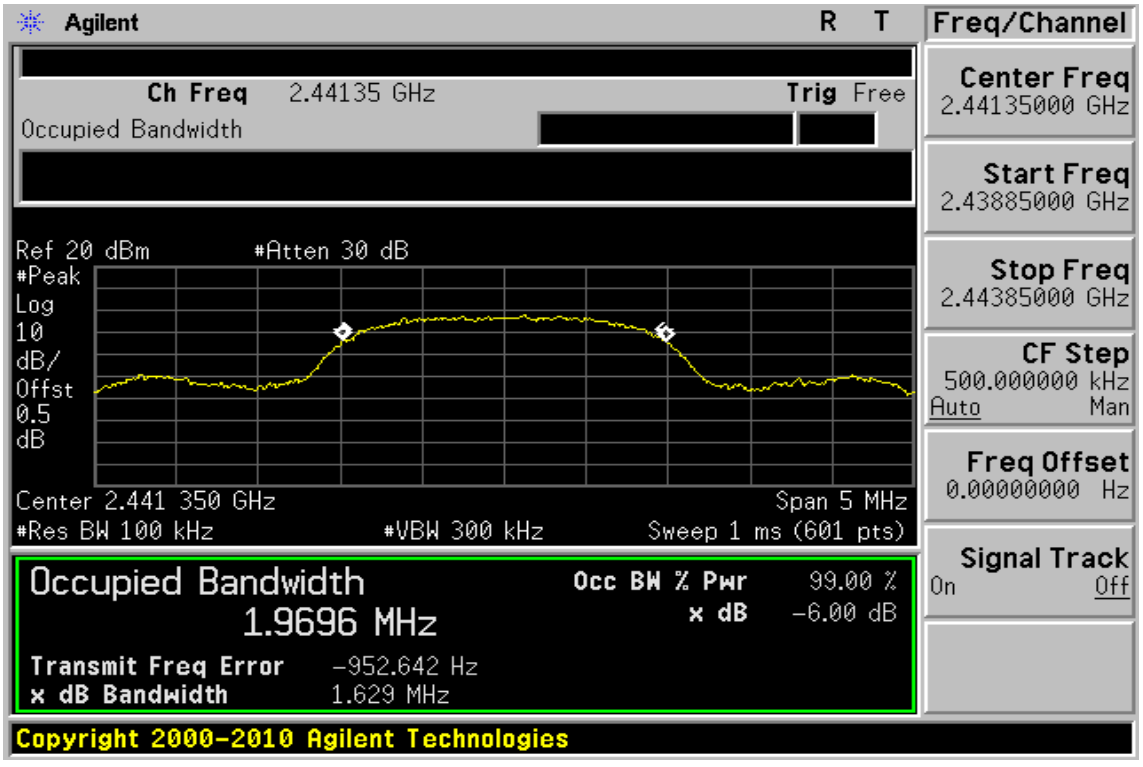
Frequency (MHz)	Bandwidth (MHz)	Bandwidth (KHz)	Result
2405.35	1.581	> 500	PASS
2441.35	1.629	> 500	PASS
2477.35	1.634	> 500	PASS

**Note: Offset 0.5dB*

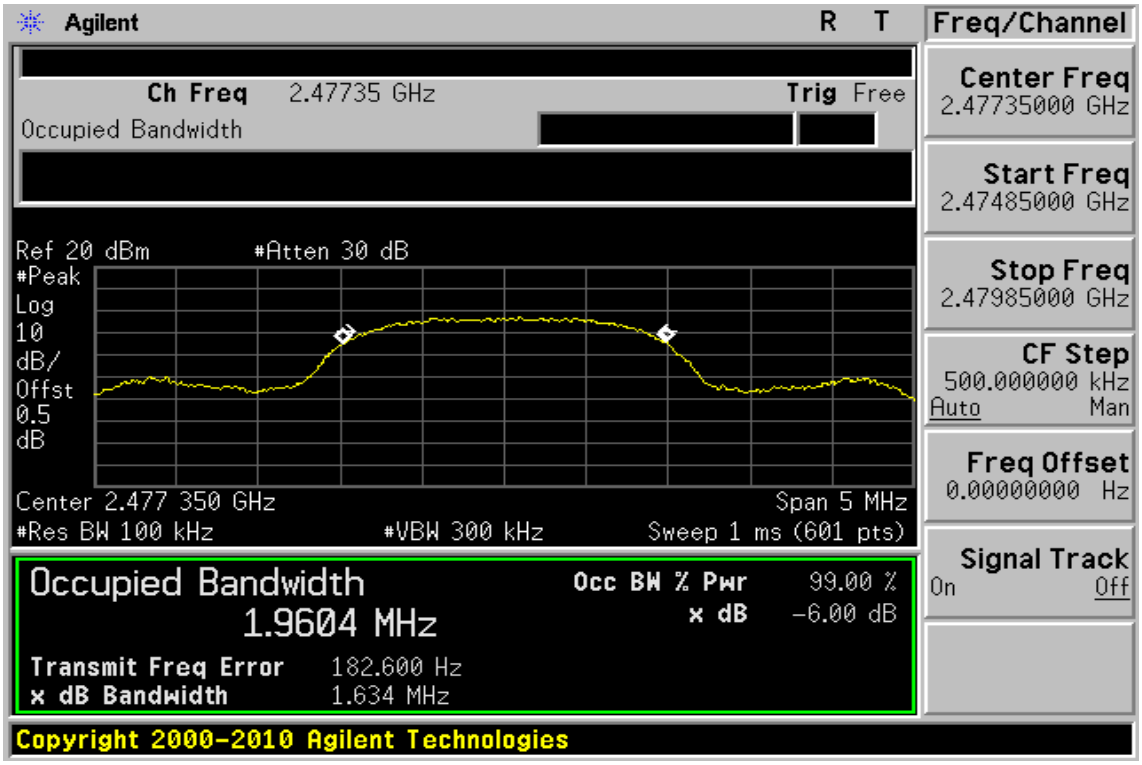
6dB Bandwidth Test Data CH-Low



6dB Bandwidth Test Data CH-Mid



6dB Bandwidth Test Data CH-High



9 100KHz BANDWIDTH OF BAND EDGES MEASUREMENT

9.1 Standard Applicable:

According to §15.247(c), in any 100 KHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator 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).

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

9.2 Measurement Equipment Used:

9.2.1. Conducted Emission at antenna port:

Refer to section 7.2 for details.

9.2.2. Radiated emission:

966 Chamber					
EQUIPMENT TYPE	**MFR**	**MODEL NUMBER**	**SERIAL NUMBER**	**LAST CAL.**	**CAL DUE.**
EMI Test Receiver	R&S	ESCI7	100759	05/20/2011	05/19/2013
Spectrum Analyzer	Agilent	E4446A	MY51100003	04/15/2011	04/14/2013
EXA Spectrum Analyzer	Agilent	N9010A	MY50420195	02/15/2011	02/14/2013
Spectrum Analyzer	R&S	FSV-30	101398	10/18/2011	10/17/2013
Bilog Antenna	SCHWAZBECK	VULB9168	378	01/10/2012	01/09/2014
Horn antenna	ETS.LINDGREN	3117	123995	05/19/2011	05/18/2013
Horn Antenna	Schwarzbeck	BBHA9170	185	07/11/2011	07/10/2013
Pre-Amplifier	Agilent	8447D	2944A07676	01/04/2012	01/03/2013
Pre-Amplifier	EMC Instruments Corp.	EMC0126530	980038	01/04/2012	01/03/2013
Filter 2400-2483.5 MHz	EWT	EWT-14-0166	M2	02/28/2012	02/28/2013
Attenuator	Mini-Circuit	BW-S10W2+	004	02/28/2012	02/27/2013
Turn Table	HD	DT420	N/A	N.C.R	N.C.R
Antenna Tower	HD	MA240-N	240/657	N.C.R	N.C.R
Controller	HD	HD100	N/A	N.C.R	N.C.R
Low Loss Cable	Huber Suhner	966_Rx	9	01/04/2012	01/03/2013
3m Site NSA	SGS	966 chamber	N/A	07/15/2012	07/14/2013

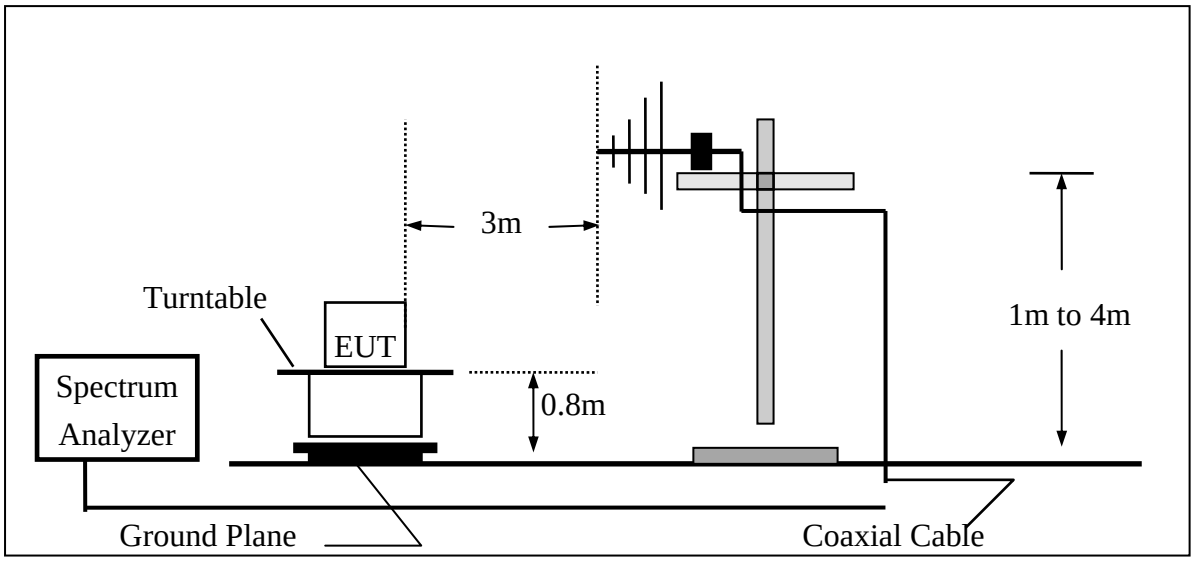
9.3 Test SET-UP:

9.3.1 Conducted Emission at antenna port:

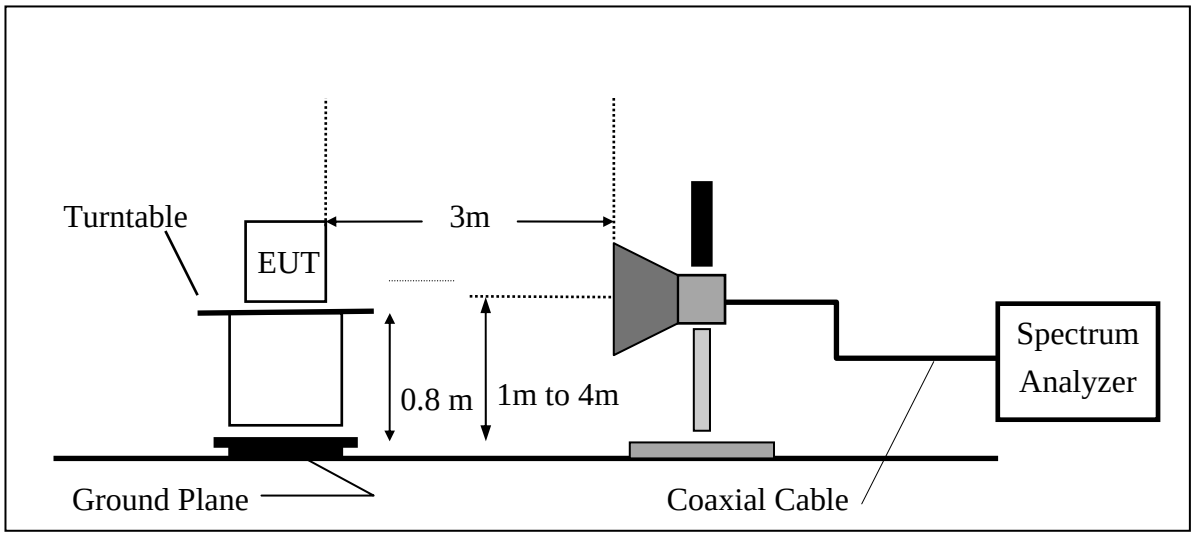
Refer to section 8.3 for details.

9.3.2 Radiated emission:

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



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



9.4 Measurement Procedure:

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

9.5 Field Strength Calculation:

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

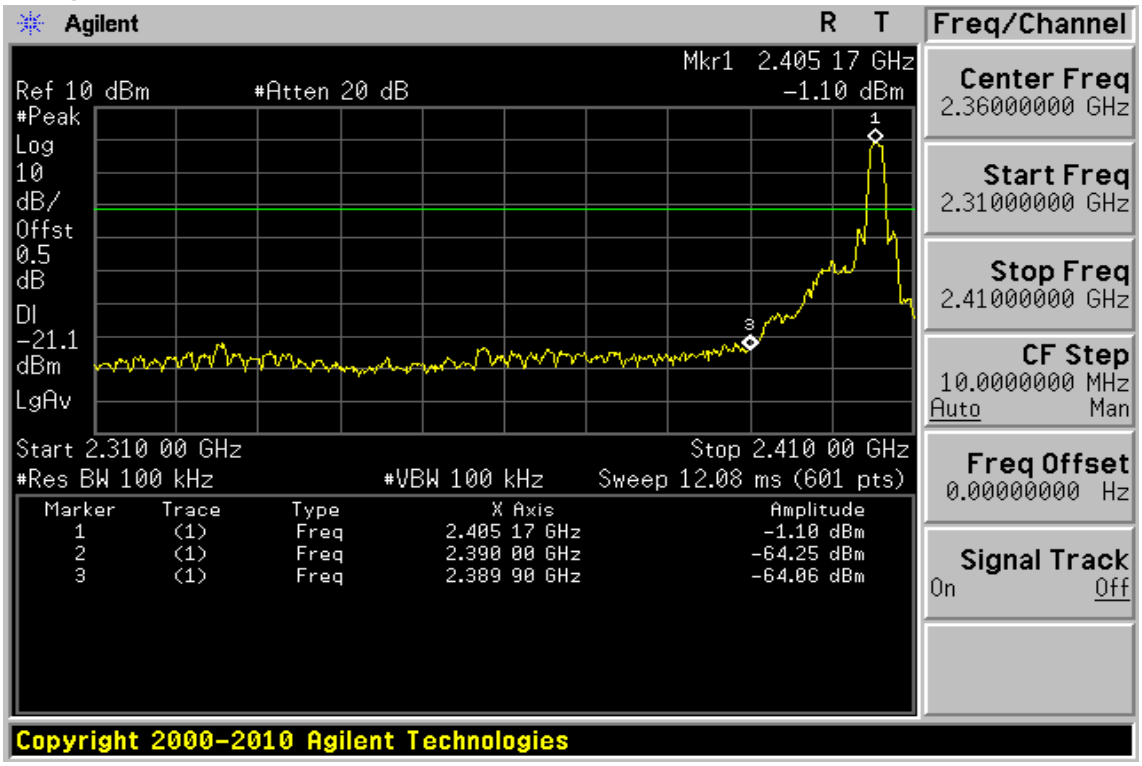
FS = RA + AF + CL - AG

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

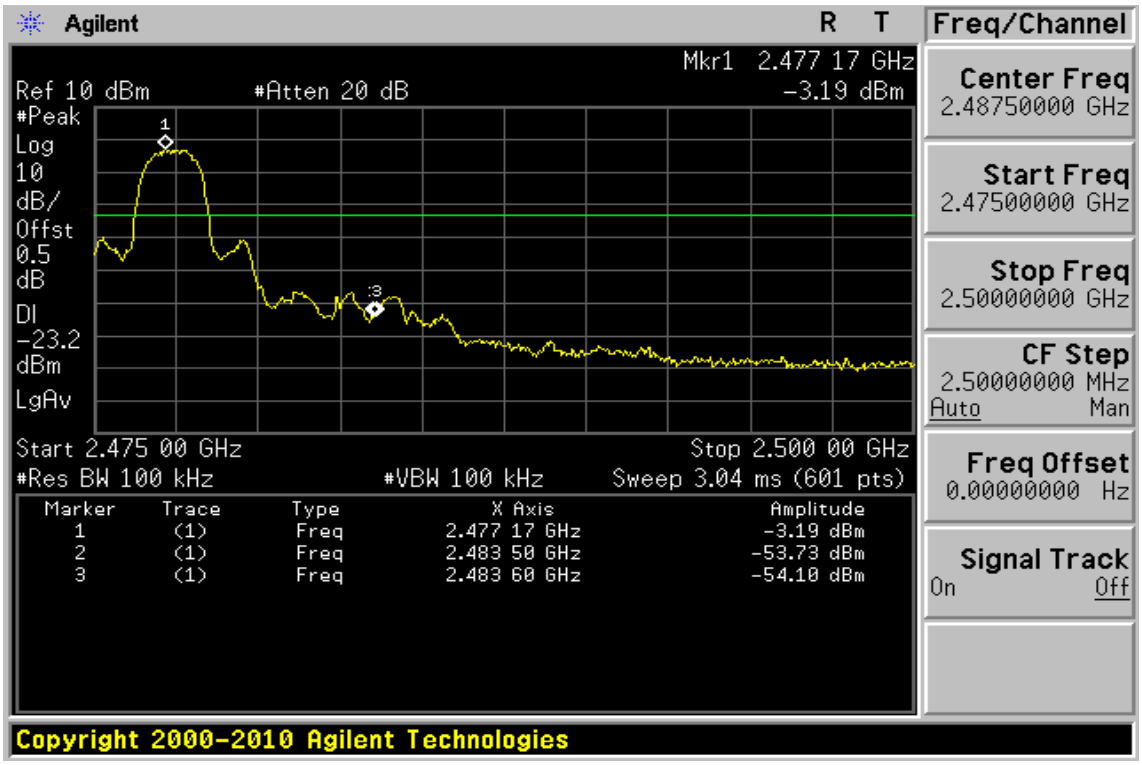
9.6 Measurement Result:

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

Band Edges Test Data CH-Low



Band Edges Test Data CH-High



Radiated Emission:

Operation Band	:2.4G	Test Date	:2012-08-15
Fundamental Frequency	:2405.35 MHz	Temp./Humi.	:27.7 deg_C / 62 RH
Operation Mode	:TX LOW BANDEDGE	Engineer	:Marcus
EUT Pol.	:E2 PLAN	Measurement Antenna Pol.	:VERTICAL

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

Factor(dB) = Antenna Factor(dBμV/m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.
"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.
"---" : denotes Noise Floor.

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2390.00	E	Average	34.39	4.68	39.07	54.00	-14.93
2390.00	E	Peak	45.78	4.68	50.46	74.00	-23.54

Operation Band	:2.4G	Test Date	:2012-08-15
Fundamental Frequency	:2405.35 MHz	Temp./Humi.	:27.7 deg_C / 62 RH
Operation Mode	:TX LOW BANDEDGE	Engineer	:Marcus
EUT Pol.	:E2 PLAN	Measurement Antenna Pol.	:HORIZONTAL

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

Factor(dB) = Antenna Factor(dBμV/m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.
"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.
"---" : denotes Noise Floor.

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2390.00	E	Average	33.68	5.30	38.98	54.00	-15.02
2390.00	E	Peak	45.76	5.30	51.06	74.00	-22.94

Operation Band	:2.4G	Test Date	:2012-08-15
Fundamental Frequency	:2477.35 MHz	Temp./Humi.	:27.7 deg_C / 62 RH
Operation Mode	:TX HIGH BANDEDGE	Engineer	:Marcus
EUT Pol.	:E2 PLAN	Measurement Antenna Pol.	:HORIZONTAL

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

Factor(dB) = Antenna Factor(dBμV/m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.
"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.
"---" : denotes Noise Floor.

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2483.50	E	Average	37.28	6.29	43.57	54.00	-10.43
2483.50	E	Peak	49.21	6.29	55.50	74.00	-18.50

Operation Band	:2.4G	Test Date	:2012-08-15
Fundamental Frequency	:2477.35 MHz	Temp./Humi.	:27.7 deg_C / 62 RH
Operation Mode	:TX HIGH BANDEDGE	Engineer	:Marcus
EUT Pol.	:E2 PLAN	Measurement Antenna Pol.	:VERTICAL

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

Factor(dB) = Antenna Factor(dBμV/m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.
"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.
"---" : denotes Noise Floor.

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2483.50	E	Average	40.41	5.26	45.67	54.00	-8.33
2483.50	E	Peak	51.14	5.26	56.40	74.00	-17.60

10 SPURIOUS RADIATED EMISSION TEST

10.1 Standard Applicable

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

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

10.2 Measurement Equipment Used:

10.2.1. Conducted Emission at antenna port:

Refer to section 7.2 for details.

10.2.2. Radiated emission:

Refer to section 9.2.2 for details.

10.3 Test SET-UP:

10.3.1. Conducted Emission at antenna port:

Refer to section 8.3 for details.

10.3.2. Radiated emission:

Refer to section 9.3.2 for details.

10.4 Measurement Procedure:

Radiated Emission:

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

Conducted Emission:

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

10.5 Field Strength Calculation

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

FS = RA + AF + CL - AG

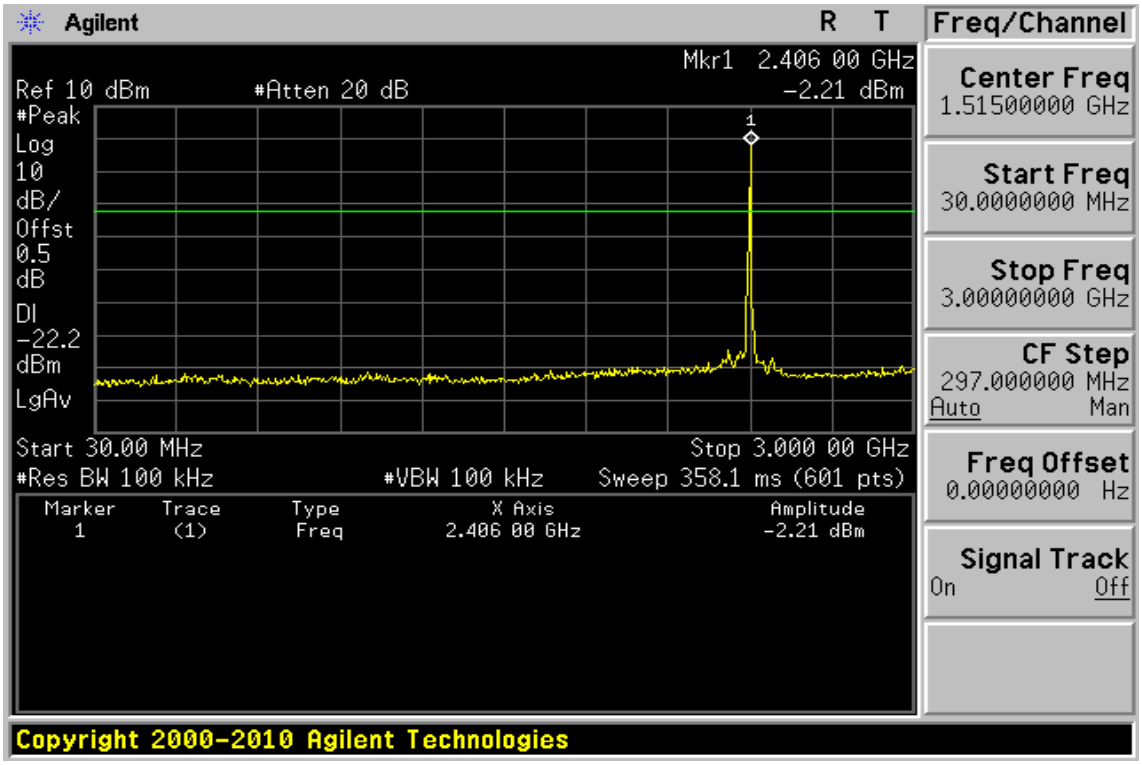
Where	FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
	RA = Reading Amplitude	AG = Amplifier Gain
	AF = Antenna Factor	

10.6 Measurement Result:

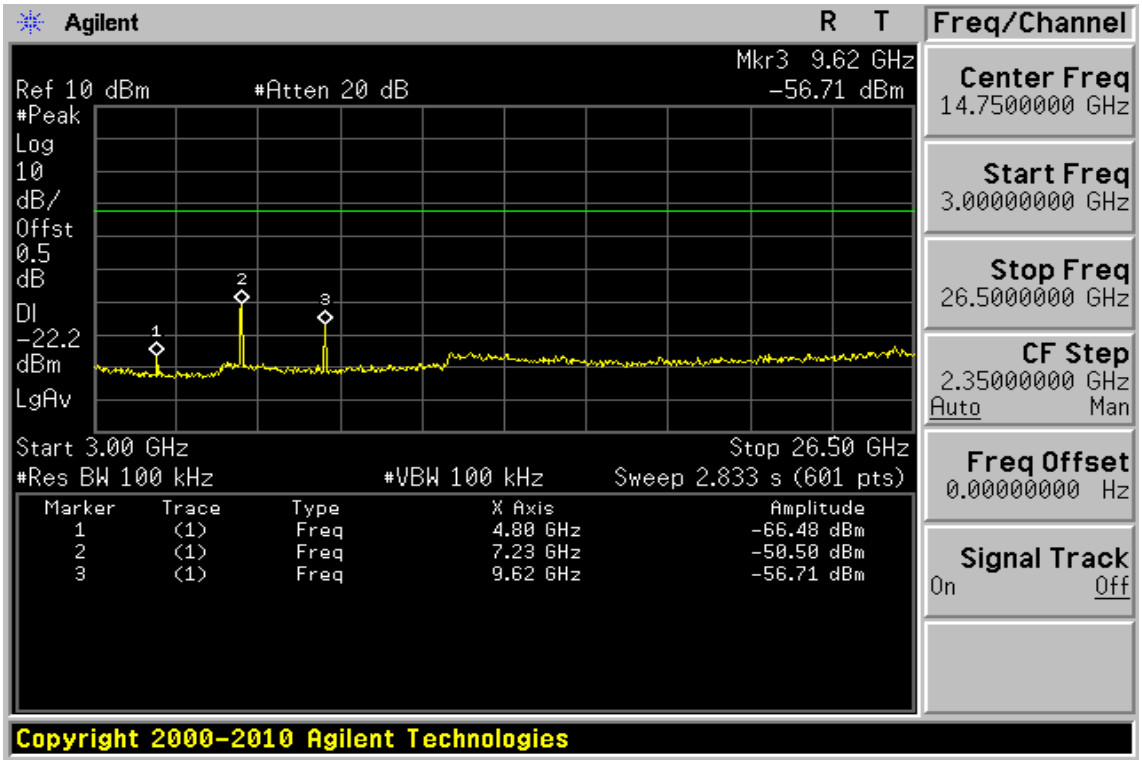
Note: Refer to next page spectrum analyzer data chart and tabular data sheets.

Conducted Spurious Emission Measurement Result

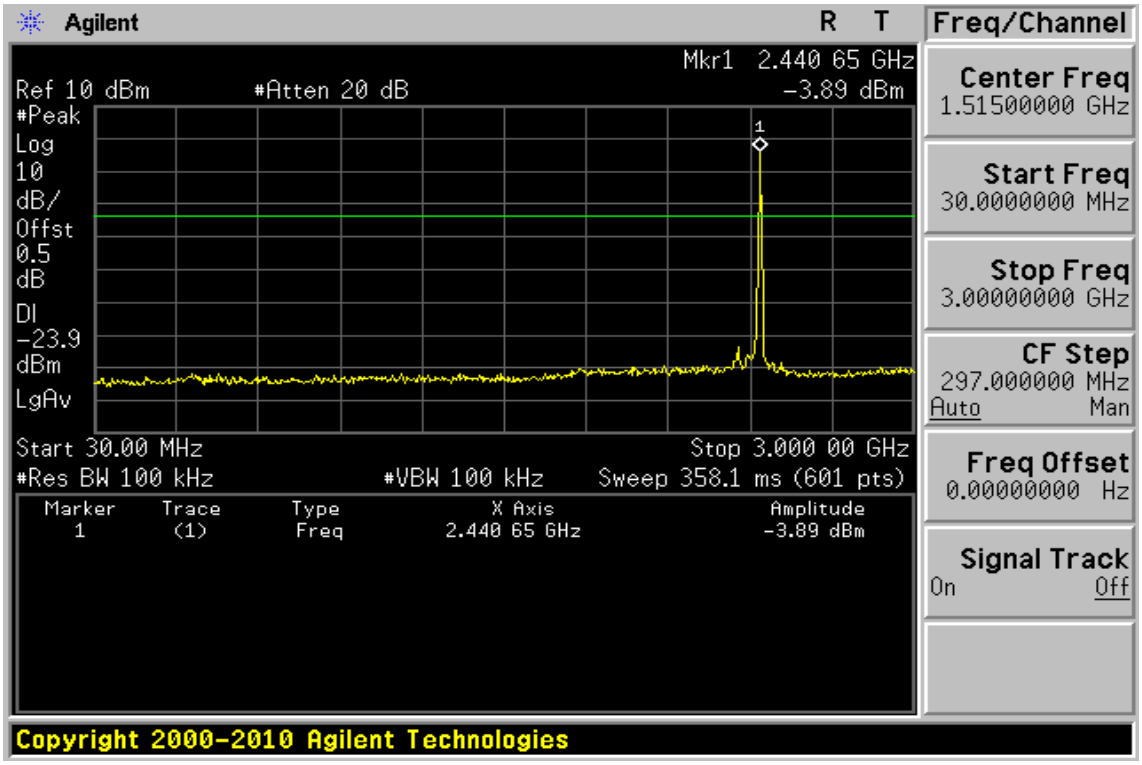
Ch Low 30MHz – 3GHz



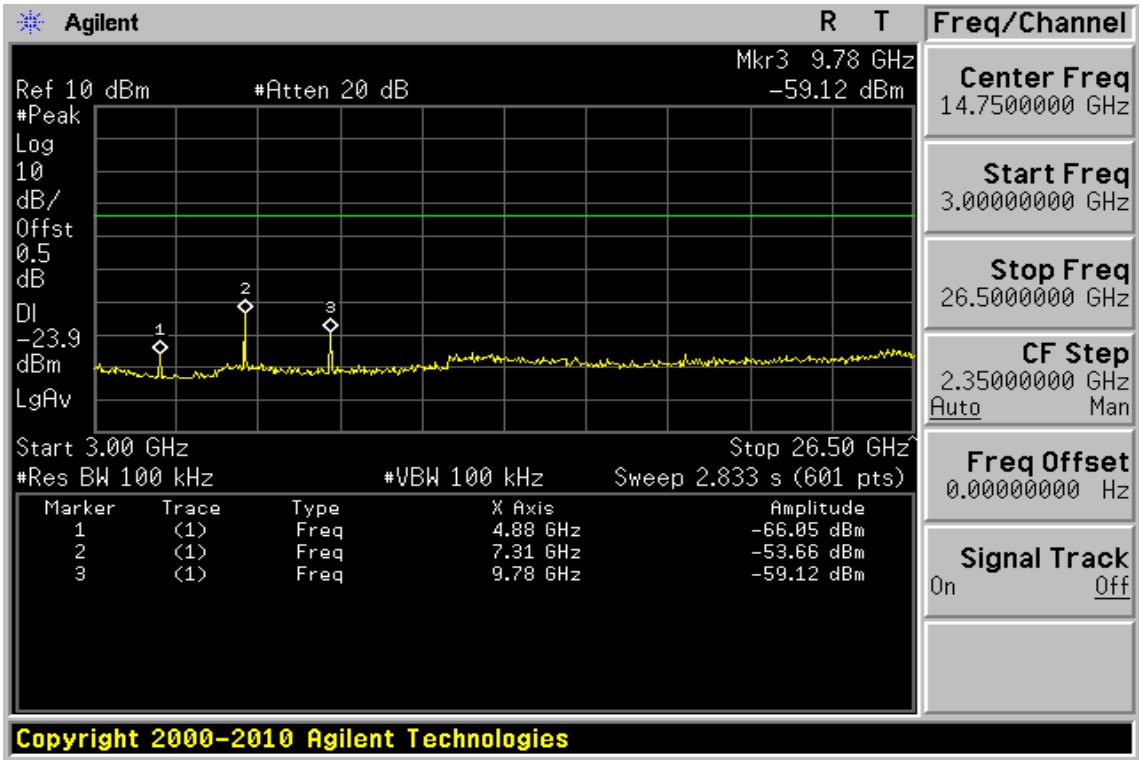
Ch Low 3GHz – 26.5GHz



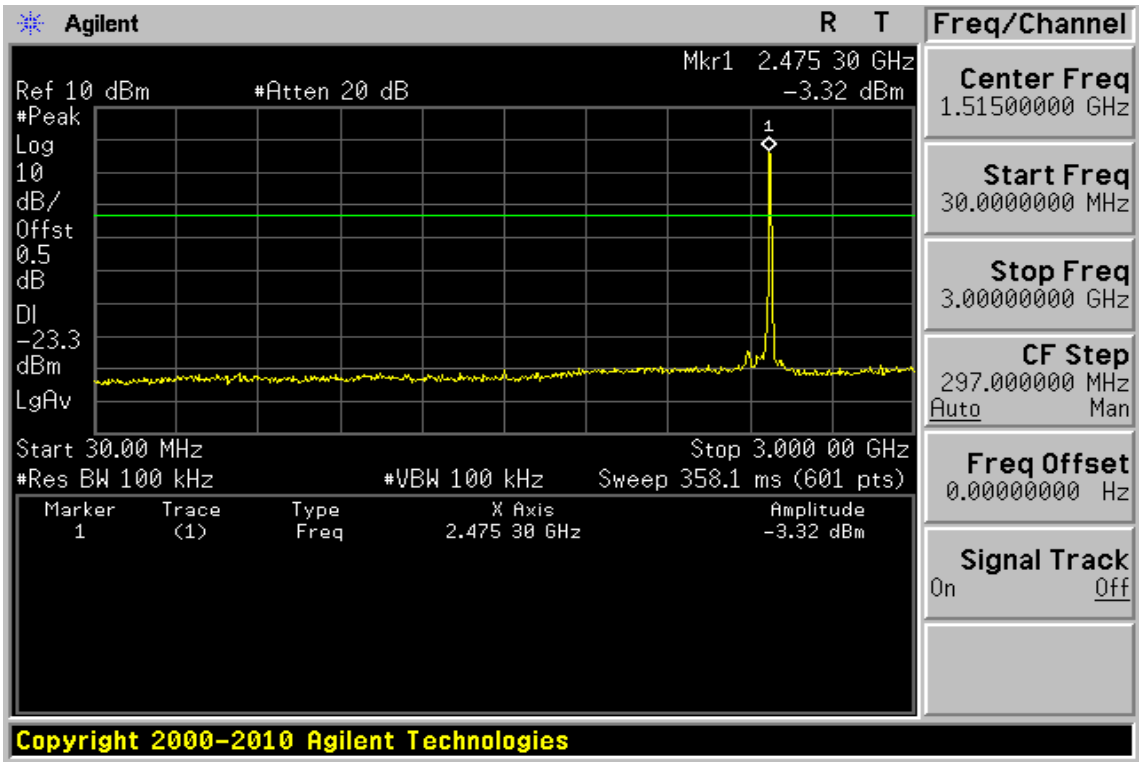
Ch Mid 30MHz – 3GHz



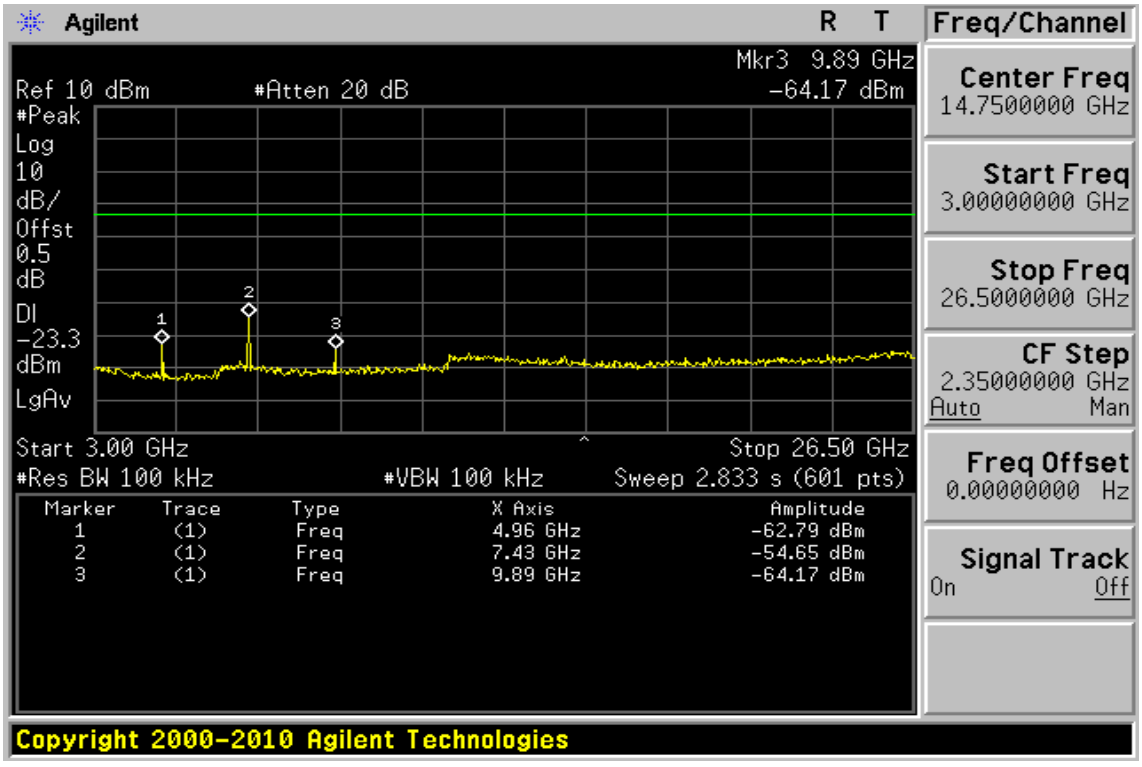
Ch Mid 3GHz – 26.5GHz



Ch High 30MHz – 3GHz



Ch High 3GHz – 26.5GHz



Radiated Spurious Emission Measurement Result (below 1GHz)

Operation Band	:2.4G	Test Date	:2012-08-15
Fundamental Frequency	:2405.35 MHz	Temp./Humi.	:27.7 deg_C / 62 RH
Operation Mode	:TX LOW	Engineer	:Marcus
EUT Pol.	:E2 PLAN	Measurement Antenna Pol.	:VERTICAL

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

Factor(dB) = Antenna Factor(dBμV/m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.
"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.
"---" : denotes Noise Floor.

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
153.19	S	Peak	44.64	-12.32	32.32	43.50	-11.18
274.44	S	Peak	41.19	-13.21	27.98	46.00	-18.02
495.60	S	Peak	39.31	-9.63	29.68	46.00	-16.32
533.43	S	Peak	36.76	-8.92	27.84	46.00	-18.16
798.24	S	Peak	33.01	-4.22	28.79	46.00	-17.21
933.07	S	Peak	34.21	-2.26	31.95	46.00	-14.05
4810.70	H	Peak	35.65	9.63	45.28	74.00	-28.72
7216.05	H	---					
9621.40	H	---					
12026.75	H	---					
14432.10	H	---					
16837.45	H	---					
19242.80	H	---					
21648.15	H	---					
24053.50	H	---					

Operation Band	:2.4G	Test Date	:2012-08-15
Fundamental Frequency	:2405.35 MHz	Temp./Humi.	:27.7 deg_C / 62 RH
Operation Mode	:TX LOW	Engineer	:Marcus
EUT Pol.	:E2 PLAN	Measurement Antenna Pol.	:HORIZONTAL

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

Factor(dB) = Antenna Factor(dBμV/m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.
"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.
"---" : denotes Noise Floor.

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
93.05	S	Peak	47.72	-17.37	30.35	43.50	-13.15
191.99	S	Peak	47.73	-15.76	31.97	43.50	-11.53
299.66	S	Peak	45.35	-12.58	32.77	46.00	-13.23
461.65	S	Peak	40.04	-9.94	30.10	46.00	-15.90
796.30	S	Peak	37.81	-4.24	33.57	46.00	-12.43
960.23	S	Peak	33.16	-2.06	31.10	54.00	-22.90
4810.70	H	Peak	35.49	9.66	45.15	74.00	-28.85
7216.05	H	---					
9621.40	H	---					
12026.75	H	---					
14432.10	H	---					
16837.45	H	---					
19242.80	H	---					
21648.15	H	---					
24053.50	H	---					

Operation Band	:2.4G	Test Date	:2012-08-15
Fundamental Frequency	:2441.35 MHz	Temp./Humi.	:27.7 deg_C / 62 RH
Operation Mode	:TX MID	Engineer	:Marcus
EUT Pol.	:E2 PLAN	Measurement Antenna Pol.	:VERTICAL

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

Factor(dB) = Antenna Factor(dBμV/m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.
"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.
"---" : denotes Noise Floor.

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
157.07	S	Peak	44.73	-12.29	32.44	43.50	-11.06
282.20	S	Peak	41.08	-12.99	28.09	46.00	-17.91
495.60	S	Peak	39.95	-9.63	30.32	46.00	-15.68
696.39	S	Peak	33.33	-5.79	27.54	46.00	-18.46
796.30	S	Peak	32.91	-4.24	28.67	46.00	-17.33
960.23	S	Peak	31.31	-2.06	29.25	54.00	-24.75
4882.70	H	Peak	35.46	10.15	45.61	74.00	-28.39
7324.05	H	---					
9765.40	H	---					
12206.75	H	---					
14648.10	H	---					
17089.45	H	---					
19530.80	H	---					
21972.15	H	---					
24413.50	H	---					

Operation Band	:2.4G	Test Date	:2012-08-15
Fundamental Frequency	:2441.35 MHz	Temp./Humi.	:27.7 deg_C / 62 RH
Operation Mode	:TX MID	Engineer	:Marcus
EUT Pol.	:E2 PLAN	Measurement Antenna Pol.	:HORIZONTAL

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

Factor(dB) = Antenna Factor(dBμV/m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.
"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.
"---" : denotes Noise Floor.

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
143.49	S	Peak	44.05	-12.82	31.23	43.50	-12.27
191.99	S	Peak	48.60	-15.76	32.84	43.50	-10.66
291.90	S	Peak	45.54	-12.76	32.78	46.00	-13.22
474.26	S	Peak	38.67	-9.87	28.80	46.00	-17.20
796.30	S	Peak	36.77	-4.24	32.53	46.00	-13.47
931.13	S	Peak	36.05	-2.28	33.77	46.00	-12.23
4882.70	H	Peak	35.22	10.09	45.31	74.00	-28.69
7324.05	H	---					
9765.40	H	---					
12206.75	H	---					
14648.10	H	---					
17089.45	H	---					
19530.80	H	---					
21972.15	H	---					
24413.50	H	---					

Operation Band	:2.4G	Test Date	:2012-08-15
Fundamental Frequency	:2477.35 MHz	Temp./Humi.	:27.7 deg_C / 62 RH
Operation Mode	:TX HIGH	Engineer	:Marcus
EUT Pol.	:E2 PLAN	Measurement Antenna Pol.	:VERTICAL

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

Factor(dB) = Antenna Factor(dBμV/m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.
"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.
"---" : denotes Noise Floor.

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
150.28	S	Peak	44.20	-12.35	31.85	43.50	-11.65
282.20	S	Peak	41.91	-12.99	28.92	46.00	-17.08
495.60	S	Peak	39.99	-9.63	30.36	46.00	-15.64
696.39	S	Peak	33.22	-5.79	27.43	46.00	-18.57
798.24	S	Peak	32.95	-4.22	28.73	46.00	-17.27
931.13	S	Peak	32.21	-2.28	29.93	46.00	-16.07
4954.70	H	Peak	34.08	10.00	44.08	74.00	-29.92
7432.05	H	---					
9909.40	H	---					
12386.75	H	---					
14864.10	H	---					
17341.45	H	---					
19818.80	H	---					
22296.15	H	---					
24773.50	H	---					

Operation Band	:2.4G	Test Date	:2012-08-15
Fundamental Frequency	:2477.35 MHz	Temp./Humi.	:27.7 deg_C / 62 RH
Operation Mode	:TX HIGH	Engineer	:Marcus
EUT Pol.	:E2 PLAN	Measurement Antenna Pol.	:HORIZONTAL

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

Factor(dB) = Antenna Factor(dBμV/m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.
"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.
"---" : denotes Noise Floor.

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
45.52	S	Peak	44.84	-13.82	31.02	40.00	-8.98
144.46	S	Peak	46.12	-12.74	33.38	43.50	-10.12
191.99	S	Peak	48.46	-15.76	32.70	43.50	-10.80
288.02	S	Peak	44.75	-12.86	31.89	46.00	-14.11
480.08	S	Peak	39.99	-9.81	30.18	46.00	-15.82
799.21	S	Peak	37.56	-4.21	33.35	46.00	-12.65
4954.70	H	Peak	33.99	9.86	43.85	74.00	-30.15
7432.05	H	---					
9909.40	H	---					
12386.75	H	---					
14864.10	H	---					
17341.45	H	---					
19818.80	H	---					
22296.15	H	---					
24773.50	H	---					

11 Peak Power Spectral Density

11.1 Standard Applicable:

According to §15.247(e) For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

According to RSS-210 issue 8, §A8.2(b) The transmitter power spectral density (into the antenna) shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission or over 1.0 second if the transmission exceeds 1.0 second duration.

11.2 Measurement Equipment Used:

Refer to section 7.2 for details.

11.3 Test Set-up:

Refer to section 8.3 for details.

11.4 Measurement Procedure:

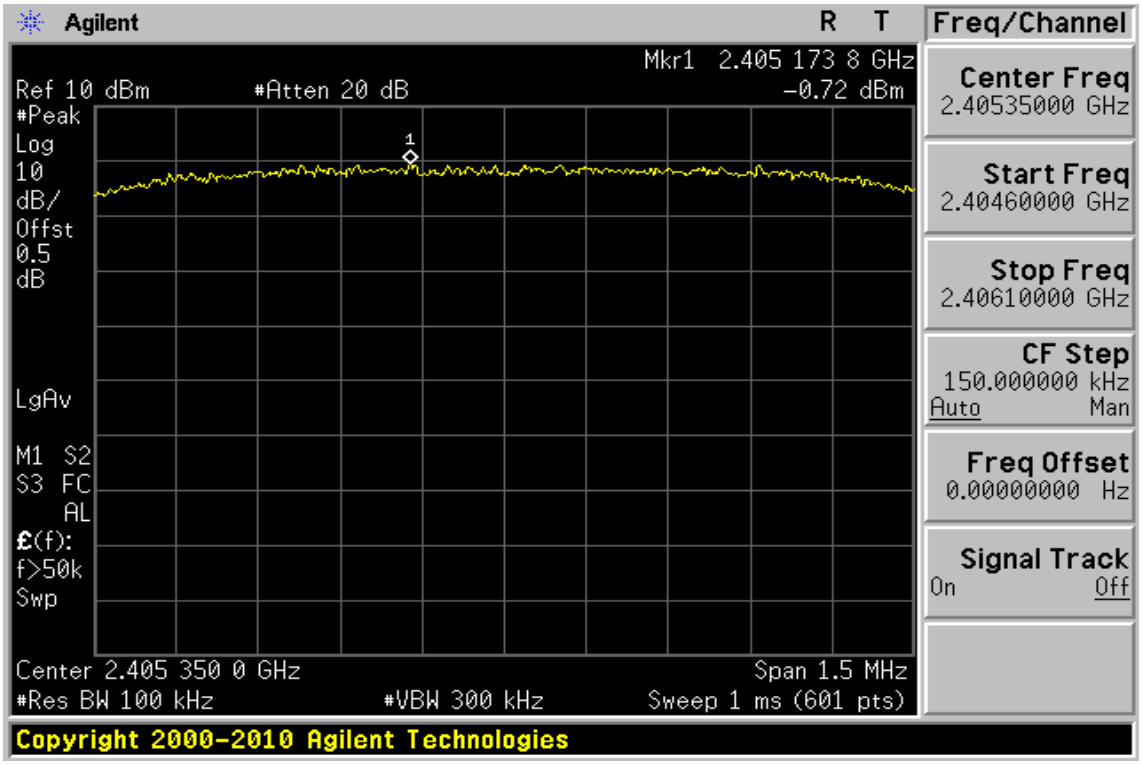
1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as RBW = 3KHz, VBW = 10KHz, Span = 1.5MHz, Sweep=100s
4. Record the max. reading.
5. Repeat above procedures until all frequency measured were complete.

11.5 Measurement Result:

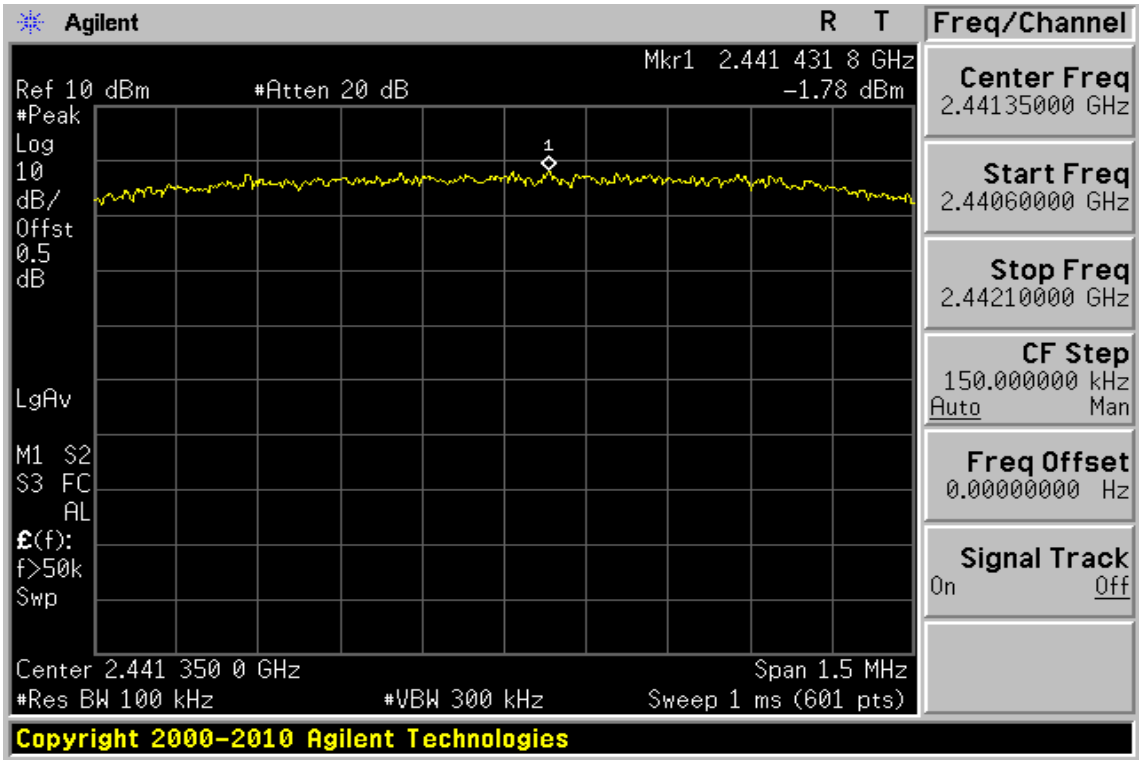
Frequency MHz	RF Power Density Reading (dBm)	RF Power Density Level (dBm)	Maximum Limit (dBm)
2405.35	-0.72	-0.72	8
2441.35	-1.78	-1.78	8
2477.35	-2.63	-2.63	8

**Offset 0.5 dB*

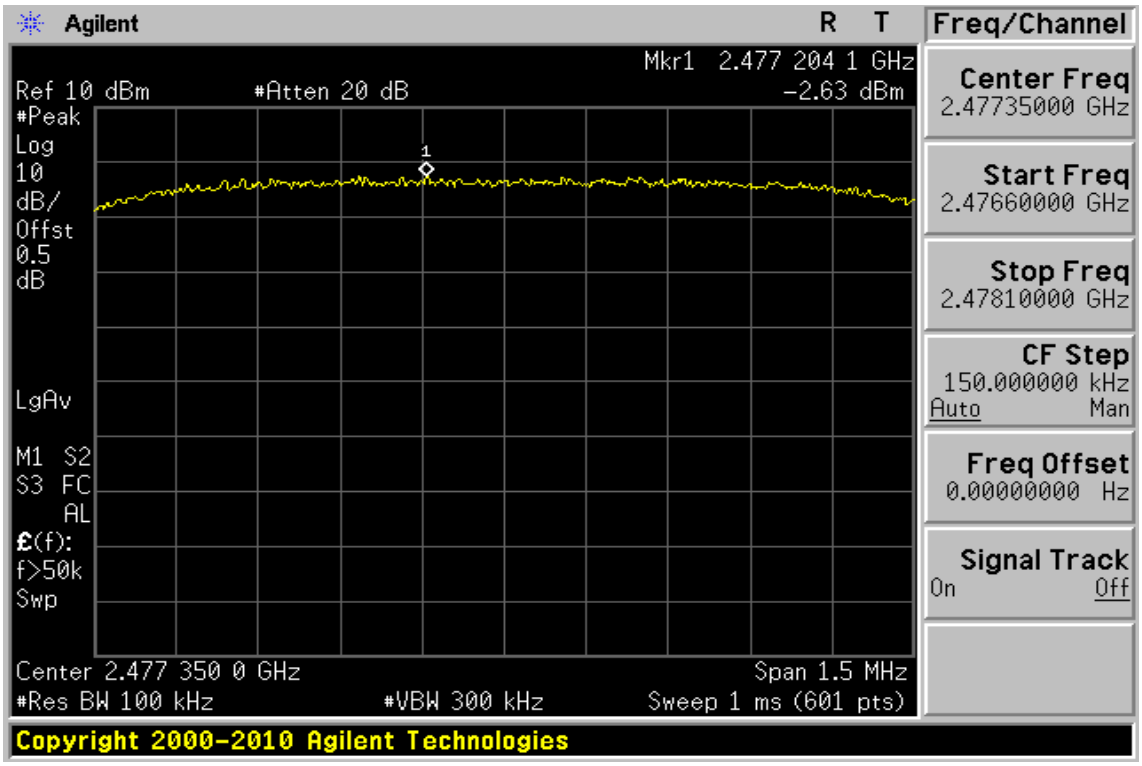
Power Spectral Density Test Plot (CH-Low)



Power Spectral Density Test Plot (CH-Mid)



Power Spectral Density Test Plot (CH-High)



12 ANTENNA REQUIREMENT

12.1. Standard Applicable:

According to §15.203, Antenna requirement.

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be

replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of Sections 15.211, 15.213, 15.217, 15.219, or 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with Section 15.31(d),

must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded.

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

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

12.2. Antenna Connected Construction:

The directional gains of antenna used for transmitting is -1.58 dBi and the antenna connector is designed with permanent attachment and no consideration of replacement. Please see EUT photo for details.

13 99% Bandwidth Measurement

13.1. Standard Applicable:

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

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

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

13.2. Measurement Equipment Used:

Refer to section 7.2 for details.

13.3. Test Set-up:

Refer to section 8.3 for details.

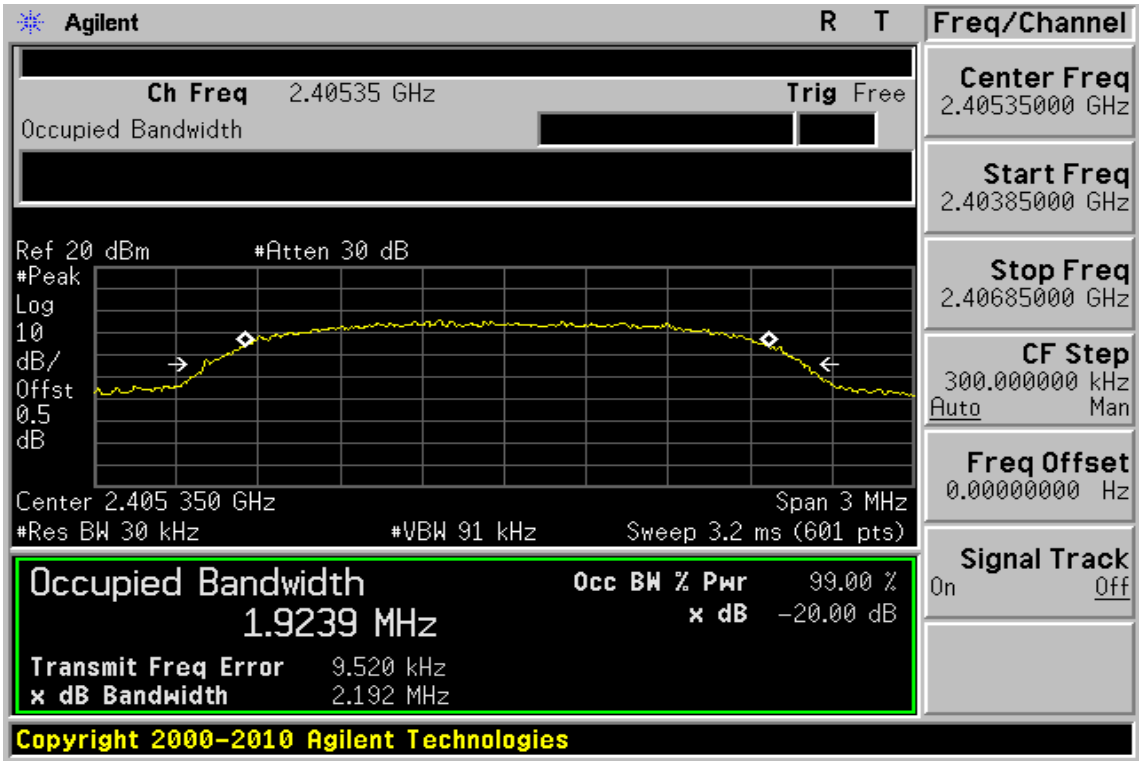
13.4. Measurement Procedure:

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=1% of the approximate emission bandwidth, VBW = 3 times RBW, Span= 30/60
4. Turn on the 99% bandwidth function, max reading..
5. Repeat above procedures until all frequency measured were complete.

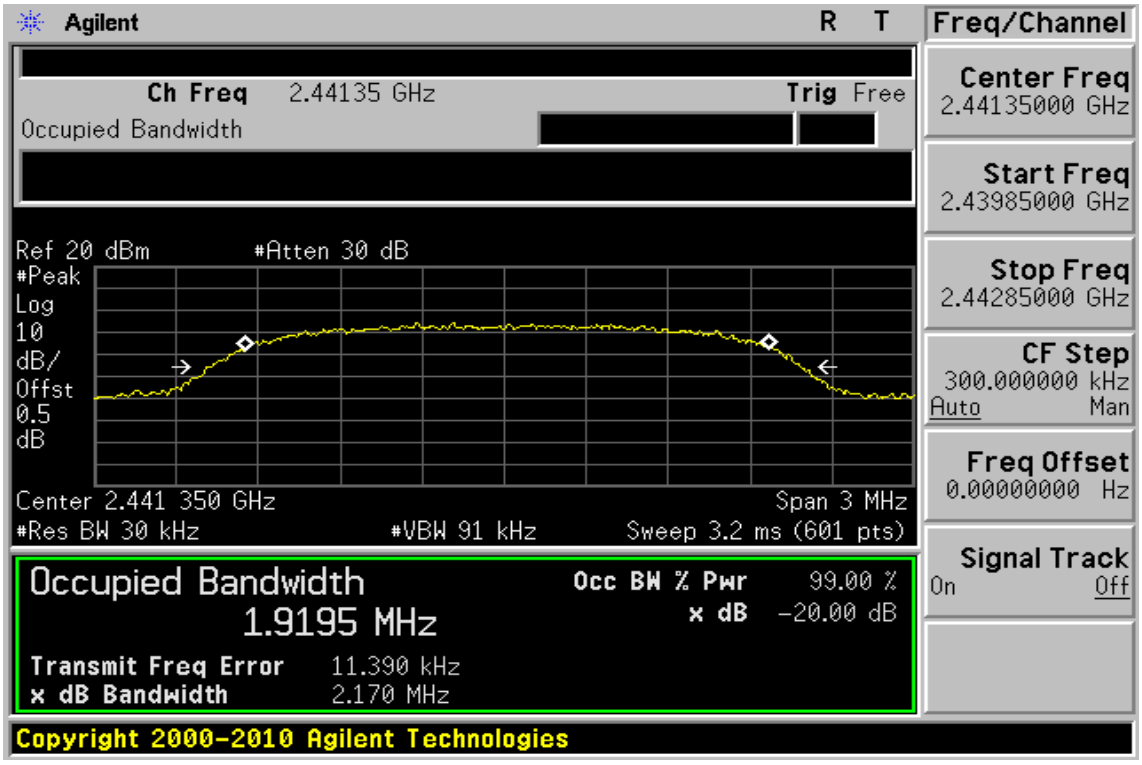
13.5. Measurement Result:

Frequency MHz	99%Bandwidth (MHz)
2405.35	1.9239
2441.35	1.9195
2477.35	1.9082

99% Band Width Test Data CH-Low



99% Band Width Test Data CH-Mid



99% Band Width Test Data CH-High