ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART C REQUIREMENT

OF

Product Name:	**USB Wireless Headset**
Brand Name:	**TATUNG, Binatone, freetalk**
Model No.:	**TALK-5193-R, THS-5193-R**
Model difference:	**For different marketing**
FCC ID:	**BJM-TALK-5193-R**
Report No.:	**ER/2013/10012**
Issue Date:	**Jan. 30, 2013**
FCC Rule Part:	**§15.247, Cat: DTS**
Prepared for:	**Tatung Company** **22, Chungshan N Road, Sec. 3, Taipei, 10451, Taiwan**
Prepared by:	**SGS Taiwan Ltd.** **Electronics & Communication Laboratory** **No.134, Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803**

VERIFICATION OF COMPLIANCE

Applicant:	Tatung Company 22, Chungshan N Road, Sec. 3, Taipei, 10451, Taiwan
Product Name:	USB Wireless Headset
Brand Name:	TATUNG, Binatone, freetalk
FCC ID:	BJM-TALK-5193-R
Model No.:	TALK-5193-R, THS-5193-R
Model difference:	For different marketing
File Number:	ER/2013/10012
Date of test:	Jan. 21, 2013 ~ Jan. 29, 2013
Date of EUT Received:	Jan. 21, 2013

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: 2009 and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits of FCC Rules Part 15.247.
The test results of this report relate only to the tested sample identified in this report.

Test By:	Marcus Tseng	***Date:***	Jan. 30, 2013
	Marcus Tseng / Engineer		
Prepared By:	Judy Hsu	***Date:***	Jan. 30, 2013
	Judy Hsu / Clerk		
Approved By:	Jim Chang	***Date:***	Jan. 30, 2013
	Jim Chang / Supervisor		

Version

Version No.	Date	Description
00	Jan. 30, 2013	Initial creation of document

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1 GENERAL INFORMATION

1.1 Product Description

General:

Product Name:	USB Wireless Headset	
Brand Name:	TATUNG, Binatone, freetalk	
Model No.:	TALK-5193-R, THS-5193-R	
Model Difference:	For different marketing	
USB Cable:	Model: Z-272, Supplier: Fortune Line Tech. Ltd.	
Power Supply:	3.7Vdc from Polymer Li-ion rechargeable battery	
	Battery:	Model: FT652531P, 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:	4.64 dBm
Antenna Designation:	PCB antenna, -1.58dBi

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: BJM-TALK-5193-R** filing to comply with Section 15.247 of the FCC Part 15, Subpart E Rules. The composite system (digital device) is compliance with Subpart B is authorized under a DoC procedure.

1.3 Test Methodology

Both conducted and radiated testing were performed according to the procedures in ANSI C63.4 :2009. Radiated testing was performed at an antenna to EUT distance 3 meters.

Tested in accordance with Oct 2012 KDB558074 D01 V02 for compliance to FCC 47CFR 15.247 requirements.

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 C63.4:2009. FCC Registration Number are: 990257 and 236194, Canada Registration Number: 4620A-4.

The 10 m Open Area Test Sites located on the address of SGS Taiwan Ltd. 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 7.3.1 of ANSI C63.4:2009.Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-Peak and Average detector mode.

2.3.2 Radiated Emissions

The EUT is a placed on as turn table which is 0.8 m above ground plane. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this hand-held transmitter(EUT) was rotated through three orthogonal axes and measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made “while keeping the antenna in the ‘cone of radiation’ from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response.” is still within the 3dB illumination BW of the measurement antenna. according to the requirements in Section 8 and 13 of ANSI C63.4:2009.

2.4 Configuration of Tested System

Fig. 2-1 Radiated Emission Configuration

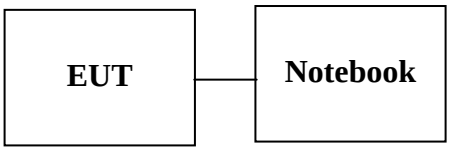


Fig. 2-2 Conducted Emission Configuration

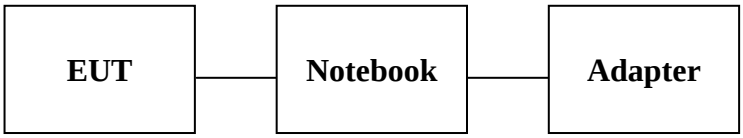


Table 2-1 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/ Type No.	Series No.
1.	Notebook	DELL	E5400	3704625136
2.	Test Software	N/A	VMIdebug v1.1.6.38	N/A

3 SUMMARY OF TEST RESULTS

FCC Rules	Description Of Test	Result
§15.207(a)	AC Power Line Conducted Emission	Compliant
§15.247(b) (3),(4)(c)	Peak Output Power	Compliant
§15.247(a)(2)	6dB Bandwidth	Compliant
§15.247(d)	100 KHz Bandwidth Of Frequency Band Edges	Compliant
§15.247(d)	Spurious Emission	Compliant
§15.247(e)	Peak Power Density	Compliant
§15.203	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 (2405.35MHz)、mid (2441.35MHz) and high (2477.35MHz) with highest data rate are chosen for full testing.

Antenna A is used for the transmit tests and Antenna B is used for the receive tests.

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, 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	09/23/2012	09/22/2013
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	01/05/2013	01/04/2014

6.3. EUT Setup:

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

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.

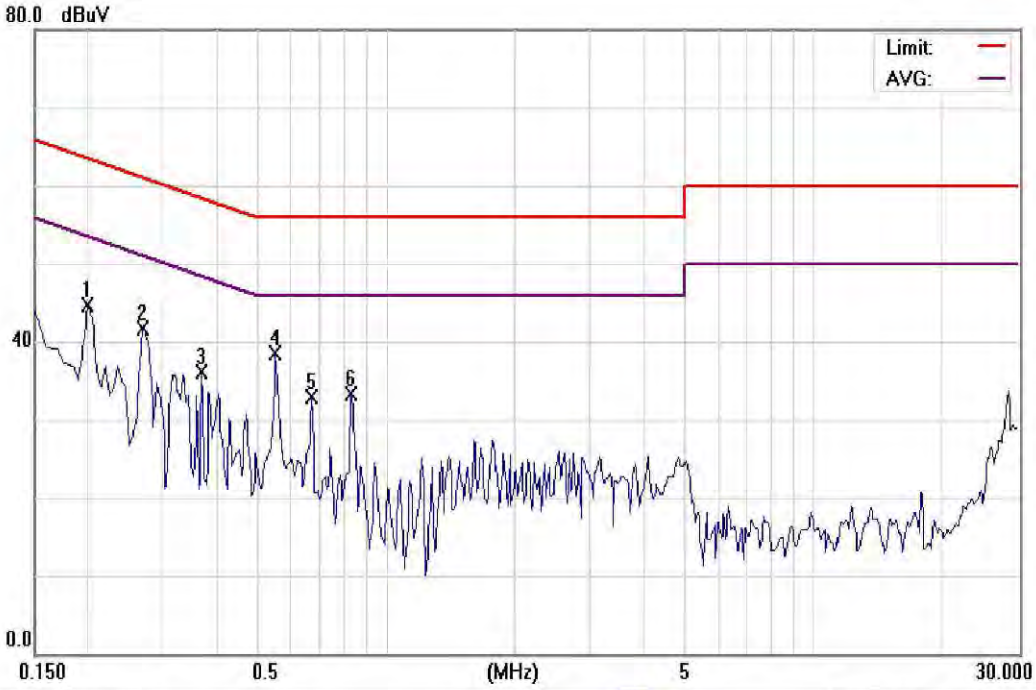
6.5. Measurement Result:

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 mode			Test Date:	Jan. 24, 2013
Temperature:	24 ℃	Humidity:	60 %	Test By:	Marcus

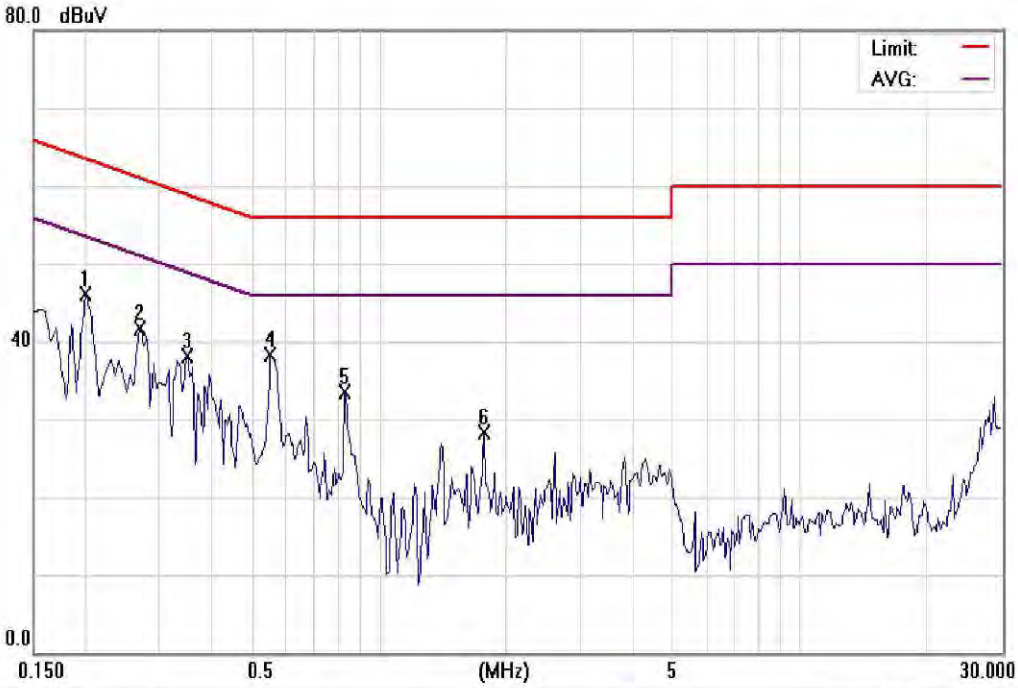


Site ConductionRoom
Limit: FCC Class B Conduction(QP)
EUT: USB Wireless Headset
M/N: TALK-5193-R,THS-5193-R
Mode: Operationmode
Note:

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	44.55	0.12	44.67	63.61	-18.94	peak	
2		0.2700	41.56	0.12	41.68	61.12	-19.44	peak	
3		0.3700	35.98	0.12	36.10	58.50	-22.40	peak	
4	*	0.5500	38.37	0.12	38.49	56.00	-17.51	peak	
5		0.6700	32.81	0.12	32.93	56.00	-23.07	peak	
6		0.8300	33.10	0.12	33.22	56.00	-22.78	peak	



Site ConductionRoom
Limit: FCC Class B Conduction(QP)
EUT: USB Wireless Headset
M/N: TALK-5193-R,THS-5193-R
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	45.98	0.13	46.11	63.61	-17.50	peak	
2		0.2700	41.48	0.13	41.61	61.12	-19.51	peak	
3		0.3500	38.05	0.12	38.17	58.96	-20.79	peak	
4		0.5500	38.17	0.12	38.29	56.00	-17.71	peak	
5		0.8300	33.28	0.13	33.41	56.00	-22.59	peak	
6		1.7800	28.06	0.15	28.21	56.00	-27.79	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:

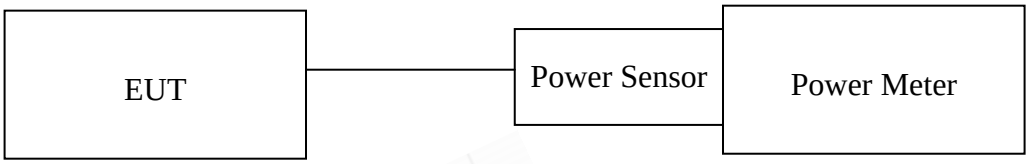
(i) Systems operating in the 2400-2483.5 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the 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.

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	01/05/2013	01/04/2014
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 or spectrum. (Channel power function, RBW, VBW = 1MHz,Bandwidth=26dB occupied Bandwidth)
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**	**4.64**	**1 Watt = 30 dBm**
20	**2441.35**	4.02	**1 Watt = 30 dBm**
38	**2477.35**	3.15	**1 Watt = 30 dBm**

CH	Frequency (MHz)	Average Power Output (dBm)	Required Limit
2	**2405.35**	2.68	**1 Watt = 30 dBm**
20	**2441.35**	1.97	**1 Watt = 30 dBm**
38	**2477.35**	1.01	**1 Watt = 30 dBm**

**Note: Measured by Power Meter*

Offset: 0.5 dB

**Read Power = Output Power + Cable Loss*

8 6dB Bandwidth

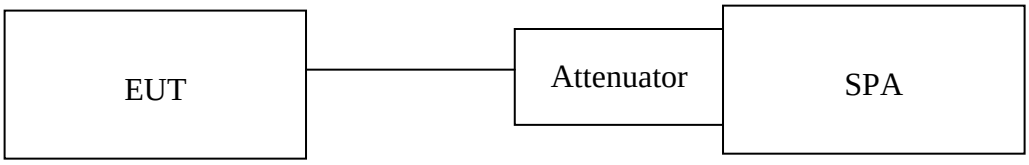
8.1 Standard Applicable:

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.

8.2 Measurement Equipment Used:

Refer to section 7.2 for details.

8.3 Test Set-up:



8.4 Measurement Procedure:

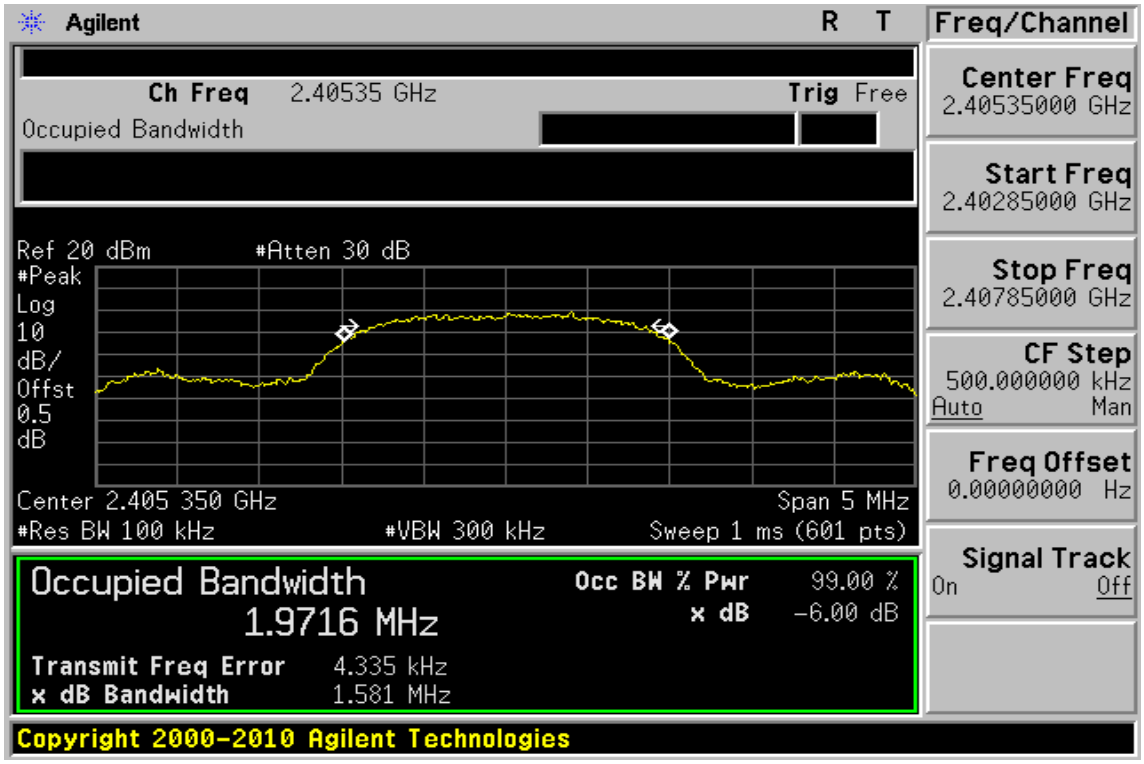
1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as RBW = 100KHz, VBW = 3*RBW, Span = 5MHz, Sweep=auto
4. Mark the peak frequency and –6dB (upper and lower) frequency.
5. Repeat above procedures until all frequency measured were complete.

8.5 Measurement Result:

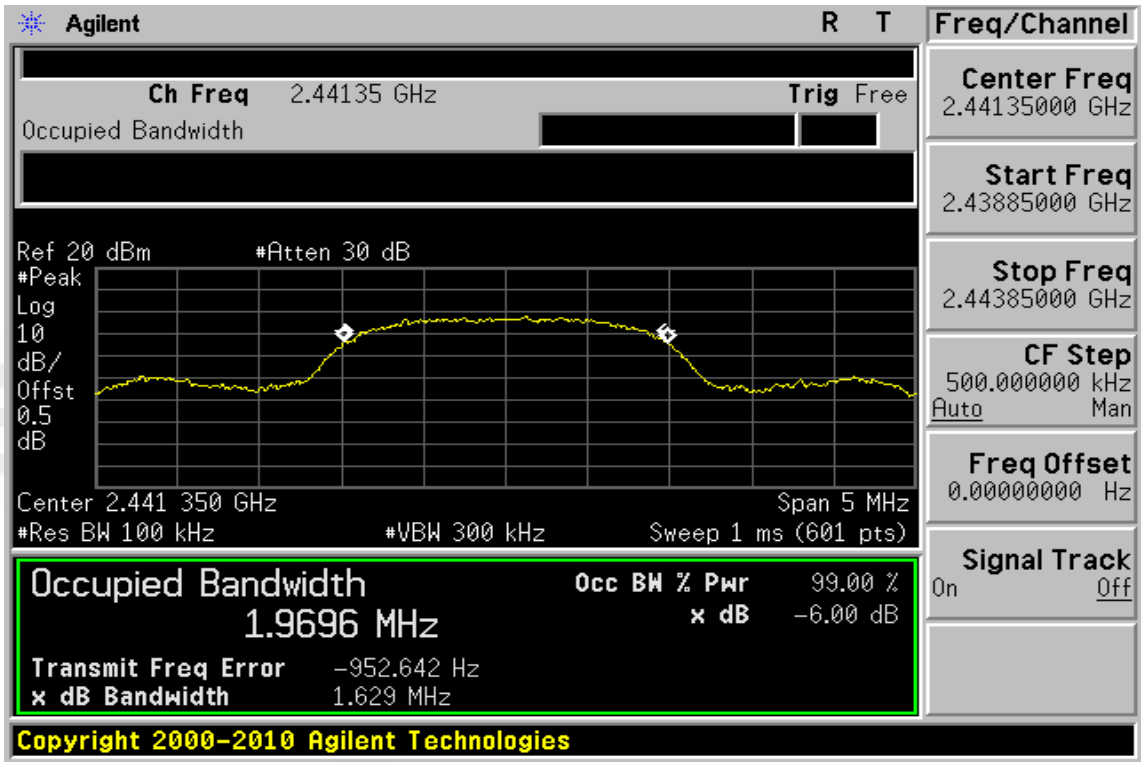
CH	Bandwidth (MHz)	Bandwidth (KHz)	Result
Lower	1.581	> 500	PASS
Mid	1.629	> 500	PASS
Higher	1.634	> 500	PASS

**Note: Offset 0.5dB*

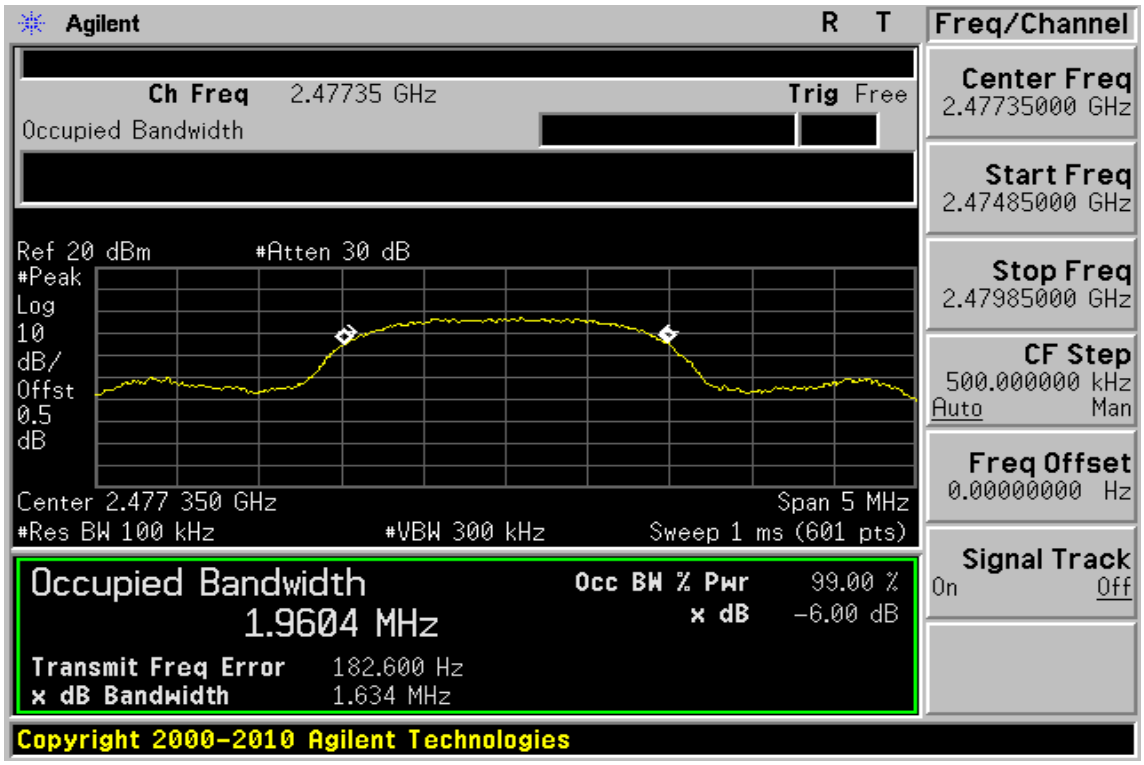
6dB Band Width Test Data CH-Low



6dB Band Width Test Data CH-Mid



6dB Band Width Test Data CH-High



9 100KHz BANDWIDTH OF BAND EDGES MEASUREMENT

9.1 Standard Applicable:

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

9.2 Measurement Equipment Used:

9.2.1. Conducted Emission at antenna port:

Refer to section 7.3 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	01/04/2013	01/03/2014
Pre-Amplifier	EMC Instruments Corp.	EMC0126530	980038	01/04/2013	01/03/2014
Filter 2400-2483.5 MHz	EWT	EWT-14-0166	M2	02/28/2012	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	01/04/2013	01/03/2014
3m Site NSA	SGS	966 chamber	N/A	07/15/2012	07/14/2013

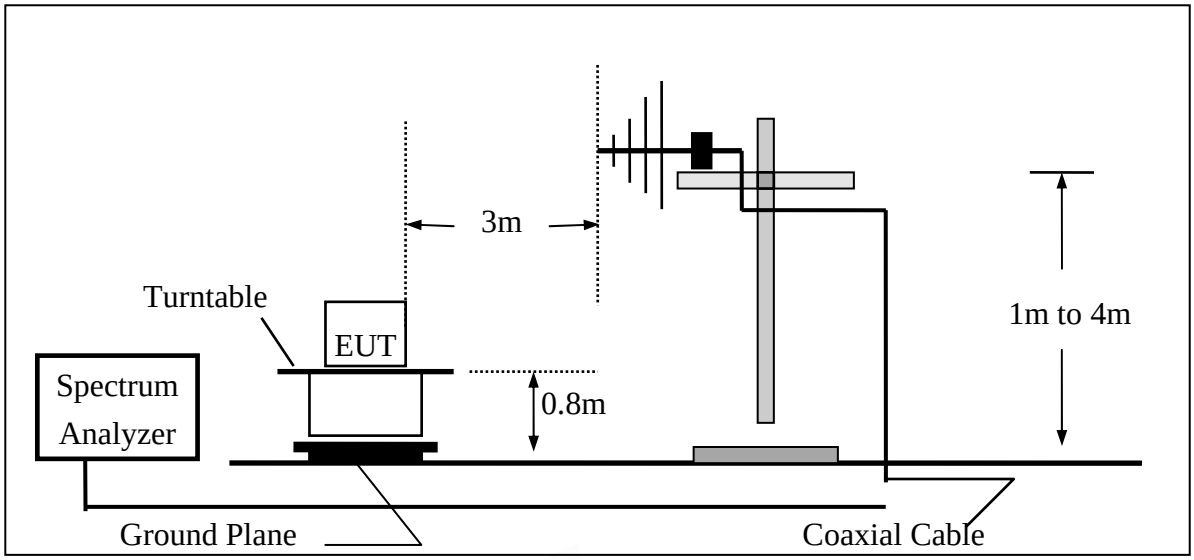
9.3 Test SET-UP:

9.3.1 Conducted Emission at antenna port:

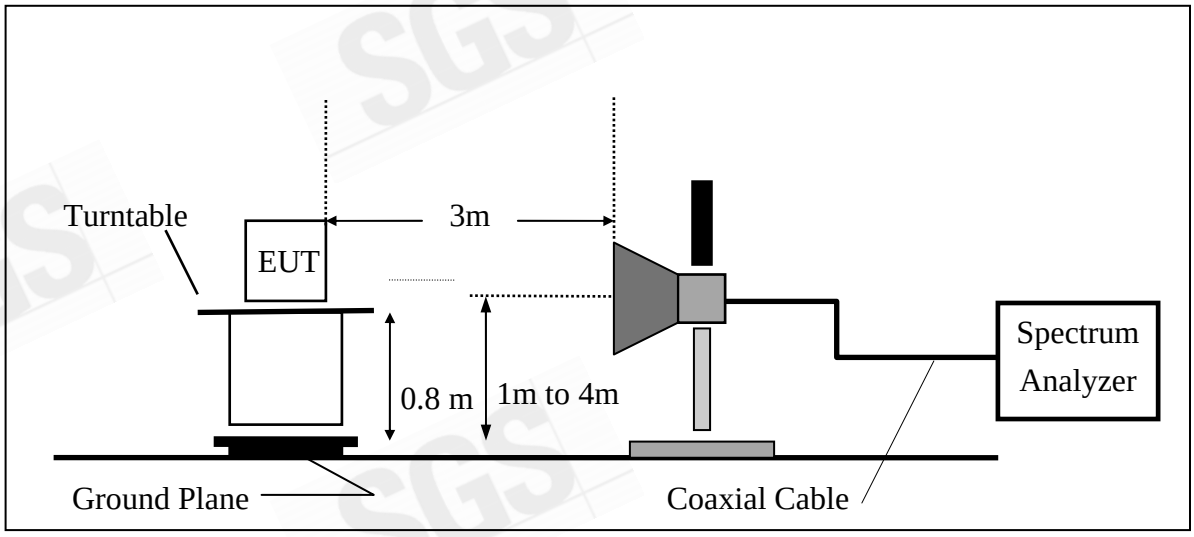
Refer to section 8.3 for details.

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, 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:

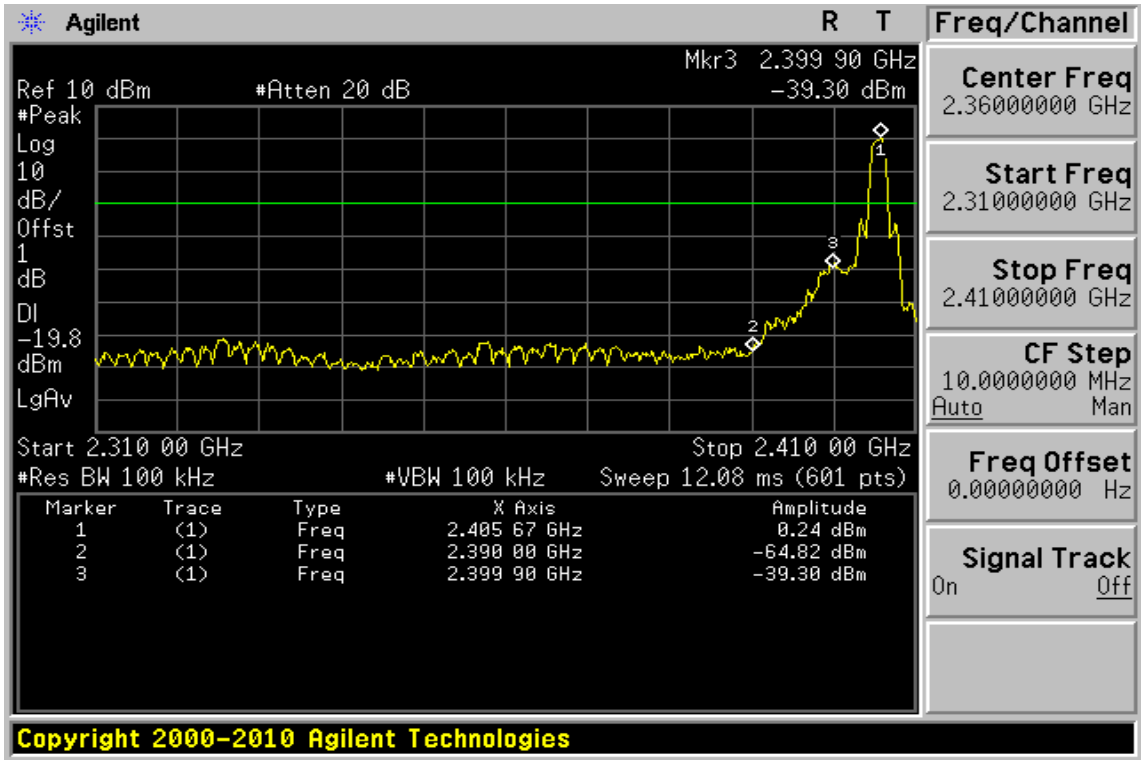
FS = RA + AF + CL - AG

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

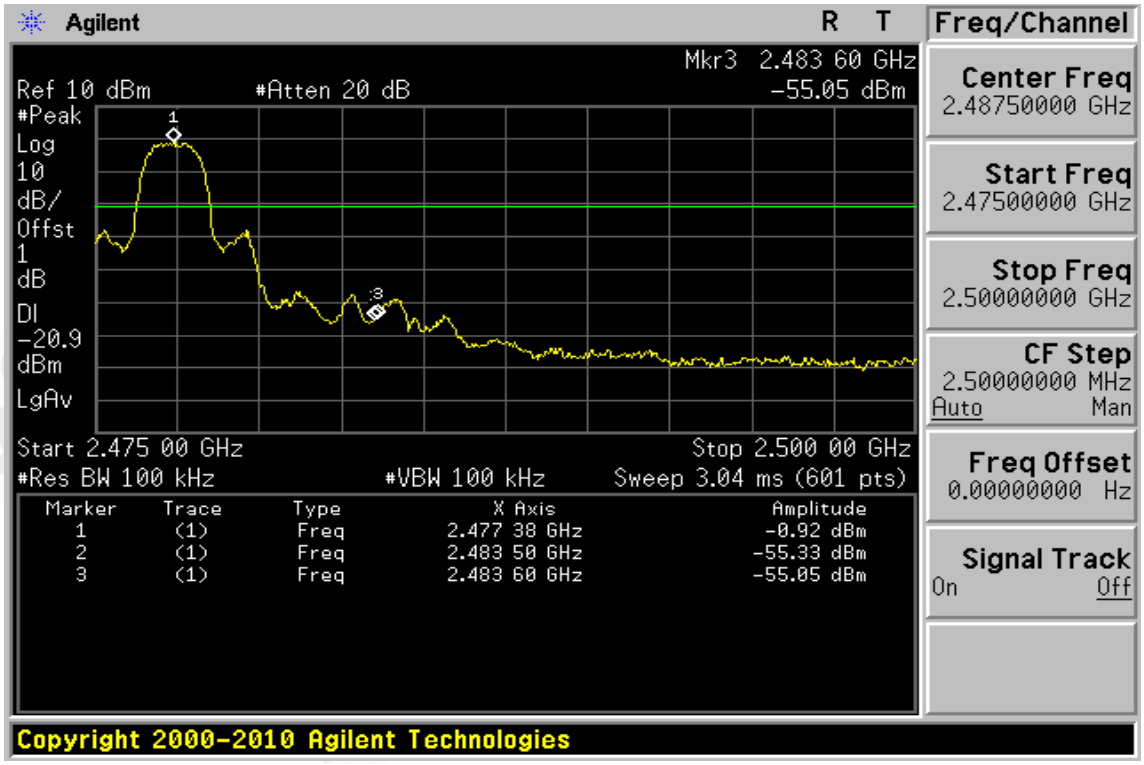
9.6 Measurement Result:

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

Band Edges Test Data CH-Low

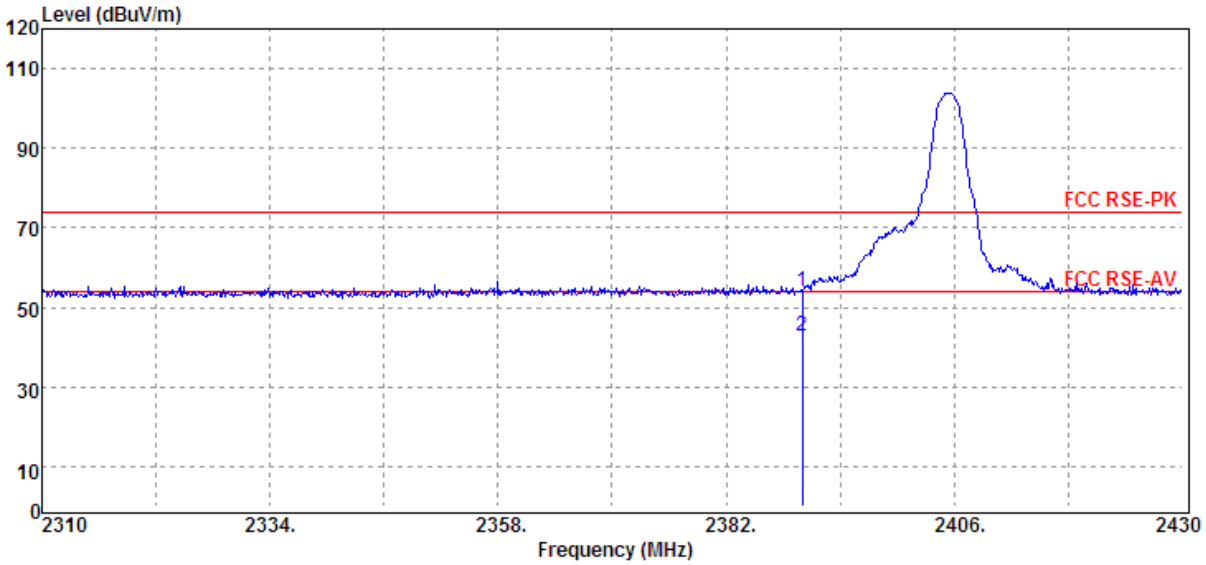


Band Edges Test Data CH-High



Radiated Emission:

Operation Band	:2.4G	Test Date	:2013-01-23
Fundamental Frequency	:2405.35 MHz	Temp./Humi.	:21.4 deg_C / 63 RH
Operation Mode	:BANDEDGE LOW	Engineer	:Allen
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.

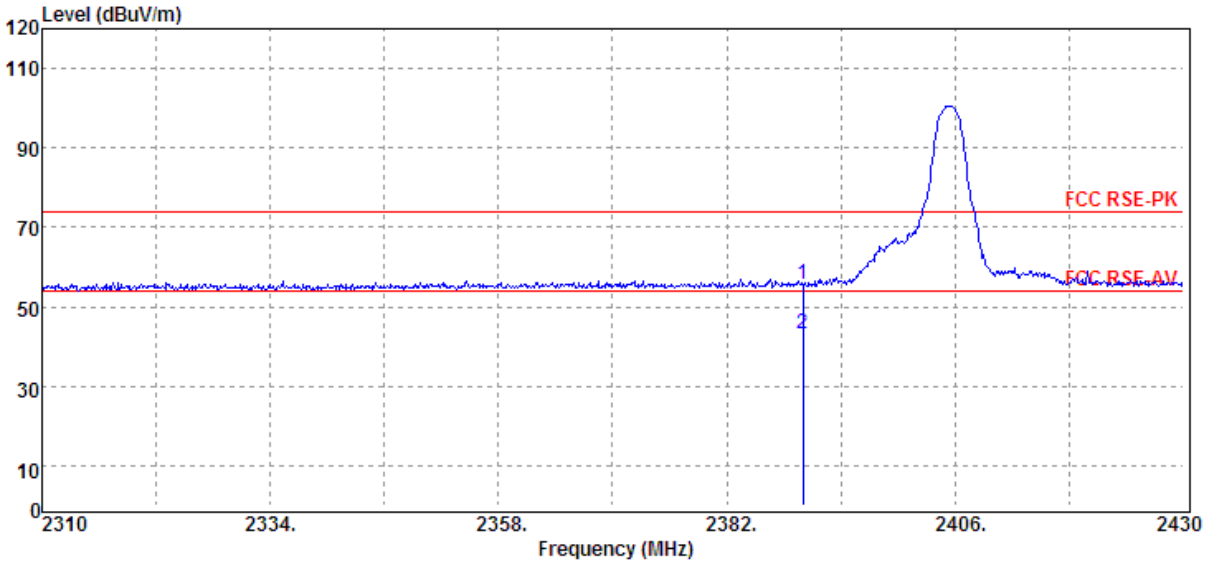
"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.

"---" : denotes Noise Floor.

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

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2390.00	E	Peak	51.93	2.12	54.05	74.00	-19.95
2390.00	E	Average	40.68	2.12	42.80	54.00	-11.20

Operation Band	:2.4G	Test Date	:2013-01-23
Fundamental Frequency	:2405.35 MHz	Temp./Humi.	:21.4 deg_C / 63 RH
Operation Mode	:BANDEDGE LOW	Engineer	:Allen
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.

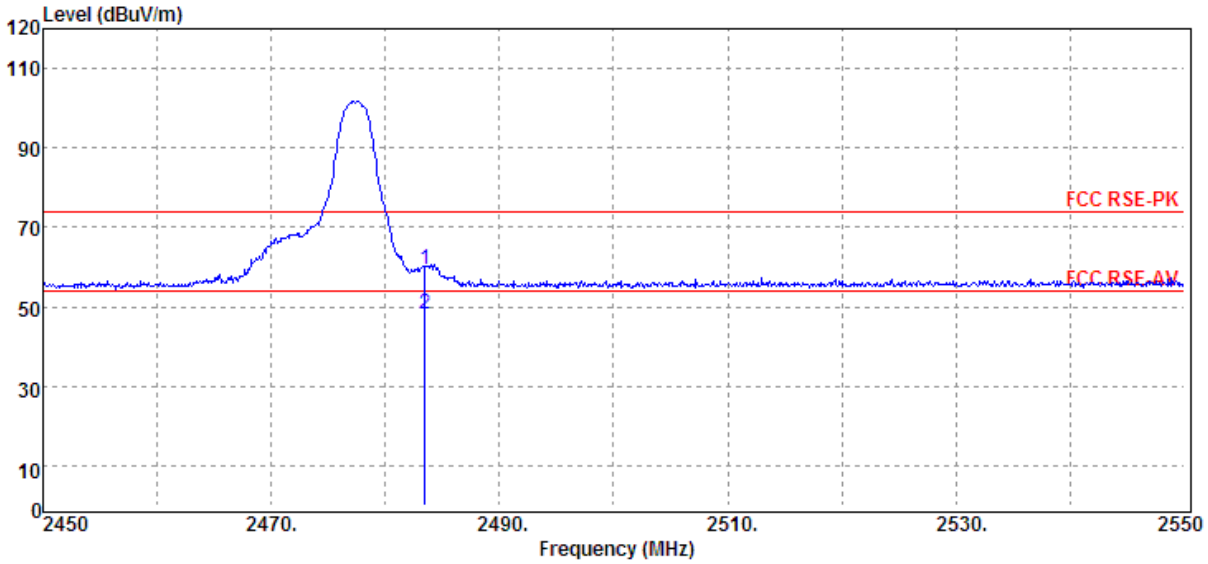
"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.

"---" : denotes Noise Floor.

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

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2390.00	E	Peak	52.83	2.74	55.57	74.00	-18.43
2390.00	E	Average	40.33	2.74	43.07	54.00	-10.93

Operation Band	:2.4G	Test Date	:2013-01-24
Fundamental Frequency	:2477.35 MHz	Temp./Humi.	:21.4 deg_C / 63 RH
Operation Mode	:BANDEDGE HIGH	Engineer	:Allen
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.

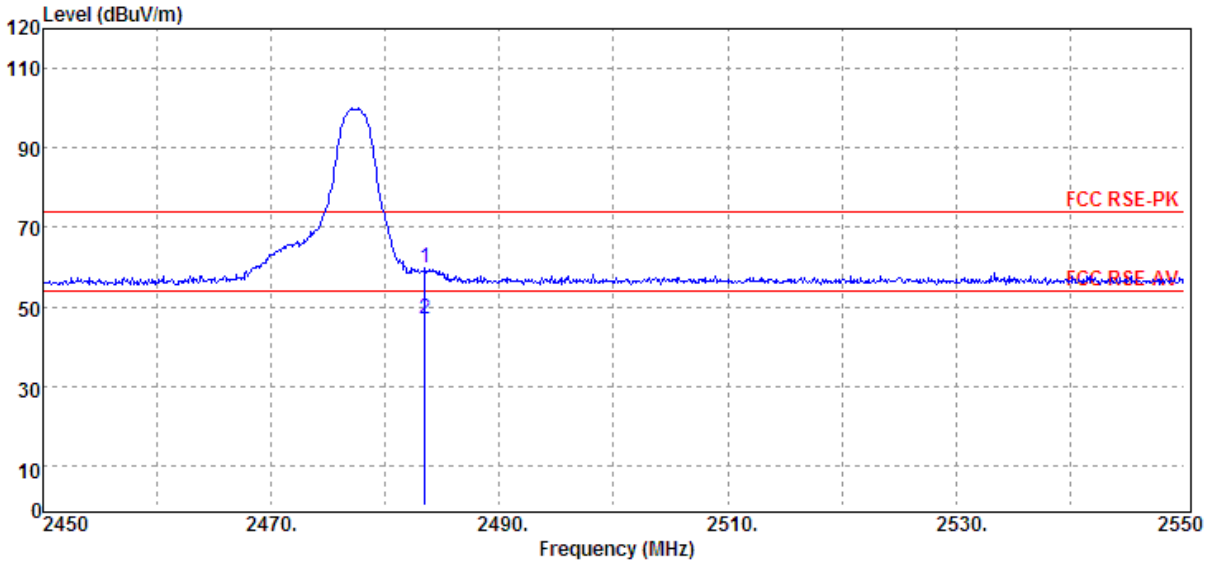
"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.

"---" : denotes Noise Floor.

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

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2483.50	E	Peak	56.92	2.53	59.45	74.00	-14.55
2483.50	E	Average	45.65	2.53	48.18	54.00	-5.82

Operation Band	:2.4G	Test Date	:2013-01-24
Fundamental Frequency	:2477.35 MHz	Temp./Humi.	:21.4 deg_C / 63 RH
Operation Mode	:BANDEDGE HIGH	Engineer	:Allen
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.

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

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2483.50	E	Peak	56.33	3.56	59.89	74.00	-14.11
2483.50	E	Average	43.33	3.56	46.89	54.00	-7.11

10 SPURIOUS RADIATED EMISSION TEST

10.1 Standard Applicable

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

10.2 Measurement Equipment Used:

10.2.1. Conducted Emission at antenna port:

Refer to section 7.2 for details.

10.2.2. Radiated emission:

Refer to section 9.2.2 for details.

10.3 Test SET-UP:

10.3.1. Conducted Emission at antenna port:

Refer to section 8.3 for details.

10.3.2. Radiated emission:

Refer to section 9.3.2 for details.

10.4 Measurement Procedure:

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

Conducted Emission:

1. To connect Antenna Port of EUT to Spectrum.
2. Set RBW = 100K & VBW = 300K on Spectrum.
3. Sweep the frequency to determine spurious emission as seen on spectrum from span of 30 to 3G, 3G to 8G, 8G to 13G, 13G to 18G and 18G to 26.5GHz
4. Via Software, combine 5 spans of frequency range into one plot

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

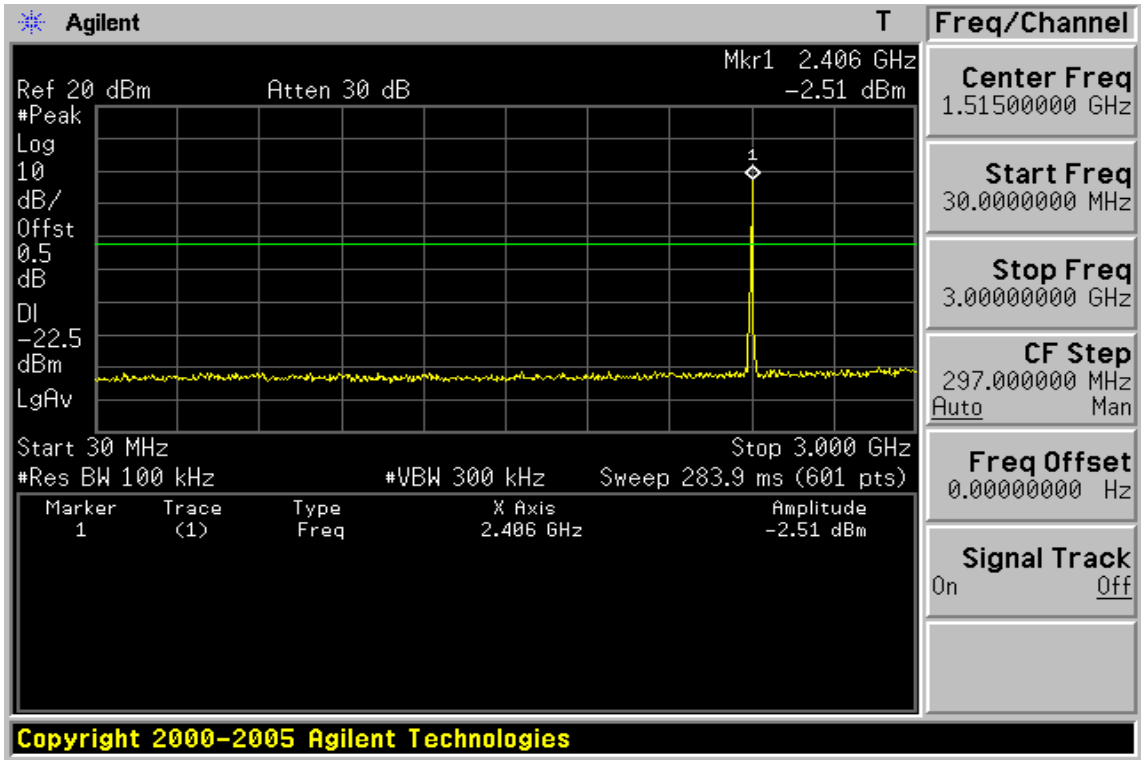
Where	FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
	RA = Reading Amplitude	AG = Amplifier Gain
	AF = Antenna Factor	

10.6 Measurement Result:

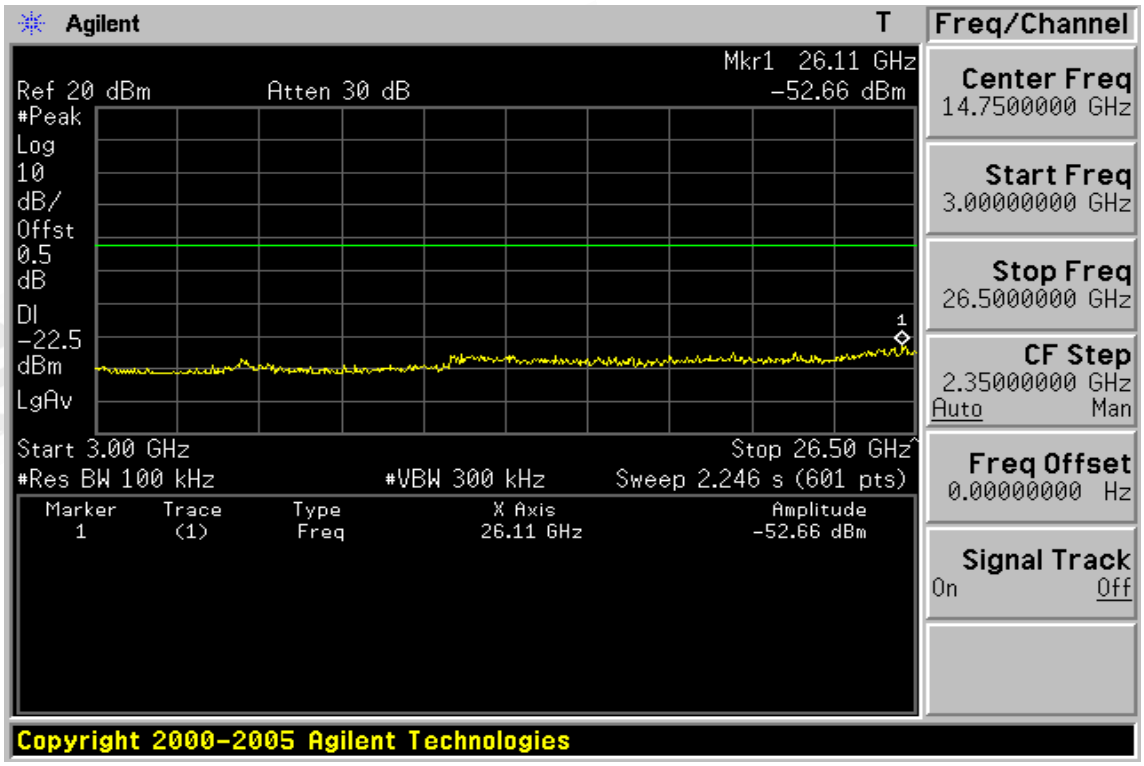
Note: Refer to next page spectrum analyzer data chart and tabular data sheets.

Conducted Spurious Emission Measurement Result

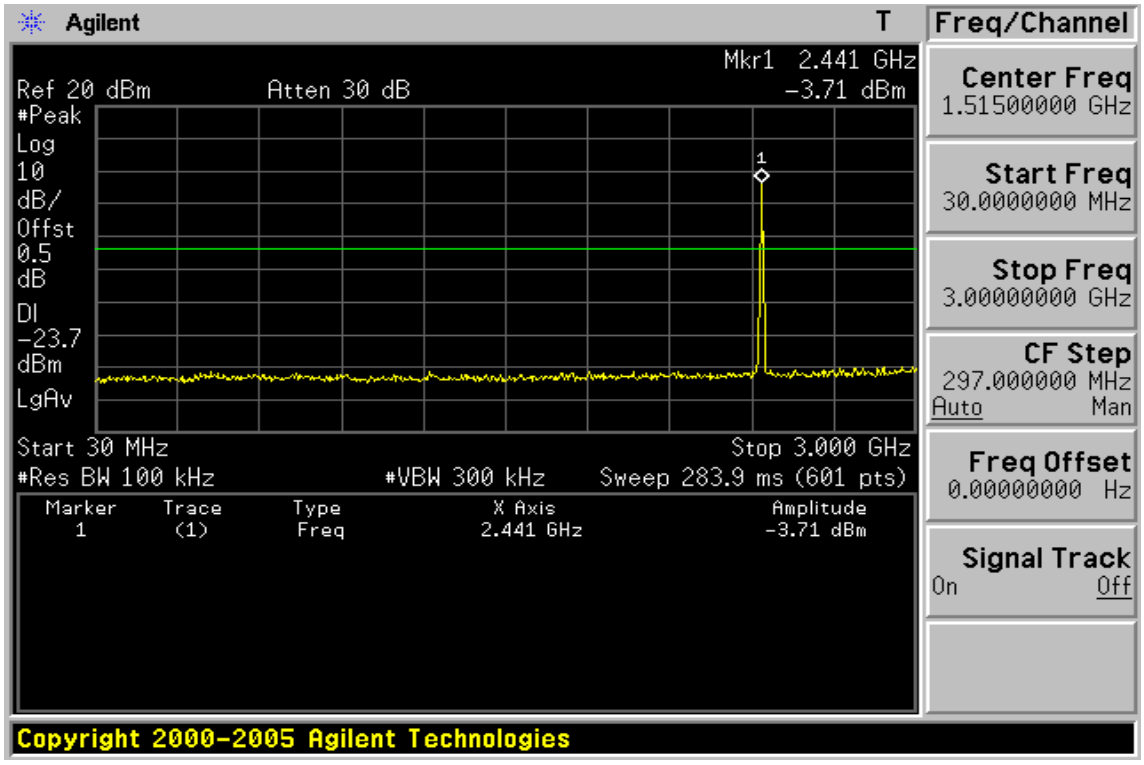
Ch Low 30MHz – 3GHz



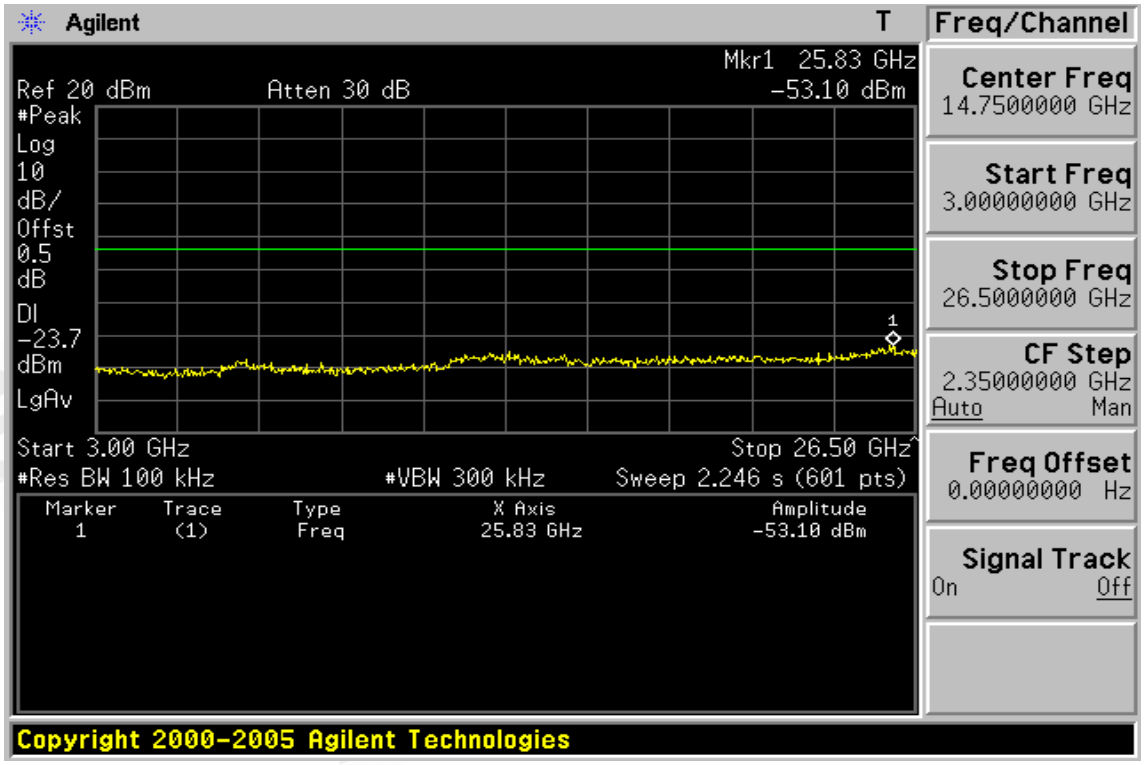
Ch Low 3GHz – 26.5GHz



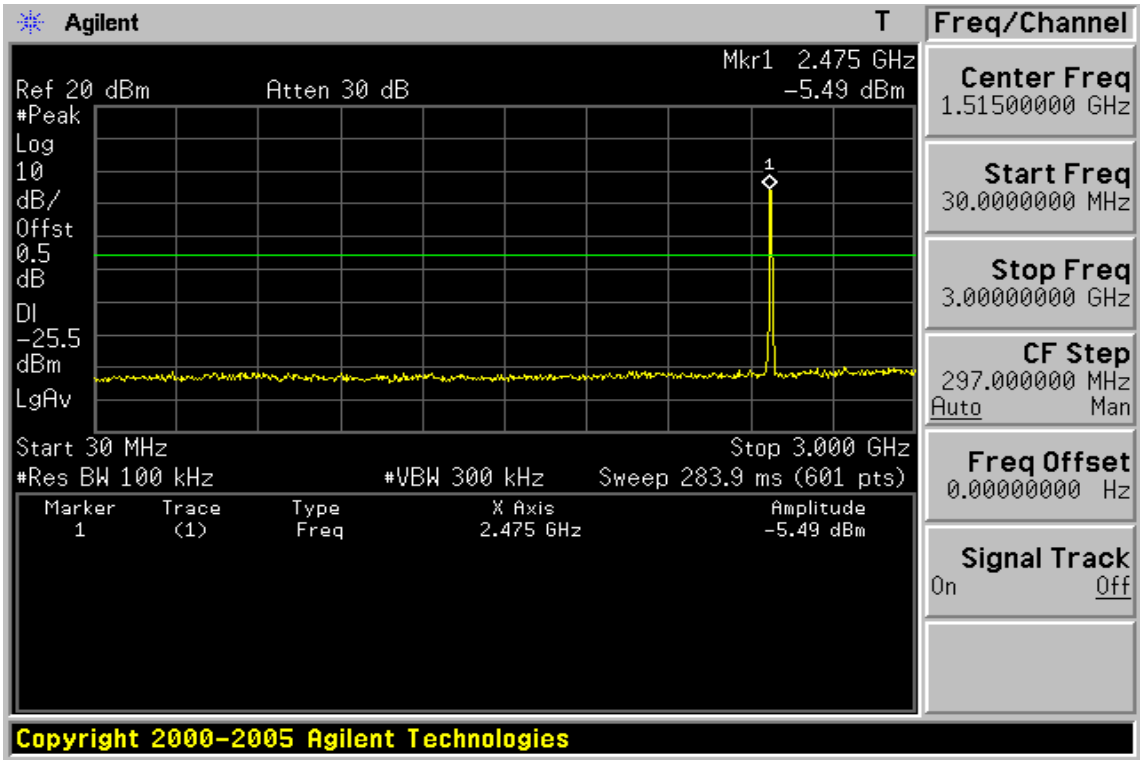
Ch Mid 30MHz – 3GHz



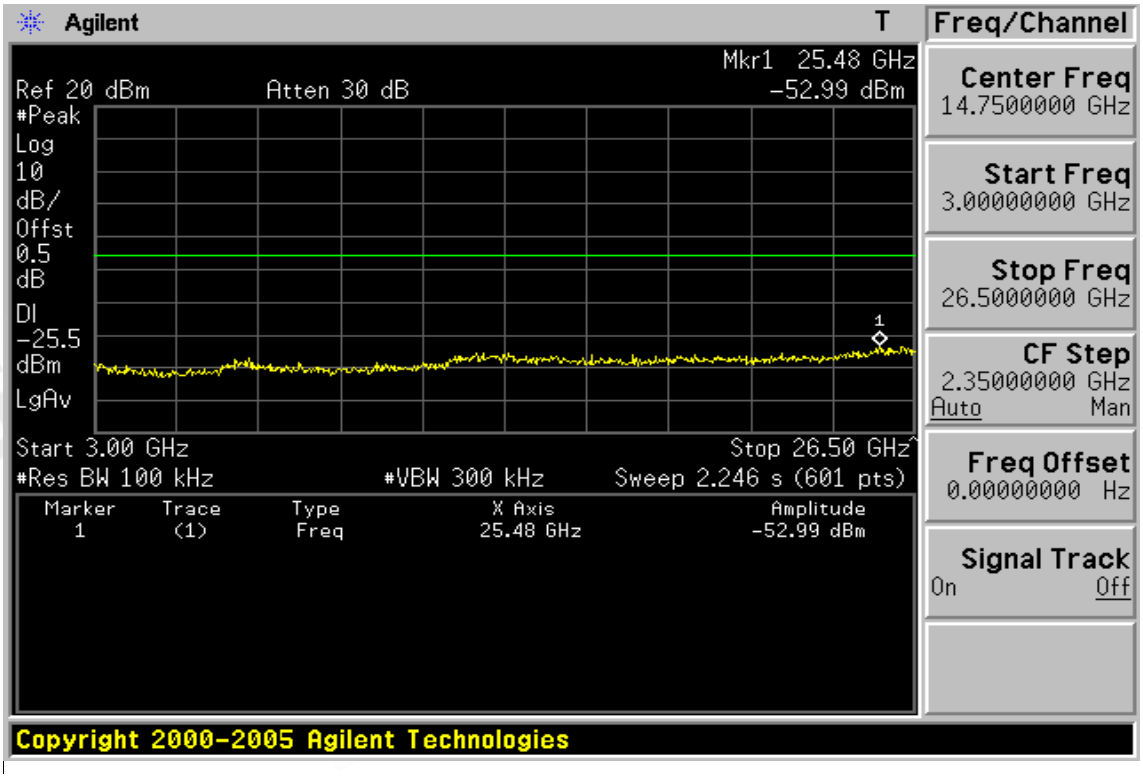
Ch Mid 3GHz – 26.5GHz



Ch High 30MHz – 3GHz



Ch High 3GHz – 26.5GHz



Radiated Spurious Emission Measurement Result

Operation Band	:2.4G	Test Date	:2013-01-24
Fundamental Frequency	:2405.35 MHz	Temp./Humi.	:21.4 deg_C / 63 RH
Operation Mode	:TX LOW	Engineer	:Allen
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
88.20	S	Peak	45.99	-17.68	28.31	43.50	-15.19
153.19	S	Peak	42.98	-12.32	30.66	43.50	-12.84
499.48	S	Peak	36.88	-9.60	27.28	46.00	-18.72
612.00	S	Peak	35.44	-7.30	28.14	46.00	-17.86
806.97	S	Peak	35.68	-4.11	31.57	46.00	-14.43
932.10	S	Peak	33.17	-2.27	30.90	46.00	-15.10
4810.70	H	Average	26.73	7.02	33.75	54.00	-20.25
4810.70	H	Peak	36.91	7.02	43.93	74.00	-30.07
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	:2013-01-24
Fundamental Frequency	:2405.35 MHz	Temp./Humi.	:21.4 deg_C / 63 RH
Operation Mode	:TX LOW	Engineer	:Allen
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
62.01	S	Peak	38.97	-14.97	24.00	40.00	-16.00
127.00	S	Peak	48.74	-14.11	34.63	43.50	-8.87
288.99	S	Peak	44.30	-12.83	31.47	46.00	-14.53
666.32	S	Peak	34.85	-6.27	28.58	46.00	-17.42
796.30	S	Peak	37.51	-4.24	33.27	46.00	-12.73
930.16	S	Peak	31.95	-2.28	29.67	46.00	-16.33
4810.70	H	Average	30.18	7.05	37.23	54.00	-16.77
4810.70	H	Peak	37.76	7.05	44.81	74.00	-29.19
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	:2013-01-24
Fundamental Frequency	:2441.35 MHz	Temp./Humi.	:21.4 deg_C / 63 RH
Operation Mode	:TX MID	Engineer	:Allen
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
89.17	S	Peak	46.15	-17.67	28.48	43.50	-15.02
127.00	S	Peak	46.86	-14.11	32.75	43.50	-10.75
499.48	S	Peak	38.21	-9.60	28.61	46.00	-17.39
628.49	S	Peak	38.43	-6.96	31.47	46.00	-14.53
799.21	S	Peak	34.52	-4.21	30.31	46.00	-15.69
937.92	S	Peak	31.52	-2.21	29.31	46.00	-16.69
4882.70	H	Average	24.57	7.16	31.73	54.00	-22.27
4882.70	H	Peak	36.54	7.16	43.70	74.00	-30.30
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	:2013-01-24
Fundamental Frequency	:2441.35 MHz	Temp./Humi.	:21.4 deg_C / 63 RH
Operation Mode	:TX MID	Engineer	:Allen
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
62.98	S	Peak	38.58	-15.16	23.42	40.00	-16.58
130.88	S	Peak	51.28	-13.83	37.45	43.50	-6.05
286.08	S	Peak	45.43	-12.89	32.54	46.00	-13.46
495.60	S	Peak	36.60	-9.63	26.97	46.00	-19.03
657.59	S	Peak	33.98	-6.43	27.55	46.00	-18.45
798.24	S	Peak	34.13	-4.22	29.91	46.00	-16.09
4882.70	H	Average	24.53	7.10	31.63	54.00	-22.37
4882.70	H	Peak	36.78	7.10	43.88	74.00	-30.12
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	:2013-01-24
Fundamental Frequency	:2477.35 MHz	Temp./Humi.	:21.4 deg_C / 63 RH
Operation Mode	:TX HIGH	Engineer	:Allen
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
88.20	S	Peak	46.24	-17.68	28.56	43.50	-14.94
127.97	S	Peak	46.77	-14.04	32.73	43.50	-10.77
499.48	S	Peak	37.67	-9.60	28.07	46.00	-17.93
675.05	S	Peak	34.07	-6.11	27.96	46.00	-18.04
799.21	S	Peak	33.85	-4.21	29.64	46.00	-16.36
930.16	S	Peak	32.64	-2.28	30.36	46.00	-15.64
4954.70	H	Average	24.12	7.17	31.29	54.00	-22.71
4954.70	H	Peak	36.27	7.17	43.44	74.00	-30.56
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	:2013-01-24
Fundamental Frequency	:2477.35 MHz	Temp./Humi.	:21.4 deg_C / 63 RH
Operation Mode	:TX HIGH	Engineer	:Allen
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
62.01	S	Peak	39.25	-14.97	24.28	40.00	-15.72
125.06	S	Peak	51.64	-14.23	37.41	43.50	-6.09
283.17	S	Peak	44.41	-12.97	31.44	46.00	-14.56
495.60	S	Peak	36.27	-9.63	26.64	46.00	-19.36
668.26	S	Peak	33.06	-6.23	26.83	46.00	-19.17
800.18	S	Peak	37.17	-4.19	32.98	46.00	-13.02
4954.70	H	Average	24.09	7.03	31.12	54.00	-22.88
4954.70	H	Peak	35.87	7.03	42.90	74.00	-31.10
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.

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:

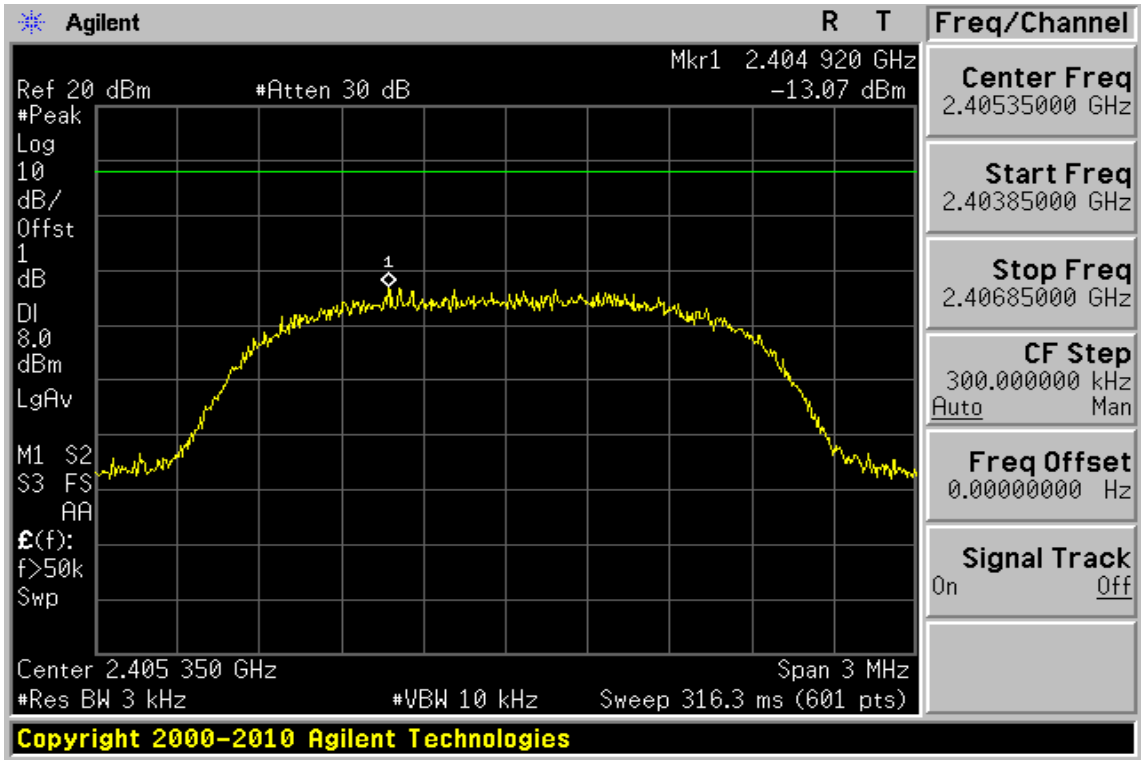
11. Set analyzer center frequency to DTS channel center frequency.
2. Set the span to 1.5 times the DTS channel bandwidth.
3. Set the RBW ≥ 3 kHz.
4. Set the VBW ≥ 3 x RBW.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum amplitude level.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

11.5 Measurement Result:

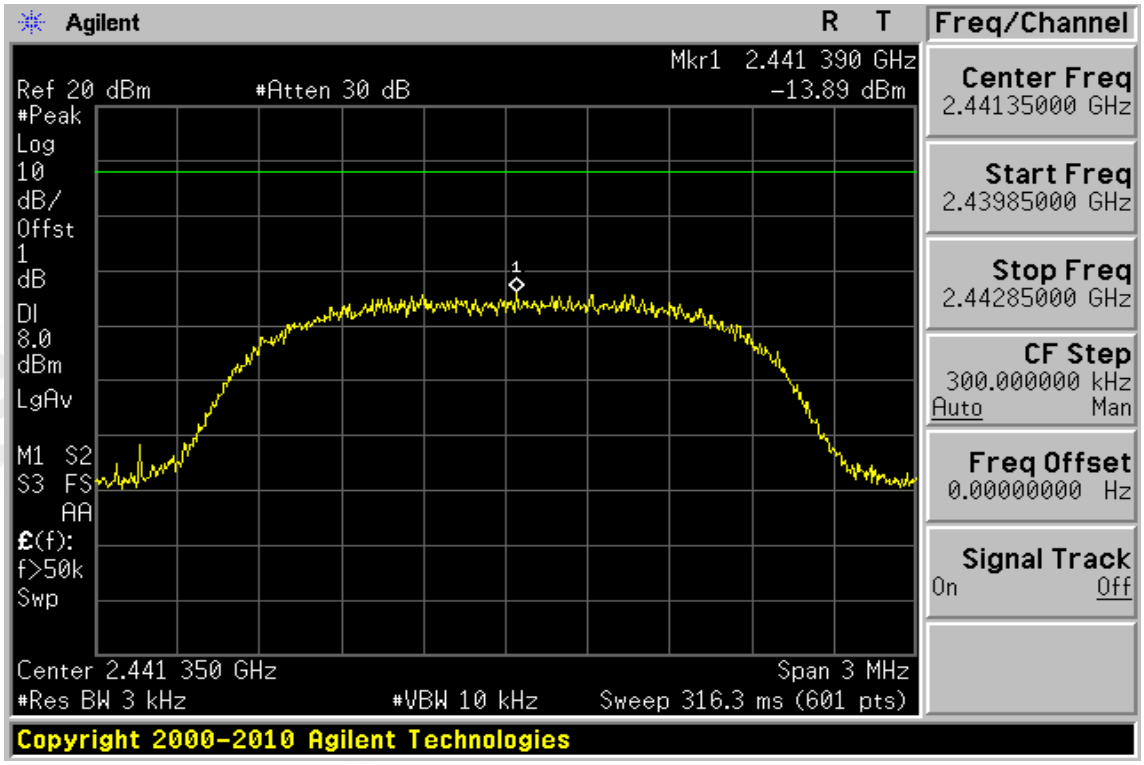
Frequency MHz	RF Power Density Reading (dBm)	RF Power Density Level (dBm)	Maximum Limit (dBm)
2405.35	-13.07	-13.07	8
2441.35	-13.89	-13.89	8
2477.35	-16.14	-16.14	8

**Offset 1 dB*

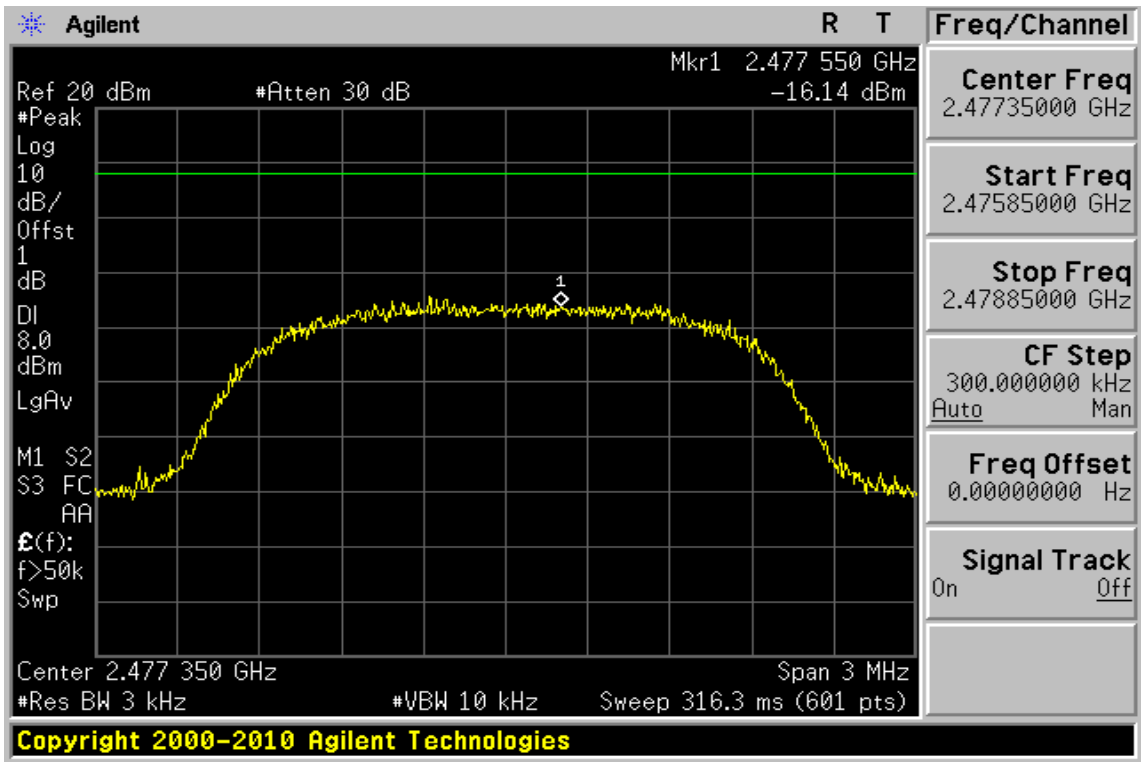
Power Spectral Density Test Plot (CH-Low)



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.

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.