TEST REPORT

of

FCC Part 15 Subpart C
AND CANADA RSS-247

☒ New Application; ☐ Class I PC; ☐ Class II PC

Product :	**Almond**
Brand:	**SECURIFI**
Model:	**Almond, Almond1**
Model Difference:	**Market Segment**
FCC ID:	**AHL-ALMOND1**
IC:	**10114A-ALMOND1**
FCC Rule Part:	**§15.247, Cat: DTS**
IC Rule Part:	**RSS-247 issue 1: May 28, 2015** **RSS-Gen issue 4: 2014**
Applicant:	**Securifi LTD.**
Address:	**11F, No.92, Sec. 5, Nanjing E. Rd., Songshan Dist., Taipei City 105, Taiwan**

Test Performed by:
International Standards Laboratory
<Lung-Tan LAB>
*Site Registration No.
BSMI: SL2-IN-E-0013; MRA TW1036; TAF: 0997; IC: IC4067B-3;
*Address:
No. 120, Lane 180, Hsin Ho Rd., Lung-Tan Dist., Tao Yuan City 325, Taiwan
*Tel : 886-3-407-1718; Fax: 886-3-407-1738

Report No.: **ISL-14LR061FC-R1**
Issue Date : **2015/12/23**

Test results given in this report apply only to the specific sample(s) tested and are traceable to national or international standard through calibration of the equipment and evaluating measurement uncertainty herein.
This report MUST not be used to claim product endorsement by TAF, NVLAP or any agency of the Government.

VERIFICATION OF COMPLIANCE

Applicant:	Securifi LTD.
Product Description:	Almond
Brand Name:	SECURIFI
Model No.:	Almond, Almond1
Model Difference:	Market Segment
FCC ID:	AHL-ALMOND1
IC:	10114A-ALMOND1
Date of test:	2014/03/03 ~ 2015/12/21
Date of EUT Received:	2014/03/03

We hereby certify that:

All the tests in this report have been performed and recorded in accordance with the standards described above and performed by an independent electromagnetic compatibility consultant, International Standards Laboratory.

The test results contained in this report accurately represent the measurements of the characteristics and the energy generated by sample equipment under test at the time of the test. The sample equipment tested as described in this report is in compliance with the limits of above standards.

Test By:	Dion Chen	***Date:***	2015/12/23
	Dion Chang / Engineer		
Prepared By:	Gigi yeh	***Date:***	2015/12/23
	Gigi Yeh / Specialist		
Approved By:	Vincent Su	***Date:***	2015/12/23
	Vincent Su / Technical Manager		

Version

Version No.	Date	Description
00	2015/12/23	Initial creation of document

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1 GENERAL INFORMATION

1.1. Product Description

General:

Product Name:	Almond	
Brand Name:	SECURIFI	
Model Name:	Almond, Almond1	
Model Difference:	Market Segment	
Hardware Version:	N/A	
Software Version:	N/A	
Power Supply:	12Vdc form AC/DC Adapter	
	Adaptor:	1. Model: DSA-12G-12FUS, Supplier: Switching 2. Model: MU12AB120100-A1, Supplier: I.T.E. 3. Model: MU12AR120100-A1, Supplier: I.T.E.

WLAN: 2X2 SM-MIMO

Wi-Fi	Frequency Range (MHz)	Channels	Peak Rated Power	Modulation Technology
802.11b	2412 – 2462(DTS)	11	17.74dBm	DSSS
802.11g	2412 – 2462(DTS)	11	23.99dBm	DSSS, OFDM
802.11n	HT20 2412 – 2462(DTS)	11	23.44dBm	OFDM
	HT40 2422 – 2452(DTS)	7	24.65dBm	
Modulation type		CCK, DQPSK, DBPSK for DSSS 64QAM. 16QAM, QPSK, BPSK for OFDM		
Transition Rate:		Upto 72Mbps		
Antenna Designation:		PIFA Antenna WiFi 2.4GHz: 4.95dBi According to KDB662911 D01 SM-MIMO signals could be considered uncorrelated for purposes of directional gain computation. Directional gain = G_{ANT}		

The EUT is compliance with IEEE 802.11 b/g/n Standard. This report is applied for band wifi.

Remark: The above DUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

1.1 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for **FCC ID: AHL-ALMOND1** filing to comply with Section 15.247 of the FCC Part 15, Subpart C Rules. And **IC: 10114A-ALMOND1** filing to comply with Industry Canada RSS-247 issue 1: 2015. 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 (2009). Radiated testing was performed at an antenna to EUT distance 3 meters.

KDB Document:

558074 D01 DTS Meas Guidance v03r01

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 **International Standards Laboratory** <Lung-Tan LAB> No. 120, Lane 180, Hsin Ho Rd., Lung-Tan Dist., Tao Yuan City 325, Taiwan which are constructed and calibrated to meet the FCC requirements in documents ANSI C63.4: 2009. FCC Registration Number is: TW1036, Canada Registration Number: 4067B-3.

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 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 C63.4-2009.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 according to the requirements in Section 8 and 13 of ANSI C63.4-2009.

2.4 Configuration of Tested System

Fig. 2-1 Configuration of Tested System

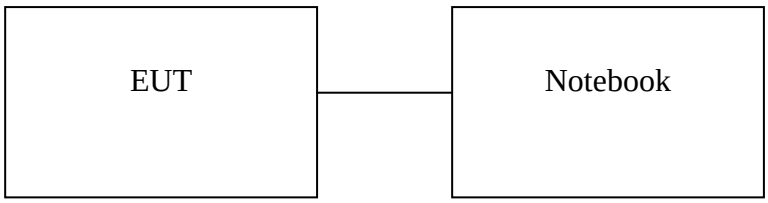


Table 2-1 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/ Type No.	Series No.	Data Cable	Power Cord
1	Notebook	Lenovo	X220i	NA	shield	Non-shield

3 SUMMARY OF TEST RESULTS

FCC /IC Rules	Description Of Test	Result
§15.207(a) RSS-Gen §8.8	AC Power Line Conducted Emission	Compliant
§15.247(b) (3),(4) RSS-247 issue 1,§5.4(4)	Peak Output Power	Compliant
§15.247(a)(2) RSS-247 issue 1, §5.2(1) RSS-Gen §6.6	6dB Bandwidth & 99% Power Bandwidth	Compliant
§15.247(d) RSS-247 issue 1, §5.5	100 KHz Bandwidth Of Frequency Band Edges	Compliant
§15.247(d) RSS-247 issue 1, §5.5	Spurious Emission	Compliant
§15.247(e) RSS-247 issue 1, §5.2(2)	Peak Power Density	Compliant
§15.203 RSS-GEN 8.3	Antenna Requirement	Compliant
MPE	Maximum Permissible Exposure	Compliant

4 DESCRIPTION OF TEST MODES

The EUT has been tested under engineering operating condition.
Test program used to control the EUT for staying in continuous transmitting mode is programmed.

2.4GHz:
802.11 b mode: Channel low (2412MHz)、mid (2437MHz) and high (2462MHz) (2472MHz) with 1Mbps lowest data rate are chosen for pre-test testing of radiated emissions.

802.11 g mode: Channel low (2412MHz)、mid (2437MHz) and high (2462MHz) (2472MHz) with 6Mbps lowest data rate are chosen for pre-test testing of radiated emissions.

802.11 n HT20: Channel low (2412MHz)、mid (2437MHz) and high (2462MHz) (2472MHz) with 6.5Mbps lowest data rate are chosen for pre-test testing of radiated emissions.

802.11 n HT40: Channel low (2422MHz)、mid (2437MHz) and high (2452MHz) (2462MHz) with 13.5Mbps lowest data rate are chosen for pre-test testing of radiated emissions.

The worst case 802.11 g mode was reported for Radiated Emission.

5 CONDUCTED EMISSION TEST

5.1 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.		

5.2 Measurement Equipment Used:

Conducted Emission Test Site					
EQUIPMENT TYPE	**MFR**	**MODEL NUMBER**	**SERIAL NUMBER**	**LAST CAL.**	**CAL DUE.**
Conduction 04-3 Cable	WOKEN	CFD 300-NL	Conduction 04 -3	07/28/2015	07/27/2016
EMI Receiver 17	Rohde & Schwarz	ESCI 7	100887	09/08/2015	09/07/2016
LISN 18	ROHDE & SCHWARZ	ENV216	101424	02/11/2015	02/10/2016
LISN 19	ROHDE & SCHWARZ	ENV216	101425	03/12/2015	03/11/2016

5.3 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.

5.4 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.

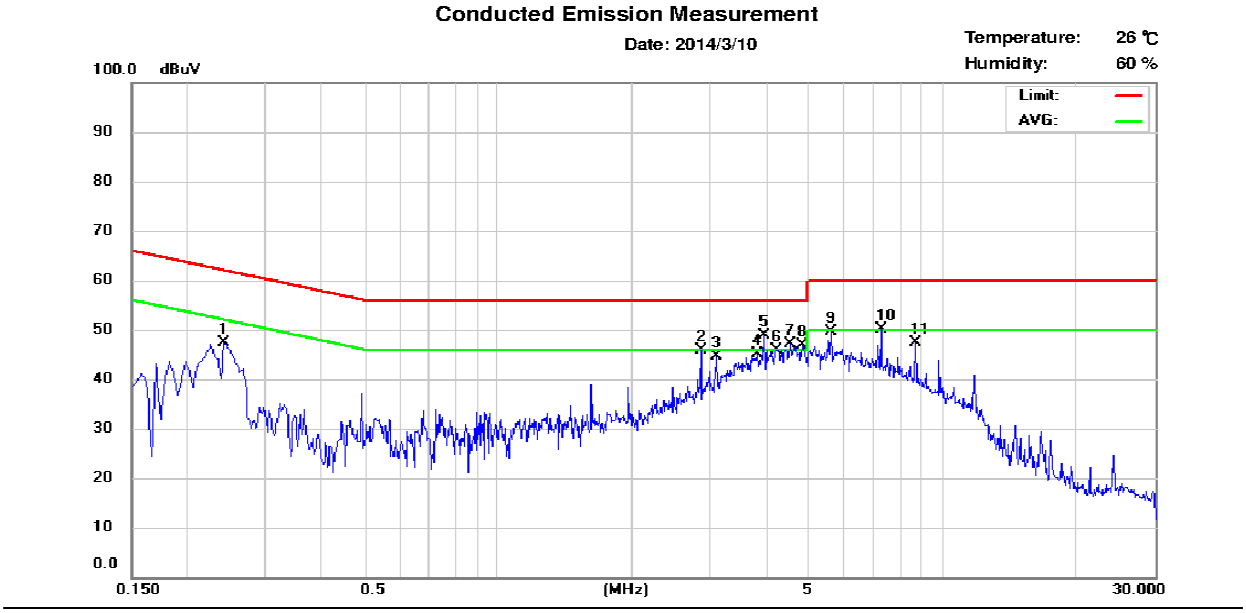
5.5 Measurement Result:

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.

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

AC POWER LINE CONDUCTED EMISSION TEST DATA

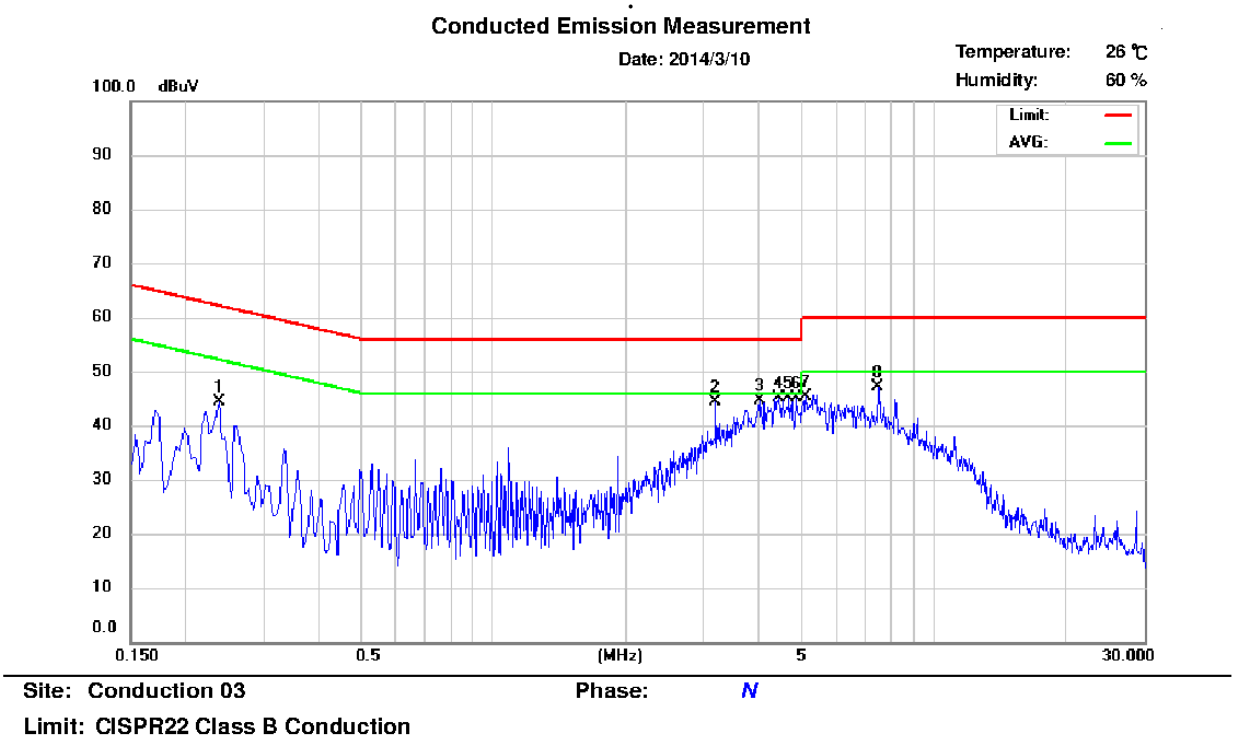
Operation Mode:	Operation Mode	Test Date:	2014/03/10
Test By:	Dino		
Adapter name:	DSA-12G-12 FUS		



Site: Conduction 03 Phase: L1

Limit: CISPR22 Class B Conduction

No.	Frequency (MHz)	Correct Factor (dB)	QP Emission (dBuV)	QP Limit (dBuV)	QP Margin (dB)	AVG Emission (dBuV)	AVG Limit (dBuV)	AVG Margin (dB)	Note
1	0.242	9.62	46.69	62.03	-15.34	35.72	52.03	-16.31	
2	2.858	9.72	35.23	56.00	-20.77	26.23	46.00	-19.77	
3	3.094	9.74	36.70	56.00	-19.30	27.69	46.00	-18.31	
4	3.822	9.75	41.33	56.00	-14.67	31.33	46.00	-14.67	
5	3.974	9.75	41.56	56.00	-14.44	32.22	46.00	-13.78	
6	4.238	9.75	41.59	56.00	-14.41	32.46	46.00	-13.54	
7	4.526	9.76	43.11	56.00	-12.89	33.01	46.00	-12.99	
8	4.834	9.77	43.42	56.00	-12.58	32.73	46.00	-13.27	
9	5.622	9.78	41.69	60.00	-18.31	31.98	50.00	-18.02	
10	7.258	9.82	39.42	60.00	-20.58	29.78	50.00	-20.22	
11	8.706	9.85	36.19	60.00	-23.81	26.62	50.00	-23.38	



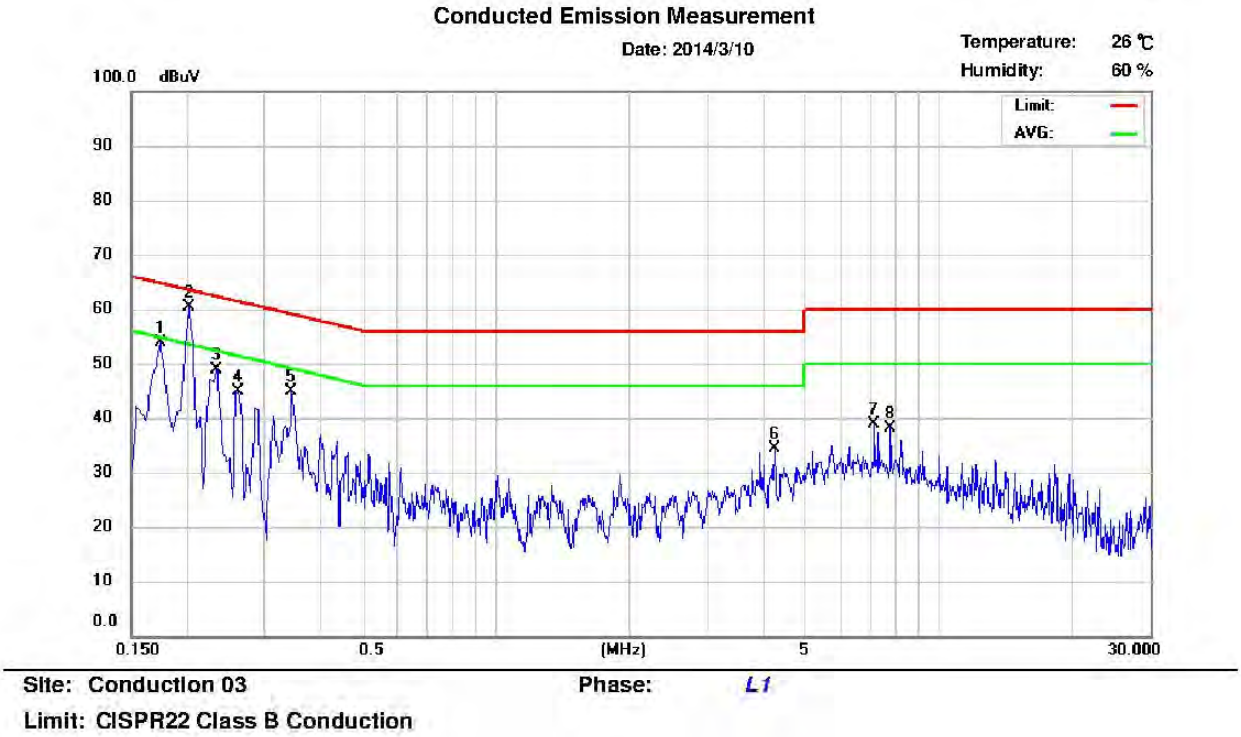
Site: Conduction 03 Phase: N

Limit: CISPR22 Class B Conduction

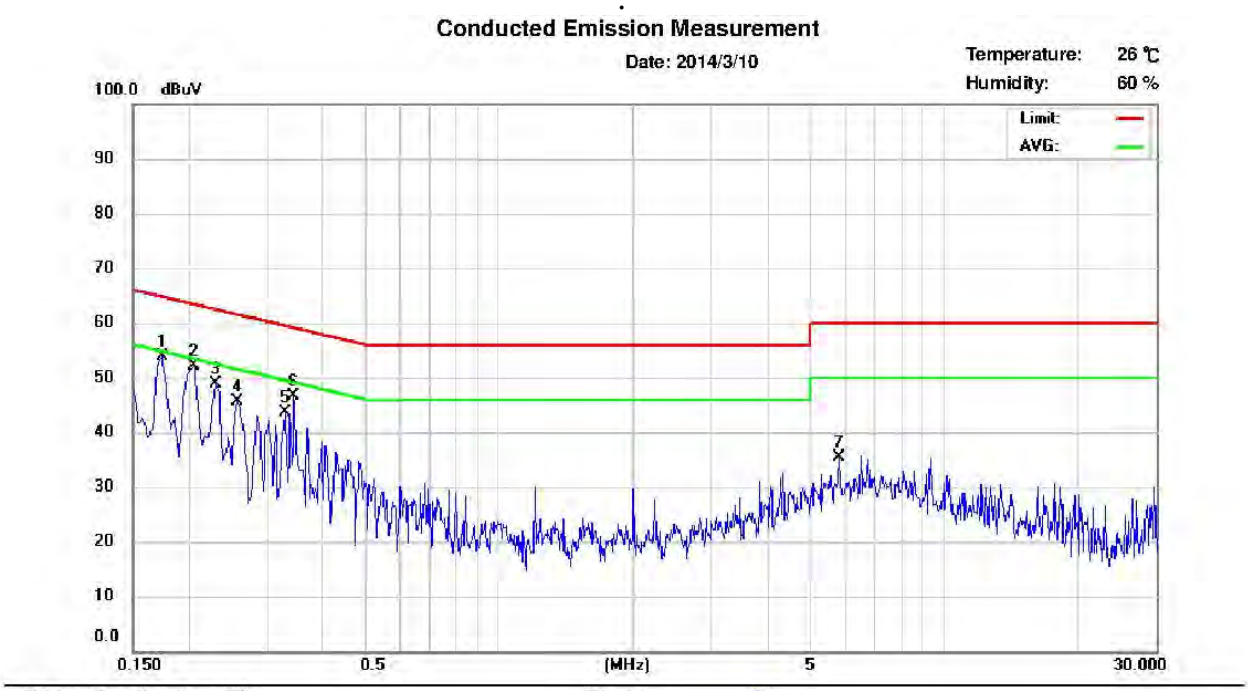
No.	Frequency (MHz)	Correct Factor (dB)	QP Emission (dBuV)	QP Limit (dBuV)	QP Margin (dB)	AVG Emission (dBuV)	AVG Limit (dBuV)	AVG Margin (dB)	Note
1	0.238	9.62	41.62	62.17	-20.55	28.96	52.17	-23.21	
2	3.190	9.72	32.50	56.00	-23.50	20.85	46.00	-25.15	
3	4.030	9.74	37.75	56.00	-18.25	26.39	46.00	-19.61	
4	4.450	9.75	38.60	56.00	-17.40	27.65	46.00	-18.35	
5	4.682	9.76	38.68	56.00	-17.32	28.25	46.00	-17.75	
6	4.874	9.76	37.93	56.00	-18.07	27.57	46.00	-18.43	
7	5.122	9.76	38.21	60.00	-21.79	26.21	50.00	-23.79	
8	7.506	9.81	35.77	60.00	-24.23	24.65	50.00	-25.35	

AC POWER LINE CONDUCTED EMISSION TEST DATA

Operation Mode:	Operation Mode	Test Date:	2014/03/10
Test By:	Dino		
Adapter name:	MU12AB120100-A1		



No.	Frequency (MHz)	Correct Factor (dB)	QP Emission (dBuV)	QP Limit (dBuV)	QP Margin (dB)	AVG Emission (dBuV)	AVG Limit (dBuV)	AVG Margin (dB)	Note
1	0.174	9.61	53.81	64.77	-10.96	53.81	54.77	-0.96	
2	0.202	9.61	60.28	63.53	-3.25	60.28	53.53	6.75	
3	0.234	9.62	48.94	62.31	-13.37	48.94	52.31	-3.37	
4	0.262	9.62	44.93	61.37	-16.44	44.93	51.37	-6.44	
5	0.346	9.62	44.90	59.06	-14.16	44.90	49.06	-4.16	
6	4.250	9.75	34.43	56.00	-21.57	34.43	46.00	-11.57	
7	7.170	9.82	38.98	60.00	-21.02	38.98	50.00	-11.02	
8	7.770	9.83	38.21	60.00	-21.79	38.21	50.00	-11.79	



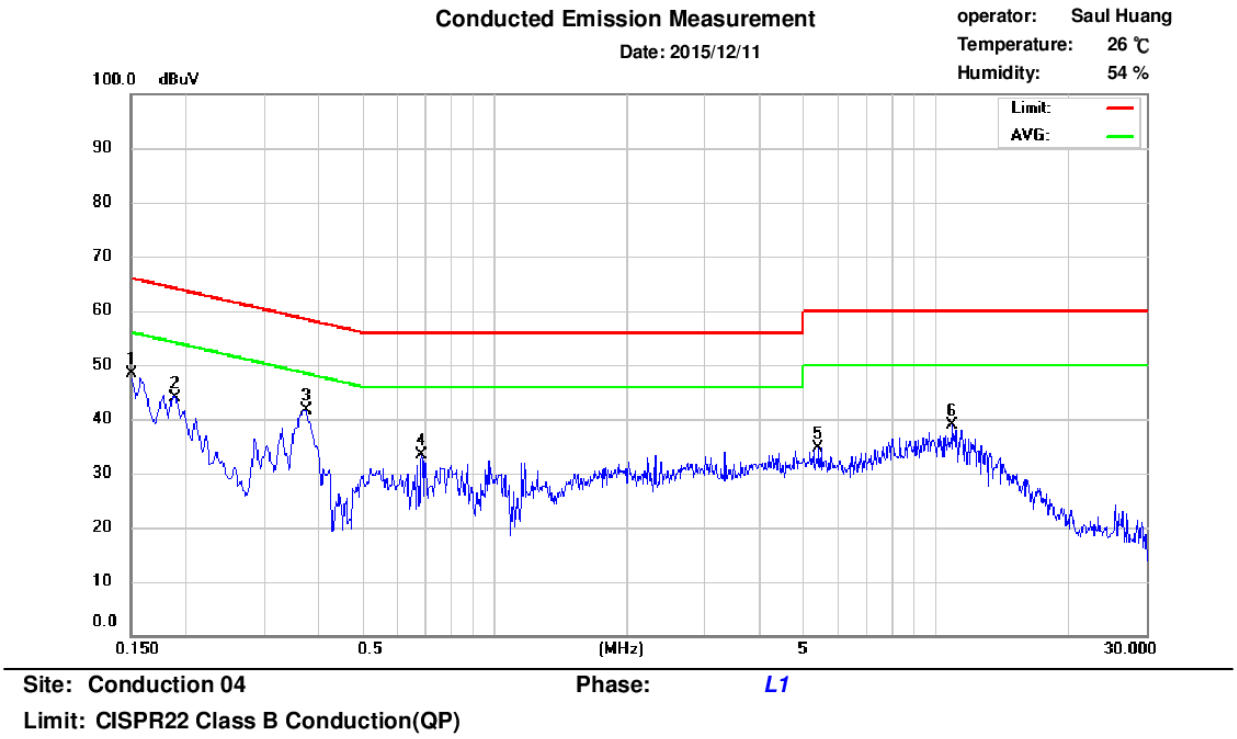
Site: Conduction 03 Phase: *N*

Limit: CISPR22 Class B Conduction

No.	Frequency (MHz)	Correct Factor (dB)	QP Emission (dBuV)	QP Limit (dBuV)	QP Margin (dB)	AVG Emission (dBuV)	AVG Limit (dBuV)	AVG Margin (dB)	Note
1	0.174	9.61	53.85	64.77	-10.92	53.85	54.77	-0.92	
2	0.206	9.61	52.01	63.37	-11.36	52.01	53.37	-1.36	
3	0.230	9.62	48.84	62.45	-13.61	48.84	52.45	-3.61	
4	0.258	9.62	45.61	61.50	-15.89	45.61	51.50	-5.89	
5	0.330	9.62	43.71	59.45	-15.74	43.71	49.45	-5.74	
6	0.346	9.62	46.65	59.06	-12.41	46.65	49.06	-2.41	
7	5.814	9.78	35.45	60.00	-24.55	35.45	50.00	-14.55	

AC POWER LINE CONDUCTED EMISSION TEST DATA

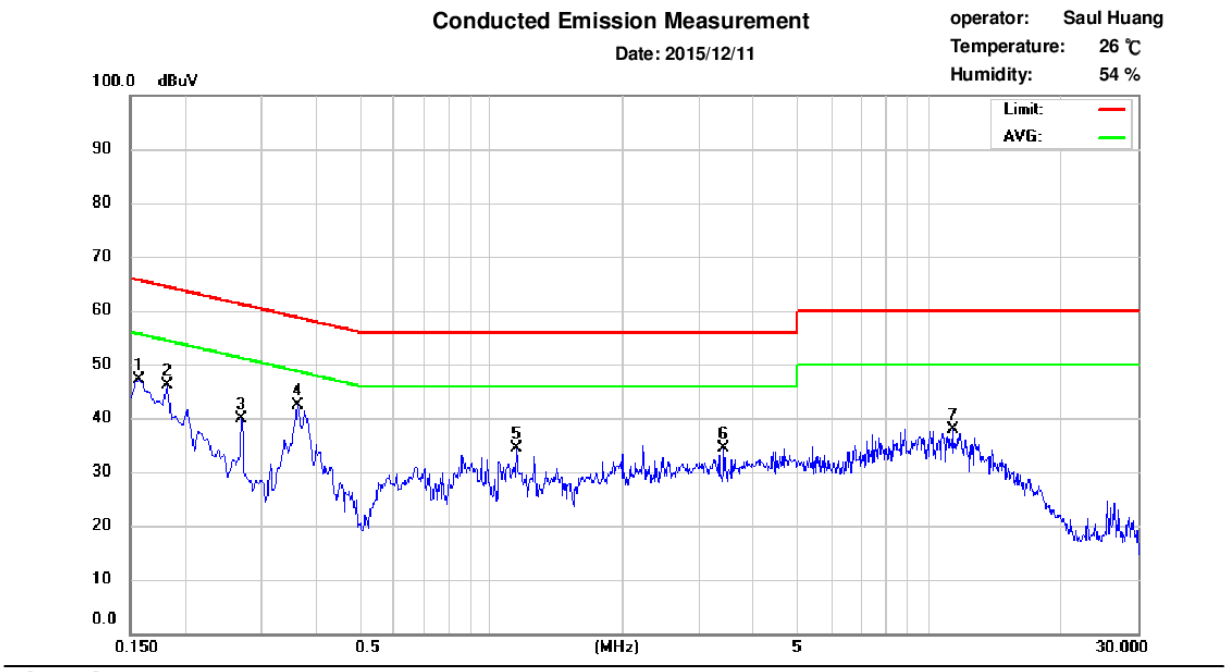
Operation Mode:	Operation Mode	Test Date:	2015/12/11
Test By:	Dino		
Adapter name:	MU12AR120100-A1		



Site: Conduction 04 Phase: *L1*

Limit: CISPR22 Class B Conduction(QP)

No.	Frequency (MHz)	QP_R (dBuV)	AVG_R (dBuV)	Correct Factor (dB)	QP Emission (dBuV)	QP Limit (dBuV)	QP Margin (dB)	AVG Emission (dBuV)	AVG Limit (dBuV)	AVG Margin (dB)
1	0.150	35.16	19.74	9.64	44.80	66.00	-21.20	29.38	56.00	-26.62
2	0.191	29.53	17.07	9.61	39.14	63.98	-24.84	26.68	53.98	-27.30
3	0.374	31.58	29.58	9.61	41.19	58.41	-17.22	39.19	48.41	-9.22
4	0.686	15.56	5.29	9.62	25.18	56.00	-30.82	14.91	46.00	-31.09
5	5.446	17.98	11.74	9.78	27.76	60.00	-32.24	21.52	50.00	-28.48
6	10.906	20.24	14.49	9.91	30.15	60.00	-29.85	24.40	50.00	-25.60



Site: Conduction 04 Phase: N

Limit: CISPR22 Class B Conduction(QP)

No.	Frequency (MHz)	QP_R (dBuV)	AVG_R (dBuV)	Correct Factor (dB)	QP Emission (dBuV)	QP Limit (dBuV)	QP Margin (dB)	AVG Emission (dBuV)	AVG Limit (dBuV)	AVG Margin (dB)
1	0.158	35.73	19.74	9.62	45.35	65.57	-20.22	29.36	55.57	-26.21
2	0.182	31.13	16.93	9.62	40.75	64.39	-23.64	26.55	54.39	-27.84
3	0.270	21.04	9.82	9.62	30.66	61.12	-30.46	19.44	51.12	-31.68
4	0.362	31.35	28.51	9.62	40.97	58.68	-17.71	38.13	48.68	-10.55
5	1.146	18.75	12.18	9.65	28.40	56.00	-27.60	21.83	46.00	-24.17
6	3.402	16.55	10.16	9.73	26.28	56.00	-29.72	19.89	46.00	-26.11
7	11.350	18.57	13.18	9.93	28.50	60.00	-31.50	23.11	50.00	-26.89

6 PEAK /AVERAGE OUTPUT POWER MEASUREMENT

6.1 Standard Applicable:

According to §15.247(b)(3),(4)(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-247 issue 1,§5.4

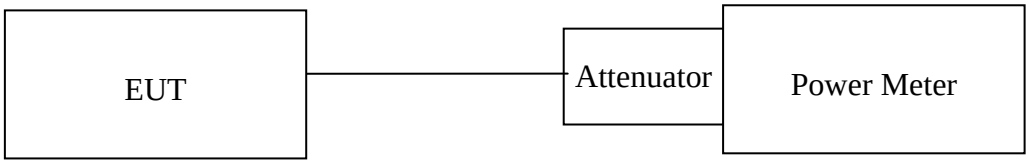
(4) For DTSs employing digital modulation techniques operating in the bands 902-928 MHz and 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1W. Except as provided in Section 5.4(5), the e.i.r.p. shall not exceed 4 W.

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.

6.2 Measurement Equipment Used:

Conducted Emission Test Site					
EQUIPMENT TYPE	**MFR**	**MODEL NUMBER**	**SERIAL NUMBER**	**LAST CAL.**	**CAL DUE.**
Power Meter 05	Anritsu	ML2495A	1116010	07/29/2015	07/28/2016
Power Sensor 05	Anritsu	MA2411B	34NKF50	07/29/2015	07/28/2016
Power Sensor 06	DARE	RPR3006W	13I00030SNO33	11/03/2015	11/02/2016
Power Sensor 07	DARE	RPR3006W	13I00030SNO34	11/03/2015	11/02/2016
Temperature Chamber	KSON	THS-B4H100	2287	06/05/2015	06/04/2016
DC Power supply	ABM	8185D	N/A	09/05/2015	09/04/2016
AC Power supply	EXTECH	CFC105W	NA	12/27/2014	12/26/2015
Attenuator	Woken	Watt-65m3502	11051601	NA	NA
Splitter	MCLI	PS4-199	12465	12/27/2013	12/26/2015
Spectrum analyzer	Agilent	N9030A	MY51360021	10/02/2015	10/01/2016

6.3 Test Set-up:



6.4 Measurement Procedure:

Refer to section 9.1.3 and 9.2.3 Peak and Average Conducted Output Power Measurement Procedure of KDB Document: 558074 D01 DTS Meas Guidance v03r01

6.5 Measurement Result:

802.11b

Cable loss = 0		Output Power		Limit (dBm)
CH	Frequency (MHz)	Detector		
		PK (dBm)	AV (dBm)	
1	2412	17.74	13.48	30
7	2442	17.6	13.35	
11	2462	17.42	13.22	

802.11g

Cable loss = 0		Output Power		Limit (dBm)
CH	Frequency (MHz)	Detector		
		PK (dBm)	AV (dBm)	
1	2412	23.99	11.99	30
7	2442	23.95	11.82	
11	2462	23.85	11.61	

802.11n
Peak Measurement:
2*2 MIMO

Channel		Frequency (MHz)	Output Chain (dBm)		Combine Output Power (dBm)	Limit(dBm)	Result
			Chain A	chain B			
AN HT20	1	2412	20.46	20.39	**23.44**	30	Pass
	7	2442	20.33	20.3	23.33	30	Pass
	11	2462	19.71	19.76	22.75	30	Pass
AN HT40	3	2422	19.79	22.93	**24.65**	30	Pass
	7	2442	19.52	23.04	24.64	30	Pass
	9	2452	19.24	23.01	24.53	30	Pass

Average Measurement
2*2 MIMO

Channel		Frequency (MHz)	Output Chain (dBm)		Combine Output Power (dBm)	Limit(dBm)	Result
			Chain A	chain B			
AN HT20	1	2412	9.29	9.23	12.27	30	Pass
	7	2442	9.09	9.15	12.13	30	Pass
	11	2462	8.59	8.63	11.62	30	Pass
AN HT40	3	2422	8.48	8.44	11.47	30	Pass
	7	2442	8.20	8.26	11.24	30	Pass
	9	2452	7.93	7.98	10.97	30	Pass

7 6dB /99% Bandwidth(EBW)

7.1 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-247 issue 1, §5.2

(1) The minimum 6 dB bandwidth shall be 500 kHz.

7.2 Measurement Equipment Used:

Refer to section 6.2 for details.

7.3 Test Set-up:

Refer to section 6.3 for details.

7.4 Measurement Procedure:

Refer to section 8.1 DTS bandwidth Measurement Procedure of KDB Document: 558074 D01 DTS Meas Guidance v03r01

1. Set resolution bandwidth (RBW) = 100KHz.
2. Set the video bandwidth (VBW) =300KHz.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Allow the trace to stabilize.
7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission. Compare the resultant bandwidth with the RBW setting of the analyzer.

7.5 Measurement Result:

2.4GHz

802.11b

Frequency (MHz)	6dB Bandwidth (MHz)	99% Bandwidth (MHz)	Bandwidth (KHz)	Result
2412	10.09	12.46	> 500	PASS
2442	10.03	12.41	> 500	PASS
2462	10.09	12.37	> 500	PASS

802.11g

Frequency (MHz)	6dB Bandwidth (MHz)	99% Bandwidth (MHz)	Bandwidth (KHz)	Result
2412	16.38	17.05	> 500	PASS
2442	16.38	17.04	> 500	PASS
2462	16.37	17.01	> 500	PASS

802.11n HT20

Frequency (MHz)	6dB Bandwidth (MHz)	99% Bandwidth (MHz)	Bandwidth (KHz)	Result
2412	17.54	17.58	> 500	PASS
2442	17.05	17.60	> 500	PASS
2462	16.78	17.65	> 500	PASS

802.11n HT40

Frequency (MHz)	6dB Bandwidth (MHz)	99% Bandwidth (MHz)	Bandwidth (KHz)	Result
2422	35.66	36.41	> 500	PASS
2442	35.76	36.45	> 500	PASS
2452	35.80	36.42	> 500	PASS

Note: Refer to next page for plots.

802.11b

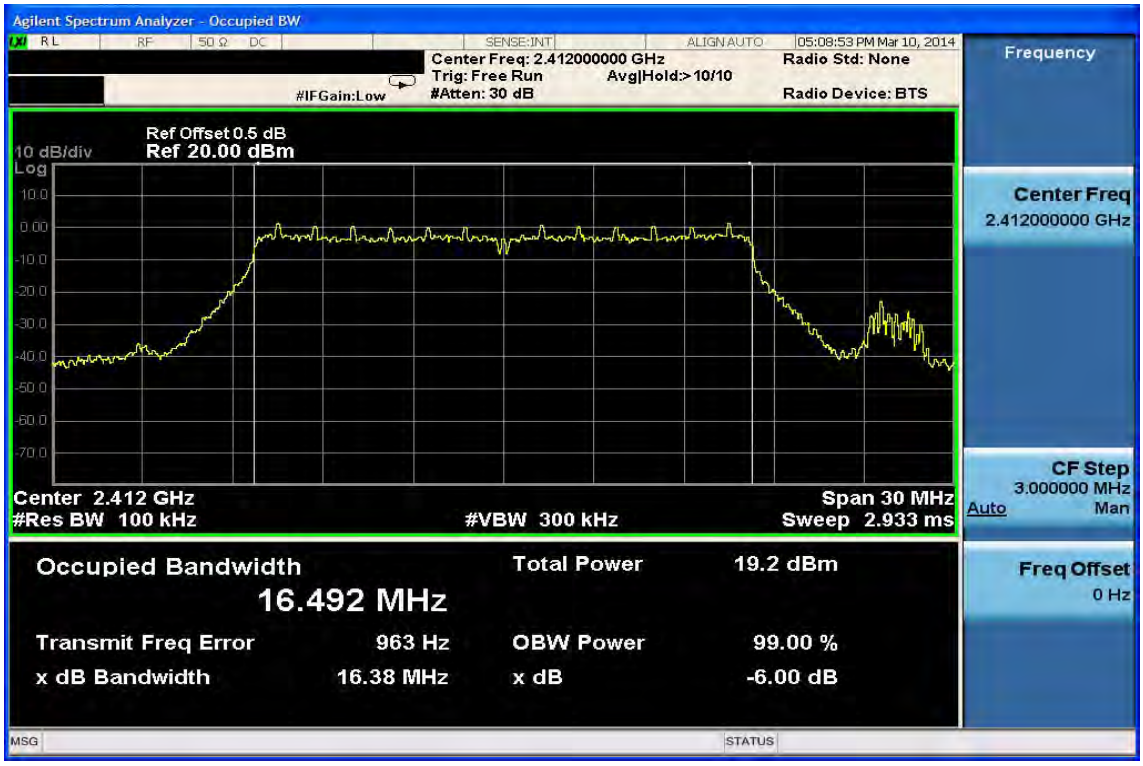
6dB Band Width Test Data 2412MHz

6dB Band Width Test Data 2442MHz

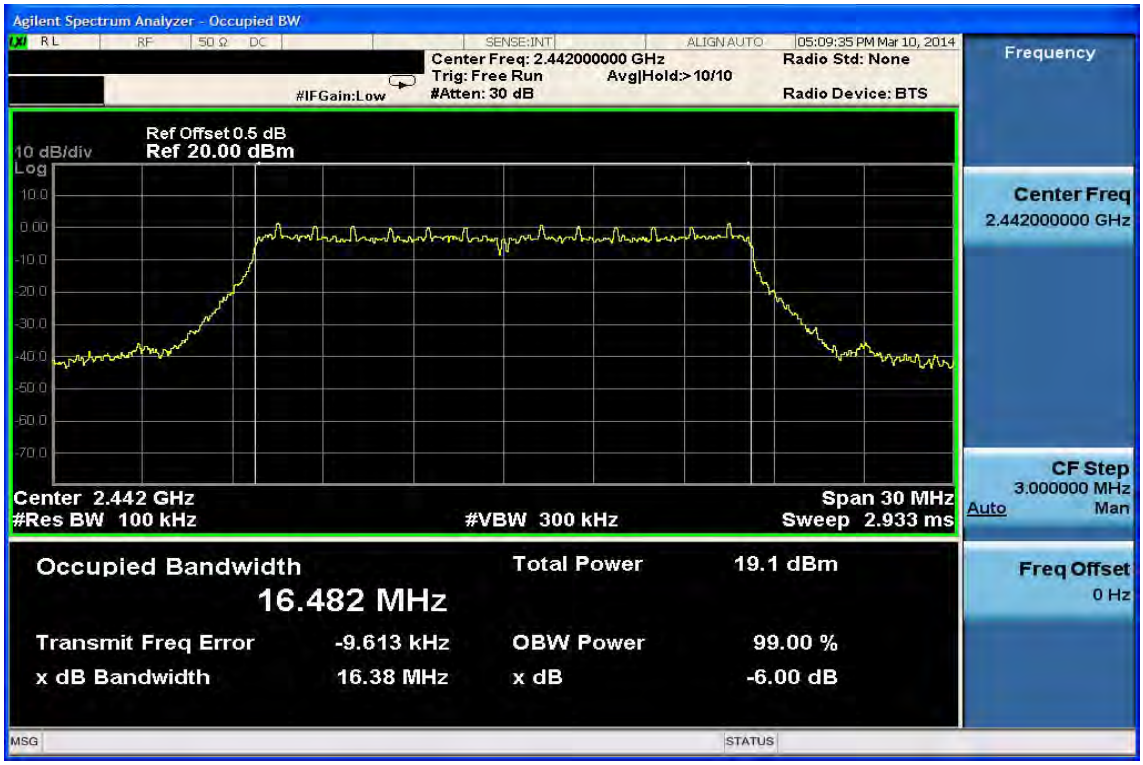
6dB Band Width Test Data 2462MHz

802.11g

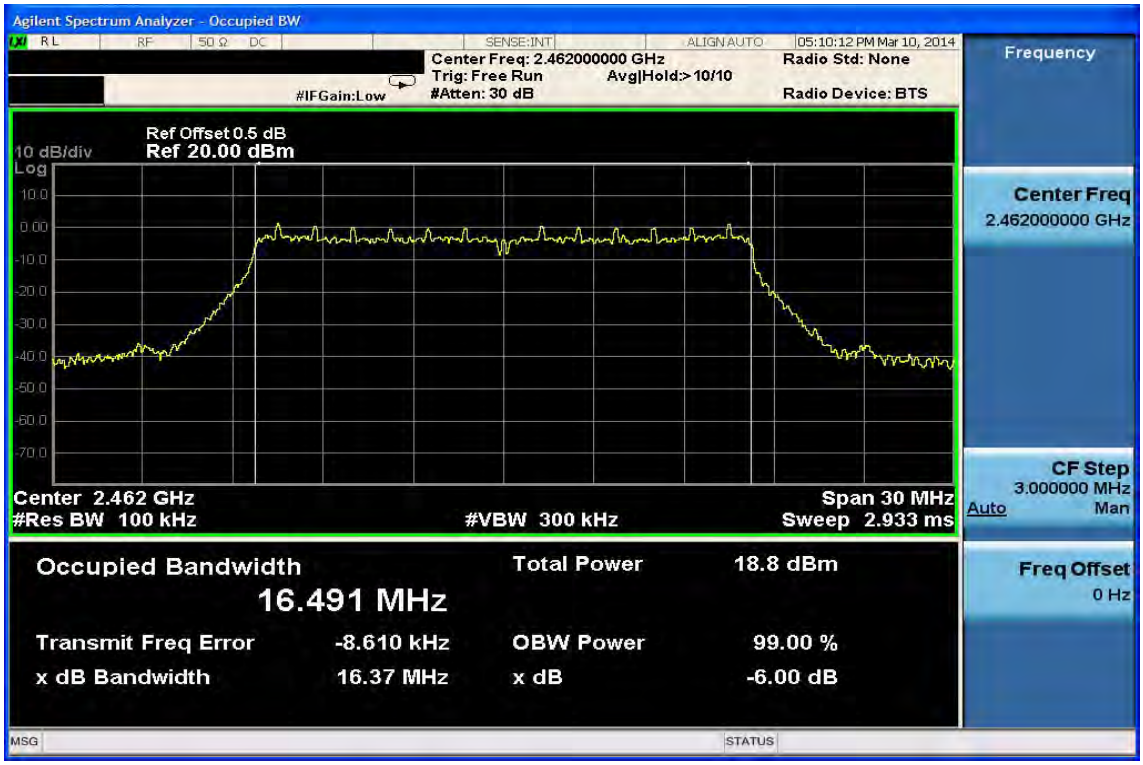
6dB Band Width Test Data 2412MHz



6dB Band Width Test Data 2442MHz



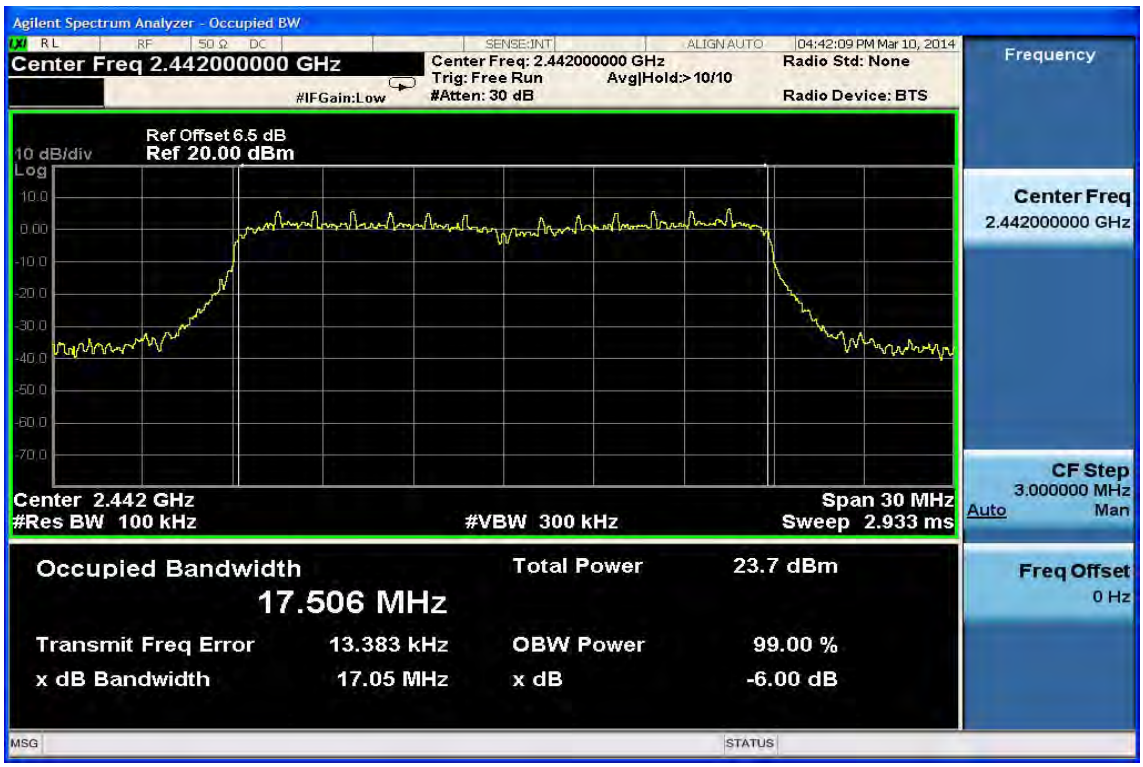
6dB Band Width Test Data 2462MHz



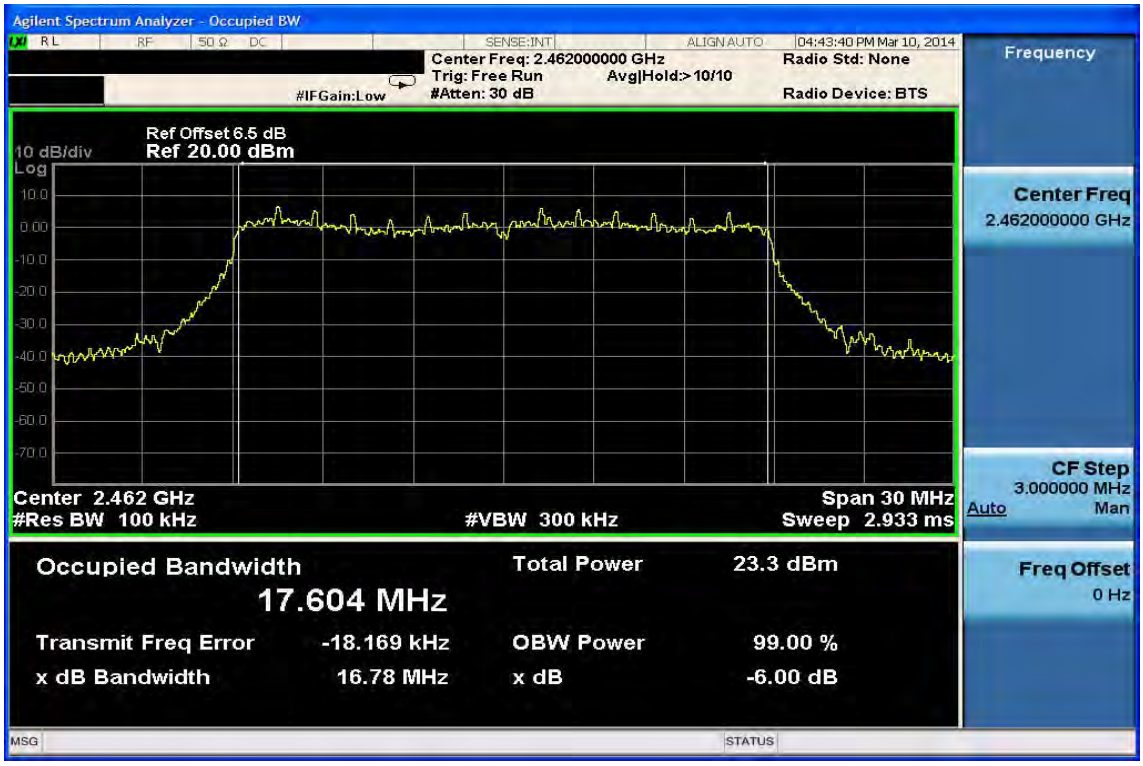
802.11n_20M

6dB Band Width Test Data 2412MHz

6dB Band Width Test Data 2442MHz

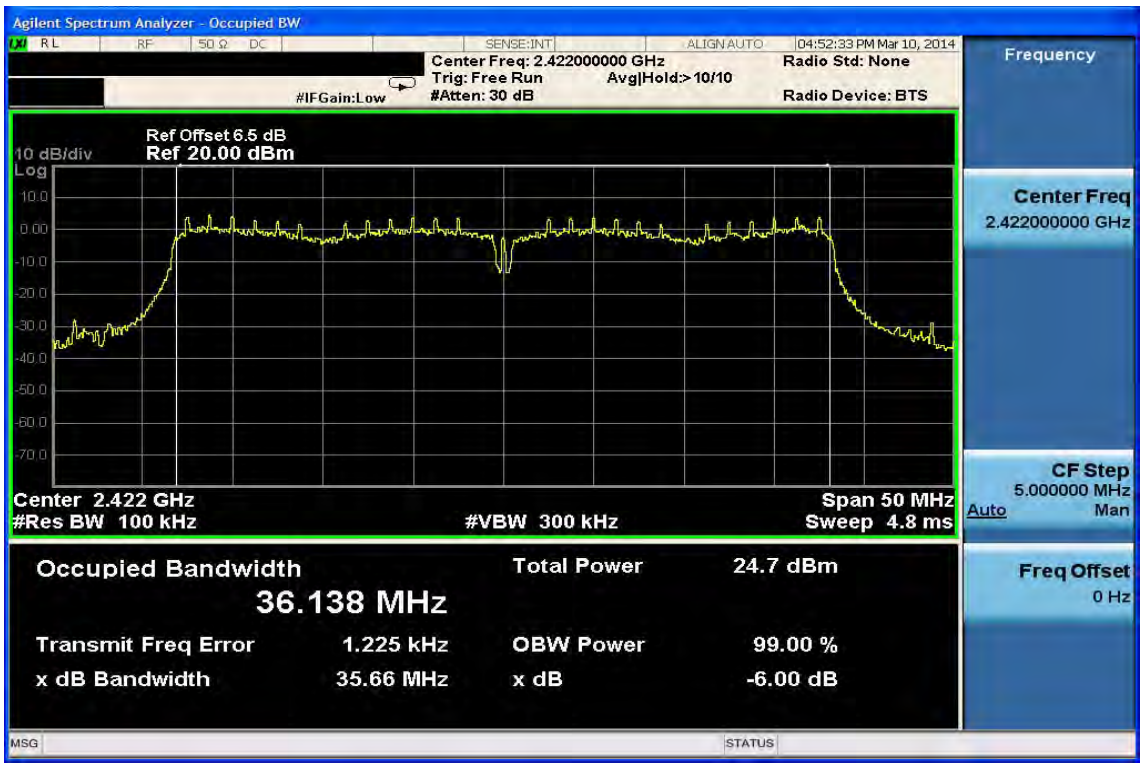


6dB Band Width Test Data 2462MHz

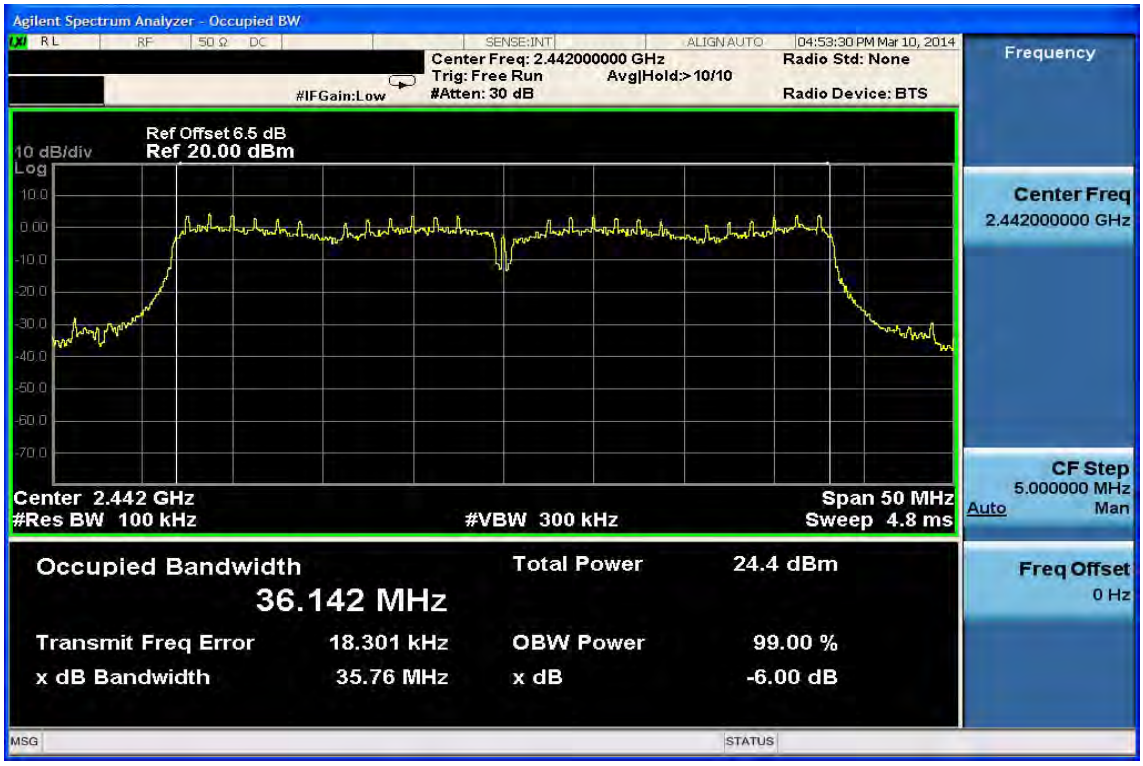


802.11n_40M

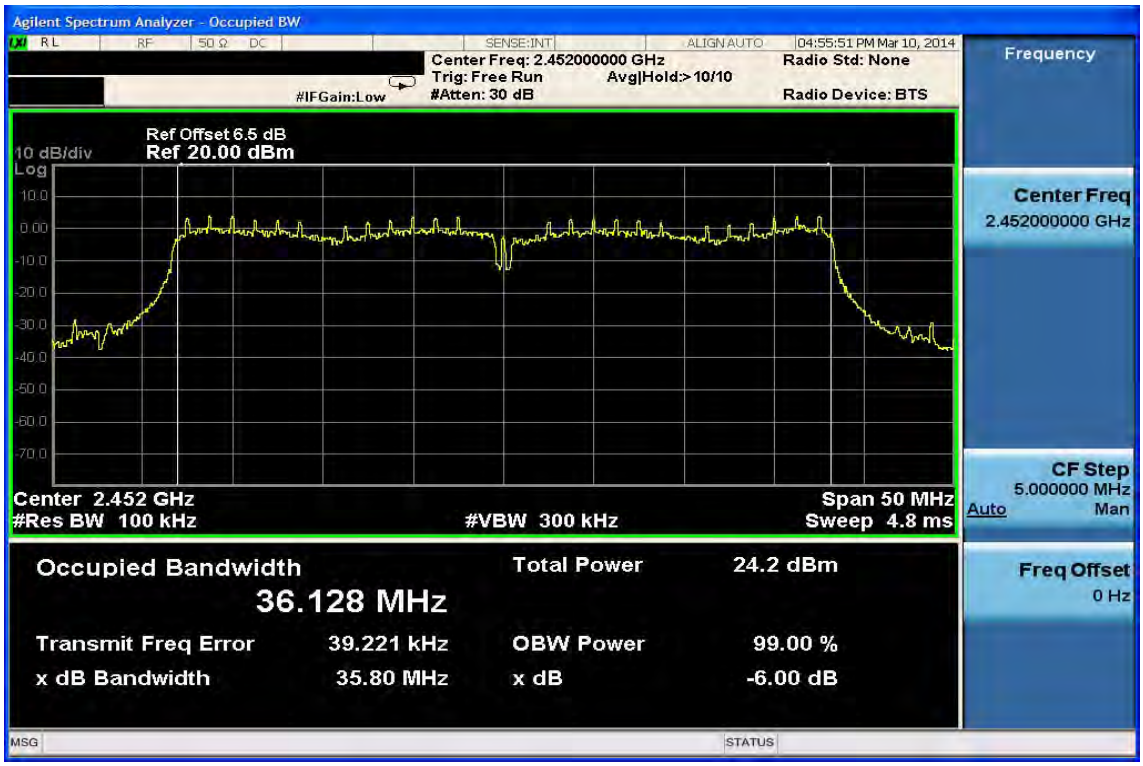
6dB Band Width Test Data 2422MHz



6dB Band Width Test Data 2442MHz



6dB Band Width Test Data 2452MHz



802.11b

99% Band Width Test Data 2412MHz

99%Band Width Test Data 2442MHz

99%Band Width Test Data 2462MHz

802.11g

99% Band Width Test Data 2412MHz

99% Band Width Test Data 2442MHz

99% Band Width Test Data 2462MHz

802.11n_20M

99% Band Width Test Data 2412MHz

99% Band Width Test Data 2442MHz

99% Band Width Test Data 2462MHz

802.11n_40M

99% Band Width Test Data 2422MHz

99% Band Width Test Data 2442MHz

99% Band Width Test Data 2452MHz

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 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-247 issue 1, §5.5

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digi-tally modulated device is operating, the RF power that is produced shall be at least 20 dB be-low that in the 100 kHz bandwidth within the band that contains the highest level of the de-sired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under Section 5.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

8.2 Measurement Equipment Used:

8.2.1 Conducted Emission at antenna port:

Refer to section 6.2 for details.

8.2.2 Radiated emission:

Chamber 14(966)					
EQUIPMENT TYPE	**MFR**	**MODEL NUMBER**	**SERIAL NUMBER**	**LAST CAL.**	**CAL DUE.**
Spectrum Analyzer 21(26.5GHz)	Agilent	N9010A	MY49060537	07/30/2015	07/29/2016
Spectrum Analyzer 20(6.5GHz)	Agilent	E4443A	MY48250315	05/21/2015	05/20/2016
Spectrum Analyzer 22(43GHz)	R&S	FSU43	100143	05/23/2015	05/22/2016
Dipole antenna	SCHWARZBECK	VHAP,30-300	919	12/03/2015	12/02/2017
Dipole antenna	SCHWARZBECK	UHAP,300-1000	1195	12/03/2015	12/02/2017
Loop Antenna9K-30M	A.H.SYSTEM	SAS-564	294	06/17/2015	06/16/2017
Bilog Antenna30-1G	Schaffner	CBL 6112D	37873	06/16/2015	06/15/2016
Horn antenna1-18G	ETS	3117	00066665	11/27/2015	11/26/2016
Horn antenna26-40G(05)	Com-power	AH-640	100A	01/21/2015	01/20/2017
Horn antenna18-26G(04)	Com-power	AH-826	081001	07/24/2015	07/23/2017
Preamplifier9-1000M	HP	8447D	NA	03/12/2015	03/11/2016
Preamplifier1-18G	MITEQ	AFS44-00101800-25-10P-44	1329256	07/28/2015	07/27/2016
Preamplifier1-26G	EM	EM01M26G	NA	03/11/2015	03/10/2016
Preamplifier26-40G	MITEQ	JS-26004000-27-5A	818471	07/23/2015	07/22/2017
Cable1-18G	HUBER SUHNER	Sucoflex 106	NA	12/02/2015	12/01/2016
Cable UP to 1G	HUBER SUHNER	RG 214/U	NA	10/02/2015	10/01/2016
SUCOFLEX 1GHz~40GHz cable	HUBER SUHNER	Sucoflex 102	27963/2&37421/2	11/03/2015	11/02/2017
Signal Generator	R&S	SMU200A	102330	03/11/2015	02/10/2016
Signal Generator	Anritsu	MG3692A	20311	11/04/2015	11/03/2016
2.4G Filter	Micro-Tronics	Brm50702	76	12/27/2014	12/26/2015

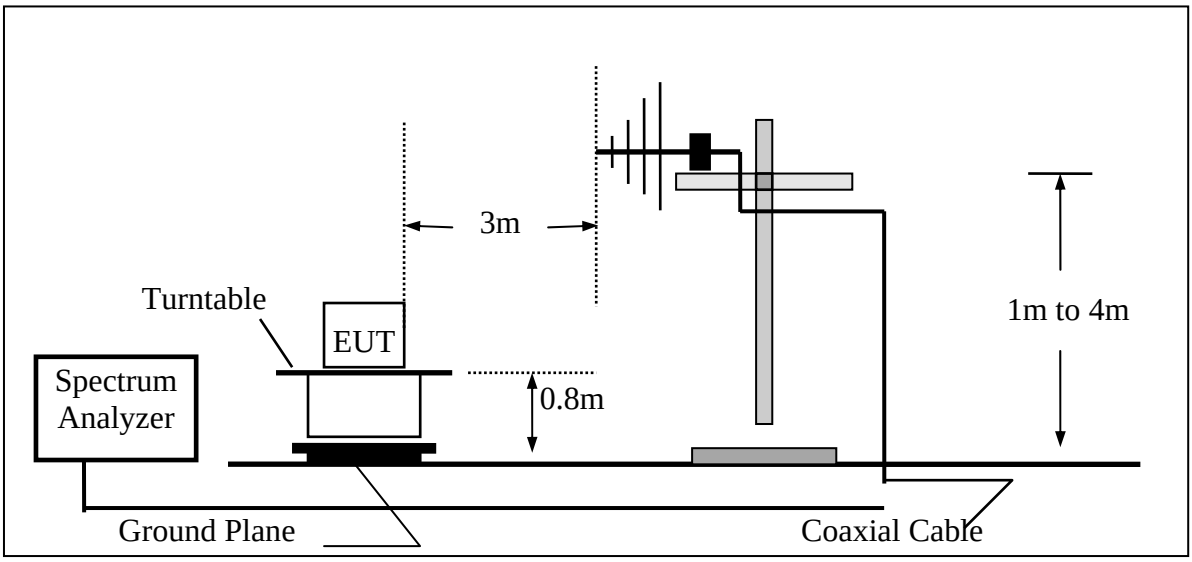
8.3 Test SET-UP:

8.3.1 Conducted Emission at antenna port:

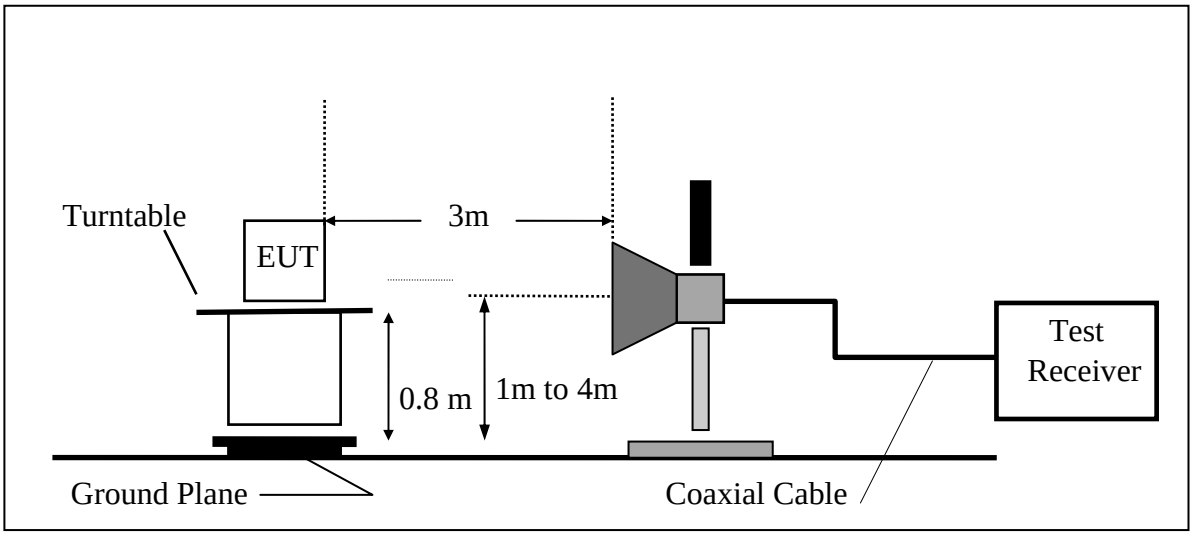
Refer to section 6.3 for details.

8.3.2 Radiated emission:

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



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



8.4 Measurement Procedure:

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

Refer to section 11 and 12 emissions in restricted and non-restricted frequency bands Measurement Procedure of KDB Document: 558074 D01 DTS Meas Guidance v03r01

The measurement of unwanted emissions at the edge of the authorized frequency bands can be complicated by the leakage of RF energy from the fundamental emission into the RBW pass band. Thus, for measurements at the band edges, a narrower resolution bandwidth (no less than 10 kHz) can be used within the first 1 MHz beyond the fundamental emission, provided that that measured energy is subsequently integrated over the appropriate reference bandwidth (i.e., 100 kHz or 1 MHz). This integration can be performed using the band power function of the spectrum analyzer or by summing the spectral levels (in linear power units) over the appropriate reference bandwidth.

8.5 Field Strength Calculation:

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

FS = RA + AF + CL - AG

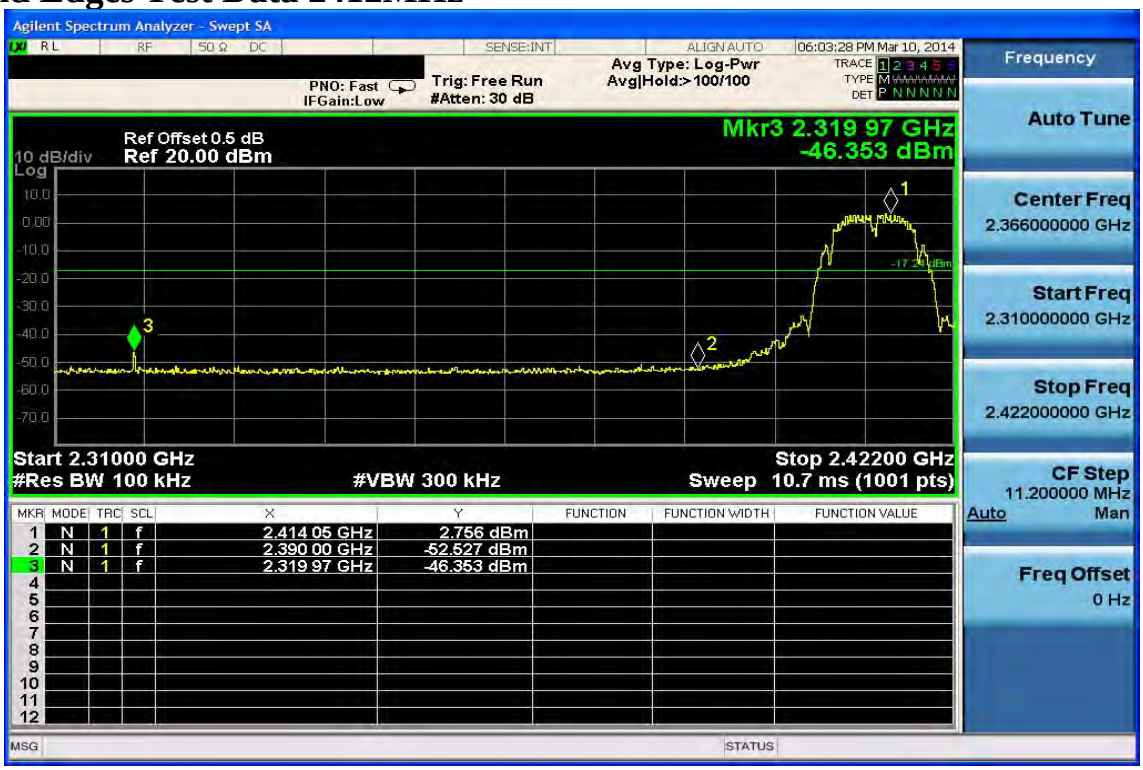
Where	FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
	RA = Reading Amplitude	AG = Amplifier Gain
	AF = Antenna Factor	

8.6 Measurement Result:

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

802.11b

Band Edges Test Data 2412MHz



Band Edges Test Data 2462MHz

Radiated Emission: 802.11b mode

Operation Mode	TX CH Low	Test Date	2014/03/24
Fundamental Frequency	2412 MHz	Test By	Dino
Temperature	25 ℃	Humidity	60 %

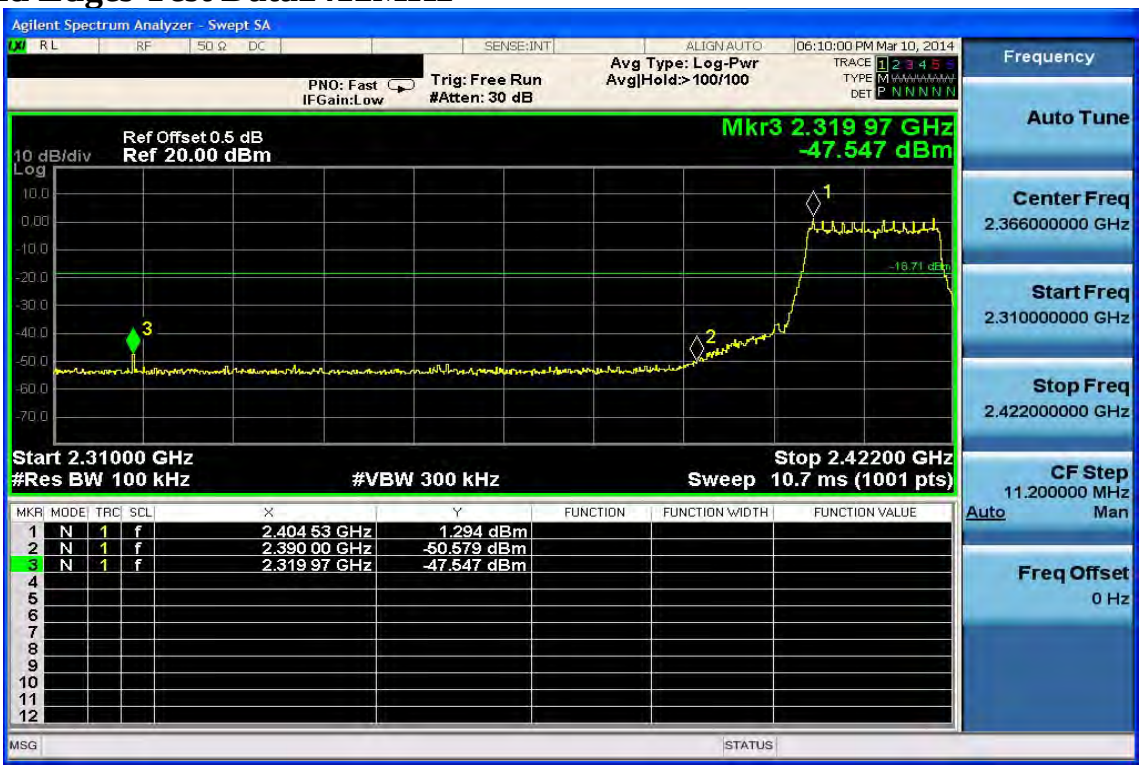
No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	2390.00	17.34	31.40	48.74	54.00	-5.26	Average	VERTICAL
2	2390.00	27.86	31.40	59.26	74.00	-14.74	Peak	VERTICAL
1	2390.00	15.98	31.40	47.38	54.00	-6.62	Average	HORIZONTAL
2	2390.00	26.76	31.40	58.16	74.00	-15.84	Peak	HORIZONTAL

Operation Mode	TX CH High	Test Date	2014/03/24
Fundamental Frequency	2462 MHz	Test By	Dino
Temperature	25 ℃	Humidity	60 %

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	2483.50	17.58	31.56	49.14	54.00	-4.86	Average	VERTICAL
2	2483.50	27.77	31.56	59.33	74.00	-14.67	Peak	VERTICAL
1	2483.50	15.77	31.56	47.33	54.00	-6.67	Average	HORIZONTAL
2	2483.50	28.32	31.56	59.88	74.00	-14.12	Peak	HORIZONTAL

802.11g

Band Edges Test Data2412MHz



Band Edges Test Data 2462MHz

Radiated Emission: 802.11g mode

Operation Mode	TX CH Low	Test Date	2014/03/24
Fundamental Frequency	2412 MHz	Test By	Dino
Temperature	25 ℃	Humidity	60 %

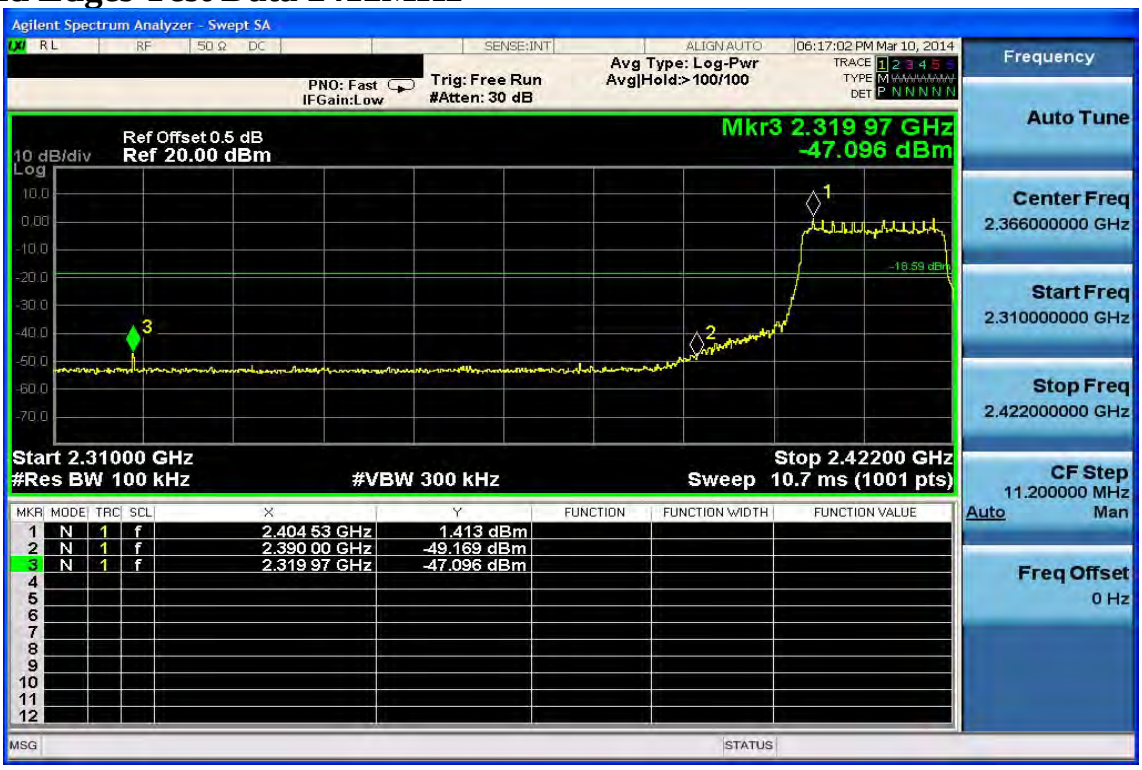
No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	2390.00	18.61	31.40	50.01	54.00	-3.99	Average	VERTICAL
2	2390.00	31.08	31.40	62.48	74.00	-11.52	Peak	VERTICAL
1	2390.00	16.47	31.40	47.87	54.00	-6.13	Average	HORIZONTAL
2	2390.00	28.67	31.40	60.07	74.00	-13.93	Peak	HORIZONTAL

Operation Mode	TX CH High	Test Date	2014/03/24
Fundamental Frequency	2462 MHz	Test By	Dino
Temperature	25 ℃	Humidity	60 %

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	2483.50	18.75	31.56	50.31	54.00	-3.69	Average	VERTICAL
2	2483.50	32.01	31.56	63.57	74.00	-10.43	Peak	VERTICAL
3	2484.65	17.95	31.56	49.51	54.00	-4.49	Average	VERTICAL
4	2484.65	34.59	31.56	66.15	74.00	-7.85	Peak	VERTICAL
1	2483.50	16.54	31.56	48.10	54.00	-5.90	Average	HORIZONTAL
2	2483.50	29.09	31.56	60.65	74.00	-13.35	Peak	HORIZONTAL

802.11n_20M (chain a), Conducted

Band Edges Test Data 2412MHz



Band Edges Test Data 2462MHz

802.11n_20M (chain b)

Band Edges Test Data 2412MHz

Band Edges Test Data 2462MHz

Radiated Emission: 802.11 n_20M mode

Operation Mode	TX CH Low	Test Date	2014/03/24
Fundamental Frequency	2412 MHz	Test By	Dino
Temperature	25 ℃	Humidity	60 %

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	2390.00	18.86	31.40	50.26	54.00	-3.74	Average	VERTICAL
2	2390.00	33.82	31.40	65.22	74.00	-8.78	Peak	VERTICAL
1	2390.00	16.34	31.40	47.74	54.00	-6.26	Average	HORIZONTAL
2	2390.00	29.26	31.40	60.66	74.00	-13.34	Peak	HORIZONTAL

Operation Mode	TX CH High	Test Date	2014/03/24
Fundamental Frequency	2462 MHz	Test By	Dino
Temperature	25 ℃	Humidity	60 %

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	2483.50	18.65	31.56	50.21	54.00	-3.79	Average	VERTICAL
2	2483.50	33.17	31.56	64.73	74.00	-9.27	Peak	VERTICAL
3	2484.15	18.29	31.56	49.85	54.00	-4.15	Average	VERTICAL
4	2484.15	35.34	31.56	66.90	74.00	-7.10	Peak	VERTICAL
1	2483.50	17.07	31.56	48.63	54.00	-5.37	Average	HORIZONTAL
2	2483.50	29.64	31.56	61.20	74.00	-12.80	Peak	HORIZONTAL

802.11n_40M (chain a), Conducted
Band Edges Test Data 2422MHz

Band Edges Test Data 2452MHz

802.11n_40M (chain b)

Band Edges Test Data 2422MHz

Band Edges Test Data 2452MHz

Radiated Emission: 802.11 n_40M mode

Operation Mode	TX CH Low	Test Date	2014/03/24
Fundamental Frequency	2422 MHz	Test By	Dino
Temperature	25 ℃	Humidity	60 %

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	2390.00	18.97	31.40	50.37	54.00	-3.63	Average	VERTICAL
2	2390.00	31.76	31.40	63.16	74.00	-10.84	Peak	VERTICAL
1	2390.00	17.74	31.40	49.14	54.00	-4.86	Average	HORIZONTAL
2	2390.00	29.32	31.40	60.72	74.00	-13.28	Peak	HORIZONTAL

Operation Mode	TX CH High	Test Date	2014/03/24
Fundamental Frequency	2452 MHz	Test By	Dino
Temperature	25 ℃	Humidity	60 %

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	2483.50	18.38	31.56	49.94	54.00	-4.06	Average	VERTICAL
2	2483.50	32.92	31.56	64.48	74.00	-9.52	Peak	VERTICAL
1	2483.50	17.97	31.56	49.53	54.00	-4.47	Average	HORIZONTAL
2	2483.50	32.17	31.56	63.73	74.00	-10.27	Peak	HORIZONTAL

9 SPURIOUS RADIATED EMISSION TEST

9.1 Standard Applicable

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

According to RSS-247 issue 1, §5.5

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digi-tally modulated device is operating, the RF power that is produced shall be at least 20 dB be-low that in the 100 kHz bandwidth within the band that contains the highest level of the de-sired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under Section 5.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

9.2 Measurement Equipment Used:

9.2.1 Conducted Emission at antenna port:

Refer to section 6.2 for details.

9.2.2 Radiated emission:

Refer to section 7.2 for details.

9.3 Test SET-UP:

9.3.1 Conducted Emission at antenna port:

Refer to section 6.3 for details.

9.3.2 Radiated emission:

Refer to section 7.3 for details.

9.4 Measurement Procedure:

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

Refer to section 11 and 12 emissions in restricted and non-restricted frequency bands Measurement Procedure of KDB Document: 558074 D01 DTS Meas Guidance v03r01

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:

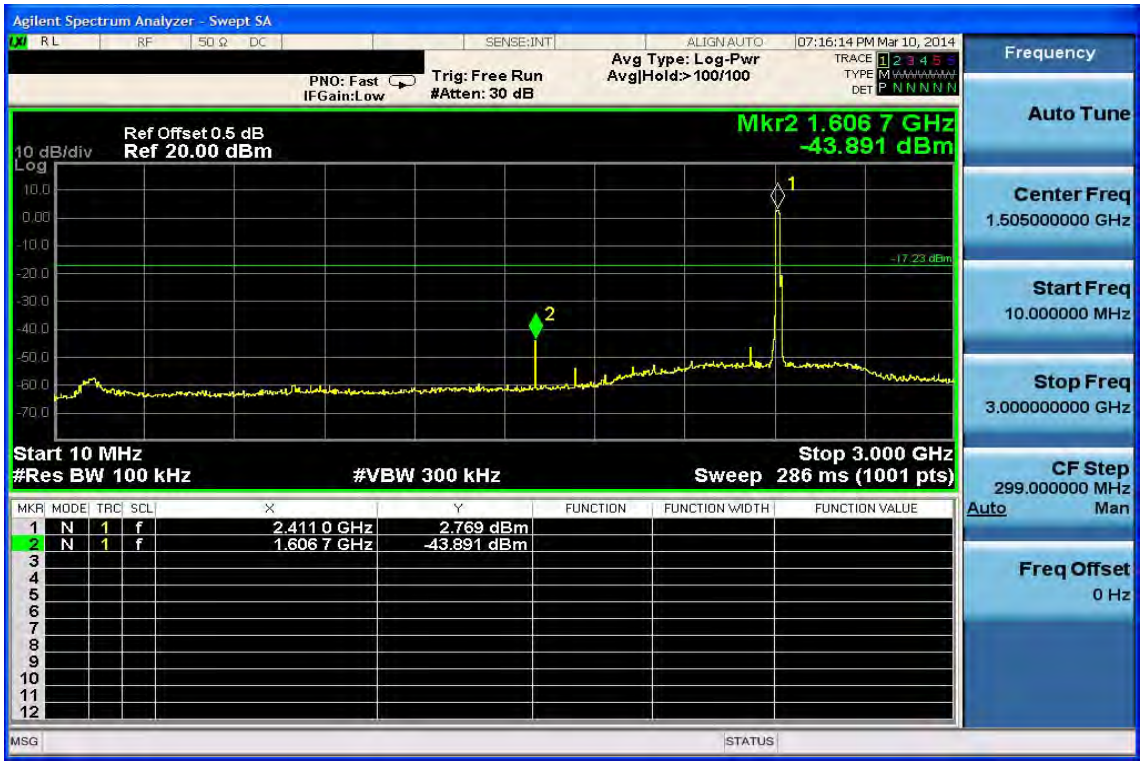
FS = RA + AF + CL - AG

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

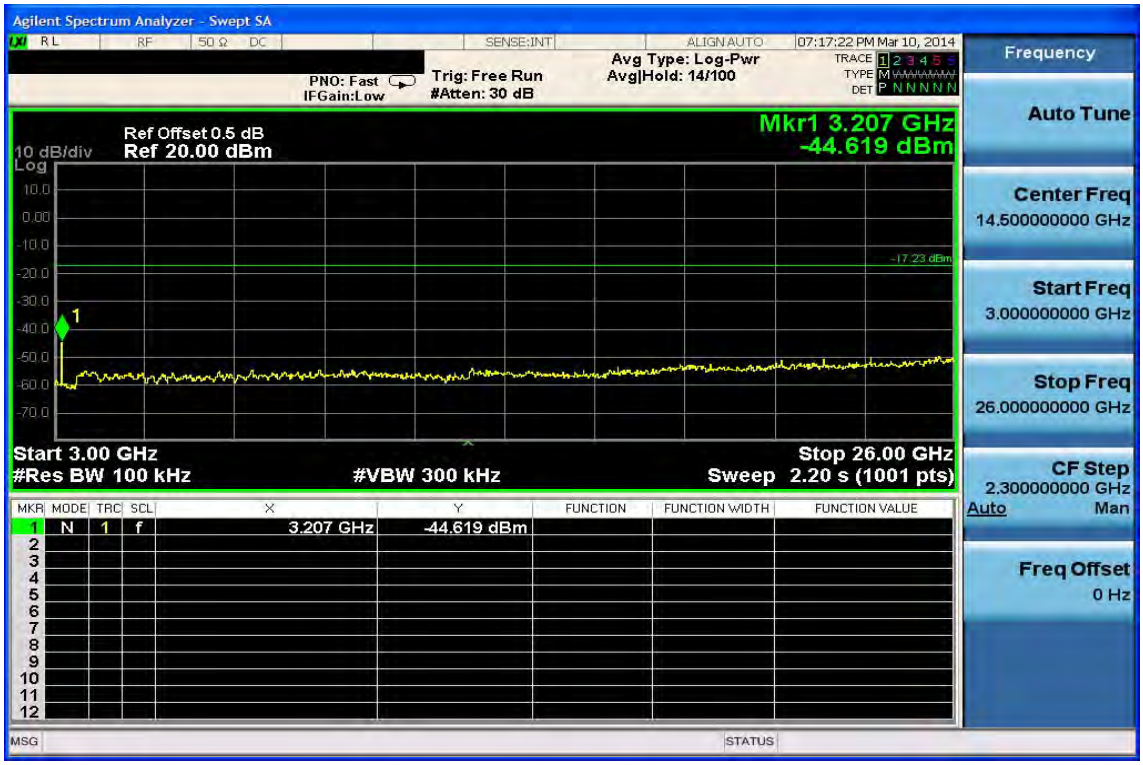
9.6 Measurement Result:

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

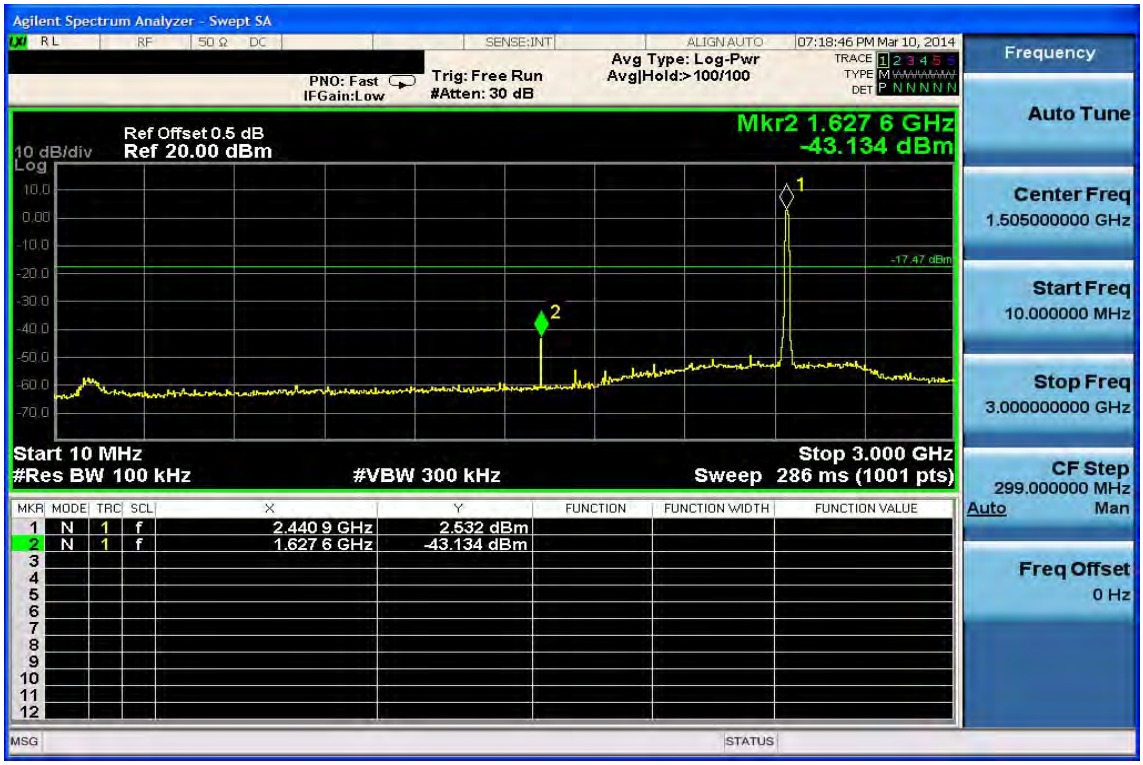
Conducted Spurious Emission Measurement Result
802.11b
2412MHz
Ch Low 30MHz – 3GHz



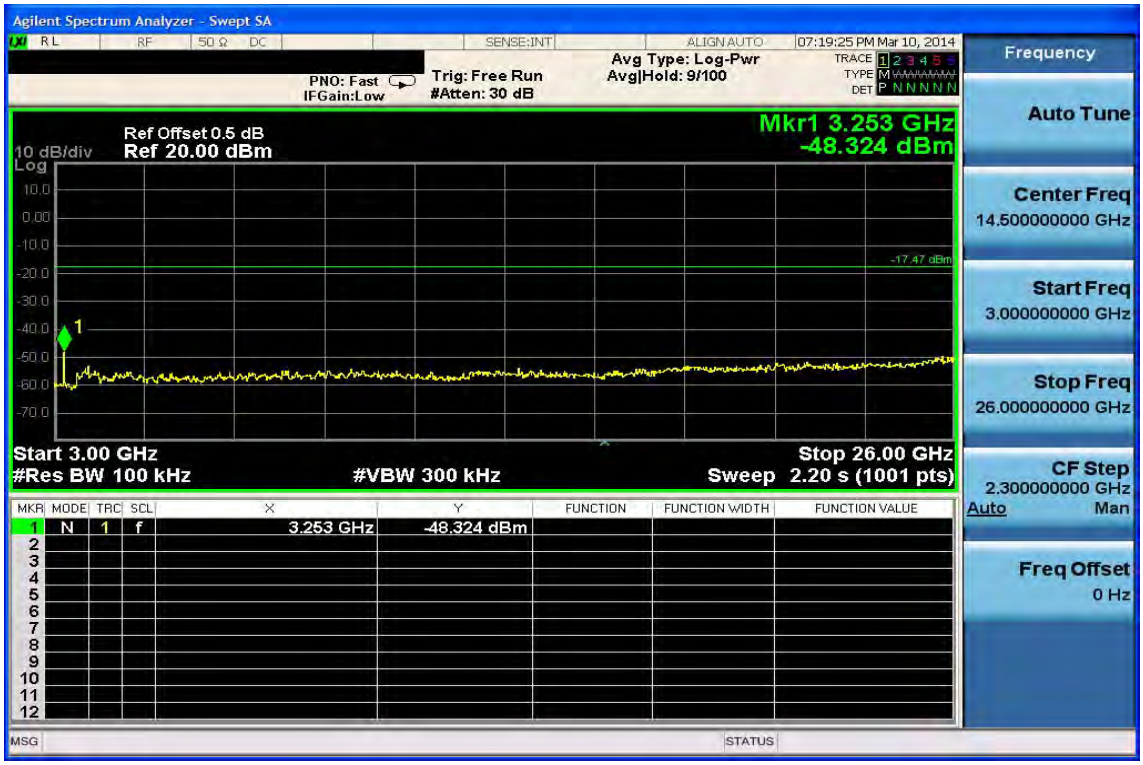
Ch Low 3GHz – 26.5GHz



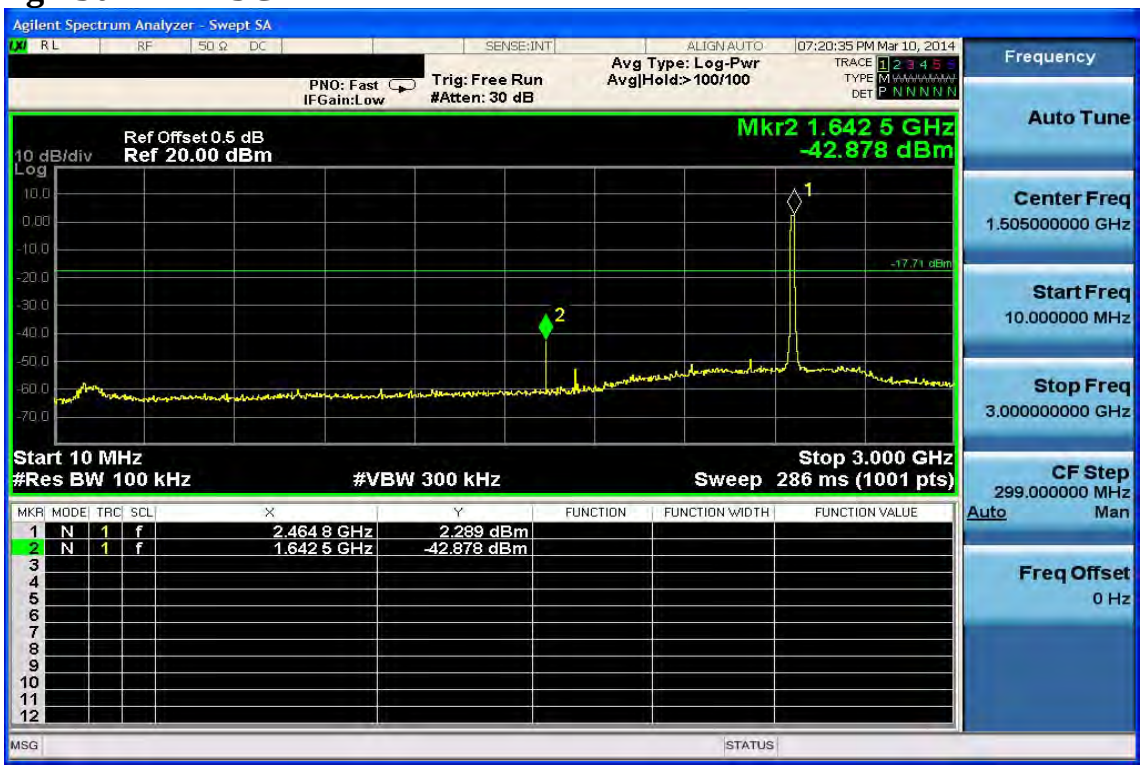
2442MHz
Ch Mid 30MHz – 3GHz



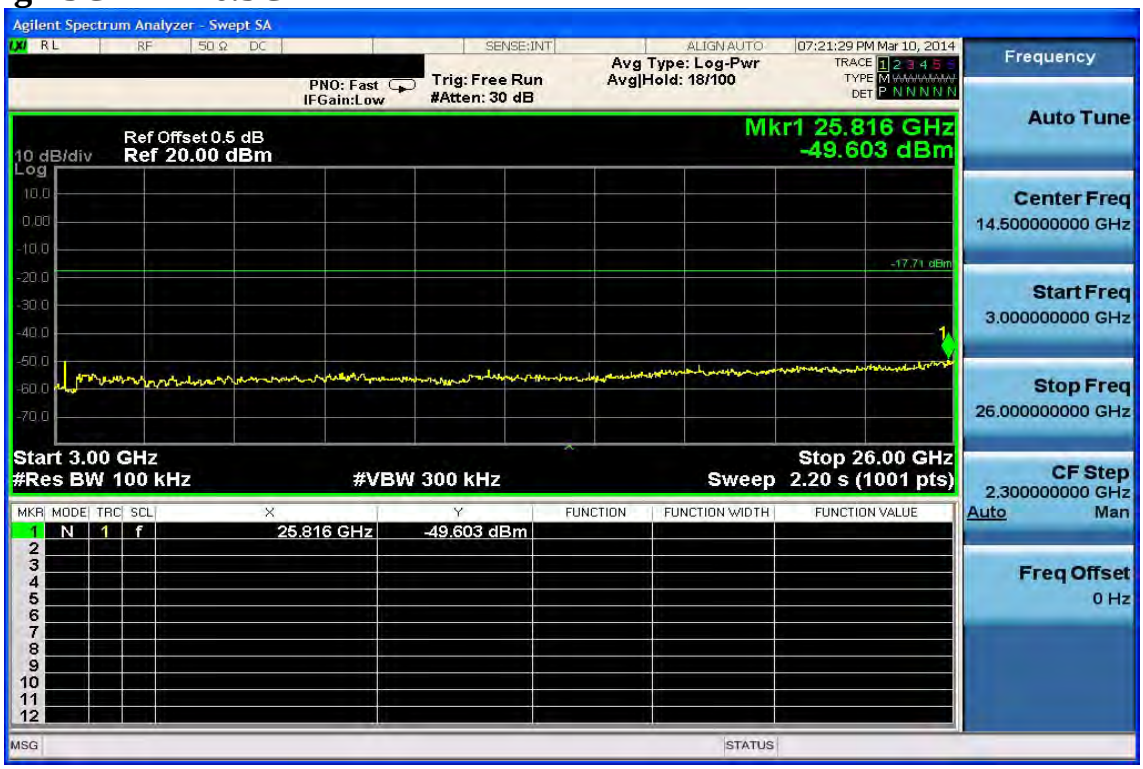
Ch Mid 3GHz – 26.5GHz



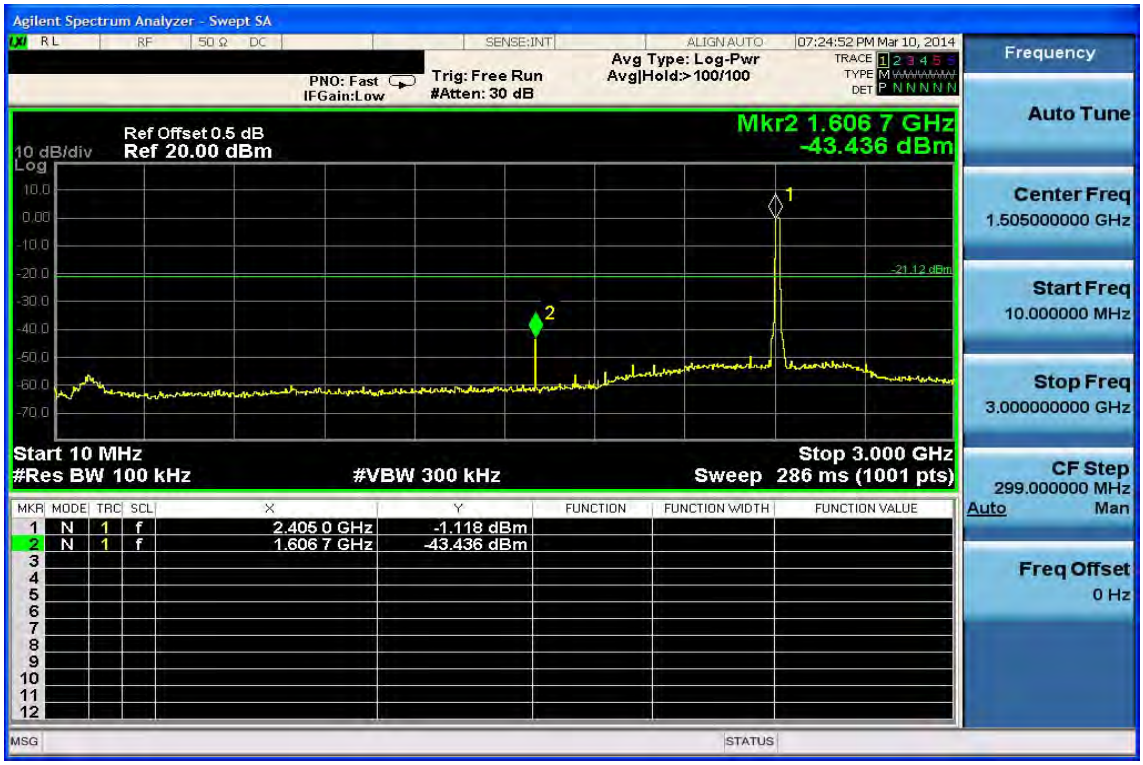
2462MHz
Ch High 30MHz – 3GHz



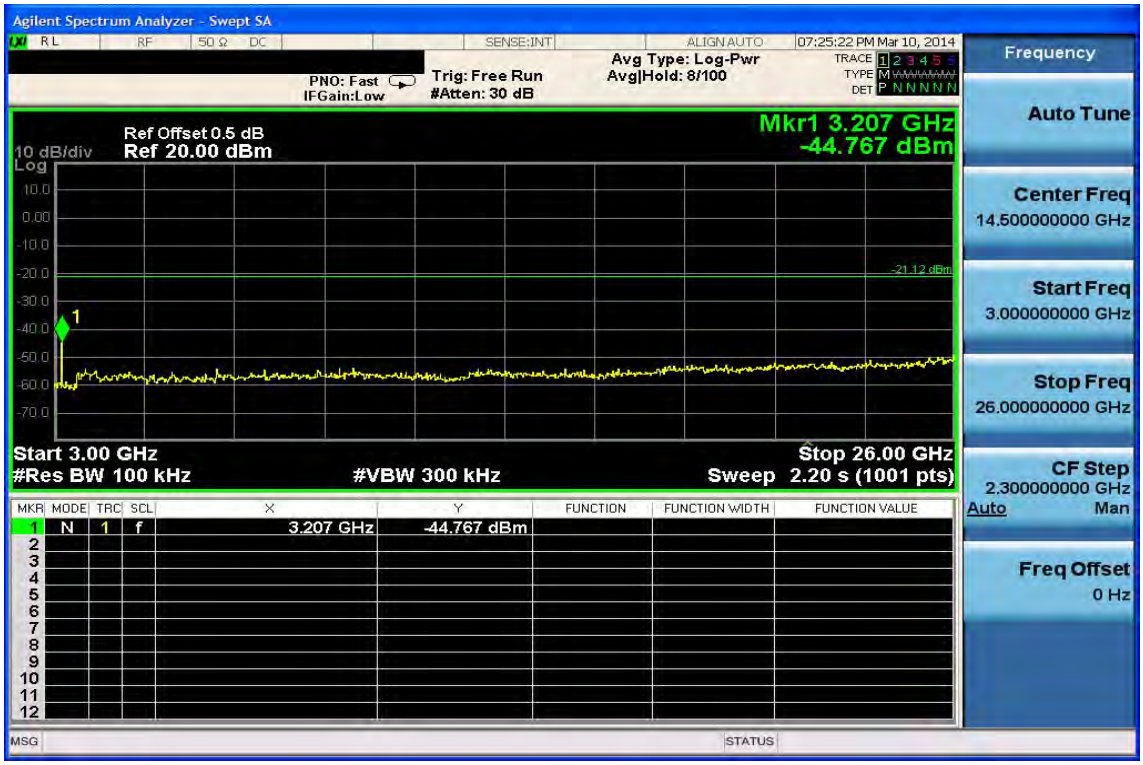
Ch High 3GHz – 26.5GHz



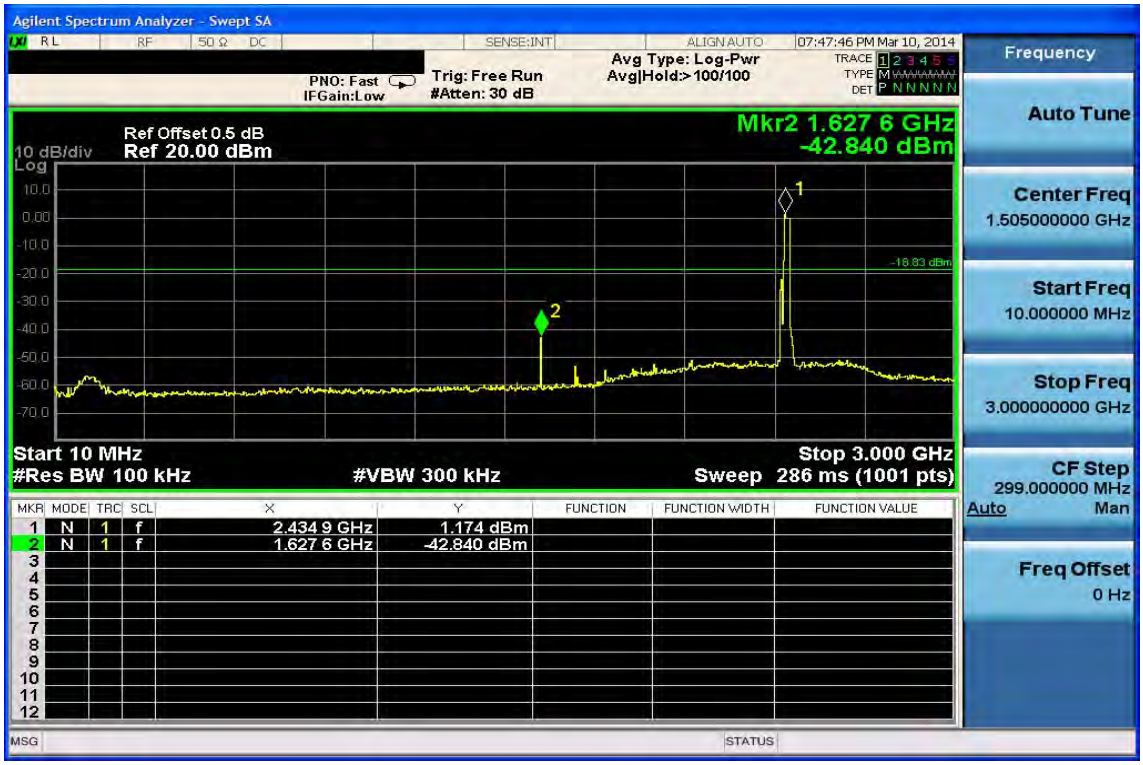
Conducted Spurious Emission Measurement Result
802.11g
2412MHz
Ch Low 30MHz – 3GHz



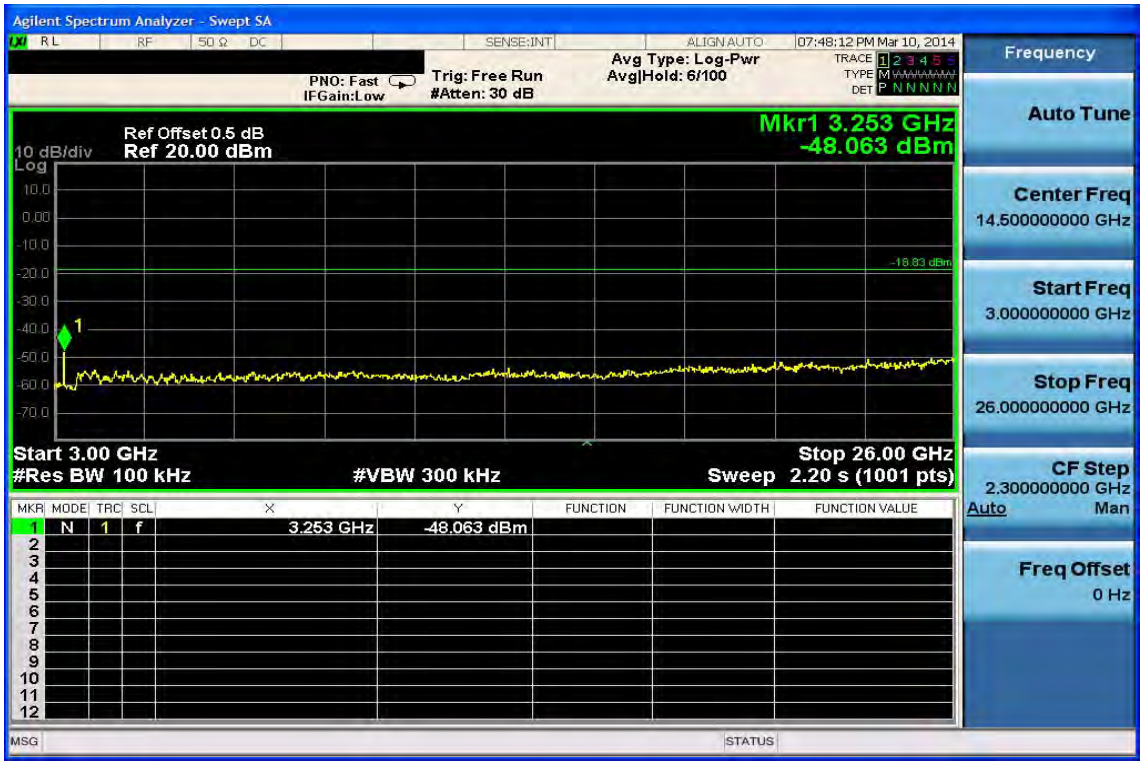
Ch Low 3GHz – 26.5GHz



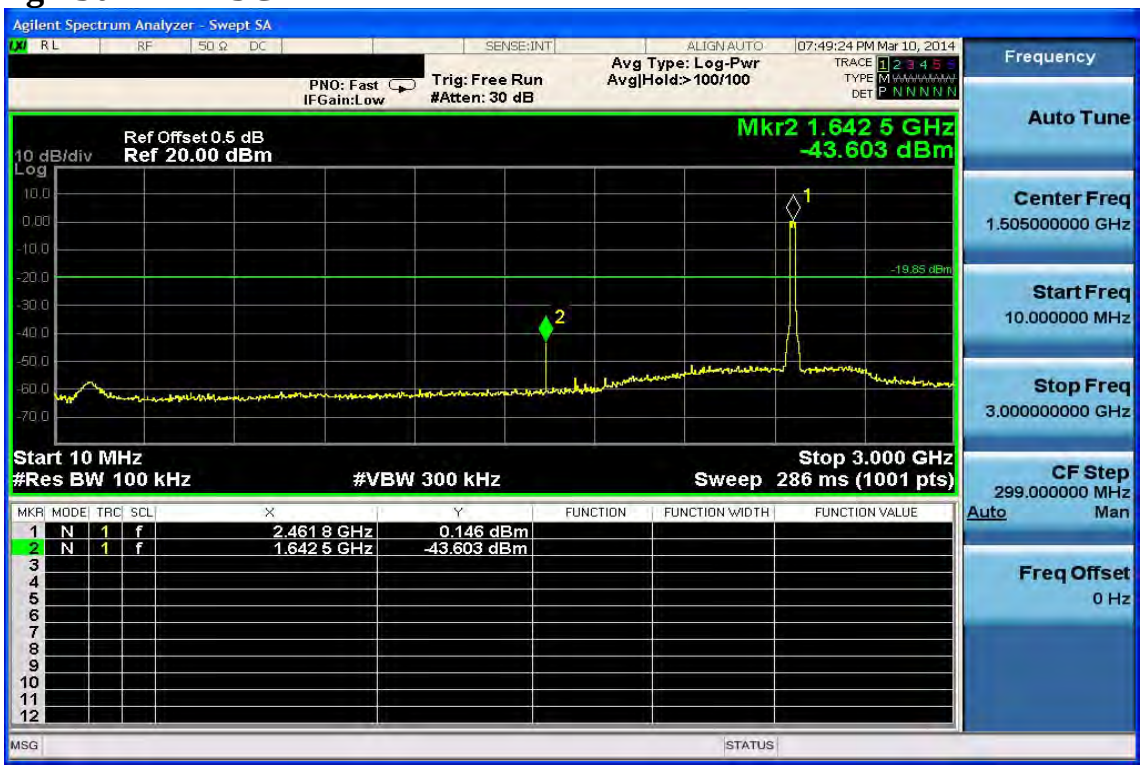
2442MHz
Ch Mid 30MHz – 3GHz



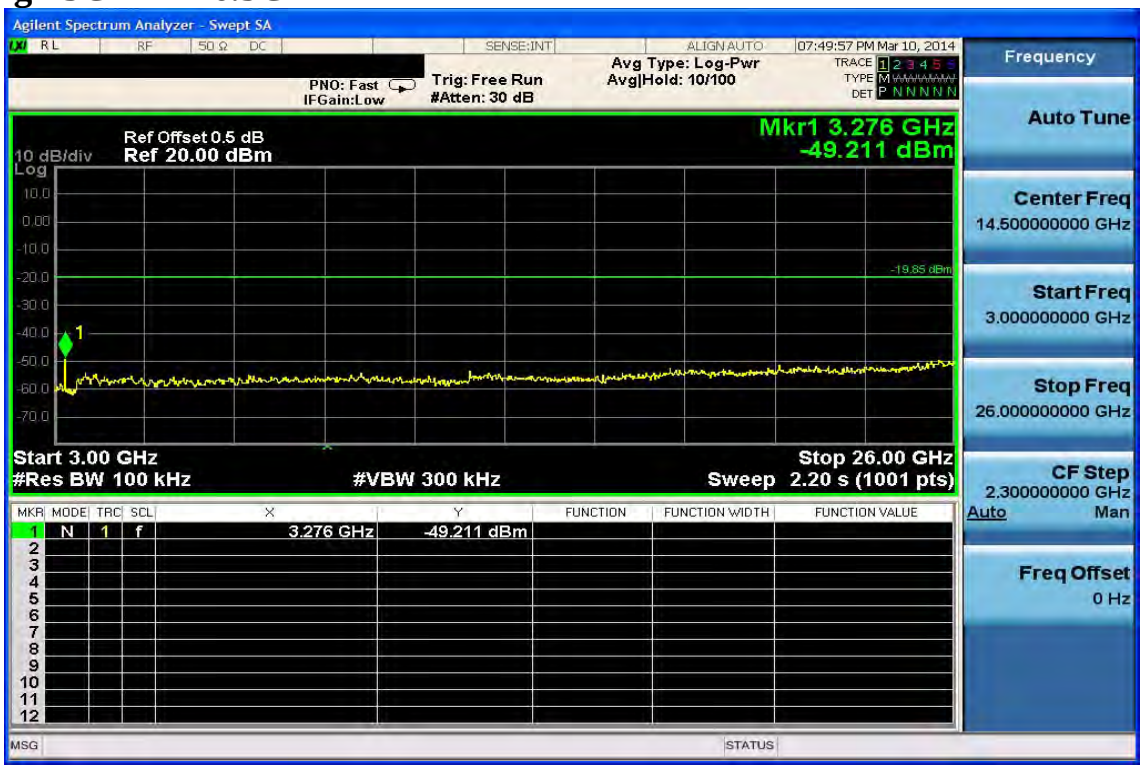
Ch Mid 3GHz – 26.5GHz



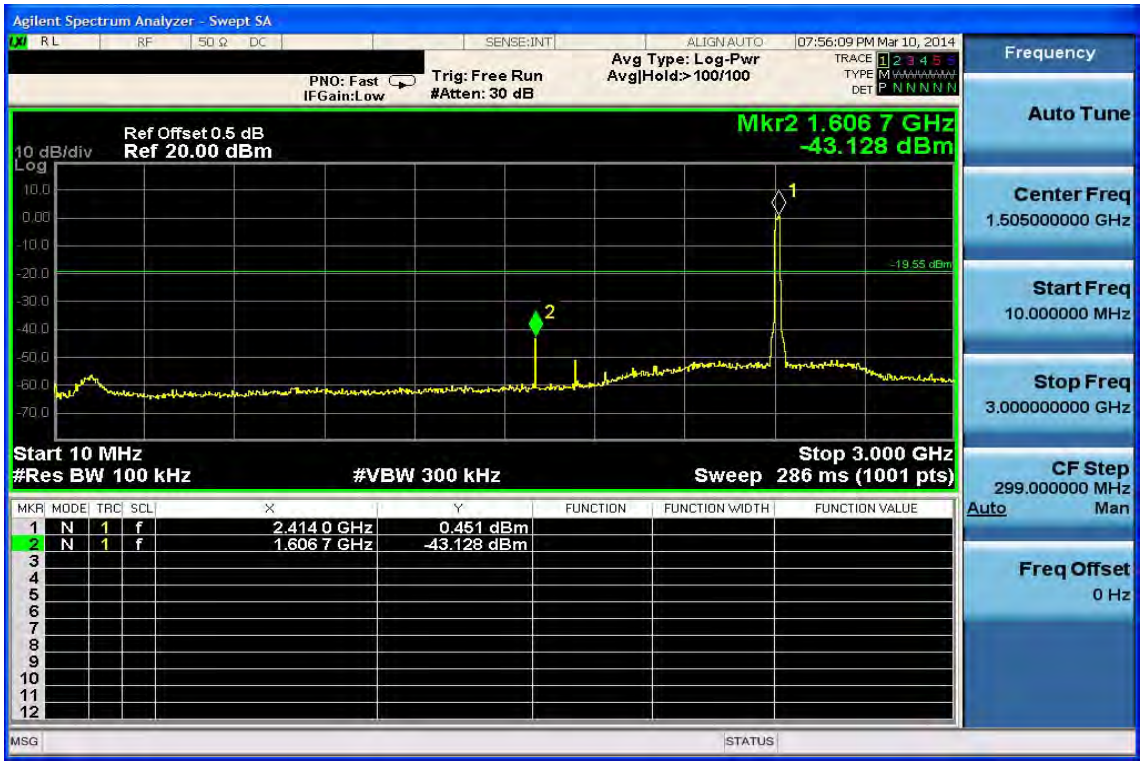
2462MHz
Ch High 30MHz – 3GHz



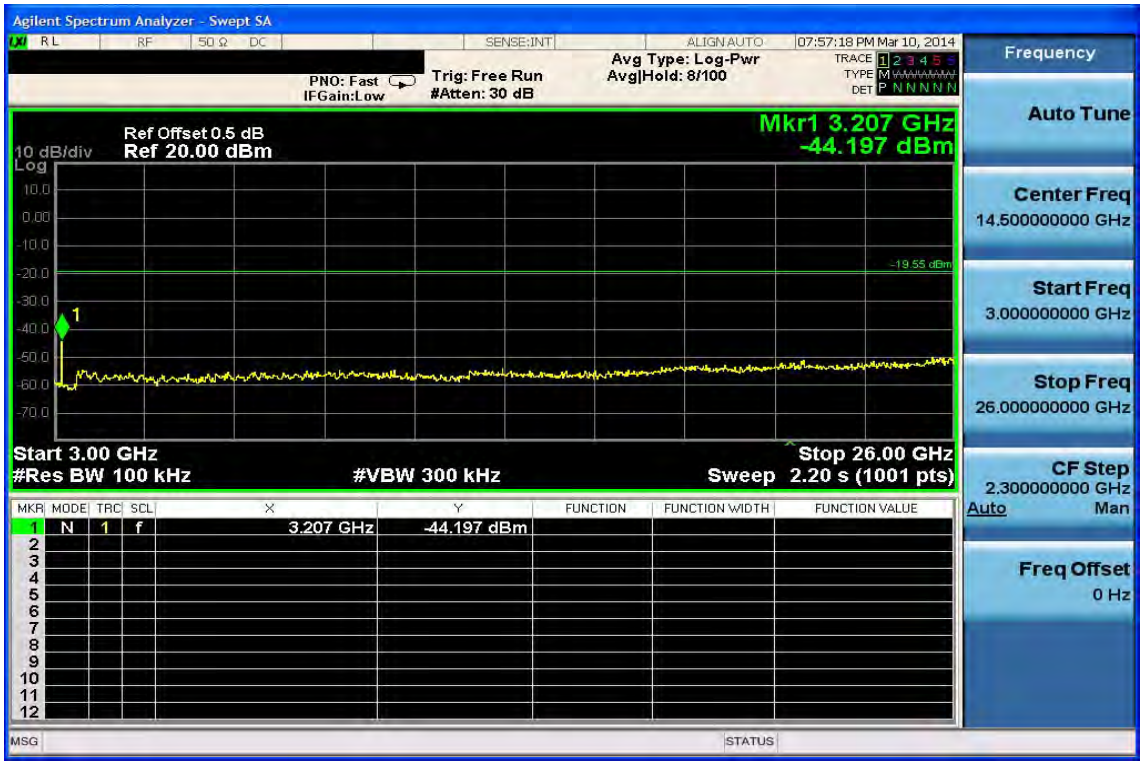
Ch High 3GHz – 26.5GHz



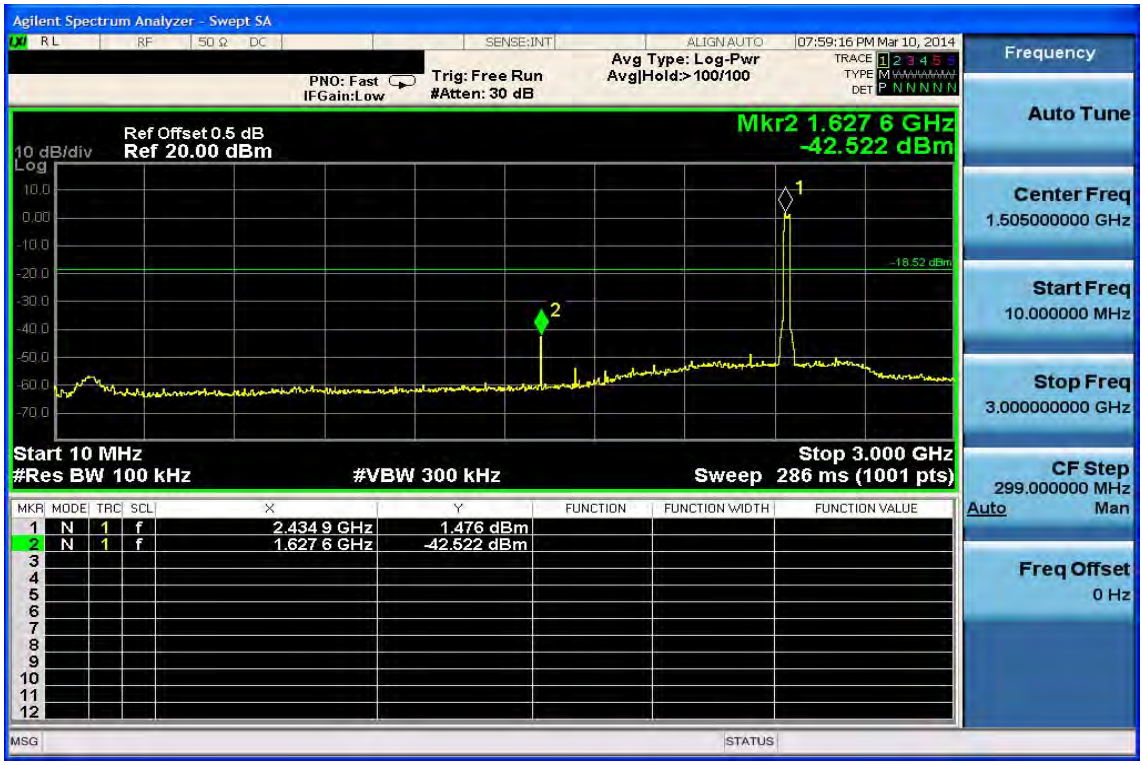
Conducted Spurious Emission Measurement Result
802.11n_20M (chain a)
2412MHz
Ch Low 30MHz – 3GHz



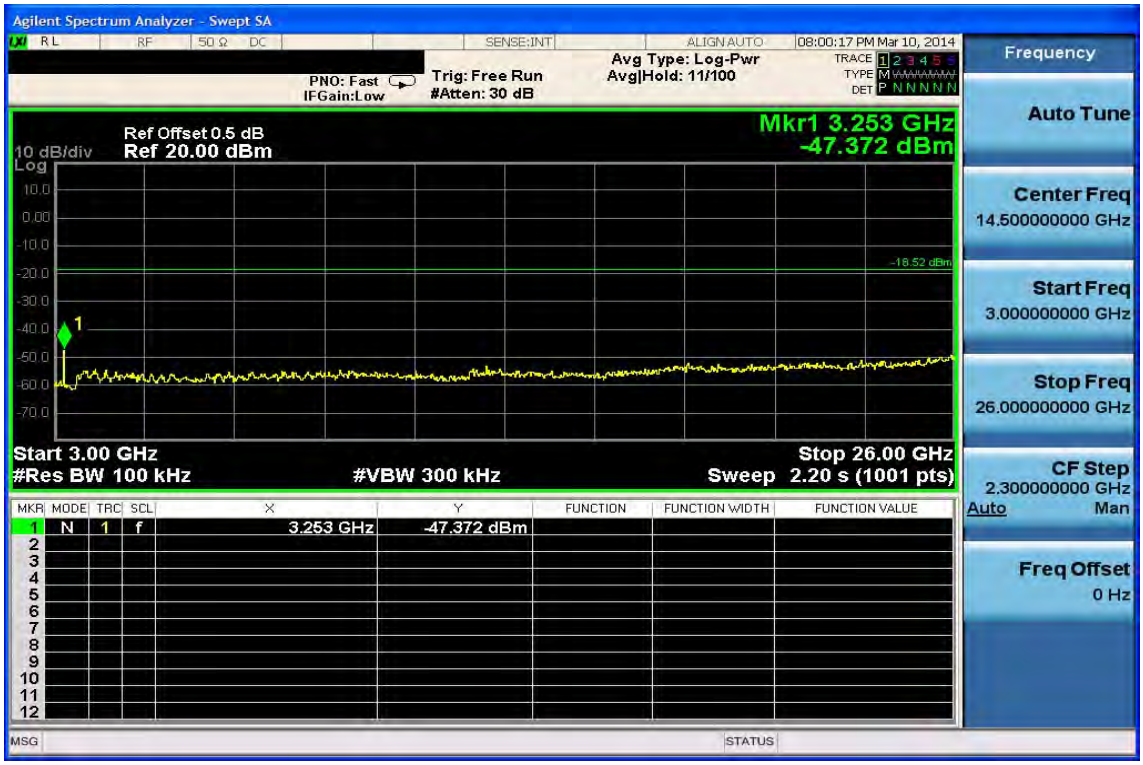
Ch Low 3GHz – 26.5GHz



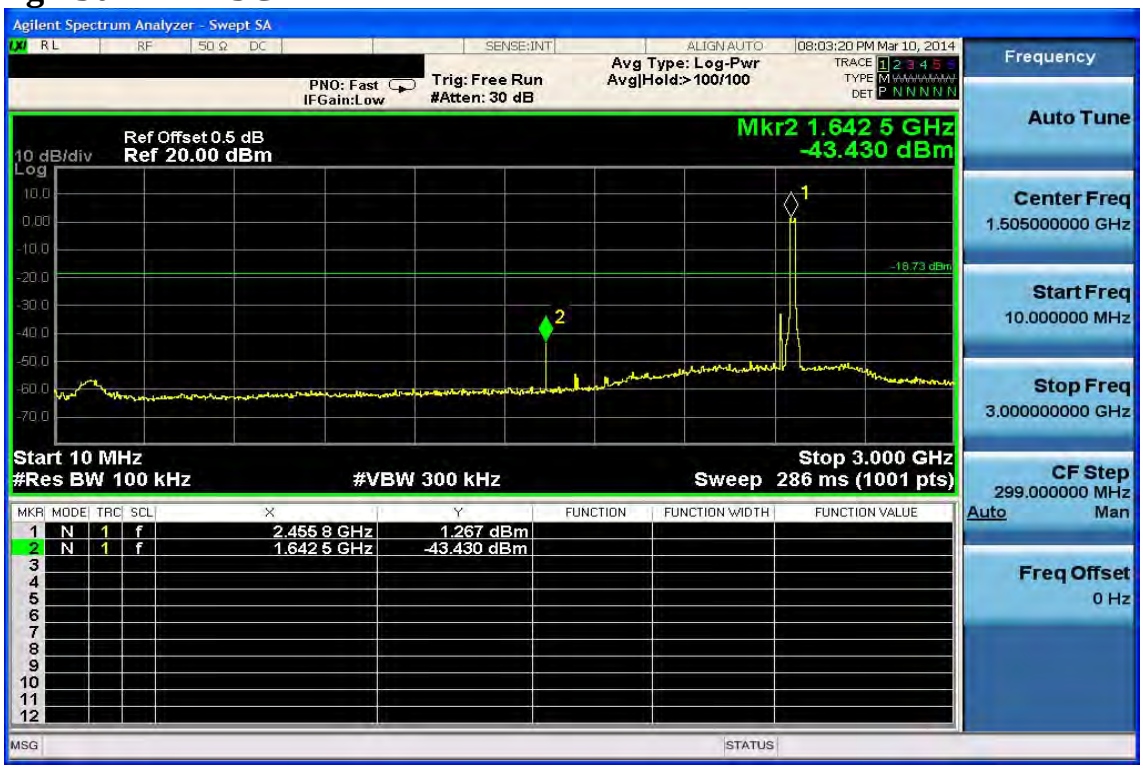
2442MHz
Ch Mid 30MHz – 3GHz



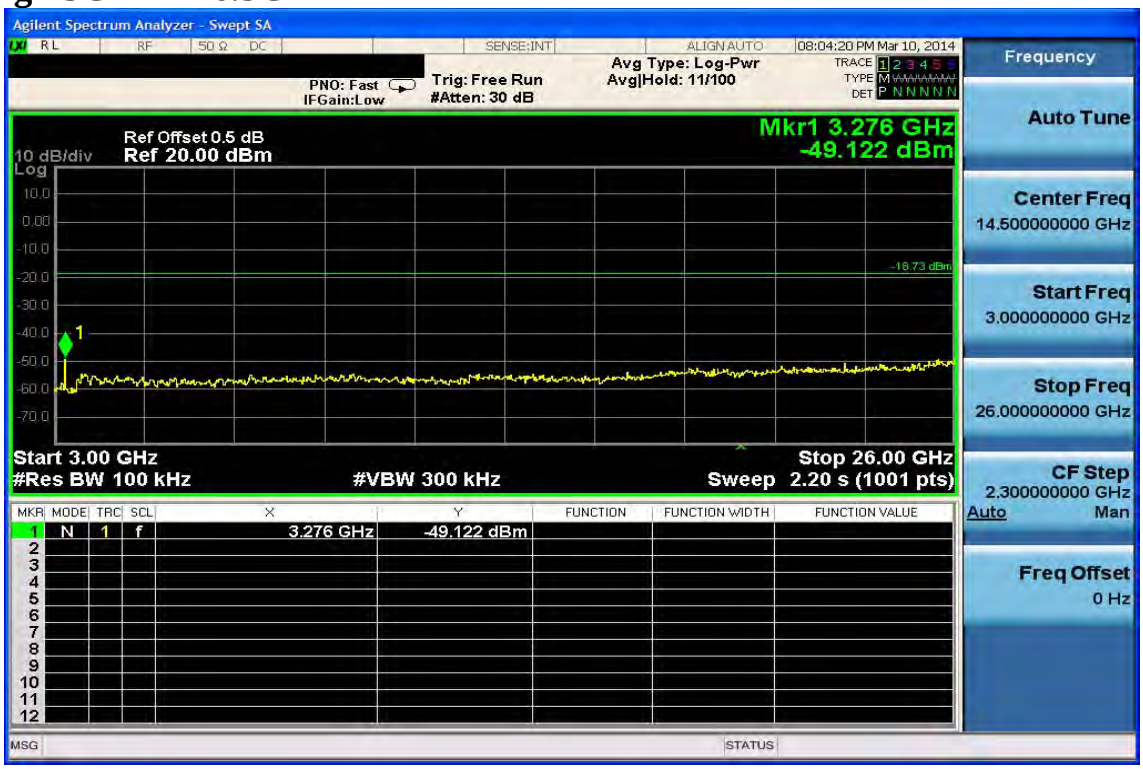
Ch Mid 3GHz – 26.5GHz



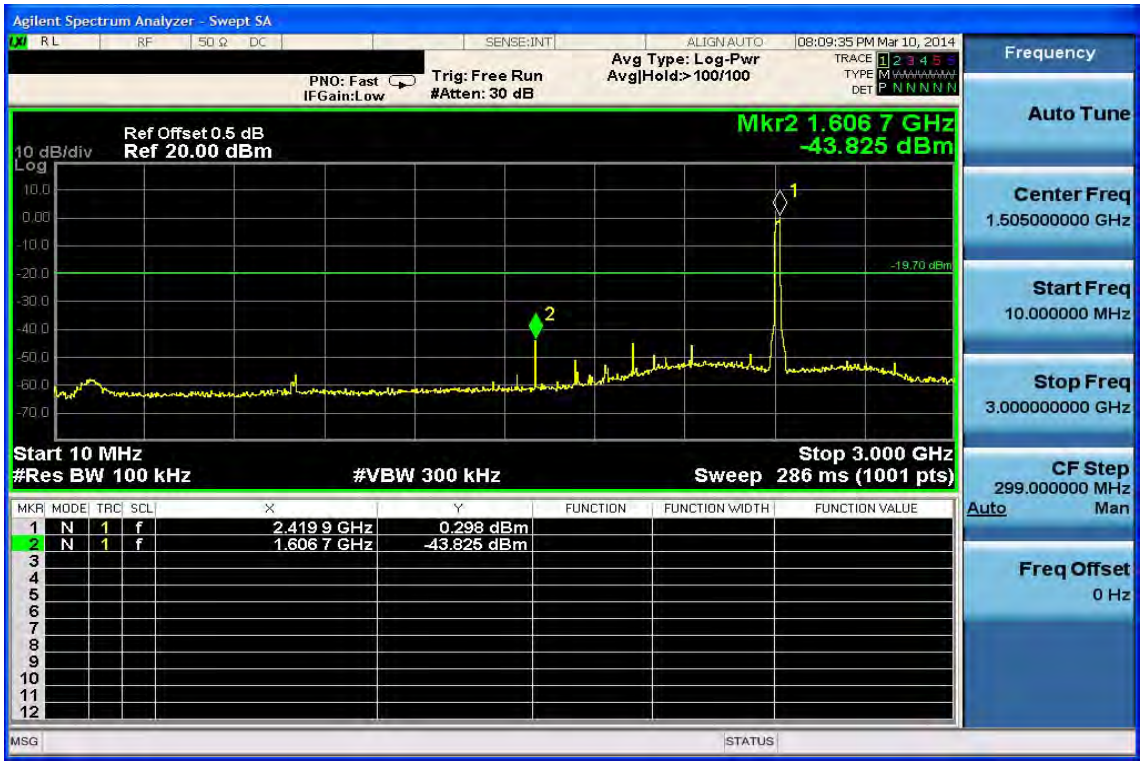
2462MHz
Ch High 30MHz – 3GHz



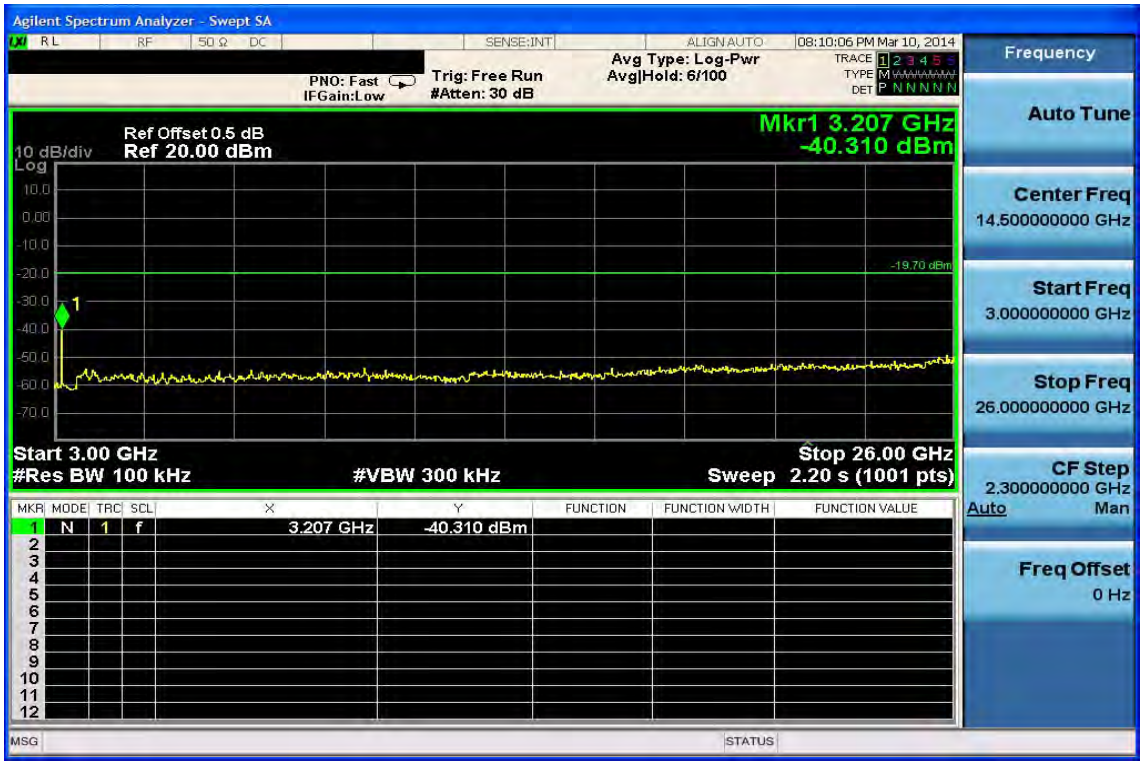
Ch High 3GHz – 26.5GHz



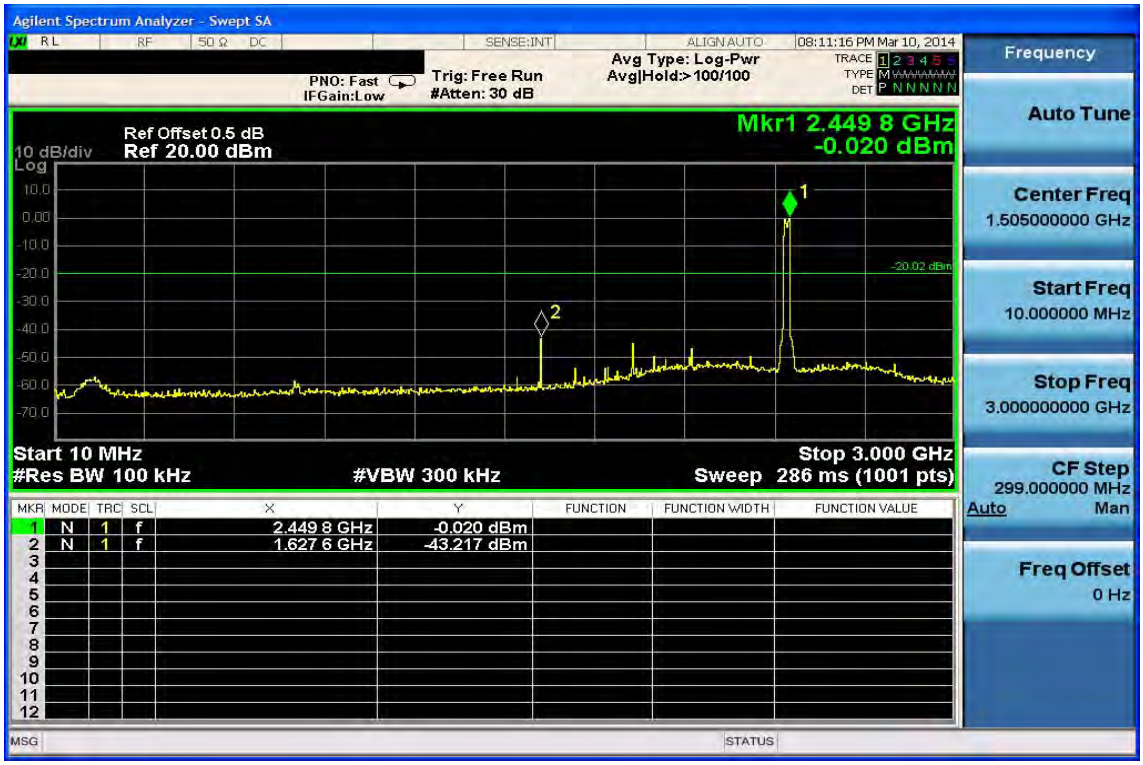
Conducted Spurious Emission Measurement Result
802.11n_20M (chain b)
2412MHz
Ch Low 30MHz – 3GHz



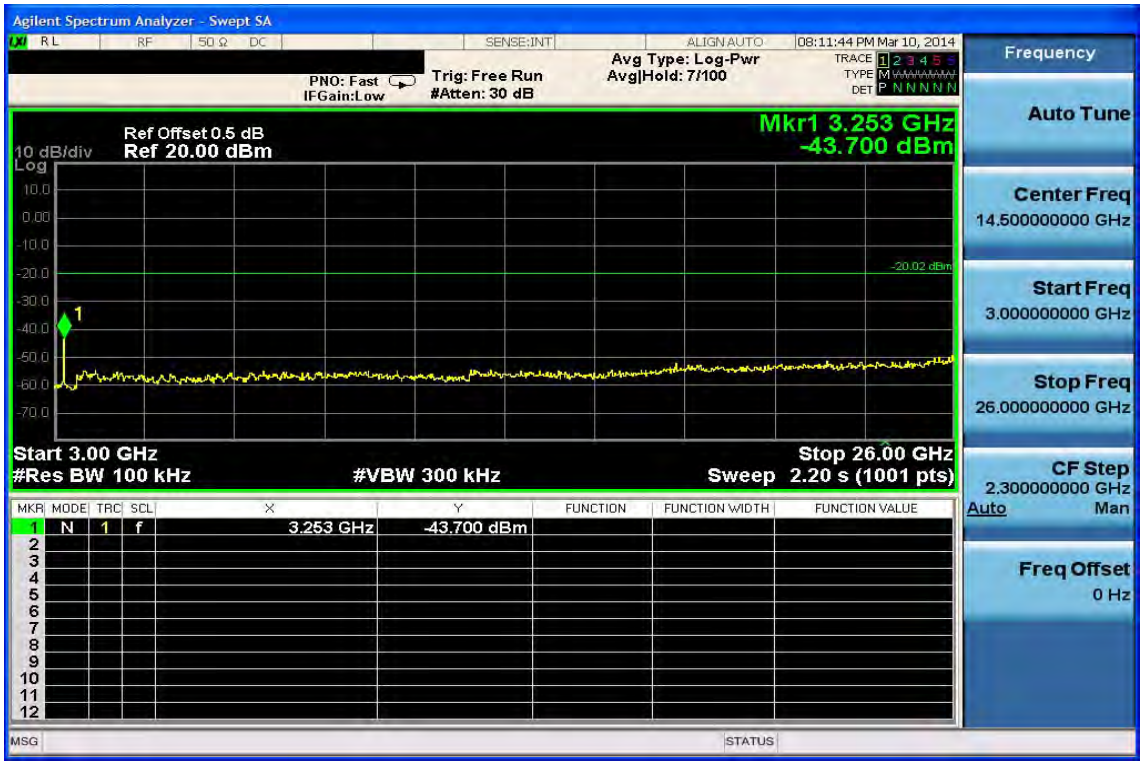
Ch Low 3GHz – 26.5GHz



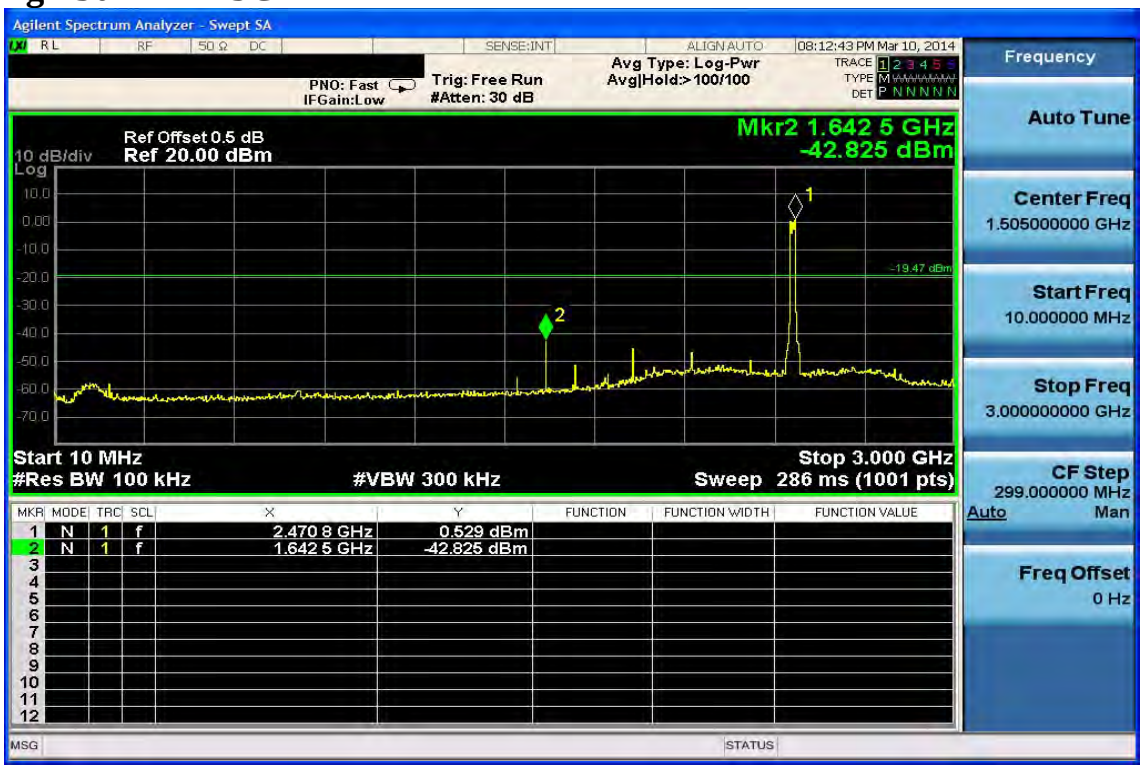
2442MHz
Ch Mid 30MHz – 3GHz



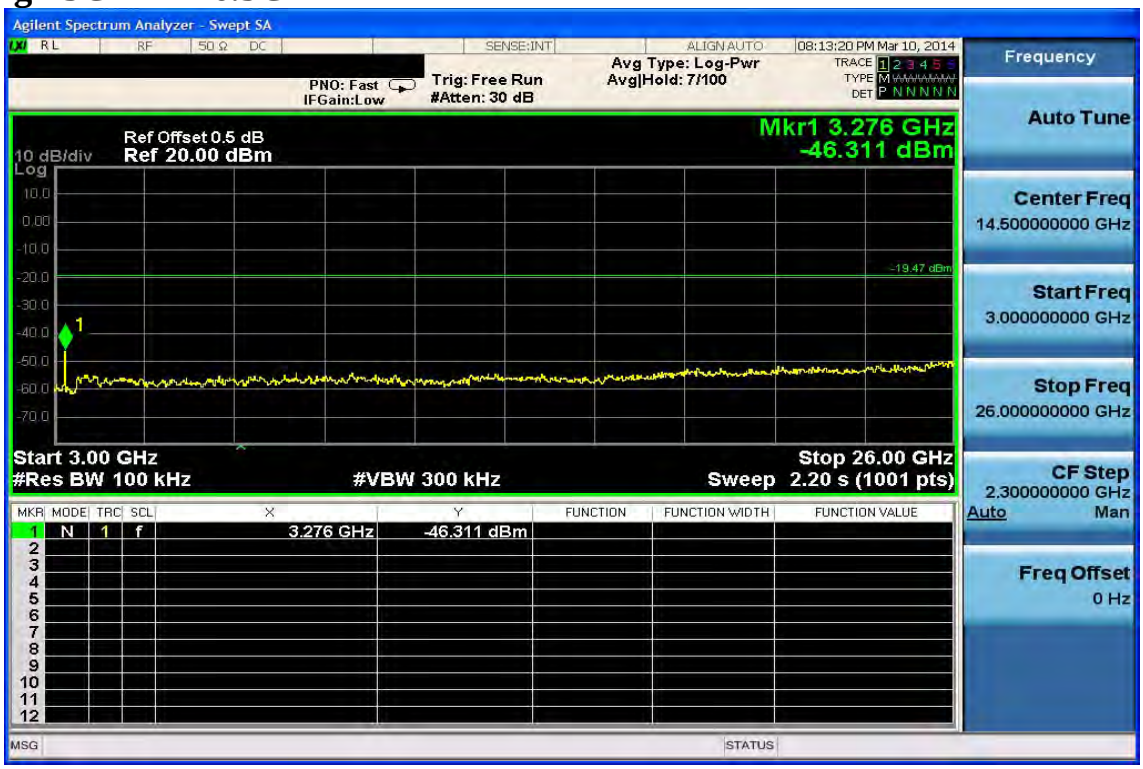
Ch Mid 3GHz – 26.5GHz



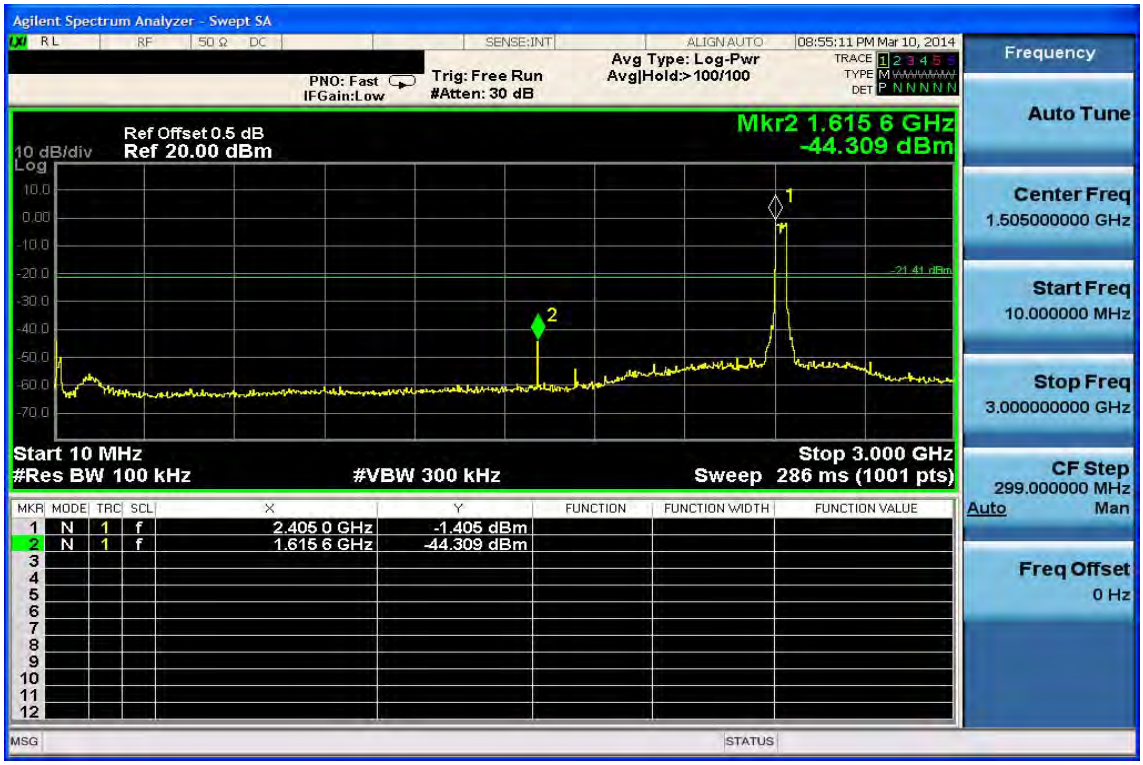
2462MHz
Ch High 30MHz – 3GHz



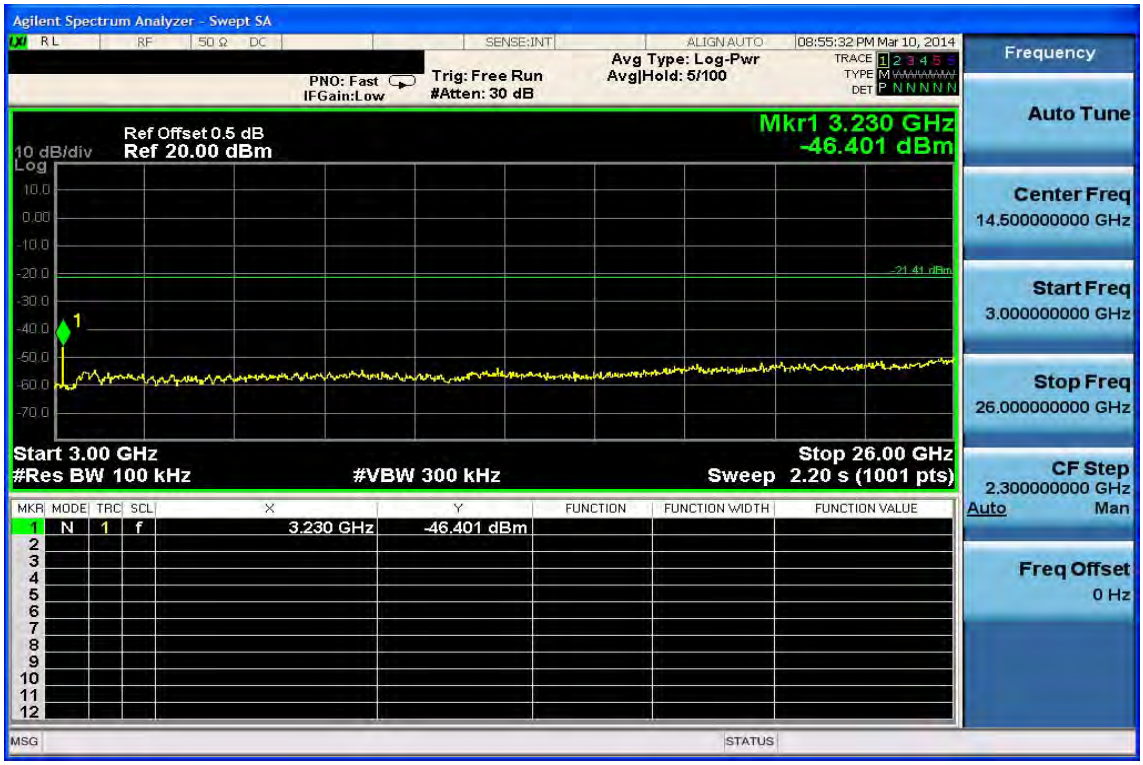
Ch High 3GHz – 26.5GHz



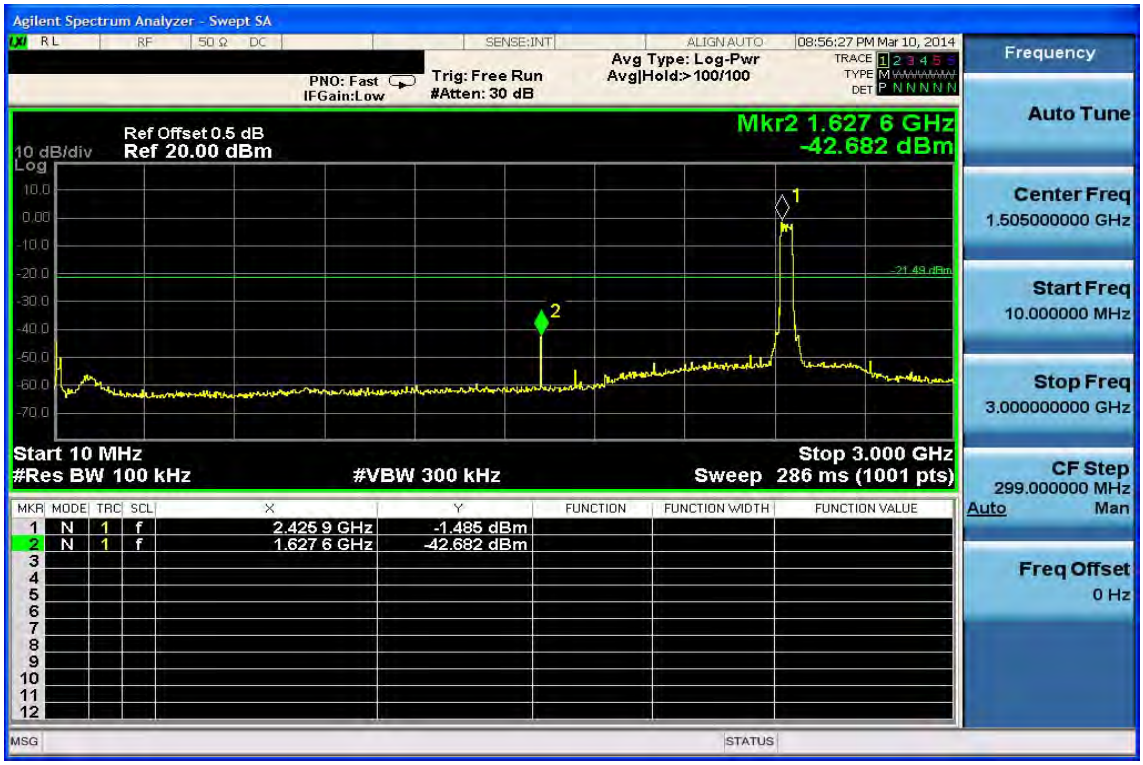
Conducted Spurious Emission Measurement Result
802.11n_40M (chain a)
2422MHz
Ch Low 30MHz – 3GHz



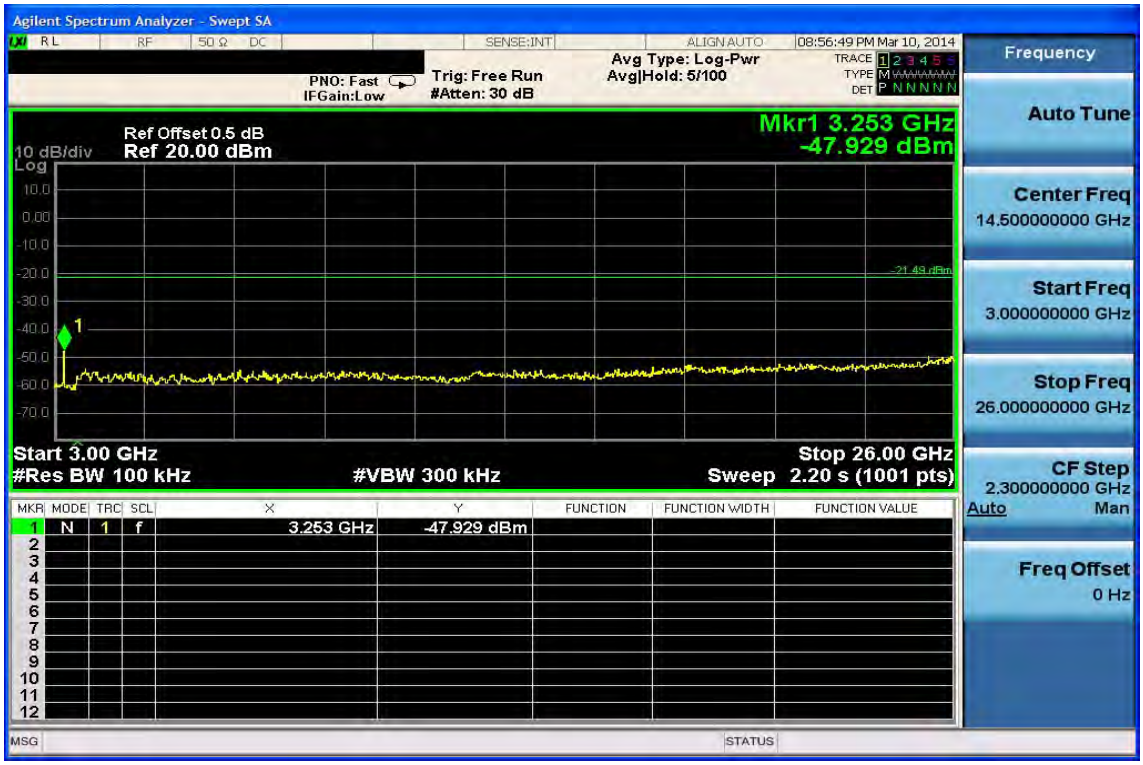
Ch Low 3GHz – 26.5GHz



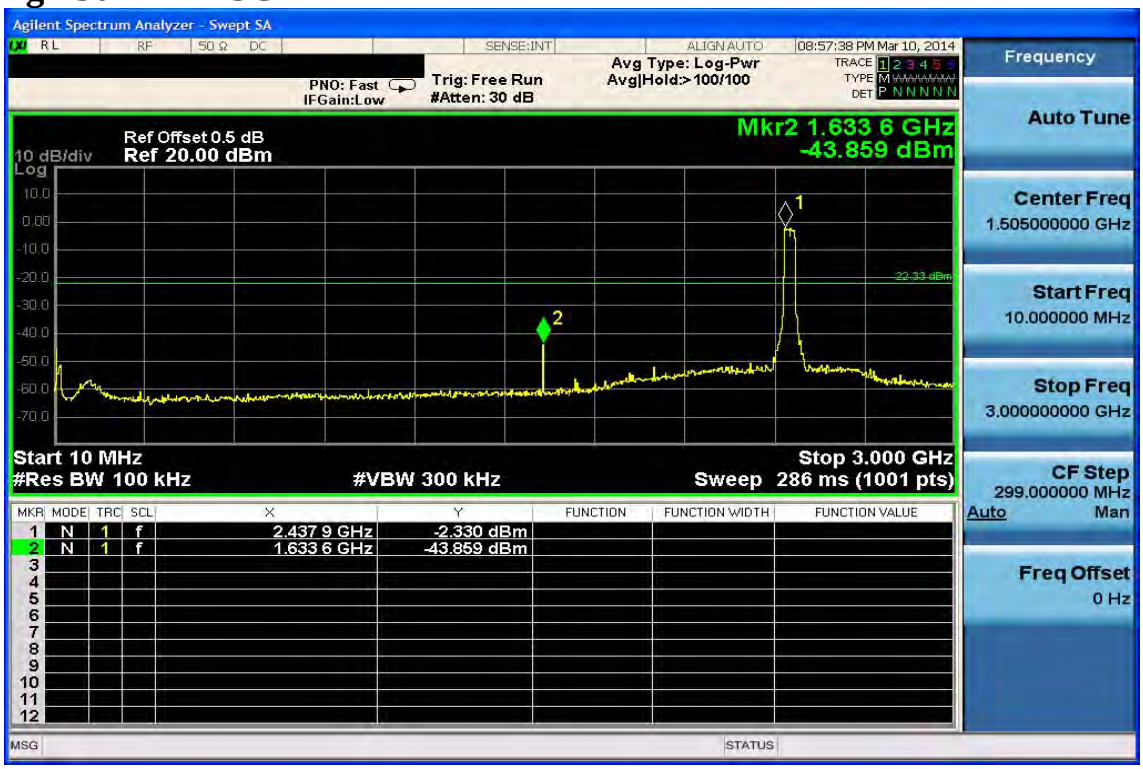
2442MHz
Ch Mid 30MHz – 3GHz



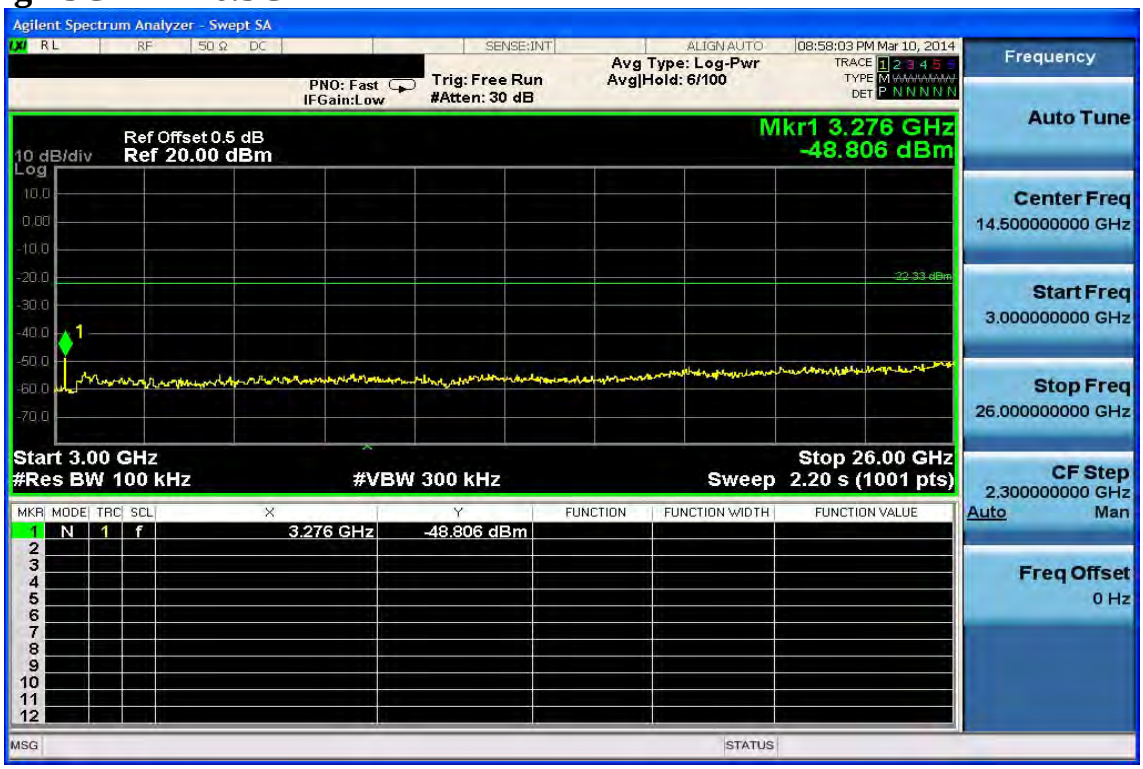
Ch Mid 3GHz – 26.5GHz



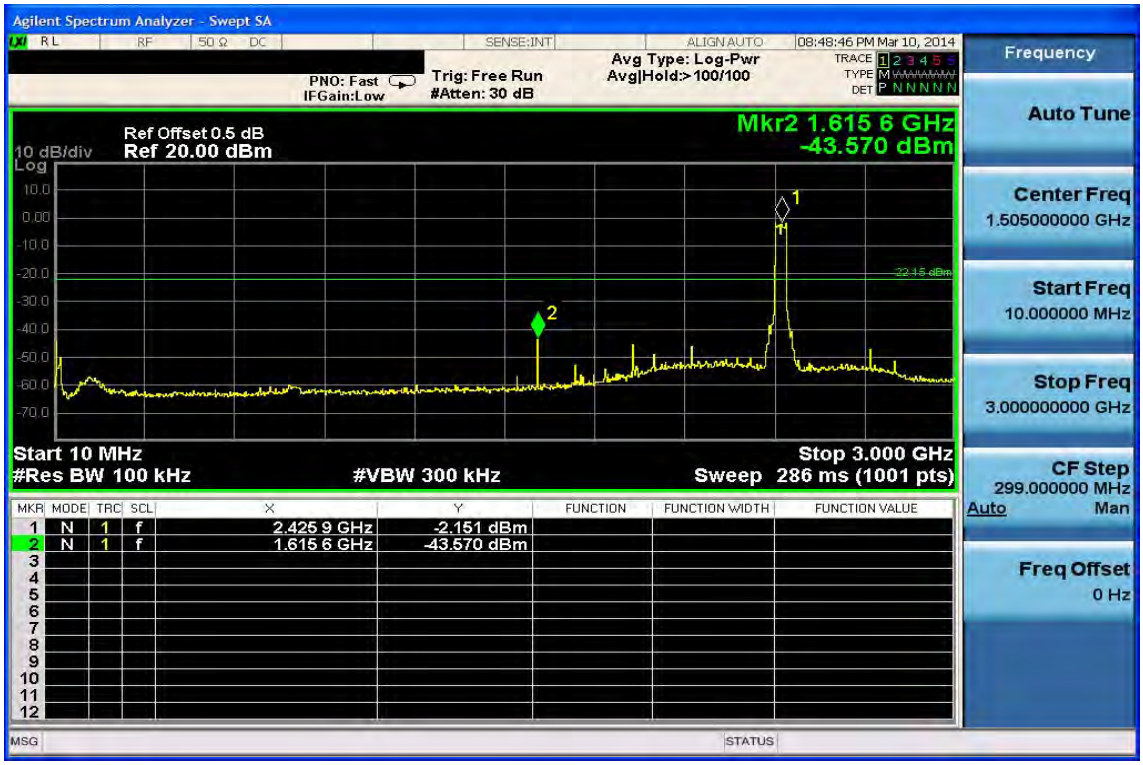
2452MHz
Ch High 30MHz – 3GHz



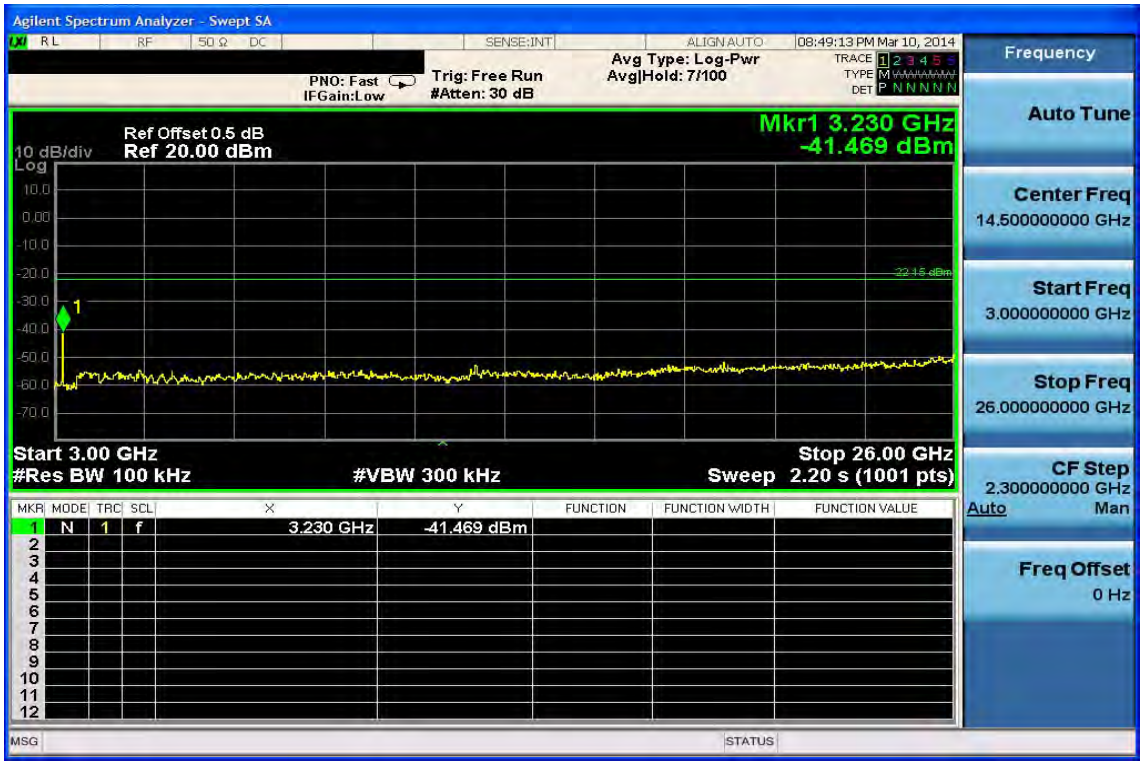
Ch High 3GHz – 26.5GHz



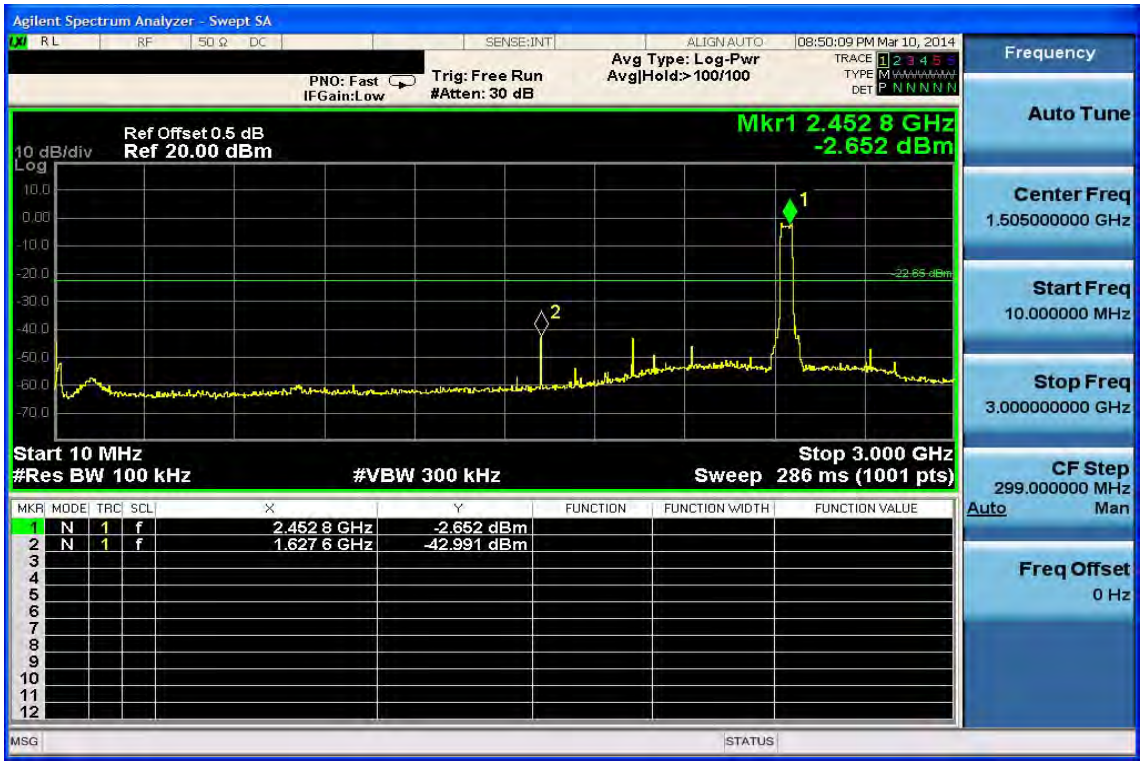
Conducted Spurious Emission Measurement Result
802.11n_40M (chain b)
2422MHz
Ch Low 30MHz – 3GHz



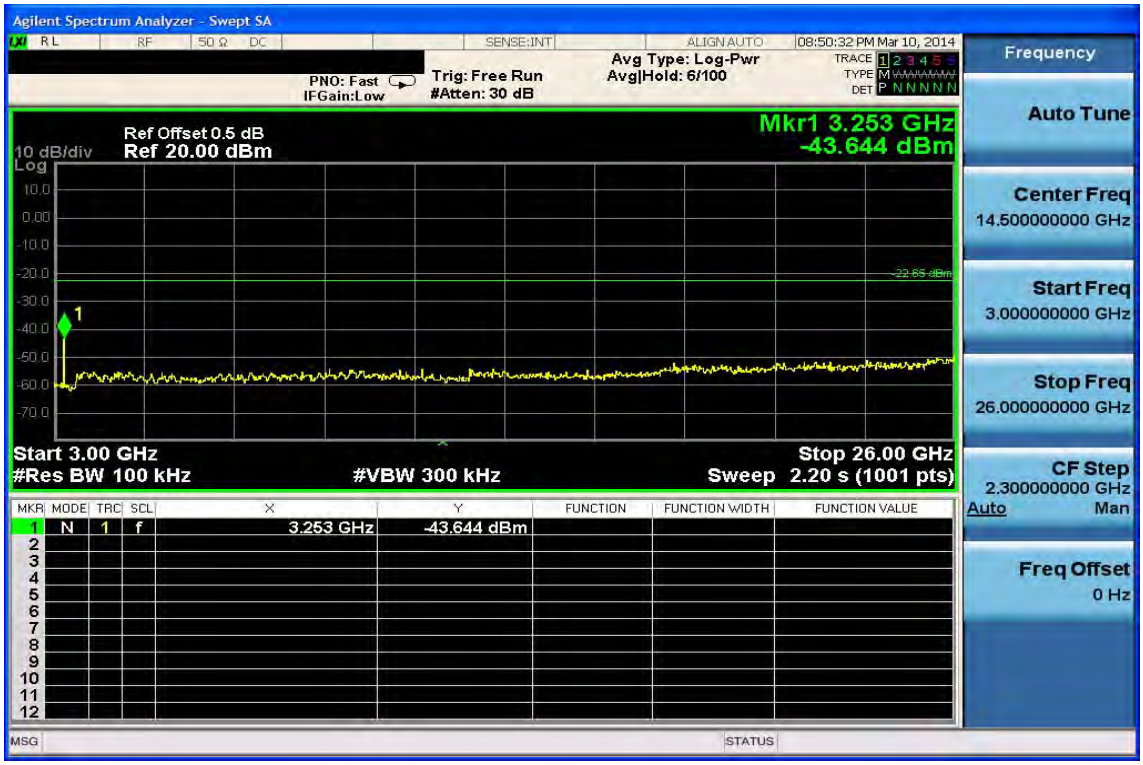
Ch Low 3GHz – 26.5GHz



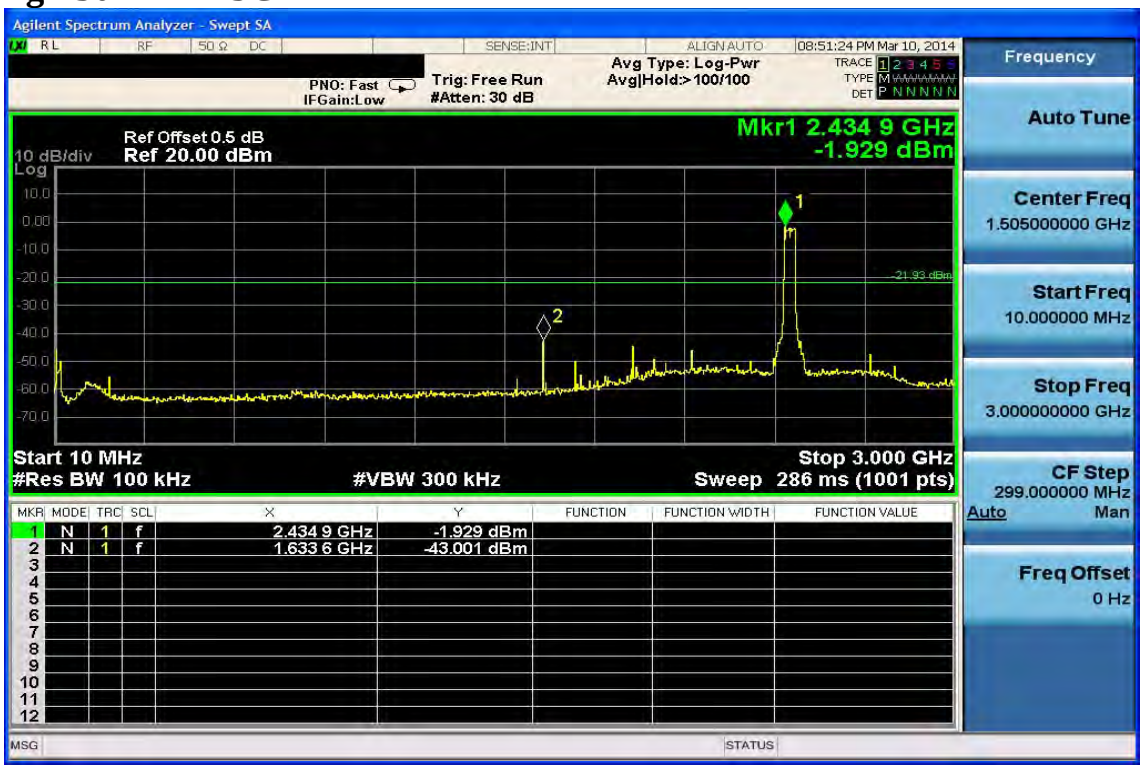
2442MHz
Ch Mid 30MHz – 3GHz



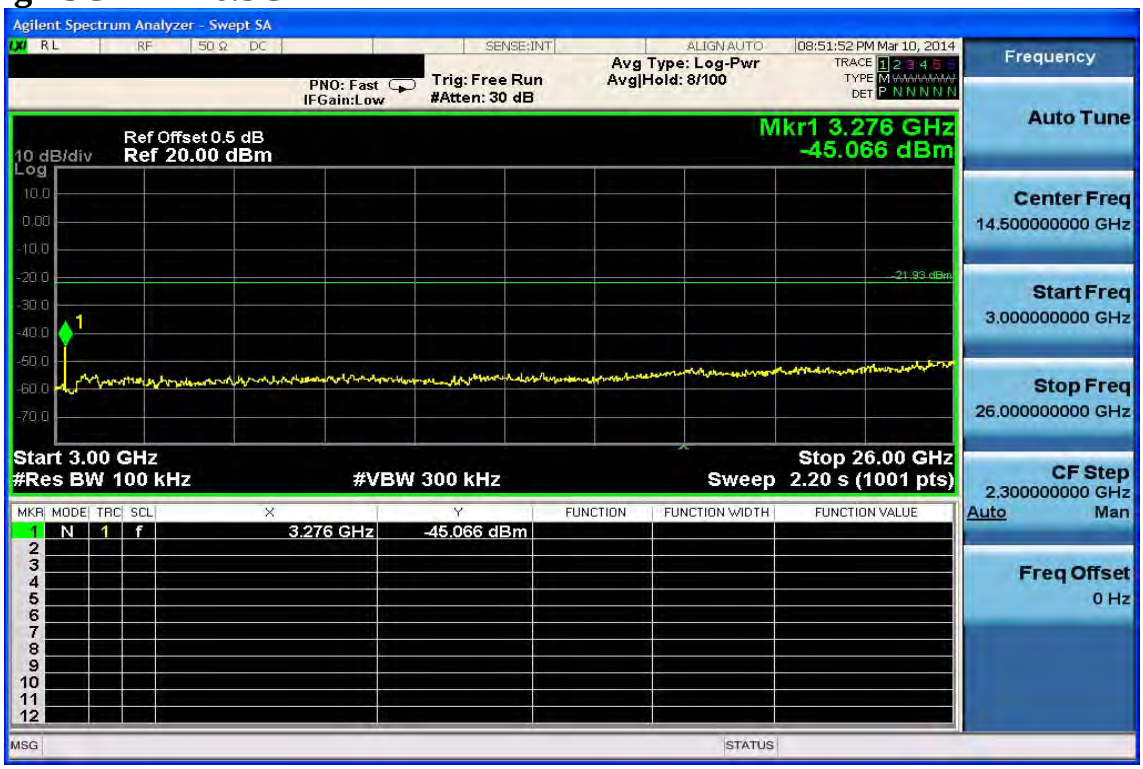
Ch Mid 3GHz – 26.5GHz



2452MHz
Ch High 30MHz – 3GHz



Ch High 3GHz – 26.5GHz



Radiated Spurious Emission Measurement Result (below 1GHz) (worst case)

Operation Mode	802.11g TX CH Low	Test Date	2014/03/24
Fundamental Frequency	2412MHz	Test By	Dino
Temperature	25 ℃	Pol	Ver./Hor
Humidity	60 %		

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	56.19	42.04	-12.47	29.57	40.00	-10.43	Peak	VERTICAL
2	67.83	46.03	-14.26	31.77	40.00	-8.23	Peak	VERTICAL
3	280.26	41.94	-11.57	30.37	46.00	-15.63	Peak	VERTICAL
4	579.99	35.88	-6.13	29.75	46.00	-16.25	Peak	VERTICAL
5	675.05	31.16	-4.59	26.57	46.00	-19.43	Peak	VERTICAL
6	773.02	29.38	-2.70	26.68	46.00	-19.32	Peak	VERTICAL
1	54.25	46.93	-12.36	34.57	40.00	-5.43	Peak	HORIZONTAL
2	129.91	41.66	-13.67	27.99	43.50	-15.51	Peak	HORIZONTAL
3	283.17	37.61	-11.53	26.08	46.00	-19.92	Peak	HORIZONTAL
4	447.10	30.97	-8.23	22.74	46.00	-23.26	Peak	HORIZONTAL
5	579.99	31.40	-6.13	25.27	46.00	-20.73	Peak	HORIZONTAL
6	803.09	27.26	-2.43	24.83	46.00	-21.17	Peak	HORIZONTAL

Remark:

1 No further spurious emissions detected from the lowest internal frequency and 30MHz.

2 Measuring frequencies from the lowest internal frequency to the 1GHz.

3 Radiated emissions measured in frequency range from 9MHz to 1000MHz were made with an instrument detector setting 9-90KHz/110-490KHz using PK/AV and other Frequency Band using PK/QP

4 Measurement result 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.

5 The IF bandwidth of SPA between 9kHz to 30MHz was 10kHz, VBW= 30kHz; between 30MHz to 1GHz was 100KHz, VBW=300KHz.

Radiated Spurious Emission Measurement Result (below 1GHz) (worst case)

Operation Mode	802.11 g TX CH Mid	Test Date	2014/03/24
Fundamental Frequency	2437MHz	Test By	Dino
Temperature	25 ℃	Pol	Ver./Hor
Humidity	60 %		

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	56.19	43.33	-12.47	30.86	40.00	-9.14	Peak	VERTICAL
2	65.89	44.47	-13.88	30.59	40.00	-9.41	Peak	VERTICAL
3	285.11	41.62	-11.49	30.13	46.00	-15.87	Peak	VERTICAL
4	579.99	39.58	-6.13	33.45	46.00	-12.55	Peak	VERTICAL
5	680.87	31.15	-4.49	26.66	46.00	-19.34	Peak	VERTICAL
6	773.02	29.47	-2.70	26.77	46.00	-19.23	Peak	VERTICAL
1	54.25	45.29	-12.36	32.93	40.00	-7.07	Peak	HORIZONTAL
2	127.97	41.37	-13.84	27.53	43.50	-15.97	Peak	HORIZONTAL
3	170.65	37.00	-12.71	24.29	43.50	-19.21	Peak	HORIZONTAL
4	285.11	37.52	-11.49	26.03	46.00	-19.97	Peak	HORIZONTAL
5	563.50	30.55	-6.54	24.01	46.00	-21.99	Peak	HORIZONTAL
6	803.09	27.62	-2.43	25.19	46.00	-20.81	Peak	HORIZONTAL

Remark:

1 No further spurious emissions detected from the lowest internal frequency and 30MHz.

2 Measuring frequencies from the lowest internal frequency to the 1GHz.

3 Radiated emissions measured in frequency range from 9MHz to 1000MHz were made with an instrument detector setting 9-90KHz/110-490KHz using PK/AV and other Frequency Band using PK/QP

4 Measurement result 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.

5 The IF bandwidth of SPA between 9kHz to 30MHz was 10kHz, VBW= 30kHz; between 30MHz to 1GHz was 100KHz, VBW=300KHz.

Radiated Spurious Emission Measurement Result (below 1GHz) (worst case)

Operation Mode	802.11g TX CH High	Test Date	2014/03/24
Fundamental Frequency	2462MHz	Test By	Dino
Temperature	25 ℃	Pol	Ver./Hor
Humidity	60 %		

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	56.19	42.12	-12.47	29.65	40.00	-10.35	Peak	VERTICAL
2	67.83	46.31	-14.26	32.05	40.00	-7.95	Peak	VERTICAL
3	285.11	41.98	-11.49	30.49	46.00	-15.51	Peak	VERTICAL
4	579.99	38.05	-6.13	31.92	46.00	-14.08	Peak	VERTICAL
5	671.17	30.15	-4.65	25.50	46.00	-20.50	Peak	VERTICAL
6	773.02	30.11	-2.70	27.41	46.00	-18.59	Peak	VERTICAL
1	54.25	47.62	-12.36	35.26	40.00	-4.74	Peak	HORIZONTAL
2	129.91	42.29	-13.67	28.62	43.50	-14.88	Peak	HORIZONTAL
3	192.96	46.48	-14.71	31.77	43.50	-11.73	Peak	HORIZONTAL
4	285.11	38.17	-11.49	26.68	46.00	-19.32	Peak	HORIZONTAL
5	531.49	39.00	-7.15	31.85	46.00	-14.15	Peak	HORIZONTAL
6	579.99	34.77	-6.13	28.64	46.00	-17.36	Peak	HORIZONTAL

Remark:

1 No further spurious emissions detected from the lowest internal frequency and 30MHz.

2 Measuring frequencies from the lowest internal frequency to the 1GHz.

3 Radiated emissions measured in frequency range from 9MHz to 1000MHz were made with an instrument detector setting 9-90KHz/110-490KHz using PK/AV and other Frequency Band using PK/QP

4 Measurement result 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.

5 The IF bandwidth of SPA between 9kHz to 30MHz was 10kHz, VBW= 30kHz; between 30MHz to 1GHz was 100KHz, VBW=300KHz.

Radiated Spurious Emission Measurement Result (above 1GHz) (worst case)

Operation Mode	802.11g TX CH Low	Test Date	2014/03/24
Fundamental Frequency	2412MHz	Test By	Dino
Temperature	25 ℃	Pol	Ver./Hor
Humidity	60 %		

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	3212.00	54.39	-4.65	49.74	74.00	-24.26	Peak	VERTICAL
2	4824.00	44.93	1.33	46.26	74.00	-27.74	Peak	VERTICAL
1	3219.00	52.05	-4.62	47.43	74.00	-26.57	Peak	HORIZONTAL
2	4824.00	45.82	1.33	47.15	74.00	-26.85	Peak	HORIZONTAL

Remark:

1 Measuring frequencies from the lowest internal frequency to the 10th of fundamental frequency

2 Field strength limits for frequency above 1000MHz are based on average limits. However, Peak mode field strength shall not exceed the average limits specified plus 20dB.

3 Measurement of data 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 Spectrum Peak mode IF bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, Sweep time= 200 ms., the VBW setting was 3 MHz.

5 Spectrum AV mode if bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

Radiated Spurious Emission Measurement Result (above 1GHz) (worst case)

Operation Mode	802.11g TX CH Mid	Test Date	2014/03/24
Fundamental Frequency	2442MHz	Test By	Dino
Temperature	25 ℃	Pol	Ver./Hor
Humidity	60 %		

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	3254.00	55.32	-4.50	50.82	74.00	-23.18	Peak	VERTICAL
2	4884.00	44.39	1.54	45.93	74.00	-28.07	Peak	VERTICAL
1	3254.00	50.91	-4.50	46.41	74.00	-27.59	Peak	HORIZONTAL
2	4884.00	44.02	1.54	45.56	74.00	-28.44	Peak	HORIZONTAL

Remark:

1 Measuring frequencies from the lowest internal frequency to the 10th of fundamental frequency

2 Field strength limits for frequency above 1000MHz are based on average limits. However, Peak mode field strength shall not exceed the average limits specified plus 20dB.

3 Measurement of data 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 Spectrum Peak mode IF bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, Sweep time= 200 ms., the VBW setting was 3 MHz.

5 Spectrum AV mode if bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

Radiated Spurious Emission Measurement Result (above 1GHz) (worst case)

Operation Mode	802.11g TX CH High	Test Date	2014/03/24
Fundamental Frequency	2462MHz	Test By	Dino
Temperature	25 ℃	Pol	Ver./Hor
Humidity	60 %		

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	3282.00	54.59	-4.41	50.18	74.00	-23.82	Peak	VERTICAL
2	4924.00	43.16	1.68	44.84	74.00	-29.16	Peak	VERTICAL
1	3282.00	51.64	-4.41	47.23	74.00	-26.77	Peak	HORIZONTAL
2	4924.00	44.31	1.68	45.99	74.00	-28.01	Peak	HORIZONTAL

Remark:

1 Measuring frequencies from the lowest internal frequency to the 10th of fundamental frequency

2 Field strength limits for frequency above 1000MHz are based on average limits. However, Peak mode field strength shall not exceed the average limits specified plus 20dB.

3 Measurement of data 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 Spectrum Peak mode IF bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, Sweep time= 200 ms., the VBW setting was 3 MHz.

5 Spectrum AV mode if bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

10 Peak Power Spectral Density

10.1 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-247 issue 1, §5.2
(2)The transmitter power spectral density conducted from the transmitter 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 Section 5.4(4), (i.e. the power spectral density shall be determined using the same method as is used to determine the conducted output power).

10.2 Measurement Equipment Used:

Refer to section 6.2 for details.

10.3 Test Set-up:

Refer to section 6.3 for details.

10.4 Measurement Procedure:

Refer to section 10.2 Peak Power Density(PKPPSD) Measurement Procedure of KDB Document: 558074 D01 DTS Meas Guidance v03r01

1. Use this procedure when the maximum peak conducted output power in the fundamental emission is used to demonstrate compliance.
2. Set the RBW = 100 kHz.
3. Set the VBW ≥ 300 kHz.
4. Set the span to 5-30 % greater than the EBW.
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 power level in any 100 kHz band segment within the fundamental EBW.
10. Scale the observed power level to an equivalent value in 3 kHz by adjusting (reducing) the measured power by a bandwidth correction factor (BWCF) where BWCF = 10log (3 kHz/100 kHz = -15.2 dB).
11. The resulting peak PSD level must be ≤ 8 dBm.

10.5 Measurement Result:

802.11b Mode

Frequency MHz	Power Density Level (dBm)	Maximum Limit (dBm)
2412	-7.02	8
2442	-7.80	8
2462	-8.14	8

802.11g Mode

Frequency MHz	Power Density Level (dBm)	Maximum Limit (dBm)
2412	-7.41	8
2442	-7.76	8
2462	-7.68	8

802.11n for 2.4GHz
2*2 MIMO

	Frequency (MHz)	Output Chain (dBm/100KHz)		Combine Power Density (dBm) /3KHz	Limit (dBm)
		Chain A	chain B		
AN HT20	2412	-10.30	-13.26	-8.53	8
	2442	-10.75	-13.53	-8.91	8
	2462	-10.98	-14.03	-9.23	8
AN HT40	2422	-9.80	-13.44	-8.24	8
	2442	-9.84	-13.70	-8.34	8
	2452	-10.13	-13.76	-8.57	8

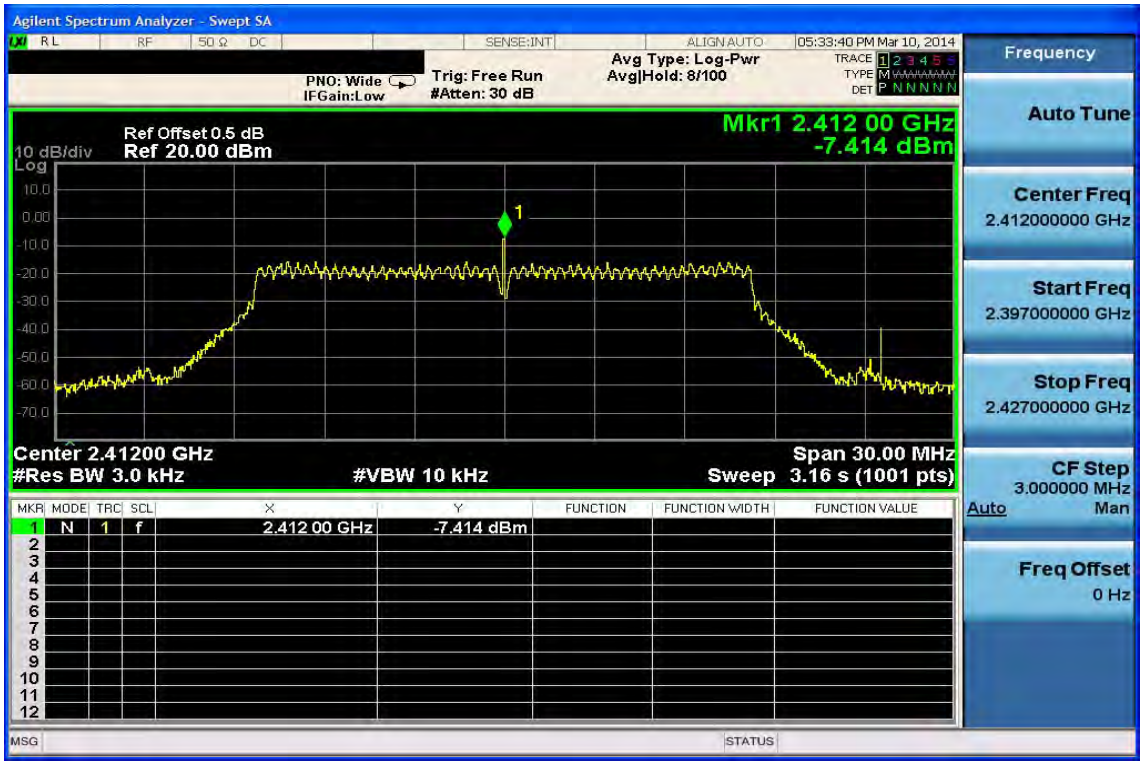
802.11b

Power Spectral Density Test Plot 2412MHz

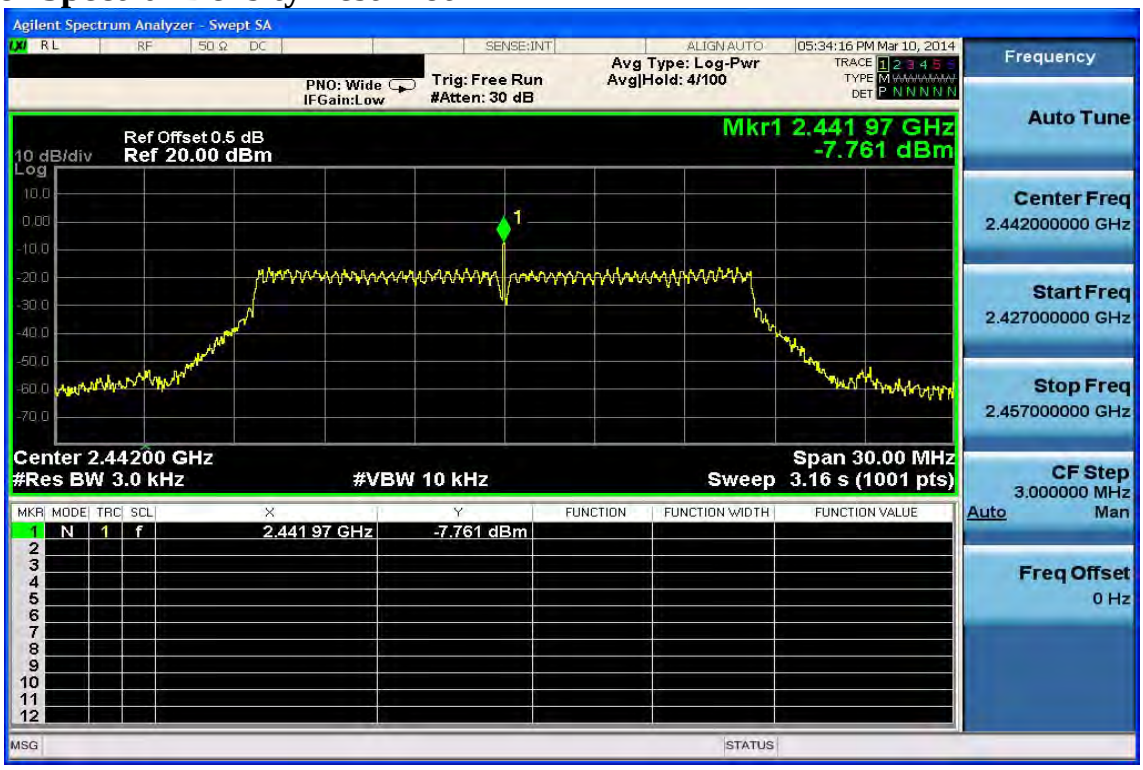
Power Spectral Density Test Plot 2442MHz

Power Spectral Density Test Plot 2462MHz

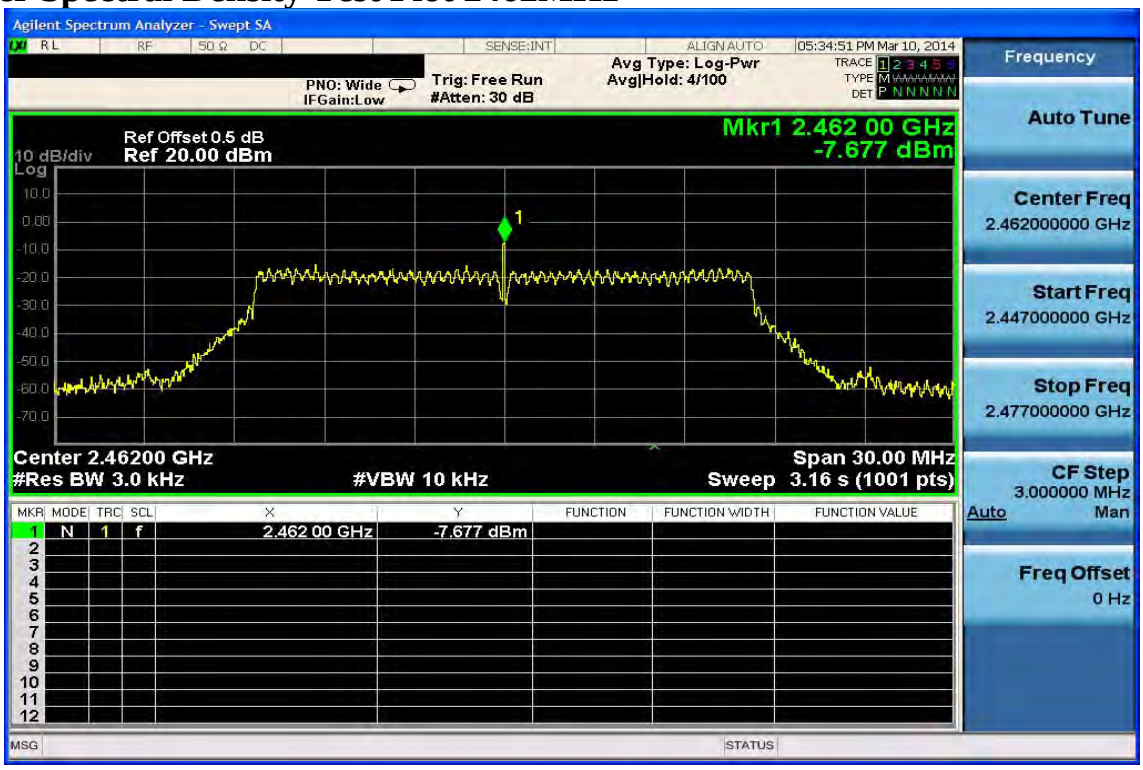
802.11g
Power Spectral Density Test Plot 2412MHz



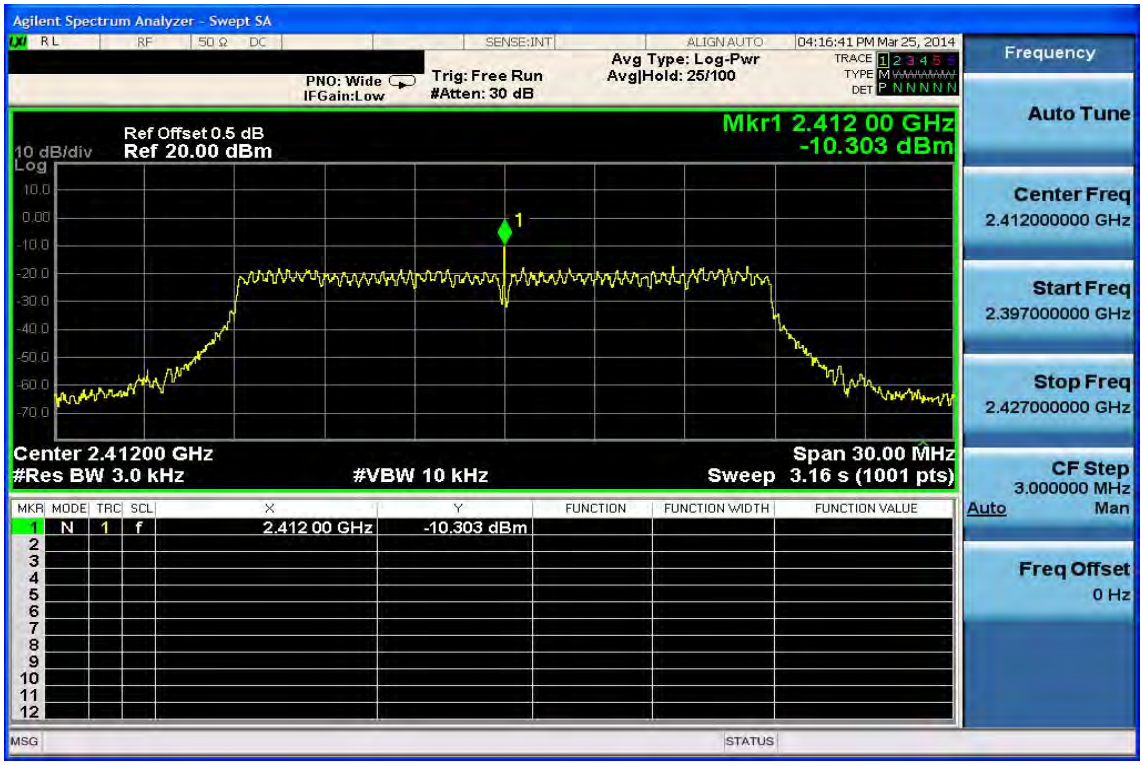
Power Spectral Density Test Plot 2442MHz



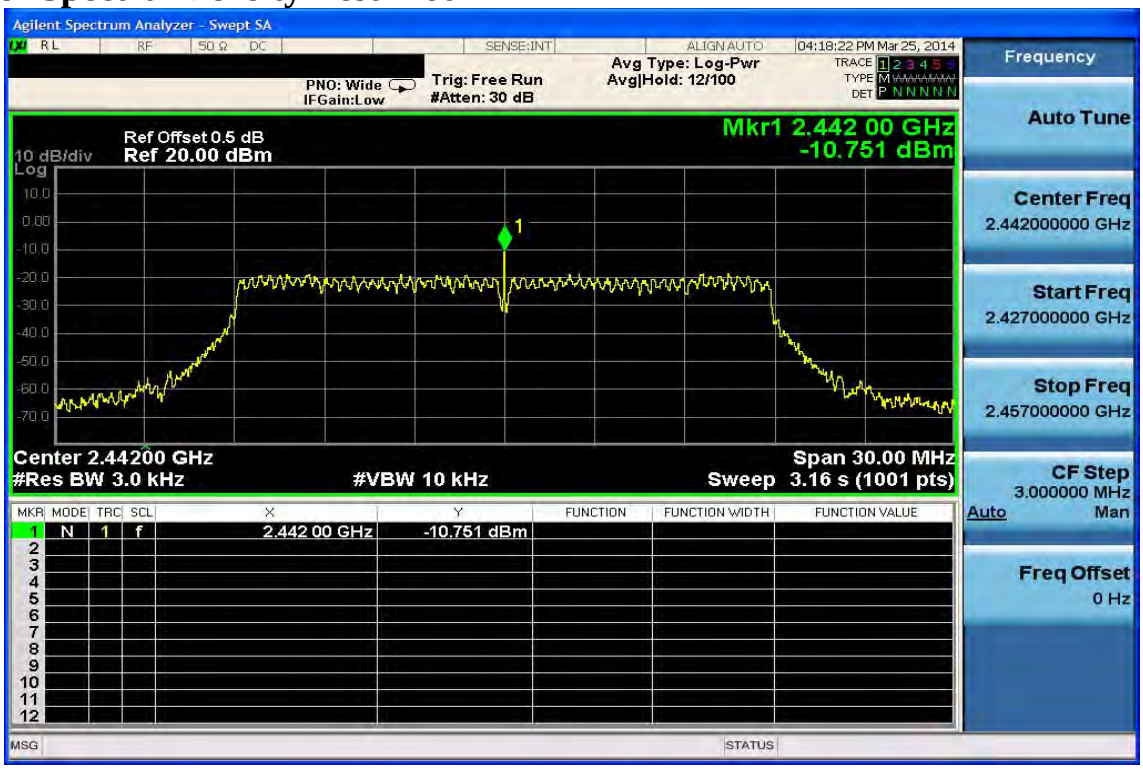
Power Spectral Density Test Plot 2462MHz



802.11n_20M (chain a)
Power Spectral Density Test Plot 2412MHz

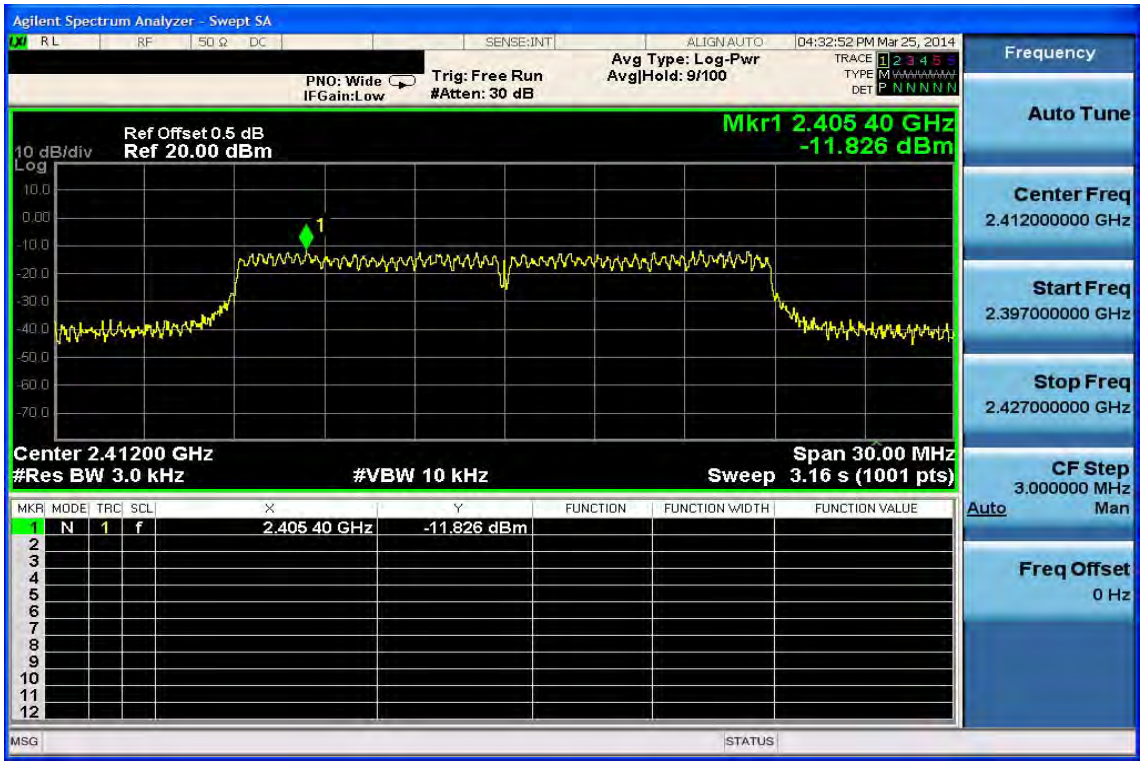


Power Spectral Density Test Plot 2442MHz

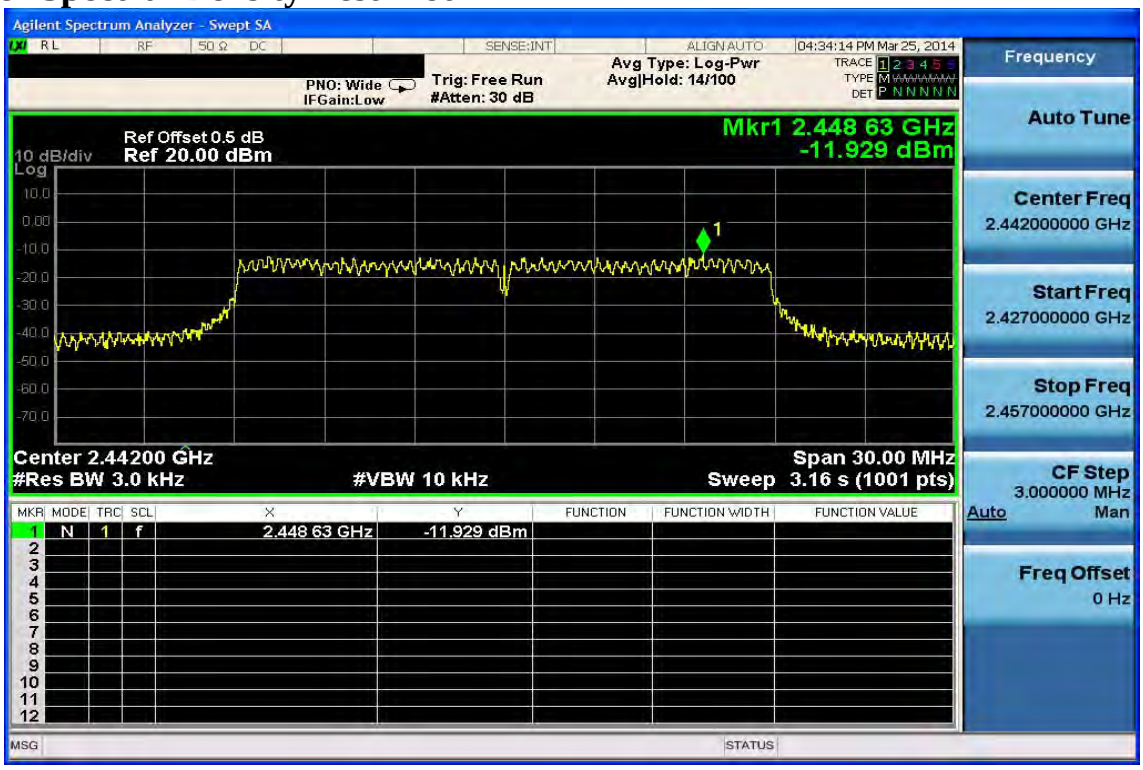


Power Spectral Density Test Plot 2462MHz

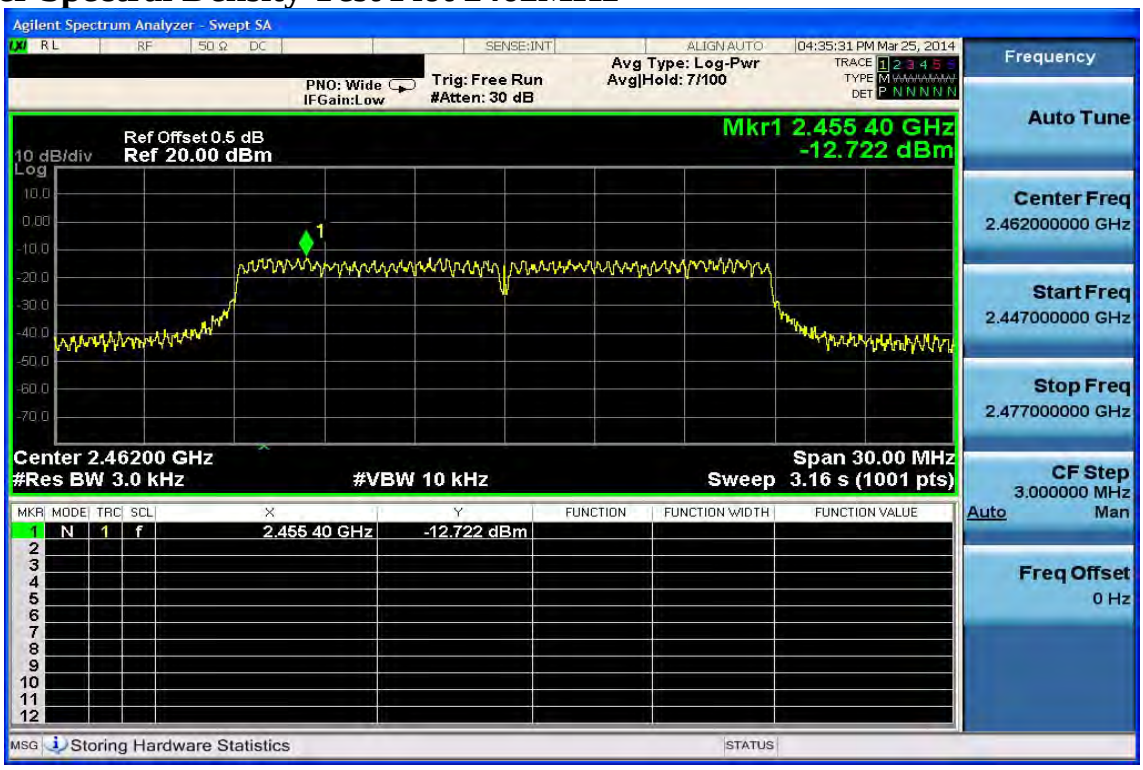
802.11n_20M (chain b)
Power Spectral Density Test Plot 2412MHz



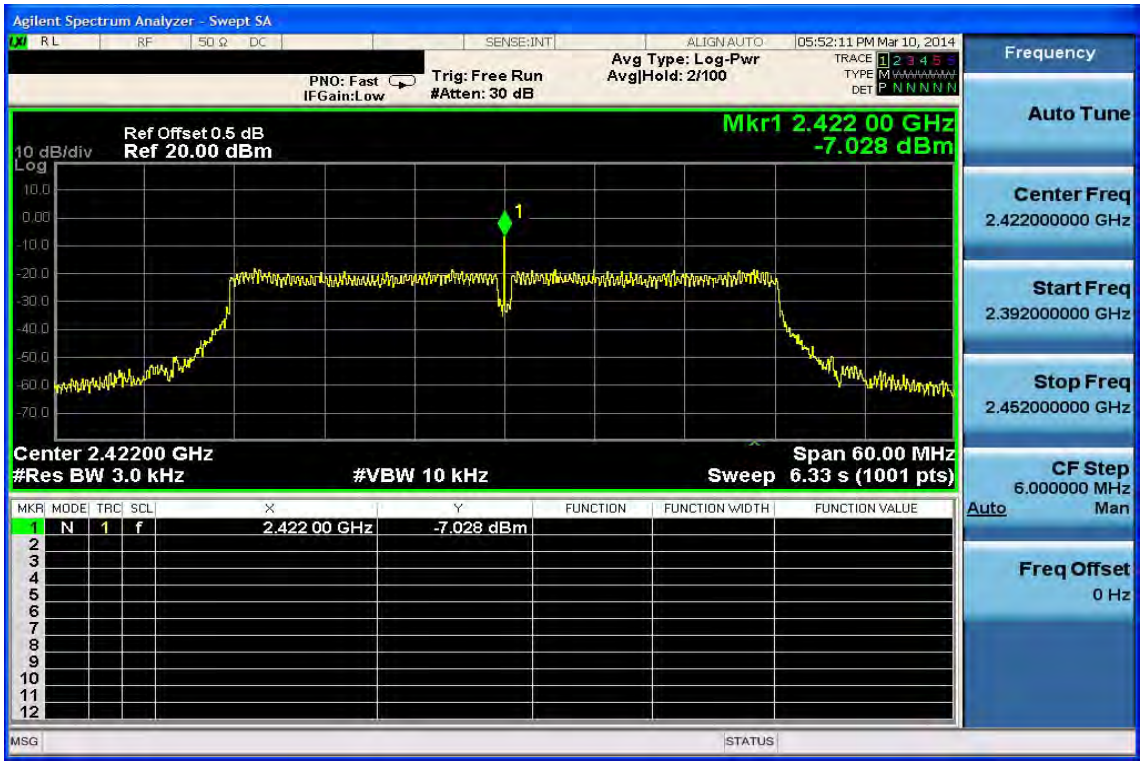
Power Spectral Density Test Plot 2442MHz



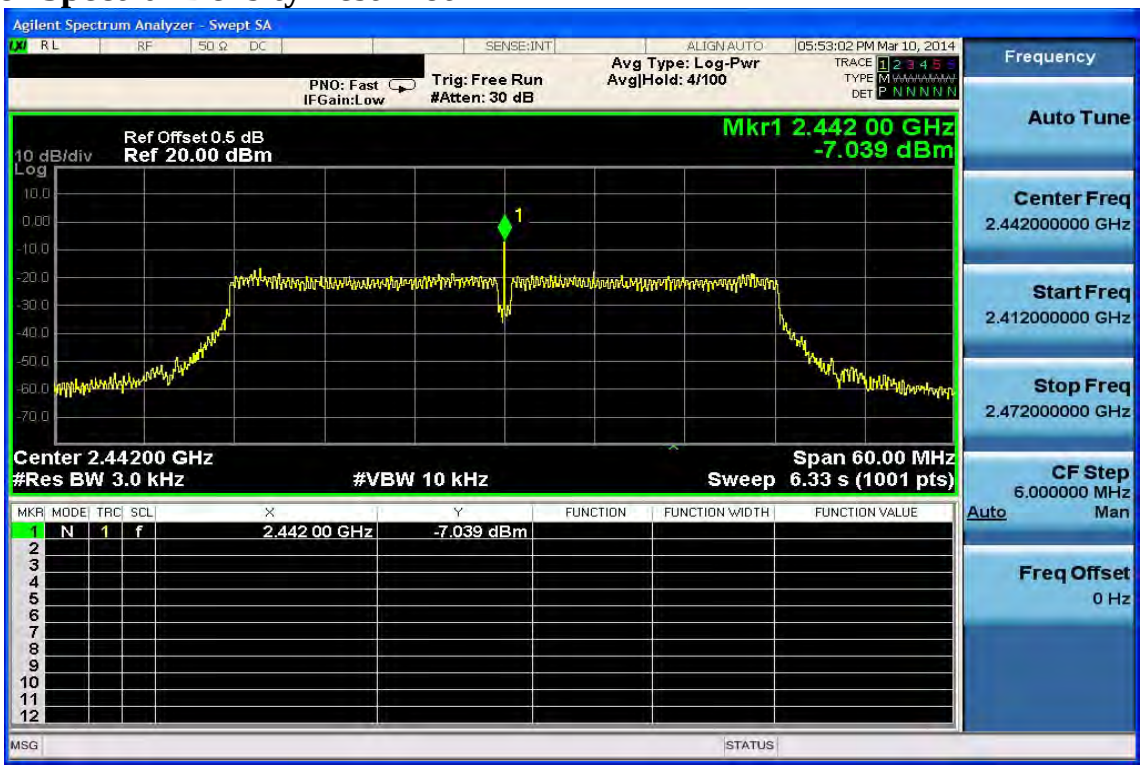
Power Spectral Density Test Plot 2462MHz



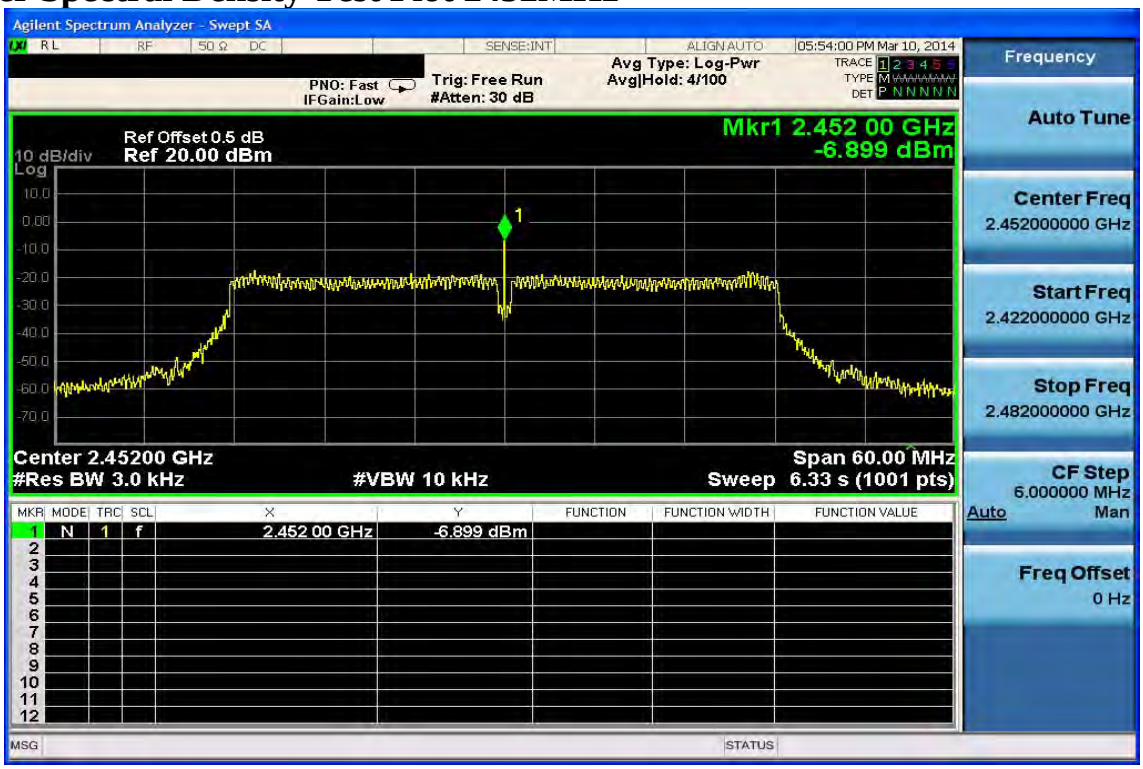
802.11n_40M (chain b)
Power Spectral Density Test Plot 2422MHz



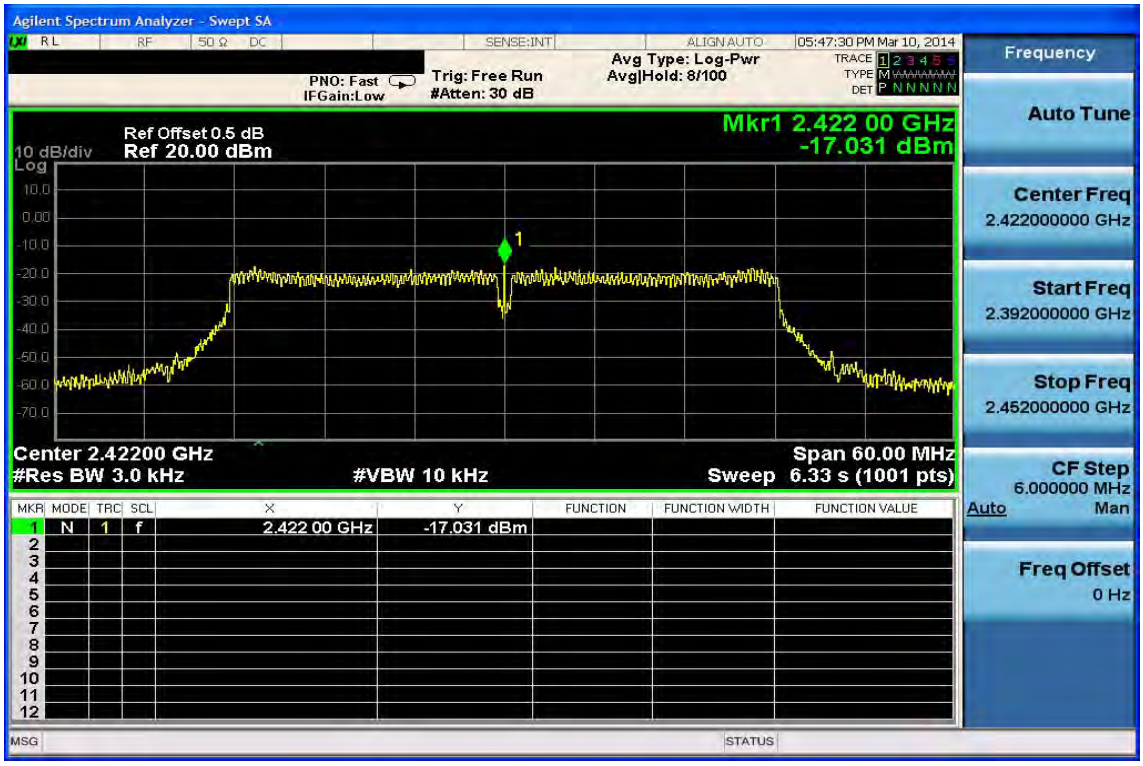
Power Spectral Density Test Plot 2442MHz



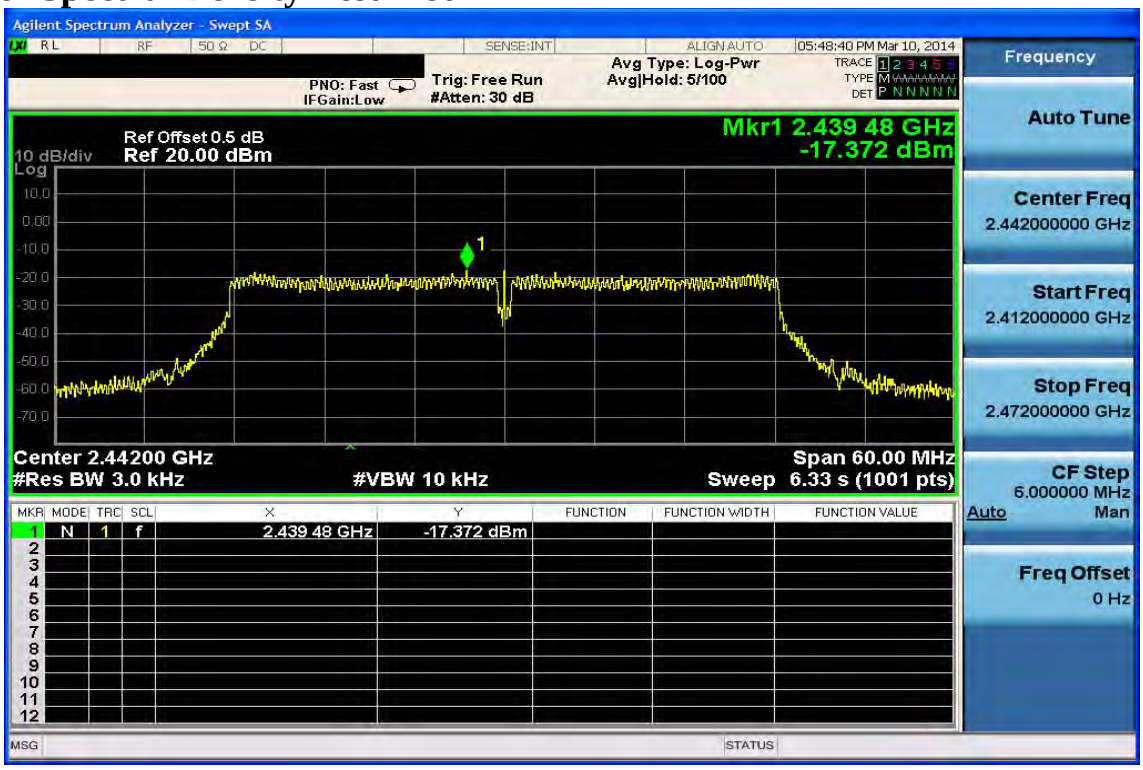
Power Spectral Density Test Plot 2452MHz



802.11n_40M (chain b)
Power Spectral Density Test Plot 2422MHz



Power Spectral Density Test Plot 2442MHz



Power Spectral Density Test Plot 2452MHz

11 ANTENNA REQUIREMENT

11.1 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 ad
ded 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.

11.2 Antenna Connected Construction:

The directional gins of antenna used for transmitting is 4.95dBi for 2.4G WiFi, and the antenna connector is designed with unique type RF connector and no consideration of replacement. Please see EUT photo and antenna spec. for details.

According to KDB662911 D01 SM-MIMO signals could be considered uncorrelated for purposes of directional gain computation.

Directional gain = G_{ANT}

12 Maximum Permissible Exposure (MPE)

12.1 Standard Applicable

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

This is a Mobile device, the MPE is required.

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

Limits for Maximum Permissive Exposure (MPE)

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

F = frequency in MHz

* = Plane-wave equipment power density

12.2 Maximum Permissible Exposure (MPE) Evaluation

The worst case of Average power: refer to section 6.5 for detail measurement date.

802.11b

Cable loss = 0		Output Power		Limit (dBm)
CH	Frequency (MHz)	Detector		
		PK (dBm)	AV (dBm)	
1	2412	17.74	13.48	30
7	2442	17.60	13.35	
11	2462	17.42	13.22	

MPE Prediction (802.11b)

Prediction of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

$S=PG/4\pi R^2$

Where: S = Power density

P = Power input to antenna

G = Power gain of the antenna in the direction of interest relative to an isotropic radiator

R = Distance to the center of radiation of the antenna

Maximum average output power at antenna input	13.48	(dBm)
Maximum Average output power at antenna input	22.28435149	(mW)
Duty cycle:	100	(%)
Maximum Pav :	22.28435149	(mW)
Antenna gain (typical):	4.95	(dBi)
Maximum antenna gain:	3.126079367	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	2412	(MHz)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm2)
Power density at predication frequency at 20 (cm)	0.0138660	(mW/cm^2)

Measurement Result

The predicted power density level at 20 cm is 0.0138660 mW/cm^2. This is below the uncontrolled exposure limit of 1 mW/cm^2 at 2412MHz.

The worst case of Average power: refer to section 6.5 for detail measurement date.

Average Measurement

2*2 MIMO

Channel		Frequency (MHz)	Output Chain (dBm)		Combine Output Power (dBm)	Limit(dBm)	Result
			Chain A	chain B			
AN HT20	1	2412	9.29	9.23	12.27	30	Pass
	7	2442	9.09	9.15	12.13	30	Pass
	11	2462	8.59	8.63	11.62	30	Pass
AN HT40	3	2422	8.48	8.44	11.47	30	Pass
	7	2442	8.20	8.26	11.24	30	Pass
	9	2452	7.93	7.98	10.97	30	Pass

MPE Prediction (802.11n HT20)

Prediction of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

$S=PG/4\pi R^2$

Where: S = Power density

P = Power input to antenna

G = Power gain of the antenna in the direction of interest relative to an isotropic radiator

R = Distance to the center of radiation of the antenna

MIMO Chain A

Maximum average output power at antenna input	9.29	(dBm)
Maximum Average output power at antenna input	8.49180475	(mW)
Duty cycle:	100	(%)
Maximum Pav :	8.49180475	(mW)
Antenna gain (typical):	4.95	(dBi)
Maximum antenna gain:	3.126079367	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	2412	(MHz)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm2)
Power density at predication frequency at 20 (cm)	0.0052838	(mW/cm^2)

MIMO Chain B

Maximum average output power at antenna input	9.23	(dBm)
Maximum Average output power at antenna input	8.375292821	(mW)
Duty cycle:	100	(%)
Maximum Pav :	8.375292821	(mW)
Antenna gain (typical):	4.95	(dBi)
Maximum antenna gain:	3.126079367	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	2412	(MHz)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm2)
Power density at predication frequency at 20 (cm)	0.0052114	(mW/cm^2)

Measurement Result

The predicted power density level at 20 cm is 0.0052838 mW/cm^2, 0.0052114 mW/cm^2 . This is below the uncontrolled exposure limit of 1 mW/cm^2 at 2412MHz.

Remark: The worst case of which power is higher between hT20, and hT40 is deduced, and shown on the test report