TEST REPORT

of

FCC PART 15 SUBPART E

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

Full Modular Approval

Product :	**5G +2.4G 2T/2R WLAN FMC**
Brand:	**Nane**
Model:	**Detail please refer to page 6**
Model Difference:	**Market Segmentation**
FCC ID:	**O7N-CWFB211-XXX** **it identifies a single equipment "X" is letter of the alphabet**
FCC Rule Part:	**§15.407**
Applicant:	**ChipSiP Technology CO., Ltd.**
Address:	**8F.-1, No.186, Jian 1st Rd., Zhonghe Dist., New Taipei City 235, 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, San Ho Tsuen, Hsin Ho Rd.
Lung-Tan Hsiang, Tao Yuan County 325, Taiwan
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Report No.: **ISL-13LR006FE**

Issue Date : **2013/02/21**

VERIFICATION OF COMPLIANCE

Applicant:	ChipSiP Technology CO., Ltd.
Product Description:	5G +2.4G 2T/2R WLAN FMC
Brand Name:	Nane
Model No.:	Detail please refer to page 6
Model Difference:	Market segmentation
FCC ID:	O7N-CWFB211-XXX, it identifies a single equipment "X" is letter of the alphabet
FCC Rule Part:	§15.407
Date of test:	2013/01/07 ~ 2013/01/19
Date of EUT Received:	2013/01/07

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:***	2013/02/21
	Dion Chang / Engineer		
Prepared By:	Eva Kao	***Date:***	2013/02/21
	Eva Kao / Technical Supervisor		
Approved By:	Vincent Su	***Date:***	2013/02/21
	Vincent Su / Technical Manager		

Version

Version No.	Date	Description
00	2013/02/21	Initial creation of document

Table of Contents

1. GENERAL INFORMATION

1.1. Product Description

General:

Product Name	5G +2.4G 2T/2R WLAN FMC			
Brand Name	Nane			
Model Name	CWFB210		CWFB211-D00	
	CWFB210-T01	CWFB210-R01	CWFB211-D01	CWFB212-L01
	CWFB210-T02	CWFB210-R02	CWFB211-D02	CWFB212-L02
	CWFB210-T03	CWFB210-R03	CWFB211-D03	CWFB212-L03
	CWFB210-T04	CWFB210-R04	CWFB211-D04	CWFB212-L04
	CWFB210-T05	CWFB210-R05	CWFB211-D05	CWFB212-L05
	CWFB210-T06	CWFB210-R06	CWFB211-D06	CWFB212-L06
	CWFB210-T07	CWFB210-R07	CWFB211-D07	CWFB212-L07
	CWFB210-T08	CWFB210-R08	CWFB211-D08	CWFB212-L08
	CWFB210-T09	CWFB210-R09	CWFB211-D09	CWFB212-L09
	CWFB210-T10	CWFB210-R10	CWFB211-D10	CWFB212-L10
Model Difference	Market segmentation			
Power Supply	3.7Vdc			

WLAN: 2X2 MIMO

Wi-Fi	Frequency Range (MHz)	Channels	Peak Rated Power	Modulation Technology
802.11b	2412 – 2462(DTS)	11	19.52dBm	DSSS
802.11g	2412 – 2462(DTS)	11	23.87dBm	DSSS, OFDM
802.11n	HT20 2412 – 2462(DTS)	11	23.77dBm	OFDM
	HT40 2422 – 2452(DTS)	7	23.71dBm	
802.11a	5180 – 5240(NII)	4	9.19dBm	OFDM
	5745 – 5825(DTS)	5	23.88dBm	
802.11n	HT20 5180 – 5240(NII)	4	8.65dBm	OFDM
	HT20 5745 – 5825(DTS)	5	24.81dBm	
	HT40 5190 – 5230(NII)	2	10.93dBm	
	HT40 5755 – 5795(DTS)	2	24.60dBm	
Modulation type		CCK, DQPSK, DBPSK for DSSS 64QAM. 16QAM, QPSK, BPSK for OFDM		
Transition Rate:		Upto 300Mbps		

Antenna Designation:

	Manufacturer	Model No.	Connector Type	Type	Gain (2.4GHz)	Gain (5GHz)
Ant 1	Airwave Technologies INC.	EDA-8709-25GR2-A4-RM	Revise SMA, unique	Dipole Ant	2 dBi	2 dBi
Ant 2	ARISTRTLE	RFA-25-C2S1-70-90	unique	Dipole Ant	2 dBi	2 dBi
Ant 3	Tranwo technology corp.	SD001-201003-A101	Revise SMA, unique	Dipole Ant	2dBi	2 dBi
Ant 3-1	Tranwo technology corp.	RFA-05-2-L14M3-B70-1	Revise SMA, unique	Dipole Ant	2dBi	2 dBi
Ant 3-2	Tranwo technology corp.	202-000442-00	unique	Patch Ant	0 dBi	-1 dBi
Ant 3-3	Tranwo technology corp.	202-000441-00	unique	Patch Ant	0.5 dBi	-0.5 dBi
Ant 4	UDM Group Tech-nology Co., Ltd	26-52-01800G	unique	PCB Ant (Green)	2.5 dBi	4 dBi
Ant 5	Unictron Technologies Corporation	H2P566WKBA0100	unique	PCB Ant (Blue)	2.3 dBi	4dBi

The EUT is compliance with IEEE 802.11 a/b/g/n Standard.
This report applies for frequency bands 5150 MHz– 5250 MHz

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

This submittal(s) (test report) is intended for FCC ID: NM8DGH100 filing to comply with Section 15.407 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 (2003). Radiated testing was performed at an antenna to EUT distance 3 meters.

KDB Document: KDB789033 D01 General UNII Test Procedures v01r02

1.4. Test Facility

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

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

1.5. Special Accessories

Not available for this EUT intended for grant.

1.6. Equipment Modifications

Not available for this EUT intended for grant.

2. SYSTEM TEST CONFIGURATION

2.1. EUT Configuration

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

2.2. EUT Exercise

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

2.3. Test Procedure

2.3.1 Conducted Emissions

The EUT is a placed on as turn table which is 0.8 m above ground plane. According to the requirements in Section 7 and 13 of ANSI C63.4-2003.Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30 MHz 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 and Subclause 8.3.1.2 of ANSI C63.4-2003.

2.4. Configuration of Tested System

Fig. 2-1 Configuration of Tested System

Table 1-1 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/ Type No.	Series No.	Data Cable	Power Cord
1	Notebook	IBM	X40	N/A	Shield	Non-shield
2	Kit	N/A	N/A	N/A	Shield	Non-shield

3. SUMMARY OF TEST RESULT

FCC Rules	Description Of Test	Result
§15.207	AC Power Line Conducted Emission	Compliant
§15.407(a)	26 dB Emission Bandwidth	Compliant
§15.407(a)	Peak Output Power Measurement	Compliant
§15.407(a)	Peak Power Spectral Density Measurement	Compliant
15.407(a)(6)	Peak Excursion Measurement	Compliant
§15.407(b)	Undesirable Emission – Conducted Measurement	Compliant
§15.407(b)	Undesirable Emission – Radiated Measurement	Compliant
§15.407©	Transmission in case of Absence of Information	Compliant
§15.407(g)	Frequency Stability	Compliant
§15.407(a)	Antenna Requirement	Compliant
§15.407(d)	TPC and DFS Measurement	Compliant
MPE	Maximum Permissible Exposure	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 mode is programmed.

a mode: 5150MHz-5250MHz: Channel lowest (5180MHz)、Mid (5220MHz) and Highest (5240MHz) with 6Mbps data rate are chosen for full testing.

n HT 20 mode: 5150MHz-5250MHz: Channel lowest (5180MHz)、Mid (5220MHz) and Highest (5240MHz) with 6.5Mbps data rate are chosen for full testing

n HT 40 mode: 5150MHz-5250MHz: Channel lowest (5190MHz) and Highest (5230MHz) with 13.5Mbps data rate are chosen for full testing

The worst case 802.11 n HT40 (5GHz) with antenna 4 was reported for Radiated Emission.

5. AC POWER LINE CONDUCTED EMISSION TEST

5.1. Standard Applicable

According to §15.207, frequency range within 150 KHz to 30 MHz 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 03 -1 Cable	WOKEN	CFD 300-NL	Conduction 0-1	06/28/2012	06/28/2013
EMI Receiver 12	ROHDE & SCHWARZ	ESCI	100804	07/13/2012	07/13/2013
LISN 07	FCC Inc.	FCC-LISN-50-100-4-02	07040	07/13/2012	07/13/2013
LISN 08	FCC	FCC-LISN50-25-2-01	07039	07/13/2012	07/13/2013

5.3. EUT Setup:

1. The conducted emission tests were performed in the test site, using the setup in accordance with the ANSI C63.4-2003.
2. The AC/DC Power adaptor of EUT was plug-in LISN. The EUT was placed flushed with the rear of the table.
3. The LISN was connected with 120Vac/60Hz power source.

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.

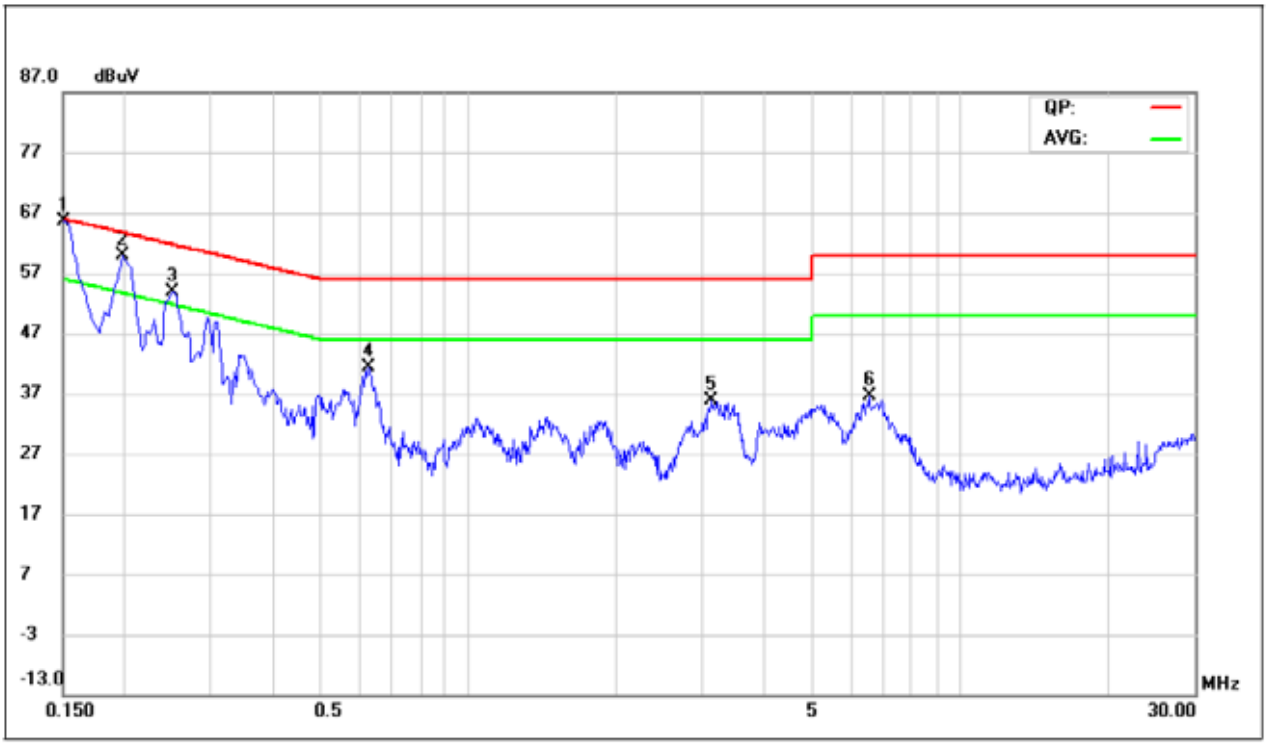
5.5. Measurement Result:

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.

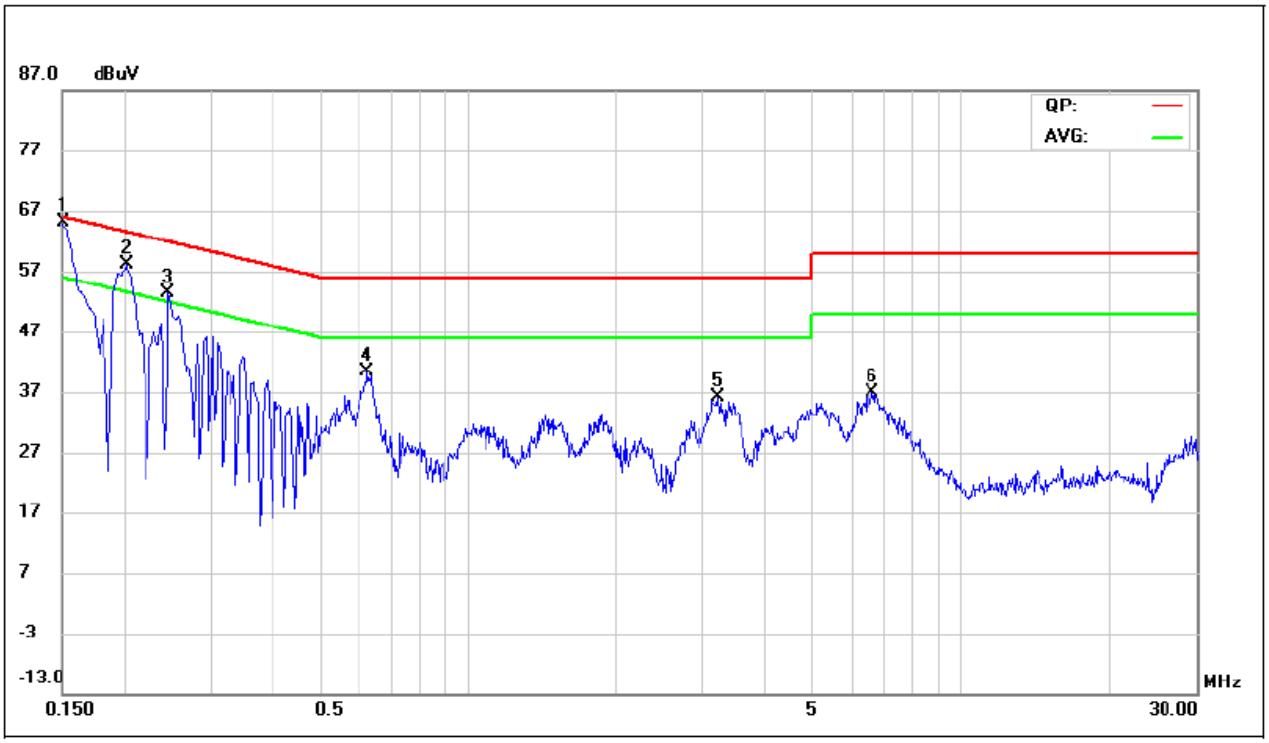
AC POWER LINE CONDUCTED EMISSION TEST DATA

Operation Mode:	Operation Mode	Test Date:	2013/01/17
Test By:	Dino		



Site:	Conduction 04	Phase: L1	Temperature(℃):26(℃)
Condition:	CISPR13 Class B Conduction		Humidity:54%
		Power:	AC 120V/60Hz

No.	Frequency)	reading(dBuV)			Factor(dB)	Measurement(dBuV)			limit(dBuV)		margin(dB)		Comment
	(MHz)	Peak	QP	AVG	(dB)	Peak	QP	AVG	P/Q	AVG	P/Q	AVG	
1	0.1516	56.77	53.97	39.66	9.58	66.35	63.55	49.24	65.91	55.91	-2.36	-6.67	
2	0.1980	50.23	47.29	33.14	9.59	59.82	56.88	42.73	63.69	53.69	-6.81	-10.96	
3	0.2500	45.13	41.78	29.18	9.59	54.72	51.37	38.77	61.76	51.76	-10.39	-12.99	
4	0.6300	33.00	28.97	23.35	9.60	42.60	38.57	32.95	56.00	46.00	-17.43	-13.05	
5	3.1260	25.97	21.27	15.36	9.60	35.57	30.87	24.96	56.00	46.00	-25.13	-21.04	
6	6.5500	26.69	22.23	16.64	9.63	36.32	31.86	26.27	60.00	50.00	-28.14	-23.73	



Site:	Conduction 04	Phase: N	Temperature(℃):26(℃)
Condition:	CISPR13 Class B Conduction		Humidity:54%
Compamy:	景鉅	Power:	AC 120V/60Hz

No.	Frequency)	reading(dBuV)			Factor(dB)`	Measurement(dBuV)			limit(dBuV)		margin(dB)		Comment
	(MHz)	Peak	QP	AVG	(dB)	Peak	QP	AVG	P/Q	AVG	P/Q	AVG	
1	0.1500	31.43	23.72	19.59	9.59	41.02	33.31	29.18	66.00	56.00	-32.69	-26.82	
2	0.2020	49.00	46.13	30.70	9.59	58.59	55.72	40.29	63.53	53.53	-7.81	-13.24	
3	0.2460	43.95	39.26	24.10	9.59	53.54	48.85	33.69	61.89	51.89	-13.04	-18.20	
4	0.6260	31.51	27.80	22.10	9.60	41.11	37.40	31.70	56.00	46.00	-18.60	-14.30	
5	3.2100	27.08	22.14	15.91	9.60	36.68	31.74	25.51	56.00	46.00	-24.26	-20.49	
6	6.6100	28.52	22.46	16.76	9.63	38.15	32.09	26.39	60.00	50.00	-27.91	-23.61	

6. PEAK OUTPUT POWER MEASUREMENT

6.1 Standard Applicable

According to §15.407(a)

1. For the band 5.15-5.25 GHz, the maximum conducted power over the frequency of operation shall not exceed the lesser of 50 mW (17dBm) or 4 dBm + 10log B.
2. For the band 5.25-5.35 GHz and 5.47-5.725GMHz, the maximum conducted power over the frequency of operation shall not exceed the lesser of 250 mW (24dBm) or 11 dBm + 10log B.
3. For the band 5.725-5.825 GHz, the maximum conducted power over the frequency of operation shall not exceed the lesser of 1W (30dBm) or 17 dBm + 10log B.

6.2 Measurement Procedure

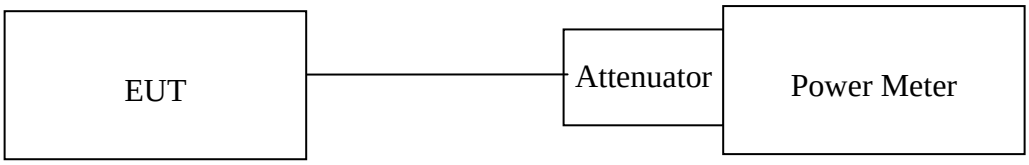
1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the power meter
3. Record the max. reading.
4. Repeat above procedures until all frequency measured were complete.

Refer to section C4 of KDB Document: KDB789033 D01 General UNII Test Procedures v01r02

6.3 Measurement Equipment Used:

Conducted Emission Test Site					
EQUIPMENT TYPE	**MFR**	**MODEL NUMBER**	**SERIAL NUMBER**	**LAST CAL.**	**CAL DUE.**
Power Meter 05	Anritsu	ML2495A	1116010	04/17/2012	04/16/2013
Power Sensor 05	Anritsu	MA2411B	34NKF50	04/16/2012	04/15/2013
Temperature Chamber	KSON	THS-B4H100	2287	03/03/2012	03/02/2013
DC Power supply	ABM	51850	N/A	06/17/2012	06/16/2013
AC Power supply	EXTECH	CFC105W	NA	12/19/2012	12/18/2013
Splitter	MCLI	PS4-199	12465	07/18/2012	07/17/2013
Spectrum analyzer	Agilent	N9030A	MY51360021	03/11/2012	03/10/2013

6.4 Measurement Equipment Used:



6.5 Measurement Result

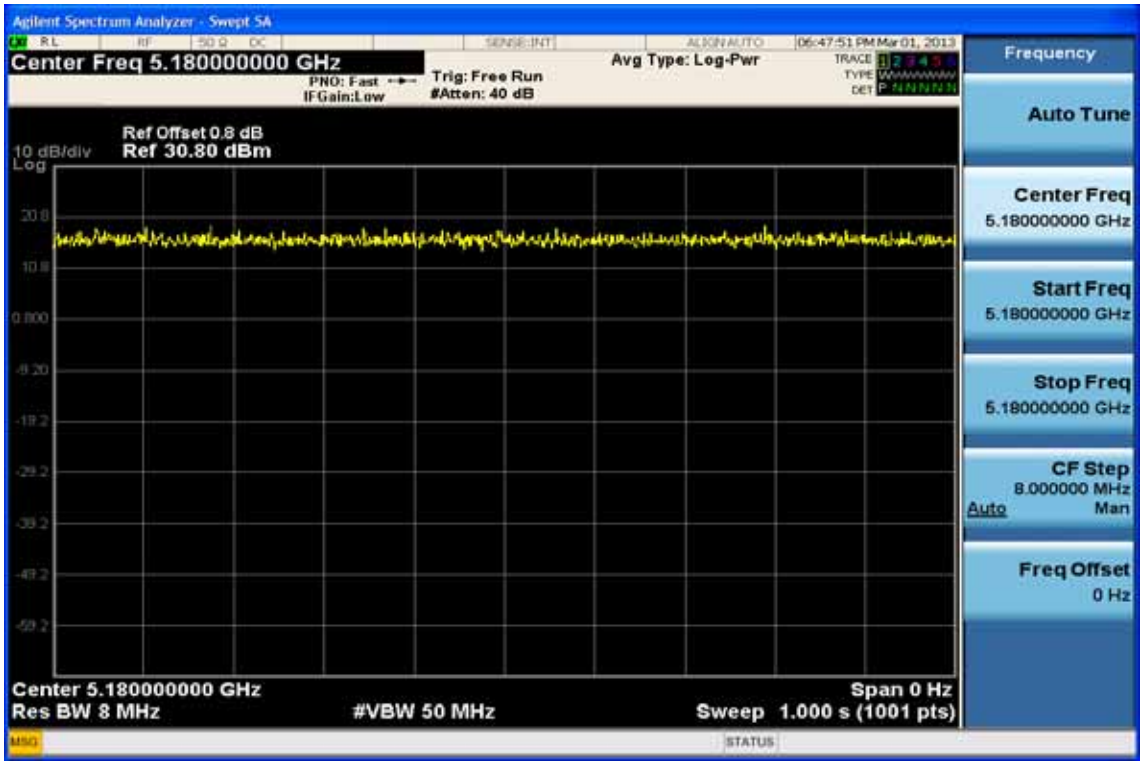
Mode	Freq(MHz)	channel	Peak power (dBm)	limit(dBm)	result
802.11a	5180	36	9.19	16.98	pass
	5200	40	8.67	16.98	pass
	5220	44	8.89	16.98	pass
	5240	48	8.76	16.98	pass

2*2 MIMO

Mode	Freq(MHz)	channel	Output Chain (dBm)		Combine Peak Output Power (dBm)	Limit(dBm)	Result
			Chain A	chain B			
N HT20	5180	36	5.21	6.03	8.65	16.98	Pass
	5200	40	5.52	5.05	8.30	16.98	Pass
	5220	44	5.61	5.45	8.54	16.98	Pass
	5240	48	5.63	4.82	8.25	16.98	Pass

Mode	Freq(MHz)	channel	Output Chain (dBm)		Combine Peak Output Power (dBm)	Limit(dBm)	Result
			Chain A	chain B			
N HT40	5190	38	8.02	7.81	10.93	16.98	Pass
	5230	46	7.59	7.33	10.47	16.98	Pass

100% Duty Cycle



7. 26dB EMISSION BANDWIDTH MEASUREMENT

7.1 Standard Applicable

According to §15.407(a). No Limit required.

7.2 Measurement Procedure

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the.antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as RBW=300KHz, VBW =1MHz, Span= 50MHz, Sweep=auto
4. Mark the peak frequency and –26dB (upper and lower) frequency.
5. Repeat above procedures until all frequency measured were complete.

Refer to section D of KDB Document: KDB789033 D01 General UNII Test Procedures v01r02

7.3 Measurement Equipment Used:

Refer to section 6.3 for details.

7.4 Test Set-up:

Refer to section 6.4 for details.

7.5 Measurement Result

802.11a Mode

Frequency (MHz)	26dB Bandwidth (MHz)	10 Log (B) (dB)
5180	21.220	13.27
5220	21.820	13.39
5240	21.280	13.28

802.11n HT20 Mode

Frequency (MHz)	26dB Bandwidth (MHz)	10 Log (B) (dB)
5180	21.520	13.33
5220	21.520	13.33
5240	21.640	13.35

802.11n HT40 Mode

Frequency (MHz)	26dB Bandwidth (MHz)	10 Log (B) (dB)
5190	39.370	15.95
5270	39.480	15.96

802.11a

26dB Band Width Test Data CH-Low

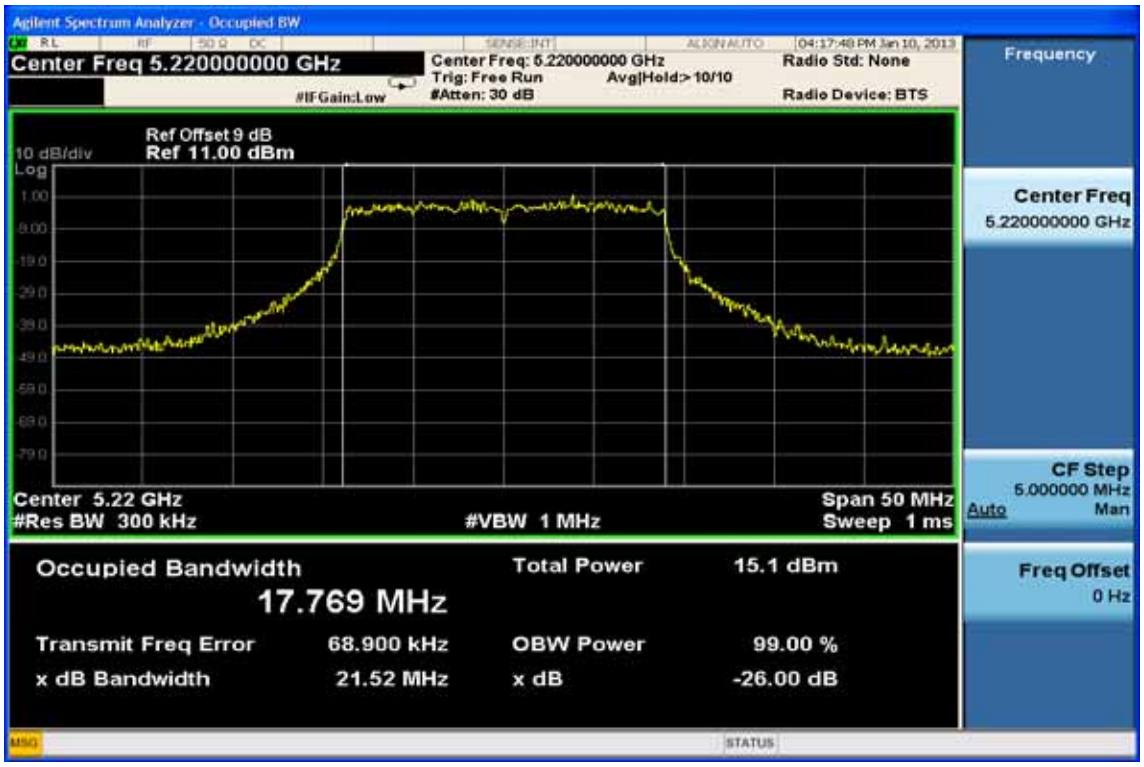
26dB Band Width Test Data CH-Mid

26dB Band Width Test Data CH-High

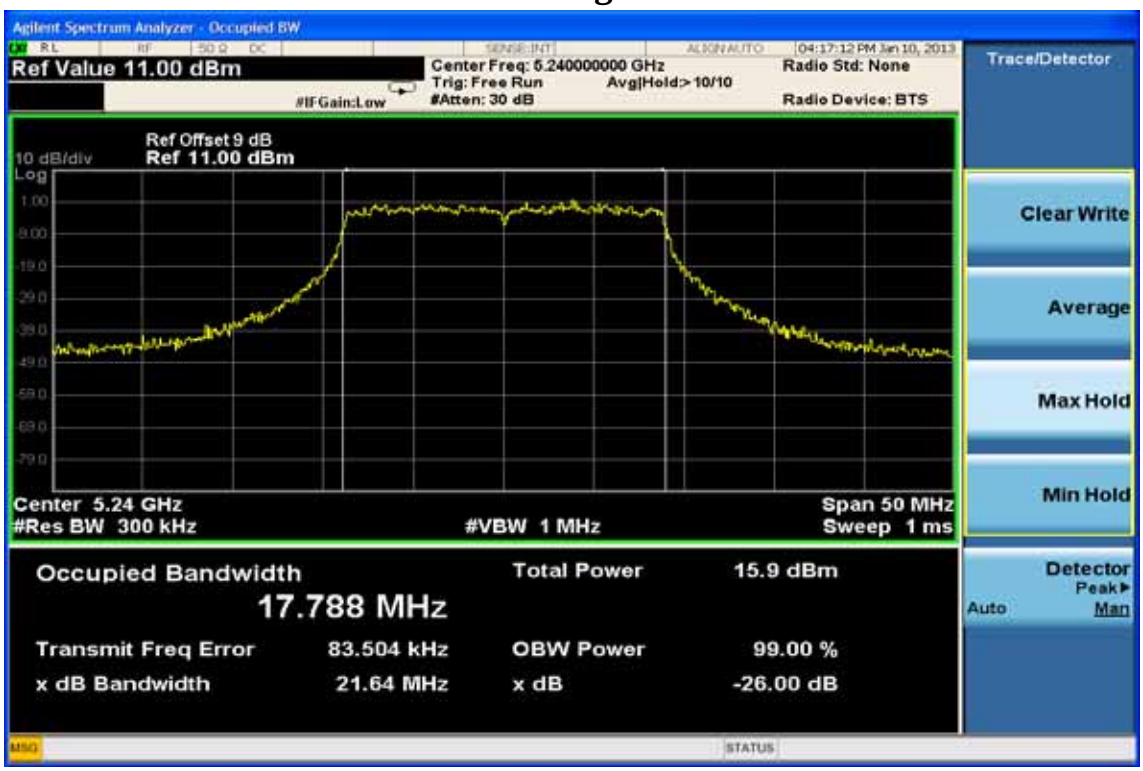
802.11n HT20

26dB Band Width Test Data CH-Low

26dB Band Width Test Data CH-Mid



26dB Band Width Test Data CH-High



802.11n HT40

26dB Band Width Test Data CH-Low

26dB Band Width Test Data CH-High

8. PEAK POWER SPECTRAL DENSITY

8.1 Standard Applicable

According to §15.407(a)

1. For the band 5.15-5.25 GHz, the peak power spectral density shall not exceed 4 dBm in any 1-MHz band.
2. For the band 5.25-5.35 GHz and 5.47-5.725GMHz, the peak power spectral density shall not exceed 11 dBm in any 1-MHz band.
3. For the band 5.725-5.825 GHz, the peak power spectral density shall not exceed 17 dBm in any 1-MHz band.

8.2 Measurement Procedure

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to Spectrum.
3. Set RBW=1MHz,VBW=3MHz, Span=50MHz (Base Mode), Sweep time = Auto, traces 100 sweeps of video averaging.
4. Record the max. reading.
5. Repeat above procedures until all frequency measured were complete.

Refer to section E of KDB Document: KDB789033 D01 General UNII Test Procedures v01r02

8.3 Measurement Equipment Used:

Refer to section 6.3 for details.

8.4 Test Set-up:

Refer to section 6.4 for details.

8.5 Measurement Result

802.11a Mode

Frequency MHz	RF Power Density Reading (dBm)	Cable loss (dB)	Maximum Limit (dBm)
5180	3.717	0.00	4
5220	3.781	0.00	4
5240	3.679	0.00	4
802.**11n** HT20			

Frequency MHz	Chain A RF Power Density Reading (dBm)	Chain A RF Power Density Reading (dBm)	Cable loss (dB)	RF Power Density Level (dBm)	Maximum Limit (dBm)
5180	0.652	0.721	0.00	3.697	4
5220	0.434	0.931	0.00	3.700	4
5240	0.638	0.980	0.00	3.823	4

802.11n HT40 Mode

Frequency MHz	Chain A RF Power Density Reading Reading (dBm)	Chain B RF Power Density Reading Reading (dBm)	Cable loss (dB)	RF Power Density Level Level (dBm)	Maximum Limit (dBm)
5190	0.480	0.997	0.00	3.756	4
5270	0.694	0.899	0.00	3.808	4

802.11a

Peak Power Spectral Density Data Plot (CH Low)

Peak Power Spectral Density Data Plot (CH Mid)

Peak Power Spectral Density Data Plot (CH High)

802.11n HT20 (Antenna A Port)

Power Spectral Density Test Plot (CH-Low)

Power Spectral Density Test Plot (CH-Mid)

Power Spectral Density Test Plot (CH-High)

802.11n HT20 for 5GHz (Antenna B Port)

Power Spectral Density Test Plot (CH-Low)

Power Spectral Density Test Plot (CH-Mid)

Power Spectral Density Test Plot (CH-High)

802.11n HT40 (Antenna A Port)

Power Spectral Density Test Plot (CH-Low)

Power Spectral Density Test Plot (CH-High)

802.11n HT40 for 5GHz (Antenna B Port)

Power Spectral Density Test Plot (CH-Low)

Power Spectral Density Test Plot (CH-High)

9. PEAK EXCURSION MEASUREMENT

9.1 Standard Applicable

15.407(a)(6) The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the peak transmit power (measured as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

9.2 Measurement Procedure

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to spectrum.
3. Trace A, Set RBW=1MHz, VBW = 3MHz, Span = 26dBc, Max. hold.
4. Trace B, Set RBW=1MHz, VBW = 30KHz, Span = 26dBc, Max. hold..
5. Delta Mark trace A center frequency and trace B center frequency.
6. Repeat above procedures until all frequency measured were complete.

Refer to section F of KDB Document: KDB789033 D01 General UNII Test Procedures v01r02

9.3 Measurement Equipment Used:

Refer to section 6.3 for details.

9.4 Test Set-up:

Refer to section 6.4 for details.

9.5 Test Results:

802.11a Mode

Frequency (MHz)	peak excursion (dB)	Limit (dB)	Margin (dB)
5180	6.683	13.00	-6.32
5220	6.809	13.00	-6.19
5240	6.860	13.00	-6.14

802.11n HT20 Mode

Frequency (MHz)	peak excursion (dB)	Limit (dB)	Margin (dB)
5180	6.181	13.00	-6.82
5220	6.606	13.00	-6.39
5240	6.899	13.00	-6.10

802.11n HT40 Mode

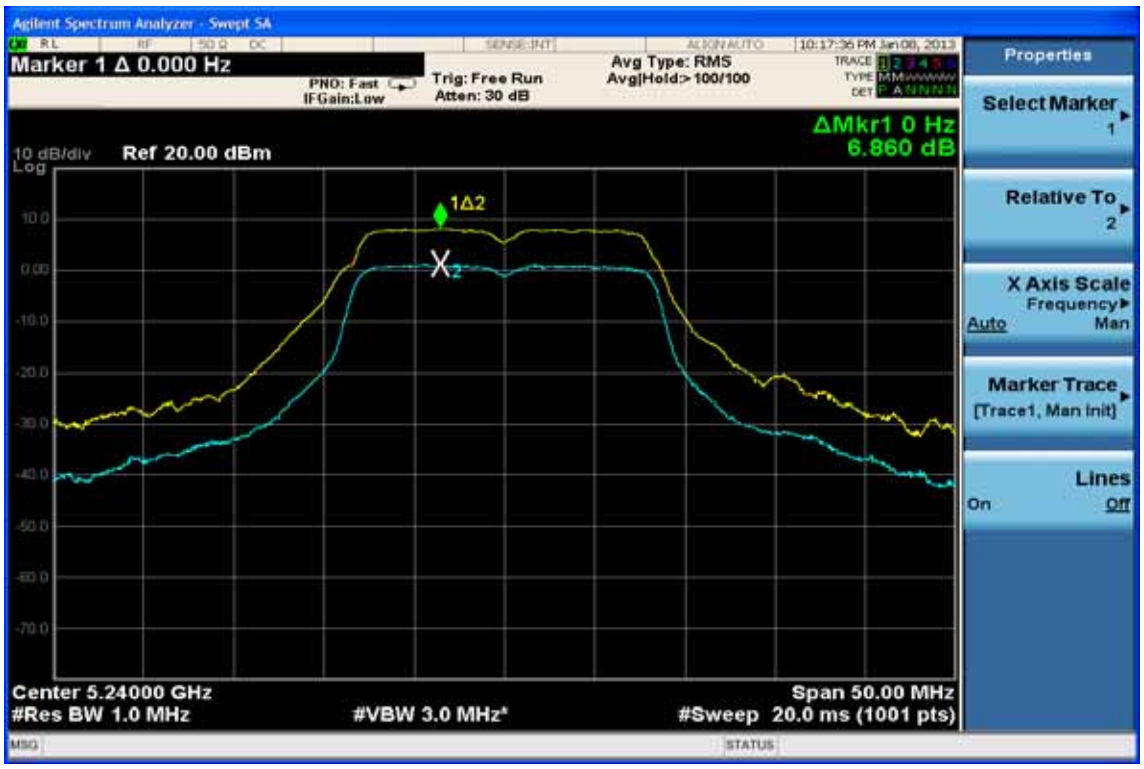
Frequency (MHz)	peak excursion (dB)	Limit (dB)	Margin (dB)
5190	6.240	13.00	-6.76
5230	6.299	13.00	-6.70

802.11a mode

Peak Excursion Data Plot (CH Low)

Peak Excursion Data Plot (CH Mid)

Peak Excursion Data Plot (CH High)

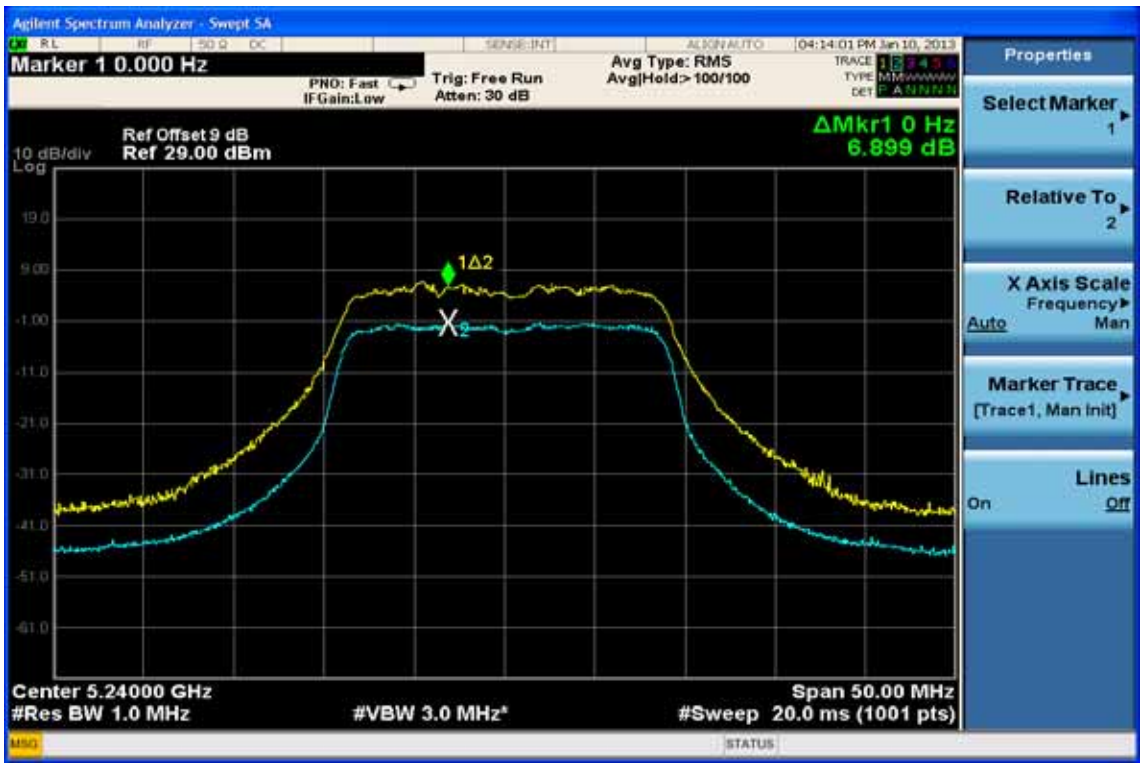


802.11n HT20 Mode

Peak Excursion Data Plot (CH Low)

Peak Excursion Data Plot (CH Mid)

Peak Excursion Data Plot (CH High)



802.11n HT40 Mode

Peak Excursion Data Plot (CH Low)

Peak Excursion Data Plot (CH High)

10. UNDESIRABLE EMISSION - CONDUCTED MEASUREMENT

10.1 Standard Applicable

According to §15.407(b),

(b) Undesirable Emission Limits: Except as shown in Paragraph (b)(6) of this section, the peak emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

(1) For transmitters operating in the 5.15-5.25 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27 dBm/MHz.

(2) For transmitters operating in the 5.25-5.35 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27 dBm/MHz. Devices operating in the 5.25-5.35 GHz band that generate emissions in the 5.15-5.25 GHz band must meet all applicable technical requirements for operation in the 5.15-5.25 GHz band (including indoor use) or alternatively meet an out-of-band emission EIRP limit of -27 dBm/MHz in the 5.15-5.25 GHz band.

(3) For transmitters operating in the 5.47-5.725 GHz band: all emissions outside of the 5.47-5.725 GHz band shall not exceed an EIRP of -27 dBm/MHz.

(4) For transmitters operating in the 5.725-5.825 GHz band: all emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an EIRP of -17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an EIRP of -27 dBm/MHz.

(5) The above emission measurements shall be performed using a minimum resolution bandwidth of 1 MHz. A lower resolution bandwidth may be employed near the band edge, when necessary, provided the measured energy is integrated to show the total power over 1 MHz.

(6) Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in Section 15.209. Further, any U-NII devices using an AC power line are required to comply also with the conducted limits set forth in Section 15.207.

(7) The provisions of Section 15.205 of this part apply to intentional radiators operating under this section.

(8) When measuring the emission limits, the nominal carrier frequency shall be adjusted as close to the upper and lower frequency block edges as the design of the equipment permits.

10.2 Measurement Procedure

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to spectrum.
3. Set Spectrum RBW=1MHz, VBW = 1MHz for peak measurement and 10Hz for average measurement.
4. Set Spectrum at lower/upper band edge and the restricted band adjacent to the lower/upper edge of the authorized band, with the transmitter set to the lowest/highest channel.
5. Set Spectrum over the 30MHz to 40GHz range with the transmitter set to the lowest, middle, and highest channels.

Refer to section E of KDB Document: KDB789033 D01 General UNII Test Procedures v01r02

Conducted RF measurements of the transmitter output were made at the band edges and the adjacent restricted bands.

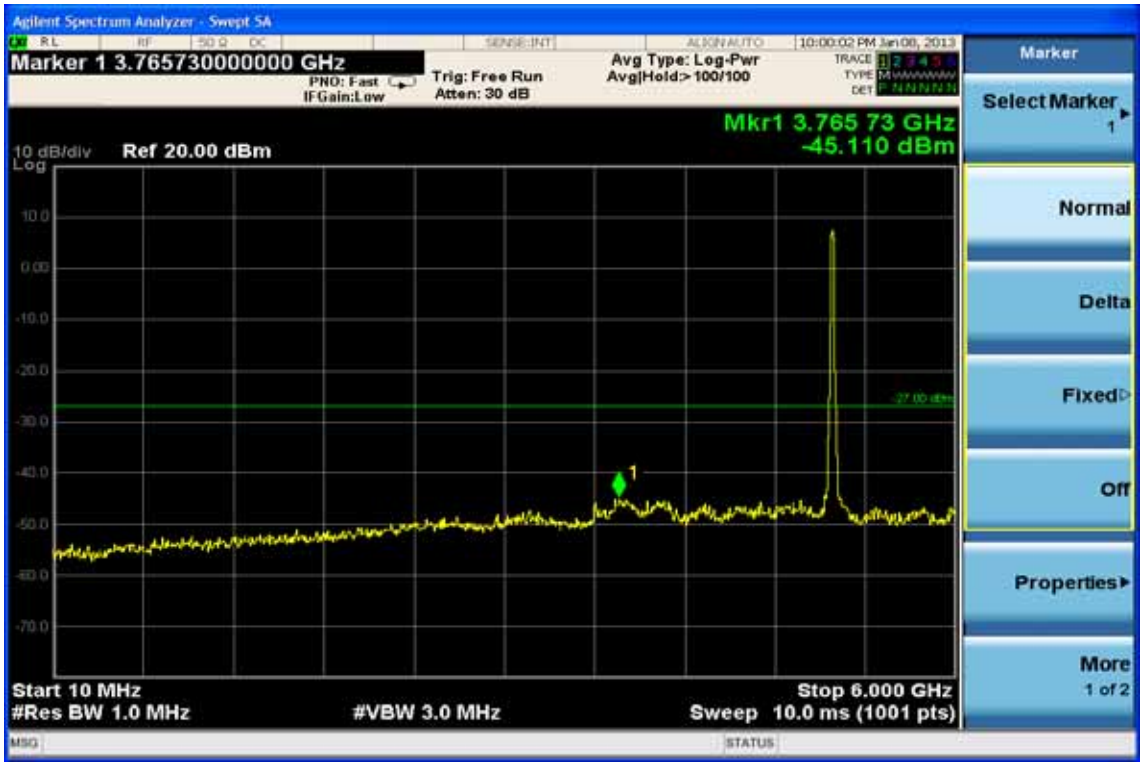
Also, conducted RF measurements of the transmitter output over the 30 MHz to 40 GHz band were made in order to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

10.3 Measurement Equipment Used:

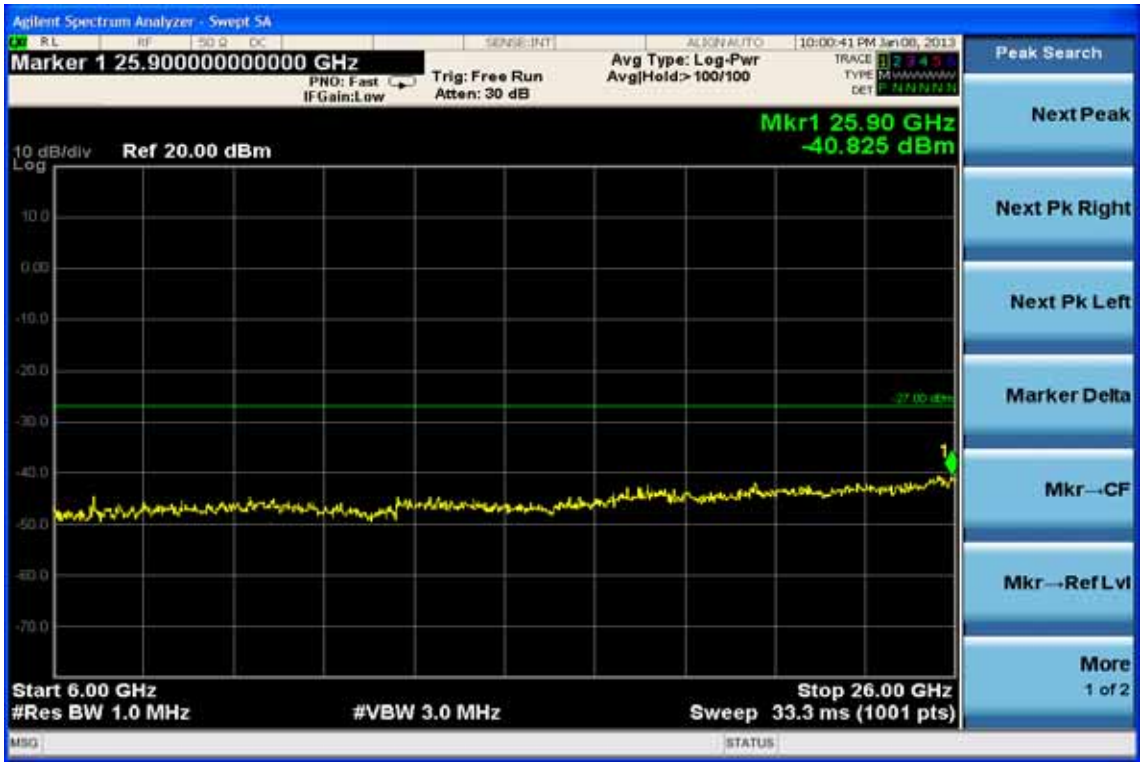
Refer to section 6.3 for details.

802.11a mode

Ch Low 30MHz – 6GHz

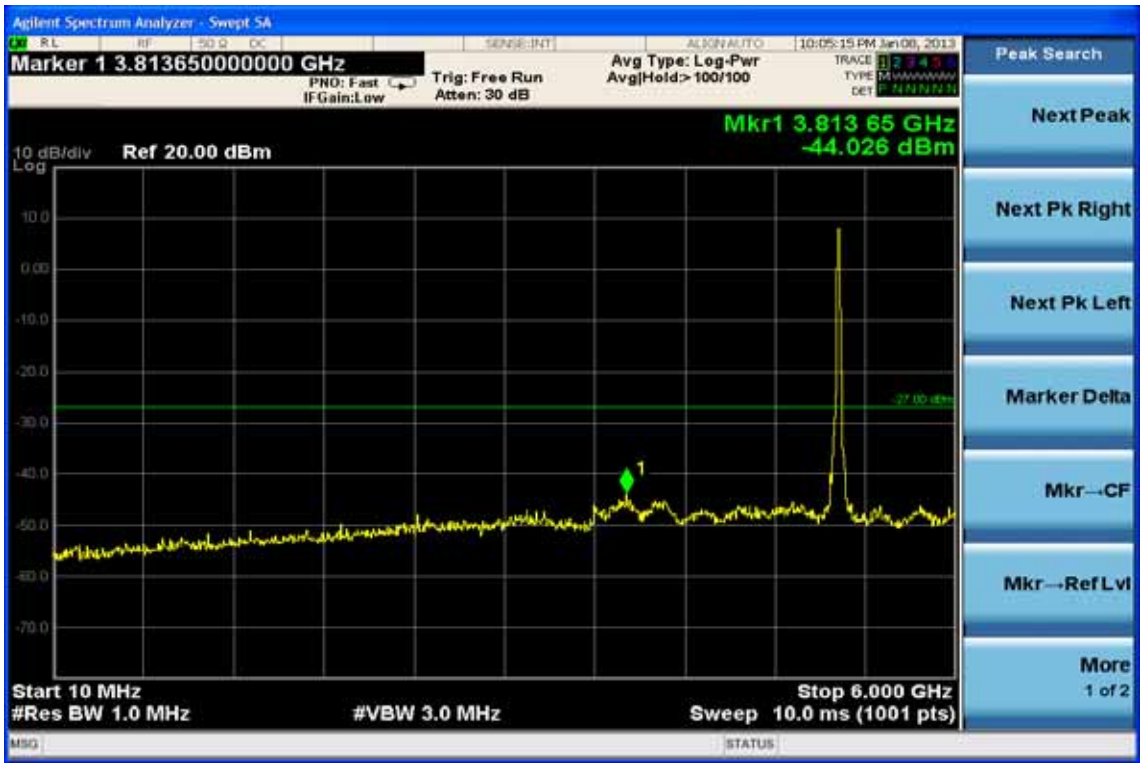


Ch Low 6GHz – 18GHz

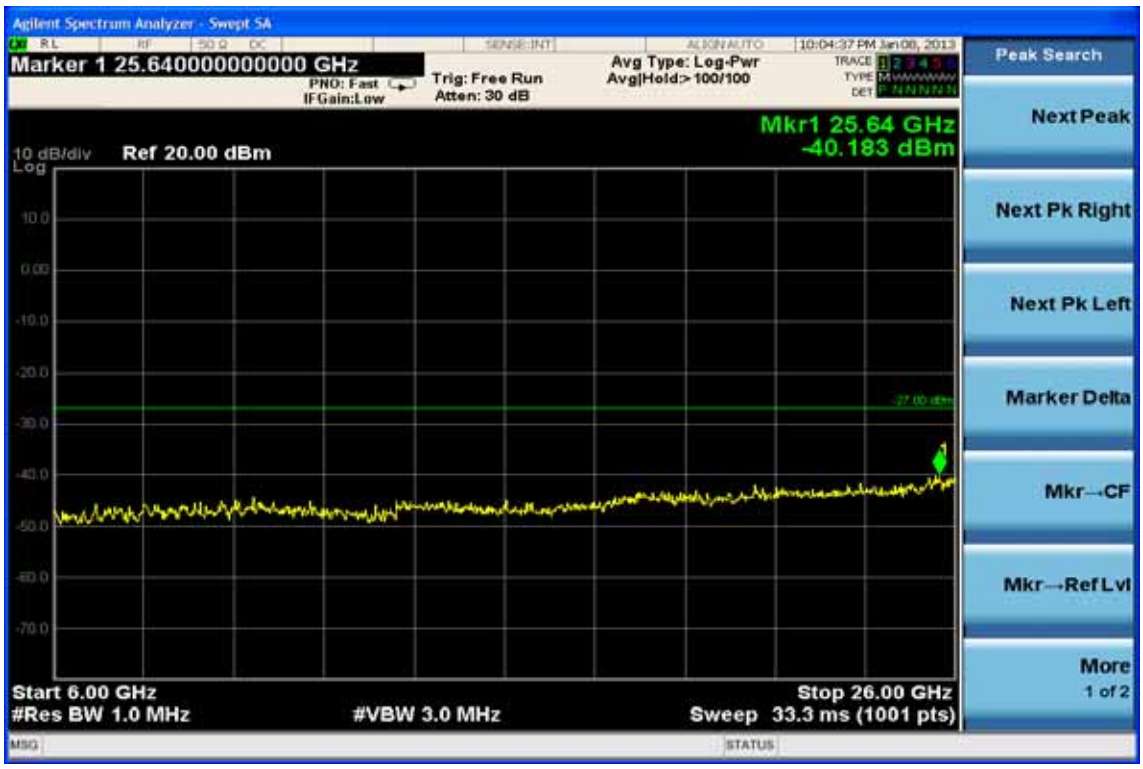


Ch Low 18GHz – 40GHz

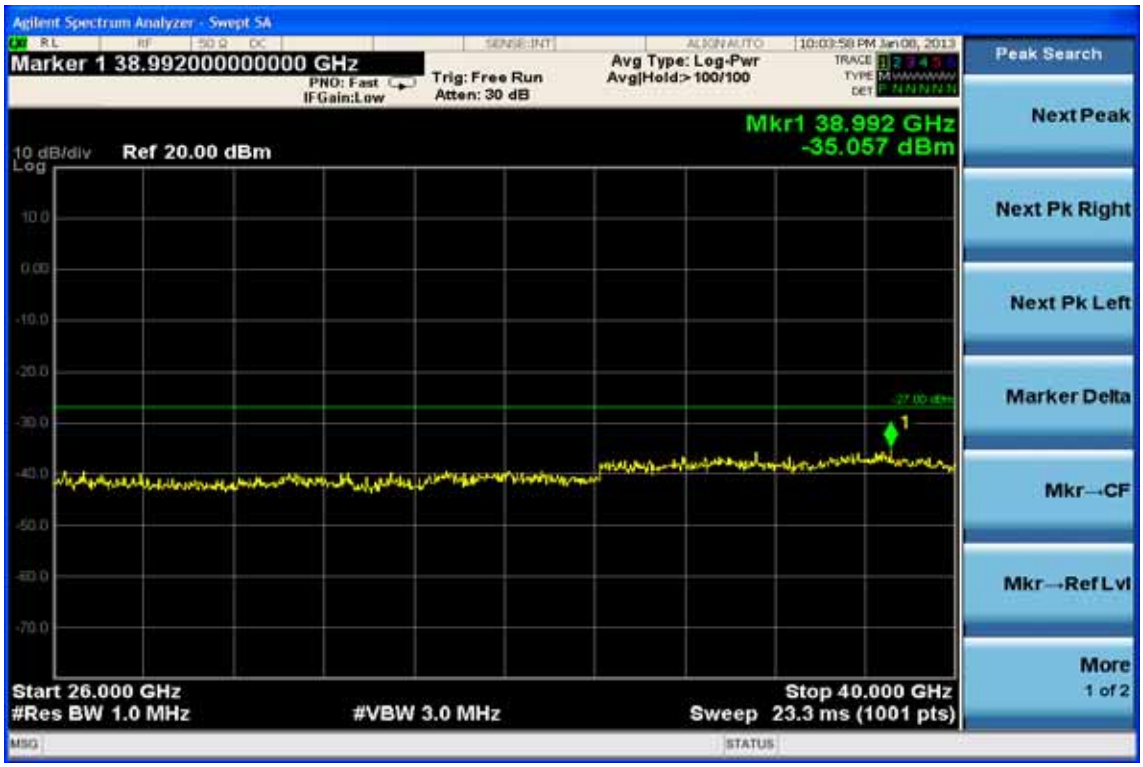
Ch Mid 30MHz – 6GHz



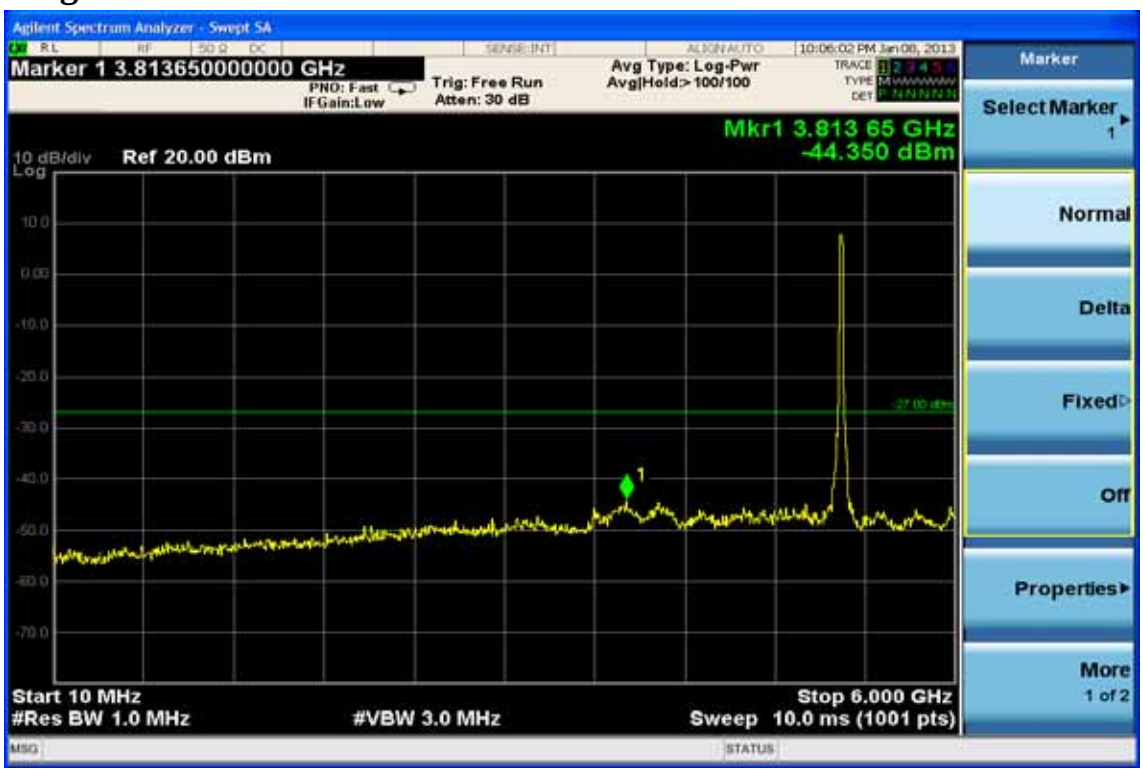
Ch Mid 6GHz – 18GHz



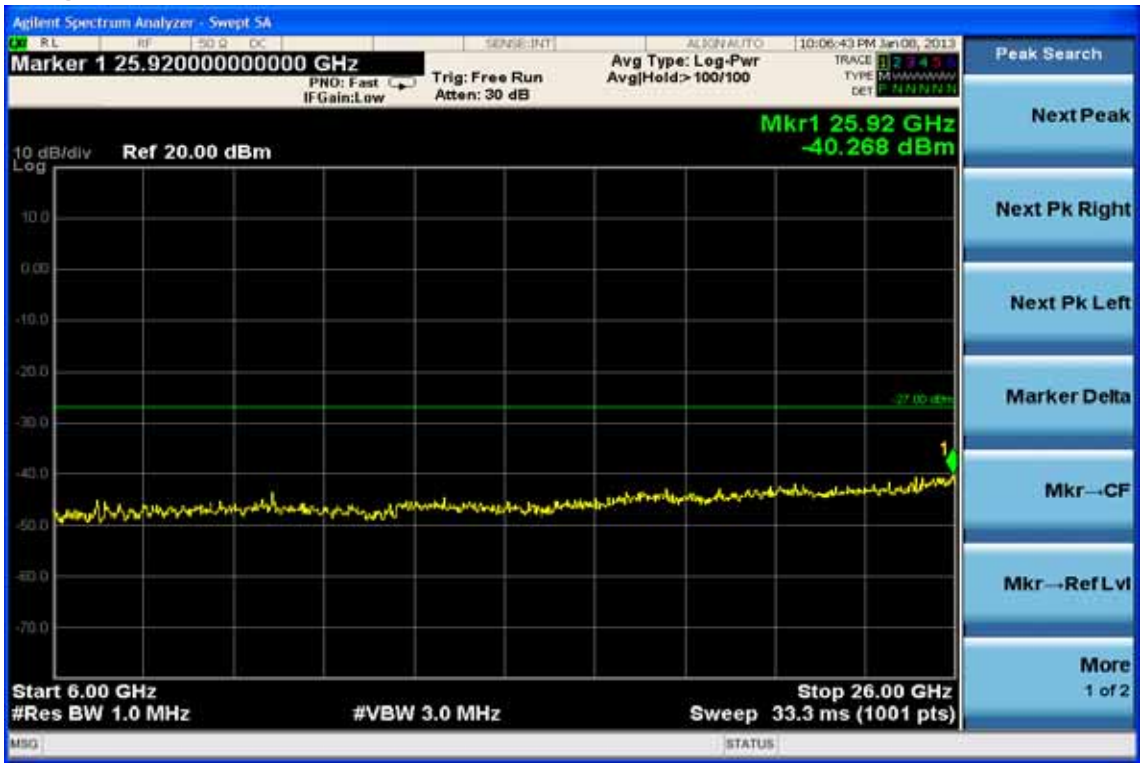
Ch Mid 18GHz – 40GHz



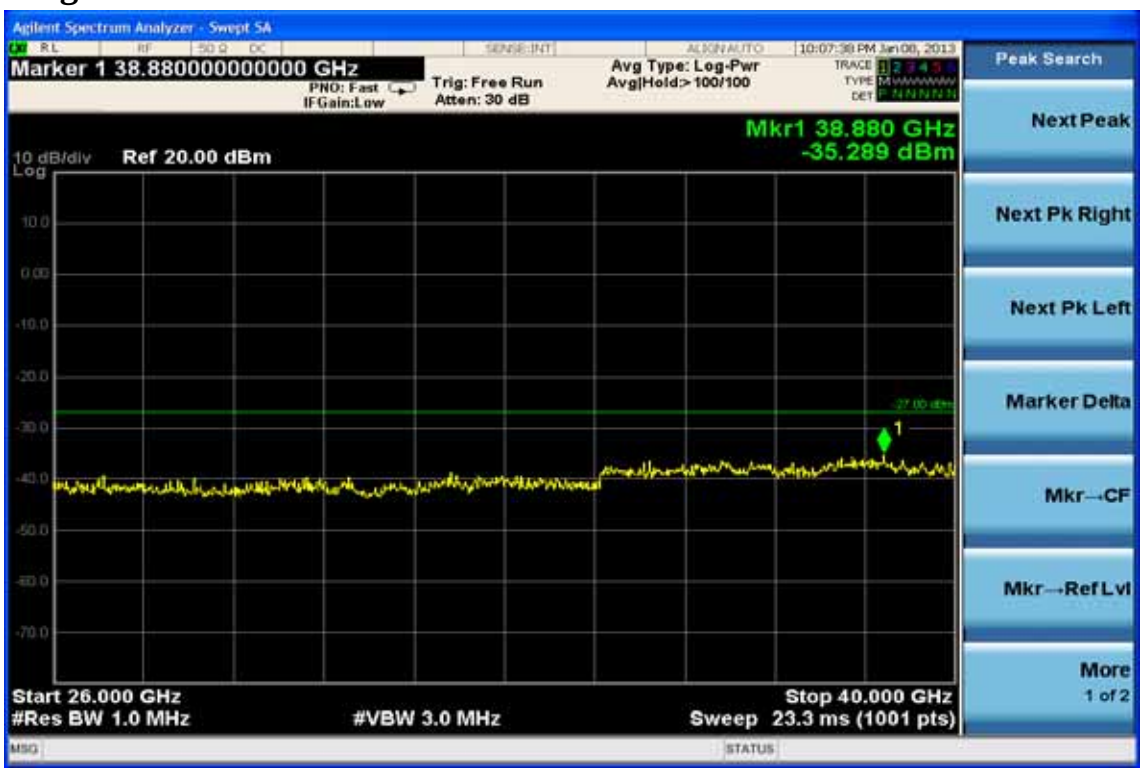
Ch High 30MHz – 6GHz



Ch High 6GHz – 18GHz

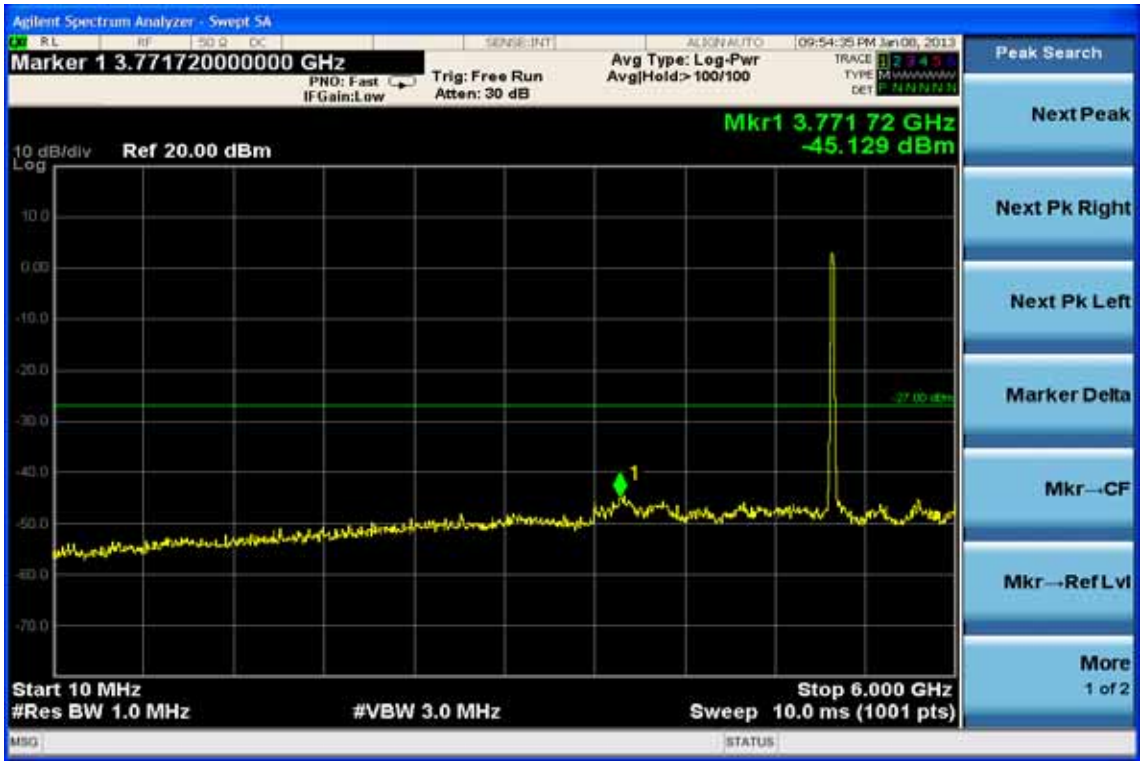


Ch High 18GHz – 40GHz

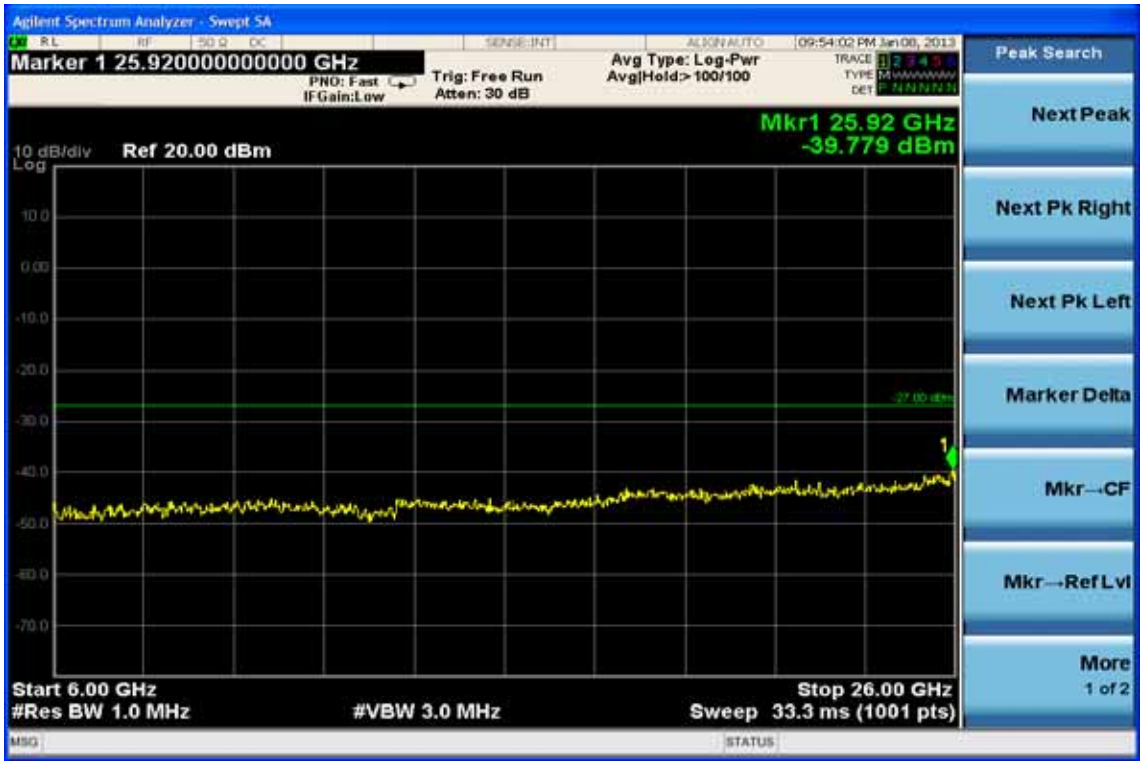


802.11n HT20 Mode (Antenna A Port)

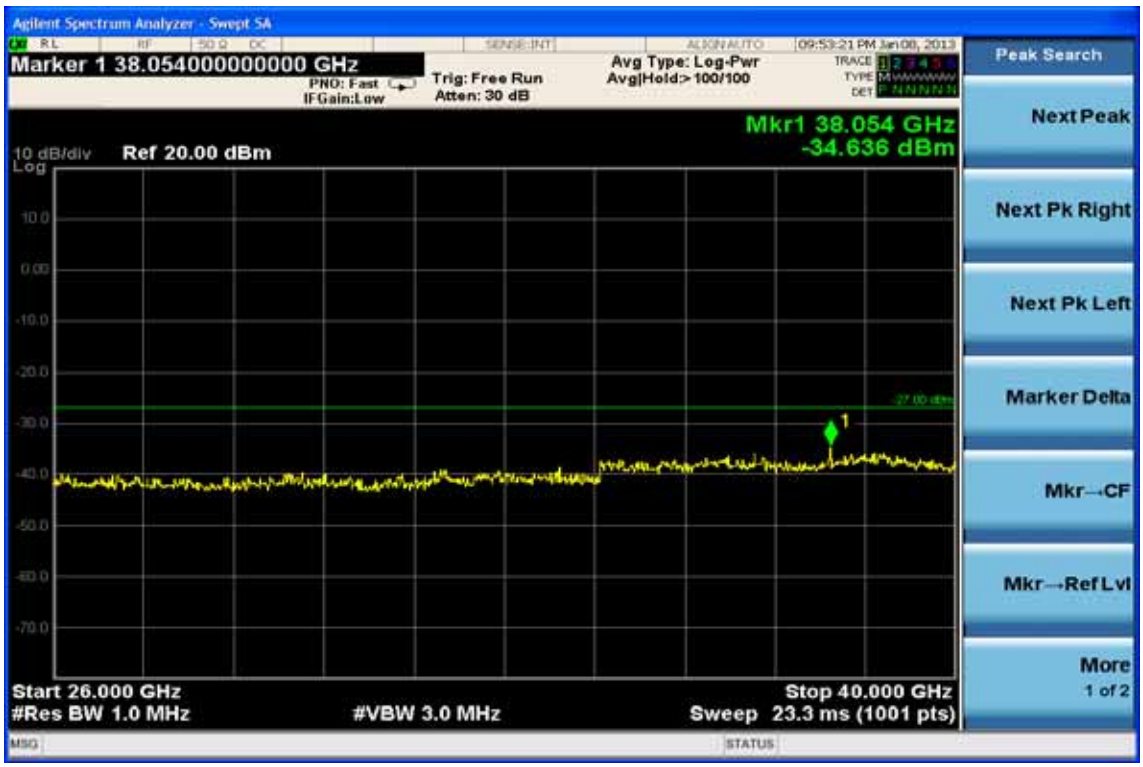
Ch Low 30MHz – 6GHz



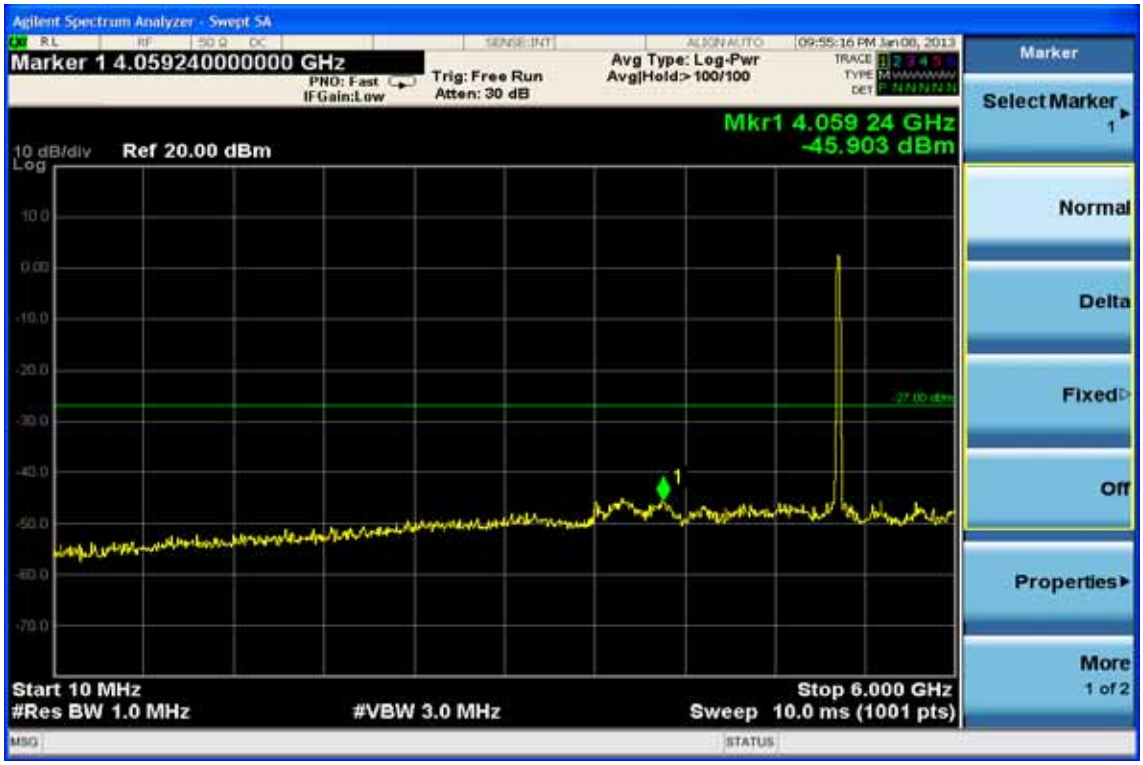
Ch Low 6GHz – 18GHz



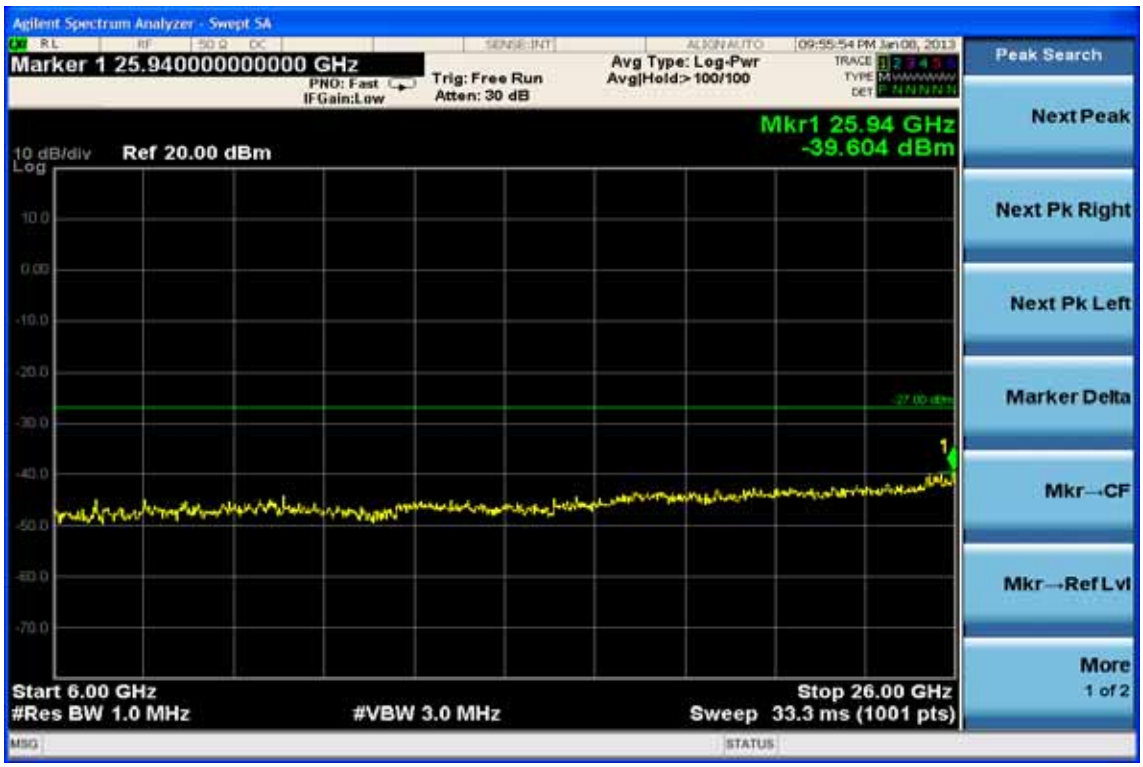
Ch Low 18GHz – 40GHz



Ch Mid 30MHz – 6GHz

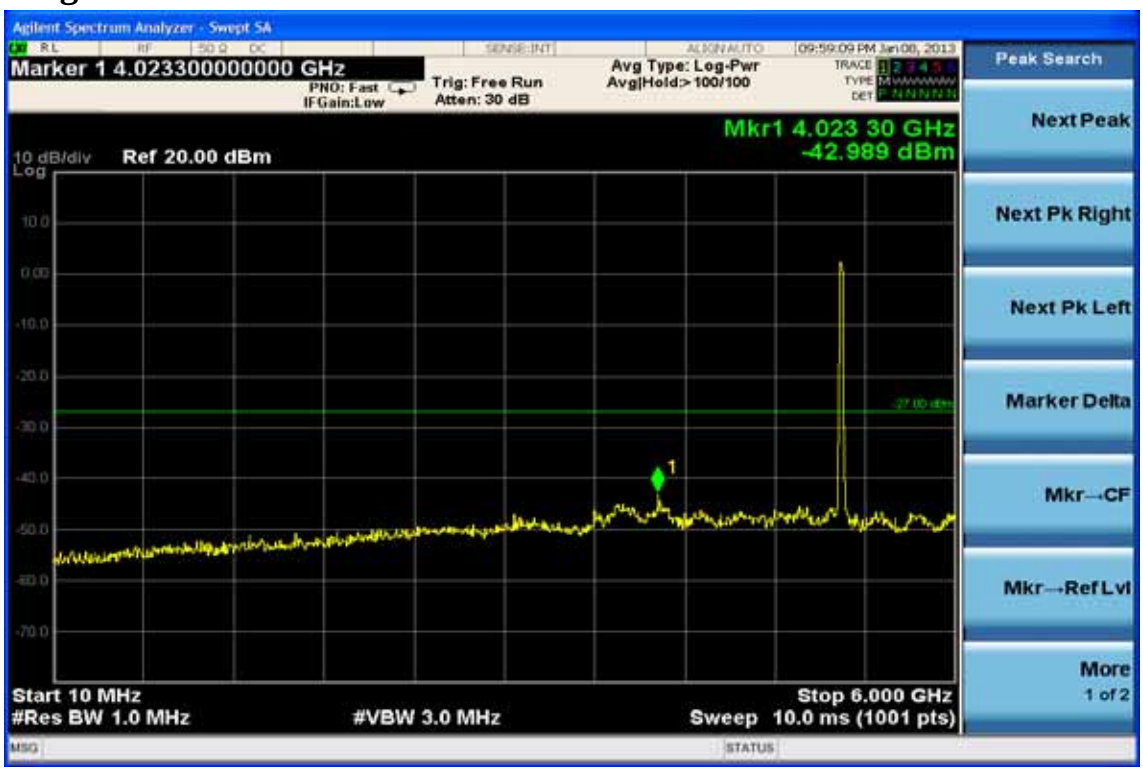


Ch Mid 6GHz – 18GHz

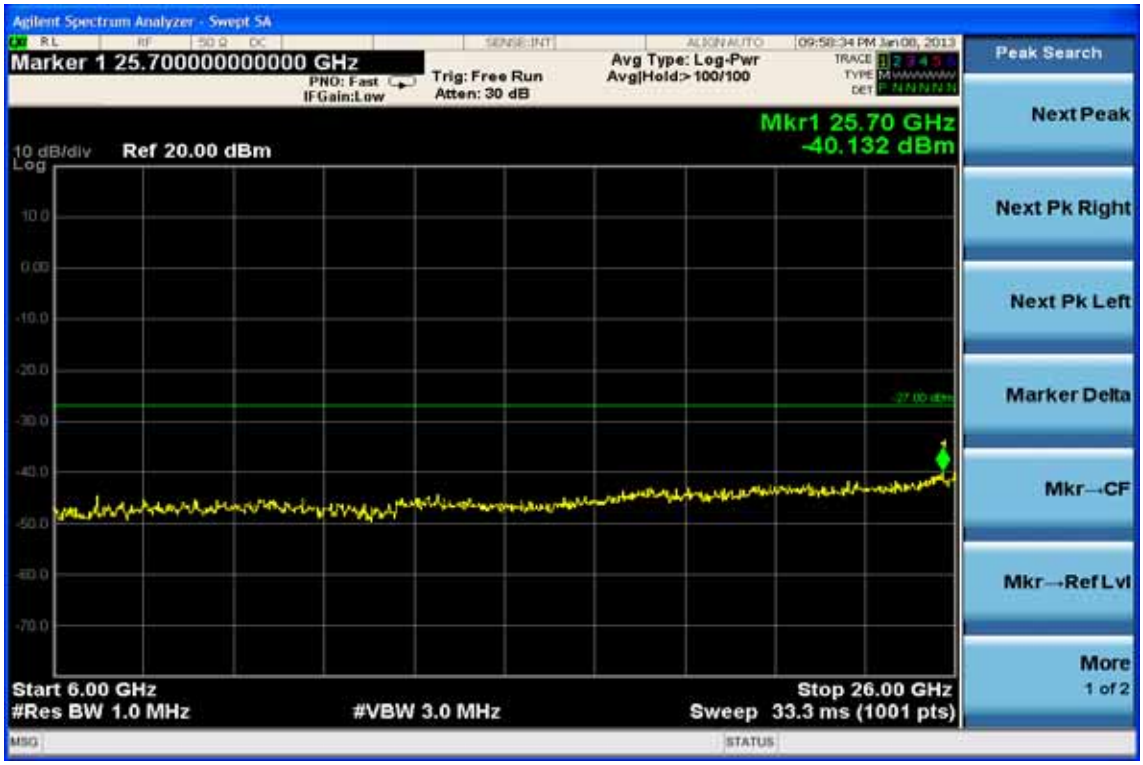


Ch Mid 18GHz – 40GHz

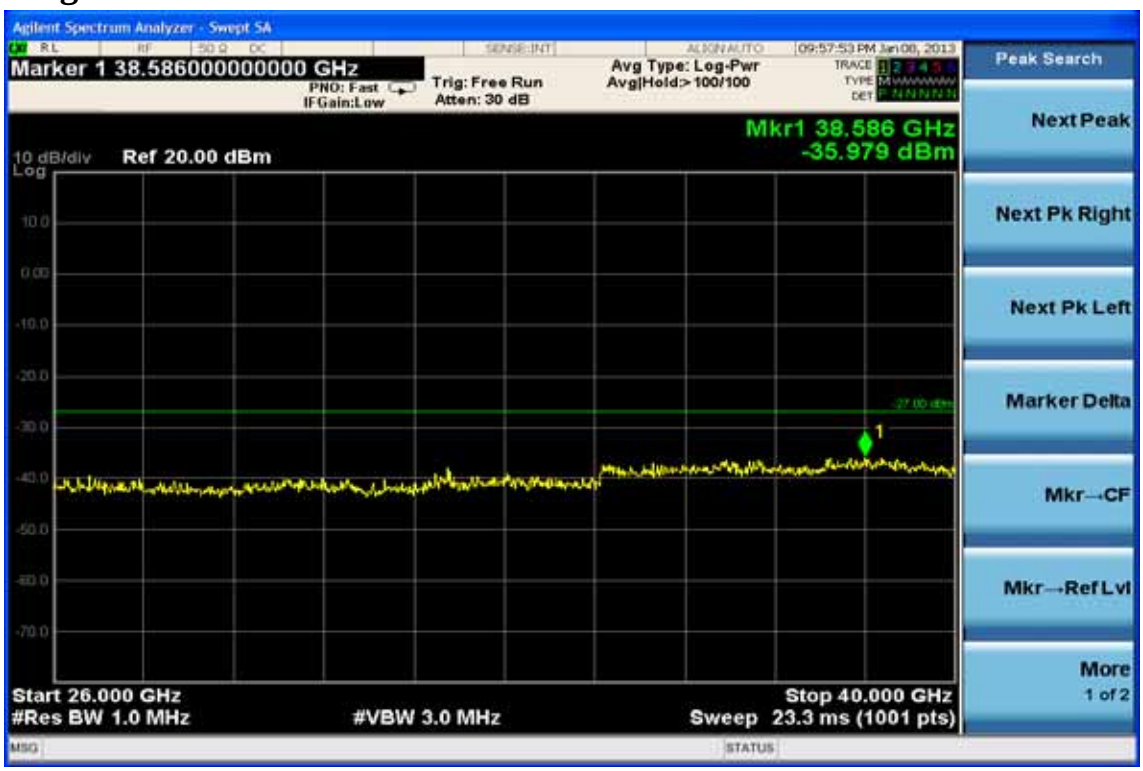
Ch High 30MHz – 6GHz



Ch High 6GHz – 18GHz

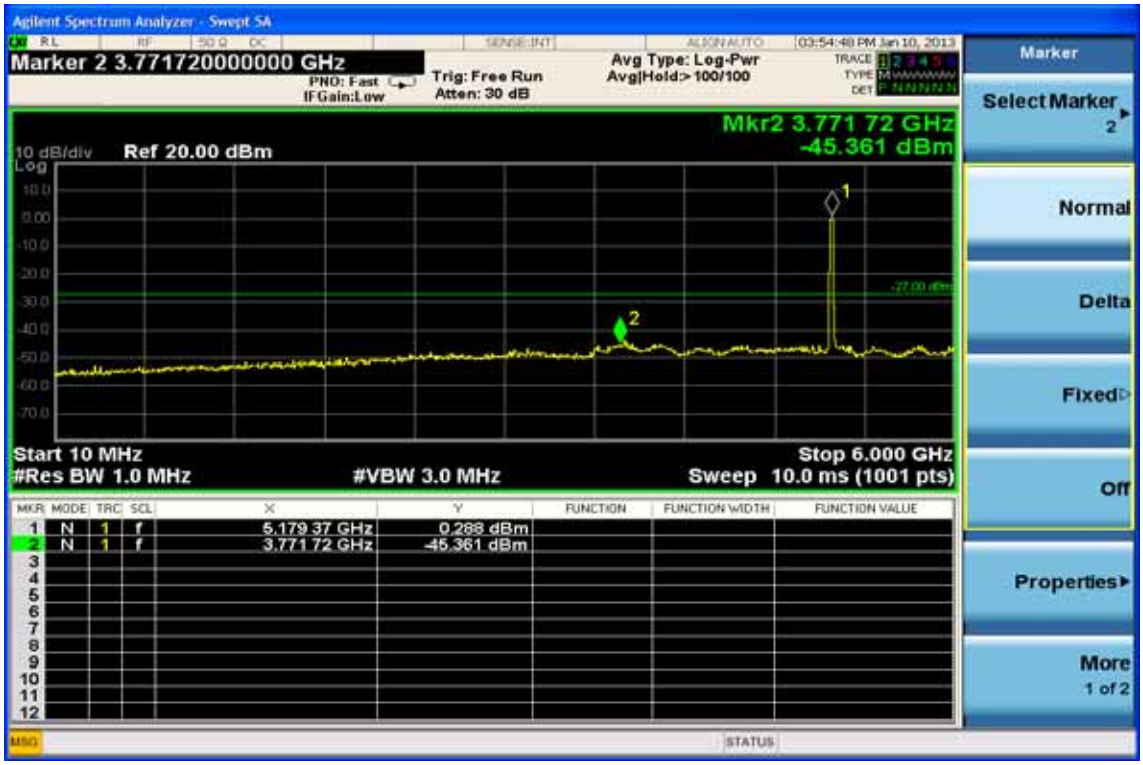


Ch High 18GHz – 40GHz

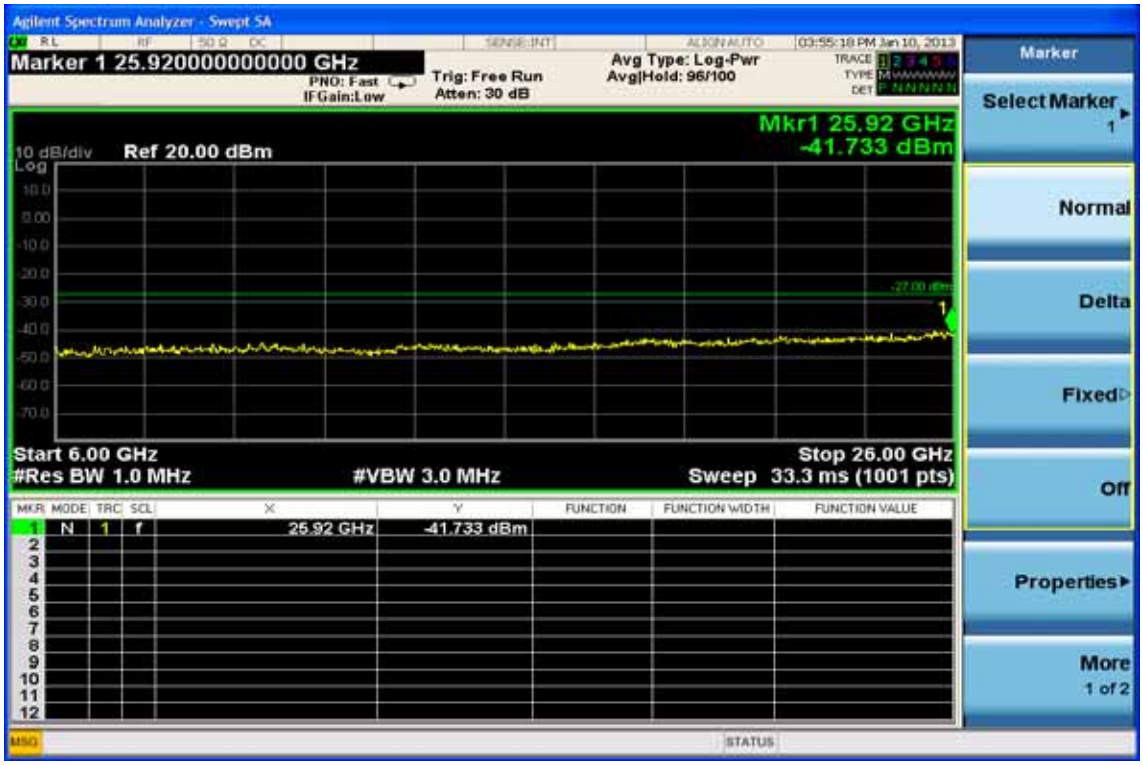


802.11n HT20 Mode (Antenna B Port)

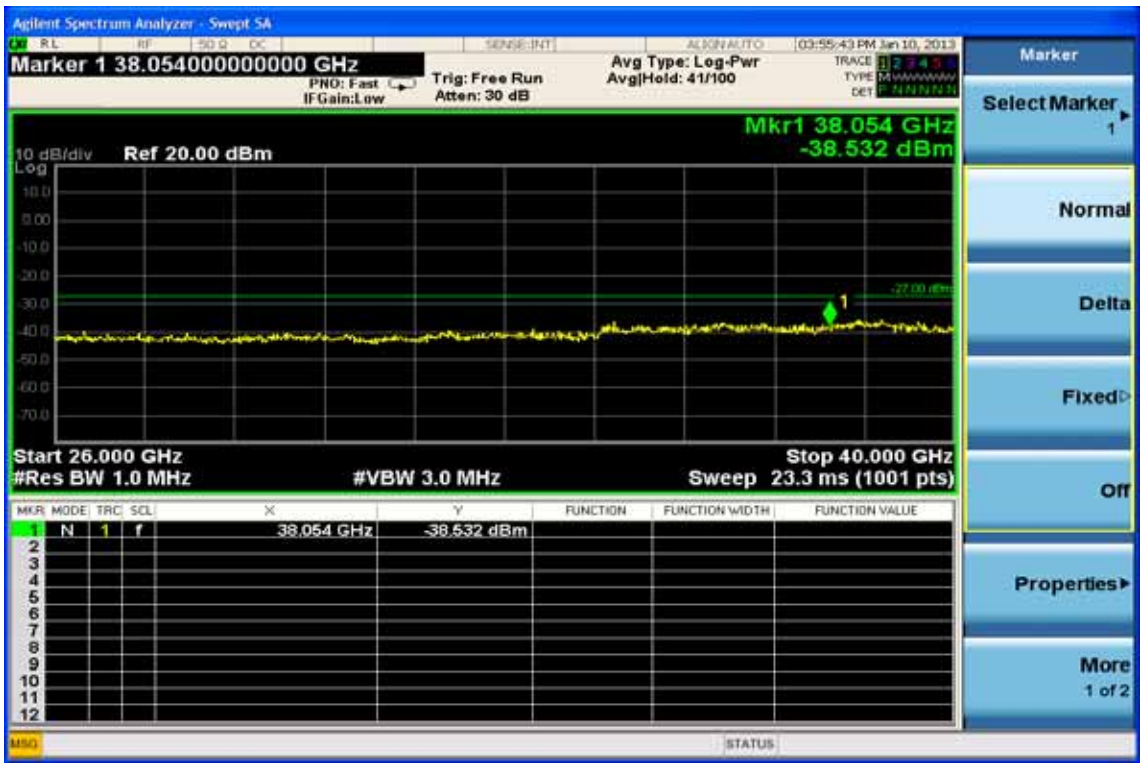
Ch Low 30MHz – 6GHz



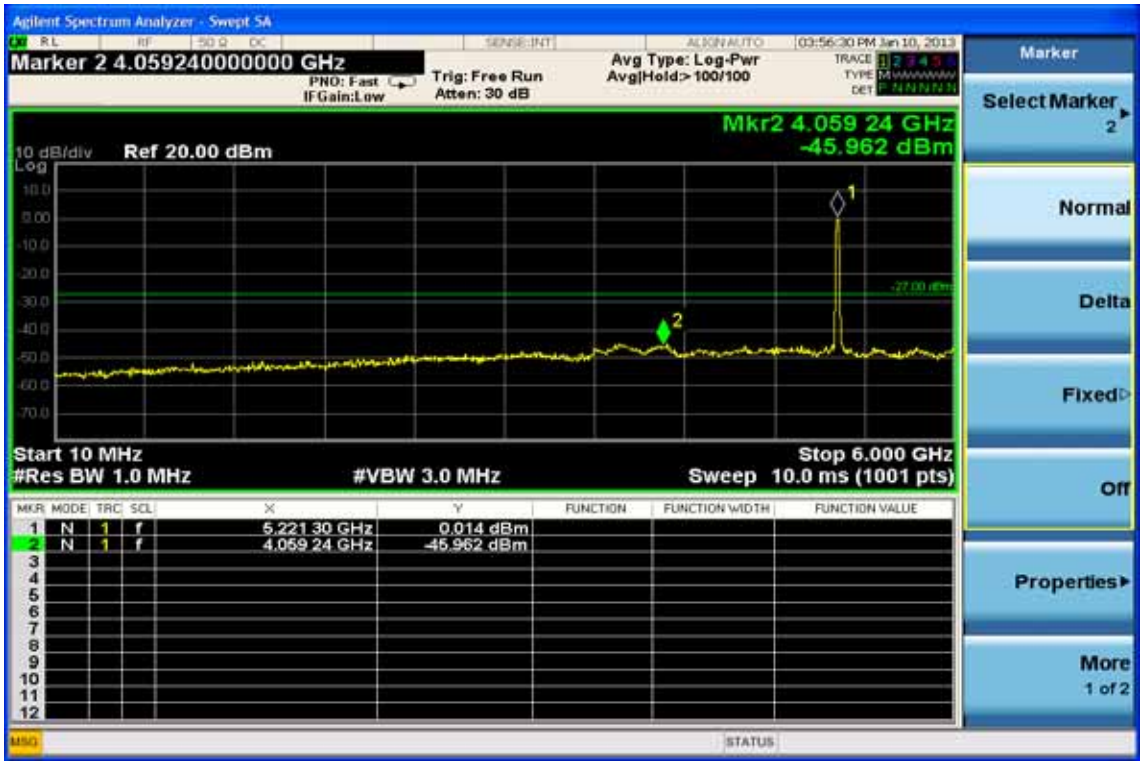
Ch Low 6GHz – 18GHz



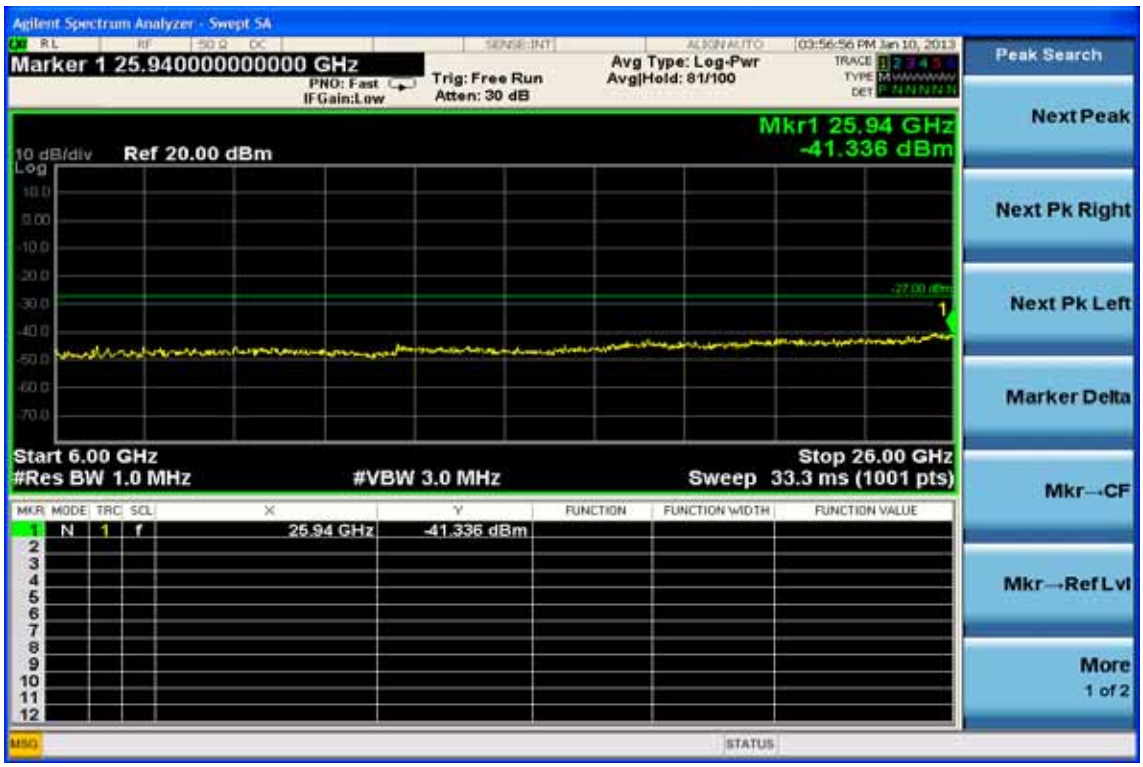
Ch Low 18GHz – 40GHz



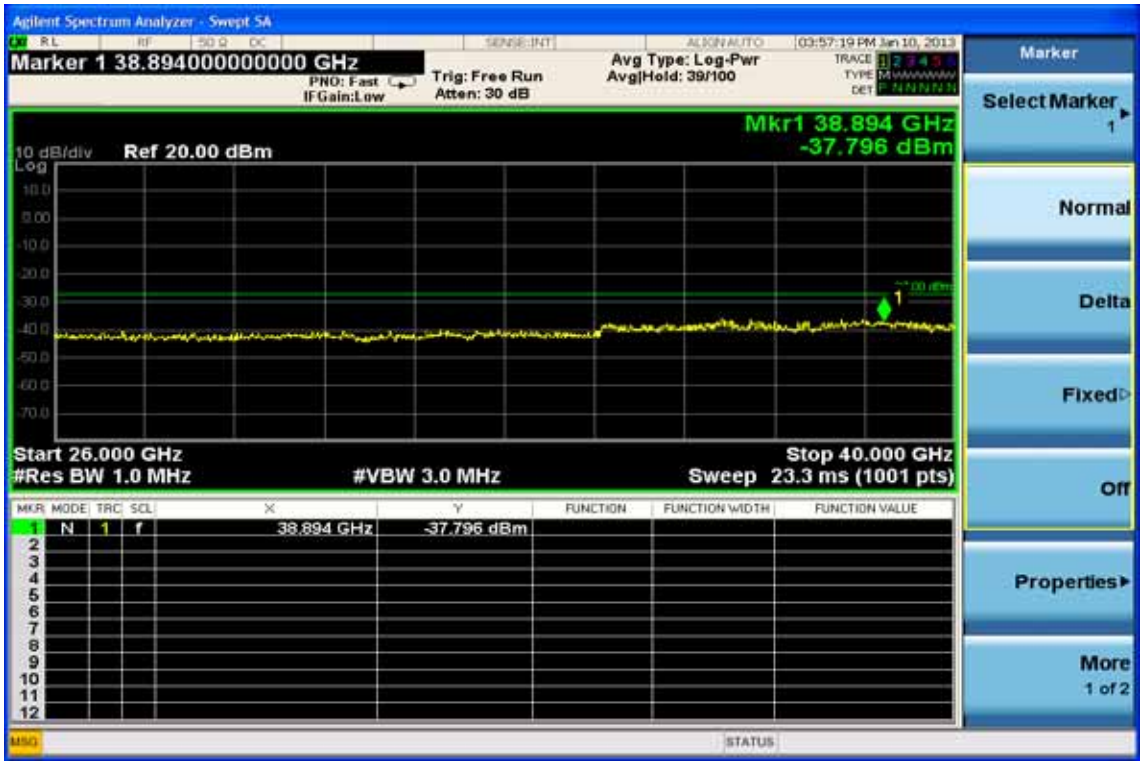
Ch Mid 30MHz – 6GHz



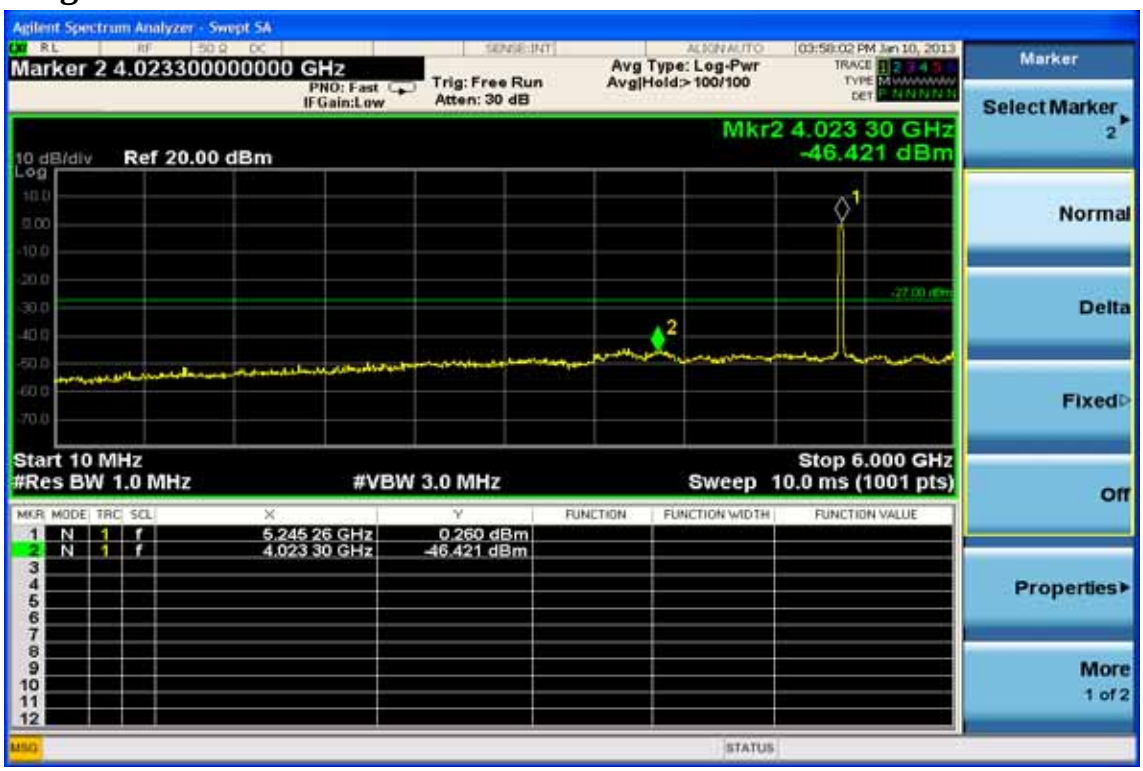
Ch Mid 6GHz – 18GHz



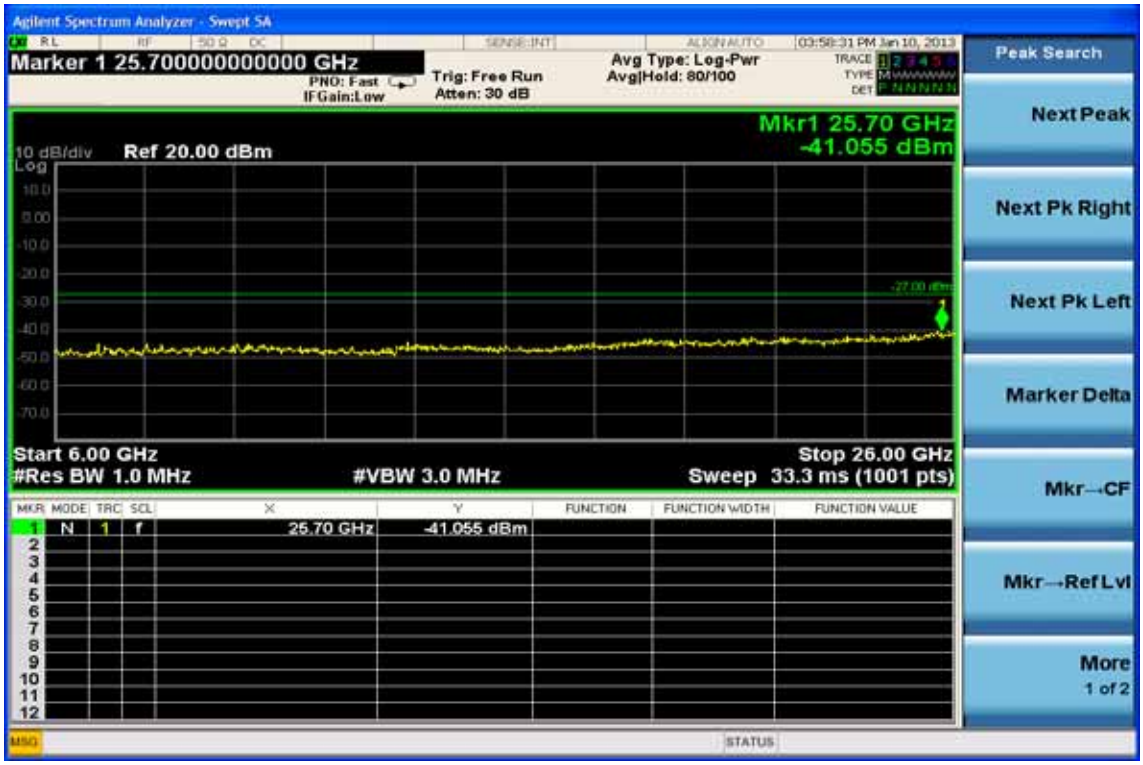
Ch Mid 18GHz – 40GHz



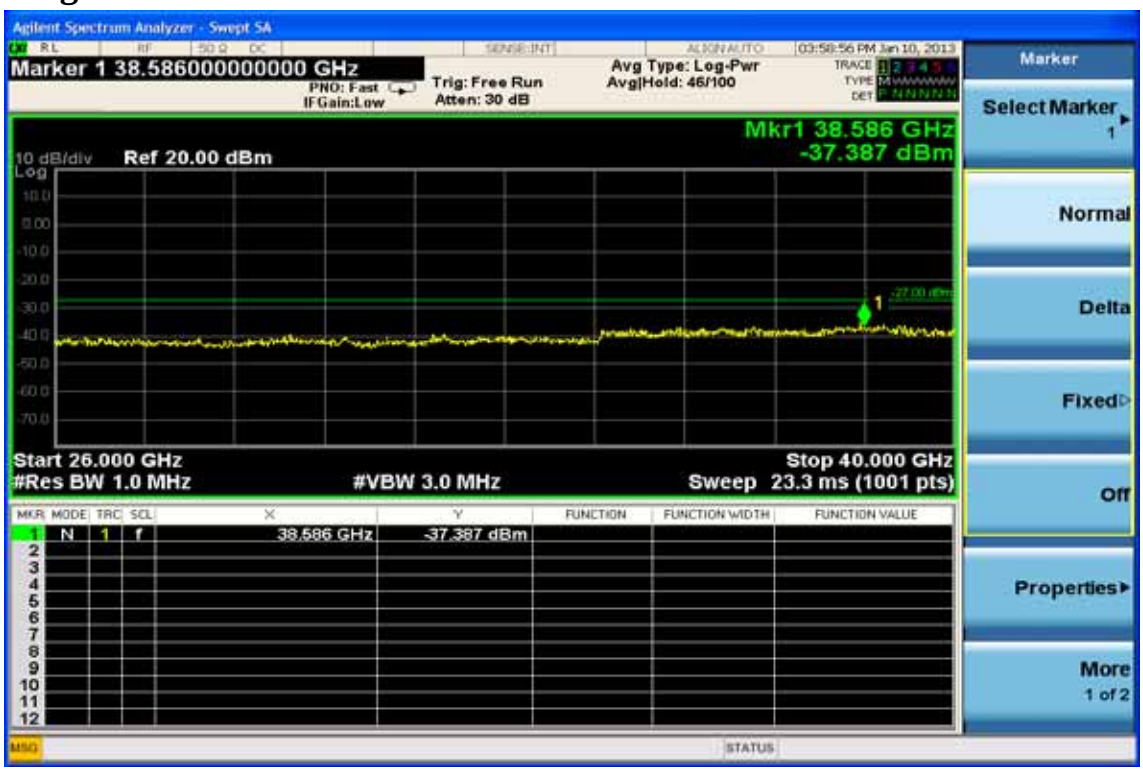
Ch High 30MHz – 6GHz



Ch High 6GHz – 18GHz

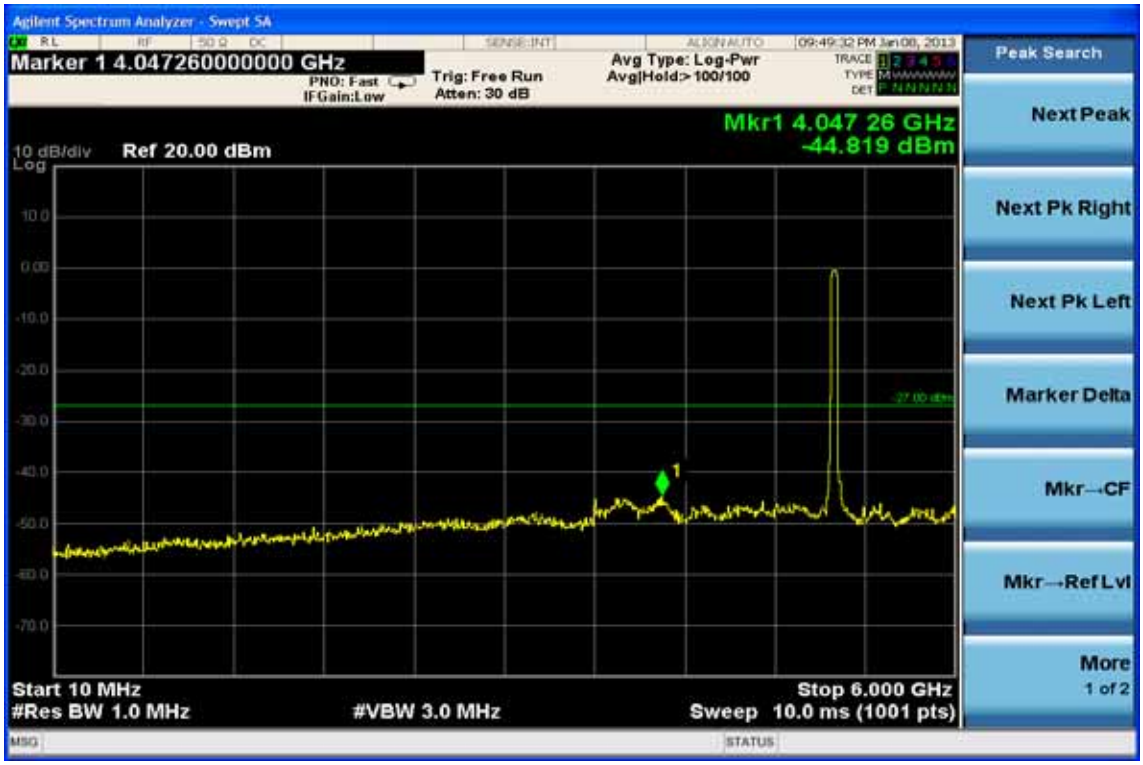


Ch High 18GHz – 40GHz

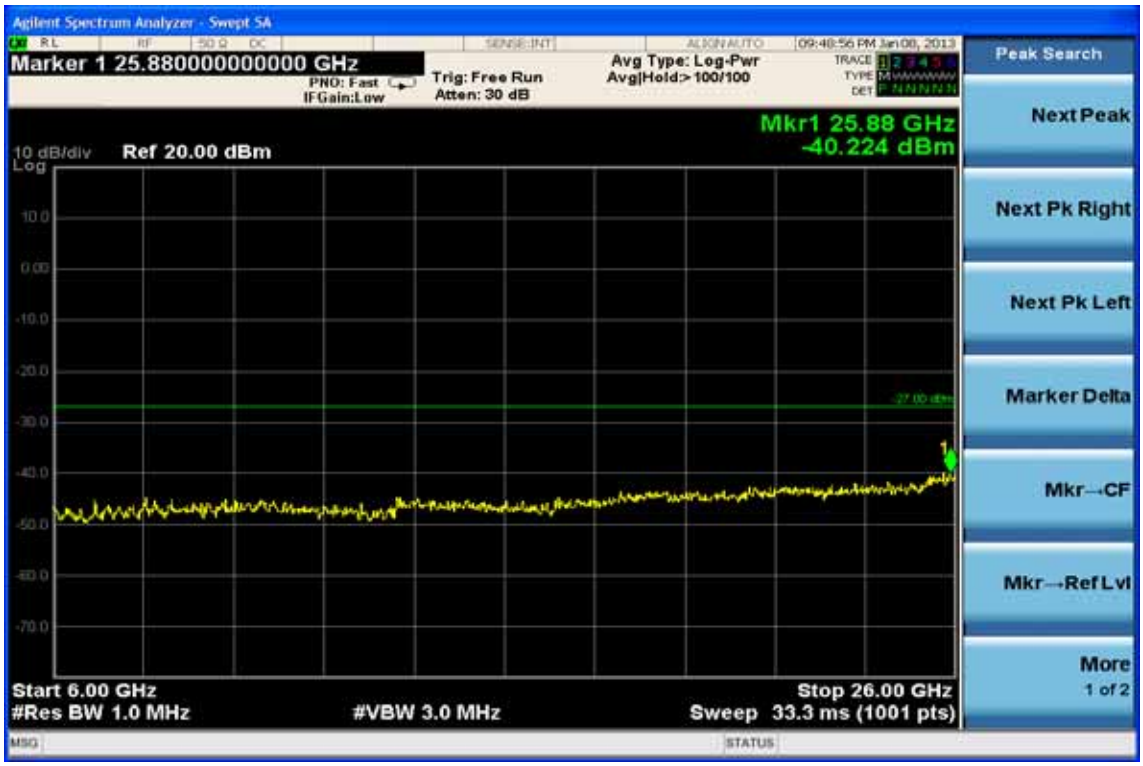


802.11n HT40 Mode (Antenna A Port)

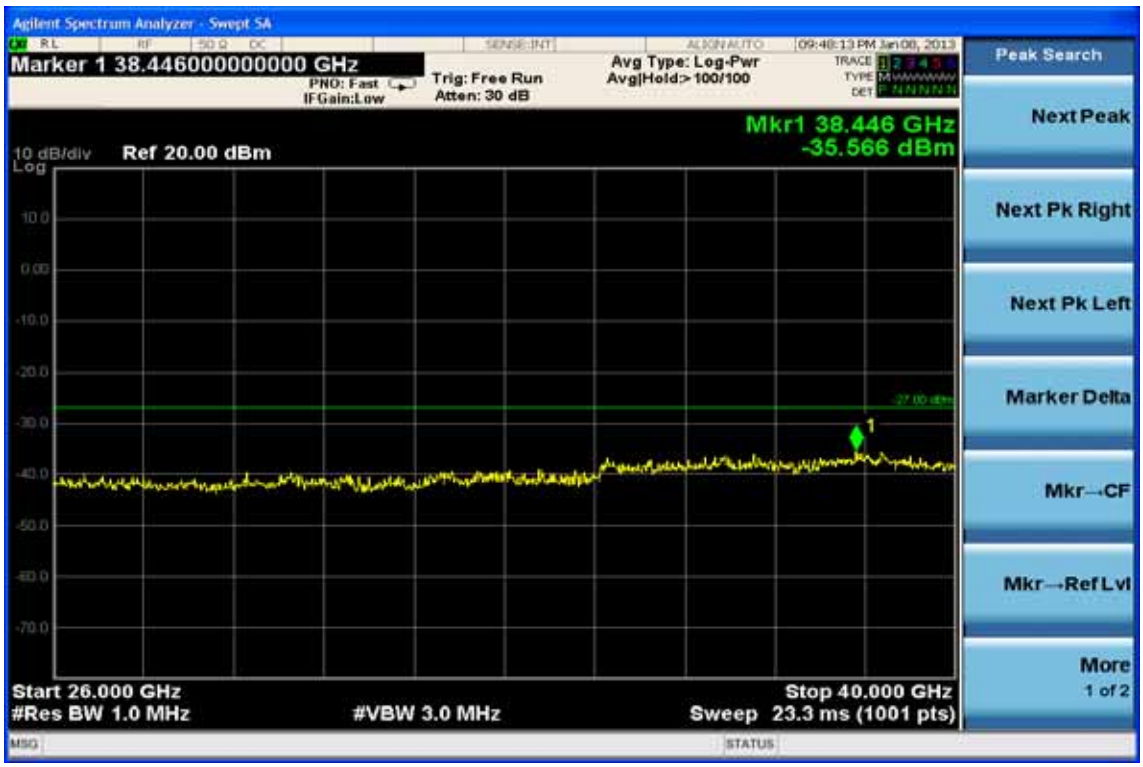
Ch Low 30MHz – 6GHz



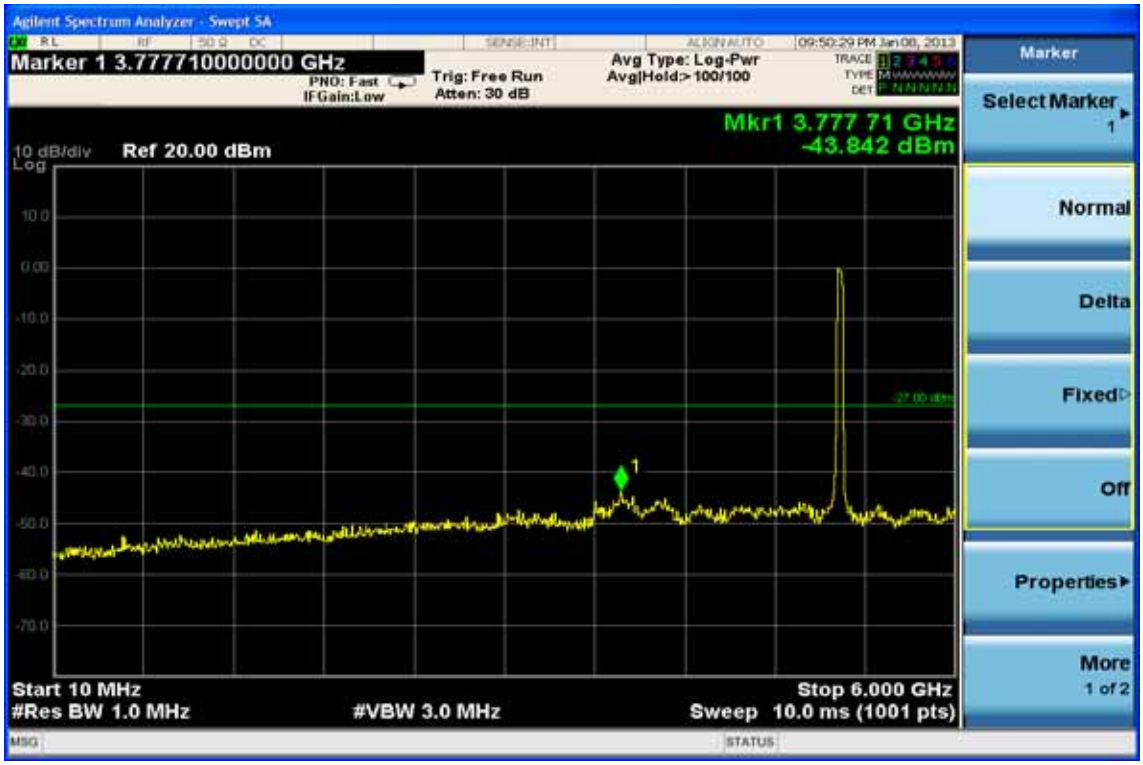
Ch Low 6GHz – 18GHz



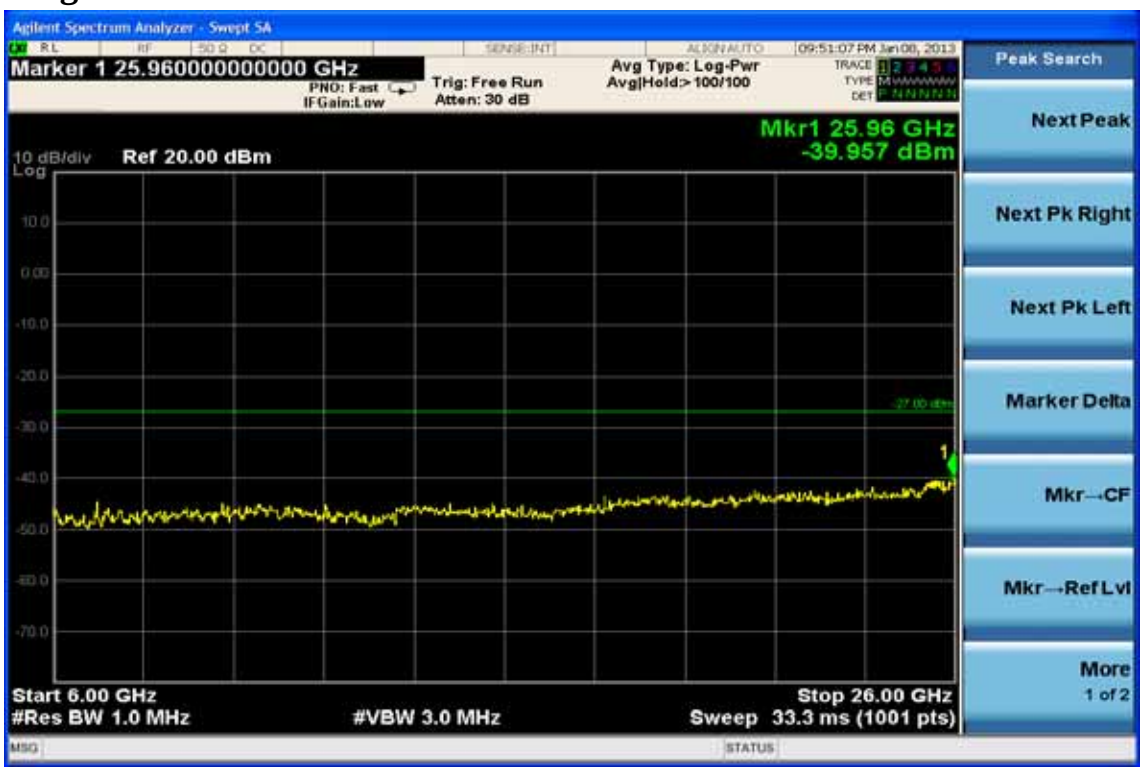
Ch Low 18GHz – 40GHz



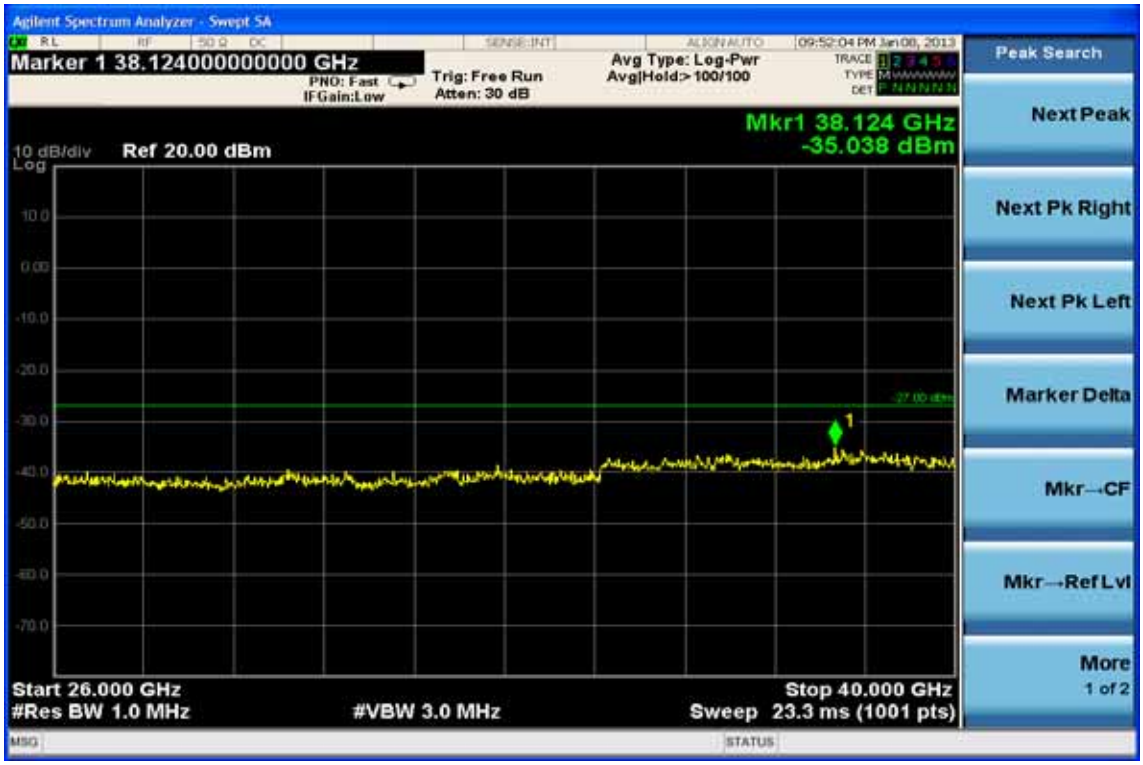
Ch High 30MHz – 6GHz



Ch High 6GHz – 18GHz

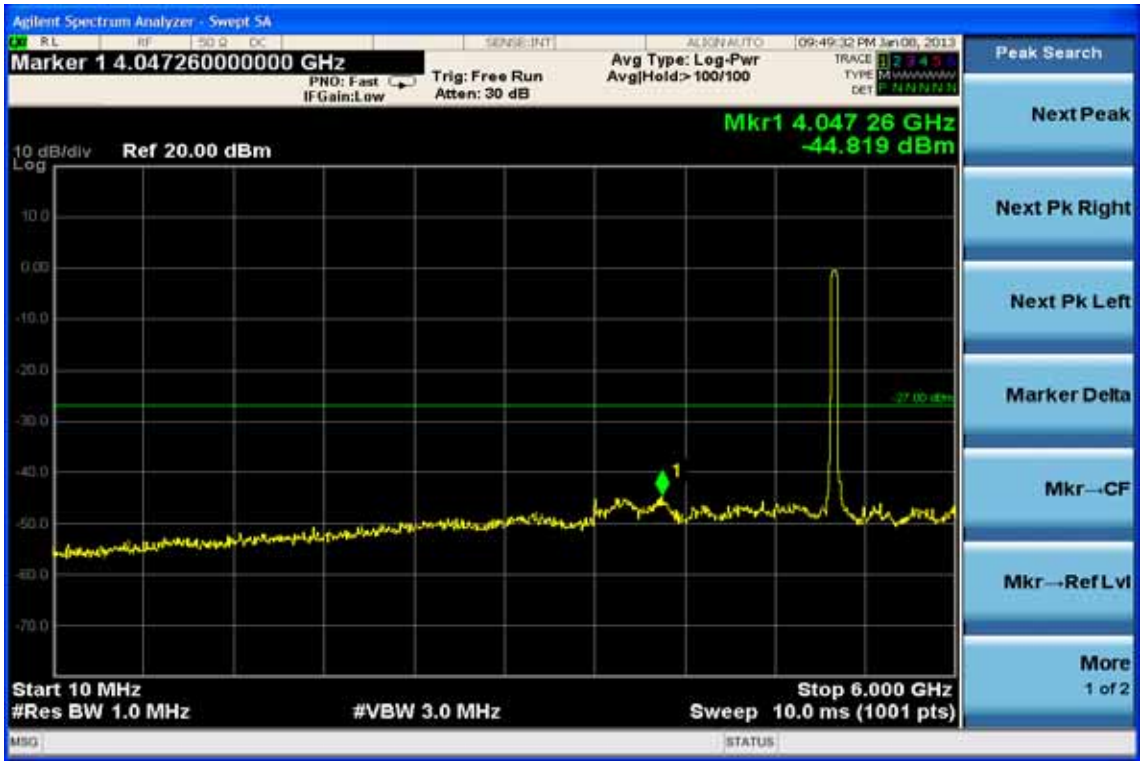


Ch High 18GHz – 40GHz

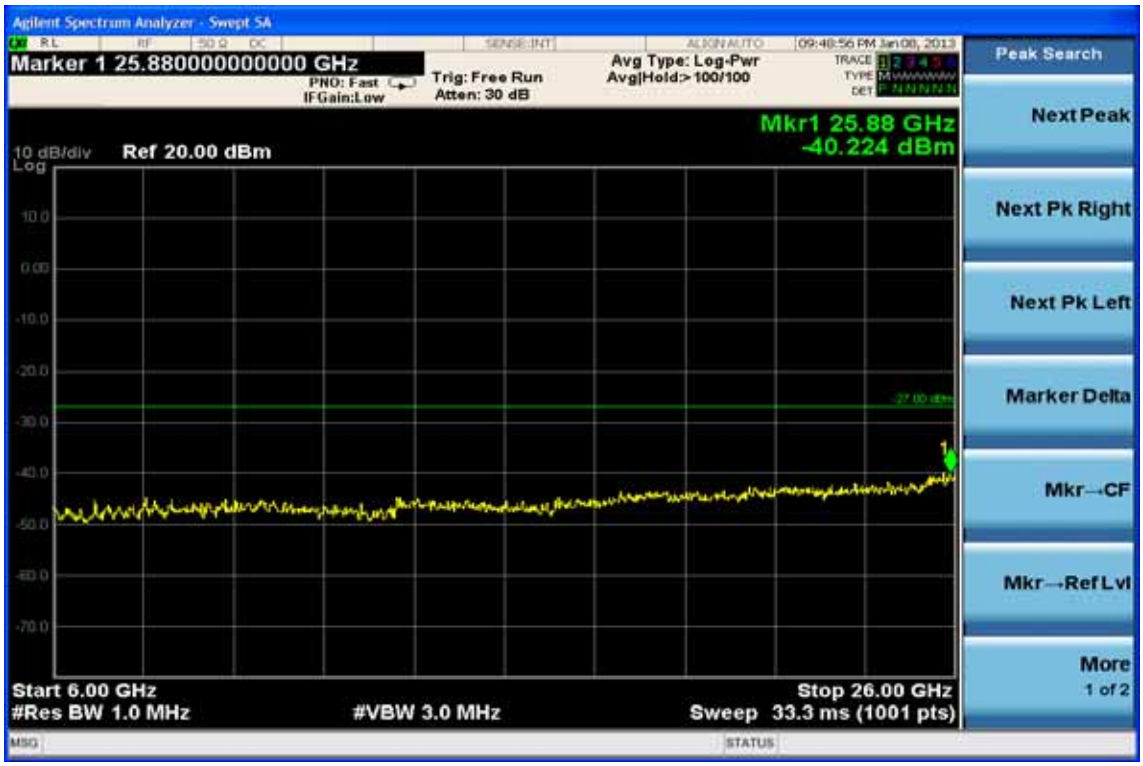


802.11n HT40 Mode (Antenna B Port)

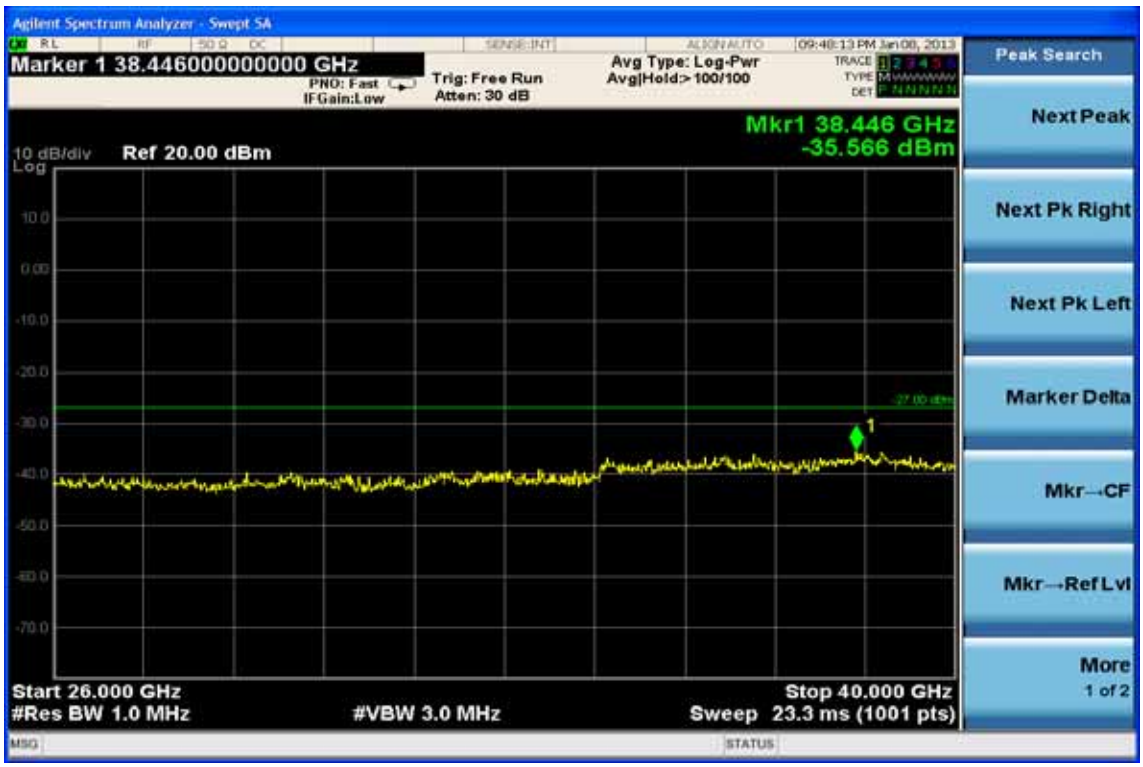
Ch Low 30MHz – 6GHz



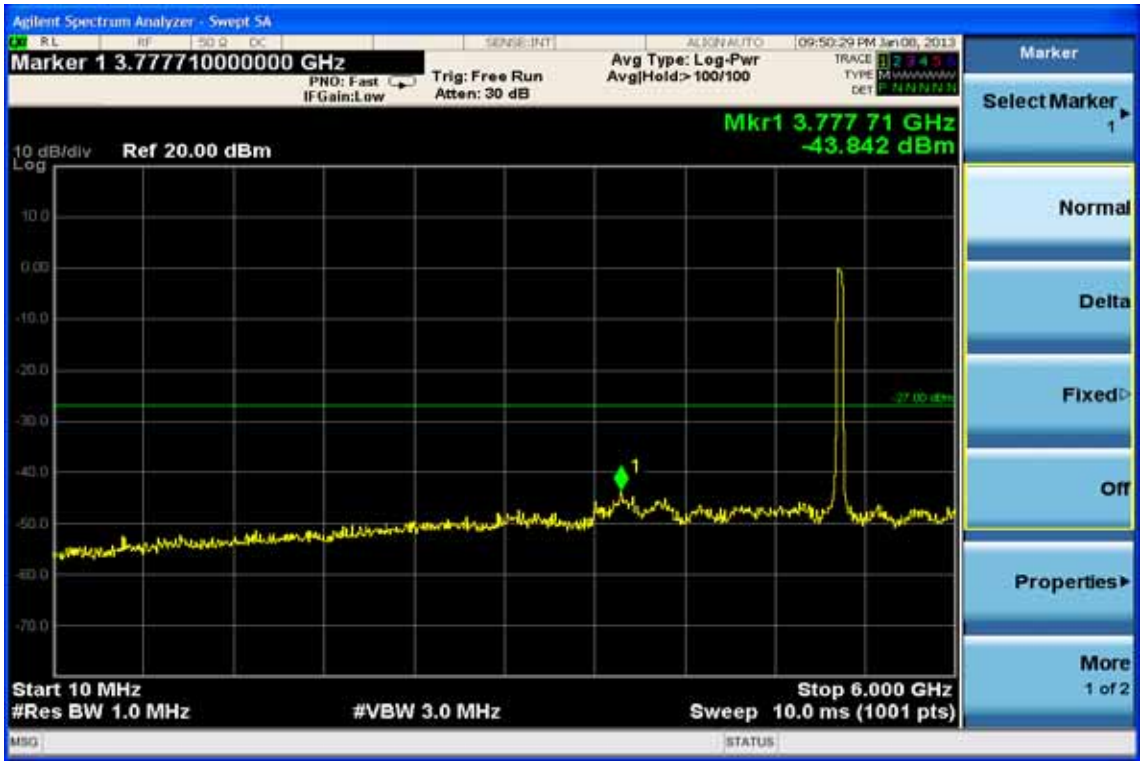
Ch Low 6GHz – 18GHz



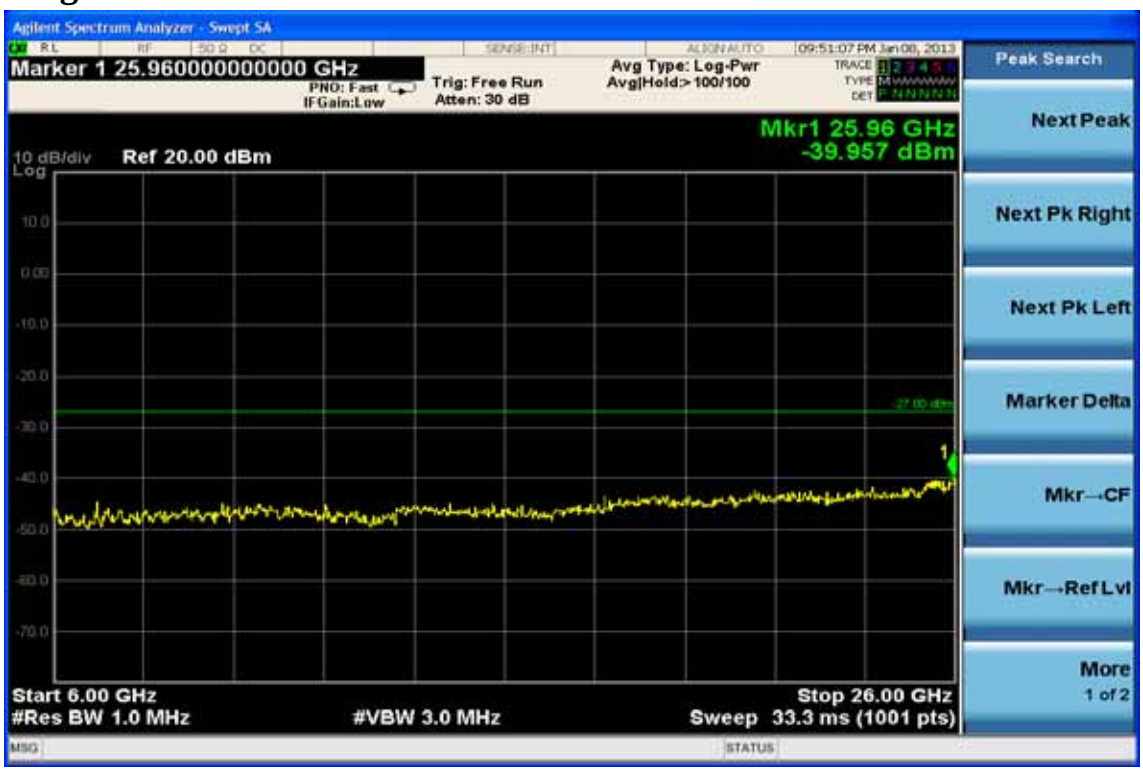
Ch Low 18GHz – 40GHz



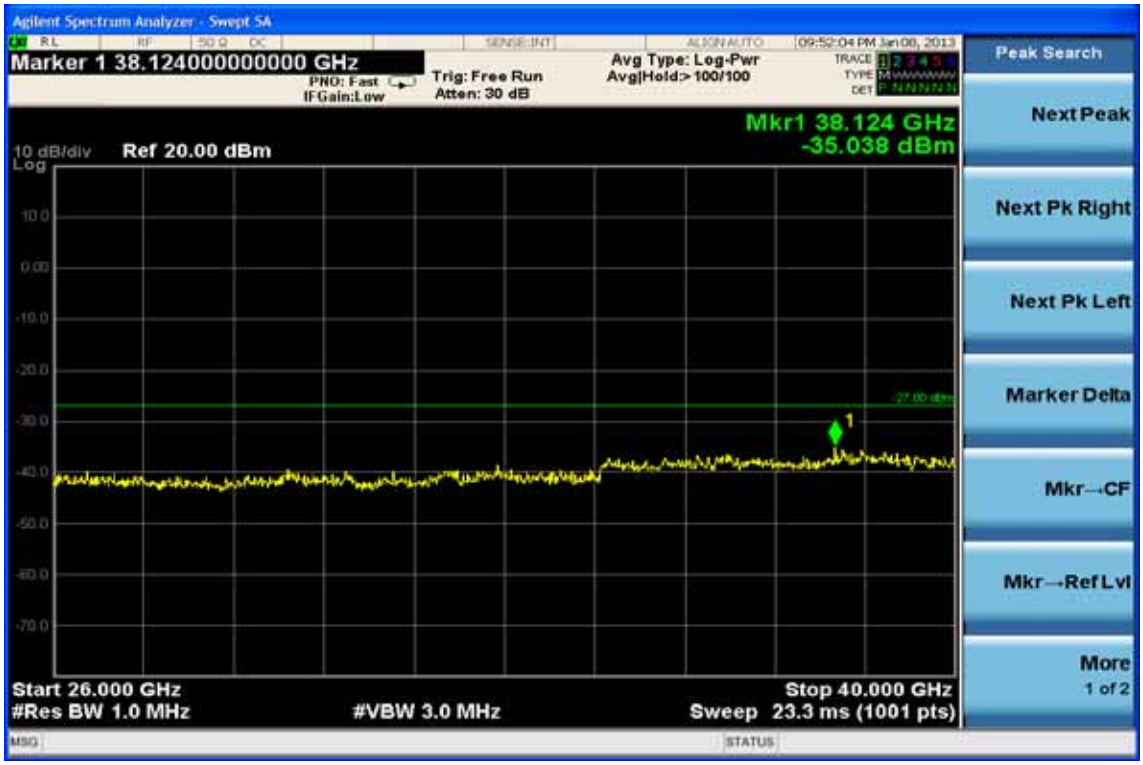
Ch High 30MHz – 6GHz



Ch High 6GHz – 18GHz



Ch High 18GHz – 40GHz



11. UNDESIRABLE EMISSION - RADICTED MEASUREMENT

11.1 Standard Applicable

According to §15.407(b),

(b) Undesirable Emission Limits: Except as shown in Paragraph (b)(6) of this section, the peak emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

(1) For transmitters operating in the 5.15-5.25 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27 dBm/MHz.

(2) For transmitters operating in the 5.25-5.35 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27 dBm/MHz. Devices operating in the 5.25-5.35 GHz band that generate emissions in the 5.15-5.25 GHz band must meet all applicable technical requirements for operation in the 5.15-5.25 GHz band (including indoor use) or alternatively meet an out-of-band emission EIRP limit of -27 dBm/MHz in the 5.15-5.25 GHz band.

(3) For transmitters operating in the 5.47-5.725 GHz band: all emissions outside of the 5.47-5.725 GHz band shall not exceed an EIRP of -27 dBm/MHz.

(4) For transmitters operating in the 5.725-5.825 GHz band: all emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an EIRP of -17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an EIRP of -27 dBm/MHz.

(5) The above emission measurements shall be performed using a minimum resolution bandwidth of 1 MHz. A lower resolution bandwidth may be employed near the band edge, when necessary, provided the measured energy is integrated to show the total power over 1 MHz.

(6) Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in Section 15.209. Further, any U-NII devices using an AC power line are required to comply also with the conducted limits set forth in Section 15.207.

(7) The provisions of Section 15.205 of this part apply to intentional radiators operating under this section.

(8) When measuring the emission limits, the nominal carrier frequency shall be adjusted as close to the upper and lower frequency block edges as the design of the equipment permits.

§15.205- RESTRICTED BANDS OF OPERATIONS

(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
[1]0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 -	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.52525	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	156.7 - 156.9	3260 - 3267	23.6 - 24.0
12.29 - 12.293	162.0125 - 167.17	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	167.72 - 173.2	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	240 - 285	3600 - 4400	([2])
13.36 - 13.41	322 - 335.4		

[1] Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

[2] Above 38.6

(b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

§15.209- RADIATED EMISSION LIMITS: GENERAL REQUIREMENTS

FCC PART 15.209

MEASURING DISTANCE OF 3 METER		
FREQUENCY RANGE (MHz)	FIELD STRENGTH (Microvolts/m)	FIELD STRENGTH (dBuV/m)
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

11.2 EUT Setup

1. The radiated emission tests were performed in the 3 meter open-test site, using the setup in accordance with the ANSI C63.4-1992.
2. The EUT was put in the front of the test table. The host PC system was placed on the center of the back edge on the test table. The peripherals like modem, monitor printer, K/B, and mouse were placed on the side of the host PC system. The rear of the EUT and peripherals were placed flushed with the rear of the tabletop.
3. The keyboard was placed directly in the front of the monitor, flushed with the front table-top. The mouse was placed next to the Keyboard, flushed with the back of keyboard.
4. The spacing between the peripherals was 10 centimeters.
5. External I/O cables were draped along the edge of the test table and bundle when neces-sary.
6. The host PC system was connected with 120Vac/60Hz power source.

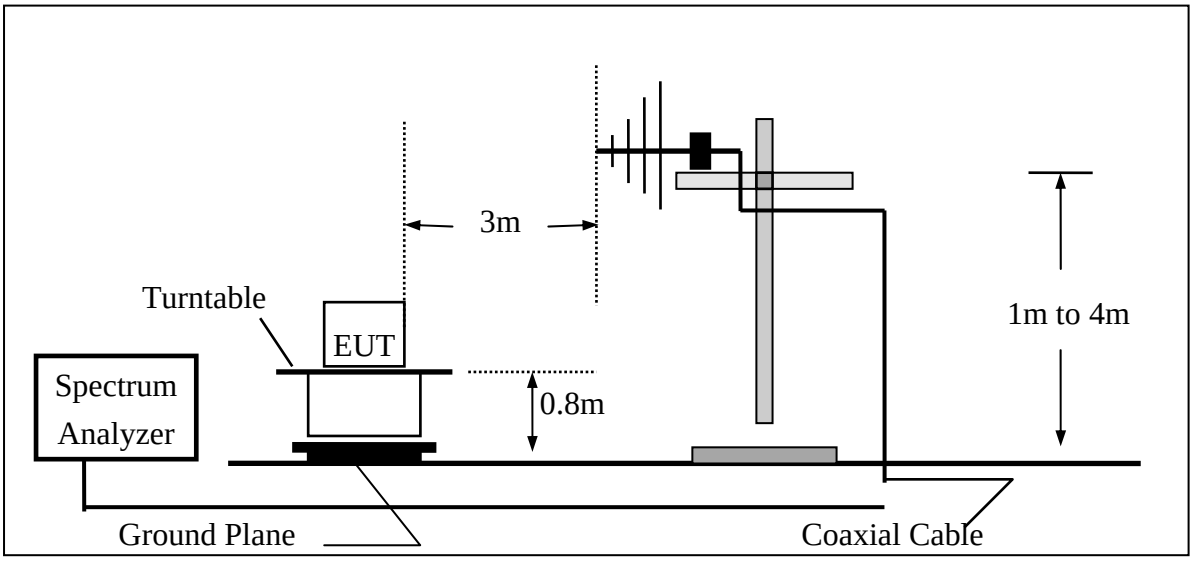
11.3 Measurement Procedure

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

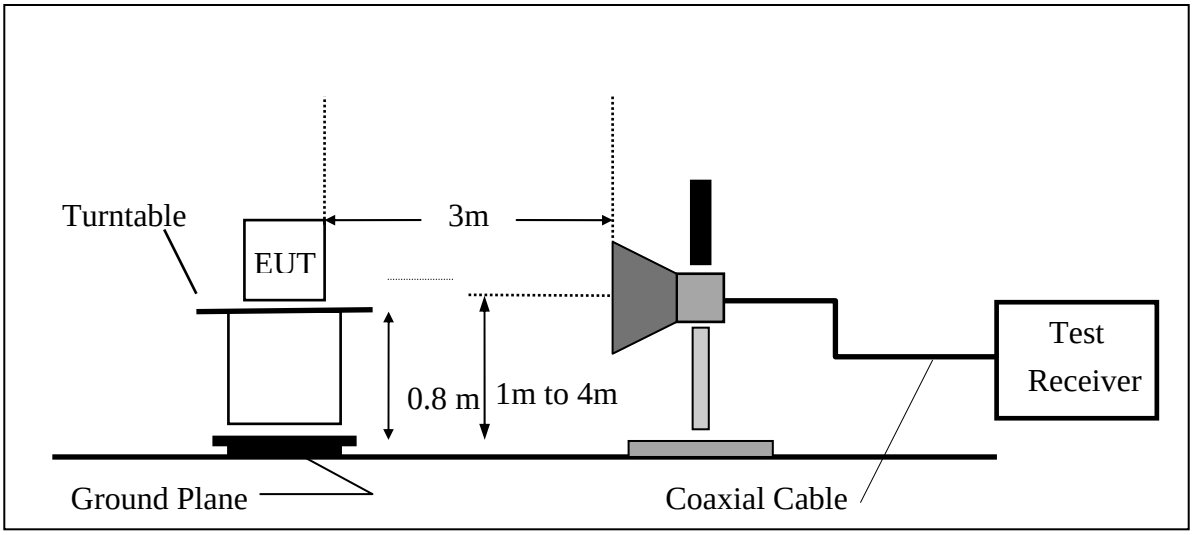
Refer to section E of KDB Document: KDB789033 D01 General UNII Test Procedures v01r02

11.4 Test SET-UP (Block Diagram of Configuration)

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



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



11.5 Measurement Equipment Used:

Chamber 14(966)					
EQUIPMENT TYPE	**MFR**	**MODEL NUMBER**	**SERIAL NUMBER**	**LAST CAL.**	**CAL DUE.**
Spectrum Analyzer 21(26.5GHz)	Agilent	N9010A	MY49060537	07/17/2012	07/16/2013
Spectrum Analyzer 20(6.5GHz)	Agilent	E4443A	MY48250315	05/24/2012	05/23/2013
Spectrum Analyzer 22(43GHz)	R&S	FSU43	100143	04/25/2012	04/24/2013
Dipole antenna	SCHWARZBECK	VHAP,30-300	919	11/16/2011	11/15/2013
Dipole antenna	SCHWARZBECK	UHAP,300-1000	1195	10/25/2011	10/24/2013
Loop Antenna9K-30M	A.H.SYSTEM	SAS-564	294	02/28/2011	02/27/2013
Bilog Antenna30-1G	Schaffner	CBL 6111B	2756	01/13/2013	01/12/2014
Horn antenna1-18G	COM-POWER	AH118	2011071401	03/01/2012	02/29/2013
Horn antenna1-18G(06)	EMCO	3117	0006665	10/15/2012	10/14/2013
Horn antenna26-40G(05)	Com-power	AH-640	100A	01/09/2013	01/08/2015
Horn antenna18-26G(04)	Com-power	AH-826	081001	05/04/2011	05/03/2013
Preamplifier9-1000M	HP	8447D	NA	02/10/2012	02/09/2013
Preamplifier1-18G	MITEQ	AFS44-00101800-25-10P-44	1329256	07/23/2012	07/22/2013
Preamplifier1-26G	EM	EM01M26G	NA	02/21/2012	02/202013
Preamplifier26-40G	MITEQ	JS-26004000-27-5A	818471	05/21/2011	05/20/2013
Cable1-18G	HUBER SUHNER	Sucoflex 106	NA	02/10/2012	02/09/2013
Cable UP to 1G	HUBER SUHNER	RG 214/U	NA	10/08/2012	10/07/2013
SUCOFLEX 1GHz~40GHz cable	HUBER SUHNER	Sucoflex 102	27963/2&37421/2	09/21/2011	09/20/2013
Signal Generator	R&S	SMU200A	102330	02/07/2012	02/06/2013
Signal Generator	Anritsu	MG3692A	20311	09/18/2012	09/17/2013
2.4G Filter	Micro-Tronics	Brm50702	76	12/27/2012	12/26/2013
5G Filter	Micro-Tronics	Brm50716	005	12/27/2012	12/26/2013

11.6 Field Strength Calculation

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

FS = RA + AF + CL - AG

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

11.7 Measurement Result

Refer to attach tabular data sheets.

NOTE:

The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 100kHz for Peak detection (PK) and Quasi-peak detection (QP) at frequency below 1GHz.

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

Operation Mode	802.11n HT40 TX CH Low	Test Date	2013/01/16
Fundamental Frequency	5190MHz	Test By	Dino
Temperature	25 ℃	Pol	Ver./Hor
Humidity	65 %		

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	120.21	51.60	-15.34	36.26	43.50	-7.24	Peak	VERTICAL
2	250.19	51.52	-14.13	37.39	46.00	-8.61	Peak	VERTICAL
3	312.27	54.52	-12.17	42.35	46.00	-3.65	Peak	VERTICAL
4	399.57	50.46	-10.62	39.84	46.00	-6.16	Peak	VERTICAL
5	468.44	49.18	-9.32	39.86	46.00	-6.14	Peak	VERTICAL
6	759.44	40.64	-3.77	36.87	46.00	-9.13	Peak	VERTICAL
1	120.21	55.36	-15.34	40.02	43.50	-3.48	Peak	HORIZONTAL
2	199.75	53.89	-16.48	37.41	43.50	-6.09	Peak	HORIZONTAL
3	312.27	52.33	-12.17	40.16	46.00	-5.84	Peak	HORIZONTAL
4	350.10	52.57	-11.54	41.03	46.00	-4.97	Peak	HORIZONTAL
5	468.44	50.16	-9.32	40.84	46.00	-5.16	Peak	HORIZONTAL
6	749.74	36.18	-3.86	32.32	46.00	-13.68	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)

Operation Mode	802.11n HT40 TX CH High	Test Date	2013/01/16
Fundamental Frequency	5230MHz	Test By	Dino
Temperature	25 ℃	Pol	Ver./Hor
Humidity	65 %		

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	120.21	54.33	-15.34	38.99	43.50	-4.51	Peak	VERTICAL
2	250.19	50.57	-14.13	36.44	46.00	-9.56	Peak	VERTICAL
3	312.27	54.56	-12.17	42.39	46.00	-3.61	Peak	VERTICAL
4	375.32	52.30	-10.88	41.42	46.00	-4.58	Peak	VERTICAL
5	500.45	49.79	-9.04	40.75	46.00	-5.25	Peak	VERTICAL
6	755.56	41.69	-3.81	37.88	46.00	-8.12	Peak	VERTICAL
1	120.21	54.19	-15.34	38.85	43.50	-4.65	Peak	HORIZONTAL
2	312.27	51.39	-12.17	39.22	46.00	-6.78	Peak	HORIZONTAL
3	399.57	51.72	-10.62	41.10	46.00	-4.90	Peak	HORIZONTAL
4	500.45	49.01	-9.04	39.97	46.00	-6.03	Peak	HORIZONTAL
5	600.36	39.25	-6.74	32.51	46.00	-13.49	Peak	HORIZONTAL
6	749.74	34.97	-3.86	31.11	46.00	-14.89	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	802.11n HT40 TX CH Low	Test Date	2013/01/16
Fundamental Frequency	5190MHz	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	6537.00	35.13	3.02	38.15	74.00	-35.85	Peak	VERTICAL
2	10380.00	27.72	7.01	34.73	74.00	-39.27	Peak	VERTICAL
1	6922.00	37.07	3.93	41.00	74.00	-33.00	Peak	HORIZONTAL
2	10380.00	28.67	7.01	35.68	74.00	-38.32	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	802.11n HT40 TX CH High	Test Date	2013/01/16
Fundamental Frequency	5230MHz	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	7370.00	33.63	4.55	38.18	74.00	-35.82	Peak	VERTICAL
2	10460.00	26.34	7.13	33.47	74.00	-40.53	Peak	VERTICAL
1	6971.00	36.00	4.04	40.04	74.00	-33.96	Peak	HORIZONTAL
2	10460.00	27.79	7.13	34.92	74.00	-39.08	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.

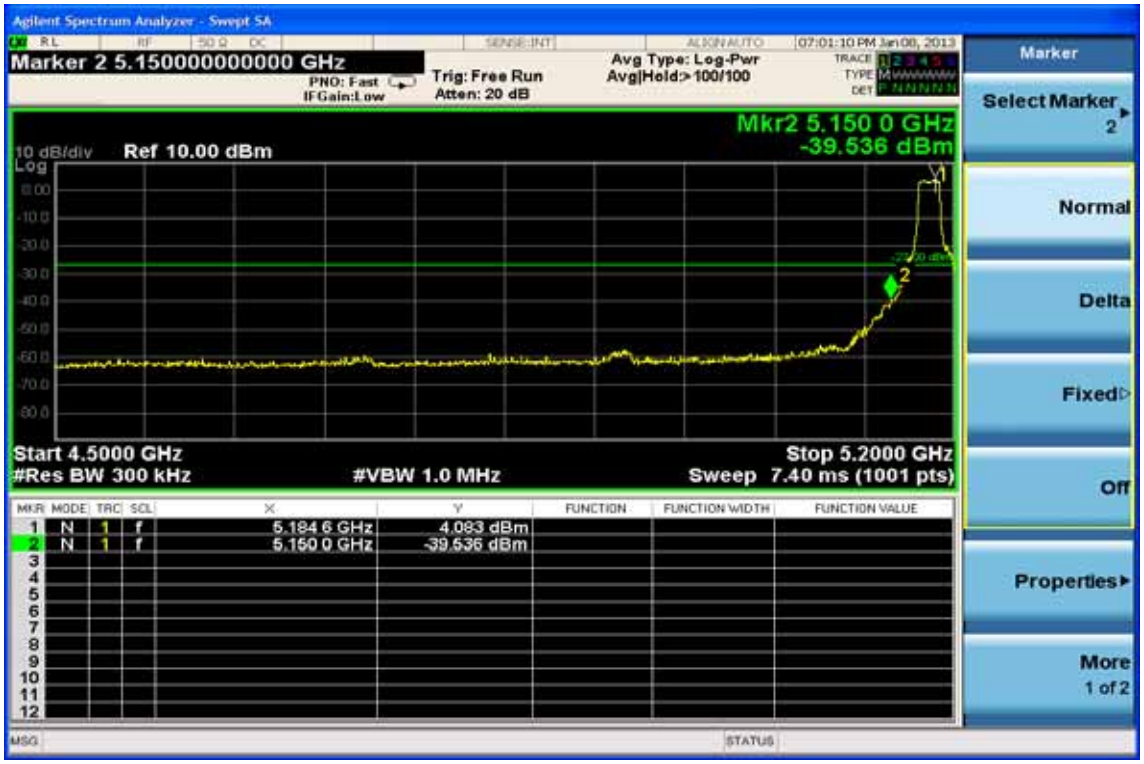
3 Measurement of data within this frequency range shown " - " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

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

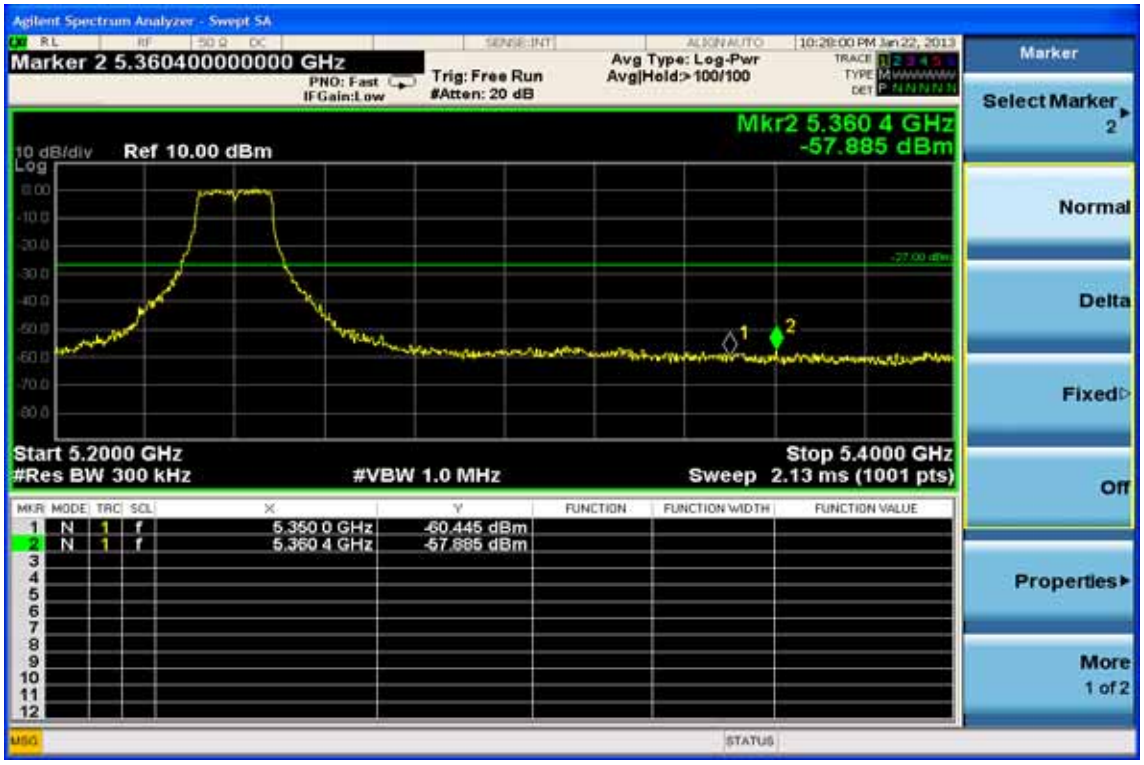
5 Spectrum AV mode if bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

Band Edges test

802.11a mode CH-Low



Band Edges Test Data CH-High



Radiated Emission: 802.11a mode

Operation Mode	TX CH Low	Test Date	2013/01/16
Fundamental Frequency	5180 MHz	Test By	Dino
Temperature	25 ℃	Humidity	65 %

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	5150.00	48.13	-1.27	46.86	74.00	-27.14	Peak	VERTICAL
1	5150.00	47.94	-1.27	46.67	74.00	-27.33	Peak	HORIZONTAL

Operation Mode	TX CH High	Test Date	2013/01/16
Fundamental Frequency	5240MHz	Test By	Dino
Temperature	25 ℃	Humidity	65 %

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	5350.00	47.60	-0.75	46.85	74.00	-27.15	Peak	VERTICAL
1	5350.00	46.18	-0.75	45.43	74.00	-28.57	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.

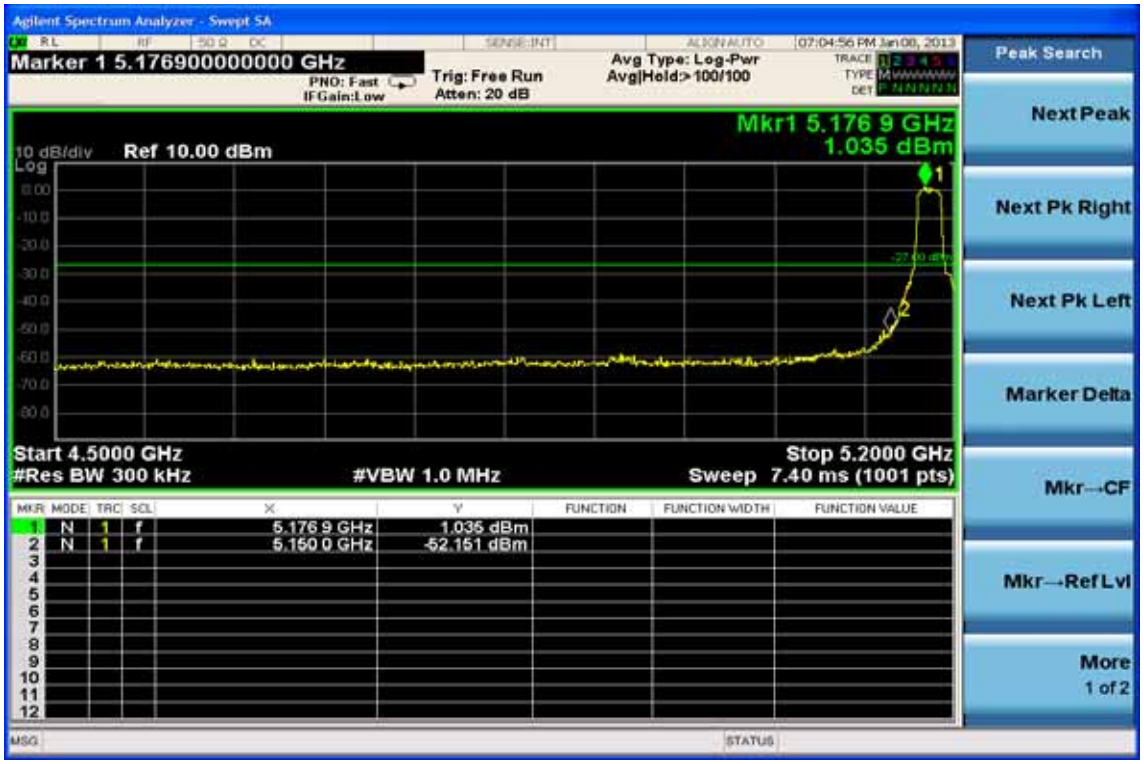
3 Measurement of data within this frequency range shown " - " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

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

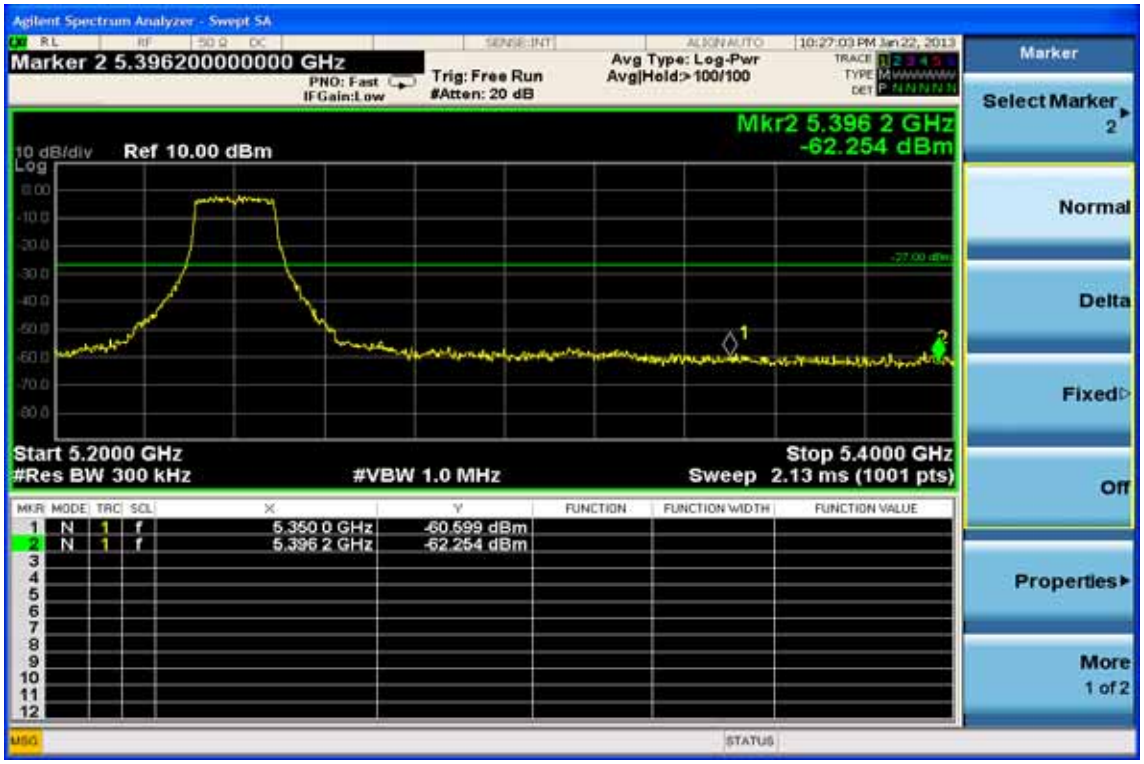
5 Spectrum AV mode if bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

802.11n HT20 mode (Antenna A Port)

Band Edges Test Data CH-Low

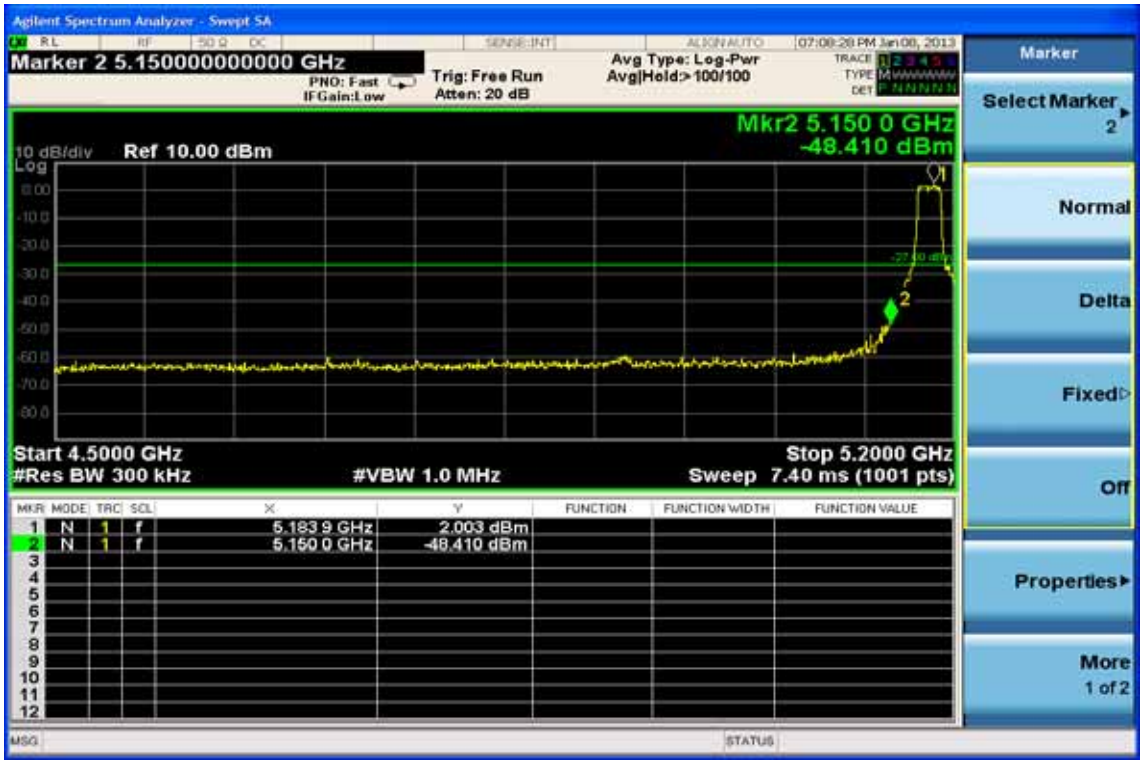


Band Edges Test Data CH-High

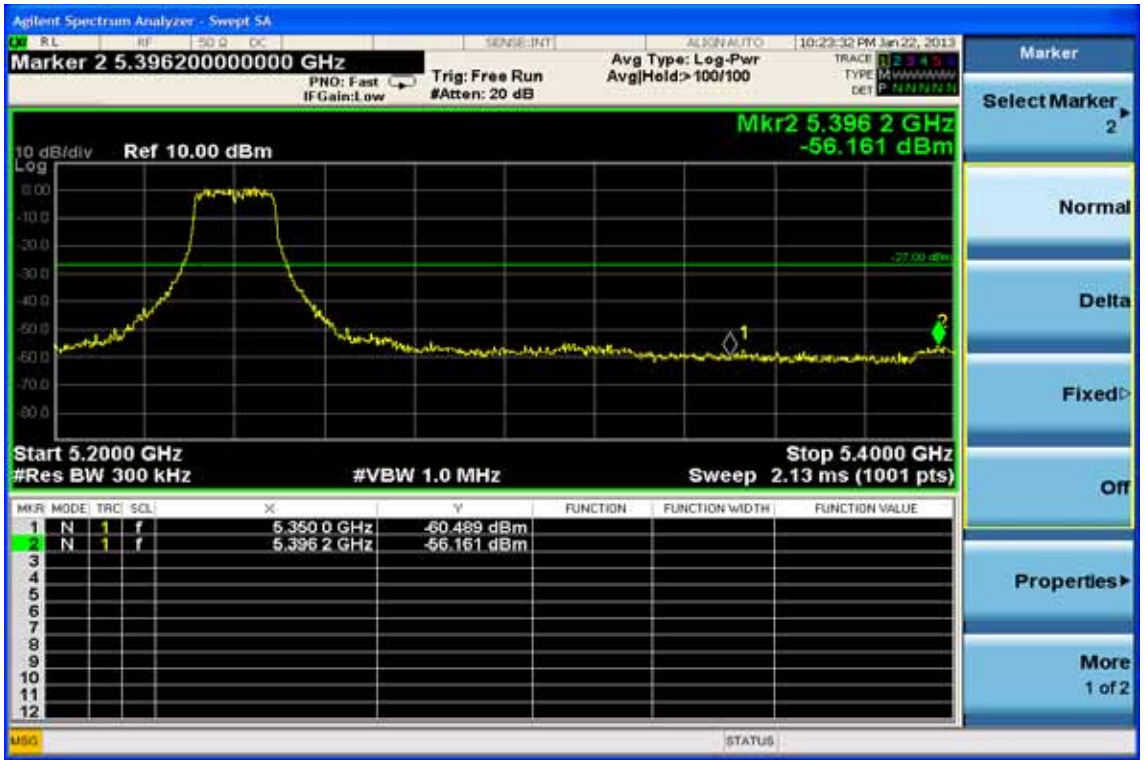


802.11n HT20 mode (Antenna B Port)

Band Edges Test Data CH-Low



Band Edges Test Data CH-High



Radiated Emission: 802.11n HT20 mode, Antenna A+B

Operation Mode	TX CH Low	Test Date	2013/01/16
Fundamental Frequency	5180 MHz	Test By	Dino
Temperature	25 ℃	Humidity	65 %

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	5150.00	48.21	-1.27	46.94	74.00	-27.06	Peak	VERTICAL
1	5150.00	48.22	-1.27	46.95	74.00	-27.05	Peak	HORIZONTAL

Operation Mode	TX CH High	Test Date	2013/01/16
Fundamental Frequency	5240MHz	Test By	Dino
Temperature	25 ℃	Humidity	65 %

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	5350.00	46.99	-0.75	46.24	74.00	-27.76	Peak	VERTICAL
1	5350.00	46.49	-0.75	45.74	74.00	-28.26	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.

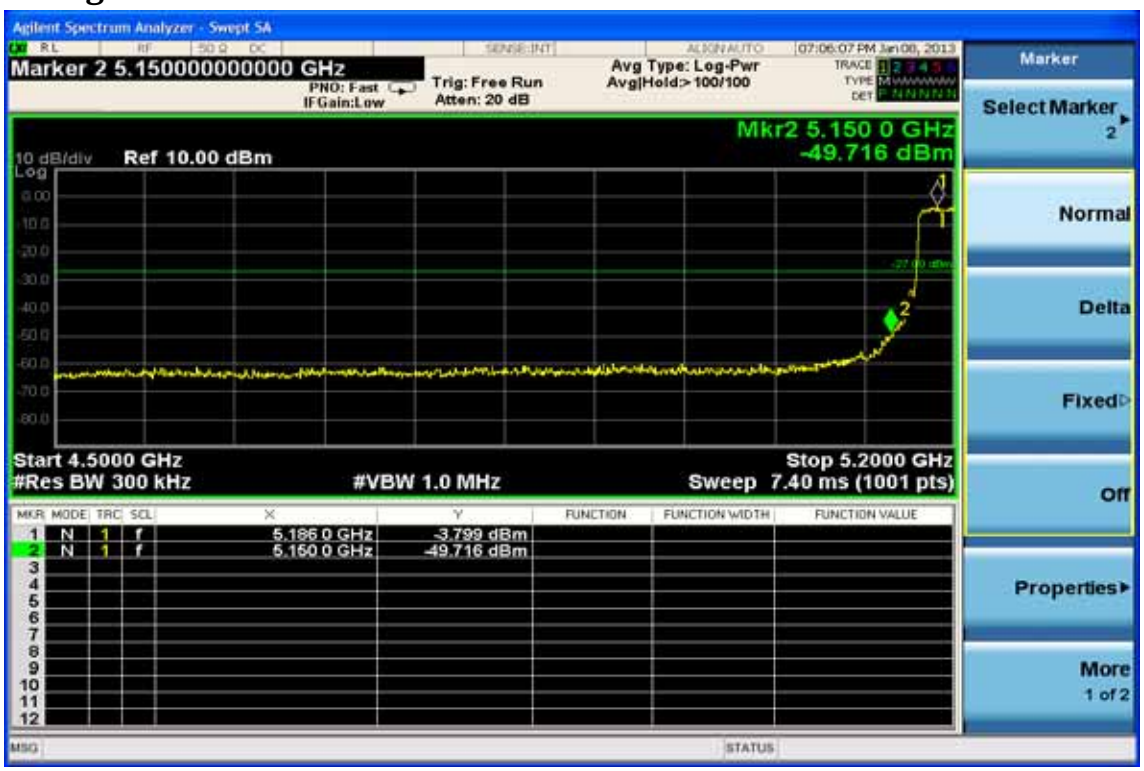
3 Measurement of data within this frequency range shown " - " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

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

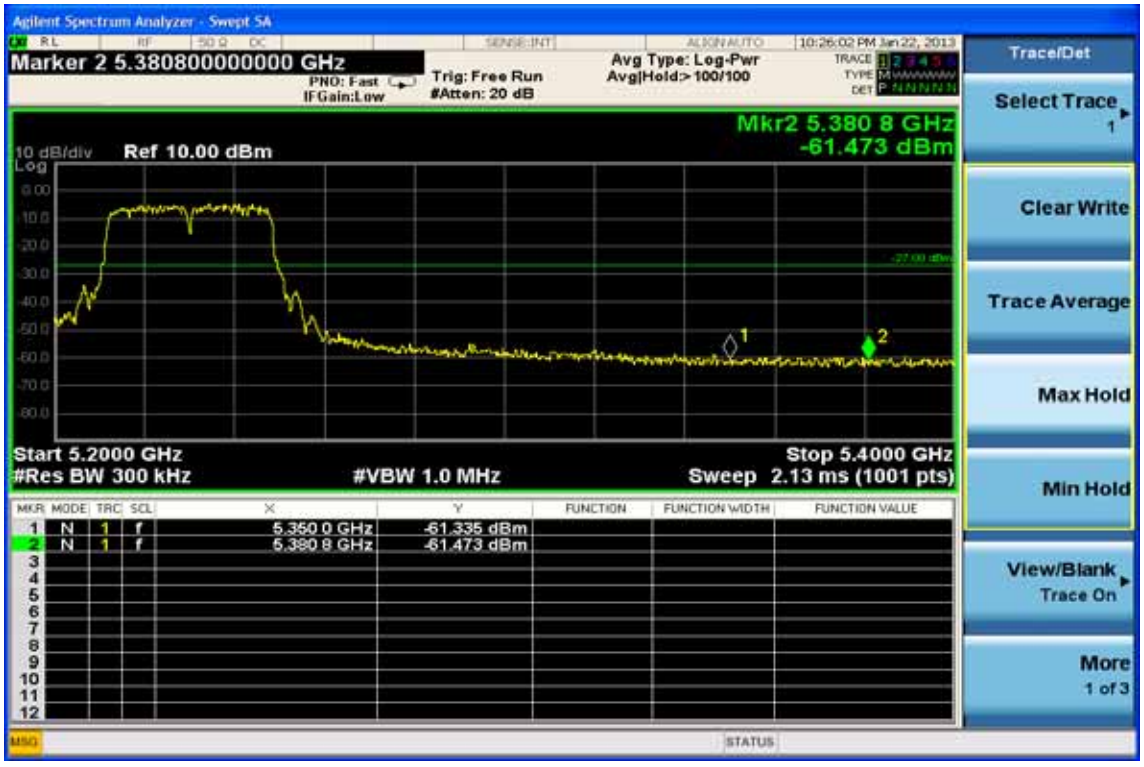
5 Spectrum AV mode if bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

802.11n HT40 mode (Antenna A Port)

Band Edges Test Data CH-Low

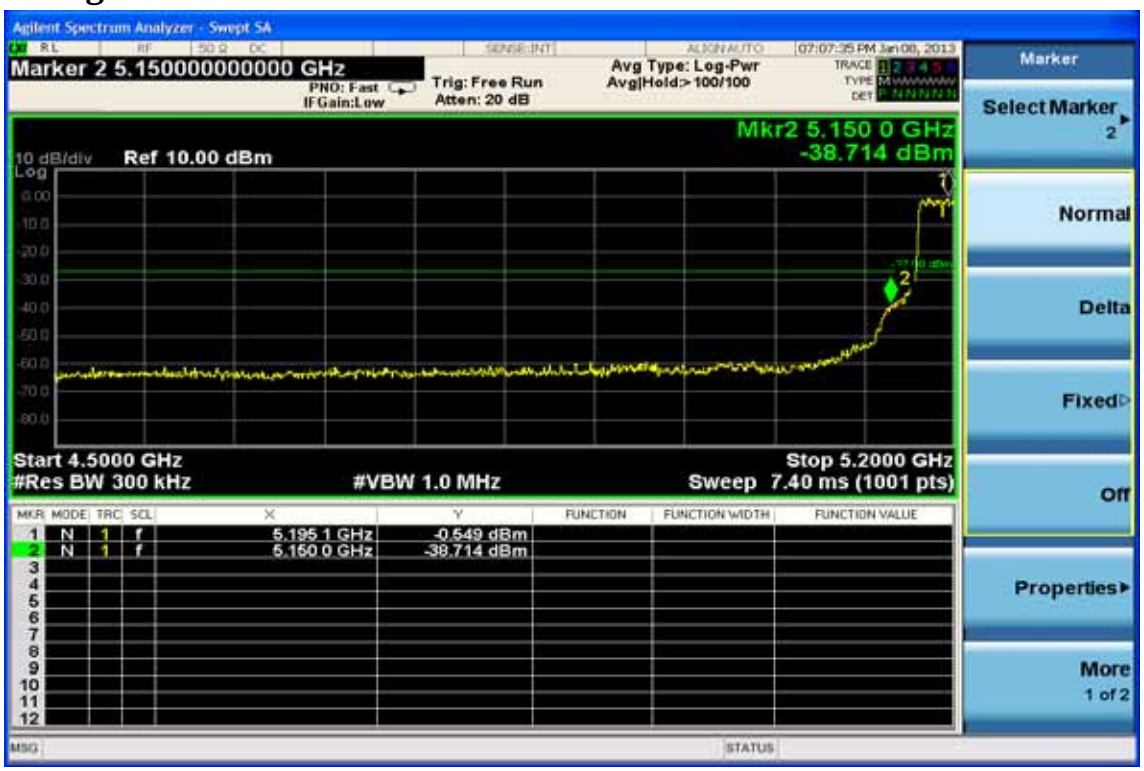


Band Edges Test Data CH-High

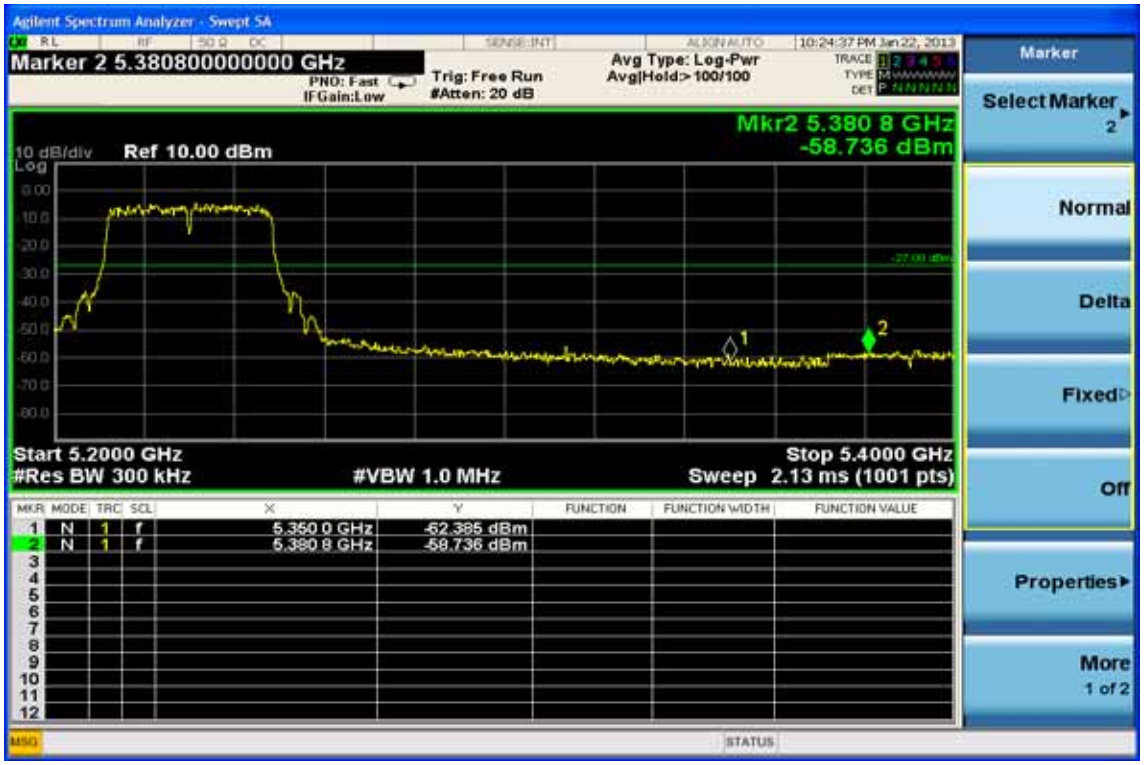


802.11n HT40 mode (Antenna B Port)

Band Edges Test Data CH-Low



Band Edges Test Data CH-High



Radiated Emission: 802.11n HT40 mode, Antenna A+B

Operation Mode	TX CH Low	Test Date	2013/01/16
Fundamental Frequency	5190 MHz	Test By	Dino
Temperature	25 ℃	Humidity	65 %

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	5150.00	47.58	-1.27	46.31	74.00	-27.69	Peak	VERTICAL
1	5150.00	51.75	-1.27	50.48	74.00	-23.52	Peak	HORIZONTAL

Operation Mode	TX CH High	Test Date	2013/01/16
Fundamental Frequency	5230MHz	Test By	Dino
Temperature	25 ℃	Humidity	65 %

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	5350.00	46.84	-0.75	46.09	74.00	-27.91	Peak	VERTICAL
1	5350.00	47.90	-0.75	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.

12. TRANSMISSION IN THE ABSENCE OF DATA

12.1 Standard Applicable

According to §15.407(c)

The device shall automatically discontinue transmission in case of either absence of information to transmit or operational failure. These provisions are not intended to preclude the transmission of control or signalling information or the use of repetitive codes used by certain digital technologies to complete frame or burst intervals. Applicants shall include in their application for equipment authorization a description of how this requirement is met.

12.2 Result:

No non-compliance noted:

Refer to the theory of operation.

13. FREQUENCY STABILITY

13.1 Standard Applicable

According to §15.407 (g) Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual.

13.2 Result:

No non-compliance noted:

±20ppm ppm was defined in product specification.

14. ANTENNA REQUIREMENT

14.1 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.

14.2 Antenna Connected Construction

The directional gins of antenna used for transmitting please refer to below table, 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.

Antenna Designation:

	Manufacturer	Model No.	Connector Type	Type	Gain (2.4GHz)	Gain (5GHz)
Ant 1	Airwave Technologies INC.	EDA-8709-25GR2-A4-RM	Revise SMA, unique	Dipole Ant	2 dBi	2 dBi
Ant 2	ARISTRTLE	RFA-25-C2S1-70-90	unique	Dipole Ant	2 dBi	2 dBi
Ant 3	Tranwo technology corp.	SD001-201003-A101	Revise SMA, unique	Dipole Ant	2dBi	2 dBi
Ant 3-1	Tranwo technology corp.	RFA-05-2-L14M3-B70-1	Revise SMA, unique	Dipole Ant	2dBi	2 dBi
Ant 3-2	Tranwo technology corp.	202-000442-00	unique	Patch Ant	0 dBi	-1 dBi
Ant 3-3	Tranwo technology corp.	202-000441-00	unique	Patch Ant	0.5 dBi	-0.5 dBi
Ant 4	UDM Group Technology Co., Ltd	26-52-01800G	unique	PCB Ant (Green)	2.5 dBi	4 dBi
Ant 5	Unictron Technologies Corporation	H2P566WKBA0100	unique	PCB Ant (Blue)	2.3 dBi	4dBi

15. Maximum Permissible Exposure (MPE)

15.1 Standard Applicable

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

This is a Mobile device, the MPE is required.

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

Limits for Maximum Permissive Exposure (MPE)

Frequency Range (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

15.2 Maximum Permissible Exposure (MPE) Evaluation

MPE Prediction (802.11n HT40) (worst case)

Power measurement:

Mode	Freq(MHz)	channel	Output Chain (dBm)		Combine Peak Output Power (dBm)	Limit(dBm)	Result
			Chain A	chain B			
N HT40	5190	38	8.02	7.81	10.93	16.98	Pass
	5230	46	7.59	7.33	10.47	16.98	Pass

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 peak output power at antenna input terminal:	10.93	(dBm)
Maximum peak output power at antenna input terminal:	12.38796587	(mW)
Duty cycle:	100	(%)
Maximum Pav :	12.38796587	(mW)
Antenna gain (typical):	4	(dBi)
Maximum antenna gain:	2.511886432	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	5190	(MHz)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm2)
Power density at predication frequency at 20 (cm)	0.0061937	(mW/cm^2)

Measurement Result

The predicted power density level at 20 cm is 0.00619 mW/cm^2. This is below the uncontrolled exposure limit of 1 mW/cm^2 at 5190MHz.