

ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

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

OF

Product Name: AirMax AP

Brand Name: UBIQUITI

Model No.: NBE-M5-16

Model Difference: N/A

FCC ID: SWX-NBM5

IC: 6545A-NBM5

Report No.: E2/2013/90039

Issue Date: Nov. 21, 2013

FCC Rule Part: §15.247, Cat: DTS

IC Rule Part: RSS-210 issue 8 :2010, Annex 8

Prepared for FCC: Ubiquiti Networks, Inc.
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Prepared for IC: UBIQUITI NETWORKS
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VERIFICATION OF COMPLIANCE

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Applicant for IC: UBIQUITI NETWORKS
12F, No. 105, Song Ren Rd., Sin Yi District, Taipei 110, Taiwan

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Brand Name: UBIQUITI

Model No.: NBE-M5-16

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File Number: E2/2013/90039

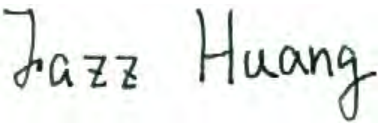
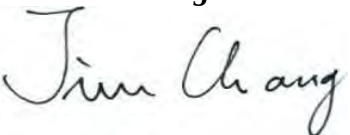
Date of test: Oct. 30, 2013 ~ Nov. 21, 2013

Date of EUT Received: Oct. 30, 2013

We hereby certify that:

The above equipment was tested by SGS Taiwan Ltd. Electronics & Communication Laboratory. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.4:2009 and RSS-Gen. issue 3. The energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits of FCC Rules Part 15.247 and IC RSS 210 issue 8: 2010 Annex 8.

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

Test By:		Date	Nov. 21, 2013
	Jazz Huang / Sr. Engineer		
Prepared By:		Date	Nov. 21, 2013
	Julia Chang / Clerk		
Approved By:		Date	Nov. 21, 2013
	Jim Chang / Supervisor		

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Version

Version No.	Date	Description
00	Nov. 21, 2013	Initial creation of document

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1 GENERAL INFORMATION

1.1 Product description

General:

Product Name:	AirMax AP	
Brand Name:	UBIQUITI	
Model No.:	NBE-M5-16	
Model Difference:	N/A	
Hardware Version:	N/A	
Software Version:	N/A	
Power Supply:	24Vdc from AC/DC adapter	
	Adapter:	Model No.: GP-A240-050, Supplier: UBIQUITI

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WLAN 5.7GHz:

Wi-Fi	Frequency Range	Channels	Rated Power	Modulation Technology	Type of Emission
11a	5725-5850	5	a: 21.61dBm	OFDM	16M5D1D
11n (5GHz)	HT20 5725-5850	5	n: 22.12dBm (MIMO Chain0) n: 21.62dBm (MIMO Chain 1) n: 24.88dBm (MIMO Chain 0+1)		17M7D1D
11n (5GHz)	HT40 5725-5850	2	n: 21.86dBm (MIMO Chain0) n: 21.66dBm (MIMO Chain 1) n: 24.73dBm (MIMO Chain 0+1)		36M3D1D
Antenna Designation:			Array of patch Antenna 5GHz Gain(Main): 4.78dBi (5725MHz-5850MHz) 5GHz Gain(Aux) : 7.77dBi (5725MHz-5850MHz) 5GHz Gain(MIMO):8.09 dBi (5725MHz-5850MHz)		
Modulation type			64QAM, 16QAM, QPSK, BPSK for OFDM		
Transition Rate:			802.11 a: 6/9/12/18/24/36/48/54 Mbps; 802.11 n_20MHz: 6.5 – 144Mbps 802.11 n_40MHz: 13.5 – 300Mbps		

The max antenna gain is 7.77dBi which was choosing for Radiated Spurious Emission test.

The EUT is in compliance with FCC §15.247 at which the frequency band of 5725~5850MHz has been tested.

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IEEE 802.11n Spec:

MCS Index	Nss	Modulation	R	NBPSC	NCBPS		NDBPS		Data rate(Mbps)			
									800nsGI		400nsGI	
					20MHz	40MHz	20MHz	40MHz	20MHz	40MHz	20MHz	40MHz
0	1	BPSK	1/2	1	52	108	26	54	6.5	13.5	7.200	15
1	1	QPSK	1/2	2	104	216	52	108	13.0	27.0	14.400	30
2	1	QPSK	3/4	2	104	216	78	162	19.5	40.5	21.700	45
3	1	16-QAM	1/2	4	208	432	104	216	26.0	54.0	28.900	60
4	1	16-QAM	3/4	4	208	432	156	324	39.0	81.0	43.300	90
5	1	64-QAM	2/3	6	312	648	208	432	52.0	108.0	57.800	120
6	1	64-QAM	3/4	6	312	648	234	486	58.5	121.5	65.000	135
7	1	64-QAM	5/6	6	312	648	260	540	65.0	135.0	72.200	150

Symbol	Explanation
NSS	Number of spatial streams
R	Code rate
NBPSC	Number of coded bite per single carrier
NCBPS	Number of coded bite per symbol
NDBPS	Number of data bite per symbol
GI	Guard interval

802.11n_HT20 MCS8 -15

MCS Index	Modulation	R	$N_{BPS_{CS}(i_{SS})}$	N_{SD}	N_{SP}	N_{CBPS}	N_{DBPS}	Data rate (Mb/s)	
								800 ns GI	400 ns GI (see NOTE)
8	BPSK	1/2	1	52	4	104	52	13.0	14.4
9	QPSK	1/2	2	52	4	208	104	26.0	28.9
10	QPSK	3/4	2	52	4	208	156	39.0	43.3
11	16-QAM	1/2	4	52	4	416	208	52.0	57.8
12	16-QAM	3/4	4	52	4	416	312	78.0	86.7
13	64-QAM	2/3	6	52	4	624	416	104.0	115.6
14	64-QAM	3/4	6	52	4	624	468	117.0	130.0
15	64-QAM	5/6	6	52	4	624	520	130.0	144.4

NOTE—The 400 ns GI rate values are rounded to 1 decimal place.

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802.11n_HT40 MCS8 -15

MCS Index	Modulation	R	$N_{BPSCS(i_{SS})}$	N_{SD}	N_{SP}	N_{CBPS}	N_{DBPS}	Data rate (Mb/s)	
								800 ns GI	400 ns GI
8	BPSK	1/2	1	108	6	216	108	27.0	30.0
9	QPSK	1/2	2	108	6	432	216	54.0	60.0
10	QPSK	3/4	2	108	6	432	324	81.0	90.0
11	16-QAM	1/2	4	108	6	864	432	108.0	120.0
12	16-QAM	3/4	4	108	6	864	648	162.0	180.0
13	64-QAM	2/3	6	108	6	1296	864	216.0	240.0
14	64-QAM	3/4	6	108	6	1296	972	243.0	270.0
15	64-QAM	5/6	6	108	6	1296	1080	270.0	300.0

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1.2 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for FCC ID: SWX-NBM5 filing to comply with Section 15.247 of the FCC Part 15, Subpart C Rules. And IC: 6545A-NBM5 filing to comply with Industry Canada RSS-210 issue 8: 2010 Annex 8. The composite system (digital device) is compliance with Subpart B under the DoC procedure.

1.3 Test Methodology

Both conducted and radiated testing was performed according to the procedures in ANSI C63.4:2009 and RSS-Gen: 2010. Radiated testing was performed at an antenna to EUT distance 3 meters.

Tested in accordance with Apr 2013 KDB558074 D01 V03 for compliance to FCC 47CFR 15.247 requirements.

1.4 Test Facility

The measurement facilities used to collect the 3m Radiated Emission and AC power line conducted data are located on the address of SGS Taiwan Ltd. Electronics & Communication Laboratory No.2, Keji 1st Rd., Guishan Township, Taoyuan County, Taiwan 333 which are constructed and calibrated to meet the FCC requirements in documents ANSI C63.4:2009. FCC Registration Number is: 990257. 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

There are no special accessories used while test was conducted.

1.6 Equipment Modifications

There was no modification incorporated into the EUT.

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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

An engineering test mode (software/firmware) that applicant provided was utilized to manipulate the EUT into transmit, selection of the test channel, and modulation scheme.

2.3 Test Procedure

2.3.1 Conducted Emissions

The EUT is placed on a turn table which is 0.8 m above ground plane. According to the general criterion in Section 7.1 of ANSI C63.4:2009, conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30 MHz, and the measurement procedure 7.3 in ANSI C63.4:2009 is followed to carry out the test. The CISPR Quasi-Peak and Average detector mode is employed according to §15.107

2.3.2 Radiated Emissions

The EUT is placed on a turn table which is 0.8 m above ground plane. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this hand-held transmitter (EUT) was rotated through three orthogonal axes 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 of ANSI C63.4:2009,

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2.4 Configuration of Tested System

Fig. 2-1 Radiated Emission & Conducted (Antenna Port) Configuration

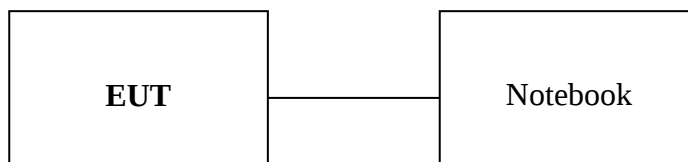


Fig. 2-2 AC Power Line Conducted Emission

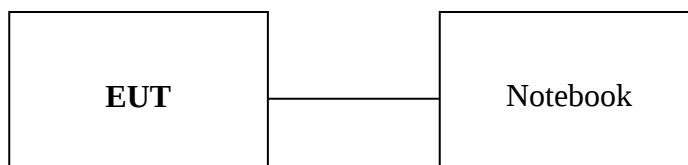


Table 2-1 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Data Cable	Power Cord
1.	WLAN Test Software	N/A	N/A	N/A	N/A	N/A
2.	Notebook	Lenovo	L430	LR-7HXZA	shielding	Un-shielding

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3 SUMMARY OF TEST RESULTS

FCC / IC Rules	Description Of Test	Result
§15.207(a) RSS-Gen §7.2.4	AC Power Line Conducted Emission	Compliant
§15.247(b) (3) RSS-210 §A8.4(4)	Peak Output Power	Compliant
§15.247(a)(2) RSS-210 §A8.2 (a)	6dB Bandwidth	Compliant
§15.247(d) RSS-210 §A8.5	100 KHz Bandwidth Of Frequency Band Edges	Compliant
§15.247(d) RSS-210 §A8.5	Spurious Emission	Compliant
§15.247(e) RSS-210 §A8.2(b)	Peak Power Density	Compliant
§15.203 RSS-GEN §7.1.2,	Antenna Requirement	Compliant
RSS-Gen §4.6.1	99% Power Bandwidth	Compliant

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4 DESCRIPTION OF TEST MODES

The EUT has been tested under operating condition.

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

802.11 a mode: Channel low (5745MHz) 、mid (5785MHz) and high (5825MHz) with 6Mbps lowest data rate are chosen for full testing.

802.11 n (5GHz) _20MHz: Lowest (5745MHz), Mid (5785MHz) and high (5825MHz) with 6.5 Mbps lowest data rate are chosen for full testing.

802.11 n (5GHz) _40MHz: Lowest (5755MHz) and high (5795MHz) with 13.5 Mbps lowest data rate are chosen for full testing.

The worst case is determined by the output power that generates the highest emission. As examined in the section of output power measurement, the section 7.5, the lowest data rate at a/n_HT20/n_HT40 resulted the highest level of fundamental emission, and therefore, the lowest data rate is chosen as the worst-case to conduct the remaining of other mandatory test cases.

The field strength of radiation emission was measured as EUT stand-up position (H mode) and lie down position (E1, E2 mode) for 802.11a/n WLAN Transmitter for channel Low, Mid and High, the worst case E1 position was tested as resulted in pre-scanned measurement with respect to 5.8GHz 802.11a/n_HT20/n_HT40.

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5 MEASUREMENT UNCERTAINTY

Test Items	Uncertainty
AC Power Line Conducted Emission	+/- 2.586 dB
Peak Output Power	+/- 1.55dB (for Spectrum) +/- 1.42 dB (for Power Meter)
6dB Bandwidth	+/- 123.36 Hz
100 KHz Bandwidth Of Frequency Band Edges	+/- 1.55 dB
Peak Power Density	+/- 1.55 dB
99% Power Bandwidth	+/- 123.36 Hz
Temperature	+/- 0.8 °C
Humidity	+/- 4.7 %
DC / AC Power Source	DC= +/- 1%, AC=+/- 0.2%

Radiated Spurious Emission:

Measurement uncertainty (Polarization : Vertical)	30MHz - 180MHz: +/- 3.37dB
	180MHz -417MHz: +/- 3.19dB
	0.417GHz-1GHz: +/- 3.19dB
	1GHz - 18GHz: +/- 4.04dB
	18GHz - 40GHz: +/- 4.04dB

Measurement uncertainty (Polarization : Horizontal)	30MHz - 167MHz: +/- 4.22dB
	167MHz -500MHz: +/- 3.44dB
	0.5GHz-1GHz: +/- 3.39dB
	1GHz - 18GHz: +/- 4.08dB
	18GHz - 40GHz: +/- 4.08dB

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

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6 CONDUCTED EMISSION TEST

6.1 Standard Applicable:

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

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

6.2 Measurement Equipment Used:

SGS Conducted Emission Test Site No.A					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
EMI Test Receiver	R&S	ESCI 7	100924	05/10/2013	05/09/2014
Coaxial Cables	N/A	N30N30-1042 -150cm	N/A	02/07/2013	02/06/2014
LISN	SCHWARZB ECK	NSLK 8127	8127-648	06/17/2012	06/16/2014
Pulse Limit	narda	PL01	1110X30602	08/14/2013	08/13/2014
Test Software	Farad	EZ-EMC	Ver. SGS-03A1	N.C.R.	N.C.R.

6.3 EUT Setup:

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

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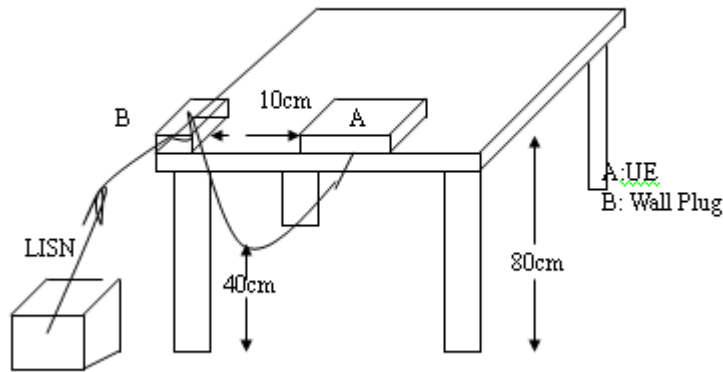
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6.4 Test SET-UP (Block Diagram of Configuration)



6.5 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 phases of power being supplied by given UE are completed

6.6 Measurement Result:

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

Note2: The * reveals the worst-case results that closet to the limit

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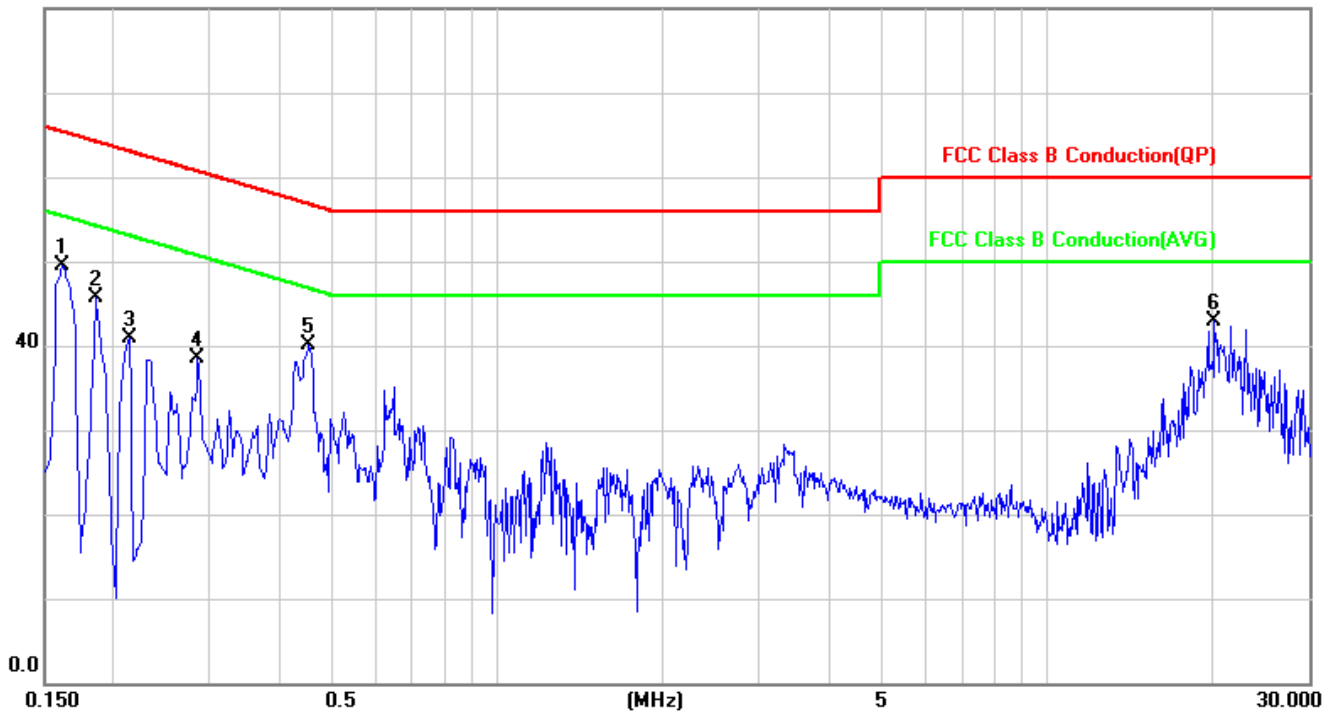
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AC POWER LINE CONDUCTED EMISSION TEST DATA

Operation Mode:	Operation mode			Test Date:	Nov. 15, 2013
Temperature:	23 °C	Humidity:	60 %	Test By:	Jazz
EUT:	NBE-M5-16			Probe:	L1/N

80.0 dBuV



No.	Mk.	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Comment
		(MHz)	(dBuV)	(dB)	(dBuV)	(dBuV)	(dB)		
1	*	0.1620	48.99	0.52	49.51	65.36	-15.85	QP	
2		0.1860	45.20	0.51	45.71	64.21	-18.50	QP	
3		0.2140	40.46	0.51	40.97	63.05	-22.08	QP	
4		0.2860	37.93	0.51	38.44	60.64	-22.20	QP	
5		0.4540	39.58	0.53	40.11	56.80	-16.69	QP	
6		20.2620	41.46	1.54	43.00	60.00	-17.00	QP	

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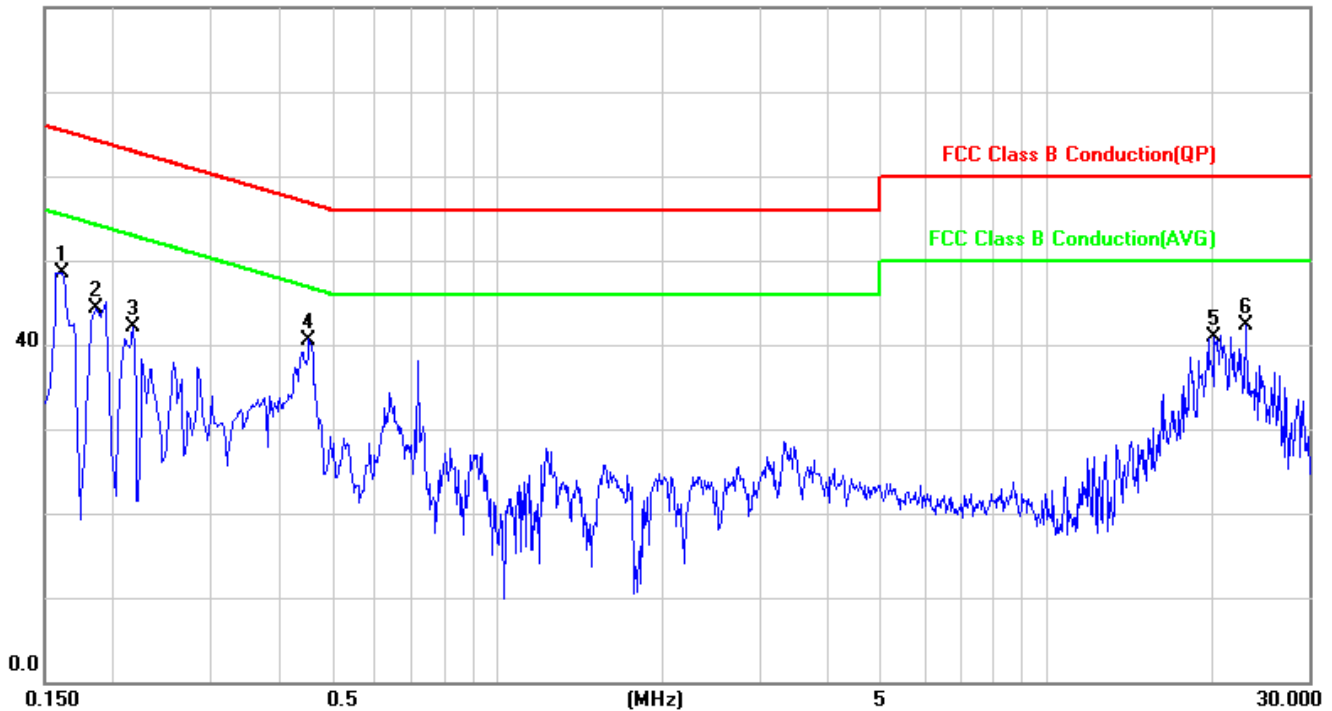
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80.0 dBuV



No.	Mk.	Freq. (MHz)	Reading dBuV	Factor (dB)	Measurement (dBuV)	Limit (dBuV)	Over (dB)	Detector	Comment
1		0.1620	48.33	0.16	48.49	65.36	-16.87	QP	
2		0.1860	44.24	0.16	44.40	64.21	-19.81	QP	
3		0.2180	41.93	0.16	42.09	62.89	-20.80	QP	
4	*	0.4540	40.42	0.18	40.60	56.80	-16.20	QP	
5		20.2620	40.03	0.93	40.96	60.00	-19.04	QP	
6		23.1300	41.21	1.04	42.25	60.00	-17.75	QP	

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7 PEAK OUTPUT POWER MEASUREMENT

7.1 Standard Applicable:

According to §15.247 (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.

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

As an alternative to a peak power measurement, compliance can be based on a measurement of the maximum conducted output power. The maximum conducted output power is the total transmitted 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 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.

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Note: The antenna gain is greater than 6 dBi in 5GHz MIMO mode so the limit reduce as below:

5725-5850 MHz

Antenna Gain: 8.09dBi -6dBi = 2.69

$$1 + (2.69/6) = 1.45$$

$$30 - 1.45 = 28.55$$

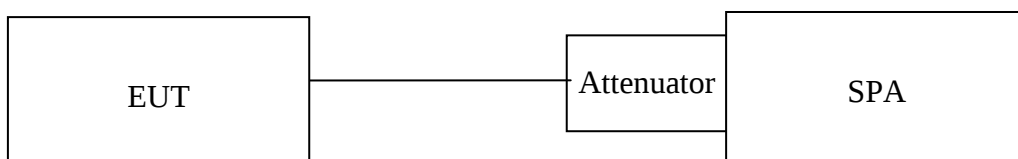
Limit: 28.55dB = 0.72W

7.2 Measurement Equipment Used:

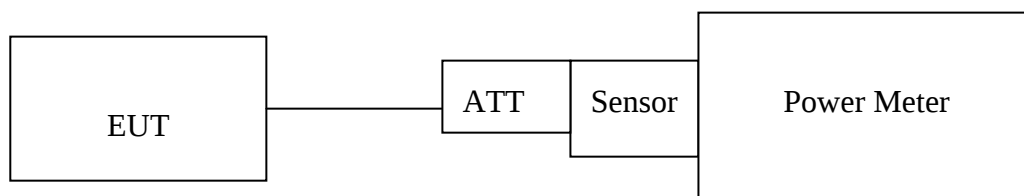
SGS Conducted Room					
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
Spectrum Analyzer	Agilent	N9010A	MY51440121	02/13/2012	02/12/2014
Power Meter	Anritsu	ML2495A	1005007	02/08/2012	02/07/2014
Power Sensor	Anritsu	MA2411B	917032	02/08/2012	02/07/2014
DC Power Supply	HOLA	DP-3003	001	N.C.R.	N.C.R.
Coaxial Cable	WOKEN	conducted #2	001	12/21/2012	12/20/2013
DC Block	Mini-Circuits	BLK-18-S+	002	12/21/2012	12/20/2013
Splitter	RF-LAMBAD	RFLT2W1G18G	11-JSPF412-018	12/21/2012	12/20/2013
Attenuator	Mini-Circuits	BW-S10W2+	002	12/21/2012	12/20/2013
Temperature Chamber	TERCHY	MHK-120LK	1020582	06/20/2013	06/19/2014

7.3 Test Set-up:

Spectrum:



Power Meter:



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7.4 Measurement Procedure:

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the power meter or spectrum. (**Peak power setting on Spectrum:** Channel power function, RBW = 1MHz, VBW = 3MHz, Span: 30/60MHz, Detector = peak, Sweep = Auto. Setting on spectrum is adjusted based on the mandatory procedure in 9.1.2 of the KDB558074). Power Meter is used as the auxiliary test equipment to conduct the output power measurement. 9.1.3 in KDB558074 is followed.
(**Avg. power setting on Spectrum:** Channel power function, RBW = 1MHz, VBW = 3MHz, Span: 30/60MHz, Detector = Avg., Trace avg = 100, Sweep = Auto, Setting on spectrum is adjusted based on the mandatory procedure in 9.2.2.4 of the KDB558074). Power Meter is used as the auxiliary test equipment to conduct the output power measurement. 9.2.3, option 3 in KDB558074 is followed.
3. Record the max. Reading as observed from Spectrum or Power Meter.
4. Repeat above procedures until all frequency of interest measured was complete.
5. For MIMO operation, measurement is done per chain basis, and then sum the simultaneous transmitting output in linear.

Pre-analysis Check: While conducting average power measurement, duty cycle of each mode (a/n_ht20) shall be checked to ensure its duty cycle in order to compensate for the loss due to insufficient ratio of duty cycle. All duty cycle is pre-scanned, resulted as obtained below, and showed only the most representative ones

Tabular results as indicates below entails the results of duty factor for all supported modes.

Formula:

$$\text{Duty Cycle} = \text{Ton} / (\text{Ton} + \text{Toff})$$

Test Procedure:

Set span = 0, RBW = 1MHz, VBW = 3MHz, Detector = Peak

Duty Cycle:

	Duty Cycle	Duty Factor (dB)
802.11a-Single	0.943	0.2528
802.11n_20 (5G)-MIMO	0.906	0.4266
802.11n_40 (5G) -MIMO	0.912	0.4023

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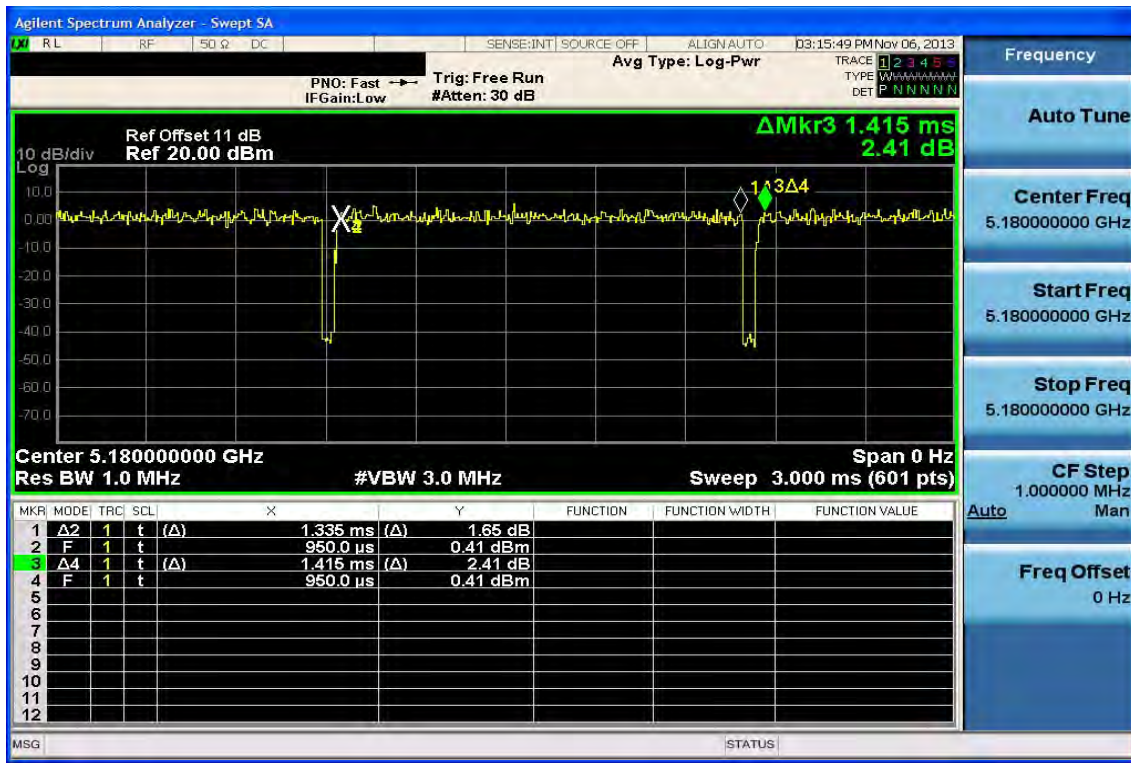
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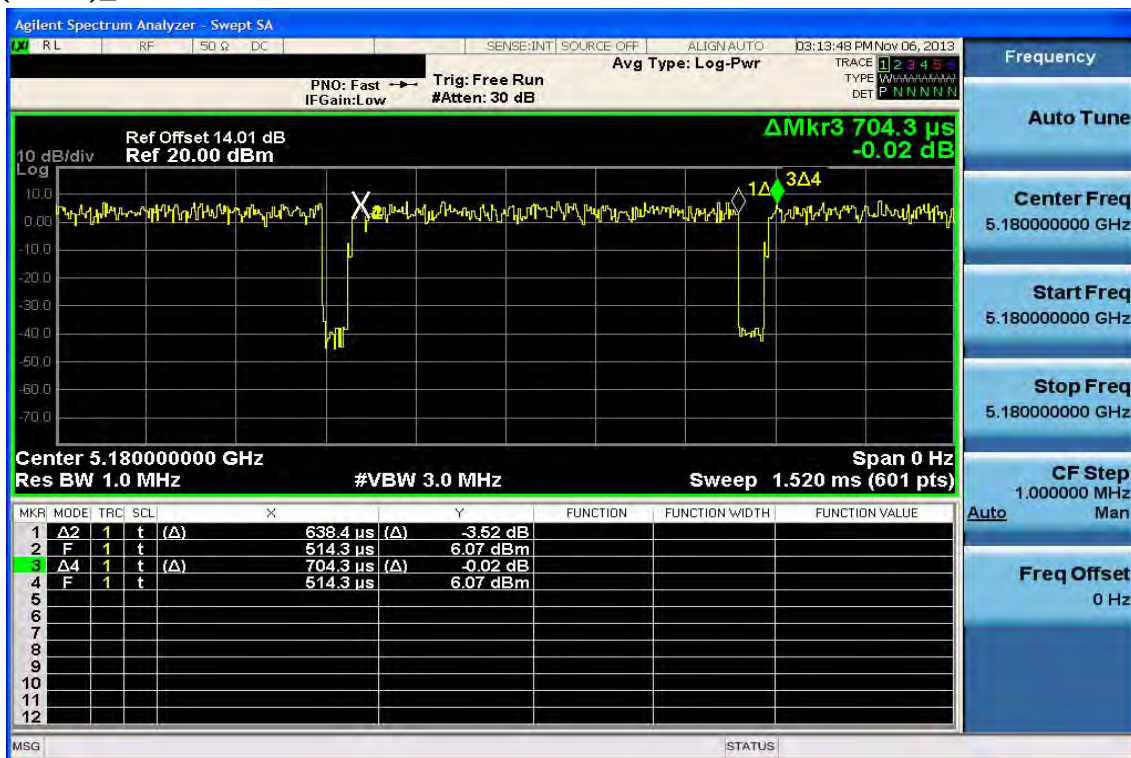
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Duty Factor:

802.11a



802.11 n (5GHz)_20M



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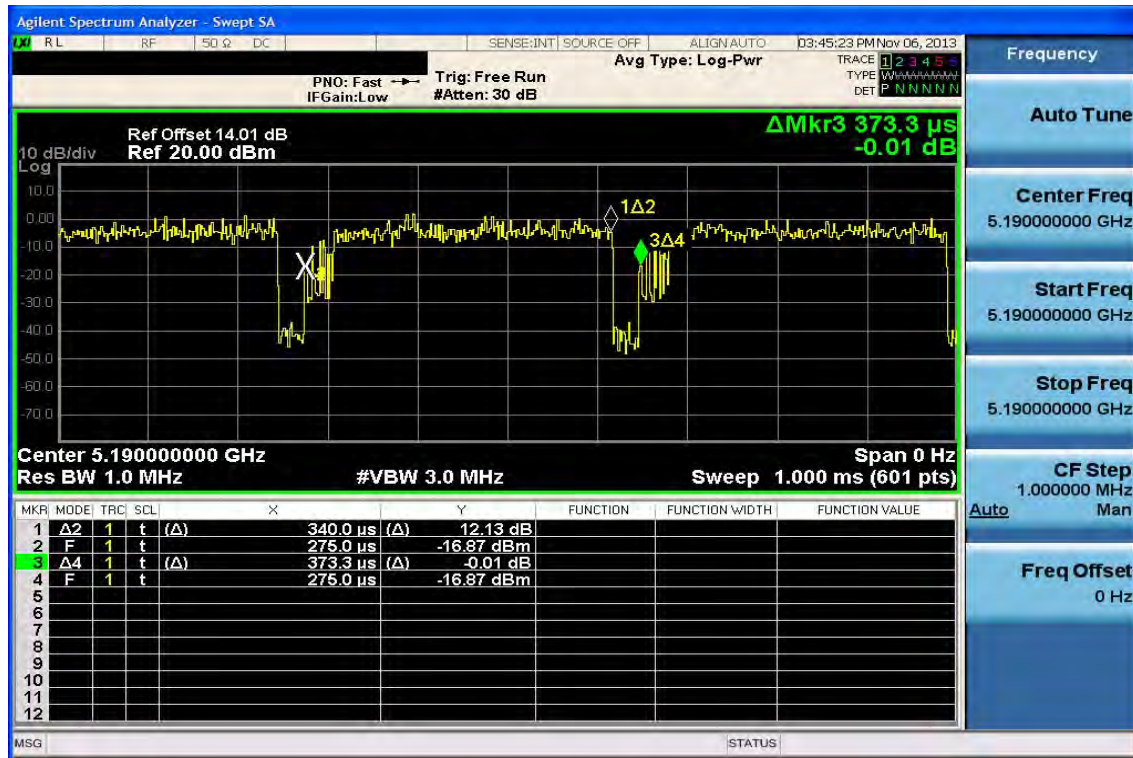
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802.11 n (5GHz)_40M



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7.5 Measurement Result:

802.11a (Main)

		Peak Power Output (dBm)								
CH	Frequency (MHz)	Data Rate								Required Limit
		6	9	12	18	24	36	48	54	
149	5745	21.61	21.58	21.55	21.56	21.53	21.48	21.44	21.34	1 Watt = 30 dBm
157	5785	21.56	21.55	21.49	21.44	21.32	21.05	20.97	20.76	1 Watt = 30 dBm
165	5825	20.78	20.44	20.18	20.73	20.43	20.15	20.07	19.77	1 Watt = 30 dBm

		Average Power Output(dBm)								
CH	Frequency (MHz)	Data Rate								Required Limit
		6	9	12	18	24	36	48	54	
149	5745	10.86	10.78	10.76	10.75	10.62	10.18	10.03	9.85	1 Watt = 30 dBm
157	5785	10.66	10.61	10.52	10.36	10.07	9.86	9.68	9.53	1 Watt = 30 dBm
165	5825	10.18	9.61	9.57	9.65	9.39	9.20	9.03	8.51	1 Watt = 30 dBm

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802.11a (Aux)

		Peak Power Output (dBm)								
CH	Frequency (MHz)	Data Rate								Required Limit
		6	9	12	18	24	36	48	54	
149	5745	21.11	20.97	20.96	21.07	20.97	20.96	20.88	20.83	1 Watt = 30 dBm
157	5785	21.33	21.26	21.21	21.23	20.96	20.87	20.67	20.48	1 Watt = 30 dBm
165	5825	20.53	20.46	20.39	20.71	20.51	20.08	20.01	19.84	1 Watt = 30 dBm

		Average Power Output(dBm)								Required Limit
CH	Frequency (MHz)	Data Rate								
		6	9	12	18	24	36	48	54	
149	5745	10.25	10.22	10.19	10.15	10.06	9.86	9.51	9.22	1 Watt = 30 dBm
157	5785	10.40	10.36	10.38	10.37	10.26	10.18	10.06	8.99	1 Watt = 30 dBm
165	5825	10.13	9.81	9.78	9.73	9.34	9.08	8.90	8.35	1 Watt = 30 dBm

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802.11n (5GHz)_20M (Main)

		Peak Power Output(dBm)								
CH	Frequency (MHz)	Data Rate								Required Limit
		MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7	
149	5745	21.62	21.61	21.55	21.43	21.53	21.50	21.46	21.41	1 Watt = 30 dBm
157	5785	21.01	20.96	20.79	20.68	20.66	20.64	20.67	20.68	1 Watt = 30 dBm
165	5825	20.45	19.98	20.13	20.17	20.33	20.41	20.39	20.04	1 Watt = 30 dBm

		Average Power Output(dBm)								
CH	Frequency (MHz)	Data Rate								Required Limit
		MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7	
149	5745	10.65	10.57	10.50	10.41	10.38	10.26	10.18	10.03	1 Watt = 30 dBm
157	5785	10.30	10.21	10.16	10.01	9.87	9.72	9.61	9.53	1 Watt = 30 dBm
165	5825	9.62	9.52	9.35	9.33	9.22	9.11	8.94	8.46	1 Watt = 30 dBm

802.11n (5GHz)_20M (Aux)

		Peak Power Output(dBm)								
CH	Frequency (MHz)	Data Rate								Required Limit
		MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7	
149	5745	20.76	20.73	20.75	20.73	20.71	20.68	20.69	20.65	1 Watt = 30 dBm
157	5785	20.70	20.68	20.58	20.40	20.48	20.43	20.45	20.51	1 Watt = 30 dBm
165	5825	20.53	20.09	20.19	20.20	20.41	20.48	20.32	19.87	1 Watt = 30 dBm

		Average Power Output(dBm)								
CH	Frequency (MHz)	Data Rate								Required Limit
		MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7	
149	5745	10.05	9.88	9.81	9.73	9.68	9.54	9.29	9.11	1 Watt = 30 dBm
157	5785	10.31	10.01	9.86	9.54	9.48	9.36	9.22	9.16	1 Watt = 30 dBm
165	5825	9.66	9.47	9.43	9.36	9.25	9.06	9.03	8.39	1 Watt = 30 dBm

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802.11n (5GHz)_20M MIMO Chain 0

		Peak Power Output(dBm)								
CH	Frequency (MHz)	Data Rate								Required Limit
		MCS8	MCS9	MCS10	MCS11	MCS12	MCS13	MCS14	MCS15	
149	5745	22.12	22.04	22.01	21.93	21.91	21.88	21.51	21.83	0.72 Watt = 28.55dBm
157	5785	22.10	21.81	21.71	21.70	21.68	21.72	21.57	21.48	0.72 Watt = 28.55dBm
165	5825	21.35	21.01	21.04	20.72	20.88	21.11	20.94	20.52	0.72 Watt = 28.55dBm

		Average Power Output(dBm)								
CH	Frequency (MHz)	Data Rate								Required Limit
		MCS8	MCS9	MCS10	MCS11	MCS12	MCS13	MCS14	MCS15	
149	5745	11.72	10.99	10.96	10.56	10.54	10.46	10.33	9.98	0.72 Watt = 28.55dBm
157	5785	11.76	10.81	10.77	10.51	10.48	10.31	10.17	9.66	0.72 Watt = 28.55dBm
165	5825	10.61	9.87	9.80	9.57	9.36	9.18	9.05	8.57	0.72 Watt = 28.55dBm

802.11n (5GHz)_20M MIMO Chain 1

		Peak Power Output(dBm)								
CH	Frequency (MHz)	Data Rate								Required Limit
		MCS8	MCS9	MCS10	MCS11	MCS12	MCS13	MCS14	MCS15	
149	5745	21.61	21.46	21.39	21.72	21.69	21.71	21.46	21.44	0.72 Watt = 28.55dBm
157	5785	21.62	21.54	21.53	21.81	21.76	21.73	21.56	21.50	0.72 Watt = 28.55dBm
165	5825	20.99	20.51	20.88	20.87	20.85	20.56	20.69	20.63	0.72 Watt = 28.55dBm

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		Average Power Output(dBm)								
CH	Frequency (MHz)	Data Rate								Required Limit
		MCS8	MCS9	MCS10	MCS11	MCS12	MCS13	MCS14	MCS15	
149	5745	11.21	10.57	10.55	10.32	10.22	10.17	10.10	9.70	0.72 Watt = 28.55dBm
157	5785	11.28	10.75	10.71	10.58	10.42	10.27	10.21	9.60	0.72 Watt = 28.55dBm
165	5825	10.28	9.63	9.62	9.70	9.11	9.05	8.81	8.69	0.72 Watt = 28.55dBm

802.11n (5GHz)_20M MIMO Chain 0+ Chain1

		Peak Power Output(dBm)								
CH	Frequency (MHz)	Data Rate								Required Limit
		MCS8	MCS9	MCS10	MCS11	MCS12	MCS13	MCS14	MCS15	
149	5745	24.88	24.77	24.72	24.84	24.81	24.81	24.50	24.65	0.72 Watt = 28.55dBm
157	5785	24.88	24.69	24.63	24.77	24.73	24.74	24.58	24.50	0.72 Watt = 28.55dBm
165	5825	24.18	23.78	23.97	23.81	23.88	23.85	23.83	23.59	0.72 Watt = 28.55dBm

		Average Power Output(dBm)								
CH	Frequency (MHz)	Data Rate								Required Limit
		MCS8	MCS9	MCS10	MCS11	MCS12	MCS13	MCS14	MCS15	
149	5745	14.48	13.80	13.77	13.45	13.39	13.33	13.23	12.85	0.72 Watt = 28.55dBm
157	5785	14.54	13.79	13.75	13.56	13.46	13.30	13.20	12.64	0.72 Watt = 28.55dBm
165	5825	13.46	12.76	12.72	12.65	12.25	12.13	11.94	11.64	0.72 Watt = 28.55dBm

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802.11n (5GHz)_40M (Main)

		Peak Power Output(dBm)								
CH	Frequency (MHz)	Data Rate								Required Limit
		MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7	
151	5755	22.98	21.58	21.44	21.35	21.28	20.96	20.81	20.62	1 Watt = 30 dBm
159	5795	22.26	20.50	20.66	20.63	20.17	20.06	19.97	19.67	1 Watt = 30 dBm

		Average Power Output(dBm)								
CH	Frequency (MHz)	Data Rate								Required Limit
		MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7	
151	5755	10.01	9.98	9.93	9.88	9.72	9.62	9.31	9.11	1 Watt = 30 dBm
159	5795	9.36	9.12	8.97	8.85	8.45	8.37	8.22	8.21	1 Watt = 30 dBm

802.11n (5GHz)_40M (Aux)

		Peak Power Output(dBm)								
CH	Frequency (MHz)	Data Rate								Required Limit
		MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7	
151	5755	22.31	21.16	21.07	21.00	20.83	20.76	20.55	20.41	1 Watt = 30 dBm
159	5795	21.58	20.27	20.22	19.86	19.76	19.58	19.54	19.43	1 Watt = 30 dBm

		Average Power Output(dBm)								
CH	Frequency (MHz)	Data Rate								Required Limit
		MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7	
151	5755	9.23	9.21	9.11	9.00	8.96	8.87	8.76	8.73	1 Watt = 30 dBm
159	5795	8.88	8.61	8.73	8.33	8.14	7.93	7.83	7.82	1 Watt = 30 dBm

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802.11n (5GHz)_40M MIMO Chain 0

		Peak Power Output(dBm)								
CH	Frequency (MHz)	Data Rate								Required Limit
		MCS8	MCS9	MCS10	MCS11	MCS12	MCS13	MCS14	MCS15	
151	5755	21.86	21.13	21.06	21.05	21.13	21.18	21.19	21.17	0.72 Watt = 28.55dBm
159	5795	21.76	22.09	21.06	20.91	20.91	20.83	20.83	20.78	0.72 Watt = 28.55dBm

		Average Power Output(dBm)								
CH	Frequency (MHz)	Data Rate								Required Limit
		MCS8	MCS9	MCS10	MCS11	MCS12	MCS13	MCS14	MCS15	
151	5755	10.17	10.04	9.91	9.53	9.44	9.34	9.23	9.19	0.72 Watt = 28.55dBm
159	5795	9.91	9.83	9.62	9.45	9.38	9.27	9.18	9.07	0.72 Watt = 28.55dBm

802.11n (5GHz)_40M MIMO Chain 1

		Peak Power Output(dBm)								
CH	Frequency (MHz)	Data Rate								Required Limit
		MCS8	MCS9	MCS10	MCS11	MCS12	MCS13	MCS14	MCS15	
151	5755	21.58	21.12	21.05	21.02	21.03	21.01	20.98	20.99	0.72 Watt = 28.55dBm
159	5795	21.66	21.15	20.86	20.84	20.76	20.68	20.59	20.48	0.72 Watt = 28.55dBm

		Average Power Output(dBm)								
CH	Frequency (MHz)	Data Rate								Required Limit
		MCS8	MCS9	MCS10	MCS11	MCS12	MCS13	MCS14	MCS15	
151	5755	9.98	9.95	9.42	9.27	9.38	9.24	9.11	8.96	0.72 Watt = 28.55dBm
159	5795	9.24	9.22	9.11	8.92	8.86	8.79	8.65	8.67	0.72 Watt = 28.55dBm

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802.11n (5GHz)_40M MIMO Chain 0+Chain 1

		Peak Power Output(dBm)								Required Limit
CH	Frequency (MHz)	Data Rate								
		MCS8	MCS9	MCS10	MCS11	MCS12	MCS13	MCS14	MCS15	
151	5755	24.73	24.14	24.07	24.05	24.09	24.11	24.10	24.09	0.72 Watt = 28.55dBm
159	5795	24.72	24.66	23.97	23.89	23.85	23.77	23.72	23.64	0.72 Watt = 28.55dBm

		Average Power Output(dBm)								Required Limit
CH	Frequency (MHz)	Data Rate								
		MCS8	MCS9	MCS10	MCS11	MCS12	MCS13	MCS14	MCS15	
151	5755	13.09	13.01	12.68	12.41	12.42	12.30	12.18	12.09	0.72 Watt = 28.55dBm
159	5795	12.60	12.55	12.38	12.20	12.14	12.05	11.93	11.88	0.72 Watt = 28.55dBm

*** Note: The duty cycle factor is compensated back to obtain the maximum value of the measurement in average.**

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802.11a (Main)

		EIRP (dBm)								
CH	Frequency (MHz)	Data Rate								Required Limit
		6	9	12	18	24	36	48	54	
149	5745	15.64	15.56	15.54	15.53	15.40	14.96	14.81	14.63	4 Watts = 36 dBm
157	5785	15.44	15.39	15.30	15.14	14.85	14.64	14.46	14.31	4 Watts = 36 dBm
165	5825	14.96	14.39	14.35	14.43	14.17	13.98	13.81	13.29	4 Watts = 36 dBm

802.11a (Aux)

		EIRP (dBm)								
CH	Frequency (MHz)	Data Rate								Required Limit
		6	9	12	18	24	36	48	54	
149	5745	18.02	17.99	17.96	17.92	17.83	17.63	17.28	16.99	4 Watts = 36 dBm
157	5785	18.17	18.13	18.15	18.14	18.03	17.95	17.83	16.76	4 Watts = 36 dBm
165	5825	17.90	17.58	17.55	17.50	17.11	16.85	16.67	16.12	4 Watts = 36 dBm

802.11n (5GHz)_20M (Main)

		EIRP (dBm)								
CH	Frequency (MHz)	Data Rate								Required Limit
		MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7	
149	5745	15.43	15.35	15.28	15.19	15.16	15.04	14.96	14.81	4 Watts = 36 dBm
157	5785	15.08	14.99	14.94	14.79	14.65	14.50	14.39	14.31	4 Watts = 36 dBm
165	5825	14.40	14.30	14.13	14.11	14.00	13.89	13.72	13.24	4 Watts = 36 dBm

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802.11n (5GHz)_20M (Aux)

		EIRP (dBm)								
CH	Frequency (MHz)	Data Rate								Required Limit
		MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7	
149	5745	17.82	17.65	17.58	17.50	17.45	17.31	17.06	16.88	4 Watts = 36 dBm
157	5785	18.08	17.78	17.63	17.31	17.25	17.13	16.99	16.93	4 Watts = 36 dBm
165	5825	17.43	17.24	17.20	17.13	17.02	16.83	16.80	16.16	4 Watts = 36 dBm

802.11n (5GHz)_20M MIMO Chain 0

		EIRP (dBm)								Required Limit
CH	Frequency (MHz)	Data Rate								
		MCS8	MCS9	MCS10	MCS11	MCS12	MCS13	MCS14	MCS15	
149	5745	19.81	19.08	19.05	18.65	18.63	18.55	18.42	18.07	4 Watts = 36 dBm
157	5785	19.85	18.90	18.86	18.60	18.57	18.40	18.26	17.75	4 Watts = 36 dBm
165	5825	18.70	17.96	17.89	17.66	17.45	17.27	17.14	16.66	4 Watts = 36 dBm

802.11n (5GHz)_20M MIMO Chain 1

		EIRP (dBm)								Required Limit
CH	Frequency (MHz)	Data Rate								
		MCS8	MCS9	MCS10	MCS11	MCS12	MCS13	MCS14	MCS15	
149	5745	19.30	18.66	18.64	18.41	18.31	18.26	18.19	17.79	4 Watts = 36 dBm
157	5785	19.37	18.84	18.80	18.67	18.51	18.36	18.30	17.69	4 Watts = 36 dBm
165	5825	18.37	17.72	17.71	17.79	17.20	17.14	16.90	16.78	4 Watts = 36 dBm

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802.11n (5GHz)_20M MIMO Chain 0+Chain 1

		EIRP (dBm)								
CH	Frequency (MHz)	Data Rate								Required Limit
		MCS8	MCS9	MCS10	MCS11	MCS12	MCS13	MCS14	MCS15	
149	5745	22.57	21.89	21.86	21.54	21.48	21.42	21.32	20.94	4 Watts = 36 dBm
157	5785	22.63	21.88	21.84	21.65	21.55	21.39	21.29	20.73	4 Watts = 36 dBm
165	5825	21.55	20.85	20.81	20.74	20.34	20.22	20.03	19.73	4 Watts = 36 dBm

802.11n (5GHz)_40M (Main)

		EIRP (dBm)								Required Limit
CH	Frequency (MHz)	Data Rate								
		MCS8	MCS9	MCS10	MCS11	MCS12	MCS13	MCS14	MCS15	
151	5755	14.79	14.76	14.71	14.66	14.50	14.40	14.09	13.89	4 Watts = 36 dBm
159	5795	14.14	13.90	13.75	13.63	13.23	13.15	13.00	12.99	4 Watts = 36 dBm

802.11n (5GHz)_40M (Aux)

		EIRP (dBm)								
CH	Frequency (MHz)	Data Rate								Required Limit
		MCS8	MCS9	MCS10	MCS11	MCS12	MCS13	MCS14	MCS15	
151	5755	17.00	16.98	16.88	16.77	16.73	16.64	16.53	16.50	4 Watts = 36 dBm
159	5795	16.65	16.38	16.50	16.10	15.91	15.70	15.60	15.59	4 Watts = 36 dBm

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802.11n (5GHz)_40M MIMO Chain 0

		EIRP (dBm)								Required Limit
CH	Frequency (MHz)	Data Rate								
		MCS8	MCS9	MCS10	MCS11	MCS12	MCS13	MCS14	MCS15	
151	5755	18.26	18.13	18.00	17.62	17.53	17.43	17.32	17.28	4 Watts = 36 dBm
159	5795	18.00	17.92	17.71	17.54	17.47	17.36	17.27	17.16	4 Watts = 36 dBm

802.11n (5GHz)_40M MIMO Chain 1

		EIRP (dBm)								Required Limit
CH	Frequency (MHz)	Data Rate								
		MCS8	MCS9	MCS10	MCS11	MCS12	MCS13	MCS14	MCS15	
151	5755	18.07	18.04	17.51	17.36	17.47	17.33	17.20	17.05	4 Watts = 36 dBm
159	5795	17.33	17.31	17.20	17.01	16.95	16.88	16.74	16.76	4 Watts = 36 dBm

802.11n (5GHz)_40M MIMO Chain 0+Chain 1

		EIRP (dBm)								Required Limit
CH	Frequency (MHz)	Data Rate								
		MCS8	MCS9	MCS10	MCS11	MCS12	MCS13	MCS14	MCS15	
151	5755	11.96	11.90	11.85	11.76	11.70	11.61	11.54	11.42	4 Watts = 36 dBm
159	5795	11.75	11.72	11.66	11.55	11.43	11.36	11.31	11.22	4 Watts = 36 dBm

* Note: EIRP = Average Power + Gain, where the antenna gain was 4.78dBi for 5GHz Main, 7.77dBi for 5GHz Aux, and 8.09dBi for 5GHz (MIMO)

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8 6dB BANDWIDTH

8.1 Standard Applicable:

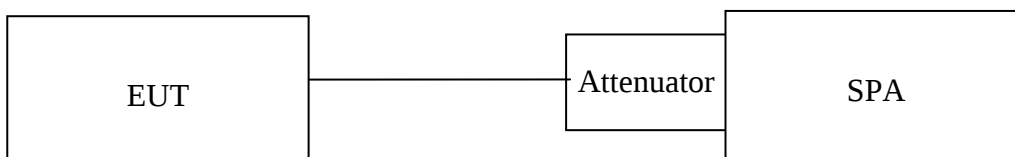
According to §15.247(a)(2), Systems using digital modulation techniques may operate in the 902 - 928 MHz, 2400 - 2483.5 MHz, and 5725 - 5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500kHz.

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

8.2 Measurement Equipment Used:

SGS Conducted Room					
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
Spectrum Analyzer	Agilent	N9010A	MY51440121	02/13/2012	02/12/2014
Power Meter	Anritsu	ML2495A	1005007	02/08/2012	02/07/2014
Power Sensor	Anritsu	MA2411B	917032	02/08/2012	02/07/2014
DC Power Supply	HOLA	DP-3003	001	N.C.R.	N.C.R.
Coaxial Cable	WOKEN	conducted #2	001	12/21/2012	12/20/2013
DC Block	Mini-Circuits	BLK-18-S+	002	12/21/2012	12/20/2013
Splitter	RF-LAMBAD	RFLT2W1G18G	11-JSPF412-018	12/21/2012	12/20/2013
Attenuator	Mini-Circuits	BW-S10W2+	002	12/21/2012	12/20/2013
Temperature Chamber	TERCHY	MHK-120LK	1020582	06/20/2013	06/19/2014

8.3 Test Set-up:



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8.4 Measurement Procedure:

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as RBW = 100 kHz, VBW = 3*RBW, Span = 30M/50MHz, Detector=Peak, Sweep=auto, the setting on spectrum is adjusted based on the procedure as guide in 8.1 option 1 of KDB558074.
4. Mark the peak frequency and -6dB (upper and lower) frequency.
5. Repeat above procedures until all frequency of interest measured was complete.

8.5 Measurement Result:**802.11a**

Frequency (MHz)	Bandwidth (kHz)	Limit (kHz)	Result
5745	16380	> 500	PASS
5785	16360	> 500	PASS
5825	16360	> 500	PASS

802.11n (5GHz)_20M MIMO-Main

Frequency (MHz)	Bandwidth (kHz)	Limit (kHz)	Result
5745	17680	> 500	PASS
5785	17640	> 500	PASS
5825	17680	> 500	PASS

802.11n (5GHz)_20M MIMO-Aux

Frequency (MHz)	Bandwidth (kHz)	Limit (kHz)	Result
5745	17620	> 500	PASS
5785	17610	> 500	PASS
5825	17630	> 500	PASS

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802.11n (5GHz)_40M MIMO-Main

Frequency (MHz)	Bandwidth (kHz)	Limit (kHz)	Result
5755	35910	> 500	PASS
5795	35750	> 500	PASS

802.11n (5GHz)_40M MIMO-Aux

Frequency (MHz)	Bandwidth (kHz)	Limit (kHz)	Result
5755	35890	> 500	PASS
5795	36080	> 500	PASS

* Note: Offset 11dB for 5G 802.11a; Offset 14.01dB for 5G 802.11n_20/n_40

* Note: The diamond reveals X decibel level

*Refer to next page for plots

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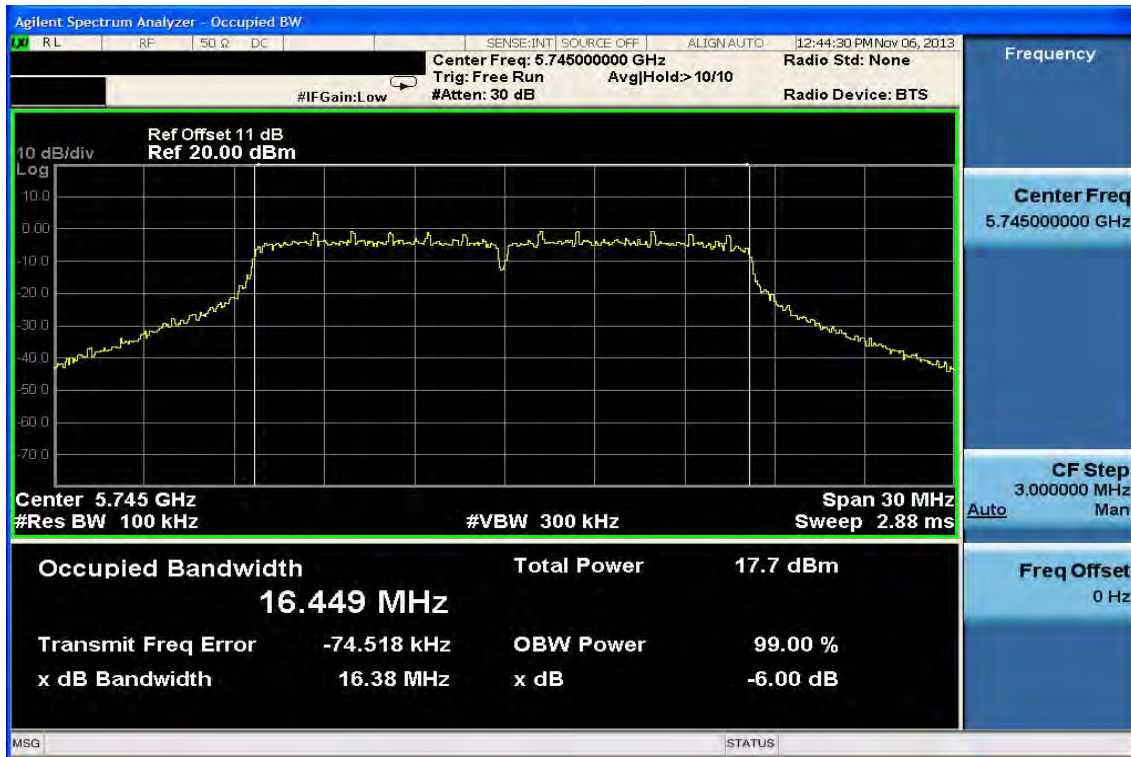
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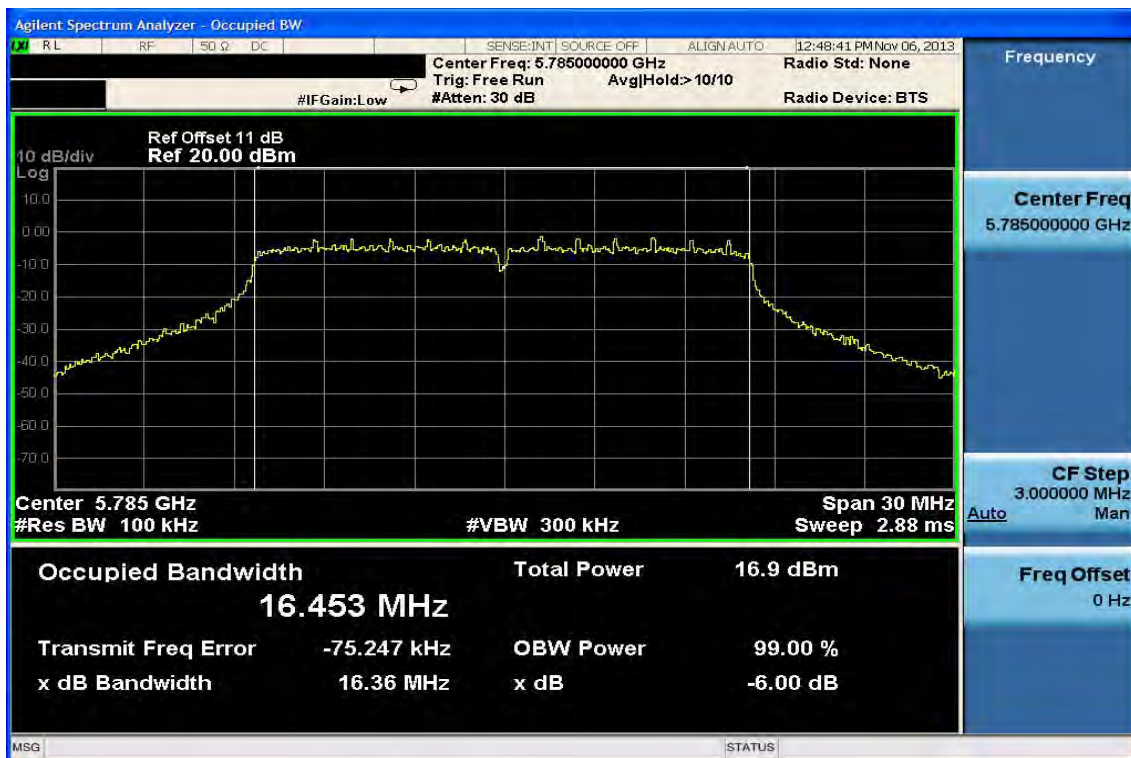
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802.11a

6dB Band Width Test Data CH-Low



6dB Band Width Test Data CH-Mid



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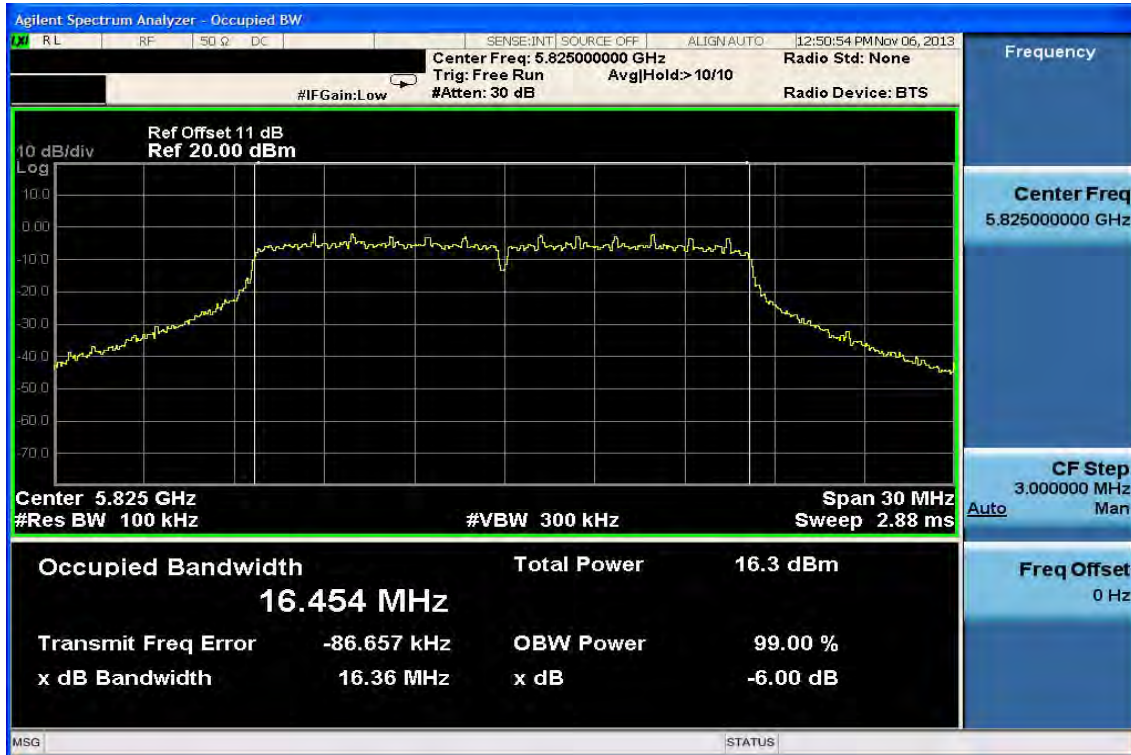
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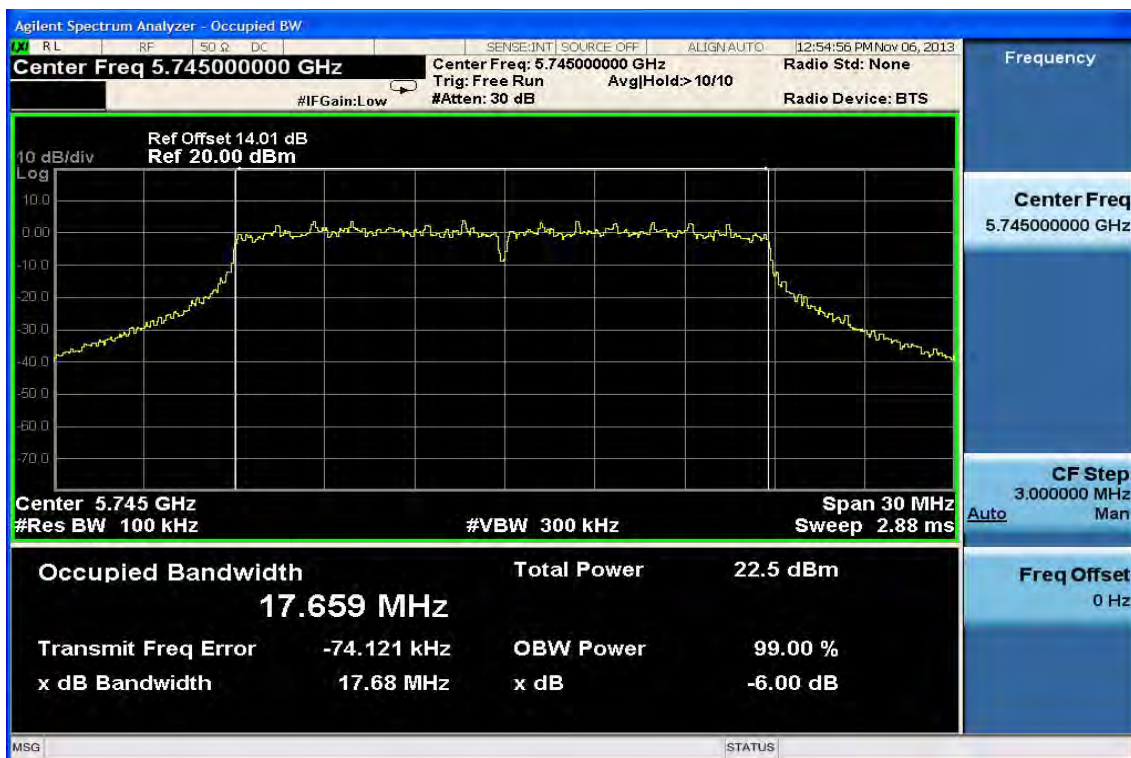
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6dB Band Width Test Data CH-High



802.11n (5GHz)_20M MIMO-Main

6dB Band Width Test Data CH-Low



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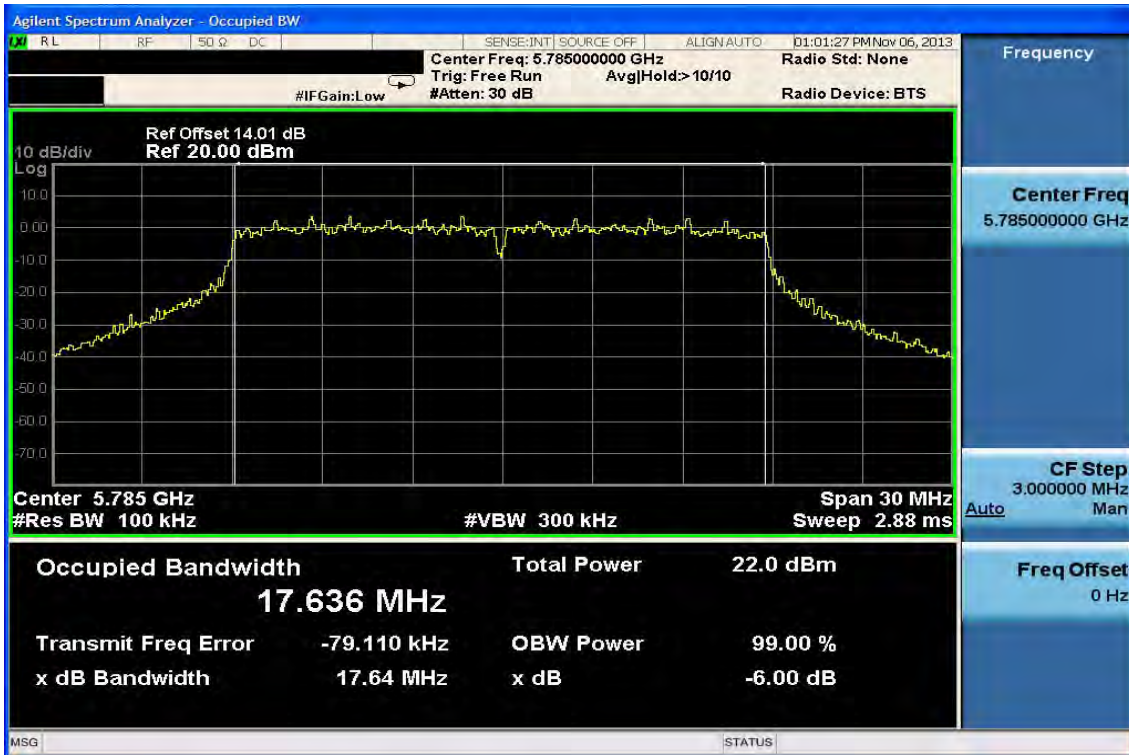
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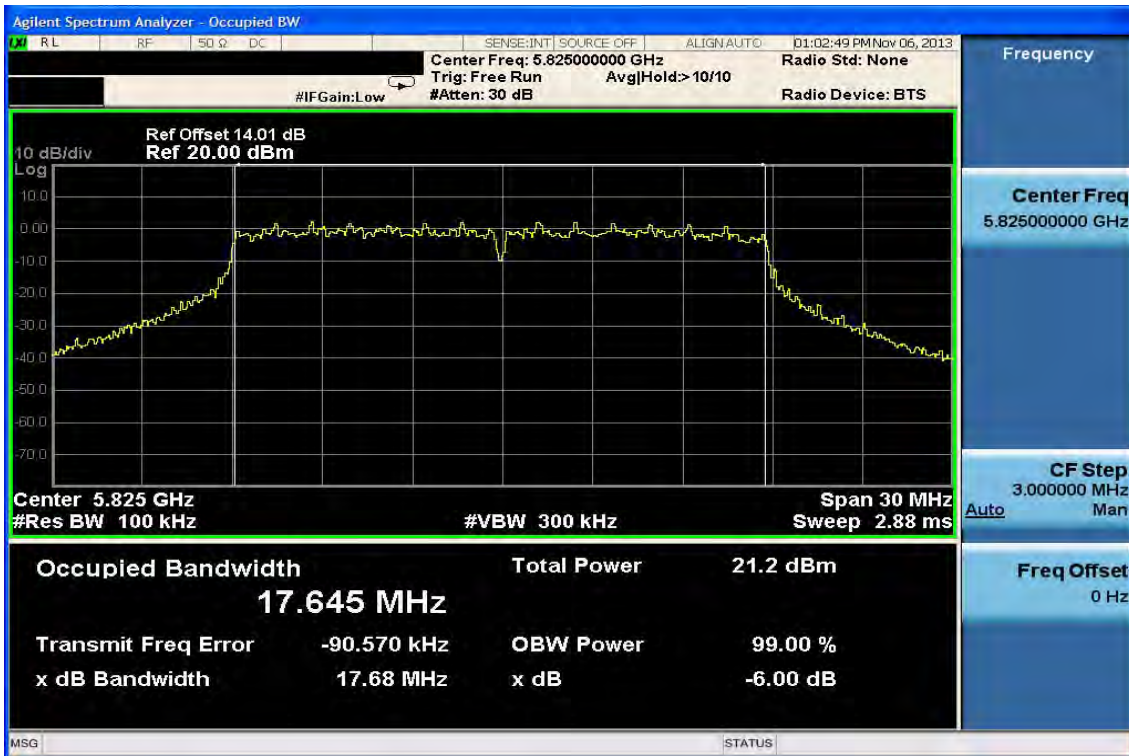
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6dB Band Width Test Data CH-Mid



6dB Band Width Test Data CH-High



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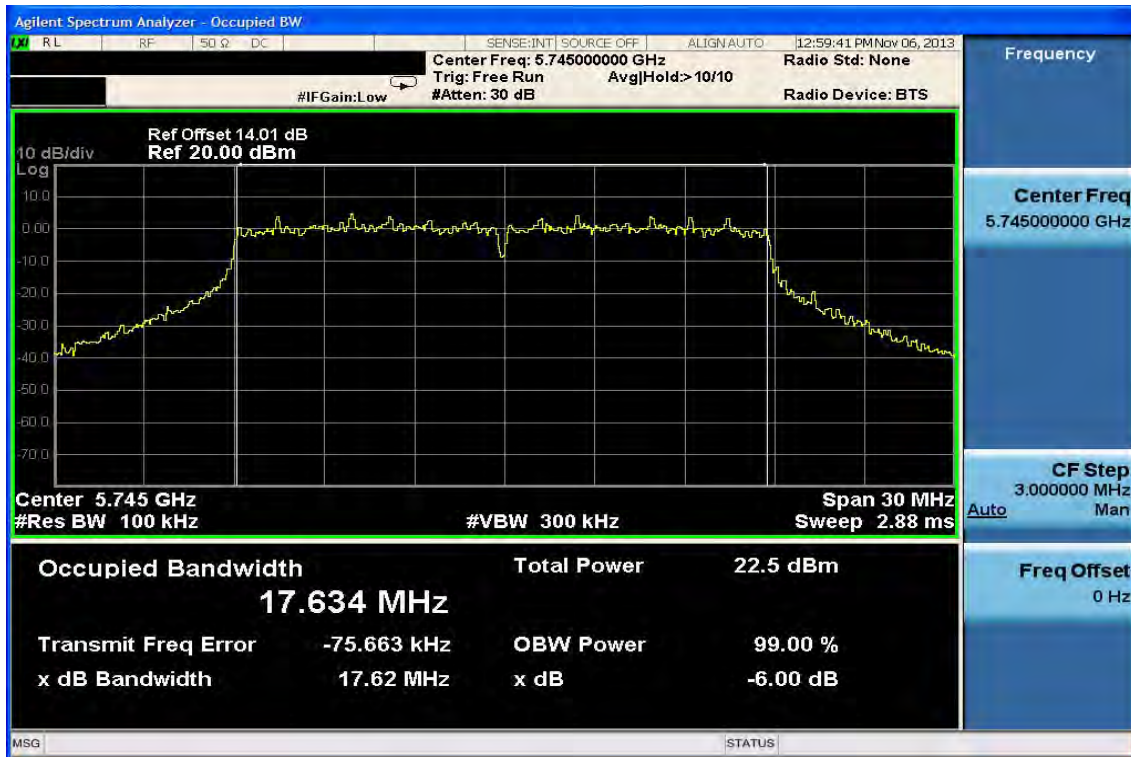
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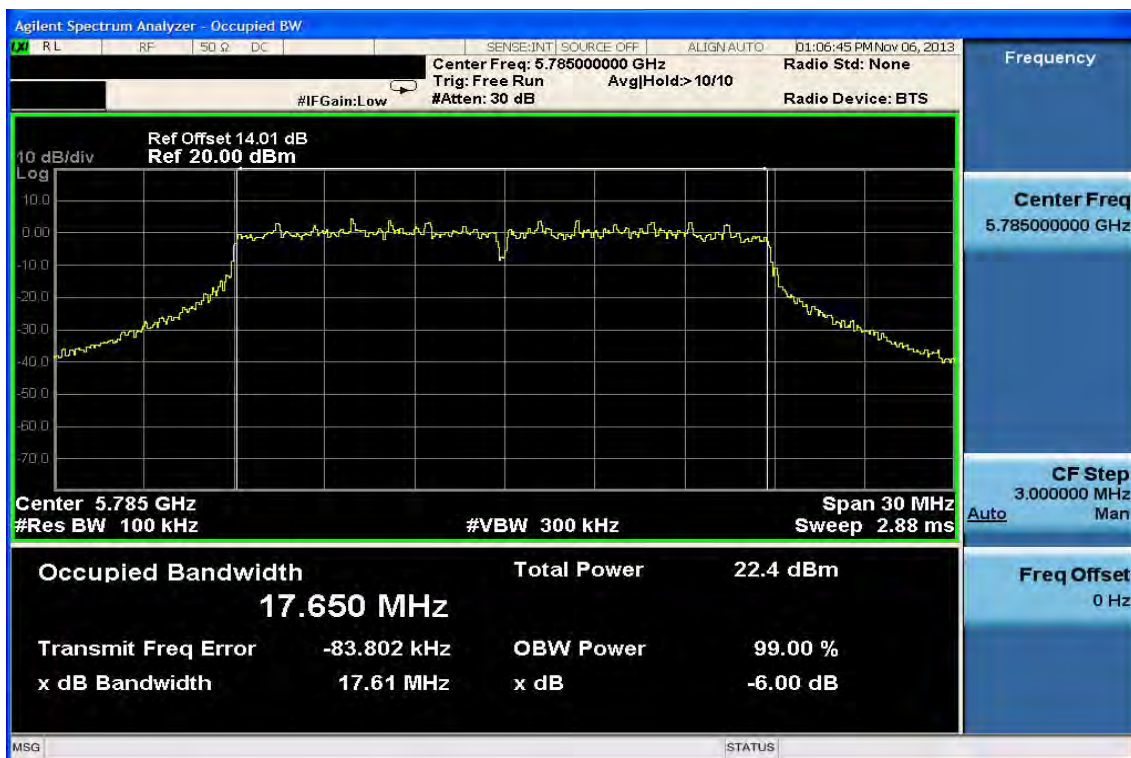
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802.11n (5GHz)_20M MIMO-Aux 6dB Band Width Test Data CH-Low



6dB Band Width Test Data CH-Mid



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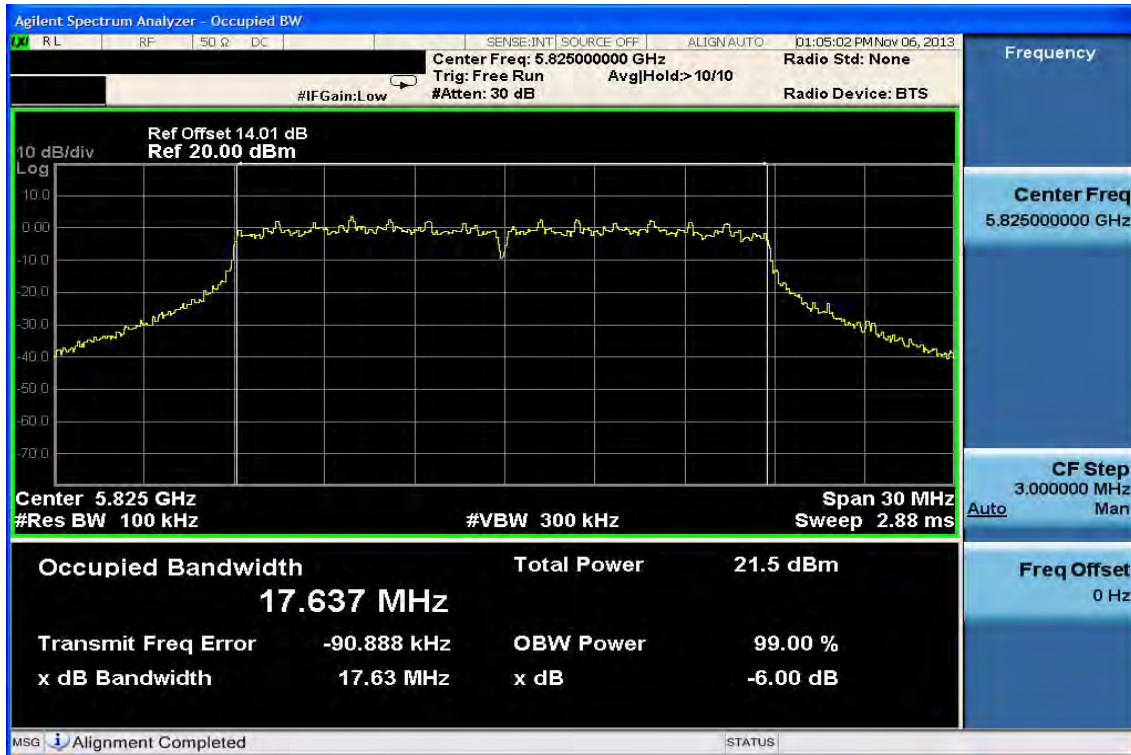
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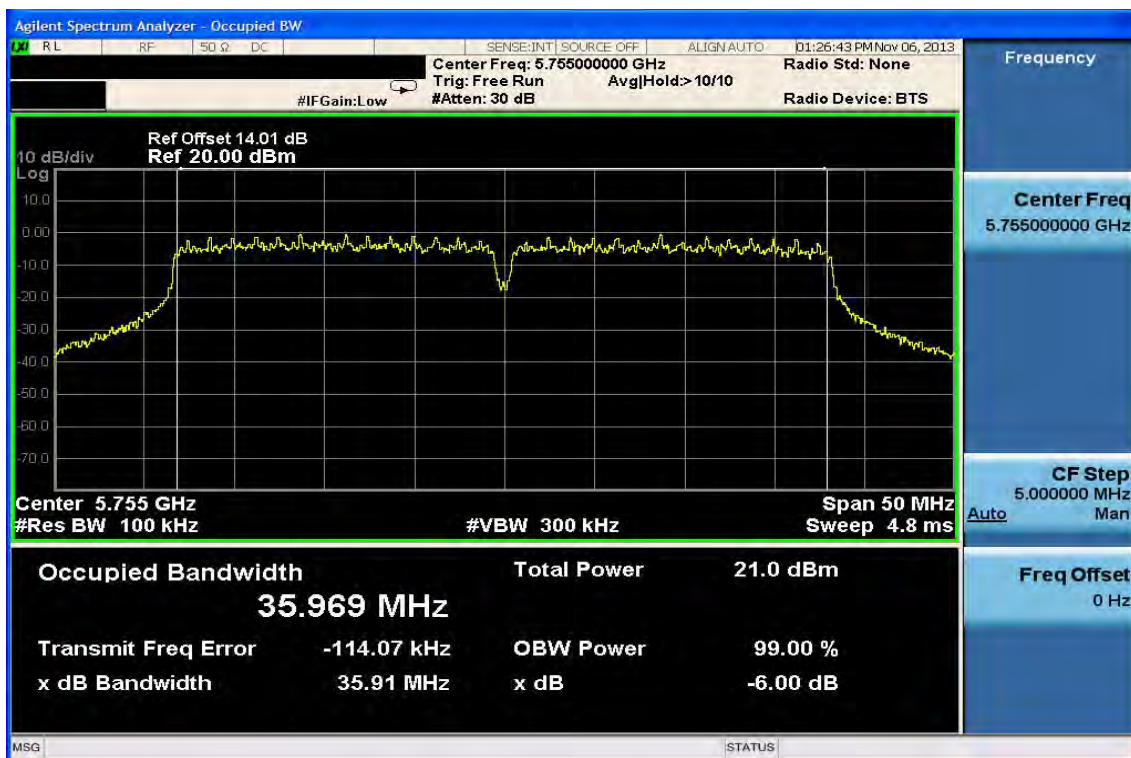
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6dB Band Width Test Data CH-High



802.11n (5GHz)_40M MIMO-Main

6dB Band Width Test Data CH-Low



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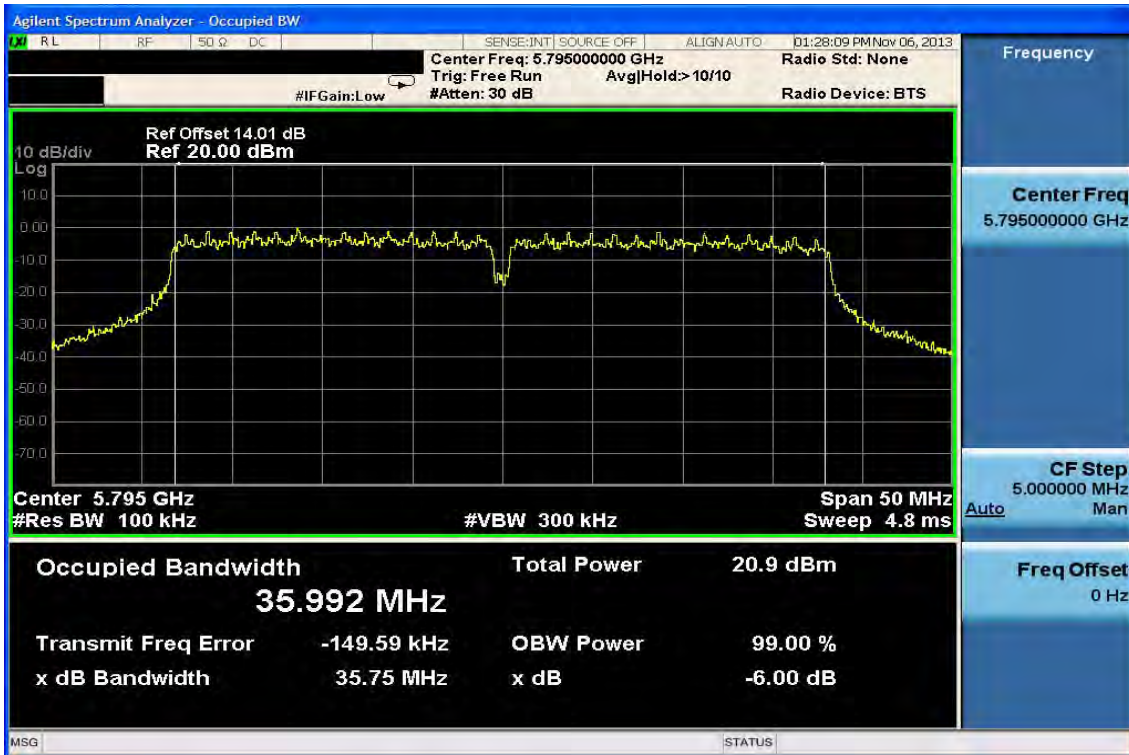
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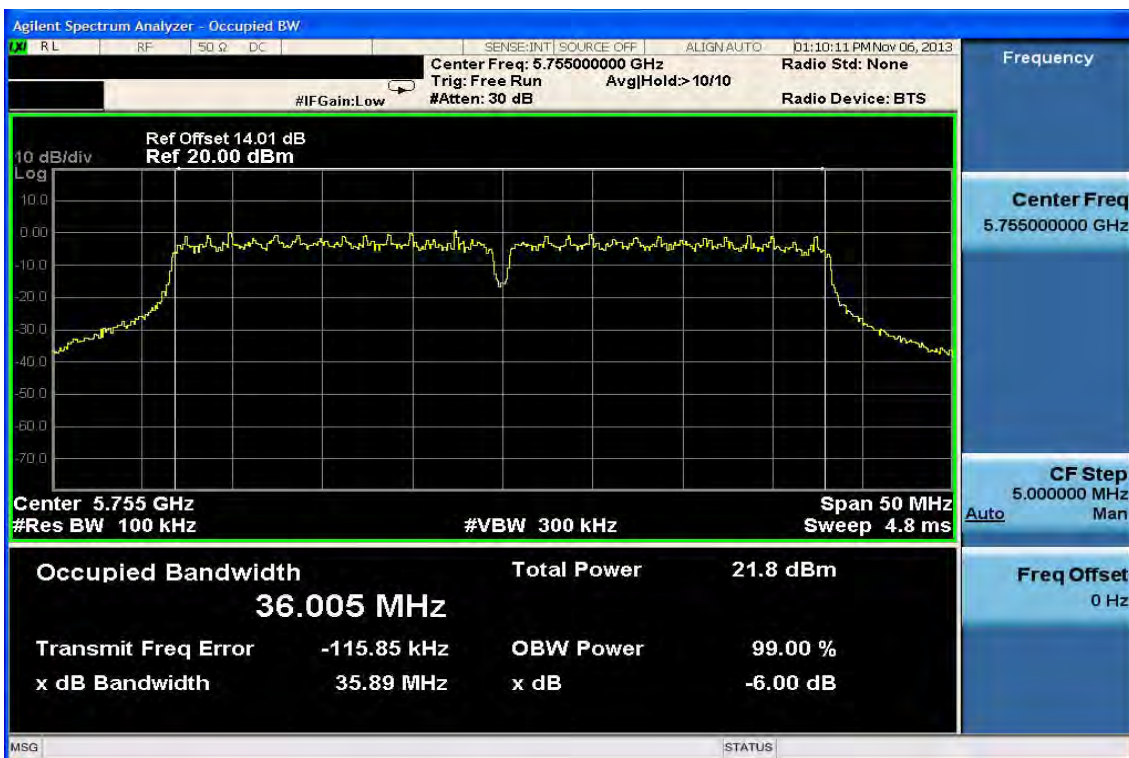
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6dB Band Width Test Data CH-High



802.11n (5GHz)_40M MIMO-Aux

6dB Band Width Test Data CH-Low



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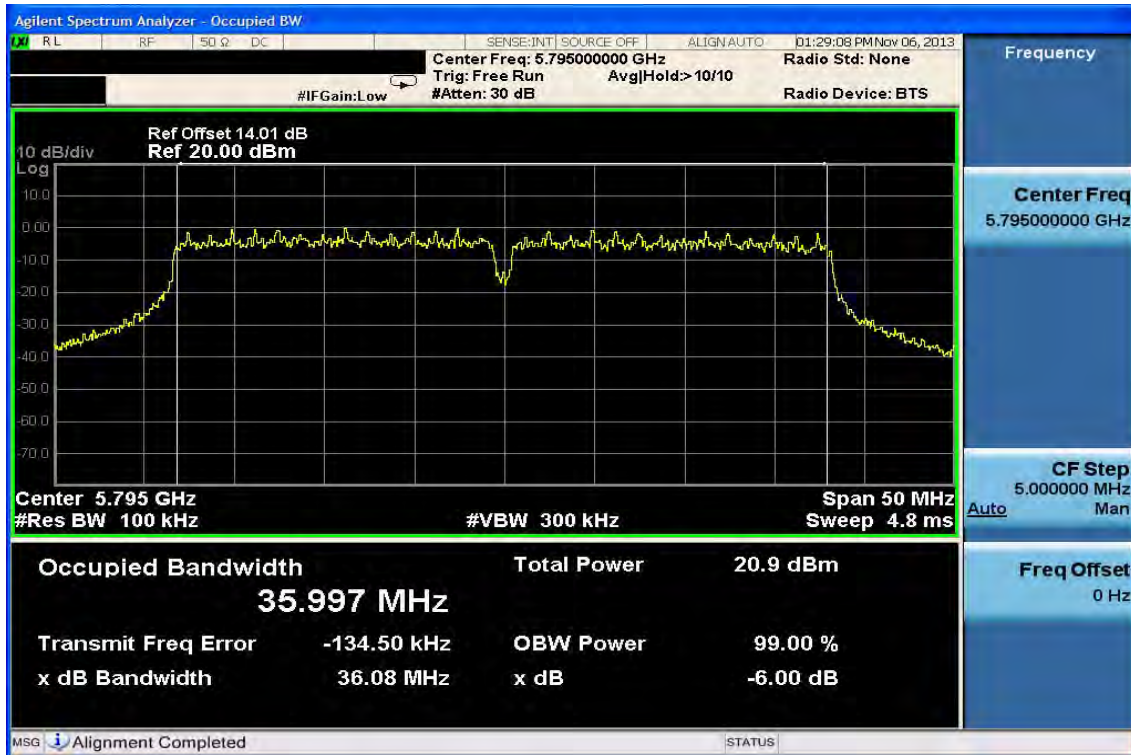
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9 BAND EDGES MEASUREMENT

9.1 Standard Applicable:

According to §15.247(d), in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a).

According to RSS-Gen §7.2.5 and RSS-210 issue 8, §A8.5, In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the radio frequency power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under section A8.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Tables 5 and 6 is not required. In addition, radiated emissions which fall in the restricted bands of Table 3 must also comply with the radiated emission limits specified in Tables 5 and 6.

9.2 Measurement Equipment Used:

9.2.1 Conducted Emission at antenna port:

Refer to section 7.2 for details.

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9.2.2 Radiated emission:

966 Chamber

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
EMI Test Receiver	R&S	ESU 40	100363	01/30/2013	01/29/2014
Broadband Antenna	TESEQ	CBL 6112D	35240	02/04/2013	02/03/2014
Horn Antenna	ETS-Lindgren	3117	00143272	01/16/2013	01/15/2014
Horn Antenna	ETS-Lindgren	3160-09	00117911	02/14/2013	02/13/2014
Pre-Amplifier	R&S	SCU-18	10203	01/21/2013	01/20/2014
Pre-Amplifier	EM Electronics Corp.	EMC330	980096	01/04/2013	01/03/2014
Pre-Amplifier	EM Electronics Corp.	EMC184045	980135	01/28/2013	01/27/2014
Coaxial Cable	Huber+Suhner	SAC-C TX-30M-1GHz	TX1	04/22/2013	04/21/2014
Coaxial Cable	Huber+Suhner	SAC-C TX-1-26.5GHz	TX2	04/22/2013	04/21/2014
Coaxial Cable	Huber+Suhner	SAC-C RX-150k-30MHz	RX1	04/22/2013	04/21/2014
Coaxial Cable	Huber+Suhner	SAC-C RX-30M-1GHz	RX2	04/22/2013	04/21/2014
Coaxial Cable	Huber+Suhner	SAC-C RX-1-26.5GHz	RX3	04/22/2013	04/21/2014
Controller	Chance Most	886	N/A	N.C.R.	N.C.R.
Antenna Master	Chance Most	N/A	N/A	N.C.R.	N.C.R.
Turn Table	Chance Most	N/A	N/A	N.C.R.	N.C.R.
Filter Bank	R&S	TS8996	SCIN.EMC.1023.12	04/22/2013	04/21/2014
Test Software	World-Pallas	Dr. E	V 3.0 Lite	N.C.R.	N.C.R.

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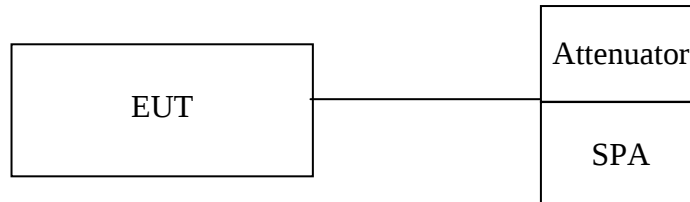
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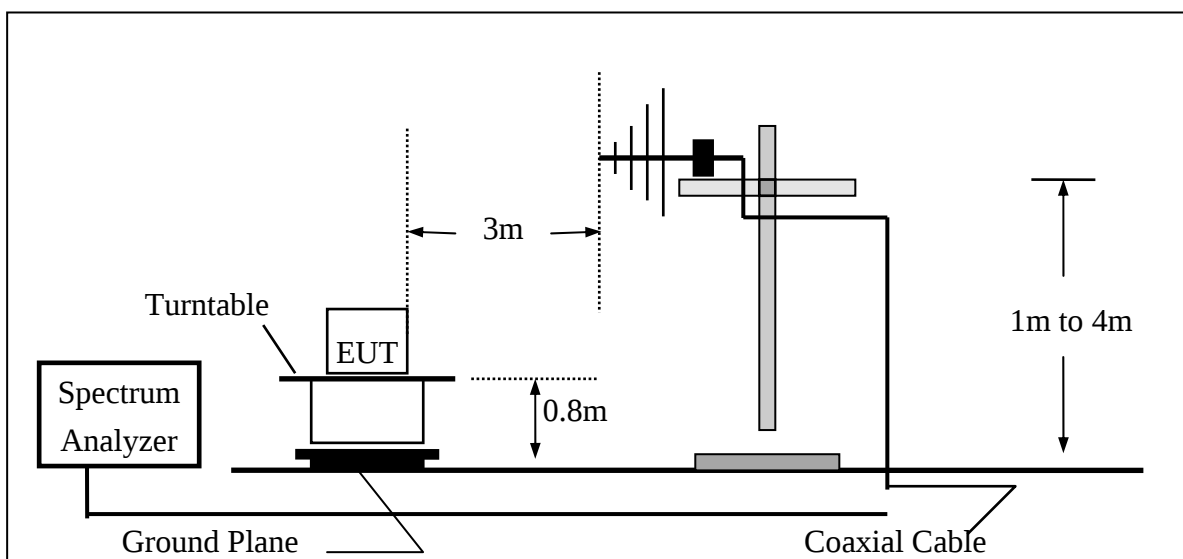
9.3 Test SET-UP:

9.3.1 Conducted Emission at antenna port:

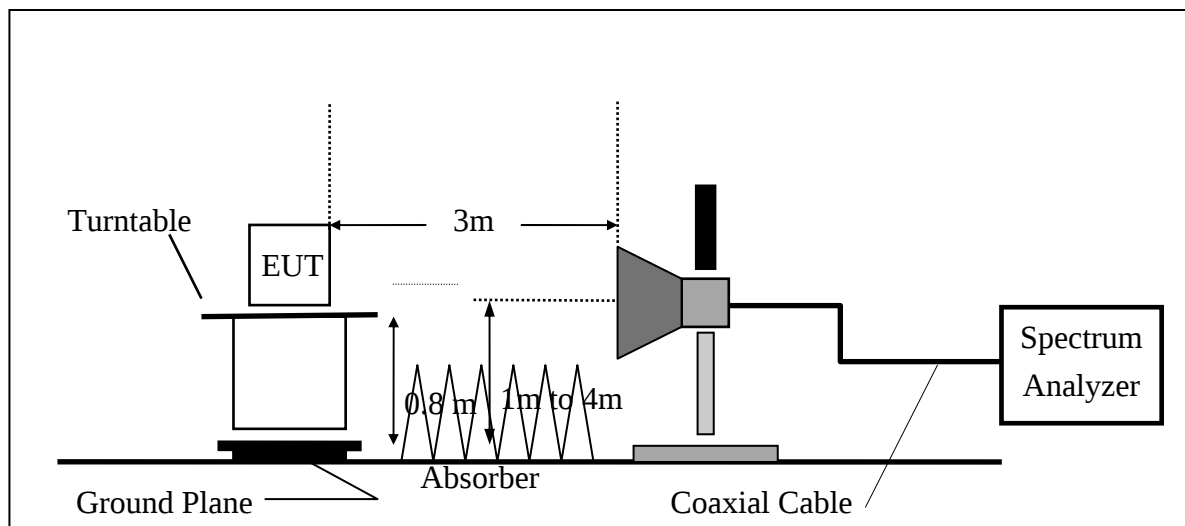


9.3.2 Radiated emission:

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



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



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9.4 Measurement Procedure:

Unwanted Emissions into Non-Restricted Frequency Bands, Measurement Procedure followed by 11.1 of KDB558074 D01

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 start to edge frequency, and stop frequency of spectrum analyzer so as to encompass the spectrum to be examined.
4. Set the spectrum analyzer as RBW, VBW=300KHz, Detector = Peak, Sweep = auto
5. Mark the highest reading of the emission as the reference level measurement.
6. Set DL as the limit = reading on marker 1 – 20dBm
7. Marker on frequency, 2.3999GHz and 2.4836GHz, and examine shall 100 KHz immediately outside the authorized (2400~2483.5) be attenuated by 20dB at least relative to the maximum emission of power.
8. Repeat above procedures until all default test channel (low, middle, and high) was complete.

Unwanted Emission falling into Restricted Frequency Bands, Measurement Procedure followed by 12.1 of KDB558074 D01

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. On spectrum, following 8.1.2, and RBW = 1MHz, VBW = 3MHz, & Marker 2390MHz, and 2483.5MHz (Peak Measurement). Average Measurement: following 8.2 with the modification span to 1MHz, & RBW = 1MHz, VBW = 3MHz and peak marker function to obtain the highest reading on 2390, and 2483.5MHz.
8. Repeat above procedures until all default test channel (low, middle, and high) was complete

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Note: For MIMO operation, directional gain and limit are subject to be varied as per 15.247 c)1)i)

Due to correlation of two transmitting signal antenna, directional gain = Gain + 10 Log (N) dBi is used in determination of total power being transmitting while MIMO mode is enabled.

For the measurement of MIMO operation complying with the conducted bandedge test item, Aux with 3dB offset on HT_20 and main with 3dB offset on HT_40 is measured out, and its corresponding resultant plot is captured, respectively. Following the higher emission generated by respective port while signal is being transmitted singularly, 3dB offset with higher value yields worsen and representative data. While measuring HT_20 at single transmission of Aux port, Aux is observed and test out to obtain worsen outcome. Likewise, HT_40 at Main results the worsen data while undertaking single transmission, and therefore offset 3dB would results worsen emission.

Note: Following “measure and add 10 Log (N)” as per KDB 662911 by adding 10 Log (N) on spectrum to measure the conducted emission at MIMO mode.

Offset = cable loss + attenuator + 10 log (N), where N is number of transmitting antenna. N=2 for this given application.

9.5 The Derivation of Limit of Compliance to Unwanted Emissions into Restricted Frequency Bands

EIRP = the equivalent isotropic radiated power in dBm,

E = electric field strength in dBμV/m,

d = measurement distance in meters.

$EIRP = E + 20\log(d) - 104.8$

Average: $54 + 20\log(3) - 104.8 = -41.3$

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.

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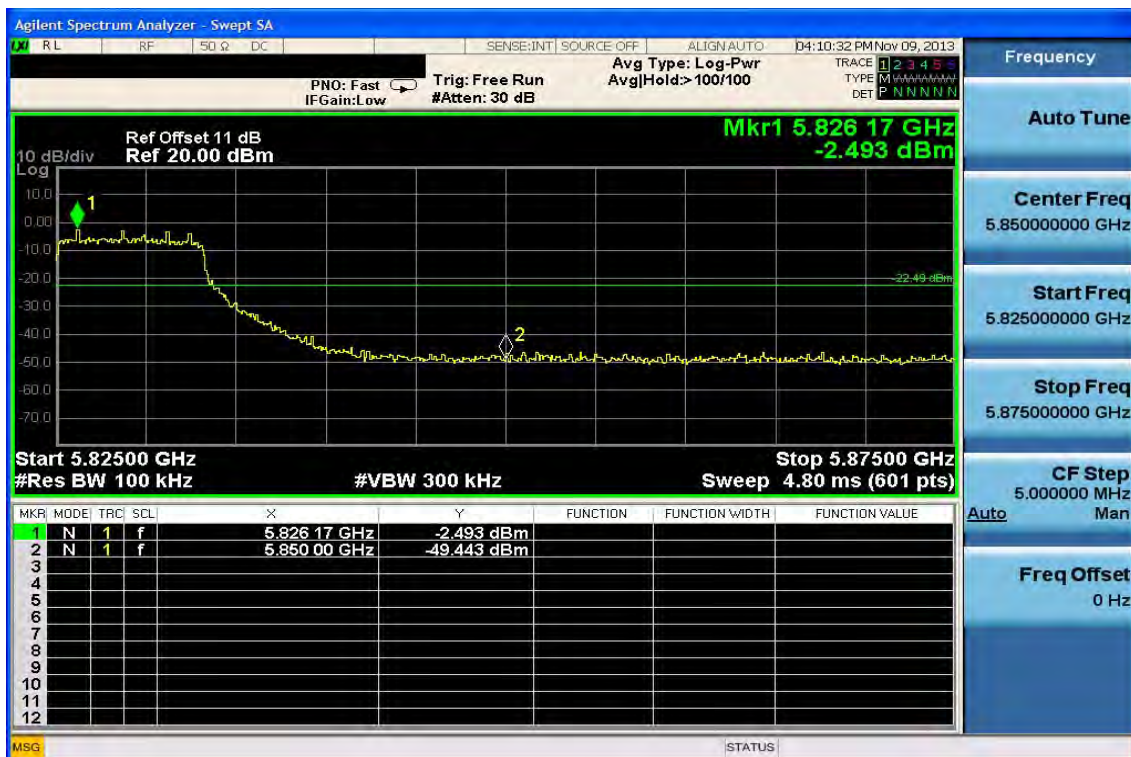
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802.11a - Unwanted Emissions into Non-Restricted Frequency Bands

Band Edges Test Data CH-Low



Band Edges Test Data CH-High



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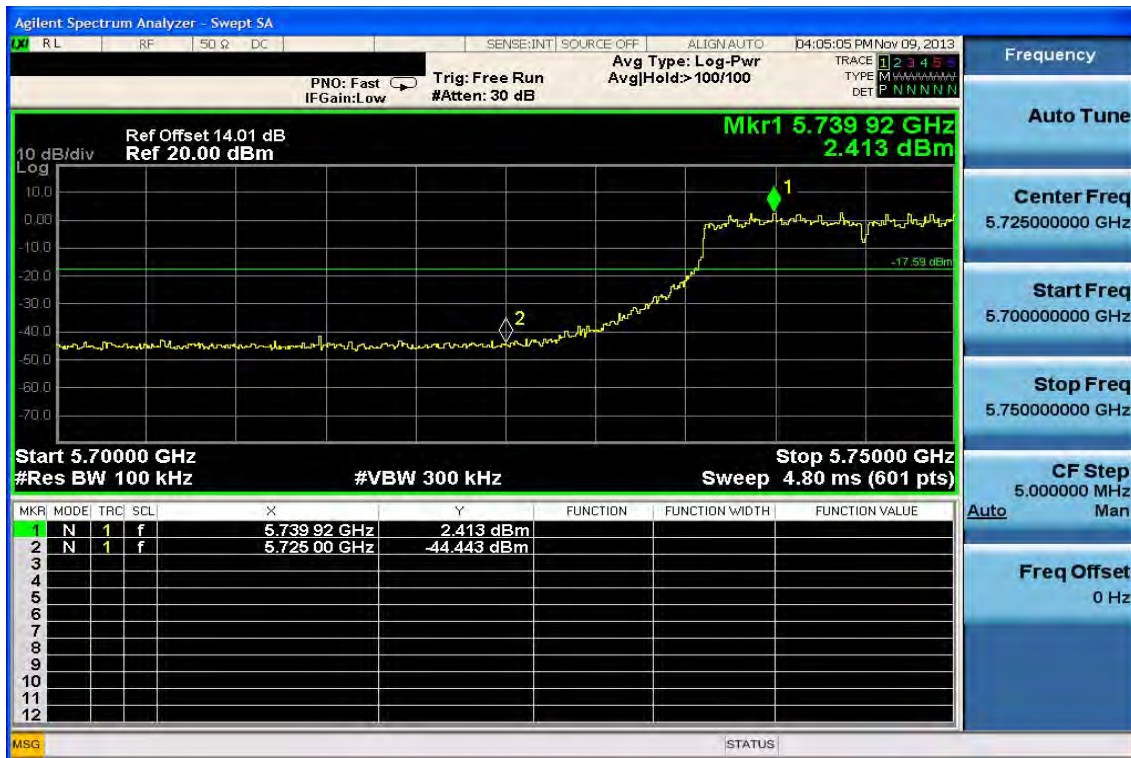
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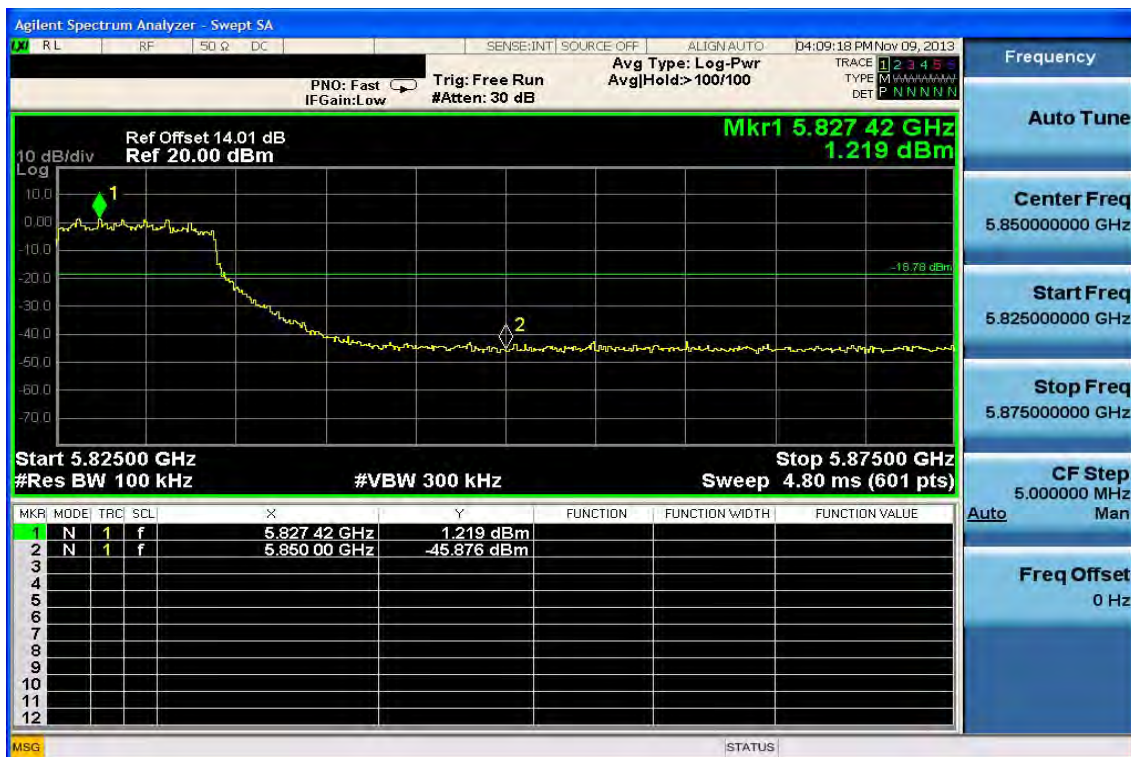
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802.11n (5GHz)_20M - Unwanted Emissions into Non-Restricted Frequency Bands Band Edges Test Data CH-Low



Band Edges Test Data CH-High



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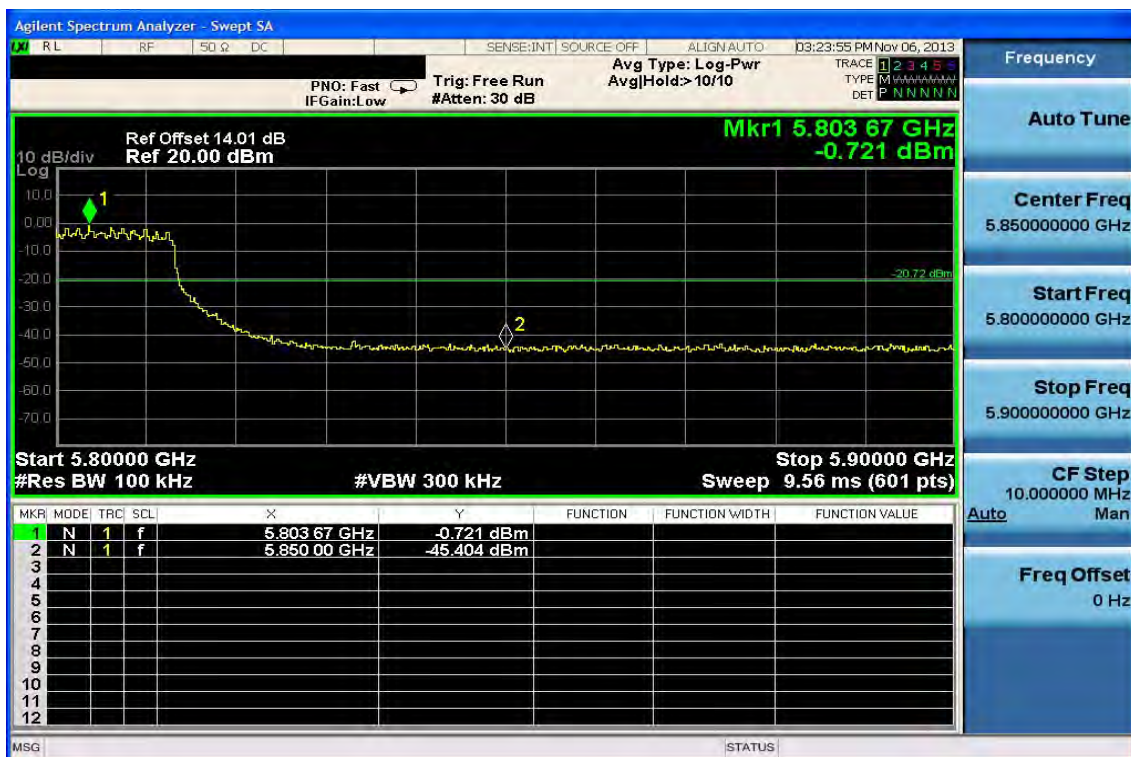
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802.11n (5GHz)_40M - Unwanted Emissions into Non-Restricted Frequency Bands

Band Edges Test Data CH-Low



Band Edges Test Data CH-High



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10 SPURIOUS EMISSION TEST

10.1 Standard Applicable

According to §15.247(d),

Emission at antenna port:

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

Radiated Spurious Emission

Attenuation below the general limits specified in § 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a) (see § 15.205(c)).

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-Gen §7.2.5 and RSS-210 issue 8, §A8.5, In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the radio frequency power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under section A8.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Tables 5 and 6 is not required. In addition, radiated emissions which fall in the restricted bands of Table 3 must also comply with the radiated emission limits specified in Tables 5 and 6 of RSS-GEN.

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10.2 Measurement Equipment Used:**10.2.1 Conducted Emission at antenna port:**

Refer to section 7.2 for details.

10.2.2 Radiated emission:

Refer to section 9.2.2 for details.

10.3 Test SET-UP:**10.3.1 Conducted Emission at antenna port:**

Refer to section 7.3 for details.

10.3.2 Radiated emission:

Refer to section 9.3.2 for details.

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10.4 Measurement Procedure:

Radiated Emission:

1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. The turn table shall rotate 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emissions.
4. When measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made “while keeping the antenna in the ‘cone of radiation’ from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response.” is still within the 3dB illumination BW of the measurement antenna.
5. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
6. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. On spectrum, change spectrum mode in linear display mode, and reduce VBW = 10Hz if average reading is measured.
7. Repeat above procedures until all default test channel measured were complete.

Conducted Emission:

1. To connect Antenna Port of EUT to Spectrum.
2. Set RBW = 100K & VBW = 300K on Spectrum.
3. Sweep the frequency to determine spurious emission as seen on spectrum from span of 30 to 3G, 3G to 8G, 8G to 13G, 13G to 18G and 18G to 26.5GHz, 18G to 40GHz (applicable if operation mode is 5GHz)
4. Via Software, combine 5 spans of frequency range into one plot
5. Repeat above procedures until all default test channel measured were complete.

Note: For MIMO operation, directional gain is not subjected to offset back as prescribe in KDB 662911 D01 for relative out-of-band measurement, including conducted bandedge falling into non-restricted frequency band.

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10.5 Field Strength Calculation

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

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

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

10.6 Measurement Result:

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

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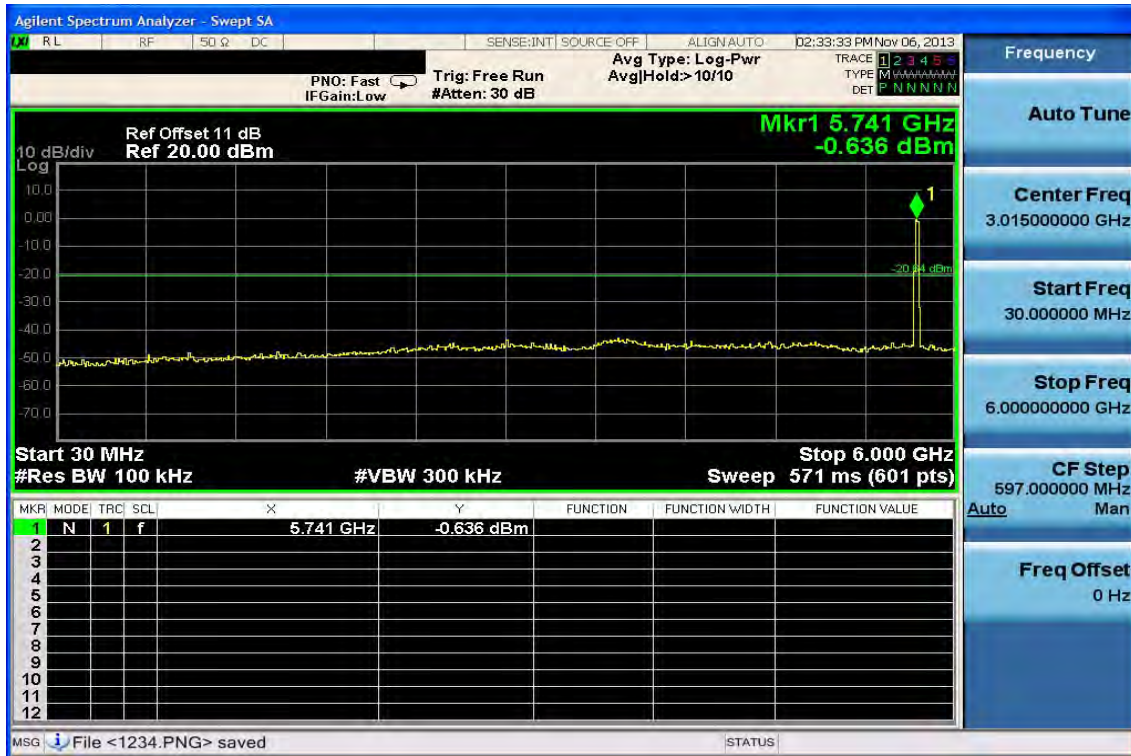
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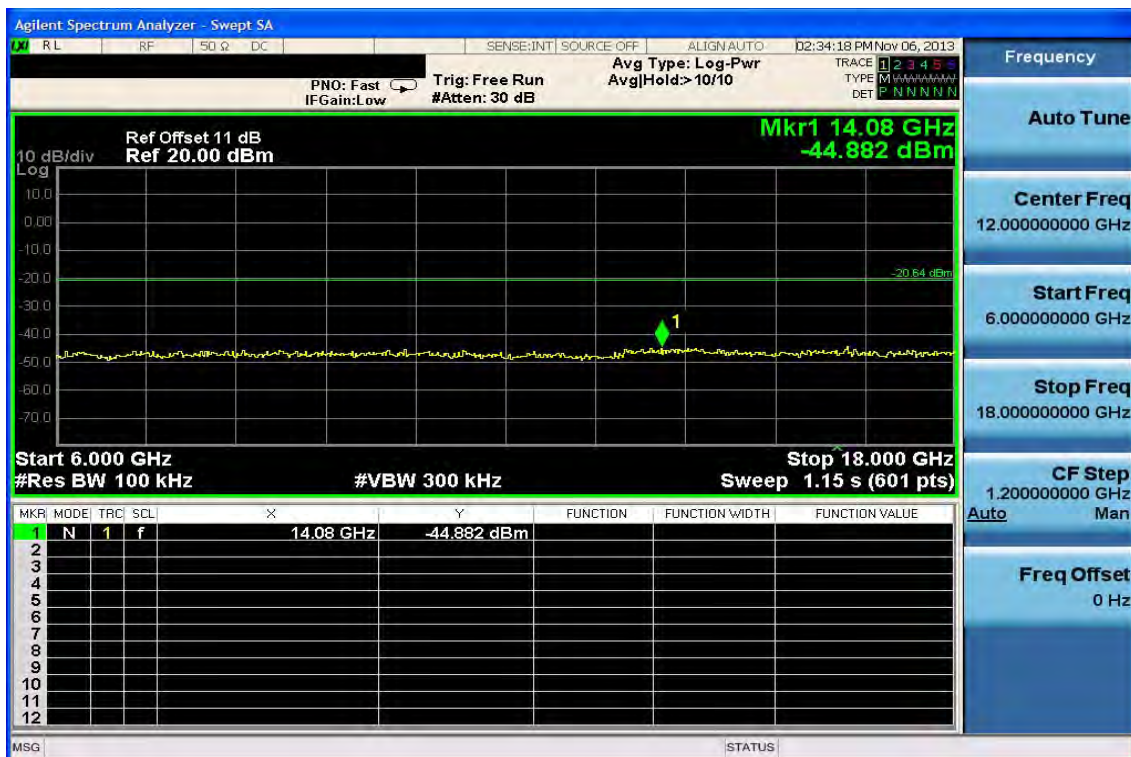
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Conducted Spurious Emission Measurement Result (802.11a)

Ch Low 30MHz – 6GHz



Ch Low 6GHz – 18GHz



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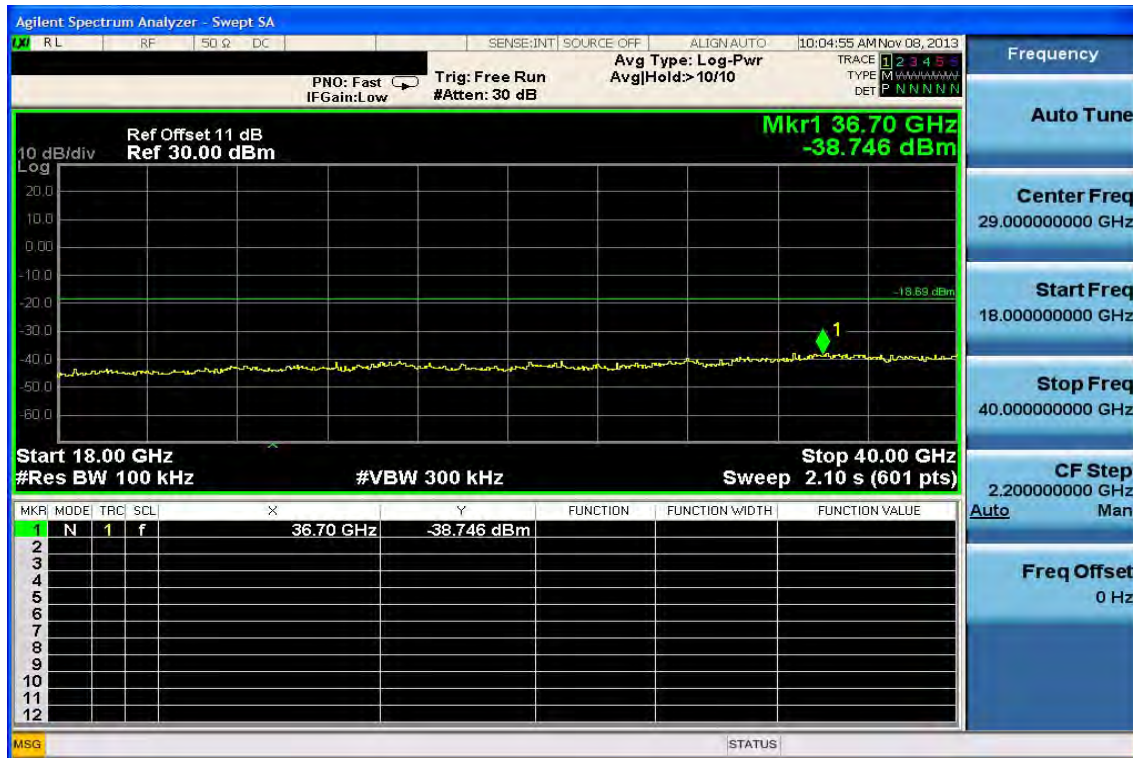
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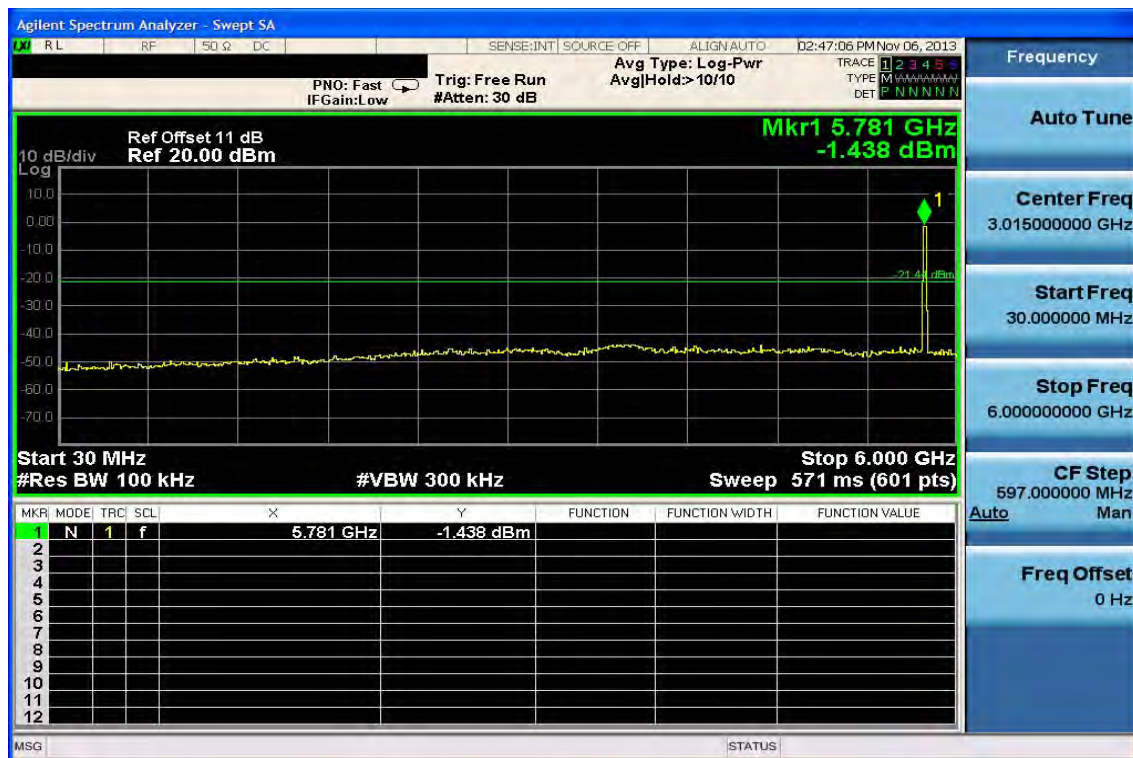
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Ch Low 18GHz – 40GHz



Ch Mid 30MHz – 6GHz



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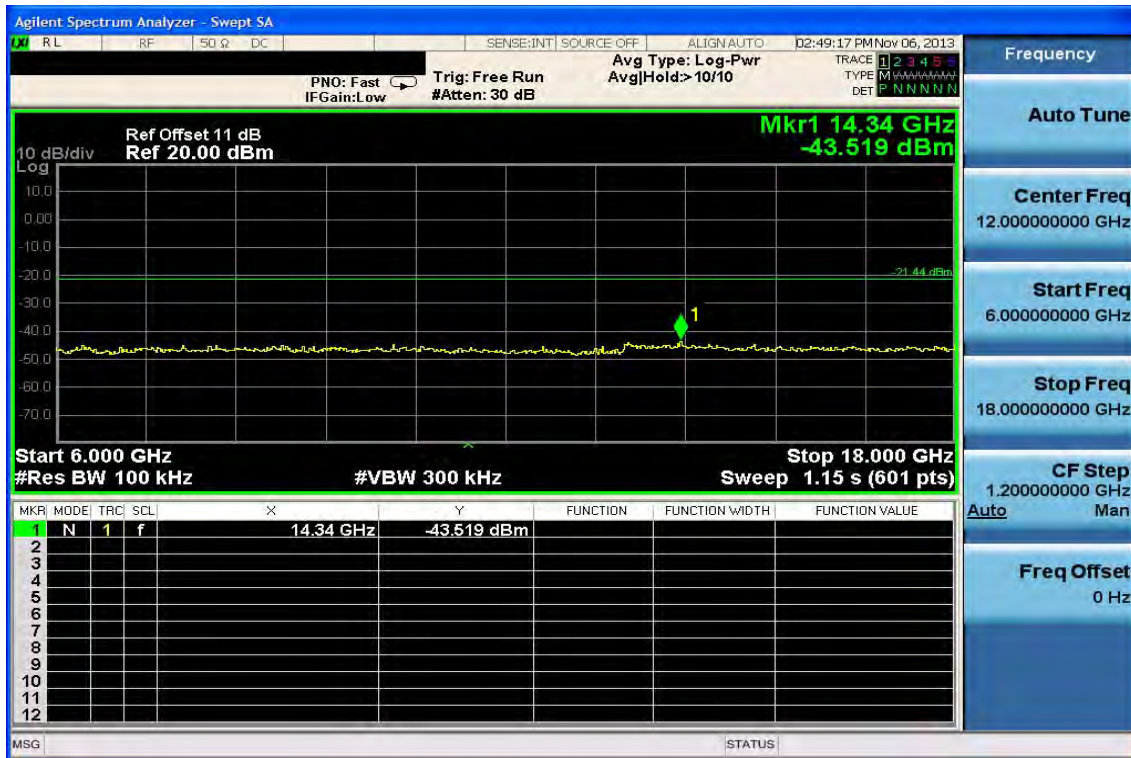
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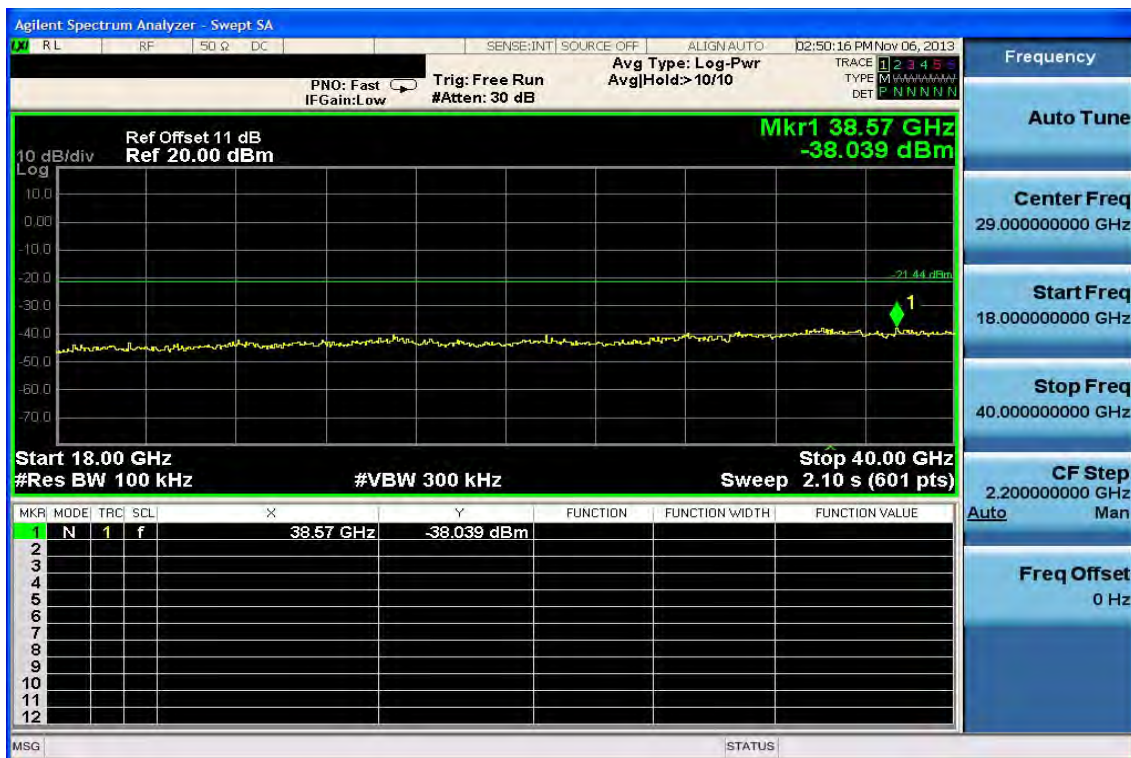
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Ch Mid 6GHz – 18GHz



Ch Mid 18GHz – 40GHz



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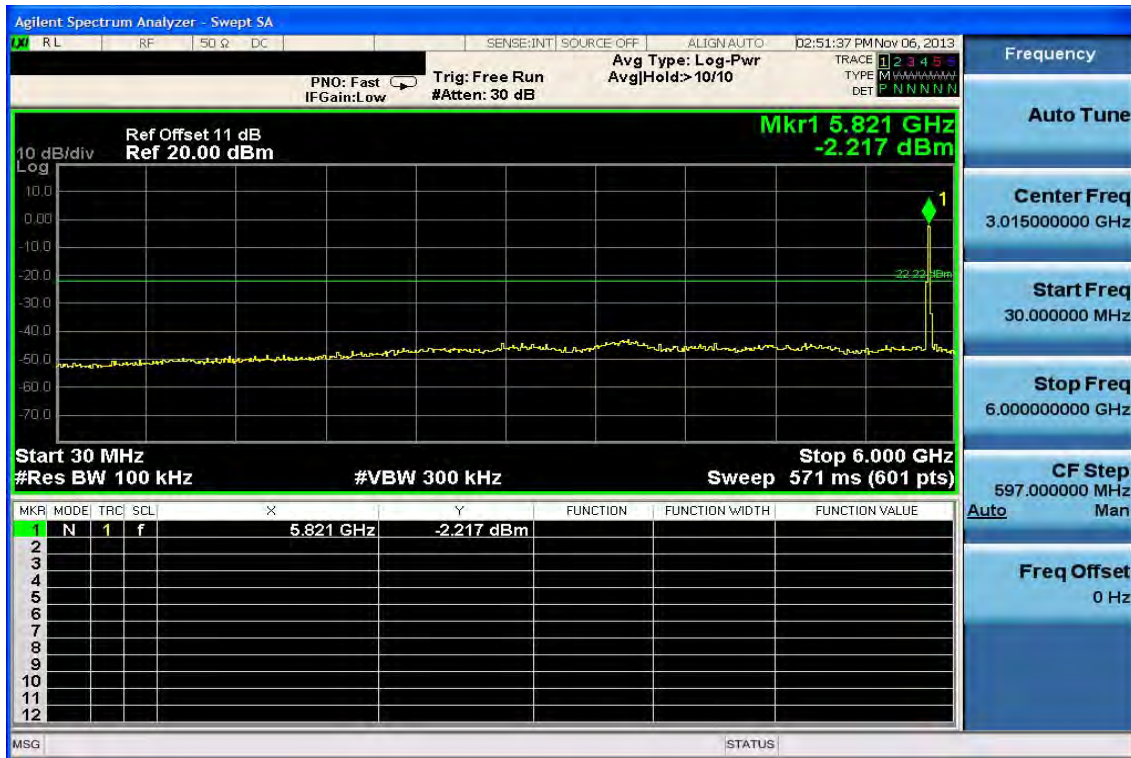
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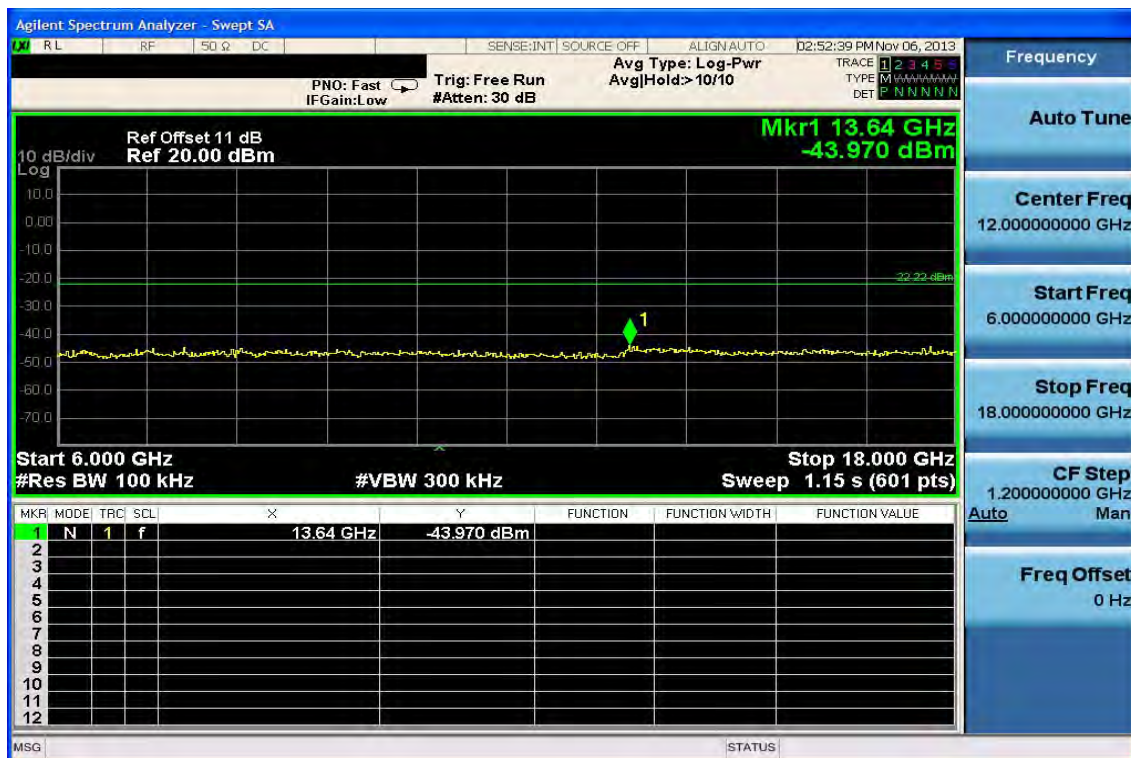
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Ch High 30MHz – 6GHz



Ch High 6GHz – 18GHz



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Ch High 18GHz – 40GHz



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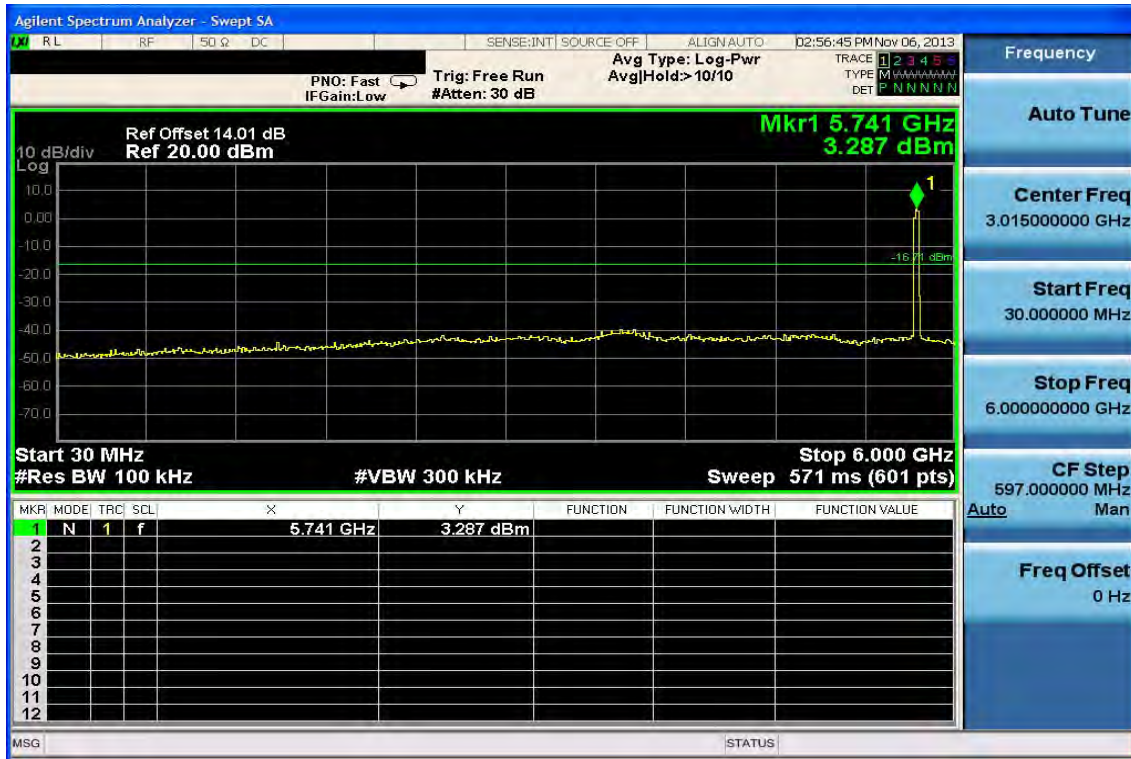
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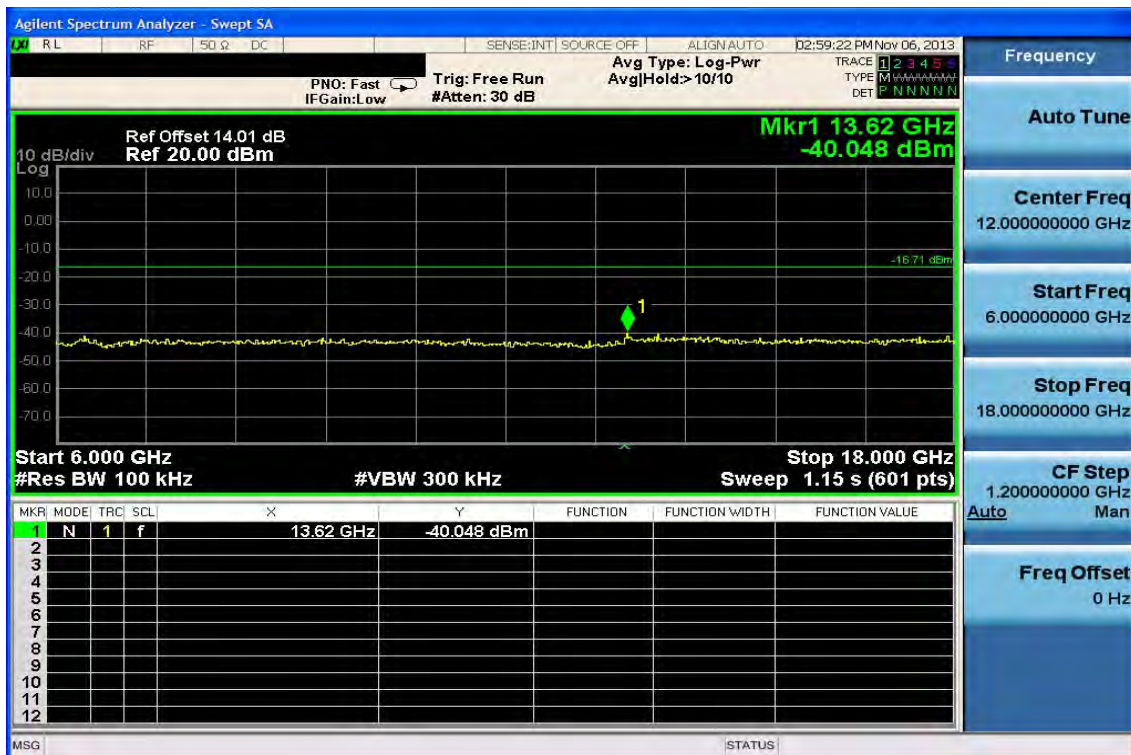
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Conducted Spurious Emission Measurement Result (802.11n (5GHz)_20M) Ch Low 30MHz – 6GHz



Ch Low 6GHz – 18GHz



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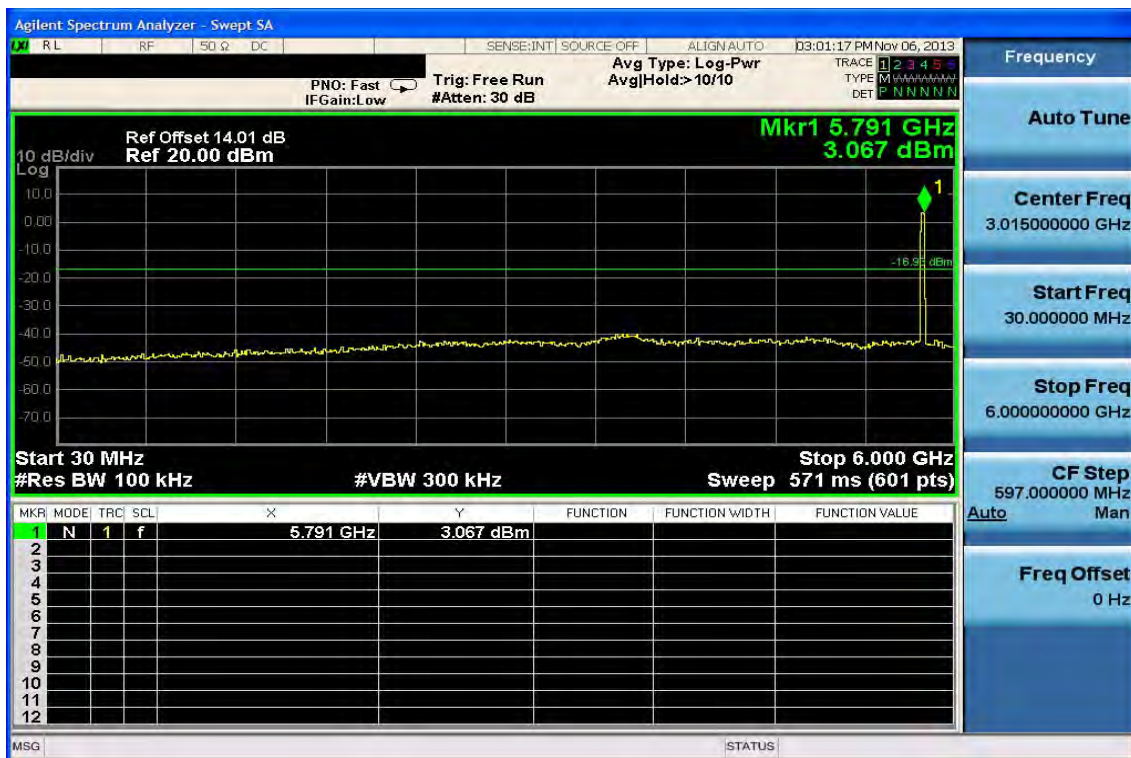
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Ch Low 18GHz – 40GHz



Ch Mid 30MHz – 6GHz



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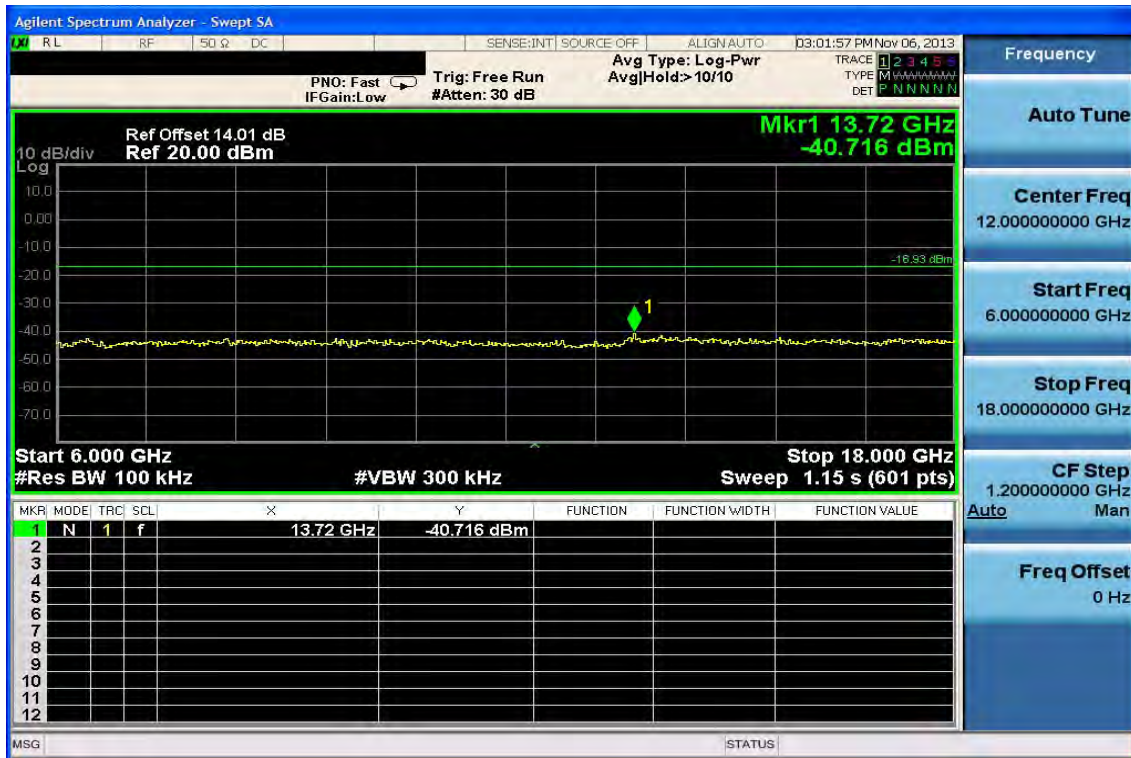
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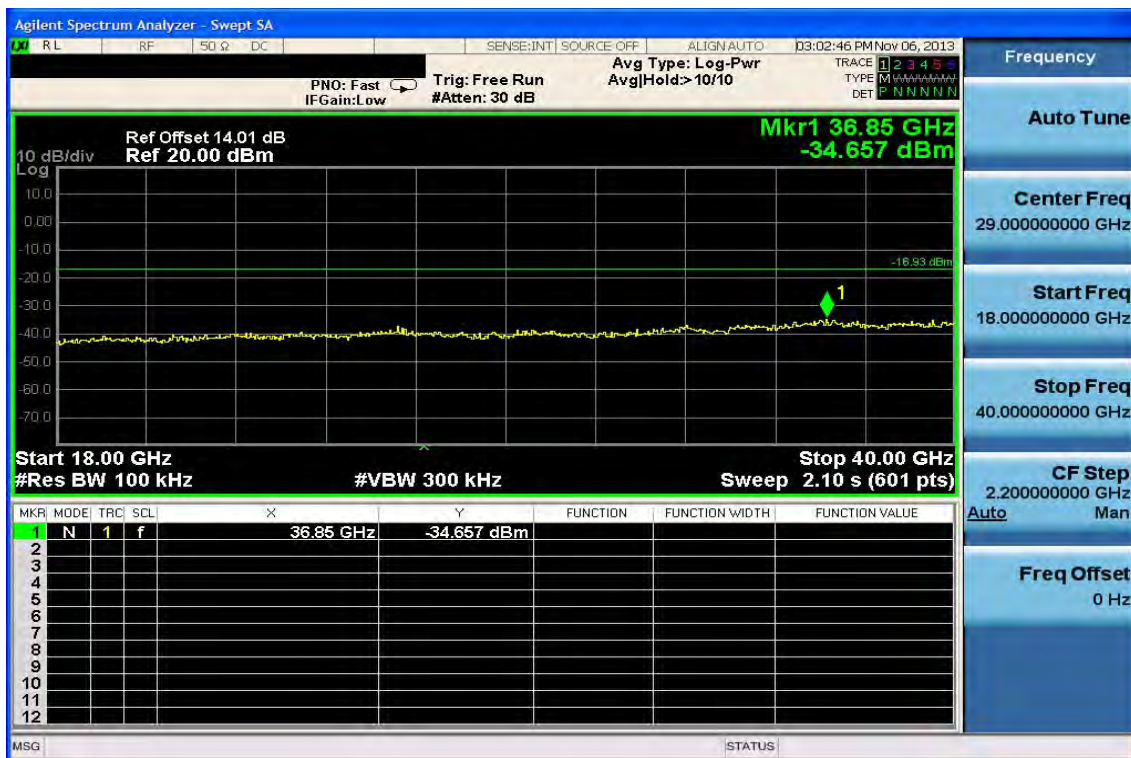
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Ch Mid 6GHz – 18GHz



Ch Mid 18GHz – 40GHz



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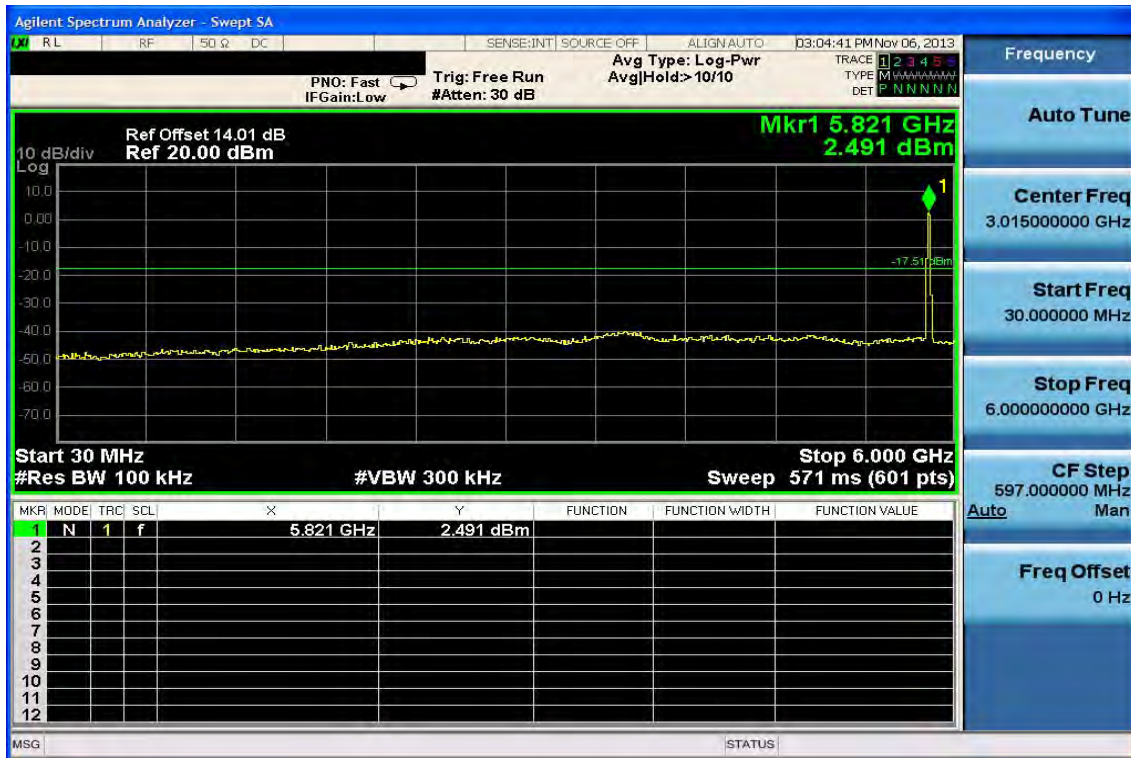
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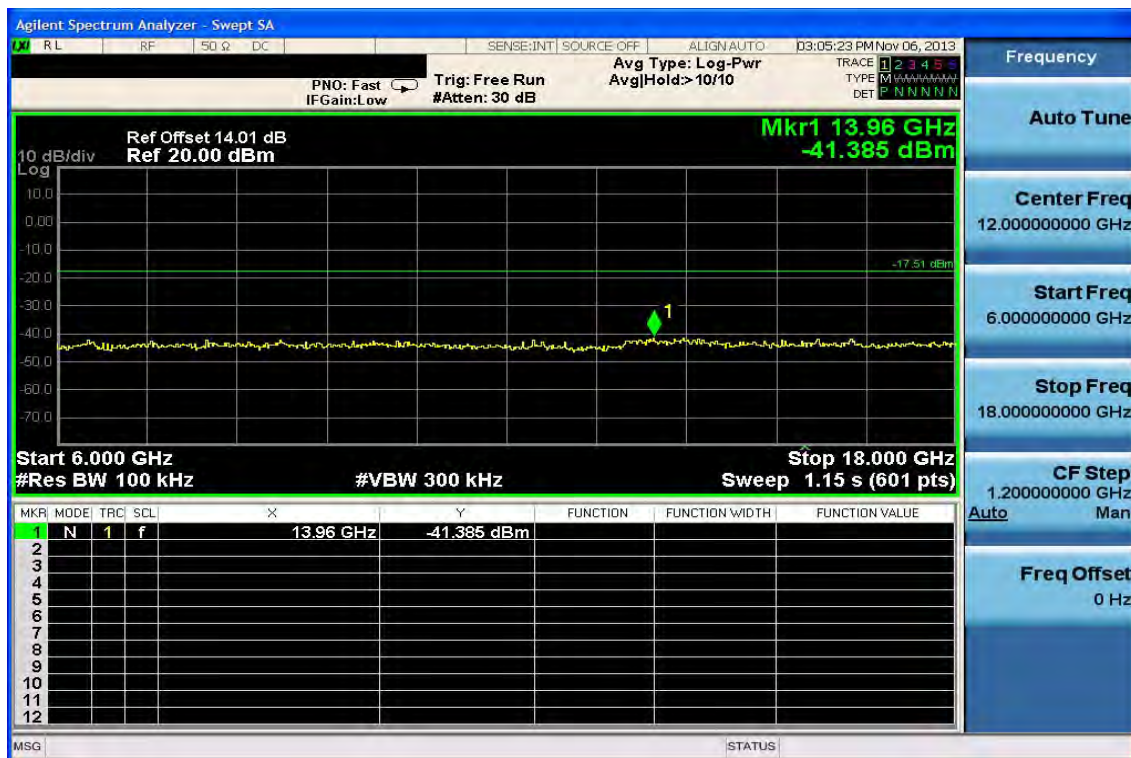
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Ch High 30MHz – 6GHz



Ch High 6GHz – 18GHz



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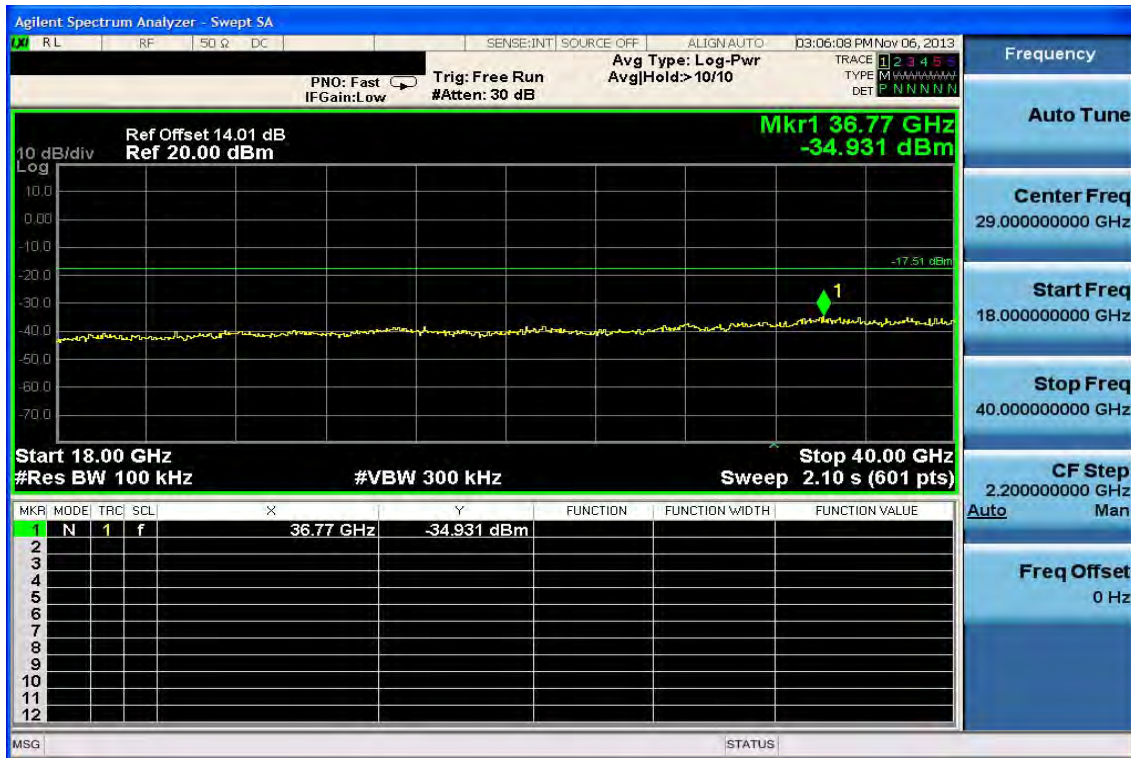
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Ch High 18GHz – 40GHz



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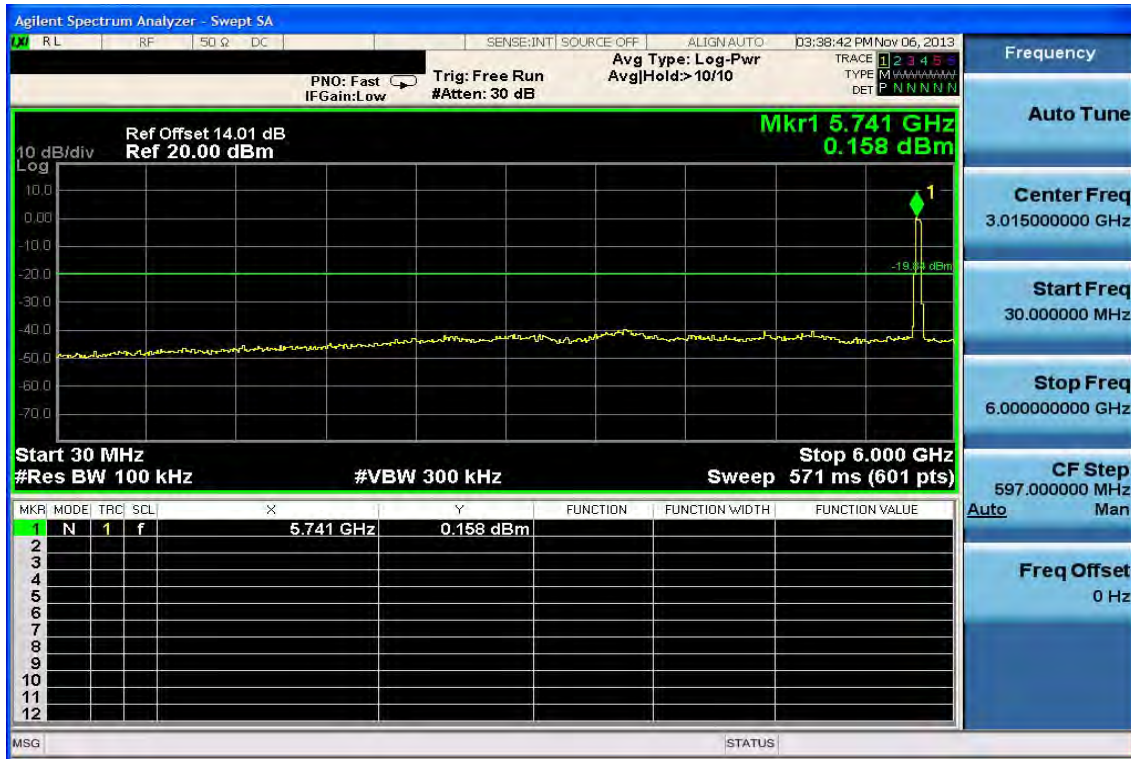
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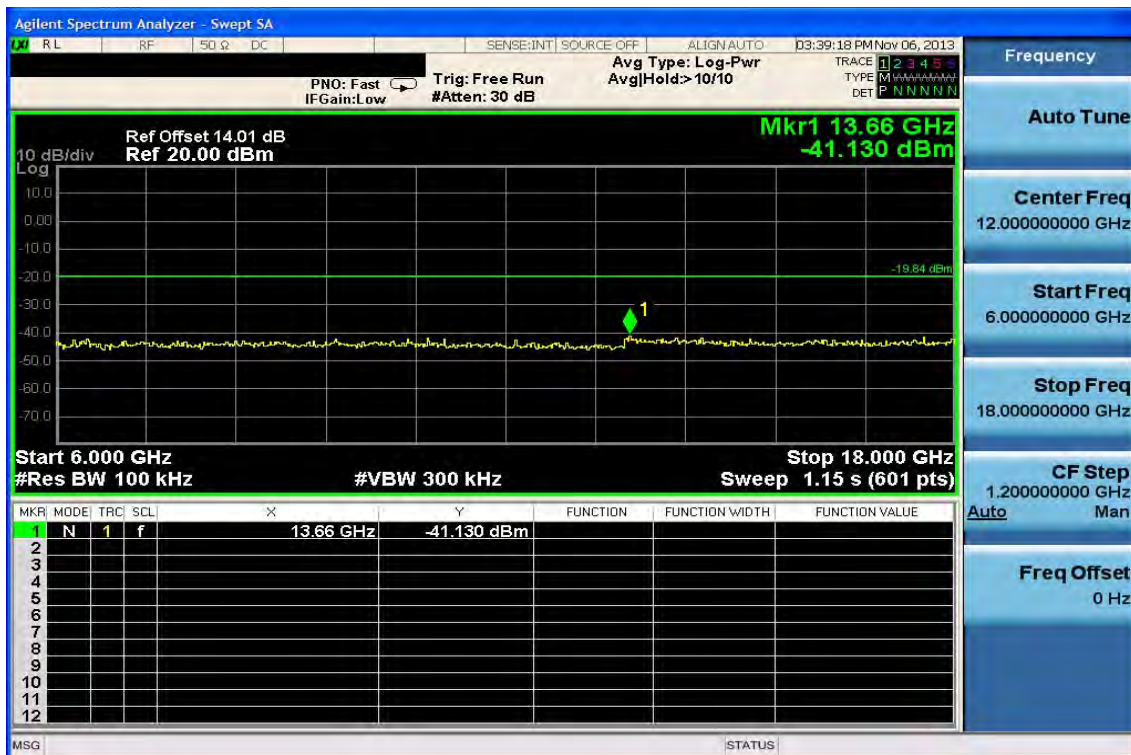
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Conducted Spurious Emission Measurement Result (802.11n (5GHz)_40M) Ch Low 30MHz – 6GHz



Ch Low 6GHz – 18GHz



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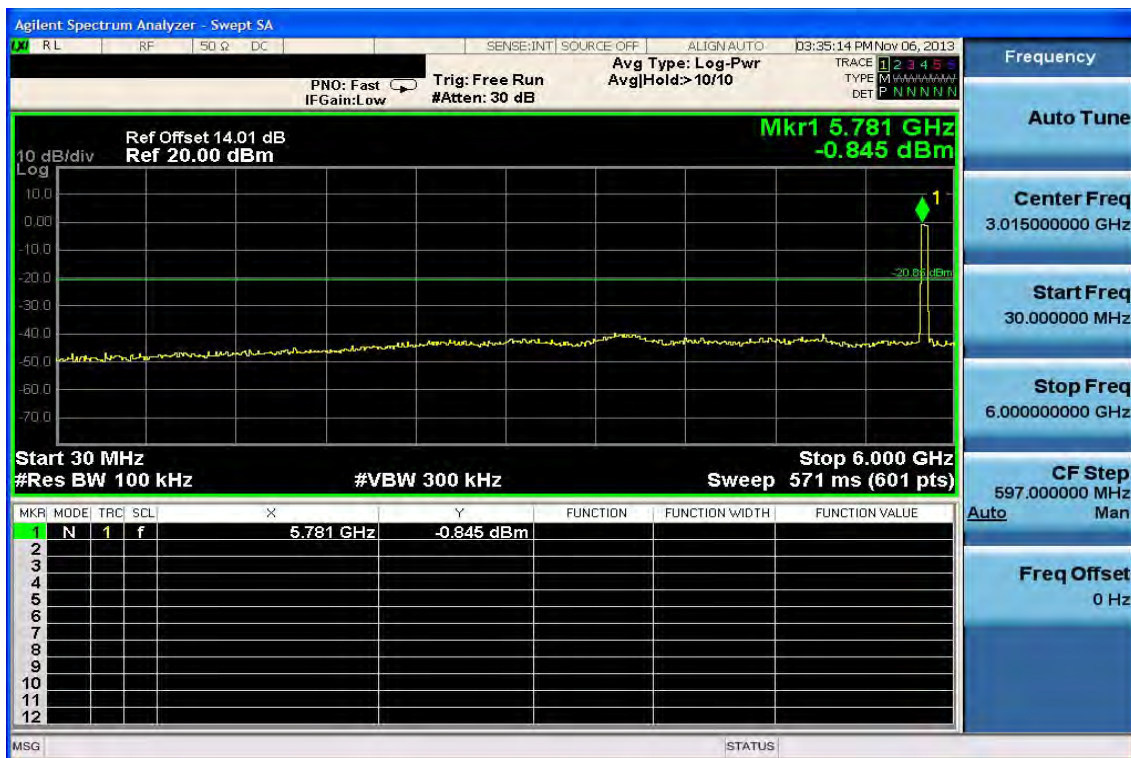
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Ch Low 18GHz – 40GHz



Ch High 30MHz – 6GHz



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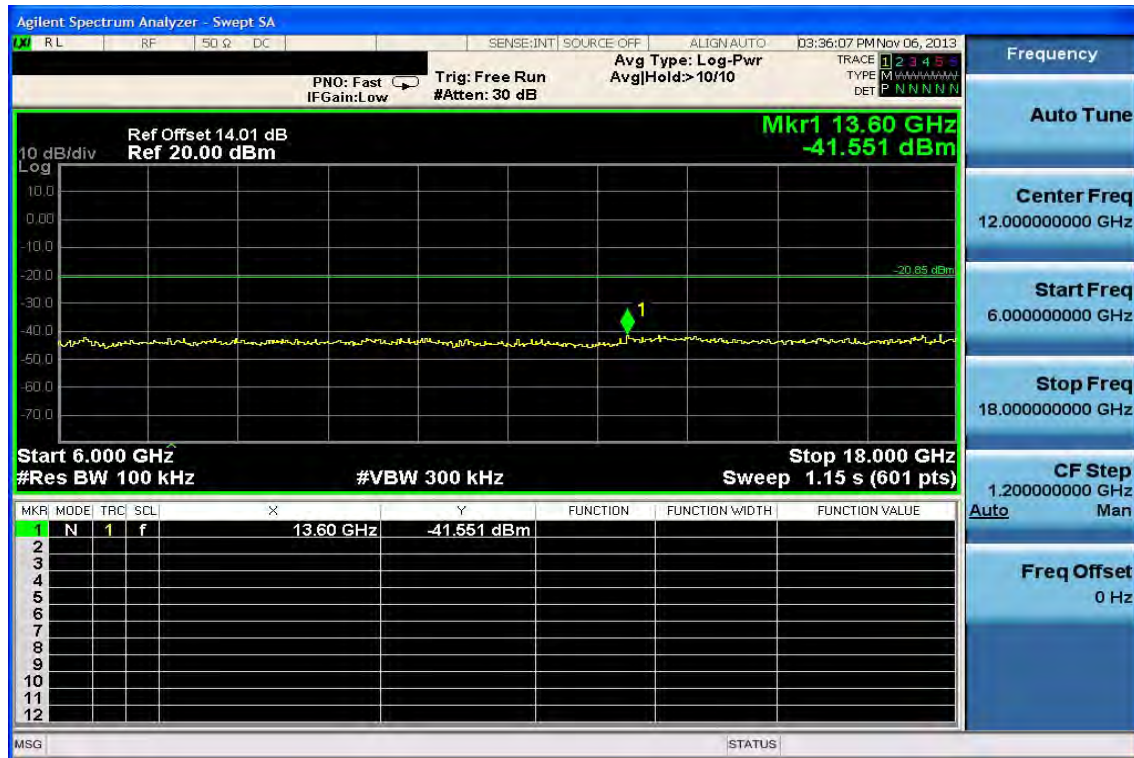
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Ch High 6GHz – 18GHz



Ch High 18GHz – 40GHz



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Radiated Spurious Emission Measurement Result (802.11a)

Operation Band	:802.11 a	Test Date	:2013-11-17
Fundamental Frequency	:5745 MHz	Temp./Humi.	:24.7 deg_C/56RH
Operation Mode	:TX LOW	Engineer	:Vito
EUT Pol.	:E1 Plan	Measurement Antenna Pol.	:VERTICAL

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

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

Note : “F” : denotes Fundamental Frequency. ; “H” : denotes Harmonic Frequency.

“E” : denotes Band Edge Frequency. ; “S” : denotes Spurious Frequency.

“---” : denotes Noise Floor.

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
38.73	S	Peak	57.06	-20.40	36.66	40.00	-3.34
47.46	S	Peak	60.24	-25.34	34.90	40.00	-5.10
93.05	S	Peak	64.19	-24.20	39.99	43.50	-3.51
101.78	S	Peak	59.80	-22.93	36.87	43.50	-6.63
305.48	S	Peak	48.08	-18.76	29.32	46.00	-16.68
400.54	S	Peak	46.29	-15.56	30.73	46.00	-15.27
1119.00	S	Peak	55.97	-10.19	45.78	74.00	-28.22
1119.00	S	Average	35.12	-10.19	24.93	54.00	-29.07
2001.00	S	Peak	53.87	-6.24	47.63	74.00	-26.37
2001.00	S	Average	46.62	-6.24	40.38	54.00	-13.62
5536.00	S	Peak	51.61	1.59	53.19	74.00	-20.81
5536.00	S	Average	38.68	1.59	40.27	54.00	-13.73
11490.00	H	Peak	44.49	10.19	54.68	74.00	-19.32
11490.00	H	Average	33.30	10.19	43.49	54.00	-10.51
17235.00	H	Peak	-	-	-	-	-
22980.00	H	Peak	-	-	-	-	-
28725.00	H	Peak	-	-	-	-	-
34470.00	H	Peak	-	-	-	-	-

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Operation Band	:802.11 a	Test Date	:2013-11-17
Fundamental Frequency	:5745 MHz	Temp./Humi.	:24.7 deg_C/56RH
Operation Mode	:TX LOW	Engineer	:Vito
EUT Pol.	:E1 Plan	Measurement Antenna Pol.	:HORIZONTAL

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

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

Note : “F” : denotes Fundamental Frequency. ; “H” : denotes Harmonic Frequency.

“E” : denotes Band Edge Frequency. ; “S” : denotes Spurious Frequency.

“---” : denotes Noise Floor.

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
93.05	S	Peak	61.21	-24.20	37.01	43.50	-6.49
101.78	S	Peak	57.58	-22.93	34.65	43.50	-8.85
125.06	S	Peak	52.14	-21.59	30.56	43.50	-12.94
296.75	S	Peak	55.32	-19.19	36.13	46.00	-9.87
307.42	S	Peak	55.32	-18.70	36.62	46.00	-9.38
750.71	S	Peak	45.79	-10.71	35.08	46.00	-10.92
1119.00	S	Peak	58.14	-7.19	50.95	74.00	-23.05
1119.00	S	Average	52.87	-7.19	45.68	54.00	-8.32
5522.00	S	Peak	60.26	1.53	61.79	74.00	-12.21
5522.00	S	Average	36.67	1.53	38.20	54.00	-15.80
7664.00	S	Peak	50.39	5.06	55.45	74.00	-18.55
7664.00	S	Average	47.67	5.06	52.73	54.00	-1.27
11490.00	H	Peak	43.84	10.13	53.97	74.00	-20.03
11490.00	H	Average	33.01	10.13	43.14	54.00	-10.86
17235.00	H	Peak	-	-	-	-	-
22980.00	H	Peak	-	-	-	-	-
28725.00	H	Peak	-	-	-	-	-
34470.00	H	Peak	-	-	-	-	-

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Operation Band	:802.11 a	Test Date	:2013-11-17
Fundamental Frequency	:5785 MHz	Temp./Humi.	:24.7 deg_C/56RH
Operation Mode	:TX MID	Engineer	:Vito
EUT Pol.	:E1 Plan	Measurement Antenna Pol.	:VERTICAL

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

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

Note : “F” : denotes Fundamental Frequency. ; “H” : denotes Harmonic Frequency.

“E” : denotes Band Edge Frequency. ; “S” : denotes Spurious Frequency.

“---” : denotes Noise Floor.

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
38.73	S	Peak	57.38	-20.40	36.99	40.00	-3.01
47.46	S	Peak	60.42	-25.34	35.08	40.00	-4.92
93.05	S	Peak	64.31	-24.20	40.11	43.50	-3.39
101.78	S	Peak	59.78	-22.93	36.85	43.50	-6.65
306.45	S	Peak	48.39	-18.75	29.64	46.00	-16.36
625.58	S	Peak	44.37	-11.93	32.44	46.00	-13.56
1119.00	S	Peak	56.46	-10.19	46.27	74.00	-27.73
1119.00	S	Average	52.10	-10.19	41.91	54.00	-12.09
2001.00	S	Peak	52.93	-6.24	46.69	74.00	-27.31
2001.00	S	Average	46.26	-6.24	40.02	54.00	-13.98
5459.00	S	Peak	52.40	1.43	53.83	74.00	-20.17
5459.00	S	Average	45.68	1.43	47.11	54.00	-6.89
11570.00	H	Peak	43.82	10.29	54.10	74.00	-19.90
11570.00	H	Average	33.75	10.29	44.04	54.00	-9.96
17355.00	H	Peak	-	-	-	-	-
23140.00	H	Peak	-	-	-	-	-
28925.00	H	Peak	-	-	-	-	-
34710.00	H	Peak	-	-	-	-	-

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Operation Band	:802.11 a	Test Date	:2013-11-17
Fundamental Frequency	:5785 MHz	Temp./Humi.	:24.7 deg_C/56RH
Operation Mode	:TX MID	Engineer	:Vito
EUT Pol.	:E1 Plan	Measurement Antenna Pol.	:HORIZONTAL

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

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

Note : “F” : denotes Fundamental Frequency. ; “H” : denotes Harmonic Frequency.

“E” : denotes Band Edge Frequency. ; “S” : denotes Spurious Frequency.

“---” : denotes Noise Floor.

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
93.05	S	Peak	61.09	-24.20	36.89	43.50	-6.61
100.81	S	Peak	58.63	-23.05	35.58	43.50	-7.92
125.06	S	Peak	51.02	-21.59	29.43	43.50	-14.07
297.72	S	Peak	54.60	-19.14	35.46	46.00	-10.54
308.39	S	Peak	55.73	-18.64	37.08	46.00	-8.92
750.71	S	Peak	46.61	-10.71	35.90	46.00	-10.10
1119.00	S	Peak	58.43	-7.19	51.24	74.00	-22.76
1119.00	S	Average	52.92	-7.19	45.73	54.00	-8.27
5522.00	S	Peak	60.50	1.53	62.03	74.00	-11.97
5522.00	S	Average	47.63	1.53	49.16	54.00	-4.84
7720.00	S	Peak	50.39	4.97	55.37	74.00	-18.63
7720.00	S	Average	47.79	4.97	52.76	54.00	-1.24
11570.00	H	Peak	43.82	10.29	54.11	74.00	-19.89
11570.00	H	Average	33.27	10.29	43.56	54.00	-10.44
17355.00	H	Peak	-	-	-	-	-
23140.00	H	Peak	-	-	-	-	-
28925.00	H	Peak	-	-	-	-	-
34710.00	H	Peak	-	-	-	-	-

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Operation Band	:802.11 a	Test Date	:2013-11-17
Fundamental Frequency	:5825 MHz	Temp./Humi.	:24.7 deg_C/56RH
Operation Mode	:TX HIGH	Engineer	:Vito
EUT Pol.	:E1 Plan	Measurement Antenna Pol.	:VERTICAL

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

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

Note : “F” : denotes Fundamental Frequency. ; “H” : denotes Harmonic Frequency.

“E” : denotes Band Edge Frequency. ; “S” : denotes Spurious Frequency.

“---” : denotes Noise Floor.

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
38.73	S	Peak	56.46	-20.40	36.06	40.00	-3.94
47.46	S	Peak	60.31	-25.34	34.97	40.00	-5.03
93.05	S	Peak	64.14	-24.20	39.94	43.50	-3.56
101.78	S	Peak	60.15	-22.93	37.22	43.50	-6.28
306.45	S	Peak	47.69	-18.75	28.94	46.00	-17.06
400.54	S	Peak	46.21	-15.56	30.65	46.00	-15.35
1119.00	S	Peak	55.53	-10.19	45.34	74.00	-28.66
1119.00	S	Average	49.62	-10.19	39.43	54.00	-14.57
5522.00	S	Peak	52.85	1.53	54.38	74.00	-19.62
5522.00	S	Average	46.23	1.53	47.76	54.00	-6.24
11650.00	H	Peak	44.90	10.43	55.32	74.00	-18.68
11650.00	H	Average	33.53	10.43	43.96	54.00	-10.05
17475.00	H	Peak	-	-	-	-	-
23300.00	H	Peak	-	-	-	-	-
29125.00	H	Peak	-	-	-	-	-
34950.00	H	Peak	-	-	-	-	-

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Operation Band	:802.11 a	Test Date	:2013-11-17
Fundamental Frequency	:5825 MHz	Temp./Humi.	:24.7 deg_C/56RH
Operation Mode	:TX HIGH	Engineer	:Vito
EUT Pol.	:E1 Plan	Measurement Antenna Pol.	:HORIZONTAL

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

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

Note : “F” : denotes Fundamental Frequency. ; “H” : denotes Harmonic Frequency.

“E” : denotes Band Edge Frequency. ; “S” : denotes Spurious Frequency.

“---” : denotes Noise Floor.

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
93.05	S	Peak	61.47	-24.20	37.27	43.50	-6.23
101.78	S	Peak	57.87	-22.93	34.94	43.50	-8.56
194.90	S	Peak	54.15	-23.84	30.31	43.50	-13.19
309.36	S	Peak	55.81	-18.63	37.19	46.00	-8.81
625.58	S	Peak	44.11	-11.93	32.17	46.00	-13.83
750.71	S	Peak	45.57	-10.71	34.86	46.00	-11.14
1119.00	S	Peak	58.22	-7.19	51.03	74.00	-22.97
1119.00	S	Average	50.87	-7.19	43.68	54.00	-10.32
5508.00	S	Peak	60.05	1.47	61.52	74.00	-12.48
5508.00	S	Average	47.14	1.47	48.61	54.00	-5.39
7769.00	S	Peak	49.35	4.85	54.19	74.00	-19.81
7769.00	S	Average	47.12	4.85	51.97	54.00	-2.03
11650.00	H	Peak	45.00	10.43	55.43	74.00	-18.57
11650.00	H	Average	32.84	10.43	43.27	54.00	-10.74
17475.00	H	Peak	-	-	-	-	-
23300.00	H	Peak	-	-	-	-	-
29125.00	H	Peak	-	-	-	-	-
34950.00	H	Peak	-	-	-	-	-

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Radiated Spurious Emission Measurement Result (802.11n (5GHz)_20M)

Operation Band	:802.11 n20M	Test Date	:2013-11-17
Fundamental Frequency	:5745 MHz	Temp./Humi.	:24.7 deg_C/56RH
Operation Mode	:TX LOW	Engineer	:Vito
EUT Pol.	:E1 Plan	Measurement Antenna Pol.	:VERTICAL

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

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

Note : “F” : denotes Fundamental Frequency. ; “H” : denotes Harmonic Frequency.

“E” : denotes Band Edge Frequency. ; “S” : denotes Spurious Frequency.

“---” : denotes Noise Floor.

Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
38.73	S	Peak	57.50	-20.40	37.10	40.00	-2.90
47.46	S	Peak	60.14	-25.34	34.80	40.00	-5.20
93.05	S	Peak	64.18	-24.20	39.98	43.50	-3.52
101.78	S	Peak	58.88	-22.93	35.95	43.50	-7.55
400.54	S	Peak	46.06	-15.56	30.50	46.00	-15.50
625.58	S	Peak	45.35	-11.93	33.41	46.00	-12.59
1126.00	S	Peak	54.96	-10.18	44.79	74.00	-29.21
1126.00	S	Average	48.97	-10.18	38.80	54.00	-15.20
3828.00	S	Peak	50.97	-1.53	49.44	74.00	-24.56
3828.00	S	Average	45.79	-1.53	44.26	54.00	-9.74
5522.00	S	Peak	61.02	1.53	62.55	74.00	-11.45
5522.00	S	Average	51.84	1.53	53.37	54.00	-0.63
11490.00	H	Peak	45.42	10.13	55.55	74.00	-18.45
11490.00	H	Average	34.47	10.13	44.60	54.00	-9.40
17235.00	H	Peak	-	-	-	-	-
22980.00	H	Peak	-	-	-	-	-
28725.00	H	Peak	-	-	-	-	-
34470.00	H	Peak	-	-	-	-	-

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Operation Band	:802.11 n20M	Test Date	:2013-11-17
Fundamental Frequency	:5745 MHz	Temp./Humi.	:24.7 deg_C/56RH
Operation Mode	:TX LOW	Engineer	:Vito
EUT Pol.	:E1 Plan	Measurement Antenna Pol.	:HORIZONTAL

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

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

Note : “F” : denotes Fundamental Frequency. ; “H” : denotes Harmonic Frequency.

“E” : denotes Band Edge Frequency. ; “S” : denotes Spurious Frequency.

“---” : denotes Noise Floor.

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
93.05	S	Peak	59.18	-24.20	34.97	43.50	-8.53
101.78	S	Peak	58.61	-22.93	35.68	43.50	-7.82
115.36	S	Peak	52.87	-21.90	30.97	43.50	-12.53
306.45	S	Peak	55.70	-18.75	36.95	46.00	-9.05
575.14	S	Peak	47.32	-12.36	34.96	46.00	-11.04
750.71	S	Peak	49.96	-10.71	39.25	46.00	-6.75
1119.00	S	Peak	57.67	-7.19	50.48	74.00	-23.53
1119.00	S	Average	52.87	-7.19	45.68	54.00	-8.32
3828.00	S	Peak	50.69	-1.53	49.15	74.00	-24.85
3828.00	S	Average	48.63	-1.53	47.10	54.00	-6.90
5529.00	S	Peak	58.53	1.56	60.09	74.00	-13.91
5529.00	S	Average	46.37	1.56	47.93	54.00	-6.07
7664.00	S	Peak	49.48	5.06	54.53	74.00	-19.47
7664.00	S	Average	46.98	5.06	52.04	54.00	-1.96
11490.00	H	Peak	43.67	10.13	53.80	74.00	-20.20
11490.00	H	Average	33.38	10.13	43.51	54.00	-10.49
17235.00	H	Peak	-	-	-	-	-
22980.00	H	Peak	-	-	-	-	-
28725.00	H	Peak	-	-	-	-	-
34470.00	H	Peak	-	-	-	-	-

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Operation Band	:802.11 n20M	Test Date	:2013-11-17
Fundamental Frequency	:5785 MHz	Temp./Humi.	:24.7 deg_C/56RH
Operation Mode	:TX MID	Engineer	:Vito
EUT Pol.	:E1 Plan	Measurement Antenna Pol.	:VERTICAL

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

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

Note : “F” : denotes Fundamental Frequency. ; “H” : denotes Harmonic Frequency.

“E” : denotes Band Edge Frequency. ; “S” : denotes Spurious Frequency.

“---” : denotes Noise Floor.

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
38.73	S	Peak	56.87	-20.40	36.48	40.00	-3.52
47.46	S	Peak	59.77	-25.34	34.43	40.00	-5.57
93.05	S	Peak	64.36	-24.20	40.16	43.50	-3.34
102.75	S	Peak	60.46	-22.79	37.67	43.50	-5.83
400.54	S	Peak	46.52	-15.56	30.96	46.00	-15.04
625.58	S	Peak	45.79	-11.93	33.85	46.00	-12.15
3856.00	S	Peak	50.85	-1.50	49.35	74.00	-24.65
3856.00	S	Average	47.43	-1.50	45.93	54.00	-8.07
5480.00	S	Peak	60.20	1.43	61.63	74.00	-12.37
5480.00	S	Average	51.92	1.43	53.35	54.00	-0.65
11570.00	H	Peak	45.85	10.29	56.14	74.00	-17.86
11570.00	H	Average	34.48	10.29	44.77	54.00	-9.23
17355.00	H	Peak	-	-	-	-	-
23140.00	H	Peak	-	-	-	-	-
28925.00	H	Peak	-	-	-	-	-
34710.00	H	Peak	-	-	-	-	-

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Operation Band	:802.11 n20M	Test Date	:2013-11-17
Fundamental Frequency	:5785 MHz	Temp./Humi.	:24.7 deg_C/56RH
Operation Mode	:TX MID	Engineer	:Vito
EUT Pol.	:E1 Plan	Measurement Antenna Pol.	:HORIZONTAL

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

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

Note : “F” : denotes Fundamental Frequency. ; “H” : denotes Harmonic Frequency.

“E” : denotes Band Edge Frequency. ; “S” : denotes Spurious Frequency.

“---” : denotes Noise Floor.

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
93.05	S	Peak	59.95	-24.20	35.74	43.50	-7.76
100.81	S	Peak	58.69	-23.05	35.63	43.50	-7.87
307.42	S	Peak	55.09	-18.70	36.39	46.00	-9.61
524.70	S	Peak	48.35	-13.69	34.66	46.00	-11.34
600.36	S	Peak	49.43	-12.32	37.12	46.00	-8.88
750.71	S	Peak	51.81	-10.71	41.10	46.00	-4.90
1119.00	S	Peak	57.75	-7.19	50.55	74.00	-23.45
1119.00	S	Average	52.97	-7.19	45.78	54.00	-8.22
3856.00	S	Peak	51.82	-1.50	50.32	74.00	-23.68
3856.00	S	Average	48.60	-1.50	47.10	54.00	-6.90
5494.00	S	Peak	61.72	1.44	63.16	74.00	-10.84
5494.00	S	Average	46.01	1.44	47.45	54.00	-6.55
7720.00	S	Peak	50.06	4.97	55.03	74.00	-18.97
7720.00	S	Average	47.52	4.97	52.49	54.00	-1.51
11570.00	H	Peak	45.85	10.27	56.13	74.00	-17.87
11570.00	H	Average	32.81	10.27	43.08	54.00	-10.92
17355.00	H	Peak					
23140.00	H	Peak					
28925.00	H	Peak					
34710.00	H	Peak					

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Operation Band	:802.11 n20M	Test Date	:2013-11-17
Fundamental Frequency	:5825 MHz	Temp./Humi.	:24.7 deg_C/56RH
Operation Mode	:TX HIGH	Engineer	:Vito
EUT Pol.	:E1 Plan	Measurement Antenna Pol.	:VERTICAL

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

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

Note : “F” : denotes Fundamental Frequency. ; “H” : denotes Harmonic Frequency.

“E” : denotes Band Edge Frequency. ; “S” : denotes Spurious Frequency.

“---” : denotes Noise Floor.

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
38.73	S	Peak	57.22	-20.40	36.82	40.00	-3.18
47.46	S	Peak	59.91	-25.34	34.57	40.00	-5.43
93.05	S	Peak	64.00	-24.20	39.80	43.50	-3.70
101.78	S	Peak	60.03	-22.93	37.10	43.50	-6.40
400.54	S	Peak	47.09	-15.56	31.53	46.00	-14.47
625.58	S	Peak	45.47	-11.93	33.54	46.00	-12.46
1119.00	S	Peak	55.78	-10.19	45.59	74.00	-28.41
1119.00	S	Average	48.63	-10.19	38.44	54.00	-15.56
3884.00	S	Peak	51.83	-1.48	50.35	74.00	-23.65
3884.00	S	Average	45.88	-1.48	44.40	54.00	-9.60
5480.00	S	Peak	61.67	1.43	63.10	74.00	-10.90
5480.00	S	Average	45.97	1.43	47.40	54.00	-6.60
11650.00	H	Peak	45.33	10.43	55.76	74.00	-18.24
11650.00	H	Average	33.94	10.43	44.37	54.00	-9.64
17475.00	H	Peak	-	-	-	-	-
23300.00	H	Peak	-	-	-	-	-
29125.00	H	Peak	-	-	-	-	-
34950.00	H	Peak	-	-	-	-	-

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Operation Band	:802.11 n20M	Test Date	:2013-11-17
Fundamental Frequency	:5825 MHz	Temp./Humi.	:24.7 deg_C/56RH
Operation Mode	:TX HIGH	Engineer	:Vito
EUT Pol.	:E1 Plan	Measurement Antenna Pol.	:HORIZONTAL

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

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

Note : “F” : denotes Fundamental Frequency. ; “H” : denotes Harmonic Frequency.

“E” : denotes Band Edge Frequency. ; “S” : denotes Spurious Frequency.

“---” : denotes Noise Floor.

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
93.05	S	Peak	59.84	-24.20	35.64	43.50	-7.86
101.78	S	Peak	58.28	-22.93	35.35	43.50	-8.15
115.36	S	Peak	53.06	-21.90	31.16	43.50	-12.34
307.42	S	Peak	54.79	-18.70	36.09	46.00	-9.91
600.36	S	Peak	49.09	-12.32	36.77	46.00	-9.23
750.71	S	Peak	50.67	-10.71	39.96	46.00	-6.04
1119.00	S	Peak	58.03	-7.19	50.84	74.00	-23.16
1119.00	S	Average	52.74	-7.19	45.55	54.00	-8.45
3884.00	S	Peak	51.41	-1.48	49.93	74.00	-24.07
3884.00	S	Average	48.36	-1.48	46.88	54.00	-7.12
5515.00	S	Peak	62.85	1.50	64.35	74.00	-9.65
5515.00	S	Average	48.97	1.50	50.47	54.00	-3.53
7769.00	S	Peak	49.68	4.85	54.53	74.00	-19.47
7769.00	S	Average	47.49	4.85	52.34	54.00	-1.66
11650.00	H	Peak	44.81	10.43	55.24	74.00	-18.76
11650.00	H	Average	18.55	10.43	28.98	54.00	-25.02
17475.00	H	Peak					
23300.00	H	Peak					
29125.00	H	Peak					
34950.00	H	Peak					

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Radiated Spurious Emission Measurement Result (802.11n (5GHz)_40M)

Operation Band	:802.11 n40M	Test Date	:2013-11-17
Fundamental Frequency	:5755 MHz	Temp./Humi.	:24.7 deg_C/56RH
Operation Mode	:TX LOW	Engineer	:Vito
EUT Pol.	:E1 Plan	Measurement Antenna Pol.	:VERTICAL

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

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

Note : “F” : denotes Fundamental Frequency. ; “H” : denotes Harmonic Frequency.

“E” : denotes Band Edge Frequency. ; “S” : denotes Spurious Frequency.

“---” : denotes Noise Floor.

Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
38.73	S	Peak	57.84	-20.40	37.44	40.00	-2.56
47.46	S	Peak	61.15	-25.34	35.81	40.00	-4.19
93.05	S	Peak	64.82	-24.20	40.61	43.50	-2.89
101.78	S	Peak	60.06	-22.93	37.13	43.50	-6.37
600.36	S	Peak	47.69	-12.32	35.37	46.00	-10.63
750.71	S	Peak	49.05	-10.71	38.34	46.00	-7.66
1119.00	S	Peak	54.76	-10.19	44.57	74.00	-29.43
1119.00	S	Average	51.66	-10.19	41.47	54.00	-12.53
3835.00	S	Peak	50.65	-1.52	49.12	74.00	-24.88
3835.00	S	Average	48.79	-1.52	47.27	54.00	-6.73
5522.00	S	Peak	59.46	1.53	60.99	74.00	-13.01
5522.00	S	Average	50.73	1.53	52.26	54.00	-1.74
11510.00	H	Peak	43.75	10.20	53.95	74.00	-20.05
11510.00	H	Average	33.05	10.20	43.25	54.00	-10.75
17265.00	H	Peak	-	-	-	-	-
23020.00	H	Peak	-	-	-	-	-
28775.00	H	Peak	-	-	-	-	-
34530.00	H	Peak	-	-	-	-	-

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Operation Band	:802.11 n40M	Test Date	:2013-11-17
Fundamental Frequency	:5755 MHz	Temp./Humi.	:24.7 deg_C/56RH
Operation Mode	:TX LOW	Engineer	:Vito
EUT Pol.	:E1 Plan	Measurement Antenna Pol.	:HORIZONTAL

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

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

Note : “F” : denotes Fundamental Frequency. ; “H” : denotes Harmonic Frequency.

“E” : denotes Band Edge Frequency. ; “S” : denotes Spurious Frequency.

“---” : denotes Noise Floor.

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
93.05	S	Peak	61.21	-24.20	37.00	43.50	-6.50
101.78	S	Peak	59.41	-22.93	36.48	43.50	-7.02
308.39	S	Peak	54.85	-18.64	36.21	46.00	-9.79
575.14	S	Peak	49.07	-12.36	36.71	46.00	-9.29
600.36	S	Peak	51.53	-12.32	39.21	46.00	-6.79
750.71	S	Peak	51.69	-10.71	40.98	46.00	-5.02
1119.00	S	Peak	58.36	-7.19	51.17	74.00	-22.83
1119.00	S	Average	52.74	-7.19	45.55	54.00	-8.45
3835.00	S	Peak	51.16	-1.52	49.63	74.00	-24.37
3835.00	S	Average	48.50	-1.52	46.98	54.00	-7.02
5529.00	S	Peak	60.04	1.56	61.60	74.00	-12.40
5529.00	S	Average	47.11	1.56	48.67	54.00	-5.33
7678.00	S	Peak	49.64	5.04	54.68	74.00	-19.32
7678.00	S	Average	47.44	5.04	52.48	54.00	-1.52
11510.00	H	Peak	43.62	10.20	53.82	74.00	-20.18
11510.00	H	Average	32.56	10.20	42.76	54.00	-11.24
17265.00	H	Peak					
23020.00	H	Peak					
28775.00	H	Peak					
34530.00	H	Peak					

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Operation Band	:802.11 n40M	Test Date	:2013-11-17
Fundamental Frequency	:5795 MHz	Temp./Humi.	:24.7 deg_C/56RH
Operation Mode	:TX HIGH	Engineer	:Vito
EUT Pol.	:E1 Plan	Measurement Antenna Pol.	:VERTICAL

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

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

Note : “F” : denotes Fundamental Frequency. ; “H” : denotes Harmonic Frequency.

“E” : denotes Band Edge Frequency. ; “S” : denotes Spurious Frequency.

“---” : denotes Noise Floor.

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
38.73	S	Peak	57.49	-20.40	37.09	40.00	-2.91
47.46	S	Peak	60.31	-25.34	34.97	40.00	-5.03
93.05	S	Peak	64.86	-24.20	40.66	43.50	-2.84
101.78	S	Peak	60.48	-22.93	37.55	43.50	-5.95
575.14	S	Peak	47.87	-12.36	35.51	46.00	-10.49
750.71	S	Peak	48.89	-10.71	38.18	46.00	-7.82
1119.00	S	Peak	55.78	-10.19	45.58	74.00	-28.42
1119.00	S	Average	48.75	-10.19	38.56	54.00	-15.44
3835.00	S	Peak	50.70	-1.52	49.17	74.00	-24.83
3835.00	S	Average	45.81	-1.52	44.29	54.00	-9.71
5522.00	S	Peak	59.75	1.53	61.28	74.00	-12.72
5522.00	S	Average	50.31	1.53	51.84	54.00	-2.16
11650.00	H	Peak	42.29	10.43	52.72	74.00	-21.28
11650.00	H	Average	31.82	10.43	42.25	54.00	-11.76
17385.00	H	Peak	-	-	-	-	-
23180.00	H	Peak	-	-	-	-	-
28975.00	H	Peak	-	-	-	-	-
34770.00	H	Peak	-	-	-	-	-

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Operation Band	:802.11 n40M	Test Date	:2013-11-17
Fundamental Frequency	:5795 MHz	Temp./Humi.	:24.7 deg_C/56RH
Operation Mode	:TX HIGH	Engineer	:Vito
EUT Pol.	:E1 Plan	Measurement Antenna Pol.	:HORIZONTAL

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

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

Note : “F” : denotes Fundamental Frequency. ; “H” : denotes Harmonic Frequency.

“E” : denotes Band Edge Frequency. ; “S” : denotes Spurious Frequency.

“---” : denotes Noise Floor.

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
93.05	S	Peak	61.21	-24.20	37.00	43.50	-6.50
101.78	S	Peak	59.41	-22.93	36.48	43.50	-7.02
308.39	S	Peak	54.85	-18.64	36.21	46.00	-9.79
575.14	S	Peak	49.07	-12.36	36.71	46.00	-9.29
600.36	S	Peak	51.53	-12.32	39.21	46.00	-6.79
750.71	S	Peak	51.69	-10.71	40.98	46.00	-5.02
1119.00	S	Peak	57.63	-7.19	50.43	74.00	-23.57
1119.00	S	Average	52.89	-7.19	45.70	54.00	-8.30
3835.00	S	Peak	51.83	-1.52	50.31	74.00	-23.69
3835.00	S	Average	48.51	-1.52	46.99	54.00	-7.01
5536.00	S	Peak	59.13	1.59	60.72	74.00	-13.28
5536.00	S	Average	46.31	1.59	47.90	54.00	-6.10
7678.00	S	Peak	49.40	5.04	54.45	74.00	-19.55
7678.00	S	Average	47.65	5.04	52.69	54.00	-1.31
11650.00	H	Peak	42.80	10.43	53.23	74.00	-20.77
11650.00	H	Average	31.82	10.43	42.25	54.00	-11.76
17385.00	H	Peak					
23180.00	H	Peak					
28975.00	H	Peak					
34770.00	H	Peak					

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11 PEAK POWER SPECTRAL DENSITY

11.1 Standard Applicable:

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

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

11.2 Measurement Equipment Used:

Refer to section 7.2 for details.

11.3 Test Set-up:

Refer to section 7.3 for details. (Spectrum Option)

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11.4 Measurement Procedure (following the measurement procedure 10.2 of KDB558074):

1. Set analyzer center frequency to DTS channel center frequency.
2. Set the span to 1.5 times the DTS channel bandwidth.
3. Set the RBW ≥ 3 kHz.
4. Set the VBW $\geq 3 \times$ RBW.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum amplitude level.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.
11. The resulting peak PSD level must be ≤ 8 dBm.
12. 802.11n MIMO mode: offset is set following “measure and add 10 Log (N)” on spectrum to measure the PSD for MIMO mode. Offset = cable loss + 10 log (N), where N is number of transmitting antenna. N=2 for this given application.

Note: For the test of PSD at MIMO mode, the highest emission of worst case employing Measure and add 10 log (N) technical is reported on this report after the comparison between Main Antenna at single transmitting mode and Aux that yields the higher value. . The single transmitting mode is only reported measurement that produces higher value of outcome.

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11.5 Measurement Result:**802.11a**

Frequency MHz	RF Power Density	Maximum Limit
	Reading (dBm)	(dBm)
5745	-12.466	8
5785	-12.947	8
5825	-14.209	8

802.11n (5GHz)_20M_MIMO

Frequency MHz	RF Power Density	Maximum Limit
	Reading (dBm)	(dBm)
5745	-10.054	8
5785	-10.800	8
5825	-7.658	8

802.11n (5GHz)_40M_MIMO

Frequency MHz	RF Power Density	Maximum Limit
	Reading (dBm)	(dBm)
5755	-14.492	8
5795	-14.567	8

* Note: Offset 11dB for 5G 802.11a; Offset 14.01dB for 5G 802.11/n_20/n_40.

*Refer to next page for plots

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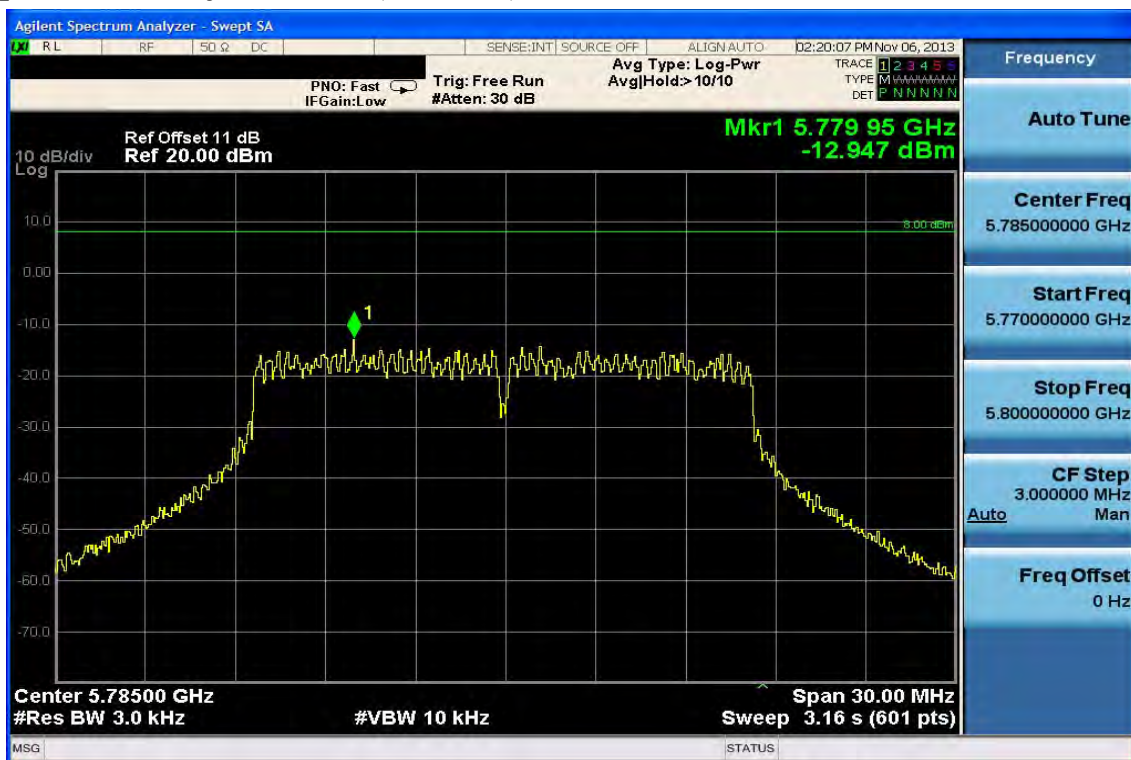
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802.11a

Power Spectral Density Test Plot (CH-Low)



Power Spectral Density Test Plot (CH-Mid)



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Power Spectral Density Test Plot (CH-High)



802.11n (5GHz)_20M

Power Spectral Density Test Plot (CH-Low)



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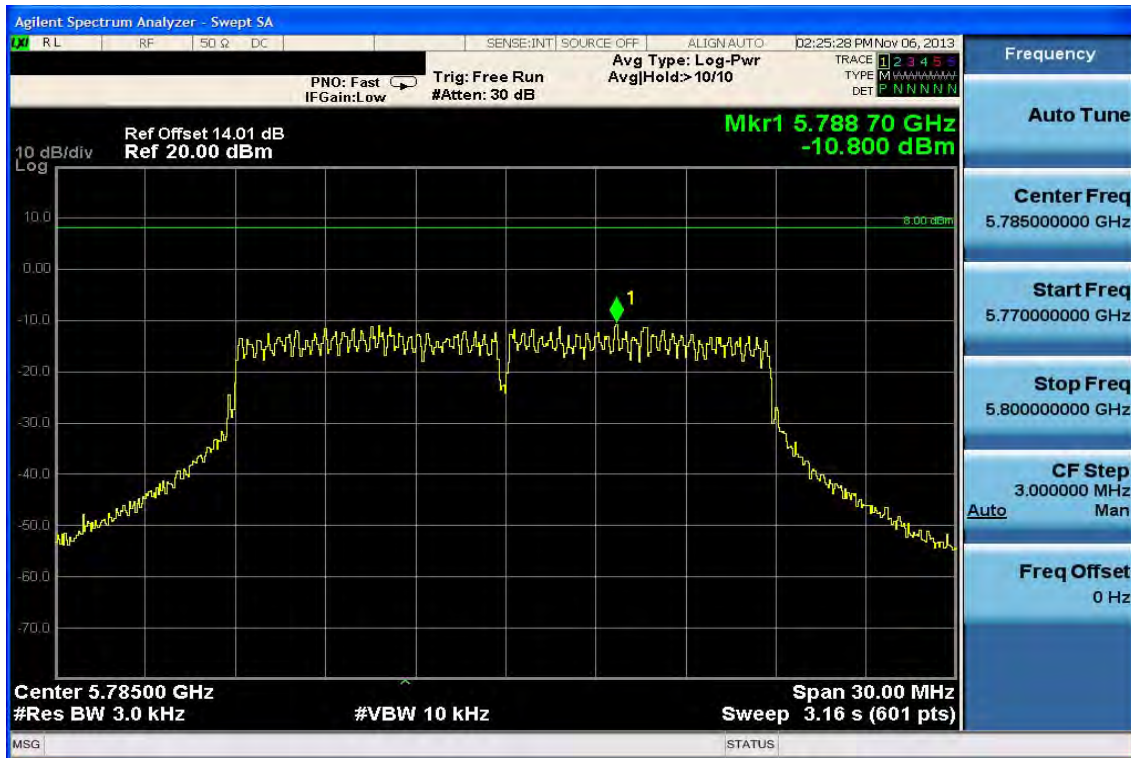
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Power Spectral Density Test Plot (CH-Mid)



Power Spectral Density Test Plot (CH-High)



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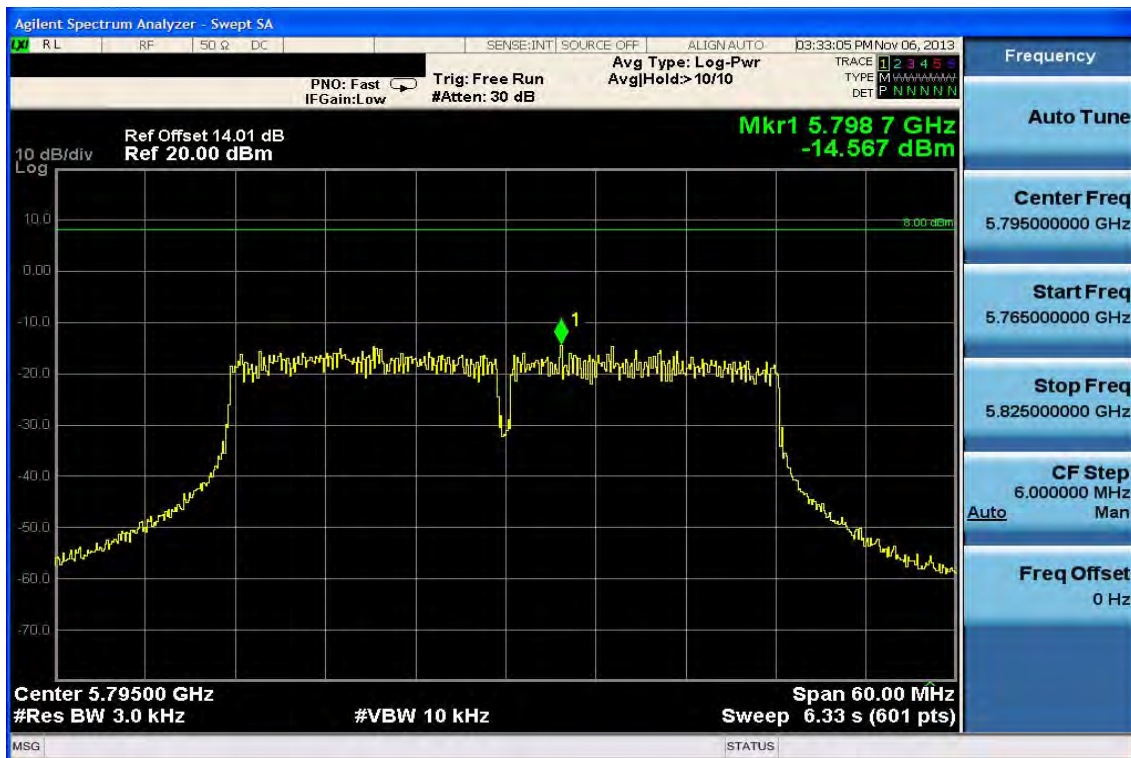
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802.11n (5GHz)_40M

Power Spectral Density Test Plot (CH-Low)



Power Spectral Density Test Plot (CH-High)



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12 ANTENNA REQUIREMENT

12.1 Standard Applicable:

For intentional device, according to §15.203, an intentional radiator shall be designed to ensure that no antenna other than furnished by the responsible party shall be used with the device.

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

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

12.2 Antenna Connected Construction:

The directional gains of antenna used for transmitting is 4.78 dBi (Main), 7.77dBi (Aux) for 5725-5850 MHz, and 8.09dBi for 5.8G MIMO. In addition, the antenna connector is designed with unique type RF connector and no consideration of replacement. Please see EUT photo and antenna spec. for details.

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13 99% BANDWIDTH MEASUREMENT

13.1 Standard Applicable:

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

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

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

13.2 Measurement Equipment Used:

Refer to section 7.2 for details.

13.3 Test Set-up:

Refer to section 7.3 for details. (Spectrum analyzer)

13.4 Measurement Procedure:

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as RBW=1% of the Span, VBW = 3 times RBW, Span= 30 MHz /50MHz.
4. Turn on the 99% bandwidth function, max reading..
5. Repeat above procedures until all frequency measured were complete.

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13.5 Measurement Result:

802.11a

Frequency MHz	99%Bandwidth (MHz)
5745	16.420
5785	16.513
5825	16.390

802.11n (5GHz)_20M MIMO-Main

Frequency MHz	99%Bandwidth (MHz)
5745	17.439
5785	17.492
5825	17.434

802.11n (5GHz)_20M MIMO-Aux

Frequency MHz	99%Bandwidth (MHz)
5745	17.534
5785	17.348
5825	17.775

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802.11n (5GHz)_40M MIMO-Main

Frequency MHz	99%Bandwidth (MHz)
5755	36.104
5795	36.180

802.11n (5GHz)_40M MIMO-Aux

Frequency MHz	99%Bandwidth (MHz)
5755	36.332
5795	36.280

Note: Refer to next page for plots.

Note: “->” reveals the bandwidth measurement in 99%.

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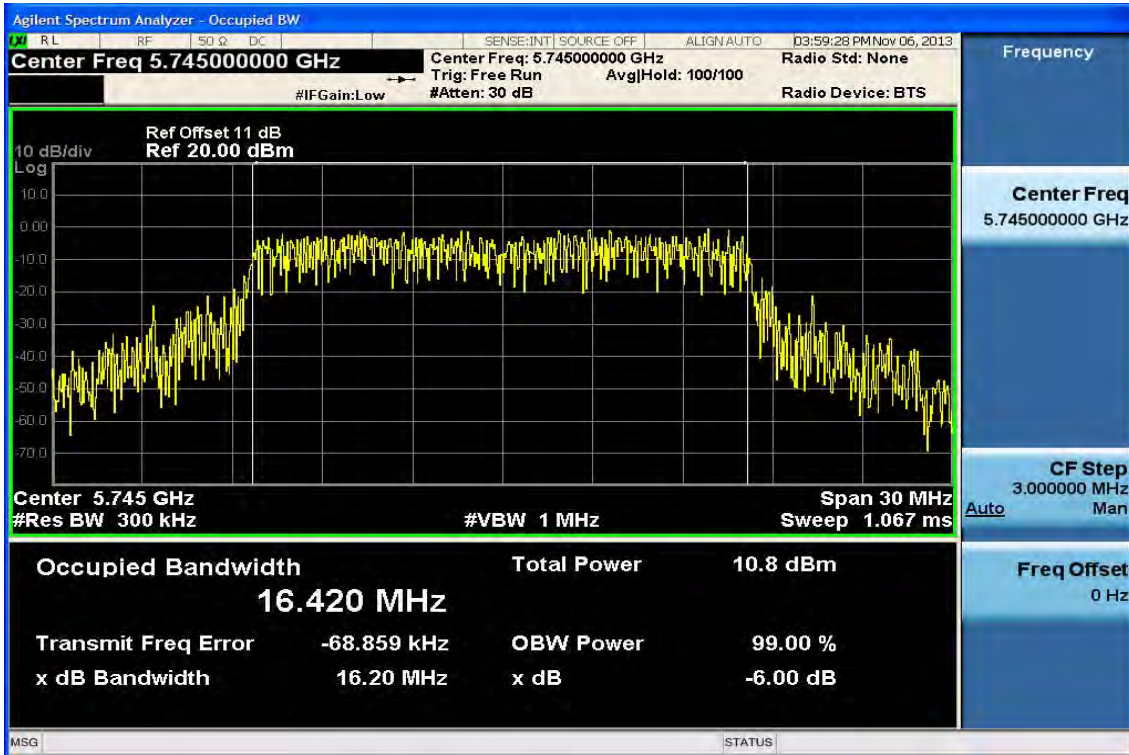
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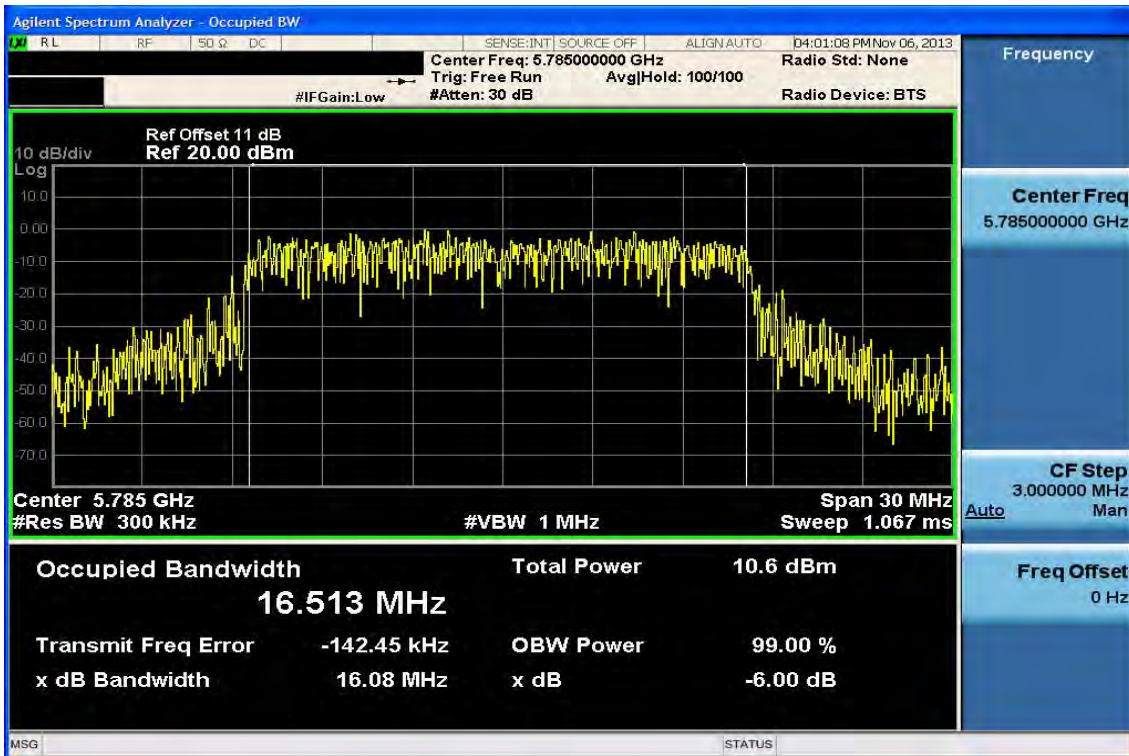
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802.11a

99% Band Width Test Data CH-Low



99% Band Width Test Data CH-Mid



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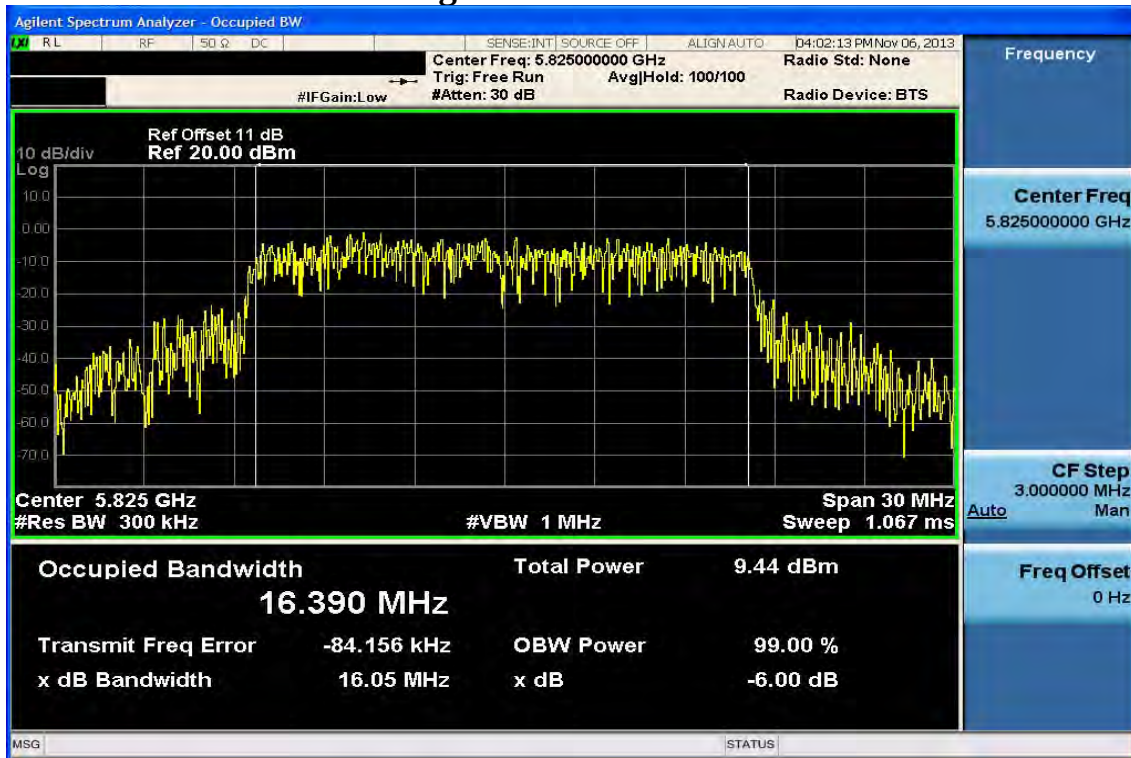
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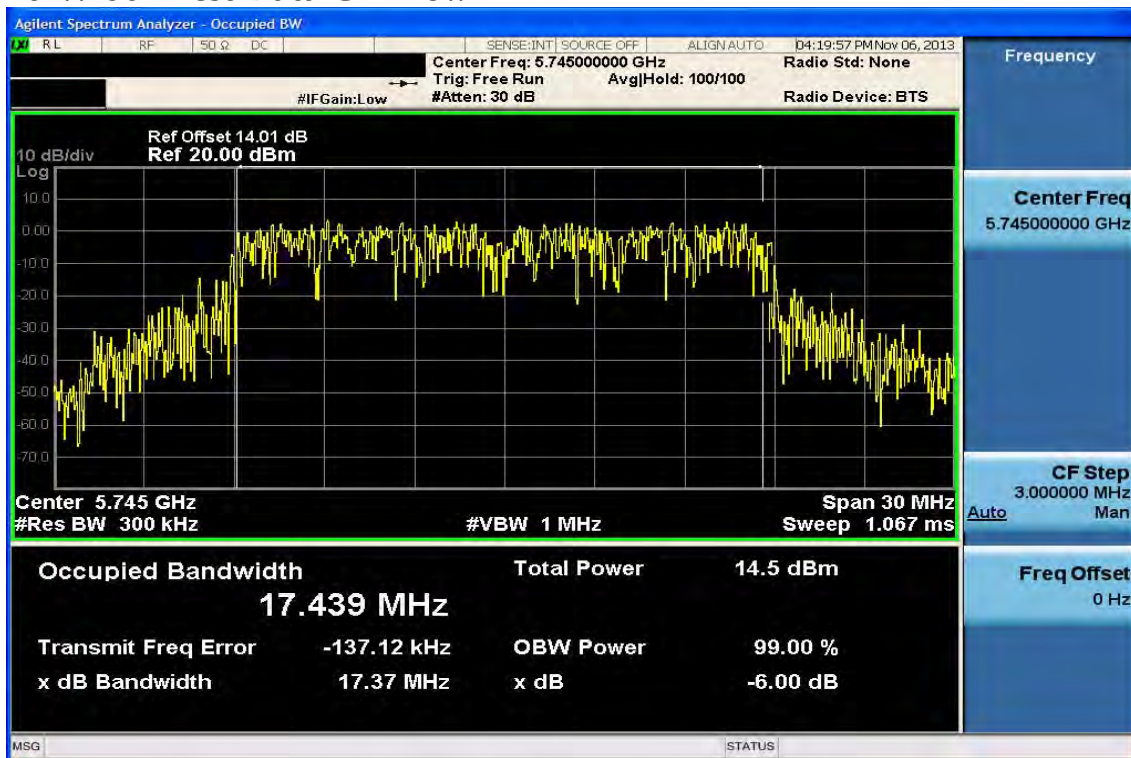
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99% Band Width Test Data CH-High



802.11n (5GHz)_20M MIMO-Main 99% Band Width Test Data CH-Low



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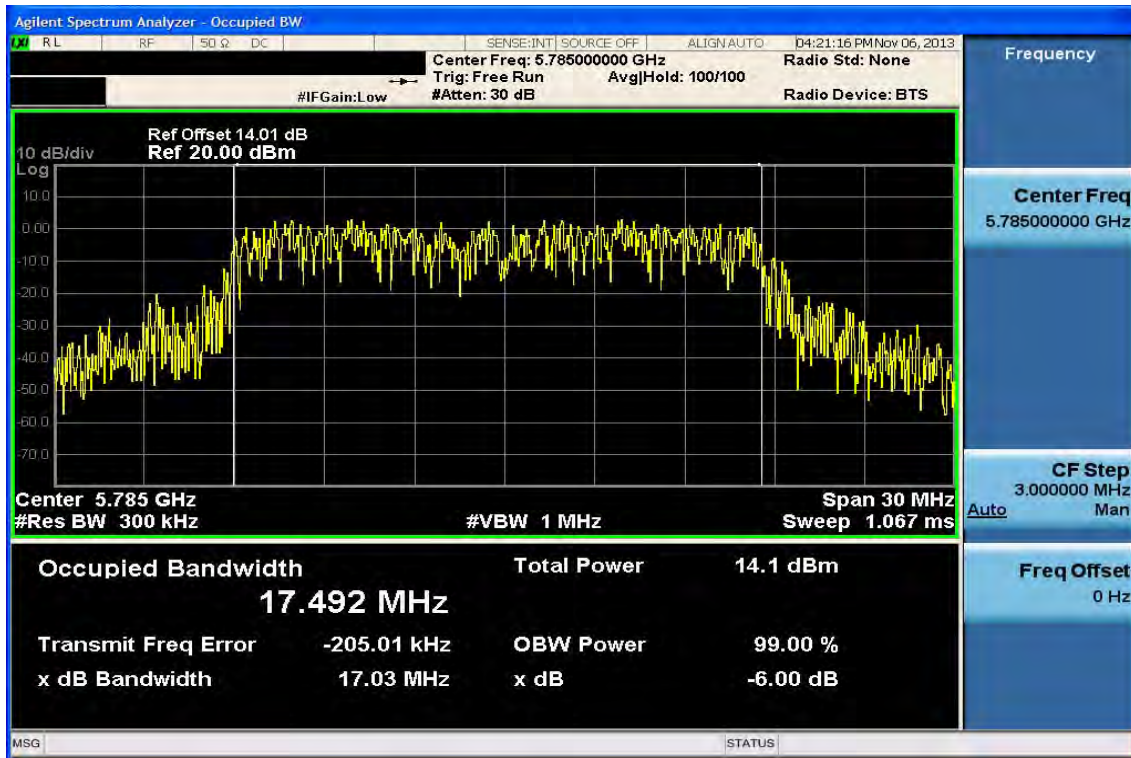
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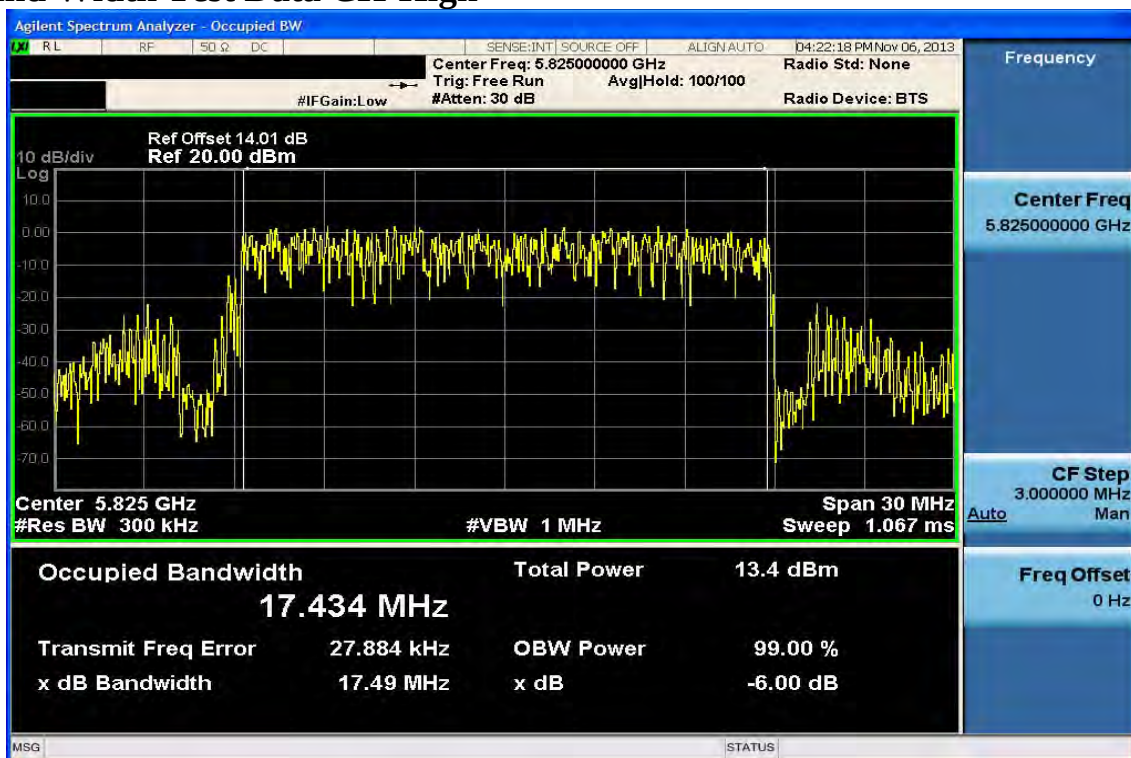
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99% Band Width Test Data CH-Mid



99% Band Width Test Data CH-High



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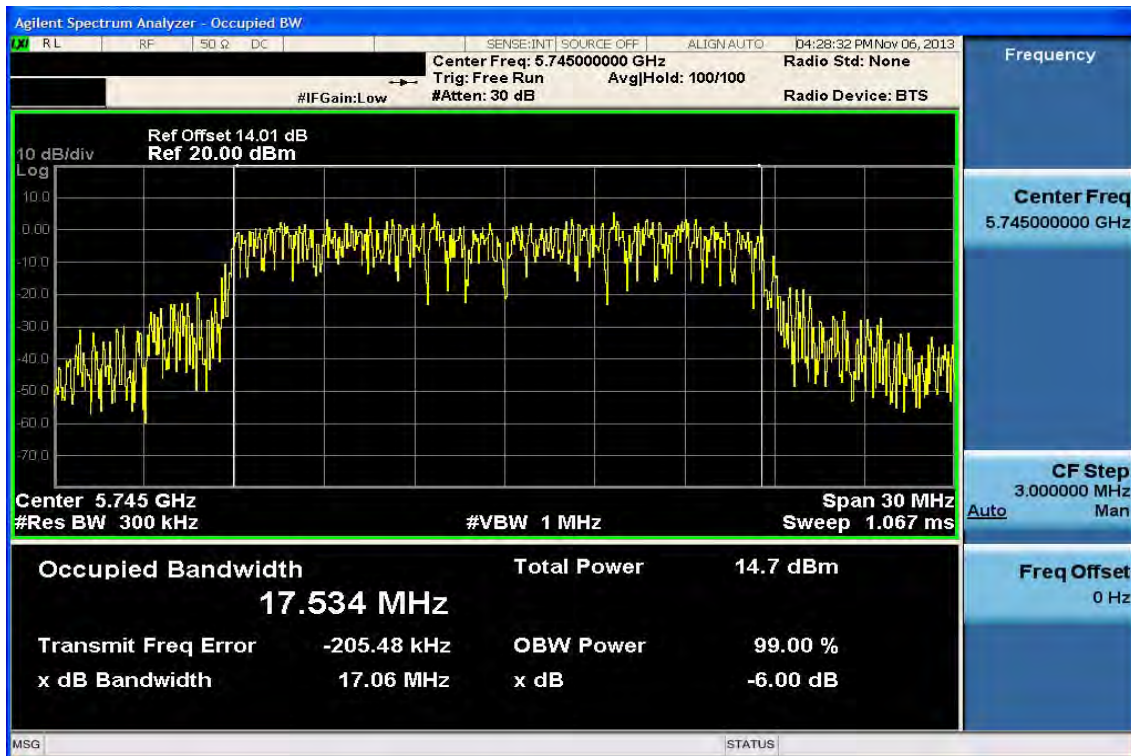
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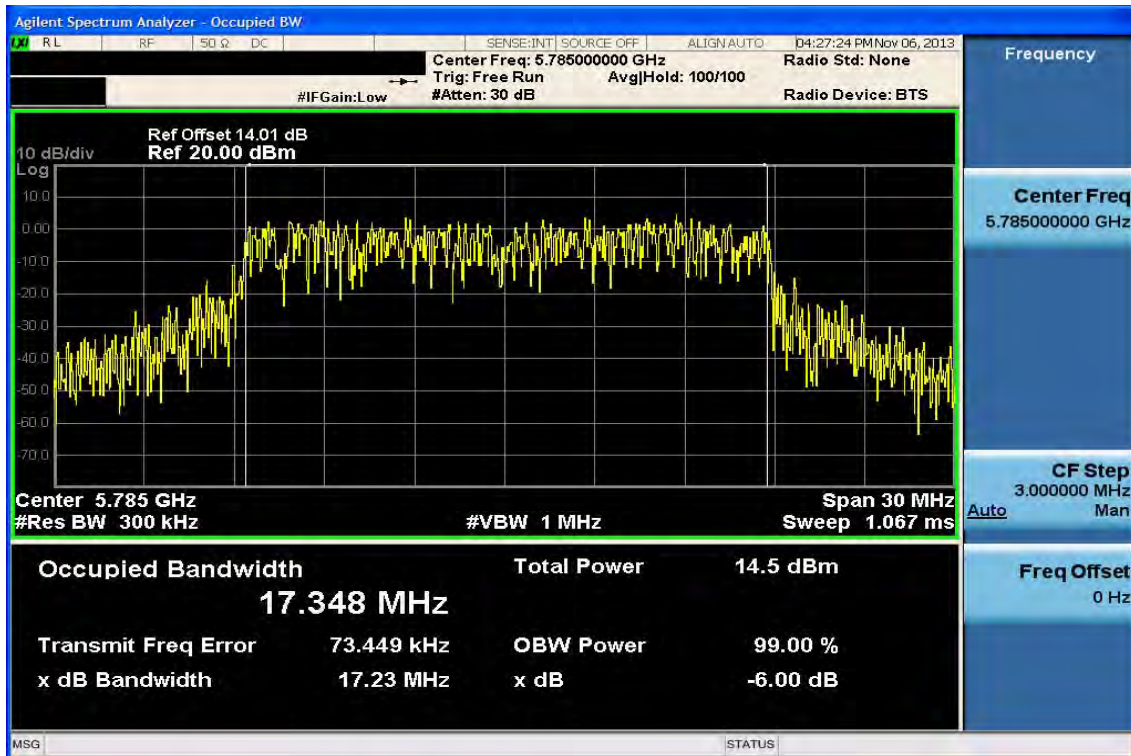
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802.11n (5GHz)_20M MIMO-Aux 99% Band Width Test Data CH-Low



99% Band Width Test Data CH-Mid



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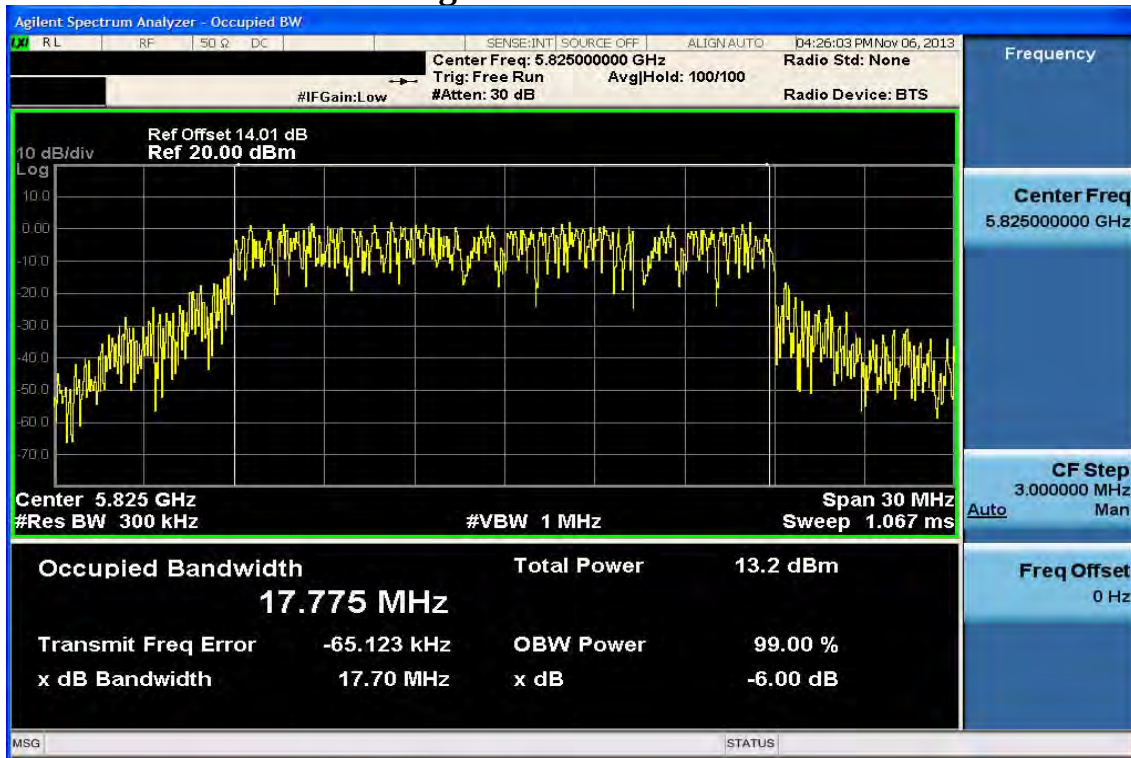
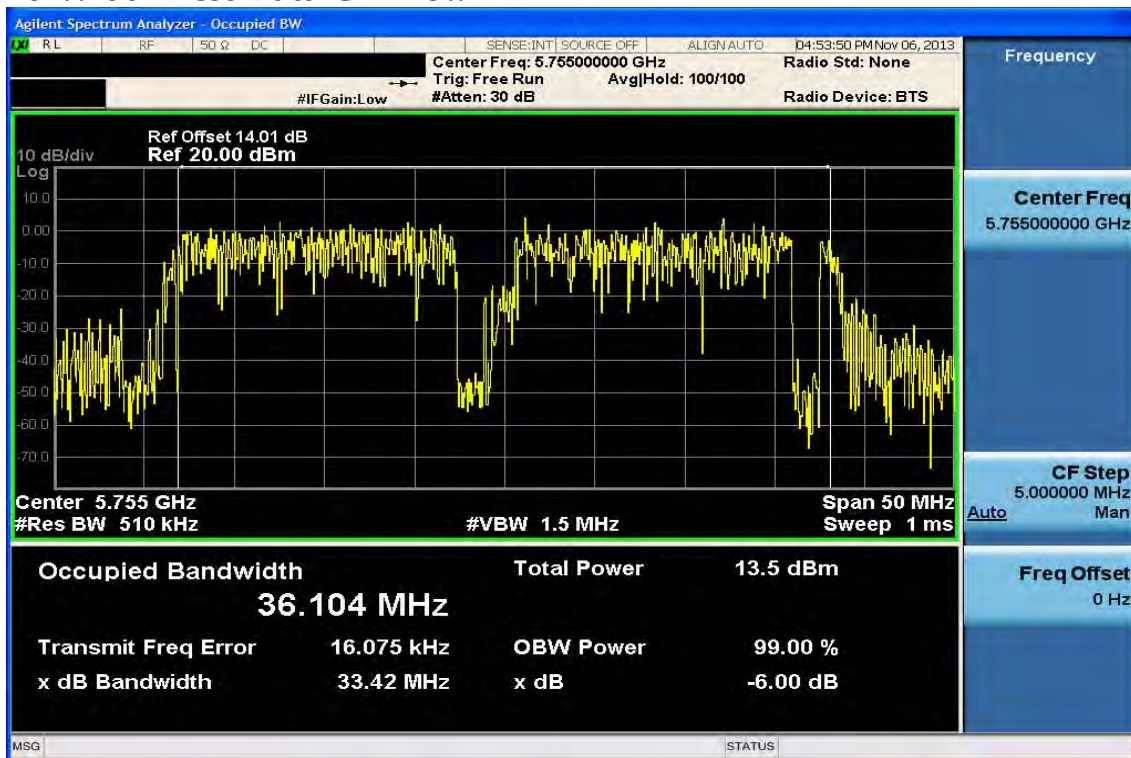
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99% Band Width Test Data CH-High

802.11n (5GHz)_40M MIMO-Main
99% Band Width Test Data CH-Low

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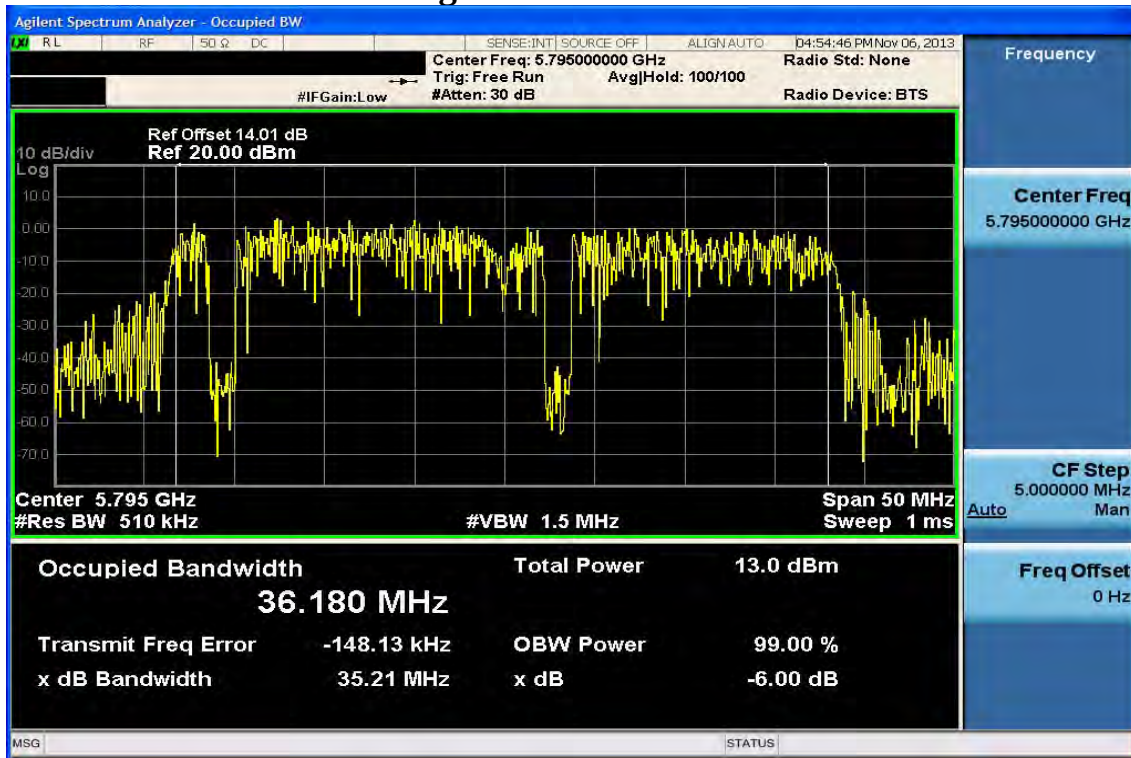
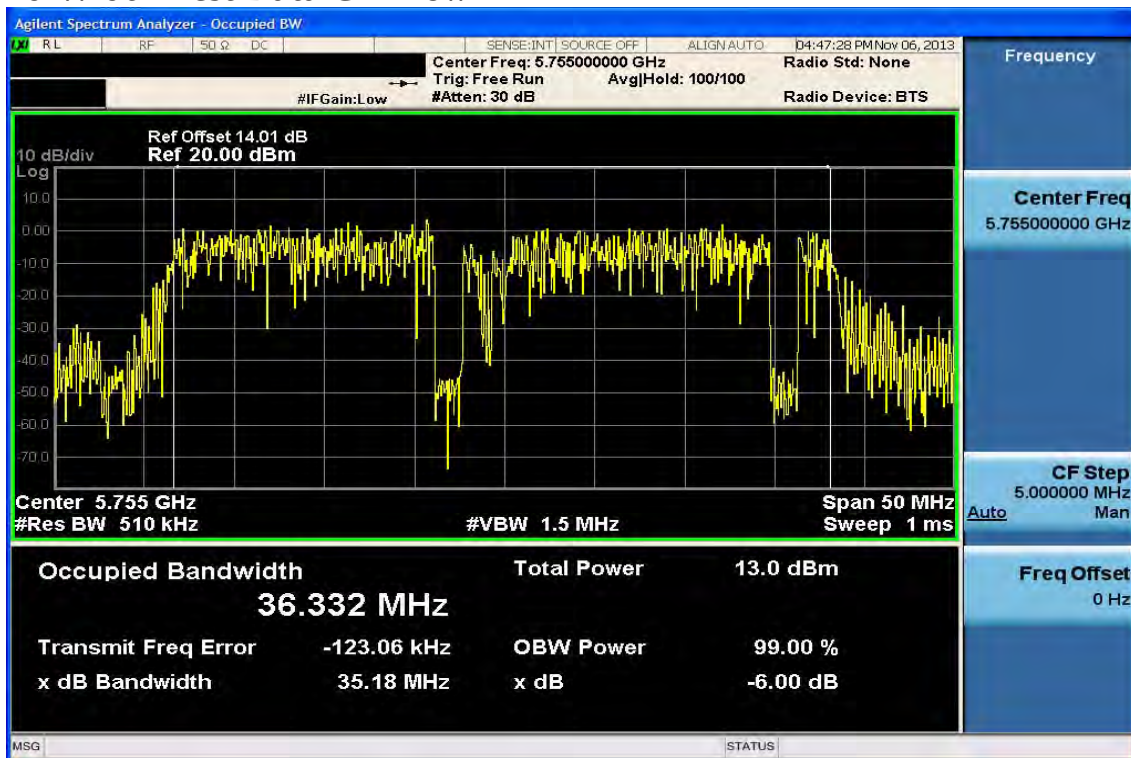
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99% Band Width Test Data CH-High

802.11n (5GHz)_40M MIMO-Aux
99% Band Width Test Data CH-Low

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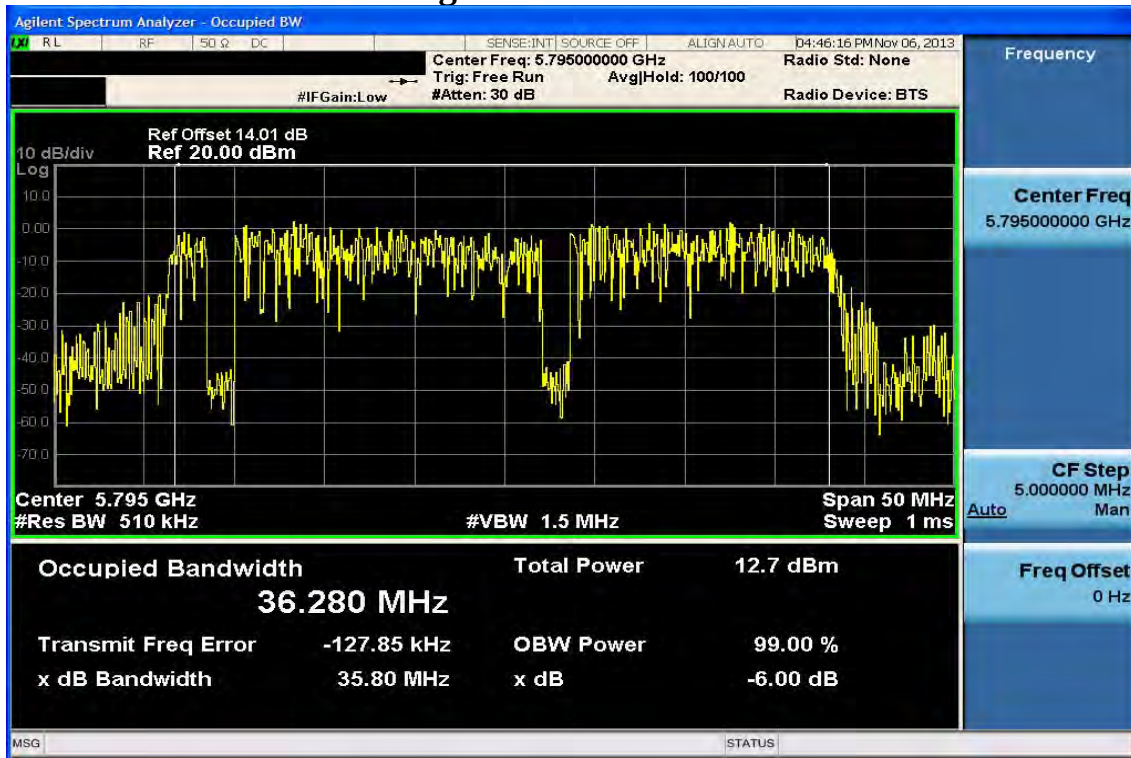
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99% Band Width Test Data CH-High



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