

ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART E REQUIREMENT OF

Product Name: IEEE 802.11 a/n Wireless AP/Client/Bridge

Brand Name: Advantech

Model No.: EKI-6331AN-BE

Model Different: N/A

FCC ID: M82-EKI6331ANBE

Report No.: E2/2015/B0116

Issue Date: Dec. 08, 2015

FCC Rule Part: §15.407

Prepared for:
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SGS Taiwan Ltd.

Prepared by:
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VERIFICATION OF COMPLIANCE

Applicant: Advantech Co., Ltd
No. 1, Alley 20, Lane 26, Rueiguang Road, Neihu District, Taipei 11491, Taiwan, R.O.C.

Product Name: IEEE 802.11 a/n Wireless AP/Client/Bridge

Brand Name: Advantech

Model No.: EKI-6331AN-BE

Model Different: N/A

FCC ID: M82-EKI6331ANBE

File Number: E2/2015/B0116

Date of Test: Aug. 01, 2014 ~ Mar. 09, 2016

Date of EUT Received: Aug. 01, 2014

We hereby certify that:

The above equipment was tested by SGS Taiwan Ltd. Electronics & Communication Laboratory. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.4:2009 and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits of FCC Rules Part 15.407.

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

Test By:**Date:**

Mar. 09, 2016

*Marcus Tseng / Sr. Engineer***Prepared By:****Date:**

Mar. 09, 2016

*Tiffany Kao / Clerk***Approved By:****Date:**

Mar. 09, 2016

Jim Chang / Asst. Manager

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Version

Version No.	Date	Description
00	Mar. 09, 2016	Initial creation of document

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1. GENERAL INFORMATION

1.1. Product Description

General:

Product Name:	IEEE 802.11 a/n Wireless AP/Client/Bridge	
Brand Name:	Advantech	
Model No.:	EKI-6331AN-BE	
Model difference:	N/A	
Hardware Version:	N/A	
Software Version:	N/A	
Pole Mounting Ring:	Model No.: N/A, Supplier: N/A	
Ferrite Suppression Core:	Model No.: N/A, Supplier: N/A	
Grounding Wire:	Model No.: N/A, Supplier: N/A	
Power Supply:	24Vdc from Power Cord & PoE Injector	
	Power Cord & PoE Injector:	Model No.: GRT-240100, Supplier: GREAT POWER SUPPLY CO. LTD

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WLAN:

Wi-Fi	Frequency Range	Channels	Rated Power	Modulation Technology
11a (5GHz)	5150-5250	3	Avg. Power: 17.12 dBm	OFDM
	5725-5850	3	Avg. Power: 12.68 dBm	
11n (5GHz)	HT20 5150-5250	3	Avg. Power: (MIMO Chain 0): 14.97dBm (MIMO Chain 1): 15.24dBm (MIMO Chain 0+1):18.06dBm	OFDM
	HT20 5725-5850	3	Avg. Power: (MIMO Chain 0): 14.88dBm (MIMO Chain 1): 15.65dBm (MIMO Chain 0+1):18.29dBm	
11n (5GHz)	HT40 5150-5250	2	Avg. Power: (MIMO Chain 0): 14.72dBm (MIMO Chain 1): 15.10dBm (MIMO Chain 0+1): 17.92dBm	
	HT40 5725-5850	2	Avg. Power: (MIMO Chain 0):14.65 dBm (MIMO Chain 1): 14.90dBm (MIMO Chain 0+1):17.79dBm	
Antenna Designation:		Waterproof Main Gain: 5GHz Gain: 6.69 dBi (5150MHz-5250MHz) 5GHz Gain: 7.80 dBi (5745MHz-5825MHz)	Replacement Antenna,, Part No.: KWX-155RSX9-999	
		Aux Gain: 5GHz Gain: 6.69 dBi (5150MHz-5250MHz) 5GHz Gain: 7.80 dBi (5745MHz-5825MHz)		
Modulation type:		64QAM, 16QAM, QPSK, BPSK for OFDM		
Transition Rate:		802.11 a_20MHz: 6 – 54Mbps 802.11 n_20MHz: 6.5 – 144Mbps 802.11 n_40MHz: 13.5 – 300Mbps		

This report applies for frequency bands 5150 MHz– 5250MHz and 5725 MHz– 5850MHz.

5GHz gain: (5745MHz~5825MHz)= $\sqrt{4.85^2(E_Plane)+4.61^2(H_Plane)}$ =6.69dBi

5GHz gain: (5745MHz~5825MHz)= $\sqrt{5.41^2(E_Plane)+5.62^2(H_Plane)}$ =7.80dBi

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IEEE 802.11n Spec:

MCS Index	Nss	Modulation	R	NBPSC	NCBPS		NDBPS		Datarate(Mbps)			
					20MHz		40MHz		20MHz		40MHz	
					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	$N_{BPSCS}(i_{SS})$	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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1.2. Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for FCC ID: **M82-EKI6331ANBE** filing to comply with Section 15.407 of the FCC Part 15, Subpart C Rules. The composite system (digital device) is authorized under the certification procedure.

1.3. Test Methodology

Both conducted and radiated testing were performed according to the procedures in ANSI C63.4:2009 & KDB 789033 D02 published on 06, 06, 2014. Radiated testing was performed at an antenna to EUT distance 3 meters.

Tested in accordance with Jun. 2014 KDB789033 V03r02 for compliance to FCC 47CFR 15.407 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: 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 is 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 30MHz, and the measurement procedure 7.3 in ANSI 63.4:2009 & 6.2.2, 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 Configuration



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	Atheros	Atheros Radio Test 2	N/A	N/A	N/A
2	Notebook	Lenovo	L412	LR-027LM	N/A	N/A

Fig. 2-2 AC Power Line Conducted Emission

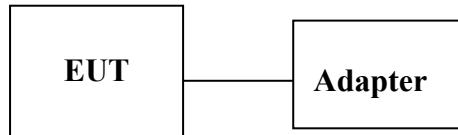


Table 2-2 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Data Cable	Power Cord
1.	WLAN Test Software	Atheros	Atheros Radio Test 2	N/A	N/A	N/A

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3. SUMMARY OF TEST RESULT

FCC Rules	Description Of Test	Result
§15.207	AC Power Line Conducted Emission	Compliant
§15.407(a) (1) (2)	26 dB & 6dB Emission Bandwidth	Compliant
§15.407(a) (1) (2)	The Maximum Output Power Measurement	Compliant
§15.407(a) (5)	Peak Power Spectral Density Measurement	Compliant
§15.407(b) (1) (2) (3)	Undesirable Emission – Conducted Measurement	Compliant
§15.407(b) (1) (2) (3)(6) (7)	Undesirable Emission – Radiated Measurement	Compliant
§15.407(c)	Transmission in case of Absence of Information	Compliant
§15.407(g)	Frequency Stability	Compliant
§15.203	Antenna Requirement	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 mode is programmed.

a mode:

5150 MHz-5350MHz: Channel lowest(5180MHz)、Mid(5220MHz) and Highest(5240MHz)with 6Mbps data rate are chosen for full testing.

5725 MHz-5850MHz: Channel lowest(5745MHz)、Mid(5785MHz) and Highest(5825MHz)with 6Mbps data rate are chosen for full testing.

n HT 20 mode:

5150 MHz-5350MHz: Channel lowest(5180MHz) Mid(5220MHz) and Highest(5240MHz)with 13 Mbps data rate are chosen for full testing

5725 MHz-5850MHz: Channel lowest(5745MHz) Mid(5785MHz) and Highest(5825MHz)with 13 Mbps data rate are chosen for full testing.

n HT 40 mode:

5150 MHz-5350MHz: Channel lowest (5190MHz) and Highest (5230MHz)with 27Mbps data rate are chosen for full testing

5755MHz-5795MHz: Channel lowest (5755MHz) and Highest (5795MHz)with 27Mbps 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 802.11n WLAN Transmitter for channel Low, Mid and High, the worst case E2 position was reported.

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Remark: While conducting average power measurement, duty cycle of each mode (n_ht20/n_ht40) shall be greater than 98%. All duty cycle is pre-scanned, but verified to be greater than 98%, where $n_ht20 = 99\%$, and $n_ht_40 = 98.96\%$, where duty cycle is conducted as the given transmission with given virtual operation that expresses the percentage.

Formula:

$$\text{Duty Cycle} = T_{on} / (T_{on} + T_{off})$$

Test Procedure:

Set span = 0, RBW = 8MHz, the largest as possible, VBW = 8MHz, Detector = Peak, and RBW, and VBW = 8 MHz where zero-span is permissible, that $> 50/T$, where T is $\sim 4.3\text{ms}$

Duty Cycle:

	Antenna	Duty Cycle	Duty Factor (dB)
802.11 a	Single	0.9694	0.14
802.11 n_20	Mimo-Main	0.9362	0.29
	Mimo-Aux	0.9362	0.29
802.11 n_40	Mimo-Main	0.9101	0.41
	Mimo-Aux	0.9101	0.41

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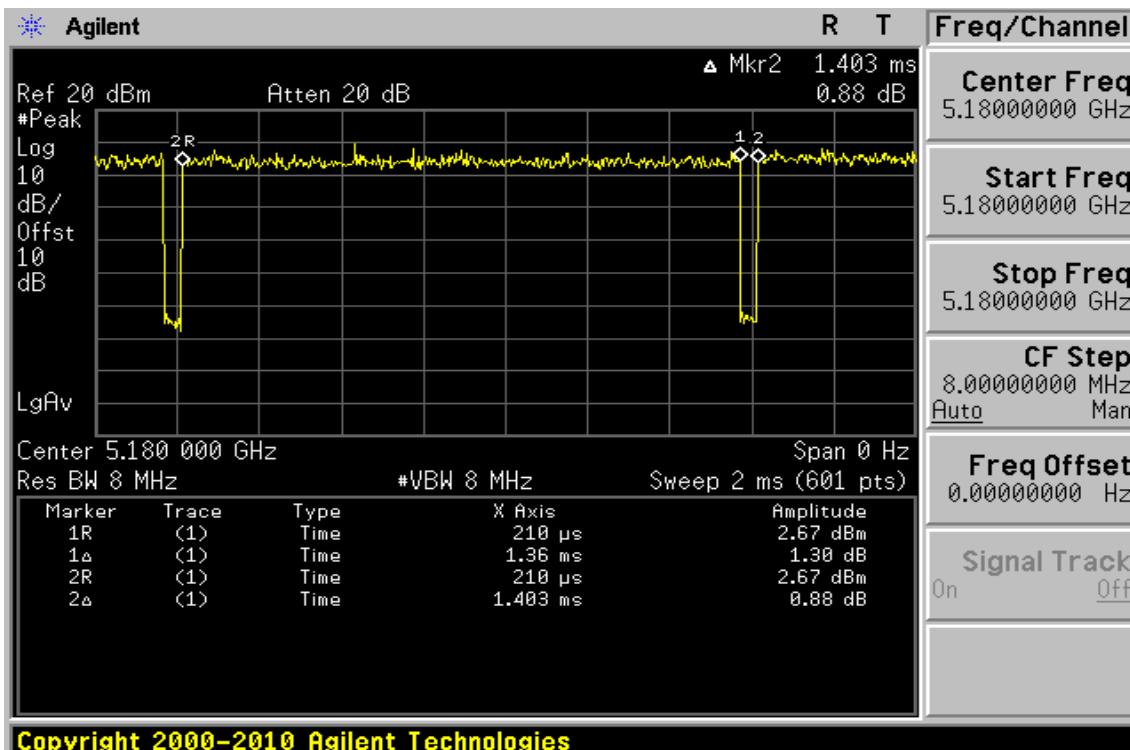
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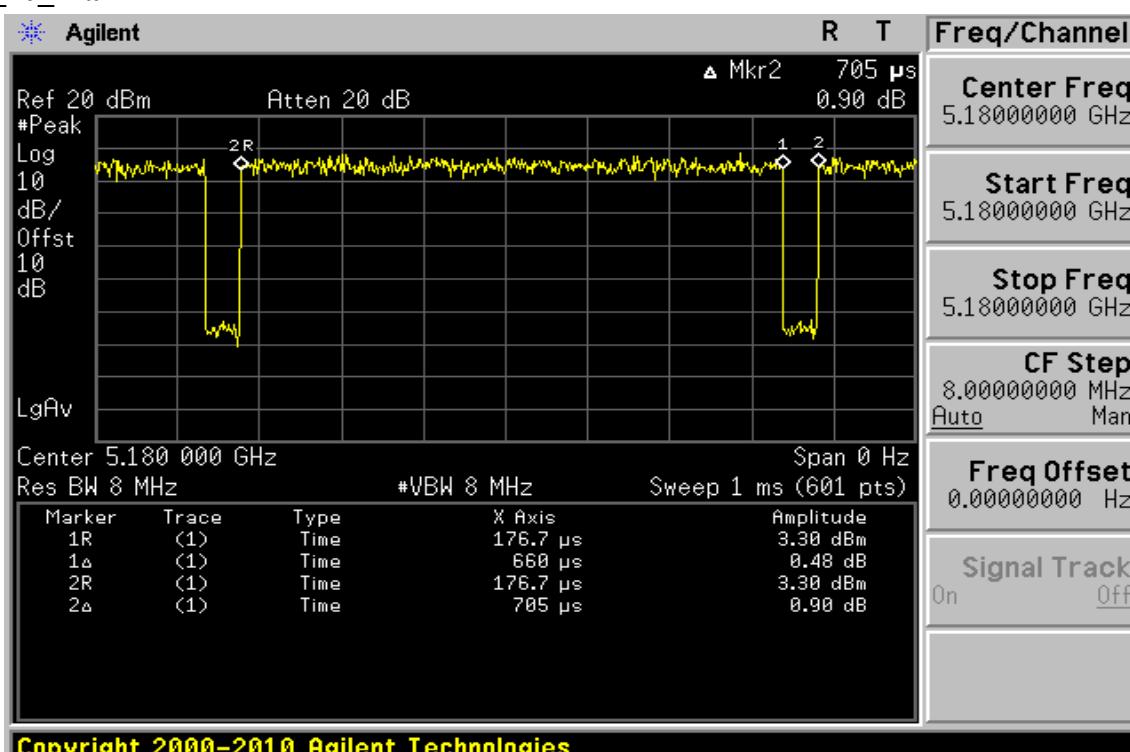
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Duty Factor:

802.11a



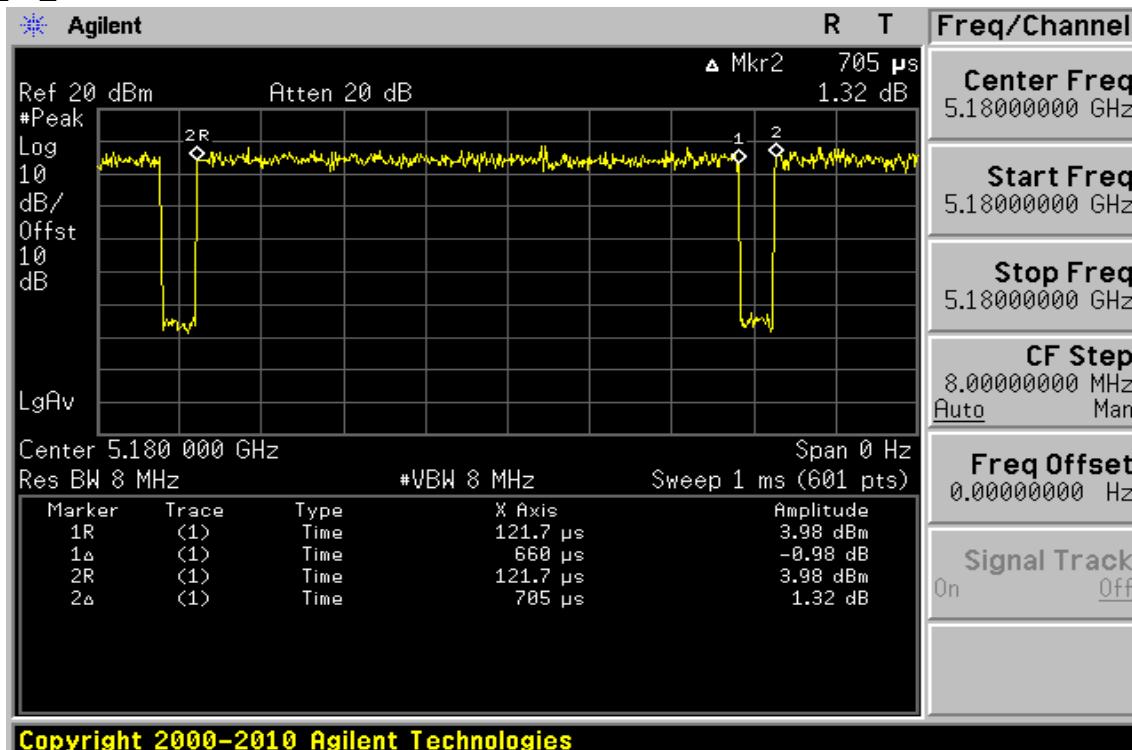
802.11 n 20 Main



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802.11 n_20_Aux

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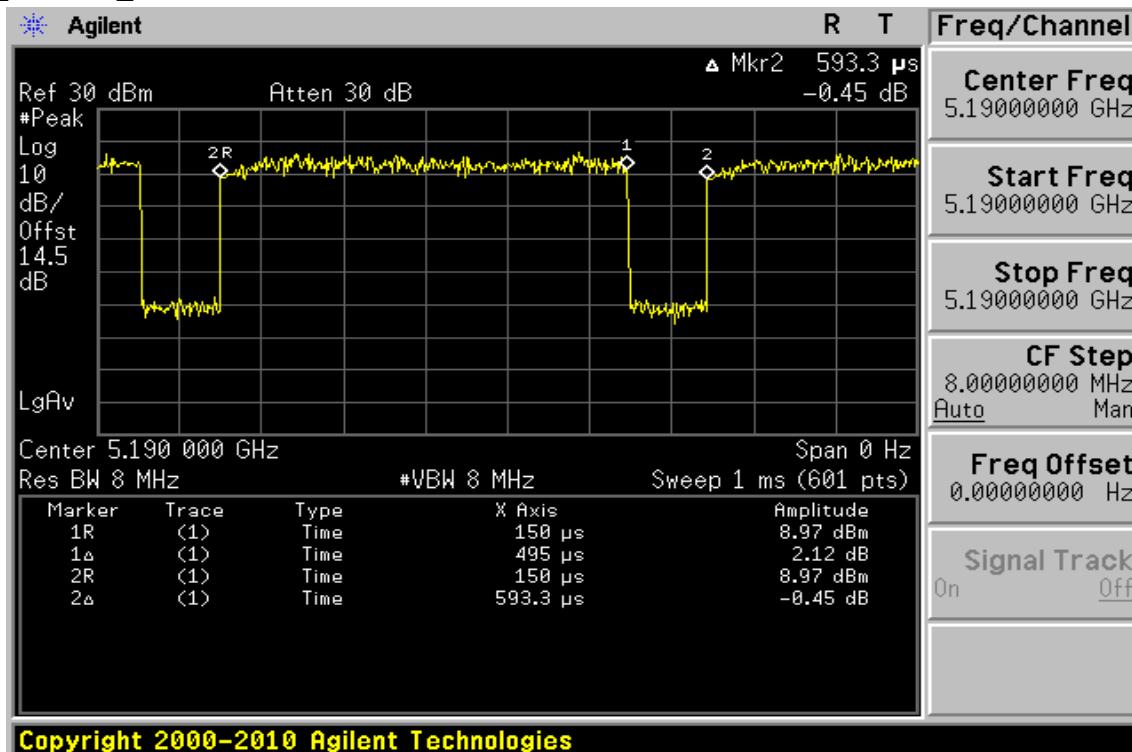
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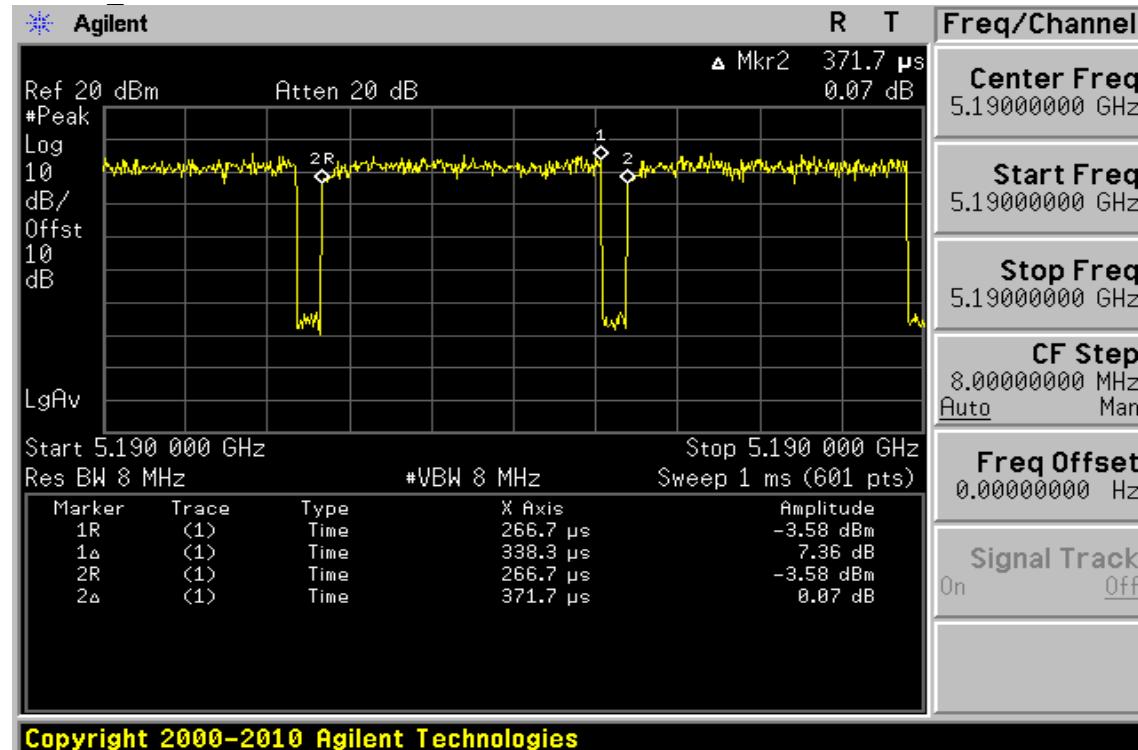
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802.11 n_40 MHz_Main



802.11 n_40 MHz_Aux



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5. MEASUREMENT UNCERTAINTY

Test Items	Uncertainty
AC Power Line Conducted Emission	+/- 2.586 dB
26 dB and 99% Emission Bandwidth	+/- 123.36 Hz
The Maximum Output Power Measurement	+/- 1.42 dB
Peak Power Spectral Density Measurement	+/- 1.55 dB
Peak Excursion Measurement	+/- 1.55 dB
Undesirable Emission – Conducted Measurement	+/- 1.55 dB
Transmission in case of Absence of Information	+/- 1.55 dB
Frequency Stability	+/- 123.36 Hz
TPC and DFS Measurement	+/- 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 frequency range within 150 KHz to 30 MHz shall not exceed the Limit table as below.

Frequency range MHz	Limits dB(uV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50

Note

- 1.The lower limit shall apply at the transition frequencies
- 2.The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

6.2. Measurement Equipment Used:

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
EMI Test Receiver	R&S	ESCI7	100760	05/26/2014	05/25/2015
LISN	Rolf-Heine	NNB-2/16Z	99012	03/26/2014	03/25/2015
LISN	FCC	FCC-LISN-50/250-25-2-01	04034	03/19/2014	03/18/2015
Coaxial Cables	N/A	WK CE Cable	N/A	11/26/2013	11/25/2014
EMI Test Receiver	R&S	ESCI7	100760	05/26/2014	05/25/2015

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 rear of the EUT and peripherals were placed flushed with the rear of the tabletop.
3. The LISN was connected with 120Vac/60Hz power source.

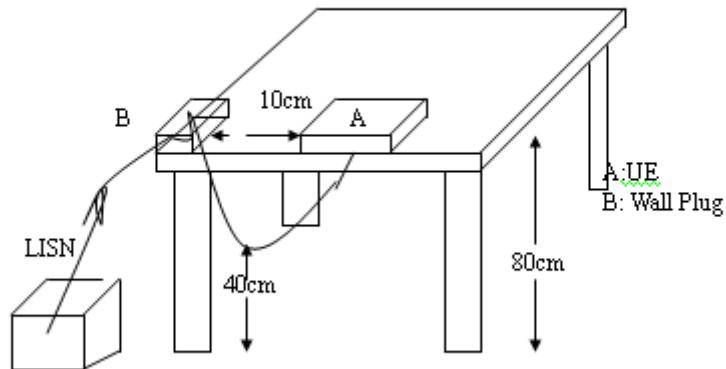
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6.4. Test SET-UP (Block Diagram of Configuration)



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 that closet to the limit

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AC POWER LINE CONDUCTED EMISSION TEST DATA

Operation Mode:	Operation mode	Test Date:	Sep. 26, 2014
Temperature:	26	Humidity:	60 %



No.	MR.	Freq. ²	Reading ²	Factor ²	Measurement ²	Limit ²	Over ²	Detector ²	Comment ²
		(MHz) ²	dBuV ²	(dB) ²	(dBuV) ²	(dBuV) ²	(dB) ²		
1		0.1660 ²	45.90 ²	0.09 ²	45.99 ²	65.16 ²	-19.17 ²	QP ²	
2		0.1660 ²	30.20 ²	0.09 ²	30.29 ²	55.16 ²	-24.87 ²	AVG ²	
3		0.1780 ²	50.40 ²	0.09 ²	50.49 ²	64.58 ²	-14.09 ²	QP ²	
4		0.1780 ²	34.00 ²	0.09 ²	34.09 ²	54.58 ²	-20.49 ²	AVG ²	
5		0.2140 ²	44.70 ²	0.09 ²	44.79 ²	63.05 ²	-18.26 ²	QP ²	
6		0.2140 ²	25.90 ²	0.09 ²	25.99 ²	53.05 ²	-27.06 ²	AVG ²	
7	*	0.5540 ²	45.10 ²	0.25 ²	45.35 ²	56.00 ²	-10.65 ²	QP ²	
8		0.5540 ²	32.50 ²	0.25 ²	32.75 ²	46.00 ²	-13.25 ²	AVG ²	
9		1.3180 ²	40.60 ²	0.48 ²	41.08 ²	56.00 ²	-14.92 ²	peak ²	
10		13.1700 ²	41.30 ²	0.62 ²	41.92 ²	60.00 ²	-18.08 ²	QP ²	
11		13.1700 ²	25.70 ²	0.62 ²	26.32 ²	50.00 ²	-23.68 ²	AVG ²	

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100.0 dBuV



No.	Mk.	Freq. (MHz)	Reading (dBuV)	Factor	Measurement (dBuV)	Limit (dBuV)	Over (dB)	Detector	Comment
1		0.1780	53.86	0.09	53.95	64.58	-10.63	peak	
2		0.3860	44.91	0.16	45.07	58.15	-13.08	peak	
3	*	0.5540	46.00	0.25	46.25	56.00	-9.75	QP	
4		0.5540	33.50	0.25	33.75	46.00	-12.25	AVG	
5		0.7820	40.00	0.34	40.34	56.00	-15.66	QP	
6		0.7820	26.30	0.34	26.64	46.00	-19.36	AVG	
7		13.1700	39.60	0.62	40.22	60.00	-19.78	QP	
8		13.1700	23.30	0.62	23.92	50.00	-26.08	AVG	
9		13.1820	39.80	0.62	40.42	60.00	-19.58	QP	
10		13.1820	23.50	0.62	24.12	50.00	-25.88	AVG	

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7. 26dB & 6dB & 99% EMISSION BANDWIDTH MEASUREMENT

7.1 Standard Applicable

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

According to §15.215(c) Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§15.217 through 15.257 and in subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. In the case of intentional radiators operating under the provisions of subpart E, the emission bandwidth may span across multiple contiguous frequency bands identified in that subpart. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If a frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

7.2 Measurement Procedure

1. Place the EUT on the table and set it in transmitting mode. (5.150-5.250 GHz)
2. Remove the antenna from the EUT and then connect a low loss RF cable from the Antenna port to the spectrum analyzer.
3.
 - a. 26dB Band width Measurement: Set the spectrum analyzer as 1% of emission BW Sweep=auto, Detector = Peak, Trace Mode = Max Hold, Manually readjust RBW until the RBW/EBW ratio is 1% based on EBW as observed on the result of pre-sequence measurement.
 - b. Mark the peak frequency and -26dB (upper and lower) frequency.
4. Repeat the procedures as list above until all test default channels (low, middle, and high) are completed.
5. Minimum Emission Bandwidth for the band 5.725-5.850GHz
 - a. Set the spectrum analyzer as RBW = 100 kHz, VBW = 3*RBW, Span = 30M/50MHz, Detector=Peak, Sweep=auto
 - b. Mark the peak frequency and -6dB (upper and lower) frequency.

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7.3 Measurement Equipment Used:

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Power Meter	Anritsu	ML2495A	1005007	01/13/2014	01/12/2015
Power Sensor	Anritsu	MA2411B	917032	01/13/2014	01/12/2015
Spectrum Analyzer	Agilent	E4446A	MY51100003	05/19/2014	05/18/2015
Spectrum Analyzer	Agilent	E4440A	MY45304525	03/08/2014	03/07/2015
DC Block	Mini-Circuits	BLK-18-S+	1	02/27/2014	02/26/2015
Low Loss Cable	HUBER+SUHNER	SUCOFLEX 104PEA	N/A	01/03/2014	01/02/2015
Attenuator	Mini-Circuit	BW-S10W2+	002	02/27/2014	02/26/2015
Splitter	Agilent	11636B	N/A	02/27/2014	02/26/2015

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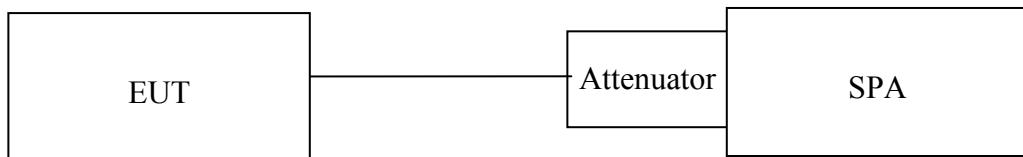
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Conducted Emission Test Site – For 99% Bandwidth					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	KEYSIGHT	N9010A	MY54510568	04/14/2015	04/13/2016
Power Meter	Anritsu	ML2496A	1326001	06/23/2015	06/22/2016
Power Sensor	Anritsu	MA2411B	1315048	06/23/2015	06/22/2016
Power Sensor	Anritsu	MA2411B	1315049	06/23/2015	06/22/2016
Coaxial Cable 30cm	WOKEN	00100A1F1A1 95C	RF01	12/12/2015	12/11/2016
DC Block	PASTERNACK	PE8210	RF29	12/12/2015	12/11/2016
Splitter	RF-LAMBAD	RFLT2W1G18 G	RF35	12/12/2015	12/11/2016
Attenuator	WOKEN	218FS-10	RF23	12/12/2015	12/11/2016
Temperature Chamber	TERCHY	MHK-120LK	1020582	06/23/2015	06/22/2016

Remark: Please note that the duration to conduct the test took place in the mean time when the calibration for several equipments is due, and therefore extra tables of equipment calibration is constructed to indicate the calibration work is still maintained.

7.4 Test Set-up:



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7.5 Measurement Result

26dB Bandwidth

802.11a, 5150~5250 MHz

Frequency (MHz)	26dB Bandwidth (B) (MHz)	10 Log (B) (dB)
5180	20.976	13.22
5220	20.397	13.10
5240	20.880	13.20

802.11n HT20, 5150~5250 MHz

Main

Frequency (MHz)	26dB Bandwidth (B) (MHz)	10 Log (B) (dB)
5180	20.695	13.16
5220	20.969	13.22
5240	20.328	13.08

Aux

Frequency (MHz)	26dB Bandwidth (B) (MHz)	10 Log (B) (dB)
5180	20.903	13.20
5220	20.630	13.14
5240	21.008	13.22

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802.11n HT40, 5150~5250 MHz

Main

Frequency (MHz)	26dB Bandwidth (B) (MHz)	10 Log (B) (dB)
5190	42.533	16.29
5230	43.432	16.38

Aux

Frequency (MHz)	26dB Bandwidth (B) (MHz)	10 Log (B) (dB)
5190	43.595	16.39
5230	42.936	16.33

6dB Bandwidth

802.11a, 5725~5850 MHz

Frequency (MHz)	6dB Bandwidth (B) (MHz)	10 Log (B) (dB)
5745	16.073	12.06
5785	15.918	12.02
5825	15.706	11.96

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802.11n HT20, 5725~5850 MHz

Main

Frequency (MHz)	6dB Bandwidth (B) (MHz)	10 Log (B) (dB)
5745	17.627	12.46
5785	17.617	12.46
5825	17.639	12.46

Aux

Frequency (MHz)	6dB Bandwidth (B) (MHz)	10 Log (B) (dB)
5745	17.578	12.45
5785	17.560	12.45
5825	17.634	12.46

802.11n HT40, 5725~5850 MHz

Main

Frequency (MHz)	6dB Bandwidth (B) (MHz)	10 Log (B) (dB)
5755	35.238	15.47
5795	35.387	15.49

Aux

Frequency (MHz)	6dB Bandwidth (B) (MHz)	10 Log (B) (dB)
5755	35.823	15.54
5795	35.527	15.51

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20dB Bandwidth

802.11a, 5150~5250 MHz

Frequency (MHz)	Measured Frequency (MHz)	Limit (MHz)
5240	5248.940	5250

802.11n HT20, 5150~5250 MHz

Main

Frequency (MHz)	Measured Frequency (MHz)	Limit (MHz)
5240	5249.480	5250

Aux

Frequency (MHz)	Measured Frequency (MHz)	Limit (MHz)
5240	5249.450	5250

802.11n HT40, 5150~5250 MHz

Main

Frequency (MHz)	Measured Frequency (MHz)	Limit (MHz)
5230	5248.850	5250

Aux

Frequency (MHz)	Measured Frequency (MHz)	Limit (MHz)
5230	5248.850	5250

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99% Bandwidth

802.11a, 5150~5250 MHz

Frequency (MHz)	99% Bandwidth (MHz)	10 Log (B) (dB)
5240	16.567	12.19

802.11n HT20, 5150~5250 MHz

Main

Frequency (MHz)	99% Bandwidth (MHz)	10 Log (B) (dB)
5240	17.727	12.49

Aux

Frequency (MHz)	99% Bandwidth (MHz)	10 Log (B) (dB)
5240	17.694	12.48

802.11n HT40, 5150~5250 MHz

Main

Frequency (MHz)	99% Bandwidth (MHz)	10 Log (B) (dB)
5230	36.123	15.58

Aux

Frequency (MHz)	99% Bandwidth (MHz)	10 Log (B) (dB)
5230	36.125	15.58

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802.11a, 5725~5850MHz

Frequency (MHz)	99% Bandwidth (MHz)	10 Log (B) (dB)
5745	16.426	12.16

802.11n HT20, 5725~5850MHz

Main

Frequency (MHz)	99% Bandwidth (MHz)	10 Log (B) (dB)
5745	17.599	12.45

Aux

Frequency (MHz)	99% Bandwidth (MHz)	10 Log (B) (dB)
5745	17.574	12.45

802.11n HT40, 5725~5850MHz

Main

Frequency (MHz)	99% Bandwidth (MHz)	10 Log (B) (dB)
5755	36.054	15.57

Aux

Frequency (MHz)	99% Bandwidth (MHz)	10 Log (B) (dB)
5755	36.057	15.57

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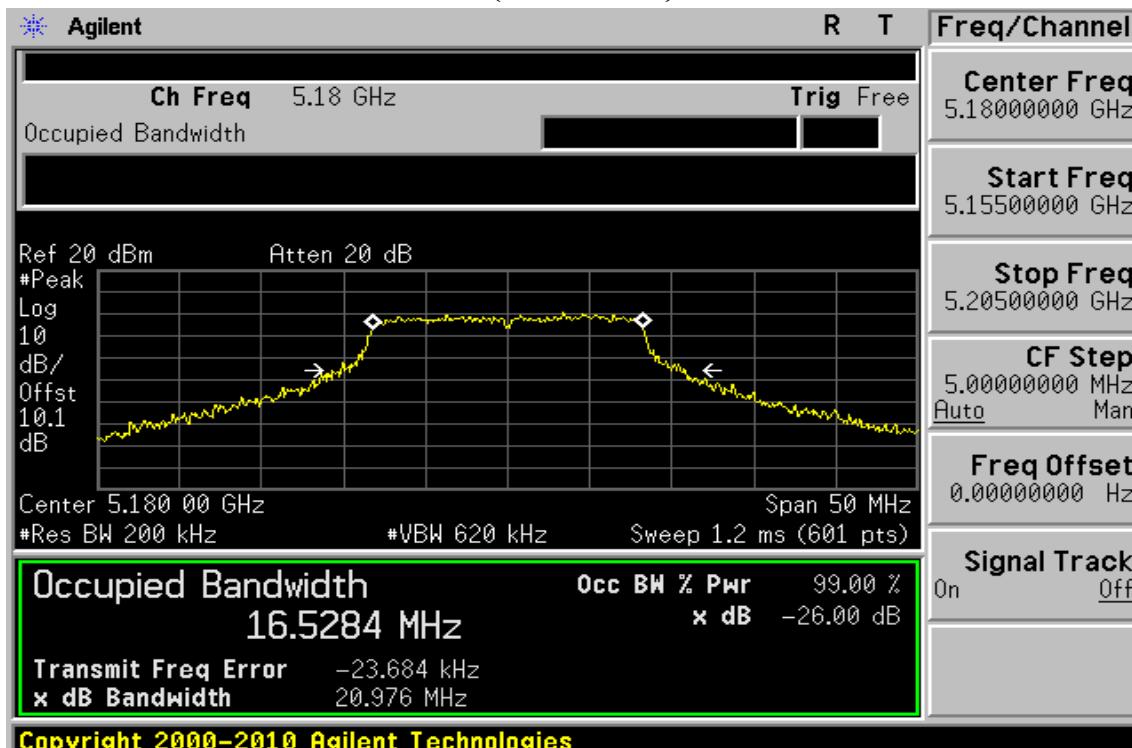
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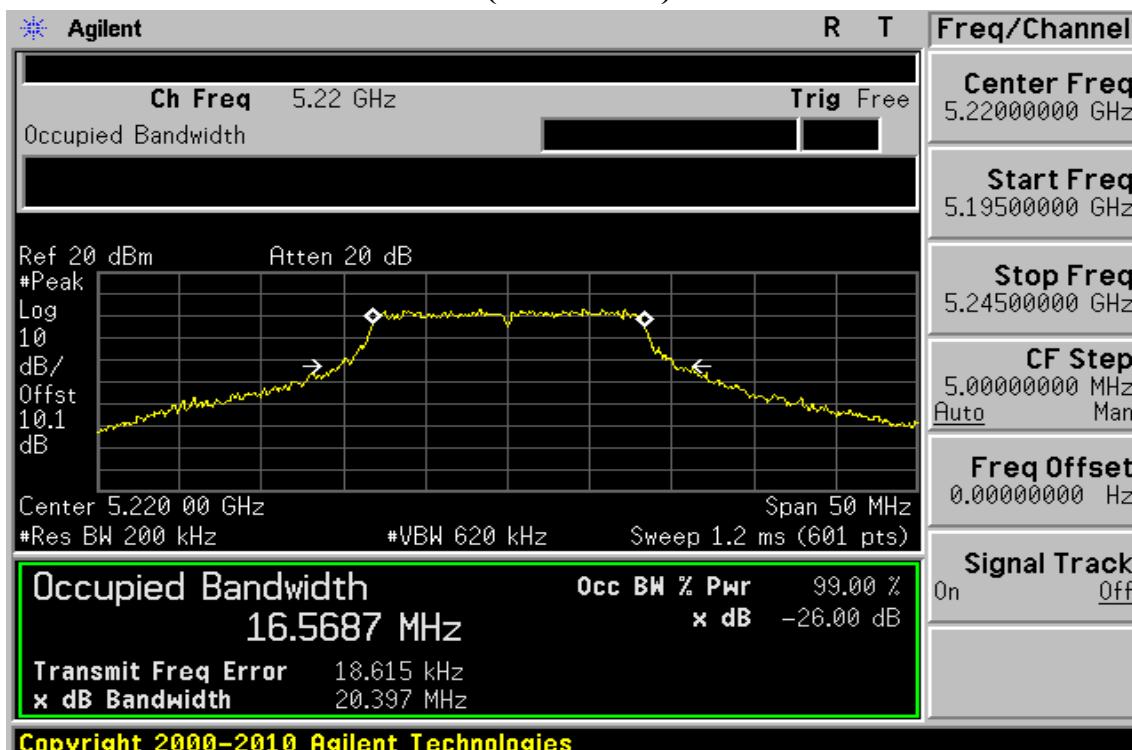
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802.11a, 5150~5250 MHz

26dB Band Width Test Data CH-Low (5180 MHz)



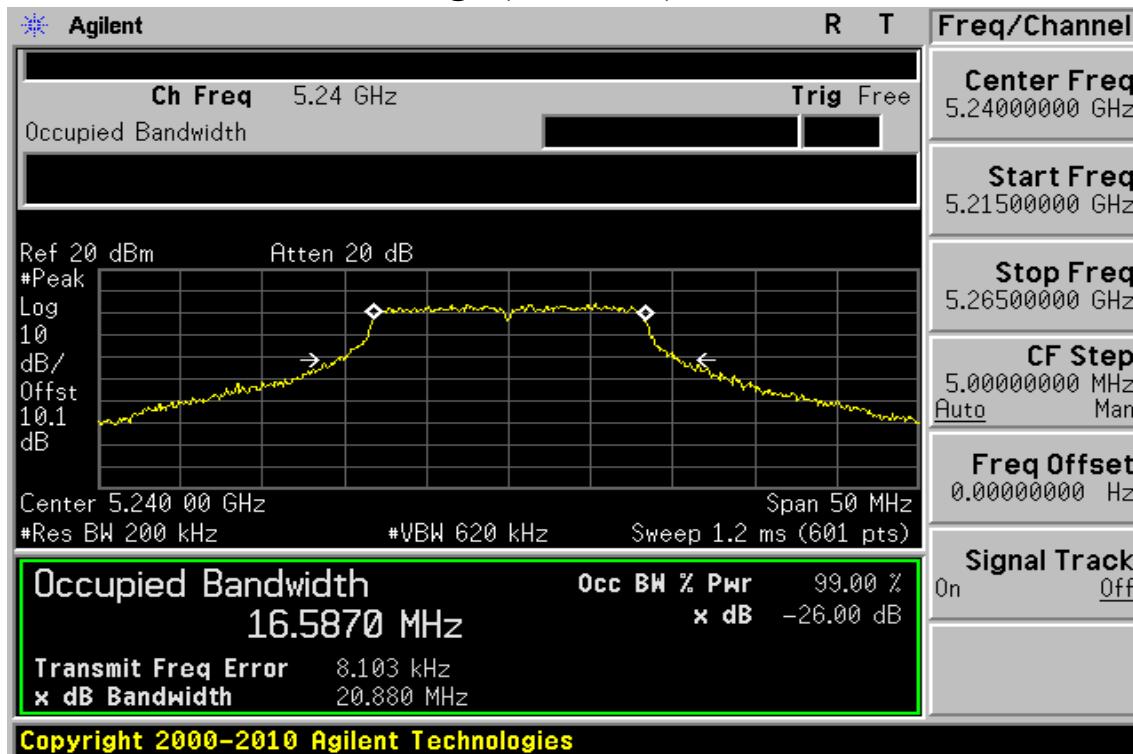
26dB Band Width Test Data CH-Mid (5220 MHz)



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26dB Band Width Test Data CH-High (5240MHz)

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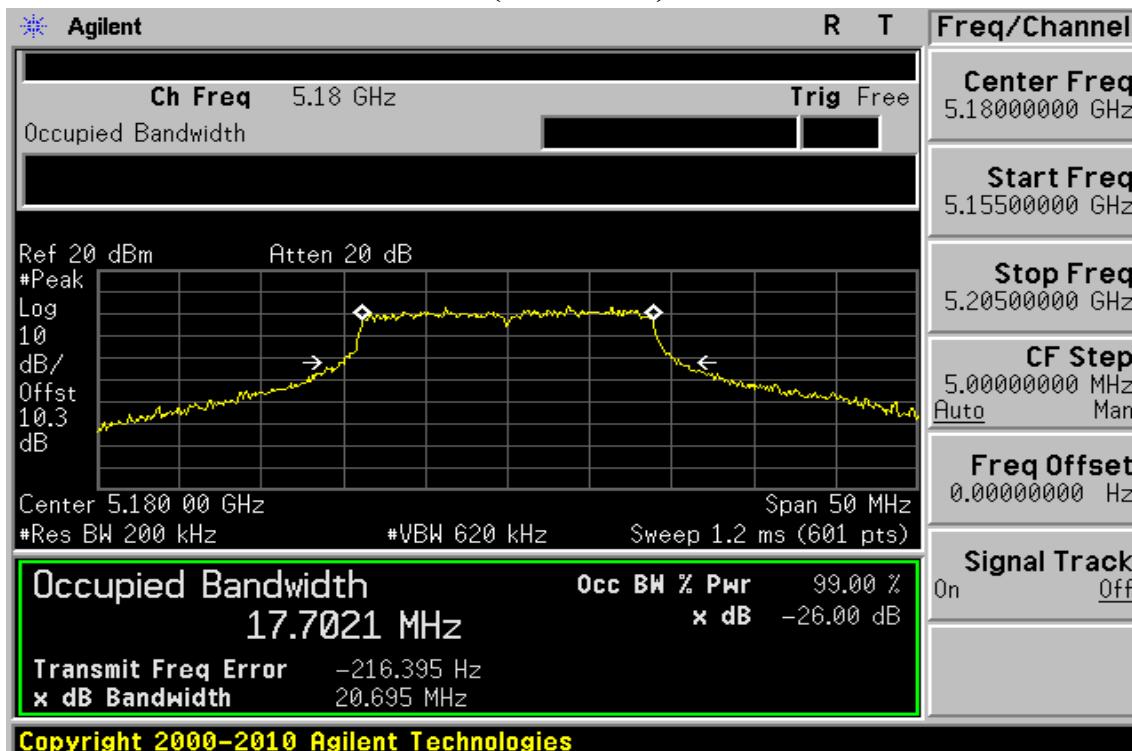
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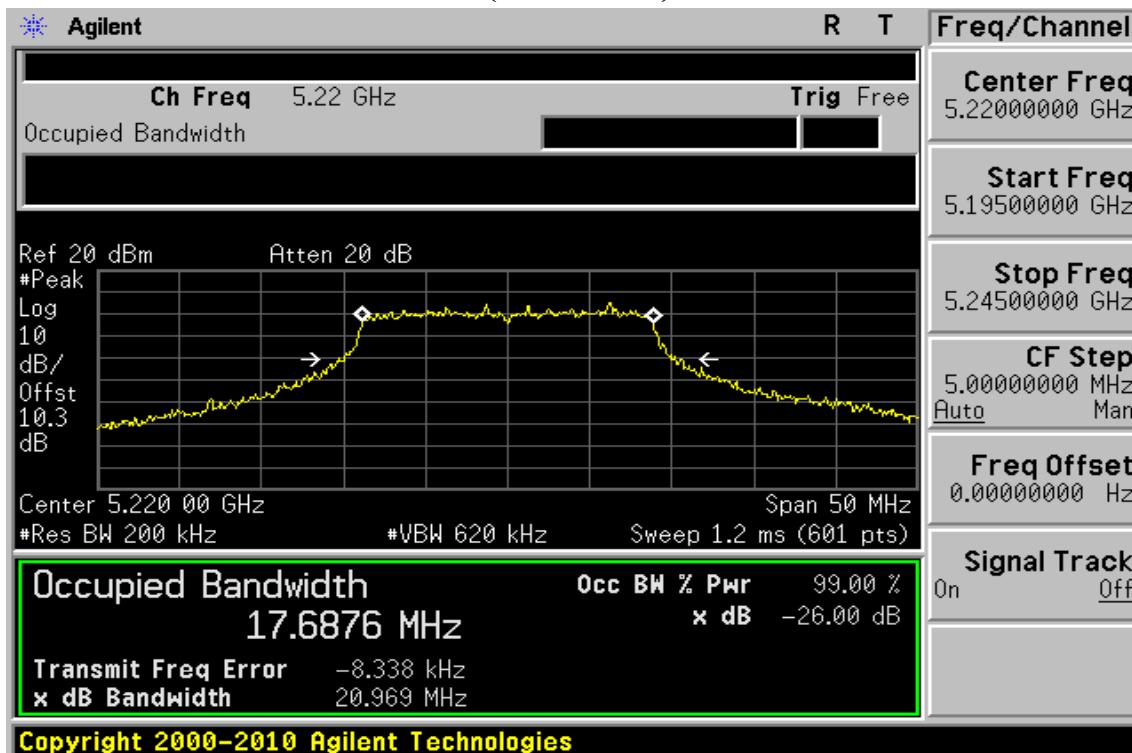
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802.11n HT20, 5150~5350 MHz for Main 26dB Band Width Test Data CH-Low (5180MHz)



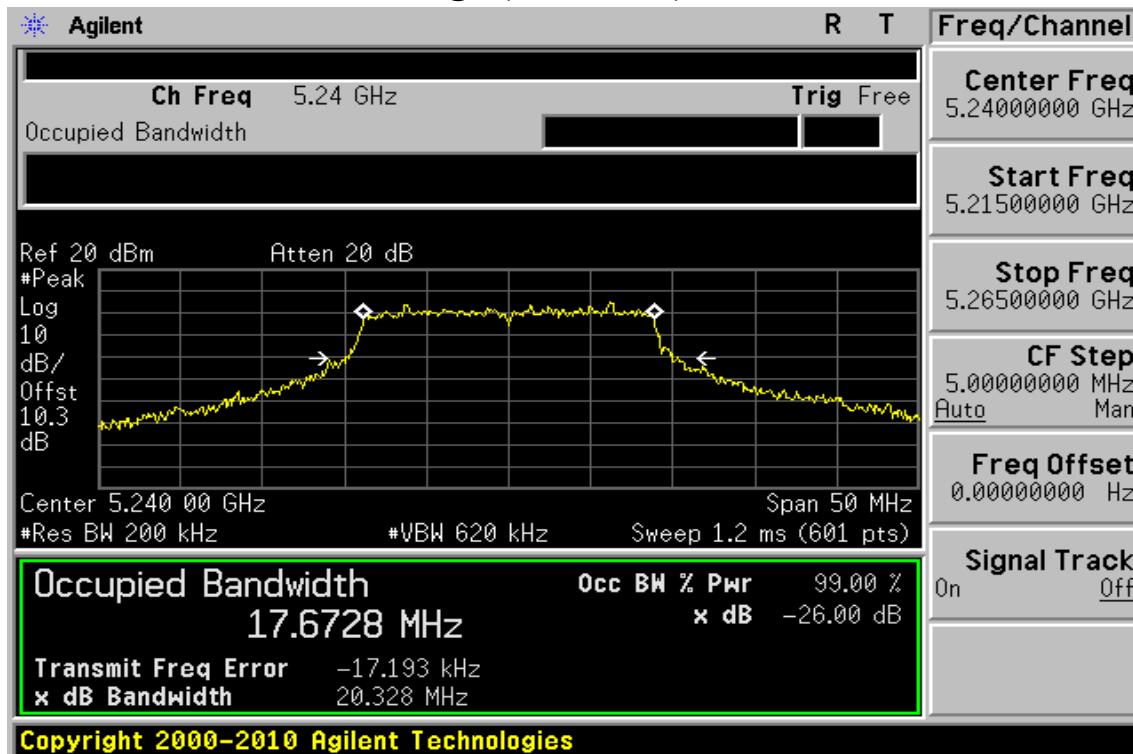
26dB Band Width Test Data CH-Mid (5220 MHz)



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26dB Band Width Test Data CH-High (5240 MHz)

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台灣檢驗科技股份有限公司

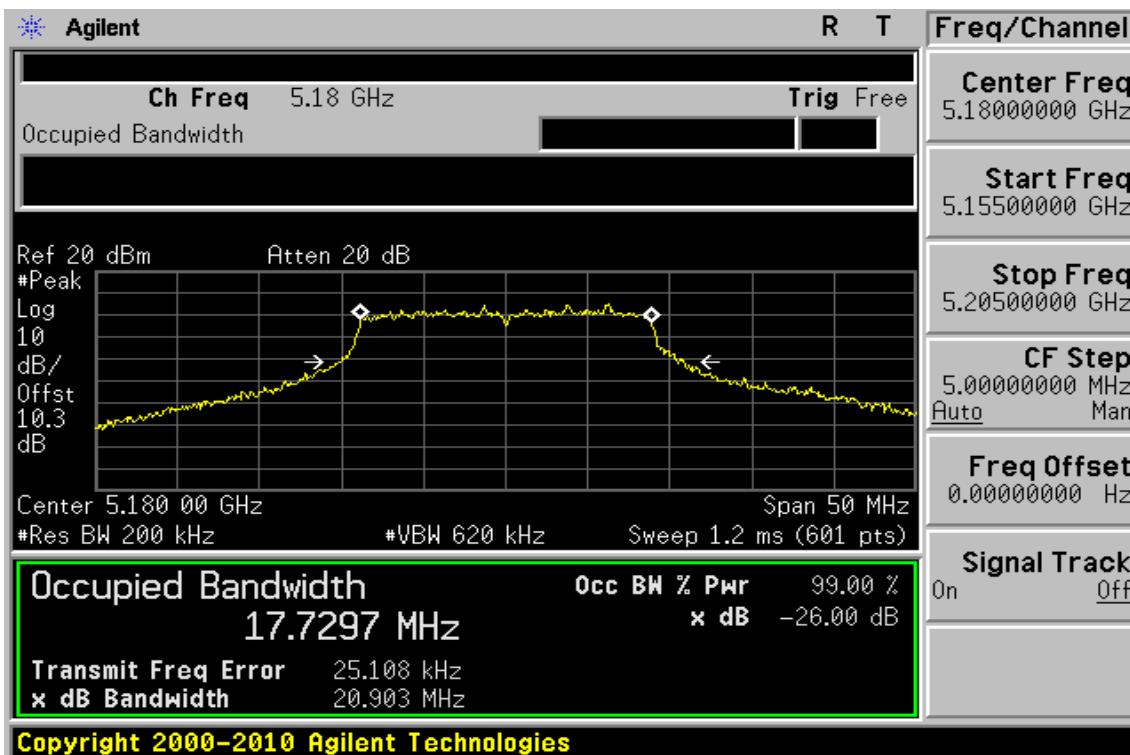
t (886-2) 2299-3279

f (886-2) 2298-0488

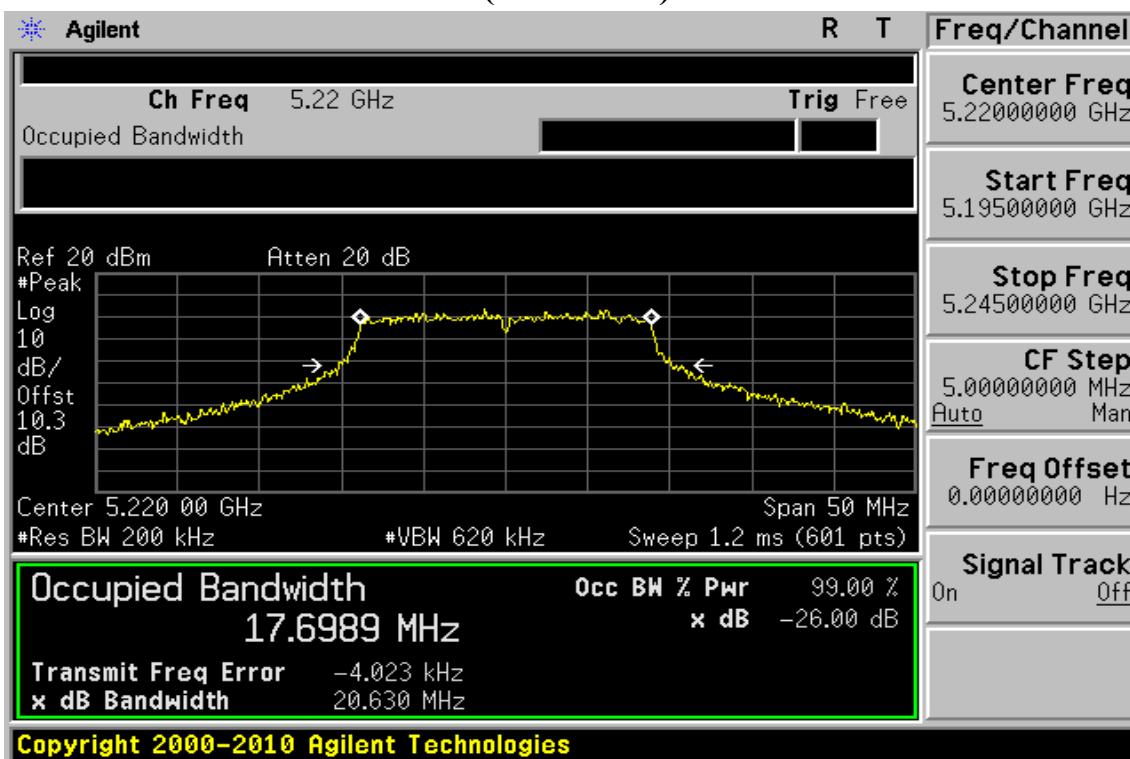
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802.11n HT20, 5150~5350 MHz for Aux 26dB Band Width Test Data CH-Low (5180 MHz)



26dB Band Width Test Data CH-Mid (5220 MHz)

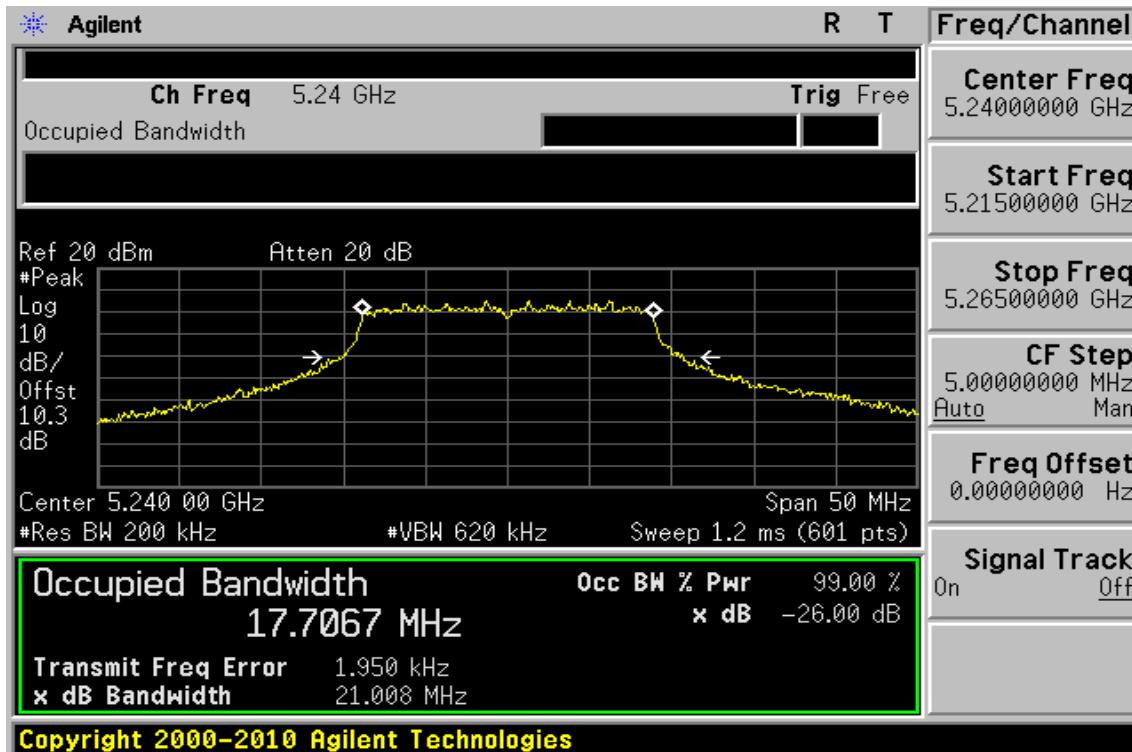


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26dB Band Width Test Data CH-High (5240 MHz)

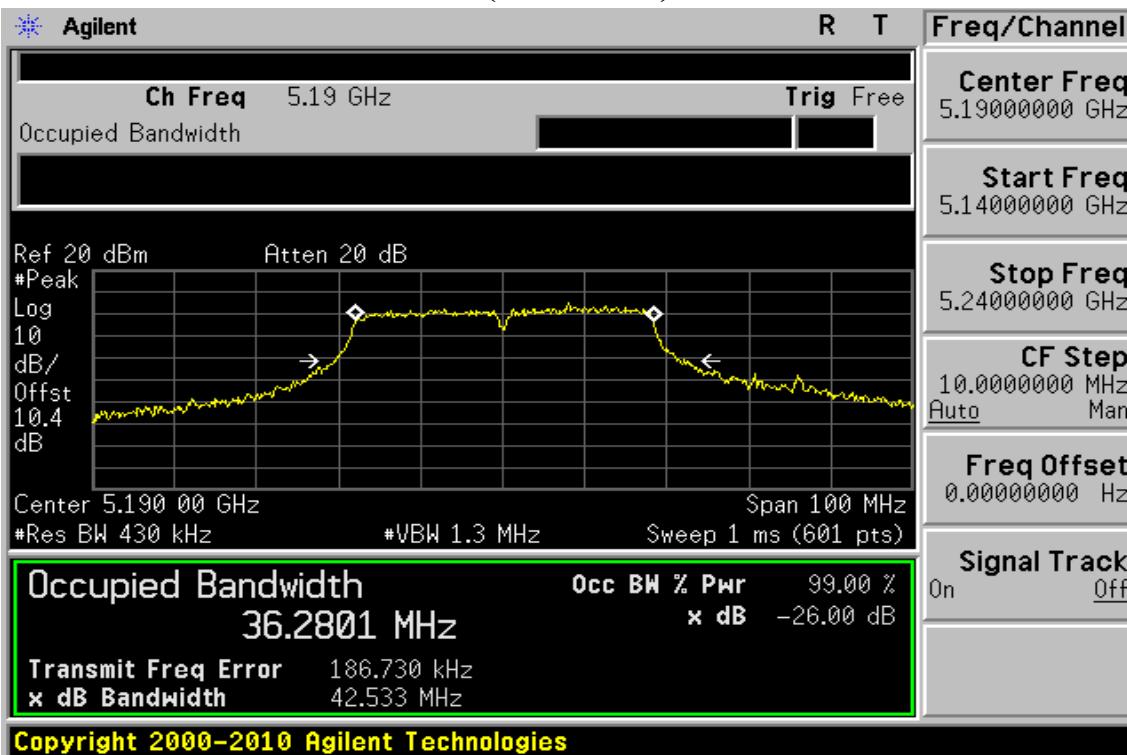
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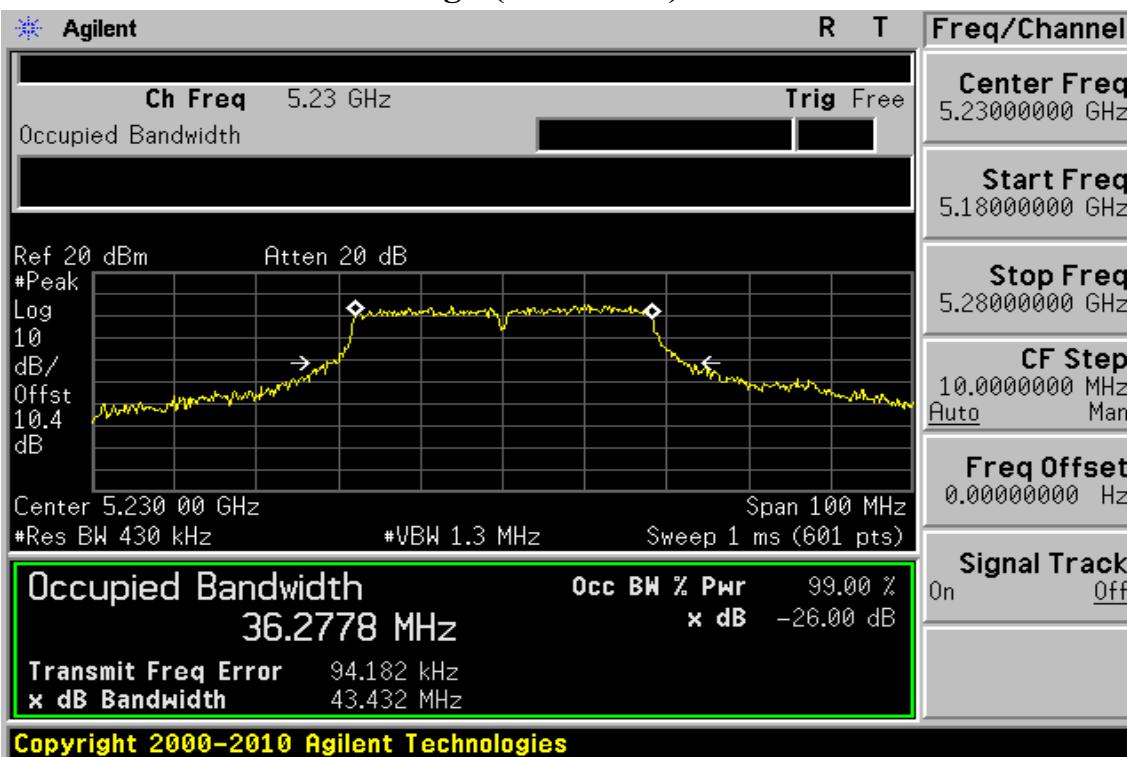
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802.11n HT40, 5150~5350 MHz for Main 26dB Band Width Test Data CH-Low (5190 MHz)



26dB Band Width Test Data CH-High (5230 MHz)



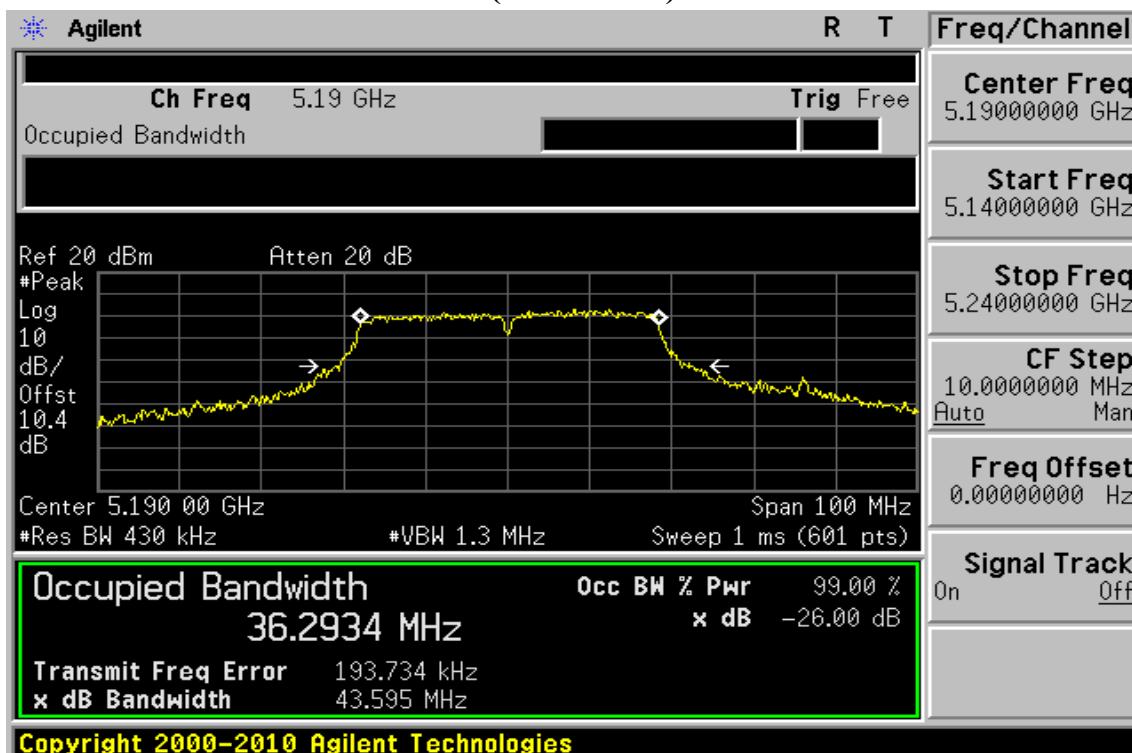
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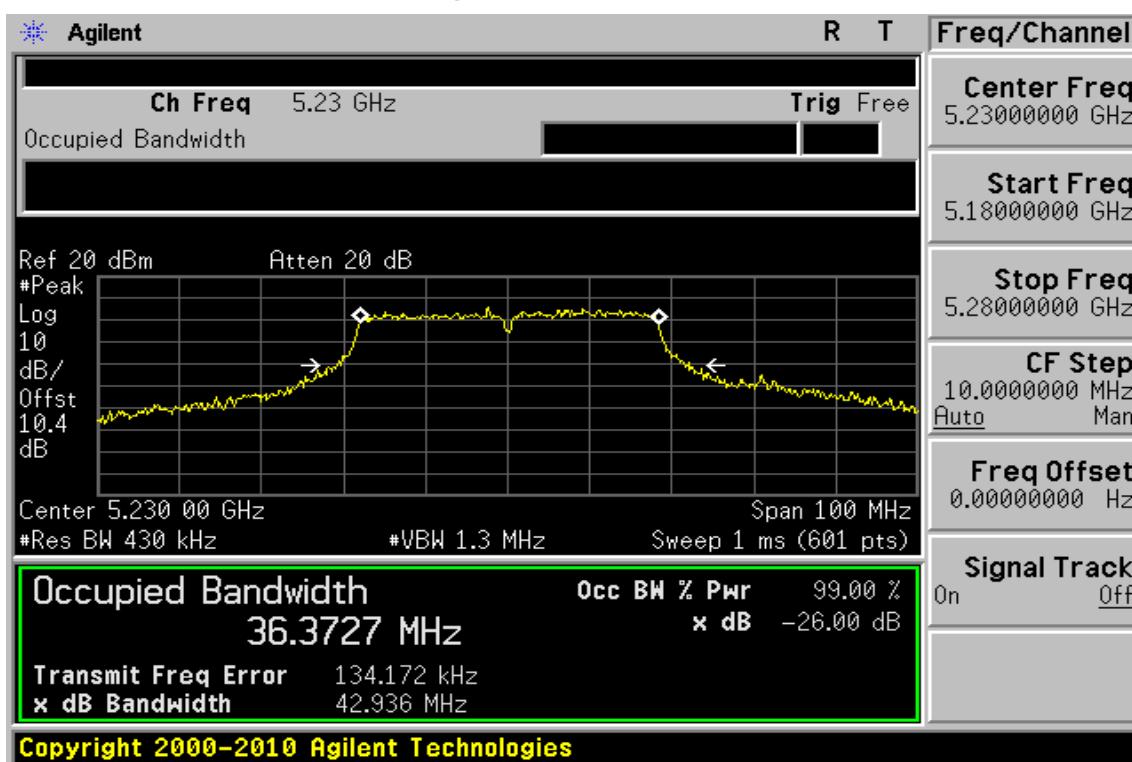
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802.11n HT40, 5150~5350 MHz for Aux 26dB Band Width Test Data CH-Low (5190 MHz)



26dB Band Width Test Data CH-High (5230MHz)



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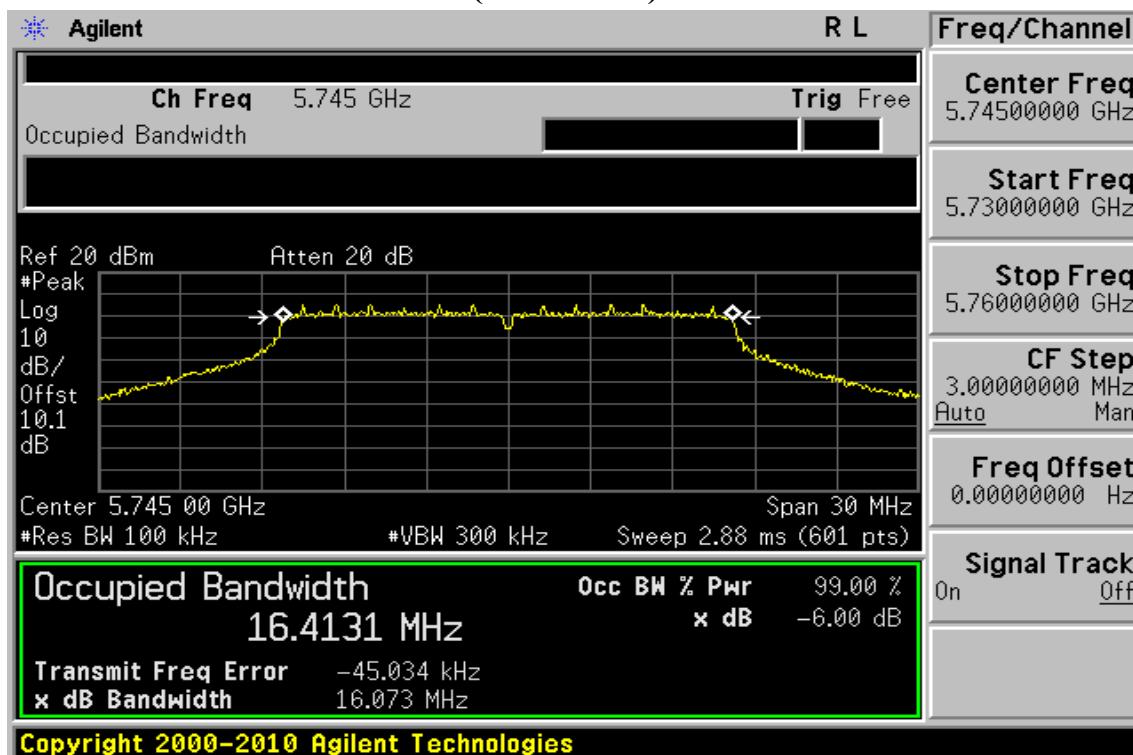
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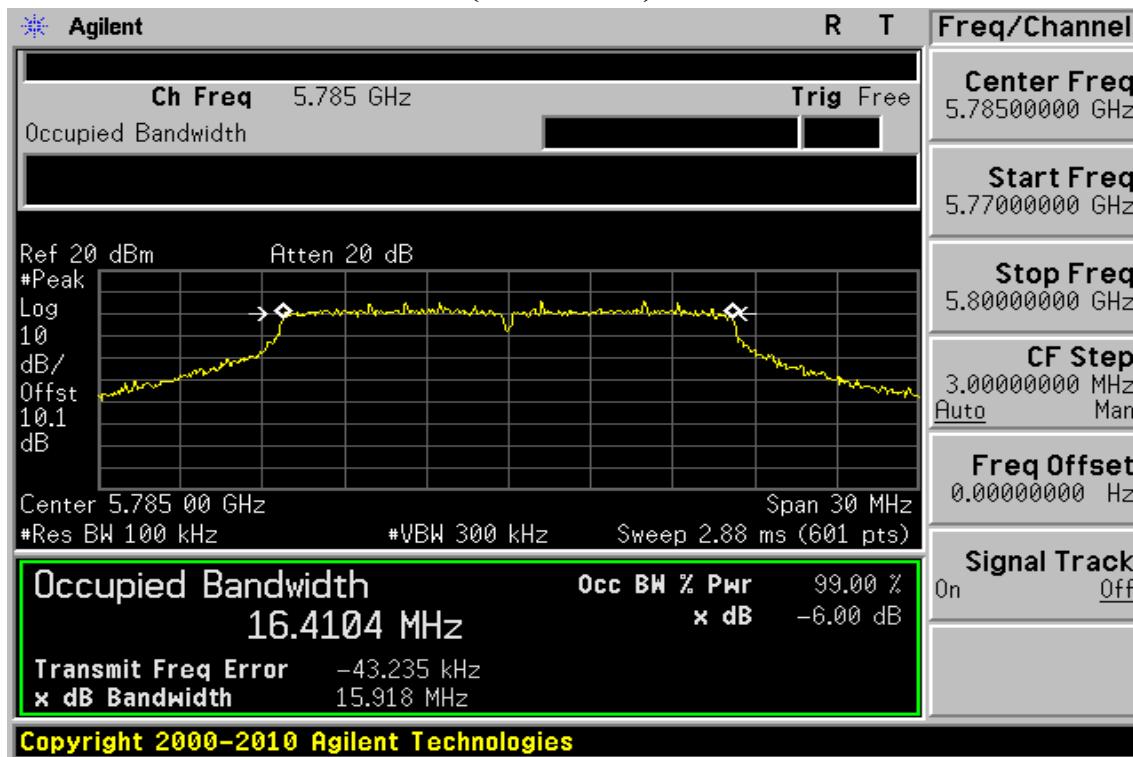
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802.11a, 5725~5850 MHz

6dB Band Width Test Data CH-Low (5745 MHz)



6dB Band Width Test Data CH-Mid (5785 MHz)



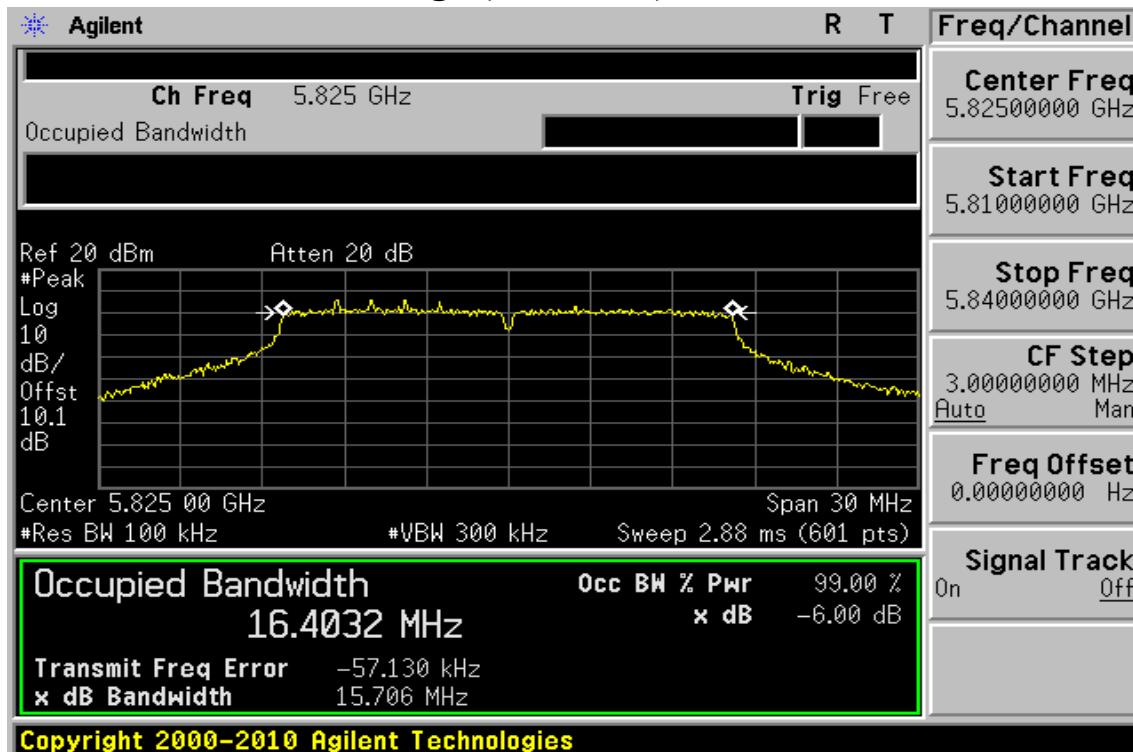
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6dB Band Width Test Data CH-High (5825 MHz)



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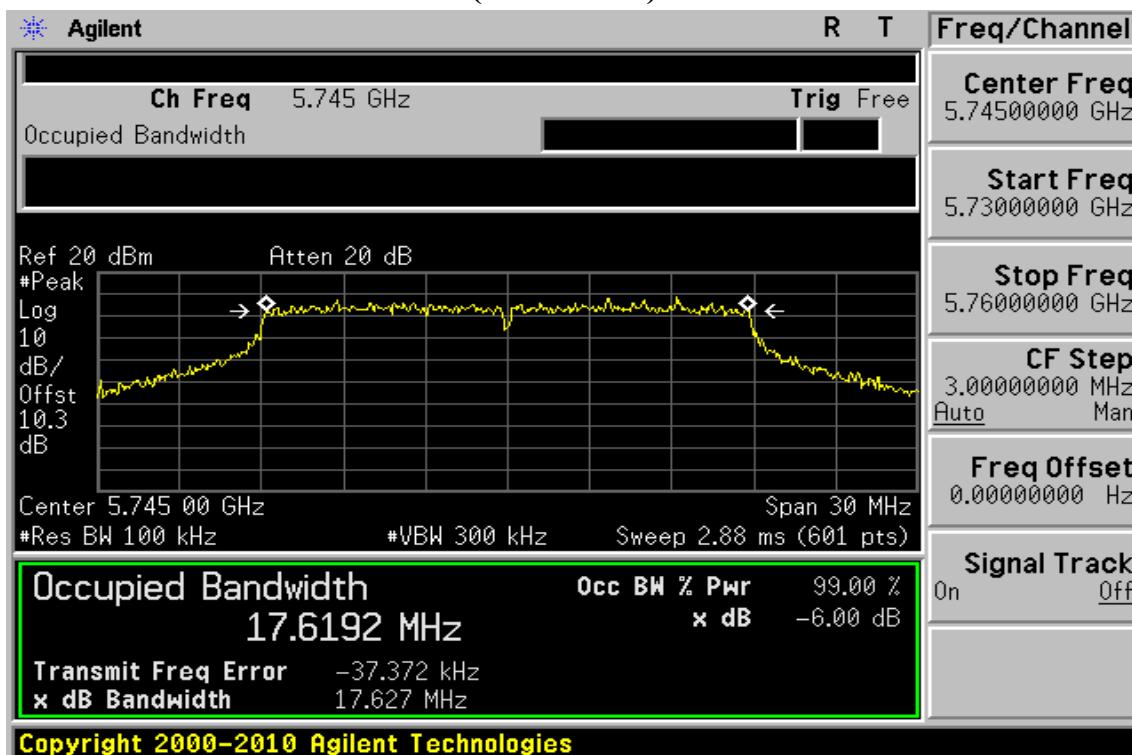
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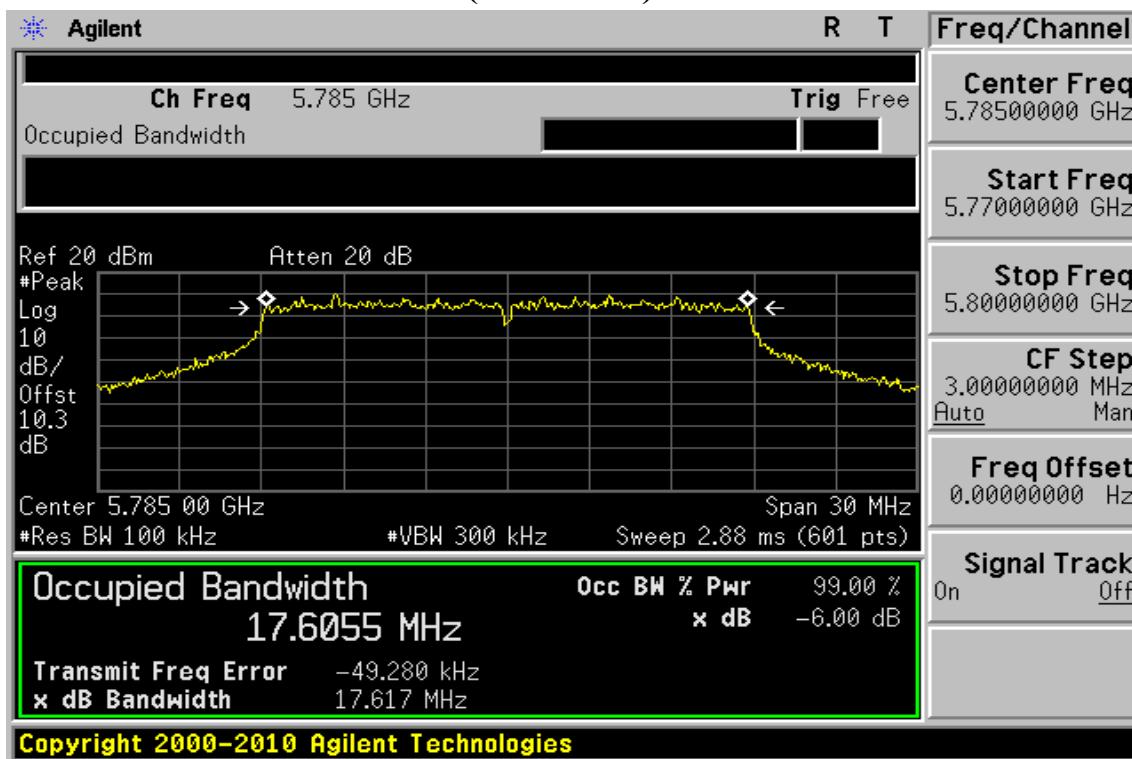
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802.11n HT20, 5725~5850 MHz for Main
6dB Band Width Test Data CH-Low (5745 MHz)

6dB Band Width Test Data CH-Mid (5785 MHz)



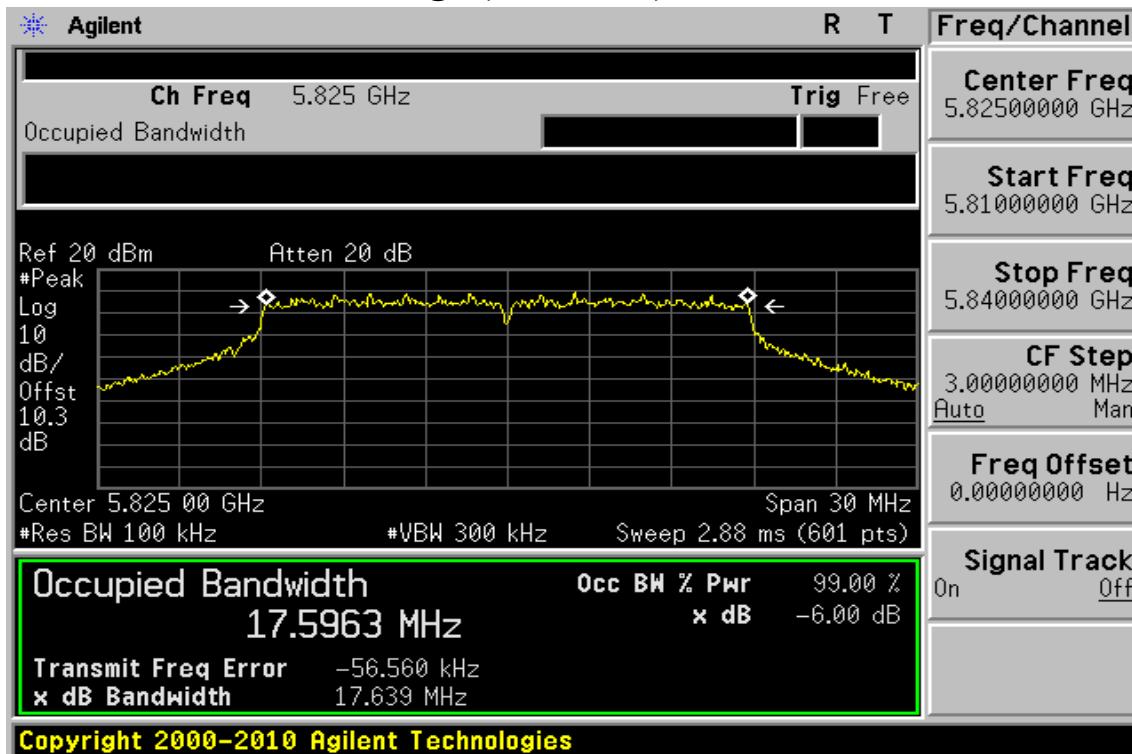
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6dB Band Width Test Data CH-High (5825 MHz)



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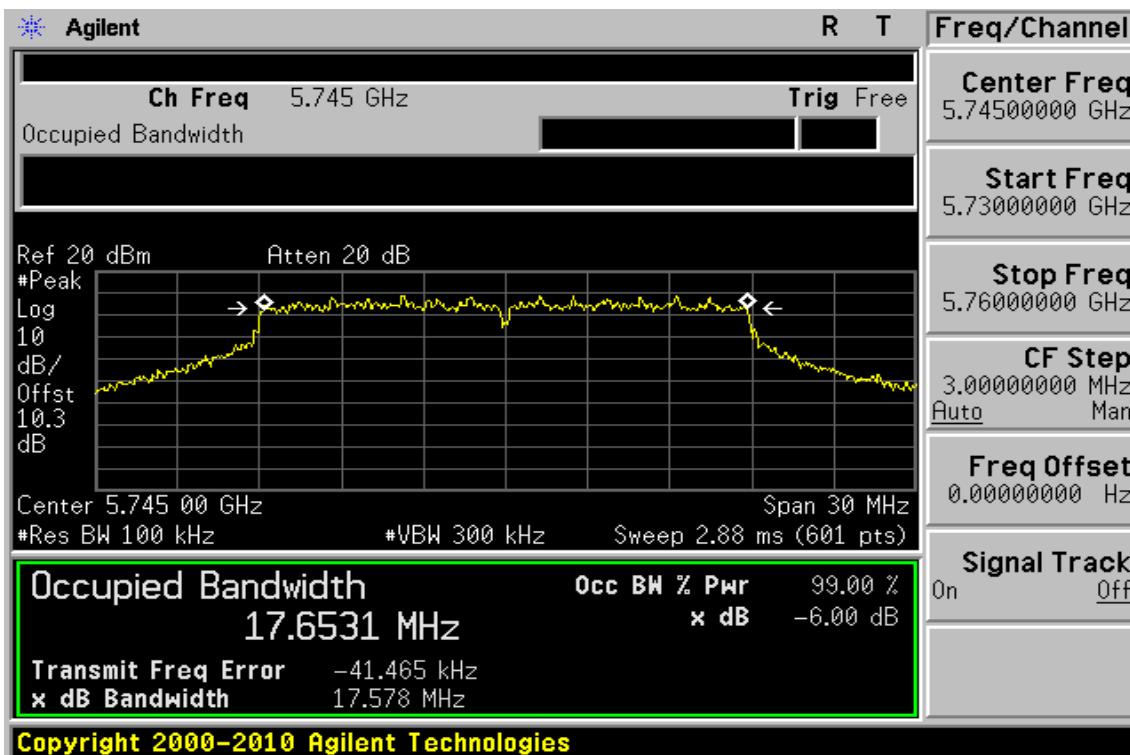
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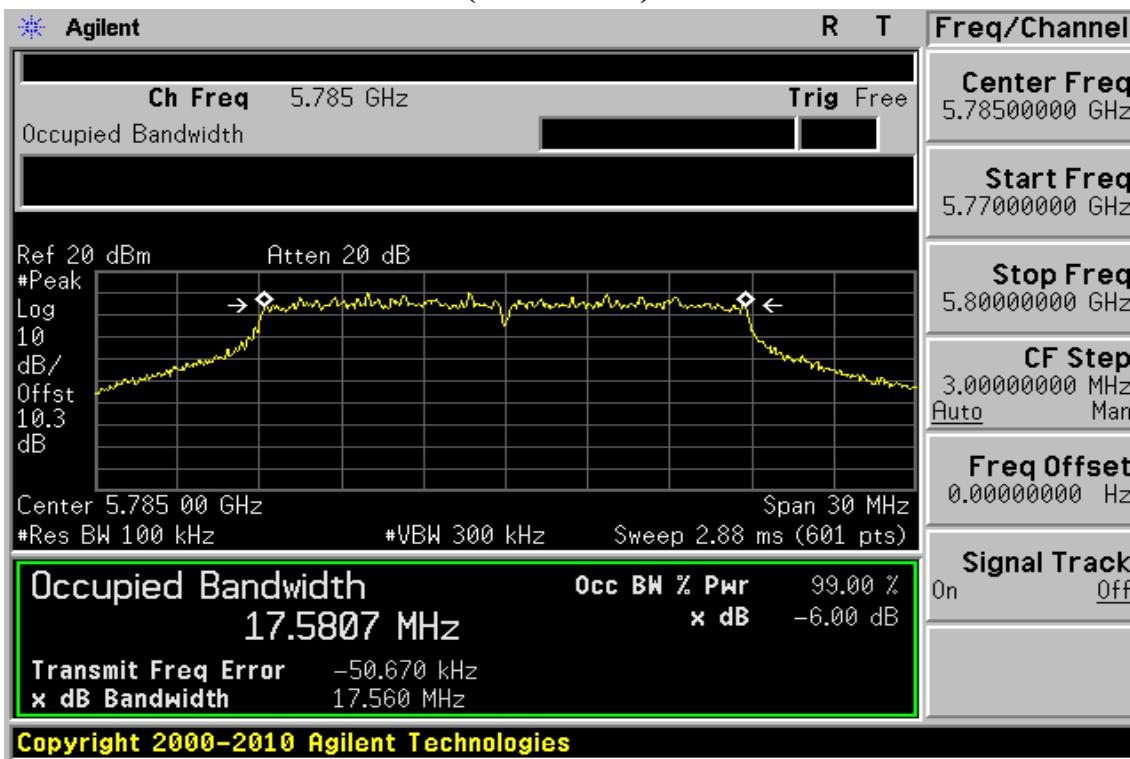
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802.11n HT20, 5725~5850 MHz for Aux 6dB Band Width Test Data CH-Low (5745 MHz)



6dB Band Width Test Data CH-Mid (5785 MHz)

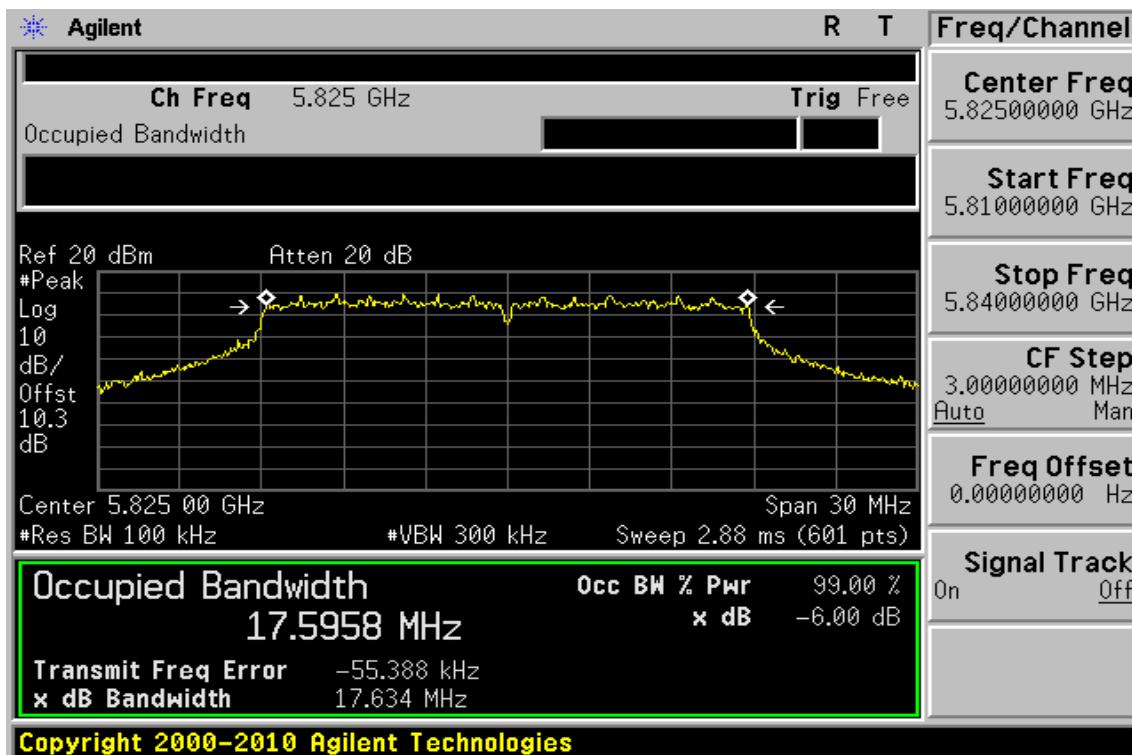


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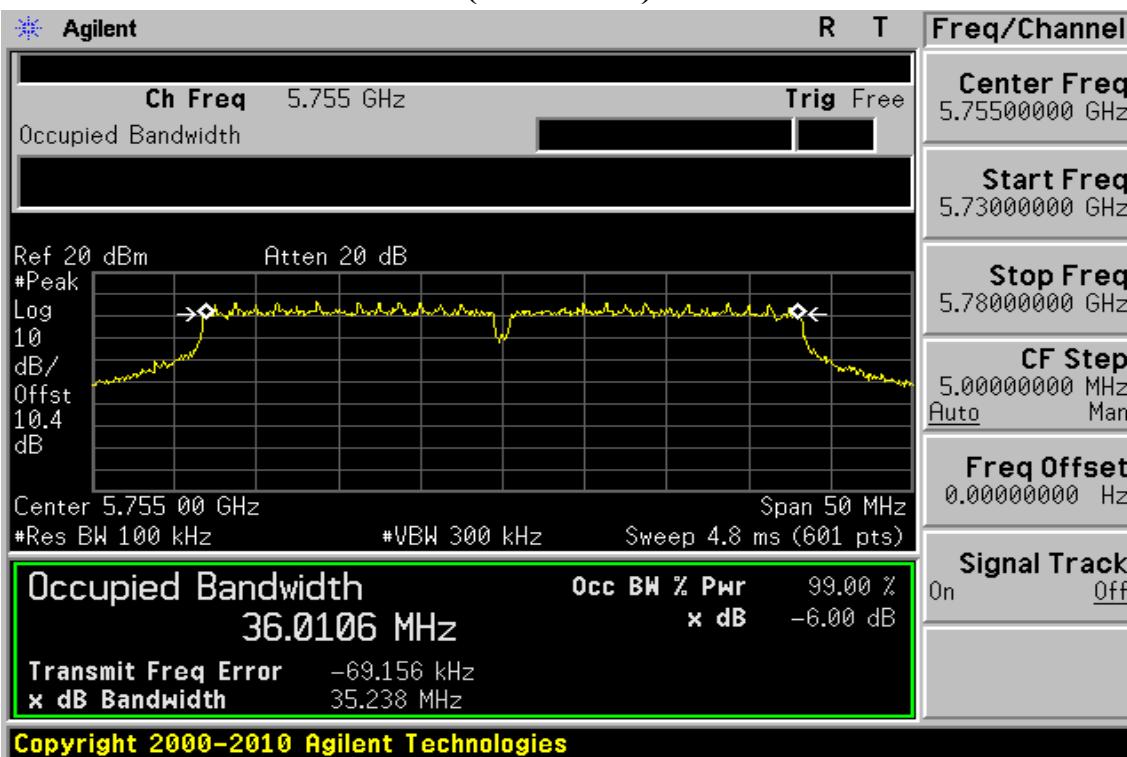
6dB Band Width Test Data CH-High (5825 MHz)

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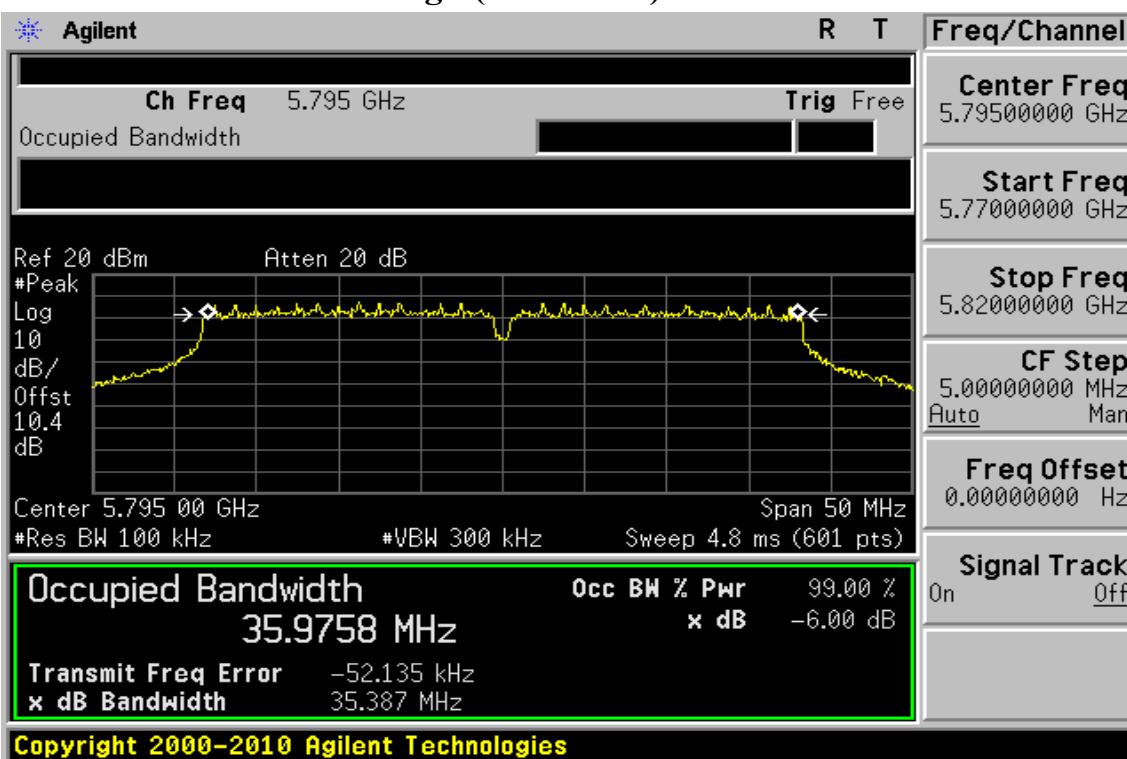
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802.11n HT40, 5725~5850 MHz for Main
6dB Band Width Test Data CH-Low (5755 MHz)

6dB Band Width Test Data CH-High (5795 MHz)

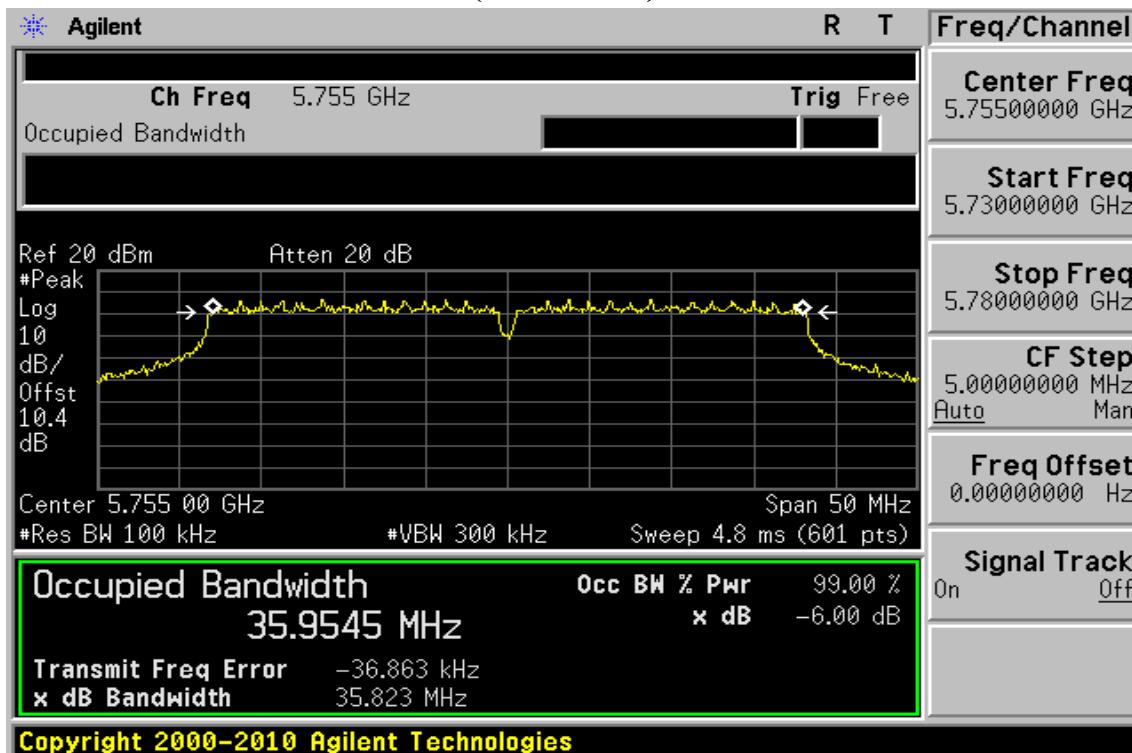


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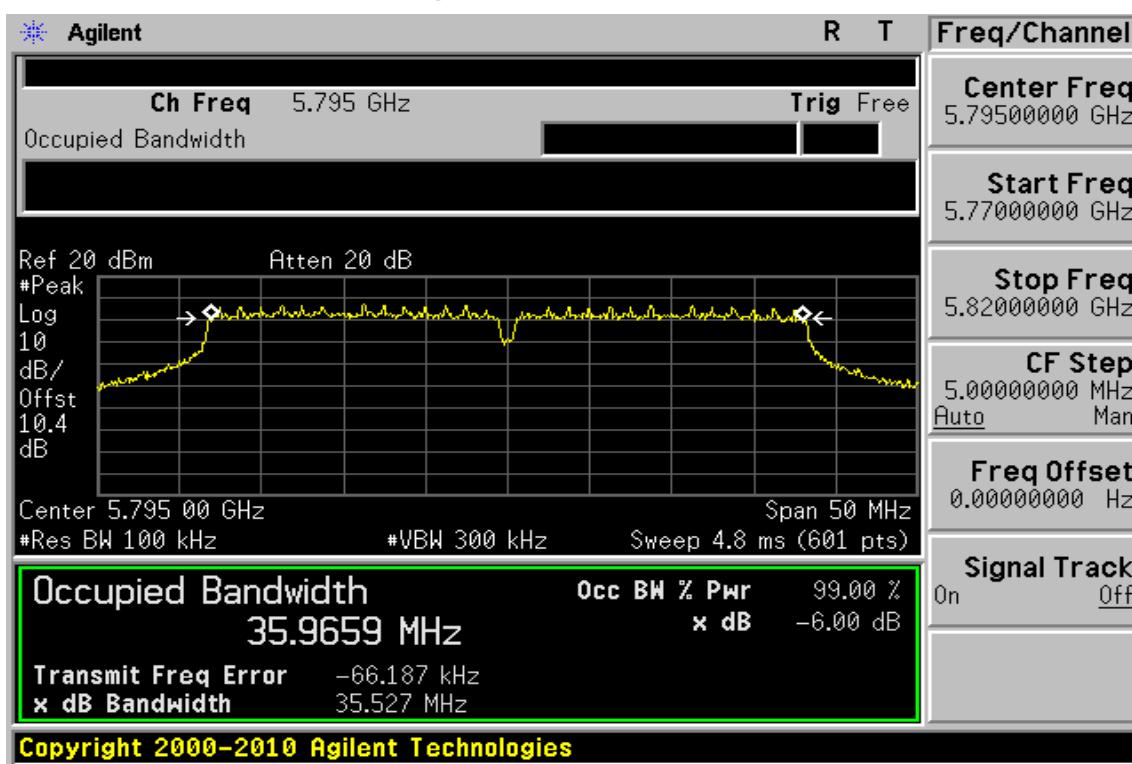
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802.11n HT40, 5725~5850 MHz for Aux
6dB Band Width Test Data CH-Low (5755 MHz)

6dB Band Width Test Data CH-High (5795MHz)



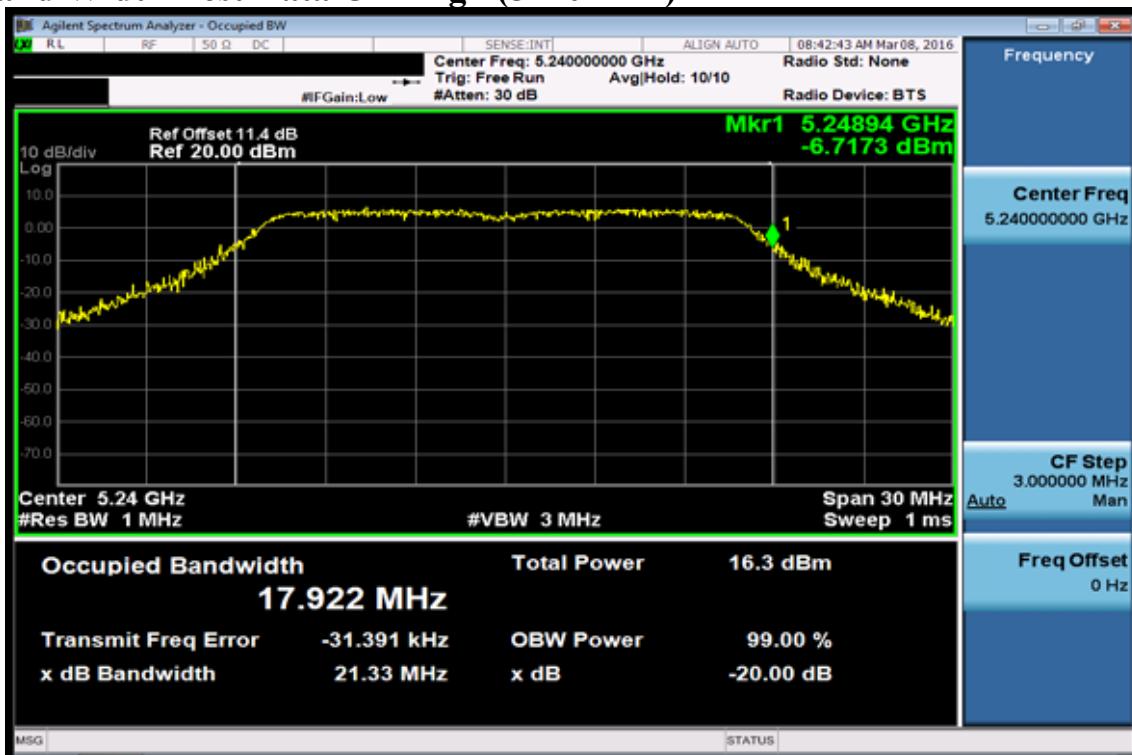
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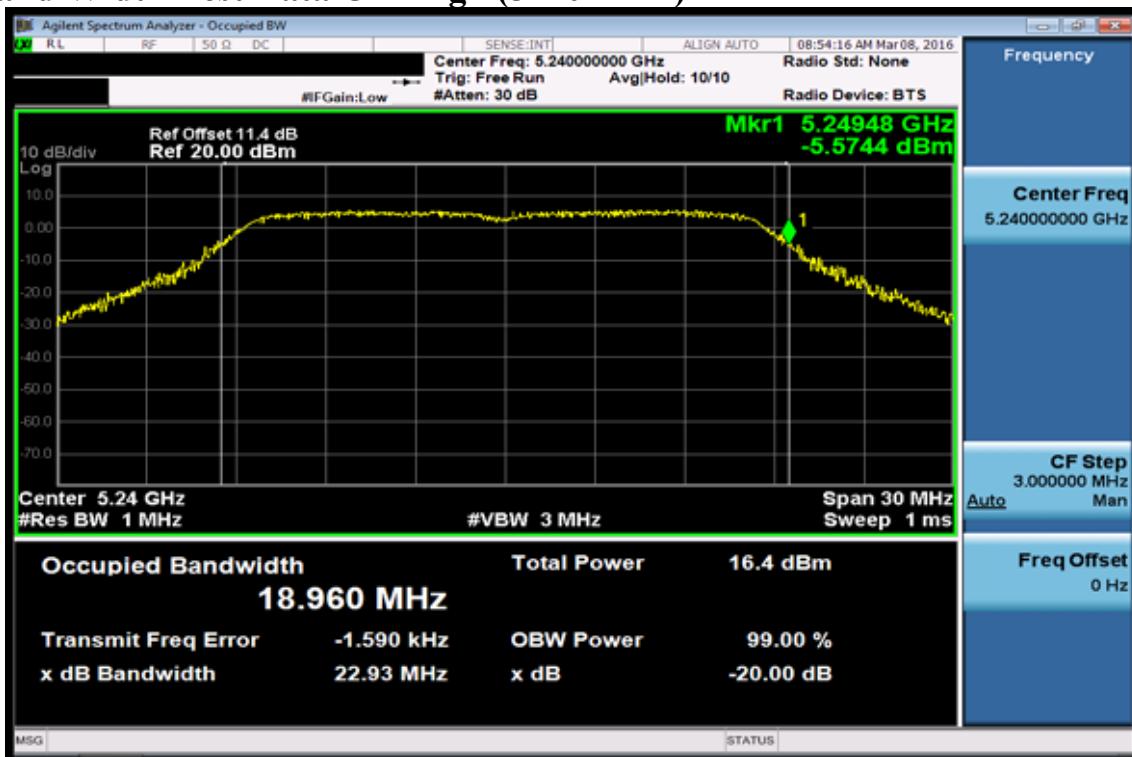
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802.11a, 5150~5250 MHz 20dB Band Width Test Data CH-High (5240MHz)



802.11n HT20, 5150~5350 MHz for Main 20dB Band Width Test Data CH-High (5240 MHz)

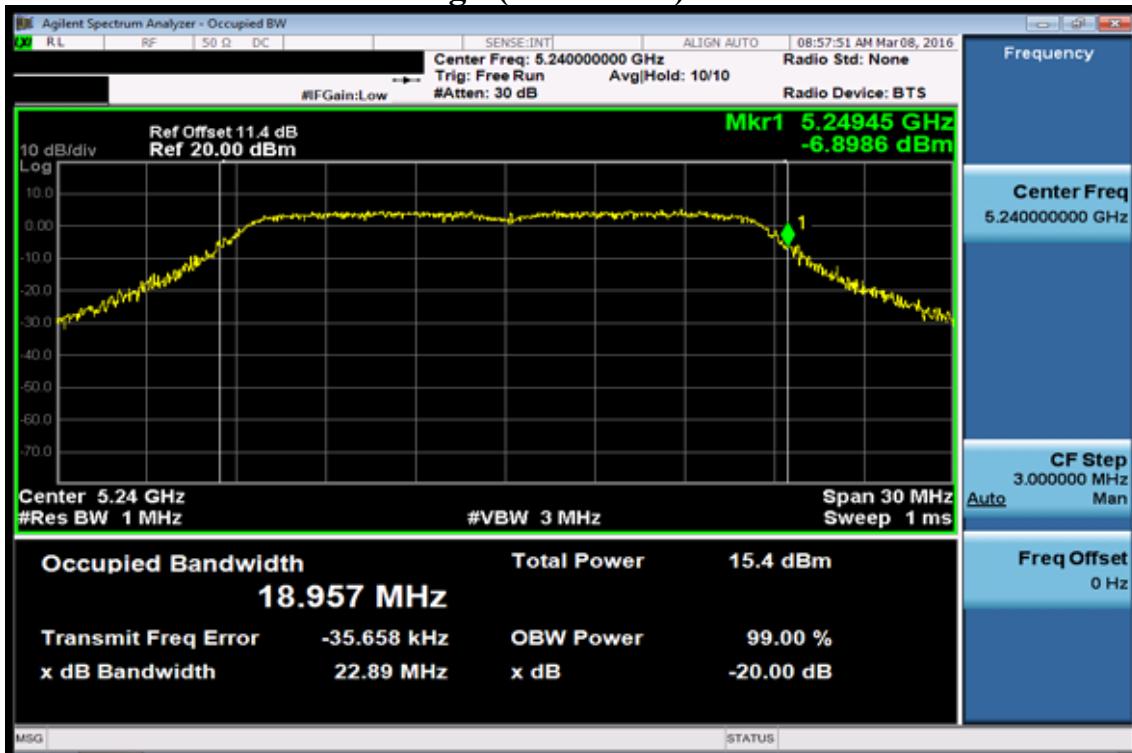


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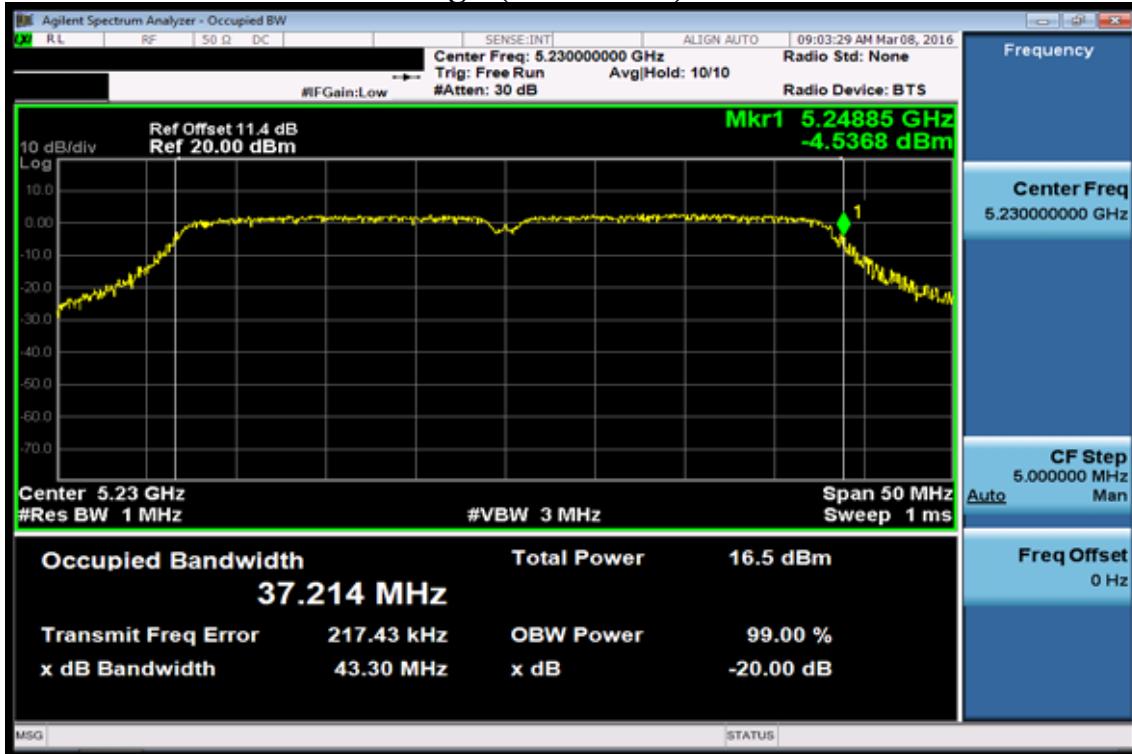
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802.11n HT20, 5150~5350 MHz for Aux 20dB Band Width Test Data CH-High (5240 MHz)



802.11n HT40, 5150~5350 MHz for Main 20dB Band Width Test Data CH-High (5230 MHz)

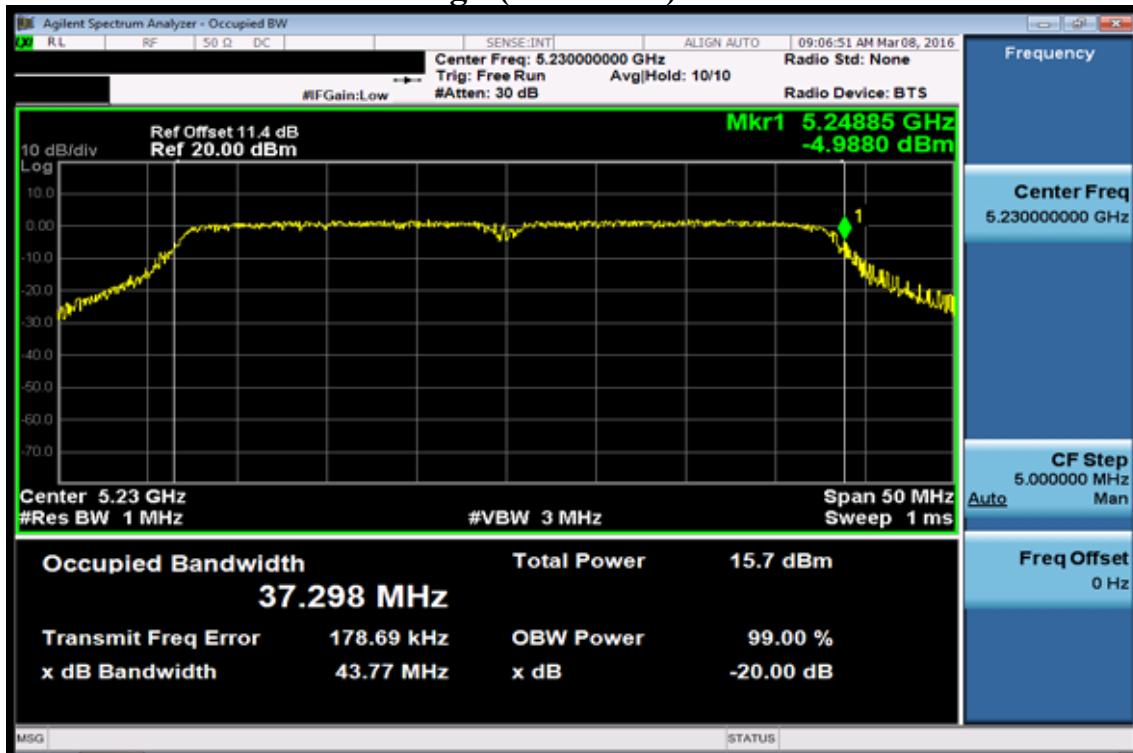


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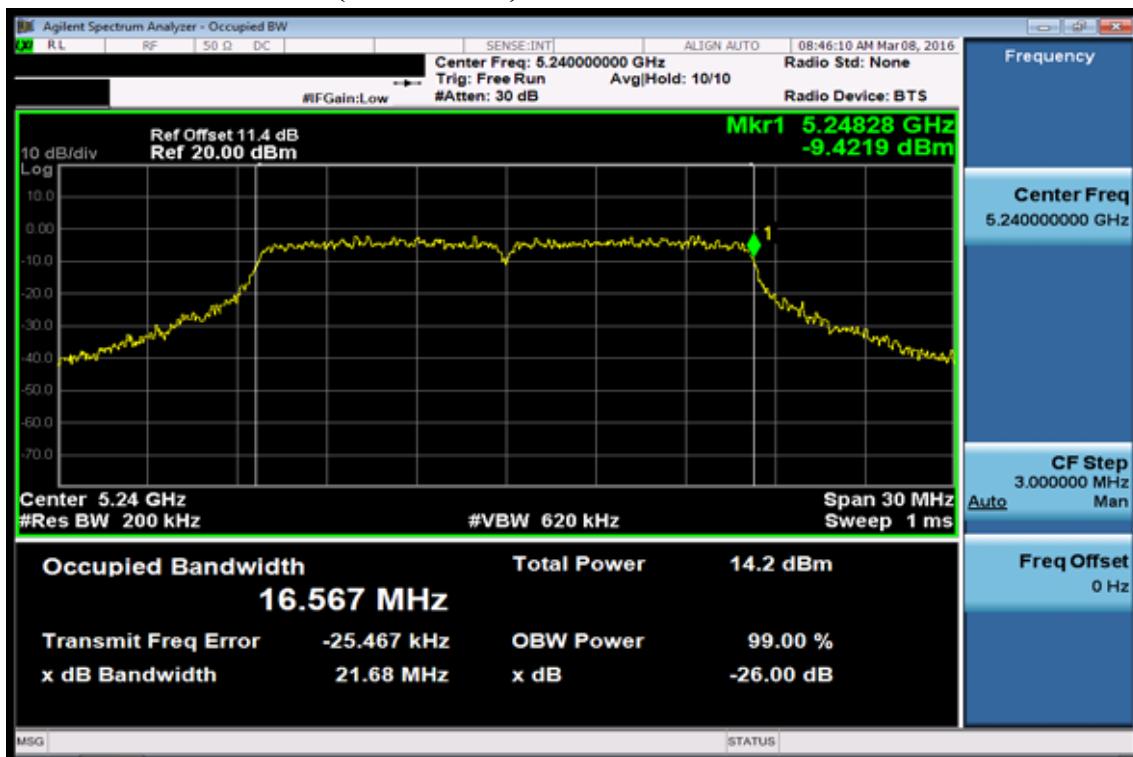
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802.11n HT40, 5150~5350 MHz for Aux 20dB Band Width Test Data CH-High (5230MHz)



802.11a, 5150~5250 MHz 99% Band Width Test Data (5240 MHz)

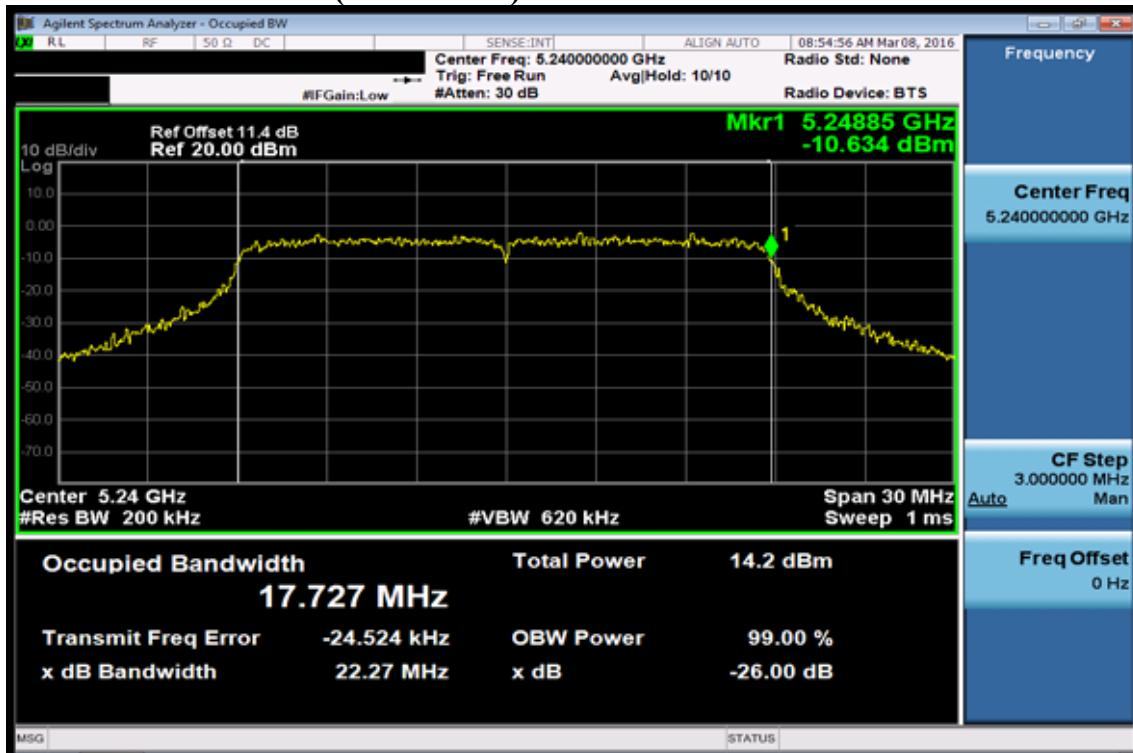


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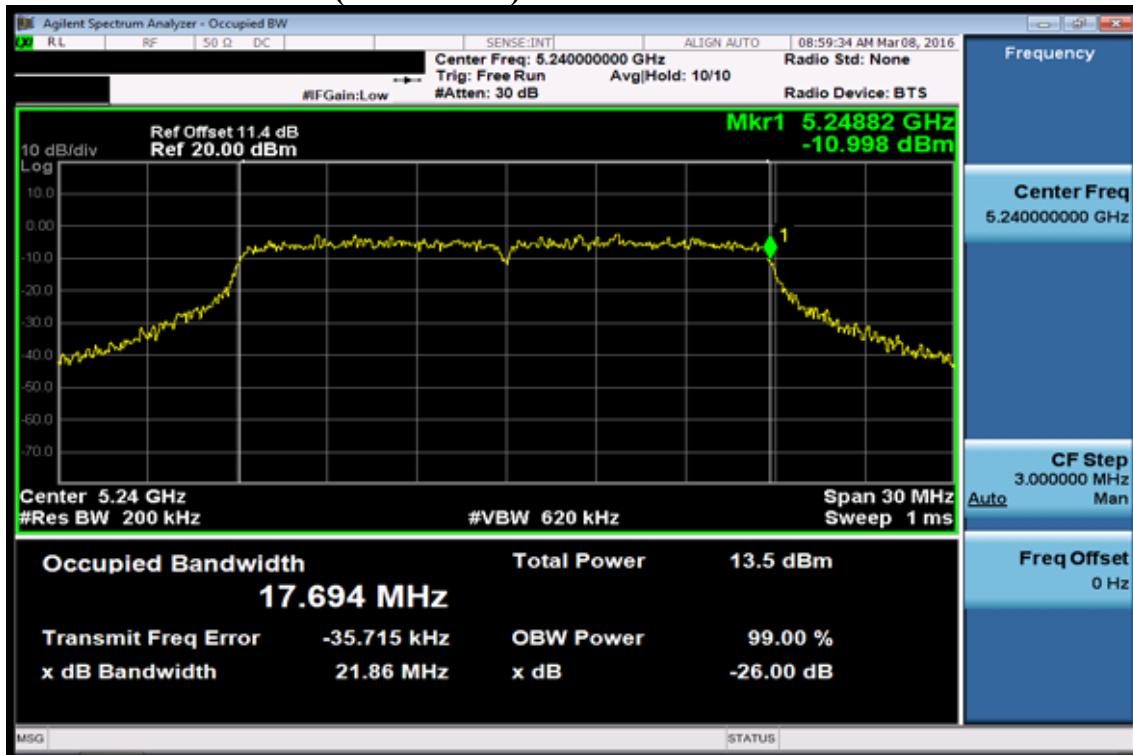
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802.11n_HT20, 5150~5250 MHz for Main 99% Band Width Test Data (5240 MHz)



802.11n_HT20, 5150~5250 MHz for Aux 99% Band Width Test Data (5240 MHz)

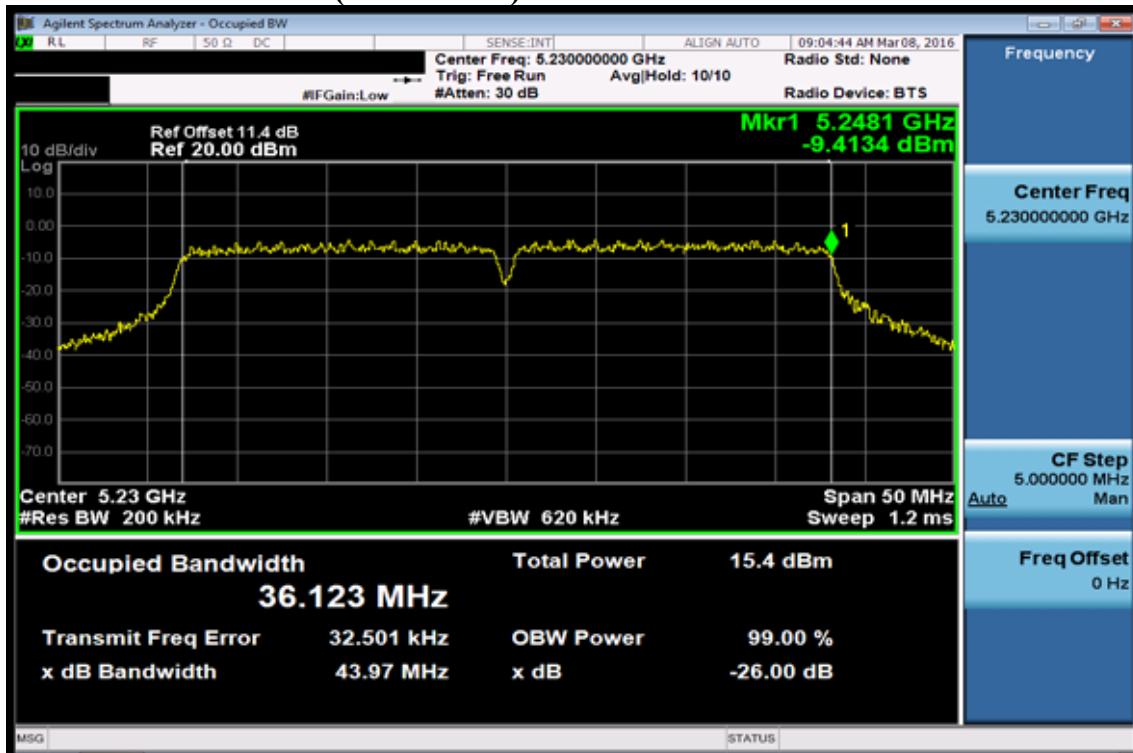


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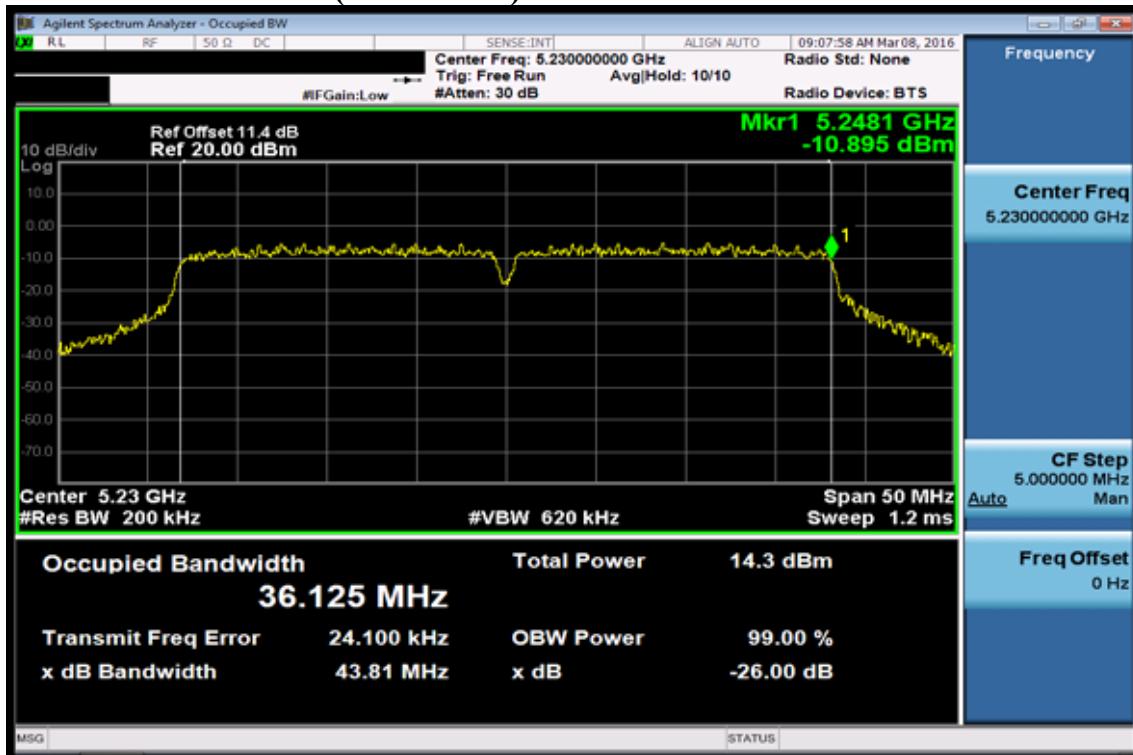
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802.11n_HT40, 5150~5250 MHz for Main 99% Band Width Test Data (5230 MHz)



802.11n_HT40, 5150~5250 MHz for Aux 99% Band Width Test Data (5230 MHz)

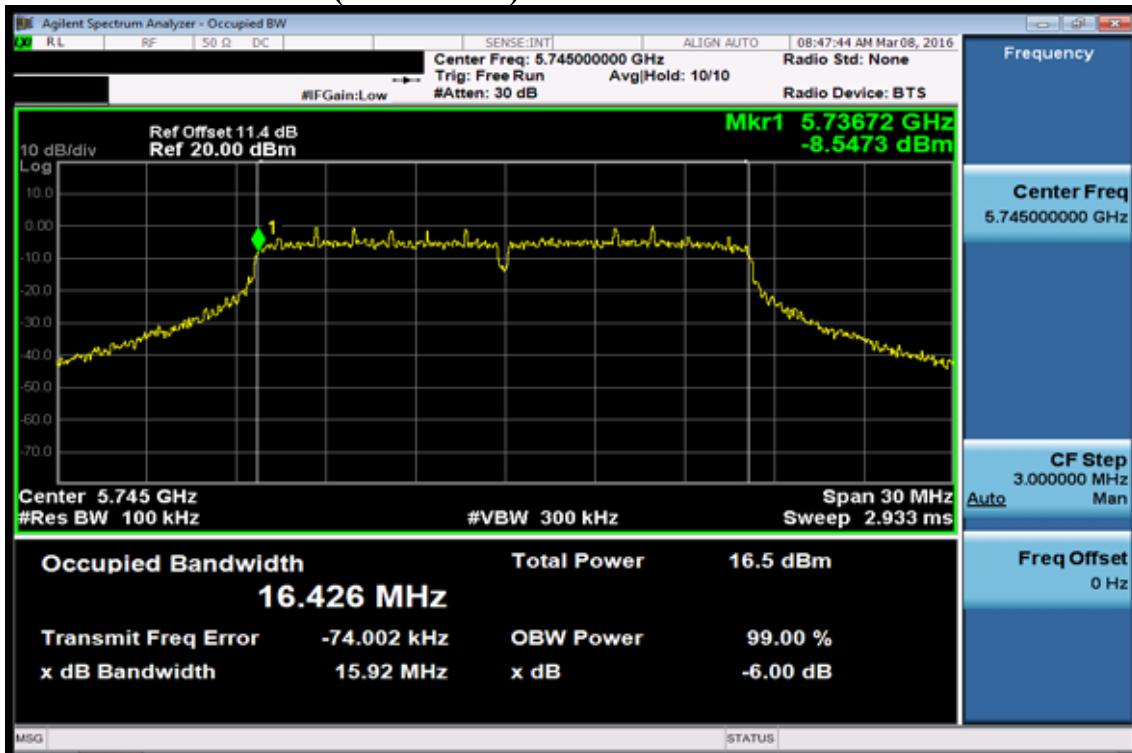


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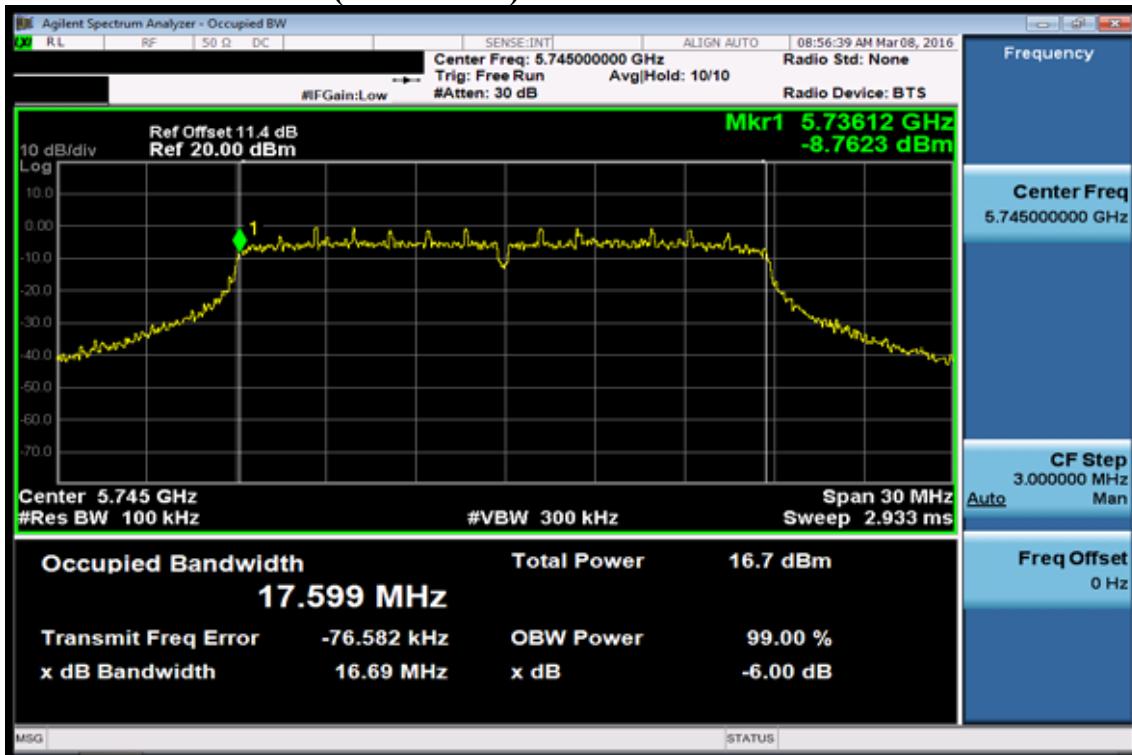
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802.11a, 5725~5850 MHz 99% Band Width Test Data (5745 MHz)



802.11n_HT20, 5725~5850 MHz for Main 99% Band Width Test Data (5745 MHz)

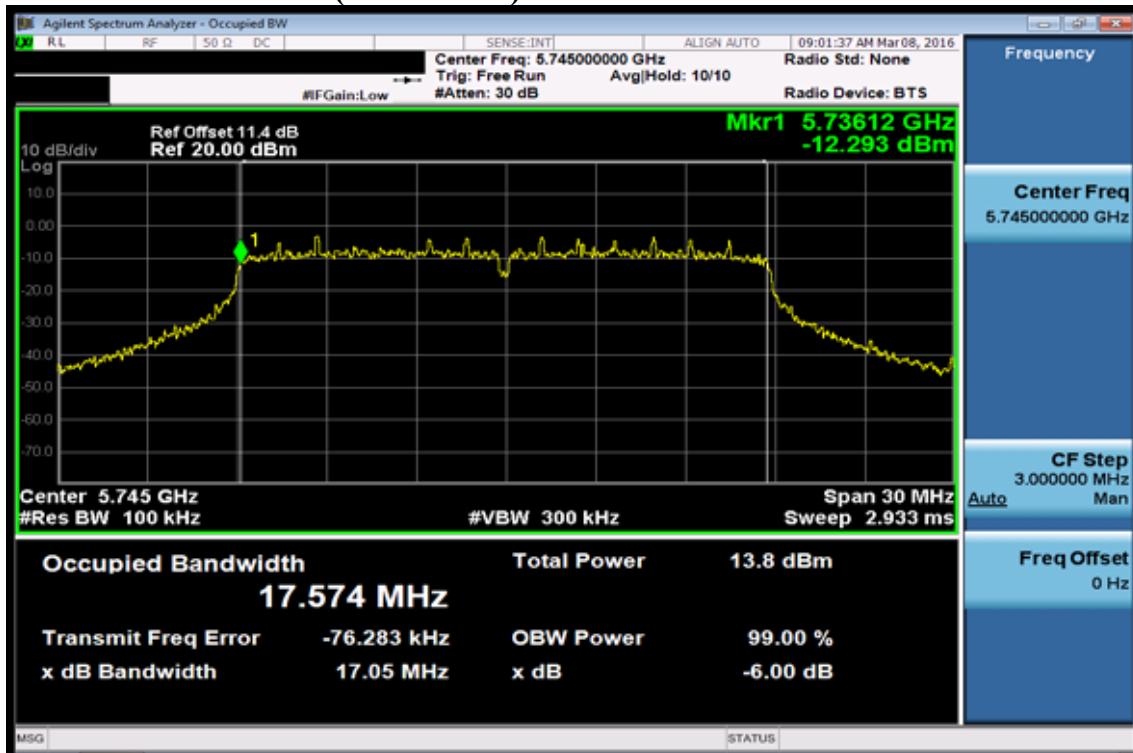


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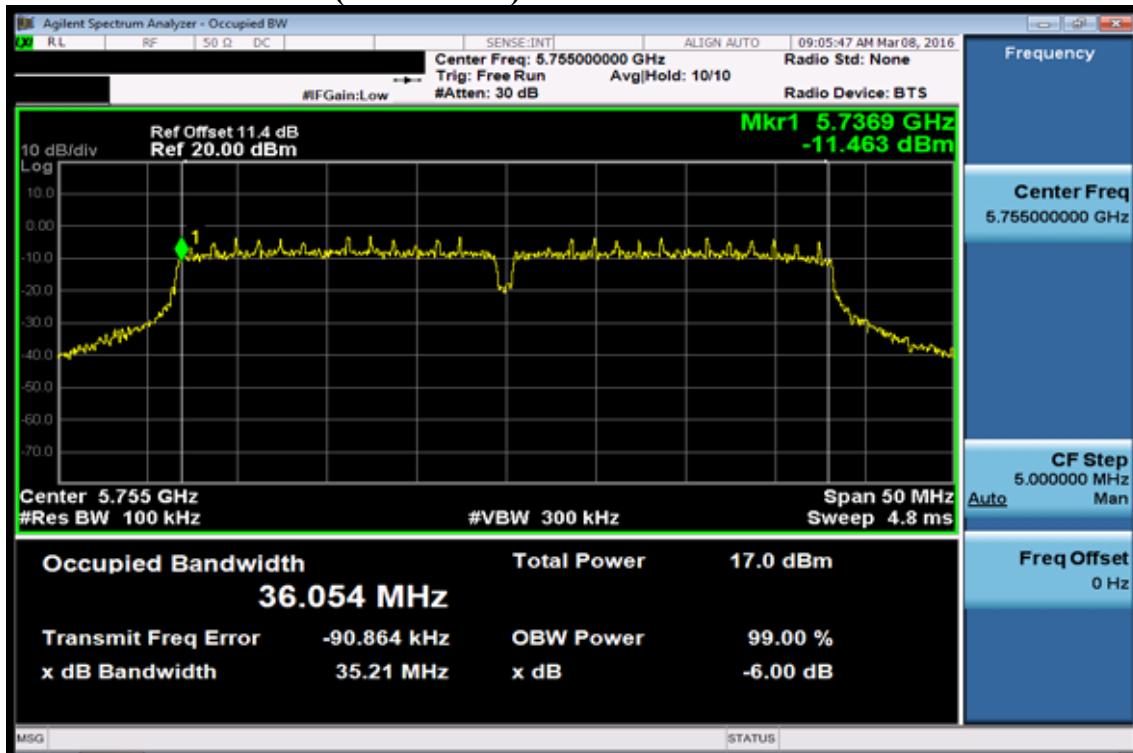
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802.11n_HT20, 5725~5850 MHz for Aux 99% Band Width Test Data (5745 MHz)



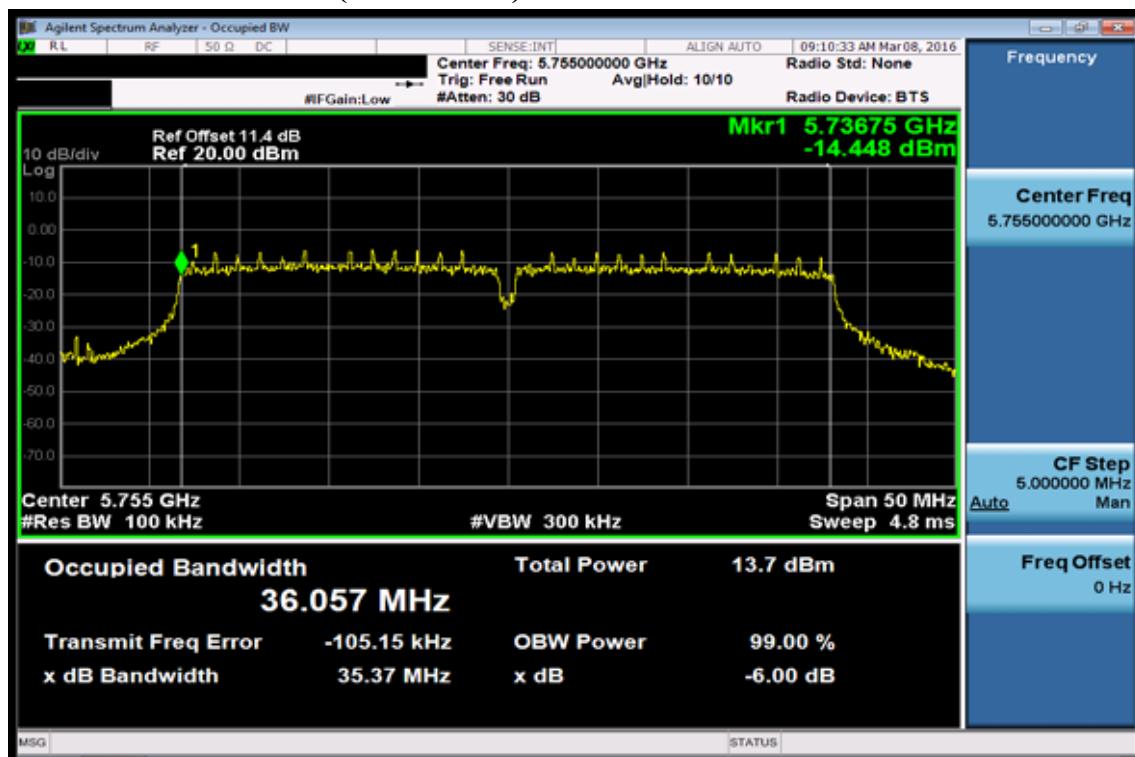
802.11n_HT40, 5725~5850 MHz for Main 99% Band Width Test Data (5755 MHz)



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**802.11n_HT40, 5725~5850 MHz for Aux
99% Band Width Test Data (5755 MHz)**

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8. The MAXIMUM OUTPUT POWER MEASUREMENT

8.1 Standard Applicable

According to §15.407(a)

For the band 5.150-5.350 GHz, the maximum conducted power over the frequency of operation shall not exceed the lesser of 1W (30dBm)

Directional gain = gain of antenna element + 10 log (# of TX antenna elements)

Effective Legacy Gain (dBi) = 9.70

The effective legacy gain is 9.70 dBi, therefore the limit needs to reduce.

Limit = 30dBm - (9.70-6) = 26.30dBm

For the band 5.725-5.850 GHz, the maximum conducted power over the frequency of operation shall not exceed the lesser of 1W (30dBm)

Directional gain = gain of antenna element + 10 log (# of TX antenna elements)

Effective Legacy Gain (dBi) = 10.81

The effective legacy gain is 10.81 dBi, therefore the limit needs to reduce.

Limit = 30dBm - (10.81-6) = 25.19dBm

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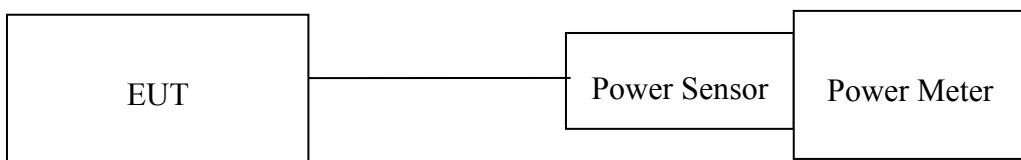
8.2 Measurement Procedure

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the power meter
3. Set the offset $10 \cdot \log(1/x)$ ($x=0.4$), 0.013048 approximately
4. Record the max. reading.
5. Repeat above procedures until all frequency (low, middle, and high channel) measured were complete.

8.3 Measurement Equipment Used:

Refer to section 7.3 for details.

8.4 Test Set-up:



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8.5 Measurement Result

802.11 a

Cable loss = 0		The Maximum Output Power								
CH	Frequency (MHz)	Data Rate								Required Limit
		6	9	12	18	24	36	48	54	
36	5180	17.12	17.08	17.01	16.97	16.91	16.87	16.81	16.77	29.31dBm
44	5220	16.91	16.87	16.82	16.77	16.71	16.67	16.63	16.59	29.31dBm
48	5240	17.02	16.97	16.91	16.87	16.81	16.77	16.72	16.67	29.31dBm

Note: Offset 10.01dB

Limit: 30dBm - (6.69-6) = 29.31dBm

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802.11n HT20 MIMO operation CH0

Cable loss = 0		The Maximum Output Power								
CH	Frequency (MHz)	Data Rate								Required Limit
		MCS8	MCS9	MCS10	MCS11	MCS12	MCS13	MCS14	MCS15	
36	5180	14.84	14.70	14.62	14.51	14.49	14.40	14.31	14.26	26.30 dBm
44	5220	14.97	14.93	14.88	14.83	14.78	14.68	14.54	14.50	26.30 dBm
48	5240	14.81	14.70	14.59	14.49	14.47	14.38	14.29	14.21	26.30 dBm

802.11n HT20 MIMO operation CH1

Cable loss = 0		The Maximum Output Power								
CH	Frequency (MHz)	Data Rate								Required Limit
		MCS8	MCS9	MCS10	MCS11	MCS12	MCS13	MCS14	MCS15	
36	5180	15.18	15.11	15.05	14.91	14.80	14.73	14.65	14.60	26.30 dBm
44	5220	15.13	15.04	14.96	14.96	14.90	14.84	14.75	14.71	26.30 dBm
48	5240	15.24	15.20	15.17	15.17	15.11	15.08	14.95	14.89	26.30 dBm

802.11n HT20 MIMO operation CH0+CH1

Cable loss = 0		The Maximum Output Power								
CH	Frequency (MHz)	Data Rate								Required Limit
		MCS8	MCS9	MCS10	MCS11	MCS12	MCS13	MCS14	MCS15	
36	5180	18.02	17.92	17.85	17.72	17.66	17.58	17.49	17.44	26.30 dBm
44	5220	18.06	18.00	17.93	17.91	17.85	17.77	17.66	17.62	26.30 dBm
48	5240	18.04	17.97	17.90	17.85	17.81	17.75	17.64	17.57	26.30 dBm

Note: Offset 10.01dB

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802.11n HT40 MIMO operation CH0

Cable loss = 0		The Maximum Output Power								
CH	Frequency (MHz)	Data Rate								Required Limit
		MCS8	MCS9	MCS10	MCS11	MCS12	MCS13	MCS14	MCS15	
38	5190	14.72	14.59	14.49	14.47	14.42	14.30	14.25	14.16	26.30 dBm
46	5230	14.65	14.55	14.42	14.38	14.31	14.25	14.21	14.09	26.30 dBm

802.11n HT40 MIMO operation CH1

Cable loss = 0		The Maximum Output Power								
CH	Frequency (MHz)	Data Rate								Required Limit
		MCS8	MCS9	MCS10	MCS11	MCS12	MCS13	MCS14	MCS15	
38	5190	15.10	15.05	14.96	14.91	14.88	14.80	14.69	14.55	26.30 dBm
46	5230	14.90	14.87	14.74	14.63	14.56	14.43	14.36	14.23	26.30 dBm

802.11n HT40 MIMO operation CH0+CH1

Cable loss = 0		The Maximum Output Power								
CH	Frequency (MHz)	Data Rate								Required Limit
		MCS8	MCS9	MCS10	MCS11	MCS12	MCS13	MCS14	MCS15	
38	5190	17.92	17.84	17.74	17.71	17.67	17.57	17.49	17.37	26.30 dBm
46	5230	17.79	17.72	17.59	17.52	17.45	17.35	17.30	17.17	26.30 dBm

Note: Offset 10.01dB

Limit: 30dBm - (9.70-6) = 26.30dBm

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802.11 a

Cable loss = 0		The Maximum Output Power								
CH	Frequency (MHz)	Data Rate								Required Limit
		6	9	12	18	24	36	48	54	
149	5745	11.89	11.83	11.78	11.74	11.69	11.64	11.59	11.55	28.20 dBm
157	5785	12.33	12.29	12.25	12.20	12.16	12.11	12.07	12.01	28.20 dBm
165	5825	12.68	12.64	12.59	12.55	12.51	12.47	12.43	12.39	28.20 dBm

*Note: Offset 10.01dB**Limit: 30dBm - (7.80-6) = 28.20dBm*

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802.11n HT20 MIMO operation CH0

Cable loss = 0		The Maximum Output Power								
CH	Frequency (MHz)	Data Rate								Required Limit
		MCS8	MCS9	MCS10	MCS11	MCS12	MCS13	MCS14	MCS15	
149	5745	14.88	14.84	14.76	14.67	14.56	14.46	14.44	14.39	25.19 dBm
157	5785	14.77	14.68	14.62	14.53	14.39	14.27	14.23	14.17	25.19 dBm
165	5825	14.64	14.58	14.51	14.48	14.45	14.41	14.31	14.27	25.19 dBm

802.11n HT20 MIMO operation CH1

Cable loss = 0		The Maximum Output Power								
CH	Frequency (MHz)	Data Rate								Required Limit
		MCS8	MCS9	MCS10	MCS11	MCS12	MCS13	MCS14	MCS15	
149	5745	15.65	15.60	15.57	15.54	15.49	15.43	15.38	15.35	25.19 dBm
157	5785	14.94	14.87	14.83	14.81	14.71	14.68	14.62	14.55	25.19 dBm
165	5825	15.12	14.99	14.90	14.82	14.75	14.63	14.58	14.49	25.19 dBm

802.11n HT20 MIMO operation CH0+CH1

Cable loss = 0		The Maximum Output Power								
CH	Frequency (MHz)	Data Rate								Required Limit
		MCS8	MCS9	MCS10	MCS11	MCS12	MCS13	MCS14	MCS15	
149	5745	18.29	18.25	18.19	18.14	18.06	17.98	17.95	17.91	25.19 dBm
157	5785	17.87	17.79	17.74	17.68	17.56	17.49	17.44	17.37	25.19 dBm
165	5825	17.90	17.80	17.72	17.66	17.61	17.53	17.46	17.39	25.19 dBm

Note: Offset 10.01dB

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802.11n HT40 MIMO operation CH0

Cable loss = 0		The Maximum Output Power								
CH	Frequency (MHz)	Data Rate								Required Limit
		MCS8	MCS9	MCS10	MCS11	MCS12	MCS13	MCS14	MCS15	
151	5755	13.82	13.77	13.64	13.61	13.56	13.51	13.43	13.41	25.19 dBm
159	5795	14.65	14.56	14.43	14.40	14.33	14.24	14.19	14.14	25.19 dBm

802.11n HT40 MIMO operation CH1

Cable loss = 0		The Maximum Output Power								
CH	Frequency (MHz)	Data Rate								Required Limit
		MCS8	MCS9	MCS10	MCS11	MCS12	MCS13	MCS14	MCS15	
151	5755	14.24	14.14	14.12	13.99	13.91	13.84	13.81	13.68	25.19 dBm
159	5795	14.90	14.87	14.84	14.75	14.68	14.54	14.49	14.45	25.19 dBm

802.11n HT40 MIMO operation CH0+CH1

Cable loss = 0		The Maximum Output Power								
CH	Frequency (MHz)	Data Rate								Required Limit
		MCS8	MCS9	MCS10	MCS11	MCS12	MCS13	MCS14	MCS15	
151	5755	17.05	16.97	16.90	16.81	16.75	16.69	16.63	16.56	25.19 dBm
159	5795	17.79	17.73	17.65	17.59	17.52	17.40	17.35	17.31	25.19 dBm

Note: Offset 10.01dB

Limit: 30dBm - (10.81-6) = 25.19dBm

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9 MAXIMUM POWER SPECTRAL DENSITY

9.1 Standard Applicable

According to §15.407(a)

1. For the band 5.15-5.25 GHz, the peak power spectral density shall not exceed 17 dBm in any 1 MHz band.
2. For the band 5.725-5.850 GHz and 5.47-5.725GHz, the peak power spectral density shall not exceed 30 dBm in any 500KHz band.

If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

9.2 Measurement Procedure (following procedure F, & E) d) method SA-2 in KDB789033 D02)

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to Spectrum.
3. Set RBW=1MHz, VBW=3MHz, Span=50MHz/80MHz (Base Mode), where span is enough to capture the entire bandwidth, Sweep time = Auto (601 pts), detector = sample, traces 100 sweeps of video averaging. (SA-2 with the omission of procedure x, the integration with 26dB EBW bandwidth)
4. User the cursor on spectrum to peak search the highest level of trace
5. Add offset, duty factor = 0.013048, on the spectrum
6. Record the max. reading.
7. Repeat above procedures until all default test channel (low, middle, and high) was complete.

9.3 Measurement Equipment Used:

Refer to section 7.3 for details.

9.4 Test Set-up:

Refer to section 7.4 for details.

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9.5 Measurement Result

802.11a, 5150~5250 MHz

Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
5180	-2.303	16.31	-18.61
5220	-0.994	16.31	-17.30
5240	0.703	16.31	-15.61

Note: Offset 10.1dB

802.11n HT20, 5150~5250 MHz

Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
5180	-2.996	13.30	-16.30
5220	-2.188	13.30	-15.49
5240	-2.030	13.30	-15.33

Note: Offset 10.3dB

802.11n HT40, 5150~5250 MHz

Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
5190	-6.453	13.30	-19.75
5230	-7.068	13.30	-20.37

Note: Offset 10.4dB

limit: 802.11a: 17dBm - (6.69-6) = 16.31dBm

802.11n HT20/40: 17dBm - (9.70-6) = 13.3dBm

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802.11a, 5725~5850 MHz

Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
5745	5.67	28.20	-22.53
5785	6.49	28.20	-21.71
5825	6.21	28.20	-21.99

Note: Offset 10.1dB

802.11n HT20, 5725~5850 MHz

Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
5745	7.69	25.19	-17.50
5785	6.75	25.19	-18.44
5825	7.19	25.19	-18.00

Note: Offset 10.3dB

802.11n HT40, 5725~5850 MHz

Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
5755	4.30	25.19	-20.89
5795	5.33	25.19	-19.86

*Note: Offset 10.4dB*limit: 802.11a: $30\text{dBm} - (7.80-6) = 28.20\text{dBm}$ 802.11n HT20/40: $30\text{dBm} - (10.81-6) = 25.19\text{dBm}$

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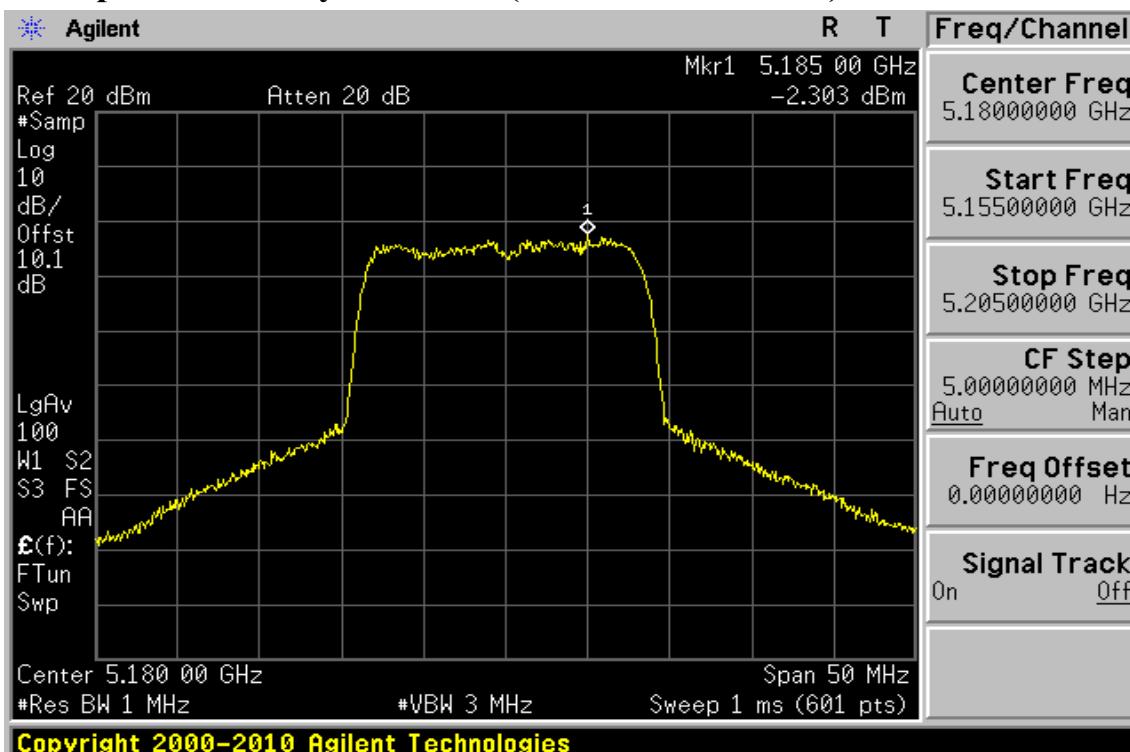
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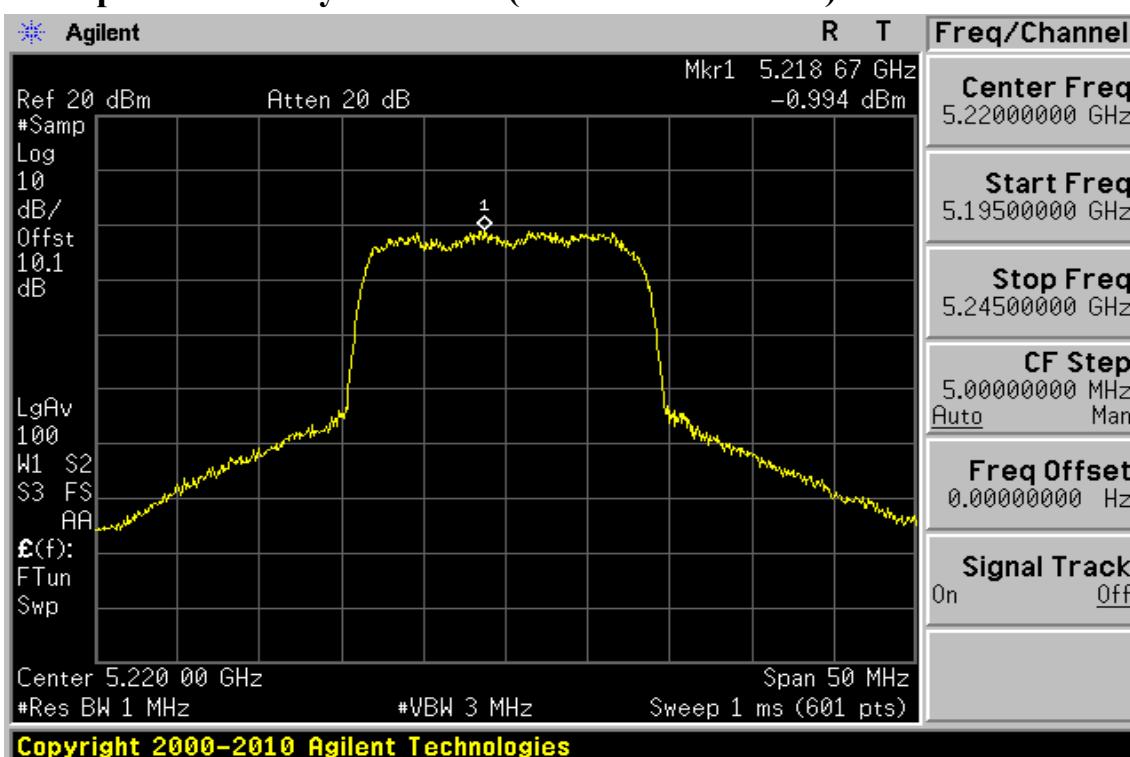
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802.11a, 5150~5250 MHz

Peak Power Spectral Density Data Plot (CH Low 5180 MHz)



Peak Power Spectral Density Data Plot (CH Mid 5220 MHz)



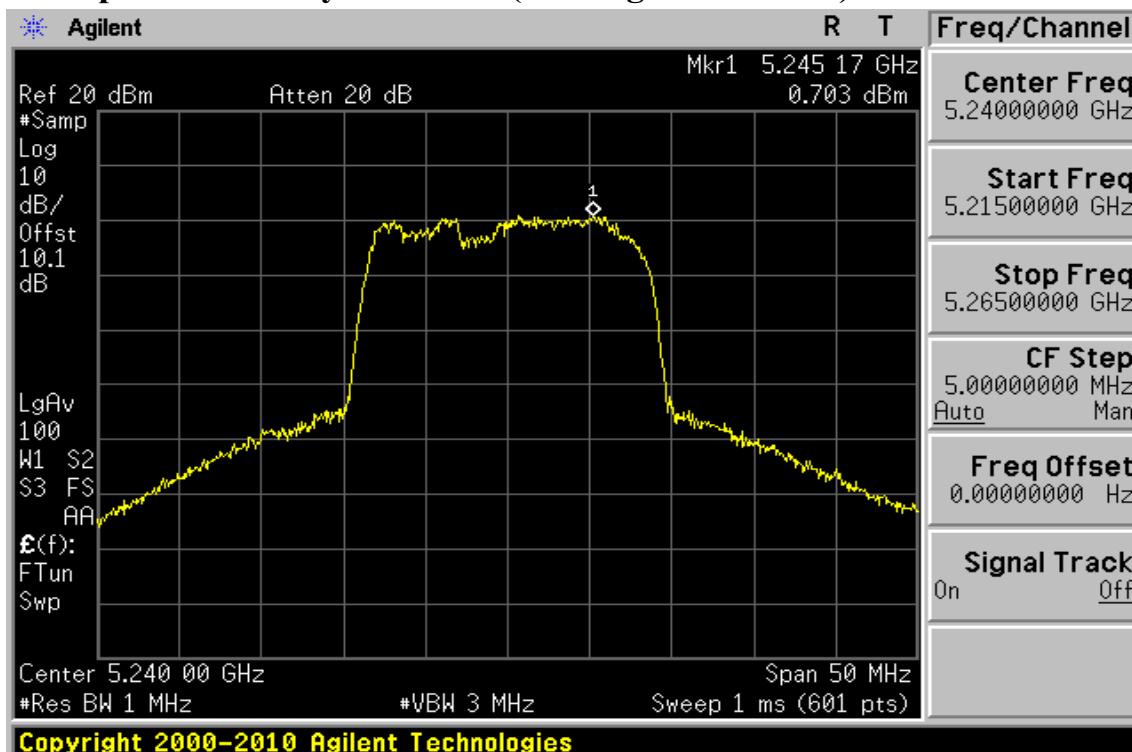
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Peak Power Spectral Density Data Plot (CH High 5240 MHz)



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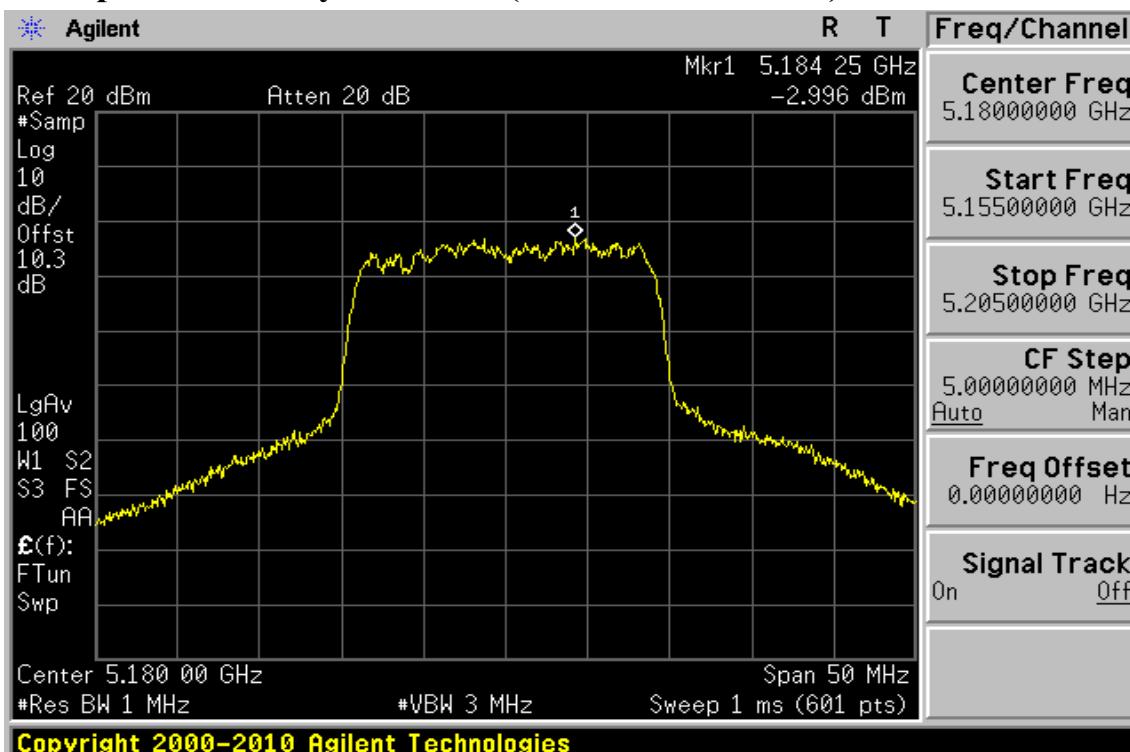
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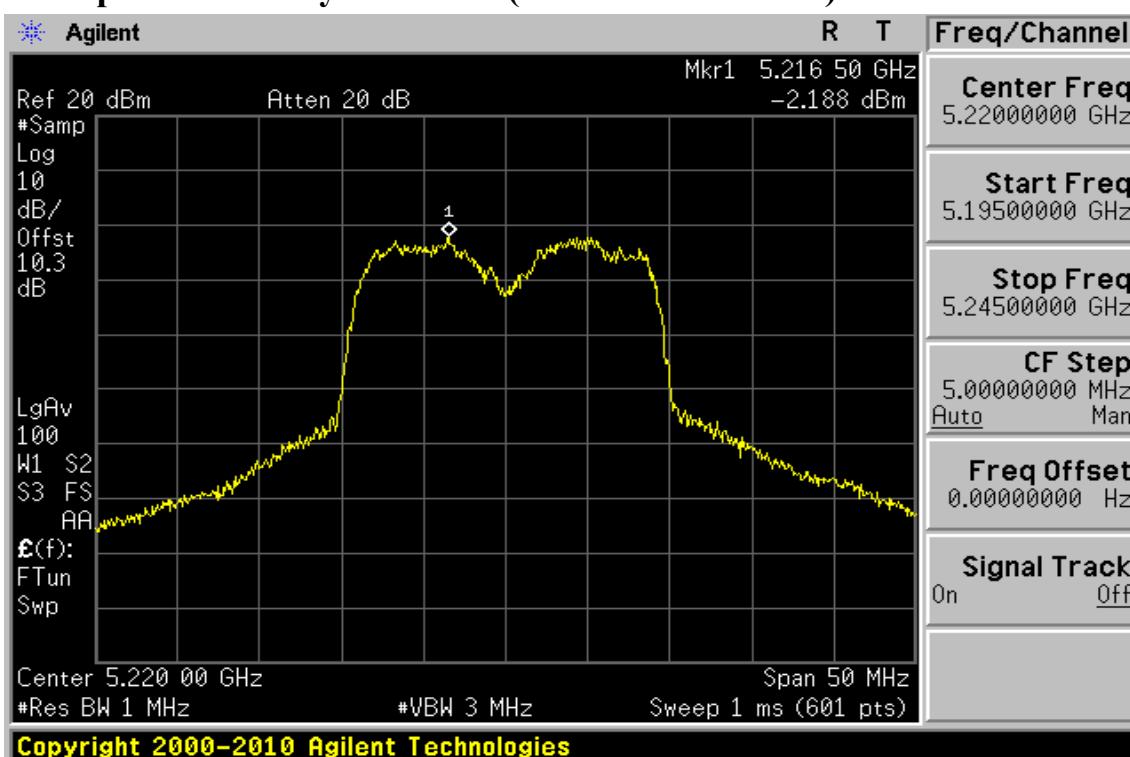
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802.11n HT20, 5150~5350 MHz

Peak Power Spectral Density Data Plot (CH Low 5180 MHz)



Peak Power Spectral Density Data Plot (CH Mid 5220 MHz)

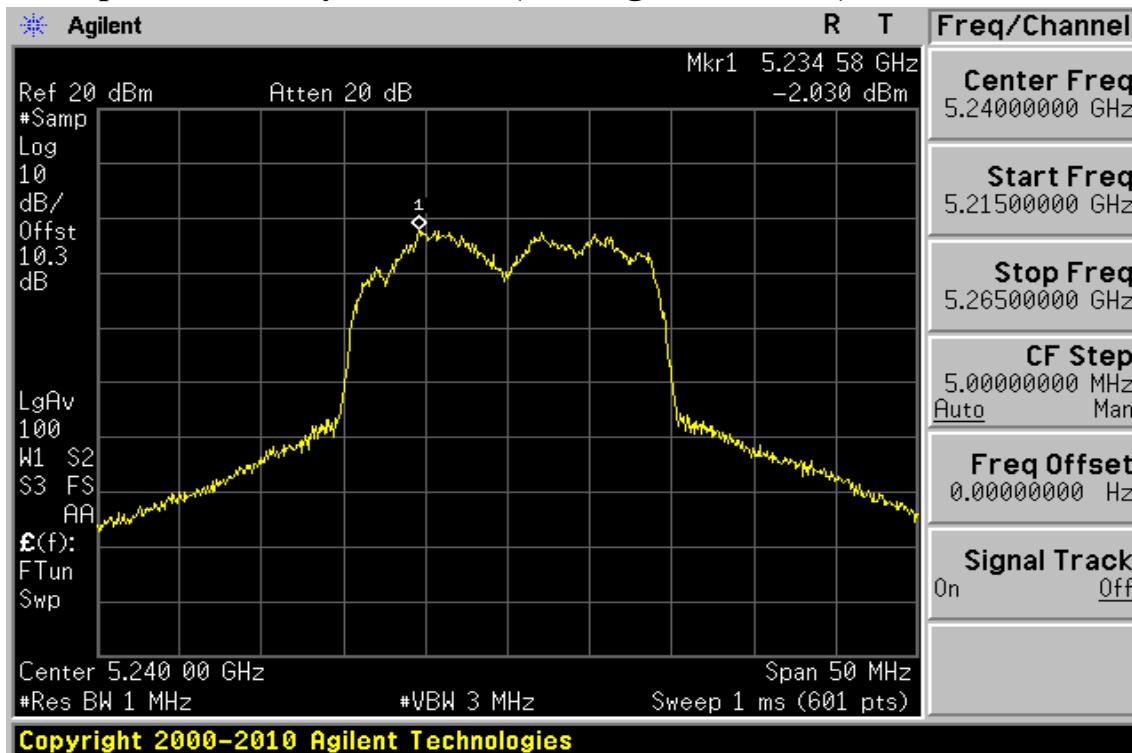


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Peak Power Spectral Density Data Plot (CH High 5240 MHz)

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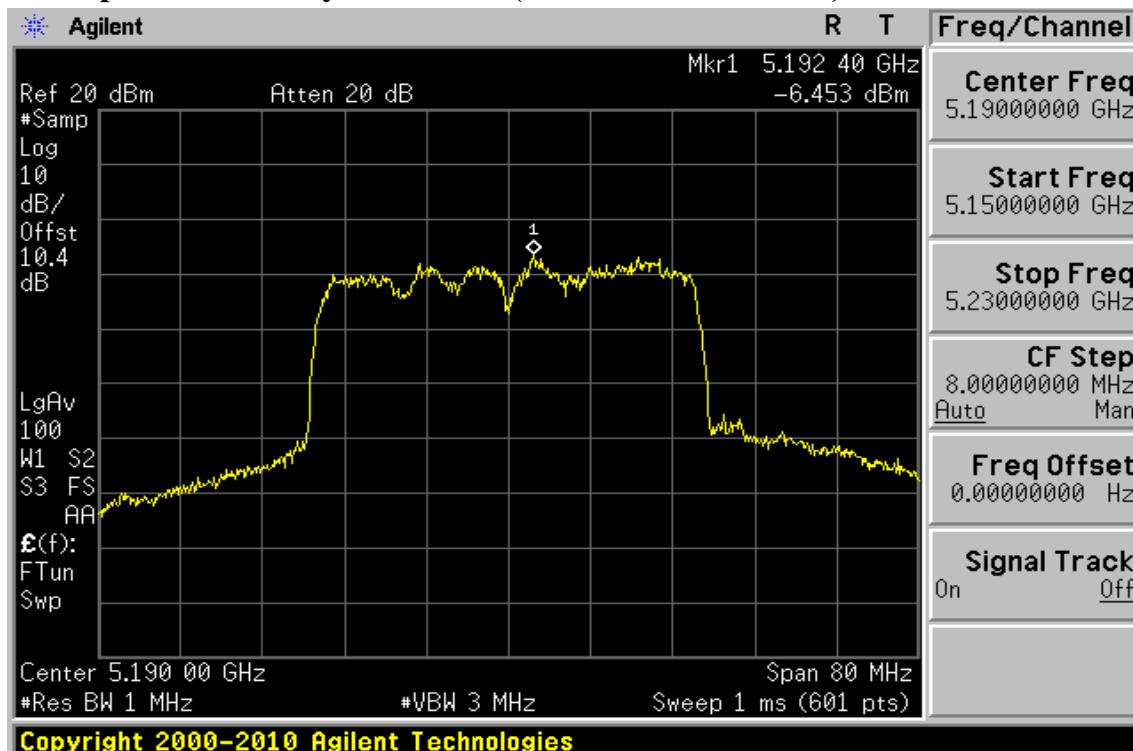
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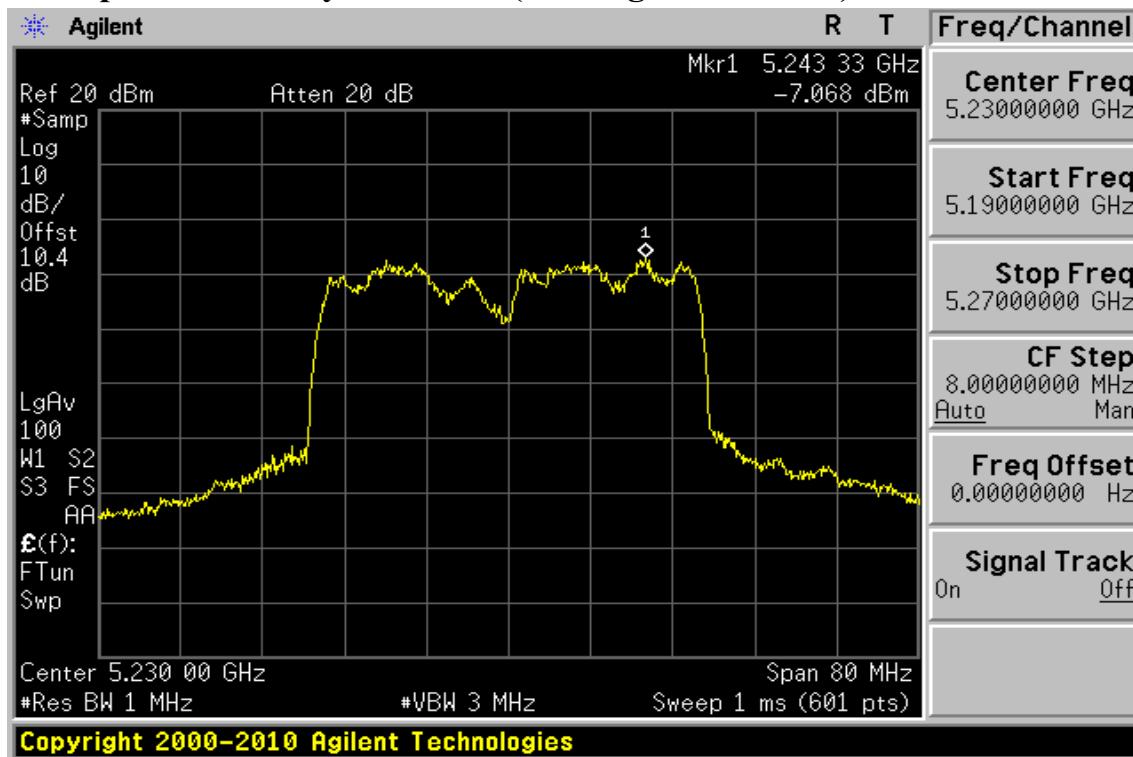
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802.11n HT40, 5150~5350 MHz

Peak Power Spectral Density Data Plot (CH Low 5190 MHz)



Peak Power Spectral Density Data Plot (CH High 5230 MHz)



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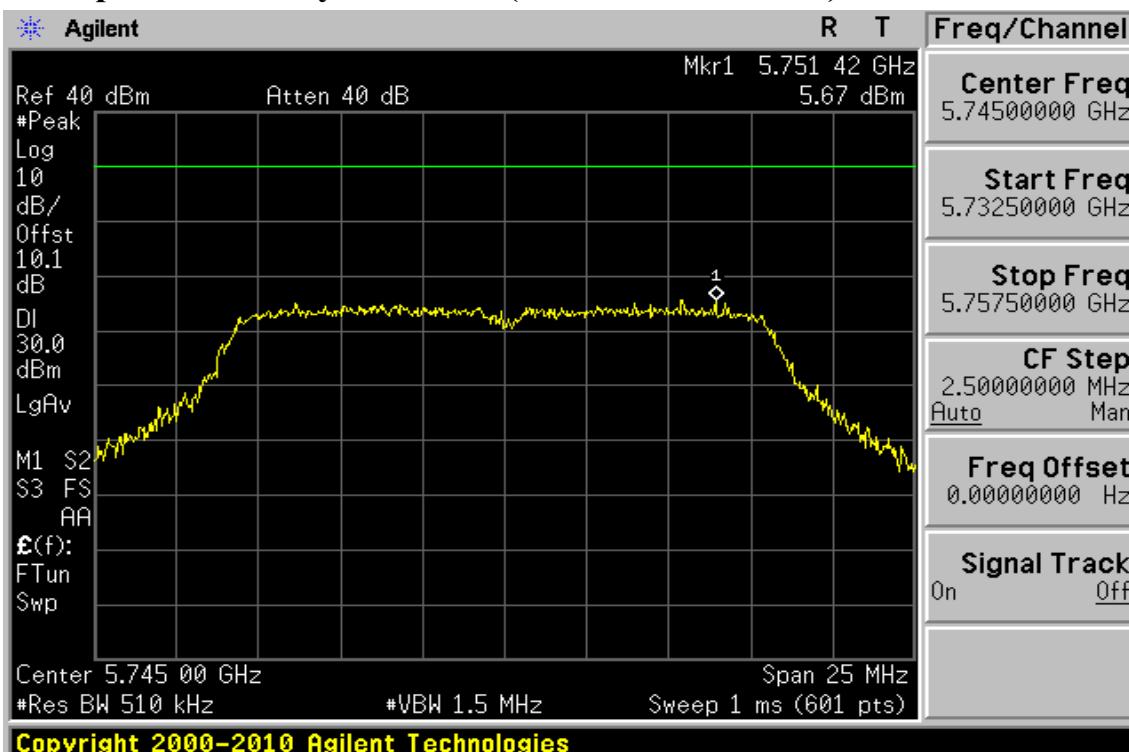
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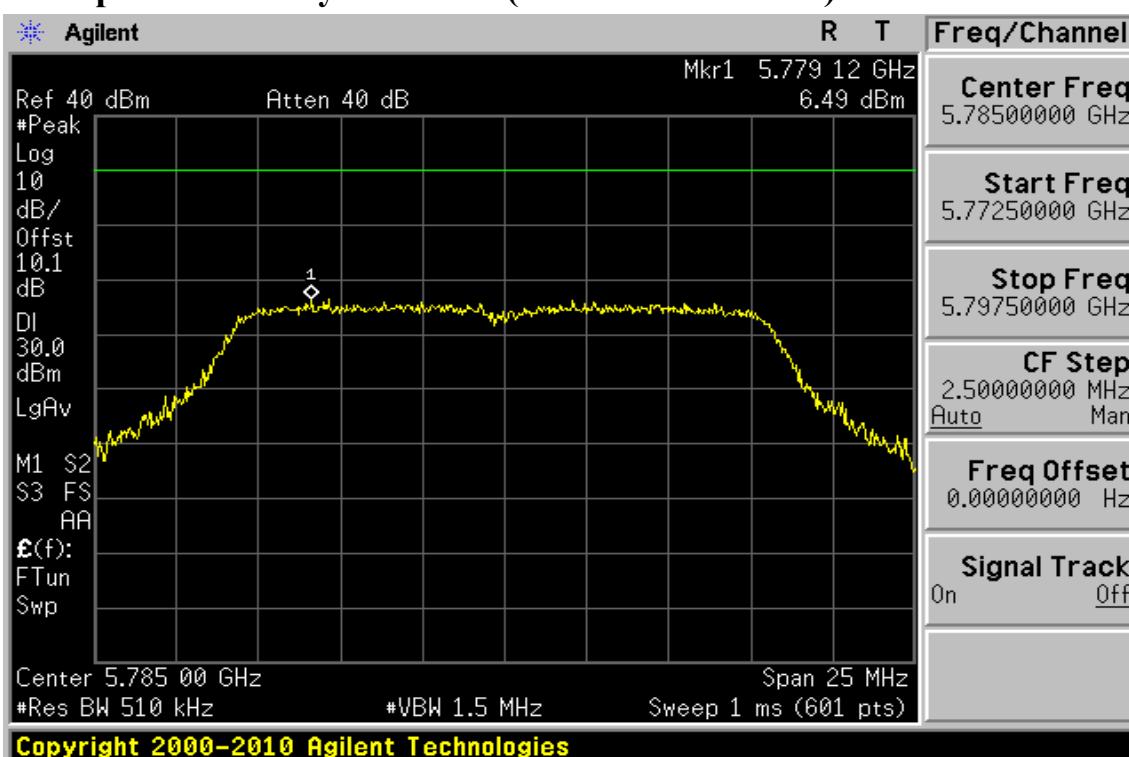
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802.11a, 5725~5850 MHz

Peak Power Spectral Density Data Plot (CH Low 5745 MHz)



Peak Power Spectral Density Data Plot (CH Mid 5785 MHz)



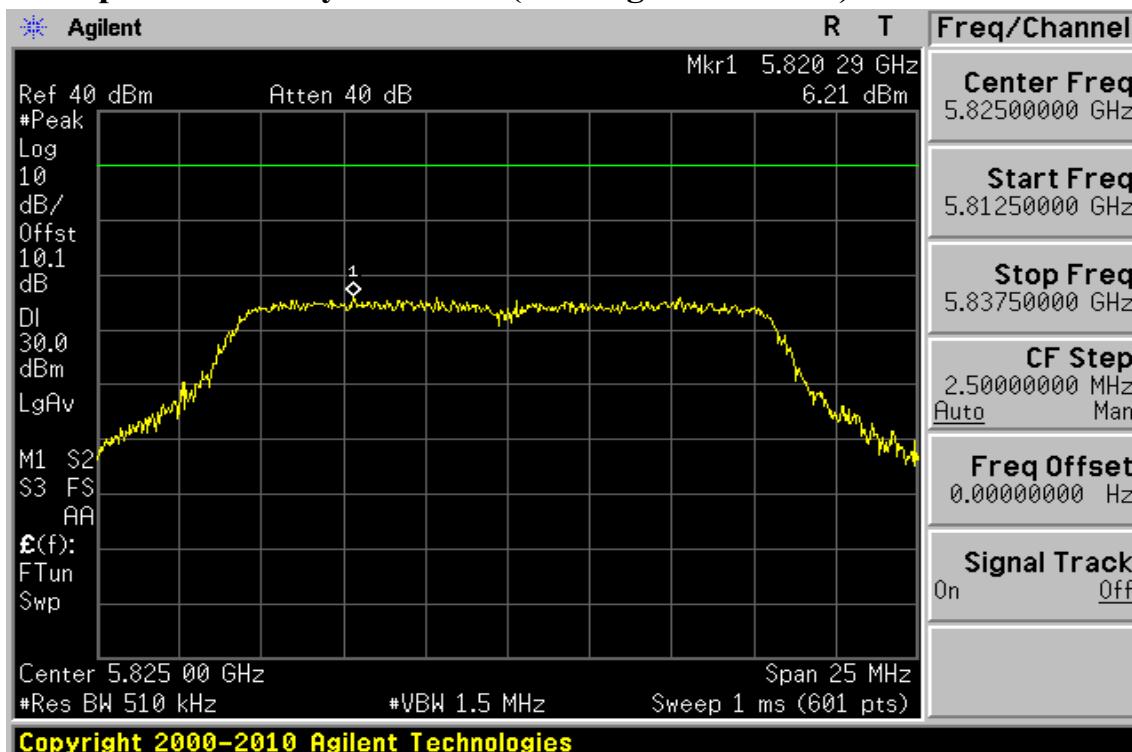
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Peak Power Spectral Density Data Plot (CH High 5825 MHz)



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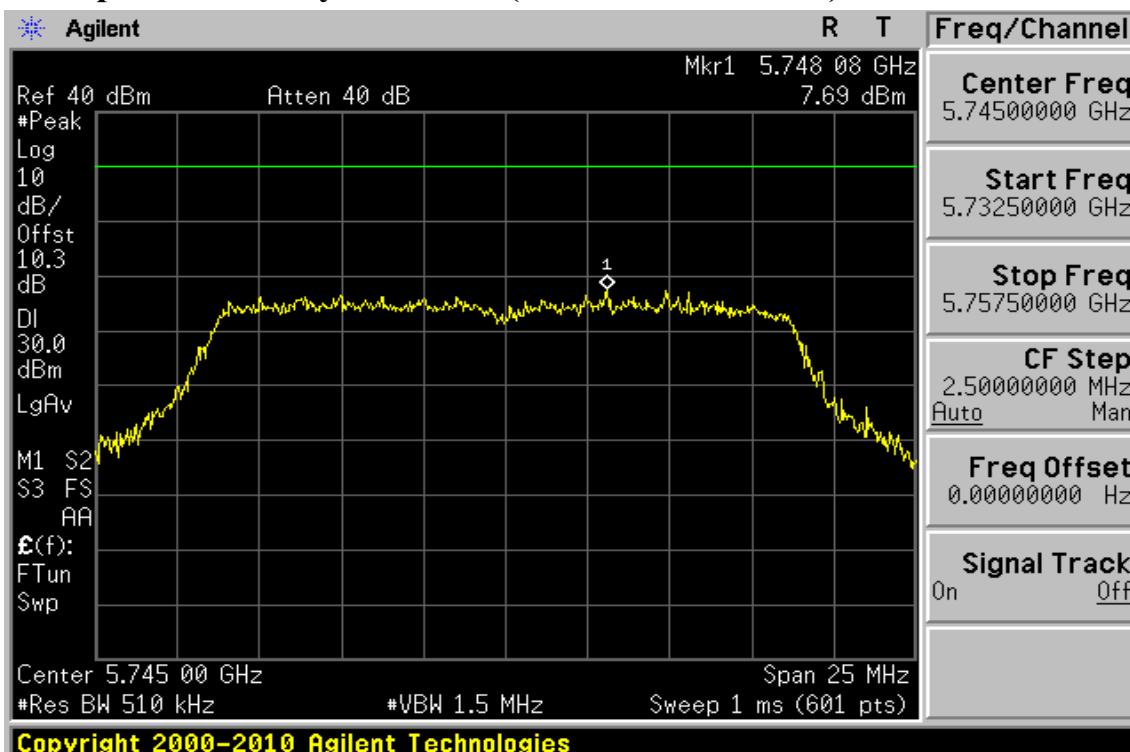
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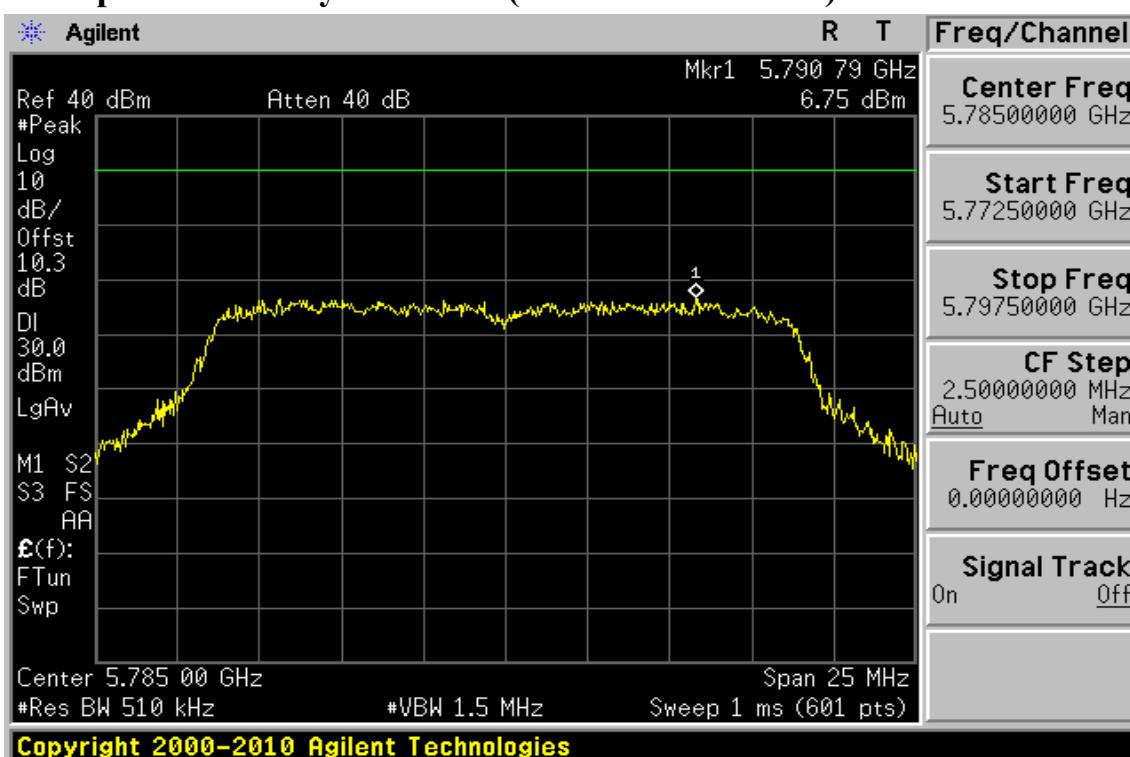
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802.11n HT20, 5725~5850 MHz

Peak Power Spectral Density Data Plot (CH Low 5745 MHz)



Peak Power Spectral Density Data Plot (CH Mid 5785 MHz)

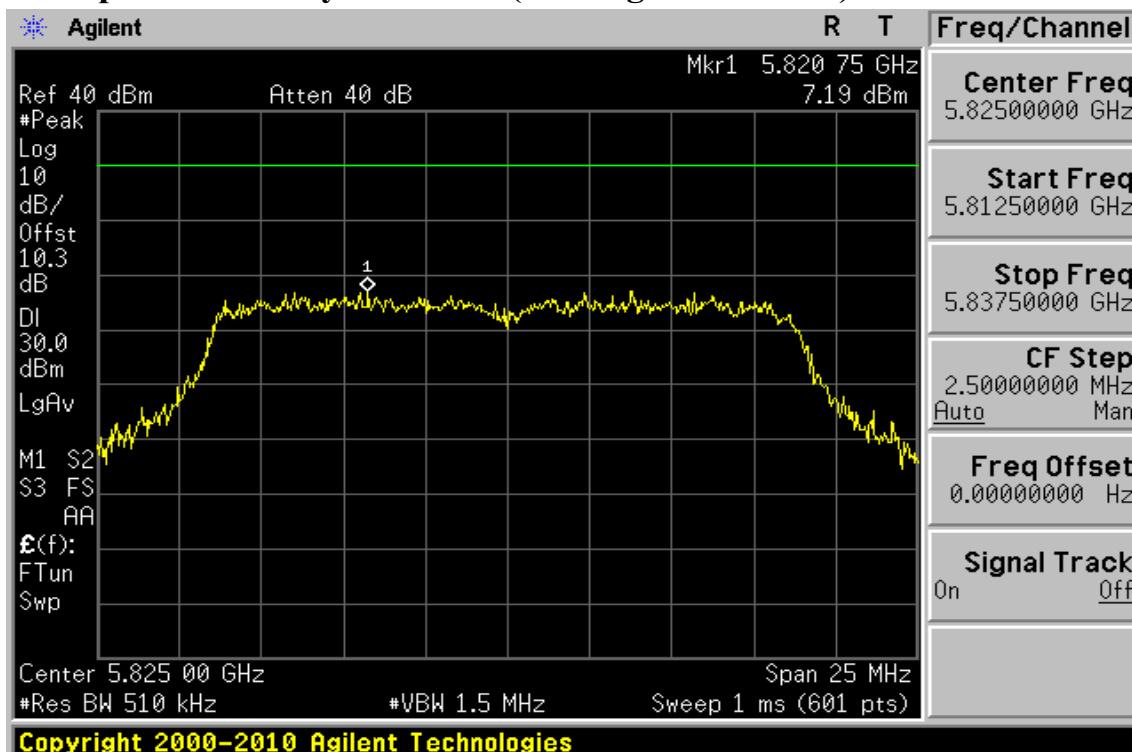


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Peak Power Spectral Density Data Plot (CH High 5825 MHz)

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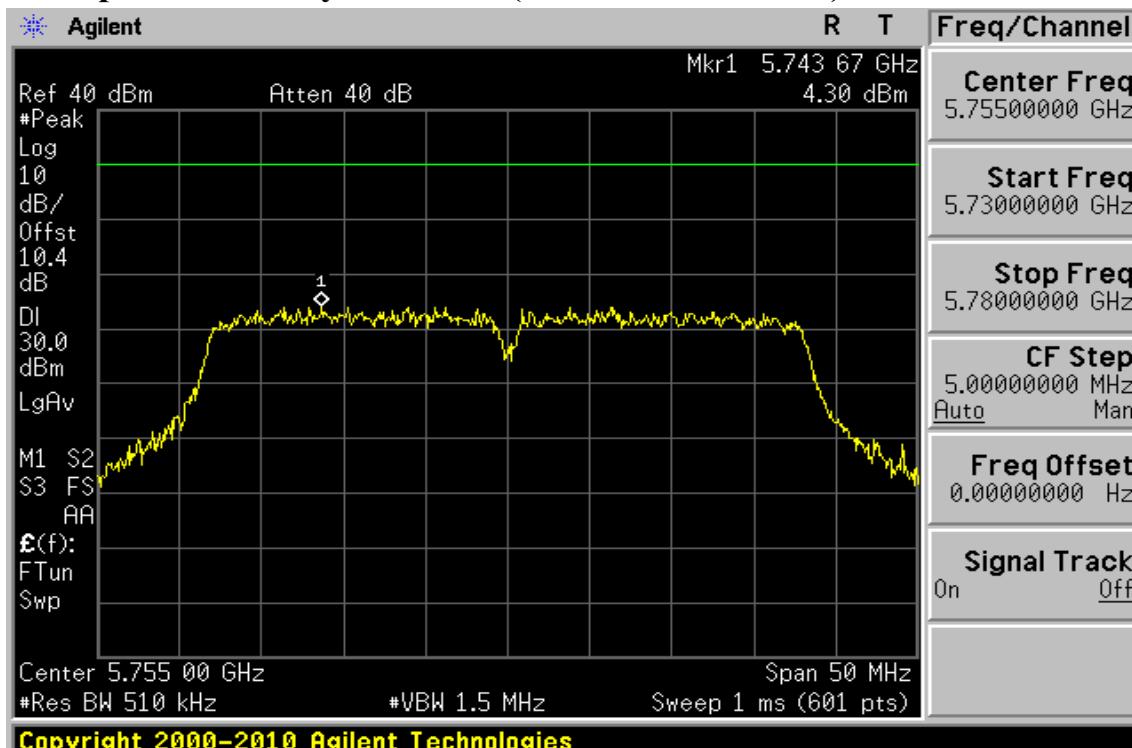
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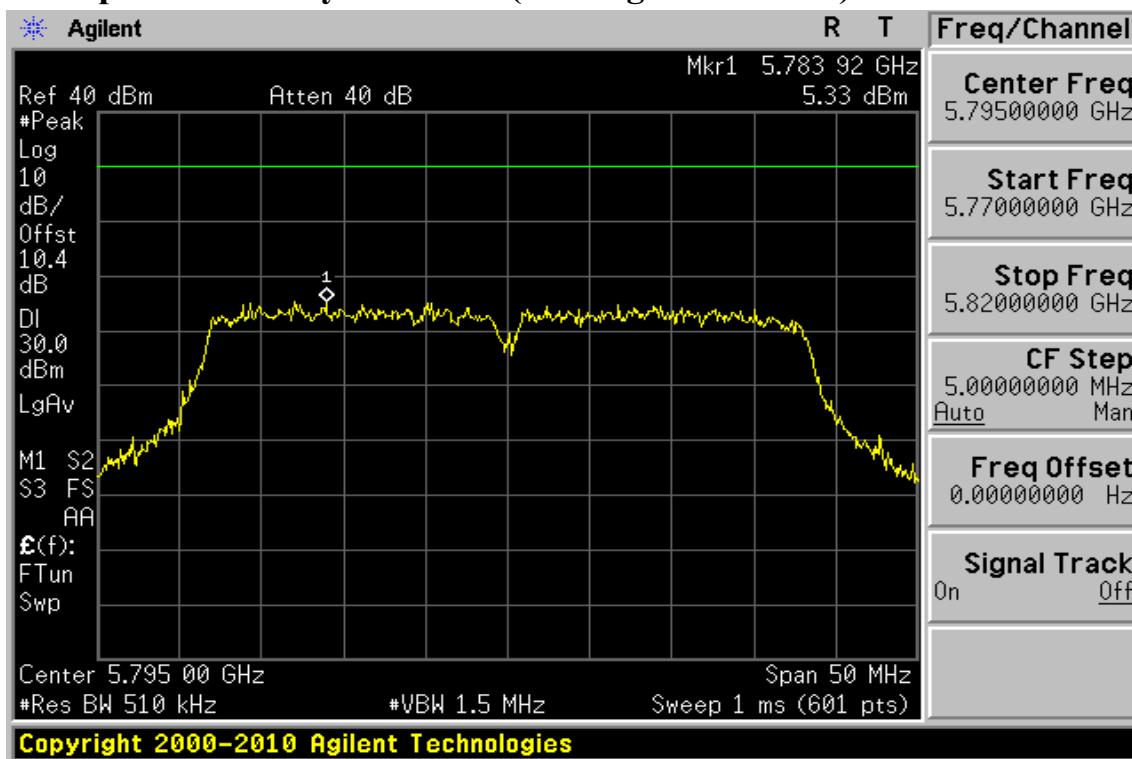
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802.11n HT40, 5725~5850 MHz

Peak Power Spectral Density Data Plot (CH Low 5755 MHz)



Peak Power Spectral Density Data Plot (CH High 5795 MHz)



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10 UNDESIRABLE EMISSION - RADIATED MEASUREMENT

10.1 Standard Applicable

According to §15.407(b) (6) (7),

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

- (1) Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in Section 15.209. Further, any U-NII devices using an AC power line are required to comply also with the conducted limits set forth in Section 15.207.
- (2) The provisions of Section 15.205 of this part apply to intentional radiators operating under this section.
- (3) When measuring the emission limits, the nominal carrier frequency shall be adjusted as close to the upper and lower frequency block edges as the design of the equipment permits.

Procedure H1) a) b) c) are adopted, KDB 789033 D02, where the conducted measurement is being used to comply with out of emission requirement as per FCC 15.407 b) 6) 7)

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§15.205- RESTRICTED BANDS OF OPERATIONS

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

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

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

² Above 38.6

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

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§15.209- RADIATED EMISSION LIMITS: GENERAL REQUIREMENTS

FCC PART 15.209

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

10.1.1 Transmitter Spurious Emission Limits

Spurious emissions from licence-exempt transmitters shall comply with the field strength limits shown below. Additionally, the level of any transmitter spurious emission shall not exceed the level of the transmitter's fundamental emission.

Table 5: General Field Strength Limits for Transmitters at Frequencies Above 30 MHz

Frequency (MHz)	Field Strength (microvolt/m at 3 metres)
30-88	100
88-216	150
216-960	200
Above 960	500

Note: Transmitting devices are not permitted in Table 1 bands or, unless stated otherwise, in TV bands (54-72 MHz, 76-88 MHz, 174-216 MHz, 470-608 MHz and 614-806 MHz).

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10.1.2 Unwanted Emission that complies with the undesirable emission ruling by 15.407 (b) (1) (2) (3),

Frequencies (MHz)	EIRP Limit (dBm)	Equivalent Field Strength at 3m (dBuV/m)
5150 – 5250	-27	68.3
5250 – 5350	-27	68.3
5470 - 5725	-27	68.3
5725 - 5850	-27	68.3

Limit derivation in terms of Field Strength:

$EIRP = ((E \cdot d)^2) / 30$, where E is the field in V/m, d is the measurement distance (3m), EIRP is the equivalent isotropically radiated power in Watts.

$$\begin{aligned} E &= 1000000 * (30 * EIRP)^{(1/2)} / 3 \text{ uV/m} \\ &= 68.3 \text{ dBuV/m} \end{aligned}$$

10.1.3 Band edge that complies with the ruling by FCC 14-30 (iv) (6),

Frequencies (MHz)	EIRP Limit (dBm)	Equivalent Field Strength at 3m (dBuV/m)
5725 – 5850	-17	78.2

Limit derivation in terms of band edge:

$$\begin{aligned} E &= 1000000 * (30 * EIRP)^{(1/2)} / 3 \text{ uV/m} \\ &= 78.2 \text{ dBuV/m} \end{aligned}$$

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10.2 EUT Setup

1. The radiated emission tests were performed in the 3 meter open-test site, using the setup in accordance with the ANSI C63.4:2009.
2. The EUT was put in the front of the test table. The host PC system was placed on the center of the back edge on the test table. The peripherals like modem, monitor printer, K/B, and mouse were placed on the side of the host PC system. The rear of the EUT and peripherals were placed flushed with the rear of the tabletop.
3. The keyboard was placed directly in the front of the monitor, flushed with the front tabletop. The mouse was placed next to the Keyboard, flushed with the back of keyboard.
4. The spacing between the peripherals was 10 centimeters.
5. External I/O cables were draped along the edge of the test table and bundle when necessary.
6. The host PC system was connected with 120Vac/60Hz power source.

10.3 Measurement Procedure

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

For measurements below 1GHz, follow the KDB 789033 D02 requirements in section H)3), “General Requirements for Unwanted Emissions Measurements” Compliance shall be demonstrated using CISPR quasi-peak detection; however, peak detection is permitted as an alternative to quasi-peak detection.

For Measurement above 1GHz, for peak unwanted emission measurements follow the KDB 789033 D02 requirements in section H)5) b), for average unwanted emission measurements follow the KDB 789033 D02 requirements in section H)6) c) or d).

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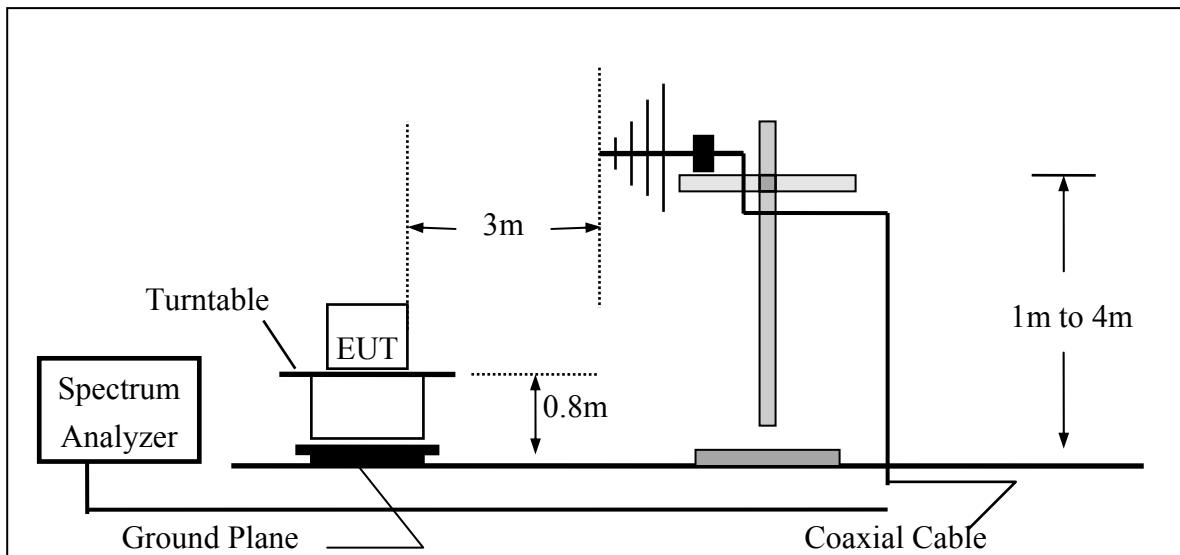
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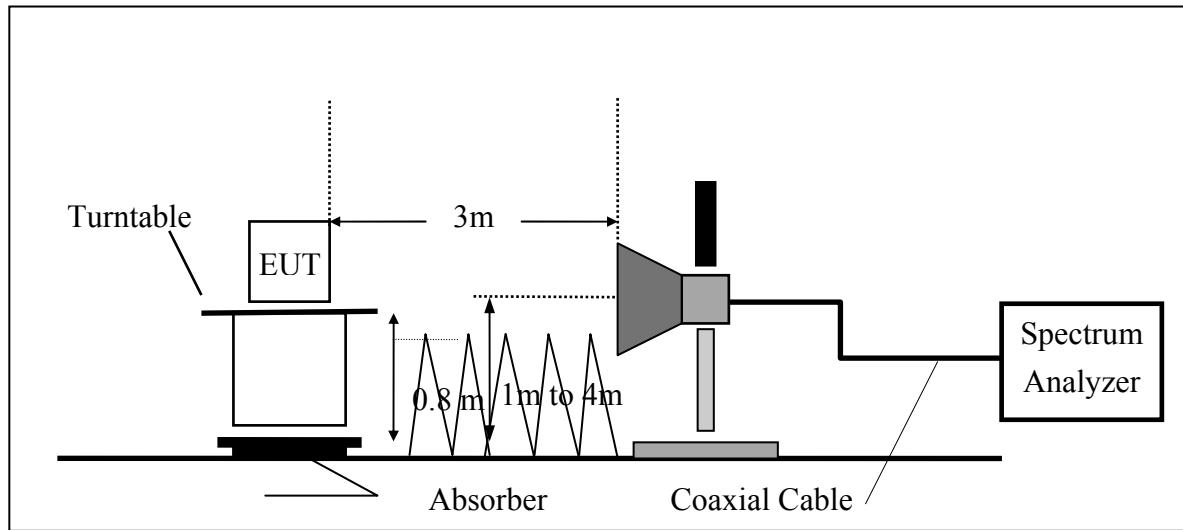
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10.4 Test SET-UP (Block Diagram of Configuration)

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



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



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10.5 Measurement Equipment Used:

966 Chamber					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
EMI Test Receiver	R&S	ESCI7	100760	05/26/2014	05/25/2015
Spectrum Analyzer	Agilent	E4446A	MY51100003	05/19/2014	05/18/2015
EXA Spectrum Analyzer	Agilent	N9010A	MY50420195	01/20/2014	01/19/2015
Spectrum Analyzer	R&S	FSV-30	101398	10/22/2013	10/21/2014
Loop Antenna	ETS.LINDGREN	6502	00148045	07/03/2014	07/02/2015
Bilog Antenna	SCHWAZBECK	VULB9168	378	05/19/2014	05/18/2015
Horn antenna	ETS.LINDGREN	3117	123995	05/19/2014	05/18/2015
Horn Antenna	Schwarzbeck	BBHA9170	184	01/23/2014	01/22/2015
Pre-Amplifier	EMC Instruments Corp.	EMC0126530	980038	01/03/2014	01/02/2015
Pre-Amplifier	Agilent	8447D	2944A07676	01/03/2014	01/02/2015
Pre-Amplifier	Agilent	8449B	3008A00578	01/03/2014	01/02/2015
Pre-Amplifier	EMC Instruments Corp.	EMC184045	980135	01/24/2014	01/23/2015
5150-5350 Band Reject Filter	Micro-Tronics	BRM50703	1	01/03/2014	01/02/2015
5470-5725 Band Reject Filter	Micro-Tronics	BRM50704	1	01/03/2014	01/02/2015
5725-5875 Band Reject Filter	Micro-Tronics	BRM50705	1	01/03/2014	01/02/2015
1GHz High Pass Filter	Micro-Tronics	HPM50108	32	02/27/2014	02/26/2015
2GHz High Pass Filter	Micro-Tronics	HPM50110	36	02/27/2014	02/26/2015
Attenuator	Mini-Circuit	BW-S10W2+	002	02/27/2014	02/26/2015
Turn Table	HD	DT420	N/A	N.C.R	N.C.R
Antenna Tower	HD	MA240-N	240/657	N.C.R	N.C.R
Controller	HD	HD100	N/A	N.C.R	N.C.R
Low Loss Cable	Huber Suhner	966_Rx	9	01/03/2014	01/02/2015
3m Site NSA	SGS	966 chamber	N/A	07/15/2014	07/14/2015

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10.6 Field Strength Calculation

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

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

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

10.7 Measurement Result

Refer to attach tabular data sheets.

NOTE:

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

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Radiated Spurious Emission Measurement Result 802.11a, 5150~5250 MHz

Operation Band	:802.11 a	Test Date	:2014-08-12
Fundamental Frequency	:5180 MHz	Temp./Humi.	:21 deg_C/58 RH
Operation Mode	:TX LOW	Engineer	:Tin
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:VERTICAL

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

Factor(dB) = Antenna Factor(dB μ V/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. MHz	Note F/H/E/S	Detector Mode	Spectrum Reading Level	Factor dB	Actual FS dB μ V	Limit @3m dB μ V/m	Margin dB
37.76	S	Peak	47.98	-13.68	34.30	40.00	-5.70
157.07	S	Peak	34.20	-12.44	21.76	43.50	-21.74
399.57	S	Peak	30.60	-9.08	21.52	46.00	-24.48
528.58	S	Peak	28.20	-7.35	20.85	46.00	-25.15
740.04	S	Peak	27.95	-2.95	25.00	46.00	-21.00
949.56	S	Peak	26.96	0.27	27.23	46.00	-18.77
5494.00	S	Peak	52.86	7.89	60.75	68.30	-7.55
10360.00	H	Peak	20.02	15.30	35.32	68.30	-32.98
15540.00	H	---					
20720.00	H	---					
25900.00	H	---					
31080.00	H	---					
36260.00	H						

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Operation Band :802.11 a
 Fundamental Frequency :5180 MHz
 Operation Mode :TX LOW
 EUT Pol. :E2 Plane

Test Date :2014-08-19
 Temp./Humi. :21 deg_C/58 RH
 Engineer :Tin
 Measurement Antenna Pol. :HORIZONTAL

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

Factor(dB) = Antenna Factor(dB μ V/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. MHz	Note F/H/E/S	Detector Mode	Spectrum Reading Level	Factor dB	Actual FS dB μ V	Limit @3m dB μ V/m	Margin dB
31.94	S	Peak	38.37	-13.88	24.49	40.00	-15.51
280.26	S	Peak	29.82	-11.61	18.21	46.00	-27.79
424.79	S	Peak	29.06	-8.81	20.25	46.00	-25.75
505.30	S	Peak	29.14	-7.37	21.77	46.00	-24.23
697.36	S	Peak	27.84	-3.89	23.95	46.00	-22.05
911.73	S	Peak	27.44	-0.44	27.00	46.00	-19.00
5186.00	S	Peak	43.10	7.60	50.70	68.30	-17.60
10360.00	H	Peak	20.21	15.30	35.51	68.30	-32.79
15540.00	H	---					
20720.00	H	---					
25900.00	H	---					
31080.00	H	---					
36260.00	H						

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Operation Band :802.11 a
Fundamental Frequency :5220 MHz
Operation Mode :TX MID
EUT Pol. :E2 Plane

Test Date :2014-08-12
Temp./Humi. :21 deg_C/58 RH
Engineer :Tin
Measurement Antenna Pol. :VERTICAL

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

Factor(dB) = Antenna Factor(dB μ V/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. MHz	Note F/H/E/S	Detector Mode	Spectrum Reading Level	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
36.79	S	Peak	48.08	-13.75	34.33	40.00	-5.67
152.22	S	Peak	32.49	-12.62	19.87	43.50	-23.63
399.57	S	Peak	31.68	-9.08	22.60	46.00	-23.40
517.91	S	Peak	27.49	-7.29	20.20	46.00	-25.80
746.83	S	Peak	27.40	-2.63	24.77	46.00	-21.23
916.58	S	Peak	27.51	-0.33	27.18	46.00	-18.82
5228.00	S	Peak	53.31	7.62	60.93	68.30	-7.37
10440.00	H	Peak	23.39	15.05	38.44	68.30	-29.86
15660.00	H	---					
20880.00	H	---					
26100.00	H	---					
31320.00	H	---					
36540.00							

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Operation Band :802.11 a
Fundamental Frequency :5220 MHz
Operation Mode :TX MID
EUT Pol. :E2 Plane

Test Date :2014-08-19
Temp./Humi. :21 deg_C/58 RH
Engineer :Tin
Measurement Antenna Pol. :HORIZONTAL

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

Factor(dB) = Antenna Factor(dB μ V/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. MHz	Note F/H/E/S	Detector Mode	Spectrum Reading Level	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin
						Factor dB	Actual FS dB μ V/m
120.21	S	Peak	35.20	-14.99	20.21	43.50	-23.29
280.26	S	Peak	30.47	-11.61	18.86	46.00	-27.14
424.79	S	Peak	28.61	-8.81	19.80	46.00	-26.20
523.73	S	Peak	28.81	-7.32	21.49	46.00	-24.51
677.96	S	Peak	27.86	-3.71	24.15	46.00	-21.85
976.72	S	Peak	27.06	0.26	27.32	54.00	-26.68
5228.00	S	Peak	44.39	7.62	52.01	68.30	-16.29
10440.00	H	Peak	19.70	15.05	34.75	68.30	-33.55
15660.00	H	---					
20880.00	H	---					
26100.00	H	---					
31320.00	H	---					
36540.00							

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Operation Band :802.11 a
 Fundamental Frequency :5240 MHz
 Operation Mode :TX HIGH
 EUT Pol. :E2 Plane

Test Date :2014-08-12
 Temp./Humi. :21 deg_C/58 RH
 Engineer :Tin
 Measurement Antenna Pol. :VERTICAL

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

Factor(dB) = Antenna Factor(dB μ V/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. MHz	Note F/H/E/S	Detector Mode	Spectrum Reading Level	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
37.76	S	Peak	48.29	-13.68	34.61	40.00	-5.39
226.91	S	Peak	34.55	-14.10	20.45	46.00	-25.55
399.57	S	Peak	30.47	-9.08	21.39	46.00	-24.61
532.46	S	Peak	28.02	-7.39	20.63	46.00	-25.37
714.82	S	Peak	28.35	-4.17	24.18	46.00	-21.82
915.61	S	Peak	26.99	-0.35	26.64	46.00	-19.36
5501.00	S	Peak	52.00	7.90	59.90	68.30	-8.40
10480.00	H	Peak	24.05	15.48	39.53	68.30	-28.77
15720.00	H	---					
20960.00	H	---					
26200.00	H	---					
31440.00	H	---					
36680.00							

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Operation Band :802.11 a
Fundamental Frequency :5240 MHz
Operation Mode :TX HIGH
EUT Pol. :E2 Plane

Test Date :2014-08-19
Temp./Humi. :21 deg_C/58 RH
Engineer :Tin
Measurement Antenna Pol. :HORIZONTAL

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

Factor(dB) = Antenna Factor(dB μ V/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. MHz	Note F/H/E/S	Detector Mode	Spectrum Reading Level	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
120.21	S	Peak	35.55	-14.99	20.56	43.50	-22.94
280.26	S	Peak	29.05	-11.61	17.44	46.00	-28.56
424.79	S	Peak	29.12	-8.81	20.31	46.00	-25.69
470.38	S	Peak	27.49	-7.71	19.78	46.00	-26.22
747.80	S	Peak	26.66	-2.59	24.07	46.00	-21.93
973.81	S	Peak	27.11	0.31	27.42	54.00	-26.58
5249.00	S	Peak	49.70	7.63	57.33	68.30	-10.97
10480.00	H	Peak	20.16	15.48	35.64	68.30	-32.66
15720.00	H	---					
20960.00	H	---					
26200.00	H	---					
31440.00	H	---					
36680.00	H						

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Radiated Emission:

Operation Band	:802.11 a	Test Date	:2014-09-23
Fundamental Frequency	:5180 MHz	Temp./Humi.	:21 deg_C/58 RH
Operation Mode	:Band Edge LOW	Engineer	:Curry
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:VERTICAL

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

Factor(dB) = Antenna Factor(dB μ V/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.

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

Freq. MHz	Note F/H/E/S	Detector PK/QP/AV	Spectrum		Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
			Mode	Reading Level dB μ V				
5150.00	E	Average		45.89	7.54	53.43	54.00	-0.57
5150.00	E	Peak		64.59	7.54	72.13	74.00	-1.87

Operation Band	:802.11 a	Test Date	:2014-09-23
Fundamental Frequency	:5180 MHz	Temp./Humi.	:21 deg_C/58 RH
Operation Mode	:Band Edge LOW	Engineer	:Curry
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:HORIZONTAL

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

Factor(dB) = Antenna Factor(dB μ V/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.

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

Freq. MHz	Note F/H/E/S	Detector PK/QP/AV	Spectrum		Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
			Mode	Reading Level dB μ V				
5150.00	E	Average		39.58	7.54	47.12	54.00	-6.88
5150.00	E	Peak		56.00	7.54	63.54	74.00	-10.46

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Radiated Spurious Emission Measurement Result 802.11n HT20, 5150~5250 MHz

Operation Band	:802.11 n20M	Test Date	:2014-08-12
Fundamental Frequency	:5180 MHz	Temp./Humi.	:21 deg_C/58 RH
Operation Mode	:TX LOW	Engineer	:Tin
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:VERTICAL

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

Factor(dB) = Antenna Factor(dB μ V/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. MHz	Note F/H/E/S	Detector Mode	Spectrum Reading Level	Factor dB	Actual FS dB μ V	Limit @3m dB μ V/m	Margin dB
37.76	S	Peak	48.08	-13.68	34.40	40.00	-5.60
156.10	S	Peak	34.02	-12.48	21.54	43.50	-21.96
399.57	S	Peak	30.28	-9.08	21.20	46.00	-24.80
475.23	S	Peak	28.57	-7.66	20.91	46.00	-25.09
735.19	S	Peak	27.80	-3.28	24.52	46.00	-21.48
985.45	S	Peak	27.13	0.29	27.42	54.00	-26.58
5536.00	S	Peak	52.36	7.90	60.26	68.30	-8.04
10360.00	H	Peak	20.94	15.30	36.24	68.30	-32.06
15540.00	H	---					
20720.00	H	---					
25900.00	H	---					
31080.00	H						
36260.00	H	---					

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Operation Band :802.11 n20M Test Date :2014-08-19
 Fundamental Frequency :5180 MHz Temp./Humi. :21 deg_C/58 RH
 Operation Mode :TX LOW Engineer :Tin
 EUT Pol. :E2 Plane Measurement Antenna Pol. :HORIZONTAL

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

Factor(dB) = Antenna Factor(dB μ V/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. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
31.94	S	Peak	37.60	-13.88	23.72	40.00	-16.28
280.26	S	Peak	31.81	-11.61	20.20	46.00	-25.80
435.46	S	Peak	28.25	-8.72	19.53	46.00	-26.47
553.80	S	Peak	28.16	-6.92	21.24	46.00	-24.76
685.72	S	Peak	27.92	-3.64	24.28	46.00	-21.72
959.26	S	Peak	27.34	0.34	27.68	46.00	-18.32
5179.00	S	Peak	42.99	7.58	50.57	68.30	-17.73
10360.00	H	Peak	19.44	15.30	34.74	68.30	-33.56
15540.00	H	---					
20720.00	H	---					
25900.00	H	---					
31080.00	H						
36260.00	H	---					

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Operation Band :802.11 n20M Test Date :2014-08-12
Fundamental Frequency :5220 MHz Temp./Humi. :21 deg_C/58 RH
Operation Mode :TX MID Engineer :Tin
EUT Pol. :E2 Plane Measurement Antenna Pol. :VERTICAL

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

Factor(dB) = Antenna Factor(dB μ V/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. MHz	Note F/H/E/S	Detector Mode	Spectrum Reading Level	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
37.76	S	Peak	47.56	-13.68	33.88	40.00	-6.12
231.76	S	Peak	34.97	-13.86	21.11	46.00	-24.89
399.57	S	Peak	30.70	-9.08	21.62	46.00	-24.38
520.82	S	Peak	27.25	-7.30	19.95	46.00	-26.05
727.43	S	Peak	29.17	-3.75	25.42	46.00	-20.58
985.45	S	Peak	26.86	0.29	27.15	54.00	-26.85
5221.00	S	Peak	54.08	7.61	61.69	68.30	-6.61
10440.00	H	Peak	23.32	15.05	38.37	68.30	-29.93
15660.00	H	---					
20880.00	H	---					
26100.00	H	---					
31320.00	H						
36540.00	H	---					

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Operation Band :802.11 n20M Test Date :2014-08-19
Fundamental Frequency :5220 MHz Temp./Humi. :21 deg_C/58 RH
Operation Mode :TX MID Engineer :Tin
EUT Pol. :E2 Plane Measurement Antenna Pol. :HORIZONTAL

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

Factor(dB) = Antenna Factor(dB μ V/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. MHz	Note F/H/E/S	Detector Mode	Spectrum Reading Level	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
31.94	S	Peak	37.46	-13.88	23.58	40.00	-16.42
280.26	S	Peak	30.91	-11.61	19.30	46.00	-26.70
435.46	S	Peak	30.23	-8.72	21.51	46.00	-24.49
547.01	S	Peak	28.14	-7.26	20.88	46.00	-25.12
750.71	S	Peak	26.27	-2.48	23.79	46.00	-22.21
967.99	S	Peak	26.76	0.36	27.12	54.00	-26.88
5228.00	S	Peak	46.54	7.62	54.16	68.30	-14.14
10440.00	H	Peak	19.42	15.05	34.47	68.30	-33.83
15660.00	H	---					
20880.00	H	---					
26100.00	H	---					
31320.00	H						
36540.00	H	---					

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Operation Band :802.11 n20M Test Date :2014-08-12
Fundamental Frequency :5240 MHz Temp./Humi. :21 deg_C/58 RH
Operation Mode :TX HIGH Engineer :Tin
EUT Pol. :E2 Plane Measurement Antenna Pol. :VERTICAL

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

Factor(dB) = Antenna Factor(dB μ V/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. MHz	Note F/H/E/S	Detector Mode	Spectrum Reading Level	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
37.76	S	Peak	48.32	-13.68	34.64	40.00	-5.36
225.94	S	Peak	35.14	-14.14	21.00	46.00	-25.00
399.57	S	Peak	30.74	-9.08	21.66	46.00	-24.34
559.62	S	Peak	27.44	-6.54	20.90	46.00	-25.10
689.60	S	Peak	28.44	-3.64	24.80	46.00	-21.20
941.80	S	Peak	26.51	0.16	26.67	46.00	-19.33
5536.00	S	Peak	55.77	7.90	63.67	68.30	-4.63
10480.00	H	Peak	24.15	15.48	39.63	68.30	-28.67
15720.00	H	---					
20960.00	H	---					
26200.00	H	---					
31440.00	H						
36680.00	H	---					

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Operation Band :802.11 n20M Test Date :2014-08-19
Fundamental Frequency :5240 MHz Temp./Humi. :21 deg_C/58 RH
Operation Mode :TX HIGH Engineer :Tin
EUT Pol. :E2 Plane Measurement Antenna Pol. :HORIZONTAL

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

Factor(dB) = Antenna Factor(dB μ V/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. MHz	Note F/H/E/S	Detector Mode	Spectrum Reading Level	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
31.94	S	Peak	37.05	-13.88	23.17	40.00	-16.83
280.26	S	Peak	29.42	-11.61	17.81	46.00	-28.19
350.10	S	Peak	29.17	-10.12	19.05	46.00	-26.95
559.62	S	Peak	27.44	-6.54	20.90	46.00	-25.10
750.71	S	Peak	27.11	-2.48	24.63	46.00	-21.37
961.20	S	Peak	27.87	0.36	28.23	54.00	-25.77
5242.00	S	Peak	50.34	7.62	57.96	68.30	-10.34
10480.00	H	Peak	20.22	15.48	35.70	68.30	-32.60
15720.00	H	---					
20960.00	H	---					
26200.00	H	---					
31440.00	H						
36680.00	H	---					

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Radiated Emission:

Operation Band	:802.11 n20M	Test Date	:2014-09-23
Fundamental Frequency	:5180 MHz	Temp./Humi.	:21 deg_C/58 RH
Operation Mode	:Band Edge LOW	Engineer	:Curry
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:VERTICAL

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

Factor(dB) = Antenna Factor(dB μ V/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.

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

Freq. MHz	Note F/H/E/S	Detector PK/QP/AV	Spectrum		Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
			Mode	Reading Level dB μ V				
5150.00	E	Average		39.56	7.54	47.10	54.00	-6.90
5150.00	E	Peak		60.56	7.54	68.10	74.00	-5.90

Operation Band	:802.11 n20M	Test Date	:2014-09-23
Fundamental Frequency	:5180 MHz	Temp./Humi.	:21 deg_C/58 RH
Operation Mode	:Band Edge LOW	Engineer	:Curry
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:HORIZONTAL

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

Factor(dB) = Antenna Factor(dB μ V/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.

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

Freq. MHz	Note F/H/E/S	Detector PK/QP/AV	Spectrum		Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
			Mode	Reading Level dB μ V				
5150.00	E	Peak		52.65	7.54	60.19	74.00	-13.81
5150.00	E	Peak		31.99	7.54	39.53	74.00	-34.47

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Radiated Spurious Emission Measurement Result 802.11n HT40, 5150~5250 MHz

Operation Band	:802.11 n40M	Test Date	:2014-08-12
Fundamental Frequency	:5190 MHz	Temp./Humi.	:21 deg_C/58 RH
Operation Mode	:TX LOW	Engineer	:Tin
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:VERTICAL

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

Factor(dB) = Antenna Factor(dB μ V/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. MHz	Note F/H/E/S	Detector Mode	Spectrum Reading Level	Factor dB	Actual FS dB μ V	Limit @3m dB μ V/m	Margin dB
37.76	S	Peak	47.95	-13.68	34.27	40.00	-5.73
223.03	S	Peak	33.52	-14.24	19.28	46.00	-26.72
399.57	S	Peak	30.26	-9.08	21.18	46.00	-24.82
484.93	S	Peak	27.89	-7.59	20.30	46.00	-25.70
757.50	S	Peak	27.69	-2.52	25.17	46.00	-20.83
984.48	S	Peak	26.35	0.28	26.63	54.00	-27.37
5529.00	S	Peak	51.47	7.91	59.38	68.30	-8.92
10380.00	H	Peak	19.58	15.16	34.74	68.30	-33.56
15570.00	H	---					
20760.00	H	---					
25950.00	H	---					
31140.00	H	---					
36330.00	H	---					

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Operation Band :802.11 n40M Test Date :2014-08-19
Fundamental Frequency :5190 MHz Temp./Humi. :21 deg_C/58 RH
Operation Mode :TX LOW Engineer :Tin
EUT Pol. :E2 Plane Measurement Antenna Pol. :HORIZONTAL

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

Factor(dB) = Antenna Factor(dB μ V/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. MHz	Note F/H/E/S	Detector Mode	Spectrum Reading Level	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin
120.21	S	Peak	35.75	-14.99	20.76	43.50	-22.74
155.13	S	Peak	30.13	-12.51	17.62	43.50	-25.88
424.79	S	Peak	28.85	-8.81	20.04	46.00	-25.96
551.86	S	Peak	27.80	-7.05	20.75	46.00	-25.25
746.83	S	Peak	27.97	-2.63	25.34	46.00	-20.66
990.30	S	Peak	26.91	0.36	27.27	54.00	-26.73
5193.00	S	Peak	41.54	7.61	49.15	68.30	-19.15
10380.00	H	Peak	18.67	15.16	33.83	68.30	-34.47
15570.00	H	---					
20760.00	H	---					
25950.00	H	---					
31140.00	H	---					
36330.00	H	---					

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Operation Band :802.11 n40M Test Date :2014-08-12
Fundamental Frequency :5230 MHz Temp./Humi. :21 deg_C/58 RH
Operation Mode :TX HIGH Engineer :Tin
EUT Pol. :E2 Plane Measurement Antenna Pol. :VERTICAL

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

Factor(dB) = Antenna Factor(dB μ V/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. MHz	Note F/H/E/S	Detector Mode	Spectrum Reading Level	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin
36.79	S	Peak	48.17	-13.75	34.42	40.00	-5.58
224.00	S	Peak	34.55	-14.20	20.35	46.00	-25.65
399.57	S	Peak	31.15	-9.08	22.07	46.00	-23.93
554.77	S	Peak	27.08	-6.86	20.22	46.00	-25.78
734.22	S	Peak	29.02	-3.35	25.67	46.00	-20.33
971.87	S	Peak	27.32	0.33	27.65	54.00	-26.35
5501.00	S	Peak	52.40	7.90	60.30	68.30	-8.00
10460.00	H	Peak	19.40	15.25	34.65	68.30	-33.65
15690.00	H	---					
20920.00	H	---					
26150.00	H	---					
31380.00	H	---					
36610.00	H	---					

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Operation Band :802.11 n40M Test Date :2014-08-19
Fundamental Frequency :5230 MHz Temp./Humi. :21 deg_C/58 RH
Operation Mode :TX HIGH Engineer :Tin
EUT Pol. :E2 Plane Measurement Antenna Pol. :HORIZONTAL

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

Factor(dB) = Antenna Factor(dB μ V/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. MHz	Note F/H/E/S	Detector Mode	Spectrum Reading Level	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
34.85	S	Peak	34.29	-13.86	20.43	40.00	-19.57
280.26	S	Peak	29.89	-11.61	18.28	46.00	-27.72
350.10	S	Peak	30.43	-10.12	20.31	46.00	-25.69
534.40	S	Peak	27.99	-7.41	20.58	46.00	-25.42
689.60	S	Peak	27.97	-3.64	24.33	46.00	-21.67
952.47	S	Peak	26.88	0.29	27.17	46.00	-18.83
5242.00	S	Peak	43.63	7.62	51.25	68.30	-17.05
10460.00	H	Peak	19.25	15.25	34.50	68.30	-33.80
15690.00	H	---					
20920.00	H	---					
26150.00	H	---					
31380.00	H	---					
36610.00	H	---					

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Radiated Emission:

Operation Band	:802.11 n40M	Test Date	:2014-09-23
Fundamental Frequency	:5190 MHz	Temp./Humi.	:21 deg_C/58 RH
Operation Mode	:Band Edge LOW	Engineer	:Curry
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:VERTICAL

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

Factor(dB) = Antenna Factor(dB μ V/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.

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

Freq. MHz	Note F/H/E/S	Detector PK/QP/AV	Spectrum		Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
			Mode	Reading Level dB μ V				
5150.00	E	Average	45.95	7.54	53.49	54.00	-0.51	
5150.00	E	Peak	64.55	7.54	72.09	74.00	-1.91	

Operation Band	:802.11 n40M	Test Date	:2014-09-23
Fundamental Frequency	:5190 MHz	Temp./Humi.	:21 deg_C/58 RH
Operation Mode	:Band Edge LOW	Engineer	:Curry
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:HORIZONTAL

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

Factor(dB) = Antenna Factor(dB μ V/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.

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

Freq. MHz	Note F/H/E/S	Detector PK/QP/AV	Spectrum		Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
			Mode	Reading Level dB μ V				
5150.00	E	Average	33.96	7.54	41.50	54.00	-12.50	
5150.00	E	Peak	47.57	7.54	55.11	74.00	-18.89	

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Radiated Spurious Emission Measurement Result 802.11a HT20, 5725~5850 MHz

Operation Band	:802.11 a	Test Date	:2014-08-12
Fundamental Frequency	:5745 MHz	Temp./Humi.	:21 deg_C/58 RH
Operation Mode	:TX LOW	Engineer	:Tin
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:VERTICAL

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

Factor(dB) = Antenna Factor(dB μ V/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. MHz	Note F/H/E/S	Detector Mode	Spectrum Reading Level	Factor dB	Actual FS dB μ V	Limit @3m dB μ V/m	Margin dB
						Limit dB μ V/m	Margin dB
36.79	S	Peak	48.68	-13.75	34.93	40.00	-5.07
157.07	S	Peak	33.29	-12.44	20.85	43.50	-22.65
399.57	S	Peak	30.43	-9.08	21.35	46.00	-24.65
548.95	S	Peak	26.96	-7.21	19.75	46.00	-26.25
735.19	S	Peak	29.68	-3.28	26.40	46.00	-19.60
978.66	S	Peak	27.25	0.24	27.49	54.00	-26.51
5487.00	S	Peak	54.40	7.90	62.30	68.30	-6.00
11490.00	H	Average	31.97	17.88	49.85	54.00	-4.15
11490.00	H	Peak	33.71	17.88	51.59	74.00	-22.41
17235.00	H	---					
22980.00	H	---					
28725.00	H	---					
34470.00	H	---					

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Operation Band :802.11 a
Fundamental Frequency :5745 MHz
Operation Mode :TX LOW
EUT Pol. :E2 Plane

Test Date :2014-08-19
Temp./Humi. :21 deg_C/58 RH
Engineer :Tin
Measurement Antenna Pol. :HORIZONTAL

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

Factor(dB) = Antenna Factor(dB μ V/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. MHz	Note F/H/E/S	Detector Mode	Spectrum Reading Level	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
120.21	S	Peak	36.08	-14.99	21.09	43.50	-22.41
280.26	S	Peak	30.53	-11.61	18.92	46.00	-27.08
340.40	S	Peak	30.55	-10.41	20.14	46.00	-25.86
532.46	S	Peak	27.68	-7.39	20.29	46.00	-25.71
755.56	S	Peak	26.95	-2.50	24.45	46.00	-21.55
947.62	S	Peak	27.08	0.25	27.33	46.00	-18.67
5277.00	S	Peak	44.66	7.68	52.34	68.30	-15.96
11490.00	H	Average	32.91	17.88	50.79	54.00	-3.21
11490.00	H	Peak	35.40	17.88	53.28	74.00	-20.72
17235.00	H	---					
22980.00	H	---					
28725.00	H	---					
34470.00	H	---					

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Operation Band :802.11 a
Fundamental Frequency :5785 MHz
Operation Mode :TX MID
EUT Pol. :E2 Plane
Test Date :2014-08-12
Temp./Humi. :21 deg_C/58 RH
Engineer :Tin
Measurement Antenna Pol. :VERTICAL

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

Factor(dB) = Antenna Factor(dB μ V/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. MHz	Note F/H/E/S	Detector Mode	Spectrum Reading Level	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin
37.76	S	Peak	47.41	-13.68	33.73	40.00	-6.27
153.19	S	Peak	32.28	-12.58	19.70	43.50	-23.80
399.57	S	Peak	29.16	-9.08	20.08	46.00	-25.92
550.89	S	Peak	27.23	-7.12	20.11	46.00	-25.89
750.71	S	Peak	27.77	-2.48	25.29	46.00	-20.71
918.52	S	Peak	27.11	-0.29	26.82	46.00	-19.18
5459.00	S	Peak	55.46	7.87	63.33	68.30	-4.97
11570.00	H	Average	32.23	17.74	49.97	54.00	-4.03
11570.00	H	Peak	34.18	17.74	51.92	74.00	-22.08
17355.00	H	---					
23140.00	H	---					
28925.00	H	---					
34710.00	H	---					

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Operation Band	:802.11 a	Test Date	:2014-08-19
Fundamental Frequency	:5785 MHz	Temp./Humi.	:21 deg_C/58 RH
Operation Mode	:TX MID	Engineer	:Tin
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:HORIZONTAL

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

Factor(dB) = Antenna Factor(dB μ V/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. MHz	Note F/H/E/S	Detector Mode	Spectrum Reading Level	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
120.21	S	Peak	35.59	-14.99	20.60	43.50	-22.90
280.26	S	Peak	30.10	-11.61	18.49	46.00	-27.51
435.46	S	Peak	28.75	-8.72	20.03	46.00	-25.97
511.12	S	Peak	28.46	-7.32	21.14	46.00	-24.86
749.74	S	Peak	26.58	-2.50	24.08	46.00	-21.92
914.64	S	Peak	27.21	-0.37	26.84	46.00	-19.16
5333.00	S	Peak	44.70	7.83	52.53	68.30	-15.77
11570.00	H	Average	26.58	17.74	44.32	54.00	-9.68
11570.00	H	Peak	28.04	17.74	45.78	74.00	-28.22
17355.00	H	---					
23140.00	H	---					
28925.00	H	---					
34710.00	H	---					

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Operation Band :802.11 a
Fundamental Frequency :5825 MHz
Operation Mode :TX HIGH
EUT Pol. :E2 Plane

Test Date :2014-08-12
Temp./Humi. :21 deg_C/58 RH
Engineer :Tin
Measurement Antenna Pol. :VERTICAL

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

Factor(dB) = Antenna Factor(dB μ V/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. MHz	Note F/H/E/S	Detector Mode	Spectrum Reading Level	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
37.76	S	Peak	48.04	-13.68	34.36	40.00	-5.64
155.13	S	Peak	32.95	-12.51	20.44	43.50	-23.06
399.57	S	Peak	31.04	-9.08	21.96	46.00	-24.04
554.77	S	Peak	27.30	-6.86	20.44	46.00	-25.56
743.92	S	Peak	27.46	-2.77	24.69	46.00	-21.31
951.50	S	Peak	28.17	0.29	28.46	46.00	-17.54
5410.00	S	Peak	54.57	7.79	62.36	68.30	-5.94
11650.00	H	Average	23.57	17.94	41.51	54.00	-12.49
11650.00	H	Peak	25.92	17.94	43.86	74.00	-30.14
17475.00	H	---					
23300.00	H	---					
29125.00	H	---					
34950.00	H	---					

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Operation Band :802.11 a
Fundamental Frequency :5825 MHz
Operation Mode :TX HIGH
EUT Pol. :E2 Plane

Test Date :2014-08-19
Temp./Humi. :21 deg_C/58 RH
Engineer :Tin
Measurement Antenna Pol. :HORIZONTAL

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

Factor(dB) = Antenna Factor(dB μ V/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. MHz	Note F/H/E/S	Detector Mode	Spectrum Reading Level	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
31.94	S	Peak	37.92	-13.88	24.04	40.00	-15.96
280.26	S	Peak	28.87	-11.61	17.26	46.00	-28.74
434.49	S	Peak	28.03	-8.75	19.28	46.00	-26.72
513.06	S	Peak	29.72	-7.31	22.41	46.00	-23.59
756.53	S	Peak	27.89	-2.51	25.38	46.00	-20.62
977.69	S	Peak	27.52	0.26	27.78	54.00	-26.22
5333.00	S	Peak	44.37	7.83	52.20	68.30	-16.10
11650.00	H	Average	22.22	17.94	40.16	54.00	-13.84
11650.00	H	Peak	24.69	17.94	42.63	74.00	-31.37
17475.00	H	---					
23300.00	H	---					
29125.00	H	---					
34950.00	H	---					

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Radiated Emission:

Operation Band	:802.11 a	Test Date	:2014-09-23
Fundamental Frequency	:5745 MHz	Temp./Humi.	:21 deg_C/58 RH
Operation Mode	:Band Edge LOW	Engineer	:Curry
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:VERTICAL

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

Factor(dB) = Antenna Factor(dB μ V/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.

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

Freq. MHz	Note F/H/E/S	Detector PK/QP/AV	Spectrum		Factor dB	Actual dB μ V/m	Limit @3m dB μ V/m	Margin dB
			Mode	Reading Level dB μ V				
5725.00	E	Peak		62.50	8.20	70.70	78.20	-7.50

Operation Band	:802.11 a	Test Date	:2014-09-23
Fundamental Frequency	:5745 MHz	Temp./Humi.	:21 deg_C/58 RH
Operation Mode	:Band Edge LOW	Engineer	:Curry
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:HORIZONTAL

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

Factor(dB) = Antenna Factor(dB μ V/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.

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

Freq. MHz	Note F/H/E/S	Detector PK/QP/AV	Spectrum		Factor dB	Actual dB μ V/m	Limit @3m dB μ V/m	Margin dB
			Mode	Reading Level dB μ V				
5725.00	E	Peak		51.90	8.20	60.10	78.20	-18.10

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Operation Band	:802.11 a	Test Date	:2014-09-23
Fundamental Frequency	:5825 MHz	Temp./Humi.	:21 deg_C/58 RH
Operation Mode	:Band Edge HIGH	Engineer	:Curry
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:VERTICAL

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

Factor(dB) = Antenna Factor(dB μ V/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.

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

Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum		Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
			Mode	Reading Level dB μ V				
5850.00	E	Peak	50.06	8.42	58.48	78.20	-19.72	

Operation Band	:802.11 a	Test Date	:2014-09-23
Fundamental Frequency	:5825 MHz	Temp./Humi.	:21 deg_C/58 RH
Operation Mode	:Band Edge HIGH	Engineer	:Curry
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:HORIZONTAL

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

Factor(dB) = Antenna Factor(dB μ V/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.

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

Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum		Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
			Mode	Reading Level dB μ V				
5850.00	E	Peak	44.27	8.42	52.69	78.20	-25.51	

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Radiated Spurious Emission Measurement Result 802.11n HT20, 5725~5850 MHz

Operation Band	:802.11 n20M	Test Date	:2014-08-12
Fundamental Frequency	:5745 MHz	Temp./Humi.	:21 deg_C/58 RH
Operation Mode	:TX LOW	Engineer	:Tin
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:VERTICAL

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

Factor(dB) = Antenna Factor(dB μ V/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. MHz	Note F/H/E/S	Detector Mode	Spectrum Reading Level	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
36.79	S	Peak	47.47	-13.75	33.72	40.00	-6.28
223.03	S	Peak	34.32	-14.24	20.08	46.00	-25.92
399.57	S	Peak	31.82	-9.08	22.74	46.00	-23.26
494.63	S	Peak	27.68	-7.51	20.17	46.00	-25.83
689.60	S	Peak	28.00	-3.64	24.36	46.00	-21.64
981.57	S	Peak	26.94	0.24	27.18	54.00	-26.82
5536.00	S	Peak	54.73	7.90	62.63	68.30	-5.67
11490.00	H	Average	24.85	17.88	42.73	54.00	-11.27
11490.00	H	Peak	26.66	17.88	44.54	74.00	-29.46
17235.00	H	---					
22980.00	H	---					
28725.00	H	---					
34470.00	H	---					

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Operation Band :802.11 n20M Test Date :2014-08-19
 Fundamental Frequency :5745 MHz Temp./Humi. :21 deg_C/58 RH
 Operation Mode :TX LOW Engineer :Tin
 EUT Pol. :E2 Plane Measurement Antenna Pol. :HORIZONTAL

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

Factor(dB) = Antenna Factor(dB μ V/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. MHz	Note F/H/E/S	Detector Mode	Spectrum Reading Level	Factor dB	Actual FS dB μ V	Limit @3m dB μ V/m	Margin dB
120.21	S	Peak	34.75	-14.99	19.76	43.50	-23.74
280.26	S	Peak	30.12	-11.61	18.51	46.00	-27.49
435.46	S	Peak	28.61	-8.72	19.89	46.00	-26.11
481.05	S	Peak	28.70	-7.61	21.09	46.00	-24.91
756.53	S	Peak	28.17	-2.51	25.66	46.00	-20.34
936.95	S	Peak	26.79	0.08	26.87	46.00	-19.13
5340.00	S	Peak	43.99	7.80	51.79	68.30	-16.51
11490.00	H	Average	23.27	17.88	41.15	54.00	-12.85
11490.00	H	Peak	25.42	17.88	43.30	74.00	-30.70
17235.00	H	---					
22980.00	H	---					
28725.00	H	---					
34470.00	H	---					

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Operation Band	:802.11 n20M	Test Date	:2014-08-12
Fundamental Frequency	:5785 MHz	Temp./Humi.	:21 deg_C/58 RH
Operation Mode	:TX MID	Engineer	:Tin
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:VERTICAL

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

Factor(dB) = Antenna Factor(dB μ V/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. MHz	Note F/H/E/S	Detector Mode	Spectrum Reading Level	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin
38.73	S	Peak	46.56	-13.61	32.95	40.00	-7.05
204.60	S	Peak	35.20	-15.13	20.07	43.50	-23.43
399.57	S	Peak	30.84	-9.08	21.76	46.00	-24.24
505.30	S	Peak	27.18	-7.37	19.81	46.00	-26.19
679.90	S	Peak	28.14	-3.65	24.49	46.00	-21.51
985.45	S	Peak	26.42	0.29	26.71	54.00	-27.29
5550.00	S	Peak	55.78	7.90	63.68	68.30	-4.62
11570.00	H	Average	23.66	17.74	41.40	54.00	-12.60
11570.00	H	Peak	25.84	17.74	43.58	74.00	-30.42
17355.00	H	---					
23140.00	H	---					
28925.00	H	---					
34710.00	H	---					

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Operation Band	:802.11 n20M	Test Date	:2014-08-19
Fundamental Frequency	:5785 MHz	Temp./Humi.	:21 deg_C/58 RH
Operation Mode	:TX MID	Engineer	:Tin
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:HORIZONTAL

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

Factor(dB) = Antenna Factor(dB μ V/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. MHz	Note F/H/E/S	Detector Mode	Spectrum Reading Level	Factor dB	Actual	Limit @3m dB μ V/m	Margin dB
					FS dB μ V/m		
120.21	S	Peak	34.66	-14.99	19.67	43.50	-23.83
280.26	S	Peak	29.89	-11.61	18.28	46.00	-27.72
350.10	S	Peak	29.12	-10.12	19.00	46.00	-27.00
510.15	S	Peak	27.36	-7.32	20.04	46.00	-25.96
749.74	S	Peak	26.23	-2.50	23.73	46.00	-22.27
958.29	S	Peak	25.95	0.34	26.29	46.00	-19.71
5333.00	S	Peak	44.13	7.83	51.96	68.30	-16.34
11570.00	H	Average	22.65	17.74	40.39	54.00	-13.61
11570.00	H	Peak	24.64	17.74	42.38	74.00	-31.62
17355.00	H	---					
23140.00	H	---					
28925.00	H	---					
34710.00	H	---					

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

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Operation Band :802.11 n20M Test Date :2014-08-12
Fundamental Frequency :5825 MHz Temp./Humi. :21 deg_C/58 RH
Operation Mode :TX HIGH Engineer :Tin
EUT Pol. :E2 Plane Measurement Antenna Pol. :VERTICAL

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

Factor(dB) = Antenna Factor(dB μ V/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. MHz	Note F/H/E/S	Detector Mode	Spectrum Reading Level	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
37.76	S	Peak	47.32	-13.68	33.64	40.00	-6.36
154.16	S	Peak	32.75	-12.55	20.20	43.50	-23.30
399.57	S	Peak	29.78	-9.08	20.70	46.00	-25.30
554.77	S	Peak	27.55	-6.86	20.69	46.00	-25.31
695.42	S	Peak	28.23	-3.82	24.41	46.00	-21.59
941.80	S	Peak	26.37	0.16	26.53	46.00	-19.47
5501.00	S	Peak	56.30	7.90	64.20	68.30	-4.10
11650.00	H	Average	23.12	17.94	41.06	54.00	-12.94
11650.00	H	Peak	25.50	17.94	43.44	74.00	-30.56
17475.00	H	---					
23300.00	H	---					
29125.00	H	---					
34950.00	H	---					

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Operation Band	:802.11 n20M	Test Date	:2014-08-19
Fundamental Frequency	:5825 MHz	Temp./Humi.	:21 deg_C/58 RH
Operation Mode	:TX HIGH	Engineer	:Tin
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:HORIZONTAL

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

Factor(dB) = Antenna Factor(dB μ V/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. MHz	Note F/H/E/S	Detector Mode	Spectrum Reading Level	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
31.94	S	Peak	36.34	-13.88	22.46	40.00	-17.54
280.26	S	Peak	31.82	-11.61	20.21	46.00	-25.79
350.10	S	Peak	30.71	-10.12	20.59	46.00	-25.41
522.76	S	Peak	27.67	-7.32	20.35	46.00	-25.65
670.20	S	Peak	28.55	-4.05	24.50	46.00	-21.50
825.40	S	Peak	29.50	-2.02	27.48	46.00	-18.52
5284.00	S	Peak	43.96	7.71	51.67	68.30	-16.63
11650.00	H	Average	22.22	17.94	40.16	54.00	-13.84
11650.00	H	Peak	24.27	17.94	42.21	74.00	-31.79
17475.00	H	---					
23300.00	H	---					
29125.00	H	---					
34950.00	H	---					

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Radiated Emission:

Operation Band	:802.11 n20M	Test Date	:2014-09-23
Fundamental Frequency	:5745 MHz	Temp./Humi.	:21 deg_C/58 RH
Operation Mode	:Band Edge LOW	Engineer	:Curry
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:VERTICAL

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

Factor(dB) = Antenna Factor(dB μ V/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.

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

Freq. MHz	Note F/H/E/S	Detector PK/QP/AV	Spectrum		Factor dB	Actual dB μ V/m	Limit @3m dB μ V/m	Margin dB
			Mode	Reading Level dB μ V				
5725.00	E	Peak		67.86	8.20	76.06	78.20	-2.14

Operation Band	:802.11 n20M	Test Date	:2014-09-23
Fundamental Frequency	:5745 MHz	Temp./Humi.	:21 deg_C/58 RH
Operation Mode	:Band Edge LOW	Engineer	:Curry
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:HORIZONTAL

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

Factor(dB) = Antenna Factor(dB μ V/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.

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

Freq. MHz	Note F/H/E/S	Detector PK/QP/AV	Spectrum		Factor dB	Actual dB μ V/m	Limit @3m dB μ V/m	Margin dB
			Mode	Reading Level dB μ V				
5725.00	E	Peak		51.58	8.20	59.78	78.20	-18.42

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Operation Band	:802.11 n20M	Test Date	:2014-09-23
Fundamental Frequency	:5825 MHz	Temp./Humi.	:21 deg_C/58 RH
Operation Mode	:Band Edge HIGH	Engineer	:Curry
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:VERTICAL

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

Factor(dB) = Antenna Factor(dB μ V/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.

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

Freq. MHz	Note F/H/E/S	Detector Mode	Spectrum		Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
			PK/QP/AV	Reading Level dB μ V				
5850.00	E	Peak		53.29	8.42	61.71	78.20	-16.49

Operation Band	:802.11 n20M	Test Date	:2014-09-23
Fundamental Frequency	:5825 MHz	Temp./Humi.	:21 deg_C/58 RH
Operation Mode	:Band Edge HIGH	Engineer	:Curry
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:HORIZONTAL

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

Factor(dB) = Antenna Factor(dB μ V/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.

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

Freq. MHz	Note F/H/E/S	Detector Mode	Spectrum		Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
			PK/QP/AV	Reading Level dB μ V				
5850.00	E	Peak		43.79	8.42	52.21	78.20	-25.99

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

Operation Band	:802.11 n40M	Test Date	:2014-08-12
Fundamental Frequency	:5755 MHz	Temp./Humi.	:21 deg_C/58 RH
Operation Mode	:TX LOW	Engineer	:Tin
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:VERTICAL

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

Factor(dB) = Antenna Factor(dB μ V/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. MHz	Note F/H/E/S	Detector Mode	Spectrum Reading Level		Factor dB	Actual FS dB μ V	Limit @3m dB μ V/m	Margin dB
			PK/QP/AV	dB μ V				
37.76	S	Peak	47.63	-13.68	33.95	40.00	-6.05	
227.88	S	Peak	34.84	-14.07	20.77	46.00	-25.23	
399.57	S	Peak	29.75	-9.08	20.67	46.00	-25.33	
470.38	S	Peak	28.18	-7.71	20.47	46.00	-25.53	
730.34	S	Peak	29.21	-3.62	25.59	46.00	-20.41	
979.63	S	Peak	26.82	0.22	27.04	54.00	-26.96	
5487.00	S	Peak	56.51	7.90	64.41	68.30	-3.89	
11510.00	H	Average	22.61	17.88	40.49	54.00	-13.51	
11510.00	H	Peak	24.35	17.88	42.23	74.00	-31.77	
17265.00	H	---						
23020.00	H	---						
28775.00	H	---						
34530.00	H	---						

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Operation Band :802.11 n40M Test Date :2014-08-19
Fundamental Frequency :5755 MHz Temp./Humi. :21 deg_C/58 RH
Operation Mode :TX LOW Engineer :Tin
EUT Pol. :E2 Plane Measurement Antenna Pol. :HORIZONTAL

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

Factor(dB) = Antenna Factor(dB μ V/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. MHz	Note F/H/E/S	Detector Mode	Spectrum Reading Level	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin
31.94	S	Peak	38.14	-13.88	24.26	40.00	-15.74
280.26	S	Peak	30.30	-11.61	18.69	46.00	-27.31
435.46	S	Peak	29.23	-8.72	20.51	46.00	-25.49
511.12	S	Peak	28.13	-7.32	20.81	46.00	-25.19
754.59	S	Peak	27.36	-2.49	24.87	46.00	-21.13
935.01	S	Peak	27.31	0.03	27.34	46.00	-18.66
5284.00	S	Peak	43.57	7.71	51.28	68.30	-17.02
11510.00	H	Average	22.48	17.88	40.36	54.00	-13.64
11510.00	H	Peak	24.43	17.88	42.31	74.00	-31.69
17265.00	H	---					
23020.00	H	---					
28775.00	H	---					
34530.00	H	---					

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Operation Band :802.11 n40M Test Date :2014-08-12
 Fundamental Frequency :5795 MHz Temp./Humi. :21 deg_C/58 RH
 Operation Mode :TX HIGH Engineer :Tin
 EUT Pol. :E2 Plane Measurement Antenna Pol. :VERTICAL

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

Factor(dB) = Antenna Factor(dB μ V/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. MHz	Note F/H/E/S	Detector Mode	Spectrum Reading Level	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
37.76	S	Peak	48.08	-13.68	34.40	40.00	-5.60
162.89	S	Peak	33.80	-12.51	21.29	43.50	-22.21
399.57	S	Peak	30.69	-9.08	21.61	46.00	-24.39
558.65	S	Peak	27.62	-6.60	21.02	46.00	-24.98
756.53	S	Peak	27.10	-2.51	24.59	46.00	-21.41
919.49	S	Peak	27.20	-0.27	26.93	46.00	-19.07
5403.00	S	Peak	56.20	7.77	63.97	68.30	-4.33
11590.00	H	Average	22.60	17.82	40.42	54.00	-13.58
11590.00	H	Peak	24.59	17.82	42.41	74.00	-31.59
17385.00	H	---					
23180.00	H	---					
28975.00	H	---					
34770.00	H	---					

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Operation Band :802.11 n40M Test Date :2014-08-19
Fundamental Frequency :5795 MHz Temp./Humi. :21 deg_C/58 RH
Operation Mode :TX HIGH Engineer :Tin
EUT Pol. :E2 Plane Measurement Antenna Pol. :HORIZONTAL

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

Factor(dB) = Antenna Factor(dB μ V/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. MHz	Note F/H/E/S	Detector Mode	Spectrum Reading Level	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
120.21	S	Peak	37.09	-14.99	22.10	43.50	-21.40
280.26	S	Peak	30.98	-11.61	19.37	46.00	-26.63
350.10	S	Peak	29.42	-10.12	19.30	46.00	-26.70
554.77	S	Peak	27.87	-6.86	21.01	46.00	-24.99
681.84	S	Peak	27.93	-3.63	24.30	46.00	-21.70
919.49	S	Peak	27.55	-0.27	27.28	46.00	-18.72
5277.00	S	Peak	46.06	7.68	53.74	68.30	-14.56
11590.00	H	Average	22.08	17.82	39.90	54.00	-14.10
11590.00	H	Peak	24.08	17.82	41.90	74.00	-32.10
17385.00	H	---					
23180.00	H	---					
28975.00	H	---					
34770.00	H	---					

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Radiated Emission:

Operation Band	:802.11 n40M	Test Date	:2014-09-23
Fundamental Frequency	:5755 MHz	Temp./Humi.	:21 deg_C/58 RH
Operation Mode	:Band Edge LOW	Engineer	:Curry
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:VERTICAL

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

Factor(dB) = Antenna Factor(dB μ V/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.

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

Freq. MHz	Note F/H/E/S	Detector PK/QP/AV	Spectrum		Factor dB	Actual dB μ V/m	Limit @3m dB μ V/m	Margin dB
			Mode	Reading Level dB μ V				
5725.00	E	Peak		68.77	8.20	76.97	78.20	-1.23

Operation Band	:802.11 n40M	Test Date	:2014-09-23
Fundamental Frequency	:5755 MHz	Temp./Humi.	:21 deg_C/58 RH
Operation Mode	:Band Edge LOW	Engineer	:Curry
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:HORIZONTAL

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

Factor(dB) = Antenna Factor(dB μ V/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.

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

Freq. MHz	Note F/H/E/S	Detector PK/QP/AV	Spectrum		Factor dB	Actual dB μ V/m	Limit @3m dB μ V/m	Margin dB
			Mode	Reading Level dB μ V				
5725.00	E	Peak		57.98	8.20	66.18	78.20	-12.02

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Operation Band :802.11 n40M Test Date :2014-09-23
 Fundamental Frequency :5795 MHz Temp./Humi. :21 deg_C/58 RH
 Operation Mode :Band Edge HIGH Engineer :Curry
 EUT Pol. :E2 Plane Measurement Antenna Pol. :VERTICAL

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

Factor(dB) = Antenna Factor(dB μ V/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.

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

Freq.	Note	Detector	Spectrum		Factor	Actual	Limit	Margin
			Mode	Reading Level				
MHz	F/H/E/S	PK/QP/AV	dB μ V	dB	dB μ V/m	dB μ V/m	dB	
5850.00	E	Peak	48.63	8.42	57.05	78.20	-21.15	
5880.00	S	Peak	53.08	8.62	61.70	500.00	-438.30	

Operation Band :802.11 n40M Test Date :2014-09-23
 Fundamental Frequency :5795 MHz Temp./Humi. :21 deg_C/58 RH
 Operation Mode :Band Edge HIGH Engineer :Curry
 EUT Pol. :E2 Plane Measurement Antenna Pol. :HORIZONTAL

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

Factor(dB) = Antenna Factor(dB μ V/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.

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

Freq.	Note	Detector	Spectrum		Factor	Actual	Limit	Margin
			Mode	Reading Level				
MHz	F/H/E/S	PK/QP/AV	dB μ V	dB	dB μ V/m	dB μ V/m	dB	
5850.00	E	Peak	44.52	8.42	52.94	78.20	-25.26	

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11 TRANSMISSION IN THE ABSENCE OF DATA

11.1 Standard Applicable

According to §15.407(c)

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

11.2 Result:

No non-compliance noted:

Refer to the theory of operation.

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12 FREQUENCY STABILITY

12.1 Standard Applicable

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

12.2 Result:

Refer to next page for plots.

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Operation Mode	802.11a	Test Date	2014,09,05
Temperature	:24	Test By	Cooper
Humidity	:60 %		

Test Temp.	Test Voltage	Channel	Measured Frequency (MHz)	Spectrum Frequency (MHz)	ΔFrequency (MHz)
25	24V	36	5180.0000	5,179.984551	0.0154
		44	5220.0000	5,219.987351	0.0126
		48	5240.0000	5,239.983751	0.0162
40	24V	36	5180.0000	5,179.984651	0.0153
		44	5220.0000	5,219.987451	0.0125
		48	5240.0000	5,239.983851	0.0161
0	24V	36	5180.0000	5,179.984544	0.0155
		44	5220.0000	5,219.987371	0.0126
		48	5240.0000	5,239.983771	0.0162

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Operation Mode	802.11n HT20	Test Date	2014,09,05
Temperature	:24	Test By	Cooper
Humidity	:60 %		

Test Temp.	Test Voltage	Channel	Measured Frequency (MHz)	Spectrum Frequency (MHz)	ΔFrequency (MHz)
25	24V	36	5180.0000	5,179.949730	0.0503
		44	5220.0000	5,219.949840	0.0502
		48	5240.0000	5,239.949990	0.0500
40	24V	36	5180.0000	5,179.949770	0.0502
		44	5220.0000	5,219.949880	0.0501
		48	5240.0000	5,239.949790	0.0502
0	24V	36	5180.0000	5,179.949340	0.0507
		44	5220.0000	5,219.949520	0.0505
		48	5240.0000	5,239.949740	0.0503

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Operation Mode	802.11n_HT40	Test Date	2014,09,05
Temperature	:24	Test By	Cooper
Humidity	:60 %		

Test Temp.	Test Voltage	Channel	Measured Frequency (MHz)	Spectrum Frequency (MHz)	ΔFrequency (MHz)
25	24V	38	5190.0000	5,189.993716	0.0063
		46	5230.0000	5,229.993733	0.0063
40	24V	38	5190.0000	5,189.993416	0.0066
		46	5230.0000	5,229.993633	0.0064
0	24V	38	5190.0000	5,189.993416	0.0066
		46	5230.0000	5,229.993633	0.0064

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13 ANTENNA REQUIREMENT

13.1 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.

13.2 Antenna Connected Construction

The directional gains of antenna used for transmitting is 6.69dBi (5150-5250MHz), 7.80dBi (5475-5825) and the antenna connector is designed with unique type RF connector and no consideration of replacement. Please see EUT photo and antenna spec for details.

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14 MAXIMUM PERMISSIBLE EXPOSURE (MPE)

14.1 Standard Applicable

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

This is a Mobile device, the MPE is required.

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

Limits for Maximum Permissive Exposure (MPE)

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

F = frequency in MHz

* = Plane-wave equipment power density

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14.2 Maximum Permissible Exposure (MPE) Evaluation

802.11a operation Power Table

Frequency (MHz)	Reading Power (dBm)	Output Power (dBm)	Output Power (W)	Limit (W)
5180	17.12	17.12	0.05152	0.85
5220	16.91	16.91	0.04909	0.85
5240	17.02	17.02	0.05035	0.85

MPE Prediction (802.11a 5150~5250)

Prediction of MPE limit at a given distance

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

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

Where: S = Power density

P = Power input to antenna

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

R = Distance to the center of radiation of the antenna

Maximum peak output power at antenna input terminal:	17.12	(dBm)
Maximum peak output power at antenna input terminal:	51.52286446	(mW)
Duty cycle:	96.94	(%)
Maximum Pav :	49.94626481	(mW)
Antenna gain (Maximum):	6.69	(dBi)
Antenna gain (linear):	4.666593803	(numeric)
Prediction distance:	100	(cm)
Prediction frequency:	5180	(MHz)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm ²)
Power density at predication frequency at 100 (cm)	0.0018557	(mW/cm ²)

Measurement Result

The predicted power density level at 100 cm is 0.00186mW/cm². This is below the uncontrolled exposure limit of 1 mW/cm² at 5180MHz.

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802.11n HT20 MIMO operation (CH 0 + CH 1) Power Table

Frequency (MHz)	Reading Power (dBm)	Output Power (dBm)	Output Power (W)	Limit (W)
5180	18.02	18.02	0.06339	0.43
5220	18.06	18.06	0.06397	0.43
5240	18.04	18.04	0.06368	0.43

MPE Prediction (802.11n-HT20 5150~5250)

Prediction of MPE limit at a given distance

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

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

Where: S = Power density

P = Power input to antenna

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

R = Distance to the center of radiation of the antenna

Maximum peak output power at antenna input terminal:	18.06	(dBm)
Maximum peak output power at antenna input terminal:	63.97348355	(mW)
Duty cycle:	93.62	(%)
Maximum Pav :	59.8919753	(mW)
Antenna gain (Maximum):	6.69	(dBi)
Antenna gain (linear):	4.666593803	(numeric)
Prediction distance:	100	(cm)
Prediction frequency:	5220	(MHz)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm ²)
Power density at predication frequency at 100 (cm)	0.0022253	(mW/cm ²)

Measurement Result

The predicted power density level at 100 cm is 0.00223mW/cm². This is below the uncontrolled exposure limit of 1 mW/cm² at 5220MHz.

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802.11n HT40 MIMO operation (CH 0 + CH 1) Power Table

Frequency (MHz)	Reading Power (dBm)	Output Power (dBm)	Output Power (W)	Limit (W)
5190	17.92	17.92	0.06194	0.43
5230	17.79	17.79	0.06012	0.43

MPE Prediction (802.11n HT40 5150~5250)

Prediction of MPE limit at a given distance

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

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

Where: S = Power density

P = Power input to antenna

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

R = Distance to the center of radiation of the antenna

Maximum peak output power at antenna input terminal:	17.92	(dBm)
Maximum peak output power at antenna input terminal:	61.94410751	(mW)
Duty cycle:	91.01	(%)
Maximum Pav :	56.37533224	(mW)
Antenna gain (Maximum):	6.69	(dBi)
Antenna gain (linear):	4.666593803	(numeric)
Prediction distance:	100	(cm)
Prediction frequency:	5190	(MHz)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm ²)
Power density at predication frequency at 100 (cm)	0.0020946	(mW/cm ²)

Measurement Result

The predicted power density level at 100 cm is 0.00209mW/cm². This is below the uncontrolled exposure limit of 1 mW/cm² at 5190MHz.

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802.11a operation Power Table

Frequency (MHz)	Reading Power (dBm)	Output Power (dBm)	Output Power (W)	Limit (W)
5745	11.89	11.89	0.01545	0.66
5785	12.33	12.33	0.01710	0.66
5825	12.68	12.68	0.01854	0.66

MPE Prediction (802.11a 5725~5850)

Prediction of MPE limit at a given distance

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

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

Where: S = Power density

P = Power input to antenna

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

R = Distance to the center of radiation of the antenna

Maximum peak output power at antenna input terminal:	12.68	(dBm)
Maximum peak output power at antenna input terminal:	18.53531623	(mW)
Duty cycle:	96.94	(%)
Maximum Pav :	17.96813556	(mW)
Antenna gain (Maximum):	7.8	(dBi)
Antenna gain (linear):	6.025595861	(numeric)
Prediction distance:	100	(cm)
Prediction frequency:	5825	(MHz)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm ²)
Power density at predication frequency at 100 (cm)	0.0008620	(mW/cm ²)

Measurement Result

The predicted power density level at 100 cm is 0.00086mW/cm². This is below the uncontrolled exposure limit of 1 mW/cm² at 5825MHz.

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802.11n HT20 MIMO operation (CH 0 + CH 1) Power Table

Frequency (MHz)	Reading Power (dBm)	Output Power (dBm)	Output Power (W)	Limit (W)
5745	18.29	18.29	0.06745	0.33
5785	17.87	17.87	0.06124	0.33
5825	17.90	17.90	0.06166	0.33

MPE Prediction (802.11n-HT20 5725~5850)

Prediction of MPE limit at a given distance

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

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

Where: S = Power density

P = Power input to antenna

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

R = Distance to the center of radiation of the antenna

Maximum peak output power at antenna input terminal:	18.29	(dBm)
Maximum peak output power at antenna input terminal:	67.45280277	(mW)
Duty cycle:	93.62	(%)
Maximum Pav :	63.14931395	(mW)
Antenna gain (Maximum):	7.8	(dBi)
Antenna gain (linear):	6.025595861	(numeric)
Prediction distance:	100	(cm)
Prediction frequency:	5745	(MHz)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm ²)
Power density at predication frequency at 100 (cm)	0.0030296	(mW/cm ²)

Measurement Result

The predicted power density level at 100 cm is 0.00303mW/cm². This is below the uncontrolled exposure limit of 1 mW/cm² at 5745MHz.

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802.11n HT40 MIMO operation (CH 0 + CH 1) Power Table

Frequency (MHz)	Reading Power (dBm)	Output Power (dBm)	Output Power (W)	Limit (W)
5755	17.05	17.05	0.05070	0.33
5795	17.79	17.79	0.06012	0.33

MPE Prediction (802.11n HT40 5755~5795)

Prediction of MPE limit at a given distance

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

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

Where: S = Power density

P = Power input to antenna

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

R = Distance to the center of radiation of the antenna

Maximum peak output power at antenna input terminal:	17.79	(dBm)
Maximum peak output power at antenna input terminal:	60.11737375	(mW)
Duty cycle:	91.01	(%)
Maximum Pav :	54.71282185	(mW)
Antenna gain (Maximum):	7.8	(dBi)
Antenna gain (linear):	6.025595861	(numeric)
Prediction distance:	100	(cm)
Prediction frequency:	5795	(MHz)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm ²)
Power density at predication frequency at 100 (cm)	0.0026248	(mW/cm ²)

Measurement Result

The predicted power density level at 100 cm is 0.00262mW/cm². This is below the uncontrolled exposure limit of 1 mW/cm² at 5795MHz.

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