cisco

### Test Report

## AIR-CAP1602y-A-K9 AIR-SAP1602y-A-K9 AIR-CLD1602y-A-K9

**Cisco Aironet 802.11n Dual Band Access Points** 

FCC ID: LDK102084 IC: 2461B-102084

Also covers:

AIR-CAP1602y-N-K9, AIR-SAP1602y-N-K9, AIR-CLD1602y-N-K9 AIR-CAP1602y-T-K9, AIR-SAP1602y-T-K9, AIR-CLD1602y-T-K9 AIR-CAP1602y-Z-K9, AIR-SAP1602y-Z-K9, AIR-CLD1602y-Z-K9

y = E (External Antenna) or I (Internal Antenna)

### 5725-5850 MHz

Against the following Specifications: CFR47 Part 15.247 RSS210

> **Cisco Systems** 170 West Tasman Drive San Jose, CA 95134

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### Section 1: Overview

#### 1.1 Test Summary

# The samples were assessed against the tests detailed in section 3 under the requirements of the following specifications:

Emission	Immunity
CFR47 Part 15.247 RSS210	N/A

The specifications listed above represent actual tests performed to demonstrate compliance against the specifications

and basic standards listed on the front cover of this report. This list is not a one to one match to the front cover for one

or more of the following reasons.

- 1. Basic standards call up many different test phenomena specifications such as the 61000-4-X series. The basic standards define which elements and levels shall be applied from these specifications and as such it is not appropriate to list the individual specifications on the front cover.
- 2. A Standard listed on the front cover may be required in a particular country but is not appropriate for the particular technologies included in the equipment under test. E.g. You cannot test a DC product to the mains Harmonics requirements in EN61000-3-2. See section 3.2.
- 3. Test results against a particular standard or specification may be included in a different test report. See section 3.2 for an EDCS reference of this data.
- 4. Where appropriate, Cisco may have substituted a later revision of a basic standard to those referenced in the specification on the front sheet of this test report. This decision was based upon improved test methodology and repeatability and/or where the newer revision represented a more stringent test.
- 5. Where relevant, testing has been carried out to the requirements of both EN and IEC Specifications. This was possible because of the similarities of the test methods involved and the Cisco EMC test procedures.
- 6. Testing may have been performed to an equivalent test that satisfies the requirements of the standards and specifications listed on the front cover of the report. See section 3.2.
- Where radiated emissions testing has been performed to EN55022/CISPR22 the additional requirements of VCCI: V- 3/2006.04, EN55022: 1994 +A1/2 and CAN/CSA- CISPR 22-02 have also been evaluated unless otherwise stated.
- Testing to the requirements of CFR47 Part 15 was performed against the CISPR22 limits. The results are therefore deemed satisfactory evidence of compliance with Industry Canada Interference Causing Equipment Standard ICES-003.
- 9. Where assessment has been performed to CISPR24, all the applicable test requirements may have not been covered. Refer to the results section for the tests performed.

Notes:

- 1) Where a specification listed on the front cover of this report has deviations from the basic standards listed above, the additional technical requirements of the specification were also assessed.
- 2) Where appropriate, Cisco may have substituted a later revision of a basic standard to those referenced in the specification on the front sheet of this test report. This decision was based upon improved test methodology and repeatability and/or where the newer revision represented a more stringent test.
- 3) Where relevant, testing has been carried out to the requirements of both EN and IEC Specifications. This was possible because of the similarities of the test methods involved and the Cisco EMC test procedures.

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### Section 2: Assessment Information

### 2.1 General

This report contains an assessment of an apparatus against Electromagnetic Compatibility Standards based upon tests carried out on the samples submitted. The testing was performed by and for the use of Cisco systems Inc:

With regard to this assessment, the following points should be noted:

- a) The results contained in this report relate only to the items tested and were obtained in the period between the date of the initial assessment and the date of issue of the report. Manufactured products will not necessarily give identical results due to production and measurement tolerances.
- b) The apparatus was set up and exercised using the configuration and modes of operation defined in this report only.
- c) Where relevant, the apparatus was only assessed using the susceptibility criteria defined in this report and the Test Assessment Plan (TAP).
- d) All testing was performed under the following environmental conditions:

Temperature15°C to 35°C (54°F to 95°F)

Atmospheric Pressure 860mbar to 1060mbar (25.4" to 31.3")

Humidity 10% to 75\*%

\*[Where applicable] For ESD testing the humidity limits used were 30% to 60% and for EFT/B tests the humidity limits used were 25% to 75%.

e) All AC testing was performed at one or more of the following supply voltages:

110V 60 Hz (+/-20%) 220V 50 Hz (+/-20%)

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### 2.2 Date of testing

02-July-2012 - 22-July-2012

#### 2.3 Report Issue Date

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### 2.4 Testing facilities

This assessment was performed by:

### **Testing Laboratory**

Cisco Systems, Inc.,	Cisco Systems, Inc.
4125 Highlander Parkway	170 West Tasman Drive
Richfield, OH 44286	San Jose, CA 95134
USA	USA

### **Test Engineers**

James Nicholson

### 2.5 Equipment Assessed (EUT)

AIR-CAP1602E-A-K9 Cisco Aironet 802.11n Dual Band Access Point

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### 2.6 EUT Description

The 1600 Series Cisco Aironet 802.11n Dual Band Access Points support the following modes of operation. The modes are further defined in the radio Theory of Operation. The modes included in this report represent the worst case data for all modes.

Non HT-20, One Antenna, 6 to 54 Mbps Non HT-20, Two Antennas, 6 to 54 Mbps Non HT-20, Three Antennas, 6 to 54 Mbps

Non HT-20 Beam Forming, Two Antennas, 6 to 54 Mbps Non HT-20 Beam Forming, Three Antennas, 6 to 54 Mbps

HT-20, One Antenna, M0 to M7 HT-20, Two Antennas, M0 to M15 HT-20, Three Antennas, M0 to M15

HT-20 STBC, Two Antennas, M0 to M7 HT-20 STBC, Three Antennas, M0 to M7

HT-20 Beam Forming, Two Antennas, M0 to M15 HT-20 Beam Forming, Three Antennas, M0 to M15

Non HT-40 Duplicate, One Antenna, 6-54 Mbps Non HT-40 Duplicate, Two Antennas, 6-54 Mbps Non HT-40 Duplicate, Three Antennas, 6-54 Mbps

HT-40, One Antenna, M0 to M7 HT-40, Two Antennas, M0 to M15 HT-40, Three Antennas, M0 to M15

HT-40 STBC, Two Antennas, M0 to M7 HT-40 STBC, Three Antennas, M0 to M7

HT-40 Beam Forming, Two Antennas, M0 to M15 HT-40 Beam Forming, Three Antennas, M0 to M15

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The following antennas are supported by this product series.

The data included in this report represent the worst case data for all antennas.

Frequency	Part Number	Antenna Type	Antenna Gain (dBi)
	AIR-ANT2524DB-R	Dual-resonant black dipole	2/4
	AIR-ANT2524DW-R	Dual-resonant white dipole	2/4
	AIR-ANT2524DG-R	Dual-resonant gray dipole	2/4
2.4/5 GHz	AIR-ANT2524V4C-R	Dual-resonant ceiling mount omni (4-pack)	2/4
	Internal	Omni-Directional	4 / 4
	AIR-ANT2544V4M-R	Dual-resonant omni (4-pack)	4 / 4
	AIR-ANT2566P4W-R	Dual-resonant "directional" antenna (4-pack)	6/6

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### **Section 4: Sample Details**

Note: Each sample was evaluated to ensure that its condition was suitable to be used as a test sample prior to the commencement of testing. Please also refer to the "Justification for worst Case test Configuration" section of this report for further details on the selection of EUT samples.

### 4.1 Sample Details (Photographs of the test samples, where appropriate can be found in appendix H)

Sample No.	Equipment Details	Part Number	Manufacturer	Hardware Rev.	Firmware Rev.	Software Rev.	Serial Number
S01	AIR-CAP1602E-A-K9		Cisco Systems	NA	NA	NA	
S02	AIR-PWR-B	341-0306-01	Cisco Systems	NA	NA	NA	

#### 4.2 System Details

System #	Description	Samples
1	EUT	S01, S02

#### 4.3 Mode of Operation Details

Mode#	Description	Comments
1	Continuous Transmitting	Continuous Transmitting

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### Appendix A: Emission Test Results

Testing Laboratory: Cisco Systems, Inc., 4125 Highlander Parkway, Richfield, OH, USA

### Target Maximum Channel Power

The following table details the maximum supported Total Channel Power for all operating modes.

	Maximum Channel Power (dBm)		
	Fre	quency (I	MHz)
Operating Mode	5745	5785	5825
Non HT-20, 6 to 54 Mbps	22	22	22
Non HT-20 Beam Forming, 6 to 54 Mbps	22	22	22
HT-20, M0 to M15	22	22	22
HT-20 STBC, M0 to M7	22	22	22
HT-20 Beam Forming, M0 to M15	22	22	22
	5745/5765		5785/5805
Non HT-40 Duplicate, 6-54 Mbps	19		22
HT-40, M0 to M15	22		22
HT-40 STBC, M0 to M7	22		22
HT-40 Beam Forming, M0 to M15	22		22

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### 6dB Bandwidth

15.247: Systems using digital modulation techniques may operate in the 5725-5850 MHz band. The minimum 6 dB bandwidth shall be at least 500 kHz.

Connect the antenna port(s) to the spectrum analyzer input. Using the spectrum analyzer Channel Bandwidth mode, configure the spectrum analyzer as shown below (enter all losses between the transmitter output and the spectrum analyzer).

Center Frequency:	Frequency from table below
Span:	2 x Nominal Bandwidth (e.g. 40MHz for a 20MHz channel)
Reference Level:	20 dBm
Attenuation:	10 dB
Sweep Time:	5 s
Resolution Bandwidth:	100 kHz
Video Bandwidth:	100 kHz
X dB Bandwidth:	6 dB
Detector:	Peak
Trace:	Single

Place the radio in continuous transmit mode. View the transmitter waveform on the spectrum analyzer, and record the pertinent measurements:

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Frequency (MHz)	Mode	Data Rate (Mbps)	6dB BW (MHz)	Limit (kHz)	Margin (MHz)
()	Non HT-20, 6 to 54 Mbps	6	16.4	>500	15.9
	Non HT-20 Beam Forming, 6 to 54 Mbps	6	16.4	>500	15.9
5745	HT-20, M0 to M15	m0	17.6	>500	17.1
	HT-20 STBC, M0 to M7	m0	17.6	>500	17.1
	HT-20 Beam Forming, M0 to M15	m0	17.6	>500	17.1
	Non HT-20, 6 to 54 Mbps	6	16.4	>500	15.9
	Non HT-20 Beam Forming, 6 to 54 Mbps	6	16.4	>500	15.9
5785	HT-20, M0 to M15	m0	17.7	>500	17.2
	HT-20 STBC, M0 to M7	m0	17.7	>500	17.2
	HT-20 Beam Forming, M0 to M15	m0	17.7	>500	17.2
	Non HT-20, 6 to 54 Mbps	6	16.4	>500	15.9
	Non HT-20 Beam Forming, 6 to 54 Mbps	6	16.4	>500	15.9
5825	HT-20, M0 to M15	m0	17.7	>500	17.2
	HT-20 STBC, M0 to M7	m0	17.7	>500	17.2
	HT-20 Beam Forming, M0 to M15	m0	17.7	>500	17.2
	Non HT-40 Duplicate, 6-54 Mbps	6	36.4	>500	35.9
5745/5765	HT-40, M0 to M15	m0	36.5	>500	36.0
5745/5705	HT-40 STBC, M0 to M7	m0	36.5	>500	36.0
	HT-40 Beam Forming, M0 to M15	m0	36.5	>500	36.0
	Non HT-40 Duplicate, 6-54 Mbps	6	36.4	>500	35.9
5785/5805	HT-40, M0 to M15	m0	36.4	>500	35.9
5765/5605	HT-40 STBC, M0 to M7	m0	36.4	>500	35.9
	HT-40 Beam Forming, M0 to M15	m0	36.5	>500	36.0

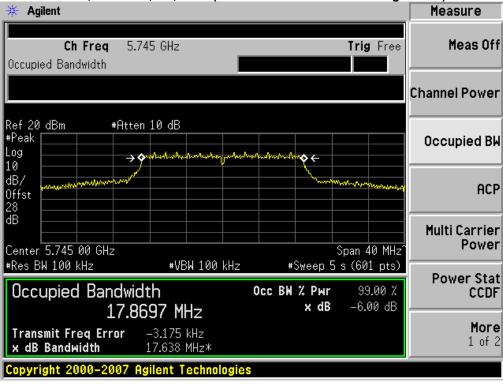
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🔆 Agilent Measure Ch Freq 5.745 GHz Trig Free Meas Off Occupied Bandwidth **Channel Power** Ref 20 dBm #Atten 10 dB #Peak Occupied BW Log ÷ ∢ 10 Ô dB/ ACP Offst 28 dB Multi Carrier Power Center 5.745 00 GHz Span 40 MHz #Res BW 100 kHz #VBW 100 kHz #Sweep 5 s (601 pts) **Power Stat** Occupied Bandwidth Occ BW % Pwr 99.00 % CCDF x dB -6.00 dB 17.1066 MHz More Transmit Freq Error -61.586 kHz 1 of 2 x dB Bandwidth 16.409 MHz\* Copyright 2000-2007 Agilent Technologies

6dB Bandwidth, 5745 MHz, 6 Mbps, Non HT-20 (with and without Beam Forming)

6dB Bandwidth, 5745 MHz, m0, HT20 (with and without Beam Forming / STBC)



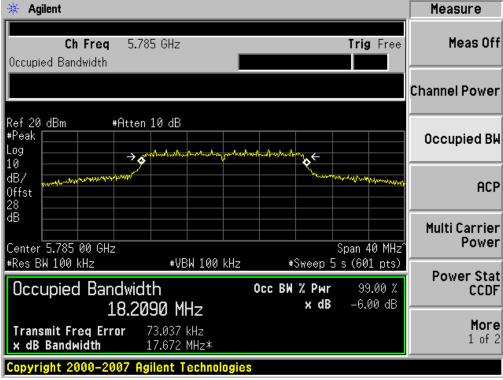
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🔆 Agilent Measure Ch Freq 5.785 GHz Trig Free Meas Off Occupied Bandwidth Channel Power #Atten 10 dB Ref 20 dBm #Peak Occupied BW Log >0 ծ← 10 dB/ ACP Offst 28.2 dB Multi Carrier Power Center 5.785 00 GHz Span 40 MHz #Res BW 100 kHz #VBW 100 kHz #Sweep 5 s (601 pts) Power Stat Occupied Bandwidth Occ BW % Pwr 99.00 % CCDF x dB -6.00 dB 16.7180 MHz More -14.601 kHz **Transmit Freq Error** 1 of 2 x dB Bandwidth 16.396 MHz\* Copyright 2000-2007 Agilent Technologies

6dB Bandwidth, 5785 MHz, 6 Mbps, Non HT-20 (with and without Beam Forming)

6dB Bandwidth, 5785 MHz, m0, HT20 (with and without Beam Forming / STBC)



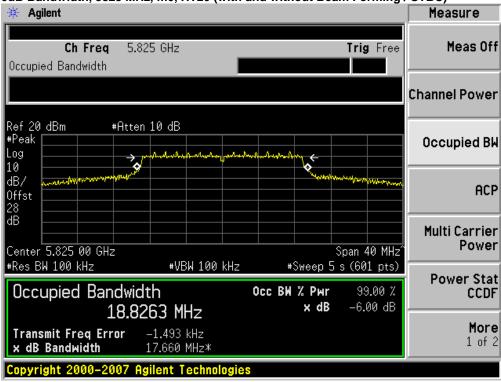
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🔆 Agilent Measure Ch Freq 5.825 GHz Trig Free Meas Off Occupied Bandwidth **Channel Power** Ref 20 dBm #Atten 10 dB #Peak Occupied BW Log → � 10 ò dB7 ACP Offst 28 dB Multi Carrier Power Center 5.825 00 GHz Span 40 MHz #Res BW 100 kHz #VBW 100 kHz #Sweep 5 s (601 pts) Power Stat Occupied Bandwidth Occ BW % Pwr 99.00 % CCDF x dB -6.00 dB 18.2296 MHz More Transmit Freg Error -12.225 kHz 1 of 2 x dB Bandwidth 16.435 MHz\* Copyright 2000-2007 Agilent Technologies

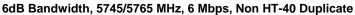
6dB Bandwidth, 5825 MHz, 6 Mbps, Non HT-20 (with and without Beam Forming)

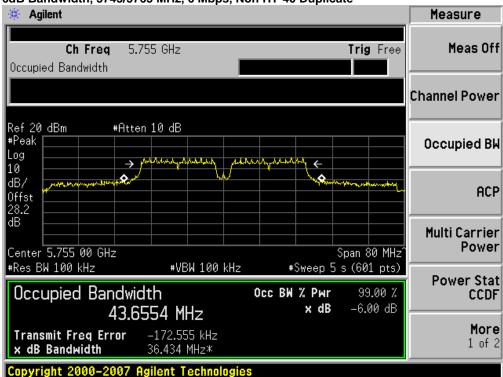
6dB Bandwidth, 5825 MHz, m0, HT20 (with and without Beam Forming / STBC)



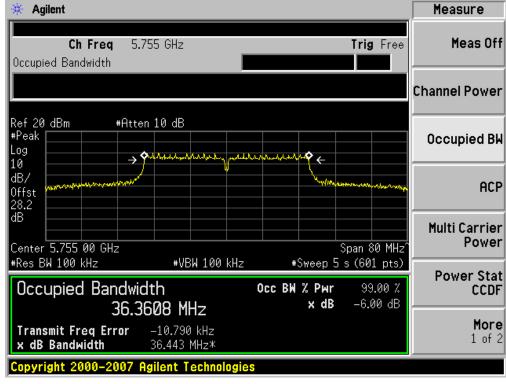
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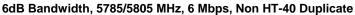


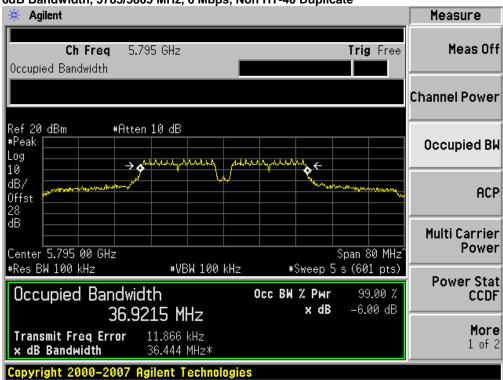
6dB Bandwidth,	5745/5765 MHz	, m0, HT-40	(with and without	Beam Forming / STBC	;)
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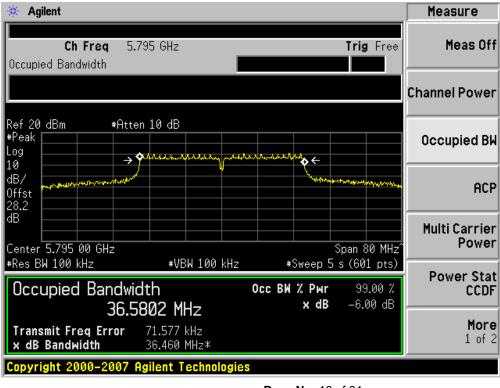
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6dB Bandwidth, 5785/5805 MHz, m0, HT-40 (with and without Beam Forming / STBC)



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### 99% and 26dB Bandwidth

Connect the antenna port(s) to the spectrum analyzer input. Using the spectrum analyzer Channel Bandwidth mode, configure the spectrum analyzer as shown below (enter all losses between the transmitter output and the spectrum analyzer).

Center Frequency:	Frequency from table be.low
Span:	2 x Nominal Bandwidth (e.g. 40MHz for a 20MHz channel)
Reference Level:	20 dBm
Attenuation:	10 dB
Sweep Time:	5 s
Resolution Bandwidth:	1%-3% of 26 dB Bandwidth
Video Bandwidth:	≥Resolution Bandwidth
X dB Bandwidth:	26 dB
Detector:	Peak
Trace:	Single

Place the radio in continuous transmit mode. View the transmitter waveform on the spectrum analyzer, and record the pertinent measurements:

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Frequency (MHz)	Mode	Data Rate (Mbps)	26aB BW (MHz)	99% BW (MHz)
	Non HT-20, 6 to 54 Mbps	6	38.6	19.4
	Non HT-20 Beam Forming, 6 to 54 Mbps	6	38.6	19.4
5745	HT-20, M0 to M15	m0	40.0	19.5
	HT-20 STBC, M0 to M7	m0	40.0	19.5
	HT-20 Beam Forming, M0 to M15	m0	40.0	19.5
	Non HT-20, 6 to 54 Mbps	6	37.9	21.1
	Non HT-20 Beam Forming, 6 to 54 Mbps	6	37.9	21.1
5785	HT-20, M0 to M15	m0	40.0	22.0
	HT-20 STBC, M0 to M7	m0	40.0	22.0
	HT-20 Beam Forming, M0 to M15	m0	40.0	22.0
	Non HT-20, 6 to 54 Mbps	6	37.9	21.7
	Non HT-20 Beam Forming, 6 to 54 Mbps	6	37.9	21.7
5825	HT-20, M0 to M15	m0	40.0	23.9
	HT-20 STBC, M0 to M7	m0	40.0	23.9
	HT-20 Beam Forming, M0 to M15	m0	40.0	23.9
	Non HT-40 Duplicate, 6-54 Mbps	6	78.9	54.9
5745/5765	HT-40, M0 to M15	m0	80.0	40.0
5745/5705	HT-40 STBC, M0 to M7	m0	80.0	40.0
	HT-40 Beam Forming, M0 to M15	m0	80.0	40.0
	Non HT-40 Duplicate, 6-54 Mbps	6	79.7	57.5
5785/5805	HT-40, M0 to M15	m0	80.0	42.8
57 65/5605	HT-40 STBC, M0 to M7	m0	80.0	42.8
	HT-40 Beam Forming, M0 to M15	m0	80.0	42.8

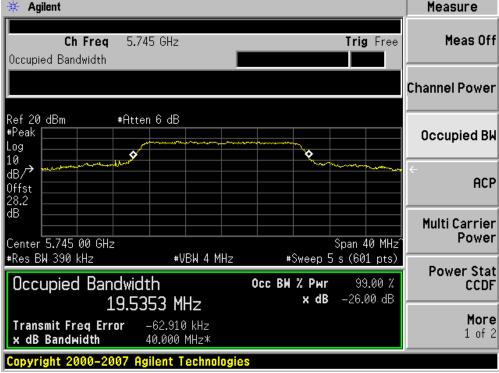
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🔆 Agilent			Measure
Ch Freq 5. Occupied Bandwidth	745 GHz	Trig Free	Meas Off
			Channel Power
#Peak	en 6 dB		Occupied BW
10 dB/ 0ffst 28.2			← ACP
dB Center 5.745 00 GHz		Span 40 MHz	Multi Carrier Power
*Res BW 390 kHz Occupied Bandwid 19 3	#VBW 4 MHz Jth 891 MHz	#Sweep 5 s (601 pts) Occ BW % Pwr 99.00 % × dB -26.00 dB	Power Stat CCDF
Transmit Freq Error x dB Bandwidth	15.766 kHz		More 1 of 2
Copyright 2000-2007 A	igilent Technologie	S	

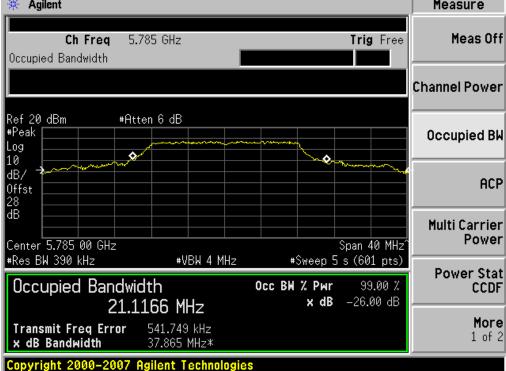
26dB / 99% Bandwidth, 5745 MHz, 6 Mbps, Non HT-20 (with and without Beam Forming)

26dB / 99% Bandwidth,	5745 MHz, m0, HT20	(with and without Be	eam Forming / STBC)
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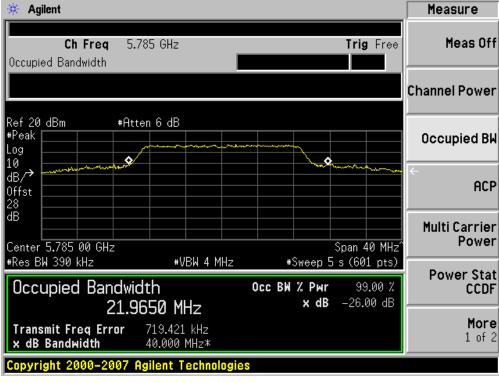
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26dB / 99% Bandwidth, 5785 MHz, 6 Mbps, Non HT-20 (with and without Beam Forming)

26dB / 99% Bandwidth, 5785 MHz, m0, HT20 (with and without Beam Forming / STBC)



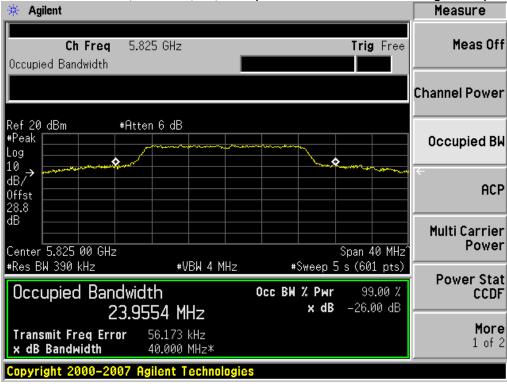
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🔆 Agilent			Measure
	.825 GHz	Trig Free	Meas Off
Occupied Bandwidth			
			Channel Power
Ref 20 dBm #At #Peak Log 10	ten 6 dB		Occupied Bk
dB/ 0ffst 28.8			ACF
dB		Span 40 MHz	Multi Carrier Power
*Res BW 390 kHz Occupied Bandwi 21 7	#VBW 4 MHz dth 7426 MHz	#Sweep 5 s (601 pts) Осс ВЖ % Рмг 99.00 % х dB -26.00 dB	Power Stat CCDF
ZI./ Transmit Freq Error x dB Bandwidth	375.079 kHz		More 1 of 2
Copyright 2000-2007	Agilent Technologia	es	

26dB / 99% Bandwidth, 5825 MHz, 6 Mbps, Non HT-20 (with and without Beam Forming)

26dB / 99% Bandwidth, 5825 MHz, m0, HT20 (with and without Beam Forming / STBC)

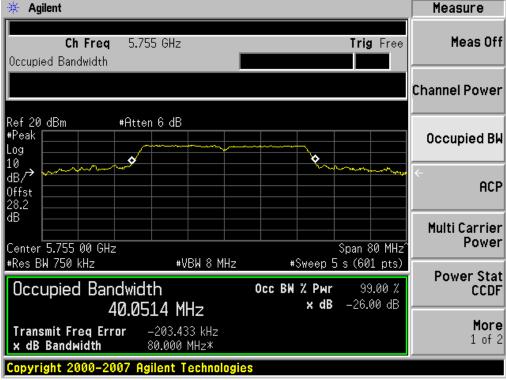


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🔆 Agilent Measure Ch Freq 5.755 GHz Trig Free Meas Off Occupied Bandwidth Channel Power Ref 20 dBm #Atten 6 dB #Peak Occupied BW Log 10 ۵ ¢. dB∕**≯** ACP Offst 28.2 dB Multi Carrier Power Center 5.755 00 GHz Span 80 MHz #Res BW 750 kHz #Sweep 5 s (601 pts) #VBW 8 MHz Power Stat Occupied Bandwidth Occ BW % Pwr 99.00 % CCDF **x dB** -26.00 dB 54.8828 MHz More -243.234 kHz Transmit Freq Error 1 of 2 78.947 MHz\* x dB Bandwidth Copyright 2000-2007 Agilent Technologies

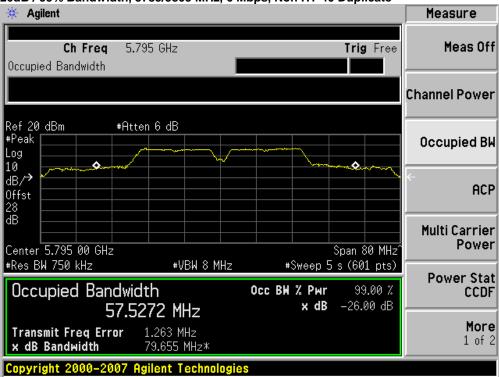
26dB / 99% Bandwidth, 5745/5765 MHz, 6 Mbps, Non HT-40 Duplicate

26dB / 99% Bandwidth, 5745/5765 MHz, m0, HT-40 (with and without Beam Forming / STBC)



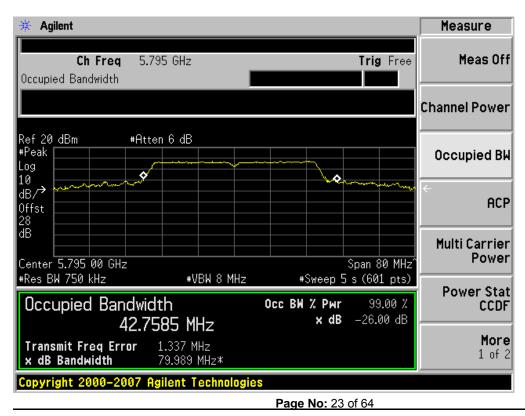
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26dB / 99% Bandwidth, 5785/5805 MHz, 6 Mbps, Non HT-40 Duplicate

26dB / 99% Bandwidth, 5785/5805 MHz, m0, HT-40 (with and without Beam Forming / STBC)



### **Peak Output Power**

15.247: The maximum conducted output power of the intentional radiator for systems using digital modulation in the 5725-5850 MHz band shall not exceed 1 Watt (30dBm). If transmitting antennas of directional gain greater than 6 dBi are used, the maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

The maximum supported antenna gain is 6dBi. The peak correlated gain for each mode is listed in the table below. See the Theory of Operation for details on the correlated gain for each mode.

Connect the antenna port(s) to the spectrum analyzer input. Place the radio in continuous transmit mode. Configure the spectrum analyzer as shown below.

Enable "Channel Power" function of analyzer

Center Frequency:	Frequency from table below
Span:	20 MHz (must be greater than 26dB bandwidth, adjust as
necessary)	
Ref Level Offset:	Correct for attenuator and cable loss.
Reference Level:	20 dBm
Attenuation:	20 dB
Sweep Time:	100ms, Single sweep
Resolution Bandwidth:	1 MHz
Video Bandwidth:	3 MHz
Detector:	Sample
Trace:	Trace Average 100 traces in Power Averaging Mode
Integration BW:	=26 dB BW from 26 dB Bandwidth Data

After averaging 100 traces of the transmitter waveform on the spectrum analyzer, record the spectrum analyzer Channel Power.

The "measure-and-sum technique" is used for measuring in-band transmit power of a device. In the measure-and-sum approach, the conducted emission level is measured at each antenna port. The measured results at the various antenna ports are then summed mathematically to determine the total emission level from the device. Summing is performed in linear power units.

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			Correlated Antenna	Tx 1 Peak	Tx 2 Peak	Tx 3 Peak	Total Tx Channel		
Frequency		Тх	Gain	Power	Power	Power	Power	Limit	Margin
(MHz)	Operating Mode	Paths	(dBi)	(dBm)	(dBm)	(dBm)	(dBm)	(dBm)	(dB)
	Non HT-20, 6 to 54 Mbps	3	6	14.5	15.0	14.2	19.3	30	10.7
	Non HT-20 Beam Forming, 6 to 54 Mbps	3	11	14.5	15.0	14.2	19.3	25	5.7
5745	HT-20, M0 to M15	3	6	14.5	15.0	14.5	19.4	30	10.6
57 15	HT-20 STBC, M0 to M7	3	6	14.5	15.0	14.5	19.4	30	10.6
	HT-20 Beam Forming, M0 to M7	3	11	14.5	15.0	14.5	19.4	25	5.6
	HT-20 Beam Forming, M8 to M15	3	9	14.5	15.0	14.5	19.4	27	7.6
	Non HT-20, 6 to 54 Mbps	4	6	14.2	15.0	14.6	19.4	30	10.6
	Non HT-20 Beam Forming, 6 to 54 Mbps	4	11	14.2	15.0	14.6	19.4	25	5.6
5785	HT-20, M0 to M15	4	6	14.5	15.0	14.6	19.5	30	10.5
2762	HT-20 STBC, M0 to M7	4	6	14.5	15.0	14.6	19.5	30	10.5
	HT-20 Beam Forming, M0 to M7	4	11	14.5	15.0	14.6	19.5	25	5.5
	HT-20 Beam Forming, M8 to M15	4	9	14.5	15.0	14.6	19.5	27	7.5
	Non HT-20, 6 to 54 Mbps	4	6	15.8	16.5	15.6	20.7	30	9.3
	Non HT-20 Beam Forming, 6 to 54 Mbps	4	12	15.8	16.5	15.6	20.7	24	3.2
5825	HT-20, M0 to M15	4	6	16.1	16.4	15.6	20.8	30	9.2
3023	HT-20 STBC, M0 to M7	4	6	16.1	16.4	15.6	20.8	30	9.2
	HT-20 Beam Forming, M0 to M7	4	12	16.1	16.4	15.6	20.8	24	3.2
	HT-20 Beam Forming, M8 to M15	4	9	16.1	16.4	15.6	20.8	27	6.2
	Non HT-40 Duplicate, 6-54 Mbps	4	6	14.1	14.1	13.7	18.7	30	11.3
	HT-40, M0 to M15	4	6	14.1	14.7	13.9	19.0	30	11.0
5745/5765	HT-40 STBC, M0 to M7	4	6	14.1	14.7	13.9	19.0	30	11.0
	HT-40 Beam Forming, M0 to M7	4	11	14.1	14.7	13.9	19.0	25	6.0
	HT-40 Beam Forming, M8 to M15	4	8	14.1	14.7	13.9	19.0	28	9.0
	Non HT-40 Duplicate, 6-54 Mbps	4	6	13.8	14.4	13.9	18.8	30	11.2
	HT-40, M0 to M15	4	6	14.4	15.1	14.3	19.4	30	10.6
<mark>5785/5805</mark>	HT-40 STBC, M0 to M7	4	6	14.4	15.1	14.3	19.4	30	10.6
	HT-40 Beam Forming, M0 to M7	4	11	14.4	15.1	14.3	19.4	25	5.6
	HT-40 Beam Forming, M8 to M15	4	8	14.4	15.1	14.3	19.4	28	8.6

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### Peak Output Power, 5745 MHz, 6 Mbps, Non HT-20 (with and without Beam Forming)



#### Antenna A

🔆 Agilent	Measure
Ch Freq 5.745 GHz Trig Free Channel Power Averages: 100	Meas Off
	Channel Power
Ref 20 dBm •Atten 6 dB •Samp Log 10	Occupied BW
dB/ 0ffst 28,2	ACP
dB Span 30 MHz	Multi Carrier Power
*Res BW 1 MHz         *VBW 3 MHz         *Sweep 100 ms (601 pts)           Channel Power         Power Spectral Density	Power Stat CCDF
14.15 dBm /18.8000 MHz -58.59 dBm/Hz	<b>More</b> 1 of 2

Antenna C

Antenna B

cisco

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### Peak Output Power, 5745 MHz, m0-m15, HT20 (with and without Beam Forming / STBC)



Antenna A

* Agilent	Measure
Ch Freq 5.745 GHz Trig Free Channel Power Averages: 100	Meas Off
	Channel Power
Ref 20 dBm •Atten 6 dB •Samp	Occupied BW
10 dB/ 0ffst 28.2	ACP
dB	Multi Carrier Power
«Res BW 1 MHz #VBW 3 MHz *Sweep 100 ms (601 pts)     Channel Power Power Spectral Density	Power Stat CCDF
14.45 dBm /19.1000 MHz -58.37 dBm/Hz	More 1 of 2

Antenna C

Antenna B

cisco

Page No: 27 of 64

### Peak Output Power, 5785 MHz, 6 Mbps, Non HT-20 (with and without Beam Forming)



Antenna A

Ch Freq 5.785 GHz Trig Free Channel Power Averages: 100	Meas Off
Chamici Fondi	
	Channel Power
Ref 20 dBm +Atten 6 dB +Samp Log	Occupied BW
10 dB/ gr_constant 28	ACP
dB Center 5.785 00 GHz Span 30 MHz	Multi Carrier Power
*Res BW 1 MHz         *VBW 3 MHz         *Sweep 100 ms (601 pts)           Channel Power         Power Spectral Density	Power Stat CCDF
14.61 dBm /18.9000 MHz -58.15 dBm/Hz	More 1 of 2

Antenna C

Antenna B

cisco

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### Peak Output Power, 5785 MHz, m0-m15, HT20 (with and without Beam Forming / STBC)



cisco

Antenna A

Antenna B

* Agilent	Measure
Ch Freq 5.785 GHz Trig Free Channel Power Averages: 100	Meas Off
	Channel Power
Ref 20 dBm +Atten 6 dB +Samp	Occupied BW
10 dB/ 0ffst 28	ACP
dB	Multi Carrier Power
*Res BW 1 MHz = VBW 3 MHz = Sweep 100 ms (601 pts)           Channel Power         Power Spectral Density	Power Stat CCDF
14.61 dBm /18.9000 MHz -58.15 dBm/Hz	<b>More</b> 1 of 2

Antenna C

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### Peak Output Power, 5825 MHz, 6 Mbps, Non HT-20 (with and without Beam Forming)



Antenna A

🔆 Agilent			Measure
Ch Freq 5.8 Channel Power	25 GHz	Trig Fr verages: 100	ee Meas Off
			Channel Power
#Samp K	en 6 dB		Occupied BW
10 dB/ 0ffst 28.8			АСР
dB Center 5.825 00 GHz		Span 30 M	
*Res BW 1 MHz Channel Power	₩VBW 3 MHz	*Sweep 100 ms (601 pt Power Spectral Densit	Power Stat
15.59 dBm /18.9	3000 MHz	-57.17 dBm/Hz	More 1 of 2
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Antenna C

Antenna B

cisco

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### Peak Output Power, 5825 MHz, m0-m15, HT20 (with and without Beam Forming / STBC)



#### Antenna A



cisco

* Agilent		Measure
Ch Freq 5.825 GHz Channel Power	Trig Free Averages: 100	Meas Off
		Channel Power
Ref 20 dBm #Atten 6 dB #Samp Log		Occupied BW
10 dB/ offst 28.8		ACP
dB	Span 30 MHz	Multi Carrier Power
*Res BW 1 MHz *VBW 3 M Channel Power	1Hz +Sweep 100 ms (601 pts) Power Spectral Density	Power Stat CCDF
15.55 dBm /18.8000 MHz	-57.19 dBm/Hz	More 1 of 2
Copyright 2000–2007 Agilent Technol	logies	

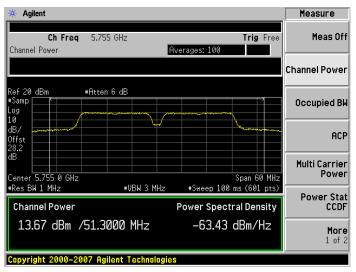
Antenna C

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### Peak Output Power, 5745/5765 MHz, 6 Mbps, Non-HT40



Antenna A



Antenna C

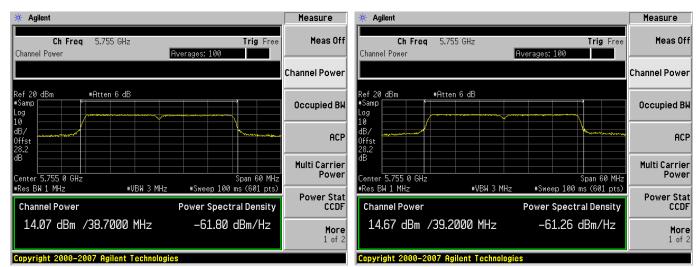
Antenna B

cisco

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# cisco

### Peak Output Power, 5745/5765 MHz, m0-m15, HT40 (with and without Beam Forming / STBC)



#### Antenna A

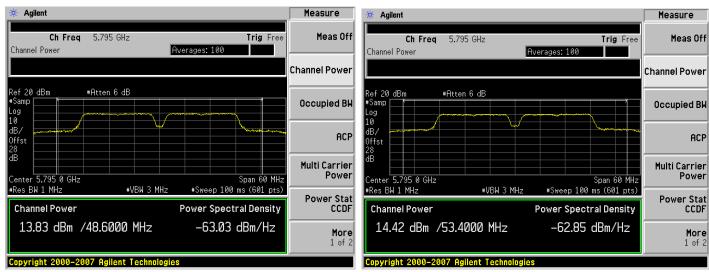
Antenna B

* Agilent	Measure	
Ch Freq 5.755 GHz Channel Power	Trig Free Meas (	
	Channel Pow	
Ref 20 dBm #Atten 6 dB #Samp	Occupied	
10 dB/ offst 28.2	A	
dB	Span 60 MHz Pow	
*Res         BW 1         MHz         *Sweep         100 ms         (601 pts)         Power Sta           Channel Power         Power Spectral Density         CCD		
13.94 dBm /38.4000 MHz	-61.90 dBm/Hz	
Copyright 2000–2007 Agilent Technologies		

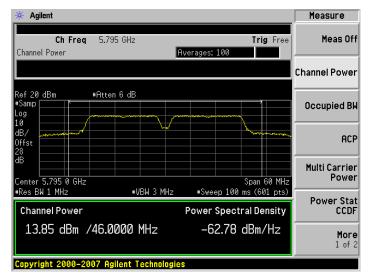
Antenna C

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### Peak Output Power, 5785/5805 MHz, 6 Mbps, Non-HT40



### Antenna A



Antenna C

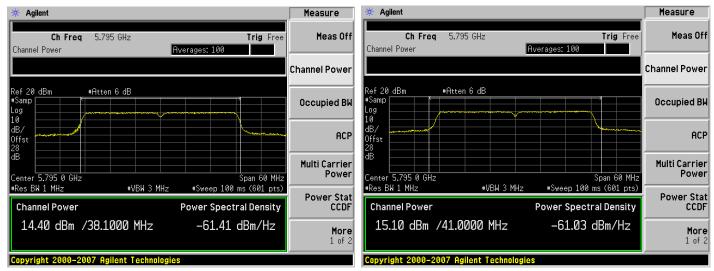
Antenna B

cisco

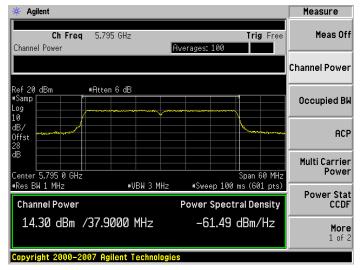
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### Peak Output Power, 5785/5805 MHz, m0-m15, HT40 (with and without Beam Forming / STBC)



#### Antenna A



Antenna C

Antenna B

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### **Power Spectral Density**

15.247: For digitally modulated systems, the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

Connect the antenna port(s) to the spectrum analyzer input. Place the radio in continuous transmit mode. Configure the spectrum analyzer as shown below.

Center Frequency: Span:	Frequency from table below 20 MHz
Ref Level Offset:	Correct for attenuator and cable loss.
Reference Level:	20 dBm
Attenuation:	20 dB
Sweep Time:	10s
Resolution Bandwidth:	3 kHz
Video Bandwidth:	10 kHz
Detector:	Peak
Trace:	Single
Marker:	Peak Search

Record the Marker value.

The "Measure and add 10 log(N) dB technique", where N is the number of outputs, is used for measuring in-band Power Spectral Density. With this technique, spectrum measurements are performed at each output of the device, and the quantity 10 log(4) (or 6dB) is added to the worst case spectrum value before comparing to the emission limit.

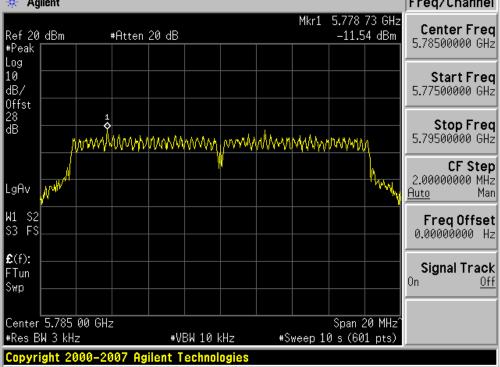
Frequency (MHz)	Mode	Data Rate (Mbps)	PSD / Antenna (dBm/3kHz)	Total PSD (dBm/3kHz)	,	Margin (dB)
	Non HT-20, 6 to 54 Mbps	6	-10.5	-4.4	8	12.4
	Non HT-20 Beam Forming, 6 to 54 Mbps	6	-10.5	-4.4	8	12.4
5745	HT-20, M0 to M15	m0	-11.2	-5.2	8	13.2
	HT-20 STBC, M0 to M7	m0	-11.2	-5.2	8	13.2
	HT-20 Beam Forming, M0 to M15	m0	-11.2	-5.2	8	13.2
		_				
	Non HT-20, 6 to 54 Mbps	6	-11.5	-5.5	8	13.5
	Non HT-20 Beam Forming, 6 to 54 Mbps	6	-11.5	-5.5	8	13.5
5785	HT-20, M0 to M15	m0	-11.7	-5.7	8	13.7
	HT-20 STBC, M0 to M7	m0	-11.7	-5.7	8	13.7
	HT-20 Beam Forming, M0 to M15	m0	-11.7	-5.7	8	13.7
	Non HT-20, 6 to 54 Mbps	6	-9.5	-3.5	8	11.5
	Non HT-20 Beam Forming, 6 to 54 Mbps	6	-9.5	-3.5	8	11.5
5825	HT-20, M0 to M15	m0	-9.4	-3.3	8	11.3
	HT-20 STBC, M0 to M7	m0	-9.4	-3.3	8	11.3
	HT-20 Beam Forming, M0 to M15	m0	-9.4	-3.3	8	11.3
	Neg UT 40 Duplicate C 54 Mbra	6	-14.1	-8.0	8	16.0
	Non HT-40 Duplicate, 6-54 Mbps	-			8	14.6
5745/5765	HT-40, M0 to M15	m0	-12.6	-6.6	8	14.0
	HT-40 STBC, M0 to M7	m0	-12.6	-6.6	о 8	14.0
	HT-40 Beam Forming, M0 to M15	m0	-12.6	-6.6	U	14.0
	Non HT-40 Duplicate, 6-54 Mbps	6	-12.9	-6.9	8	14.9
	HT-40, M0 to M23	m0	-13.7	-7.7	8	15.7
5785/5805	HT-40 STBC, M0 to M7	m0	-13.7	-7.7	8	15.7
	HT-40 Beam Forming, M0 to M23	m0	-13.7	-7.7	8	15.7

🔆 Agilent					Freq/Channel
Ref 20 dBm #Peak	#Atten 20 dB		Mkr1	5.751 27 GHz -10.46 dBm	Center Freq 5.74500000 GHz
Log 10 dB/ Offst					<b>Start Freq</b> 5.73500000 GHz
28.2	Analyndawaan	h mmmm	hww.ww	\$ Amm	<b>Stop Freq</b> 5.75500000 GHz
LgAv M <sup>MM</sup>		W		- Andrew	<b>CF Step</b> 2.00000000 MHz <u>Auto</u> Man
W1 S2 S3 FS					FreqOffset 0.00000000 Hz
£(f): FTun Swp					<b>Signal Track</b> On <u>Off</u>
Center 5.745 00 GH #Res BW 3 kHz	lz #VBW 10	rkHz ₩	Sweep <u>1</u> 6	Span 20 MHz^ )s (601 pts)	
Copyright 2000-2	007 Agilent Techn	ologies			

Power Spectral Density, 5745 MHz, m0, HT20 (with and without Beam Forming / STBC) Agilent Freq/Channel

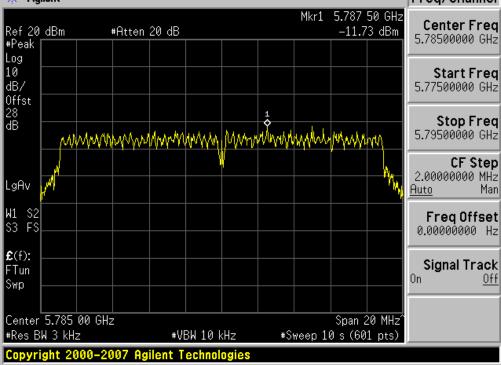
Mkr1 5.752 50 GHz **Center Freq** Ref 20 dBm -11.23 dBm #Atten 20 dB 5.74500000 GHz #Peak Log 10 Start Fred dB/ 5.73500000 GHz 0ffst 28.2 dB Stop Freq â Man Man Man Man Man www.www.www.www.www. 5.75500000 GHz **CF** Step 2.00000000 MHz LgAv <u>Auto</u> Man W1 S2 Freq Offset S3 FS 0.00000000 Hz £(f): Signal Track FTun 0n Off Swp Center 5.745 00 GHz Span 20 MHz^ #Res BW 3 kHz ₩VBW 10 kHz #Sweep 10 s (601 pts) Copyright 2000–2007 Agilent Technologies

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Power Spectral Density, 5785 MHz, 6 Mbps, Non HT-20 (with and without Beam Forming) Agilent Freq/Channel

Power Spectral Density, 5785 MHz, m0, HT20 (with and without Beam Forming / STBC) Agilent Freq/Channel



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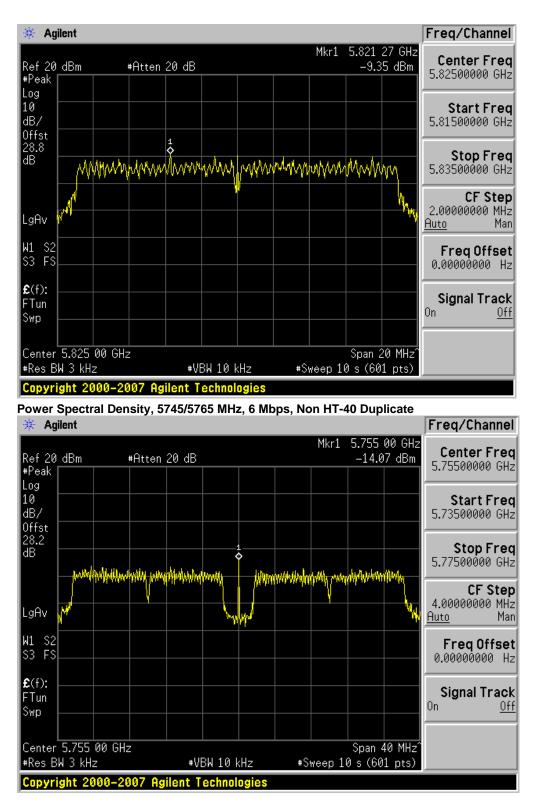


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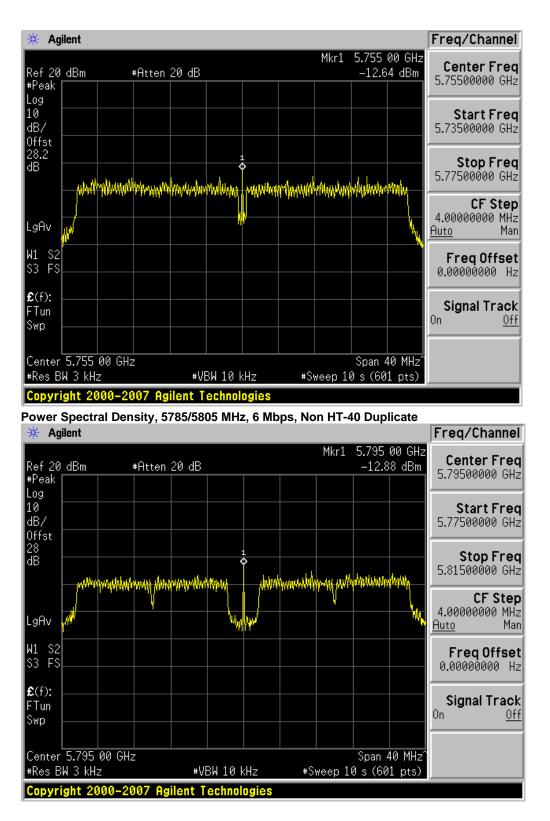
Power Spectral Density, 5825 MHz, m0, HT20 (with and without Beam Forming / STBC)

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### Power Spectral Density, 5745/5765 MHz, m0, HT-40 (with and without Beam Forming / STBC)

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### Power Spectral Density, 5785/5805 MHz, m0, HT-40 (with and without Beam Forming / STBC)

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🔆 Agilent						Freq/Channel
Ref 20 dBm #Peak	#Atten	20 dB		Mkr1	5.795 00 GHz -13.70 dBm	Center Freq 5.79500000 GHz
Log 10 dB/ Offst						Start Freq 5.77500000 GHz
28 dB	halun kalun ka	mundum	t Allar Andrea Marchard A	alla dealerated	mandlandaria	<b>Stop Freq</b> 5.81500000 GHz
LgAv		- 10 I I I I I I I I I I I I I I I I I I	A.			<b>CF Step</b> 4.00000000 MHz <u>Auto</u> Man
W1 S2 S3 FS						Freq Offset 0.00000000 Hz
£(f): FTun Swp						<b>Signal Track</b> On <u>Off</u>
Center 5.795 #Res BW 3 kH		#VBW 10	kHz #	Sweep 1	Span 40 MHz´ 0 s (601 pts)	
Copyright 20	000-2007 Ag	ilent Techno	logies			

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## **Conducted Spurious Emissions**

15.247: In any 100 kHz bandwidth outside the frequency band in which the digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 30 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power.

Connect the antenna port(s) to the spectrum analyzer input. Place the radio in continuous transmit mode. Configure the spectrum analyzer as shown below (be sure to enter all losses between the transmitter output and the spectrum analyzer).

Span: Reference Level: Attenuation: Sweep Time: Resolution Bandwidth: Video Bandwidth: Detector: Trace:	30 MHz-26 GHz 20 dBm 10 dB 5s 100 kHz 300 kHz Peak Single
Marker:	Peak

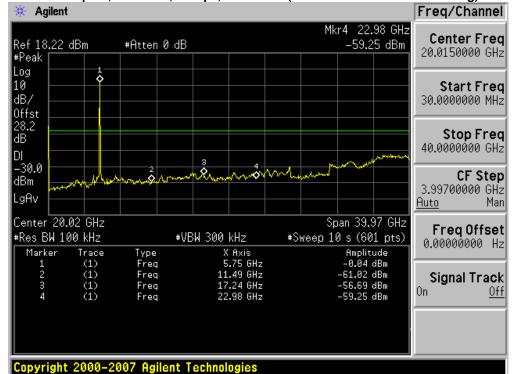
Record the marker waveform peak to spur difference

Out-of-band and spurious emissions tests are performed on each output individually without summing or adding  $10 \log(N)$  since the measurements are made relative to the in-band emissions on the individual outputs. The worst case output is recorded.

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_			Conducted		
Frequency	<b></b> .	Data Rate	•	Limit	Margin
(MHz)	Mode	(Mbps)	(dB)	(dBc)	(dB)
	Non HT-20, 6 to 54 Mbps	6	56.7	30.0	26.7
	Non HT-20 Beam Forming, 6 to 54 Mbps	6	56.7	30.0	26.7
5745	HT-20, M0 to M15	m0	56.7	30.0	26.7
	HT-20 STBC, M0 to M7	m0	56.7	30.0	26.7
	HT-20 Beam Forming, M0 to M15	m0	56.7	30.0	26.7
	Non HT-20, 6 to 54 Mbps	6	58.4	30.0	28.4
	Non HT-20 Beam Forming, 6 to 54 Mbps	6	58.4	30.0	28.4
5785	HT-20, M0 to M15	m0	58.7	30.0	28.7
	HT-20 STBC, M0 to M7	m0	58.7	30.0	28.7
	HT-20 Beam Forming, M0 to M15	m0	58.7	30.0	28.7
	Non HT-20, 6 to 54 Mbps	6	58.0	30.0	28.0
	Non HT-20 Beam Forming, 6 to 54 Mbps	6	58.0	30.0	28.0
5805	HT-20, M0 to M15	m0	57.1	30.0	27.1
	HT-20 STBC, M0 to M7	m0	57.1	30.0	27.1
	HT-20 Beam Forming, M0 to M15	m0	57.1	30.0	27.1
	Non HT-40 Duplicate, 6-54 Mbps	6	53.5	30.0	23.5
5745/5765	HT-40, M0 to M15	m0	56.7	30.0	26.7
5745/5705	HT-40 STBC, M0 to M7	m0	56.7	30.0	26.7
	HT-40 Beam Forming, M0 to M15	m0	56.7	30.0	26.7
	Non HT-40 Duplicate, 6-54 Mbps	6	54.4	30.0	24.4
E795/5905	HT-40, M0 to M15	m0	55.9	30.0	25.9
5785/5805	HT-40 STBC, M0 to M7	m0	55.9	30.0	25.9
	HT-40 Beam Forming, M0 to M15	m0	55.9	30.0	25.9

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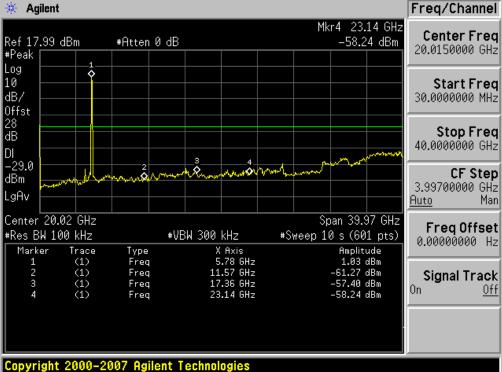


## Conducted Spurs, 5745 MHz, 6 Mbps, Non HT-20 (with and without Beam Forming)

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					Freq/Channe
18.22 ak	dBm	#Atten 0 dB		Mkr4 22.98 GHz -59.04 dBm	Center Fre 20.0150000 G
, _	1 ◆				<b>Start Fre</b> 30.0000000 M
st 2			3 4	have the safet and a showing a	<b>Stop Fre</b> 40.0000000 G
).1 <sup>n</sup> Iv		alman Superior	n kun hun kur	"hard and a second s	<b>CF Sto</b> 3.99700000 G <u>Auto</u> M
s BW 10			3W 300 kHz	Span 39.97 GHz #Sweep 10 s (601 pts)	Freq Offs 0.00000000
larker 1 2 3 4	Trace (1) (1) (1) (1)	Type Freq Freq Freq Freq	X Axis 5.75 GHz 11.49 GHz 17.24 GHz 22.98 GHz	Amplitude -0.08 dBm -61.28 dBm -56.77 dBm -59.04 dBm	Signal Trad

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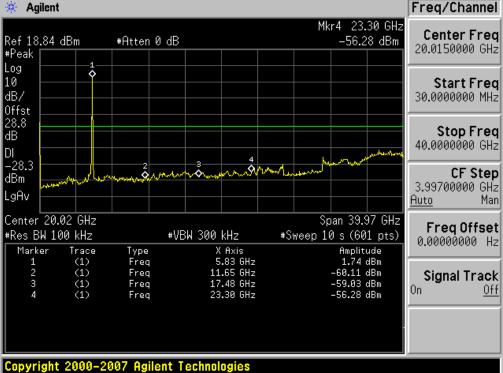


## Conducted Spurs, 5785 MHz, 6 Mbps, Non HT-20 (with and without Beam Forming)

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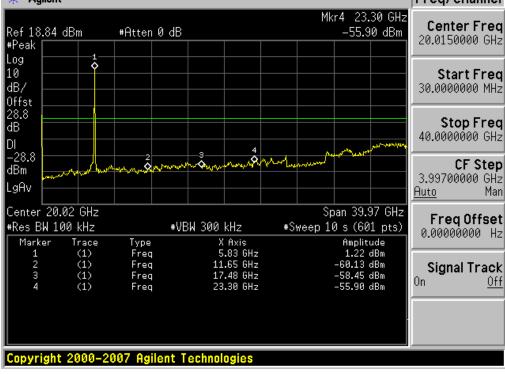
Conducted Spurs, 5	5785 MHz, m0	)-m15, HT20 (wit	h and without Beam F	Forming / STBC)
🔆 Agilent				Freq/Channel
Ref 17.99 dBm #Peak	#Atten 0 dB		Mkr4 23.14 GH -57.25 dBr	
Log 1 10 dB/ 0ffst				Start Freq 30.0000000 MHz
28 dB DI		3 4	huter and a start	<b>Stop Freq</b> 40.0000000 GHz
-30.3 dBm LgAv	nen an Sundan	hên mên mên têr	Mental and the second sec	<b>CF Step</b> 3.99700000 GHz <u>Auto</u> Man
Center 20.02 GHz #Res BW 100 kHz Marker Trace	#V{ Type	300 kHz X Axis	Span 39.97 GH #Sweep 10 s (601 pts Amplitude	F F ON LITTEOL
$ \begin{array}{cccc} 1 & (1) \\ 2 & (1) \\ 3 & (1) \\ 4 & (1) \end{array} $	Freq Freq Freq Freq	5.78 GHz 11.57 GHz 17.36 GHz 23.14 GHz	-0.31 dBm -60.41 dBm -58.97 dBm -57.25 dBm	<b>Signal Track</b> On <u>Off</u>
Copyright 2000-20	007 Agilent 1	echnologies		

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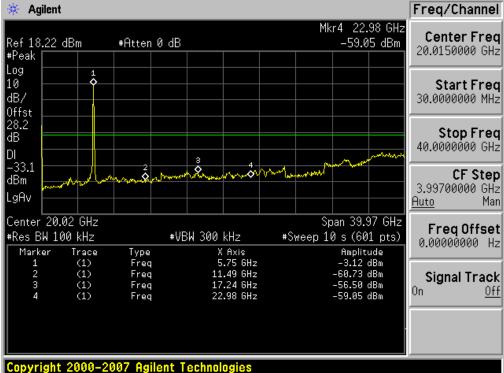


## Conducted Spurs, 5825 MHz, 6 Mbps, Non HT-20 (with and without Beam Forming)

Conducted Spurs, 5825 MHz, m0-m15, HT20 (with and without Beam Fo	rming / STBC)
🔆 Agilent	Freg/Channel

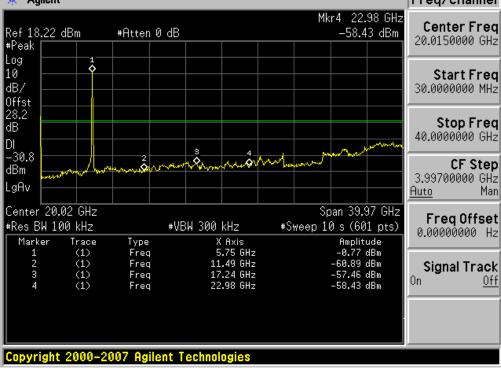


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#### Conducted Spurs, 5745/5765 MHz, 6 Mbps, Non HT-40 Duplicate

Conducted Spurs, 5745/5765 MHz, m0-m15, HT-40 (with and without Beam Forming / STBC) Agilent Freq/Channel

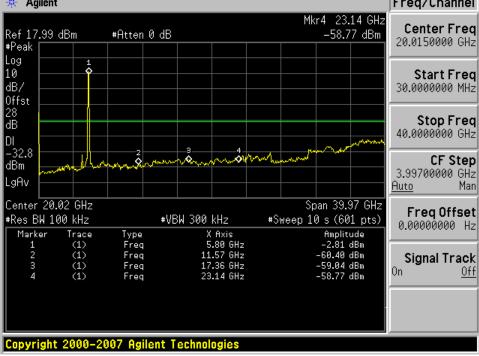


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🔆 Agilent				on m-40 Duplicate	Freq/Channel
Ref 17.99 #Peak	dBm	#Atten 0 dB		Mkr4 23.14 GHz -58.78 dBm	Center Freq 20.0150000 GHz
Log 10 dB/ Offst					Start Fred 30.0000000 MHz
28 dB DI			3 4	The second	Stop Fred 40.0000000 GHz
–33.1 dBm LgAv	ar An	wayahan Samurahan	n Anno Al		<b>CF Step</b> 3.99700000 GHz <u>Auto</u> Mar
Center 20. #Res BW 10 Marker	00 kHz Trace	Туре	BW 300 kHz X Axis	Span 39.97 GHz #Sweep 10 s (601 pts) Amplitude	Freq Offset 0.00000000 Hz
1 2 3 4	(1) (1) (1) (1)	Freq Freq Freq Freq	5.80 GHz 11.57 GHz 17.36 GHz 23.14 GHz	-3.12 dBm -60.06 dBm -57.89 dBm -58.78 dBm	<b>Signal Track</b> On <u>Off</u>
Copyright	2000-2	007 Agilent	Technologies		

#### Conducted Spurs, 5785/5805 MHz, 6 Mbps, Non HT-40 Duplicate

Conducted Spurs, 5785/5805 MHz, m0-m15, HT-40 (with and without Beam Forming / STBC) Agilent Freq/Channel



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### APPENDIX B: Conducted Bandedge

15.247: In any 100 kHz bandwidth outside the frequency band in which the digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 30 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power.

Connect the antenna port(s) to the spectrum analyzer input. Place the radio in continuous transmit mode. Configure the spectrum analyzer as shown below (be sure to enter all losses between the transmitter output and the spectrum analyzer).

Span:	30 MHz-26 GHz
Reference Level:	20 dBm
Attenuation:	10 dB
Sweep Time:	5s
Resolution Bandwidth:	100 kHz
Video Bandwidth:	300 kHz
Detector:	Peak
Trace:	Single
Marker:	Peak

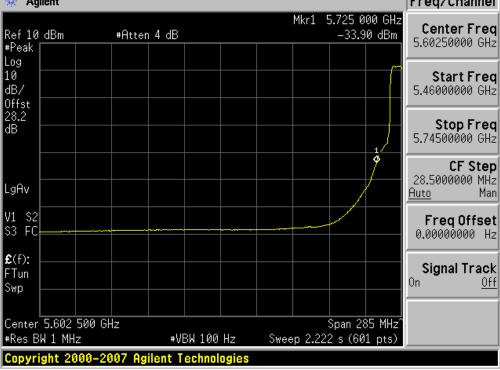
Record the marker waveform peak to spur difference

Out-of-band and spurious emissions tests are performed on each output individually without summing or adding 10 log(N) since the measurements are made relative to the in-band emissions on the individual outputs. The worst case output is recorded.

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_			Conducted		
Frequency			Bandedge	Limit	Margin
(MHz)	Operating Mode	Tx Paths	Delta (dB)	(dBc)	(dB)
	Non HT-20, 6 to 54 Mbps	3	33.9	>30	3.9
	Non HT-20 Beam Forming, 6 to 54 Mbps	3	33.9	>30	3.9
5745	HT-20, M0 to M15	3	32.9	>30	2.9
5745	HT-20 STBC, M0 to M7	3	32.9	>30	2.9
	HT-20 Beam Forming, M0 to M7	3	32.9	>30	2.9
	HT-20 Beam Forming, M8 to M15	3	32.9	>30	2.9
	Non HT-20, 6 to 54 Mbps	3	38.4	>30	8.4
	Non HT-20 Beam Forming, 6 to 54 Mbps	3	38.4	>30	8.4
5825	HT-20, M0 to M15	3	35.4	>30	5.4
5625	HT-20 STBC, M0 to M7	3	35.4	>30	5.4
	HT-20 Beam Forming, M0 to M7	3	35.4	>30	5.4
	HT-20 Beam Forming, M8 to M15	3	35.4	>30	5.4
	Non HT-40 Duplicate, 6-54 Mbps	3	31.6	>30	1.6
	HT-40, M0 to M15	3	31.6	>30	1.6
5745/5765	HT-40 STBC, M0 to M7	3	31.6	>30	1.6
	HT-40 Beam Forming, M0 to M7	3	31.6	>30	1.6
	HT-40 Beam Forming, M8 to M15	3	31.6	>30	1.6
		-			-
	Non HT-40 Duplicate, 6-54 Mbps	3	44.2	>30	14.2
	HT-40, M0 to M15	3	44.2	>30	14.2
5785/5805	HT-40 STBC, M0 to M7	3	44.2	>30	14.2
	HT-40 Beam Forming, M0 to M7	3	44.2	>30	14.2
	HT-40 Beam Forming, M8 to M15	3	44.2	>30	14.2

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Conducted Bandedge, 5745 MHz, 6 Mbps, Non HT-20 (with and without Beam Forming) Agilent Freq/Channel

Conducted Bandedge, 5745 MHz, m0-m15, HT20 (with and without Be	am Forming / STBC)
New Automation	Energy /Channel

🔆 Agilent					Freq/Channe
Ref 10 dBm	#Atten 4 dB		Mkr1	5.725 000 GHz -32.92 dBm	Center Free 5.60250000 GH
#Peak Log					
10 dB/					Start Fre 5.46000000 GH
Offst 28.2					Stop Fre
dB				1	5.74500000 GH
				Ý	CF Ste 28.5000000 MH
_gAv					<u>Auto</u> Ma
/1 S2 53 FC					Freq Offse 0.00000000
S(f):					
Tun Swp					Signal Trac On <u>O</u>
Center 5.602 50 •Res BW 1 MHz		3W 100 Hz	Sweep <u>2.2</u>	Span 285 MHz´ 22 s (601 pts)	
Copyright 2000	)-2007 Agilent T	echnologies			

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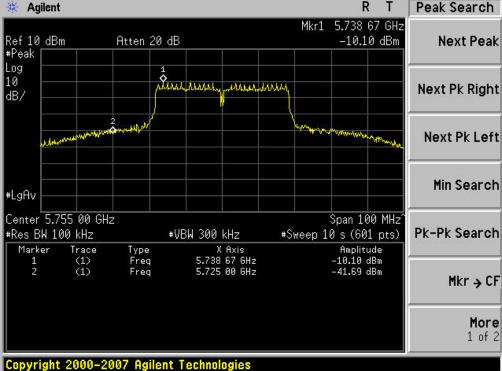
🔆 Agilent				Freq/Channel
#Peak	Atten 4 dB	Mkr1	5.850 0 GHz -38.42 dBm	Center Freq 6.16250000 GHz
Log 10 dB/ Offst				Start Freq 5.82500000 GHz
28.8 dB				<b>Stop Freq</b> 6.50000000 GHz
LgAv				<b>CF Step</b> 67.5000000 MHz <u>Auto</u> Man
V1 \$2 \$3 FC				FreqOffset 0.00000000 Hz
<b>£</b> (f): FTun Swp				<b>Signal Track</b> <sup>On <u>Off</u></sup>
Center 6.162 5 GHz #Res BW 1 MHz	#VBW 100 H		pan 675 MHz^ s (601 pts)	
Copyright 2000-2007	Agilent Technolog	gies		

Conducted Bandedge, 5825 MHz, 6 Mbps, Non HT-20 (with and without Beam Forming)

Conducted Bandedge, 5825 MHz, m0-m15, HT20 (with and without Beam	Form	ing / S1	ГВС)

🔆 Agilent			Freq/Channel
#Peak	Atten 4 dB	Mkr1 5.850 0 GHz -35.37 dBm	Center Fred 6.16250000 GHz
Log 10 dB/ Offst			Start Fred 5.82500000 GHz
28.8 dB			Stop Fred 6.50000000 GH:
LgAv			<b>CF Ster</b> 67.5000000 MH: <u>Auto</u> Mai
V1 S2 S3 FC			Freq Offse 0.00000000 H:
<b>£</b> (f): FTun Swp			<b>Signal Tracl</b> On <u>Of</u>
Center 6.162 5 GHz #Res BW 1 MHz	#VBW 100 Hz	Span 675 MHz^ Sweep 5.263 s (601 pts)	
	7 Agilent Technologies		

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## Conducted Bandedge, 5745/5765 MHz, 6Mbps, m0, HT-40 (with and without Beam Forming / STBC)

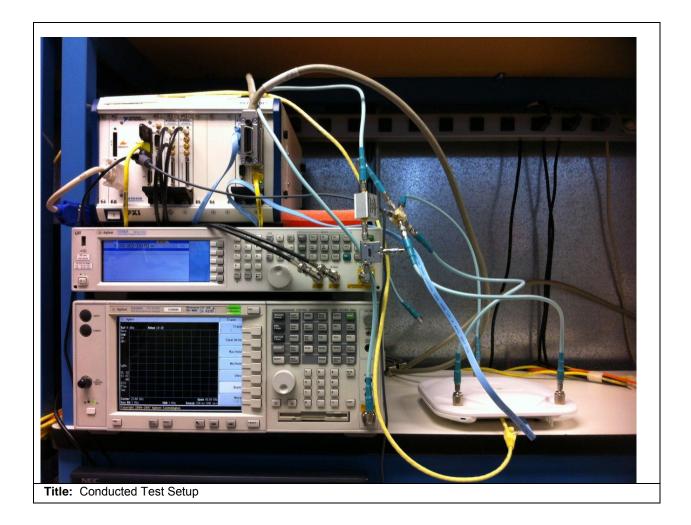
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### Conducted Bandedge, 5785/5805 MHz, 6 Mbps, m0-m15, HT-40 (with and without Beam Forming / STBC)

Peak Search	T	R								ilent	₩ А
Next Peak	67 GHz 6 dBm		Mkr1				20 dB	Atten		dBm	Ref 1 #Peak
Next Pk Right							mm	provinse.	hurren	1 MARAN	Log 10 dB/
Next Pk Left				warn	al the second pla	homeware				/	
Min Search											#LgAv
Pk-Pk Search	1 pts)	Span 10 0 s (60: Amplitu			kHz Axis	J 3W 300 >		: Type	5 00 GHz kHz Trace	W 100	
Mkr → CF	∦Bm	-9.96 c -54.17 c			67 GH: 00 GH:		4	Frec Frec	(1) (1)		
More 1 of 2											
					ogies	echno	ilent 1	107 Ag	000-20	ght 2	Copy

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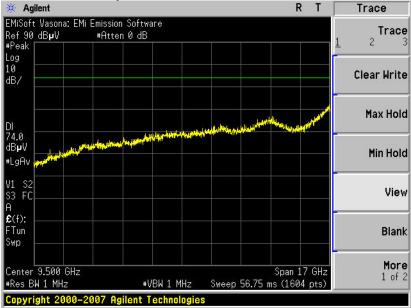
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### **Receiver Radiated Emissions**

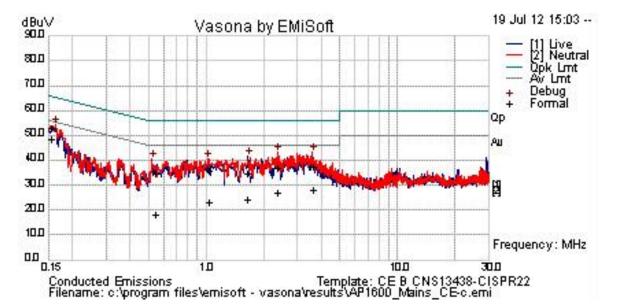
Radiated Receiver Spurs, All Rates, All Modes, Average



Radiated Receiver Spurs, All Rates, All Modes, Peak



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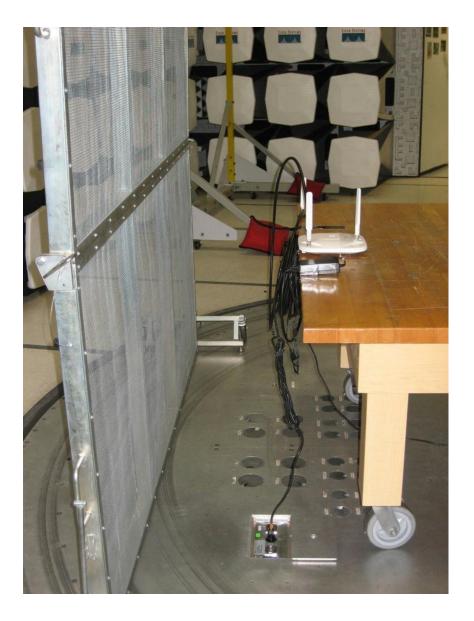


### **Conducted Emissions**

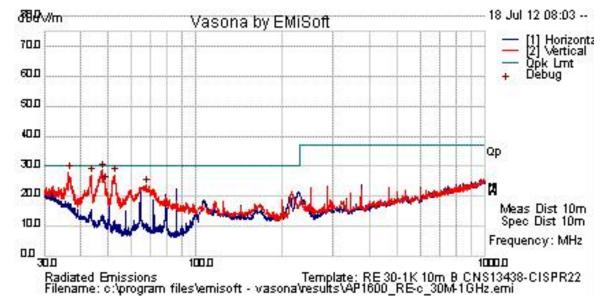
Frequency	Raw	Cable	Factors	Level	Measurem	Line	Limit	Margin	Pass	Comments
MHz	dBuV	Loss	dB	dBuV	ent Type		dBuV	dB	/Fail	
0.155687	25.7	21.4	1.6	48.7	Av	Ν	55.7	-7	Pass	
0.155687	29.8	21.4	1.6	52.8	Qp	Ν	65.7	-12.9	Pass	
0.538798	14	20.1	0.6	34.6	Qp	N	56	-21.4	Pass	
0.538798	-2.7	20.1	0.6	18	Av	Ν	46	-28	Pass	
1.027	15.3	20	0.5	35.9	Qp	N	56	-20.1	Pass	
1.027	2.4	20	0.5	23	Av	N	46	-23	Pass	
1.645	14.1	20.2	0.5	34.7	Qp	L	56	-21.3	Pass	
1.645	3.7	20.2	0.5	24.3	Av	L	46	-21.7	Pass	
2.359	6.5	20.3	0.5	27.3	Av	N	46	-18.7	Pass	
2.359	16	20.3	0.5	36.7	Qp	Ν	56	-19.3	Pass	
3.617	7.3	20.4	0.5	28.3	Av	N	46	-17.7	Pass	
3.617	16.8	20.4	0.5	37.7	Qp	N	56	-18.3	Pass	

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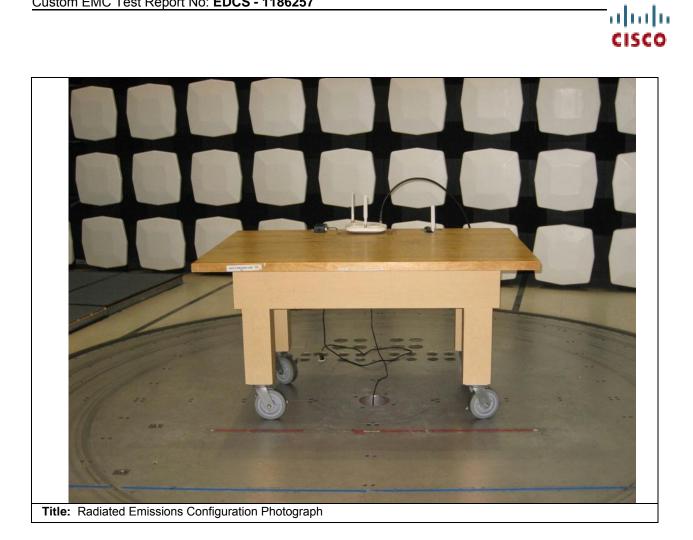


### **Radiated Emissions**

#### **Test Results Table**

Frequency	Raw	Cable	AF dB	Level	Measurem	Pol	Hgt	Azt	Limit	Margin	Pass	Comments
MHz	dBuV	Loss		dBuV/m	ent Type		cm	Deg	dBuV/m	dB	/Fail	
36.355	34.7	0.6	-10.1	25.2	Qp	V	208	102	30	-4.8	Pass	
43.321	37.9	0.6	-15.1	23.4	Qp	v	350	138	30	-6.6	Pass	
47.511	42.6	0.7	-17.6	25.6	Qp	v	261	78	30	-4.4	Pass	
52.426	40.3	0.7	-19.1	22	Qp	V	221	121	30	-8	Pass	
250.015	34.1	1.5	-14.1	21.5	Qp	V	111	195	37	-15.5	Pass	
375.005	30.6	1.8	-11.1	21.3	Qp	v	101	186	37	-15.7	Pass	
1000	24.8	3	-3.1	24.7	Qp	v	283	60	37	-12.3	Pass	

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### Maximum Permissible Exposure (MPE) Calculations

15.247: U-NII devices are subject to the radio frequency radiation exposure requirements specified in Sec. 1.1307(b), Sec. 2.1091 and Sec. 2.1093 of this chapter, as appropriate. All equipment shall be considered to operate in a ``general population/uncontrolled" environment. Applications for equipment authorization of devices operating under this section must contain a statement confirming compliance with these requirements for both fundamental emissions and unwanted emissions. Technical information showing the basis for this statement must be submitted to the Commission upon request.

Given

 $E=\sqrt{(30^{*}P^{*}G)/d}$  and  $S=E^{2}/3770$ 

where

E=Field Strength in Volts/meter P=Power in Watts G=Numeric Antenna Gain d=Distance in meters S=Power Density in mW/cm<sup>2</sup>

Combine equations and rearrange the terms to express the distance as a function of the remaining variables:

```
d=√((30*P*G)/(3770*S))
```

P(mW)=P(W)/1000

Changing to units of power in mW and distance in cm, using:

d(cm)=100\*d(m)

yields

d=100\*√((30\*(P/1000)\*G)/(3770\*S)) d=0.282\*√(P\*G/S)

where

d=Distance in cm P=Power in mW G=Numeric Antenna Gain S=Power Density in mW/cm<sup>2</sup>

## Substituting the logarithmic form of power and gain using:

 $\begin{array}{c} P(mW)=10^{(P(dBm)/10)} & G(numeric)=10^{(G(dBi)/10)} \\ \text{id}=0.282^{*}10^{((P+G)/20)/\sqrt{S}} & Equation (1) \\ \text{and} & \\ s=((0.282^{*}10^{((P+G)/20))/d})^{2} & Equation (2) \\ \text{where} & \\ d=MPE \text{ distance in cm} \\ P=Power \text{ in dBm} \\ G=Antenna \text{ Gain in dBi} \\ S=Power \text{ Density in mW/cm}^2 \end{array}$ 

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Equation (1) and the measured peak power are used to calculate the MPE distance. Note that for mobile or fixed location transmitters such as an access point, the minimum separation distance is 20 cm even if the calculations indicate that the MPE distance may be less.

S=1mW/cm<sup>2</sup> maximum. The highest supported antenna gain is 6 dBi (11dBi with beam forming). Using the peak power levels recorded in the test report along with Equation 1 above, the MPE distances are calculated as follows.

			Peak				
		Power	Transmit	Antenna	MPE		
Frequency	Bit Rate	Density	Power	Gain	Distance	Limit	Margin
(MHz)	(Mbps)	(mW/cm^2)	(dBm)	(dBi)	(cm)	(cm)	(cm)
5745	54	1	22.0	11	12.60	20	7.40
5785	54	1	22.0	11	12.60	20	7.40
5825	54	1	22.0	11	12.60	20	7.40

MPE Calculations

To maintain compliance, installations will assure a separation distance of at least 20cm.

Using Equation 2, the MPE levels (s) at 20 cm are calculated as follows:

			Peak				
		MPE	Transmit	Antenna	Power		
Frequency	Bit Rate	Distance	Power	Gain	Density	Limit	Margin
(MHz)	(Mbps)	(cm)	(dBm)	(dBi)	(mW/cm^2)	(mW/cm^2)	(mW/cm^2)
5745	54	20	22.0	11	0.40	1	0.60
5785	54	20	22.0	11	0.40	1	0.60
5825	54	20	22.0	11	0.40	1	0.60



Equip #	Manufacturer	Model	Description	Next Due
	EMC Test			
CIS004882	Systems	3115	Double Ridged Guide Horn Antenna	4-June-13
CIS005691	Miteq	NSP1800-25-S1	Broadband Preamplifier	31-Jan-13
COM001051	TTE	H785-150K-50-21378	Hi Pass Filter - 150KHz cutoff	14-May-13
COM000213	Fischer	FCC-LISN-50-50-2M	Turntable LISN (150KHz-30MHz)	28-Feb-13
CIS021117	Micro-Coax	UFB311A-0-2484-520520	RF Coaxial Cable, to 18GHz, 248.4 in	24-Aug-12
CIS030564	Micro-Coax	UFB311A-1-0950-504504	RF Coaxial Cable, to 18GHz, 95 in	24-Aug-12
COM000233	Sunol Sciences	JB1	Combination Antenna, 30MHz-2GHz	28-Sep-12
COM000239	Rohde & Schwarz	ESI40	EMI Test Receiver	12-Jun-13
CIS034972	Midwest Microwave	ATT-0640-20-29M-02	Attenuator, 20dB	16-May-12
CIS043116	Huber + Suhner	Sucoflex 104PE	N & SMA RF cable	14-Dec-12
CIS040603	Agilent	E4440A	Spectrum Analyzer	6-Aug-13
CIS040053	Agilent	E4448A	Spectrum Analyzer	6-Apr-13

### Appendix C: Test Equipment/Software Used to perform the test

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