Radio Test Report: EDCS - 1357079

For

CP-DX80

Against the following Specifications :

FCC CFR 47 part 15.247

RSS-210

5725-5850MHz

Cisco Systems

EMC Laboratory

170 West Tasman Drive

San Jose, CA 95134

Author: Johanna Knudsen
Approved By: See EDCS
Title: See EDCS

This report replaces any previously entered test report under EDCS - 1357079

This test report has been electronically authorized and archived using the CISCO Engineering Document Control system.

Section 1: Overview

Test Summary

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

Emissions:
CFR47 Part 15.247
RSS-210

Notes:

1) Measurements were made in accordance with KDB Publication No. 558074 D01 DTS Meas Guidance v03r01 & measurement method of spurious emission tolerance to the International Telecommunication Union (ITU) Recommendation SM329.

Section 2: Assessment Information

2.1 General

This report must not be used to claim product certification, approval, or endorsement by A2LA, NIST, or any agency of the federal Government.

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 tolerances and measurement uncertainties.

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:

Temperature	15°C to 35°C (54°F to 95°F)
Atmospheric Pressure	860mbar to 1060mbar (25.4" to 31.3")
Humidity	10% to 75*%

e) All AC testing was performed at one or more of the following supply voltages:
110V (+/-10%) 60Hz
220V (+/-10%) 50 or 60Hz

f) Cisco Systems, Inc. is accredited by the American Association for Laboratory Accreditation (A2LA). The scope of accreditation, certificate number 1178-01 is referenced in appendix C, along with further details.

2.2 Start Date of Testing

13-FEB-2014

2.3 Report Issue Date

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2.4 Testing facilities

This assessment was performed by:

Testing Laboratory

Cisco Systems, Inc.,
170 West Tasman Drive
San Jose, CA 95134,
USA

Registration Numbers for Industry Canada

Cisco System Site	Site Identifier
Building P, 5m Chamber	Company #: 2461N-1

Test Engineers

Johanna Knudsen, Jose Aguirre

2.5 Equipment Assessed (EUT)

CP-DX80

2.6 EUT Description

The CP-DX80 is a 23 inch HD1080p video capable personal desktop collaboration endpoint that extends the DX series portfolio utilizing Android OS 4.1.1 (EX-60 replacement).

23 inch touch LDF

16 GB eMMC Flash memory (only 8 GB available) & 2 GB RAM
2 Gigabit Ethernet ports (1 for Network Uplink & 1 for Laptop connection)
3 standard A USB ports (2 in the back and 1 on the right side)
1 standard B USB port (with ADB support)
1 micro B USB port
1 HDMI for video out (to external monitor) with a maximum resolution of 1920 x 1200
1 HDMI for video in (from laptop)
1 micro SD card slot
1 Kensington Lock

Wi-Fi (802.11 a/b/g/n) & Bluetooth 3.0
Marvell 88W8787 - Wi-Fi + Bluetooth chip
Murata module LBEH1ZNRZC-TEMP, supports 802.11/a/b/g/n + Bluetooth 3.0 chip
SDIO interface to WLAN – Omap4 SD host controller port 5
PCM (McBSP1) interface to Bluetooth
Single OMAP4470 Architecture, with dual Cortex A9 running at 1.5GHz
Single antenna for 2.4 GHz and 5 GHz bands with diplex inside the module (SISO)
Amphenol SAA CI4671-15-000-R
4.61 dBi peak gain for 2.4 Ghz
7.05 dBi peak gain for 5 GHz
Coexistence between Wi-Fi and Bluetooth (1 antenna utilized)
Supports frequencies/channels 2.412 – 2.472 GHz & 5.180 – 5.825 GHz
Up to 72 Mbps (20 MHz channel), Up to 150 Mbps (40 MHz channel width)
Non- HT20 - 1 to 54 Mbps
HT20 - M0 to M7 (7 to 72 Mbps)
HT40 - M0 to M7 (15 to 150 Mbps)
802.11i security standard (WPA/WPA2)

2.7 Scope of Assessment

Tests have been performed in accordance with the relevant Test and Assessment Plan (TAP), a copy of which is contained in Appendix F of this report, and the relevant Cisco Systems, Inc. radio test procedures (EDCS-420238). This test report may not cover all of the tests highlighted in the test plan.

2.8 Units of Measurement

The units of measurements defined in the appendices are reported in specific terms, which are test dependent. Where radiated measurements are concerned these are defined at a particular distance. Basic voltage measurements are defined in units of [dBuV]

As an example, the basic calculation for all measurements is as follows:

Emission level [dBuV] = Indicated voltage level [dBuV] + Cable Loss [dB] + Other correction factors [dB]

The combinations of correction factors are dependent upon the exact test configurations [see test equipment lists for further details] and may include:-

Antenna Factors, Pre Amplifier Gain, LISN Loss, Pulse Limiter Loss and Filter Insertion Loss..

Note: to convert the results from dBuV/m to uV/m use the following formula:-

Level in uV/m = Common Antilogarithm [(X dBuV/m)/20] = Y uV/m

2.9 Report Template Control No.

EDCS#: 703457

Section 3: Result Summary

Conducted emissions

Basic Standard	Result
6dB Bandwidth	Pass
99% and 26dB Bandwidth	Pass
20dB Bandwidth	Pass
Peak Output Power	Pass
Power Spectral Density	Pass
Conducted Spurious Emissions	Pass
Restricted Band Edge Measurements	Pass

Radiated emissions

Basic Standard	Result
Radiated Spurious and Harmonic Emissions	Pass
Co-Location Radiated Spurious Emissions	Pass

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.

4.1 Sample Details

Sample Number	Equipment Details	Serial Number	Part Number
S01	CP-DX80	FOC1801N7WM	CSO 68-00355-01 04 (P2)
S02	CP-DX80	FOC1809N3R2	CSO 68-00355-01 04 (P3A)

The following antennas were evaluated as part of this testing process. The antennas listed reflect the maximum gain allowed for each family type of antenna:

Fixed internal Amphenol Dual Band Antenna at 5GHz, Gain: 7.05 peak (no external antenna can be used)

5150 – 5250MHz: 3.4 dBi
5250 – 5350MHz: 4 dBi
5500 – 5700MHz: 6.1 dBi
5745 – 5850MHz: 7.05 dBi

4.2 System Details

System #	Description	Samples
1	Radio Test Sample - Manufacturing Image	S01
2	Radio Test Sample – Production Image	S02

4.3 Mode of Operation Details

Mode#	Description	Comments
1	802.11 Test Mode	System is placed in a continuous Tx State at various channels per Test Requirements. 802.11a running at 6Mbps, HT20 running at M0 and HT40 running M0. Manufacturing image used.
2	802.11 Test Mode + Bluetooth for co-location	System is placed in a continuous Tx State at various channels per Test Requirements. 802.11a running at 6Mbps, HT20 running at M0 and HT40 running M0. Production image used.

Section 5: Modifications

5.1 Sample Modifications Performed During Assessment

No modifications were performed during assessment.

Appendix A: Formal Test Results

Target Maximum Channel Power

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

	Maximum Channel Power (dBm)		
	Frequency (MHz)		
Operating Mode	5745	5785	5825
802.11a, 6 to 54 Mbps	16	16	16
802.11n HT20, M0 to M7	15	15	15
	5755	5795	
802.11n HT40, M0 to M7	15	15	

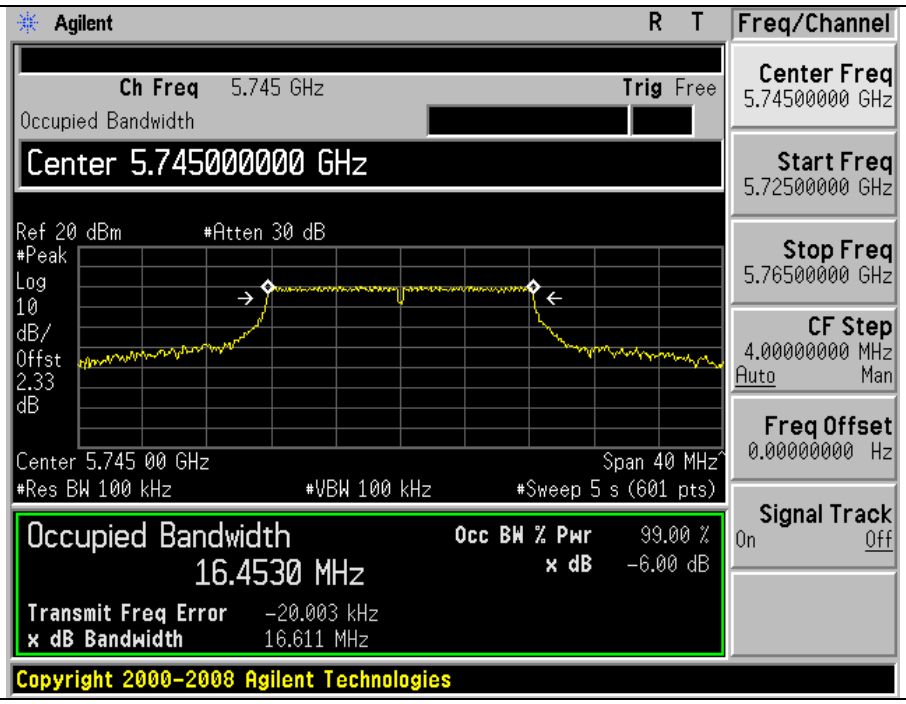
6dB & 99% Bandwidth

15.247 & RSS-210(A8.2) Systems using digital modulation techniques may operate in the 5725-5850MHz band. The minimum 6 dB bandwidth shall be at least 500 kHz.

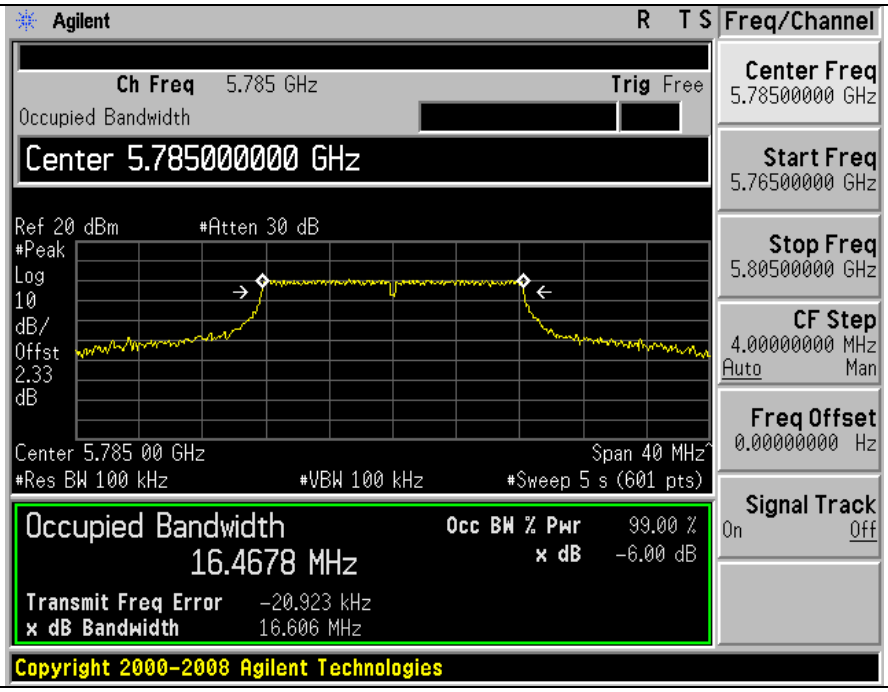
Mode	Frequency (MHz)	Data Rate (Mbps)	6dB Bandwidth (kHz)	Limit (kHz)	Margin (kHz)
802.11a	5745	6	16611	500	-16111
	5785	6	16606	500	-16106
	5825	6	16575	500	-16075
802.11n HT20	5745	M0	17855	500	-17355
	5785	M0	17815	500	-17315
	5825	M0	17806	500	-17306
802.11n HT40	5755	M0	36602	500	-36102
	5795	M0	36558	500	-36058

Mode	Frequency (MHz)	Data Rate (Mbps)	99% Bandwidth (MHz)
802.11a	5745	6	16.4530
	5785	6	16.4678
	5825	6	16.4752
802.11n HT20	5745	M0	17.6605
	5785	M0	17.6611
	5825	M0	17.6750
802.11n HT40	5755	M0	36.1875
	5795	M0	36.2027

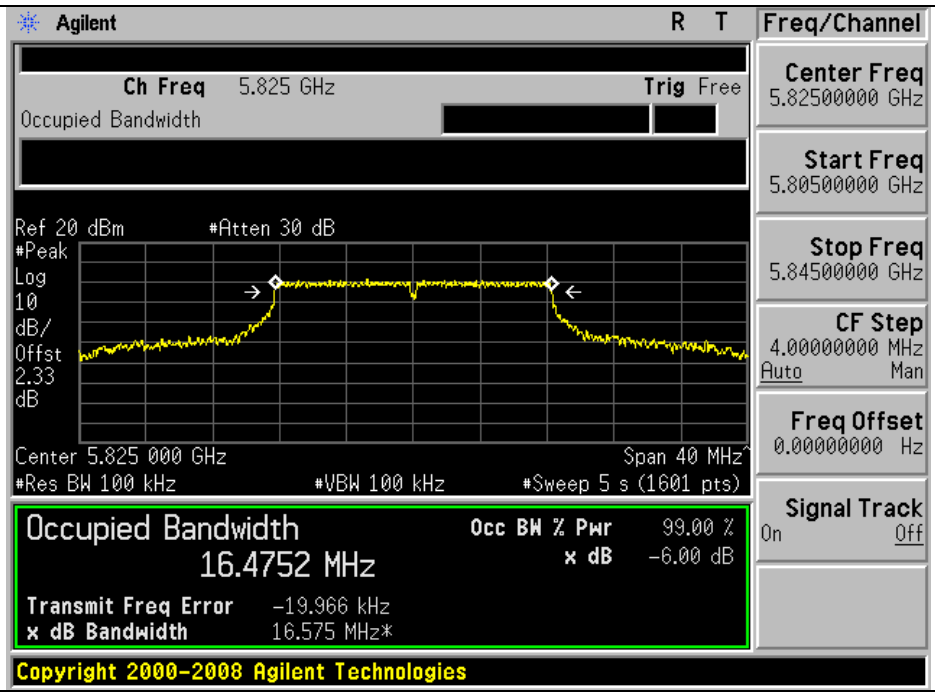
Graphical Test Results



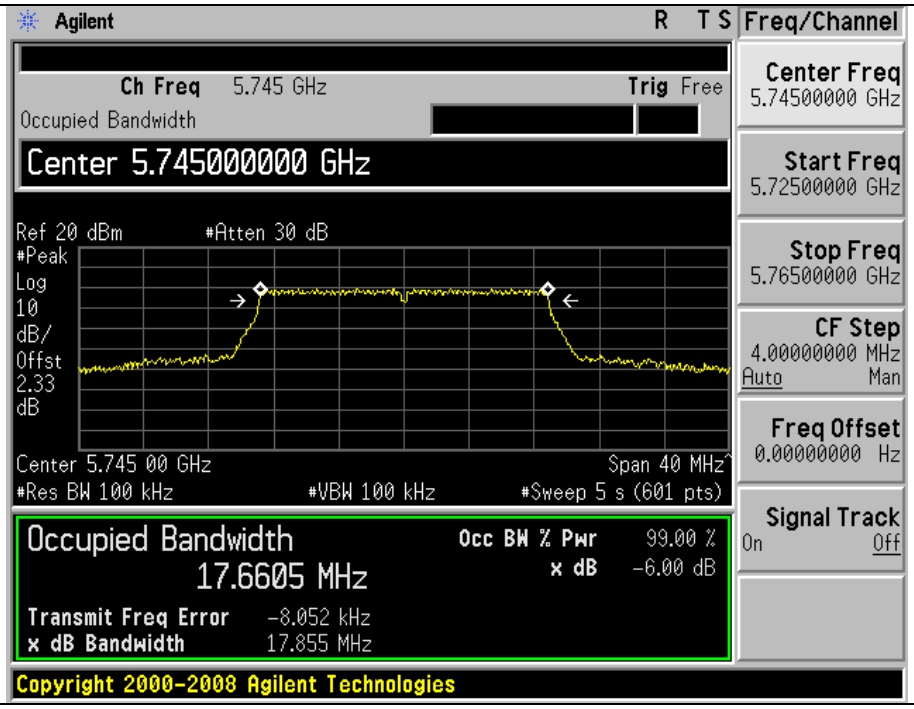
Title: 6dB & Occupied Bandwidth at 5745MHz for 802.11a



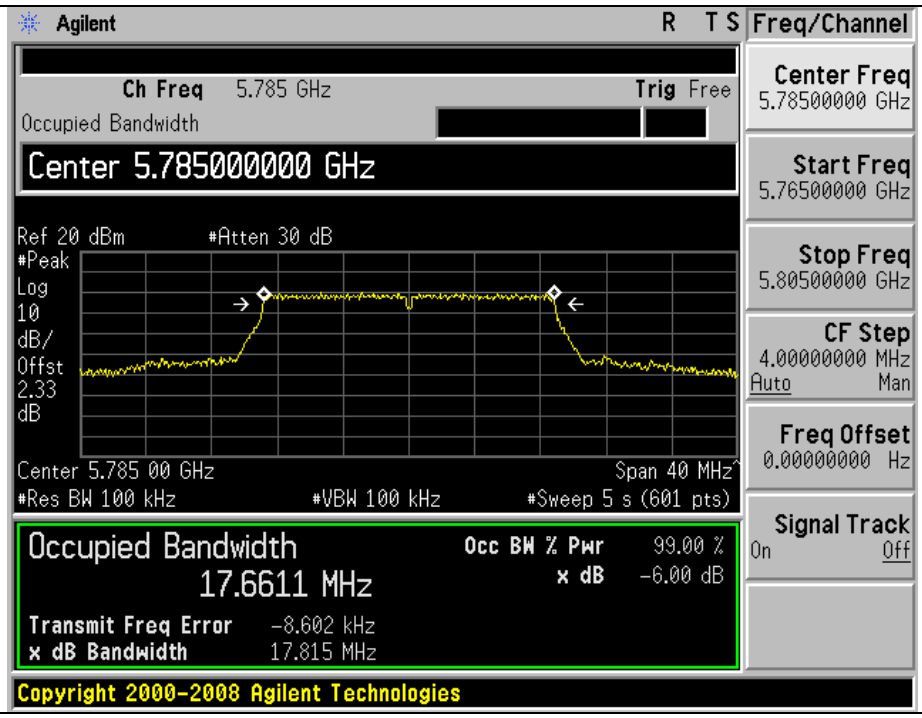
Title: 6dB & Occupied Bandwidth at 5785MHz for 802.11a



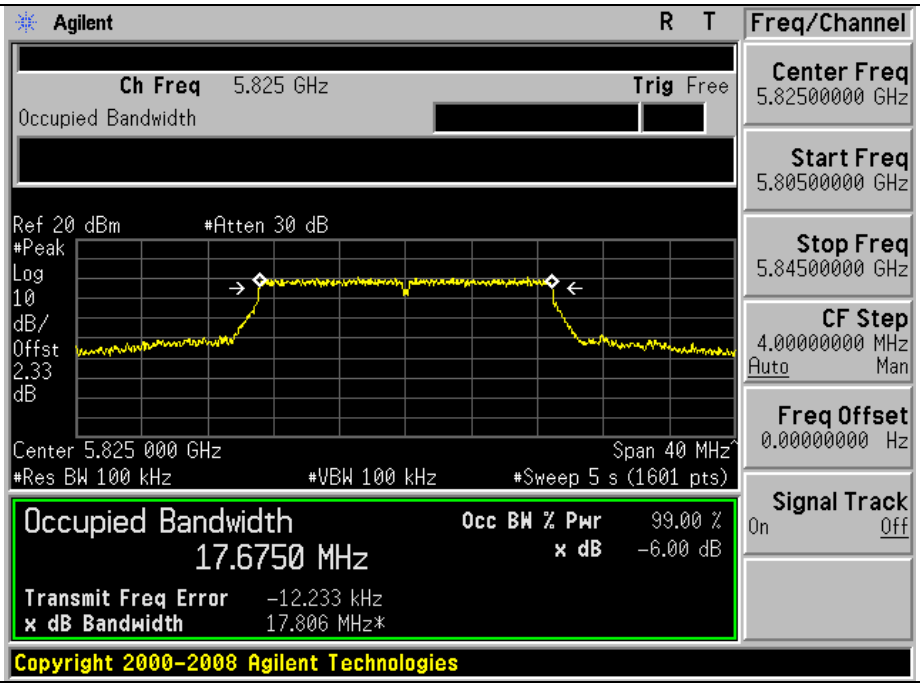
Title: 6dB & Occupied Bandwidth at 5825MHz for 802.11a



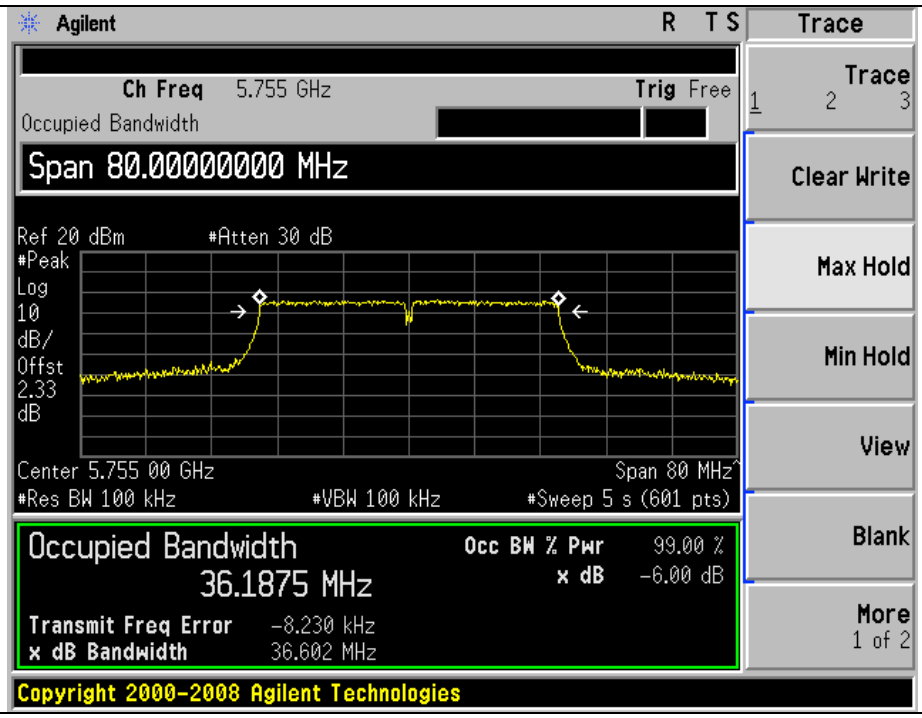
Title: 6dB & Occupied Bandwidth at 5745MHz for 802.11n HT20



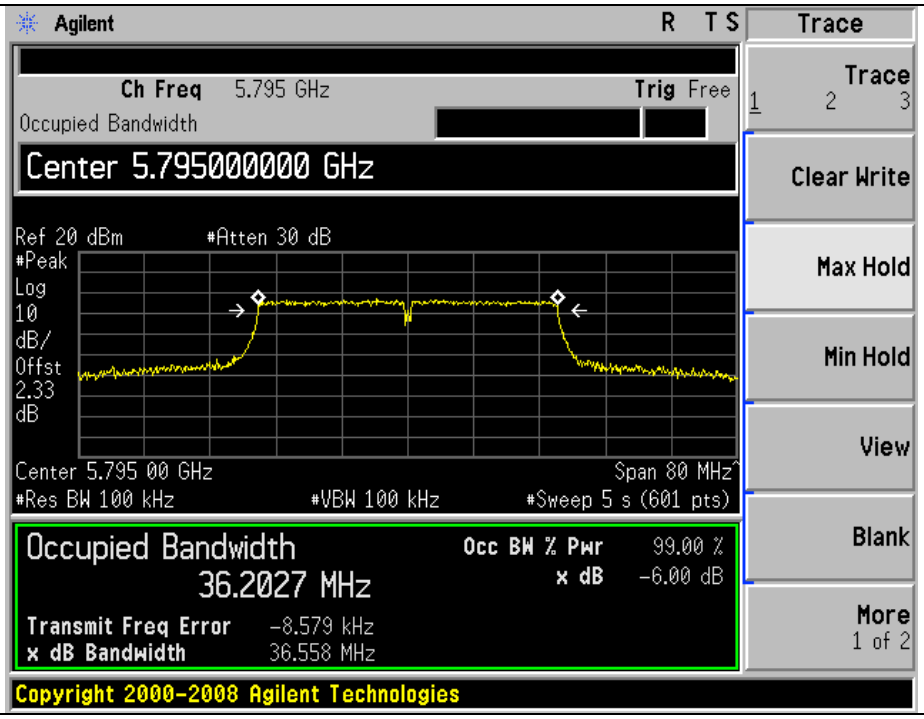
Title: 6dB & Occupied Bandwidth at 5785MHz for 802.11n HT20



Title: 6dB & Occupied Bandwidth at 5825MHz for 802.11n HT20



Title: 6dB & Occupied Bandwidth at 5755MHz for 802.11n HT40



Title: 6dB & Occupied Bandwidth at 5795MHz for 802.11n HT40

99% and 26dB Bandwidth

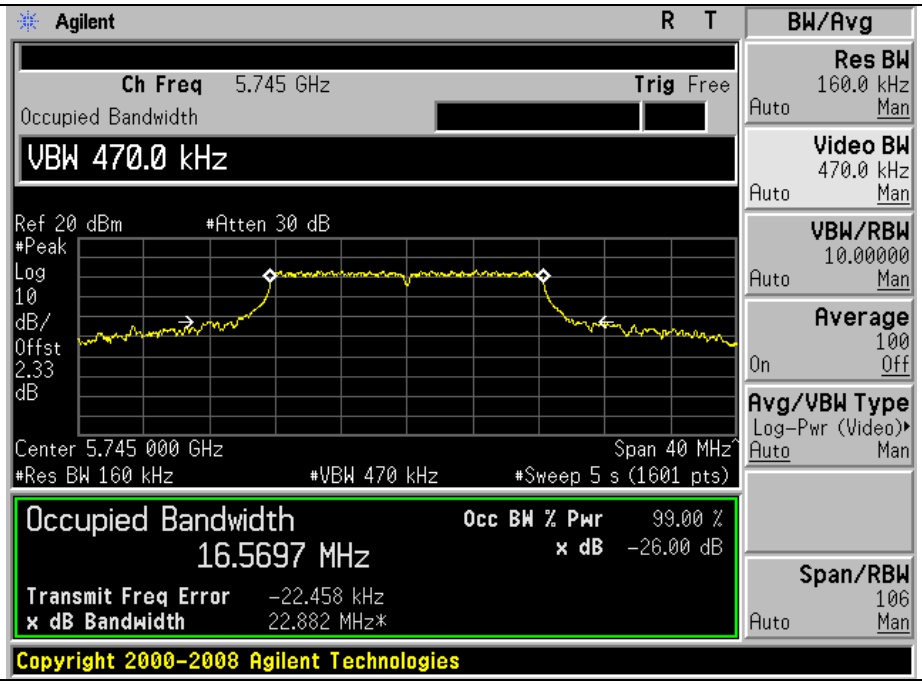
Connect the antenna port(s) to the spectrum analyzer input. Using the spectrum analyzer Channel Bandwidth mode, configure the spectrum analyzer as shown below (enter all losses between the transmitter output and the spectrum analyzer).

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

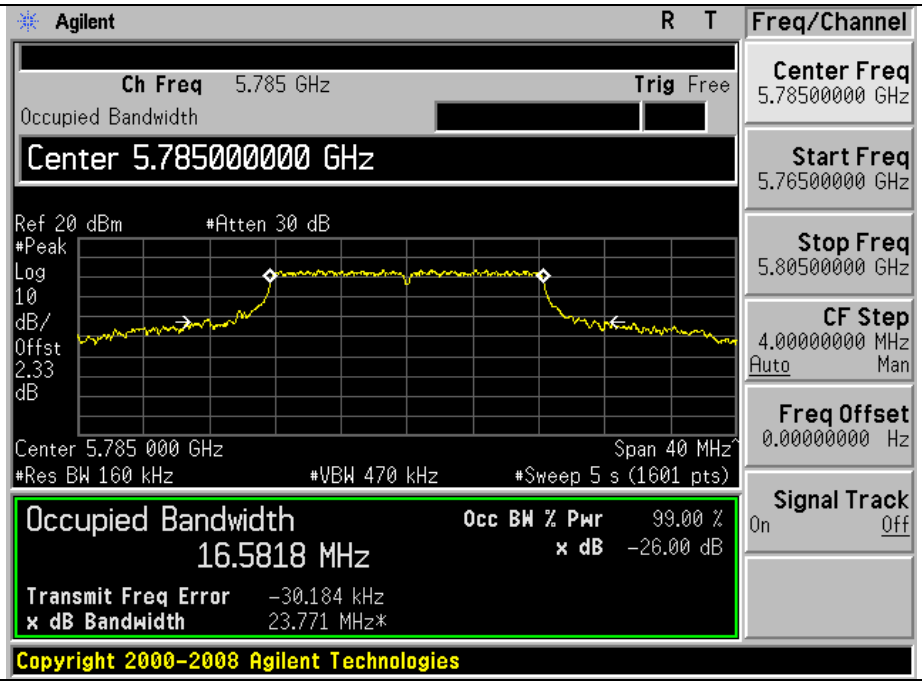
Place the radio in continuous transmit mode. View the transmitter waveform on the spectrum analyzer, and record the pertinent measurements:

Mode	Frequency (MHz)	Data Rate (Mbps)	99% Bandwidth (MHz)	26dB Bandwidth (MHz)
802.11a	5745	6	16.5697	22.882
	5785	6	16.5818	23.771
	5825	6	16.5888	24.091
802.11nHT20	5745	M0	17.7052	20.287
	5785	M0	17.7704	20.496
	5825	M0	17.7510	20.346
802.11nHT40	5755	M0	36.3466	40.896
	5795	M0	36.4024	39.829

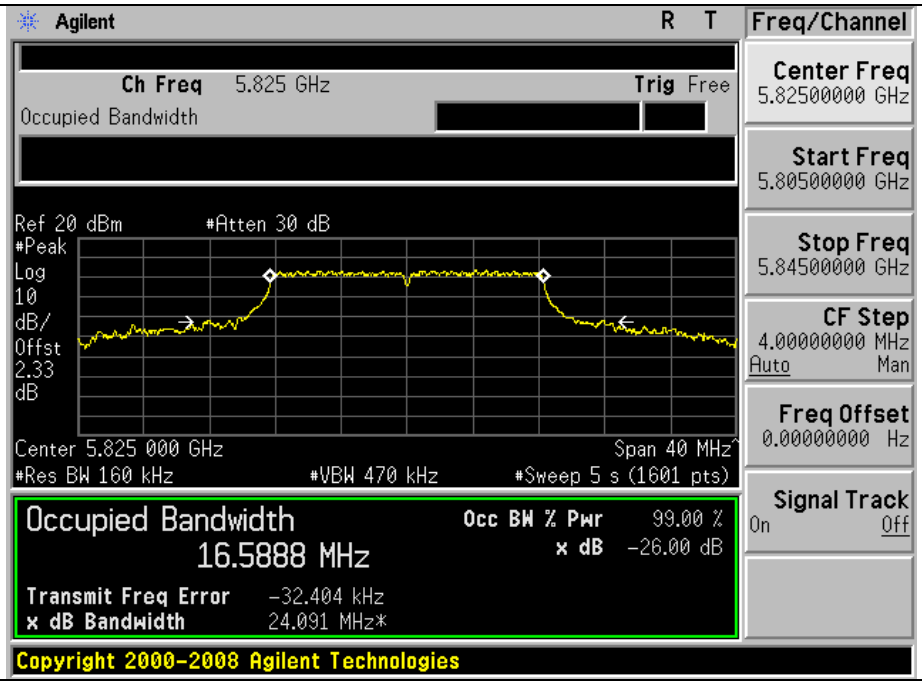
Graphical Test Results



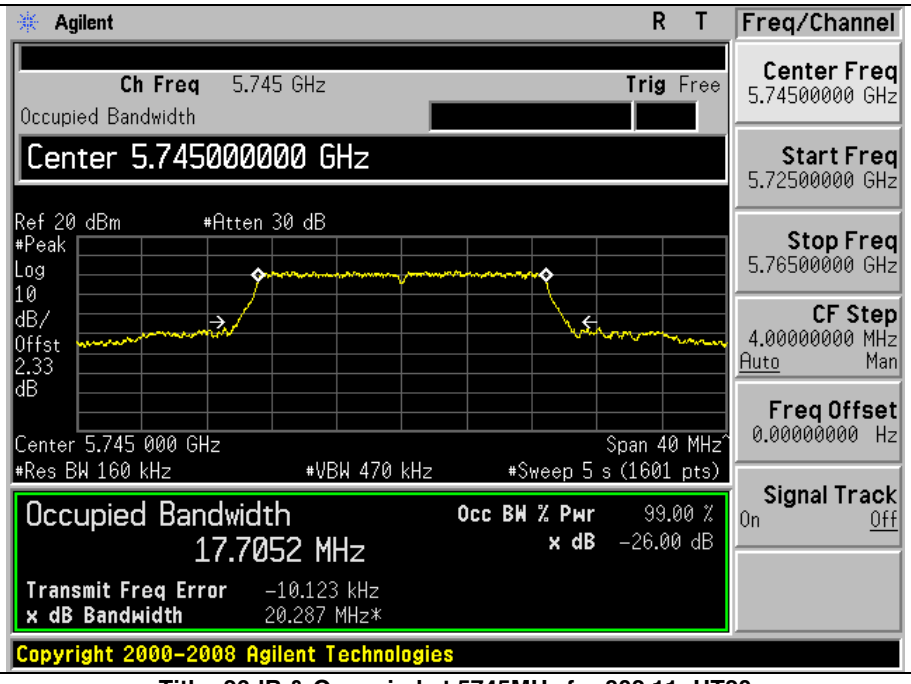
Title: 26dB & Occupied at 5745MHz for 802.11a



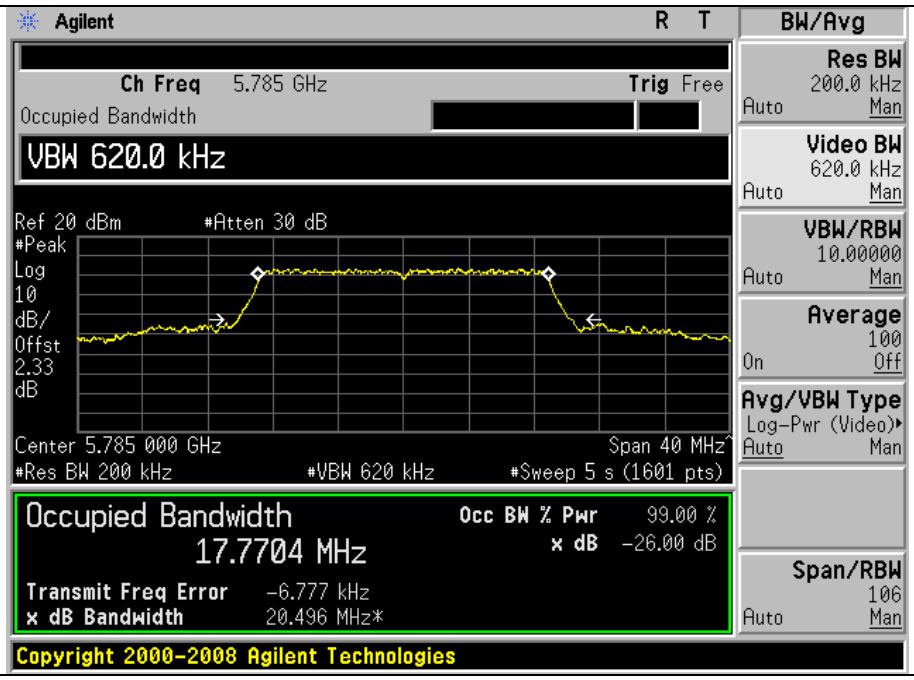
Title: 26dB & Occupied at 5785MHz for 802.11a



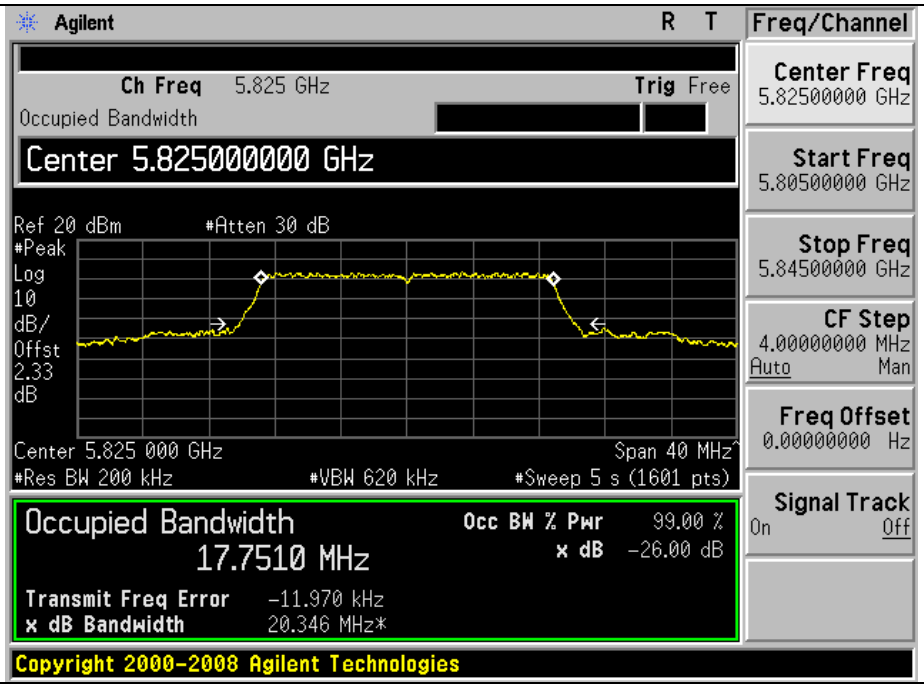
Title: 26dB & Occupied at 5825MHz for 802.11a



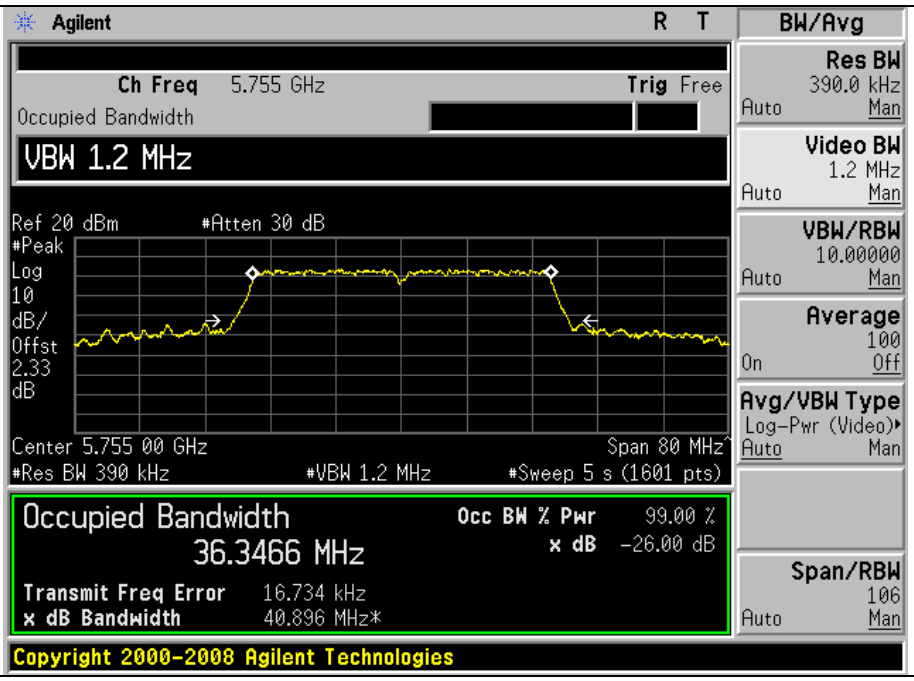
Title: 26dB & Occupied at 5745MHz for 802.11nHT20



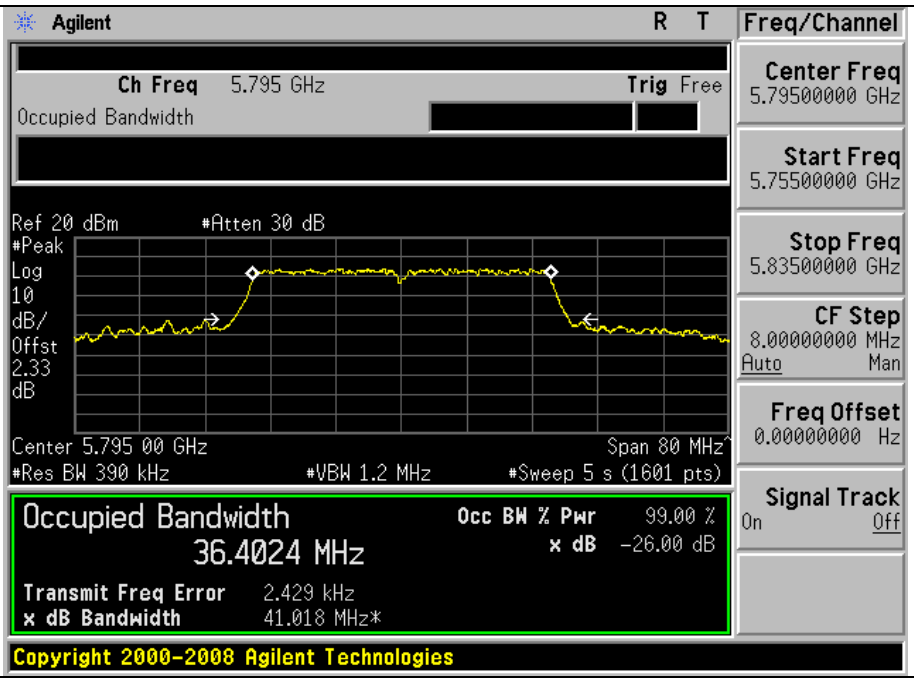
Title: 26dB & Occupied at 5785MHz for 802.11nHT20



Title: 26dB & Occupied at 5825MHz for 802.11nHT20



Title: 26dB & Occupied at 5755MHz for 802.11nHT40



Title: 26dB & Occupied at 5795MHz for 802.11nHT40

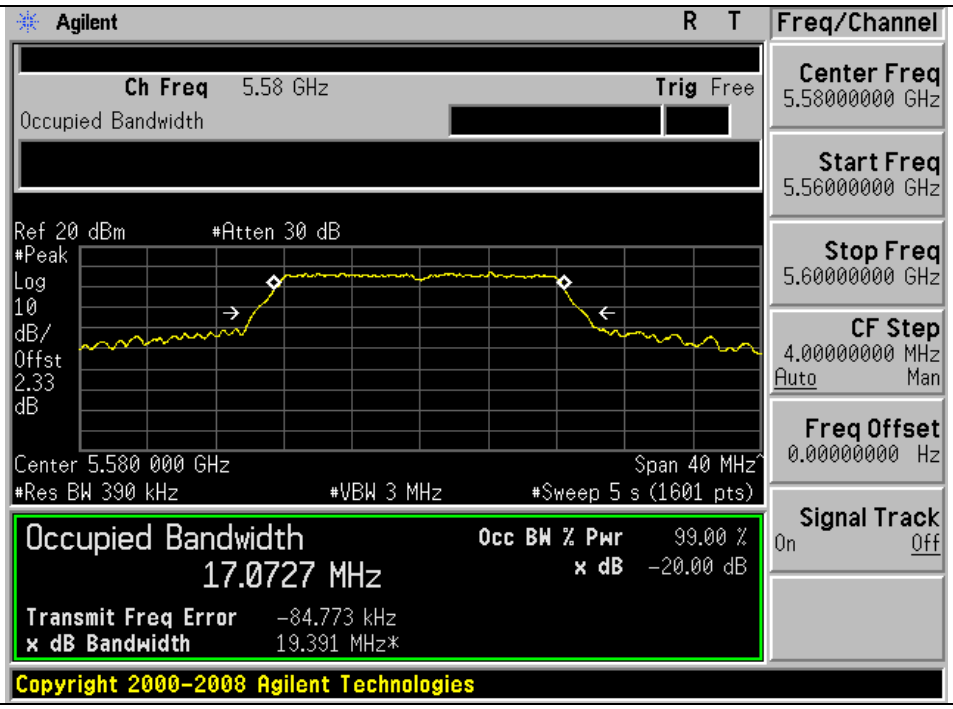
20dB Bandwidth

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).

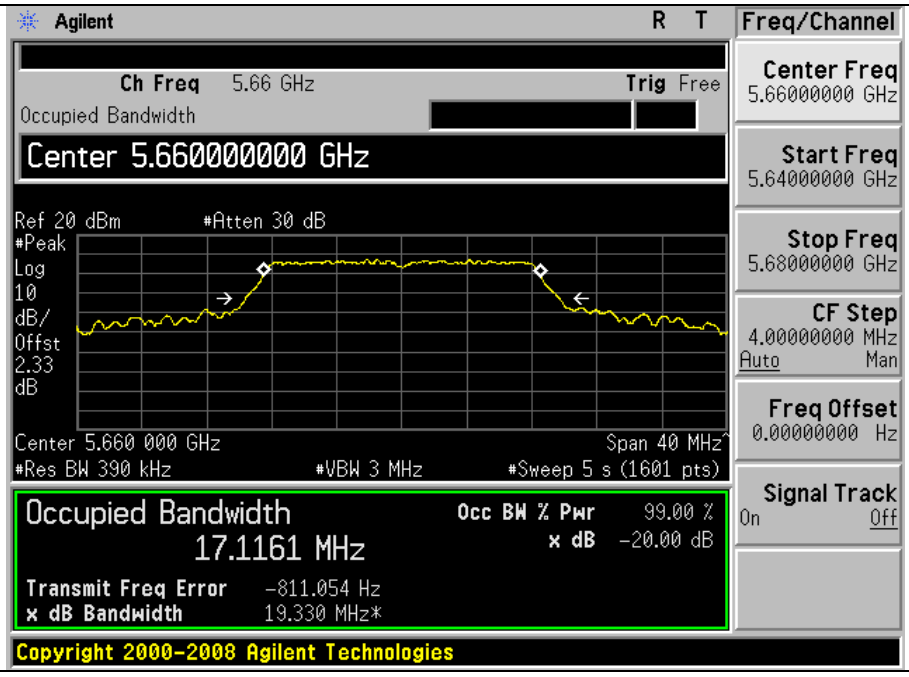
Center Frequency: Frequency from table be.low
Span: 2 x Nominal Bandwidth (e.g. 40MHz for a 20MHz channel)
Reference Level: 20 dBm
Attenuation: 10 dB
Sweep Time: 5 s
Resolution Bandwidth: 1%-3% of 20 dB Bandwidth
Video Bandwidth: ≥Resolution Bandwidth
X dB Bandwidth: 20 dB
Detector: Peak
Trace: Single

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

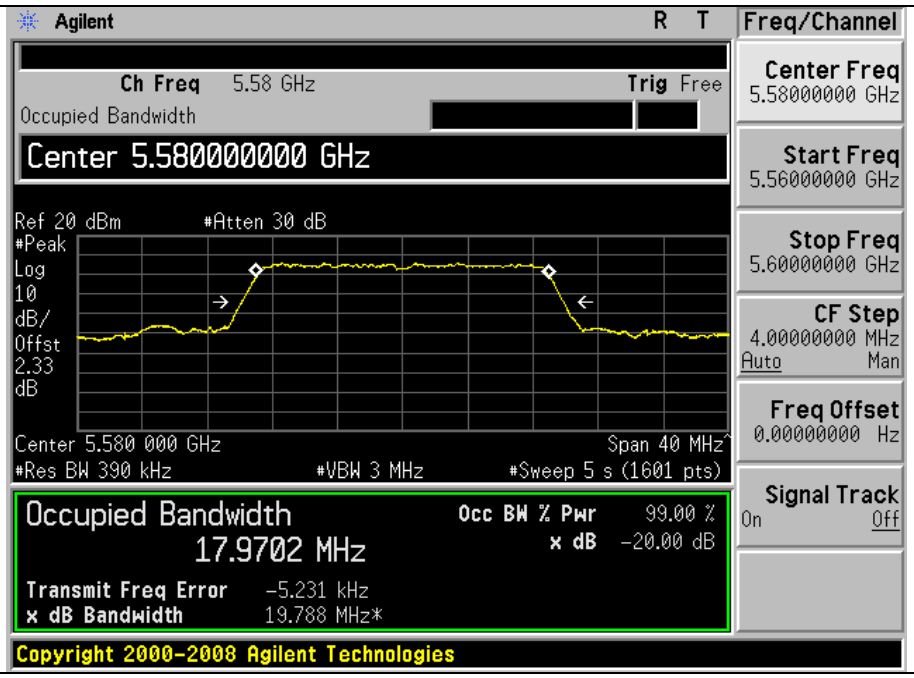
Mode	Frequency (MHz)	Data Rate (Mbps)	20dB BW (MHz)	Limit (MHz)	Margin (MHz)
802.11a	5580	6	19.391	20	0.609
	5660	6	19.330	20	0.670
802.11n HT20	5580	M0	19.788	20	0.212
	5660	M0	19.745	20	0.255
802.11n HT40	5550	M0	39.347	40	0.653
	5670	M0	39.290	40	0.710



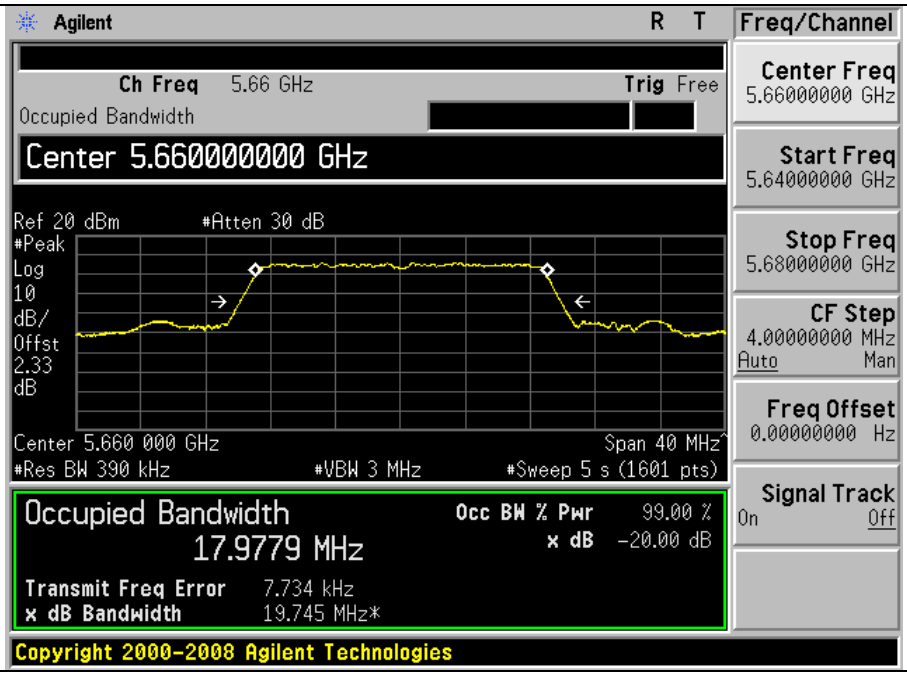
Title: 20dB at 5580MHz for 802.11a



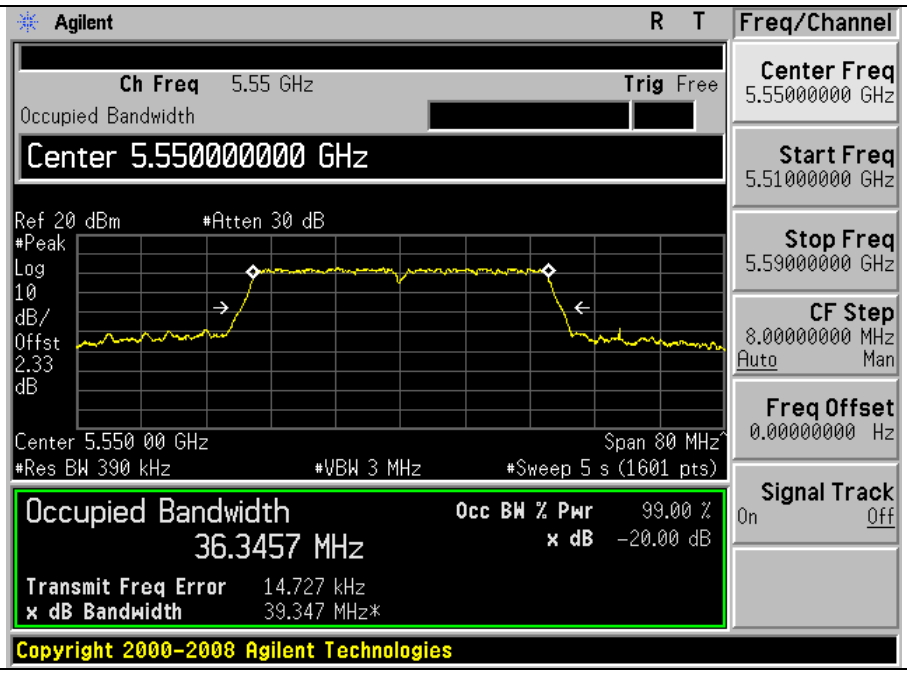
Title: 20dB at 5660MHz for 802.11a



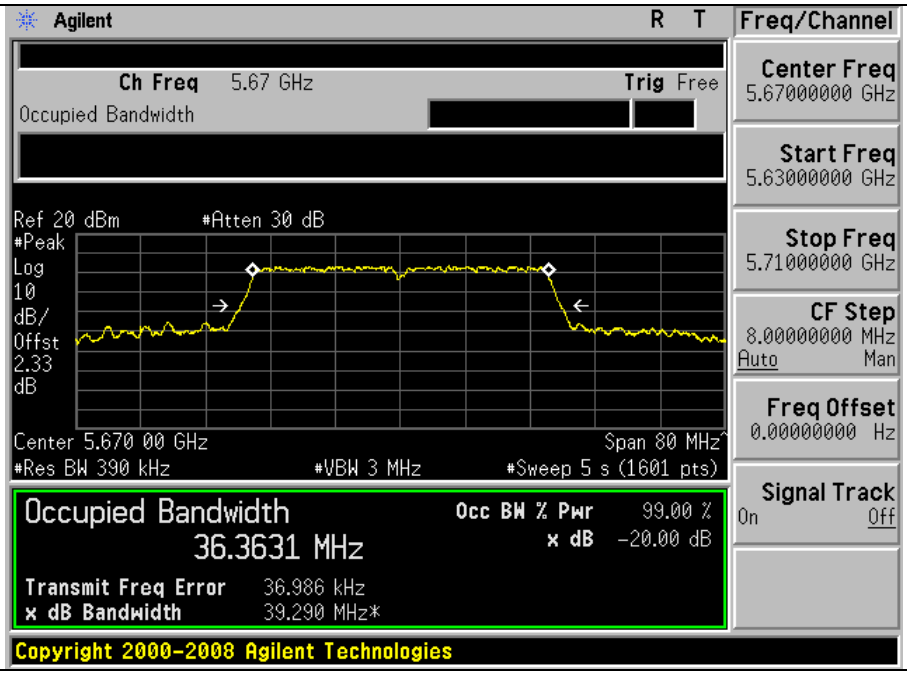
Title: 20dB at 5580MHz for 802.11nHT20



Title: 20dB at 5660MHz for 802.11nHT20



Title: 20dB at 5550MHz for 802.11nHT40



Title: 20dB at 5670MHz for 802.11nHT40

Peak Output Power

15.247 & RSS-210(A8.4):

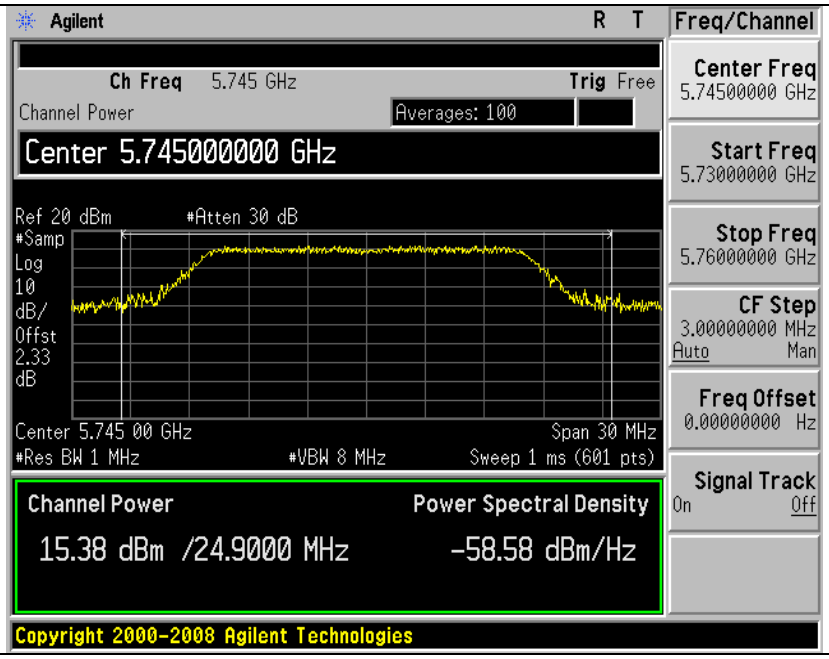
The maximum conducted output power of the intentional radiator for systems using digital modulation in the 5725-5850MHz band shall not exceed 1 Watt (30dBm). If transmitting antennas of directional gain greater than 6 dBi are used, the maximum conducted output power shall be reduced by the amount in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

Connect the antenna port(s) to the spectrum analyzer input. Place the radio in continuous transmit mode. Configure the spectrum analyzer as shown below. KDB 558074 DTS Measurement Guidance v03r01 was used to determine the method for testing. Power Measurements were made using settings described in section 9.2.2.2 Method AVGSA-1 (trace averaging with the EUT transmitting at full power throughout each sweep).

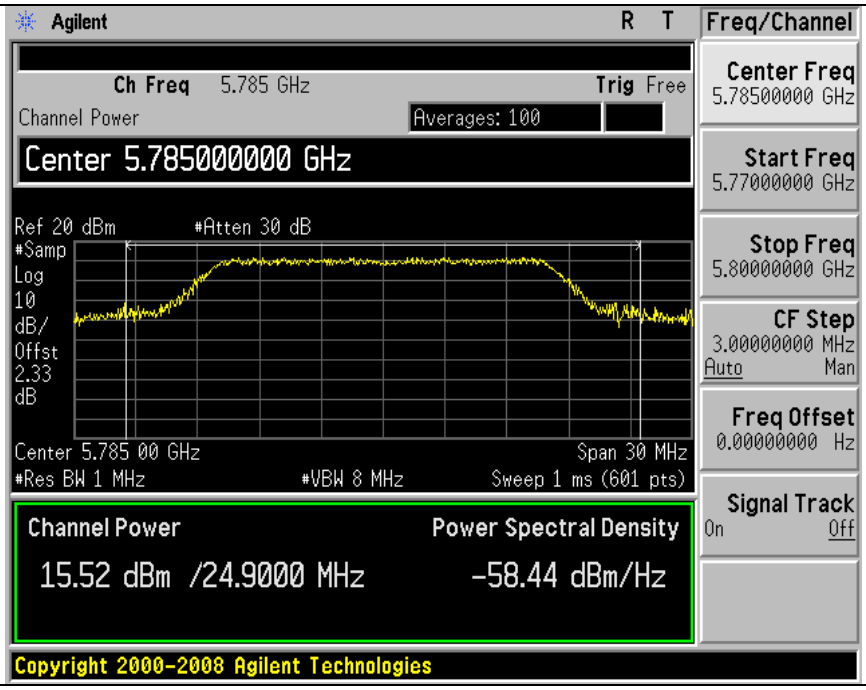
- Set span to at least 1.5 times the OBW
- Set RBW = 1-5% of the OBW, not to exceed 1 MHz
- Set VBW ≥ 3 x RBW
- Number of points in sweep ≥ 2 x span / RBW. (This gives bin-to-bin spacing ≤ RBW/2, so that narrowband signals are not lost between frequency bins.)
- Sweep time = auto.
- Detector = RMS (*i.e.*, power averaging), if available. Otherwise, use sample detector mode.
- If transmit duty cycle < 98 %, use a sweep trigger with the level set to enable triggering only on full power pulses. The transmitter shall operate at maximum power control level for the entire duration of every sweep. If the EUT transmits continuously (*i.e.*, with no off intervals) or at duty cycle ≥ 98 %, and if each transmission is entirely at the maximum power control level, then the trigger shall be set to “free run”.
- Trace average at least 100 traces in power averaging (*i.e.*, RMS) mode.
- Compute power by integrating the spectrum across the OBW of the signal using the instrument’s band power measurement function, with band limits set equal to the OBW band edges. If the instrument does not have a band power function, sum the spectrum levels (in power units) at intervals equal to the RBW extending across the entire OBW of the spectrum.

Mode	Frequency (MHz)	Data Rate (Mbps)	Peak Output Power (dBm)	Limit (dBm)	Margin (dB)
802.11a	5745	6	15.38	29	-13.62
	5785	6	15.52	29	-13.48
	5825	6	15.82	29	-13.18
802.11nHT20	5745	M0	14.41	29	-14.59
	5785	M0	14.63	29	-14.37
	5825	M0	14.94	29	-14.06
802.11nHT40	5755	M0	14.29	29	-14.71
	5795	M0	14.52	29	-14.48

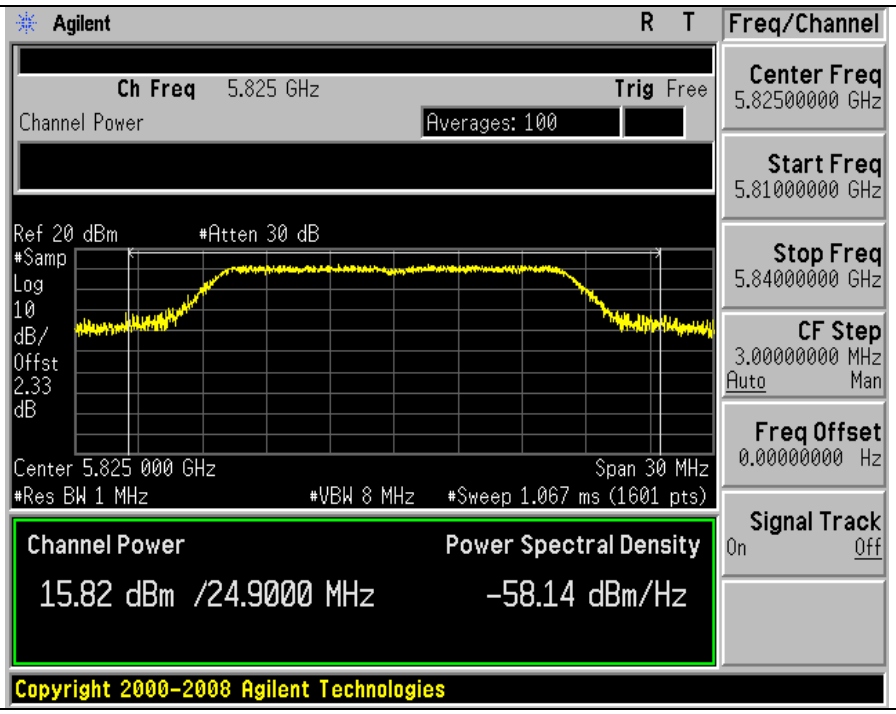
Graphical Test Results



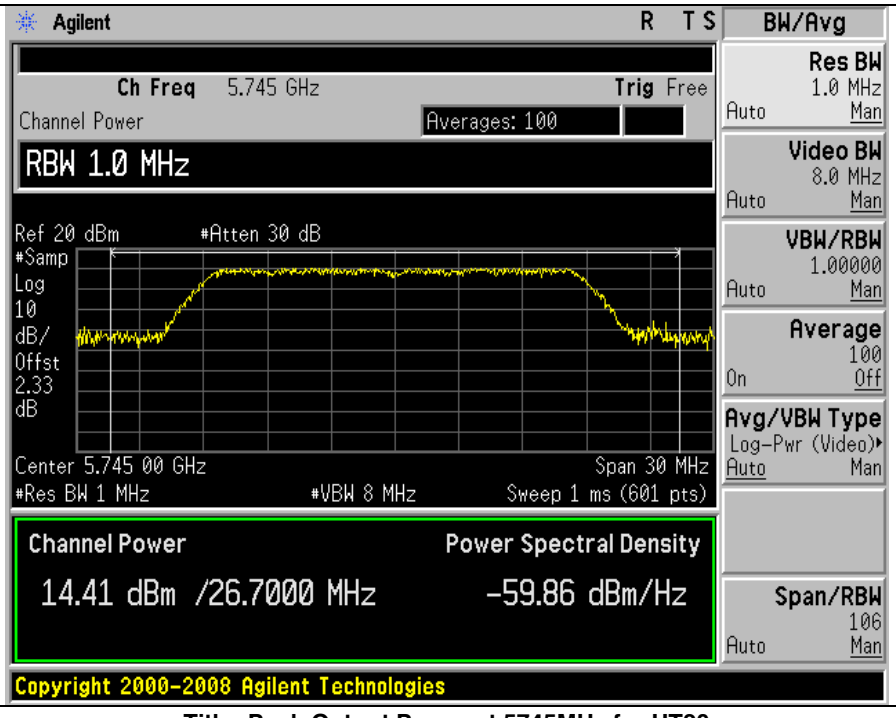
Title: Peak Output Power at 5745MHz



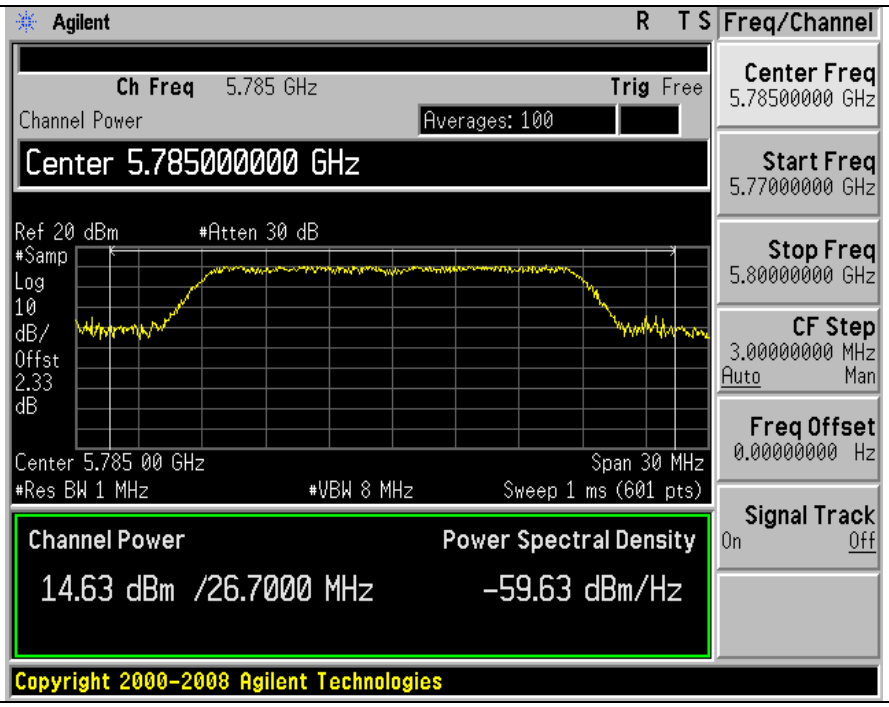
Title: Peak Output Power at 5785MHz



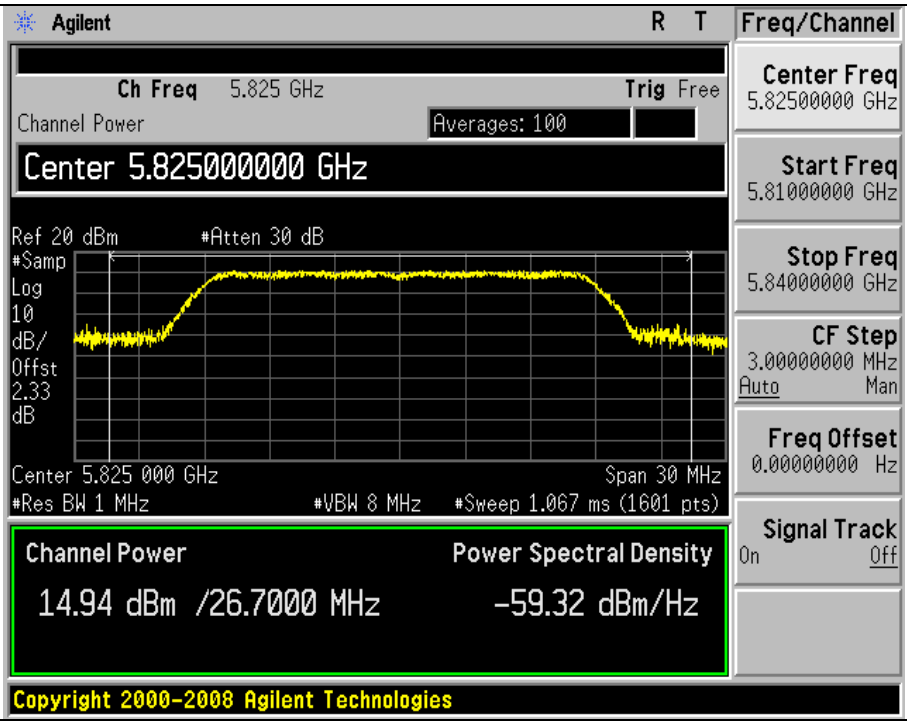
Title: Peak Output Power at 5825MHz



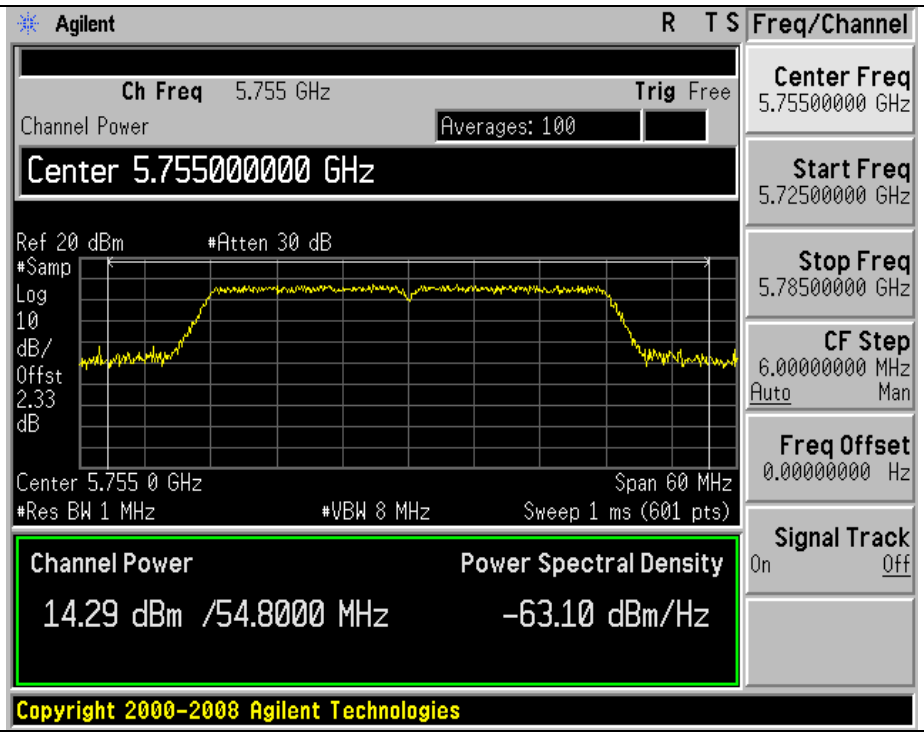
Title: Peak Output Power at 5745MHz for HT20



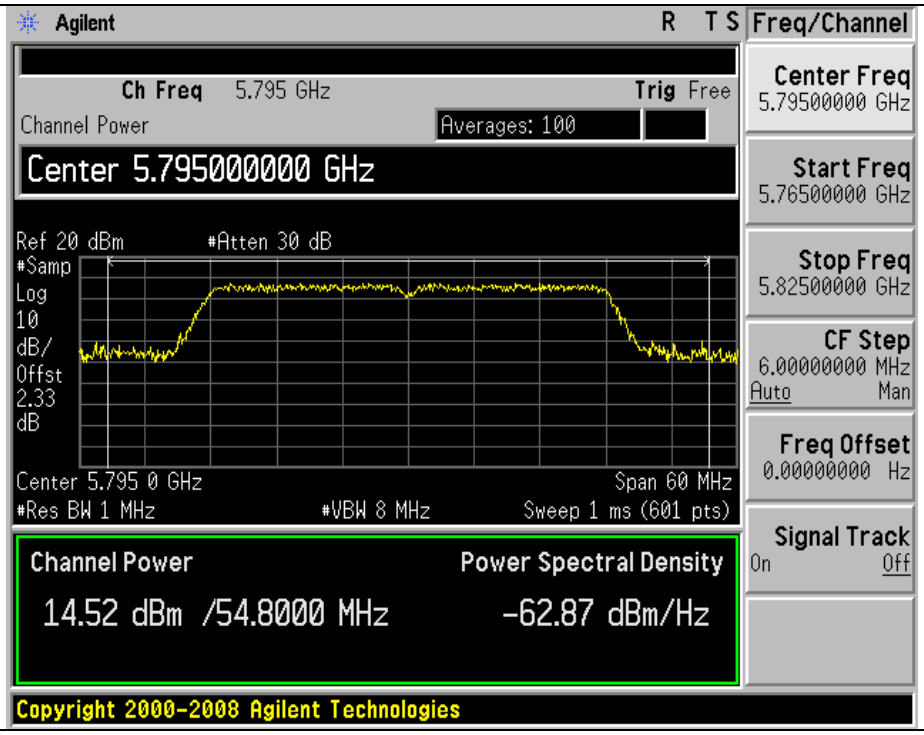
Title: Peak Output Power at 5785MHz for HT20



Title: Peak Output Power at 5825MHz for HT20



Title: Peak Output Power at 5755MHz for HT40



Title: Peak Output Power at 5795MHz for HT40

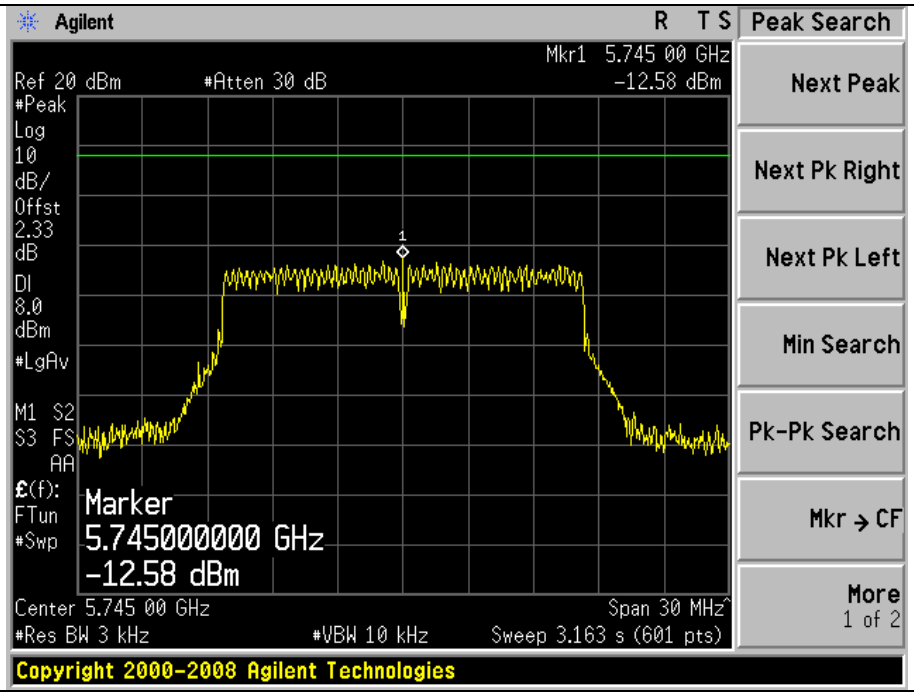
Power Spectral Density

15.247 & RSS-210(A8.2):

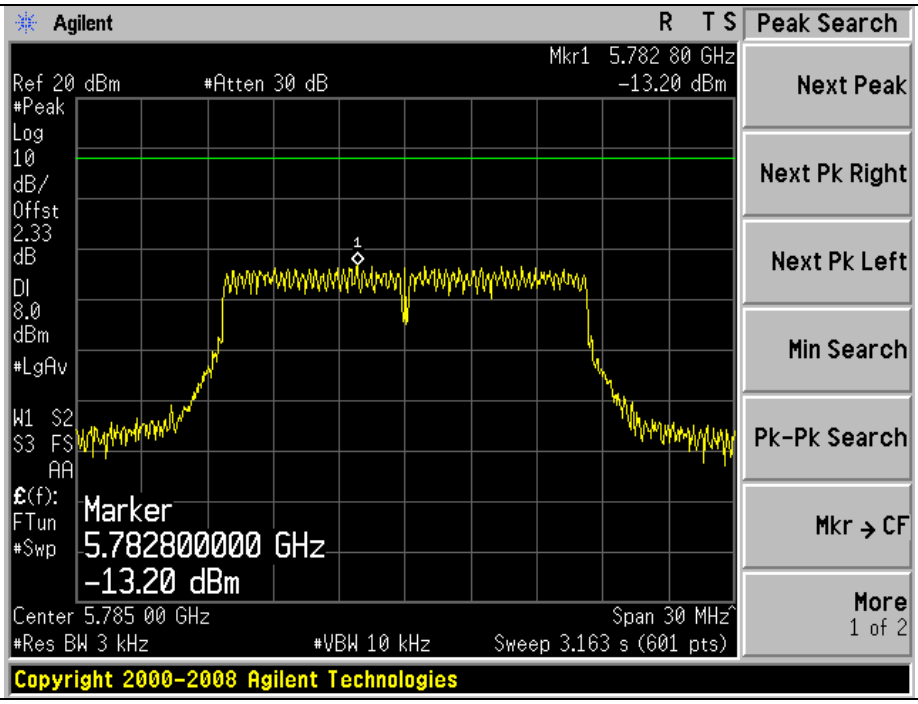
For digitally modulated systems, the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

Mode	Frequency (MHz)	Data Rate (Mbps)	Peak Power Spectral Density (dBm/3kHz)	Limit (dBm)	Margin (dB)
802.11a	5745	6	-12.58	8	-20.58
	5785	6	-13.20	8	-21.20
	5825	6	-12.18	8	-20.18
802.11nHT20	5745	M0	-12.58	8	-20.58
	5785	M0	-12.70	8	-20.70
	5825	M0	-12.00	8	-20.00
802.11nHT40	5755	M0	-12.25	8	-20.25
	5795	M0	-12.19	8	-20.19

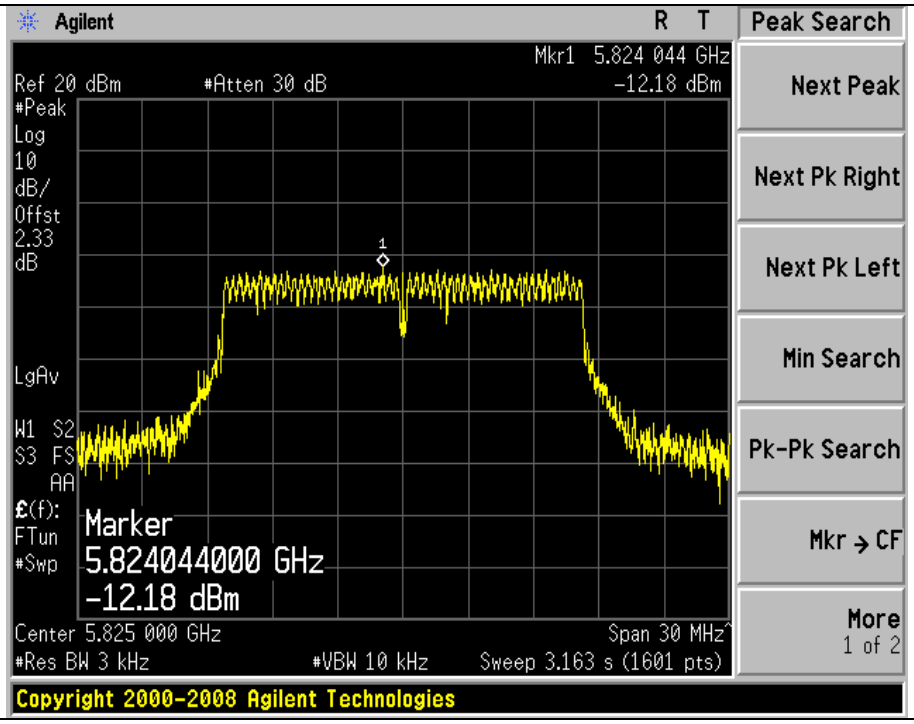
Graphical Test Results



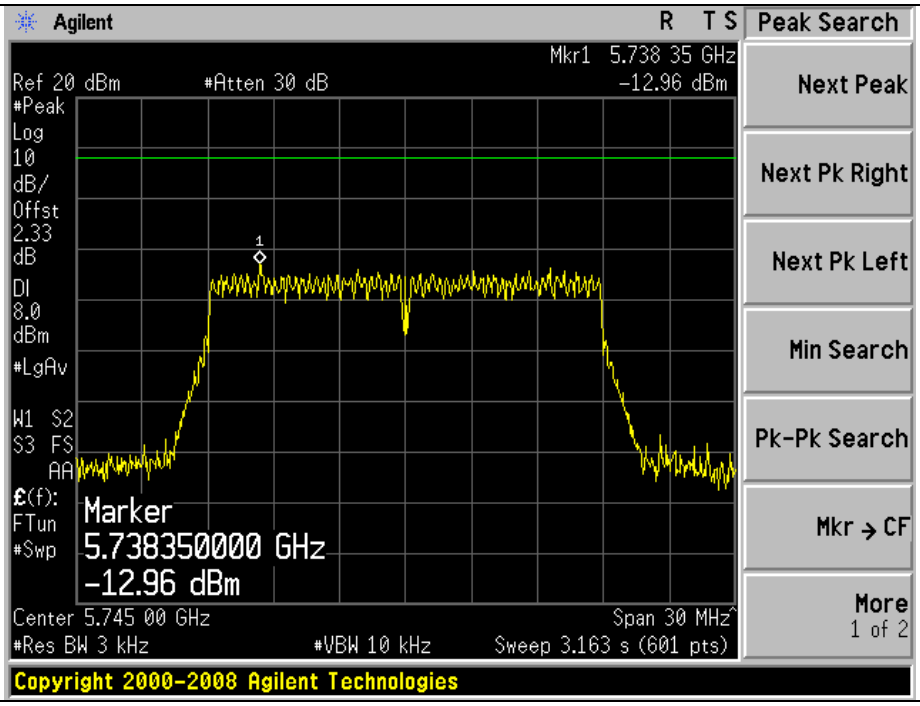
Title: Peak Power Spectral Density for 5745MHz, 802.11a at 6Mbps



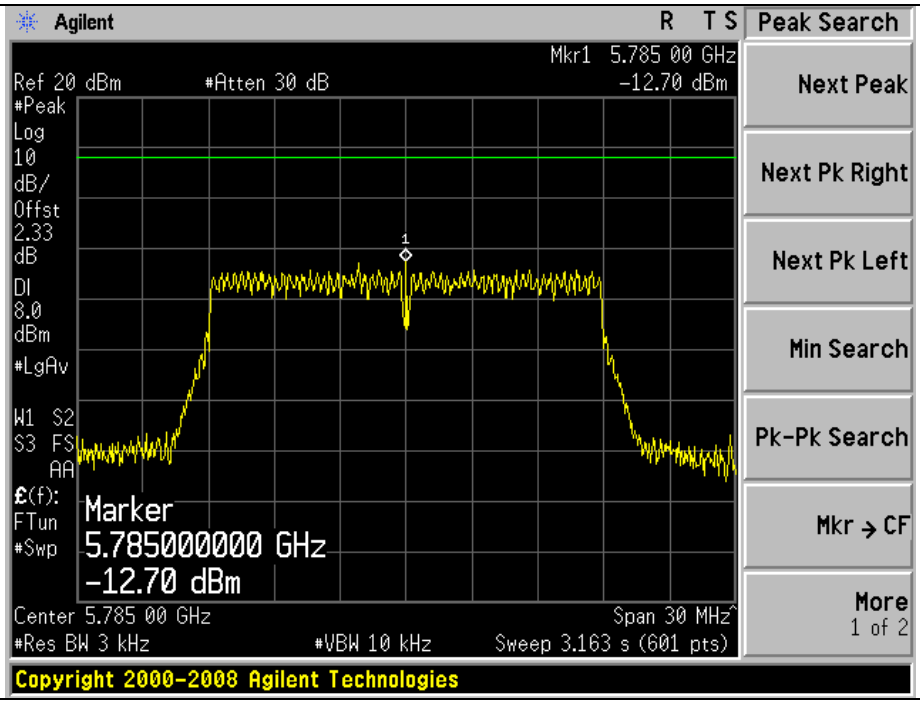
Title: Peak Power Spectral Density at 5785MHz, 802.11a at 6Mbps



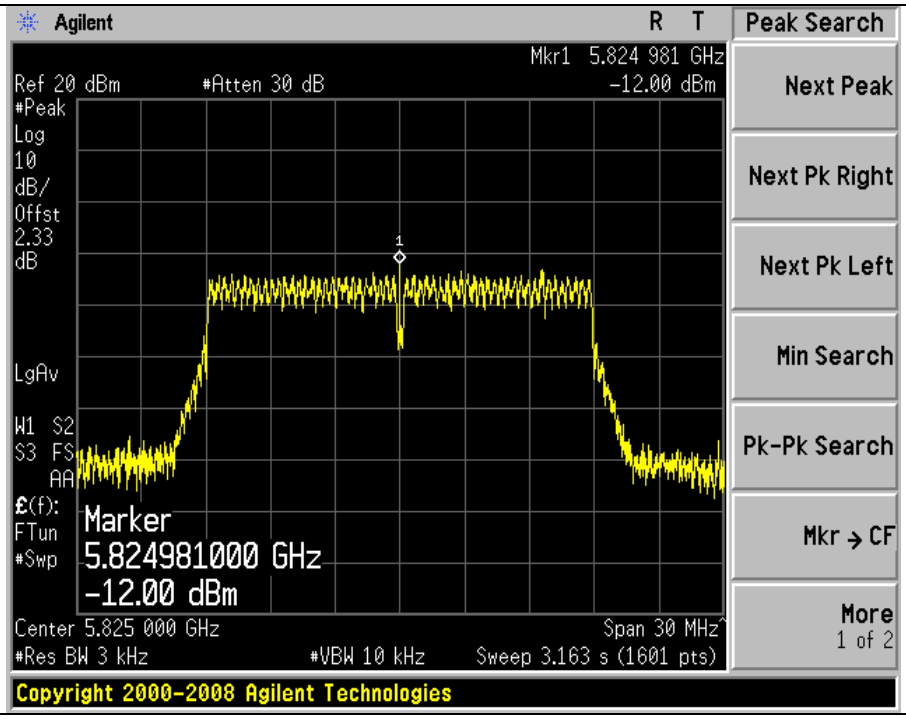
Title: Peak Power Spectral Density for 5825MHz, 802.11a at 6Mbps



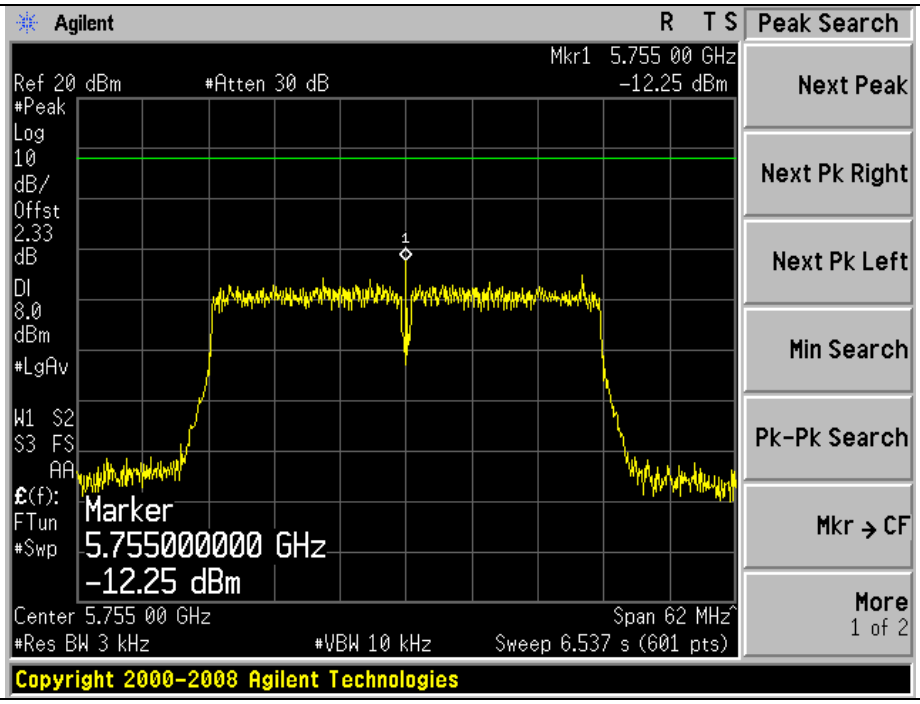
Title: Peak Power Spectral Density for 5745MHz, 802.11n HT20 at M0



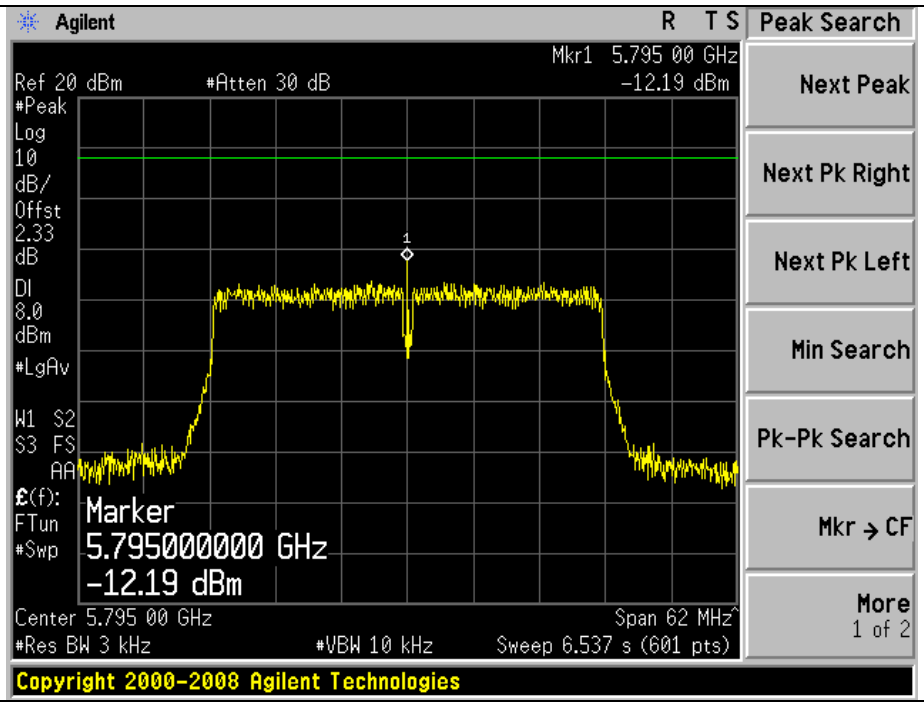
Title: Peak Power Spectral Density at 5785MHz, 802.11n HT20 at M0



Title: Peak Power Spectral Density for 5825MHz, 802.11n HT20 at M0



Title: Peak Power Spectral Density at 5755MHz, 802.11n HT40 at M0



Title: Peak Power Spectral Density for 5795MHz, 802.11n HT40 at M0

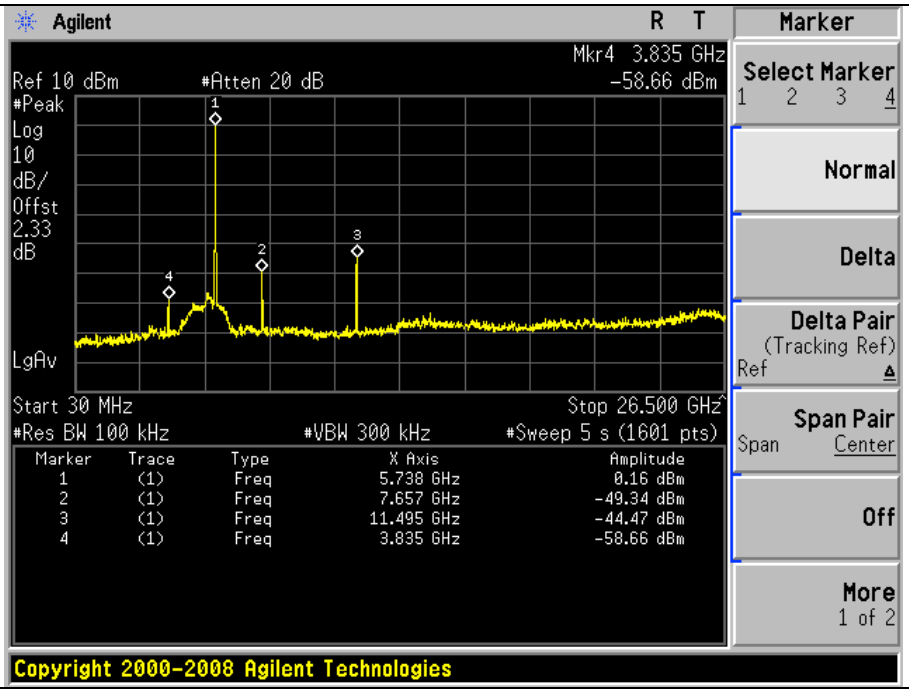
Conducted Spurious Emissions – Non-Restricted Bands

15.247 & RSS-210(A8.5):

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.

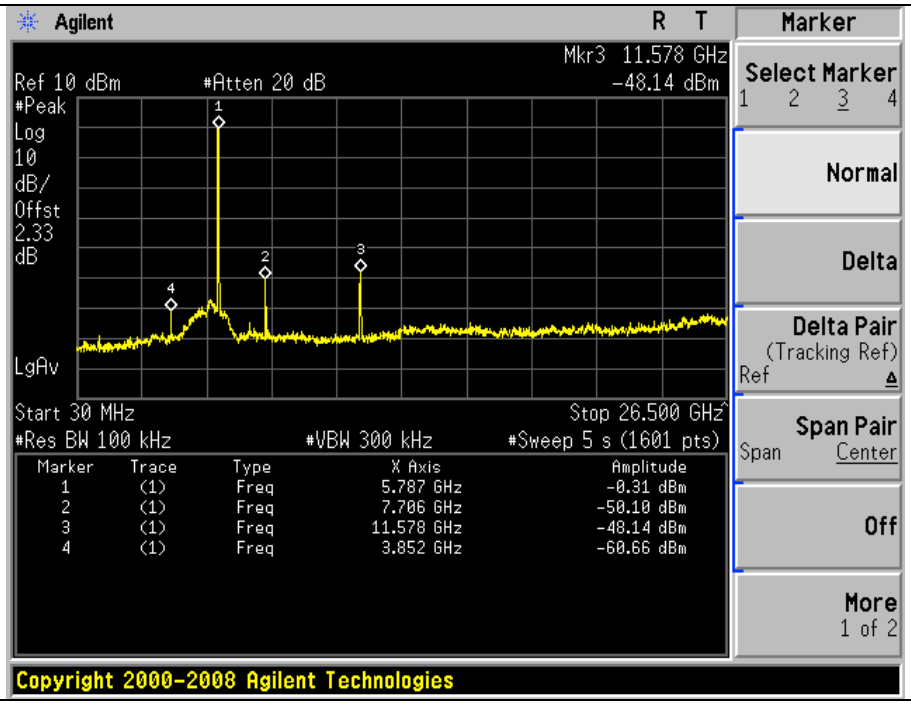
Note: Emissions in restricted bands were measured during radiated spurious emissions. No emissions observed from 26.5GHz-40GHz. All emissions were more than 30dB below the carrier.

Graphical Test Results for 5745MHz in 802.11a Mode:



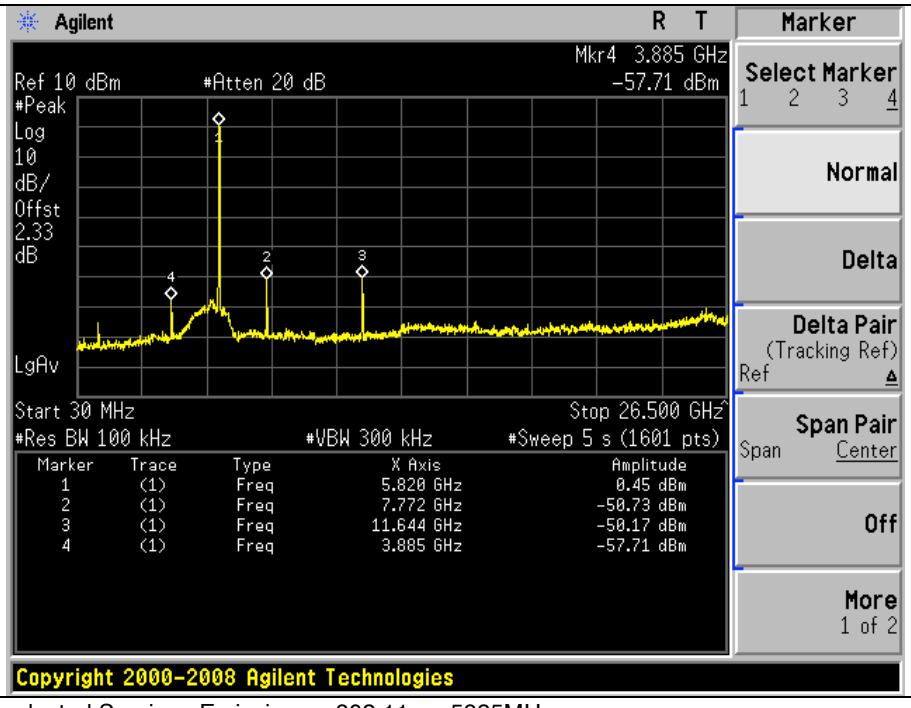
Title: 30dBc Conducted Spurious Emissions – 802.11a - 5745MHz

Graphical Test Results for 5785MHz in 802.11a Mode:



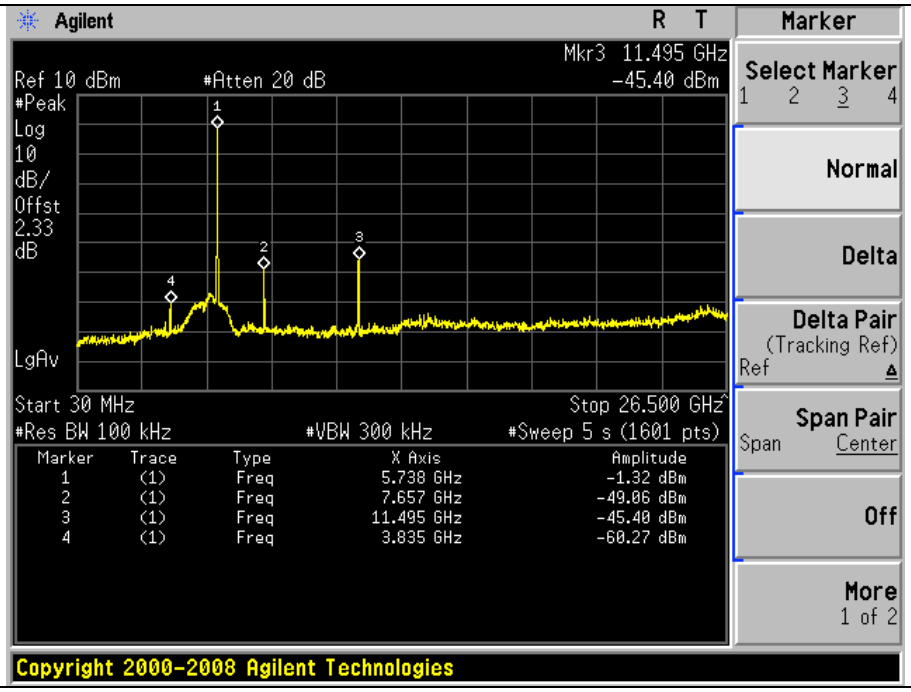
Title: 30dBc Conducted Spurious Emissions – 802.11a - 5785MHz

Graphical Test Results for 5825MHz in 802.11a Mode:



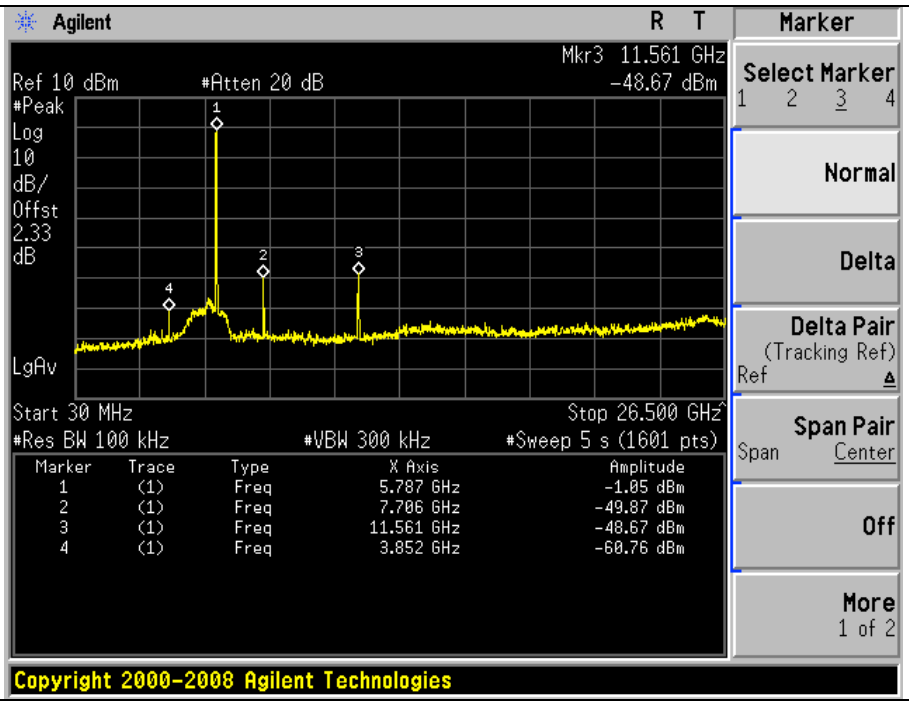
Title: 30dBc Conducted Spurious Emissions – 802.11a - 5825MHz

Graphical Test Results for 5745MHz in HT20 Mode:



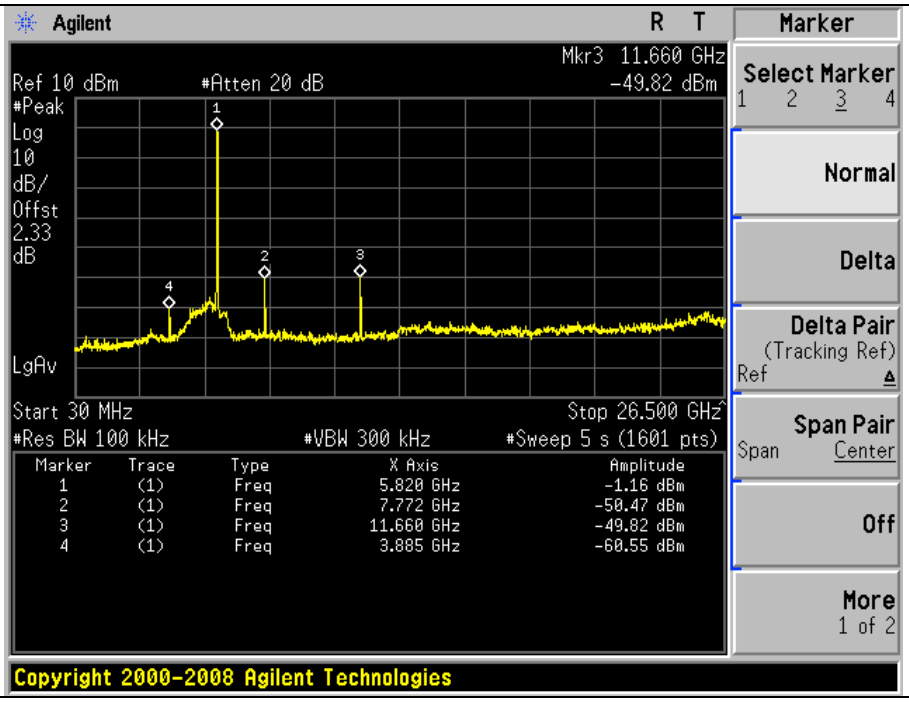
Title: 30dBc Conducted Spurious Emissions – 802.11nHT20 - 5745MHz

Graphical Test Results for 5785MHz in HT20 Mode:



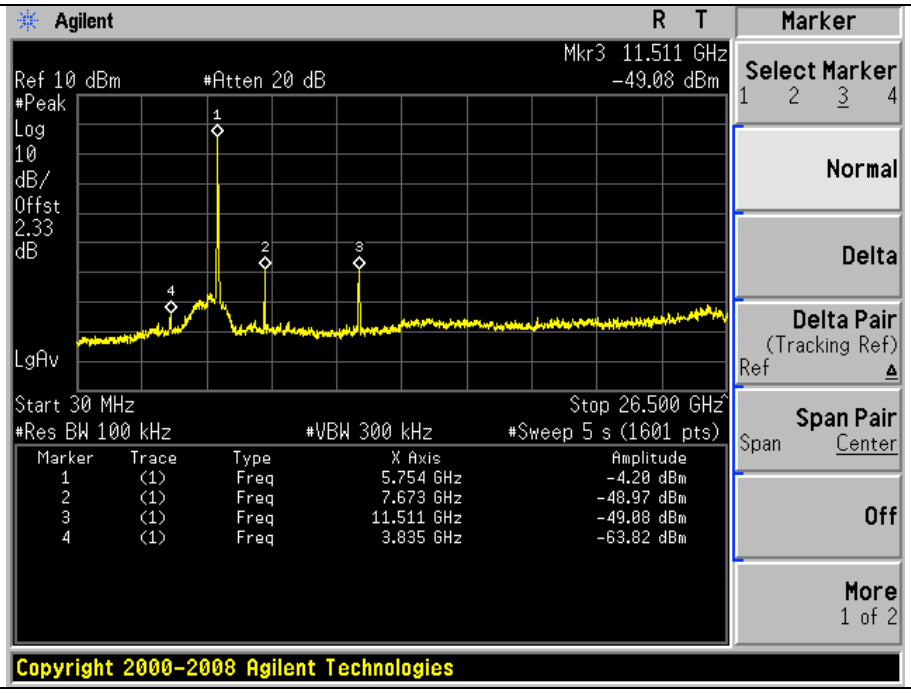
Title: 30dBc Conducted Spurious Emissions – 802.11nHT20 - 5785MHz

Graphical Test Results for 5825MHz in HT20 Mode:



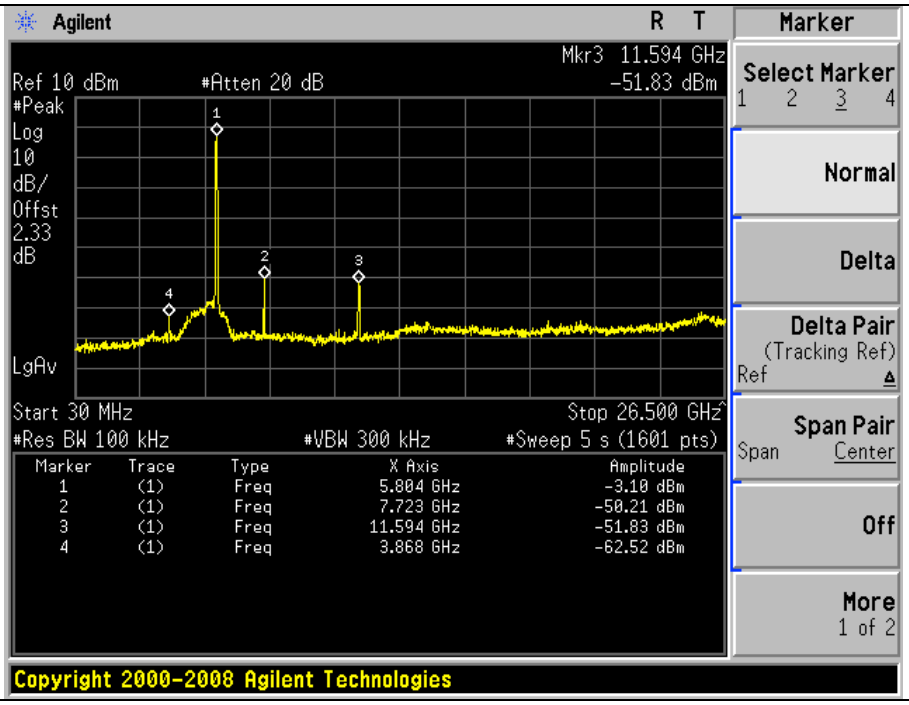
Title: 30dBc Conducted Spurious Emissions – 802.11nHT20 - 5825MHz

Graphical Test Results for 5755MHz in HT40 Mode:



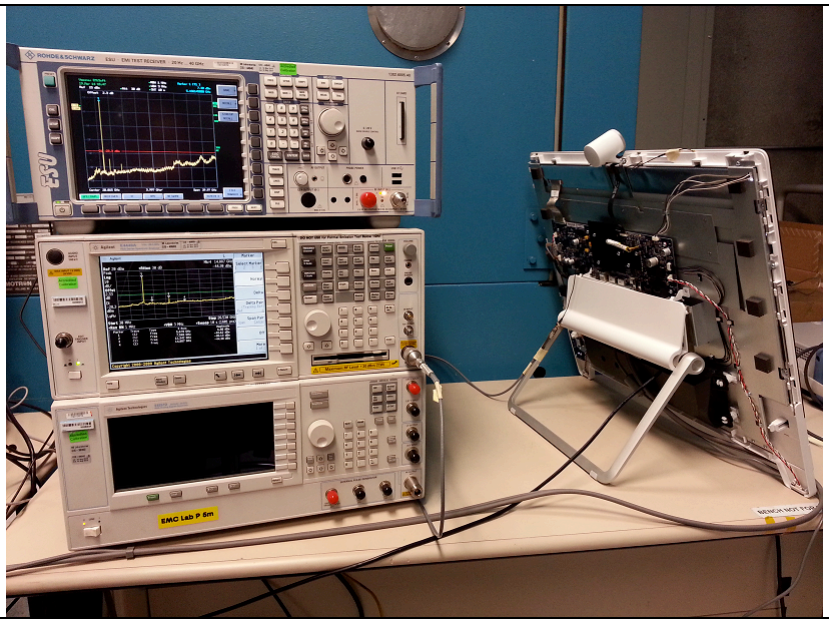
Title: 30dBc Conducted Spurious Emissions – 802.11nHT40 - 5755MHz

Graphical Test Results for 5795MHz in HT40 Mode:



Title: 30dBc Conducted Spurious Emissions – 802.11nHT40 - 5795MHz

Physical Test arrangement Photograph:

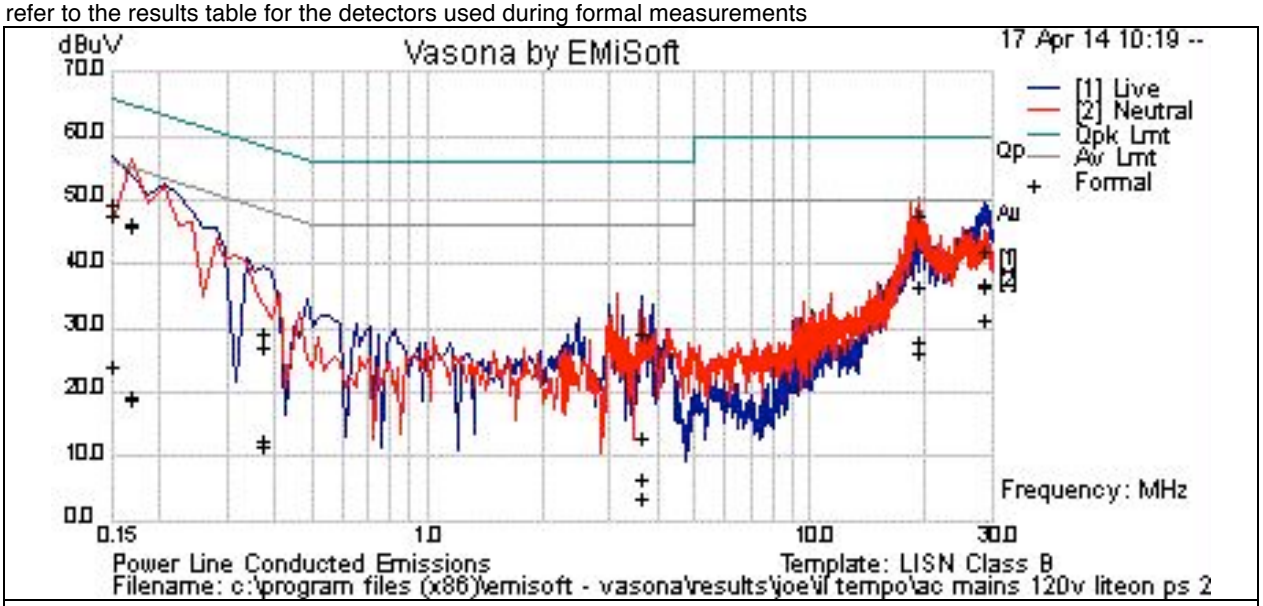


Title: Conducted Spurious Emissions Test Configuration

Conducted Emissions

Graphical Test Results

Note that the data displayed on the plots detailed in this appendix were measured using a 'Peak Detector'. Please refer to the results table for the detectors used during formal measurements



Title: Conducted Emissions Test Results from 150k - 30MHz

Test Results Table

Frequency MHz	Raw dBuV	Cable Loss	Factors dB	Level dBuV	Measurement Type	Line	Limit dBuV	Margin dB	Pass /Fail	Comments
0.15	3	21.1	0.1	24.2	Av	N	56	-31.8	Pass	
0.15	28	21.1	0.1	49.2	Qp	L	66	-16.8	Pass	
0.15	26.6	21.1	0.1	47.7	Qp	N	66	-18.3	Pass	
0.15	2.9	21.1	0.1	24	Av	L	56	-32	Pass	
0.169	-2.2	21	0	18.9	Av	N	55	-36.1	Pass	
0.169	25.2	21	0	46.2	Qp	N	65	-18.8	Pass	
0.169	-1.8	21	0	19.3	Av	L	55	-35.8	Pass	
0.169	24.9	21	0	46	Qp	L	65	-19	Pass	
0.3735	-7.8	20.2	0	12.5	Av	N	48.4	-35.9	Pass	
0.3735	-8.9	20.2	0	11.4	Av	L	48.4	-37	Pass	
0.3735	9	20.2	0	29.3	Qp	N	58.4	-29.2	Pass	
0.3735	6.9	20.2	0	27.1	Qp	L	58.4	-31.3	Pass	
3.633	9.2	20	0	29.3	Qp	N	56	-26.7	Pass	
3.633	-13.7	20	0	6.4	Av	L	46	-39.6	Pass	
3.633	-16.7	20	0	3.4	Av	N	46	-42.6	Pass	

Frequency MHz	Raw dBuV	Cable Loss	Factors dB	Level dBuV	Measurement Type	Line	Limit dBuV	Margin dB	Pass /Fail	Comments
3.633	-7.3	20	0	12.8	Qp	L	56	-43.2	Pass	
19.274	7.2	20.4	0.1	27.8	Av	L	50	-22.2	Pass	
19.274	15.9	20.4	0.1	36.5	Qp	L	60	-23.5	Pass	
19.274	27.2	20.4	0.1	47.7	Qp	N	60	-12.3	Pass	
19.274	5.5	20.4	0.1	26	Av	N	50	-24	Pass	
28.473	15.9	20.7	0.2	36.9	Qp	L	60	-23.1	Pass	
28.473	15.7	20.7	0.2	36.6	Av	N	50	-13.4	Pass	
28.473	21.2	20.7	0.2	42.1	Qp	N	60	-17.9	Pass	
28.473	10.5	20.7	0.2	31.4	Av	L	50	-18.6	Pass	

Physical Test arrangement Photograph:

Title: Conducted Emissions Test Configuration

Conducted Band Edge Measurements

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).

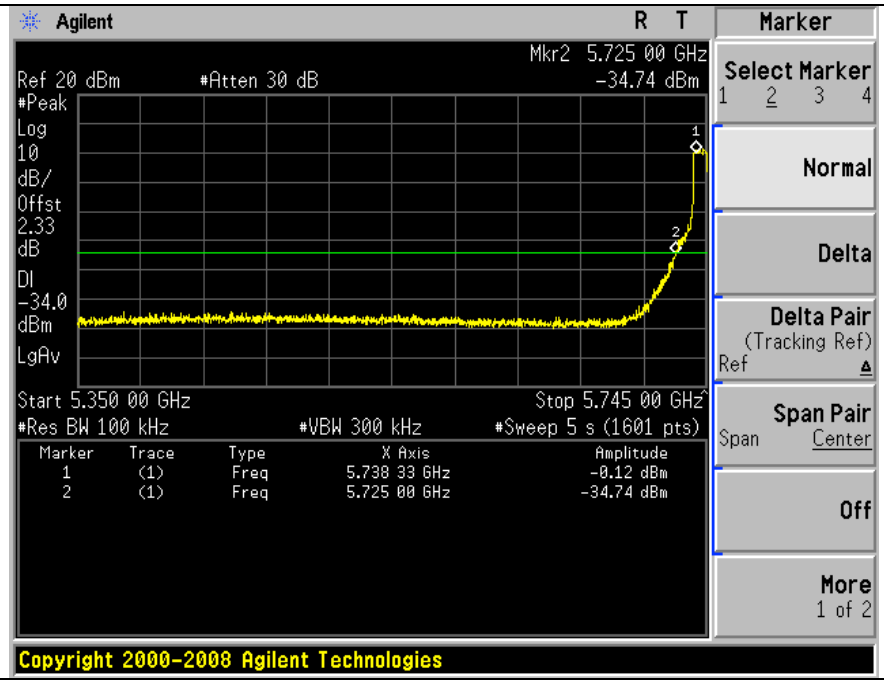
Span:	30 MHz-26 GHz
Reference Level:	20 dBm
Attenuation:	10 dB
Sweep Time:	5s
Resolution Bandwidth:	100 kHz
Video Bandwidth:	300 kHz
Detector:	Peak
Trace:	Single
Marker:	Peak

Record the marker waveform peak to spur difference

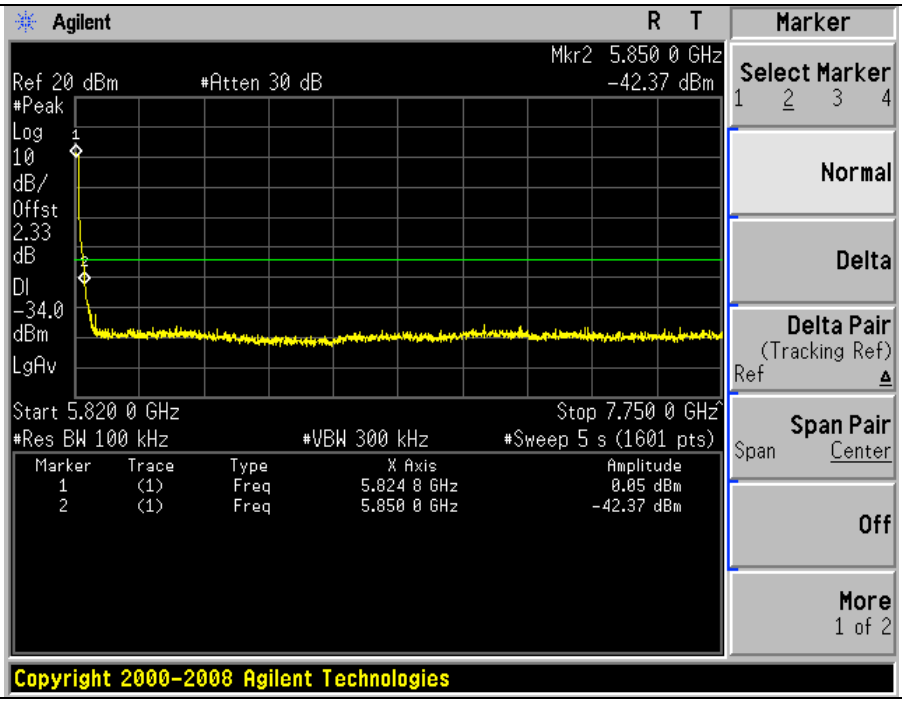
Out-of-band and spurious emissions tests are performed on each output individually without summing or adding 10 log(N) since the measurements are made relative to the in-band emissions on the individual outputs. The worst case output is recorded.

Frequency (MHz)	Mode	Data Rate	Conducted Bandedge Delta (dB)	Limit (dB c)	Margin (dB)
5745	802.11a	6	-34.74	>30	-4.74
	802.11n HT20	M0	-36.27	>30	-6.27
5755	802.11n HT 40	M0	-36.46	>30	-6.46
5795	802.11n HT 40	M0	-48.99	>30	-18.99
5825	802.11a	6	-42.37	>30	-12.37
	802.11n HT20	M0	-41.67	>30	-11.67

Graphical Test Results for 802.11a:



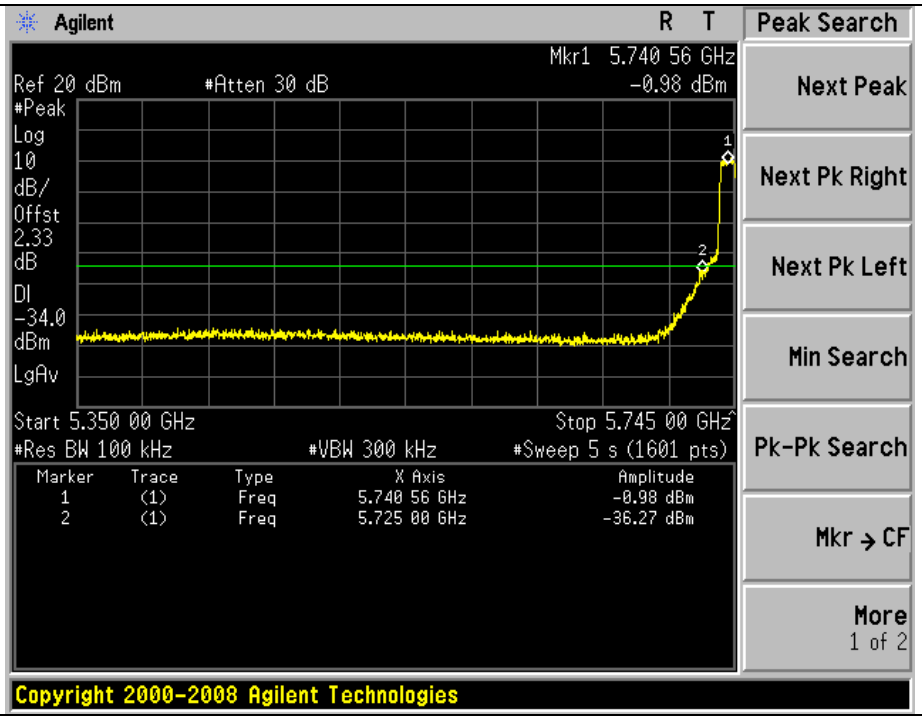
Title: Marker at 5350MHz



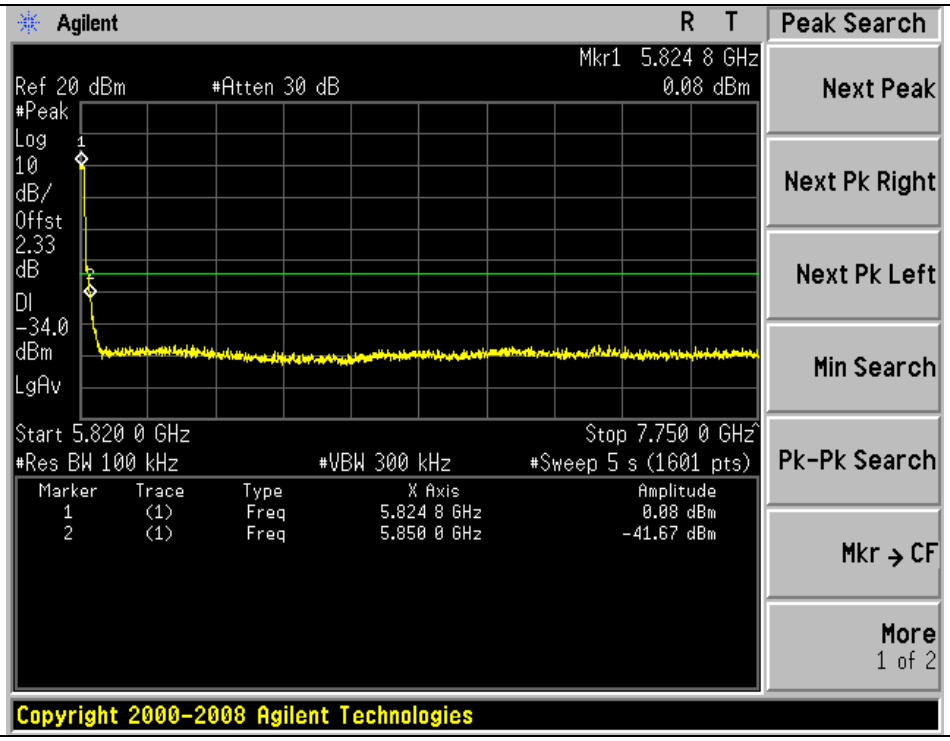
Title: Marker at 5850MHz

Graphical Test Results for 802.11n – HT20 Mode:

Note that the data displayed on the plots detailed in this appendix were measured using a 'Peak Detector'. Please refer to the results table for the detectors used during formal measurements



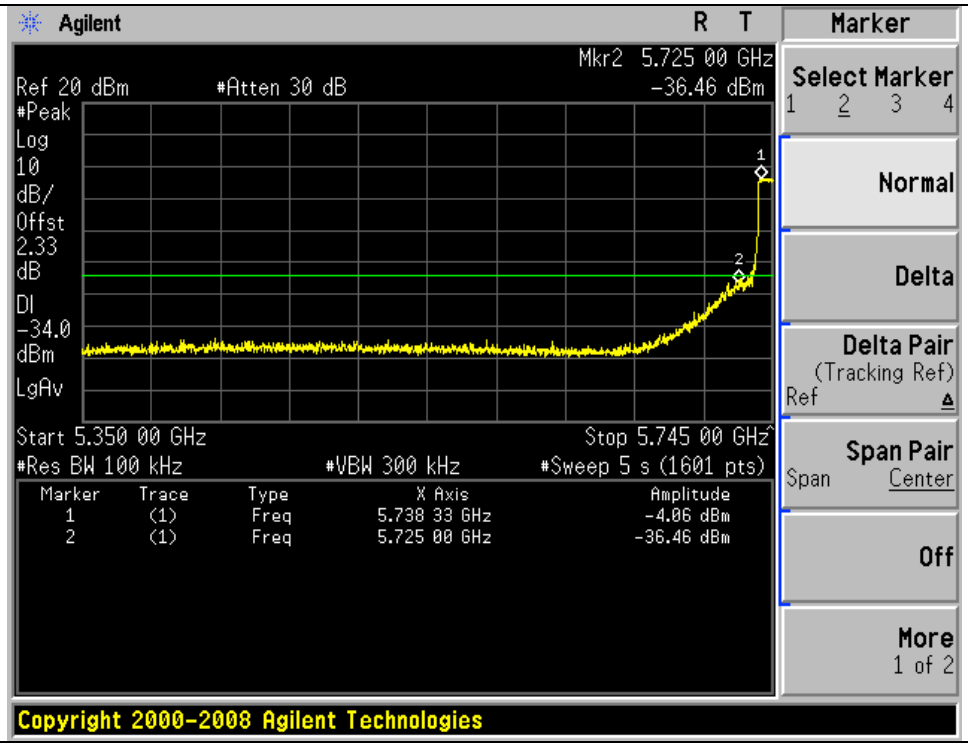
Title: Marker at 5350MHz



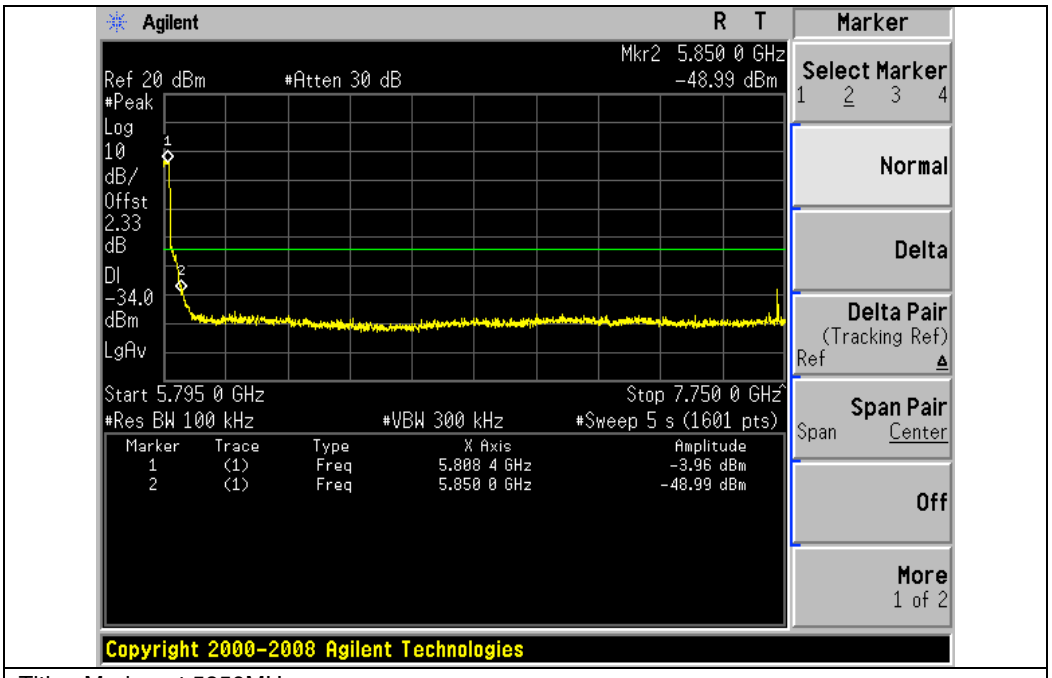
Title: Marker at 5850MHz

Graphical Test Results for 802.11n – HT40 Mode:

Note that the data displayed on the plots detailed in this appendix were measured using a 'Peak Detector'. Please refer to the results table for the detectors used during formal measurements



Title: Marker at 5725MHz



Title: Marker at 5850MHz

Radiated Transmitter Spurious Emissions

15.205

Radiated emissions which fall in the restricted bands, as defined in Sec. 15.205(a), must also comply with the radiated emission limits specified in Sec. 15.209(a)

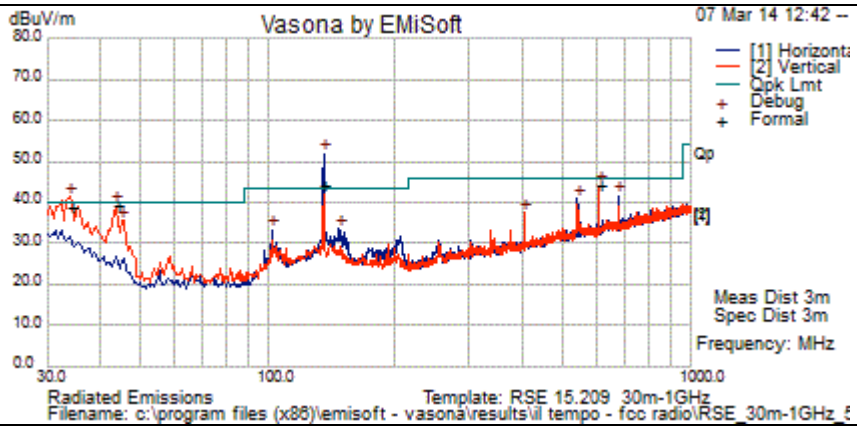
RSS-210

Radiated emissions which fall in the restricted bands, as defined in Sec. 2.7-Table 1 must also comply with the radiated emission limits specified in Sec. 2.7-Table 2.

Note: Emission at 135MHz will be evaluated during EMC testing and assessed against the applicable limits. The emission at 135MHz was not caused by the radio. A scan was performed with the radio transmitting. Another scan was performed with the radio transmitter turned off. The emission at 135MHz was present in both cases, which proves it was an EMC issue. The source of the emission was determined. There is a cable that is held in place with a piece of foam with a sticky side. The sticky foam had separated from the metal it was originally placed on. For comparison, a measurement was performed with the foam pressed back down. The result was passing (See Graphical Test Results 30MHz – 1000MHz (Transmitter Off) result with -1.6dB margin below).

Graphical Test Results: 30MHz – 1000MHz (Transmitter On)

Note that the data displayed on the plots detailed in this appendix were measured using a 'Peak Detector'. Please refer to the results table for the detectors used during formal measurements



Title: 30MHz - 1000MHz Test Results

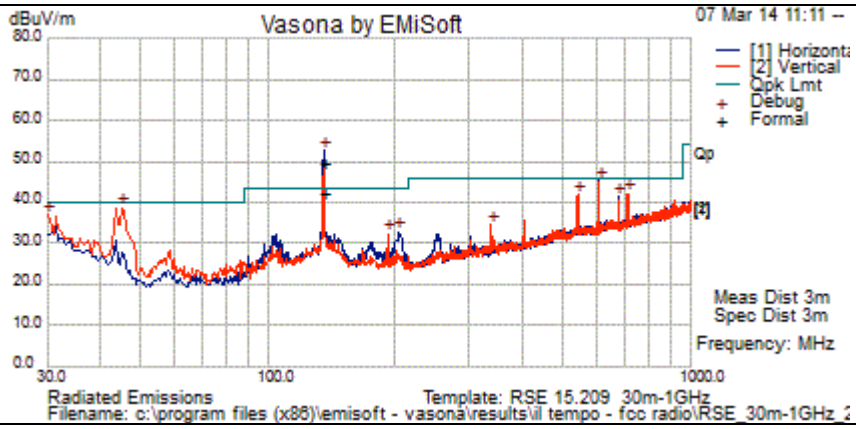
Test Results Table

Formal Data

No	Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
1	34.05	20.6	0.5	17.6	38.7	Quasi Peak	V	102	126	40	-1.3	Pass	Digital Emission
2	43.8	27.5	0.6	11.1	39.2	Peak [Scan]	V	100	89	40	-0.8	Pass	Digital Emission
3	608.12	23	2.3	18.8	44	Peak [Scan]	H	300	119	46	-2	Pass	
4	135.168	29.4	1.1	13.6	44.1	Quasi Peak	H	200	0	43.5	0.6	NA	Digital Emission

Graphical Test Results: 30MHz – 1000MHz (Transmitter Off)

Note that the data displayed on the plots detailed in this appendix were measured using a 'Peak Detector'. Please refer to the results table for the detectors used during formal measurements



Title: 30MHz - 1000MHz Test Results

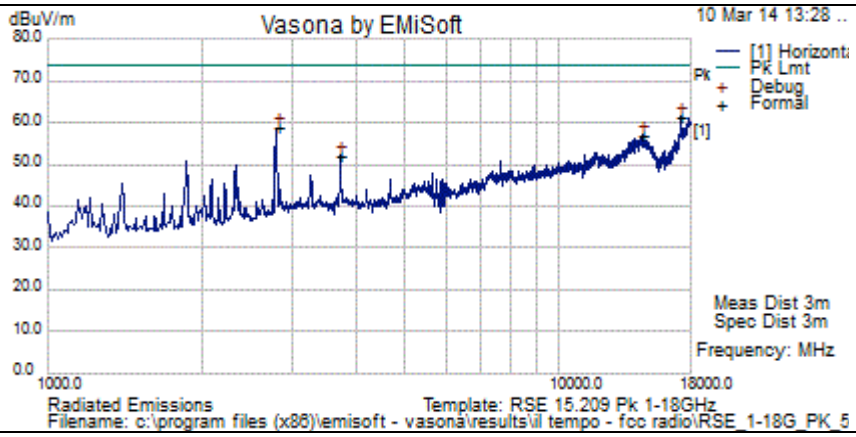
Test Results Table

Formal Data

No	Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
1	135.168	34.7	1.1	13.6	49.4	Quasi Peak	H	200	0	43.5	5.9	NA	Digital Emission
2	135.168	27.3	1.1	13.6	41.9	Quasi Peak	H	200	0	43.5	-1.6	Pass	

Graphical Test Results 802.11a: 1 – 18GHz (5745MHz – Peak)

Note that the data displayed on the plots detailed in this appendix were measured using a 'Peak Detector'. Please refer to the results table for the detectors used during formal measurements



Title: 1 - 18GHz Test Results for 5745MHz (Peak)

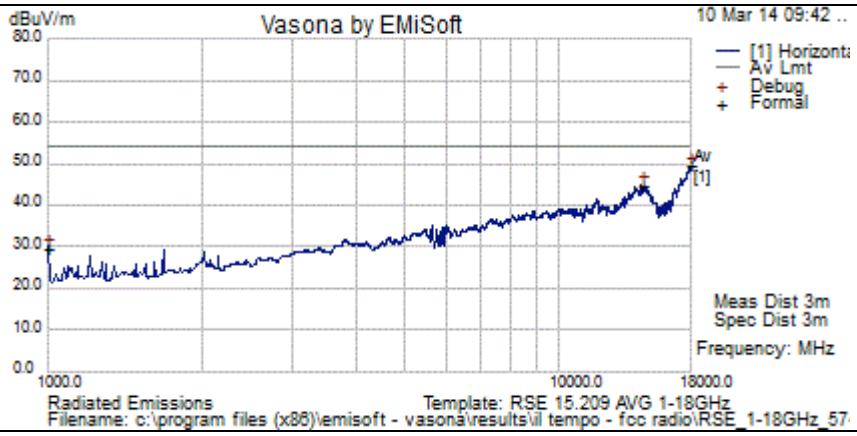
Test Results Table

Formal Data

No	Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
1	2802	59.1	5.5	-5.9	58.8	Peak [Scan]	H	100	129	74	-15.2	Pass	
2	3728.677	49.1	6.5	-3.6	52	Peak [Scan]	H	100	1	74	-22	Pass	
3	14540.5	35	14.2	7.7	57	Peak [Scan]	V	100	100	74	-17.1	Pass	
4	17243.5	38.6	15.7	7.2	61.5	Peak [Scan]	V	100	183	74	-12.5	Pass	

Graphical Test Results 802.11a: 1 – 18GHz (5745MHz – Average)

Note that the data displayed on the plots detailed in this appendix were measured using a 'Peak Detector'. Please refer to the results table for the detectors used during formal measurements



Title: 1 - 18GHz Test Results for 5745MHz (Average)

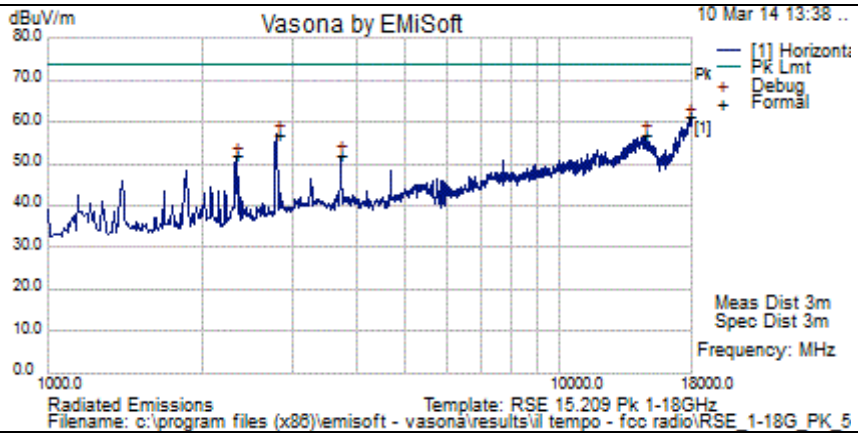
Test Results Table

Formal Data

No	Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
1	1000.367	36.1	3.2	-9.7	29.6	Peak [Scan]	H	102	2	54	-24.4	Pass	
2	14438.5	22.8	14.2	7.7	44.7	Peak [Scan]	H	100	0	54	-9.3	Pass	
3	18000	23.3	16.3	9.7	49.3	Peak [Scan]	H	100	0	54	-4.7	Pass	

Graphical Test Results 802.11a: 1 – 18GHz (5785MHz – Peak)

Note that the data displayed on the plots detailed in this appendix were measured using a 'Peak Detector'. Please refer to the results table for the detectors used during formal measurements



Title: 1 - 18GHz Test Results for 5785MHz (Peak)

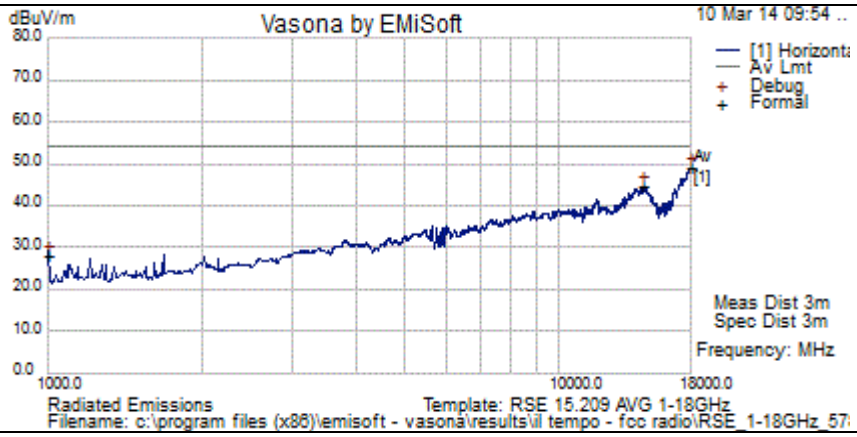
Test Results Table

Formal Data

No	Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
1	2333.215	51.6	5	-5.8	50.8	Peak [Scan]	H	100	209	74	-23.2	Pass	
2	2802	56.2	5.5	-5.9	55.9	Peak [Scan]	V	100	207	74	-18.2	Pass	
3	14379	34.7	14.1	7.1	55.9	Peak [Scan]	H	100	207	74	-18.1	Pass	
4	16750.5	38.6	15.5	4.9	58.9	Peak [Scan]	V	100	207	74	-15.1	Pass	
5	17923.5	34.2	16.3	9.7	60.1	Peak [Scan]	V	100	207	74	-13.9	Pass	

Graphical Test Results 802.11a: 1 – 18GHz (5785MHz – Average)

Note that the data displayed on the plots detailed in this appendix were measured using a 'Peak Detector'. Please refer to the results table for the detectors used during formal measurements



Title: 1 - 18GHz Test Results for 5785MHz (Average)

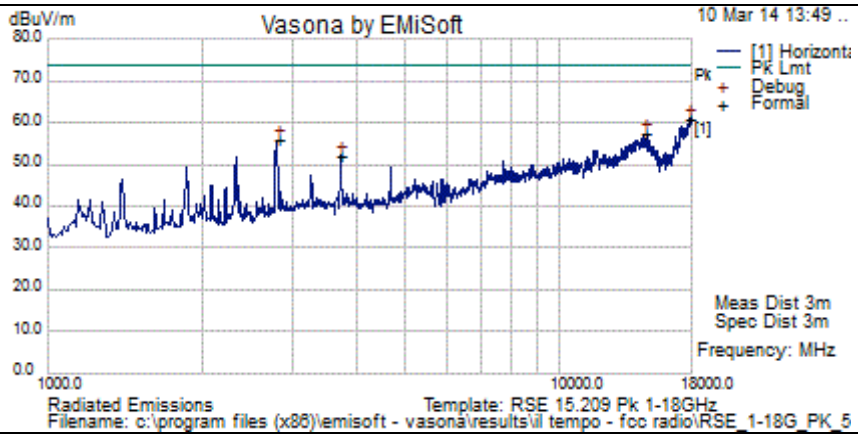
Test Results Table

Formal Data

No	Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
1	1001.381	34.7	3.2	-9.7	28.1	Peak [Scan]	H	102	2	54	-25.9	Pass	
2	14438.5	22.7	14.2	7.7	44.5	Peak [Scan]	V	100	0	54	-9.5	Pass	
3	18000	23.2	16.3	9.7	49.2	Peak [Scan]	H	100	0	54	-4.8	Pass	

Graphical Test Results 802.11a: 1 – 18GHz (5825MHz – Peak)

Note that the data displayed on the plots detailed in this appendix were measured using a 'Peak Detector'. Please refer to the results table for the detectors used during formal measurements



Title: 1 - 18GHz Test Results for 5825MHz (Peak)

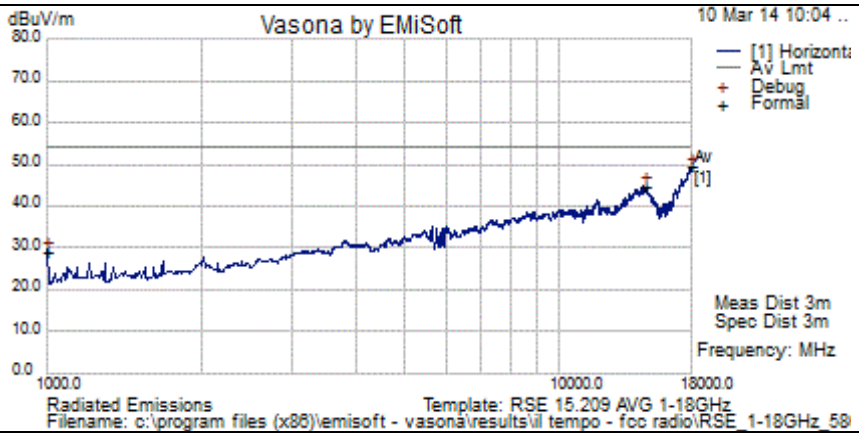
Test Results Table

Formal Data

No	Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
1	2802	56.1	5.5	-5.9	55.8	Peak [Scan]	H	100	143	74	-18.2	Pass	
2	3731.564	49	6.5	-3.6	51.9	Peak [Scan]	H	100	0	74	-22.1	Pass	
3	14566	35.7	14.2	7.3	57.2	Peak [Scan]	H	100	159	74	-16.8	Pass	
4	17864	35.1	16.2	9.7	61	Peak [Scan]	V	100	122	74	-13	Pass	

Graphical Test Results 802.11a: 1 – 18GHz (5825MHz – Average)

Note that the data displayed on the plots detailed in this appendix were measured using a 'Peak Detector'. Please refer to the results table for the detectors used during formal measurements



Title: 1 - 18GHz Test Results for 5825MHz (Average)

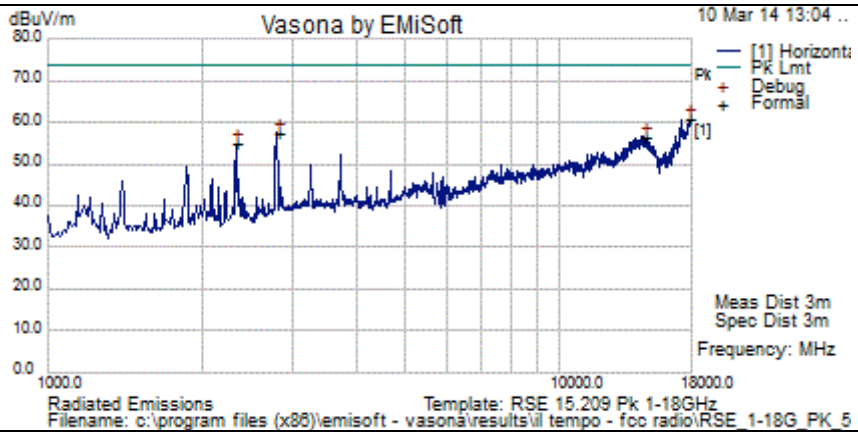
Test Results Table

Formal Data

No	Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
1	1000.653	35.7	3.2	-9.7	29.2	Peak [Scan]	H	102	2	54	-24.8	Pass	
2	14566	23.3	14.2	7.3	44.8	Peak [Scan]	H	100	0	54	-9.2	Pass	
3	18000	23.3	16.3	9.7	49.3	Peak [Scan]	H	100	0	54	-4.7	Pass	

Graphical Test Results HT20: 1 – 18GHz (5745MHz – Peak)

Note that the data displayed on the plots detailed in this appendix were measured using a 'Peak Detector'. Please refer to the results table for the detectors used during formal measurements



Title: 1 - 18GHz Test Results for 5745MHz (HT20-Peak)

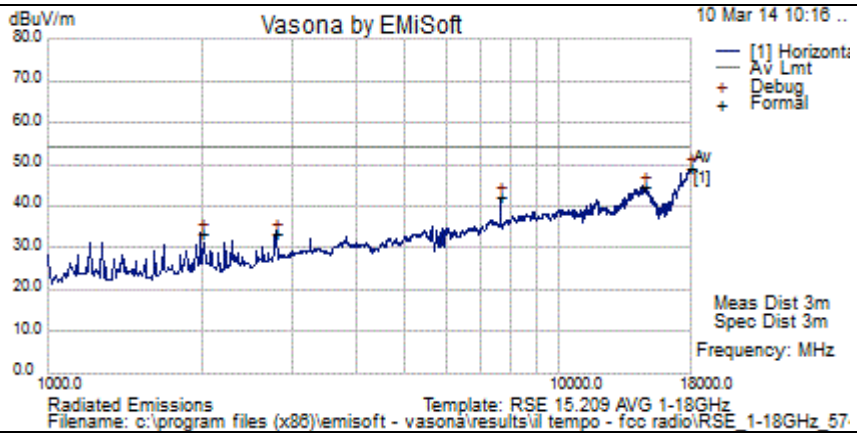
Test Results Table

Formal Data

No	Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
1	2334.5	55.7	5	-5.8	54.9	Peak [Scan]	H	100	178	74	-19.1	Pass	
2	2802	57.9	5.5	-5.9	57.6	Peak [Scan]	H	100	148	74	-16.5	Pass	
3	14566	35.1	14.2	7.3	56.6	Peak [Scan]	H	100	300	74	-17.4	Pass	
4	17838.5	34.8	16.2	9.7	60.8	Peak [Scan]	V	100	124	74	-13.2	Pass	

Graphical Test Results HT20: 1 – 18GHz (5745MHz – Average)

Note that the data displayed on the plots detailed in this appendix were measured using a 'Peak Detector'. Please refer to the results table for the detectors used during formal measurements



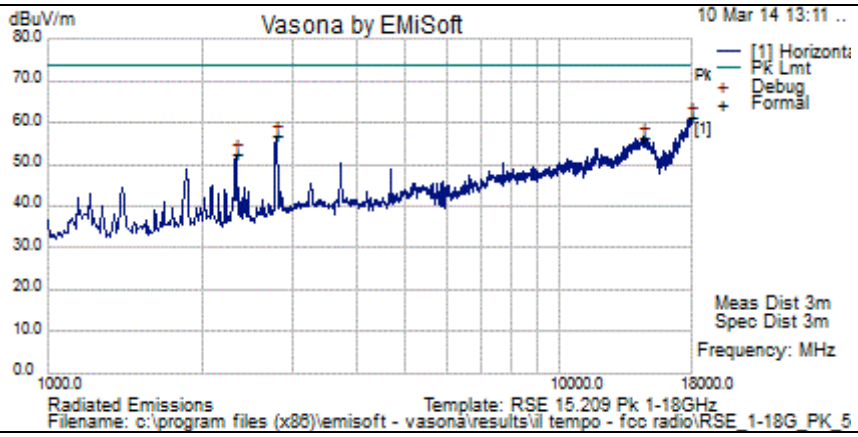
Title: 1 - 18GHz Test Results for 5745MHz (HT20-Average)

Test Results Table

Formal Data													
No	**Frequency MHz**	**Raw dBuV**	**Cable Loss**	**AF dB**	**Level dBuV/m**	**Measurement Type**	**Pol**	**Hgt cm**	**Azt Deg**	**Limit dBuV/m**	**Margin dB**	**Pass /Fail**	**Comments**
1	1993.906	34	4.6	-5.3	33.3	Peak [Scan]	H	102	-1	54	-20.7	Pass	
2	2791.68	33.8	5.5	-5.8	33.5	Peak [Scan]	H	102	-1	54	-20.5	Pass	
3	7655.5	30.8	9.7	1.6	42.2	Peak [Scan]	V	100	206	54	-11.9	Pass	
4	14566	23.2	14.2	7.3	44.7	Peak [Scan]	H	100	52	54	-9.3	Pass	
5	18000	23.2	16.3	9.7	49.3	Peak [Scan]	H	100	52	54	-4.7	Pass	

Graphical Test Results HT20: 1 – 18GHz (5785MHz – Peak)

Note that the data displayed on the plots detailed in this appendix were measured using a 'Peak Detector'. Please refer to the results table for the detectors used during formal measurements



Title: 1 - 18GHz Test Results for 5785MHz (HT20-Peak)

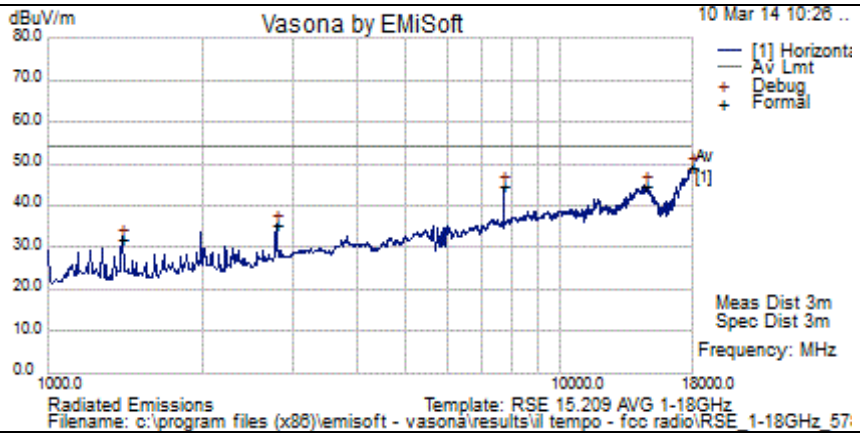
Test Results Table

Formal Data

No	Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
1	2334.418	53.1	5	-5.8	52.3	Peak [Scan]	H	100	0	74	-21.7	Pass	
2	2793.5	57.1	5.5	-5.8	56.8	Peak [Scan]	H	100	120	74	-17.2	Pass	
3	14549	34.7	14.2	7.6	56.5	Peak [Scan]	H	100	246	74	-17.5	Pass	
4	17915	35.4	16.3	9.7	61.3	Peak [Scan]	V	100	83	74	-12.7	Pass	

Graphical Test Results HT20: 1 – 18GHz (5785MHz – Average)

Note that the data displayed on the plots detailed in this appendix were measured using a 'Peak Detector'. Please refer to the results table for the detectors used during formal measurements



Title: 1 - 18GHz Test Results for 5785MHz (HT20-Average)

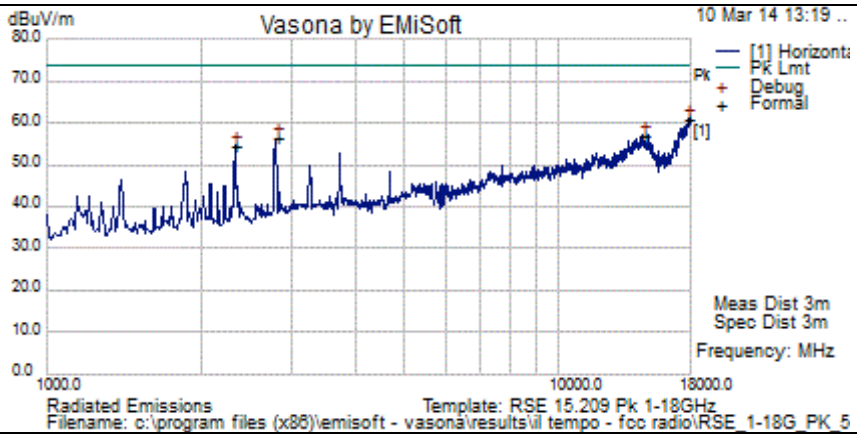
Test Results Table

Formal Data

No	Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
1	1397.82	35.7	3.8	-7.7	31.8	Peak [Scan]	H	102	-1	54	-22.2	Pass	
2	2793.5	35.8	5.5	-5.8	35.5	Peak [Scan]	V	100	203	54	-18.6	Pass	
3	7715	33.1	9.8	1.7	44.6	Peak [Scan]	V	100	203	54	-9.4	Pass	
4	14566	23.3	14.2	7.3	44.7	Peak [Scan]	V	100	203	54	-9.3	Pass	
5	18000	23.2	16.3	9.7	49.2	Peak [Scan]	H	100	103	54	-4.8	Pass	

Graphical Test Results HT20: 1 – 18GHz (5825MHz – Peak)

Note that the data displayed on the plots detailed in this appendix were measured using a 'Peak Detector'. Please refer to the results table for the detectors used during formal measurements



Title: 1 - 18GHz Test Results for 5825MHz (HT20-Peak)

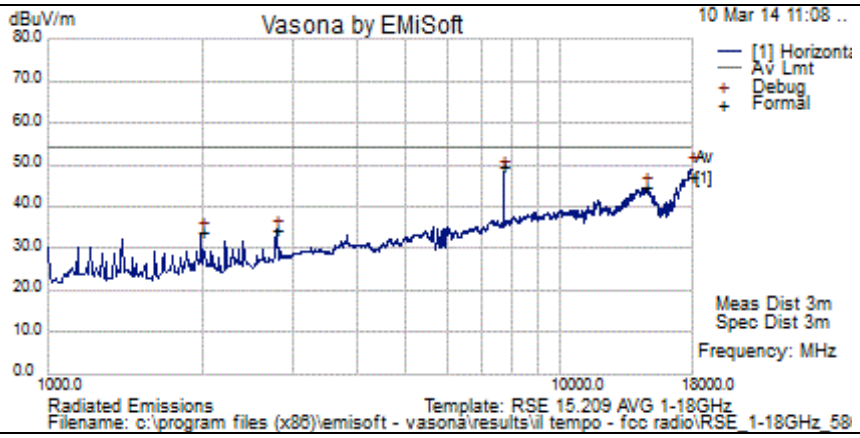
Test Results Table

Formal Data

No	Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
1	2334.5	55.3	5	-5.8	54.5	Peak [Scan]	H	100	205	74	-19.6	Pass	
2	2810.5	56.5	5.5	-5.8	56.3	Peak [Scan]	H	100	140	74	-17.8	Pass	
3	14566	35.5	14.2	7.3	57	Peak [Scan]	H	100	109	74	-17	Pass	
4	17830	35.1	16.2	9.8	61	Peak [Scan]	H	100	320	74	-13	Pass	

Graphical Test Results HT20: 1 – 18GHz (5825MHz – Average)

Note that the data displayed on the plots detailed in this appendix were measured using a 'Peak Detector'. Please refer to the results table for the detectors used during formal measurements



Title: 1 - 18GHz Test Results for 5825MHz (HT20-Average)

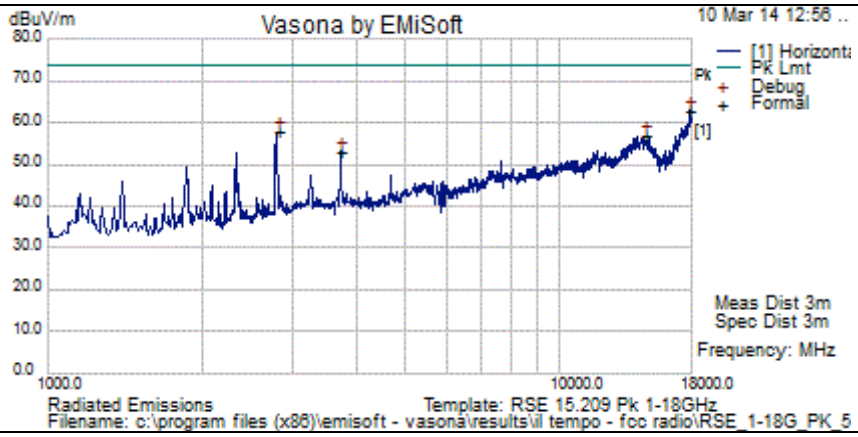
Test Results Table

Formal Data

No	Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
1	1994.46	34.5	4.6	-5.3	33.8	Peak [Scan]	H	100	361	54	-20.2	Pass	
2	2793.5	34.8	5.5	-5.8	34.4	Peak [Scan]	V	100	151	54	-19.6	Pass	
3	7740	37.8	9.8	1.8	49.4	Average	H	100	108	54	-4.6	Pass	
4	14566	23.2	14.2	7.3	44.6	Peak [Scan]	H	200	102	54	-9.4	Pass	
5	18000	21.2	16.3	9.7	47.2	Average	H	200	360	54	-6.8	Pass	

Graphical Test Results HT40: 1 – 18GHz (5755MHz – Peak)

Note that the data displayed on the plots detailed in this appendix were measured using a 'Peak Detector'. Please refer to the results table for the detectors used during formal measurements



Title: HT40 Test Results for 1 - 18GHz at 5755MHz (Peak)

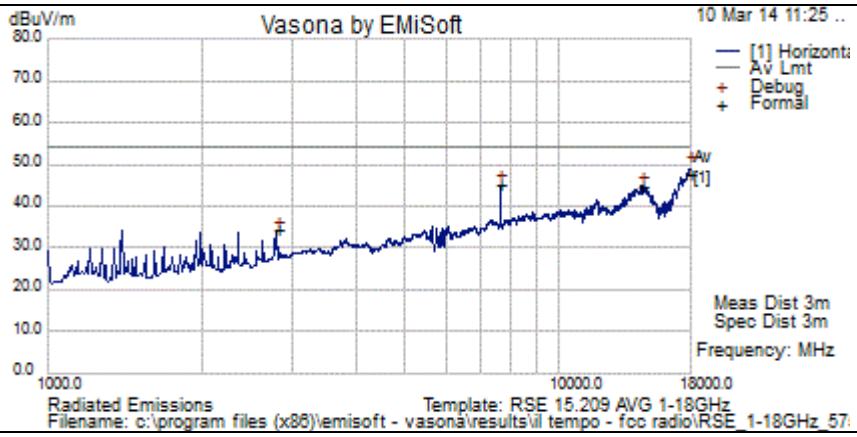
Test Results Table

Formal Data

No	Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
1	2802	58.1	5.5	-5.9	57.8	Peak [Scan]	H	100	130	74	-16.2	Pass	
2	3735.759	50	6.5	-3.5	52.9	Peak [Scan]	H	100	0	74	-21.1	Pass	
3	14566	35.2	14.2	7.3	56.7	Peak [Scan]	H	100	272	74	-17.3	Pass	
4	17881	36.9	16.2	9.7	62.8	Peak [Scan]	V	100	80	74	-11.2	Pass	

Graphical Test Results HT40: 1 – 18GHz (5755MHz – Average)

Note that the data displayed on the plots detailed in this appendix were measured using a 'Peak Detector'. Please refer to the results table for the detectors used during formal measurements



Title: HT40 Test Results for 1 - 18GHz at 5755MHz (Average)

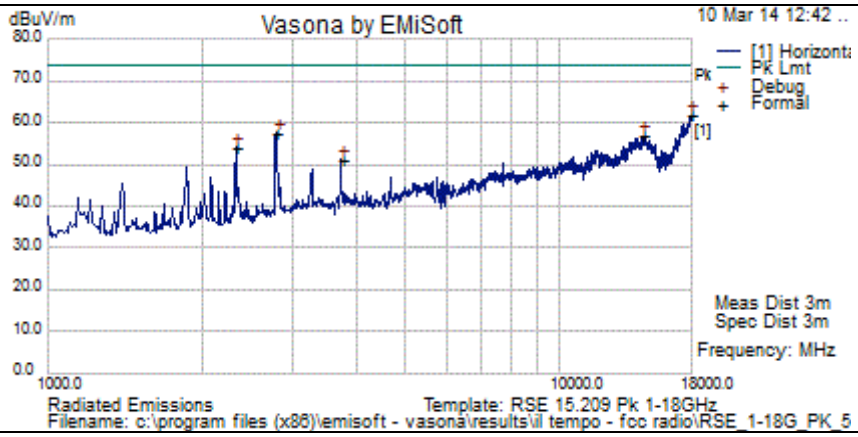
Test Results Table

Formal Data

No	Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
1	2802	34.5	5.5	-5.9	34.1	Peak [Scan]	V	100	206	54	-19.9	Pass	
2	7673.35	33.7	9.7	1.6	45.1	Average	H	100	102	54	-8.9	Pass	
3	14438.5	22.9	14.2	7.7	44.8	Peak [Scan]	H	100	360	54	-9.2	Pass	
4	18000	21.4	16.3	9.7	47.4	Average	H	100	205	54	-6.6	Pass	

Graphical Test Results HT40: 1 – 18GHz (5795MHz – Peak)

Note that the data displayed on the plots detailed in this appendix were measured using a 'Peak Detector'. Please refer to the results table for the detectors used during formal measurements



Title: HT40 Test Results for 1 - 18GHz at 5795MHz (Peak)

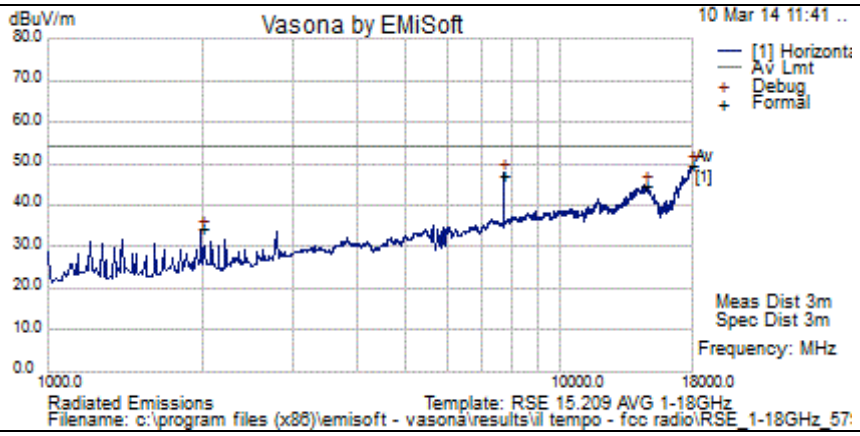
Test Results Table

Formal Data

No	Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
1	2334.5	54.9	5	-5.8	54.1	Peak [Scan]	H	100	184	74	-20	Pass	
2	2800.3	57.7	5.5	-5.9	57.3	Peak	H	100	116	74	-16.7	Pass	
3	3737.735	48	6.5	-3.5	51	Peak [Scan]	H	100	0	74	-23	Pass	
4	14540.5	34.9	14.2	7.7	56.8	Peak [Scan]	V	100	168	74	-17.2	Pass	
5	17966	35.9	16.3	9.6	61.8	Peak [Scan]	V	100	115	74	-12.2	Pass	

Graphical Test Results HT40: 1 – 18GHz (5795MHz – Average)

Note that the data displayed on the plots detailed in this appendix were measured using a 'Peak Detector'. Please refer to the results table for the detectors used during formal measurements



Title: HT40 Test Results for 1 - 18GHz at 5795MHz (Average)

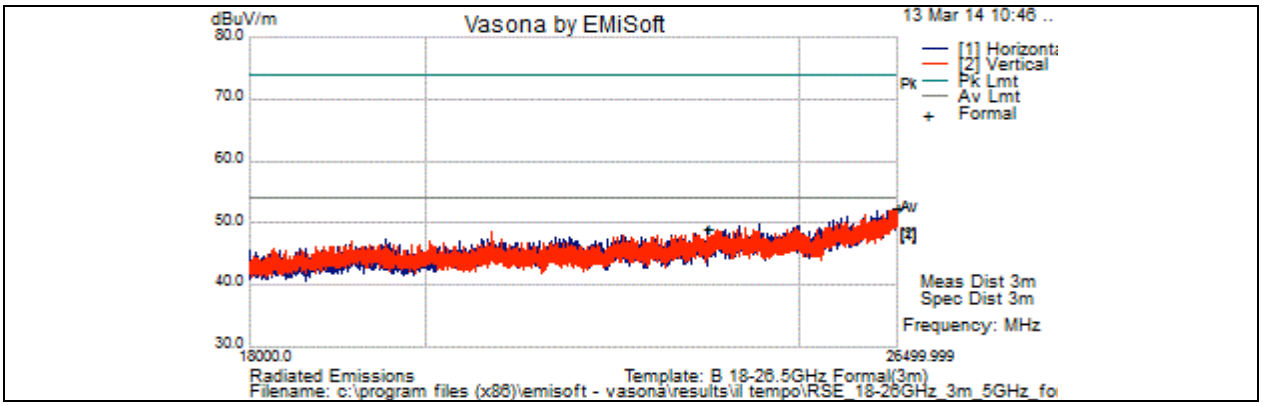
Test Results Table

Formal Data

No	Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
1	1994.5	34.8	4.6	-5.3	34.1	Peak [Scan]	H	100	205	54	-19.9	Pass	
2	7726.7	35.5	9.8	1.8	47.1	Average	H	100	102	54	-6.9	Pass	
3	14566	23.3	14.2	7.3	44.7	Peak [Scan]	V	100	152	54	-9.3	Pass	
4	18000	23.4	16.3	9.7	49.4	Peak [Scan]	H	100	154	54	-4.6	Pass	

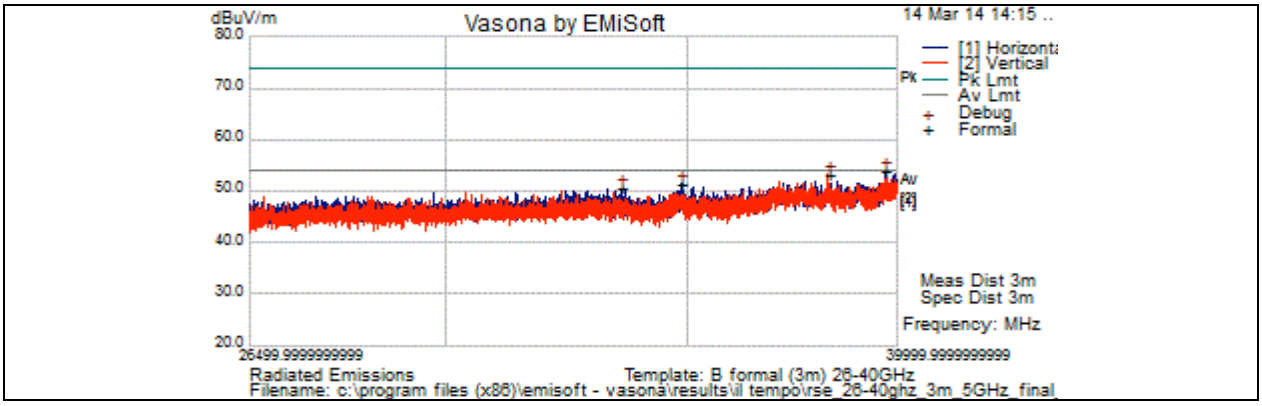
Graphical Test Results: 18 – 26GHz

Note that the data displayed on the plots detailed in this appendix were measured using a 'Peak Detector'. Please refer to the results table for the detectors used during formal measurements



Graphical Test Results: 26 – 40GHz

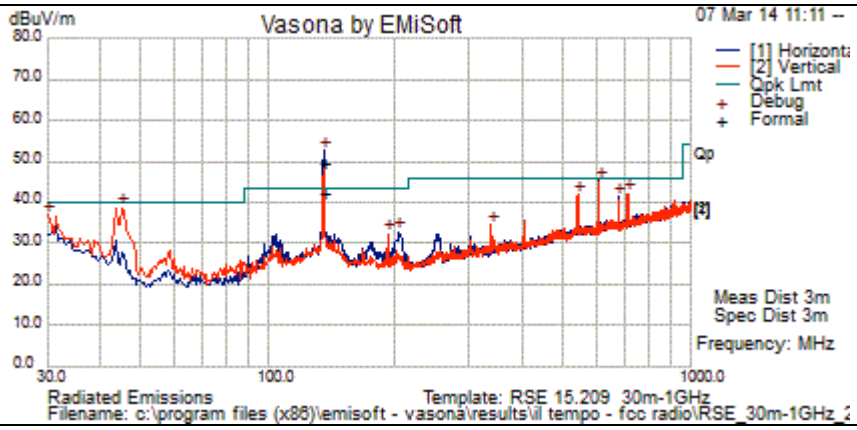
Note that the data displayed on the plots detailed in this appendix were measured using a 'Peak Detector'. Please refer to the results table for the detectors used during formal measurements



Radiated Receiver Spurious Measurements

Graphical Test Results

Note that the data displayed on the plots detailed in this appendix were measured using a 'Peak Detector'. Please refer to the results table for the detectors used during formal measurements



Title: Receiver Spurious 30 – 1000MHz

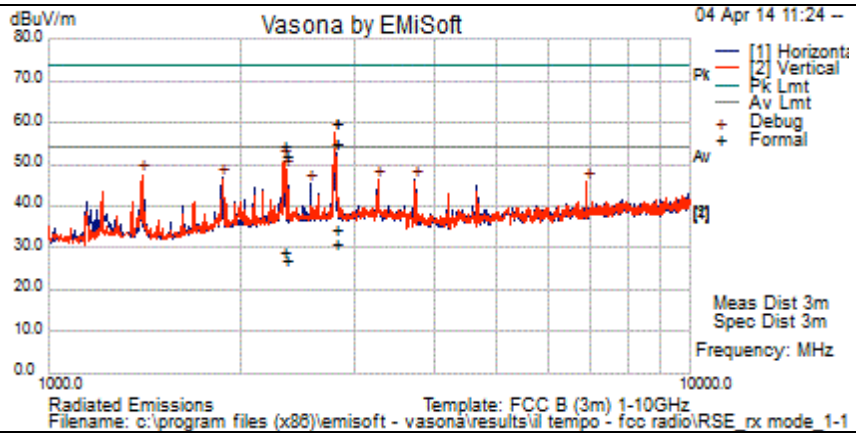
Test Results Table

Formal Data

No	Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
1	135.168	27.3	1.1	13.6	41.9	Quasi Peak	H	200	0	43.5	-1.6	Pass	Digital Signal

Graphical Test Results

Note that the data displayed on the plots detailed in this appendix were measured using a 'Peak Detector'. Please refer to the results table for the detectors used during formal measurements



Title: Receiver Spurious 1 – 10GHz

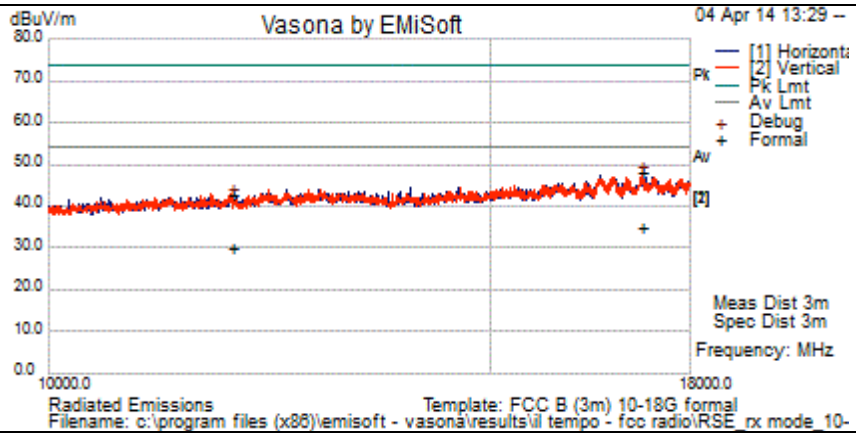
Test Results Table

Formal Data

No	Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
1	2332.002	58.9	4.6	-9.3	54.2	Peak	V	102	2	74	-19.8	Pass	
2	2345.5	56.6	4.6	-9.3	52	Peak	V	102	14	74	-22	Pass	
3	2809	58.1	5.1	-8.4	54.8	Peak	H	102	327	74	-19.2	Pass	
4	2800.002	63	5.1	-8.4	59.7	Peak	V	102	11	74	-14.3	Pass	
5	2332.001	33.7	4.6	-9.3	29	Average	V	102	2	54	-25	Pass	
6	2345.5	31.8	4.6	-9.3	27.2	Average	V	102	14	54	-26.8	Pass	
7	2809	34.2	5.1	-8.4	30.9	Average	H	102	327	54	-23.1	Pass	
8	2800.001	37.8	5.1	-8.4	34.4	Average	V	102	11	54	-19.6	Pass	

Graphical Test Results

Note that the data displayed on the plots detailed in this appendix were measured using a 'Peak Detector'. Please refer to the results table for the detectors used during formal measurements



Title: Receiver Spurious 10 – 18GHz

Test Results Table

Formal Data

No	Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
1	17224	44.3	14.6	-10.7	48.2	Peak	V	102	0	74	-25.8	Pass	
2	11830.911	45.8	11.6	-14.6	42.7	Peak	H	102	0	74	-31.3	Pass	
3	17224	31	14.6	-10.7	34.9	Average	V	102	0	54	-19.1	Pass	
4	11830.911	32.8	11.6	-14.6	29.7	Average	H	102	0	54	-24.3	Pass	

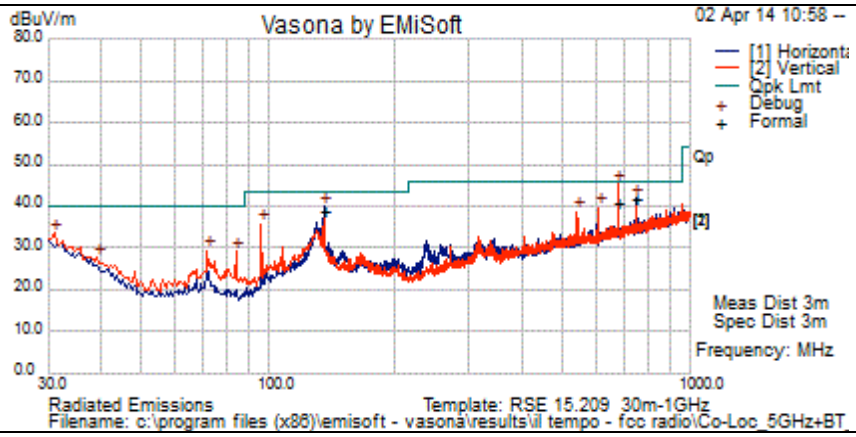
Co-Location Radiated Spurious Emissions

15.205 & RSS-210 sec2.7:

Radiated emissions which fall in the restricted bands, as defined in Sec. 15.205(a), must also comply with the radiated emission limits specified in Sec. 15.209(a).

Graphical Test Results: 30 – 1000MHz

Note that the data displayed on the plots detailed in this appendix were measured using a 'Peak Detector'. Please refer to the results table for the detectors used during formal measurements



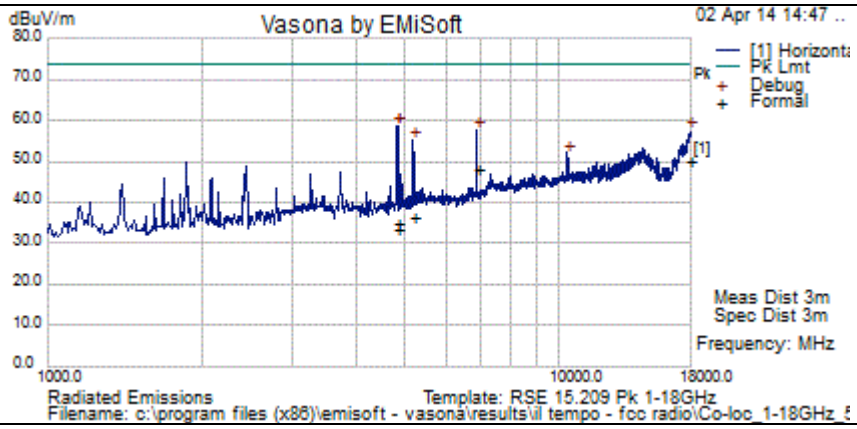
Title: 30 - 1000MHz Test Results Co-Location

Formal Data

No	Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
1	135.17	23.9	1.1	13.6	38.5	Quasi Peak	H	102	152	43.5	-5	Pass	Digital signal
2	675.971	18.5	2.4	19.9	40.8	Quasi Peak	V	102	18	46	-5.2	Pass	
3	743.599	18.7	2.5	20.6	41.8	Peak [Scan]	H	100	321	46	-4.2	Pass	

Graphical Test Results for 802.11a & Bluetooth: 1 – 18GHz (Peak)

Note that the data displayed on the plots detailed in this appendix were measured using a 'Peak Detector'. Please refer to the results table for the detectors used during formal measurements



Title: 1 - 18GHz Test Results for 802.11a & Bluetooth (Peak)

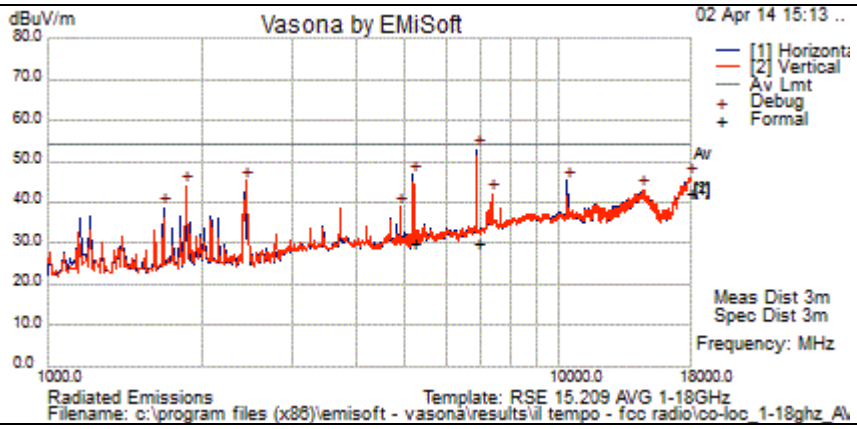
Test Results Table

Formal Data

No	Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
1	4816.501	30.3	8.6	-4.2	34.7	Peak [Scan]	V	102	338	74	-39.3	Pass	
2	4833.5	28.8	8.6	-4.2	33.2	Peak [Scan]	V	102	338	74	-40.8	Pass	
3	5173.5	31	8.9	-3.6	36.3	Peak [Scan]	V	102	338	74	-37.7	Pass	
4	6907.501	38.3	10.5	-0.9	47.9	Peak [Scan]	V	102	91	74	-26.1	Pass	
5	17966	21.4	18.9	9.6	49.9	Peak [Scan]	V	102	338	74	-24.1	Pass	

Graphical Test Results for 802.11a & Bluetooth: 1 – 18GHz (Average)

Note that the data displayed on the plots detailed in this appendix were measured using a 'Peak Detector'. Please refer to the results table for the detectors used during formal measurements



Title: 1 - 18GHz Test Results for 802.11a & Bluetooth (Average)

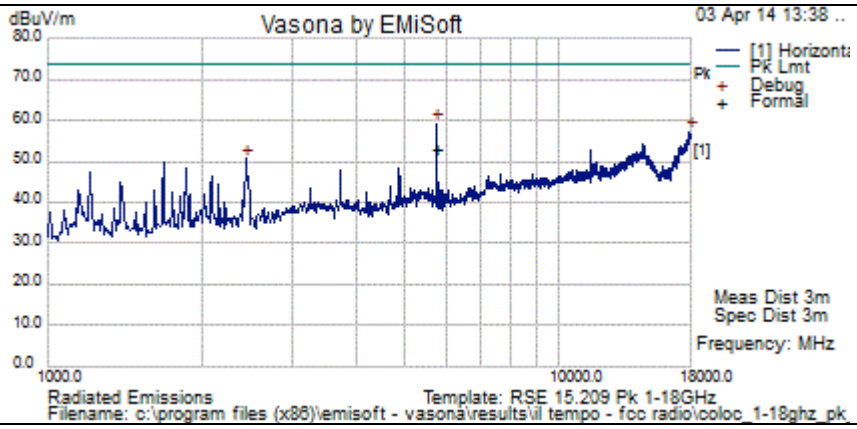
Test Results Table

Formal Data

No	Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
1	5182.002	24.7	8.9	-3.6	30	Average	H	102	202	54	-24	Pass	
2	6907.502	20.4	10.5	-0.9	29.9	Average	H	102	202	54	-24.1	Pass	
3	17966	13.7	18.9	9.6	42.3	Average	V	102	202	54	-11.7	Pass	

Graphical Test Results for HT20 & Bluetooth: 1 – 18GHz (Peak)

Note that the data displayed on the plots detailed in this appendix were measured using a 'Peak Detector'. Please refer to the results table for the detectors used during formal measurements



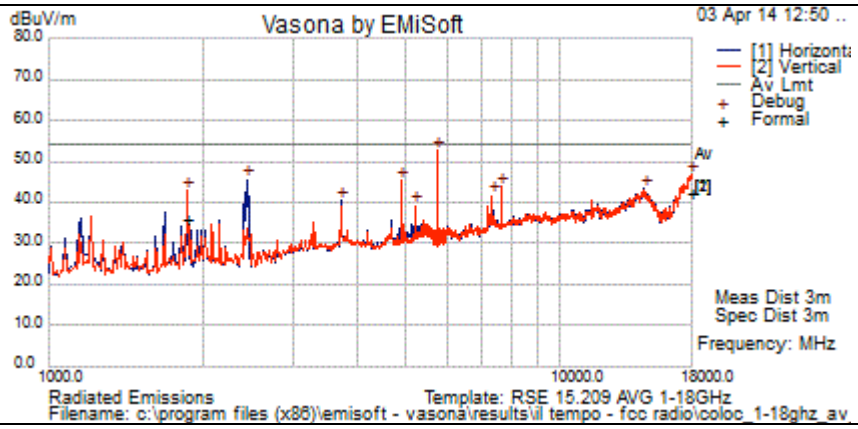
Title: 1 - 18GHz Test Results for HT20 & Bluetooth (Peak)

Test Results Table

Formal Data													
No	**Frequency MHz**	**Raw dBuV**	**Cable Loss**	**AF dB**	**Level dBuV/m**	**Measurement Type**	**Pol**	**Hgt cm**	**Azt Deg**	**Limit dBuV/m**	**Margin dB**	**Pass /Fail**	**Comments**
1	5743.001	47.5	9.4	-4.1	52.9	Peak	V	100	295	74	-21.1	Pass	

Graphical Test Results for HT20 & Bluetooth: 1 – 18GHz (Average)

Note that the data displayed on the plots detailed in this appendix were measured using a 'Peak Detector'. Please refer to the results table for the detectors used during formal measurements



Title: 1 - 18GHz Test Results for HT20 & Bluetooth (Average)

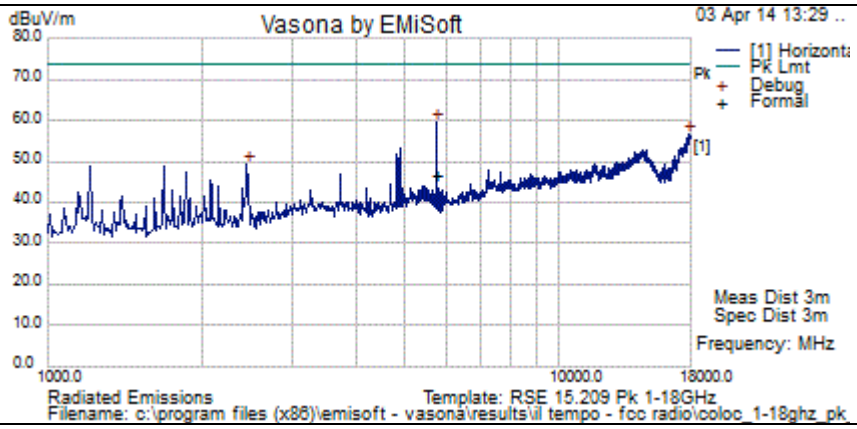
Test Results Table

Formal Data

No	Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
1	1867.001	37.7	5.1	-7	35.8	Average	V	102	358	54	-18.2	Pass	
2	18000	13.6	18.9	9.7	42.3	Average	V	102	358	54	-11.7	Pass	

Graphical Test Results for HT40 & Bluetooth: 1 – 18GHz (Peak)

Note that the data displayed on the plots detailed in this appendix were measured using a 'Peak Detector'. Please refer to the results table for the detectors used during formal measurements



Title: 1 - 18GHz Test Results for HT40 & Bluetooth (Peak)

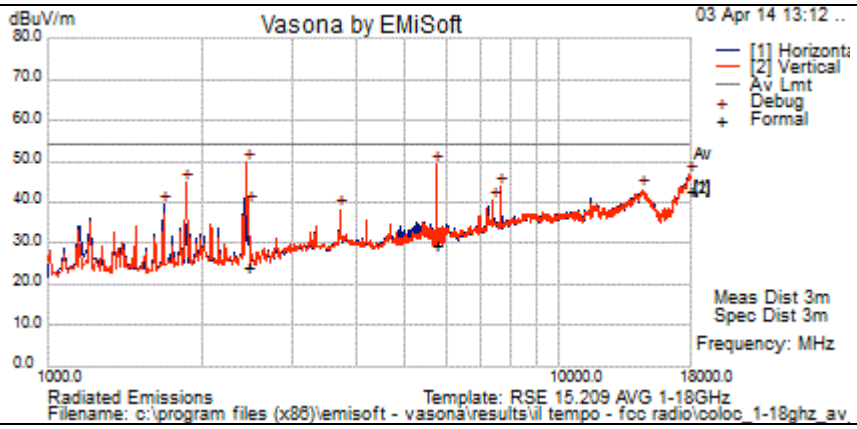
Test Results Table

Formal Data

No	Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
1	5743.001	41.2	9.4	-4.1	46.6	Peak	H	100	361	74	-27.4	Pass	

Graphical Test Results for HT40 & Bluetooth: 1 – 18GHz (Average)

Note that the data displayed on the plots detailed in this appendix were measured using a 'Peak Detector'. Please refer to the results table for the detectors used during formal measurements



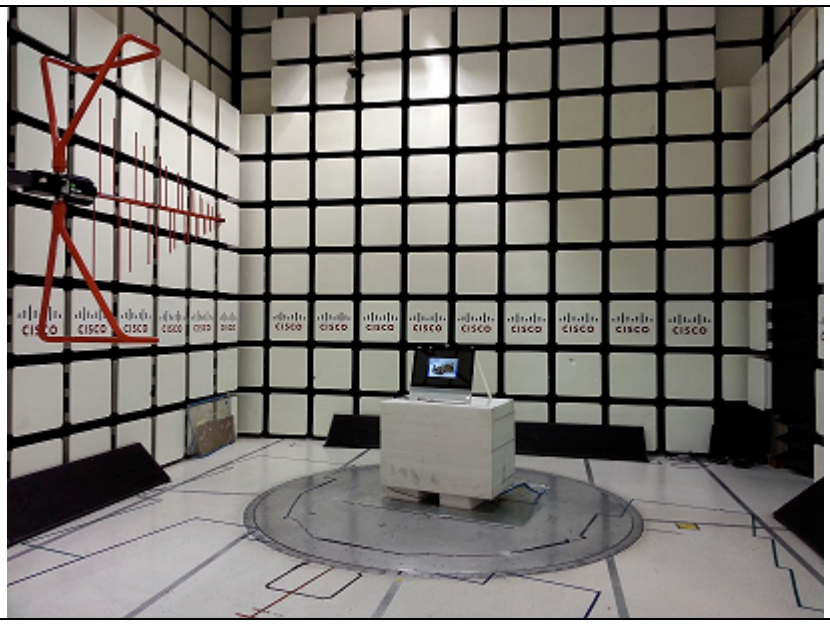
Title: 1 - 18GHz Test Results for HT40 & Bluetooth (Average)

Test Results Table

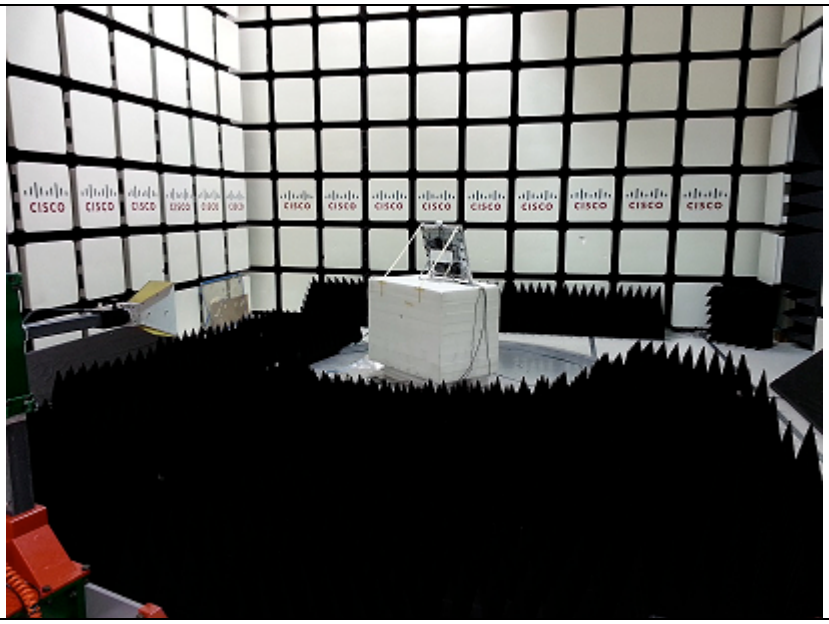
Formal Data

No	Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
1	2453.501	24.2	5.9	-6.2	23.9	Average	V	100	364	54	-30.1	Pass	
2	5743	24	9.4	-4.1	29.4	Average	V	100	364	54	-24.6	Pass	
3	17923.5	14.1	18.9	9.7	42.6	Average	V	100	364	54	-11.4	Pass	

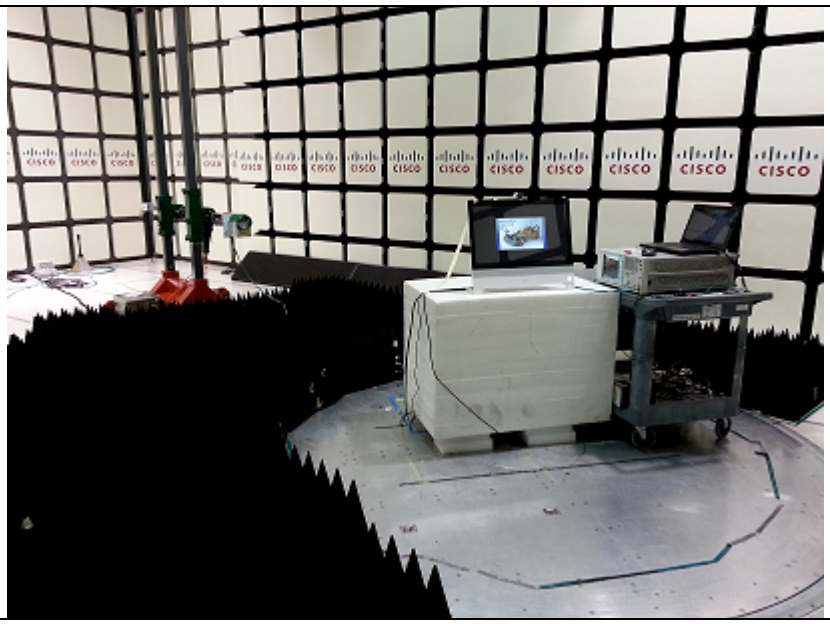
Physical Test arrangement Photograph:



Title: Radiated Spurious Emissions Test Configuration 30M - 1000MHz



Title: Radiated Spurious Emissions Test Configuration 1G - 18GHz



Title: Radiated Spurious Emissions Test Configuration 18 – 40GHz

Title: Co-Location Radiated Spurious Emissions 1-18GHz Test Setup

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=√(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^2

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

d=√((30*P*G)/(3770*S))

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

P(mW)=P(W)/1000 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^2

Substituting the logarithmic form of power and gain using:

P(mW)=10^(P(dBm)/10) G(numeric)=10^(G(dBi)/10)

yields

d=0.282*10^((P+G)/20)/√S Equation (1)

and

s=((0.282*10^((P+G)/20))/d)^2 Equation (2)

where

d=MPE distance in cm
P=Power in dBm
G=Antenna Gain in dBi
S=Power Density in mW/cm^2

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^2 maximum. The highest supported antenna gain is 7.05dBi. Using the peak power levels recorded in the test report along with Equation 1 above, the MPE distances are calculated as follows.

MPE Calculations:

Frequency (MHz)	Power Density (mW/cm^2)	Peak Transmit Power (dBm)	Antenna Gain (dBi)	MPE Distance (cm)	Limit (cm)	Margin (cm)
5745	1	15.38	7.05	3.73	20	16.27
5755	1	14.29	7.05	3.29	20	16.71
5785	1	15.52	7.05	3.79	20	16.21
5795	1	14.52	7.05	3.38	20	16.62
5825	1	15.82	7.05	3.92	20	16.08

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:

Frequency (MHz)	MPE Distance (cm)	Peak Transmit Power (dBm)	Antenna Gain (dBi)	Power Density (mW/cm^2)	Limit (mW/cm^2)	Margin (mW/cm^2)
5745	20	15.38	7.05	0.03	1	0.97
5755	20	14.29	7.05	0.03	1	0.97
5785	20	15.52	7.05	0.04	1	0.96
5795	20	14.52	7.05	0.03	1	0.97
5825	20	15.82	7.05	0.04	1	0.96

Appendix B: Abbreviation Key and Definitions

The following table defines abbreviations used within this test report.

Abbreviation	Description	Abbreviation	Description
EMC	Electro Magnetic Compatibility	°F	Degrees Fahrenheit
EMI	Electro Magnetic Interference	°C	Degrees Celsius
EUT	Equipment Under Test	Temp	Temperature
ITE	Information Technology Equipment	S/N	Serial Number
TAP	Test Assessment Schedule	Qty	Quantity
ESD	Electro Static Discharge	emf	Electromotive force
EFT	Electric Fast Transient	RMS	Root mean square
EDCS	Engineering Document Control System	Qp	Quasi Peak
Config	Configuration	Av	Average
CIS#	Cisco Number (unique identification number for Cisco test equipment)	Pk	Peak
Cal	Calibration	kHz	Kilohertz ($1x10^3$)
EN	European Norm	MHz	MegaHertz ($1x10^6$)
IEC	International Electro technical Commission	GHz	Gigahertz ($1x10^9$)
CISPR	International Special Committee on Radio Interference	H	Horizontal
CDN	Coupling/Decoupling Network	V	Vertical
LISN	Line Impedance Stabilization Network	dB	decibel
PE	Protective Earth	V	Volt
GND	Ground	kV	Kilovolt ($1x10^3$)
L1	Line 1	μV	Microvolt ($1x10^{-6}$)
L2	Line2	A	Amp
L3	Line 3	μA	Micro Amp ($1x10^{-6}$)
DC	Direct Current	mS	Milli Second ($1x10^{-3}$)
RAW	Uncorrected measurement value, as indicated by the measuring device	μS	Micro Second ($1x10^{-6}$)
RF	Radio Frequency	μS	Micro Second ($1x10^{-6}$)
SLCE	Signal Line Conducted Emissions	m	Meter
Meas dist	Measurement distance	Spec dist	Specification distance
N/A or NA	Not Applicable	SL	Signal Line (or Telecom Line)
P	Power Line	L	Live Line
N	Neutral Line	R	Return
S	Supply	AC	Alternating Current

Appendix C: Test Equipment Used to perform the test

Equip#	Manufacturer/ Model	Description	Last Cal	Next Due
40603	Agilent/HP / E4440A	Spectrum Analyzer	1-Nov-13	1-Nov-14
49517	CRISTEK/ MK-AMS-L16-AMS-A060	SMA 5ft cable	04/08/2013	8-Apr-14
41987	MURATA ELECTRONICS/ MXGS83RK3000	Special Radio Test Adaptor Cable	7/3/2013	3-Jul-14
40641	ROHDE & SCHWARZ / ESU26	EMI Test Receiver, 26GHZ	24-Jun-13	24 Jun 2014
25658	MICRO-COAX/ UFB311A-1-0840-504504	Coaxial Cable, 84.0 in. to 18GHz	2/14/2014	14-Feb-15
21117	MICRO-COAX/ UFB311A-0-2484-520520	Coaxial Cable-18Ghz	8/23/2013	23-Aug-14
49563	HUBER + SUHNER/ Sucoflex 106A	Coaxial Cable, 8m	8/23/2013	23-Aug-14
30654	SUNOL SCIENCES/ JB1	Combination Antenna, 30MHz-2GHz	7-Nov-13	31-Oct-14
27236	YORK/ CNE V	COMPARISON NOISE EMITTER	N/A	N/A
41935	NEWPORT/ iBTHP-5-DB9	5 inch Temp/RH/Press Sensor w/20ft cable	25-Mar-13	25-Mar-14
35237	STANLEY/ 33-696	TAPE RULE 5M	5/14/2013	14-May-14
21638	Rosenberger/ 32S15R-0.5E3	SMA Termination (m), 50 Ohm	10/22/2013	22-Oct-14
5971	Agilent/HP / 83712B	SYNTHESIZED CW GENERATOR	5-Jul-13	3-Jul-14
47299	Agilent/HP / N9030A	PXA Signal Analyzer	17-Sep-13	16-Sep-14
41979	Cisco / 1840	18-40GHz EMI Test Head/Verification Fixture	7/9/2013	9-Jul-14
25662	MICRO-COAX/ UFB311A-1-0840-504504	Coaxial Cable, 84.0 in. to 18GHz	2/27/2014	27-Feb-15
5691	MITEQ/ NSP1800-25-S1	PREAMPLIFIER	1/27/2014	27-Jan-15
47286	HUBER + SUHNER/ Sucoflex 102E	40GHz Cable K Connector	5/30/2013	30-May-14
49446	Micro-Tronics/ BRC50705-02	Notch Filter	3/19/2013	19-Mar-14
4882	EMCO/ 3115	HORN ANTENNA	8-Jul-13	28-Jun-14
40597	CISCO/ Above 1GHz Site Cal	1GHz Cispr Site Verification	5/30/2013	30-May-14
49443	Micro-Tronics/ BRM50702-02	Band Reject Filter	3/19/2013	19-Mar-14

49445	Micro-Tronics/ BRC50704-02	Notch Filter	3/19/2013	19-Mar-14
49444	Micro-Tronics/ BRC50703-02	Notch Filter	03/19/2013	19-Mar-14
49447	Micro-Tronics/ BRC50705-02	Notch Filter	3/20/2014	20-Mar-15
35605	Micro-Tronics/ BRC50704-02	Notch Filter	3/20/2014	20-Mar-15
49521	CRISTEK/ MK-AMS-L16-AMS-A060	SMA 5ft cable	4/8/2013	8-Apr-14
47304	FAIRVIEW MICROWAVE/ ST6S-10	SMA Termination 6GHz	10/22/2013	22-Oct-14
4924	Rohde & Schwarz/ ESHS30	EMI Receiver (9KHz-30MHz)	28-JAN-14	28-JAN-15
8195	TTE/ H613-150K-50-21378	Hi Pass Filter - 150KHz cutoff	08-JAN-14	08-JAN-15
8471	Bird/ 5-T-MB	50 Ohm, 5W Terminator,Type BNC	12-SEP-13	12-SEP-14
7036	HP/ E7401A	Spectrum Analyzer	11-SEP-13	11-SEP-14
18981	Fischer Custom Communications/ FCC-801-M2-32A	Power Line Coupling/Decoupling Network	02-MAY-13	02-MAY-14
19337	Fischer Custom Communications/ FCC-LISN-50/250-50-2-01	LISN	06-SEP-13	06-SEP-14
23874	Fischer Custom Communications/ FCC-LISN-PA-NEMA-5-15	Power Adaptor, Polarized 120VAC	06-SEP-13	06-SEP-14
36033	York/ CNE V	Comparison Noise Emitter	Cal Not Required	N/A
37006	Extech/ 380282	Digital Multimeter	09-DEC-13	09-DEC-14
39110	Coleman/ RG-223	25 ft BNC cable	25-NOV-13	25-NOV-14
46075	Newport / iBTHP-5-DB9	5 inch Temp/RH/Press Sensor w/20ft cable	21-OCT-13	21-OCT-14

Appendix D: Test Procedures

Measurements were made in accordance with

- FCC docket #: DA-02-2138A1
- KDB Publication No. 558074
- Measurement method of spurious emission tolerance to the International Telecommunication Union (ITU) Recommendation SM329.
- ANSI C63.4
- ANSI PC63.10/D8

Test procedures are summarized below

6dB Bandwidth	EDCS # - 422115
26dB Bandwidth	EDCS # - 422115
Average Output Power	EDCS # - 422117
Co-Located Transmitter	EDCS # - 422118
Conducted Spurious Test	EDCS # - 422119
Peak Transmit Power Measurement	EDCS # - 422123
Power Spectral Density	EDCS # - 422113
Peak Excursion Test	EDCS # - 422121
Radiated Band Edge	EDCS # - 422124
Radiated Spurious Test	EDCS # - 422125