Class III Change Test Report: EDCS - 501969

For

AIR-AP1242AG-A-K9 802.11a/b/g Access Point (FCC ID: LDK102056)

Against the following Specifications :

FCC CFR 47 Part 15.407

Cisco Systems

EMC Laboratory

170 West Tasman Drive

San Jose, CA 95134

Certificate Number : 1178-01

Author: James Nicholson

Approved By:

Title:

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 Parts 15.407.

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.
4) For Radiated and Conducted emissions results refer to section 2.9 for measurement uncertainty considerations
5) Where applicable, details of the precise distance used when performing radiated immunity measurements can be found in Cisco document EDCS-221012.
6) Where testing has been performed to EN61000-4-3, additional measurements were conducted to establish the field strength at a 40cm height in both the horizontal and vertical antenna polarities (applies to floor standing EUT's only). This field strength data can be found in Cisco document ENG-72588.

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.

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

This report may contain data that are not covered by the A2LA accreditation (Certificate number 1178-01). Please refer to Appendix F for further details.

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:

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*%

*[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 (+/-10%) 60Hz
220V (+/-10%) 50 or 60Hz

f) Cisco Systems Inc., are accredited by the American Association for Laboratory Accreditation (A2LA). For the specific scope of accreditation under certificate number 1178-01.see appendix F for further details.

2.2 Date of start of testing

06-Feb-2006

2.3 Report Issue Date

Cisco uses an electronic system to issue, store and control the revision of test reports. This system is called the Engineering Document Control System (EDCS). The actual report issue date is embedded into the original file on EDCS. Any copies of this report, either electronic or paper, that are not on EDCS must be considered uncontrolled

2.4 Testing facilities

This assessment was performed by:

Testing Laboratory

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

Test Engineers

James Nicholson

2.5 Equipment Assessed (EUT)

AIR-AP1242AG-A-K9 5GHz 802.11a/b/g Access Point

2.6 EUT Description

The AIR-AP1242AG-x-K9 access point operates simultaneously in both the 2.4 and 5 GHz spectrum, to provide data rates up to 54 Mbps in each band in accordance with IEEE 802.11a and 802.11g standards, including backwards compatibility to 802.11b. AIR-AP1242AG-x-K9 supports both inline power and local power, and ships with a power supply brick.

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 H of this report, and the relevant Cisco EMC compliance test procedures (ENG-23438). 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, these are test dependent. Where radiated measurements are concerned these are defined at a particular distance. Basic voltage measurements are defined in dBuV and current in dBuA.

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 components of 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, Current Probe Factors.

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 Measurement Uncertainty

Where relevant measurement uncertainty levels have been estimated for tests performed on the apparatus. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

Radiated emissions (expanded uncertainty, confidence interval 95%)

10kHz - 30 MHz	+/- 2.8 dB (E Field)
10kHz - 30 MHz	+/- 2.8 dB (H Field)
30 MHz - 300 MHz	+/- 3.8 dB
300 MHz - 1000 MHz	+/- 4.3 dB
1 GHz - 10 GHz	+/- 4.0 dB
10 GHz - 18GHz	+/- 8.2 dB
18GHz - 26.5GHz	+/- 4.1 dB
26.5GHz - 40GHz	+/- 3.9 dB

Conducted emissions (expanded uncertainty, confidence interval 95%)

4 kHz - 30 MHz	+/- 2.2 dB (using Current Probe)
9 kHz - 150 kHz	+/- 4.1 dB (using LISN)
10 kHz - 30 MHz	+/- 2.6 dB (using Current Probe)
150 kHz - 30 MHz	+/- 3.7 dB (using LISN)
150 kHz - 30 MHz	+/- 3.1 dB (using CDN)
150 kHz - 30 MHz	+/- 2.7 dB (using CVP-1)
150 KHz - 30 MHz	+/1 2.7 dB (using TISN)

Section 3: 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.

3.1 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-AP1242AG-A-K9	NA	Cisco Systems	3	NA	NA	NA
S02	AIR-ANT5195P-R	NA	Cisco Systems	NA	NA	NA	NA
S03	AIR-ANT5160V-R	NA	Cisco Systems	NA	NA	NA	NA

The following antennas are included in this filing:

AIR-ANT5135D-R (5 GHz, 3.5 dBi Omnidirectional)
AIR-ANT5145V-R (5 GHz, 4.5 dBi Diversity Omnidirectional)
AIR-ANT5160V-R (5 GHz, 6.0dBi Diversity Omnidirectional)
AIR-ANT5170P-R (5 GHz, 7.0 dBi Diversity Patch)
AIR-ANT5195P-R (5 GHz, 9.5 dBi Patch)

3.2 System Details

System #	Description	Samples
4	AIR-AP1242AG-A-K9 with 5GHz 9.5dBi Patch Antenna	S01, S05 and S07
5	AIR-AP1242AG-A-K9 with 5GHz 6dBi Omnidirectional Antenna	S01, S06 and S07

3.3 Mode of Operation Details

Mode#	Description	Comments
1	IOS Test Interface	The various radio parameters will be invoked in the IOS test interface via either a telnet session or serial interface.

Appendix A: Formal Emission Test Results

Average Output Power

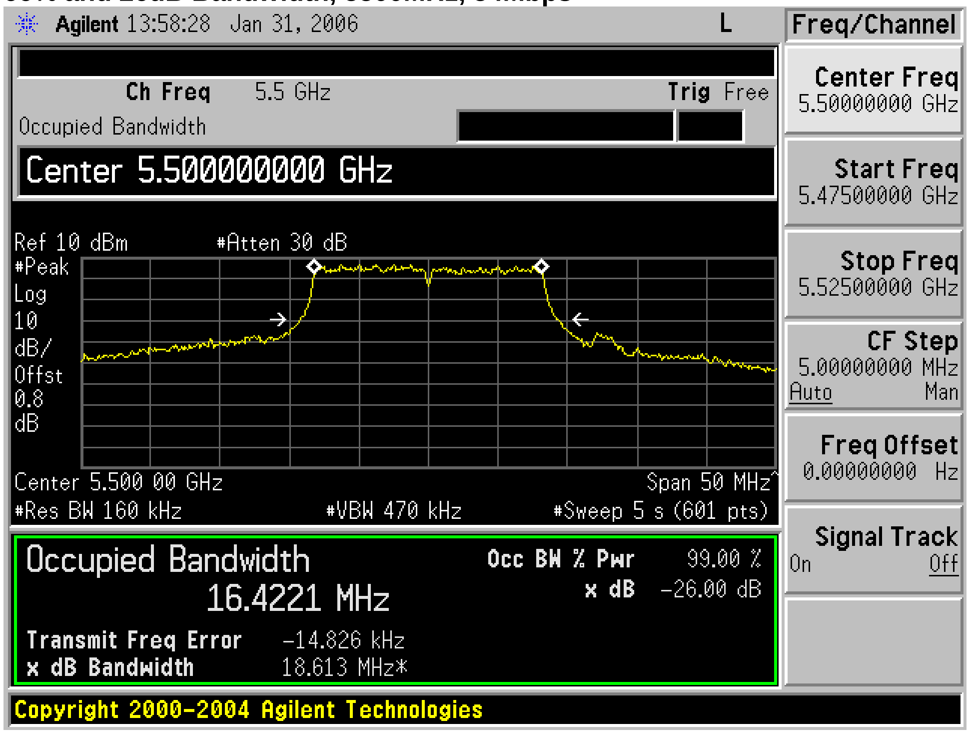
5GHz Average Power with up to 9.5dBi Antennas

Frequency (MHz)	Data Rate (Mbps)	Target Power (dBm)	Measured Power (dBm)
5500	54	17	17.1
5600	54	17	17.0
5700	54	17	16.7

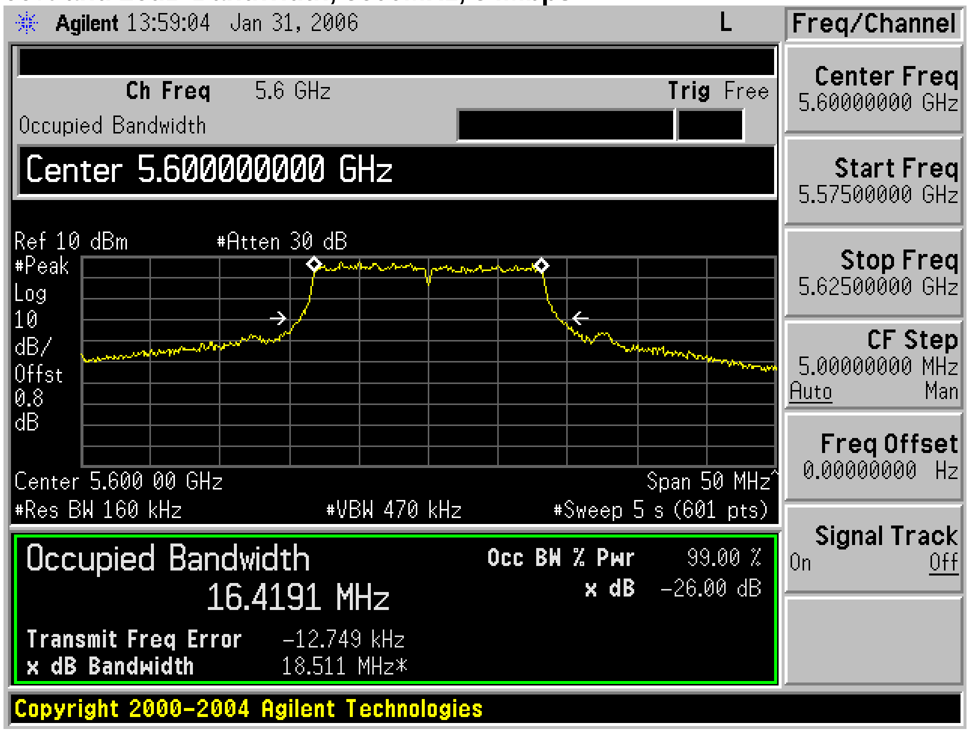
99% and 26dB Bandwidth

Frequency (MHz)	Data Rate (Mbps)	99% Bandwidth (MHz)	26dB Bandwidth (MHz)
5500	54	16.42	18.61
5600	54	16.42	18.51
5700	54	16.44	19.15

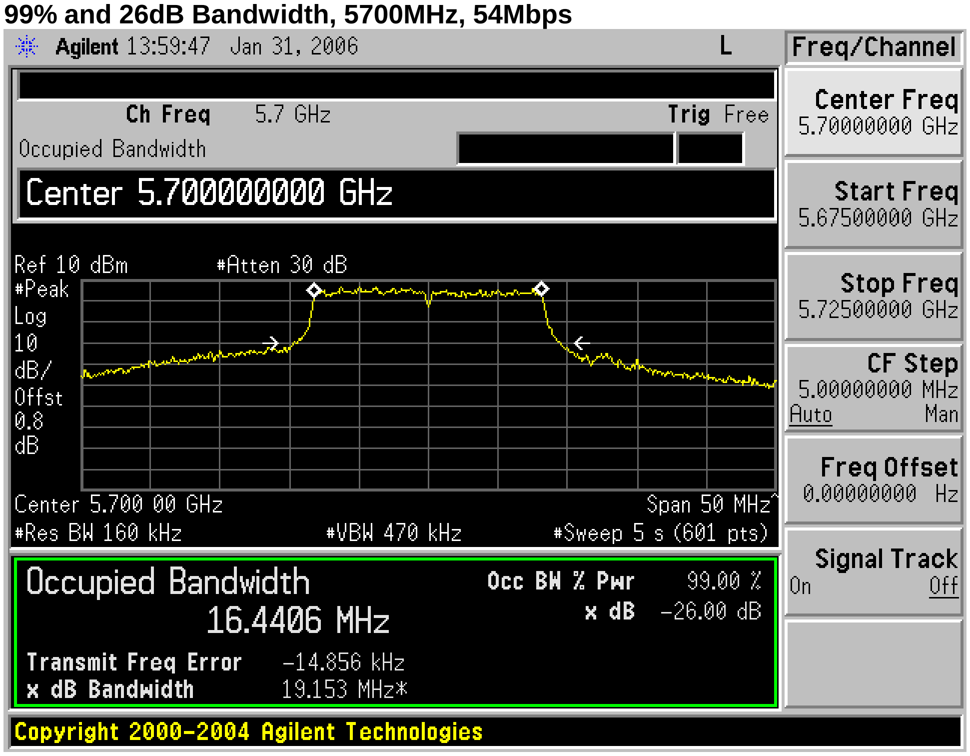
99% and 26dB Bandwidth, 5500MHz, 54Mbps



99% and 26dB Bandwidth, 5600MHz, 54Mbps



99% and 26dB Bandwidth, 5700MHz, 54Mbps



Peak Output Power

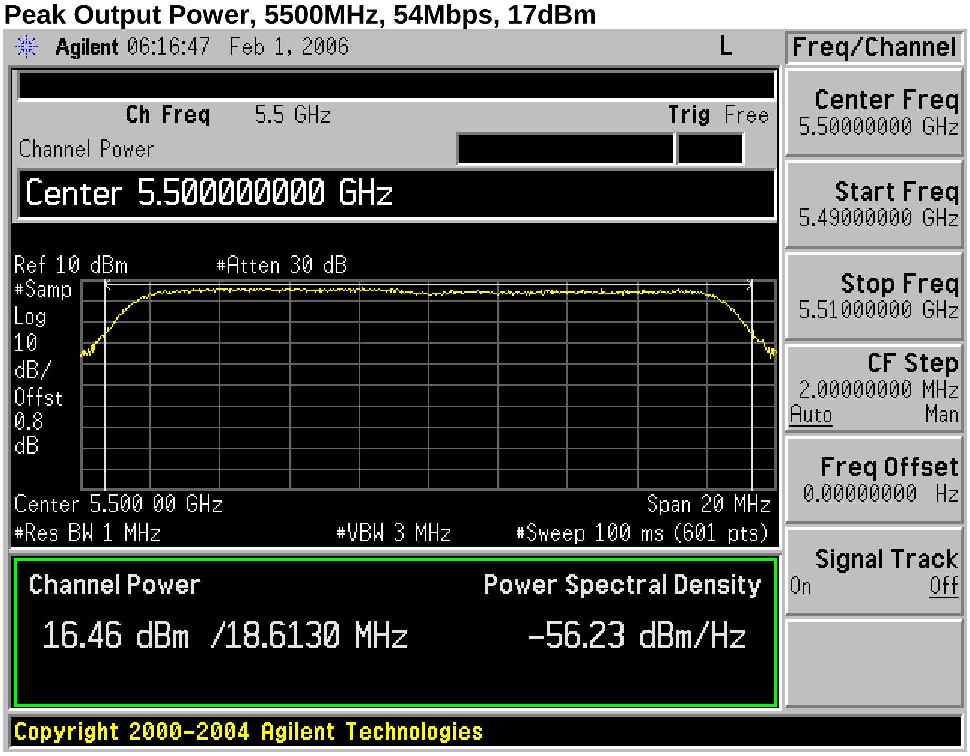
15.407: For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz. If transmitting antennas of directional gain greater than 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 smallest 26dB bandwidth for all channels is 18.5 MHz. The maximum conducted output power is calculated as 11dBm+10*log(18.5MHz) = 23.7dBm

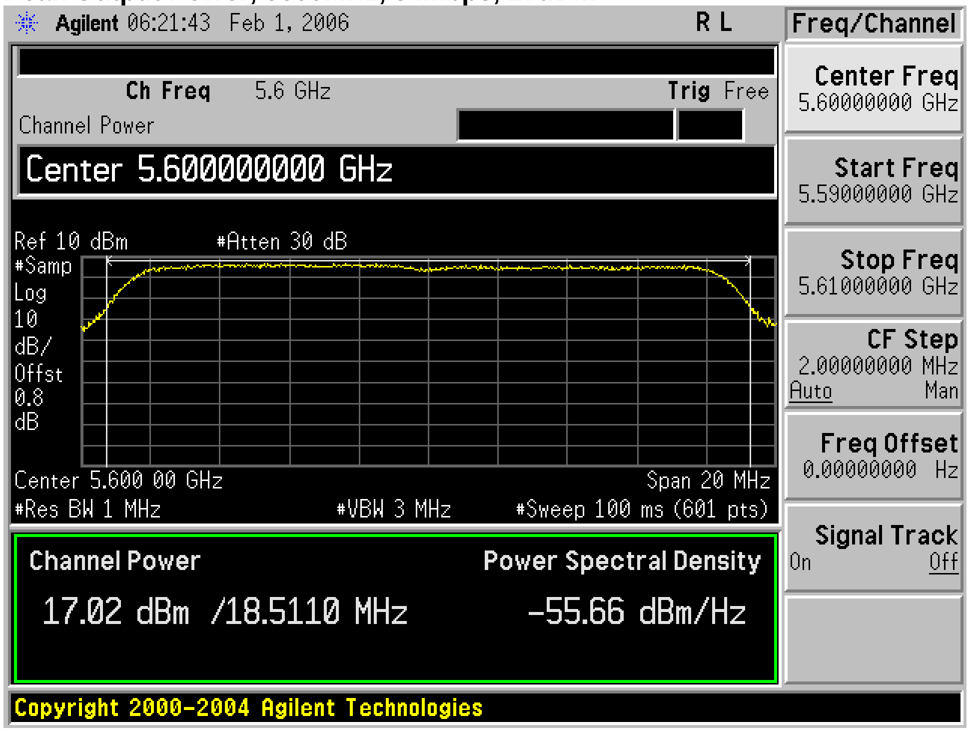
The maximum supported antenna gain for all bands is 9.5dBi. Therefore the maximum allowable output power for all bands must be reduced by 9.5dBi-6dbi = 3.5dBi.

Frequency (MHz)	Data Rate (Mbps)	Peak Output Power (dBm)	Limit (dBm)	Margin (dB)
5500	54	16.5	20.2	3.7
5600	54	17.0	20.2	3.2
5700	54	16.3	20.2	3.9

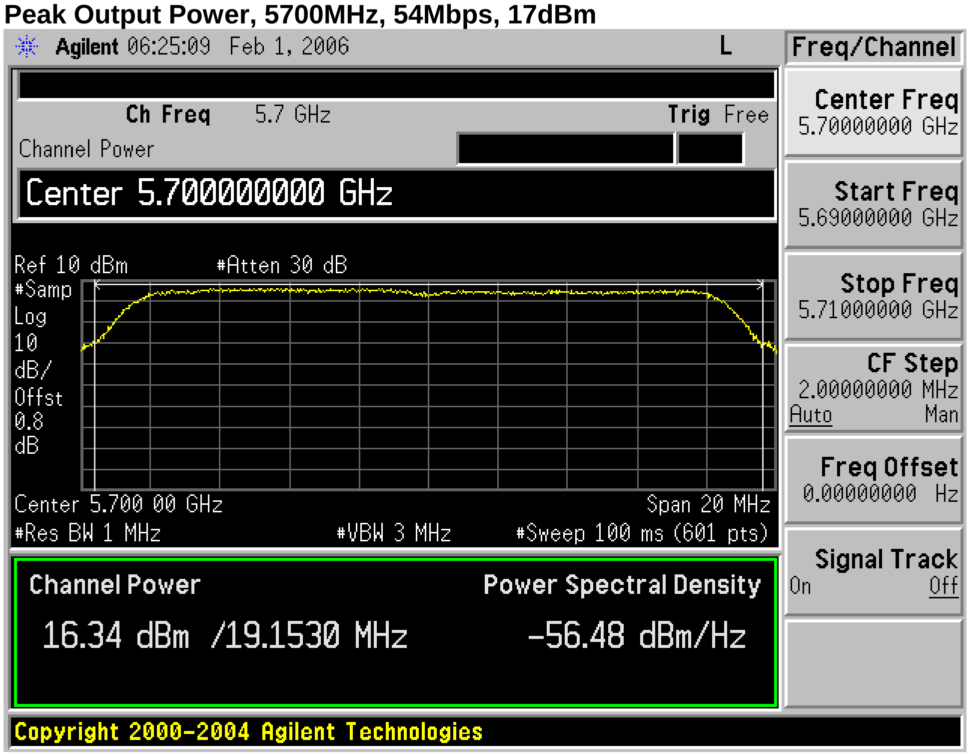
Peak Output Power, 5500MHz, 54Mbps, 17dBm



Peak Output Power, 5600MHz, 54Mbps, 17dBm



Peak Output Power, 5700MHz, 54Mbps, 17dBm



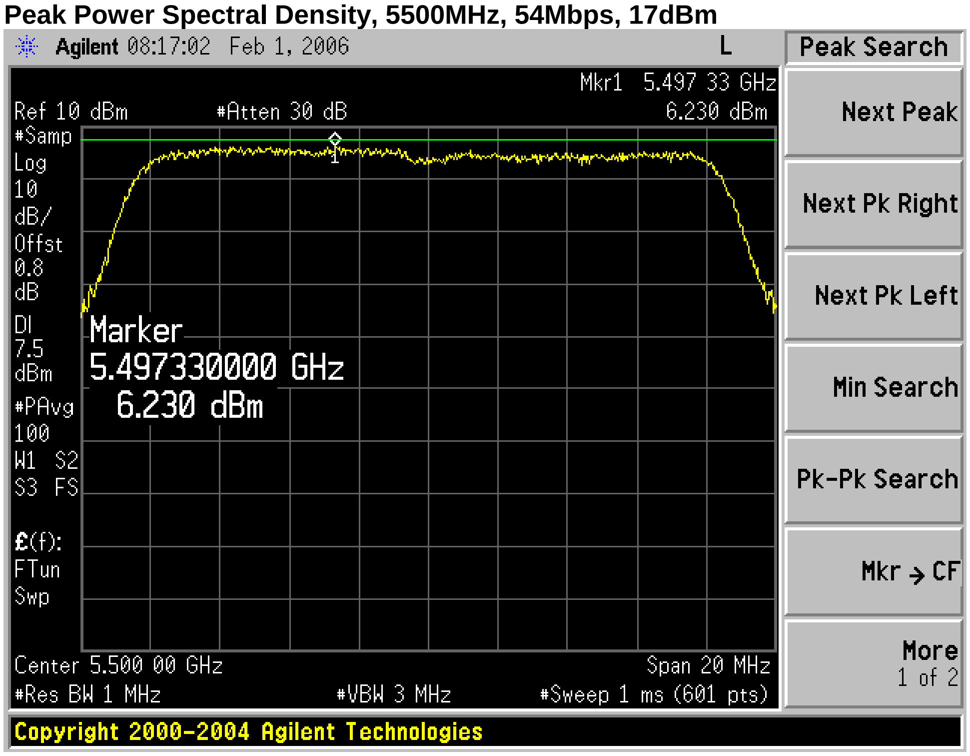
Power Spectral Density

15.407: For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the peak power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

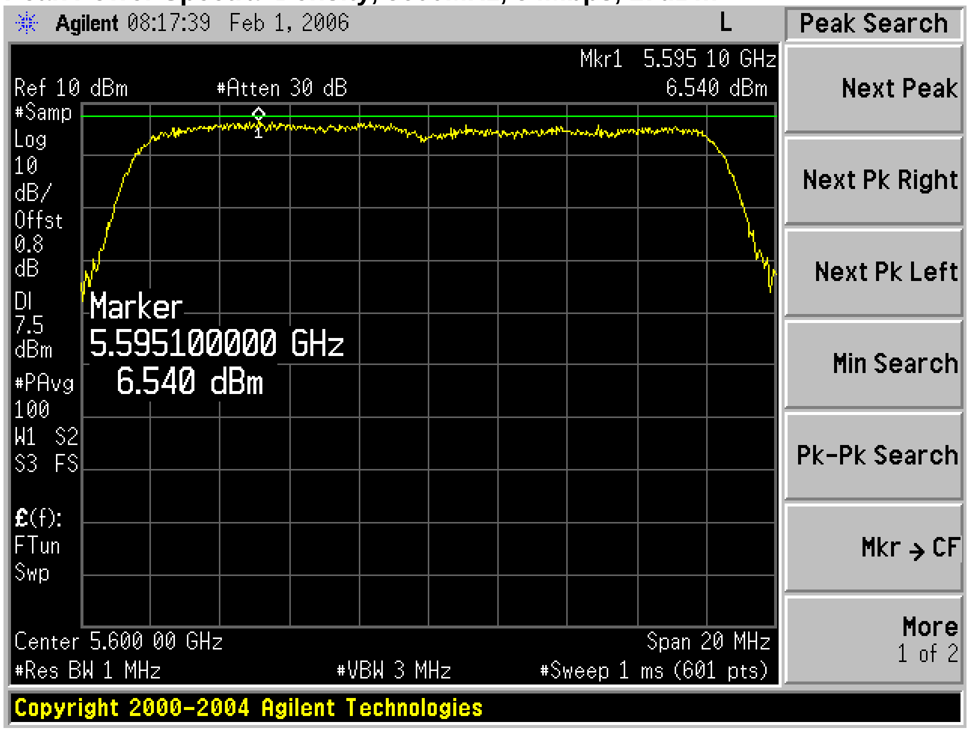
The maximum supported antenna gain is 9.5dBi. Therefore the maximum allowable peak power spectral density must be reduced by 9.5dBi-6dbi = 3.5dBi.

Frequency (MHz)	Data Rate (Mbps)	Peak Power Spectral Density (dBm/MHz)	Limit (dBm)	Margin (dB)
5500	36	6.2	7.5	1.3
5600	36	6.5	7.5	1.0
5700	36	5.9	7.5	1.4

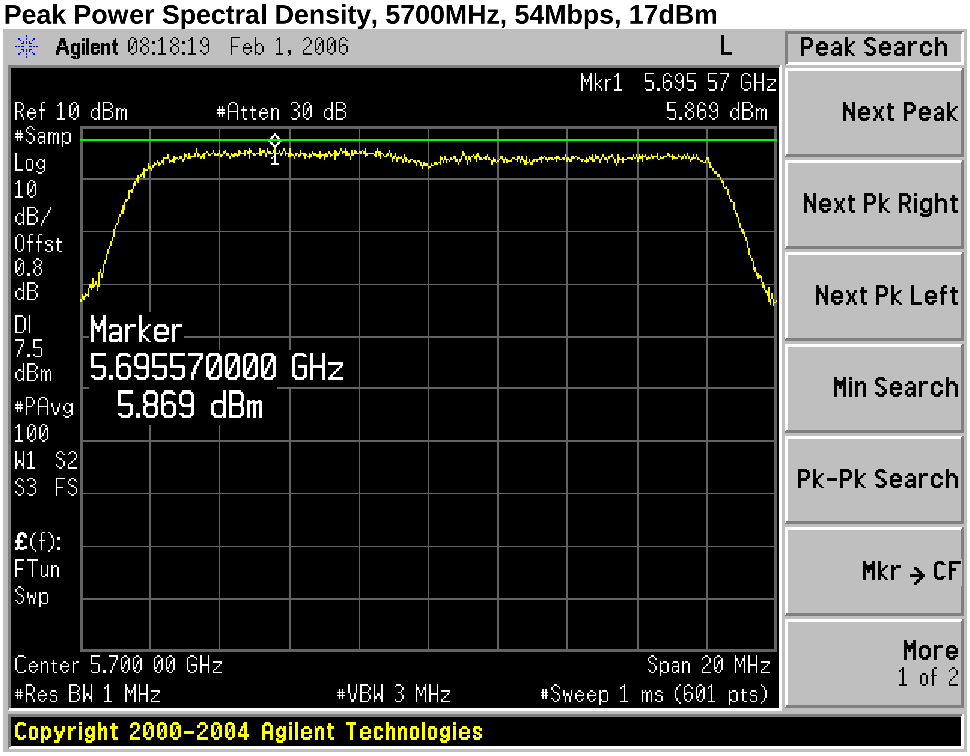
Peak Power Spectral Density, 5500MHz, 54Mbps, 17dBm



Peak Power Spectral Density, 5600MHz, 54Mbps, 17dBm



Peak Power Spectral Density, 5700MHz, 54Mbps, 17dBm

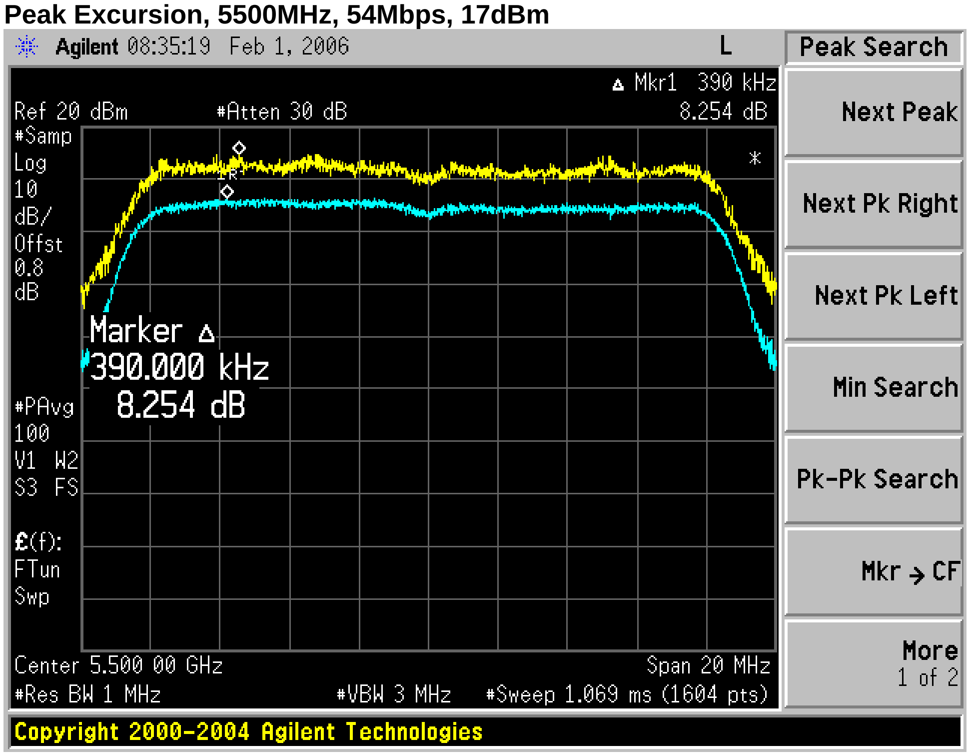


Peak Excursion

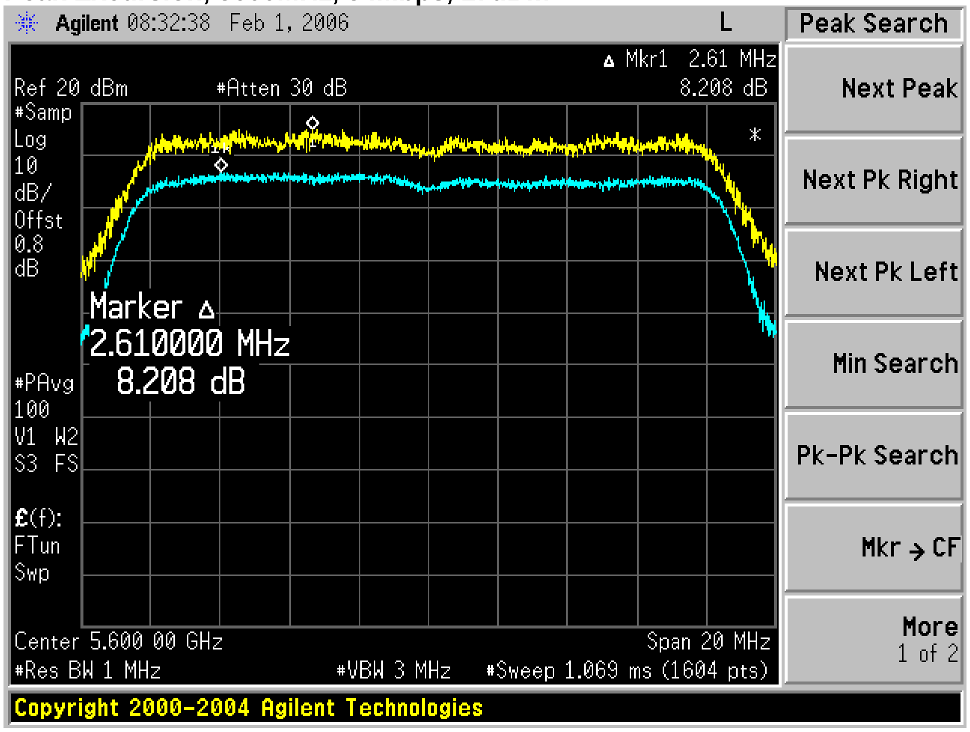
15.407: The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the maximum conducted output power (measured as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

Frequency (MHz)	Data Rate (Mbps)	Peak Excursion (dB)	Limit (dBm)	Margin (dB)
5500	54	8.25	13	4.75
5600	54	8.21	13	4.79
5700	54	7.69	13	5.31

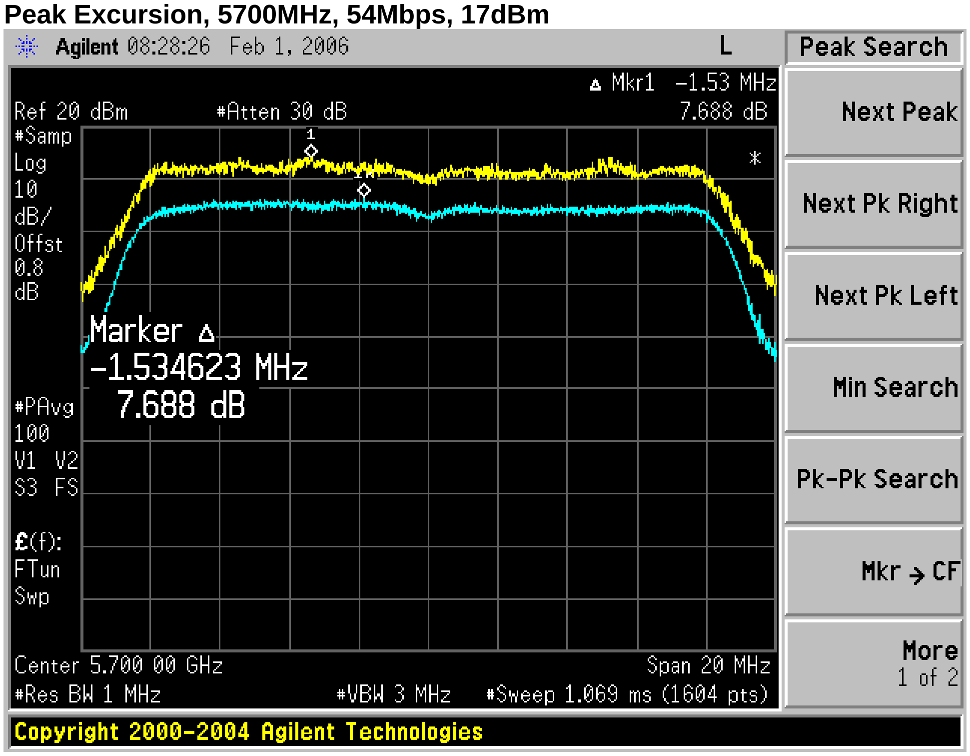
Peak Excursion, 5500MHz, 54Mbps, 17dBm



Peak Excursion, 5600MHz, 54Mbps, 17dBm



Peak Excursion, 5700MHz, 54Mbps, 17dBm



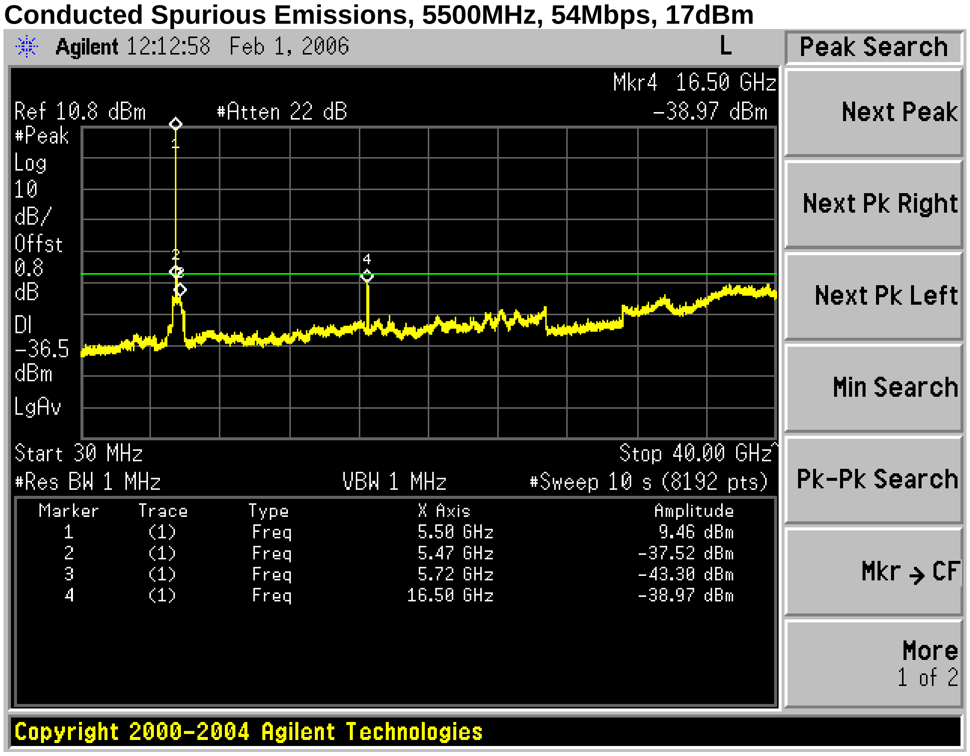
Conducted Spurious Emissions

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

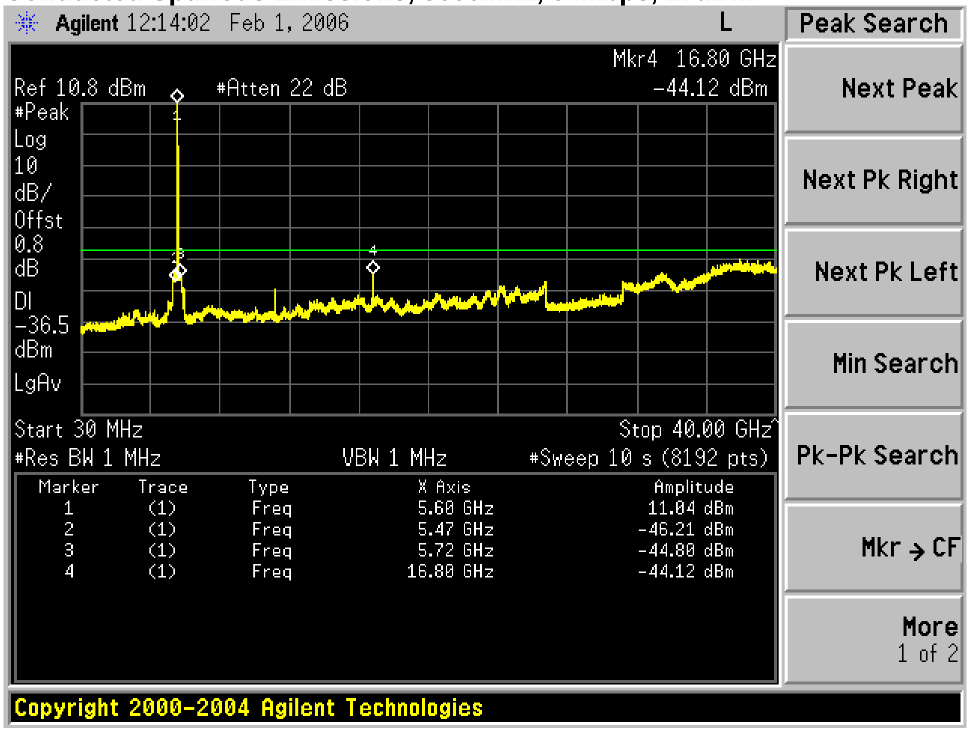
For transmitters operating in the 5.47-5.725 GHz band: all emissions outside of the 5.47-5.725 GHz band shall not exceed an EIRP of -27dBm/MHz.

The maximum supported antenna gain for all bands is 9.5dBi. Therefore the maximum allowable conducted spurious emissions for all bands is -27dBm/MHz-9.5dBi = -36.5 dBm/MHz.

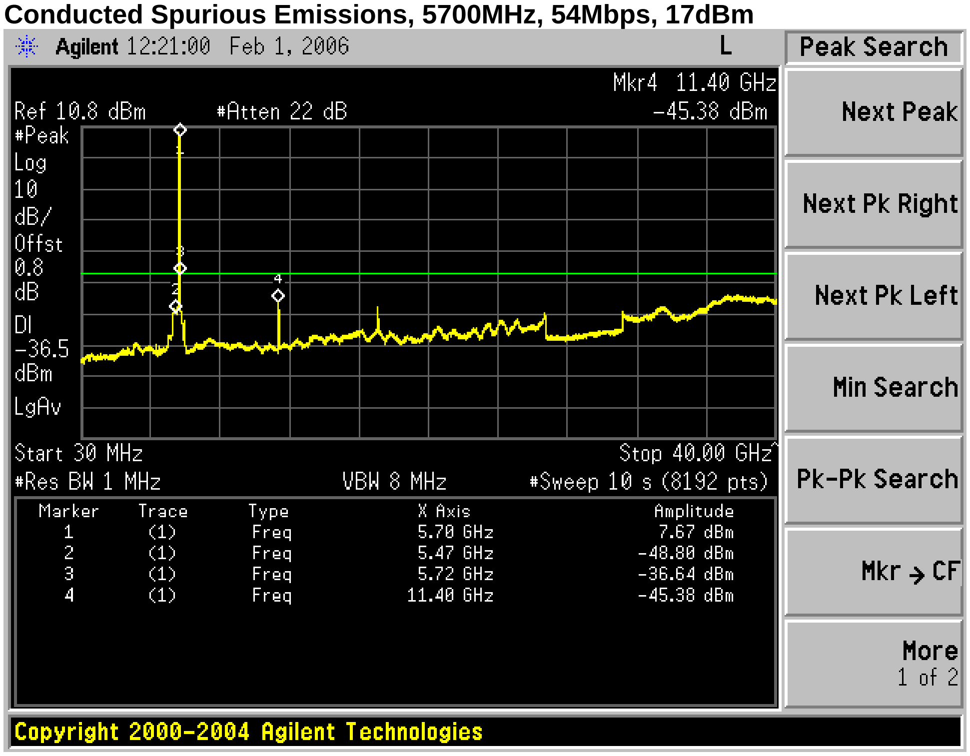
Conducted Spurious Emissions, 5500MHz, 54Mbps, 17dBm



Conducted Spurious Emissions, 5600MHz, 54Mbps, 17dBm



Conducted Spurious Emissions, 5700MHz, 54Mbps, 17dBm



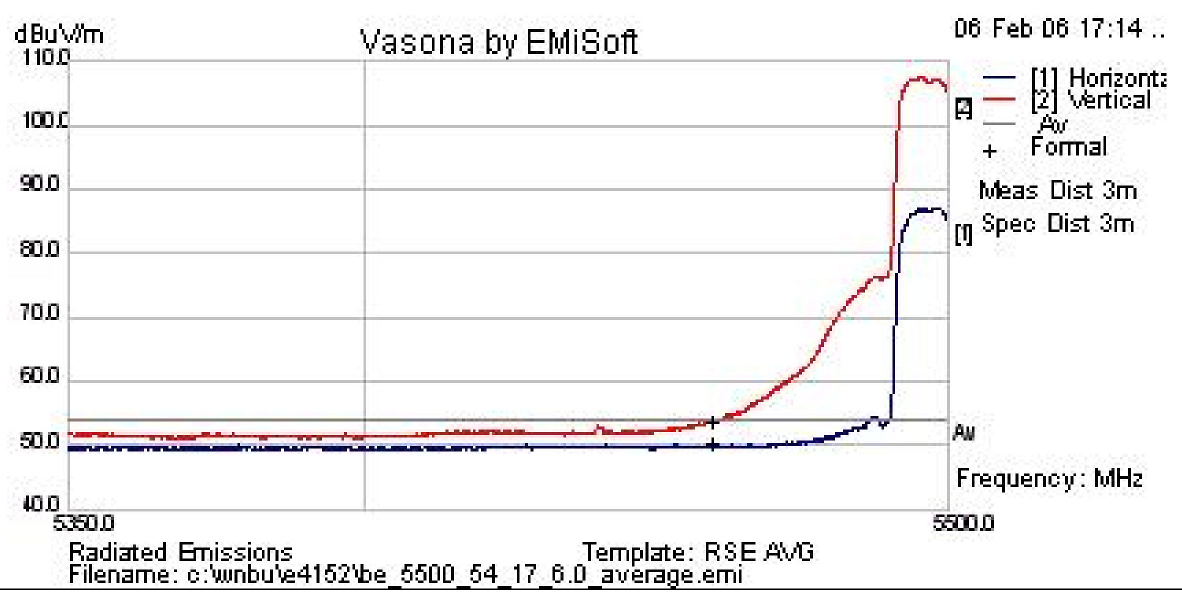
Radiated Transmitter Spurious Emissions

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).

Radiated Bandedge with 6.0dBi Omni-directional Antenna

Subtest Number: 20097 - 7	**Subtest Date:** 06-Feb-2006
Engineer	James Nicholson
Lab Information	Building P, 10m Anechoic
Subtest Results	
Subtest Title	**Average Bandedge, 5500 MHz, 54 Mbps, 17 dBm, 6.0 dBi Omni Antenna**
Subtest Result	Pass
Highest Frequency	5500.0
Lowest Frequency	5350.0
Comments on the above Test Results	1 MHz RBW, 10 Hz VBW

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: Average Bandedge, 5500 MHz, 54 Mbps, 17 dBm, 6.0 dBi Omni Antenna

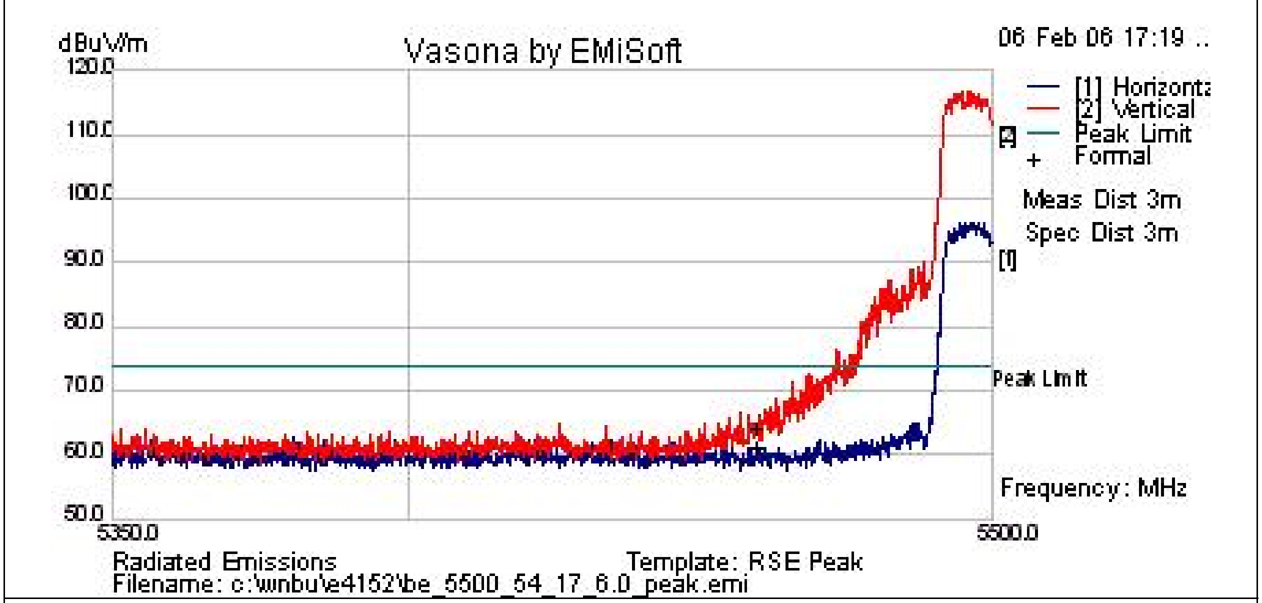
Test Results Table

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
5460	30.1	28.7	-7.2	51.6	Av	V	162	204	54	-2.4	Pass	
5460	26.7	28.7	-7.2	48.2	Av	H	162	204	54	-5.8	Pass	

Subtest Number: 20097 - 8	**Subtest Date:** 06-Feb-2006
Engineer	James Nicholson
Lab Information	Building P, 10m Anechoic
Subtest Results	
Subtest Title	**Peak Bandedge, 5500 MHz, 54 Mbps, 17 dBm, 6.0 dBi Omni Antenna**
Subtest Result	Pass
Highest Frequency	5500.0
Lowest Frequency	5350.0
Comments on the above Test Results	1 MHz RBW, 1 MHz VBW

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: Peak Bandedge, 5500 MHz, 54 Mbps, 17 dBm, 6.0 dBi Omni Antenna

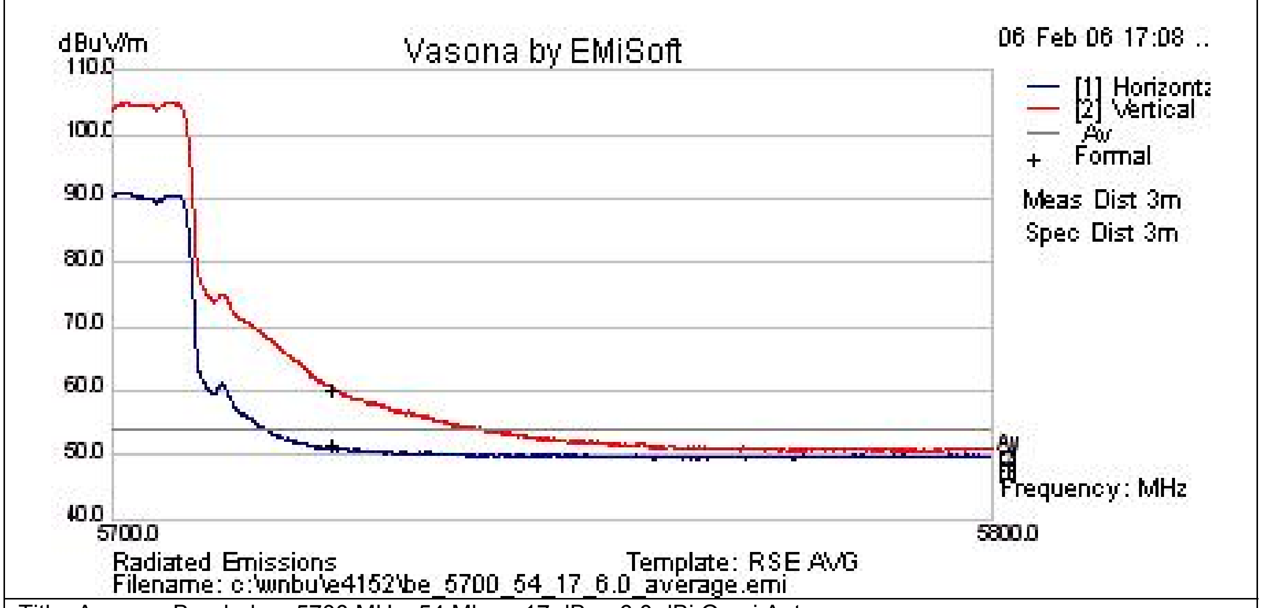
Test Results Table

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
5460	40.5	28.7	-7.2	62	Pk	V	162	203	74	-12	Pass	
5460	37.5	28.7	-7.2	59.1	Pk	H	162	203	74	-14.9	Pass	

Subtest Number: 20097 - 5	**Subtest Date:** 06-Feb-2006
Engineer	James Nicholson
Lab Information	Building P, 10m Anechoic
Subtest Results	
Subtest Title	**Average Bandedge, 5700 MHz, 54 Mbps, 17 dBm, 6.0 dBi Omni Antenna**
Subtest Result	Pass
Highest Frequency	5800.0
Lowest Frequency	5700.0
Comments on the above Test Results	1 MHz RBW, 10 Hz VBW

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



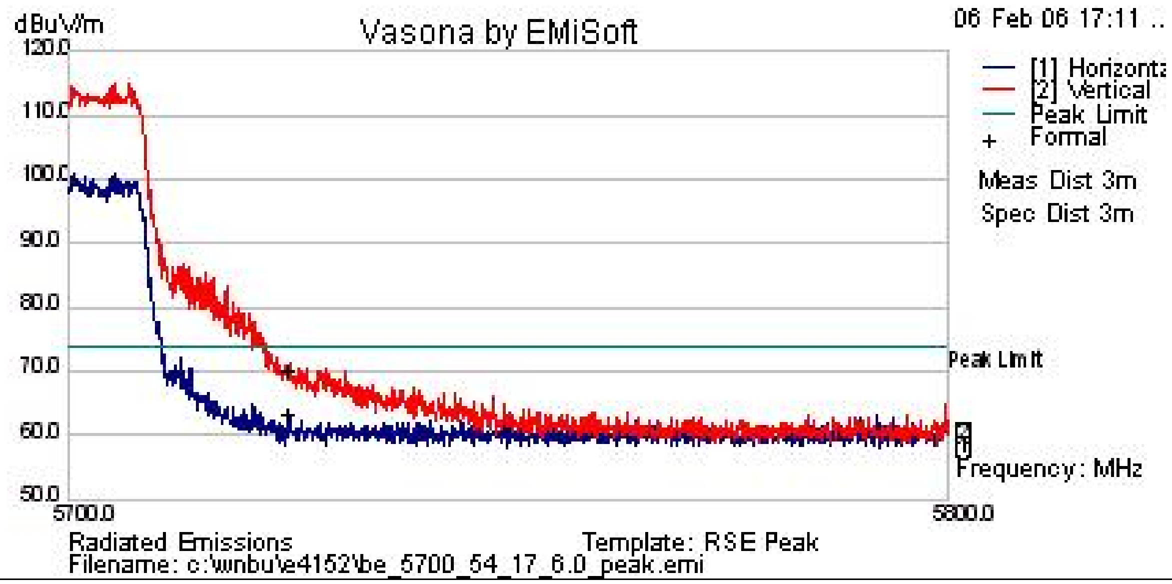
Title: Average Bandedge, 5700 MHz, 54 Mbps, 17 dBm, 6.0 dBi Omni Antenna

Test Results Table

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
5725	36.1	28.8	-6.7	58.2	Av	V	162	204	68.2	-10.0	Pass	Limit=68.2dBuV
5725	27.3	28.8	-6.7	49.4	Av	H	162	204	68.2	-18.8	Pass	Limit=68.2dBuV

Subtest Number: 20097 - 6	**Subtest Date:** 06-Feb-2006
Engineer	James Nicholson
Lab Information	Building P, 10m Anechoic
Subtest Results	
Subtest Title	**Peak Bandedge, 5700 MHz, 54 Mbps, 17 dBm, 6.0 dBi Omni Antenna**
Subtest Result	Pass
Highest Frequency	5800.0
Lowest Frequency	5700.0
Comments on the above Test Results	1 MHz RBW, 1 MHz VBW

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: Peak Bandedge, 5700 MHz, 54 Mbps, 17 dBm, 6.0 dBi Omni Antenna

Test Results Table

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
5725	46	28.8	-6.7	68.1	Pk	V	162	204	88.2	-20.1	Pass	Limit=88.2dBuV
5725	39.3	28.8	-6.7	61.4	Pk	H	162	204	88.2	-26.8	Pass	Limit=88.2dBuV

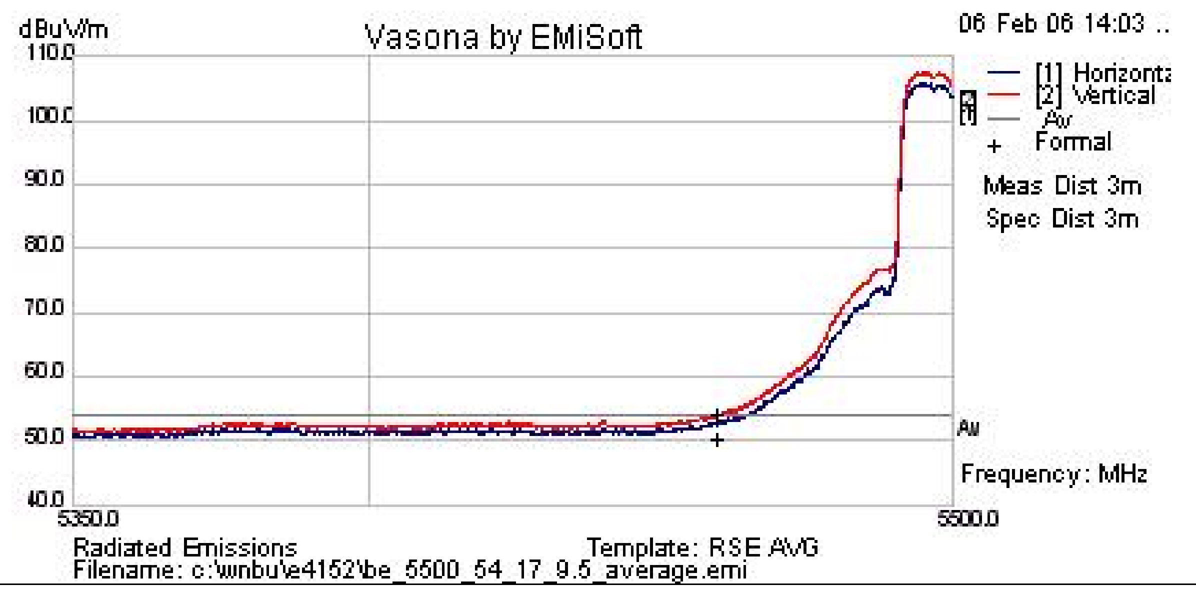
Physical Test arrangement Photograph:

Title: 5GHz 6.0 dBi Omnidirectional Antenna

Radiated Bandedge with 9.5dBi Patch Antenna

Subtest Number: 20076 - 7	**Subtest Date:** 06-Feb-2006
Engineer	James Nicholson
Lab Information	Building P, 10m Anechoic
Subtest Results	
Subtest Title	**Average Bandedge, 5500 MHz, 54 Mbps, 17 dBm, 9.5 dBi Patch Antenna**
Subtest Result	Pass
Highest Frequency	5500.0
Lowest Frequency	5350.0
Comments on the above Test Results	1 MHz RBW, 10 Hz VBW

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: Average Bandedge, 5500 MHz, 54 Mbps, 17 dBm, 9.5 dBi Patch Antenna

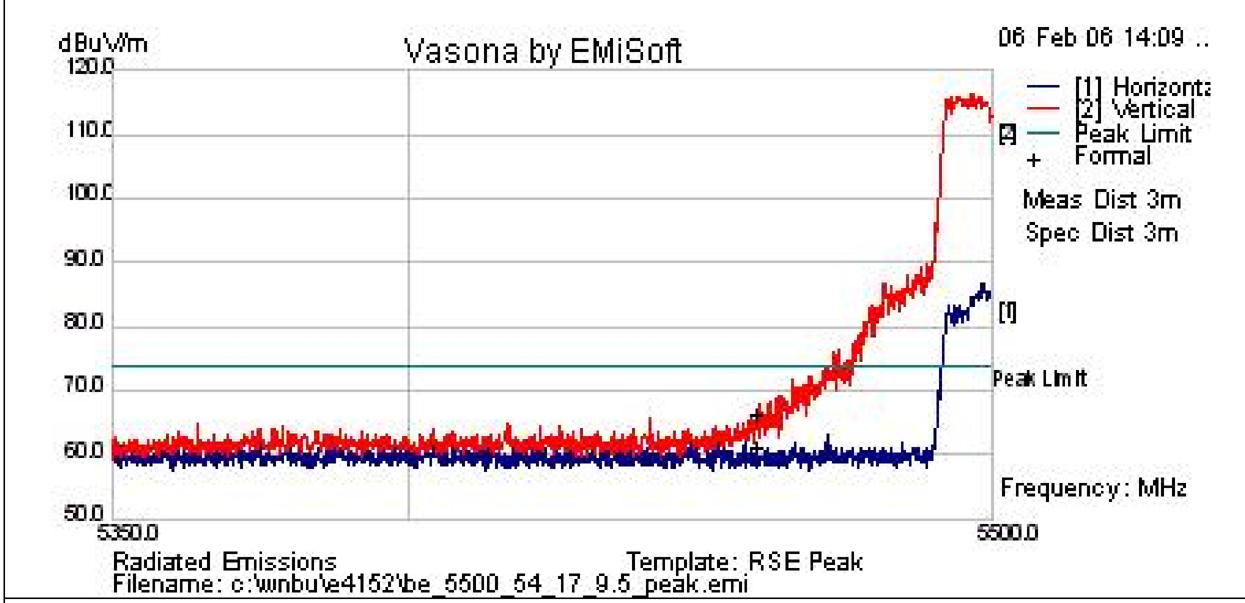
Test Results Table

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
5460	30.4	28.7	-7.2	51.9	Av	V	165	123	54	-2.1	Pass	
5460	26.7	28.7	-7.2	48.2	Av	H	165	123	54	-5.8	Pass	

Subtest Number: 20076 - 8	**Subtest Date:** 06-Feb-2006
Engineer	James Nicholson
Lab Information	Building P, 10m Anechoic
Subtest Results	
Subtest Title	**Peak Bandedge, 5500 MHz, 54 Mbps, 17 dBm, 9.5 dBi Patch Antenna**
Subtest Result	Pass
Highest Frequency	5500.0
Lowest Frequency	5350.0
Comments on the above Test Results	1 MHz RBW, 1 MHz VBw

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: Peak Bandedge, 5500 MHz, 54 Mbps, 17 dBm, 9.5 dBi Patch Antenna

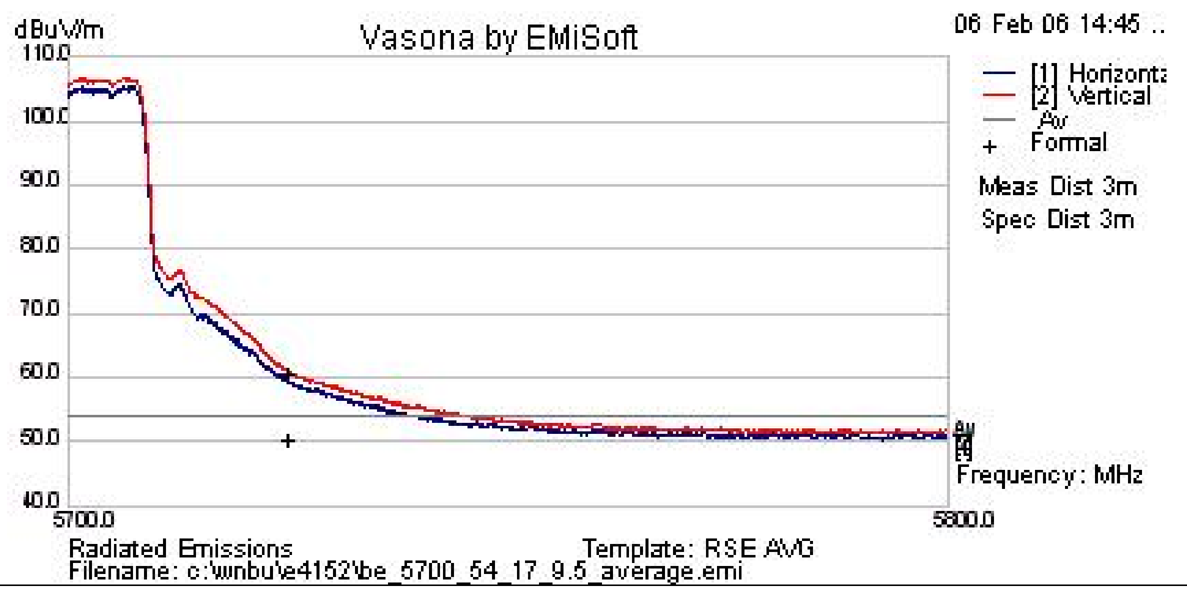
Test Results Table

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
5459.99	42.8	28.7	-7.2	64.4	Pk	V	165	123	74	-9.6	Pass	
5459.99	37.6	28.7	-7.2	59.2	Pk	H	165	123	74	-14.8	Pass	

Subtest Number: 20076 - 9	**Subtest Date:** 06-Feb-2006
Engineer	James Nicholson
Lab Information	Building P, 10m Anechoic
Subtest Results	
Subtest Title	**Average Bandedge, 5700 MHz, 54 Mbps, 17 dBm, 9.5 dBi Patch Antenna**
Subtest Result	Pass
Highest Frequency	5800.0
Lowest Frequency	5700.0
Comments on the above Test Results	1 MHz RBW, 10 Hz VBW

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: Average Bandedge, 5700 MHz, 54 Mbps, 17 dBm, 9.5 dBi Patch Antenna

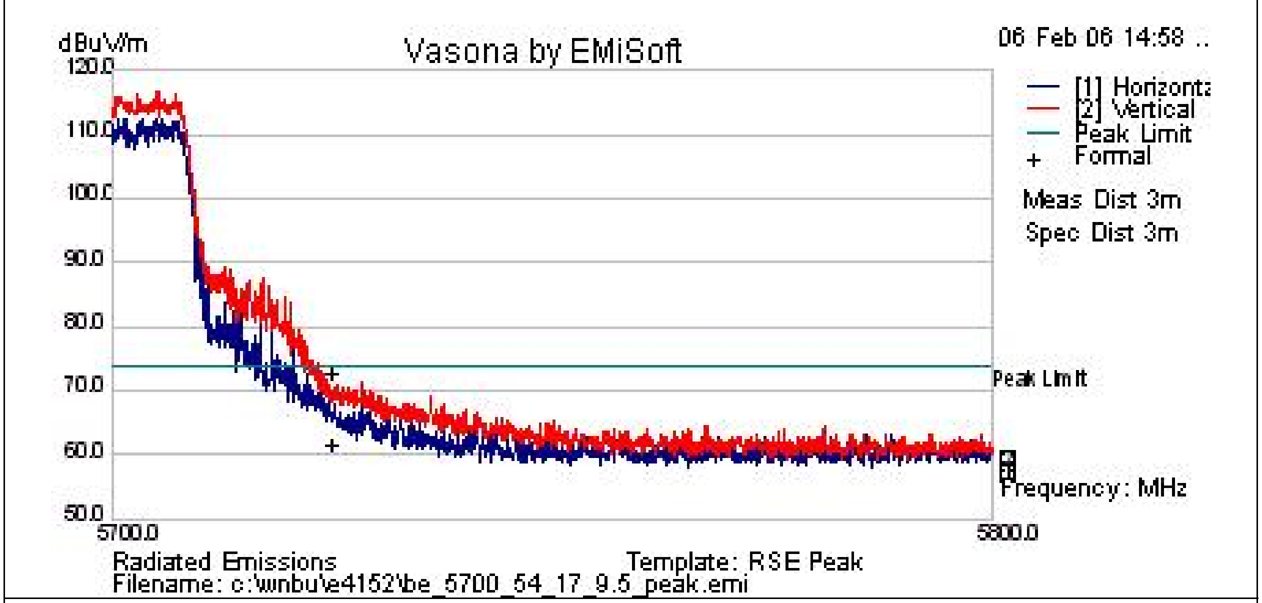
Test Results Table

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
5724.99	36.5	28.8	-6.7	58.6	Av	V	165	123	68.2	-9.6	Pass	Limit=68.2dBuV
5724.99	28.2	28.8	-6.7	50.3	Av	H	165	123	68.2	-17.9	Pass	Limit=68.2dBuV

Subtest Number: 20076 - 10	**Subtest Date:** 06-Feb-2006
Engineer	James Nicholson
Lab Information	Building P, 10m Anechoic
Subtest Results	
Subtest Title	**Peak Bandedge, 5700 MHz, 54 Mbps, 17 dBm, 9.5 dBi Patch Antenna**
Subtest Result	Pass
Highest Frequency	5800.0
Lowest Frequency	5700.0
Comments on the above Test Results	1 MHz RBW, 1 MHz VBW

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: Peak Bandedge, 5700 MHz, 54 Mbps, 17 dBm, 9.5 dBi Patch Antenna

Test Results Table

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
5725	48.4	28.8	-6.7	70.5	Pk	V	165	123	88.2	-17.7	Pass	Limit=88.2dBuV
5725	37.4	28.8	-6.7	59.5	Pk	H	165	123	88.2	-28.7	Pass	Limit=88.2dBuV

Physical Test arrangement Photograph:

Title: 5GHz 9.5dBi Patch Antenna

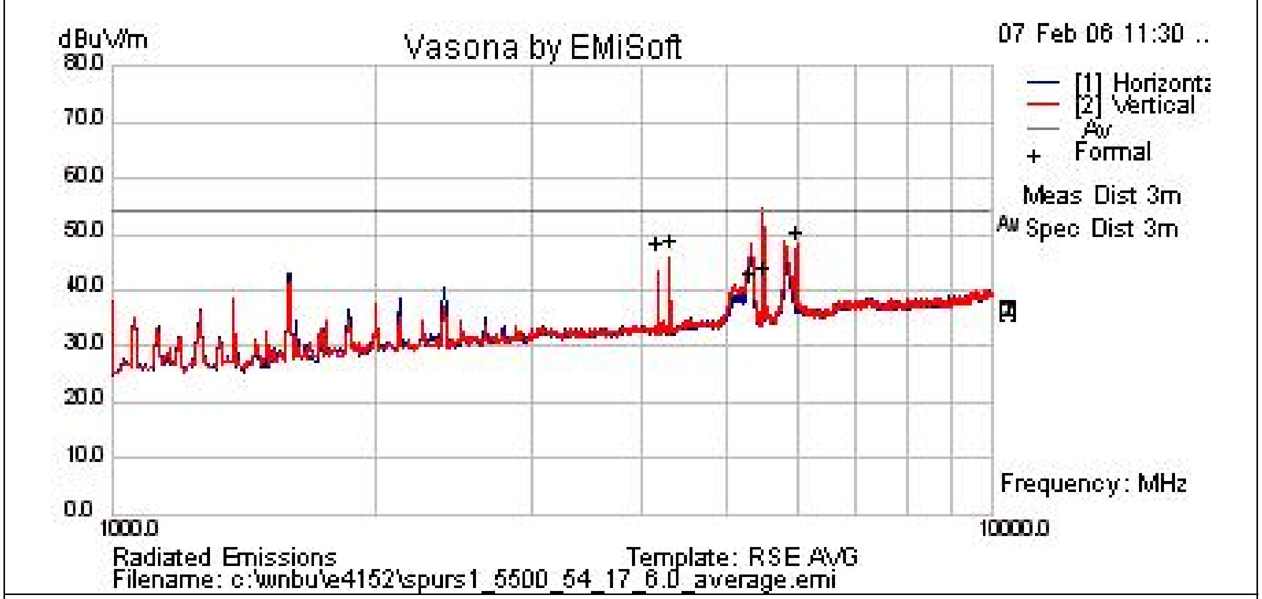
Radiated Spurs and Harmonics with All Antennas (1-18GHz)

There were no measurable emissions above 18GHz for any of the channel/antenna combinations.

Subtest Number: 20100 - 9	**Subtest Date:** 07-Feb-2006
Engineer	James Nicholson
Lab Information	Building P, 10m Anechoic
Subtest Results	
Subtest Title	**Average Spurs , 1 to 10 GHz, 5500 MHz, 54 Mbps, 17 dBm, All Antennas**
Subtest Result	Pass
Highest Frequency	10000.0
Lowest Frequency	1000.0
Comments on the above Test Results	1 MHz RBW, 10 Hz VBW

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: Average Spurs , 1 to 10 GHz, 5500 MHz, 54 Mbps, 17 dBm, All Antennas

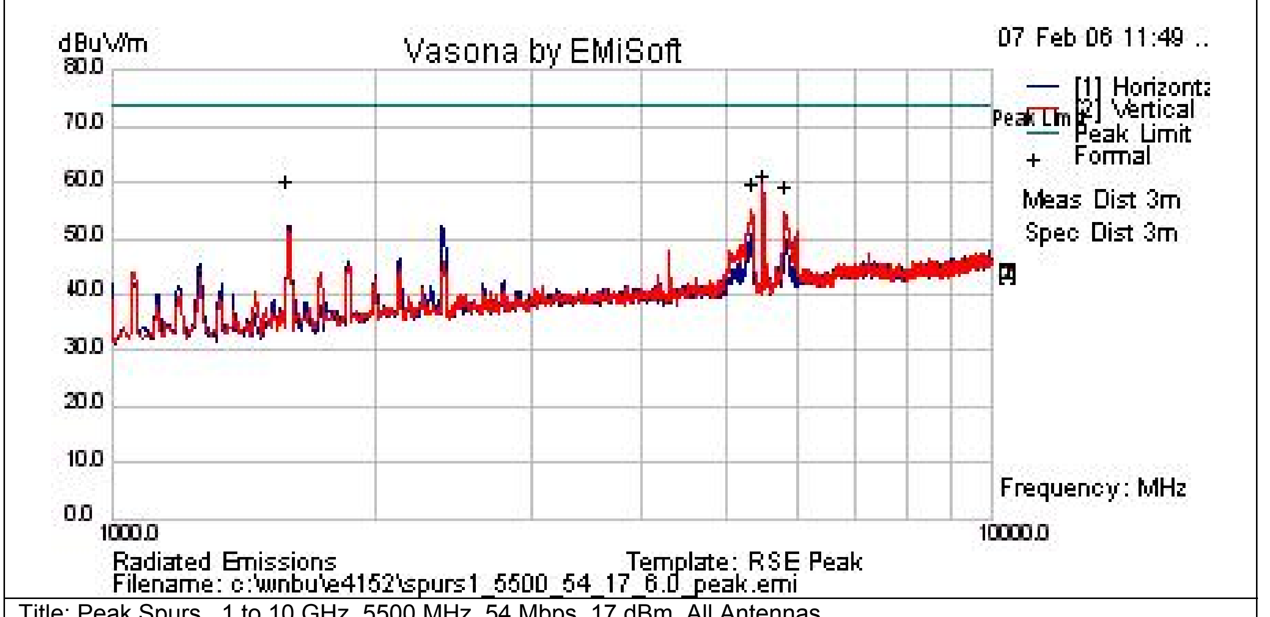
Test Results Table

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
4179.9	47.2	7.7	-8.4	46.4	Av	V	167	229	54	-7.6	Pass	
4309.34	47.3	7.9	-8.7	46.4	Av	V	167	202	54	-7.6	Pass	
5337.5	37.9	10.1	-7.5	40.5	Av	V	157	234	54	-13.5	Pass	
5500	38.4	10.5	-7	41.9	Av	V	177	226	54	-12.1	Pass	Notched carrier
6000.06	44	9.7	-5.8	47.9	Av	V	161	126	54	-6.1	Pass	

Subtest Number: 20100 - 10	**Subtest Date:** 07-Feb-2006
Engineer	James Nicholson
Lab Information	Building P, 10m Anechoic
Subtest Results	
Subtest Title	**Peak Spurs , 1 to 10 GHz, 5500 MHz, 54 Mbps, 17 dBm, All Antennas**
Subtest Result	Pass
Highest Frequency	10000.0
Lowest Frequency	1000.0
Comments on the above Test Results	1 MHz RBW, 1 MHz VBW

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: Peak Spurs , 1 to 10 GHz, 5500 MHz, 54 Mbps, 17 dBm, All Antennas

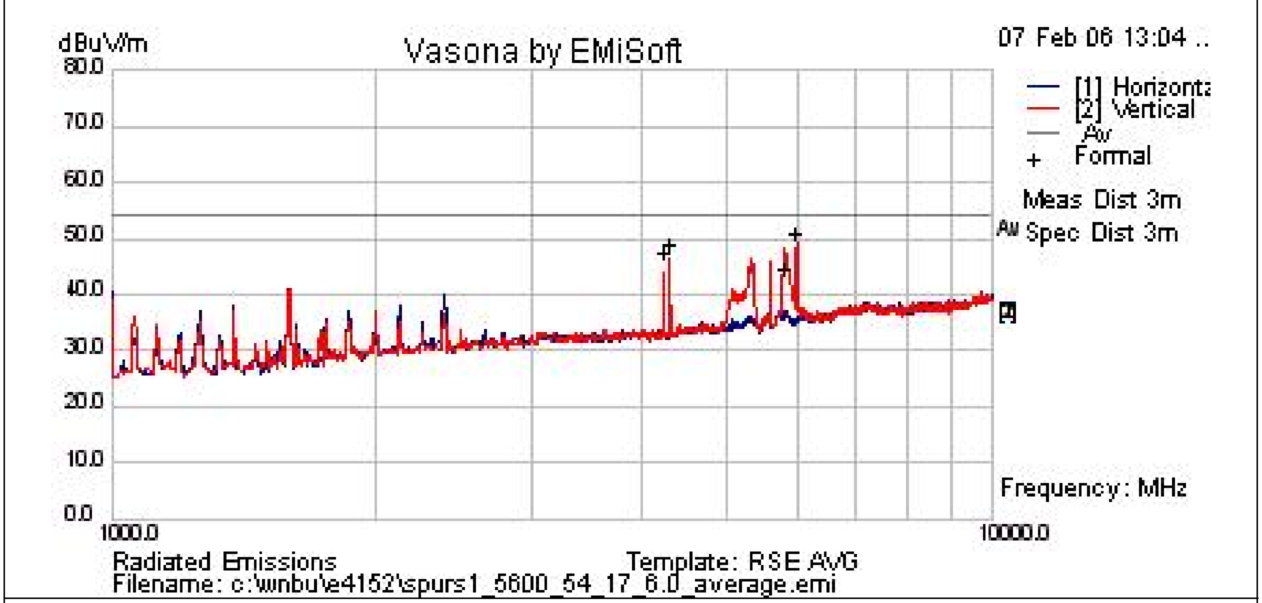
Test Results Table

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
1584.53	67.6	4.6	-14.2	58	Pk	V	112	189	74	-16	Pass	
5347.3	55	10.1	-7.5	57.6	Pk	V	163	224	74	-16.4	Pass	
5500	55.5	10.5	-7	59	Pk	V	165	173	74	-15	Pass	Notched Carrier
5830.5	52.5	10.5	-6.2	56.8	Pk	V	174	207	74	-17.2	Pass	

Subtest Number: 20100 - 11	**Subtest Date:** 07-Feb-2006
Engineer	James Nicholson
Lab Information	Building P, 10m Anechoic
Subtest Results	
Subtest Title	**Average Spurs , 1 to 10 GHz, 5600 MHz, 54 Mbps, 17 dBm, All Antennas**
Subtest Result	Pass
Highest Frequency	10000.0
Lowest Frequency	1000.0
Comments on the above Test Results	1 MHz RBW, 10 Hz VBW

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: Average Spurs , 1 to 10 GHz, 5600 MHz, 54 Mbps, 17 dBm, All Antennas

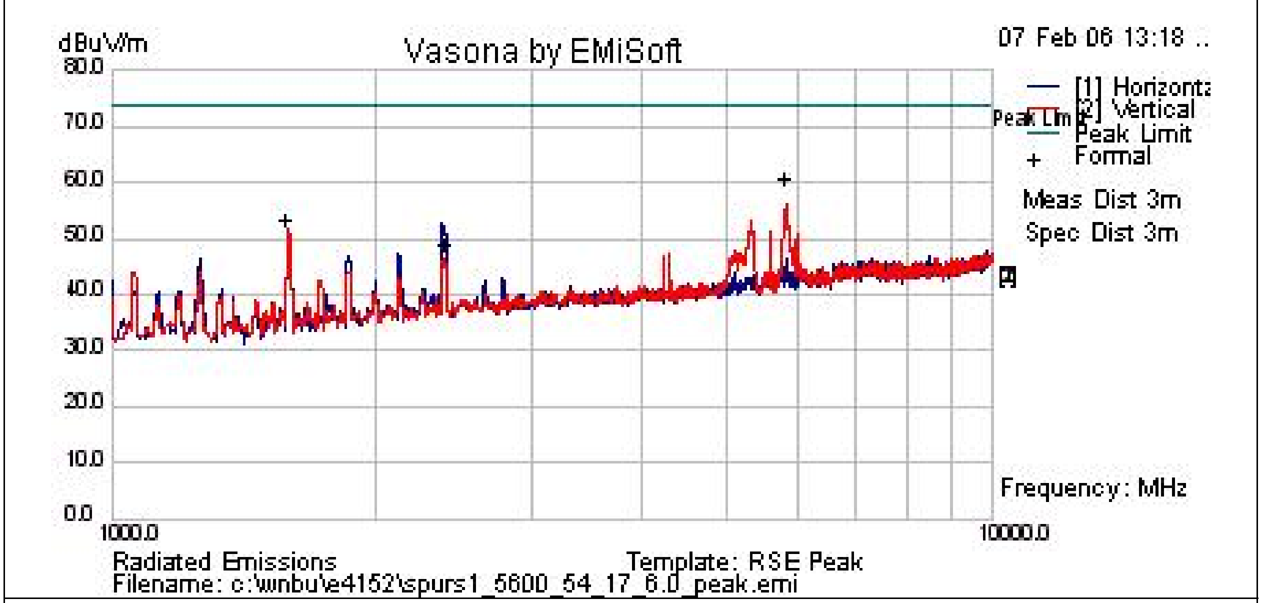
Test Results Table

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
4246.68	46.2	7.8	-8.6	45.4	Av	V	182	234	54	-8.6	Pass	
4309.35	47.4	7.9	-8.7	46.6	Av	V	188	196	54	-7.4	Pass	
5820.9	37.4	11	-6.2	42.2	Av	V	146	127	54	-11.8	Pass	
5999.99	44.8	9.7	-5.8	48.7	Av	V	150	201	54	-5.3	Pass	

Subtest Number: 20100 - 12	Subtest Date: 07-Feb-2006
Engineer	James Nicholson
Lab Information	Building P, 10m Anechoic
Subtest Results	
Subtest Title	**Peak Spurs , 1 to 10 GHz, 5600 MHz, 54 Mbps, 17 dBm, All Antennas**
Subtest Result	Pass
Highest Frequency	10000.0
Lowest Frequency	1000.0
Comments on the above Test Results	1 MHz RBW, 1 MHz VBW

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: Peak Spurs , 1 to 10 GHz, 5600 MHz, 54 Mbps, 17 dBm, All Antennas

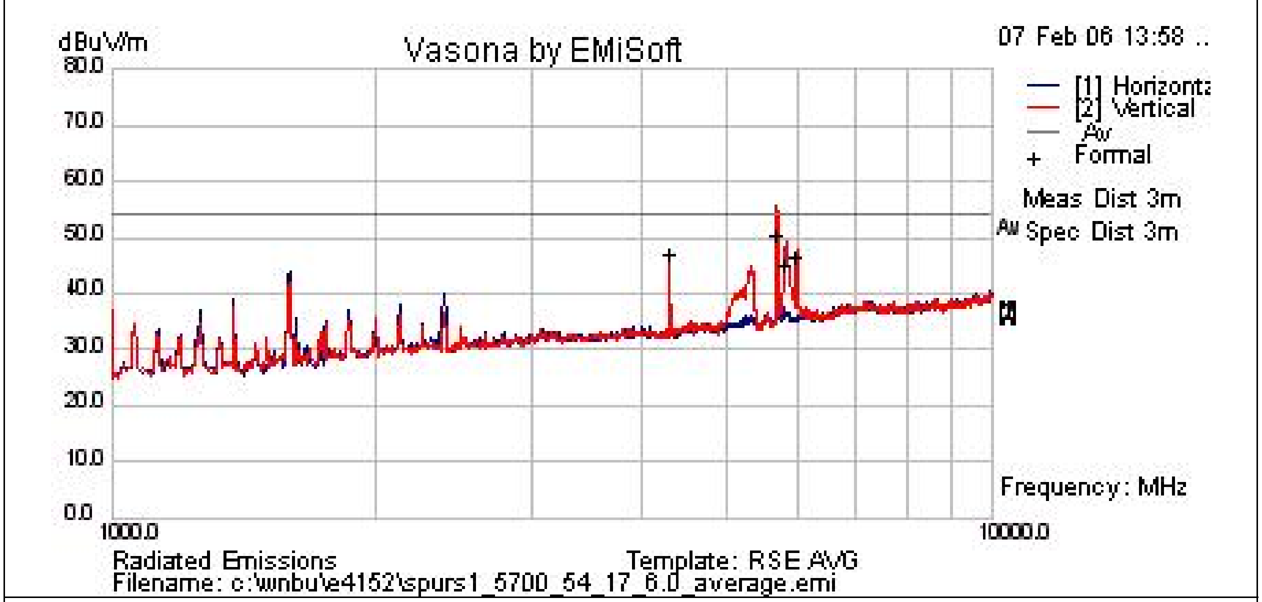
Test Results Table

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
1584.56	60.6	4.6	-14.2	51	Pk	V	99	252	74	-23	Pass	
2391.68	51.4	5.8	-10.4	46.8	Pk	H	197	151	74	-27.2	Pass	
5824.1	53.8	10.8	-6.2	58.4	Pk	V	174	190	74	-15.6	Pass	

Subtest Number: 20100 - 13	**Subtest Date:** 07-Feb-2006
Engineer	James Nicholson
Lab Information	Building P, 10m Anechoic
Subtest Results	
Subtest Title	**Average Spurs , 1 to 10 GHz, 5700 MHz, 54 Mbps, 17 dBm, All Antennas**
Subtest Result	Pass
Highest Frequency	10000.0
Lowest Frequency	1000.0
Comments on the above Test Results	1 MHz RBW, 10 Hz VBW

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: Average Spurs , 1 to 10 GHz, 5700 MHz, 54 Mbps, 17 dBm, All Antennas

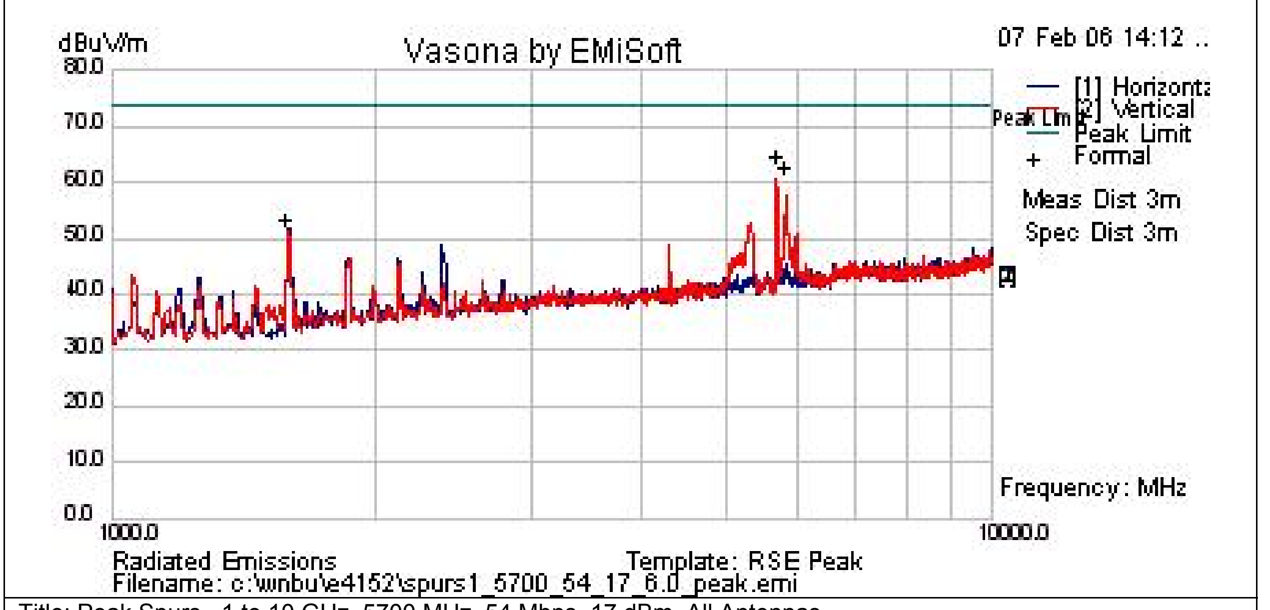
Test Results Table

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
4309.29	45.4	7.9	-8.7	44.6	Av	V	144	101	54	-9.4	Pass	
5700	43.7	10.9	-6.6	48	Av	V	165	116	54	-6	Pass	Notched Carrier
5851	38.8	10	-6.2	42.6	Av	V	158	191	54	-11.4	Pass	
6000.15	40.2	9.7	-5.8	44.1	Av	V	180	208	54	-9.9	Pass	

Subtest Number: 20100 - 14	**Subtest Date:** 07-Feb-2006
Engineer	James Nicholson
Lab Information	Building P, 10m Anechoic
Subtest Results	
Subtest Title	**Peak Spurs , 1 to 10 GHz, 5700 MHz, 54 Mbps, 17 dBm, All Antennas**
Subtest Result	Pass
Highest Frequency	10000.0
Lowest Frequency	1000.0
Comments on the above Test Results	1 MHz RBW, 1 MHz VBW

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: Peak Spurs , 1 to 10 GHz, 5700 MHz, 54 Mbps, 17 dBm, All Antennas

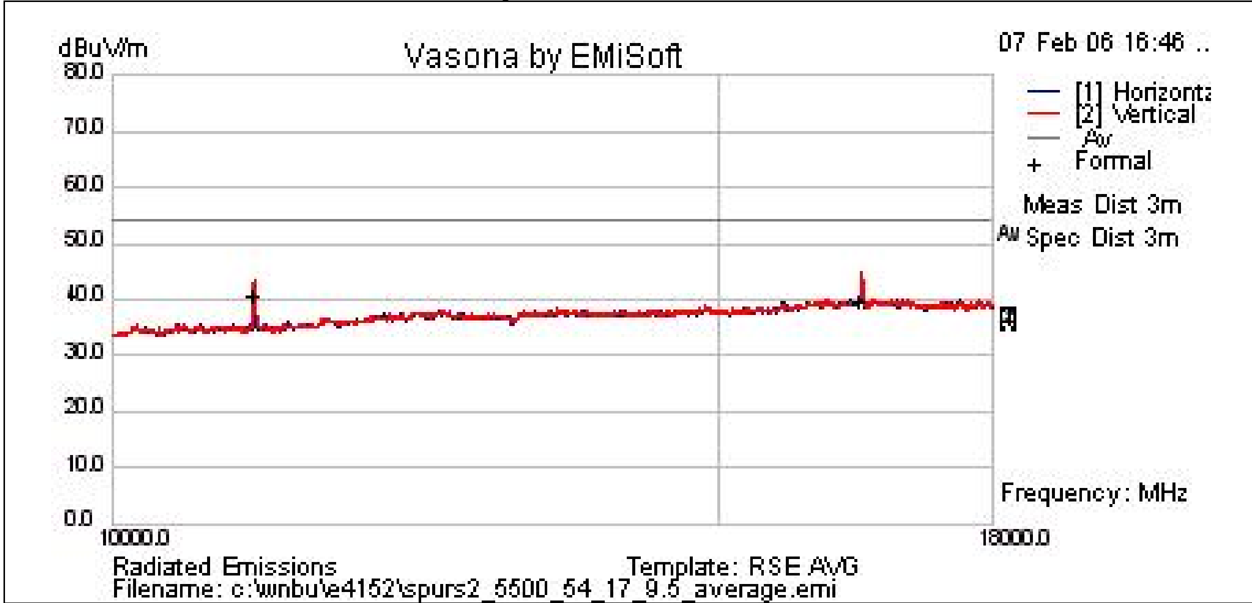
Test Results Table

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
1584.56	60.5	4.6	-14.2	50.9	Pk	V	192	168	74	-23.1	Pass	
5700	57.8	10.9	-6.6	62.1	Pk	V	163	202	74	-11.9	Pass	Notched Carrier
5851.7	56.6	10	-6.2	60.4	Pk	V	182	199	74	-13.6	Pass	

Subtest Number: 20100 - 23	**Subtest Date:** 07-Feb-2006
Engineer	James Nicholson
Lab Information	Building P, 10m Anechoic
Subtest Results	
Subtest Title	**Average Spurs , 10 to 18 GHz, 5500 MHz, 54 Mbps, 17 dBm, All Antennas**
Subtest Result	Pass
Highest Frequency	18000.0
Lowest Frequency	10000.0
Comments on the above Test Results	1 MHz RBW, 10 Hz VBW

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: Average Spurs , 10 to 18 GHz, 5500 MHz, 54 Mbps, 17 dBm, All Antennas

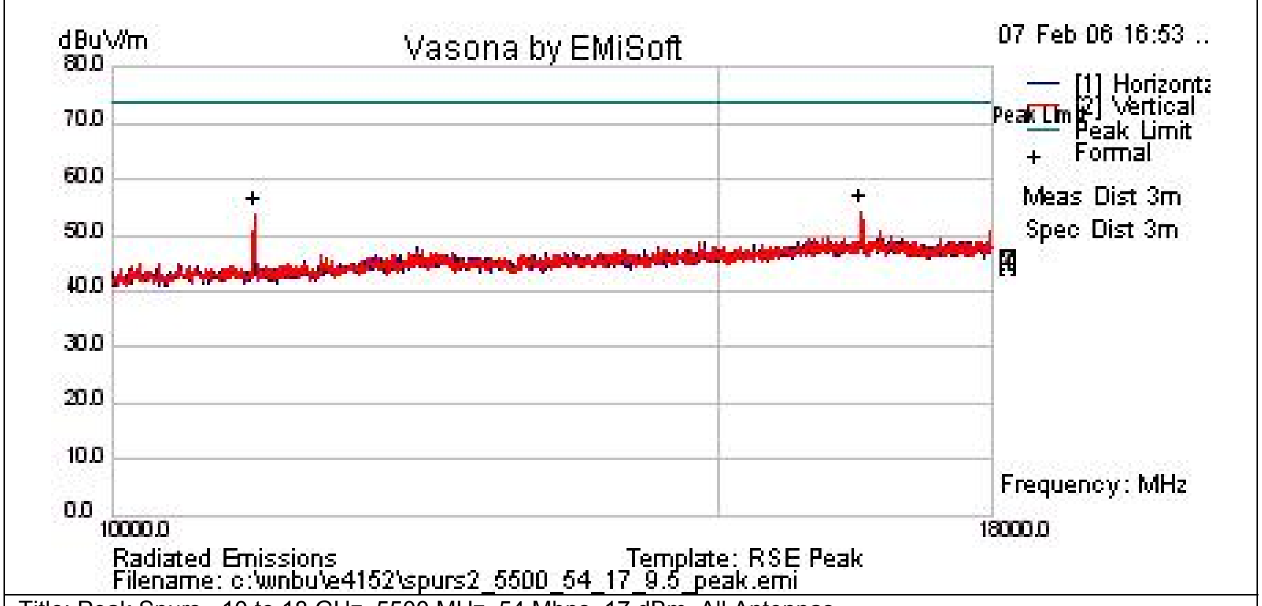
Test Results Table

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
11000	40.1	12.7	-14.4	38.4	Av	V	105	188	54	-15.6	Pass	
16500	33.7	15.8	-12.2	37.2	Av	V	170	137	54	-16.8	Pass	

Subtest Number: 20100 - 24	**Subtest Date:** 07-Feb-2006
Engineer	James Nicholson
Lab Information	Building P, 10m Anechoic
Subtest Results	
Subtest Title	**Peak Spurs , 10 to 18 GHz, 5500 MHz, 54 Mbps, 17 dBm, All Antennas**
Subtest Result	Pass
Highest Frequency	18000.0
Lowest Frequency	10000.0
Comments on the above Test Results	1 MHz RBW, 1 MHz VBW

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



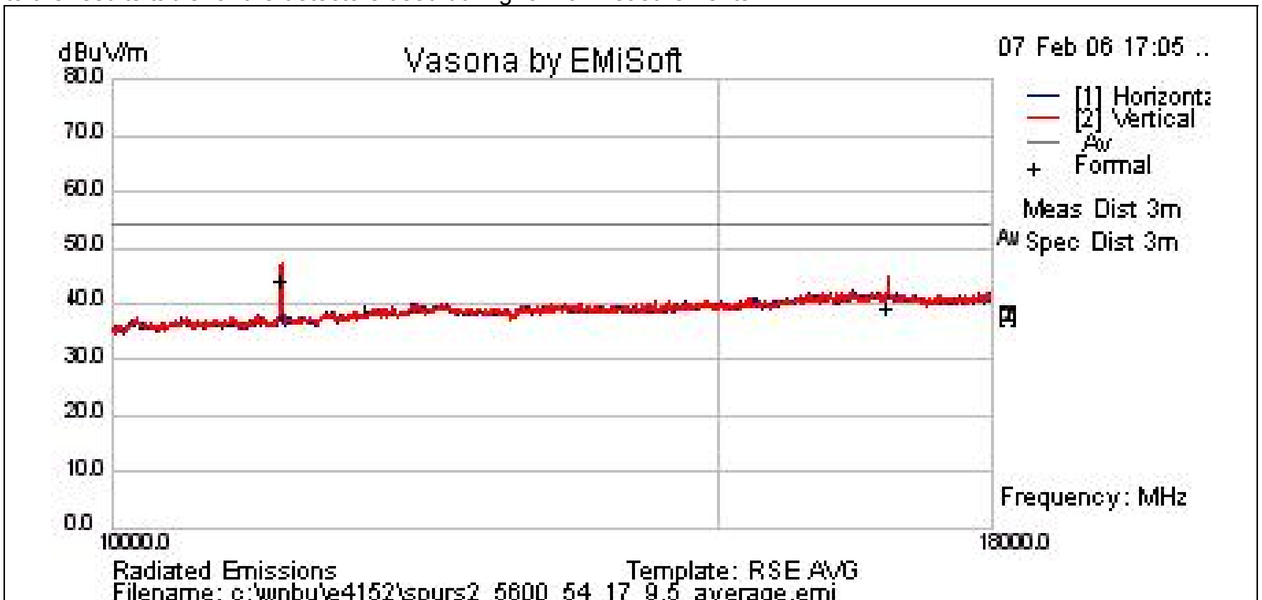
Title: Peak Spurs , 10 to 18 GHz, 5500 MHz, 54 Mbps, 17 dBm, All Antennas

Test Results Table

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
11000	56	12.7	-14.4	54.3	Pk	V	113	199	74	-19.7	Pass	
16500	51.4	15.8	-12.2	55	Pk	V	144	120	74	-19	Pass	

Subtest Number: 20100 - 25	**Subtest Date:** 07-Feb-2006
Engineer	James Nicholson
Lab Information	Building P, 10m Anechoic
Subtest Results	
Subtest Title	**Average Spurs , 10 to 18 GHz, 5600 MHz, 54 Mbps, 17 dBm, All Antennas**
Subtest Result	Pass
Highest Frequency	18000.0
Lowest Frequency	10000.0
Comments on the above Test Results	1 MHz RBW, 10 Hz VBW

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: Average Spurs , 10 to 18 GHz, 5600 MHz, 54 Mbps, 17 dBm, All Antennas

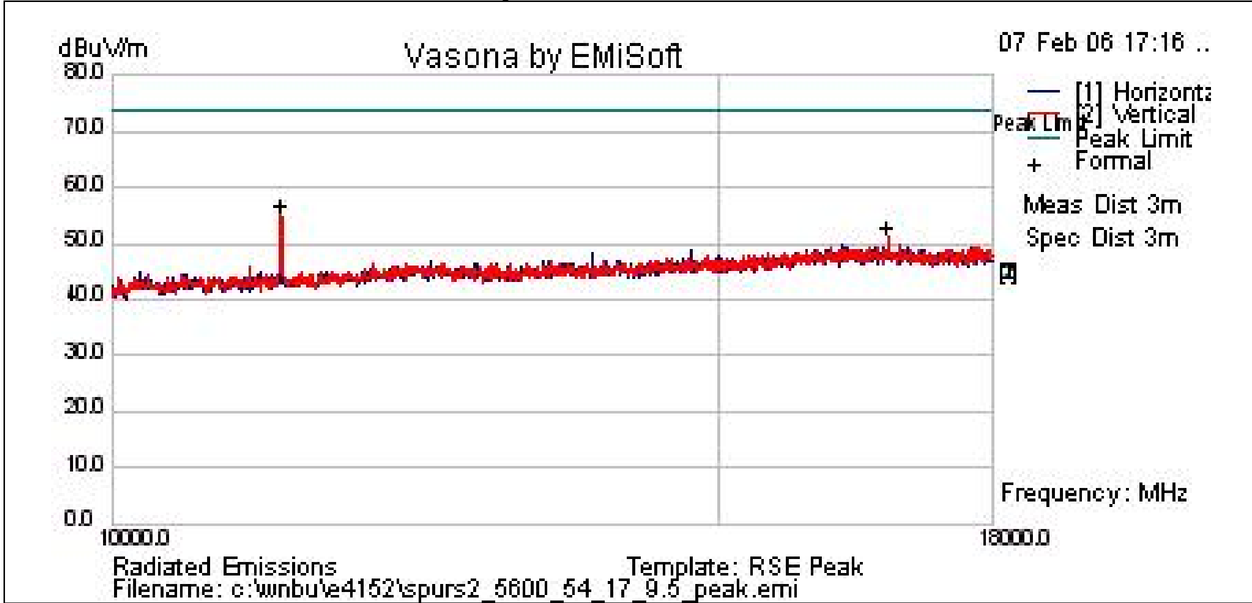
Test Results Table

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
11200	43.4	12.9	-14.3	41.9	Av	V	159	139	54	-12.1	Pass	
16800	33	15.9	-12.1	36.8	Av	V	167	214	54	-17.2	Pass	

Subtest Number: 20100 - 26	**Subtest Date:** 07-Feb-2006
Engineer	James Nicholson
Lab Information	Building P, 10m Anechoic
Subtest Results	
Subtest Title	**Peak Spurs , 10 to 18 GHz, 5600 MHz, 54 Mbps, 17 dBm, All Antennas**
Subtest Result	Pass
Highest Frequency	18000.0
Lowest Frequency	10000.0
Comments on the above Test Results	1 MHz RBW, 1 MHz VBW

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



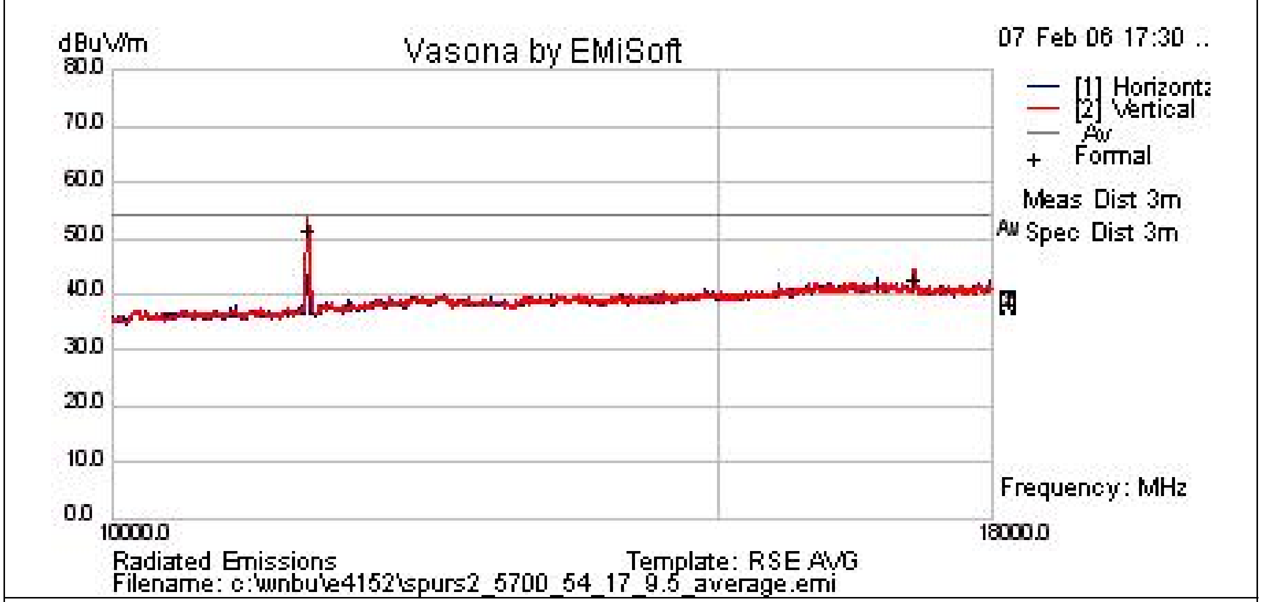
Title: Peak Spurs , 10 to 18 GHz, 5600 MHz, 54 Mbps, 17 dBm, All Antennas

Test Results Table

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
11200	56	12.9	-14.3	54.5	Pk	V	142	183	74	-19.5	Pass	
16800	47	15.9	-12.1	50.8	Pk	V	145	179	74	-23.2	Pass	

Subtest Number: 20100 - 27	**Subtest Date:** 07-Feb-2006
Engineer	James Nicholson
Lab Information	Building P, 10m Anechoic
Subtest Results	
Subtest Title	**Average Spurs , 10 to 18 GHz, 5700 MHz, 54 Mbps, 17 dBm, All Antennas**
Subtest Result	Pass
Highest Frequency	18000.0
Lowest Frequency	10000.0
Comments on the above Test Results	1 MHz RBW, 10 Hz VBW

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: Average Spurs , 10 to 18 GHz, 5700 MHz, 54 Mbps, 17 dBm, All Antennas

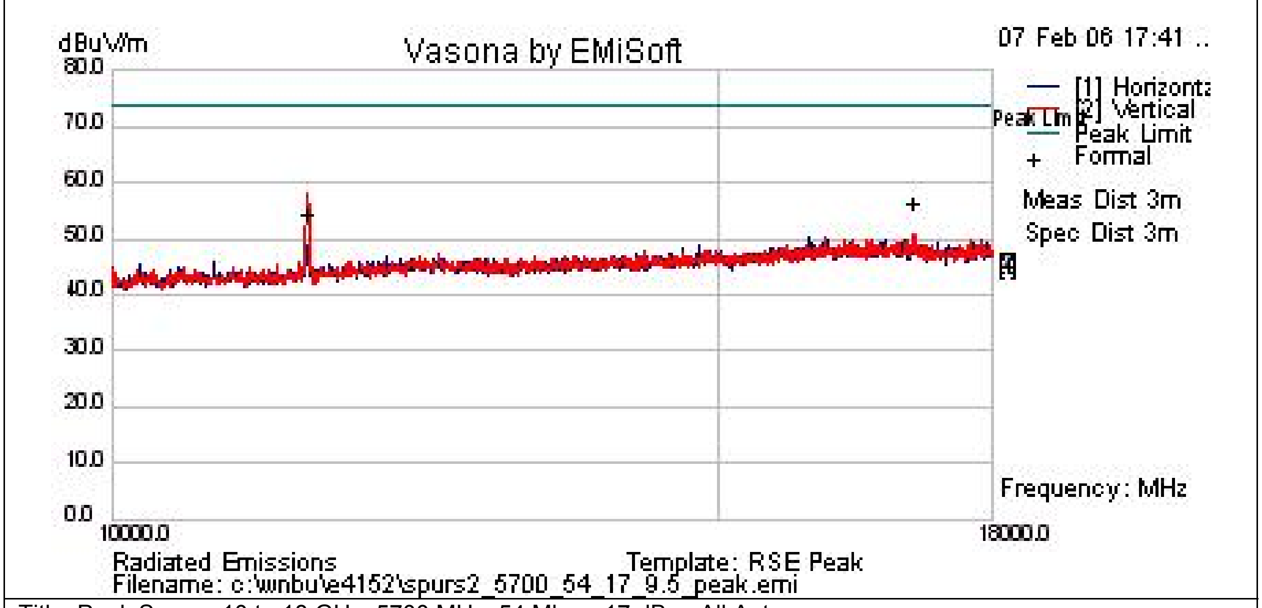
Test Results Table

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
11400	49.9	13.1	-13.9	49.1	Av	V	163	145	54	-4.9	Pass	
17100	36.5	16.2	-12.4	40.2	Av	V	194	125	54	-13.8	Pass	

Subtest Number: 20100 - 28	**Subtest Date:** 07-Feb-2006
Engineer	James Nicholson
Lab Information	Building P, 10m Anechoic
Subtest Results	
Subtest Title	**Peak Spurs , 10 to 18 GHz, 5700 MHz, 54 Mbps, 17 dBm, All Antennas**
Subtest Result	Pass
Highest Frequency	18000.0
Lowest Frequency	10000.0
Comments on the above Test Results	1 MHz RBW, 1 MHz VBW

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: Peak Spurs , 10 to 18 GHz, 5700 MHz, 54 Mbps, 17 dBm, All Antennas

Test Results Table

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
11400	53	13.1	-13.9	52.2	Pk	V	201	149	74	-21.8	Pass	
17100	50	16.2	-12.4	53.8	Pk	V	125	115	74	-20.2	Pass	

Maximum Permissible Exposure (MPE) Calculations

15.407: 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^2

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

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

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

P(mW)=P(W)/1000 d(cm)=100*d(m)

yields

$d=100*\sqrt{((30*(P/1000)*G)/(3770*S))}$
$d=0.282*\sqrt{(P*G/S)}$

where

d=Distance in cm
P=Power in mW
G=Numerica 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

$d=0.282*10^{((P+G)/20)}/\sqrt{S}$ 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 is 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 2.4GHz antenna gain supported is 8 dBi, the highest 4.9GHz antenna gain supported is 6 dBi, and the highest 5 GHz antenna gain is 20 dBi. Using the peak power levels recorded in the test report along with Equation 1 above, the MPE distances are calculated as follows.

Frequency (MHz)	Bit Rate (Mbps)	Power Density (mW/cm^2)	Peak Transmit Power (dBm)	Antenna Gain (dBi)	MPE Distance (cm)	Limit (cm)	Margin (cm)
5500	54	1	16.46	9.5	5.60	20	14.40
5600	54	1	17.02	9.5	5.97	20	14.03
5700	54	1	16.34	9.5	5.52	20	14.48

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:

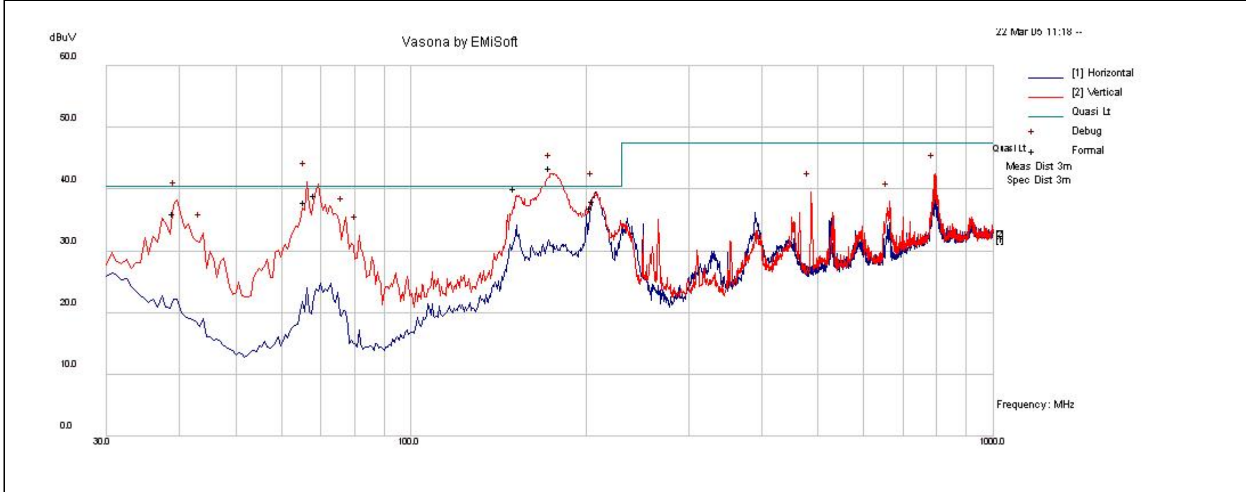
Frequency (MHz)	Bit Rate (Mbps)	MPE Distance (cm)	Peak Transmit Power (dBm)	Antenna Gain (dBi)	Power Density (mW/cm^2)	Limit (mW/cm^2)	Margin (mW/cm^2)
5500	54	20	16.46	9.5	0.08	1	0.92
5600	54	20	17.02	9.5	0.09	1	0.91
5700	54	20	16.34	9.5	0.08	1	0.92

30MHz-1GHz Radiated Spurious Emissions

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).

Subtest Number: 16441 - 1	**Subtest Date:** 13-May-2005
Engineer	James Nicholson
Lab Information	Building P, 10m Anechoic
Subtest Results	
Subtest Title	30MHz-1GHz Radiated Emissions
Subtest Result	Pass
Highest Frequency	1000.0
Lowest Frequency	30.0
Comments on the above Test Results	No further comments

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: 30MHz-1GHz Radiated Emissions

Test Results Table

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV	Type	Pol	Hgt cm	Azt Deg	Limit dBuV	Margin dB	Pass /Fail	Comments
175	24.5	1.3	11.9	37.8	Qp	V	98	246	40.5	-2.7	Pass	
152.496	22.5	1.3	13.2	37	Qp	V	98	244	40.5	-3.5	Pass	
69.02	26.5	0.9	8.5	35.8	Qp	V	98	191	40.5	-4.6	Pass	
208.322	20.9	1.5	12.6	34.9	Qp	V	117	226	40.5	-5.6	Pass	
66.285	25.8	0.9	8.1	34.8	Qp	V	118	142	40.5	-5.7	Pass	
206.513	19.7	1.5	12.7	33.9	Qp	H	112	122	40.5	-6.6	Pass	

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV	Type	Pol	Hgt cm	Azt Deg	Limit dBuV	Margin dB	Pass /Fail	Comments
39.46	18.1	0.7	14.2	33	Qp	V	106	244	40.5	-7.5	Pass	

Physical Test arrangement Photograph:

Title: 30MHz-1GHz Radiated Emissions

Comments on the above Photograph:

No further comments

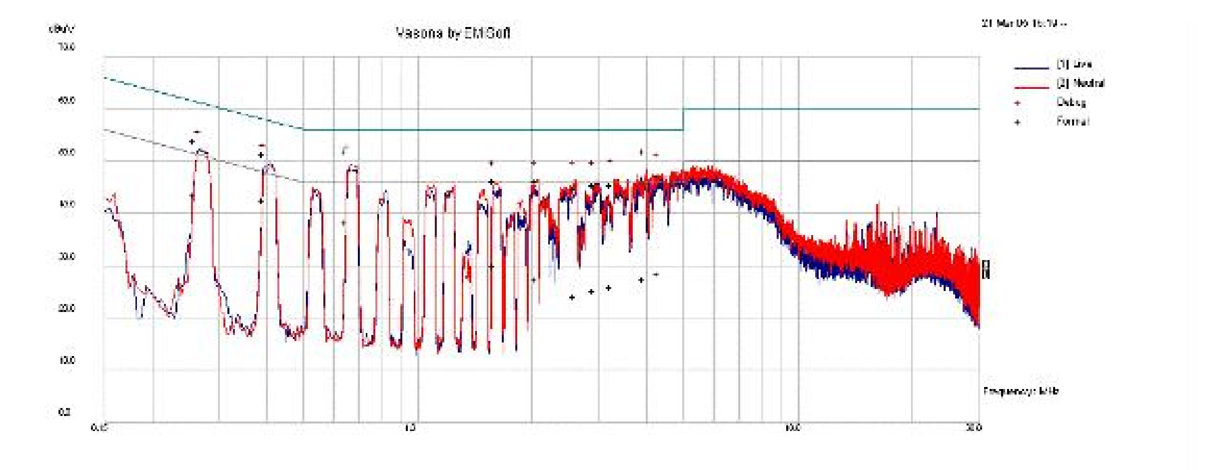
CISCO SYSTEMS

AC Mains .150-30MHz Conducted Emissions

Subtest Number: 16440 - 1	**Subtest Date:** 13-May-2005
Engineer	James Nicholson
Lab Information	Building B, Shield Room
Subtest Results	
Line Under Test	AC Mains
Transducer	LISN
Subtest Result	Pass
Highest Frequency	30.0
Lowest Frequency	0.15
Comments on the above Test Results	No further comments

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



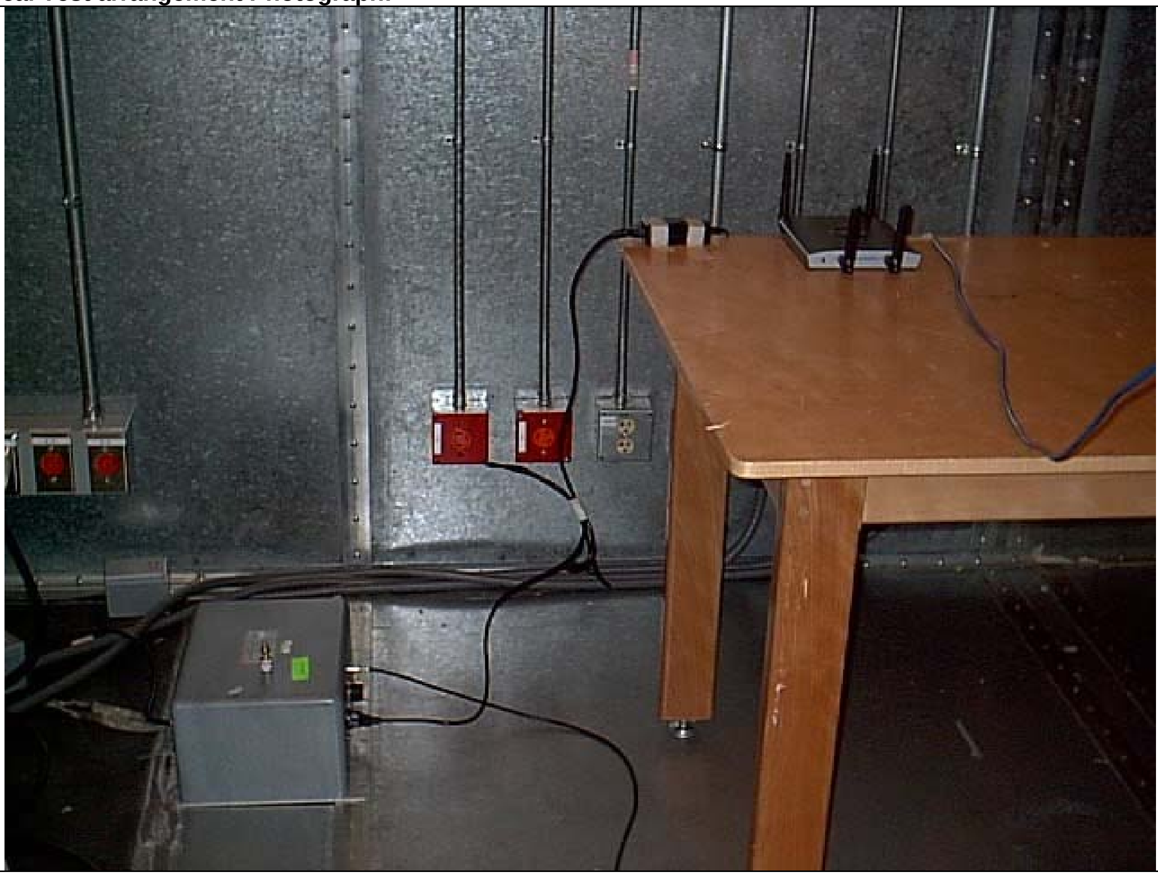
Title: AC Mains Conducted Emissions

Test Results Table

Frequency MHz	Raw dBuV	Cable Loss	Factors dB	Level dBuV	Type	Line	Limit dBuV	Margin dB	Pass /Fail	Comments
0.656	28.3	19.9	0.1	48.3	Qp	N	56	-7.7	Pass	
0.397	19.1	20	0.1	39.2	Av	L	47.9	-8.8	Pass	
0.397	27.7	20	0.1	47.7	Qp	L	57.9	-10.2	Pass	
0.262	30.2	20.1	0.1	50.4	Qp	L	61.4	-11	Pass	
0.262	19.8	20.1	0.1	40	Av	L	51.4	-11.3	Pass	
0.656	14.7	19.9	0.1	34.6	Av	N	46	-11.4	Pass	
4.356	23.7	20	0.1	43.8	Qp	N	56	-12.2	Pass	
3.993	23.2	20	0.1	43.2	Qp	N	56	-12.8	Pass	
1.61	22.8	19.9	0.1	42.8	Qp	N	56	-13.2	Pass	

Frequency MHz	Raw dBuV	Cable Loss	Factors dB	Level dBuV	Type	Line	Limit dBuV	Margin dB	Pass /Fail	Comments
2.065	22.8	19.9	0.1	42.7	Qp	N	56	-13.3	Pass	
3.274	21.9	20	0.1	42	Qp	N	56	-14	Pass	
2.959	21.9	20	0.1	41.9	Qp	N	56	-14.1	Pass	
2.623	21.3	19.9	0.1	41.3	Qp	N	56	-14.7	Pass	
1.61	6.3	19.9	0.1	26.2	Av	N	46	-19.8	Pass	
4.356	5	20	0.1	25	Av	N	46	-21	Pass	
3.993	4	20	0.1	24	Av	N	46	-22	Pass	
2.065	4	19.9	0.1	24	Av	N	46	-22	Pass	
3.274	2.3	20	0.1	22.4	Av	N	46	-23.6	Pass	
2.959	1.5	20	0.1	21.5	Av	N	46	-24.5	Pass	
2.623	0.5	19.9	0.1	20.5	Av	N	46	-25.5	Pass	

Physical Test arrangement Photograph:



Title: AC Mains Conducted Emissions

Comments on the above Photograph:

Dynamic Frequency Selection (DFS) Test Results

15.407: U-NII devices operating in the 5.25-5.35 GHz band and the 5.47-5.725 GHz band shall employ a TPC mechanism. The U-NII device is required to have the capability to operate at least 6 dB below the mean EIRP value of 30 dBm. A TPC mechanism is not required for systems with an e.i.r.p. of less than 500 mW.

U-NII devices operating in the 5.25-5.35 GHz and 5.47-5.725 GHz bands shall employ a DFS radar detection mechanism to detect the presence of radar systems and to avoid co-channel operation with radar systems.

1.0 UNII Device Description

1. The AIR-AP1242AG-A-K9 operates in the following bands:
    a. 2400-2483.5 MHz
    b. 5150-5250 MHz
    c. 5250-5350 MHz
    d. 5470-5725 MHz
    e. 5725-5850 MHz

2. The maximum EIRP of the 5GHz equipment is 26.5 dBm, and the minimum possible EIRP is -1 dBm.

    Below are the available 50 ohm antenna assemblies and their corresponding gains. 0dBi gain was used to set the -63 dBm threshold level (-64dBm +1 dB) during calibration of the test setup.

    AIR-ANT5135D-R (5 GHz, 3.5 dBi Omnidirectional)
    AIR-ANT5145V-R (5 GHz, 4.5 dBi Diversity Omnidirectional)
    AIR-ANT5160V-R (5 GHz, 6.0dBi Diversity Omnidirectional)
    AIR-ANT5170P-R (5 GHz, 7.0 dBi Diversity Patch)
    AIR-ANT5195P-R (5 GHz, 9.5 dBi Patch)

    Antenna gain measurement plots are included with this filing.

3. System testing was performed with the designated MPEG test file that streams full motion video at 30 frames per second from the Master to the Client IP based system.

4. This device does not exceed 27dBm eirp, so no transmit power control is implemented.

5. The Master requires 1.333 minutes to complete its power-on cycle.

6. Information regarding the parameters of the detected Radar Waveforms is not available to the end user.

7. For the 5250-5350 MHz and 5470-5725 MHz bands, the Master device provides, on aggregate, uniform loading of the spectrum across all devices by selecting an operating channel among the available channels using a random algorithm.

2.0 DFS Detection Thresholds

1. **Interference Threshold values, Master or Client incorporating In-Service Monitoring**

Maximum Transmit Power	**Value (see note)**
≥ 200 milliwatt	-64 dBm
< 200 milliwatt	-62 dBm
Note 1: This is the level at the input of the receiver assuming a 0 dBi receive antenna Note 2: Throughout these test procedures an additional 1 dB has been added to the amplitude of the test transmission waveforms to account for variations in measurement equipment. This will ensure that the test signal is at or above the detection threshold level to trigger a DFS response.	

2. **DFS Response requirement values**

Parameter	**Value**
Non-occupancy period	Minimum 30 minutes
Channel Availability Check Time	60 seconds
Channel Move Time	10 seconds See Note 1.
Channel Closing Transmission Time	200 milliseconds + an aggregate of 60 milliseconds over remaining 10 second period. See Notes 1 and 2.
U-NII Detection Bandwidth	Minimum 80% of the 99% power bandwidth See Note 3.
Note 1: The instant that the *Channel Move Time* and the *Channel Closing Transmission Time* begins is as follows: • For the Short pulse radar Test Signals this instant is the end of the *Burst*. • For the Frequency Hopping radar Test Signal, this instant is the end of the last radar *Burst* generated. • For the Long Pulse radar Test Signal this instant is the end of the 12 second period defining the radar transmission. Note 2: The *Channel Closing Transmission Time* is comprised of 200 milliseconds starting at the beginning of the *Channel Move Time* plus any additional intermittent control signals required to facilitate *Channel* changes (an aggregate of 60 milliseconds) during the remainder of the 10 second period. The aggregate duration of control signals will not count quiet periods in between transmissions. Note 3: During the *U-NII Detection Bandwidth* detection test, radar type 1 is used and for each frequency step the minimum percentage of detection is 90%. Measurements are performed with no data traffic.	

3.0 Radar Test Waveforms

This section provides the parameters for required test waveforms, minimum percentage of successful detections, and the minimum number of trials that must be used for determining DFS conformance. Step intervals of 0.1 microsecond for Pulse Width, 1 microsecond for PRI, 1 MHz for chirp width and 1 for the number of pulses will be utilized for the random determination of specific test waveforms.

1. Short Pulse Radar Test Waveforms

Radar Type	Pulse Width (μsec)	PRI (μsec)	Number of Pulses	Minimum Percentage of Successful Detection	Minimum Trials
1	1	1428	18	60%	30
2	1-5	150-230	23-29	60%	30
3	6-10	200-500	16-18	60%	30
4	11-20	200-500	12-16	60%	30
Aggregate (Radar Types 1-4)				80%	120

A minimum of 30 unique waveforms are required for each of the short pulse radar types 2 through 4. For short pulse radar type 1, the same waveform is used a minimum of 30 times. If more than 30 waveforms are used for short pulse radar types 2 through 4, then each additional waveform must also be unique and not repeated from the previous waveforms. The aggregate is the average of the percentage of successful detections of short pulse radar types 1-4.

2. Long Pulse Radar Test Waveform

Radar Type	Pulse Width (μsec)	Chirp Width (MHz)	PRI (μsec)	Number of Pulses per *Burst*	Number of *Bursts*	Minimum Percentage of Successful Detection	Minimum Trials
5	50-100	5-20	1000-2000	1-3	8-20	80%	30

The parameters for this waveform are randomly chosen. Thirty unique waveforms are required for the Long Pulse radar test signal. If more than 30 waveforms are used for the Long Pulse radar test signal, then each additional waveform must also be unique and not repeated from the previous waveforms.

Each waveform is defined as follows:

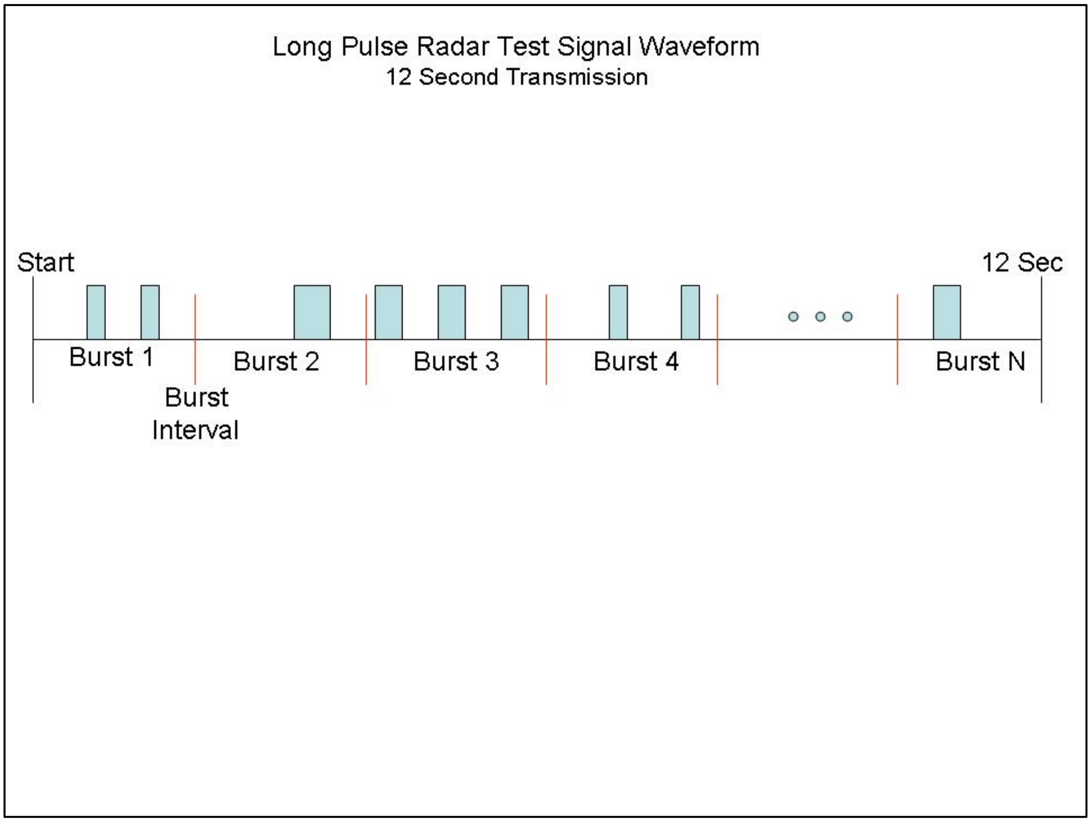
1) The transmission period for the Long Pulse Radar test signal is 12 seconds.
2) There are a total of 8 to 20 Bursts in the 12 second period, with the number of Bursts being randomly chosen. This number is Burst_Count.
3) Each Burst consists of 1 to 3 pulses, with the number of pulses being randomly chosen. Each Burst within the 12 second sequence may have a different number of pulses.

4) The pulse width is between 50 and 100 microseconds, with the pulse width being randomly chosen. Each pulse within a Burst will have the same pulse width. Pulses in different Bursts may have different pulse widths.
5) Each pulse has a linear FM chirp between 5 and 20 MHz, with the chirp width being randomly chosen. Each pulse within a Burst will have the same chirp width. Pulses in different Bursts may have different chirp widths. The chirp is centered on the pulse. For example, with a radar frequency of 5300 MHz and a 20 MHz chirped signal, the chirp starts at 5290 MHz and ends at 5310 MHz.
6) If more than one pulse is present in a Burst, the time between the pulses will be between 1000 and 2000 microseconds, with the time being randomly chosen. If three pulses are present in a Burst, the time between the first and second pulses is chosen independently of the time between the second and third pulses.
7) The 12 second transmission period is divided into even intervals. The number of intervals is equal to Burst_Count. Each interval is of length (12,000,000 / Burst_Count) microseconds. Each interval contains one Burst. The start time for the Burst, relative to the beginning of the interval, is between 1 and [(12,000,000 / Burst_Count) – (Total Burst Length) + (One Random PRI Interval)] microseconds, with the start time being randomly chosen. The step interval for the start time is 1 microsecond. The start time for each Burst is chosen independently.

A representative example of a Long Pulse radar test waveform:

1) The total test signal length is 12 seconds.
2) 8 Bursts are randomly generated for the Burst_Count.
3) Burst 1 has 2 randomly generated pulses.
4) The pulse width (for both pulses) is randomly selected to be 75 microseconds.
5) The PRI is randomly selected to be at 1213 microseconds.
6) Bursts 2 through 8 are generated using steps 3 – 5.
7) Each Burst is contained in even intervals of 1,500,000 microseconds. The starting location for Pulse 1, Burst 1 is randomly generated (1 to 1,500,000 minus the total Burst 1 length + 1 random PRI interval) at the 325,001 microsecond step. Bursts 2 through 8 randomly fall in successive 1,500,000 microsecond intervals (i.e. Burst 2 falls in the 1,500,001 – 3,000,000 microsecond range).

Graphical Representation of a Long Pulse radar Test Waveform



3. **Frequency Hopping Radar Test Waveform**

Radar Type	Pulse Width (μsec)	PRI (μsec)	Pulses per Hop	Hopping Rate (kHz)	Hopping Sequence Length (msec)	Minimum Percentage of Successful Detection	Minimum Trials
6	1	333	9	.333	300	70%	30

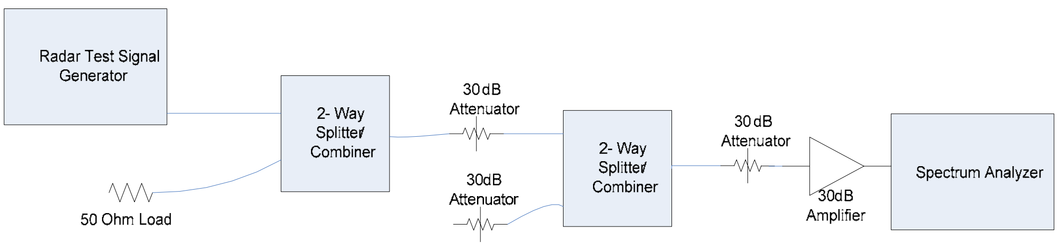
For the Frequency Hopping Radar Type, the same *Burst* parameters are used for each waveform. The hopping sequence is different for each waveform and a 100-length segment is selected[1] from the hopping sequence defined by the following algorithm:

The first frequency in a hopping sequence is selected randomly from the group of 475 integer frequencies from 5250 – 5724 MHz. Next, the frequency that was just chosen is removed from the group and a frequency is randomly selected from the remaining 474 frequencies in the group. This process continues until all 475 frequencies are chosen for the set. For selection of a random frequency, the frequencies remaining within the group are always treated as equally likely.

4.0 Radar Waveform Calibration

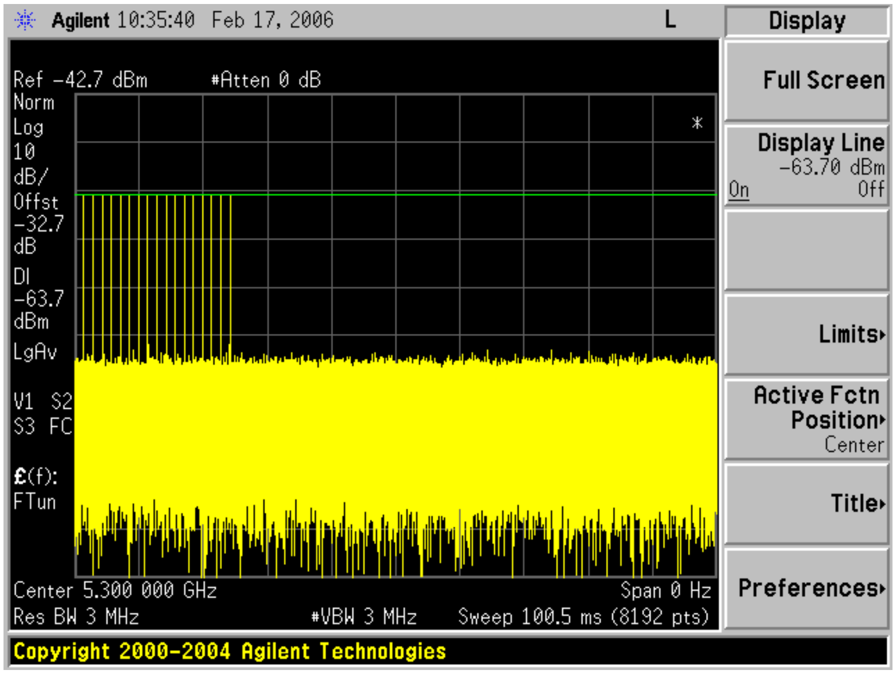
1. The following equipment setup was used to calibrate the conducted Radar Waveform. A spectrum analyzer was used to establish the test signal level for each radar type. During this process there were no transmissions by either the Master or Client Device. The spectrum analyzer was switched to the zero span (Time Domain) mode at the frequency of the Radar Waveform generator. Peak detection was utilized. The spectrum analyzer resolution bandwidth (RBW) and video bandwidth (VBW) were set to 3 MHz.

   The signal generator amplitude was set so that the power level measured at the spectrum analyzer was -63dBm. The 30dB amplifier gain was entered as an amplitude offset on the spectrum analyzer.

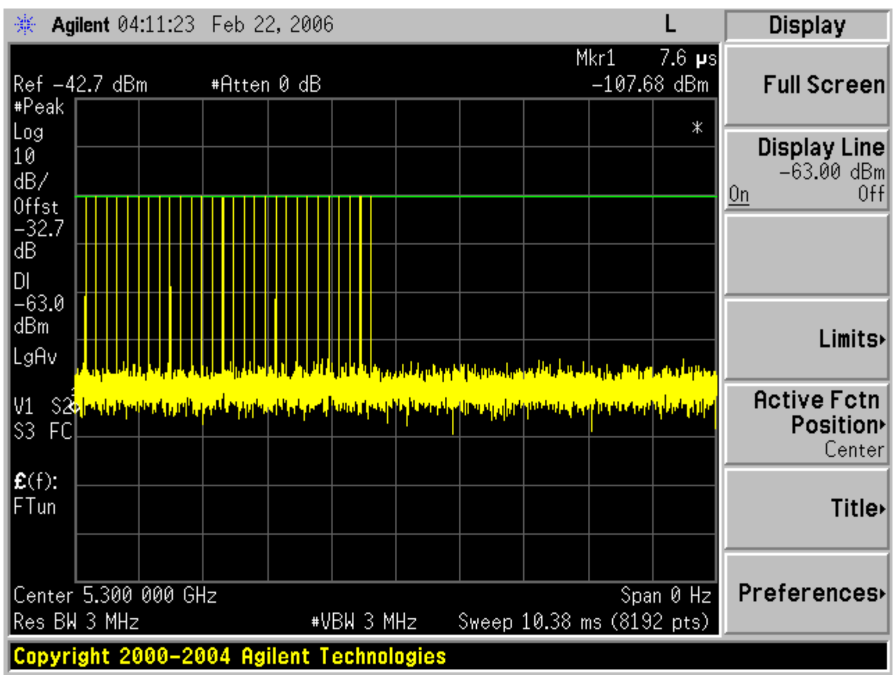


Conducted Calibration Setup

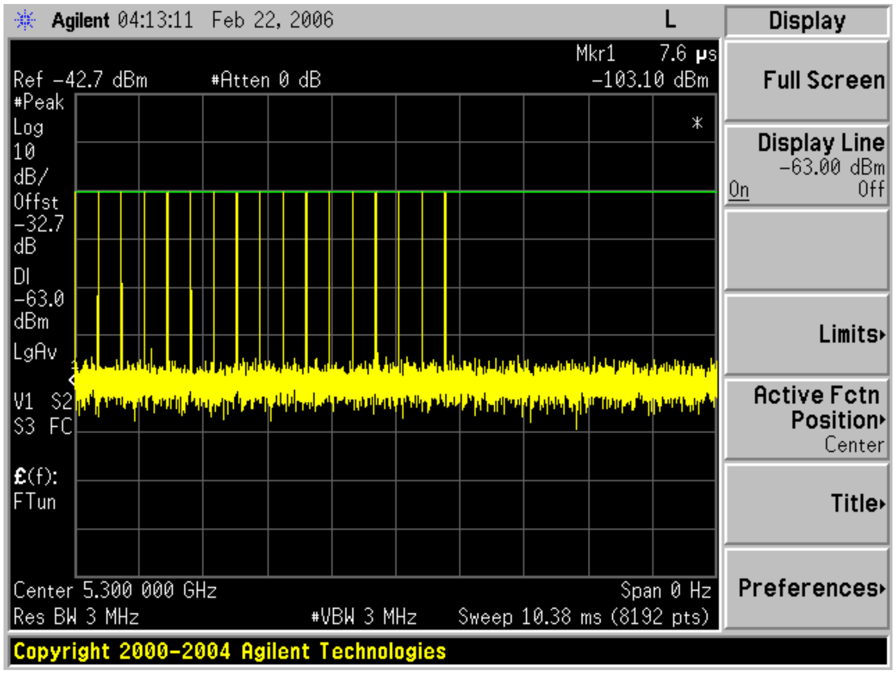
2. Following are the calibration plots for each of the required radar waveforms.



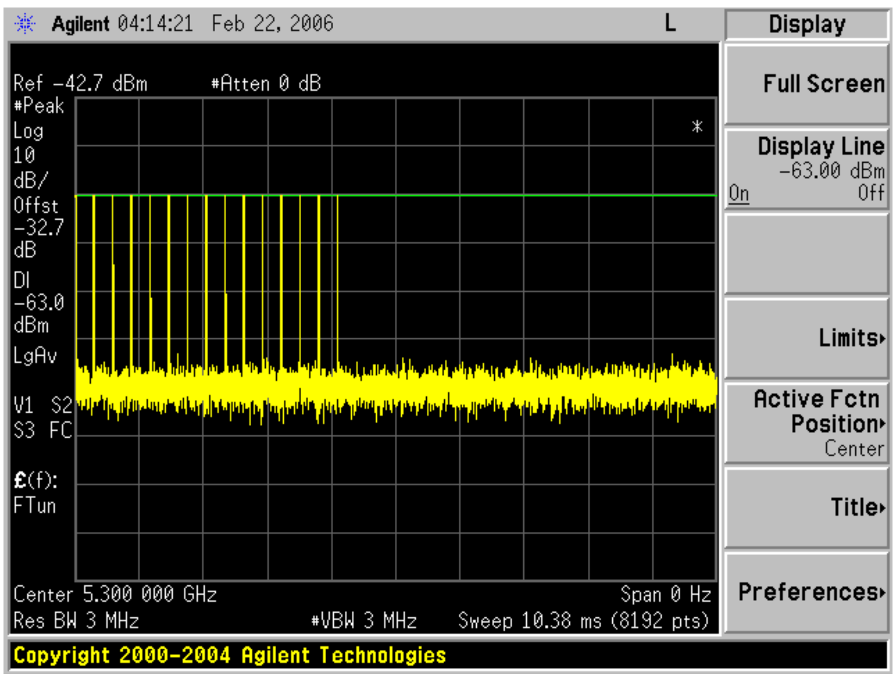
Bin 1 Radar Calibration



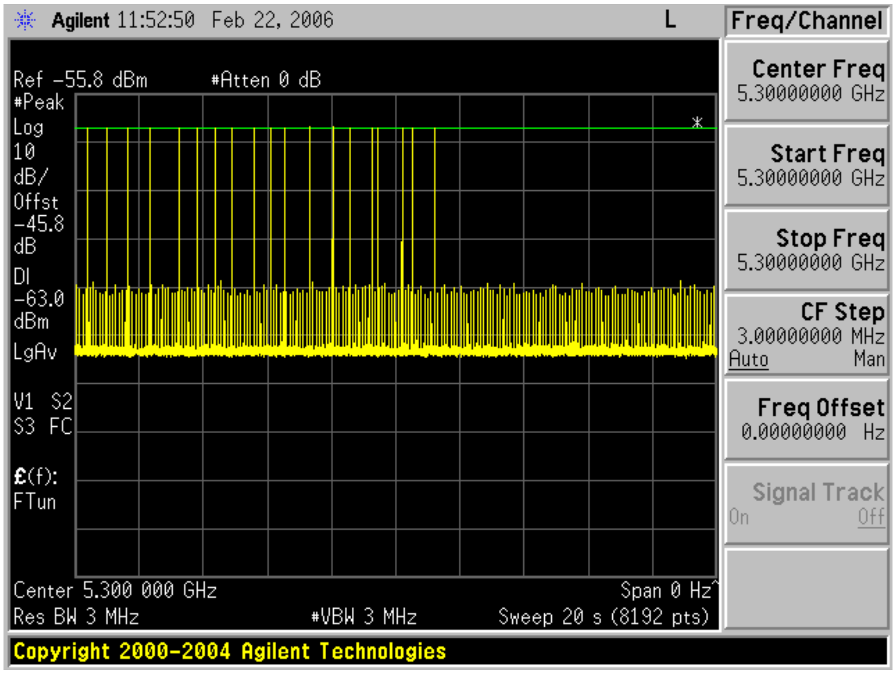
Bin 2 Radar Calibration



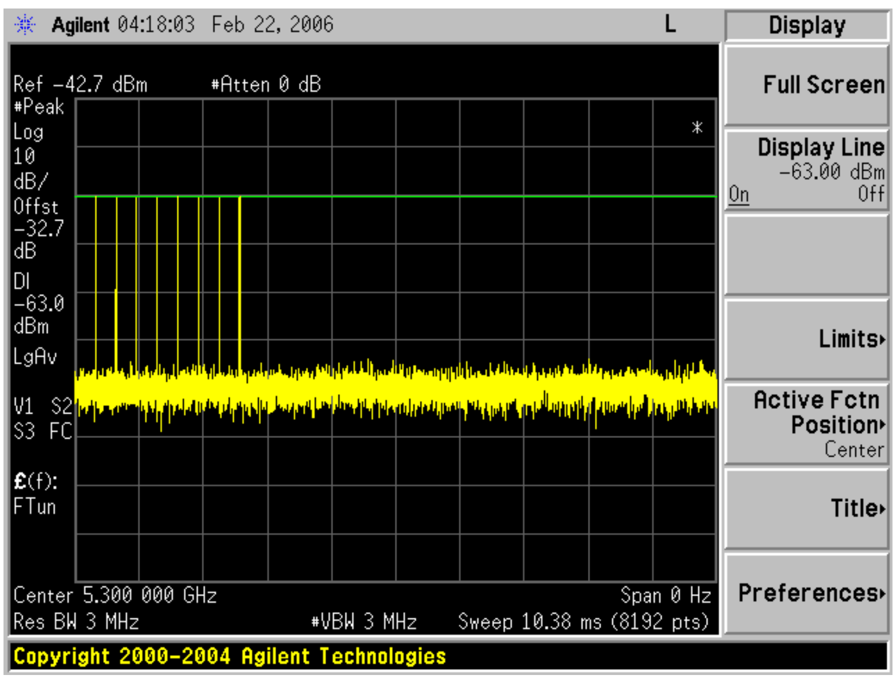
Bin 3 Radar Calibration



Bin 4 Radar Calibration



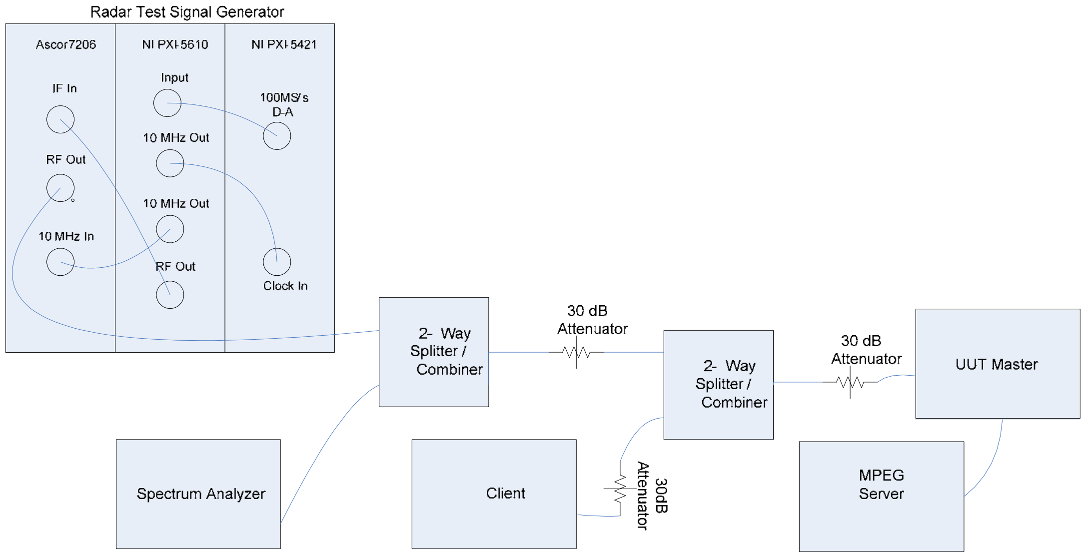
Bin 5 Radar Calibration



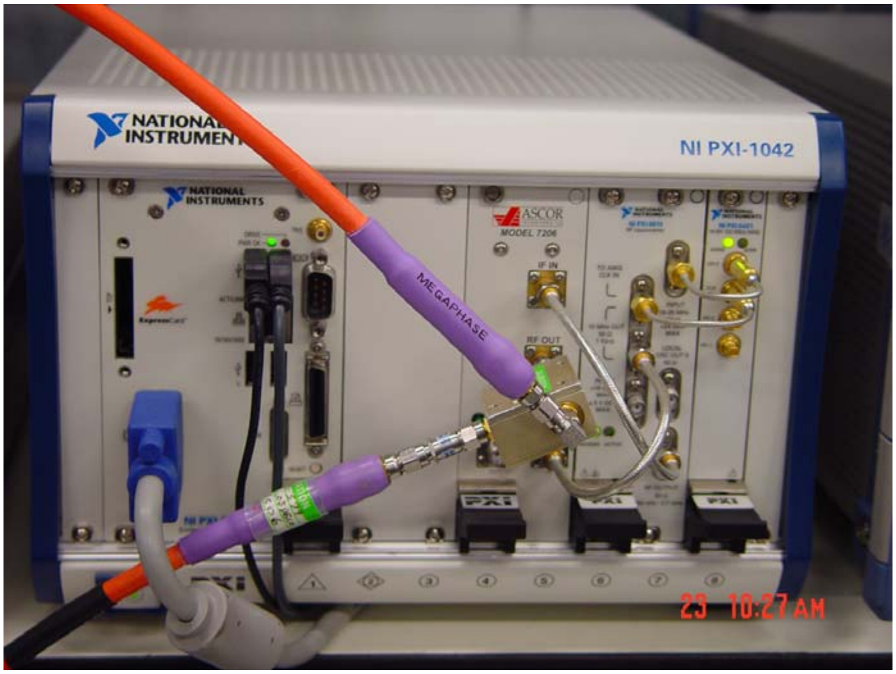
Bin 6 Radar Calibration

5.0 Test Procedure/Results

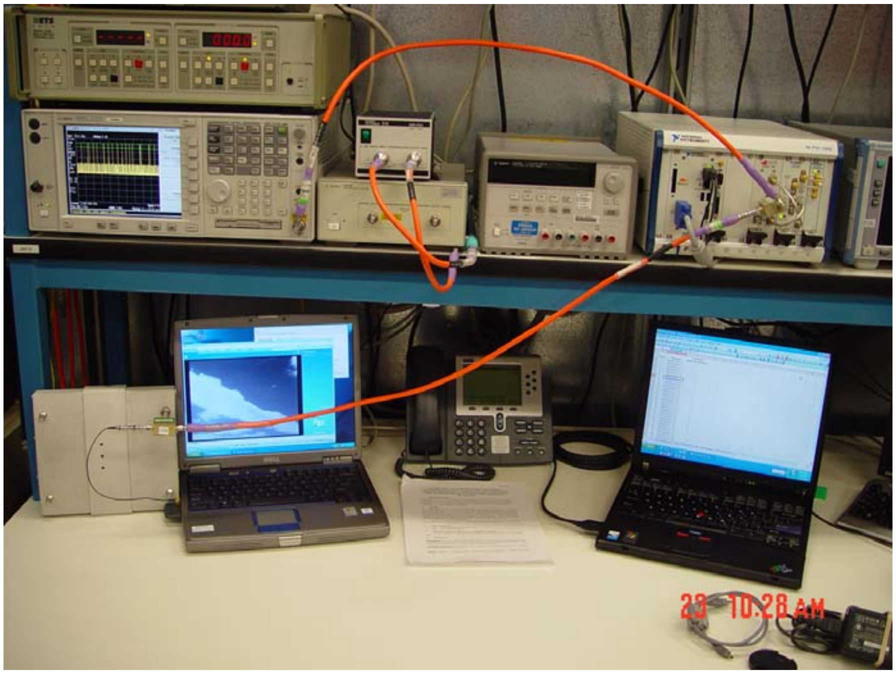
1. A spectrum analyzer is used as a monitor to verify that the UUT has vacated the Channel within the (Channel Closing Transmission Time and Channel Move Time, and does not transmit on a Channel during the Non-Occupancy Period after the detection and Channel move. It is also used to monitor UUT transmissions during the Channel Availability Check Time.
2. Following is the test setup used to generate the Radar Waveforms, and for all DFS tests described herein.



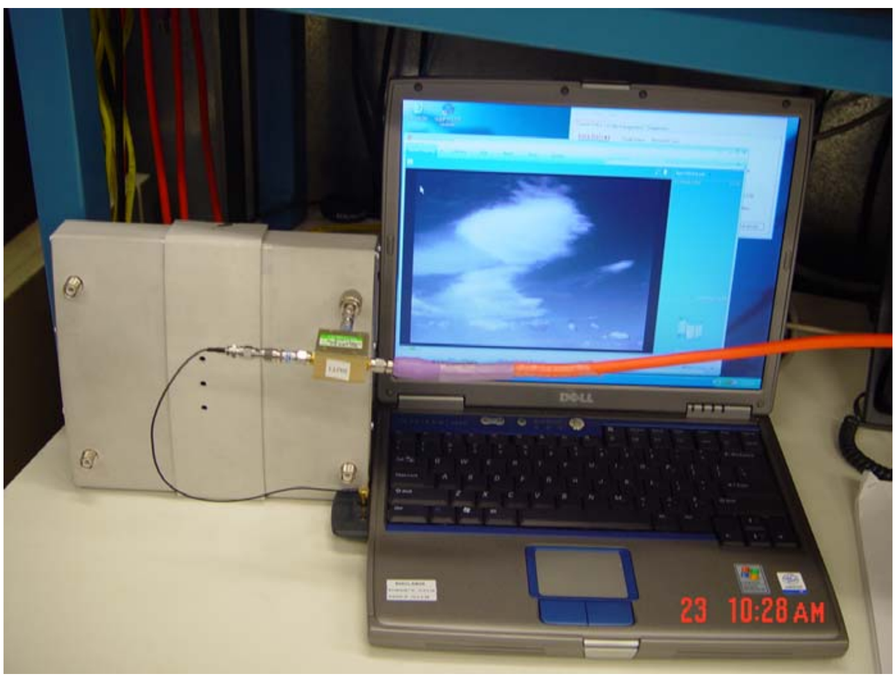
Conducted Setup: Radar Test Waveforms are injected into the Master



Radar Test Signal Generator



DFS Test Setup



DFS Setup: UUT and Client

The test setup is constructed of the following equipment:

Radar Test Signal Generator
- National Instruments NI PXI-1042 8-Slot 3U Chassis
- National Instruments NI PXI-5421 16-Bit 100MS/s Arbitrary Waveform Generator
- National Instruments NI PXI-5610 2.7GHz RF Upconverter
- Ascor 7206 PXI 4.9 to 6GHz Upconverter

Agilent E4448A Spectrum Analyzer
Mini-Circuits ZFSC-2-9G Splitter/Combiner (Qty. 2)
Mini-Circuits BW-S30W2 30dB Attenuator (Qty. 3)
Agilent 8449B Preamplifier (used for detection level calibration only)
Megaphase SF26 S1S1 36" Coaxial Cable (Qty. 2)
Dell 600M Laptop (Qty. 2: 1 for wireless client, 1 for MPEG server)
Cisco AIR-CB21AG 802.11a/b/g NIC card (wireless client)

The waveform parameters from within the bounds of the signal type are selected randomly using uniform distribution.

3. **UNII Detection Bandwidth**: All UNII channels for this device have identical Channel bandwidths. Therefore, all DFS testing was done at 5300 MHz. The 99% channel bandwidth is 16.4MHz. (See the 26dB BW section of the RF report for further measurement details).

   The generating equipment is configured as shown in the Conducted Test Setup above. A single *Burst* of the short pulse radar type 1 is produced at 5300MHz at a -63dBm level. The UUT is set up as a standalone device (no associated Client and no traffic).

   A single radar Burst is generated for a minimum of 10 trials, and the response of the UUT is noted. The UUT must detect the Radar Waveform 90% or more of the time.

   The radar frequency is increased in 1 MHz steps, repeating the above test sequence, until the detection rate falls below 90%. The highest frequency at which detection is greater than or equal to 90% is denoted as Fh.

   The radar frequency is decreased in 1 MHz steps, repeating the above test sequence, until the detection rate falls below 90%. The lowest frequency at which detection is greater than or equal to 90% is denoted as Fl.

   The U-NII Detection Bandwidth is calculated as follows:

   U-NII Detection Bandwidth = $F_H – F_L$

   The U-NII Detection Bandwidth must be at least 80% of the UUT transmitter 99% power, otherwise, the UUT does not comply with DFS requirements.

UNII Detection Bandwidth Results

EUT Frequency=5300MHz											
	DFS Detection Trials (1=Detection, Blank= No Detection)										
Radar Frequency (MHz)	1	2	3	4	5	6	7	8	9	10	Detection Rate (%)
5292											0%
5293 (Fl)	1	1	1	1	1	1	1	1	1	1	100%
5294	1	1	1	1	1	1	1	1	1	1	100%
5295	1	1	1	1	1	1	1	1	1	1	100%
5296	1	1	1	1	1	1	1	1	1	1	100%
5297	1	1	1	1	1	1	1	1	1	1	100%
5298	1	1	1	1	1	1	1	1	1	1	100%
5299	1	1	1	1	1	1	1	1	1	1	100%
5300	1	1	1	1	1	1	1	1	1	1	100%
5301	1	1	1	1	1	1	1	1	1	1	100%
5302	1	1	1	1	1	1	1	1	1	1	100%
5303	1	1	1	1	1	1	1	1	1	1	100%
5304	1	1	1	1	1	1	1	1	1	1	100%
5305	1	1	1	1	1	1	1	1	1	1	100%
5306	1	1	1	1	1	1	1	1	1	1	100%
5307 (Fh)	1	1	1	1	1	1	1	1	1	1	100%
5308											0%
Detection Bandwidth = Fh-Fl = 5307MHz-5293MHz = 14MHz											
EUT 99% Bandwidth = 16.4MHz											
16.4MHz*80% = 13.12MHz											

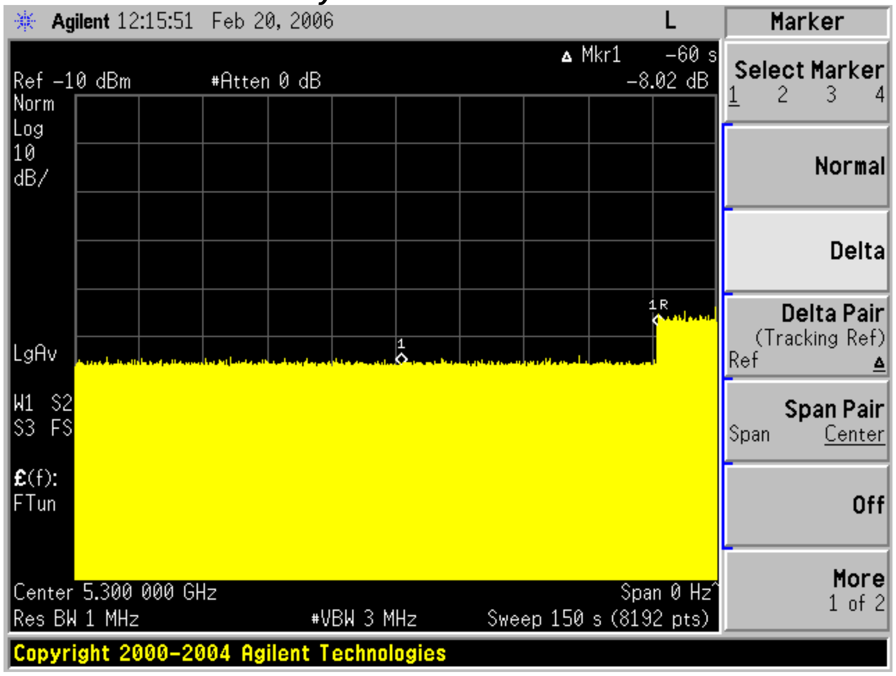
4. The **Initial Channel Availability Check Time** tests that the UUT does not emit beacon, control, or data signals on the test Channel until the power-up sequence has been completed and the U-NII device checks for Radar Waveforms for one minute on the test Channel. This test does not use any Radar Waveforms.

   The U-NII device is powered on and be instructed to operate at 5300 MHz. At the same time the UUT is powered on, the spectrum analyzer is set to zero span mode with a 1 MHz resolution bandwidth at 5300MHz with a 2.5 minute sweep time. The analyzer's sweep will be started the same time power is applied to the U-NII device.

   The UUT should not transmit any beacon or data transmissions until at least 1 minute after the completion of the power-on cycle.

   The initial power up time of the UUT is indicated by marker 1 in the plot. Initial beacons/data transmissions are indicated by marker 1R.

Initial Channel Availability Check Time



5. **Radar Burst at the Beginning of the Channel Availability Check Time:** The steps below define the procedure to verify successful radar detection on the selected Channel during a period equal to the Channel Availability Check Time and avoidance of operation on that Channel when a radar Burst with a level equal to the DFS Detection Threshold + 1 dB (-63dBm) occurs at the beginning of the Channel Availability Check Time.

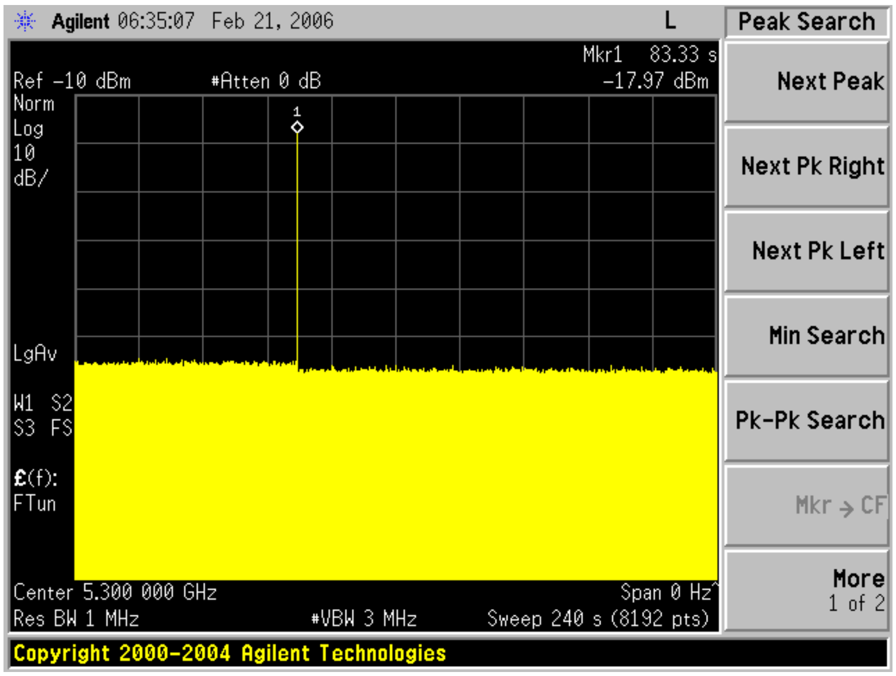
   The UUT is powered on at T_0. T_1 denotes the instant when the UUT has completed its power-up sequence. The Channel Availability Check Time commences at instant T_1 and will end no sooner than T_1 + 60 seconds.

   A single Burst of short pulse of radar type 1 at -63 dBm will commence within a 6 second window starting at T_1.

   Visual indication on the UUT of successful detection of the radar Burst will be recorded and reported. Observation of emissions at 5300MHz will continue for 2.5 minutes after the radar Burst has been generated.

   Verify that during the 2.5 minute measurement window no UUT transmissions occurred at 5300MHz.

Radar Burst at the Beginning of the Channel Availability Check Time



6. **Radar Burst at the End of the Channel Availability Check Time:** The steps below define the procedure to verify successful radar detection on the selected Channel during a period equal to the Channel Availability Check Time and avoidance of operation on that Channel when a radar Burst with a level equal to the DFS Detection Threshold + 1 dB (-63dBm) occurs at the end of the Channel Availability Check Time.

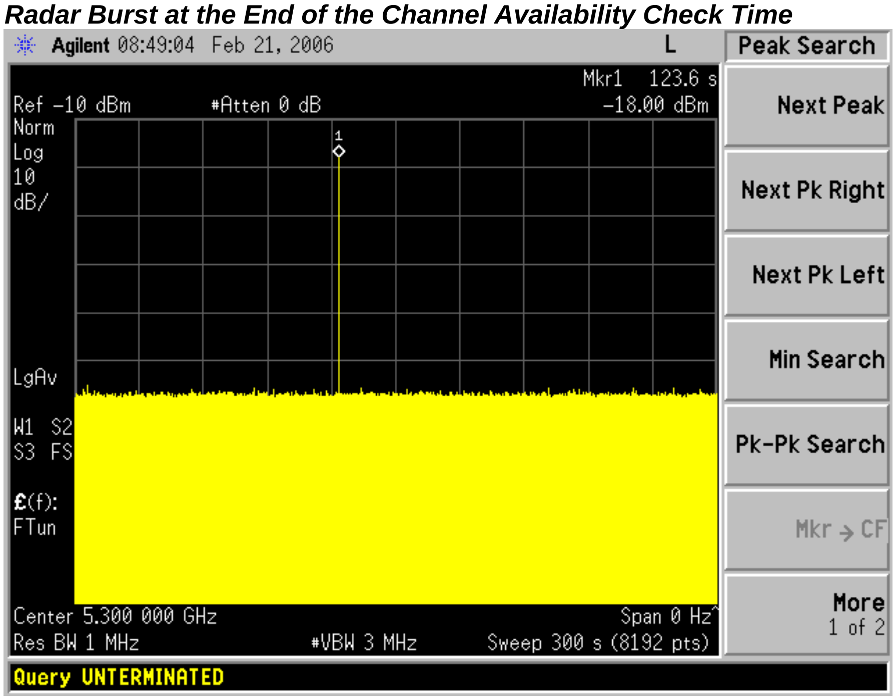
   The UUT is powered on at T_0. T_1 denotes the instant when the UUT has completed its power-up sequence. The Channel Availability Check Time commences at instant T_1 and will end no sooner than T_1 + 60 seconds.

   A single Burst of short pulse of radar type 1 at -63 dBm will commence within a 6 second window starting at T_1+ 54 seconds.

   Visual indication on the UUT of successful detection of the radar Burst will be recorded and reported. Observation of emissions at 5300MHz will continue for 2.5 minutes after the radar Burst has been generated.

   Verify that during the 2.5 minute measurement window no UUT transmissions occurred at 5300MHz.

Radar Burst at the End of the Channel Availability Check Time



6. In-Service Monitoring for Channel Move Time, Channel Closing Transmission Time and Non-Occupancy Period

These tests define how the following DFS parameters are verified during In-Service Monitoring; Channel Closing Transmission Time, Channel Move Time, and Non-Occupancy Period.

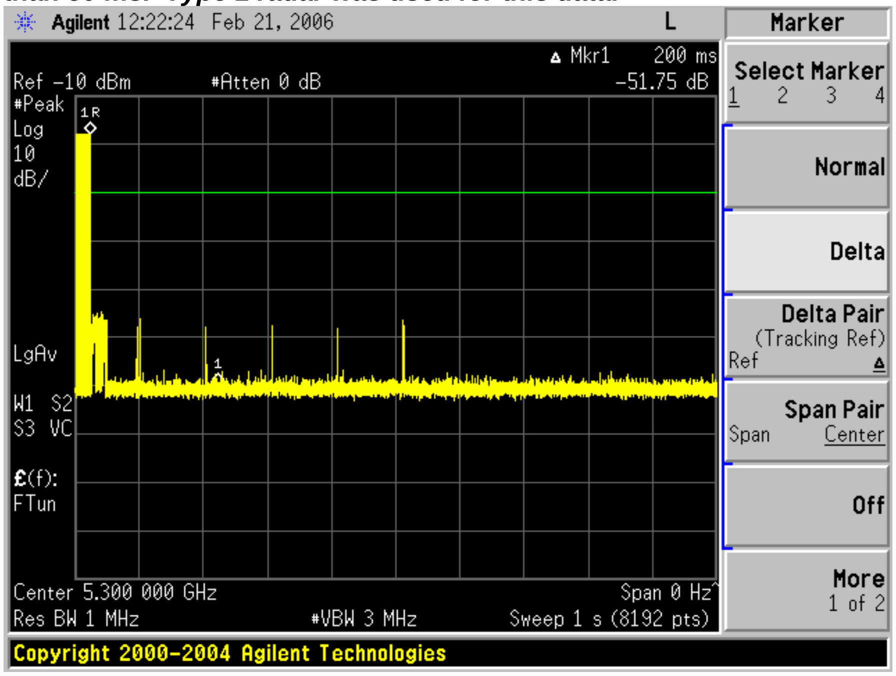
The steps below define the procedure to determine the above mentioned parameters when a radar Burst with a level equal to the DFS Detection Threshold + 1dB (-63dBm) is generated on the Operating Channel of the U-NII device.

A U-NII device operating as a Client Device will associate with the UUT (Master) at 5300 MHz. Stream the MPEG test file from the Master Device to the Client Device on the selected Channel for the entire period of the test.

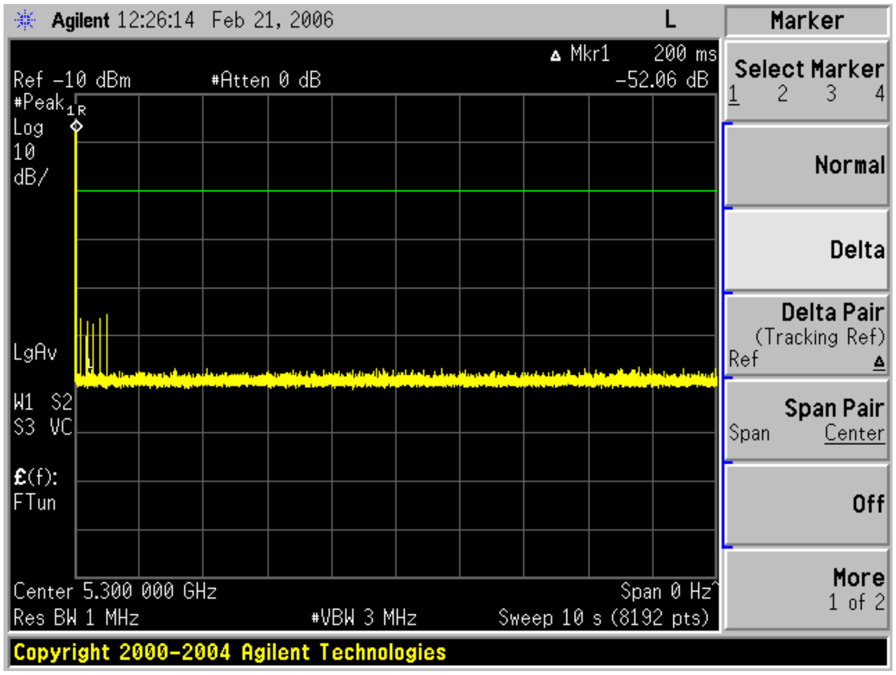
At time T_0 the Radar Waveform generator sends a Burst of pulses for each of the radar types at -63dBm.

Observe the transmissions of the UUT at the end of the radar Burst on the Operating Channel for duration greater than 10 seconds. Measure and record the transmissions from the UUT during the observation time (Channel Move Time). Compare the Channel Move Time and Channel Closing Transmission Time results to the limits defined in the *DFS Response requirement values table*.

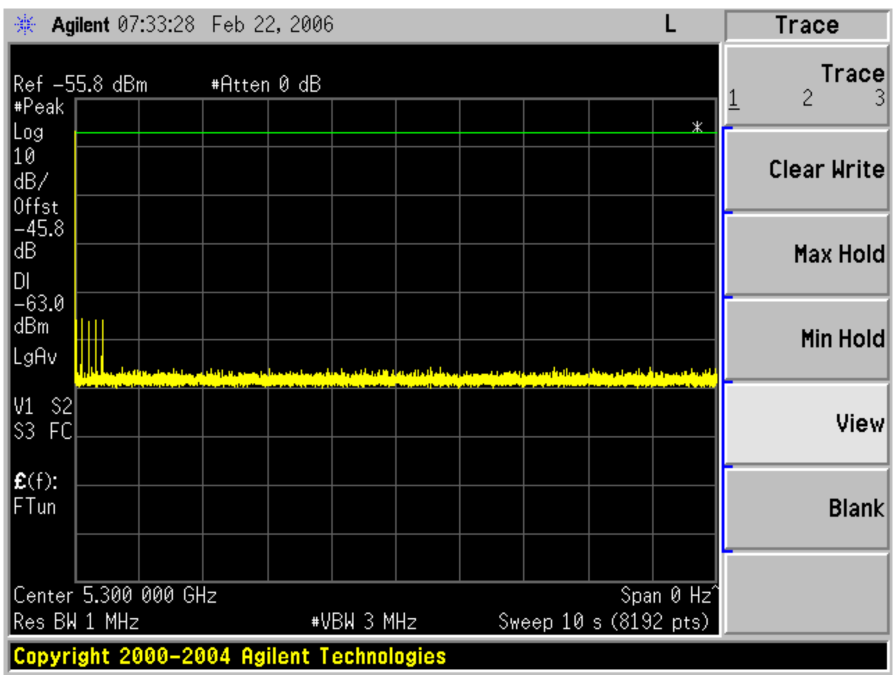
The following plot demonstrates a channel close time of 50ms, with an aggregate of no more than 50 ms. Type 1 radar was used for this data.



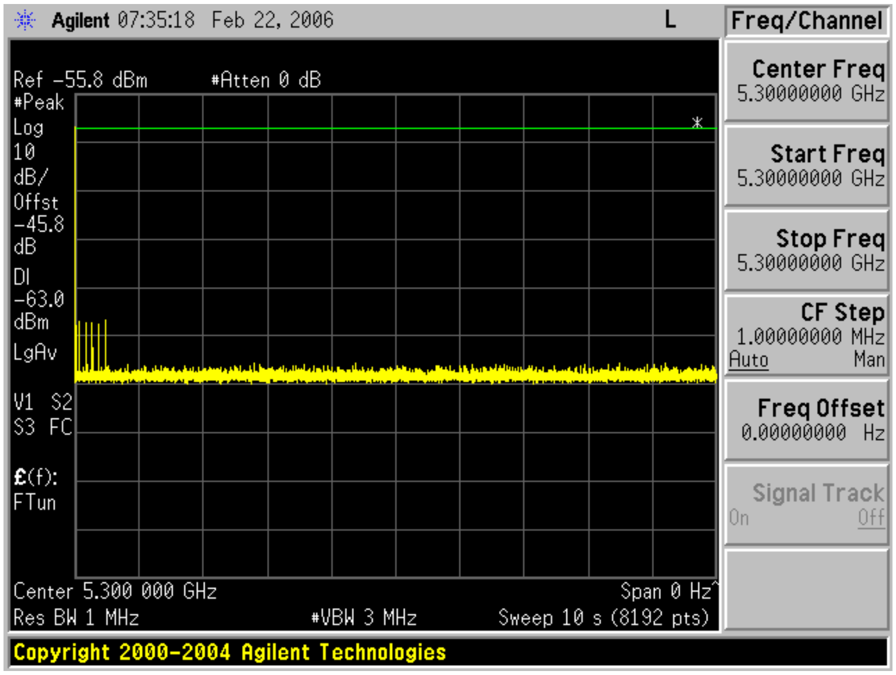
Channel Move Time, Channel Closing Transmission Time for Type 1 radar.



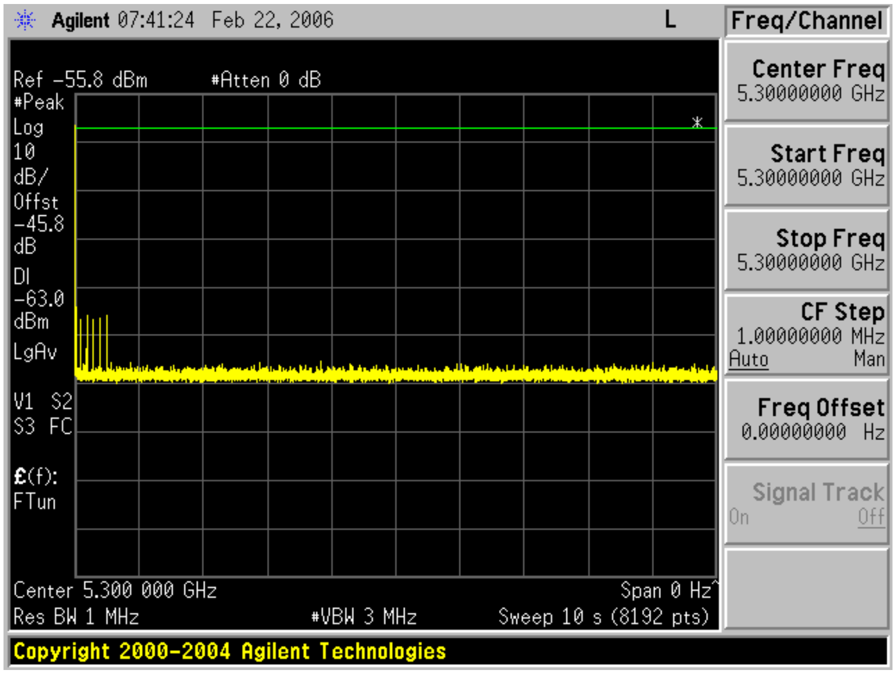
Channel Move Time, Channel Closing Transmission Time for Type 2 radar.



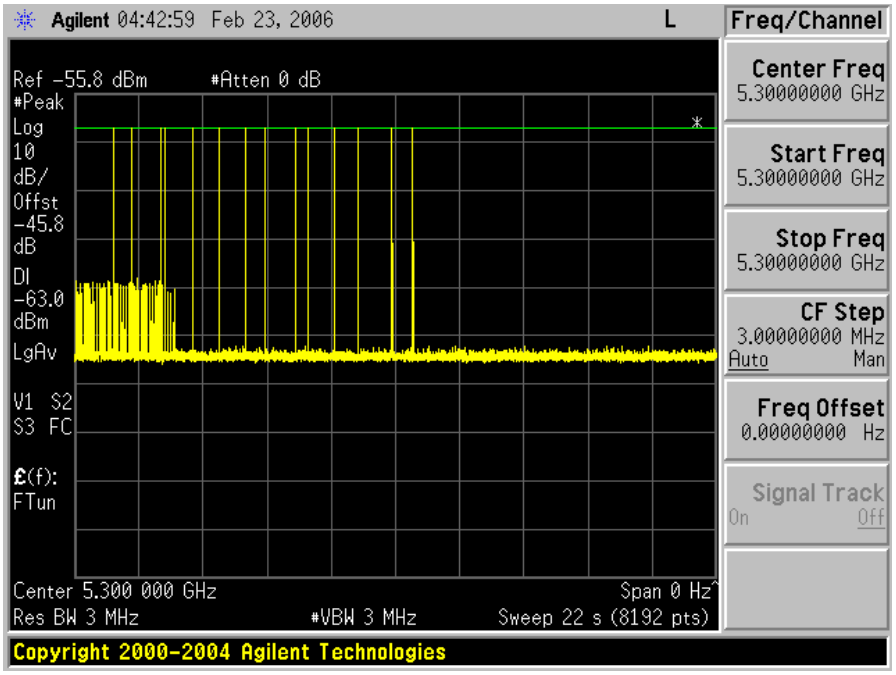
Channel Move Time, Channel Closing Transmission Time for Type 3 radar.



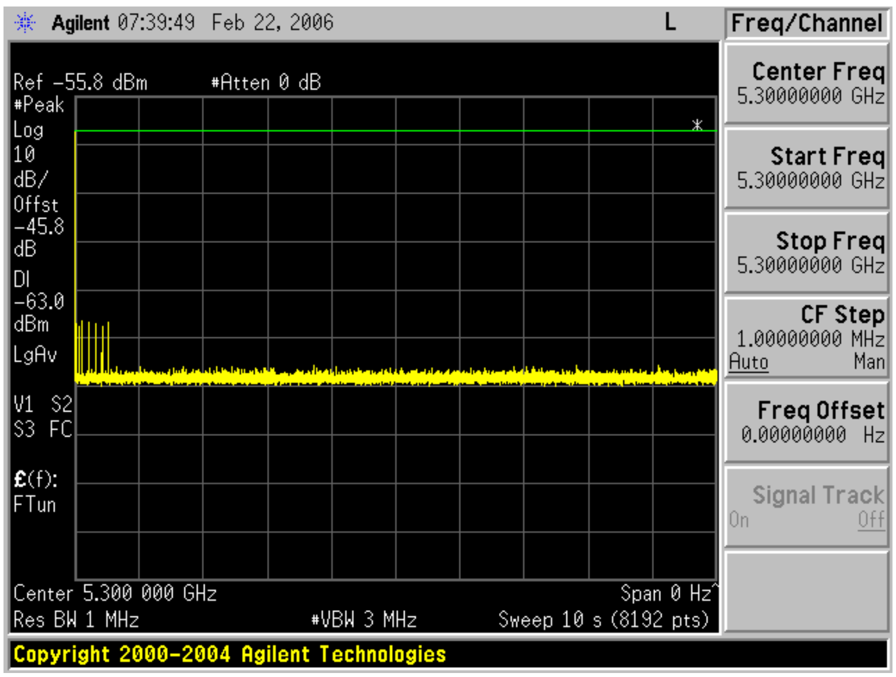
Channel Move Time, Channel Closing Transmission Time for Type 4 radar.



Channel Move Time, Channel Closing Transmission Time for Type 5 radar.

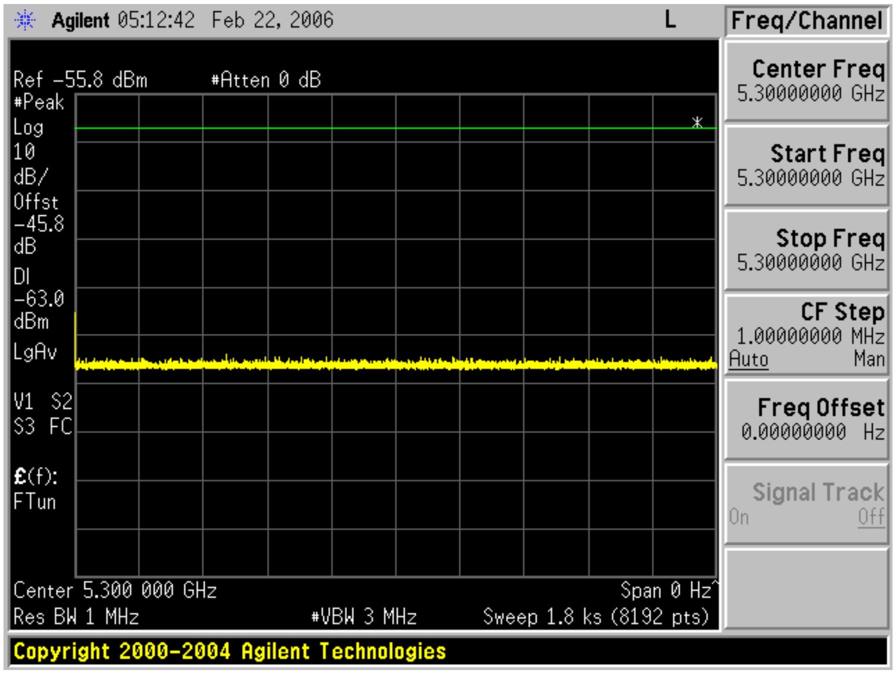


Channel Move Time, Channel Closing Transmission Time for Type 6 radar.



Measure the UUT for more than 30 minutes following the channel close/move time to verify that the UUT does not resume any transmissions on this Channel.

30 Minute Non-Occupancy Period (using Type 1 radar)



7. Statistical Performance Check

The steps below define the procedure to determine the minimum percentage of detection when a radar burst with a level equal to the DFS Detection Threshold + 1dB (-63dBm) is generated on the Operating Channel of the U-NII device.

A U-NII device operating as a Client Device will associate with the UUT (Master) at 5300 MHz. Stream the MPEG test file from the Master Device to the Client Device on the selected Channel for the entire period of the test.

The Radar Waveform generator sends the individual waveform for each of the radar types 1-6 at -63dbm. Statistical data will be gathered to determine the ability of the device to detect the radar test waveforms. The device can utilize a test mode to demonstrate when detection occurs to prevent the need to reset the device between trial runs. The percentage of successful detection is calculated by:

$$\frac{TotalWaveformDetections}{TotalWaveformTrials} \times 100 \text{ = Probability of Detection Radar Waveform}$$

The Minimum number of trails, minimum percentage of successful detection and the average minimum percentage of successful detection are found in the *Radar Test Waveforms* section.

Type 1 Radar Statistical Performance

Trial #	Pulse Width (us)	PRI (us)	Pulses/Burst	1=Detection Blank=No Detection
1	1	1428	18	1
2	1	1428	18	1
3	1	1428	18	1
4	1	1428	18	
5	1	1428	18	1
6	1	1428	18	1
7	1	1428	18	1
8	1	1428	18	1
9	1	1428	18	1
10	1	1428	18	1
11	1	1428	18	1
12	1	1428	18	
13	1	1428	18	
14	1	1428	18	1
15	1	1428	18	1
16	1	1428	18	1
17	1	1428	18	
18	1	1428	18	1
19	1	1428	18	1
20	1	1428	18	1
21	1	1428	18	1
22	1	1428	18	1
23	1	1428	18	1
24	1	1428	18	1
25	1	1428	18	1
26	1	1428	18	1
27	1	1428	18	1
28	1	1428	18	1
29	1	1428	18	1
30	1	1428	18	1
			Detection Percentage	87% (>60%)

Type 2 Radar Statistical Performance

Trial #	Pulses/Burst	Pulse Width (us)	PRI (us)	1=Detection Blank=No Detection
1	25	3.3	186	1
2	25	2.2	193	1
3	29	1.8	194	1
4	29	2.4	230	1
5	23	1.1	207	1
6	27	1.9	187	1
7	27	3.3	164	1
8	23	4.5	197	1
9	26	3.9	188	1
10	26	2.0	199	1
11	28	4.2	190	1
12	29	2.9	204	1
13	26	5.0	175	1
14	28	4.0	191	1
15	27	2.0	208	1
16	28	3.9	197	1
17	25	1.7	205	1
18	29	1.0	180	1
19	23	4.4	171	1
20	27	3.6	228	
21	24	1.0	159	1
22	25	4.1	191	1
23	25	3.8	170	1
24	29	1.0	222	1
25	28	2.0	229	1
26	23	1.0	208	1
27	28	2.2	154	1
28	28	1.8	230	1
29	23	1.8	166	1
30	25	2.1	226	1
			Detection Percentage	97% (>60%)

Type 3 Radar Statistical Performance

Trial #	Pulses/Burst	Pulse Width (us)	PRI (us)	1=Detection Blank=No Detection
1	18	7.5	460	1
2	16	7.4	424	1
3	16	7.4	240	1
4	16	6.0	288	1
5	16	9.8	329	1
6	16	9.2	378	1
7	18	9.8	223	1
8	17	8.0	362	1
9	17	6.1	373	
10	16	8.7	461	
11	16	6.9	376	1
12	17	8.9	308	1
13	18	9.9	471	1
14	17	9.3	355	1
15	18	6.1	446	1
16	16	6.9	478	1
17	18	7.6	482	1
18	16	6.8	403	1
19	17	6.5	405	1
20	16	6.5	285	1
21	17	7.4	316	1
22	16	7.0	427	1
23	18	6.0	266	1
24	16	6.5	230	1
25	17	8.2	489	1
26	16	6.3	267	1
27	16	8.0	370	1
28	16	9.0	354	1
29	18	6.6	284	1
30	16	6.0	390	1
			Detection Percentage	93% (>60%)

Type 4 Radar Statistical Performance

Trial #	Pulses/Burst	Pulse Width (us)	PRI (us)	1=Detection Blank=No Detection
1	12	11.2	248	1
2	12	13.6	204	1
3	15	15.1	238	
4	13	14.8	429	1
5	15	18.6	460	1
6	14	19.0	247	1
7	12	15.0	211	1
8	13	12.0	247	1
9	16	16.7	378	1
10	14	19.4	417	1
11	13	15.0	418	1
12	13	18.8	283	1
13	12	13.0	226	1
14	12	14.9	259	1
15	16	16.1	207	
16	14	16.9	235	1
17	12	17.1	491	
18	15	17.8	267	1
19	13	12.5	355	1
20	14	11.7	425	1
21	15	12.7	284	1
22	16	15.2	318	1
23	13	19.6	346	1
24	13	13.8	356	1
25	13	17.0	359	1
26	14	15.2	473	1
27	12	16.9	246	1
28	16	11.2	221	1
29	13	13.7	345	1
30	13	13.0	443	1
			Detection Percentage	90% (>60%)

In addition an average minimum percentage of successful detection across all four Short pulse radar test waveforms is required and is calculated as follows:

$$\frac{P_d 1 + P_d 2 + P_d 3 + P_d 4}{4}$$ = (87%+97%+93%+90%)/4 = 91.75% (>80%)

Type 5 Radar Statistical Performance

Trial #	Filename*	1=Detection Blank=No Detection
1	Bin5Statistics_1	1
2	Bin5Statistics_2	1
3	Bin5Statistics_3	
4	Bin5Statistics_4	1
5	Bin5Statistics_5	1
6	Bin5Statistics_6	1
7	Bin5Statistics_7	1
8	Bin5Statistics_8	1
9	Bin5Statistics_9	1
10	Bin5Statistics_10	1
11	Bin5Statistics_11	1
12	Bin5Statistics_12	1
13	Bin5Statistics_13	1
14	Bin5Statistics_9	1
15	Bin5Statistics_15	1
16	Bin5Statistics_16	1
17	Bin5Statistics_17	1
18	Bin5Statistics_18	1
19	Bin5Statistics_19	1
20	Bin5Statistics_20	1
21	Bin5Statistics_21	1
22	Bin5Statistics_22	1
23	Bin5Statistics_23	1
24	Bin5Statistics_24	1
25	Bin5Statistics_25	1
26	Bin5Statistics_26	1
27	Bin5Statistics_27	
28	Bin5Statistics_28	1
29	Bin5Statistics_29	1
30	Bin5Statistics_30	1
Detection Percentage		93% (>80%)

*See the Bin5 Radar Characteristics at the end of this report.

Type 6 Radar Statistical Performance

Trial #	Pulses/Hop	Pulse Width (us)	PRI (us)	1=Detection Blank=No Detection
1	9	1	333	1
2	9	1	333	1
3	9	1	333	1
4	9	1	333	1
5	9	1	333	1
6	9	1	333	1
7	9	1	333	1
8	9	1	333	1
9	9	1	333	1
10	9	1	333	
11	9	1	333	1
12	9	1	333	1
13	9	1	333	1
14	9	1	333	1
15	9	1	333	1
16	9	1	333	1
17	9	1	333	1
18	9	1	333	1
19	9	1	333	1
20	9	1	333	1
21	9	1	333	1
22	9	1	333	1
23	9	1	333	1
24	9	1	333	1
25	9	1	333	1
26	9	1	333	1
27	9	1	333	1
28	9	1	333	1
29	9	1	333	1
30	9	1	333	1
			Detection Percentage	97% (>70%)

Bin5Statistics_1.txt

Burst#	Pulses	Chirp(MHz)	PW(uS)	Inter-pulse spacing/s(uS)	Pulse Start(S)
1	2	9	55	1521	0.246287
2	3	6	80	1262,1901	0.924482
3	3	10	85	1824,1637	1.872273
4	1	8	100	NA	2.431316
5	1	8	95	NA	3.889790
6	3	15	95	1758,1730	4.753358
7	3	9	80	1413,1222	5.572570
8	3	17	50	1397,1158	5.918443
9	2	10	80	1977	6.557103
10	2	5	90	1861	7.522707
11	3	19	65	1983,1770	8.486594
12	1	12	60	NA	9.389964
13	2	11	85	1563	9.784574
14	1	16	60	NA	10.783674
15	1	5	90	NA	11.594683

Bin5Statistics_2.txt

Burst#	Pulses	Chirp(MHz)	PW(uS)	Inter-pulse spacing/s(uS)	Pulse Start(S)
1	1	18	90	NA	0.452644
2	1	9	75	NA	2.099265
3	3	13	65	1031,1696	2.807488
4	1	5	60	NA	3.741491
5	3	16	65	1325,1857	5.409811
6	3	19	60	1880,1092	5.760215
7	1	17	80	NA	7.027694
8	1	12	100	NA	7.661985
9	1	15	55	NA	8.771149
10	3	20	55	1119,1195	10.351116
11	3	14	90	1713,1583	11.494393

Bin5Statistics_3.txt

Burst#	Pulses	Chirp(MHz)	PW(uS)	Inter-pulse spacing/s(uS)	Pulse Start(S)
1	1	13	65	NA	0.134358
2	1	10	70	NA	1.712318
3	1	12	60	NA	2.950198
4	1	17	55	NA	4.063267
5	1	17	70	NA	4.800903
6	3	20	50	1071,1420	6.241647
7	3	11	65	1105,1203	7.291000
8	1	20	65	NA	9.476822
9	1	12	90	NA	10.744746
10	1	12	70	NA	11.877409

Bin5Statistics_4.txt

Burst#	Pulses	Chirp(MHz)	PW(uS)	Inter-pulse spacing/s(uS)	Pulse Start(S)
1	3	17	50	1414,1793	0.392262
2	1	5	65	NA	1.300813
3	1	10	75	NA	2.058838
4	2	19	60	1624	2.330585
5	1	14	60	NA	3.349062
6	3	17	75	1448,1433	4.190149
7	1	8	55	NA	4.395628
8	1	17	95	NA	5.162492
9	2	14	50	1559	5.927574
10	3	18	65		6.684199
11	3	15	55	1005,1949 1215,1314	7.609330
12	2	9	90	1884	8.071826
13	2	12	50	1199	8.541376
14	1	20	65	NA	9.435895
15	2	17	65	1220	9.896956
16	1	13	50	NA	10.784747
17	1	5	75	NA	11.375583

Bin5Statistics_5.txt

Burst#	Pulses	Chirp(MHz)	PW(uS)	Inter-pulse spacing/s(uS)	Pulse Start(S)
1	3	7	75	1345,1830	0.942297
2	3	11	85	1011,1989	1.958298
3	2	16	60	1584	3.230325
4	1	7	90	NA	5.367928
5	2	9	95	1087	6.574788
6	1	18	80	NA	8.239984
7	3	9	60	1749,1221	9.783378
8	3	15	50	1548,1840	11.741036

Bin5Statistics_6.txt

Burst#	Pulses	Chirp(MHz)	PW(uS)	Inter-pulse spacing/s(uS)	Pulse Start(S)
1	1	5	100	NA	0.790197
2	1	7	85	NA	2.410497
3	3	12	75	1405,1036	3.244272
4	2	7	100	1699	5.742278
5	3	8	95	1639,1341	6.693310
6	1	16	75	NA	8.333037
7	2	18	80	1640	9.014737
8	1	11	80	NA	11.871922

Bin5Statistics_7.txt

Burst#	Pulses	Chirp(MHz)	PW(uS)	Inter-pulse spacing/s(uS)	Pulse Start(S)
1	3	15	60	1595,1224	0.457801
2	3	11	100	1591,1089	1.061580
3	3	9	90	1977,1765	1.603406
4	2	15	65	1343	2.203330
5	2	9	70	1295	2.494725
6	2	5	60	1401	3.520407
7	3	16	60	1062,1661	3.616961
8	3	19	100	1836,1737	4.207720
9	1	16	60	NA	5.103347
10	3	11	55	1814,1493	5.988766
11	1	15	65	NA	6.186605
12	1	7	70	NA	6.803399
13	3	13	60	1535,1037	7.441443
14	3	6	100	1270,1482	7.827951
15	1	14	75	NA	8.731000
16	3	18	90	1053,1161	9.234468
17	2	10	70	1130	9.958936
18	2	5	95	1793	10.364713
19	2	14	50	1217	11.052249
20	3	20	55	1154,1427	11.882144

Bin5Statistics_8.txt

Burst#	Pulses	Chirp(MHz)	PW(uS)	Inter-pulse spacing/s(uS)	Pulse Start(S)
1	3	16	90	1456,1571	0.353281
2	1	14	90	NA	0.836312
3	1	15	75	NA	1.382728
4	1	9	70	NA	2.185795
5	3	6	75	1297,1226	2.662728
6	1	13	95	NA	3.564776
7	2	6	100	1594	3.971332
8	3	8	50	1825,1923	4.508699
9	2	14	95	1836	5.361428
10	1	16	50	NA	5.536490
11	3	13	60	1234,1066	6.349730
12	2	20	60	1446	7.019008
13	2	12	100	1467	7.789912
14	2	14	55	1591	7.924687
15	3	6	50	1128,1434	8.825602
16	1	19	60	NA	9.028199
17	2	20	80	1513	9.790945
18	1	12	65	NA	10.756373
19	3	6	65	1892,1028	11.244397
20	2	10	80	1695	11.693240

Bin5Statistics_9.txt

Burst#	Pulses	Chirp(MHz)	PW(uS)	Inter-pulse spacing/s(uS)	Pulse Start(S)
1	3	10	65	1319,1320	0.123725
2	1	13	95	NA	0.679258
3	2	10	55	1710	1.561018
4	2	9	95	1460	2.029640
5	3	8	85	1586,1947	2.816176
6	2	17	90	1359	3.488058
7	2	19	60	1523	3.833848
8	1	10	75	NA	4.600990
9	2	16	70	1207	5.355715
10	3	12	60	1776,1186	5.565856
11	3	12	75	1803,1524	6.203642
12	2	9	60	1267	7.149198
13	1	18	70	NA	7.380846
14	3	11	55	1636,1448	8.090914
15	1	6	65	NA	8.597364
16	3	7	70	1461,1760	9.466593
17	2	19	60	1501	9.961888
18	3	17	60	1302,1156	10.395089
19	2	15	75	1416	10.956211
20	3	15	70	1654,1259	11.461361

Bin5Statistics_10.txt

Burst#	Pulses	Chirp(MHz)	PW(uS)	Inter-pulse spacing/s(uS)	Pulse Start(S)
1	3	20	100	1337,1945	0.917037
2	3	5	85	1636,1035	2.737162
3	2	20	85	1185	3.893494
4	2	11	80	1808	5.542858
5	1	6	55	NA	6.082829
6	2	14	60	1234	8.796411
7	1	9	70	NA	9.529375
8	2	9	100	1877	10.700461

Bin5Statistics_11.txt

Burst#	Pulses	Chirp(MHz)	PW(uS)	Inter-pulse spacing/s(uS)	Pulse Start(S)
1	1	14	60	NA	0.990167
2	3	9	70	1406,1986	2.244706
3	3	8	90	1106,1488	2.960573
4	3	15	50	1739,1038	4.509384
5	1	19	90	NA	5.033382
6	3	6	85	1678,1959	6.756751
7	1	9	70	NA	7.485086
8	1	8	90	NA	8.784489
9	2	14	50	1147	10.581212
10	2	10	65	1020	11.289374

Bin5Statistics_12.txt

Burst#	Pulses	Chirp(MHz)	PW(uS)	Inter-pulse spacing/s(uS)	Pulse Start(S)
1	3	19	95	1225,1231	0.033670
2	2	13	75	1867	0.761849
3	1	17	50	NA	2.105049
4	3	12	90	1445,1620	2.436484
5	1	17	60	NA	3.322861
6	2	6	65	1156	4.041820
7	3	11	75	1341,1667	4.559879
8	1	14	80	NA	5.605528
9	3	17	55	1303,1906	6.491394
10	3	13	80	1016,1672	7.064682
11	1	10	70	NA	8.238815
12	3	18	80	1536,1619	8.671898
13	3	9	80	1852,1505	9.459053
14	3	7	50	1699,1838	10.434823
15	1	6	50	NA	10.937071
16	1	7	65	NA	11.572879

Bin5Statistics_13.txt

Burst#	Pulses	Chirp(MHz)	PW(uS)	Inter-pulse spacing/s(uS)	Pulse Start(S)
1	3	5	100	1994,1657	0.212483
2	2	7	65	1908	1.737974
3	1	11	80	NA	1.850478
4	1	19	50	NA	3.154995
5	2	6	75	1708	4.606621
6	3	8	60	1760,1885	5.508717
7	2	10	100	1403	5.784591
8	2	12	55	1734	7.043373
9	2	20	80	1130	8.202944
10	1	12	95	NA	8.338472
11	3	11	65	1894,1082	9.662044
12	3	19	65	1257,1910	10.352585
13	3	18	65	1564,1246	11.820741

Bin5Statistics_14.txt

Burst#	Pulses	Chirp(MHz)	PW(uS)	Inter-pulse spacing/s(uS)	Pulse Start(S)
1	1	14	85	NA	0.398389
2	3	15	95	1630,1500	1.151616
3	2	10	95	1005	2.037676
4	1	5	90	NA	3.273951
5	2	15	75	1491	3.766544
6	1	12	80	NA	4.569432
7	3	8	50	1942,1764	5.498577
8	1	12	50	NA	6.731193
9	2	12	55	1555	7.270068
10	3	17	100	1643,1419	8.408891
11	1	7	85	NA	9.260391
12	3	7	75	1258,1416	9.544812
13	1	18	95	NA	10.915297
14	3	7	90	1623,1394	11.162282

Bin5Statistics_15.txt

Burst#	Pulses	Chirp(MHz)	PW(uS)	Inter-pulse spacing/s(uS)	Pulse Start(S)
1	2	18	100	1847	0.549291
2	3	11	80	1095,1664	1.710120
3	1	5	100	NA	2.092751
4	3	8	70	1790,1146	3.084616
5	2	16	50	1299	4.423566
6	1	15	70	NA	4.956382
7	1	12	85	NA	5.711146
8	2	14	50	1063	6.999373
9	1	20	70	NA	7.949971
10	1	7	55	NA	8.698228
11	3	20	90	1628,1382	9.364847
12	3	12	85	1857,1720	10.478761
13	3	17	80	1133,1861	11.374023

Bin5Statistics_16.txt

Burst#	Pulses	Chirp(MHz)	PW(uS)	Inter-pulse spacing/s(uS)	Pulse Start(S)
1	2	20	95	1972	0.982727
2	1	18	100	NA	1.266440
3	2	14	90	1898	3.517665
4	1	20	55	NA	4.497820
5	3	11	80	1861,1717	5.106569
6	2	12	60	1660	7.073856
7	3	7	55	1645,1085	8.323434
8	2	15	55	1694	9.512301
9	2	18	55	1434	10.480360
10	2	12	80	1088	11.621332

Bin5Statistics_17.txt

Burst#	Pulses	Chirp(MHz)	PW(uS)	Inter-pulse spacing/s(uS)	Pulse Start(S)
1	2	9	75	1153	1.088453
2	3	9	60	1680,1359	2.051927
3	1	20	90	NA	3.327541
4	1	13	90	NA	4.183652
5	3	9	100	1795,1157	4.880381
6	1	15	75	NA	7.126289
7	2	10	85	1748	7.231523
8	2	19	75	1952	8.469657
9	3	12	100	1492,1044	10.544474
10	3	11	80	1069,1485	11.068740

Bin5Statistics_18.txt

Burst#	Pulses	Chirp(MHz)	PW(uS)	Inter-pulse spacing/s(uS)	Pulse Start(S)
1	2	16	90	1354	0.627796
2	1	13	50	NA	2.059322
3	1	14	55	NA	2.936790
4	2	8	50	1956	3.778622
5	2	12	50	1240	4.658820
6	2	15	95	1193	5.525153
7	1	20	70	NA	6.558312
8	1	13	100	NA	8.618717
9	2	12	65	1267	9.057408
10	1	14	75	NA	10.852975
11	2	14	90	1086	11.214612

Bin5Statistics_19.txt

Burst#	Pulses	Chirp(MHz)	PW(uS)	Inter-pulse spacing/s(uS)	Pulse Start(S)
1	1	11	50	NA	0.295058
2	3	13	60	1022,1096	0.758336
3	3	7	65	1560,1592	1.890348
4	1	13	85	NA	1.896963
5	3	8	95	1398,1163	2.846130
6	1	14	65	NA	3.378350
7	1	15	90	NA	3.973148
8	3	15	100	1633,1157	4.970687
9	1	11	95	NA	5.125884
10	3	16	70	1508,1771	5.712335
11	1	12	70	NA	6.943145
12	2	14	65	1297	7.392205
13	1	12	75	NA	7.639831
14	1	15	55	NA	8.491171
15	3	6	90	1495,1376	9.295285
16	2	10	100	1741	9.504974
17	1	9	75	NA	10.468330
18	2	5	50	1507	11.065044
19	3	9	80	1833,1428	11.864814

Bin5Statistics_20.txt

Burst#	Pulses	Chirp(MHz)	PW(uS)	Inter-pulse spacing/s(uS)	Pulse Start(S)
1	2	16	50	2000	0.372643
2	3	6	50	1398,1499	1.232612
3	1	19	85	NA	1.514363
4	3	16	65	1298,1593	2.532303
5	3	19	65	1035,1000	3.017801
6	3	11	80	1954,1369	3.878699
7	1	20	80	NA	5.075896
8	2	5	80	1283	5.919874
9	1	6	85	NA	6.424047
10	1	6	65	NA	7.294505
11	3	5	80	1858,1520	8.236850
12	2	9	80	1698	8.526208
13	2	10	50	1800	9.562765
14	3	11	80	1997,1651	9.780188
15	1	20	65	NA	10.823517
16	1	19	55	NA	11.918558

Bin5Statistics_21.txt

Burst#	Pulses	Chirp(MHz)	PW(uS)	Inter-pulse spacing/s(uS)	Pulse Start(S)
1	2	15	95	1090	0.154670
2	2	12	60	1730	1.754179
3	3	10	95	1166,1941	2.618319
4	3	19	75	1018,1841	3.538059
5	3	15	85	1744,1809	4.435161
6	2	16	90	1586	5.604252
7	1	9	100	NA	6.358547
8	2	7	70	1314	7.562533
9	3	18	65	1257,1357	8.731204
10	3	12	50	1838,1221	9.004081
11	1	17	100	NA	10.311876
12	1	14	80	NA	11.492352

Bin5Statistics_22.txt

Burst#	Pulses	Chirp(MHz)	PW(uS)	Inter-pulse spacing/s(uS)	Pulse Start(S)
1	2	15	50	1833	0.733368
2	3	10	100	1150,1568	1.357979
3	3	10	80	1095,1252	2.800413
4	2	11	100	1497	4.247862
5	3	20	70	1680,1707	5.373839
6	3	10	70	1391,1656	5.793849
7	3	15	85	1604,1732	6.726478
8	2	10	85	1101	8.529162
9	2	6	75	1019	9.002649
10	2	10	85	1399	10.746289
11	2	12	60	1828	11.618874

Bin5Statistics_23.txt

Burst#	Pulses	Chirp(MHz)	PW(uS)	Inter-pulse spacing/s(uS)	Pulse Start(S)
1	3	16	80	1819,1773	0.192466
2	2	13	50	1535	1.405143
3	3	11	55	1221,1185	2.761553
4	2	8	85	1826	4.020767
5	3	20	60	1872,1156	5.491484
6	3	8	50	1633,1412	7.137450
7	3	17	90	1066,1569	8.263974
8	1	8	100	NA	10.072129
9	1	19	60	NA	10.765613

Bin5Statistics_24.txt

Burst#	Pulses		PW(uS)	Inter-pulse spacing/s(uS)	Pulse Start(S)
1	3	Chirp(MHz) 9	85	1613,1283	0.346674
2	3	11	100	1622,1911	1.009025
3	2	12	75	1469	2.027916
4	3	11	70	1410,1545	3.007877
5	3	17	90	1960,1422	3.903858
6	2	19	65	1064	4.374226
7	1	16	70	NA	5.303858
8	2	10	65	1650	5.729172
9	2	10	50	1238	6.960769
10	3	15	80	1055,1798	7.350575
11	2	7	60	1901	8.479697
12	1	9	60	NA	9.023576
13	3	8	55	1646,1897	10.114573
14	1	17	80	NA	11.155209
15	1	17	85	NA	11.327446

Bin5Statistics_25.txt

Burst#	Pulses	Chirp(MHz)	PW(uS)	Inter-pulse spacing/s(uS)	Pulse Start(S)
1	2	8	90	1881	0.114491
2	3	16	100	1391,1864	1.879320
3	1	20	65	NA	2.885220
4	2	19	80	1770	3.593760
5	1	20	95	NA	4.424549
6	2	19	90	1307	5.594003
7	1	11	65	NA	6.153904
8	2	6	95	1302	7.160734
9	2	13	50	1485	8.404539
10	3	13	70	1797,1591	9.319933
11	3	13	60	1768,1822	10.480072
12	2	6	85	1218	11.280752

Bin5Statistics_26.txt

Burst#	Pulses	Chirp(MHz)	PW(uS)	Inter-pulse spacing/s(uS)	Pulse Start(S)
1	1	8	80	NA	0.304141
2	1	15	80	NA	1.507392
3	2	16	85	1112	3.216967
4	3	20	95	1968,1181	5.328848
5	3	13	60	1429,1737	6.022028
6	3	8	90	1385,1562	7.551800
7	1	8	70	NA	9.405552
8	1	10	60	NA	10.827510

Bin5Statistics_27.txt

Burst#	Pulses	Chirp(MHz)	PW(uS)	Inter-pulse spacing/s(uS)	Pulse Start(S)
1	2	12	75	1663	0.487285
2	2	19	90	1709	2.135252
3	1	6	85	NA	3.140017
4	1	5	55	NA	4.745021
5	1	17	95	NA	6.916680
6	3	5	85	1265,1022	7.778005
7	1	6	55	NA	9.109545
8	3	6	75	1828,1069	11.041950

Bin5Statistics_28.txt

Burst#	Pulses	Chirp(MHz)	PW(uS)	Inter-pulse spacing/s(uS)	Pulse Start(S)
1	2	20	50	1059	0.911509
2	2	7	95	1195	1.350836
3	1	20	100	NA	2.522307
4	1	16	95	NA	4.131000
5	2	19	95	1262	5.239877
6	2	15	70	1067	5.899036
7	3	20	55	1507,1757	6.678873
8	2	10	100	1352	8.059416
9	1	19	70	NA	9.811315
10	2	17	50	1679	10.878139
11	3	12	90	1242,1078	11.549879

Bin5Statistics_29.txt

Burst#	Pulses	Chirp(MHz)	PW(uS)	Inter-pulse spacing/s(uS)	Pulse Start(S)
1	1	15	55	NA	0.404580
2	1	16	55	NA	1.449394
3	3	20	75	1789,1807	2.016031
4	1	14	80	NA	2.689175
5	3	19	50	1661,1776	3.206599
6	2	14	55	1729	4.169881
7	3	9	50	1293,1404	5.284722
8	2	19	60	1509	6.331572
9	3	14	60	1354,1849	6.652558
10	3	13	70	1692,1200	7.263614
11	3	14	90	1071,1318	8.162366
12	3	13	90	1674,1911	8.972822
13	1	17	90	NA	10.125491
14	2	20	90	1832	10.821064
15	2	19	50	1753	11.824729

Bin5Statistics_30.txt

Burst#	Pulses	Chirp(MHz)	PW(uS)	Inter-pulse spacing/s(uS)	Pulse Start(S)
1	2	10	70	1462	0.127083
2	1	19	85	NA	0.873202
3	1	16	55	NA	1.779357
4	3	13	55	1589,1655	2.026120
5	1	6	70	NA	2.682897
6	2	13	75	1694	3.166846
7	3	7	65	1747,1684	4.166501
8	2	6	90	1731	4.819822
9	3	18	60	1798,1544	5.434693
10	2	5	70	1242	6.174259
11	1	11	90	NA	6.819444
12	3	12	50	1506,1289	7.399999
13	2	5	90	1364	7.886215
14	1	6	95	NA	8.322875
15	3	19	70	1146,1661	9.416912
16	2	15	85	1949	9.509949
17	3	14	50	1280,1797	10.731485
18	3	7	90	1925,1662	10.760541
19	2	5	65	1162	11.509563

Appendix C: 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 D: Radiated Emissions Test Procedure

The following is a summary of the actual test procedure used by Cisco Systems (**Doc No:** ENG-36583)

Pre-Assessment

The object of the Pre-Assessment Testing is to identify emissions that must be evaluated against the specification limit, under conditions called out in the applicable specification. During this type of testing the repeatability of the test setup and the worst-case layout of the EUT are also determined..

1. Arrange the EUT in the chamber as defined in the configuration section of ENG-36583, the TAP and the appropriate specification.
2. Where the EUT cannot be configured in accordance with the specification then carry out the following:
    i. Set the equipment up as close as possible to the requirements.
    ii. Note within the logbook any deviations from the ard.
    iii. Use only non-metallic supports.
    iv. Ensure that the set up used is repeatable.
    v. Evaluate the effect of the configuration upon the test results.
3. Set the antenna to EUT distance to the appropriate test distance.
4. An initial scan of the frequency ranges should be undertaken to ensure that all emissions emanate from the EUT and are not ambient (from mobile phones, support equipment etc).
5. The EUT should be evaluated in the mode(s) of operation defined in the TAP.
6. Measure the emissions profile of the EUT over the required frequency range using the Automated test software
7. Once an initial preview scan has been performed the emissions profile of the EUT should be maximized in accordance with the specification.
8. Repeat the preview scan after maximizing (unless the overhead cable rack has been utilized). Compare the results with the initial scan to ensure that the worst-case profile has been obtained. *IMPORTANT* If the obtained profiles are considerably different an investigation should be undertaken to ensure that there is not an intermittent problem with the EUT or its cabling.
9. If the obtained profiles are similar all emissions within 6dB of the test specification should be identified for formal measurements. If the test software is used to do this then the results must be confirmed manually. Where there are <6 emissions within 6dB of the specification, the worst six emissions should be identified.
10. Where the frequencies of emissions are close together care must be taken to ensure that the actual worst case emission has been chosen for the formal measurement. This can usually only be confirmed by

maximizing the emission profile. If in doubt identify both (or all) suspect emissions near the center frequency identified by the preview software.

11. During testing the overload indicator of the test Rx should be monitored to ensure that the testing is valid. Where an overload condition is suspected this can normally be confirmed by the use of an external attenuator or the Rx linearity function.

12. If no signals are within 20dB of the specification limit no formal measurements are required. If this happens the equipment setup should be re-checked to ensure that that it has not developed a fault. When testing to CNS13438 the worst 6 emissions should be recorded regardless

13. Repeat the preceding for the remaining Modes and Configurations defined by the TAP or until a worst-case configuration has been obtained. Plots must be made of the worst case emission profile for inclusion in the test report. Plots may also be taken of other representative profiles.

Formal Testing:
The object of Formal/Final measurements is to formally measure the emissions highlighted during the pre-assessment phase against the appropriate specification limits. Maximization of the configuration of the EUT should not be performed during this phase as maximizing the profile at one frequency may change the profile at another and as such invalidate the preview results

1. In the **worst case configuration** each emission identified in the pre-assessment phase should be measured against the appropriate specification limit with the appropriate detector:

    i. Quasi-Peak detector for emissions from 30 MHz to 1GHz

    ii. Peak detector and average detector for emissions above 1GHz

2. Fine Tune the frequency of the emission.

3. The emissions should be observed for a sufficient period of time to allow the EUT to undergo a full exercising routine.

4. Maximize the amplitude of the emission by rotating the EUT, changing the antenna polarity and scanning the receive antenna height.

5. If the emission varies in amplitude with respect to the specification limit, the emission should be observed for at least 15 seconds and the highest reading shall be recorded, with the exception of any brief isolated high reading.

6. During testing the overload indicator of the test Rx should be monitored to ensure that the testing is valid., where an overload condition is suspected this can normally be confirmed by the use of external attenuation or the Rx linearity function.

7. If the EUT fails to meet the specification, investigations should be undertaken to ensure that the EUT has sufficient isolation from its support equipment and/ or ambient interference.

8. Above 1GHz Emissions that do not meet the average specification limit with a peak detector should be compared against the peak limit and re-measured with an Average detector.

9. Repeat steps 2 to 8 on the remaining emissions identified in the pre-assessment phase.

10. Record all relevant data in the eRAT.

Appendix E: Conducted Emissions Test Procedure

The following is a summary of the actual test procedure used by Cisco Systems (**Doc No:** ENG-36541)

Pre-Assessment

The object of the Pre-Assessment Testing is to identify emissions that must be evaluated against the specification limit, under conditions called out in the applicable standard. During this type of testing the repeatability of the test setup and the worst-case layout of the EUT are also determined..

1. Arrange the EUT in the chamber as defined in the configuration section of ENG-36541, the TAP and the appropriate Specification
2. If drive/support equipment is located outside of the shielded enclosure, care must be taken to adequately filter cables coming into the chamber to reduce any potential ambient noise.
3. An initial investigation should be undertaken to ensure that ambient interference from external sources or support equipment are not affecting the measured results of the EUT.
4. The EUT should be connected to the LISN via an appropriate length of mains power cord as defined in the Specification.
5. Investigations should be made to assess possible effects of I/O cables on the measured emission profile. Such investigations should remain within the boundaries of acceptable configurations defined in the Specification. The main purpose of this investigation is to check for cabling problems and for repeatability. I/O cables should not come within 80cm of the LISN (AMN) This information should be recorded in JLS.
6. Ensure that there is a pulse limiter in the measurement path to the input of the spectrum analyzer. Ensure that unused ports of the LISN are terminated in 50 ohms.
7. The emission profile of the EUT should be measured across the required frequency range.
8. Maximize the emission profile of the EUT over the entire frequency range. The following issues should be considered during the maximization process:
   i. Cable placement and EUT location (within the boundaries of the Specification)
   ii. EUT operating modes (allow for full EUT Cycle times)
9. Once the maximum configuration has been discovered, the emission profile should be compared with the most stringent limit from the appropriate Specification.
10. If no signals are within 20dB of the Specification limit no formal measurements are required. If this happens the equipment setup should be re-checked to ensure that that it has not developed a fault. When testing to CNS13438 the worst 6 emissions should be recorded regardless.
11. Make a Plot of the entire emission profile.
12. Repeat steps 9 to 11on the remaining lines.
13. Identify all emissions that fail to meet the most stringent limit. These emissions should be formally measured.

14. Where the emission profile meets the most stringent limit, the six worst-case emissions should be identified for formal measurements. If the emission profile is broadband in Nature (i.e. switch mode PSU noise) it may be necessary to identify more than 6 emissions to adequately assess the EUT.

Formal Testing:

The object of Formal/Final measurements is to formally measure the emissions highlighted during the pre-assessment phase against the appropriate Specification limits.

1. Each emission identified in the pre-assessment phase should be measured against the appropriate Specification limit with a Quasi-Peak detector.

2. The emissions should be observed for a sufficient period of time to allow the EUT to undergo a full exercising routine.

3. Where the emission varies in amplitude with respect to the Specification limit the emission should be observed for an extended time period (normally 15 seconds). The highest level observed within this 15 second period should be recorded with the exception of any brief isolated transients.

4. If the EUT meets the most stringent limit (e.g. the average limit) with the Quasi-Peak detector, measurements with an average detector are not necessary.

5. If the EUT fails to meet the most stringent limit with the Quasi-Peak detector the emission should be measured with an Average detector.

6. Repeat the measurements on all available power supply conductors.

7. If the results are within 3dB of the Specification when measured at 120V 60HZ AC measurements should also be performed at 100V 60/50Hz AC to satisfy VCCI requirements.

8. If the EUT fails to meet the Specification, investigations should be undertaken to ensure that the EUT has sufficient isolation from its support equipment and/ or ambient interference.

9. If the EUT fails to meet the CFR47 limit, investigations should be undertaken to determine if the emission is a broadband in nature. If the difference between the results obtained with the average detector and the results obtained with quasi peak detector are >6dB the emission is deemed to be broadband and the quasi peak reading can be reduced by a factor of 13dB.

Appendix F: Test Procedures

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
Extreme Test Condition	EDCS # - 450056
Equivalent Isotropic Radiated Power	EDCS # - 450047
Frequency Tolerance	EDCS # - 462996
Power per MHz	EDCS # - 463000

Appendix G: Scope of Accreditation: A2LA certificate number 1178-01

The Cisco Systems Scope of Accreditation for EMC testing can be found on the following web page:

http://www.a2la2.net/scopepdf/1178-01.pdf

Summary:

EMC/EMI

Building P**:**	GR 1089, Issue 3 (2002): Sections 2 to 4 (excluding section 4.6.10-17, 4.8) CISPR 22 (1997) CISPR 22, KN 22 (RRL No. 2004-69, September 22, 2004) EN 55022 (1998) EN 55022 CNS 13438 AS/NZS CISPR22 CFR 47, Part 15, Subpart B, using ANSI C63.4 (RRL No. 2004-70, September 22, 2004) IEC 61000-4-2, KN 61000-4-2 IEC 61000-4-3, KN 61000-4-3 IEC 61000-4-4, KN 61000-4-4 IEC 61000-4-5, KN 61000-4-5 IEC 61000-4-6 (2001), KN 61000-4-6 IEC 61000-4-8, KN 61000-4-8 IEC 61000-4-11 (1995), KN 61000-4-11 (A2LA Cert. No. 1178.01) 10/04/05 Page 5 of 6
Building 16**:**	GR 1089: Issue 3 (2002): Sections 2 to 4 (excluding section 3.2.1 below 30 MHz, 4.6.10-17, 4.8) CISPR 22 (1997) CISPR 22, KN 22 EN 55022 (1998) EN 55022 CNS 13438 (conducted emissions only) AS/NZS CISPR 22 CFR 47, Part 15, Subpart B, using ANSI C63.4 IEC 61000-4-2, KN 61000-4-2 IEC 61000-4-3, KN 61000-4-3 IEC 61000-4-4, KN 61000-4-4 IEC 61000-4-5, KN 61000-4-5 IEC 61000-4-6 (2001), KN 61000-4-6 IEC 61000-4-8, KN 61000-4-8 IEC 61000-4-11 (1995), KN 61000-4-11
Building N, I & 7**:**	GR 1089: Issue 3 (2002): Sections 2 to 4 (excluding section 3.2.1 below 30 MHz, 3.3.1, 4.6.10-17 & 4.8) CISPR 22 (1997)

CISPR 22, KN 22
EN 55022 (1998)
EN 55022
CNS 13438 (conducted emissions only)
AS/NZS CISPR 22
CFR 47, Part 15, Subpart B, using ANSI C63.4
(RRL No. 2004-70, September 22, 2004)
IEC 61000-4-2, KN 61000-4-2
IEC 61000-4-3, KN 61000-4-3
IEC 61000-4-4, KN 61000-4-4
IEC 61000-4-5, KN 61000-4-5
IEC 61000-4-6 (2001), KN 61000-4-6
IEC 61000-4-8, KN 61000-4-8
IEC 61000-4-11 (1995), KN 61000-4-11

Building B**:**

GR 1089: Issue 3 (2002): Sections 2 to 4 (excluding section 3.2.1, 3.3.1, 4.6.10-17 & 4.8)
CISPR 22 (1997)(conducted emissions only)
CISPR 22 (conducted emissions only), KN 22
EN 55022 (1998)(conducted emissions only)
EN 55022 (conducted emissions only)
CNS 13438 (conducted emissions only)
AS/NZS CISPR 22 (conducted emissions only)
CFR 47, Part 15, Subpart B, using ANSI C63.4 (conducted emissions only)
(RRL No. 2004-70, September 22, 2004)
IEC 61000-4-2, KN 61000-4-2
IEC 61000-4-3, KN 61000-4-3
IEC 61000-4-4, KN 61000-4-4
IEC 61000-4-5, KN 61000-4-5
IEC 61000-4-6 (2001), KN 61000-4-6
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IEC 61000-4-8, KN 61000-4-8
IEC 61000-4-11 (1995), KN 61000-4-11

<u>On the following products or types of products </u>:

Information Technology Equipment (ITE), Telecommunications Network Equipment (TNE)

Appendix H: Test Equipment/Software Used to perform the test

Equip#	Manufacturer/ Model	Description	Last Cal	Next Due	Test Number(s)
025001	Micro-Coax/ UFB197C-1-0240-504504	RF Coaxial Cable, to 18GHz, 24 in	06-MAY-2005	06-MAY-2006	[20076], [20097], [20100], [20121]
025654	Micro-Coax/ UFB311A-1-0840-504504	RF Coaxial Cable, to 18GHz, 84 in	28-MAR-2005	28-MAR-2006	[20076], [20097], [20100], [20121]
030442	Micro-Coax/ UFB311A-0-4800-520520	RF Coaxial Cable, to 18GHz, 480 In.	28-MAR-2005	28-MAR-2006	[20076], [20097], [20100], [20121]
030565	Micro-Coax/ UFB311A-1-3510-504504	Rf Coaxial Cable to 18GHz	28-MAR-2005	28-MAR-2006	[20076], [20097], [20100], [20121]
031700	Micro-Tronics/ BRC50705	Notch Filter, SB:5.725-5.875GHz, to 12 GHz	07-FEB-2006	07-FEB-2007	[20100], [20121]
032671	Cisco/ TH0118	Mast Mount Preamplifier Array, 1-18GHz	20-JUN-2005	20-JUN-2006	[20076], [20097], [20100], [20121]
034188	Micro-Tronics/ BRC50703-02	Notch Filter, SB:5.150-5.350GHz, to 11GHz	22-JUN-2005	22-JUN-2006	[20100], [20121]
034189	Micro-Tronics/ BRC50704-02	Notch Filter, SB:5.470-5.725GHz, to 12GHz	22-JUN-2005	22-JUN-2006	[20100], [20121]
034304	Micro-Tronics/ BRM50702-02	Notch Filter, SB:2.4-2.5GHz, to 18GHz	22-JUN-2005	22-JUN-2006	[20121]
034972	Midwest Microwave/ ATT-0640-20-29M-02	Attenuator, 20dB, DC-40GHz	06-APR-2005	06-APR-2006	[20076], [20097]
035040	Micro-Tronics/ HPM50112-02	High pass Filter, 6.4-18GHz	22-JUN-2005	22-JUN-2006	[20100], [20121]
035267	Agilent/ E4440A	Precision Spectrum Analyzer	08-APR-2005	08-APR-2006	[20076], [20097], [20100], [20121]
035285	ETS-Lindgren/ 3117	Double Ridged Waveguide Horn Antenna	20-MAY-2005	20-MAY-2006	[20076], [20097], [20100], [20121]
037065	Midwest Microwave/ ADT-2588-MF-NNN-02	Port Saver	Cal Not Required	N/A	[20076], [20097], [20100], [20121]

Software used in the tests

A:Vasona File Version

Vasona File Version	Used in Subtests
4.194	[20097 - 1, 20097 - 2, 20097 - 3, 20097 - 4, 20097 - 5, 20097 - 6, 20097 - 7, 20097 - 8, 20097 - 9, 20097 - 10, 20097 - 11, 20097 - 12, 20097 - 13, 20097 - 14, 20100 - 1, 20100 - 2, 20100 - 3, 20100 - 4, 20100 - 5, 20100 - 6, 20100 - 7, 20100 - 8, 20100 - 9, 20100 - 10, 20100 - 11, 20100 - 12, 20100 - 13, 20100 - 14, 20100 - 15, 20100 - 16, 20100 - 17, 20100 - 18, 20100 - 19, 20100 - 20, 20100 - 21, 20100 - 22, 20100 - 23, 20100 - 24, 20100 - 25, 20100 - 26, 20100 - 27, 20100 - 28, 20100 - 29, 20100 - 30, 20100 - 31, 20100 - 32, 20100 - 33, 20100 - 34, 20100 - 35, 20100 - 36, 20100 - 37, 20100 - 38, 20100 - 39, 20100 - 40, 20100 - 41, 20100 - 42, 20076 - 1, 20076 - 2, 20076 - 3, 20076 - 4, 20076 - 5, 20076 - 6, 20076 - 7, 20076 - 8, 20076 - 9, 20076 - 10, 20076 - 11, 20076 - 12, 20076 - 13, 20076 - 14, 20121 - 1, 20121 - 2, 20121 - 3, 20121 - 4, 20121 - 5, 20121 - 6, 20121 - 7, 20121 - 8, 20121 - 9, 20121 - 10, 20121 - 11, 20121 - 12, 20121 - 13, 20121 - 14, 20121 - 15, 20121 - 16, 20121 - 17, 20121 - 18, 20121 - 19, 20121 - 20]

B:Other Software Used

Software Name	Version	Vendor	Description	Start Date	End Date
ECAT - BurstWare	4.23	Thermo Keytek	EFT/Burst Test Software	01-JAN-2000	Current
ECAT - PQFWare	2.1.3	Thermo Keytek	Voltage Dips and Interrupts Test Software	01-JAN-1997	Current
ECAT - SurgeWare	4.23	Thermo Keytek	Surge Test Software	01-JAN-2000	Current
ECAT - SurgeWare	5.30	Thermo Keytek	Voltage Protection Coordination Software	04-FEB-2004	Current
HFTS	B.00.01	Agilent Technologies	Harmonics/Flicker Test System Software	02-JUL-2001	Current
CTS	3.0.19	California Instruments	Harmonics/Flicker Test System Software	26-APR-2004	Current
CEWare32	4.00	Thermo Keytek	EMC Pro surge, EFT/B, VDI, Mag Immunity test software.	21-JUL-2004	Current