

EMC Test Report

Application for FCC Grant of Equipment Authorization Canada Certification Class II Permissive Change/Reassessment

Innovation, Science and Economic Development Canada RSS-Gen Issue 4 / RSS 247 Issue 1 FCC Part 15, Subpart E

Model: APINH205

IC CERTIFICATION #: 4675A-APINH205
FCC ID: Q9DAPINH205

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REVISION HISTORY

Rev#	Date	Comments	Modified By
-	May 16, 2016	First release	
1.0	May 16, 2016	Updated reference to C63.10. Updated test configuration.	MEH

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SCOPE

An electromagnetic emissions test has been performed on the Aruba Networks model APINH205, pursuant to the following rules:

RSS-Gen Issue 4 “General Requirements for Compliance of Radio Apparatus”
RSS 247 Issue 1 “Digital Transmission Systems (DTSS), Frequency Hopping Systems (FHSS) and Licence-Exempt Local Area Network (LE-LAN) Devices”
FCC Part 15, Subpart E requirements for UNII Devices

Conducted and radiated emissions data has been collected, reduced, and analyzed within this report in accordance with measurement guidelines set forth in the following reference standards and as outlined in National Technical Systems - Silicon Valley test procedures:

ANSI C63.10-2013
FCC General UNII Test Procedures KDB789033

The intentional radiator above has been tested in a simulated typical installation to demonstrate compliance with the relevant Industry Canada performance and procedural standards.

Final system data was gathered in a mode that tended to maximize emissions by varying orientation of EUT, orientation of power and I/O cabling, antenna search height, and antenna polarization.

Every practical effort was made to perform an impartial test using appropriate test equipment of known calibration. All pertinent factors have been applied to reach the determination of compliance.

OBJECTIVE

The primary objective of the manufacturer is compliance with the regulations outlined in the previous section.

Prior to marketing in the USA, all unlicensed transmitters and transceivers require certification. Receive-only devices operating between 30 MHz and 960 MHz are subject to either certification or a manufacturer’s declaration of conformity, with all other receive-only devices exempt from the technical requirements.

Prior to marketing in Canada, Class I transmitters, receivers and transceivers require certification. Class II devices are required to meet the appropriate technical requirements but are exempt from certification requirements.

Certification is a procedure where the manufacturer submits test data and technical information to a certification body and receives a certificate or grant of equipment authorization upon successful completion of the certification body’s review of the submitted documents. Once the equipment authorization has been obtained, the label

indicating compliance must be attached to all identical units, which are subsequently manufactured.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product which may result in increased emissions should be checked to ensure compliance has been maintained (i.e., printed circuit board layout changes, different line filter, different power supply, harnessing or I/O cable changes, etc.).

STATEMENT OF COMPLIANCE

The tested sample of Aruba Networks model APINH205 complied with the requirements of the following regulations:

RSS 247 Issue 1 “Digital Transmission Systems (DTSS), Frequency Hopping Systems (FHSS) and Licence-Exempt Local Area Network (LE-LAN) Devices”
FCC Part 15, Subpart E requirements for UNII Devices

Maintenance of compliance is the responsibility of the manufacturer. Any modifications to the product should be assessed to determine their potential impact on the compliance status of the device with respect to the standards detailed in this test report.

The test results recorded herein are based on a single type test of Aruba Networks model APINH205 and therefore apply only to the tested sample. The sample was selected and prepared by Rob Hastings of Aruba Networks.

DEVIATIONS FROM THE STANDARDS

Testing is based on a software change reducing power to address spurious emission near the band of operation. The spurious emissions testing was limited to specific frequency ranges observed in preliminary testing. Power measurements were performed to confirm final output power levels.

TEST RESULTS SUMMARY
UNII / LELAN DEVICES
OPERATION IN THE 5.15 – 5.25 GHZ BAND – ACCESS POINTS

FCC Rule Part		Description	Measured Value / Comments	Limit / Requirement	Result
15.407 (a) (1) (ii)		Output Power	a: 19.2dBm (82.6 mW) n20: 19.2dBm (83.5 mW) n40: 19.0dBm (80.1 mW) ac80: 14.9dBm (30.7 mW) (Max eirp: 25.2dBm (0.332W))	30 dBm EIRP <= 4W	Complies
15.407(b) (1) / 15.209		Spurious Emissions above 1GHz	53.9 dBμV/m @ 5399.0 MHz (-0.1 dB)	Refer to the limits section (p20) for restricted bands, all others -27 dBm/MHz EIRP	Complies

OPERATION IN THE 5.15 – 5.25 GHZ BAND

	RSS Rule Part	Description	Measured Value / Comments	Limit / Requirement	Result
	RSS-247 6.2.1 (1)	EIRP Output Power	ac80: 20.9dBm (0.123 W)	23 dBm (200 mW)	Complies
	RSS-247 6.2.1 (2)	Spurious Emissions above 1GHz	53.9 dBμV/m @ 5399.0 MHz (-0.1 dB)	Refer to the limits section (p20) for restricted bands, all others -27 dBm/MHz EIRP 26 dBc in 5.25-5.35 GHz band	Complies

OPERATION IN THE 5.25 – 5.35 GHZ BAND

FCC Rule Part	RSS Rule Part	Description	Measured Value / Comments	Limit / Requirement	Result (margin)
15.407(a) (2)	RSS-247 6.2.1 (2)	Output Power	a: 18.7dBm (74.1 mW) n20: 18.9dBm (77.6 mW) n40: 18.7dBm (74.1 mW) ac80: 15.6dBm (36.5 mW) (Max eirp: 24.9 dBm (306.5 mW))	24 dBm (250 mW) EIRP <= 1W	Complies
15.407(b) (2) / 15.209	RSS-247 6.2.2 (2)	Spurious Emissions above 1GHz	53.8 dBμV/m @ 5417.9 MHz (-0.2 dB)	Refer to the limits section (p20) for restricted bands, all others -27 dBm/MHz EIRP	Complies

OPERATION IN THE 5.47 – 5.725 GHZ BAND

FCC Rule Part	RSS Rule Part	Description	Measured Value / Comments	Limit / Requirement	Result (margin)
15.407(a) (2)	RSS-210 A9.2(2)	Output Power	a: 18.3dBm (67.8mW) n20: 18.4dBm (69.0 mW) n40: 19.1dBm (81.0 mW) ac80: 19.5dBm (88.6 mW) (Max eirp: 25.5 dBm (352.7 mW))	24 dBm (250 mW) EIRP <= 1W	Complies
15.407(b) (3) / 15.209	RSS-247 6.2.3 (2)	Spurious Emissions above 1GHz	52.2 dB μ V/m @ 5459.3 MHz (-1.8 dB)	Refer to the limits section (p20) for restricted bands, all others -27 dBm/MHz EIRP	Complies
	RSS-247 6.2.3	Non-operation in 5600 – 5650 MHz sub band	Device cannot operate in the 5600 – 5650 MHz band		Complies

OPERATION IN THE 5.725 – 5.85 GHZ BAND

FCC Rule Part	RSS Rule Part	Description	Measured Value / Comments	Limit / Requirement	Result (margin)
15.407(a) (3)	RSS-210 A9.2(2)	Output Power (multipoint systems)	a: 19.3dBm (85.4 mW) n20: 19.5dBm (88.4 mW) n40: 19.4dBm (87.9 mW) ac80: 16.2dBm (41.9 mW) (Max eirp: 25.5dBm (351.9mW))	30 dBm (1 W) EIRP <= 4W	Complies
15.407(b) (4) / 15.209	RSS-247 6.2.4 (2)	Spurious Emissions above 1GHz	65.4 dB μ V/m @ 5942.4 MHz (-2.9 dB)	Refer to the limits section (p20) for restricted bands, all others -17 dBm/MHz EIRP bandedge and -27 dBm/MHz EIRP	Complies

MEASUREMENT UNCERTAINTIES

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level and were calculated in accordance with UKAS document LAB 34.

Measurement Type	Measurement Unit	Frequency Range	Expanded Uncertainty
RF power, conducted (power meter)	dBm	25 to 7000 MHz	± 0.52 dB
RF power, conducted (Spectrum analyzer)	dBm	25 to 7000 MHz	± 0.7 dB
Conducted emission of transmitter	dBm	25 to 26500 MHz	± 0.7 dB
Conducted emission of receiver	dBm	25 to 26500 MHz	± 0.7 dB
Radiated emission (substitution method)	dBm	25 to 26500 MHz	± 2.5 dB
Radiated emission (field strength)	dB μ V/m	25 to 1000 MHz	± 3.6 dB
		1000 to 40000 MHz	± 6.0 dB
Conducted Emissions (AC Power)	dB μ V	0.15 to 30 MHz	± 2.4 dB

EQUIPMENT UNDER TEST (EUT) DETAILS

GENERAL

The Aruba Networks model APINH205 is an access point that is designed to be used in wireless networks. Since the EUT could be placed in any location in use, the EUT was treated as tabletop equipment during testing to simulate the end-user environment. The electrical rating of the EUT is 48Vdc supplied either via POE or an AC adapter rated 100-240V, 47-63 Hz, 0.75 Amps..

The sample was received on May 5, 2016 and tested on May 5, 6, 10 and 11, 2016. The EUT consisted of the following component(s):

Company	Model	Description	Serial Number	FCC ID
Aruba Networks	APINH205-2	Access Point	DN0010196	Q9DAPINH205

OTHER EUT DETAILS

802.11AC 2x2 dual radio access point
One radio fixed 2.4GHz, second radio fixed 5GHz
Radios can transmit simultaneous
Each radio is 2x2, does not support 1Tx modes
2.4GHz radio supports 11b/11g/n20/n40 data rates
5GHz radio supports 11a/n20/n40/VHT20/VHT40/VHT80 data rates
Operation on CH144 (20MHz), CH142 (40MHz), CH138 (80MHz) is supported
DFS Master Device
Indoor Use only
Internal antennas

ANTENNA SYSTEM

The antenna system consists of: Metal Sheet with 4dBi Gain Antennas for 2.4GHz Band and 6dBi Antenna for 5GHz Band

ENCLOSURE

The EUT enclosure is primarily constructed of metal and plastic. It measures approximately 8.3x3.7x15cm.

MODIFICATIONS

No modifications were made to the EUT during the time the product was at NTS Silicon Valley.

SUPPORT EQUIPMENT

No local support equipment was used during testing.

The following equipment was used as remote support equipment for emissions testing:

Company	Model	Description	Serial Number	FCC ID
Dell	E5440	Laptop	GDPNP12	DoC
NetGear	FS305	Switch	-	-

EUT INTERFACE PORTS

The I/O cabling configuration during testing was as follows:

Port	Connected To	Description	Cable(s)	
			Shielded or Unshielded	Length(m)
DC Power In	AC/DC Adapter	2Wire	Unshielded	1.9
Serial	USB/Serial Adapter / Remote Laptop	Multiconductor	Shielded	5.0
USB	Not connected	-	-	-
Ethernet (x4) Bottom	Remote Switch	CAT5	Unshielded	10
ENET0 (back)	Remote Switch	CAT5	Unshielded	10
Pass Through (back)	Remote Switch	CAT5	Unshielded	10

EUT OPERATION

The laptop computer was used to configure the system for continuous transmission via the serial connection. The EUT was configured to transmit continuously at the channel noted at the worse case data rate for the mode under test. Power was set to the maximum.

TEST SITE**GENERAL INFORMATION**

Final test measurements were taken at the test sites listed below. Pursuant to section 2.948 of the FCC's Rules and section 3.3 of RSP-100, construction, calibration, and equipment data has been filed with the Commission and with industry Canada.

Site	Designation / Registration Numbers		Location
	FCC	Canada	
Chamber 4	US0027	2845B-4	41039 Boyce Road Fremont, CA 94538-2435
Chamber 7	US0027	2845B-7	

ANSI C63.4 recommends that ambient noise at the test site be at least 6 dB below the allowable limits. Ambient levels are below this requirement. The test site(s) contain separate areas for radiated and conducted emissions testing. Considerable engineering effort has been expended to ensure that the facilities conform to all pertinent requirements of ANSI C63.4.

CONDUCTED EMISSIONS CONSIDERATIONS

Conducted emissions testing is performed in conformance with ANSI C63.10. Measurements are made with the EUT connected to the public power network through a nominal, standardized RF impedance, which is provided by a line impedance stabilization network, known as a LISN. A LISN is inserted in series with each current-carrying conductor in the EUT power cord.

RADIATED EMISSIONS CONSIDERATIONS

The FCC has determined that radiation measurements made in a shielded enclosure are not suitable for determining levels of radiated emissions. Radiated measurements are performed in an open field environment or in a semi-anechoic chamber. The test sites are maintained free of conductive objects within the CISPR defined elliptical area incorporated in ANSI C63.4 guidelines and meet the Normalized Site Attenuation (NSA) requirements of ANSI C63.4.

MEASUREMENT INSTRUMENTATION

RECEIVER SYSTEM

An EMI receiver as specified in CISPR 16-1-1 is used for emissions measurements. The receivers used can measure over the frequency range of 9 kHz up to 2000 MHz. These receivers allow both ease of measurement and high accuracy to be achieved. The receivers have Peak, Average, and CISPR (Quasi-peak) detectors built into their design so no external adapters are necessary. The receiver automatically sets the required bandwidth for the CISPR detector used during measurements. If the repetition frequency of the signal being measured is below 20Hz, peak measurements are made in lieu of Quasi-Peak measurements.

For measurements above the frequency range of the receivers, a spectrum analyzer is utilized because it provides visibility of the entire spectrum along with the precision and versatility required to support engineering analysis. Average measurements above 1000MHz are performed on the spectrum analyzer using the linear-average method with a resolution bandwidth of 1 MHz and a video bandwidth of 10 Hz, unless the signal is pulsed in which case the average (or video) bandwidth of the measuring instrument is reduced to onset of pulse desensitization and then increased.

INSTRUMENT CONTROL COMPUTER

Software is used to view and convert receiver measurements to the field strength at an antenna or voltage developed at the LISN measurement port, which is then compared directly with the appropriate specification limit. This provides faster, more accurate readings by performing the conversions described under Sample Calculations within the Test Procedures section of this report. Results are printed in a graphic and/or tabular format, as appropriate. A personal computer is used to record all measurements made with the receivers. The software used for radiated and conducted emissions measurements is NTS EMI Test Software (rev 2.10)

LINE IMPEDANCE STABILIZATION NETWORK (LISN)

Line conducted measurements utilize a fifty microhenry Line Impedance Stabilization Network as the monitoring point. The LISN used also contains a 250 uH CISPR adapter. This network provides for calibrated radio frequency noise measurements by the design of the internal low pass and high pass filters on the EUT and measurement ports, respectively.

FILTERS/ATTENUATORS

External filters and precision attenuators are often connected between the receiving antenna or LISN and the receiver. This eliminates saturation effects and non-linear operation due to high amplitude transient events.

ANTENNAS

A loop antenna is used below 30 MHz. For the measurement range 30 MHz to 1000 MHz either a combination of a biconical antenna and a log periodic or a bi-log antenna is used. Above 1000 MHz, horn antennas are used. The antenna calibration factors to convert the received voltage to an electric field strength are included with appropriate cable loss and amplifier gain factors to determine an overall site factor, which is then programmed into the test receivers or incorporated into the test software.

ANTENNA MAST AND EQUIPMENT TURNTABLE

The antennas used to measure the radiated electric field strength are mounted on a non-conductive antenna mast equipped with a motor-drive to vary the antenna height. Measurements below 30 MHz are made with the loop antenna at a fixed height of 1m above the ground plane.

ANSI C63.10 specifies that the test height above ground for table mounted devices shall be 1.5m for measurements above 1GHz and 80 centimeters for measurements below 1GHz. Floor mounted equipment shall be placed on the ground plane if the device is normally used on a conductive floor or separated from the ground plane by insulating material from 3 to 12 mm if the device is normally used on a non-conductive floor as specified in ANSI C63.4. During radiated measurements, the EUT is positioned on a motorized turntable in conformance with this requirement.

INSTRUMENT CALIBRATION

All test equipment is regularly checked to ensure that performance is maintained in accordance with the manufacturer's specifications. All antennas are calibrated at regular intervals with respect to tuned half-wave dipoles. An exhibit of this report contains the list of test equipment used and calibration information.

TEST PROCEDURES**EUT AND CABLE PLACEMENT**

The regulations require that interconnecting cables be connected to the available ports of the unit and that the placement of the unit and the attached cables simulate the worst case orientation that can be expected from a typical installation, so far as practicable. To this end, the position of the unit and associated cabling is varied within the guidelines of ANSI C63.10, and the worst-case orientation is used for final measurements.

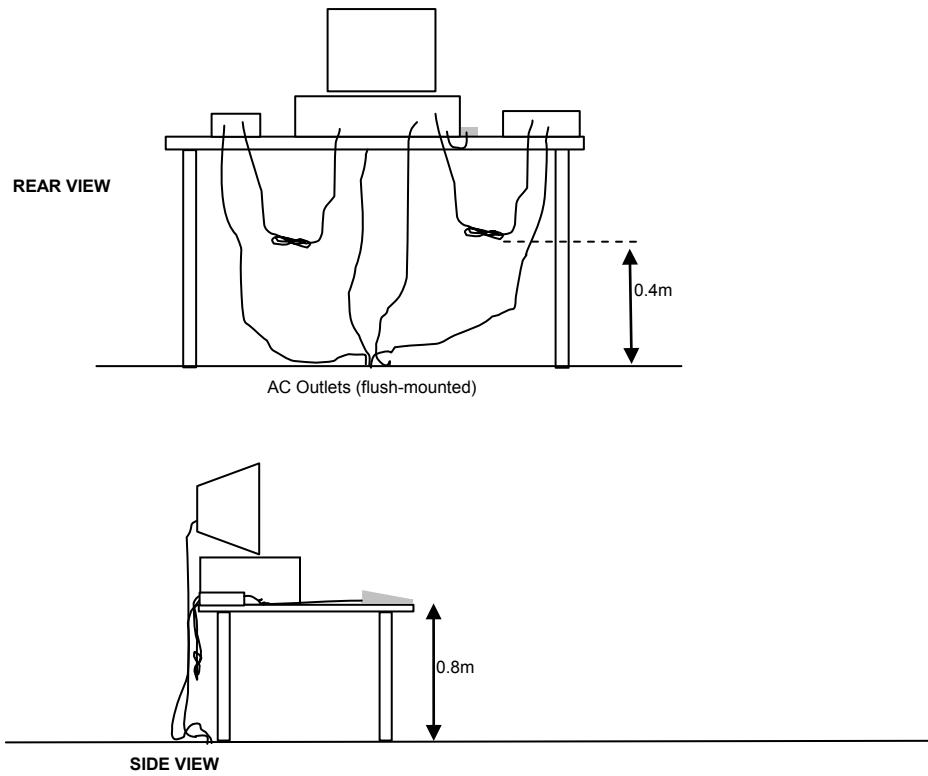
RADIATED EMISSIONS

A preliminary scan of the radiated emissions is performed in which all significant EUT frequencies are identified with the system in a nominal configuration. At least two scans are performed, one scan for each antenna polarization (horizontal and vertical; loop parallel and perpendicular to the EUT). During the preliminary scans, the EUT is rotated through 360°, the antenna height is varied (for measurements above 30 MHz) and cable positions are varied to determine the highest emission relative to the limit. Preliminary scans may be performed in a fully anechoic chamber for the purposes of identifying the frequencies of the highest emissions from the EUT.

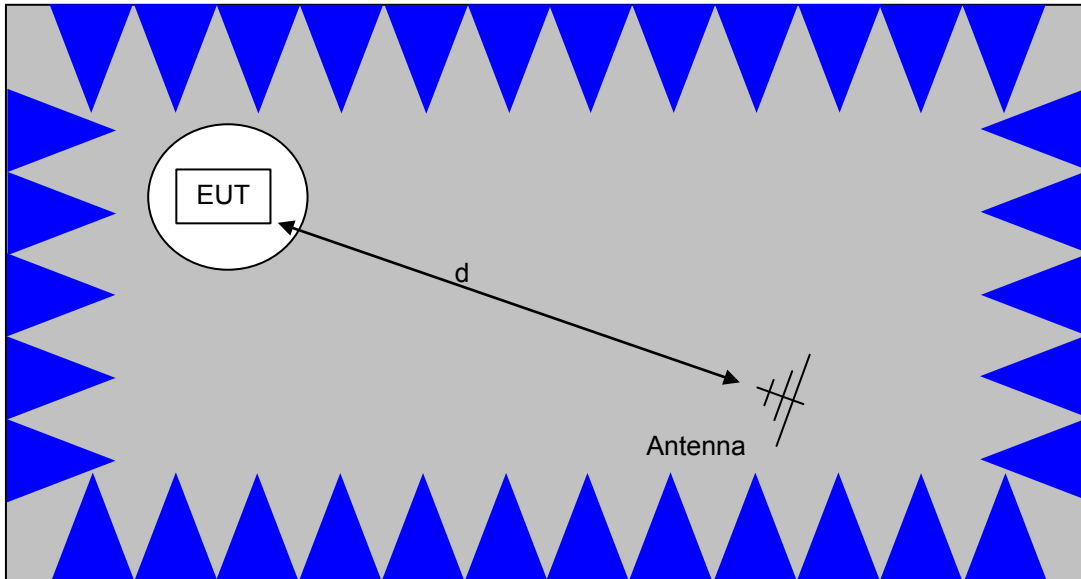
A speaker is provided in the receiver to aid in discriminating between EUT and ambient emissions. Other methods used during the preliminary scan for EUT emissions involve scanning with near field magnetic loops, monitoring I/O cables with RF current clamps, and cycling power to the EUT.

Final maximization is a phase in which the highest amplitude emissions identified in the spectral search are viewed while the EUT azimuth angle is varied from 0 to 360 degrees relative to the receiving antenna. The azimuth, which results in the highest emission is then maintained while varying the antenna height from one to four meters (for measurements above 30 MHz, measurements below 30 MHz are made with the loop antenna at a fixed height of 1m). The result is the identification of the highest amplitude for each of the highest peaks. Each recorded level is corrected in the receiver using appropriate factors for cables, connectors, antennas, and preamplifier gain.

When testing above 18 GHz, the receive antenna is located at 1 meter from the EUT and the antenna height is restricted to a maximum of 2.5 meters.

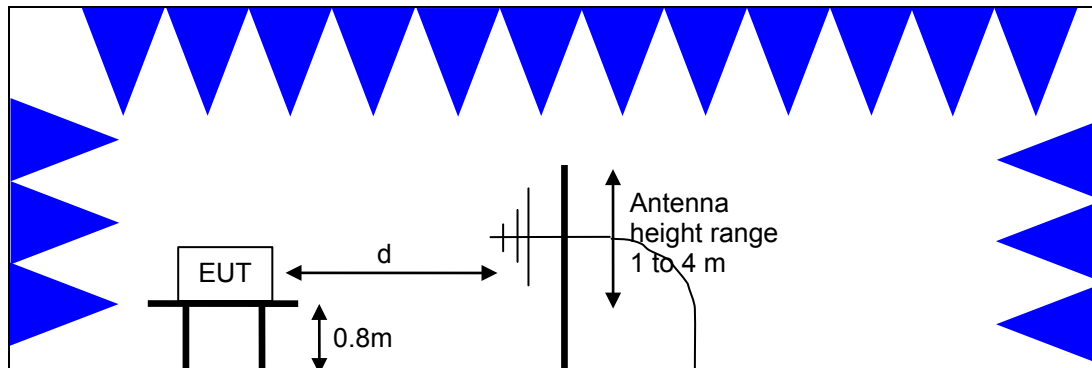


Typical Test Configuration for Radiated Field Strength Measurements



The anechoic materials on the walls and ceiling ensure compliance with the normalized site attenuation requirements of CISPR 16 / CISPR 22 / ANSI C63.4 for an alternate test site at the measurement distances used.

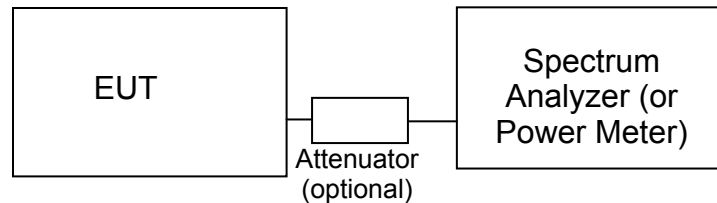
Floor-standing equipment is placed on the floor with insulating supports between the unit and the ground plane.



Test Configuration for Radiated Field Strength Measurements
Semi-Anechoic Chamber, Plan and Side Views

CONDUCTED EMISSIONS FROM ANTENNA PORT

Direct measurements of power, bandwidth and power spectral density are performed, where possible, with the antenna port of the EUT connected to either the power meter or spectrum analyzer via a suitable attenuator and/or filter. These are used to ensure that the front end of the measurement instrument is not overloaded by the fundamental transmission.

Test Configuration for Antenna Port Measurements

Measurement bandwidths (video and resolution) are set in accordance with the relevant standards and NTS Silicon Valley's test procedures for the type of radio being tested. When power measurements are made using a resolution bandwidth less than the signal bandwidth the power is calculated by summing the power across the signal bandwidth using either the analyzer channel power function or by capturing the trace data and calculating the power using software. In both cases the summed power is corrected to account for the equivalent noise bandwidth (ENBW) of the resolution bandwidth used.

If power averaging is used (typically for certain digital modulation techniques), the EUT is configured to transmit continuously. Power averaging is performed using either the built-in function of the analyzer or, if the analyzer does not feature power averaging, using external software. In both cases the average power is calculated over a number of sweeps (typically 100). When the EUT cannot be configured to continuously transmit then either the analyzer is configured to perform a gated sweep to ensure that the power is averaged over periods that the device is transmitting or power averaging is disabled and a max-hold feature is used.

If a power meter is used to make output power measurements the sensor head type (peak or average) is stated in the test data table.

BANDWIDTH MEASUREMENTS

The 6dB, 20dB, 26dB and/or 99% signal bandwidth are measured using the bandwidths recommended by ANSI C63.10 and RSS GEN.

SPECIFICATION LIMITS AND SAMPLE CALCULATIONS

The limits for conducted emissions are given in units of microvolts, and the limits for radiated emissions are given in units of microvolts per meter at a specified test distance. Data is measured in the logarithmic form of decibels relative to one microvolt, or dB microvolts (dBuV). For radiated emissions, the measured data is converted to the field strength at the antenna in dB microvolts per meter (dBuV/m). The results are then converted to the linear forms of uV and uV/m for comparison to published specifications.

For reference, converting the specification limits from linear to decibel form is accomplished by taking the base ten logarithm, then multiplying by 20. These limits in both linear and logarithmic form are as follows:

CONDUCTED EMISSIONS SPECIFICATION LIMITS: FCC 15.207; FCC 15.107(a), RSS GEN

The table below shows the limits for the emissions on the AC power line from an intentional radiator and a receiver.

Frequency (MHz)	Average Limit (dBuV)	Quasi Peak Limit (dBuV)
0.150 to 0.500	Linear decrease on logarithmic frequency axis between 56.0 and 46.0	Linear decrease on logarithmic frequency axis between 66.0 and 56.0
0.500 to 5.000	46.0	56.0
5.000 to 30.000	50.0	60.0

GENERAL TRANSMITTER RADIATED EMISSIONS SPECIFICATION LIMITS

The table below shows the limits for the spurious emissions from transmitters that fall in restricted bands¹.

Frequency Range (MHz)	Limit (uV/m)	Limit (dBuV/m @ 3m)
0.009-0.490	2400/F _{KHz} @ 300m	67.6-20*log ₁₀ (F _{KHz}) @ 300m
0.490-1.705	24000/F _{KHz} @ 30m	87.6-20*log ₁₀ (F _{KHz}) @ 30m
1.705 to 30	30 @ 30m	29.5 @ 30m
30 to 88	100 @ 3m	40 @ 3m
88 to 216	150 @ 3m	43.5 @ 3m
216 to 960	200 @ 3m	46.0 @ 3m
Above 960	500 @ 3m	54.0 @ 3m

FCC 15.407 (a) OUTPUT POWER LIMITS

The table below shows the limits for output power and output power density. For the 5250-5350 and 5470-5725 MHz bands, where the signal bandwidth is less than 20 MHz the maximum output power is reduced to the power spectral density limit plus 10 times the log of the bandwidth (in MHz).

Operating Frequency (MHz)	Output Power	Power Spectral Density
5150 – 5250	1Watt (30 dBm)	17 dBm/MHz
5250 – 5350 and 5470-5725	250 mW (24 dBm)	11 dBm/MHz
5725 – 5825	1 Watt (30 dBm)	30 dBm/500kHz

For system using antennas with gains exceeding 6dBi, the output power and power spectral density limits are reduced by 1dB for every dB the antenna gain exceeds 6dBi.

OUTPUT POWER LIMITS –LELAN DEVICES

The table below shows the limits for output power and output power density defined by RSS 247. Where the signal bandwidth is less than 20 MHz the maximum output power is reduced to the power spectral density limit plus 10 times the log of the bandwidth (in MHz).

Operating Frequency (MHz)	Output Power	Power Spectral Density
5150 – 5250	200mW (23 dBm) eirp	10 dBm/MHz eirp
5250 – 5350 and 5470 - 5725	250 mW (24 dBm) ² 1W (30dBm) eirp	11 dBm/MHz
5725 – 5825	1 Watt (30 dBm) 4W eirp	30 dBm/500kHz

¹ The restricted bands are detailed in FCC 15.205 and RSS-Gen Table 6

² If EIRP exceeds 500mW the device must employ TPC

SPURIOUS EMISSIONS LIMITS –UNII and LELAN DEVICES

The spurious emissions limits for signals below 1GHz are the FCC/RSS-Gen general limits. For emissions above 1GHz, signals in restricted bands are subject to the FCC/RSS-Gen general limits. All other signals have a limit of -27dBm/MHz , which is field strength of 68.3dBuV/m/MHz at a distance of 3m. For devices operating in the 5725-5850 MHz bands under the LELAN/UNII rules, the limit within 10MHz of the allocated band is increased to -17dBm/MHz .

SAMPLE CALCULATIONS - CONDUCTED EMISSIONS

Receiver readings are compared directly to the conducted emissions specification limit (decibel form) as follows:

$$R_r - S = M$$

where:

R_r = Receiver Reading in dBuV

S = Specification Limit in dBuV

M = Margin to Specification in +/- dB

SAMPLE CALCULATIONS - RADIATED EMISSIONS

Receiver readings are compared directly to the specification limit (decibel form). The receiver internally corrects for cable loss, preamplifier gain, and antenna factor. The calculations are in the reverse direction of the actual signal flow, thus cable loss is added and the amplifier gain is subtracted. The Antenna Factor converts the voltage at the antenna coaxial connector to the field strength at the antenna elements.

A distance factor, when used for electric field measurements above 30MHz, is calculated by using the following formula:

$$F_d = 20 * \text{LOG}_{10} (D_m/D_s)$$

where:

F_d = Distance Factor in dB

D_m = Measurement Distance in meters

D_s = Specification Distance in meters

For electric field measurements below 30MHz the extrapolation factor is either determined by making measurements at multiple distances or a theoretical value is calculated using the formula:

$$F_d = 40 * \text{LOG}_{10} (D_m/D_s)$$

Measurement Distance is the distance at which the measurements were taken and Specification Distance is the distance at which the specification limits are based. The antenna factor converts the voltage at the antenna coaxial connector to the field strength at the antenna elements.

The margin of a given emission peak relative to the limit is calculated as follows:

$$R_c = R_r + F_d$$

and

$$M = R_c - L_s$$

where:

R_r = Receiver Reading in dBuV/m

F_d = Distance Factor in dB

R_c = Corrected Reading in dBuV/m

L_s = Specification Limit in dBuV/m

M = Margin in dB Relative to Spec

SAMPLE CALCULATIONS - FIELD STRENGTH TO EIRP CONVERSION

Where the radiated electric field strength is expressed in terms of the equivalent isotropic radiated power (eirp), or where a field strength measurement of output power is made in lieu of a direct measurement, the following formula is used to convert between eirp and field strength at a distance of d (meters) from the equipment under test:

$$E = \frac{1000000 \sqrt{30 P}}{d} \text{ microvolts per meter}$$

where P is the eirp (Watts)

For a measurement at 3m the conversion from a logarithmic value for field strength (dBuV/m) to an eirp power (dBm) is -95.3dB.

Appendix A Test Equipment Calibration Data

Radiated Emissions, 1,000 - 6,500 MHz, 05-May-16

<u>Manufacturer</u>	<u>Description</u>	<u>Model</u>	<u>Asset #</u>	<u>Calibrated</u>	<u>Cal Due</u>
Rohde & Schwarz	EMI Test Receiver, 20 Hz-40 GHz	ESIB40 (1088.7490.40)	2493	2/20/2016	2/20/2017
EMCO	Antenna, Horn, 1-18 GHz	3115	2733	11/18/2014	11/18/2016

Radiated Emissions, 1,000 - 6,500 MHz, 06-May-16

<u>Manufacturer</u>	<u>Description</u>	<u>Model</u>	<u>Asset #</u>	<u>Calibrated</u>	<u>Cal Due</u>
EMCO	Antenna, Horn, 1-18 GHz	3115	1561	6/27/2014	6/27/2016
Rohde & Schwarz	EMI Test Receiver, 20 Hz-40 GHz	ESIB40 (1088.7490.40)	2493	2/20/2016	2/20/2017

Radiated Emissions, 1,000 - 6,500 MHz, 10-May-16

<u>Manufacturer</u>	<u>Description</u>	<u>Model</u>	<u>Asset #</u>	<u>Calibrated</u>	<u>Cal Due</u>
EMCO	Antenna, Horn, 1-18 GHz	3115	487	7/29/2014	7/29/2016
Rohde & Schwarz	EMI Test Receiver, 20 Hz-7 GHz	ESIB7	1538	12/19/2015	12/19/2016

Radio Antenna Port (Power and Spurious Emissions), 10-May-16

<u>Manufacturer</u>	<u>Description</u>	<u>Model</u>	<u>Asset #</u>	<u>Calibrated</u>	<u>Cal Due</u>
Agilent Technologies	PSA, Spectrum Analyzer, (installed options, 111, 115, 123, 1DS, B7J, HYX,	E4446A	2139	6/22/2015	6/22/2016

Radio Antenna Port (Power and Spurious Emissions), 11-May-16

<u>Manufacturer</u>	<u>Description</u>	<u>Model</u>	<u>Asset #</u>	<u>Calibrated</u>	<u>Cal Due</u>
Agilent Technologies	PSA, Spectrum Analyzer, (installed options, 111, 115, 123, 1DS, B7J, HYX,	E4446A	2139	6/22/2015	6/22/2016

Appendix B Test Data

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EMC Test Data

Client:	Aruba Networks	Job Number:	JD99613
Product:	APINH205	T-Log Number:	T101553
System Configuration:	-	Project Manager:	Christine Krebill
Contact:	Rob Hastings	Project Coordinator:	-
Emissions Standard(s):	FCC 15.407 / RSS-210	Class:	B
Immunity Standard(s):	-	Environment:	-

EMC Test Data

For The

Aruba Networks

Product

APINH205

Date of Last Test: 5/10/2016

Client: Aruba Networks	Job Number: JD99613
Model: APINH205	T-Log Number: T101553
	Project Manager: Christine Krebill
Contact: Rob Hastings	Project Coordinator: -
Standard: FCC 15.407 / RSS-210	Class: N/A

Duty Cycle

Date of Test: 5/3/2016
 Test Engineer: Mark Hill
 Test Location: FT Lab #4

Duty cycle measurements performed on the worse case data rate for power (from original testing/filing)

Notes: Measurements taken with maximum RBW/VBW settings allowed.

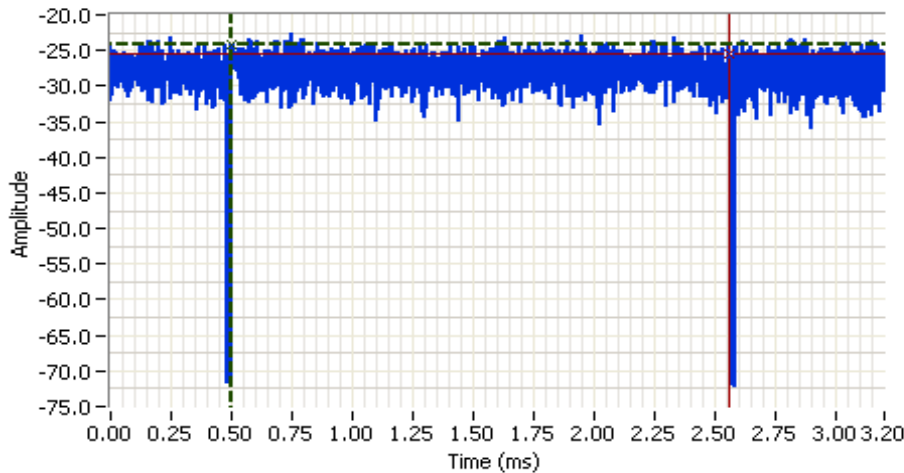
Mode	Data Rate	Duty Cycle (x)	Constant DC?	T (ms)	Pwr Cor Factor*	Lin Volt Cor Factor**	Min VBW for FS (Hz)
11a	6Mbps	0.99	Yes	2.1	0.0	0.0	10.0
n20	MCS8	0.98	Yes	1.0	0.1	0.2	10.0
n40	MCS0	0.96	Yes	0.5	0.2	0.3	2024.3
ac80	VHT0	0.93	Yes	0.3	0.3	0.6	3921.6

* Correction factor when using RMS/Power averaging - $10 \cdot \log(1/x)$

** Correction factor when using linear voltage average - $20 \cdot \log(1/x)$

T = Minimum transmission duration

Client: Aruba Networks	Job Number: JD99613
Model: APINH205	T-Log Number: T101553
Contact: Rob Hastings	Project Manager: Christine Krebill
Standard: FCC 15.407 / RSS-210	Project Coordinator: -
	Class: N/A

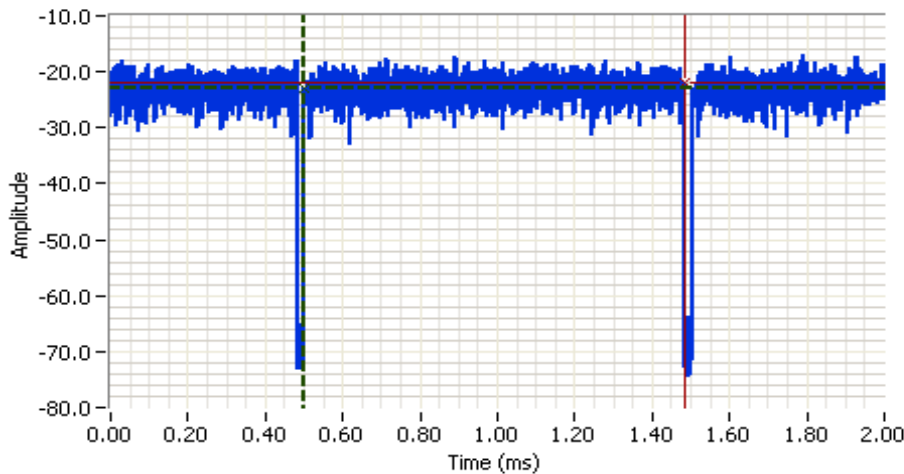


Analyzer Settings
 Agilent Technologies, E4446A
 CF: 5194.661 MHz
 SPAN: 0.000 MHz
 RB: 8.000 MHz
 VB: 8.000 MHz
 Detector: POS
 Attn: 10 DB
 RL Offset: 0.0 DB
 Sweep Time: 3.2ms
 Ref Lvl: 0.0 DBM

Comments
 11a - 6Mbps
 Tx off = 0.020ms
 Tx on = 2.06ms

Cursor 1 0.5008 -24.3  Delta Time (ms) 2.059

Cursor 2 2.5600 -25.6  Delta Amplitude 1.3



Analyzer Settings
 Agilent Technologies, E4446A
 CF: 5200.000 MHz
 SPAN: 0.000 MHz
 RB: 8.000 MHz
 VB: 8.000 MHz
 Detector: POS
 Attn: 10 DB
 RL Offset: 0.0 DB
 Sweep Time: 2.0ms
 Ref Lvl: 0.0 DBM

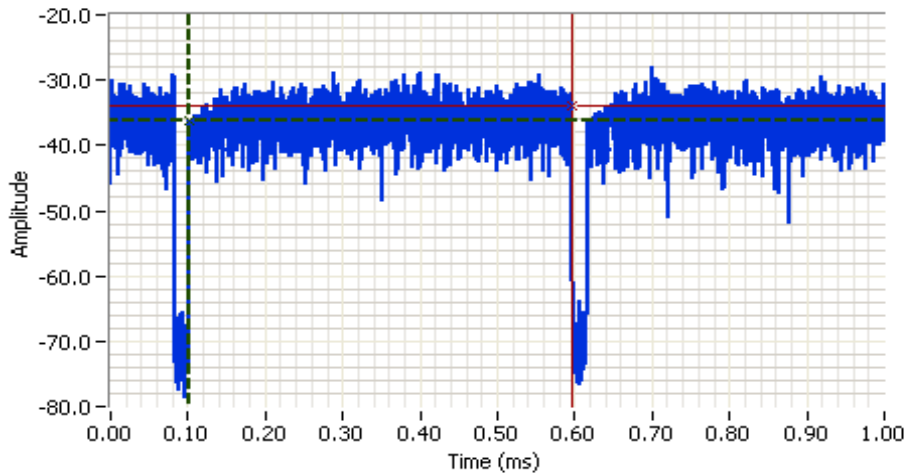
Comments
 11n (20MHz) - MCS8
 Tx off = 0.021ms
 Tx on = 0.981ms

Cursor 1 0.5016 -23.0  Delta Time (ms) 0.981

Cursor 2 1.4824 -22.0  Delta Amplitude 1.1



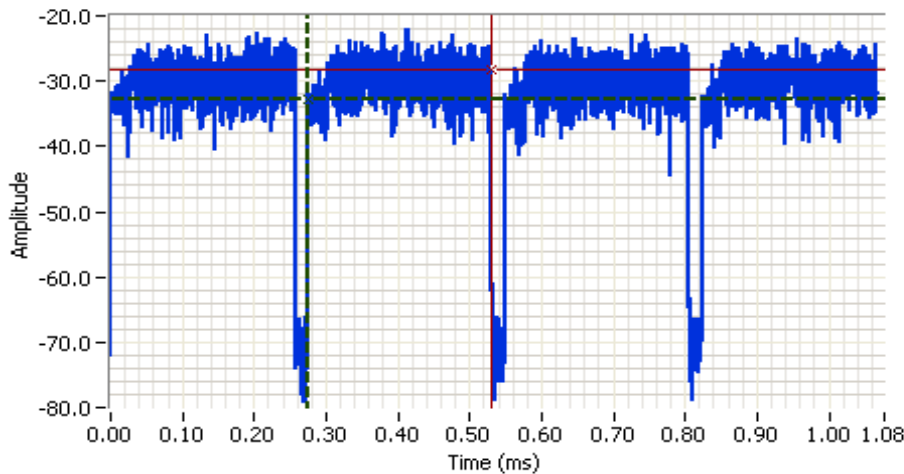
Client: Aruba Networks	Job Number: JD99613
Model: APINH205	T-Log Number: T101553
Contact: Rob Hastings	Project Manager: Christine Krebill
Standard: FCC 15.407 / RSS-210	Project Coordinator: -
	Class: N/A



Analyzer Settings
 Agilent Technologies, E4446A
 CF: 5190.000 MHz
 SPAN: 0.000 MHz
 RB: 8.000 MHz
 VB: 8.000 MHz
 Detector: POS
 Attn: 10 DB
 RL Offset: 0.0 DB
 Sweep Time: 1.0ms
 Ref Lvl: 0.0 DBM

Comments
 11n (40MHz) - MCS8
 Tx off = 0.019ms
 Tx on = 0.494ms

Cursor 1	0.1018	-36.2		Delta Time (ms)	0.494
Cursor 2	0.5956	-33.9		Delta Amplitude	2.3



Analyzer Settings
 Agilent Technologies, E4446A
 CF: 5210.000 MHz
 SPAN: 0.000 MHz
 RB: 8.000 MHz
 VB: 8.000 MHz
 Detector: POS
 Attn: 10 DB
 RL Offset: 0.0 DB
 Sweep Time: 1.1ms
 Ref Lvl: 0.0 DBM

Comments
 11ac (80MHz) - VHT0
 Tx off = 0.018ms
 Tx on = 0.255ms

Cursor 1	0.2755	-32.9		Delta Time (ms)	0.255
Cursor 2	0.5307	-28.3		Delta Amplitude	4.6





EMC Test Data

Client:	Aruba Networks	Job Number:	JD99613
Model:	APINH205	T-Log Number:	T101553
Contact:	Rob Hastings	Project Manager:	Christine Krebill
Standard:	FCC 15.407 / RSS-210	Project Coordinator:	-
		Class:	N/A

RSS-247 and FCC 15.407 (UNII) Radiated Spurious Emissions

Test Specific Details

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

General Test Configuration

The EUT and all local support equipment were located on the turntable for radiated spurious emissions testing. For radiated emissions testing the measurement antenna was located 3 meters from the EUT, unless otherwise noted.

Ambient Conditions:

Temperature: 20-23 °C
Rel. Humidity: 30-37 %



EMC Test Data

Client: Aruba Networks	Job Number: JD99613
Model: APINH205	T-Log Number: T101553
Contact: Rob Hastings	Project Manager: Christine Krebill
Standard: FCC 15.407 / RSS-210	Project Coordinator: -
	Class: N/A

Summary of Results

Run #	Mode	Channel	Target Power Setting	Final Power Setting	Test Performed	Limit	Result / Margin
11a operation							
1	a	36 - 5180MHz	q72	q68	Radiated Emissions, 4900-5460MHz	FCC 15.209 / 15 E	53.8 dBµV/m @ 5357.7 MHz (-0.2 dB)
	a	40 - 5200MHz	q72	q72	Radiated Emissions, 4900-5460MHz	FCC 15.209 / 15 E	51.4 dBµV/m @ 5097.4 MHz (-2.6 dB)
	a	48 - 5240MHz	q72	q60	Radiated Emissions, 4900-5460MHz	FCC 15.209 / 15 E	53.9 dBµV/m @ 5399.0 MHz (-0.1 dB)
n20 operation							
2	n20	36 - 5180MHz	q72	q72	Radiated Emissions, 4900-5460MHz	FCC 15.209 / 15 E	49.3 dBµV/m @ 5107.6 MHz (-4.7 dB)
	n20	40 - 5200MHz	q72	q72	Radiated Emissions, 4900-5460MHz	FCC 15.209 / 15 E	53.7 dBµV/m @ 5358.6 MHz (-0.3 dB)
	n20	48 - 5240MHz	q72	q68	Radiated Emissions, 4900-5460MHz	FCC 15.209 / 15 E	53.9 dBµV/m @ 5398.7 MHz (-0.1 dB)
n40 operation							
3	n40	38 - 5190MHz	q65	q60	Radiated Emissions, 4900-5460MHz	FCC 15.209 / 15 E	53.2 dBµV/m @ 5149.2 MHz (-0.8 dB)
	n40	46 - 5230MHz	q72	q72	Radiated Emissions, 4900-5460MHz	FCC 15.209 / 15 E	52.4 dBµV/m @ 5394.4 MHz (-1.6 dB)
ac80 operation							
4	ac80	42 - 5210MHz	q53	q53	Radiated Emissions, 4900-5460MHz	FCC 15.209 / 15 E	52.9 dBµV/m @ 5148.3 MHz (-1.1 dB)



EMC Test Data

Client: Aruba Networks	Job Number: JD99613
Model: APINH205	T-Log Number: T101553
Contact: Rob Hastings	Project Manager: Christine Krebill
Standard: FCC 15.407 / RSS-210	Project Coordinator: -
	Class: N/A

Summary of Results

Run #	Mode	Channel	Target Power Setting	Final Power Setting	Test Performed	Limit	Result / Margin
11a operation							
5	a	52 - 5260MHz	q71	q58	Radiated Emissions, 4900-5460MHz	FCC 15.209 / 15 E	53.8 dBµV/m @ 5417.9 MHz (-0.2 dB)
	a	60 - 5300MHz	q70	q56	Radiated Emissions, 4900-5460MHz	FCC 15.209 / 15 E	53.7 dBµV/m @ 5457.7 MHz (-0.3 dB)
	a	64 - 5320MHz	q69	q69	Radiated Emissions, 4900-5460MHz	FCC 15.209 / 15 E	52.8 dBµV/m @ 5399.1 MHz (-1.2 dB)
n20 operation							
6	n20	52 - 5260MHz	q72	q68	Radiated Emissions, 4900-5460MHz	FCC 15.209 / 15 E	53.6 dBµV/m @ 5421.5 MHz (-0.4 dB)
	n20	60 - 5300MHz	q72	q64	Radiated Emissions, 4900-5460MHz	FCC 15.209 / 15 E	53.7 dBµV/m @ 5458.6 MHz (-0.3 dB)
	n20	64 - 5320MHz	q71	q71	Radiated Emissions, 4900-5460MHz	FCC 15.209 / 15 E	52.2 dBµV/m @ 5401.5 MHz (-1.8 dB)
n40 operation							
7	n40	54 - 5270MHz	q72	q72	Radiated Emissions, 4900-5460MHz	FCC 15.209 / 15 E	53.4 dBµV/m @ 5426.3 MHz (-0.6 dB)
	n40	62 - 5310MHz	q67	q62	Radiated Emissions, 4900-5460MHz	FCC 15.209 / 15 E	53.8 dBµV/m @ 5351.5 MHz (-0.2 dB)
ac80 operation							
8	ac80	58 - 5290MHz	q58	q56	Radiated Emissions, 4900-5460MHz	FCC 15.209 / 15 E	53.7 dBµV/m @ 5350.7 MHz (-0.3 dB)



EMC Test Data

Client: Aruba Networks	Job Number: JD99613
Model: APINH205	T-Log Number: T101553
Contact: Rob Hastings	Project Manager: Christine Krebill
Standard: FCC 15.407 / RSS-210	Project Coordinator: -
	Class: N/A

Summary of Results

Run #	Mode	Channel	Target Power Setting	Final Power Setting	Test Performed	Limit	Result / Margin
11a operation							
9	a	100 - 5500MHz	q68	q68	Radiated Emissions, 5350-5900MHz	FCC 15.209 / 15 E	51.1 dBµV/m @ 5423.0 MHz (-2.9 dB)
	a	116 - 5580MHz	q67	q67	Radiated Emissions, 5350-5900MHz	FCC 15.209 / 15 E	50.1 dBµV/m @ 5418.9 MHz (-3.9 dB)
	a	140 - 5700MHz	q69	q69	Radiated Emissions, 5350-5900MHz	FCC 15.209 / 15 E	64.9 dBµV/m @ 5857.9 MHz (-3.4 dB)
n20 operation							
10	n20	100 - 5500MHz	q69	q69	Radiated Emissions, 5350-5900MHz	FCC 15.209 / 15 E	48.5 dBµV/m @ 5421.0 MHz (-5.5 dB)
	n20	116 - 5580MHz	q69	q69	Radiated Emissions, 5350-5900MHz	FCC 15.209 / 15 E	47.7 dBµV/m @ 5422.5 MHz (-6.3 dB)
	n20	140 - 5700MHz	q68	q68	Radiated Emissions, 5350-5900MHz	FCC 15.209 / 15 E	65.7 dBµV/m @ 5861.4 MHz (-2.6 dB)
n40 operation							
11	n40	102 - 5510MHz	q67	q67	Radiated Emissions, 5350-5900MHz	FCC 15.209 / 15 E	50.8 dBµV/m @ 5460.0 MHz (-3.2 dB)
	n40	110 - 5550MHz	q72	q72	Radiated Emissions, 5350-5900MHz	FCC 15.209 / 15 E	49.0 dBµV/m @ 5456.5 MHz (-5.0 dB)
ac80 operation							
12	ac80	106 - 5530MHz	q55	q55	Radiated Emissions, 5350-5900MHz	FCC 15.209 / 15 E	52.2 dBµV/m @ 5459.3 MHz (-1.8 dB)
	ac80	122 - 5610MHz	q72	q72	Radiated Emissions, 5350-5900MHz	FCC 15.209 / 15 E	49.9 dBµV/m @ 5453.6 MHz (-4.1 dB)



EMC Test Data

Client: Aruba Networks	Job Number: JD99613
Model: APINH205	T-Log Number: T101553
Contact: Rob Hastings	Project Manager: Christine Krebill
Standard: FCC 15.407 / RSS-210	Project Coordinator: -
	Class: N/A

Summary of Results

Run #	Mode	Channel	Target Power Setting	Final Power Setting	Test Performed	Limit	Result / Margin
11a operation							
13	a	149 - 5745MHz	q65	q65	Radiated Emissions, 5600-6000MHz	FCC 15.209 / 15 E	64.2 dBµV/m @ 5902.9 MHz (-4.1 dB)
	a	157 - 5785MHz	q70	q70	Radiated Emissions, 5600-6000MHz	FCC 15.209 / 15 E	64.9 dBµV/m @ 5946.8 MHz (-3.4 dB)
	a	165 - 5825MHz	q72	q72	Radiated Emissions, 5600-6000MHz	FCC 15.209 / 15 E	64.9 dBµV/m @ 5982.9 MHz (-3.4 dB)
n20 operation							
14	n20	149 - 5745MHz	q65	q65	Radiated Emissions, 5600-6000MHz	FCC 15.209 / 15 E	64.2 dBµV/m @ 5902.4 MHz (-4.1 dB)
	n20	157 - 5785MHz	q72	q72	Radiated Emissions, 5600-6000MHz	FCC 15.209 / 15 E	65.4 dBµV/m @ 5942.4 MHz (-2.9 dB)
	n20	165 - 5825MHz	q72	q72	Radiated Emissions, 5600-6000MHz	FCC 15.209 / 15 E	64.5 dBµV/m @ 5991.4 MHz (-3.8 dB)
n40 operation							
15	n40	151 - 5755MHz	q65	q65	Radiated Emissions, 5600-6000MHz	FCC 15.209 / 15 E	60.9 dBµV/m @ 5909.5 MHz (-7.4 dB)
	n40	159 - 5795MHz	q72	q72	Radiated Emissions, 5600-6000MHz	FCC 15.209 / 15 E	61.4 dBµV/m @ 5947.4 MHz (-6.9 dB)
ac80 operation							
16	ac80	155 - 5775MHz	q58	q58	Radiated Emissions, 5600-6000MHz	FCC 15.209 / 15 E	59.2 dBµV/m @ 5926.7 MHz (-9.1 dB)

Modifications Made During Testing

No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.

Notes

Testing limited in frequency based on the results from TCB audit testing. Tabular results represent the worse case (least margin) results observed.

Client: Aruba Networks	Job Number: JD99613
Model: APINH205	T-Log Number: T101553
	Project Manager: Christine Krebill
Contact: Rob Hastings	Project Coordinator: -
Standard: FCC 15.407 / RSS-210	Class: N/A

Procedure Comments:

Measurements performed in accordance with FCC KDB 789033

Peak measurements performed with: RBW=1MHz, VBW=3MHz, peak detector, max hold, auto sweep time

Unless otherwise stated/noted, emission has duty cycle $\geq 98\%$ and was measured using RBW=1MHz, VBW=10Hz, peak detector, linear average mode, auto sweep time, max hold 50 traces. (method VB of KDB 789033)

Frequency range of investigation limited based on results observed during TCB audit.

Mode	Data Rate	Duty Cycle (x)	Constant DC?	T (ms)	Pwr Cor Factor*	Lin Volt Cor Factor**	Min VBW for FS (Hz)
11a	6Mbs	99.0%	Yes	2.1	0.0	0.0	10.0
n20	MCS8	97.9%	Yes	1.0	0.1	0.2	10.0
n40	MCS0	96.3%	Yes	0.5	0.2	0.3	2024.3
ac80	VHT0	93.4%	Yes	0.3	0.3	0.6	3921.6

Sample Notes

Sample S/N: DN0010091

Driver: -

Antenna: Internal

Measurement Specific Notes:

Note 1:	For emissions outside of the restricted bands the limit is -27dBm/MHz eirp (68.3dBuV/m). The measurement method required is a peak measurement (RB=1MHz, VB \geq 3MHz, peak detector). Per KDB 789033 2) c) (i), compliance can be demonstrated by meeting the average and peak limits of 15.209, as an alternative.
Note 3:	Emission has constant duty cycle < 98%, average measurement performed: RBW=1MHz, VBW>1/T but not less than 10Hz, peak detector, linear averaging, auto sweep,max hold 50*1/DC traces (method VB of KDB 789033)



EMC Test Data

Client: Aruba Networks	Job Number: JD99613
Model: APINH205	T-Log Number: T101553
Contact: Rob Hastings	Project Manager: Christine Krebill
Standard: FCC 15.407 / RSS-210	Project Coordinator: -
	Class: N/A

Run #1c: High Channel

Channel: 48 Mode: a
Tx Chain: 2Tx Data Rate: 6Mbs

Frequency	Level	Pol	15.209 / 15E		Detector	Azimuth	Height	Comments
MHz	dB μ V/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
5397.880	53.9	H	54.0	-0.1	AVG	48	1.3	POS; RB 1 MHz; VB: 10 Hz q60
5398.960	53.9	V	54.0	-0.1	AVG	21	2.2	POS; RB 1 MHz; VB: 10 Hz q62
5402.290	64.4	H	74.0	-9.6	PK	48	1.3	POS; RB 1 MHz; VB: 3 MHz q60
5398.360	63.7	V	74.0	-10.3	PK	21	2.2	POS; RB 1 MHz; VB: 3 MHz q62

Note 1: For emissions in restricted bands, the limit of 15.209 was used which requires average and peak measurements.

Note 2: For emissions outside of the restricted bands the limit is -27dBm/MHz eirp (68.3dBuV/m). The measurement method required is a peak measurement (RB=1MHz, VB \geq 3MHz, peak detector).

Run #2, Radiated Spurious Emissions, 4900-5460 MHz. Operation in the 5150-5250 MHz Band

Date of Test: 05/05/16 Config. Used: 1
Test Engineer: Mehran Birgani Config Change: -
Test Location: Chamber #4 EUT Voltage: 120V/ 60Hz

Run #2a: Low Channel

Channel: 36 Mode: n20
Tx Chain: 2Tx Data Rate: MCS8

Frequency	Level	Pol	15.209 / 15E		Detector	Azimuth	Height	Comments
MHz	dB μ V/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
5107.620	49.3	H	54.0	-4.7	AVG	49	1.3	POS; RB 1 MHz; VB: 10 Hz
5107.620	47.7	V	54.0	-6.3	AVG	12	2.3	POS; RB 1 MHz; VB: 10 Hz
5146.240	64.9	H	74.0	-9.1	PK	49	1.3	POS; RB 1 MHz; VB: 3 MHz
5098.900	63.4	V	74.0	-10.6	PK	12	2.3	POS; RB 1 MHz; VB: 3 MHz

Note 1: For emissions in restricted bands, the limit of 15.209 was used which requires average and peak measurements.

Note 2: For emissions outside of the restricted bands the limit is -27dBm/MHz eirp (68.3dBuV/m). The measurement method required is a peak measurement (RB=1MHz, VB \geq 3MHz, peak detector).



EMC Test Data

Client: Aruba Networks	Job Number: JD99613
Model: APINH205	T-Log Number: T101553
	Project Manager: Christine Krebill
Contact: Rob Hastings	Project Coordinator: -
Standard: FCC 15.407 / RSS-210	Class: N/A

Run #2b: Center Channel

Date of Test: 05/05/16
 Test Engineer: Rafael Varelas
 Test Location: Chamber #4
 Config. Used: 1
 Config Change: -
 EUT Voltage: 120V/ 60Hz

Channel: 40 Mode: n20
 Tx Chain: 2Tx Data Rate: MCS8

Frequency MHz	Level dB μ V/m	Pol v/h	15.209 / 15E		Detector Pk/QP/Avg	Azimuth degrees	Height meters	Comments
			Limit	Margin				
5358.620	53.7	H	54.0	-0.3	AVG	46	1.2	POS; RB 1 MHz; VB: 10 Hz
5358.660	53.6	V	54.0	-0.4	AVG	45	1.4	POS; RB 1 MHz; VB: 10 Hz
5353.810	64.5	H	74.0	-9.5	PK	46	1.2	POS; RB 1 MHz; VB: 3 MHz
5356.970	64.3	V	74.0	-9.7	PK	45	1.4	POS; RB 1 MHz; VB: 3 MHz

- Note 1: For emissions in restricted bands, the limit of 15.209 was used which requires average and peak measurements.
- Note 2: For emissions outside of the restricted bands the limit is -27dBm/MHz eirp (68.3dBuV/m). The measurement method required is a peak measurement (RB=1MHz, VB \geq 3MHz, peak detector).

Run #2c: High Channel

Channel: 48 Mode: n20
 Tx Chain: 2Tx Data Rate: MCS8

Frequency MHz	Level dB μ V/m	Pol v/h	15.209 / 15E		Detector Pk/QP/Avg	Azimuth degrees	Height meters	Comments
			Limit	Margin				
5398.670	53.9	H	54.0	-0.1	AVG	47	1.2	POS; RB 1 MHz; VB: 10 Hz q68
5398.690	53.4	V	54.0	-0.6	AVG	20	2.2	POS; RB 1 MHz; VB: 10 Hz q72
5402.270	65.1	H	74.0	-8.9	PK	47	1.2	POS; RB 1 MHz; VB: 3 MHz q68
5401.550	63.8	V	74.0	-10.2	PK	20	2.2	POS; RB 1 MHz; VB: 3 MHz q72

- Note 1: For emissions in restricted bands, the limit of 15.209 was used which requires average and peak measurements.
- Note 2: For emissions outside of the restricted bands the limit is -27dBm/MHz eirp (68.3dBuV/m). The measurement method required is a peak measurement (RB=1MHz, VB \geq 3MHz, peak detector).



EMC Test Data

Client: Aruba Networks	Job Number: JD99613
Model: APINH205	T-Log Number: T101553
Contact: Rob Hastings	Project Manager: Christine Krebill
Standard: FCC 15.407 / RSS-210	Project Coordinator: -
	Class: N/A

Run #3b: Center Channel

Channel: 46 Mode: n40
 Tx Chain: 2Tx Data Rate: MCS0

Frequency	Level	Pol	15.209 / 15E		Detector	Azimuth	Height	Comments
MHz	dB μ V/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
5394.370	52.4	H	54.0	-1.6	Avg	45	1.2	POS; RB 1 MHz; VB: 3 kHz
5382.460	62.3	H	74.0	-11.7	PK	45	1.2	POS; RB 1 MHz; VB: 3 MHz
5395.830	51.4	V	54.0	-2.6	Avg	21	2.4	POS; RB 1 MHz; VB: 3 kHz
5395.590	61.5	V	74.0	-12.5	PK	21	2.4	POS; RB 1 MHz; VB: 3 MHz

Note 1: For emissions in restricted bands, the limit of 15.209 was used which requires average and peak measurements.

Note 2: For emissions outside of the restricted bands the limit is -27dBm/MHz eirp (68.3dBuV/m). The measurement method required is a peak measurement (RB=1MHz, VB \geq 3MHz, peak detector).

Run #4, Radiated Spurious Emissions, 4900-5460 MHz. Operation in the 5150-5250 MHz Band

Date of Test: 05/05/16 Config. Used: 1
 Test Engineer: Rafael Varelas Config Change: -
 Test Location: Chamber #4 EUT Voltage: 120V/ 60Hz

Run #4a: Low Channel

Channel: 42 Mode: ac80
 Tx Chain: 2Tx Data Rate: VHT0

Frequency	Level	Pol	15.209 / 15E		Detector	Azimuth	Height	Comments
MHz	dB μ V/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
5148.260	52.9	H	54.0	-1.1	Avg	40	1.4	POS; RB 1 MHz; VB: 5 kHz
5149.460	65.2	H	74.0	-8.8	PK	40	1.4	POS; RB 1 MHz; VB: 3 MHz
5143.710	51.4	V	54.0	-2.6	Avg	18	2.1	POS; RB 1 MHz; VB: 5 kHz
5132.600	63.6	V	74.0	-10.4	PK	18	2.1	POS; RB 1 MHz; VB: 3 MHz

Note 1: For emissions in restricted bands, the limit of 15.209 was used which requires average and peak measurements.

Note 2: For emissions outside of the restricted bands the limit is -27dBm/MHz eirp (68.3dBuV/m). The measurement method required is a peak measurement (RB=1MHz, VB \geq 3MHz, peak detector).

Client: Aruba Networks	Job Number: JD99613
Model: APINH205	T-Log Number: T101553
	Project Manager: Christine Krebill
Contact: Rob Hastings	Project Coordinator: -
Standard: FCC 15.407 / RSS-210	Class: N/A

Run #5c: High Channel

Channel: 64 Mode: a
 Tx Chain: 2Tx Data Rate: 6Mbps

Frequency MHz	Level dB μ V/m	Pol v/h	15.209 / 15E		Detector Pk/QP/Avg	Azimuth degrees	Height meters	Comments
			Limit	Margin				
5399.060	52.8	V	54.0	-1.2	AVG	18	2.3	POS; RB 1 MHz; VB: 10 Hz
5402.600	52.1	H	54.0	-1.9	AVG	44	1.4	POS; RB 1 MHz; VB: 10 Hz
5398.260	63.5	V	74.0	-10.5	PK	18	2.3	POS; RB 1 MHz; VB: 3 MHz
5403.080	62.3	H	74.0	-11.7	PK	44	1.4	POS; RB 1 MHz; VB: 3 MHz

Note 1: For emissions in restricted bands, the limit of 15.209 was used which requires average and peak measurements.

Note 2: For emissions outside of the restricted bands the limit is -27dBm/MHz eirp (68.3dBuV/m). The measurement method required is a peak measurement (RB=1MHz, VB \geq 3MHz, peak detector).

Run #6, Radiated Spurious Emissions, 4900-5460 MHz. Operation in the 5250-5350 MHz Band

Date of Test: 05/06/16 Config. Used: 1
 Test Engineer: Mehran Birgani Config Change: -
 Test Location: Chamber #4 EUT Voltage: 120V/ 60Hz

Run #6a: Low Channel

Channel: 52 Mode: n20
 Tx Chain: 2Tx Data Rate: MCS8

Frequency MHz	Level dB μ V/m	Pol v/h	15.209 / 15E		Detector Pk/QP/Avg	Azimuth degrees	Height meters	Comments
			Limit	Margin				
5421.460	53.6	H	54.0	-0.4	AVG	49	1.4	POS; RB 1 MHz; VB: 10 Hz q68
5422.460	51.2	V	54.0	-2.8	AVG	25	1.1	POS; RB 1 MHz; VB: 10 Hz q68
5417.860	65.4	H	74.0	-8.6	PK	49	1.4	POS; RB 1 MHz; VB: 3 MHz q68
5421.700	62.6	V	74.0	-11.4	PK	25	1.1	POS; RB 1 MHz; VB: 3 MHz q68

Note 1: For emissions in restricted bands, the limit of 15.209 was used which requires average and peak measurements.

Note 2: For emissions outside of the restricted bands the limit is -27dBm/MHz eirp (68.3dBuV/m). The measurement method required is a peak measurement (RB=1MHz, VB \geq 3MHz, peak detector).



EMC Test Data

Client:	Aruba Networks	Job Number:	JD99613
Model:	APINH205	T-Log Number:	T101553
Contact:	Rob Hastings	Project Manager:	Christine Krebill
Standard:	FCC 15.407 / RSS-210	Project Coordinator:	-
		Class:	N/A

Run #6b: Center Channel

Channel: 60 Mode: n20
Tx Chain: 2Tx Data Rate: MCS8

Frequency MHz	Level dB μ V/m	Pol v/h	15.209 / 15E		Detector Pk/QP/Avg	Azimuth degrees	Height meters	Comments
			Limit	Margin				
5458.600	53.7	H	54.0	-0.3	AVG	51	1.3	POS; RB 1 MHz; VB: 10 Hz q64
5458.780	52.6	V	54.0	-1.4	AVG	17	1.9	POS; RB 1 MHz; VB: 10 Hz q64
5457.460	65.4	H	74.0	-8.6	PK	51	1.3	POS; RB 1 MHz; VB: 3 MHz q64
5456.570	63.6	V	74.0	-10.4	PK	17	1.9	POS; RB 1 MHz; VB: 3 MHz q64

Note 1: For emissions in restricted bands, the limit of 15.209 was used which requires average and peak measurements.

Note 2: For emissions outside of the restricted bands the limit is -27dBm/MHz eirp (68.3dBuV/m). The measurement method required is a peak measurement (RB=1MHz, VB \geq 3MHz, peak detector).

Run #6c: High Channel

Channel: 64 Mode: n20
Tx Chain: 2Tx Data Rate: MCS8

Frequency MHz	Level dB μ V/m	Pol v/h	15.209 / 15E		Detector Pk/QP/Avg	Azimuth degrees	Height meters	Comments
			Limit	Margin				
5401.460	52.2	H	54.0	-1.8	AVG	51	1.3	POS; RB 1 MHz; VB: 10 Hz
5400.990	47.3	V	54.0	-6.7	AVG	13	1.4	POS; RB 1 MHz; VB: 10 Hz
5397.700	64.3	H	74.0	-9.7	PK	51	1.3	POS; RB 1 MHz; VB: 3 MHz
5403.800	59.8	V	74.0	-14.2	PK	13	1.4	POS; RB 1 MHz; VB: 3 MHz

Note 1: For emissions in restricted bands, the limit of 15.209 was used which requires average and peak measurements.

Note 2: For emissions outside of the restricted bands the limit is -27dBm/MHz eirp (68.3dBuV/m). The measurement method required is a peak measurement (RB=1MHz, VB \geq 3MHz, peak detector).



EMC Test Data

Client: Aruba Networks	Job Number: JD99613
Model: APINH205	T-Log Number: T101553
	Project Manager: Christine Krebill
Contact: Rob Hastings	Project Coordinator: -
Standard: FCC 15.407 / RSS-210	Class: N/A

Date of Test: 05/06/16
 Test Engineer: Rafael Varelas
 Test Location: Chamber #4

Config. Used: 1
 Config Change: -
 EUT Voltage: 120V/ 60Hz

Run #9c: High Channel

Channel: 140 Mode: a
 Tx Chain: 2Tx Data Rate: 6Mbs

Frequency	Level	Pol	15.209 / 15E		Detector	Azimuth	Height	Comments
MHz	dB μ V/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
5857.900	64.9	H	68.3	-3.4	PK	56	1.3	POS; RB 1 MHz; VB: 3 MHz
5459.140	45.8	H	54.0	-8.2	AVG	56	1.3	POS; RB 1 MHz; VB: 10 Hz
5454.650	57.4	H	74.0	-16.6	PK	56	1.3	POS; RB 1 MHz; VB: 3 MHz
5863.430	63.1	V	68.3	-5.2	PK	19	2.1	POS; RB 1 MHz; VB: 3 MHz

Note 1: For emissions in restricted bands, the limit of 15.209 was used which requires average and peak measurements.

Note 2: For emissions outside of the restricted bands the limit is -27dBm/MHz eirp (68.3dBuV/m). The measurement method required is a peak measurement (RB=1MHz, VB \geq 3MHz, peak detector).

Run #10, Radiated Spurious Emissions, 5350-5900 MHz. Operation in the 5470-5725 MHz Band

Date of Test: 05/06/16
 Test Engineer: Rafael Varelas
 Test Location: Chamber #4

Config. Used: 1
 Config Change: -
 EUT Voltage: 120V/ 60Hz

Run #10a: Low Channel

Channel: 100 Mode: n20
 Tx Chain: 2Tx Data Rate: MCS8

Frequency	Level	Pol	15.209 / 15E		Detector	Azimuth	Height	Comments
MHz	dB μ V/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
5420.980	48.5	H	54.0	-5.5	AVG	54	1.1	POS; RB 1 MHz; VB: 10 Hz
5417.460	61.4	H	74.0	-12.6	PK	54	1.1	POS; RB 1 MHz; VB: 3 MHz
5422.520	47.8	V	54.0	-6.2	AVG	13	1.7	POS; RB 1 MHz; VB: 10 Hz
5419.880	59.4	V	74.0	-14.6	PK	13	1.7	POS; RB 1 MHz; VB: 3 MHz

Note 1: For emissions in restricted bands, the limit of 15.209 was used which requires average and peak measurements.

Note 2: For emissions outside of the restricted bands the limit is -27dBm/MHz eirp (68.3dBuV/m). The measurement method required is a peak measurement (RB=1MHz, VB \geq 3MHz, peak detector).



EMC Test Data

Client:	Aruba Networks	Job Number:	JD99613
Model:	APINH205	T-Log Number:	T101553
Contact:	Rob Hastings	Project Manager:	Christine Krebill
Standard:	FCC 15.407 / RSS-210	Project Coordinator:	-
		Class:	N/A

Run #10b: Center Channel

Channel: 116 Mode: n20
 Tx Chain: 2Tx Data Rate: MCS8

Frequency MHz	Level dB μ V/m	Pol v/h	15.209 / 15E		Detector Pk/QP/Avg	Azimuth degrees	Height meters	Comments
			Limit	Margin				
5422.540	47.7	H	54.0	-6.3	AVG	303	1.0	POS; RB 1 MHz; VB: 10 Hz
5427.760	59.0	H	74.0	-15.0	PK	303	1.0	POS; RB 1 MHz; VB: 3 MHz
5421.640	45.0	V	54.0	-9.0	AVG	189	1.9	POS; RB 1 MHz; VB: 10 Hz
5434.510	57.2	V	74.0	-16.8	PK	189	1.9	POS; RB 1 MHz; VB: 3 MHz

Note 1: For emissions in restricted bands, the limit of 15.209 was used which requires average and peak measurements.
 Note 2: For emissions outside of the restricted bands the limit is -27dBm/MHz eirp (68.3dBuV/m). The measurement method required is a peak measurement (RB=1MHz, VB \geq 3MHz, peak detector).

Run #10c: High Channel

Channel: 140 Mode: n20
 Tx Chain: 2Tx Data Rate: MCS8

Frequency MHz	Level dB μ V/m	Pol v/h	15.209 / 15E		Detector Pk/QP/Avg	Azimuth degrees	Height meters	Comments
			Limit	Margin				
5861.420	65.7	H	68.3	-2.6	PK	48	1.2	POS; RB 1 MHz; VB: 3 MHz
5854.410	62.4	V	68.3	-5.9	PK	22	1.0	POS; RB 1 MHz; VB: 3 MHz

Note 1: For emissions in restricted bands, the limit of 15.209 was used which requires average and peak measurements.
 Note 2: For emissions outside of the restricted bands the limit is -27dBm/MHz eirp (68.3dBuV/m). The measurement method required is a peak measurement (RB=1MHz, VB \geq 3MHz, peak detector).

Client: Aruba Networks	Job Number: JD99613
Model: APINH205	T-Log Number: T101553
	Project Manager: Christine Krebill
Contact: Rob Hastings	Project Coordinator: -
Standard: FCC 15.407 / RSS-210	Class: N/A

RSS-247 (LELAN) and FCC 15.407(UNII) Antenna Port Measurements Power, PSD, Bandwidth and Spurious Emissions

Test Specific Details

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

Summary of Results

Run #	Test Performed	Limit	Pass / Fail	Result / Margin
1	Power, 5150 - 5250MHz	15.407(a) (1) (ii)	Pass	a: 19.2dBm (82.6 mW) n20: 19.2dBm (83.5 mW) n40: 19.0dBm (80.1 mW) ac80: 14.9dBm (30.7 mW)
1	Power, 5150 - 5250MHz	RSS-247 6.2.1 (1)	Pass	ac80: 14.9dBm (30.7 mW) 20.9dBm (0.123W) eirp

General Test Configuration

When measuring the conducted emissions from the EUT's antenna port, the antenna port of the EUT was connected to the spectrum analyzer or power meter via a suitable attenuator to prevent overloading the measurement system. All measurements are corrected to allow for the external attenuators and cables used.

Ambient Conditions:

Temperature: 22.4 °C
Rel. Humidity: 35 %

Modifications Made During Testing

No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.

Notes

Power measured for Canada only for those modes/channels where the power was lowered from the original filing.



EMC Test Data

Client: Aruba Networks	Job Number: JD99613
Model: APINH205	T-Log Number: T101553
	Project Manager: Christine Krebill
Contact: Rob Hastings	Project Coordinator: -
Standard: FCC 15.407 / RSS-210	Class: N/A

Procedure Comments:

Measurements performed in accordance with FCC KDB 789033 D01

Mode	Data Rate	Duty Cycle (x)	Constant DC?	T (ms)	Pwr Cor Factor*	Lin Volt Cor Factor**	Min VBW for FS (Hz)
11a	6Mbps	0.99	Yes	2.06	0	0	10
n20	MCS8	0.98	Yes	0.98	0.09	0.18	10
n40	MCS0	0.96	Yes	0.494	0.16	0.33	2024
ac80	VHT0	0.93	Yes	0.255	0.30	0.59	3922

Sample Notes

Sample S/N: -

Driver: -

Tab6- Ant 1 (txchain 1)

Tab5- Ant 2 (txchain 2)



EMC Test Data

Client:	Aruba Networks	Job Number:	JD99613
Model:	APINH205	T-Log Number:	T101553
Contact:	Rob Hastings	Project Manager:	Christine Krebill
Standard:	FCC 15.407 / RSS-210	Project Coordinator:	-
		Class:	N/A

Run #1: Bandwidth, Output Power and Power Spectral Density - MIMO Systems

Date of Test: 5/10/2016 0:00 Config. Used: 1
 Test Engineer: Rafael Varelas Config Change: None
 Test Location: FT Lab #4B EUT Voltage: 120V/60Hz

Note 1:	Duty Cycle $\geq 98\%$. Output power measured using a spectrum analyzer (see plots below). RBW=1MHz, VB=3 MHz, Span > OBW, # of points in sweep $\geq 2 \cdot \text{span}/\text{RBW}$, auto sweep, RMS detector, power averaging on (transmitted signal was continuous, duty cycle $\geq 98\%$) and power integration over the OBW (method SA-1 of ANSI C63.10).
Note 2:	Measured using the same analyzer settings used for output power.
Note 3:	For RSS-247 the limit for the 5150 - 5250 MHz band accounts for the antenna gain as the maximum eirp allowed is 10dBm/MHz. The limits are also corrected for instances where the highest measured value of the PSD exceeds the average PSD (calculated from the measured power divided by the measured 99% bandwidth) by more than 3dB by the amount that the measured value exceeds the average by more than 3dB.
Note 4:	99% Bandwidth measured in accordance with C63.10 - RB between 1-5 % of OBW and VB $\geq 3 \cdot \text{RB}$, Span between 1.5 and 5 times OBW.
Note 5:	For MIMO systems the total output power and total PSD are calculated from the sum of the powers of the individual chains (in linear terms). The antenna gain used to determine the EIRP and limits for PSD/Output power depends on the operating mode of the MIMO device. If the signals on the non-coherent between the transmit chains then the gain used to determine the limits is the highest gain of the individual chains and the EIRP is the sum of the products of gain and power on each chain. If the signals are coherent then the effective antenna gain is the sum (in linear terms) of the gains for each chain and the EIRP is the product of the effective gain and total power.

Antenna Gain Information

Freq	Antenna Gain (dBi) / Chain				BF	MultiChain Legacy	CDD	Sectorized / Xpol	Dir G (PWR)	Dir G (PSD)
	1	2	3	4						
5150-5250	6.0	6.0			No	Yes	Yes	No	6.00	9.01
5250-5350	6.0	6.0			No	Yes	Yes	No	6.00	9.01
5470-5725	6.0	6.0			No	Yes	Yes	No	6.00	9.01
5725-5825	6.0	6.0			No	Yes	Yes	No	6.00	9.01

For devices that support CDD modes

Min # of spatial streams: 1
 Max # of spatial streams: 2



EMC Test Data

Client:	Aruba Networks	Job Number:	JD99613
Model:	APINH205	T-Log Number:	T101553
		Project Manager:	Christine Krebill
Contact:	Rob Hastings	Project Coordinator:	-
Standard:	FCC 15.407 / RSS-210	Class:	N/A

Notes:	BF = beamforming mode supported, Multichain Legacy = 802.11 legacy data rates supported for multichain transmissions, CDD = Cyclic Delay Diversity (or Cyclic Shift Diversity) modes supported, Sectorized / Xpol = antennas are sectorized or cross polarized.
Notes:	Dir G (PWR) = total gain (Gant + Array Gain) for power calculations; GA (PSD) = total gain for PSD calculations based on FCC KDB 662911. Depending on the modes supported, the Array Gain value for power could be different from the PSD value.
Notes:	Array gain for power/psd calculated per KDB 662911 D01.
Notes:	For systems with Beamforming and CDD, choose one the following options: Option 1: Delays are optimized for beamforming, rather than being selected from cyclic delay table of 802.11; Array gains calculated based on beamforming criteria. Option 2: Antennas are paired for beamforming, and the pairs are configured to use the cyclic delay diversity of 802.11; the array gain associated with beamforming with 2 antennas (3dB), and the array gain associated with CDD with two antennas (3dB for PSD and 0 dB for power)

FCC UNII-1 Limits		Pwr	PSD
	Outdoor AP	30	17
X	Indoor AP	30	17
	Station (e.g. Client)	24	11
	Outdoor AP (>30° Elv.)	21	-



EMC Test Data

Client: Aruba Networks	Job Number: JD99613
Model: APINH205	T-Log Number: T101553
	Project Manager: Christine Krebill
Contact: Rob Hastings	Project Coordinator: -
Standard: FCC 15.407 / RSS-210	Class: N/A

MIMO Device - 5150-5250 MHz Band - FCC

Mode: 11a

Max EIRP (mW): 328.83652

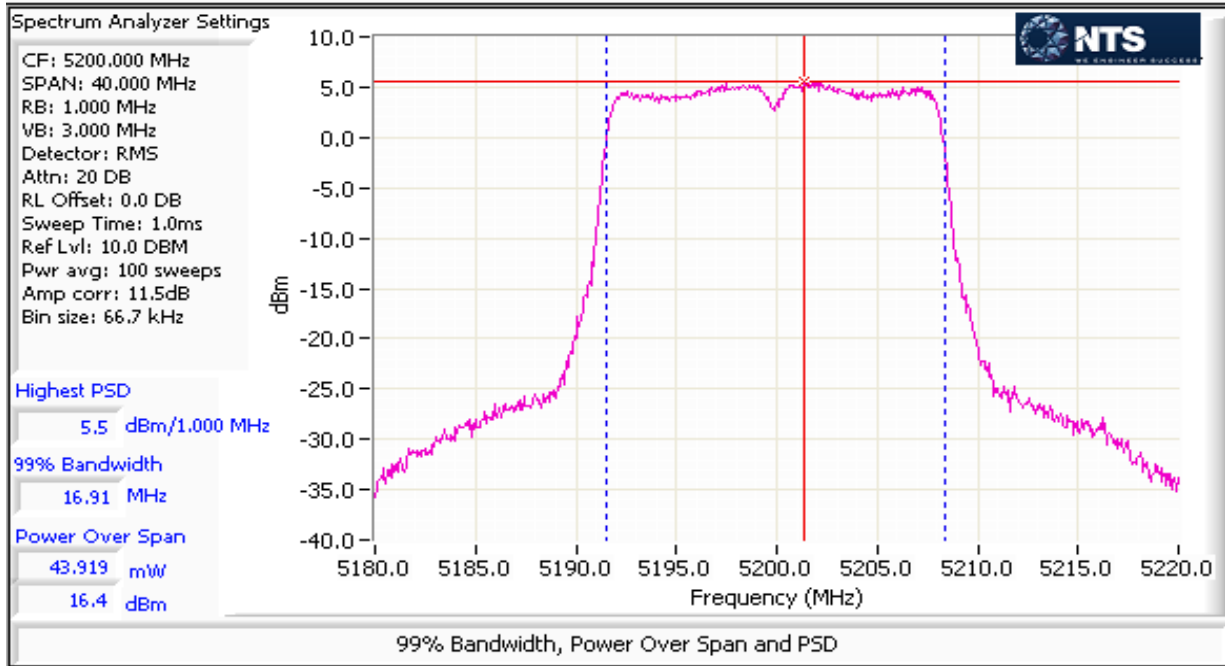
Frequency (MHz)	Chain	Software Setting	26dB BW (MHz)	Duty Cycle %	Power ¹ dBm	Total Power mW	dBm	FCC Limit dBm	Max Power (W)	Result
5180	1	q68		99	15.2	68.6	18.4	30.0	0.083	Pass
	3									
	4									
	2				15.5					
5200	1	q72		99	15.9	82.6	19.2	30.0		Pass
	3									
	4									
	2				16.4					
5240	1	q60		99	13.3	44.3	16.5	30.0		Pass
	3									
	4									
	2				13.6					

5150-5250 PSD - FCC

Mode: 11a

Frequency (MHz)	Chain	Software Setting	99% BW (MHz)	Duty Cycle %	PSD dBm/MHz	Total PSD ¹ mW/MHz	dBm/MHz	FCC Limit dBm/MHz	Result
5180	1	q68		99	4.4	5.8	7.6	14.0	Pass
	3								
	4								
	2				4.8				
5200	1	q72		99	4.9	6.6	8.2	14.0	Pass
	3								
	4								
	2				5.5				
5240	1	q60		99	2.3	3.6	5.6	14.0	Pass
	3								
	4								
	2				2.8				

Client: Aruba Networks	Job Number: JD99613
Model: APINH205	T-Log Number: T101553
	Project Manager: Christine Krebill
Contact: Rob Hastings	Project Coordinator: -
Standard: FCC 15.407 / RSS-210	Class: N/A





EMC Test Data

Client: Aruba Networks	Job Number: JD99613
Model: APINH205	T-Log Number: T101553
Contact: Rob Hastings	Project Manager: Christine Krebill
Standard: FCC 15.407 / RSS-210	Project Coordinator: -
	Class: N/A

MIMO Device - 5150-5250 MHz Band - FCC

Mode: n20

Max EIRP (mW): 332.41949

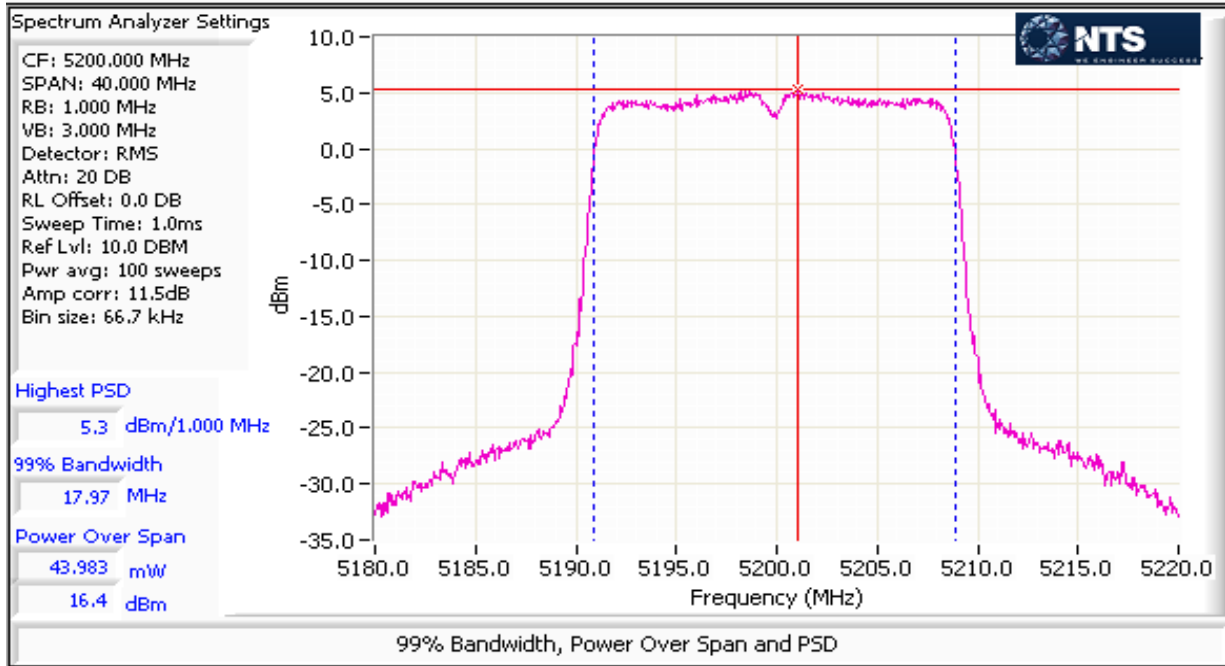
Frequency (MHz)	Chain	Software Setting	26dB BW (MHz)	Duty Cycle %	Power ¹ dBm	Total Power mW	Total Power dBm	FCC Limit dBm	Max Power (W)	Result
5180	1	q72		98	15.8	81.7	19.1	30.0	0.084	Pass
	3									
	4									
	2				16.4					
5200	1	q72		98	16.0	83.5	19.2	30.0		Pass
	3									
	4									
	2				16.4					
5240	1	q68		98	15.1	68.7	18.4	30.0		Pass
	3									
	4									
	2				15.6					

5150-5250 PSD - FCC

Mode: n20

Frequency (MHz)	Chain	Software Setting	99% BW (MHz)	Duty Cycle %	PSD dBm/MHz	Total PSD ¹ mW/MHz	Total PSD ¹ dBm/MHz	FCC Limit dBm/MHz	Result
5180	1	q72		98	4.6	6.2	7.9	14.0	Pass
	3								
	4								
	2				5.2				
5200	1	q72		98	4.9	6.5	8.1	14.0	Pass
	3								
	4								
	2				5.3				
5240	1	q68		98	3.8	5.2	7.2	14.0	Pass
	3								
	4								
	2				4.5				

Client: Aruba Networks	Job Number: JD99613
Model: APINH205	T-Log Number: T101553
	Project Manager: Christine Krebill
Contact: Rob Hastings	Project Coordinator: -
Standard: FCC 15.407 / RSS-210	Class: N/A





EMC Test Data

Client: Aruba Networks	Job Number: JD99613
Model: APINH205	T-Log Number: T101553
	Project Manager: Christine Krebill
Contact: Rob Hastings	Project Coordinator: -
Standard: FCC 15.407 / RSS-210	Class: N/A

MIMO Device - 5150-5250 MHz Band - FCC

Mode: n40

Max EIRP (mW): 318.88384

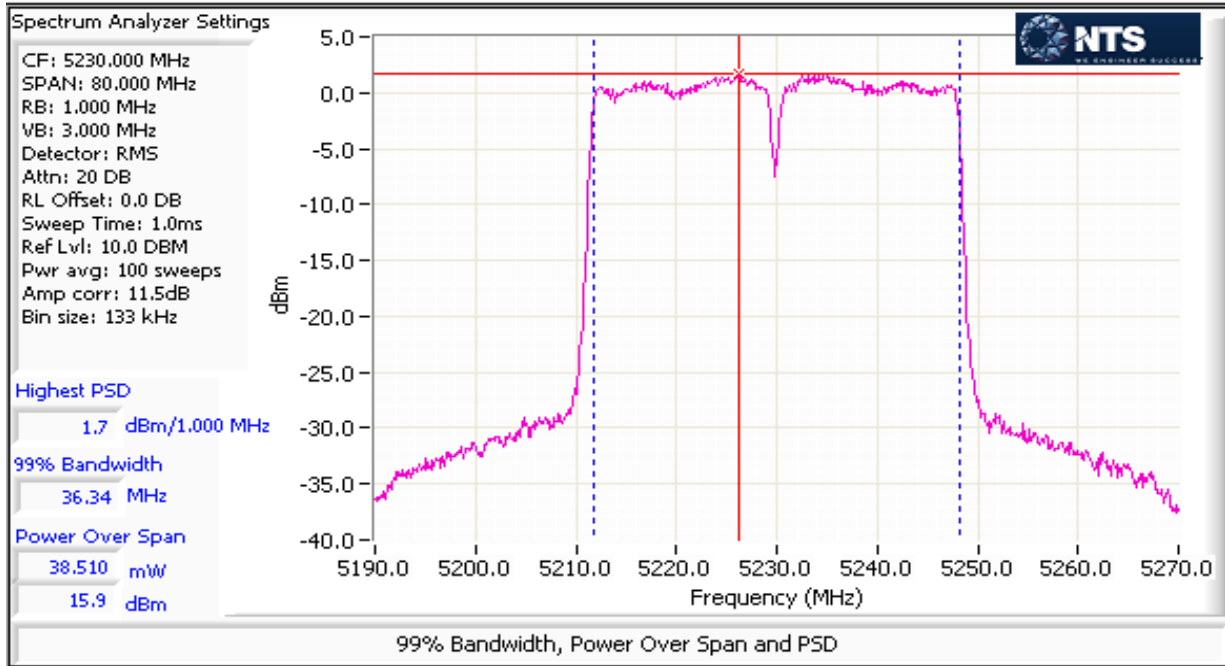
Frequency (MHz)	Chain	Software Setting	26dB BW (MHz)	Duty Cycle %	Power dBm	Total Power ¹ mW	dBm	FCC Limit dBm	Max Power (W)	Result	
5190	1	q60		96	13.2	43.5	16.4	30.0	0.080	Pass	
	3										
	4										
	2				13.2						
5230	1	q72		96	15.8	80.1	19.0	30.0			Pass
	3										
	4										
	2				15.9						

5150-5250 PSD - FCC

Mode: n40

Frequency (MHz)	Chain	Software Setting	99% BW (MHz)	Duty Cycle %	PSD dBm/MHz	Total PSD ¹ mW/MHz	dBm/MHz	FCC Limit dBm/MHz	Result
5190	1	q60		96	-1.2	1.6	2.0	14.0	Pass
	3								
	4								
	2				-0.9				
5230	1	q72		96	1.5	3.0	4.8	14.0	Pass
	3								
	4								
	2				1.7				

Client: Aruba Networks	Job Number: JD99613
Model: APINH205	T-Log Number: T101553
	Project Manager: Christine Krebill
Contact: Rob Hastings	Project Coordinator: -
Standard: FCC 15.407 / RSS-210	Class: N/A





EMC Test Data

Client: Aruba Networks	Job Number: JD99613
Model: APINH205	T-Log Number: T101553
Contact: Rob Hastings	Project Manager: Christine Krebill
Standard: FCC 15.407 / RSS-210	Project Coordinator: -
	Class: N/A

MIMO Device - 5150-5250 MHz Band - FCC

Mode: ac80

Max EIRP (mW): 122.2189

Frequency (MHz)	Chain	Software Setting	26dB BW (MHz)	Duty Cycle %	Power dBm	Total Power ¹ mW	dBm	FCC Limit dBm	Max Power (W)	Result
5210	1	q53		93	11.4	30.7	14.9	30.0	0.031	Pass
	3									
	4									
	2				11.7					

MIMO Device - 5150-5250 MHz Band - Industry Canada

Mode: ac80

Max EIRP (mW): 123.0

Frequency (MHz)	Chain	Software Setting	99% BW (MHz)	Duty Cycle %	Power ¹ dBm	Total Power dBm	dBm (eirp)	IC limit dBm (eirp)	Max Power (W)	Result
5210	1	q53	75.6	93	11.4	14.9	20.9	23.0	0.031	Pass
	3									
	4									
	2				11.7					

5150-5250 PSD - FCC

Mode: ac80

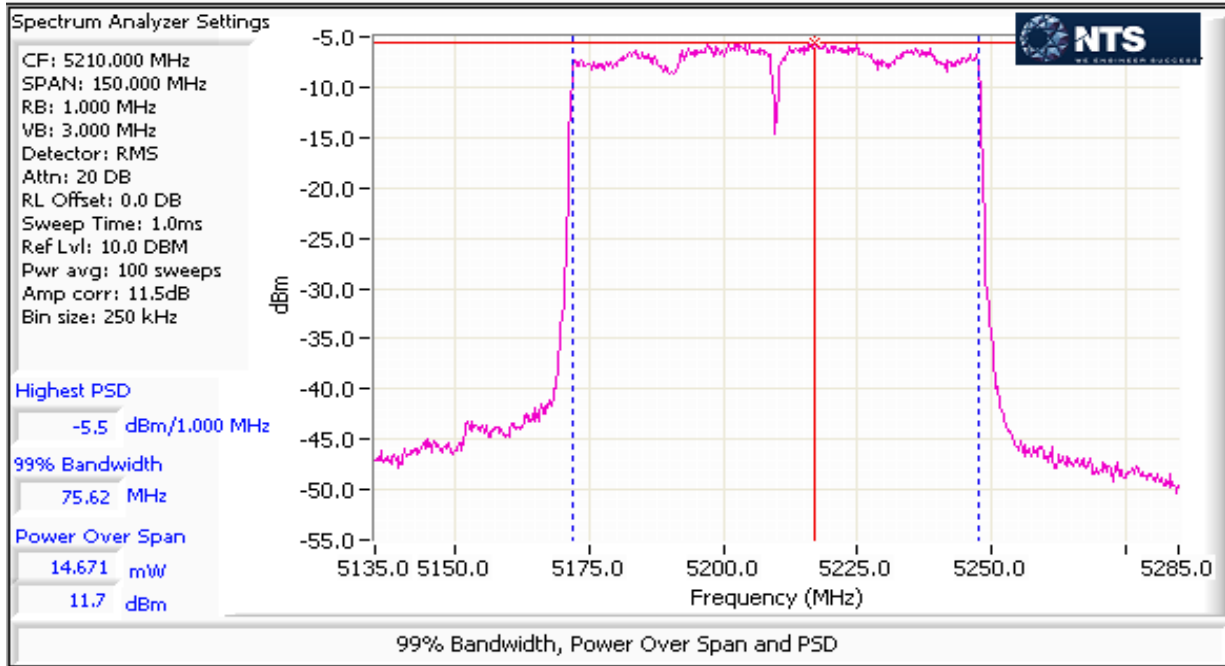
Frequency (MHz)	Chain	Software Setting	99% BW (MHz)	Duty Cycle %	PSD dBm/MHz	Total PSD ¹ mW/MHz	dBm/MHz	FCC Limit dBm/MHz	Result
5210	1	q53		93	-5.7	0.6	-2.2	14.0	Pass
	3								
	4								
	2				-5.5				

5150-5250 PSD - IC

Mode: ac80

Frequency (MHz)	Chain	Software Setting	99% BW (MHz)	Duty Cycle %	PSD dBm/MHz	Total PSD ¹ mW/MHz	dBm/MHz	IC Limit dBm/MHz	Result
5210	1	q53		93	-5.7	0.6	-2.2	1.0	Pass
	3								
	4								
	2				-5.5				

Client: Aruba Networks	Job Number: JD99613
Model: APINH205	T-Log Number: T101553
	Project Manager: Christine Krebill
Contact: Rob Hastings	Project Coordinator: -
Standard: FCC 15.407 / RSS-210	Class: N/A





EMC Test Data

Client:	Aruba Networks	Job Number:	JD99613
Model:	APINH205	T-Log Number:	T101553
Contact:	Rob Hastings	Project Manager:	Christine Krebill
Standard:	FCC 15.407 / RSS-210	Project Coordinator:	-
		Class:	N/A

RSS-247 (LELAN) and FCC 15.407(UNII) Antenna Port Measurements Power, PSD, Bandwidth and Spurious Emissions

Test Specific Details

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

Summary of Results

Run #	Test Performed	Limit	Pass / Fail	Result / Margin
1	Power, 5250 - 5350MHz	15.407(a) (2) RSS-247 6.2.2 (1)	Pass	a: 18.7dBm (74.1 mW) n20: 18.9dBm (77.6 mW) n40: 18.7dBm (74.1 mW) ac80: 15.6dBm (36.5 mW)
1	Max EIRP 5250 - 5350MHz	TPC required if EIRP ≥ 500mW (27dBm). EIRP ≥ 200mW (23dBm) DFS threshold = -64dBm.	Pass	EIRP = 24.9 dBm (306.5 mW)

General Test Configuration

When measuring the conducted emissions from the EUT's antenna port, the antenna port of the EUT was connected to the spectrum analyzer or power meter via a suitable attenuator to prevent overloading the measurement system. All measurements are corrected to allow for the external attenuators and cables used.

Ambient Conditions:

Temperature: 22.4 °C
Rel. Humidity: 35 %



EMC Test Data

Client: Aruba Networks	Job Number: JD99613
Model: APINH205	T-Log Number: T101553
	Project Manager: Christine Krebill
Contact: Rob Hastings	Project Coordinator: -
Standard: FCC 15.407 / RSS-210	Class: N/A

Modifications Made During Testing

No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.

Procedure Comments:

Measurements performed in accordance with FCC KDB 789033 D01

Mode	Data Rate	Duty Cycle (x)	Constant DC?	T (ms)	Pwr Cor Factor*	Lin Volt Cor Factor**	Min VBW for FS (Hz)
11a	6Mbs	0.99	Yes	2.06	0	0	10
n20	MCS8	0.98	Yes	0.98	0.09	0.18	10
n40	MCS0	0.96	Yes	0.494	0.16	0.33	2024
ac80	VHT0	0.93	Yes	0.255	0.30	0.59	3922

Sample Notes

Sample S/N: -

Driver: -

Tab6- Ant 1 (txchain 1)

Tab5- Ant 2 (txchain 2)



EMC Test Data

Client:	Aruba Networks	Job Number:	JD99613
Model:	APINH205	T-Log Number:	T101553
		Project Manager:	Christine Krebill
Contact:	Rob Hastings	Project Coordinator:	-
Standard:	FCC 15.407 / RSS-210	Class:	N/A

For devices that support CDD modes

Min # of spatial streams: 1
 Max # of spatial streams: 2

Notes:	BF = beamforming mode supported, Multichain Legacy = 802.11 legacy data rates supported for multichain transmissions, CDD = Cyclic Delay Diversity (or Cyclic Shift Diversity) modes supported, Sectorized / Xpol = antennas are sectorized or cross polarized.
Notes:	Dir G (PWR) = total gain (Gant + Array Gain) for power calculations; GA (PSD) = total gain for PSD calculations based on FCC KDB 662911. Depending on the modes supported, the Array Gain value for power could be different from the PSD value.
Notes:	Array gain for power/psd calculated per KDB 662911 D01.
Notes:	For systems with Beamforming and CDD, choose one the following options: Option 1: Delays are optimized for beamforming, rather than being selected from cyclic delay table of 802.11; Array gains calculated based on beamforming criteria. Option 2: Antennas are paired for beamforming, and the pairs are configured to use the cyclic delay diversity of 802.11; the array gain associated with beamforming with 2 antennas (3dB), and the array gain associated with CDD with two antennas (3dB for PSD and 0 dB for power)



EMC Test Data

Client: Aruba Networks	Job Number: JD99613
Model: APINH205	T-Log Number: T101553
	Project Manager: Christine Krebill
Contact: Rob Hastings	Project Coordinator: -
Standard: FCC 15.407 / RSS-210	Class: N/A

MIMO Device - 5250-5350 MHz Band - FCC

Mode: 11a

Max EIRP (mW): 292.6

Frequency (MHz)	Chain	Software Setting	26dB BW (MHz)	Duty Cycle %	Power dBm	Total Power ¹ mW	FCC Limit dBm	Max Power (W)	Result	
5260	1	q58	20.33	99	12.4	36.4	15.6	0.074	Pass	
	3									
	4									
	2				12.8					
5300	1	q56	20.2	99	12.1	34.8	15.4		24.0	Pass
	3									
	4									
	2				12.7					
5320	1	q69	20.6	99	15.5	73.5	18.7		24.0	Pass
	3									
	4									
	2				15.8					

MIMO Device - 5250-5350 MHz Band - Industry Canada

Mode: 11a

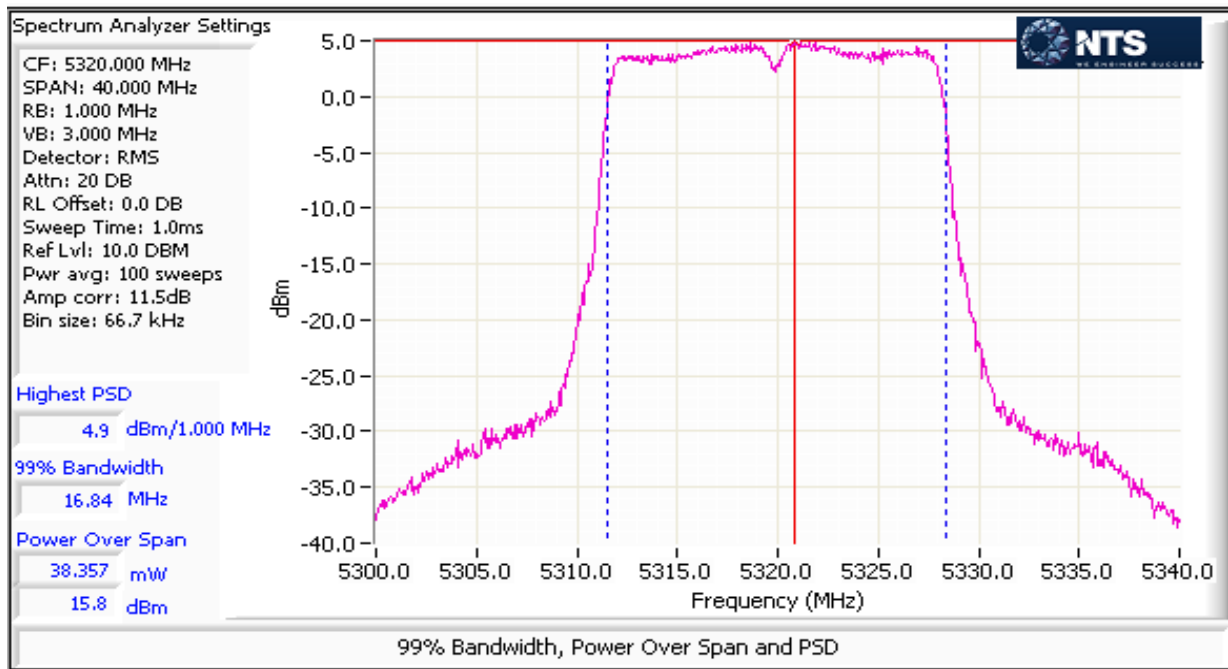
Frequency (MHz)	Chain	Software Setting	99% BW (MHz)	Duty Cycle %	Power ¹ dBm	Total Power dBm	Total Power dBm (eirp)	IC limit dBm	Max Power (W)	Result	
5260	1	q58	16.8	99	12.4	15.6	21.6	23.3	0.074	Pass	
	3										
	4										
	2				12.8						
5300	1	q56	16.8	99	12.1	15.4	21.4	23.3		23.3	Pass
	3										
	4										
	2				12.7						
5320	1	q69	16.8	99	15.5	18.7	24.7	23.3		23.3	Pass
	3										
	4										
	2				15.8						

Client: Aruba Networks	Job Number: JD99613
Model: APINH205	T-Log Number: T101553
	Project Manager: Christine Krebill
Contact: Rob Hastings	Project Coordinator: -
Standard: FCC 15.407 / RSS-210	Class: N/A

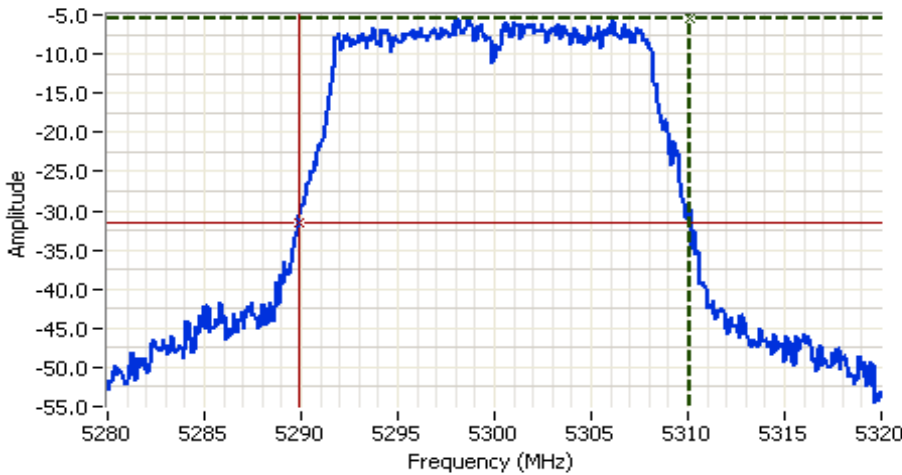
5250-5350 PSD - FCC/IC

Mode: 11a

Frequency (MHz)	Chain	Software Setting	99% BW (MHz)	Duty Cycle %	PSD dBm/MHz	Total PSD ¹ mW/MHz	Total PSD ¹ dBm/MHz	FCC Limit dBm/MHz	IC Limit dBm/MHz	Result
5260	1	q58		99	1.4	3.0	4.8	8.0	11.0	Pass
	3									
	4									
	2									
5300	1	q56		99	1.2	2.8	4.5	8.0	11.0	Pass
	3									
	4									
	2									
5320	1	q69		99	4.6	6.0	7.8	8.0	11.0	Pass
	3									
	4									
	2									



Client: Aruba Networks	Job Number: JD99613
Model: APINH205	T-Log Number: T101553
Contact: Rob Hastings	Project Manager: Christine Krebill
Standard: FCC 15.407 / RSS-210	Project Coordinator: -
	Class: N/A



Analyzer Settings

Agilent Technologies, E4446A
 CF: 5300.000 MHz
 SPAN: 40.000 MHz
 RB: 300 kHz
 VB: 1.000 MHz
 Detector: POS
 Attn: 20 DB
 RL Offset: 0.0 DB
 Sweep Time: 1.0ms
 Ref Lvl: 10.0 DBM

Comments

26dB BW: 20.200 MHz

Cursor 1	5310.1333	-5.5	
Cursor 2	5289.9333	-31.5	

Delta Freq.	20.200
Delta Amplitude	26.0



EMC Test Data

Client: Aruba Networks	Job Number: JD99613
Model: APINH205	T-Log Number: T101553
	Project Manager: Christine Krebill
Contact: Rob Hastings	Project Coordinator: -
Standard: FCC 15.407 / RSS-210	Class: N/A

MIMO Device - 5250-5350 MHz Band - FCC

Mode: n20

Max EIRP (mW): 306.5

Frequency (MHz)	Chain	Software Setting	26dB BW (MHz)	Duty Cycle %	Power dBm	Total Power ¹ mW	FCC Limit dBm	Max Power (W)	Result	
5260	1	q68	20.7	98	14.7	61.1	17.9	0.077	Pass	
	3									
	4									
	2				15.0					
5300	1	q64	20.4	98	13.7	53.0	17.2		24.0	Pass
	3									
	4									
	2				14.7					
5320	1	q69	20.4	98	15.8	76.9	18.9		24.0	Pass
	3									
	4									
	2				15.9					

MIMO Device - 5250-5350 MHz Band - Industry Canada

Mode: n20

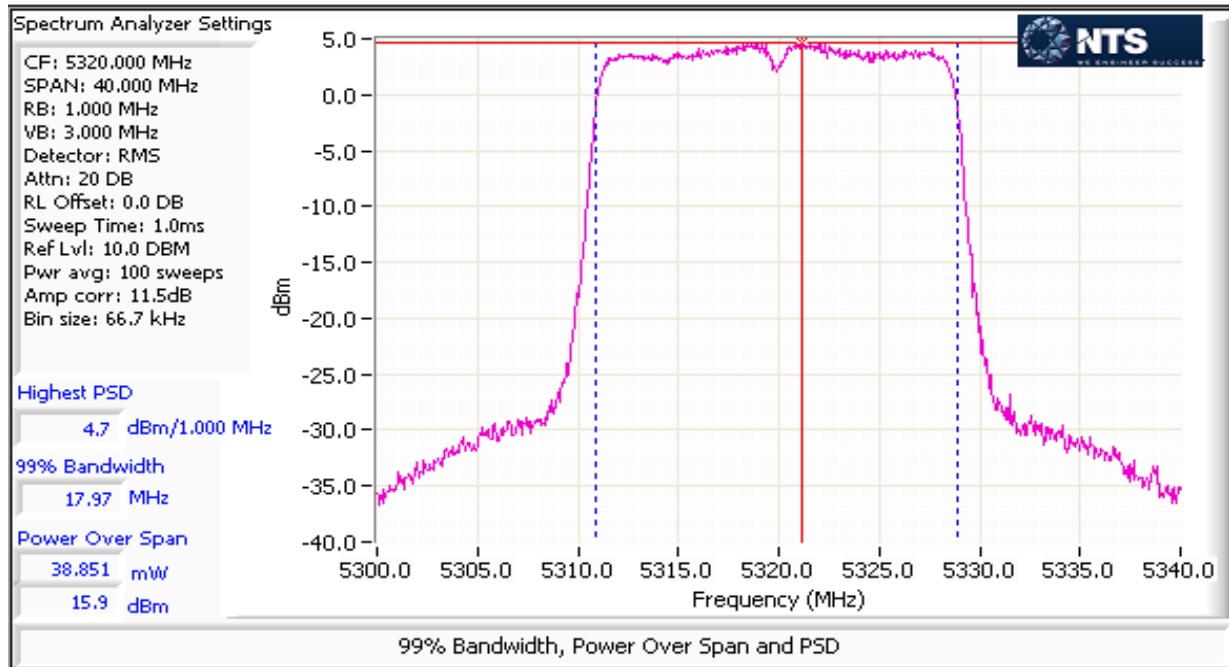
Frequency (MHz)	Chain	Software Setting	99% BW (MHz)	Duty Cycle %	Power ¹ dBm	Total Power dBm	dBm (eirp)	IC limit dBm	Max Power (W)	Result	
5260	1	q68	18.04	98	14.7	17.9	23.9	23.6	0.077	Pass	
	3										
	4										
	2				15.0						
5300	1	q64	17.7	98	13.7	17.2	23.2	23.5		23.5	Pass
	3										
	4										
	2				14.7						
5320	1	q69	20.4	98	15.8	18.9	24.9	24.0		24.0	Pass
	3										
	4										
	2				15.9						

Client: Aruba Networks	Job Number: JD99613
Model: APINH205	T-Log Number: T101553
Contact: Rob Hastings	Project Manager: Christine Krebill
Standard: FCC 15.407 / RSS-210	Project Coordinator: -
	Class: N/A

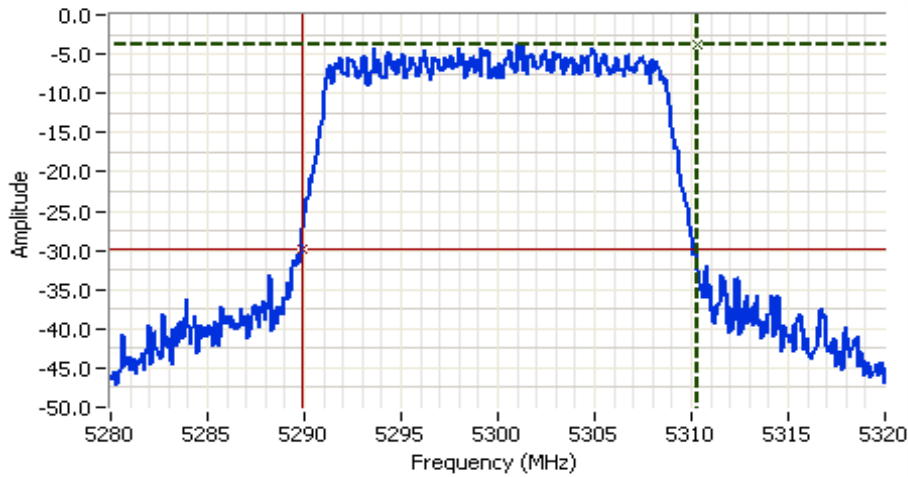
5250-5350 PSD - FCC/IC

Mode: n20

Frequency (MHz)	Chain	Software Setting	99% BW (MHz)	Duty Cycle %	PSD dBm/MHz	Total PSD ¹ mW/MHz	Total PSD ¹ dBm/MHz	FCC Limit dBm/MHz	IC Limit dBm/MHz	Result
5260	1	q68		98	3.5	4.6	6.6	8.0	11.0	Pass
	3									
	4									
	2									
5300	1	q64		98	-2.5	1.3	1.1	8.0	11.0	Pass
	3									
	4									
	2									
5320	1	q69		98	4.8	6.0	7.8	8.0	11.0	Pass
	3									
	4									
	2									



Client: Aruba Networks	Job Number: JD99613
Model: APINH205	T-Log Number: T101553
Contact: Rob Hastings	Project Manager: Christine Krebill
Standard: FCC 15.407 / RSS-210	Project Coordinator: -
	Class: N/A


Analyzer Settings

Agilent Technologies, E4446A
 CF: 5300.000 MHz
 SPAN: 40.000 MHz
 RB: 300 kHz
 VB: 1.000 MHz
 Detector: POS
 Attn: 20 DB
 RL Offset: 0.0 DB
 Sweep Time: 1.0ms
 Ref Lvl: 10.0 DBM

Comments

26dB BW: 20.400 MHz

Cursor 1	5310.2667	-3.8	
Cursor 2	5289.8667	-29.8	

Delta Freq.	20.400
Delta Amplitude	26.0



EMC Test Data

Client: Aruba Networks	Job Number: JD99613
Model: APINH205	T-Log Number: T101553
	Project Manager: Christine Krebill
Contact: Rob Hastings	Project Coordinator: -
Standard: FCC 15.407 / RSS-210	Class: N/A

MIMO Device - 5250-5350 MHz Band - FCC

Mode: n40

Max EIRP (mW): 294.2

Frequency (MHz)	Chain	Software Setting	26dB BW (MHz)	Duty Cycle %	Power dBm	Total Power ¹ mW	FCC Limit dBm	Max Power (W)	Result		
5270	1	q72	40	96	15.4	73.9	18.7	0.074	Pass		
	3										
	4										
	2										
5310	1	q62	39.3	96	13.5	48.9	16.9			24.0	Pass
	3										
	4										
	2										

MIMO Device - 5250-5350 MHz Band - Industry Canada

Mode: n40

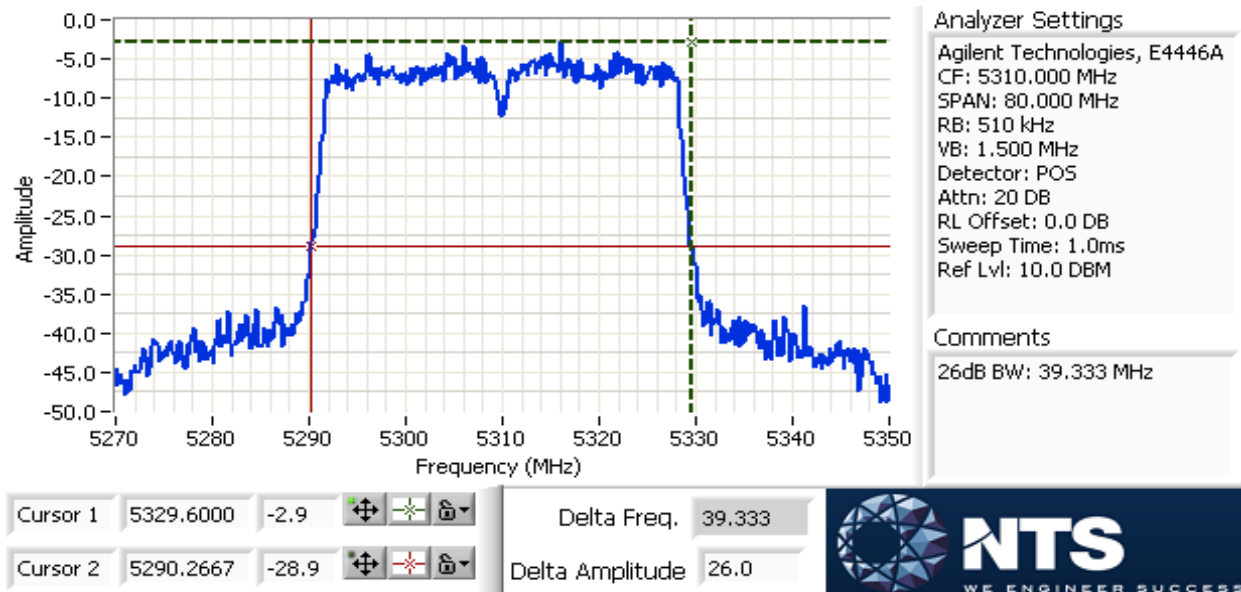
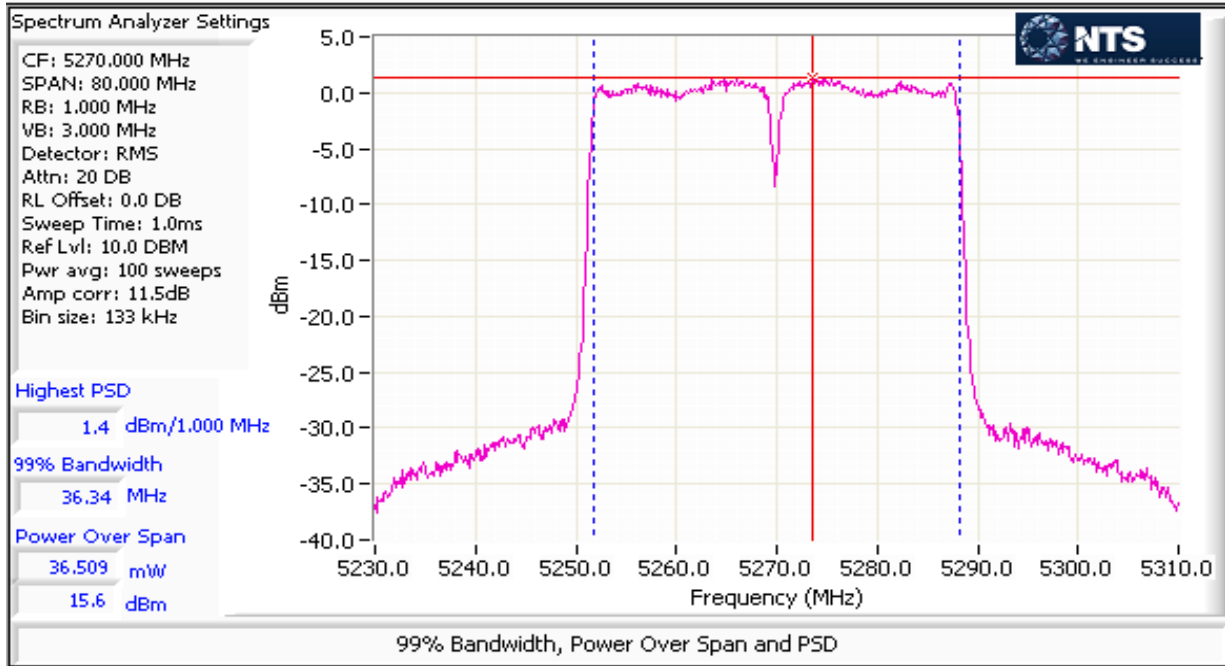
Frequency (MHz)	Chain	Software Setting	99% BW (MHz)	Duty Cycle %	Power ¹ dBm	Total Power dBm	dBm (eirp)	IC limit dBm	Max Power (W)	Result	
5270	1	q72	36.47	96	15.4	18.7	24.7	24.0	0.074	Pass	
	3										
	4										
	2										
5310	1	q62	36.34	96	13.5	16.9	22.9	24.0			Pass
	3										
	4										
	2										

MIMO Device 5250-5350 PSD - FCC/IC

Mode: n40

Frequency (MHz)	Chain	Software Setting	99% BW (MHz)	Duty Cycle %	PSD dBm/MHz	Total PSD ¹ mW/MHz	dBm/MHz	FCC Limit dBm/MHz	IC Limit dBm/MHz	Result
5270	1	q72		96	1.1	2.8	4.5	8.0	11.0	Pass
	3									
	4									
	2									
5310	1	q62		96	-0.8	1.8	2.6	8.0	11.0	Pass
	3									
	4									
	2									

Client: Aruba Networks	Job Number: JD99613
Model: APINH205	T-Log Number: T101553
Contact: Rob Hastings	Project Manager: Christine Krebill
Standard: FCC 15.407 / RSS-210	Project Coordinator: -
	Class: N/A





EMC Test Data

Client: Aruba Networks	Job Number: JD99613
Model: APINH205	T-Log Number: T101553
	Project Manager: Christine Krebill
Contact: Rob Hastings	Project Coordinator: -
Standard: FCC 15.407 / RSS-210	Class: N/A

MIMO Device - 5250-5350 MHz Band - FCC

Mode: ac80

Max EIRP (mW): 145.3

Frequency (MHz)	Chain	Software Setting	26dB BW (MHz)	Duty Cycle %	Power dBm	Total Power ¹ mW	dBm	FCC Limit dBm	Max Power (W)	Result
5290	1	q56	83	93	12.2	36.5	15.6	24.0	0.037	Pass
	3									
	4									
	2				12.4					

MIMO Device - 5250-5350 MHz Band - Industry Canada

Mode: ac80

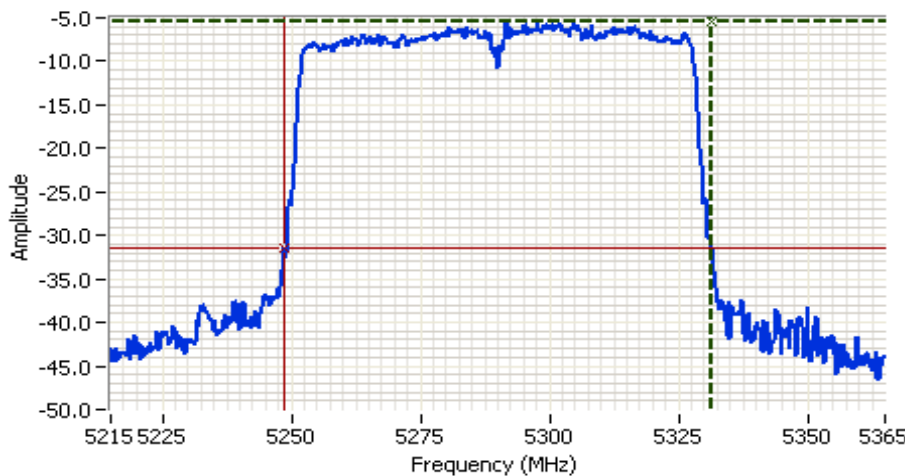
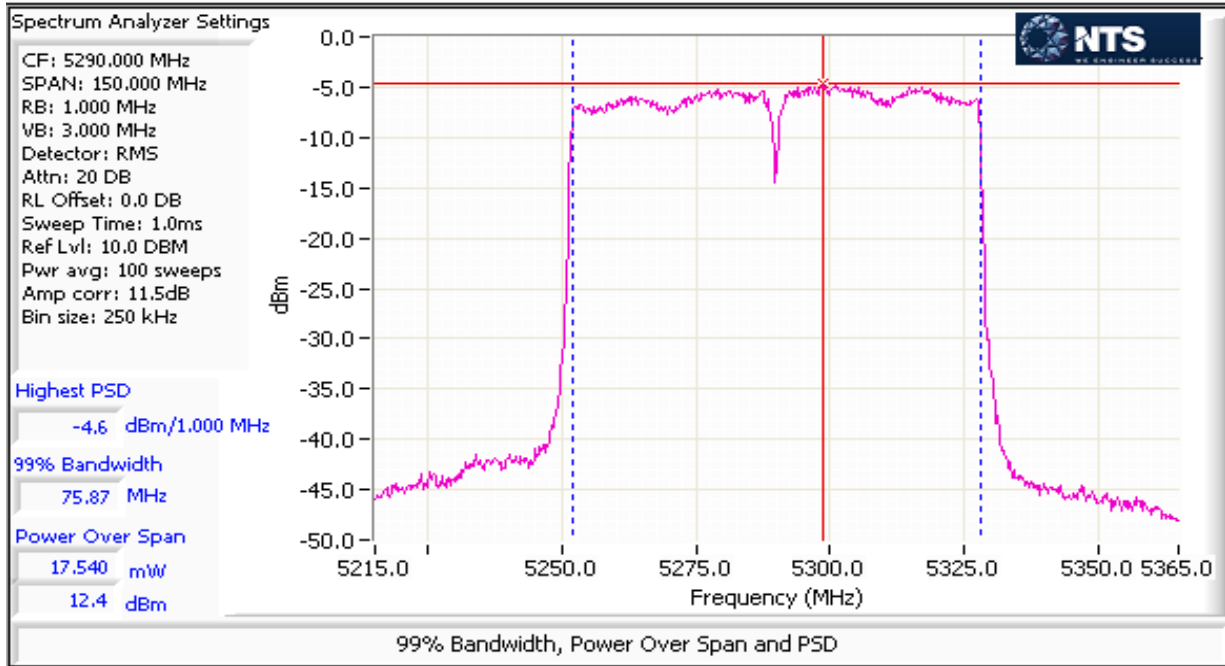
Frequency (MHz)	Chain	Software Setting	99% BW (MHz)	Duty Cycle %	Power ¹ dBm	Total Power dBm	dBm (eirp)	IC limit dBm	Max Power (W)	Result
5290	1	q56	75.87	93	12.2	15.6	21.6	24.0	0.036	Pass
	3									
	4									
	2				12.4					

MIMO Device 5250-5350 PSD - FCC/IC

Mode: ac80

Frequency (MHz)	Chain	Software Setting	99% BW (MHz)	Duty Cycle %	PSD dBm/MHz	Total PSD ¹ mW/MHz	dBm/MHz	FCC Limit dBm/MHz	IC Limit dBm/MHz	Result
5290	1	q56		93	-4.8	0.7	-1.5	8.0	11.0	Pass
	3									
	4									
	2				-4.6					

Client: Aruba Networks	Job Number: JD99613
Model: APINH205	T-Log Number: T101553
Contact: Rob Hastings	Project Manager: Christine Krebill
Standard: FCC 15.407 / RSS-210	Project Coordinator: -
	Class: N/A



Analyzer Settings

Agilent Technologies, E4446A

- CF: 5290.000 MHz
- SPAN: 150.000 MHz
- RB: 1.000 MHz
- VB: 3.000 MHz
- Detector: POS
- Attn: 20 DB
- RL Offset: 0.0 DB
- Sweep Time: 1.0ms
- Ref Lvl: 10.0 DBM

Comments

26dB BW: 83.000 MHz

Cursor 1 5331.5000 -5.5

Cursor 2 5248.5000 -31.5

Delta Freq. 83.000

Delta Amplitude 26.0

Client:	Aruba Networks	Job Number:	JD99613
Model:	APINH205	T-Log Number:	T101553
Contact:	Rob Hastings	Project Manager:	Christine Krebill
Standard:	FCC 15.407 / RSS-210	Project Coordinator:	-
		Class:	N/A

RSS-247 (LELAN) and FCC 15.407(UNII) Antenna Port Measurements Power, PSD, Bandwidth and Spurious Emissions

Test Specific Details

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

Summary of Results

Run #	Test Performed	Limit	Pass / Fail	Result / Margin
1	Power, 5470 - 5725MHz	15.407(a) (1), (2)	Pass	a: 18.3dBm (67.8mW) n20: 18.4dBm (69.0 mW) n40: 19.1dBm (81.0 mW) ac80: 19.5dBm (88.6 mW)
1	Max EIRP 5470 - 5725MHz	TPC required if EIRP ≥ 500mW (27dBm). EIRP ≥ 200mW (23dBm) DFS threshold	Pass	EIRP = 25.5 dBm (352.7 mW)

General Test Configuration

When measuring the conducted emissions from the EUT's antenna port, the antenna port of the EUT was connected to the spectrum analyzer or power meter via a suitable attenuator to prevent overloading the measurement system. All measurements are corrected to allow for the external attenuators and cables used.

Ambient Conditions:

Temperature: 22.4 °C
Rel. Humidity: 35 %

Modifications Made During Testing

No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.



EMC Test Data

Client:	Aruba Networks	Job Number:	JD99613
Model:	APINH205	T-Log Number:	T101553
		Project Manager:	Christine Krebill
Contact:	Rob Hastings	Project Coordinator:	-
Standard:	FCC 15.407 / RSS-210	Class:	N/A

Procedure Comments:

Measurements performed in accordance with FCC KDB 789033 D01

Mode	Data Rate	Duty Cycle (x)	Constant DC?	T (ms)	Pwr Cor Factor*	Lin Volt Cor Factor**	Min VBW for FS (Hz)
11a	6Mbps	99%	Yes	2.06	0	0	10
n20	MCS8	98%	Yes	0.98	0.09	0.18	10
n40	MCS0	96%	Yes	0.494	0.16	0.33	2024
ac80	VHT0	93%	Yes	0.255	0.30	0.59	3922

Sample Notes

Sample S/N: -

Driver: -

Tab6- Ant 1 (txchain 1)

Tab5- Ant 2 (txchain 2)



EMC Test Data

Client: Aruba Networks	Job Number: JD99613
Model: APINH205	T-Log Number: T101553
	Project Manager: Christine Krebill
Contact: Rob Hastings	Project Coordinator: -
Standard: FCC 15.407 / RSS-210	Class: N/A

Run #1: Bandwidth, Output Power and Power Spectral Density - MIMO Systems
 Date of Test: 5/10/2016 0:00 Config. Used: 1
 Test Engineer: Rafael Varelas Config Change: None
 Test Location: FT Lab #4B EUT Voltage: 120V/60Hz

- Note 1: Duty Cycle $\geq 98\%$. Output power measured using a spectrum analyzer (see plots below). RBW=1MHz, VB=3 MHz, Span > OBW, # of points in sweep $\geq 2 \cdot \text{span} / \text{RBW}$, auto sweep, **RMS** detector, power averaging on (transmitted signal was continuous, duty cycle $\geq 98\%$) and power integration over the OBW (method SA-1 of ANSI C63.10).
- Note 2: Measured using the same analyzer settings used for output power.
- Note 3: 99% Bandwidth measured in accordance with C63.10 - RB between 1-5 % of OBW and VB $\geq 3 \cdot \text{RB}$, Span between 1.5 and 5 times OBW.
- Note 4: For MIMO systems the total output power and total PSD are calculated from the sum of the powers of the individual chains (in linear terms). The antenna gain used to determine the EIRP and limits for PSD/Output power depends on the operating mode of the MIMO device. If the signals are non-coherent between the transmit chains then the gain used to determine the limits is the highest gain of the individual chains and the EIRP is the sum of the products of gain and power on each chain. If the signals are coherent then the effective antenna gain is the sum (in linear terms) of the gains for each chain and the EIRP is the product of the effective gain and total power.

Antenna Gain Information

Freq	Antenna Gain (dBi) / Chain				BF	MultiChain Legacy	CDD	Sectorized / Xpol	Dir G (PWR)	Dir G (PSD)
	1	2	3	4						
5150-5250	6.0	6.0			No	Yes	Yes	No	6.00	9.01
5250-5350	6.0	6.0			No	Yes	Yes	No	6.00	9.01
5470-5725	6.0	6.0			No	Yes	Yes	No	6.00	9.01
5725-5825	6.0	6.0			No	Yes	Yes	No	6.00	9.01

For devices that support CDD modes

Min # of spatial streams: 1
 Max # of spatial streams: 2



EMC Test Data

Client:	Aruba Networks	Job Number:	JD99613
Model:	APINH205	T-Log Number:	T101553
		Project Manager:	Christine Krebill
Contact:	Rob Hastings	Project Coordinator:	-
Standard:	FCC 15.407 / RSS-210	Class:	N/A

Notes:	BF = beamforming mode supported, Multichain Legacy = 802.11 legacy data rates supported for multichain transmissions, CDD = Cyclic Delay Diversity (or Cyclic Shift Diversity) modes supported, Sectorized / Xpol = antennas are sectorized or cross polarized.
Notes:	Dir G (PWR) = total gain (Gant + Array Gain) for power calculations; GA (PSD) = total gain for PSD calculations based on FCC KDB 662911. Depending on the modes supported, the Array Gain value for power could be different from the PSD value.
Notes:	Array gain for power/psd calculated per KDB 662911 D01.
Notes:	For systems with Beamforming and CDD, choose one the following options: Option 1: Delays are optimized for beamforming, rather than being selected from cyclic delay table of 802.11; Array gains calculated based on beamforming criteria. Option 2: Antennas are paired for beamforming, and the pairs are configured to use the cyclic delay diversity of 802.11; the array gain associated with beamforming with 2 antennas (3dB), and the array gain associated with CDD with two antennas (3dB for PSD and 0 dB for power)



EMC Test Data

Client: Aruba Networks	Job Number: JD99613
Model: APINH205	T-Log Number: T101553
	Project Manager: Christine Krebill
Contact: Rob Hastings	Project Coordinator: -
Standard: FCC 15.407 / RSS-210	Class: N/A

MIMO Device - 5470-5725 MHz Band - FCC

Mode: 11a

Max EIRP (mW): 269.9

Frequency (MHz)	Chain	Software Setting	26dB BW (MHz)	Duty Cycle %	Power dBm	Total Power mW	Total Power dBm	FCC Limit dBm	Max Power (W)	Result			
5500	1	q68	20.4	99	15.2	67.8	18.3	24.0	0.068	Pass			
	3												
	4												
	2				15.4								
5580	1	q67	20.4	99	14.7	61.9	17.9	24.0		0.068	Pass		
	3												
	4												
	2				15.1								
5700	1	q68	20.5	99	15.2	67.0	18.3	24.0			0.068	Pass	
	3												
	4												
	2				15.3								
5720	1	q65	15.2	99	14.0	52.0	17.2	22.8				0.068	Pass
	3												
	4												
	2				14.3								

Portion within 5725-5850 MHz band (UNII-3)

5720	1	q65		99	7.8	11.9	10.8	30.0	0.0119	Pass
	3									
	4									
	2				7.7					



EMC Test Data

Client: Aruba Networks	Job Number: JD99613
Model: APINH205	T-Log Number: T101553
	Project Manager: Christine Krebill
Contact: Rob Hastings	Project Coordinator: -
Standard: FCC 15.407 / RSS-210	Class: N/A

MIMO Device - 5470-5725 MHz Band - Industry Canada
Mode: 11a

Frequency (MHz)	Chain	Software Setting	99% BW (MHz)	Duty Cycle %	Power ¹ dBm	Total Power		IC Limit dBm	Max Power (W)	Result		
						dBm	dBm (eirp)					
5500	1	q68	16.9	99	15.2	18.3	24.3	23.3	0.068	Pass		
	3											
	4											
	2											
5580	1	q67	16.8	99	14.7	17.9	23.9	23.3		0.068	Pass	
	3											
	4											
	2											
5700	1	q68	16.8	99	15.2	18.3	24.3	23.3			0.068	Pass
	3											
	4											
	2											
5720	1	q65	13.52	99	14.0	17.2	23.2	22.3	0.068			Pass
	3											
	4											
	2											

Portion within 5725-5850 MHz band (UNII-3)

5720	1	q65		99	7.8	10.8	16.8	30.0	0.012	Pass
	3									
	4									
	2									



EMC Test Data

Client: Aruba Networks	Job Number: JD99613
Model: APINH205	T-Log Number: T101553
	Project Manager: Christine Krebill
Contact: Rob Hastings	Project Coordinator: -
Standard: FCC 15.407 / RSS-210	Class: N/A

5470-5700 PSD - FCC/IC

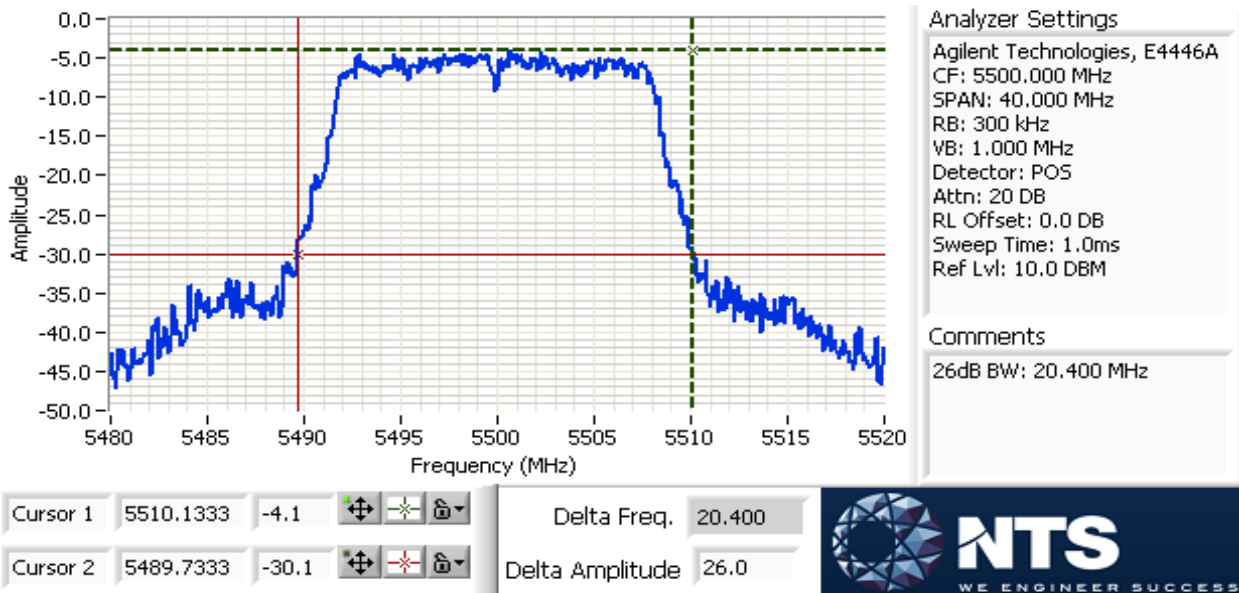
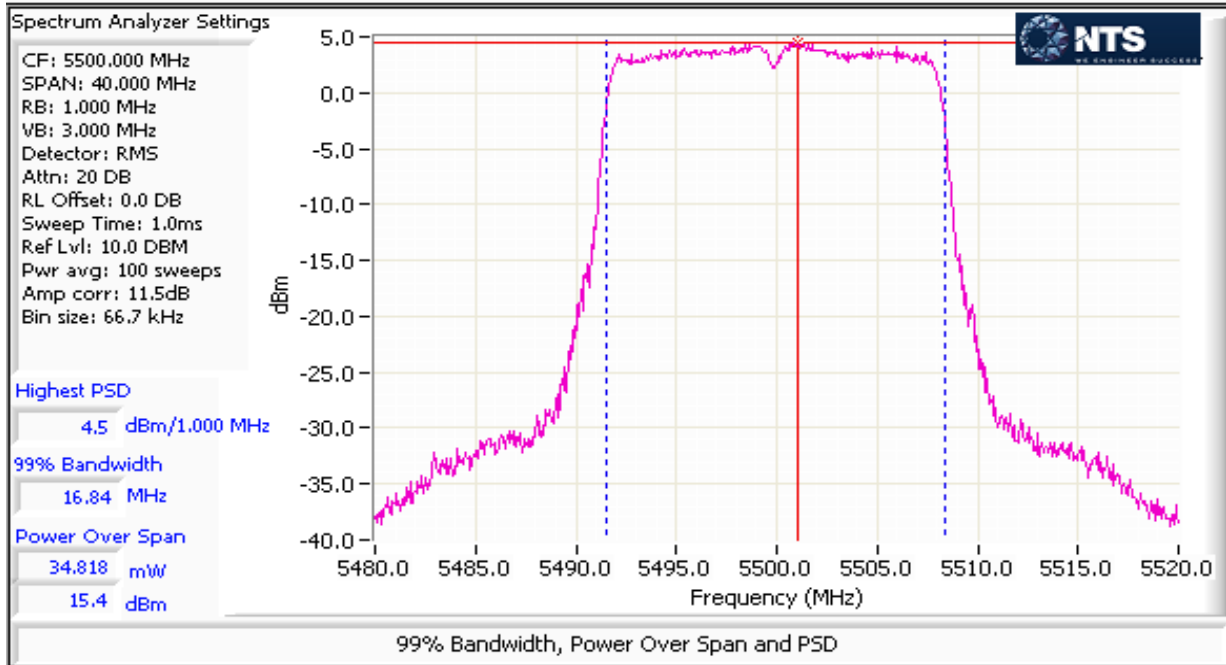
Mode: 11a

Frequency (MHz)	Chain	Software Setting	99% BW (MHz)	Duty Cycle %	PSD dBm/MHz	Total PSD ¹		FCC Limit dBm/MHz	IC limit dBm/MHz	Result
						mW/MHz	dBm/MHz			
5500	1	q68		99	4.4	5.6	7.5	8.0	11.0	Pass
	3									
	4									
	2									
5580	1	q67		99	4.2	5.3	7.2	8.0	11.0	Pass
	3									
	4									
	2									
5700	1	q68		99	4.3	5.6	7.5	8.0	11.0	Pass
	3									
	4									
	2									
5720	1	q65		99	4.3	5.6	7.5	8.0	11.0	Pass
	3									
	4									
	2									

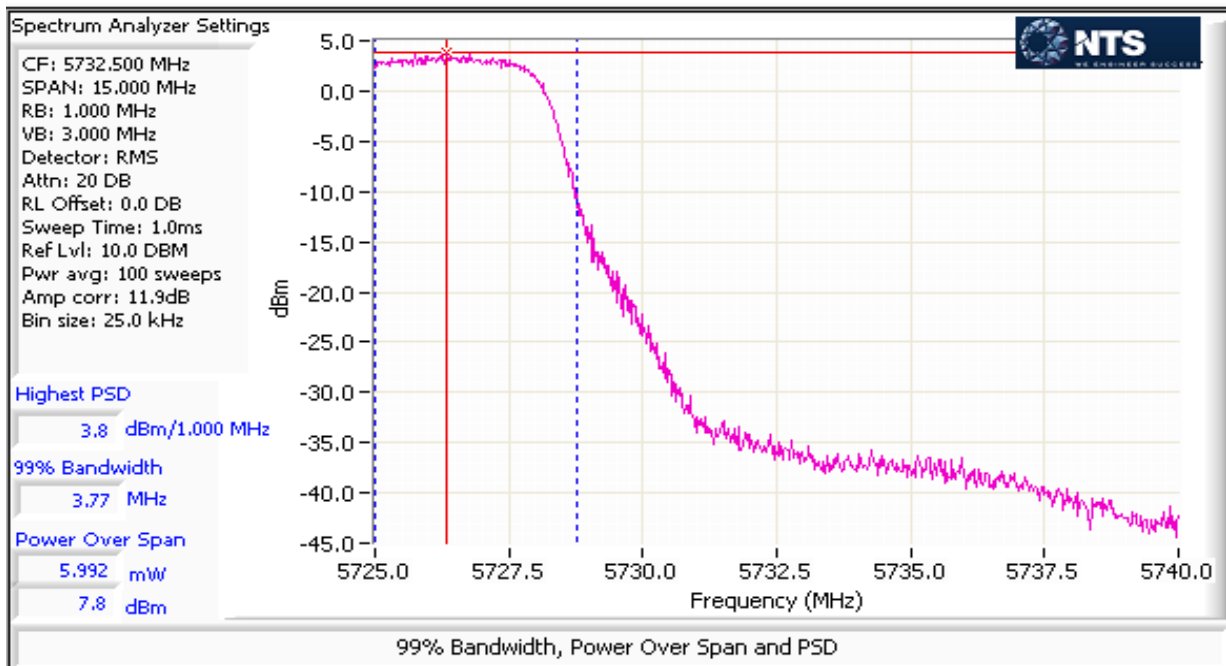
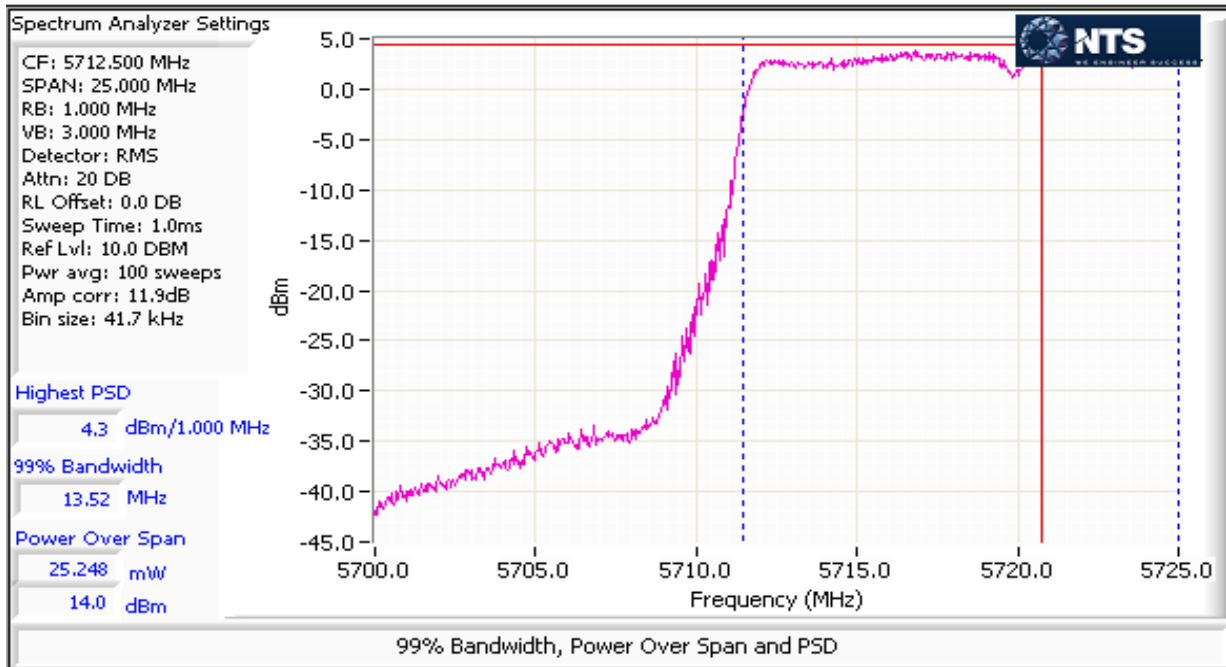
Portion within 5725-5850 MHz band (UNII-3)

5720	1	q65		99	3.3	4.5	6.5	27.0	27.0	Pass
	3									
	4									
	2									

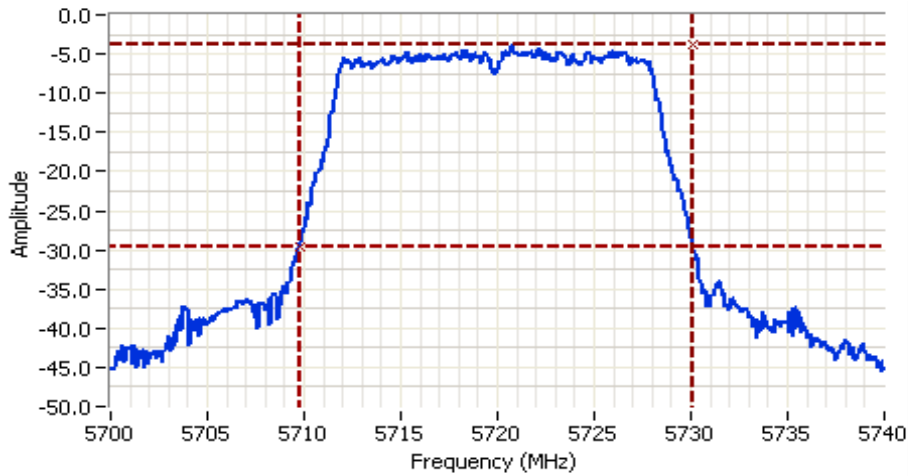
Client: Aruba Networks	Job Number: JD99613
Model: APINH205	T-Log Number: T101553
Contact: Rob Hastings	Project Manager: Christine Krebill
Standard: FCC 15.407 / RSS-210	Project Coordinator: -
	Class: N/A



Client: Aruba Networks	Job Number: JD99613
Model: APINH205	T-Log Number: T101553
Contact: Rob Hastings	Project Manager: Christine Krebill
Standard: FCC 15.407 / RSS-210	Project Coordinator: -
	Class: N/A



Client: Aruba Networks	Job Number: JD99613
Model: APINH205	T-Log Number: T101553
Contact: Rob Hastings	Project Manager: Christine Krebill
Standard: FCC 15.407 / RSS-210	Project Coordinator: -
	Class: N/A



Analyzer Settings

Agilent Technologies, E4446A
 CF: 5720.000 MHz
 SPAN: 40.000 MHz
 RB: 300 kHz
 VB: 1.000 MHz
 Detector: POS
 Attn: 20 DB
 RL Offset: 0.0 DB
 Sweep Time: 1.0ms
 Ref Lvl: 10.0 DBM

Comments

26dB BW: 20.267 MHz
 a mode
 UNII-2C: 15.2 MHz
 UNII-3: 5.07 MHz

Cursor 1	5730.0667	-3.7	
Cursor 2	5709.8000	-29.7	

Delta Freq. 20.267

Delta Amplitude 26.0



EMC Test Data

Client: Aruba Networks	Job Number: JD99613
Model: APINH205	T-Log Number: T101553
	Project Manager: Christine Krebill
Contact: Rob Hastings	Project Coordinator: -
Standard: FCC 15.407 / RSS-210	Class: N/A

MIMO Device - 5470-5725 MHz Band - FCC

Mode: n20

Max EIRP (mW): 273.1

Frequency (MHz)	Chain	Software Setting	26dB BW (MHz)	Duty Cycle %	Power dBm	Total Power mW	Total Power dBm	FCC Limit dBm	Max Power (W)	Result			
5500	1	q69	20.6	98	15.3	68.6	18.4	24.0	0.069	Pass			
	3												
	4												
	2				15.4								
5580	1	q69	22.9	98	15.1	67.0	18.3	24.0		0.069	Pass		
	3												
	4												
	2				15.4								
5700	1	q68	20.5	98	15.1	66.2	18.2	24.0			0.069	Pass	
	3												
	4												
	2				15.3								
5720	1	q68	15.4	98	14.5	59.1	17.7	22.9				0.069	Pass
	3												
	4												
	2				14.9								

Portion within 5725-5850 MHz band (UNII-3)

5720	1	q68		98	8.8	11.9	17.9	30.0	0.015	Pass
	3									
	4									
	2				9.0					



EMC Test Data

Client: Aruba Networks	Job Number: JD99613
Model: APINH205	T-Log Number: T101553
	Project Manager: Christine Krebill
Contact: Rob Hastings	Project Coordinator: -
Standard: FCC 15.407 / RSS-210	Class: N/A

MIMO Device - 5470-5725 MHz Band - Industry Canada
Mode: n20

Frequency (MHz)	Chain	Software Setting	99% BW (MHz)	Duty Cycle %	Power ¹ dBm	Total Power		IC Limit dBm	Max Power (W)	Result		
						dBm	dBm (eirp)					
5500	1	q69	17.97	98	15.3	18.4	24.4	23.5	0.069	Pass		
	3											
	4											
	2				15.4							
5580	1	q69	17.97	98	15.1	18.3	24.3	23.5		0.069	Pass	
	3											
	4											
	2				15.4							
5700	1	q68	17.97	98	15.1	18.2	24.2	23.5			0.069	Pass
	3											
	4											
	2				15.3							
5720	1	q68	14.1	98	14.5	17.7	23.7	22.5	0.069			Pass
	3											
	4											
	2				14.9							

Portion within 5725-5850 MHz band (UNII-3)

5720	1	q68		98	8.8	11.9	17.9	30.0	0.0119	Pass
	3									
	4									
	2				9.0					



EMC Test Data

Client: Aruba Networks	Job Number: JD99613
Model: APINH205	T-Log Number: T101553
	Project Manager: Christine Krebill
Contact: Rob Hastings	Project Coordinator: -
Standard: FCC 15.407 / RSS-210	Class: N/A

5470-5725 PSD - FCC/IC

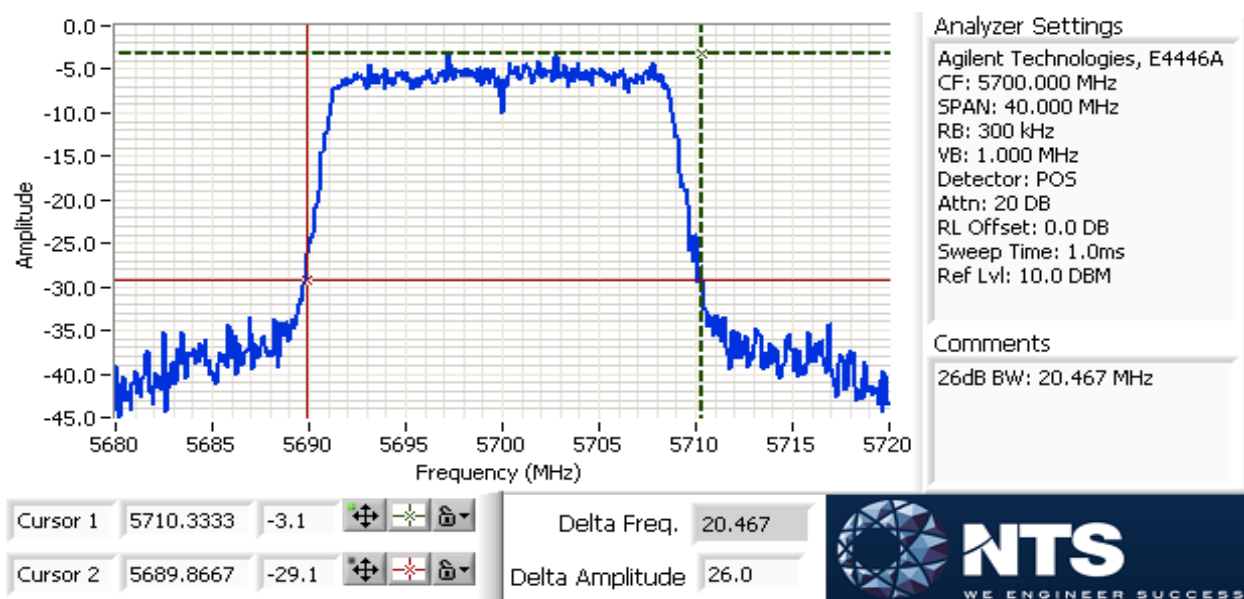
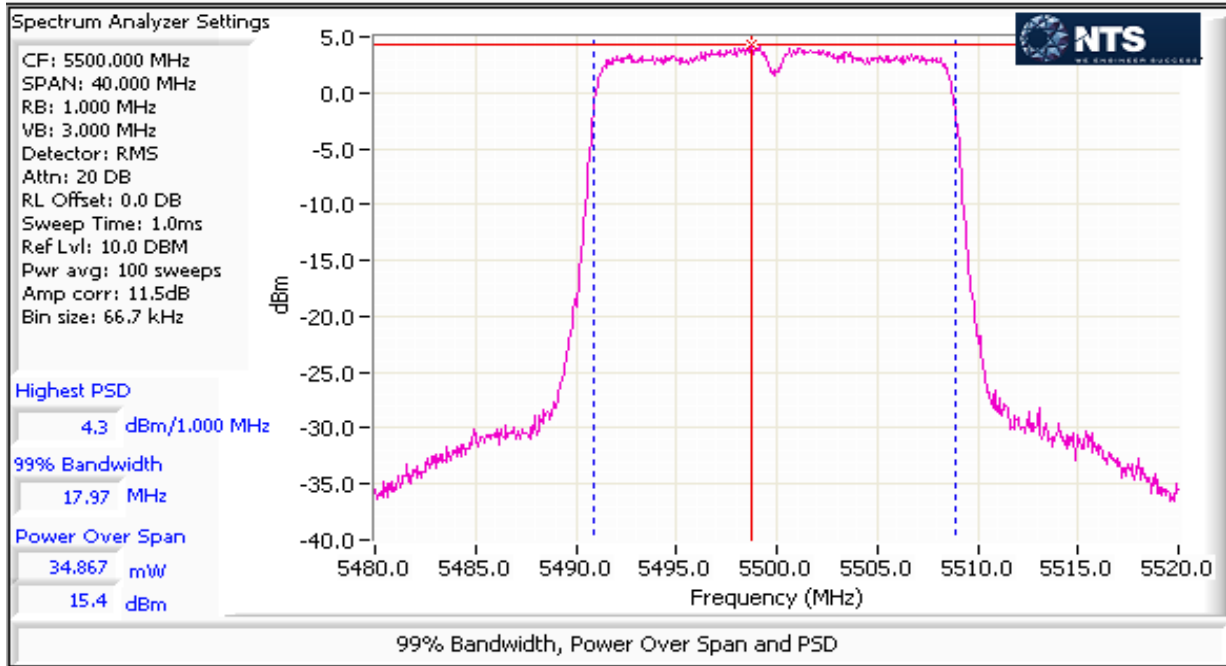
Mode: n20

Frequency (MHz)	Chain	Software Setting	99% BW (MHz)	Duty Cycle %	PSD dBm/MHz	Total PSD ¹ mW/MHz	Total PSD ¹ dBm/MHz	FCC Limit dBm/MHz	IC limit dBm/MHz	Result
5500	1	q69		98	4.0	5.2	7.2	8.0	11.0	Pass
	3									
	4									
	2				4.3					
5580	1	q69		98	3.8	5.2	7.2	8.0	11.0	Pass
	3									
	4									
	2				4.4					
5700	1	q68		98	3.9	5.1	7.1	8.0	11.0	Pass
	3									
	4									
	2				4.2					
5720	1	q68		98	4.3	5.7	7.6	8.0	11.0	Pass
	3									
	4									
	2				4.8					

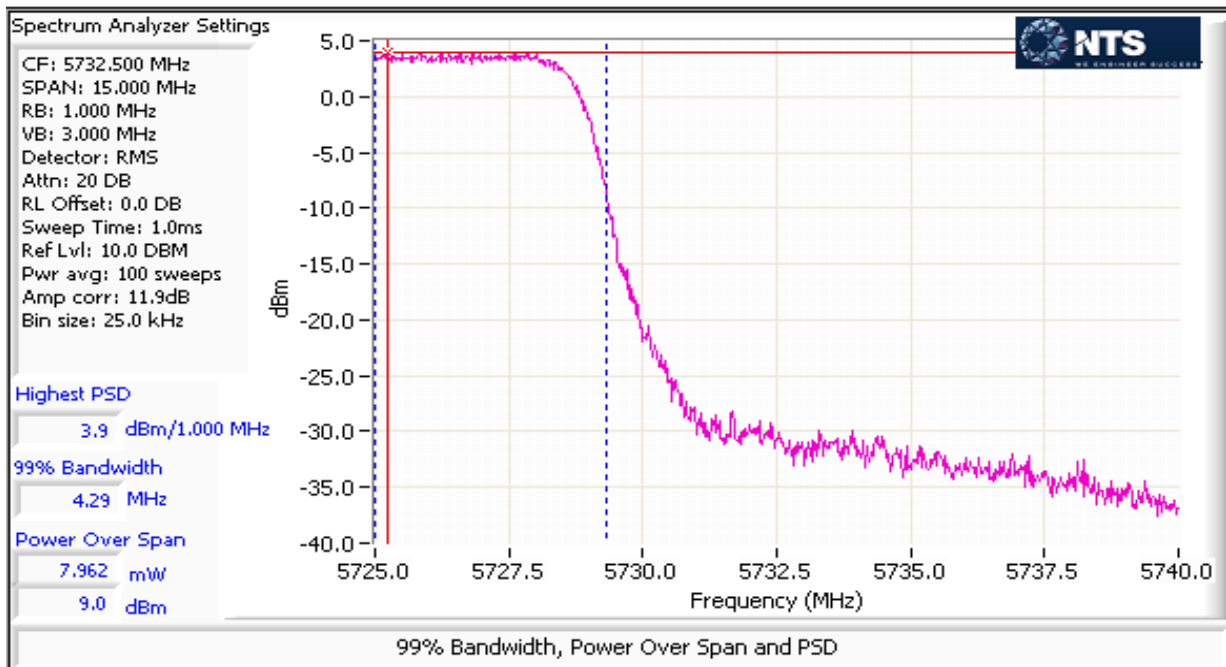
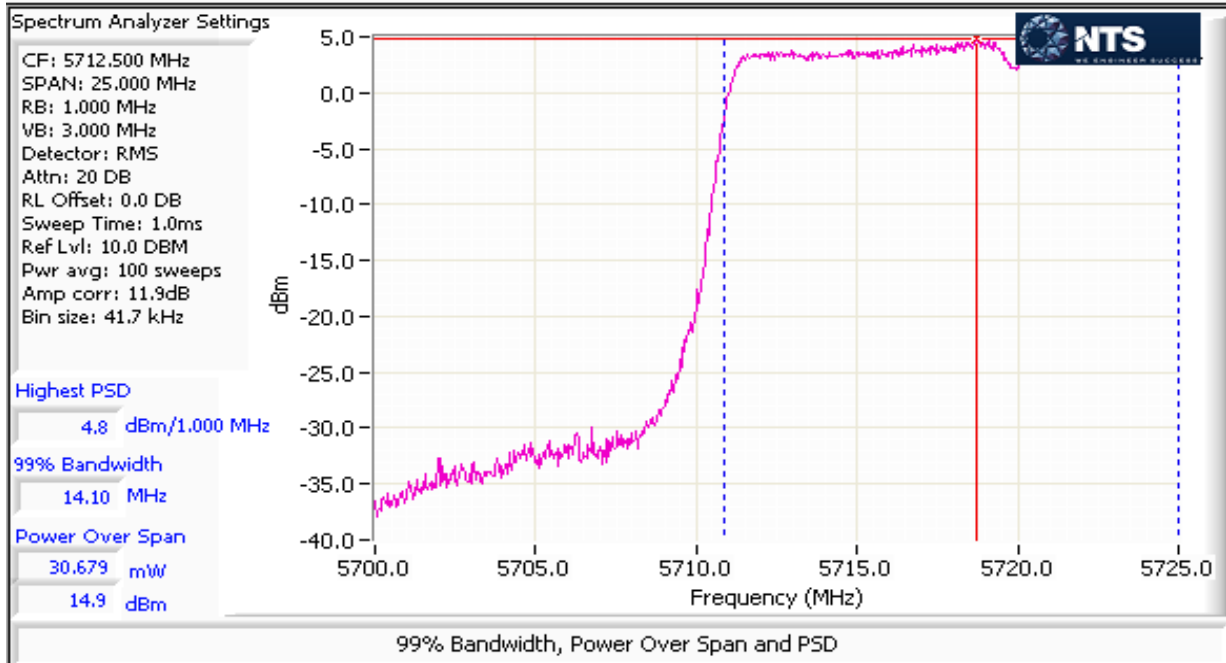
Portion within 5725-5850 MHz band (UNII-3)

5720	1	q68		98	3.8	4.9	6.9	27.0	27.0	Pass
	3									
	4									
	2				3.9					

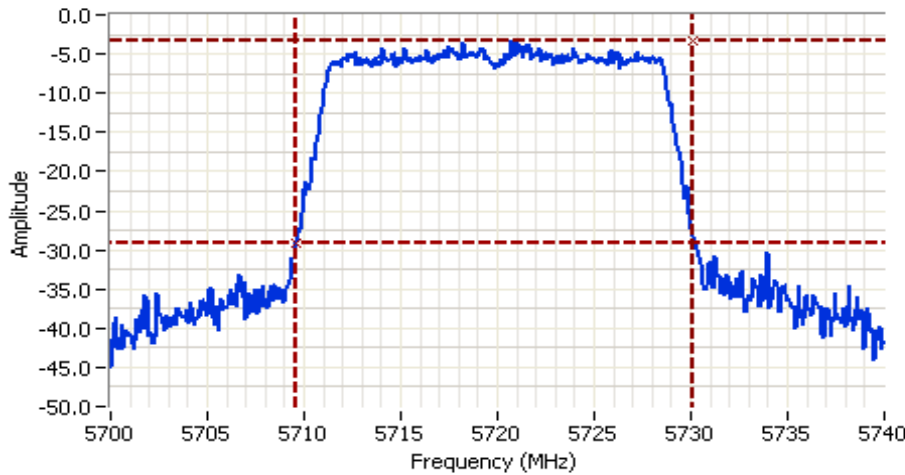
Client: Aruba Networks	Job Number: JD99613
Model: APINH205	T-Log Number: T101553
Contact: Rob Hastings	Project Manager: Christine Krebill
Standard: FCC 15.407 / RSS-210	Project Coordinator: -
	Class: N/A



Client: Aruba Networks	Job Number: JD99613
Model: APINH205	T-Log Number: T101553
	Project Manager: Christine Krebill
Contact: Rob Hastings	Project Coordinator: -
Standard: FCC 15.407 / RSS-210	Class: N/A



Client: Aruba Networks	Job Number: JD99613
Model: APINH205	T-Log Number: T101553
Contact: Rob Hastings	Project Manager: Christine Krebill
Standard: FCC 15.407 / RSS-210	Project Coordinator: -
	Class: N/A



Analyzer Settings

Agilent Technologies, E4446A
 CF: 5720.000 MHz
 SPAN: 40.000 MHz
 RB: 300 kHz
 VB: 1.000 MHz
 Detector: POS
 Attn: 20 DB
 RL Offset: 0.0 DB
 Sweep Time: 1.0ms
 Ref Lvl: 10.0 DBM

Comments

26dB BW: 20.533 MHz
 n20 mode
 UNII-2C: 15.4 MHz
 UNII-3: 5.13 MHz

Cursor 1	5730.1333	-3.2	
Cursor 2	5709.6000	-29.2	

Delta Freq.	20.533
Delta Amplitude	26.0





EMC Test Data

Client: Aruba Networks	Job Number: JD99613
Model: APINH205	T-Log Number: T101553
Contact: Rob Hastings	Project Manager: Christine Krebill
Standard: FCC 15.407 / RSS-210	Project Coordinator: -
	Class: N/A

MIMO Device - 5470-5725 MHz Band - FCC

Mode: n40

Max EIRP (mW): 322.9

Frequency (MHz)	Chain	Software Setting	26dB BW (MHz)	Duty Cycle %	Power dBm	Total Power mW	Total Power dBm	FCC Limit dBm	Max Power (W)	Result			
5510	1	q67	40.4	96	14.5	59.4	17.7	24.0	0.081	Pass			
	3												
	4												
	2				14.6								
5550	1	q72	40.1	96	15.5	73.1	18.6	24.0		0.081	Pass		
	3												
	4												
	2				15.4								
5670	1	q72	49.6	96	15.5	76.6	18.8	24.0			0.081	Pass	
	3												
	4												
	2				15.8								
5710	1	q72	34.9	96	15.8	81.1	19.1	24.0				0.081	Pass
	3												
	4												
	2				16.0								

Portion within 5725-5850 MHz band (UNII-3)

5710	1	q72		96	5.6	7.7	8.9	30.0	0.0077	Pass
	3									
	4									
	2				5.7					



EMC Test Data

Client: Aruba Networks	Job Number: JD99613
Model: APINH205	T-Log Number: T101553
	Project Manager: Christine Krebill
Contact: Rob Hastings	Project Coordinator: -
Standard: FCC 15.407 / RSS-210	Class: N/A

MIMO Device - 5470-5725 MHz Band - Industry Canada
Mode: n40

Frequency (MHz)	Chain	Software Setting	99% BW (MHz)	Duty Cycle %	Power ¹ dBm	Total Power		IC Limit dBm	Max Power (W)	Result
						dBm	dBm (eirp)			
5510	1	q67	36.34	96	14.5	17.7	23.7	24.0	0.081	Pass
	3									
	4									
	2									
5550	1	q72	36.47	96	15.5	18.6	24.6	24.0		Pass
	3									
	4									
	2									
5670	1	q72	36.47	96	15.5	18.8	24.8	24.0		Pass
	3									
	4									
	2									
5710	1	q72	33.32	96	15.8	19.1	25.1	24.0		Pass
	3									
	4									
	2									

Portion within 5725-5850 MHz band (UNII-3)

5710	1	q72		96	5.6	8.8	14.8	30.0	0.008	Pass
	3									
	4									
	2									



EMC Test Data

Client: Aruba Networks	Job Number: JD99613
Model: APINH205	T-Log Number: T101553
	Project Manager: Christine Krebill
Contact: Rob Hastings	Project Coordinator: -
Standard: FCC 15.407 / RSS-210	Class: N/A

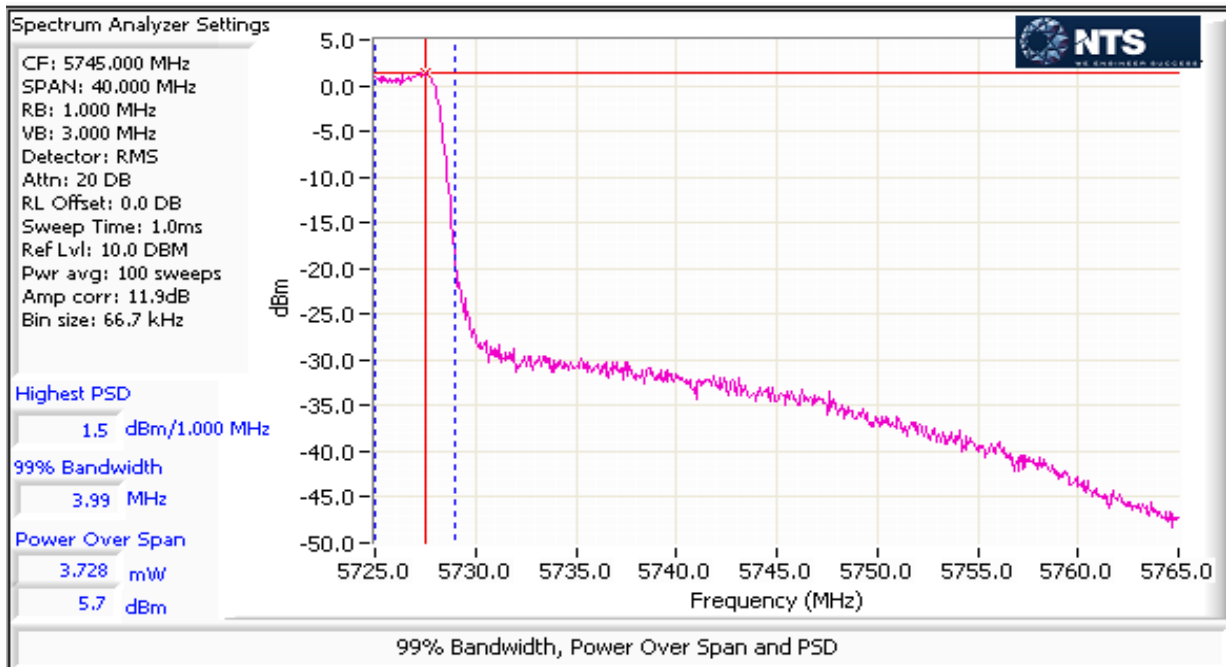
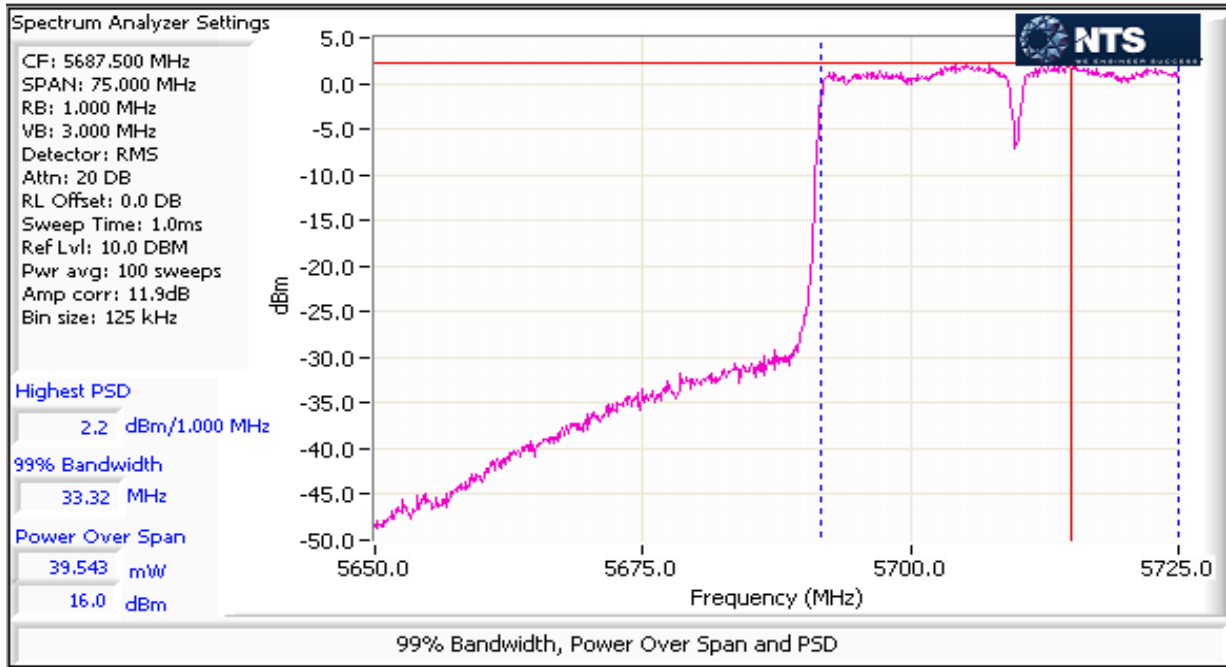
MIMO Device 5470-5725 PSD - FCC/IC
Mode: n40

Frequency (MHz)	Chain	Software Setting	99% BW (MHz)	Duty Cycle %	PSD dBm/MHz	Total PSD ¹		FCC Limit dBm/MHz	IC limit dBm/MHz	Result
						mW/MHz	dBm/MHz			
5510	1	q67		96	0.4	2.4	3.8	8.0	11.0	Pass
	3									
	4									
	2									
5550	1	q72		96	1.2	2.8	4.5	8.0	11.0	Pass
	3									
	4									
	2									
5670	1	q72		96	1.2	2.8	4.5	8.0	11.0	Pass
	3									
	4									
	2									
5710	1	q72		96	1.9	3.3	5.2	8.0	11.0	Pass
	3									
	4									
	2									

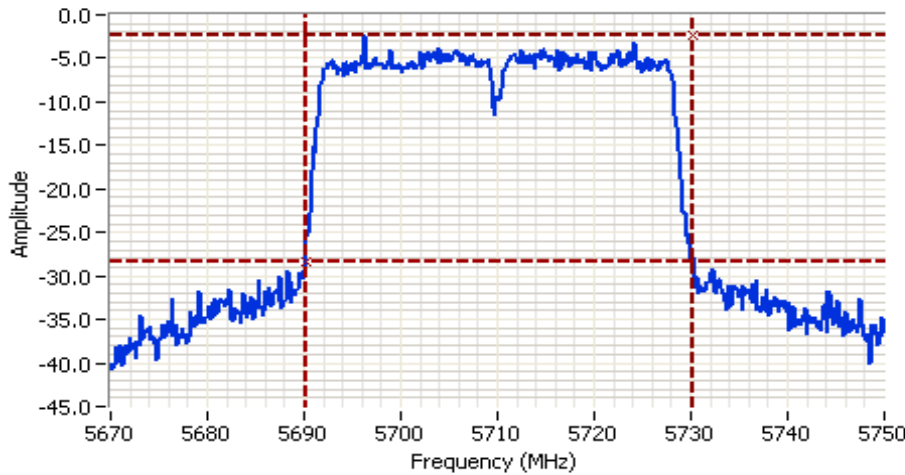
Portion within 5725-5850 MHz band (UNII-3)

5710	1	q72		96	1.6	3.0	4.8	27.0	27.0	Pass
	3									
	4									
	2									

Client: Aruba Networks	Job Number: JD99613
Model: APINH205	T-Log Number: T101553
	Project Manager: Christine Krebill
Contact: Rob Hastings	Project Coordinator: -
Standard: FCC 15.407 / RSS-210	Class: N/A



Client: Aruba Networks	Job Number: JD99613
Model: APINH205	T-Log Number: T101553
	Project Manager: Christine Krebill
Contact: Rob Hastings	Project Coordinator: -
Standard: FCC 15.407 / RSS-210	Class: N/A



Analyzer Settings

Agilent Technologies, E4446A
 CF: 5710.000 MHz
 SPAN: 80.000 MHz
 RB: 510 kHz
 VB: 1.500 MHz
 Detector: POS
 Attn: 20 DB
 RL Offset: 0.0 DB
 Sweep Time: 1.0ms
 Ref Lvl: 10.0 DBM

Comments

26dB BW: 40.133 MHz
 n40 mode
 UNII-2C: 34.867 MHz
 UNII-3: 5.2667 MHz

Cursor 1	5730.2667	-2.4		Delta Freq.	40.133
Cursor 2	5690.1333	-28.4		Delta Amplitude	26.0



EMC Test Data

Client: Aruba Networks	Job Number: JD99613
Model: APINH205	T-Log Number: T101553
	Project Manager: Christine Krebill
Contact: Rob Hastings	Project Coordinator: -
Standard: FCC 15.407 / RSS-210	Class: N/A

MIMO Device - 5470-5725 MHz Band - FCC

Mode: ac80

Max EIRP (mW): 352.7

Frequency (MHz)	Chain	Software Setting	26dB BW (MHz)	Duty Cycle %	Power ¹ dBm	Total Power mW	Total Power dBm	FCC Limit dBm	Max Power (W)	Result
5530	1	q55	81.3	93	11.7	32.6	15.1	24.0	0.089	Pass
	3									
	4									
	2				11.9					
5610	1	q72	85.9	93	15.7	83.8	19.2	24.0		Pass
	3									
	4									
	2				16.1					
5690	1	q72	80.3	93	16.1	88.6	19.5	24.0		Pass
	3									
	4									
	2				16.2					

Portion within 5725-5850 MHz band (UNII-3)

5690	1	q72		93	2.2	3.5	5.4	30.0	0.0035	Pass
	3									
	4									
	2				2.0					



EMC Test Data

Client: Aruba Networks	Job Number: JD99613
Model: APINH205	T-Log Number: T101553
	Project Manager: Christine Krebill
Contact: Rob Hastings	Project Coordinator: -
Standard: FCC 15.407 / RSS-210	Class: N/A

MIMO Device - 5470-5725 MHz Band - Industry Canada
Mode: ac80

Frequency (MHz)	Chain	Software Setting	99% BW (MHz)	Duty Cycle %	Power ¹ dBm	Total Power dBm	Total Power dBm (eirp)	IC Limit dBm	Max Power (W)	Result
5530	1	q55	75.87	93	11.7	15.1	21.1	24.0	0.089	Pass
	3									
	4									
	2				11.9					
5690	1	q72	72.7	93	16.1	19.5	25.5	24.0		
	3									
	4									
	2				16.2					

Portion within 5725-5850 MHz band (UNII-3)

5690	1	q72		93	2.2	5.4	11.4	30.0	0.003	Pass
	3									
	4									
	2				2.0					



EMC Test Data

Client: Aruba Networks	Job Number: JD99613
Model: APINH205	T-Log Number: T101553
	Project Manager: Christine Krebill
Contact: Rob Hastings	Project Coordinator: -
Standard: FCC 15.407 / RSS-210	Class: N/A

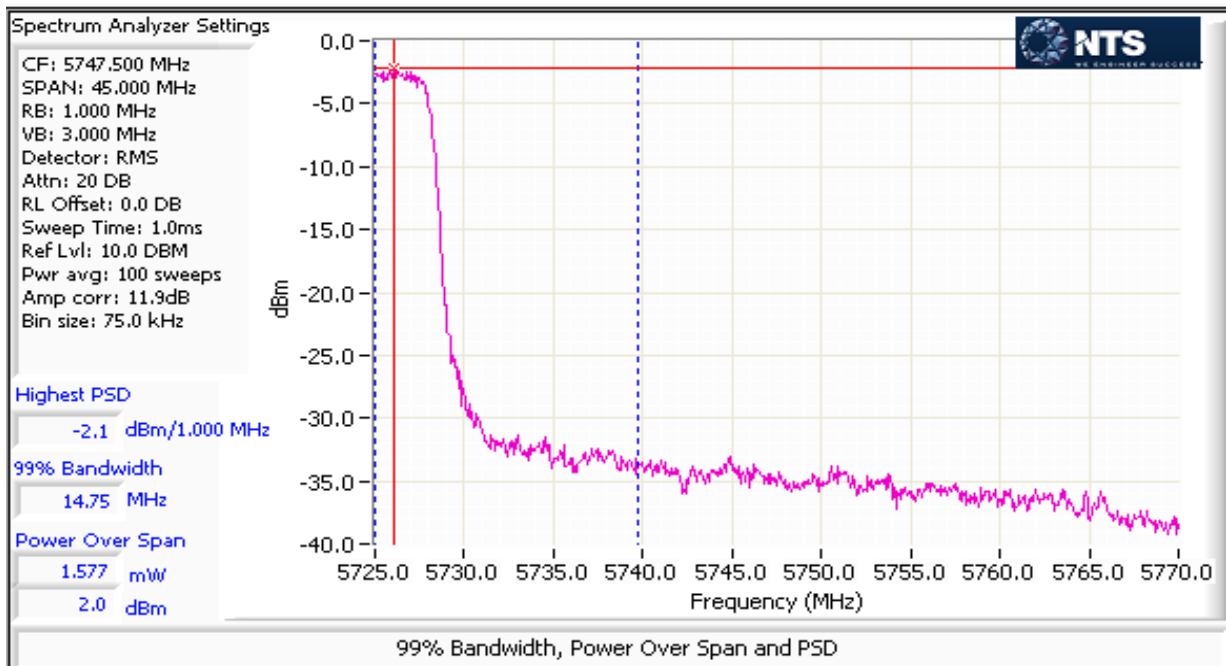
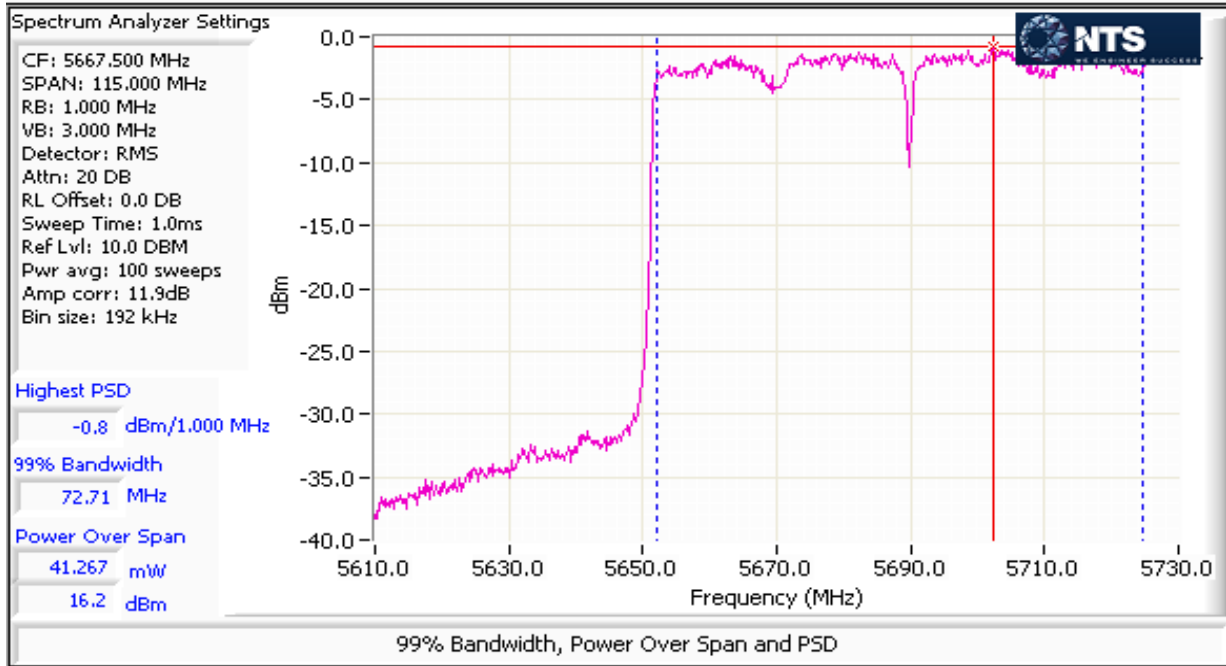
5470-5725 PSD - FCC/IC Note: 5610 MHz channel not used for Canada
Mode: ac80

Frequency (MHz)	Chain	Software Setting	99% BW (MHz)	Duty Cycle %	PSD dBm/MHz	Total PSD ¹ mW/MHz	Total PSD ¹ dBm/MHz	FCC Limit dBm/MHz	IC limit dBm/MHz	Result
5530	1	q55		93	-5.8	0.6	-2.2	8.0	11.0	Pass
	3									
	4									
	2									
5610	1	q72		93	-1.6	1.6	2.0	8.0	-	Pass
	3									
	4									
	2									
5690	1	q72		93	-0.9	1.8	2.6	8.0	11.0	Pass
	3									
	4									
	2									

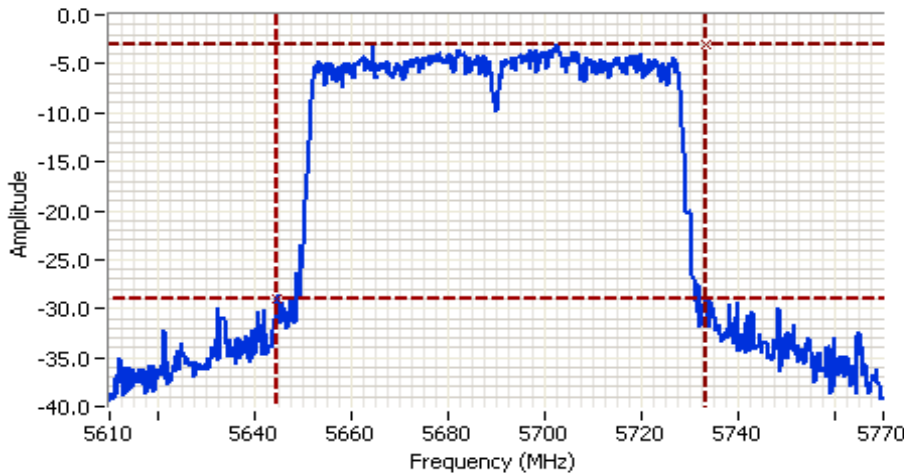
Portion within 5725-5850 MHz band (UNII-3)

5690	1	q72		93	-2.1	1.3	1.1	27.0	27.0	Pass
	3									
	4									
	2									

Client: Aruba Networks	Job Number: JD99613
Model: APINH205	T-Log Number: T101553
Contact: Rob Hastings	Project Manager: Christine Krebill
Standard: FCC 15.407 / RSS-210	Project Coordinator: -
	Class: N/A



Client: Aruba Networks	Job Number: JD99613
Model: APINH205	T-Log Number: T101553
Contact: Rob Hastings	Project Manager: Christine Krebill
Standard: FCC 15.407 / RSS-210	Project Coordinator: -
	Class: N/A



Analyzer Settings

Agilent Technologies, E4446A
 CF: 5690.000 MHz
 SPAN: 160.000 MHz
 RB: 1.000 MHz
 VB: 3.000 MHz
 Detector: POS
 Attn: 20 DB
 RL Offset: 0.0 DB
 Sweep Time: 1.0ms
 Ref Lvl: 10.0 DBM

Comments

26dB BW: 88.533 MHz
 ac80 mode
 UNII-2C: 80.3 MHz
 UNII-3: 8.2 MHz

Cursor 1	5733.2000	-3.0	
Cursor 2	5644.6667	-29.0	

Delta Freq. 88.533

Delta Amplitude 26.0



Client:	Aruba Networks	Job Number:	JD99613
Model:	APINH205	T-Log Number:	T101553
Contact:	Rob Hastings	Project Manager:	Christine Krebill
Standard:	FCC 15.407 / RSS-210	Project Coordinator:	-
		Class:	N/A

RSS-247 (LELAN) and FCC 15.407(UNII) Antenna Port Measurements Power, PSD, Bandwidth and Spurious Emissions

Test Specific Details

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

Summary of Results

Run #	Test Performed	Limit	Pass / Fail	Result / Margin
1	Power, 5725 - 5850MHz	15.407(a)(3) RSS-247 6.2.4(1)	Pass	a: 19.3dBm (85.4 mW) n20: 19.5dBm (88.4 mW) n40: 19.4dBm (87.9 mW) ac80: 16.2dBm (41.9 mW)

General Test Configuration

When measuring the conducted emissions from the EUT's antenna port, the antenna port of the EUT was connected to the spectrum analyzer or power meter via a suitable attenuator to prevent overloading the measurement system. All measurements are corrected to allow for the external attenuators and cables used.

Ambient Conditions:

Temperature:	20-22 °C
Rel. Humidity:	30-35 %

Modifications Made During Testing

No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.

Client: Aruba Networks	Job Number: JD99613
Model: APINH205	T-Log Number: T101553
	Project Manager: Christine Krebill
Contact: Rob Hastings	Project Coordinator: -
Standard: FCC 15.407 / RSS-210	Class: N/A

Procedure Comments:

Measurements performed in accordance with FCC KDB 789033 D01

Mode	Data Rate	Duty Cycle (x)	Constant DC?	T (ms)	Pwr Cor Factor*	Lin Volt Cor Factor**	Min VBW for FS (Hz)
11a	6Mbs	99%	Yes	2.06	0	0	10
n20	MCS8	98%	Yes	0.98	0.09	0.18	10
n40	MCS0	96%	Yes	0.494	0.16	0.33	2024
ac80	VHT0	93%	Yes	0.255	0.30	0.59	3922

Sample Notes

Sample S/N:

Driver:

Note 1:	Duty Cycle \geq 98%. Output power measured using a spectrum analyzer (see plots below). RBW=1MHz, VB=3 MHz, Span > OBW, # of points in sweep \geq 2*span/RBW, auto sweep, RMS detector, power averaging on (transmitted signal was continuous, duty cycle \geq 98%) and power integration over the OBW (method SA-1 of ANSI C63.10).
	Duty Cycle < 98%. Output power measured using a spectrum analyzer (see plots below). RBW=1MHz, VB=3 MHz, Span > OBW, # of points in sweep \geq 2*span/RBW, auto sweep, RMS detector, power averaging on (transmitted signal was not continuous, but the analyzer was configured to trigger only on full power pulses such that the analyzer was only sweeping when the device was transmitting) and power integration over the OBW (method SA-1 of ANSI C63.10).
Note 2:	Measured using the same analyzer settings used for output power.
Note 3:	99% Bandwidth measured in accordance with C63.10 - RB between 1-5 % of OBW and VB \geq 3*RB, Span between 1.5 and 5 times OBW.
Note 4:	For MIMO systems the total output power and total PSD are calculated from the sum of the powers of the individual chains (in linear terms). The antenna gain used to determine the EIRP and limits for PSD/Output power depends on the operating mode of the MIMO device. If the signals on the non-coherent between the transmit chains then the gain used to determine the limits is the highest gain of the individual chains and the EIRP is the sum of the products of gain and power on each chain. If the signals are coherent then the effective antenna gain is the sum (in linear terms) of the gains for each chain and the EIRP is the product of the effective gain and total power.



EMC Test Data

Client: Aruba Networks	Job Number: JD99613
Model: APINH205	T-Log Number: T101553
	Project Manager: Christine Krebill
Contact: Rob Hastings	Project Coordinator: -
Standard: FCC 15.407 / RSS-210	Class: N/A

Antenna Gain Information

Freq	Antenna Gain (dBi) / Chain				BF	MultiChain Legacy	CDD	Sectorized / Xpol	Dir G (PWR)	Dir G (PSD)
	1	2	3	4						
5150-5250	6.0	6.0			No	Yes	Yes	No	6.00	9.01
5725-5850	6.0	6.0			No	Yes	Yes	No	6.00	9.01
5470-5725	6.0	6.0			No	Yes	Yes	No	6.00	9.01
5725-5825	6.0	6.0			No	Yes	Yes	No	6.00	9.01

For devices that support CDD modes

Min # of spatial streams: 1
 Max # of spatial streams: 2

Run #1: Bandwidth, Output Power and Power Spectral Density - MIMO Systems

Date of Test: 05/11/16
 Test Engineer: Mehran Birgani
 Test Location: Lab 4
 Config. Used: Antenna Port
 Config Change: -
 EUT Voltage: 120V/ 60Hz

Notes:	BF = beamforming mode supported, Multichain Legacy = 802.11 legacy data rates supported for multichain transmissions, CDD = Cyclic Delay Diversity (or Cyclic Shift Diversity) modes supported, Sectorized / Xpol = antennas are sectorized or cross polarized.
Notes:	Dir G (PWR) = total gain (Gant + Array Gain) for power calculations; GA (PSD) = total gain for PSD calculations based on FCC KDB 662911. Depending on the modes supported, the Array Gain value for power could be different from the PSD value.
Notes:	Array gain for power/psd calculated per KDB 662911 D01.
Notes:	For systems with Beamforming and CDD, choose one the following options: Option 1: Delays are optimized for beamforming, rather than being selected from cyclic delay table of 802.11; Array gains calculated based on beamforming criteria. Option 2: Antennas are paired for beamforming, and the pairs are configured to use the cyclic delay diversity of 802.11; the array gain associated with beamforming with 2 antennas (3dB), and the array gain associated with CDD with two antennas (3dB for PSD and 0 dB for power)



EMC Test Data

Client: Aruba Networks	Job Number: JD99613
Model: APINH205	T-Log Number: T101553
Contact: Rob Hastings	Project Manager: Christine Krebill
Standard: FCC 15.407 / RSS-210	Project Coordinator: -
	Class: N/A

MIMO Device - 5725-5850 MHz Band - FCC/IC

Mode: 11a

Max EIRP (mW): 340

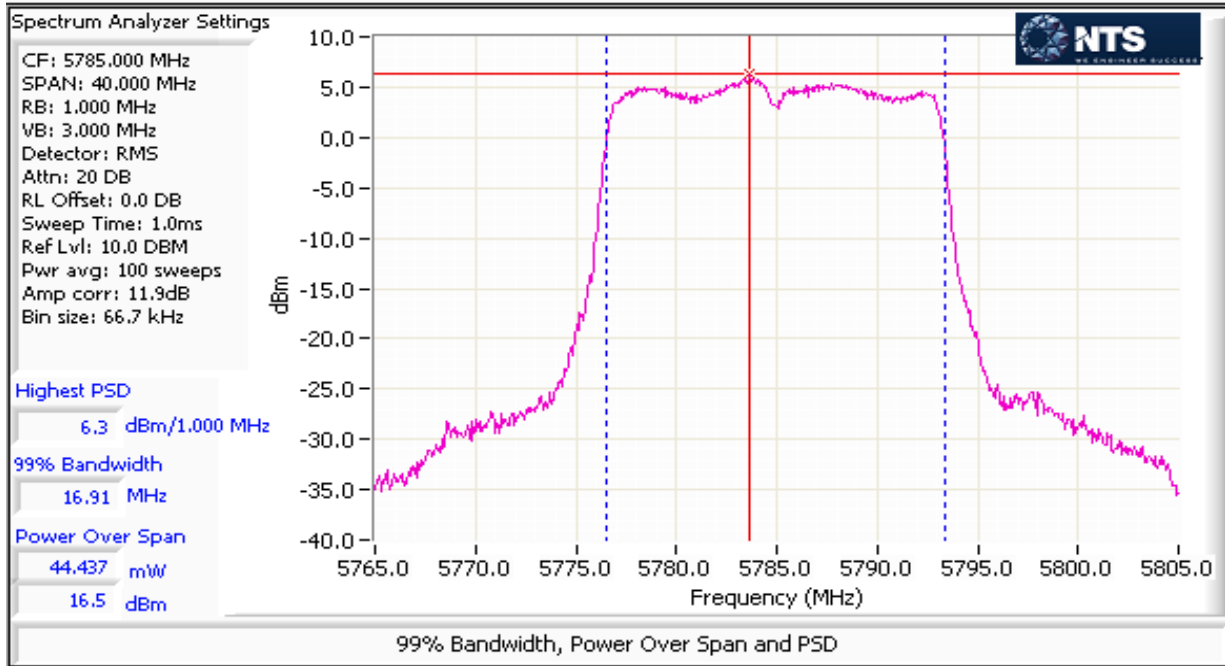
Frequency (MHz)	Chain	Software Setting	99% BW (MHz)	Duty Cycle %	Power dBm	Total Power ¹ mW	Total Power ¹ dBm	Limit dBm	Max Power (W)	Result		
5745	1	q65	16.8	99	14.6	62.7	18.0	30.0	0.085	Pass		
	3											
	4											
	2											
5785	1	q70	16.9	99	16.1	85.4	19.3	30.0		0.085	Pass	
	3											
	4											
	2											
5825	1	q69	16.9	99	15.7	77.0	18.9	30.0			0.085	Pass
	3											
	4											
	2											

5725-5850 PSD - FCC/IC

Mode: 11a

Frequency (MHz)	Chain	Software Setting	99% BW (MHz)	Duty Cycle %	PSD dBm/MHz	Total PSD ¹ mW/MHz	Total PSD ¹ dBm/MHz	FCC Limit dBm/500kHz	IC Limit dBm/500kHz	Result
5745	1	q65		99	3.8	5.4	7.3	27.0	27.0	Pass
	3									
	4									
	2									
5785	1	q70		99	5.4	7.7	8.9	27.0	27.0	Pass
	3									
	4									
	2									
5825	1	q69		99	5.0	6.8	8.3	27.0	27.0	Pass
	3									
	4									
	2									

Client: Aruba Networks	Job Number: JD99613
Model: APINH205	T-Log Number: T101553
	Project Manager: Christine Krebill
Contact: Rob Hastings	Project Coordinator: -
Standard: FCC 15.407 / RSS-210	Class: N/A





EMC Test Data

Client: Aruba Networks	Job Number: JD99613
Model: APINH205	T-Log Number: T101553
Contact: Rob Hastings	Project Manager: Christine Krebill
Standard: FCC 15.407 / RSS-210	Project Coordinator: -
	Class: N/A

MIMO Device - 5725-5850 MHz Band - FCC/IC

Mode: n20

Max EIRP (mW): 351.9

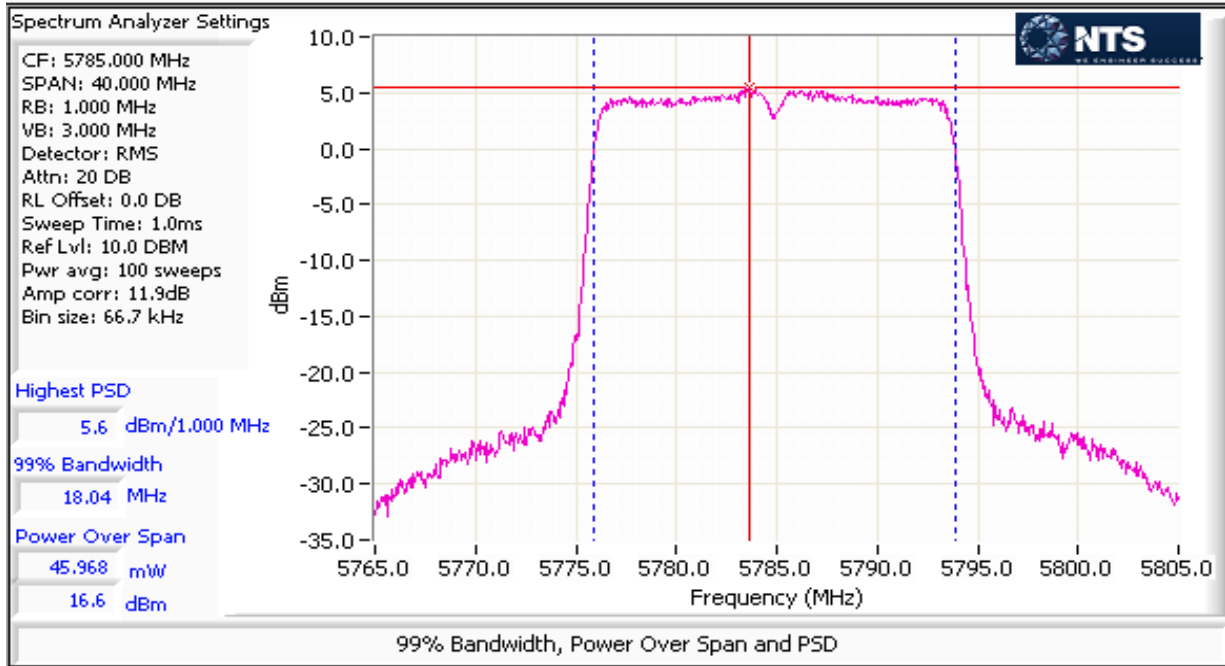
Frequency (MHz)	Chain	Software Setting	99% BW (MHz)	Duty Cycle %	Power dBm	Total Power ¹ mW	dBm	FCC Limit dBm	Max Power (W)	Result
5745	1	q65	18.0	98	14.4	59.2	17.7	30.0	0.088	Pass
	3									
	4									
	2									
5785	1	q72	18.0	98	16.3	88.4	19.5	30.0		Pass
	3									
	4									
	2									
5825	1	q72	18.0	98	16.0	83.5	19.2	30.0		Pass
	3									
	4									
	2									

5725-5850 PSD - FCC/IC

Mode: n20

Frequency (MHz)	Chain	Software Setting	99% BW (MHz)	Duty Cycle %	PSD dBm/MHz	Total PSD ¹ mW/MHz	dBm/MHz	FCC Limit dBm/MHz	IC Limit dBm/MHz	Result
5745	1	q65		98	3.1	4.6	6.6	27.0	27.0	Pass
	3									
	4									
	2									
5785	1	q72		98	5.1	6.9	8.4	27.0	27.0	Pass
	3									
	4									
	2									
5825	1	q72		98	4.7	6.3	8.0	27.0	27.0	Pass
	3									
	4									
	2									

Client: Aruba Networks	Job Number: JD99613
Model: APINH205	T-Log Number: T101553
Contact: Rob Hastings	Project Manager: Christine Krebill
Standard: FCC 15.407 / RSS-210	Project Coordinator: -
	Class: N/A





EMC Test Data

Client: Aruba Networks	Job Number: JD99613
Model: APINH205	T-Log Number: T101553
	Project Manager: Christine Krebill
Contact: Rob Hastings	Project Coordinator: -
Standard: FCC 15.407 / RSS-210	Class: N/A

MIMO Device - 5725-5850 MHz Band - FCC/IC

Mode: n40

Max EIRP (mW): 349.9

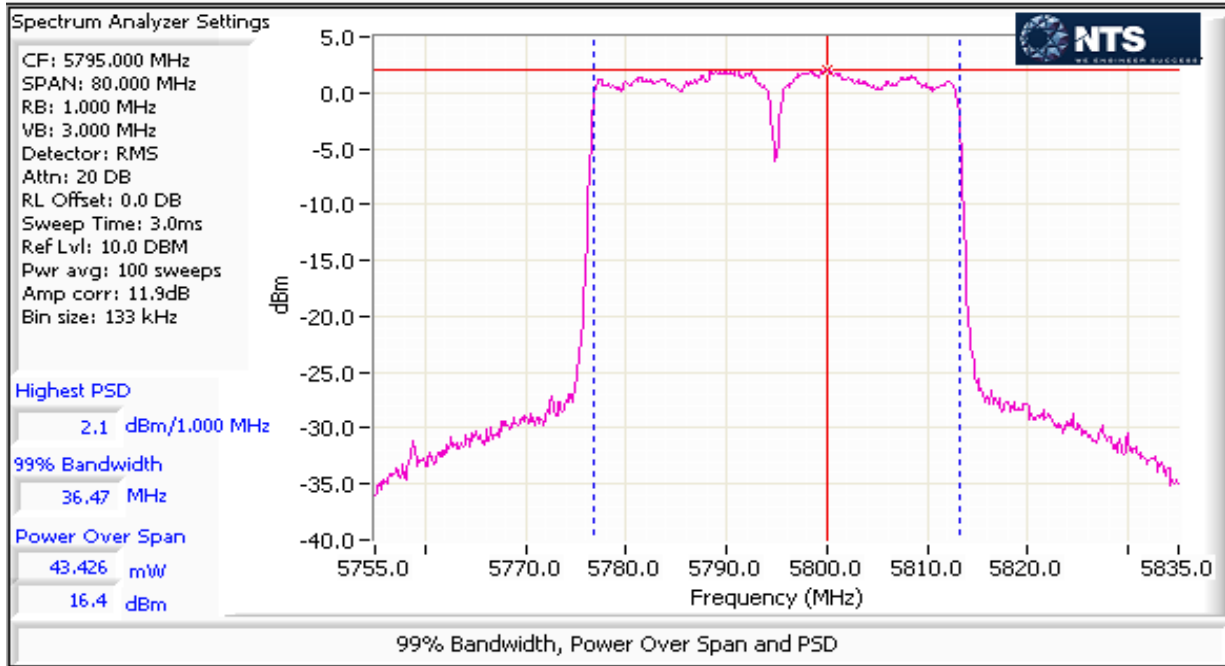
Frequency (MHz)	Chain	Software Setting	99% BW (MHz)	Duty Cycle %	Power dBm	Total Power ¹ mW	FCC Limit dBm	Max Power (W)	Result		
5755	1	q65	36.5	96	14.3	58.1	17.6	0.088	Pass		
	3										
	4										
	2				14.6						
5795	1	q72	36.5	96	16.1	87.9	19.4			30.0	Pass
	3										
	4										
	2				16.4						

MIMO Device 5725-5850 PSD - FCC/IC

Mode: n40

Frequency (MHz)	Chain	Software Setting	99% BW (MHz)	Duty Cycle %	PSD dBm/MHz	Total PSD ¹ mW/MHz	FCC Limit dBm/MHz	IC Limit dBm/MHz	Result	
5755	1	q65		96	-0.1	2.1	3.2	27.0	27.0	Pass
	3									
	4									
	2				0.2					
5795	1	q72		96	1.7	3.2	5.1	27.0	27.0	Pass
	3									
	4									
	2				2.1					

Client: Aruba Networks	Job Number: JD99613
Model: APINH205	T-Log Number: T101553
	Project Manager: Christine Krebill
Contact: Rob Hastings	Project Coordinator: -
Standard: FCC 15.407 / RSS-210	Class: N/A



Client: Aruba Networks	Job Number: JD99613
Model: APINH205	T-Log Number: T101553
Contact: Rob Hastings	Project Manager: Christine Krebill
Standard: FCC 15.407 / RSS-210	Project Coordinator: -
	Class: N/A

MIMO Device - 5725-5850 MHz Band - FCC/IC

Mode: ac80

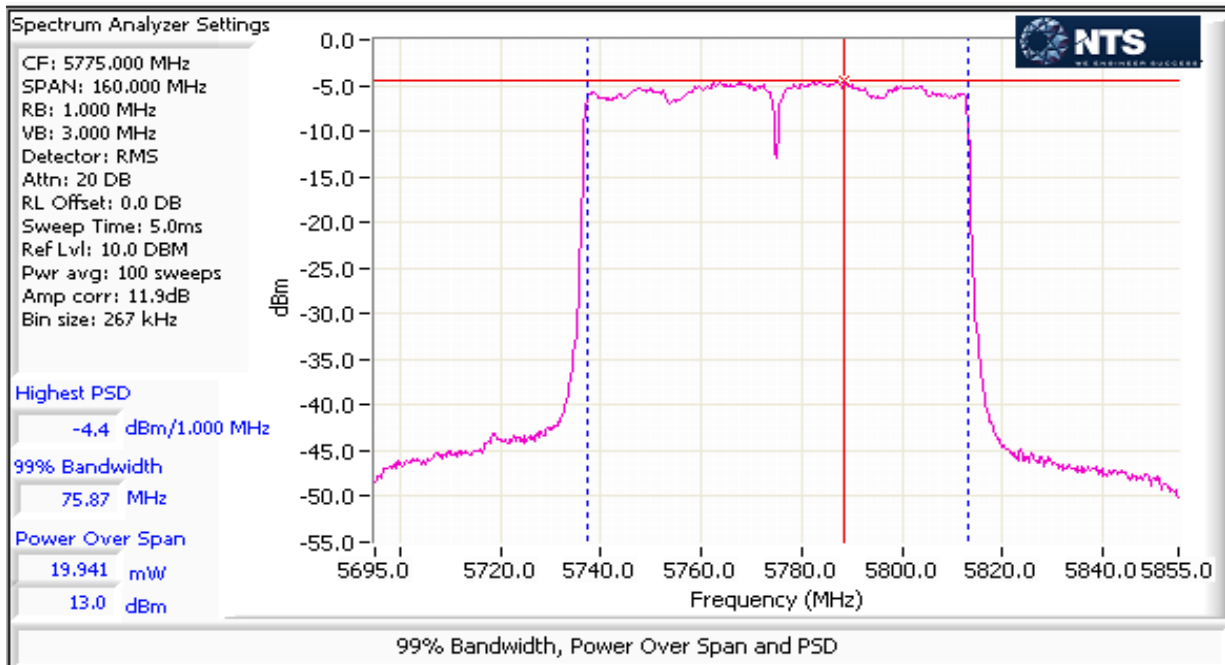
Max EIRP (mW): 166.8

Frequency (MHz)	Chain	Software Setting	99% BW (MHz)	Duty Cycle %	Power dBm	Total Power ¹ mW	Total Power ¹ dBm	FCC Limit dBm	Max Power (W)	Result
5775	1	q58	75.9	93	12.8	41.9	16.2	30.0	0.042	Pass
	3									
	4									
	2				13.0					

MIMO Device 5725-5850 PSD - FCC/IC

Mode: ac80

Frequency (MHz)	Chain	Software Setting	99% BW (MHz)	Duty Cycle %	PSD dBm/MHz	Total PSD ¹ mW/MHz	Total PSD ¹ dBm/MHz	FCC Limit dBm/MHz	IC Limit dBm/MHz	Result
5775	1	q58		93	-4.6	0.8	-1.0	27.0	27.0	Pass
	3									
	4									
	2				-4.4					



End of Report

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