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Electromagnetic Emissions Test Report
Application for Grant of Equipment Authorization
Class II Permissive Change
pursuant to
Industry Canada RSS-Gen Issue 2 / RSS 210 Issue 7
FCC Part 15, Subpart E
on the
Intel Corporation
Transmitter
Model: 512ANM

UPN:	1000M-512ANM
FCC ID:	PD9512ANM
GRANTEE:	Intel Corporation 2111 N.E. 25th Ave. Hillsboro, OR 97124-5961
TEST SITE:	Elliott Laboratories 41039 Boyce Road Fremont, CA. 94538
REPORT DATE:	August 13, 2008
FINAL TEST DATE:	June 26 and June 27, 2008

AUTHORIZED SIGNATORY: Mark Briggs

Mark Briggs
Staff Engineer

ACCREDITED

Testing Cert #2016-01

REVISION HISTORY

Rev #	Date	Comments	Modified By
1	August 13, 2008	First Release	

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SCOPE

An electromagnetic emissions test has been performed on the Intel Corporation model 512ANMpursuant to the following rules:

Industry Canada RSS-Gen Issue 2
RSS 210 Issue 7 "Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment"
FCC Part 15, Subpart E requirements for UNII Devices (using FCC DA 02-2138, August 30, 2002)

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 Elliott Laboratories test procedures:

ANSI C63.4:2003
FCC UNII test procedure 2002-08 DA-02-2138, August 2002

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.

The test results recorded herein are based on a single type test of the Intel Corporation model 512ANMand therefore apply only to the tested sample. The sample was selected and prepared by Robert Paxman of Intel Corporation

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 Intel Corporation model 512ANMcomplied with the requirements of the following regulations:

RSS 210 Issue 7 "Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment"
FCC Part 15, Subpart E requirements for UNII Devices

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.).

TEST RESULTS SUMMARY

In the following tables the highlighted entries for receiver- and transmitter-spurious emissions were taken from the original report and are included for reference only.

UNII / LELAN DEVICES

OPERATION IN THE 5.15 – 5.25 GHz and 5250-5350 GHz BANDS

FCC Rule Part	RSS Rule Part	Description	Measured Value / Comments	Limit / Requirement	Result
15.407(e)		Indoor operation only	No tests performed, the maximum power, power spectral density remain unchanged from the values originally reported. The proposed addition of antenna does not affect the operation of the device as it relates to these requirements..		
15.407(a) (1)		26dB Bandwidth			
15.407 (a) (1)	A9.2(1)	Output Power			
15.407(a) (2))		Power Spectral Density			
	A9.2(2) / A9.5 (2)	Peak Spectral Density			

GENERAL REQUIREMENTS FOR ALL BANDS

FCC Rule Part	RSS Rule Part	Description	Measured Value / Comments	Limit / Requirement	Result
	A9.5a	Modulation	Modulation and 99% bandwidth are not affected by the proposed change		
	RSP 100	99% bandwidth			
15.407(b) (5) / 15.209	A9.3	Spurious Emissions below 1GHz	During the original testing spurious emissions below 1GHz were shown to be independent of antenna or transmitter/receiver operating mode. Test was not performed as the proposed changes are only to the antenna		
15.407(b) (2)	A9.3	Spurious Emissions above 1GHz	52.9dBµV/m @ 5149.9MHz	15.207 in restricted bands, all others <-27dBm eirp	Complies (-1.1dB)
			52.9dBµV/m @ 5459.9MHz		Complies (-1.1dB)
	A9.5 (3)	Channel Selection	Spurious emissions tested at outermost channels in each band	Device was tested on the top, bottom and center channels in each band	N/A
15			Measurements on three channels in each band		
15.407(a) (6)	-	Peak Excursion Ratio	The proposed addition of antenna does not affect the operation of the device as it relates to these requirements		
15.407 (c)	A9.5(4)	Operation in the absence of information to transmit			
15.407 (g)	A9.5 (5)	Frequency Stability			
15.407 (h1)	A9.4	Transmit Power Control			
15.407 (h2)	A9.4	Dynamic frequency Selection			
	A9.9g	User Manual information			

GENERAL REQUIREMENTS APPLICABLE TO ALL BANDS

FCC Rule Part	RSS Rule part	Description	Measured Value / Comments	Limit / Requirement	Result (margin)
15.203	-	RF Connector	The proposed addition of antenna does not affect the antenna connector		
-	RSS GEN 7.2.3 Table 1	Receiver spurious emissions[1]	47.6dBµV/m @ 3000.3MHz	RSS GEN Table 1	Complies (- 6.4 dB)
			51.4dBµV/m @ 3000.3MHz		Complies (- 2.6 dB)
15.207	RSS GEN Table 2	AC Conducted Emissions	The proposed addition of antenna does not affect the AC conducted emissions.		
15.247 (b) (5) 15.407 (f)	RSS 102	RF Exposure Requirements	Refer to MPE calculations in Exhibit 11, RSS 102 declaration. Minimum separation remains at 20cm, as stated in the original User Manual.	Refer to OET 65, FCC Part 1 and RSS 102	Complies
	RSP 100 RSS GEN 7.1.5	User Manual	The User's Manual that was submitted for the original application remains unchanged.		
	RSP 100 RSS GEN 7.1.5	User Manual			

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	Frequency Range (MHz)	Calculated Uncertainty (dB)
Conducted Emissions	0.15 to 30	± 2.4
Radiated Emissions	0.015 to 30	± 3.0
Radiated Emissions	30 to 1000	± 3.6
Radiated Emissions	1000 to 40000	± 6.0

[1] The original testing determined that the receiver spurious emissions below 1GHz were independent of operating channel and operating mode (transmit versus receive) and dominated by emissions from the test fixture. The highest emission below 1GHz from the combination of EUT and test fixture was measured to be 43.4dBµV/m @ 108.287MHz. Refer to Elliott report R71537 rev 2.

EQUIPMENT UNDER TEST (EUT) DETAILS

GENERAL

The Intel Corporation model 512ANMis a 2x1 MISO 802.11abgn radio module that is designed to be installed in laptops. The module supports 802.11b, 802.11g and 802.11n protocols in the 2400 - 2483.5 MHz band and 802.11a and 802.11n protocols in the 5150 - 5250 MHz, 5250 - 5350 MHz, 5470 - 5725 MHz and 5725 - 5850 MHz bands. In legacy modes (802.11abg) and n (802.11n) modes one transmit chain is active and either 1 or 2 receive chains can be active. In 802.11n mode it supports both 20-MHz and 40-MHz channels.

The sample was received on June 26, 2008 and tested on June 26 and June 27, 2008. The EUT consisted of the following component(s):

Manufacturer	Model	Description	Serial Number	FCC ID
Intel	512AN_MW	802.11abgn Module		

OTHER EUT DETAILS

List any items from the test log.

ANTENNA SYSTEM

Refer to the PROPOSED MODIFICATION DETAILS section of this report.

ENCLOSURE

The EUT does not have an enclosure as it is designed to be installed within the enclosure of a host computer or system.

MODIFICATIONS

The EUT did not require modifications during testing in order to comply with emissions specifications.

SUPPORT EQUIPMENT

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

Manufacturer	Model	Description	Serial Number	FCC ID
Dell		Laptop PC	Prototype	

EUT INTERFACE PORTS

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

Port	Connected To	Cable(s)		
		Description	Shielded or Unshielded	Length(m)
DC power port	DC power source	Multi connect	Unshielded	0.3
PCI Extender	Laptop	Multi connect	Unshielded	0.3
Antenna port 1	Antenna	u.FL	Shielded	0.2
Antenna port 2	Antenna	u.FL	Shielded	0.2

EUT OPERATION

During transmitter-related testing the EUT was configured to transmit continuously in each of the various modulation modes (802.11a, and 802.11n). Preliminary testing determined the data rates with the highest power and power spectral density to be evaluated for the formal testing, as detailed in the table below.

Mode \ Active Chains	1 Chain	2 Chains
802.11b	1Mb/s	Not applicable, second chain is receive only
802.11g/a	6 MBs	
802.11n (20MHz channel)	HT 0 (6Mbps)	
802.11n (40MHz channel)	HT 0 (15Mbps)	

Spurious transmitter emissions were measured with the device tuned to the high, low and center channels in both the 5150-5250MHz and 5250-5350 MHz operating bands. Spurious measurements in the restricted bands immediately above and below the 5150 – 5350 MHz band were made in all three 5GHz modes (802.11a, 802.11n (20MHz) and 902.11n (40MHz). Spurious emissions outside of those restricted bands were made with the device operating in 802.11a mode based on the fact that the Universe PIFA antenna previously tested had highest spurious emissions in 802.11a mode.

Spurious receiver emissions were measured with the device tuned to the center channel in both the 5150-5250MHz and 5250-5350 MHz operating bands. Measurements were made on both single chain modes (SISO modes with one, then the other chain active) and in MISO mode (with both chains active simultaneously).

PROPOSED MODIFICATION DETAILS

GENERAL

This section details the modifications to the Intel Corporation model 512ANM being proposed. All performance and construction deviations from the characteristics originally reported to the FCC and Industry Canada are addressed. Note that the maximum output power in each operating band remains unchanged.

ANTENNA

The original certification included a Universe PIFA antenna and so covered all PIFA antennas of lower gain. The proposed change is to add a PIFA antenna that has higher gain in one of the 512AN_MMW's operating bands. The table below shows the antenna gain of the orignal Universe antenna and the new antenna in each of the operating bands.

Antenna Name and model	Type	Antenna Gain			
		2.4GHz	5.2GHz	5.5GHz	5.7GHz
Universe	PIFA	3.24	3.73	4.77	4.97
WNC 81.EBC15.102 Vader T-Type	PIFA	2.93	**4.7**	4.69	2.68

The new antenna has higher gain than the original PIFA antenna in the 5.2Ghz bands (5150 – 5250MHz and 5250 – 5350MHz). Testing was limited to radiated spurious emissions in the bands where the proposed antenna had higher gains than the original antenna.

The original filing also included data to support use of an Ethertronics magnetic dipole antenna.

TEST SITE

GENERAL INFORMATION

Final test measurements were taken on June 26 and June 27, 2008 at the Elliott Laboratories semi anechoic chamber 3 located at 41039 Boyce Road, Fremont, California. 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.

ANSI C63.4:2003 recommends that ambient noise at the test site be at least 6 dB below the allowable limits. Ambient levels are below this requirement with the exception of predictable local TV, radio, and mobile communications traffic. The test site contains 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 C63.4:2003.

CONDUCTED EMISSIONS CONSIDERATIONS

Conducted emissions testing is performed in conformance with ANSI C63.4:2003. 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 C63.4:2003 guidelines and meet the Normalized Site Attenuation (NSA) requirements of ANSI C63.4:2003.

MEASUREMENT INSTRUMENTATION

RECEIVER SYSTEM

An EMI receiver as specified in CISPR 16-1 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

The receivers utilize either a Rohde & Schwarz EZM Spectrum Monitor/Controller or contain an internal Spectrum Monitor/Controller to view and convert the 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 Spectrum Monitor provides a visual display of the signal being measured. In addition, the controller or a personal computer run automated data collection programs which control the receivers. This provides added accuracy since all site correction factors, such as cable loss and antenna factors are added automatically.

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 C63.4:2003 specifies that the test height above ground for table mounted devices shall be 80 centimeters. 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. 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.

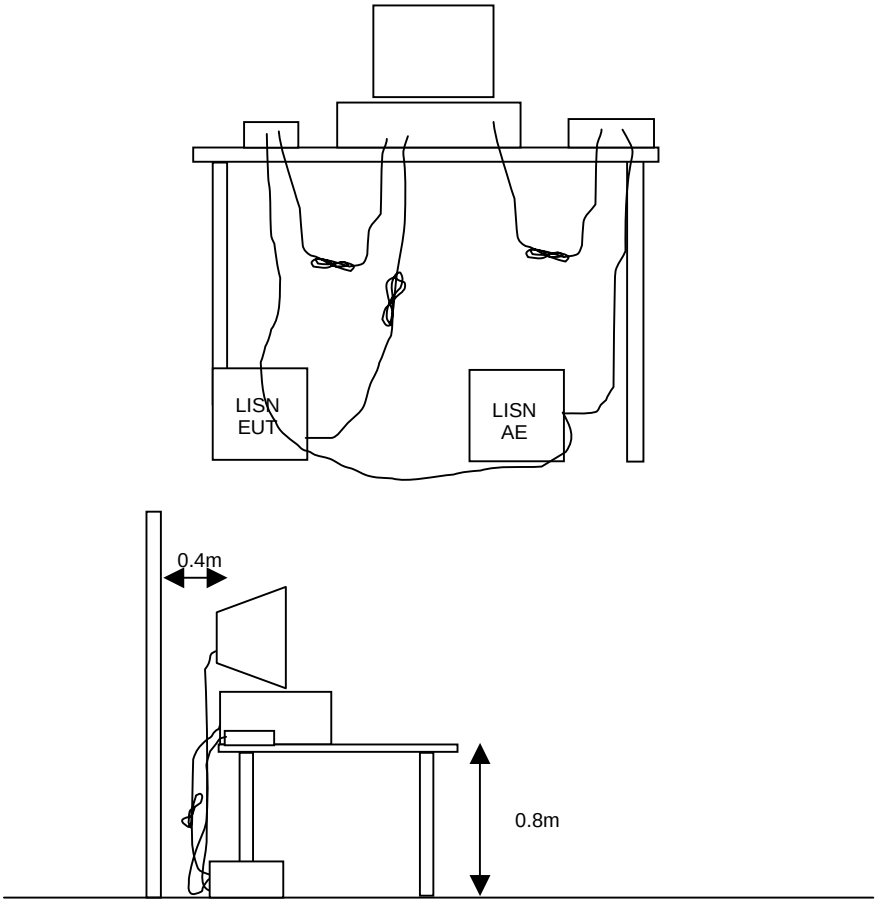
TEST PROCEDURES

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 C63.4:2003, and the worst-case orientation is used for final measurements.

CONDUCTED EMISSIONS

Conducted emissions are measured at the plug end of the power cord supplied with the EUT. Excess power cord length is wrapped in a bundle between 30 and 40 centimeters in length near the center of the cord. Preliminary measurements are made to determine the highest amplitude emission relative to the specification limit for all the modes of operation. Placement of system components and varying of cable positions are performed in each mode. A final peak mode scan is then performed in the position and mode for which the highest emission was noted on all current carrying conductors of the power cord.

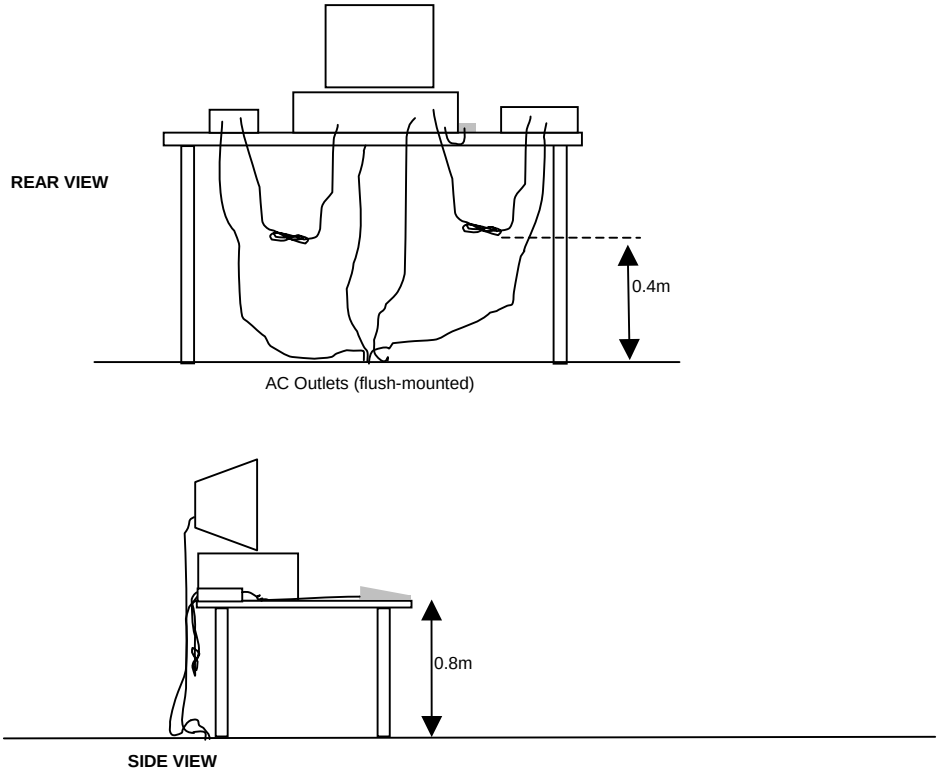


A preliminary scan of the radiated emissions is performed in which all significant EUT frequencies are identified with the system in a nominal configuration. At least two scans are performed, one scan for each antenna polarization (horizontal and vertical; loop parallel and perpendicular to the EUT). 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.

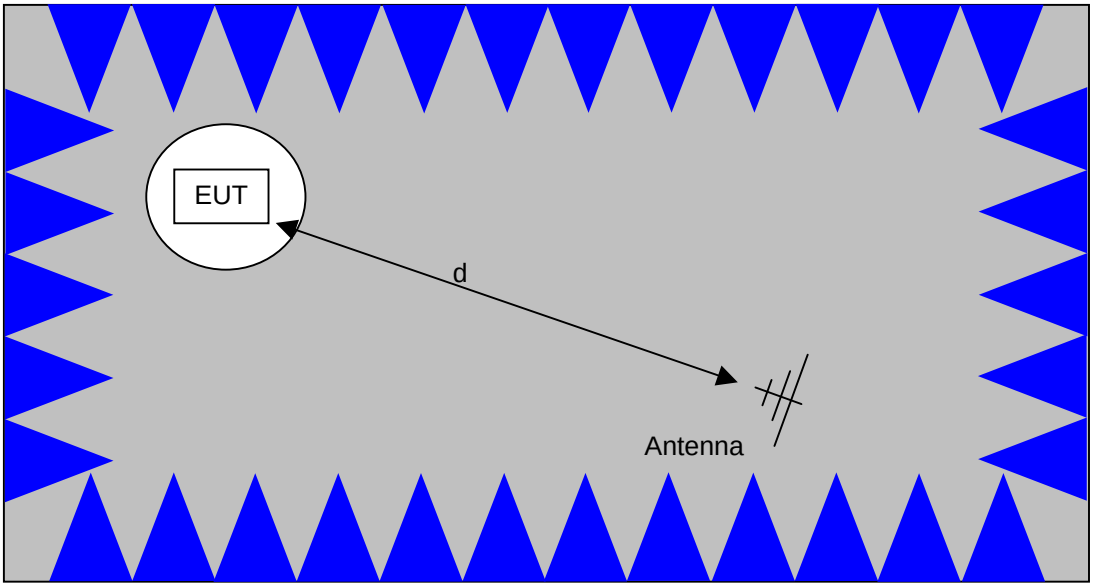
A speaker is provided in the receiver to aid in discriminating between EUT and ambient emissions. Other methods used during the preliminary scan for EUT emissions involve scanning with near field magnetic loops, monitoring I/O cables with RF current clamps, and cycling power to the EUT.

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 1meter from the EUT and the antenna height is restricted to a maximum of 2.5 meters.

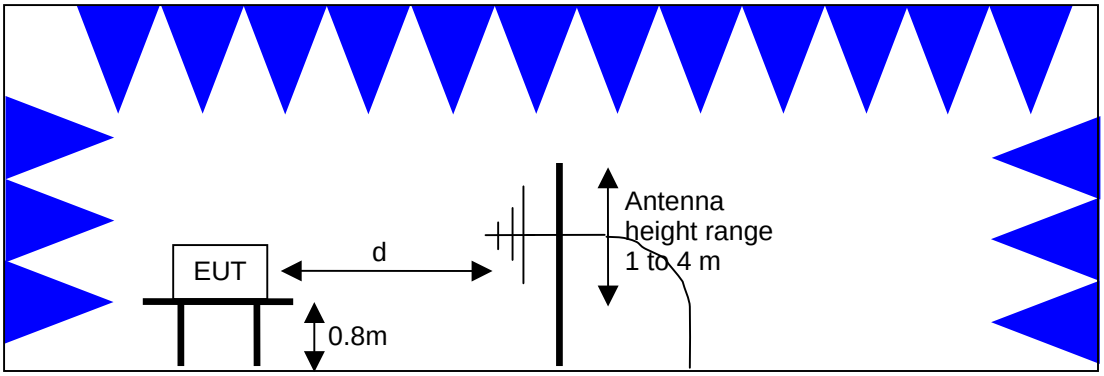


Typical Test Configuration for Radiated Field Strength Measurements



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

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:

GENERAL TRANSMITTER RADIATED EMISSIONS SPECIFICATION LIMITS

The table below shows the limits for the spurious emissions from transmitters that fall in restricted bands[1] (with the exception of transmitters operating under FCC Part 15 Subpart D and RSS 210 Annex 9), the limits for all emissions from a low power device operating under the general rules of RSS 310 (tables 3 and 4), RSS 210 (table 2) and FCC Part 15 Subpart C section 15.209.

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

[1] The restricted bands are detailed in FCC 15.203, RSS 210 Table 1 and RSS 310 Table 2

OUTPUT POWER AND SPURIOUS LIMITS –LE-LAN DEVICES

The table below shows the limits for output power and output power density defined by RSS 210. 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	250 mW (24 dBm)[1] 1W (30dBm) eirp	11 dBm/MHz
5470 - 5725	250 mW (24 dBm)[2] 1W (30dBm) eirp	11 dBm/MHz
5725 – 5825	1 Watts (30 dBm) 4W eirp	17 dBm/MHz

In addition, the power spectral density limit shall be reduced by 1dB for every dB the highest power spectral density exceeds the "average" power spectral density, determined by dividing the output power by 10log(99% bandwidth), by more than 3dB.

Fixed point-to-point applications using the 5725 – 5825 MHz band may use antennas with gains of up to 23dBi without this limitation. If the gain exceeds 23dBi then the output power limit of 1 Watt is reduced by 1dB for every dB the gain exceeds 23dBi.

OUTPUT POWER AND SPURIOUS LIMITS –UNII DEVICES

The table below shows the limits for output power and output power density defined by FCC Part 15 Subpart E. 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	50mW (17 dBm)	10 dBm/MHz
5250 - 5350	250 mW (24 dBm)	11 dBm/MHz
5470 - 5725	250 mW (24 dBm)	11 dBm/MHz
5725 – 5825	1 Watts (30 dBm)	17 dBm/MHz

The peak excursion envelope is limited to 13dB.

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. Fixed point-to-point applications using the 5725 – 5825 MHz band may use antennas with gains of up to 23dBi without this limitation. If the gain exceeds 23dBi then the output power limit of 1 Watt is reduced by 1dB for every dB the gain exceeds 23dBi.

[1] If EIRP exceeds 500mW the device must employ TPC
[2] If EIRP exceeds 500mW the device must employ TPC

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:

$$F_d = 20*LOG_{10} (D_m/D_s)$$

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:

$$F_d = 40*LOG_{10} (D_m/D_s)$$

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 3m from the equipment under test:

$$E = \frac{1000000 \sqrt{30 P}}{3} \quad \text{microvolts per meter}$$

where P is the eirp (Watts)

EXHIBIT 1: Test Equipment Calibration Data

2 Pages

Radiated Emissions, 802 11a Band-edge, 31-May-08
Engineer: Ben Jing

Manufacturer	Description	Model #	Asset #	Cal Due
EMCO	Antenna, Horn, 1-18 GHz (SA40-Red)	3115	1142	07-Jun-08
Rohde & Schwarz	Power Meter, Single Channel	NRVS	1290	12-Jul-08
Hewlett Packard	Spectrum Analyzer 9 kHz - 40 GHz, FT (SA40) Blue	8564E (84125C)	1393	15-Jan-09
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	1780	06-Nov-08
Rohde & Schwarz	Power Sensor, 1 uW-100 mW, DC-18 GHz, 50ohms	NRV-Z51	1797	21-Aug-08

Radio Spurious Emissions, 01-Jun-08
Engineer: skhushzad

Manufacturer	Description	Model #	Asset #	Cal Due
EMCO	Antenna, Horn, 1-18 GHz (SA40-Red)	3115	1142	07-Jun-08
Hewlett Packard	Spectrum Analyzer 9 kHz - 40 GHz, FT (SA40) Blue	8564E (84125C)	1393	15-Jan-09
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	1780	06-Nov-08

Radiated Emissions, 1000 - 18,000 MHz, 03-Jun-08
Engineer: Ben Jing

Manufacturer	Description	Model #	Asset #	Cal Due
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	785	29-Jun-08
EMCO	Antenna, Horn, 1-18 GHz (SA40-Red)	3115	1142	07-Jun-08
Rohde & Schwarz	Power Meter, Single Channel	NRVS	1534	05-Mar-09
Micro-Tronics	Band Reject Filter, 5150-5350 MHz	BRC50703-02	1729	17-Oct-08
Micro-Tronics	Band Reject Filter, 5470-5725 MHz	BRC50704-02	1730	17-Oct-08
Hewlett Packard	SpecAn 9 kHz - 40 GHz, (SA40) Purple	8564E (84125C)	1771	17-Dec-08

Radiated Emissions, 1000 - 18,000 MHz, 04-Jun-08
Engineer: Ben Jing

Manufacturer	Description	Model #	Asset #	Cal Due
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	785	29-Jun-08
EMCO	Antenna, Horn, 1-18 GHz (SA40-Red)	3115	1142	07-Jun-08
Rohde & Schwarz	Power Meter, Single Channel	NRVS	1534	05-Mar-09
Micro-Tronics	Band Reject Filter, 5470-5725 MHz	BRC50704-02	1730	17-Oct-08
Hewlett Packard	SpecAn 9 kHz - 40 GHz, (SA40) Purple	8564E (84125C)	1771	17-Dec-08

Radiated Emissions, NII 5 GHz band-edge , 06-Jun-08
Engineer: Ben Jing

Manufacturer	Description	Model #	Asset #	Cal Due
EMCO	Antenna, Horn, 1-18 GHz (SA40-Red)	3115	1142	07-Jul-08
Hewlett Packard	SpecAn 9 kHz - 40 GHz, (SA40) Purple	8564E (84125C)	1771	17-Dec-08

Radiated Emissions, 1000 - 18,000 MHz, 07-Jun-08
Engineer: Ben Jing

Manufacturer	Description	Model #	Asset #	Cal Due
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	263	28-May-09
EMCO	Antenna, Horn, 1-18 GHz (SA40-Red)	3115	1142	07-Jul-08
Hewlett Packard	SpecAn 9 kHz - 40 GHz, (SA40) Purple	8564E (84125C)	1771	17-Dec-08

Radiated Emissions, 1000 - 26,500 MHz , 26-Jun-08
Engineer: bjing

Manufacturer	Description	Model #	Asset #	Cal Due
EMCO	Antenna, Horn, 1-18GHz	3115	868	10-Jun-10
Rohde & Schwarz	Power Meter, Single Channel	NRVS	1290	12-Jul-08
Micro-Tronics	Band Reject Filter, 5150-5350 MHz	BRC50703-02	1729	17-Oct-08
Hewlett Packard	SpecAn 9 kHz - 40 GHz, (SA40) Purple	8564E (84125C)	1771	17-Dec-08
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	1780	06-Nov-08
Rohde & Schwarz	Power Sensor, 1 uW-100 mW, DC-18 GHz, 50ohms	NRV-Z51	1797	21-Aug-08

Radio Spurious Emissions, 27-Jun-08
Engineer: skhushzad

Manufacturer	Description	Model #	Asset #	Cal Due
Hewlett Packard	Test Oscillator, 10Hz-10MHz	651B	264	N/A
EMCO	Antenna, Horn, 1-18 GHz	3115	786	07-Dec-08
Hewlett Packard	SpecAn 9 kHz - 40 GHz, (SA40) Purple	8564E (84125C)	1771	17-Dec-08
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	1780	06-Nov-08

Radiated Emissions, 1000 - 26,500 MHz, 27-Jun-08
Engineer: bjing

Manufacturer	Description	Model #	Asset #	Cal Due
EMCO	Antenna, Horn, 1-18GHz	3115	868	10-Jun-10
Hewlett Packard	SpecAn 9 kHz - 40 GHz, (SA40) Purple	8564E (84125C)	1771	17-Dec-08
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	1780	06-Nov-08

EXHIBIT 2: Test Measurement Data

24 Pages

Elliott An NTS company

EMC Test Data

Client:	Intel	Job Number:	J72064
Model:	512ANM with Vader Antenna	T-Log Number:	T72075
		Account Manager:	Briggs / Eriksen
Contact:	Robert Paxman		-
Emissions Standard(s):	RSS 210 / FCC 15.407 UNII (Radiated)	Class:	-
Immunity Standard(s):	-	Environment:	-

EMC Test Data - NII Radiated, Universe Antenna

For The

Intel

Model

512ANM with Vader Antenna

Date of Last Test: 7/1/2008

Client:	Intel	Job Number:	J72064
Model:	512ANM with Vader Antenna	T-Log Number:	T72075
		Account Manager:	Briggs / Eriksen
Contact:	Robert Paxman		
Standard:	RSS 210 / FCC 15.407 UNII (Radiated)	Class:	-

Radiated Emissions - Receiver, Vader Antenna

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.

Date of Test: 6/27/2008
Test Engineer: Suhaila Khushzad and Ben Jing
Test Location: Chamber # 3

Config. Used: 1
Config Change: None
Host Unit Voltage 120V/60Hz

General Test Configuration

The EUT and all local support equipment were located on the turntable for radiated emissions testing. Remote support equipment was located approximately 30 meters from the test area with all I/O connections running on top of the groundplane.

The test distance and extrapolation factor (if applicable) are detailed under each run description.

Note, **preliminary** testing indicates that the emissions were maximized by orientation of the EUT and elevation of the measurement antenna. **Maximized** testing indicated that the emissions were maximized by orientation of the EUT, elevation of the measurement antenna, and manipulation of the EUT's interface cables.

Ambient Conditions:

Temperature: 22 °C
Rel. Humidity: 36 %

Summary of Results

Tests performed on center channels in 5150-5250 and 5250 - 5350 MHz bands

Run #	Test Performed	Limit	Result	Margin
1 - Single Receiver chain	RE, 1000 - 18000 MHz, Maximized Emissions	RSS GEN	Pass	47.6dBµV/m @ 3000.3MHz (-6.4dB)
2 - All Receiver chains	RE, 1000 - 18000 MHz, Maximized Emissions	RSS GEN	Pass	46.3 dBuV/m @ 3000.4 MHz (-7.7dB)

Modifications Made During Testing

No modifications were made to the EUT during testing

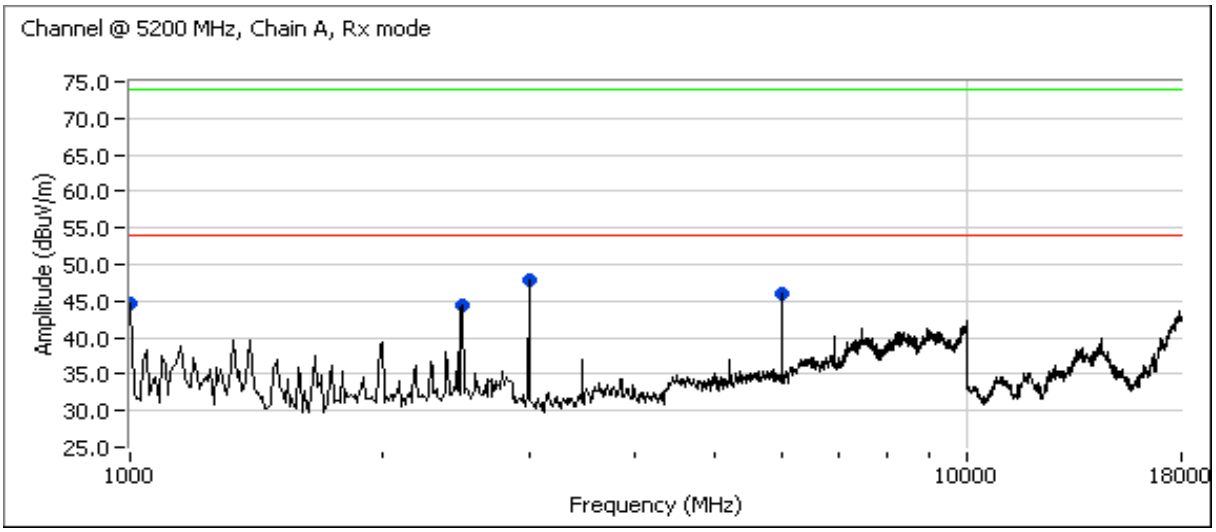
Deviations From The Standard

No deviations were made from the requirements of the standard.

Client:	Intel	Job Number:	J72064
Model:	512ANM with Vader Antenna	T-Log Number:	T72075
		Account Manager:	Briggs / Eriksen
Contact:	Robert Paxman		
Standard:	RSS 210 / FCC 15.407 UNII (Radiated)	Class:	-

Run # 1: Maximized readings, 1000 - 18000 MHz, Single Receiver Active (Chain A)

Frequency Range	Test Distance	Limit Distance	Extrapolation Factor
1000 - 10000 MHz	3	3	0.0
10000 - 18000 MHz	1	3	-9.5



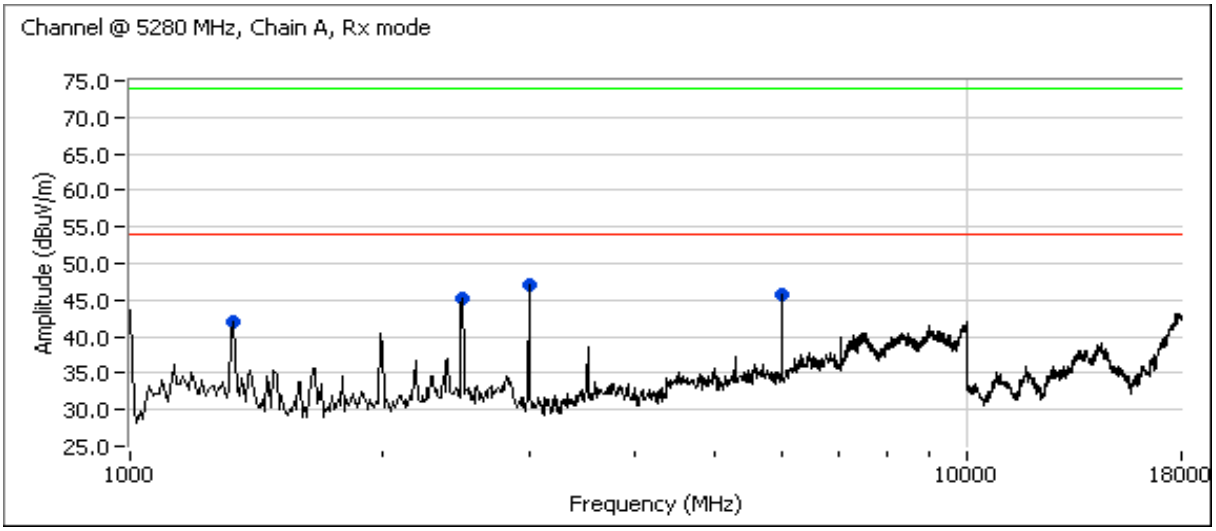
Receiver Tuned to 5200 MHz - Single chain active

Frequency	Level	Pol	RSS GEN		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
999.284	27.8	V	54.0	-26.2	AVG	124	1.1	
2490.560	31.0	H	54.0	-23.0	AVG	120	1.0	
3000.320	47.6	V	54.0	-6.4	AVG	261	1.0	
6000.870	45.6	V	54.0	-8.4	AVG	97	1.0	
999.284	41.4	V	74.0	-32.6	PK	124	1.1	
2490.560	51.8	H	74.0	-22.2	PK	120	1.0	
3000.320	50.8	V	74.0	-23.2	PK	261	1.0	
6000.870	48.6	V	74.0	-25.4	PK	97	1.0	

Note 1:	Above 1 GHz, the limit is for an average measurement. In addition, the peak value of any emission above 1 GHz, can not exceed the average limit by more than 20 dB.

Client:	Intel	Job Number:	J72064
Model:	512ANM with Vader Antenna	T-Log Number:	T72075
		Account Manager:	Briggs / Eriksen
Contact:	Robert Paxman		
Standard:	RSS 210 / FCC 15.407 UNII (Radiated)	Class:	-

Run # 1: Maximized readings, 1000 - 18000 MHz, Single Receiver Active (Chain A)



Receiver Tuned to 5280 MHz - Single chain active

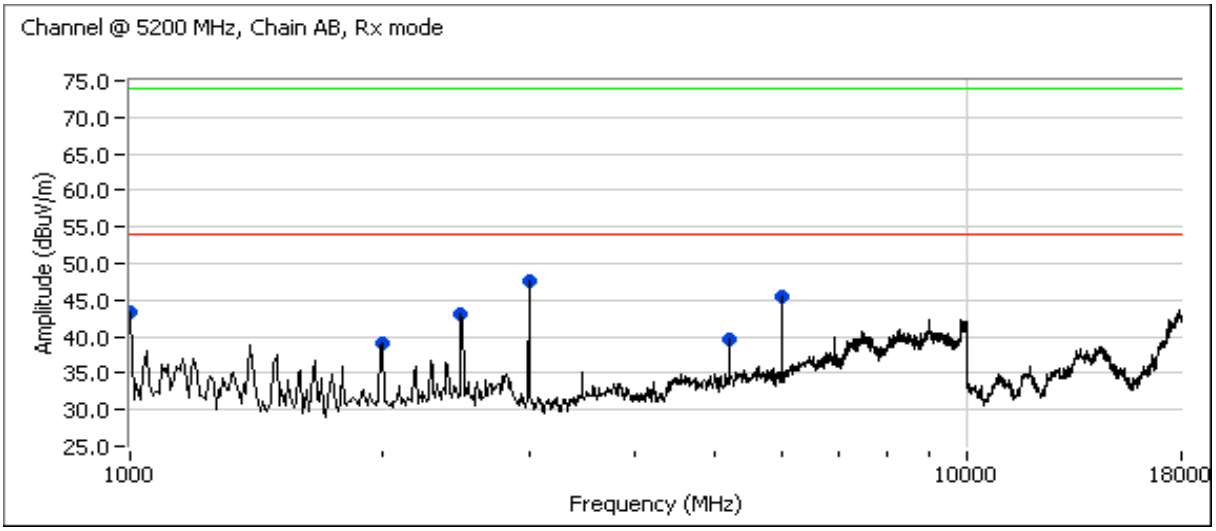
Frequency	Level	Pol	RSS GEN		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2490.580	30.6	H	54.0	-23.4	AVG	114	1.0	
3000.450	47.0	V	54.0	-7.0	AVG	262	1.0	
6000.920	44.8	V	54.0	-9.2	AVG	107	1.0	
2490.580	51.7	H	74.0	-22.3	PK	114	1.0	
3000.450	50.4	V	74.0	-23.6	PK	262	1.0	
6000.920	48.0	V	74.0	-26.0	PK	107	1.0	

Note 1:	Above 1 GHz, the limit is for an average measurement. In addition, the peak value of any emission above 1 GHz, can not exceed the average limit by more than 20 dB.

Client:	Intel	Job Number:	J72064
Model:	512ANM with Vader Antenna	T-Log Number:	T72075
		Account Manager:	Briggs / Eriksen
Contact:	Robert Paxman		
Standard:	RSS 210 / FCC 15.407 UNII (Radiated)	Class:	-

Run # 2: Maximized readings, 1000 - 18000 MHz, All Receivers Active

Frequency Range	Test Distance	Limit Distance	Extrapolation Factor
1000 - 10000 MHz	3	3	0.0
10000 - 18000 MHz	1	3	-9.5

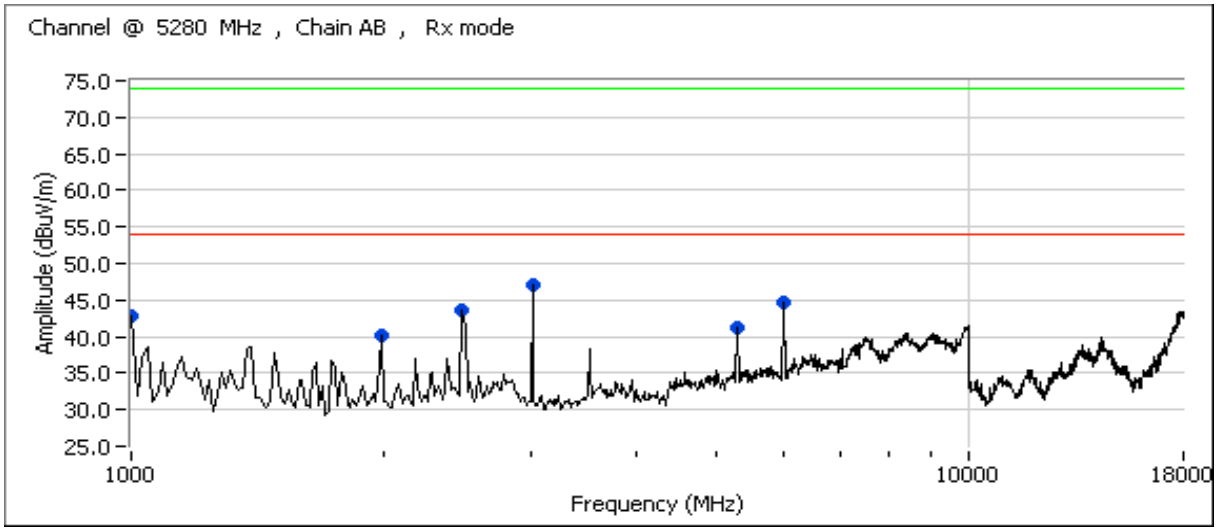


Receiver Tuned to 5200 MHz - All chains active

Frequency	Level	Pol	RSS GEN		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
999.559	26.1	V	54.0	-27.9	AVG	123	1.4	
1994.540	25.4	V	54.0	-28.6	AVG	177	2.2	
2491.090	28.7	H	54.0	-25.3	AVG	105	1.3	
3000.450	46.1	V	54.0	-7.9	AVG	265	1.0	
5200.030	37.6	V	54.0	-16.4	AVG	170	1.0	
6000.820	44.0	V	54.0	-10.0	AVG	106	1.0	
999.559	38.9	V	74.0	-35.1	PK	123	1.4	
1994.540	37.9	V	74.0	-36.1	PK	177	2.2	
2491.090	47.0	H	74.0	-27.0	PK	105	1.3	
3000.450	49.8	V	74.0	-24.2	PK	265	1.0	
5200.030	43.0	V	74.0	-31.0	PK	170	1.0	
6000.820	47.9	V	74.0	-26.1	PK	106	1.0	

Note 1:	Above 1 GHz, the limit is for an average measurement. In addition, the peak value of any emission above 1 GHz, can not exceed the average limit by more than 20 dB.

Client:	Intel	Job Number:	J72064
Model:	512ANM with Vader Antenna	T-Log Number:	T72075
		Account Manager:	Briggs / Eriksen
Contact:	Robert Paxman		
Standard:	RSS 210 / FCC 15.407 UNII (Radiated)	Class:	-



Receiver Tuned to 5280 MHz - All chains active

Frequency	Level	Pol	RSS GEN		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
1998.250	29.1	V	54.0	-24.9	AVG	164	1.6	
2490.290	28.7	V	54.0	-25.3	AVG	110	1.0	
3000.400	46.3	V	54.0	-7.7	AVG	103	1.0	
5280.030	40.5	H	54.0	-13.5	AVG	108	1.0	
6000.820	43.4	V	54.0	-10.6	AVG	265	1.6	
1998.250	47.2	V	74.0	-26.8	PK	164	1.6	
2490.290	47.6	V	74.0	-26.4	PK	110	1.0	
3000.400	49.9	V	74.0	-24.1	PK	103	1.0	
5280.030	44.8	H	74.0	-29.2	PK	108	1.0	
6000.820	48.1	V	74.0	-25.9	PK	265	1.6	

Note 1:	Above 1 GHz, the limit is for an average measurement. In addition, the peak value of any emission above 1 GHz, can not exceed the average limit by more than 20 dB.

Client:	Intel	Job Number:	J72064
Model:	512ANM with Vader Antenna	T-Log Number:	T72075
		Account Manager:	Briggs / Eriksen
Contact:	Robert Paxman		
Standard:	RSS 210 / FCC 15.407 UNII (Radiated)	Class:	N/A

RSS 210 and FCC 15.E (U-NII, 5150- 550/5250-5350/5460-5725MHz)

Radiated Spurious Emissions - Band Edge 802.11a Vader Antenna

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.

Date of Test: 6/26/2008
Test Engineer: Ben Jing
Test Location: FT Chamber # 3

Config. Used: 1
Config Change: None
Host Unit Voltage 120V/60Hz

General Test Configuration

The EUT and all local support equipment were located on the turntable for radiated spurious emissions testing. All remote support equipment was located approximately 30 meters from the EUT with all I/O connections running on top of the groundplane.

For radiated emissions testing the measurement antenna was located 3 meters from the EUT.

Ambient Conditions:

Temperature: 22 °C
Rel. Humidity: 36 %

Summary of Results

Run #	Mode	Channel	Power Setting	Measured Power	Test Performed	Limit	Result / Margin
1a	802.11a Chain A	5180MHz	GC = 29. 0	16.9	Band Edge radiated field strength	FCC Part 15.209	49.5dBµV/m @ 5149.7MHz (-4.5dB)
1b	802.11a Chain A	5320MHz	GC = 25.5	16.6	Band Edge radiated field strength	FCC Part 15.209	48.4dBµV/m @ 5350.1MHz (-5.6dB)

Note - with ethertronics antenna, band edge complied at AP=18.4dBm.

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:	Intel	Job Number:	J72064
Model:	512ANM with Vader Antenna	T-Log Number:	T72075
		Account Manager:	Briggs / Eriksen
Contact:	Robert Paxman		
Standard:	RSS 210 / FCC 15.407 UNII (Radiated)	Class:	N/A

Run #1: Radiated Spurious Emissions, Band Edges. Operating Mode: 802.11a - Chain A

Run #1a: Low Channel @ 5180 MHz (band edge at 5150 MHz)

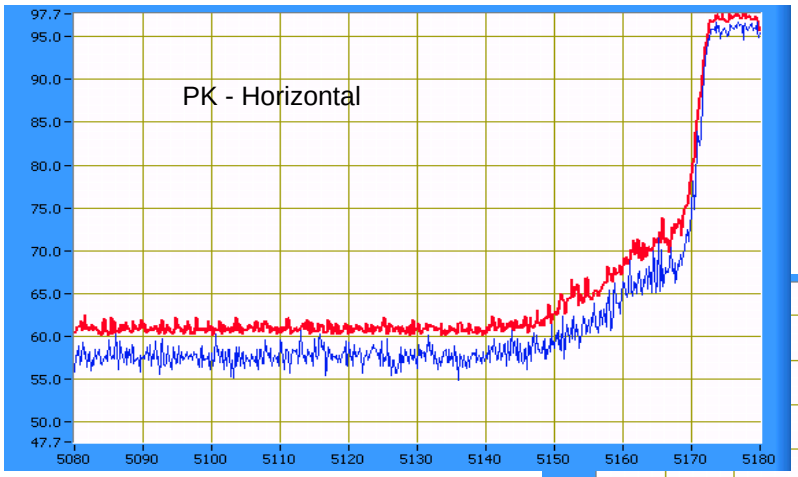
Power Setting: 29. 0 Average power: 16. 9 (for reference purposes)

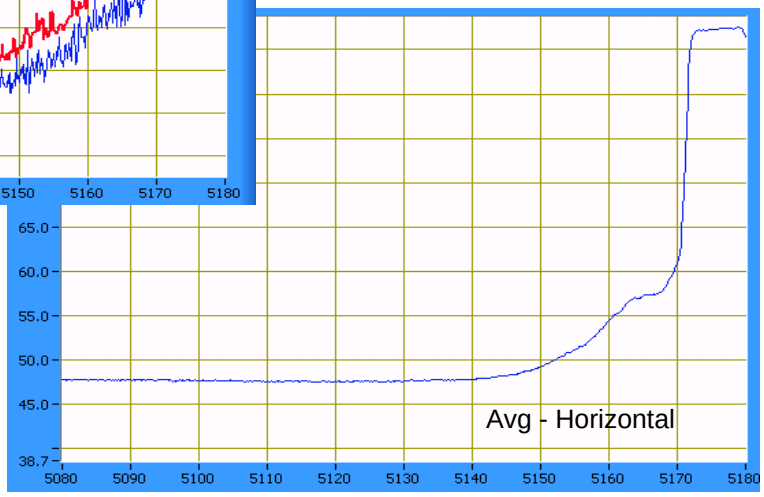
Fundamental Signal Field Strength: Peak and average values measured in 1 MHz, for reference only

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
5180.900	84.4	V	-	-	AVG	164	1.0	
5180.900	93.0	V	-	-	PK	164	1.0	
5181.490	90.2	H	-	-	AVG	180	1.0	
5181.490	98.9	H	-	-	PK	180	1.0	

Band Edge Signal Field Strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
5149.720	49.5	H	54.0	-4.5	AVG	179	1.0	
5149.720	62.7	H	74.0	-11.3	PK	179	1.0	
5149.700	48.1	V	54.0	-5.9	AVG	173	1.0	
5149.780	61.0	V	74.0	-13.0	PK	163	1.0	





Client:	Intel	Job Number:	J72064
Model:	512ANM with Vader Antenna	T-Log Number:	T72075
		Account Manager:	Briggs / Eriksen
Contact:	Robert Paxman		
Standard:	RSS 210 / FCC 15.407 UNII (Radiated)	Class:	N/A

Run #1b: High Channel @ 5320 MHz (band edge at 5350 MHz)

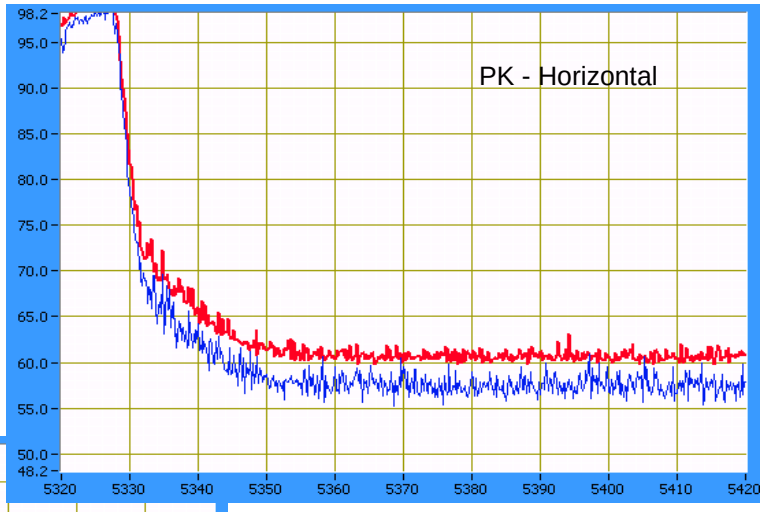
Power Setting: 25. 5 Average power: 16. 6 (for reference purposes)

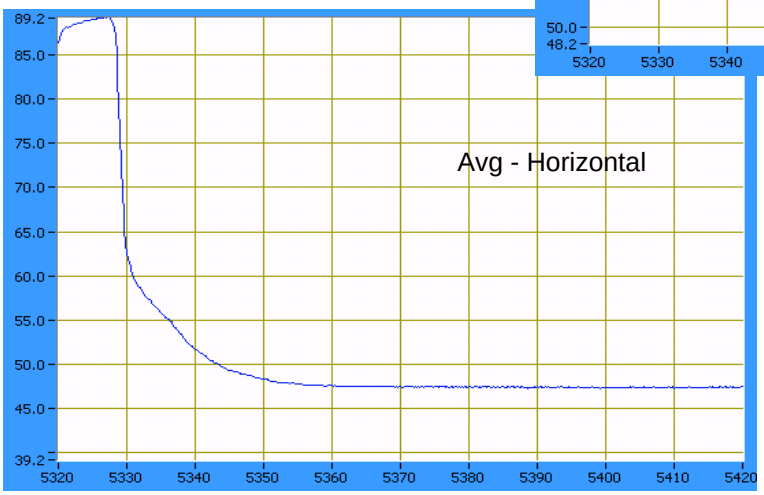
Fundamental Signal Field Strength: Peak and average values measured in 1 MHz, for reference only

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
5321.400	86.0	V	-	-	AVG	153	1.0	
5321.400	94.6	V	-	-	PK	153	1.0	
5321.200	88.9	H	-	-	AVG	257	1.0	
5321.200	97.1	H	-	-	PK	257	1.0	

Band Edge Signal Field Strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
5350.120	48.4	H	54.0	-5.6	AVG	261	1.0	
5350.250	61.5	H	74.0	-12.5	PK	256	1.0	
5350.110	47.9	V	54.0	-6.1	AVG	152	1.0	
5350.280	61.1	V	74.0	-12.9	PK	152	1.0	





Client:	Intel	Job Number:	J72064
Model:	512ANM with Vader Antenna	T-Log Number:	T72075
		Account Manager:	Briggs / Eriksen
Contact:	Robert Paxman		
Standard:	RSS 210 / FCC 15.407 UNII (Radiated)	Class:	N/A

RSS 210 and FCC 15.E (U-NII, 5150- 550/5250-5350/5460-5725MHz)

Radiated Spurious Emissions - Band Edge 802.11n 20MHz Vader Antenna

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.

Date of Test: 6/26/2008
Test Engineer: Ben Jing
Test Location: FT Chamber # 3

Config. Used: 1
Config Change: None
Host Unit Voltage: Powered From Host System (3.3 V DC)

General Test Configuration

The EUT and all local support equipment were located on the turntable for radiated spurious emissions testing. All remote support equipment was located approximately 30 meters from the EUT with all I/O connections running on top of the groundplane.

For radiated emissions testing the measurement antenna was located 3 meters from the EUT.

Ambient Conditions:

Temperature: 22 °C
Rel. Humidity: 36 %

Summary of Results

Run #	Mode	Channel	Power Setting	Measured Power	Test Performed	Limit	Result / Margin
1a	802.11n20 Chain A	5180MHz	GC = 28 5	16.5	Band Edge radiated field strength	FCC Part 15.209	49.6dBµV/m @ 5149.8MHz (-4.4dB)
1b	802.11n20 Chain A	5320MHz	GC = 25.5	16.5	Band Edge radiated field strength	FCC Part 15.209	48.4dBµV/m @ 5350.1MHz (-5.6dB)

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.

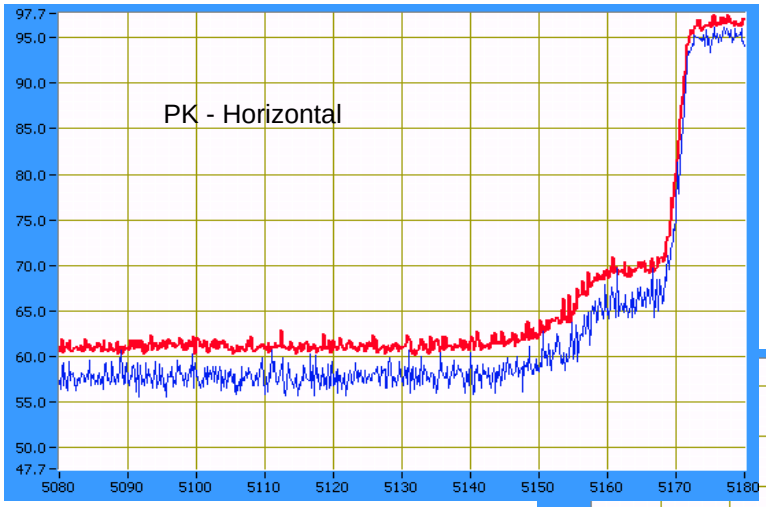
Client:	Intel	Job Number:	J72064
Model:	512ANM with Vader Antenna	T-Log Number:	T72075
		Account Manager:	Briggs / Eriksen
Contact:	Robert Paxman		
Standard:	RSS 210 / FCC 15.407 UNII (Radiated)	Class:	N/A

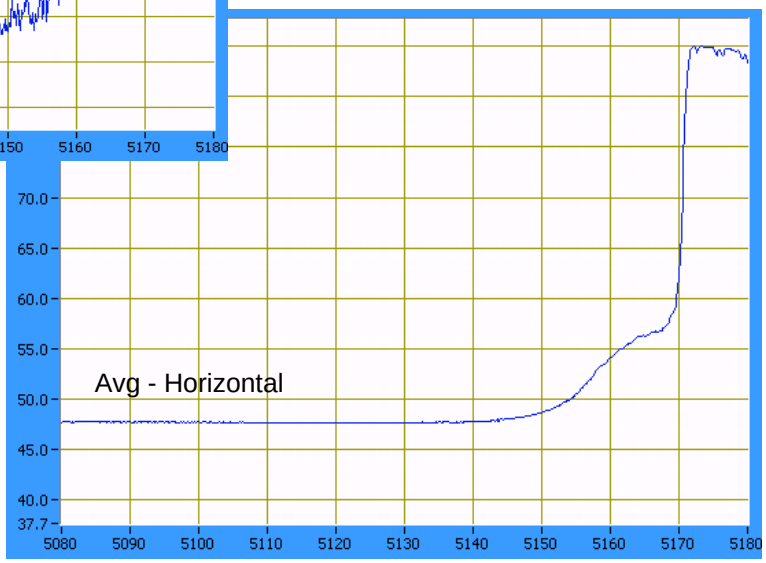
Run #1: Radiated Spurious Emissions, Band Edges. Operating Mode: 802.11n 20MHz - Chain A
Run #1a: Low Channel @ 5180 MHz (band edge at 5150 MHz)
Power Setting: 28.5 Average power: 16.5 (for reference purposes)
Fundamental Signal Field Strength: Peak and average values measured in 1 MHz, for reference only

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
5180.650	83.9	V	-	-	AVG	277	1.0	
5180.650	91.9	V	-	-	PK	277	1.0	
5181.150	89.0	H	-	-	AVG	170	1.0	
5181.150	97.5	H	-	-	PK	170	1.0	

Band Edge Signal Field Strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
5149.750	49.6	H	54.0	-4.4	AVG	178	1.0	
5149.840	61.8	H	74.0	-12.2	PK	178	1.0	
5149.700	48.1	V	54.0	-5.9	AVG	291	1.0	
5149.780	60.8	V	74.0	-13.2	PK	278	1.0	





Client:	Intel	Job Number:	J72064
Model:	512ANM with Vader Antenna	T-Log Number:	T72075
		Account Manager:	Briggs / Eriksen
Contact:	Robert Paxman		
Standard:	RSS 210 / FCC 15.407 UNII (Radiated)	Class:	N/A

Run #1b: High Channel @ 5320 MHz (band edge at 5350 MHz)

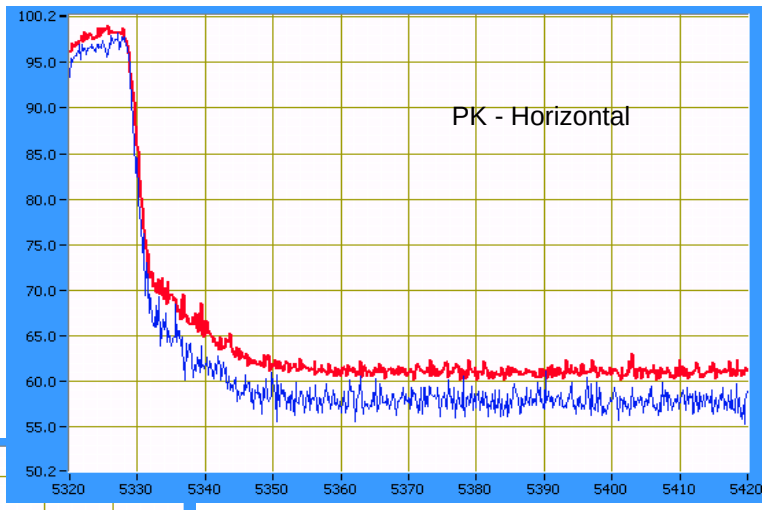
Power Setting: 25.5 Average power: 16.5 (for reference purposes)

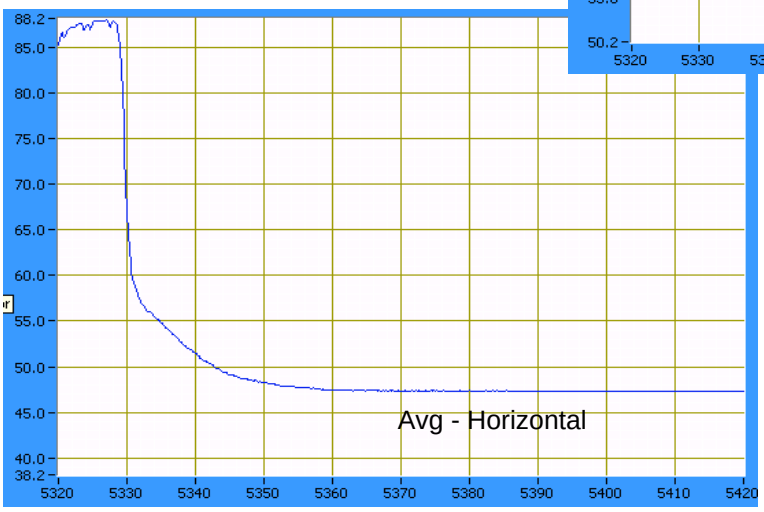
Fundamental Signal Field Strength: Peak and average values measured in 1 MHz, for reference only

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
5321.300	85.5	V	-	-	AVG	154	1.0	
5321.300	94.0	V	-	-	PK	154	1.0	
5321.290	89.2	H	-	-	AVG	257	1.0	
5321.290	97.6	H	-	-	PK	257	1.0	

Band Edge Signal Field Strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
5350.100	48.4	H	54.0	-5.6	AVG	255	1.0	
5350.290	61.6	H	74.0	-12.4	PK	258	1.0	
5350.150	48.1	V	54.0	-5.9	AVG	157	1.0	
5350.220	60.6	V	74.0	-13.4	PK	154	1.0	





Client:	Intel	Job Number:	J72064
Model:	512ANM with Vader Antenna	T-Log Number:	T72075
		Account Manager:	Briggs / Eriksen
Contact:	Robert Paxman		
Standard:	RSS 210 / FCC 15.407 UNII (Radiated)	Class:	N/A

RSS 210 and FCC 15.E (U-NII, 5150- 550/5250-5350/5460-5725MHz)

Radiated Spurious Emissions - Band Edge 802.11n 40MHz Mode

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.

Date of Test: 6/26/2008
Test Engineer: Ben Jing
Test Location: FT Chamber # 3

Config. Used: 1
Config Change: None
Host Unit Voltage: Powered From Host System (3.3 V DC)

General Test Configuration

The EUT and all local support equipment were located on the turntable for radiated spurious emissions testing. All remote support equipment was located approximately 30 meters from the EUT with all I/O connections running on top of the groundplane.

For radiated emissions testing the measurement antenna was located 3 meters from the EUT.

Ambient Conditions:

Temperature: 22 °C
Rel. Humidity: 36 %

Summary of Results

Run #	Mode	Channel	Power Setting	Measured Power	Test Performed	Limit	Result / Margin
1a	802.11n40 Chain A	5190MHz	GC = 26. 0	15.1	Band Edge radiated field strength	FCC Part 15.209	52.9dBµV/m @ 5149.9MHz (-1.1dB)
1b	802.11n40 Chain A	5310MHz	GC = 25. 0	15.7	Band Edge radiated field strength	FCC Part 15.209	50.0dBµV/m @ 5350.1MHz (-4.0dB)

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.

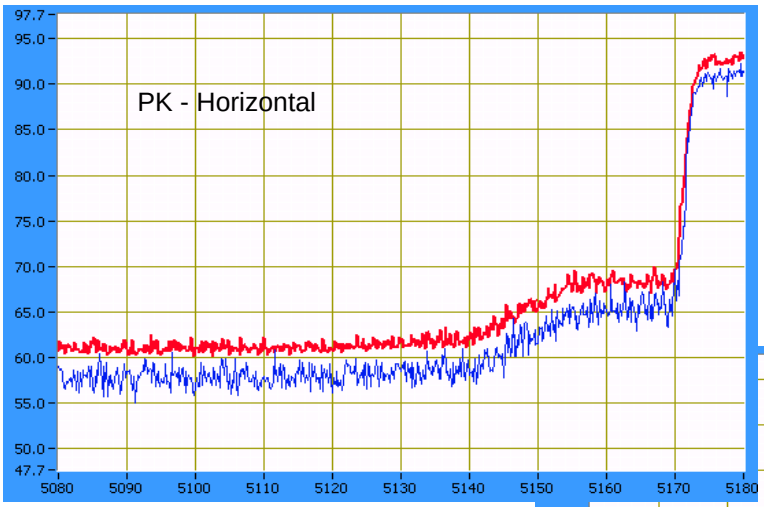
Client:	Intel	Job Number:	J72064
Model:	512ANM with Vader Antenna	T-Log Number:	T72075
		Account Manager:	Briggs / Eriksen
Contact:	Robert Paxman		
Standard:	RSS 210 / FCC 15.407 UNII (Radiated)	Class:	N/A

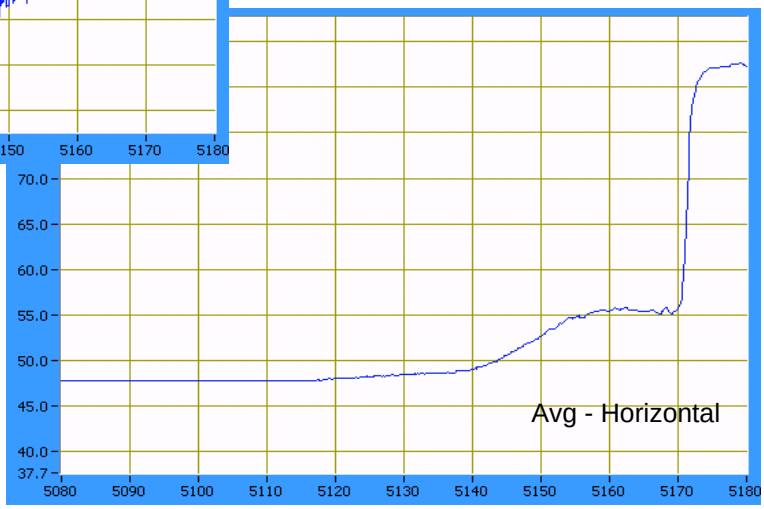
Run #1: Radiated Spurious Emissions, Band Edges. Operating Mode: 802.11n 40MHz - Chain A
Run #1a: Low Channel @ 5190 MHz (band edge at 5150 MHz)
Power Setting: 26.0 Average power: 15.1 (for reference purposes)
Fundamental Signal Field Strength: Peak and average values measured in 1 MHz, for reference only

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
5188.690	80.5	V	-	-	AVG	151	1.0	
5188.690	89.5	V	-	-	PK	151	1.0	
5188.870	83.3	H	-	-	AVG	179	1.0	
5188.870	92.4	H	-	-	PK	179	1.0	

Band Edge Signal Field Strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
5149.890	52.9	H	54.0	-1.1	AVG	182	1.0	
5149.750	66.0	H	74.0	-8.0	PK	170	1.0	
5149.890	50.4	V	54.0	-3.6	AVG	147	1.2	
5149.790	64.3	V	74.0	-9.7	PK	146	1.2	





Client:	Intel	Job Number:	J72064
Model:	512ANM with Vader Antenna	T-Log Number:	T72075
		Account Manager:	Briggs / Eriksen
Contact:	Robert Paxman		
Standard:	RSS 210 / FCC 15.407 UNII (Radiated)	Class:	N/A

Run #1b: High Channel @ 5310 MHz (band edge at 5350 MHz)

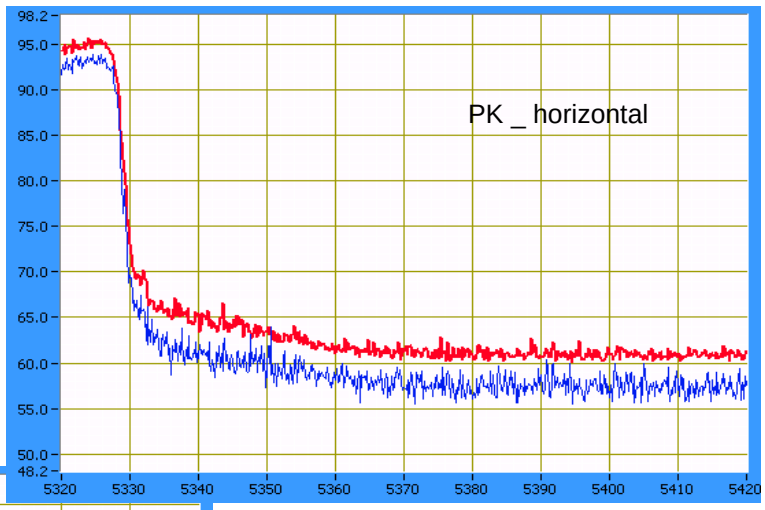
Power Setting: 25.0 Average power: 15.7 (for reference purposes)

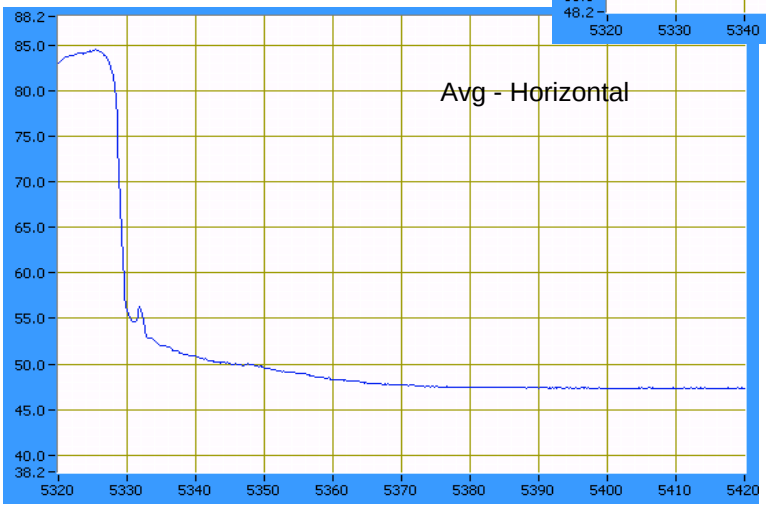
Fundamental Signal Field Strength: Peak and average values measured in 1 MHz, for reference only

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
5311.430	82.4	V	-	-	AVG	186	1.0	
5311.430	92.4	V	-	-	PK	186	1.0	
5308.610	84.7	H	-	-	AVG	217	1.0	
5308.610	93.0	H	-	-	PK	217	1.0	

Band Edge Signal Field Strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
5350.130	50.0	H	54.0	-4.0	AVG	220	1.0	
5350.250	63.8	H	74.0	-10.2	PK	217	1.0	
5350.100	48.7	V	54.0	-5.3	AVG	186	1.0	
5350.130	61.7	V	74.0	-12.3	PK	188	1.0	





Client:	Intel	Job Number:	J72064
Model:	512ANM with Vader Antenna	T-Log Number:	T72075
		Account Manager:	Briggs / Eriksen
Contact:	Robert Paxman		
Standard:	RSS 210 / FCC 15.407 UNII (Radiated)	Class:	N/A

RSS 210 and FCC 15.247 (UNII, 2400 - 2483.5 MHz)

Radiated Spurious Emissions, 1 - 40GHz 802.11a Mode

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. All remote support equipment was located approximately 30 meters from the EUT with all I/O connections running on top of the groundplane.

For radiated emissions testing the measurement antenna was located 3 meters from the EUT.

Ambient Conditions:

Temperature: 21 - 23 °C

Rel. Humidity: 32 - 38 %

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.

Summary of Results

Run #	Mode	Channel	Power Setting	Measured Power	Test Performed	Limit	Result / Margin
1a	802.11a Chain A	5180	GC = 28.0	16.5	Radiated Emissions, 1 - 18 GHz	FCC Part 15.209 / 15.407	52.3 dBuV/m @ 10361.8 MHz (-16.0dB)
1b	802.11a Chain A	5200	GC = 27.5	16.6	Radiated Emissions, 1 - 18 GHz	FCC Part 15.209 / 15.407	51.2 dBuV/m @ 10399.8 MHz (-17.1dB)
1c	802.11a Chain A	5240	GC = 26.5	16.6	Radiated Emissions, 1 - 18 GHz	FCC Part 15.209 / 15.407	48.2dBµV/m @ 10481.7MHz (-20.1dB)
2a	802.11a Chain A	5260	GC = 26	16.6	Radiated Emissions, 1 - 18 GHz	FCC Part 15.209 / 15.407	46.6dBµV/m @ 6000.8MHz (-21.7dB)
2b	802.11a Chain A	5280	GC = 25.5	16.5	Radiated Emissions, 1 - 18 GHz	FCC Part 15.209 / 15.407	48.9dBµV/m @ 10562.6MHz (-19.4dB)
2c	802.11a Chain A	5320	GC = 24.5	16.6	Radiated Emissions, 1 - 18 GHz	FCC Part 15.209 / 15.407	48.4dBµV/m @ 10638.3MHz (-5.6dB)

Client:	Intel	Job Number:	J72064
Model:	512ANM with Vader Antenna	T-Log Number:	T72075
		Account Manager:	Briggs / Eriksen
Contact:	Robert Paxman		
Standard:	RSS 210 / FCC 15.407 UNII (Radiated)	Class:	N/A

Run #1: Radiated Spurious Emissions, 1000 - 40000 MHz. Operating Mode: 802.11a Chain A

Date of Test: 6/26/2008

Test Engineer: Ben Jing

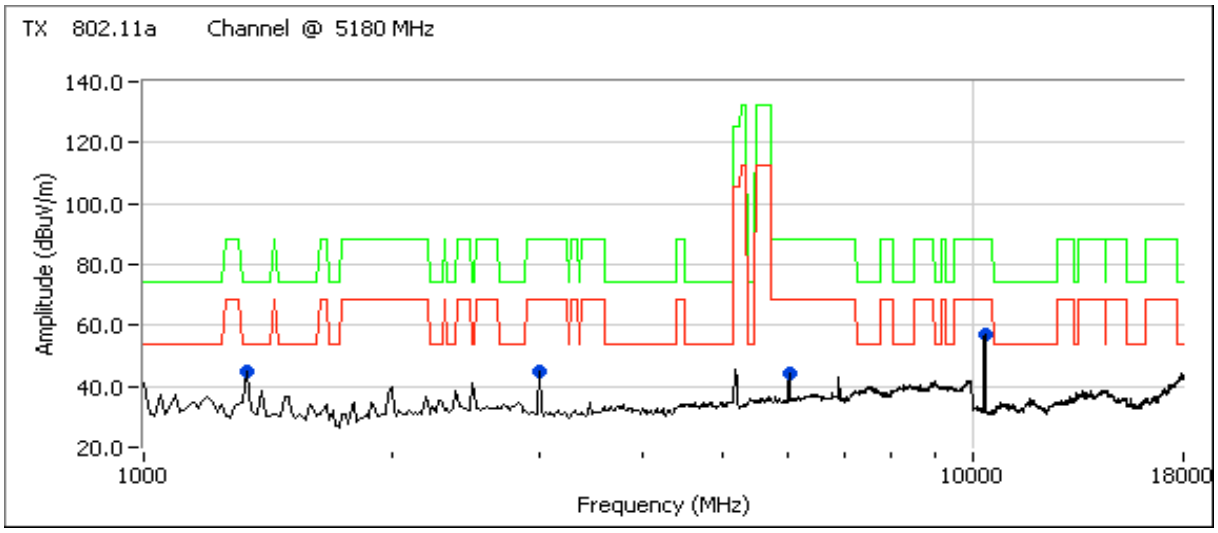
Test Location: FT Chamber # 3

Run #1a: Low Channel @ 5180 MHz

Spurious Emissions

Frequency	Level	Pol	15.209 / 15.407		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
1333.710	29.9	V	54.0	-24.1	AVG	118	1.0	
3000.350	45.6	V	68.3	-22.7	AVG	257	1.3	Note 2
6000.730	41.4	V	68.3	-26.9	AVG	114	1.0	Note 2
10361.830	52.3	V	68.3	-16.0	AVG	227	1.0	Note 2
1333.710	43.7	V	74.0	-30.3	PK	118	1.0	
3000.350	49.0	V	88.3	-39.3	PK	257	1.3	Note 2
6000.730	47.1	V	88.3	-41.2	PK	114	1.0	Note 2
10361.830	64.4	V	88.3	-23.9	PK	227	1.0	Note 2

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set to -27dBm eirp (68.3dBuV/m average, 88.3dBuV/m peak)
Note 2:	Signal is not in a restricted band

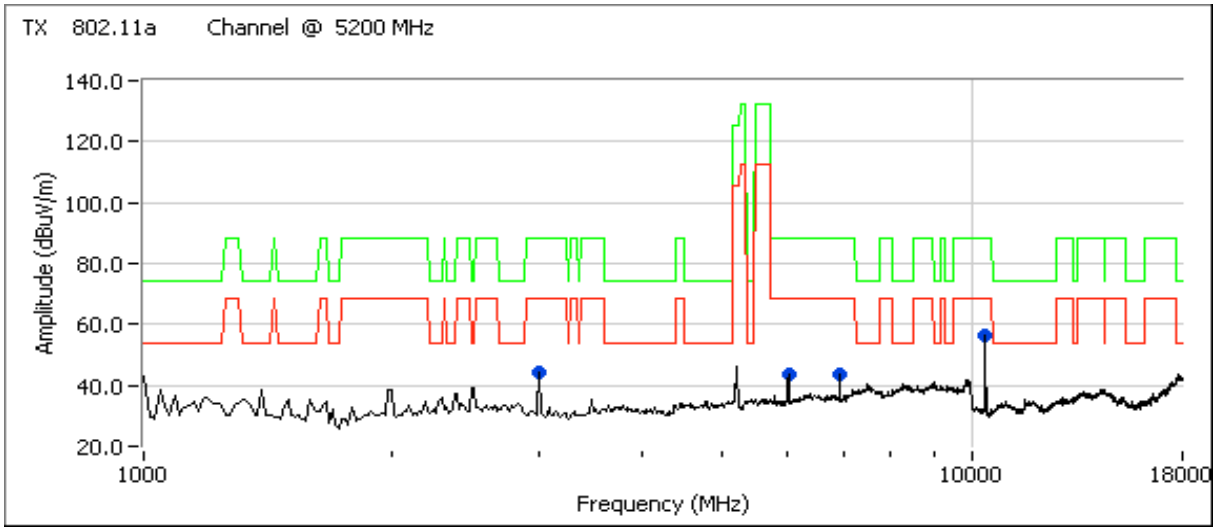


Client:	Intel	Job Number:	J72064
Model:	512ANM with Vader Antenna	T-Log Number:	T72075
		Account Manager:	Briggs / Eriksen
Contact:	Robert Paxman		
Standard:	RSS 210 / FCC 15.407 UNII (Radiated)	Class:	N/A

Run #1b: Center Channel @ 5200 MHz
Spurious Emissions

Frequency	Level	Pol	15.209 / 15.407		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
3000.370	43.7	V	68.3	-24.6	AVG	260	1.6	Note 2
6000.730	44.0	V	68.3	-24.3	AVG	262	1.6	Note 2
6933.300	42.3	V	68.3	-26.0	AVG	275	1.6	Note 2
10399.830	51.2	V	68.3	-17.1	AVG	269	1.0	Note 2
3000.370	47.7	V	88.3	-40.6	PK	260	1.6	Note 2
6000.730	48.6	V	88.3	-39.7	PK	262	1.6	Note 2
6933.300	46.8	V	88.3	-41.5	PK	275	1.6	Note 2
10399.830	64.3	V	88.3	-24.0	PK	269	1.0	Note 2

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set to -27dBm eirp (68.3dBuV/m average, 88.3dBuV/m peak)
Note 2:	Signal is not in a restricted band.

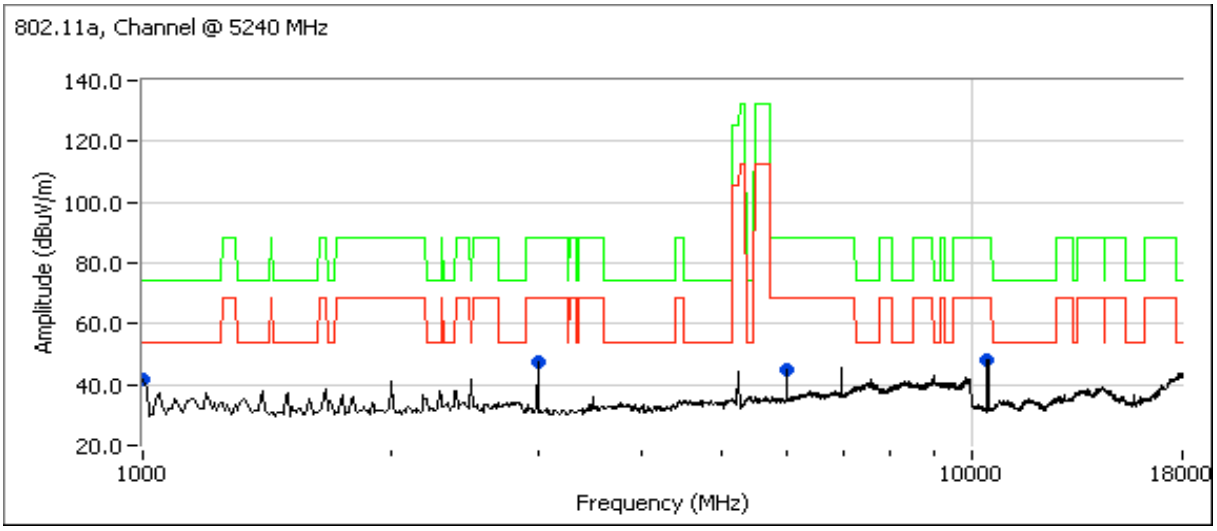


Client:	Intel	Job Number:	J72064
Model:	512ANM with Vader Antenna	T-Log Number:	T72075
		Account Manager:	Briggs / Eriksen
Contact:	Robert Paxman		
Standard:	RSS 210 / FCC 15.407 UNII (Radiated)	Class:	N/A

Run #1: Radiated Spurious Emissions, 1000 - 40000 MHz. Operating Mode: 802.11a Chain A

Date of Test: 6/27/2008
Test Engineer: Suhaila Khushzad
Test Location: Chamber # 3

Run #1c: High Channel @ 5240 MHz



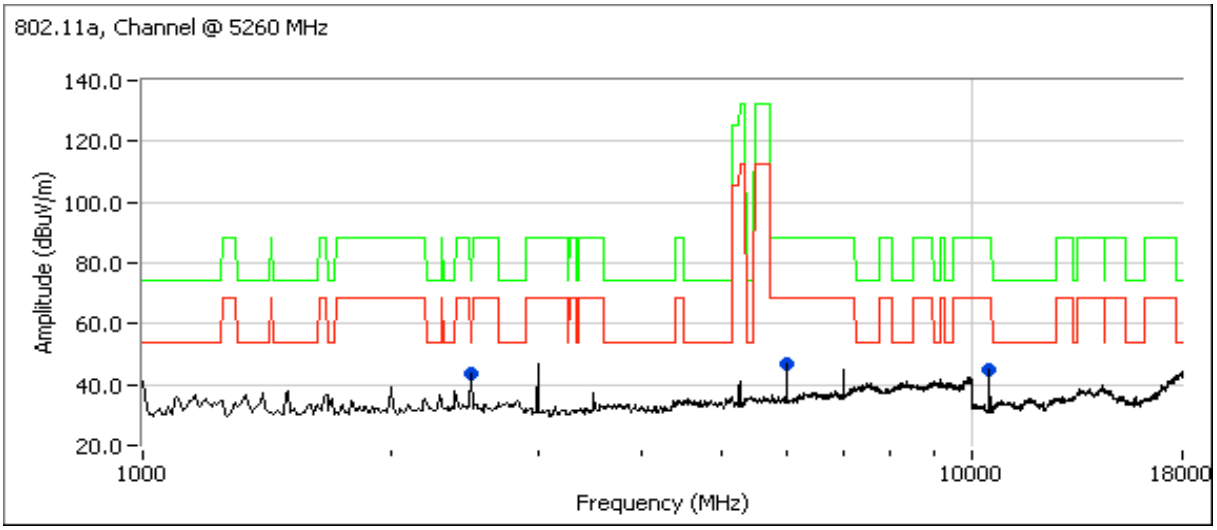
Spurious Emissions

Frequency	Level	Pol	15.209 / 15.407		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
1000.023	18.7	V	54.0	-35.3	AVG	122	1.0	
3000.250	47.7	V	68.3	-20.6	Peak	262	1.0	Note 2
6000.820	44.6	V	68.3	-23.7	Peak	274	1.9	Note 2
10481.650	48.2	V	68.3	-20.1	Peak	152	1.0	Note 2
1000.023	30.9	V	74.0	-43.1	PK	122	1.0	

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set to -27dBm eirp (68.3dBuV/m average, 88.3dBuV/m peak)
Note 2:	Peak reading vs average limit.

Client:	Intel	Job Number:	J72064
Model:	512ANM with Vader Antenna	T-Log Number:	T72075
		Account Manager:	Briggs / Eriksen
Contact:	Robert Paxman		
Standard:	RSS 210 / FCC 15.407 UNII (Radiated)	Class:	N/A

Run #2: Radiated Spurious Emissions, 1000 - 40000 MHz. Operating Mode: 802.11a Chain A
Run #2a: Low Channel @ 5260 MHz



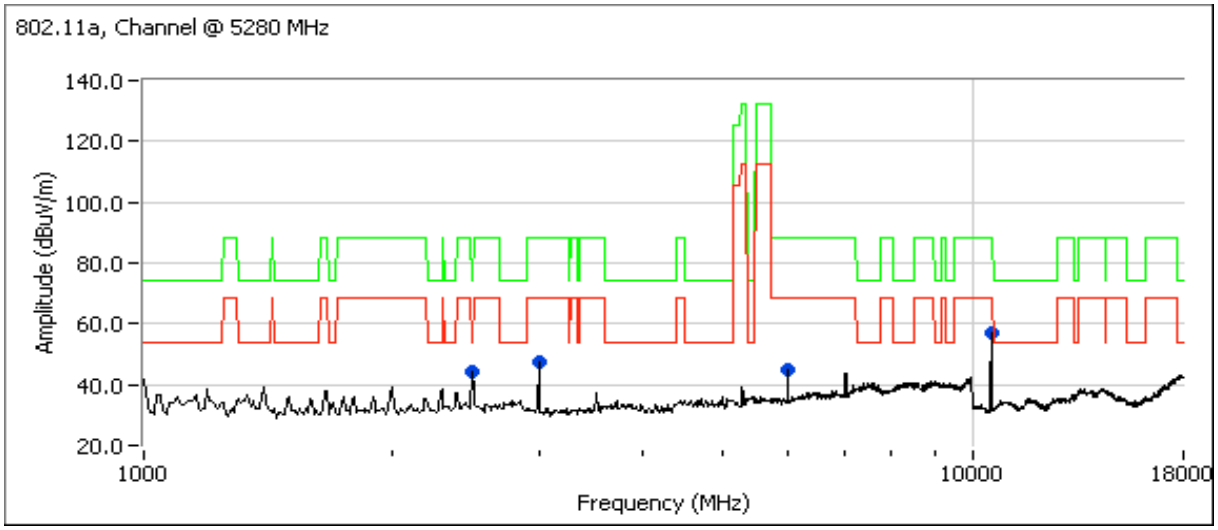
Spurious Emissions

Frequency	Level	Pol	15.209 / 15.407		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2490.240	30.0	H	54.0	-24.0	AVG	120	1.0	
6000.820	46.6	V	68.3	-21.7	Peak	103	1.0	Note 2
10520.200	44.9	V	68.3	-23.4	Peak	153	1.0	Note 2
2490.240	50.0	H	74.0	-24.0	PK	120	1.0	

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set to -27dBm eirp (68.3dBuV/m average, 88.3dBuV/m peak)
Note 2:	Peak reading vs average limit.

Client:	Intel	Job Number:	J72064
Model:	512ANM with Vader Antenna	T-Log Number:	T72075
		Account Manager:	Briggs / Eriksen
Contact:	Robert Paxman		
Standard:	RSS 210 / FCC 15.407 UNII (Radiated)	Class:	N/A

Run #2: Radiated Spurious Emissions, 1000 - 40000 MHz. Operating Mode: 802.11a Chain A
Run #2b: Center Channel @ 5280 MHz



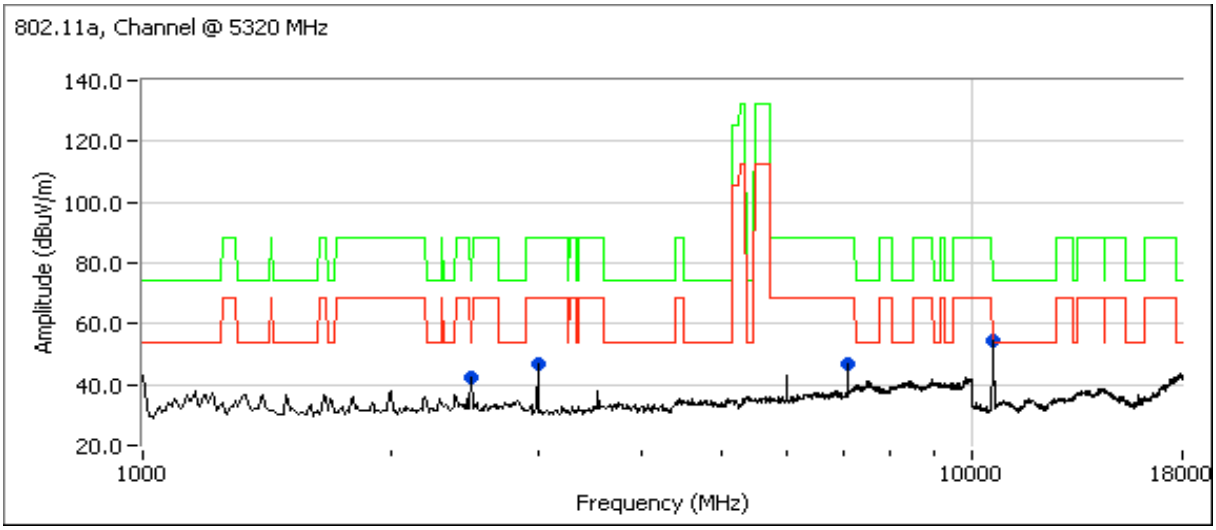
Spurious Emissions

Frequency	Level	Pol	15.209 / 15.407		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2492.670	29.9	V	54.0	-24.1	AVG	95	1.0	Note 2
10562.570	48.9	V	68.3	-19.4	AVG	129	1.0	
3000.250	47.7	V	68.3	-20.6	Peak	263	1.0	Note 2
6000.820	45.0	V	68.3	-23.3	Peak	105	1.0	Note 2
2492.670	51.0	V	74.0	-23.0	PK	95	1.0	Note 2
10562.570	61.5	V	88.3	-26.8	PK	129	1.0	

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set to -27dBm eirp (68.3dBuV/m average, 88.3dBuV/m peak)
Note 2:	Peak reading vs average limit.

Client:	Intel	Job Number:	J72064
Model:	512ANM with Vader Antenna	T-Log Number:	T72075
		Account Manager:	Briggs / Eriksen
Contact:	Robert Paxman		
Standard:	RSS 210 / FCC 15.407 UNII (Radiated)	Class:	N/A

Run #2: Radiated Spurious Emissions, 1000 - 40000 MHz. Operating Mode: 802.11a Chain A
Run #2c: High Channel @ 5320 MHz



Spurious Emissions

Frequency	Level	Pol	15.209 / 15.407		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2490.710	30.4	H	54.0	-23.6	AVG	118	1.0	
10638.290	48.4	H	54.0	-5.6	AVG	237	1.0	
3000.300	46.9	V	68.3	-21.4	Peak	257	1.3	Note 2
7093.340	46.6	H	68.3	-21.7	Peak	241	1.0	Note 2
2490.710	50.4	H	74.0	-23.6	PK	118	1.0	
10638.290	59.8	H	74.0	-14.2	PK	237	1.0	

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set to -27dBm eirp (68.3dBuV/m average, 88.3dBuV/m peak)
Note 2:	Peak reading vs average limit.

Client:	Intel	Job Number:	J72064
Model:	512ANM with Vader Antenna	T-Log Number:	T72075
		Account Manager:	Briggs / Eriksen
Contact:	Robert Paxman		
Standard:	RSS 210 / FCC 15.407 UNII (Radiated)	Class:	N/A

RSS 210 and FCC 15.E (U-NII, 5150- 550/5250-5350/5460-5725MHz)

Radiated Spurious Emissions, 1 - 40GHz 802.11n 20MHz Mode

Test Specific Details

Summary of Results

Run #	Mode	Channel	Power Setting	Measured Power	Test Performed	Limit	Result / Margin
1a	802.11n20 Chain A	5180	27. 0	16. 5	Radiated Emissions, 1 - 40 GHz	FCC Part 15.209 / 15.407	802.11a mode is worst case in this sub-band
1b		5200	26. 5	16. 5			
1c		5240	25. 5	16. 5			
2a		5260	25. 5	16. 7			802.11a and 802.11n 40MHz modes were worst case in this sub-band
2b		5280	24. 5	16. 5			
2c		5320	24. 0	16. 5			

Client:	Intel	Job Number:	J72064
Model:	512ANM with Vader Antenna	T-Log Number:	T72075
		Account Manager:	Briggs / Eriksen
Contact:	Robert Paxman		
Standard:	RSS 210 / FCC 15.407 UNII (Radiated)	Class:	N/A

RSS 210 and FCC 15.E (U-NII, 5150- 550/5250-5350/5460-5725MHz)

Radiated Spurious Emissions, 1 - 40GHz 802.11n 40MHz Mode

Run #	Mode	Channel	Power Setting	Measured Power	Test Performed	Limit	Result / Margin
1a	802.11n20 Chain A	5190	26.5	16.5	Radiated Emissions, 1 - 40 GHz	FCC Part 15.209 / 15.407	802.11a mode is worst case in this sub-band
1b	802.11n20 Chain A	5230	26.0	16.6	Radiated Emissions, 1 - 40 GHz	FCC Part 15.209 / 15.407	