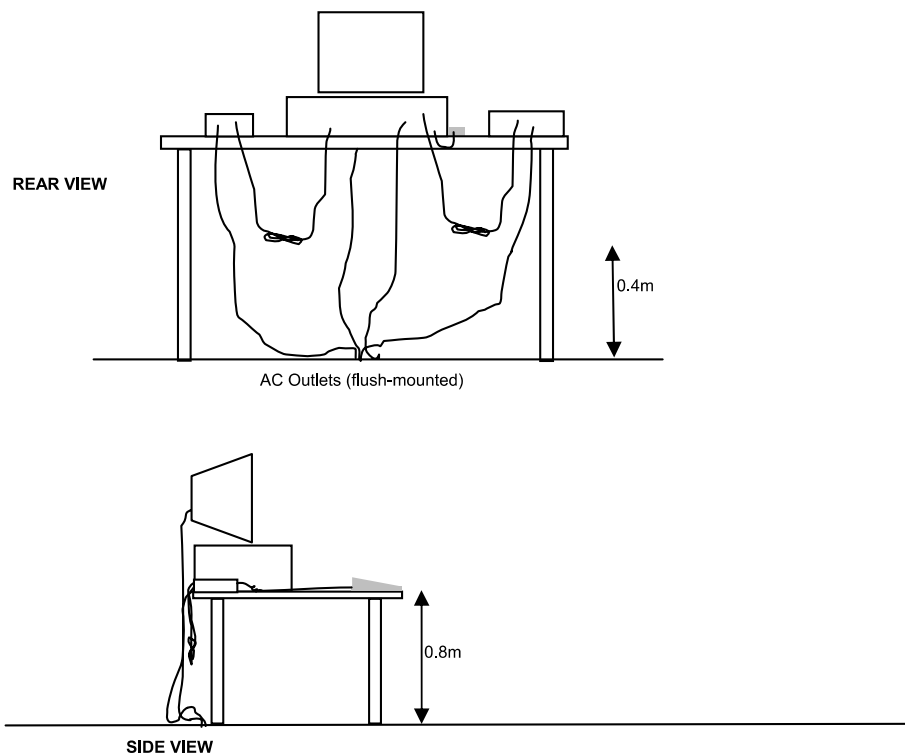


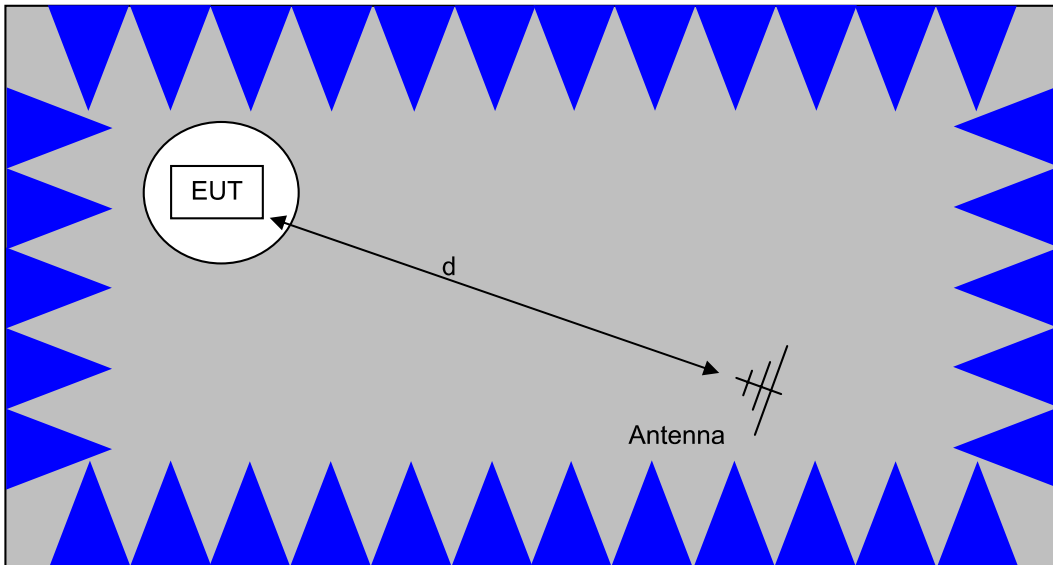
A preliminary scan of the radiated emissions is performed in which all significant EUT frequencies are identified with the system in a nominal configuration. At least two scans are performed, one scan for each antenna polarization (horizontal and vertical; loop parallel and perpendicular to the EUT).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

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.

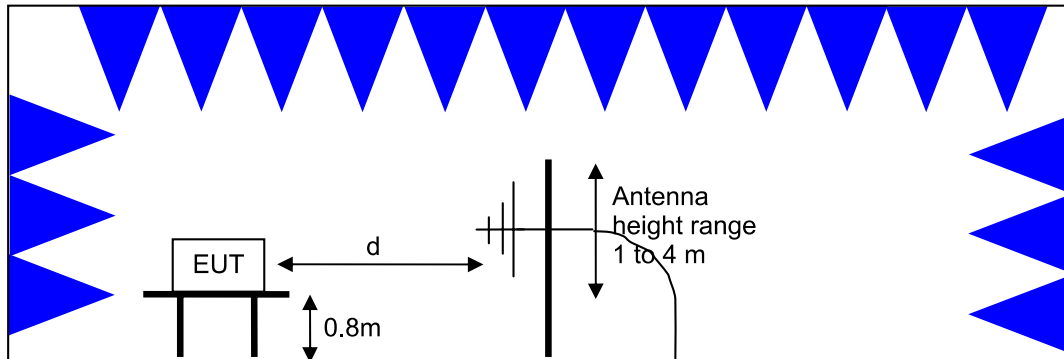


Typical Test Configuration for Radiated Field Strength Measurements



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

**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.

**GENERAL TRANSMITTER RADIATED EMISSIONS SPECIFICATION LIMITS**

The table below shows the limits for the spurious emissions from transmitters that fall in restricted bands<sup>1</sup> (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	$2400/F_{\text{KHz}} @ 300\text{m}$	$67.6-20*\log_{10}(F_{\text{KHz}}) @ 300\text{m}$
0.490-1.705	$24000/F_{\text{KHz}} @ 30\text{m}$	$87.6-20*\log_{10}(F_{\text{KHz}}) @ 30\text{m}$
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

<sup>1</sup> The restricted bands are detailed in FCC 15.203, RSS 210 Table 1 and RSS 310 Table 2

**RECEIVER RADIATED SPURIOUS EMISSIONS SPECIFICATION LIMITS**

The table below shows the limits for the spurious emissions from receivers as detailed in FCC Part 15.109, RSS 210 Table 2, RSS GEN Table 1 and RSS 310 Table 3. Note that receivers operating outside of the frequency range 30 MHz – 960 MHz are exempt from the requirements of 15.109.

Frequency Range (MHz)	Limit (uV/m @ 3m)	Limit (dBuV/m @ 3m)
30 to 88	100	40
88 to 216	150	43.5
216 to 960	200	46.0
Above 960	500	54.0

**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 a field strength of 68.3dBuV/m/MHz at a distance of 3m. This is an average limit so the peak value of the emission may not exceed –7dBm/MHz (88.3dBuV/m/MHz at a distance of 3m). For devices operating in the 5725-5850Mhz bands under the LELAN/UNII rules, the limit within 10MHz of the allocated band is increased to –17dBm/MHz.

**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:

$$F_d = \text{Distance Factor in dB}$$

$$D_m = \text{Measurement Distance in meters}$$

$$D_s = \text{Specification Distance in meters}$$

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:

$$R_R = \text{Receiver Reading in dBuV/m}$$

$$F_d = \text{Distance Factor in dB}$$

$$R_C = \text{Corrected Reading in dBuV/m}$$

$$L_S = \text{Specification Limit in dBuV/m}$$

$$M = \text{Margin in dB Relative to Spec}$$

#### **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:

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

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, 1000 - 40,000 MHz, 16& 17-Jun-11**

<u>Manufacturer</u>	<u>Description</u>	<u>Model</u>	<u>Asset #</u>	<u>Cal Due</u>
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	785	5/18/2012
EMCO	Antenna, Horn, 1-18 GHz	3115	786	12/11/2011
Hewlett Packard	SpecAn 9 kHz - 40 GHz, FT (SA40) Blue	8564E (84125C)	1393	6/14/2011
Hewlett Packard	Head (Inc W1-W4, 1742 , 1743) Blue	84125C	1620	5/9/2012
Micro-Tronics	Band Reject Filter, 2400-2500 MHz	BRM50702-02	1683	8/10/2011
A.H. Systems	Blue System Horn, 18-40GHz	SAS-574, p/n: 2581	2159	3/23/2012

**Radiated Emissions, 1000 - 18,000 MHz, 17-Jun-11**

<u>Manufacturer</u>	<u>Description</u>	<u>Model</u>	<u>Asset #</u>	<u>Cal Due</u>
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	263	12/8/2011
EMCO	Antenna, Horn, 1-18 GHz	3115	487	7/6/2012
Hewlett Packard	SpecAn 30 Hz -40 GHz, SV (SA40) Red	8564E (84125C)	1148	7/12/2011
Micro-Tronics	Band Reject Filter, 5150-5350 MHz	BRC50703-02	1729	9/3/2011
Micro-Tronics	Band Reject Filter, 5470-5725 MHz	BRC50704-02	1730	9/3/2011

**Radiated Emissions, 1000 - 6,500 MHz, 20-21-Jun-11**

<u>Manufacturer</u>	<u>Description</u>	<u>Model</u>	<u>Asset #</u>	<u>Cal Due</u>
EMCO	Antenna, Horn, 1-18 GHz	3115	487	7/6/2012
Hewlett Packard	SpecAn 30 Hz -40 GHz, SV (SA40) Red	8564E (84125C)	1148	7/12/2011

**Appendix B Test Data**

T83587 33 Pages





## EMC Test Data

Client:	Intel Corporation	Job Number:	J83582
Model:	62205ANHMW (Intel® Centrino® Advanced-N 6205) with WNC 81XCAA15.G03 Dipole	T-Log Number:	T83587
Contact:	Steven Hackett	Account Manager:	Christine Krebil
Emissions Standard(s):	FCC 15.247 / FCC 15 E / RSS 210	Class:	B
Immunity Standard(s):	-	Environment:	Radio

## EMC Test Data

For The

## Intel Corporation

Model

**62205ANHMW (Intel® Centrino® Advanced-N 6205) with WNC 81XCAA15.G03 Dipole**

Date of Last Test: 6/20/2011

Client:	Intel Corporation	Job Number:	J83582
Model:	62205ANHMW (Intel® Centrino® Advanced-N 6205) with WNC 81XCAA15.G03 Dipole	T-Log Number:	T83587
		Account Manager:	Christine Krebil
Contact:	Steven Hackett		
Standard:	FCC 15.247 / FCC 15 E / RSS 210	Class:	N/A

**RSS 210 and FCC 15 E (DTS) 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.

**Summary of Results**

**DRTU Version: 1.1.3**  
**Driver Version: 13.0.0238**  
**MAC Address: 001500634F48**

**Run #1 - 2** - Band edge measurements in restricted bands based on worst case operating configurations for 40-MHz channels from the original certification tests

Run #	Mode	Channel	Target Power	Measured Power	Test Performed	Limit	Result / Margin
Run #1	802.11n40 Chain A+B	#38 5190MHz	A: 10dBm B: 10dBm	A: 10.1dBm B: 10.2dBm	Restricted Band Edge at 5150 MHz	15.209	<b>52.1dBµV/m @ 5150.0MHz (-1.9dB)</b>
		#62 5310MHz	A: 10dBm B: 10dBm	A: 10.0dBm B: 10.1dBm	Restricted Band Edge at 5350 MHz	15.209	49.4dBµV/m @ 5350.0MHz (-4.6dB)
		#102 5510MHz	A: 10dBm B: 10dBm	A: 10.3dBm B: 10.2dBm	Restricted Band Edge at 5460 MHz	15.209	46.8dBµV/m @ 5459.7MHz (-7.2dB)
					Band Edge at 5470 MHz	15 E	66.3dBµV/m @ 5469.0MHz (-2.0dB)
Run # 2	802.11n40 Chain B	#38 5190MHz	11dBm	11.2dBm	Restricted Band Edge at 5150 MHz	15.209	49.5dBµV/m @ 5150.0MHz (-4.5dB)

**Ambient Conditions:** Temperature: 15-25 °C  
Rel. Humidity: 30-80 %

**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:	Intel Corporation	Job Number:	J83582
Model:	62205ANHMW (Intel® Centrino® Advanced-N 6205) with WNC 81XCAA15.G03 Dipole	T-Log Number:	T83587
		Account Manager:	Christine Krebil
Contact:	Steven Hackett		
Standard:	FCC 15.247 / FCC 15 E / RSS 210	Class:	N/A

## Run #1, Band Edge Field Strength - 802.11n40, Chain A+B

### Run #1a, EUT on Channel #38 5190MHz - 802.11n40, Chain A+B

Date of Test: 6/20/2011  
Test Engineer: Rafael Varelas

Test Location: FT Chamber #4  
Config Change: None

Chain	Target (dBm)				Power Settings Measured (dBm)				Software Setting
	A	B	C	Total	A	B	C	Total	
	10.0	10.0		13.0	10.1	10.2		13.2	

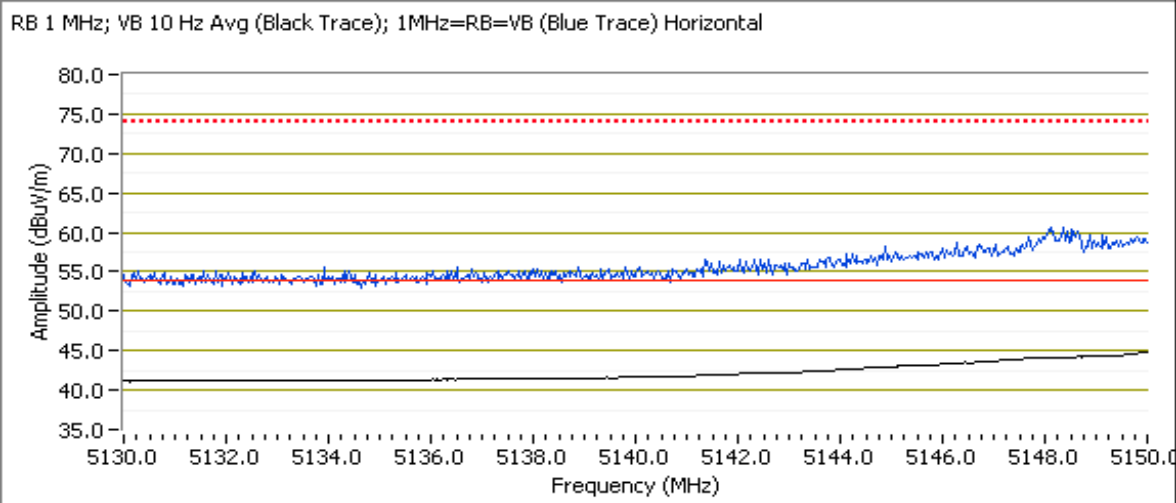
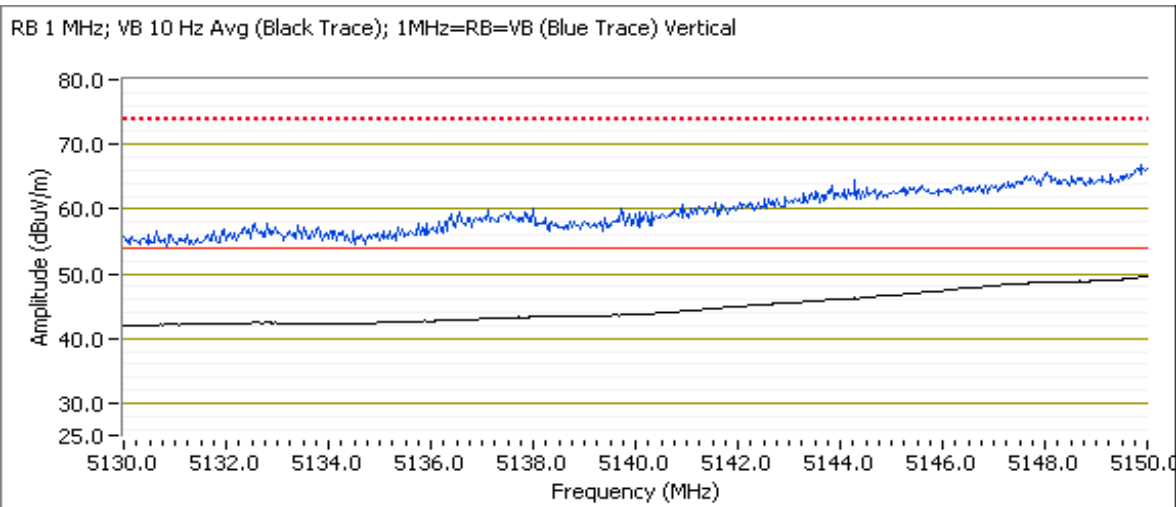
### Fundamental Signal Field Strength

Frequency MHz	Level dBμV/m	Pol V/H	15.209 / 15 E		Detector Pk/QP/Avg	Azimuth degrees	Height meters	Comments
			Limit	Margin				
5187.130	92.5	V	-	-	AVG	258	1.0	RB 1 MHz;VB 10 Hz;Pk
5186.600	102.3	V	-	-	PK	258	1.0	RB 1 MHz;VB 3 MHz;Pk
5192.730	85.5	H	-	-	AVG	283	1.0	RB 1 MHz;VB 10 Hz;Pk
5185.530	95.8	H	-	-	PK	283	1.0	RB 1 MHz;VB 3 MHz;Pk

### Field Strength at 5150 MHz Band Edge

Frequency MHz	Level dBμV/m	Pol V/H	15.209 / 15 E		Detector Pk/QP/Avg	Azimuth degrees	Height meters	Comments
			Limit	Margin				
5149.980	52.1	V	54.0	-1.9	AVG	244	1.2	RB 1 MHz;VB 10 Hz;Pk
5149.700	66.1	V	74.0	-7.9	PK	244	1.2	RB 1 MHz;VB 3 MHz;Pk
5149.920	47.0	H	54.0	-7.0	AVG	330	1.0	RB 1 MHz;VB 10 Hz;Pk
5148.770	60.7	H	74.0	-13.3	PK	330	1.0	RB 1 MHz;VB 3 MHz;Pk

Client:	Intel Corporation	Job Number:	J83582
Model:	62205ANHMW (Intel® Centrino® Advanced-N 6205) with WNC 81XCAA15.G03 Dipole	T-Log Number:	T83587
		Account Manager:	Christine Krebil
Contact:	Steven Hackett		
Standard:	FCC 15.247 / FCC 15 E / RSS 210	Class:	N/A





# EMC Test Data

Client:	Intel Corporation	Job Number:	J83582
Model:	62205ANHMW (Intel® Centrino® Advanced-N 6205) with WNC 81XCAA15.G03 Dipole	T-Log Number:	T83587
		Account Manager:	Christine Krebil
Contact:	Steven Hackett		
Standard:	FCC 15.247 / FCC 15 E / RSS 210	Class:	N/A

**Run #1b, EUT on Channel #62 5310MHz - 802.11n40, Chain A+B**  
 Date of Test: 6/20/2011      Test Location: FT Chamber #4  
 Test Engineer: Rafael Varelas      Config Change: none

Chain	Target (dBm)				Power Settings				Software Setting
	A	B	C	Total	A	B	C	Total	
	10.0	10.0		13.0	10.0	10.1		13.1	

### Fundamental Signal Field Strength

Frequency MHz	Level dBμV/m	Pol V/H	15.209 / 15 E		Detector Pk/QP/Avg	Azimuth degrees	Height meters	Comments
			Limit	Margin				
5307.270	91.9	V	-	-	AVG	225	1.1	RB 1 MHz;VB 10 Hz;Pk
5302.400	101.7	V	-	-	PK	225	1.1	RB 1 MHz;VB 3 MHz;Pk
5307.270	83.9	H	-	-	AVG	330	1.0	RB 1 MHz;VB 10 Hz;Pk
5302.070	94.9	H	-	-	PK	330	1.0	RB 1 MHz;VB 3 MHz;Pk

### 5350 MHz Band Edge Signal Radiated Field Strength

Frequency MHz	Level dBμV/m	Pol V/H	15.209 / 15 E		Detector Pk/QP/Avg	Azimuth degrees	Height meters	Comments
			Limit	Margin				
5350.000	49.4	V	54.0	-4.6	AVG	213	1.0	RB 1 MHz;VB 10 Hz;Pk
5350.140	62.3	V	74.0	-11.7	PK	213	1.0	RB 1 MHz;VB 3 MHz;Pk
5350.130	44.3	H	54.0	-9.7	AVG	280	1.3	RB 1 MHz;VB 10 Hz;Pk
5350.680	55.8	H	74.0	-18.2	PK	280	1.3	RB 1 MHz;VB 3 MHz;Pk

Client:	Intel Corporation	Job Number:	J83582
Model:	62205ANHMW (Intel® Centrino® Advanced-N 6205) with WNC 81XCAA15.G03 Dipole	T-Log Number:	T83587
		Account Manager:	Christine Krebil
Contact:	Steven Hackett		
Standard:	FCC 15.247 / FCC 15 E / RSS 210	Class:	N/A

