

***Electromagnetic Emissions Test Report
and
Application for Grant of Equipment Authorization
pursuant to
FCC Part 15, Subpart E (UNII Devices)
on the Netgear
Model: HE102***

FCC ID: PY3HE102

GRANTEE: Netgear
4401 Great America Parkway
Santa Clara, Ca. 95052

TEST SITE: Elliott Laboratories, Inc.
684 W. Maude Avenue
Sunnyvale, CA 94086

REPORT DATE: November 12, 2001

FINAL TEST DATE: November 2 and November 6, 2001



AUTHORIZED SIGNATORY: _____

Mark Briggs
Director of Engineering

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DECLARATIONS OF COMPLIANCE

Equipment Name and Model:
HE102

Manufacturer:
Netgear

Tested to applicable standards:
FCC Part 15 Subpart E (UNII Devices)

I declare that the testing was performed or supervised by me; that the test measurements were made in accordance with the above-mentioned departmental standards and that the equipment performed in accordance with the data submitted in this report.



Signature _____
Name Mark Briggs
Title Director of Engineering
Company Elliott Laboratories Inc.
Address 684 W. Maude Ave
Sunnyvale, CA 94086
USA

Date: November 12, 2001

Maintenance of compliance with the above standards 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.).

TABLE OF CONTENTS

COVER PAGE	1
DECLARATIONS OF COMPLIANCE	2
TABLE OF CONTENTS	3
SCOPE	4
OBJECTIVE	4
SUMMARY OF RESULTS	5
MEASUREMENT UNCERTAINTIES	6
MODULAR APPROVAL REQUIREMENTS	7
EQUIPMENT UNDER TEST (EUT) DETAILS	8
GENERAL	8
ANTENNA	8
ENCLOSURE.....	8
MODIFICATIONS	8
SUPPORT EQUIPMENT	9
EUT INTERFACE PORTS.....	9
EUT OPERATION.....	9
ANTENNA REQUIREMENTS.....	9
TEST SITE	10
GENERAL INFORMATION	10
CONDUCTED EMISSIONS CONSIDERATIONS.....	10
RADIATED EMISSIONS CONSIDERATIONS.....	10
MEASUREMENT INSTRUMENTATION	11
RECEIVER SYSTEM	11
INSTRUMENT CONTROL COMPUTER	11
LINE IMPEDANCE STABILIZATION NETWORK (LISN)	11
POWER METER	12
FILTERS/ATTENUATORS	12
ANTENNAS.....	12
ANTENNA MAST AND EQUIPMENT TURNTABLE	12
INSTRUMENT CALIBRATION.....	12
TEST PROCEDURES	13
EUT AND CABLE PLACEMENT	13
CONDUCTED EMISSIONS.....	13
RADIATED EMISSIONS.....	13
CONDUCTED EMISSIONS FROM ANTENNA PORT	14
SPECIFICATION LIMITS AND SAMPLE CALCULATIONS	14
FCC 15.407 (A) OUTPUT POWER LIMITS.....	15
RS-210 6.2.2(q1) OUTPUT POWER LIMITS.....	15
SPURIOUS RADIATED EMISSIONS LIMITS.....	16
AC POWER PORT CONDUCTED EMISSIONS LIMITS.....	16
SAMPLE CALCULATIONS - CONDUCTED EMISSIONS	17
SAMPLE CALCULATIONS - RADIATED EMISSIONS.....	18
APPENDIX 1: Test Equipment Calibration Data.....	1
APPENDIX 2: Test Data Log Sheets.....	2

SCOPE

An electromagnetic emissions test has been performed on the Netgear model HE102 pursuant to Subpart E of Part 15 of FCC Rules for Unlicensed National Information Infrastructure (UNII) devices. Conducted and radiated emissions data has been collected, reduced, and analyzed within this report in accordance with measurement guidelines set forth in ANSI C63.4-1992 as outlined in Elliott Laboratories test procedures.

The intentional radiator above has been tested in a simulated typical installation to demonstrate compliance with the relevant FCC 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 Netgear model HE102 and therefore apply only to the tested sample. The sample was selected and prepared by Jimmy Su of Netgear.

OBJECTIVE

The primary objective of the manufacturer is compliance with Subpart E of Part 15 of FCC Rules for the radiated and conducted emissions of intentional radiators. Certification of these devices is required as a prerequisite to marketing as defined in Part 2 the FCC Rules.

Certification is a procedure where the manufacturer or a contracted laboratory makes measurements and submits the test data and technical information to the FCC. The FCC issues a grant of equipment authorization upon successful completion of their 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.

SUMMARY OF RESULTS

The test data below represents the highest recorded measurements with respect to the FCC Part 15 Subpart E. Unless stated otherwise, the complete data can be found in the Tests Data Sheets (Exhibit 2) submitted with this report.

FCC Part 15 Section	-	Description	Comments	Result
Operation in the 5.15 – 5.25 GHz Band (Normal Mode)				
15.407 (d)	-	Maximum Antenna Gain /Integral Antenna	6 dBi Integral	Pass
15.407(e)	-	Indoor operation only	Refer to user's manual in Exhibit 7	Pass
15.407(a) (1)	-	Bandwidth	26.42 MHz	N/A
15.407(a) (1)	-	Output Power	15.4 dBm	Pass
15.407(a) (1))	-	Power Spectral Density	.77 dBm	Pass
Operation in the 5.25 – 5.35 GHz Band (Normal Mode)				
		Maximum Antenna Gain	6 dBi Integral	Pass
15.407(a) (2)	-	Bandwidth	31.42 MHz	N/A
15.407(a) (2)	-	Output Power	19.6 dBm	Pass
15.407(a) (2))	-	Power Spectral Density	4.6 dBm	Pass
Operation in the 5.15 – 5.25 GHz Band (Turbo Mode)				
15.407 (d)	-	Maximum Antenna Gain /Integral Antenna	6 dBi Integral	Pass
15.407(e)	-	Indoor operation only	Refer to user's manual in Exhibit 7	Pass
15.407(a) (1)	-	Bandwidth	43.5 MHz	N/A
15.407(a) (1)	-	Output Power	15.5 dBm	Pass
15.407(a) (1))	-	Power Spectral Density	-1.73 dBm	Pass
Operation in the 5.25 – 5.35 GHz Band (Turbo Mode)				
		Maximum Antenna Gain	6 dBi Integral	Pass
15.407(a) (2)	-	Bandwidth	57 MHz	N/A
15.407(a) (2)	-	Output Power	19.8 dBm	Pass
15.407(a) (2))	-	Power Spectral Density	2.43 dBm	Pass
Spurious Emissions (All Modes)				
15.407(b) (5) / 15.209	-	Spurious Emissions below 1GHz	-1.7dB @ 66.21 MHz\	Pass
15.407(b) (2)	-	Spurious Emissions above 1GHz	-5.8dB @ 15870 MHz	Pass

FCC Part 15 Section		Description	Comments	Result
Other Requirements (Both Modes)				
15.407(a)(6)	-	Peak Excursion Ratio	Less than 13dB	Pass
15.407 (c)	-	Automatic Discontinuation of Operation in the absence of information to transmit	Operation is discontinued in the absence of information to transmit, refer to the "Theory of Operations" in exhibit 9 for a detailed explanation.	Pass
15.407 (g)	-	Frequency Stability	Frequency stability is ± 20 ppm. Refer to the "Theory of Operations" (exhibit 9) for a detailed analysis.	Pass
15.407 (f)	-	RF Exposure Requirements	Refer to MPE Calculations (Exhibit 11)	Pass
15.407(b) / 15.207	-	AC Conducted Emissions	-8dB @ 4.222 MHz	Pass

MEASUREMENT UNCERTAINTIES

ISO Guide 25 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 NAMAS document NIS 81.

Measurement Type	Frequency Range (MHz)	Calculated Uncertainty (dB)
Conducted Emissions	0.15 to 30	± 2.4
Radiated Emissions	30 to 1000	± 3.2

MODULAR APPROVAL REQUIREMENTS

Modular approval for the device is being requested. The device must meet the eight requirements outlined in FCC Public Notice DA 00-1407 Released: June 26, 2000. Each requirement is addressed below:

- 1) The modular transmitter must have its own RF shielding.
The EUT contains its own rf shielding. It was tested without an enclosure
- 2) The modular transmitter must have buffered modulation/data inputs.
The data input is provided by a 10/100Mb/s ethernet interface. The data is buffered and data rate limited by the ethernet interface circuitry.
- 3) The modular transmitter must have its own power supply regulation.
The EUT contains a separate dc power input connector. The dc power is fully regulated before it goes to any of the rf or digital circuits.
- 4) The modular transmitter must comply with the antenna requirements of Section 15.203 and 15.204(c).
The antenna is integral to the device and so meets all requirements of 15.203 and of FCC Part 15 Subpart E.
- 5) The modular transmitter must be tested in a stand-alone configuration.
The EUT was tested in a stand-alone configuration with cables connected to the ethernet and dc power ports representative of those that would be connected during normal use.
- 6) The modular transmitter must be labeled with its own FCC ID number, and, if the FCC ID is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module.
The device is intended to be used by NetGear in their AccessPoint products. The devices containing the module will be labeled with the FCC ID of the module.
- 7) The modular transmitter must comply with any specific rule or operating requirements applicable to the transmitter and the manufacturer must provide adequate instructions along with the module to explain any such requirements. A copy of these instructions must be included in the application for equipment authorization.
The device is intended to be used by the module manufacturer, NetGear, in their AccessPoint products. The operating limitations are fully understood by their engineering division.
- 8) The modular transmitter must comply with any applicable RF exposure requirements.
The MPE calculations show that the device meets the rf exposure requirements provided that a separation of at least 20cm is maintained between the EUT and people in its vicinity. The installation and user manuals for products containing this module will all reference this requirement.

EQUIPMENT UNDER TEST (EUT) DETAILS**GENERAL**

The Netgear model HE102 is a UNII radio transceiver module that is designed to provide a wireless LAN access using 802.11a protocol for data rates of up to 54Mb/s and a turbo mode for data rates of up to 72 Mb/s.

Normally, the EUT would be wall-mounted during operation. The EUT was treated as tabletop equipment during testing to simulate the end user environment. The electrical rating of the EUT is 120 V, 60 Hz, 3 Amps.

The sample was received on November 2, 2001 and tested on November 2 and November 6, 2001. The EUT consisted of the following component(s):

Manufacturer/Model/Description	Serial Number
Netgear HE102 Wireless LAN Access Point	143

ANTENNA

The EUT uses an integral antenna with a gain of 6 dBi.

ENCLOSURE

The EUT enclosure is primarily constructed with a plated steel shield enclosure. It measures approximately 17 cm wide by 13 cm deep by 11 cm high.

MODIFICATIONS

The EUT required the following modifications during testing in order to comply with the specifications for radiated emissions below 1GHz:

Added 3 Standoffs to the EUT to meet the FCC Class B limits.

SUPPORT EQUIPMENT

The following equipment was used as local support equipment when testing antenna port emissions, radiated emissions above 1GHz and for measuring the output power:

Manufacturer	Model	Description	Serial Number	FCC ID
IBM	ThinkPad	Laptop	78-RVFN5	DoC
Boonton	4531	Power Meter	100201	N/A
Boonton	57318	Power Sensor	2110	N/A

The following equipment was used as remote support equipment when testing conducted and radiated emissions below 1GHz:

Manufacturer	Model	Description	Serial Number	FCC ID
IBM	Thinkpad	Laptop	78-RVFN5	DoC
Netgear	DS108	Hub	DS18J18380052	DoC

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)
Ethernet	Laptop (Hub*)	RJ-45	Unshielded	30

* The hub was used between the EUT and the laptop for radiated and conducted emissions tests below 1GHz.

EUT OPERATION

The radio was transmitting at full power on the specified channel with a duty cycle of 99% (maximum allowed). The EUT was tested in both normal mode (channel bandwidth of approximately 30 MHz) and turbo mode (channel bandwidth of approximately 60 MHz).

"Normal Mode" allows data rates of up to 54 Mb/s. The device was, therefore, tested in Normal mode at the data rate that produced the highest output power for normal mode (6 Mb/s).

"Turbo Mode" allows data rates of up to 72Mb/s. At data rates higher than 12Mb/s the PA gain is reduced to improve signal fidelity. The device was, therefore, tested in turbo mode at the data rate that produced the highest output power for turbo mode (12Mb/s).

ANTENNA REQUIREMENTS

As the device is intended to operate in the 15.15 – 15.25 GHz band an integral antenna as detailed in 15.407 (d). The antenna for the device is an integral antenna with a gain of 6 dBi.

TEST SITE

GENERAL INFORMATION

Final test measurements were taken on November 2, November 5 & November 6, 2001 at the Elliott Laboratories Open Area Test Sites #1 & #4 located at 684 West Maude Avenue, Sunnyvale, California. The test site contains separate areas for radiated and conducted emissions testing. Pursuant to section 2.948 of the Rules, construction, calibration, and equipment data has been filed with the Federal Communications Commission. In accordance with Industry Canada rules detailed in RSS 210 Issue 4 and RSS-212, construction, calibration, and equipment data for the test sites have been filed with the Federal Communications Commission.

The FCC 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 FCC requirements.

CONDUCTED EMISSIONS CONSIDERATIONS

Conducted emissions' testing is performed in conformance with ANSI C63.4-1992. 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. The test site is maintained free of conductive objects within the CISPR defined elliptical area incorporated in ANSI C63.4 guidelines.

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.

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.

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.

POWER METER

Both a spectrum analyzer and a power meter are used for all direct output power measurements from transmitters.

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 biconical antenna is used to cover the range from 30 MHz to 300 MHz and a log periodic antenna is utilized from 300 MHz to 1000 MHz. Narrowband tuned dipole antennas are used over the entire 30 to 1000 MHz range for precision measurements of field strength. Above 1000 MHz, a horn antenna is used. The antenna calibration factors are included in site factors programmed into the test receivers.

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.

ANSI C63.4 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 FCC requires 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, 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.

RADIATED EMISSIONS

Radiated emissions measurements are performed in two phases as well. A preliminary scan of emissions is conducted in which all significant EUT frequencies are identified with the system in a nominal configuration. At least two scans are performed from 30 MHz up to the frequency required by the regulation specified on page 1. One or more of these is with the antenna polarized vertically while the one or more of these is with the antenna polarized horizontally. During the preliminary scans, the EUT is rotated through 360°, the antenna height is varied and cable positions are varied to determine the highest emission relative to the limit.

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. 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. Emissions, which have values close to the specification limit may also be measured with a tuned dipole antenna to determine compliance.

CONDUCTED EMISSIONS FROM ANTENNA PORT

Direct measurements are performed 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.

Measurement bandwidths (video and resolution) are set in accordance with FCC procedures for the type of radio being tested.

SPECIFICATION LIMITS AND SAMPLE CALCULATIONS

The limits for conducted emissions from the AC power port are given in units of microvolts, the limits for radiated electric field emissions are given in units of microvolts per meter at a specified test distance and the output power limits are given in terms of Watts, milliwatts or dBm. 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.

Where the radiated electric field strength is expressed in terms of the equivalent isotropic radiated power (eirp) the following formula is used to determine the field strength limit in terms of microvolts per meter at a distance of 3m from the equipment under test:

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

where P is the eirp (Watts)

For reference, converting the voltage and electric field strength specification limits from linear to decibel form is accomplished by taking the base ten logarithm, then multiplying by 20. Conversion of power specification limits from linear units (in milliwatts) to decibel form (in dBm) is accomplished by taking the base ten logarithm, then multiplying by 10.

FCC 15.407 (a) OUTPUT POWER LIMITS

The table below shows the limits for output power and output power density. 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)	4 dBm/MHz
5250 - 5350	250 mW (24 dBm)	11 dBm/MHz
5725 – 5825	1 Watts (30 dBm)	17 dBm/MHz

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.

RS-210 6.2.2(q1) OUTPUT POWER LIMITS

The table below shows the limits for output power and output power density. 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)	10 dBm/MHz
5250 - 5350	250 mW (24 dBm)	11 dBm/MHz
5725 – 5825	1 Watts (30 dBm)	17 dBm/MHz

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.

SPURIOUS RADIATED EMISSIONS LIMITS

The table below shows the limits for unwanted (spurious) emissions falling in the restricted bands detailed in Part 15.205 and Industry Canada RSS-210 Table 2.

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

The table below shows the limits for unwanted (spurious) emissions outside of the restricted band.

Operating Frequency (MHz)	EIRP Limit (dBm)	Equivalent Field Strength At 3m (dBuV/m)
5150 - 5250	-27 dBm	68.3 dBuV/m
5250 - 5350	-27 dBm	68.3 dBuV/m
5725 - 5825	-27 dBm (note 1)	68.3 dBuV/m
	-17 dBm (note 2)	78.3 dBuV/m

Note 1: Applies to spurious signals separated by more than 10 MHz from the allocated band.

Note 2: Applies to spurious signals within 10 MHz of the allocated band.

AC POWER PORT CONDUCTED EMISSIONS LIMITS

The table below shows the limits for emissions on the AC power line as detailed in FCC Part 15.205 and Industry Canada RSS-210 section 6.6.

Frequency Range (MHz)	Limit (uV)	Limit (dBuV)
0.450 to 30.000	250	48

SAMPLE CALCULATIONS - CONDUCTED EMISSIONS

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

$$R_T - B = C$$

and

$$C - S = M$$

where:

R_T = Receiver Reading in dBuV

B = Broadband Correction Factor*

C = Corrected Reading in dBuV

S = Specification Limit in dBuV

M = Margin to Specification in +/- dB

* Broadband Level - Per ANSI C63.4, 13 dB may be subtracted from the quasi-peak level if it is determined that the emission is broadband in nature. If the signal level in the average mode is six dB or more below the signal level in the peak mode, the emission is classified as broadband.

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, is calculated by using the following formula:

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

where:

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

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

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

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:

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

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

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

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

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

APPENDIX 1: Test Equipment Calibration Data

1 Page

Radiated Emissions, 1 - 18 GHz, 02-Nov-01 03:45 PM

Engineer: jmartinez

<u>Manufacturer</u>	<u>Description</u>	<u>Model #</u>	<u>Assett #</u>	<u>Cal interval</u>	<u>Last Calibrated</u>	<u>Cal Due</u>
EMCO	Horn Antenna, D. Ridge 1-18GHz	3115	1242	12	10/9/2001	10/9/2002
Hewlett Packard	Microwave EMI test system (SA40, 30Hz - 40GHz)	84125C	1149	12	2/5/2001	2/5/2002
Hewlett Packard	Preamplifier, 1-26.5 GHz	8449B	TY,84299	12	4/1/2001	4/1/2002
Hewlett Packard	Spectrum Analyzer, 9KHz - 22GHz	8593EM	1319	12	5/31/2001	5/31/2002

Antenna Conducted emissions, 02-Nov-01 03:45 PM

Engineer: jmartinez

<u>Manufacturer</u>	<u>Description</u>	<u>Model #</u>	<u>Assett #</u>	<u>Cal interval</u>	<u>Last Calibrated</u>	<u>Cal Due</u>
Hewlett Packard	Microwave EMI test system (SA40, 30Hz - 40GHz)	84125C	1149	12	2/5/2001	2/5/2002

Conducted and Radiated Emissions, 05-Nov-01 02:39 PM

Engineer: jgonzalez

<u>Manufacturer</u>	<u>Description</u>	<u>Model #</u>	<u>Assett #</u>	<u>Cal interval</u>	<u>Last Calibrated</u>	<u>Cal Due</u>
Elliott Laboratories	Biconical Antenna, 30-300 MHz	DM-105-T1	382	12	8/22/2001	8/22/2003
EMCO	Log Periodic Antenna, 0.2-2 GHz	3148	1321	12	4/10/2001	4/10/2002
Rohde & Schwarz	Pulse Limiter	ESH3 Z2	372	12	7/27/2001	7/27/2002
Rohde & Schwarz	Test Receiver, 0.009-2000 MHz	ESN	1332(775)	12	10/12/2001	10/12/2002
Solar Electronics Co	LISN	8028-50-TS-24-BNC	904	12	5/18/2001	5/18/2002

Radiated Emissions, 30 - 1000 MHz, 06-Nov-01 09:33 PM

Engineer: bwright

<u>Manufacturer</u>	<u>Description</u>	<u>Model #</u>	<u>Assett #</u>	<u>Cal interval</u>	<u>Last Calibrated</u>	<u>Cal Due</u>
Elliott Laboratories	Biconical Antenna, 30-300 MHz	EL30.300	773	12	2/15/2001	2/15/2002
Elliott Laboratories	Log Periodic Antenna 300-1000 MHz	EL300.1000	297	12	1/2/2001	1/2/2002
Rohde & Schwarz	Test Receiver, 20-1300MHz	ESVP	213	12	11/10/2000	11/10/2001

APPENDIX 2: Test Data Log Sheets

ELECTROMAGNETIC EMISSIONS

TEST LOG SHEETS

AND

MEASUREMENT DATA

T45229 Radio Test Data 54 Pages
T45229 Digital Device Data 9 pages



EMC Test Data

Client: Netgear	Job Number: J45225
Model: HE102	T-Log Number: T45229
	Proj Eng:
Contact: Jimmy Su	
Emissions Spec: FCC 15 Sub. B & E	Class: B
Immunity Spec:	Environment:

EMC Test Data

For The

Netgear

Model

HE102



EMC Test Data

Client: Netgear	Job Number: J45225
Model: HE102	T-Log Number: T45229
	Proj Eng:
Contact: Jimmy Su	
Emissions Spec: FCC 15 Sub. B & E	Class: B
Immunity Spec: Enter immunity spec on cover	Environment:

EUT INFORMATION

General Description

The EUT is a 802.11A wireless local area network access point which is designed to access a networks data.. Normally, the EUT would be wall mounted, for testing placed on a table top during operation. The EUT was, therefore, treated as table-top equipment during testing to simulate the end user environment. The electrical rating of the EUT is 120 V, 50 Hz, 3 Amps.

Equipment Under Test

Manufacturer	Model	Description	Serial Number	FCC ID
Atheros	HE102	Network Access Point	143	none

Antenna

The EUT uses an integral antenna with a gain of 6 dBi.

EUT Enclosure

The EUT enclosure is primarily constructed of sheet metal. It measures approximately 17 cm wide by 13 cm deep by 11 cm high (with antennas vertical).

Modification History

Mod. #	Test	Date	Modification
1	Radiated	11/6/2001	Tested EUT with 3 standoffs.
2			
3			



EMC Test Data

Client: Netgear	Job Number: J45225
Model: HE102	T-Log Number: T45229
Contact: Jimmy Su	Proj Eng:
Emissions Spec: FCC 15 Sub. B & E	Class: B
Immunity Spec: Enter immunity spec on cover	Environment:

Test Configuration #2

Local Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
None				

Remote Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
IBM	ThinkPad	laptop	78-RVPN5	none

Interface Ports

Port	Connected To	Cable(s)		
		Description	Shielded or Unshielded	Length(m)
Ethernet	Laptop	Ethernet	unshielded CAT 5	1
RS232	Laptop	Com1	Shielded	1

EUT Operation During Emissions Testing (Radio)

The radio was transmitting at full power on the specified channel with a duty cycle of 99% (maximum allowed). The EUT was tested in both normal mode (channel bandwidth of approximately 30 MHz) and turbo mode (channel bandwidth of approximately 60 MHz).

"Normal Mode" allows data rates of up to 54 Mb/s. The device was, therefore, tested in normal mode at the data rate that produced the highest output power for normal mode (6 Mb/s).

"Turbo Mode" allows data rates of up to 72Mb/s. At data rates higher than 12Mb/s the PA gain is reduced to improve signal fidelity. The device was, therefore, tested in turbo mode at the data rate that produced the highest output power in that mode (12Mb/s).



EMC Test Data

Client: Netgear	Job Number: J45225
Model: HE102	T-Log Number: T45229
	Proj Eng: Enter on cover sheet
Contact: Jimmy Su	
Spec: FCC 15 Sub. B & E	Class: B

FCC Part 15 Subpart E Tests: Normal Mode

Test Specifics

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:	11/2/2001
Test Engineer:	Jmartinez
Test Location:	SVOATS# 4

Config. Used: 2
 Config Change: None
 Host Unit Voltage 120Vac, 60Hz

General Test Configuration

The EUT was located on the turntable for radiated spurious emissions testing.

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

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

Ambient Conditions: Temperature: 18°C
 Rel. Humidity: 44%

Summary of Results: Normal Mode

Run #	Test Performed	Limit	Result	Comments
1	Output Power	15.407(a) (1), (2)	Pass	19.6 dBm@5260MHz, 15.4 dBm @ 5180MHz
2	Power Spectral Density (PSD)	15.407(a) (1), (2)	Pass	.77 dBm @ 5180MHz, 4.6 dBm @ 5260MHz
3	26dB Bandwidth	15.407	Pass	> 20 MHz
3	20 dB Bandwidth	RSS 210	Pass	> 17 MHz
4	Peak Excursion Envelope	15.407(a) (6)	Pass	Peak to average excursion < 13dB
5	Antenna Conducted - Out of Band Spurious	15.407(b)	Pass	All emissions below the -27dBm/MHz limit
6	RE, 1000 - 40000 MHz - Spurious Emissions	15.407(b)(6)	Pass	-6dB @ 15960 MHz



EMC Test Data

Client: Netgear	Job Number: J45225
Model: HE102	T-Log Number: T45229
	Proj Eng: Enter on cover sheet
Contact: Jimmy Su	
Spec: FCC 15 Sub. B & E	Class: B

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.

Run #1: Output Power

Antenna Gain: 6 dBi

Channel	Frequency (MHz)	99.7% Signal BW	Output Power	FCC Limit (dBm) (note 3)	Comments
Low	5180		13.8	17.0	Note 2
	5180		15.4	17.0	Note 1
Mid	5260		17.9	24.0	Note 2
	5260		19.6	24.0	Note 1
High	5320		18.0	24.0	Note 2
	5320		18.7	24.0	Note 1

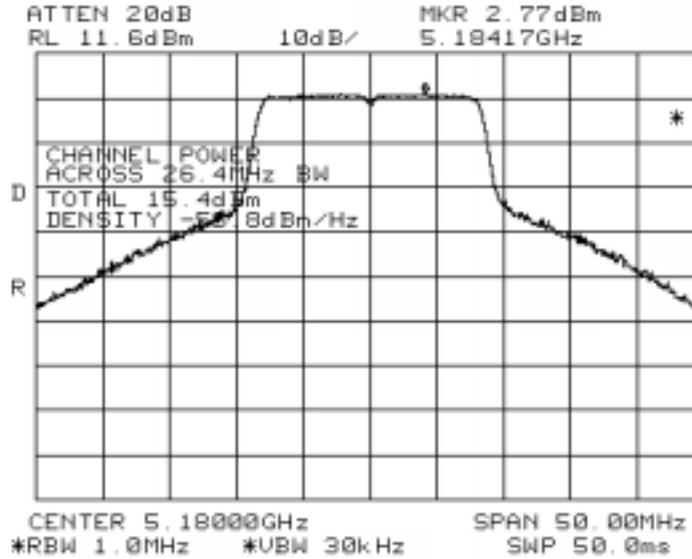
Note 1:	Measured using spectrum analyzer's power measurement function (RBW = 1MHz, VBW = 30kHz)
Note 2:	Measured using a Boonton Power Meter with a peak power sensor in average mode
Note 3:	RSS 210 limit is 23dBm in the 5.15 to 5.25 GHz band, 6dB higher than the FCC limit. This limit is based on the emission bandwidth and operating frequency.



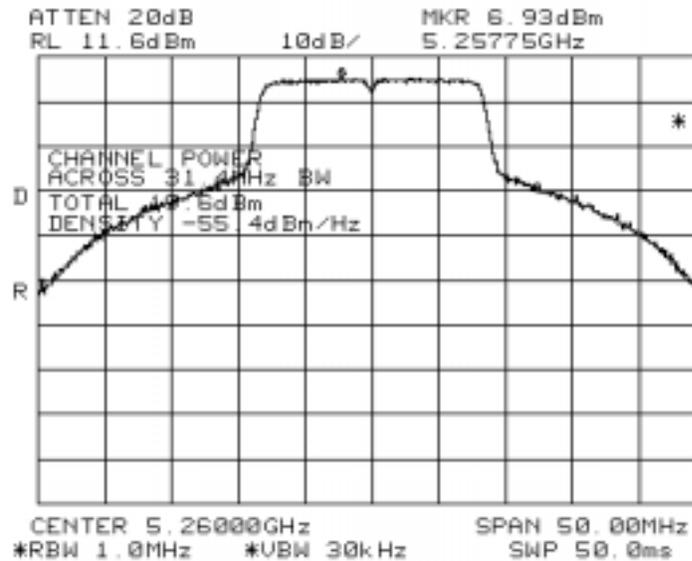
EMC Test Data

Client: Netgear	Job Number: J45225
Model: HE102	T-Log Number: T45229
Contact: Jimmy Su	Proj Eng: Enter on cover sheet
Spec: FCC 15 Sub. B & E	Class: B

Spectrum Analyzer (13.8 dBm @ 5.18 GHz)



Spectrum Analyzer (17.9 dBm @ 5.26 GHz)

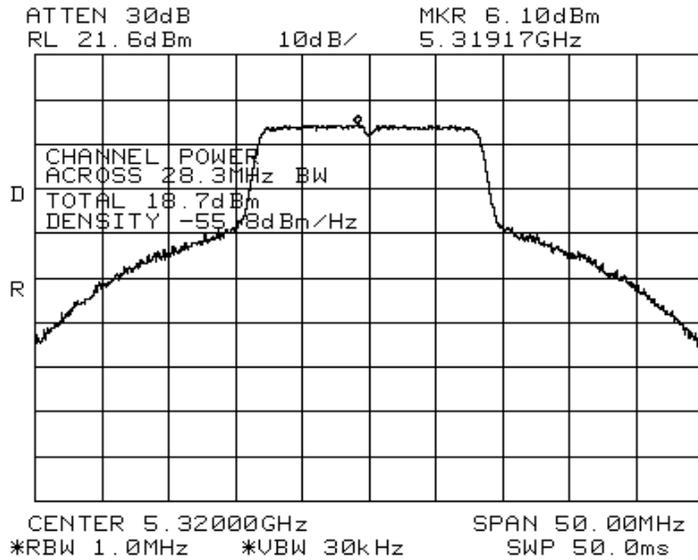




EMC Test Data

Client: Netgear	Job Number: J45225
Model: HE102	T-Log Number: T45229
	Proj Eng: Enter on cover sheet
Contact: Jimmy Su	
Spec: FCC 15 Sub. B & E	Class: B

Spectrum Analyzer (18 dBm @ 5.32 GHz)





EMC Test Data

Client: Netgear	Job Number: J45225
Model: HE102	T-Log Number: T45229
	Proj Eng: Enter on cover sheet
Contact: Jimmy Su	
Spec: FCC 15 Sub. B & E	Class: B

Run #2: Power Spectral Density

Antenna Gain: 6 dBi

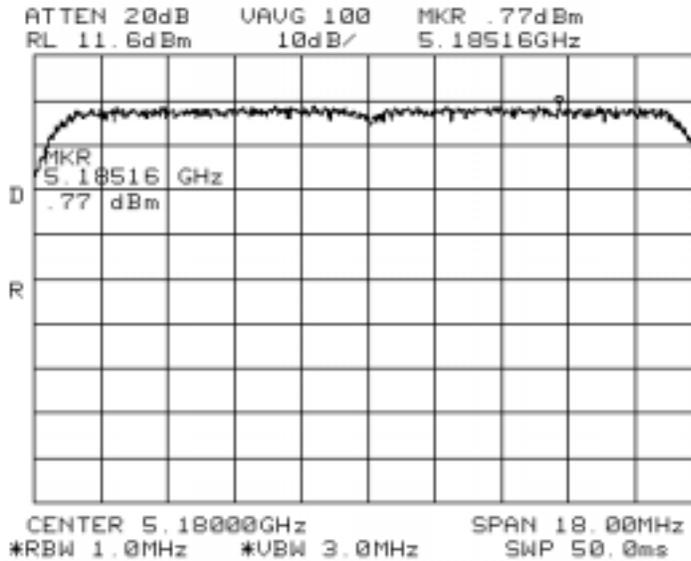
Channel	Frequency (MHz)	Power Spectral Density (dBm/MHz)	FCC Limit (dBm) note 2	Graph Reference	
Low	5180	0.77	4.0	T45229/201	Note 1
Mid	5260	4.6	11.0	T45229/202	Note 1
High	5320	4.1	11.0	T45229/204	Note 1

Note 1: The above measurements were made using RBW = 1MHz, VBW = 1MHz, video averaging on. To demonstrate compliance with RSS 210, the peak PSD was also measured using RBW= VBW=1MHz, video averaging off during the peak excursion measurements (run #4). As per RSS 210 requirements, the peak PSD of **9.78 dBm** in the 5.15 to 5.25 GHz band did not exceed the maximum permitted average PSD of 10dBm by more than 6dB. Similarly, in the 5.25-5.35GHz band, the peak power sepctral density of **13.45 dBm** did not exceed the maximum permitted average PSD of 11dBm by more than 6dB. No restriction is placed on the output power or average PSD with respect to RSS 210.

Note 2: RSS 210 limit is 10dBm/MHz in the 5.15 to 5.25 GHz band, 6dB higher than the FCC limit.

Plots Showing Power Spectral Density (RBW = 1MHz, VBW = 3 MHz, video averaging ON)

T45229 / 201 (13.8 dBm @ 5.18)

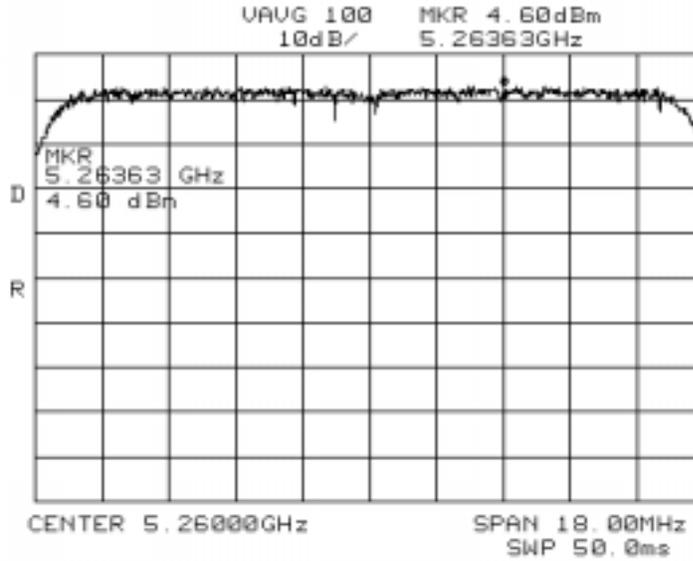




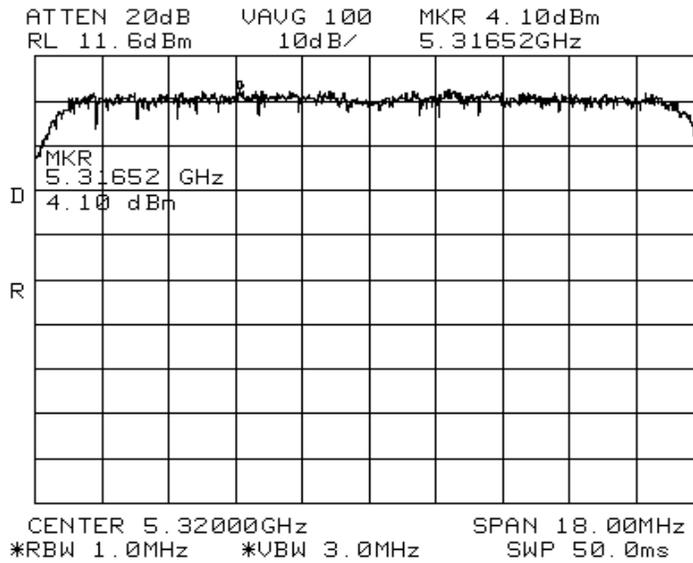
EMC Test Data

Client: Netgear	Job Number: J45225
Model: HE102	T-Log Number: T45229
	Proj Eng: Enter on cover sheet
Contact: Jimmy Su	
Spec: FCC 15 Sub. B & E	Class: B

T45229 / 202 (17.9 dBm @ 5.26)



T45229 / 203 (18.0 dBm @ 5.32)

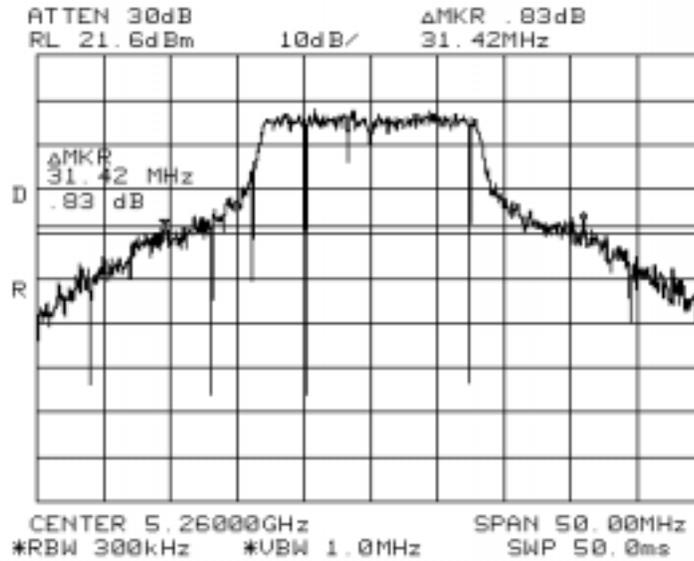




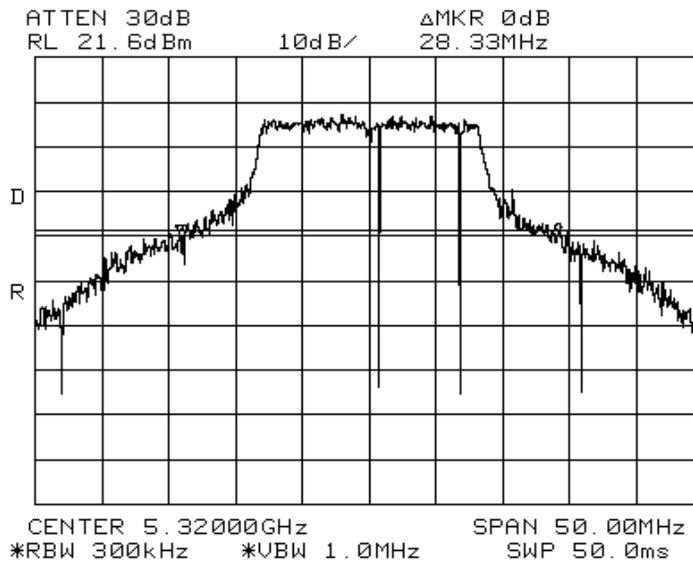
EMC Test Data

Client: Netgear	Job Number: J45225
Model: HE102	T-Log Number: T45229
Contact: Jimmy Su	Proj Eng: Enter on cover sheet
Spec: FCC 15 Sub. B & E	Class: B

T45229 / 302 (17.9 dBm @ 5.26)



T45229 / 304 (18.0 dBm @ 5.32)





EMC Test Data

Client: Netgear	Job Number: J45225
Model: HE102	T-Log Number: T45229
	Proj Eng: Enter on cover sheet
Contact: Jimmy Su	
Spec: FCC 15 Sub. B & E	Class: B

Run #4: Peak Excursion Measurement

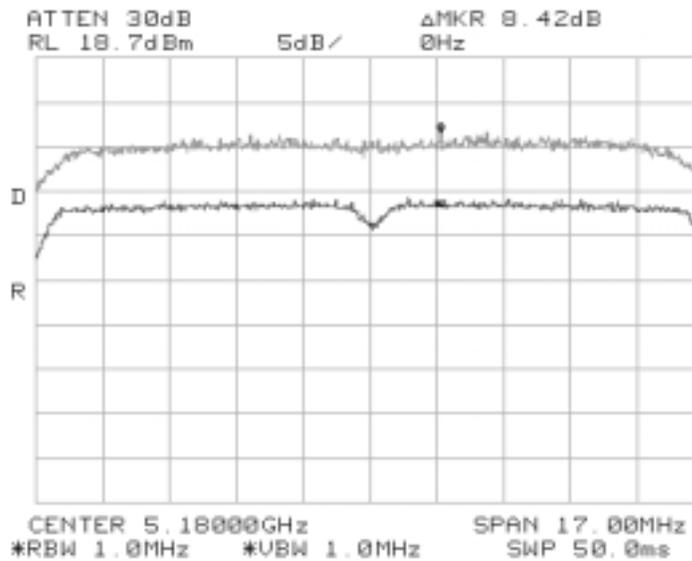
Plots Showing Peak Excursion

Trace A: RBW = VBW = 1MHz

Trace B: RBW = 1 MHz, VBW = 30kHz

Low Channel Peak Excursion = 8.42 dB. Peak power spectral density (RSS210 only) = 9.78 dBm.

FCC Peak Excursion

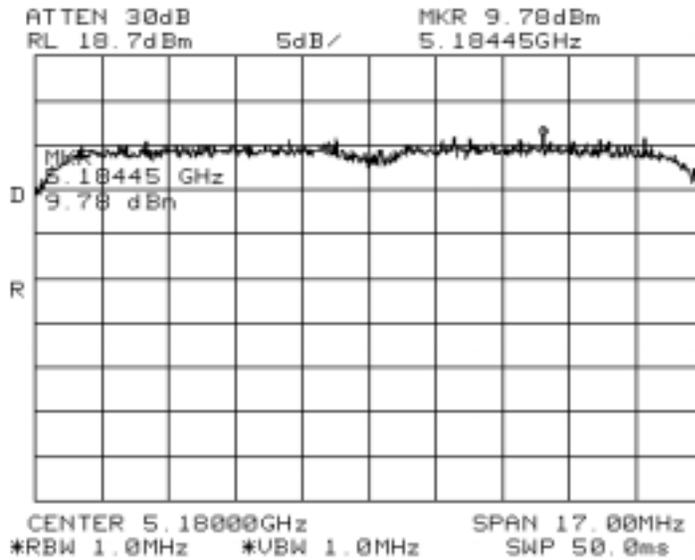




EMC Test Data

Client: Netgear	Job Number: J45225
Model: HE102	T-Log Number: T45229
	Proj Eng: Enter on cover sheet
Contact: Jimmy Su	
Spec: FCC 15 Sub. B & E	Class: B

Canada Peak Spectral Density

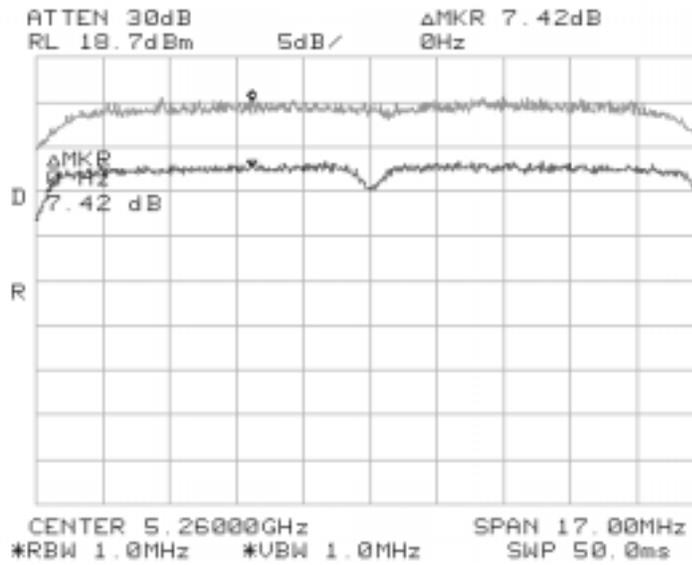




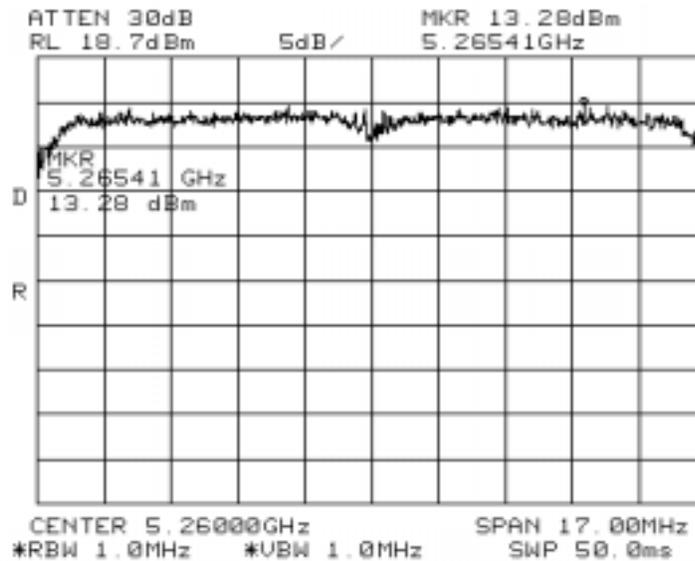
EMC Test Data

Client: Netgear	Job Number: J45225
Model: HE102	T-Log Number: T45229
	Proj Eng: Enter on cover sheet
Contact: Jimmy Su	
Spec: FCC 15 Sub. B & E	Class: B

Middle Channel Peak Excursion = 7.42 dB. Peak power spectral density (RSS210 only) = 13.28 dBm.
FCC Peak Excursion



Canada Peak Spectral Density

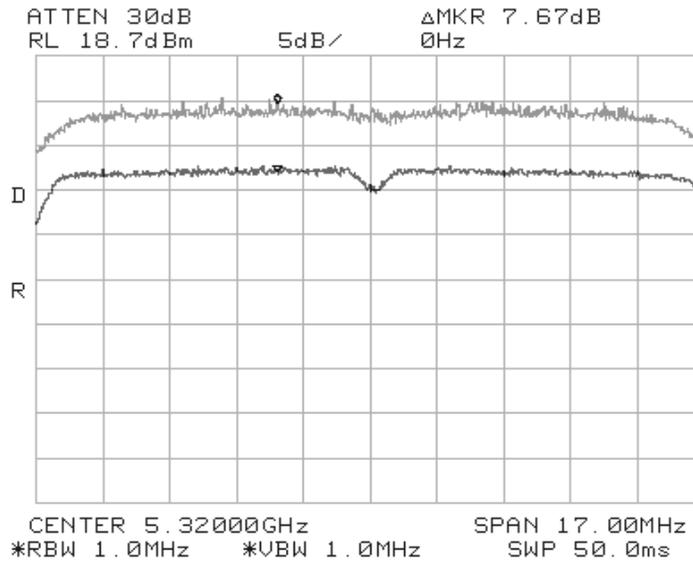




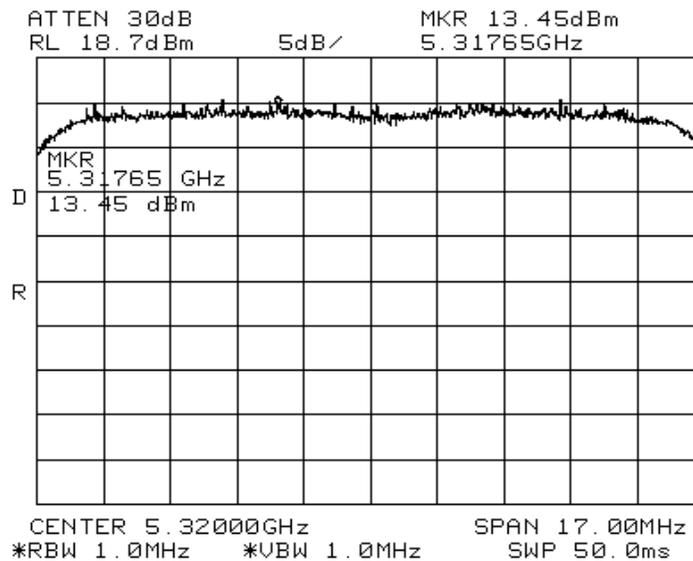
EMC Test Data

Client: Netgear	Job Number: J45225
Model: HE102	T-Log Number: T45229
	Proj Eng: Enter on cover sheet
Contact: Jimmy Su	
Spec: FCC 15 Sub. B & E	Class: B

High Channel Peak Excursion = 7.67 dB. Peak power spectral density (RSS210 only) = 13.45 dBm.
FCC Peak Excursion



Canada Peak Spectral Density





EMC Test Data

Client: Netgear	Job Number: J45225
Model: HE102	T-Log Number: T45229
	Proj Eng: Enter on cover sheet
Contact: Jimmy Su	
Spec: FCC 15 Sub. B & E	Class: B

Run #5: Out Of Band Spurious Emissions - Antenna Conducted

The antenna gain of the radios integral antenna is 6 dBi. The EIRP limit is -27dBm/MHz for all out of band signals that do not fall in restricted bands. A limit of -33 dBm was, therefore, used for signals not in restricted bands and close to the intentional band with the assumption that the antenna gain was equal to 6 within 100 MHz of the upper and lower band edges. For signals removed from the band edge by more than 100MHz, radiated measurements were made (refer to run #6) if the signal amplitude exceeded -37dBm.

Channel	Frequency (MHz)	Frequency Range	Highest Spurious Signal	Graph reference #
Low	5180	30 - 1000 MHz	Note 4	T45229/501
		1 to 5.15 GHz	None	T45229/501
		5.25 to 10 GHz	6216 (Note 3)	T45229/501 & 503
		10 GHz to 20 GHz	10360 (Note 3)	T45229/501 & 504
		20 GHz to 40 GHz	None	T45229/501
Mid	5260	30 - 1000 MHz	Note 4	T45229/506
		1 to 5.15 GHz	4208 (Note 1)	T45229/506 & 507
		5.25 to 10 GHz	6312 (Note 3)	T45229/506 & 508
		10 GHz to 20 GHz	10520 (Note 3)	T45229/506 & 509
		20 GHz to 40 GHz	None	T45229/506
High	5320	30 - 1000 MHz	Note 4	T45229/511
		1 to 5.25 GHz	4256 (Note 1)	T45229/511 & 512
		5.35 to 10 GHz	6384 (Note 3)	T45229/511 & 513
		10 GHz to 20 GHz	10640 (Note 1), 15960 (Note 1)	T45229/511 & 514
		20 GHz to 40 GHz	None	T45229/511

- Note 1: Signal is in a restricted band. Refer to run #6 for field strength measurements.
- Note 2: Signal is not in restricted band. Limit is -27dBm eirp. As the signal strength is significantly lower than -27dBm no field strength measurements required.
- Note 3: Signal is not in restricted band. Limit is -27dBm eirp. Although the signal strength is significantly lower than -27dBm field strength measurements were made (refer to run #6)
- Note 4: All spurious signals in this frequency band measured during digital device radiated emissions test.

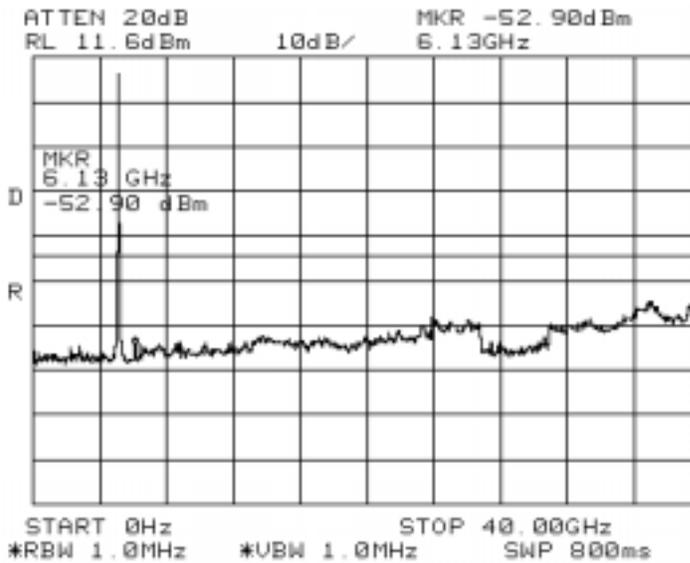


EMC Test Data

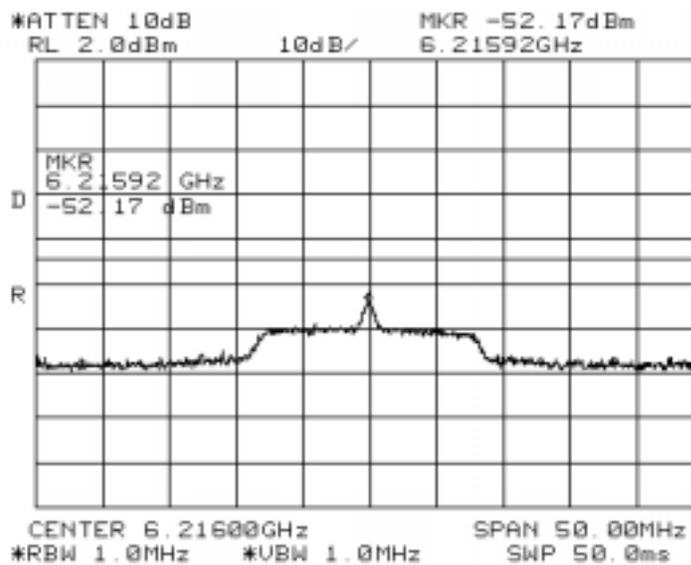
Client: Netgear	Job Number: J45225
Model: HE102	T-Log Number: T45229
	Proj Eng: Enter on cover sheet
Contact: Jimmy Su	
Spec: FCC 15 Sub. B & E	Class: B

Plots Showing Out-Of-Band Emissions (RBW=VBW=1MHz)

T45229 / 501 @ 13.8 dBm



T45229 / 503 (6GHz)

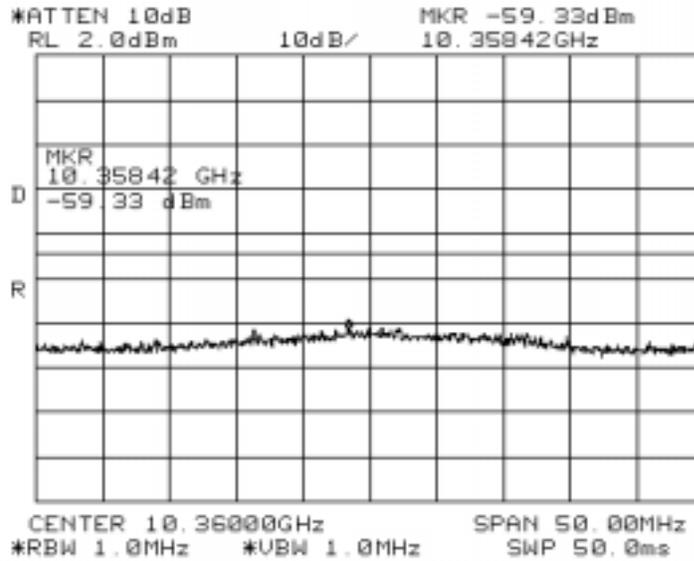




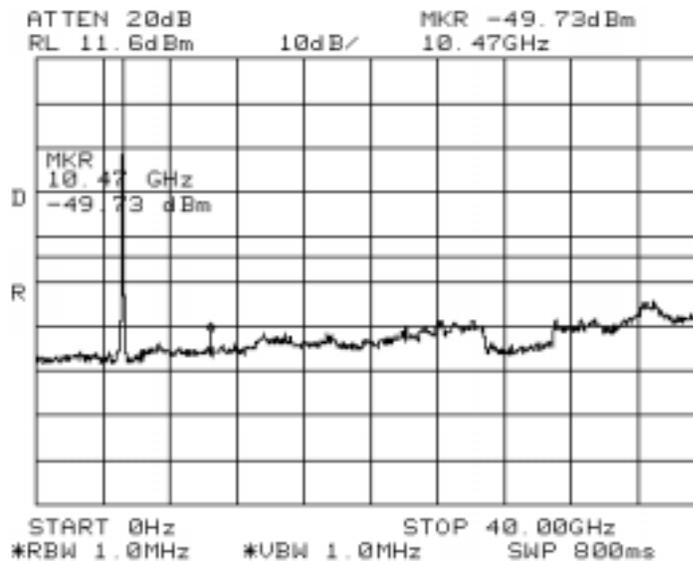
EMC Test Data

Client: Netgear	Job Number: J45225
Model: HE102	T-Log Number: T45229
Contact: Jimmy Su	Proj Eng: Enter on cover sheet
Spec: FCC 15 Sub. B & E	Class: B

T45229 / 504 (10GHz)



T45229 / 506 @ 17.9 dBm

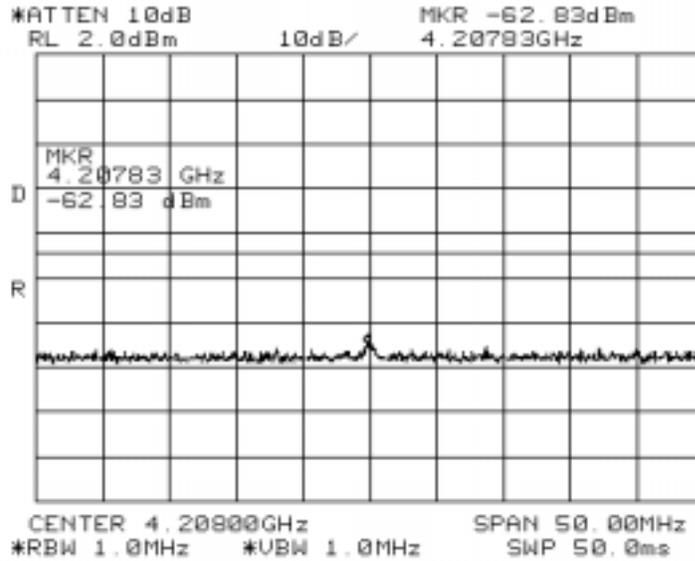




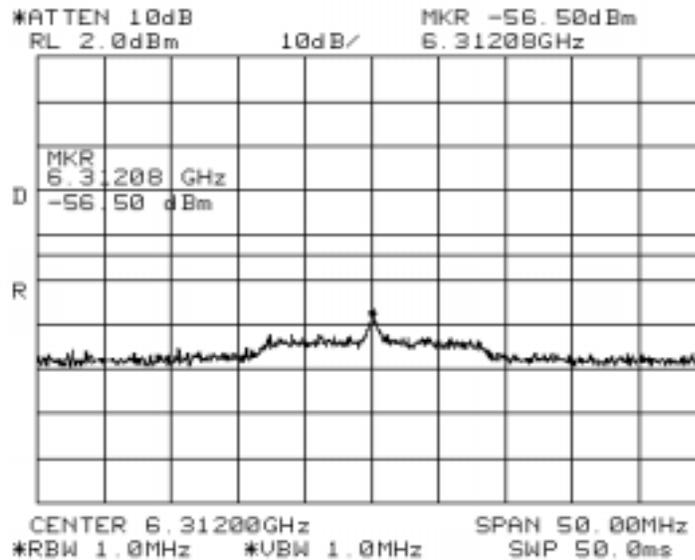
EMC Test Data

Client: Netgear	Job Number: J45225
Model: HE102	T-Log Number: T45229
	Proj Eng: Enter on cover sheet
Contact: Jimmy Su	
Spec: FCC 15 Sub. B & E	Class: B

T45229 / 507 (4GHz)



T45229 / 508 (6GHz)

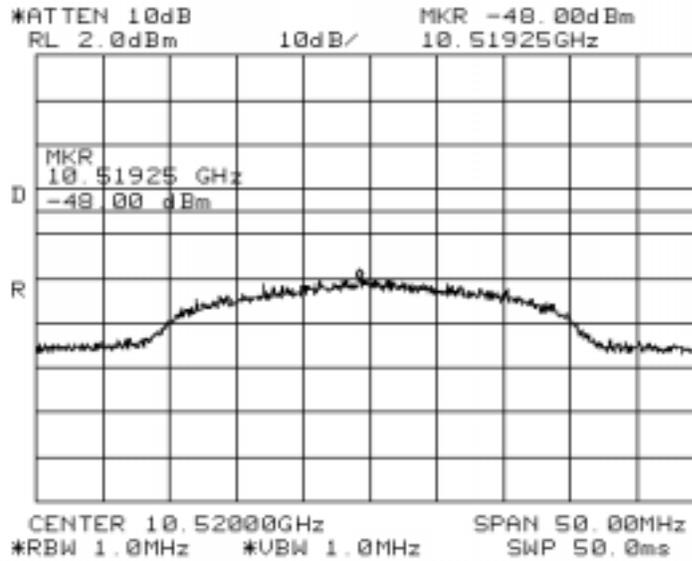




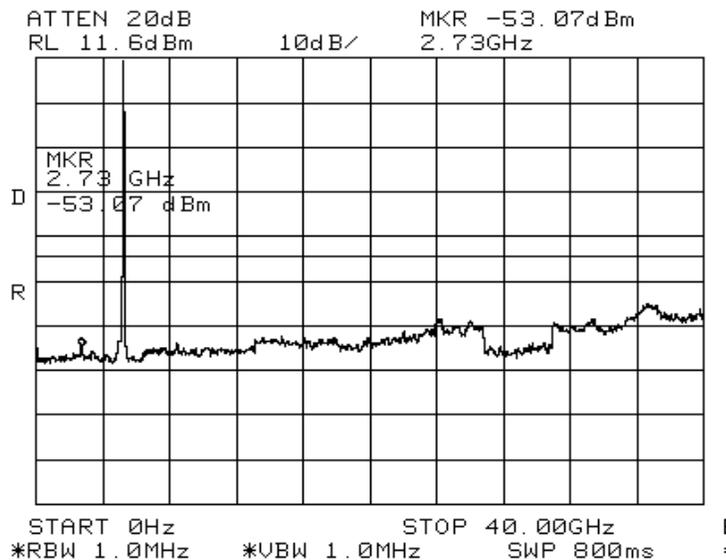
EMC Test Data

Client: Netgear	Job Number: J45225
Model: HE102	T-Log Number: T45229
Contact: Jimmy Su	Proj Eng: Enter on cover sheet
Spec: FCC 15 Sub. B & E	Class: B

T45229 / 509 (10GHz)



T45229 / 511 @ 17.0 dBm

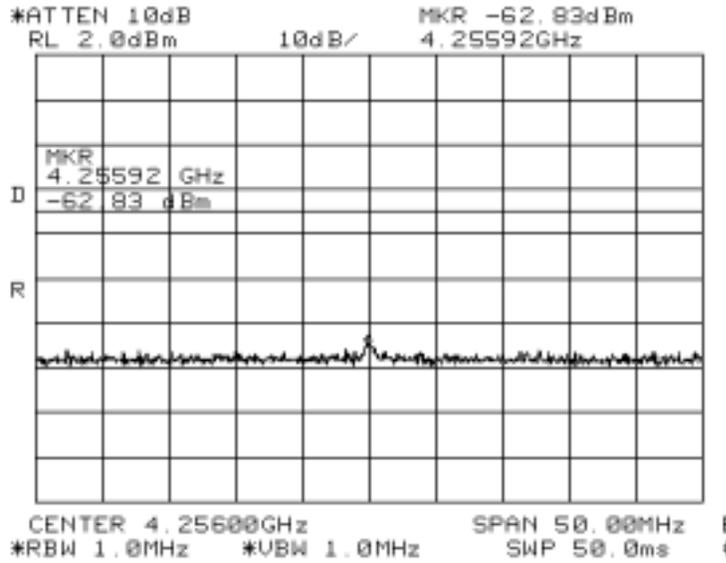




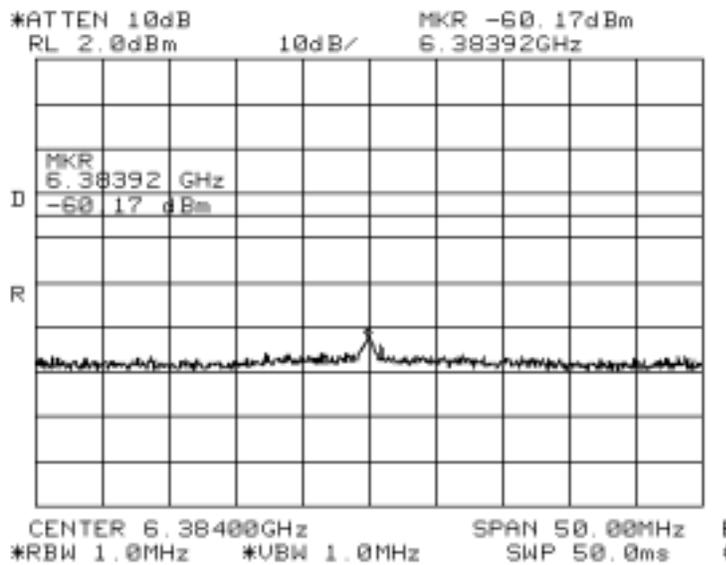
EMC Test Data

Client: Netgear	Job Number: J45225
Model: HE102	T-Log Number: T45229
	Proj Eng: Enter on cover sheet
Contact: Jimmy Su	
Spec: FCC 15 Sub. B & E	Class: B

T45229 / 512 (4GHz)



T45229 / 513 (6GHz)

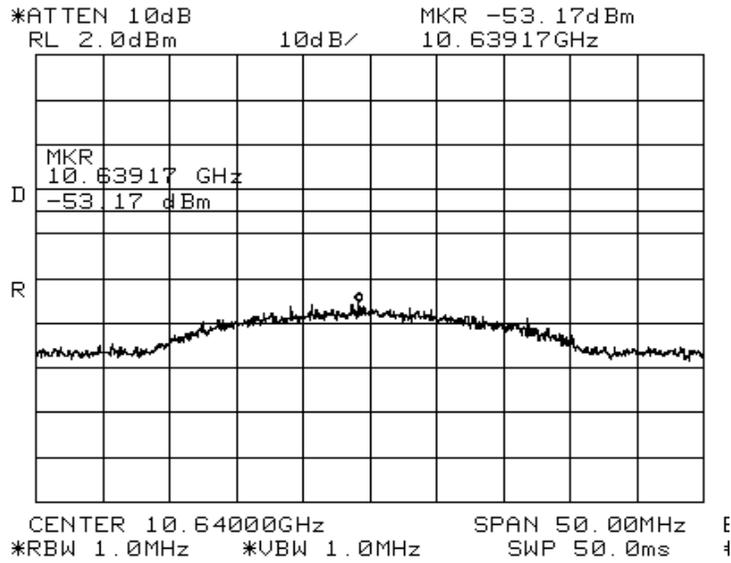




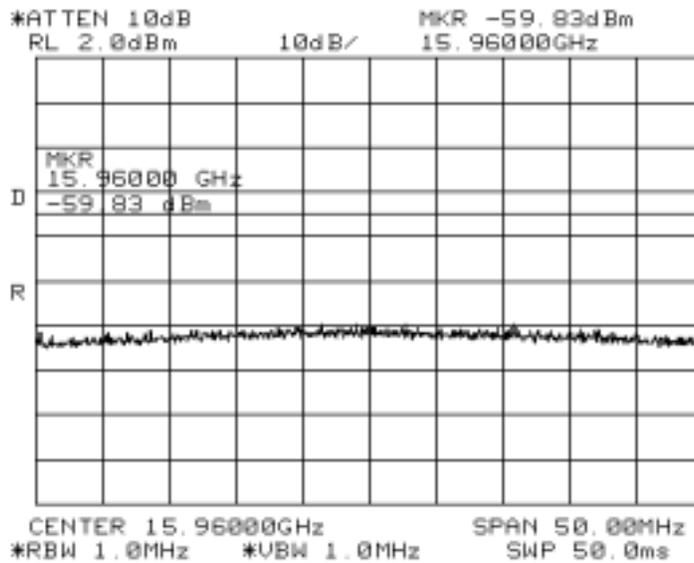
EMC Test Data

Client: Netgear	Job Number: J45225
Model: HE102	T-Log Number: T45229
Contact: Jimmy Su	Proj Eng: Enter on cover sheet
Spec: FCC 15 Sub. B & E	Class: B

T45229 / 514(10GHz)



T45229 / 514(15GHz)





EMC Test Data

Client: Netgear	Job Number: J45225
Model: HE102	T-Log Number: T45229
Contact: Jimmy Su	Proj Eng: Enter on cover sheet
Spec: FCC 15 Sub. B & E	Class: B

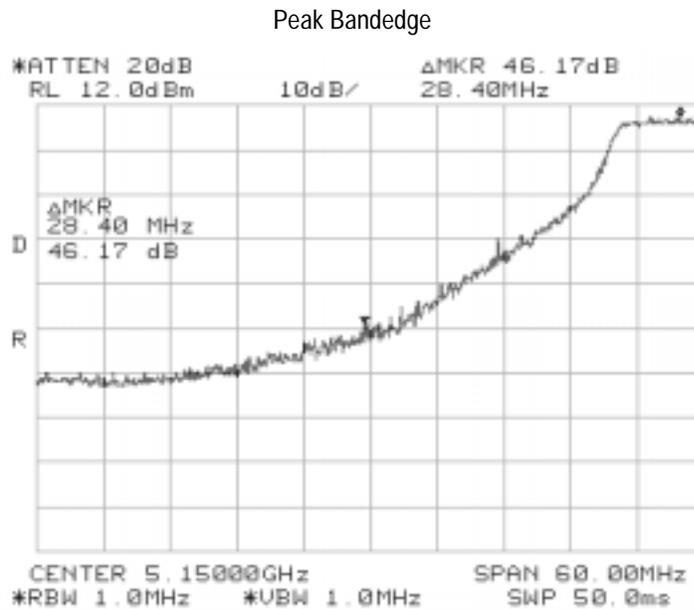
Band Edge Measurements:

For signals in the restricted bands immediately above and below the 5.15 to 5.35 GHz allocated band a measurement was made of the amplitude of the spurious emissions with respect to the intentional signals. The relative amplitude, in dBc, was then applied to the average and peak field strength of the intentional signal made on the OATS to calculate the field strength of the unintentional signals.

Plots Showing Out-Of-Band Emissions (Peak RBW=VBW=1MHz; Average RBW = 1MHz, VBW = 10Hz)

5.15 GHz band edge, EUT operating on the lowest channel

The highest signal within 30 MHz of the 5.15 GHz band was -46.16 dBc (Peak) / -51.84 dBc (Average)

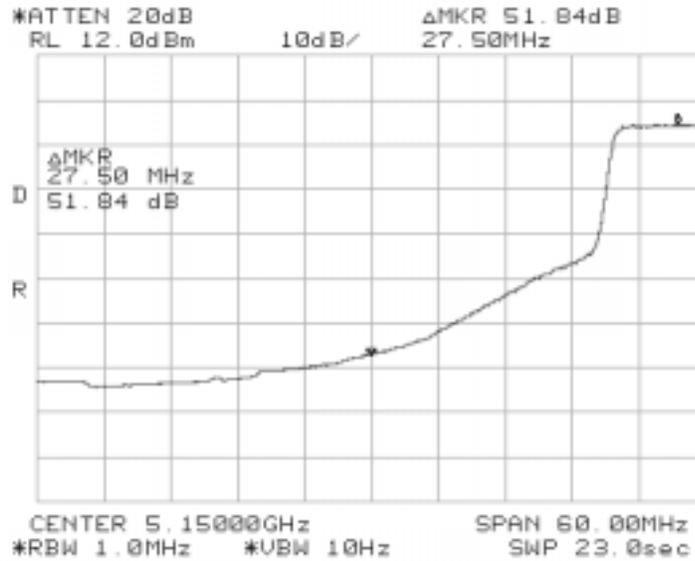




EMC Test Data

Client: Netgear	Job Number: J45225
Model: HE102	T-Log Number: T45229
Contact: Jimmy Su	Proj Eng: Enter on cover sheet
Spec: FCC 15 Sub. B & E	Class: B

Average Bandedge





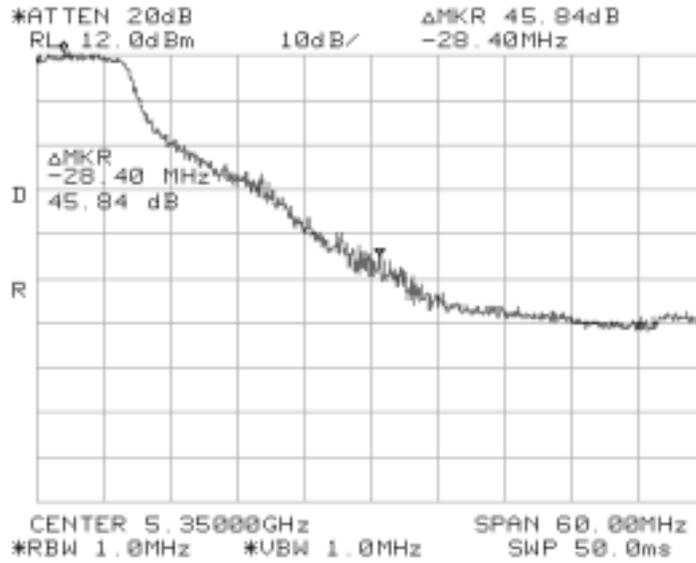
EMC Test Data

Client: Netgear	Job Number: J45225
Model: HE102	T-Log Number: T45229
Contact: Jimmy Su	Proj Eng: Enter on cover sheet
Spec: FCC 15 Sub. B & E	Class: B

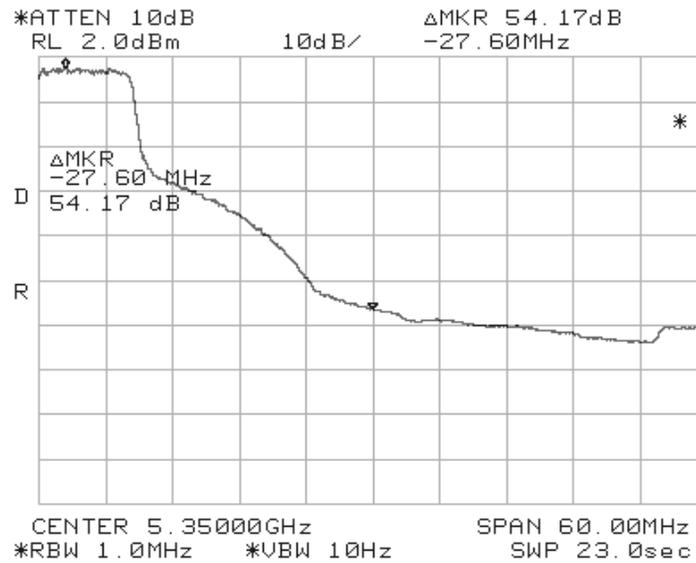
5.35 GHz band edge EUT operating on the highest channel:

The highest signal within 30 MHz of the 5.35 GHz band was -45.84 dBc (Peak) / -54.17 dBc (Average)

Peak Bandedge



Average Bandedge





EMC Test Data

Client: Netgear	Job Number: J45225
Model: HE102	T-Log Number: T45229
Contact: Jimmy Su	Proj Eng: Enter on cover sheet
Spec: FCC 15 Sub. B & E	Class: B

Run #6a: Radiated Spurious Emissions, 1000 - 40000 MHz

Spurious emissions from 30 - 1000 MHz were measured while performing emissions measurements of the digital device. Refer to run #1 performed on 11-06-2001

Limit for emissions in restricted bands:	54dBuV/m (Average)	74dBuV/m (Peak)
Limit for emissions outside of restricted bands:	EIRP < -27dBm/MHz	(68dBuV/m)

Fundamental signal measurements (to calculate the band edge field strengths):

Frequency	Level	Pol	15.209 / 15.407		Detector	Azimuth	Height	Comments
MHz	dBuV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
5180.0	112.7	v	-	-	Pk			RBW = VBW = 1 MHz
5180.0	102.5	v	-	-	Avg			RBW = 1MHz, VBW = 10Hz
5180.0	97.6	h	-	-	Pk			RBW = VBW = 1 MHz
5180.0	87.7	h	-	-	Avg			RBW = 1MHz, VBW = 10Hz
5320.0	115.8	v	-	-	Pk			RBW = VBW = 1 MHz
5320.0	106.2	v	-	-	Avg			RBW = 1MHz, VBW = 10Hz
5320.0	103.1	h	-	-	Pk			RBW = VBW = 1 MHz
5320.0	93.4	h	-	-	Avg			RBW = 1MHz, VBW = 10Hz

Band Edge Field Strength Calculations

Frequency	Level	Pol	15.209 / 15.407		Detector	Azimuth	Height	Comments
MHz	dBuV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
5150.0	66.5	v	74.0	-7.5	Pk			Note 1
5150.0	50.6	v	54.0	-3.4	Avg			Note 1
5150.0	51.4	h	74.0	-22.6	Pk			Note 1
5150.0	35.9	h	54.0	-18.1	Avg			Note 1
5350.0	70.0	v	74.0	-4.0	Pk			Note 2
5350.0	52.1	v	54.0	-1.9	Avg			Note 2
5350.0	57.3	h	74.0	-16.8	Pk			Note 2
5350.0	39.2	h	54.0	-14.8	Avg			Note 2

Note 1: EUT operating on the lowest channel available in the 5.15 - 5.25 MHz band. Signal level calculated using the relative measurements in run #5 (-46.16 dBc for peak and -51.84 dBc for average) applied to the highest peak and average field strength measurements of

Note 2: EUT operating on highest channel available in the 5.25 - 5.35 MHz band. Signal level calculated using the relative measurements in run #5 (-45.84 dBc for peak and -54.17 dBc for average) applied to the highest peak and average field strength measurements of th



EMC Test Data

Client: Netgear	Job Number: J45225
Model: HE102	T-Log Number: T45229
Contact: Jimmy Su	Proj Eng: Enter on cover sheet
Spec: FCC 15 Sub. B & E	Class: B

Run #6b: Radiated Spurious Emissions, 1000 - 40000 MHz

EUT On Lowest Channel Available (5.18 GHz)

Frequency	Level	Pol	15.209 / 15.407		Detector	Azimuth	Height	Comments
MHz	dBμV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
6216.0	50.6	v	68.3	-17.7	Note 3	100	1.3	Note 4
10360.0	46.8	v	68.3	-21.5	Note 3	254	1.4	Note 4
10360.0	45.0	h	68.3	-23.3	Note 3	15	1.4	Note 4
6216.0	44.5	h	68.3	-23.8	Note 3	333	1.3	Note 4

EUT On Center Channel (5.32 GHz)

4208.0	42.1	v	54.0	-11.9	Avg	0	1.2	Note 2, Peak Reading, Average limit
4208.0	37.7	h	54.0	-16.3	Avg	0	1.2	Note 2, Peak Reading, Average limit
10520.0	47.5	h	68.3	-20.8	Note 3	84	1.3	Note 4
6312.0	45.9	v	68.3	-22.4	Note 3	133	1.2	Note 4; Noise Floor measurement
6312.0	45.2	h	68.3	-23.1	Note 3	323	1.2	Note 4; Noise Floor measurement
10520.0	44.3	v	68.3	-24.0	Note 3	96	1.3	Note 4

EUT On Highest Channel (5.32 GHz)

15960.0	48.0	v	54.0	-6.0	Avg	261	1.2	Note 2; Noise Floor Measurement
15960.0	47.9	h	54.0	-6.1	Avg	172	1.3	Note 2; Noise Floor Measurement
10640.0	47.8	v	54.0	-6.2	Avg	44	1.4	Note 2
10640.0	46.7	h	54.0	-7.3	Avg	99	1.5	Note 2
4256.0	44.0	h	54.0	-10.0	Avg	72	1.2	Note 2, Peak Reading, Average limit
4256.0	42.6	v	54.0	-11.4	Avg	283	1.2	Note 2, Peak Reading, Average limit
10640.0	61.7	v	74.0	-12.3	Pk	44	1.4	Note 2
15960.0	60.7	h	74.0	-13.3	Pk	172	1.3	Note 2; Noise Floor Measurement
15960.0	60.3	v	74.0	-13.7	Pk	261	1.2	Note 2; Noise Floor Measurement
10640.0	59.8	h	74.0	-14.2	Pk	99	1.5	Note 2
6384.0	46.2	h	68.3	-22.1	Note 3	354	1.1	Note 4; Noise Floor measurement
6384.0	45.9	v	68.3	-22.4	Note 3	251	1.8	Note 4; Noise Floor measurement

See following page for test notes...

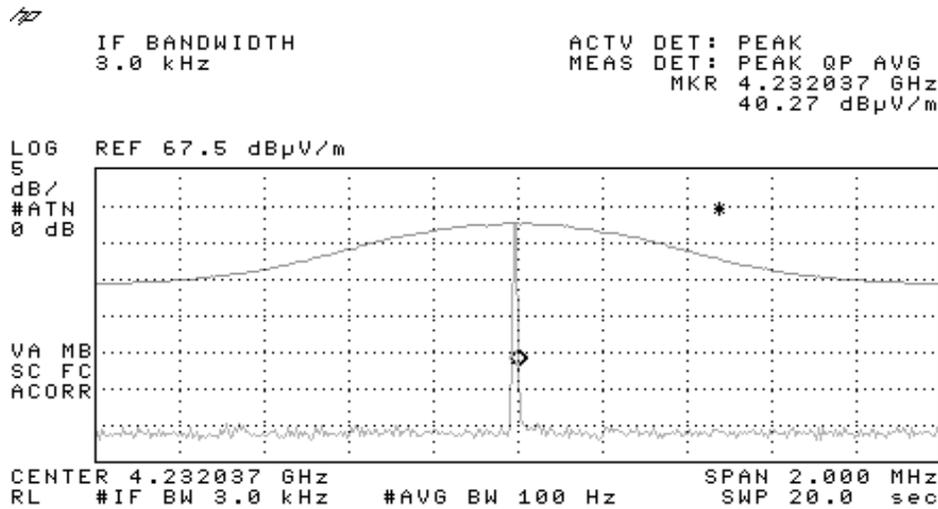


EMC Test Data

Client: Netgear	Job Number: J45225
Model: HE102	T-Log Number: T45229
Contact: Jimmy Su	Proj Eng: Enter on cover sheet
Spec: FCC 15 Sub. B & E	Class: B

...test notes for run 6b

- Note 1: For emissions falling in the restricted bands detailed in 15.205 the general limits of 15.209 apply. For all other emissions the limit is EIRP < -27dBm (equivalent to a field strength at 3m of 68dBuV/m)
- Note 2: Signal is in a restricted band
- Note 3: Restricted Band Peak Measurements: Resolution and Video BW: 1 MHz, Restricted Band Average Measurements: Resolution Bw: 1MHz and Video Bw: 10 Hz. All other measurements, RBW = 1MHz and VBW = 3MHz, video averaging on (100 samples).
- Note 4: Signal does not fall in a restricted band.
- Note 5: This measurement was made using a resolution bandwidth of 3 kHz The instrumentation noise floor was too high to allow measurements with RBW = 1MHz because a preamplifier could not be used (with the EUT operating the intentional signal would overload the amplifier and there is no low pass filter with sufficient shape factor to reject the intentionally trasmitted signal but pass the spuious signal). The signal was a narrowband signal (as verified during the conducted antenna measurements) and so the amplitude (peak/average) in a 3kHz bandwidth would be the same as that in a 1MHz bandwidth (please refer to the plot below). The peak reading has been compared with the average limit.



Plot showing LO signal at 4GHz measured using RBW = 1MHz and RBW = 3kHz. Amplitude of the signal does not change with resolution bandwidth.



EMC Test Data

Client: Netgear	Job Number: J45225
Model: HE102	T-Log Number: T45229
	Proj Eng: Enter on cover sheet
Contact: Jimmy Su	
Spec: FCC 15 Sub. B & E	Class: B

FCC Part 15 Subpart E Tests: Turbo Mode

Test Specifics

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: 11/2/2001	Config. Used: 2
Test Engineer: Jmartinez	Config Change: None
Test Location: SVOATS# 4	Host Unit Voltage 120Vac, 60Hz

General Test Configuration

The EUT was located on the turntable for radiated spurious emissions testing.

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

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

Ambient Conditions: Temperature: 18°C
Rel. Humidity: 44%

Summary of Results: Turbo Mode

Run #	Test Performed	Limit	Result	Comments
1	Output Power	15.407(a) (1), (2)	Pass	15.5 dBm@5250MHz, 19.8 dBm@5290MHz
2	Power Spectral Density (PSD)	15.407(a) (1), (2)	Pass	-1.73 dBm@5210MHz, 2.43 dBm@5290 MHz
3	26dB Bandwidth	15.407	Pass	> 20 MHz
3	20 dB Bandwidth	RSS 210	Pass	> 20 MHz
4	Peak Excursion Envelope	15.407(a) (6)	Pass	Peak to average excursion < 13dB
5	Antenna Conducted - Out of Band Spurious	15.407(b)	Pass	All emissions below the 27dBm/MHz limit
6	RE, 1000 - 40000 MHz - Spurious Emissions	15.407(b)(6)	Pass	-5.8dB @ 15870 MHz



EMC Test Data

Client: Netgear	Job Number: J45225
Model: HE102	T-Log Number: T45229
	Proj Eng: Enter on cover sheet
Contact: Jimmy Su	
Spec: FCC 15 Sub. B & E	Class: B

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.

Run #1: Output Power

Antenna Gain: 6 dBi

Channel	Frequency (MHz)	99.7% Signal BW	Output Power	FCC Limit (dBm) (note 3)	Comments
Low	5210		13.9	17.0	Note 2
	5210		14.9	17.0	Note 1
Mid	5250		14.0	17.0	Note 2
	5250		15.5	17.0	Note 1
High	5290		18.3	24.0	Note 2
	5290		19.8	24.0	Note 1

Note 1:	Measured using spectrum analyzer's power measurement function (RBW = 1MHz, VBW = 30kHz)
Note 2:	Measured using a Boonton Power Meter with a peak power sensor in average mode
Note 3:	RSS 210 limit is 23dBm in the 5.15 to 5.25 GHz band, 6dB higher than the FCC limit. This limit is based on the emission bandwidth and operating frequency.



EMC Test Data

Client: Netgear	Job Number: J45225
Model: HE102	T-Log Number: T45229
	Proj Eng: Enter on cover sheet
Contact: Jimmy Su	
Spec: FCC 15 Sub. B & E	Class: B

Run #2: Power Spectral Density
 Antenna Gain: 6 dBi

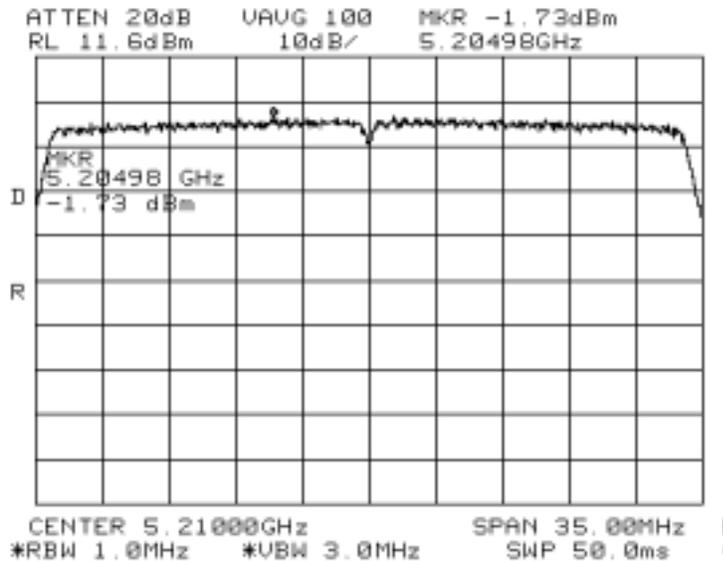
Channel	Frequency (MHz)	Power Spectral Density (dBm/MHz)	FCC Limit (dBm) note 2	Graph Reference	
Low	5210	-1.73	4.0	T45229/201	Note 1
Mid	5250	-1.73	4.0	T45229/202	Note 1
High	5290	2.43	11.0	T45229/203	Note 1

Note 1: The above measurements were made using RBW = 1MHz, VBW = 1MHz, video averaging on. To demonstrate compliance with RSS 210, the peak PSD was also measured using RBW= VBW=1MHz, video averaging off during the peak excursion measurements (run #4). As per RSS 210 requirements, the peak PSD of **7.28 dBm** in the 5.15 to 5.25 GHz band did not exceed the maximum permitted average PSD of 10dBm by more than 6dB. Similarly, in the 5.25-5.35GHz band, the peak power sepctral density of **11.37 dBm** did not exceed the maximum permitted average PSD of 11dBm by more than 6dB. No restriction is placed on the output power or average PSD with respect to RSS 210.

Note 2: RSS 210 limit is 10dBm/MHz in the 5.15 to 5.25 GHz band, 6dB higher than the FCC limit.

Plots Showing Power Spectral Density (RBW = 1MHz, VBW = 3 MHz, video averaging ON)

T45229 / 201 (13.9 dBm @ 5.21)

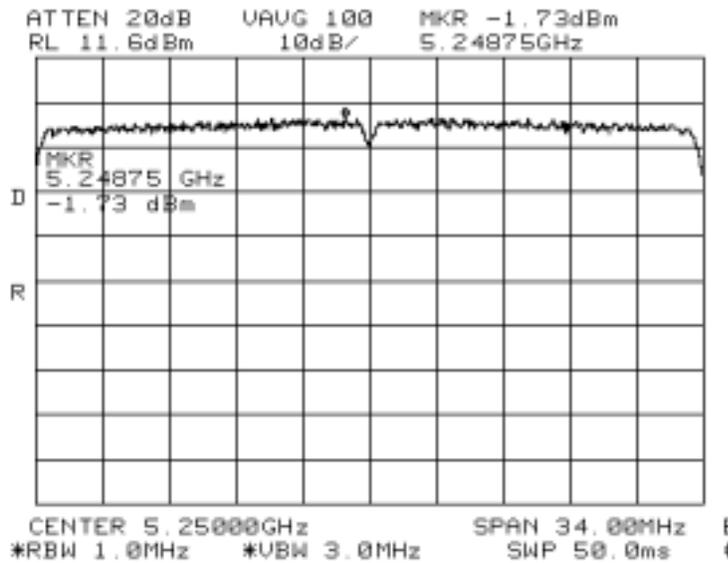




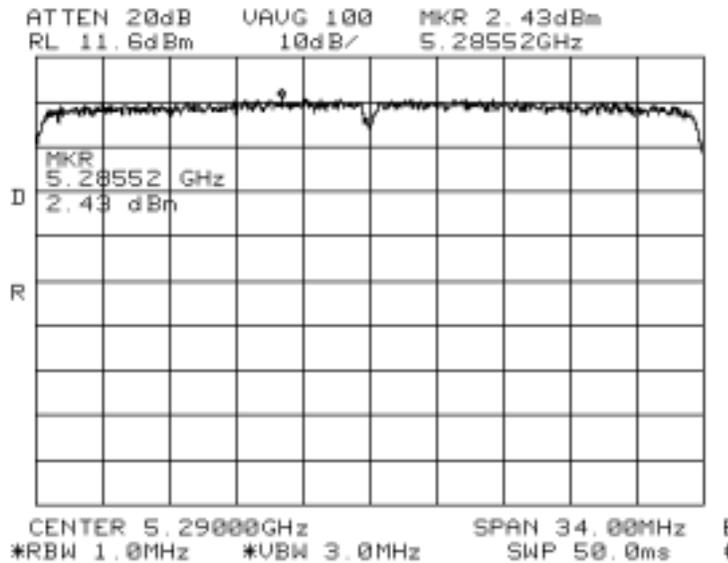
EMC Test Data

Client: Netgear	Job Number: J45225
Model: HE102	T-Log Number: T45229
Contact: Jimmy Su	Proj Eng: Enter on cover sheet
Spec: FCC 15 Sub. B & E	Class: B

T45229 / 202 (14.0 dBm @ 5.25)



T45229 / 203 (18.3 dBm @ 5.29)





EMC Test Data

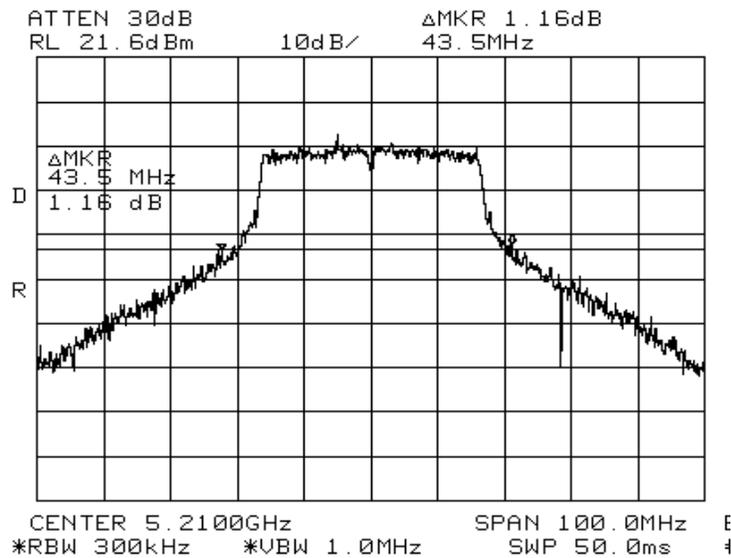
Client: Netgear	Job Number: J45225
Model: HE102	T-Log Number: T45229
	Proj Eng: Enter on cover sheet
Contact: Jimmy Su	
Spec: FCC 15 Sub. B & E	Class: B

Run #3: Signal Bandwidth

Channel	Frequency (MHz)	Resolution Bandwidth	26 dB Signal Bandwidth (MHz)	20 dB Signal Bandwidth (MHz)	Graph reference #
Low	5210	300 kHz	43.5	33.2	T45229/301
Mid	5250	300 kHz	43.2	33.0	T45229/302
High	5290	300 kHz	57.0	33.5	T45229/303

Plots Showing Signal Bandwidth

T45229 / 301 (13.9 dBm @ 5.21)

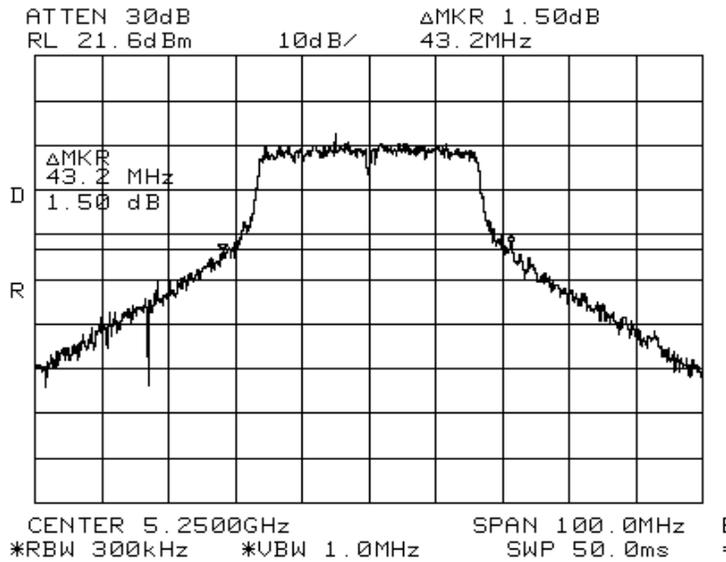




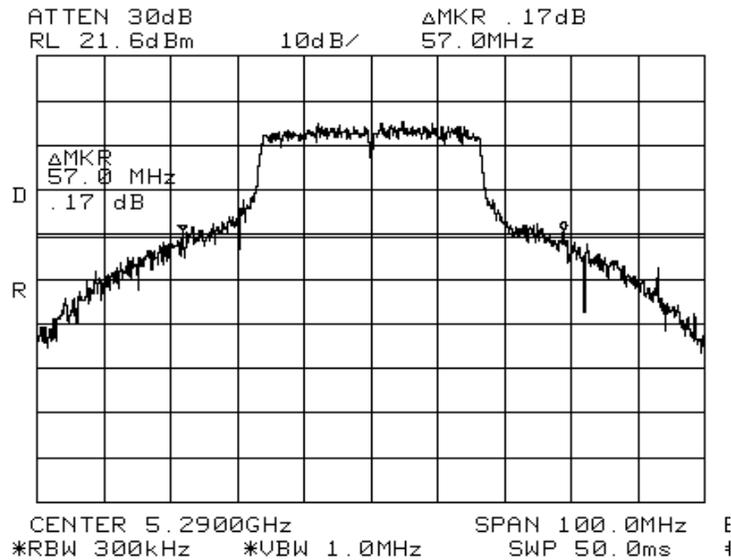
EMC Test Data

Client: Netgear	Job Number: J45225
Model: HE102	T-Log Number: T45229
Contact: Jimmy Su	Proj Eng: Enter on cover sheet
Spec: FCC 15 Sub. B & E	Class: B

T45229 / 302 (14.0 dBm @ 5.25)



T45229 / 303 (18.3 dBm @ 5.29)





EMC Test Data

Client: Netgear	Job Number: J45225
Model: HE102	T-Log Number: T45229
	Proj Eng: Enter on cover sheet
Contact: Jimmy Su	
Spec: FCC 15 Sub. B & E	Class: B

Run #4: Peak Excursion Measurement

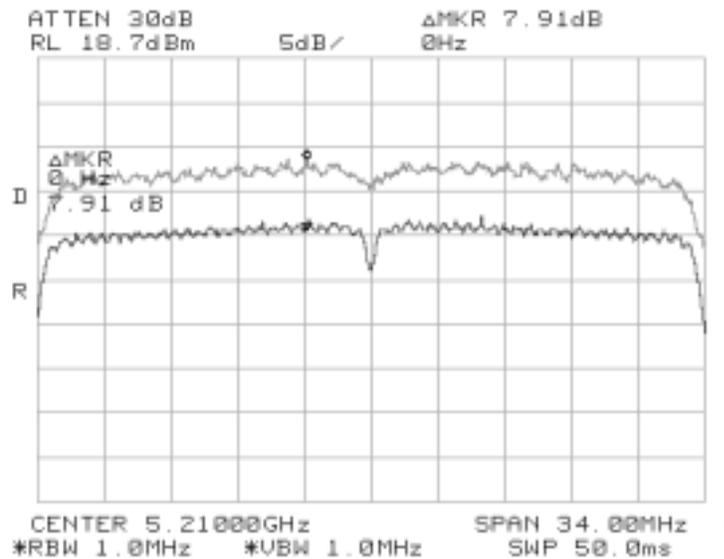
Plots Showing Peak Excursion

Trace A: RBW = VBW = 1MHz

Trace B: RBW = 1 MHz, VBW = 30kHz

Low Channel Peak Excursion = 7.91 dB. Peak power spectral density (RSS210 only) = 7.28 dBm.

FCC Peak Excursion

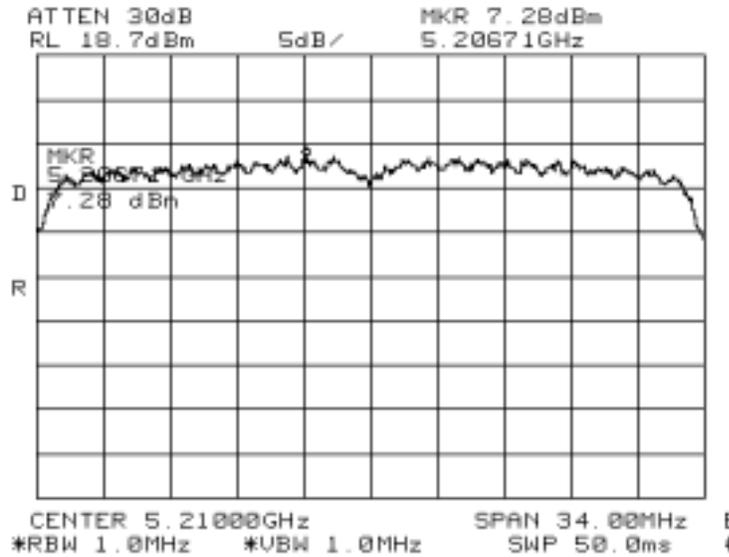




EMC Test Data

Client: Netgear	Job Number: J45225
Model: HE102	T-Log Number: T45229
Contact: Jimmy Su	Proj Eng: Enter on cover sheet
Spec: FCC 15 Sub. B & E	Class: B

Canada Peak Spectral Density

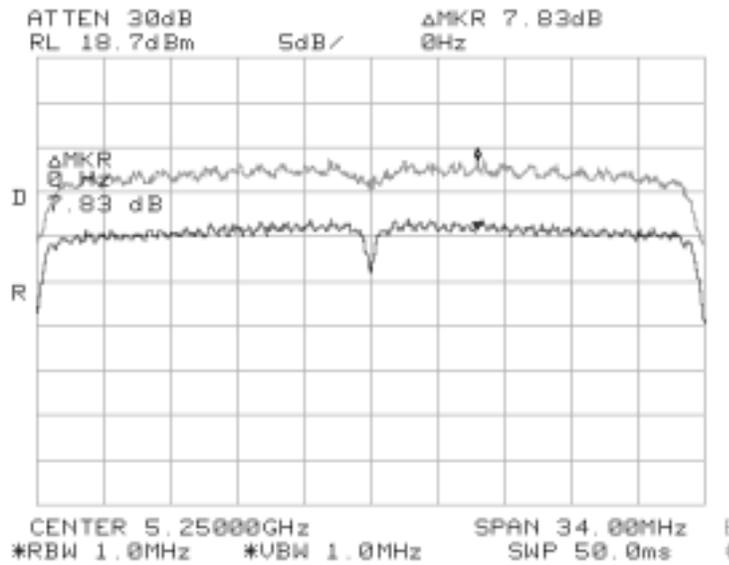




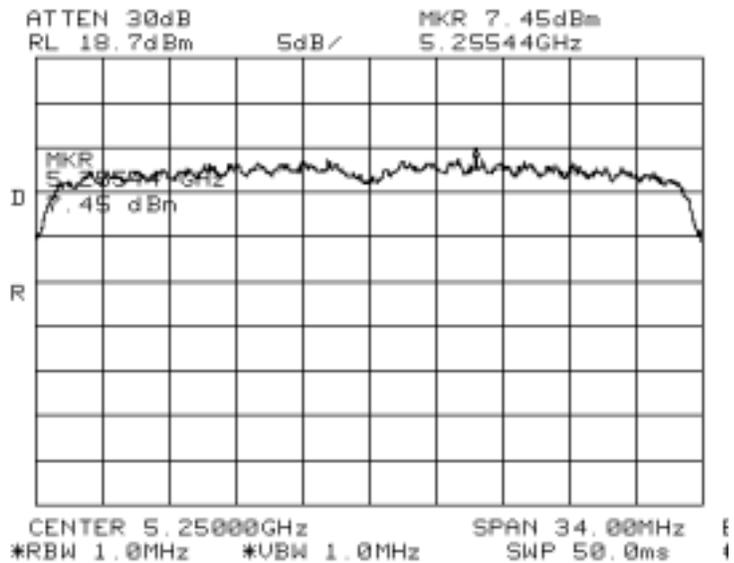
EMC Test Data

Client: Netgear	Job Number: J45225
Model: HE102	T-Log Number: T45229
Contact: Jimmy Su	Proj Eng: Enter on cover sheet
Spec: FCC 15 Sub. B & E	Class: B

Middle Channel Peak Excursion = 7.83 dB. Peak power spectral density (RSS210 only) = 7.45 dBm.
FCC Peak Excursion



Canada Peak Spectral Density

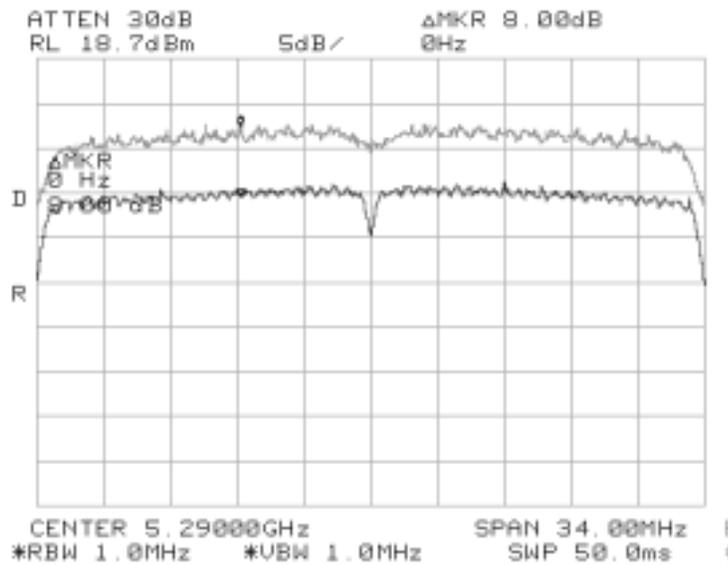




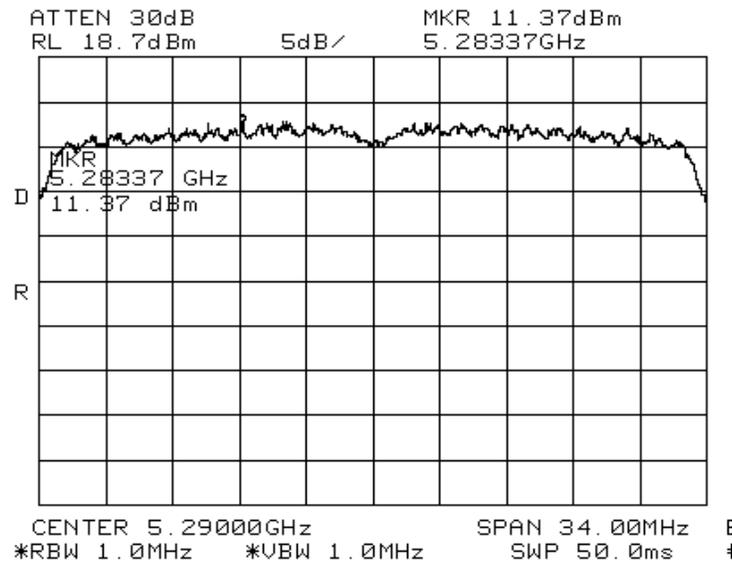
EMC Test Data

Client: Netgear	Job Number: J45225
Model: HE102	T-Log Number: T45229
Contact: Jimmy Su	Proj Eng: Enter on cover sheet
Spec: FCC 15 Sub. B & E	Class: B

High Channel Peak Excursion = 8.0 dB. Peak power spectral density (RSS210 only) = 11.37 dBm.
FCC Peak Excursion



Canada Peak Spectral Density





EMC Test Data

Client: Netgear	Job Number: J45225
Model: HE102	T-Log Number: T45229
	Proj Eng: Enter on cover sheet
Contact: Jimmy Su	
Spec: FCC 15 Sub. B & E	Class: B

Run #5: Out Of Band Spurious Emissions - Antenna Conducted

The antenna gain of the radios integral antenna is 6 dBi. The EIRP limit is -27dBm/MHz for all out of band signals that do not fall in restricted bands. A limit of -33 dBm was, therefore, used for signals not in restricted bands and close to the intentional band with the assumption that the antenna gain was equal to 6 within 100 MHz of the upper and lower band edges. For signals removed from the band edge by more than 100MHz, radiated measurements were made (refer to run #6) if the signal amplitude exceeded -37dBm.

Channel	Frequency (MHz)	Frequency Range	Highest Spurious Signal	Graph reference #
Low	5210	30 - 1000 MHz	Note 4	T45229/501
		1 to 5.15 GHz	4168 (Note 1)	T45229/501
		5.25 to 10 GHz	6252 (Note 3)	T45229/501 & 503
		10 GHz to 20 GHz	10420 (Note 3)	T45229/501 & 504
		20 GHz to 40 GHz	None	T45229/501
Mid	5250	30 - 1000 MHz	Note 4	T45229/506
		1 to 5.15 GHz	4200 (Note 1)	T45229/506 & 507
		5.25 to 10 GHz	6300 (Note 3)	T45229/506 & 508
		10 GHz to 20 GHz	10,500 (Note 3)	T45229/506 & 509
		20 GHz to 40 GHz	None	T45229/506
High	5290	30 - 1000 MHz	Note 4	T45229/511
		1 to 5.25 GHz	4232 (Note 1)	T45229/511 & 512
		5.35 to 10 GHz	6348 (Note 3)	T45229/511 & 513
		10 GHz to 20 GHz	10580 (Note 3), 15870	T45229/511 & 514
		20 GHz to 40 GHz	None	T45229/511

Note 1:	Signal is in a restricted band. Refer to run #6 for field strength measurements.
Note 2:	Signal is not in restricted band. Limit is -27dBm eirp. As the signal strength is significantly lower than -27dBm no field strength measurements required.
Note 3:	Signal is not in restricted band. Limit is -27dBm eirp. Although the signal strength is significantly lower than -27dBm field strength measurements were made (refer to run #6)
Note 4:	All spurious signals in this frequency band measured during digital device radiated emissions test.

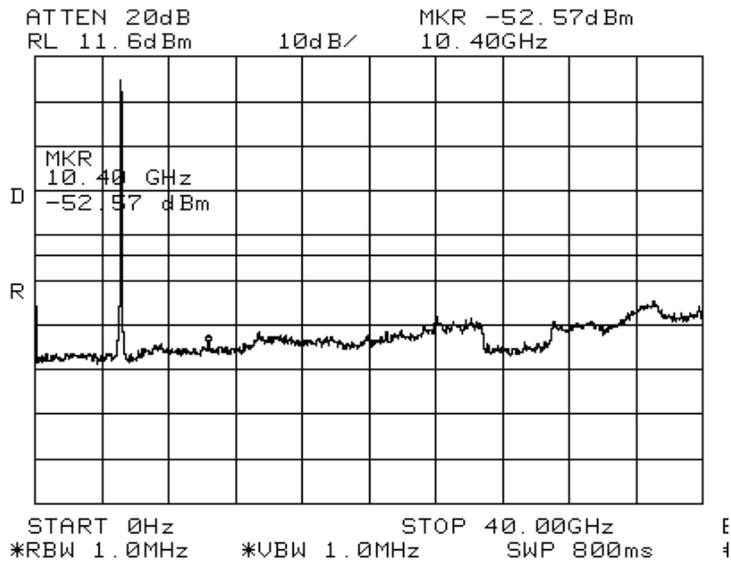


EMC Test Data

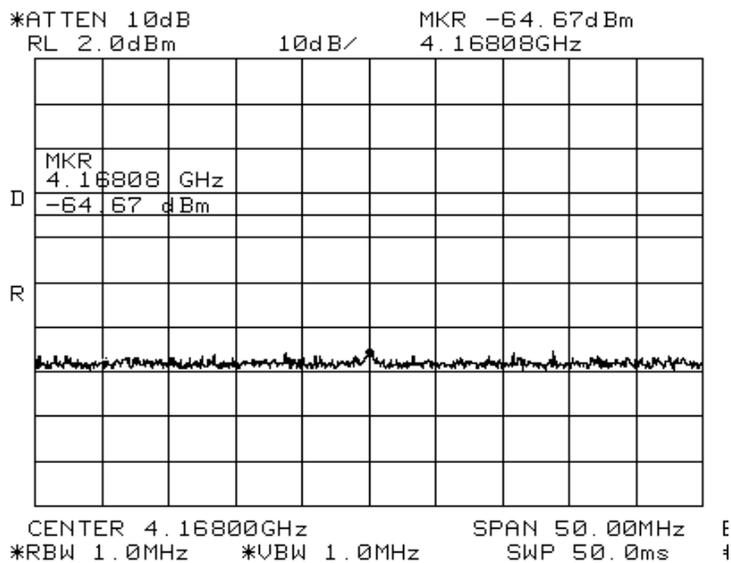
Client: Netgear	Job Number: J45225
Model: HE102	T-Log Number: T45229
Contact: Jimmy Su	Proj Eng: Enter on cover sheet
Spec: FCC 15 Sub. B & E	Class: B

Plots Showing Out-Of-Band Emissions (RBW=VBW=1MHz)

T45229 / 501 @ 13.9 dBm



T45229 / 502 (4 GHz)

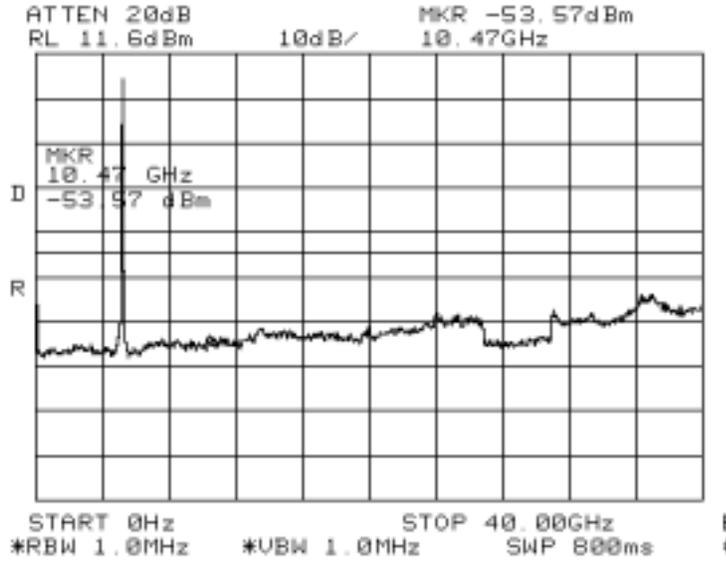




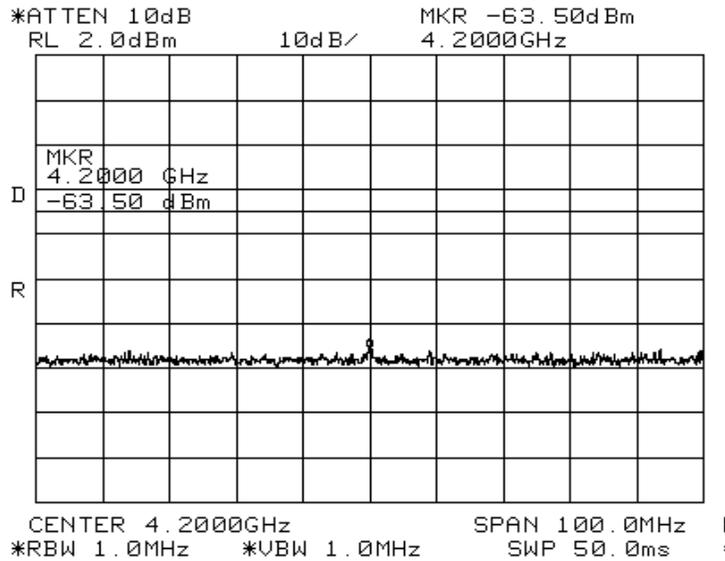
EMC Test Data

Client: Netgear	Job Number: J45225
Model: HE102	T-Log Number: T45229
	Proj Eng: Enter on cover sheet
Contact: Jimmy Su	
Spec: FCC 15 Sub. B & E	Class: B

T45229 / 506 @ 14.0 dBm



T45229 / 507 (4 GHz)

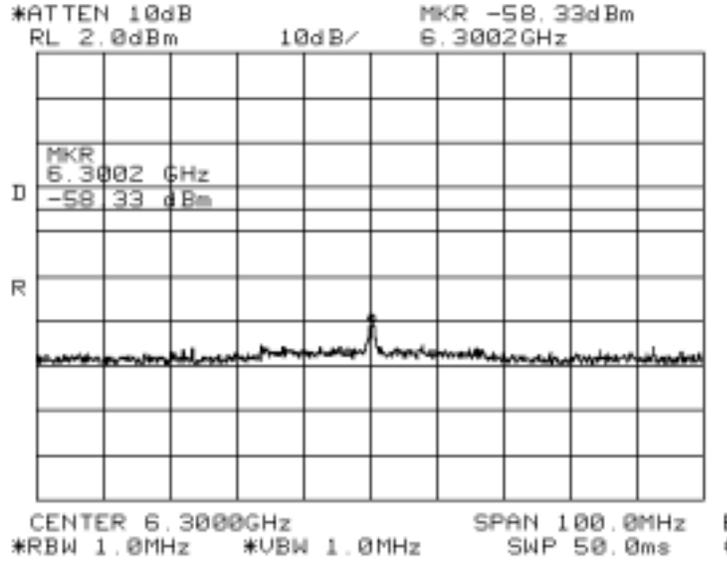




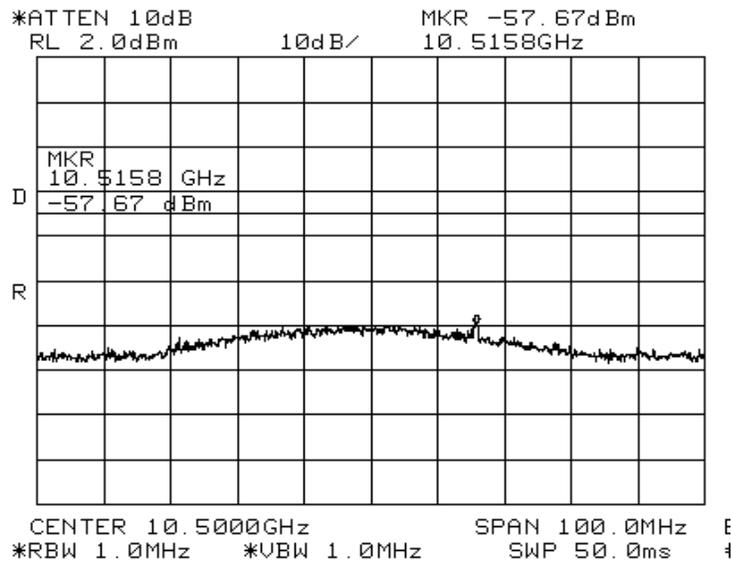
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Model: HE102	T-Log Number: T45229
	Proj Eng: Enter on cover sheet
Contact: Jimmy Su	
Spec: FCC 15 Sub. B & E	Class: B

T45229 / 508 (6 GHz)



T45229 / 509 (10 GHz)

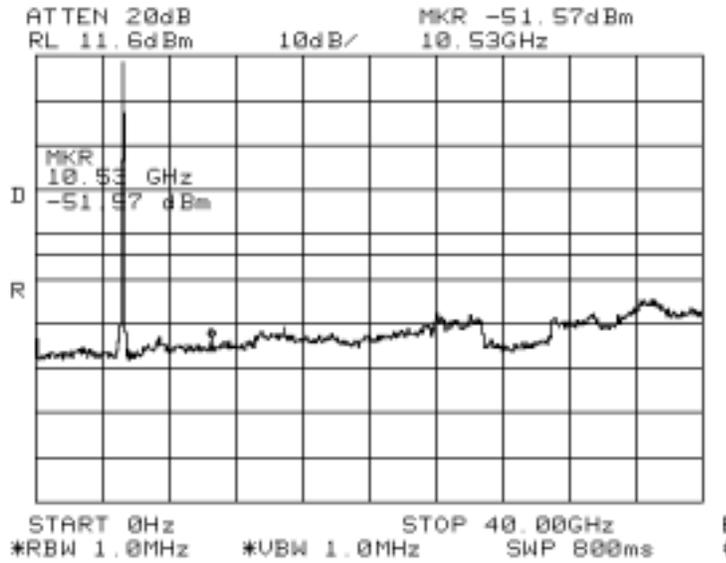




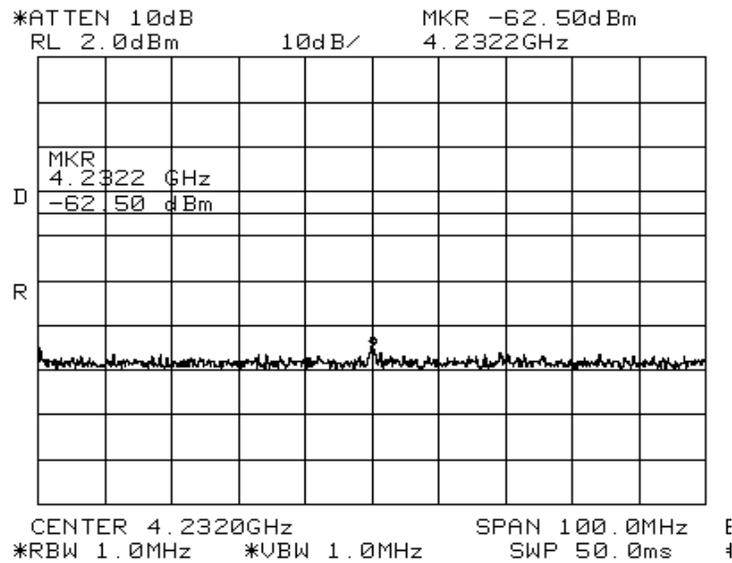
EMC Test Data

Client: Netgear	Job Number: J45225
Model: HE102	T-Log Number: T45229
	Proj Eng: Enter on cover sheet
Contact: Jimmy Su	
Spec: FCC 15 Sub. B & E	Class: B

T45229 / 511 @ 18.3 dBm



T45229 / 512 (4 GHz)

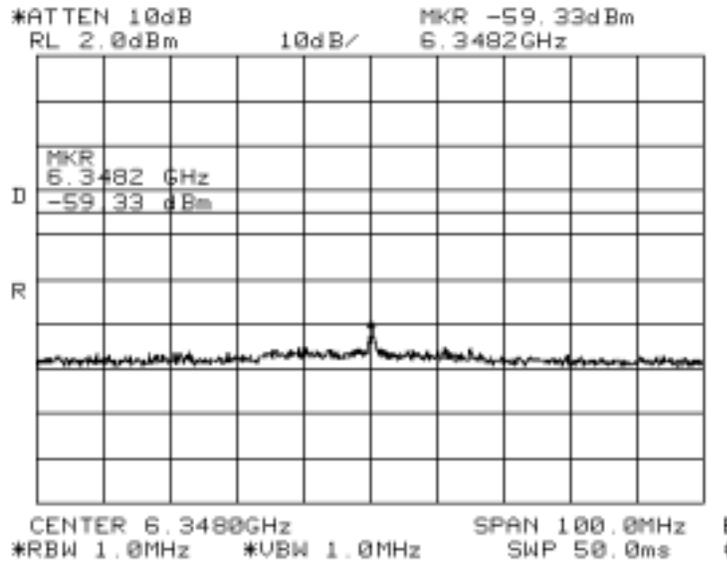




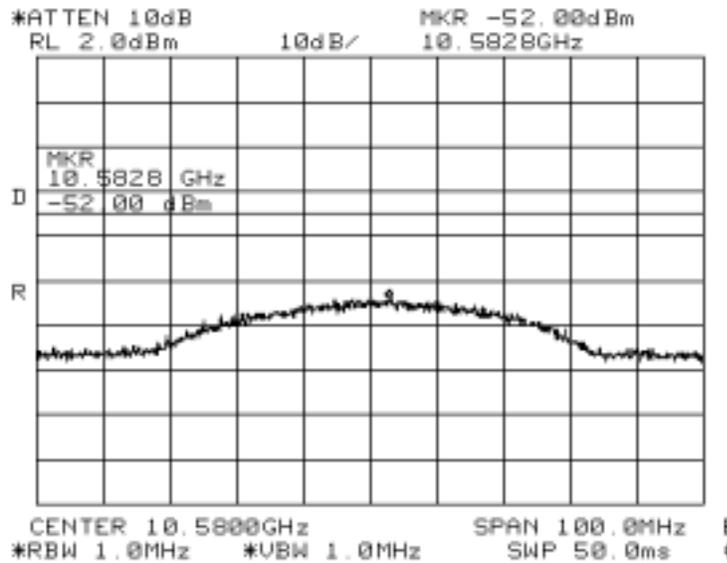
EMC Test Data

Client: Netgear	Job Number: J45225
Model: HE102	T-Log Number: T45229
	Proj Eng: Enter on cover sheet
Contact: Jimmy Su	
Spec: FCC 15 Sub. B & E	Class: B

T45229 / 513 (6 GHz)



T45229 / 514 (10 GHz)

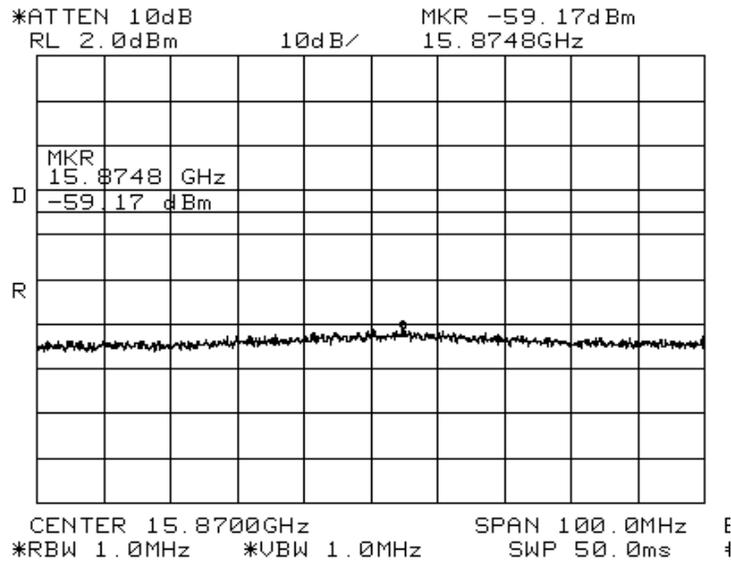




EMC Test Data

Client: Netgear	Job Number: J45225
Model: HE102	T-Log Number: T45229
	Proj Eng: Enter on cover sheet
Contact: Jimmy Su	
Spec: FCC 15 Sub. B & E	Class: B

T45229 / 514 (15 GHz)

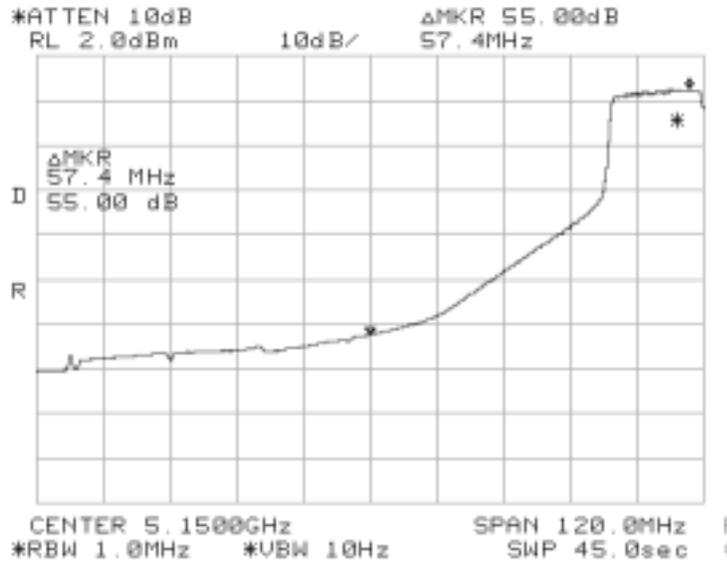




EMC Test Data

Client: Netgear	Job Number: J45225
Model: HE102	T-Log Number: T45229
	Proj Eng: Enter on cover sheet
Contact: Jimmy Su	
Spec: FCC 15 Sub. B & E	Class: B

Average Bandedge





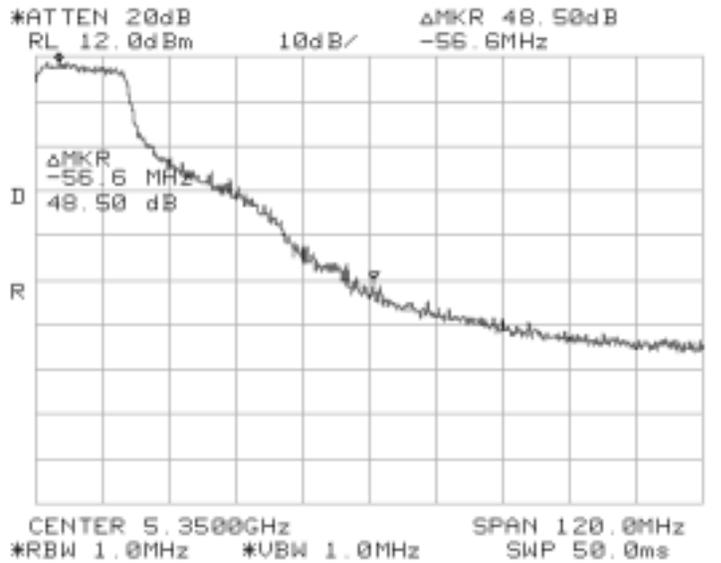
EMC Test Data

Client: Netgear	Job Number: J45225
Model: HE102	T-Log Number: T45229
Contact: Jimmy Su	Proj Eng: Enter on cover sheet
Spec: FCC 15 Sub. B & E	Class: B

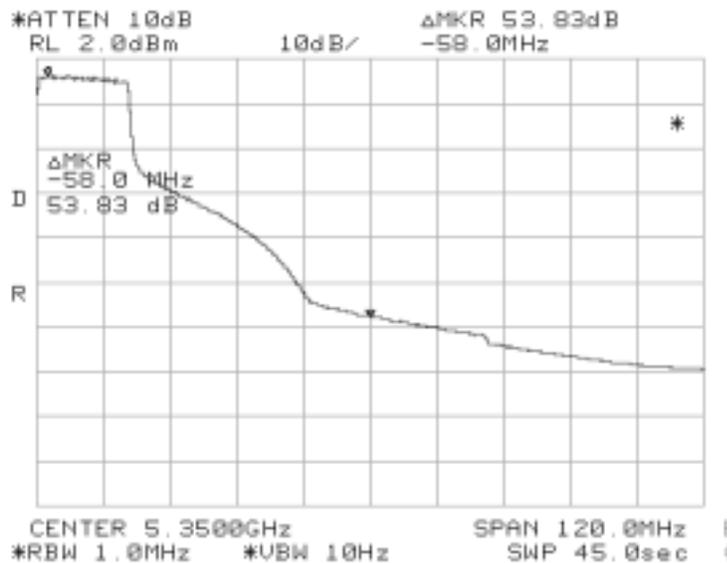
5.35 GHz band edge EUT operating on channel 17 (highest channel):

The highest signal in the 5.35 to 5.46 GHz band was -48.5 dBc (Peak) / -53.83 dBc (Average)

Peak Bandedge



Average Bandedge





EMC Test Data

Client: Netgear	Job Number: J45225
Model: HE102	T-Log Number: T45229
Contact: Jimmy Su	Proj Eng: Enter on cover sheet
Spec: FCC 15 Sub. B & E	Class: B

Run #6a: Radiated Spurious Emissions, 1000 - 40000 MHz

Spurious emissions from 30 - 1000 MHz were measured while performing emissions measurements of the digital device. Refer to run #1 performed on 11-06-2001

Limit for emissions in restricted bands:	54dBuV/m (Average)	74dBuV/m (Peak)
Limit for emissions outside of restricted bands:	EIRP < -27dBm/MHz	(68dBuV/m)

Fundamental signal measurements (to calculate the band edge field strengths):

Frequency	Level	Pol	15.209 / 15.407		Detector	Azimuth	Height	Comments
MHz	dBuV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
5210.0	109.1	v	-	-	Pk			RBW = VBW = 1 MHz
5210.0	100.0	v	-	-	Avg			RBW = 1MHz, VBW = 10Hz
5210.0	95.1	h	-	-	Pk			RBW = VBW = 1 MHz
5210.0	86.3	h	-	-	Avg			RBW = 1MHz, VBW = 10Hz
5290.0	113.4	v	-	-	Pk			RBW = VBW = 1 MHz
5290.0	103.4	v	-	-	Avg			RBW = 1MHz, VBW = 10Hz
5290.0	99.0	h	-	-	Pk			RBW = VBW = 1 MHz
5290.0	89.0	h	-	-	Avg			RBW = 1MHz, VBW = 10Hz

Band Edge Field Strength Calculations

Frequency	Level	Pol	15.209 / 15.407		Detector	Azimuth	Height	Comments
MHz	dBuV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
5150.0	56.9	v	74.0	-17.1	Pk			Note 1
5150.0	45.0	v	54.0	-9.0	Avg			Note 1
5150.0	42.9	h	74.0	-31.1	Pk			Note 1
5150.0	31.3	h	54.0	-22.7	Avg			Note 1
5350.0	64.9	v	74.0	-9.1	Pk			Note 2
5350.0	49.6	v	54.0	-4.4	Avg			Note 2
5350.0	50.5	h	74.0	-23.5	Pk			Note 2
5350.0	35.2	h	54.0	-18.8	Avg			Note 2

Note 1:	EUT operating on the lowest channel available in the 5.15 - 5.25 MHz band. Signal level calculated using the relative measurements in run #5 (-52.17 dBc for peak and -55 dBc for average) applied to the highest peak and average field strength measurements of
Note 2:	EUT operating on highest channel available in the 5.25 - 5.35 MHz band. Signal level calculated using the relative measurements in run #5 (-48.5 dBc for peak and -53.83 dBc for average) applied to the highest peak and average field strength measurements of th



EMC Test Data

Client: Netgear	Job Number: J45225
Model: HE102	T-Log Number: T45229
	Proj Eng: Enter on cover sheet
Contact: Jimmy Su	
Spec: FCC 15 Sub. B & E	Class: B

Run #6b: Radiated Spurious Emissions, 1000 - 40000 MHz

EUT On Lowest Channel Available (5.21 GHz)

Frequency	Level	Pol	15.209 / 15.407		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
4168.0	40.1	h	54.0	-13.9	Avg	63	1.3	Note 2, Peak Reading, Average limit
4168.0	40.0	v	54.0	-14.0	Pk	63	1.3	Note 2, Peak Reading, Average limit
6252.0	49.4	v	68.3	-18.9	Note 3	120	1.1	Note 4
10420.0	44.0	v	68.3	-24.4	Note 3	149	1.3	Note 4
6252.0	43.7	h	68.3	-24.6	Note 3	339	1.1	Note 4
10420.0	43.2	h	68.3	-25.1	Note 3	73	1.3	Note 4

EUT On Center Channel (5.25 GHz)

4200.0	42.2	v	54.0	-11.8	Avg	151	1.3	Note 2, Peak Reading, Average limit
4200.0	42.0	h	54.0	-12.0	Avg	151	1.3	Note 2, Peak Reading, Average limit
6300.0	47.3	v	68.3	-21.0	Note 3	72	1.3	Note 4; Noise Floor measurement
6300.0	46.7	h	68.3	-21.6	Note 3	151	1.3	Note 4; Noise Floor measurement
10500.0	43.5	v	68.3	-24.8	Note 3	120	1.3	Note 4
10500.0	41.8	h	68.3	-26.5	Note 3	78	1.6	Note 4

EUT On Highest Channel (5.29 GHz)

15870.0	48.2	v	54.0	-5.8	Avg	28	1.2	Note 2
15870.0	47.4	h	54.0	-6.6	Avg	243	1.2	Note 2
10600.0	44.5	v	54.0	-9.5	Avg	219	1.2	Note 2
10600.0	43.3	h	54.0	-10.7	Avg	104	1.1	Note 2
4232.0	42.0	v	54.0	-12.0	Avg	0	99.0	Note 2, Peak Reading, Average limit
4232.0	41.8	h	54.0	-12.2	Avg	136	1.2	Note 2, Peak Reading, Average limit
15870.0	60.7	v	74.0	-13.3	Pk	28	1.2	Note 2
15870.0	59.8	h	74.0	-14.2	Pk	243	1.2	Note 2
10600.0	57.8	v	74.0	-16.2	Pk	219	1.2	Note 2
10600.0	55.8	h	74.0	-18.2	Pk	104	1.1	Note 2
6348.0	46.1	h	68.3	-22.2	Note 3	212	1.2	Note 4; Noise Floor measurement
6348.0	45.6	v	68.3	-22.8	Note 3	57	1.1	Note 4; Noise Floor measurement
10580.0	45.3	v	68.3	-23.0	Note 3	219	1.2	Note 4
10580.0	43.0	h	68.3	-25.3	Note 3	104	1.1	Note 4

See following page for test notes...

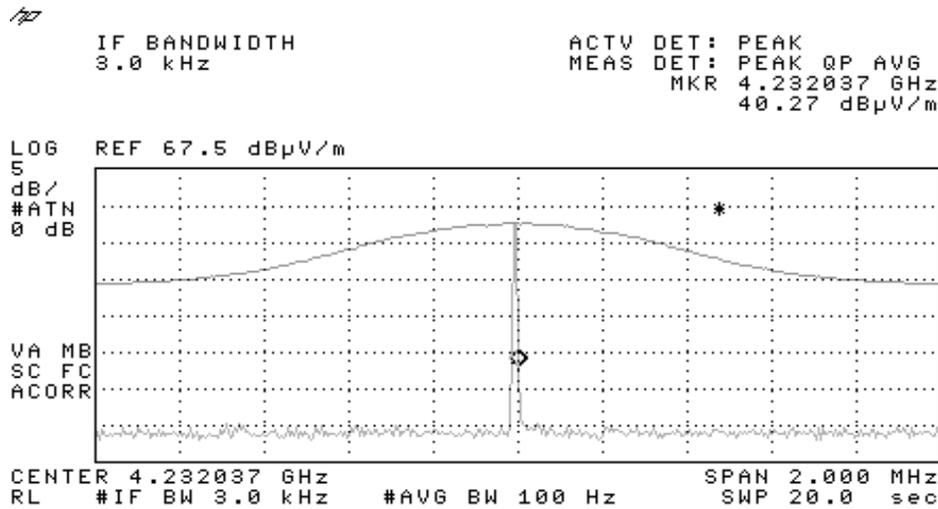


EMC Test Data

Client: Netgear	Job Number: J45225
Model: HE102	T-Log Number: T45229
Contact: Jimmy Su	Proj Eng: Enter on cover sheet
Spec: FCC 15 Sub. B & E	Class: B

...test notes for run 6b

- Note 1: For emissions falling in the restricted bands detailed in 15.205 the general limits of 15.209 apply. For all other emissions the limit is EIRP < -27dBm (equivalent to a field strength at 3m of 68dBuV/m)
- Note 2: Signal is in a restricted band
- Note 3: Restricted Band Peak Measurements: Resolution and Video BW: 1 MHz, Restricted Band Average Measurements: Resolution Bw: 1MHz and Video Bw: 10 Hz. All other measurements, RBW = 1MHz and VBW = 3MHz, video averaging on (100 samples).
- Note 4: Signal does not fall in a restricted band.
- Note 5: This measurement was made using a resolution bandwidth of 3 kHz The instrumentation noise floor was too high to allow measurements with RBW = 1MHz because a preamplifier could not be used (with the EUT operating the intentional signal would overload the amplifier and there is no low pass filter with sufficient shape factor to reject the intentionally trasmitted signal but pass the spuorous signal). The signal was a narrowband signal (as verified during the conducted antenna measurements) and so the amplitude (peak/average) in a 3kHz bandwidth would be the same as that in a 1MHz bandwidth (please refer to the plot below). The peak reading has been compared with the average limit.



Plot showing LO signal at 4GHz measured using RBW = 1MHz and RBW = 3kHz. Amplitude of the signal does not change with resolution bandwidth.



EMC Test Data

Client: Netgear	Job Number: J45225
Model: HE102	T-Log Number: T45229
	Proj Eng:
Contact: Jimmy Su	
Emissions Spec: FCC 15 Sub. B & E	Class: B
Immunity Spec:	Environment:

EMC Test Data

For The

Netgear

Model

HE102



EMC Test Data

Client: Netgear	Job Number: J45225
Model: HE102	T-Log Number: T45229
	Proj Eng:
Contact: Jimmy Su	
Emissions Spec: FCC 15 Sub. B & E	Class: B
Immunity Spec: Enter immunity spec on cover	Environment:

EUT INFORMATION

General Description

The EUT is a 802.11A wireless local area network access point which is designed to access a networks data.. Normally, the EUT would be wall mounted, for testing placed on a table top during operation. The EUT was, therefore, treated as table-top equipment during testing to simulate the end user environment. The electrical rating of the EUT is 120 V, 50 Hz, 3 Amps.

Equipment Under Test

Manufacturer	Model	Description	Serial Number	FCC ID
Atheros	HE102	Network Access Point	143	none

Antenna

The EUT uses an integral antenna with a gain of 6 dBi.

EUT Enclosure

The EUT enclosure is primarily constructed of sheet metal. It measures approximately 17 cm wide by 13 cm deep by 11 cm high (with antennas vertical).

Modification History

Mod. #	Test	Date	Modification
1	Radiated	11/6/2001	Tested EUT with 3 standoffs.
2			
3			



EMC Test Data

Client: Netgear	Job Number: J45225
Model: HE102	T-Log Number: T45229
Contact: Jimmy Su	Proj Eng:
Emissions Spec: FCC 15 Sub. B & E	Class: B
Immunity Spec: Enter immunity spec on cover	Environment:

Test Configuration #1

Local Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
None				

Remote Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
IBM	ThinkPad	laptop	78-RVPM5	none
Netgear	DS108	Hub	DS18J18380052	none

Interface Ports

Port	Connected To	Cable(s)		
		Description	Shielded or Unshielded	Length(m)
Ethernet	Hub	Ethernet	unshielded CAT 5	30
RS232	Note:1			

Note: The RS232 port was not connected as the manufacturer stated that this was for setup purpose and therefore would not normally be connected.

EUT Operation During Emissions

EUT was set to transmit continuously at full power. EUT ethernet port was pinging.



EMC Test Data

Client: Netgear	Job Number: J45225
Model: HE102	T-Log Number: T45229
	Proj Eng: Enter on cover sheet
Contact: Jimmy Su	
Spec: FCC 15 Sub. B & E	Class: B

Radiated Emissions

Test Specifics

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: 11/6/2001	Config. Used: 1
Test Engineer: Blair Wright	Config Change: None
Test Location: SVOATS #1	EUT Voltage: 120V/60Hz

General Test Configuration

The EUT was 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 routed overhead.

On the OATS, the measurement antenna was located 3 meters from the EUT for the measurement range 30 - 1000 MHz.

Ambient Conditions: Temperature: 12.8°C
Rel. Humidity: 71%

Summary of Results

Run #	Test Performed	Limit	Result	Margin
1	RE, 30 - 1000MHz - Maximized Emissions	FCC B	Pass	-1.8dB @ 66.212MHz

Modifications Made During Testing:

System configured with 3 standoffs in order to comply with FCC limits.

Deviations From The Standard

No deviations were made from the requirements of the standard.



EMC Test Data

Client: Netgear	Job Number: J45225
Model: HE102	T-Log Number: T45229
	Proj Eng: Enter on cover sheet
Contact: Jimmy Su	
Spec: FCC 15 Sub. B & E	Class: B

Run #1 Pre-liminary Radiated Emissions, 30-1000 MHz from Nov 5, 2001 (Retesting top 6 with 3 Standoffs)

Frequency MHz	Level dB μ V/m	Pol v/h	FCC B		Detector Pk/QP/Avg	Azimuth degrees	Height meters	Comments
			Limit	Margin				
66.212	38.2	V	40.0	-1.8	QP	360	1.0	BroadBand
287.970	38.2	H	46.0	-7.8	QP	158	1.0	
287.970	35.1	V	46.0	-10.9	QP	219	1.3	
85.510	28.6	V	40.0	-11.4	QP	178	1.0	
671.993	33.3	H	46.0	-12.7	QP	222	1.4	
671.993	33.2	V	46.0	-12.8	QP	312	1.0	
56.000	24.3	H	40.0	-15.7	QP	57	1.8	Ambient
56.000	37.5	V	40.0	-2.5	QP	360	1.0	Ambient

Note: Unplugged EUT and the signals taken at 56MHz were proven to be Ambient signals dB reading was the same.

Run #2 Maximized Radiated Emissions from Run #1

Frequency MHz	Level dB μ V/m	Pol v/h	FCC B		Detector Pk/QP/Avg	Azimuth degrees	Height meters	Comments
			Limit	Margin				
66.212	38.2	V	40.0	-1.8	QP	360	1.0	BroadBand
287.970	38.2	H	46.0	-7.8	QP	158	1.0	
287.970	35.1	V	46.0	-10.9	QP	219	1.3	
85.510	28.6	V	40.0	-11.4	QP	178	1.0	
671.993	33.3	H	46.0	-12.7	QP	222	1.4	
671.993	33.2	V	46.0	-12.8	QP	312	1.0	



EMC Test Data

Client:	Netgear	Job Number:	J45225
Model:	HE102	T-Log Number:	T45229
		Proj Eng:	Enter on cover sheet
Contact:	Jimmy Su		
Spec:	FCC 15 Sub. B & E	Class:	B

Conducted Emissions - Power Ports

Test Specifics

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: 11/5/2001

Config. Used: 1

Test Engineer: jgonzalez

Config Change: None

Test Location: SVOATS #3

EUT Voltage: 120V/60Hz

General Test Configuration

For tabletop equipment, the EUT was located on a wooden table, 40 cm from a vertical coupling plane and 80cm from the LISN. Remote support equipment was located approximately 30 meters away from the test area, with all I/O connections routed overhead.

Ambient Conditions:

Temperature: 21°C

Rel. Humidity: 39%

Summary of Results

Run #	Test Performed	Limit	Result	Margin
1	CE, AC Power 120V/60Hz	FCC B	Pass	-8dB @ 4.222MHz

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: Netgear	Job Number: J45225
Model: HE102	T-Log Number: T45229
	Proj Eng: Enter on cover sheet
Contact: Jimmy Su	
Spec: FCC 15 Sub. B & E	Class: B

Run #1: AC Power Port Conducted Emissions, 0.15 - 30MHz, 120V/60Hz

Frequency	Level	AC	FCC B		Detector	Comments
MHz	dB μ V	Line	Limit	Margin	QP/Ave	
4.2224	40.0	Line	48.0	-8.0	QP	
4.2257	39.2	Neutral	48.0	-8.8	QP	
24.3512	31.2	Line	48.0	-16.8	QP	
9.9335	30.7	Line	48.0	-17.3	QP	
9.9335	30.1	Neutral	48.0	-17.9	QP	
21.6683	27.9	Neutral	48.0	-20.1	QP	

Elliott Labs
CE on AC

05. Nov 01 15:11

Operator: Juan Gonzalez
Comment: NetGear
HE102
120V / 60Hz Line
/-EUT, A=ambient

