TEST NUMBER - 332-04B

TEST REPORT TO

INDUSTRY CANADA RSS 210 SECTION 6.2.2(o) AS AMMENDED
FEDERAL COMMUNICATIONS COMMISSION CFR47 PART15.247

Low Power License-Exempt Radiocommunication Devices
Spread Spectrum Intentional Radiators
Transceiver, certified Tx, receiver DOC

for

Amperion
Two Tech Drive
Andover, MA 01810
(978) 824-2026
of

WAG311 WiFi LAN DSSS

FCC ID: SKIWAG311
IC: 5438A-WAG311

on

2/4/2005

Tested by

_____
Andrew Mertinooke

Reviewed by

_____
Clifton P. Brick

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TEST DESCRIPTION

1. TEST OBJECTIVE

To test the WAG311 to RSS 210 / Part 15 Subpart C Rules and write a report.

2. E.U.T. DESCRIPTION

GENERAL

The WAG311 is an 802.11 2.4GHz LAN device that works in conjunction with Amperion's broadband over powerline equipment to provide a wireless LAN link from the telephone pole to a PC network.

SERIAL NUMBERS:

Pre-Production Prototype

TEST RESULTS AND CONCLUSIONS

PRODUCT TESTED – WiFi LAN device

MODEL NUMBER – WAG311

RADIATED AND CONDUCTED SPURIOUS EMISSION TEST RESULTS

The test results show that the emissions radiated and conducted from this equipment are in compliance with IC Rules RSS 210 / FCC Rules Part 15 Subpart C.

BANDWIDTH & OUTPUT POWER

The test results show that the occupied bandwidth and output power of this equipment are in compliance with IC Rules RSS 210 / FCC Rules Part 15 Subpart C .

AC CONDUCTED TEST RESULTS

The test results show that the emissions conducted on to the AC Mains from this equipment are in compliance with IC Rules RSS 210 / FCC Rules Part 15 Subpart C.

ANALYSIS AND CONCLUSIONS

All results are based on a test of one sample, and represent other production units, only in as much as a sample represents other production units. If any significant changes are made to the unit, the changes shall be evaluated and a retest may be required.

TEST RESULTS AND CONCLUSIONS

Requirement	FCC Ref	IC Ref (RSS210)	Result
Max Output Power	15.247(b)(3)	6.2.2 (o)(iv)	Pass
6 dB Bandwidth	15.247(a)(2)	6.2.2 (o)(iv)	Pass
Max Power Density	15.247(d)	6.2.2 (o)(iv)	Pass
Antenna Conducted Emissions	15.247(c)	6.2.2 (e1)	Pass
Radiated in Restricted Bands	15.207(c), 15.209(c)	6.3 and Table 2	Pass
AC Mains Conducted Emissions	15.207	6.6	See Notes
Antenna Requirement	15.203	5.5	Pass Professional Installation
RF Exposure	15.247(b)(5)	15	See test report and User Manual

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TEST PROCEDURES

1. TEST EQUIPMENT

A. HP 8546A (9 kHz - 6.5 GHz) EMI Receiver w/ RF Filter Section, S/N 3704B00323 / 3650A00360. Calibration Date 1-16-2004/1-5-2005, calibrated annually.

B. HP 8593E (9 kHz - 26.5 GHz) Spectrum Analyzer, S/N 3829A03887. Calibration Date 1-17-2005, calibrated annually.

B. Com-Power Biconilog Antenna, Model AC220, S/N 25509. Calibration Date 7-17-2004, calibrated annually.

C. Electro-Metrics Double Ridged Guide Antenna, Model EM-6961, S/N 6337. Calibration Date: 7-30-2004, calibrated annually.

D. HP 1 - 26.5 GHz Preamplifier, Model 08449B, S/N 3008A01323. Calibration Date: 1-7-2004, calibrated annually.

E. EMCO LISN, Model EM 3825/2, S/N 9109-1860. Calibration Date: 3-10-2004, calibrated annually.

F. Micro-Tronics 2.4GHz Band Reject Filter, Model BRM50702, S/N 014. Calibration Data: 11-3-2004, calibrated annually

G. Agilent Schottky Detector, HSMS-2865. Calibration not required, use with calibrated equipment.

H. HP 500 MHz Oscilloscope, Model 54610B, S/N US37340501. Calibration Data: 1-20-2004, calibrated annually

2. FREQUENCY RANGE TO BE SCANNED.

A. Radiated Test from 30 MHz to 40 GHz (or the 10^{th} harmonic of the highest frequency whichever is lower).

B. Conducted Test from 150 kHz to 30 MHz.

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3. TEST PROCEDURES.

Radiated test procedure:

The EUT, associated cables and peripheral devices are placed on the supporting table and any support equipment is placed off the site. The EUT is turned on and any necessary operating or test software installed and allowed to warm up. The EUT is pre-scanned in our ferrite tile lined chamber where it is rotated 360 degrees and examined in both horizontal and vertical polarization, all emission frequencies are identified and recorded. The EUT is then moved to the OATS and the frequency band from 30 MHz to 40 GHz is scanned, all frequencies identified in the chamber are investigated, as well as harmonic frequencies of the EUT. When an emission is found the emission is maximized by varying the bundle position of the connecting cables, the antenna height, the antenna polarization (vertical and horizontal) and the table orientation (360 degrees). The maximum reading is recorded and the next signal is searched for.

Conducted test procedure:

The power line of the EUT is connected to the LISN (Line Impedance Stabilization Network). A measurement of the emissions are made from the power line for both phase and neutral on the analyzer in the frequency range from 150 kHz to 30 MHz. The maximum readings are recorded for each phase.

All measurements are made according to the procedures defined in: "ANSI C63.4-1992 Standard Methods of Measurement of Radio Noise Emissions from Low-Voltage Electrical and Electronics Equipment in the Range of 9 kHz to 40 GHz, American National Standard for (ISBN 1-55937-215-5).

RSS 210/ FCC PART 15 TEST LIMITS

1. RSS 210 Section 6.2.2, Table 3 Radiation Limits:
   FCC Part 15.247 Radiation Limits:

The maximum peak output power from a device in the 2.4 GHz band using digital modulation is 1 Watt (+30.0dBm).

The peak power spectral density in any 3kHz band shall not be greater than 8dBm during any time interval of continuous transmission.

In any 100 kHz bandwidth outside the operating frequency bands, the peak unwanted emission spectral density shall be at least 20 dB below the peak in band spectral density.

15.247(b)(4)(i) states that systems used exclusively for fixed point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum peak output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

The radiated emission limit is 54 dBuV/m at 3 meters using an average detector for any emission that falls into a restricted band.

2. RSS 210 Section 6.6a Conduction Limits:
   FCC Part 15.207 Conduction Limits:

Frequency MHz	Quasi-Peak Limit dBμV	Average Limit dBμV
0.150 - 0.500	66 to 56	56 to 46
0.500 - 5.0	56	46
5.0 - 30.0	60	50

TEST FACILITY DESCRIPTION

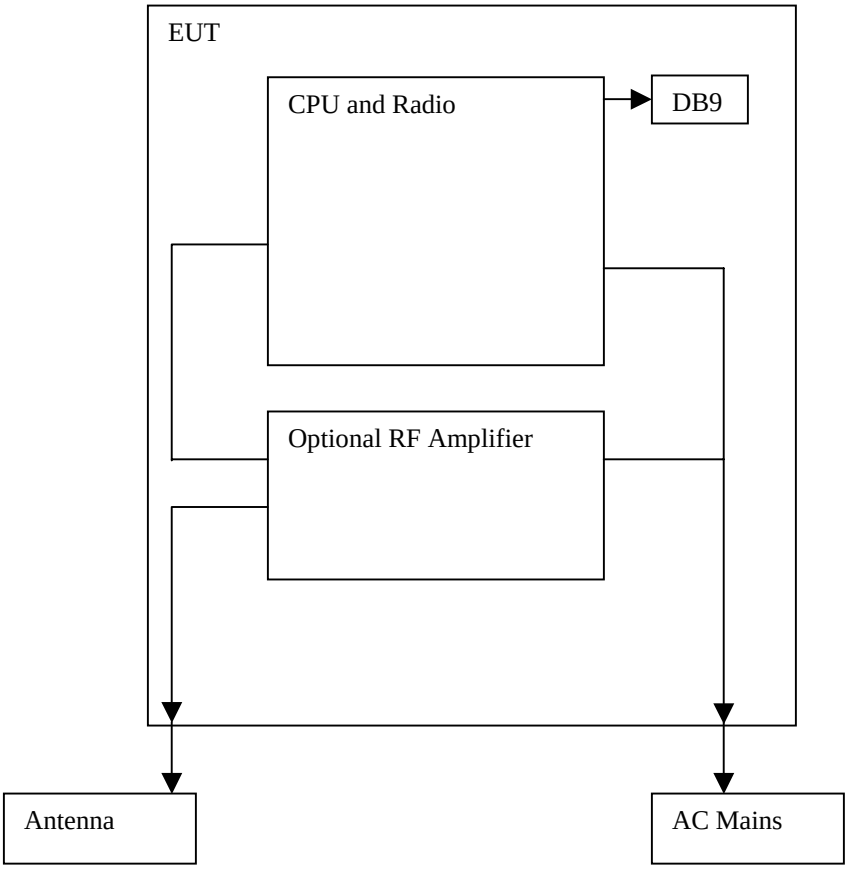
Compliance Worldwide is located on 357 Main Street in Sandown, New Hampshire. The conducted and radiated test sites, located at C.W. are used for Federal Communications Commission (FCC) testing and Industry Canada Testing. A site description is on file with the FCC in Columbia, MD USA. Site information is also on file with Industry Canada, anyone wishing to review this Test Facility Description is referred to file number **IC 3023**. This is currently on file at Industry Canada, 1241 Clyde Avenue, Ottawa, ON K2C 1Y3.

The radiated site is a 3/10 meter indoor site with an enclosure for the product and a basement for the personnel, support equipment and test equipment.

The conducted site is part of a 16' x 20' x 12' ferrite tile chamber and uses one of the walls for the vertical metal wall required by EN 55022.

Both sites are designed to test products or systems 1.5 meter x 1.0 meter, floor standing or table top.

TEST SET UP
AND
PERIPHERAL CONNECTION INFORMATION



Note: If the RF amplifier is not included in the system, the cable that is used from the RF amplifier to the enclosure is connected directly to the radio and the radio to amplifier cable is simply deleted from the system.

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PLEASE NOTE - EUT (equipment under test) is WAG311.

The cables directly connected to this equipment are listed below.

Connection Descriptions

1. ____Power cable_____
(description)

_____EUT_____
(from device)

_____AC Mains_____
(to device)

CABLE LENGTH __2m__ (S) SHIELDED or (U) UNSHIELDED __U_

2. ___RS232 Serial Cable_____
(description)

_____EUT_____
(from device)

_____Not terminated during testing, used for setup_____
(to device)

CABLE LENGTH _1.0m_ (S) SHIELDED or (U) UNSHIELDED _U__

3. ___50 ohm Coax cable_____
(description)

_____EUT enclosure_____
(from device)

_____Antenna _____
(to device)

CABLE LENGTH _____ (S) SHIELDED or (U) UNSHIELDED __S__

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MAXIMUM OUTPUT POWER RESULTS

Frequency Range: 2400.0-2483.5 MHz.

Measurement Distance: Conducted

Measurement taken using a diode detector, oscilloscope and signal generator. The voltage of the EUT was matched by a signal from the signal generator, the signal generator output was recorded as the EUT RF output level.

PLEASE SEE BELOW FOR TEST DATA:

MAXIMUM OUTPUT POWER RESULTS without amplifier

Frequency (MHz)	Peak Amplitude (dBm)	Limit (dBm)	Margin (dB)
2412	+12.2	+30	-17.8
2437	+12.3	+30	-17.7
2462	+13.4	+30	-16.6

MAXIMUM OUTPUT POWER RESULTS with amplifier

Frequency (MHz)	Peak Amplitude (dBm)	Limit (dBm)	Margin (dB)
2412	+25.5	+30	-4.5
2437	+25.8	+30	-4.2
2462	+25.9	+30	-4.1

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In Band 100kHz Bandwidth conducted data

Frequency Range:	2402-2483.5 MHz
Measurement Distance:	Conducted
Bandwidth:	100 kHz
Detector Functions:	Peak
Video Filter:	100 kHz

SEE NEXT PAGES FOR DATA.

In any 100 kHz bandwidth outside the operating frequency bands, the peak unwanted emission spectral density shall be at least 20 dB below the peak in band spectral density.

Data taken with amplifier installed.

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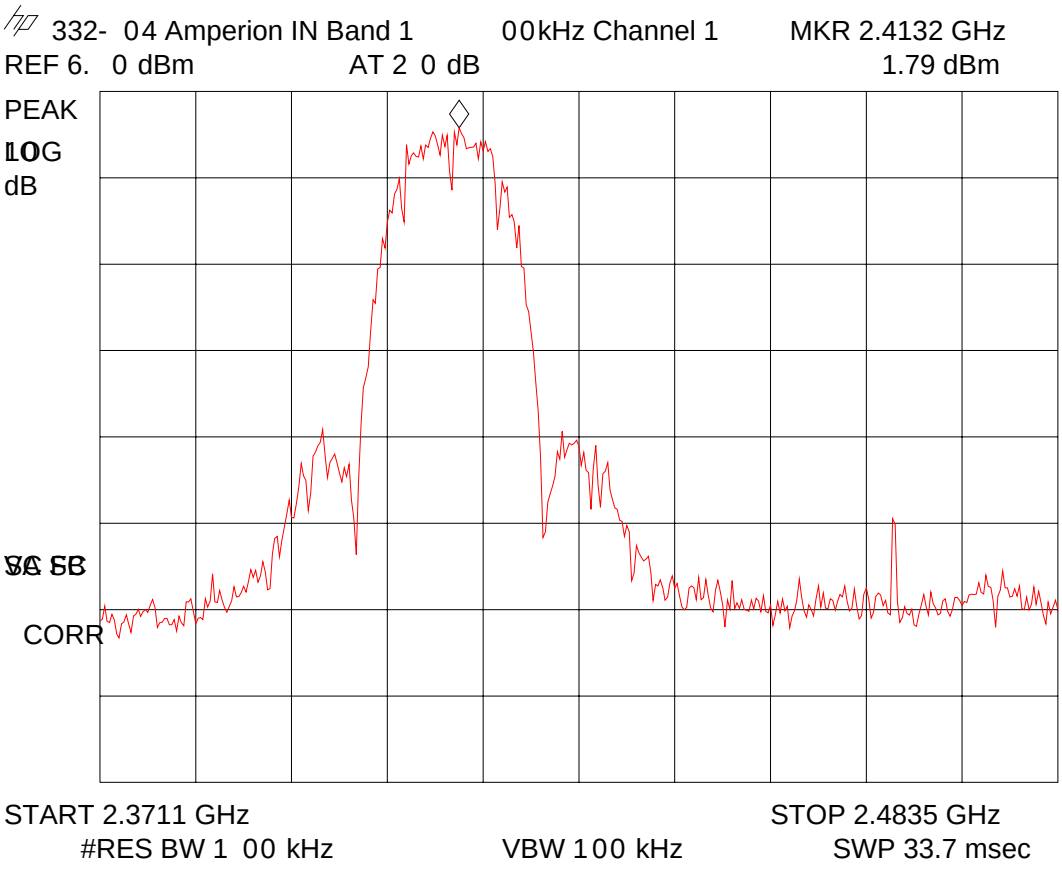
Worst Case In Band Channel 1



Frequency (MHz)	Peak Amplitude (dBm)
2413.20	+1.79

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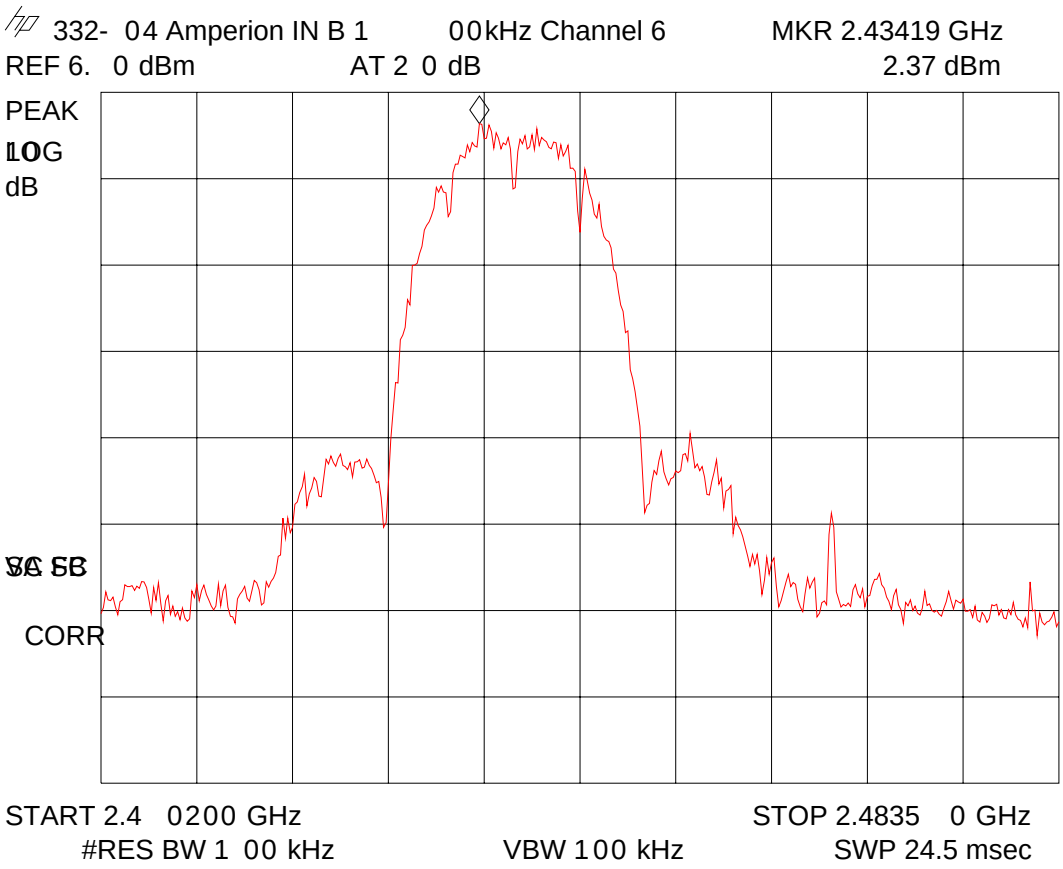
Worst Case In Band Channel 6



Frequency (MHz)	Peak Amplitude (dBm)
2434.19	+2.37

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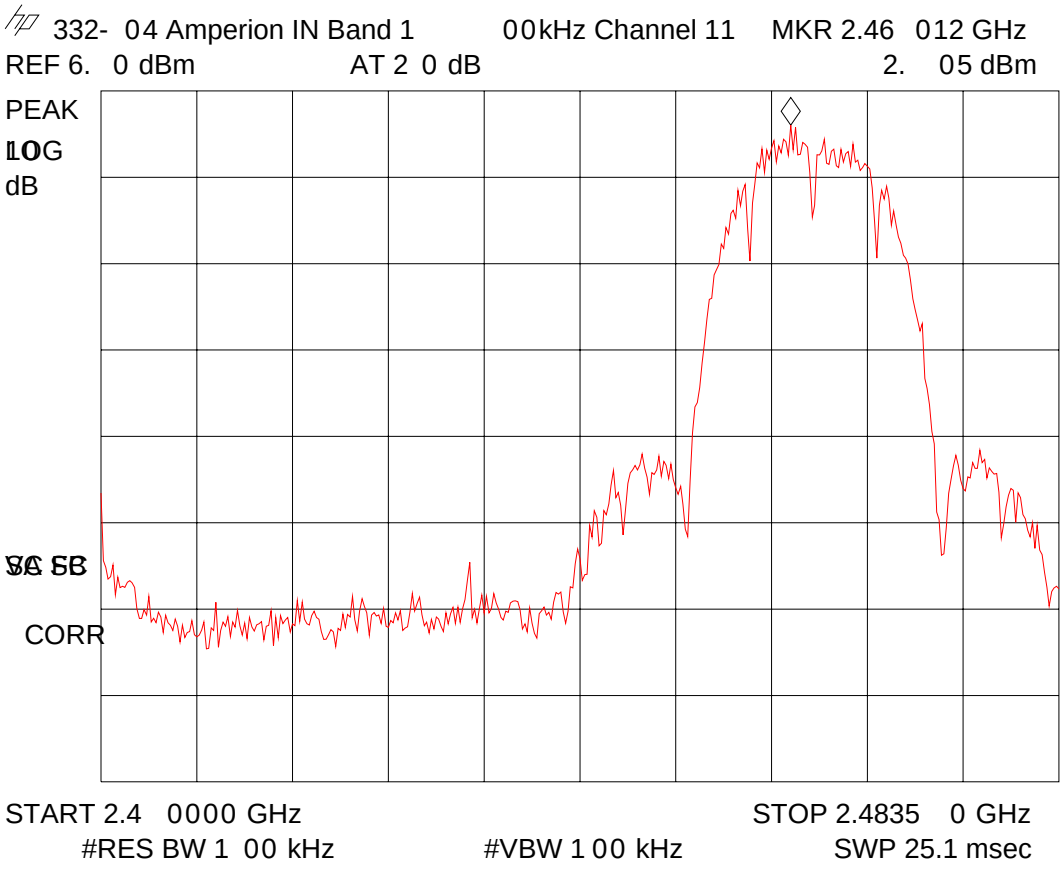
Worst Case In Band Channel 11



Frequency (MHz)	Peak Amplitude (dBm)
2460.12	+2.05

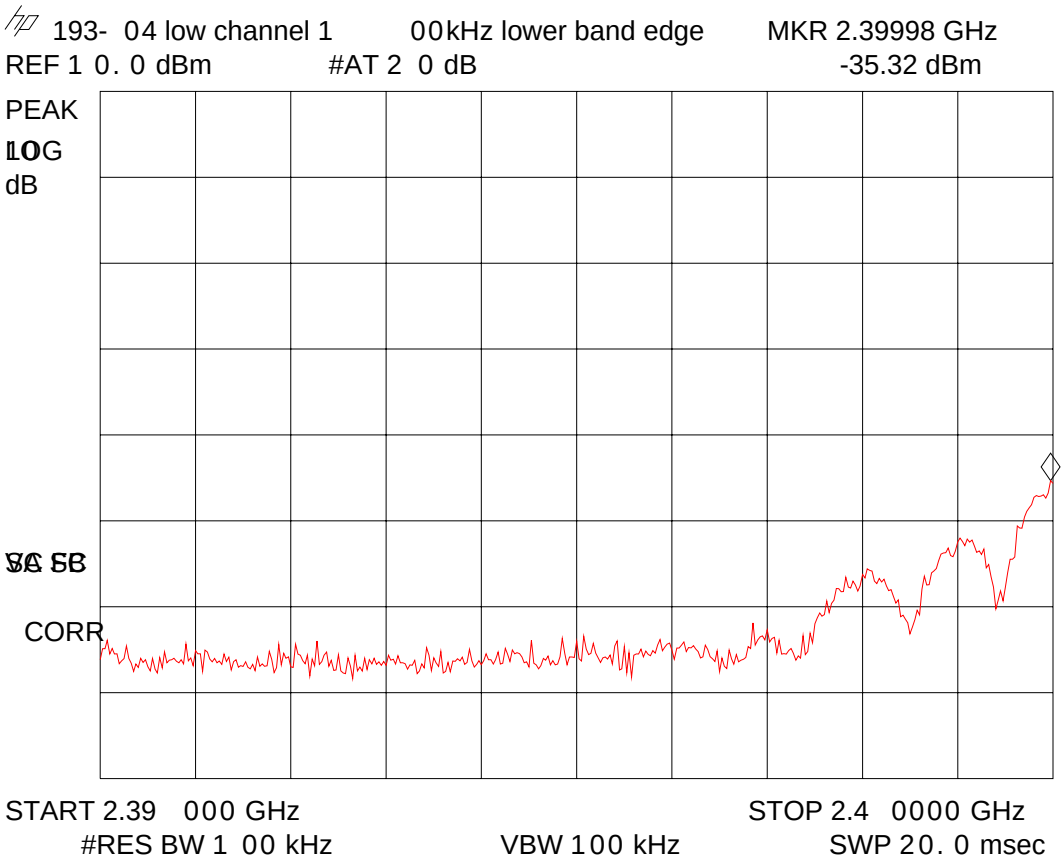
Out of Band/ Band Edge 100kHz Bandwidth conducted data

Frequency Range:	30-25 GHz
Measurement Distance:	Conducted
Bandwidth:	100 kHz
Detector Functions:	Peak
Video Filter:	100 kHz

SEE NEXT PAGES FOR DATA.

In any 100 kHz bandwidth outside the operating frequency bands, the peak unwanted emission spectral density shall be at least 20 dB below the peak in band spectral density.

Channel 1 lower band edge plot



Frequency (MHz)	Peak Amplitude (dBm)	Limit (dBm)	Margin (dB)
2399.98	-35.32	-18.21	-17.11

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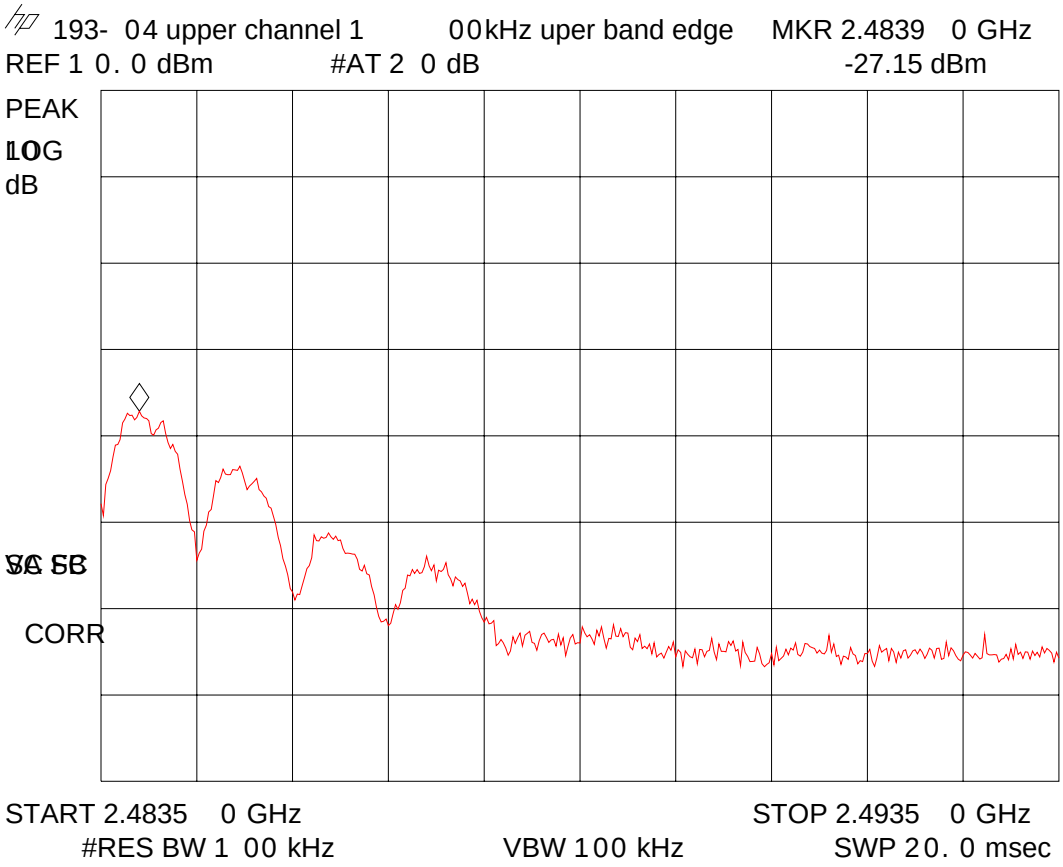
Channel 11 upper band edge plot



Frequency (MHz)	Peak Amplitude (dBm)	Limit (dBm)	Margin (dB)
2483.90	-27.15	-17.95	-9.20

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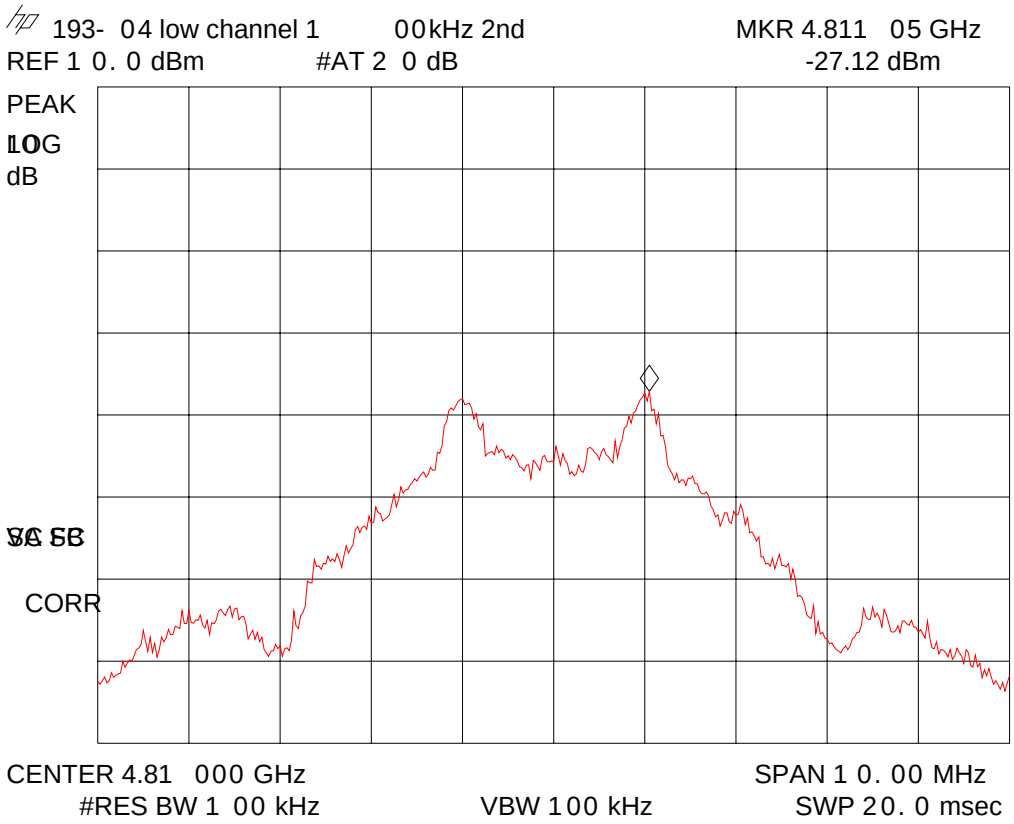
Channel 1 worst case conducted plot and tabular data



Frequency (MHz)	Peak Amplitude (dBm)	Limit (dBm)	Margin (dB)
4811.05	-27.12	-18.21	-8.91
7216.68	-49.89	-18.21	-31.68

Worst case spurious plot shown, no other signals found within 30 dB of limit.

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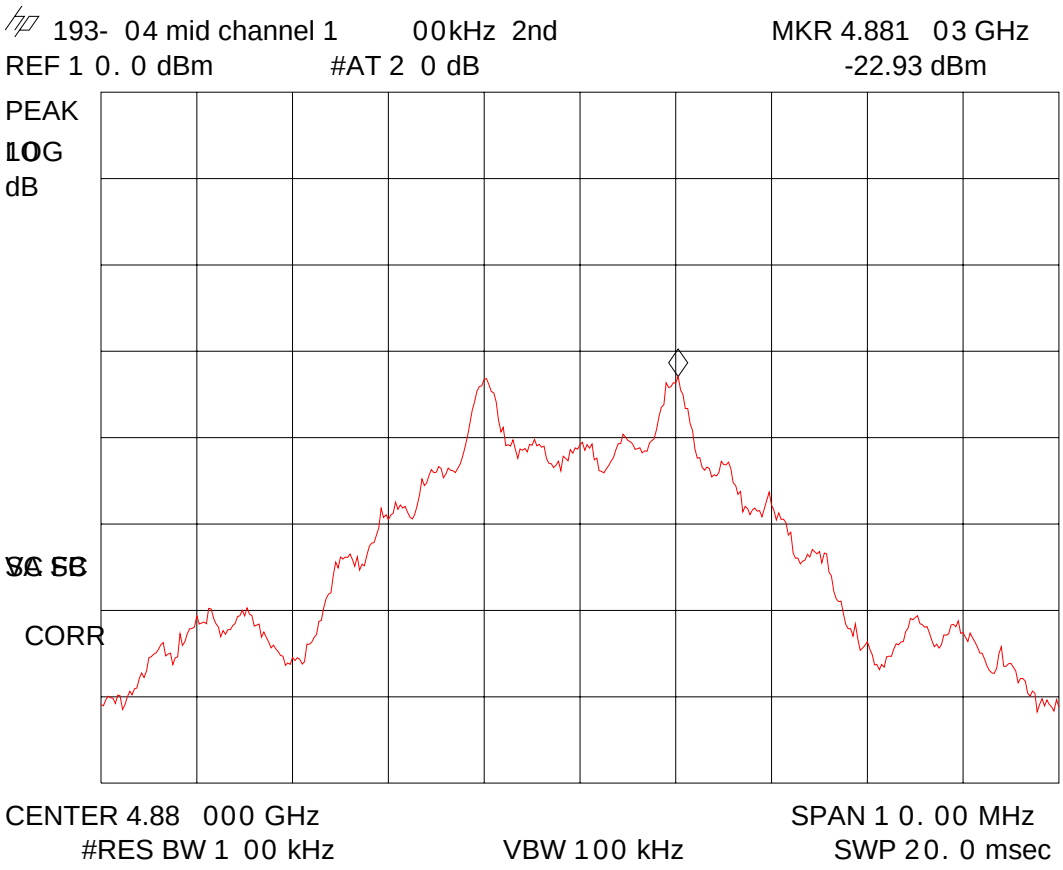
Channel 6 worst case conducted plot and tabular data



Frequency (MHz)	Peak Amplitude (dBm)	Limit (dBm)	Margin (dB)
4881.03	-22.93	-17.63	-5.30
7321.58	-44.41	-17.63	-26.78

Worst case spurious plot shown, no other signals found within 30 dB of limit.

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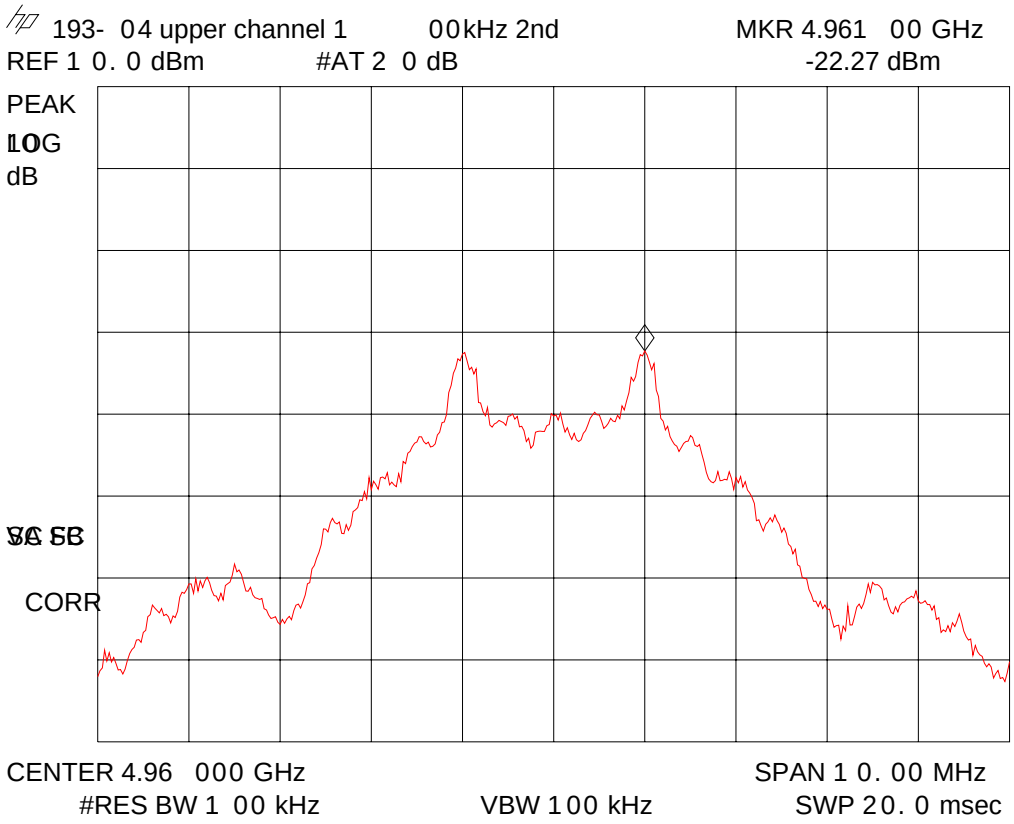
Channel 11 worst case conducted plot and tabular data



Frequency (MHz)	Peak Amplitude (dBm)	Limit (dBm)	Margin (dB)
4961.00	-22.27	-17.95	-4.06
7438.65	-42.34	-17.95	-24.13

Worst case spurious plot shown, no other signals found within 30 dB of limit.

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POWER DENSITY RESULTS

Frequency Range:	2400-2483.5 MHz
Measurement Distance:	Conducted
Bandwidth:	3 kHz
Sweep Rate:	100 seconds
Detector Functions:	Peak
Video Filter:	3 kHz

A 12000 kHz area, centered on the channel frequency was examined and the highest peak value was recorded, data is shown for the window of maximum reading.

Data was recorded as segments, 300kHz centered on the channel being examined (0), then in 300 kHz segments above (+1,+2,+3…) and 300 kHz segments below (-1,-2,-3…). This allows 1 second per 3kHz at 100 second sweep.

Power Density data was taken only with the amplifier included, as this was determined to be worst case.

PLEASE SEE NEXT PAGE FOR TEST DATA

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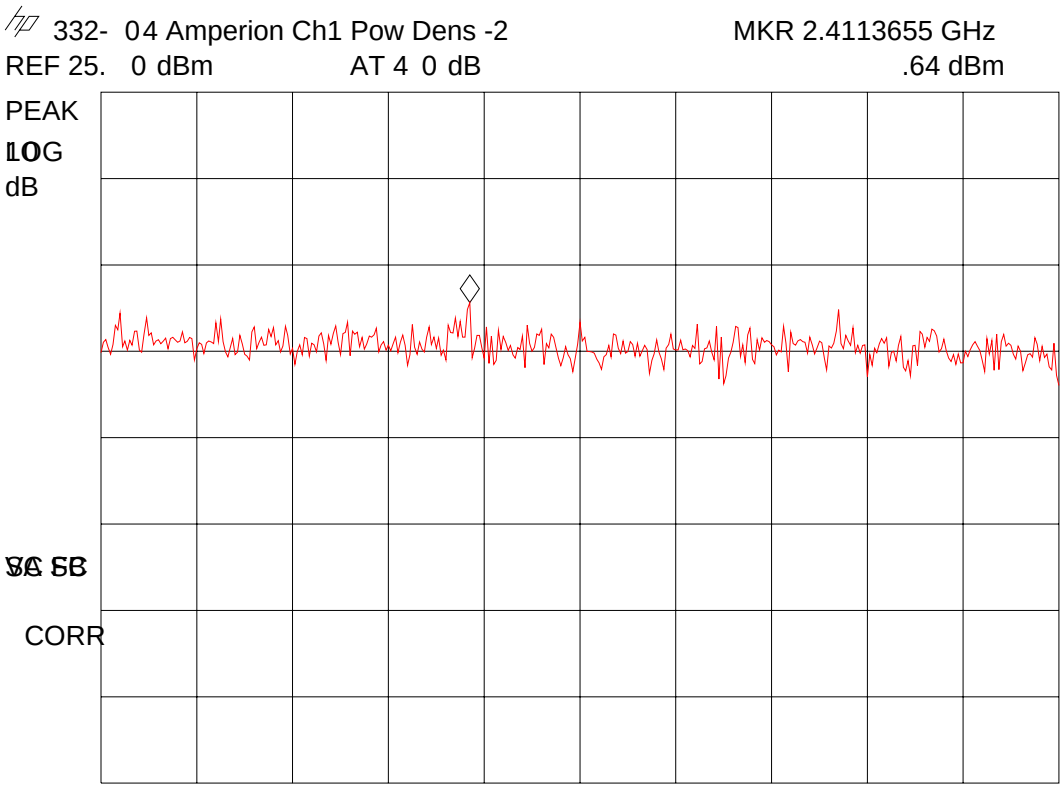

Frequency (MHz)	Peak Amplitude (dBm)	Limit (dBm)	Margin (dB)
2411.3655	+0.64	+8	-7.36

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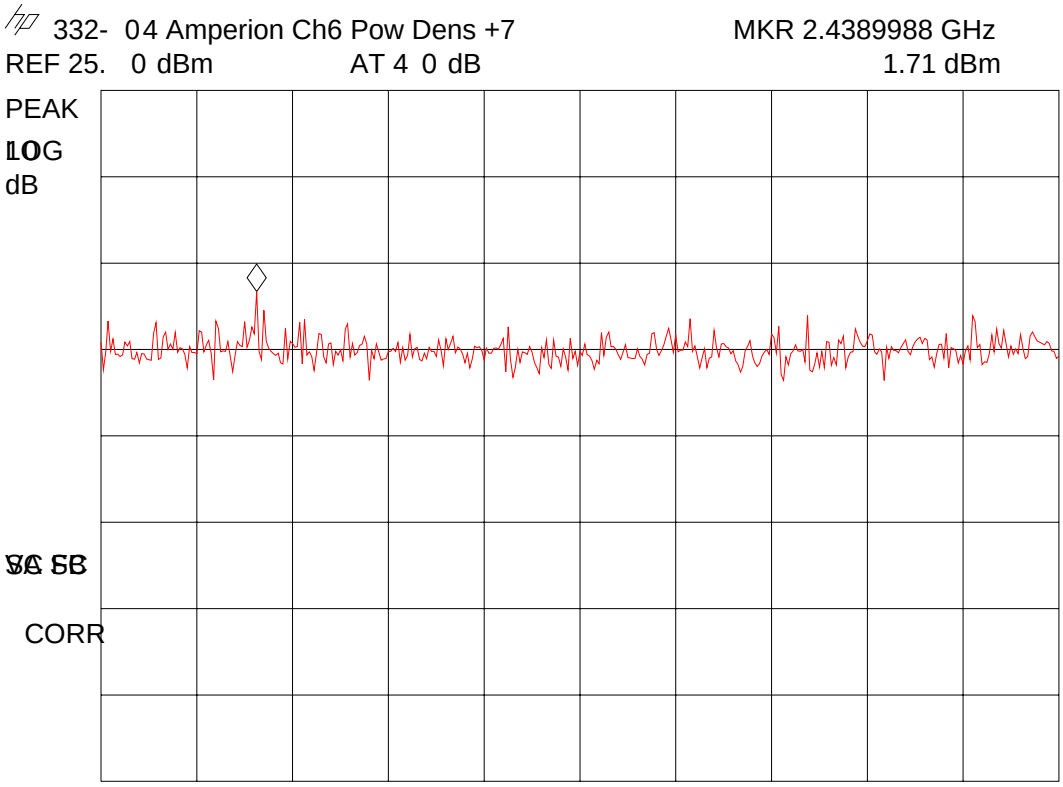

Frequency (MHz)	Peak Amplitude (dBm)	Limit (dBm)	Margin (dB)
2438.9988	+1.71	+8	-6.29

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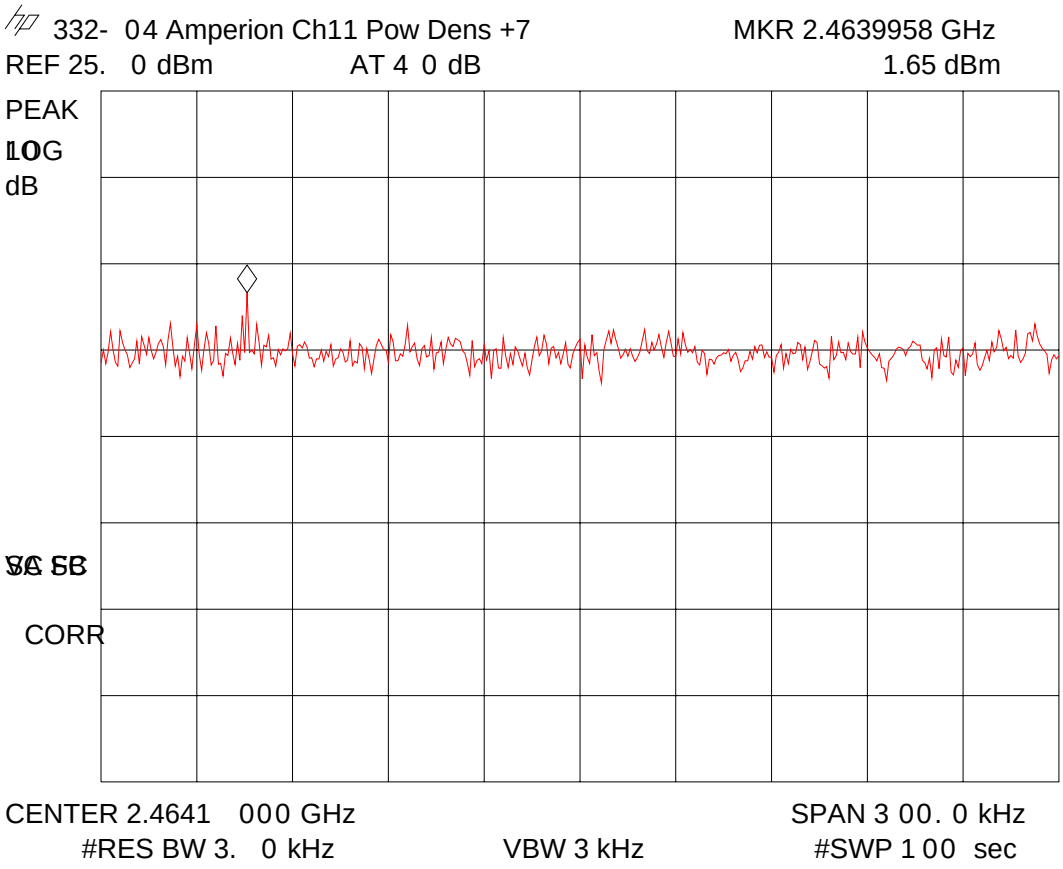

Frequency (MHz)	Peak Amplitude (dBm)	Limit (dBm)	Margin (dB)
2463.9985	+1.65	+8	-6.35

6 dB BANDWIDTH TEST RESULTS

Frequency Range:	2400.0-2483.5 MHz.
Measurement Distance:	Conducted
Bandwidth:	100 kHz
Detector Functions:	Peak
Video Filter:	100 kHz

PLEASE SEE NEXT PAGE FOR TEST DATA

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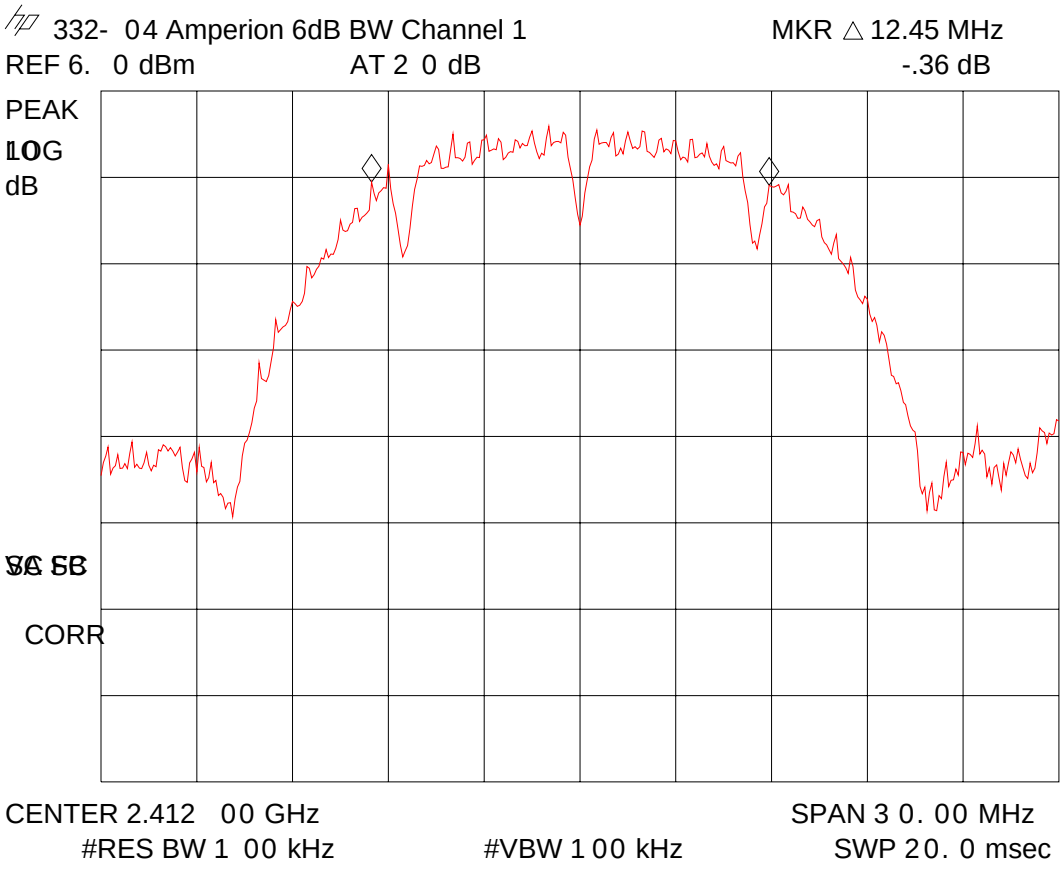

Channel Frequency (MHz)	6 dB BW (kHz)	Limit	Result
2412.000	12,450	>500 kHz	Pass

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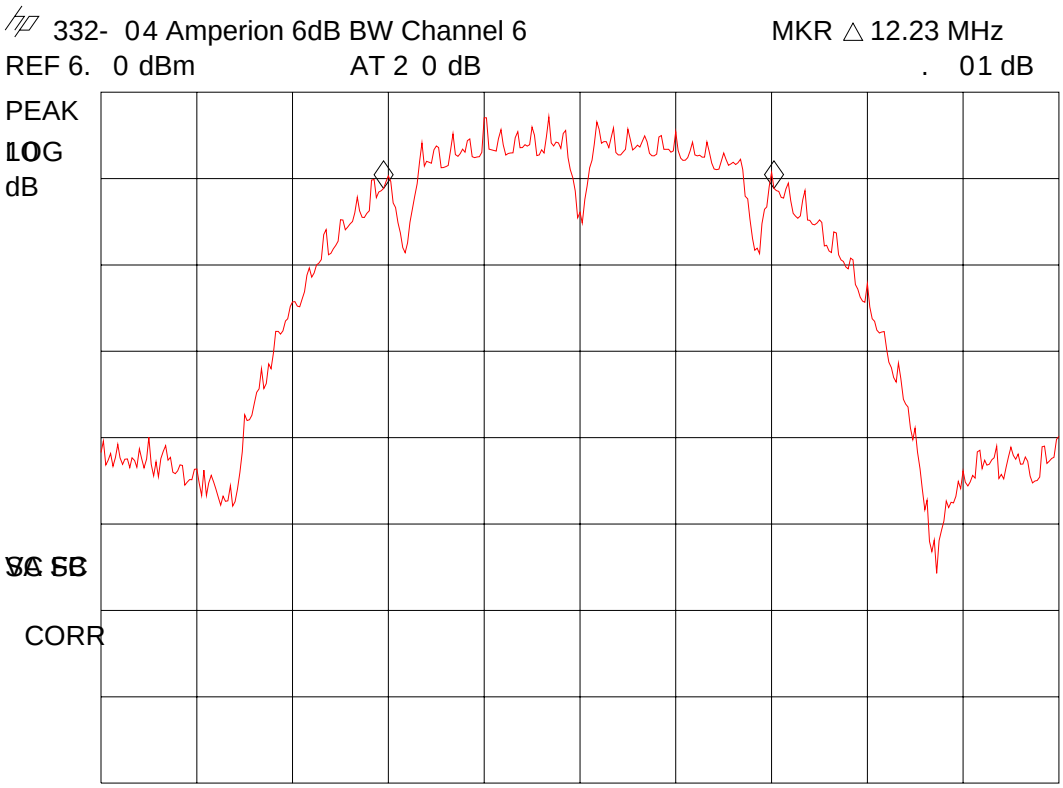

Channel Frequency (MHz)	6 dB BW (kHz)	Limit	Result
2437.000	12,230	>500 kHz	Pass

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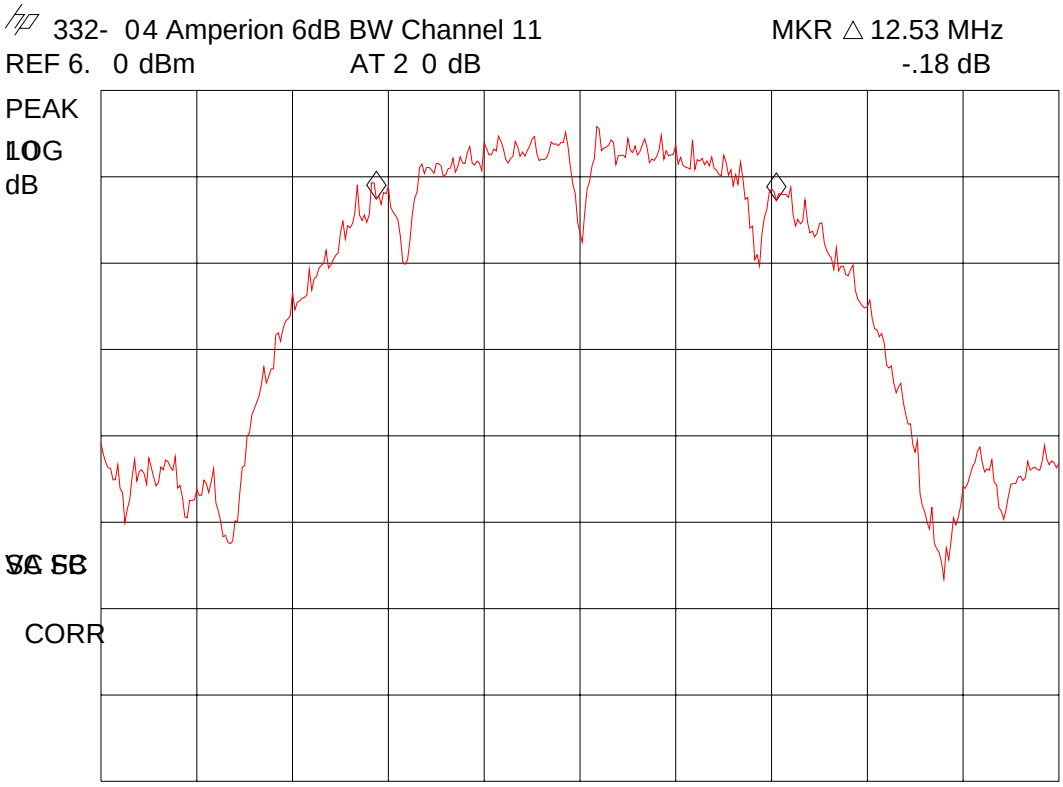

Channel Frequency (MHz)	6 dB BW (kHz)	Limit	Result
2462.000	12,530	>500 kHz	Pass

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99% Power Bandwidth data

Frequency Range:	2402-2483.5 MHz
Measurement Distance:	3 meters
Bandwidth:	100 kHz
Detector Functions:	Peak
Video Filter:	100 kHz

SEE NEXT PAGES FOR DATA.

99% Power Bandwidth Data

Channel	Bandwidth (MHz)
1	16.19
6	16.00
11	16.06

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RADIATED TEST RESULTS

Frequency Range:	30 – 24.9 GHz.
Measurement Distance:	3.0 Meters.
Bandwidth:	120 kHz, Per ANSI C63.4-1992.*
Detector Functions:	Peak, Quasi Peak, Average
Video Filter:	300 kHz*
Table Height:	0.8 meters
Antenna Height Variation:	1 - 4 Meters.

Horizontal and Vertical Polarization Measurements Taken.

*Measurement Bandwidth is 1 MHz and video filter is 3 MHz above 1 GHz

Data includes Restricted bands, digital component and receiver component.

PLEASE SEE NEXT PAGE FOR RADIATED TEST DATA

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Radiated Restricted Band Transmitter Spurious Data

Data taken at 3 meter distance.

Channel	Freq (MHz)	Polarization (H/V)	Peak Amp (dBuV/m)	Avg Amp (dBuV/m)	Avg Limit (dBuV/m)	Avg Margin (dB)
With amplifier and omni antenna						
1	4824	V	59.29	39.29	54.0	-14.71
6	4874	V	58.49	38.49	54.0	-15.51
6	7311	V	45.88	25.88	54.0	-28.16
11	4924	V	61.46	41.46	54.0	-12.54
11	7386	V	46.05	26.05	54.0	-27.95
With amplifier and patch antenna						
1	4824	H	53.05	33.05	54.0	-20.95
1	12060	H	56.92	36.92	54.0	-17.08
6	4874	H	53.38	33.38	54.0	-20.62
6	7311	H	44.85	24.85	54.0	-29.15
11	4924	H	49.63	29.63	54.0	-24.37
11	7386	H	43.36	23.36	54.0	-30.64
Without amplifier/ with omni antenna						
1	4824	V	46.86	26.86	54.0	-27.14
6	4874	V	50.10	30.10	54.0	-23.90
6	7311	V	44.90	24.90	54.0	-29.10
11	4924	V	46.86	26.86	54.0	-27.14
11	7386	V	44.24	24.24	54.0	-29.76
Without amplifier/ with patch antenna						
1	4824	H	48.63	28.63	54.0	-25.37
1	12060	H	56.08	36.08	54.0	-17.92
6	4874	H	46.75	26.75	54.0	-27.25
6	7311	H	44.22	24.22	54.0	-29.78
11	4924	H	46.20	26.20	54.0	-27.80
11	7386	H	44.16	24.16	54.0	-29.84

No other signals found within 15 dB of limit in restricted bands to the 10^{th} harmonic.

Average measured values were greater than 20 dB, 20dB average factor was used.

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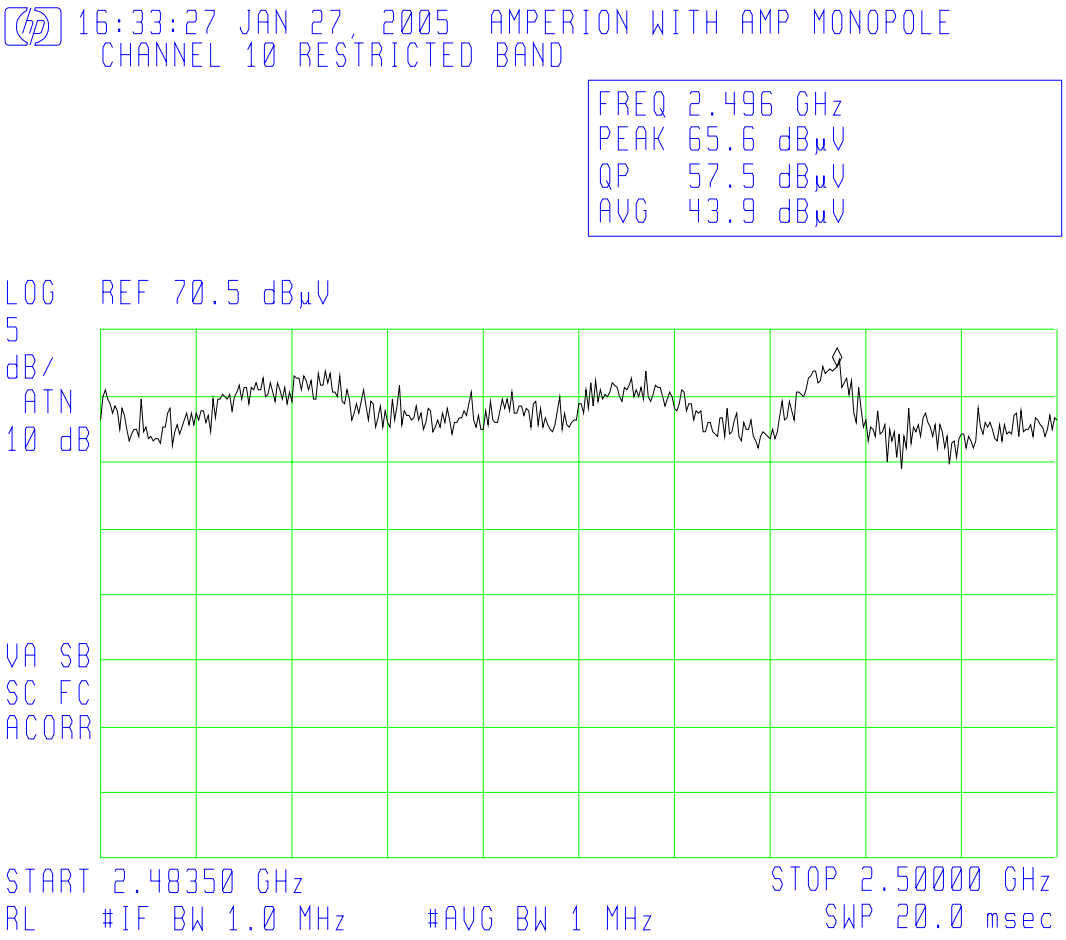
Radiated Band Edge/restricted band with amplifier Data
Monopole antenna Channel 10



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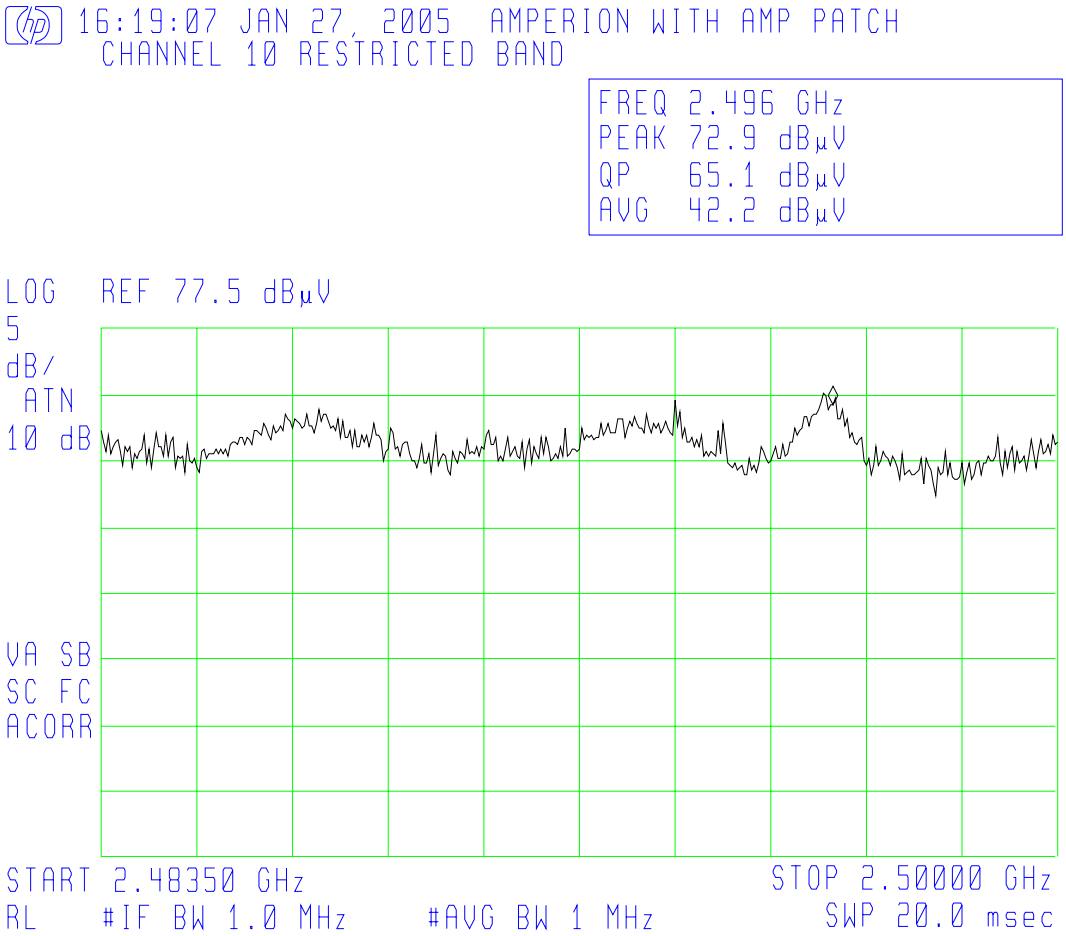
Radiated Band Edge/restricted band with amplifier Data
Patch Antenna Channel 10



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Radiated Band Edge/restricted band without amplifier Data
Patch antenna Channel 11

Measurement	Result	Limit
Peak of Fund using 1MHz BW	108.16 dBuV/m @ 3m	
Average of Fund using 1MHz BW	64.70 dBuV/m @ 3m	20dB below Peak
Peak of Fund using 30kHz BW	99.34 dBuV/m @ 3m	
Peak of Highest band edge signal using 30kHz BW	57.04 dBuV/m @ 3m	
Difference between the 30kHz BW peak of fundamental and 30kHz BW peak of worst case band edge	42.30 dB	
Fund 1MHz BW Peak minus the difference at 30kHz (corrected peak amplitude at band edge)	65.86 dBuV/m @ 3m peak	74 dBuV/m @ 3m
Average difference from fundamental at 1MHz	20dB	
Corrected peak at band edge minus the average difference at 1MHz BW (corrected average amplitude at band edge)	45.86 dBuV/m @ 3m Avg	54 dBuV/m @ 3m

Data reflects the worst case at the band edge and through the 2483.5-2500MHz Restricted Band. Delta marker method per DA 00-705 was used up to 2MHz from band edge.

Radiated Band Edge/restricted band without amplifier Data
Monopole antenna Channel 11

Measurement	Result	Limit
Peak of Fund using 1MHz BW	104.51 dBuV/m @ 3m	
Average of Fund using 1MHz BW	59.3 dBuV/m @ 3m	20dB below Peak
Peak of Fund using 30kHz BW	96.26 dBuV/m @ 3m	
Peak of Highest band edge signal using 30kHz BW	47.30 dBuV/m @ 3m	
Difference between the 30kHz BW peak of fundamental and 30kHz BW peak of worst case band edge	48.96 dB	
Fund 1MHz BW Peak minus the difference at 30kHz (corrected peak amplitude at band edge)	55.55 dBuV/m @ 3m peak	74 dBuV/m @ 3m
Average difference from fundamental at 1MHz	20dB	
Corrected peak at band edge minus the average difference at 1MHz BW (corrected average amplitude at band edge)	35.55 dBuV/m @ 3m Avg	54 dBuV/m @ 3m

Data reflects the worst case at the band edge and through the 2483.5-2500MHz Restricted Band. Delta marker method per DA 00-705 was used up to 2MHz from band edge.

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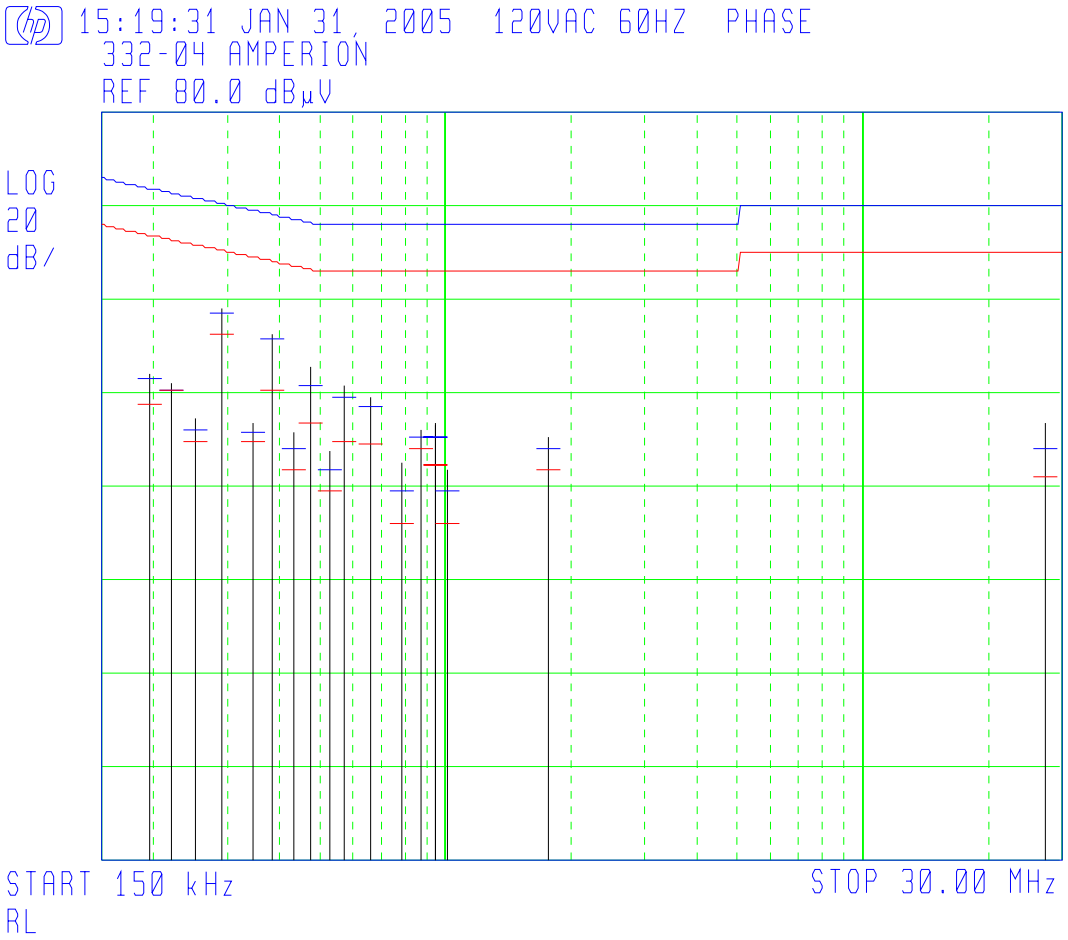
CONDUCTED TEST RESULTS

Frequency Range:	150 kHz to 30.0 MHz.
Bandwidth:	9 kHz per ANSI C63.4-1992.
Detector Functions:	Peak, Quasi-Peak, Average
Table Height:	0.8 meters
Video Bandwidth:	30 kHz.

Please see next pages for conducted data.

TEST NUMBER - 332-04B

CONDUCTED TEST RESULTS PHASE PLOT



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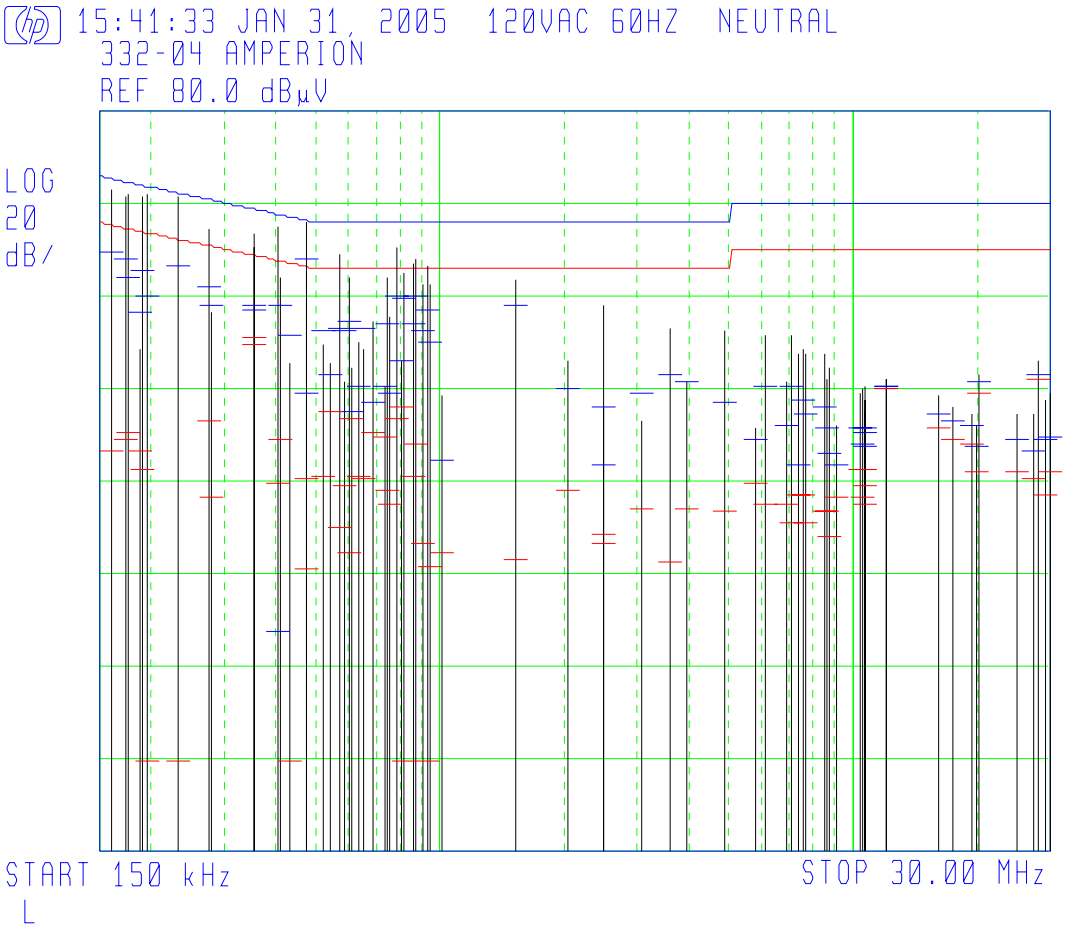
CONDUCTED TEST RESULTS PHASE LIST

Freq (MHz)	Peak Amp (dBuV)	QP Amp (dBuV)	Avg Amp (dBuV)	QP Limit (dBuV)	Avg Limit (dBuV)	QP Margin (dB)	Avg Margin (dB)
0.196330	24.56	23.30	17.88	63.80	53.80	-40.50	-35.92
0.220359	22.31	21.32	20.97	62.87	52.87	-41.55	-31.90
0.253488	14.48	12.16	10.12	61.68	51.68	-49.52	-41.56
0.292391	38.08	37.34	32.78	60.50	50.50	-23.16	-17.72
0.345280	13.75	11.51	10.09	59.14	49.14	-47.63	-39.05
0.386773	33.00	32.07	21.19	58.15	48.15	-26.08	-26.96
0.436058	11.99	8.28	3.53	57.20	47.20	-48.92	-43.67
0.479125	25.68	22.12	13.92	56.39	46.39	-34.27	-32.47
0.529383	8.09	3.66	-0.77	56.00	46.00	-52.34	-46.77
0.570370	21.78	19.51	10.31	56.00	46.00	-36.49	-35.69
0.664155	19.17	16.84	9.30	56.00	46.00	-39.16	-36.70
0.783955	5.76	-0.72	-7.44	56.00	46.00	-56.72	-53.44
0.879003	12.52	10.57	8.50	56.00	46.00	-45.43	-37.50
0.942618	13.53	10.59	4.56	56.00	46.00	-45.41	-41.44
0.942783	14.22	10.68	4.38	56.00	46.00	-45.32	-41.62
1.018358	3.98	-1.14	-7.80	56.00	46.00	-57.14	-53.80
1.755833	11.19	8.81	4.14	56.00	46.00	-47.19	-41.86
27.091559	14.10	8.46	2.32	60.00	50.00	-51.54	-47.68

TEST NUMBER - 332-04B

CONDUCTED TEST RESULTS NEUTRAL PLOT



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CONDUCTED TEST RESULTS NEUTRAL LIST

Freq (MHz)	Peak Amp (dBuV)	QP Amp (dBuV)	Avg Amp (dBuV)	QP Limit (dBuV)	Avg Limit (dBuV)	QP Margin (dB)	Avg Margin (dB)
0.160641	63.52	49.74	7.12	65.48	55.48	-15.74	-48.36
0.174676	61.47	48.32	9.07	64.80	54.80	-16.48	-45.73
0.177239	62.69	44.20	10.84	64.67	54.67	-20.47	-43.83
0.188775	29.25	37.00	7.22	64.11	54.11	-27.11	-46.89
0.190470	61.32	46.07	3.37	64.03	54.03	-17.96	-50.66
0.196416	62.38	40.57	-59.99	63.79	53.79	-23.22	-113.78
0.233648	61.57	46.55	-59.99	62.36	52.36	-15.81	-112.35
0.275529	54.60	42.32	12.88	61.01	51.01	-18.69	-38.13
0.281348	36.46	38.34	-3.42	60.84	50.84	-22.50	-54.26
0.356752	54.06	37.20	29.76	58.86	48.86	-21.66	-19.10
0.357701	50.53	38.35	31.43	58.84	48.84	-20.49	-17.41
0.409246	55.20	-32.03	0.09	57.70	47.70	-89.73	-47.61
0.414885	44.25	38.15	9.13	57.59	47.59	-19.44	-38.46
0.434664	26.13	32.01	-59.99	57.22	47.22	-25.21	-107.21
0.476666	56.08	48.26	0.86	56.44	46.44	-8.18	-45.58
0.479476	46.06	19.21	-18.78	56.38	46.38	-37.17	-65.16
0.524341	30.03	32.95	1.79	56.00	46.00	-23.05	-44.21
0.542048	25.76	23.04	15.66	56.00	46.00	-32.96	-30.34
0.571169	48.93	33.22	-8.99	56.00	46.00	-22.78	-54.99
0.585953	21.86	32.73	-0.71	56.00	46.00	-23.27	-46.71
0.603409	44.50	34.87	-14.69	56.00	46.00	-21.13	-60.69
0.615096	25.11	15.62	13.70	56.00	46.00	-40.38	-32.30
0.637949	30.53	21.07	1.40	56.00	46.00	-34.93	-44.60
0.654016	29.21	33.88	0.52	56.00	46.00	-22.12	-45.48
0.686770	35.02	17.20	10.65	56.00	46.00	-38.80	-35.35
0.733815	21.43	20.80	10.29	56.00	46.00	-35.20	-35.71
0.743524	44.78	34.28	-1.39	56.00	46.00	-21.72	-47.39
0.757378	35.89	19.14	-4.50	56.00	46.00	-36.86	-50.50
0.786659	50.64	40.33	14.12	56.00	46.00	-15.67	-31.88
0.812016	26.89	26.88	16.48	56.00	46.00	-29.12	-29.52
0.824119	45.47	40.07	-59.99	56.00	46.00	-15.93	-105.99
0.866116	47.60	33.95	1.25	56.00	46.00	-22.05	-44.75
0.870353	48.06	40.23	8.51	56.00	46.00	-15.77	-37.49
0.911763	43.00	32.93	-13.06	56.00	46.00	-23.07	-59.06
0.935754	46.69	37.52	-59.99	56.00	46.00	-18.48	-105.99
0.947830	43.16	30.67	-17.85	56.00	46.00	-25.33	-63.85
1.009401	18.75	4.32	-14.98	56.00	46.00	-51.68	-60.98
1.530525	43.89	37.92	-16.41	56.00	46.00	-18.08	-62.41
2.033580	26.88	20.16	-1.44	56.00	46.00	-35.84	-47.44
2.471446	38.48	16.56	-13.50	56.00	46.00	-39.44	-59.50

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Freq (MHz)	Peak Amp (dBuV)	QP Amp (dBuV)	Avg Amp (dBuV)	QP Limit (dBuV)	Avg Limit (dBuV)	QP Margin (dB)	Avg Margin (dB)
2.478011	16.20	3.69	-11.30	56.00	46.00	-52.31	-57.30
3.060828	13.21	19.88	-5.29	56.00	46.00	-36.12	-51.29
3.621360	33.78	23.71	-17.32	56.00	46.00	-32.29	-63.32
3.962196	21.95	21.97	-5.72	56.00	46.00	-34.03	-51.72
4.876754	32.64	16.81	-6.10	56.00	46.00	-39.19	-52.10
5.774734	12.03	9.06	-0.25	60.00	50.00	-50.94	-50.25
6.140938	32.22	21.14	-4.96	60.00	50.00	-38.86	-54.96
6.831069	21.75	12.68	-4.57	60.00	50.00	-47.32	-54.57
7.057075	31.69	21.46	-8.72	60.00	50.00	-38.54	-58.72
7.324549	28.44	4.28	-2.23	60.00	50.00	-55.72	-52.23
7.560093	29.09	17.80	-2.51	60.00	50.00	-42.20	-52.51
7.638558	27.72	14.64	-8.49	60.00	50.00	-45.36	-58.49
8.459610	28.06	16.15	-5.92	60.00	50.00	-43.85	-55.92
8.576940	22.96	11.90	-6.46	60.00	50.00	-48.10	-56.46
8.726776	24.72	6.46	-12.00	60.00	50.00	-53.54	-62.00
9.101561	12.24	3.91	-2.92	60.00	50.00	-56.09	-52.92
10.384511	19.82	11.92	2.91	60.00	50.00	-48.08	-47.09
10.427953	20.16	8.31	-3.38	60.00	50.00	-51.69	-53.38
10.568915	21.43	12.00	3.32	60.00	50.00	-48.00	-46.68
10.611336	15.65	7.70	-0.92	60.00	50.00	-52.30	-50.92
10.674141	17.63	10.82	-4.51	60.00	50.00	-49.18	-54.51
11.999700	22.31	21.16	20.60	60.00	50.00	-38.84	-29.40
12.000106	22.43	21.14	20.62	60.00	50.00	-38.86	-29.38
16.001148	18.91	14.85	11.84	60.00	50.00	-45.15	-38.16
17.332199	16.09	13.15	9.04	60.00	50.00	-46.85	-40.96
19.256728	14.89	12.12	8.65	60.00	50.00	-47.88	-41.35
19.730674	12.38	7.60	2.13	60.00	50.00	-52.40	-47.87
20.000535	23.41	21.59	19.41	60.00	50.00	-38.41	-30.59
24.922135	14.51	8.97	2.58	60.00	50.00	-51.03	-47.42
27.122479	14.59	6.91	0.71	60.00	50.00	-53.09	-49.29
28.000549	26.15	23.37	22.72	60.00	50.00	-36.63	-27.28
29.077319	18.31	9.21	-2.33	60.00	50.00	-50.79	-52.33
29.906576	19.28	10.50	2.08	60.00	50.00	-49.50	-47.92

RF EXPOSURE UNCONTROLLED

Per CFR47 Part15.247(b)(4) and Part1.1307(b)(1), equipment shall be operated in such a way as to not expose the public to RF energy levels in excess of FCC guidelines.

Limits for Exposure (MPE) From FCC OET Bulletin 65 Edition 97-01.

(B) Limits for General Population/Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm^2)	Averaging Time $\|E\|^2$, $\|H\|^2$ or S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	($180/f^2$)*	30
30-300	27.5	0.073	0.2	30
300-1500	--	--	f/1500	30
1500-100,000	--	--	1.0	30

f = frequency in MHz *Plane-wave equivalent power density

Prediction of MPE (Maximum Permitted Exposure)

Equation from Page 18 of OET65.

$S = PG/4\pi R^2$

Where:
S= power density
P= power input to the antenna
G= power gain of the antenna (Numeric relative to isotropic radiator)
R= distance to the center of radiation of the antenna

Antenna Model Number S2406B, Manufactured by Cushcraft, Gain 12(dBi)

Peak input to the antenna (mW): 389.05

Antenna Numeric Gain: 15.84

Prediction distance from antenna center (cm): 25

S at the prediction distance (mW/cm^2): 0.785

Limit for general/uncontrolled exposure(mW/cm^2): 1.0 at 2400MHz

CONCLUSION:
This device was found to have a predicted power density below the FCC guidelines limits for uncontrolled/general population exposure at a distance of 25 centimeters.

RF EXPOSURE CONTROLLED/OCCUPATIONAL

Per CFR47 Part15.247(b)(4) and Part1.1307(b)(1), equipment shall be operated in such a way as to not expose the public to RF energy levels in excess of FCC guidelines.

Limits for Exposure (MPE) From FCC OET Bulletin 65 Edition 97-01.

(A) Limits for Occupational/Controlled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm^2)	Averaging Time $\|E\|^2$, $\|H\|^2$ or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842/f	4.89/f	($900/f^2$)*	6
30-300	61.4	0.163	1.0	6
300-1500	--	--	f/300	6
1500-100,000	--	--	5	6

Prediction of MPE (Maximum Permitted Exposure)

Equation from Page 18 of OET65.

$S = PG/4\pi R^2$

Where:
S= power density
P= power input to the antenna
G= power gain of the antenna (Numeric relative to isotropic radiator)
R= distance to the center of radiation of the antenna

Antenna Model Number S2406B, Manufactured by Cushcraft, Gain 12(dBi)

Peak input to the antenna (mW): 389.05

Antenna Numeric Gain: 15.84

Prediction distance from antenna center (cm): 10

S at the prediction distance (mW/cm^2): 4.904

Limit for controlled exposure(mW/cm^2): 5.0 at 2400MHz

CONCLUSION:
This device was found to have a predicted power density below the FCC guidelines limits for Occupational/Controlled population exposure at a distance of 10 centimeters.

NOTES AND COMMENTS

(Special conditions unique to this test)

Based on output power being below the limit, such that maximum output power can be used on the maximum gain antenna requested, radiated testing was conducted only on the highest gain antenna of each type.

All tests were made at the output of the NEMA enclosure and included all manufacturers internal cabling as appropriate for the system.

The following 2 antennas were used during testing:

Amperion 8dBi Monopole AKA:Cushcraft Model S2406B 6dBd/8dBi omnidirectional monopole antenna.

Amperion Part Number 170-0000-026-34 Patch antenna AKA: Cushcraft Model S2401240P 12dBi patch antenna.

Amperion also expects to use the following antennas of equivalent or lower gain and similar type:

Amperion Part Number 170-0000-08-16 3dBi Monopole
Amperion Part Number 170-0000-020-37 5dBi Monopole

A schaffner part FN2080-6-06 Line filter was required to meet conducted emission limits.

The highest frequency that can be utilized with the amplifier is channel 10, this is to prevent exceeding the limit in the 2483.5 – 2500 MHz restricted band. Band edge data using the amplifier was taken using channel 10 (2457.0 MHz).

This report supercedes report numbered 332-04, and 332-04A, radiated restricted band measurements are taken at 3 meters, also the distance used in calculating RF exposure to the general population was decreased to 25cm.

NOTES AND COMMENTS CONTINUED

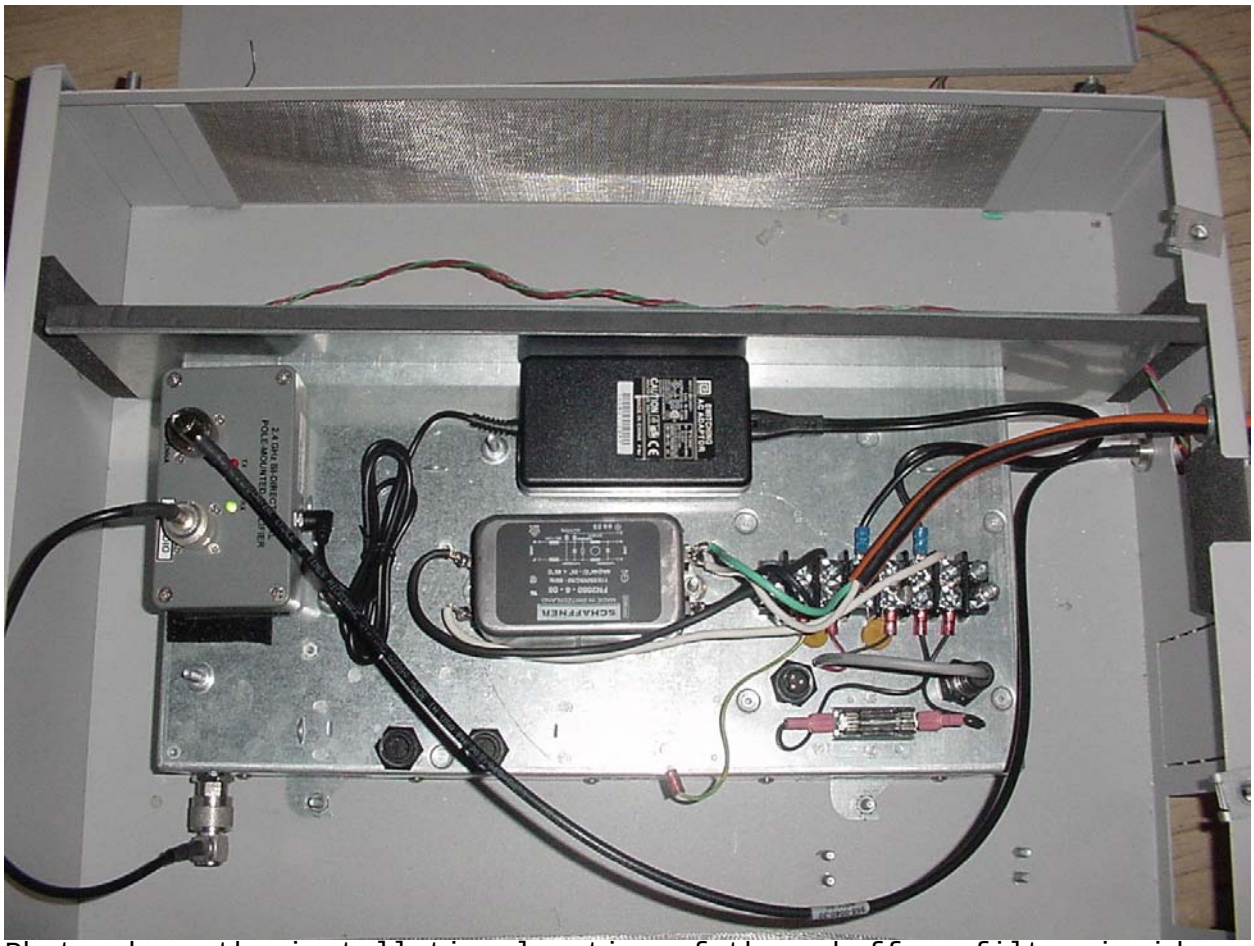

Photo shows the installation location of the schaffner filter inside the NEMA enclosure.

NOTE FROM 15.247 of FCC RULES

Note: Spread spectrum systems are sharing these bands on a noninterference basis with systems supporting critical Government requirements that have been allocated the usage of these bands, secondary only to ISM equipment operated under the provisions of Part 18 of this Chapter. Many of these Government systems are airborne radiolocation systems that emit a high EIRP which can cause interference to other users. Also, investigations of the effect of spread spectrum interference to U. S. Government operations in the 902-928 MHz band may require a future decrease in the power limits allowed for spread spectrum operation.

RSS-210 Section 15

For systems that do not employ low gain integral antennas (e.g. spread spectrum systems of section 6.2.2(o)), a notice in the **user manual** is required, as follows or equivalent:

"The installer of this radio equipment must ensure that the antenna is located or pointed such that it does not emit RF field in excess of Health Canada limits for the general population; consult Safety Code 6, obtainable from Health Canada's website www.hc-sc.gc.ca/rpb"