FCC/IC Test Report

FOR:

Model Name: Allegro MX
Ultra-Rugged Field PC with WLAN and BT radios
FCC ID: VSF22553
IC ID: 7980A-22553

47 CFR Part 15.247 for DSSS Systems

IC RSS-210 Issue 7

TEST REPORT #: EMC_JUNIP_010_10001_15.247DSSS_rev1
DATE: 2010-12-03

ilac-MRA ACCREDITED TESTING LABORATORY Certificate #2135.01

Bluetooth

Bluetooth Qualification Test Facility (BQTF)

CTIA Authorized Test Lab
LAB CODE 20020328-00

FCC listed: A2LA accredited

IC recognized # 3462B

***CETECOM* Inc.**
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CETECOM Inc. is a Delaware Corporation with Corporation number: 2113686
Board of Directors: Dr. Harald Ansorge, Dr. Klaus Matkey, Hans Peter May

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1 Assessment

The following device was tested against the applicable criteria specified in FCC rules Parts 15.247 of Title 47 of the Code of Federal Regulations and Industry Canada Standards RSS 210 Issue 7 and no deviations were ascertained during the course of the tests performed.

Company	Description	Model #
Juniper Systems	**Ultra-Rugged Field PC with WLAN and BT radios**	**Allegro MX**

Responsible for Testing Laboratory:

Date	Section	Name	Signature
2010-12-03	Compliance	Marc Douat (EMC Test Lab Manager)	

Responsible for the Report:

Date	Section	Name	Signature
2010-12-03	Compliance	Satya Radhakrishna (EMC Project Engineer)	Satya Radhakrishna I am the author of this document

2 Administrative Data

2.1 Identification of the Testing Laboratory Issuing the EMC Test Report

Company Name:	CETECOM Inc.
Department:	Compliance
Address:	411 Dixon Landing Road Milpitas, CA 95035 U.S.A.
Telephone:	+1 (408) 586 6200
Fax:	+1 (408) 586 6299
Test Lab Director:	Heiko Strehlow
Responsible Project Leader:	Satya Radhakrishna

2.2 Identification of the Client

Applicant's Name:	Juniper Systems, Inc.
Street Address:	1132 W 1700 N
City/Zip Code	Logan/84321
Country	United States
Contact Person:	Kent Campbell
Phone No.	435-753-1881
Fax:	435-774-8990
e-mail:	kent@junipersys.com

2.3 Identification of the Manufacturer

Same as above

3 Equipment under Test (EUT)

3.1 Specification of the Equipment under Test

Marketing Name:	Allegro MX
Model No:	Allegro MX
Product Type:	Ultra-Rugged Field PC with WLAN and BT radios
Hardware Revision :	0.1.7.0.
Software Revision :	2.0.2
FCC-ID:	VSF22553
IC-ID :	7980A-22553
Frequency:	ISM Band 2400-2483.5 MHz
Type(s) of Modulation:	DSSS with BPSK
Number of channels:	11
Antenna Type/Gain:	Internal PCB/ 0 dBi Gain
Power Supply:	AC Adapter with 12Vdc output
Temperature Range:	-20ºC to 75ºC

3.2 Identification of the Equipment under Test (EUT)

EUT #	Manufacturer	Model	HW Version	SW Version	Serial Number
1	Juniper Systems	Allegro MX	0.1.7.0.	2.0.2.	AMX B30
2	Juniper Systems	Allegro MX	0.1.7.0.	2.0.2.	AMX B40
3	Juniper Systems	Allegro MX	0.1.7.0.	2.0.2.	AMX B45
4	Juniper Systems	Allegro MX	0.1.7.0.	2.0.2.	AMX B46

3.3 Identification of Accessory equipment

AE #	Type	Manufacturer	Model	Serial Number
1	AC Adapter	Phihong	PSA18R-120P	P02600373A1
2	AC Adapter	Phihong	PSA18R-120P	P02600424A1
3	AC Adapter	Phihong	PSA18R-120P	P02801459A1
4	AC Adapter	Phihong	PSA18R-120P	P02801464A1

3.4 Test modes of operation:

The reason 1Mbps and 6Mbps are used are they are the lowest available data rates in 802.11 b and 802.11 g respectively and they have the maximum available duty cycle as a result. Since the duty cycle is the highest in these data rates, the transmitter is on for a greater duration and hence this is the worst case to test under.

Mode	Data rate (Mbps)	Modulation scheme	Channels Used
802.11b	1.0	BPSK	Channel 1:2412 MHz Channel 6 :2437 MHz Channel 11 :2462 MHz
802.11g	6.0	BPSK	Channel 1 :2412 MHz Channel 6 :2437 MHz Channel 11 :2462 MHz

4 Subject Of Investigation

The objective of the measurements done by Cetecom Inc. was to measure the performance of the EUT as specified by requirements listed in FCC rules Part 15.247 of Title 47 of the Code of Federal Regulations and Industry Canada rules RSS-210 Issue 7.
All testing was performed on the product referred to in Section 3 as EUT.
This test report contains full radiated and conducted testing results as per

- 47 CFR Part 15: Title 47 of the Code of Federal Regulations: Chapter I-Federal Communications Commission subchapter A- General, Part 15- Radio Frequency Devices.
- RSS-210 Issue 7: Spectrum Management and Telecommunications- Radio Standards Specification. Low-power Licence-exempt radio communication devices (All frequency bands): Category 1 equipment.

During the testing process the EUT was tested on low, mid and high channels for all the supported modes of operation. For radiated measurements, all data in this report shows the worst case between horizontal and vertical antenna polarizations and for all orientations of the EUT.

This test is to support a Class II Permissive change to the Wi-Fi Module with FCC ID VSF22553 for limited use in host body worn configuration Allegro MX. When installed in this device, the module may also be collocated with a BT module with FCC ID VSF19799AR.

5 Summary of Measurement Results

Test Specification	Test Case	Temperature and Voltage Conditions	Mode	Pass	Fail	NA	NP	Result
§15.247(b)(4) RSS210 A8.4(2)	Antenna Gain	Nominal	802.11b 802.11g	■	☐	☐	☐	Complies
§15.247(e) RSS210 A8.2(b)	Power Spectral Density	Nominal	802.11b 802.11g	☐	☐	☐	■	Complies
§15.247(a)(1) RSS210 A8.1(b)	Carrier Frequency Separation	Nominal	802.11b 802.11g	☐	☐	☐	■	Complies
§15.247(a)(1) RSS210 A8.1(d)	Number of Hopping Channels	Nominal	802.11b 802.11g	☐	☐	☐	■	Complies
§15.247(a)(1)(iii) RSS210 A8.3(1)	Time of occupancy	Nominal	802.11b 802.11g	☐	☐	☐	■	Complies
§15.247(a)(1) RSS210 A8.2(a)	Spectrum Bandwidth	Nominal	802.11b 802.11g	☐	☐	☐	■	Complies
§15.247(b)(1) RSS210 A8.4(2)	Maximum Output Power	Nominal	802.11b 802.11g	☐	☐	☐	■	Complies
§15.247(d) RSS210 A8.5	Band edge compliance-Conducted	Nominal	802.11b 802.11g	☐	☐	☐	■	Complies
§15.247(d) RSS210 A8.5	Band edge compliance-Radiated	Nominal	802.11b 802.11g	■	☐	☐	☐	Complies
§15.247(d) RSS210 A8.5	TX Spurious emissions-Conducted	Nominal	802.11b 802.11g	☐	☐	☐	■	Complies
§15.247(d) RSS210 A8.5	TX Spurious emissions-Radiated	Nominal	802.11b 802.11g	■	☐	☐	☐	Complies
§15.209(a) RSS Gen	TX Spurious Emissions Radiated<30MHz	Nominal	802.11b 802.11g	■	☐	☐	☐	Complies
§15.109 RSS Gen	RX Spurious Emissions Radiated	Nominal	802.11b 802.11g	■	☐	☐	☐	Complies
§15.107(a)	Conducted Emissions <30MHz	Nominal	802.11b 802.11g	■	☐	☐	☐	Complies

Note: NA= Not Applicable; NP= Not Performed.
NP: data leveraged from Module data/ refer to test report # R0708036. Band Edge compliance-conducted is NOT PERFORMED as the device passes radiated measurement.

6 Measurements

6.1 Radiated Measurement Procedure

ANSI C63.4 Section 8.3.1.1: Exploratory radiated emission measurements

Exploratory radiated measurements shall be performed at the measurement distance or at a closer distance than that specified for compliance to determine the emission characteristics of the EUT. At near distances, for EUTs of comparably small size, it is relatively easy to determine the spectrum signature of the EUT and, if applicable, the EUT configuration that produces the maximum level of emissions. A shielded room may be used for exploratory testing, but may have anomalies that can lead to significant errors in amplitude measurements.

Broadband antennas and a spectrum analyzer or a radio-noise meter with a panoramic display are often useful in this type of testing. It is recommended that either a headset or loudspeaker be connected as an aid in detecting ambient signals and finding frequencies of significant emission from the EUT when the exploratory and final testing is performed in an OATS with strong ambient signals. Caution should be taken if either antenna height between 1 and 4 meters or EUT azimuth is not fully explored. Not fully exploring these parameters during exploratory testing may require complete testing at the OATS or semi-anechoic chamber when the final full spectrum testing is conducted.

The EUT should be set up in its typical configuration and arrangement, and operated in its various modes. For tabletop systems, cables or wires should be manipulated within the range of likely arrangements. For floor-standing equipment, the cables or wires should be located in the same manner as the user would install them and no further manipulation is made. For combination EUTs, the tabletop and floor-standing portions of the EUT shall follow the procedures for their respective setups and cable manipulation. If the manner of cable installation is not known, or if it changes with each installation, cables or wires for floor-standing equipment shall be manipulated to the extent possible to produce the maximum level of emissions.

For each mode of operation required to be tested, the frequency spectrum shall be monitored. Variations in antenna height between 1 and 4 m, antenna polarization, EUT azimuth, and cable or wire placement (each variable within bounds specified elsewhere) shall be explored to produce the emission that has the highest amplitude relative to the limit. A step-by-step technique for determining this emission can be found in Annex C.

When measuring emissions above 1 GHz, the frequencies of maximum emission shall be determined by manually positioning the antenna close to the EUT and by moving the antenna over all sides of the EUT while observing a spectral display. It will be advantageous to have prior knowledge of the frequencies of emissions above 1 GHz. If the EUT is a device with dimensions approximately equal to that of the measurement antenna beamwidth, the measurement antenna shall be aligned with the EUT.

ANSI C63.4 Section 8.3.1.2: Final radiated emission measurements

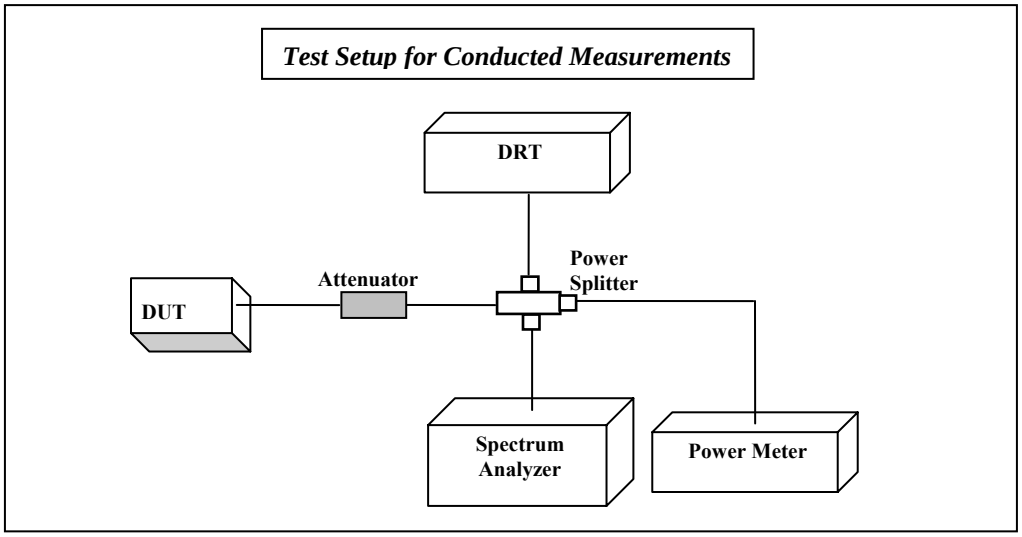
Based on the measurement results in 8.3.1.1, the one EUT, cable and wire arrangement, and mode of operation that produces the emission that has the highest amplitude relative to the limit is selected for the final measurement. The final measurement is then performed on a site meeting the requirements of 5.3, 5.4, or 5.5 as appropriate without variation of the EUT arrangement or EUT mode of operation. If the EUT is relocated from an exploratory test site to a final test site, the highest emission shall be remaximized at the final test location before final radiated emissions measurements are performed. However, antenna height and polarity and EUT azimuth are to be varied. In addition, the full frequency spectrum (for the range to be checked for meeting compliance) shall be investigated.

This investigation is performed with the EUT rotated 360°, the antenna height scanned between 1 m and 4 m, and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations. During the full frequency spectrum investigation, particular focus should be made on those frequencies found in exploratory testing that were used to find the final test configuration, mode of operation, and arrangement (associated with achieving the least margin with respect to the limit). This full spectrum test constitutes the compliance measurement.

For measurements above 1 GHz, use the cable, EUT arrangement, and mode of operation determined in the exploratory testing to produce the emission that has the highest amplitude relative to the limit. Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the antenna in the “cone of radiation” from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response. The antenna may have to be higher or lower than the EUT, depending on the EUT’s size and mounting height, but the antenna should be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane. If the transmission line for the measurement antenna restricts its range of height and polarization, the steps needed to ensure the correct measurement of the maximum emissions, shall be described in detail in the report of measurements. Data collected shall satisfy the report requirements of Clause 10.
NOTES

1— Where limits are specified by agencies for both average and peak (or quasi-peak) detection, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement.
2—Use of waveguide and flexible waveguide may be necessary at frequencies above 10 GHz to achieve usable signal-to noise ratios at required measurement distances. If so, it may be necessary to restrict the height search of the antenna, and special care should be taken to ensure that maximum emissions are correctly measured.
3—All presently known devices causing emissions above 10 GHz are physically small compared with the beam-widths of typical horn antennas used for EMC measurements. For such EUTs and frequencies, it may be preferable to vary the height and polarization of the EUT instead of the receiving antenna to maximize the measured emissions.

6.2 Conducted Measurement Procedure



1. Connect the equipment as shown in the above diagram.
2. Adjust the settings of the Digital Radio Communication Tester (DRT) to connect the EUT at the required channel (OR) alternatively use the EUT to set to transmit at a specific mode.
3. Measurements are to be performed with the EUT set to the low, middle and high channels.

6.3 Maximum Peak Output Power

6.3.1 References:

FCC CFR §2.1046
RSS-Gen 4.8

6.3.2 Measurement requirements:

6.3.2.1 FCC 2.1046: RF power output.

Power output shall be measured at the RF output terminals when the transmitter is adjusted in accordance with the tune-up procedure to give the values of current and voltage on circuit elements as specified. The electrical characteristics of the radio frequency load attached to the output terminals when this test is made shall be stated.

6.3.2.2 RSS-Gen 4.8: RF power output.

Transmitter output power measurements shall be carried out before the unwanted emissions test. The transmitter output power value, obtained from this test, serves as the reference level used to determine the unwanted emissions.

6.3.3 Limits:

6.3.3.1 §15.247 (b)(1)

The maximum peak conducted output power of the intentional radiator shall not exceed the following: For frequency hopping systems operating in the 2400–2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725–5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400–2483.5 MHz band: 0.125 watts.

6.3.3.2 RSS 210- A8.4(2)

Nominal Peak Output Power < 30 dBm (1W)
EIRP < 36dBm

6.3.4 Test Conditions:

Tnom: 25°C; Vnom: 4.2 V

Spectrum Analyzer settings:

RBW=20MHz, VBW=30MHz, Detector: Peak- Max Hold.
Sweep Time: Auto
Span=40MHz

Antenna Gain (dBi):

Low Channel: 0 dBi
Mid Channel: 0 dBi
High Channel: 0 dBi

Conducted tests results can be obtained from test report no. R0708036 issued by Bay Area Compliance Laboratories Corp. (BACL) .The output power measurements according to the report were performed with a spectrum analyzer using its peak detector function.

6.3.5 Test Result:

Conducted peak power was measured with a peak detector.

Output Power- Conducted (dBm)			
Mode	**Frequency (MHz)**		
	2412 Channel 1	**2437 Channel 6**	**2462 Channel 11**
	Peak	Peak	Peak
802.11b	14.71	14.77	14.69
802.11g	12.24	12.27	12.40
Measurement Uncertainty: ±0.5dB			

EIRP is calculated from conducted peak power.

Max Peak Output Power- Radiated (dBm)			
Mode	**Frequency (MHz)**		
	2412 Channel 1	**2437 Channel 6**	**2462 Channel 11**
802.11b	14.71	14.77	14.69
802.11g	12.24	12.27	12.40
Measurement Uncertainty: ±3dB			

Note: Radiated EIRP is calculated as
Conducted Measurement + Antenna Gain (0 dBi)

6.3.5.1 Measurement Result

Pass.

6.4 Restricted Band Edge Compliance

6.4.1 References:

FCC CFR §2.1053
RSS-210 A8.5

6.4.2 Limits: §15.247/15.205

(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
[1]0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2690 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	([2])
13.36 - 13.41			

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

6.4.3 Measurement Procedure:

Peak measurements are made using a peak detector and RBW=1MHz.
Average measurements performed using a peak detector and according to video averaging procedure with RBW=1MHz and VBW=10Hz.
*PEAK LIMIT= 74dBµV/m
*AVG. LIMIT= 54dBµV/m
Measurement Uncertainty: ±3.0dB

6.4.3.1 Measurement Result

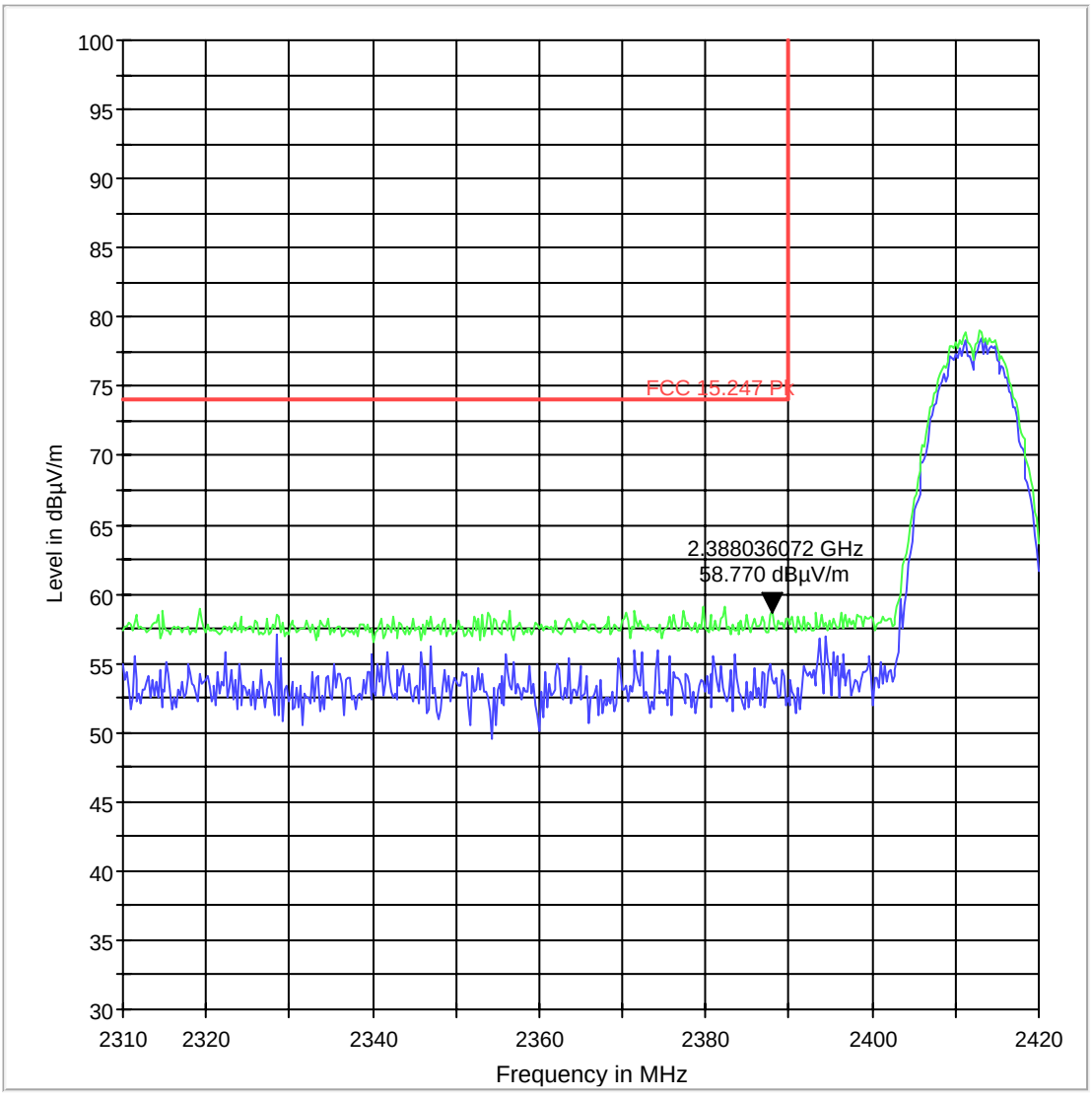
Pass.

6.4.4 Test Data/plots:

Lower band edge peak -802.11b mode

Description: Ultra-Rugged Field PC with WLAN and BT radios:
EUT Name: Allegro MX
Manufacturer: Juniper Systems
Serial Number: AMX B45
Comment : 802.11b ch1 (2412MHz) TX

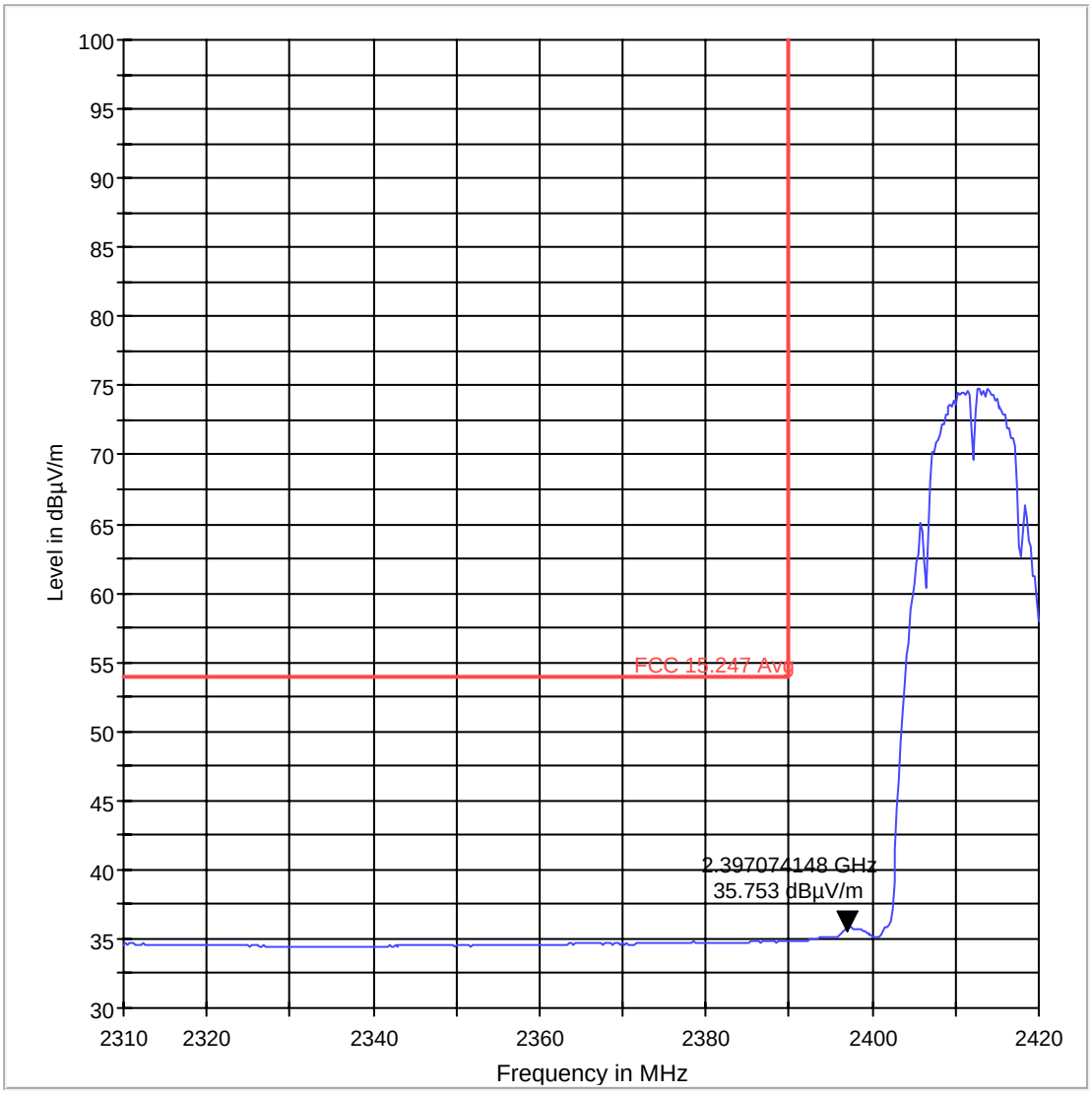
FCC 15.247 LBE Pk 3m



Lower band edge average -802.11b mode

Description: Ultra-Rugged Field PC with WLAN and BT radios:
EUT Name: Allegro MX
Manufacturer: Juniper Systems
Serial Number: AMX B45
Comment : 802.11b ch1 (2412MHz) TX

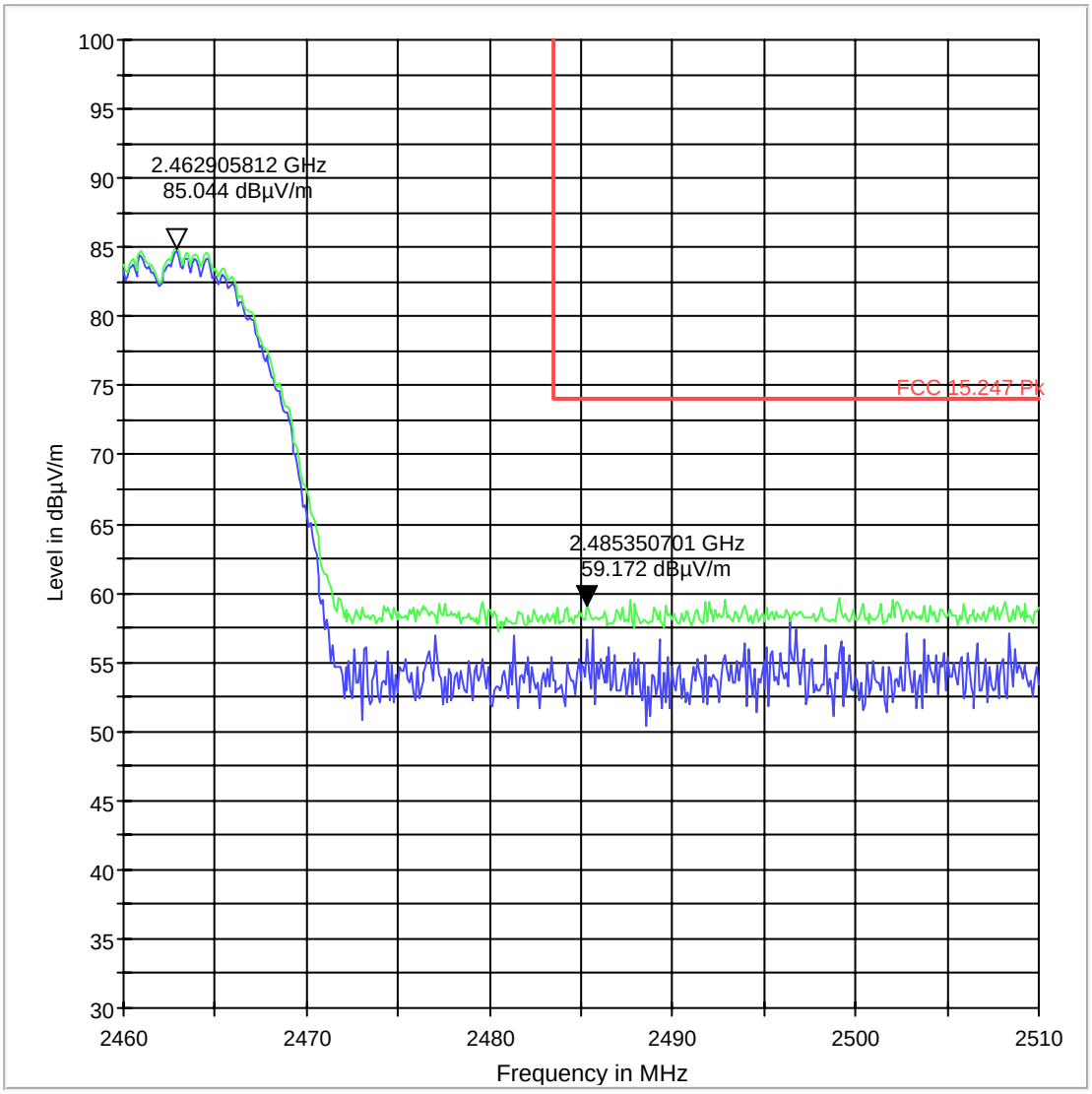
FCC 15.247 LBE Avg 3m



Higher band edge peak -802.11b mode

Description: Ultra-Rugged Field PC with WLAN and BT radios:
EUT Name: Allegro MX
Manufacturer: Juniper Systems
Serial Number: AMX B45
Comment : 802.11b ch11 (2462MHz) TX

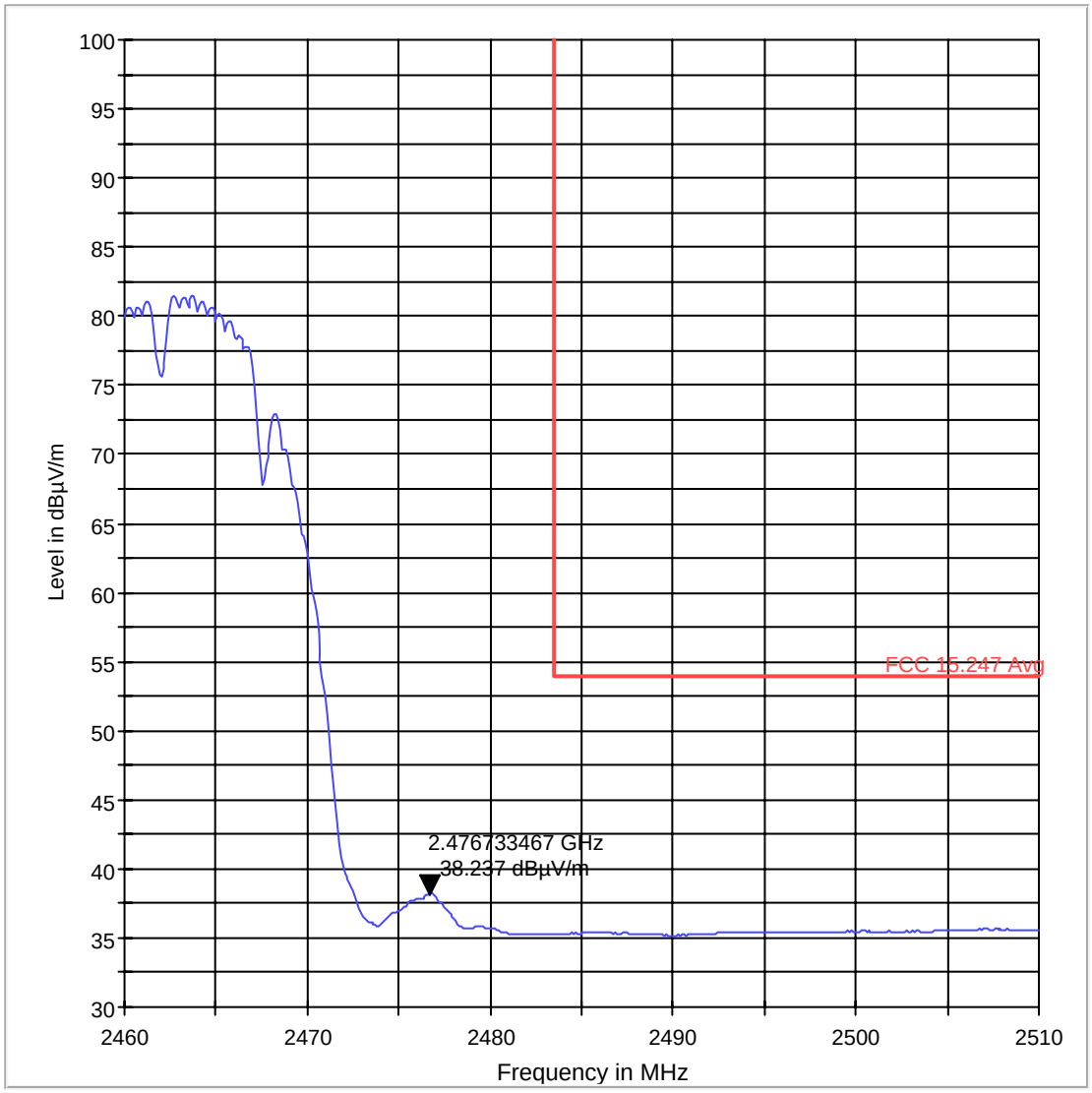
FCC 15.247 HBE Pk 3m



Higher band edge average-802.11b mode

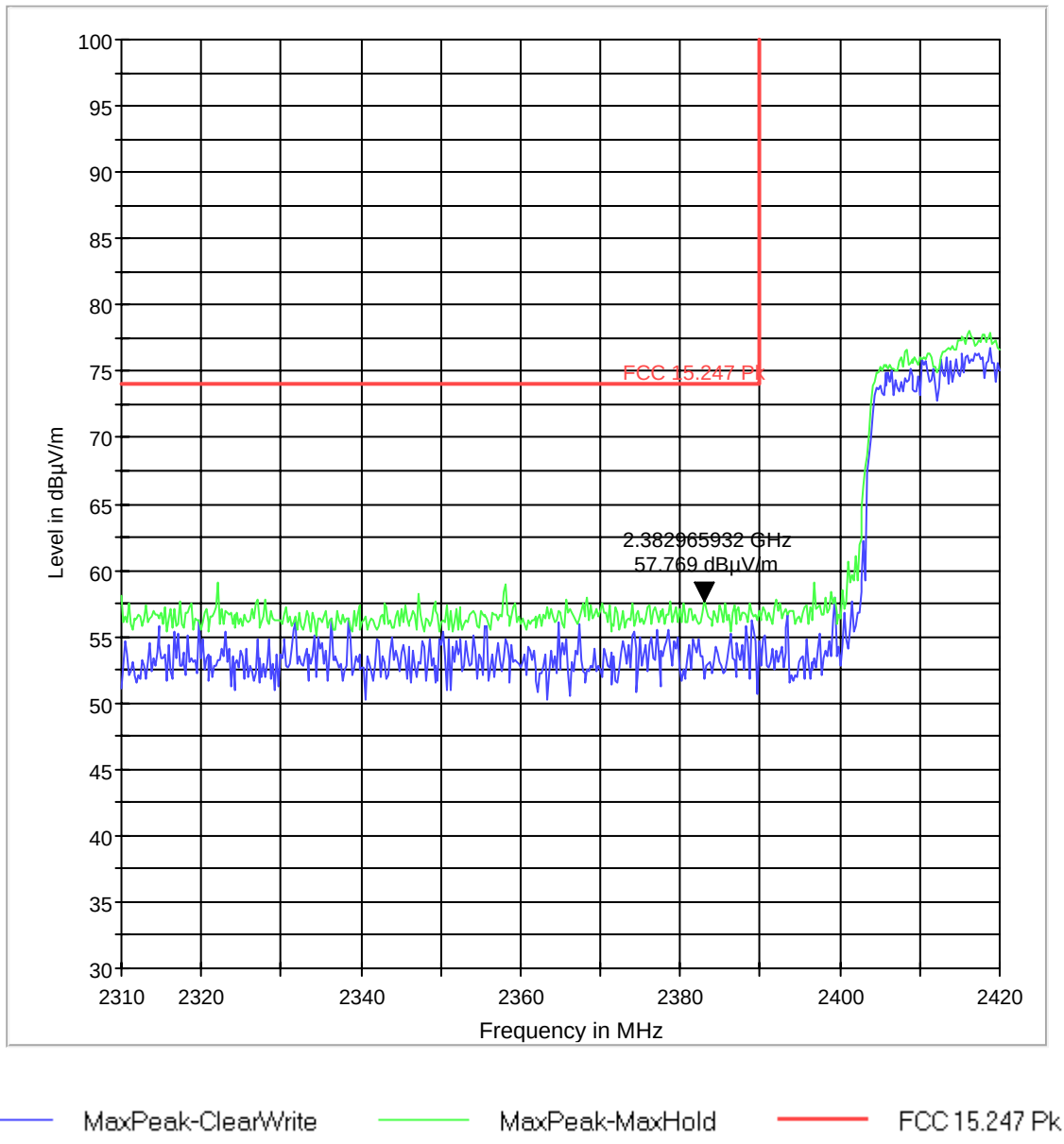
Description: Ultra-Rugged Field PC with WLAN and BT radios:
EUT Name: Allegro MX
Manufacturer: Juniper Systems
Serial Number: AMX B45
Comment : 802.11b ch11 (2462MHz) TX

FCC 15.247 HBE Avg 3m



Lower band edge peak – 802.11g mode

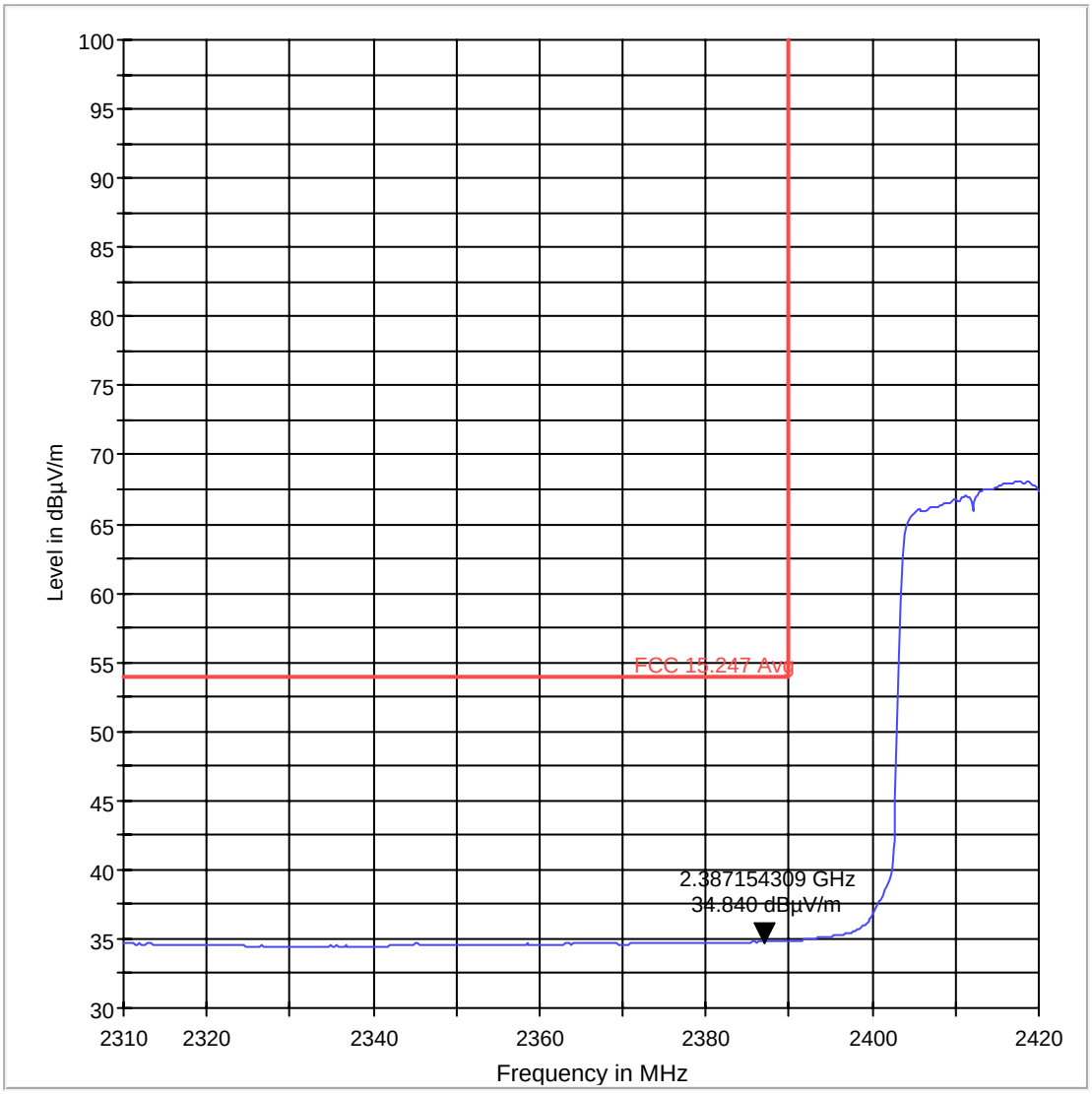
Description: Ultra-Rugged Field PC with WLAN and BT radios:
EUT Name: Allegro MX
Manufacturer: Juniper Systems
Serial Number: AMX B45
Comment : 802.11g ch1 (2412MHz) TX



Lower band edge average -802.11g mode

Description: Ultra-Rugged Field PC with WLAN and BT radios:
EUT Name: Allegro MX
Manufacturer: Juniper Systems
Serial Number: AMX B45
Comment : 802.11g ch1 (2412MHz) TX

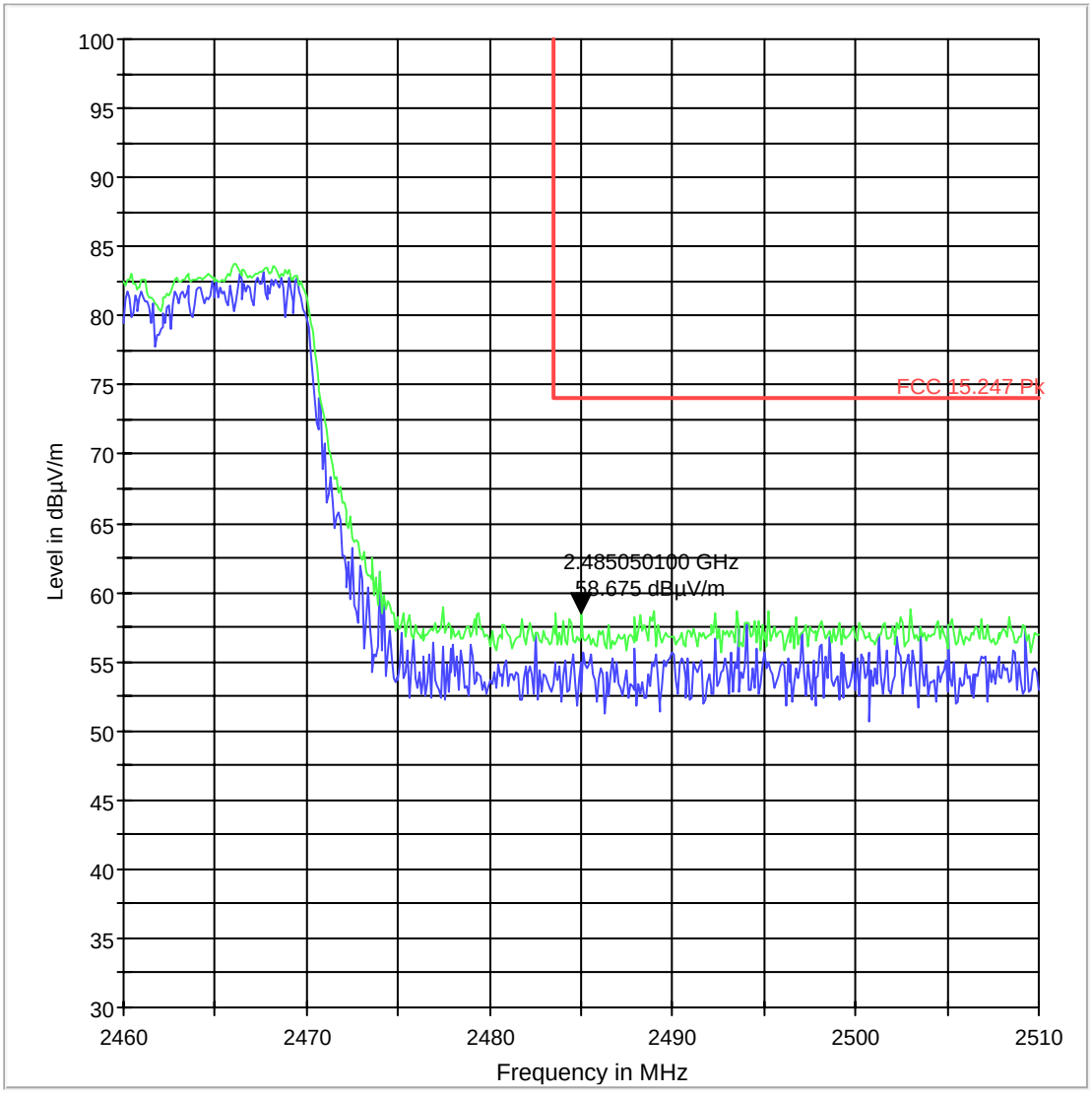
FCC 15.247 LBE Avg 3m



Higher band edge peak -802.11g mode

Description: Ultra-Rugged Field PC with WLAN and BT radios:
EUT Name: Allegro MX
Manufacturer: Juniper Systems
Serial Number: AMX B45
Comment : 802.11g ch11 (2462MHz) TX

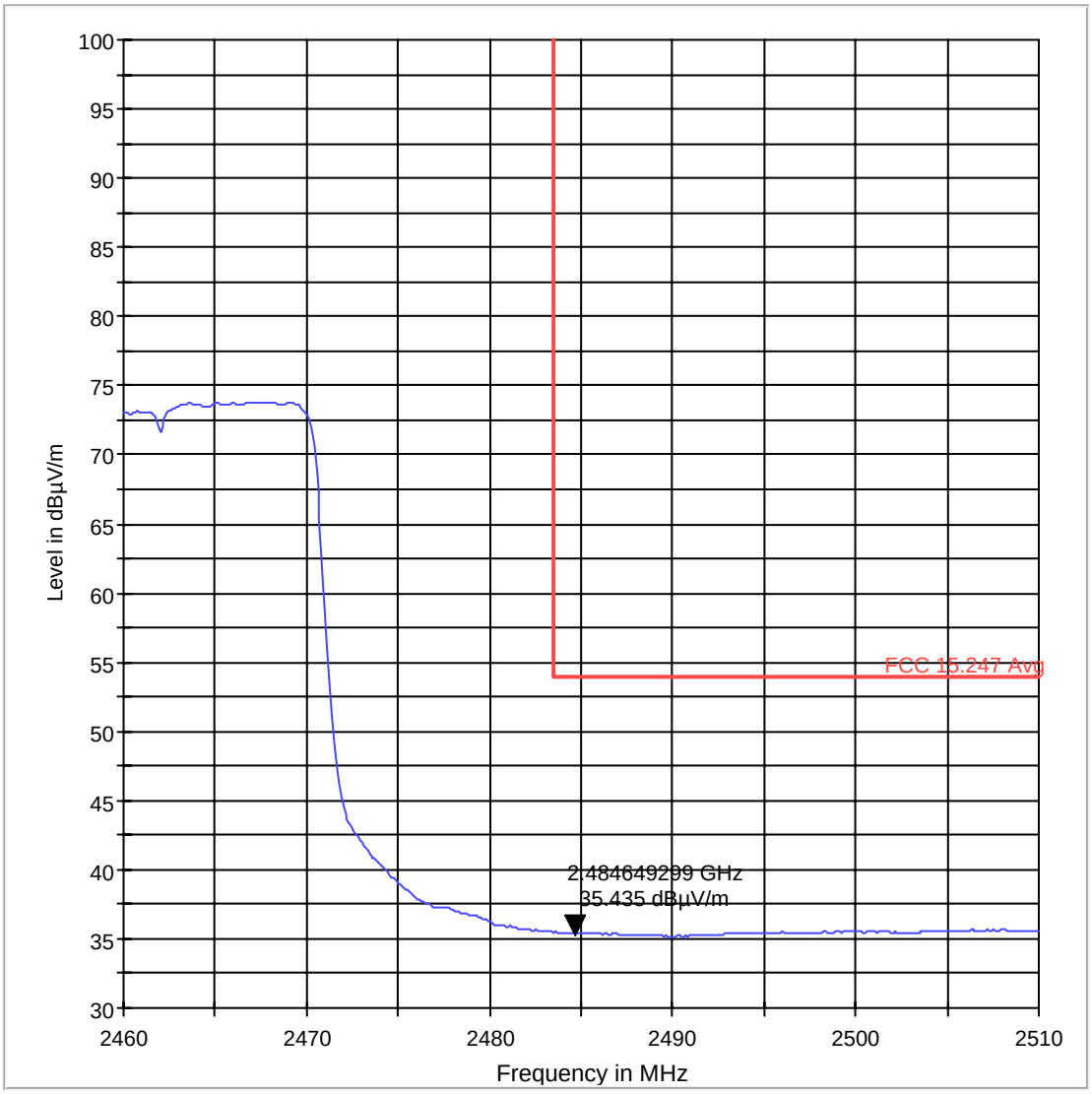
FCC 15.247 HBE Pk 3m



Higher band edge average- 802.11g mode

Description: Ultra-Rugged Field PC with WLAN and BT radios:
EUT Name: Allegro MX
Manufacturer: Juniper Systems
Serial Number: AMX B45
Comment : 802.11g ch11 (2462MHz) TX

FCC 15.247 HBE Avg 3m



6.5 Transmitter Spurious Emissions- Radiated

6.5.1 References:

FCC CFR 2.1053
RSS-Gen Section 4.9; RSS 210-A8.5

6.5.2 Measurement requirements:

6.5.2.1 FCC 2.1053: Field strength of spurious radiation.

Measurements shall be made to detect spurious emissions that may be radiated directly from the cabinet, control circuits, power leads or intermediate circuit elements under normal conditions of installation and operation. Curves or equivalent data shall be supplied showing the magnitude of each harmonic and other spurious emission.

6.5.2.2 RSS-Gen 4.9: Transmitter unwanted spurious emissions

The same parameter, peak power or average power, used for the transmitter output power measurement shall be used for unwanted emission measurements.
The search for unwanted emissions shall be from the lowest frequency internally generated or used in the device (local oscillator, intermediate or carrier frequency), or from 30 MHz, whichever is the lower, to the 5th harmonic of the highest frequency generated without exceeding 40 GHz.

6.5.3 Limits:

§15.247/15.205
RSS 210-A8.5

(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
[1]0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2690 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	([2])
13.36 - 13.41			

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under Section A8.4(4), the attenuation required shall be 30 dB instead of 20 dB.
*PEAK LIMIT= 74dBµV/m
*AVG. LIMIT= 54dBµV/m

Table 1:

Frequency of emission (MHz)	Field strength (µV/m)
30–88	100 (40dBµV/m)
88–216	150 (43.5 dBµV/m)
216–960	200 (46 dBµV/m)
Above 960	500 (54 dBµV/m)

Table 2:

Frequency of emission (MHz)	Field strength (µV/m)	Measurement Distance (m)
0.009–0.490	2400/F(kHz)	300
0.490–1.705	24000/F(kHz)	30
1.705–30.0	30	30

6.5.4 Test Result:

Test mode: *Modulation:* 802.11b- since highest conducted power
Unless mentioned otherwise, the emissions outside the limit lines in the plots are from the transmit signal.
Plots reported here represent the worse case emissions for horizontal and vertical antenna polarizations and for three orientations of the EUT.
Measurement Uncertainty: ±3.0dB

6.5.4.1 Measurement Result

Pass.

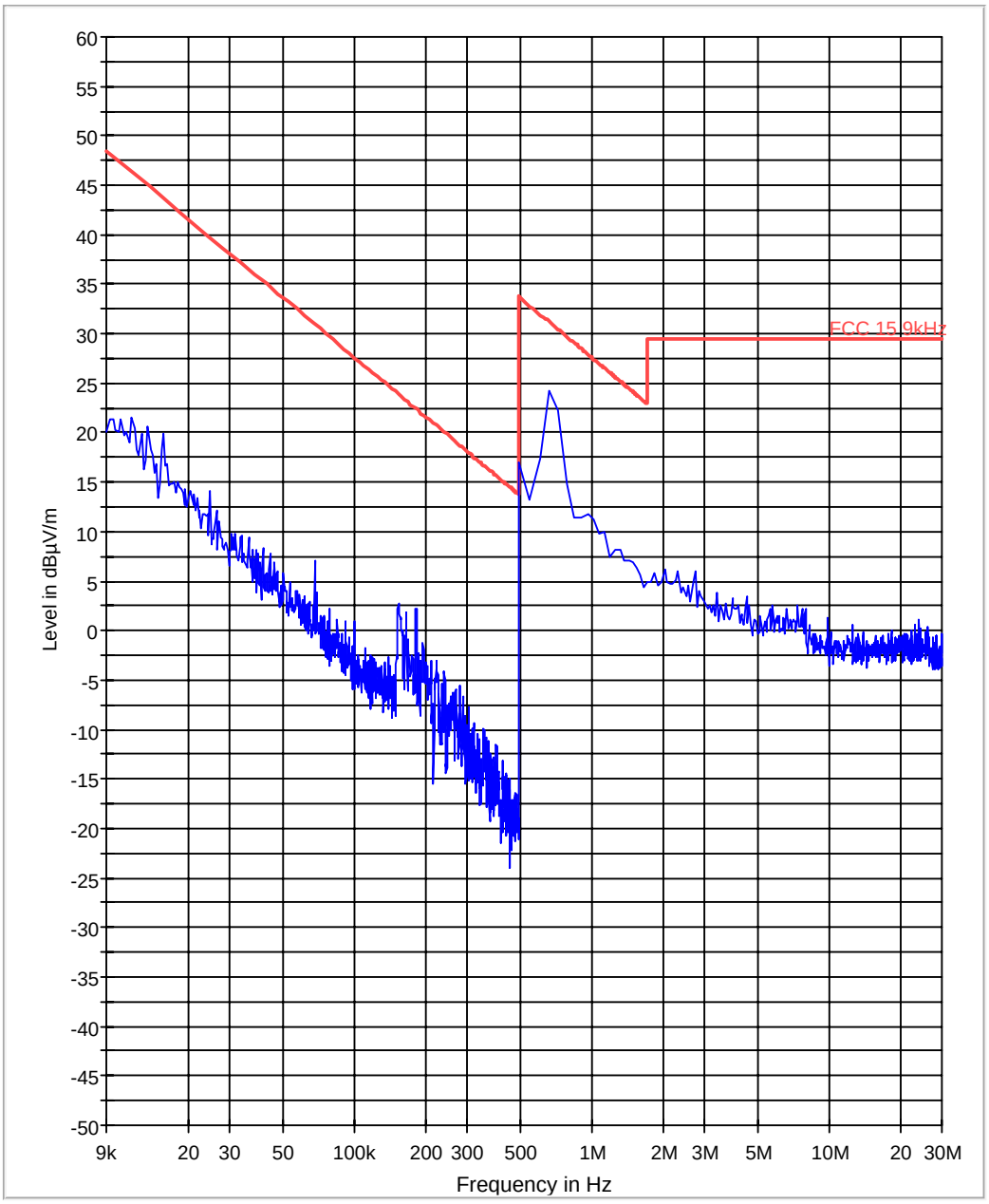
No spurious emissions reported below 30MHz.

6.5.5 Test data/ plots:

Transmitter Radiated Spurious Emission- 9 kHz-30 MHz

Description: Ultra-Rugged Field PC with WLAN and BT radios:
EUT Name: Allegro MX
Manufacturer: Juniper Systems
Serial Number: AMX B45
Comment : 802.11b ch1 (2412MHz) TX

FCC 15 9kHz - 30 MHz

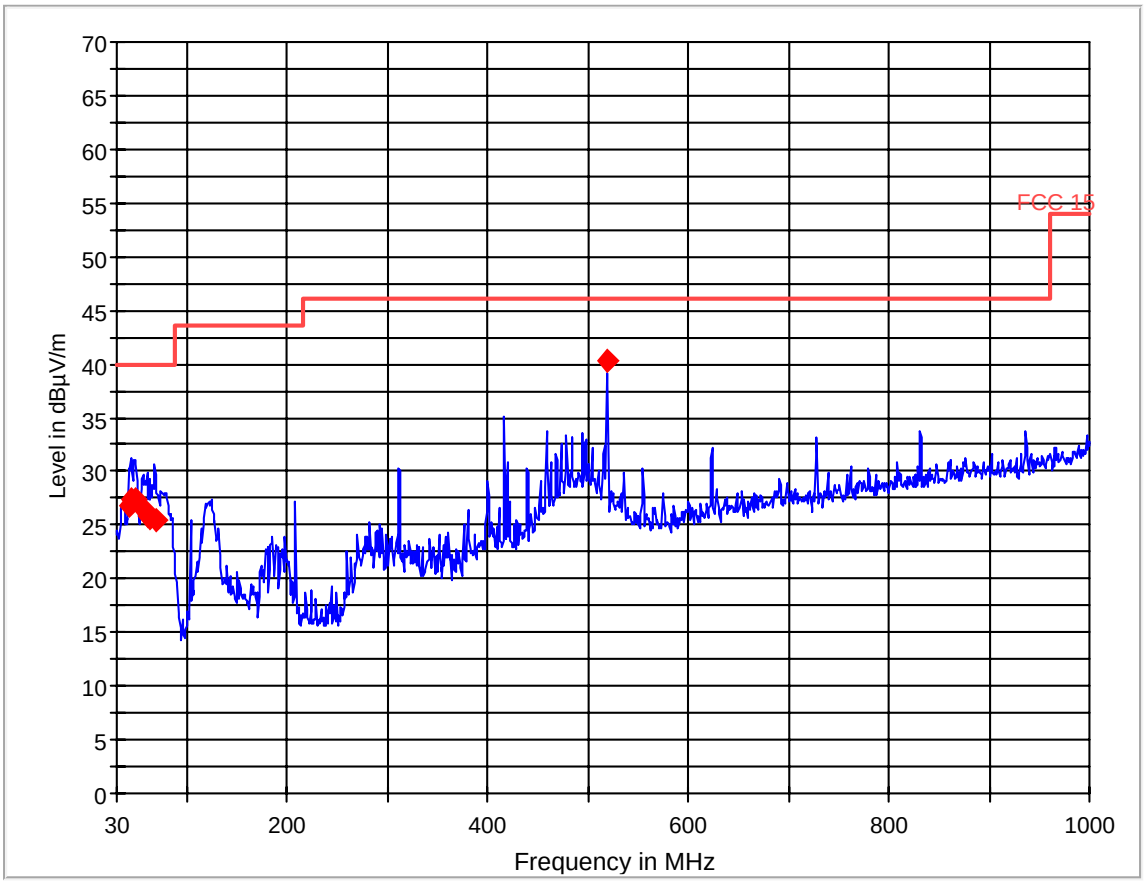


Transmitter Radiated Spurious Emission- Ch1- 30M-1GHz

Description: Ultra-Rugged Field PC with WLAN and BT radios:
EUT Name: Allegro MX
Manufacturer: Juniper Systems
Serial Number: AMX B45
Comment : 802.11b ch1 (2412MHz) TX

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
43.165050	26.7	20.0	120.000	120.0	V	0.0	5.9	13.3	40.0
44.904115	27.3	20.0	120.000	120.0	V	90.0	6.1	12.7	40.0
47.629134	27.4	20.0	120.000	120.0	V	135.0	6.5	12.6	40.0
57.194718	26.5	20.0	120.000	120.0	V	45.0	7.6	13.5	40.0
61.234009	25.9	20.0	120.000	120.0	V	24.0	8.1	14.1	40.0
63.226540	25.6	20.0	120.000	120.0	V	248.0	8.3	14.4	40.0
68.214485	25.4	20.0	120.000	120.0	V	0.0	8.9	14.6	40.0
520.014026	40.4	20.0	120.000	120.0	V	0.0	21.4	5.6	46.0

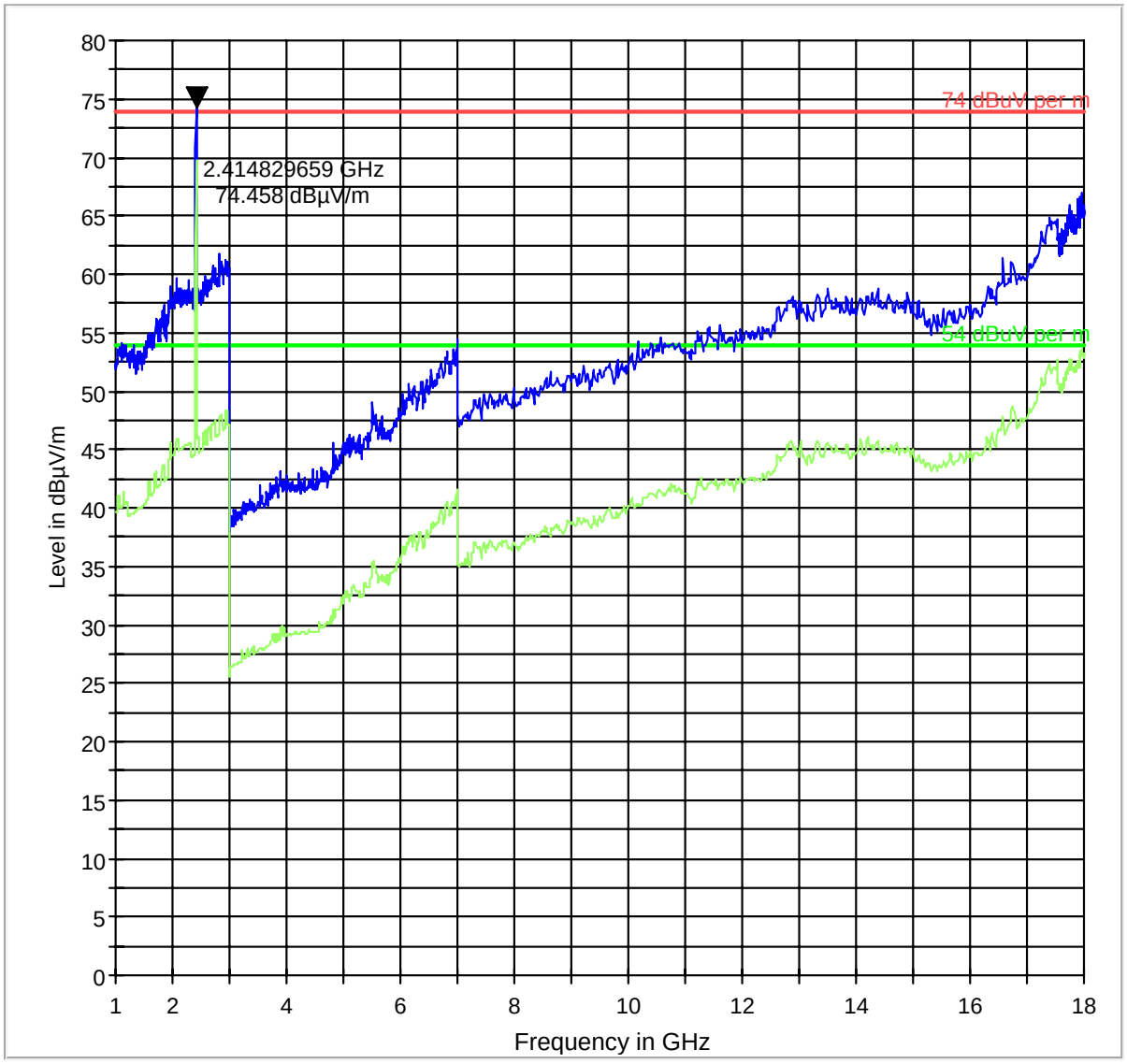
FCC 15 30-1000MHz



Transmitter Radiated Spurious Emission- Ch1- 1GHz-18GHz

Description: Ultra-Rugged Field PC with WLAN and BT radios:
EUT Name: Allegro MX
Manufacturer: Juniper Systems
Serial Number: AMX B45
Comment: Marker placed on transmit signal; 802.11b ch1 (2412MHz) TX

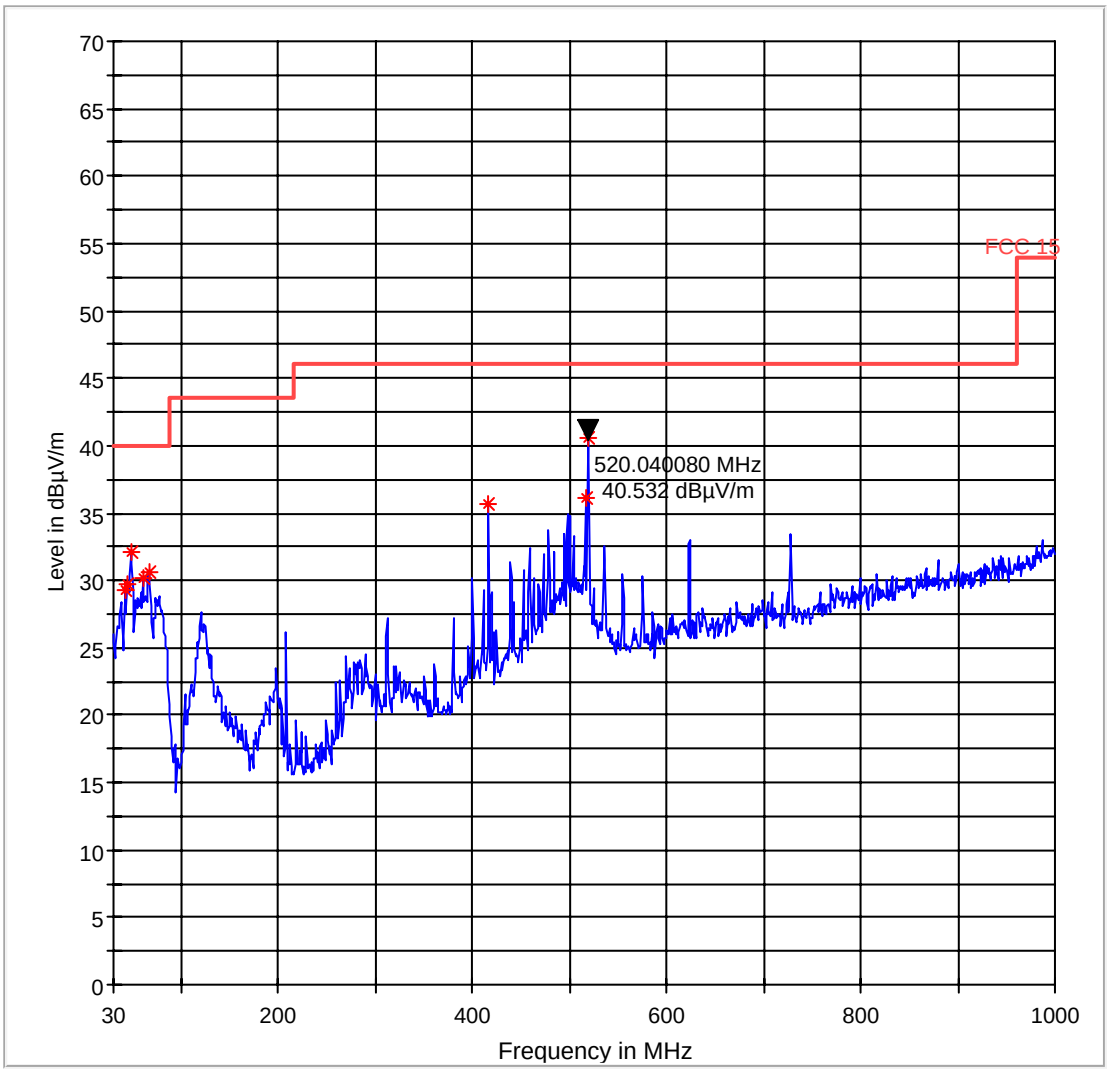
FCC 15 1-18GHz



Transmitter Radiated Spurious Emission- Ch6- 30MHz-1GHz

EUT Name: Allegro MX
Manufacturer: Juniper Systems
Serial Number: AMX B45
Comment: 802.11b ch6 (2437MHz) TX

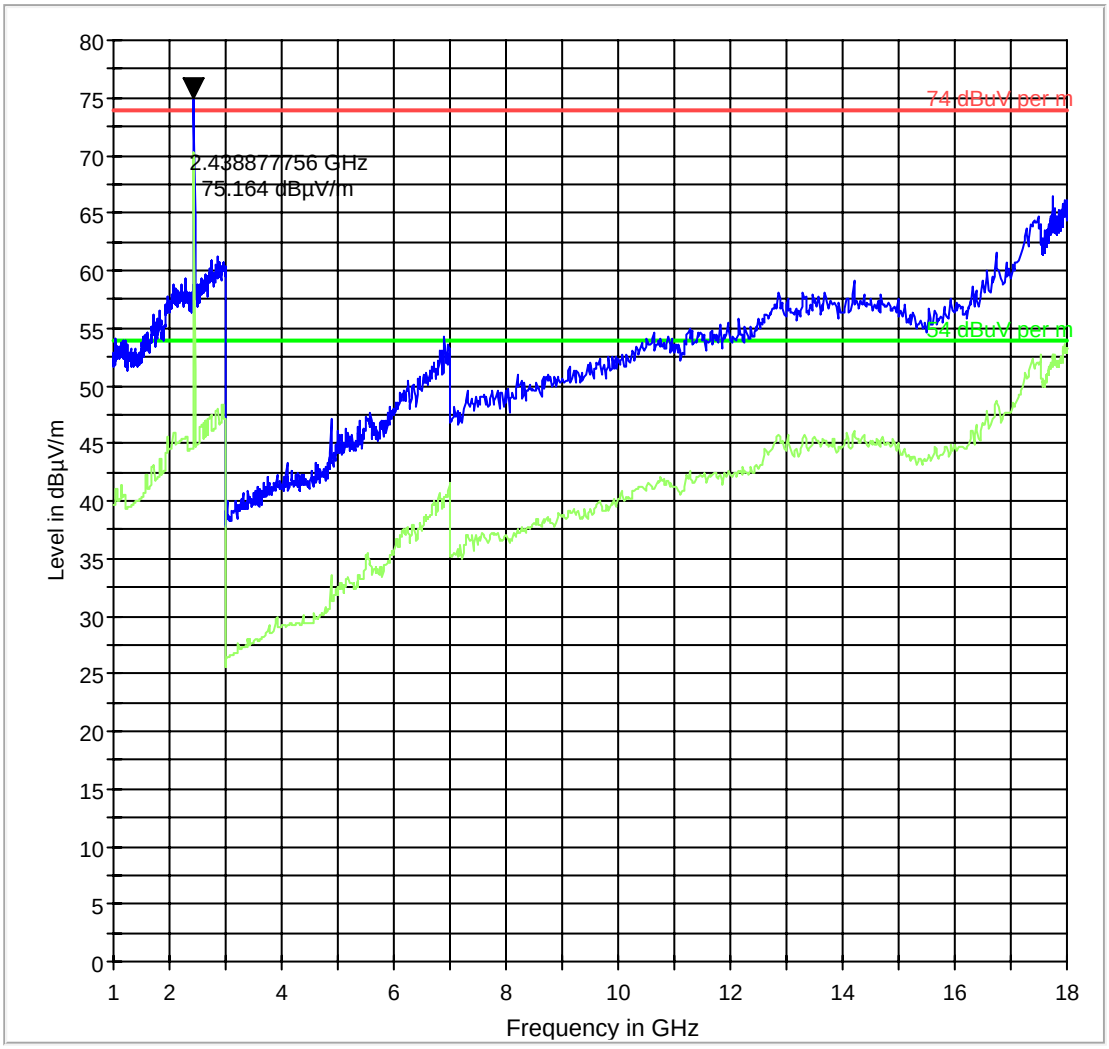
FCC 15 30-1000MHz



Transmitter Radiated Spurious Emission Ch6- 1GHz-18GHz

Description: Ultra-Rugged Field PC with WLAN and BT radios:
EUT Name: Allegro MX
Manufacturer: Juniper Systems
Serial Number: AMX B45
Comment: Marker placed on transmit signal; 802.11b ch6 (2437MHz) TX

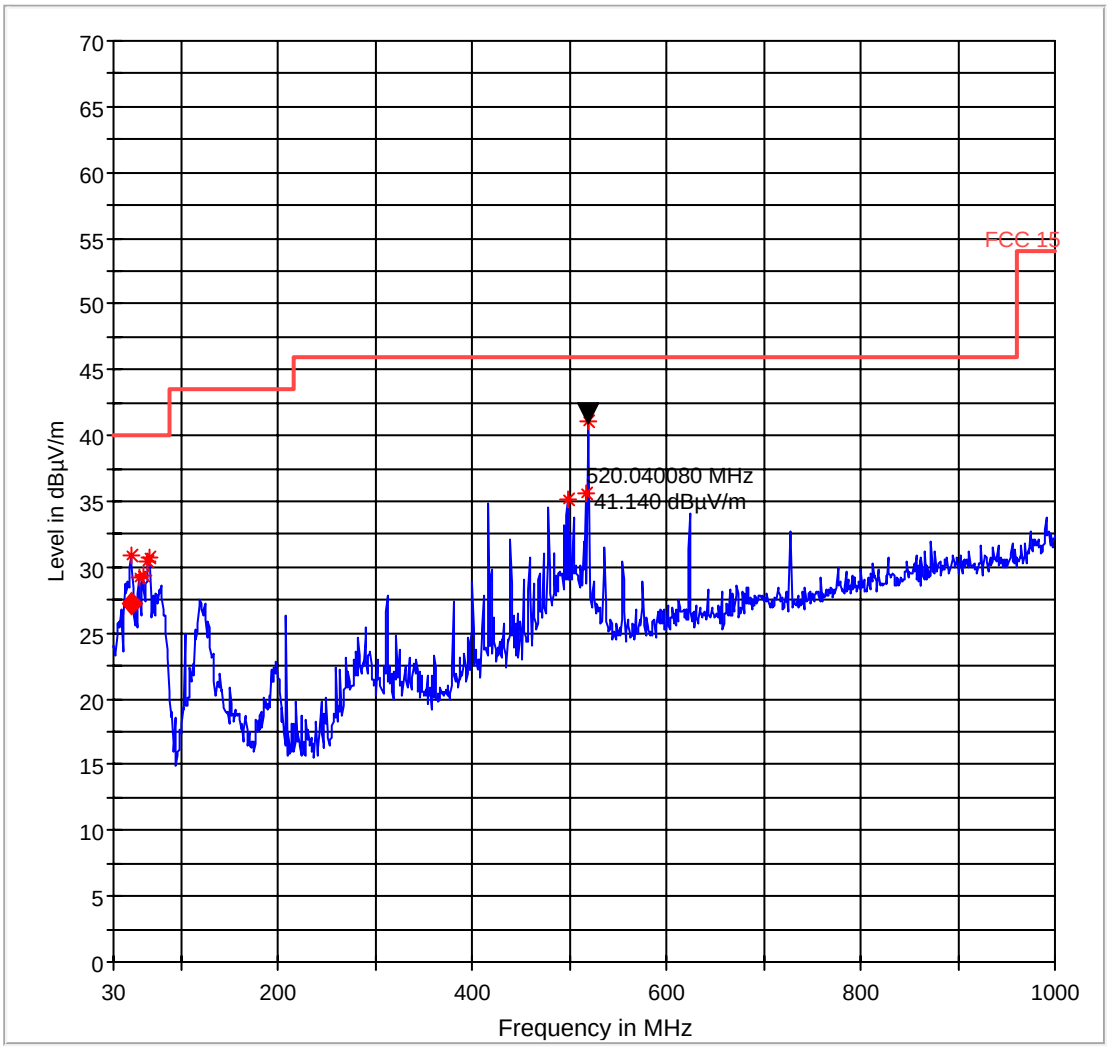
FCC 15 1-18GHz



Transmitter Radiated Spurious Emission- Ch11- 30MHz-1GHz

EUT Name: Allegro MX
Manufacturer: Juniper Systems
Serial Number: AMX B45
Comment: 802.11b ch11 (2462MHz) TX

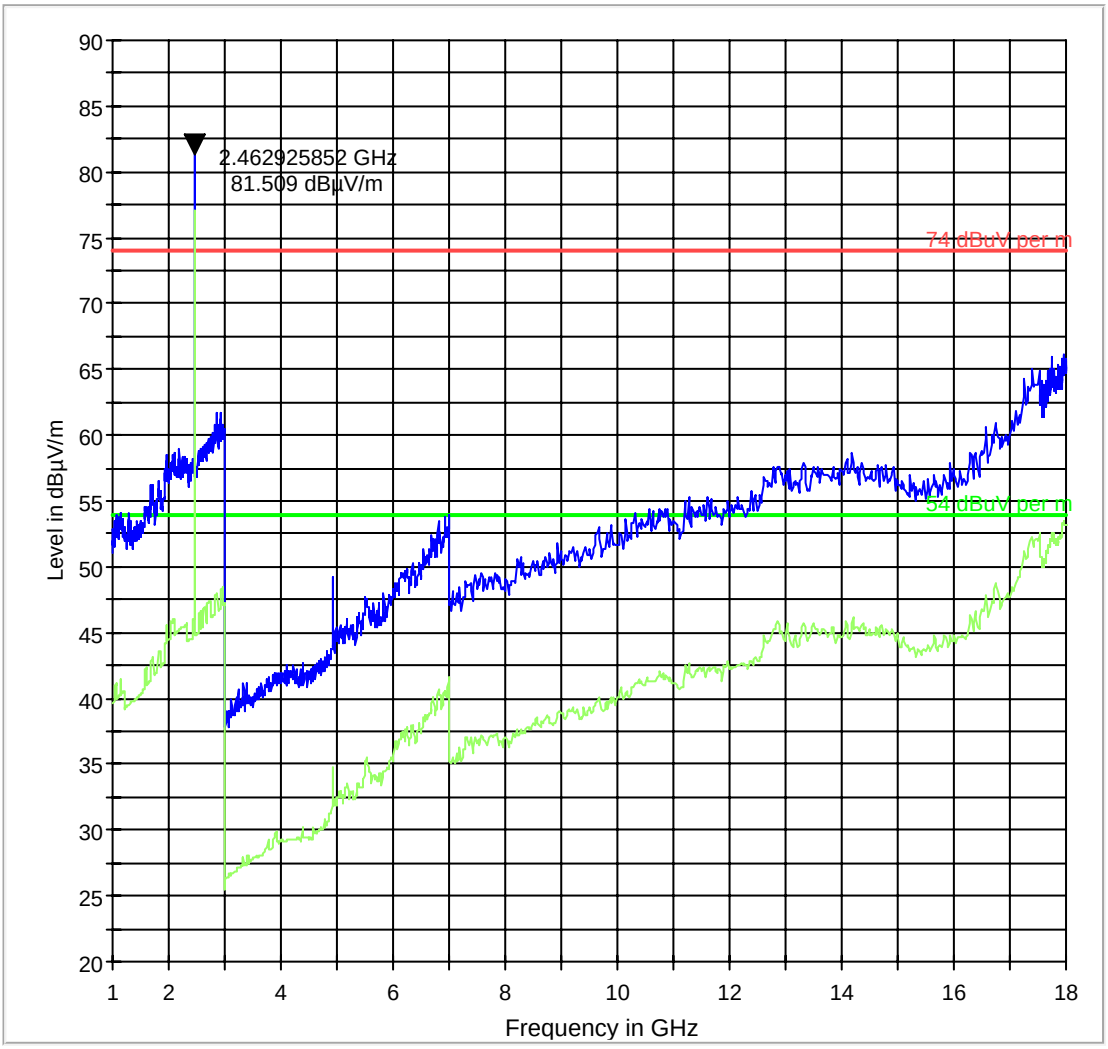
FCC 15 30-1000MHz



Transmitter Radiated Spurious Emission- Ch11- 1GHz-18GHz

Description: Ultra-Rugged Field PC with WLAN and BT radios:
EUT Name: Allegro MX
Manufacturer: Juniper Systems
Serial Number: AMX B45
Comment: Marker placed on transmit signal; 802.11b ch11 (2462MHz) TX

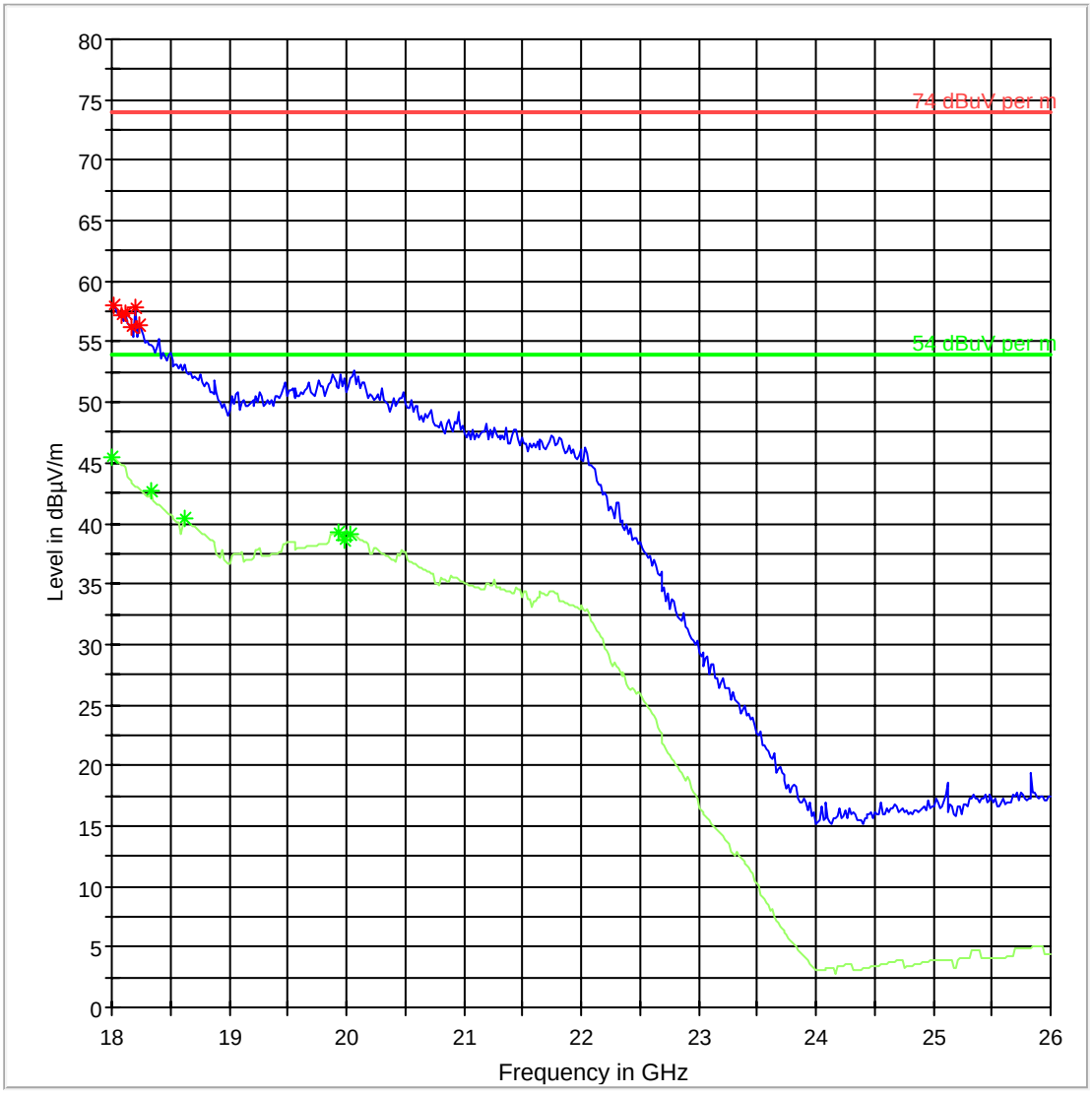
FCC 15 1-18GHz



Transmitter Radiated Spurious Emission- Ch11- 18GHz-26GHz

Description: Ultra-Rugged Field PC with WLAN and BT radios:
EUT Name: Allegro MX
Manufacturer: Juniper Systems
Serial Number: AMX B45
Comment: 802.11b ch11 (2462MHz) TX

FCC 15 18-26GHz



74 dBuV per m
54 dBuV per m
MaxPeak-ClearWrite
Average-ClearWrite

6.6 Receiver Spurious Emissions- Radiated

6.6.1 Limits:

6.6.1.1 FCC CFR §15.109
6.6.1.2 RSS-210

Frequency of emission (MHz)	Field strength (µV/m)	Measurement Distance (m)
0.009–0.490	2400/F(kHz)	300
0.490–1.705	24000/F(kHz)	30
1.705–30.0	30	30
30–88	100 (40dBµV/m)	3
88–216	150 (43.5 dBµV/m)	3
216–960	200 (46 dBµV/m)	3
Above 960	500 (54 dBµV/m)	3

6.6.2 Test Conditions:

Mode: Receive mode
Measurement Uncertainty: ±3.0dB

6.6.3 Test Result:

No significant emissions measurable. Plots reported here represent the worse case emissions for horizontal and vertical antenna polarizations and for three orientations of the EUT.

6.6.3.1 Measurement Result

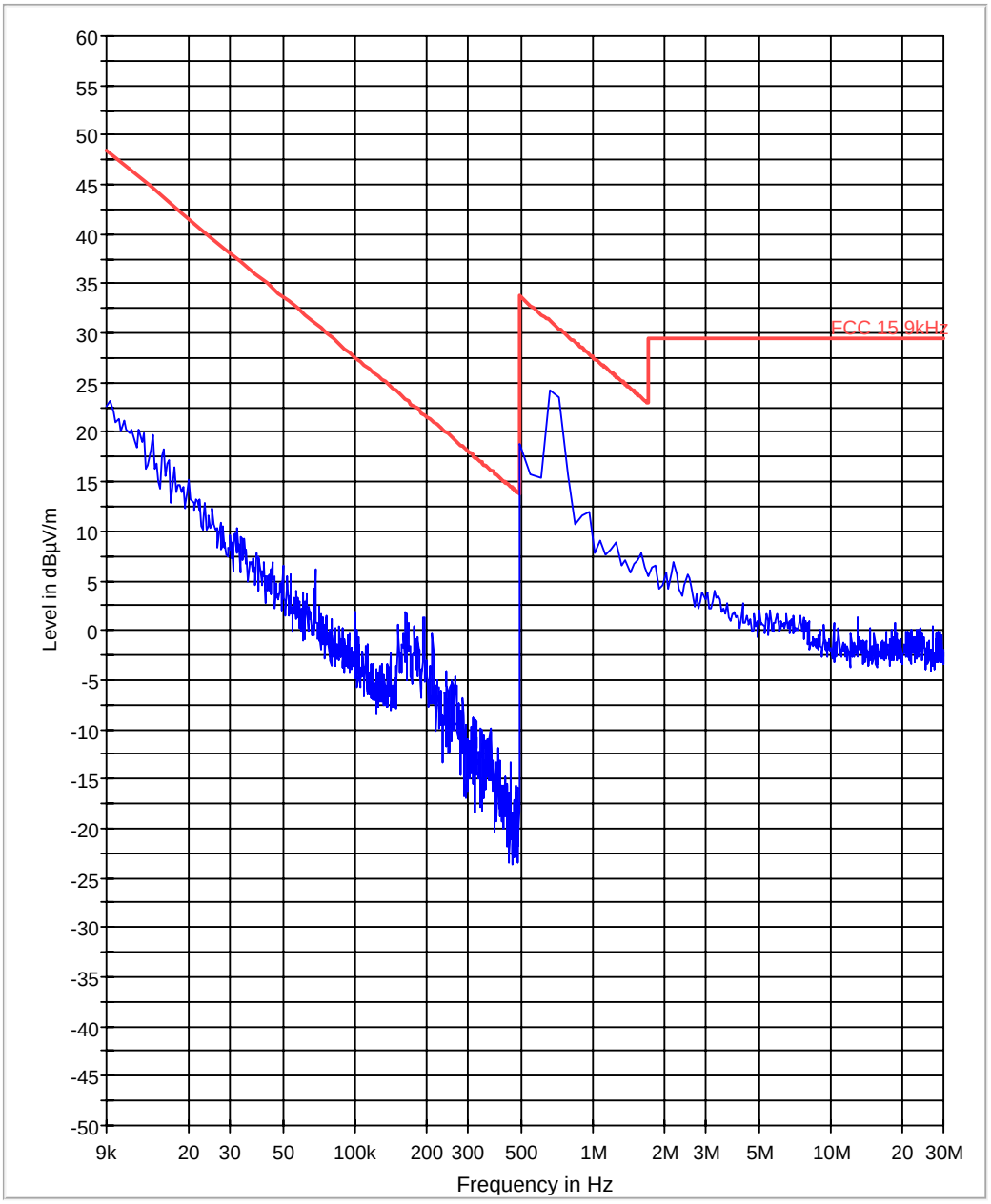
Pass.

6.6.4 Test data/ plots:

Receive Mode: 9 kHz – 30 MHz

Description:	Ultra-Rugged Field PC with WLAN and BT radios:
EUT Name:	Allegro MX
Manufacturer:	Juniper Systems
Serial Number:	AMX B45
Comment:	Device in RX mode

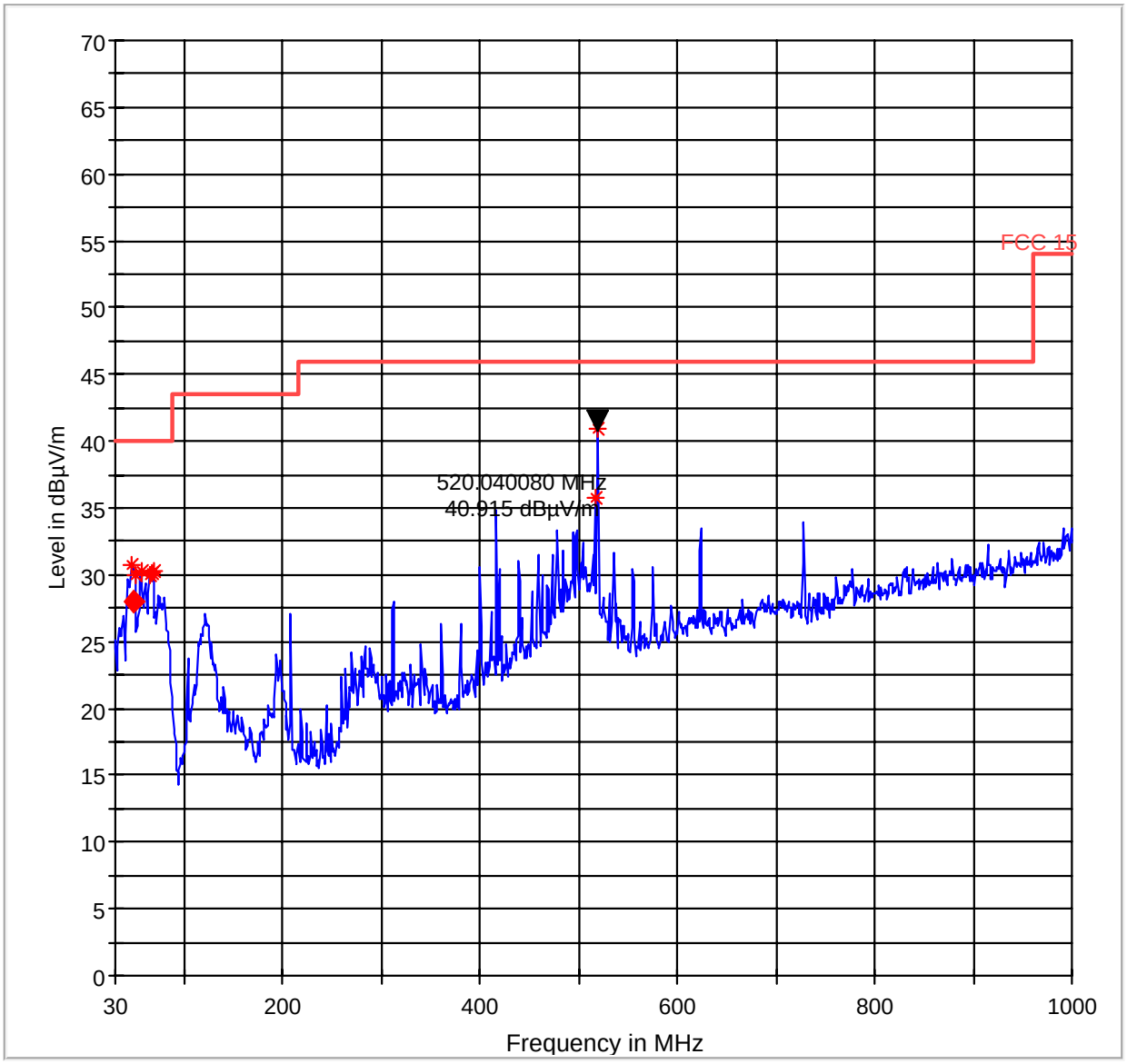
FCC 15 9kHz - 30 MHz



Receive Mode: 30MHz-1GHz

Description:	Ultra-Rugged Field PC with WLAN and BT radios:
EUT Name:	Allegro MX
Manufacturer:	Juniper Systems
Serial Number:	AMX B45
Comment:	Device in RX mode

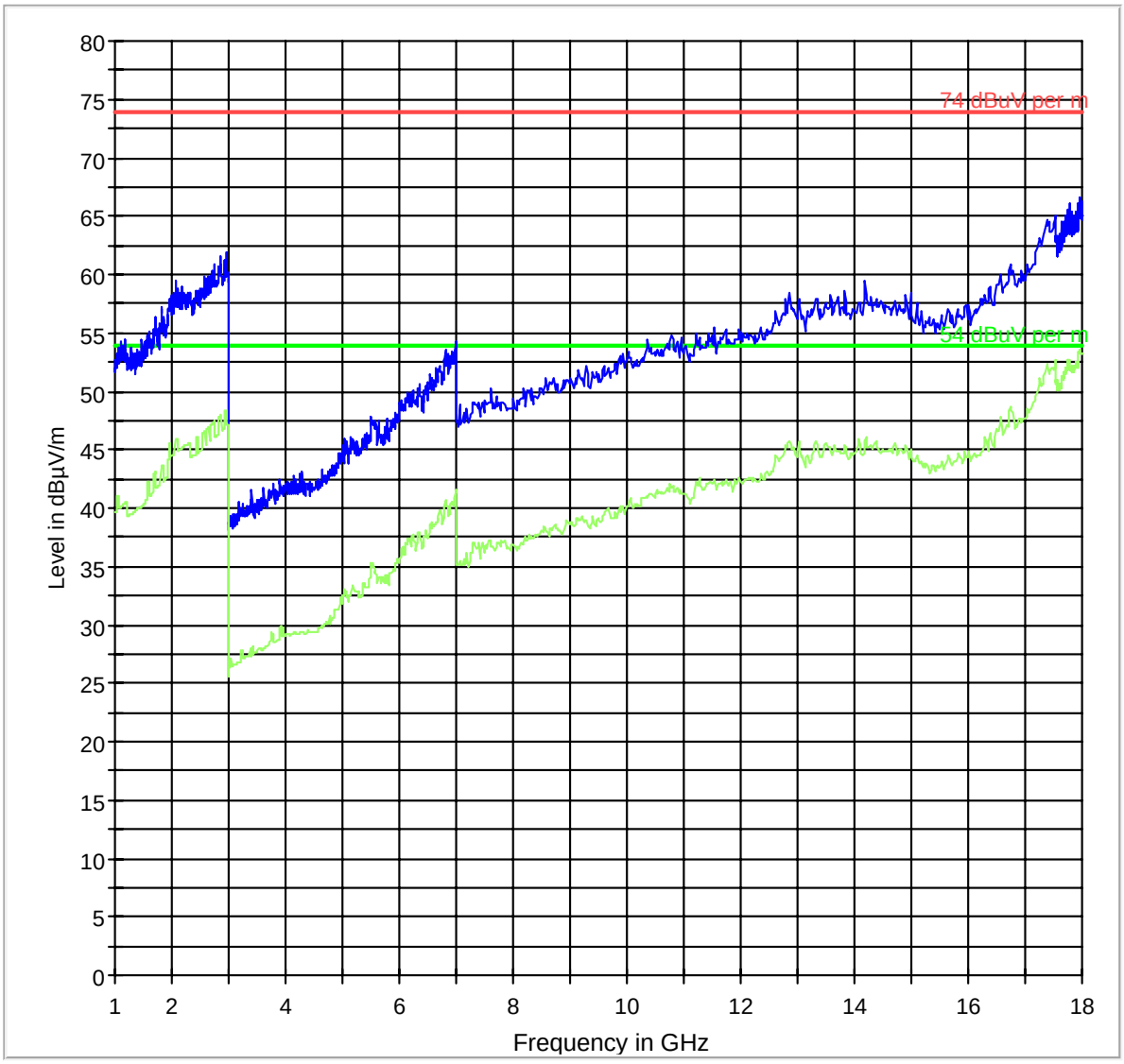
FCC 15 30-1000MHz



Receive Mode: 1GHz-18GHz

Description: Ultra-Rugged Field PC with WLAN and BT radios:
EUT Name: Allegro MX
Manufacturer: Juniper Systems
Serial Number: AMX B45
Comment: Device in RX mode

FCC 15 1-18GHz



74 dBuV per m.LimitLine
Preview Result 1
54 dBuV per m.LimitLine
Preview Result 2

6.7 AC Power Line Conducted Emissions

6.7.1 References:

FCC: CFR Part 15.207
IC: RSS-Gen Section 7.2.2
The purpose of this test is to measure unwanted radio frequency currents induced in any AC conductor external to the equipment which could conduct interference to other equipment via the AC electrical network.

6.7.2 Limits:

6.7.2.1 §15.207 Conducted limits- Intentional Radiators:

(a) Except as shown in paragraphs (b) and (c) of this section of the CFR, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table (1), as measured using a 50 μH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

6.7.2.2 RSS-Gen 7.2.2

Except when the requirements applicable to a given device state otherwise, for any licence-exempt radiocommunication device equipped to operate from the public utility AC power supply, either directly or indirectly, the radio frequency voltage that is conducted back onto the AC power lines in the frequency range of 0.15 MHz to 30 MHz shall not exceed the limits shown below. The tighter limit applies at the frequency range boundaries.

Table 1:

Frequency of emission (MHz)	Conducted limit (dBμV)	
	Quasi-peak	Average
0.15–0.5	66 to 56*	56 to 46*
0.5–5	56	46
5–30	60	50

*Decreases with the logarithm of the frequency.

Analyzer Settings: CISPR Bandwidth- 9KHz.

6.7.3 Test Conditions:

Modulation: 802.11b- Transmit and Receive modes of operation
Measurement Uncertainty: ±3.0dB

6.7.4 Results

Plots shown here represent the combined worse case emissions for power lines, phases and neutral line.

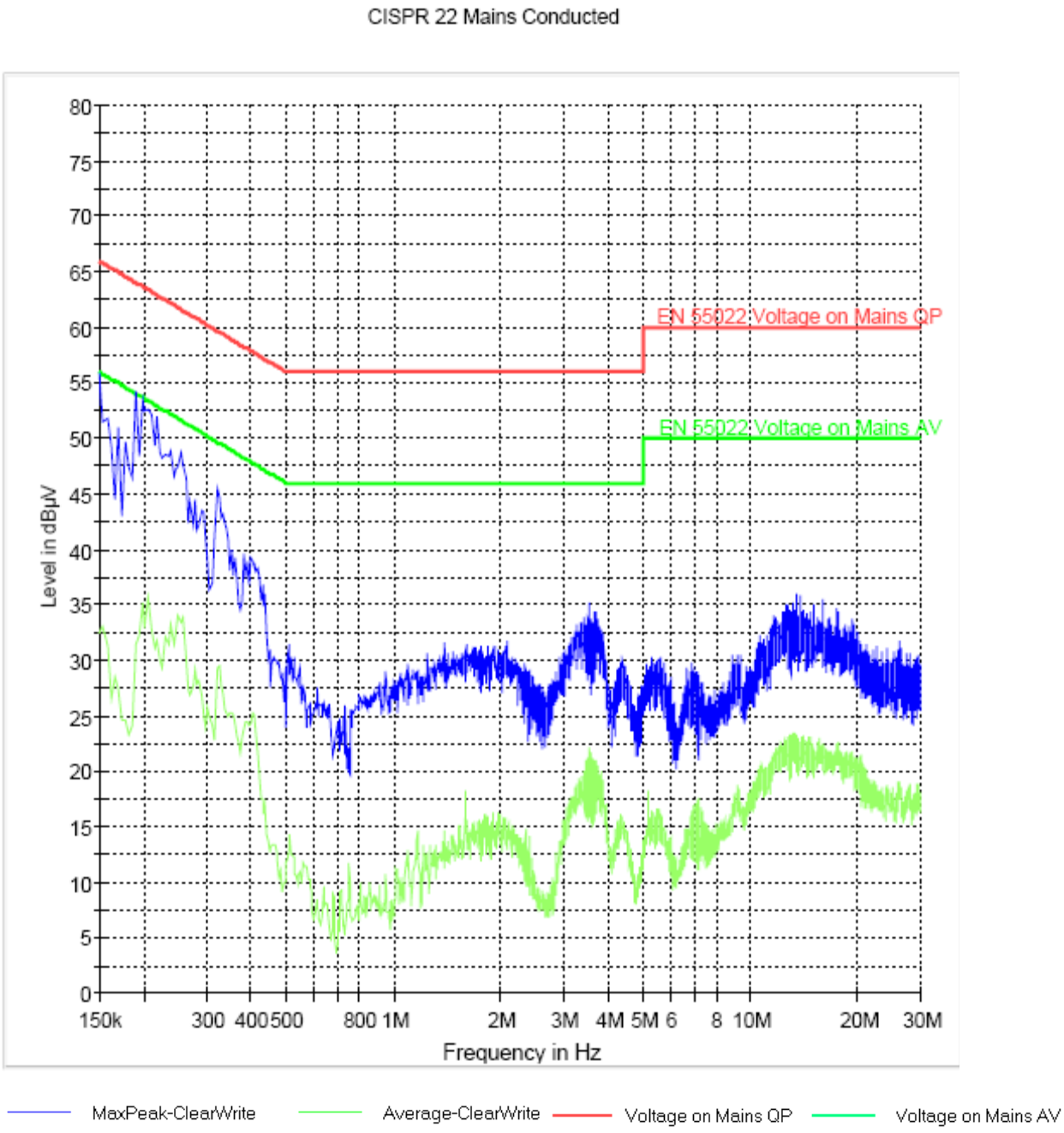
6.7.4.1 Measurement Result

Pass.

6.7.5 Test Results:

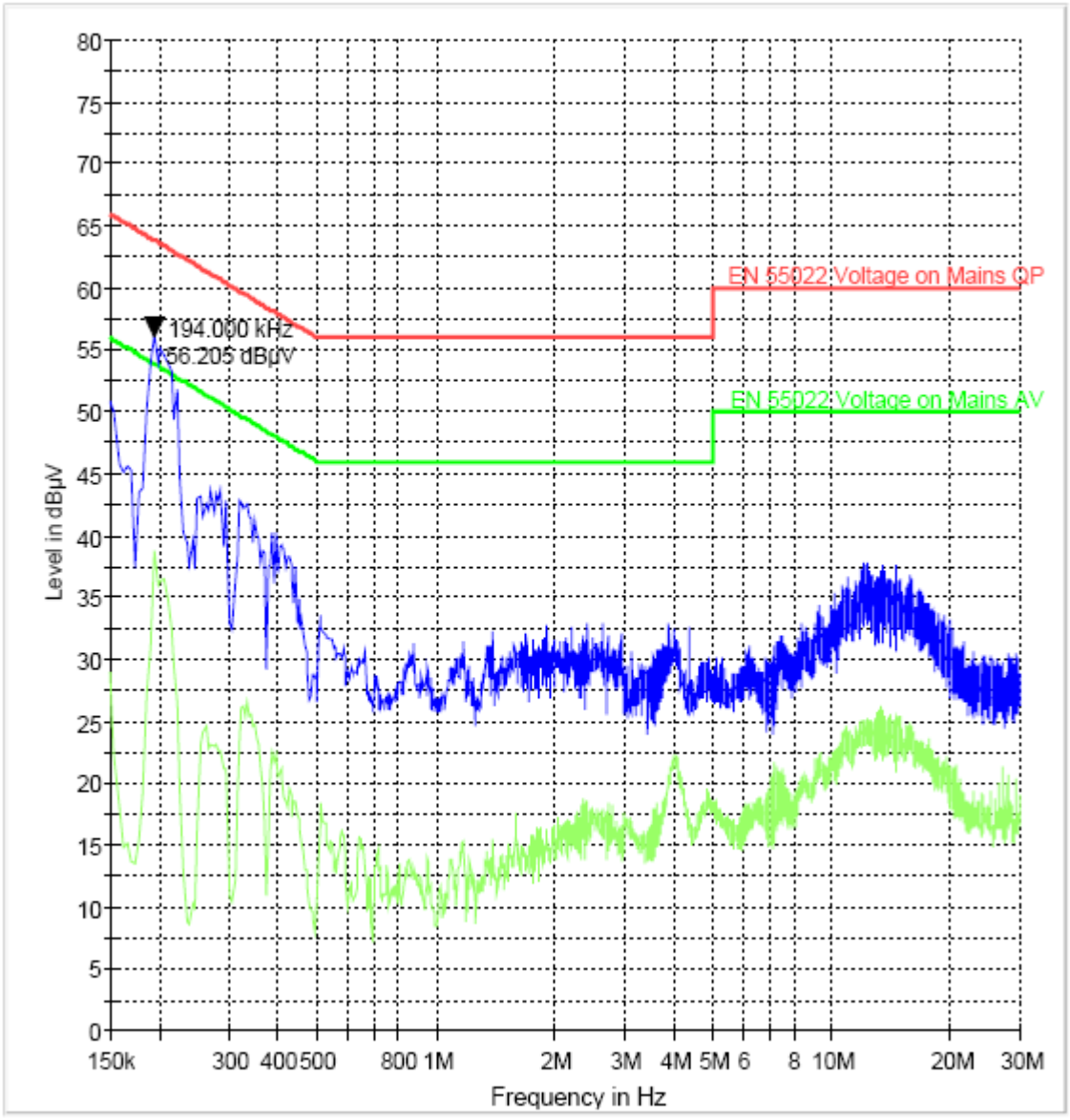
WLAN TX Mode:

Description:	Ultra-Rugged Field PC with WLAN and BT radios:
EUT Name:	Allegro MX
Manufacturer:	Juniper Systems
Serial Number:	AMX B45
Comment:	802.11b ch1 (2412MHz) TX



WLAN RX Mode:

Description:	Ultra-Rugged Field PC with WLAN and BT radios:
EUT Name:	Allegro MX
Manufacturer:	Juniper Systems
Serial Number:	AMX B45
Comment:	Device is in rx mode

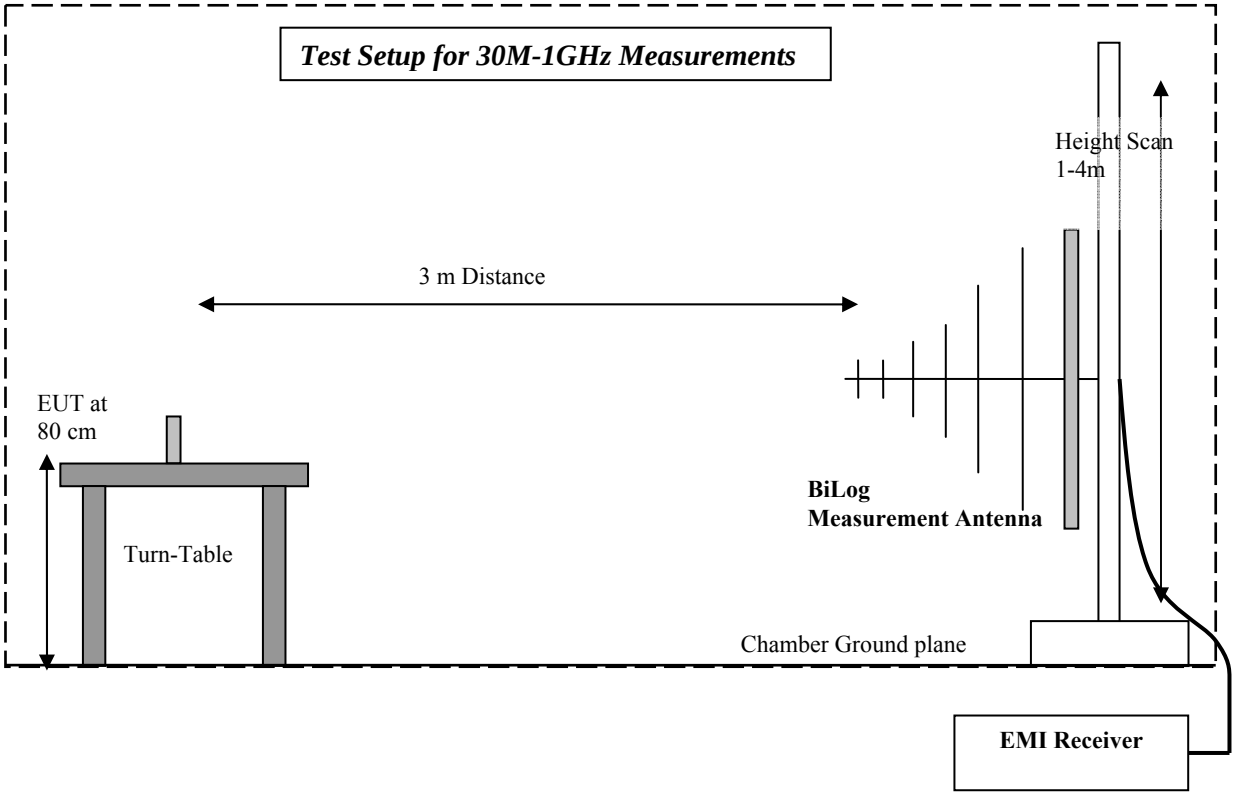


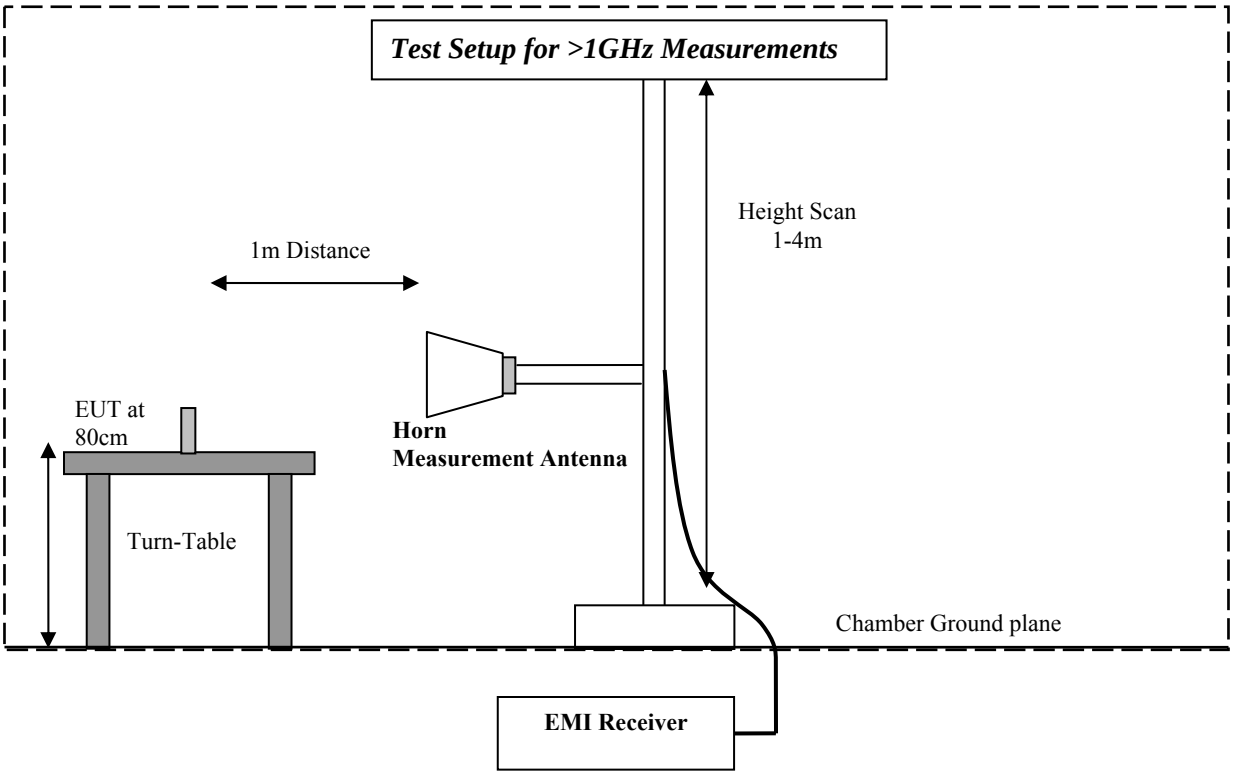
7 Test Equipment and Ancillaries used for tests

Select only one of the CMUs and LISNs and DC Power Supply and delete the others. THEN DELETE THIS LINE.

Instrument/Ancillary	Model	Manufacturer	Serial No.	Cal Date	Cal Interval
Radio Communication Tester	CMU 200	Rohde & Schwarz	101821	June 2010	1 year
Radio Communication Tester	CMU 200	Rohde & Schwarz	109879	June 2010	1 year
Radio Communication Tester	CMU 200	Rohde & Schwarz	110759	June 2010	1 year
Bluetooth Tester	CBT	Rohde & Schwarz	100212	May 2009	2 Years
EMI Receiver/Analyzer	ESIB 40	Rohde & Schwarz	100107	May 2010	1 year
Spectrum Analyzer	FSU	Rohde & Schwarz	200302	Jul 2010	1 year
Loop Antenna	6512	EMCO	00049838	April 2009	2 years
Biconilog Antenna	3141	EMCO	0005-1186	June 2009	2 years
Horn Antenna (1-18GHz)	3115	ETS	00035111	Jan 2009	3 years
Horn Antenna (18-40GHz)	3116	ETS	00070497	Jan 2009	3 years
Communication Antenna	IBP5-900/1940	Kathrein	n/a	n/a	n/a
High Pass Filter	5HC2700	Trilithic Inc.	9926013	Part of system calibration	
High Pass Filter	4HC1600	Trilithic Inc.	9922307	Part of system calibration	
6GHz High Pass Filter	HPM50106	Microtronics	001	Part of system calibration	
Pre-Amplifier	JS4-00102600	Miteq	00616	Part of system calibration	
LISN	50-25-2-08	FCC	08014	June 2010	1 year
LISN	R&S	ESH3-Z5	836679/003	May 2009	2 Years
LISN	R&S	ESH3-Z6	836154/011	May 2009	2 Years
Power Smart Sensor	R&S	NRP-Z81	100161	June 2010	1 Year
DC Power Supply	E3610A	Hewlett Packard	KR83021224	n/a	n/a
DC Power Supply	E3610A	Hewlett Packard	KR83023316	n/a	n/a
DC Power Supply	6632A	Hewlett Packard	3524A-12822	n/a	n/a
DC Power Supply	6655A	Hewlett Packard	3403A-00487	n/a	n/a
Multimeter	179	Fluke	N/A	Feb 2010	1 Year
Temp Hum Logger	TM320	Dickson	03280063	Feb 2010	1 Year
Temp Hum Logger	TM325	Dickson	5285354	Feb 2010	1 Year

8 Block Diagrams





9 Revision History

Date	Report Name	Changes to report	Report prepared by
2010-11-15	EMC_JUNIP_010_10001_15.247DSSS	First Version	Satya Radhakrishna
2010-12-03	EMC_JUNIP_010_10001_15.247DSSS_rev1	1.page 5:changed modulation information 2. page 6: included information about channels used and reason for testing at the data rates used 3.page 7: modified subject of investigation 4.page 12: included gain information at different channels 5.page 15-32:furnished 802.11 mode, channel and frequency information	Satya Radhakrishna