



FCC/IC Test Report

FOR

Manufacturer: Sony
Type Number: PM-0745-BV
FCC ID: PY7PM-0745

47 CFR Part 15.247

TEST REPORT #: CETEC_063_13001_WLAN2.4G_WLAN5.8G_15.247
DATE: 2014-01-22



FCC :
Accredited

IC recognized #
3462B-1

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CETECOM Inc. is a Delaware Corporation with Corporation number: 2905571



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1 Assessment

The following equipment (and as identified in Ch.3 of this test report) was evaluated against the applicable criteria specified in FCC CFR47 Part 15.247, 15.207, 15.209. No deviations were ascertained during the course of the tests performed.

| Company | Description | Type # |
|---------|-------------|------------|
| Sony | Phablet | PM-0745-BV |

Responsible for Testing Laboratory:

| | | Franz Engert | |
|------------|------------|----------------------|-----------|
| 2014-01-22 | Compliance | (Manager Compliance) | |
| Date | Section | Name | Signature |

Responsible for the Report:

| | | Josie Sabado | |
|------------|------------|-------------------|-----------|
| 2014-01-22 | Compliance | (Lab Manager SAR) | |
| Date | Section | Name | Signature |

The test results of this test report relate exclusively to the test item specified in Section 3. CETECOM Inc. USA does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item. The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of CETECOM Inc. USA.



2 Administrative Data

2.1 Identification of the Testing Laboratory Issuing the 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 Manager: | Franz Engert |
| Responsible Project Leader: | Franz Engert |

2.2 Identification of the Client

| | |
|--------------------------|------------------------------|
| Applicant's Name: | Nya Vattentornet |
| Street Address: | 22188 Lund / SWEDEN |
| City/Zip Code | --- |
| Country | SWEDEN |
| Contact Person: | Mikael Nilsson |
| Phone No. | +46 7 03 22 75 03 |
| Fax: | --- |
| e-mail: | Micke.nilsson@sonymobile.com |

2.3 Identification of the Manufacturer

Same as above client.



3 Equipment under Test (EUT)

3.1 Specification of the Equipment under Test

| | |
|-------------------------------------|---|
| Product Type: | Portable |
| Prototype/Production: | Pre-Production |
| RF Exposure Environment: | General / Uncontrolled |
| Dimensions: | 73.3 x 146.8 x 8.2 mm |
| Exposure Conditions: | Held next to the ear Body worn Personal Wireless Router |
| Type No: | PM-0745-BV |
| FCC ID: | PY7PM-0745 |
| Antenna Type: | Cellular: Internal 1 Tx/Rx antenna 1 Rx only antenna WLAN/BT: Internal |
| Operating Voltage Range: | Power Supply: 3.7 V DC by embedded battery |
| Operating Temperature Range: | Temperature range: -30°C to +60°C |
| Supported Radios: | GSM/GPRS/EGPRS MS Class 12, DTM MS Class 11, Power Class 4/1, Mobile Class A WCDMA/HSDPA/DC-HSDPA/HSUPA/HSPA+, Power Class 3, DL cat 24, UL cat 6 (5.7 Mbps uplink and QPSK) LTE Bluetooth v2.1 + EDR, Bluetooth 4.0 ANT+ 802.11 b/g/n (HT20)/ac (VHT-20) SISO 802.11 a/n (HT20, HT40)/ac (VHT-20, VHT-40, VHT-80) SISO GPS receiver at 1.575 MHz NFC |
| Power Back-Off Modes: | None |



3.2 Identification of the Equipment Under Test (EUT)

| EUT # | Serial Number | HW Version | SW Version | Comment |
|-------|---------------|------------|------------|---------|
| | CB5A1W5TQV | AP1.1 | ETS SW | ETS SW |
| | | | | |

3.3 Identification of Accessory Equipment

| AE # | Type | Manufacturer | Type | Serial Number |
|------|------------------|--------------|------------|---------------|
| 1 | AC Power Adapter | SONY | PM-0745-BV | CB5A1 |

3.4 Environmental conditions during Test:

The following environmental conditions were maintained during the course of testing:

Ambient Temperature: 20-25°C

Relative humidity: 40-60%

3.5 Dates of Testing:

January 7th, 2014 – January 21th, 2014



3.6 Other Testing Notes

The device was configured with a manufacturer provided ETS test SW, capable of setting the unit in different supported modulation schemes, data rates and channels of operation.

The Device was set to continuous framed Tx (burst) mode per test SW and could thus be operated with 100% duty cycle during testing.

The EUT was tested on low, mid and high channels (2.4GHz and 5GHz band 4) in 802.11b, 802.11g, 802.11n (HT20), 802.11n (HT40), 802.11ac (HT80)..

The below listed worst case test modes of operation have been established from the output power measurement and evaluation of long term test data available to the lab for the different data rates and modulations which are supported by the equipment.

| Mode | | Data rate (Mbps) | Modulation scheme |
|---------------|----------------|------------------|-------------------|
| 2.4 GHz | 802.11b | 1.0 | BPSK |
| | 802.11g | 6.0 | BPSK |
| | 802.11n (HT20) | 6.5 | BPSK |
| 5 GHz U-NII-3 | 802.11a | 6 | BPSK |
| | 802.11n (HT20) | 6.5 | BPSK |
| | 802.11n (HT40) | 13.5 | BPSK |
| | 802.11ac(HT80) | 29.3 | BPSK |

802.11a is not measured individually. For the radiated emissions the results of 802.11n (HT20) are leveraged as they are performed on same channel with same bandwidth, OFDM modulated with BPSK. Only difference between 802.11a and 802.11n (HT20) is the channel coding which can be neglected for EMC performance according to the expert opinion of CETECOM INC.

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4 Subject of Investigation

The objective of the measurements applied by CETECOM Inc. was to establish compliance of the EUT as described under Ch. 3 of this Test Report, with the applicable criteria specified in

- FCC CFR47 Parts 15.247, 15.207, 15.209

This test report is to support a request for new equipment authorization under the
FCC ID: PY7PM-0745



5 Summary of Measurement Results

| Test Specification | Test Case | Temperature and Voltage Conditions | Mode | Pass | Fail | NA | NP | Result |
|--------------------------|--|------------------------------------|-------------------|------|------|----|----|----------|
| §15.247(d) | Unwanted Emissions into Restricted Frequency Bands: Band Edge-Radiated | Nominal | 802.11 a/b/g/n/ac | ■ | □ | □ | □ | Complies |
| §15.209(a) §15.247(d) | Unwanted Emissions into Restricted Frequency Bands - Radiated | Nominal | 802.11 a/b/g/n/ac | ■ | □ | □ | □ | Complies |
| §15.207(a) | AC Line Conducted Emissions<30MHz | Nominal | 802.11 a/b/g/n/ac | ■ | □ | □ | □ | Complies |
| §15.109 | RX Spurious emissions-Radiated | Nominal | RX | ■ | □ | □ | □ | Complies |

Note: NA= Not Applicable; NP= Not Performed.

6 Measurements

6.1 Measurement Method:

In addition to the related rules in FCC 15.247 and RSS-210 the measurement guidelines in FCC publication KDB558074 D01Meas Guidance v03: Measurement Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) operating under 15.247, April 2013 has been applied.

6.1.1 **ANSI C63.4 (2009) 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 beam width, the measurement antenna shall be aligned with the EUT.

6.1.2 ANSI C63.4 (2009) 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 re-maximized 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.

Radiated Measurement Uncertainty: ± 3 dB



6.1.3 Sample Calculations for Radiated Measurements

6.1.3.1 Field Strength Measurements:

Measurements from the Spectrum Analyzer/ Receiver are used to calculate the Field Strength, taking into account the following parameters:

1. Measured reading in dBμV
2. Cable Loss between the receiving antenna and SA in dB and
3. Antenna Factor in dB/m

$FS (dB\mu V/m) = \text{Measured Value on SA } (dB\mu V) + \text{Cable Loss } (dB) + \text{Antenna Factor } (dB/m)$

Eg:

| Frequency (MHz) | Measured SA (dBμV) | Cable Loss (dB) | Antenna Factor Correction (dB) | Field Strength Result (dBμV/m) |
|-----------------|--------------------|-----------------|--------------------------------|--------------------------------|
| 1000 | 80.5 | 3.5 | 14 | 98.0 |

All radiated measurement plots in this report are taken from a test SW that calculates the Field Strength based on the above equation.

6.1.3.2 Power Measurements using Substitution Procedure:

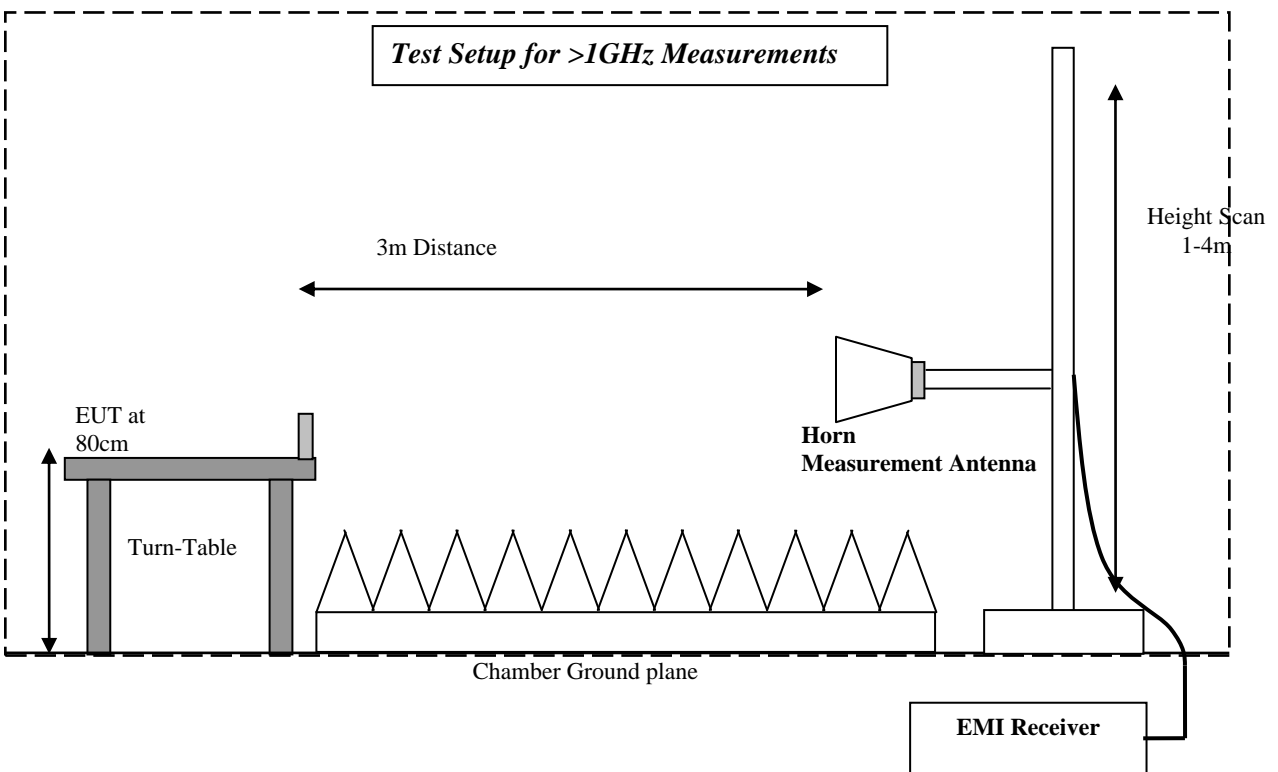
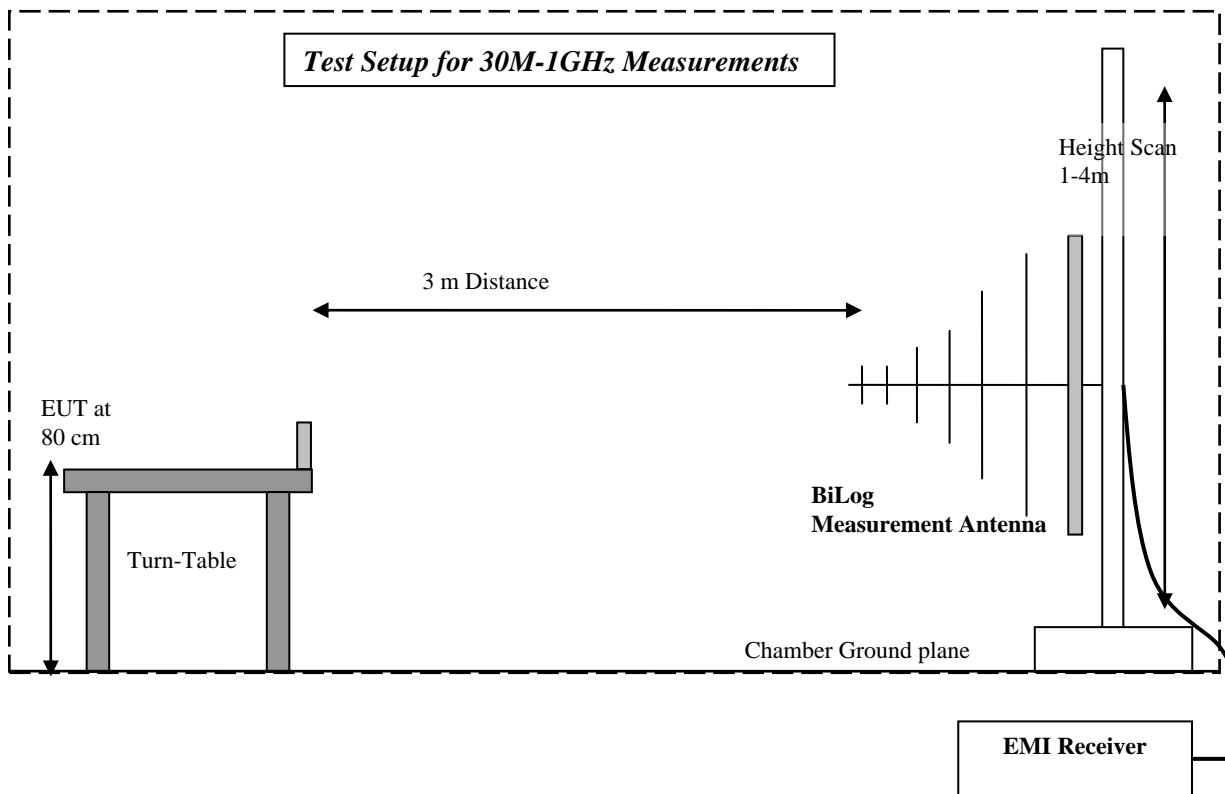
The measurement on the Spectrum Analyzer is used as a basis for the Substitution procedure. The EUT is replaced with a Signal Generator and an antenna. The setting on the Signal Generator is varied until the Spectrum Analyzer displays the original reading. EIRP is calculated as-

$EIRP (dBm) = \text{Signal Generator setting } (dBm) - \text{Cable Loss } (dB) + \text{Antenna Gain } (dBi)$

Eg:

| Frequency (MHz) | Measured SA (dBμV) | Signal Generator setting (dBm) | Antenna Gain (dBi) | Dipole Gain (dBd) | Cable Loss (dB) | EIRP (dBm) |
|-----------------|--------------------|--------------------------------|--------------------|-------------------|-----------------|------------|
| 1000 | 95.5 | 24.5 | 6.5 | 0 | 3.5 | 27.5 |

6.1.4 Test Setup Diagrams





6.2 Antenna gain

6.2.1 Limits:

| | |
|--------------|-----|
| FCC | -/- |
| Antenna Gain | |
| 6 dBi | |

6.2.2 Results for 2.4GHz:

| T _{nom} | V _{nom} | lowest channel 2412 MHz | middle channel 2437 MHz | highest channel 2462 MHz |
|--|------------------|----------------------------|----------------------------|-----------------------------|
| Gain [dBi] Declared by the manufacturer | | -2.7 | -1.7 | -0.6 |

6.2.3 Results for 5.8GHz

| T _{nom} | V _{nom} | lowest channel 5745 MHz | middle channel 5785 MHz | highest channel 5825 MHz |
|--|------------------|----------------------------|----------------------------|-----------------------------|
| Gain [dBi] Declared by the manufacturer | | 1.7 | 2.3 | 2.0 |

6.2.4 Verdict:

Passed



6.3 Unwanted Emissions into Restricted Frequency Bands: Band Edge - Radiated

6.3.1 Limits

§15.247/15.205

15.247 (d) Radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a).

15.205 (a) 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 | | | |

15.209 (a) Emission Limits:

The emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

| Frequency (MHz) | Field strength (microvolts/meter) | 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** | 3 |
| 88–216 | 150** | 3 |
| 216–960 | 200** | 3 |
| Above 960 | 500 | 3 |

6.3.2 Test Conditions:

Tnom: 20°C; Vnom: 3.8 VDC

6.3.3 Test Procedure:

Marker delta method according to ANSI C63.10

Peak measurements are made using a peak detector and RBW=1MHz.

*PEAK LIMIT= 74dB μ V/m

Average measurements performed using a peak detector and according to video averaging procedure with RBW=1MHz and VBW=10Hz.

*AVG. LIMIT= 54dB μ V/m

Measurement Uncertainty: \pm 3.0dB

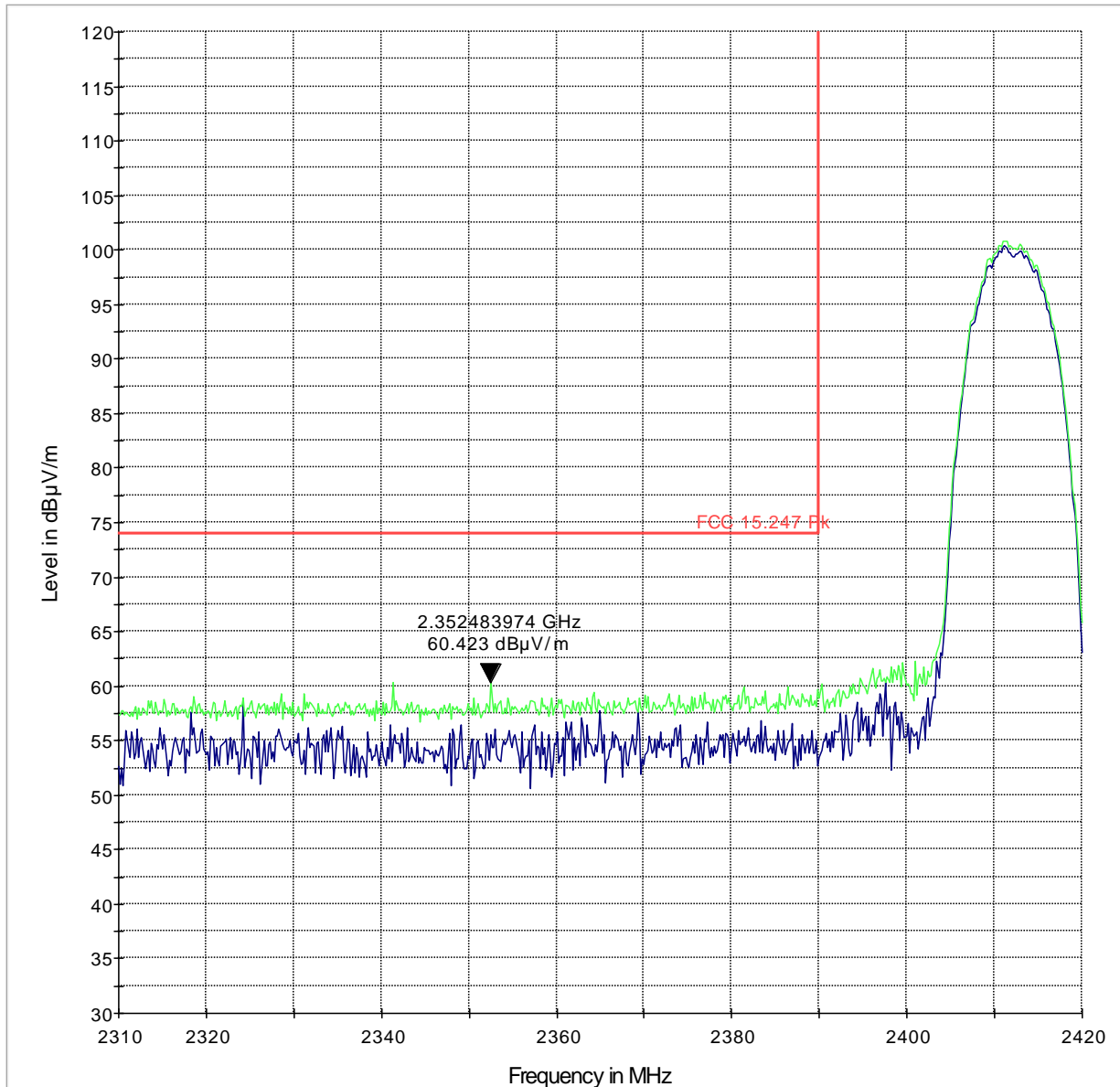
6.3.4 Measurement Result – Unwanted Emissions into Restricted Frequency Bands: Band Edge - Radiated

Pass.

6.3.5 Bandedge Test Data/plots:

6.3.5.1 Bandedge 802.11b – 2.4GHz

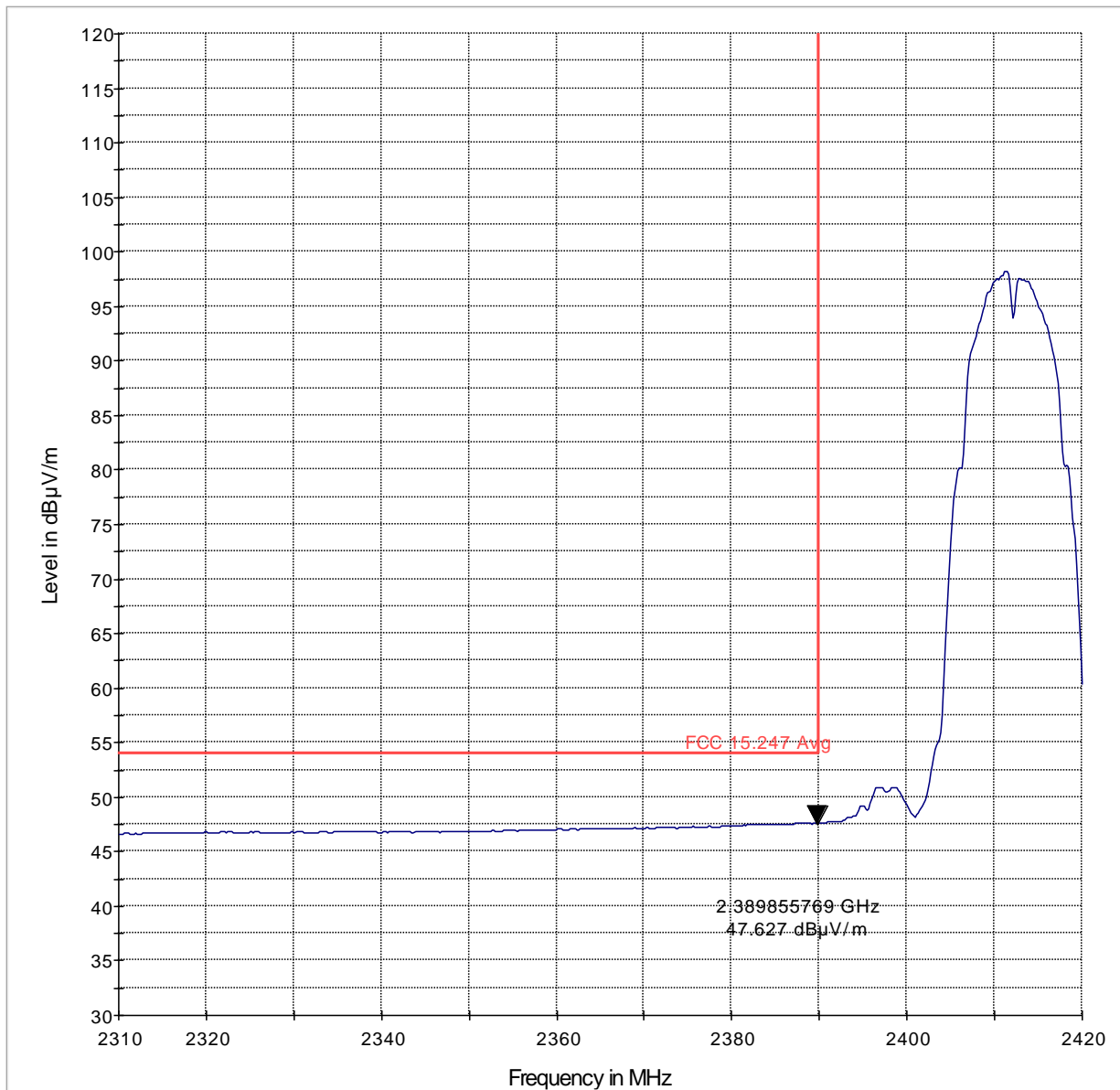
Lower Band Edge Peak - 802.11b



— MaxPeak-ClearWrite-PK+ — MaxPeak-MaxHold-PK+ — FCC 15.247 Pk

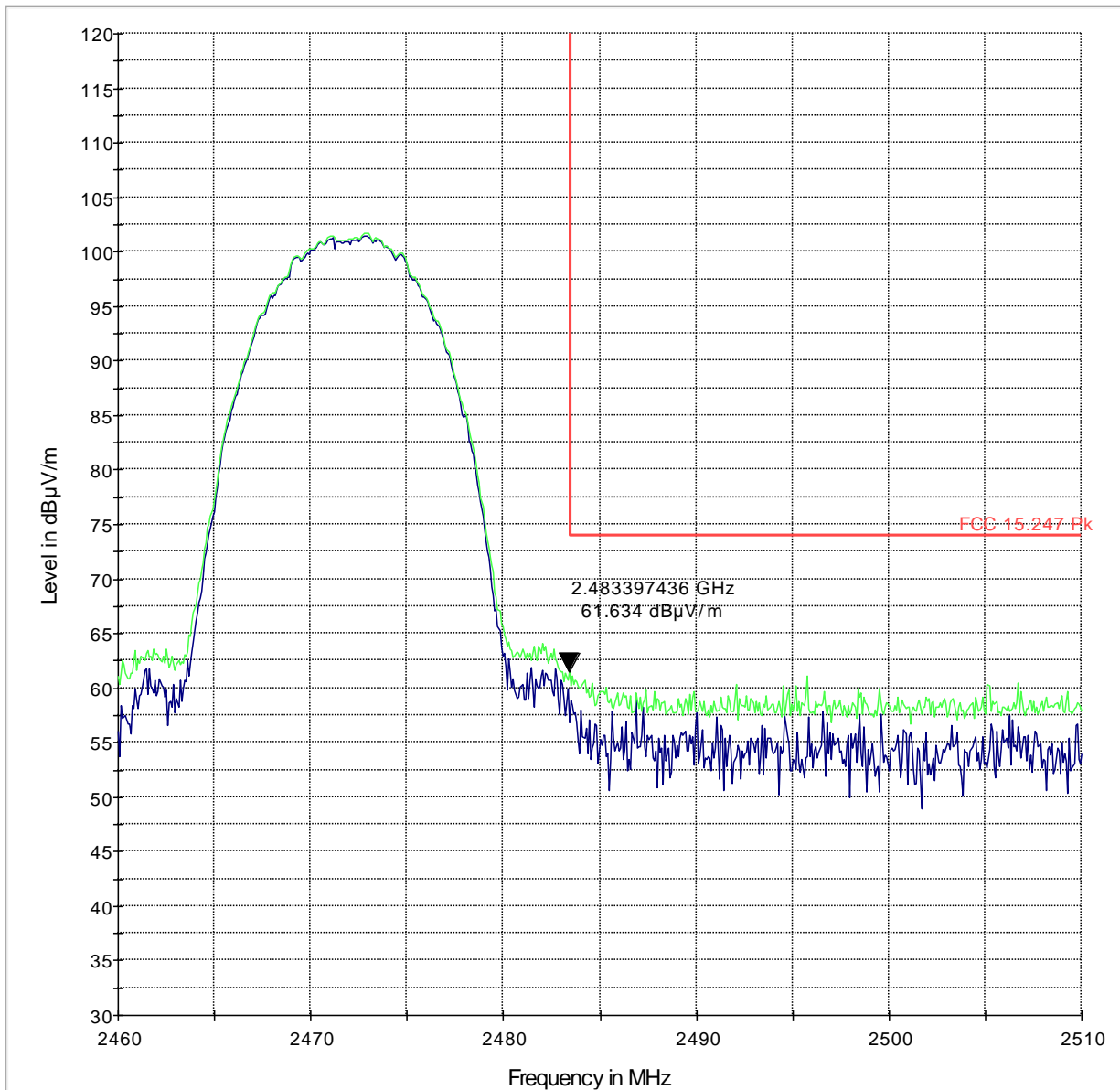


Lower Band Edge Average - 802.11b



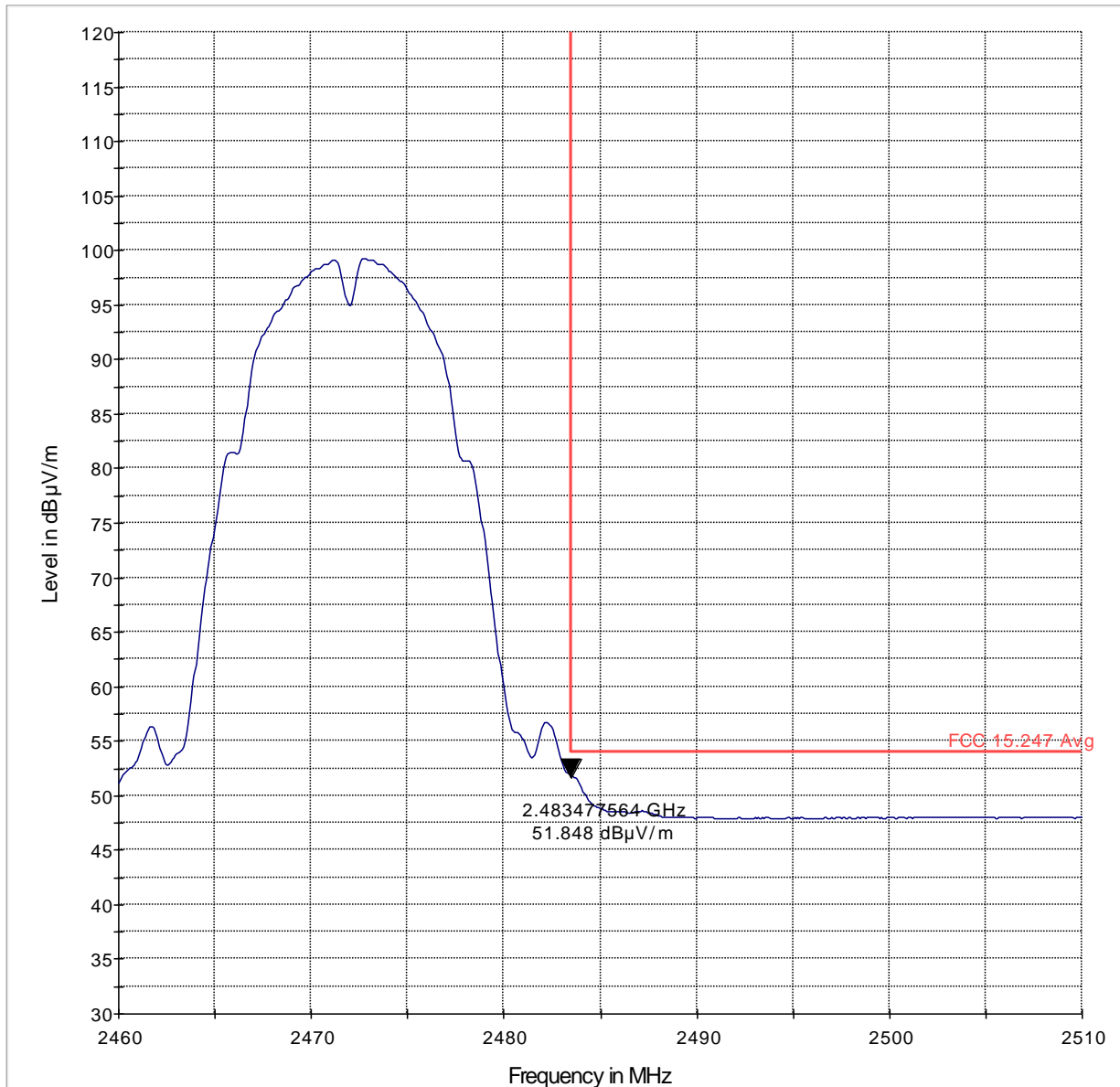
— MaxPeak-MaxHold-PK+ — Average-MaxHold-AVG — FCC 15.247 Avg

Higher Band Edge Peak - 802.11b



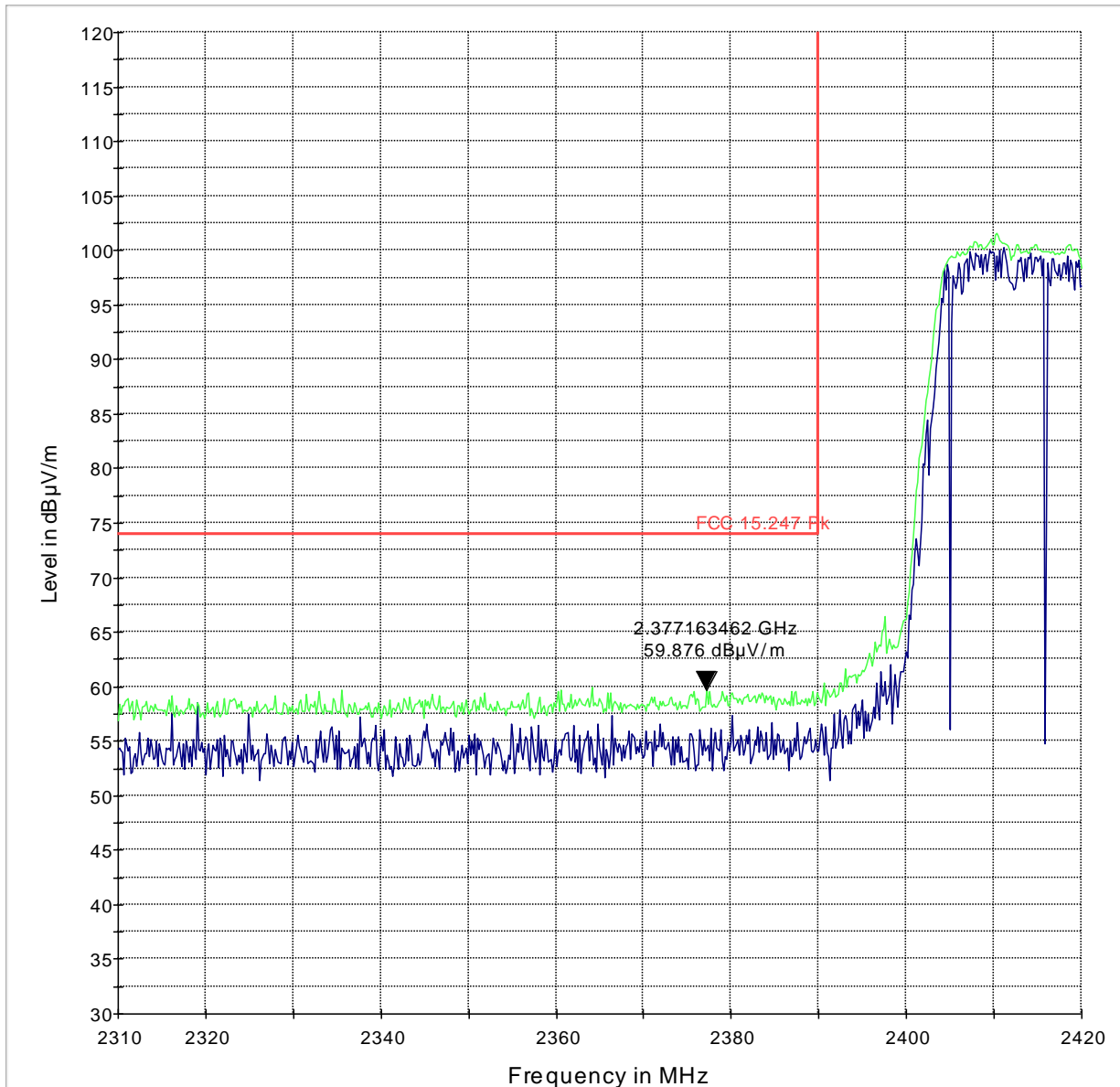
— MaxPeak-ClearWrite-PK+ — MaxPeak-MaxHold-PK+ — FCC 15.247 Pk

Higher Band Edge Average - 802.11b



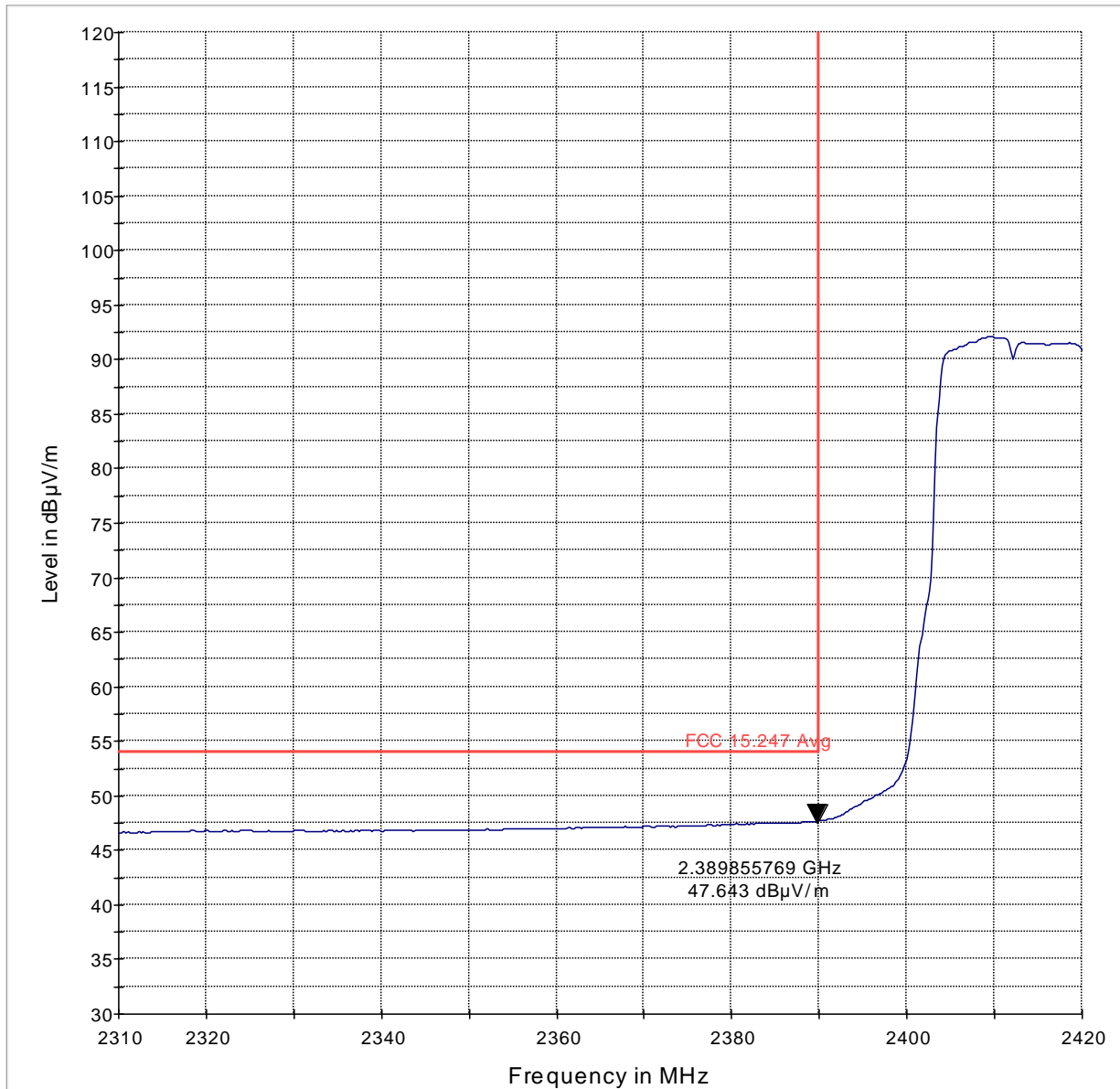
— MaxPeak-MaxHold-PK+ — FCC 15.247 Avg

6.3.5.2 Bandedge 802.11g – 2.4GHz
Lower Band Edge Peak - 802.11g



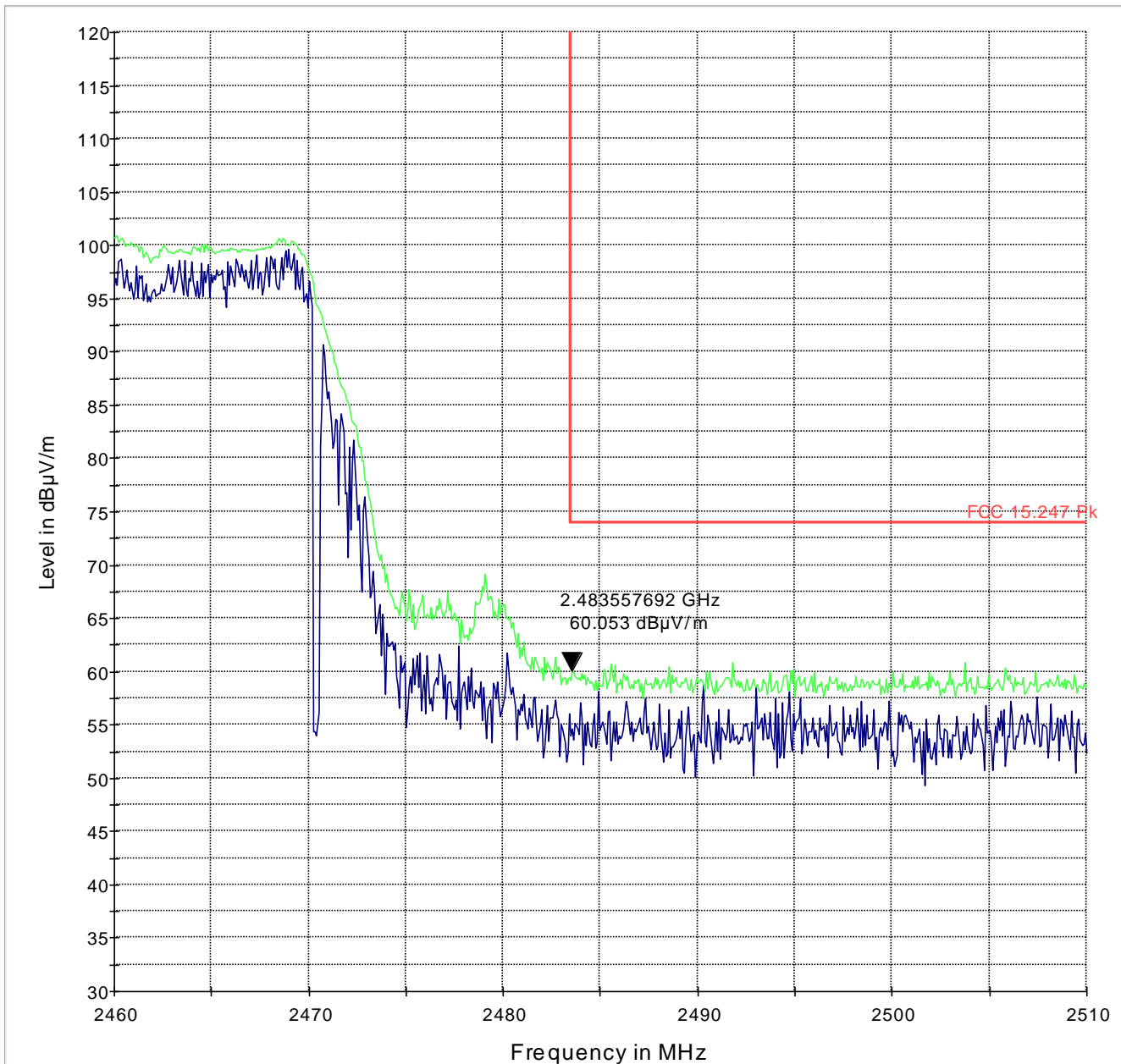
MaxPeak-ClearWrite-PK+ MaxPeak-MaxHold-PK+ FCC 15.247 Pk

Lower Band Edge Average - 802.11g



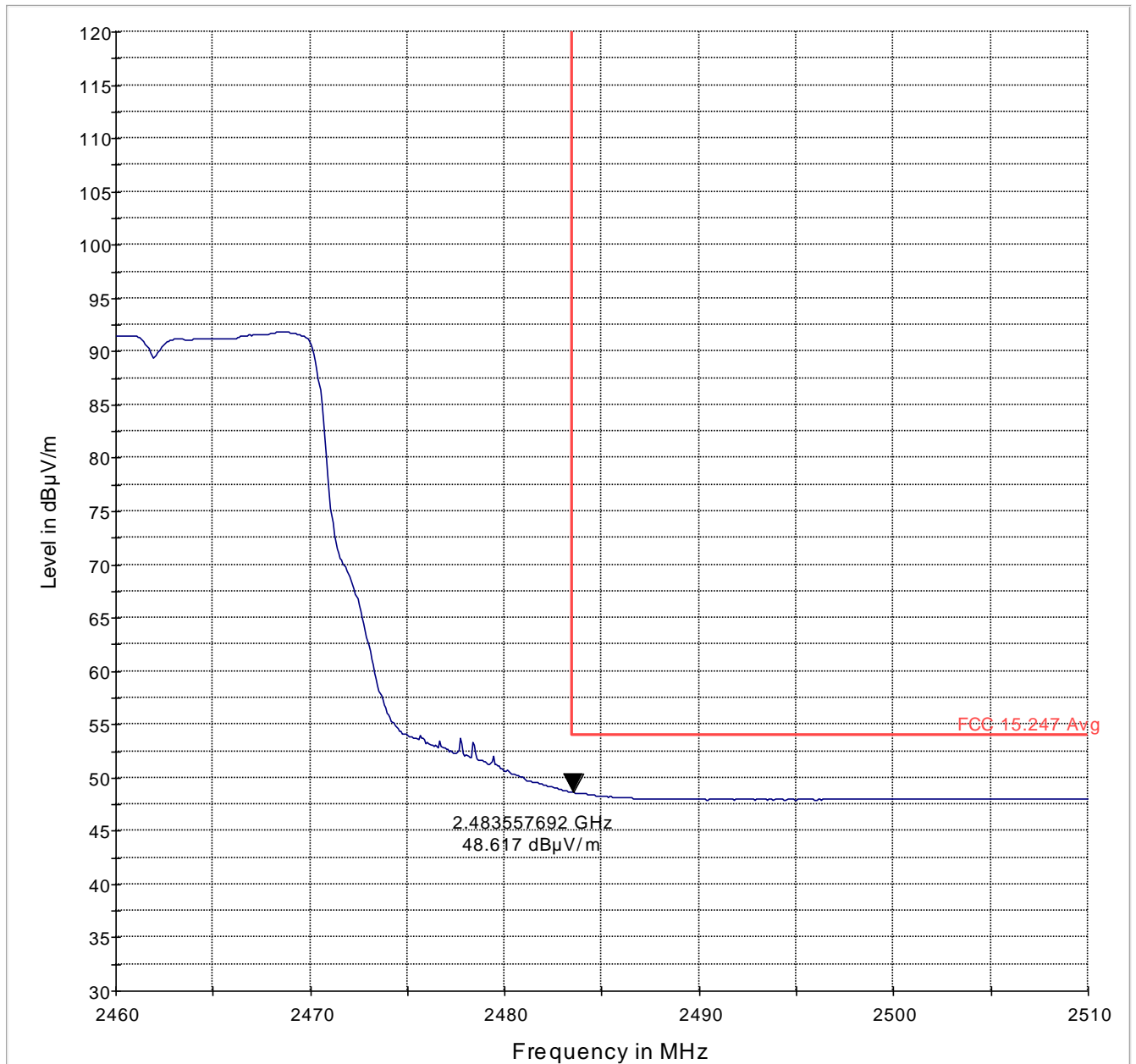
MaxPeak-MaxHold-PK+ Average-MaxHold-AVG FCC 15.247 Avg

Higher Band Edge Peak - 802.11g



MaxPeak-ClearW ite-PK+ MaxPeak-MaxHold-PK+ FCC 15.247 Pk

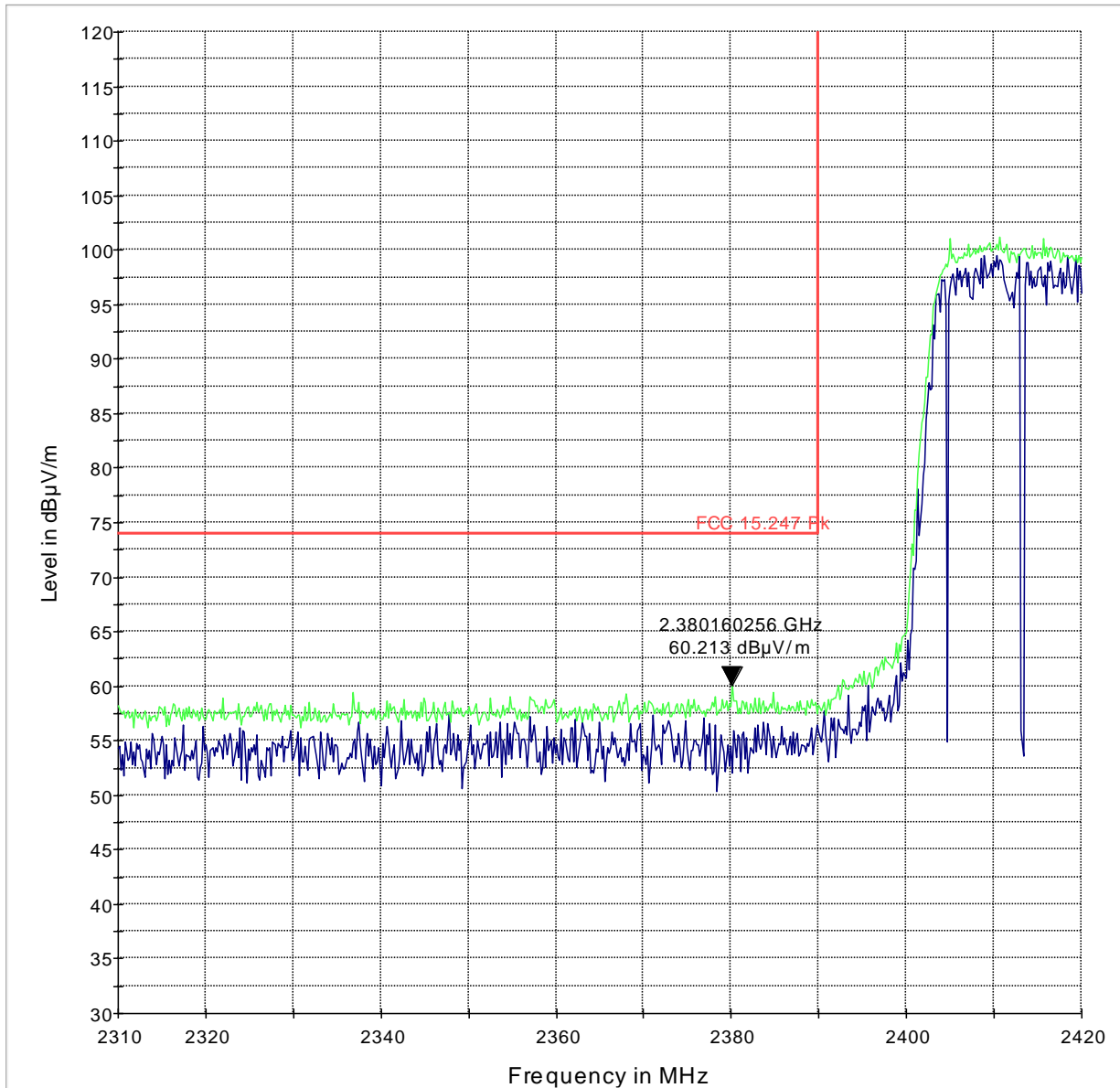
Higher Band Edge Average - 802.11g



— MaxPeak-MaxHold-PK+ — FCC 15.247 Avg

6.3.5.3 Bandedge 802.11n [HT20] – 2.4GHz

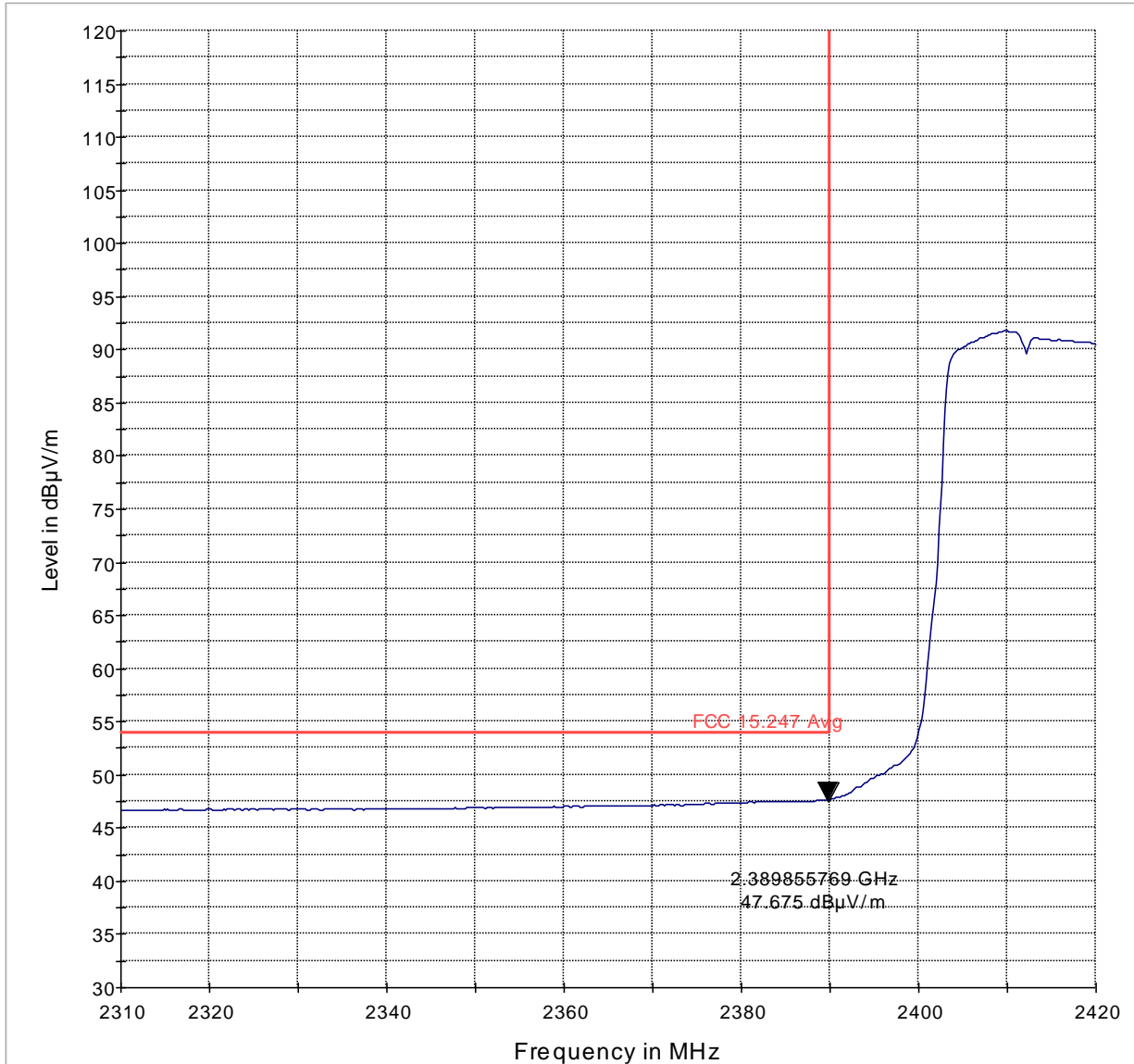
Lower Band Edge Peak - 802.11n [HT20]



— MaxPeak-ClearWrite-PK+ — MaxPeak-MaxHold-PK+ — FCC 15.247 Pk

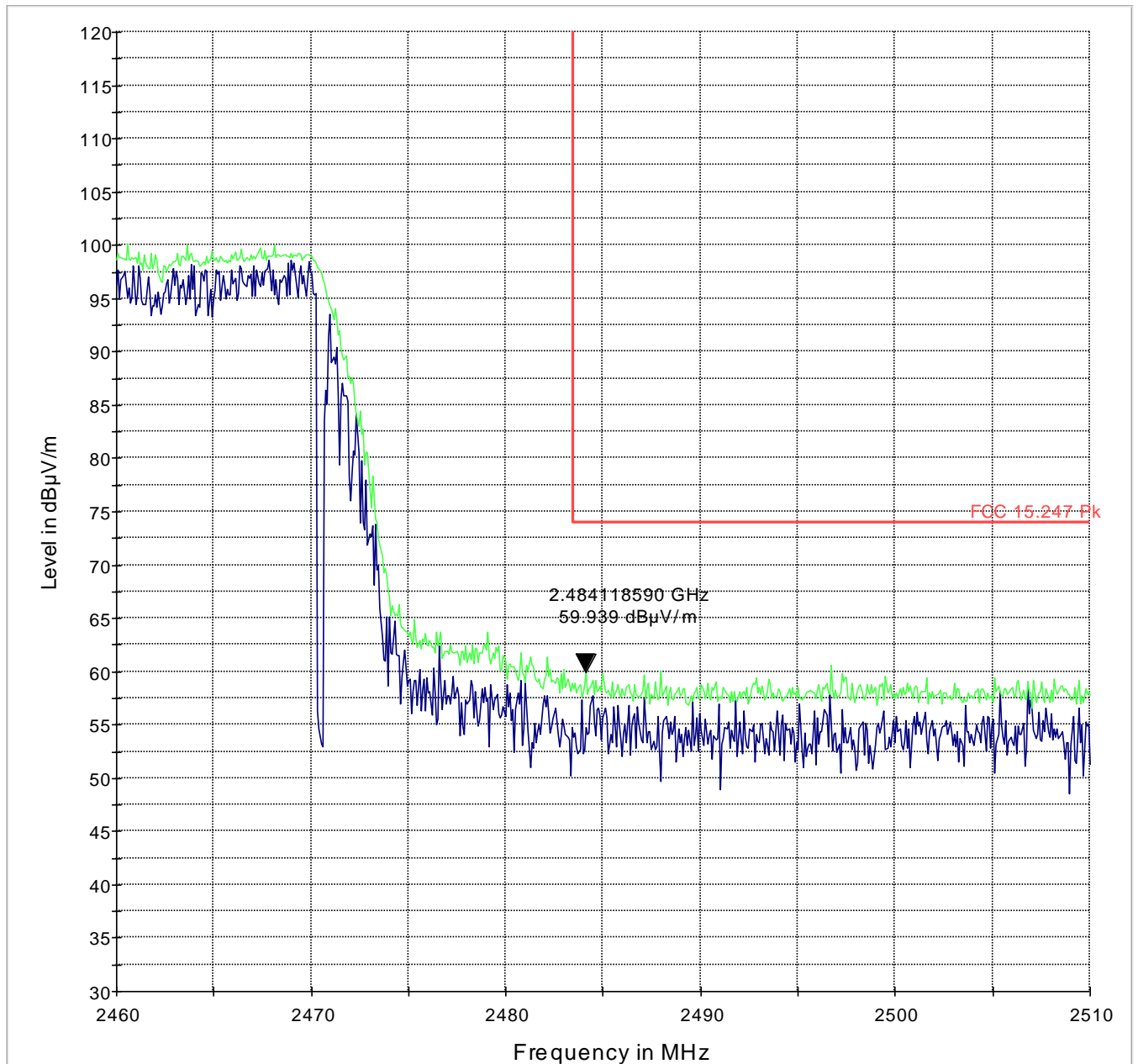


Lower Band Edge Average - 802.11n [HT20]



— MaxPeak-MaxHold-PK+ — Average-MaxHold-AVG — FCC 15.247 Avg

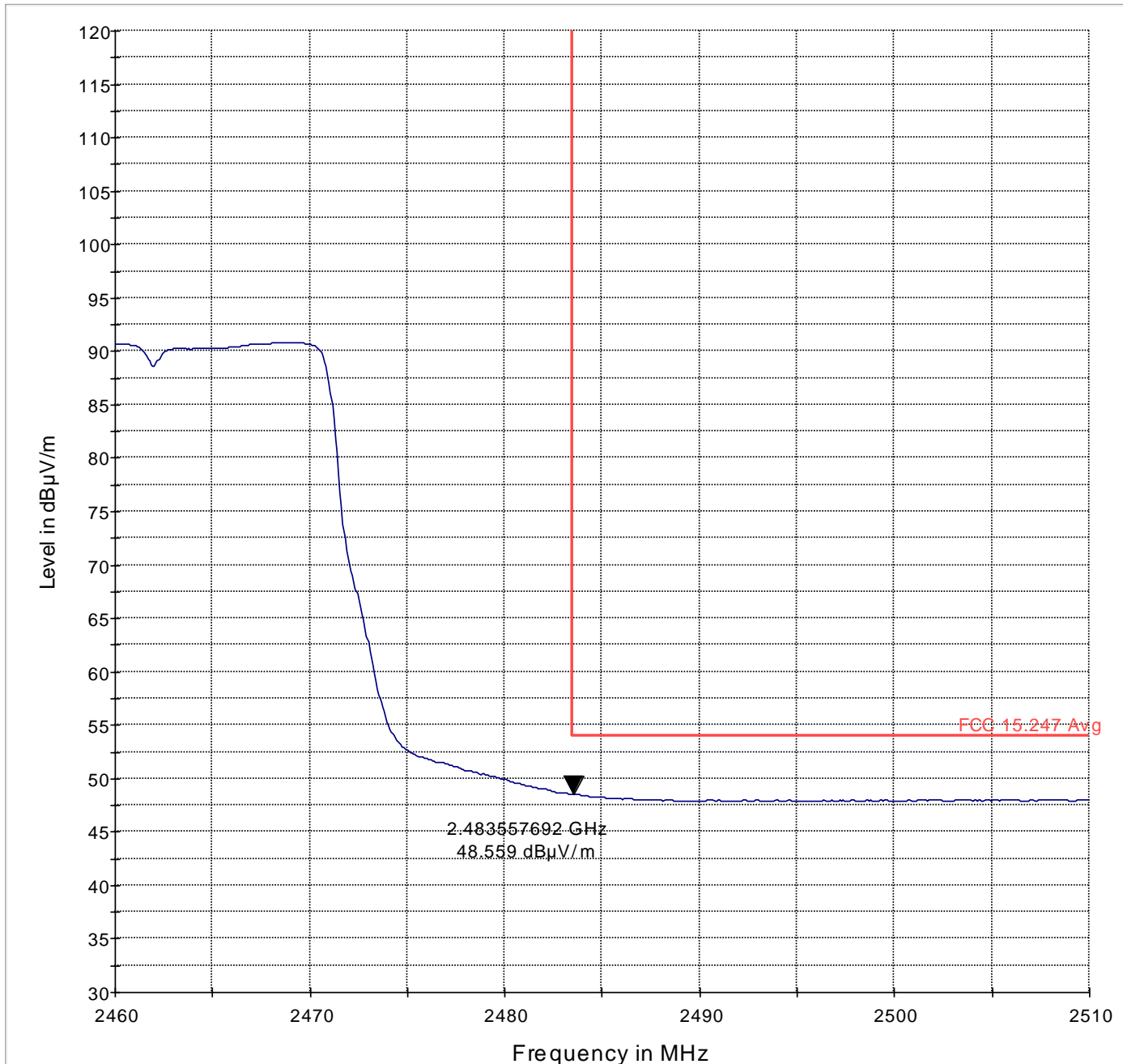
Higher Band Edge Peak - 802.11n [HT20]



— MaxPeak-ClearW rite-PK+ — MaxPeak-MaxHold-PK+ — FCC 15.247 Pk



Higher Band Edge Average - 802.11n [HT20]

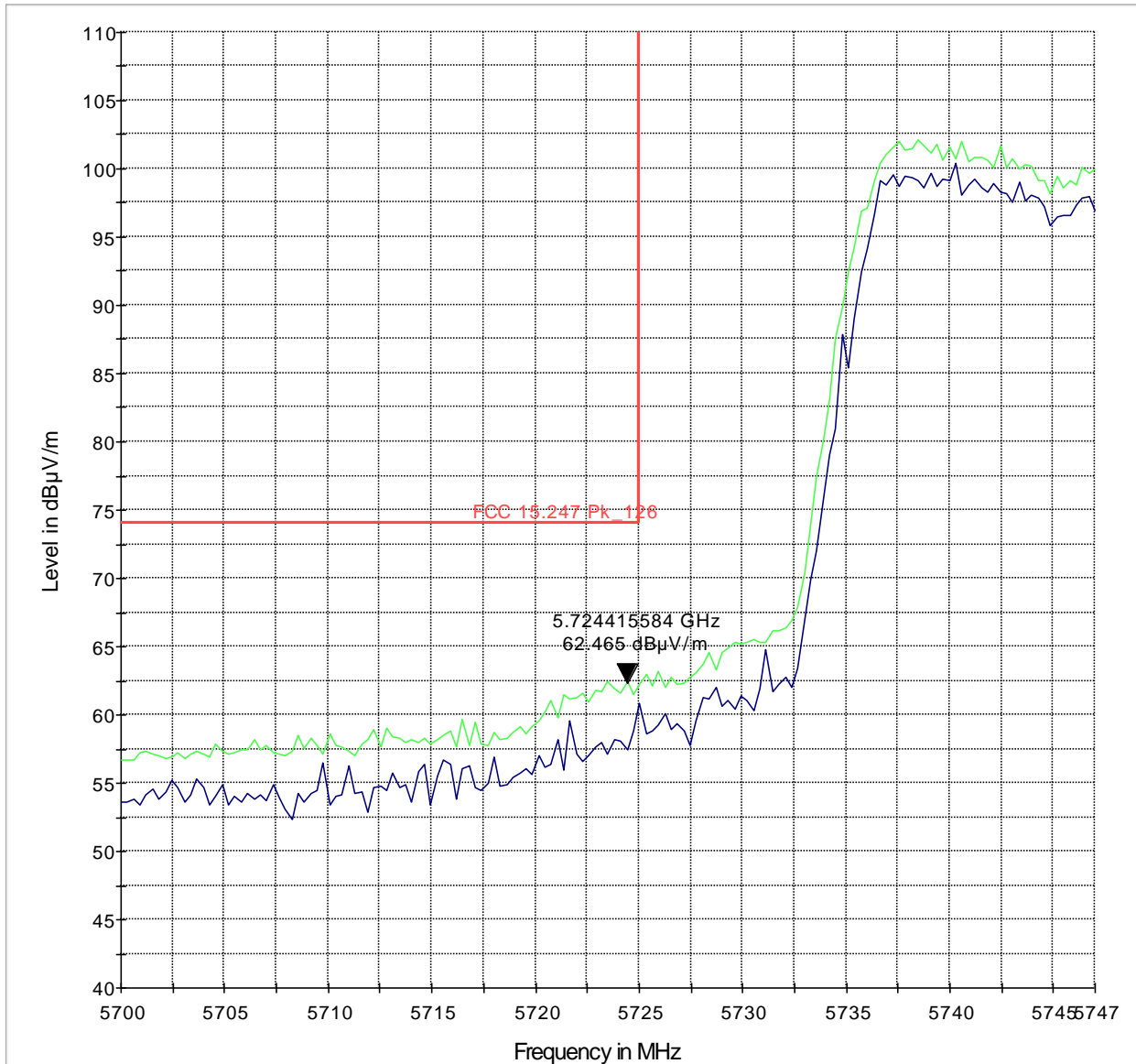


— MaxPeak-MaxHold-PK+ — FCC 15.247 Avg



6.3.5.4 Bandedge 802.11n U-NII-3 HT20

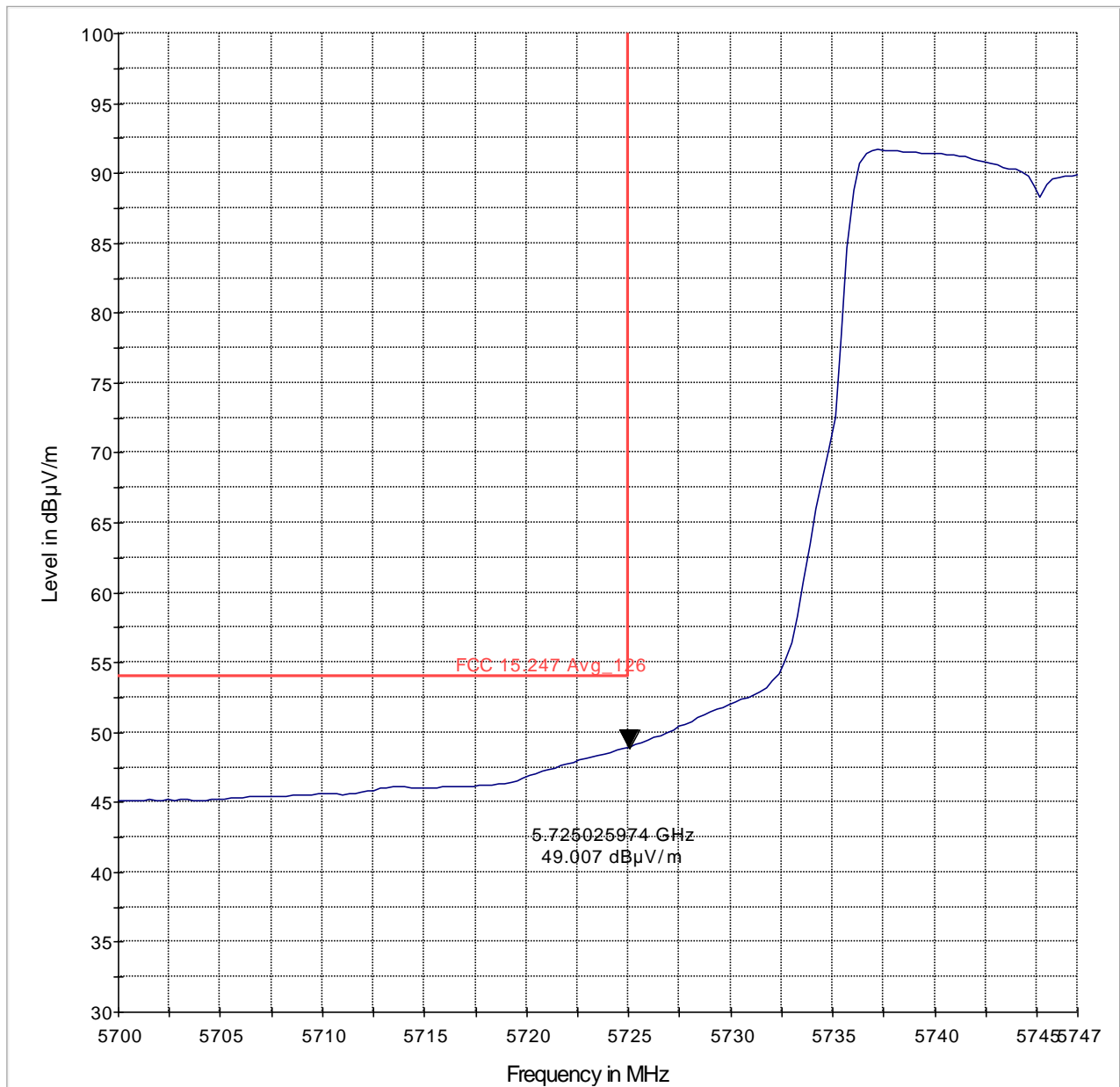
802.11n [HT20] Channel 149 Low Band Edge Peak measurement



— MaxPeak-ClearWrite-PK+ — MaxPeak-MaxHold-PK+ — FCC 15.247 Pk_126



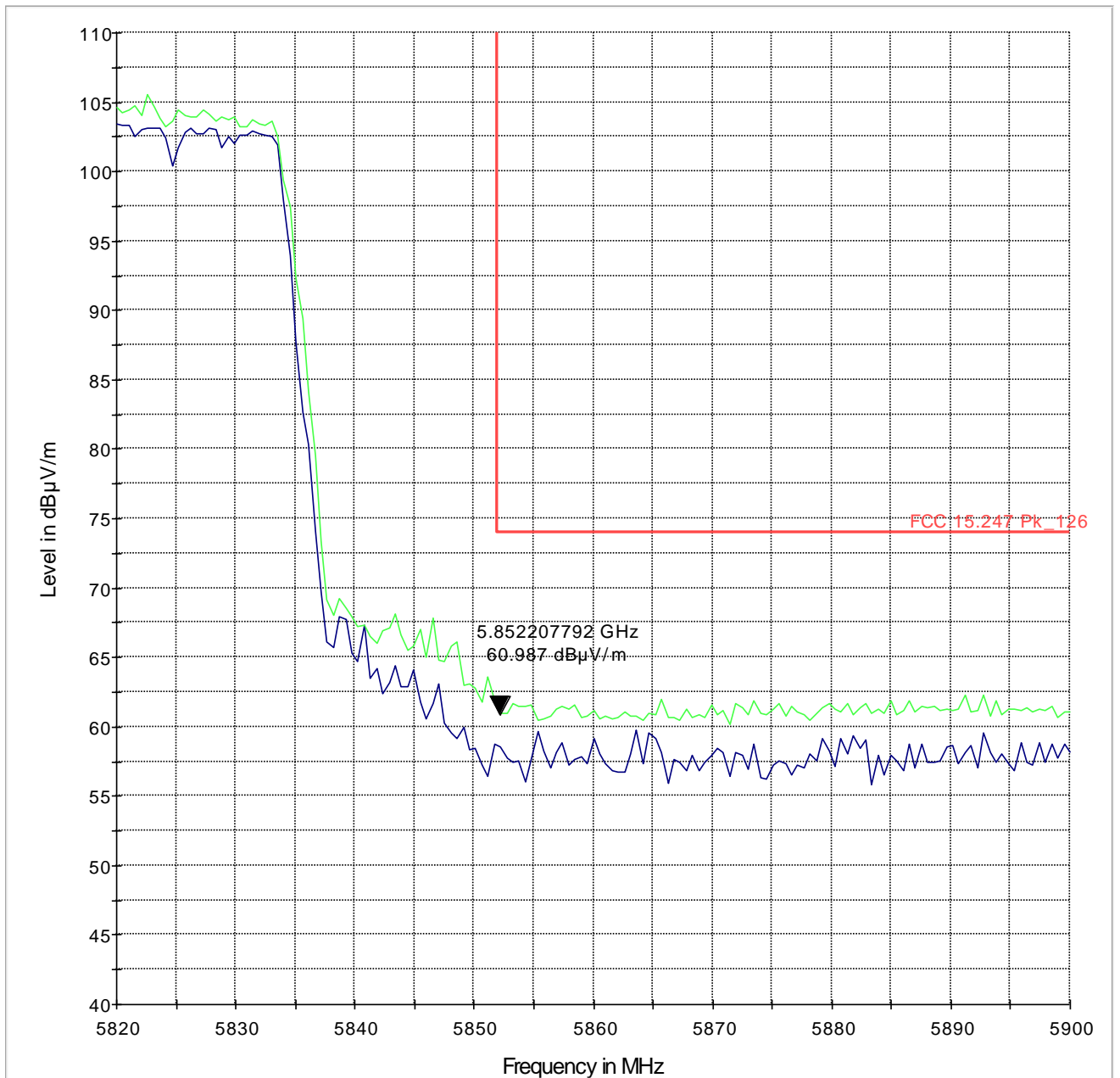
802.11n [HT20] Channel 149 Low Band Edge Average measurement



— MaxPeak-MaxHold-PK+ — FCC 15.247 Avg_126



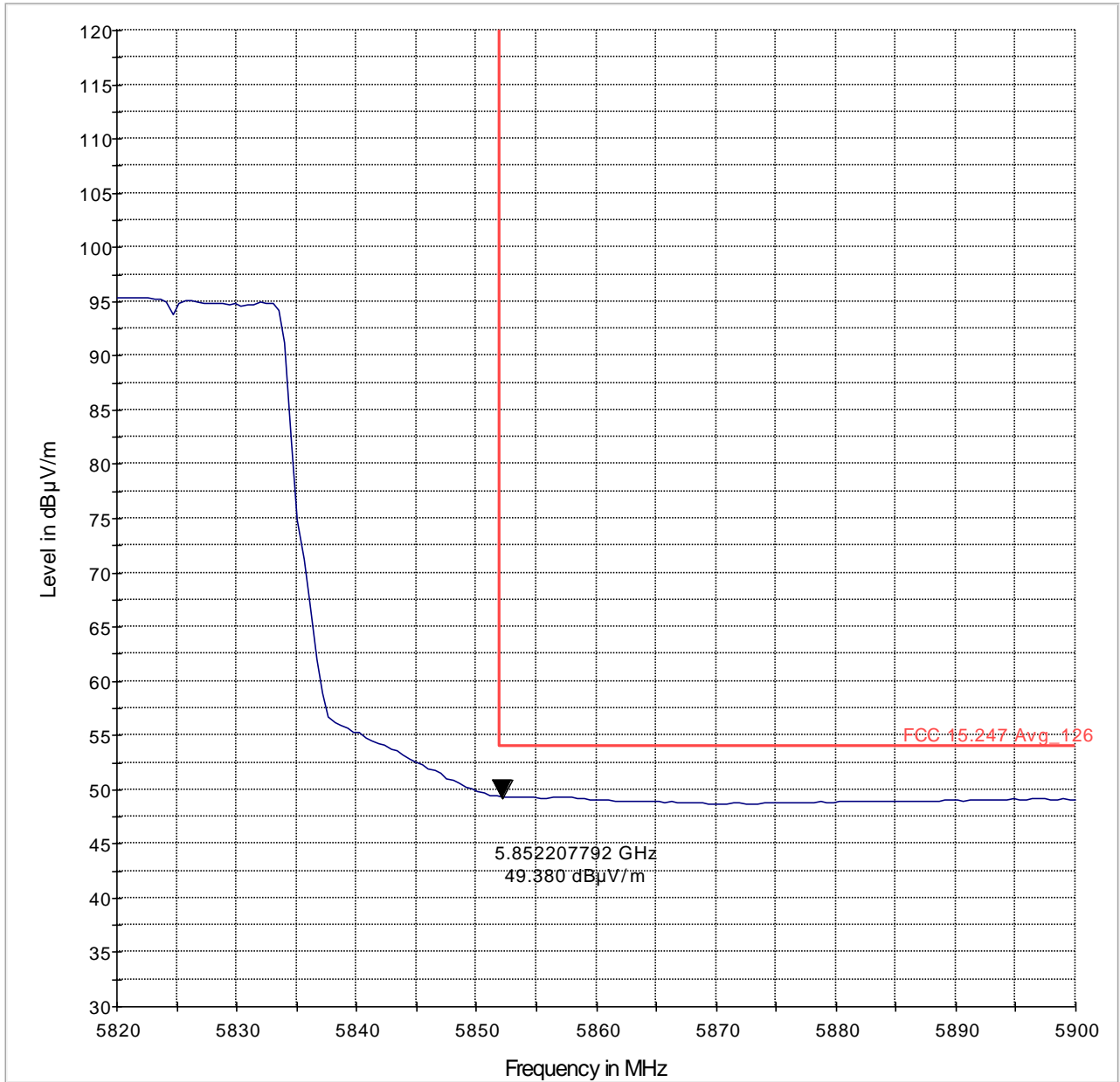
802.11n [HT20] Channel 165 High Band Edge Peak measurement



— MaxPeak-ClearWrite-PK+ — MaxPeak-MaxHold-PK+ — FCC 15.247 Pk_126



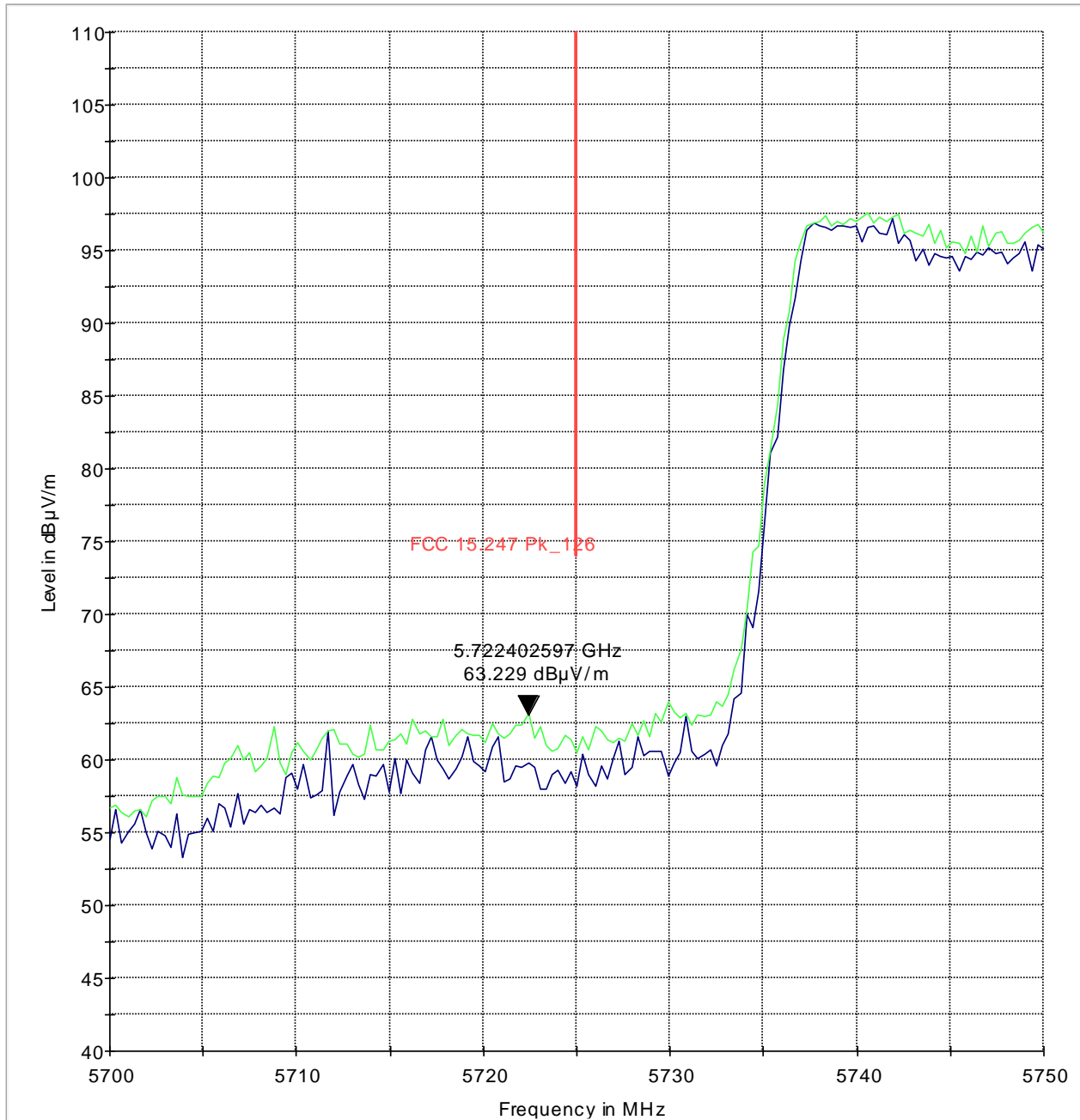
802.11n [HT20] Channel 165 High Band Edge Peak measurement



— MaxPeak-MaxHold-PK+ — FCC 15.247 Avg_126



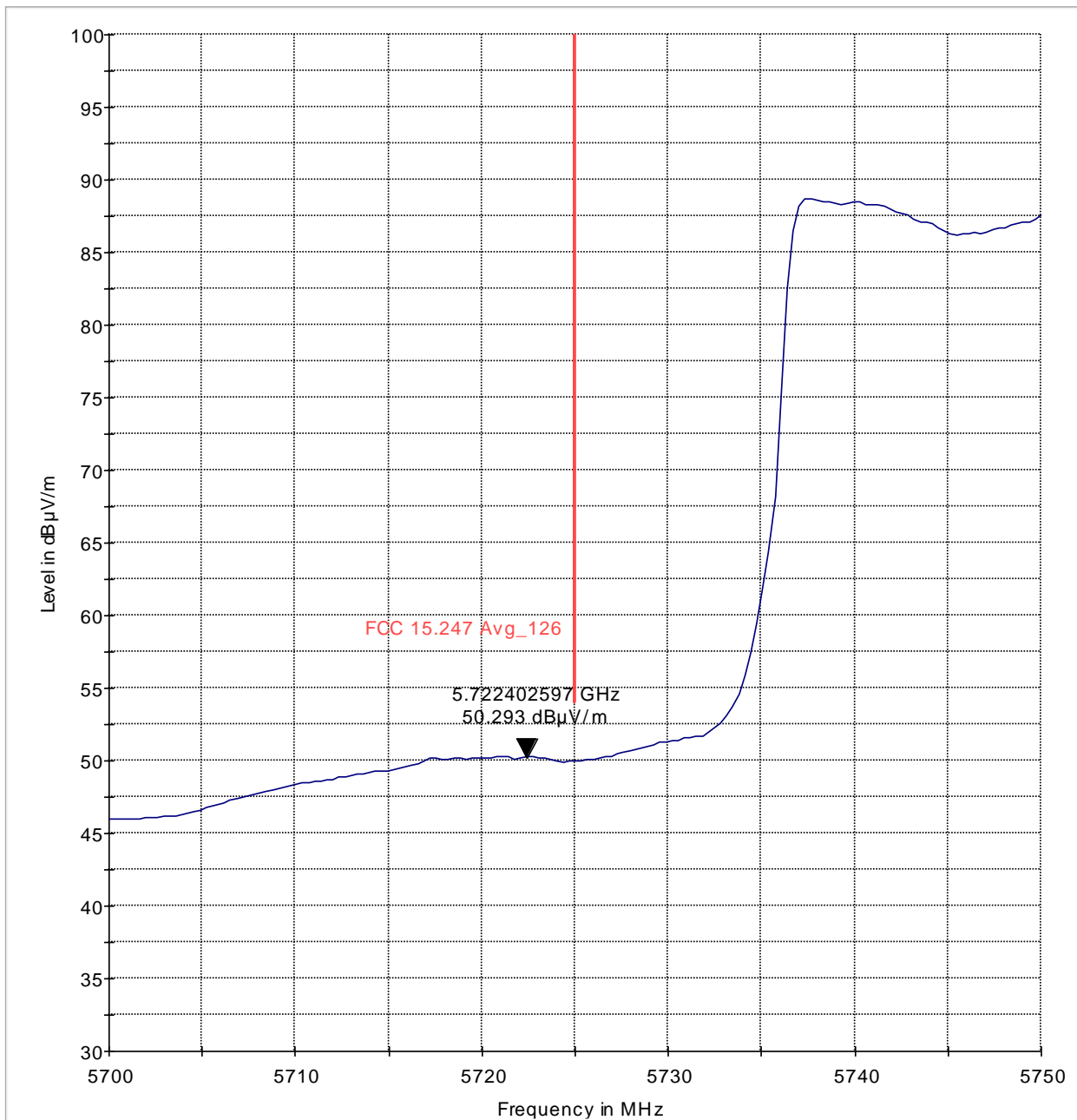
6.3.5.5 Bandedge 802.11n U-NII-3 HT40
802.11n [HT40] Channel 151 Low Band Edge Peak measurement



— MaxPeak-ClearW rite-PK+ — MaxPeak-MaxHold-PK+ — FCC 15.247 Pk_126



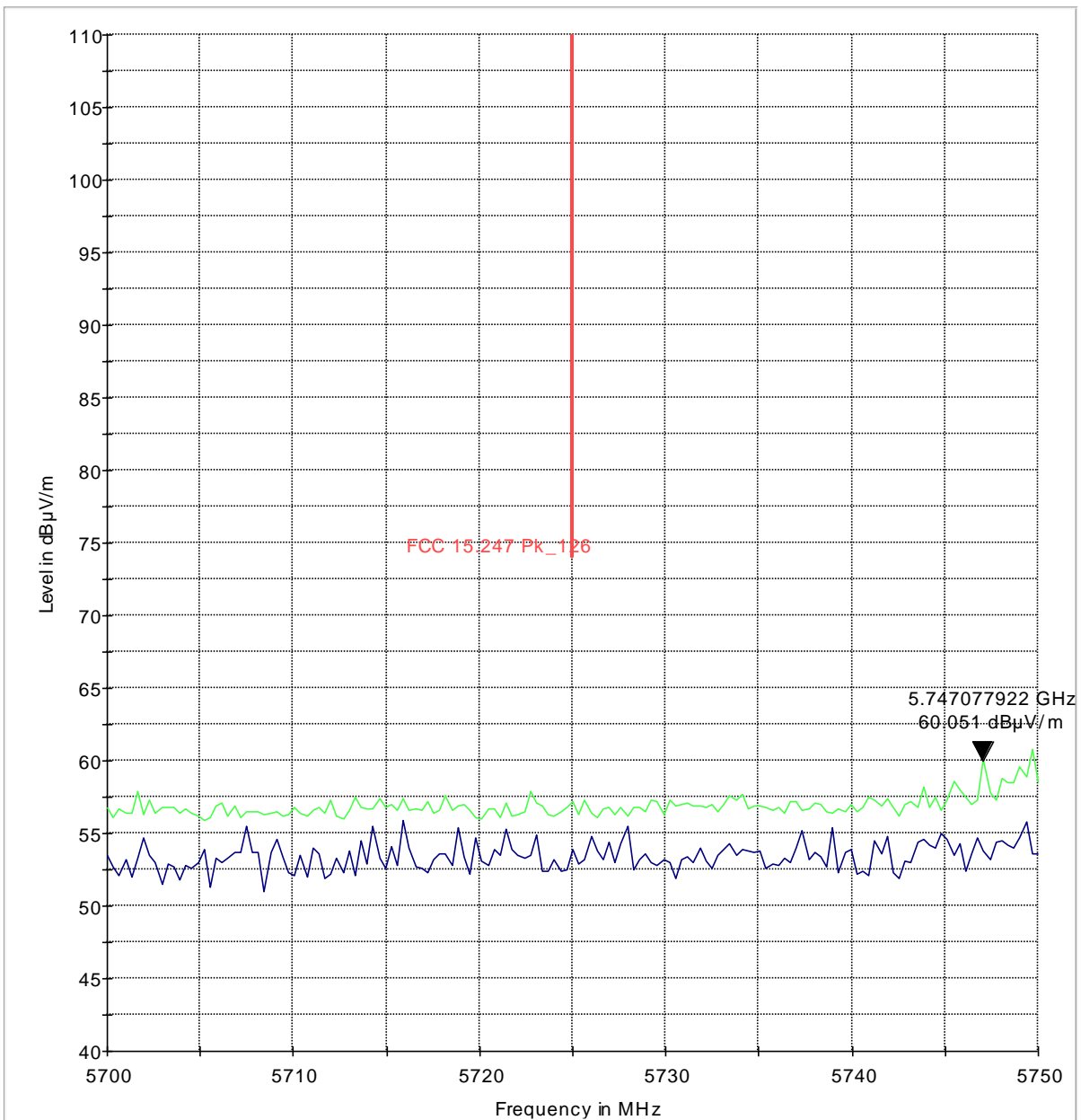
802.11n [HT40] Channel 151 Low Band Edge Average measurement



— MaxPeak-MaxHold-PK+ — FCC 15.247 Avg_126



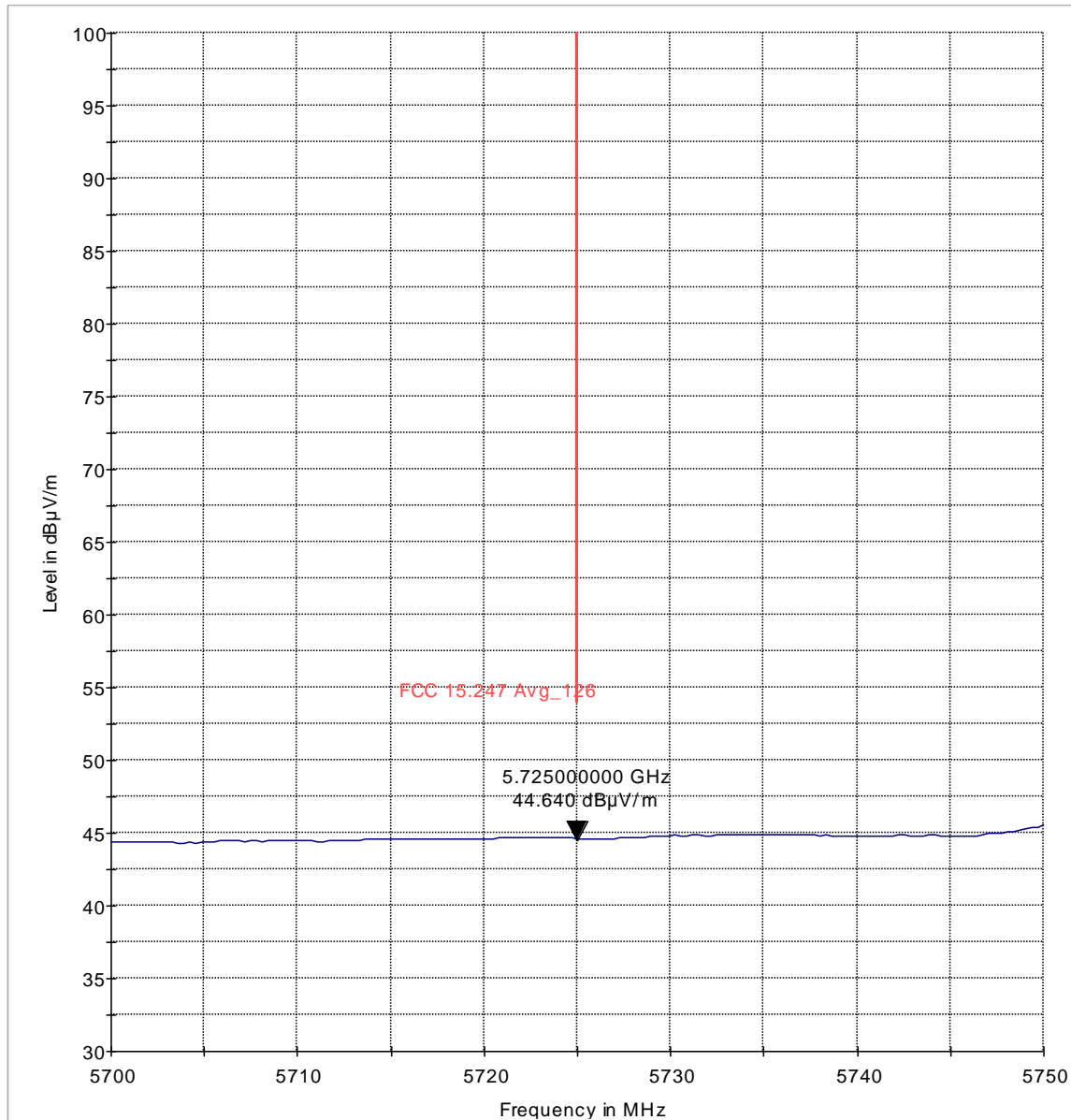
802.11n [HT40] Channel 159 High Band Edge Peak measurement



— MaxPeak-ClearWrite-PK+ — MaxPeak-MaxHold-PK+ — FCC 15.247 Pk_126



802.11n [HT40] Channel 159 High Band Edge Average measurement

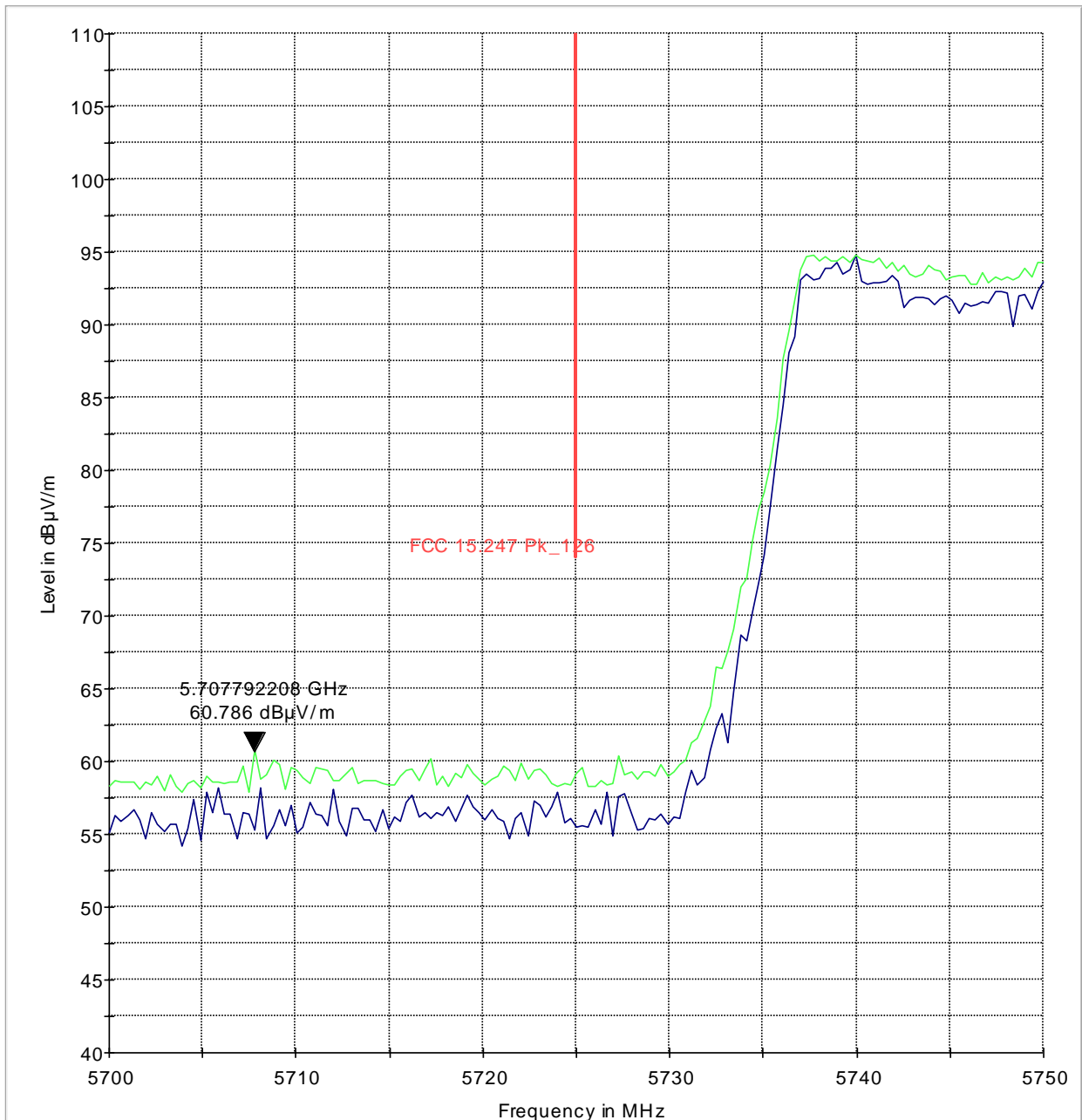


— MaxPeak-MaxHold-PK+ — FCC 15.247 Avg_126



6.3.5.6 Bandedge 802.11ac U-NII-3 HT80

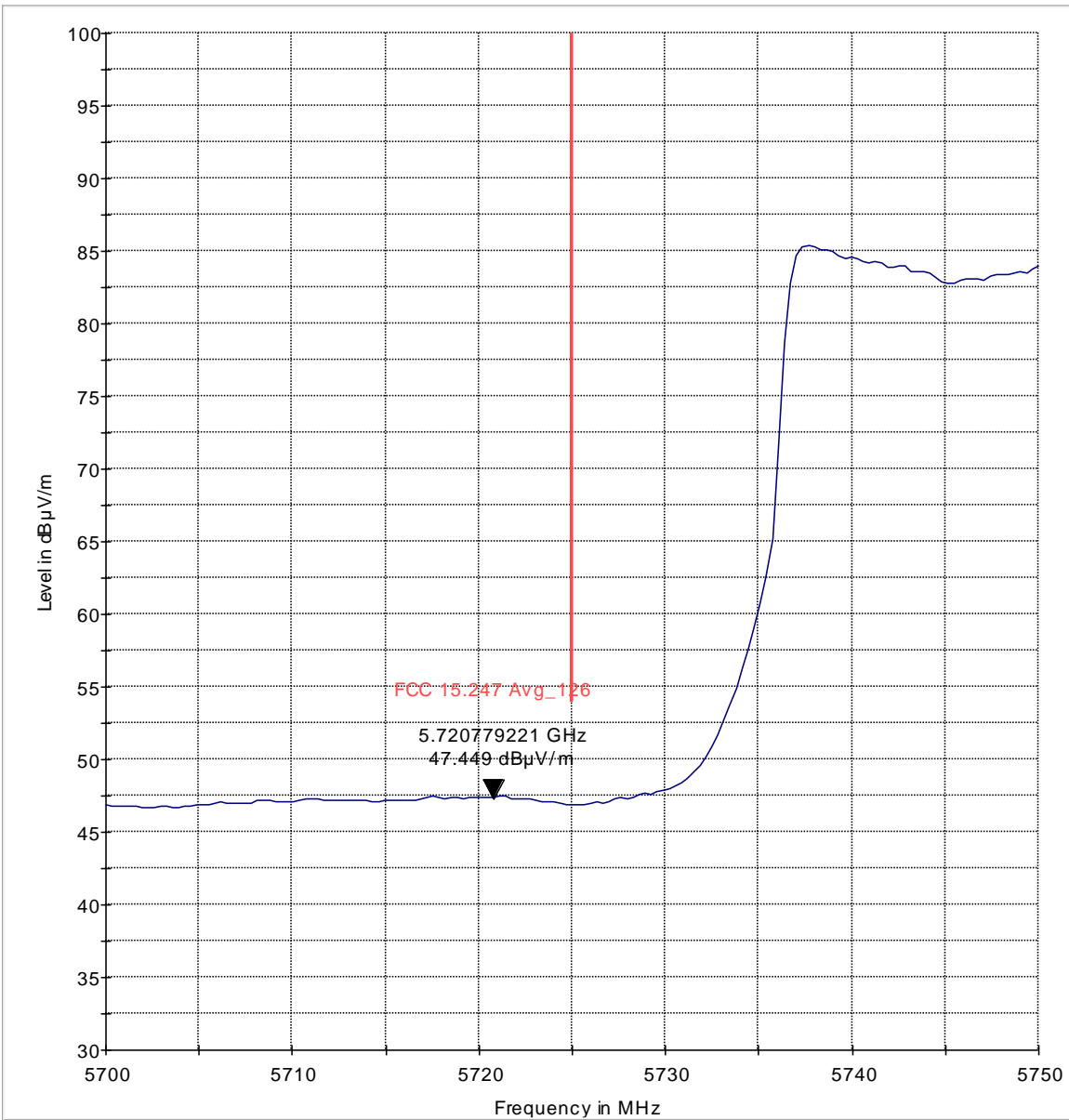
802.11ac [HT80] Channel 155 Low Band Edge Peak measurement



— MaxPeak-ClearWrite-PK+ — MaxPeak-MaxHold-PK+ — FCC 15.247 Pk_126



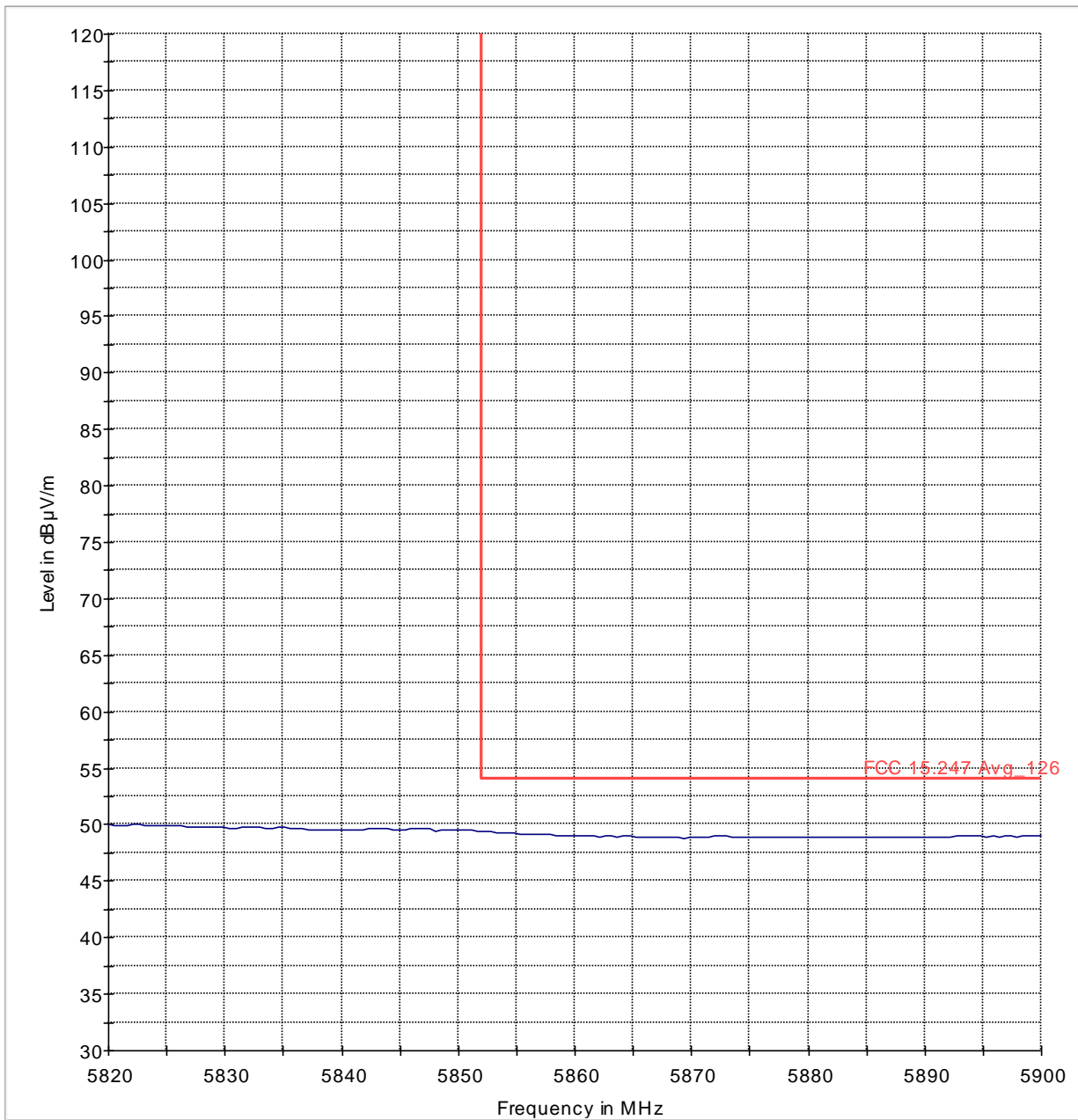
802.11ac [HT80] Channel 155 Low Band Edge Average measurement



— MaxPeak-MaxHold-PK+ — FCC 15.247 Avg_126



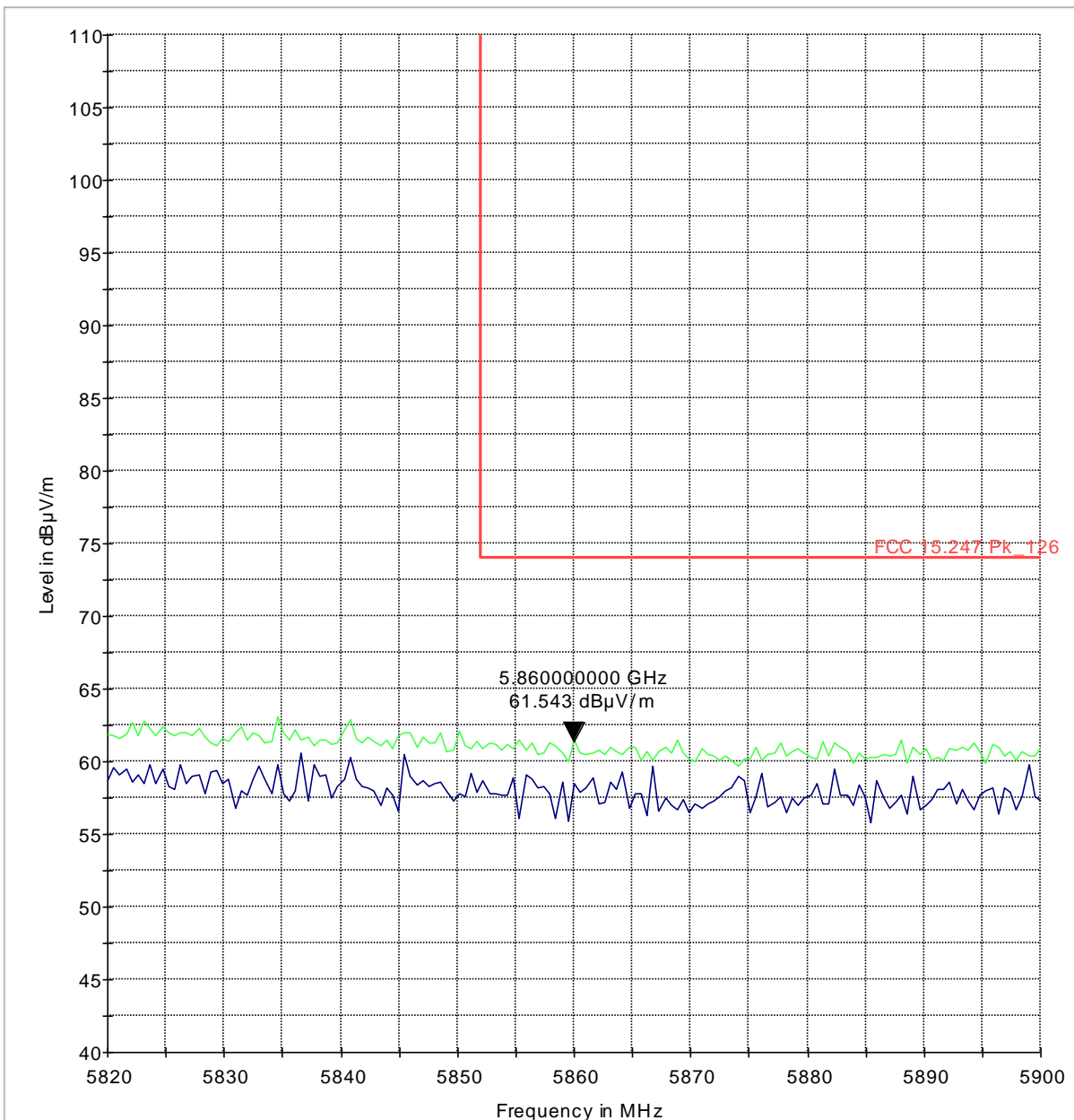
802.11ac [HT80] Channel 155 High Band Edge Average measurement



— MaxPeak-MaxHold-PK+ — FCC 15.247 Avg_126



802.11ac [HT80] Channel 155 High Band Edge Peak measurement



— MaxPeak-ClearWrite-PK+ — MaxPeak-MaxHold-PK+ — FCC 15.247 PK_126



6.4 Unwanted Emissions into Restricted Frequency Bands - Radiated

**6.4.1 Limits:
§15.209/15.205**

15.205 (a) 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 | | | |

15.209 (a) Emission Limits:

The emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

| Frequency (MHz) | Field strength (microvolts/meter) | 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** | 3 |
| 88–216 | 150** | 3 |
| 216–960 | 200** | 3 |
| Above 960 | 500 | 3 |

6.4.2 Test Conditions:

Tnom: 20°C; Vnom: 3.8 VDC

6.4.3 Test Result:

All inadvertent emissions are below the applicable limits.

6.4.4 Testing Notes

The following plots show the worst case per frequency range out of all tested modes of operation.

For the measurement range up to 30 MHz in the following plots the field strength results from 3m distance measurement are extrapolated to 300m and 30m distance respectively, by 40dB/decade, according to part 15.31(f)(2), per antenna factor scaling.

The red limit line shows the 300 m limit up to 490 kHz, the 30m limit up to 30 MHz and 3m limit above 30MHz.

Frequencies >18GHz are measured only for MidChannel. In case the results are within 3dB of the limit measurements at these frequencies are also performed for MidChannel and HighChannel.

Unless mentioned otherwise, the emissions outside the limit lines in the plots are from the transmit signal.

Measurement Uncertainty: $\pm 3.0\text{dB}$

6.4.5 Measurement Verdict – Unwanted Emissions into Restricted Frequency Bands - Radiated Pass.

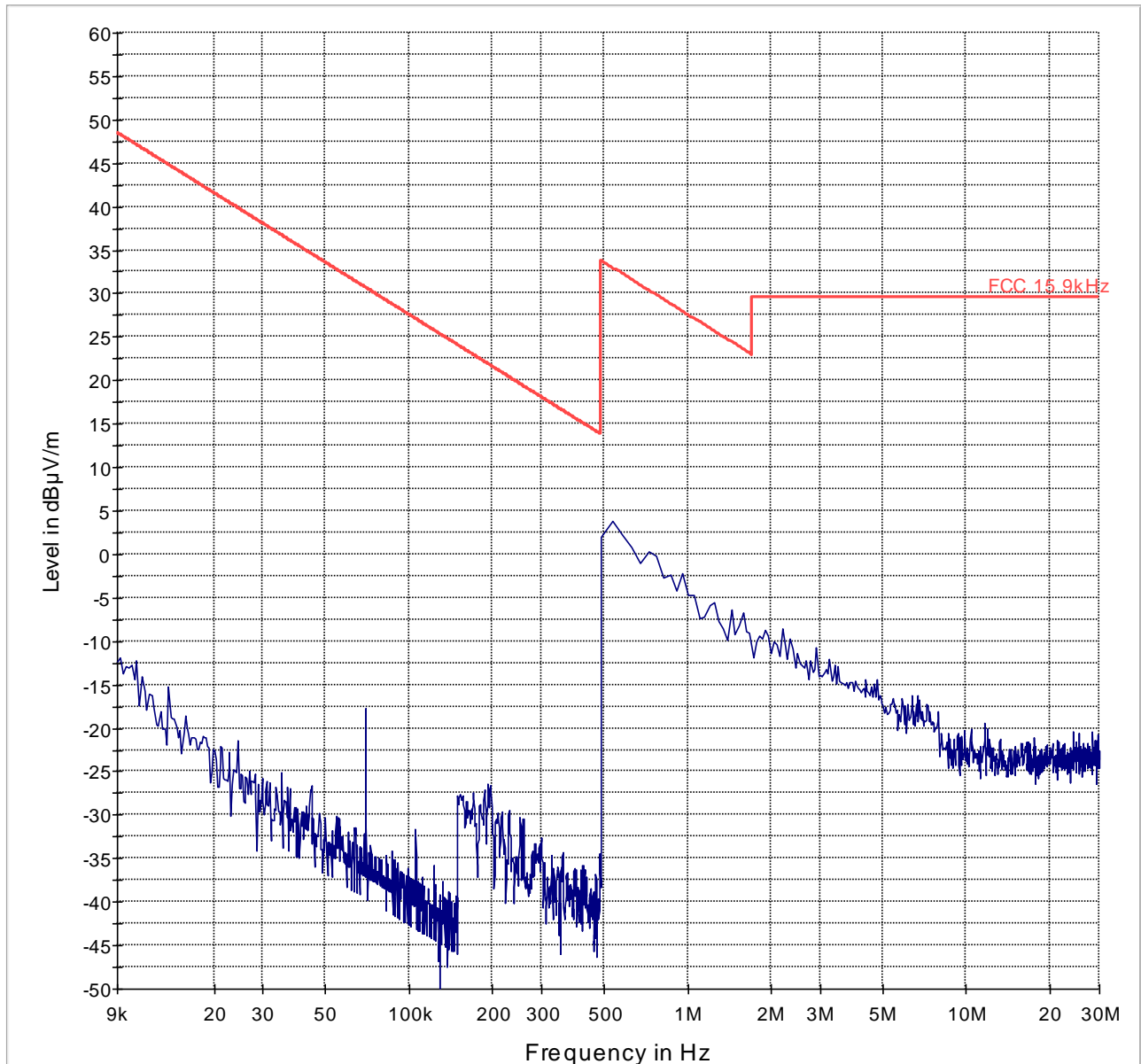


6.4.6 Test data/plots

6.4.6.1 Radiated Emissions 802.11b - 2.4GHz

<30MHz

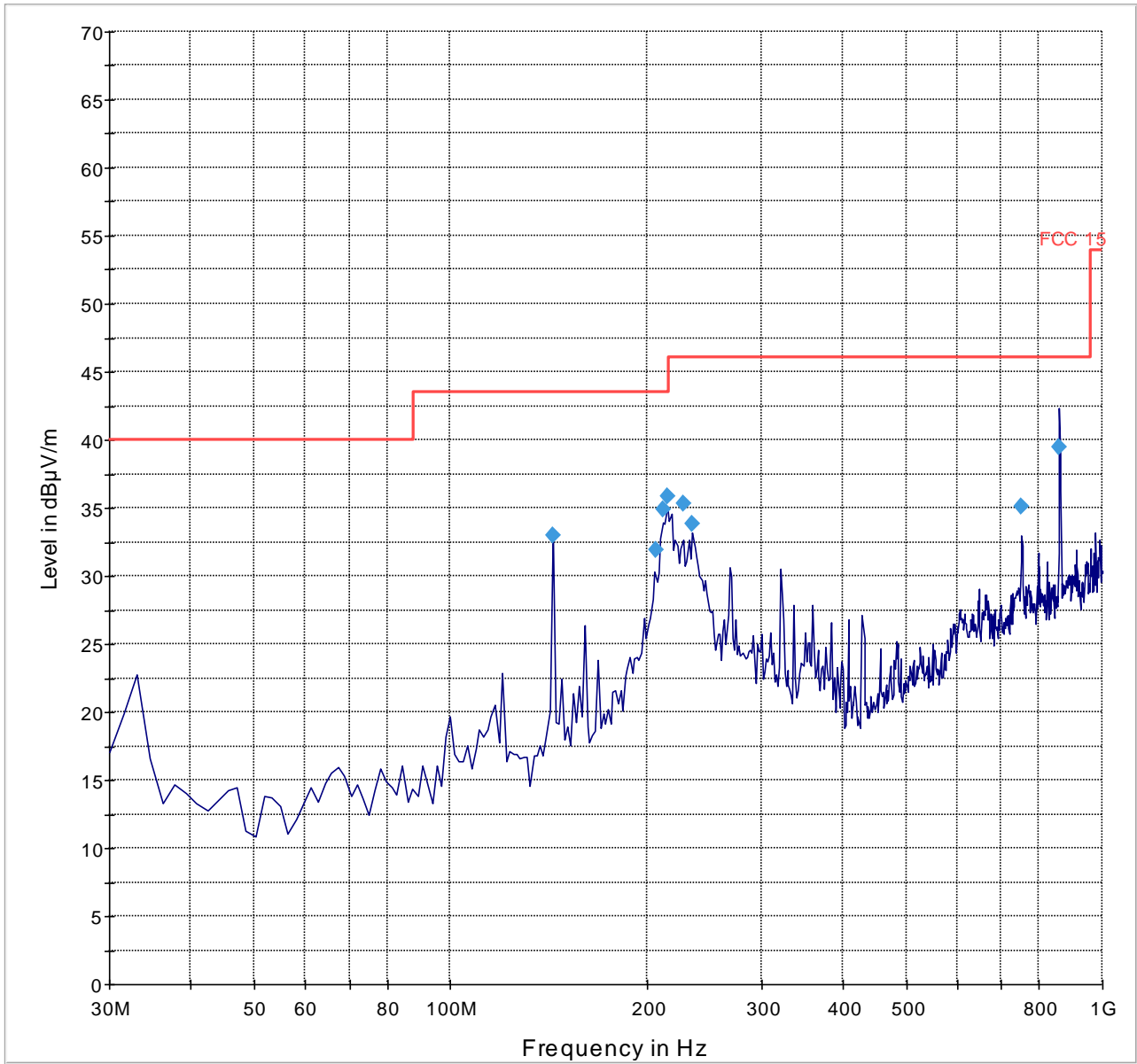
Mode: 802.11b-Ch1-Lo



— FCC 15.9kHz — Preview Result 1-PK+



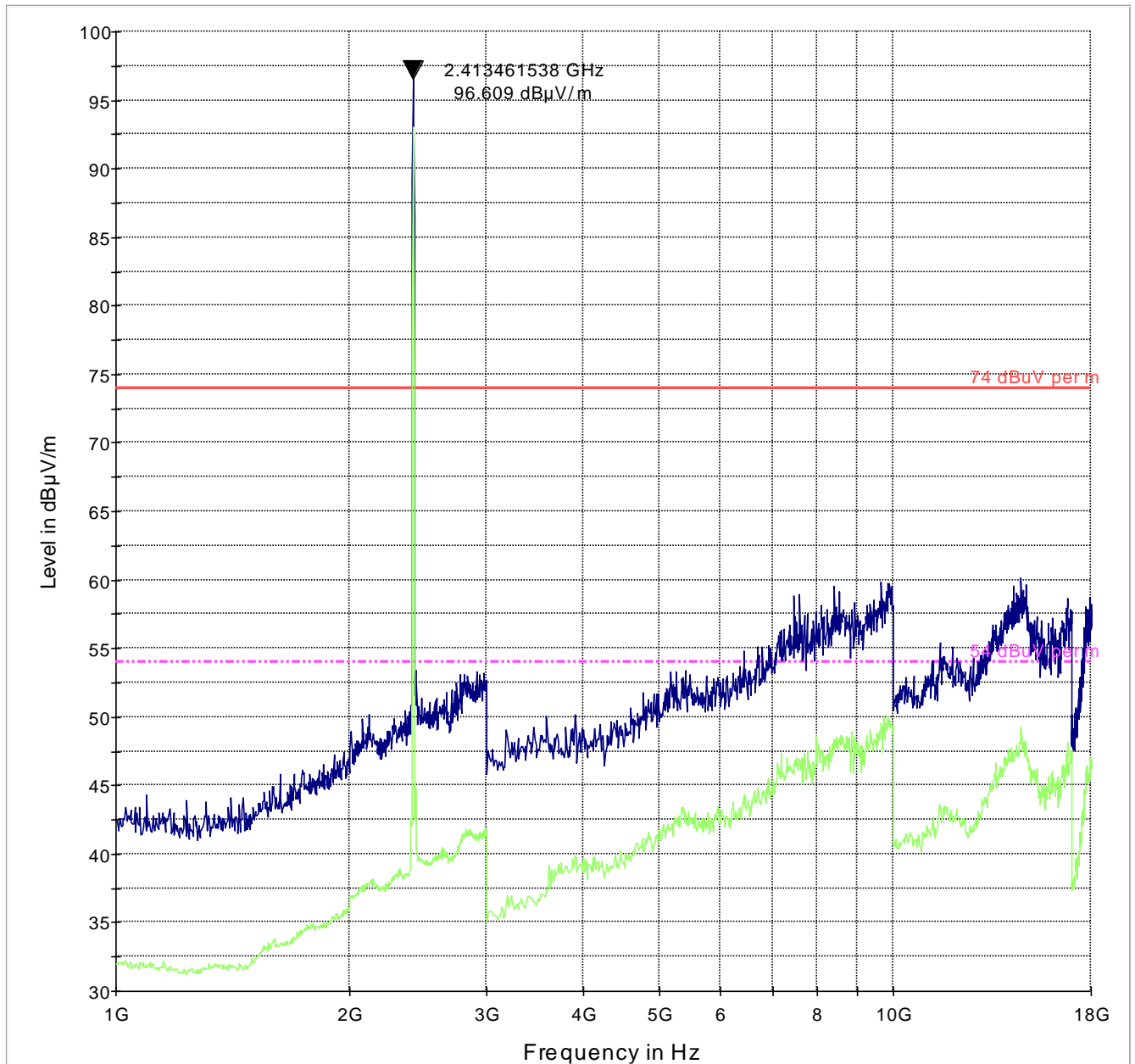
30MHz - 1GHz
Mode: 802.11b-Ch1-Lo



— FCC 15 — Preview Result 1-PK+ ◆ Final Result 1-PK+



1GHz - 18GHz
Mode: 802.11b-Ch1-Lo

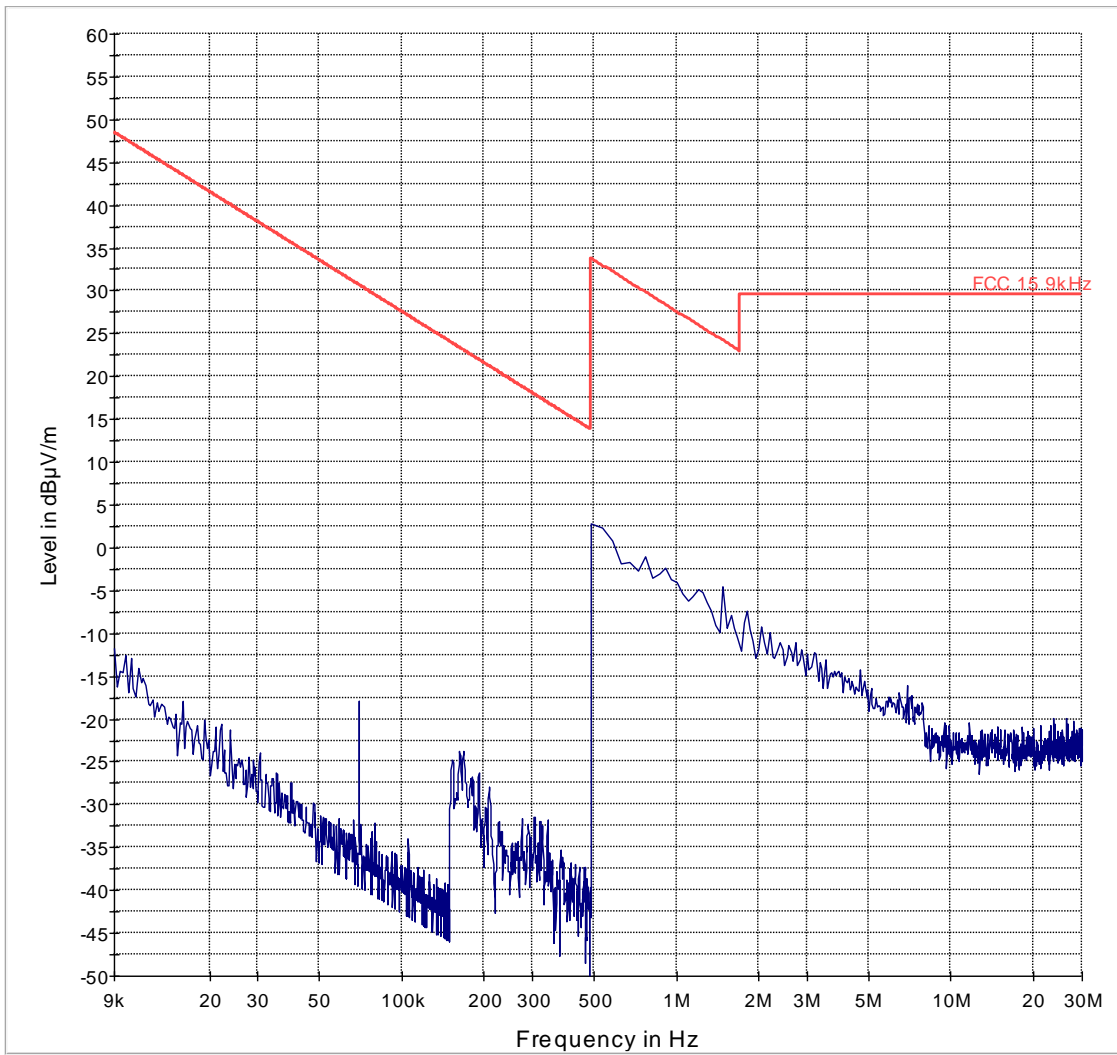


— 74 dBuV per m - - - - 54 dBuV per m — Preview Result 1-PK+ — Preview Result 2-AVG



<30MHz

Mode: 802.11b-MidChannel

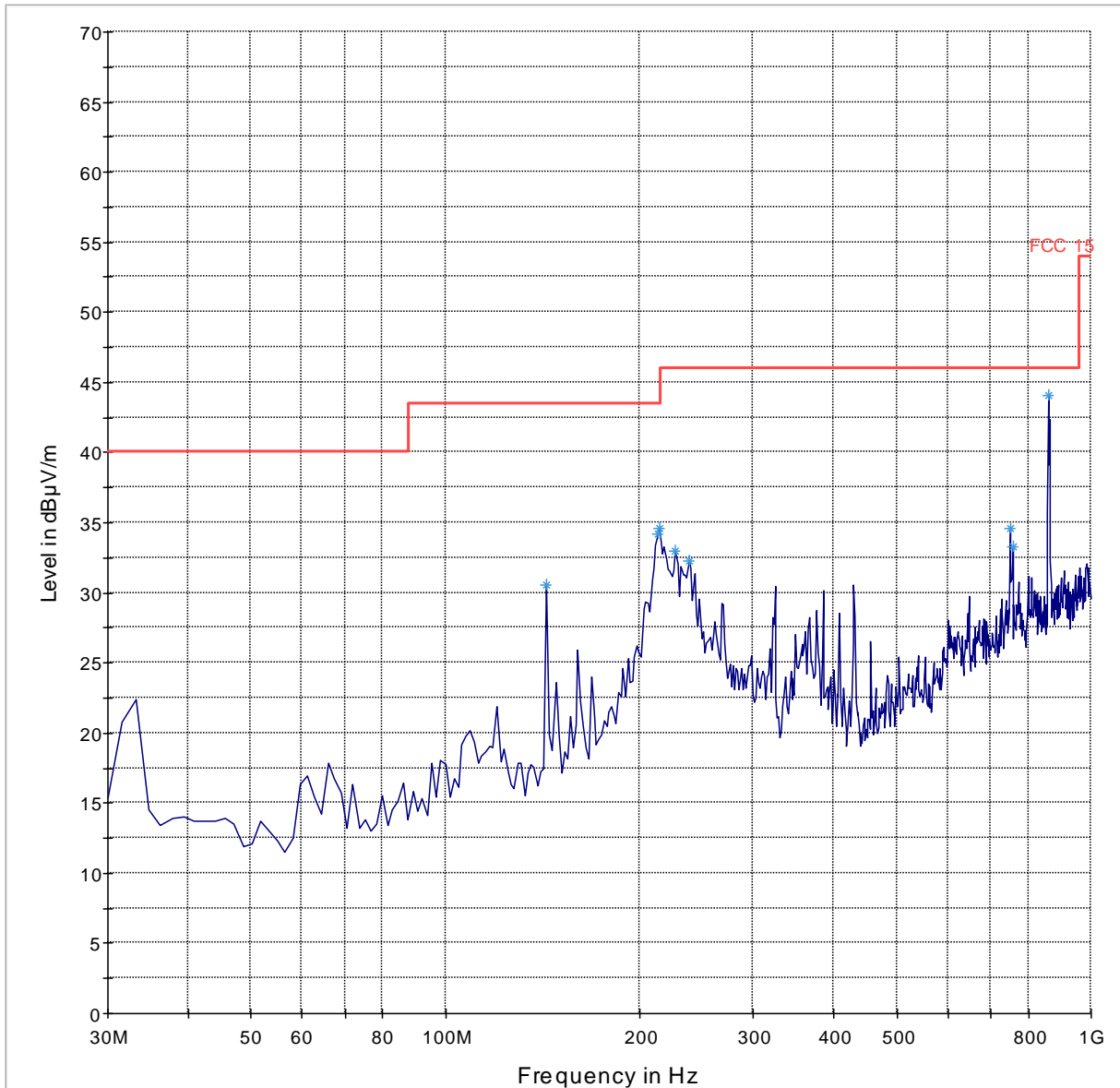


— FCC 15.9kHz — Preview Result 1-PK+



30MHz - 1GHz

Mode: 802.11b-MidChannel

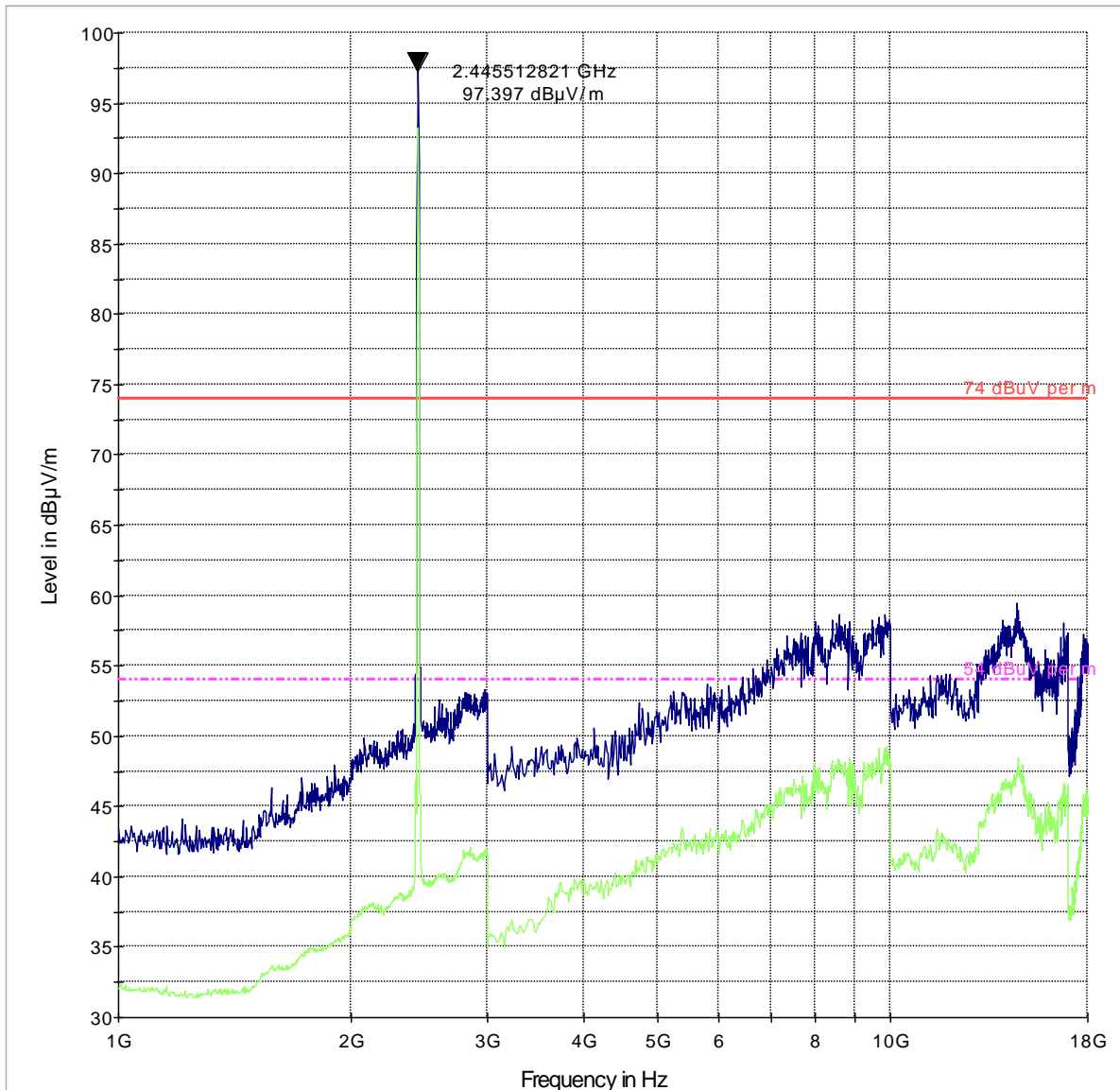


— FCC 15 — Preview Result 1-PK+ * Data Reduction Result 1 [3]-PK+



1GHz - 18GHz

Mode: 802.11b-MidChannel

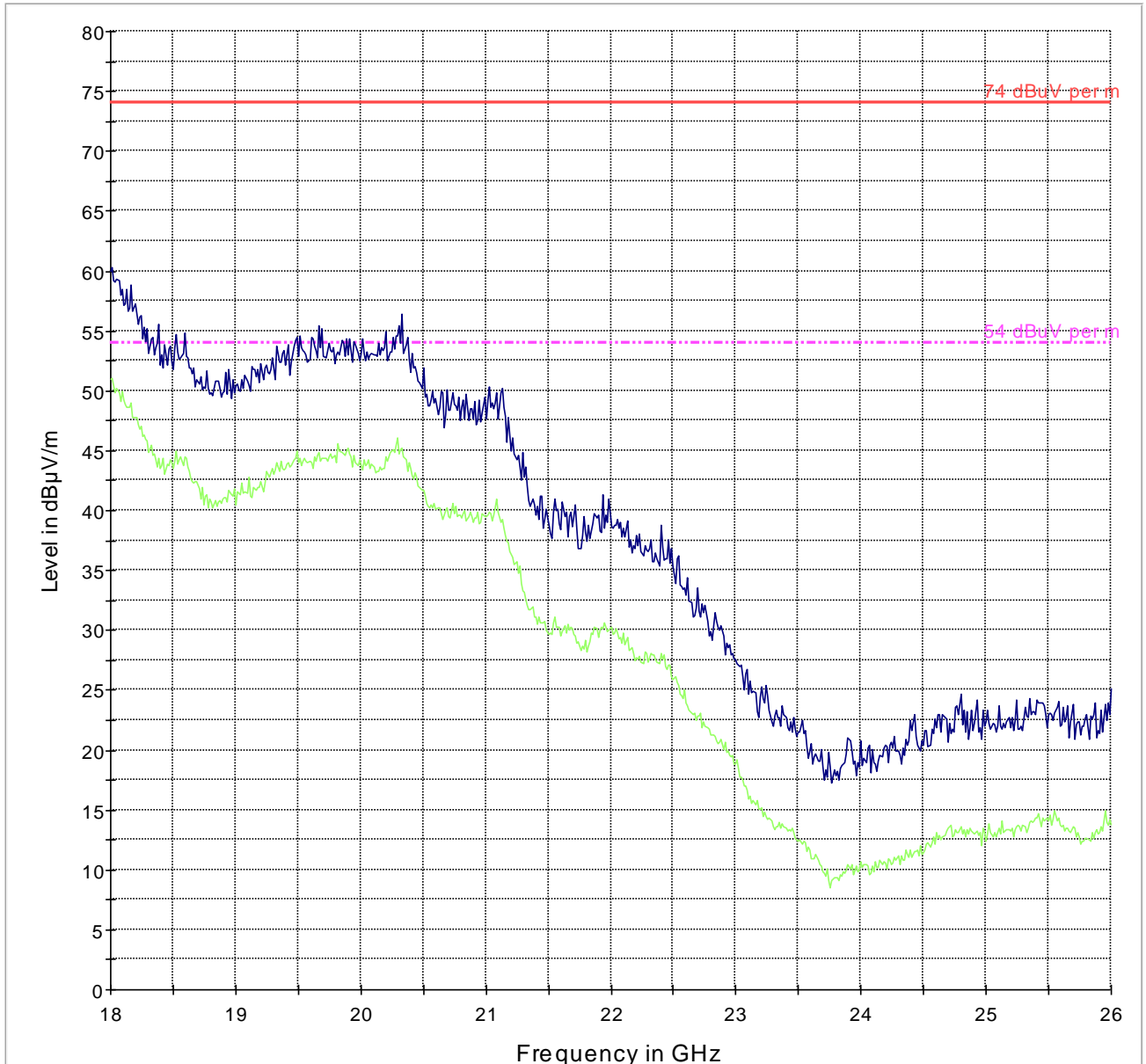


— 74 dBµV per m - - - - 54 dBµV per m — Preview Result 1-PK+ — Preview Result 2-AVG



18GHz - 25GHz

Mode: 802.11b-MidChannel

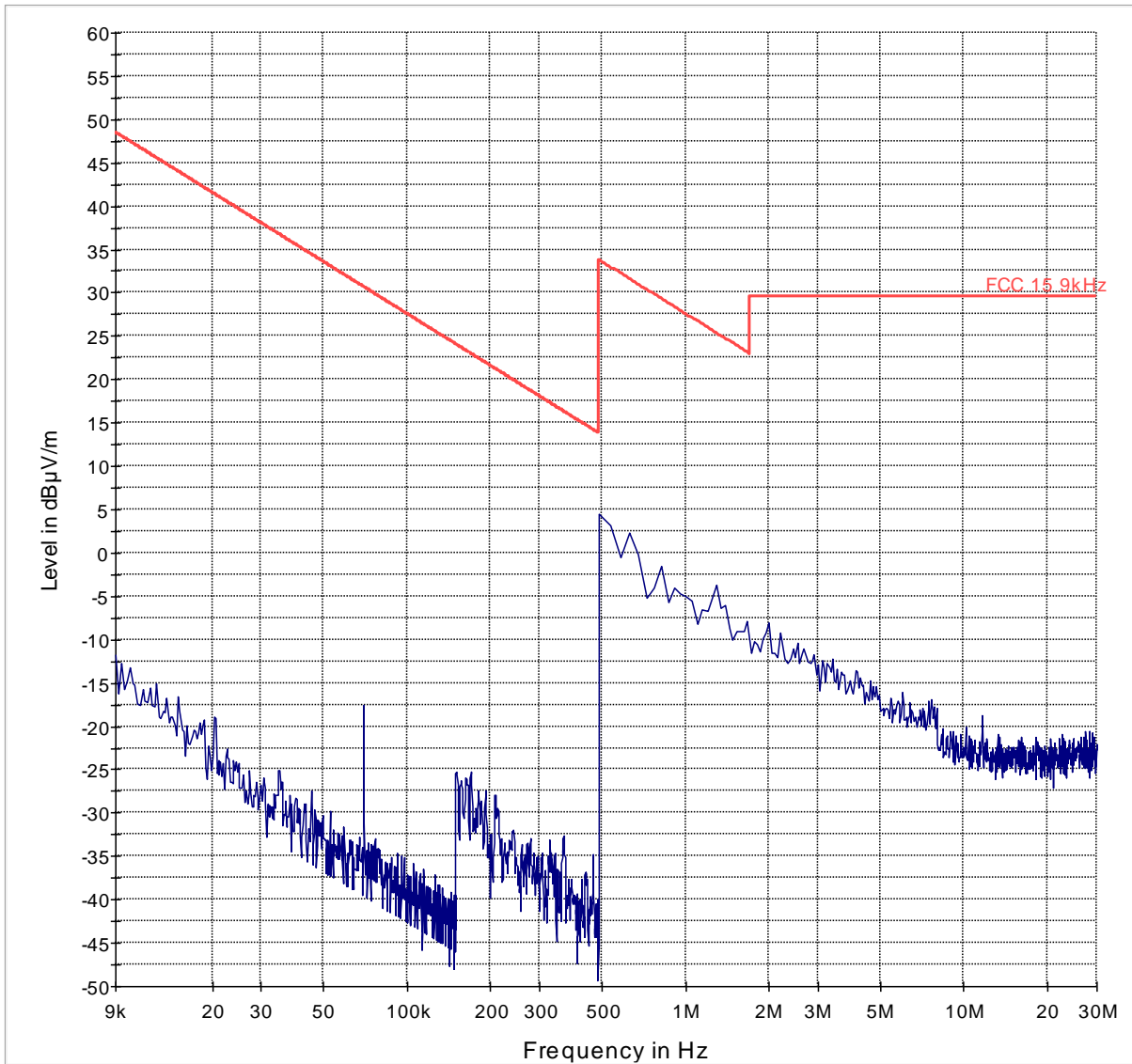


— 74 dBµV per m - - - 54 dBµV per m — Preview Result 1-PK+ — Preview Result 2-AVG



<30MHz

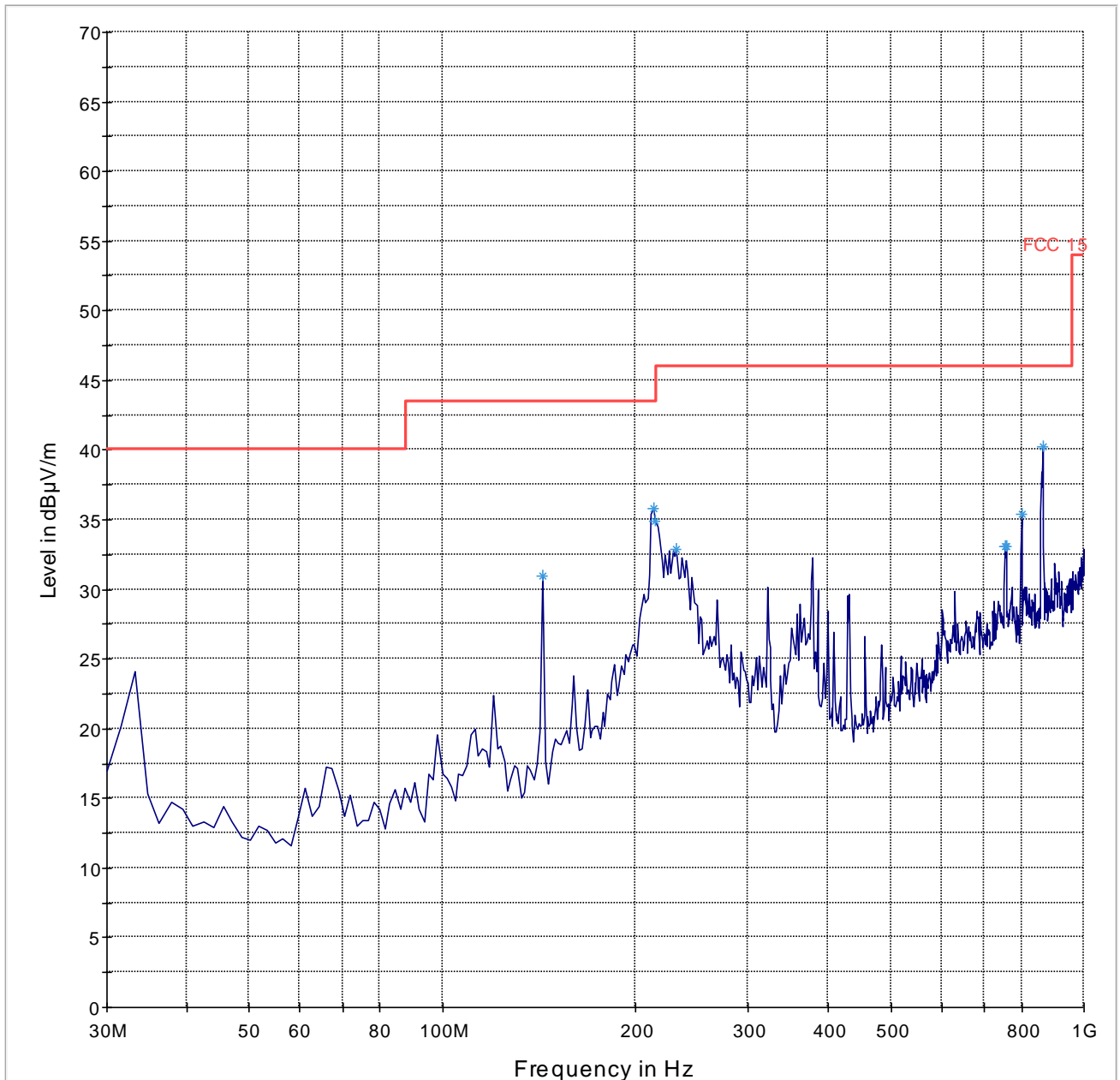
Mode: 802.11b-HighChannel



— FCC 15.9kHz — Preview Result 1-PK+

30MHz - 1GHz

Mode: 802.11b-HighChannel

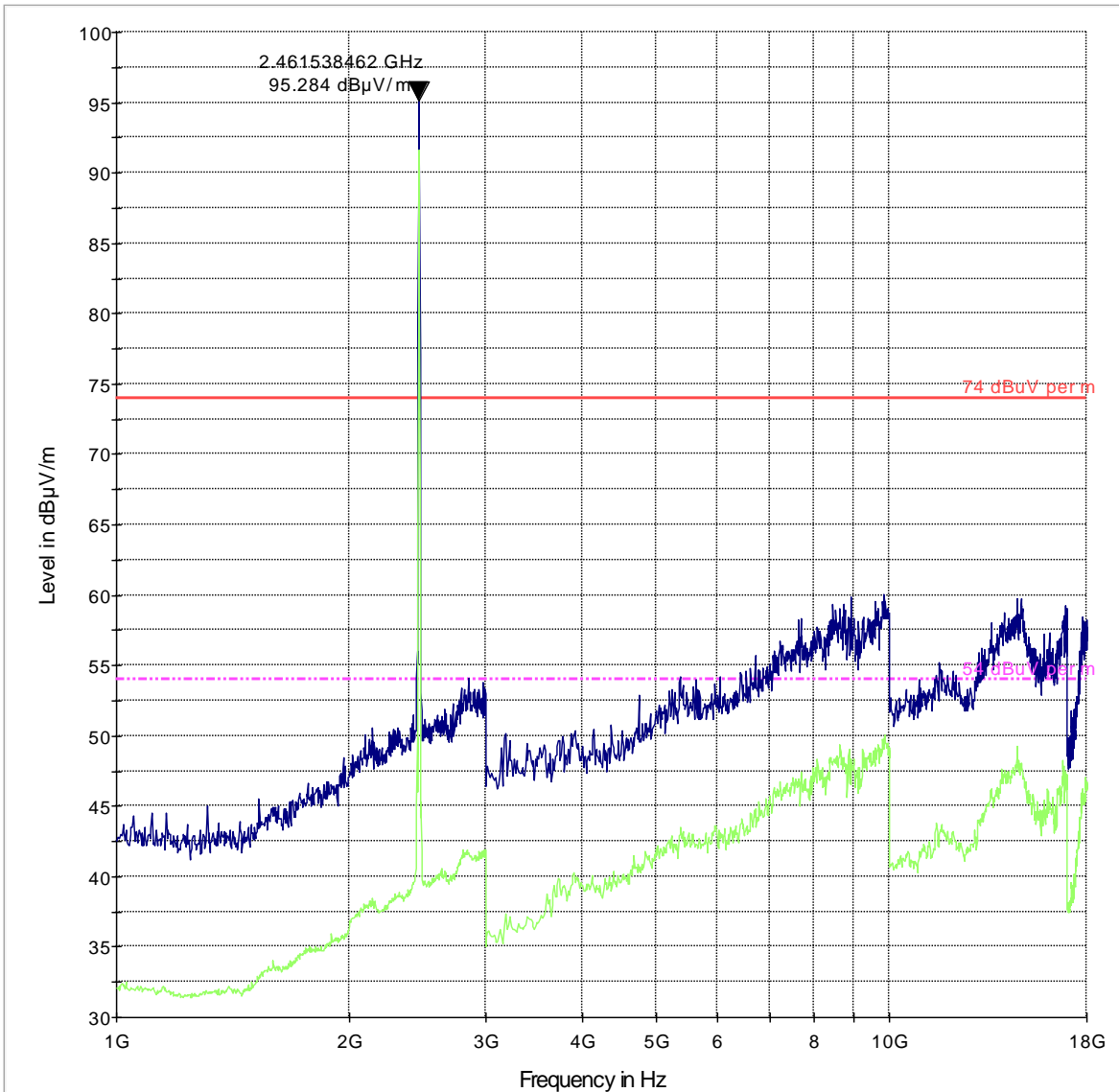


— FCC 15 — Preview Result 1-PK+ * Data Reduction Result 1 [3]-PK+



1GHz - 18GHz

Mode: 802.11b-HighChannel



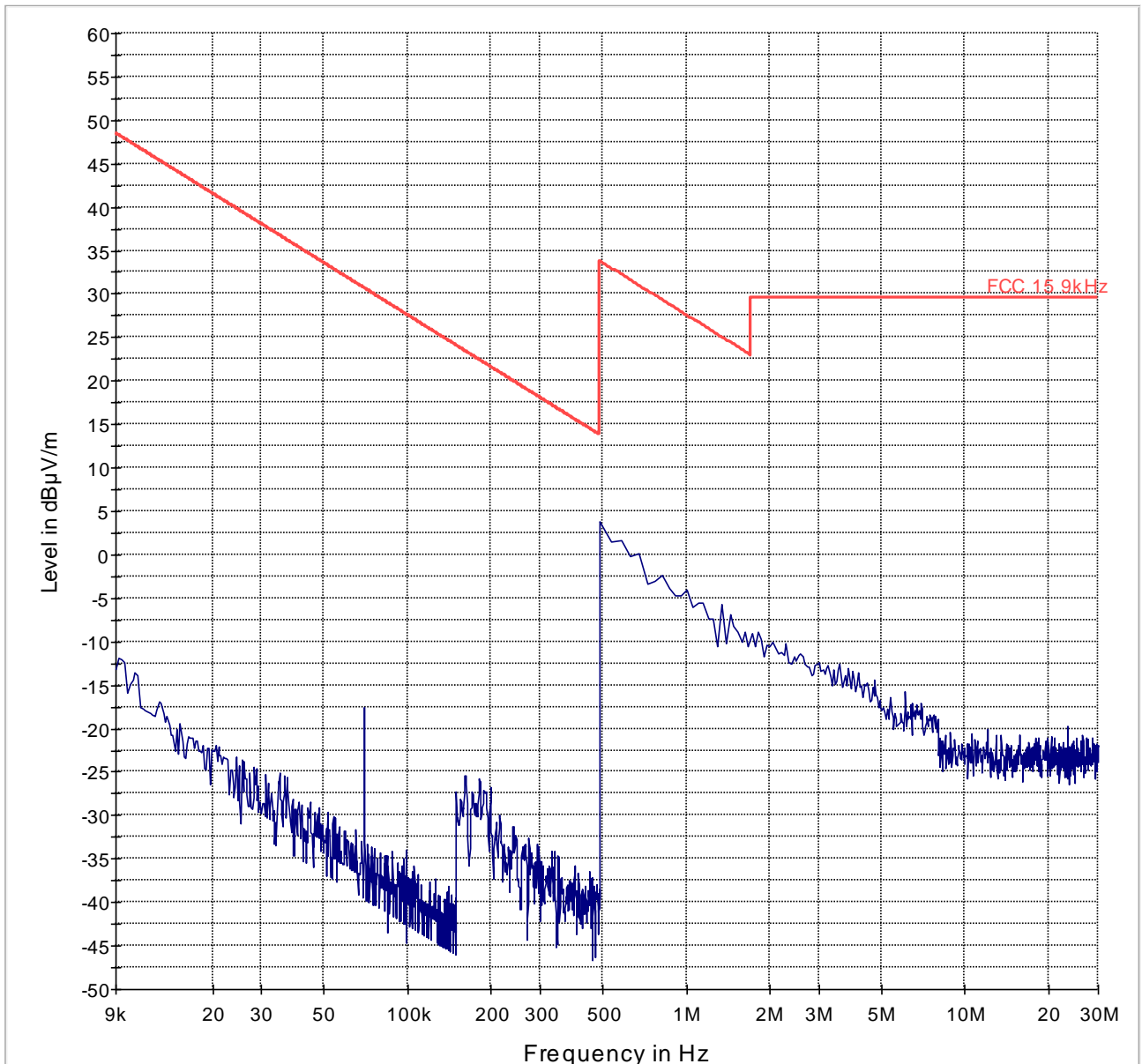
74 dBµV per m 54 dBµV per m Preview Result 1-PK+ Preview Result 2-AVG



6.4.6.2 Radiated Emissions 802.11g - 2.4GHz

<30MHz

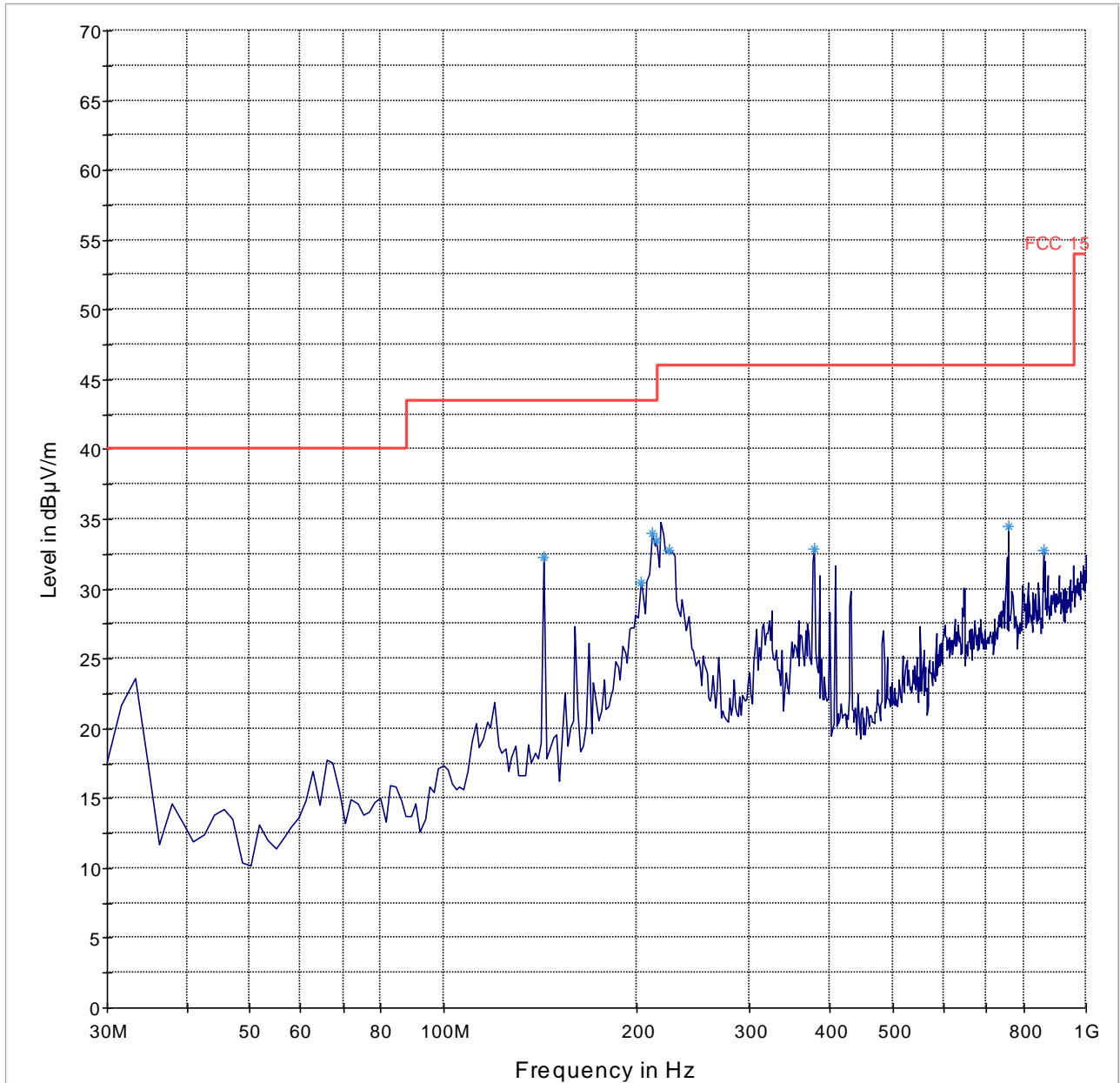
Mode: 802.11g-LowChannel



— FCC 15.9kHz — Preview Result 1-PK+



30MHz - 1GHz
Mode: 802.11g-LowChannel

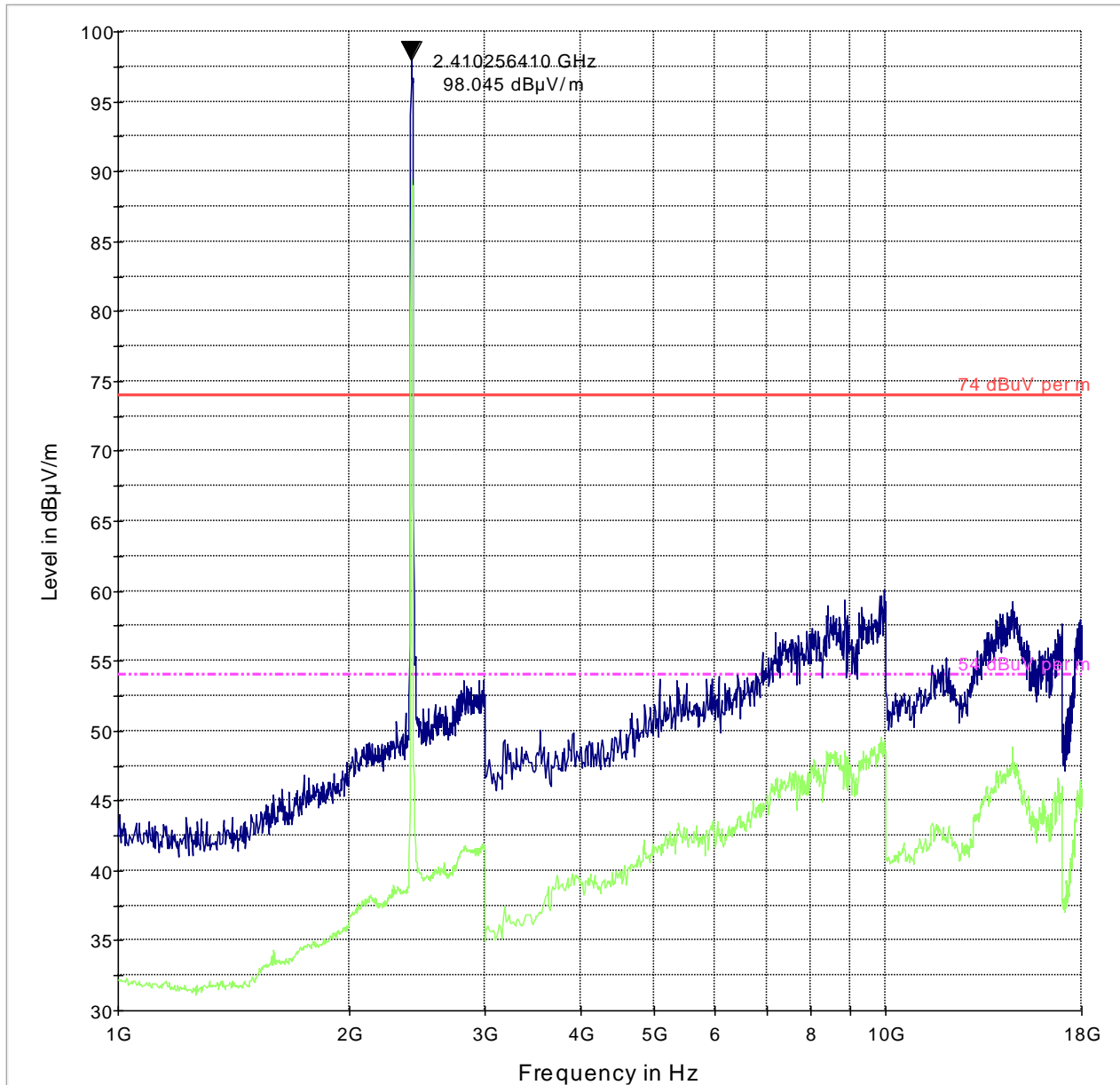


— FCC 15 — Preview Result 1-PK+ * Data Reduction Result 1 [3]-PK+



1GHz - 18GHz

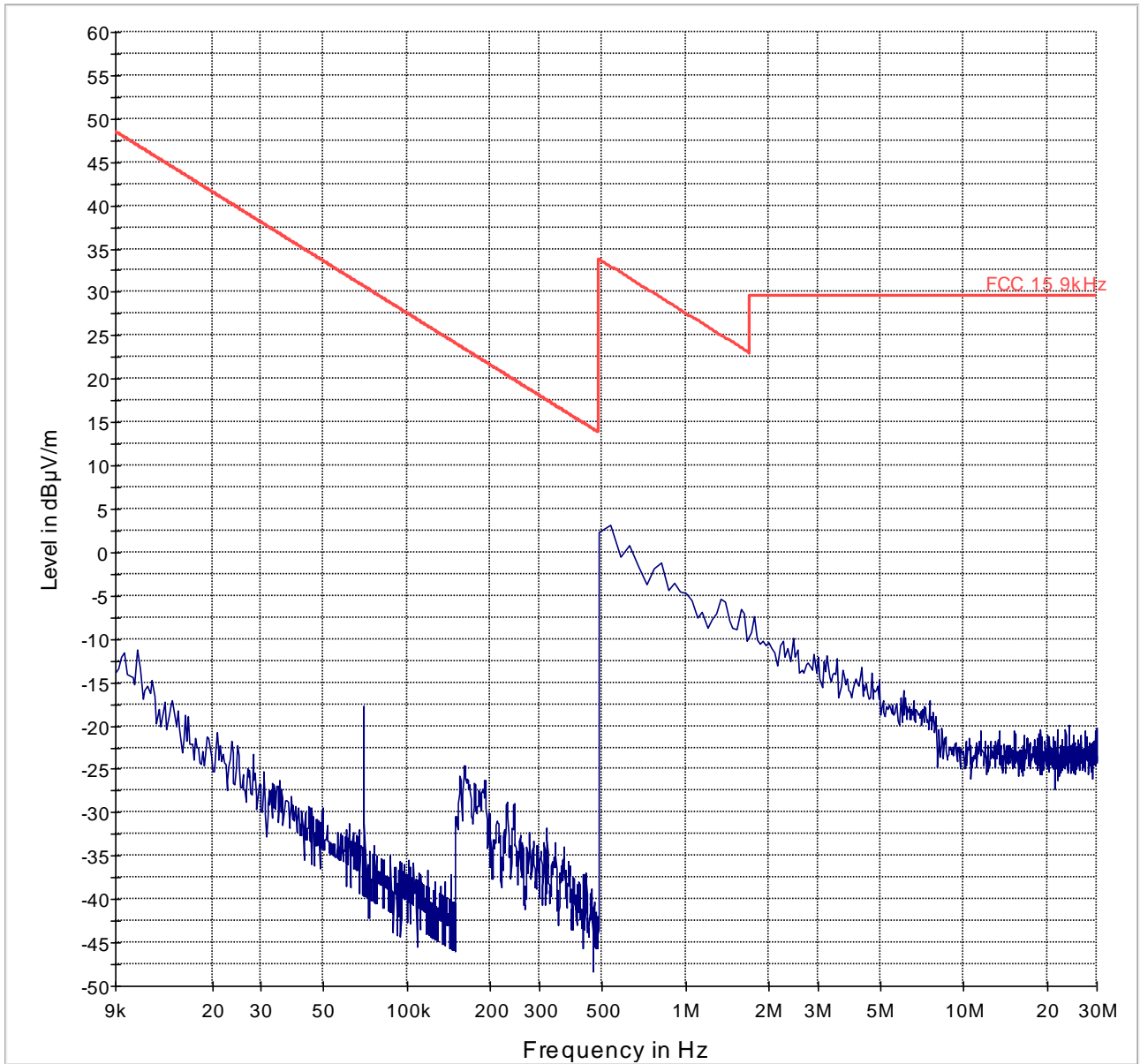
Mode: 802.11g-LowChannel



— 74 dBuV per m - - - 54 dBuV per m — Preview Result 1-PK+ — Preview Result 2-AVG

<30MHz

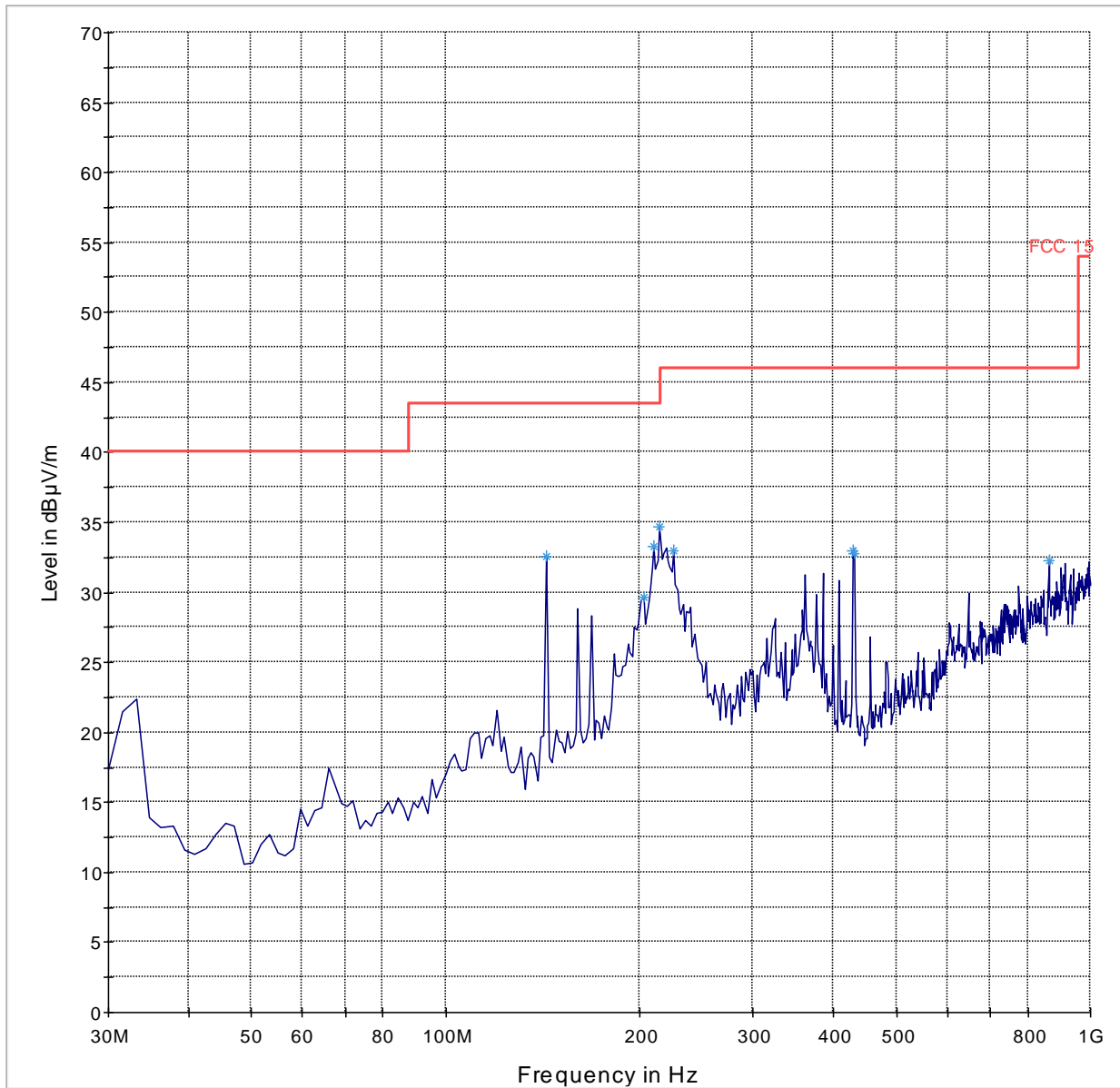
Mode: 802.11g-MidChannel



— FCC 15.9kHz — Preview Result 1-PK+

30MHz - 1GHz

Mode: 802.11g-MidChannel

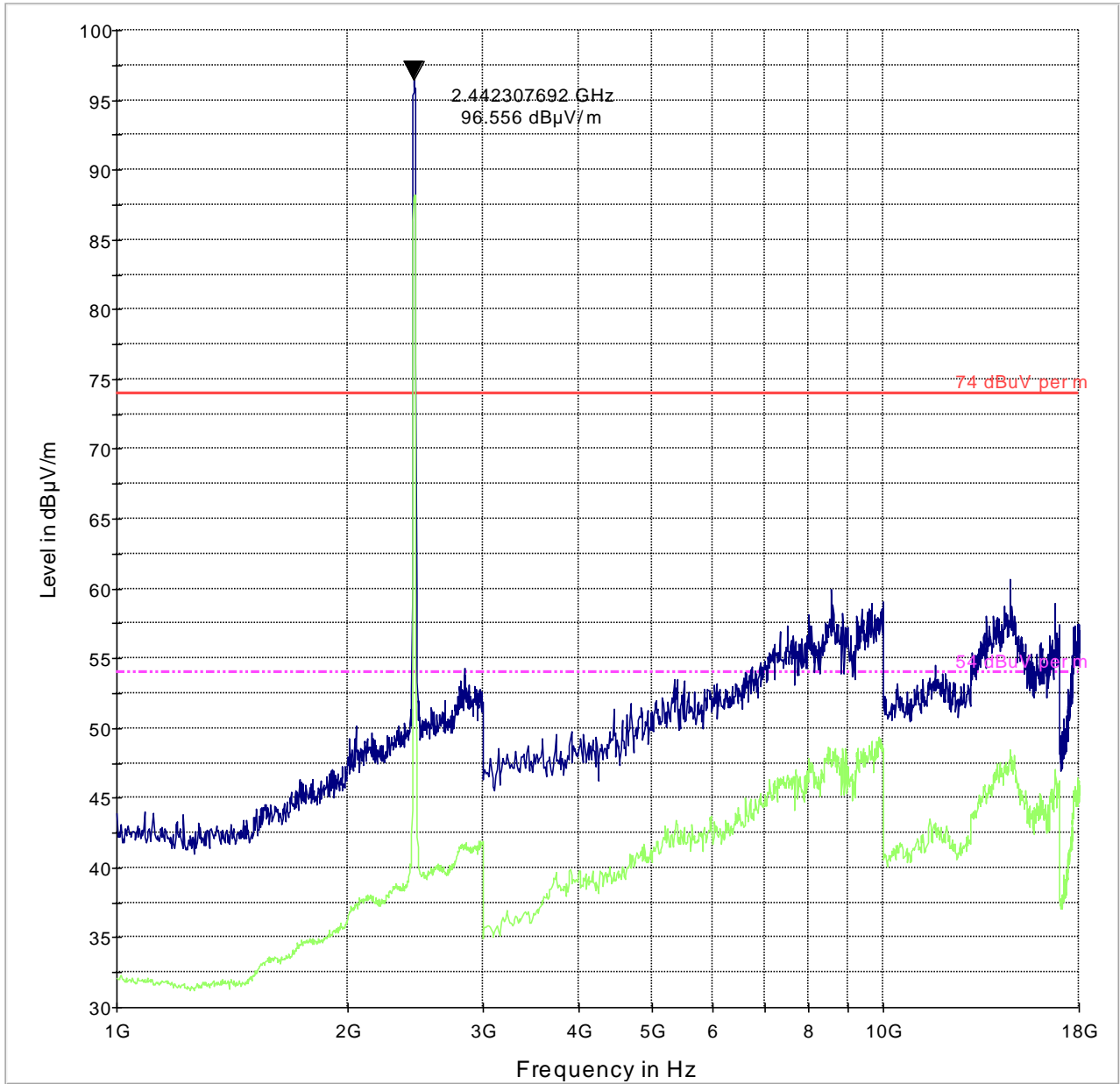


— FCC 15 — Preview Result 1-PK+ * Data Reduction Result 1 [3]-PK+



1GHz - 18GHz

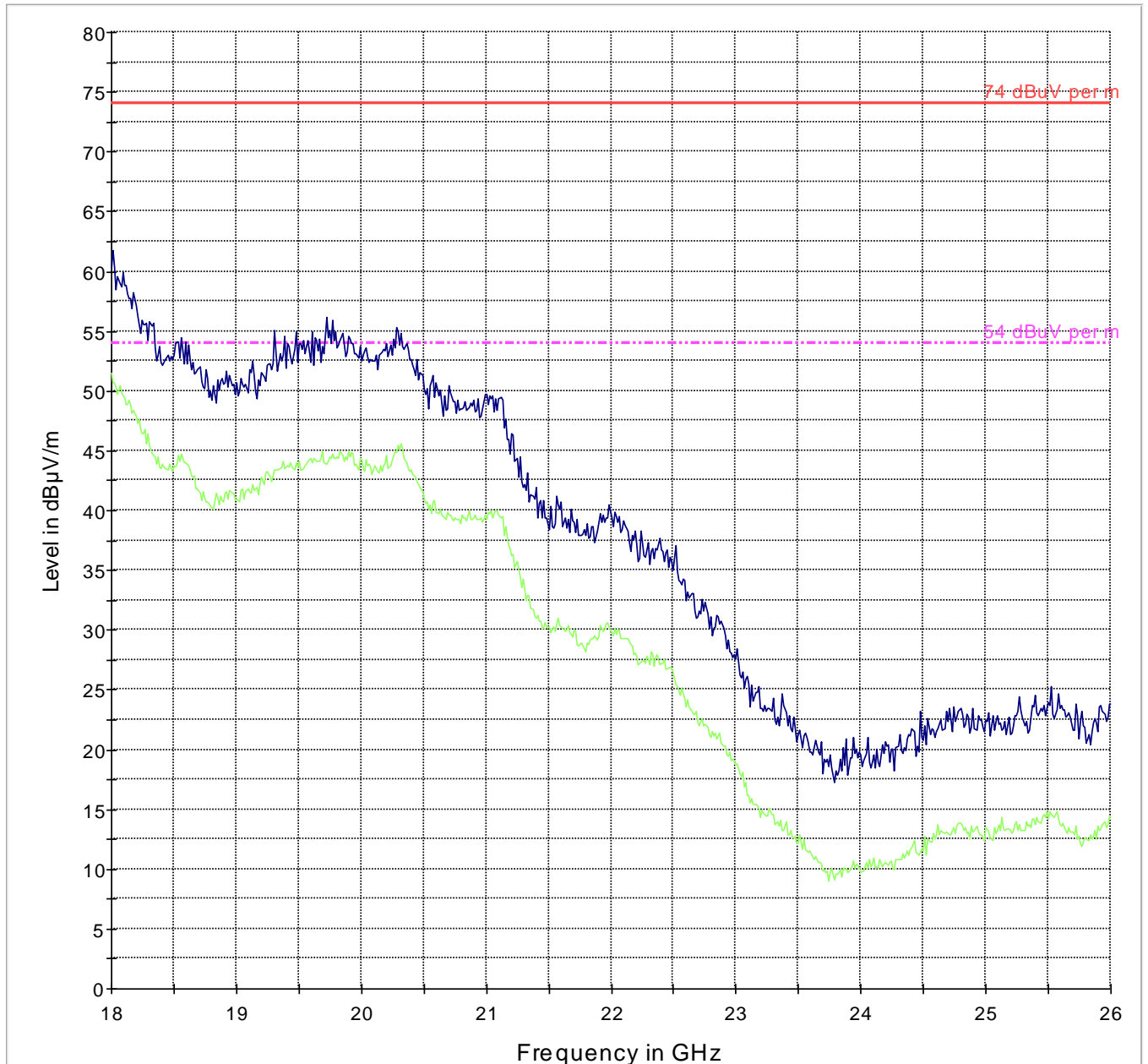
Mode: 802.11g-MidChannel



— 74 dBµV per m - - - 54 dBµV per m — Preview Result 1-PK+ — Preview Result 2-AVG



18GHz - 26GHz
Mode: 802.11g-MidChannel

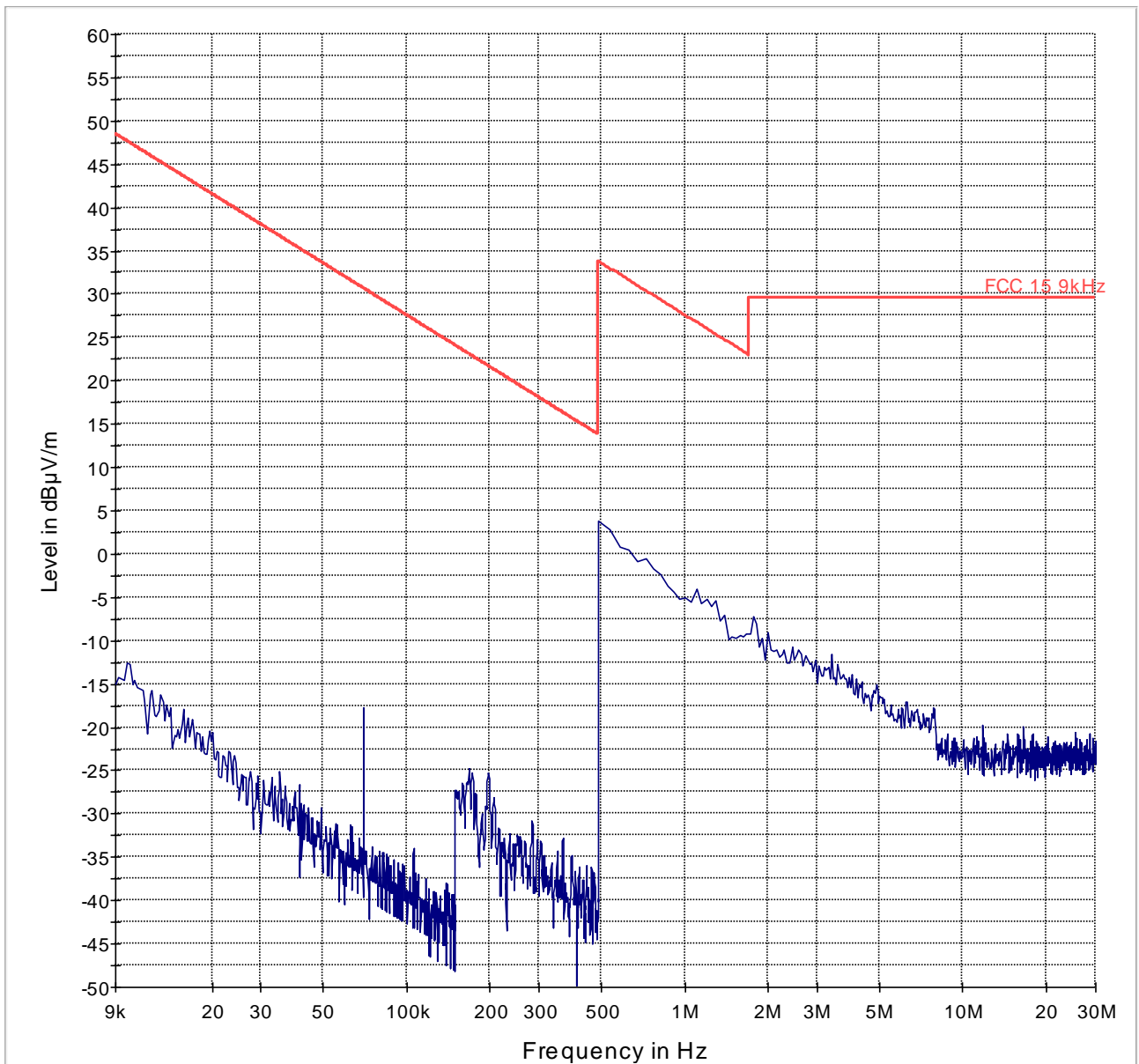


— 74 dBuV per m - - - - 54 dBuV per m — Preview Result 1-PK+ — Preview Result 2-AVG



<30MHz

Mode: 802.11g-HighChannel

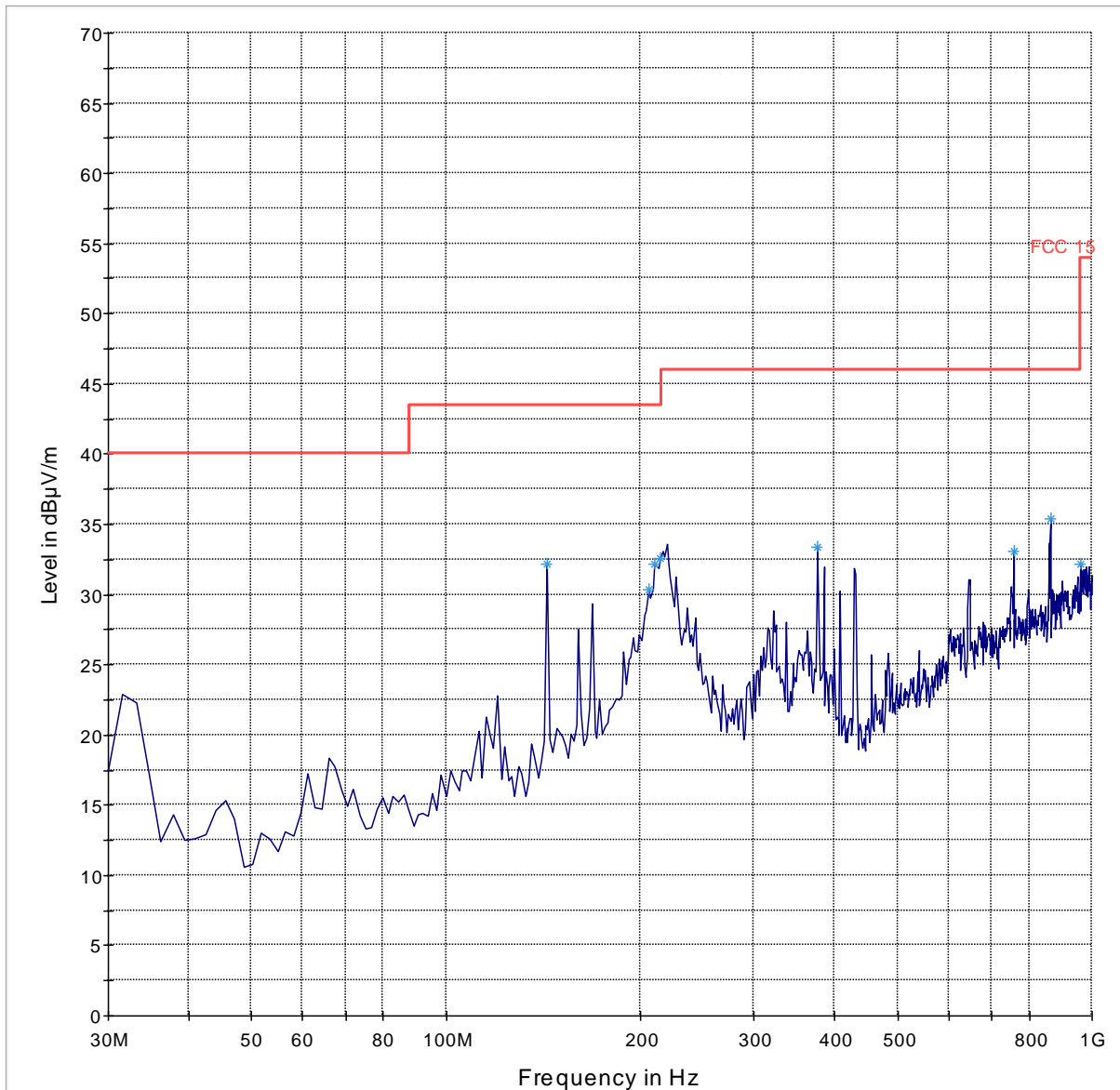


— FCC 15.9kHz — Preview Result 1-PK+



30MHz - 1GHz

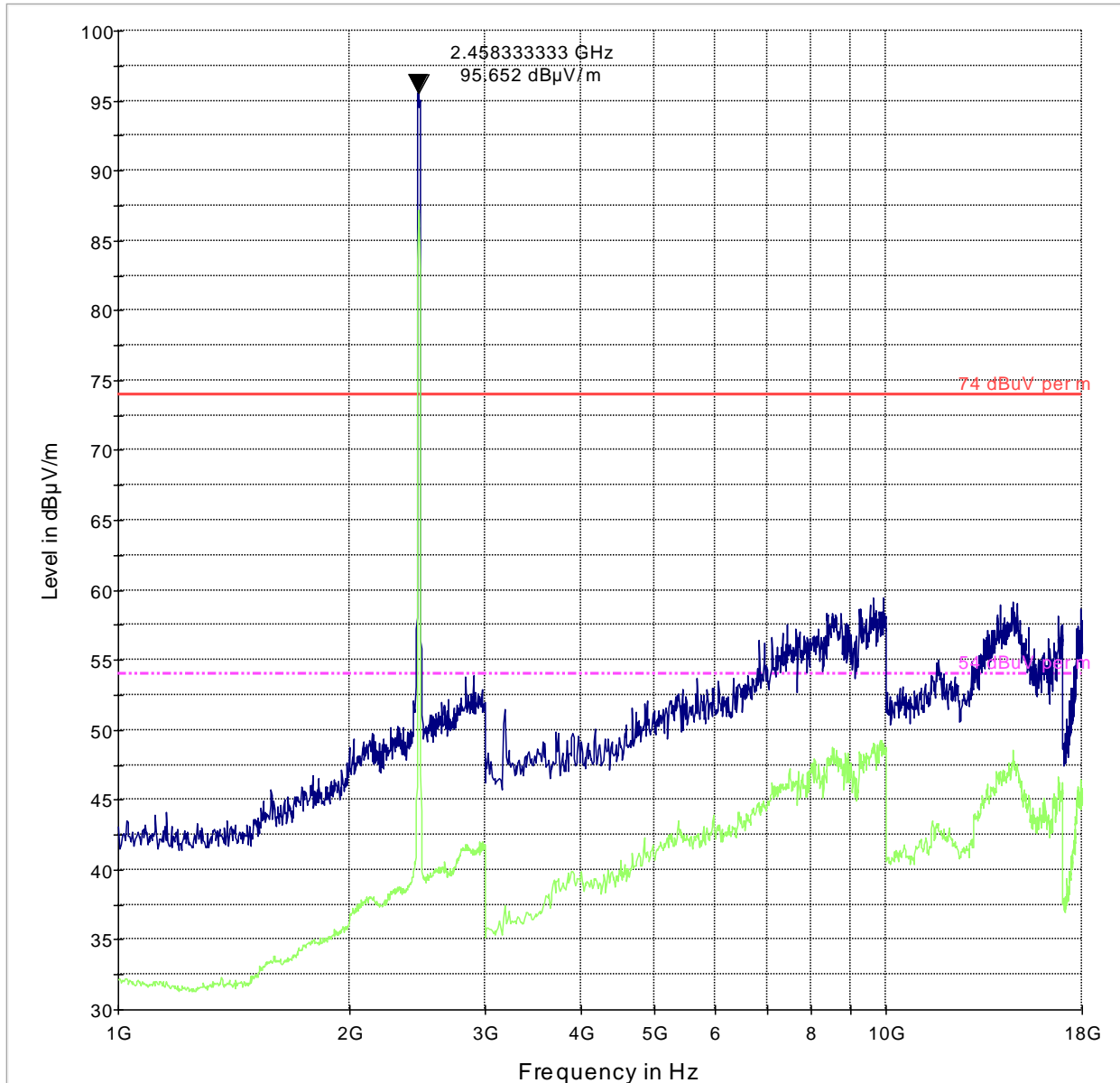
Mode: 802.11g-HighChannel



— FCC 15 — Preview Result 1-PK+ * Data Reduction Result 1 [3]-PK+

1GHz - 18GHz

Mode: 802.11g-HighChannel



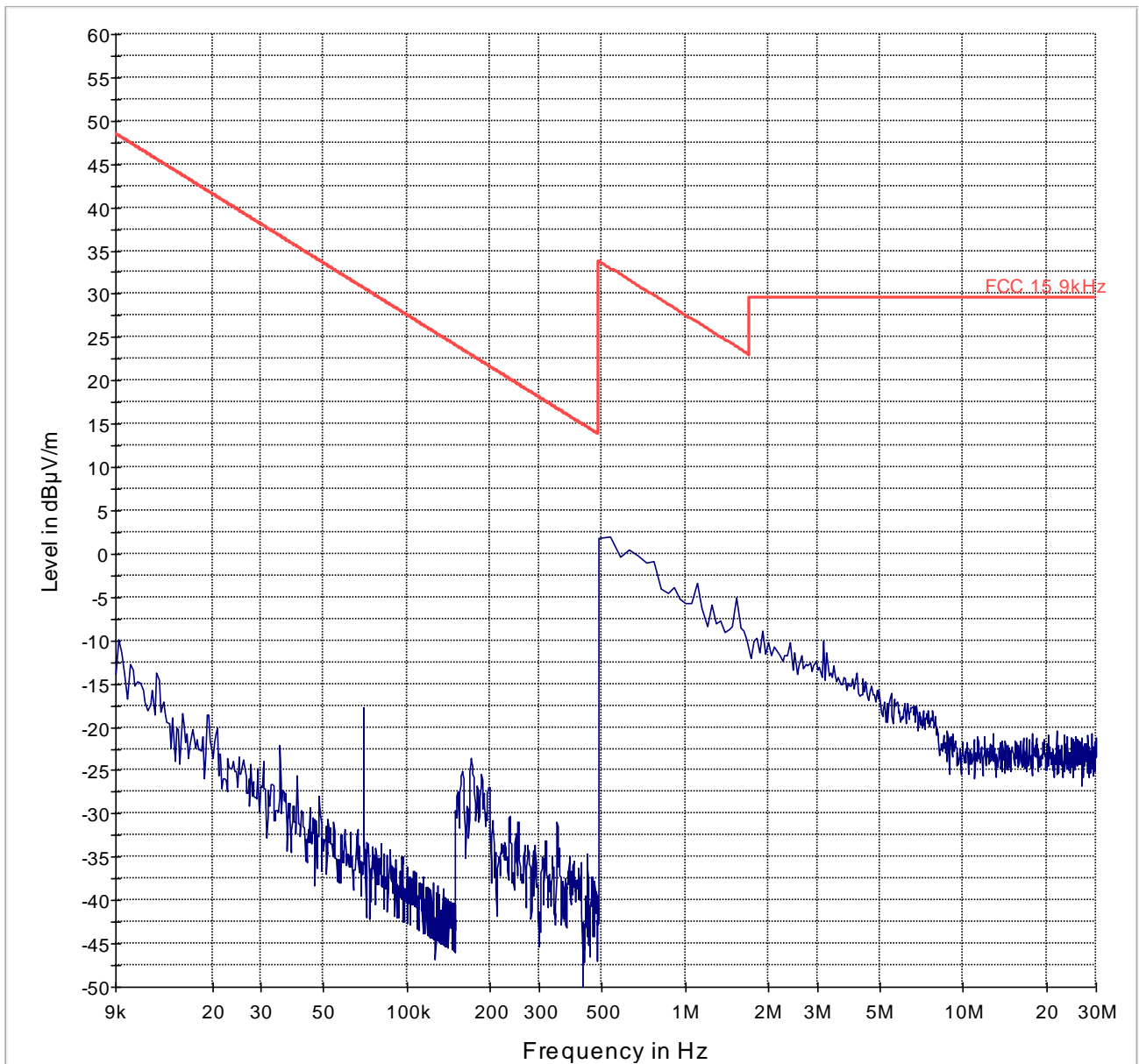
— 74 dBµV per m - - - 54 dBµV per m — Preview Result 1-PK+ — Preview Result 2-AVG



6.4.6.3 Radiated Emissions 802.11n - 2.4GHz

<30MHz

Mode: 802.11n-LowChannel

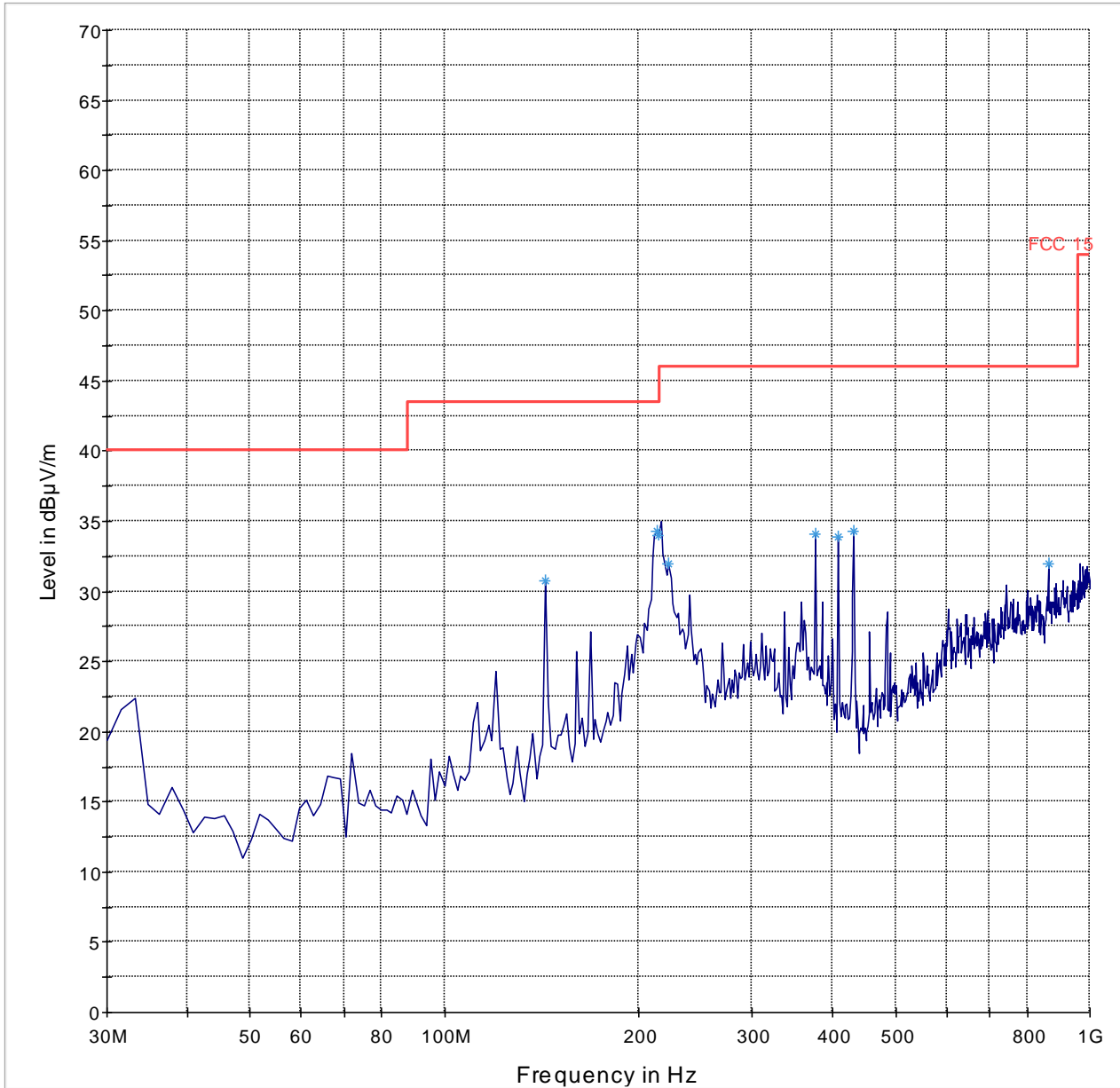


— FCC 15.9kHz — Preview Result 1-PK+



30MHz – 1GHz

Mode: 802.11n-LowChannel

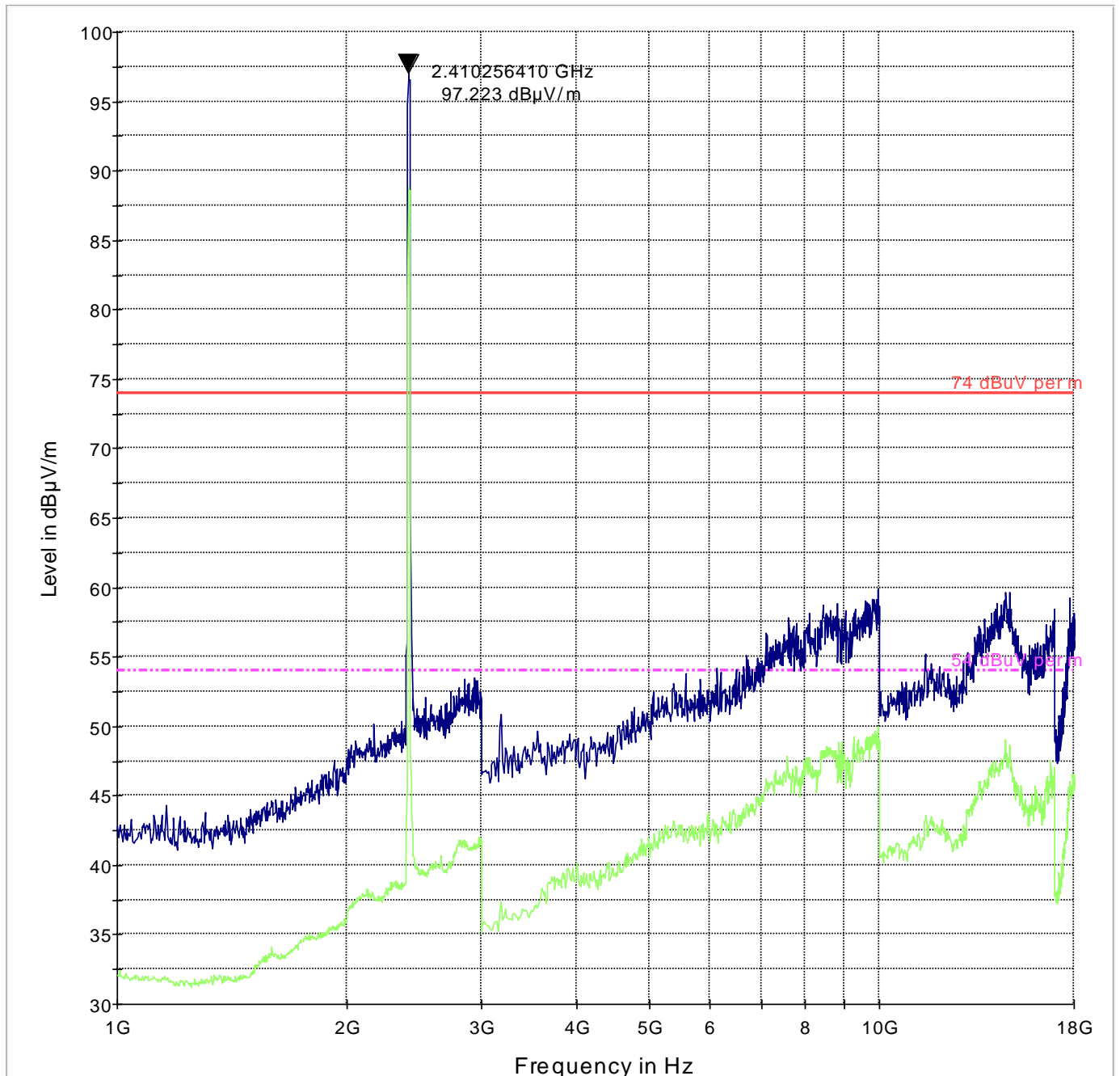


— FCC 15 — Preview Result 1-PK+ * Data Reduction Result 1 [3]-PK+



1GHz – 18GHz

Mode: 802.11n-LowChannel

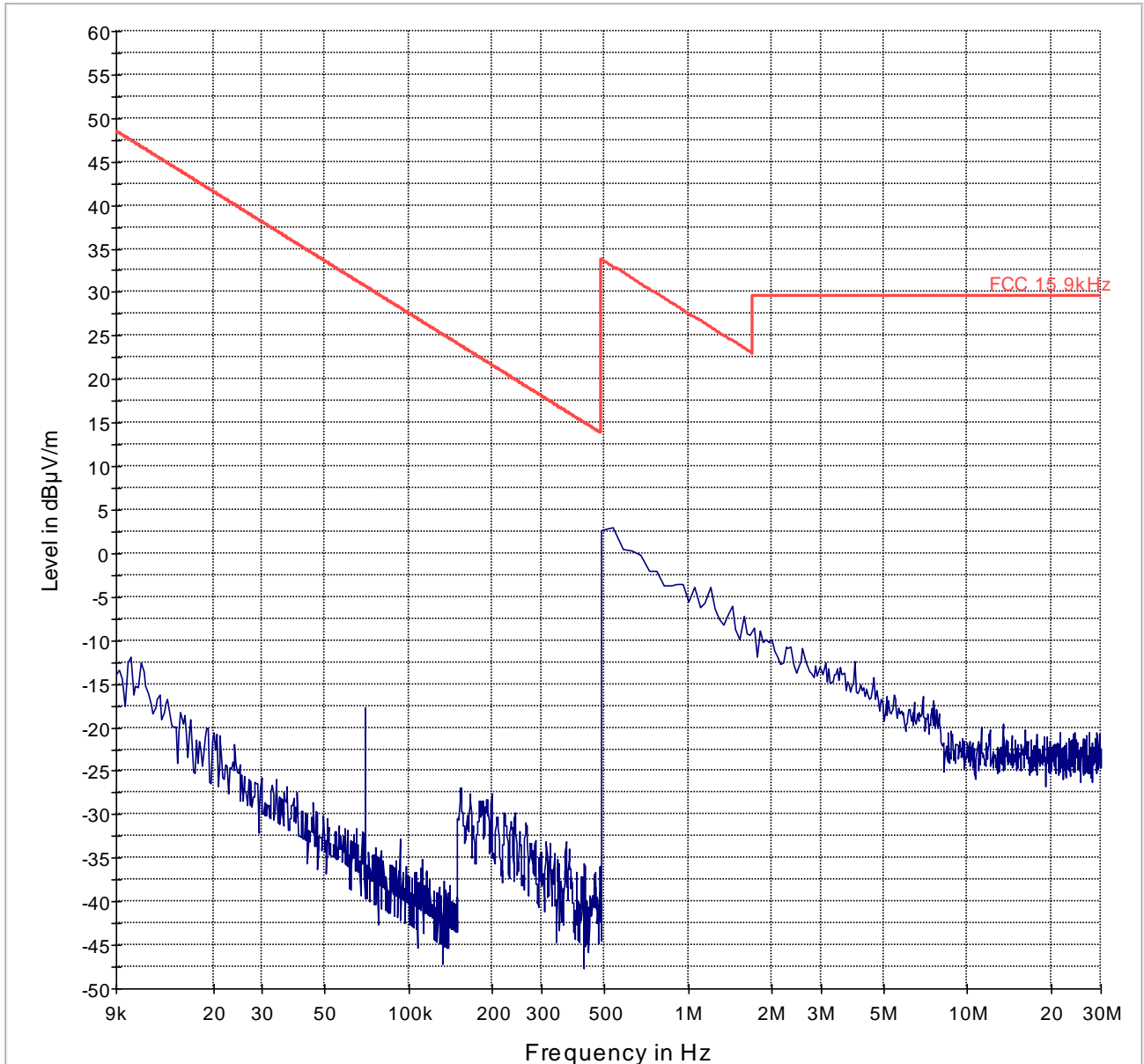


— 74 dBµV per m - - - - 54 dBµV per m — Preview Result 1-PK+ — Preview Result 2-AVG



<30MHz

Mode: 802.11n-MidChannel

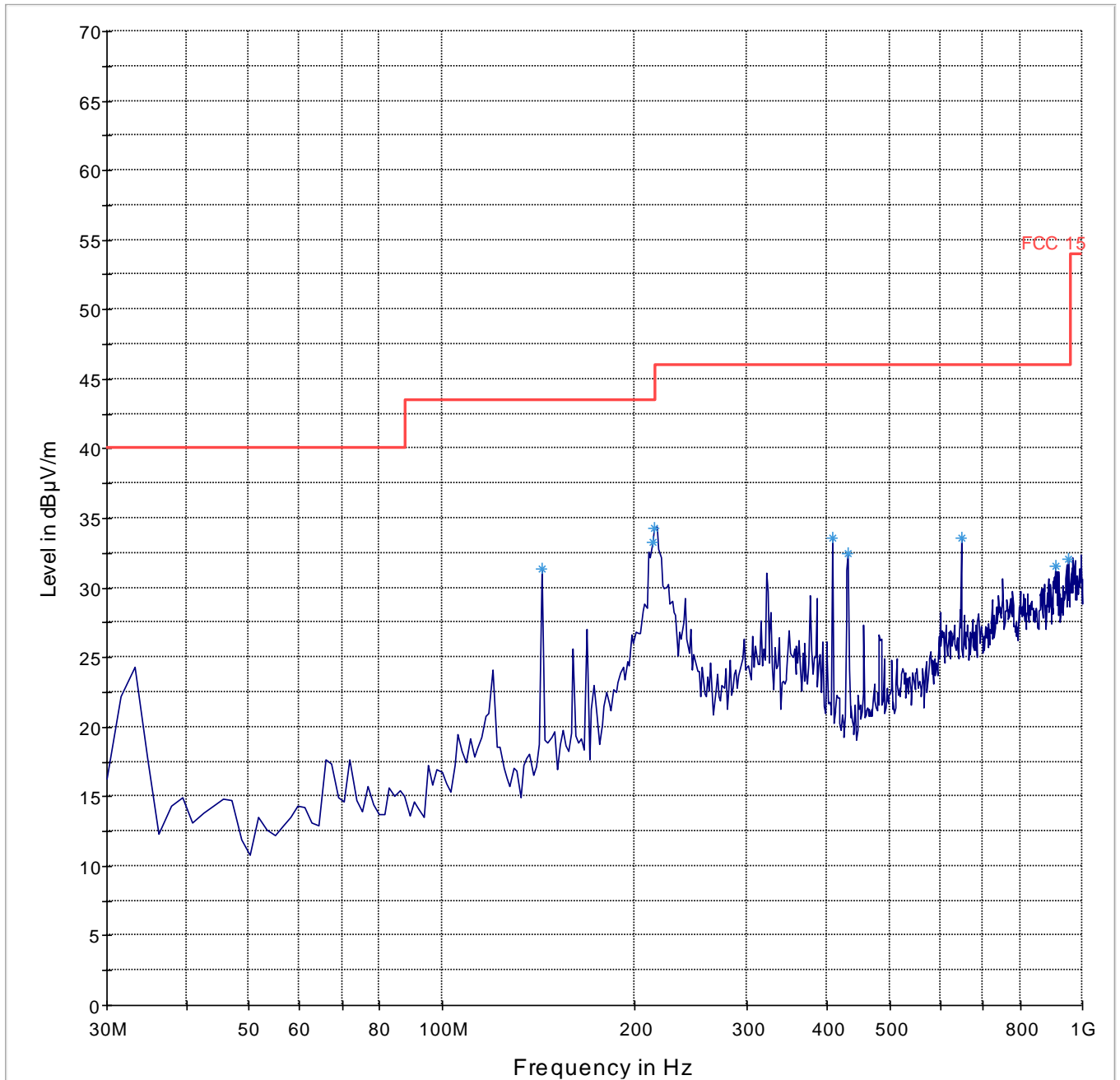


— FCC 15.9kHz — Preview Result 1-PK+



30MHz – 1GHz

Mode: 802.11n-MidChannel

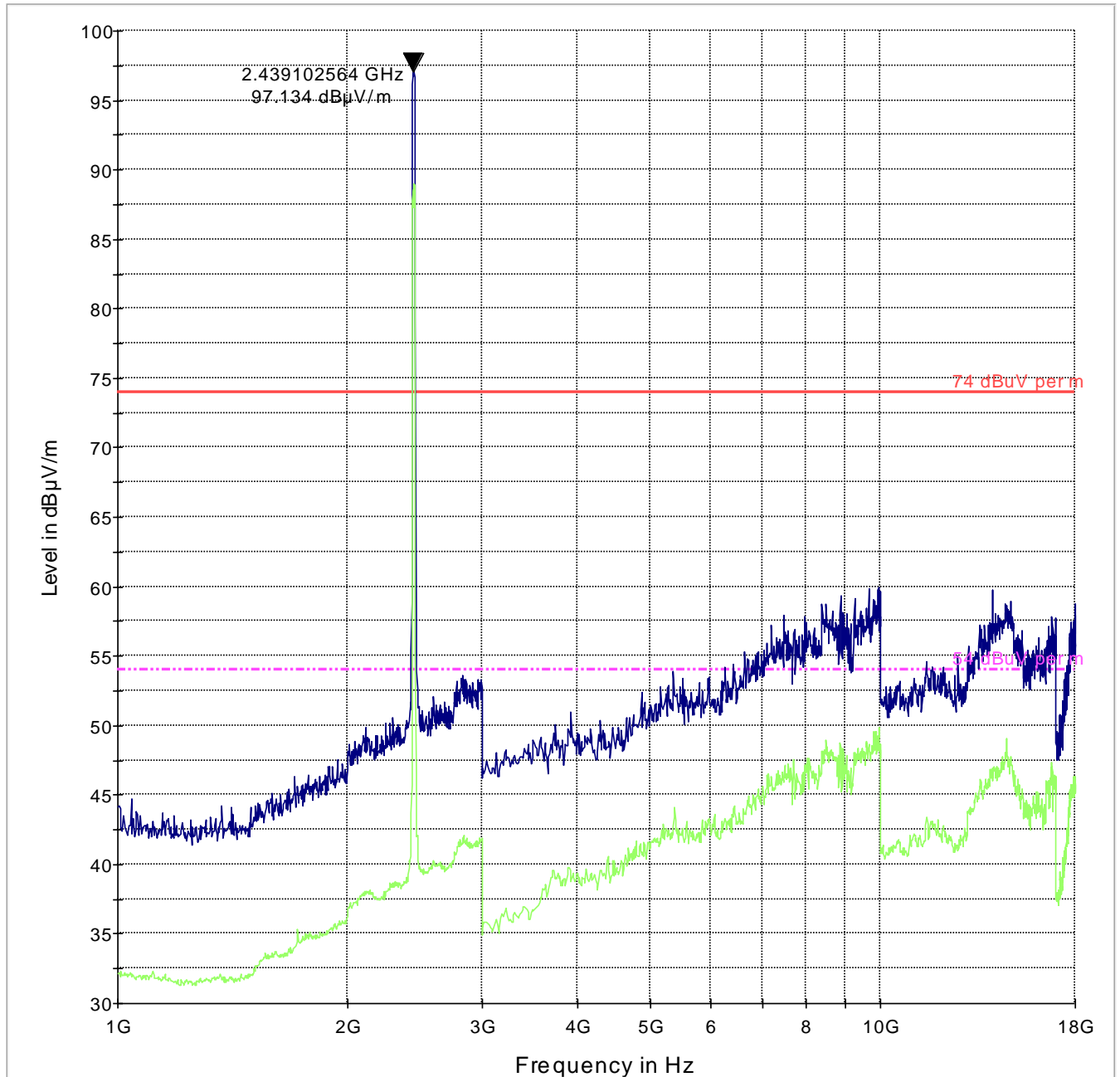


— FCC 15 — Preview Result 1-PK+ * Data Reduction Result 1 [3]-PK+



1GHz – 18GHz

Mode: 802.11n-MidChannel

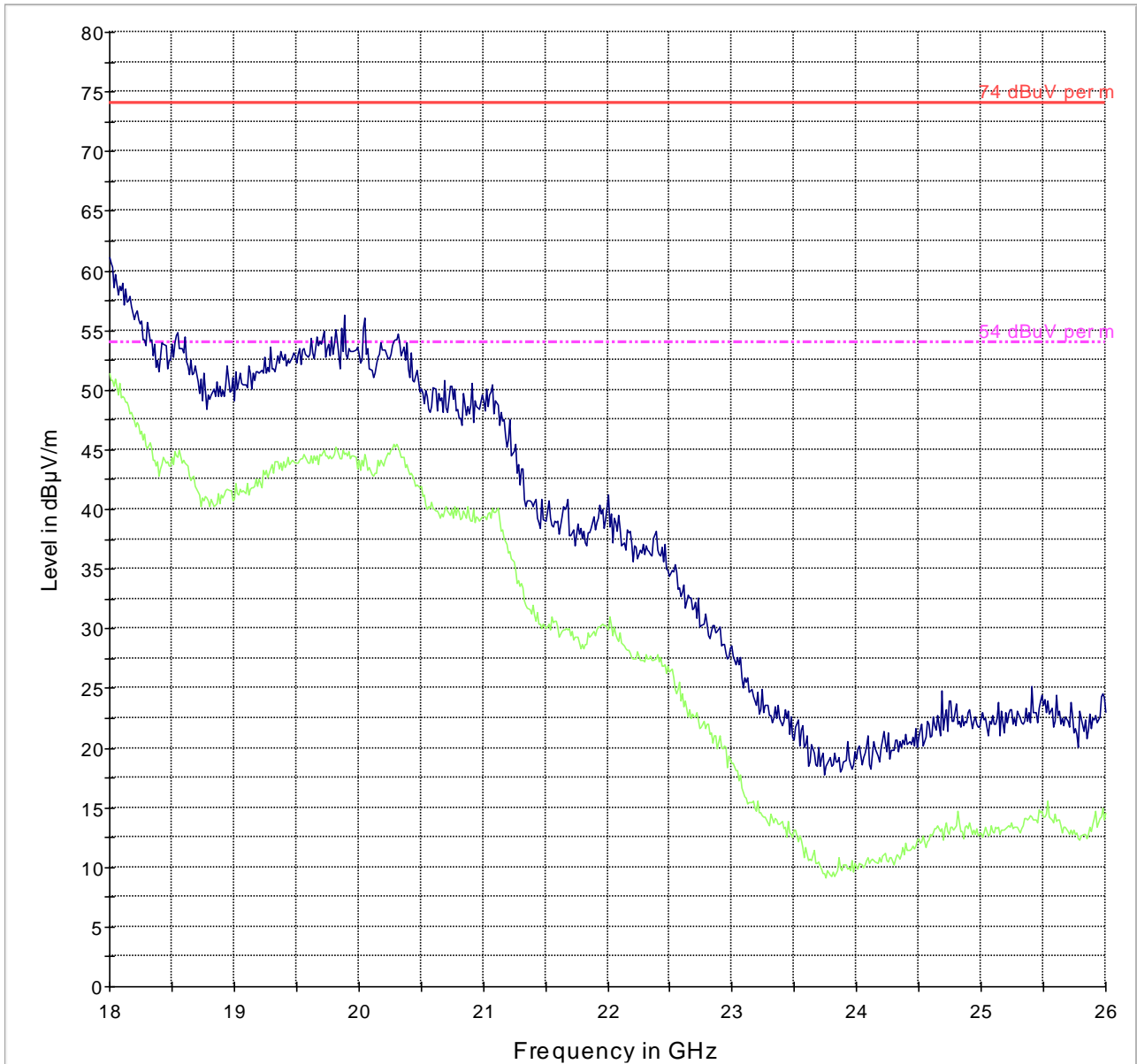


— 74 dBµV per m - - - 54 dBµV per m — Preview Result 1-PK+ — Preview Result 2-AVG



18GHz – 26GHz

Mode: 802.11n-MidChannel

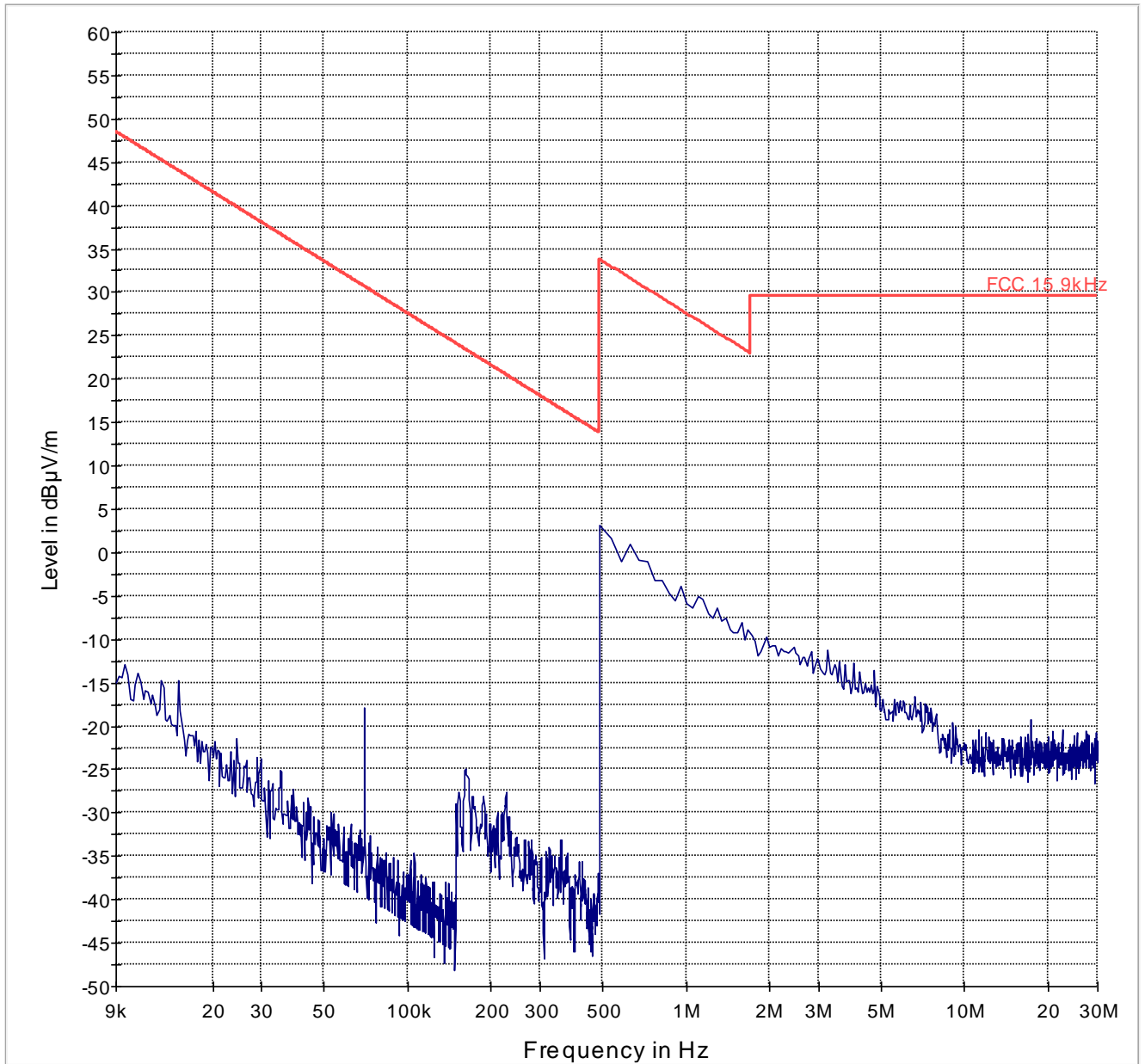


— 74 dBuV per m - - - - 54 dBuV per m — Preview Result 1-PK+ — Preview Result 2-AVG



<30MHz

Mode: 802.11n-HighChannel

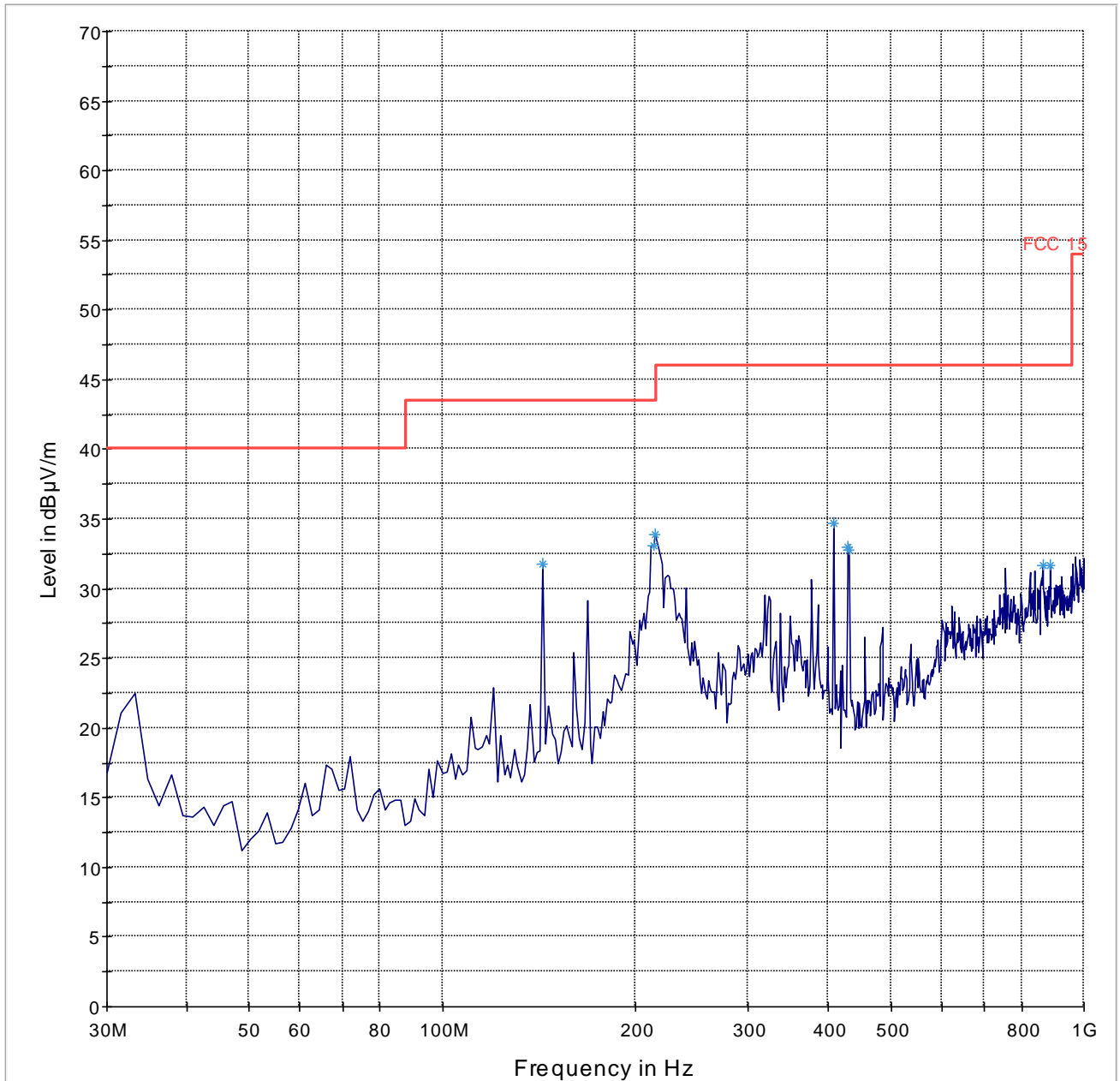


— FCC 15.9kHz — Preview Result 1-PK+



30MHz – 1GHz

Mode: 802.11n-HighChannel

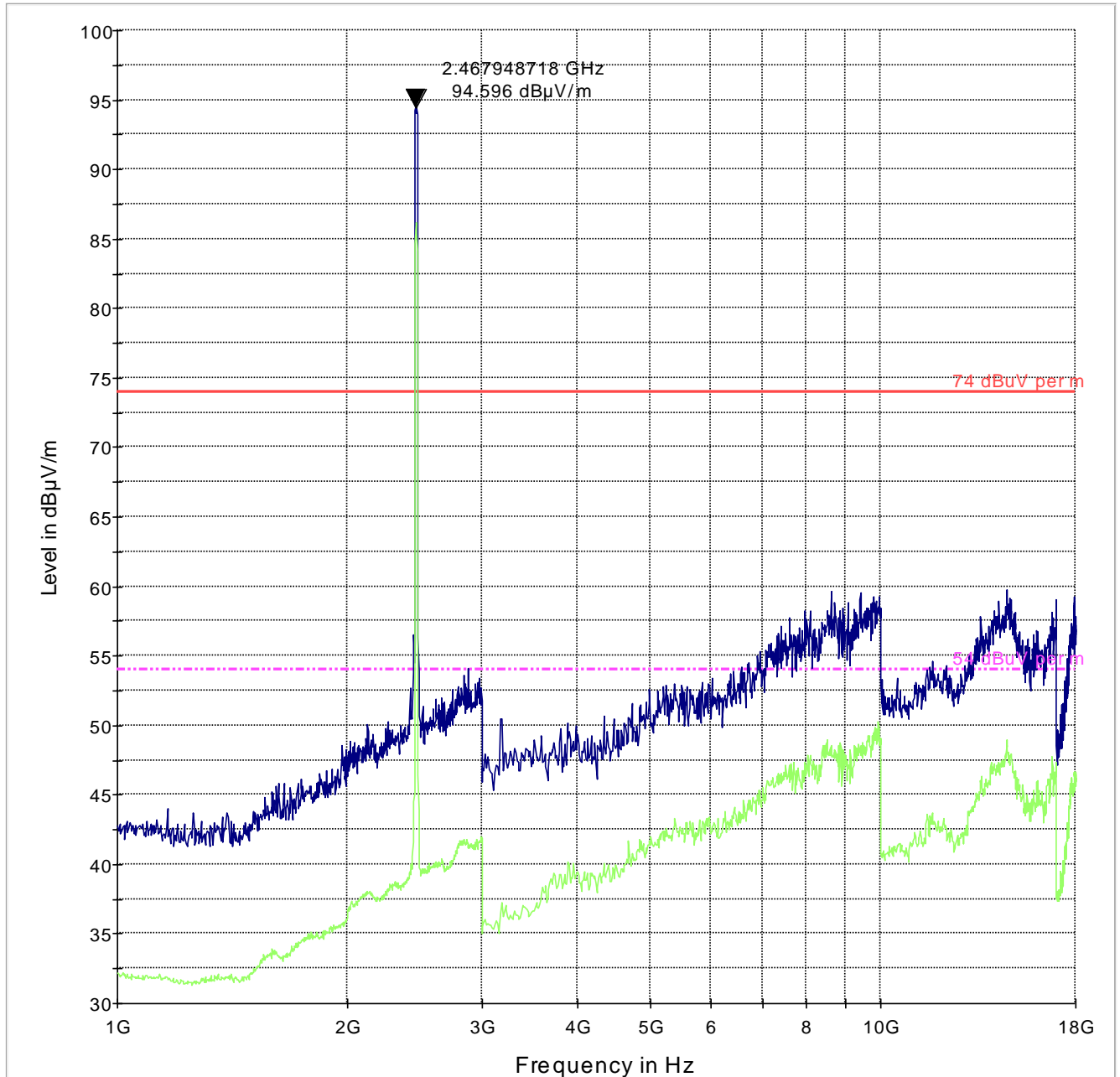


— FCC 15 — Preview Result 1-PK+ * Data Reduction Result 1 [3]-PK+



1GHz – 18GHz

Mode: 802.11n-HighChannel

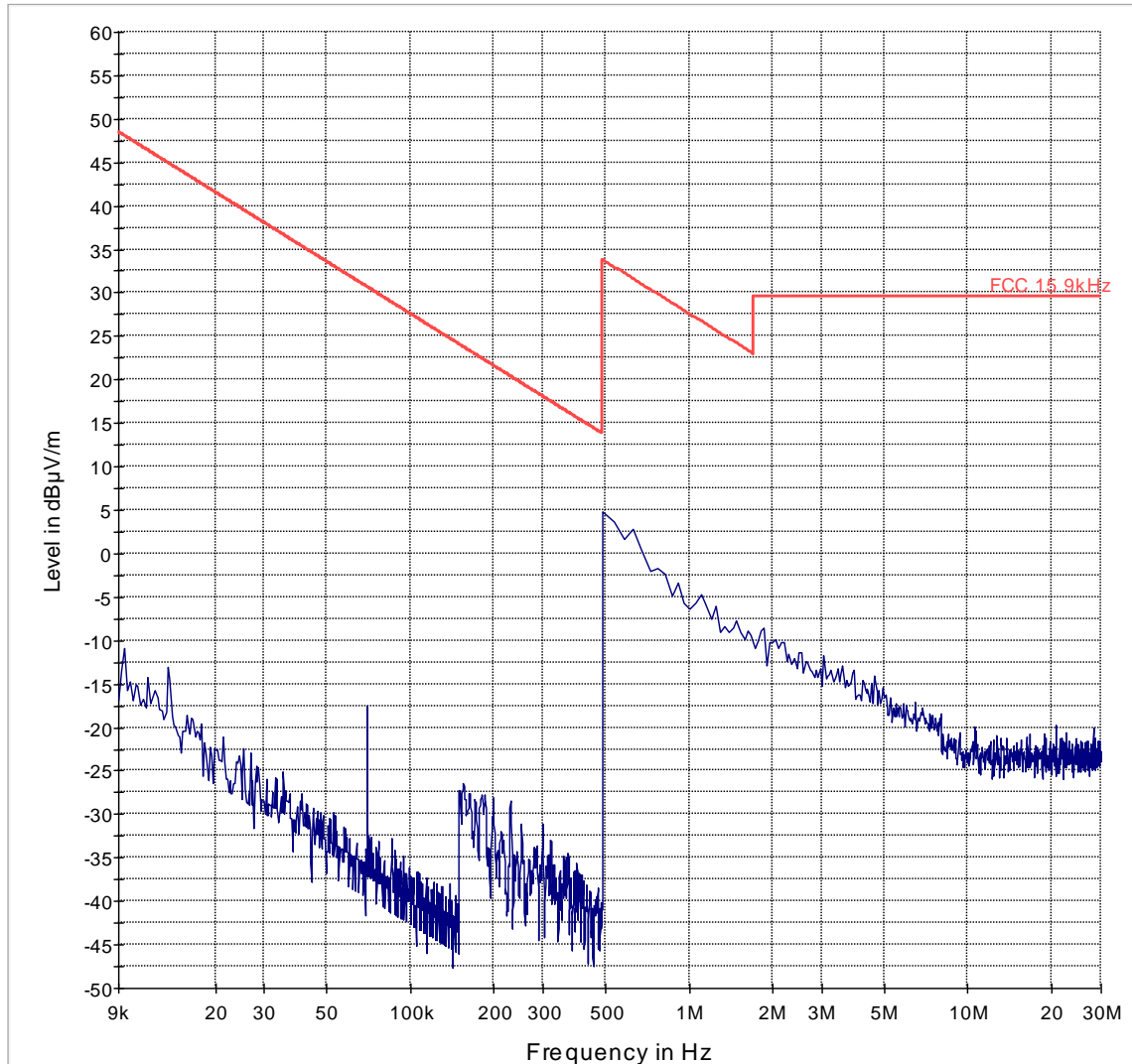


— 74 dBµV per m - - - 54 dBµV per m — Preview Result 1-PK+ — Preview Result 2-AVG

6.4.6.4 Radiated Emissions 802.11n U-NII-3 HT20 – 5.8GHz

<30MHz

Mode: 802.11n-HighChannel

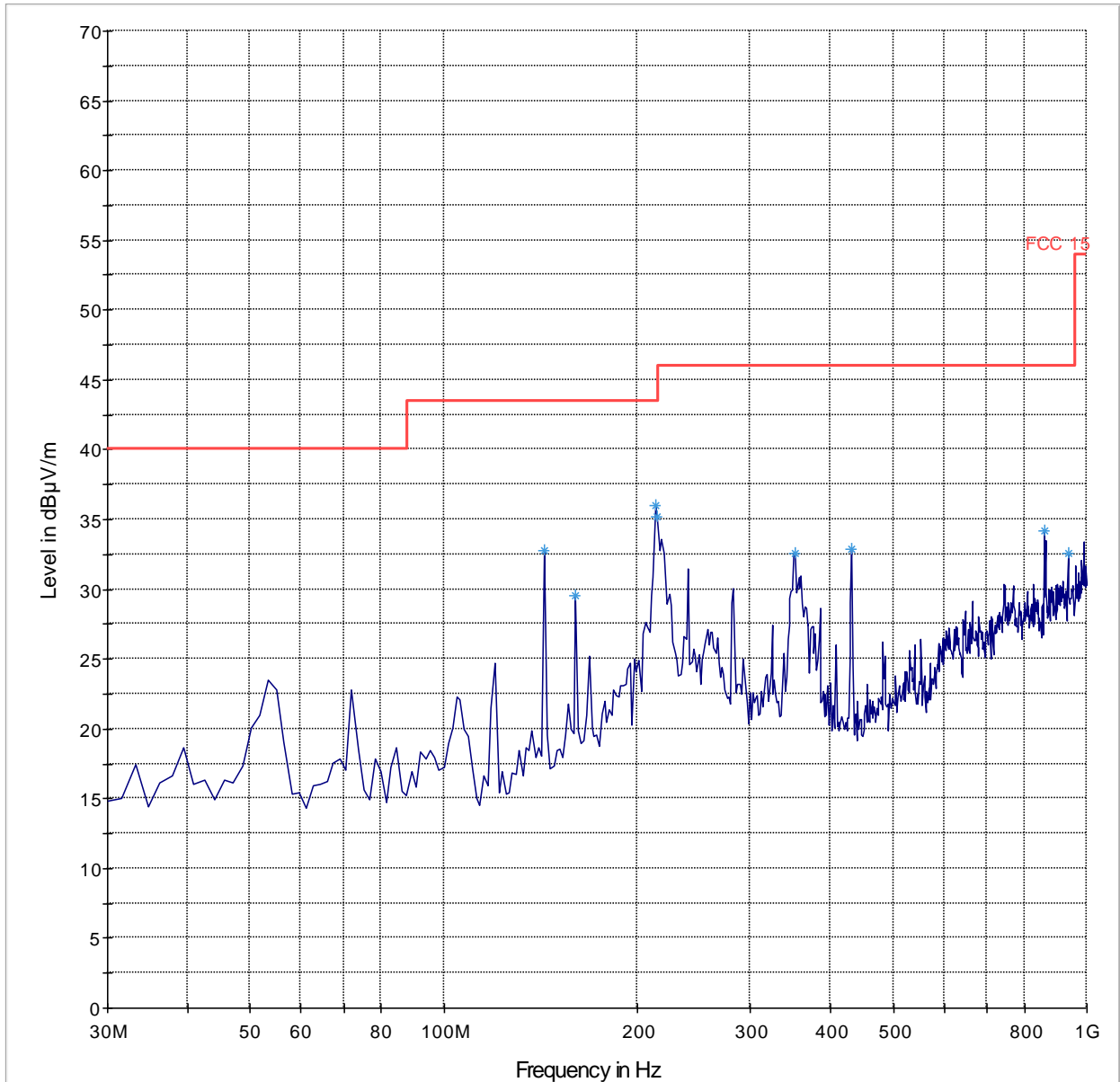


— FCC 15.9kHz — Preview Result 1-PK+



30MHz – 1GHz

Mode: 802.11n-HighChannel

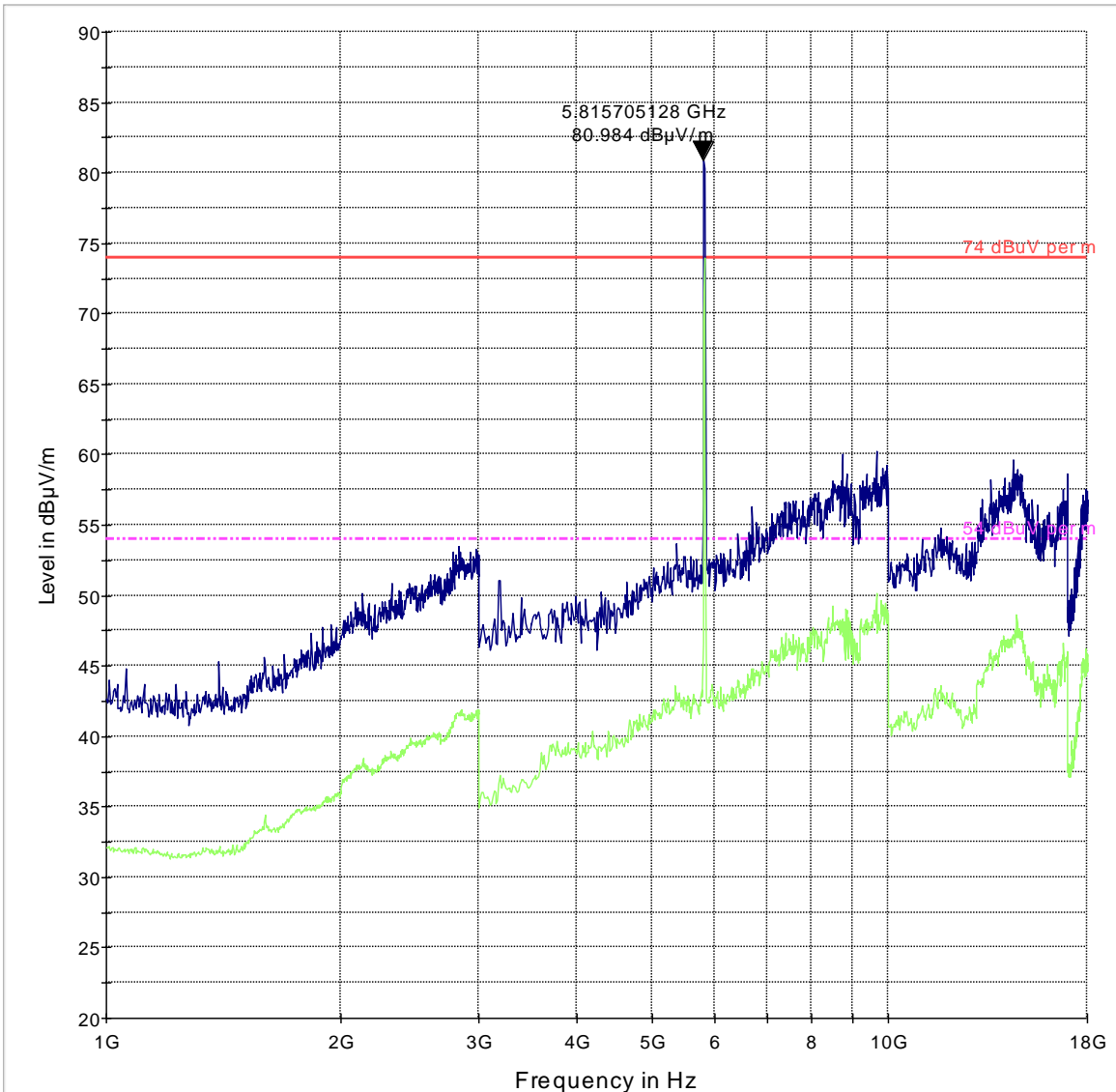


— FCC 15 — Preview Result 1-PK+ * Data Reduction Result 1 [3]-PK+



1GHz – 18GHz

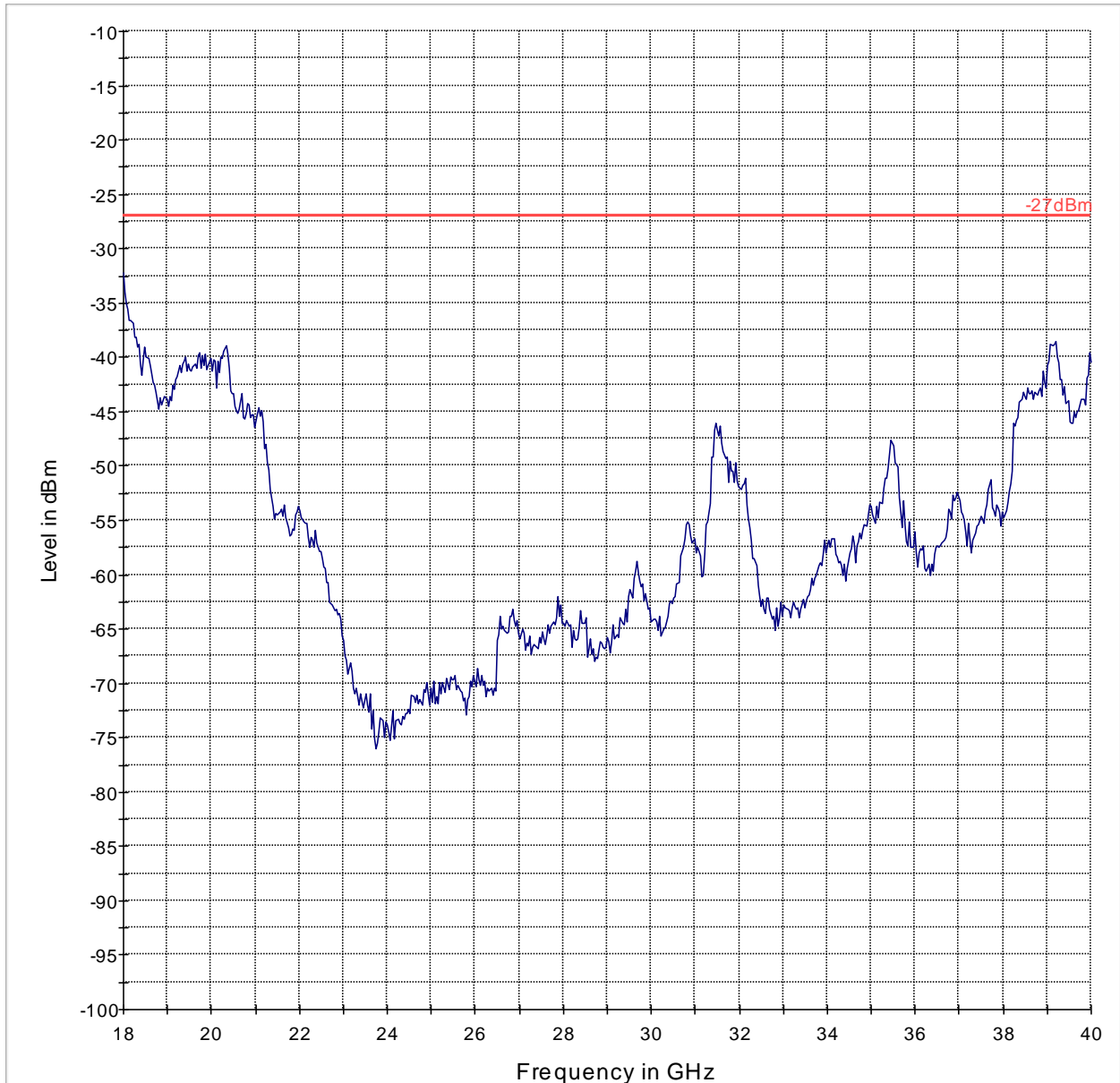
Mode: 802.11n-HighChannel



— 74 dBµV per m - - - 54 dBµV per m — Preview Result 1-PK+ — Preview Result 2-AVG



18GHz – 40GHz
Mode: 802.11n-HighChannel



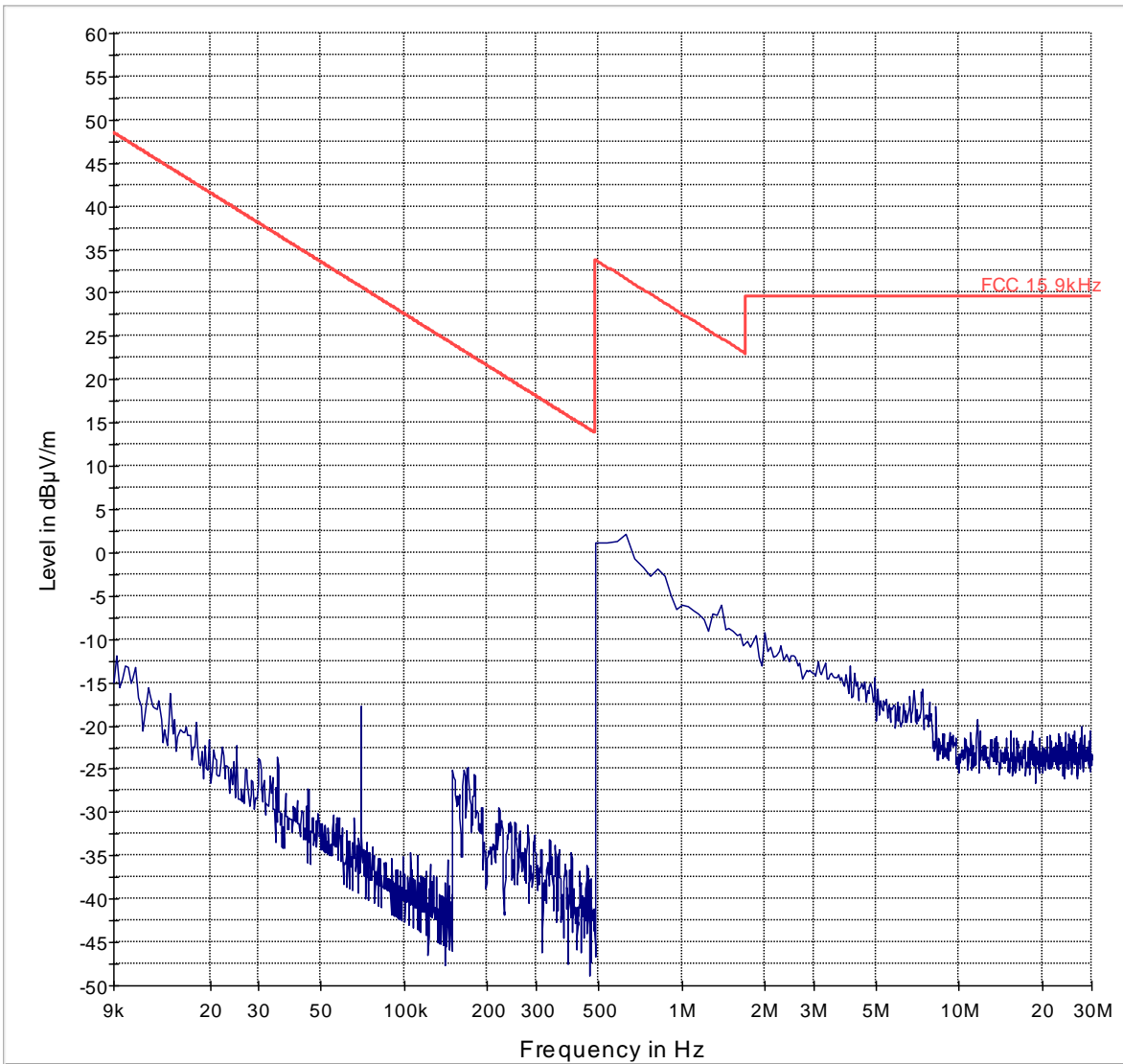
— -27dBm — Preview Result 1-PK+



6.4.6.5 Radiated Emissions 802.11n U-NII-3 HT40 – 5.8GHz

<30MHz

Mode: 802.11n[HT40] -HighChannel

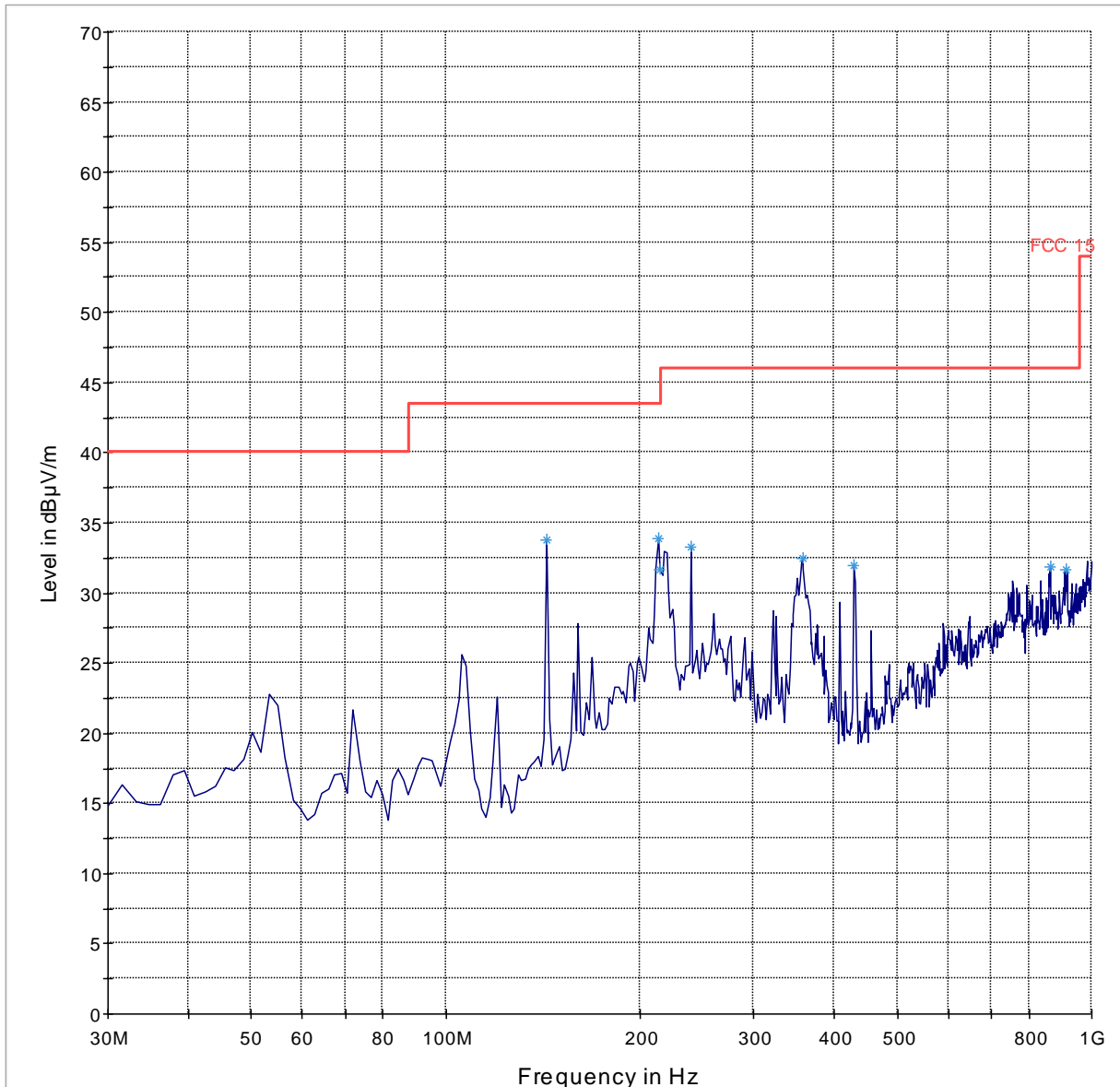


— FCC 15.9kHz — Preview Result 1-PK+



30MHz – 1GHz

Mode: 802.11n[HT40] -HighChannel

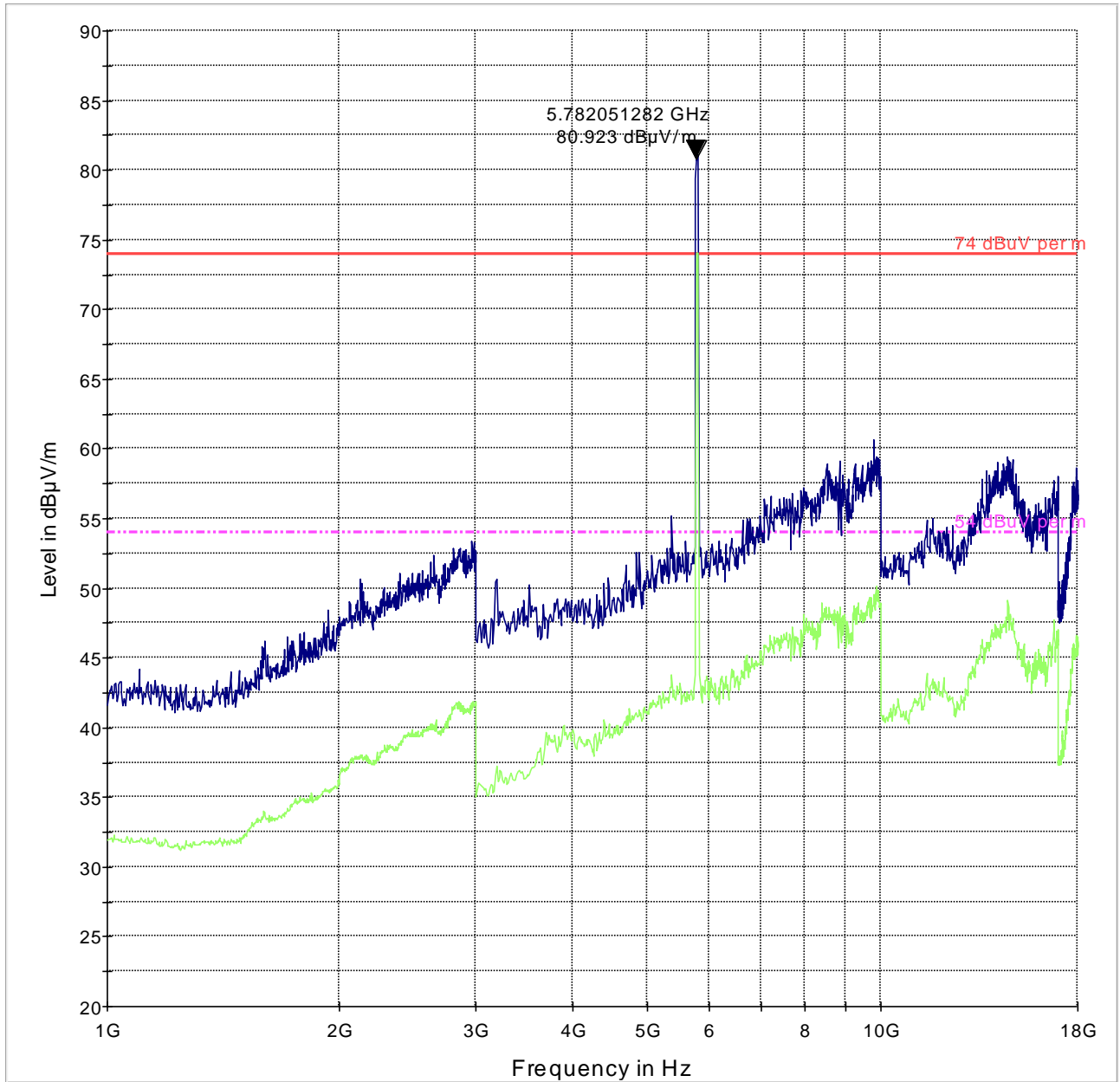


— FCC 15 — Preview Result 1-PK+ * Data Reduction Result 1 [3]-PK+



1GHz – 18GHz

Mode: 802.11n[HT40] -HighChannel

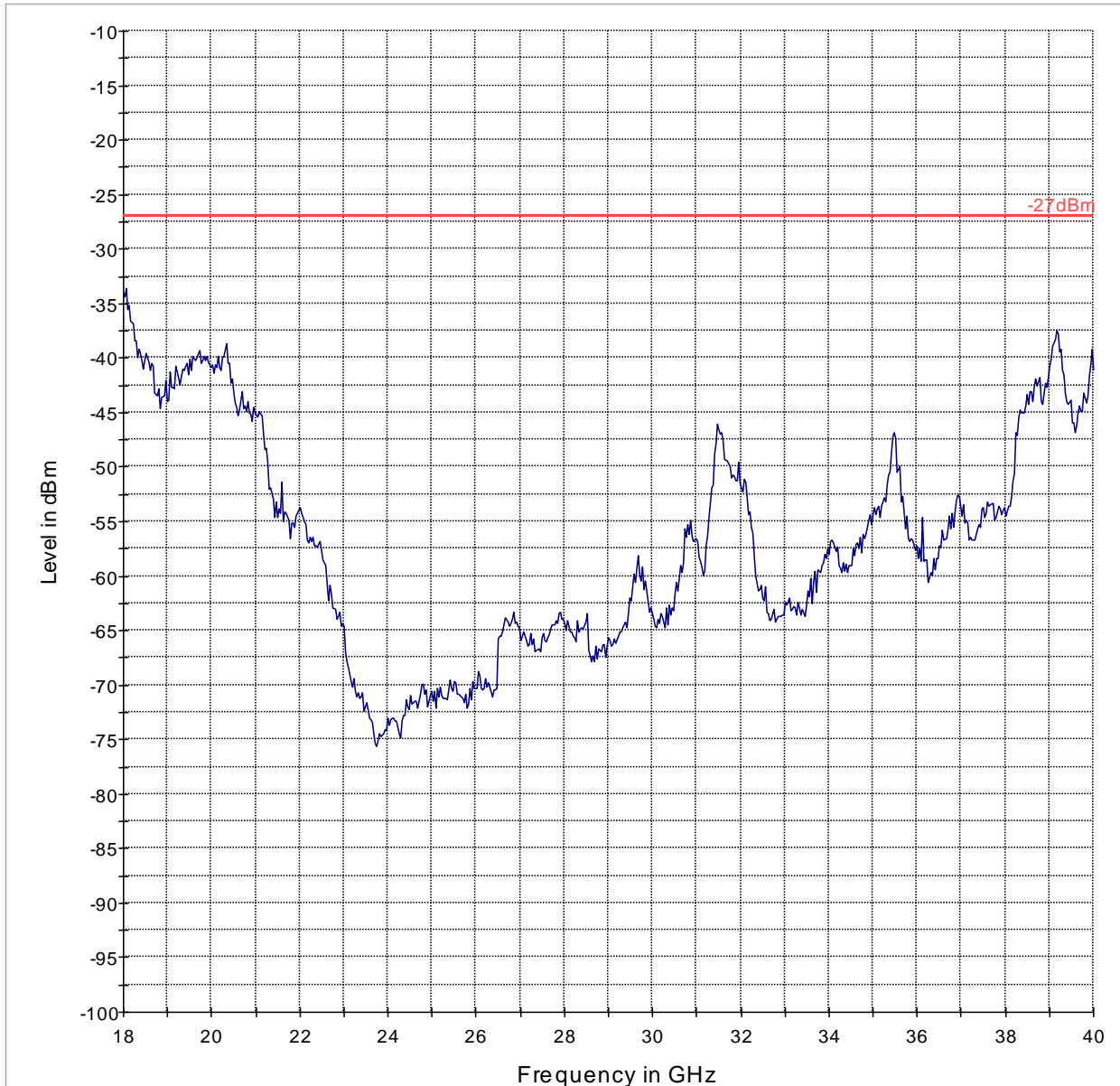


— 74 dBµV per m - - - 54 dBµV per m — Preview Result 1-PK+ — Preview Result 2-AVG



18GHz – 40GHz

Mode: 802.11n[HT40] -HighChannel



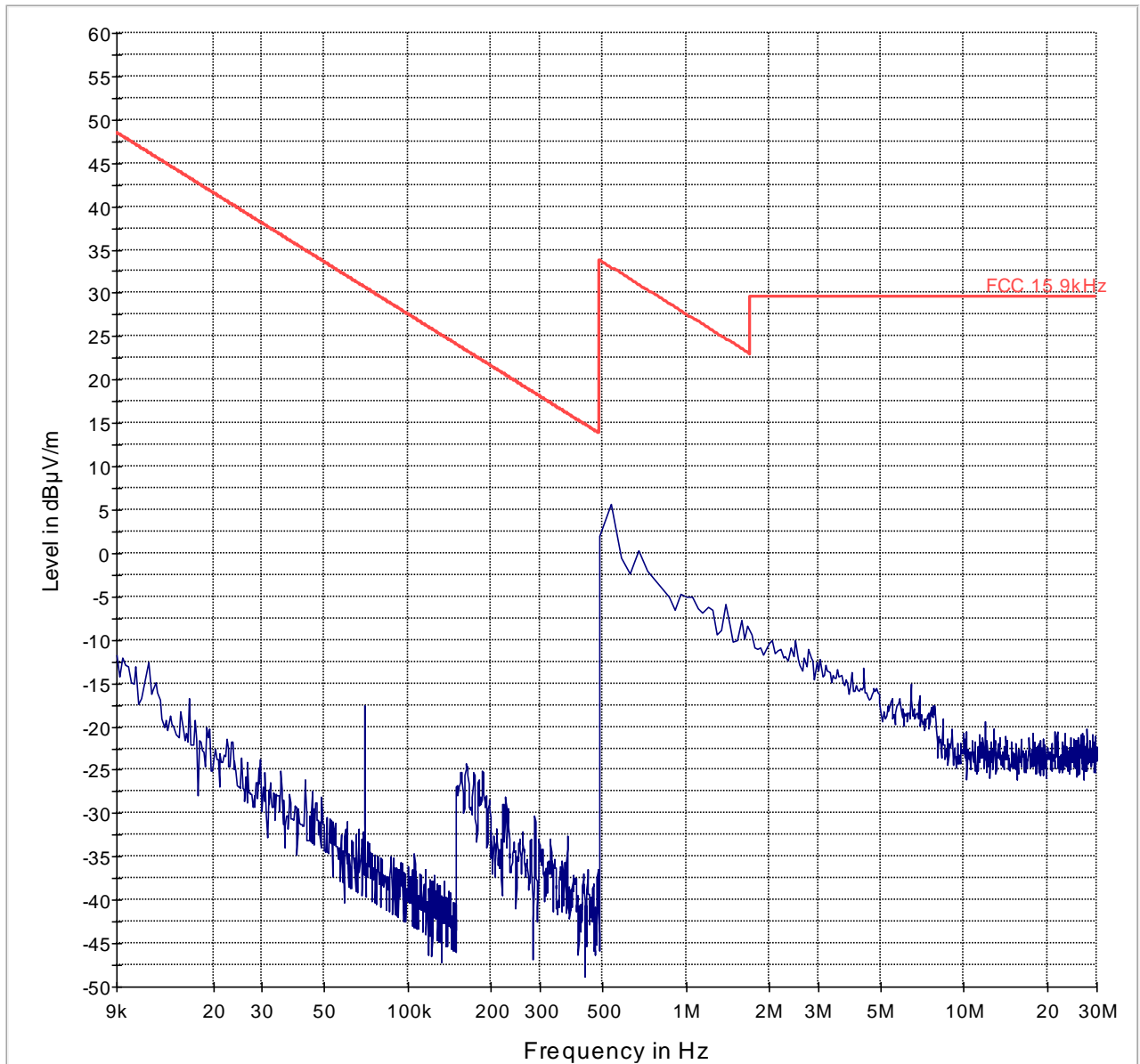
— -27dBm — Preview Result 1-PK+



6.4.6.6 Radiated Emissions 802.11ac U-NII-3 HT80 – 5.8GHz

<30MHz

Mode: 802.11ac[HT80] -HighChannel

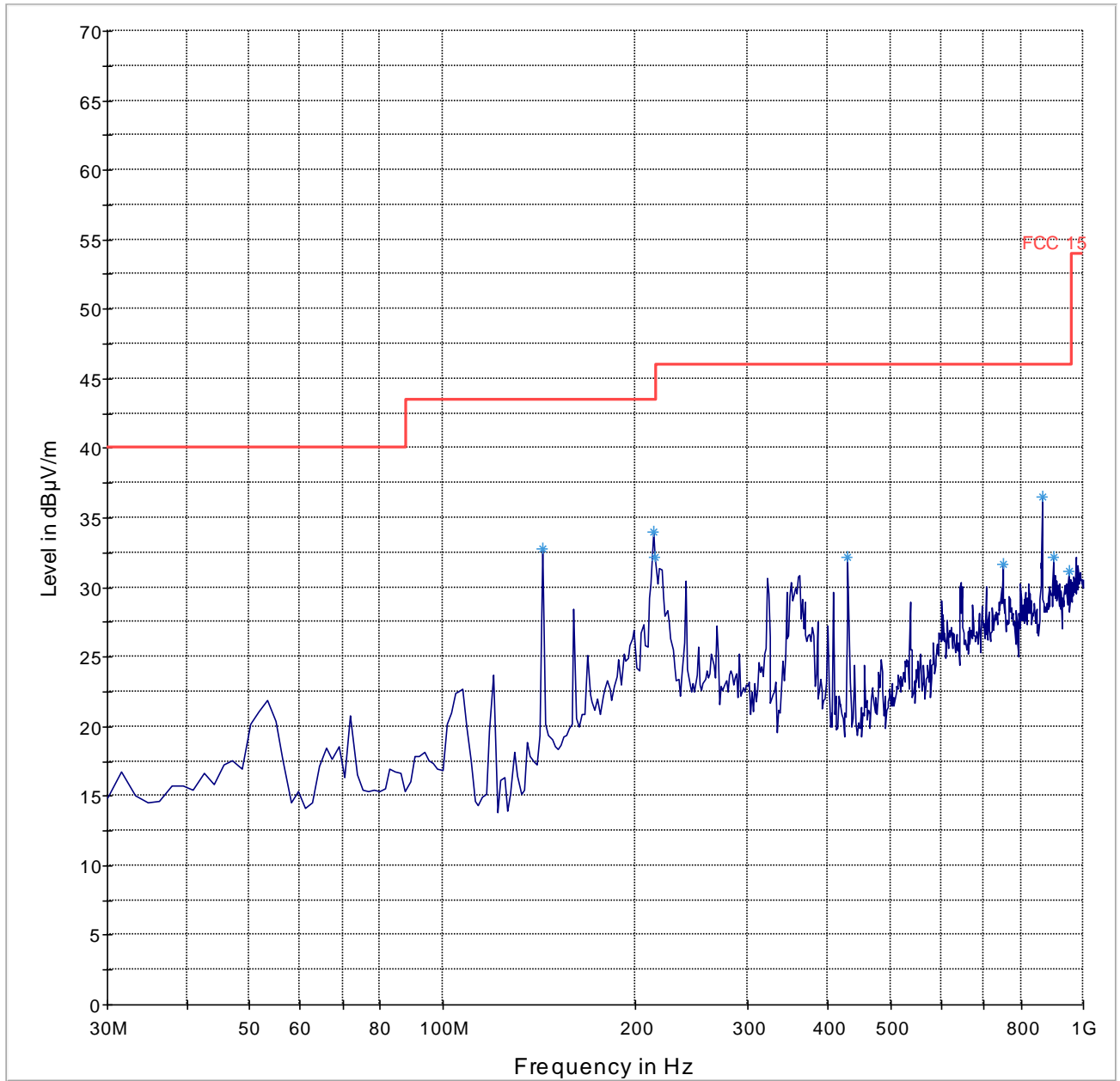


— FCC 15.9kHz — Preview Result 1-PK+



30MHz – 1GHz

Mode: 802.11ac[HT80] -HighChannel

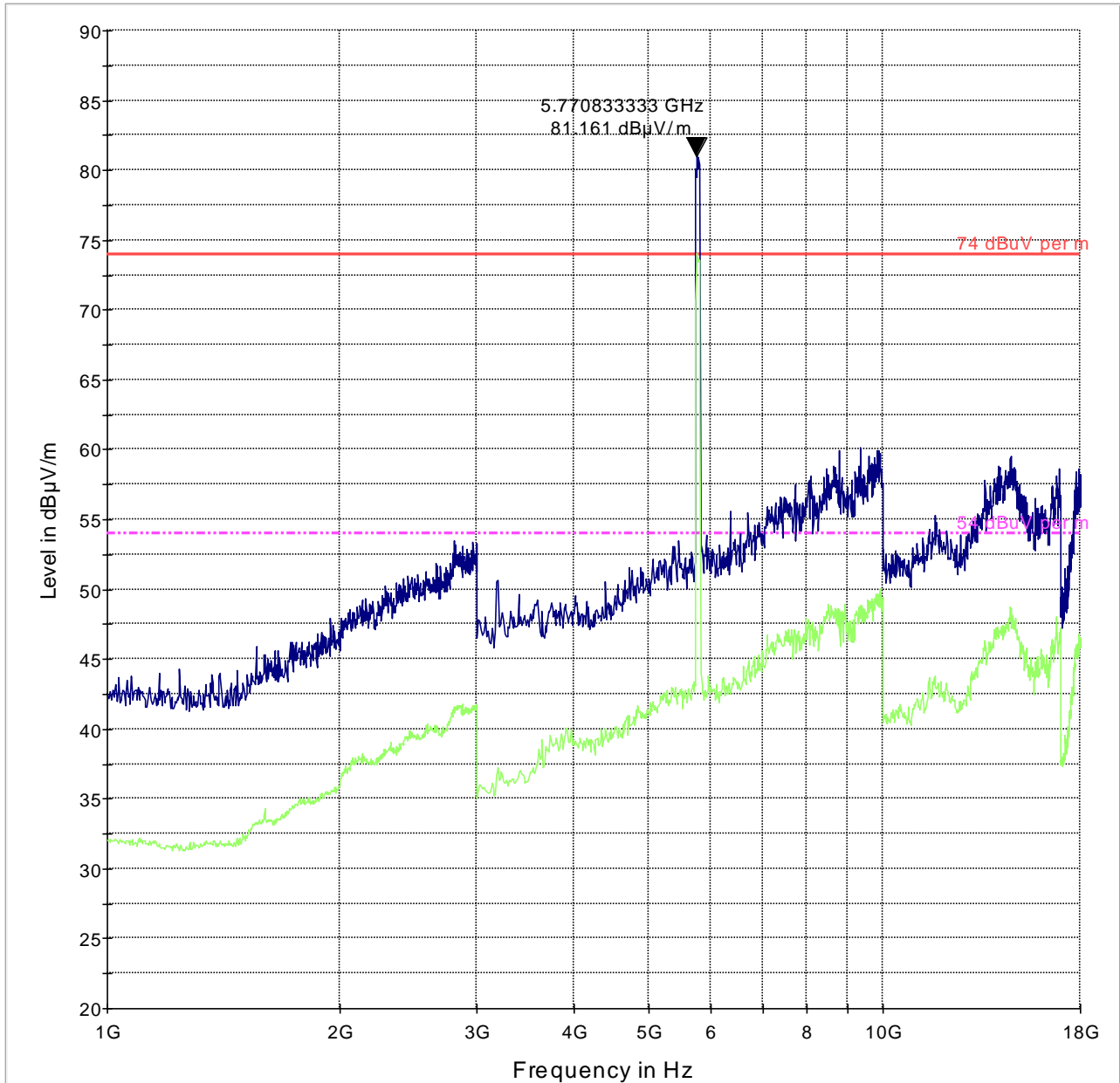


— FCC 15 — Preview Result 1-PK+ * Data Reduction Result 1 [3]-PK+



1GHz – 18GHz

Mode: 802.11ac[HT80] -HighChannel

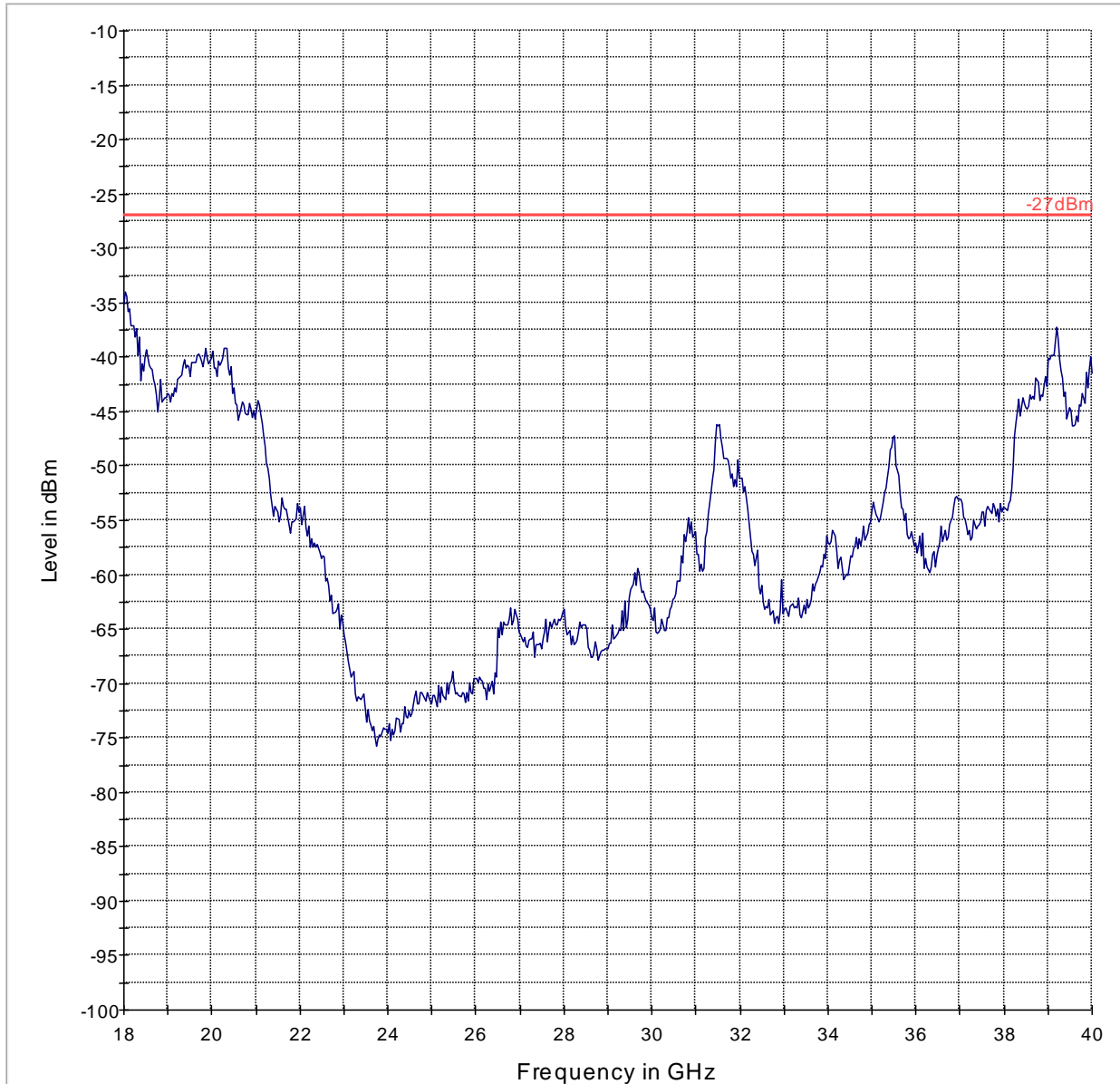


— 74 dBuV per m - - - - 54 dBuV per m — Preview Result 1-PK+ — Preview Result 2-AVG



18GHz-40GHz

Mode: 802.11ac[HT80] -HighChannel



— -27dBm — Preview Result 1-PK+



6.5 AC Power Line Conducted Emissions

6.5.1 References:

FCC: CFR Part 15.207

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.

6.5.2 Limits:

§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.

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- 9 KHz.

6.5.3 Test Conditions:

Modulation: 802.11g mode.

Measurement Uncertainty: ±3.0dB

6.5.4 Results

All emissions are below applicable limits.

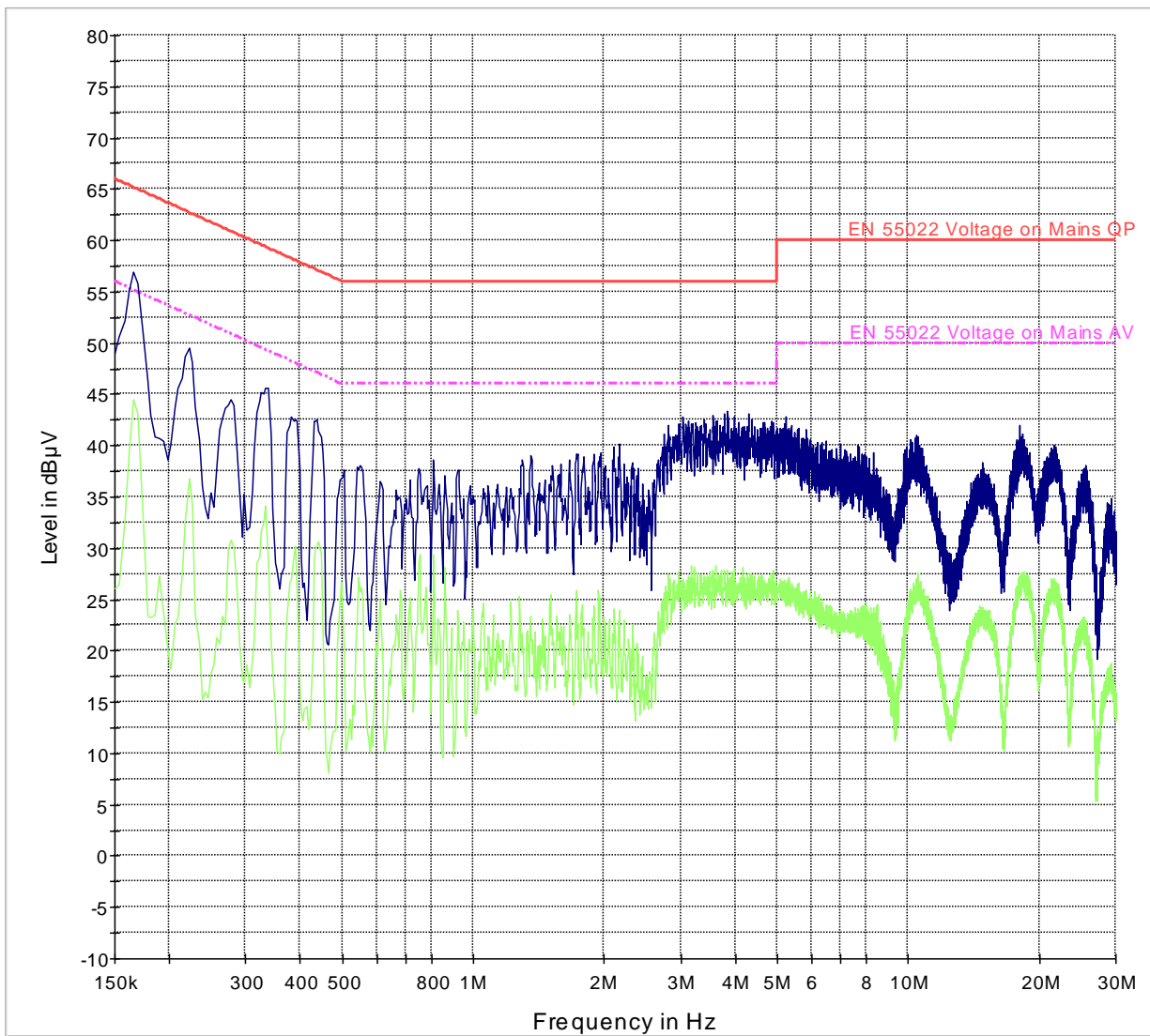
Plots shown here represent the combined worse case emissions for power lines, phases and neutral line.

6.5.5 Measurement Verdict – AC Power Line Conducted Emissions

Pass.

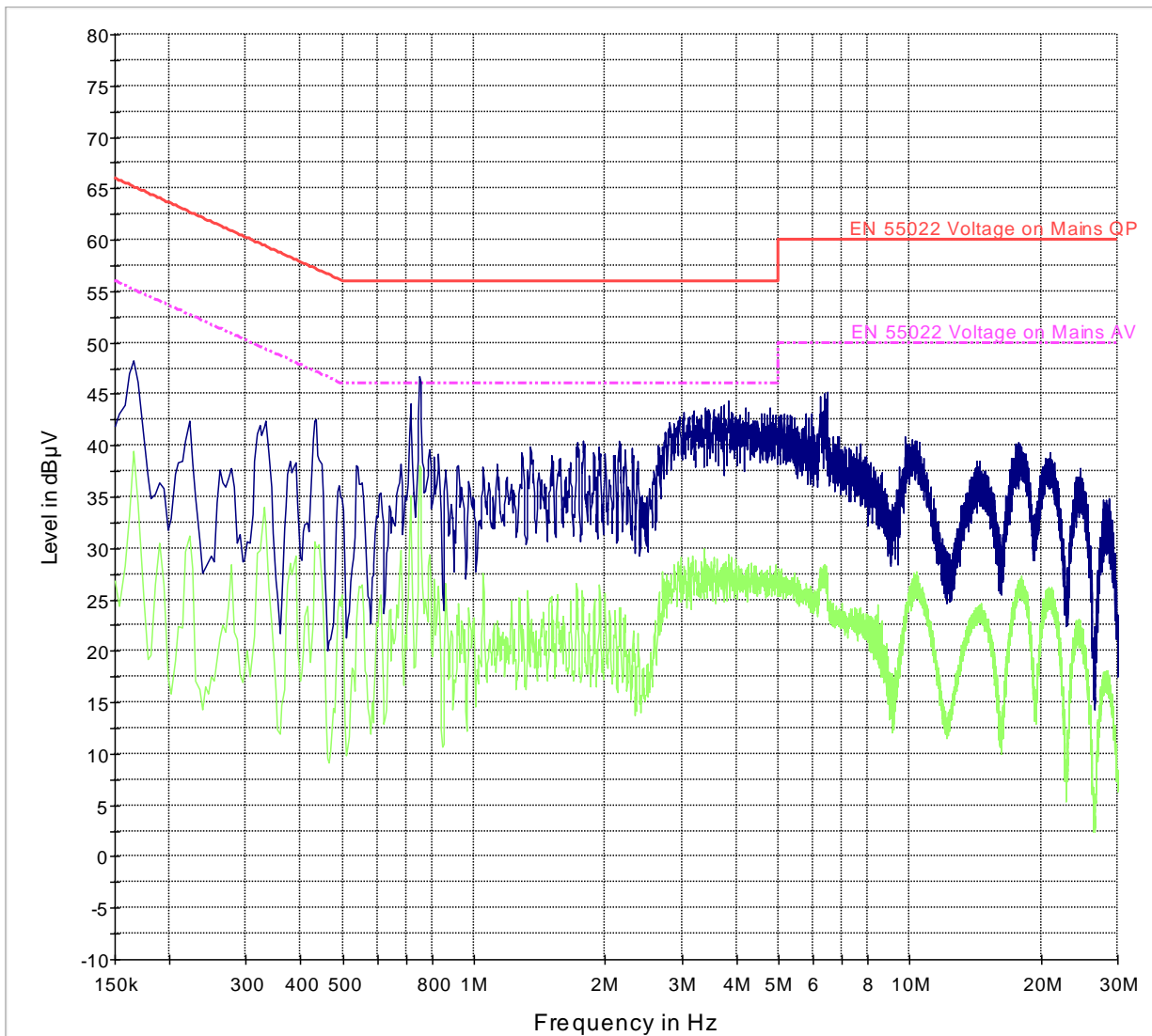
6.5.6 Test data/plots:

6.5.6.1 AC Line Emissions 150kHz – 30MHz WLAN (b-mode):



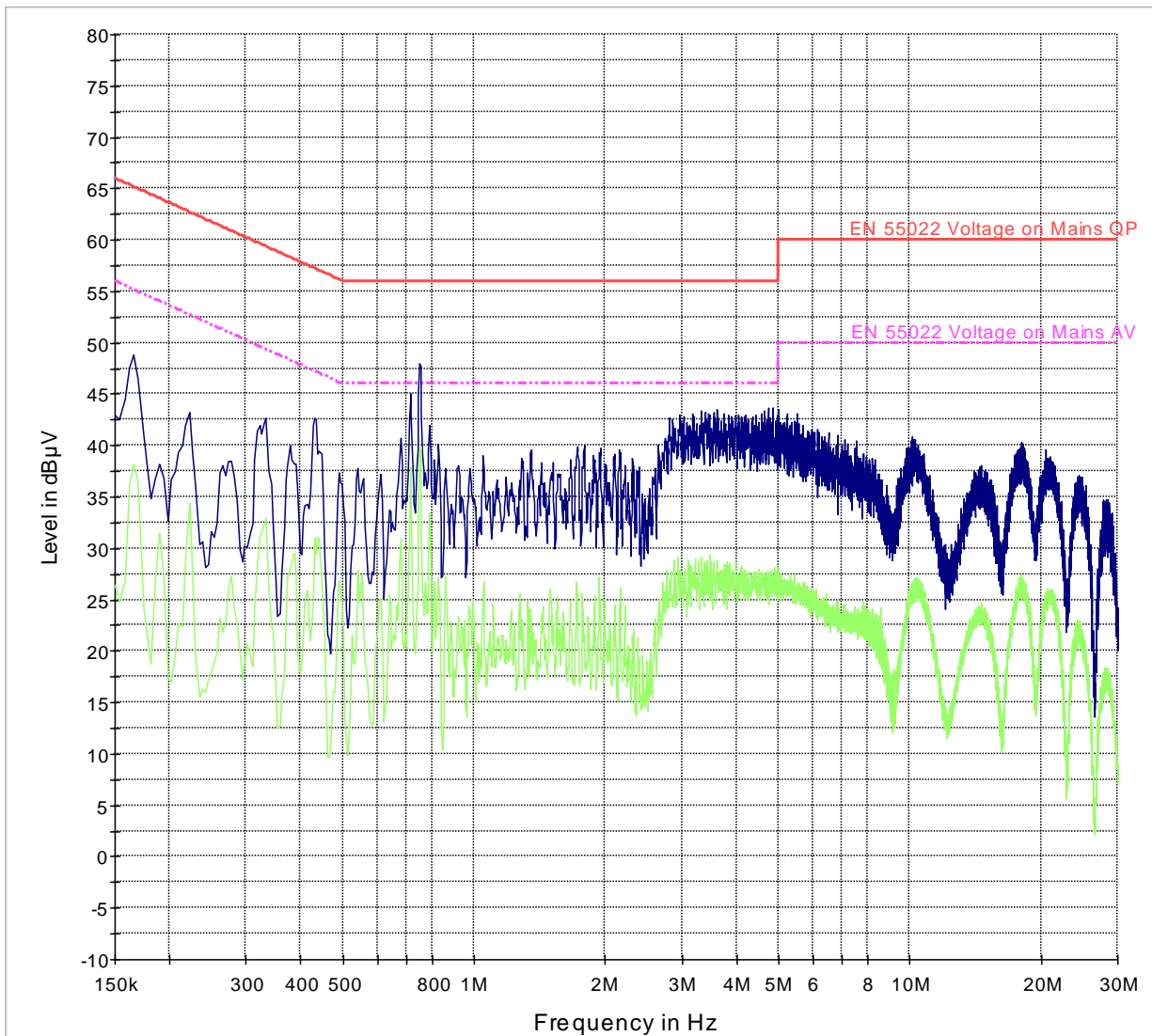
- EN 55022 Voltage on Mains QP
- EN 55022 Voltage on Mains AV
- Preview Result 1-PK+
- Preview Result 2-AVG

6.5.6.2 AC Line Emissions 150kHz – 30MHz WLAN (g-mode):



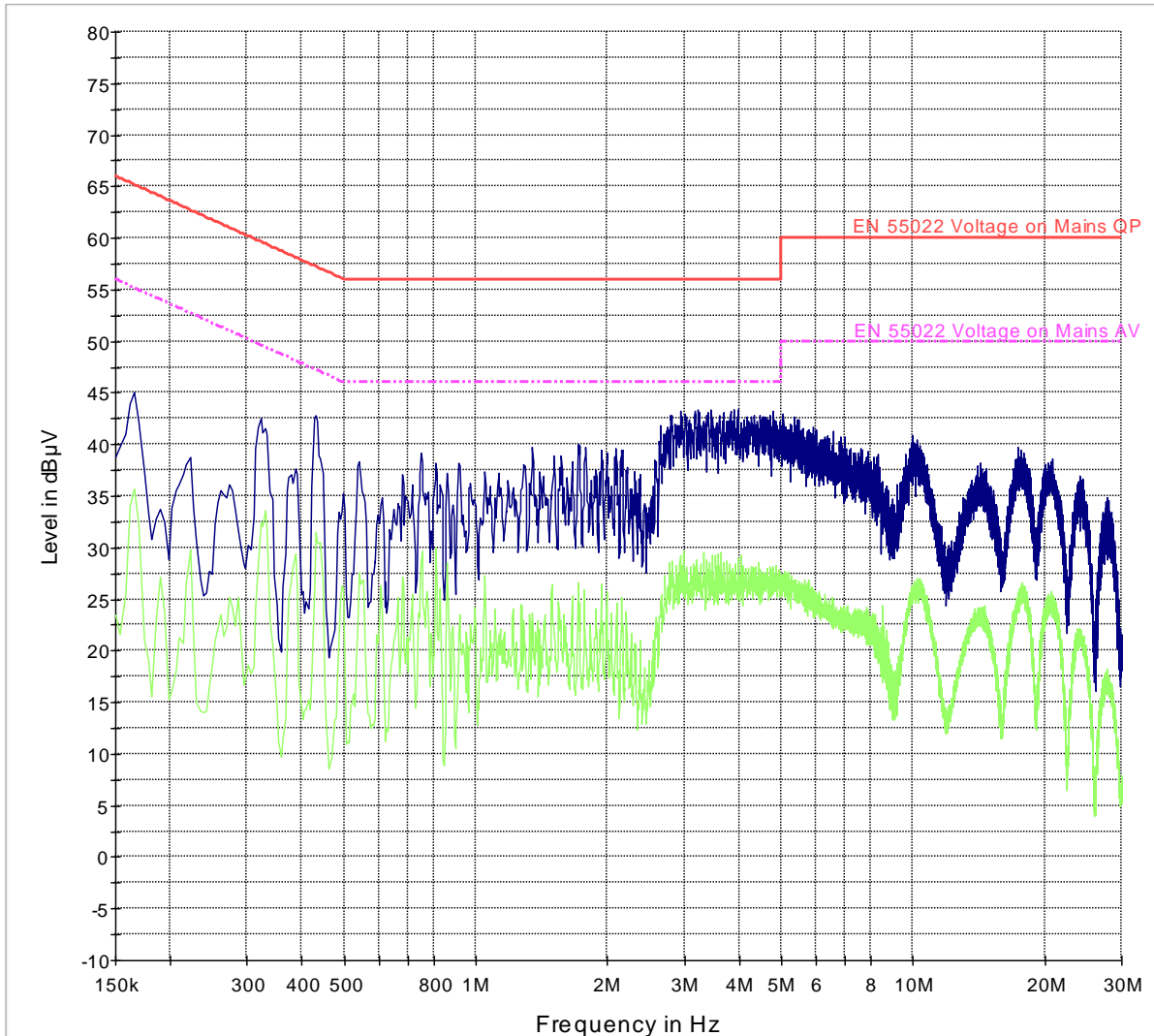
- EN 55022 Voltage on Mains QP
- EN 55022 Voltage on Mains AV
- Preview Result 1-PK+
- Preview Result 2-AVG

6.5.6.3 AC Line Emissions 150kHz – 30MHz 2.4GHz WLAN (n-mode):



- EN 55022 Voltage on Mains QP
- EN 55022 Voltage on Mains AV
- Preview Result 1-PK+
- Preview Result 2-AVG

6.5.6.4 AC Line Emissions 150kHz – 30MHz 5GHz WLAN (ac-mode HT80):



— EN 55022 Voltage on Mains QP - - - EN 55022 Voltage on Mains AV
— Preview Result 1-PK+ — Preview Result 2-AVG



6.6 Unwanted RX Emissions into restricted and non-restricted bands

6.6.1 Limits: §15.109

| FCC | | IC |
|--------------------------------|-------------------------|----------------------|
| RX Spurious Emissions Radiated | | |
| Frequency (MHz) | Field Strength (dBµV/m) | Measurement distance |
| 30 - 88 | 30.0 | 10 |
| 88 – 216 | 33.5 | 10 |
| 216 – 960 | 36.0 | 10 |
| Above 960 | 54.0 | 3 |

6.6.2 Test Conditions

- Tnom: 20°C;
- Vnom: 3.7V DC
- Measurement distance: 3m
- The unit was switched on into normal operation. No networks were available in the chamber to connect to. The resulting emissions are thus a summary of the RX spurious of all the radios of the EUT.

6.6.3 Measurement parameter

| Measurement parameter | |
|-----------------------|---|
| Detector: | Peak / Quasi Peak / RMS |
| Sweep time: | Auto |
| Resolution bandwidth: | F > 1 GHz: 1 MHz F < 1 GHz: 100 kHz |
| Video bandwidth: | 3 x RBW Remeasurement: 10 Hz / 3 MHz |
| Span: | 30 MHz to 25 GHz |
| Trace-Mode: | Max Hold |

6.6.4 Result

| RX Spurious Emissions Radiated [dBµV/m] | | |
|--|----------|----------------|
| F [MHz] | Detector | Level [dBµV/m] |
| For emissions below 1 GHz, please take a look at the table below the 1 GHz plot. | | |
| All detected peaks are below the average limit! | | |
| Measurement uncertainty | ± 3 dB | |

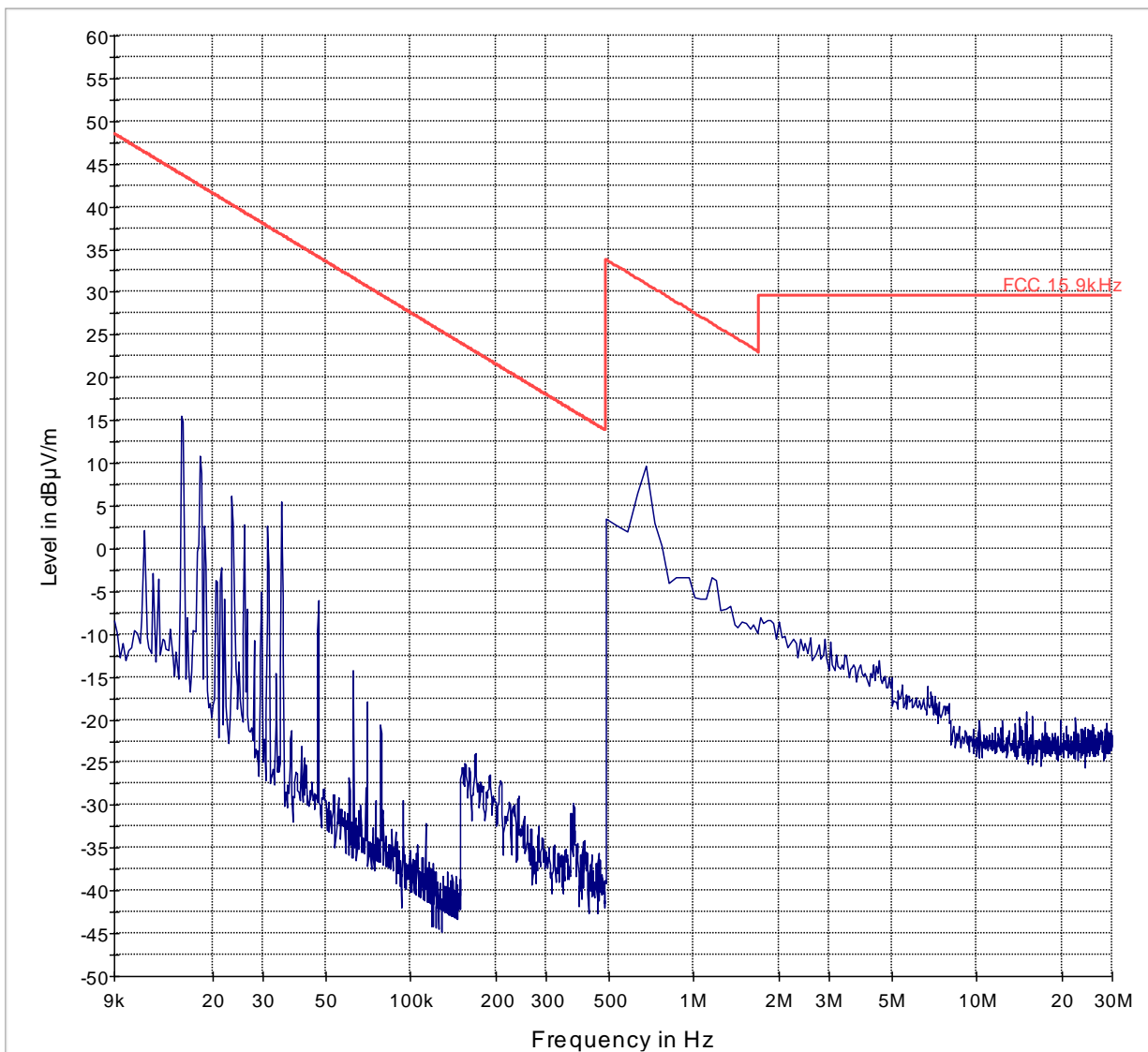


6.6.5 Verdict

Pass

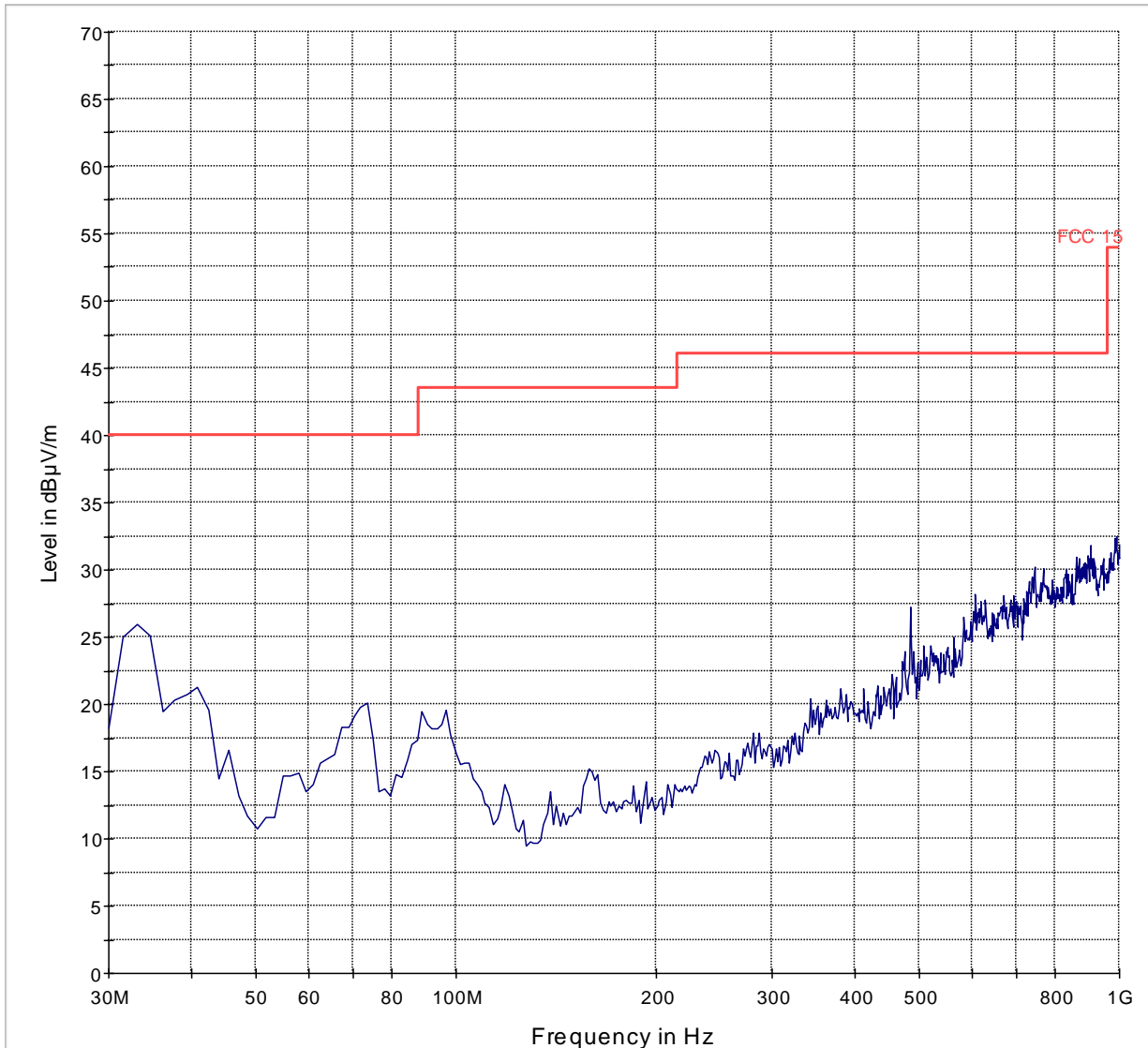
6.6.6 Plots

6.6.6.1 RX Emissions: 9kHz – 30MHz; EUT + AC Adapter Mode



— FCC 15.9kHz — Preview Result 1-PK+

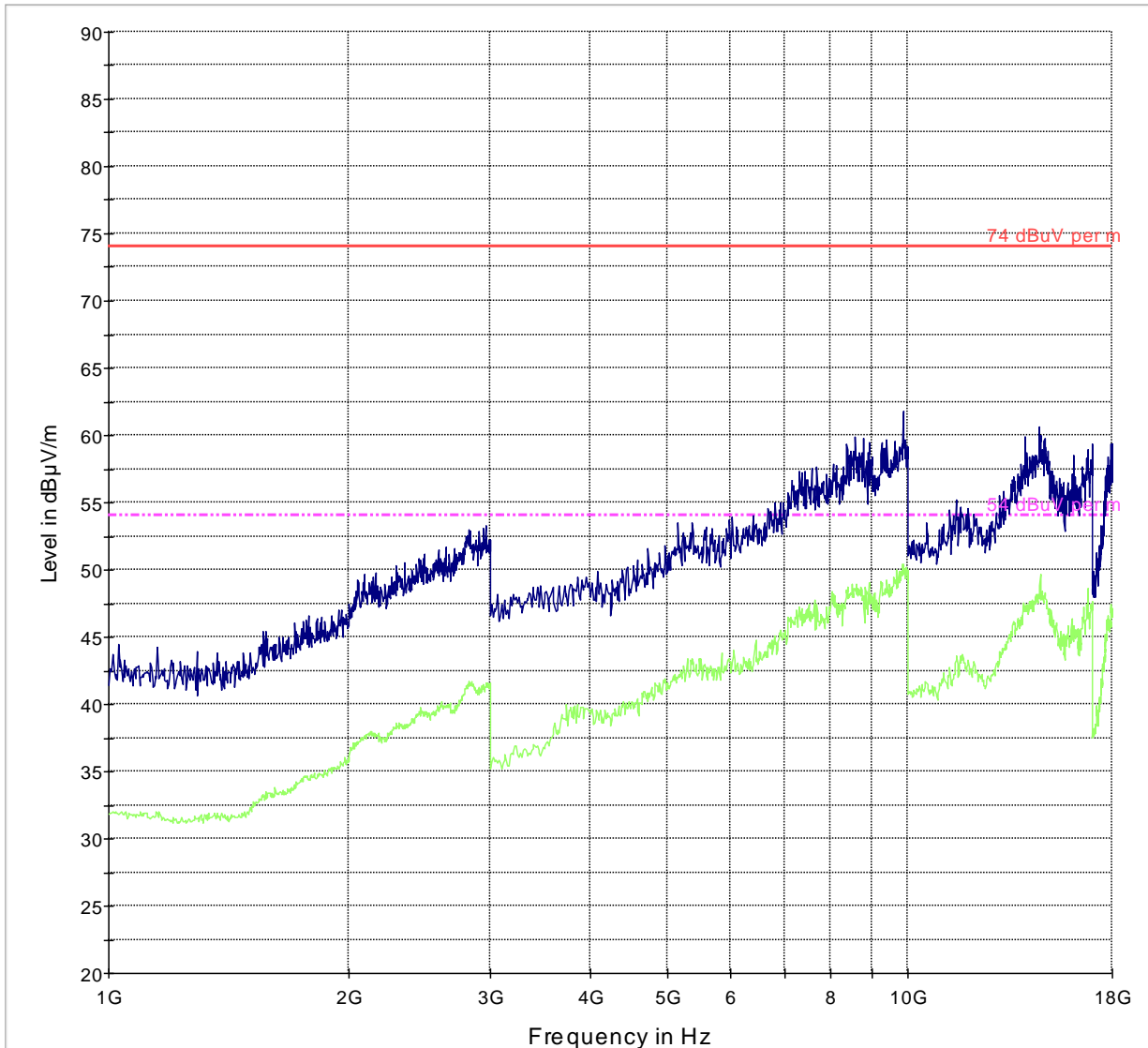
6.6.6.2 RX Emissions: 30MHz – 1GHz; EUT + AC Adapter Mode



— FCC 15 — Preview Result 1-PK+



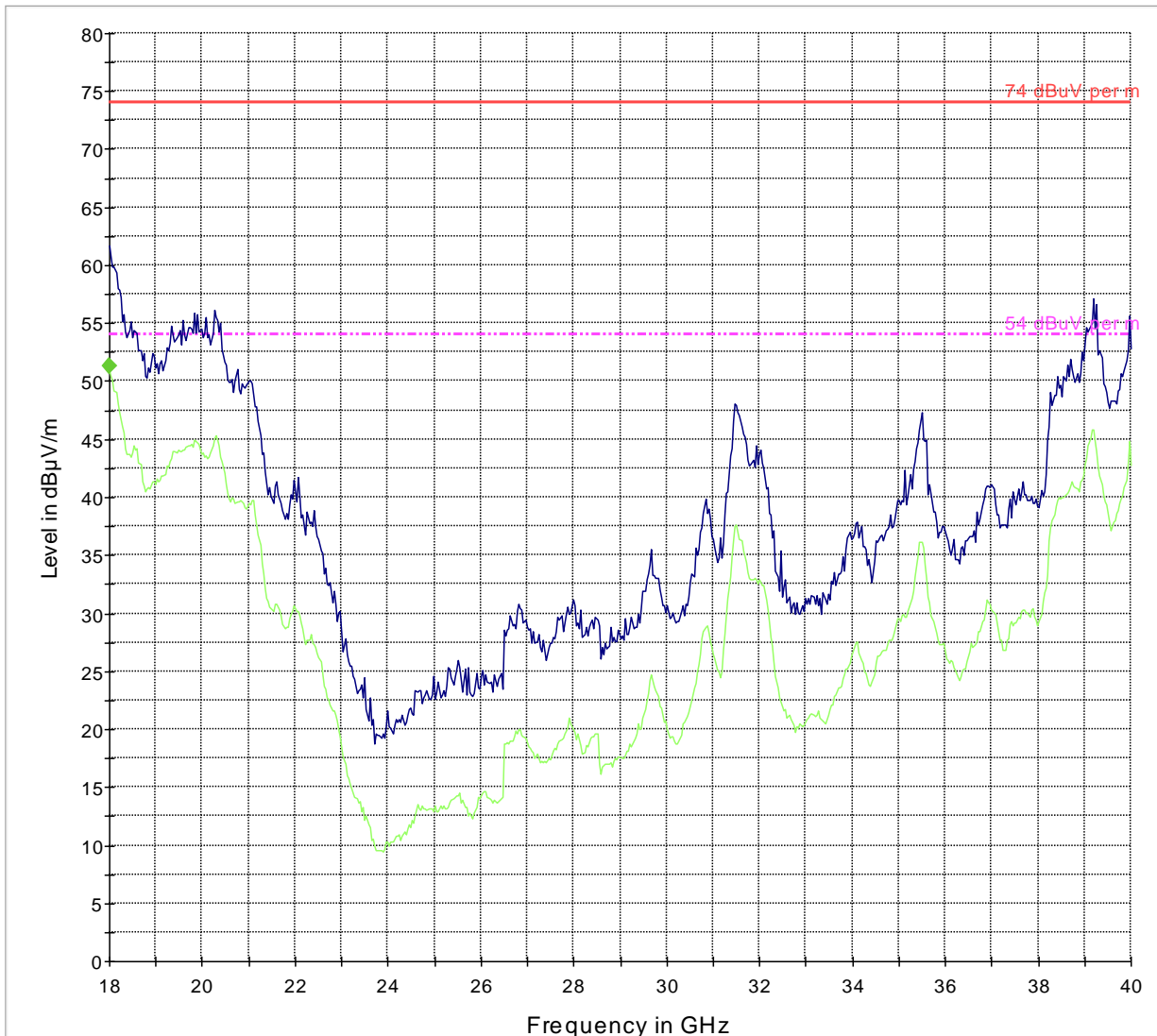
6.6.6.3 RX Emissions: 1GHz – 18GHz; EUT + AC Adapter Mode



— 74 dBuV per m - - - 54 dBuV per m — Preview Result 1-PK+ — Preview Result 2-AVG



6.6.6.4 RX Emissions: 18GHz – 40GHz; EUT + AC Adapter Mode



— 74 dBuV per m - - - 54 dBuV per m — Preview Result 1-PK+
— Preview Result 2-AVG ◆ Final Result 2-AVG

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FCC ID: PY7PM-0745

Date of Report : 2014-01-22



7 Setup Pictures

See

TestSetupPhotos_FCC_Part15.doc



8 Test Equipment and ancillaries used for tests

| No. | Equipment Name | Manufacturer | Type/model | Serial No. | Cal Date | Cal Interval |
|----------------------------|-----------------------------|---------------|------------|------------|----------|--------------|
| 3m Semi- Anechoic Chamber: | | | | | | |
| | Turn table | EMCO | 2075 | N/A | N/A | N/A |
| | MAPS Position Controller | ETS Lindgren | 2092 | 0004-1510 | N/A | N/A |
| | Antenna Mast | EMCO | 2075 | N/A | N/A | N/A |
| | Relay Switch Unit | Rohde&Schwarz | RSU | 338964/001 | N/A | N/A |
| | EMI Receiver/Analyzer(*) | Rohde&Schwarz | ESU 40 | 100365 | Feb 2013 | 1 Year |
| | 1500MHz HP Filter | Filtek | HP12/1700 | 14c48 | N/A | N/A |
| | 2800 MHz HP Filter | Filtek | HP12/2800 | 14C47 | N/A | N/A |
| | Pre-Amplifier | Miteq | JS40010260 | 340125 | N/A | N/A |
| | Binconilog Antenna | EMCO | 3141 | 0005-1186 | Apr 2012 | 3 Years |
| | Binconilog Antenna | ETS | 3149 | J000123908 | Feb 2012 | 3 years |
| | Horn Antenna | EMCO | 3115 | 35114 | Mar 2012 | 3 Years |
| | LISN | FCC | 50-25-2-08 | 08014 | Jul 2012 | 2 Year |
| Ancillary equipment | | | | | | |
| | Multimeter | Klein Tools | MM200 | 001 | Apr 2011 | 3 Years |
| | Humidity Temperature Logger | Dickson | TM320 | 03280063 | Apr 2013 | 1 Year |
| | Digital Barometer | VWR | 35519-055 | 91119547 | Nov 2011 | 3 Years |
| | DC Power Supply | HP | E3610A | KR83023316 | N/A | N/A |
| | DC Power Supply | Protek | 3003B | H012771 | N/A | N/A |
| | Communication Antenna | IBP5-900/1940 | Kathrein | N/A | N/A | N/A |

Calibration details valid at the time of testing.

Equipment used meets the measurement uncertainty requirements as required per applicable standards for 95% confidence levels.

Calibration due dates, unless defined specifically, falls on the last day of the month.

Items indicated "N/A" for cal status either do not specifically require calibration or is internally characterized before use.

Test Report #: EMC_CETEC_063_13001_WLAN2.4G_WLAN5.8G_15.247

FCC ID: PY7PM-0745

Date of Report : 2014-01-22



9 Revision History

| Version | Date | By | Status / changes |
|---------|---------|--------------|------------------|
| 01 | 1/22/14 | Franz Engert | Official Version |
| | | | |
| | | | |
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