FCC/IC Test Report

FOR

Intel Corporation

Model Number: CZ120

Product Description: HSPA+ Smartphone

FCC ID: O2Z-CZ120
IC ID: 1000W – CZ120

47 CFR Part 15.247 for DTS Systems, 2.4 & 5 GHz WLAN

IC RSS-210 Issue 8, Annex 8

TEST REPORT #: EMC_INTEL-032-12001_DTS
DATE: 2013-08-29

ilac-MRA

A2LA ACCREDITED TESTING LABORATORY Certificate #2135.01

CTIA Authorized Test Lab LAB CODE 20020328-00

FCC : Accredited

IC recognized # 3462B-1

***CETECOM* Inc.**
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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 and Industry Canada Standards RSS-210 Issue 8, Annex 8.
No deviations were ascertained during the course of the tests performed.

Company	Description	Model #
Intel Corporation	HSPA+ Smartphone	CZ120

Responsible for Testing Laboratory:

Date	Section	Name	Signature
2013-08-29	Compliance	Tunji Yusuf (Test Lab Manager)	

Responsible for the Report:

Date	Section	Name	Signature
2013-08-29	Compliance	Daniel Salinas (EMC Test Engineer)	

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:	Tunji Yusuf
Responsible Project Leader:	Daniel Salinas

2.2 Identification of the Client

Client:	Intel Corporation
Street Address:	2200 Mission College Blvd
City/Zip Code	Santa Clara, 95054
Country	United States
Contact Person:	Christine Ryan
Phone No.	+1 (408) 300 2167

2.3 Identification of the Manufacturer

Manufacturer's Name:	Same as client.
Manufacturers Address:	
City/Zip Code	
Country	

3 Equipment under Test (EUT)

3.1 Specification of the Equipment under Test

Marketing Name:	HSPA+ Smartphone
Model No:	CZ120
FCC-ID:	O2Z-CZX20
ICC ID:	1000W-CZ120
Product Description:	HSPA+ Smartphone
Technology/ Type(s) of Modulation:	2.4 GHz 802.11 b/g/n: CCK, BPSK, QPSK, 16QAM, 64QAM 5 GHz 802.11 a/n: BPSK, QPSK, 16QAM, 64QAM
Modes of Operation	In the 2.4 GHz band: Client, Adhoc mode connection and active beacon scanning supported In the 5 GHz band 4: Client only, no Adhoc mode connection or active beacon scanning supported
Channel Bandwidths	HT20
Operating Frequency Ranges (MHz)/ Channels:	Nominal band: 2400 – 2483.5 MHz; Center to center with HT20: 2412(ch 1) – 2462(ch 11), 11 channels Nominal band: 5725 – 5850 MHz Center to center with HT20: 5745(ch 149) – 5825(ch 165), 5 channels
Antenna info:	Internal Monopole 2.4 GHz: -0.7 dBi 5 GHz: -1.83 dBi
Max. Output Powers:	**2.4 GHz:** Conducted (Measured): 20.3 dBm Radiated–EIRP (Calculated): 19.6 dBm **5 GHz:** Conducted (Measured): 25.3 dBm Radiated-EIRP (Calculated): 23.5 dBm
Rated Operating Voltage:	3.6 Vmin/3.8 Vnom/4.2 Vmax
Rated Operating temperature range:	Tmin: -10°C/ Tmax: 55°C

Other radios supported in the device:	GSM/GPRS/EGPRS: 850/900/1800/1900 UMTS FDD Bands I/II/IV/V/VIII Bluetooth: 2402 – 2480 MHz / 79 Channels GPS: 1.575 GHz / 1 Channel
Test sample status:	Production

3.2 Identification of the Equipment Under Test (EUT)

EUT #	Serial Number	HW Version	SW Version	Model	Notes/Comments
1	RHBEC244302204	PR 2.0	JB ENG R42-2	CZ120	2.4 GHz Band Radiated Test Sample
2	RHBEC2244302235	PR 2.0	JB ENG R42-36	CZ120	5 GHz Band Radiated Test Sample
3	RHBEC245500069	PR 2.0	JB ENG R42-77	CZ120	Conducted Test Sample

3.3 Identification of Accessory Equipment

AE #	Type	Manufacturer	Model	Serial Number
1	AC Power Adapter	Saicomp	SC1402	1237400330319

3.4 Environmental conditions during Test:

The following environmental conditions were maintained during the course of testing:
Ambient Temperature: 20-25^{o}C
Relative humidity: 40-60%

3.5 Dates of Testing:

April 8th, 2013 – June 28th, 2013

3.6 Other Testing Notes:

The device was configured with a manufacturer provided 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 802.11a, 802.11b, 802.11g, and 802.11n (HT20) modes (n-mode is used with 20 MHz channel bandwidth (HT20) only).

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	**802.11a**	6.0	BPSK
	802.11n(HT20)	6.5	BPSK

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
- IC RSS-210 Issue 8

This test report is to support a request for new equipment authorization under the FCC ID**: O2Z-CZ120** and IC ID**: 1000W-CZ120**

5 Summary of Measurement Results

Test Specification	Test Case	Temperature and Voltage Conditions	Mode	Pass	Fail	NA	NP	Result
§15.247(e) RSS-210 A8.2(b)	Power Spectral Density	Nominal	802.11 a/b/g/n	■	☐	☐	☐	Complies
§15.247(a)(1) RSS-210 A8.1(b)	Carrier Frequency Separation	Nominal	-	☐	☐	■	☐	See Note 1
§15.247(a)(1) RSS-210 A8.1(d)	Number of Hopping Channels	Nominal	-	☐	☐	■	☐	See Note 1
§15.247(a)(1)(iii) RSS-210 A8.3(1)	Time of occupancy	Nominal	-	☐	☐	■	☐	See Note 1
§15.247(a)(2) RSS-210 A8.2(a)	Spectrum Bandwidth	Nominal	802.11 a/b/g/n	■	☐	☐	☐	Complies
§15.247(b)(3) RSS-210 A8.4(2)	Maximum Peak Conducted Output Power	Nominal	802.11 a/b/g/n	■	☐	☐	☐	Complies
§15.247(d) RSS-210 A8.5	Unwanted Emissions into non-Restricted Frequency Bands band edge-Conducted	Nominal	802.11 a/b/g/n	☐	☐	☐	■	See Note 2
§15.247(d) RSS-210 A8.5	Unwanted Emissions into Restricted Frequency Bands band edge-Radiated	Nominal	802.11 a/b/g/n	■	☐	☐	☐	Complies
§15.247(d) RSS-210 A8.5	Unwanted Emissions into Non-Restricted Frequency Bands-Conducted	Nominal	802.11 a/b/g/n	■	☐	☐	☐	Complies
§15.209(a) §15.247(d) RSS Gen RSS-210 A8.5	Unwanted Emissions into Non-Restricted Frequency Bands - Radiated	Nominal	802.11 a/b/n	■	☐	☐	☐	Complies
§15.207(a) RSS Gen	AC Line Conducted Emissions<30MHz	Nominal	802.11 a/b/n	■	☐	☐	☐	Complies

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

1. Test only applicable to frequency hopping systems.
2. Band Edge compliance-conducted is not performed as the device passes radiated measurement against the more stringent restricted band limits.

6 Measurements

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 Measurement Method:

6.1.1 Radiated Measurement Procedure

6.1.1.1 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.

6.1.1.2 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: ±3dB

6.1.1.3 Sample Calculations for Radiated Measurements

6.1.1.4 Field Strength Measurements:

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

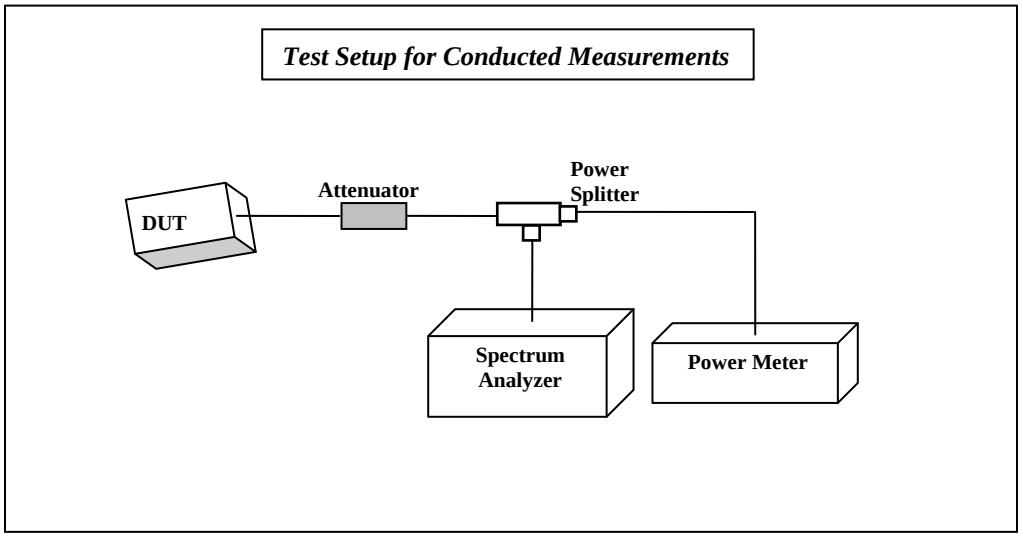
1. Measured reading in dBµV
2. Cable Loss between the receiving antenna and SA in dB and
3. Antenna Factor in dB/m

FS (dBµV/m) = Measured Value on SA (dBµV) + Cable Loss (dB) + 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.

6.1.2 Conducted Measurement Procedure



1. Connect the equipment as shown in the above diagram.
2. A test SW provided by the manufacturer is used to control the different modulations, data rates and max output power configurations.
3. Measurements are to be performed with the EUT set to the low, middle and high channels for 802.11a, 802.11b, 802.11g and 802.11n (HT20) modes.

   Measurement uncertainty for all conducted measurements: ±0.5dB

6.2 Maximum Peak Conducted Output Power

6.2.1 Limits:

§15.247 (b)(3)

For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the *maximum conducted output power* is the highest total transmit power occurring in any mode.

6.2.2 Test Conditions:

Tnom: 20°C; Vnom: 3.8 VDC

6.2.3 Test Procedure:

Measurement according to FCC KDB 558074 D01 DTS Meas Guidance v03, section 9.1.2- Integrated Band Power Method

Spectrum Analyzer settings:

RBW=1MHz, VBW=3MHz, Detector: Peak- Max Hold.
Sweep Time: Auto
Span= 20 MHz / 25 MHz (to fully encompass DTS Bandwidth for 802.11 a/b/g & n modes)

Maximum Antenna Gain (dBi):

2.4 GHz: -0.7 dBi
5 GHz: -1.83 dBi

6.2.4 Test Results:

6.2.4.1 2.4GHz Band

Measured Maximum Peak Conducted Output Power (dBm)			
Mode	**Frequency (MHz)**		
	2412 Channel 1	**2437 Channel 6**	**2462 Channel 11**
802.11b	19.8	20.0	20.3
802.11g	18.9	19.4	19.4
802.11n (HT20)	16.5	16.6	17.0

Calculated Maximum Peak Radiated Output Power (dBm)			
Mode	**Frequency (MHz)**		
	2412 Channel 1	**2437 Channel 6**	**2462 Channel 11**
802.11b	19.1	19.3	19.6
802.11g	18.2	18.7	18.7
802.11n (HT20)	15.8	15.9	16.3

Note: Radiated EIRP is calculated as
Conducted Measurement + Antenna Gain

6.2.4.2 Test Result: 5GHz Band

Measured Maximum Peak Conducted Output Power (dBm)			
Mode	**Frequency (MHz)**		
	5745 Channel 149	**5785 Channel 157**	**5825 Channel 165**
802.11a	25.3	25.3	24.6
802.11n (HT20)	24.8	25.1	24.5

Calculated Maximum Peak Radiated Output Power (dBm)			
Mode	**Frequency (MHz)**		
	5745 Channel 149	**5785 Channel 157**	**5825 Channel 165**
802.11a	23.5	23.5	22.8
802.11n (HT20)	23.0	23.3	22.7

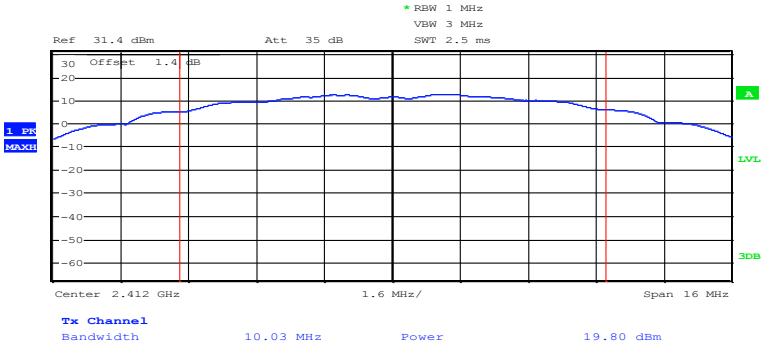
Note: Radiated EIRP is calculated as
Conducted Measurement + Antenna Gain

6.2.5 Measurement Verdict – Peak Conducted Output Power

Pass.

6.2.6 Test Data/plots:

Conducted Peak Power 802.11b 2412 MHz



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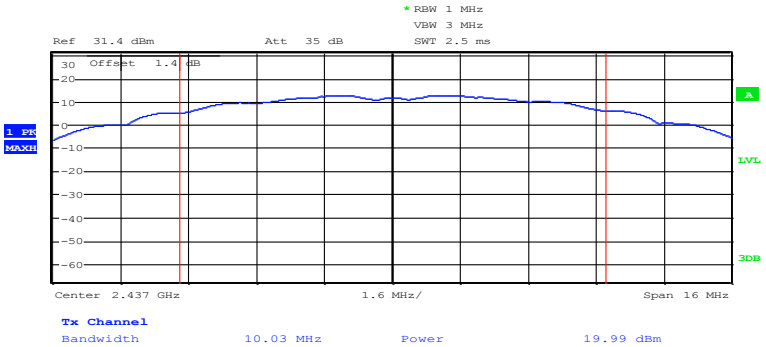
Conducted Peak Power 802.11b 2437 MHz



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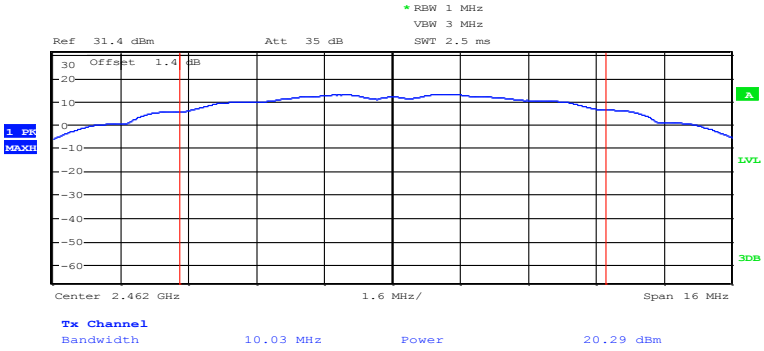
Conducted Peak Power 802.11b 2462 MHz



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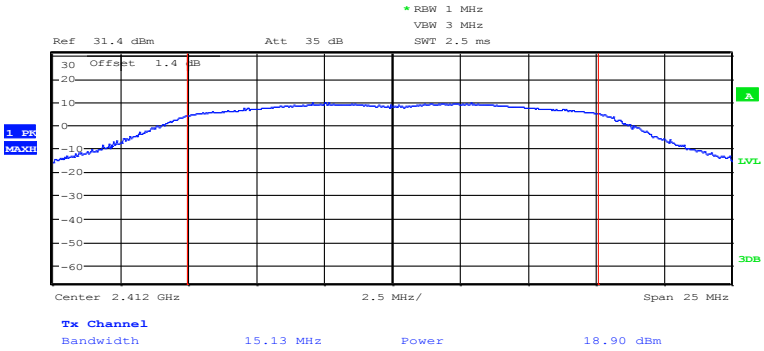
Conducted Peak Power 802.11g 2412 MHz



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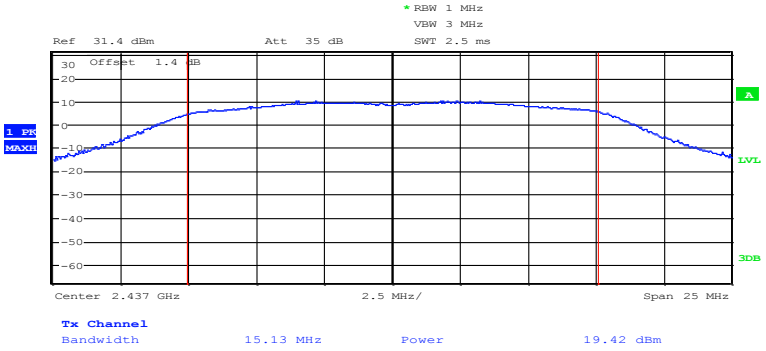
Conducted Peak Power 802.11g 2437 MHz



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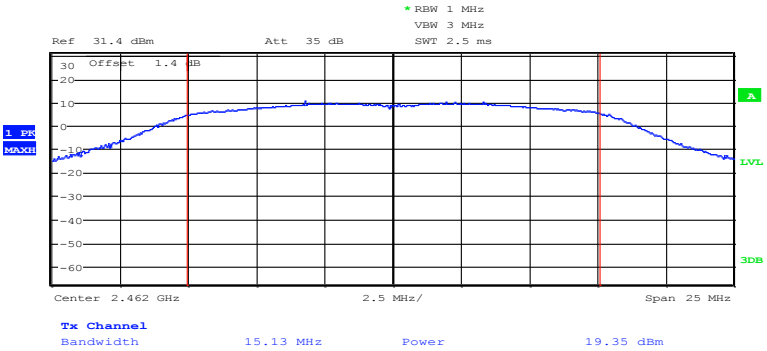
Conducted Peak Power 802.11g 2462 MHz



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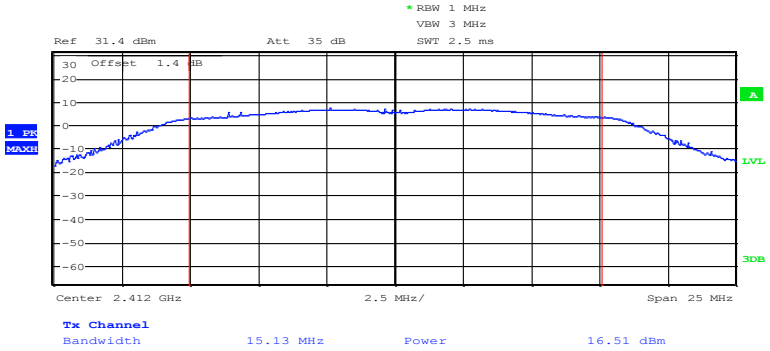
Conducted Peak Power 802.11n (HT20) 2412 MHz



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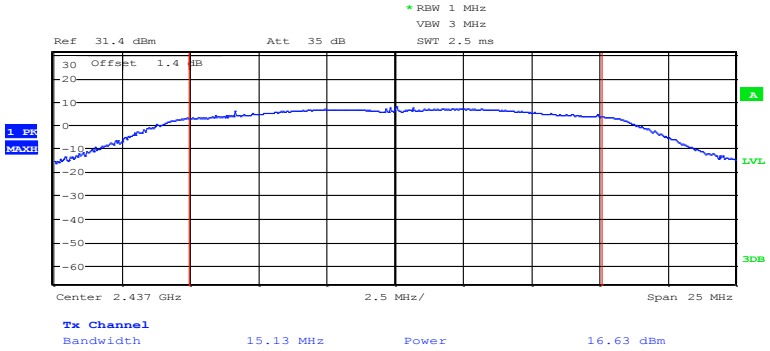
Conducted Peak Power 802.11n (HT20) 2437 MHz



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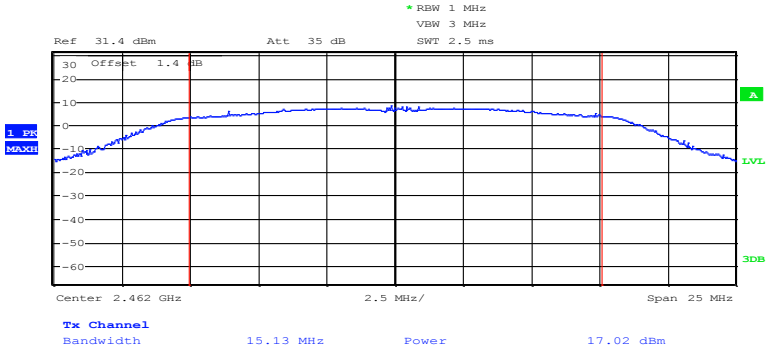
Conducted Peak Power 802.11n (HT20) 2462 MHz



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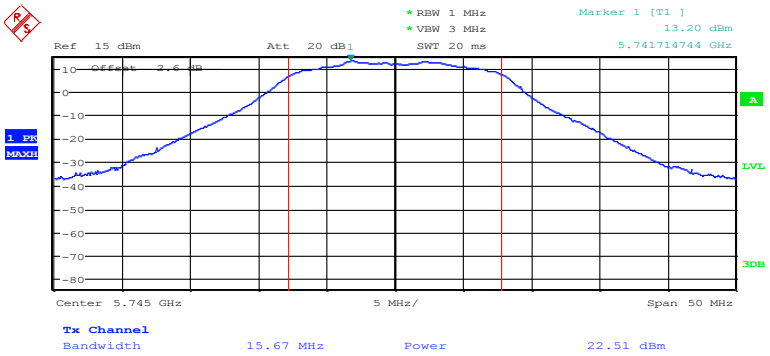
Conducted Peak Power 802.11a 5745 MHz



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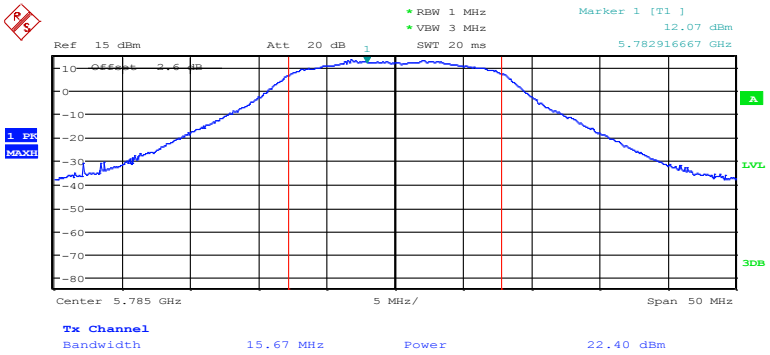
Conducted Peak Power 802.11a 5785 MHz



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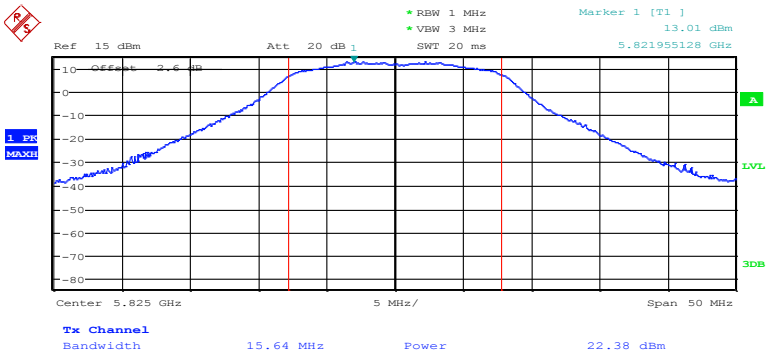
Conducted Peak Power 802.11a 5825 MHz



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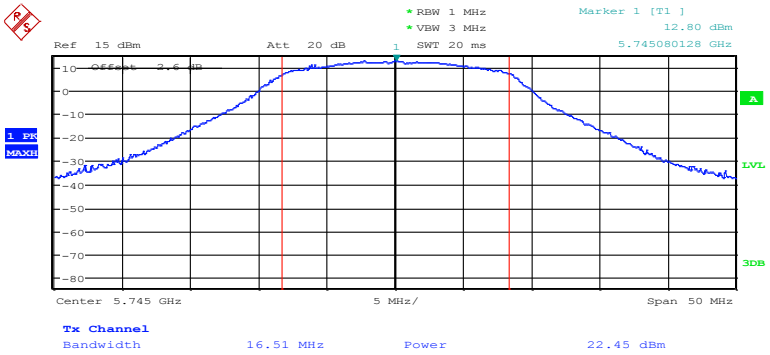
Conducted Peak Power 802.11n 5745 MHz



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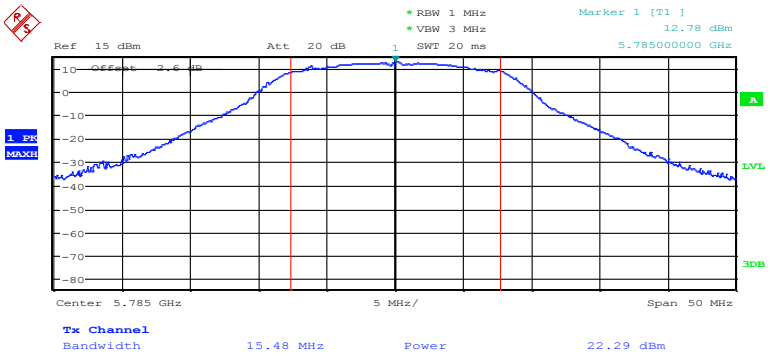
Conducted Peak Power 802.11n 5785 MHz



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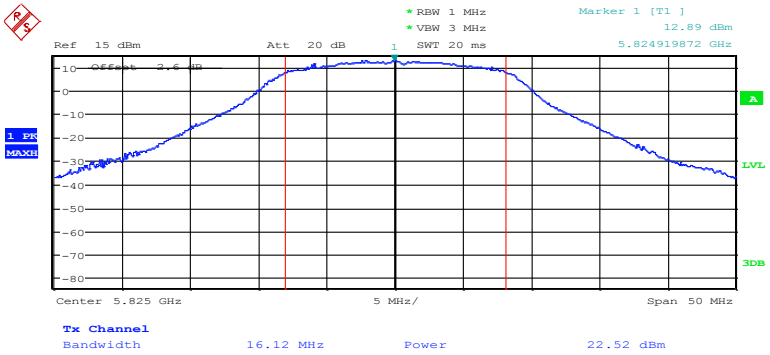
Conducted Peak Power 802.11n 5825 MHz



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6.3 Emission & Occupied Bandwidth

6.3.1 Limits:

§15.247 (a)(2)
RSS-210 A8.2 (a)
Systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

6.3.2 Test Conditions:

Tnom: 20°C; Vnom: 3.8 VDC

6.3.3 Test Procedure:

Measurement according to FCC KDB 558074 D01 Meas Guidance v03, section 8.1 – DTS (6dB) Channel Bandwidth Procedure Option 1
Spectrum Analyzer settings:
DTS (6dB) Bandwidth:
RBW = 100 kHz, VBW = 300 kHz, Detector: Peak- Max hold;
Sweep Time: Auto
Span = b mode: 15 MHz; g and n modes: 20 MHz
99% Bandwidth:
RBW = 300 kHz, VBW = 1 MHz, Detector: Peak-Max hold;
Sweep Time: Auto
Span = 2 x Signal Bandwidth

6.3.4 Test Result:

6.3.4.1 2.4GHz Band

Emission & Occupied Bandwidth (MHz)						
Mode	**Frequency (MHz)**					
	2412 Channel 1		**2437 Channel 6**		**2462 Channel 11**	
	6dB	**99%**	**6dB**	**99%**	**6dB**	**99%**
802.11b	10.0	14.0	10.0	14.0	10.0	14.0
802.11g	15.1	16.8	15.1	16.8	15.1	16.7
802.11n (HT20)	15.1	18.0	15.1	17.9	15.1	18.0
Measurement Uncertainty: ±100 kHz						

6.3.4.2 Test Result: 5GHz Band

Emission & Occupied Bandwidth (MHz)						
Mode	**Frequency (MHz)**					
	5745 Channel 149		**5785 Channel 157**		**5825 Channel 165**	
	6dB	**99%**	**6dB**	**99%**	**6dB**	**99%**
802.11a	15.7	16.4	15.7	16.4	15.6	16.4
802.11n (HT20)	16.5	17.5	16.48	17.56	16.12	17.56

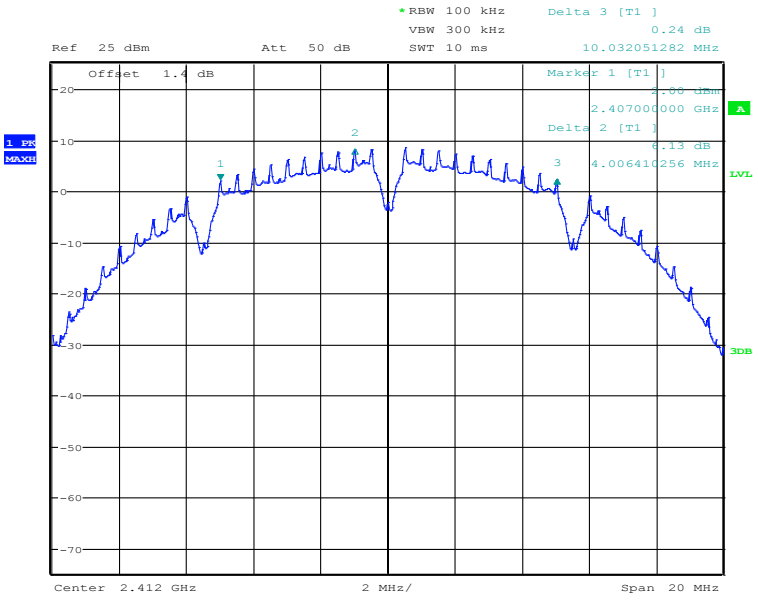
6.3.5 Measurement Verdict – Emission & Occupied Bandwidth

Pass.

6.3.6 Test Data/plots:

6.3.6.1 2.4 GHz 6dB Bandwidth:

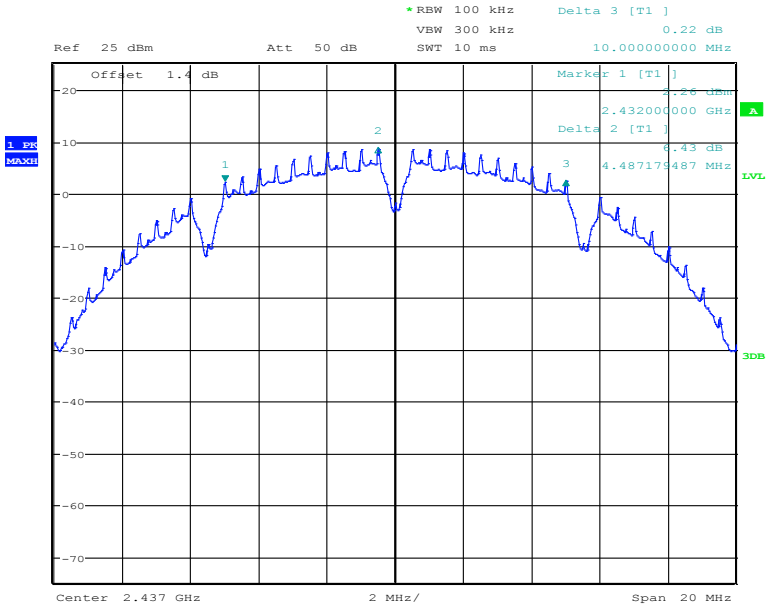
6dB Bandwidth 802.11b 2412 MHz



low

Date: 25.APR.2013 20:13:48

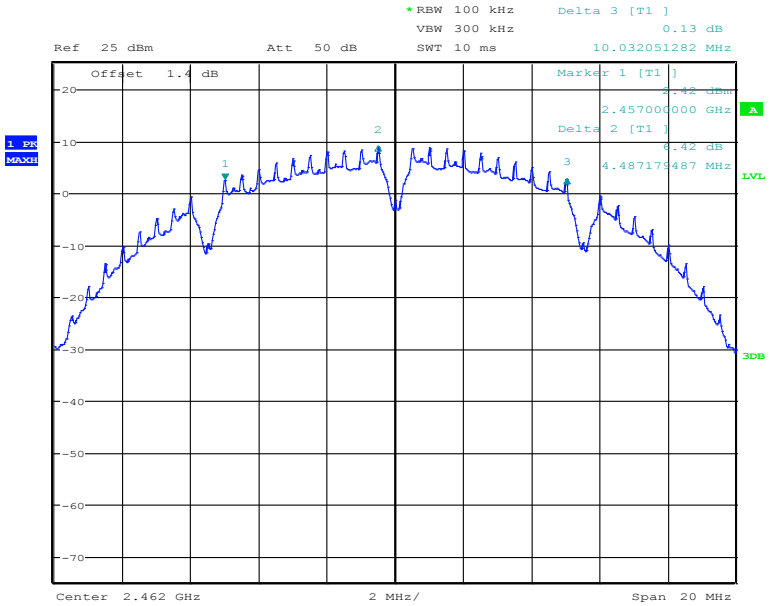
6dB Bandwidth 802.11b 2437 MHz



low

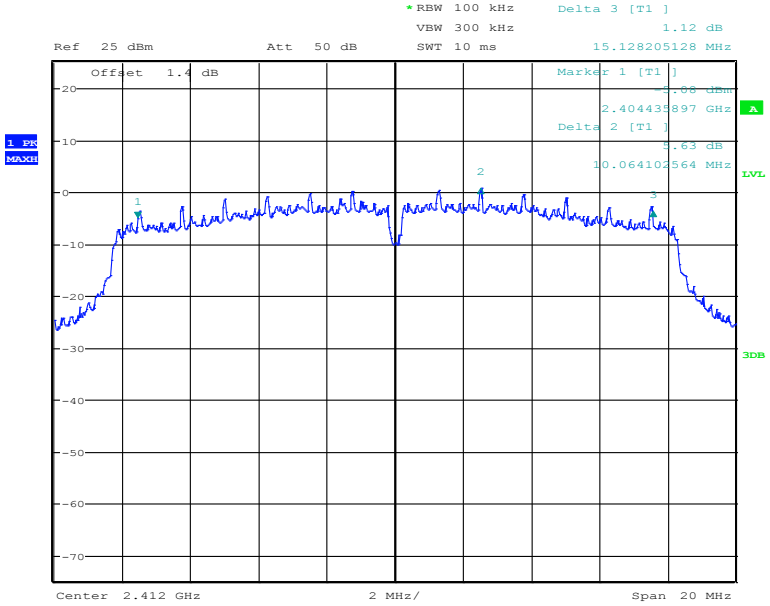
Date: 25.APR.2013 20:20:36

6dB Bandwidth 802.11b 2462 MHz



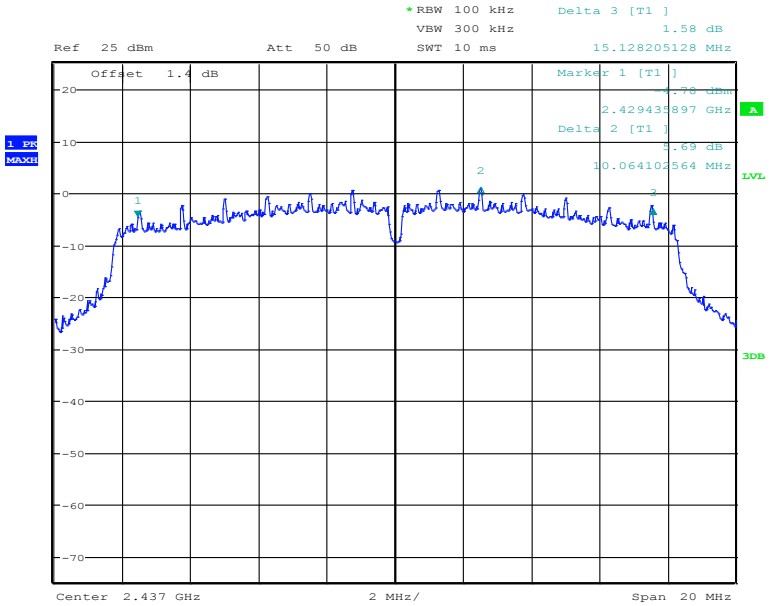
low
Date: 25.APR.2013 20:23:18

6dB Bandwidth 802.11g 2412 MHz



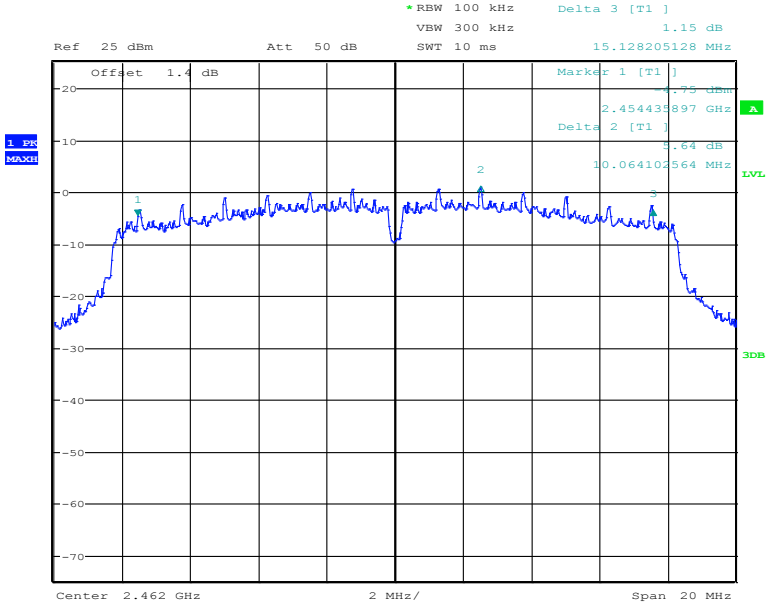
low
Date: 25.APR.2013 22:45:05

6dB Bandwidth 802.11g 2437 MHz



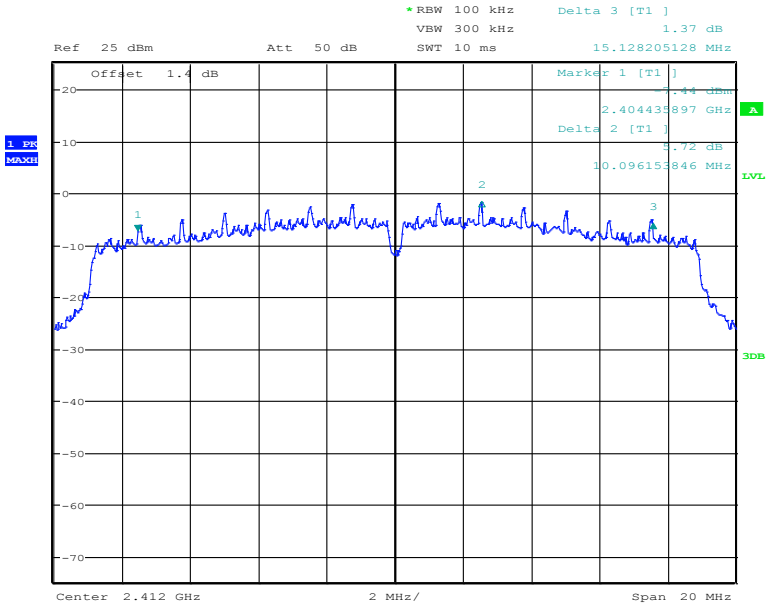
low
Date: 25.APR.2013 22:48:35

6dB Bandwidth 802.11g 2462 MHz



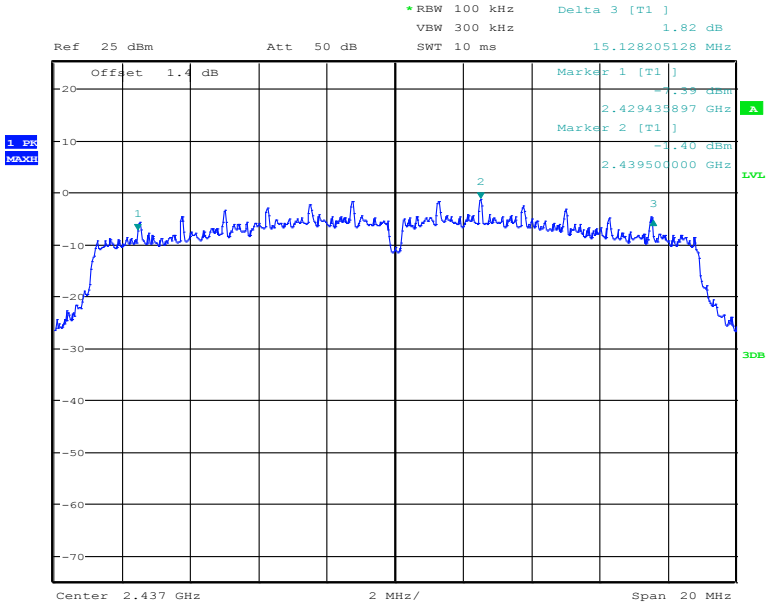
low
Date: 25.APR.2013 22:51:20

6dB Bandwidth 802.11n (HT20) 2412 MHz



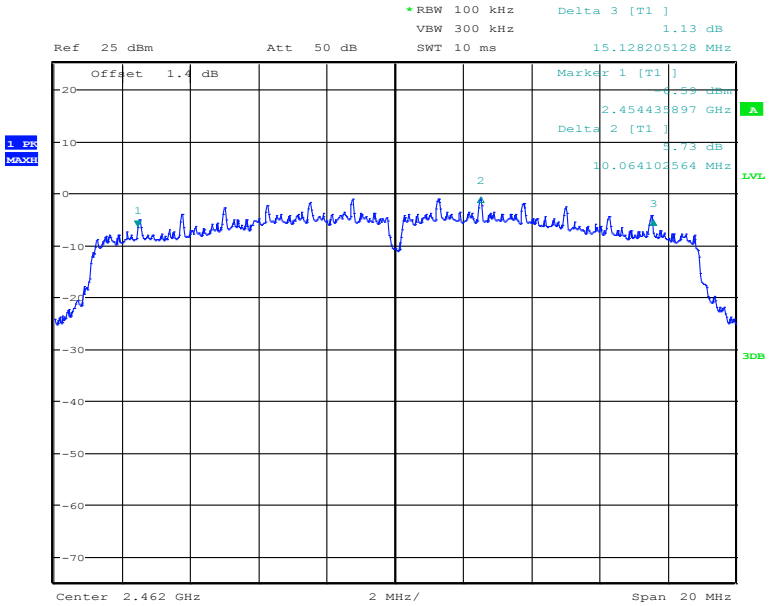
low
Date: 25.APR.2013 22:35:45

6dB Bandwidth 802.11n (HT20) 2437 MHz



low
Date: 25.APR.2013 22:37:39

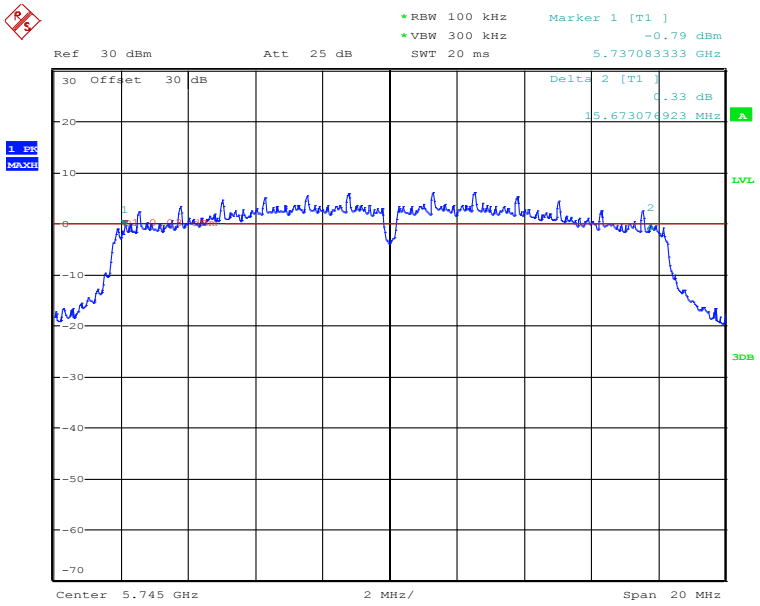
6dB Bandwidth 802.11n (HT20) 2462 MHz



low
Date: 25.APR.2013 22:40:45

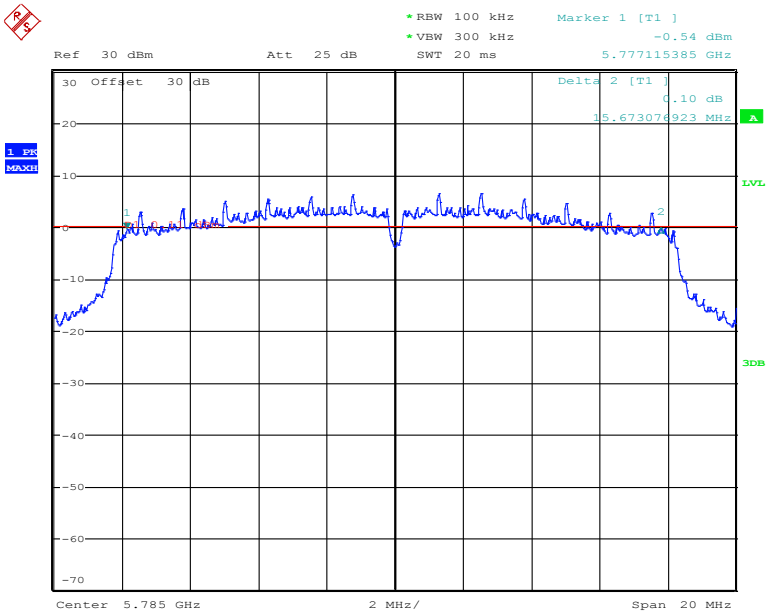
6.3.6.2 5GHz 6dB Bandwidth:

6dB Bandwidth 802.11a 5745 MHz



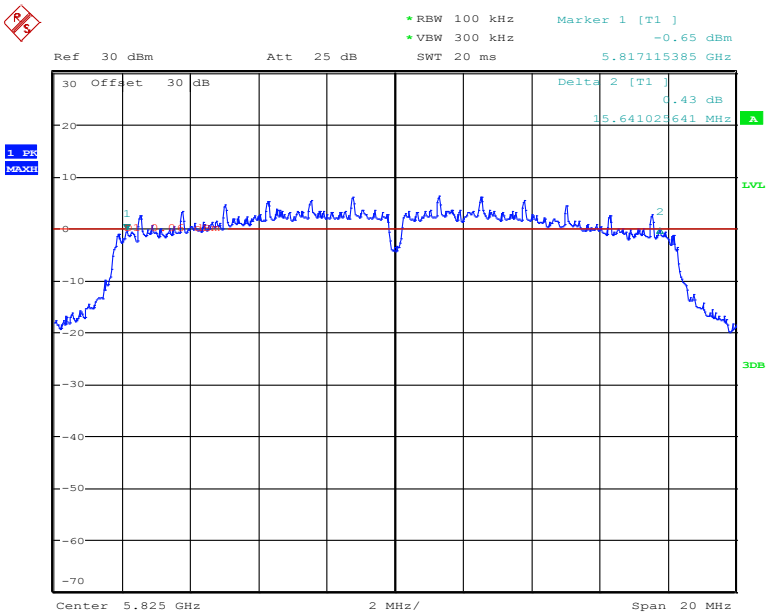
low
Date: 15.MAY.2013 18:10:06

6dB Bandwidth 802.11a 5785 MHz



low
Date: 15.MAY.2013 18:15:57

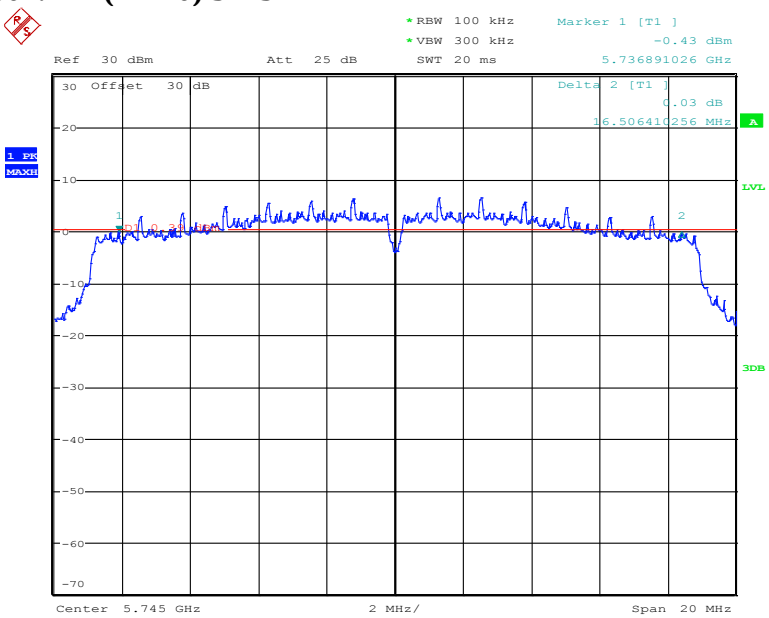
6dB Bandwidth 802.11a 5825 MHz



low

Date: 15.MAY.2013 18:18:06

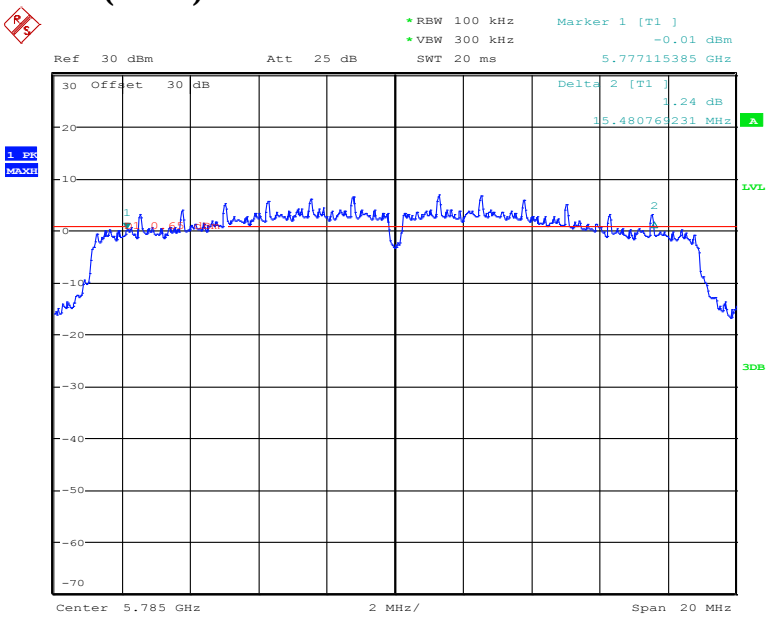
6dB Bandwidth 802.11n (HT20) 5745 MHz



low

Date: 15.MAY.2013 18:22:54

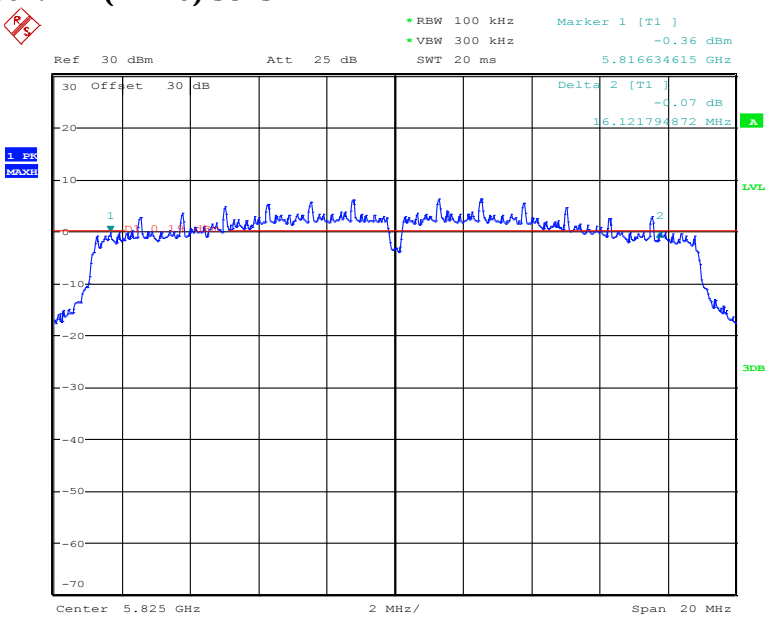
6dB Bandwidth 802.11n (HT20) 5785 MHz



low

Date: 15.MAY.2013 18:25:55

6dB Bandwidth 802.11n (HT20) 5825 MHz

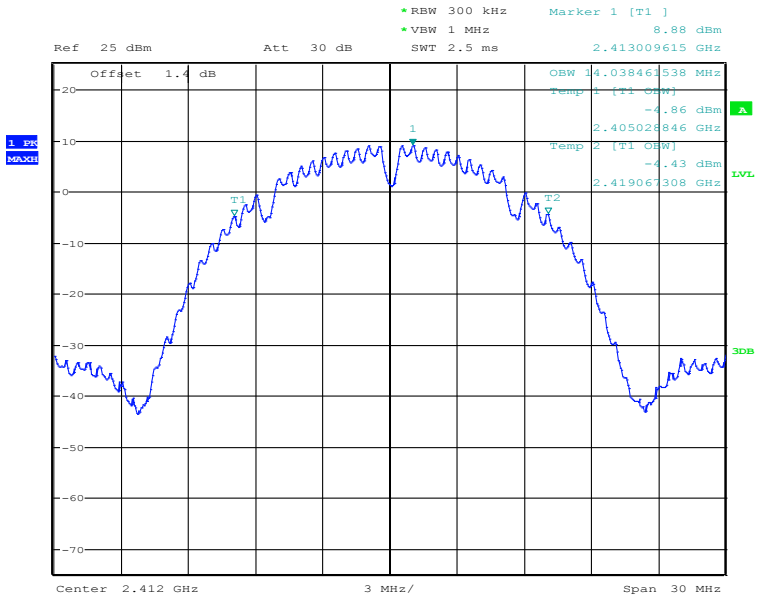


low

Date: 15.MAY.2013 18:29:46

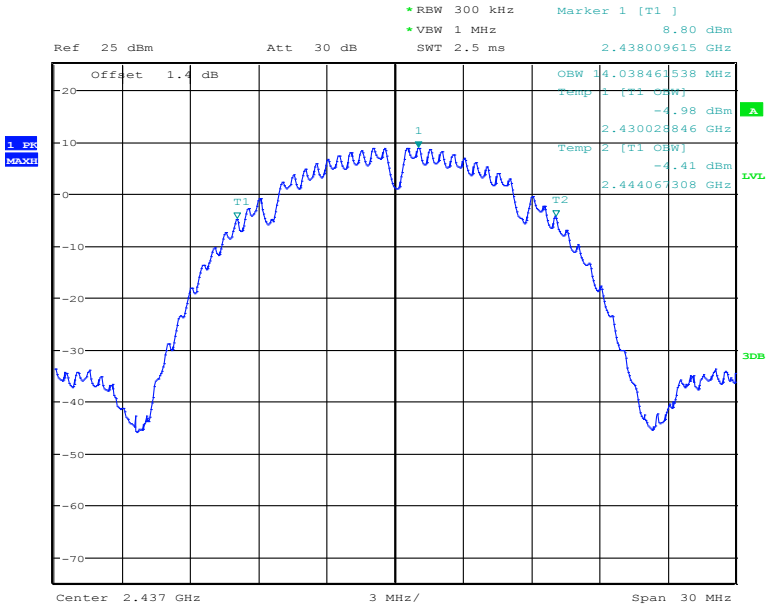
6.3.6.3 2.4 GHz Occupied Bandwidth:

99% Bandwidth 802.11b 2412 MHz



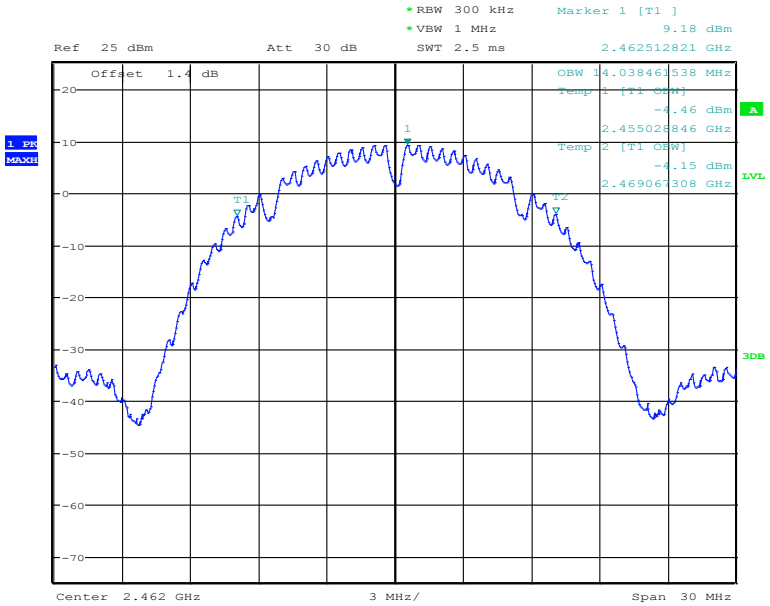
low
Date: 25.APR.2013 22:14:20

99% Bandwidth 802.11b 2437 MHz



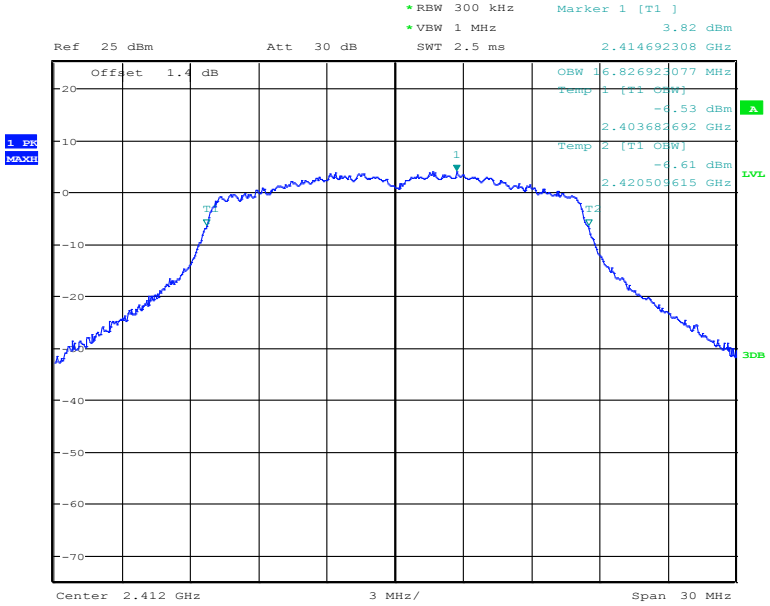
low
Date: 25.APR.2013 22:18:34

99% Bandwidth 802.11b 2462 MHz



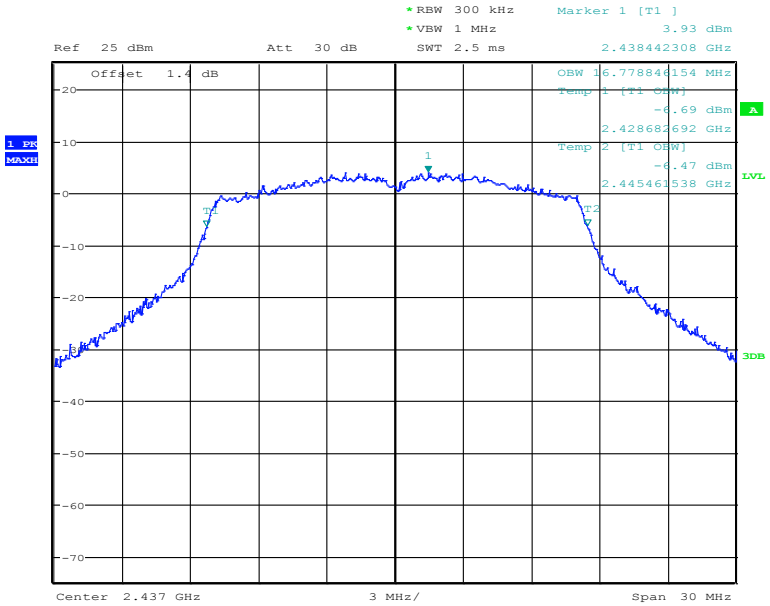
low
Date: 25.APR.2013 20:36:16

99% Bandwidth 802.11g 2412 MHz



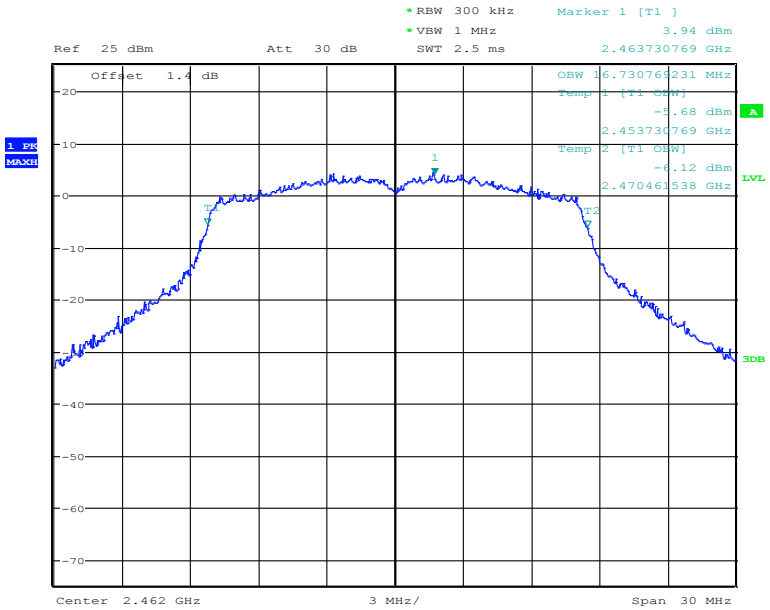
low
Date: 25.APR.2013 22:23:06

99% Bandwidth 802.11g 2437 MHz



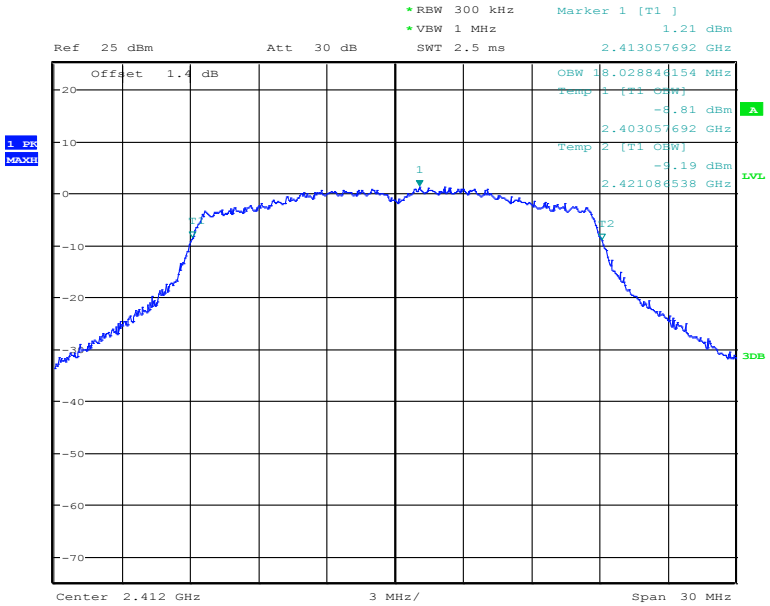
low
Date: 25.APR.2013 22:25:20

99% Bandwidth 802.11g 2462 MHz



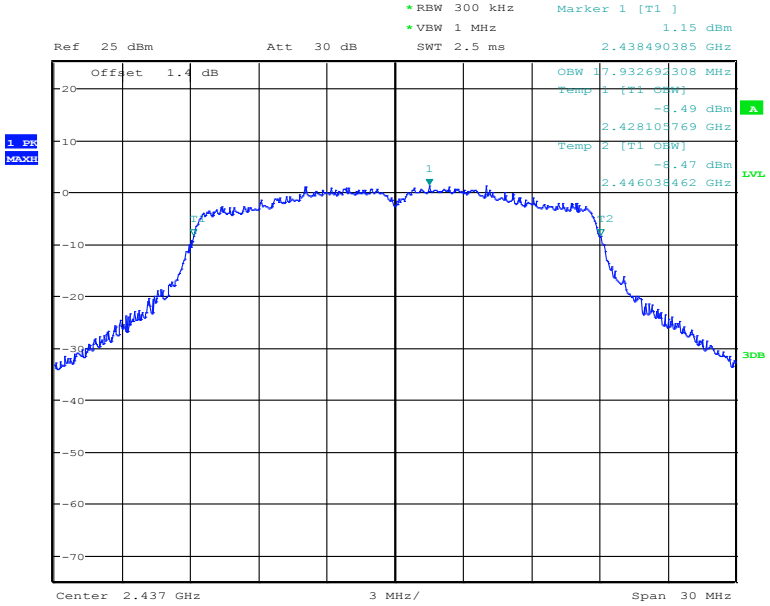
low
Date: 25.APR.2013 22:26:29

99% Bandwidth 802.11n (HT20) 2412 MHz



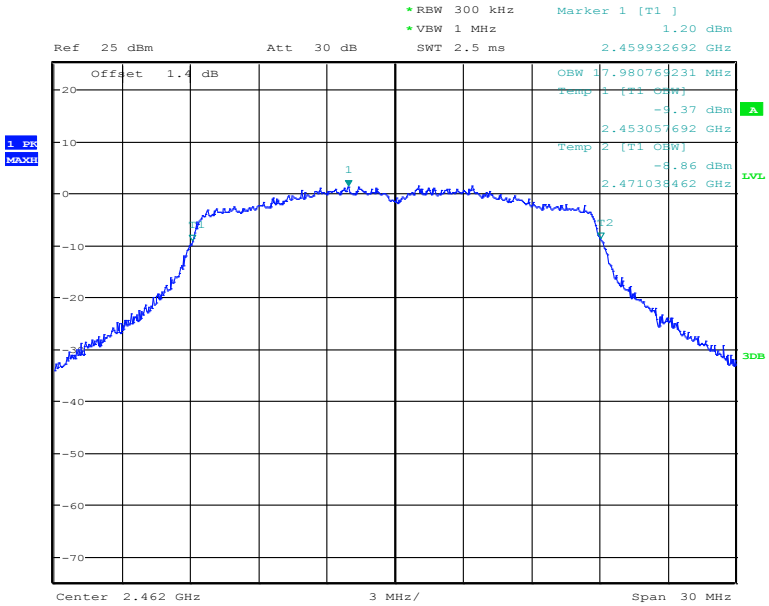
low
Date: 25.APR.2013 22:29:17

99% Bandwidth 802.11n (HT20) 2437 MHz



low
Date: 25.APR.2013 22:30:22

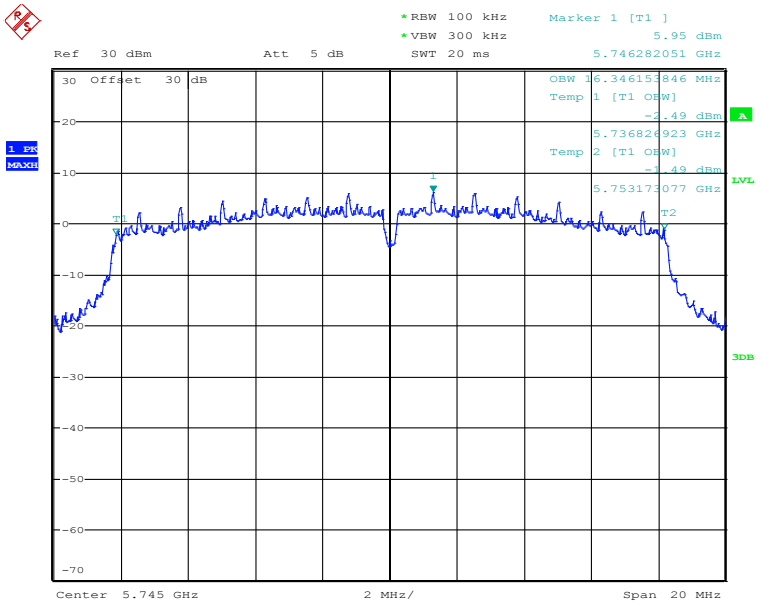
99% Bandwidth 802.11n (HT20) 2462 MHz



low
Date: 25.APR.2013 22:31:24

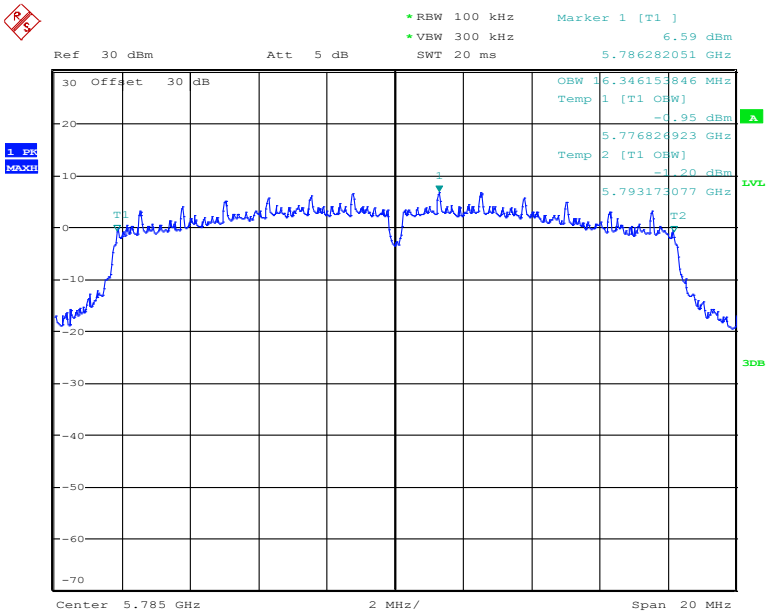
6.3.6.4 5 GHz Occupied Bandwidth:

99% Bandwidth 802.11a 5745 MHz



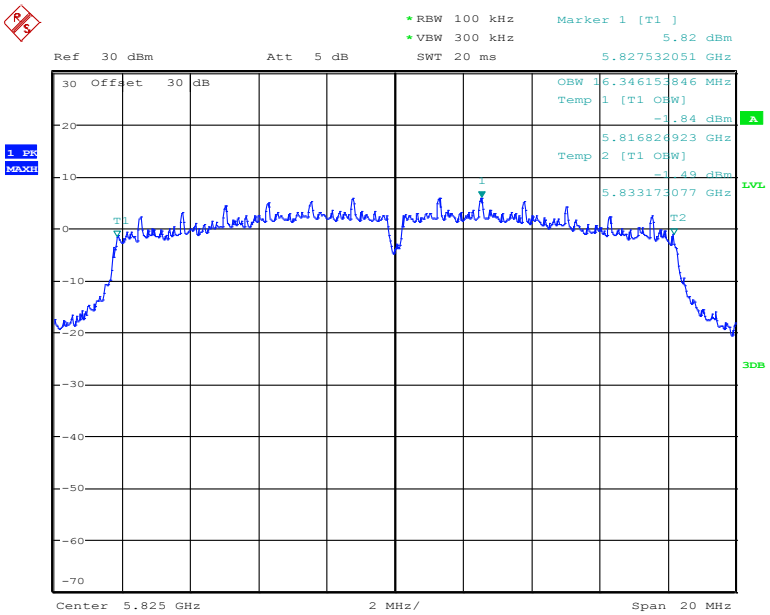
low
Date: 15.MAY.2013 18:11:51

99% Bandwidth 802.11a 5785 MHz



low
Date: 15.MAY.2013 18:14:05

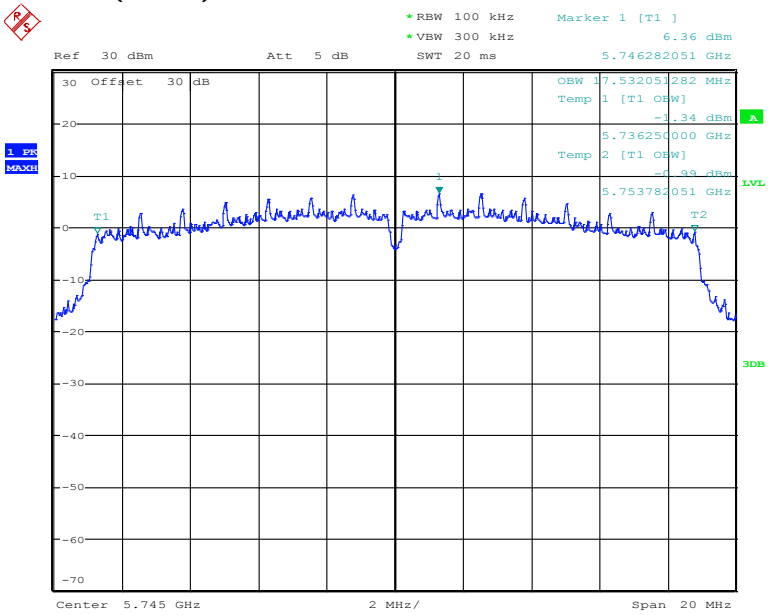
99% Bandwidth 802.11a 5825 MHz



low

Date: 15.MAY.2013 18:19:06

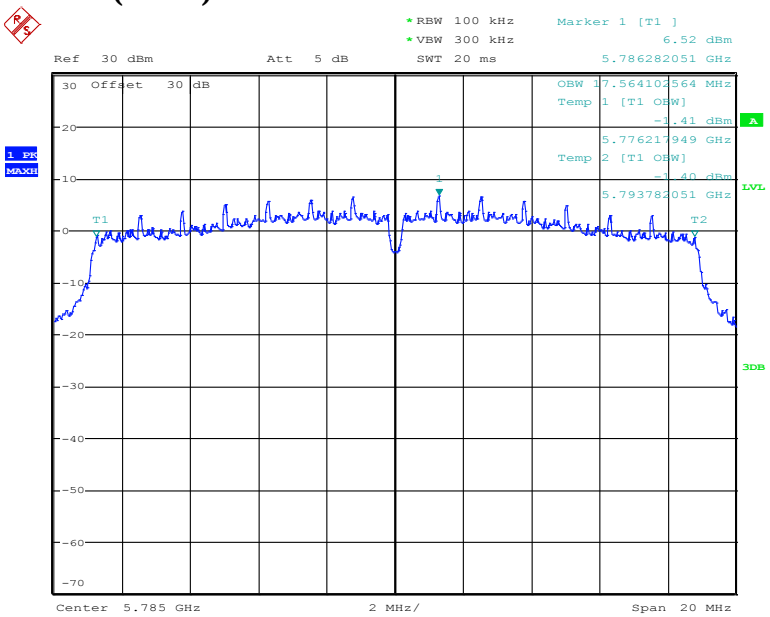
99% Bandwidth 802.11n (HT20) 5745 MHz



low

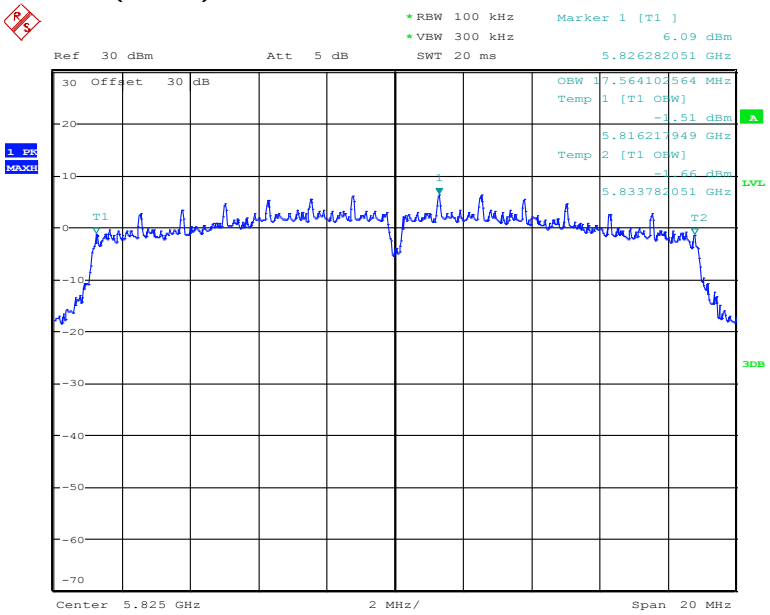
Date: 15.MAY.2013 18:21:02

99% Bandwidth 802.11n (HT20) 5785 MHz



low
Date: 15.MAY.2013 18:27:02

99% Bandwidth 802.11n (HT20) 5825 MHz



low
Date: 15.MAY.2013 18:28:03

6.4 Maximum Power Spectral Density Level in the Fundamental Emission

6.4.1 Limits:

§ 15.247 (e)
RSS-210 A8.2 (b)
For digitally modulated systems, the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3 kHz band during any time interval of continuous transmission.

6.4.2 Test procedure:

Measurement according to FCC KDB 558074 D01 Meas Guidance v03, section 10.2

1. Set the analyzer center frequency to DTS channel center frequency
2. Span = 1.5 x DTS channel Bandwidth
3. RBW = 3 KHz; VBW = 10 KHz; Detector: Peak – Max hold

6.4.3 Test Conditions:

Tnom: 20°C; Vnom: 3.8 VDC

6.4.4 Test results:

6.4.4.1 2.4 GHz Band

Power Spectral Density (dBm)			
Mode	**Frequency (MHz)**		
	2412 Channel 1	**2437 Channel 6**	**2462 Channel 11**
802.11b	5.42	5.84	7.21
802.11g	-0.37	0.45	0.74
802.11n (HT20)	-1.83	-2.11	-1.31
Measurement Uncertainty: ±0.5dB			

6.4.4.2 5GHz Band

Power Spectral Density (dBm)			
Mode	**Frequency (MHz)**		
	5745 Channel 149	**5785 Channel 157**	**5825 Channel 165**
802.11a	-8.9	-8.67	-7.6
802.11n (HT20)	-7.3	-8.8	-8.9

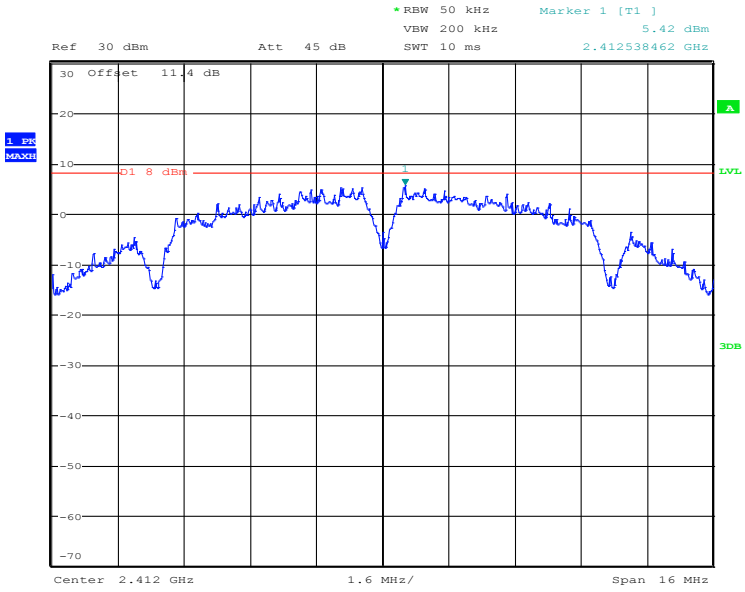
6.4.5 Measurement Verdict – Maximum Power Spectral Density

Pass.

6.4.6 Test Data/plots:

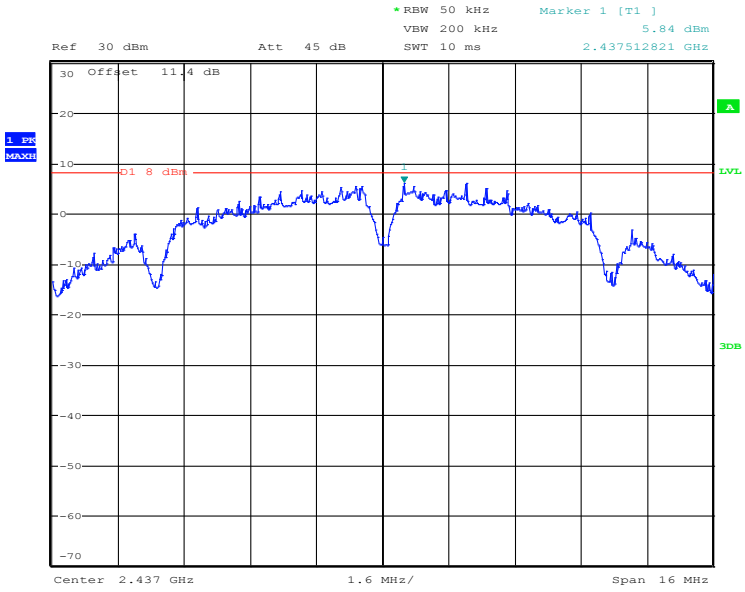
6.4.6.1 2.4 GHz:

Power Spectral Density 802.11b 2412 MHz



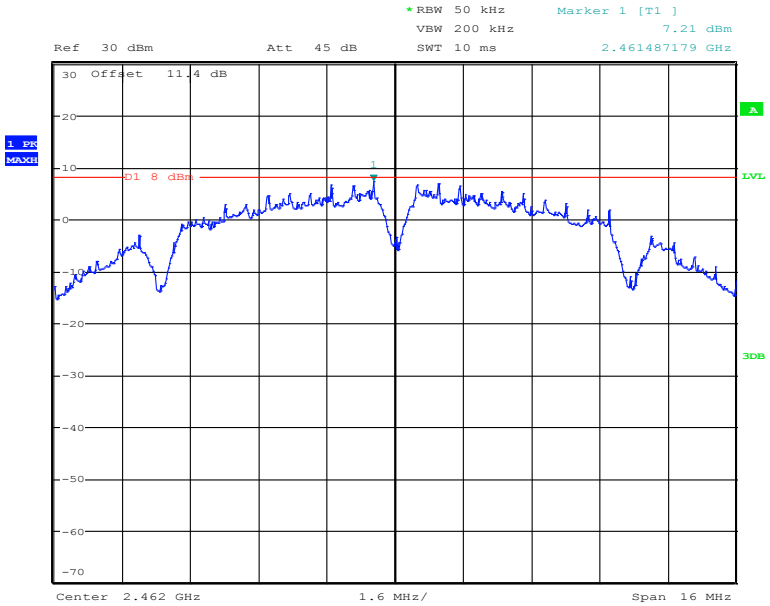
low
Date: 25.APR.2013 23:52:21

Power Spectral Density 802.11b 2437 MHz



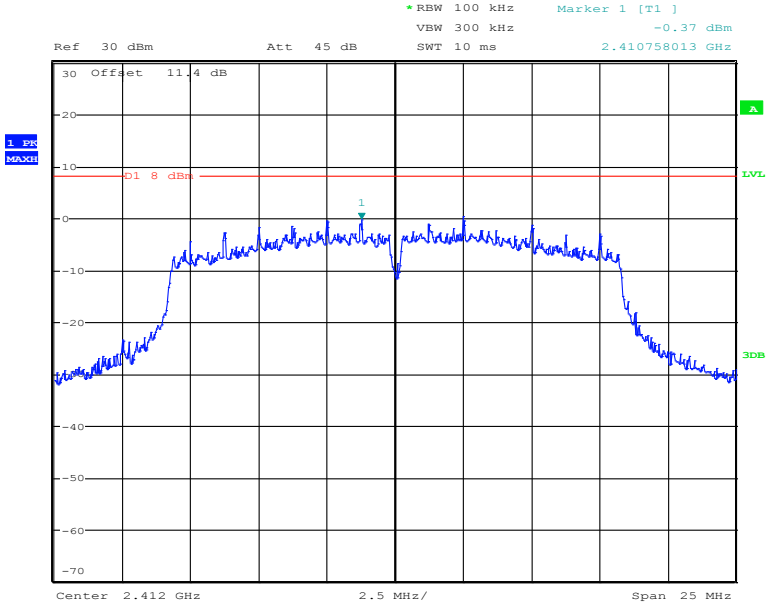
low
Date: 25.APR.2013 23:51:30

Power Spectral Density 802.11b 2462 MHz



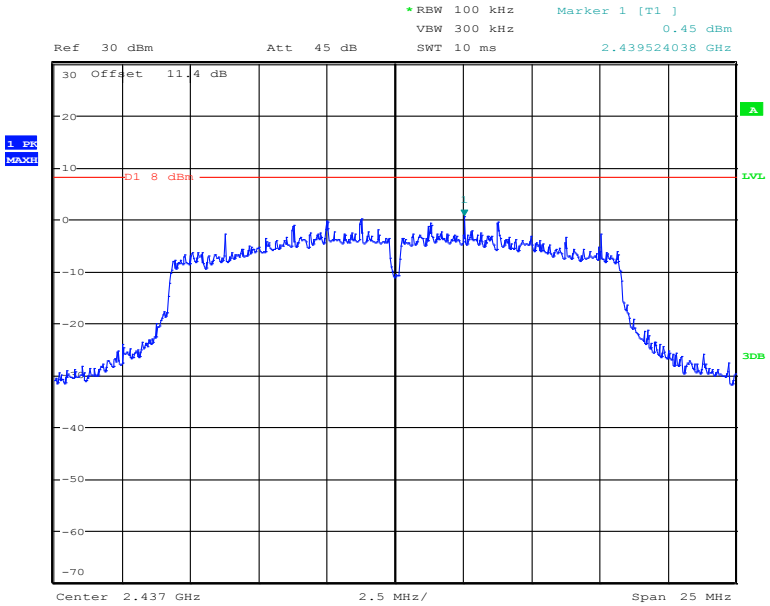
low
Date: 25.APR.2013 23:54:33

Power Spectral Density 802.11g 2412 MHz



low
Date: 26.APR.2013 00:08:07

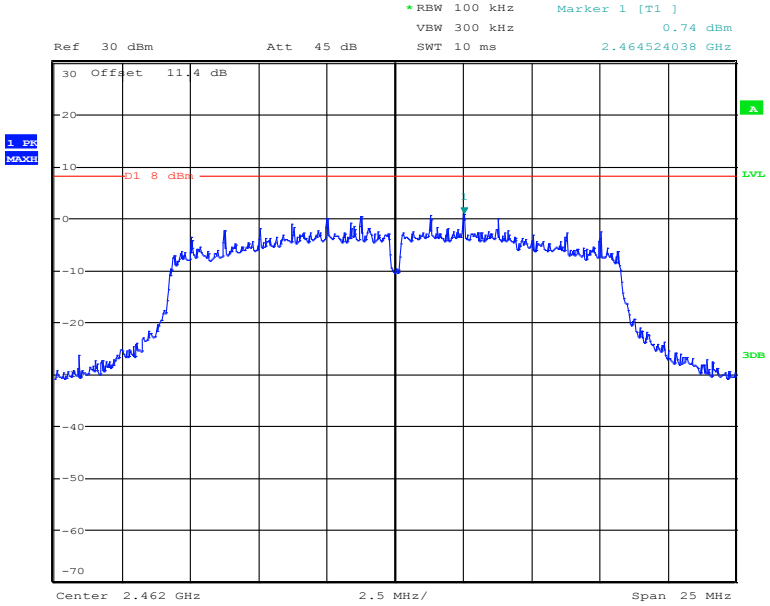
Power Spectral Density 802.11g 2437 MHz



low

Date: 26.APR.2013 00:09:50

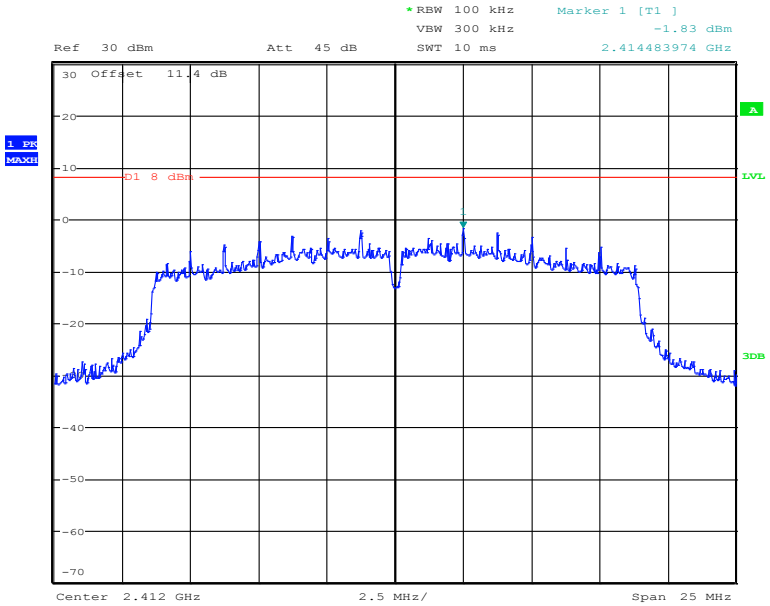
Power Spectral Density 802.11g 2462 MHz



low

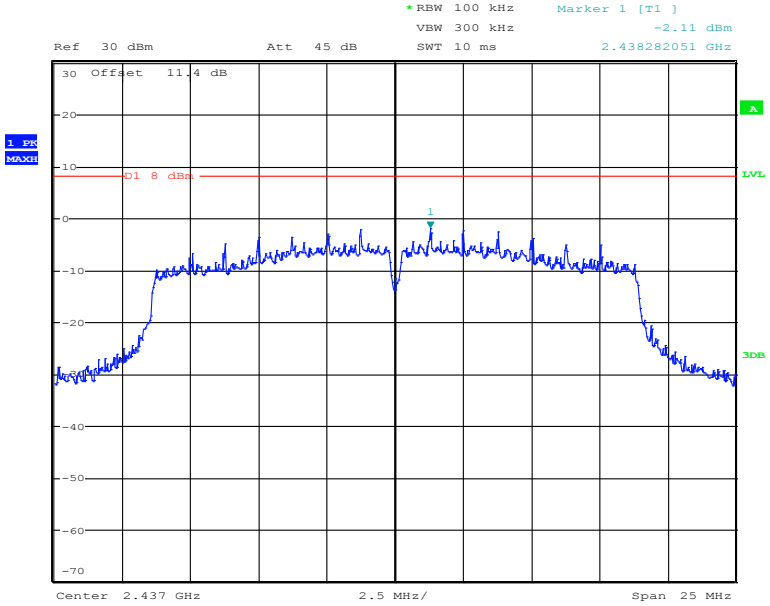
Date: 26.APR.2013 00:10:17

Power Spectral Density 802.11n (HT20) 2412 MHz



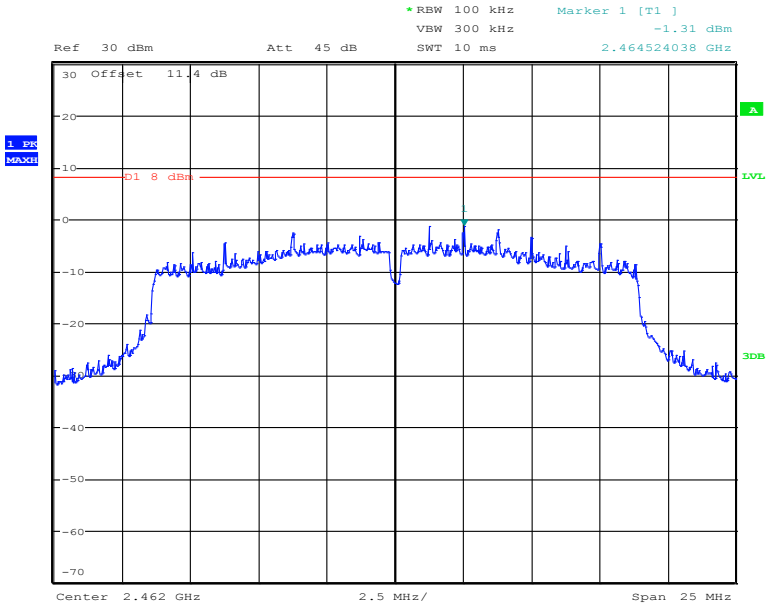
low
Date: 26.APR.2013 00:05:23

Power Spectral Density 802.11n (HT20) 2437 MHz



low
Date: 26.APR.2013 00:06:03

Power Spectral Density 802.11n (HT20) 2462 MHz

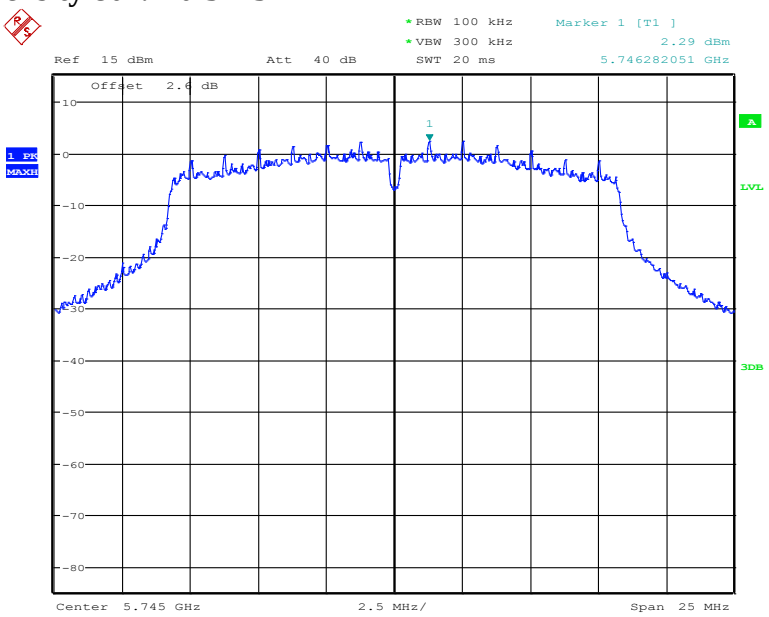


low

Date: 26.APR.2013 00:07:28

6.4.6.2 5 GHz Band:

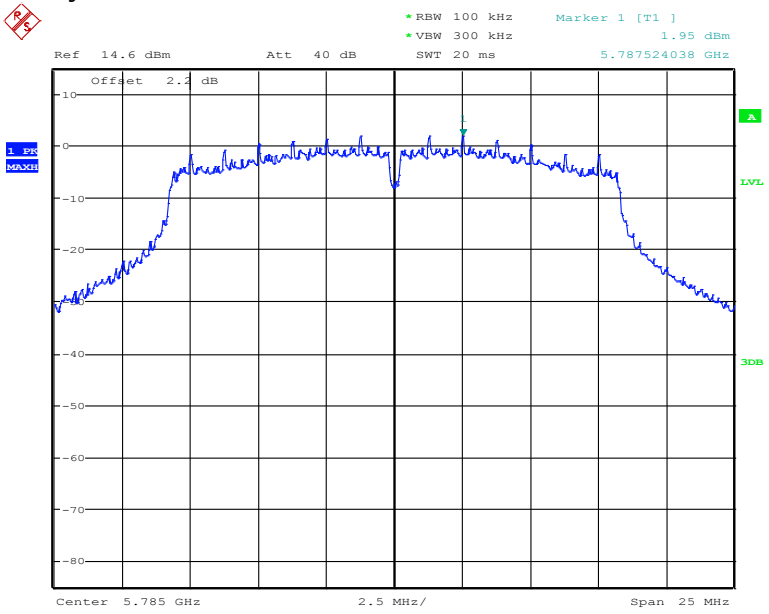
Power Spectral Density 802.11a 5745 MHz



low

Date: 28.JUN.2013 23:19:14

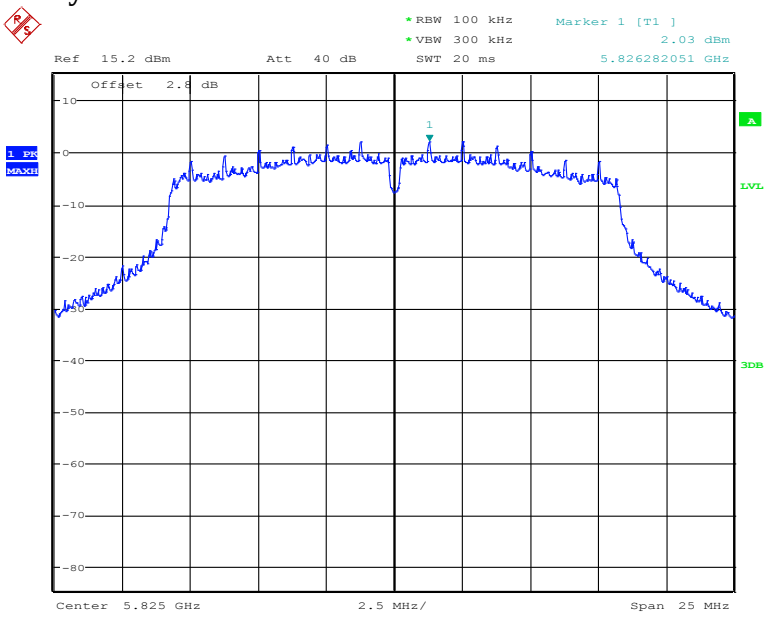
Power Spectral Density 802.11a 5785 MHz



low

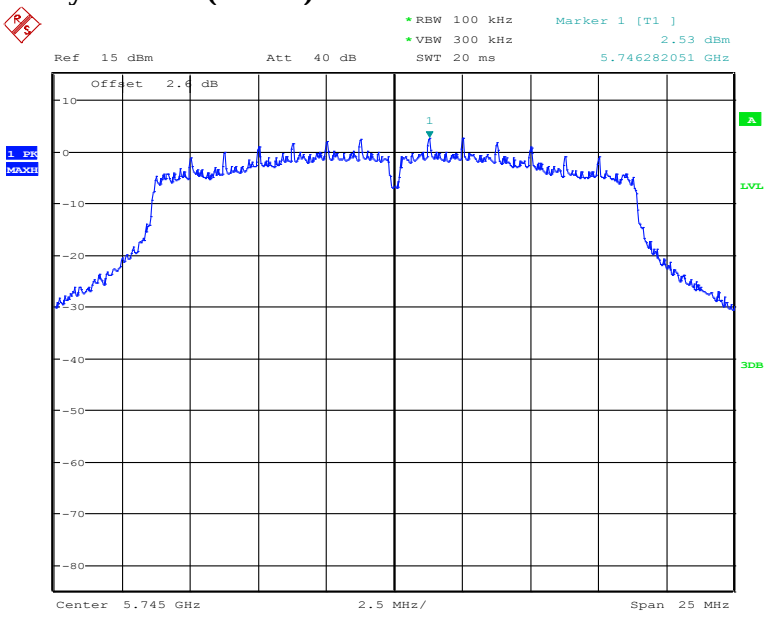
Date: 28.JUN.2013 23:29:00

Power Spectral Density 802.11a 5825 MHz



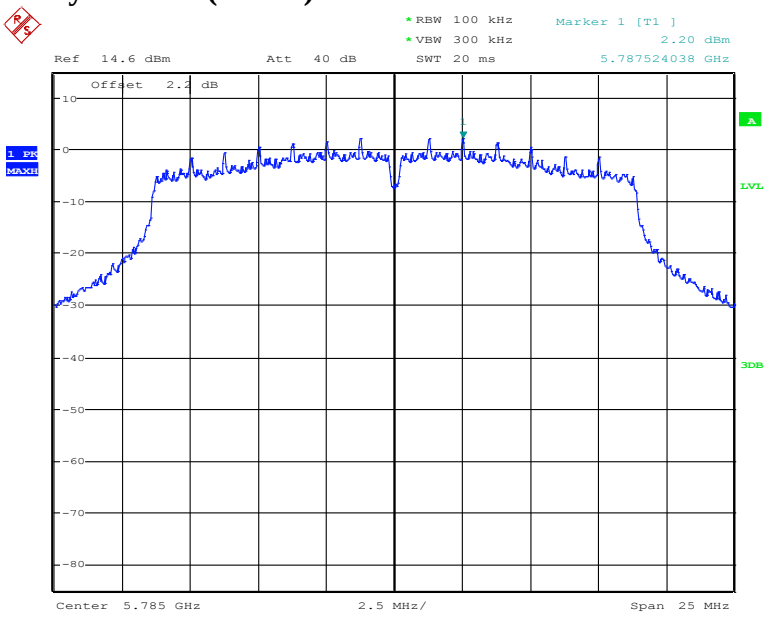
low
Date: 28.JUN.2013 23:31:34

Power Spectral Density 802.11n (HT 20) 5745 MHz



low
Date: 28.JUN.2013 23:22:43

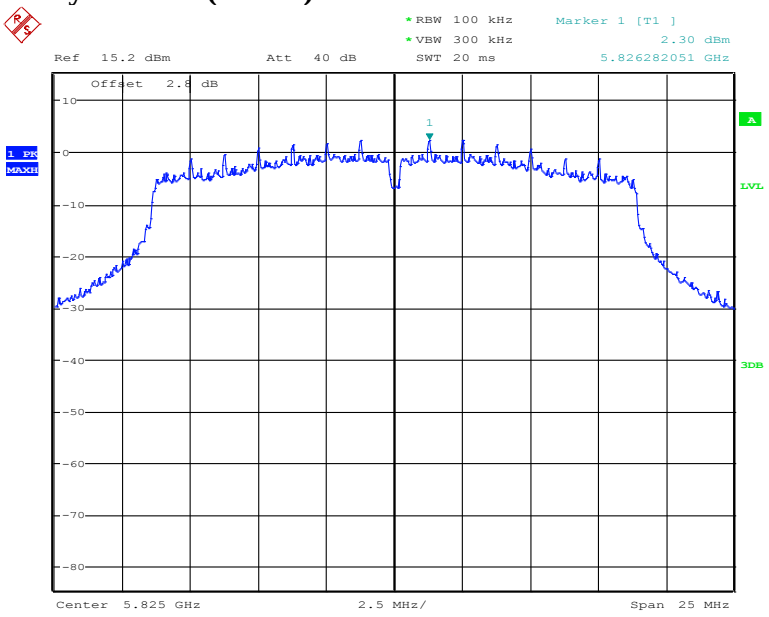
Power Spectral Density 802.11n (HT 20) 5785 MHz



low

Date: 28.JUN.2013 23:26:00

Power Spectral Density 802.11n (HT 20) 5825 MHz



low

Date: 28.JUN.2013 23:33:43

6.5 Unwanted Emissions into Non-Restricted Frequency Bands- Conducted

6.5.1 Reference and Limits:

§ 15.247 (d)
RSS-210 A8.5
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the radio frequency power that is produced 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.
The EUT meets the peak conducted power limits; therefore the limit for the non-restricted bands outside the transmission band is -20 dBc / 100 kHz

6.5.2 Test Conditions:

Tnom: 20°C; Vnom: 3.8 VDC

6.5.3 Test Procedure:

Measurement according to FCC KDB 558074 D01 Meas Guidance v03, section 11.0 – Unwanted Emissions into Non-Restricted Frequency Bands
Spectrum Analyzer settings:
RBW=100 kHz, VBW=300 kHz, Detector: Peak- Max hold;
Sweep Time: Auto, Span=Full range

6.5.4 Test Result:

6.5.4.1 2.4 GHz Band

Conducted Unwanted Emissions					
Channel	**Frequency (MHz)**	**Amplitude (dBm)**			**Limits**
		802.11b	**802.11g**	**802.11n (HT20)**	
Low	**2412**	-49.18	-40.42	-38.07	
	Unwanted Emissions	All other peaks >20dB below limit			-20dBc
Mid	**2437**	-49.11	-40.42	-38.31	
	Unwanted Emissions	All other peaks >20dB below limit			-20dBc
High	**2462**	-48.30	-38.55	-38.69	
	Unwanted Emissions	All other peaks >20dB below limit			-20dBc
Measurement Uncertainty: ±1.0 dB					

6.5.4.2 Test Result: 5 GHz Band

Conducted Unwanted Emissions				
Channel	**Frequency (MHz)**	**Amplitude (dBm)**		**Limits**
		802.11a	**802.11n (HT20)**	
Low	**5745**	-28.38	-25.7	
	Unwanted Emissions	All other peaks >20dB below limit		-20dBc
Mid	**5785**	-34.86	-36.44	
	Unwanted Emissions	All other peaks >20dB below limit		-20dBc
High	**5825**	-25.65	-26.64	
	Unwanted Emissions	All other peaks >20dB below limit		-20dBc
Measurement Uncertainty: ±1.0 dB				

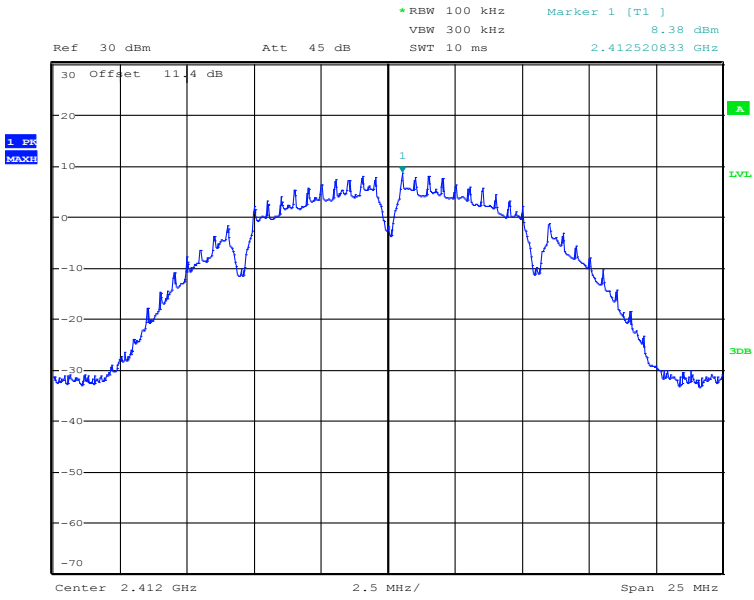
6.5.5 Measurement Verdict – Unwanted Emissions into Non-Restricted Frequency Bands-Conducted:

Pass.

6.5.6 Test data/ plots:

6.5.6.1 2.4GHz

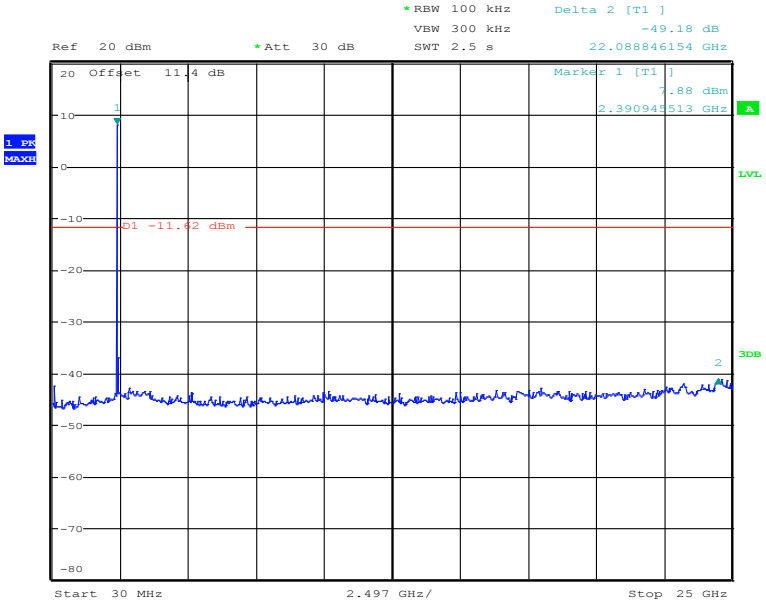
Unwanted emissions into non-restricted Bands, conducted 802.11b 2412 MHz – Reference Level



low

Date: 26.APR.2013 00:15:23

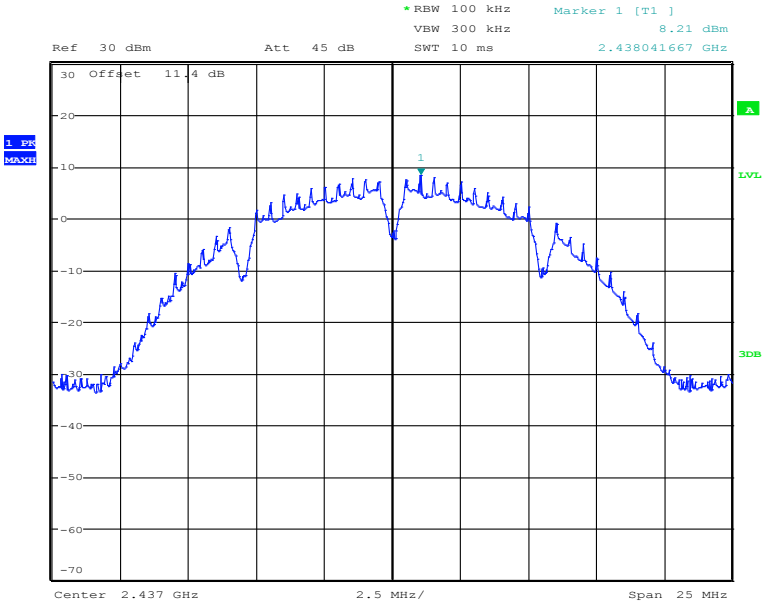
Unwanted emissions into non-restricted Bands, conducted 802.11b 2412 MHz – 30 MHz – 25 GHz



low

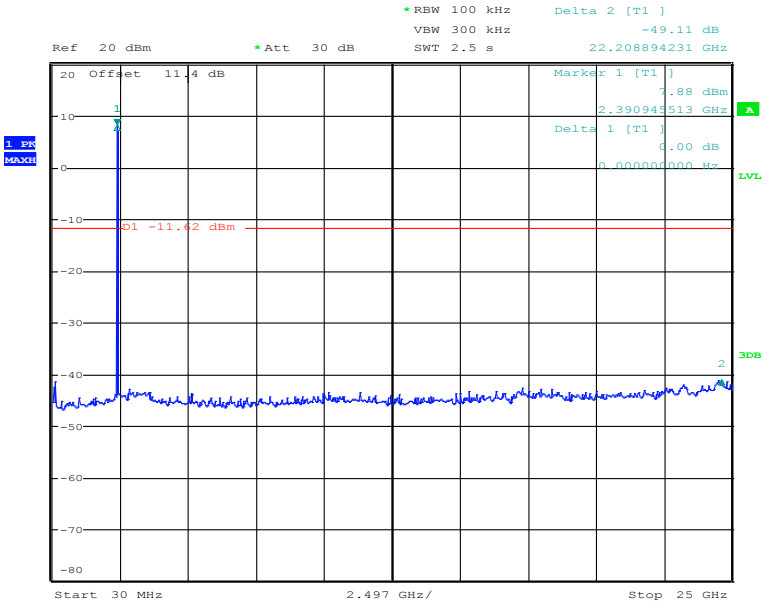
Date: 26.APR.2013 00:32:20

Unwanted emissions into non-restricted Bands, conducted 802.11b 2437 MHz – Reference Level



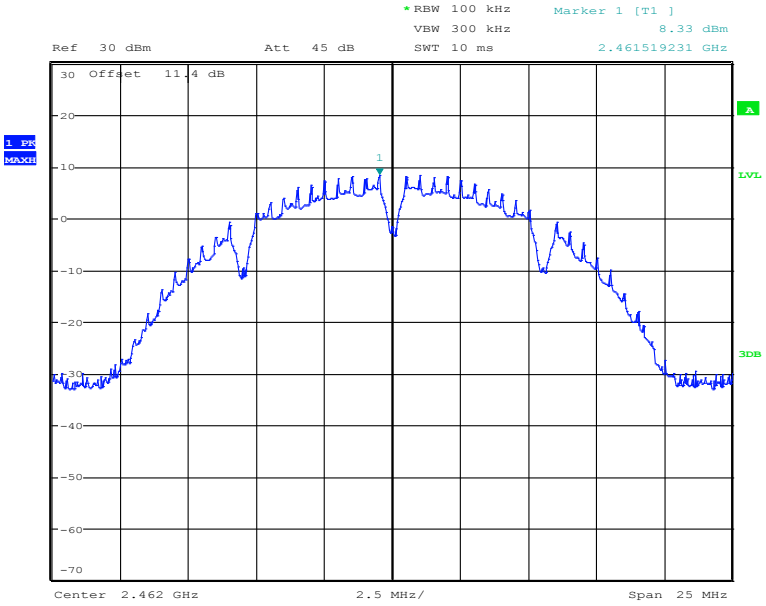
low
Date: 26.APR.2013 00:17:18

Unwanted emissions into non-restricted Bands, conducted 802.11b 2437 MHz – 30 MHz – 25 GHz



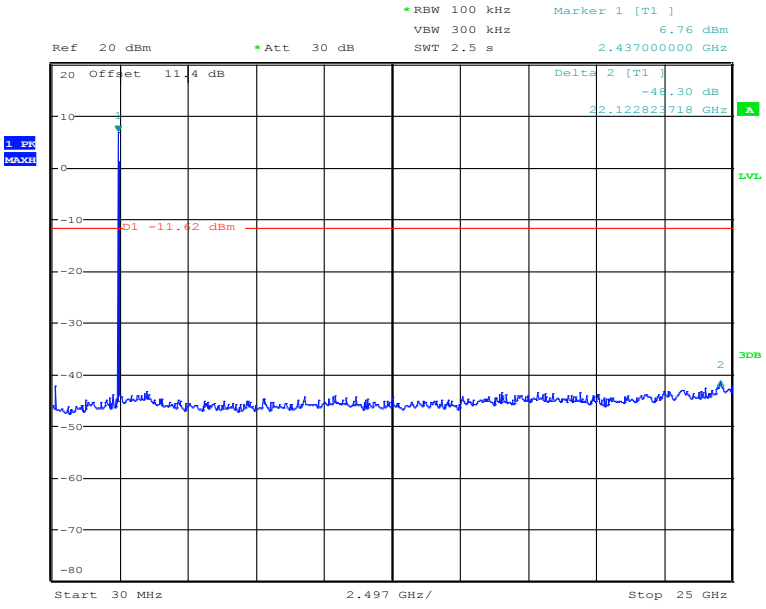
low
Date: 26.APR.2013 00:33:34

Unwanted emissions into non-restricted Bands, conducted 802.11b 2462 MHz – Reference Level



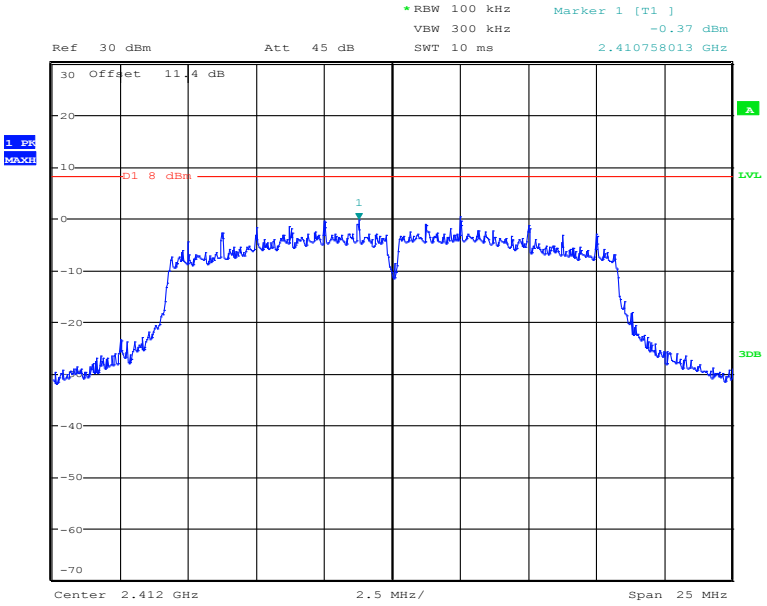
low
Date: 26.APR.2013 00:18:03

Unwanted emissions into non-restricted Bands, conducted 802.11b 2462 MHz – 30 MHz – 25 GHz



low
Date: 26.APR.2013 00:27:37

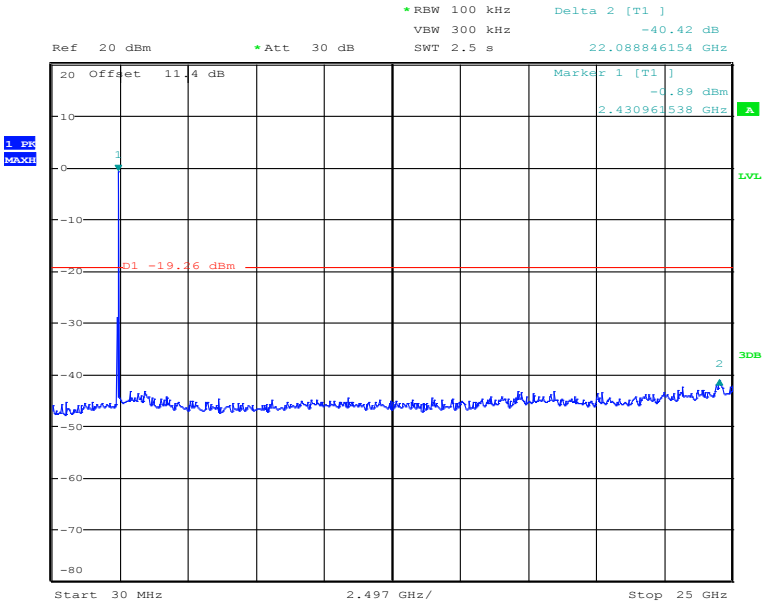
Unwanted emissions into non-restricted Bands, conducted 802.11g 2412 MHz – Reference Level



low

Date: 26.APR.2013 00:08:07

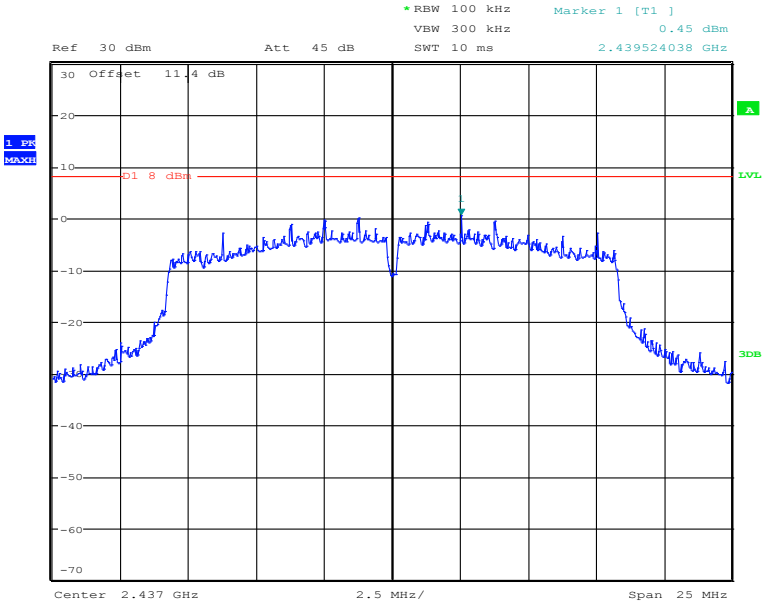
Unwanted emissions into non-restricted Bands, conducted 802.11g 2412 MHz – 30 MHz – 25 GHz



low

Date: 26.APR.2013 00:37:25

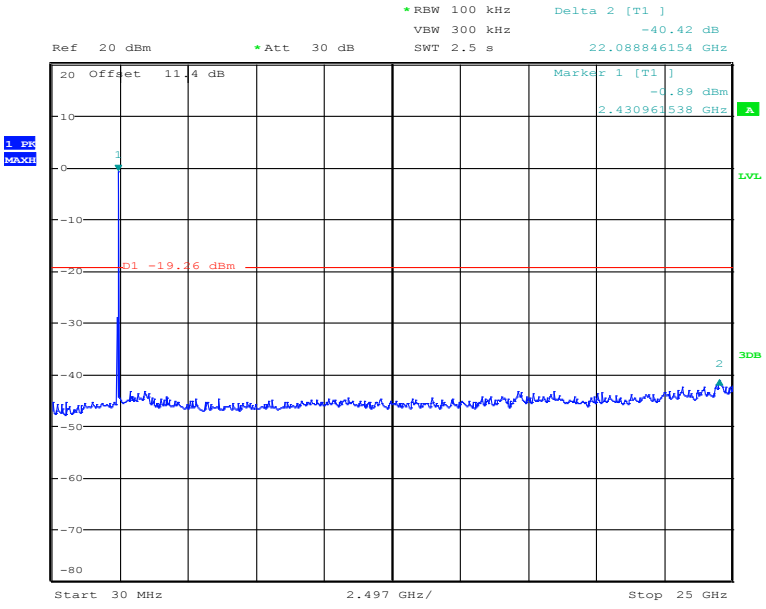
Unwanted emissions into non-restricted Bands, conducted 802.11g 2437 MHz – Reference Level



low

Date: 26.APR.2013 00:09:50

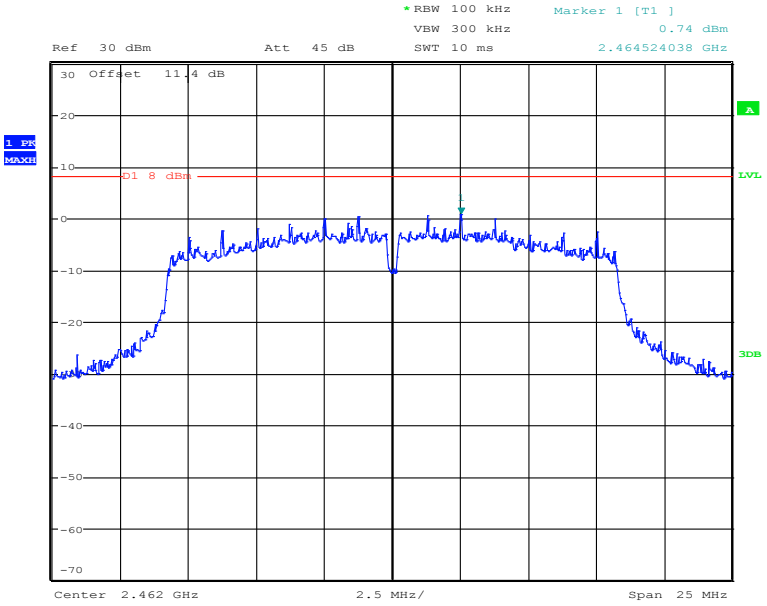
Unwanted emissions into non-restricted Bands, conducted 802.11g 2437 MHz – 30 MHz – 25 GHz



low

Date: 26.APR.2013 00:37:39

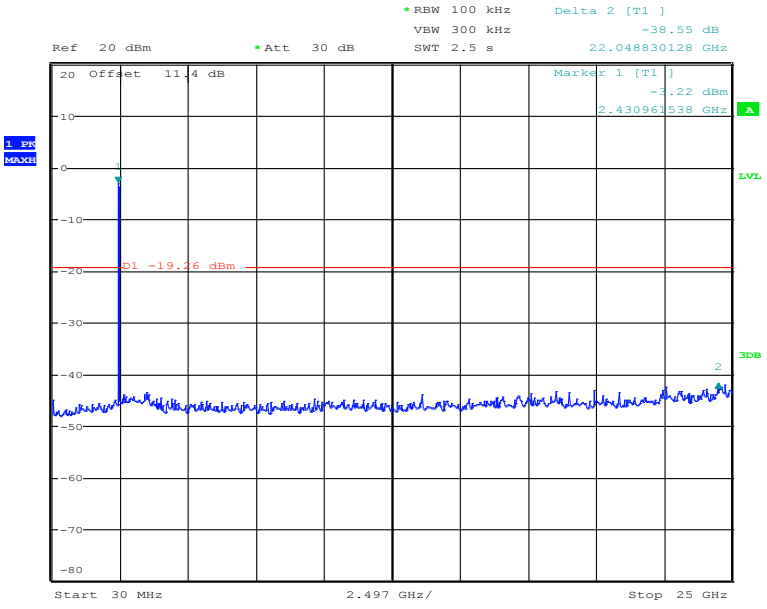
Unwanted emissions into non-restricted Bands, conducted 802.11g 2462 MHz – Reference Level



low

Date: 26.APR.2013 00:10:17

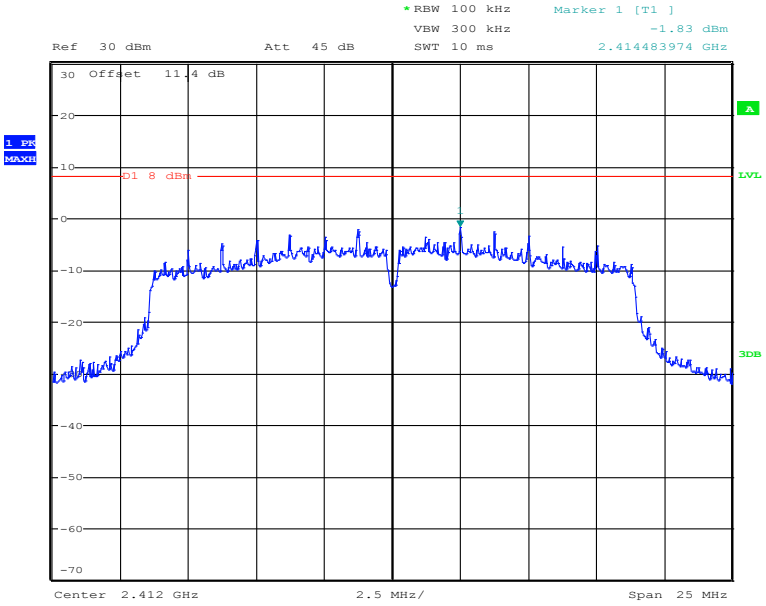
Unwanted emissions into non-restricted Bands, conducted 802.11g 2462 MHz – 30 MHz – 25 GHz



low

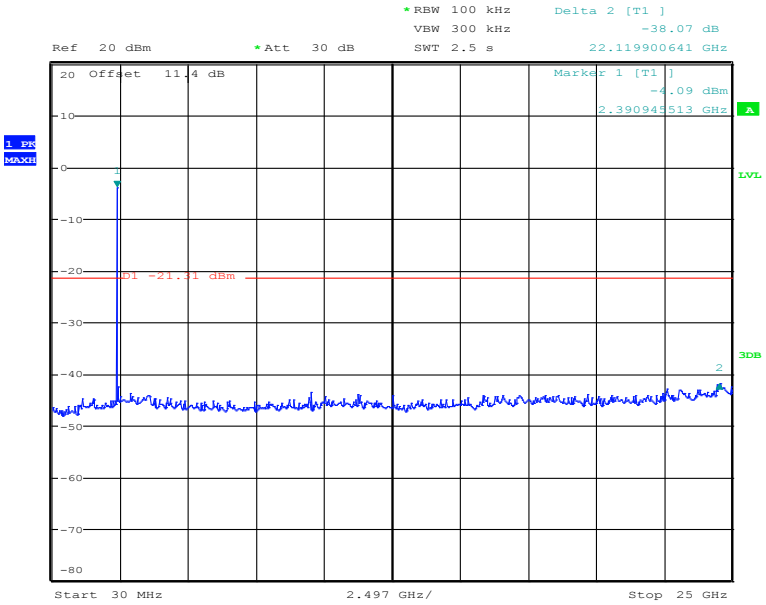
Date: 26.APR.2013 00:38:24

Unwanted emissions into non-restricted Bands, conducted 802.11n (HT20)
2412 MHz – Reference Level



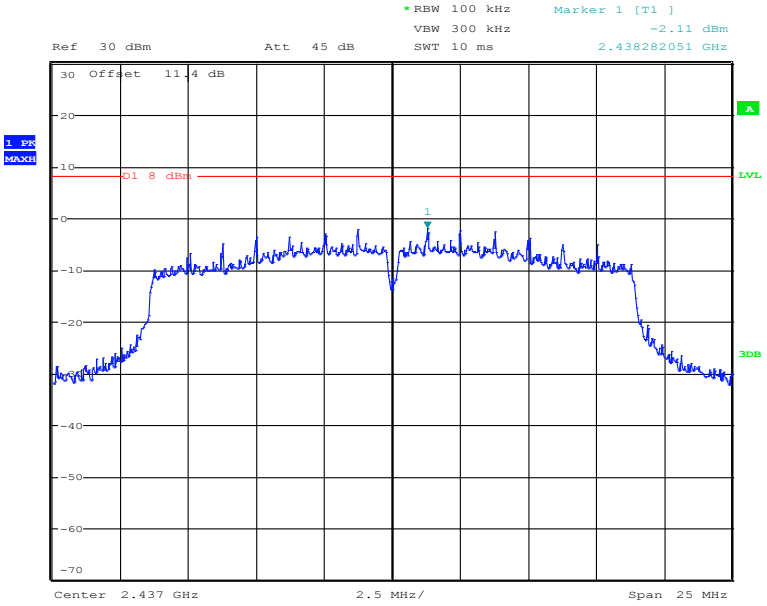
low
Date: 26.APR.2013 00:05:23

Unwanted emissions into non-restricted Bands, conducted 802.11n (HT20)
2412 MHz – 30 MHz – 25 GHz



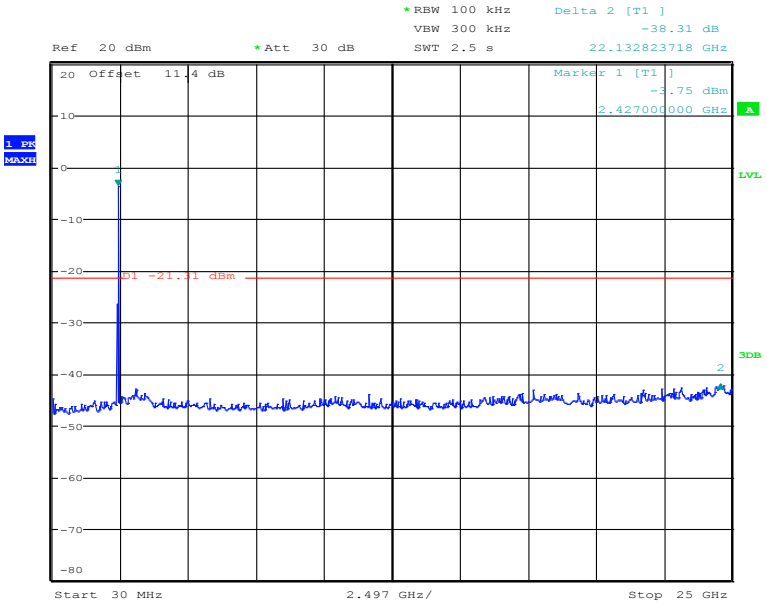
low
Date: 26.APR.2013 00:40:58

Unwanted emissions into non-restricted Bands, conducted 802.11n (HT20) 2437 MHz – Reference Level



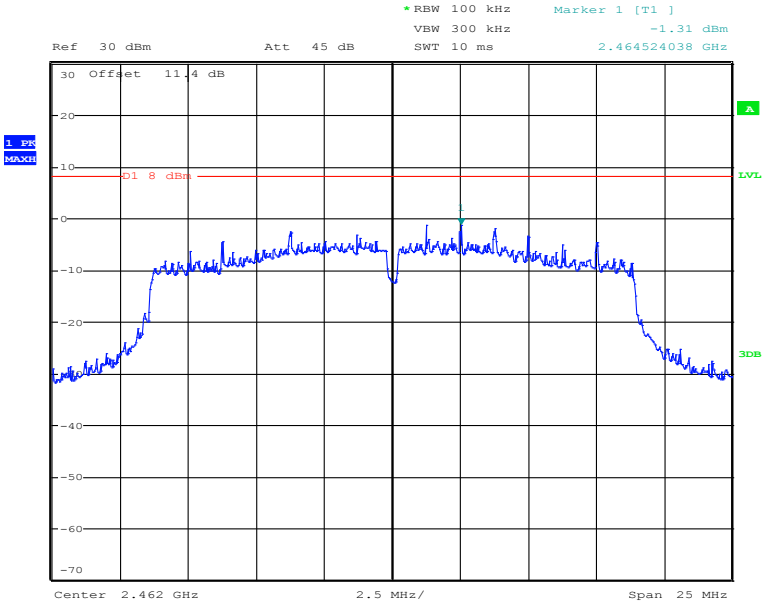
low
Date: 26.APR.2013 00:06:03

Unwanted emissions into non-restricted Bands, conducted 802.11n (HT20) 2437 MHz – 30 MHz – 25 GHz



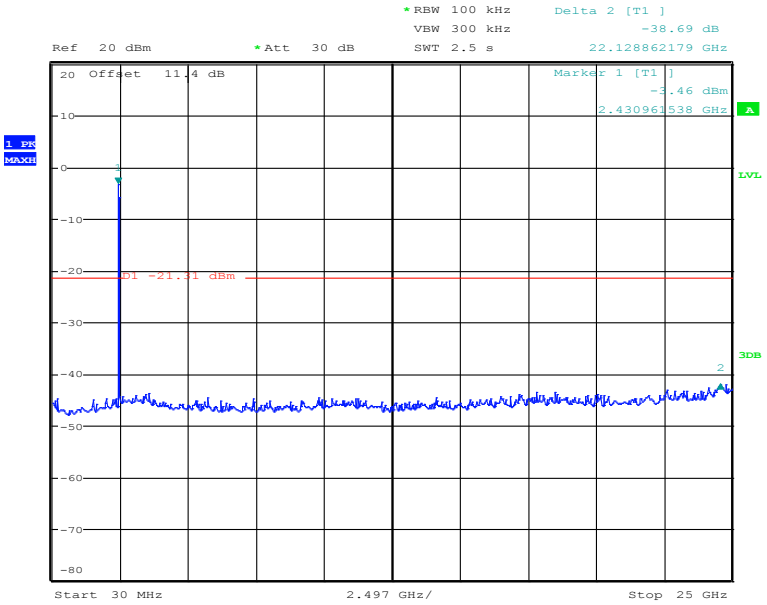
low
Date: 26.APR.2013 00:42:08

Unwanted emissions into non-restricted Bands, conducted 802.11n (HT20) 2462 MHz – Reference Level



low
Date: 26.APR.2013 00:07:28

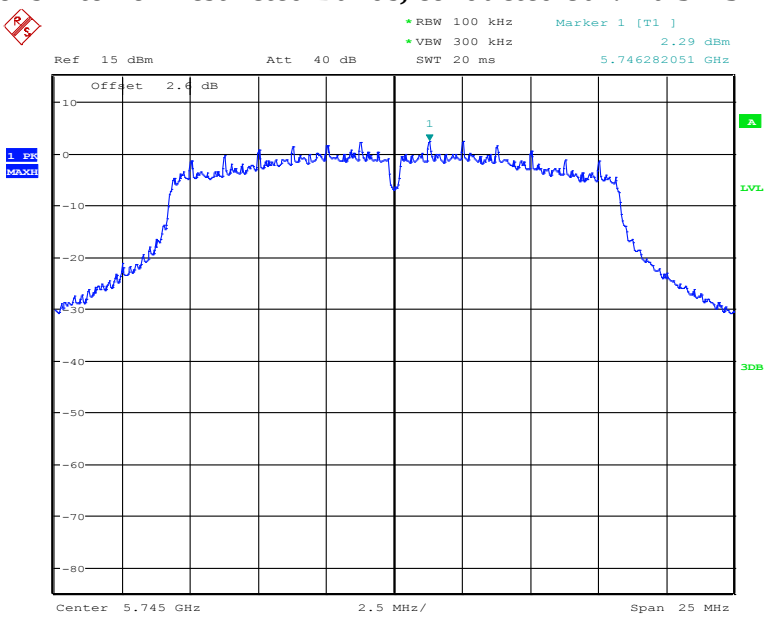
Unwanted emissions into non-restricted Bands, conducted 802.11n (HT20) 2462 MHz – 30 MHz – 25 GHz



low
Date: 26.APR.2013 00:43:02

6.5.6.2 5GHz

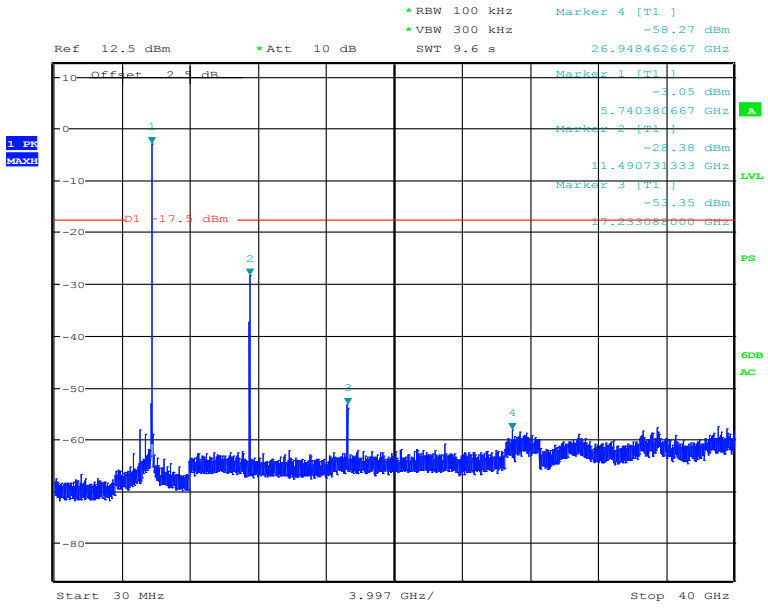
Unwanted emissions into non-restricted Bands, conducted 802.11a 5745 MHz – Reference Level



low

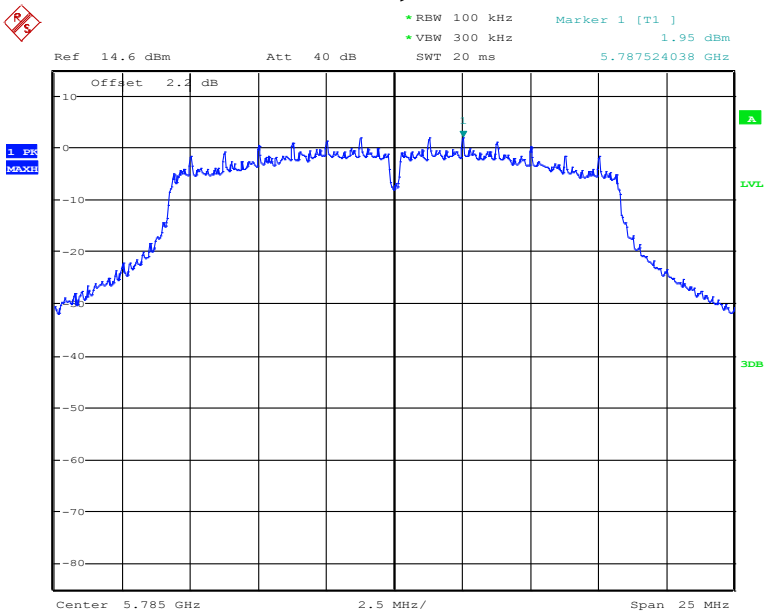
Date: 28.JUN.2013 23:19:14

Unwanted emissions into non-restricted Bands, conducted 802.11a 5745 MHz – 30 MHz – 40 GHz



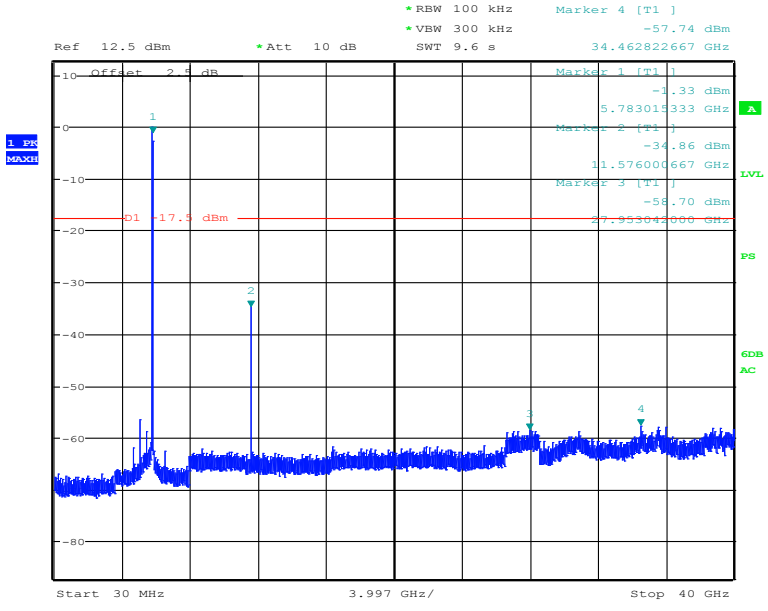
Date: 29.JUN.2013 10:23:56

Unwanted emissions into non-restricted Bands, conducted 802.11a 5785 MHz – Reference Level



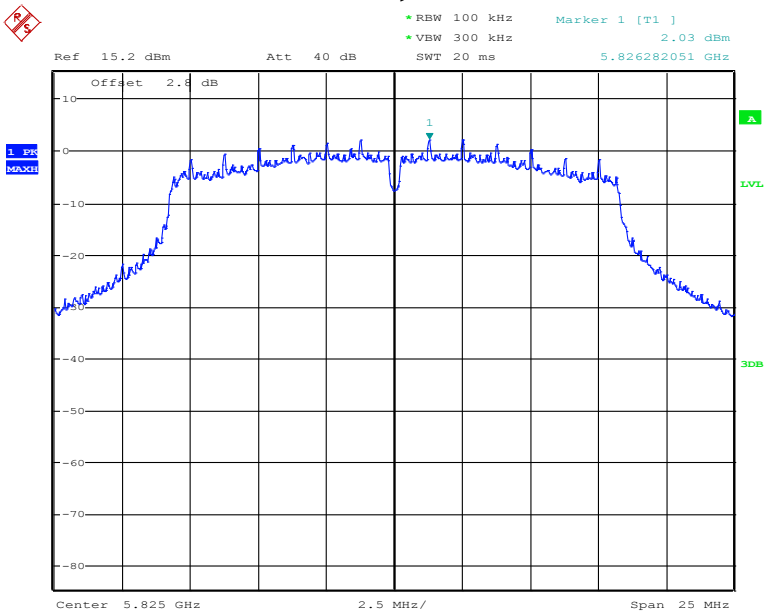
low
Date: 28.JUN.2013 23:29:00

Unwanted emissions into non-restricted Bands, conducted 802.11a 5785 MHz – 30 MHz – 40 GHz



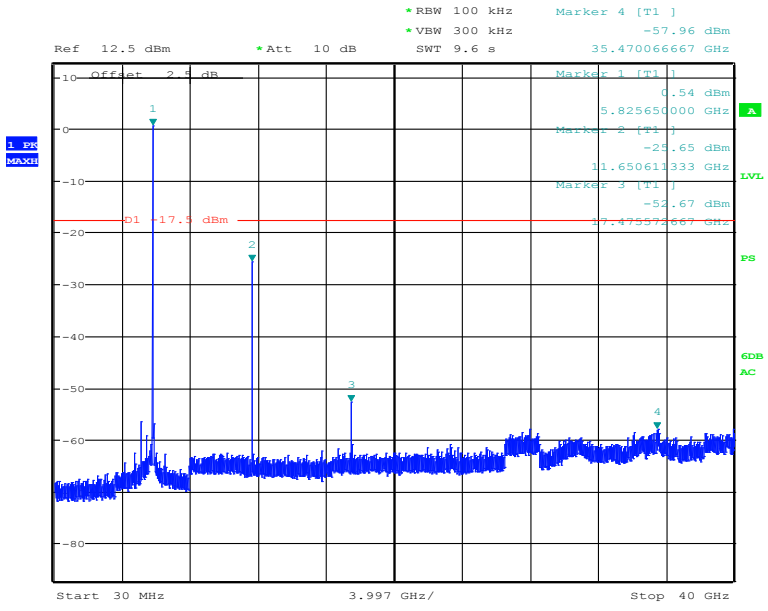
Date: 29.JUN.2013 10:16:17

Unwanted emissions into non-restricted Bands, conducted 802.11a 5825 MHz – Reference Level



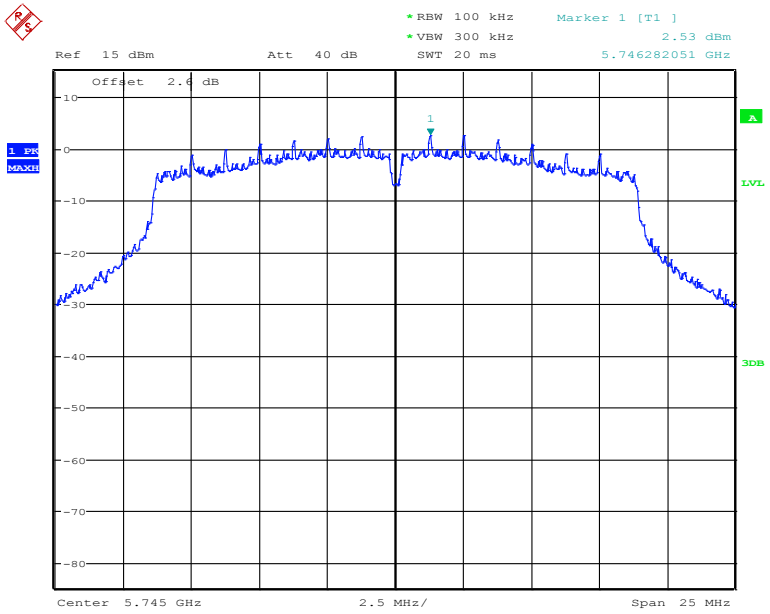
low
Date: 28.JUN.2013 23:31:34

Unwanted emissions into non-restricted Bands, conducted 802.11a 5825 MHz – 30 MHz – 40 GHz



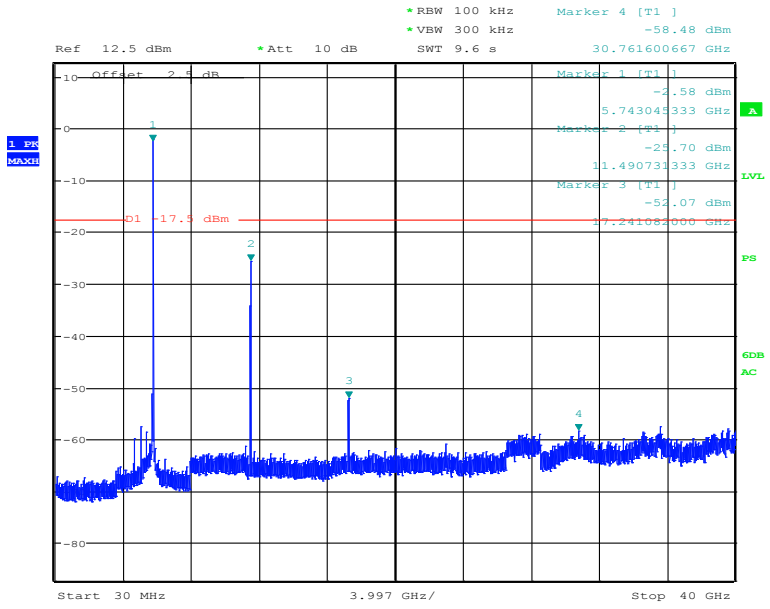
Date: 29.JUN.2013 10:21:47

Unwanted emissions into non-restricted Bands, conducted 802.11n (HT 20)
5745 MHz – Reference Level



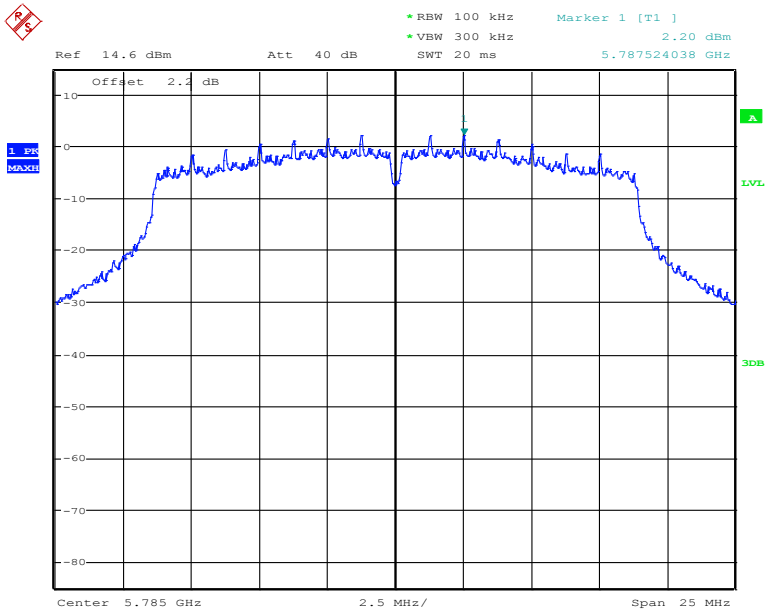
low
Date: 28.JUN.2013 23:22:43

Unwanted emissions into non-restricted Bands, conducted 802.11n (HT 20)
5745 MHz – 30 MHz – 40 GHz



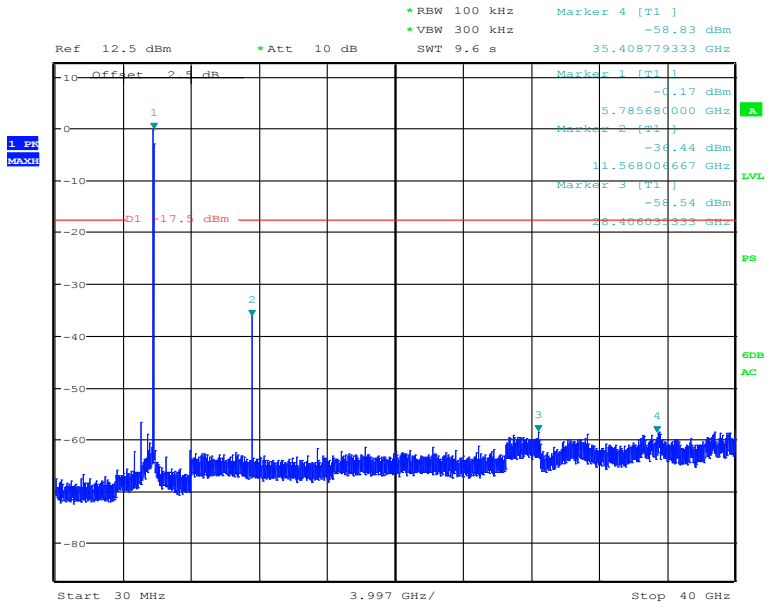
Date: 29.JUN.2013 10:25:36

Unwanted emissions into non-restricted Bands, conducted 802.11n (HT 20)
5785 MHz – Reference Level



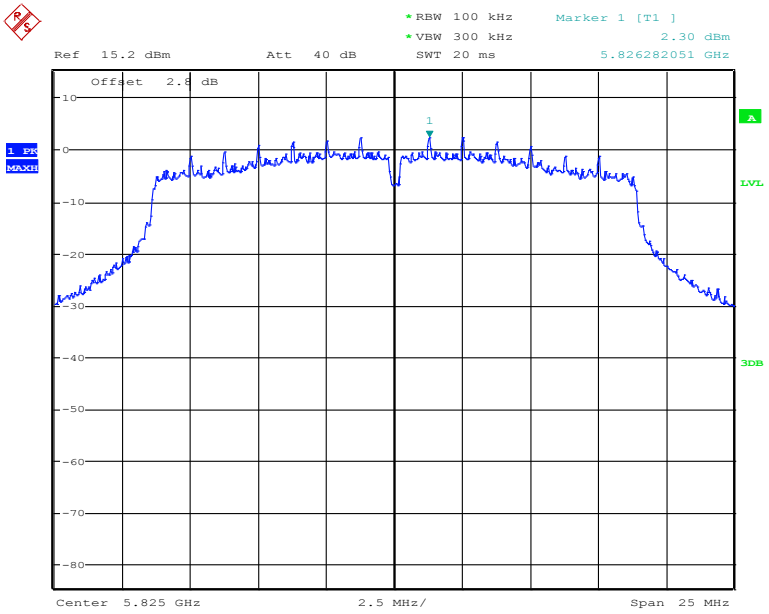
low
Date: 28.JUN.2013 23:26:00

Unwanted emissions into non-restricted Bands, conducted 802.11n (HT 20)
5785 MHz – 30 MHz – 40 GHz



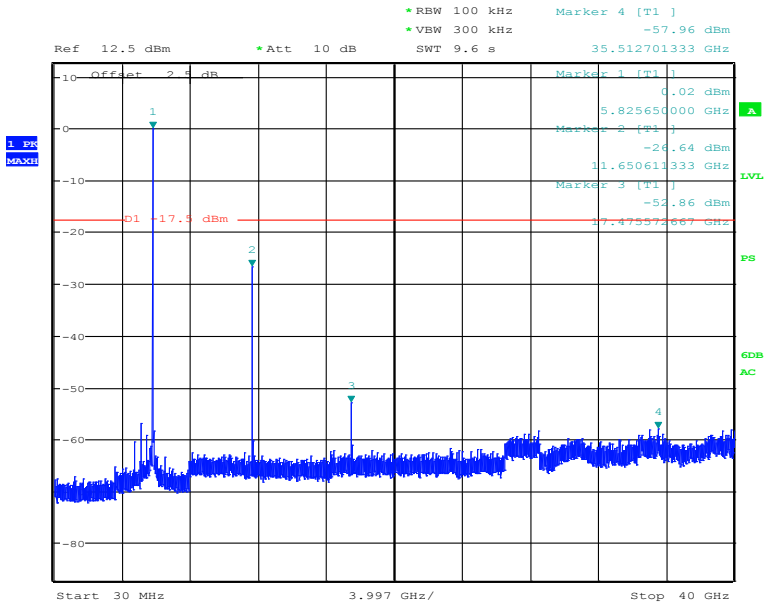
Date: 29.JUN.2013 10:17:43

Unwanted emissions into non-restricted Bands, conducted 802.11n (HT20)
5825 MHz – Reference Level



low
Date: 28.JUN.2013 23:33:43

Unwanted emissions into non-restricted Bands, conducted 802.11n (HT 20)
5825 MHz – 30 MHz – 40 GHz



Date: 29.JUN.2013 10:18:56

Note: Some of the plots include a signal from the LO of the Spectrum Analyzer at the beginning of the plot.

6.6 Unwanted Emissions into Non-Restricted Frequency Bands band edge – Conducted

6.6.1 Limits: §15.247/15.205

15.247 (d) In any 100 kHz Bandwidth outside the frequency band in which the intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in a 100 kHz Bandwidth.

6.6.2 Test Conditions:

Tnom: 20°C; Vnom: 3.8 VDC
Measurement uncertainty= ±1 dB

6.6.3 Test Procedure:

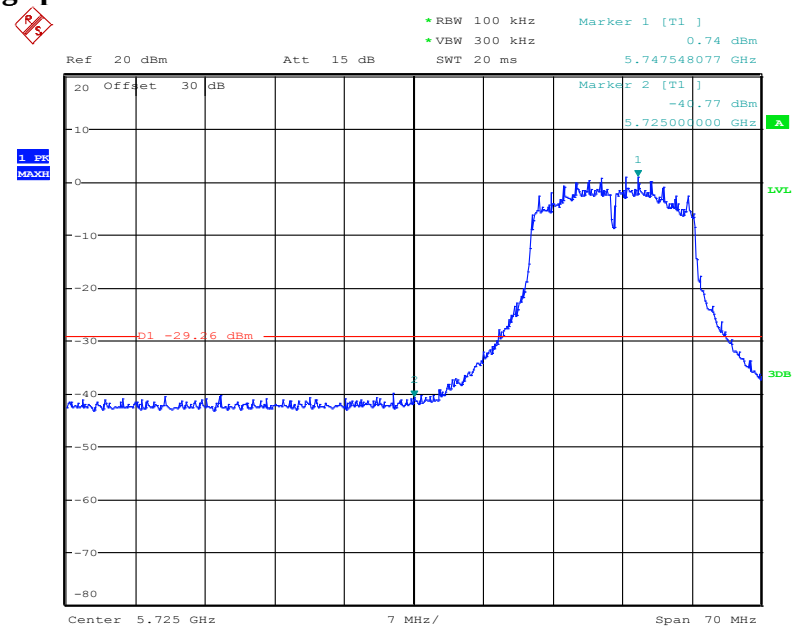
Peak measurements are made using a peak detector and RBW= 100 kHz.
Average measurements performed using an RMS detector RBW = 100 kHz

6.6.4 Measurement Results – Unwanted Emissions into Non-Restricted Frequency Bands edge – Conducted

Pass

6.6.5 Test Data/Plots:

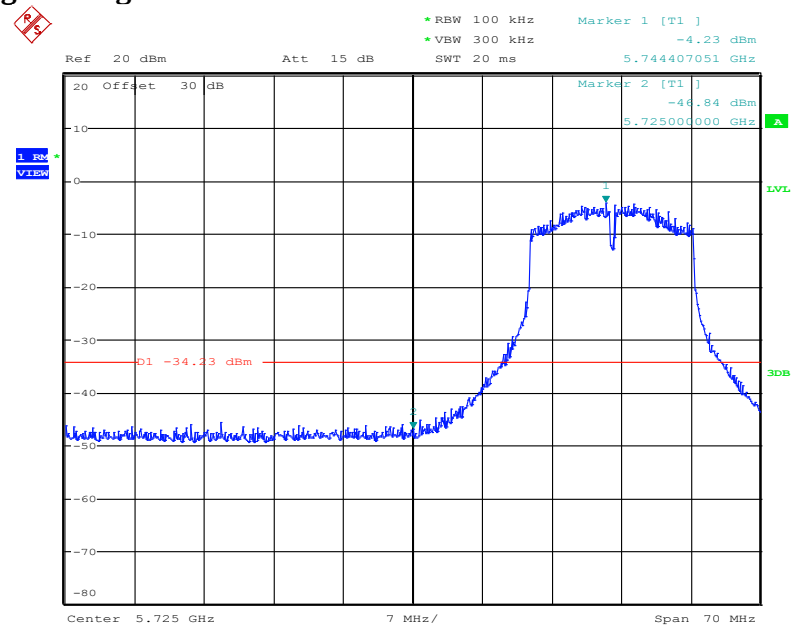
Lower band edge peak – 802.11a mode



low

Date: 24.MAY.2013 00:06:10

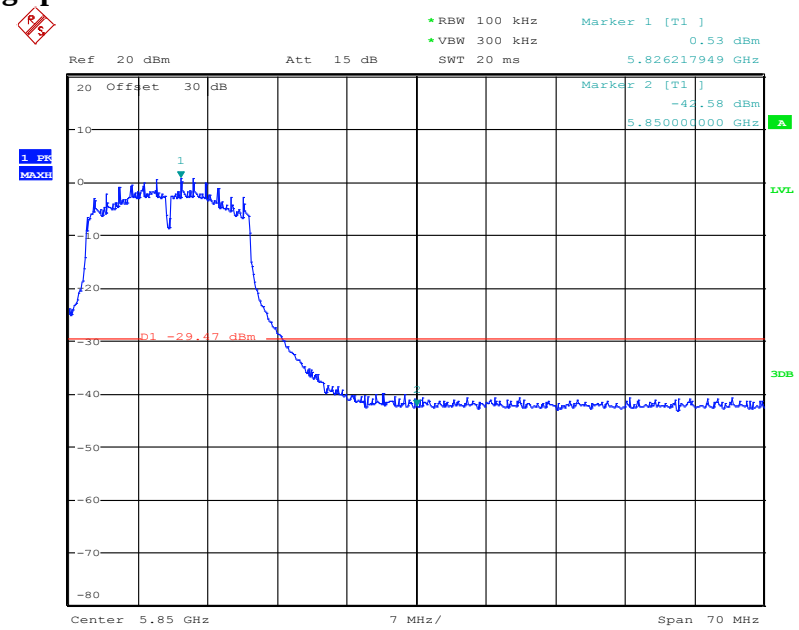
Lower band edge average -802.11a mode



low

Date: 24.MAY.2013 00:09:27

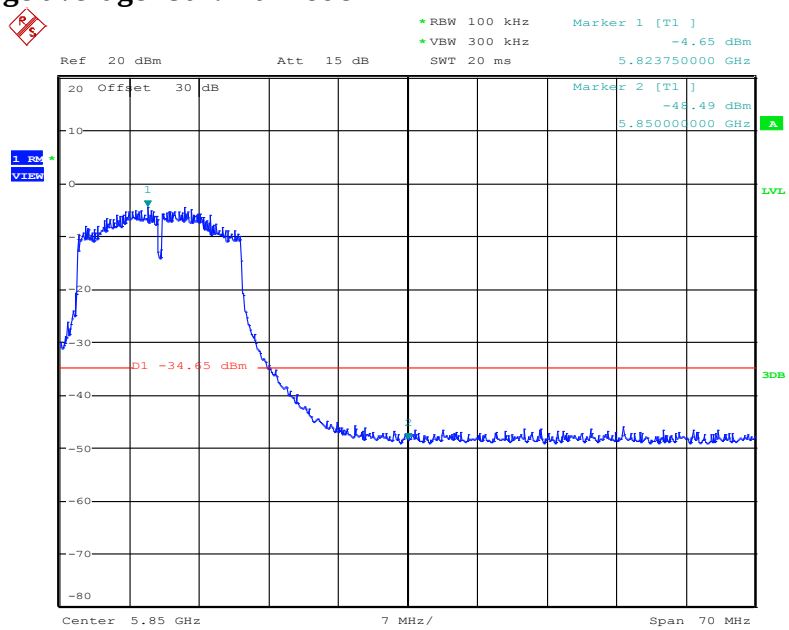
Higher band edge peak -802.11a mode



low

Date: 24.MAY.2013 00:18:28

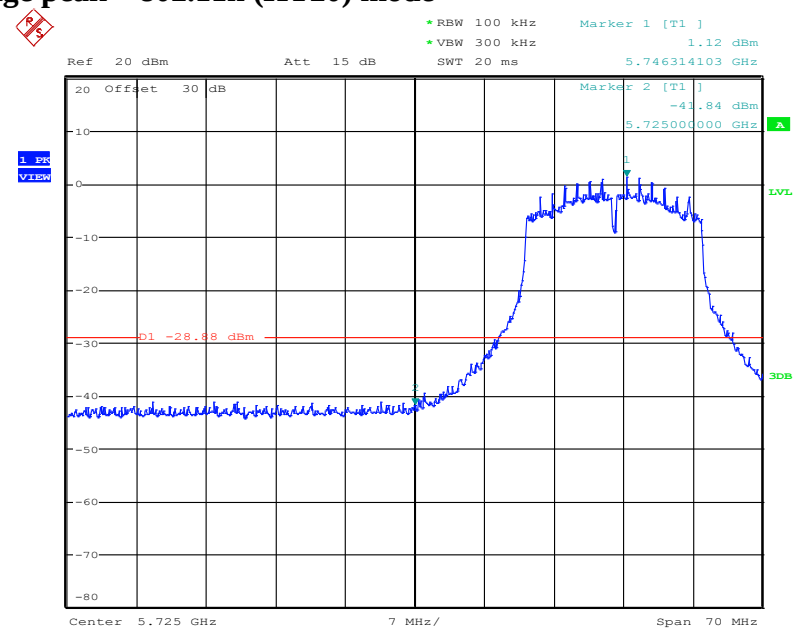
Higher band edge average- 802.11a mode



low

Date: 24.MAY.2013 00:20:40

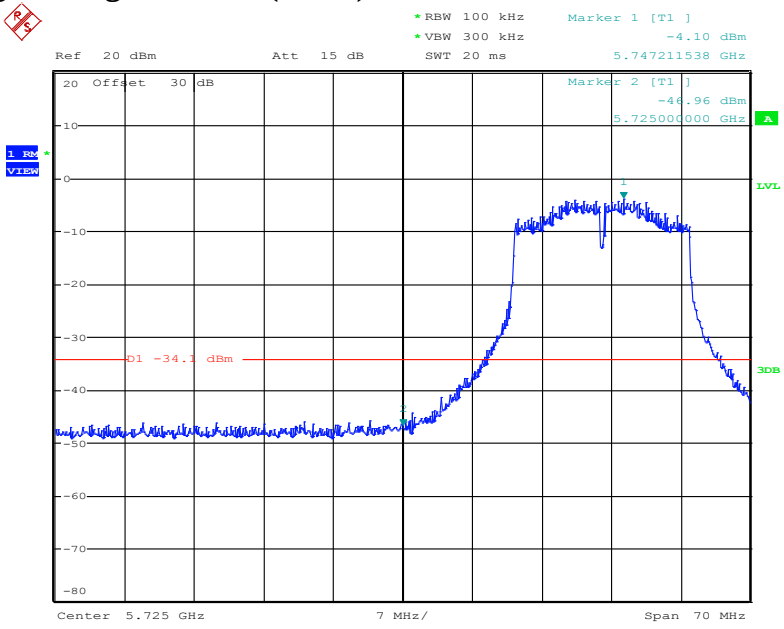
Lower band edge peak – 802.11n (HT20) mode



low

Date: 24.MAY.2013 00:12:51

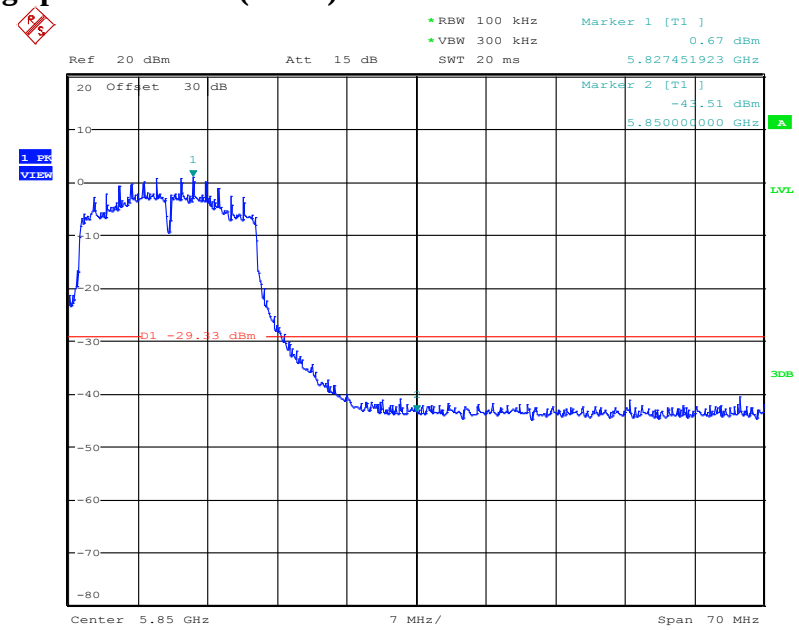
Lower band edge average -802.11n (HT20) mode



low

Date: 24.MAY.2013 00:11:37

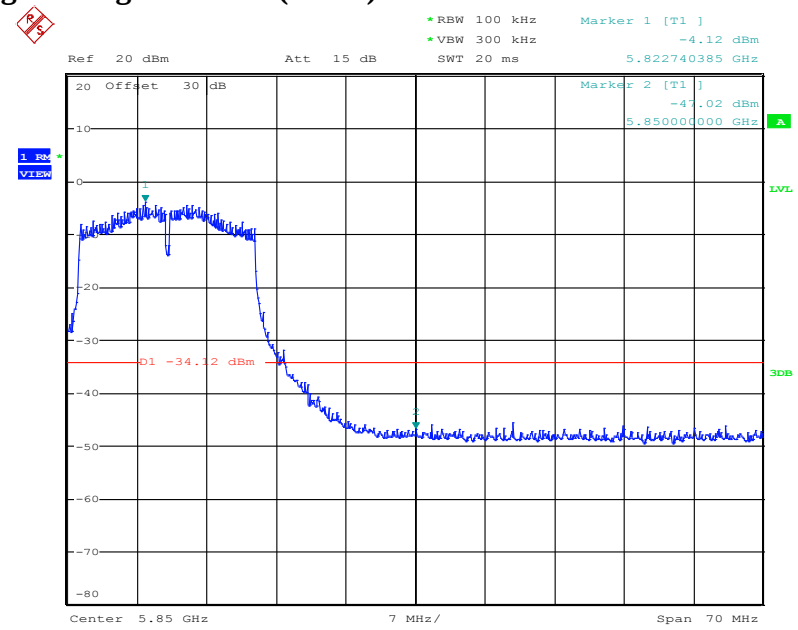
Higher band edge peak -802.11n (HT20) mode



low

Date: 24.MAY.2013 00:26:40

Higher band edge average- 802.11n (HT20) mode



low

Date: 24.MAY.2013 00:23:21

6.7 Unwanted Emissions into Restricted Frequency Bands band edge – band edge - radiated

6.7.1 Limits:

§15.247/15.205
RSS-210 A8.5

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

6.7.2 Test Conditions:

Tnom: 20°C; Vnom: 3.8 VDC

6.7.3 Test Procedure:

Marker delta method according to ANSI C63.10

Peak measurements are made using a peak detector and RBW=1MHz.
*PEAK LIMIT= 74dBµV/m

Average measurements performed using a peak detector and according to video averaging procedure with RBW=1MHz and VBW=10Hz.
*AVG. LIMIT= 54dBµV/m

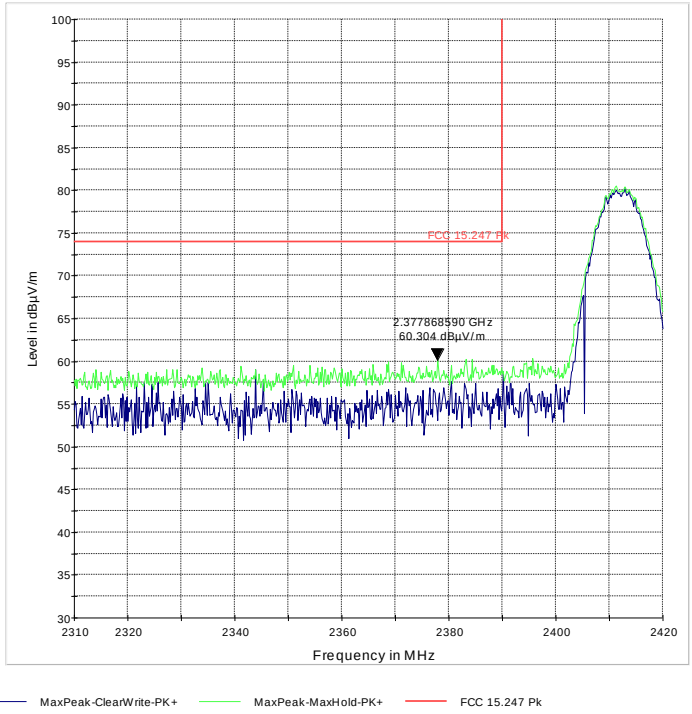
Measurement Uncertainty: ±3.0dB

6.7.4 Measurement Result – Unwanted Emissions into Non-Restricted Frequency Bands-bandedge- conducted

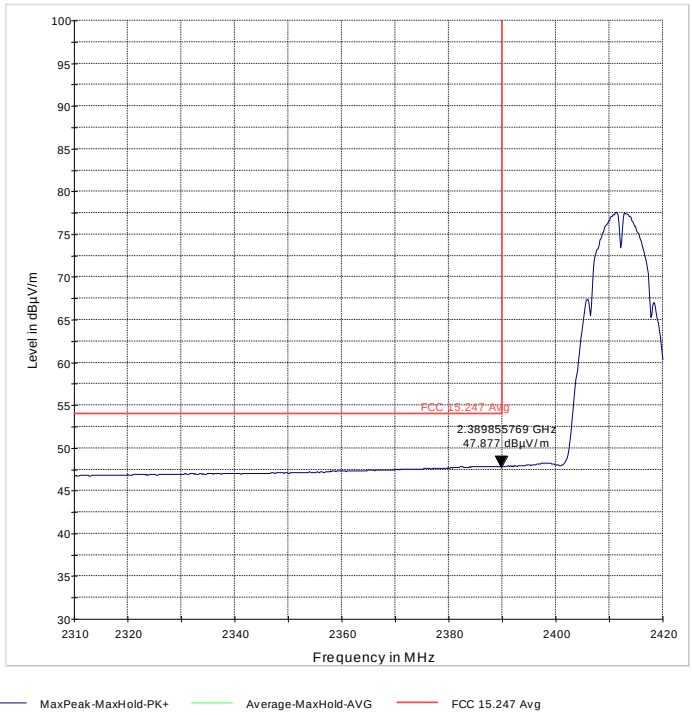
Pass.

6.7.5 Test Data/plots:

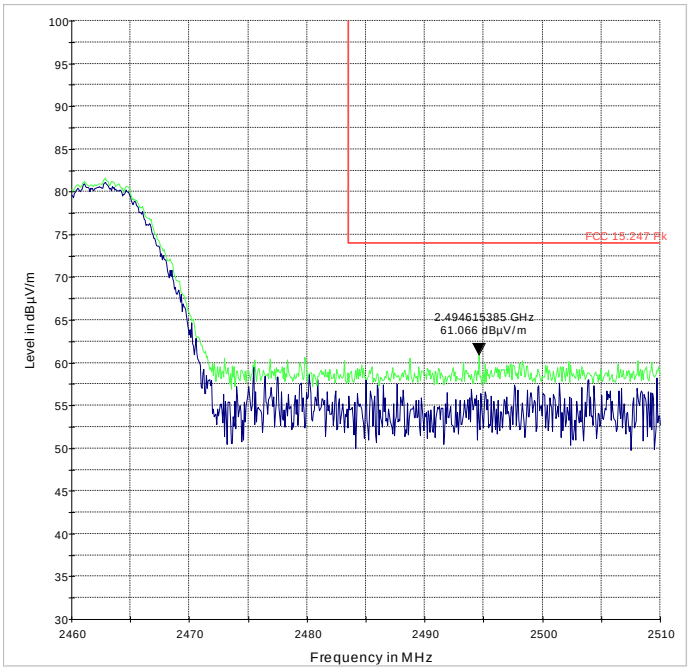
Lower band edge peak -802.11b mode



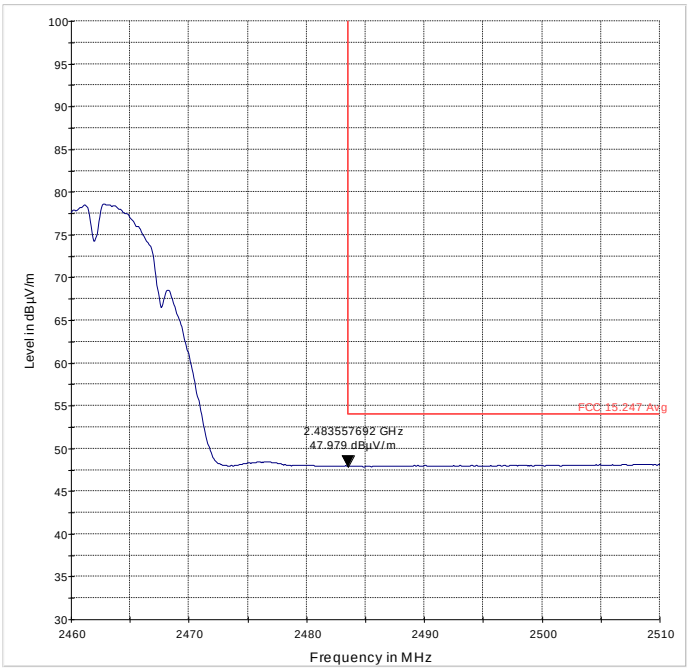
Lower band edge average -802.11b mode



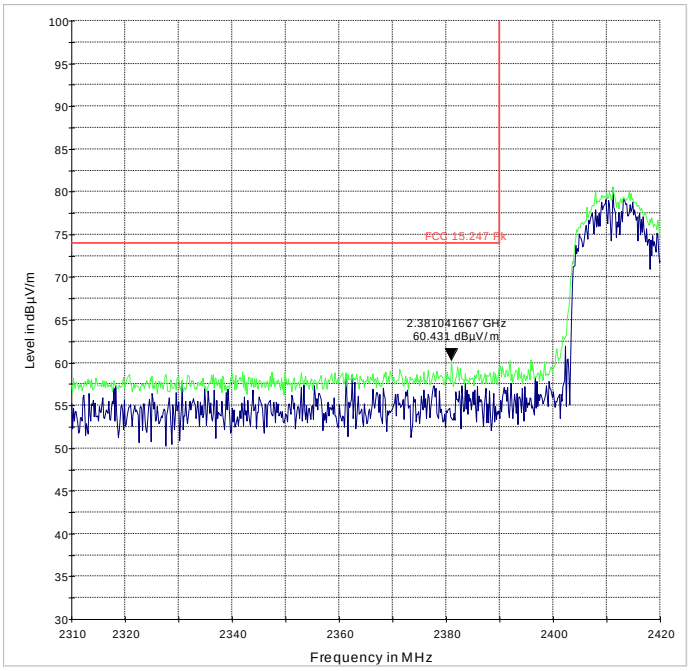
Higher band edge peak -802.11b mode



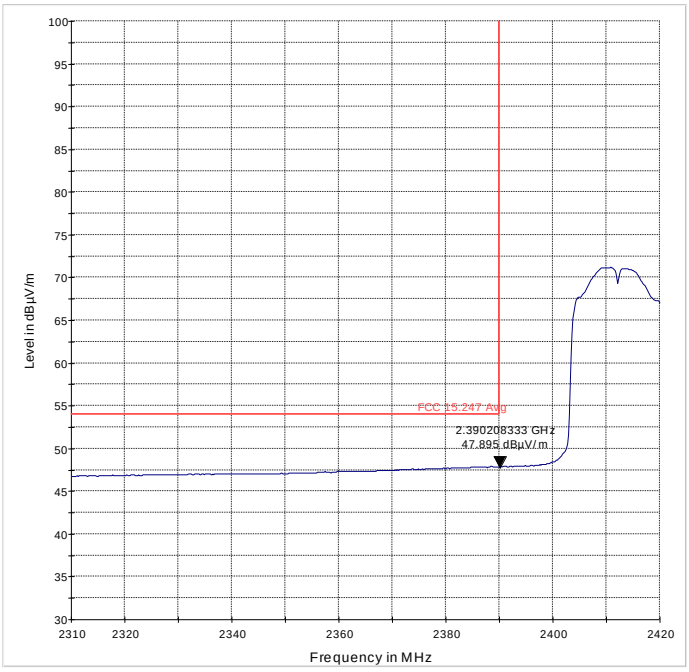
Higher band edge average-802.11b mode



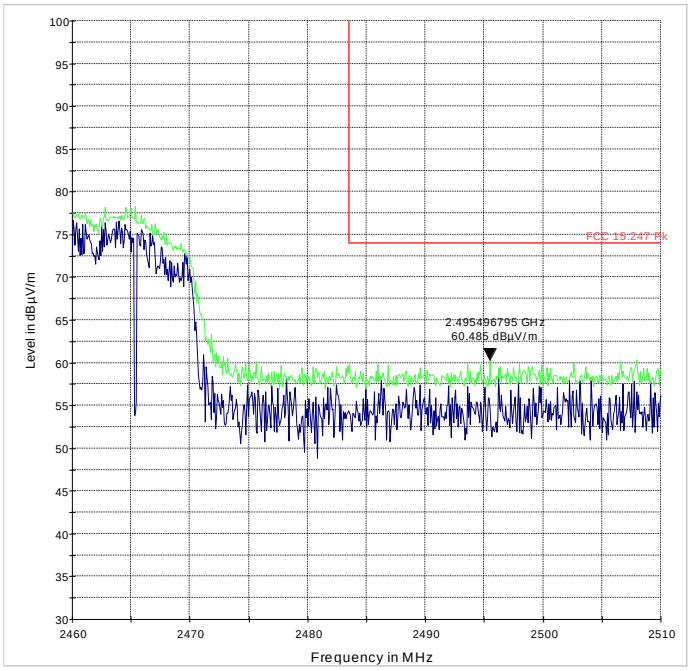
Lower band edge peak – 802.11g mode



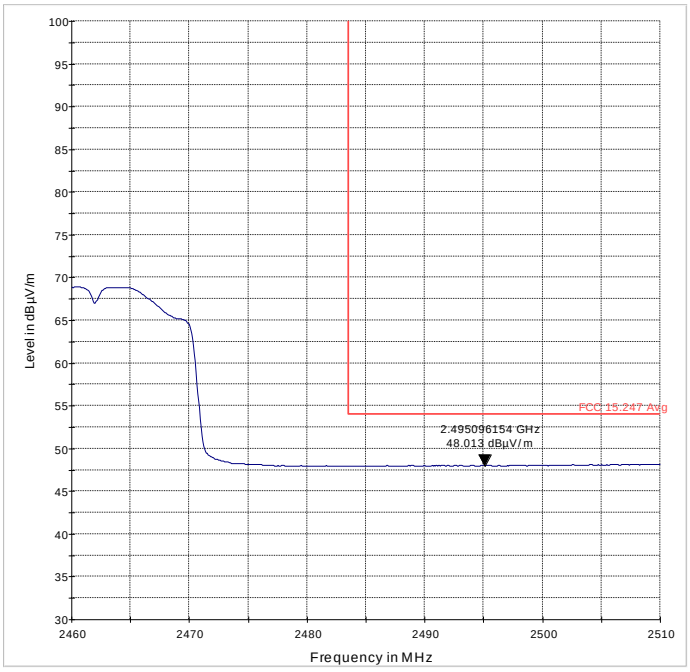
Lower band edge average -802.11g mode



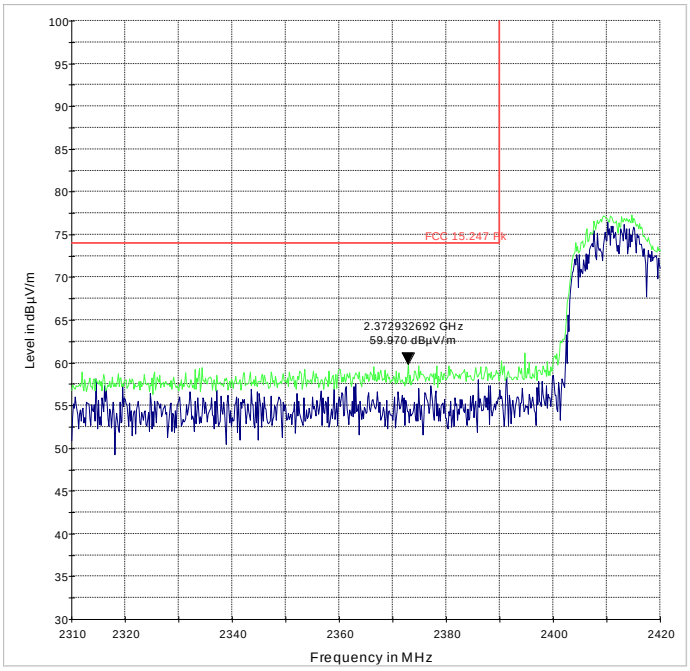
Higher band edge peak -802.11g mode



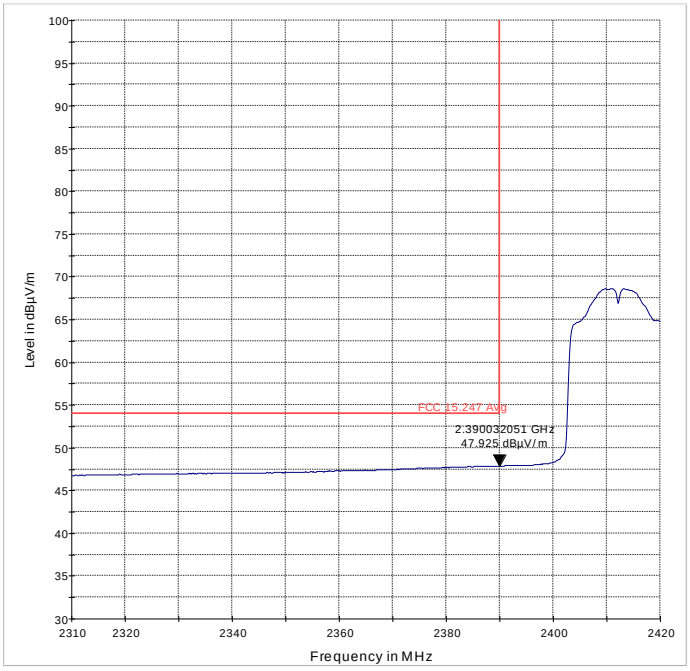
Higher band edge average- 802.11g mode



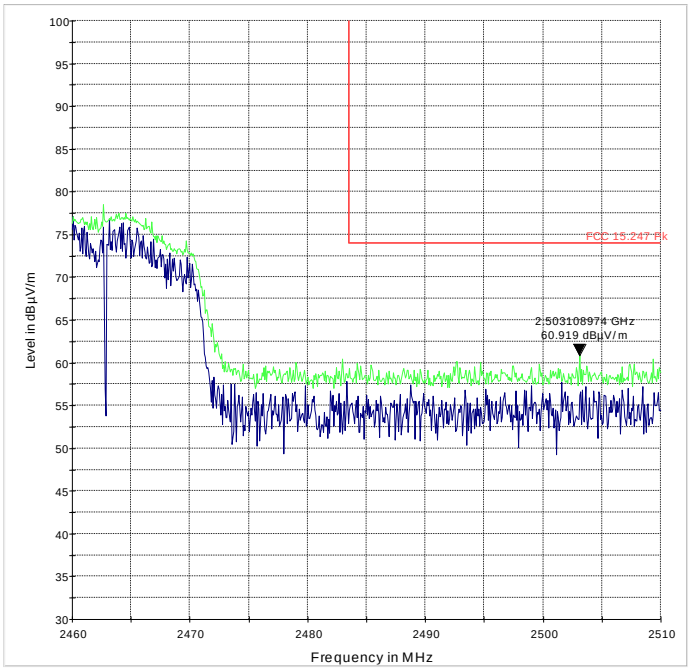
Lower band edge peak – 802.11n (HT20) mode



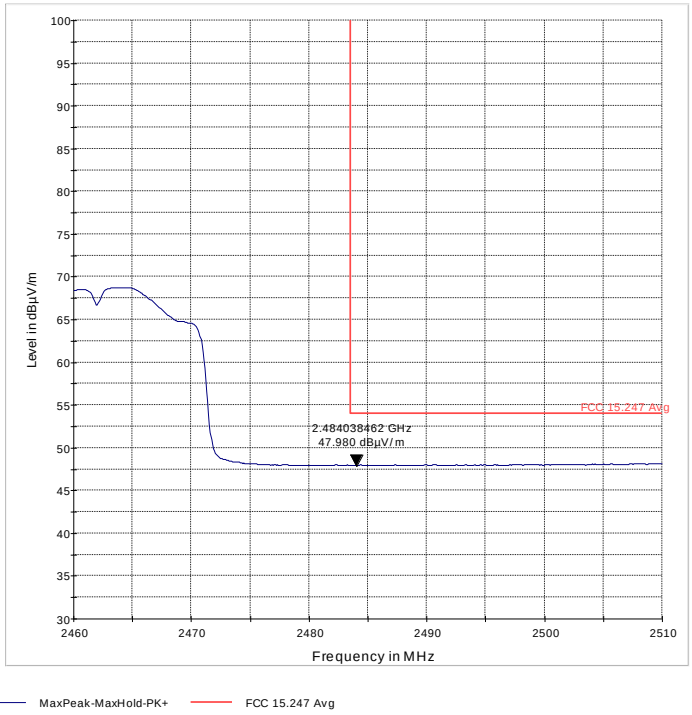
Lower band edge average -802.11n (HT20) mode



Higher band edge peak -802.11n (HT20) mode



Higher band edge average- 802.11n (HT20) mode



6.8 Unwanted Emissions into Restricted Frequency Bands- radiated

6.8.1 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

6.8.2 Test Conditions:
Tnom: 20°C; Vnom: 3.8 VDC

6.8.3 Test Result:
All inadvertent emissions are below the applicable limits.

6.8.4 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.

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

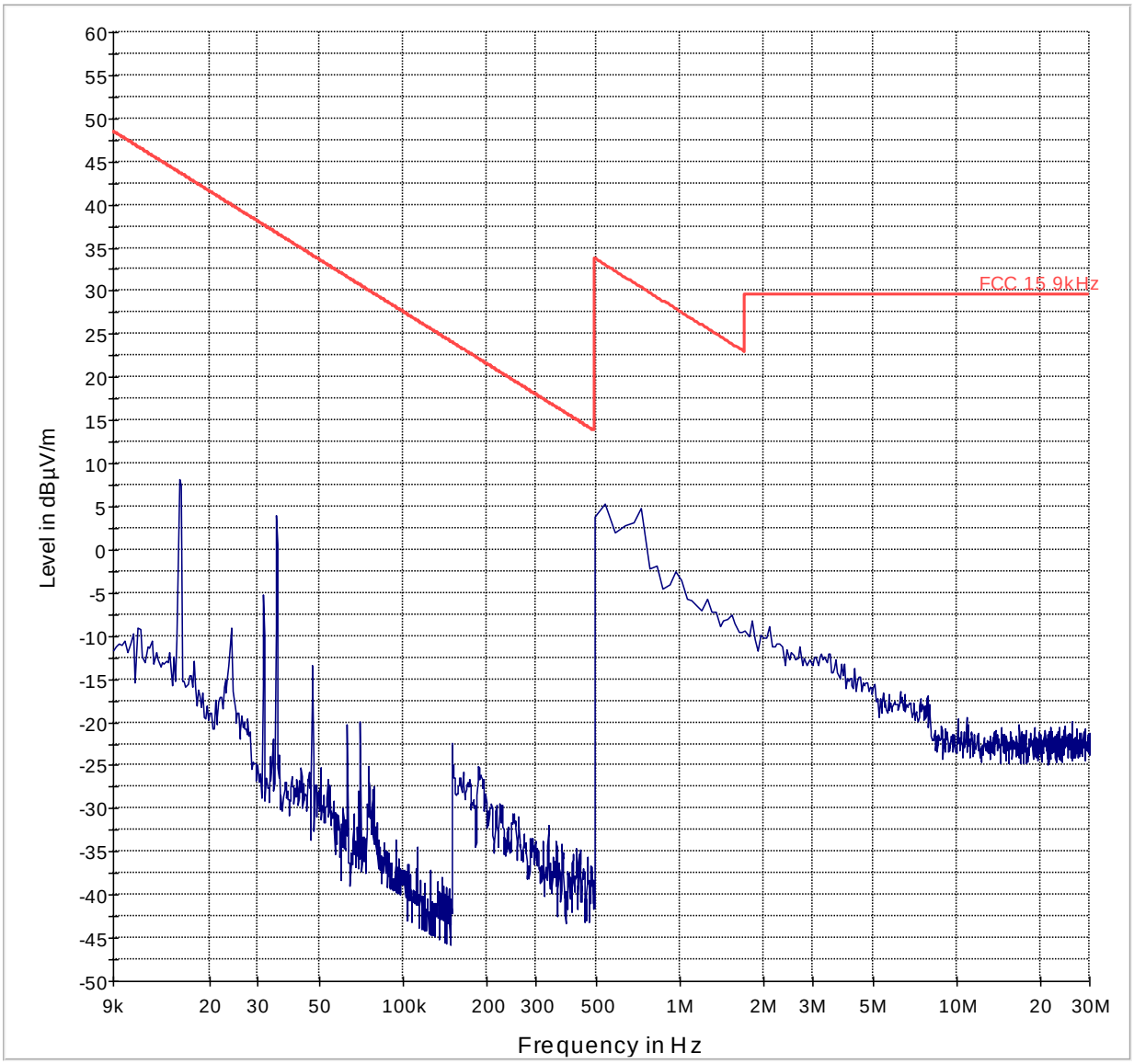
Measurement Uncertainty: ±3.0dB

6.8.5 Measurement Verdict – Unwanted Emissions into Restricted Frequency Bands-radiated
Pass.

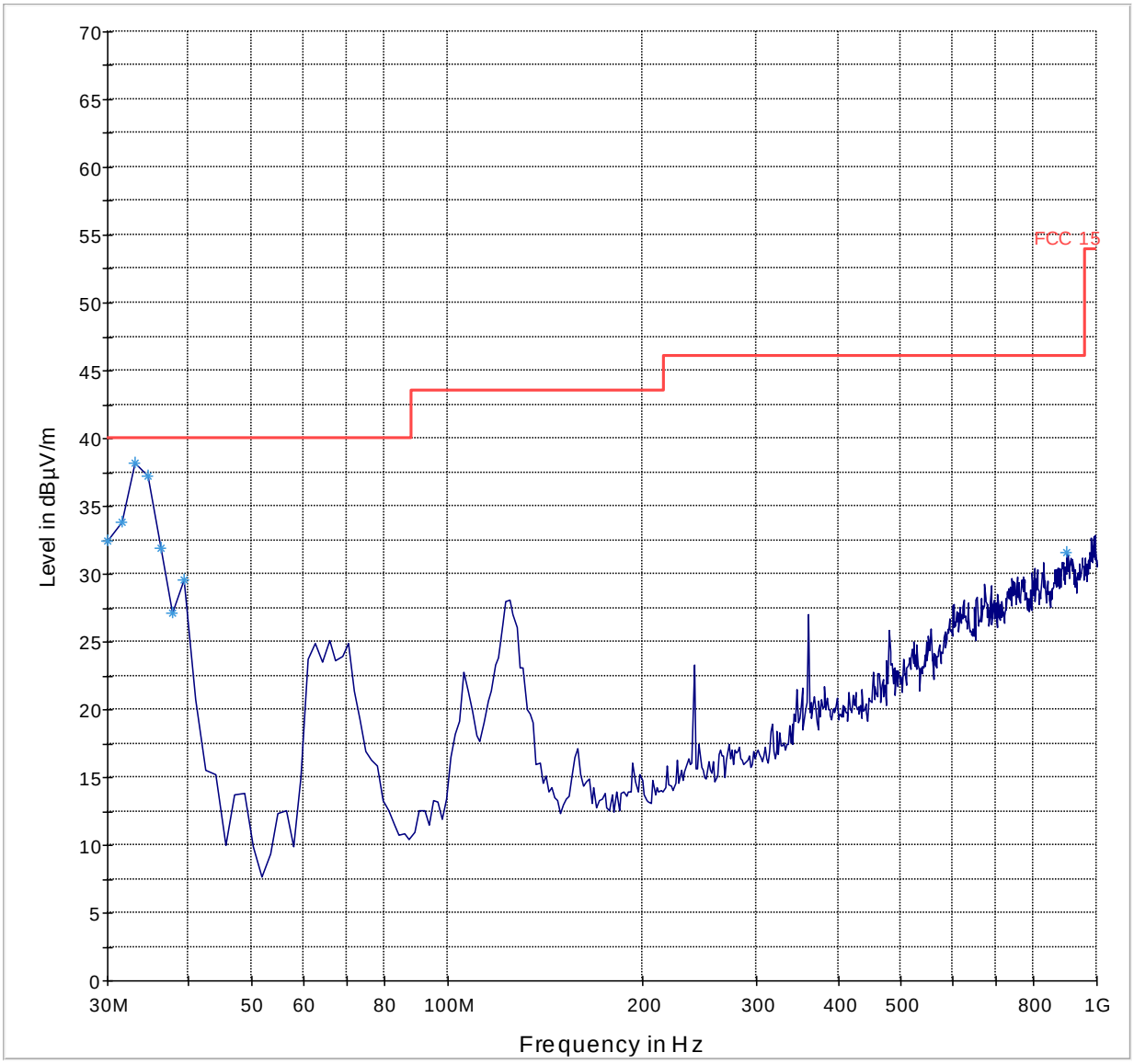
6.8.6 Test data/plots

6.8.6.1 Wi-Fi 2.4GHz

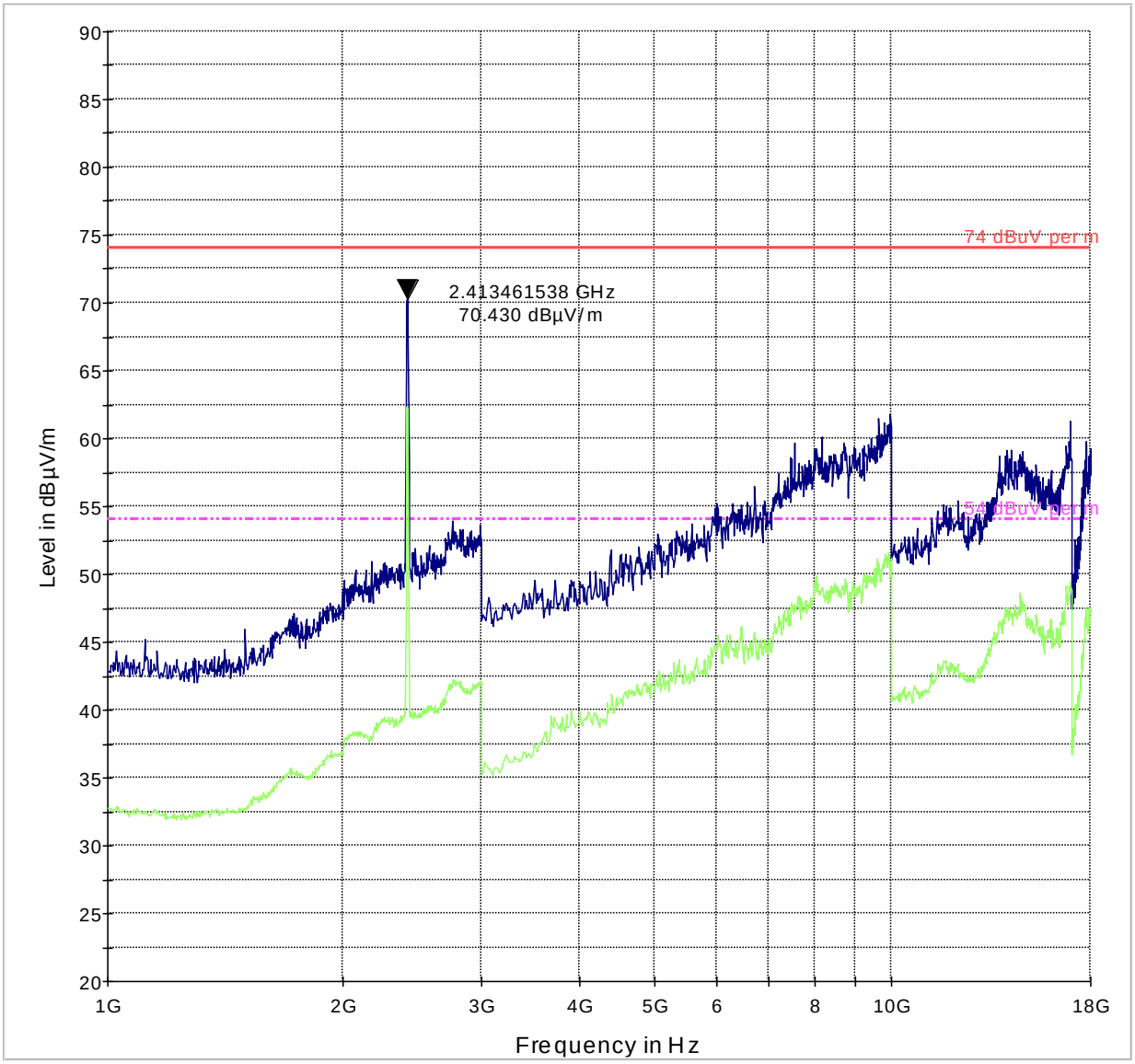
Unwanted Emissions into Restricted Frequency Bands, Radiated - 802.11b: <30MHz
Note: Worst case representation for all modes of operation in this frequency range-
Limits adjusted for 3m measurement.



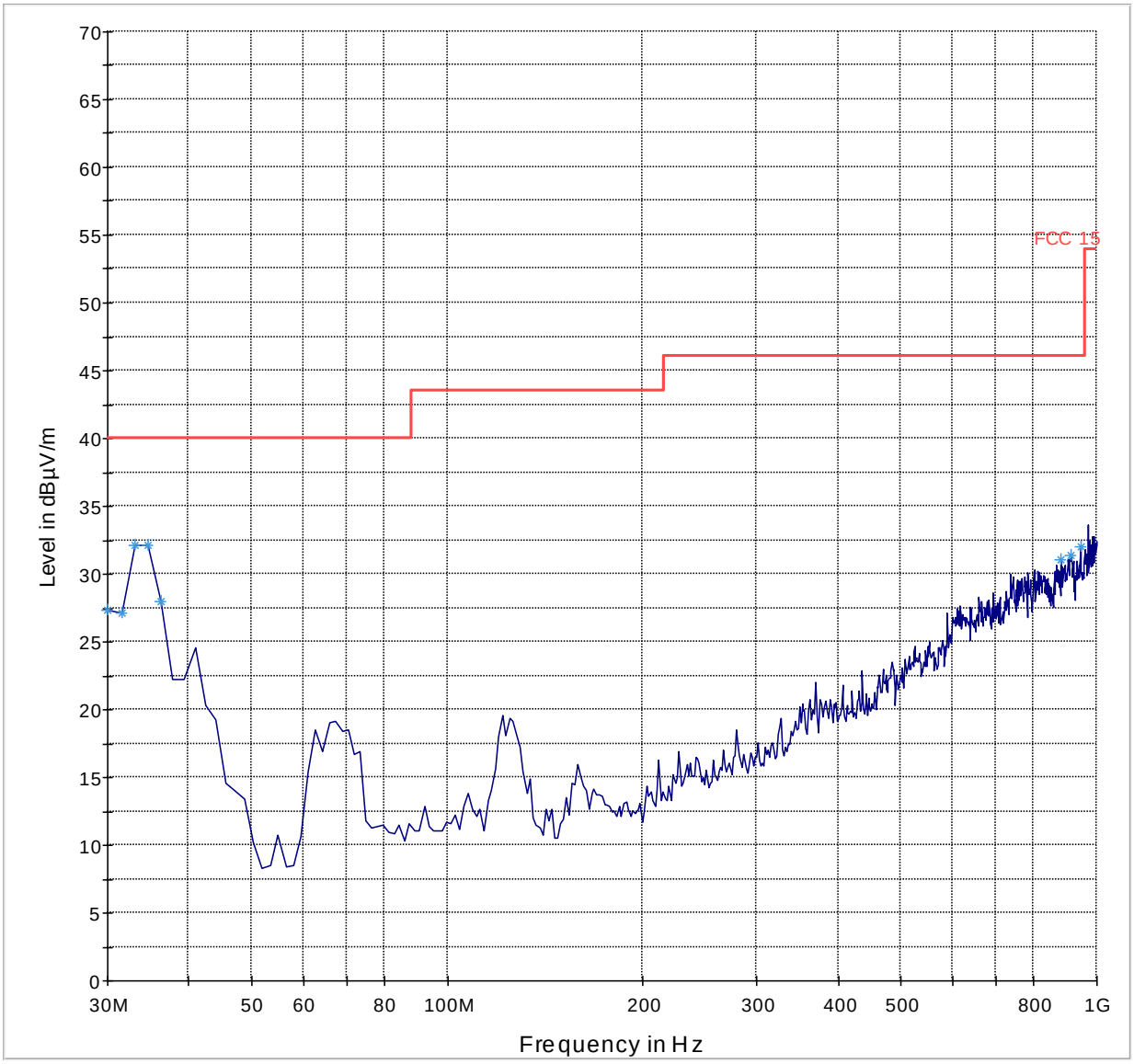
Unwanted Emissions into Restricted Frequency Bands, Radiated - 802.11b: Ch1- 30M-1GHz



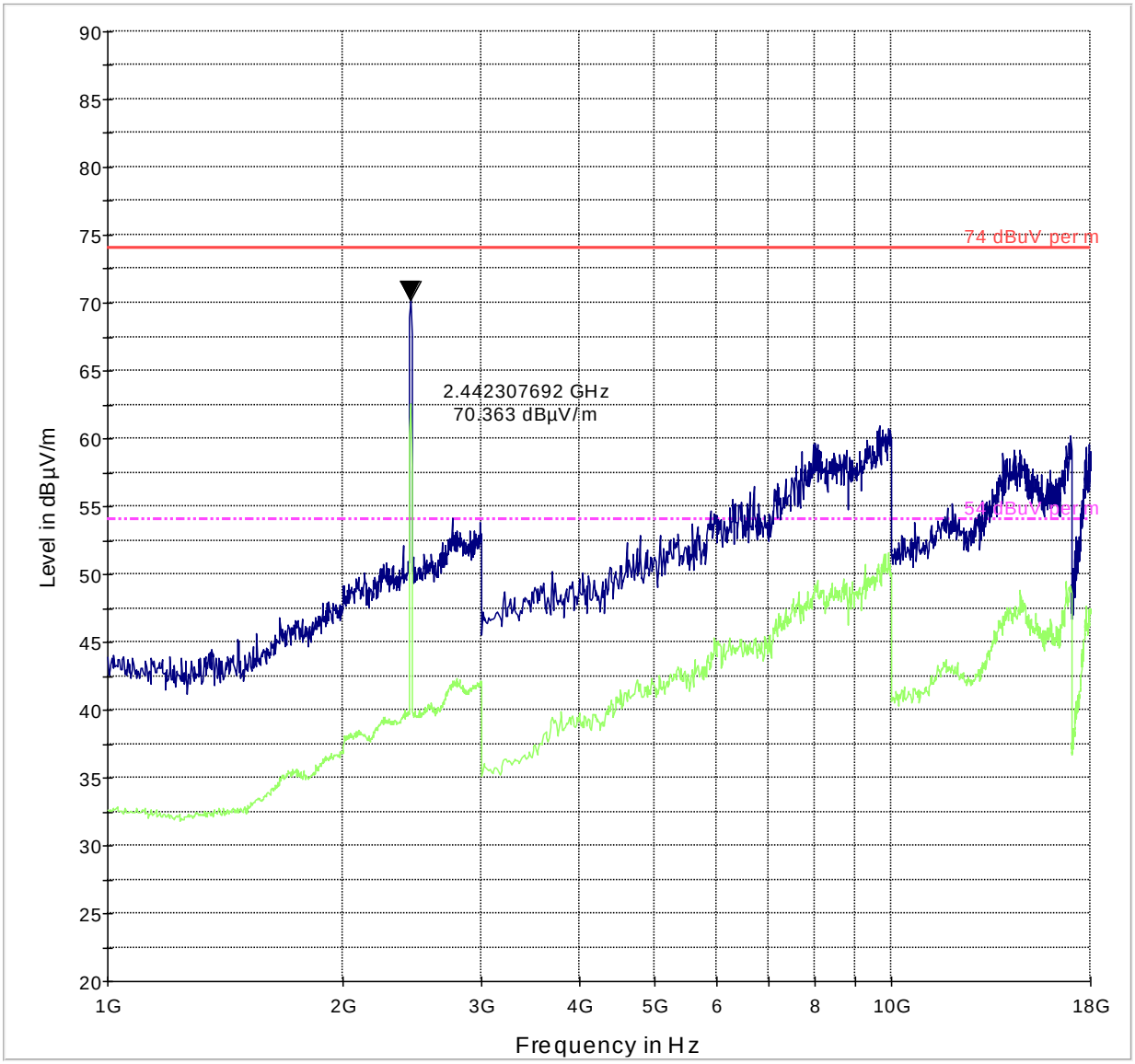
Unwanted Emissions into Restricted Frequency Bands, Radiated - 802.11b: Ch1- 1G-18GHz
Note: Signal over the limit is the carrier frequency



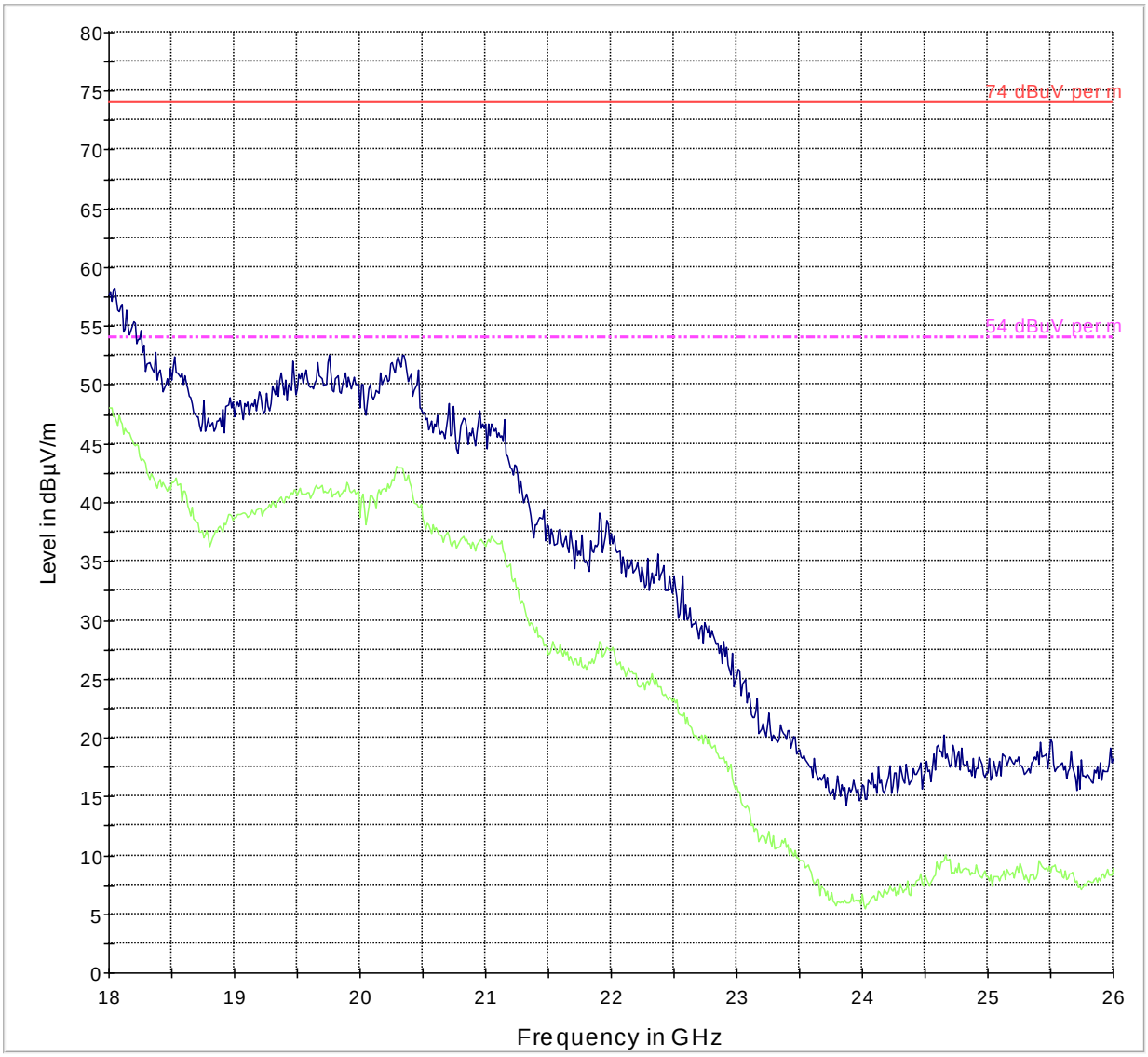
Unwanted Emissions into Restricted Frequency Bands, Radiated - 802.11b: Ch6- 30M-1GHz



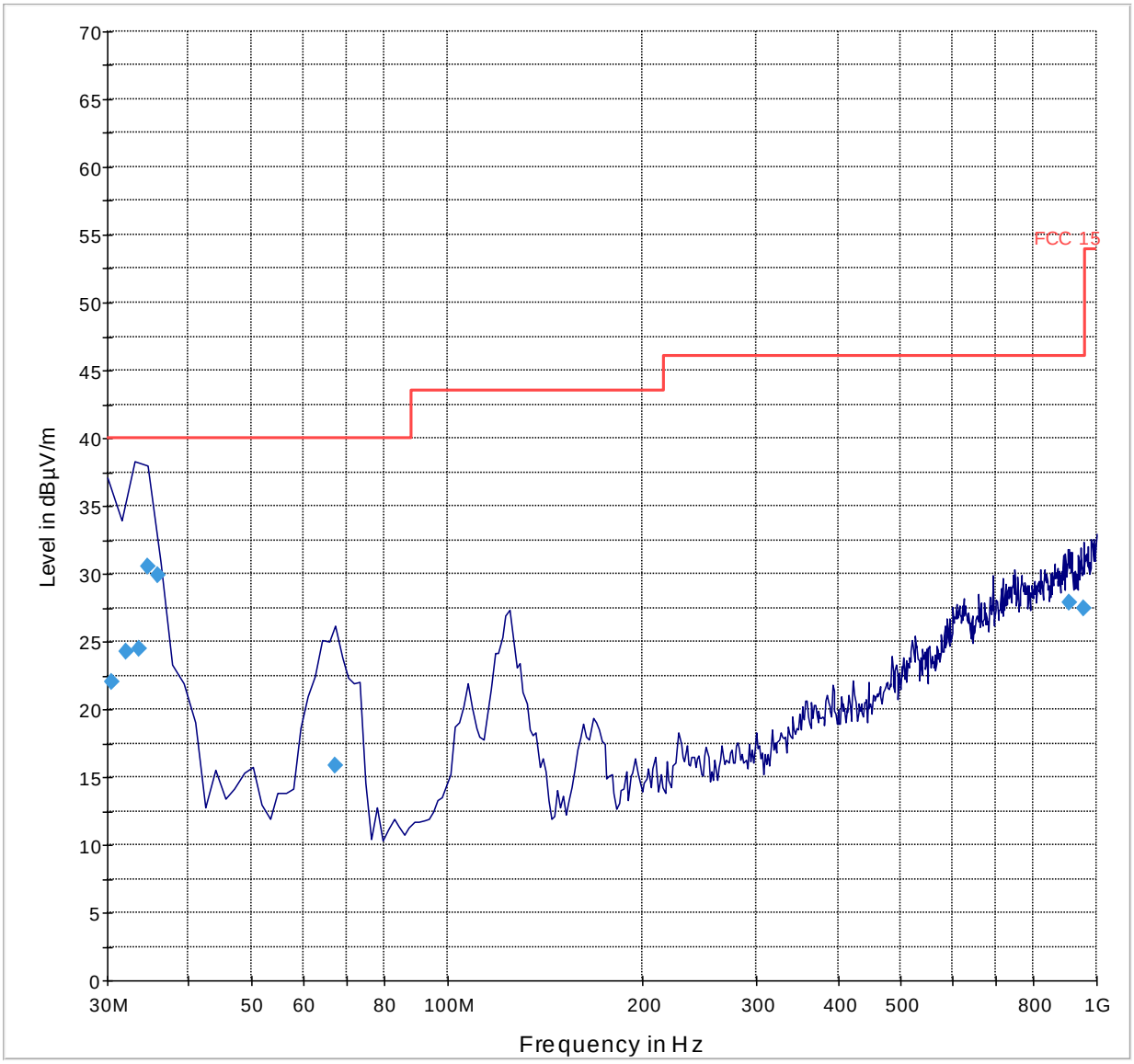
Unwanted Emissions into Restricted Frequency Bands, Radiated - 802.11b: Ch6- 1G-18GHz
Note: Signal over the limit is the carrier frequency



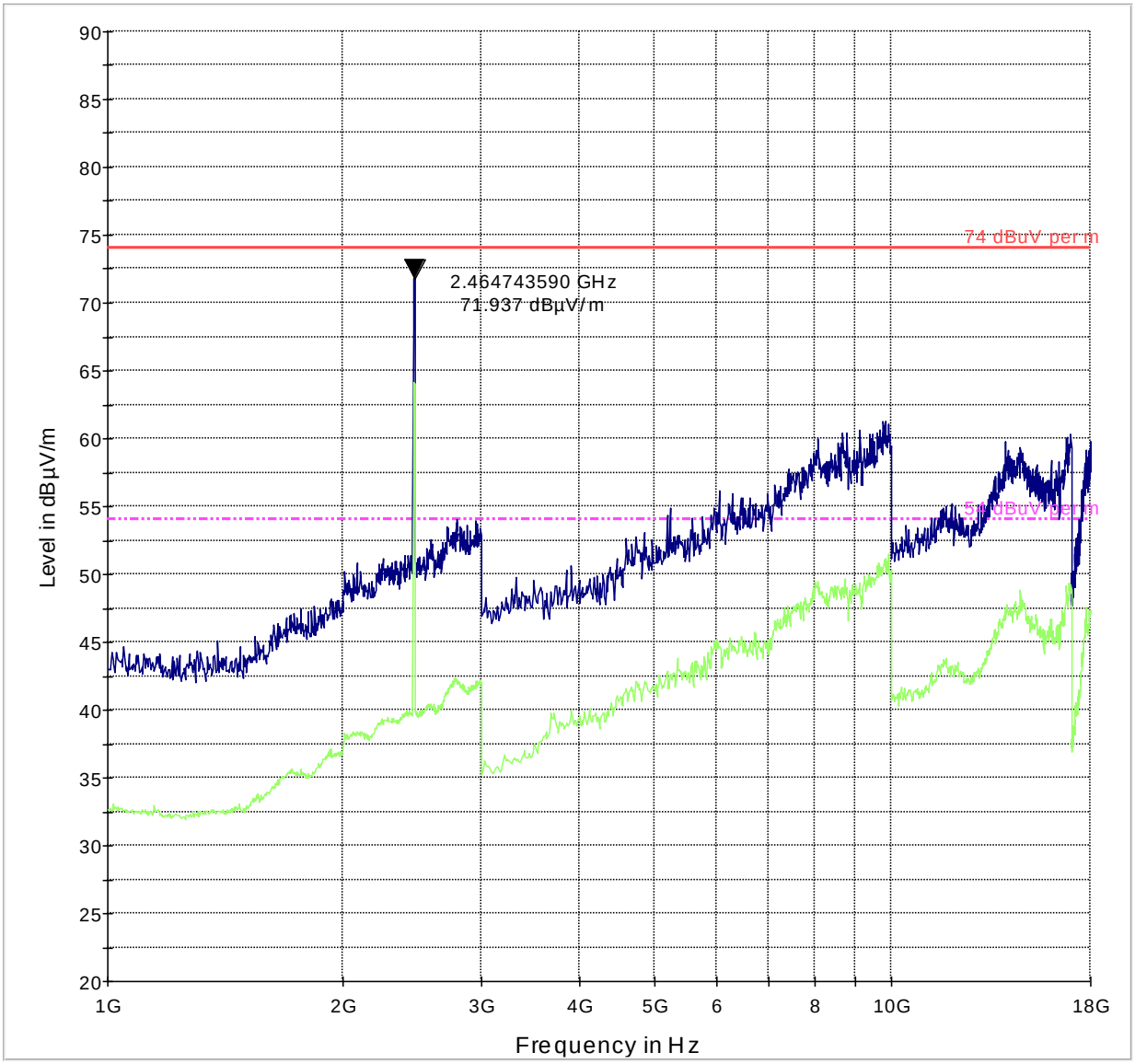
Unwanted Emissions into Restricted Frequency Bands, Radiated - 802.11b: Ch6- 18G-26GHz
NOTE: Worst case for all channels and operating modes in this frequency band.



Unwanted Emissions into Restricted Frequency Bands, Radiated - 802.11b: Ch11- 30M-1GHz

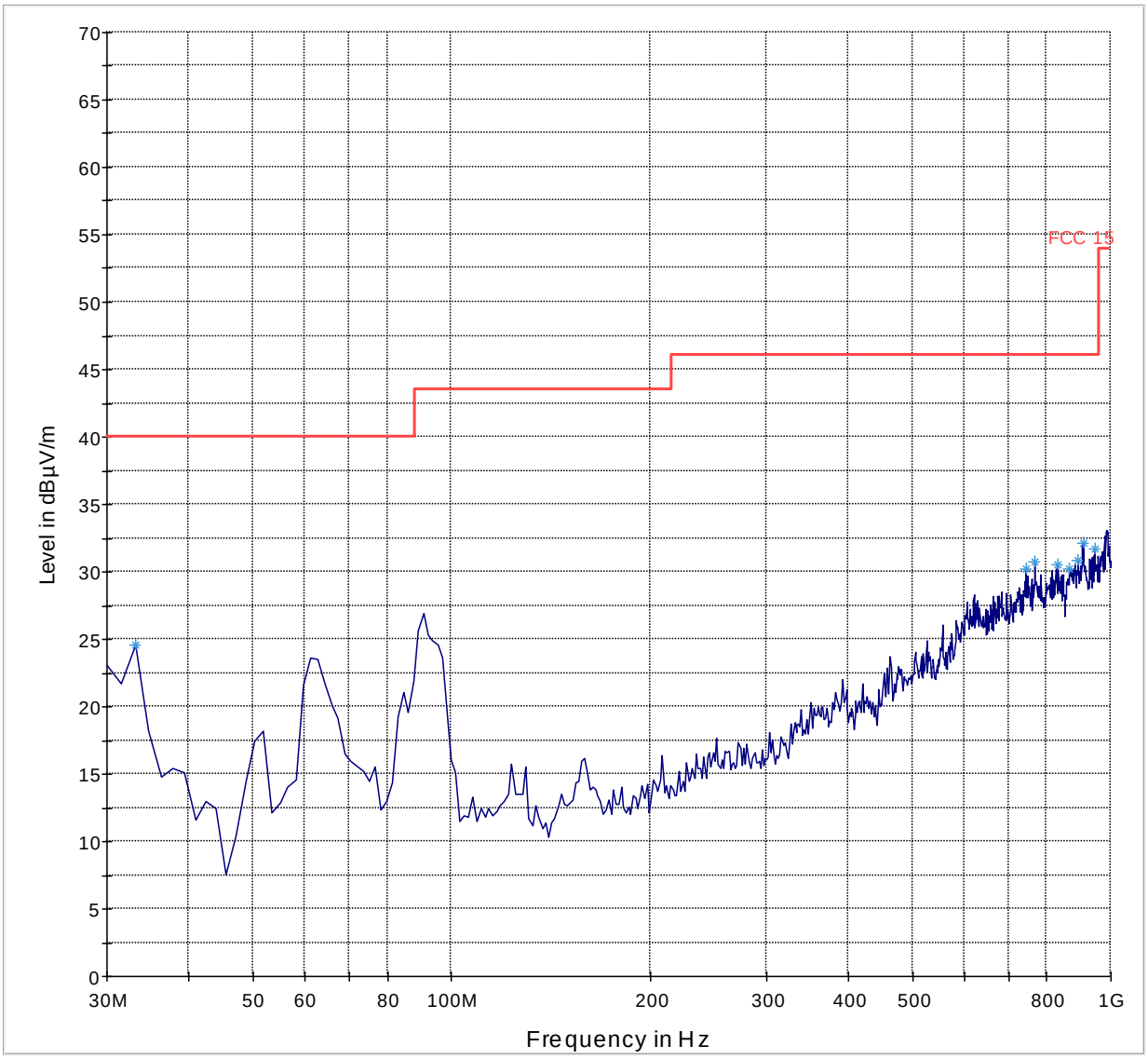


Unwanted Emissions into Restricted Frequency Bands, Radiated - 802.11b: Ch11- 1G-18GHz
Note: Signal over the limit is the carrier frequency

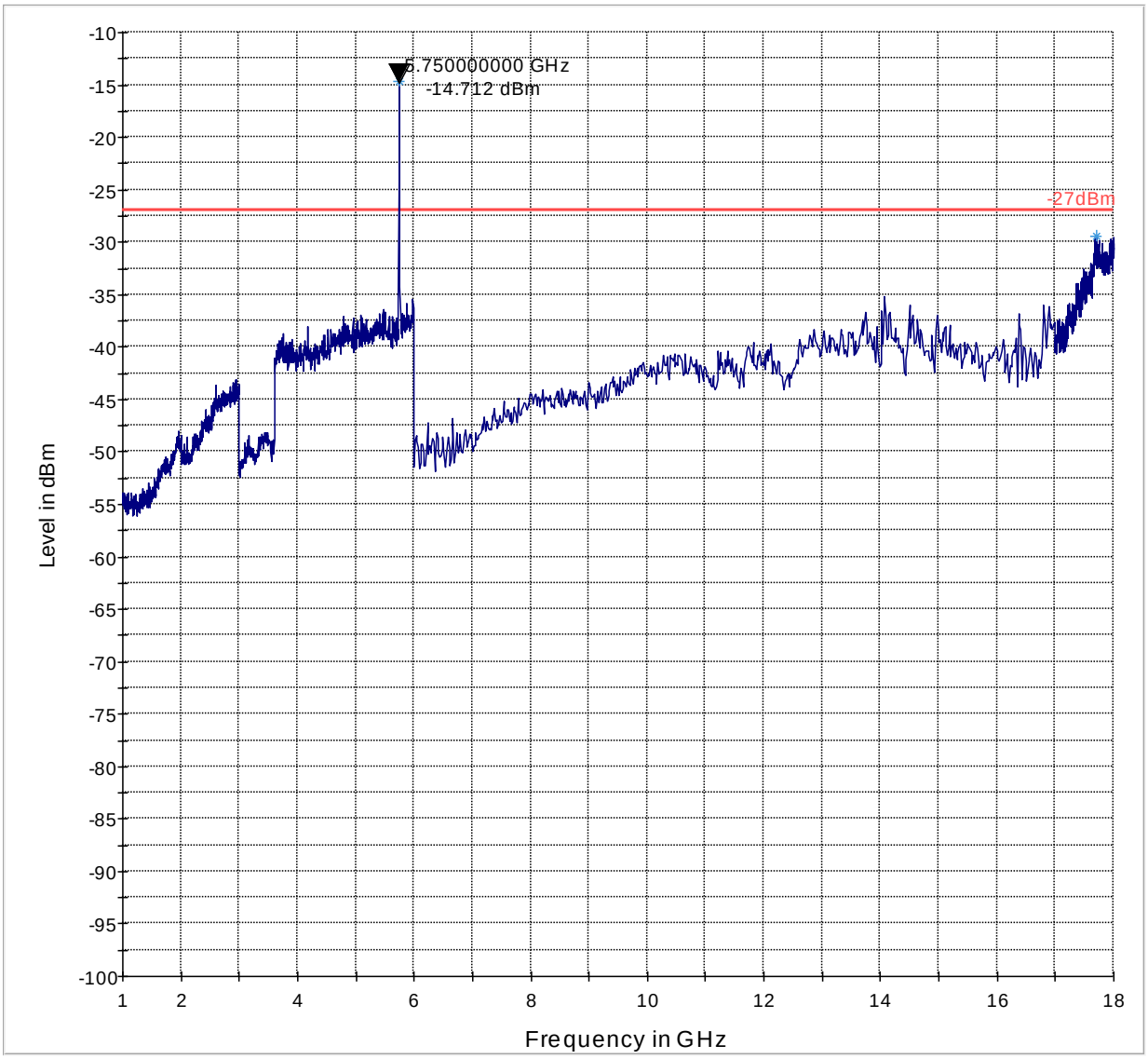


6.8.6.2 WiFi 5 GHz

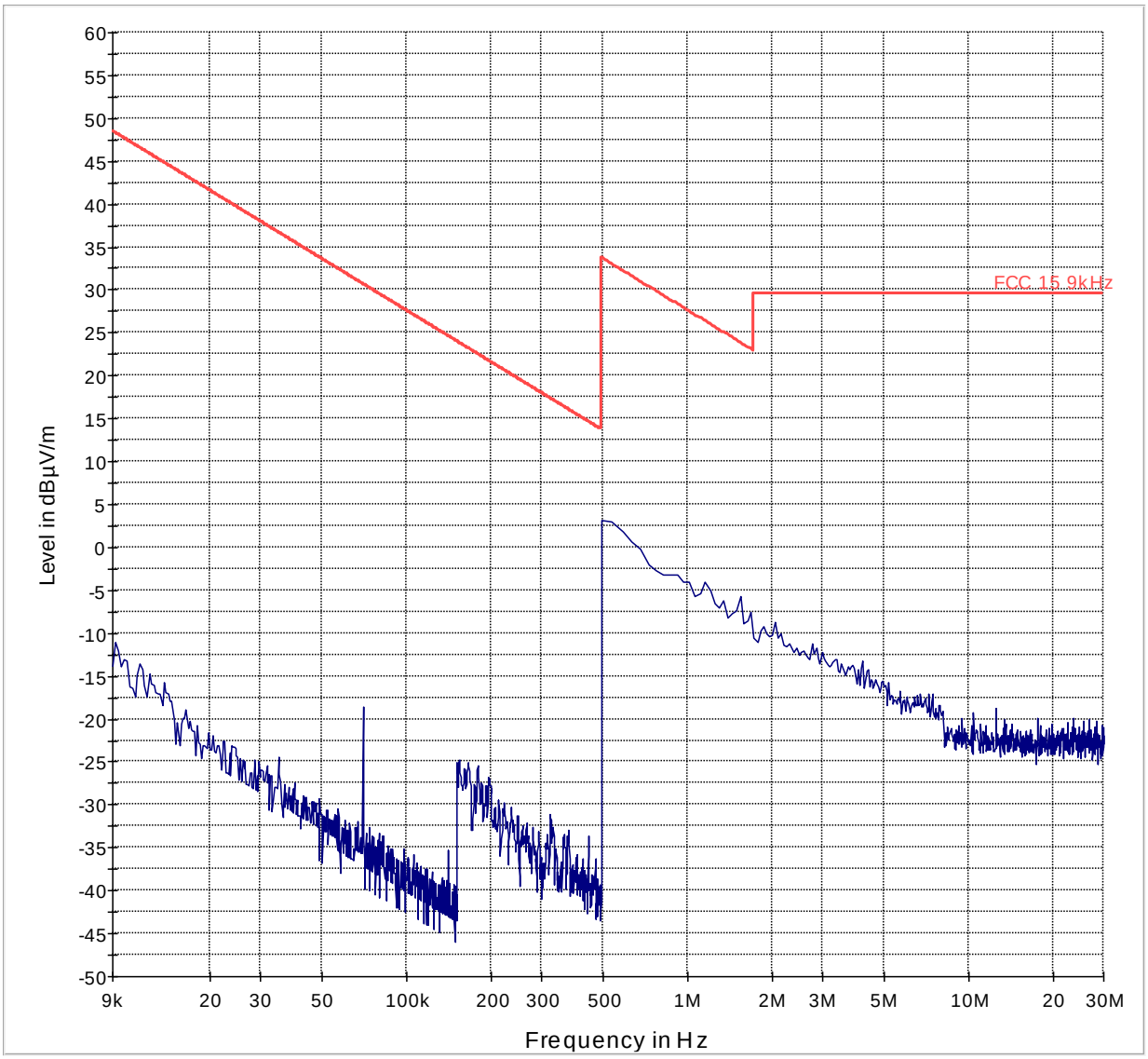
Unwanted Emissions into Restricted Frequency Bands, Radiated - 802.11a: Ch149- 30M-1GHz



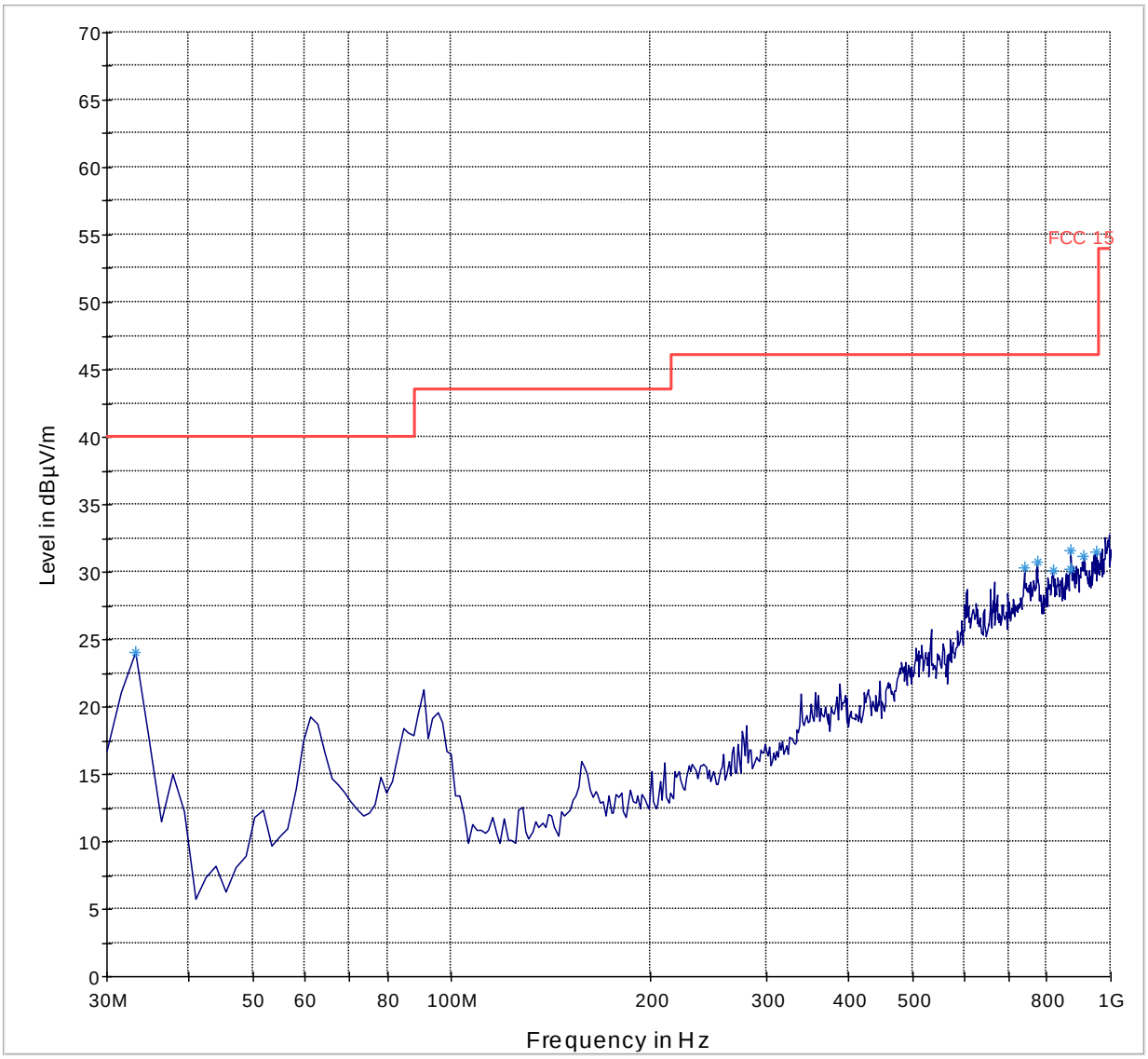
Unwanted Emissions into Restricted Frequency Bands, Radiated - 802.11a: Ch149- 1G-18GHz
Note: Signal over the limit is the carrier frequency



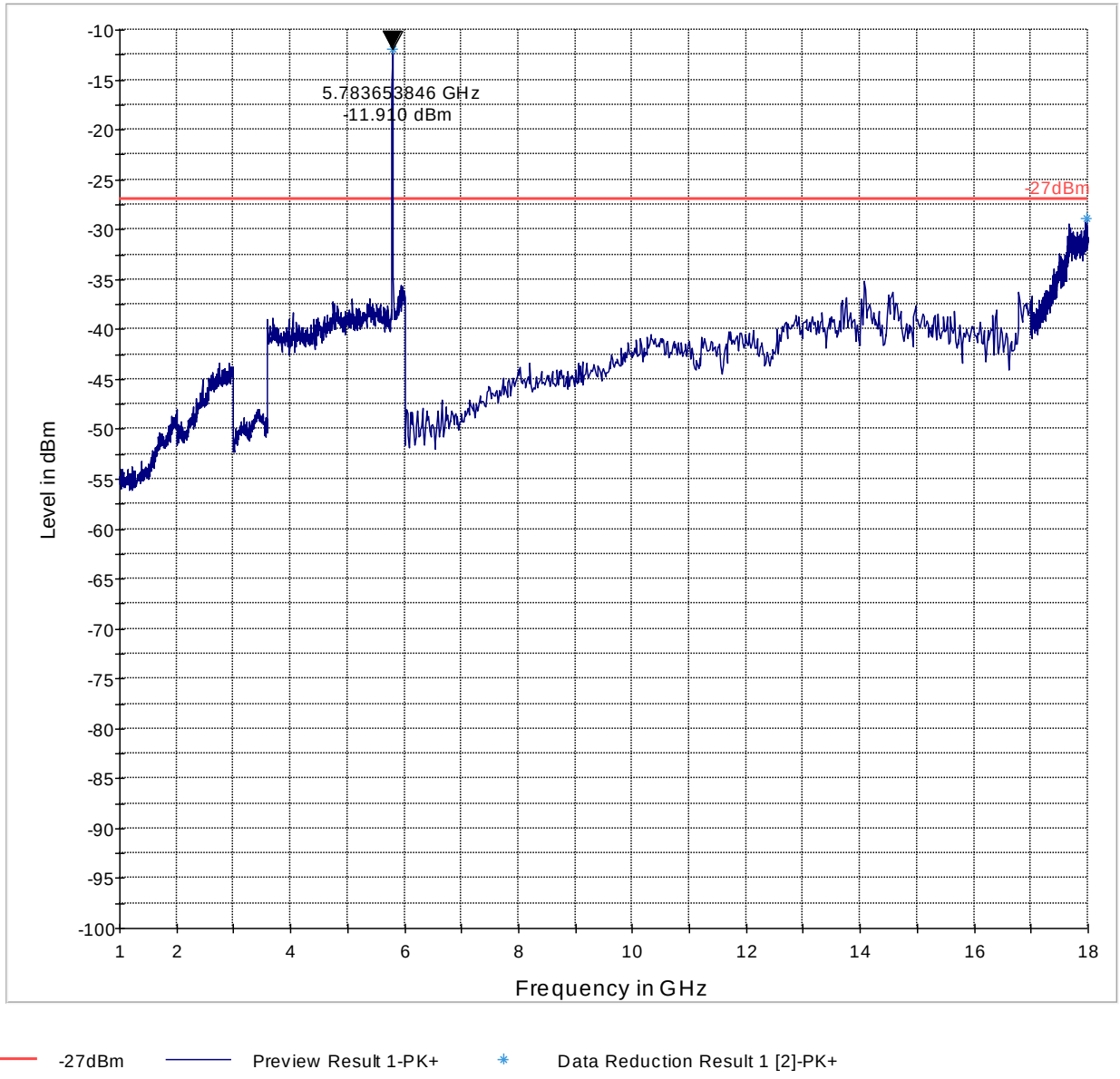
Unwanted Emissions into Restricted Frequency Bands, Radiated - 802.11a: Ch157- 9k-30MHz



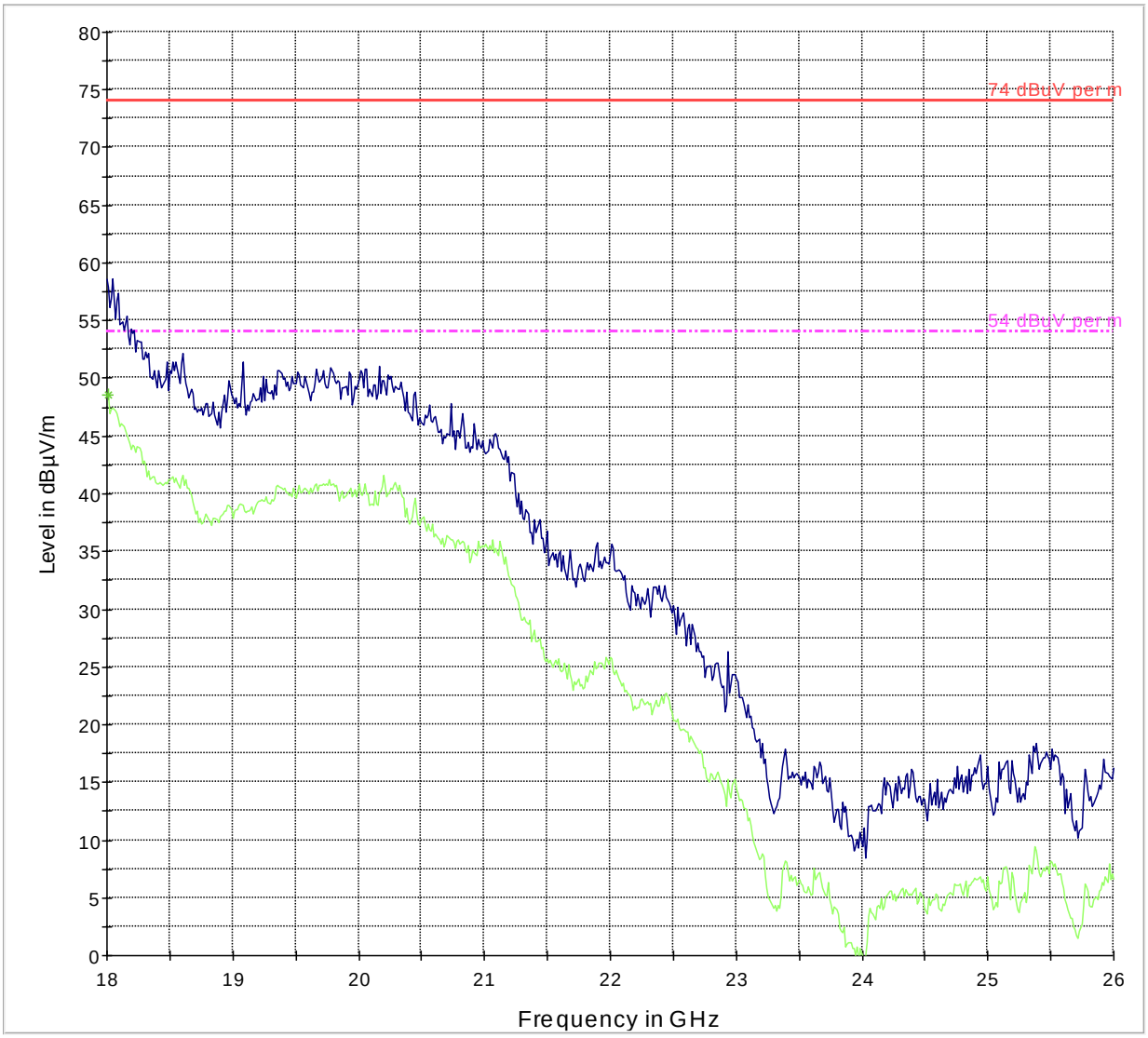
Unwanted Emissions into Restricted Frequency Bands, Radiated - 802.11a: Ch157- 30M-1GHz



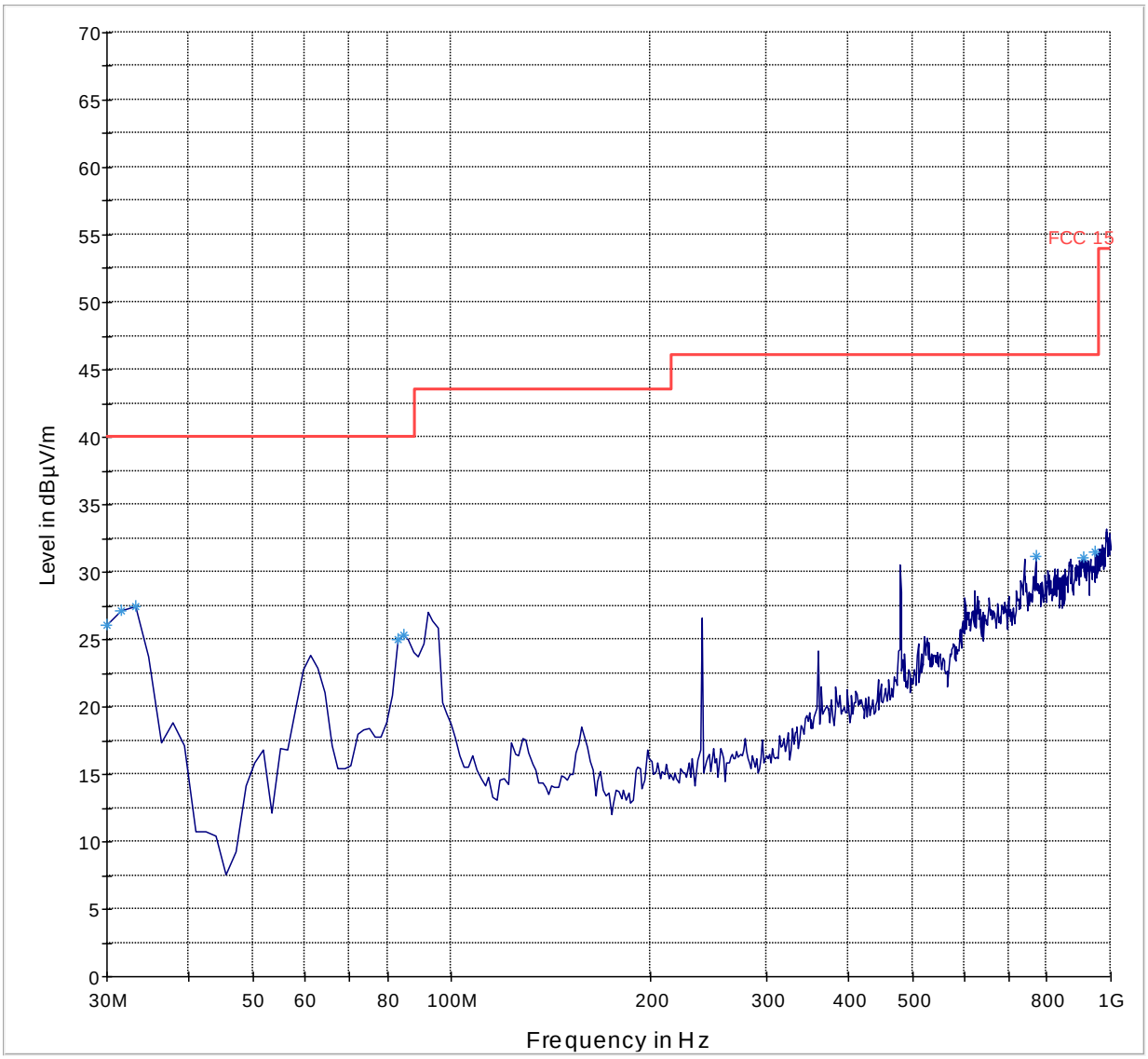
Unwanted Emissions into Restricted Frequency Bands, Radiated - 802.11a: Ch157- 1G-18GHz
Note: Signal over the limit is the carrier frequency



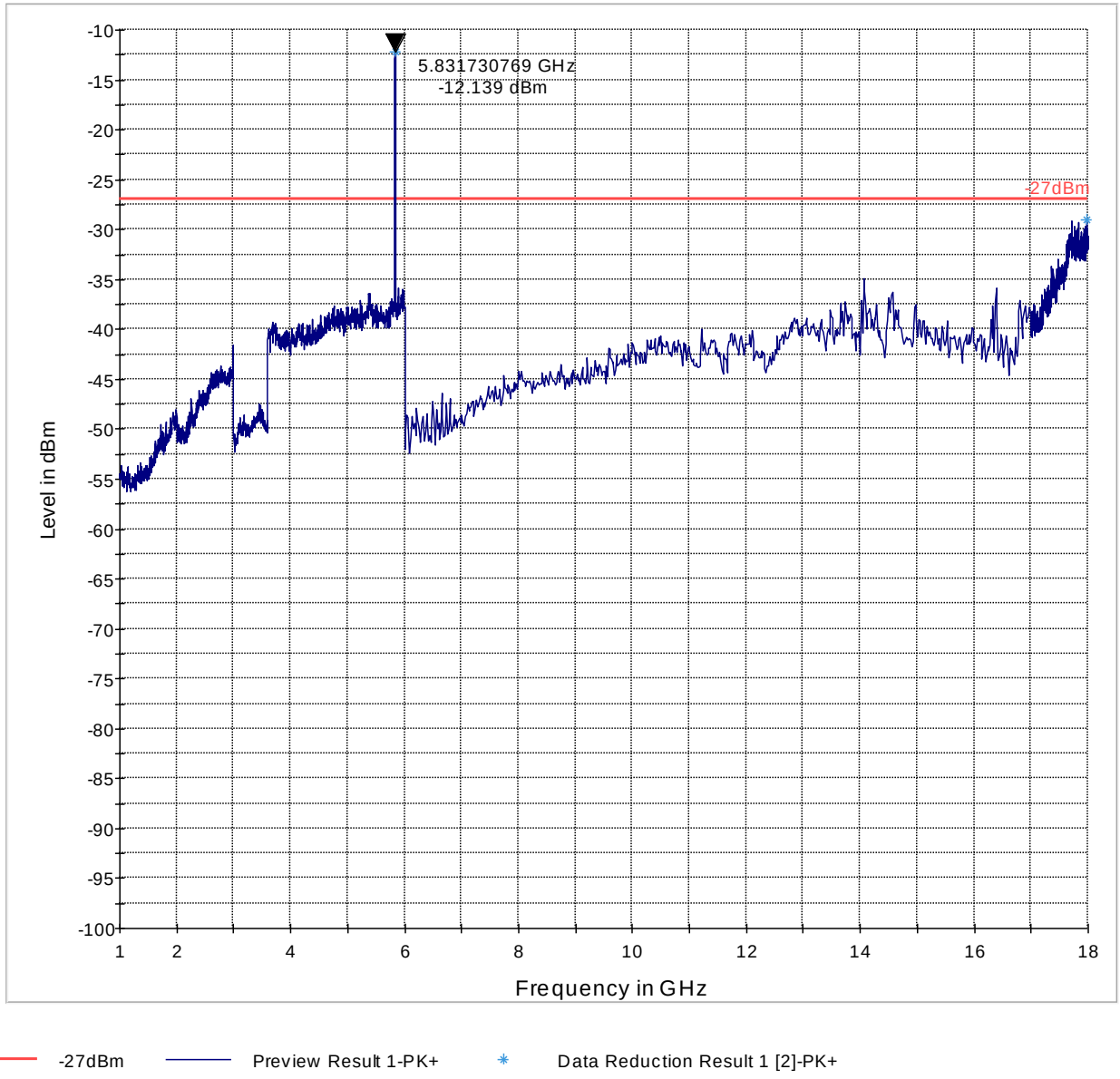
Unwanted Emissions into Restricted Frequency Bands, Radiated - 802.11a: Ch157- 18G-26GHz



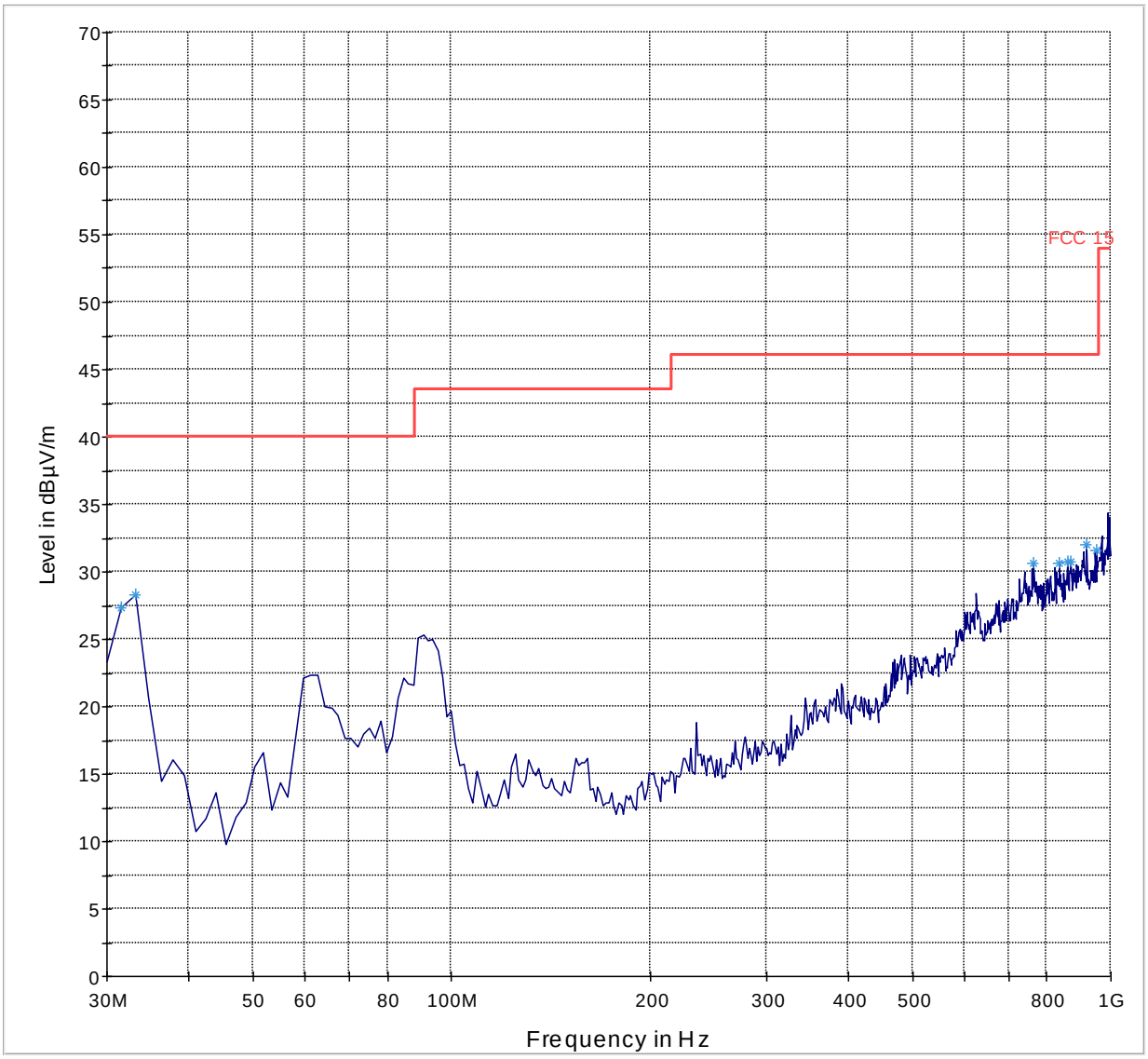
Unwanted Emissions into Restricted Frequency Bands, Radiated - 802.11a: Ch165- 30M-1GHz



Unwanted Emissions into Restricted Frequency Bands, Radiated - 802.11a: Ch165- 1G-18GHz
Note: Signal over the limit is the carrier frequency

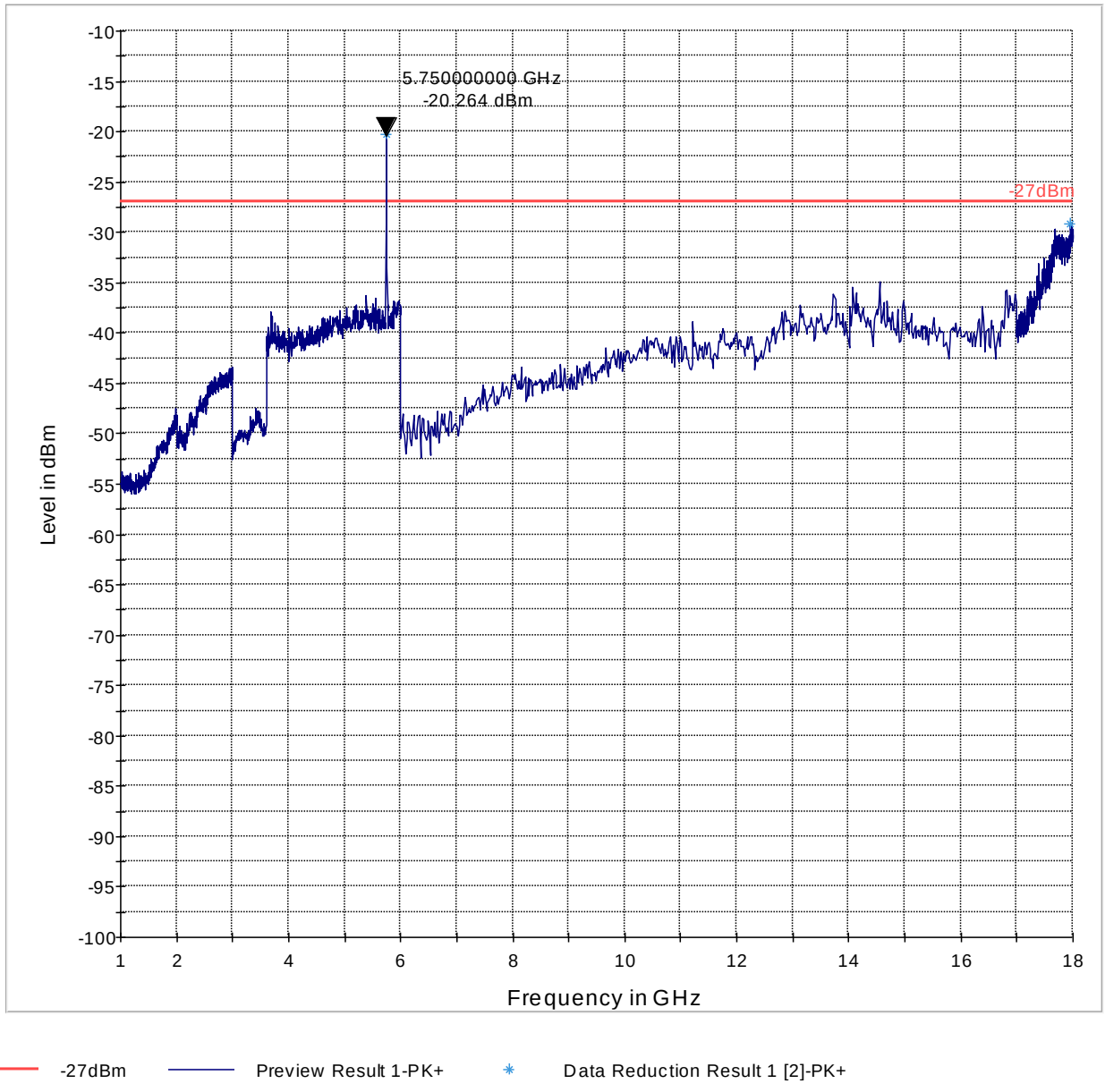


Unwanted Emissions into Restricted Frequency Bands, Radiated - 802.11n (HT20): Ch149- 30M-1GHz

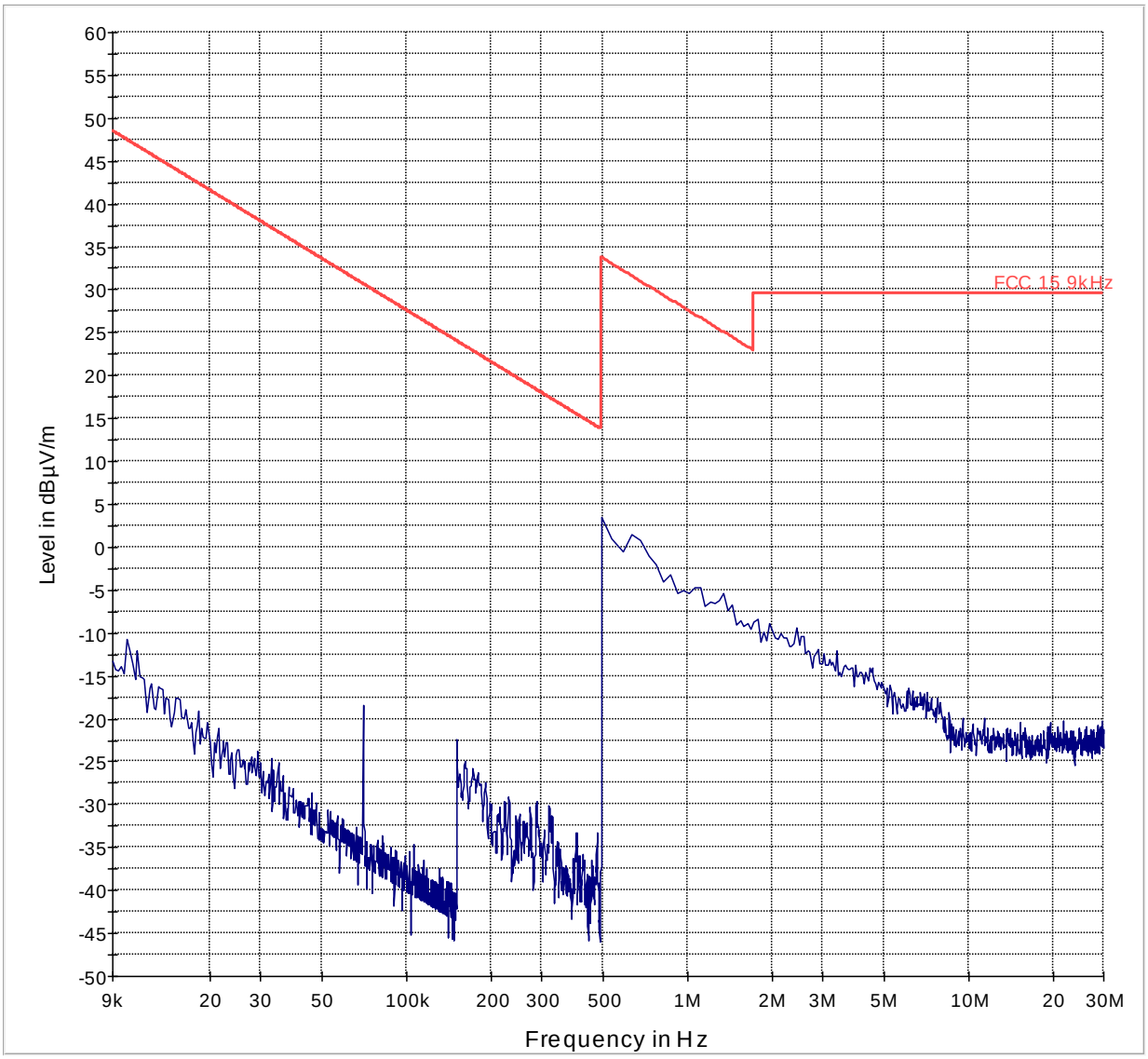


Unwanted Emissions into Restricted Frequency Bands, Radiated - 802.11n (HT20): Ch149- 1G-18GHz

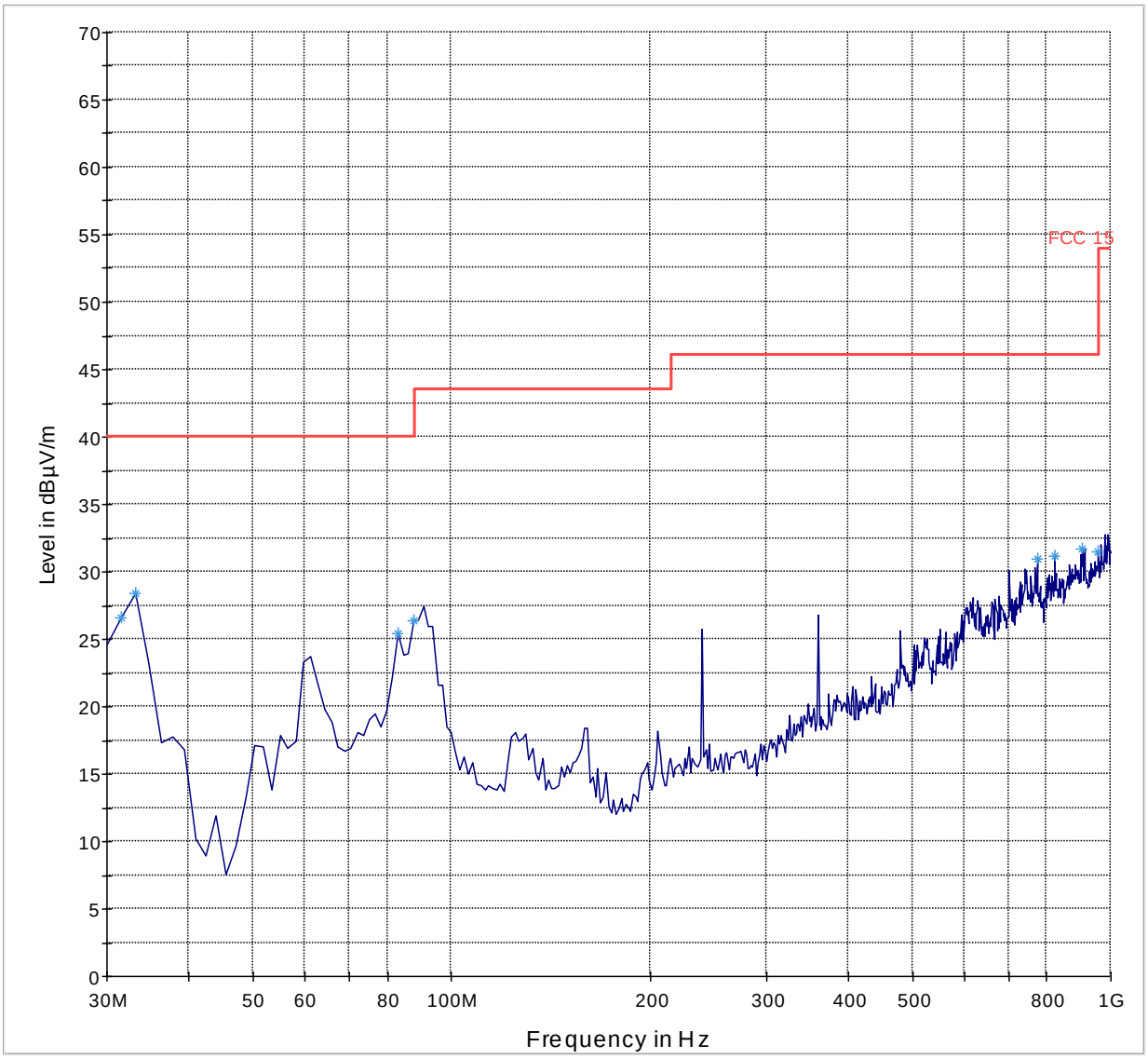
Note: Signal over the limit is the carrier frequency



Unwanted Emissions into Restricted Frequency Bands, Radiated - 802.11n (HT20): Ch157- 9k-30MHz

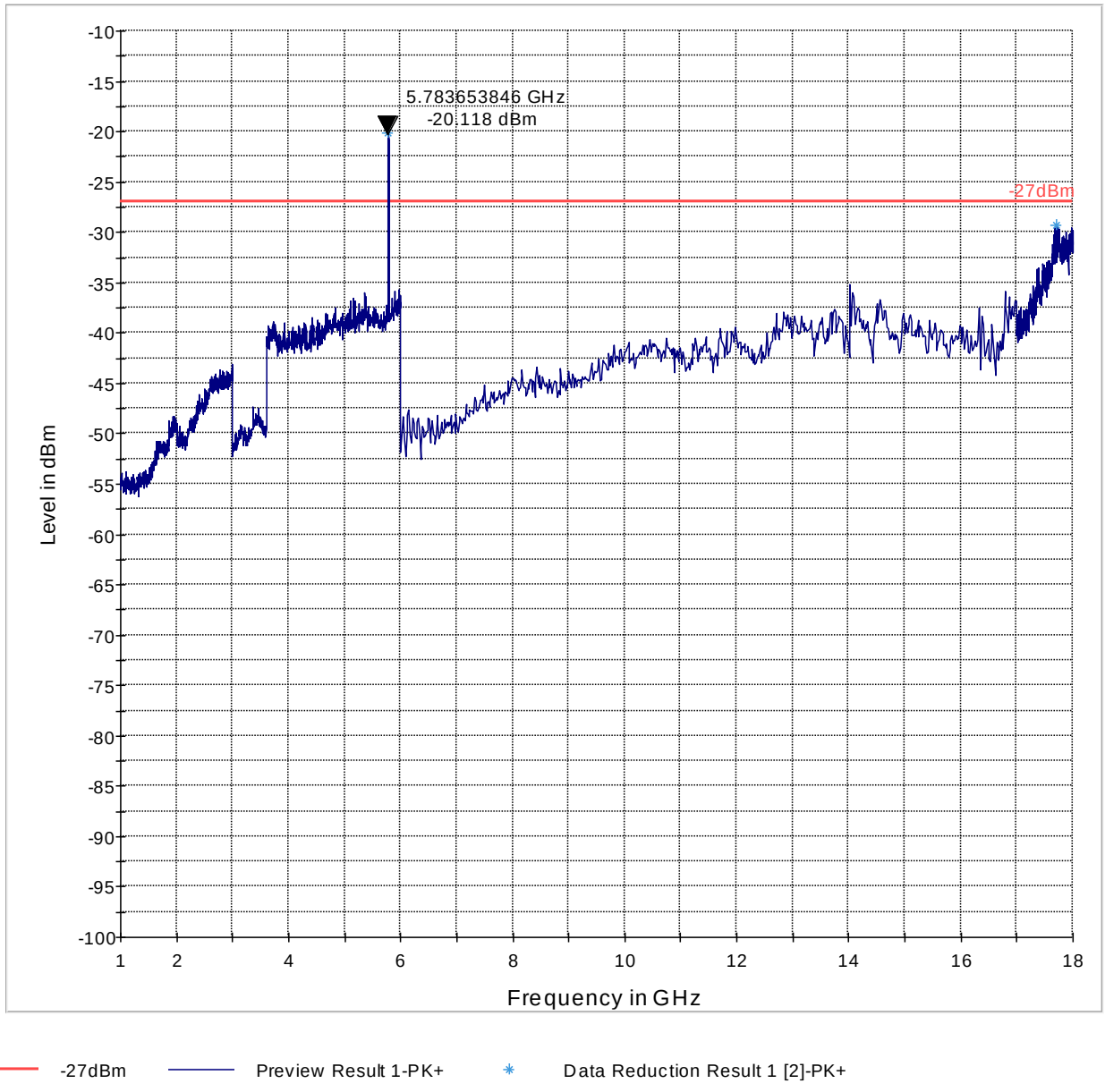


Unwanted Emissions into Restricted Frequency Bands, Radiated - 802.11n (HT20): Ch157- 30M-1GHz

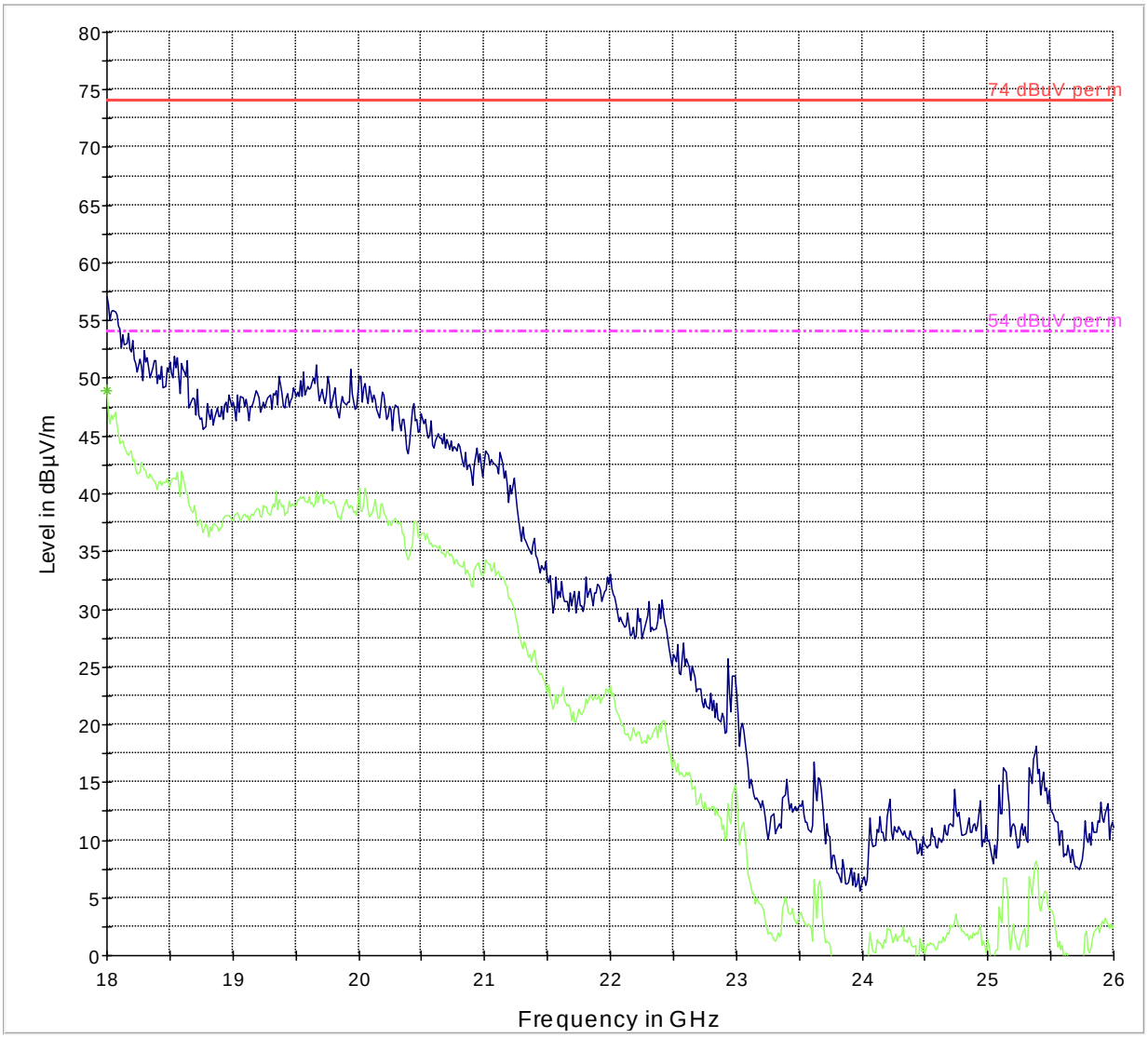


Unwanted Emissions into Restricted Frequency Bands, Radiated - 802.11n (HT20): Ch157- 1G-18GHz

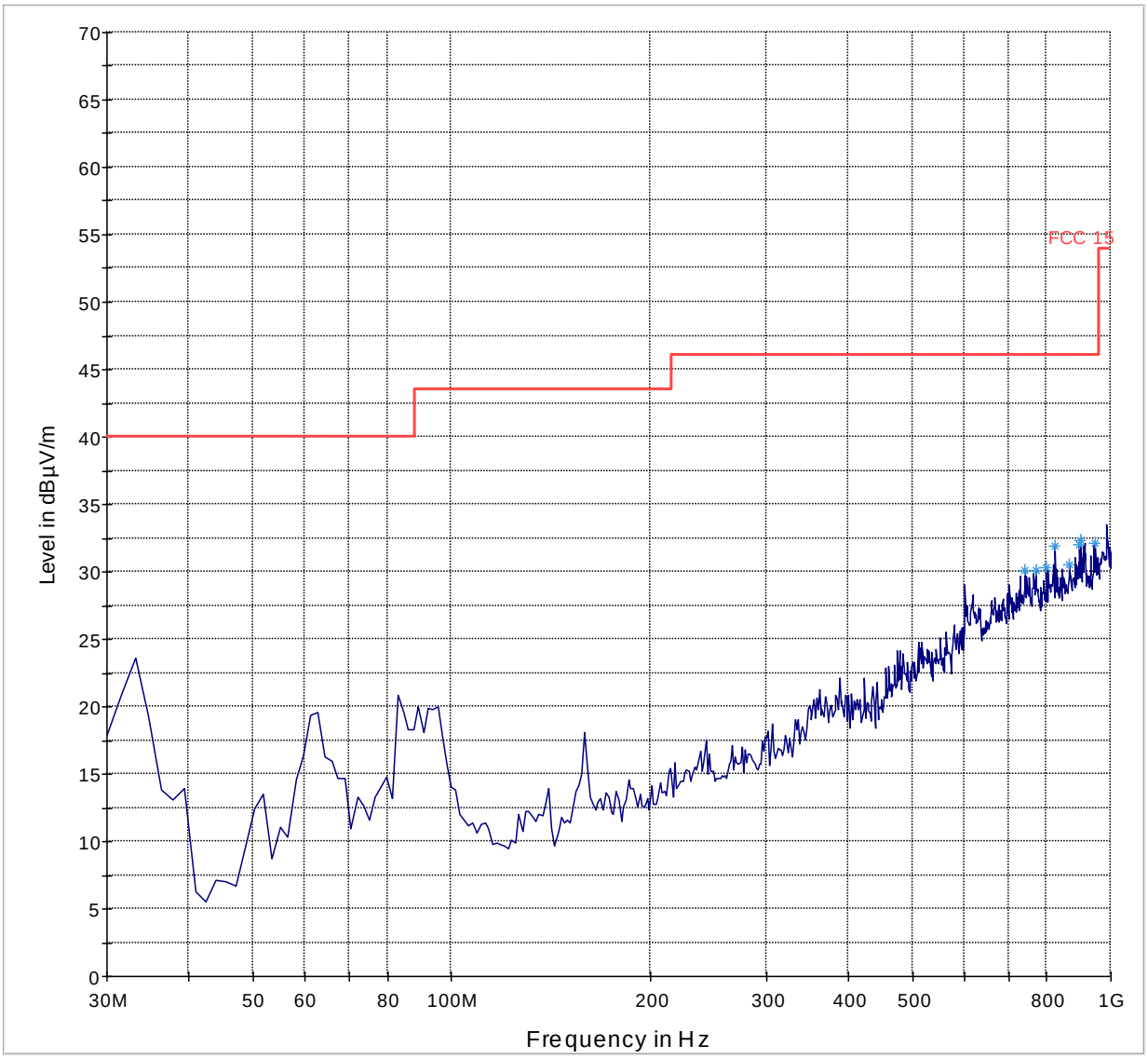
Note: Signal over the limit is the carrier frequency



Unwanted Emissions into Restricted Frequency Bands, Radiated - 802.11a: Ch157- 18G-26GHz

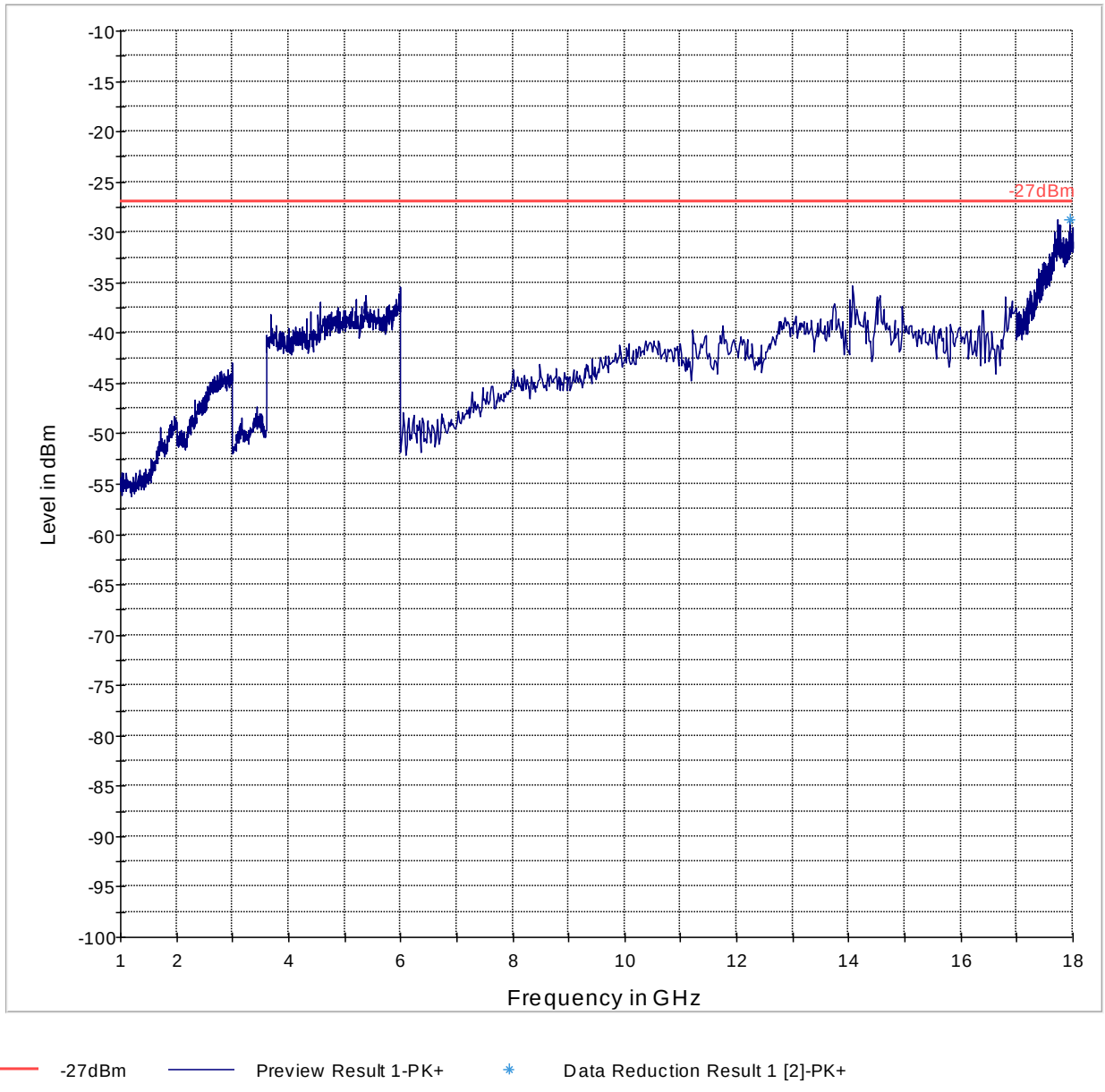


Unwanted Emissions into Restricted Frequency Bands, Radiated - 802.11n (HT20): Ch165- 30M-1GHz



Unwanted Emissions into Restricted Frequency Bands, Radiated - 802.11n (HT20):
Ch165- 1G-18GHz

Note: Signal over the limit is the carrier frequency



6.9 AC Power Line Conducted Emissions

6.9.1 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.

6.9.2 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.

6.9.3 Test Conditions:

Modulation: 802.11g mode.
Measurement Uncertainty: ±3.0dB

6.9.4 Results

All emissions are below applicable limits.

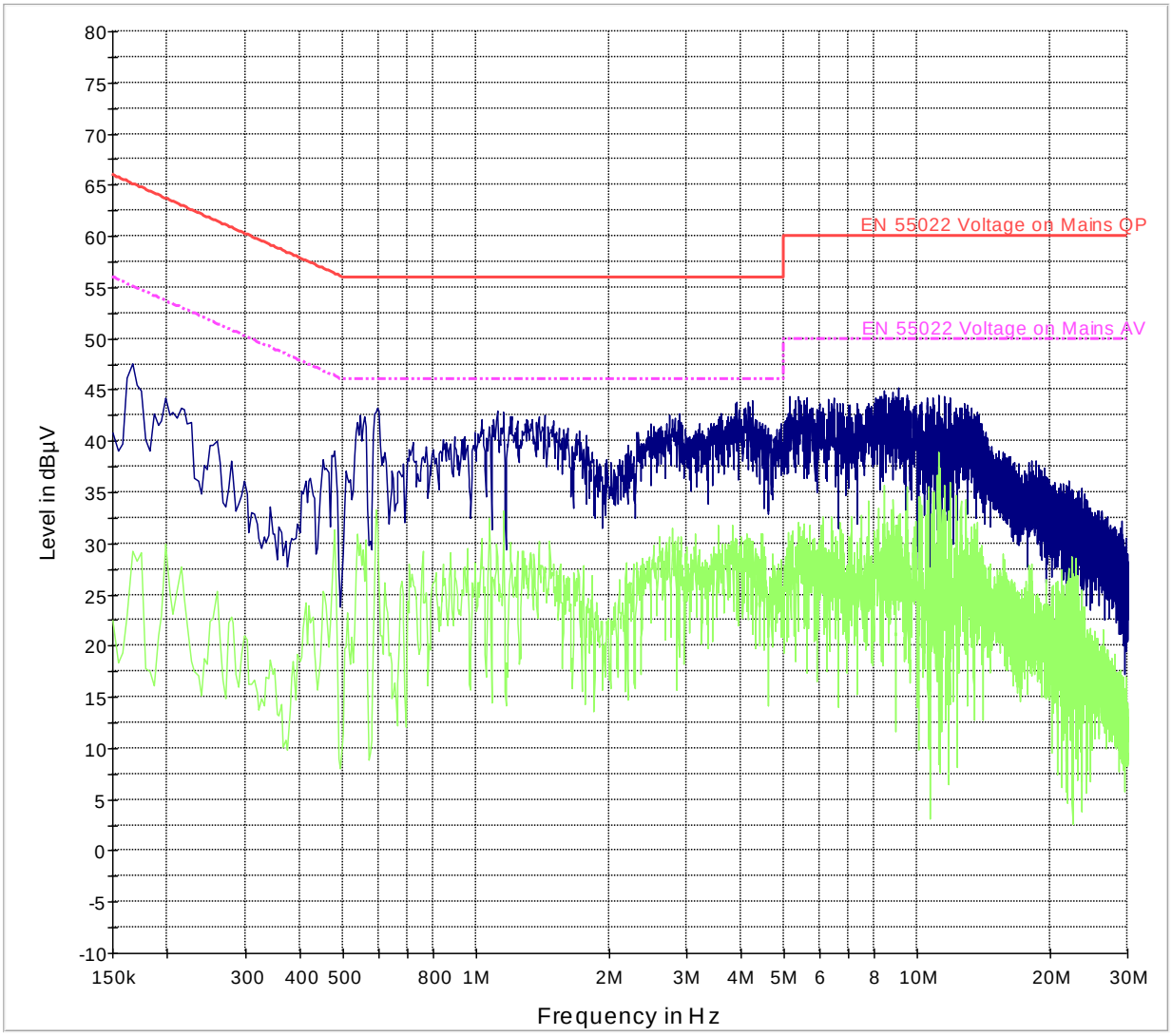
Plots shown here represent the combined worse case emissions for power lines, phases and neutral line.

6.9.5 Measurement Verdict – AC Power Line Conducted Emissions

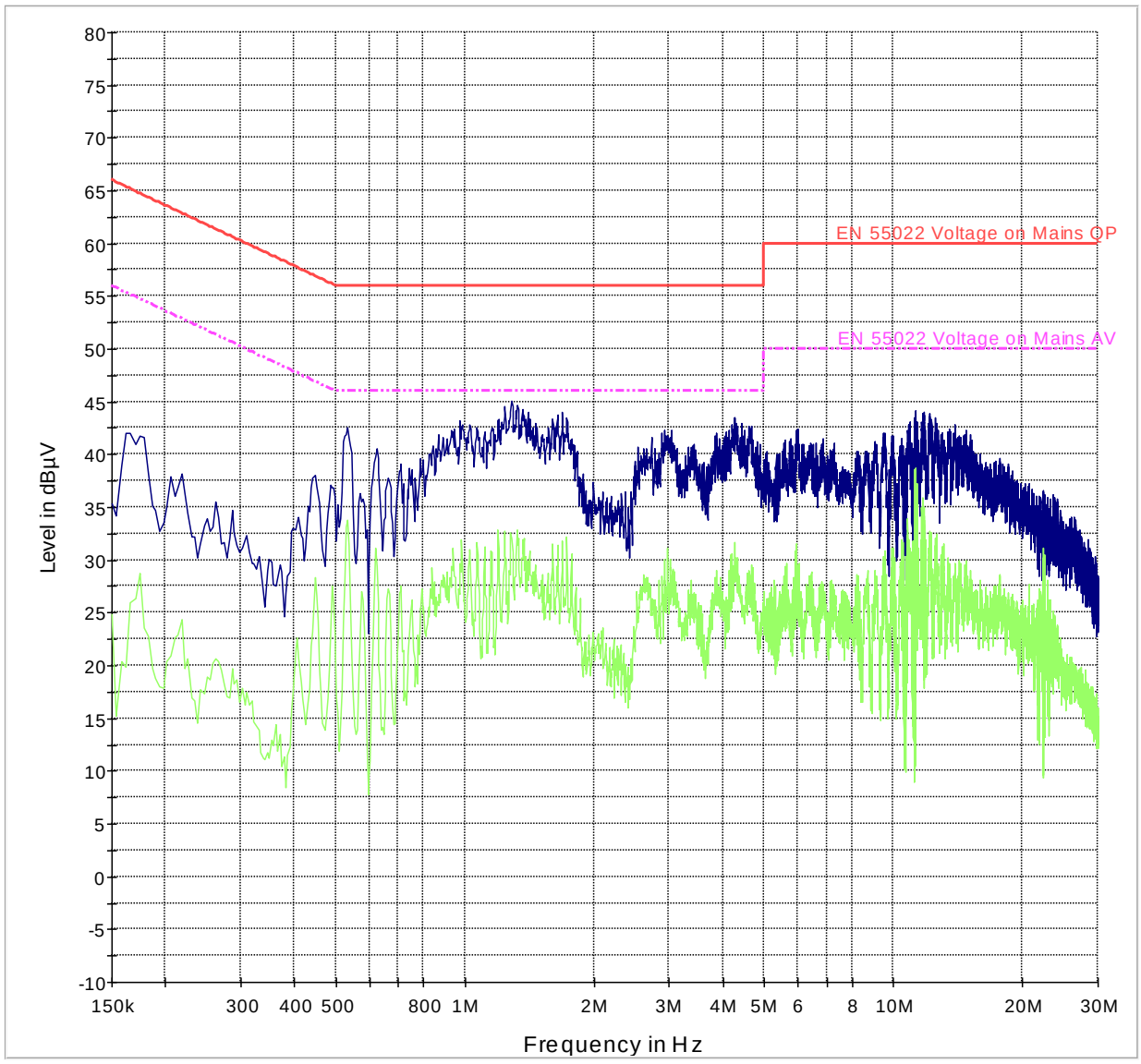
Pass.

6.9.6 Test data/plots:

6.9.6.1 2.4GHz WLAN TX Mode:



6.9.6.2 5GHz WLAN TX Mode



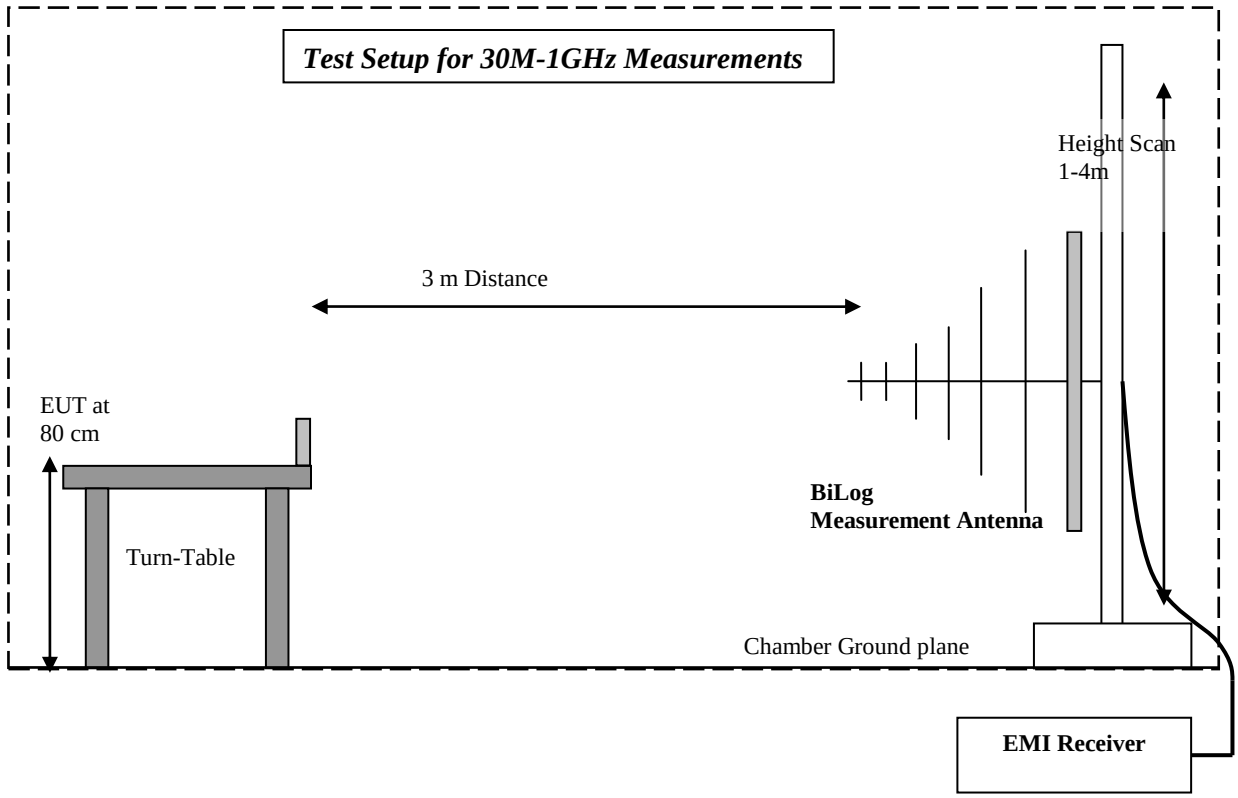
EN 55022 Voltage on Mains QP
Preview Result 1-PK+
EN 55022 Voltage on Mains AV
Preview Result 2-AVG

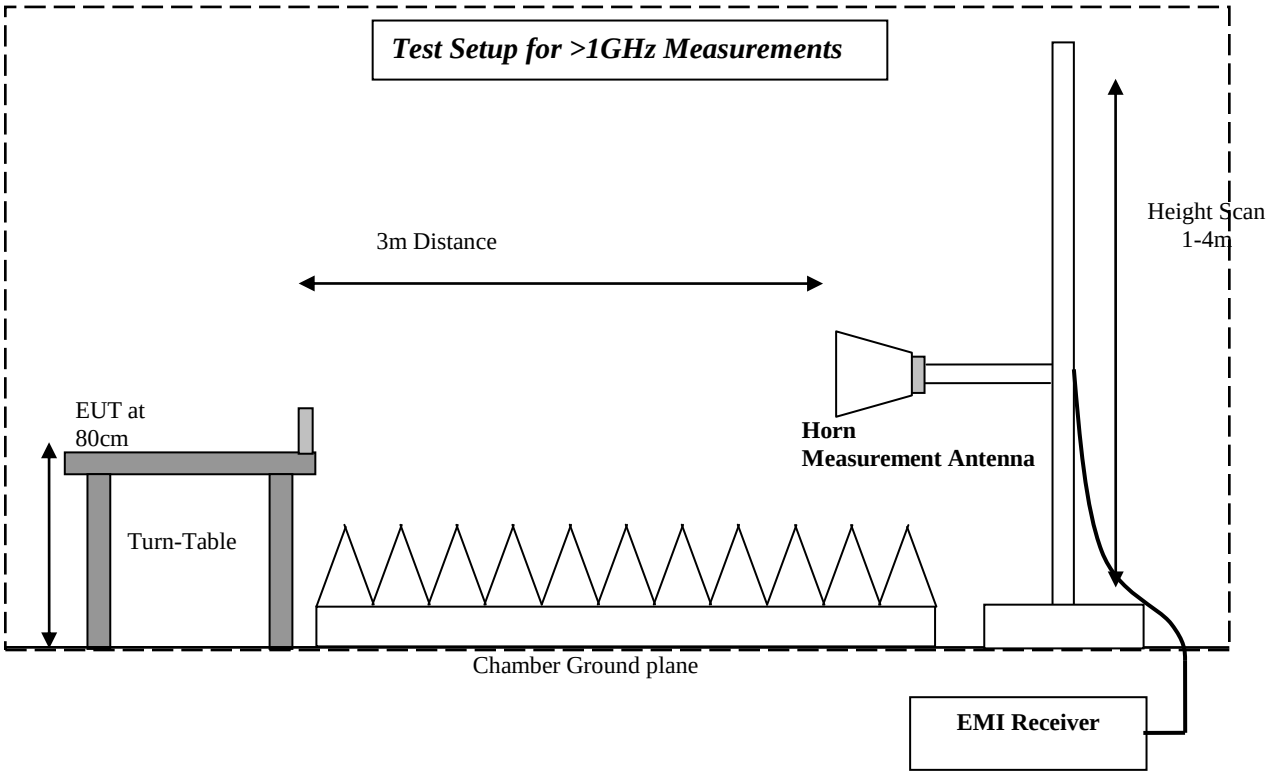
7 Test Equipment and Ancillaries used for tests

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	100251	May 2012	1 Year
	Spectrum Analyzer	Rohde&Schwarz	FSU	200302	May 2011	2 Years
	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	1 Year
Ancillary equipment						
	Multimeter	Klein Tools	MM200	001	Apr 2011	2 Years
	Humidity Temperature Logger	Dickson	TM320	03280063	Mar 2012	1 Year
	Digital Barometer	VWR	35519-055	91119547	Nov 2011	2 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

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.

8 Test Setup Diagrams





9 Revision History

Date	Report Name	Changes to report	Report prepared by
2013-08-29	EMC_INTEL-032-13001_DTS	First Version	Daniel Salinas