FCC Test Report

Test report no.: EMC_831FCC15.247_2005_5745_5825_FC_PA

FCC Part 15.247 / CANADA RSS-210

EUT: WLAN Model: BCM94318MPAGH
HOST: Test Fixture (Modular Approval)
(C2P Change to add Fairchild PA)
FCC ID: QDS-BRCM1017
IC ID: 4324A-BRCM1017
(This test report covers freq. 5745-5825MHz)

Deutscher Akkreditierungs Rat DAR

TTI-P-G 081/94-A0

Accredited according to **ISO/IEC 17025**

Bluetooth

Bluetooth Qualification Test Facility (BQTF)

CTIA Authorized Test Lab
LAB CODE 20020328-00

FCC listed # 101450

IC recognized # 3925

***CETECOM* Inc.**
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1 General information

1.1 Notes

The test results of this test report relate exclusively to the test item specified in 1.5. The 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 the CETECOM Inc USA.

TEST REPORT PREPARED BY:
EMC Engineer: Harpreet Sidhu

1.2 Testing laboratory

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1.3 Details of applicant

Name	**:**	**Broadcom corporation**
Street	**:**	**190 Mathilda Place**
City / Zip Code	**:**	**Sunnyvale, CA 94086**
Country	**:**	**USA**
Contact	**:**	**Dan Lawless**
Telephone	**:**	**408-922-5870**
Tele-fax	**:**	**408-543-3399**
e-mail	**:**	**dlawless@broadcom.com**

1.4 Application details

Date of receipt test item	:	2005-03-14
Date of test	:	2005-03-14/15/17/18/22

1.5 Test item

Manufacturer	:	Applicant
Model No. (EUT)	:	BCM94318MPAGH
Host	:	Test Fixture
Description	:	WLAN MiniPCI Multiband card incorporating 2.4GHz and 5GHz radios
FCC ID	:	QDS-BRCM1017
IC ID	:	4324A-BRCM1017
Additional information		
Frequency	:	2412MHz – 2472MHz for 2.4GHz band (not covered in this test report) 5180MHz – 5320MHz for 5GHz band (not covered in this test report) 5745MHz – 5825MHz for 5GHz band (covered in this test report)
Type of modulation	:	DSSS / OFDM (orthogonal frequency division multiplexing)
Number of channels	:	13 for 2.4GHz band 13 for 5GHz band
Antenna	:	5.7dBi max. gain Stamped metal sheet antenna for 5745-5825GHz band (Hitachi model HFT17-DL03)
Power supply	:	3.3 VDC from Host
Output power	:	14.11dBm (25.76mW) conducted power for 5745-5825GHz
Extreme temp. Tolerance	:	0^{o}C to +70^{o}C

1.6 Test standards: **FCC Part 15 §15.247 / CANADA RSS-210**

Measurements done as per DA 02-2138 / FCC04-165

PROJECT OVERVIEW:

This test report carries all radiated measurements required as per FCC 15.247 for doing a class-2 permissive change on WLAN mini PCI card model# BCM94318MPAGH tested in test fixture as per DA001407 requirements for modular transmitter approval. Conducted power was measured and found within limits of C2P change rules.

Following are the changes filed under this application;

Change #1 Adding alternate Fairchild power amp. The associated layout and filter circuitry is the same. The average power in packet is maintained the same as the original filing.

All measurements are done with under-mentioned max gain antennas for each band. WLAN was tested for spurious emissions at different data rates. Test report shows only worst-case test results of all data rates with following power levels.

802.11a Mode:
Channels 36-48:12.0dBm
Channels 52-64:15.0dBm
Channel 149-165:15.0dBm

Antenna Manufacturer	Antenna Type	Model	Peak gain @ 2400-2483.5MHz	Peak gain 5150-5350MHz	Peak gain @ 5725-5850
WNC	Stamped metal sheet	81.ED415.002	3.24dBi (Main)	1.51dBi (Main)	Main -0.35dBi
Hitachi	Stamped metal sheet	HFT17-DL03	Main 1.5 (H)	Main 5.1 (V)	Main 5.7 (V+H)

For more information on antennas covered under this C2P change please refer to *BCM94318MPAGH_C2P_Fairchild_PA_Declaration_worst_case_antenna*

2 Technical test

2.1 Summary of test results

No deviations from the technical specification(s) were ascertained in the course of the tests Performed	
Final Verdict: (Only “passed” if all single measurements are “passed”)	**Passed**

Technical responsibility for area of testing:

Date	Section	Name	Signature
2005-04-08	EMC & Radio	Lothar Schmidt (Manager)	

Responsible for test report and project leader:

Date	Section	Name	Signature
2005-04-08	EMC & Radio	Harpreet Sidhu (EMC Engineer)	

2.2 Test report

TEST REPORT

Test report no.: EMC_831FCC15.247_2005_5745_5825_FC_PA

TEST REPORT REFERENCE

LIST OF MEASUREMENTS		PAGE
OUTPUT POWER	§ 15.247 (b) (3)	8
EMISSION LIMITATIONS	§ 15.247 (d)	10
Hitachi FPC antenna		11
CONDUCTED EMISSIONS	§ 15.107/207	24
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OUTPUT POWER **§ 15.247 (b) (3)**
(Conducted)
***Measurement procedure as per DA 02-2138 is used as directed by FCC 04-165.**
Test Procedure:
DA 02-2138 Test method-3

TEST CONDITIONS		OUTPUT POWER (dBm)			
Frequency (MHz)			5745	5805	5825
T_{nom}(23)°C	V_{nom}(3.3) VDC	Av	*14.11	*14.09	*13.83
Measurement uncertainty		±0.5dBm			

LIMIT **SUBCLAUSE § 15.247 (b) (3)**

Frequency range	RF power output
5725-5850 MHz	1.0 Watt / 30dBm

OUTPUT POWER (RADIATED) **§ 15.247 (b) (3)**

Measurement procedure as per DA 02-2138 is used as directed by FCC 04-165.

EIRP:

TEST CONDITIONS		OUTPUT POWER EIRP(dBm)		
Frequency (MHz)		5745	5805	5825
T_{nom}(23)°C	V_{nom}(3.3) VDC	19.81	19.79	19.53
Measurement uncertainty		±0.5dBm		

***Note: EIRP is calculated based on 5.7dBi antenna gain and conducted peak power measurements.**

LIMIT **SUBCLAUSE § 15.247 (b) (3)**

Frequency range	RF power output
5725-5850 MHz	30dBm on Conducted

EMISSION LIMITATIONS **§ 15.247 (d)**
Transmitter (Radiated)

LIMITS

In any 100 kHz bandwidth outside the frequency band at least 20dB below the highest level of the desired power. In addition, 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) (see §15.205(c)).

NOTE:
1. The radiated emissions were done with different settings, using the relevant pre-amplifiers for the relevant frequency ranges. This is the reason that the graphs show different noise levels. In the range between 3 and 40 GHz very short cable connections to the antenna was used to minimize the noise level.

2. All measurements are done in peak mode unless specified with the plots.

Results for the radiated measurements below 30MHz according § 15.33

Frequency	Measured values	Remarks
9KHz – 30MHz	No emissions found, caused by the EUT	This is valid for all the tested channels

Hitachi Stamped metal sheet antenna
(Freq. band: 5745-5825MHz, Gain: 5.7dBi, Model HFT17-DL03)

EMISSION LIMITATIONS - Radiated (Transmitter) § 15.247 (d)

30MHz – 1GHz

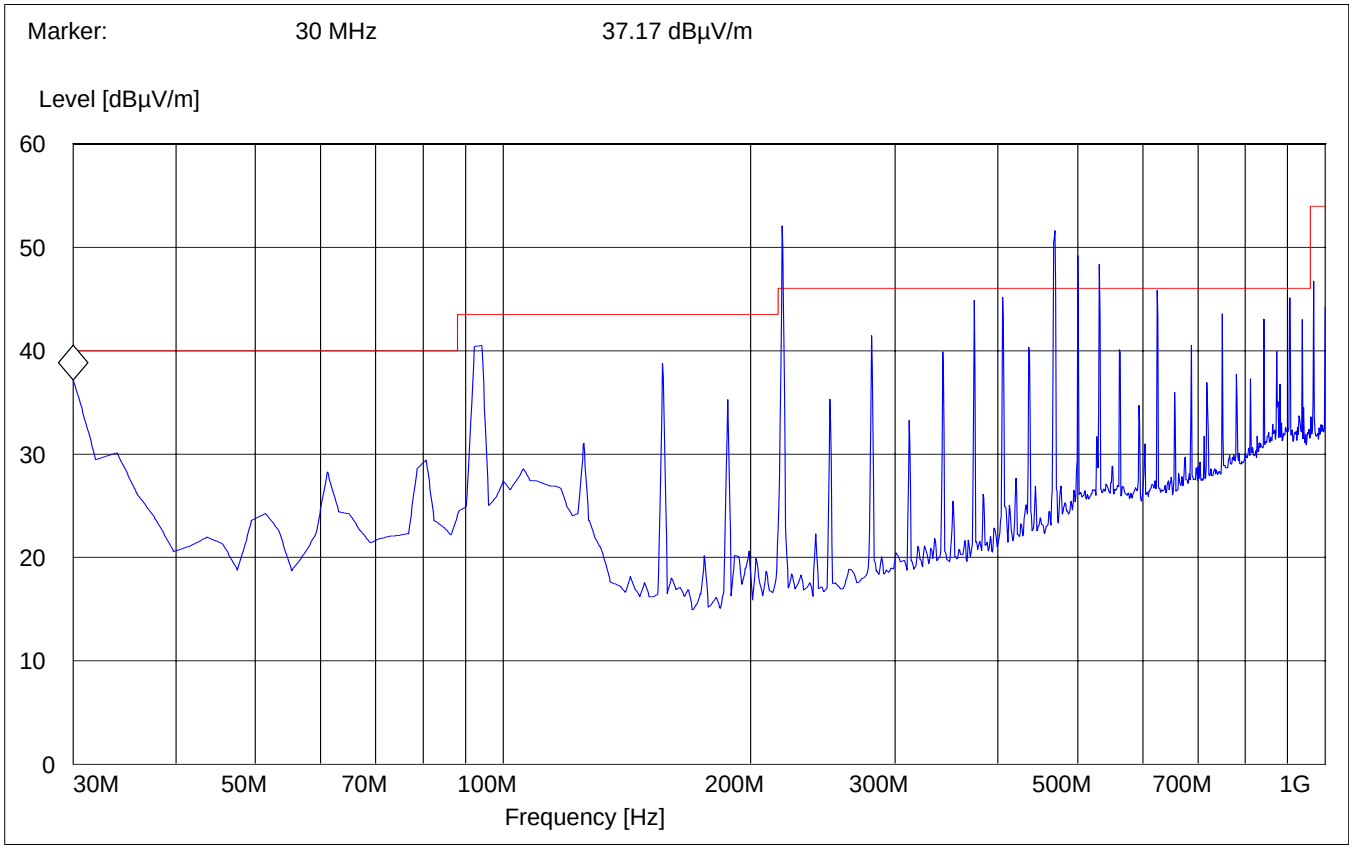
Antenna: **Vertical**
EUT plane: **Vertical**

SWEEP TABLE: "FCC 15.407 30-1G_V"

Start Frequency	Stop Frequency	Detector	Meas. Time	RBW VBW	Transducer
30.0 MHz	1.0 GHz	MaxPeak	Coupled	100 kHz	3141-#1186

Note:

1. **This plot is valid for low, mid, high channels (worst-case plot valid for all antennas)**
2. **All significant peaks were confirmed originating from test fixture, see plots on next pages with test fixture tested alone with no WLAN card**



EMISSION LIMITATIONS - Radiated (Transmitter) § 15.247 (d)
30MHz – 1GHz

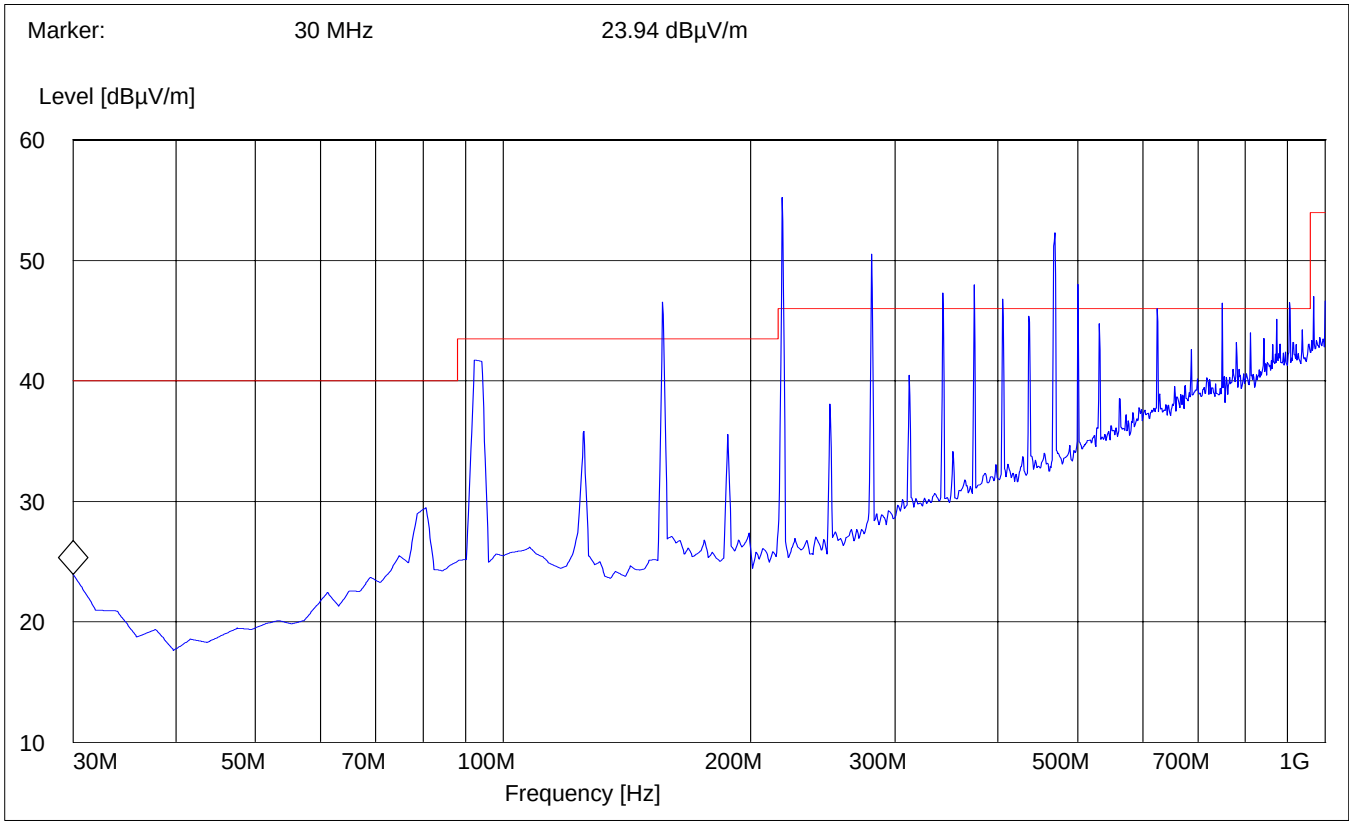
Note:

1. **This plot is valid for low, mid, high channels (worst-case plot valid for all antennas)**
2. **All significant peaks were confirmed originating from test fixture, see plots on next pages with test fixture tested alone with no WLAN card**

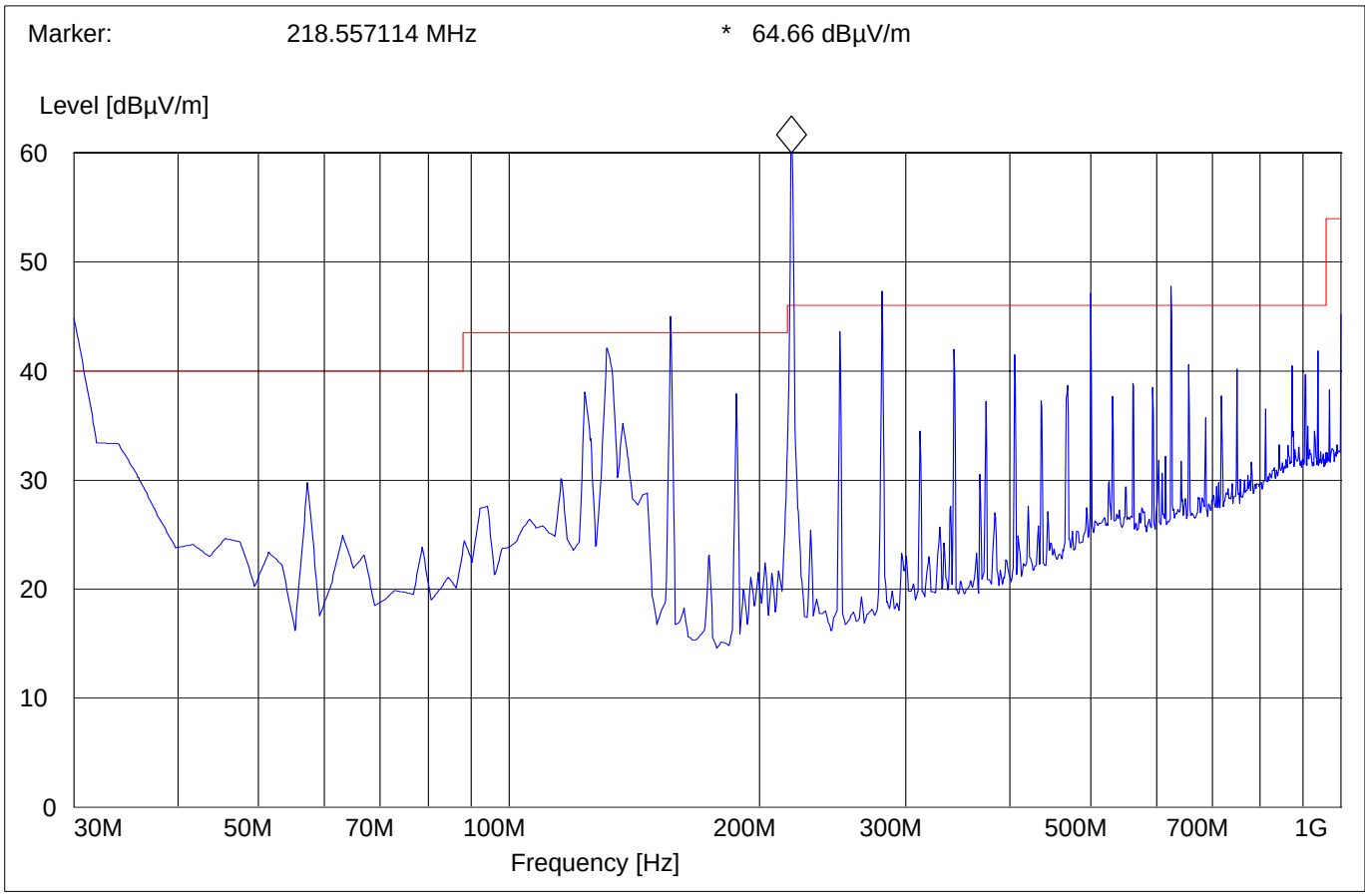
Antenna: **Horizontal**
EUT plane: **Vertical**

SWEEP TABLE: "FCC 15.407 30-1G_H"

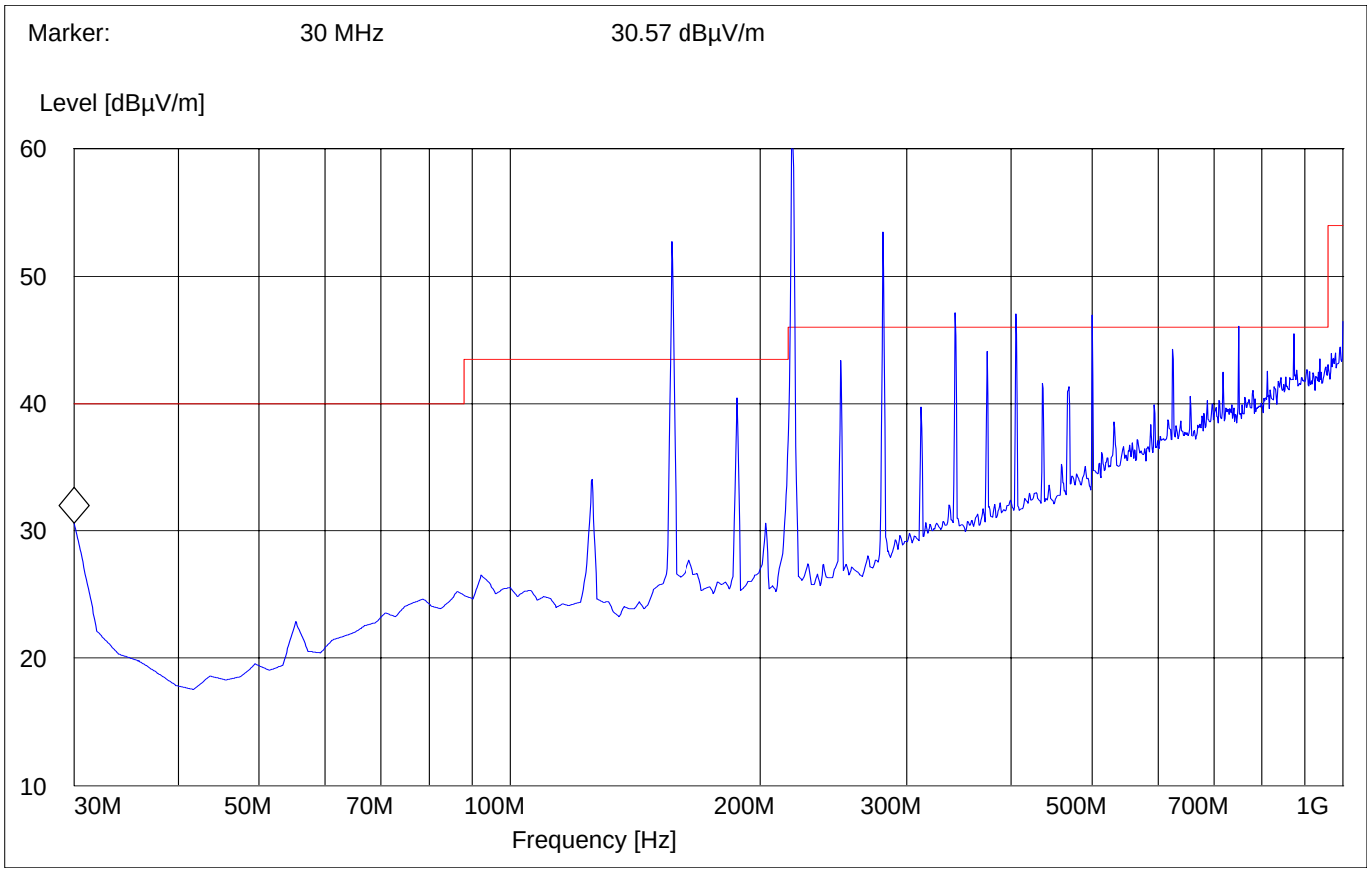
Start Frequency	Stop Frequency	Detector	Meas. Time	RBW VBW	Transducer
30.0 MHz	1.0 GHz	MaxPeak	Coupled	100 kHz	3141-#1186



EMISSION LIMITATIONS - Radiated (Transmitter) § 15.247 (d)
30MHz – 1GHz
Antenna: Vertical
Test Fixture only (no WLAN card)



EMISSION LIMITATIONS - Radiated (Transmitter) § 15.247 (c) (1)
30MHz – 1GHz
Antenna: Horizontal
Test Fixture only (no WLAN card)



EMISSION LIMITATIONS - Radiated (Transmitter) § 15.247 (d)

Lowest Channel (5745MHz): 1GHz – 7GHz

(Average)

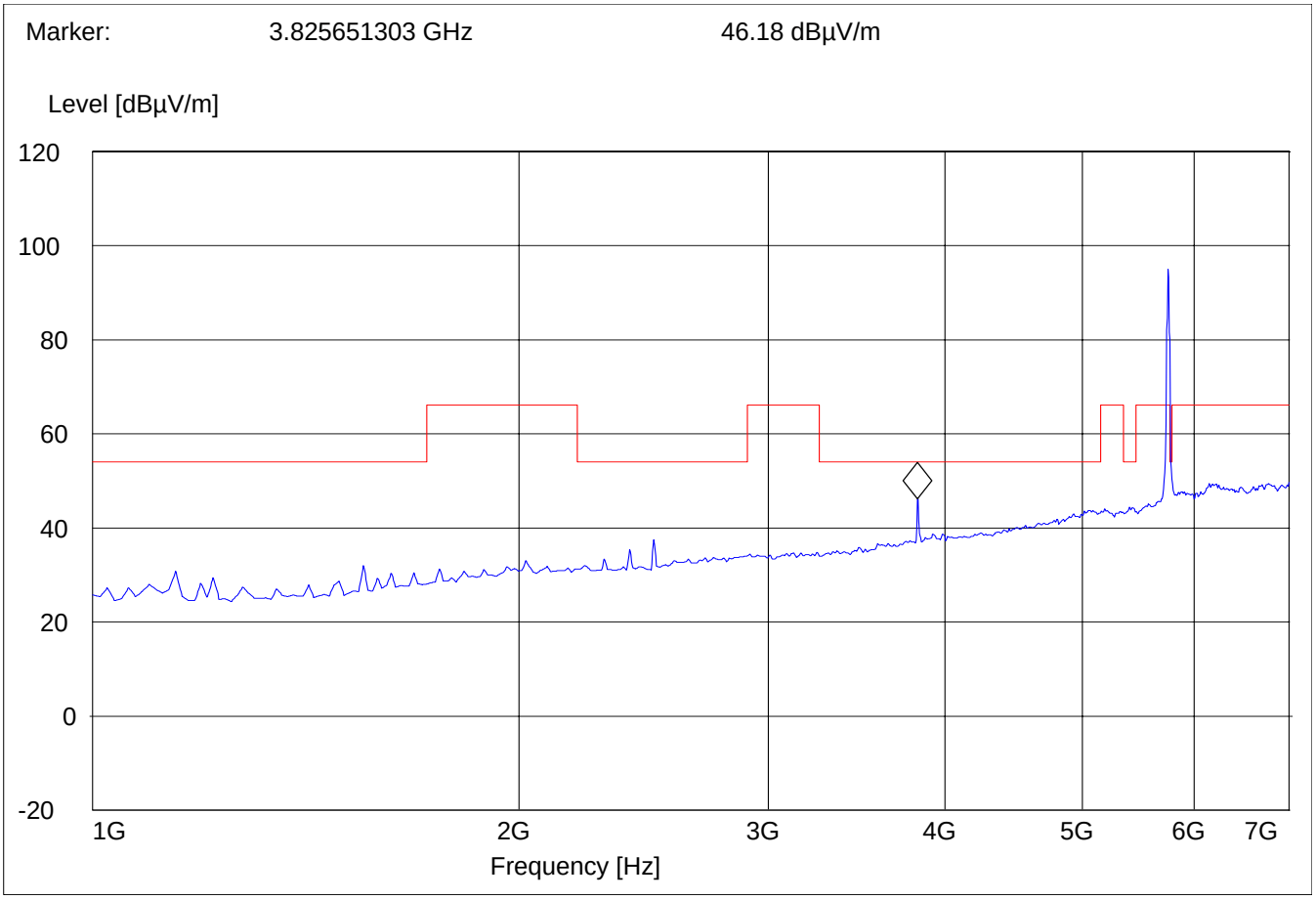
Antenna: **Vertical**

EUT plane: **Vertical**

Note: The peak above the limit line is the carrier freq.

SWEEP TABLE: "FCC 15.407 1-7G"

Start Frequency	Stop Frequency	Detector	Meas. Time	RBW	VBW	Transducer
1GHz	7.0 GHz	MaxPeak	Coupled	1MHz	10Hz	326 horn



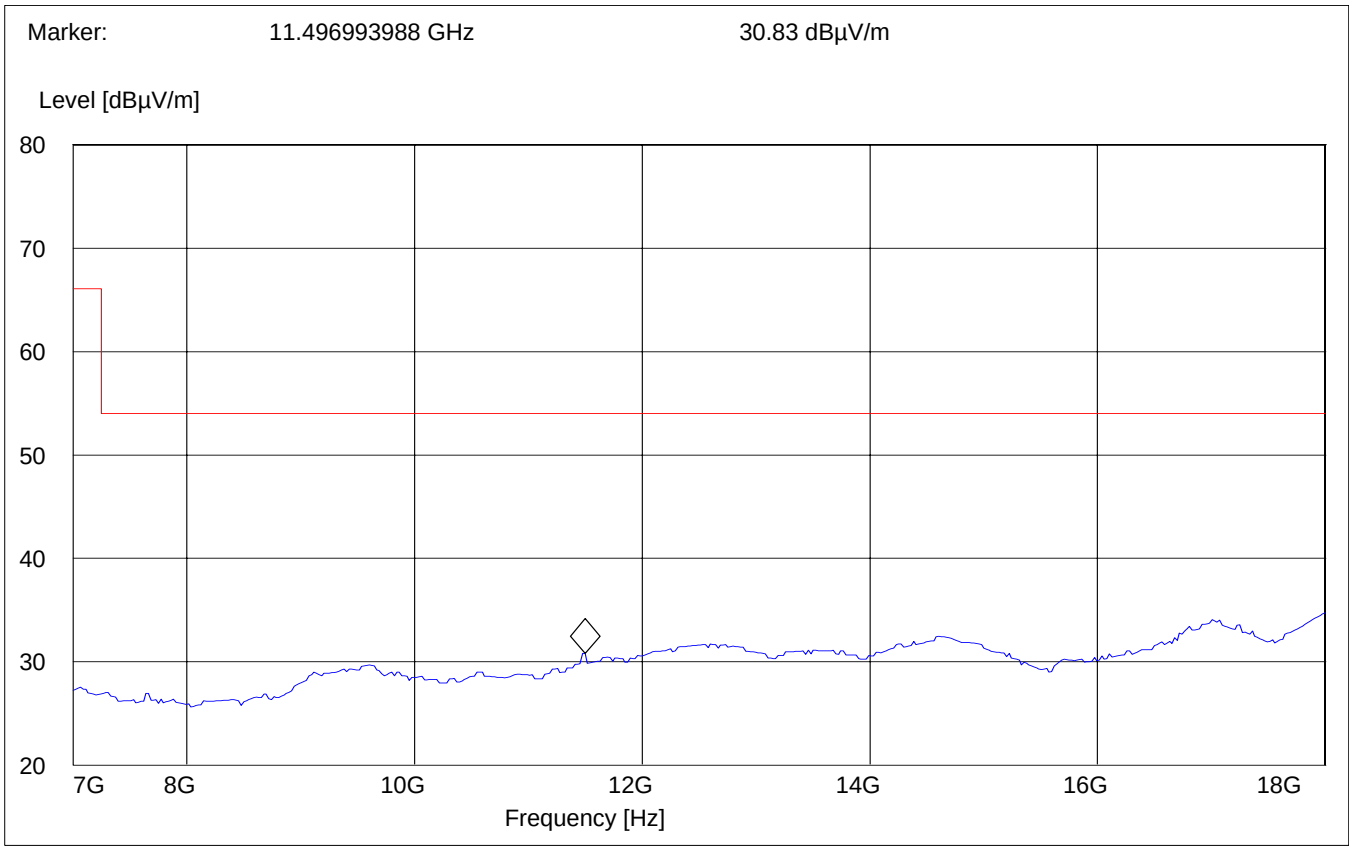
EMISSION LIMITATIONS - Radiated (Transmitter) § 15.247 (d)

Lowest Channel (5745MHz): 7GHz – 18GHz

Average
Antenna: **Vertical**
EUT plane: **Vertical**

SWEEP TABLE: "FCC 15.407 7-18G"

Start Frequency	Stop Frequency	Detector	Meas. Time	RBW	VBW	Transducer
7GHz	18.0 GHz	MaxPeak	Coupled	1MHz	10Hz	326 horn



EMISSION LIMITATIONS - Radiated (Transmitter) § 15.247 (d)

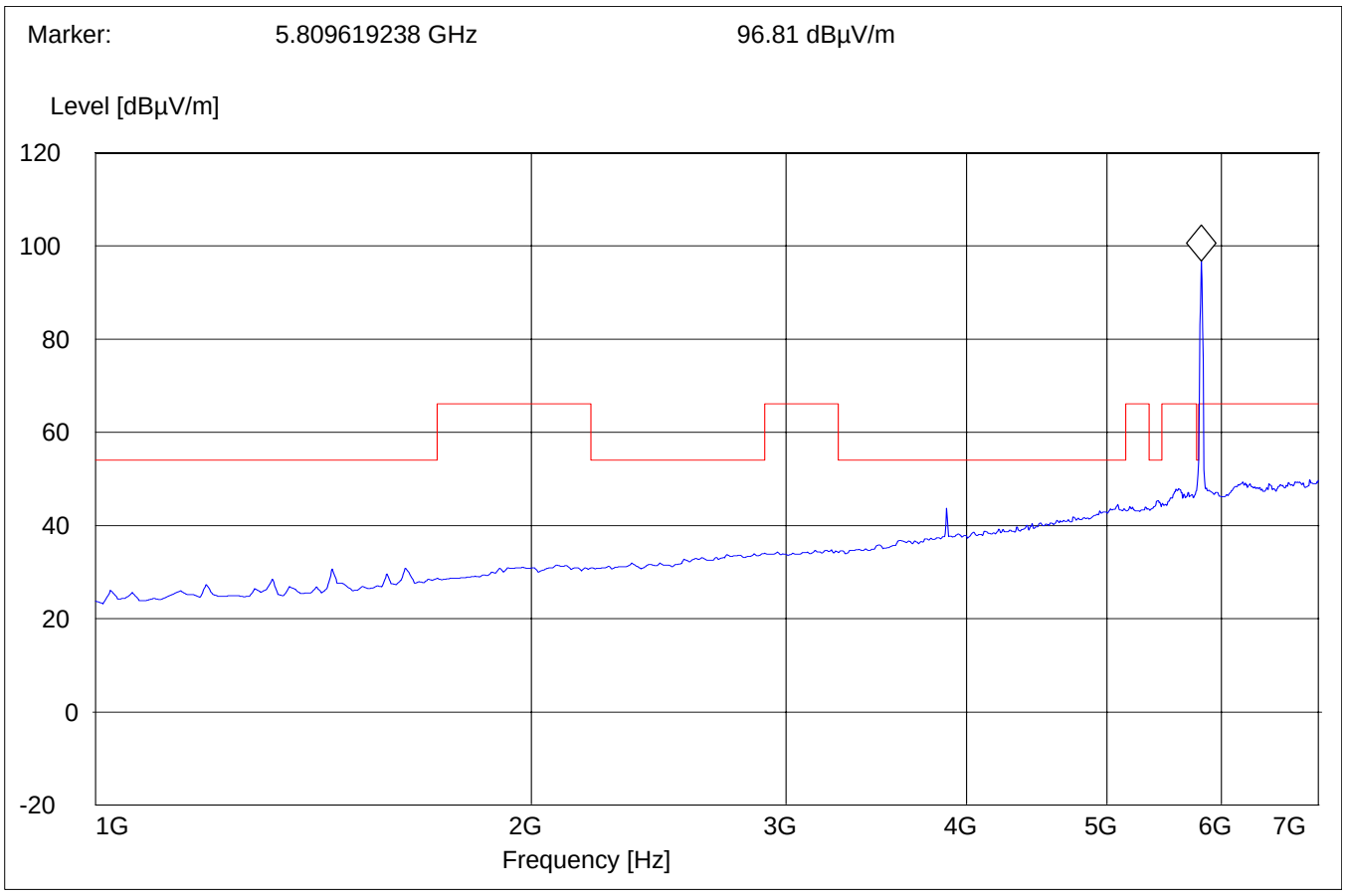
Highest Channel (5805MHz): 1GHz – 7GHz

(Average)

Antenna: **Vertical**
EUT plane: **Vertical**

Note: The peak above the limit line is the carrier freq.

SWEEP TABLE:		"FCC 15.407 1-7G"				
Start Frequency	Stop Frequency	Detector	Meas. Time	RBW	VBW	Transducer
1GHz	7.0 GHz	MaxPeak	Coupled	1MHz	10Hz	326 horn

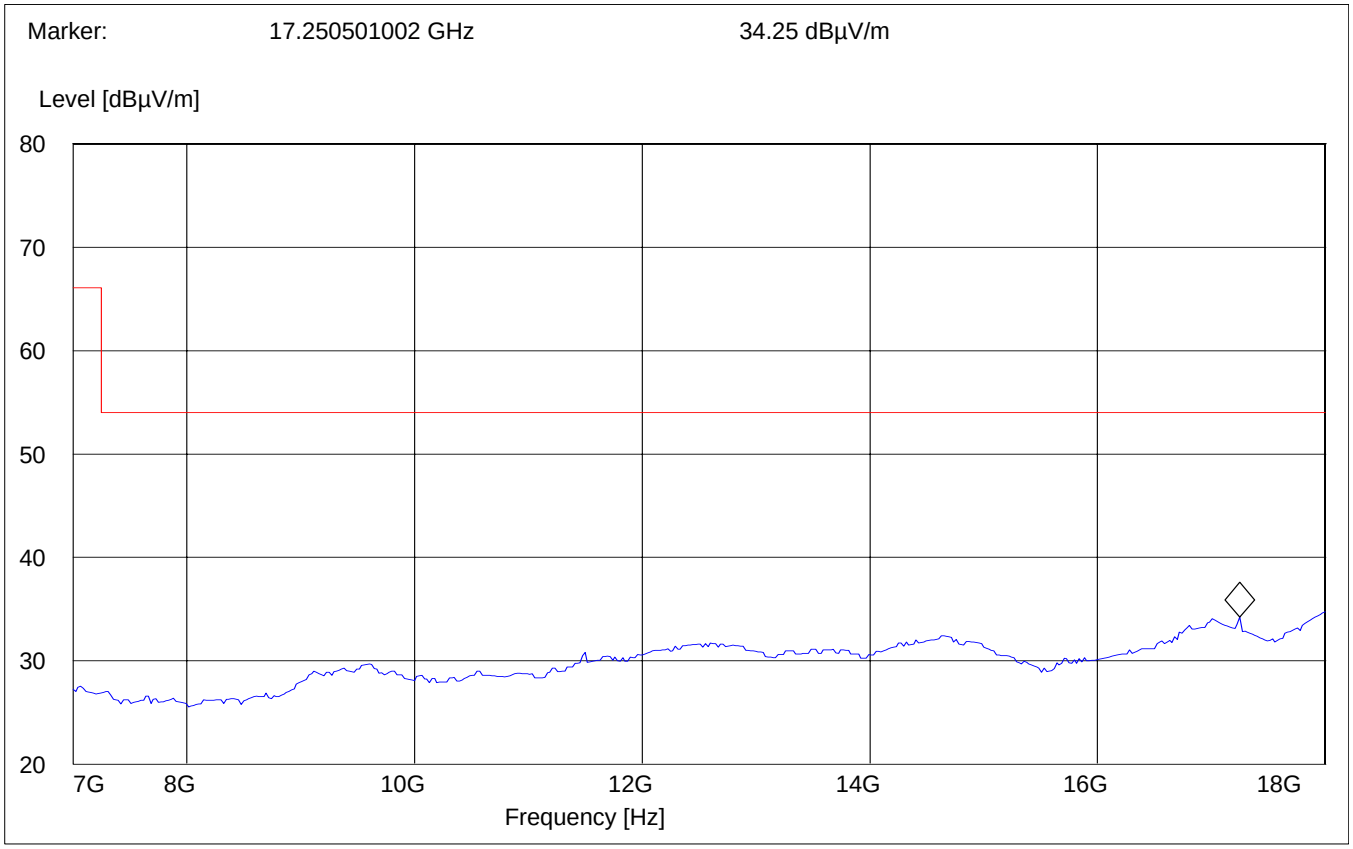


EMISSION LIMITATIONS - Radiated (Transmitter) § 15.247 (d)
Highest Channel (5805MHz): 7GHz – 18GHz
Average

Antenna: **Vertical**
EUT plane: **Vertical**

SWEEP TABLE: "FCC 15.407 7-18G"

Start Frequency	Stop Frequency	Detector	Meas. Time	RBW	VBW	Transducer
7GHz	18.0 GHz	MaxPeak	Coupled	1MHz	10Hz	326 horn

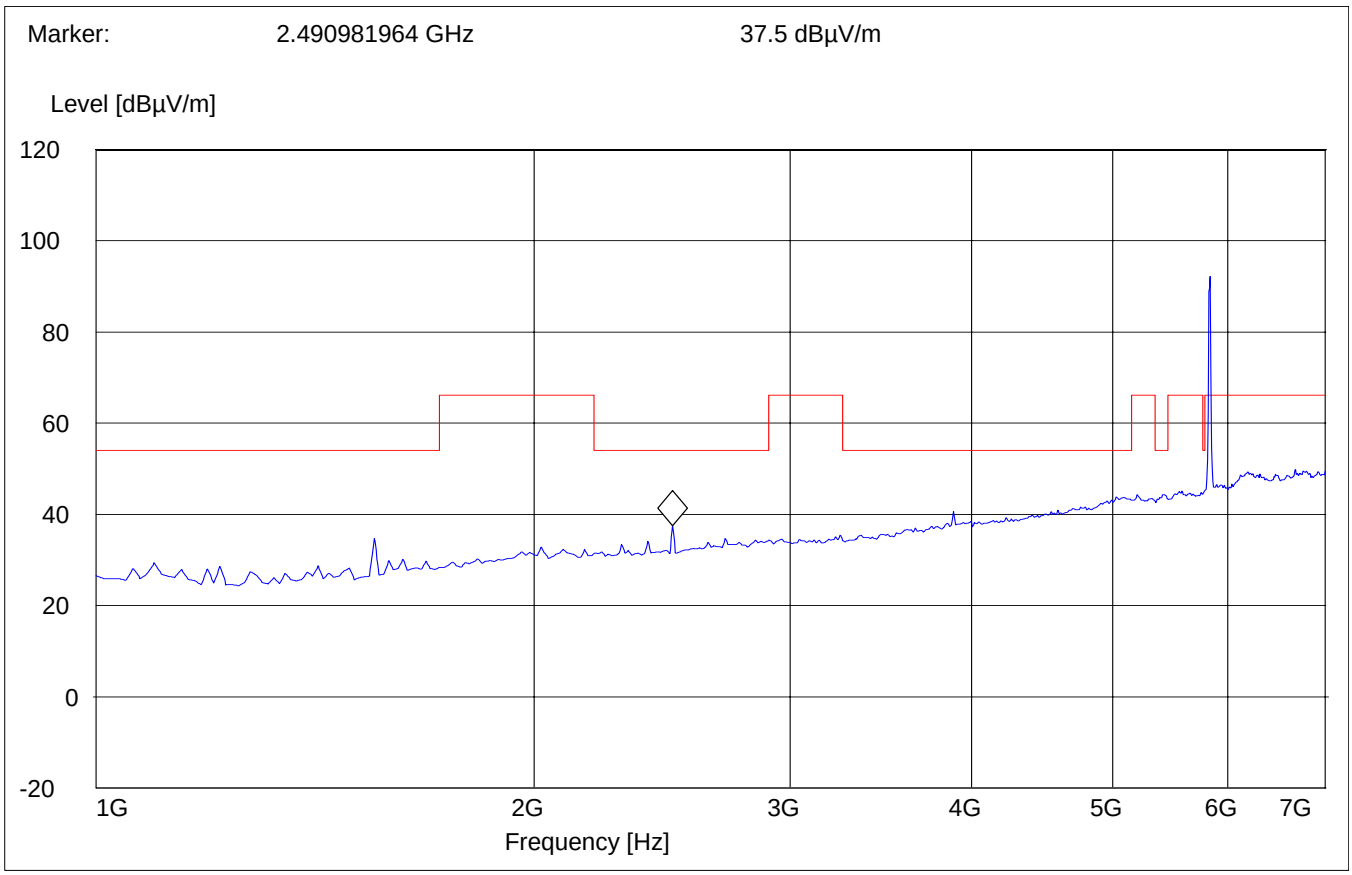


EMISSION LIMITATIONS - Radiated (Transmitter) § 15.247 (d)
(5825MHz): 1GHz – 7GHz
(Average)

Antenna: **Vertical**
EUT plane: **Vertical**

Note: The peak above the limit line is the carrier freq.

SWEEP TABLE:		"FCC 15.407 1-7G"				
Start Frequency	Stop Frequency	Detector	Meas. Time	RBW	VBW	Transducer
1GHz	7.0 GHz	MaxPeak	Coupled	1MHz	10Hz	326 horn



EMISSION LIMITATIONS - Radiated (Transmitter) § 15.247 (d)

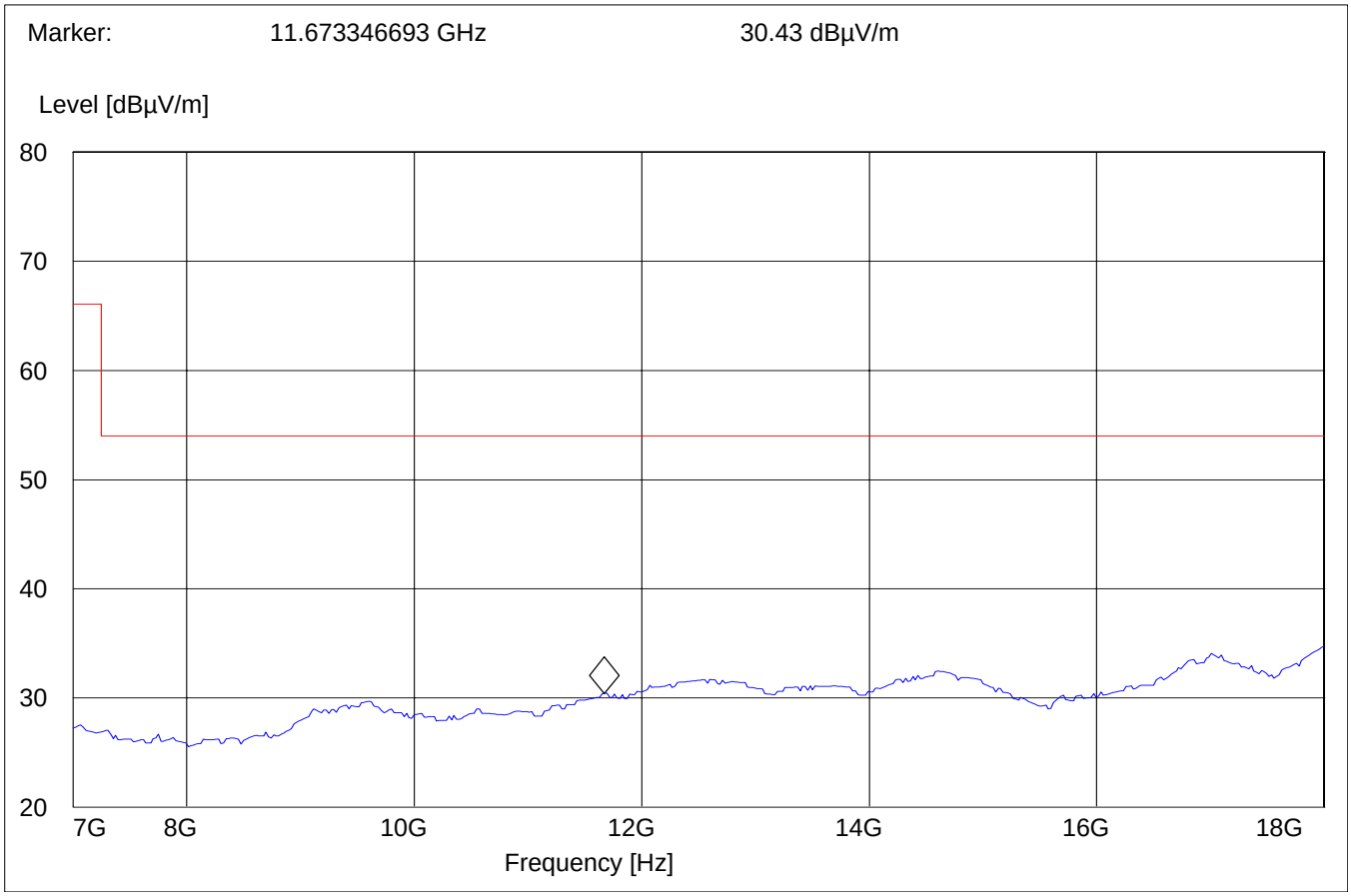
(5825MHz): 7GHz – 18GHz

Average

Antenna: **Vertical**
EUT plane: **Vertical**

SWEEP TABLE: "FCC 15.407 7-18G"

Start Frequency	Stop Frequency	Detector	Meas. Time	RBW	VBW	Transducer
7GHz	18.0 GHz	MaxPeak	Coupled	1MHz	10Hz	326 horn



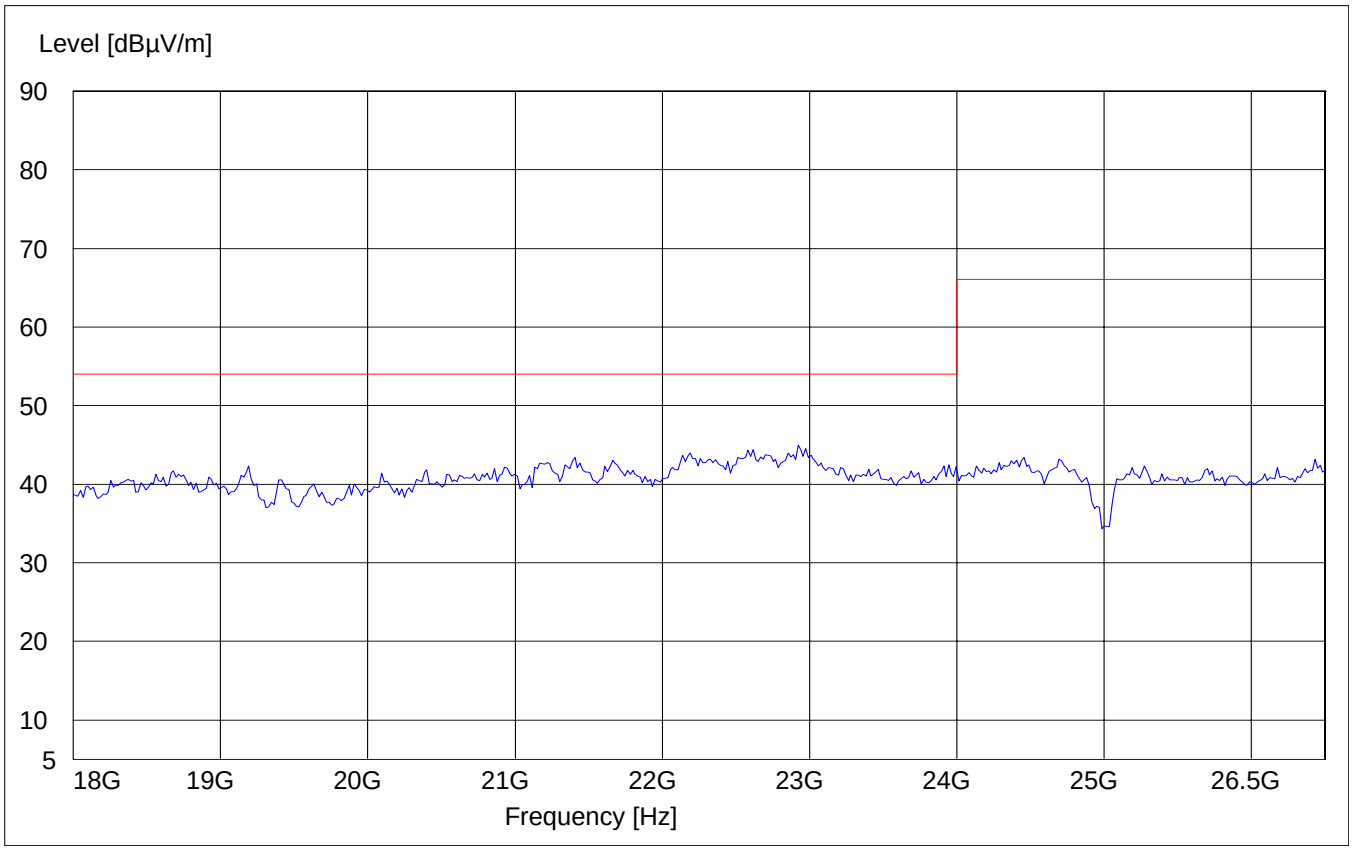
EMISSION LIMITATIONS - Radiated (Transmitter) § 15.247 (d)
18GHz – 26.5GHz

Antenna: **Vertical**
EUT plane: **Vertical**

Note: This plot is valid for low & high channels (worst-case plot)

SWEEP TABLE: "FCC 15.407 18-26.5G"

Start Frequency	Stop Frequency	Detector	Meas. Time	RBW VBW	Transducer
18GHz	26.5 GHz	MaxPeak	Coupled	1MHz	3160-09 horn



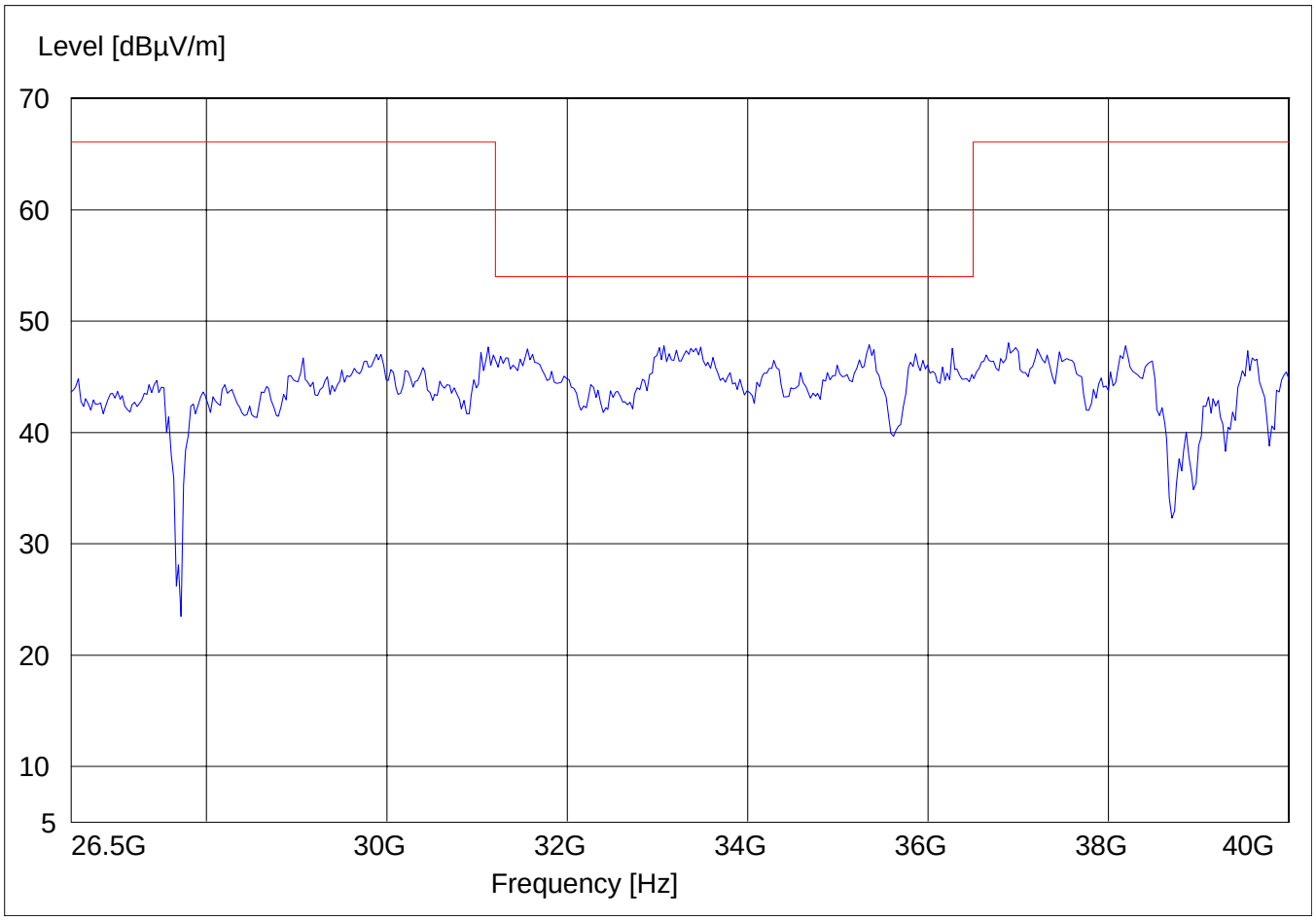
EMISSION LIMITATIONS - Radiated (Transmitter) § 15.247 (d)
26.5GHz – 40GHz

Antenna: **Vertical**
EUT plane: **Vertical**

Note: This plot is valid for low & high channels (worst-case plot)

SWEEP TABLE: "FCC 15.407 26.5-40G"

Start Frequency	Stop Frequency	Detector	Meas. Time	RBW VBW	Transducer
26.5GHz	40 GHz	MaxPeak	Coupled	1MHz	3160-10 horn



CONDUCTED EMISSIONS § 15.107/207

Measured with AC/DC power adapter

SWEEP TABLE: "55022 cond"

Short Description: EN 55022 for 150KHz-30MHz

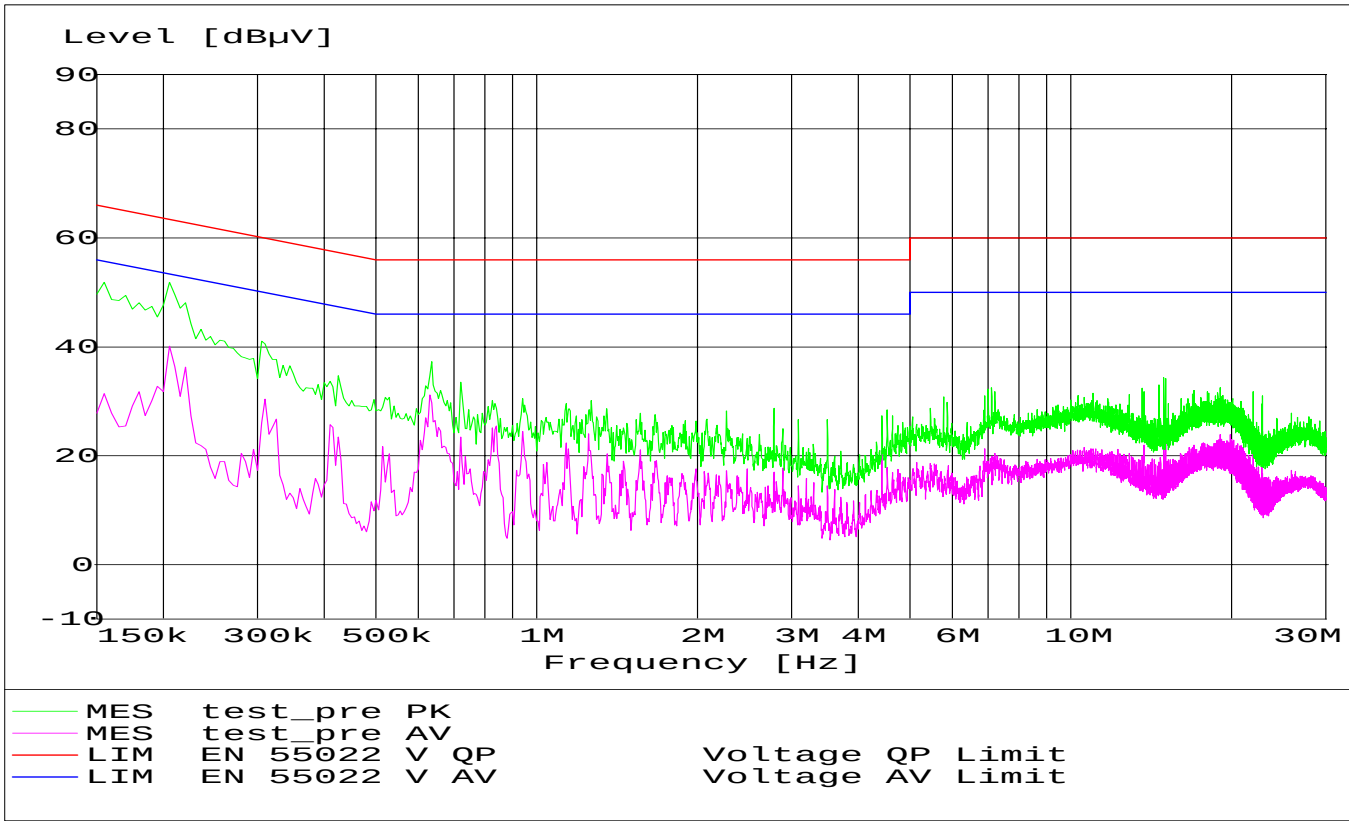
Start Frequency	Stop Frequency	Detector	Meas Time	IF Bandw.	Transducer
150.0 kHz	30.0 MHz	MaxPeak	Coupled	10 kHz	None

Technical specification: 15.107 / 15.207 (Revised as of August 20, 2002)

Limit

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 logarithm of the frequency		

ANALYZER SETTINGS: RBW = 10KHz VBW = 10KHz



RECEIVER SPURIOUS RADIATION § 15.209

Limits

Frequency (MHz)	Field strength (µV/m)	Measurement distance (m)
0.009 - 0.490	2400/F (kHz)	300
0.490 - 1.705	24000/F (kHz)	30
1.705 - 30.0	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
above 960	500	3

NOTE:
The radiated emissions were done with different settings, using the relevant pre-amplifiers for the relevant frequency ranges. This is the reason that the graphs show different noise levels. In the range between 3 and 40 GHz very short cable connections to the antenna was used to minimize the noise level.

RECEIVER SPURIOUS RADIATION § 15.209

(Data rate – 54Mbps)

Antenna: **Vertical**

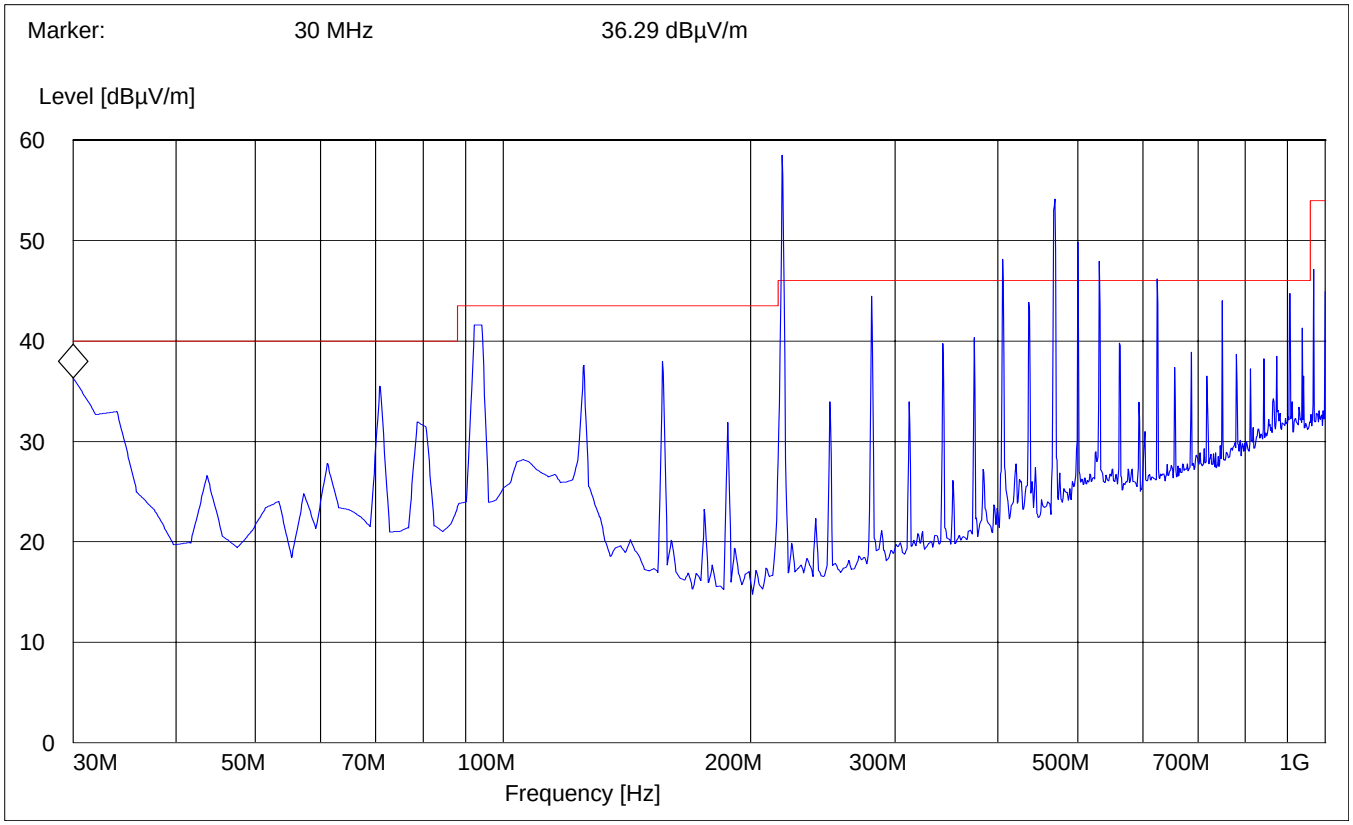
EUT plane: **Vertical**

Note:

1. **This plot is valid for low, mid, high channels (worst-case plot valid for all antennas)**
2. **All significant peaks were confirmed originating from test fixture, see next pages with test fixture tested alone with no WLAN card**

SWEEP TABLE: "WLAN Spuri hi 30-1G"

Start Frequency	Stop Frequency	Detector	Meas. Time	RBW VBW	Transducer
30.0 MHz	1.0 GHz	MaxPeak	Coupled	100 kHz	3141-#1186



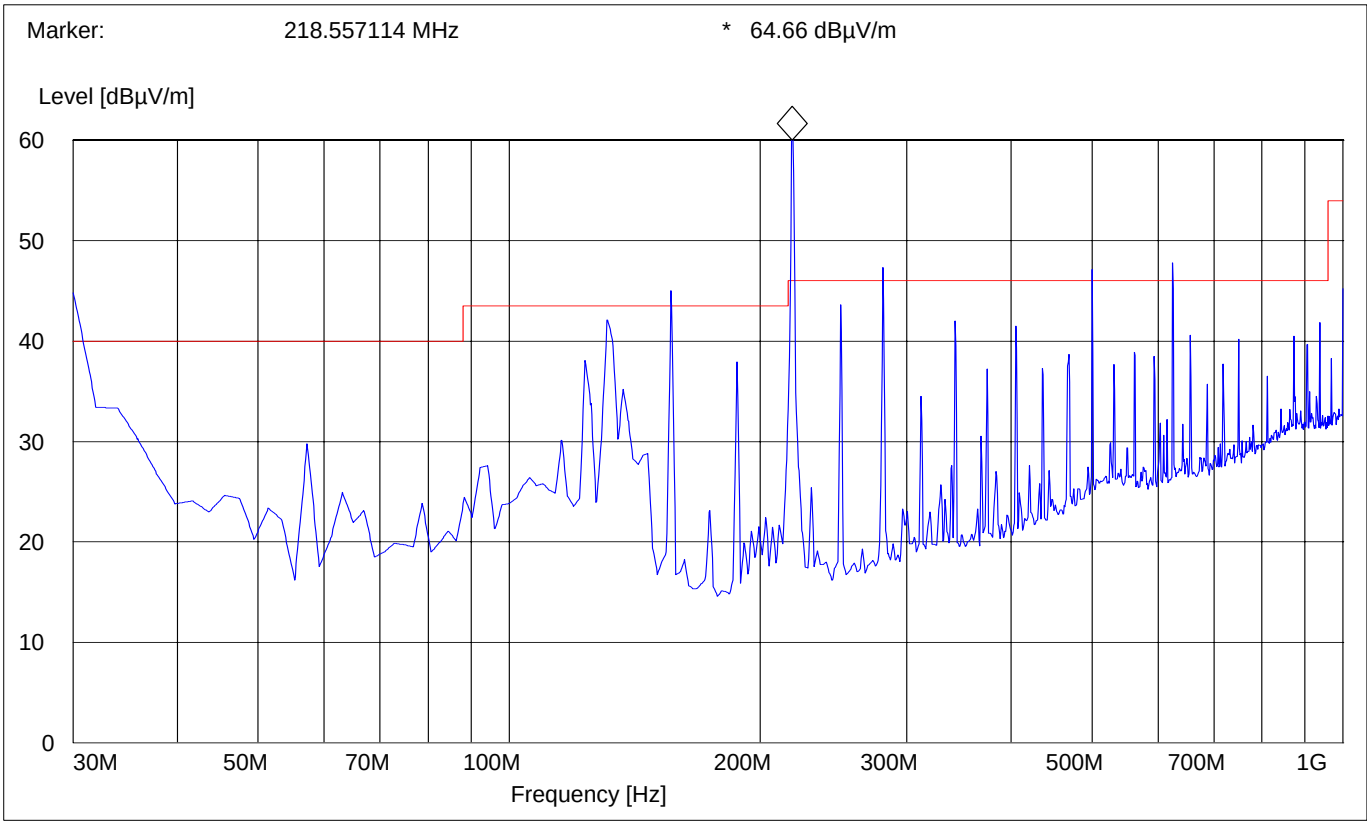
RECEIVER SPURIOUS RADIATION § 15.209

Antenna: **Vertical**
EUT plane: **Vertical**

Test Fixture only (no WLAN card)

SWEEP TABLE: "WLAN Spuri hi 30-1G"

Start Frequency	Stop Frequency	Detector	Meas. Time	RBW VBW	Transducer
30.0 MHz	1.0 GHz	MaxPeak	Coupled	100 kHz	3141-#1186

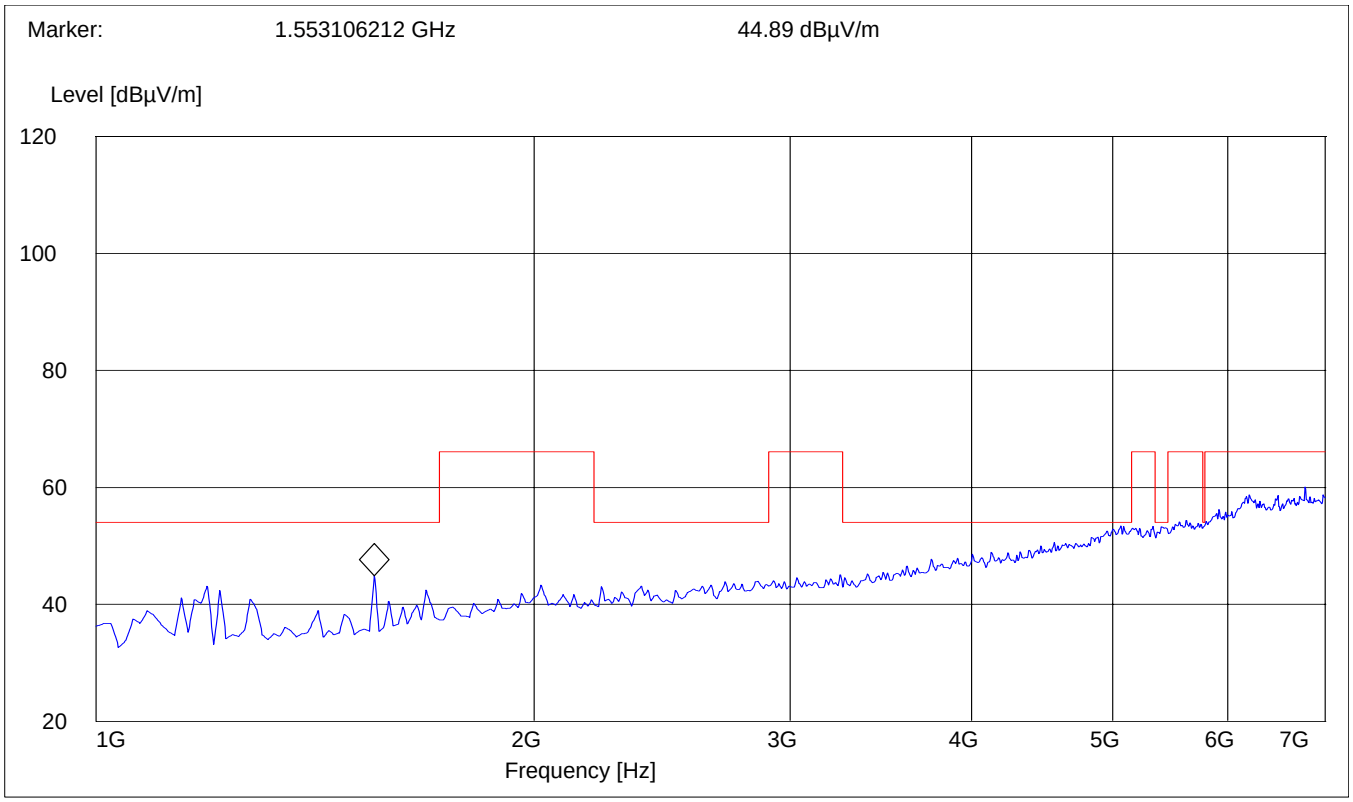


RECEIVER SPURIOUS RADIATION § 15.209
1GHz – 7GHz

Antenna: **Vertical**
EUT plane: **Vertical**

SWEEP TABLE: "WLAN Spuri hi 1-7G"

Start Frequency	Stop Frequency	Detector Time	Meas. Bandw.	RBW	VBW	Transducer
1.0 GHz	7.0 GHz	MaxPeak	Coupled	1 MHz	1MHz	#326 horn (dBi)

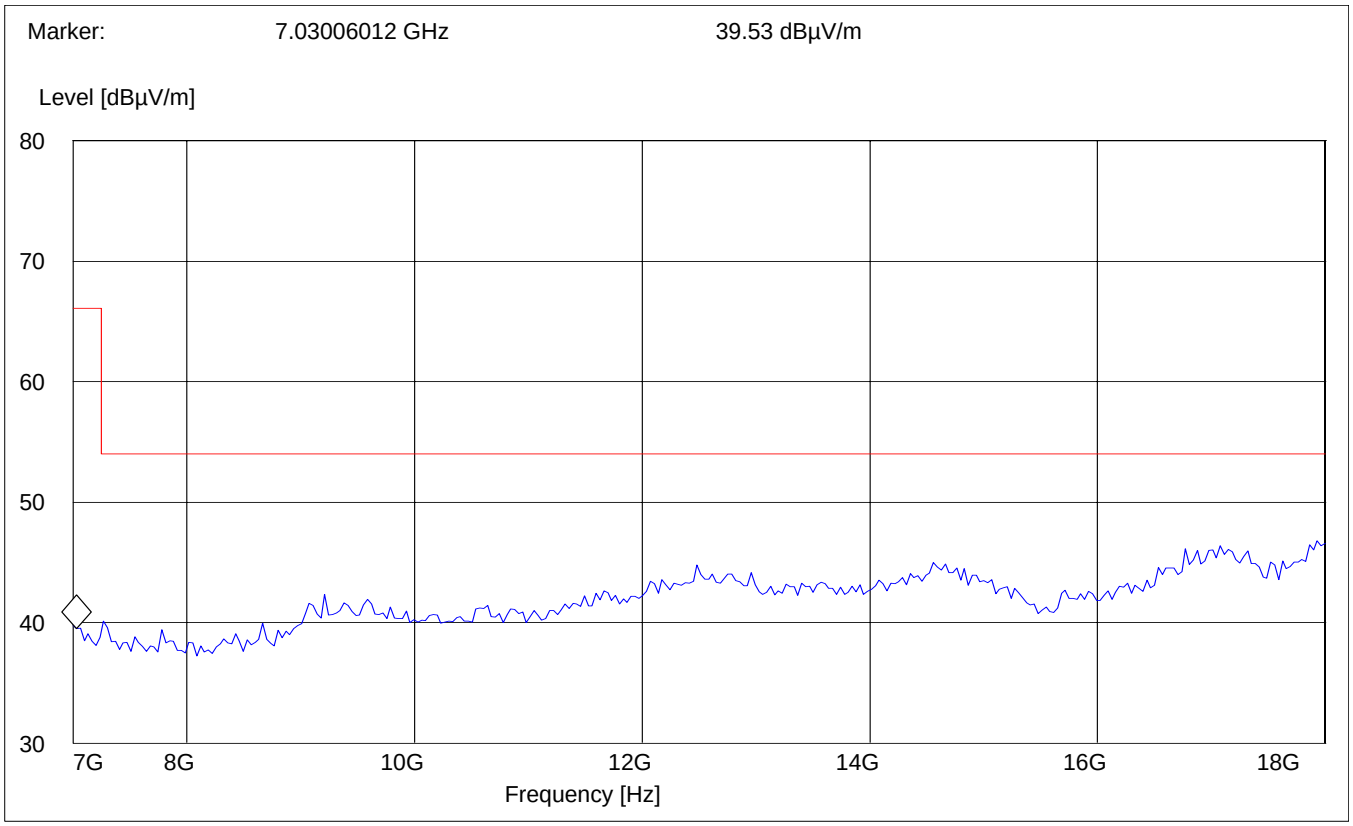


RECEIVER SPURIOUS RADIATION § 15.209
7GHz – 18GHz

Antenna: **Vertical**
EUT plane: **Vertical**

SWEEP TABLE: "WLAN Spuri hi 7-18G"

Start Frequency	Stop Frequency	Detector Time	Meas. Bandw.	RBW VBW	Transducer
7.0 GHz	18 GHz	MaxPeak	Coupled	1 MHz	#326 horn (dBi)

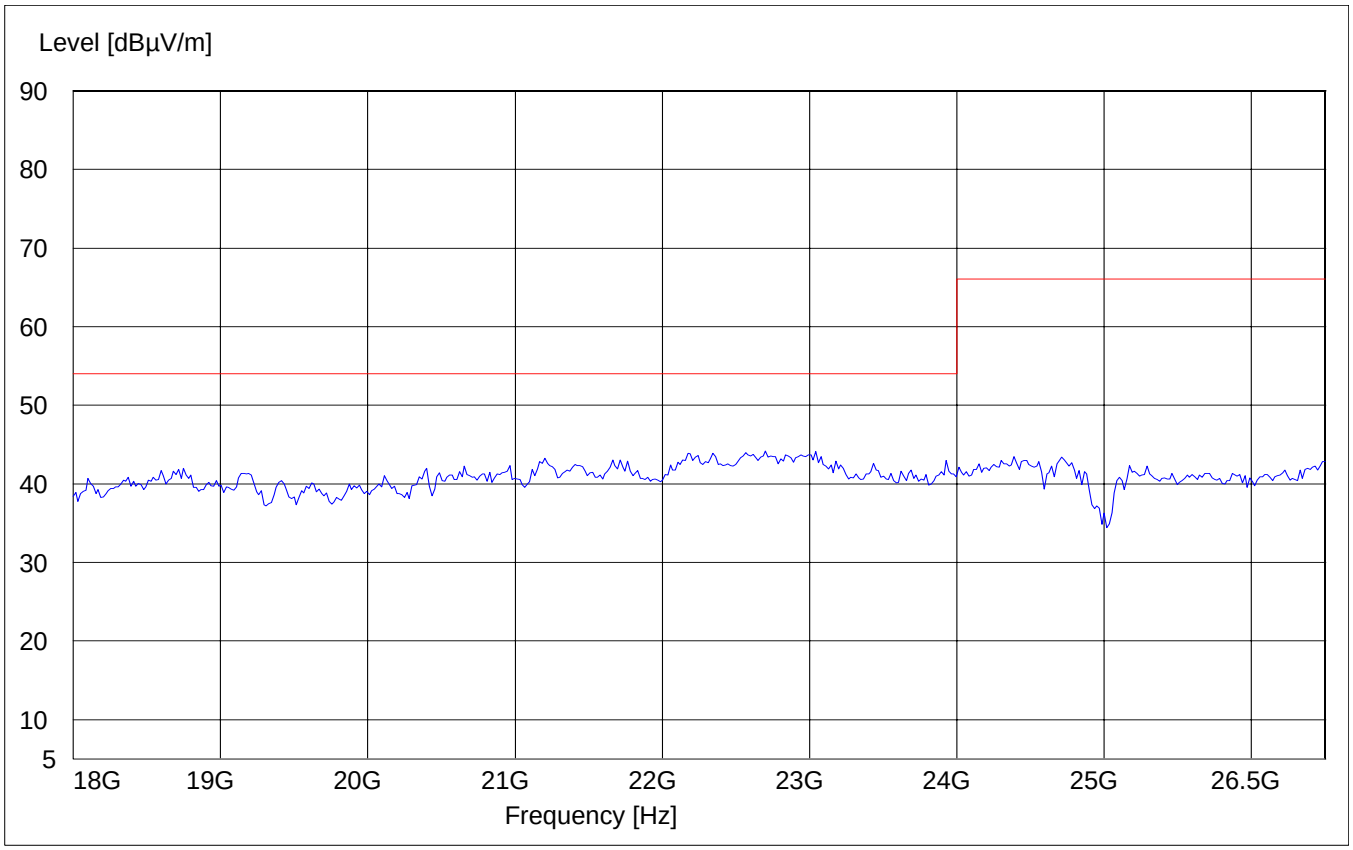


RECEIVER SPURIOUS RADIATION § 15.209
18GHz – 26.5GHz

Antenna: **Vertical**
EUT plane: **Vertical**

SWEEP TABLE: "WLAN Spuri hi 18-26.5G"

Start Frequency	Stop Frequency	Detector Time	Meas. Bandw.	RBW VBW	Transducer
18 GHz	26.5 GHz	MaxPeak	Coupled	1 MHz	#141 horn (dBi)

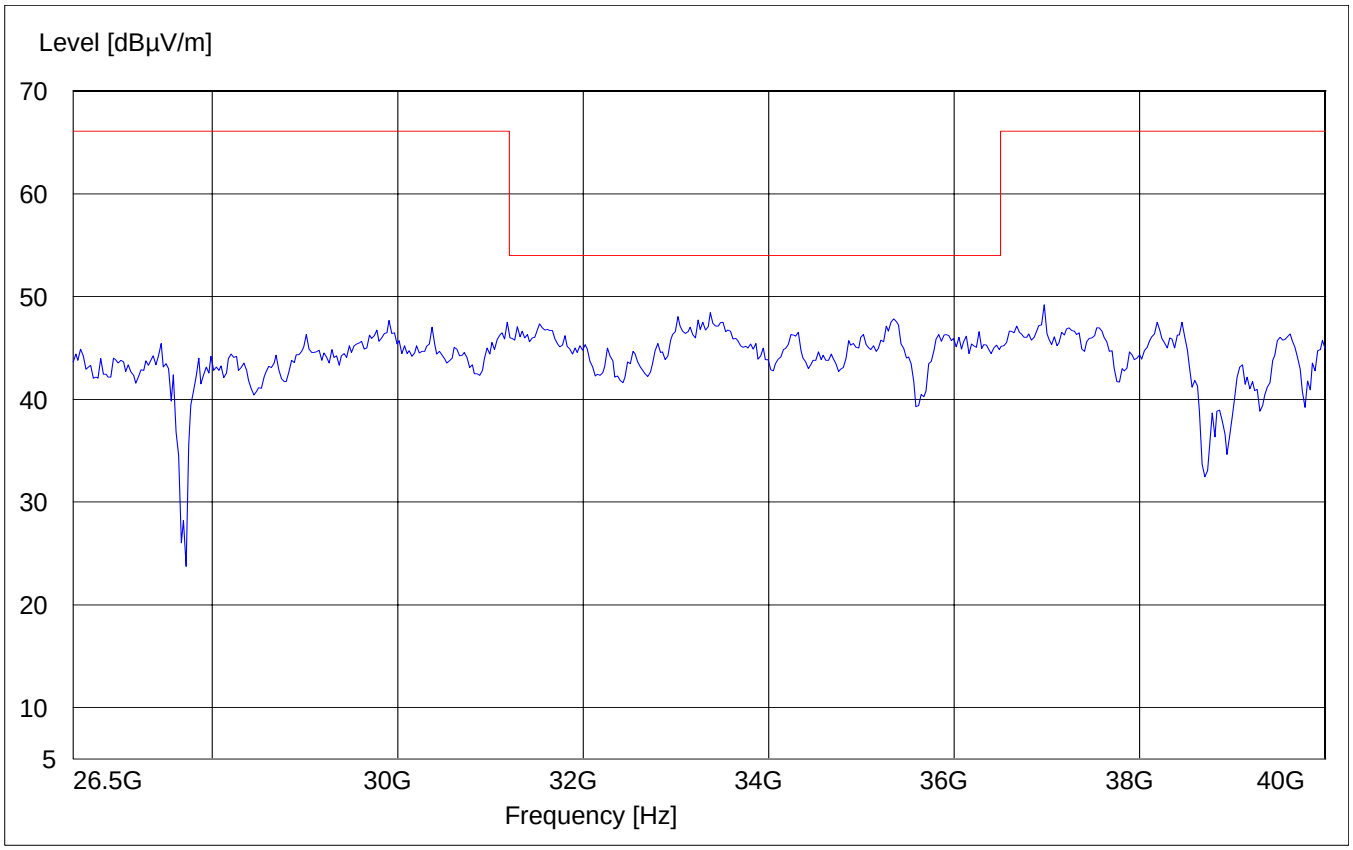


RECEIVER SPURIOUS RADIATION § 15.209
26.5GHz – 40GHz

Antenna: **Vertical**
EUT plane: **Vertical**

SWEEP TABLE: "WLAN Spuri hi 26.5-40G"

Start Frequency	Stop Frequency	Detector Time	Meas. Bandw.	RBW VBW	Transducer
26.5 GHz	40 GHz	MaxPeak	Coupled	1 MHz	3160-10 horn



TEST EQUIPMENT AND ANCILLARIES USED FOR TESTS

No	Instrument/Ancillary	Type	Manufacturer	Serial No.
01	Spectrum Analyzer	ESIB 40	Rohde & Schwarz	100107
02	Spectrum Analyzer	FSEM 30	Rohde & Schwarz	826880/010
03	Biconilog Antenna	3141	EMCO	0005-1186
04	Horn Antenna (700M-18GHz)	SAS-200/571	AH Systems	325
05	Horn Antenna (18-26.5GHz)	3160-09	EMCO	1240
06	2-3GHz Band reject filter	BRM50701	Microtronics	6
07	Power-Meter	NRVD	Rohde & Schwarz	0857.8008.02
08	Pre-Amplifier	TS-ANA	Rohde & Schwarz	--
09	Pre-Amplifier	JS4-00102600	Miteq	00616

BLOCK DIAGRAMS
Radiated Testing