



FCC Test Report

Test report no.: EMC_620FCC15.247_2004

FCC Part 15.247 for DSSS systems / CANADA RSS-210

EUT: Tablet PC Model: iX104
with WLAN Model: VM4-3B
FCC ID: Q2GIX104-119
IC ID: 4596A-iX104GSM



Accredited according to ISO/IEC 17025



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****CETECOM Inc.****411 Dixon Landing Road, Milpitas, CA-95035, USA****Phone: +1 408 586 6200 Fax: +1 408 586 6299****E-mail: lothar.schmidt@cetecomusa.com****Internet: www.cetecom.com**

1.3 Details of applicant

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City / Zip Code : Austin, TX 78728
Country : USA
Contact : Douglas L. Fowler
Telephone : +1 512 336 7797
Tele-fax : +1 512 336 7791
e-mail : dfowler@xploretech.com

1.4 Application details

Date of receipt test item : 2004-02-25
Date of test : 2004-02-25/26

1.5 Test item

EUT Manufacturer : Applicant
WLAN Manufacturer : Wistron Neweb Corporation
Street : No. 10-1, Li-hsin Road I, Science-based Industrial Park
City / Zip Code : Hsinchu 300
Country : Taiwan, R.O.C
[Model No. \(EUT\)](#) : [iX104](#)
[Model No. \(WLAN\)](#) : [VM4-3B](#)
Description : 802.11a/b wireless LAN mini PCI card in Tablet PC
FCC ID : Q2GIX104-119
IC ID : 4596A-iX104GSM

Additional information

Frequency : 2412MHz – 2462MHz for 2.4GHz band
Type of modulation : DSSS / OFDM (orthogonal frequency division multiplexing)
Number of channels : 12
Antenna : Embedded
Output power : 0.039W conducted peak power for 2.4GHz band
Extreme temp. Tolerance : -20°C to +60°C

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

NOTE:

The EUT model# iX104 carries pre-certified WLAN module model# VM4-3B with FCC ID: NKRVM43B.

This test report covers full radiated testing as per FCC 15.247 on EUT with WLAN module. All conducted measurements are covered under *test report# RF910819R02*

In addition conducted output power measurements were repeated and found same as in above mentioned test report.


WLAN was tested at different data rates. Test report shows only worst-case test results of all data rates.

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:

2004-04-21	EMC & Radio	Lothar Schmidt (Manager)	
Date	Section	Name	Signature

Responsible for test report and project leader:

2004-04-21	EMC & Radio	Harpreet Sidhu (EMC Engineer)	
Date	Section	Name	Signature

2.2 Test report

TEST REPORT

Test report no.: EMC_620FCC15.247_2004

TEST REPORT REFERENCE

LIST OF MEASUREMENTS		PAGE
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**MAXIMUM PEAK OUTPUT POWER
(CONDUCTED)**

§ 15.247 (b) (1)

TEST CONDITIONS		MAXIMUM PEAK OUTPUT POWER CONDUCTED (dBm)		
		2412	2437	2462
Frequency (MHz)				
T _{nom} (23)°C	V _{nom}	15.92	15.78	15.90
Measurement uncertainty		±0.5dBm		

LIMIT

SUBCLAUSE § 15.247 (b) (1)

Frequency range	RF power output
2400-2483.5 MHz	≤30dBm Conducted

ANALYZER SETTINGS: RBW=VBW=10MHz

**MAXIMUM PEAK OUTPUT POWER
(RADIATED)**

§ 15.247 (b) (1)

EIRP:

TEST CONDITIONS		MAXIMUM PEAK OUTPUT POWER RADIATED (dBm)		
		2412	2437	2462
Frequency (MHz)				
T _{nom} (23)°C	V _{nom}	*18.32	*18.18	*18.30
Measurement uncertainty		±0.5dBm		

*EIRP is calculated based upon 2.4dBi antenna gain

LIMIT

SUBCLAUSE § 15.247 (b) (1)

Frequency range	RF power output
2400-2483.5 MHz	≤30dBm Conducted ≤36dBm Radiated (EIRP)

ANALYZER SETTINGS: RBW=VBW=10MHz

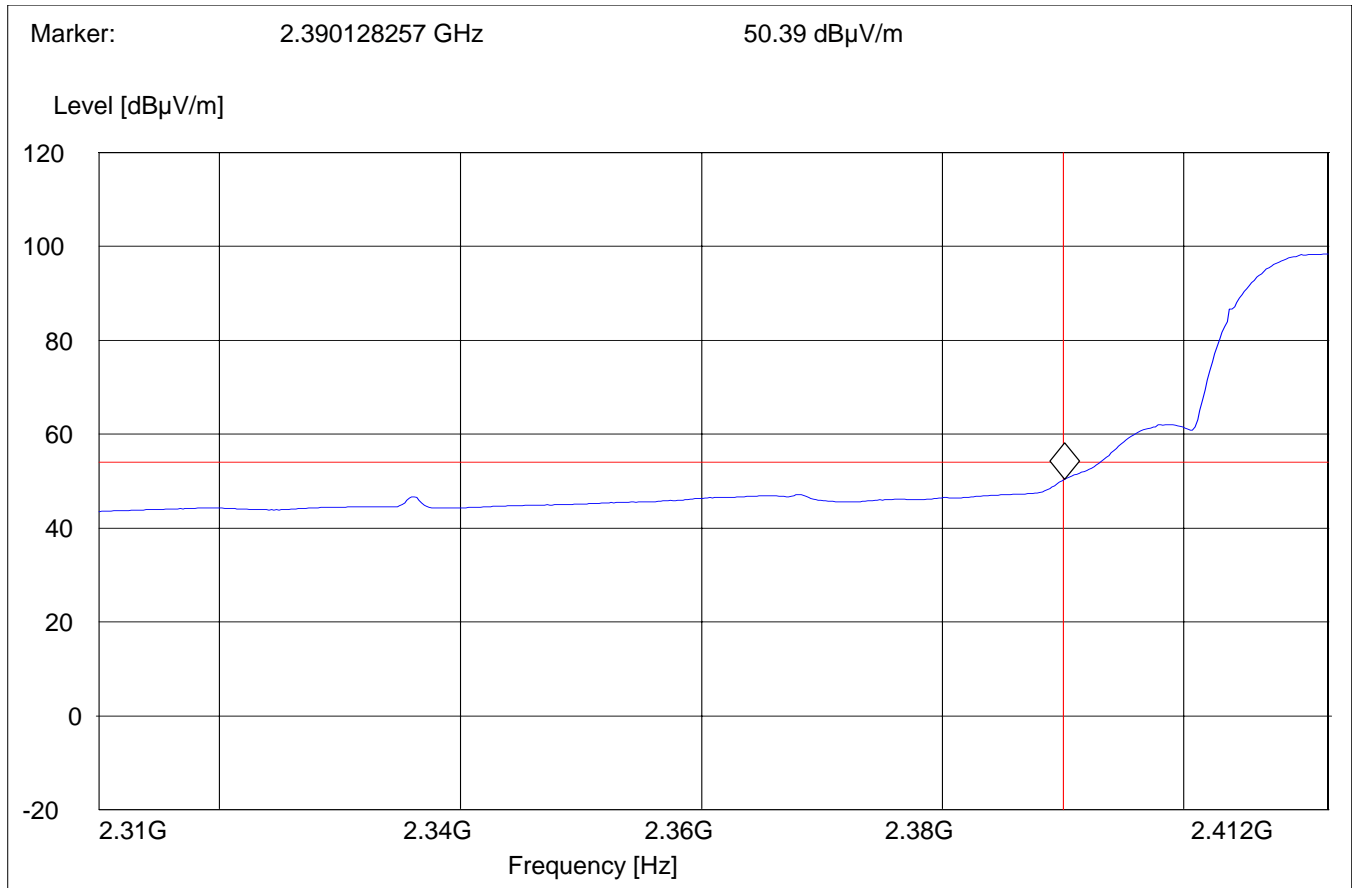
BAND EDGE COMPLIANCE

§15.247 (c)

**Low frequency section (spurious in the restricted band 2310 – 2390 MHz)
(Average measurement)**

Operating condition : Tx at 2412MHz
 SWEEP TABLE : "FCC15.247 LBE_AVG"
 Limit Line : 54dBμV

Start Frequency	Stop Frequency	Detector	Meas. Bandw.	RBW	VBW	Transducer
2.31 GHz	2.412 GHz	MaxPeak	Coupled	1 MHz	10Hz	#326 horn (dBi)



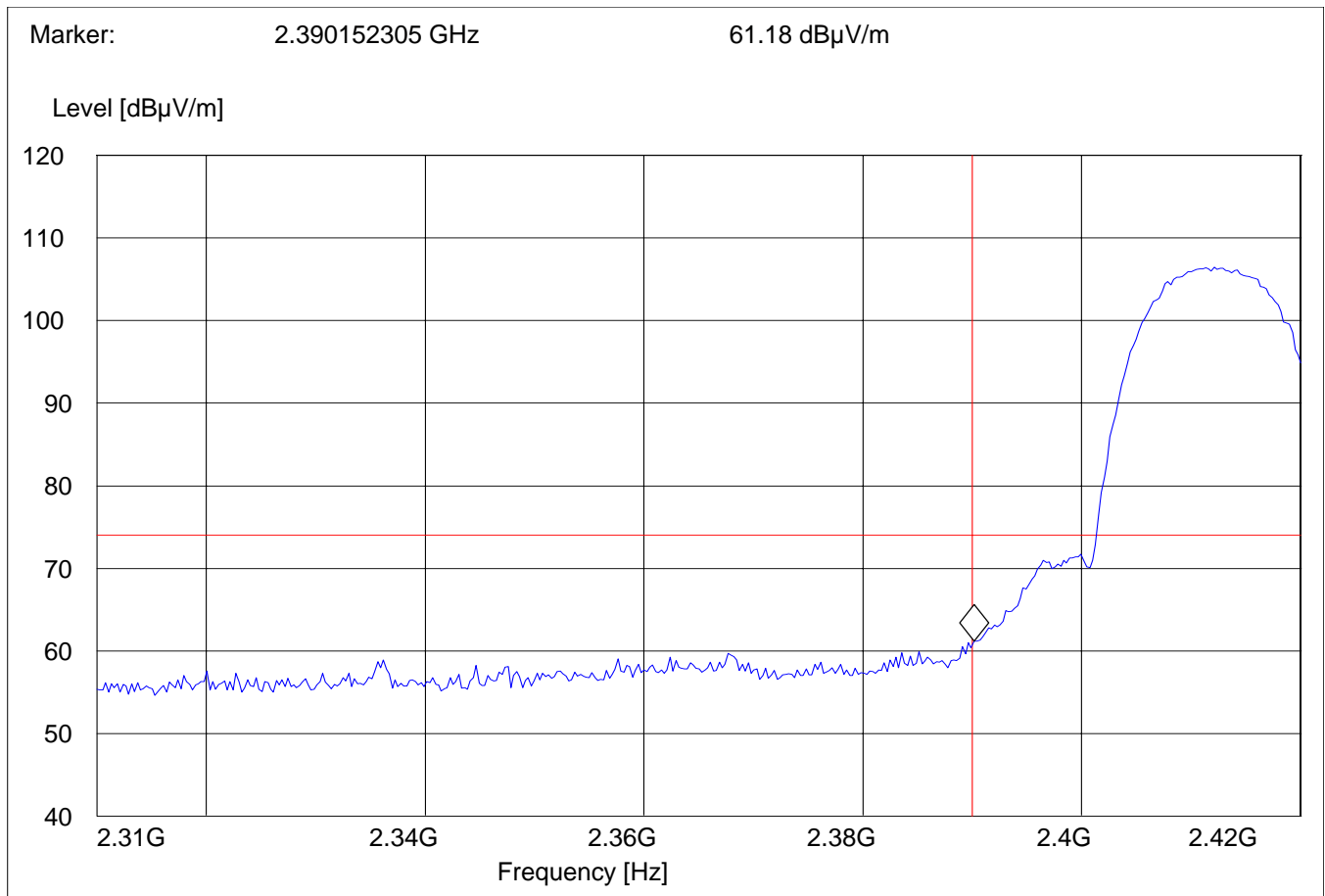
BAND EDGE COMPLIANCE

§15.247 (c)

**Low frequency section (spurious in the restricted band 2310 – 2390 MHz)
(Peak measurement)**

Operating condition : Tx at 2412MHz
 SWEEP TABLE : "FCC15.247 LBE_Pk"
 Limit Line : 74dBμV

Start Frequency	Stop Frequency	Detector	Meas. Bandw.	RBW	VBW	Transducer
2.31 GHz	2.412 GHz	MaxPeak	Coupled	1 MHz	1MHz	#326 horn (dBi)



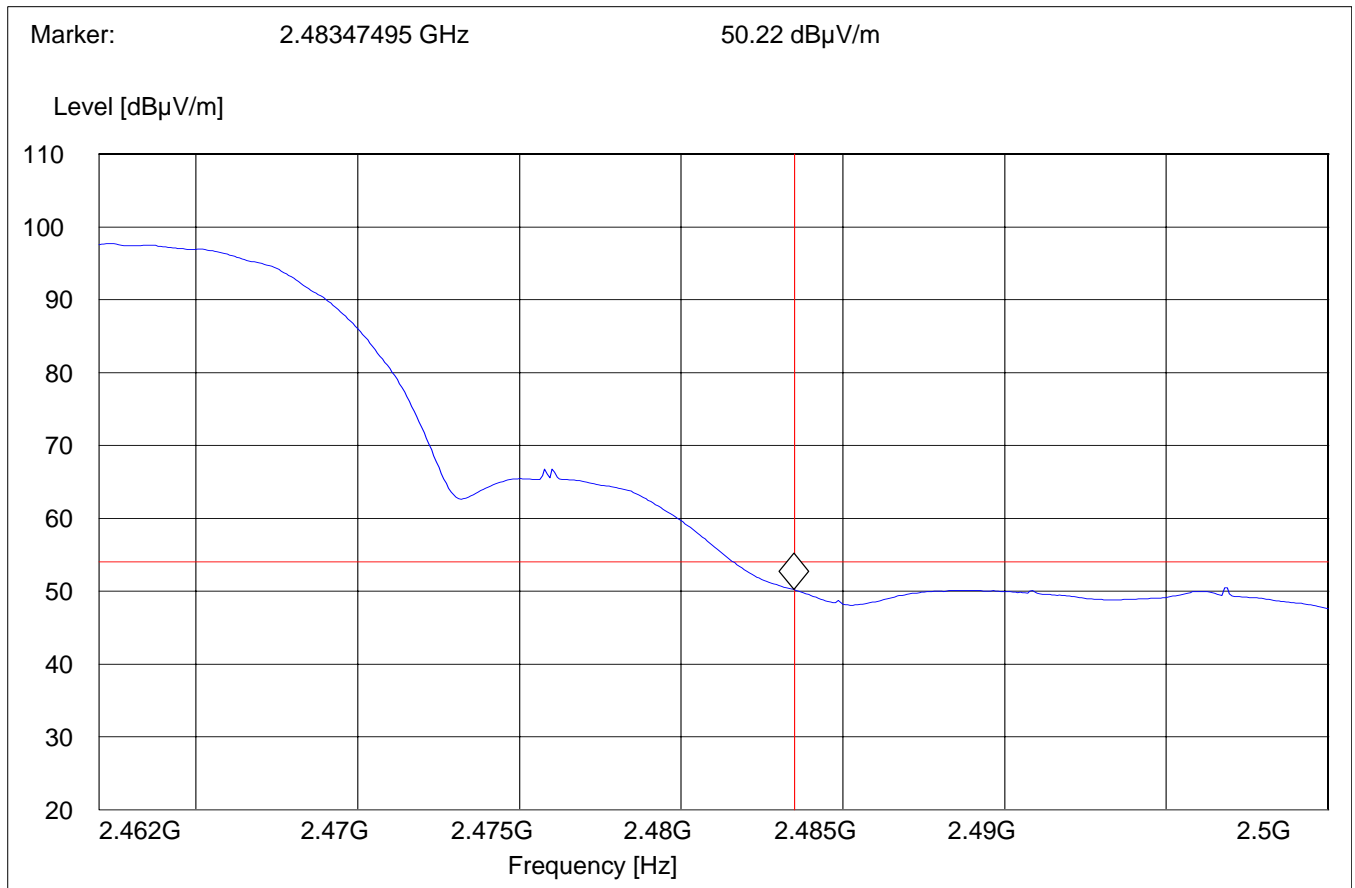
BAND EDGE COMPLIANCE

§15.247 (c)

**High frequency section (spurious in the restricted band 2483.5 – 2500 MHz)
(Average measurement)**

Operating condition : Tx at 2472MHz
 SWEEP TABLE : "FCC15.247 HBE_AVG"
 Limit Line : 54dBμV

Start Frequency	Stop Frequency	Detector	Meas. Bandw.	RBW	VBW	Transducer
2.462 GHz	2.5 GHz	MaxPeak	Coupled	1 MHz	10Hz	#326 horn (dBi)



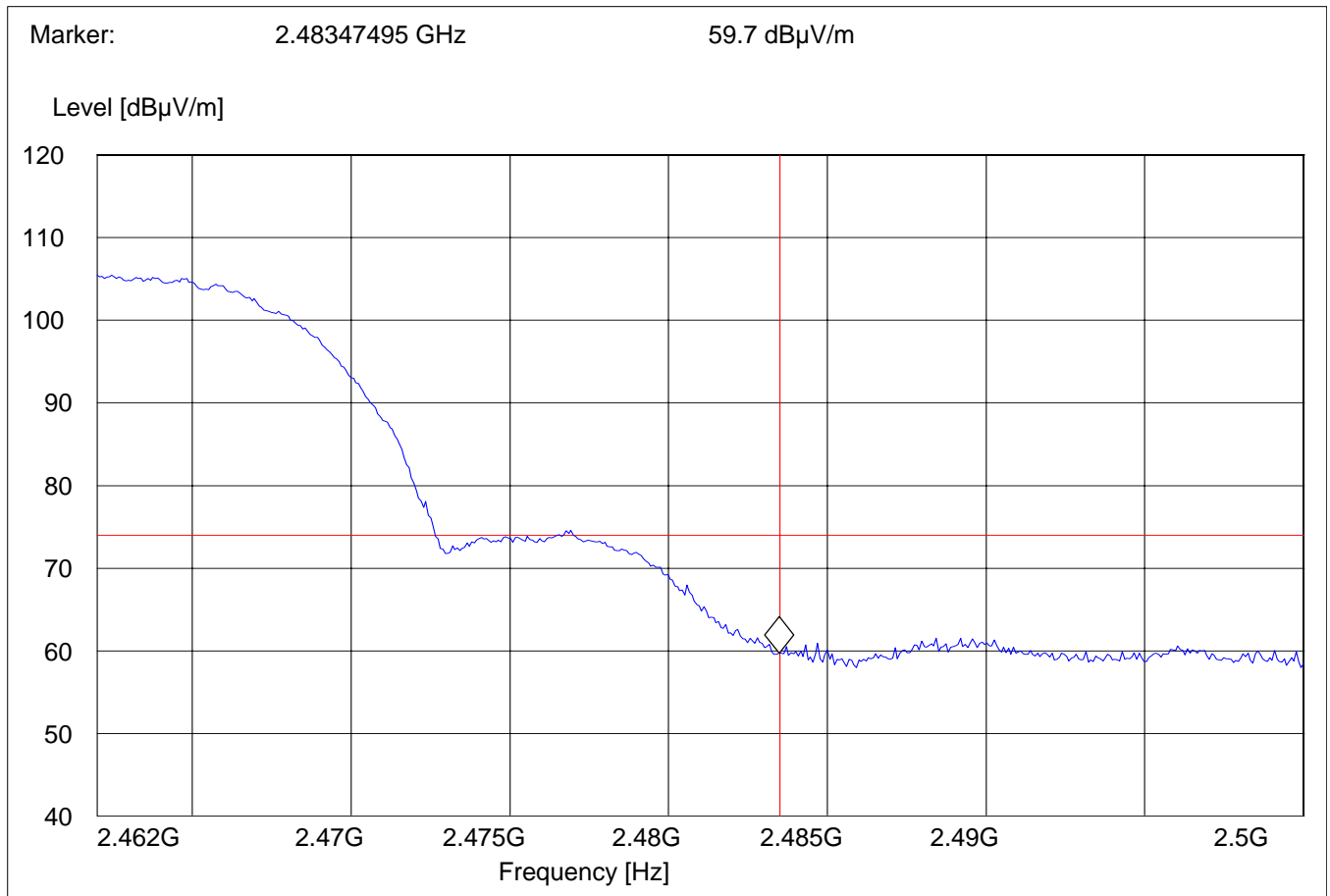
BAND EDGE COMPLIANCE

§15.247 (c)

**High frequency section (spurious in the restricted band 2483.5 – 2500 MHz)
(Peak measurement)**

Operating condition : Tx at 2472MHz
 SWEEP TABLE : "FCC15.247 HBE_PK"
 Limit Line : 74dBμV

Start Frequency	Stop Frequency	Detector Time	Meas. Bandw.	RBW	VBW	Transducer
2.462 GHz	2.5 GHz	MaxPeak	Coupled	1 MHz	1MHz	#326 horn (dBi)



**EMISSION LIMITATIONS
Transmitter (Radiated)**

§ 15.247 (c) (1)

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 25 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

EMISSION LIMITATIONS - Radiated (Transmitter)

§ 15.247 (c) (1)

Transmit at Lowest channel Frequency 2412MHz			
Frequency (MHz)	Level (dBµV/m)		
	Peak	Quasi-Peak	Average
3146.29	49.86		30.11
4815.63	45.67		31.13
5190.38	42.99		28.14
5565.13	48.20		31.75
6314.62	53.95		33.90
9653.30	45.86		31.77

Transmit at Middle channel Frequency 2437MHz			
Frequency (MHz)	Level (dBµV/m)		
	Peak	Quasi-Peak	Average
3146.29	48.45		28.62
4849.69	45.31		32.33
5599.19	48.99		35.42
6314.62	54.44		34.12

Transmit at Highest channel Frequency 2462MHz			
Frequency (MHz)	Level (dBµV/m)		
	Peak	Quasi-Peak	Average
3146.29	45.59		25.95
4917.83	42.83		28.72
5156.31	42.86		27.89
5633.26	49.34		35.78
6314.62	54.68		34.23
9857.71	46.28		31.43

EMISSION LIMITATIONS - Radiated (Transmitter)

§ 15.247 (c) (1)

Lowest Channel (2412MHz): 30MHz – 1GHz

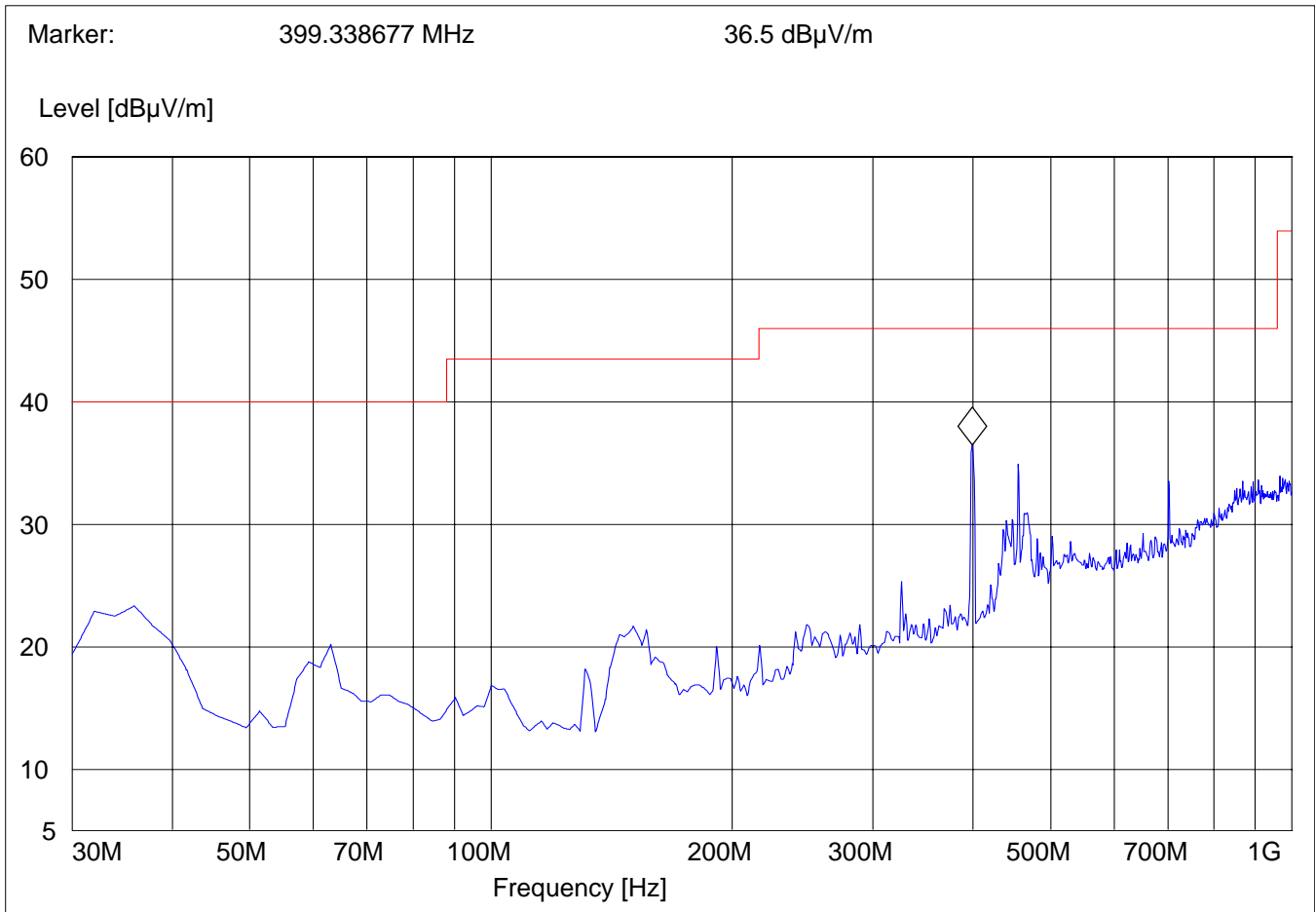
Antenna: vertical

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

SWEEP TABLE:

"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



EMISSION LIMITATIONS - Radiated (Transmitter)

§ 15.247 (c) (1)

Lowest Channel (2412MHz): 30MHz – 1GHz

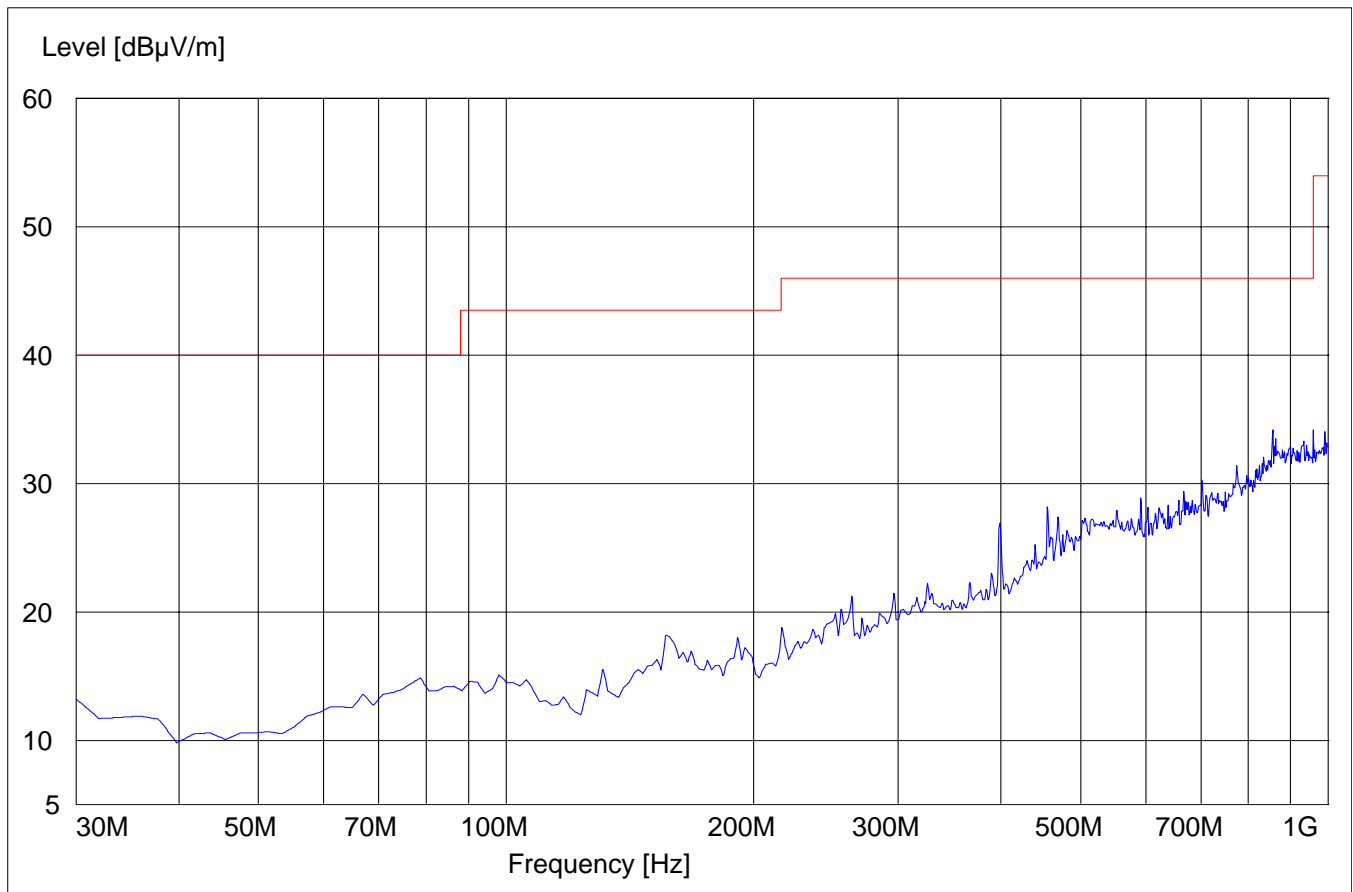
Antenna: horizontal

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

SWEEP TABLE:

"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



EMISSION LIMITATIONS - Radiated (Transmitter)

§ 15.247 (c) (1)

Lowest Channel (2412MHz): 1GHz – 3GHz

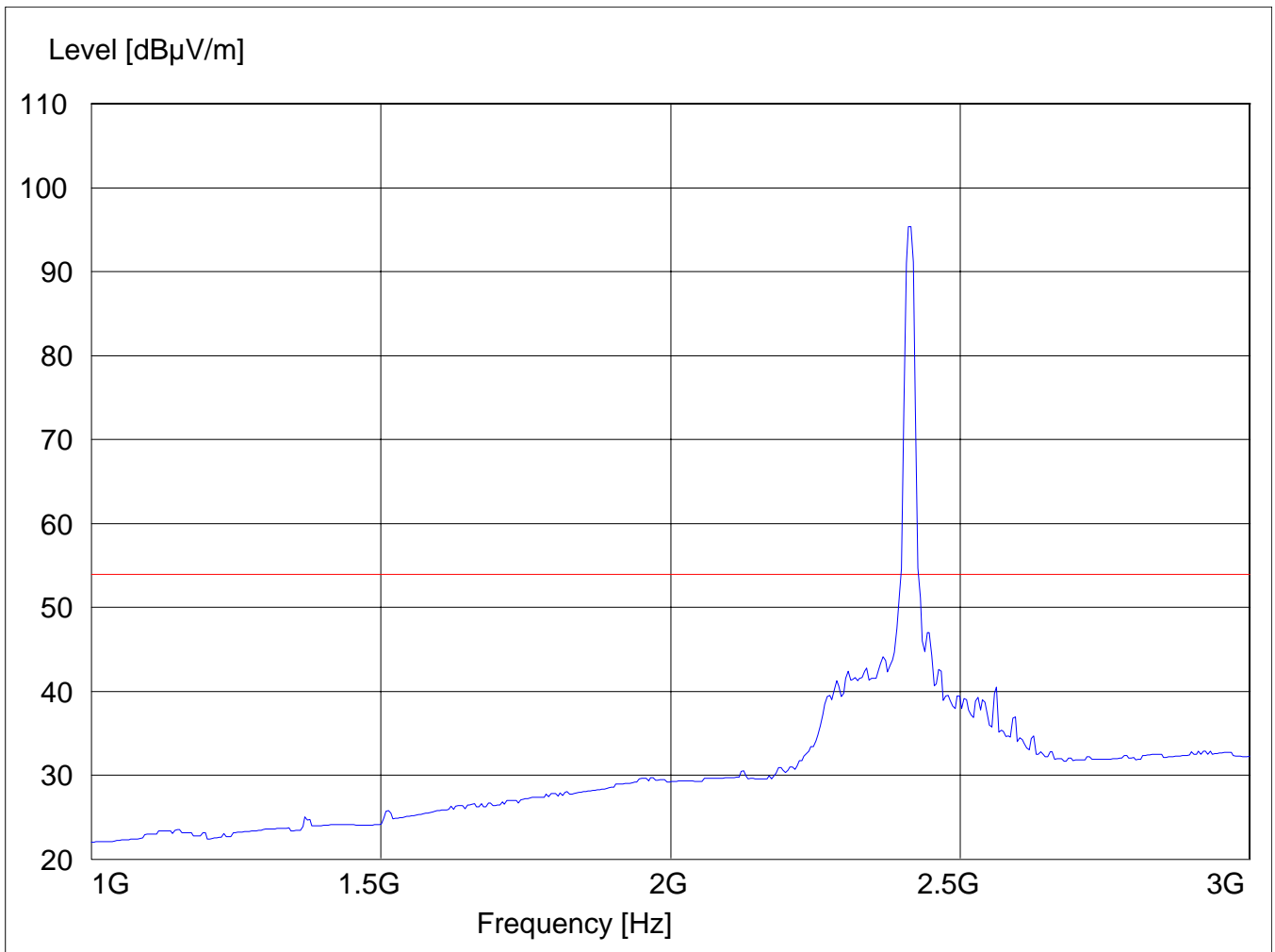
Average measurement

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

SWEEP TABLE:

"Spuri hi 1-3G"

Start Frequency	Stop Frequency	Detector Time	Meas. Bandw.	RBW	VBW	Transducer
1.0 GHz	3.0 GHz	MaxPeak	Coupled	1 MHz	10Hz	#326 horn (dBi)



EMISSION LIMITATIONS - Radiated (Transmitter)

§ 15.247 (c) (1)

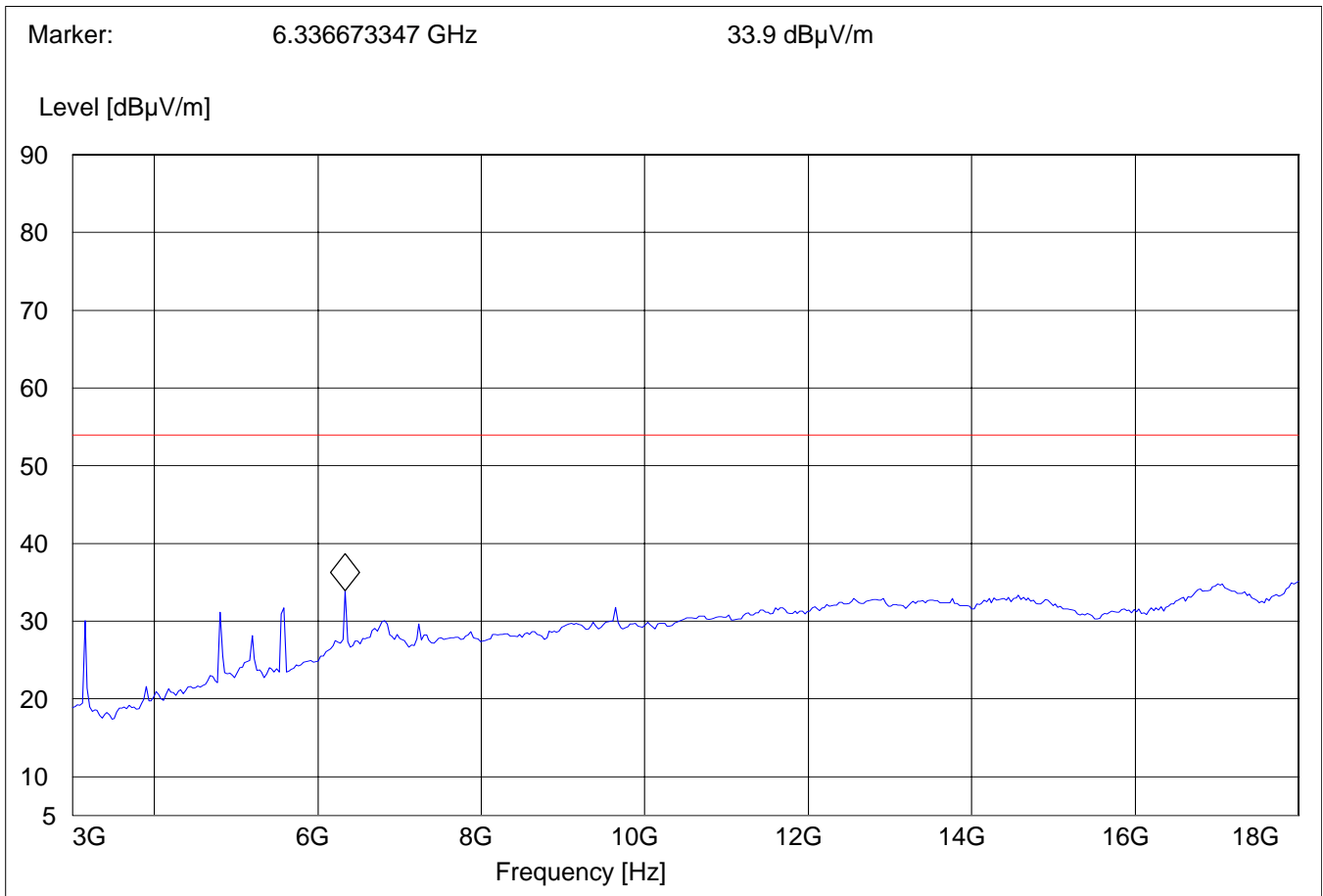
Lowest Channel (2412MHz): 3GHz – 18GHz

Average measurement

SWEEP TABLE:

"Spuri hi 3-18G"

Start Frequency	Stop Frequency	Detector Time	Meas. Bandw.	RBW	VBW	Transducer
3.0 GHz	18.0 GHz	MaxPeak	Coupled	1 MHz	10Hz	#326 horn (dBi)



EMISSION LIMITATIONS - Radiated (Transmitter)

§ 15.247 (c) (1)

Mid Channel (2437MHz): 1GHz – 3GHz

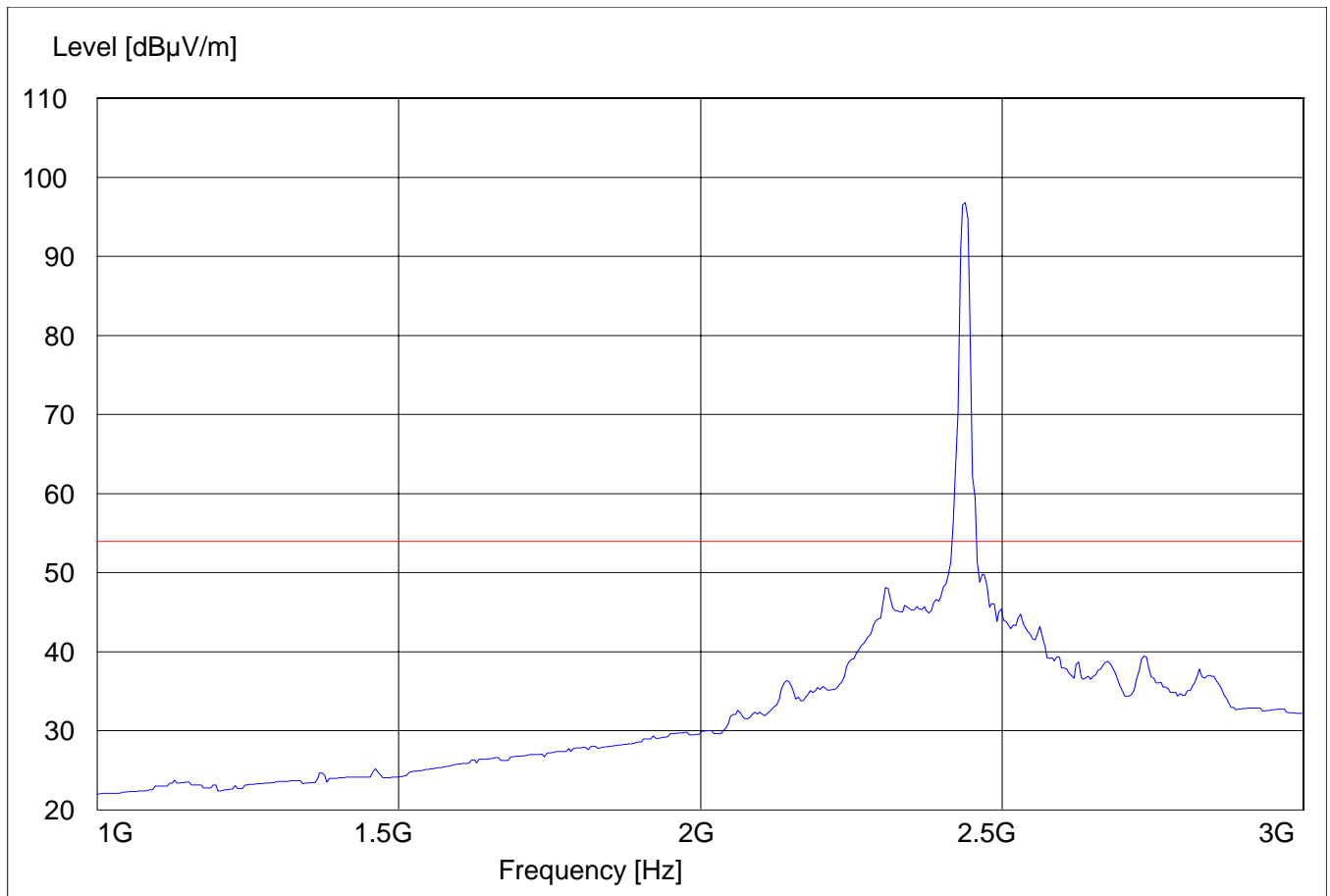
Average measurement

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

SWEEP TABLE:

"Spuri hi 1-3G"

Start Frequency	Stop Frequency	Detector Time	Meas. Bandw.	RBW	VBW	Transducer
1.0 GHz	3.0 GHz	MaxPeak	Coupled	1 MHz	10Hz	#326 horn (dBi)



EMISSION LIMITATIONS - Radiated (Transmitter)

§ 15.247 (c) (1)

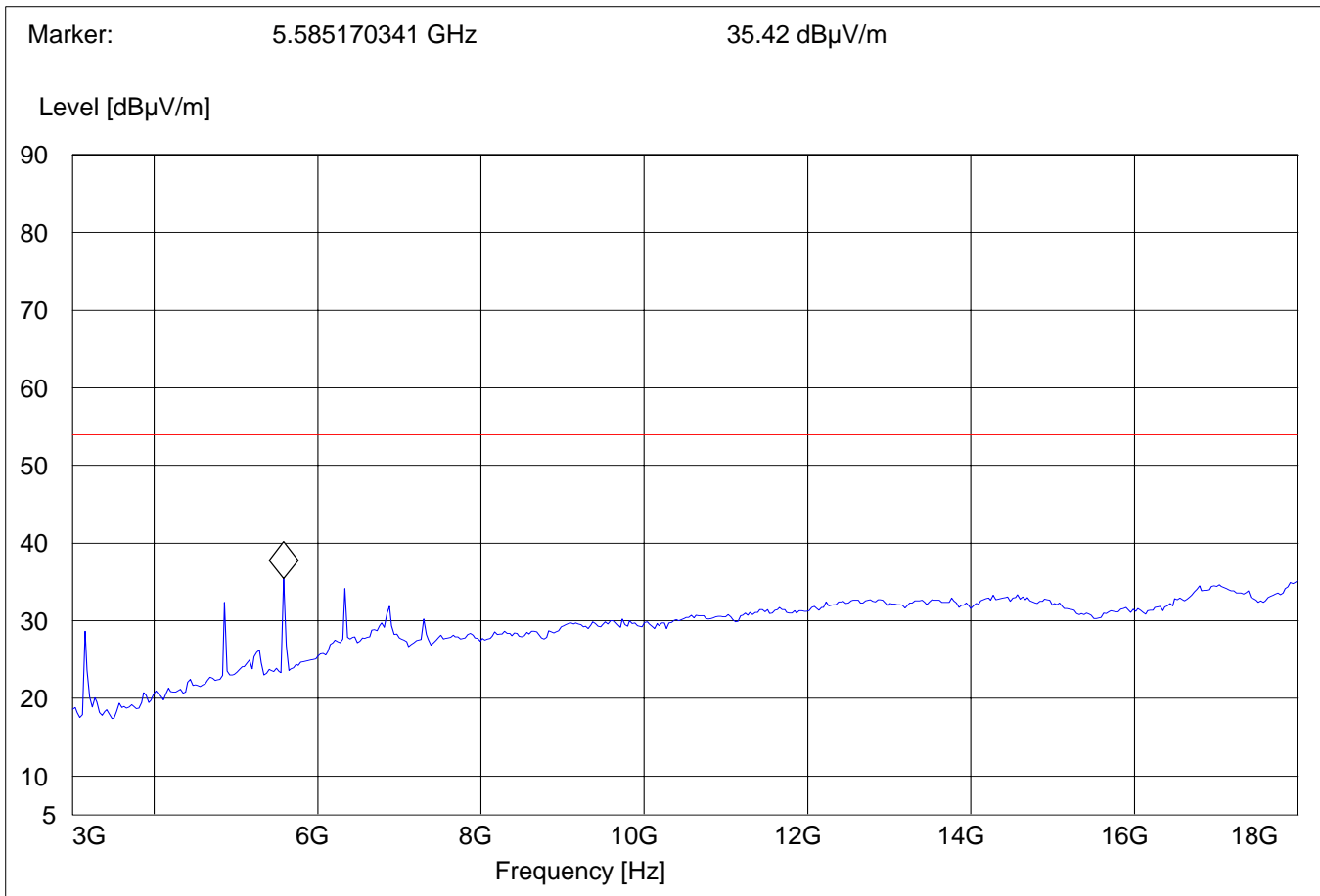
Mid Channel (2437MHz): 3GHz – 18GHz

Average measurement

SWEEP TABLE:

"Spuri hi 3-18G"

Start Frequency	Stop Frequency	Detector Time	Meas. Bandw.	RBW	VBW	Transducer
3.0 GHz	18.0 GHz	MaxPeak	Coupled	1 MHz	10Hz	#326 horn (dBi)



EMISSION LIMITATIONS - Radiated (Transmitter)

§ 15.247 (c) (1)

Highest Channel (2462MHz): 1GHz – 3GHz

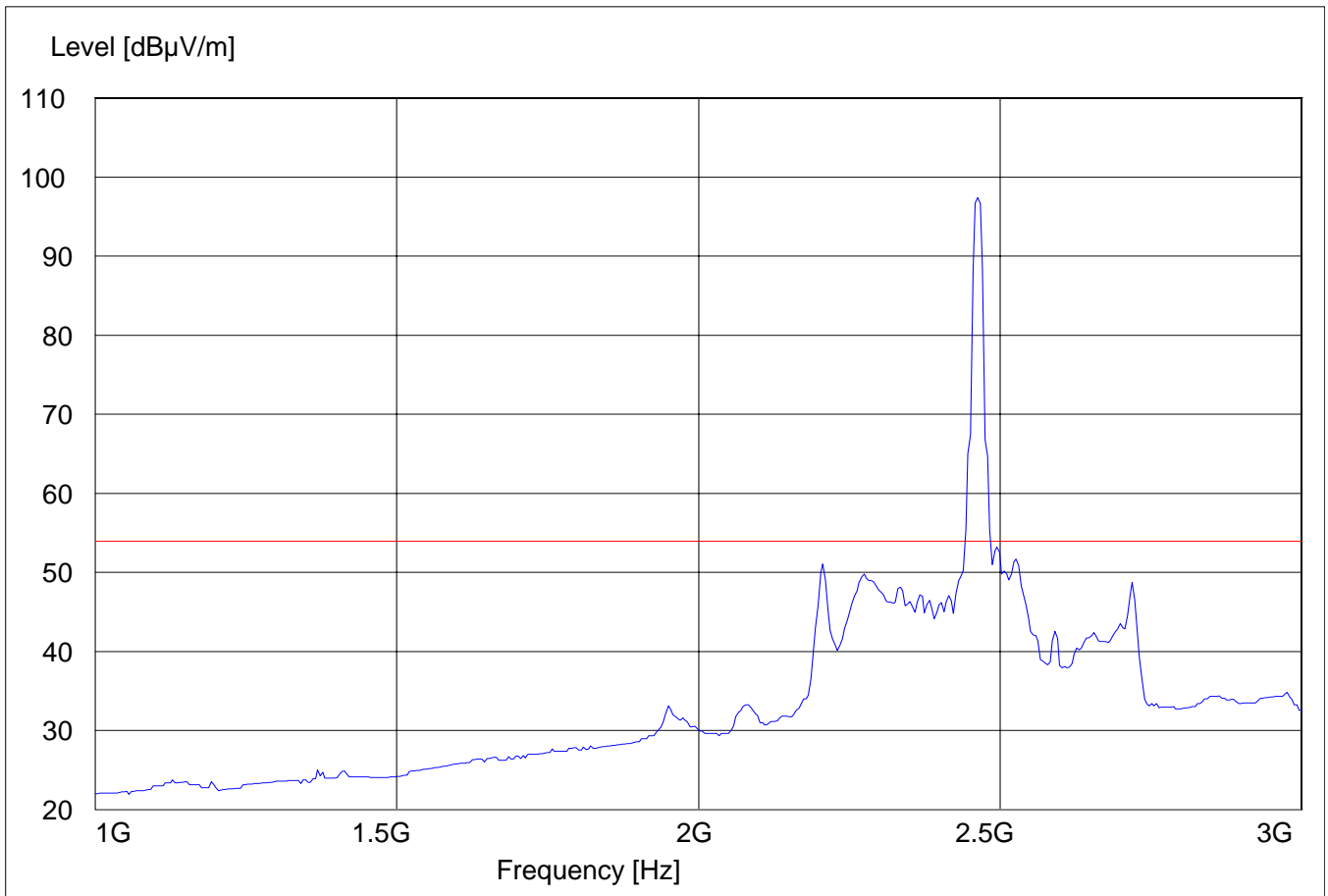
Average measurement

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

SWEEP TABLE:

"Spuri hi 1-3G"

Start Frequency	Stop Frequency	Detector Time	Meas. Bandw.	RBW	VBW	Transducer
1.0 GHz	3.0 GHz	MaxPeak	Coupled	1 MHz	10Hz	#326 horn (dBi)



EMISSION LIMITATIONS - Radiated (Transmitter)

§ 15.247 (c) (1)

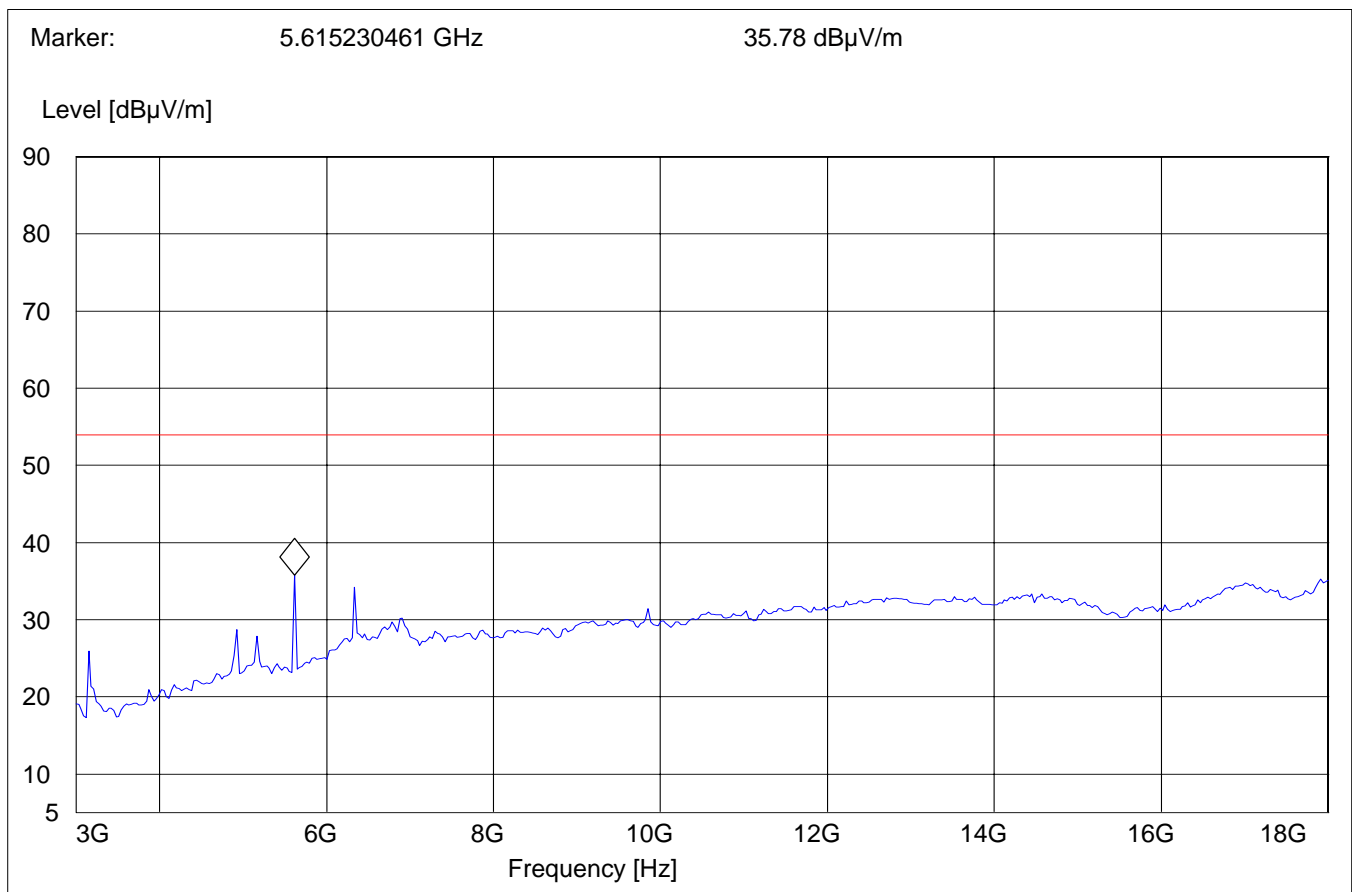
Highest Channel (2462MHz): 3GHz – 18GHz

Average measurement

SWEEP TABLE:

"Spuri hi 3-18G"

Start Frequency	Stop Frequency	Detector Time	Meas. Bandw.	RBW	VBW	Transducer
3.0 GHz	18.0 GHz	MaxPeak	Coupled	1 MHz	10Hz	#326 horn (dBi)



EMISSION LIMITATIONS - Radiated (Transmitter)

§ 15.247 (c) (1)

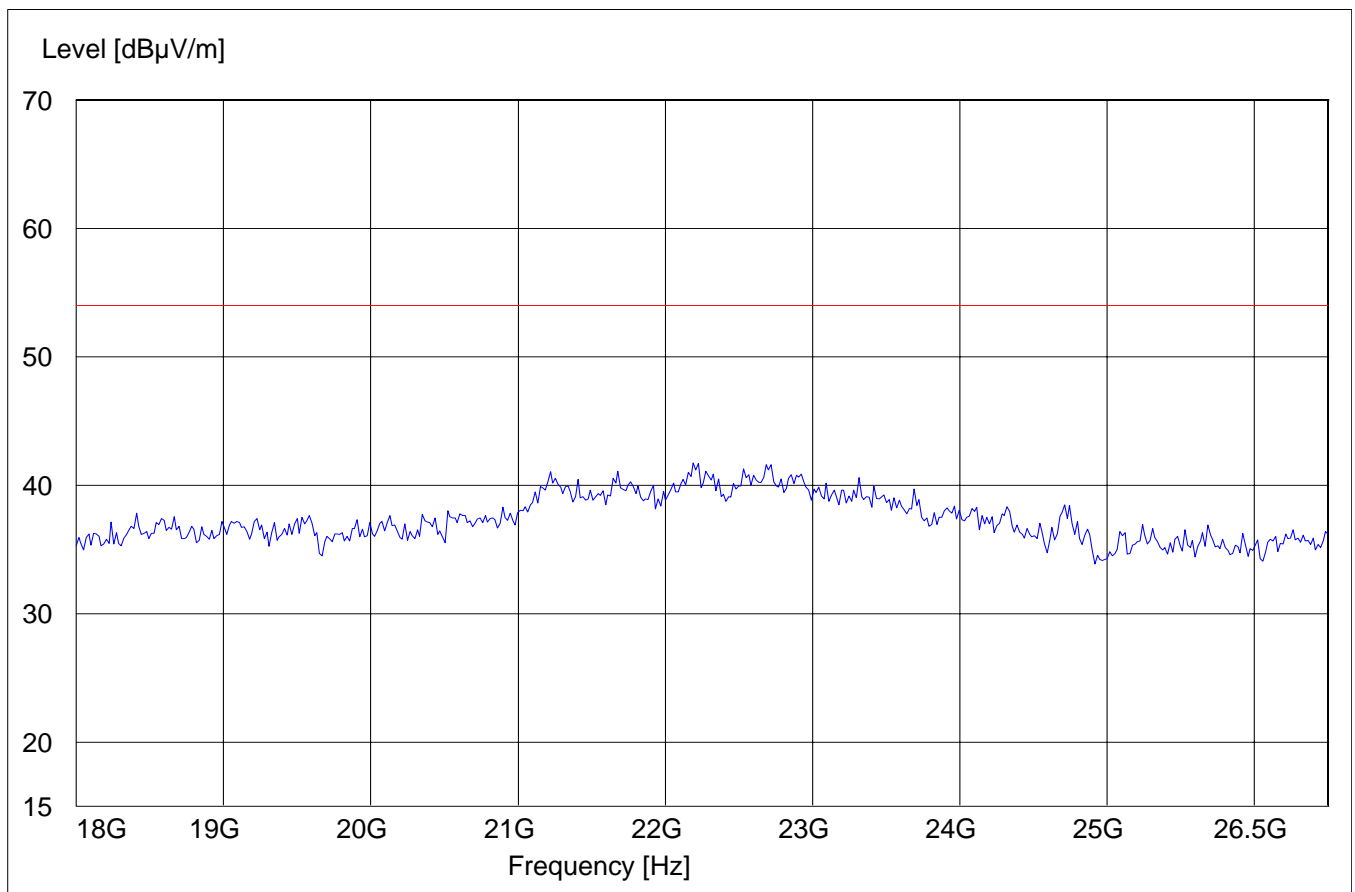
18GHz – 25GHz

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

SWEEP TABLE:

"Spuri hi 18-25G"

Start	Stop	Detector	Meas.	RBW	Transducer
Frequency	Frequency	Time	Bandw.	VBW	
18 GHz	25 GHz	MaxPeak	Coupled	1 MHz	#326 horn (dBi)



CONDUCTED EMISSIONS

§ 15.107/207

Measured with AC/DC power adapter

SWEEP TABLE: "55022 cond"

Short Description:		EN 55022 for 150KHz-30MHz			
Start	Stop	Detector	Meas	IF	Transducer
Frequency	Frequency		Time	Bandw.	
150.0 kHz	30.0 MHz	MaxPeak	Coupled	10 kHz	None

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

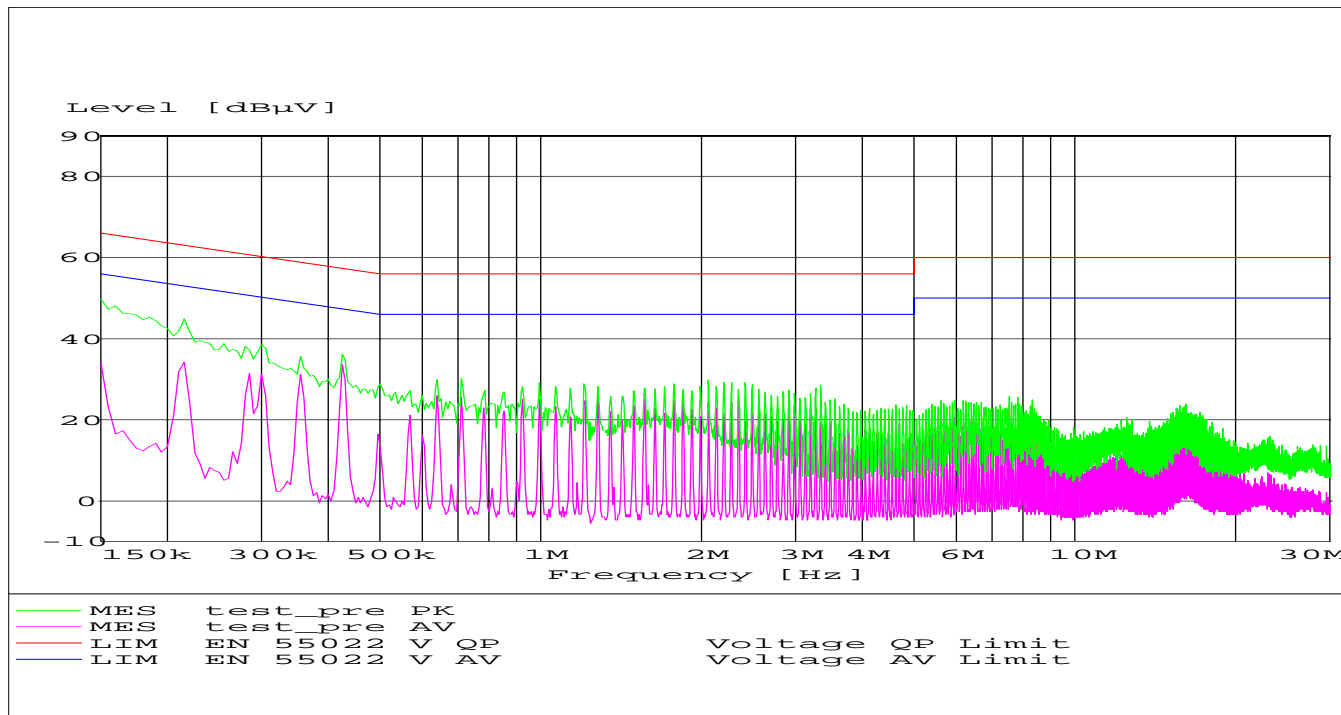
Limit

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 ($\mu\text{V/m}$)	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 26.5 GHz very short cable connections to the antenna was used to minimize the noise level.

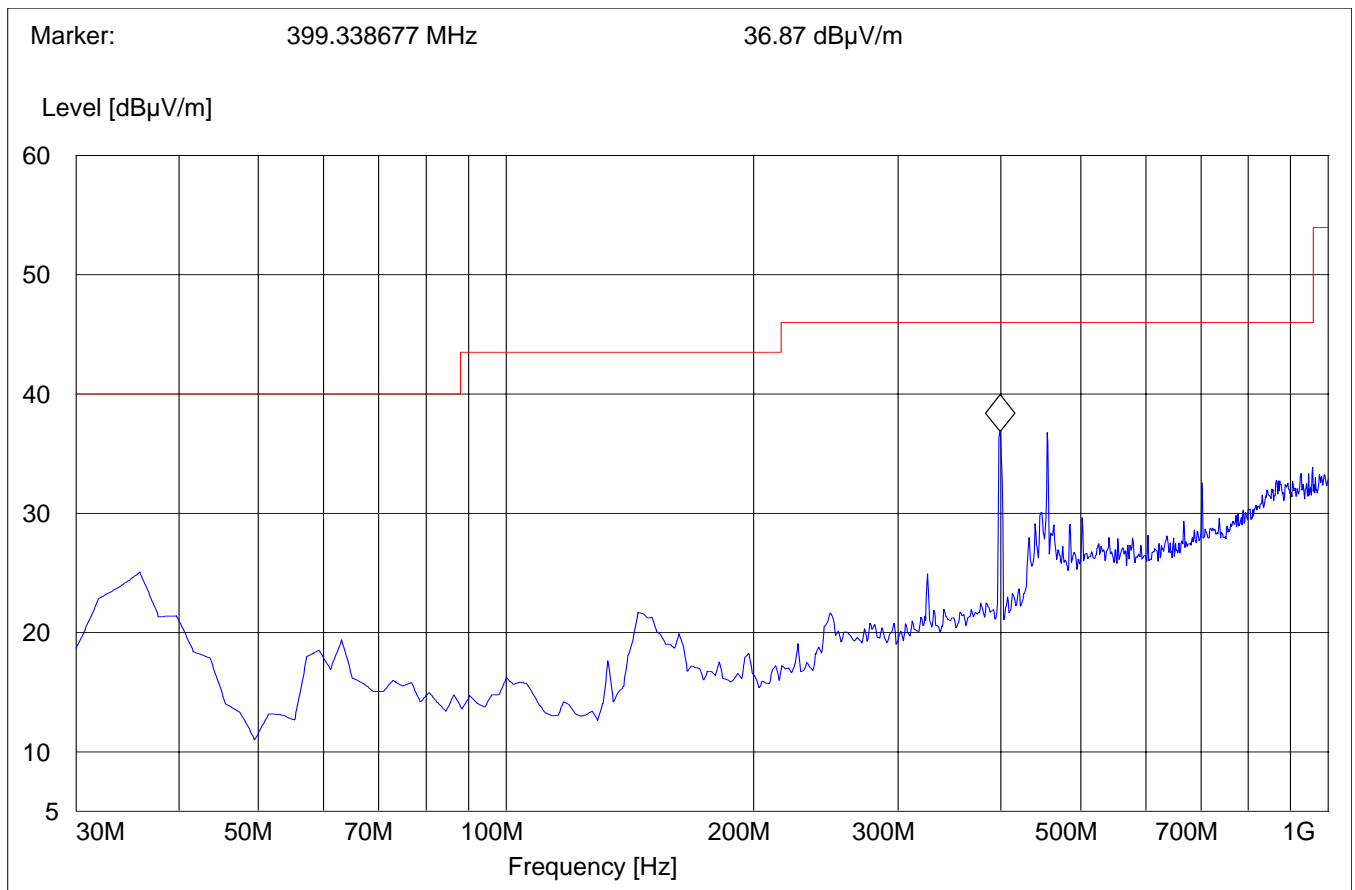
RECEIVER SPURIOUS RADIATION

§ 15.209

30MHz – 1GHz

(Worst-case plot valid for all polarities)

SWEEP TABLE:		"Spuri hi 30-1G"			
Start	Stop	Detector	Meas. Time	RBW	Transducer
30.0 MHz	1.0 GHz	MaxPeak	Coupled	100 kHz	3141-#1186



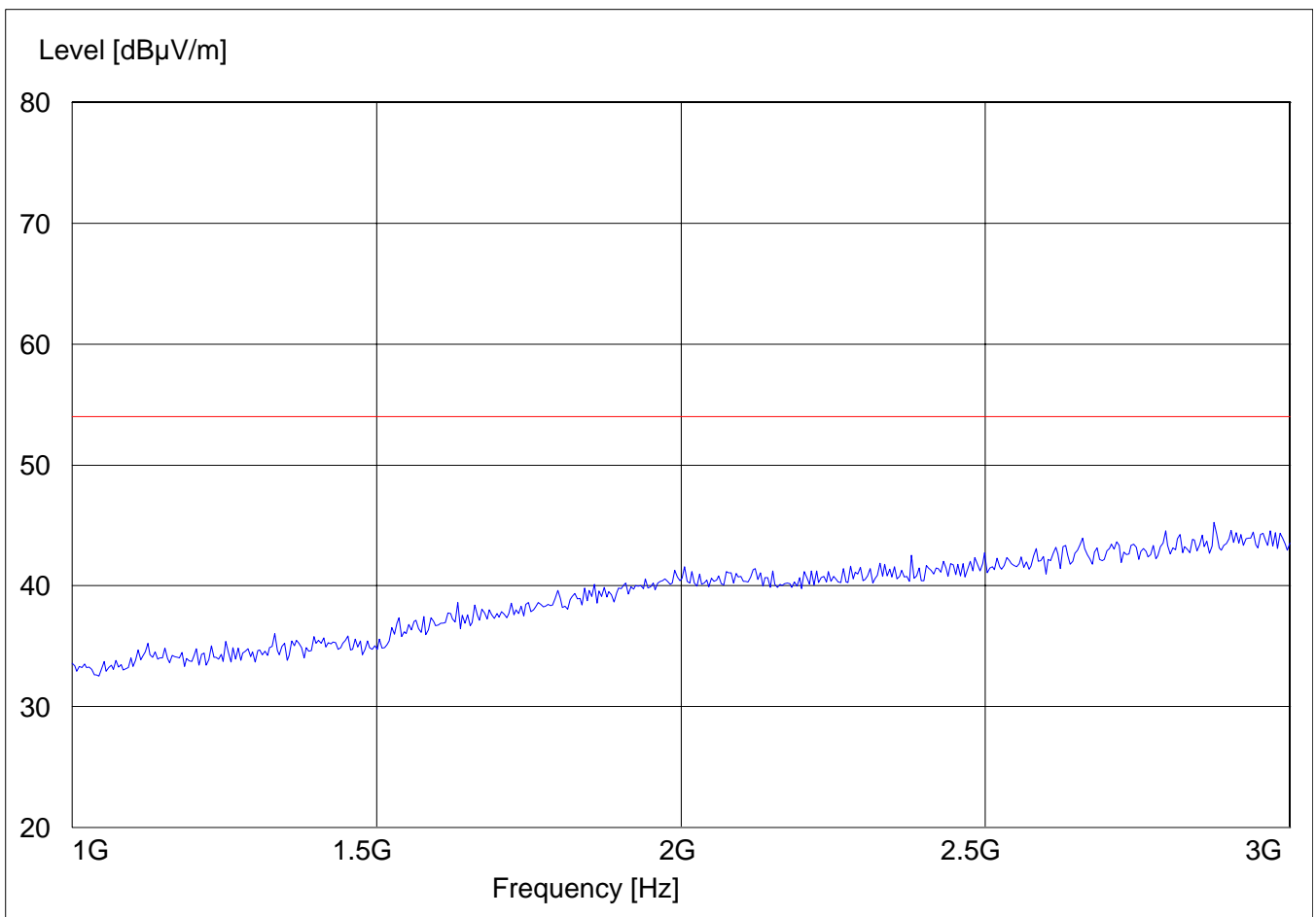
RECEIVER SPURIOUS RADIATION
1GHz – 3GHz

§ 15.209

SWEEP TABLE:

"Spuri hi 1-3G"

Start	Stop	Detector	Meas.	RBW	VBW	Transducer
Frequency	Frequency	Time	Bandw.			
1.0 GHz	3.0 GHz	MaxPeak	Coupled	1 MHz	1MHz	#326 horn (dBi)



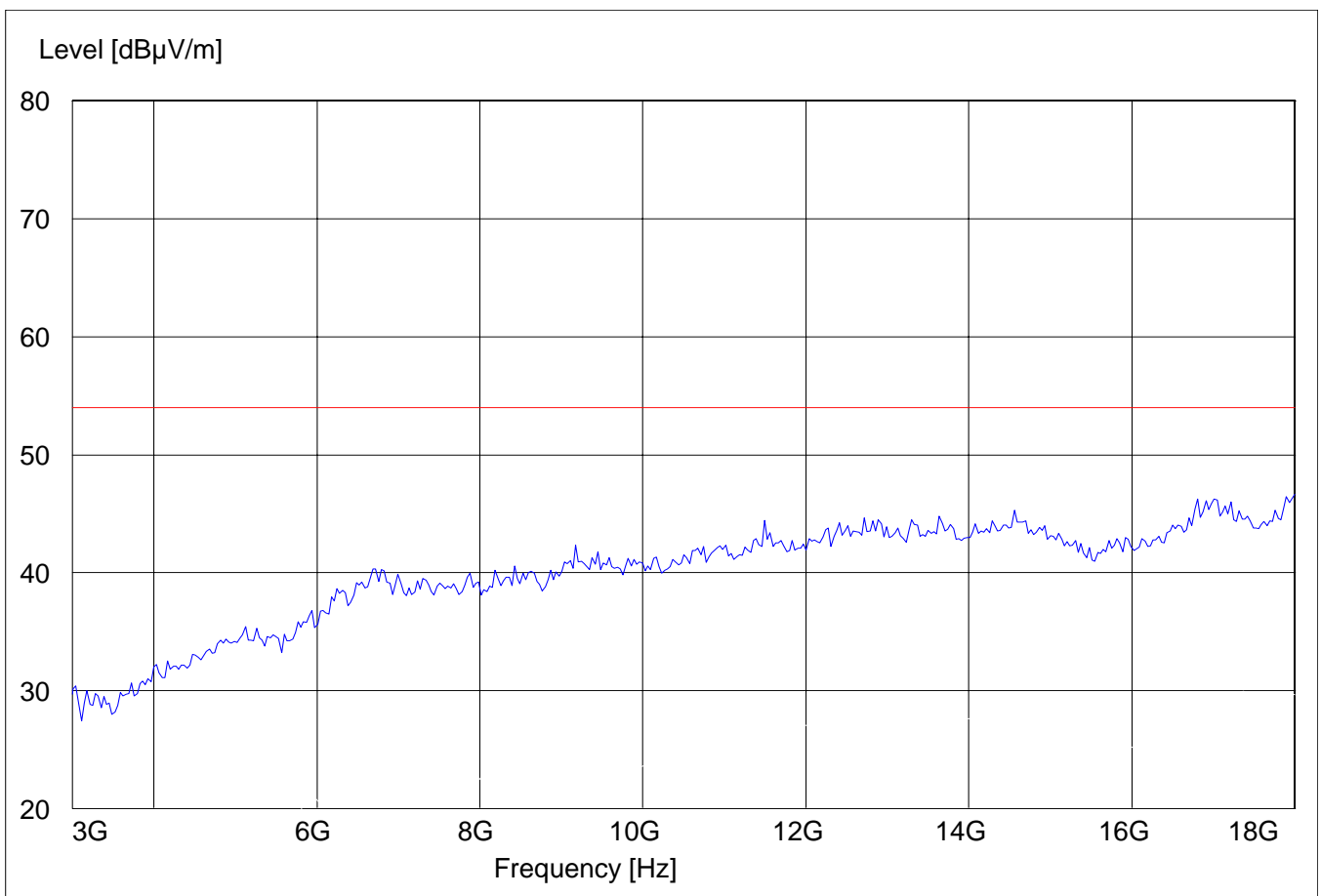
RECEIVER SPURIOUS RADIATION
3GHz – 18GHz

§ 15.209

SWEEP TABLE:

"Spuri hi 3-18G"

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



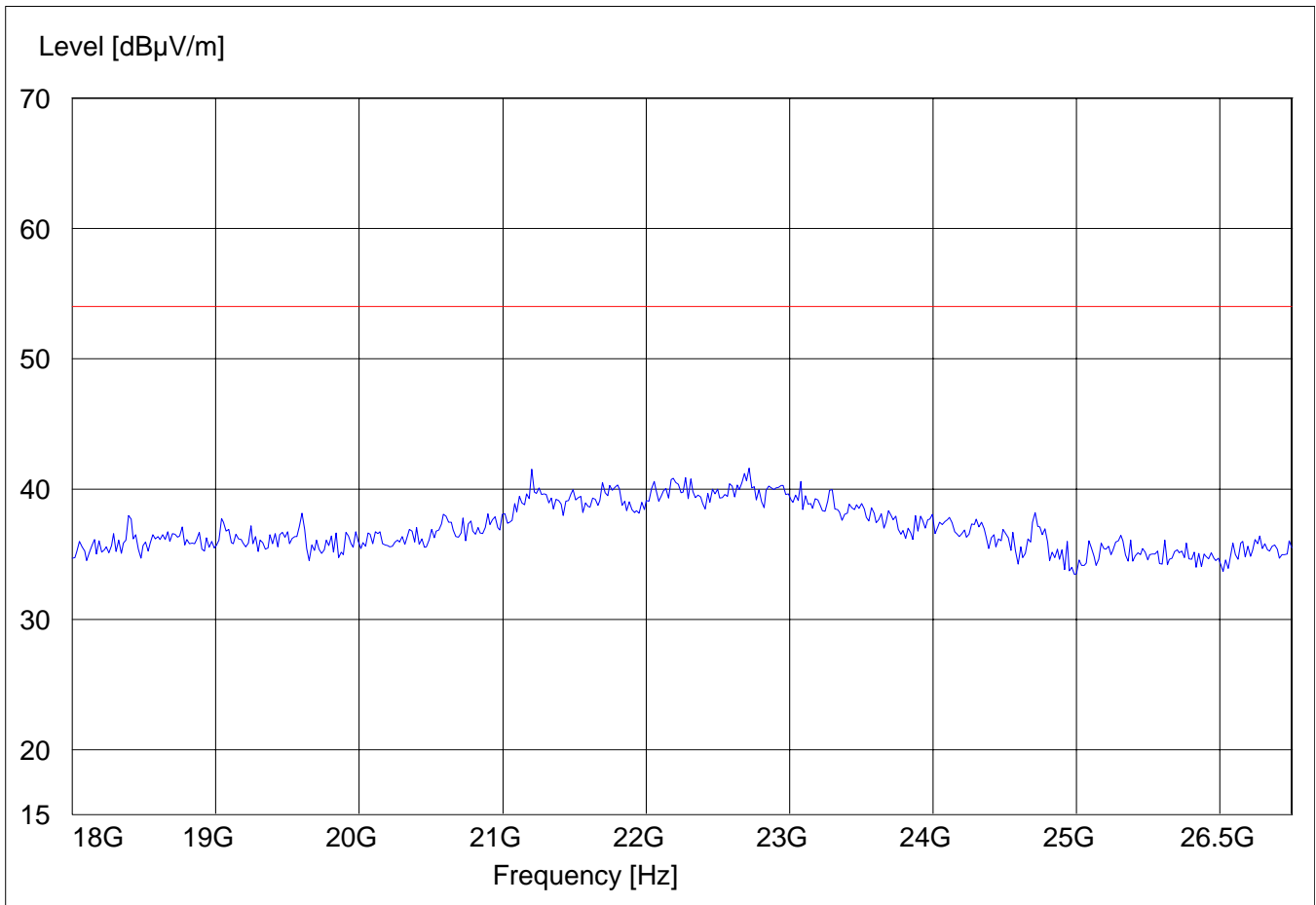
RECEIVER SPURIOUS RADIATION
18GHz – 25GHz

§ 15.209

SWEEP TABLE:

Start	Stop	Detector	Meas.	RBW	Transducer
Frequency	Frequency	Time	Bandw.	VBW	
18 GHz	25 GHz	MaxPeak	Coupled	1 MHz	#141 horn (dBi)

"Spuri hi 18-25G"



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

ANECHOIC CHAMBER

