



FCC Test Report

FCC Part 15.407 for UNII Devices/

FOR:

802.11a/g Wireless LAN PCI-E Mini Card

MODEL #: BCM94311MCAG

**Broadcom Corporation
190 Mathilda Place
Sunnyvale, CA 94086
U.S.A**

FCC ID: QDS-BRCM1019

**TEST REPORT #: EMC_BROAD_025_06002_15.407
DATE: 1/2/2007**



**FCC listed#
101450**

**IC recognized #
3925**

CETECOM Inc.

411 Dixon Landing Road ♦ Milpitas, CA 95035 ♦ U.S.A.

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CETECOM Inc. is a Delaware Corporation with Corporation number: 2113686

Board of Directors: Dr. Harald Ansorge, Dr. Klaus Matkey, Hans Peter May



Table of Contents

1	General information	3
1.1	Notes	3
1.2	Testing laboratory	3
1.3	Details of applicant.....	4
1.4	Application details.....	4
1.5	Test item.....	4
1.6	Test standards:	4
2	Technical test.....	5
2.1	Summary of test results	5
3	Test report.....	6
3.1	Measurements.....	7
3.1.1	MAXIMUM PEAK OUTPUT POWER § 15.407 (RADIATED).....	7
3.1.2	RESTRICTED BAND EDGE COMPLIANCE RADIATED §15.407(b)/15.205	11
3.1.3	TRANSMITTER SPURIOUS EMISSIONS RADIATED § 15.407(b)/15.205/15.209	16
3.1.4	AC POWER LINE CONDUCTED EMISSIONS § 15.107/207	25
4	TEST EQUIPMENT AND ANCILLARIES USED FOR TESTS	28
5	BLOCK DIAGRAMS	29



1 General information

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.

1.1 Notes

TEST REPORT PREPARED BY:

EMC Engineer: Pete Krebill

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

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

1.4 Application details

Date of receipt test item : **12/13/2006**
Date of test : **12/18/2006**

1.5 Test item

Manufacturer : **Applicant**
Marketing Name : **802.11a/g Wireless LAN PCI-E Mini Card**
Model No. : **BCM94311MCAG**
Description : **802.11g Wireless LAN PCI-E Mini Card**
FCC-ID : **QDS-BRCM1019**

Additional information

Frequency : **5180MHz – 5320MHz**
Type of modulation : **DSSS**
Number of channels : **11**
Antenna : **External**
Output power : **14.0dBm (0.03W) conducted average power Channel 36**
17.0dBm (0.05W) conducted average power Channel 52
16.5dBm (0.04W) conducted average power Channel 65

1.6 Test standards: **FCC Part 15 §15.407**



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:

1/2/2007	EMC & Radio	Lothar Schmidt (Manager)	
Date	Section	Name	Signature



3 Test report

TEST REPORT

Test report no.: EMC_BROAD_025_06002_FCC15.407



3.1 Measurements

3.1.1 MAXIMUM PEAK OUTPUT POWER § 15.407 (RADIATED)

3.1.1.1 Results EIRP 802.11 (a) MODE:

TEST CONDITIONS		MAXIMUM PEAK OUTPUT POWER (dBm)		
Frequency (MHz)		5180	5260	5320
T _{nom} (23)°C	V _{nom} VDC	22.19	21.74	22.93
Measurement uncertainty		±0.5dBm		

Notes:

1. EIRP was measured with the device transmitting on both the auxiliary and the main antenna. The EIRP was highest when transmitting on the auxiliary antenna. EIRP values shown in this report are with the device transmitting on the auxiliary antenna.



EIRP 802.11 (a) Mode (5180)

CETECOM Inc.

411 Dixon Landing Road, Milpitas CA 95035, USA

EUT:: 4311 MCAG modem

Customer:: Broadcom

Test Mode: WLAN, 802.11a, tch ch 36

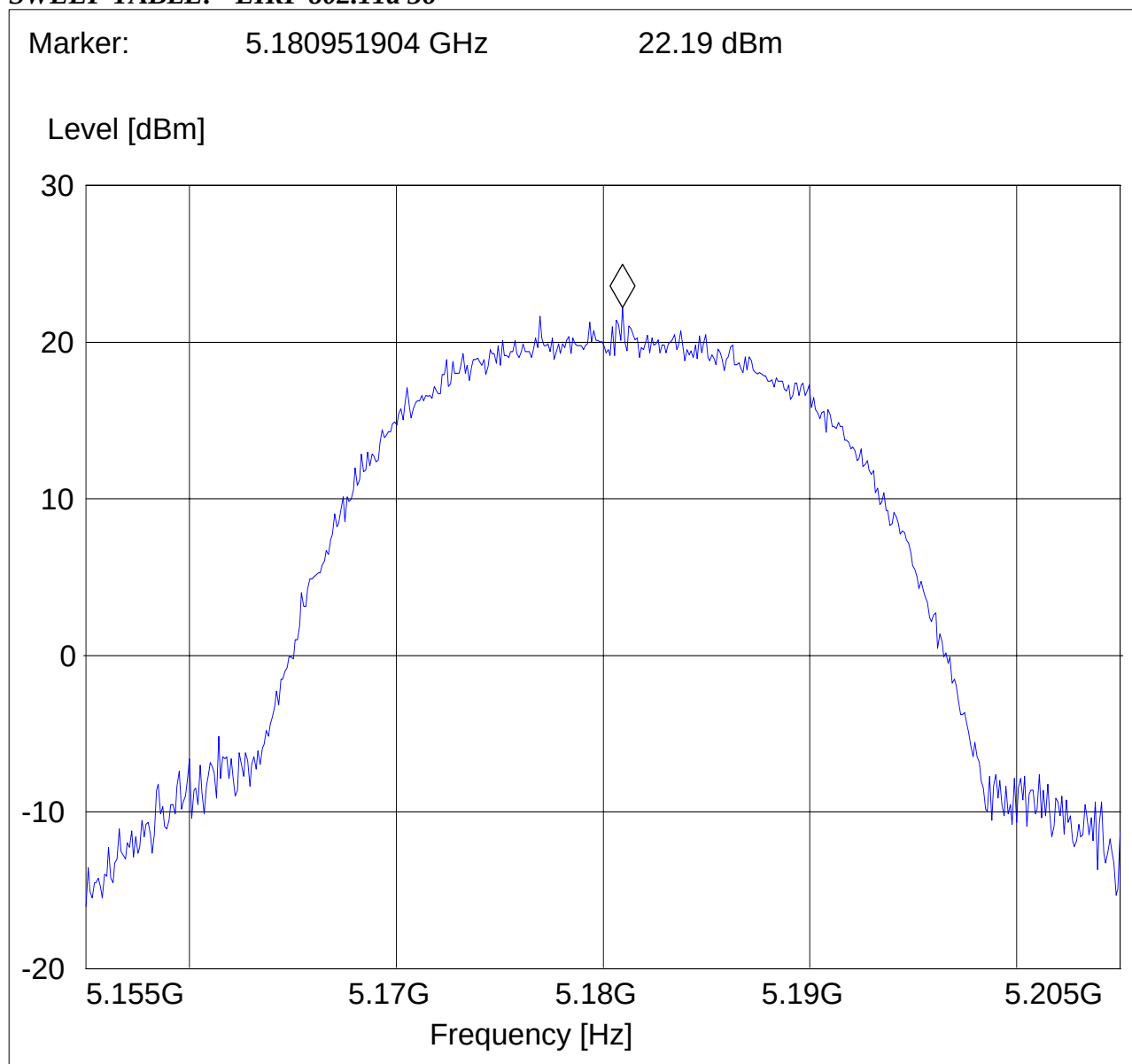
Ant Orientation: H

EUT Orientation: H, auxiliary antenna.

Test Engineer: Ed

Voltage:: AC Adapter

SWEEP TABLE: "EIRP 802.11a 36"





EIRP 802.11 (a) Mode (5260MHz)

CETECOM Inc.

411 Dixon Landing Road, Milpitas CA 95035, USA

EUT:: 4311 MCAG modem

Customer:: Broadcom

Test Mode: WLAN, 802.11a, tch ch 52

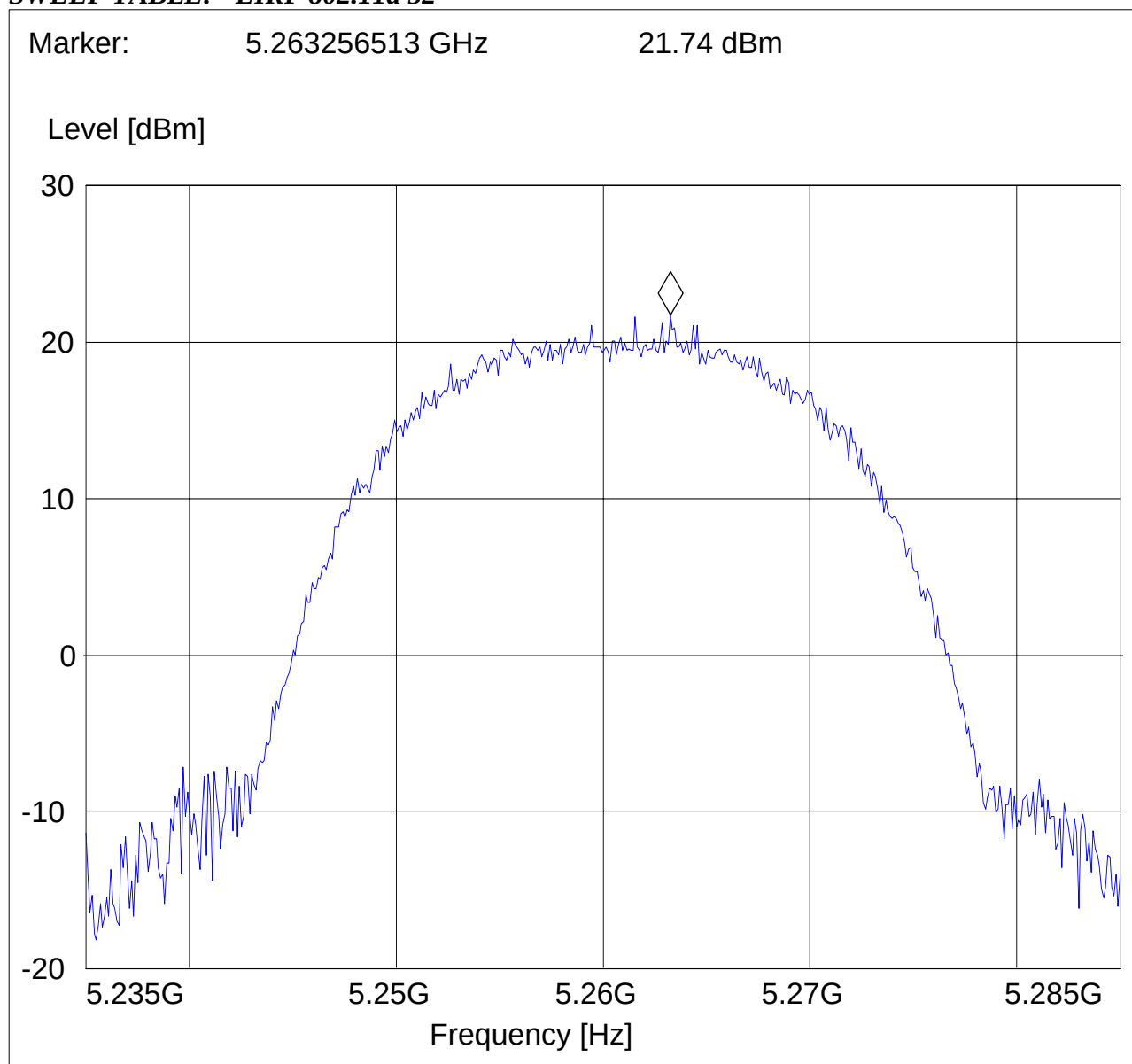
Ant Orientation: H

EUT Orientation: H, auxiliary antenna.

Test Engineer: Ed

Voltage:: AC Adapter

SWEEP TABLE: "EIRP 802.11a 52"





EIRP 802.11 (a) Mode (5320MHz)

CETECOM Inc.

411 Dixon Landing Road, Milpitas CA 95035, USA

EUT:: 4311 MCAG modem

Customer:: Broadcom

Test Mode: WLAN, 802.11a, tch ch 64

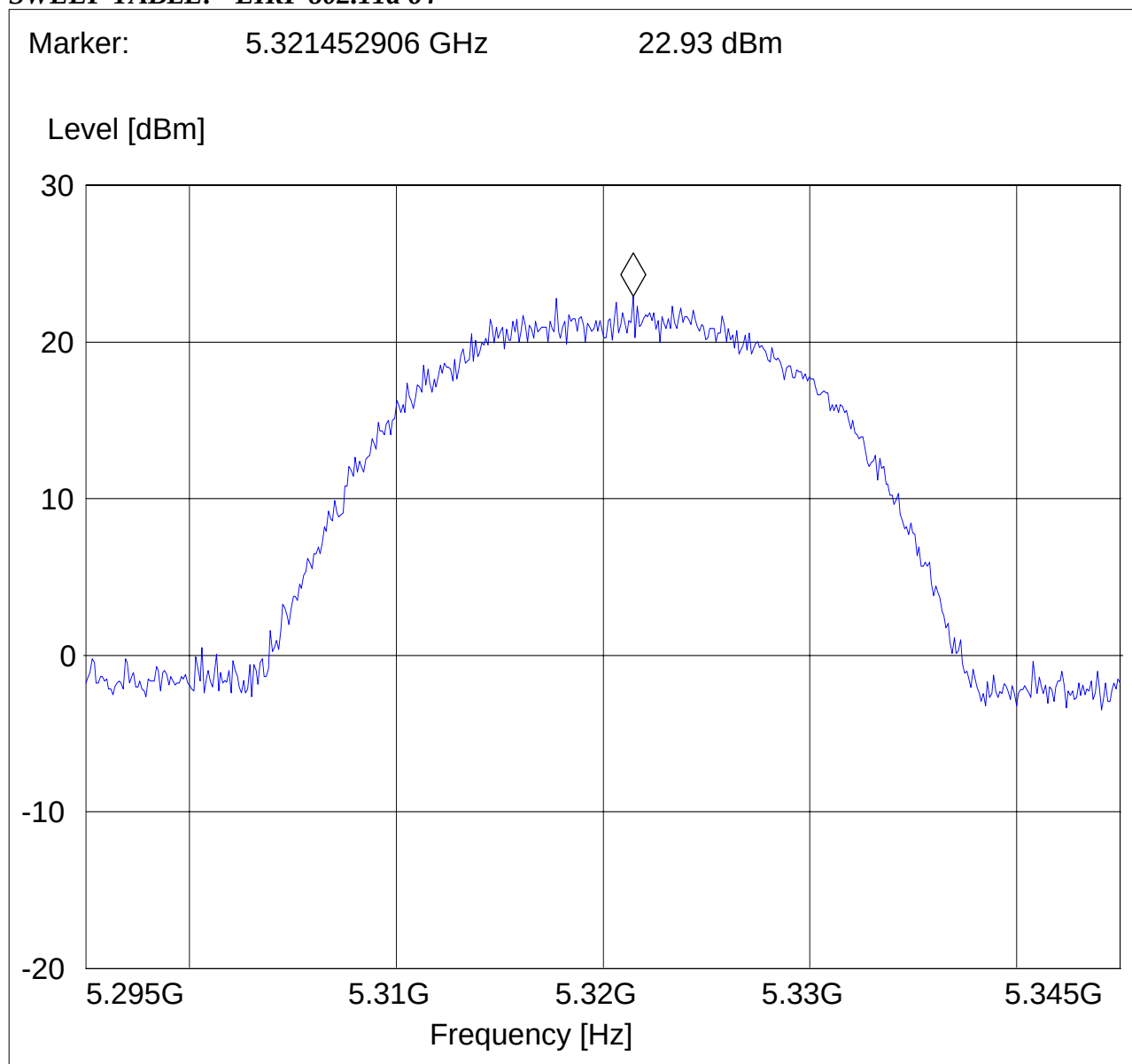
Ant Orientation: H

EUT Orientation: H, auxiliary antenna.

Test Engineer: Ed

Voltage:: AC Adapter

SWEEP TABLE: "EIRP 802.11a 64"





3.1.2 RESTRICTED BAND EDGE COMPLIANCE RADIATED §15.407(b)/15.205

3.1.2.1 LIMITS

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

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

***PEAK LIMIT= 74dBuV/m**

***AVG. LIMIT= 54dBuV/m**



3.1.2.2 802.11 (a) MODE (5180MHz)

PEAK

CETECOM Inc.

411 Dixon Landing Road, Milpitas CA 95035, USA

EUT:: 4311 MCAG modem

Customer:: Broadcom

Test Mode: TX Ch 36

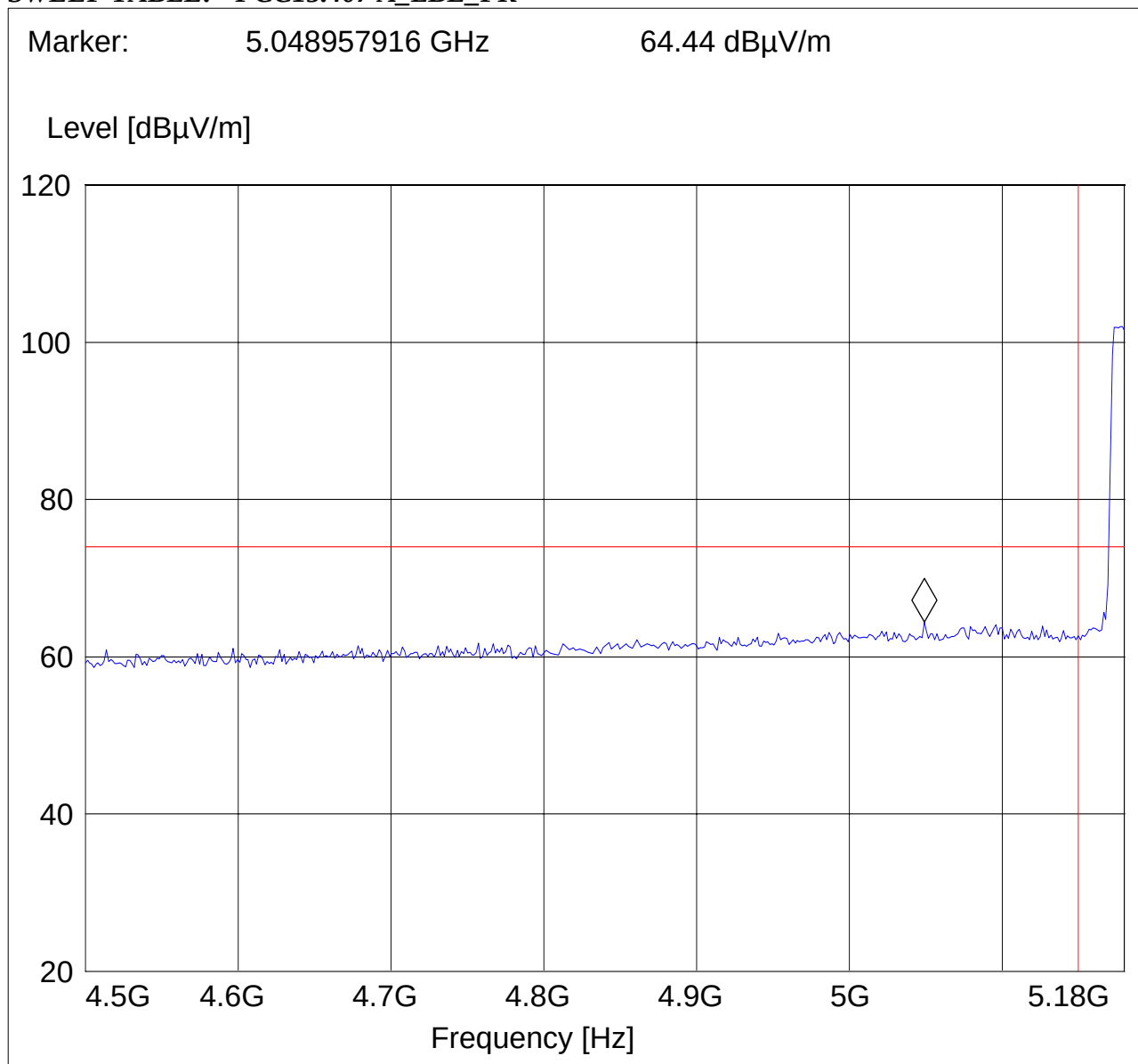
Ant Orientation: H

EUT Orientation: H Auxiliary antenna

Test Engineer: Pete Krebill

Voltage:: AC

SWEEP TABLE: "FCC15.407 A_LBE_PK"





AVG

CETECOM Inc.

411 Dixon Landing Road, Milpitas CA 95035, USA

EUT:: 4311 MCAG modem

Customer:: Broadcom

Test Mode: TX Ch 36

Ant Orientation: H

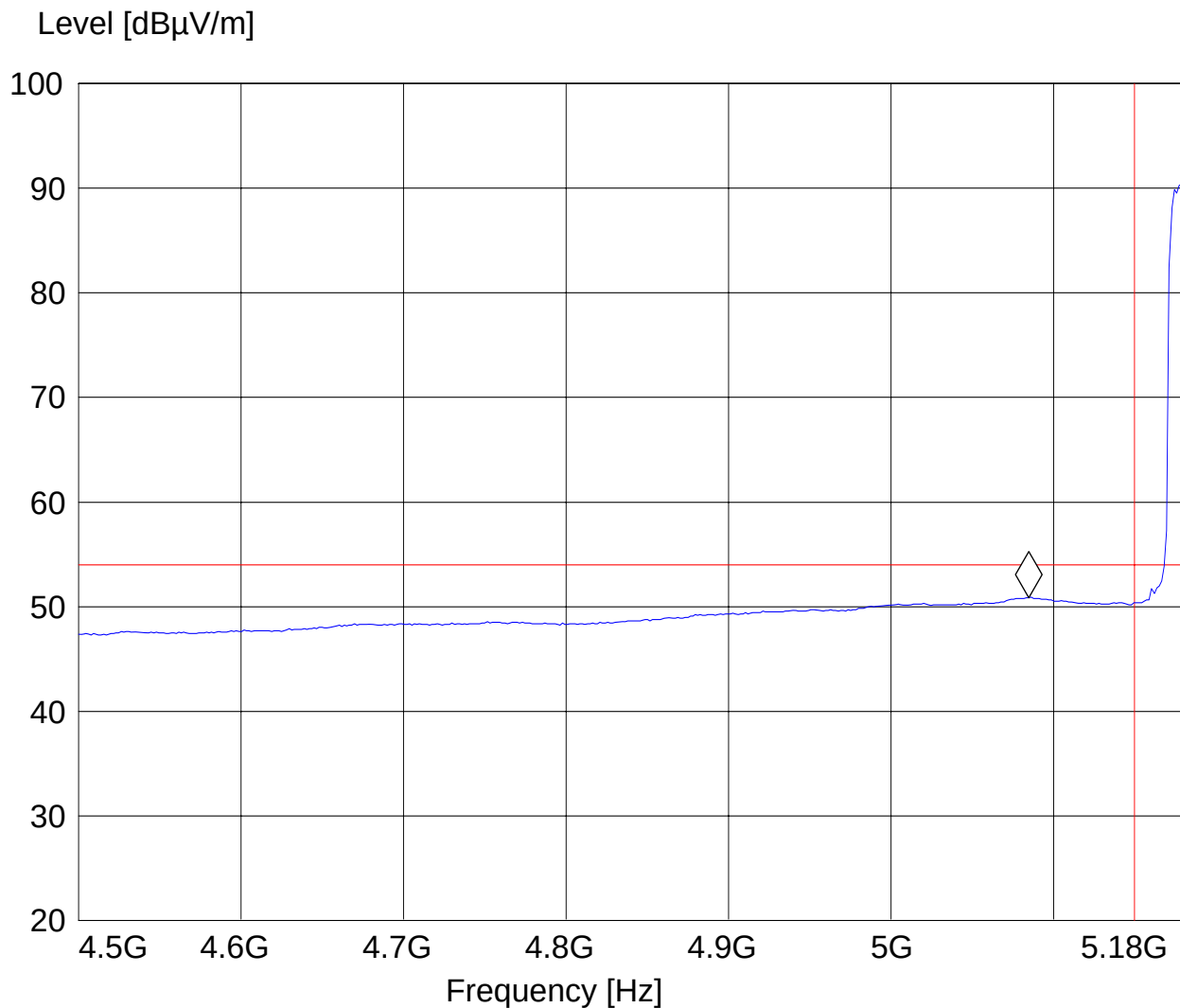
EUT Orientation: H, auxiliary antenna.

Test Engineer: Pete Krebill

Voltage:: AC Adapter

SWEEP TABLE: "FCC15.407 A_LBE_AVG"

Marker: 5.084829659 GHz 50.86 dBμV/m





3.1.2.3 802.11 (a) MODE (5320MHz)

PEAK

CETECOM Inc.

411 Dixon Landing Road, Milpitas CA 95035, USA

EUT:: 4311 MCAG modem

Customer:: Broadcom

Test Mode: TX Ch 64

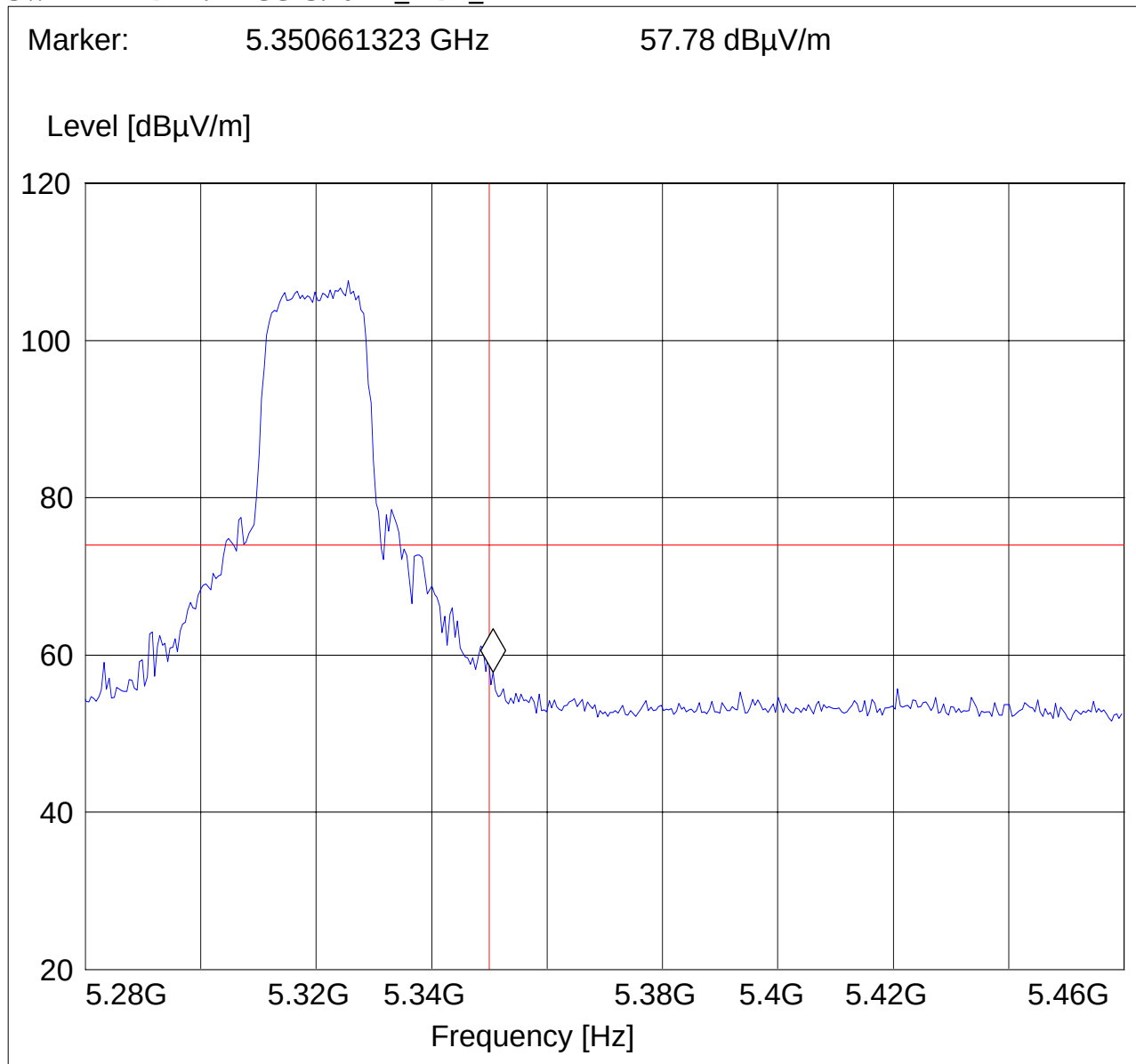
Ant Orientation: H

EUT Orientation: H Auxiliary antenna

Test Engineer: Pete Krebill

Voltage:: AC

SWEEP TABLE: "FCC15.407 A_HBE_PK"





AVG

CETECOM Inc.

411 Dixon Landing Road, Milpitas CA 95035, USA

EUT:: 4311 MCAG modem

Customer:: Broadcom

Test Mode: TX Ch 64

Ant Orientation: H

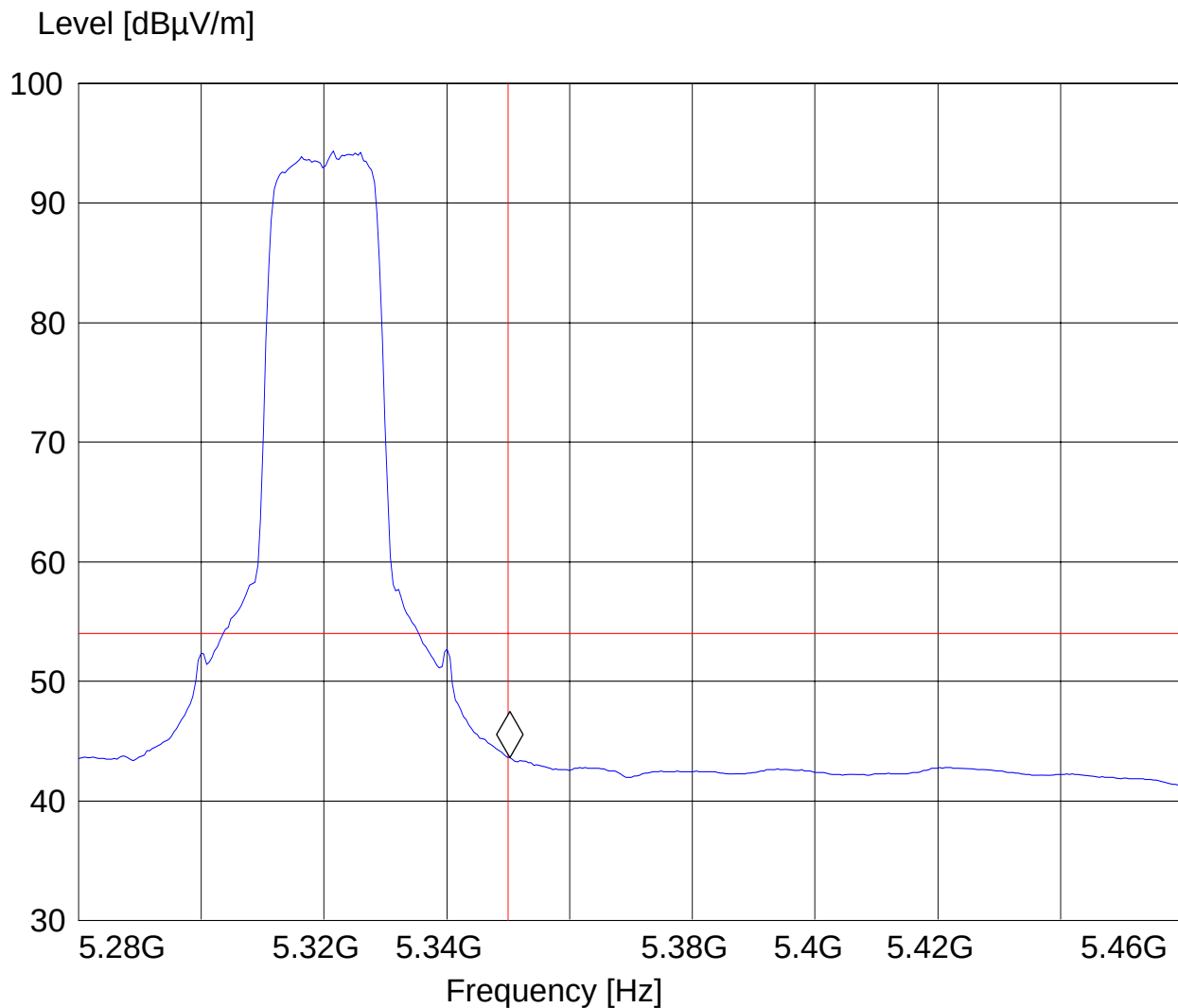
EUT Orientation: H Auxiliary antenna

Test Engineer: Pete Krebill

Voltage:: AC

SWEEP TABLE: "FCC15.407 A_HBE_AVG"

Marker: 5.350220441 GHz 43.61 dB μ V/m



3.1.3 TRANSMITTER SPURIOUS EMISSIONS RADIATED § 15.407(b)/15.205/15.209

3.1.3.1 LIMITS

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

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

***PEAK LIMIT= 74dBuV/m for spurious in restricted bands**

***AVG. LIMIT= 54dBuV/m for spurious in restricted bands**

***PEAK LIMIT= 68.2dBuV/m for spurious NOT in restricted bands**

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 were used to minimize the noise level.

2. All measurements are done in peak mode using an average limit , 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



3.1.3.2 RESULTS 802.11 (a) MODE

30MHz – 1GHz

Note: This plot is valid for low, mid, high channels horizontal and vertical polarities (worst-case plot).

CETECOM Inc.

411 Dixon Landing Road, Milpitas CA 95035, USA

EUT:: 4311 MCAG modem

Customer:: Broadcom

Test Mode: 15.407a, tch 36

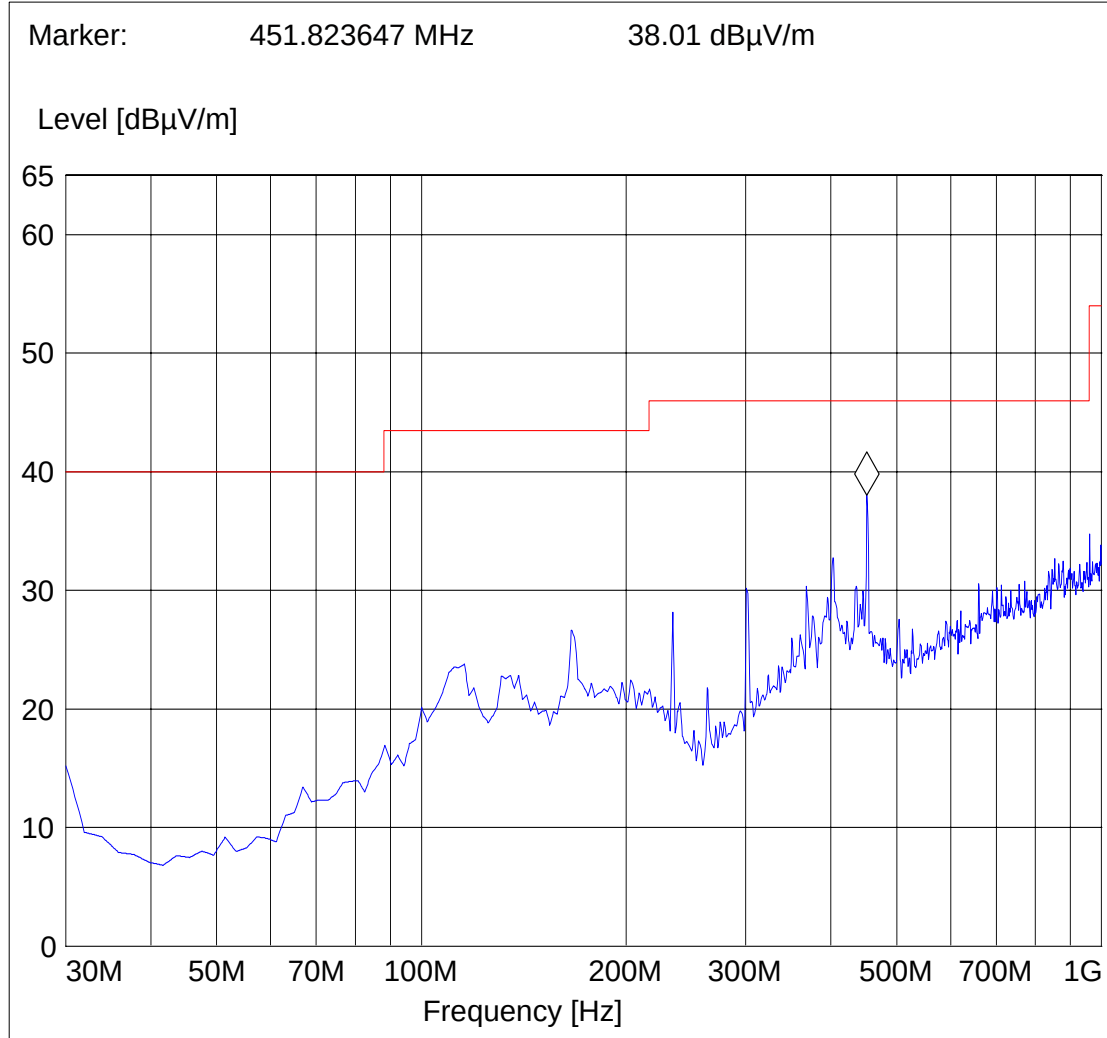
Ant Orientation: H

EUT Orientation: H

Test Engineer: Ed

Voltage:: Battery

SWEEP TABLE: "FCC15.247_30M-1G_Hor"





1-18GHz (5180MHz)

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

Note: Peak Reading vs. Average limit

CETECOM Inc.

411 Dixon Landing Road; Milpitas, CA 95035

EUT / Description: 4311 MCAG modem

Manufacturer: Broadcom

Test mode: 15.407a, tch 36

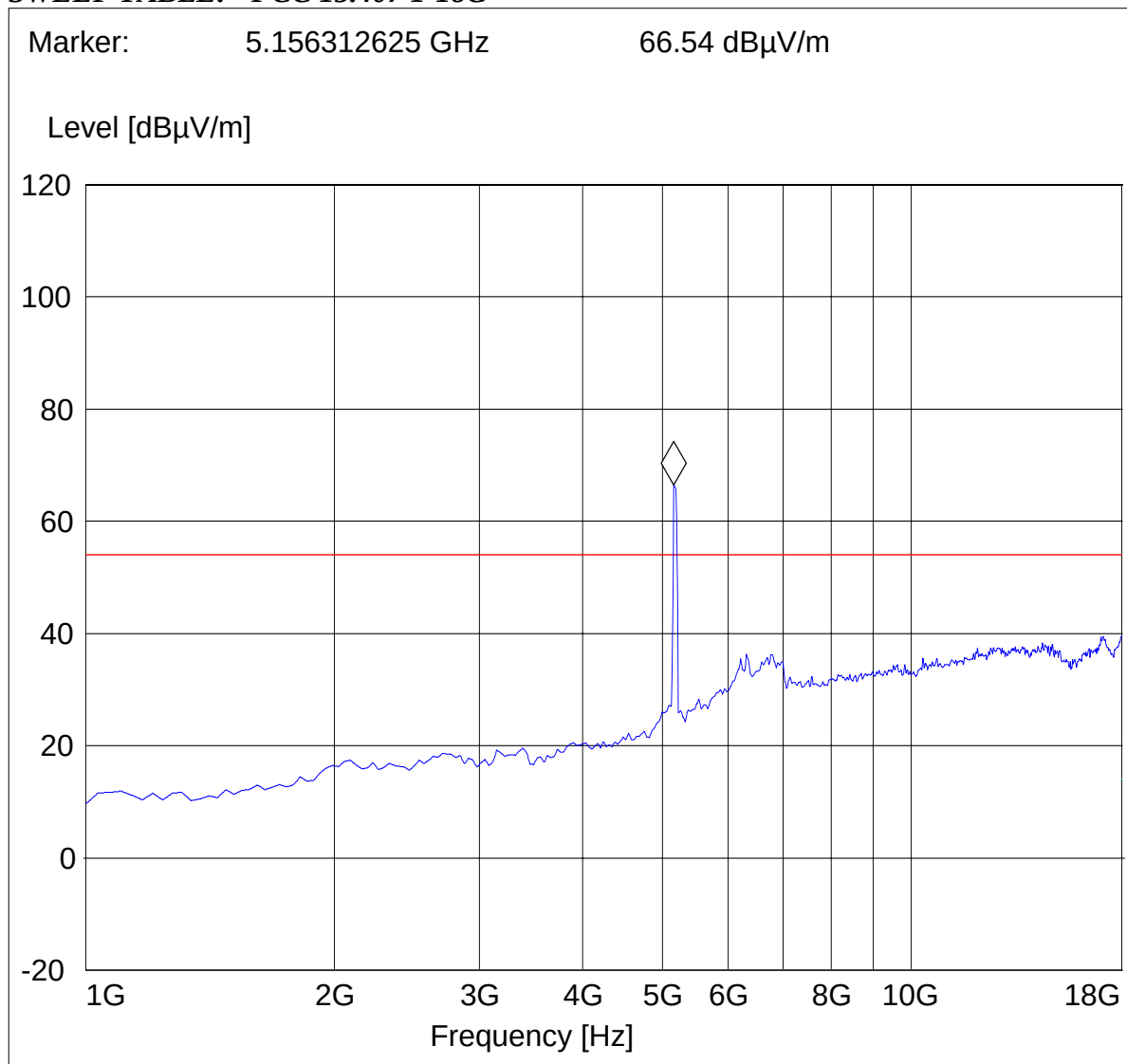
EUT: H

Antenna: H

Test Engineer: Ed

Sweep: FCC 15.407 1-18 GHz

SWEEP TABLE: "FCC 15.407 1-18G"





1-18GHz (5260MHz)

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

Note: Peak Reading vs. Average limit

CETECOM Inc.

411 Dixon Landing Road; Milpitas, CA 95035

EUT / Description: 4311 MCAG modem

Manufacturer: Broadcom

Test mode: 15.407a, tch 52

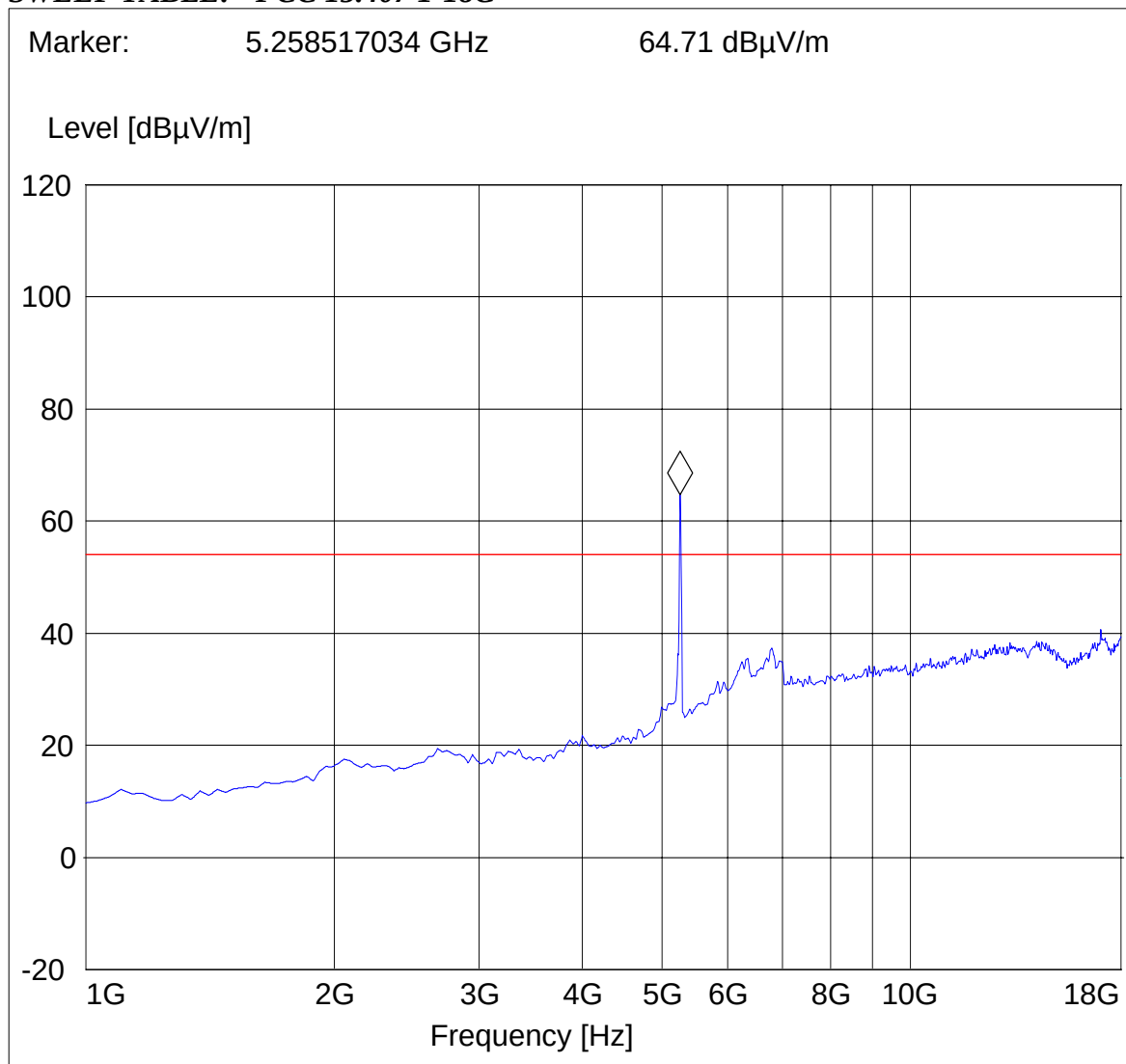
EUT: H

Antenna: H

Test Engineer: Ed

Sweep: FCC 15.407 1-18 GHz

SWEEP TABLE: "FCC 15.407 1-18G"





1-18GHz (5320MHz)

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

Note: Peak Reading vs. Average limit

CETECOM Inc.

411 Dixon Landing Road; Milpitas, CA 95035

EUT / Description: 4311 MCAG modem

Manufacturer: Broadcom

Test mode: 15.407a, tch 64

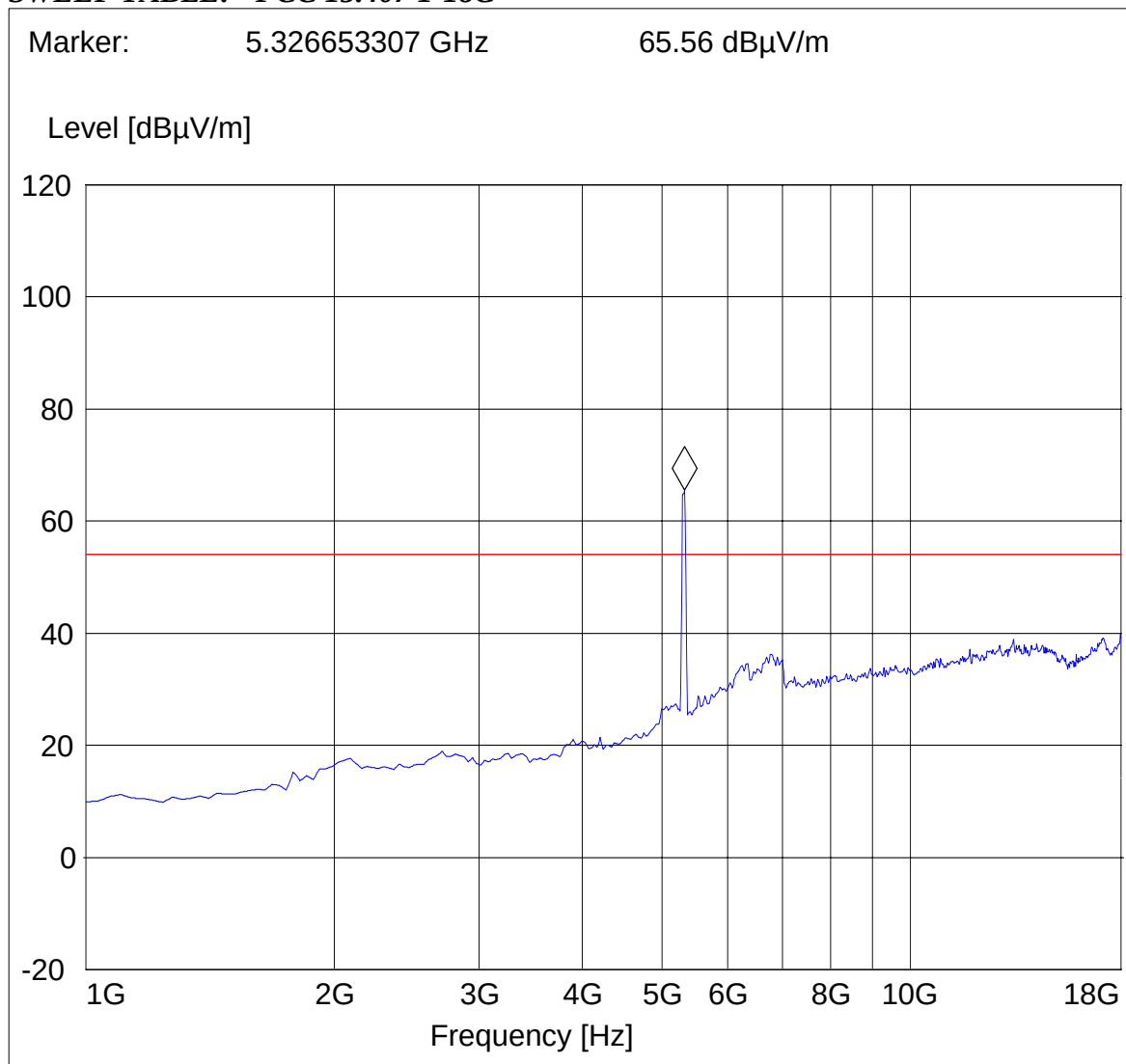
EUT: H

Antenna: H

Test Engineer: Ed

Sweep: FCC 15.407 1-18 GHz

SWEEP TABLE: "FCC 15.407 1-18G"





18-26.5GHz (5180MHz)

Note: Peak Reading vs. Average limit ,

CETECOM Inc.

411 Dixon Landing Road, Milpitas CA 95035, USA

EUT:: 4311 MCAG modem

Customer:: Broadcom

Test Mode: 15.407a, tch 36

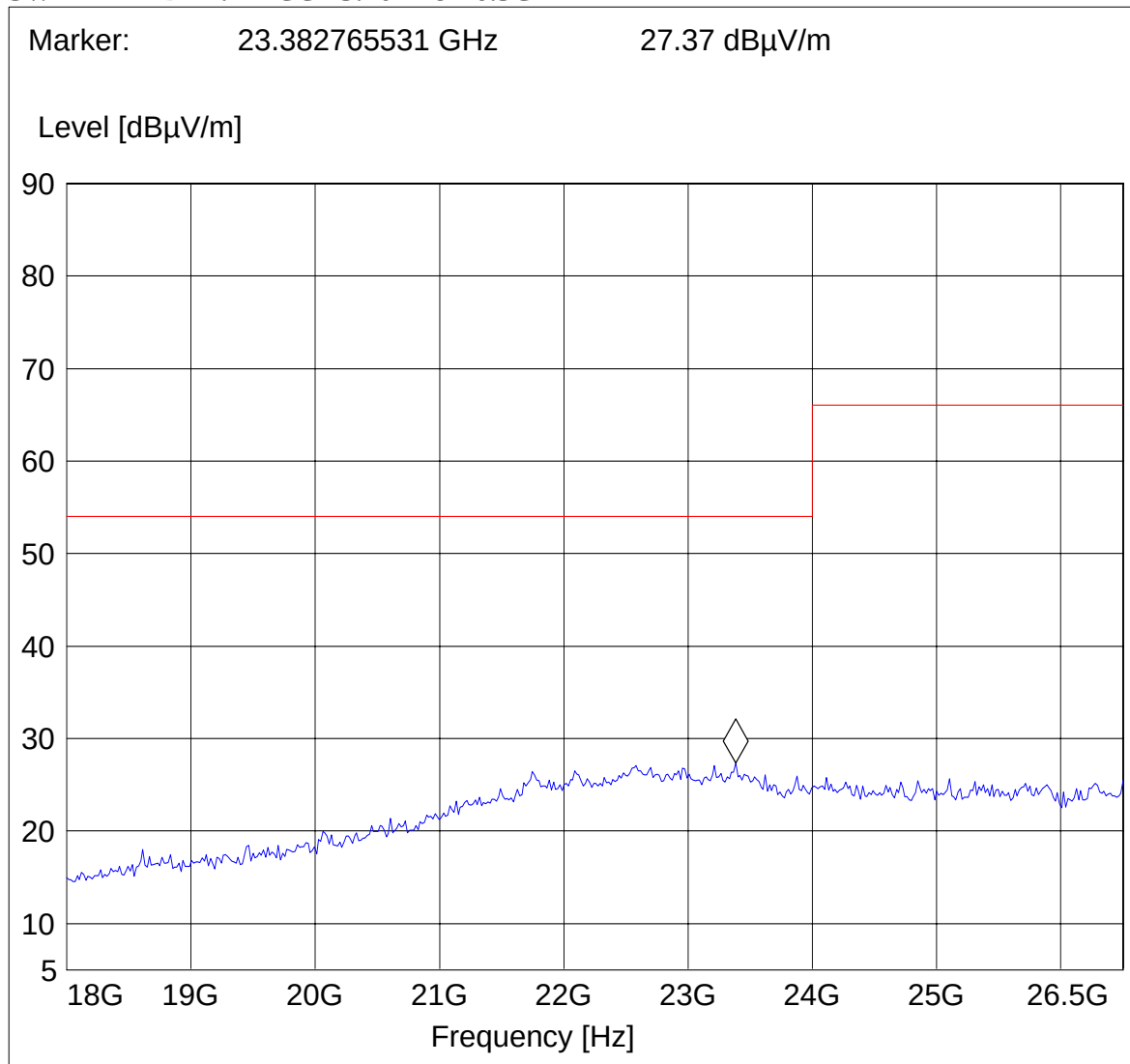
Ant Orientation: H

EUT Orientation: H

Test Engineer: Ed

Voltage:: AC Adapter

SWEEP TABLE: "FCC 15.407 18-26.5G"





18-26.5GHz (5260MHz)

Note: Peak Reading vs. Average limit ,

CETECOM Inc.

411 Dixon Landing Road, Milpitas CA 95035, USA

EUT:: 4311 MCAG modem

Customer:: Broadcom

Test Mode: 15.407a, tch 52

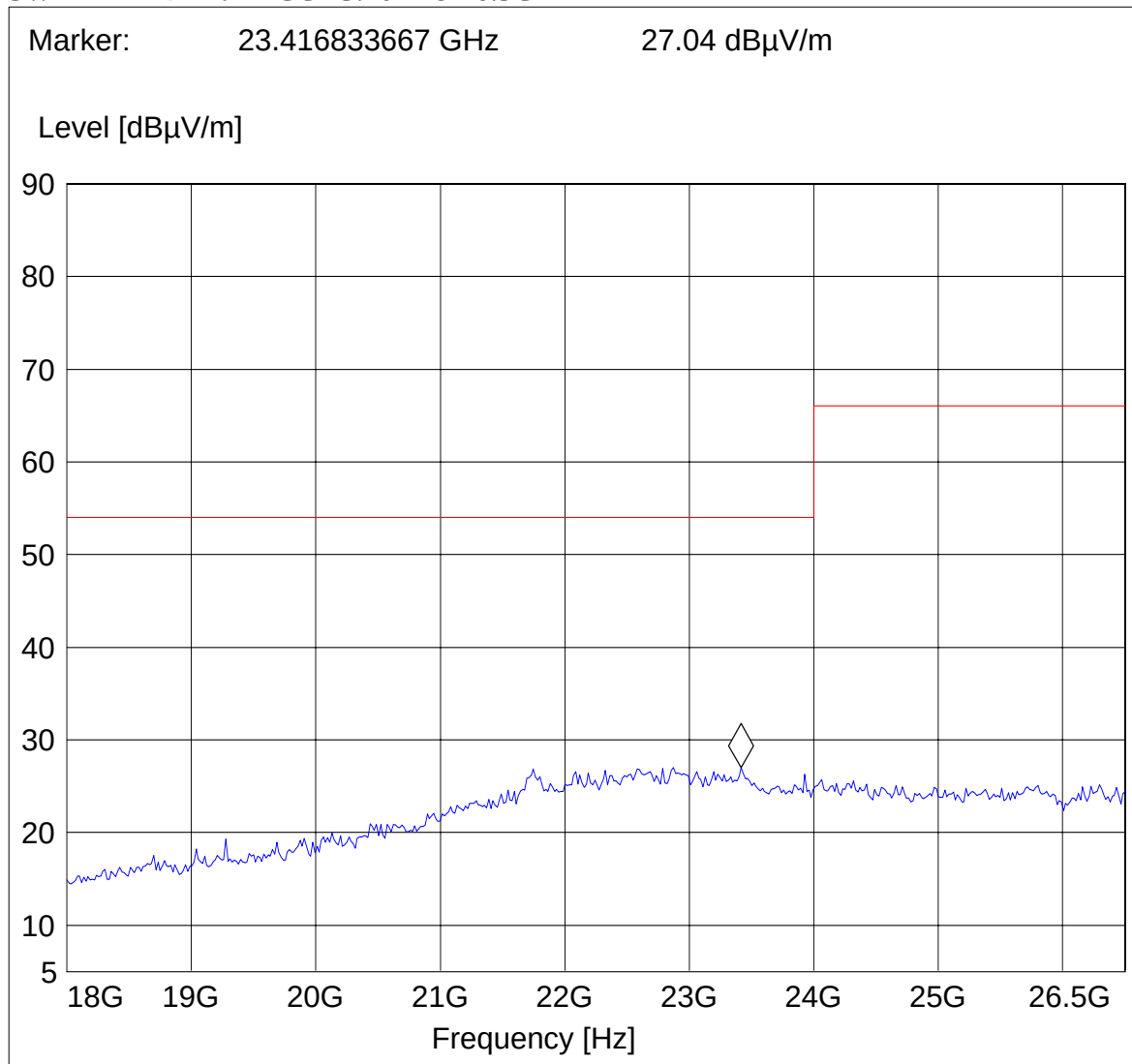
Ant Orientation: H

EUT Orientation: H

Test Engineer: Ed

Voltage:: AC Adapter

SWEEP TABLE: "FCC 15.407 18-26.5G"





18-26.5GHz (5320MHz)

**Note: Peak Reading vs. Average limit ,
CETECOM Inc.**

411 Dixon Landing Road, Milpitas CA 95035, USA

EUT:: 4311 MCAG modem

Customer:: Broadcom

Test Mode: 15.407a, tch 64

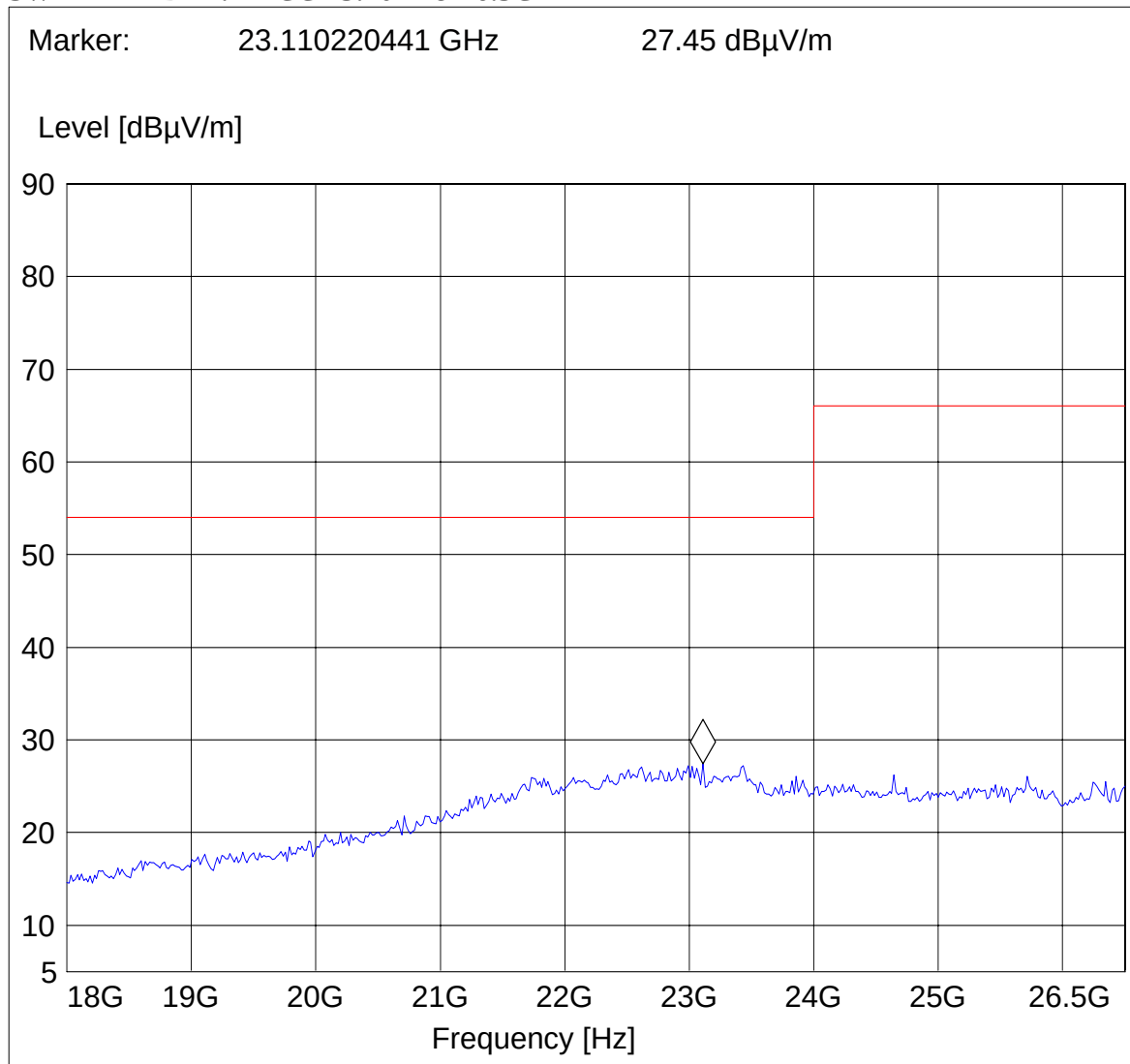
Ant Orientation: H

EUT Orientation: H

Test Engineer: Ed

Voltage:: AC Adapter

SWEEP TABLE: "FCC 15.407 18-26.5G"





26-40GHz

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

Note: Peak Reading vs. Average limit ,

CETECOM Inc.

411 Dixon Landing Road, Milpitas CA 95035, USA

EUT:: 4311 MCAG modem

Customer:: Broadcom

Test Mode: 15.407a, tch 36

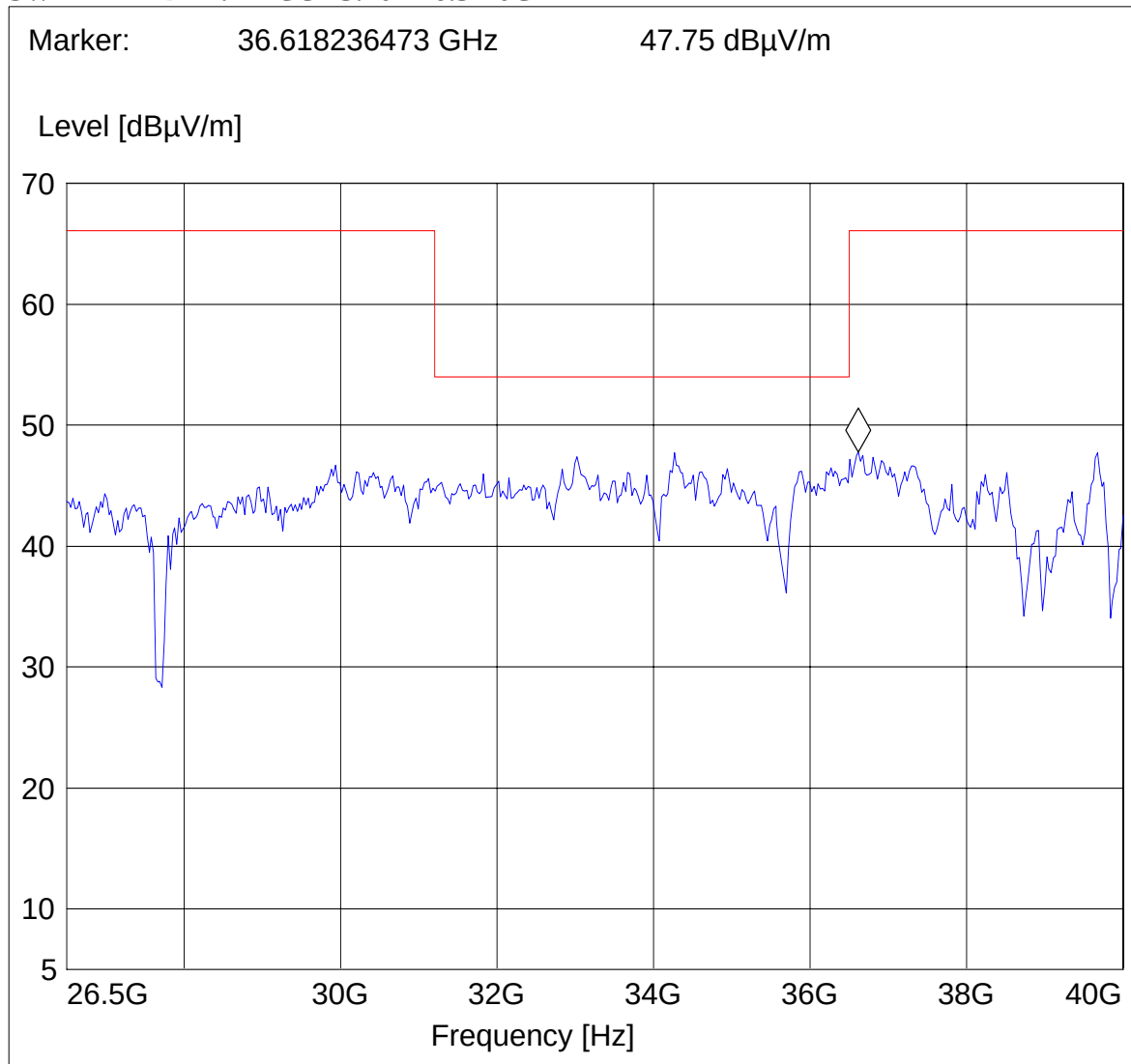
Ant Orientation: H

EUT Orientation: H

Test Engineer: Ed

Voltage:: AC Adapter

SWEEP TABLE: "FCC 15.407 26.5-40G"



3.1.4 AC POWER LINE CONDUCTED EMISSIONS § 15.107/207

LIMITS

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

§15.107 (a) Except for Class A digital devices, for equipment 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, as measured using a 50 μ H/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.

Frequency of Emission (MHz)	Conducted Limit (dB μ V)	
	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

OPERATING MODE

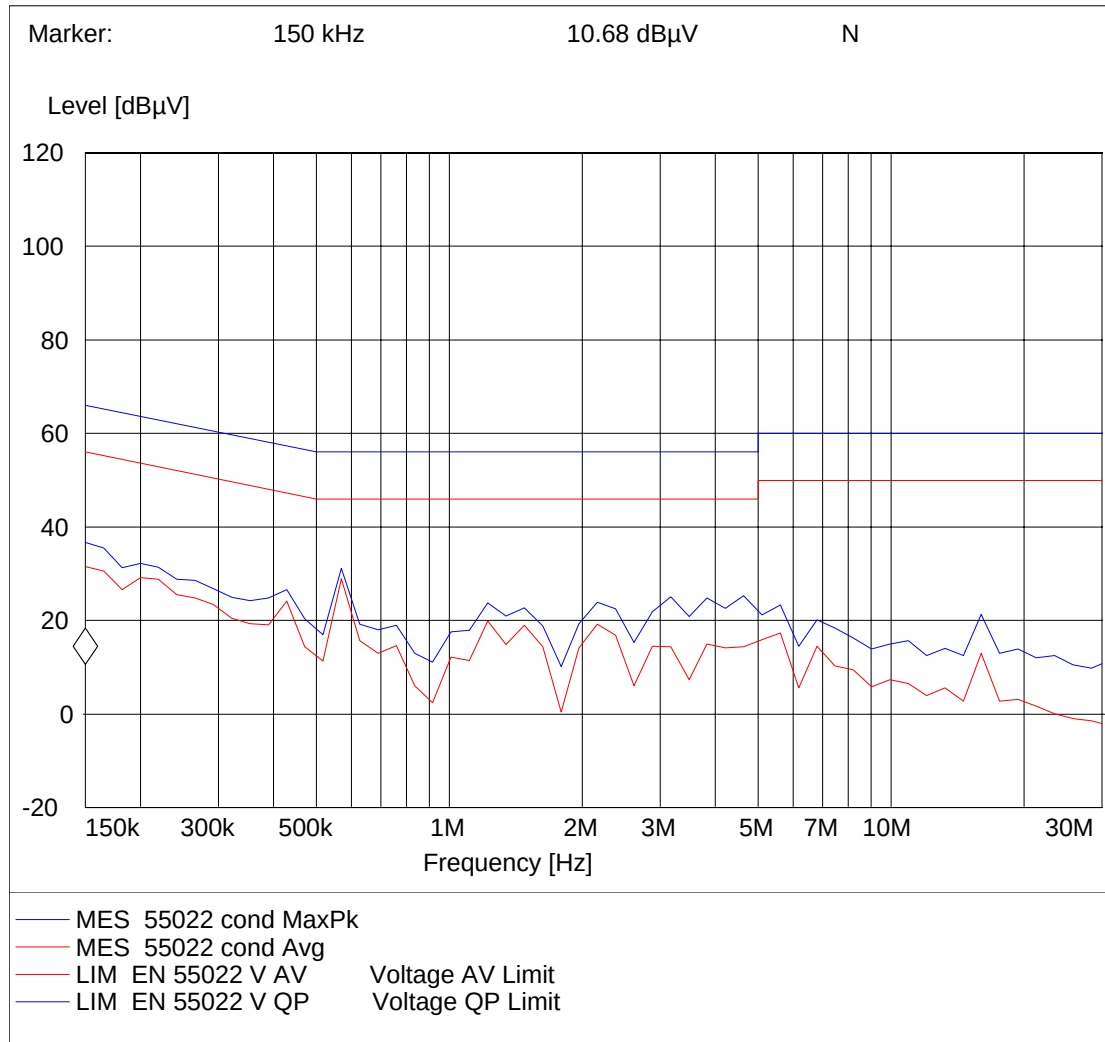
Conducted AC emissions testing was performed with 110 VAC @ 60 Hz with the EUT in 802.11a mode.



Voltage Mains Test (Line)

EUT: E.u.T.
Manufacturer: BROADCOM
Operating Condition: 802.11a
Test Site: CETECOM USA. MILPITAS
Operator: SATYA R
Test Specification: 55022 Conducted Emissions
Comment: CONNECTED TO 110V L
Start of Test: 1/9/2007 / 8:27:16AM

SWEEP TABLE: "55022 cond"

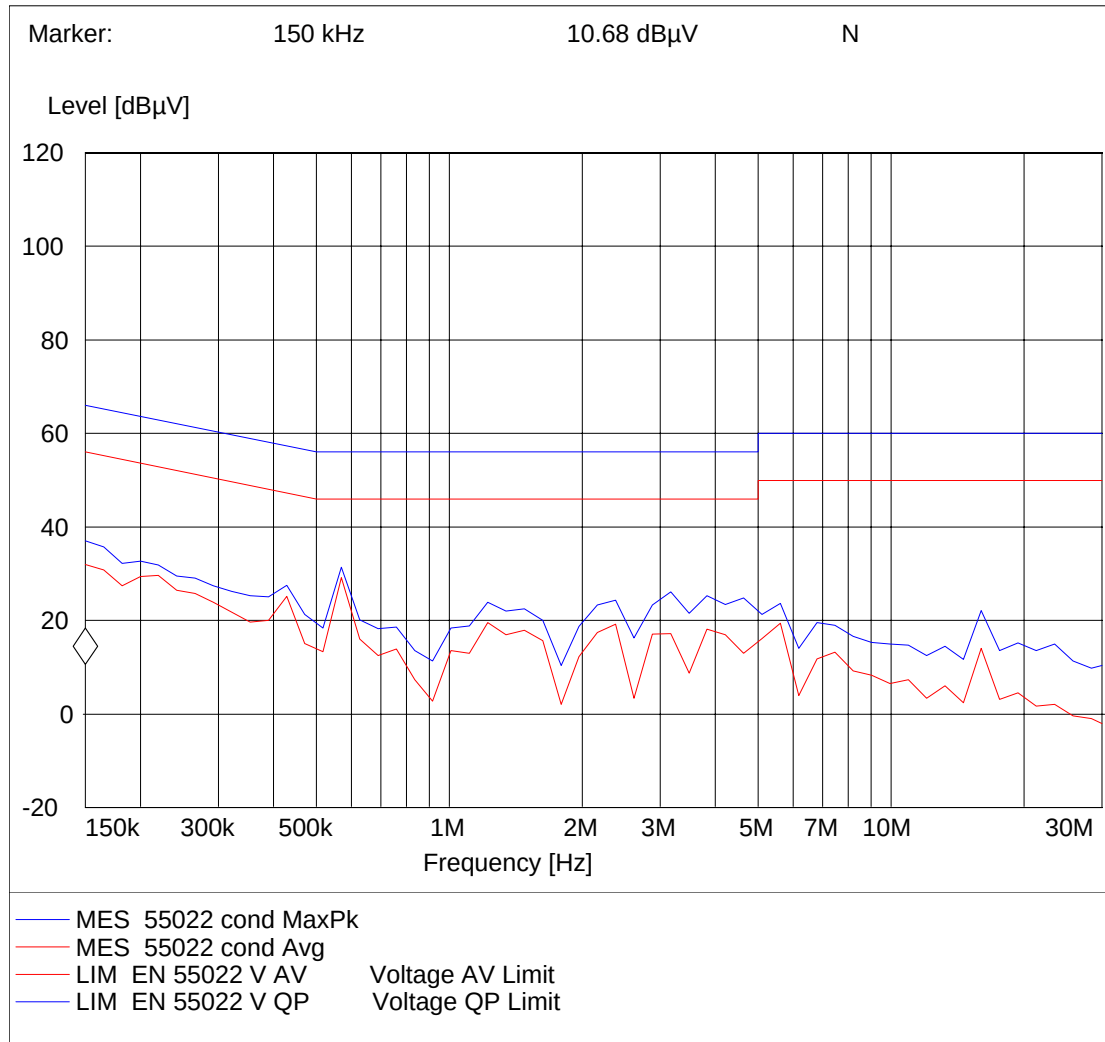




Voltage Mains Test (Neutral)

EUT: E.u.T.
Manufacturer: BROADCOM
Operating Condition: 802.11a
Test Site: CETECOM USA. MILPITAS
Operator: SATYA R
Test Specification: 55022 Conducted Emissions
Comment: CONNECTED TO 110V N
Start of Test: 1/9/2007 / 8:22:53AM

SWEEP TABLE: "55022 cond"



**4 TEST EQUIPMENT AND ANCILLARIES USED FOR TESTS**

No	Instrument/Ancillary	Type	Manufacturer	Serial No.	Cal Due	Interval
01	Spectrum Analyzer	ESIB 40	Rohde & Schwarz	100107	May 2007	1 year
02	Spectrum Analyzer	FSEM 30	Rohde & Schwarz	100017	August 2007	1 year
03	Signal Generator	SMY02	Rohde & Schwarz	836878/011	May 2007	1 year
04	Power-Meter	NRVD	Rohde & Schwarz	0857.8008.02	May 2007	1 year
05	Biconilog Antenna	3141	EMCO	0005-1186	June 2007	1 year
06	Horn Antenna (1-18GHz)	SAS-200/571	AH Systems	325	June 2007	1 year
07	Horn Antenna (18-26.5GHz)	3160-09	EMCO	1240	June 2007	1 year
08	Power Splitter	11667B	Hewlett Packard	645348	n/a	n/a
09	Climatic Chamber	VT4004	Voltsch	G1115	May 2007	1 year
10	High Pass Filter	5HC2700	Trilithic Inc.	9926013	n/a	n/a
11	High Pass Filter	4HC1600	Trilithic Inc.	9922307	n/a	n/a
12	Pre-Amplifier	JS4-00102600	Miteq	00616	May 2007	1 year
13	Power Sensor	URV5-Z2	Rohde & Schwarz	DE30807	May 2007	1 year
14	Digital Radio Comm. Tester	CMD-55	Rohde & Schwarz	847958/008	May 2007	1 year
15	Universal Radio Comm. Tester	CMU 200	Rohde & Schwarz	832221/06	May 2007	1 year
16	LISN	ESH3-Z5	Rohde & Schwarz	836679/003	May 2007	1 year
17	Loop Antenna	6512	EMCO	00049838	July 2007	2 years

5 BLOCK DIAGRAMS

Radiated Testing

