FCC Test Report

FCC Part 15.247 for DSSS systems/

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_FCC15.247A
DATE: 1/2/2007

ilac-MRA ACCREDITED Certificate # 2135.01

Bluetooth

Bluetooth Qualification Test Facility (BQTF)

CTIA Authorized Testing Laboratory

FCC listed# 101450

IC recognized # 3925

***CETECOM* Inc.**
411 Dixon Landing Road ◆ Milpitas, CA 95035 ◆ U.S.A.
Phone: + 1 (408) 586 6200 ◆ Fax: + 1 (408) 586 6299 ◆ E-mail: info@cetecomusa.com ◆ http://www.cetecom.com
CETECOM Inc. is a Delaware Corporation with Corporation number: 2113686
Board of Directors: Dr. Harald Ansorge, Dr. Klaus Matkey, Hans Peter May

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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

2 Administrative Data

2.1 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**

2.2 Application details

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

2.3 Test item

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

Additional information

Frequency	:	**5745MHz – 5825MHz**
Type of modulation	:	**DSSS**
Antenna	:	**Integral**
Output power	:	**17 dBm (0.05W) conducted average power**

2.4 Test standards: FCC Part 15 §15.247

3 Technical test

3.1 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
1/2/2007	EMC & Radio	Lothar Schmidt (Manager)	

4 Measurements

4.1 MAXIMUM PEAK OUTPUT POWER § 15.247 (RADIATED)

4.1.1 LIMIT SUB CLAUSE § 15.247 (b) (1) (2) (3) (4)

Frequency range	RF power output
5725-5850 MHz	36dBm EIRP

***limit is based upon antenna gain of less than or equal to 6dBi.**

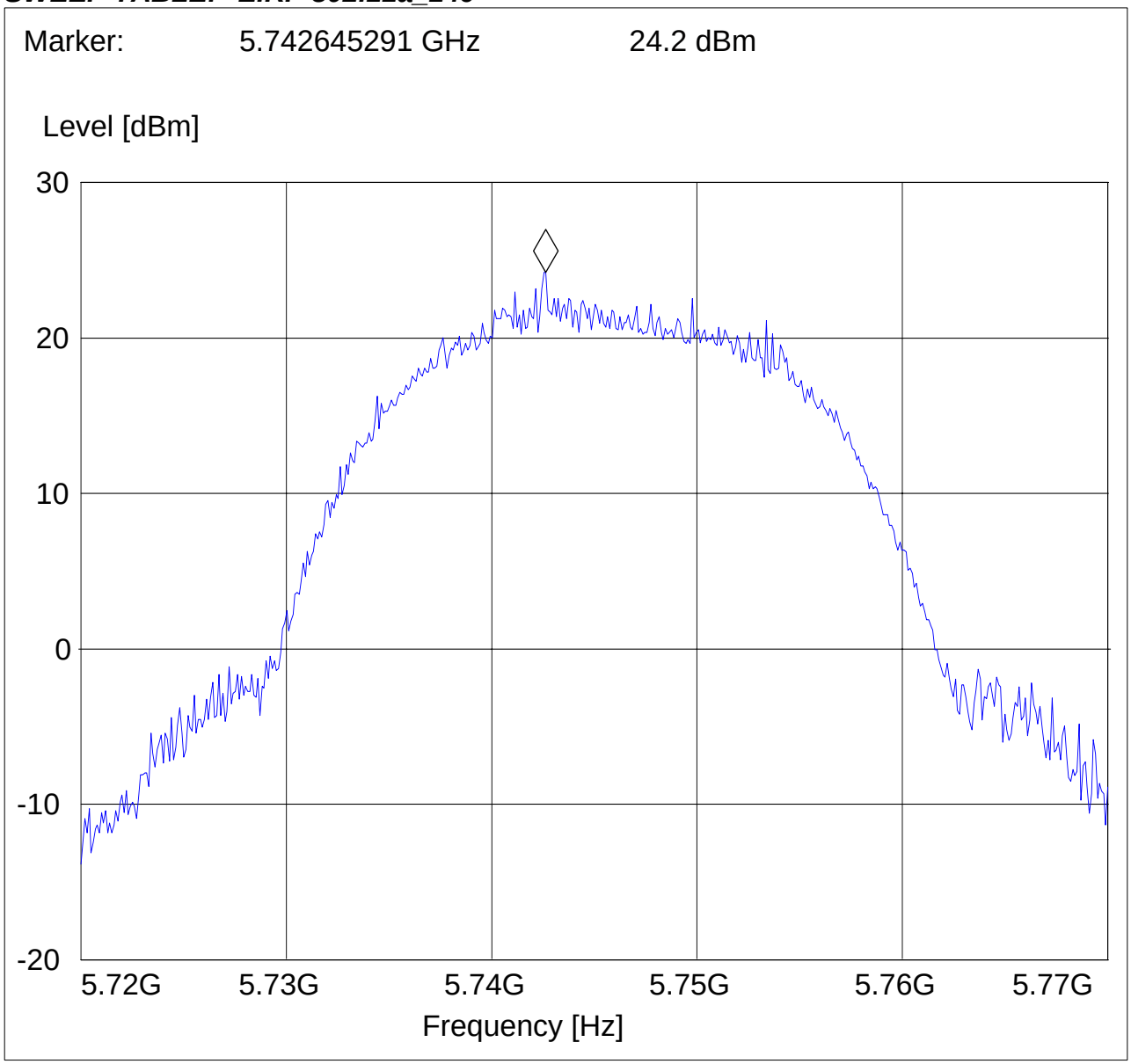
4.1.2 EIRP a MODE:

TEST CONDITIONS		MAXIMUM PEAK OUTPUT POWER (dBm)		
Frequency (MHz)		5745	5785	5825
T_{nom}(23)°C	V_{nom}VDC	24.20	23.26	23.01
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.

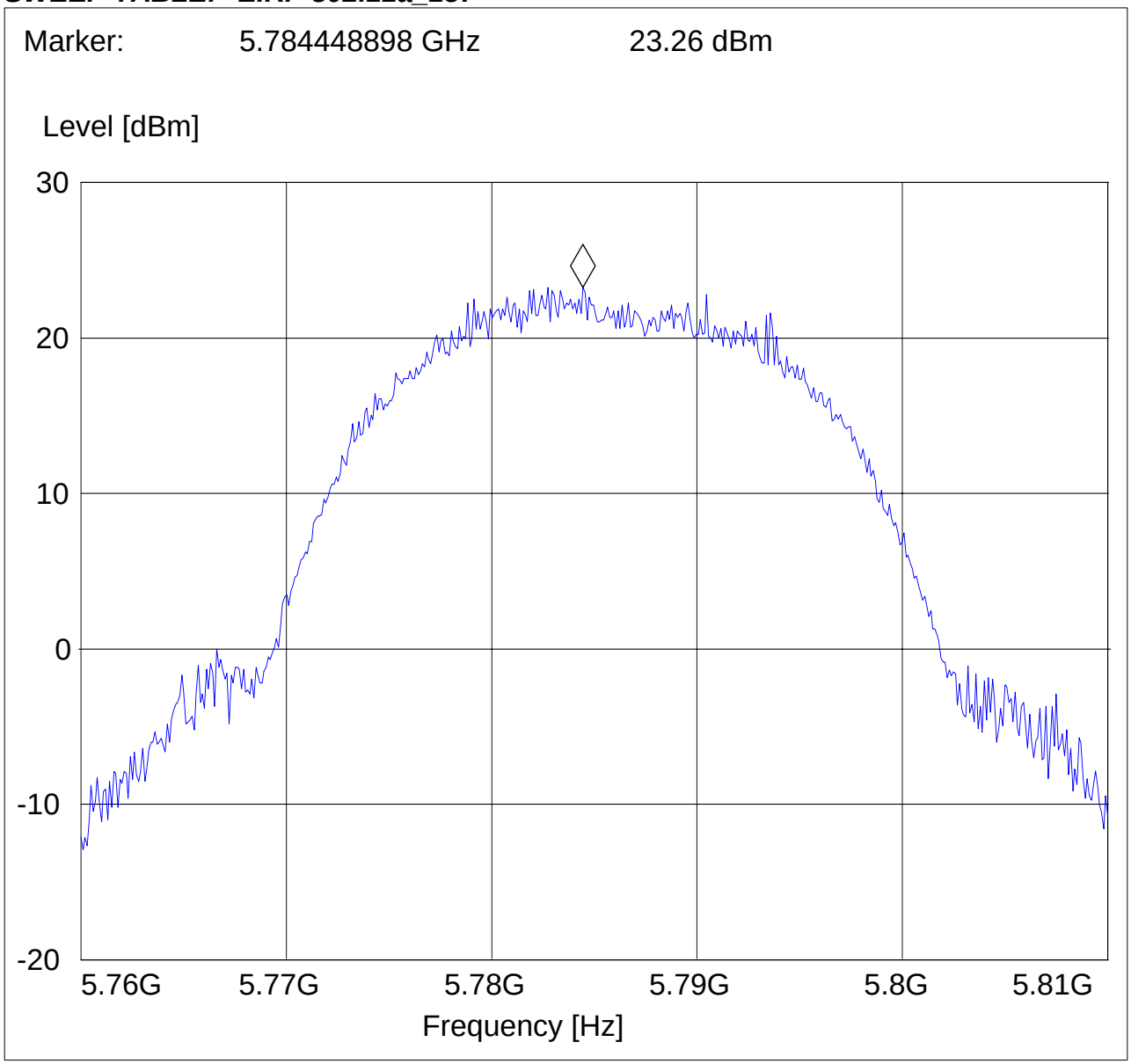
EIRP a Mode (5745)
CETECOM Inc.
411 Dixon Landing Road, Milpitas CA 95035, USA
EUT:: 4311 MCAG modem
Customer:: Broadcom
Test Mode: 15.407a, tch 149
Ant Orientation: H
EUT Orientation: H
Test Engineer: Ed
Voltage:: AC Adapter
Comments:: TT: 180°

SWEEP TABLE: "EIRP 802.11a_149"



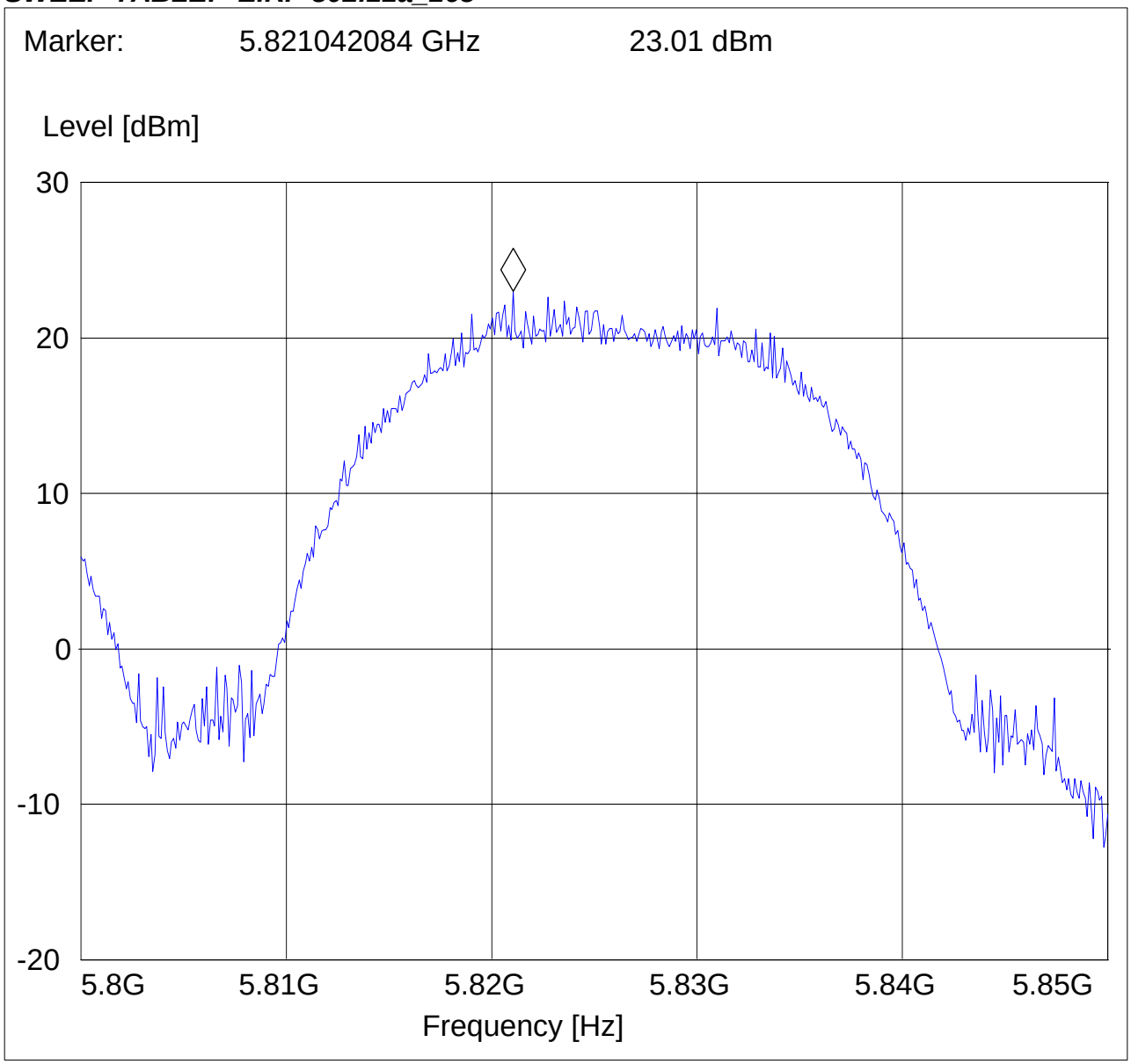
EIRP a Mode (5785MHz)
CETECOM Inc.
411 Dixon Landing Road, Milpitas CA 95035, USA
EUT:: 4311 MCAG modem
Customer:: Broadcom
Test Mode: 15.407a, tch 157
Ant Orientation: H
EUT Orientation: H
Test Engineer: Ed
Voltage:: AC Adapter
Comments:: TT: 180°

SWEEP TABLE: "EIRP 802.11a_157"



EIRP a Mode (5825MHz)
CETECOM Inc.
411 Dixon Landing Road, Milpitas CA 95035, USA
EUT:: 4311 MCAG modem
Customer:: Broadcom
Test Mode: 15.407a, tch 165
Ant Orientation: H
EUT Orientation: H
Test Engineer: Ed
Voltage:: AC Adapter
Comments:: TT: 180°

SWEEP TABLE: "EIRP 802.11a_165"



4.2 TRANSMITTER SPURIOUS EMISSIONS RADIATED § 15.247/15.205/15.209

4.2.1 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**

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 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

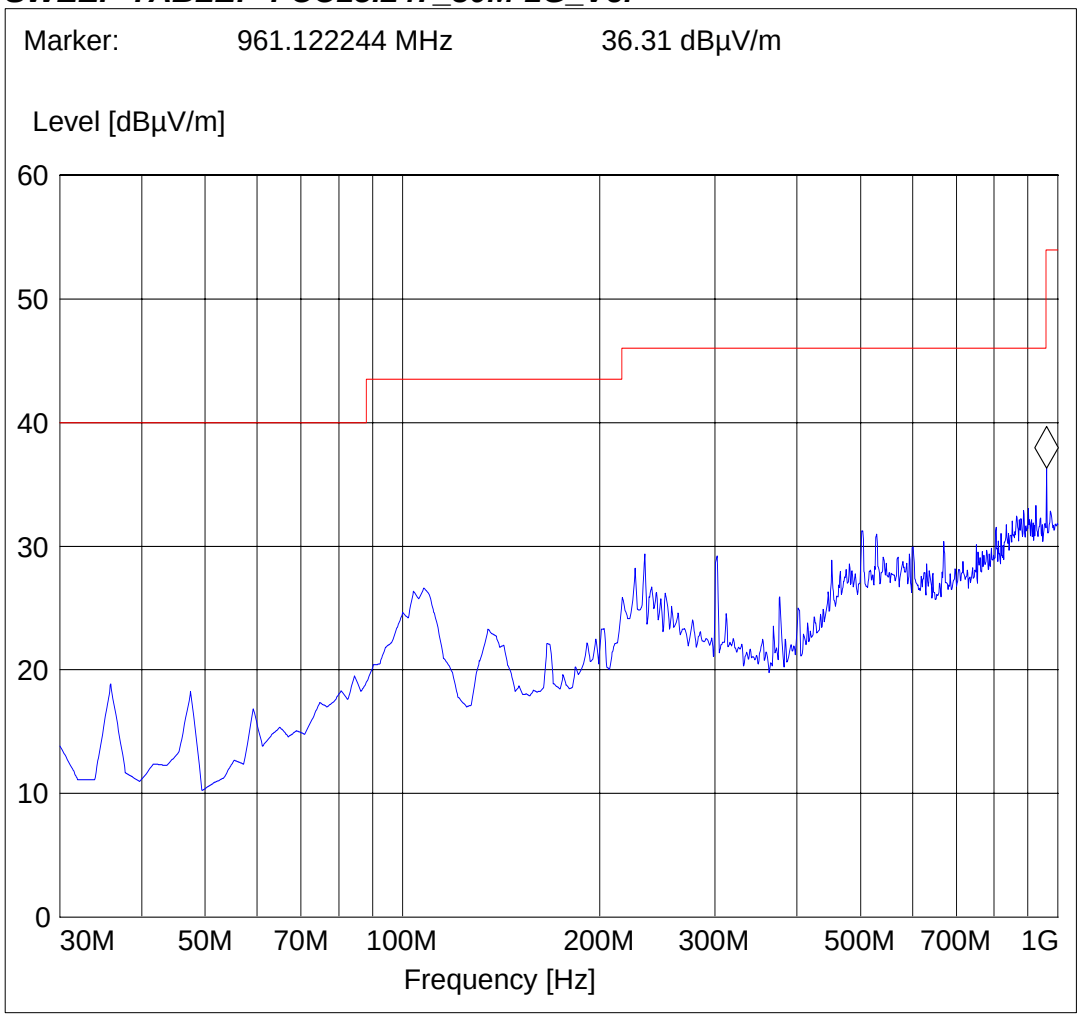
4.2.2 RESULTS (a) MODE

30MHz – 1GHz
Antenna: vertical
Note: This plot is valid for low, mid, high channels as well as for polarizations (worst-case plot)
Note: Peak reading vs. Quasi-peak limit

CETECOM Inc.
411 Dixon Landing Road, Milpitas CA 95035, USA

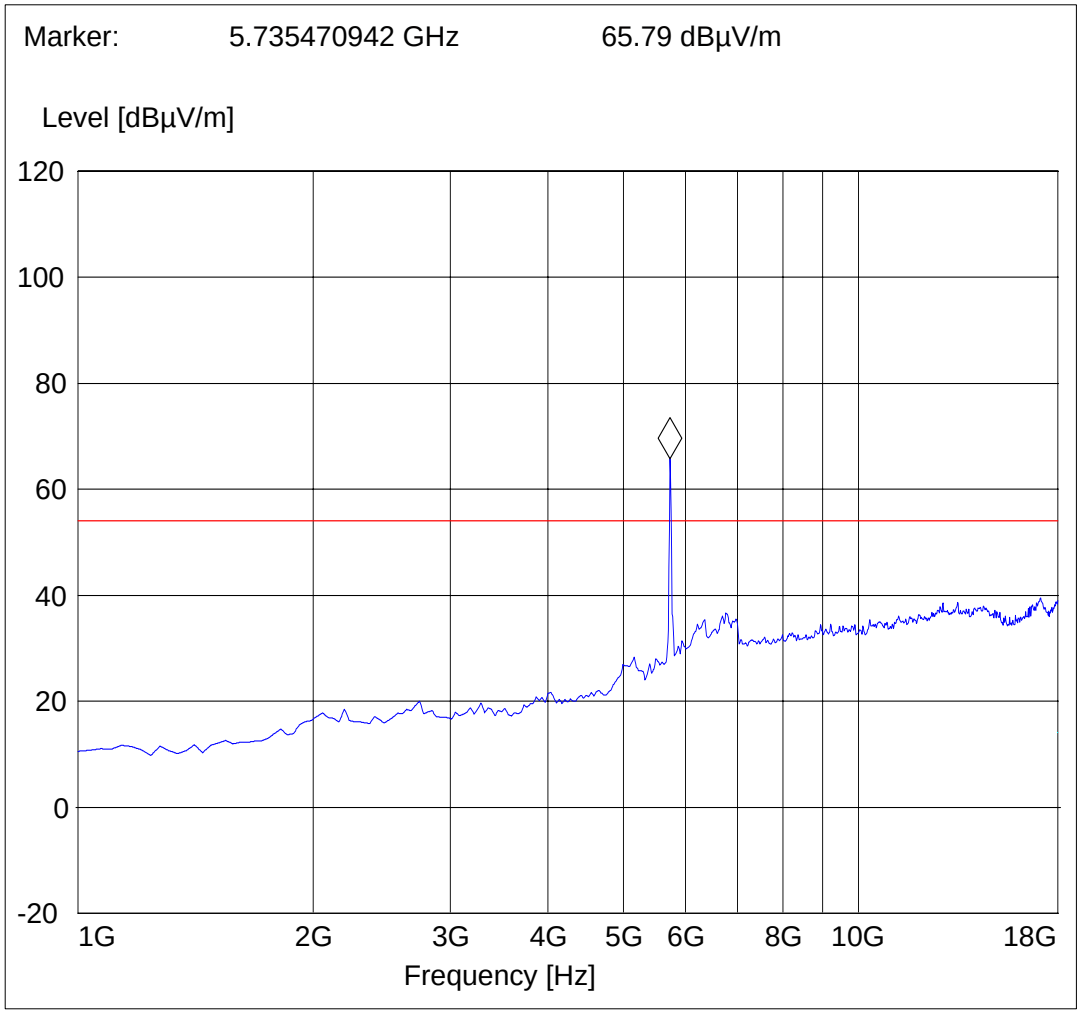
EUT:: 4311 MCAG modem
Customer:: Broadcom
Test Mode: 15.407a, tch 149
Ant Orientation: V
EUT Orientation: H
Test Engineer: Ed
Voltage:: AC Adapter
Comments:: TT: 180°

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



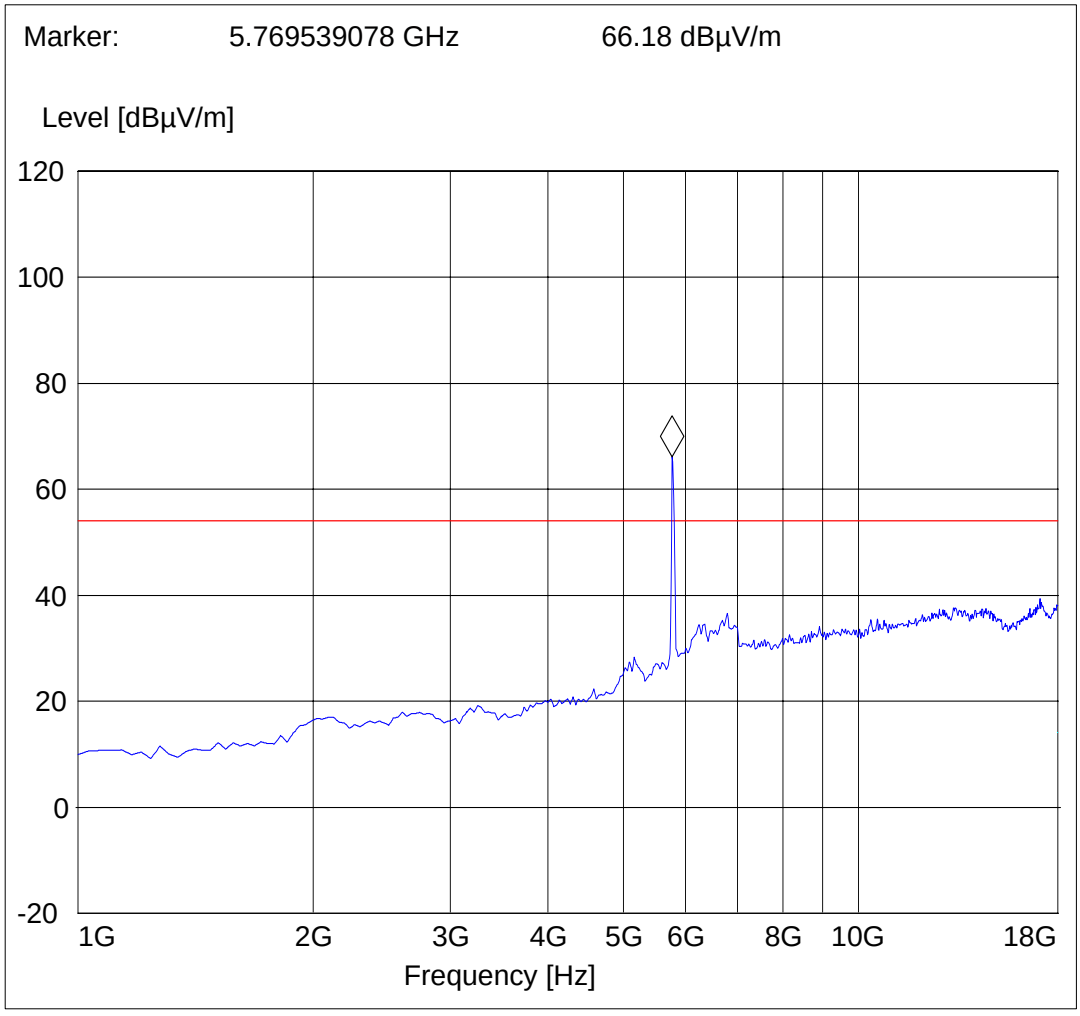
1-18GHz (5745MHz)
Note: The peaks above the limit line is the carrier freq.
Note: Peak Reading vs. Average limit
CETECOM Inc.
411 Dixon Landing Road; Milpitas, CA 95035
EUT / Description: 4311 MCAG modem
Manufacturer: Broadcom
Test mode: 15.407a, tch 149
EUT: H
Antenna: H
Test Engineer: Ed
Sweep: FCC 15.407 1-18 GHz
Comments:: marker is on uplink sig.

SWEEP TABLE: "FCC 15.407 1-18G"



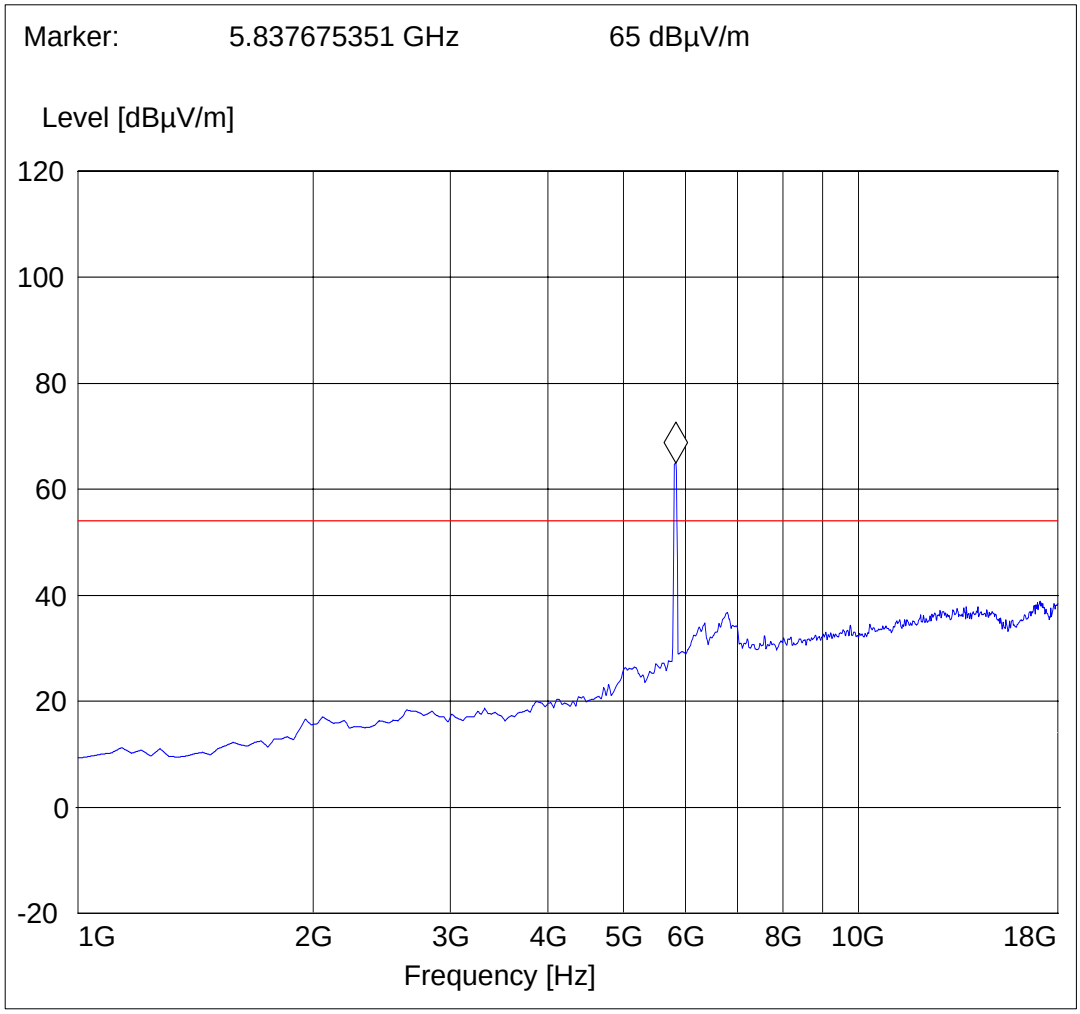
1-18GHz (5785MHz)
Note: The peaks above the limit line is the carrier freq.
Note: Peak Reading vs. Average limit
CETECOM Inc.
411 Dixon Landing Road; Milpitas, CA 95035
EUT / Description: 4311 MCAG modem
Manufacturer: Broadcom
Test mode: 15.407a, tch 157
EUT: H
Antenna: H
Test Engineer: Ed
Sweep: FCC 15.407 1-18 GHz
Comments:: marker is on uplink sig.

SWEEP TABLE: "FCC 15.407 1-18G"



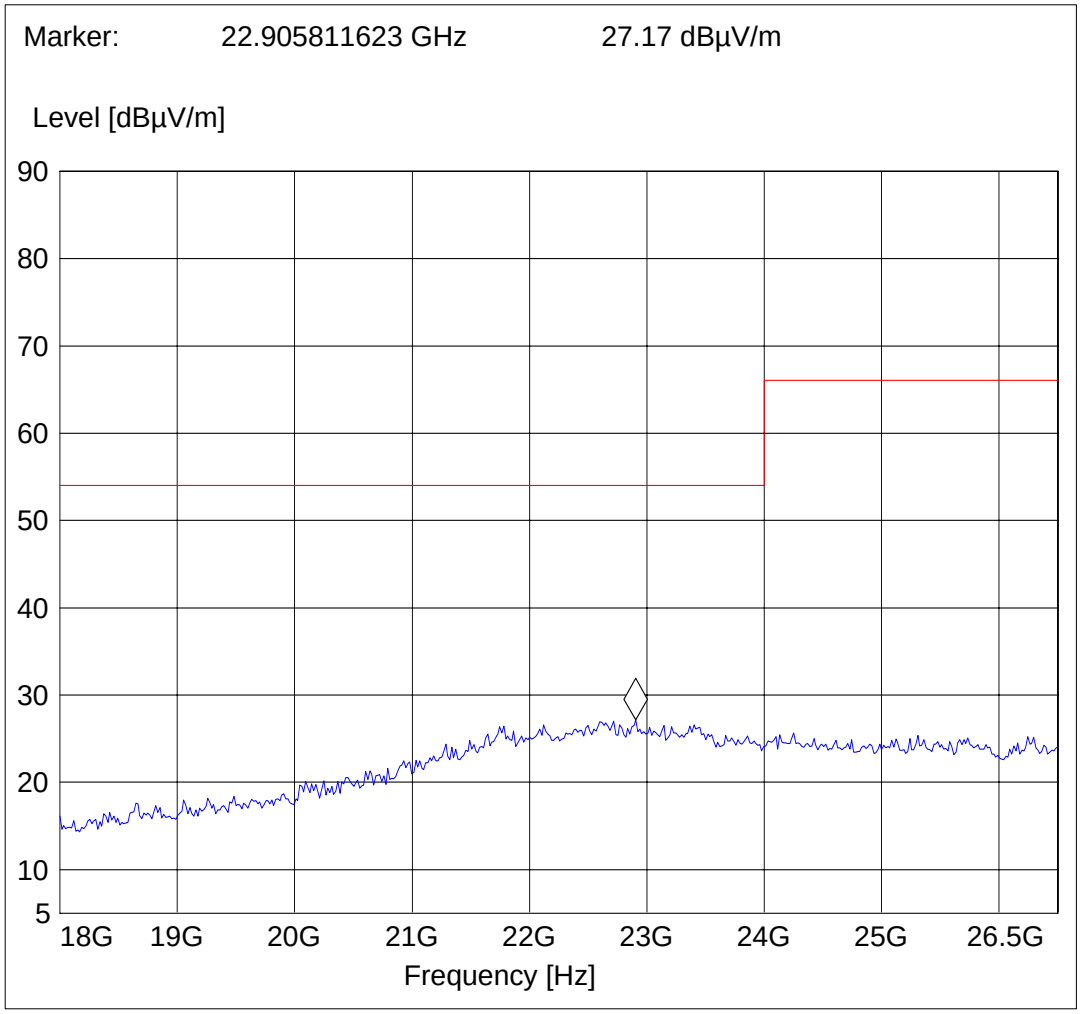
1-18GHz (5825MHz)
Note: The peaks above the limit line is the carrier freq.
Note: Peak Reading vs. Average limit
CETECOM Inc.
411 Dixon Landing Road; Milpitas, CA 95035
EUT / Description: 4311 MCAG modem
Manufacturer: Broadcom
Test mode: 15.407a, tch 165
EUT: H
Antenna: H
Test Engineer: Ed
Sweep: FCC 15.407 1-18 GHz
Comments:: marker is on uplink sig.

SWEEP TABLE: "FCC 15.407 1-18G"



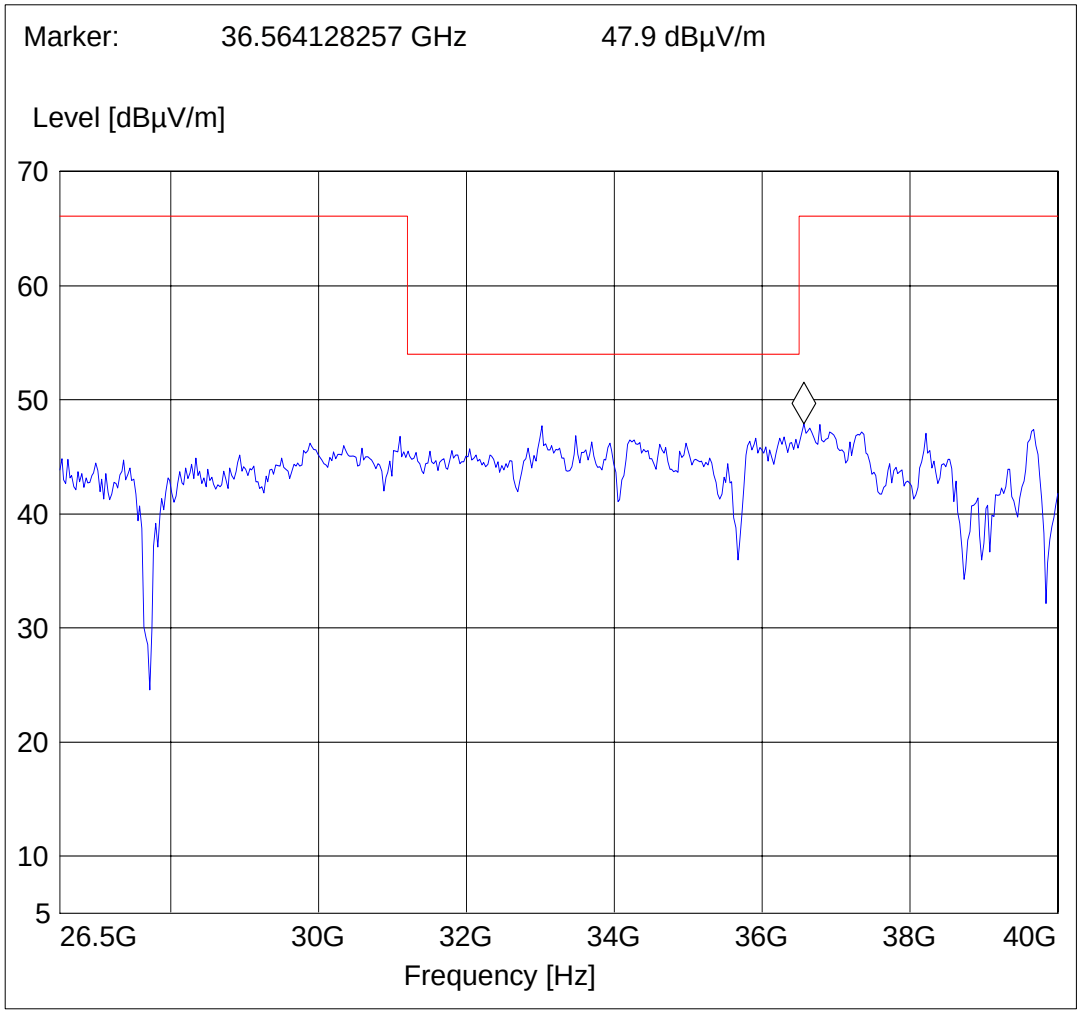
18-26.5GHz (5745MHz)
Note: This plot is valid for low, mid, high channels (worst-case plot)
Note: Peak Reading vs. Average limit ,
CETECOM Inc.
411 Dixon Landing Road, Milpitas CA 95035, USA
EUT:: 4311 MCAG modem
Customer:: Broadcom
Test Mode: 15.407a, tch 157
Ant Orientation: H
EUT Orientation: H
Test Engineer: Ed
Voltage:: AC Adapter
Comments:: TT: 180°

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 157
Ant Orientation: H
EUT Orientation: H
Test Engineer: Ed
Voltage:: AC Adapter
Comments:: TT: 180°

SWEEP TABLE: "FCC 15.407 26.5-40G"



4.3 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 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.

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		

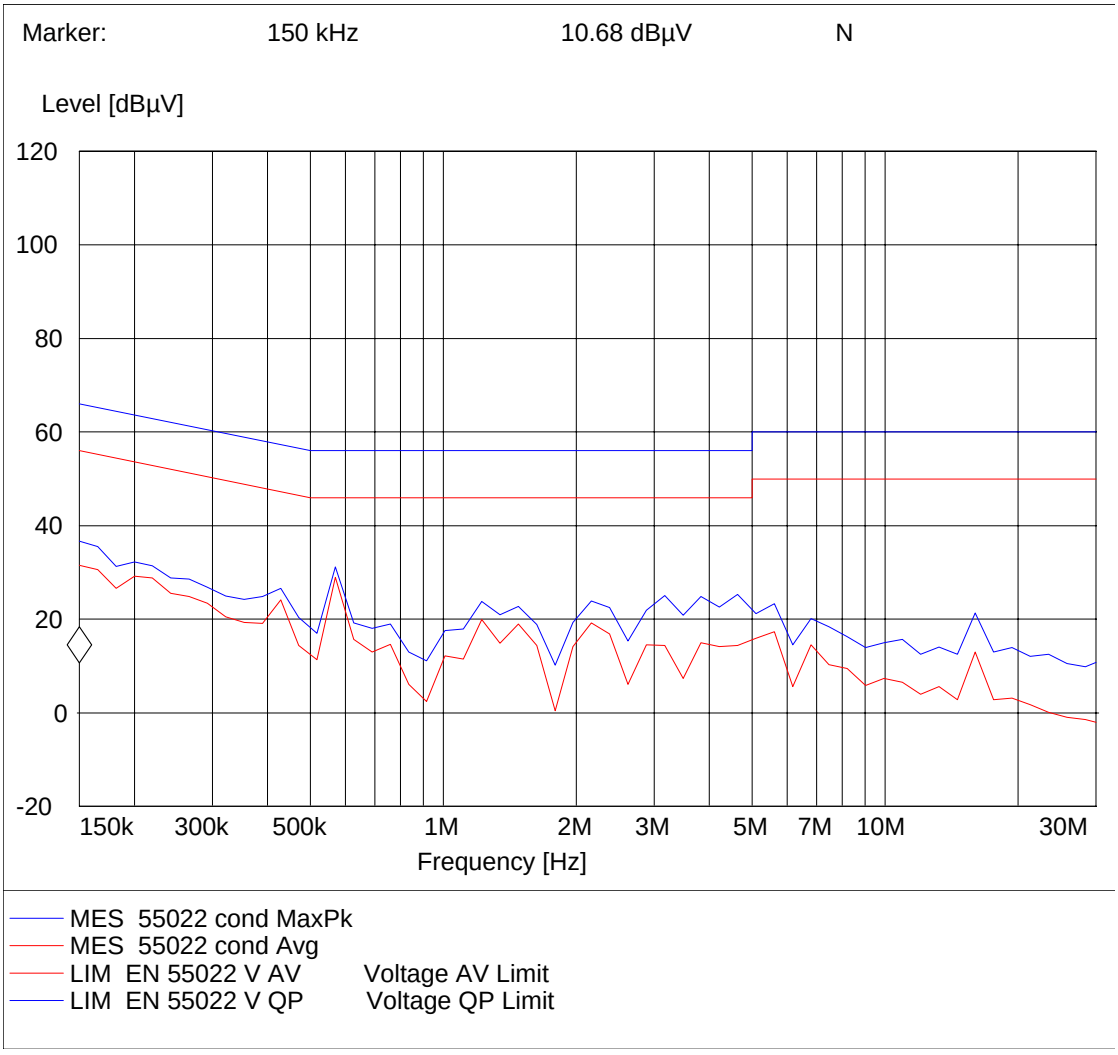
ANALYZER SETTINGS: RBW = 10KHz VBW = 10KHz

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"

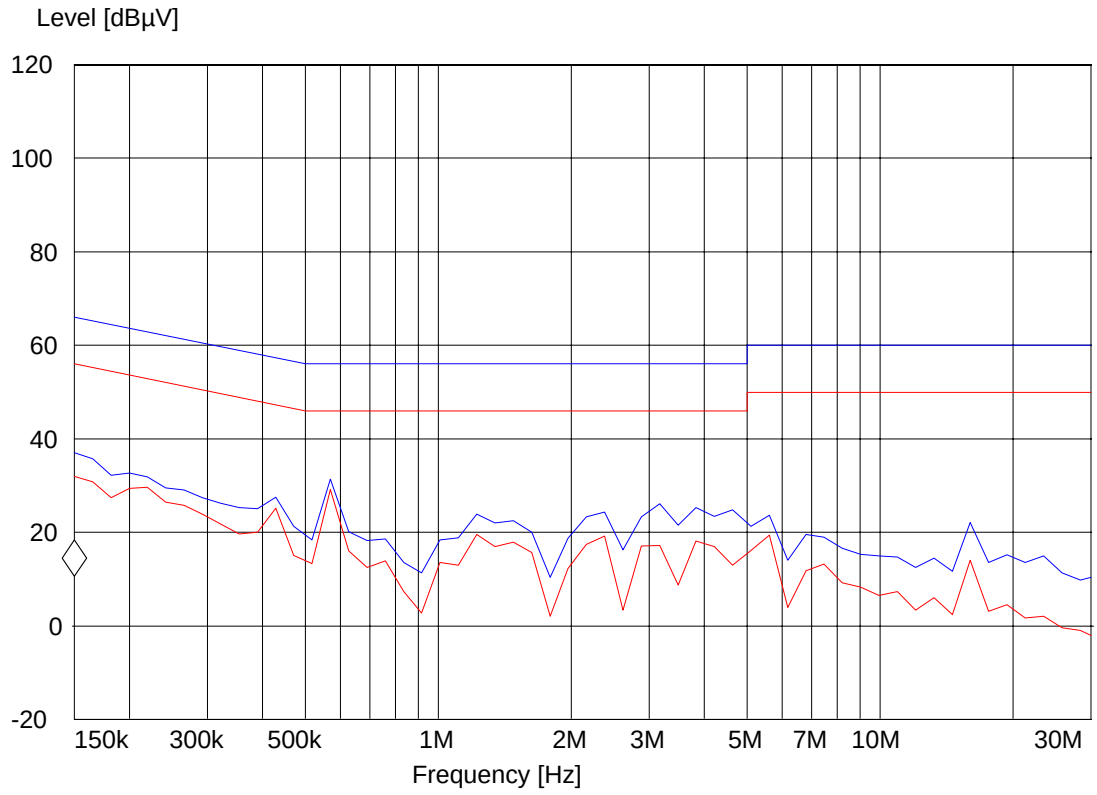


Voltage Mains Test (Neutral)

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"

Marker: 150 kHz 10.68 dBµV N



MES 55022 cond MaxPk
MES 55022 cond Avg
LIM EN 55022 V AV Voltage AV Limit
LIM EN 55022 V QP Voltage QP Limit

5 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

5.1 BLOCK DIAGRAMS

Radiated Testing