



FCC Test Report
FCC Part 15.247 for FHSS systems/
CANADA RSS-210

FOR:

SONY Corporation
Notebook PC
Model Number: PCG-4M1L
FCC ID: AK8PCG4M1L
IC-ID: 409B-PCG4M1L

TEST REPORT #: SONYE_021_07001_15.247BT
DATE: 06/14/2007



Certificate # 2135.01



FCC listed#
101450
IC recognized #
3925

CETECOM Inc.

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

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1 Assessment

The following is in compliance with the applicable criteria specified in FCC rules Part 15.247 of the Code of Federal Regulations and in compliance with the applicable criteria specified in Industry Canada rules RSS210.

Company	Description	Model #
SONY Corporation	Notebook PC	PCG-4M1L

Technical responsibility for area of testing:

Peter Mu

2007-06-14 EMC & Radio (Test Lab Manager)

Date	Section	Name	Signature
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This report is prepared by:

Satya Radhakrishna

2007-06-14 EMC & Radio (EMC Project Engineer)

Date	Section	Name	Signature
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The test results of this test report relate exclusively to the test item specified in Identification of the Equipment under Test. 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.

2 Administrative Data

2.1 Identification of the Testing Laboratory Issuing the EMC Test Report

Company Name:	CETECOM Inc.
Department:	EMC
Address:	411 Dixon Landing Road Milpitas, CA 95035 U.S.A.
Telephone:	+1 (408) 586 6200
Fax:	+1 (408) 586 6299
Responsible Test Lab Manager:	Lothar Schmidt
Responsible Project Leader:	Peter Mu

2.2 Identification of the Client

Applicant (Company Name)	
Street Address	1-7-1 Konan, Minato-ku
City/Zip Code	Tokyo 108-0075
Country	Japan
Contact Person	Michio Kobayashi
Telephone	+81-263-72-5696
Fax	+81-263-72-9755
e-mail	Michio.Kobayashi@jp.sony.com
Applicant (Company Name)	SONY Corporation

2.3 Identification of the Manufacturer

MANUFACTURER	
Manufacturer	Sony EMCS Corporation
Street Address	5432 Toyoshima, Azumino-shi,
City/Zip Code	Nagano 399-8282,
Country	Japan

3 Equipment under Test (EUT)

3.1 Specification of the Equipment under Test

EUT	
Marketing Name of EUT (if not same as Model No.)	VAIO-VGN TZ
Description	Notebook PC
Model No.	PCG-4M1L
FCC-ID	AK8PCG4M1L
IC-ID (Industry Canada)	409B-PCG4M1L

Frequency Range:	2400-2483.5MHz
Type(s) of Modulation:	GFSK, pi/4 DQPSK, 8DPSK
Number of Channels:	79
Antenna Type:	PIFA (Film Antenna)

Subject Of Investigation

All testing was performed on the product referred to in Section 3 as EUT. This test report contains full radiated testing as per FCC15.247 on the EUT with the Bluetooth module.

During the testing process the EUT was tested on a single channel using PRBS9 payload using DH5 packets, all data in this report shows the worst case between horizontal and vertical polarization for above 1GHz.

The objective of the measurements done by Cetecom Inc. was to measure the performance of the EUT as specified by requirements listed in FCC rules Part 15.247 of Title 47 of the Code of Federal Regulations and Industry Canada rules RSS210. The maximization of portable equipment is conducted in accordance with ANSI C63.4.

3.2 RESTRICTED BAND EDGE COMPLIANCE RADIATED §15.247/15.205

3.2.1 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**

3.2.2 RESULTS: 8DPSK

(2402MHz) LOWER BAND EDGE AVERAGE -8DPSK MODULATION

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

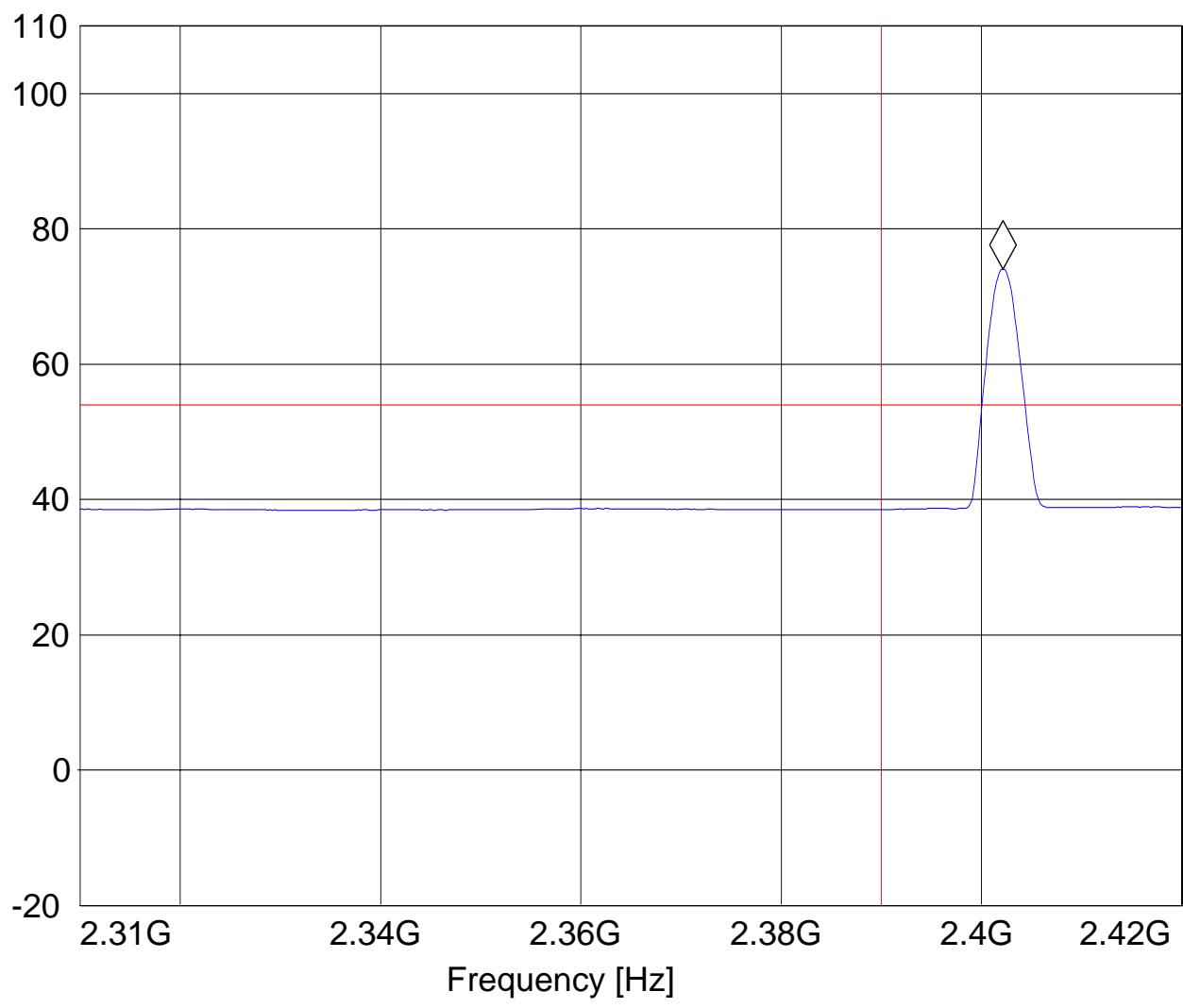
EUT: PCG-4M1L
 Customer: Sony Electronics
 Test Mode: 3-DH5; channel 0; 2402 MHz
 ANT Orientation: H
 EUT Orientation: H
 Test Engineer: Ed
 Power Supply: AC Adapter

SWEEP TABLE: "FCC15.247 LBE_AVG"

Start Frequency	Stop Frequency	Detector	Meas.	IF	Transducer
2.3 GHz	2.4 GHz	MaxPeak	Coupled	1 MHz	#326horn_AF_vert

Marker: 2.402144289 GHz 74 dB μ V/m

Level [dB μ V/m]



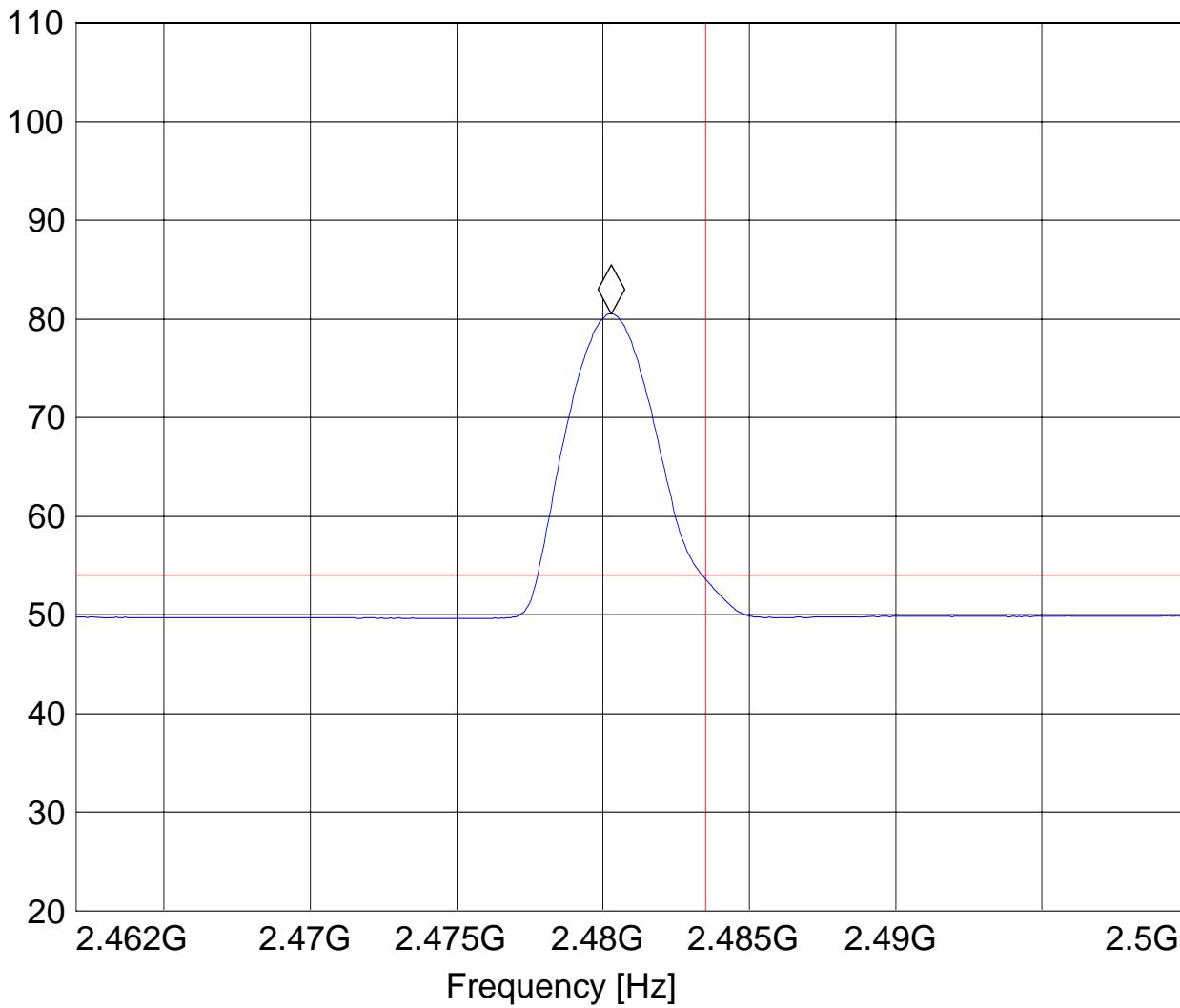
HIGHER BAND EDGE AVERAGE-8DPSK MODULATION**CETECOM Inc., 411 Dixon Landing Road, Milpitas CA 95035, USA**

EUT: PCG-4M1L
 Customer: Sony Electronics
 Test Mode: 3-DH5; channel 78; 2480 MHz
 ANT Orientation: H
 EUT Orientation: H
 Test Engineer: Ed
 Power Supply: AC Adapter

SWEEP TABLE: "FCC15.247 HBE_AVG"

Start Frequency	Stop Frequency	Detector Meas.	IF	Transducer
2.5 GHz	2.5 GHz	MaxPeak	Coupled	1 MHz #326horn_AF_horz

Marker: 2.480276553 GHz 80.5 dB μ V/m

Level [dB μ V/m]

3.3 TRANSMITTER SPURIOUS EMISSIONS RADIATED § 15.247/15.205/15.209

3.3.1 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**

***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

3.3.2 RESULTS

30MHz – 1GHz

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

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

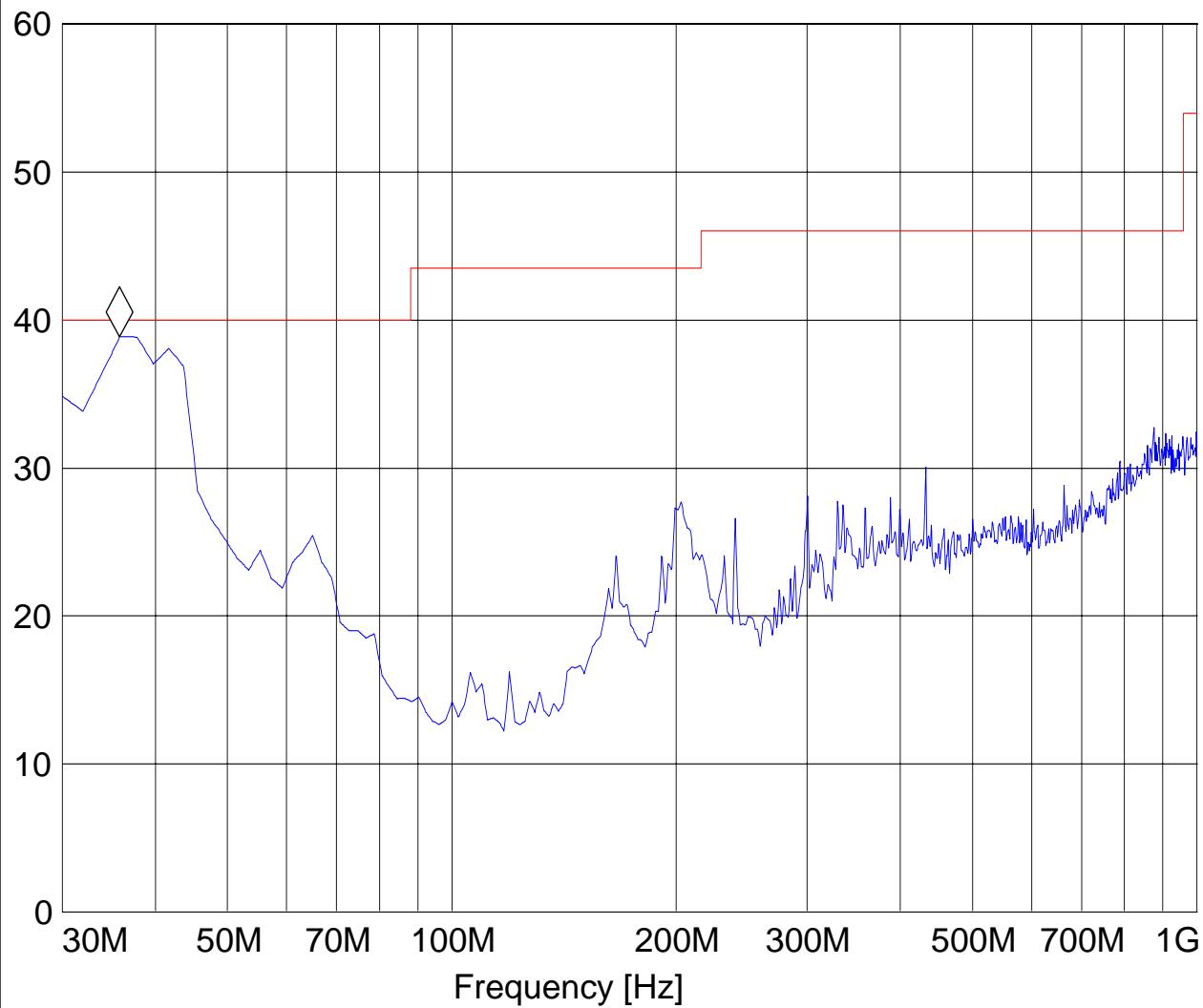
EUT: PCG-4M1L
 Customer: Sony Electronics
 Test Mode: TX CHO 3DH5
 ANT Orientation: V
 EUT Orientation: H
 Test Engineer: PETER MU
 Power Supply: AC Adapter

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

Start Frequency	Stop Frequency	Detector Meas.	IF	Transducer
30.0 MHz	1.0 GHz	MaxPeak Coupled	100 kHz	3141-#1186_Vert

Marker: 35.831663 MHz 38.89 dB μ V/m

Level [dB μ V/m]



1-18GHz (2402MHz)

Note: The peak above the limit line is the carrier freq. **Note:** Peak Reading vs. Average limit
CETECOM Inc., 411 Dixon Landing Road, Milpitas CA 95035, USA

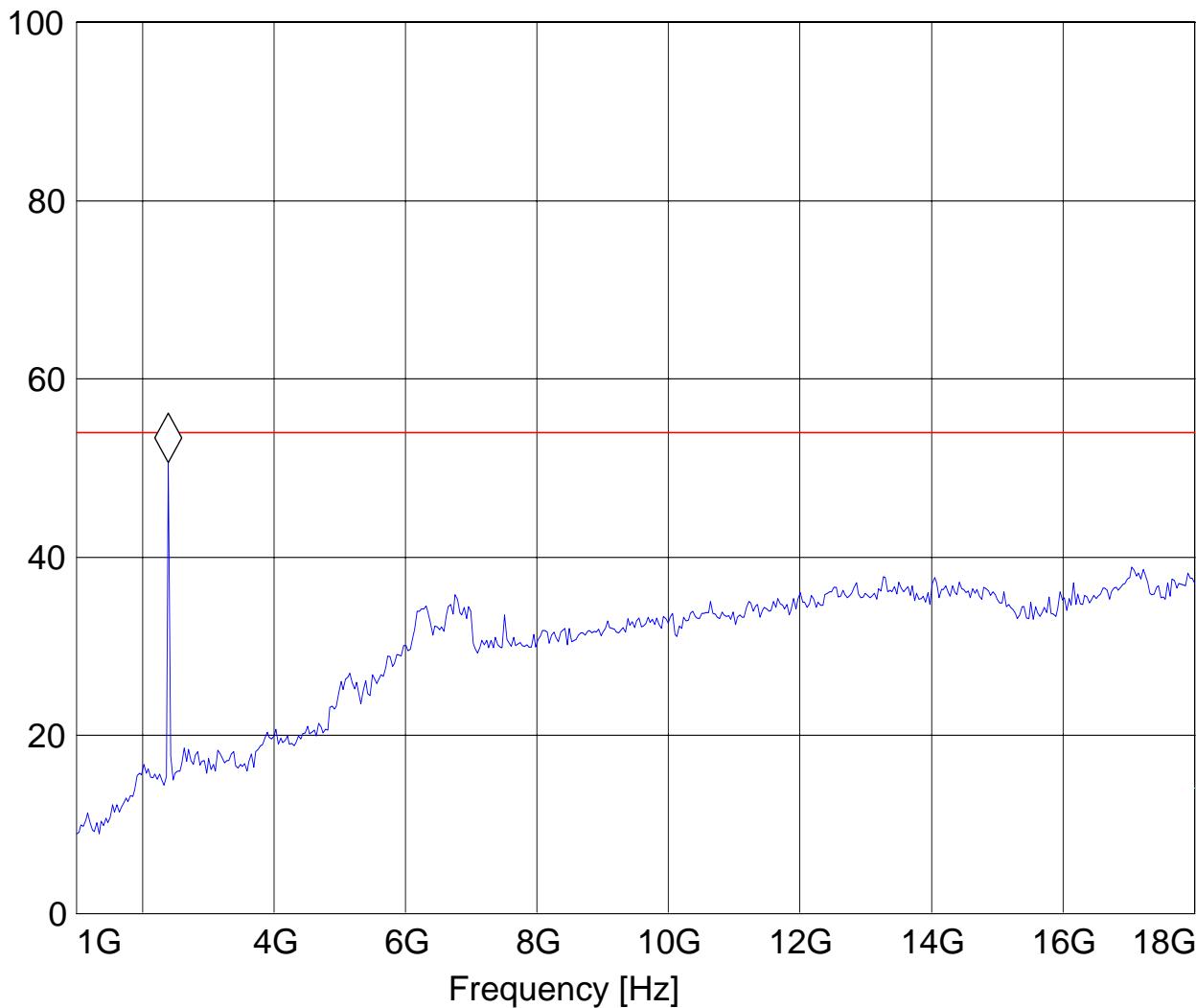
EUT / Description: PCG-4M1L
 Manufacturer: Sony Electronics
 Test mode: 3-DH5; low channel
 ANT Orientation: H
 EUT Orientation: H
 Test Engineer: Satya Radhakrishna
 Voltage: AC Adapter
 Comments: Marker is placed on transmit signal

SWEET TABLE: "FCC15.247_1-18G"

Start	Stop	Detector	Meas.	IF	Transducer
Frequency	Frequency	Time		Bandw.	
1.0 GHz	18.0 GHz	MaxPeak	Coupled	1 MHz	#326horn_AF_vert

Marker: 2.396793587 GHz 50.6 dB μ V/m

Level [dB μ V/m]



1-18GHz (2441MHz)

Note: The peak above the limit line is the carrier freq. **Note:** Peak Reading vs. Average limit
CETECOM Inc., 411 Dixon Landing Road, Milpitas CA 95035, USA

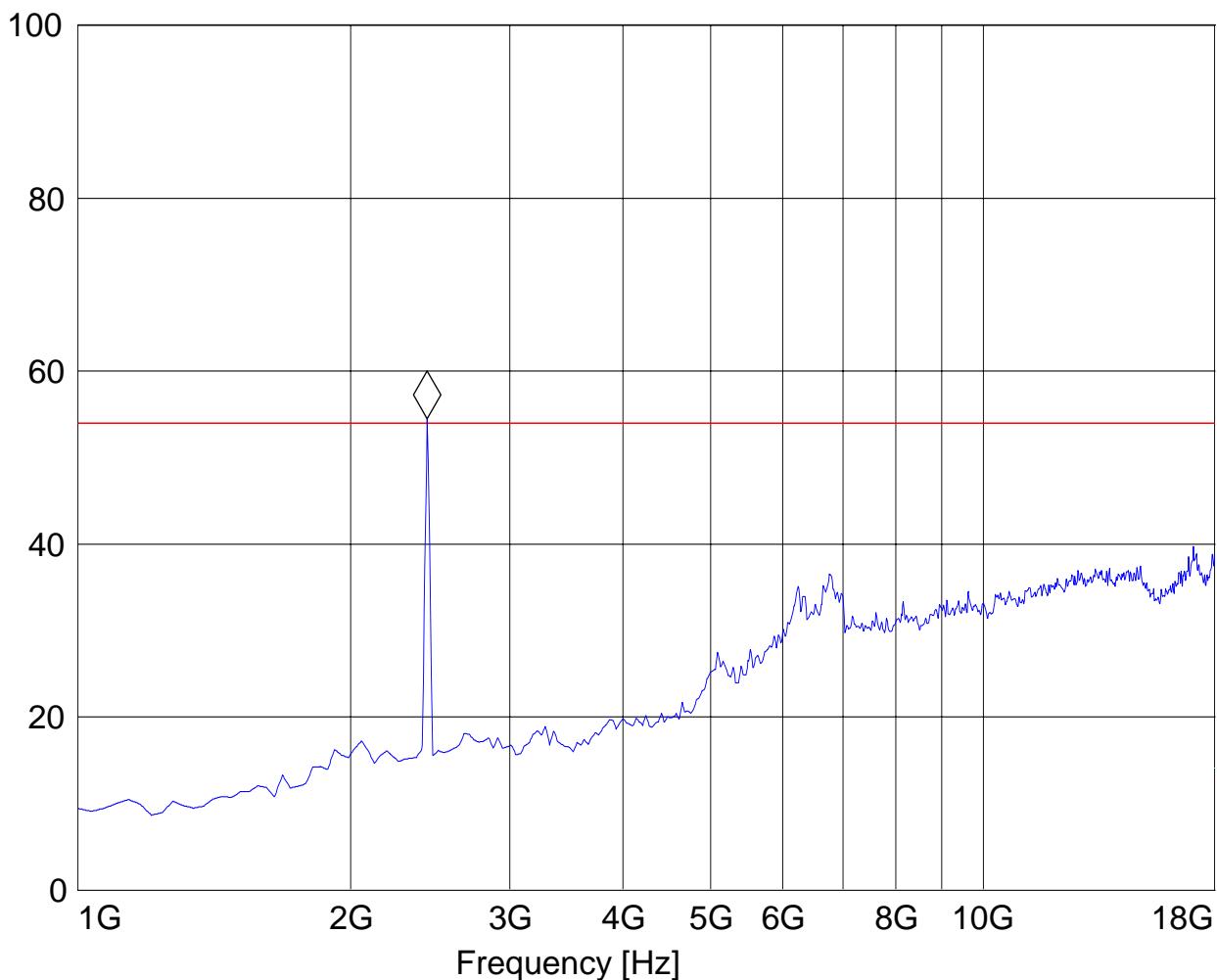
EUT / Description: PCG-4M1L
 Manufacturer: Sony Electronics
 Test mode: 3-DH5 ; channel 39
 ANT Orientation: H
 EUT Orientation : H
 Test Engineer: Satya Radhakrishna
 Voltage: AC Adapter
 Comments: Marker is placed on transmit signal

SWEET TABLE: "FCC15.247_1-18G"

Start	Stop	Detector	Meas.	IF	Transducer
Frequency	Frequency	Time		Bandw.	
1.0 GHz	18.0 GHz	MaxPeak	Coupled	1 MHz	#326horn_AF_vert

Marker: 2.430861723 GHz 54.5 dB μ V/m

Level [dB μ V/m]



1-18GHz (2480MHz)

Note: The peak above the limit line is the carrier freq. **Note:** Peak Reading vs. Average limit
CETECOM Inc., 411 Dixon Landing Road, Milpitas CA 95035, USA

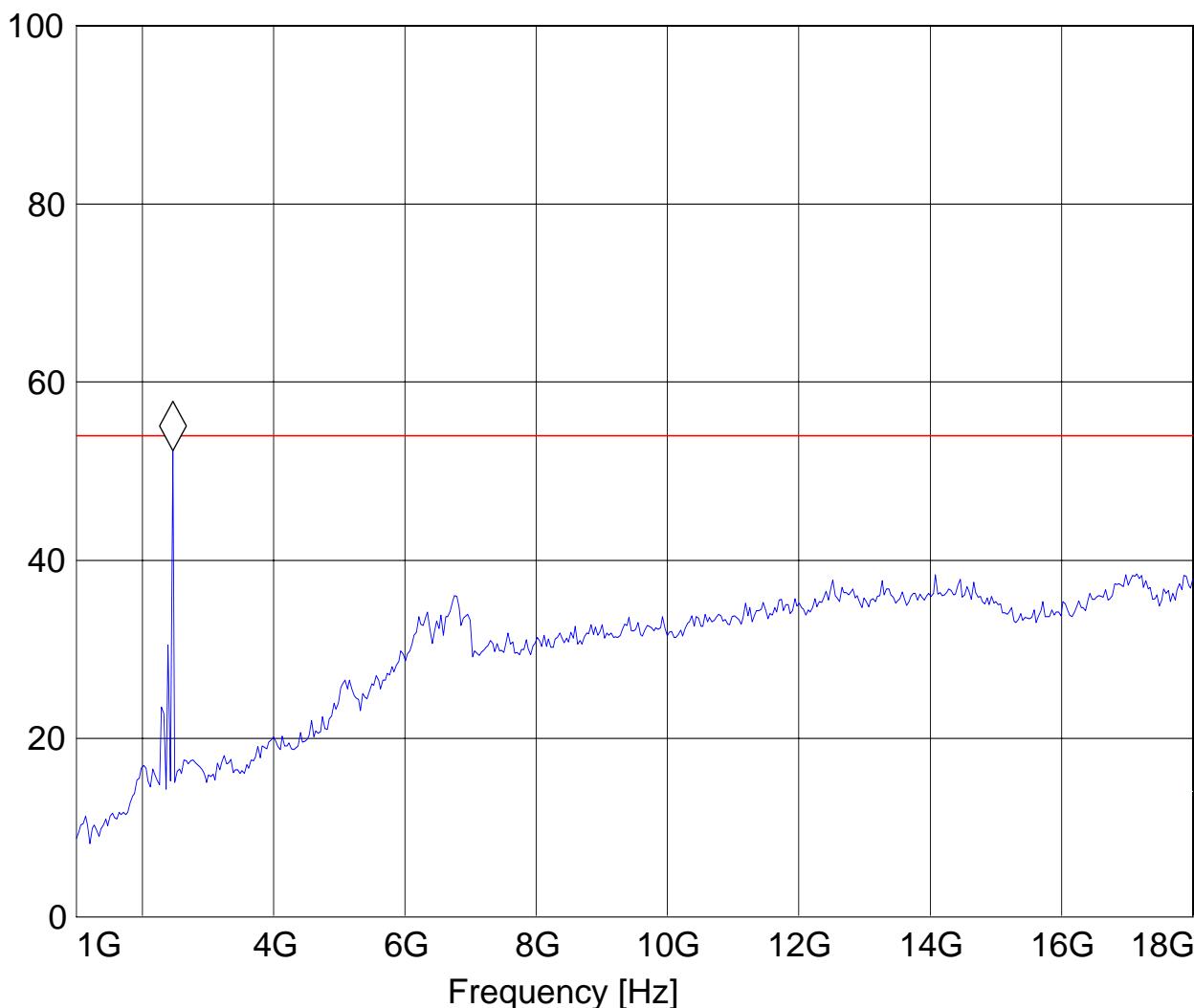
EUT / Description: PCG-4M1L
 Manufacturer: Sony Electronics
 Test mode: 3-DH5; channel 78
 ANT Orientation: H
 EUT Orientation: H
 Test Engineer: Satya Radhakrishna
 Voltage: AC Adapter
 Comments: Marker placed on transmit signal

SWEEP TABLE: "FCC15.247_1-18G"

Start Frequency	Stop Frequency	Detector Meas.	IF	Transducer
1.0 GHz	18.0 GHz	MaxPeak	Coupled	1 MHz #326horn_AF_vert

Marker: 2.46492986 GHz 52.34 dB μ V/m

Level [dB μ V/m]



18-25GHz

Note: The peak above the limit line is the carrier freq. **Note:** Peak Reading vs. Average limit
CETECOM Inc., 411 Dixon Landing Road, Milpitas CA 95035, USA

EUT / Description: PCG-4M1L

Customer: Sony Electronics

Test Mode: 3-DH5 ; channel 78; 2480 MHz

ANT Orientation: H

EUT Orientation: H

Test Engineer: Ed

Power Supply: AC Adapter

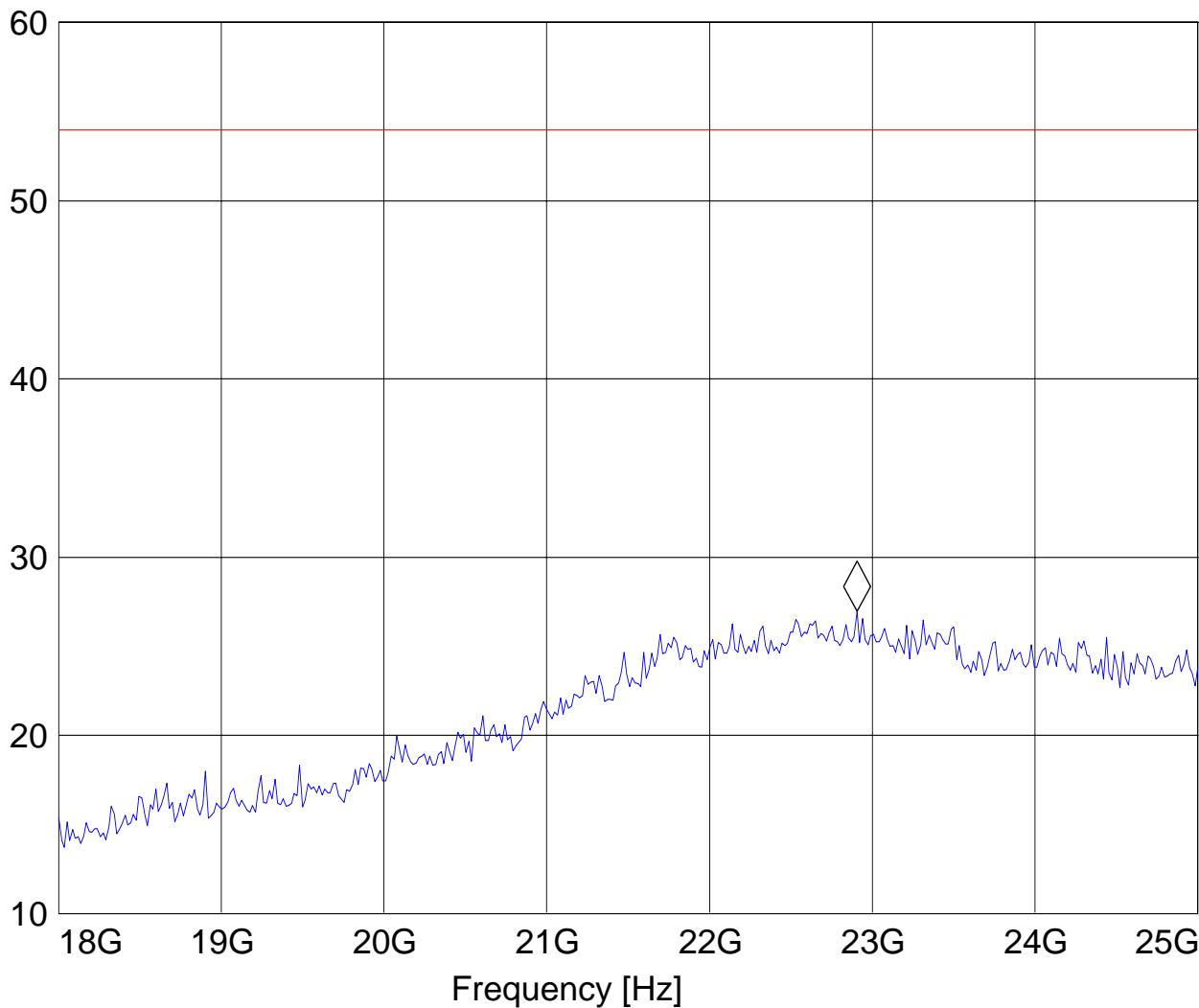
Comments: Marker placed on transmit signal

SWEET TABLE: "FCC15.247_18-26.5G"

Start	Stop	Detector	Meas.	IF	Transducer
Frequency	Frequency	Time		Bandw.	
18.0 GHz	25.0 GHz	MaxPeak	Coupled	1 MHz	#572 horn AF

Marker: 22.905811623 GHz 26.95 dB μ V/m

Level [dB μ V/m]



3.4 RECEIVER SPURIOUS RADIATION § 15.209/RSS210**3.4.1 LIMITS**

Frequency (MHz)	Field strength (μ V/m)	Measurement distance (m)
0.009 - 0.490	2400/F (kHz)	300
0.490 - 1.705	2400/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:

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 a quasi peak or average limit, unless specified with the plots.

3.4.2 RESULTS

30MHz – 1GHz

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

Note: Peak Reading vs. Quasi-peak limit

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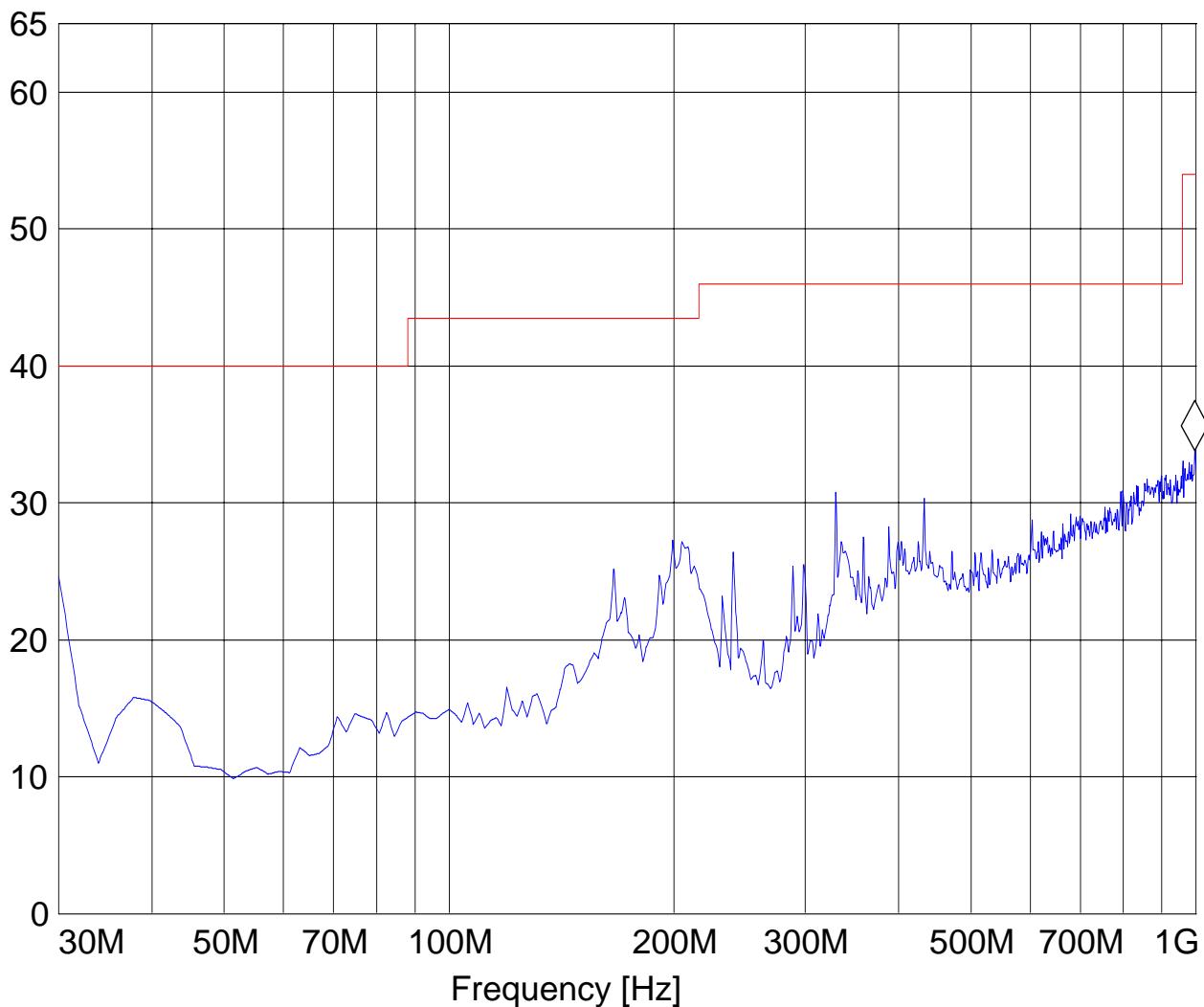
EUT: PCG-4M1L
 Customer: Sony Electronics
 Test Mode: receive
 ANT Orientation: H
 EUT Orientation: H
 Test Engineer: PETER MU
 Power Supply: AC Adapter

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

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

Marker: 996.112224 MHz 33.84 dB μ V/m

Level [dB μ V/m]

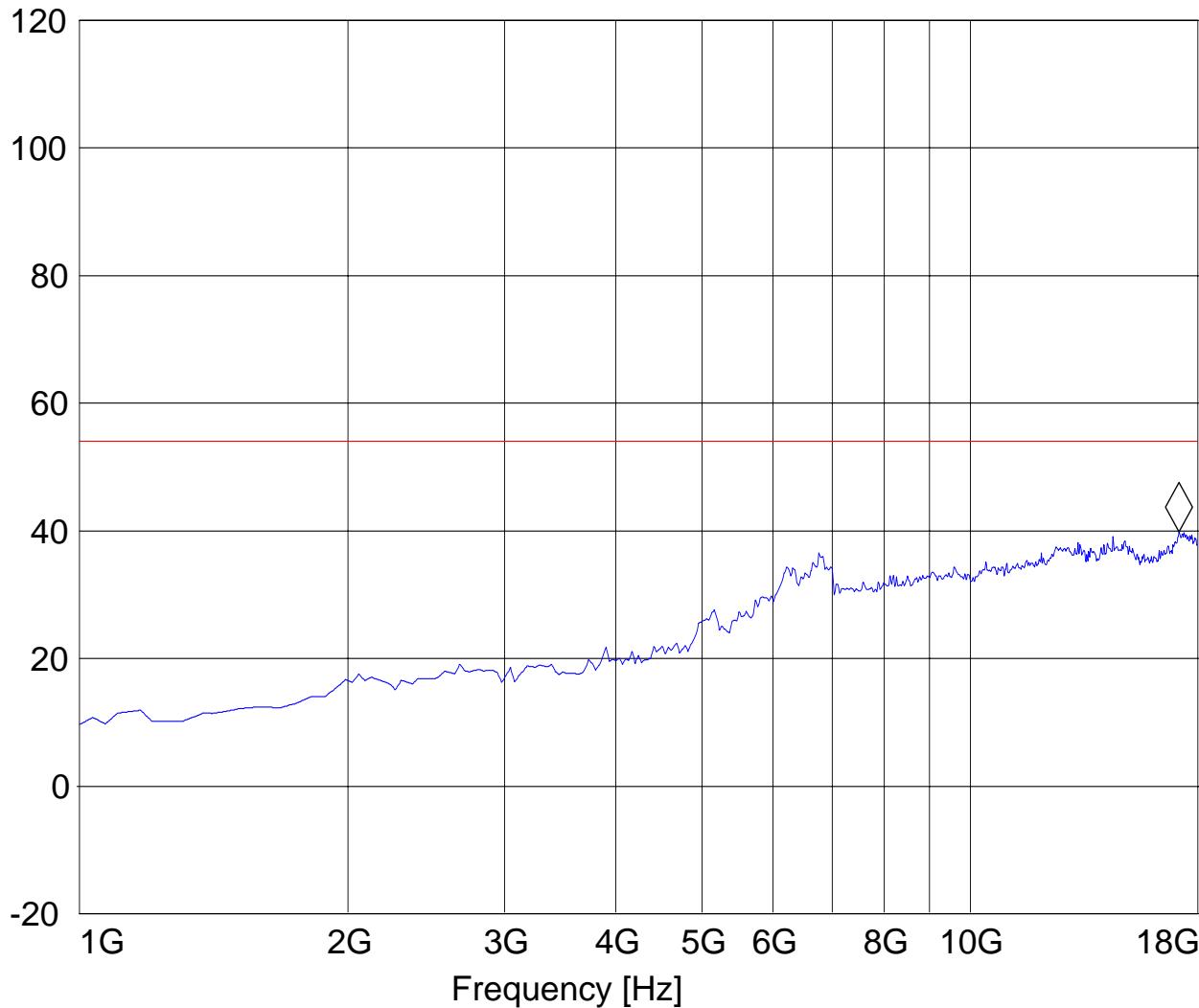


1-18GHz**Note: Peak Reading vs. Average limit****CETECOM Inc., 411 Dixon Landing Road, Milpitas CA 95035, USA**

EUT: PCG-4M1L
Manufacturer: Sony Electronics
Test mode: receive mode
ANT Orientation: H
EUT Orientation: H
Test Engineer: Ed
Voltage: AC Adapter

SWEEP TABLE: "CANADA RE_1-18G"

Start Frequency	Stop Frequency	Detector	Meas.	IF	Transducer
1.0 GHz	18.0 GHz	MaxPeak	Coupled	1 MHz	#326horn_AF_vert

Marker: **17.148296593 GHz** **39.86 dB μ V/m****Level [dB μ V/m]**

18-25GHz**Note: Peak Reading vs. Average limit****CETECOM Inc., 411 Dixon Landing Road, Milpitas CA 95035, USA**

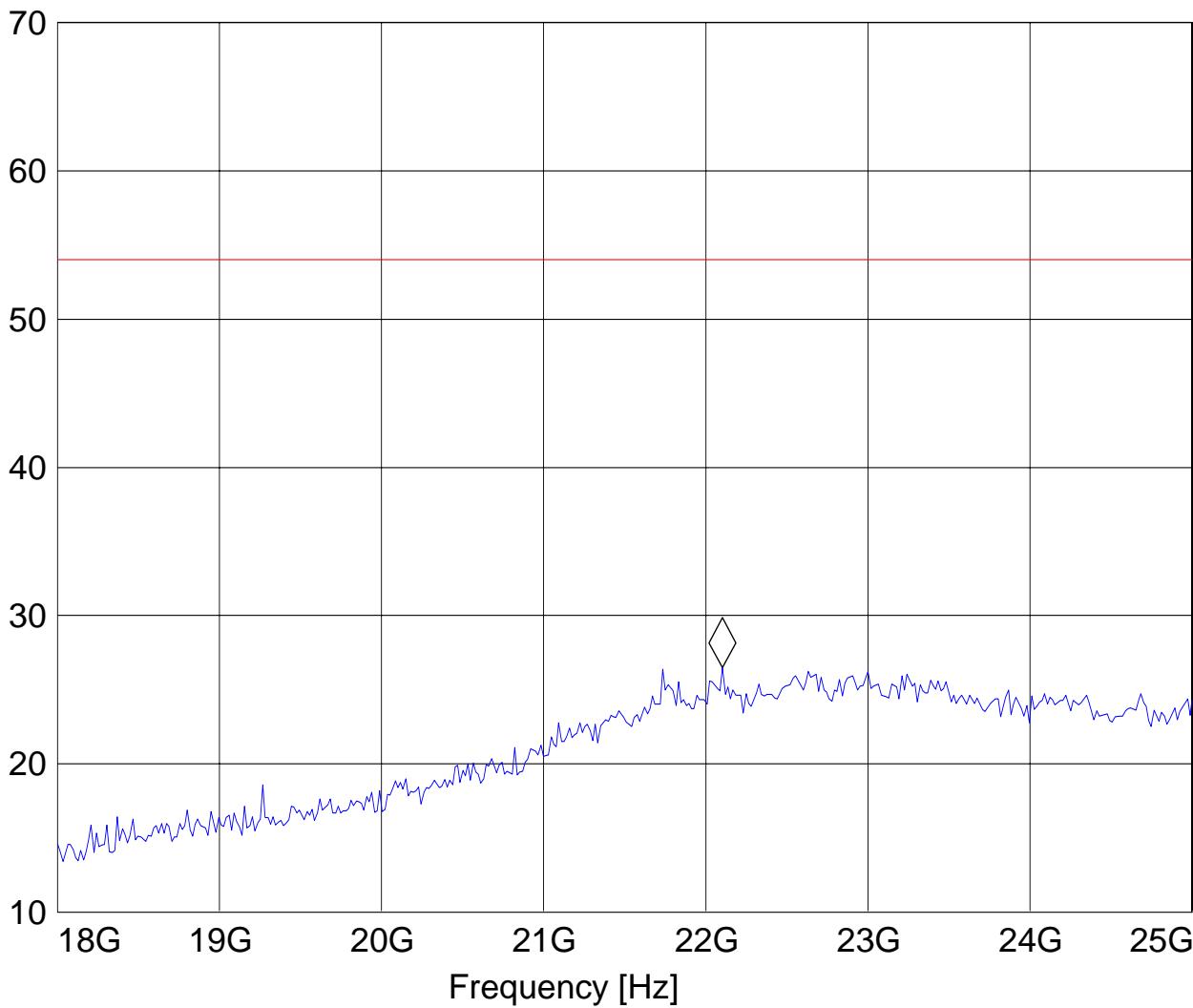
EUT: PCG-4M1L
Customer: Sony Electronics
Test Mode: receive mode
ANT Orientation: H
EUT Orientation: H
Test Engineer: Ed
Power Supply: Battery

****SWEET TABLE: "CANADA RE_18-26.5G"****

Start Frequency	Stop Frequency	Detector	Meas.	IF Time	Transducer
18.0 GHz	26.0 GHz	MaxPeak	Coupled	1 MHz	3160 Horn 18-26.5G

Marker: 22.104208417 GHz 26.48 dB μ V/m

Level [dB μ V/m]



4 Measurements (CONDUCTED)**4.1 MAXIMUM PEAK OUTPUT POWER § 15.247 (CONDUCTED)****4.1.1 LIMIT SUB CLAUSE § 15.247 (b) (1)**

Frequency range	RF power output
2400-2483.5 MHz	30dBm

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

4.1.2 RESULTS: GFSK

Please refer to conducted test report.

4.2 20dB BANDWIDTH

4.2.1 LIMIT SUB CLAUSE § 15.247 (a) (1) (i) (ii) (iii)

Alternatively, frequency hopping systems operating in the 2400–2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

4.2.2 RESULTS: GFSK

Please refer to conducted test report # BROAD_031_01001_15.247BT

4.3 CARRIER FREQUENCY SEPARATION

4.3.1 LIMIT SUB CLAUSE § 15.247 (a) (1) (i) (ii) (iii)

SEPARATION
> 25 KHz or > 20 dB BANDWIDTH

4.3.2 RESULTS:

Please refer to conducted test report # **BROAD_031_01001_15.247BT**

4.4 NUMBER OF HOPPING CHANNELS

4.4.1 LIMIT SUB CLAUSE § 15.247 (a) (1) (iii)

NUMBER OF CHANNELS
> 15

4.4.2 RESULTS:

Please refer to conducted test report # **BROAD_031_01001_15.247BT**

4.5 TIME OF OCCUPANCY (DWELL TIME)**4.5.1 LIMIT SUB CLAUSE § 15.247 (a) (1) (i) (ii) (iii)**

FREQUENCY RANGE	AVERAGE TIME OF OCCUPANCY PER 31.6 SECONDS (LIMIT)
2400-2483.5	0.4 SECONDS

4.5.2 RESULTS:

Please refer to conducted test report # **BROAD_031_01001_15.247BT**

4.6 CONDUCTED SPURIOUS EMISSION**4.6.1 LIMIT SUB CLAUSE § 15.247 (d)**

FREQUENCY RANGE	limit
30M-25GHz	-20dBc

4.6.2 RESULTS: T_{nom}(23)°C V_{nom}VDC

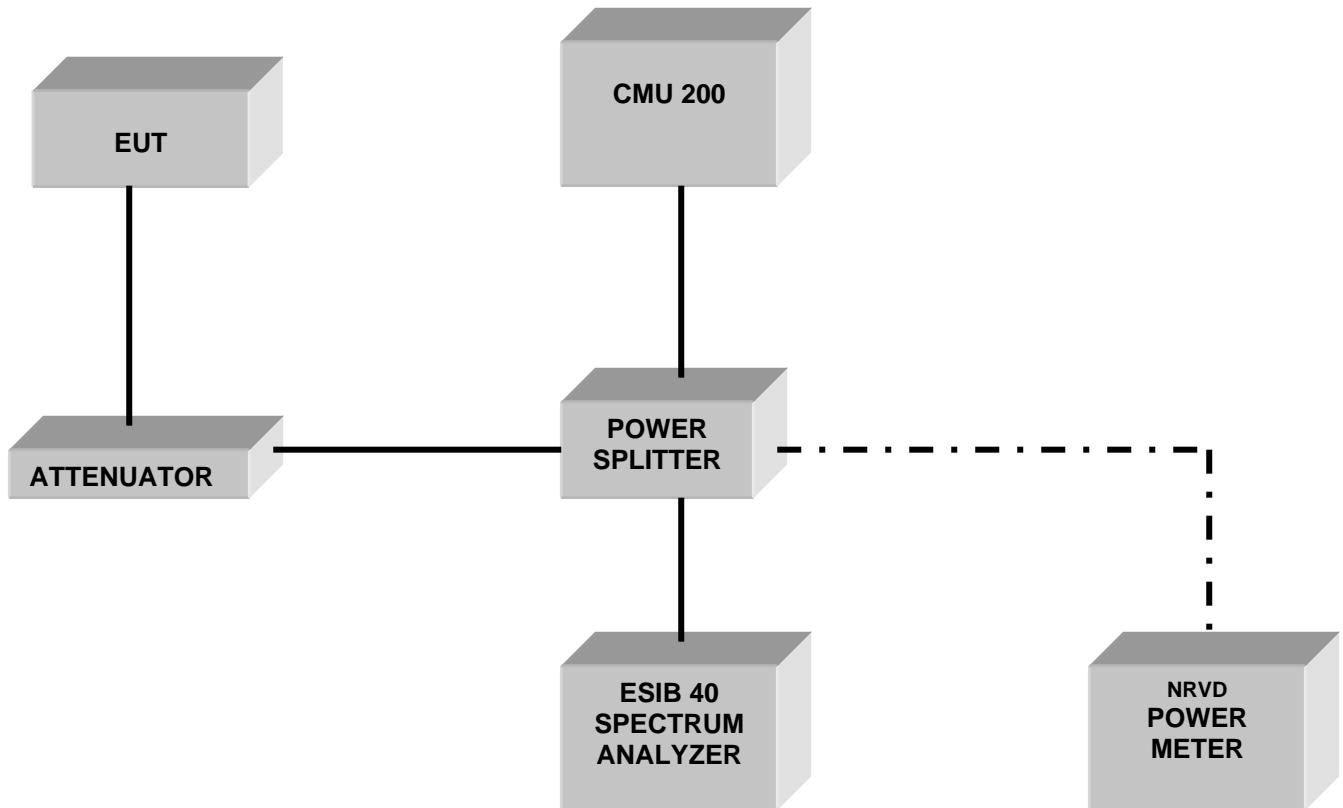
Please refer to conducted test report # **BROAD_031_01001_15.247BT**

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

6 BLOCK DIAGRAMS

Conducted Testing



Radiated Testing**ANECHOIC CHAMBER**