



Nemko USA, Inc.
Phone (858) 755-5525 Fax (858) 452-1810
11696 Sorrento Valley Rd., Suite F
San Diego, CA 92121-1024

Test Report: 2007 065696 FCC

Applicant: Broadcast Microwave Services
12367 Crosthwaite Circle Dock 10
Poway, CA 92064
(858) 391-3050 x147
(858) 391-3049 - fax

Equipment Under Test: Model: BPA-(X)CC Linear Power Amplifier

FCC ID: CNVHCII-9

In Accordance With: FCC PART 2 and FCC PART 74 Subpart F

Tested By: Nemko USA Inc.
11696 Sorrento Valley Road
San Diego, CA 92121-1024

Date: July 12, 2007

Total Number of Pages: 40

Nemko USA Inc.

EQUIPMENT: BPA-(X)CC Linear Power Amplifier

FCC ID: CNVHCII-9

REPORT NO.: 2007 065696 FCC

DOCUMENT HISTORY

REVISION	DATE	COMMENTS
-	July 12, 2007	Prepared By: F.S.Custodio
-	July 12, 2007	Initial Release: M. T. Krumweide

NOTE: Nemko USA, Inc. hereby makes the following statements so as to conform to Chapter 10 (Test Reports) Requirements of ANSI C63.4: 2003 "Methods and Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz":

- The unit described in this report was received at Nemko USA, Inc.'s facilities on June 25, 2007. Testing was performed on the unit described in this report on June 25, 2007 to July 12, 2007.
- The Test Results reported herein apply only to the Unit actually tested, and to substantially identical Units.
- This report does not imply the endorsement of the Federal Communications Commission (FCC), NVLAP or any other government agency.

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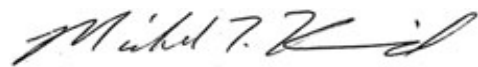
CERTIFICATION

Nemko USA, Inc., an independent Electromagnetic Compatibility (EMC) Test Laboratory, produced this Test Report and performed the Radio Frequency Interference (RFI) testing and data evaluation contained herein.

Nemko USA, Inc.'s measurement facility is currently registered with the United States Federal Communications Commission (FCC) in accordance with the provisions of 47 United States Code (CFR) Part 2, Subpart I, Section 2.948(a). A current description of Nemko USA, Inc.'s measurement facility is on file with the FCC. Nemko USA Inc. has additionally satisfied the FCC that it complies with the requirements set forth in 47 CFR Part 2, Subpart I, Section 2.948(d) regarding the accreditation of EMC laboratories. As a result, the FCC has placed Nemko USA Inc. on its list of EMC laboratories approved to perform Declaration of Conformity (DOC) procedure testing.

The RFI testing, test data collection and test data evaluation were accomplished in accordance with the ANSI C63.4: 2003 Standard, and in accordance with the applicable sections of the FCC rules (47 CFR Parts 2 and 18)." digital devices. The testing was also accomplished in accordance with Industry Canada's ICES-003 standard for unintentional radiating device per EMCAB-3, Issue 3 (May 1998). The administrative summary of this test report provides a description of the test sample

I hereby certify that the test data, test data evaluation, and equipment configurations used to compile this test report are a true and accurate representation of the test sample's radio frequency interference characteristics as of the test date(s), and, for the design of the test sample.



Mike T. Krumweide, EMC Test Supervisor

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Section 1. Summary of Test Results

General

All measurements are traceable to national standards.

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with FCC PART 2 and FCC PART 74 Subpart F. The EUT is a linear power amplifier, in order to exercise the unit; it was connected to a 6GHz Carry-Coder II (CCII) COFDM Digital Wireless Camera System with SN 477 Rev. D.

Summary Of Test Data

Name Of Test	Para. No.	Result
RF Power Output	2.1046	PASS
Modulation Characteristics	2.1047	AS REPORTED
Occupied Bandwidth	2.1049	PASS
Spurious Emissions at Antenna Terminals	2.1051	PASS
Field Strength of Spurious Emissions	2.1053	PASS
Frequency Stability	2.1055	PASS

Footnotes for 2.1047: EUT is a linear power amplifier. Parts 74 do not express limits or pass/fail criteria for Modulation Characteristics.

Test Conditions:

Indoor Temperature: 23.3—24.4 °C
 Humidity: 58-60 %

Outdoor Temperature: 27 °C
 Humidity: 47 %

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Section 2. General Equipment Specification

Manufacturer:	Broadcast Microwave Services
Part No.:	31171
Model No.:	8014079050 (Linear Power Amplifier)
Serial No.:	247-36405 Rev. _
FCC ID:	CNVHCII-9
Test Voltage:	28VDC to EUT
Frequency Range:	6.425GHz to 6.525GHz
Date Received In Laboratory:	June 25, 2007
Nemko Identification No.:	5696-1

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Section 3. RF Power Output

Para. No.: 2.1046(c)

Test Performed By: F. S. Custodio	Date of Test: 07-12-07
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Minimum Standard: Subpart F--Television Broadcast Auxiliary Stations
Sec. 74.636 Power limitations.

(a) On any authorized frequency, transmitter peak output power and the average power delivered to an antenna in this service must be the minimum amount of power necessary to carry out the communications desired and shall not exceed the values listed in the following table. Application of this principle includes, but is not to be limited to, requiring a licensee who replaces one or more of its antennas with larger antennas to reduce its antenna input power by an amount appropriate to compensate for the increased primary lobe gain of the replacement antenna(s). In no event shall the average equivalent isotropically radiated power (EIRP), as referenced to an isotropic radiator, exceed the values specified in the following table. In cases of harmful interference, the Commission may, after notice and opportunity for hearing, order a change in the effective radiated power of this station. The table follows:

Frequency Band (MHz)	Maximum allowable transmitter power Mobile (W)	Maximum allowable EIRP ²	
		Fixed (dBW)	Mobile (dBW)
2,025 to 2,110	12.0	+45	+35
2,450 to 2,483.5	12.0	+45	+35
6,425 to 6,525	12.0		+35
6,875 to 7,125	12.0	+55	+35
12,700 to 13,250	1.5	+55	+35
17,700 to 18,600		+55	
18,600 to 18,800 ¹		+35	
18,800 to 19,700		+55	

¹ The power delivered to the antenna is limited to -3 dBW.

² Stations licensed based on an application filed before April 16, 2003, for EIRP values exceeding those specified above, may continue to operate indefinitely in accordance with the terms of their current authorizations, subject to periodic renewal.

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Test Results: EUT complies**Test Conditions:**

A 6GHz Carry-Coder II (CCII) COFDM Digital Wireless Camera System (SN477 Rev.D) was connected to the EUT during this test. ALC cable from CCII was disconnected to the maximize output to EUT (Testing purposes only, ALC is normally used to regulate input to EUT preventing overdriving and damage). Measured at low, mid and high channel, RF setting set to Max using internal source via ASI (Asynchronous Serial Interface) option. Signal bandwidth is set to 8MHz, all modulation (QPSK, 16QAM and 64QAM) were measured but only the worst is reported which is 64QAM. External attenuators and cable used were verified at 41dB between 6425MHz and 6525MHz. Peak and average measurements were made using the Spectrum Analyzer's Channel Power Measurement feature. RBW and VBW are instrument controlled at RBW 100kHz/VBW 300kHz for peak and RBW 100kHz/VBW 1MHz for average. Measurement bandwidth is set to signal bandwidth.

Measurement Data (watts):

Modulation	Low Channel		Mid Channel		High Channel	
	Peak	Average	Peak	Average	Peak	Average
QPSK	20.42	3.53	23.01	3.33	23.17	3.89
16QAM	20.46	3.53	23.01	3.33	23.23	3.90
64QAM	20.51	3.53	23.12	3.34	23.33	3.93

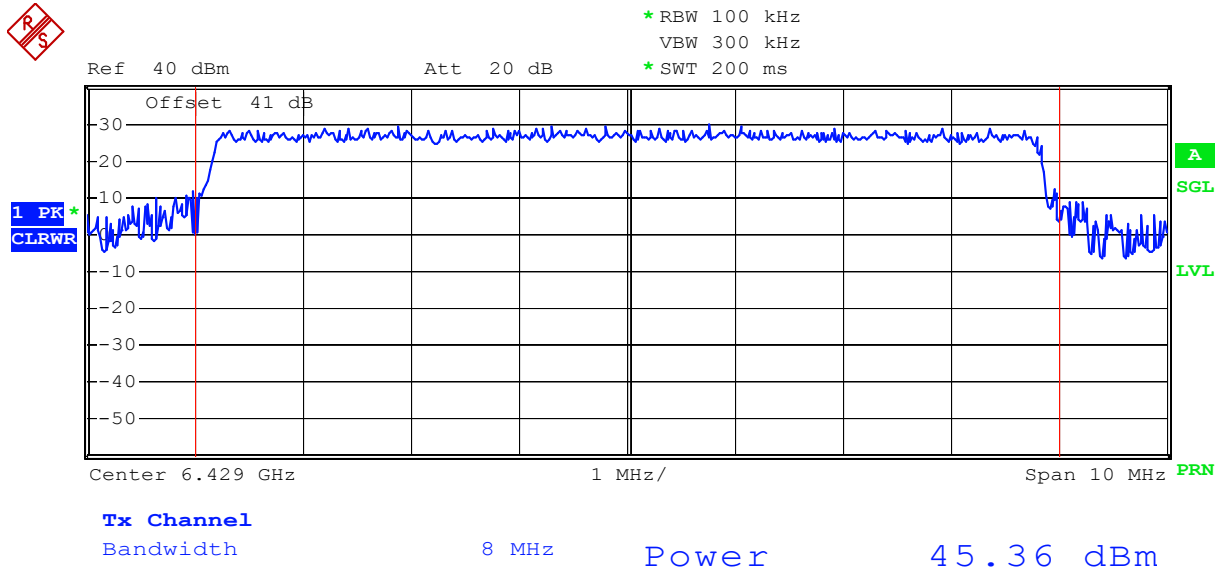
Low Channel = 6429MHz**Mid Channel = 6475MHz****High Channel = 6521MHz**

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Date: 12.JUL.2007 11:12:27

Peak Measurement (64QAM Low Channel)
Plots Shown Typical of Highest Output Power Measured
45.36 dBm = 34.36 Watts

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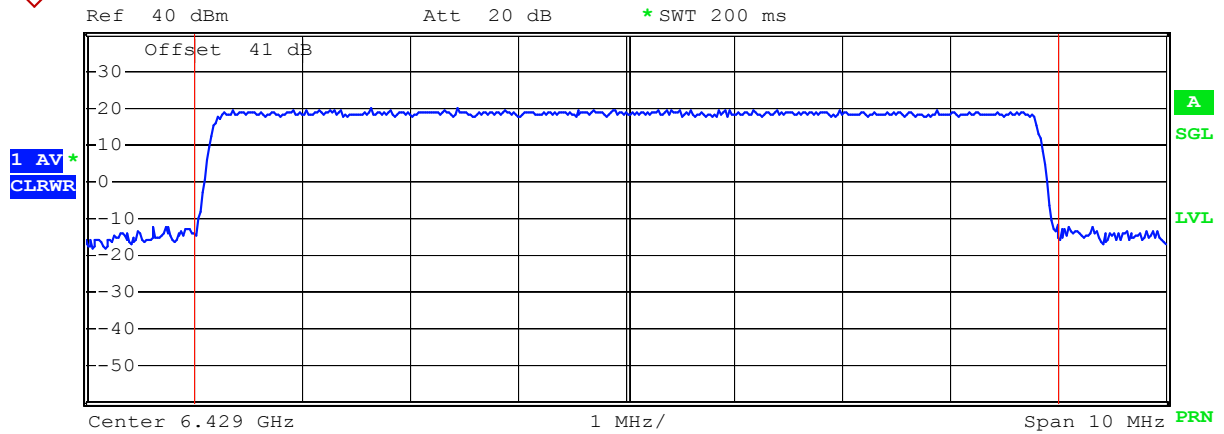
EQUIPMENT: BPA-(X)CC Linear Power Amplifier

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* RBW 100 kHz
VBW 1 MHz
* SWT 200 ms



Tx Channel

Bandwidth

8 MHz

Power

36.94 dBm

Date: 12.JUL.2007 11:11:41

**Average Measurement (64QAM Low Channel Channel)
Plots Shown Typical of Highest Output Power Measured
36.94 dBm = 4.94 Watts**

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Section 4. Modulation Characteristics

Para. No.: 2.1047

Test Performed By: Ferdinand S. Custodio	Date of Test: 06-25-2007
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Minimum Standard: Part 74 Subpart F

Test Results: As Reported. Conducted emission plots captured on the Spectrum Analyzer thru a 40 dB attenuator.

Measurement Data: See attached plots to exemplify the three modes of modulation:

Modulation modes used are QPSK, 16QAM and 64QAM. All measurements are done on QPSK modulation as it offers the highest Tx robustness among the three. Modulation mode has no evident effect on spurious, power or frequency stability measurements.


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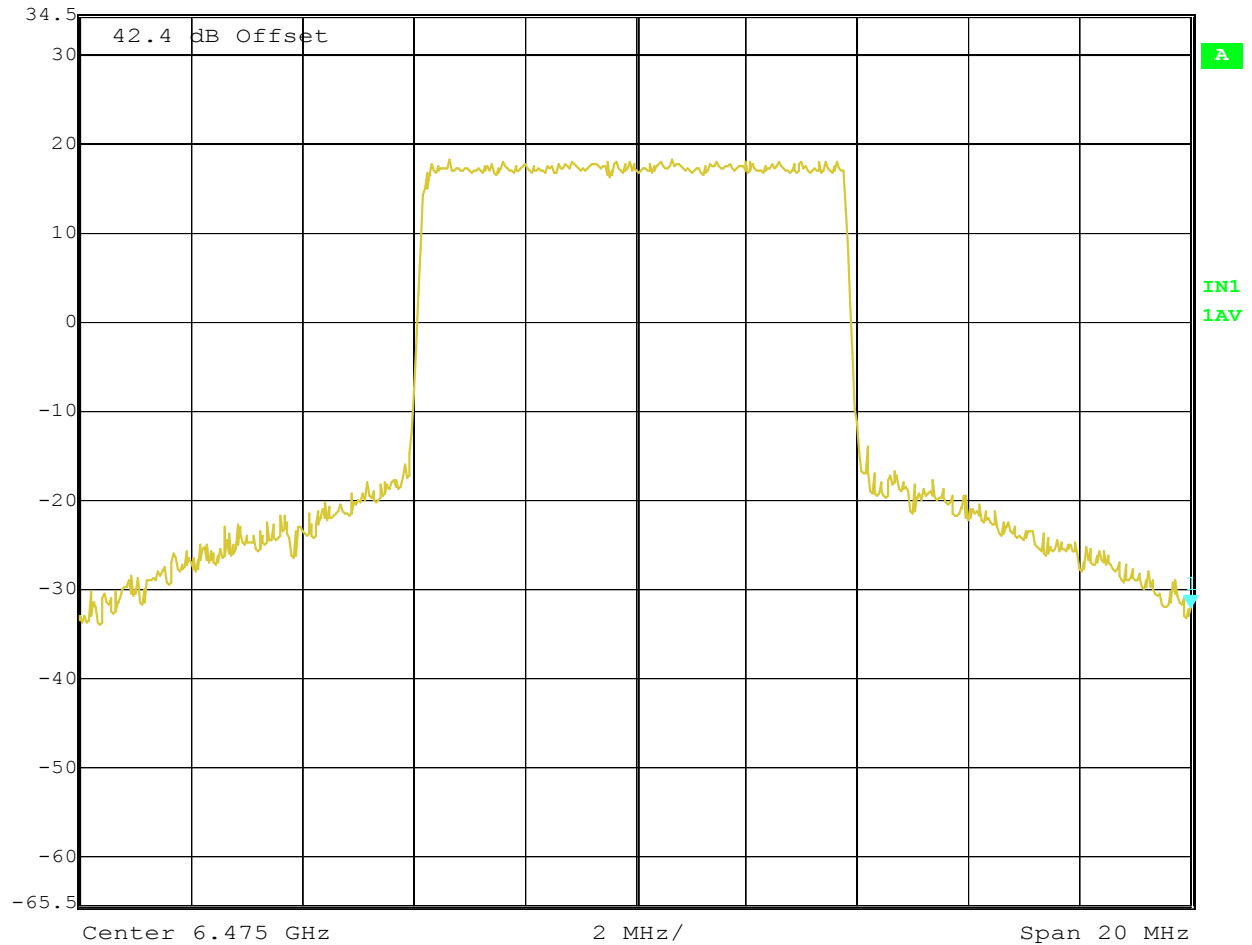
EQUIPMENT: BPA-(X)CC Linear Power Amplifier

FCC ID: CNVHCII-9

REPORT NO.: 2007 065696 FCC

Modulation Mode: 64QAM

 Marker 1 [T1] RBW 100 kHz RF Att 10 dB
Ref Lvl -32.12 dBm VBW 300 kHz
34.5 dBm 6.48500000 GHz SWT 200 ms Unit dBm



Date: 25.JUN.2007 14:16:50

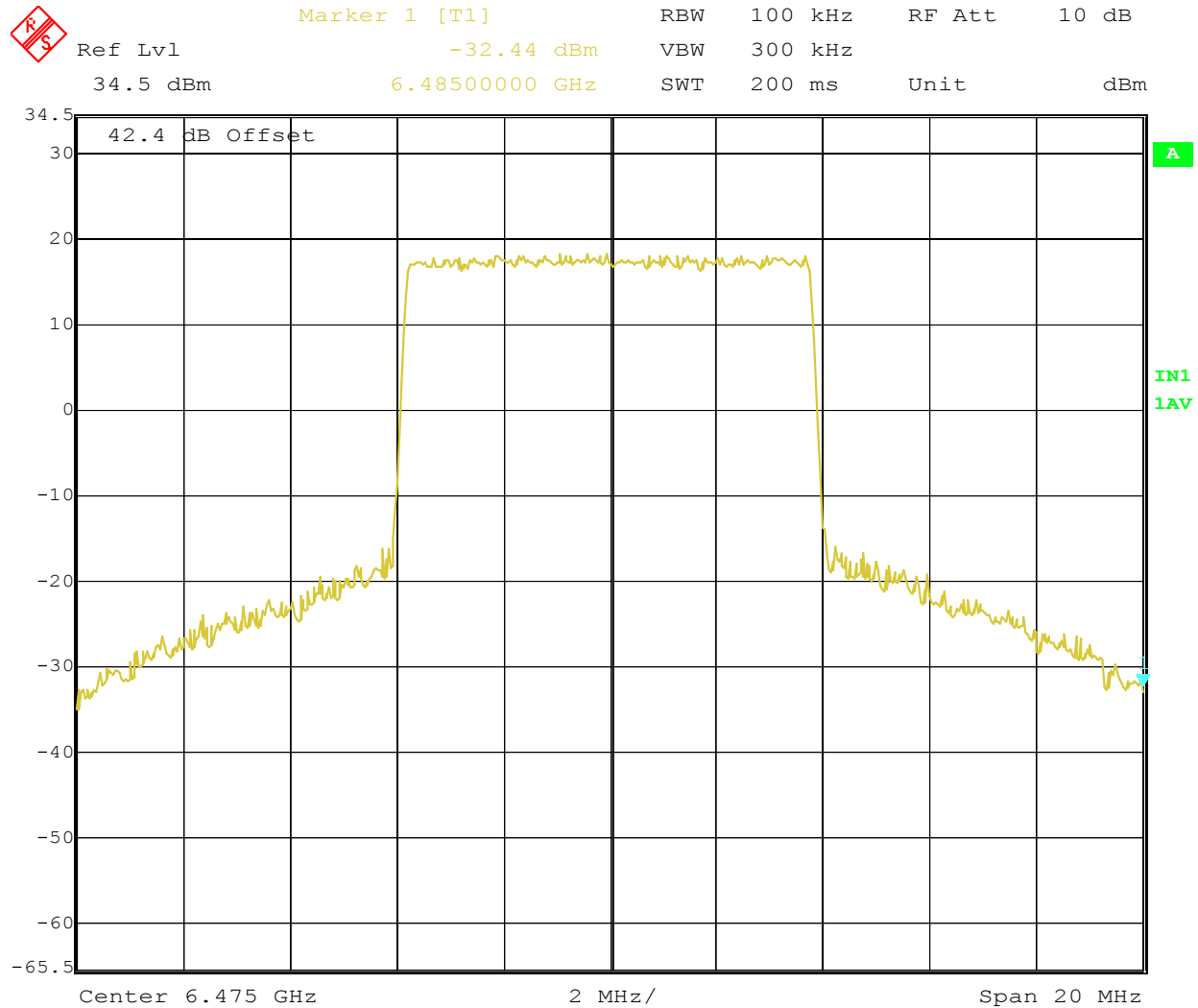
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EQUIPMENT: BPA-(X)CC Linear Power Amplifier

FCC ID: CNVHCII-9

REPORT NO.: 2007 065696 FCC

Modulation Mode: 16QAM



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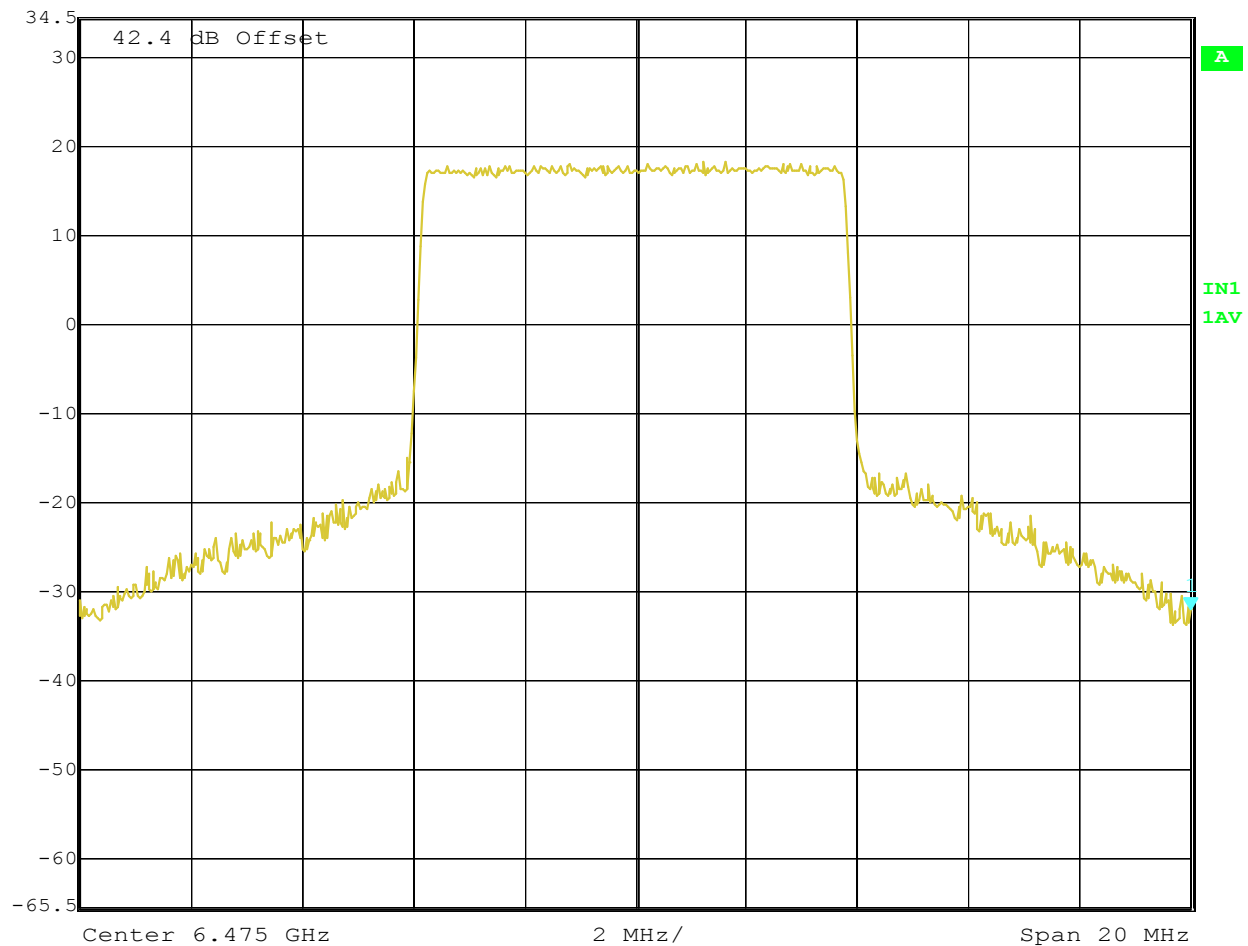
EQUIPMENT: BPA-(X)CC Linear Power Amplifier

FCC ID: CNVHCII-9

REPORT NO.: 2007 065696 FCC

Modulation Mode: QPSK

 Marker 1 [T1] RBW 100 kHz RF Att 10 dB
Ref Lvl -32.12 dBm VBW 300 kHz
34.5 dBm 6.48500000 GHz SWT 200 ms Unit dBm



Date: 25.JUN.2007 14:15:44

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Section 5. Occupied Bandwidth

Para. No.: 2.1049

Test Performed By: Ferdinand Custodio	Date of Test: 06-27-2007
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Minimum Standard: Part 74.637 (g) Occupied/Authorized bandwidth.

(g) The maximum bandwidth which will be authorized per frequency assignment is set out in the table which follows. Regardless of the maximum authorized bandwidth specified for each frequency band, the Commission reserves the right to issue a license for less than the maximum bandwidth if it appears that less bandwidth would be sufficient to support an applicant's intended communications.

Frequency Band (MHz)	Maximum authorized bandwidth (MHz)
1,990 to 2,110	18
6,425 to 6,525	25
6,875 to 7,125	25
12,700 to 13,250	25
17,700 to 19,700	80

Test Results: EUT Complies. Conductive emission plots captured on the Spectrum Analyzer thru a 40 dB attenuator.

Test Data: See attached plots. The EUT was tested with an RF Bandwidth of 6, 7 and 8MHz (Digital COFDM). The EUT was investigated using low, mid and high channel on all modulations (QPSK, 16QAM and 64QAM). The resulting plots submitted here represent each bandwidth since identical results were obtained on all configurations represented.

QPSK 8MHz Bandwidth

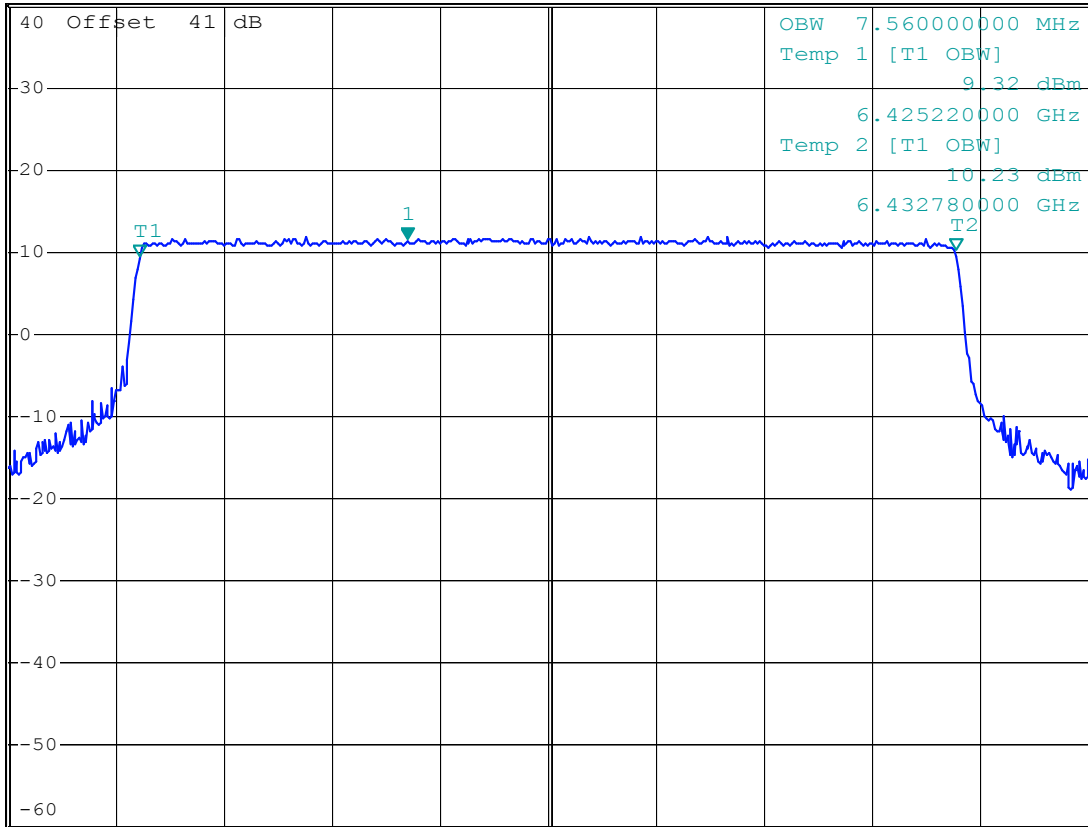


*RBW 100 kHz Marker 1 [T1]
VBW 300 kHz 11.50 dBm
*SWT 200 ms 6.427700000 GHz

Ref 40 dBm

Att 20 dB

1 PK*
AVG



Center 6.429 GHz

1 MHz/

Span 10 MHz

Date: 2.JUL.2007 14:50:50

QPSK 7MHz Bandwidth

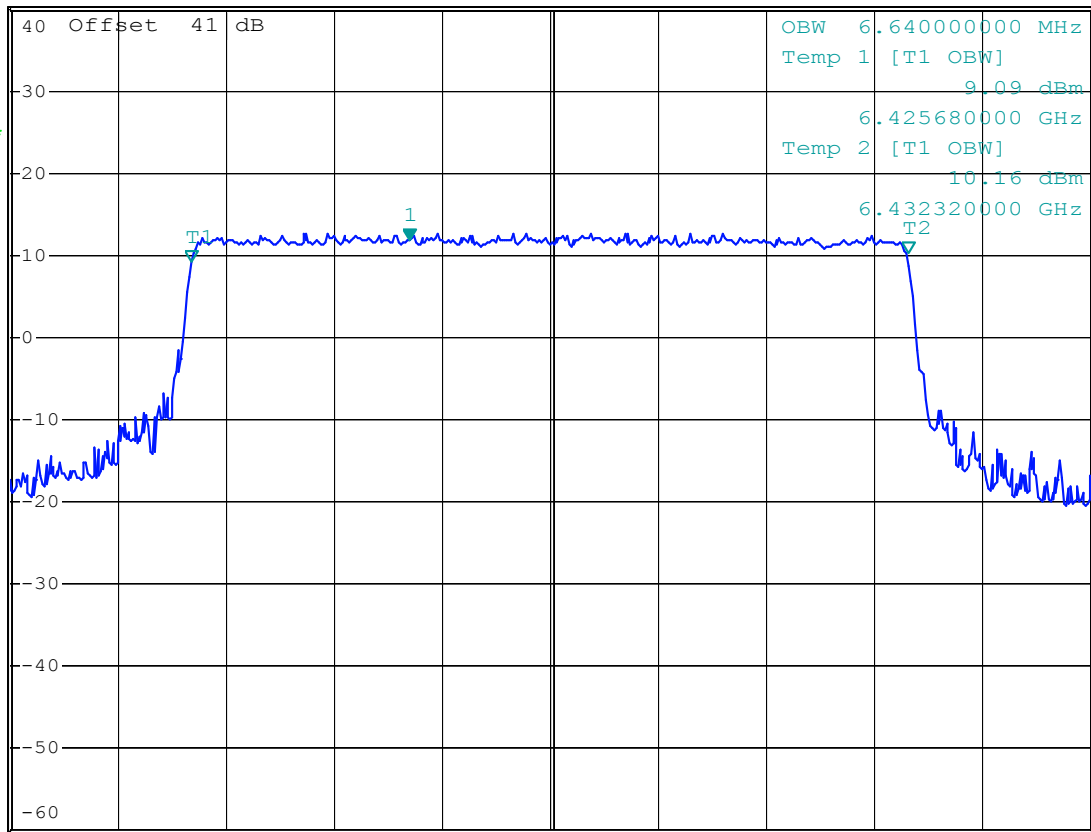


*RBW 100 kHz Marker 1 [T1]
VBW 300 kHz 11.69 dBm
*SWT 200 ms 6.427700000 GHz

Ref 40 dBm

Att 20 dB

1 PK*
AVG



Center 6.429 GHz

1 MHz/

Span 10 MHz

Date: 2.JUL.2007 14:51:44

QPSK 6MHz Bandwidth

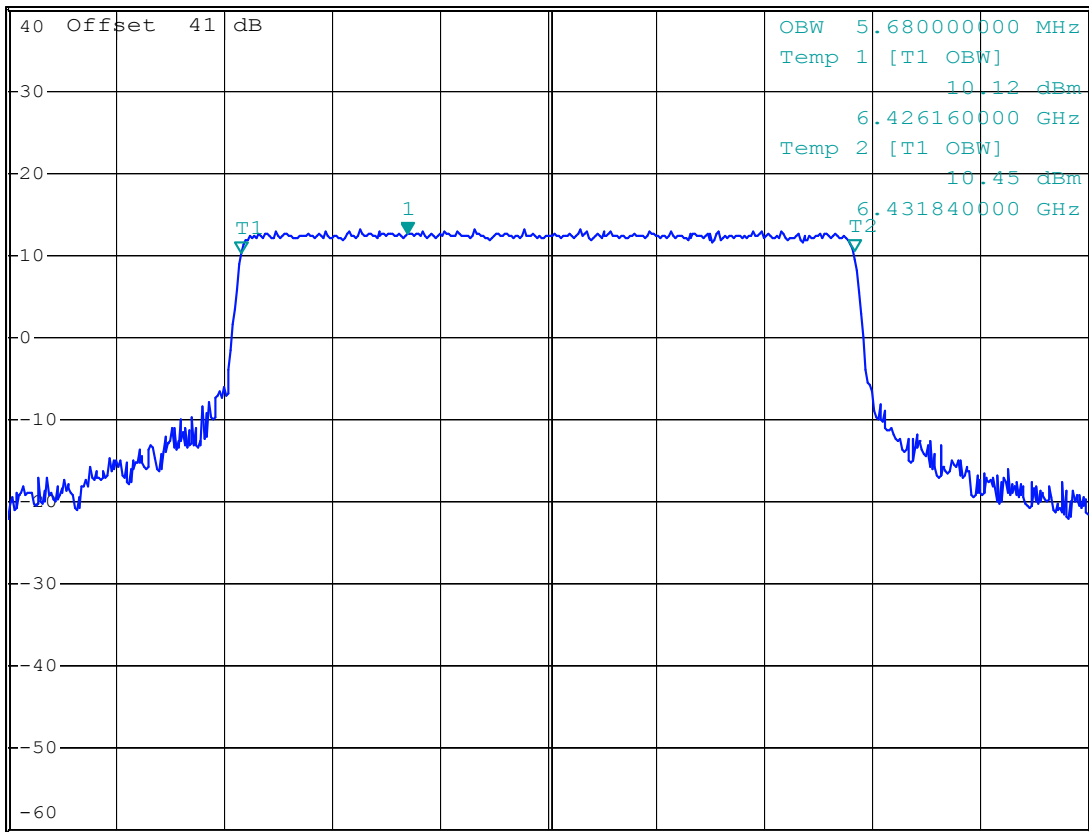


*RBW 100 kHz Marker 1 [T1]
VBW 300 kHz 12.67 dBm
*SWT 200 ms 6.427700000 GHz

Ref 40 dBm

Att 20 dB

1 PK*
AVG



Center 6.429 GHz

1 MHz/

Span 10 MHz

Date: 2.JUL.2007 14:52:14

Section 6. Spurious Emissions At Antenna Terminals

Para. No.: 2.1051

Test Performed By: Ferdinand Custodio	Date of Test: 07-03-2007
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Minimum Standard: Part 74.637 Emissions and emission limitations

(a) The mean power of emissions shall be attenuated below the mean transmitter power (P_{MEAN}) in accordance with the following schedule:

(1) When using frequency modulation:

(i) On any frequency removed from the assigned (center) frequency by more than 50% up to and including 100% of the authorized bandwidth: At least 25 dB in any 100 kHz reference bandwidth (B_{REF});

(ii) On any frequency removed from the assigned (center) frequency by more than 100% up to and including 250% of the authorized bandwidth: At least 35 dB in any 100 kHz reference bandwidth;

(iii) On any frequency removed from the assigned (center) frequency by more than 250% of the authorized bandwidth: At least $43 + 10 \log_{10} (P_{MEAN} \text{ in watts})$ dB, or 80 dB, whichever is the lesser attenuation, in any 100 kHz reference bandwidth.

(2) When using transmissions employing digital modulation techniques:

(i) For operating frequencies below 15 GHz, in any 4 kHz reference bandwidth (B_{REF}), the center frequency of which is removed from the assigned frequency by more than 50 percent up to and including 250 percent of the authorized bandwidth: As specified by the following equation but in no event less than 50 decibels:

$$A = 35 + 0.8 (G - 50) + 10 \text{ Log}_{10} B.$$

(Attenuation greater than 80 decibels is not required.)

Where:

A = Attenuation (in decibels) below the mean output power level.

G = Percent removed from the carrier frequency.

B = Authorized bandwidth in megahertz.

(c) For purposes of compliance with the emission limitation requirements of this section:

(3) For demonstrating compliance with the attenuation requirements for frequency modulation and digital modulation in paragraph (a) of this section, the resolution bandwidth (B_{RES}) of the measuring equipment used for measurements removed from the center frequency by more than 250 percent of the authorized bandwidth shall be 100 kHz for operating frequencies below 1

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GHz, and 1 MHz for operating frequencies above 1 GHz. The resolution bandwidth for frequencies removed from the center frequency by less than 250 percent of the authorized bandwidth shall be the reference bandwidth (B_{REF}) specified in the individual emission limitations, but may be reduced to not less than one percent of the authorized bandwidth (B), adjusted upward to the nearest greater resolution bandwidth available on the measuring equipment. In all cases, if B_{RES} and B_{REF} are not equal, then the attenuation requirement must be increased (or decreased) as determined by a factor of $10 \log_{10} [(B_{REF} \text{ in megahertz}) / (B_{RES} \text{ in megahertz})]$ decibels, where a positive factor indicates an increase in the attenuation requirement and a negative factor indicates a decrease in the attenuation requirement.

Test Results:

EUT Complies. Conductive emission plots captured on the Spectrum Analyzer thru a 40 dB attenuator.. Emissions were investigated from 30 MHz to 40 GHz .

Test Data:

See attached Plots (balance in Appendix).

EUT setup is similar to Section 3: RF Power Output measurements.

RF setting on CCII set to Max using internal source via ASI (Asynchronous Serial Interface) option. Signal bandwidth is set to 8MHz. External attenuators and cable used were verified at 41dB between 6.425GHz and 6.525GHz

For each channel investigated, the reference level used is the Mean Output Power (Average) measured under RF Power Output Test. A compliance factor of $10 \log (B_{ref}/B_{res})$ was used for using 100kHz RBW to calculate the mask:

$$\begin{aligned} A &= 35 + 0.8(G - 50) + 10 \log 12 + 10 \log (4/100) \\ &= 80 + (-13.98) \\ &= 66 \text{ db attenuation @100kHz RBW} \end{aligned}$$

The EUT was investigated using all three modulation schemes but identical results were obtained for all mode of operations.

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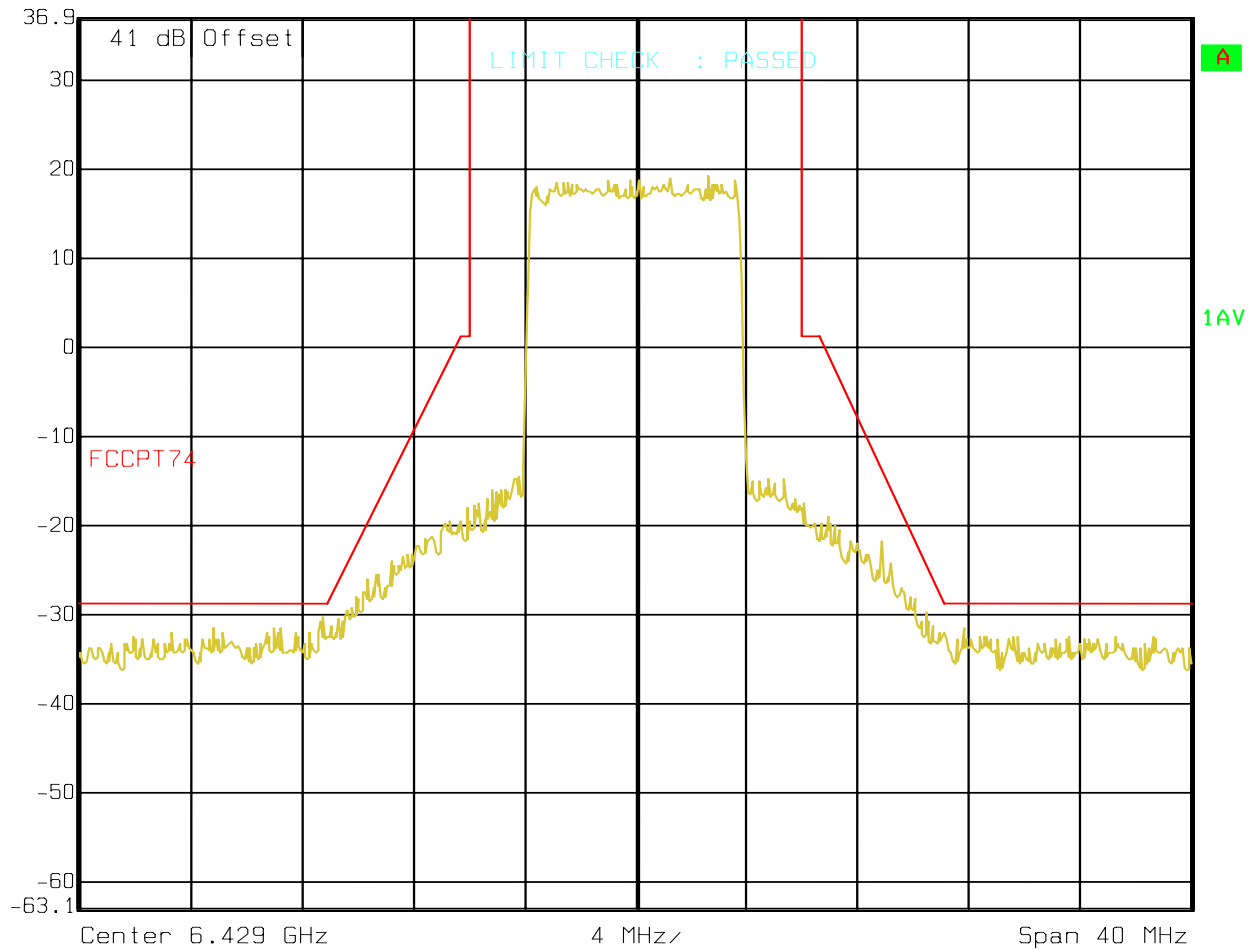
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Emission Mask Endpoints Part 74.637(C)(3):

BW = 12 MHz, REF LVL = Mean Output Power

Low Channel 6429MHz 64QAM

	Ref Lvl	RBW	100 kHz	RF Att	20 dB
	36.9 dBm	VBW	1 MHz	Unit	
		SWT	100 ms	Unit	dBm



Date: 12.JUN.2007 13:28:52

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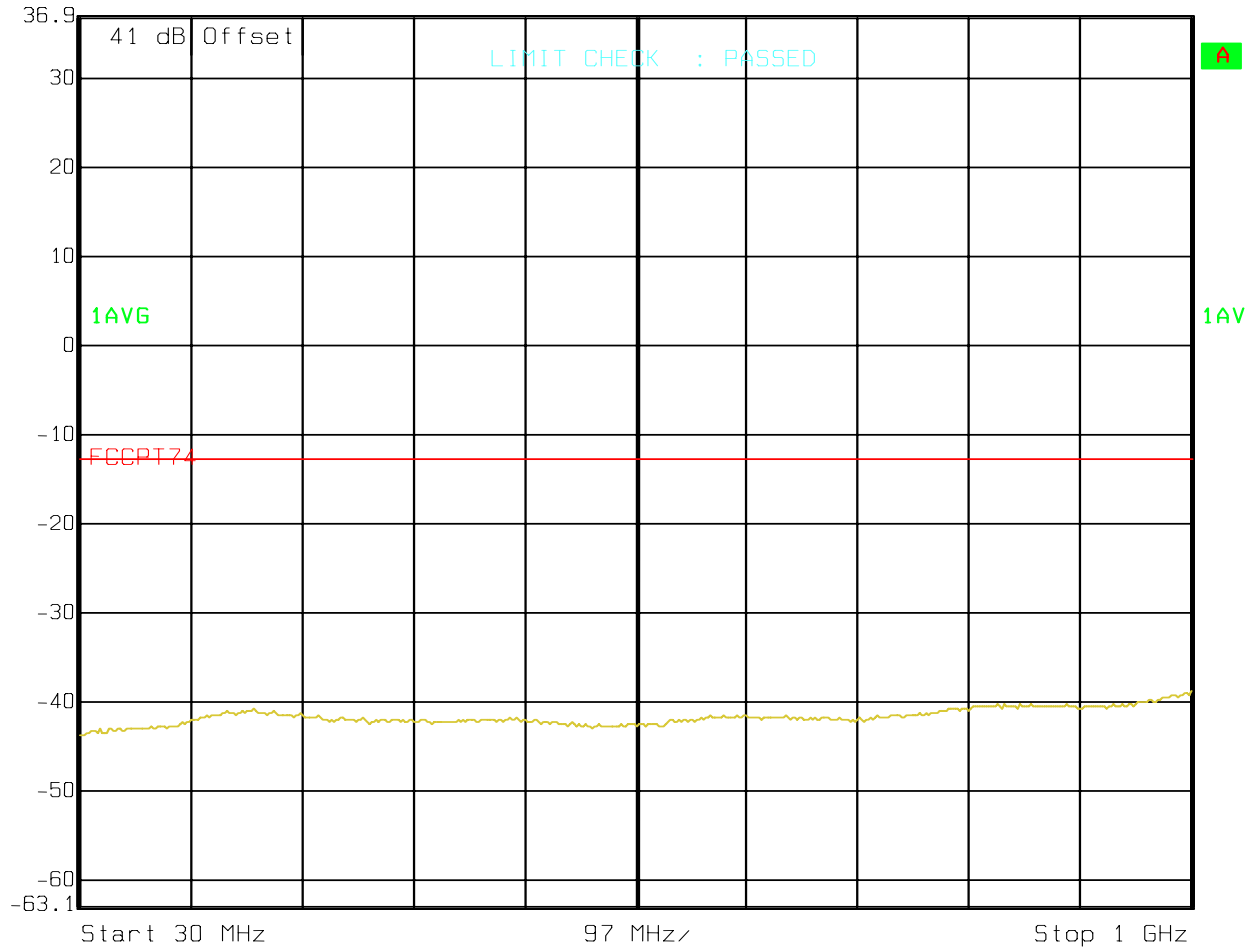
FCC ID: CNVHCII-9

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Ref Lvl
36.9 dBm

RBW 100 kHz RF Att 20 dB
VBW 1 MHz
SWT 500 ms Unit dBm



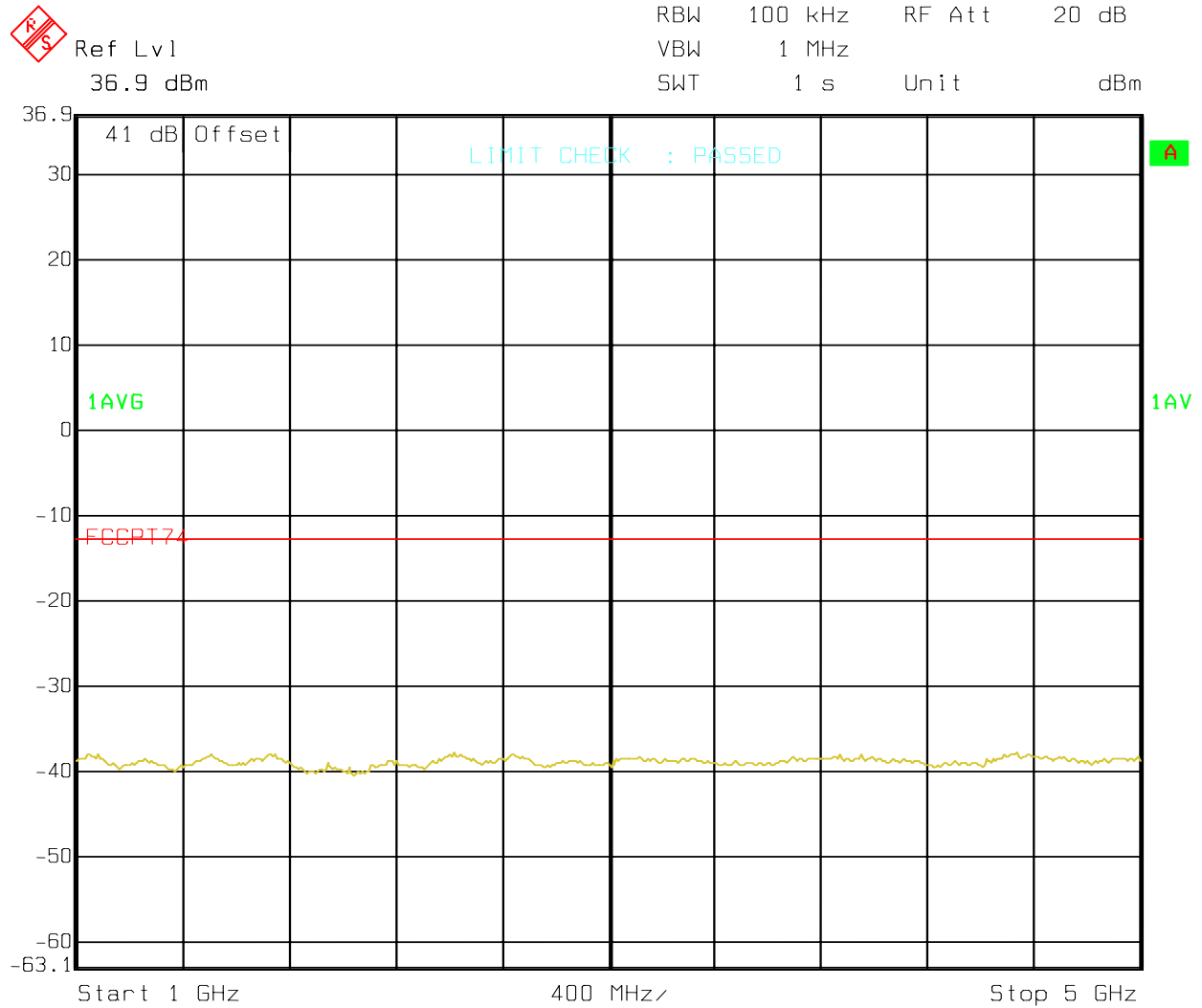
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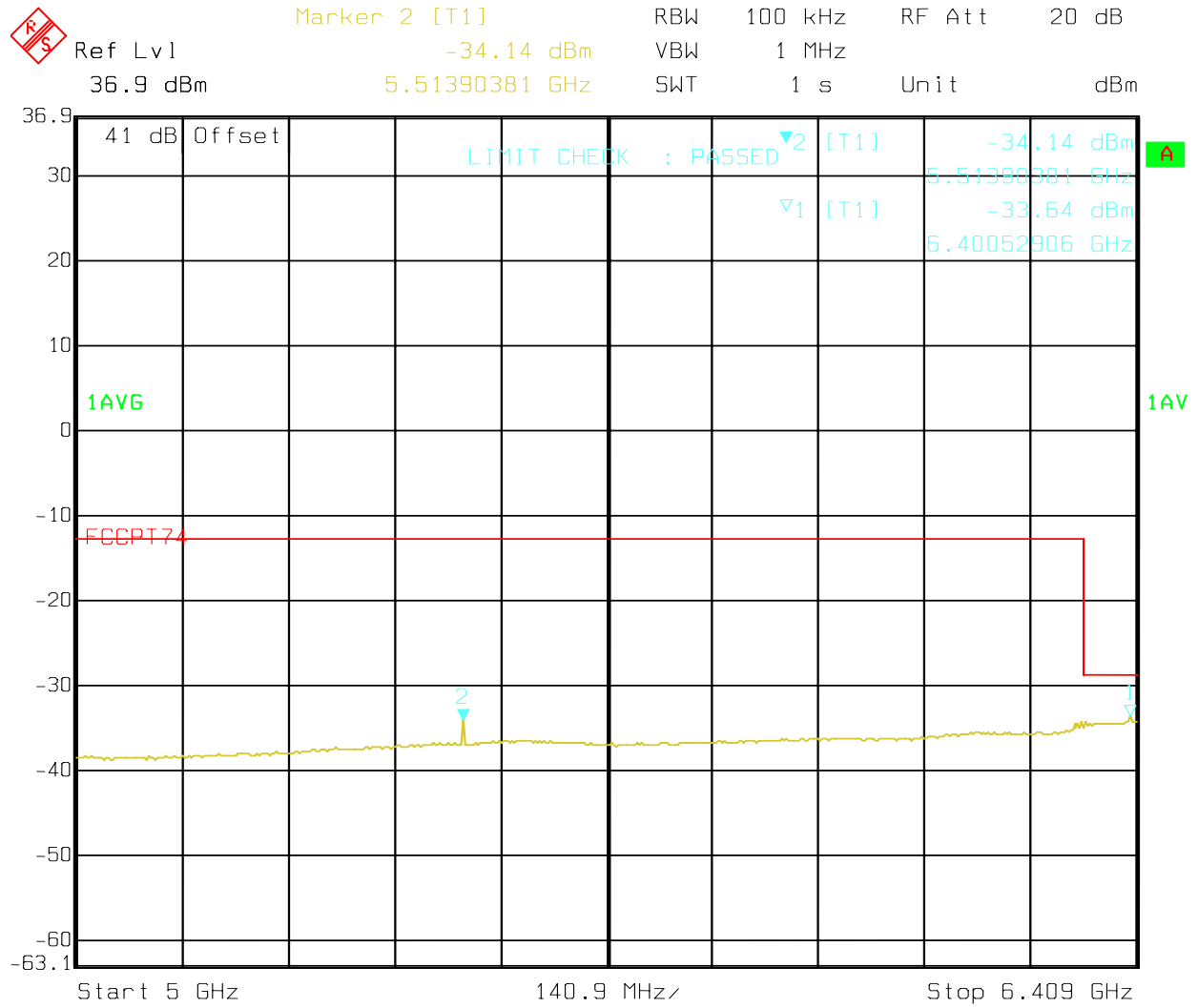
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Date: 12.JUN.2007 13:53:55

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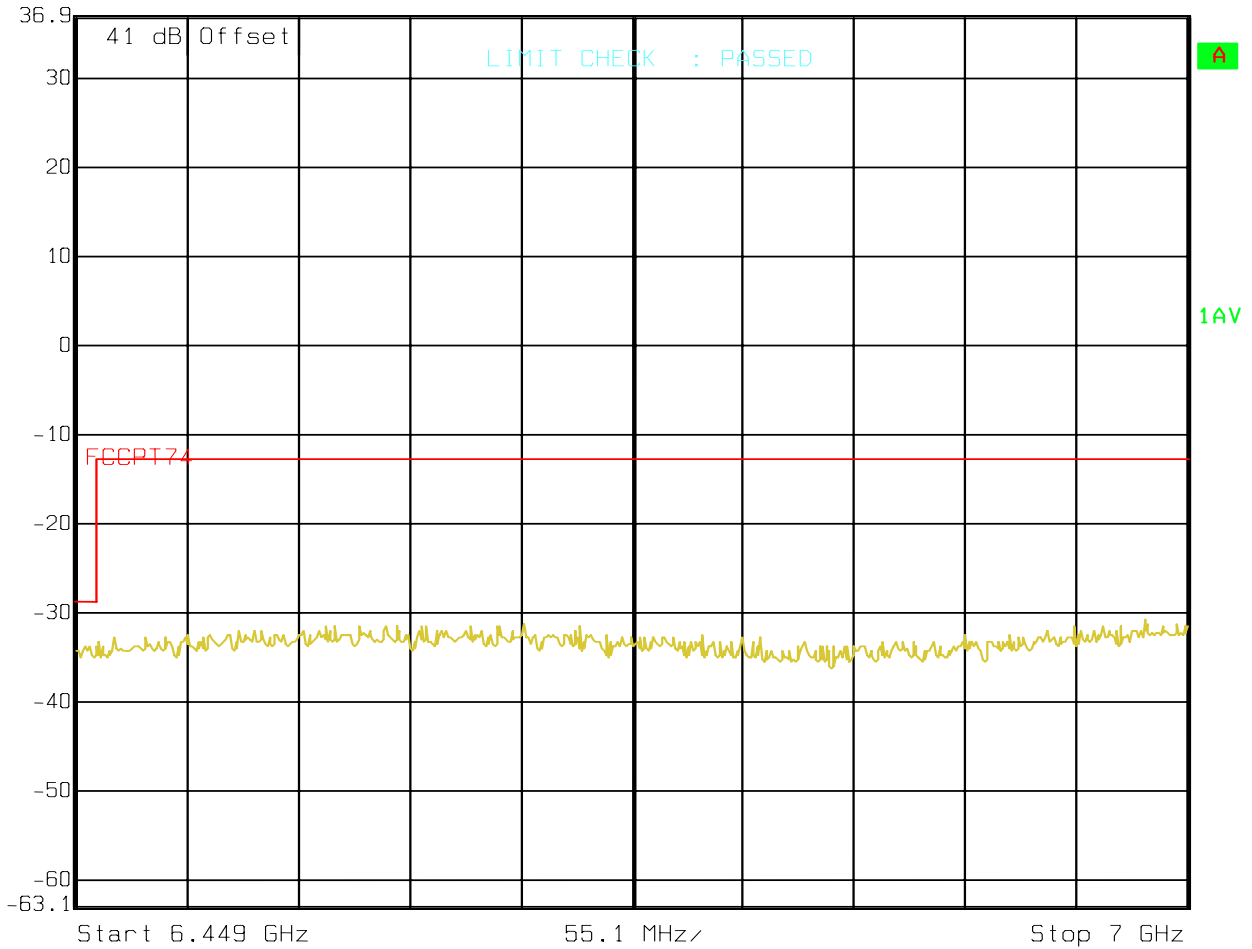
FCC ID: CNVHCII-9

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Ref Lvl
36.9 dBm

RBW 100 kHz RF Att 20 dB
VBW 1 MHz
SWT 200 ms Unit dBm



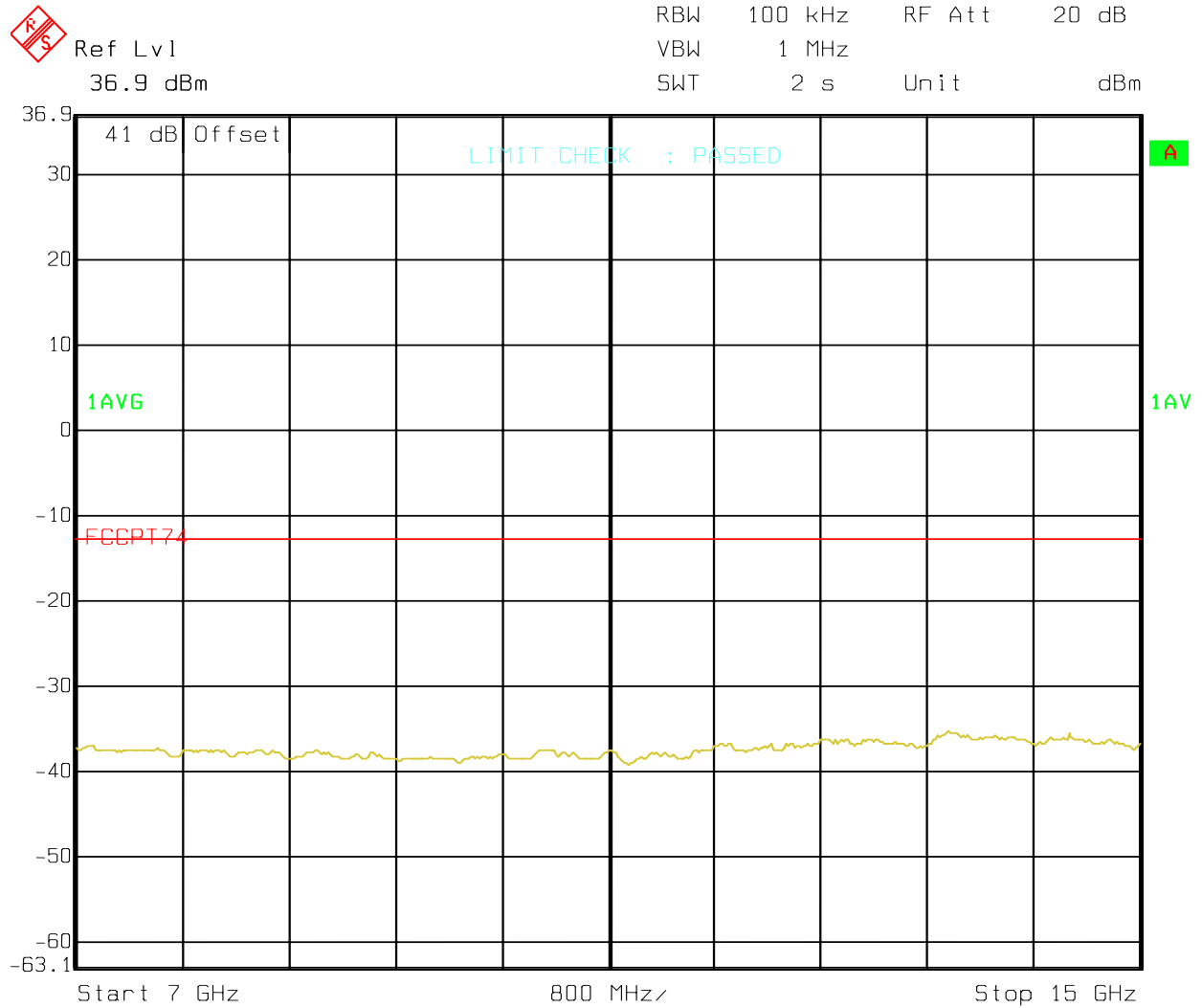
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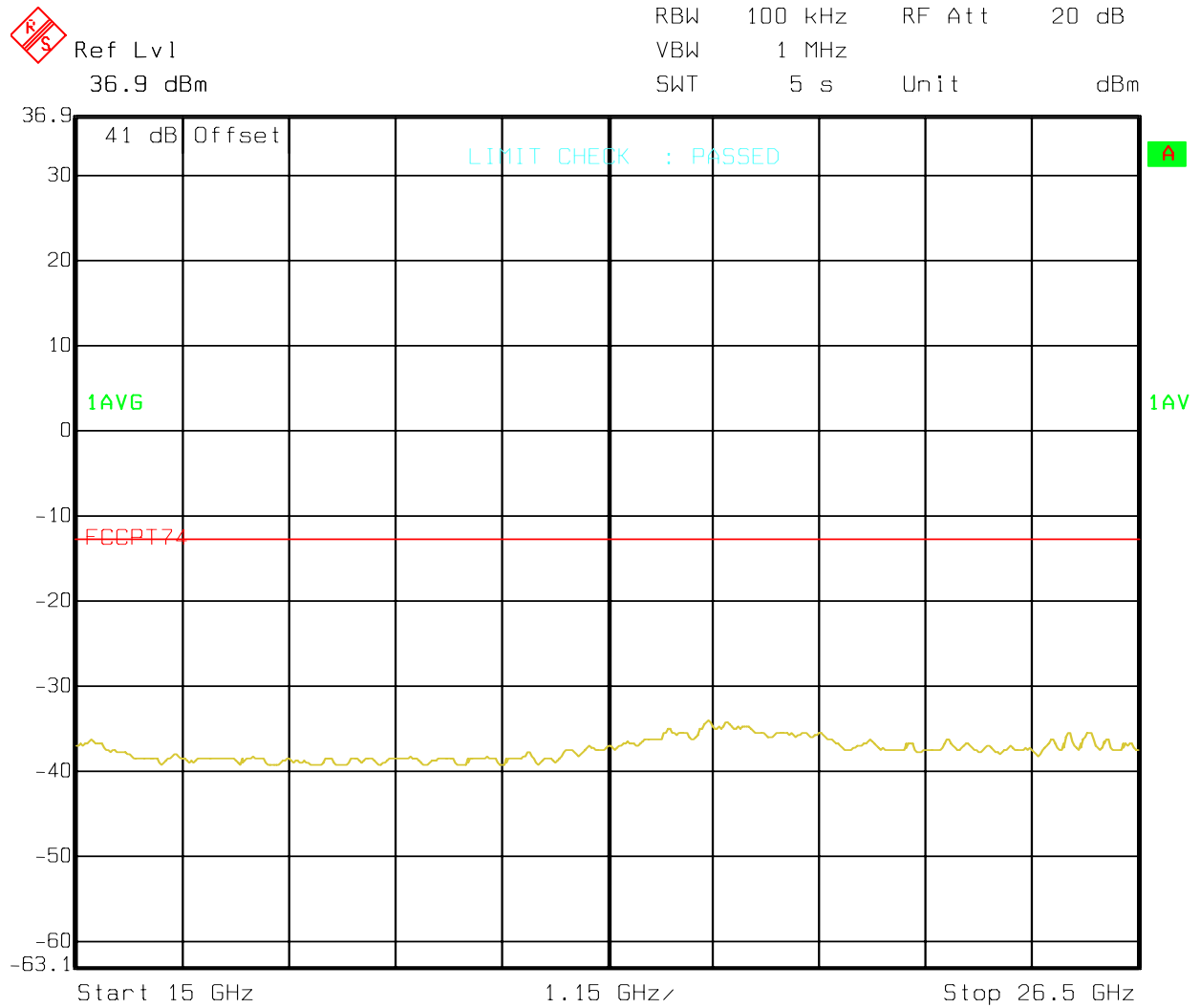
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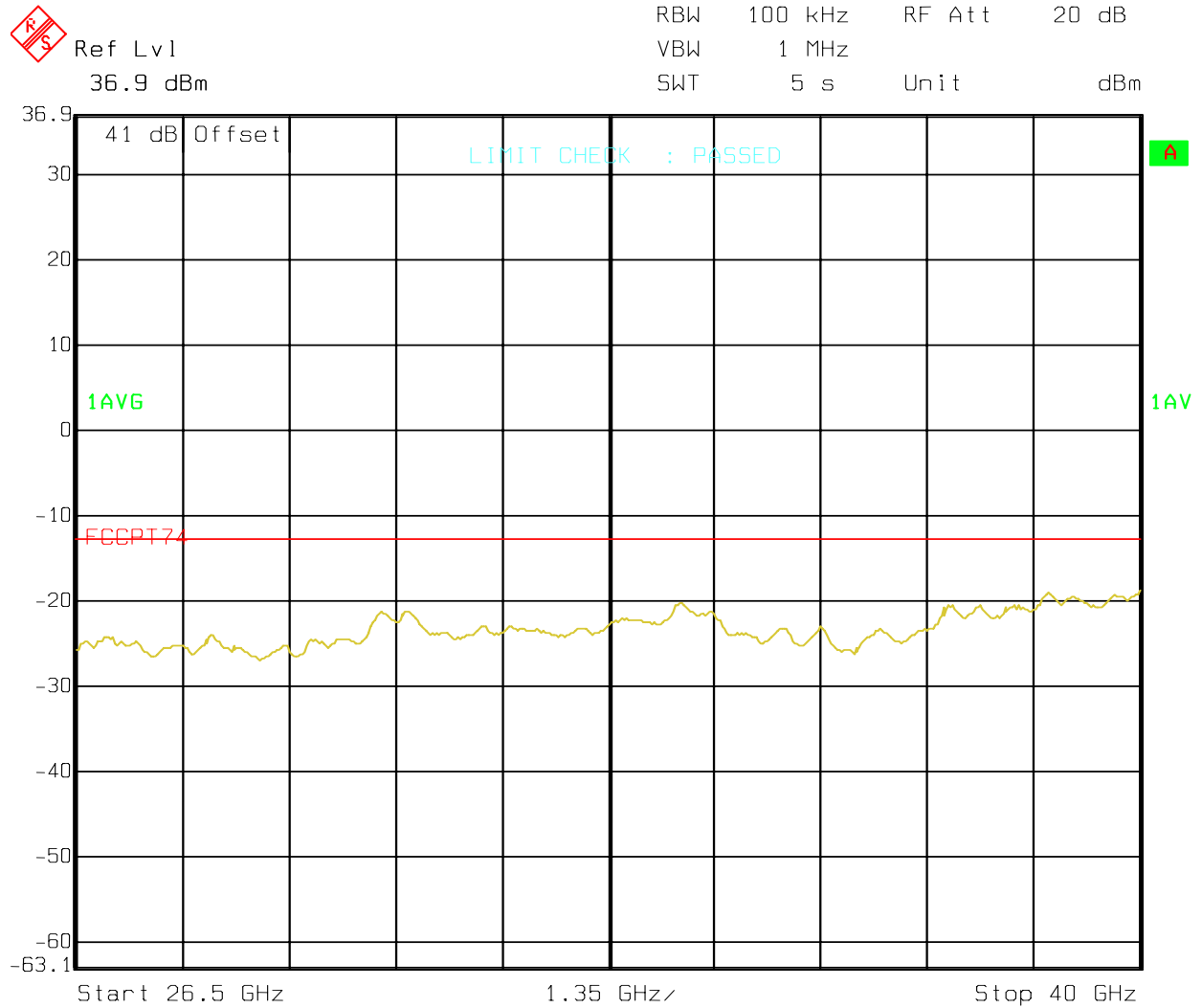
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Date: 12.JUN.2007 13:44:55

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Section 7. Field Strength of Spurious

Para. No.: 2.1053

Test Performed By: Ferdinand Custodio	Date of Test: 07-12-2007
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Minimum Standard: Part 74.637

Test Results: EUT Complies. Emissions were searched from 30 MHz to 40 GHz with the antenna port terminated into a 50 ohm load. No spurious emissions level within 20dB of the limit was observed. All emissions measured were proved by substitution method.

Test Data: See attached tables.

Quasi-peak measurements with a RBW =VBW = 100 kHz below 1GHz otherwise 1MHz.

Measured Frequency (MHz)	Antenna Polarization (H/V)	Meter Reading (dBuV)
31.36	V	30.6
37.3	V	37.3
47.98	V	22.8
64.18	V	27
69.96	V	28.5
120	V	19.9
219.4	H	19.7

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Results—Substitution Method

Target Frequency	Target Level (dBuV/m)	Antenna Gain (dipole)	Cable Loss	Signal Generator (dBm)	Total (EIRP) dBm	Specs (dBm)	Margin (dBm)
31.36	30.6	0	1	-58.08	-59.08	-13	-46.06
37.3	37.3	0	1	-49.58	-50.58	-13	-37.58
47.98	22.8	0	1	-64.08	-65.08	-13	-52.08
64.18	27	0	1	-59.88	-60.88	-13	-47.88
69.96	28.5	0	1	-58.38	-59.38	-13	-46.38
120	19.9	0	1	-78.5	-79.5	-13	-66.5
219.4	19.7	0	1	-73.52	-74.52	-13	-61.52

Location: South OATS, T = 27°C, 47% R.H. 3 meters

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Section 8. Frequency Stability

Para. No.: 2.1055

Test Performed By: F.S.Custodio	Date of Test: 04-09-2007
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Minimum Standard: 2.1055 Frequency Stability vs Temperature Variation and Power Supply Voltage Variation.

Minimum Standard: Part 74.661

Test Results: 20040 Hz difference which corresponds to 3.071 ppm
Limit = 0.005 % = 50 ppm

Measurement Data:

Part 2.1055 (-30°C to +50°C)		Spectrum Analyzer @ 100KHz RBW, 1MHz VBW		High Channel	
Worst case variation:		0.0 Hz (>Set freq.)	Monitored Frequency:		6.52491784 GHz
		20040.0 Hz (<Set freq.)	*Red are negative numbers		
Temp.Set Point	Time	85% of Vnom Frequency Δ (GHz) Difference (GHz)	Vnom=28VDC Frequency Δ (GHz) Difference (GHz)	115% of Vnom Frequency Δ (GHz) Difference (GHz)	
Temp.Actual					
-30 -29.9	8:30AM	6.5248978 0.000020040	6.5248978 0.000020040	6.5248978 0.000020040	6.5248978 0.000020040
-20 -20	9:30AM	6.5248999 0.000017940	6.5248999 0.000017940	6.5248999 0.000017940	6.5248999 0.000017940
-10 -9.9	10:30AM	6.5249024 0.000015440	6.5249024 0.000015440	6.5249024 0.000015440	6.5249024 0.000015440
0 0	11:30AM	6.52490854 0.000009300	6.52490854 0.000009300	6.52490854 0.000009300	6.52490854 0.000009300
10 10	12:30PM	6.52491326 0.000004580	6.52491326 0.000004580	6.52491326 0.000004580	6.52491326 0.000004580
20 20.1	1:30PM	6.52491784 0.000000000	6.52491784 0.000000000	6.52491784 0.000000000	6.52491784 0.000000000
30 30	2:30PM	6.52491784 0.000000000	6.52491784 0.000000000	6.52491784 0.000000000	6.52491784 0.000000000
40 39.9	3:30PM	6.52491784 0.000000000	6.52491784 0.000000000	6.52491784 0.000000000	6.52491784 0.000000000
50 49.9	4:30PM	6.52491784 0.000000000	6.52491784 0.000000000	6.52491784 0.000000000	6.52491784 0.000000000

Nemko USA Inc.

EQUIPMENT: BPA-(X)CC Linear Power Amplifier

FCC ID: CNVHCII-9

REPORT NO.: 2007 065696 FCC

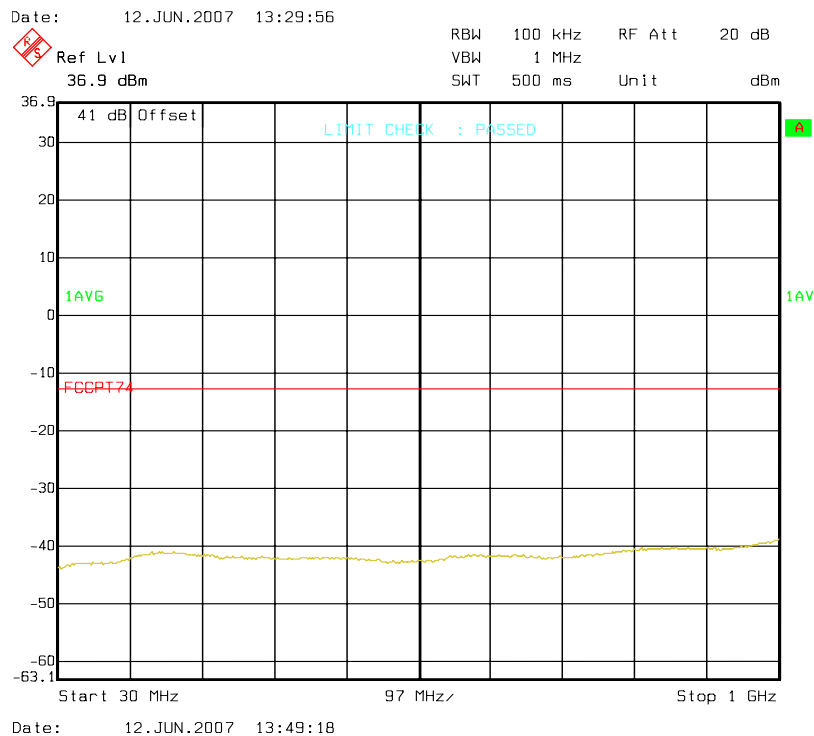
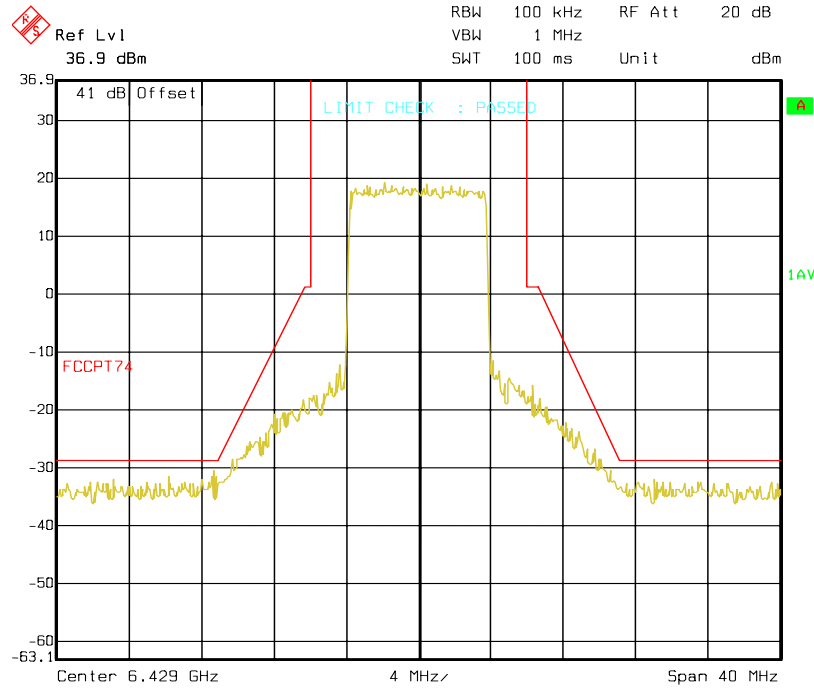
Section 9. Test Equipment List

Nemko ID	Device	Manufacturer	Model	Serial Number	Cal Date	Cal Due Date
898	EMI Receiver	HP	8546A	3625A00348	1/18/2007	01/18/08
899	RF Filter Section	HP	85460A	3448A00288	1/18/2007	01/18/08
110	Antenna, LPA	Electrometrics	LPA-25	1217	12/18/06	12/18/07
897	Spectrum Analyzer	Rohde & Schwarz	FSP	837620/009	8/11/2006	8/11/2007
836	Signal Generator	HP	E8254A	US41140229	7/27/2006	07/27/07
835	Spectrum Analyzer	Rohde & Schwarz	RHDFSEK	829058/005	6/20/2007	06/20/08
N149	Environmental Chamber	Cincinnati Sub-Zero	ZPHS-32-2-2-H/AC	ZP0552665	5/30/2007	5/30/2008
765	Antenna Set, Dipole	EMCO	3121C	1214	7/12/07	7/12/08
529	Antenna, DRWG	EMCO	3115	2505	8/31/2006	08/31/07
915	EMI Test Receiver 20 Hz- 26.5	Rohde & Schwarz	1088.7490.26	837491/0002	2/6/2007	02/06/08
128	Antenna, Bicon	EMCO	3104	2882	11/10/2006	11/10/07

Appendix A.

Section 6. Spurious Emissions At Antenna Terminals

Low Channel (6429MHz) QPSK

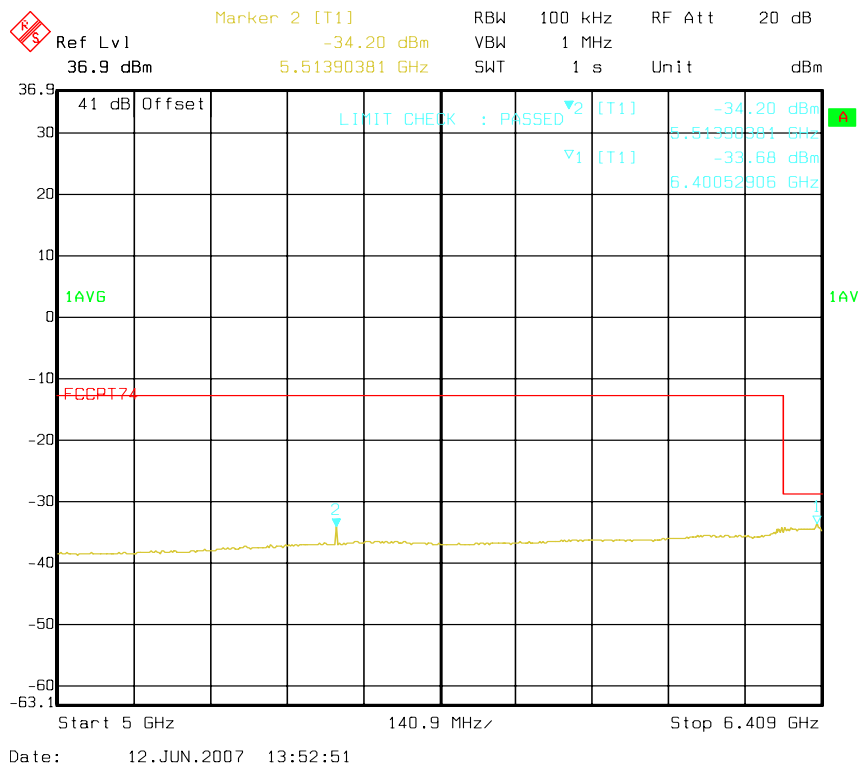
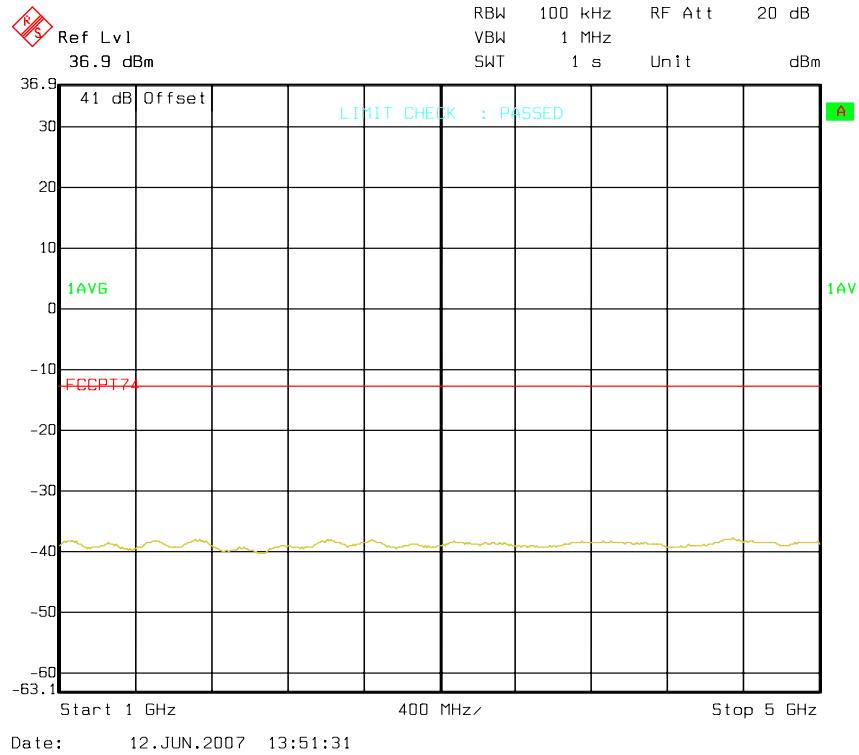


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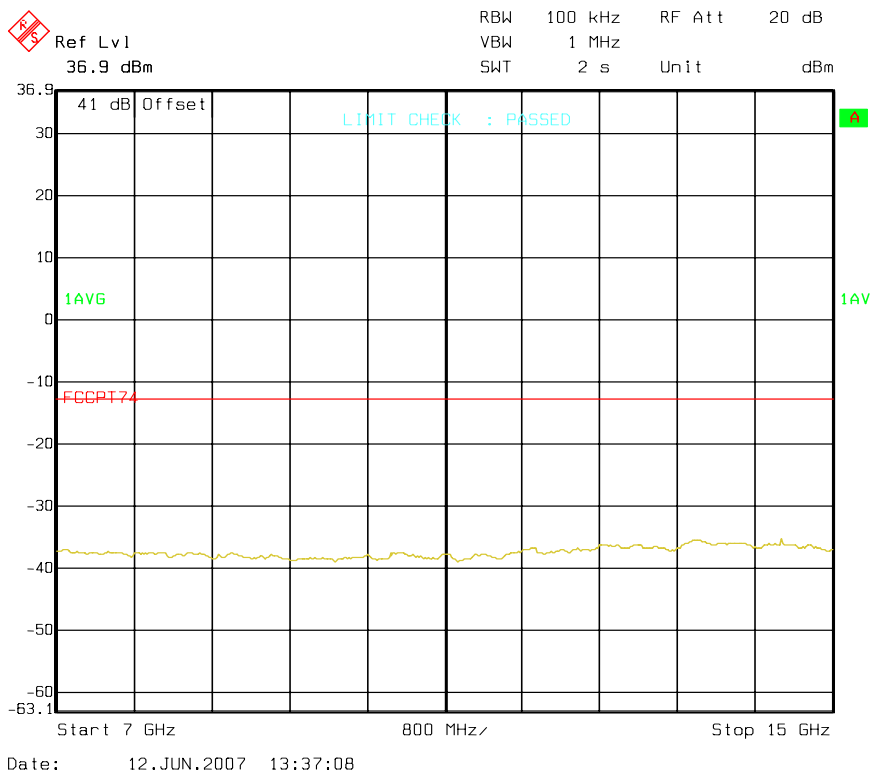
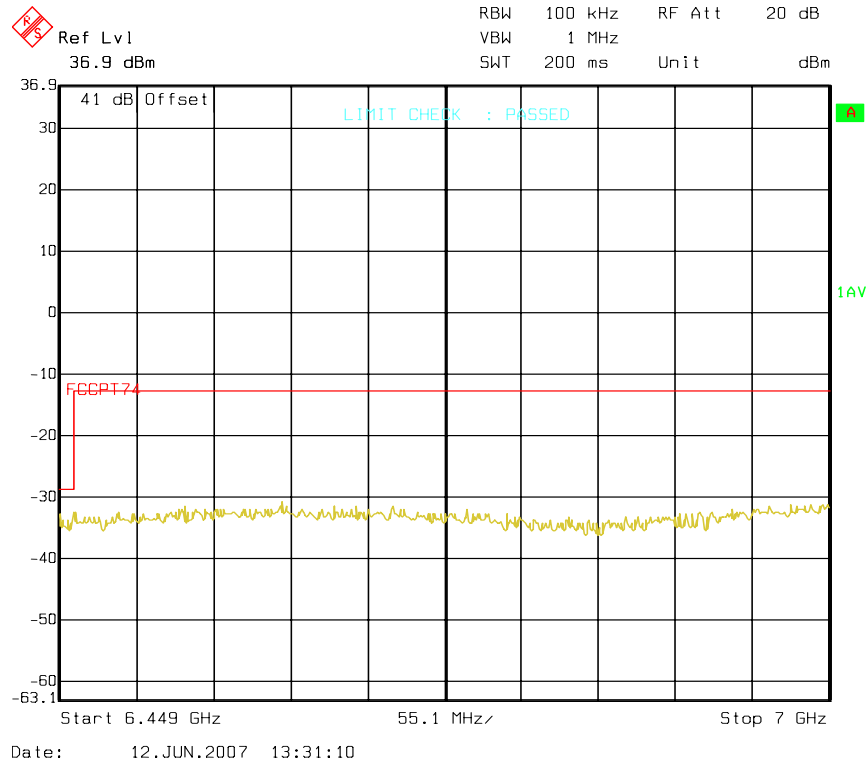


Nemko USA Inc.

EQUIPMENT: BPA-(X)CC Linear Power Amplifier

FCC ID: CNVHCII-9

REPORT NO.: 2007 065696 FCC

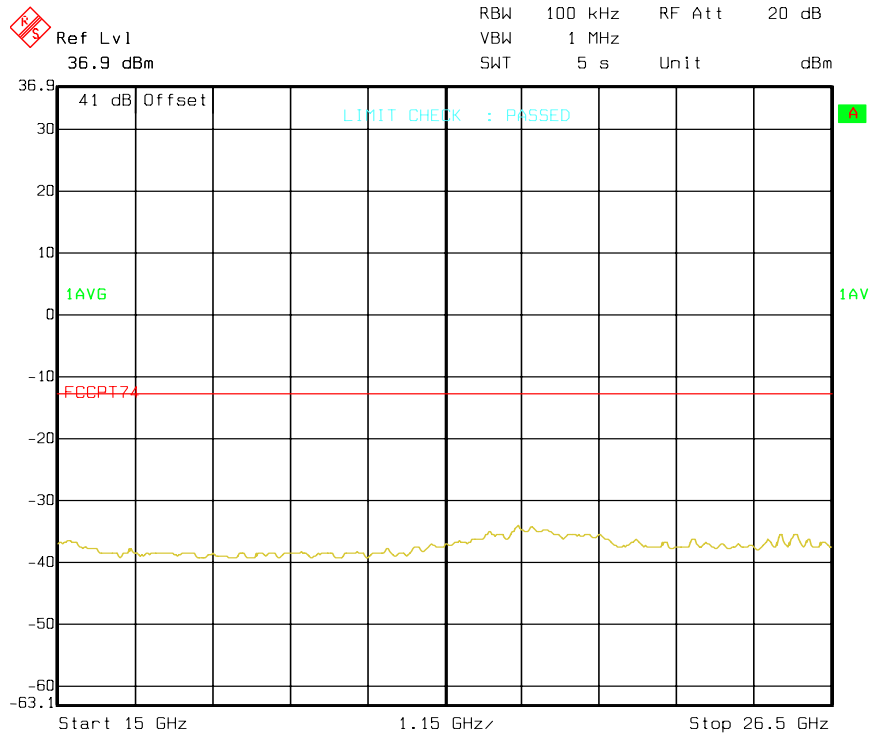


Nemko USA Inc.

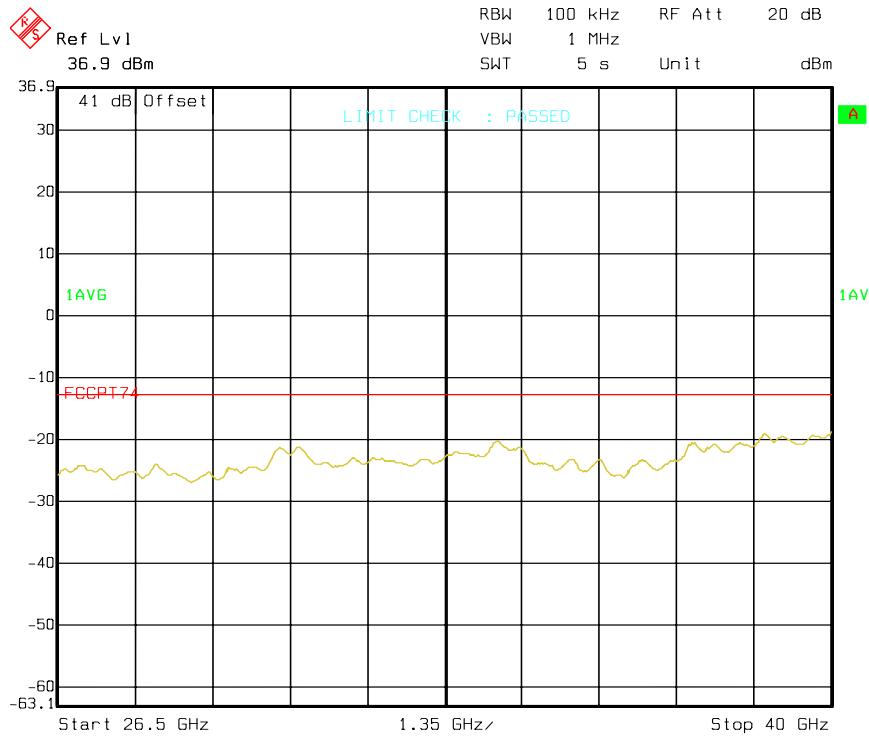
EQUIPMENT: BPA-(X)CC Linear Power Amplifier

FCC ID: CNVHCII-9

REPORT NO.: 2007 065696 FCC

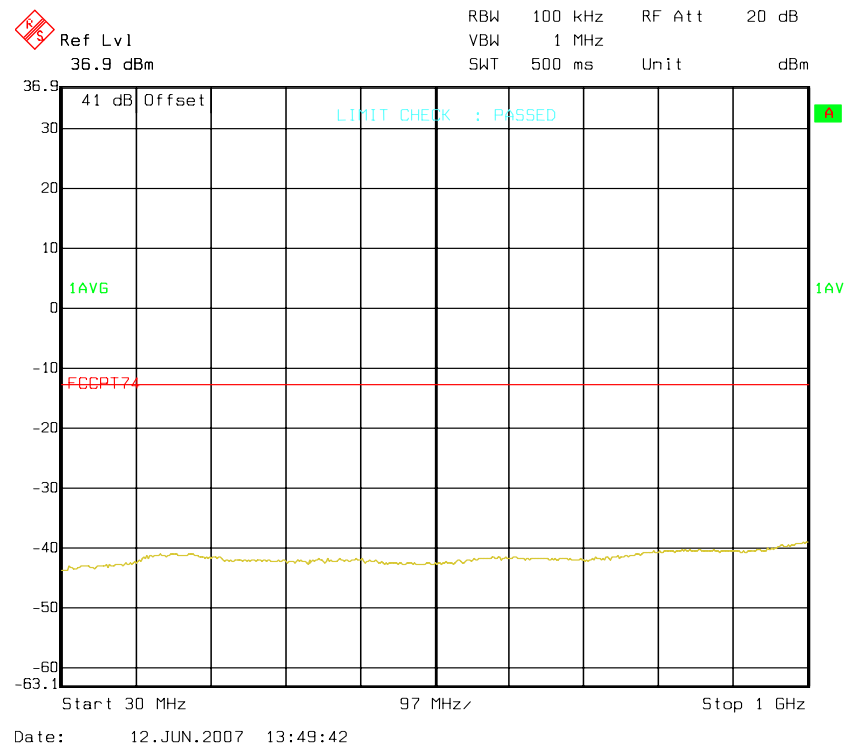
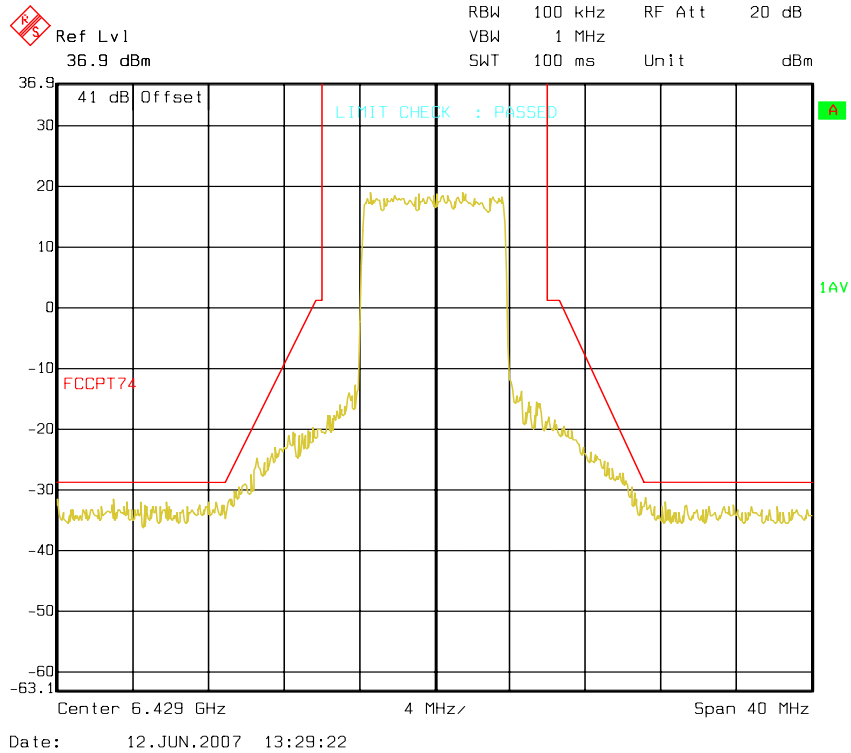


Date: 12.JUN.2007 13:43:15



Date: 12.JUN.2007 13:45:40

Low Channel (6429MHz) 16QAM

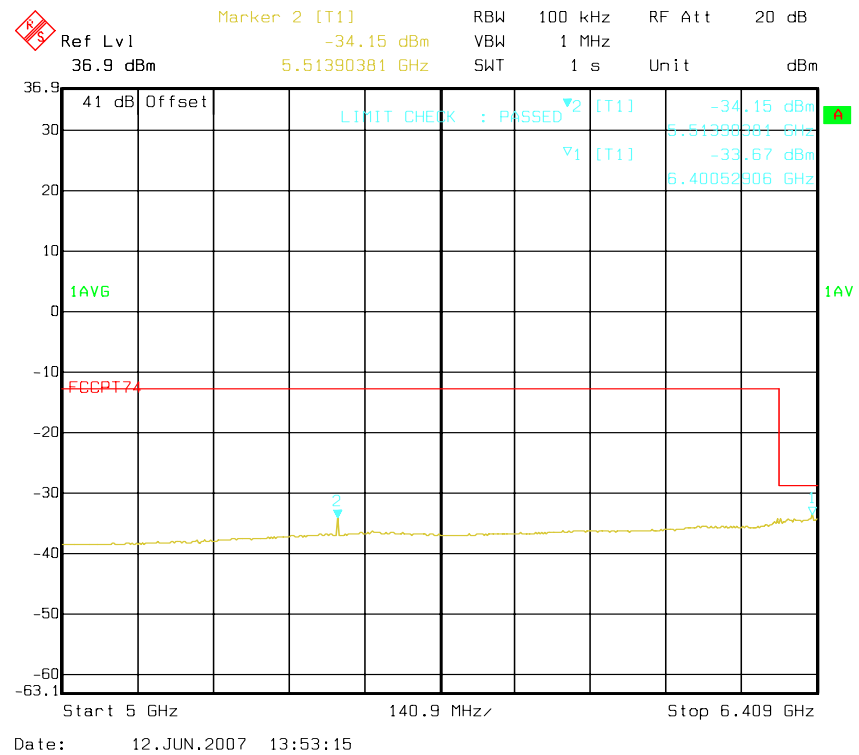
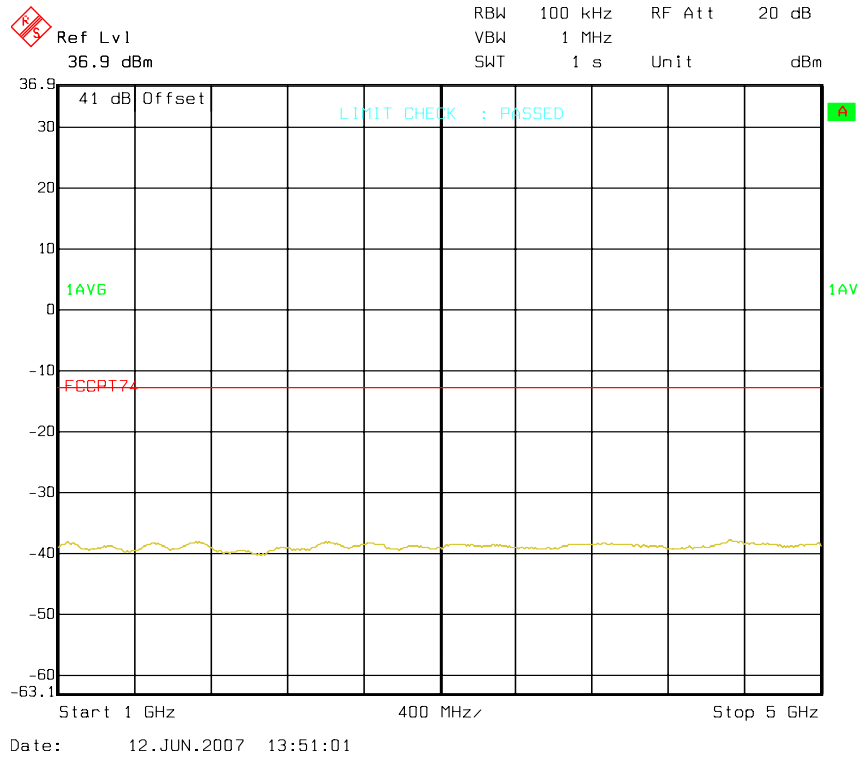


Nemko USA Inc.

EQUIPMENT: BPA-(X)CC Linear Power Amplifier

FCC ID: CNVHCII-9

REPORT NO.: 2007 065696 FCC

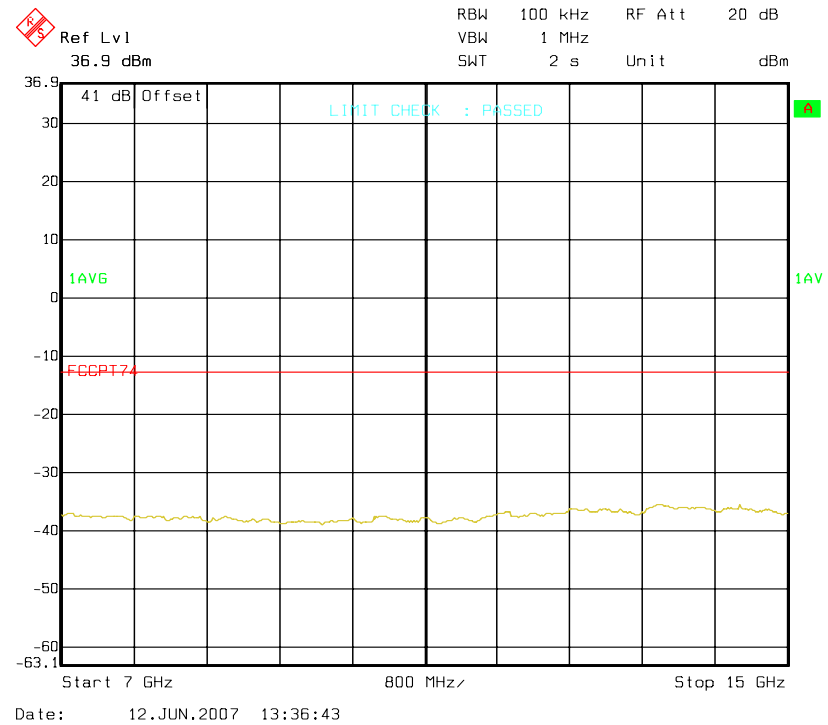
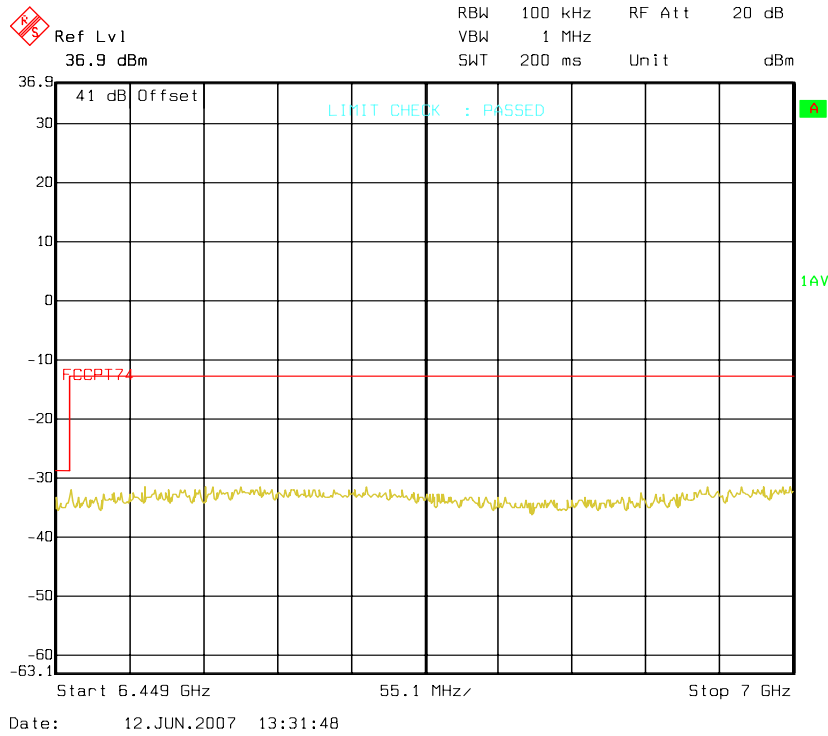


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