FCC ID: PQS-BM28001

Exhibit 2d

Engineering Report on

Spurious Emissions at Antenna Terminal (2.1051)

Assessment of Compliance

of

Spurious Emissions at Antenna Terminal in accordance with the FCC Rules & Regulations Part 2.1051 and 90

Wireless OEM Modem Module
Boomer II

Wavenet Technologies Pty Ltd.

August 2002

APREL Project No.:WVTB-Boomer II –Modem-3922-1

51 Spectrum Way Nepean ON K2R 1E6
Tel: (613) 820-2730 Fax: (613) 820-4161
email: info@aprel.com

APREL Laboratories

Engineering Report

Subject: **Assessment of Spurious Emissions at Antenna Terminal in accordance with the FCC Rules & Regulations Part 2.1051 and 90**

FCC ID: **PQS-BM28001**

Equipment: **Wireless OEM Modem Module**

Model: **Boomer II**

Client: **Wavenet Technologies Pty Ltd.**
140 Burswood Rd
Burswood, Perth, WA 6100
AUSTRALIA

Project #: WVTB-Boomer II-Modem-3922-1

Prepared By: **APREL Laboratories**
Regulatory Compliance Division
51 Spectrum Way
Nepean, Ontario
K2R 1E6

Approved by: _____ Date: Sept. 12, 2002
Jay Sarkar
Technical Director, Standards & Certification

Submitted by: _____ Date: Sept. 12, 2002
Jay Sarkar
Technical Director, Standards & Certification

Released by: _____ Date: Sept 12/02.
Dr. Jack J. Wojcik, P.Eng.

LICENSED PROFESSIONAL ENGINEER
J. WOJCIK
PROVINCE OF ONTARIO

FCC ID: **PQS-BM28001**
Applicant: Wavenet Technologies Pty Ltd.
Equipment: Wireless OEM Modem Module
Model: BOOMER II
Standard: FCC Rules and Regulations Part 2.1051 and 90

ENGINEERING SUMMARY

This report contains the results of the Spurious Emissions at antenna terminal measurement performed on a **Wavenet OEM Wireless Modem Module.** The measurements were carried out in accordance with the FCC Rules and Regulations Part 2.1051 and 90. The product was evaluated for the Spurious Emissions at the Antenna Terminal when it was set at the maximum power level and appropriately modulated.

The Wireless OEM Modem Module is an 800 MHz OEM product for integration into customer end user equipment as an OEM modem and interfaces to it via the data interface port.

The modem provides two available bands: 806-821 MHz and 821-824 MHz. The bands are software controlled and can not be switched by user.

This report presents test data for both frequency bands, 806-821 MHz (Mask G) and 821-824 MHz (Mask H).

This modem has two different profiles type with appropriate settings for data rate, deviation, modulation shaping set for 806-821 MHz G Spectral Mask (MDC 48003, RDLAP 9.6 and RDLAP 19.2) and 821-824 MHz H Spectral mask (RDLAP 9.6).

The results presented in this report relate only to the sample tested.

Table 1: Summary of the Results

Test Description	Page No.	Test Set-up Figure No.	Results Summary
Spurious Emissions at the Antenna Terminal Part 2.1051 and 90	8	1	Pass

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INTRODUCTION

General

This report describes the results of the Spurious Emissions at the Antenna Terminal measurement conducted on a Wavenet Technologies Wireless OEM Modem Module model BOOMER II**.**

Test Facility

The evaluation for compliance was performed for Wavenet Technologies Pty Ltd**.** by APREL Laboratories at APREL's EMI facility located in Nepean, Ontario, Canada. The laboratory operates an (3m and 10m) Open Area Test Site (OATS). The measurement facility is calibrated in accordance with ANSI C63.4-1992.

A description of the measurement facility in accordance with the radiated and AC line conducted test site criteria per ANSI C63.4-1992 is on file with the Federal Communications Commission and is in compliance with the requirements of Section 2.948 of the Commissions rules and regulations. ***APREL's registration number is: 90416***

APREL is accredited by Standard Council of Canada. APREL is also accredited by Industry Canada.

Standard

The evaluation and analysis were conducted in accordance with FCC Rules and Regulations Parts 2.1051 and the appropriate limits (90).

Personnel: The test was conducted by Roman Kuleba. Methodology developed and report was written by Jay Sarkar.

Test Equipment

The test equipment used during the evaluation is listed in Appendix A with calibration due dates.

Environmental Conditions

- Temperature:	25 °C ± 2
- Relative Humidity:	30 - 50 %
- Air Pressure:	101 kPa ± 3

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FCC SUBMISSION INFORMATION

FCC ID: **PQS-BM28001**

Equipment (Type): **Wireless OEM Modem Module**
As marketed

Model: **BOOMER II**

For: Certification

Applicant: **Wavenet Technologies Pty Ltd.**
140 Burswood Rd
Burswood, Perth, WA 6100
AUSTRALIA

Manufacturer: **Wavenet Technologies Pty Ltd.**
140 Burswood Rd
Burswood, Perth, WA 6100
AUSTRALIA

Evaluated by: **APREL Laboratories**
51 Spectrum Way
Nepean, Ontario
Canada K2R 1E6

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MANUFACTURER'S DATA

FCC ID No:	**PQS-BM28001**
Equipment Type:	Wireless OEM Modem Module
Model:	BOOMER II
Reference:	FCC Rules and Regulations Parts 2 and Part 90
Manufacturer:	Wavenet Technologies Pty Ltd
Power Source:	3.6 VDC Battery, Lithium-ion
Development Stage of Unit:	Production

GENERAL SPECIFICATIONS

1. Frequency Range:
   a) 806.00 to 821.00 MHz (Transmitter)
   b) 821.00 to 824.00 MHz (Transmitter)

2. Measured ERP
   a) 1.828 W (32.62 dBm) at frequency 806 MHz for band 806-821 MHz
   b) 1.496 W (31.61 dBm) at frequency 821 MHz for band 821-824 MHz

3. Emission Designators Per 47 CFR § 2.201 and §2.202
   a) 806.00 to 821.00 MHz: 20K0F1D
   b) 821.00 to 824.00 MHz: 12K6F1D

4. Antenna Impedance: 50 Ohms

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Measurements: Spurious Emissions at Antenna Terminal

Ref.: **FCC Part 2 paragraph 2.1051 and Part 90.210**

Frequency Band: 806-821 MHz

Criteria: *Emission Mask G.* The power of emissions must be attenuated below the power of the unmodulated carrier (P) on any frequency removed from the centre of the authorized bandwidth by more than 250 percent of the authorized bandwidth: At least 43 + 10 log (P) dB. This is calculated to be –13 dBm.

Frequency Band: 821-824 MHz

Criteria: *Emission Mask H. O*n any frequency removed from the centre of the authorized bandwidth by more than 25 KHz: At least 43 + log (P) dB. This is calculated to be –13 dBm.

Set-up: See Figure No. **1.**

Methodology:

The DUI was set-up in accordance with the set-up/block diagram Figure no.1. The set –up consisted of the DUI, Spectrum Analyser, Attenuator, and other auxiliary instrumentation necessary to perform the measurements (see Measurement Equipment Lists).

The mobile was configured to operate at maximum power and applicable modulation applied to the transmitter as indicated in the plots.

The Wireless Modem was coupled to the spectrum analyzer through a short test cable and a 20-dB attenuator connected to the spectrum analyser. Instead of the antenna, an MMCX-M to SMA-F test cable was connected and then from the SMA connector the 20-dB attenuator was hooked up. From the other side of the attenuator the Spectrum Analyser was directly connected (see block diagram and set-up photograph).

The spectrum was searched from 9 kHz to the 10th harmonic of the operating frequency.

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Measurements required: Spurious emissions at antenna terminals — The radio frequency voltage or powers generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminals when properly terminated with a 50 ohms measurement system.

Spectrum Analyser Set-up - RB: 10kHz, VB: 10kHz, Span: 1MHz.

Data Required: Curves or equivalent data showing the magnitude of each harmonic and other spurious emission that can be detected when the equipment is operated under the conditions specified in paragraph 2.1049 as appropriate.

Not Required: The amplitude of spurious emissions, which are attenuated more than 20 dB below the permissible value, was not reported.

Frequency Spectrum to be investigated: In all of the spurious emissions measurements of spurious emissions at antenna terminals (2.991) the Spectrum shall be investigated from the lowest radio frequency signal generated in the equipment, without going below 9 kHz, up to at least to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower if the equipment operates below 10 GHz.

If operates below 40 GHz: Since the DUI operated below 10 GHz, the spectrum was searched from nine kHz to the 10th harmonic of the operating frequency.

Harmonics and sub-harmonics: Particular attention was paid to harmonics and sub-harmonics of the carrier frequency as well as to those frequencies removed from the carrier by multiples of the oscillator frequency.

Measurements contain: Measurements shown contain spectrum analyzer reading, correction factor, and final reading. The final spurious emission levels are derived from the analyzer measurement and the correction factor (3-dB attenuator and cable loss) as shown in the following example:

Calculation of data: A sample calculation is provided showing the final data obtained from the measured value.

Sample Calculation:

A. Spectrum analyzer reading (Direct measurement)

At 1.6120 MHz a spurious level of –51.61 dBm is measured.

B. Correction factor: 20 dB

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C. Spurious Emission Level (Spurious Emissions at Antenna Terminal)

C = A+B = –51.61 dBm + 20 dB = –31.61 dBm
C= –31.61 dBm

D. The criteria level is derived from this equation:
P_{TX} is the conducted power of the unmodulated carrier: 1.828 Watts (32.62 dBm)

$D = P_{TX} – [43 + (10 \cdot \log P_{TX(W)})]$
D = 32.62 dBm – [43 + (10·log 1.932 W)]
D = Criteria (reference) level = -13.0 dBm

E = Margin (spurious emission below the reference level)

E = D - C
E = (-13.0 dBm) – (–31.61 dBm)
E = 18.61 dB

Results: **PASSED.** See Tables 2, 3 and 4 and the plots (shown only for configuration 1).

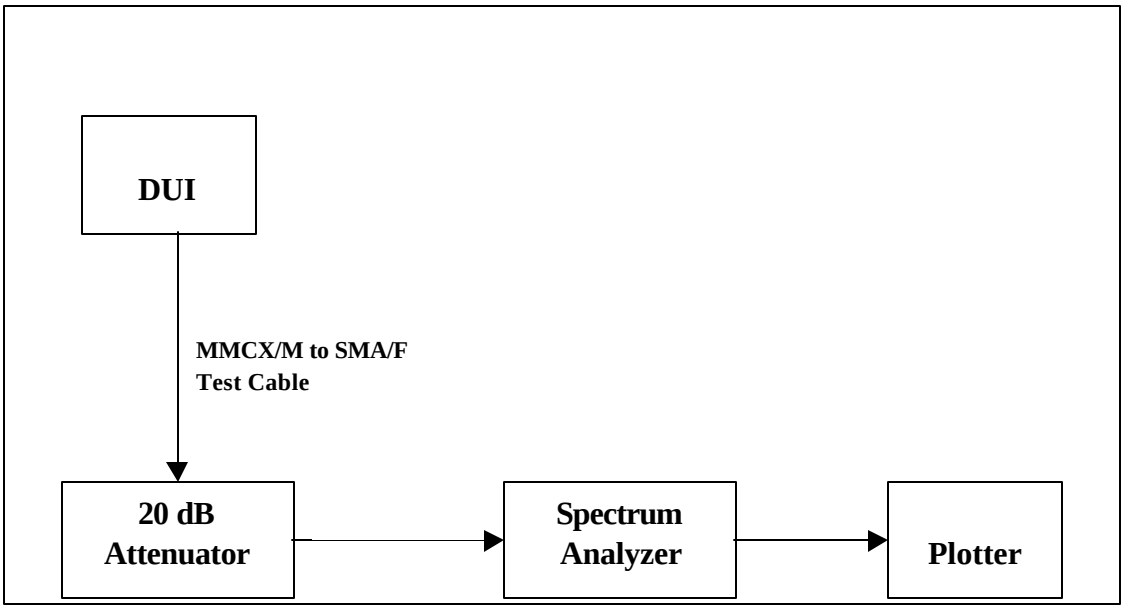

Figure 1: Set Up
Spurious Emissions at Antenna Terminal

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DATA

Table 2
WaveNet Boomer-II Wireless OEM Modem Module
Spurious Emissions from Transmitter at Antenna Terminal
Mask G, Modulation: RD-LAP 19.2 kbps, Channel: LOW

Harmonic No.	Frequency (MHz)	Measured Level (dBm) A	Correction Factor B	Spurious Emission Level (dBm) C	Criteria Level (dBm) D	Margin (dB) E
1	0.8060	12.61	20.00	32.61	-	-
2	1.6120	-51.61	20.00	-31.61	-13.00	18.61
3	2.4180	-54.38	20.00	-34.38	-13.00	21.38
4	3.2240	-76.14	20.00	-56.14	-13.00	43.14
5	4.0300	-77.03 noise floor	20.00	-57.03	-13.00	44.03
6	4.8360	-75.74	20.00	-55.74	-13.00	42.74
7	5.6420	-77.22 noise floor	20.00	-57.22	-13.00	44.22
8	6.4480	-77.64 noise floor	20.00	-57.64	-13.00	44.64
9	7.2540	-76.04	20.00	-56.04	-13.00	43.04
10	8.0600	-76.60	20.00	-56.60	-13.00	43.60
11	8.8660	-77.09	20.00	-57.09	-13.00	44.09
12	9.6720	-74.74	20.00	-54.74	-13.00	41.74
13	10.4780	-78.07 noise floor	20.00	-58.07	-13.00	45.07
14	11.2840	-76.21 noise floor	20.00	-56.21	-13.00	43.21

No other signals were detected.

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Table 3

WaveNet Boomer-II Wireless OEM Modem Module
Spurious Emissions from Transmitter at Antenna Terminal
Mask G, Modulation: RD-LAP 19.2 kbps, Channel: MEDIUM

Harmonic No.	Frequency (MHz)	Measured Level (dBm) A	Correction Factor B	Spurious Emission Level (dBm) C	Criteria Level (dBm) D	Margin (dB) E
1	0.8150	12.56	20.00	32.56	-	-
2	1.6300	-52.36	20.00	-32.36	-13.00	19.36
3	2.4450	-54.90	20.00	-34.90	-13.00	21.90
4	3.2600	-74.62	20.00	-54.62	-13.00	41.62
5	4.0750	-76.83 noise floor	20.00	-56.83	-13.00	43.83
6	4.8900	-75.20	20.00	-55.20	-13.00	42.20
7	5.7050	-77.20 noise floor	20.00	-57.20	-13.00	44.20
8	6.5200	-77.91 noise floor	20.00	-57.91	-13.00	44.91
9	7.3350	-73.93	20.00	-53.93	-13.00	40.93
10	8.1500	-71.15 noise floor	20.00	-51.15	-13.00	38.15
11	8.9650	-77.01 noise floor	20.00	-57.01	-13.00	44.01
12	9.7800	-76.42	20.00	-56.42	-13.00	43.42
13	10.5950	-77.78 noise floor	20.00	-57.78	-13.00	44.78
14	11.4100	-75.38 noise floor	20.00	-55.38	-13.00	42.38

No other signals were detected.

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Table 4

WaveNet Boomer-II Wireless OEM Modem Module
Spurious Emissions from Transmitter at Antenna Terminal
Mask G, Modulation: RD-LAP 19.2 kbps, Channel: HIGH

Harmonic No.	Frequency (MHz)	Measured Level (dBm) A	Correction Factor B	Spurious Emission Level (dBm) C	Criteria Level (dBm) D	Margin (dB) E
1	0.8210	12.47	20.00	32.47	-	-
2	1.6420	-53.29	20.00	-33.29	-13.00	20.29
3	2.4630	-55.45	20.00	-35.45	-13.00	22.45
4	3.2840	-73.30	20.00	-53.30	-13.00	40.30
5	4.1050	-77.16 noise floor	20.00	-57.16	-13.00	44.16
6	4.9260	-75.38	20.00	-55.38	-13.00	42.38
7	5.7470	-77.46 noise floor	20.00	-57.46	-13.00	44.46
8	6.5680	-78.33 noise floor	20.00	-58.33	-13.00	45.33
9	7.3890	-71.42	20.00	-51.42	-13.00	38.42
10	8.2100	-72.18	20.00	-52.18	-13.00	39.18
11	9.0310	-77.50 noise floor	20.00	-57.50	-13.00	44.50
12	9.8520	-77.65 noise floor	20.00	-57.65	-13.00	44.65
13	10.6730	-77.87 noise floor	20.00	-57.87	-13.00	44.87
14	11.4940	-75.06 noise floor	20.00	-55.06	-13.00	42.06

No other signals were detected.

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Table 5

WaveNet Boomer-II Wireless OEM Modem Module
Spurious Emissions from Transmitter at Antenna Terminal
Mask G, Modulation: RD-LAP 9.6 kbps, Channel: LOW

Harmonic No.	Frequency (MHz)	Measured Level (dBm) A	Correction Factor B	Spurious Emission Level (dBm) C	Criteria Level (dBm) D	Margin (dB) E
1	0.8060	12.73	20.00	32.73	-	-
2	1.6120	-51.26	20.00	-31.26	-13.00	18.26
3	2.4180	-54.03	20.00	-34.03	-13.00	21.03
4	3.2240	-75.71	20.00	-55.71	-13.00	42.71
5	4.0300	-77.18 noise floor	20.00	-57.18	-13.00	44.18
6	4.8360	-75.30	20.00	-55.30	-13.00	42.30
7	5.6420	-77.10 noise floor	20.00	-57.10	-13.00	44.10
8	6.4480	-77.60 noise floor	20.00	-57.60	-13.00	44.60
9	7.2540	-75.49	20.00	-55.49	-13.00	42.49
10	8.0600	-76.47	20.00	-56.47	-13.00	43.47
11	8.8660	-76.89 noise floor	20.00	-56.89	-13.00	43.89
12	9.6720	-74.54	20.00	-54.54	-13.00	41.54
13	10.4780	-78.00 noise floor	20.00	-58.00	-13.00	45.00
14	11.2840	-76.25 noise floor	20.00	-56.25	-13.00	43.25

No other signals were detected.

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Table 6

WaveNet Boomer-II Wireless OEM Modem Module
Spurious Emissions from Transmitter at Antenna Terminal
Mask G, Modulation: RD-LAP 9.6 kbps, Channel: MEDIUM

Harmonic No.	Frequency (MHz)	Measured Level (dBm) A	Correction Factor B	Spurious Emission Level (dBm) C	Criteria Level (dBm) D	Margin (dB) E
1	0.8150	12.66	20.00	32.66	-	-
2	1.6300	-52.10	20.00	-32.10	-13.00	19.10
3	2.4450	-54.45	20.00	-34.45	-13.00	21.45
4	3.2600	-74.28	20.00	-54.28	-13.00	41.28
5	4.0750	-76.61 noise floor	20.00	-56.61	-13.00	43.61
6	4.8900	-74.83	20.00	-54.83	-13.00	41.83
7	5.7050	-77.15 noise floor	20.00	-57.15	-13.00	44.15
8	6.5200	-77.78 noise floor	20.00	-57.78	-13.00	44.78
9	7.3350	-73.29	20.00	-53.29	-13.00	40.29
10	8.1500	-70.98 noise floor	20.00	-50.98	-13.00	37.98
11	8.9650	-77.09 noise floor	20.00	-57.09	-13.00	44.09
12	9.7800	-76.77	20.00	-56.77	-13.00	43.77
13	10.5950	-77.68 noise floor	20.00	-57.68	-13.00	44.68
14	11.4100	-75.29 noise floor	20.00	-55.29	-13.00	42.29

No other signals were detected.

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Table 7

WaveNet Boomer-II Wireless OEM Modem Module
Spurious Emissions from Transmitter at Antenna Terminal
Mask G, Modulation: RD-LAP 9.6 kbps, Channel: HIGH

Harmonic No.	Frequency (MHz)	Measured Level (dBm) A	Correction Factor B	Spurious Emission Level (dBm) C	Criteria Level (dBm) D	Margin (dB) E
1	0.8210	12.67	20.00	32.67	-	-
2	1.6420	-53.11	20.00	-33.11	-13.00	20.11
3	2.4630	-54.80	20.00	-34.80	-13.00	21.80
4	3.2840	-72.58	20.00	-52.58	-13.00	39.58
5	4.1050	-76.97 noise floor	20.00	-56.97	-13.00	43.97
6	4.9260	-75.40	20.00	-55.40	-13.00	42.40
7	5.7470	-77.85 noise floor	20.00	-57.85	-13.00	44.85
8	6.5680	-78.15 noise floor	20.00	-58.15	-13.00	45.15
9	7.3890	-72.48	20.00	-52.48	-13.00	39.48
10	8.2100	-72.08 noise floor	20.00	-52.08	-13.00	39.08
11	9.0310	-77.55 noise floor	20.00	-57.55	-13.00	44.55
12	9.8520	-77.58	20.00	-57.58	-13.00	44.58
13	10.6730	-77.98 noise floor	20.00	-57.98	-13.00	44.98
14	11.4940	-75.27 noise floor	20.00	-55.27	-13.00	42.27

No other signals were detected.

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Table 8

WaveNet Boomer-II Wireless OEM Modem Module
Spurious Emissions from Transmitter at Antenna Terminal
Mask G, Modulation: MDC 4.8 kbps, Channel: LOW

Harmonic No.	Frequency (MHz)	Measured Level (dBm) A	Correction Factor B	Spurious Emission Level (dBm) C	Criteria Level (dBm) D	Margin (dB) E
1	0.8060	12.59	20.00	32.59	-	-
2	1.6120	-52.01	20.00	-32.01	-13.00	19.01
3	2.4180	-56.67	20.00	-36.67	-13.00	23.67
4	3.2240	-75.88	20.00	-55.88	-13.00	42.88
5	4.0300	-77.04 noise floor	20.00	-57.04	-13.00	44.04
6	4.8360	-74.93	20.00	-54.93	-13.00	41.93
7	5.6420	-77.05 noise floor	20.00	-57.05	-13.00	44.05
8	6.4480	-77.56 noise floor	20.00	-57.56	-13.00	44.56
9	7.2540	-75.63	20.00	-55.63	-13.00	42.63
10	8.0600	-76.43	20.00	-56.43	-13.00	43.43
11	8.8660	-76.79 noise floor	20.00	-56.79	-13.00	43.79
12	9.6720	-74.88	20.00	-54.88	-13.00	41.88
13	10.4780	-78.12 noise floor	20.00	-58.12	-13.00	45.12
14	11.2840	-76.21 noise floor	20.00	-56.21	-13.00	43.21

No other signals were detected.

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Table 9

WaveNet Boomer-II Wireless OEM Modem Module
Spurious Emissions from Transmitter at Antenna Terminal
Mask G, Modulation: MDC 4.8 kbps, Channel: MEDIUM

Harmonic No.	Frequency (MHz)	Measured Level (dBm) A	Correction Factor B	Spurious Emission Level (dBm) C	Criteria Level (dBm) D	Margin (dB) E
1	0.8150	12.57	20.00	32.57	-	-
2	1.6300	-52.86	20.00	-32.86	-13.00	19.86
3	2.4450	-56.77	20.00	-36.77	-13.00	23.77
4	3.2600	-74.66	20.00	-54.66	-13.00	41.66
5	4.0750	-76.64 noise floor	20.00	-56.64	-13.00	43.64
6	4.8900	-74.88	20.00	-54.88	-13.00	41.88
7	5.7050	-76.88 noise floor	20.00	-56.88	-13.00	43.88
8	6.5200	-77.33 noise floor	20.00	-57.33	-13.00	44.33
9	7.3350	-72.64	20.00	-52.64	-13.00	39.64
10	8.1500	-70.68 noise floor	20.00	-50.68	-13.00	37.68
11	8.9650	-76.99 noise floor	20.00	-56.99	-13.00	43.99
12	9.7800	-75.80	20.00	-55.80	-13.00	42.80
13	10.5950	-77.67 noise floor	20.00	-57.67	-13.00	44.67
14	11.4100	-75.34 noise floor	20.00	-55.34	-13.00	42.34

No other signals were detected.

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Table 10

WaveNet Boomer-II Wireless OEM Modem Module
Spurious Emissions from Transmitter at Antenna Terminal
Mask G, Modulation: MDC 4.8 kbps, Channel: HIGH

Harmonic No.	Frequency (MHz)	Measured Level (dBm) A	Correction Factor B	Spurious Emission Level (dBm) C	Criteria Level (dBm) D	Margin (dB) E
1	0.8210	12.48	20.00	32.48	-	-
2	1.6420	-54.13	20.00	-34.13	-13.00	21.13
3	2.4630	-57.25	20.00	-37.25	-13.00	24.25
4	3.2840	-73.27	20.00	-53.27	-13.00	40.27
5	4.1050	-76.96	20.00	-56.96	-13.00	43.96
6	4.9260	-74.92	20.00	-54.92	-13.00	41.92
7	5.7470	-77.75	20.00	-57.75	-13.00	44.75
8	6.5680	-78.21 noise floor	20.00	-58.21	-13.00	45.21
9	7.3890	-73.55	20.00	-53.55	-13.00	40.55
10	8.2100	-71.22	20.00	-51.22	-13.00	38.22
11	9.0310	-77.60 noise floor	20.00	-57.60	-13.00	44.60
12	9.8520	-77.42	20.00	-57.42	-13.00	44.42
13	10.6730	-77.97 noise floor	20.00	-57.97	-13.00	44.97
14	11.4940	-75.19 noise floor	20.00	-55.19	-13.00	42.19

No other signals were detected.

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Table 11

WaveNet Boomer-II Wireless OEM Modem Module
Spurious Emissions from Transmitter at Antenna Terminal
Mask H, Modulation: RD-LAP 9.6 kbps, Channel: LOW

Harmonic No.	Frequency (MHz)	Measured Level (dBm) A	Correction Factor B	Spurious Emission Level (dBm) C	Criteria Level (dBm) D	Margin (dB) E
1	0.8210	12.67	20.00	32.67	-	-
2	1.6420	-53.11	20.00	-33.11	-13.00	20.11
3	2.4630	-54.80	20.00	-34.80	-13.00	21.80
4	3.2840	-72.58	20.00	-52.58	-13.00	39.58
5	4.1050	-76.97 noise floor	20.00	-56.97	-13.00	43.97
6	4.9260	-75.40	20.00	-55.40	-13.00	42.40
7	5.7470	-77.85 noise floor	20.00	-57.85	-13.00	44.85
8	6.5680	-78.15 noise floor	20.00	-58.15	-13.00	45.15
9	7.3890	-72.48	20.00	-52.48	-13.00	39.48
10	8.2100	-72.08 noise floor	20.00	-52.08	-13.00	39.08
11	9.0310	-77.55 noise floor	20.00	-57.55	-13.00	44.55
12	9.8520	-77.58	20.00	-57.58	-13.00	44.58
13	10.6730	-77.48 noise floor	20.00	-57.48	-13.00	44.48
14	11.4940	-75.27 noise floor	20.00	-55.27	-13.00	42.27

No other signals were detected.

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Table 12

WaveNet Boomer-II Wireless OEM Modem Module
Spurious Emissions from Transmitter at Antenna Terminal
Mask H, Modulation: RD-LAP 9.6 kbps, Channel: MEDIUM

Harmonic No.	Frequency (MHz)	Measured Level (dBm) A	Correction Factor B	Spurious Emission Level (dBm) C	Criteria Level (dBm) D	Margin (dB) E
1	0.8225	12.60	20.00	32.60	-	-
2	1.6450	-52.92	20.00	-32.92	-13.00	19.92
3	2.4675	-55.03	20.00	-35.03	-13.00	22.03
4	3.2900	-71.76	20.00	-51.76	-13.00	38.76
5	4.1125	-76.39 noise floor	20.00	-56.39	-13.00	43.39
6	4.9350	-75.05	20.00	-55.05	-13.00	42.05
7	5.7575	-77.51 noise floor	20.00	-57.51	-13.00	44.51
8	6.5800	-77.81 noise floor	20.00	-57.81	-13.00	44.81
9	7.4025	-72.25	20.00	-52.25	-13.00	39.25
10	8.2250	-71.75 noise floor	20.00	-51.75	-13.00	38.75
11	9.0475	-77.24 noise floor	20.00	-57.24	-13.00	44.24
12	9.8700	-77.33	20.00	-57.33	-13.00	44.33
13	10.6925	-77.62 noise floor	20.00	-57.62	-13.00	44.62
14	11.5150	-74.68 noise floor	20.00	-54.68	-13.00	41.68

No other signals were detected.

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Table 13
WaveNet Boomer-II Wireless OEM Modem Module
Spurious Emissions from Transmitter at Antenna Terminal
Mask H, Modulation: RD-LAP 9.6 kbps, Channel: HIGH

Harmonic No.	Frequency (MHz)	Measured Level (dBm) A	Correction Factor B	Spurious Emission Level (dBm) C	Criteria Level (dBm) D	Margin (dB) E
1	0.8240	12.67	20.00	32.67	-	-
2	1.6480	-53.33	20.00	-33.33	-13.00	20.33
3	2.4720	-56.10	20.00	-36.10	-13.00	23.10
4	3.2960	-71.66	20.00	-51.66	-13.00	38.66
5	4.1200	-76.85 noise floor	20.00	-56.85	-13.00	43.85
6	4.9440	-75.16	20.00	-55.16	-13.00	42.16
7	5.7680	-77.96 noise floor	20.00	-57.96	-13.00	44.96
8	6.5920	-78.10 noise floor	20.00	-58.10	-13.00	45.10
9	7.4160	-71.43	20.00	-51.43	-13.00	38.43
10	8.2400	-72.35 noise floor	20.00	-52.35	-13.00	39.35
11	9.0640	-77.17 noise floor	20.00	-57.17	-13.00	44.17
12	9.8880	-77.77 noise floor	20.00	-57.77	-13.00	44.77
13	10.7120	-78.01 noise floor	20.00	-58.01	-13.00	45.01
14	11.5360	-74.97 noise floor	20.00	-54.97	-13.00	41.97

No other signals were detected.

Test performed by: Kulcha Roman **Date:** August, 2002

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Spurious Emissions
at Antenna Terminal - Plots
806-821 MHz
Mask G
RD-LAP 19.2 kbps

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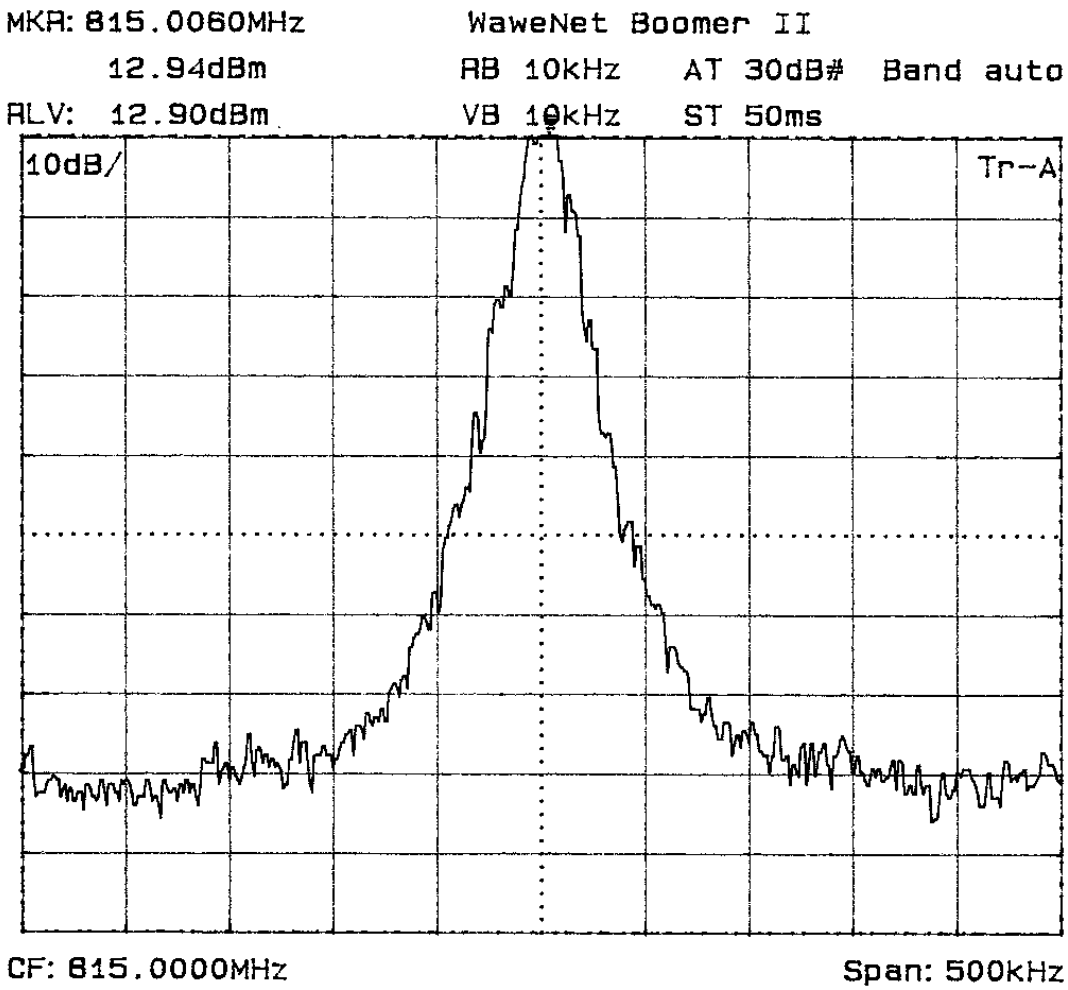

WaveNet Boomer II
Spurious Emissions from Transmitter @ Antenna Terminal
Modulation: RD-LAP 19.2 kbps, Mask G, 1st harmonic (fundamental frequency)

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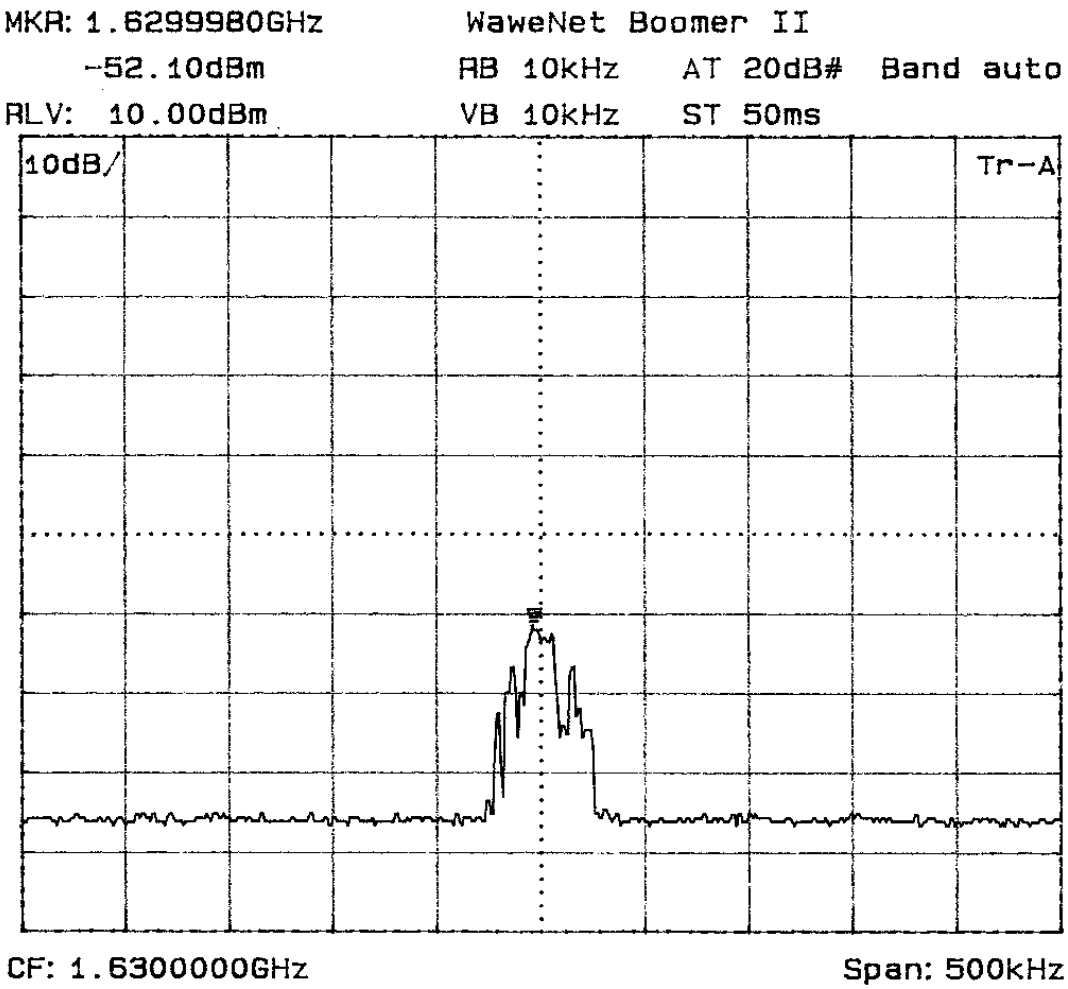

WaveNet Boomer II
Spurious Emissions from Transmitter @ Antenna Terminal
Modulation: RD-LAP 19.2 kbps, Mask G, 2nd harmonic

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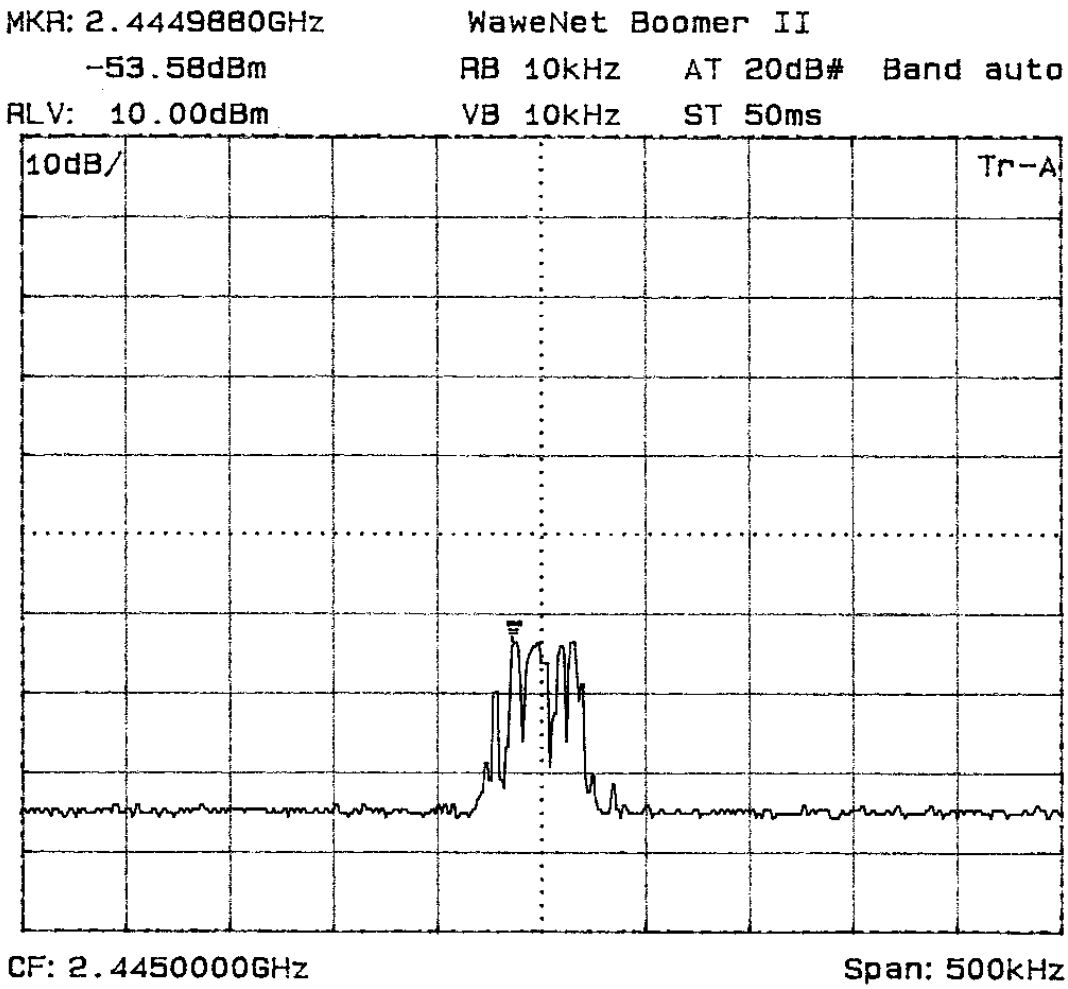

WaveNet Boomer II
Spurious Emissions from Transmitter @ Antenna Terminal
Modulation: RD-LAP 19.2 kbps, Mask G, 3rd harmonic

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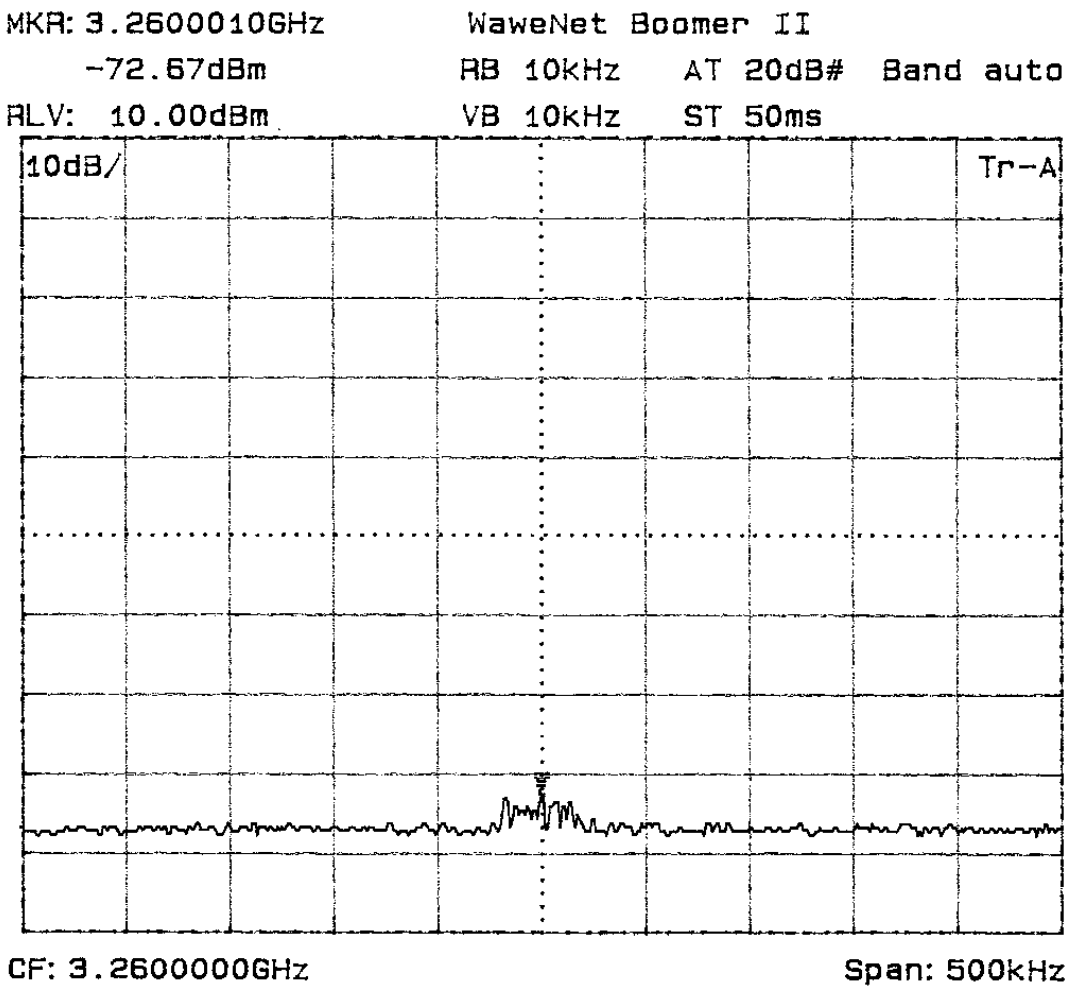

WaveNet Boomer II
Spurious Emissions from Transmitter @ Antenna Terminal
Modulation: RD-LAP 19.2 kbps, Mask G, 4th harmonic

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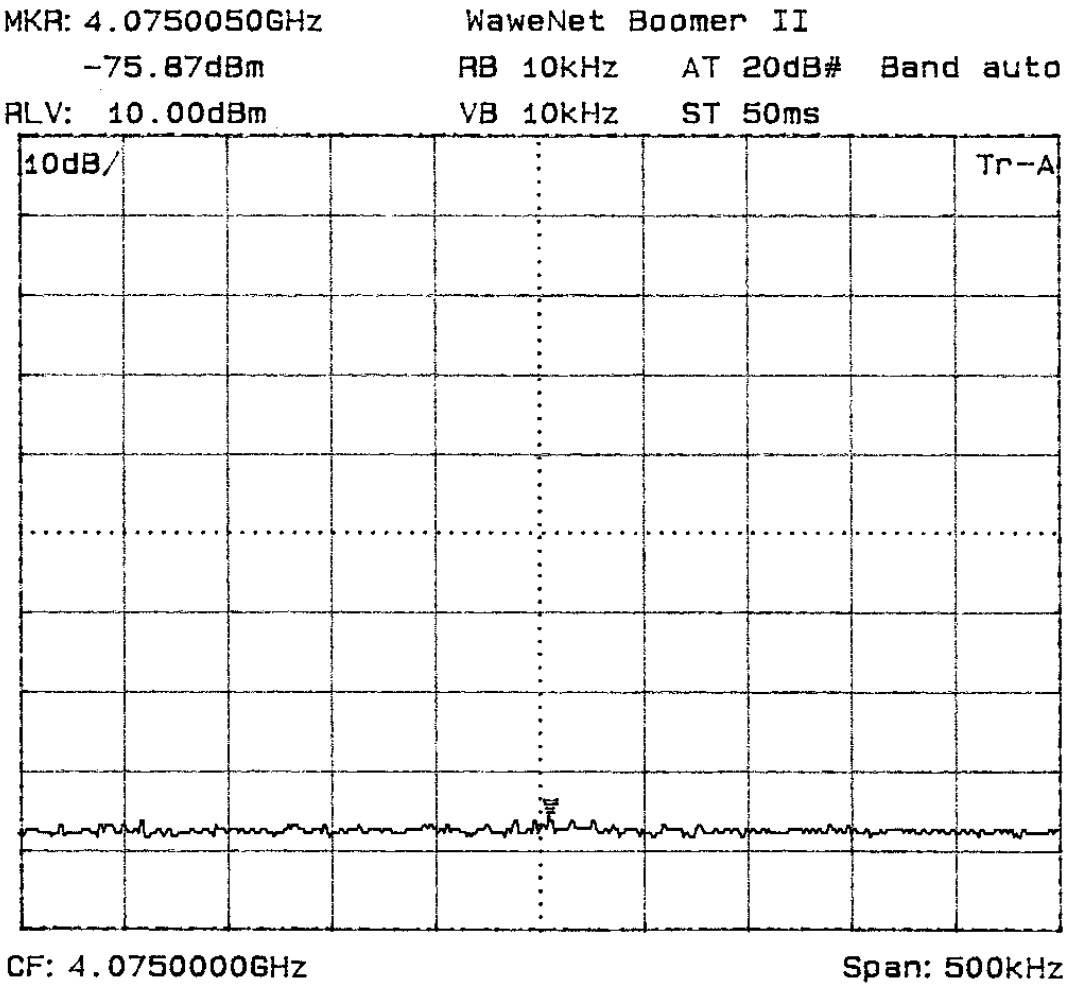

WaveNet Boomer II
Spurious Emissions from Transmitter @ Antenna Terminal
Modulation: RD-LAP 19.2 kbps, Mask G, 5th harmonic

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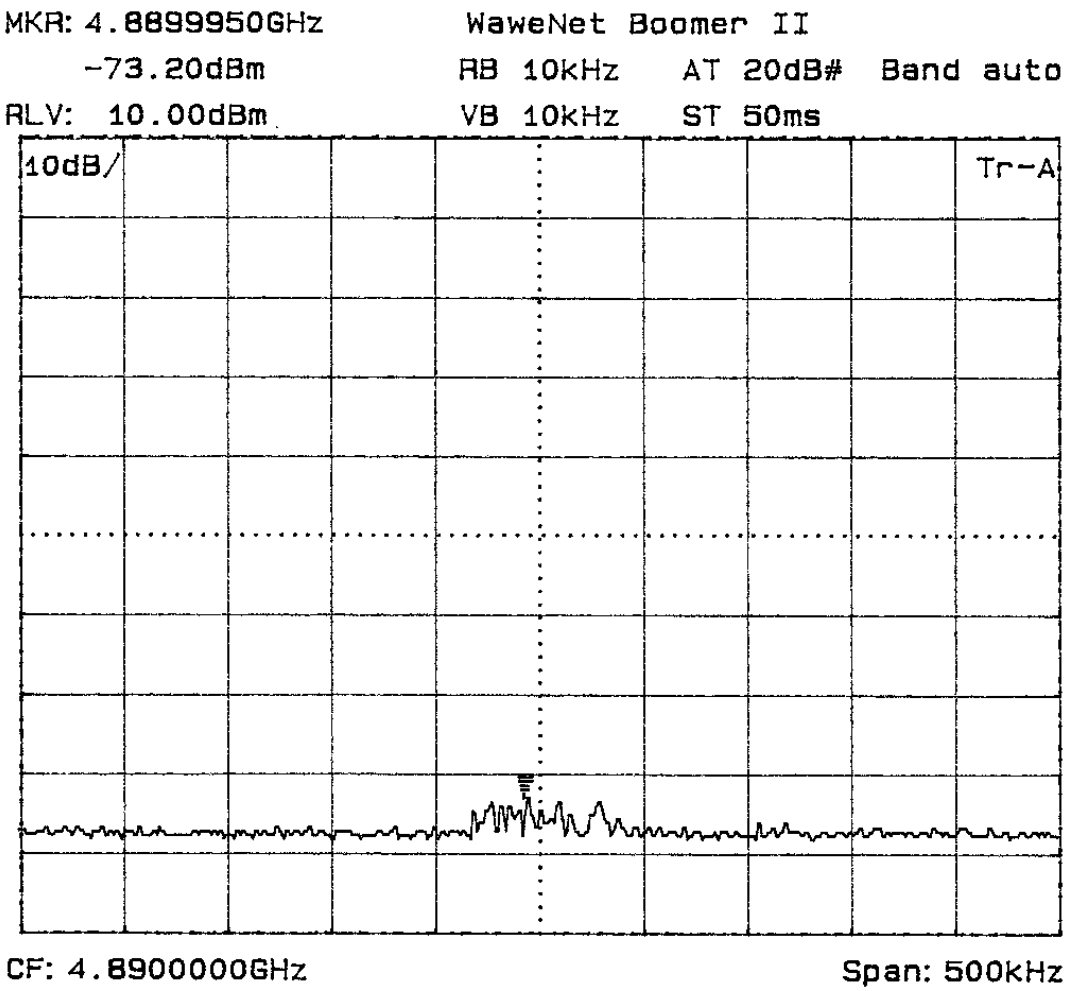

WaveNet Boomer II
Spurious Emissions from Transmitter @ Antenna Terminal
Modulation: RD-LAP 19.2 kbps, Mask G, 6th harmonic

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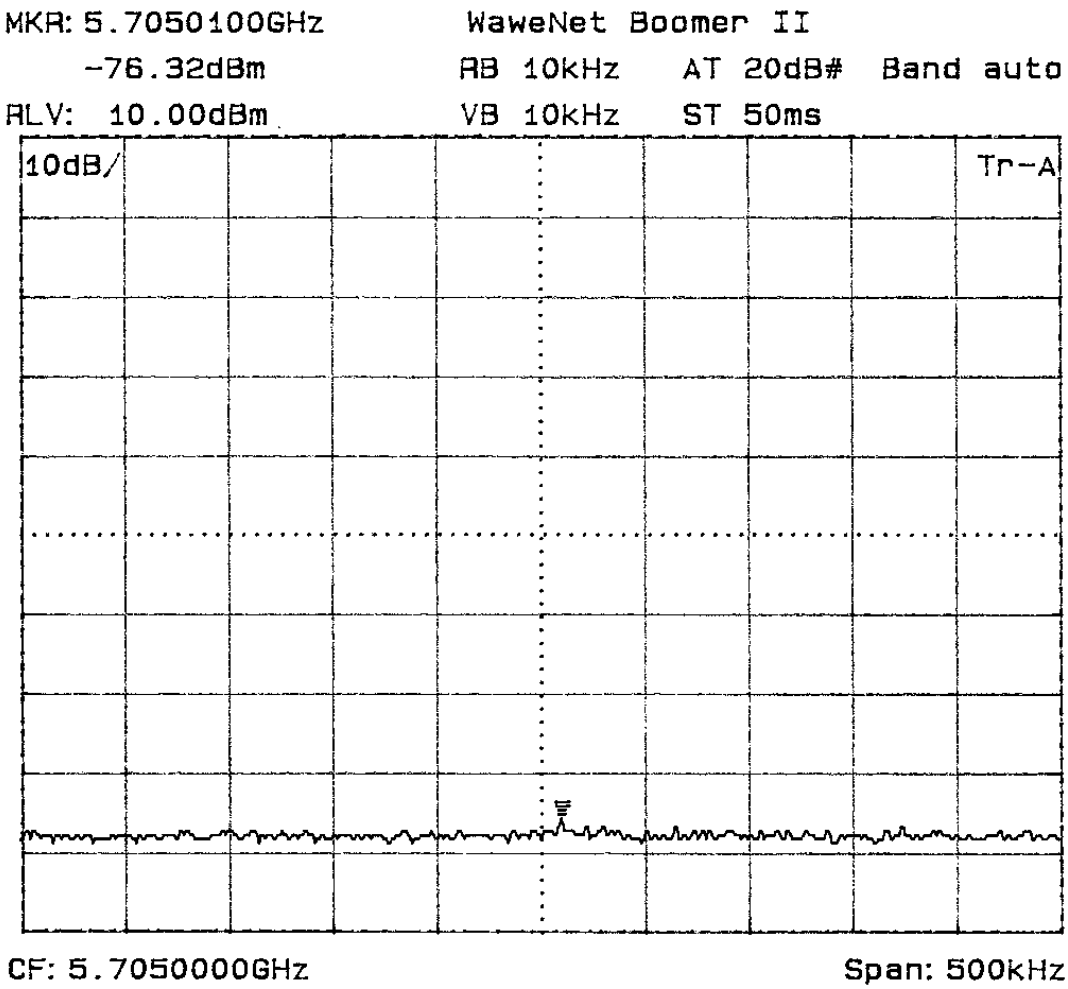

WaveNet Boomer II
Spurious Emissions from Transmitter @ Antenna Terminal
Modulation: RD-LAP 19.2 kbps, Mask G, 7th harmonic

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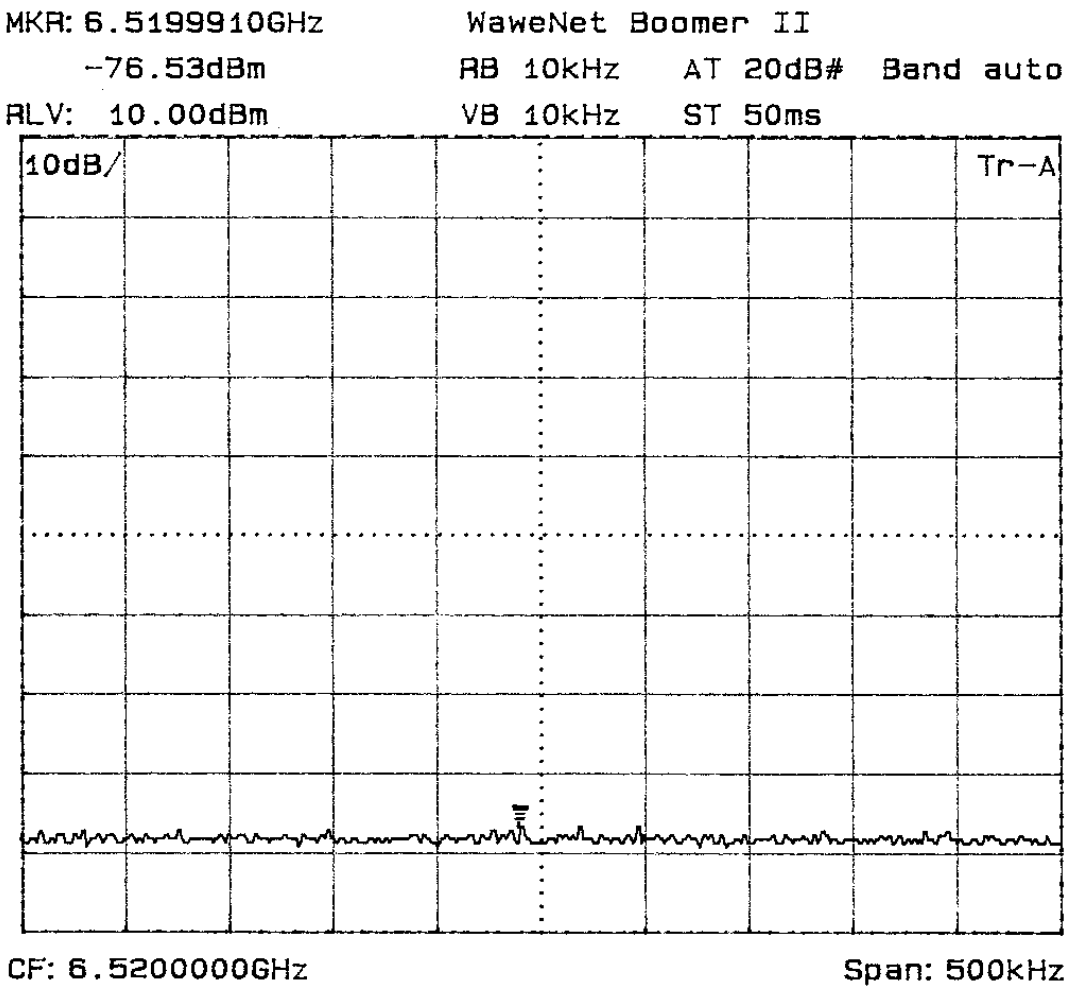

WaveNet Boomer II
Spurious Emissions from Transmitter @ Antenna Terminal
Modulation: RD-LAP 19.2 kbps, Mask G, 8th harmonic

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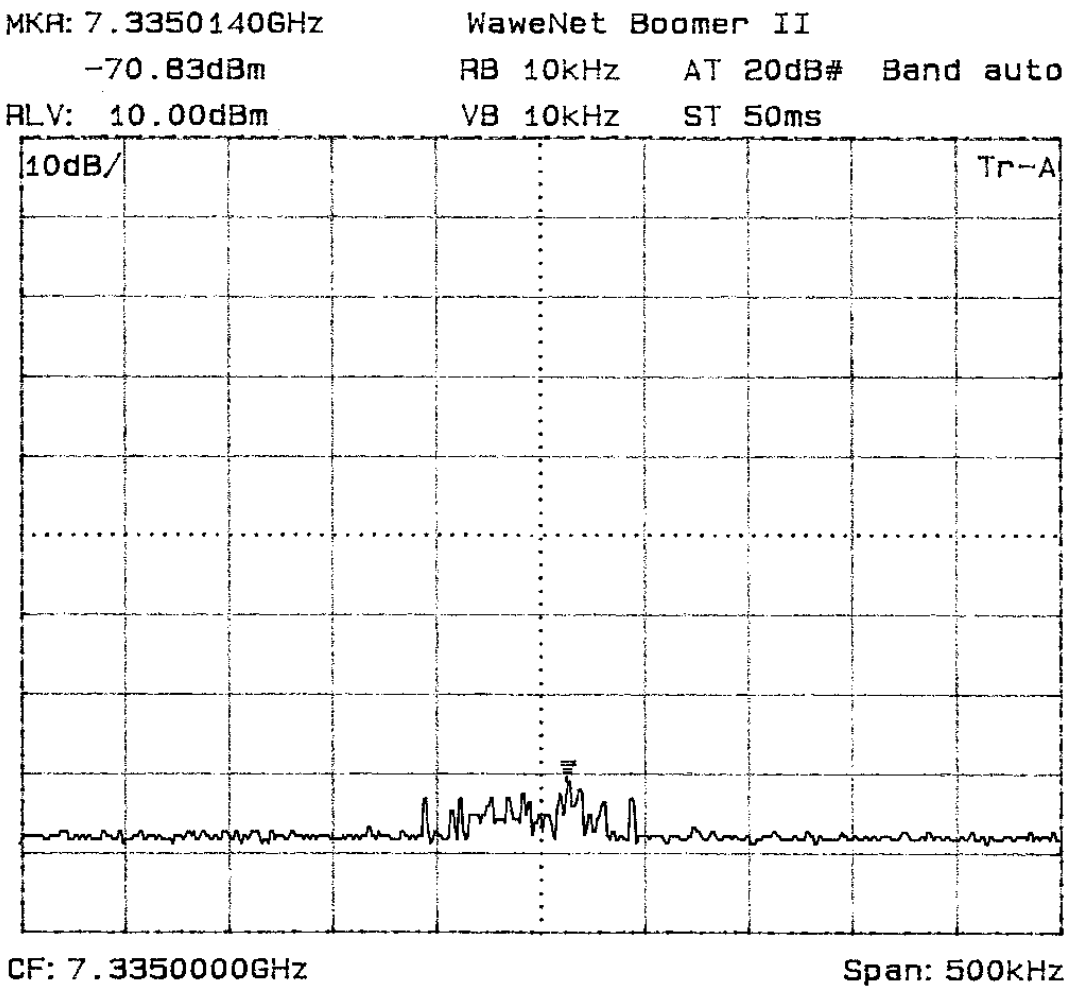

WaveNet Boomer II
Spurious Emissions from Transmitter @ Antenna Terminal
Modulation: RD-LAP 19.2 kbps, Mask G, 9th harmonic

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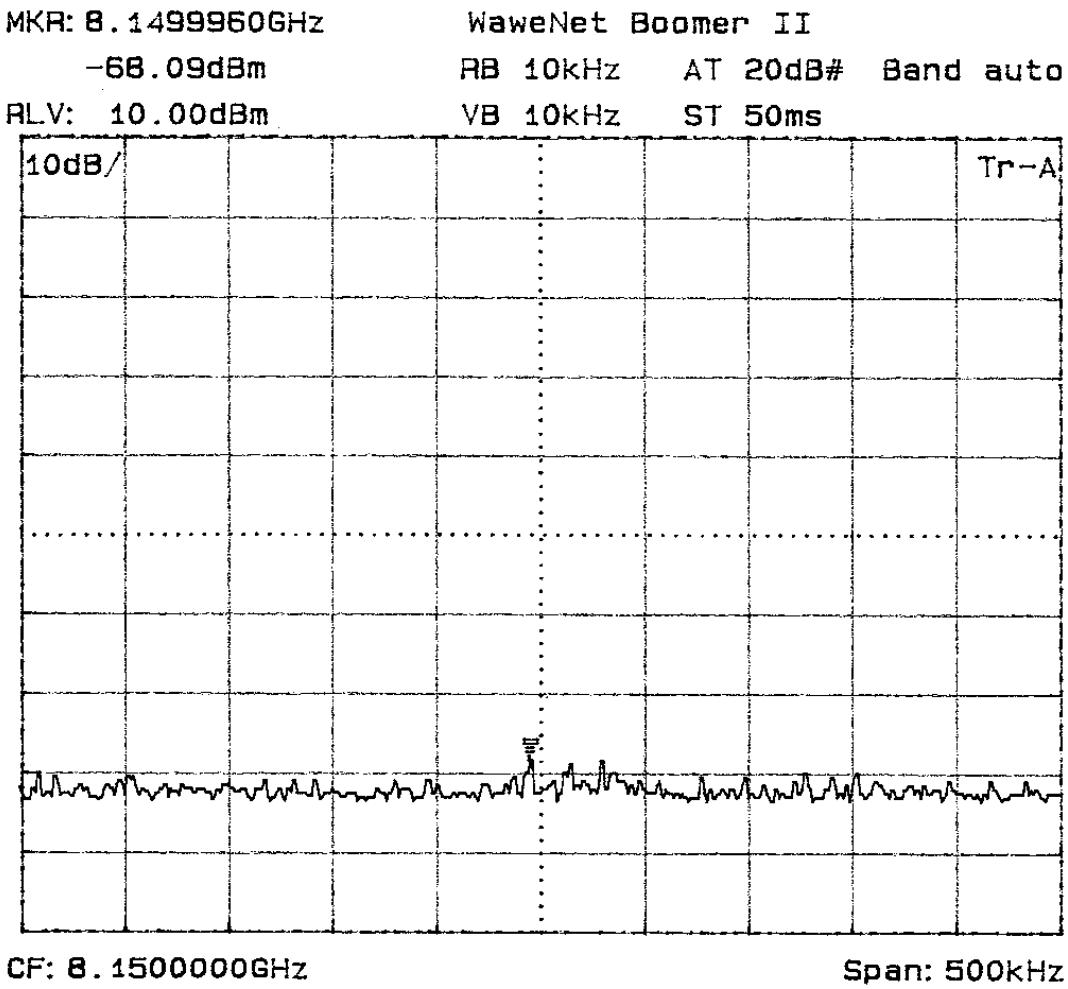

WaveNet Boomer II
Spurious Emissions from Transmitter @ Antenna Terminal
Modulation: RD-LAP 19.2 kbps, Mask G, 10th harmonic

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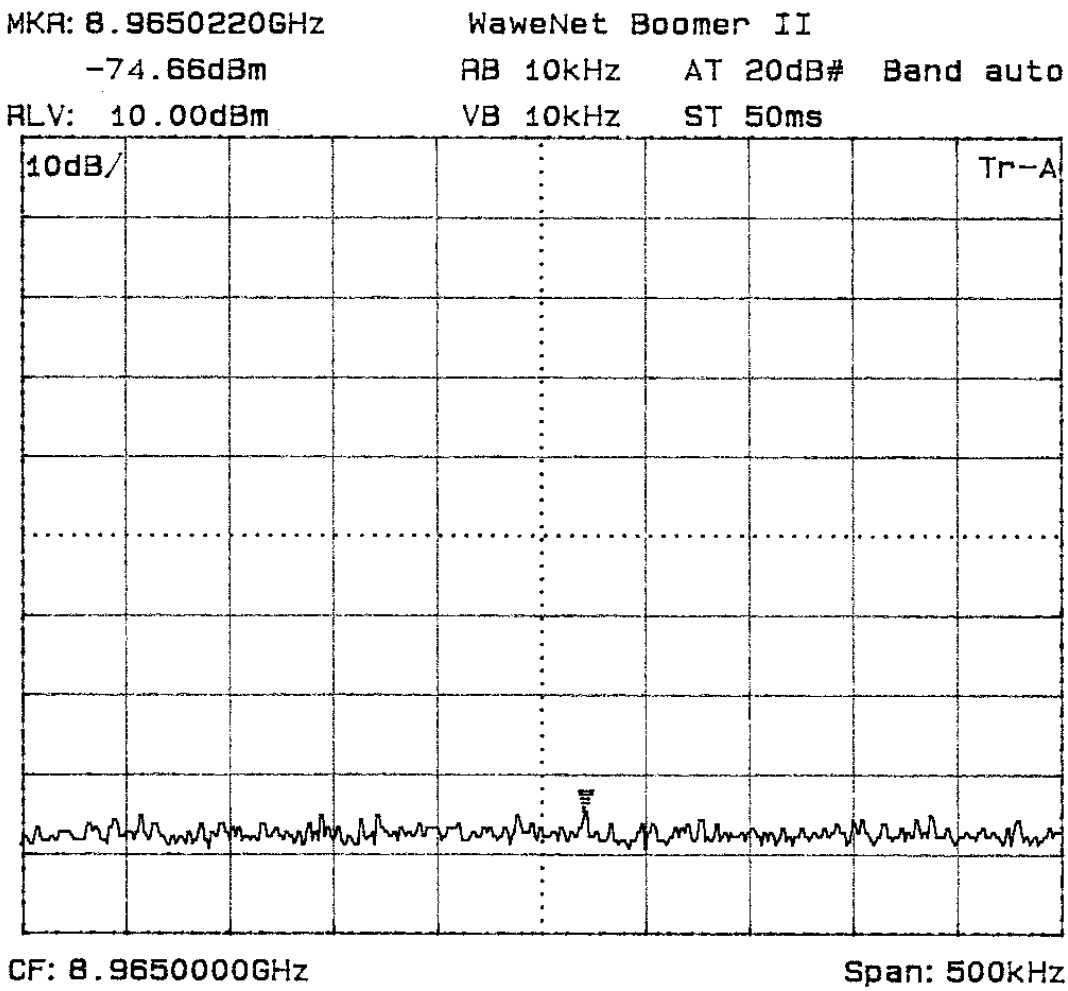

WaveNet Boomer II
Spurious Emissions from Transmitter @ Antenna Terminal
Modulation: RD-LAP 19.2 kbps, Mask G, 11th harmonic

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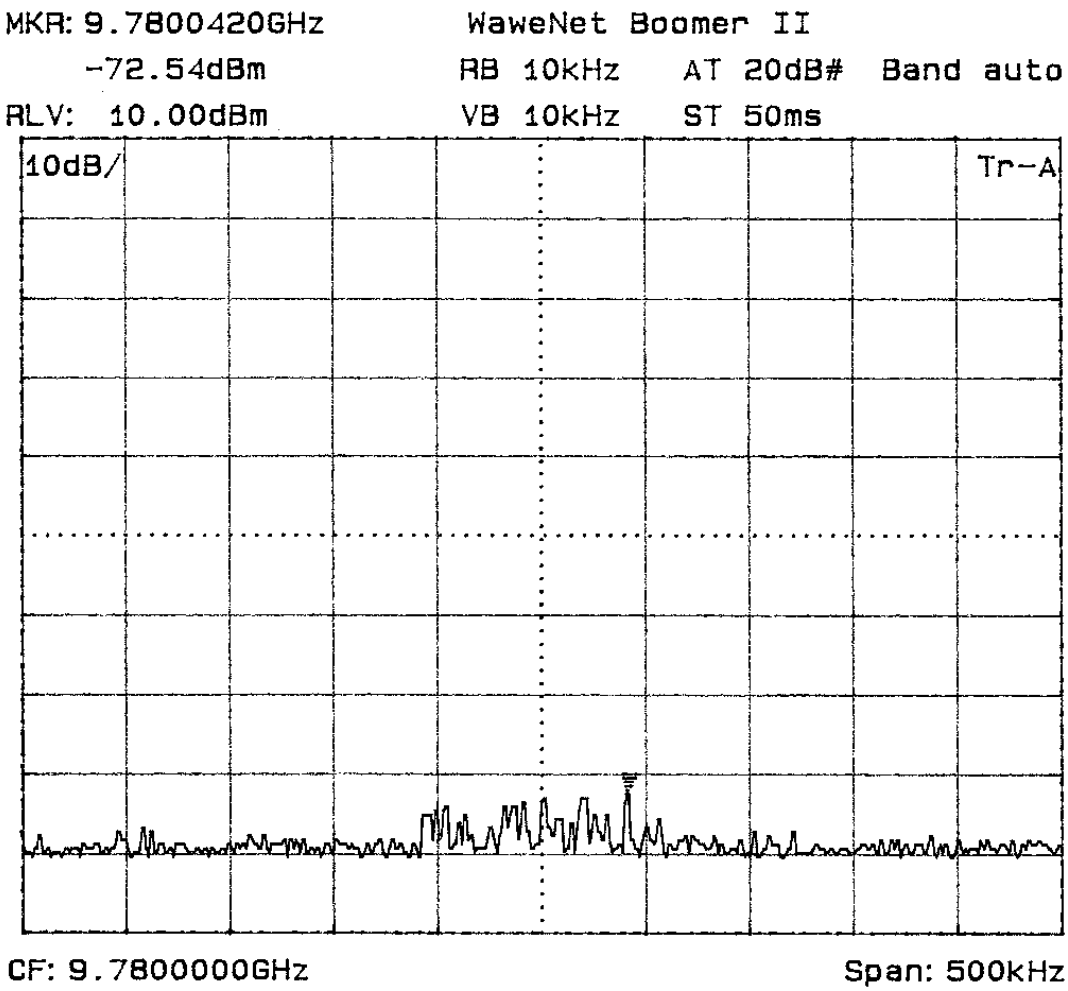

WaveNet Boomer II
Spurious Emissions from Transmitter @ Antenna Terminal
Modulation: RD-LAP 19.2 kbps, Mask G, 12th harmonic

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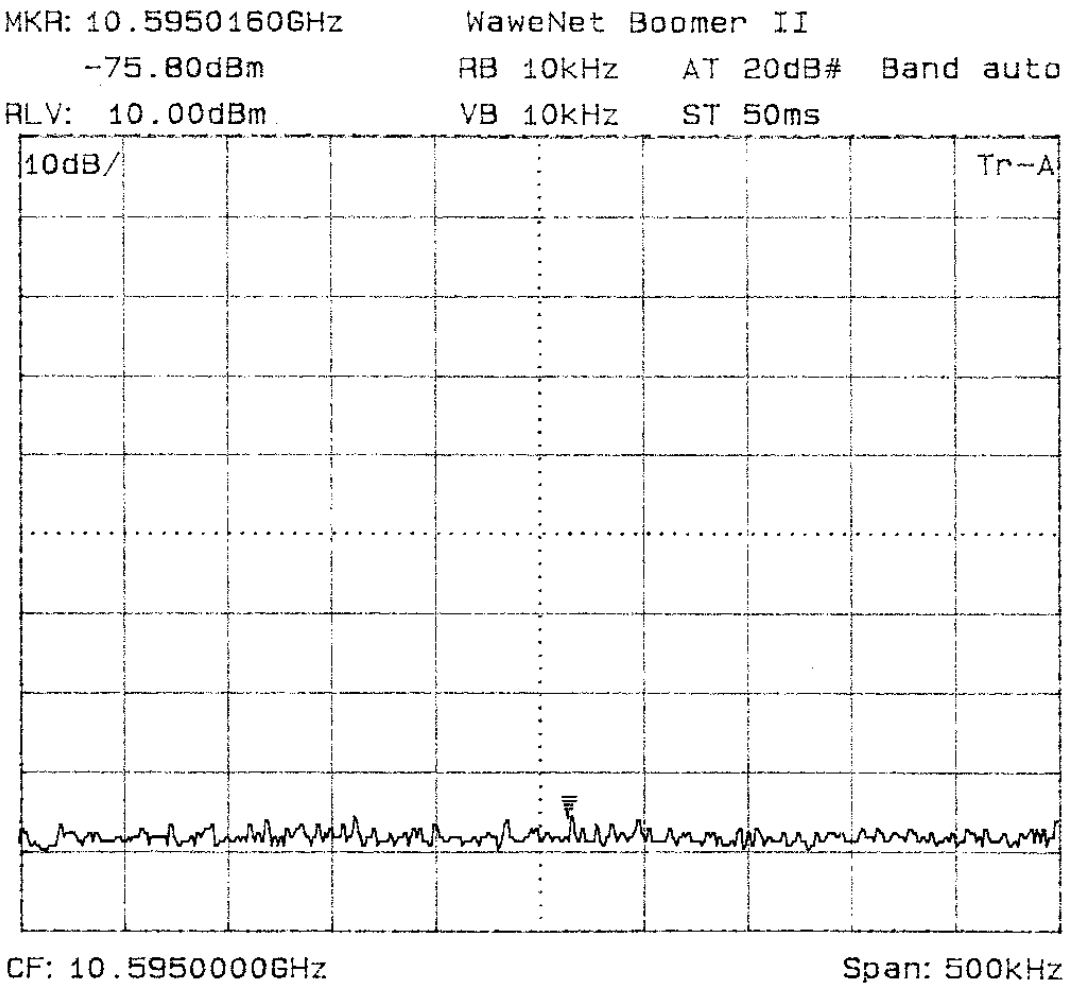

WaveNet Boomer II
Spurious Emissions from Transmitter @ Antenna Terminal
Modulation: RD-LAP 19.2 kbps, Mask G, 13th harmonic

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Plots

Spurious Emissions
at Antenna Terminal - Plots
Frequency Band: 806-821 MHz
Mask G
RD-LAP 9.6 kbps

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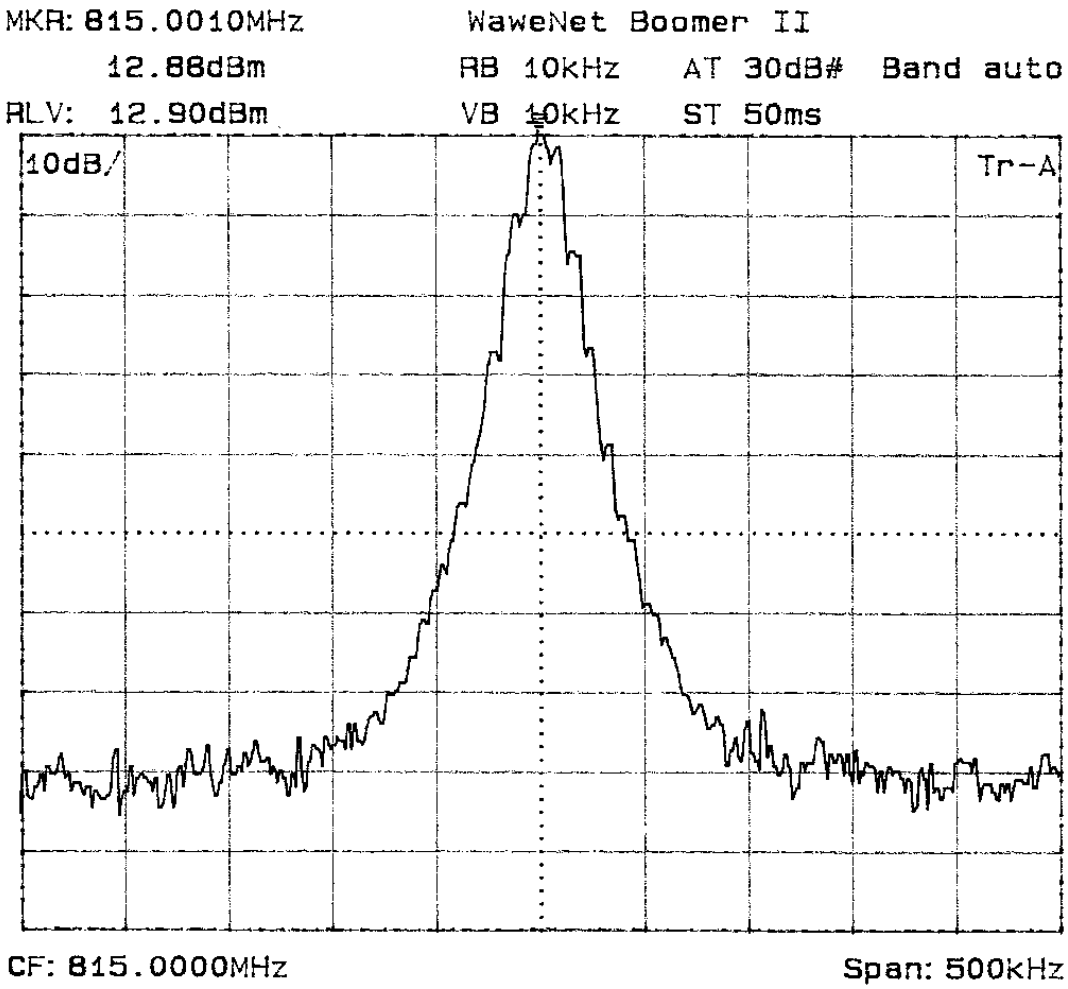

WaveNet Boomer II
Spurious Emissions from Transmitter @ Antenna Terminal
Modulation: RD-LAP 9.6 kbps, Mask G, 1st harmonic (fundamental frequency)

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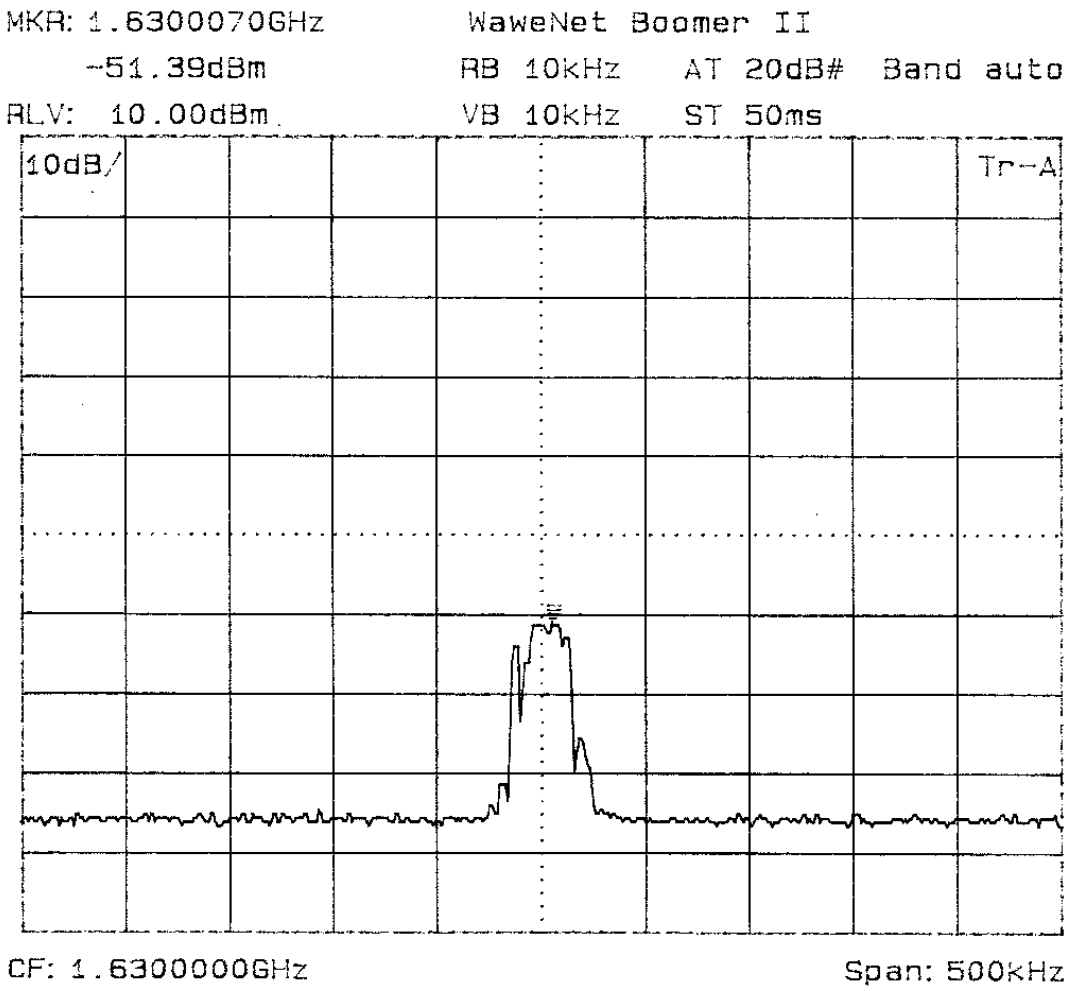

WaveNet Boomer II
Spurious Emissions from Transmitter @ Antenna Terminal
Modulation: RD-LAP 9.6 kbps, Mask G, 2nd harmonic

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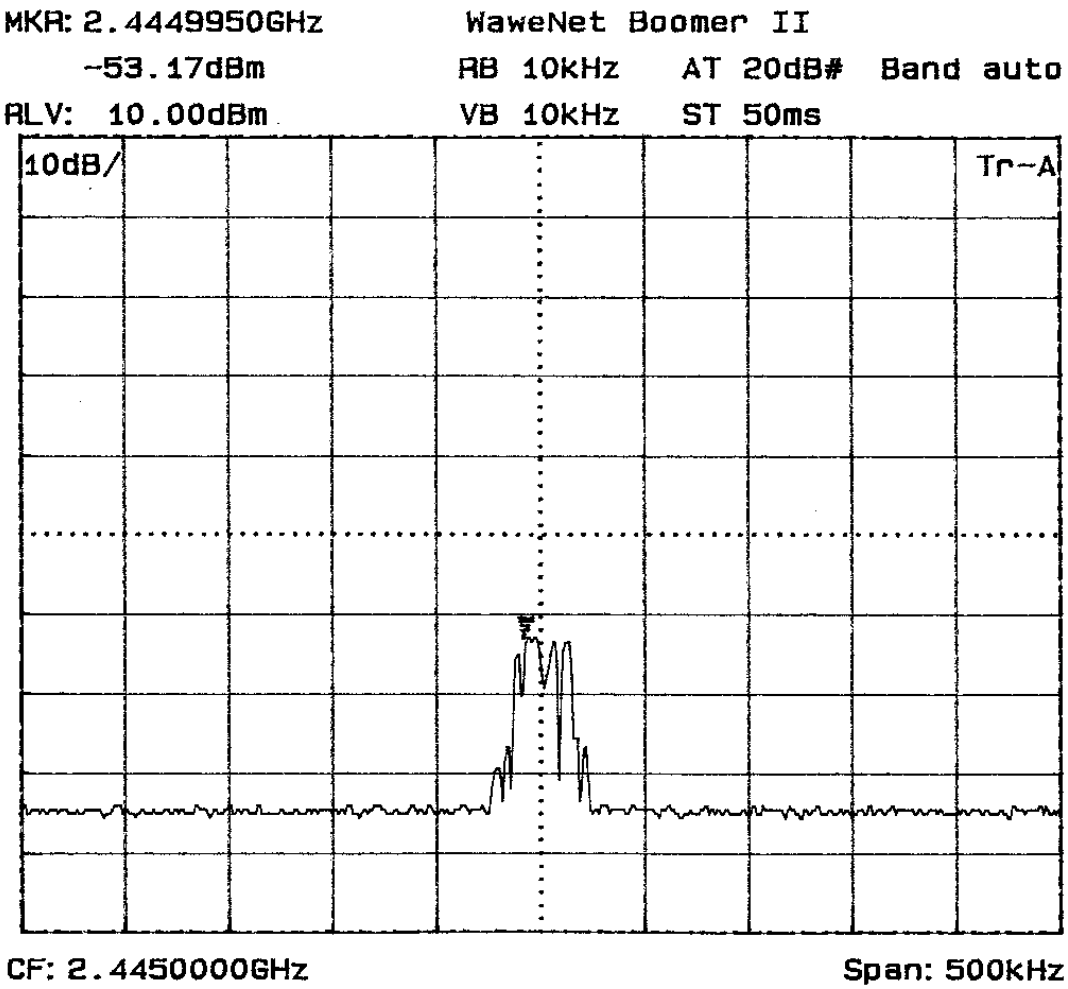

WaveNet Boomer II
Spurious Emissions from Transmitter @ Antenna Terminal
Modulation: RD-LAP 9.6 kbps, Mask G, 3rd harmonic

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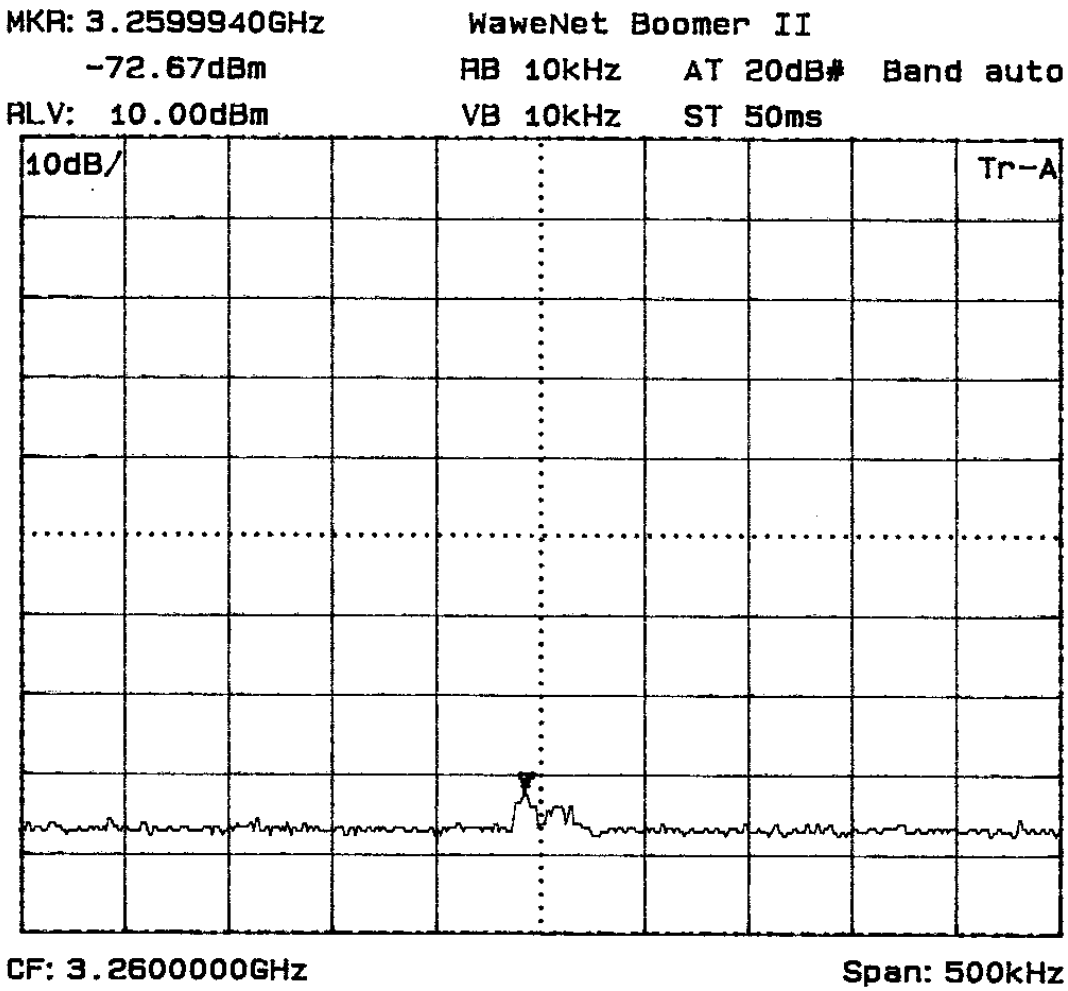

WaveNet Boomer II
Spurious Emissions from Transmitter @ Antenna Terminal
Modulation: RD-LAP 9.6 kbps, Mask G, 4th harmonic

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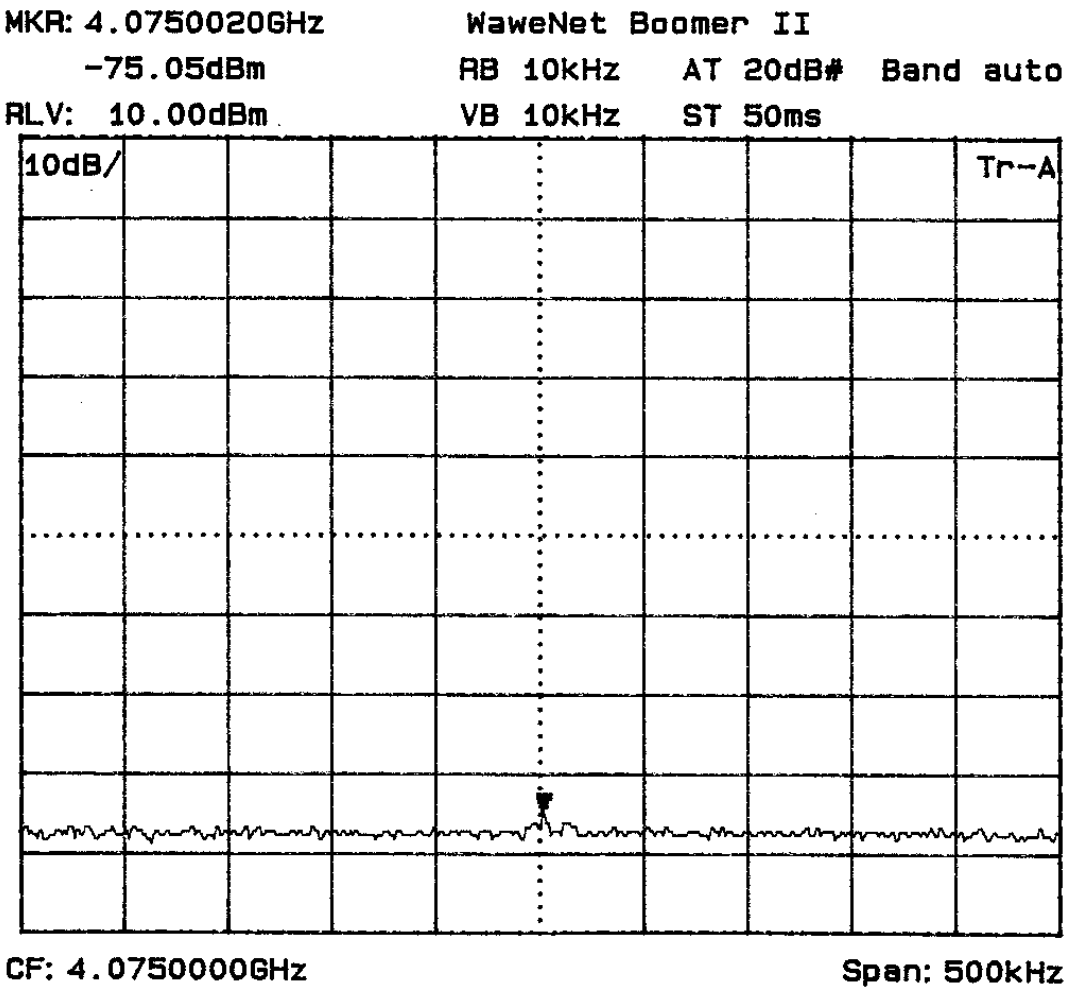

WaveNet Boomer II
Spurious Emissions from Transmitter @ Antenna Terminal
Modulation: RD-LAP 9.6 kbps, Mask G, 5th harmonic

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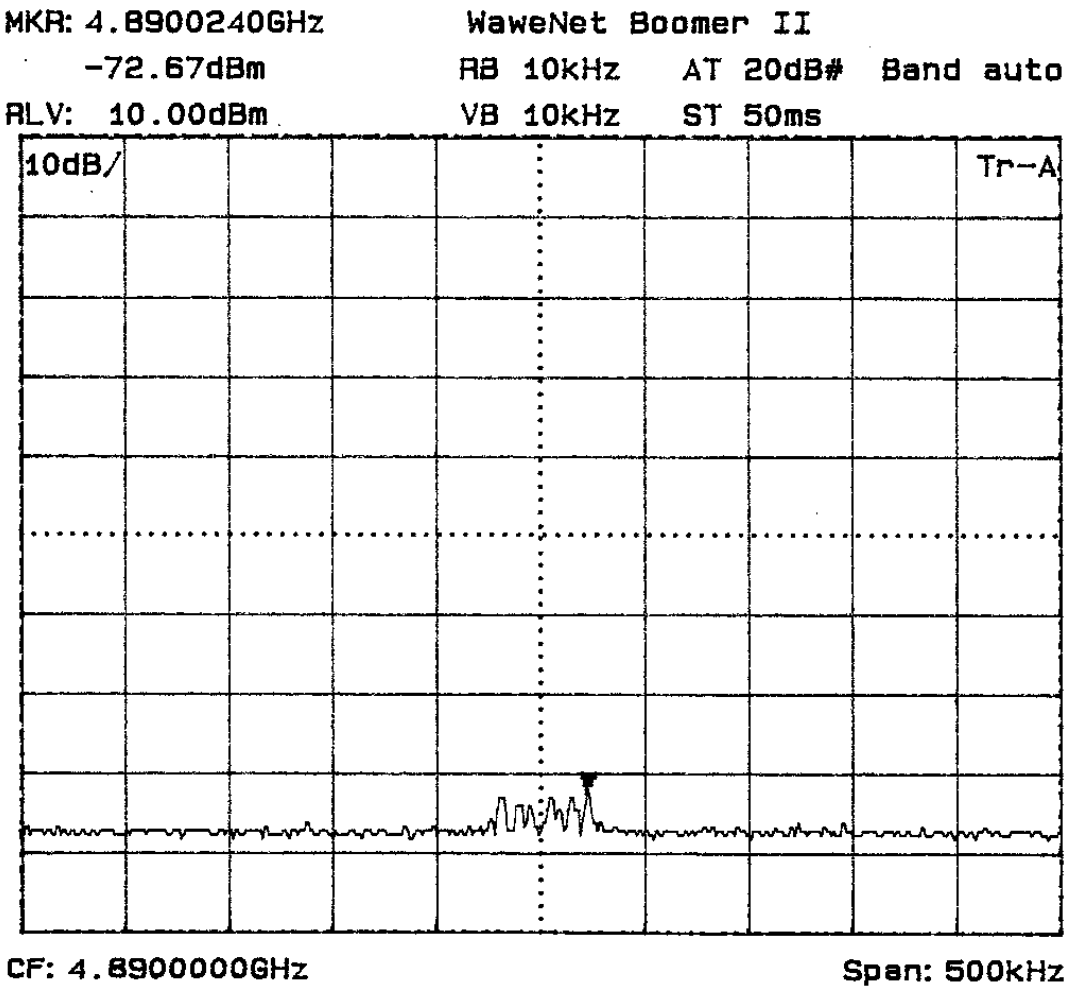

WaveNet Boomer II
Spurious Emissions from Transmitter @ Antenna Terminal
Modulation: RD-LAP 9.6 kbps, Mask G, 6th harmonic

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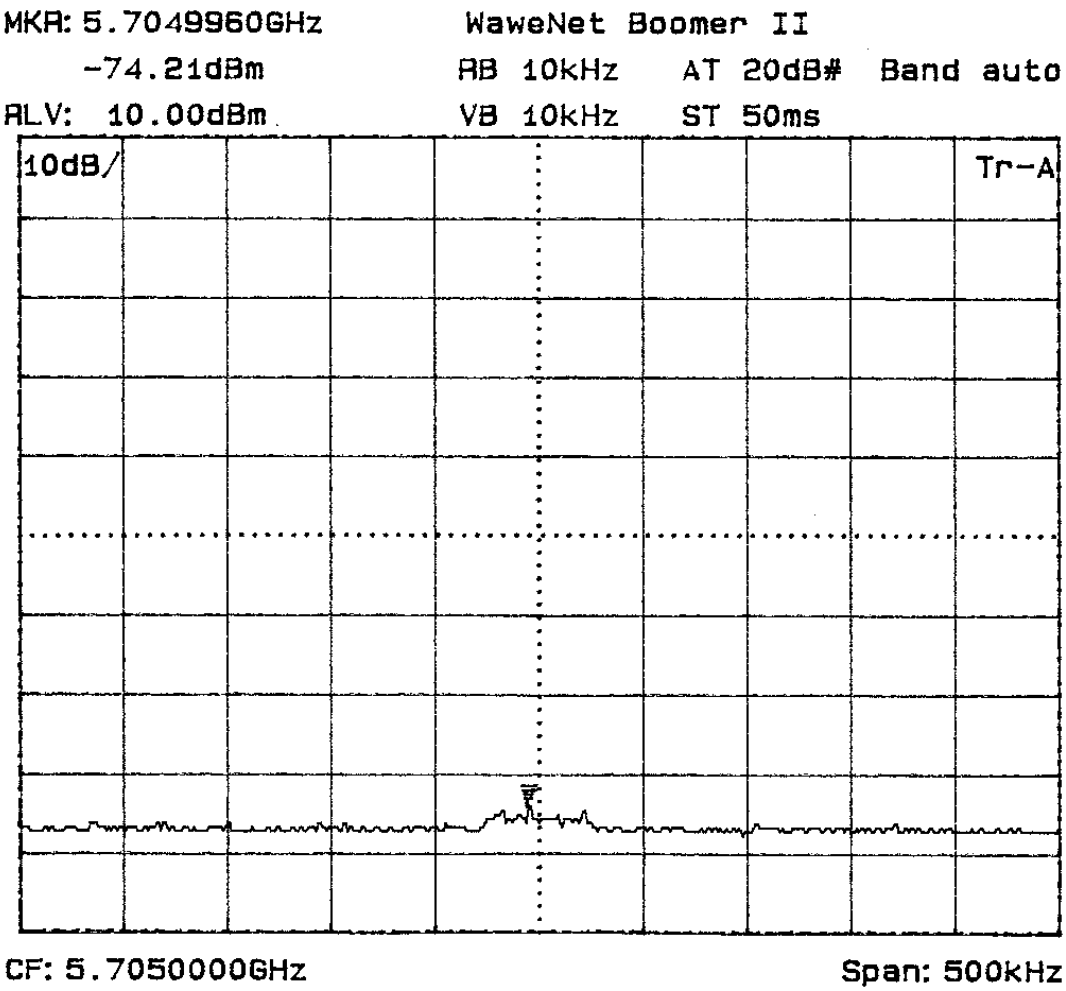

WaveNet Boomer II
Spurious Emissions from Transmitter @ Antenna Terminal
Modulation: RD-LAP 9.6 kbps, Mask G, 7th harmonic

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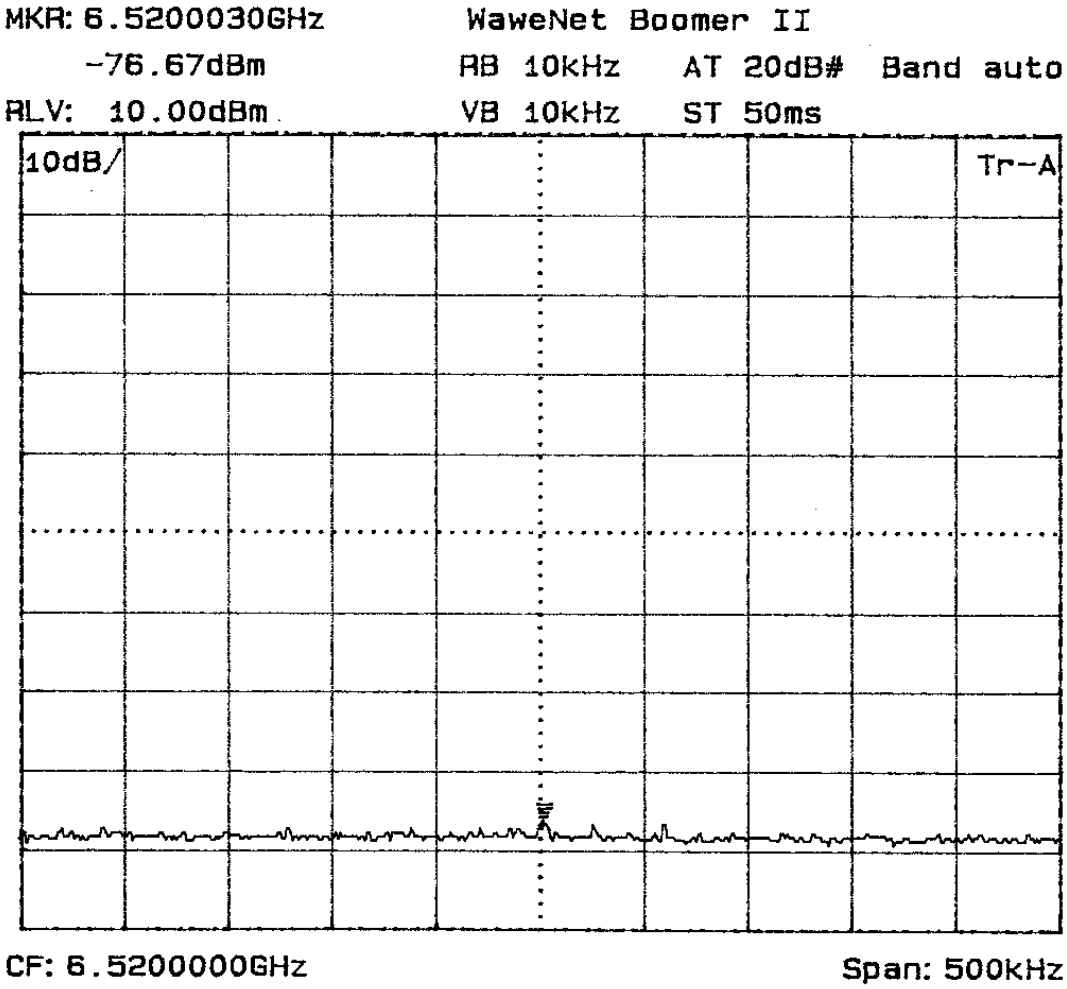

WaveNet Boomer II
Spurious Emissions from Transmitter @ Antenna Terminal
Modulation: RD-LAP 9.6 kbps, Mask G, 8th harmonic

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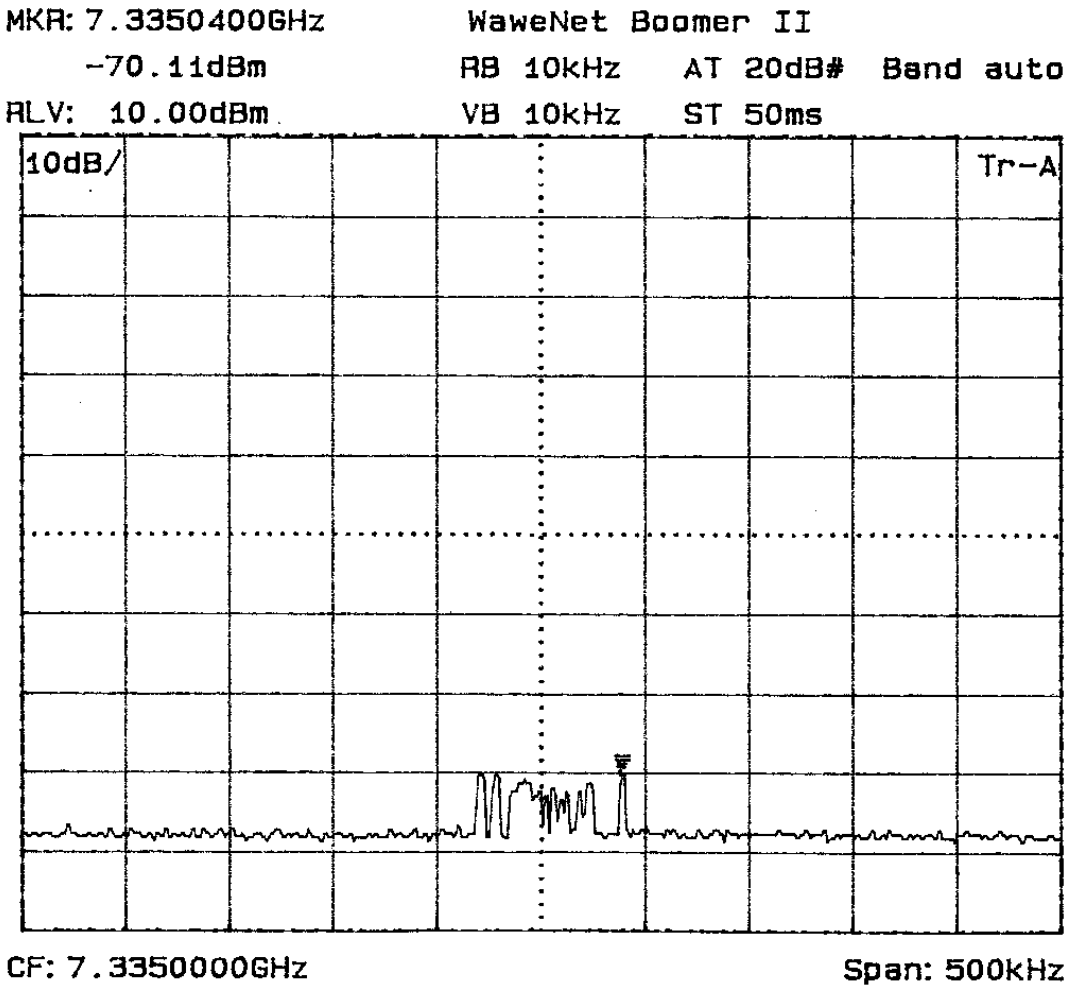

WaveNet Boomer II
Spurious Emissions from Transmitter @ Antenna Terminal
Modulation: RD-LAP 9.6 kbps, Mask G, 9th harmonic

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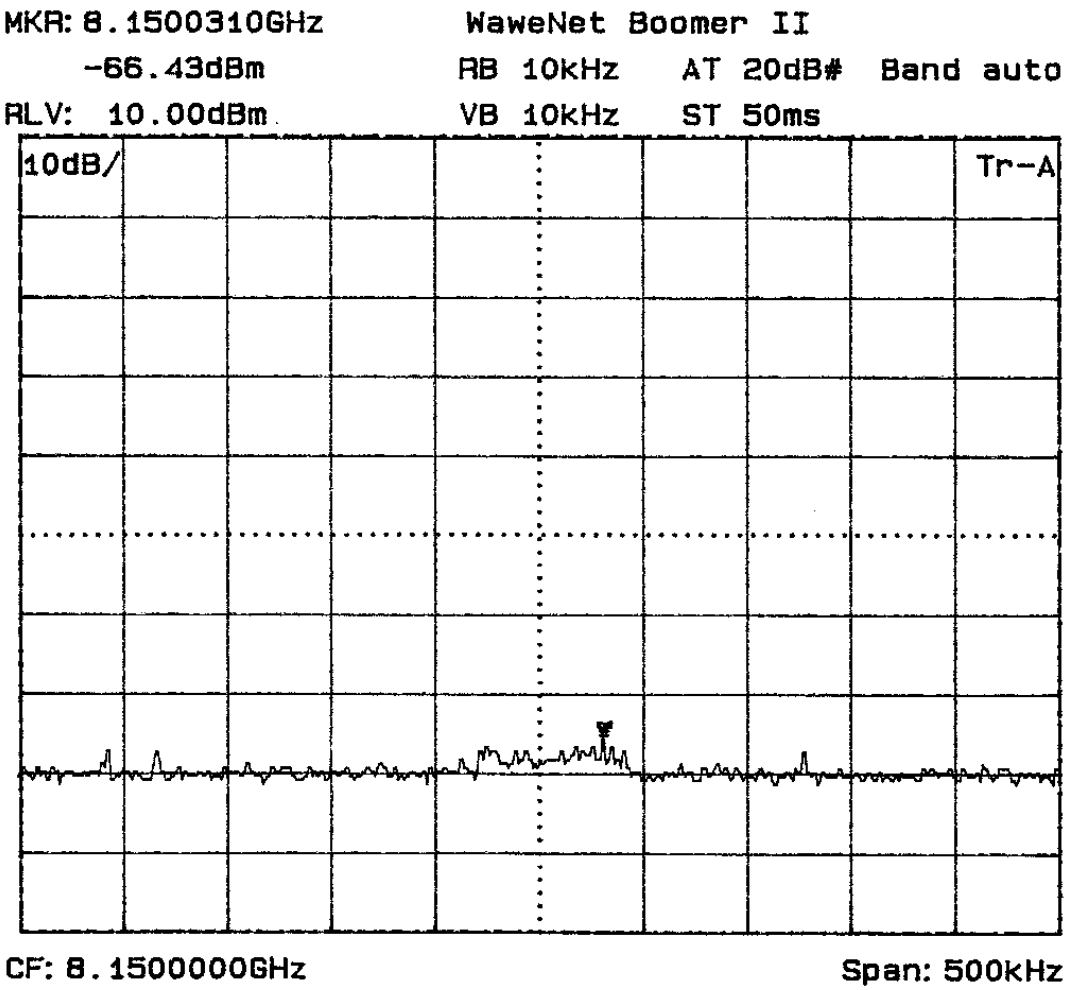

WaveNet Boomer II
Spurious Emissions from Transmitter @ Antenna Terminal
Modulation: RD-LAP 9.6 kbps, Mask G, 10th harmonic

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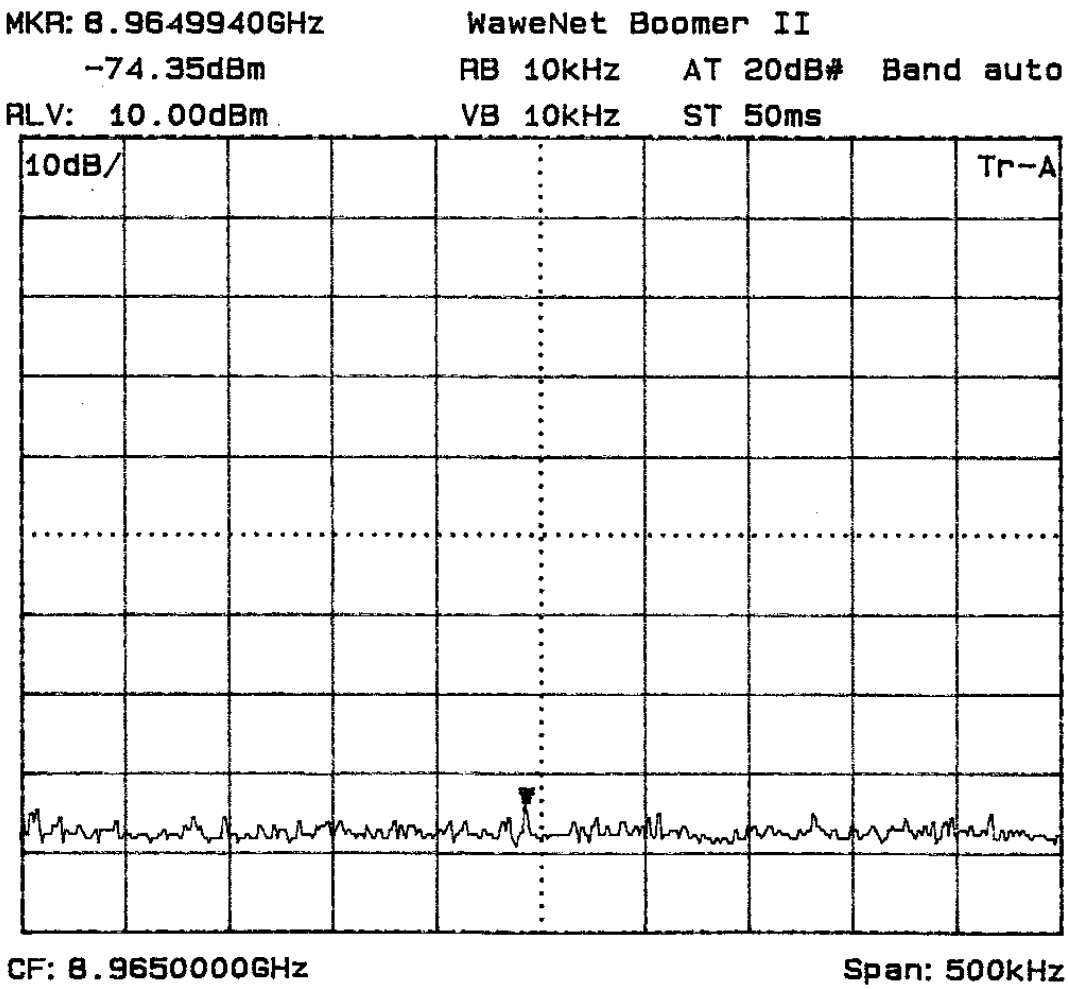

WaveNet Boomer II
Spurious Emissions from Transmitter @ Antenna Terminal
Modulation: RD-LAP 9.6 kbps, Mask G, 11th harmonic

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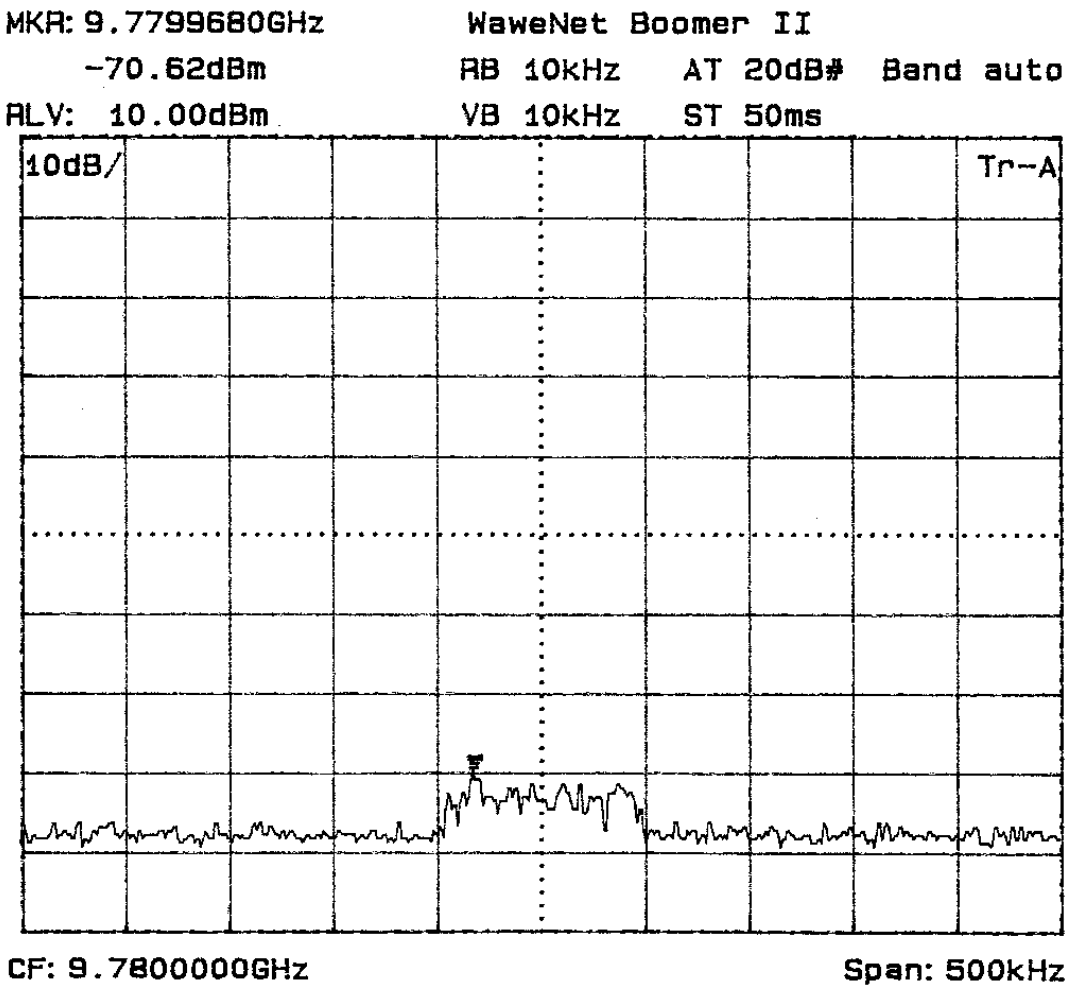

WaveNet Boomer II
Spurious Emissions from Transmitter @ Antenna Terminal
Modulation: RD-LAP 9.6 kbps, Mask G, 12th harmonic

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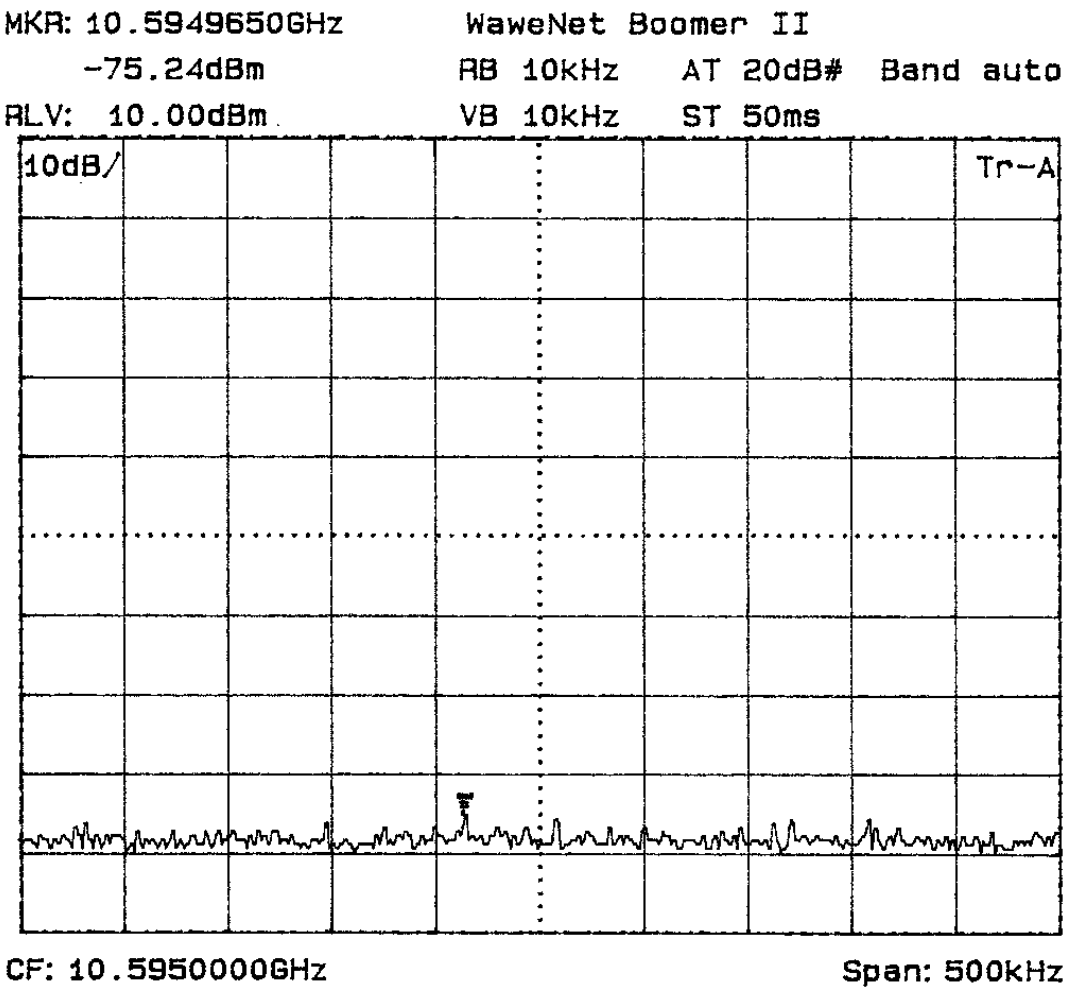

WaveNet Boomer II
Spurious Emissions from Transmitter @ Antenna Terminal
Modulation: RD-LAP 9.6 kbps, Mask G, 13th harmonic

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Plots

Spurious Emissions
at Antenna Terminal - Plots
Frequency Band: 806-821 MHz
Mask G
MDC 4.8 kbps

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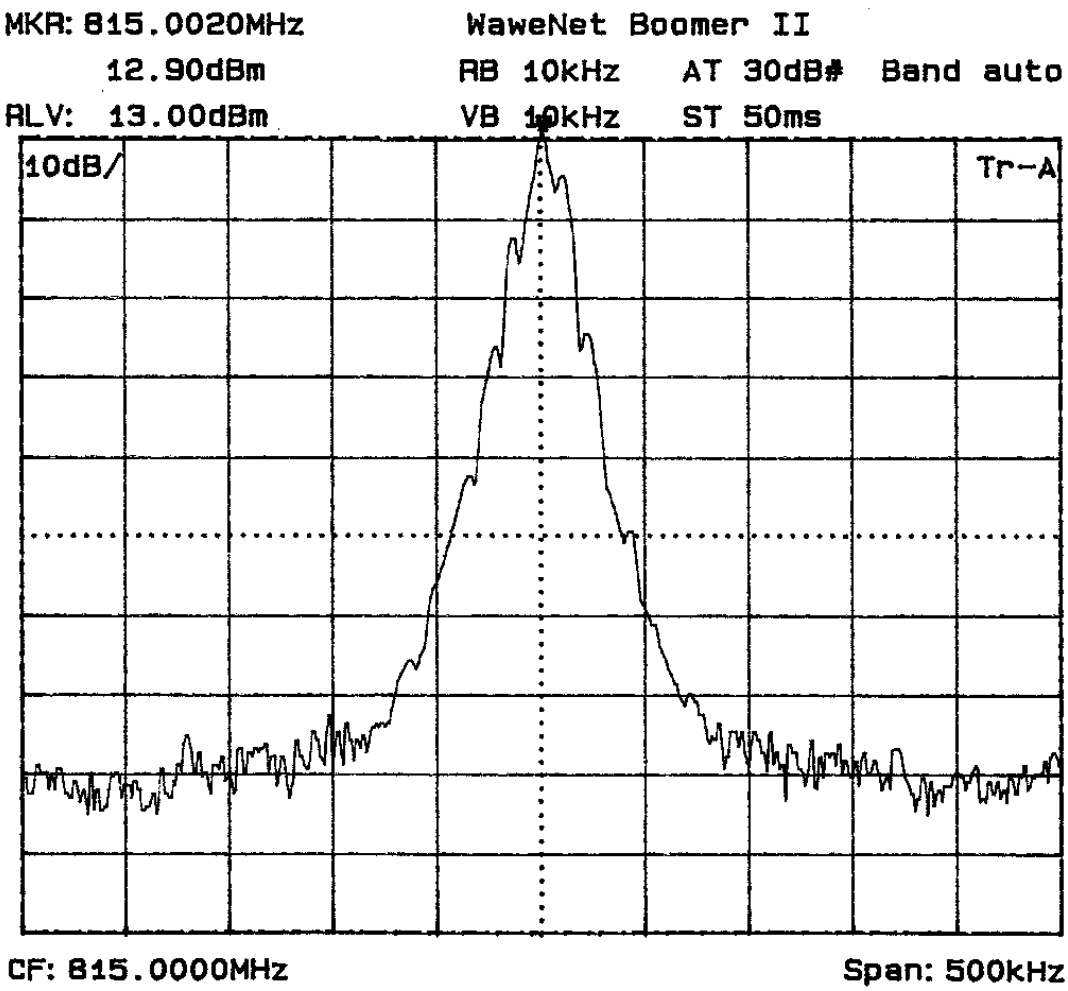

WaveNet Boomer II
Spurious Emissions from Transmitter @ Antenna Terminal
Modulation: MDC 4.8 kbps, Mask G, 1st harmonic (fundamental frequency)

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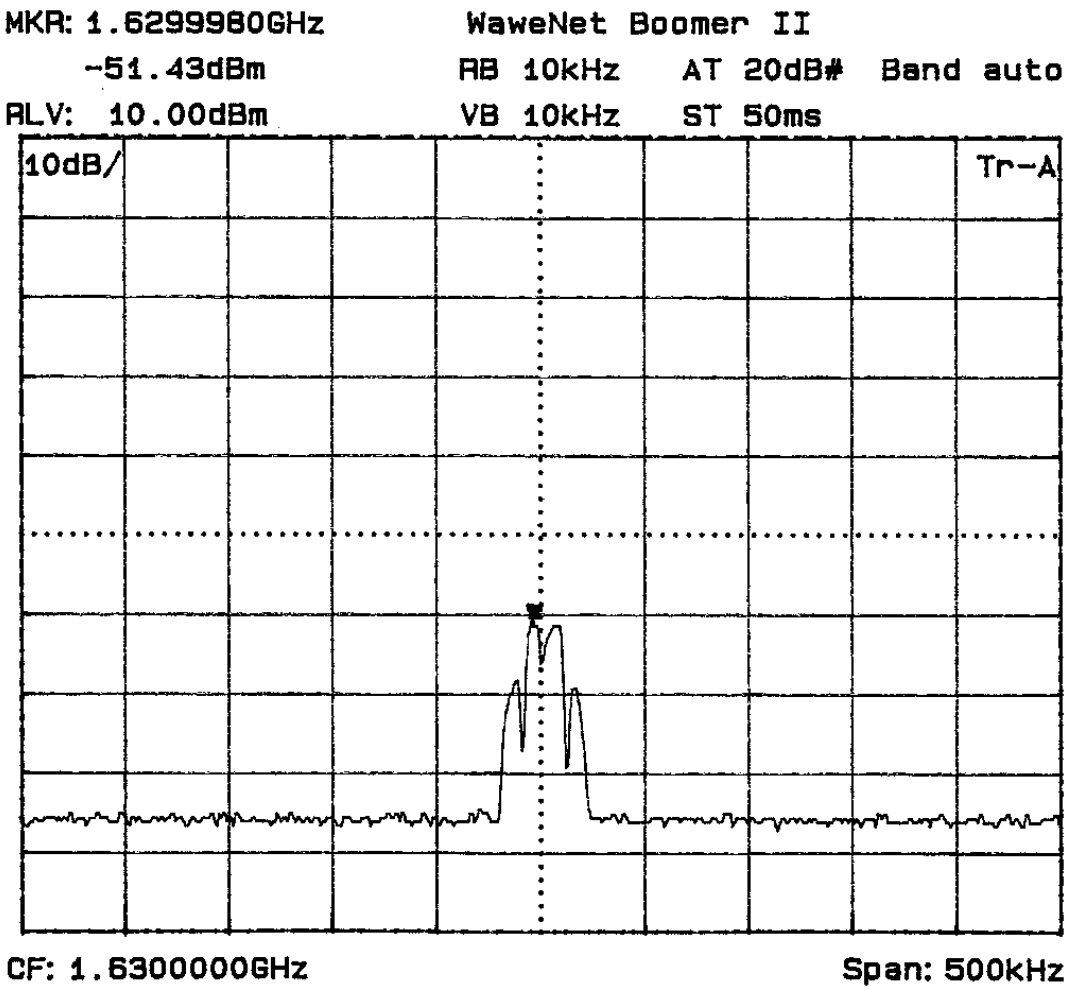

WaveNet Boomer II
Spurious Emissions from Transmitter @ Antenna Terminal
Modulation: MDC 4.8 kbps, Mask G, 2nd harmonic

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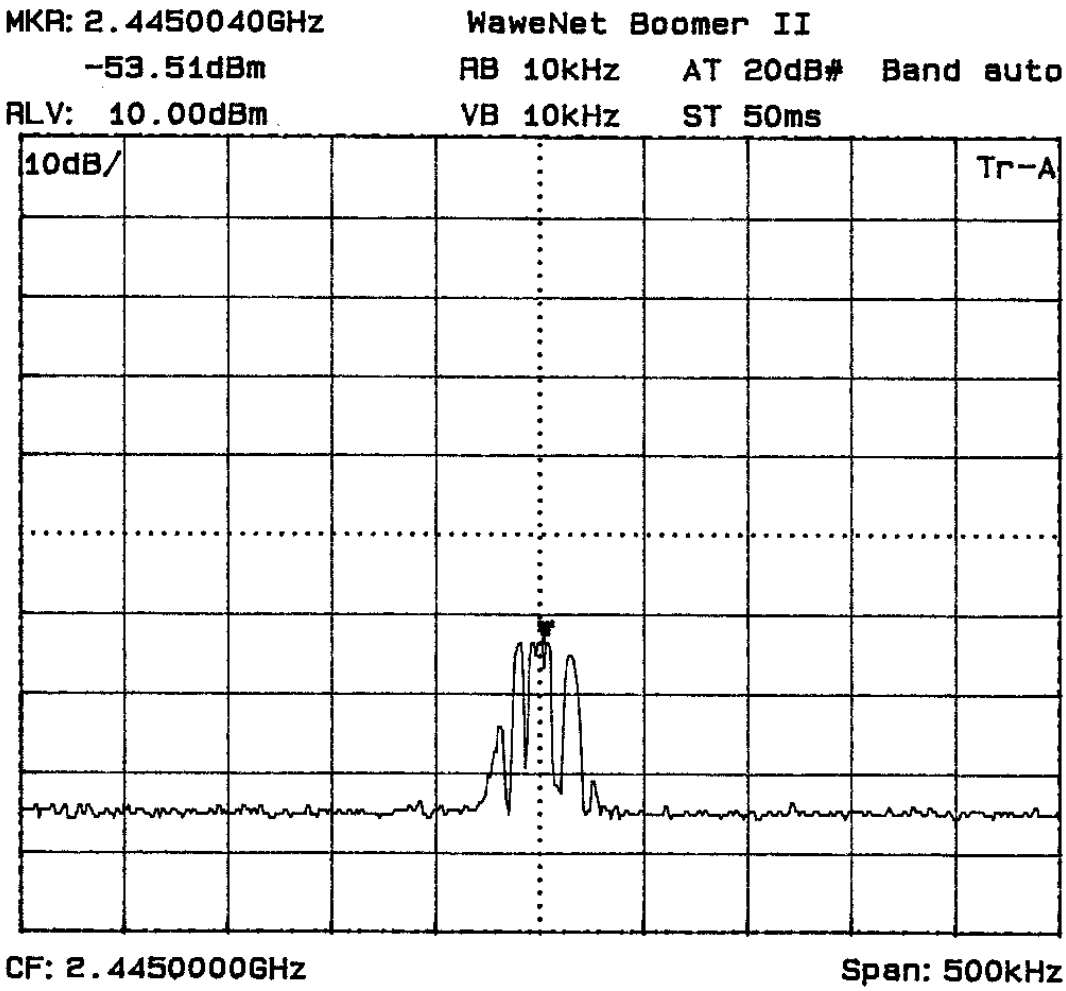

WaveNet Boomer II
Spurious Emissions from Transmitter @ Antenna Terminal
Modulation: MDC 4.8 kbps, Mask G, 3rd harmonic

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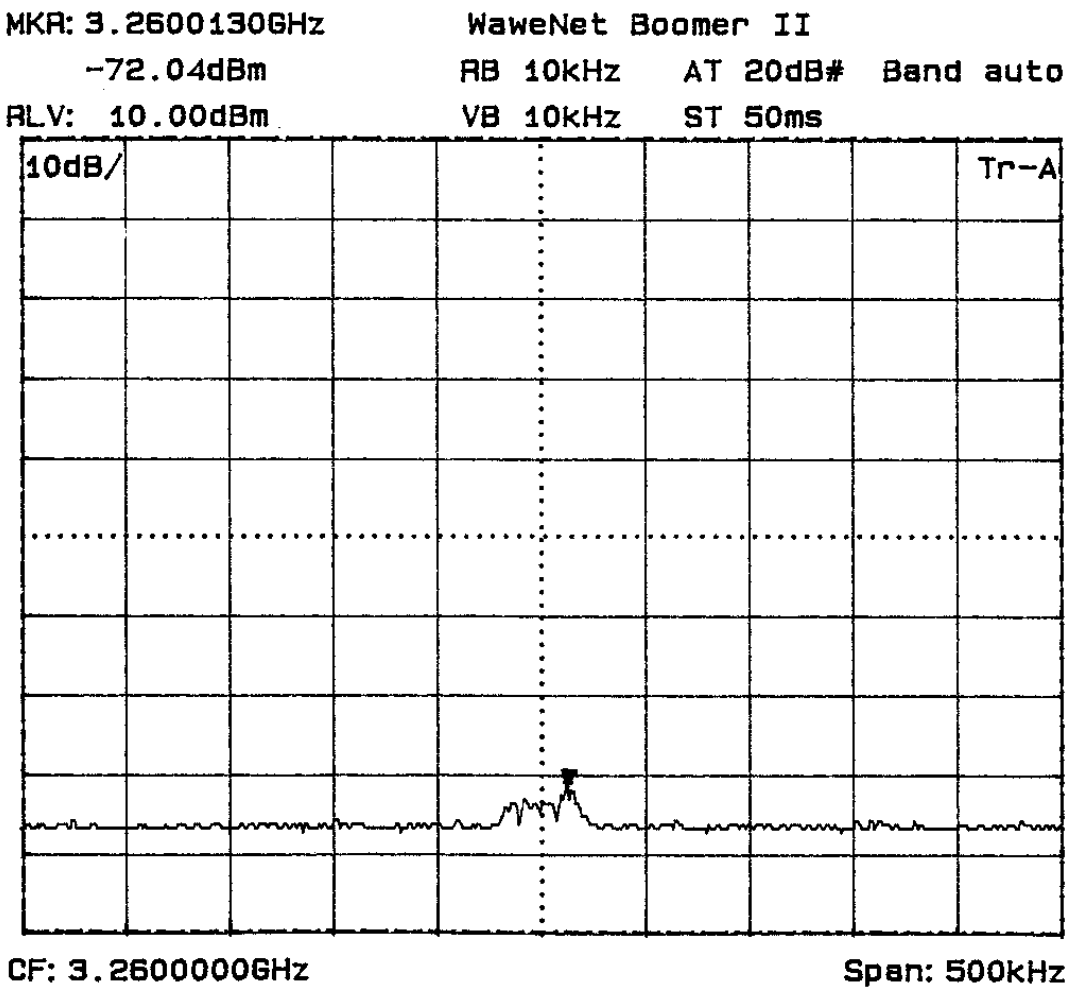

WaveNet Boomer II
Spurious Emissions from Transmitter @ Antenna Terminal
Modulation: MDC 4.8 kbps, Mask G, 4th harmonic

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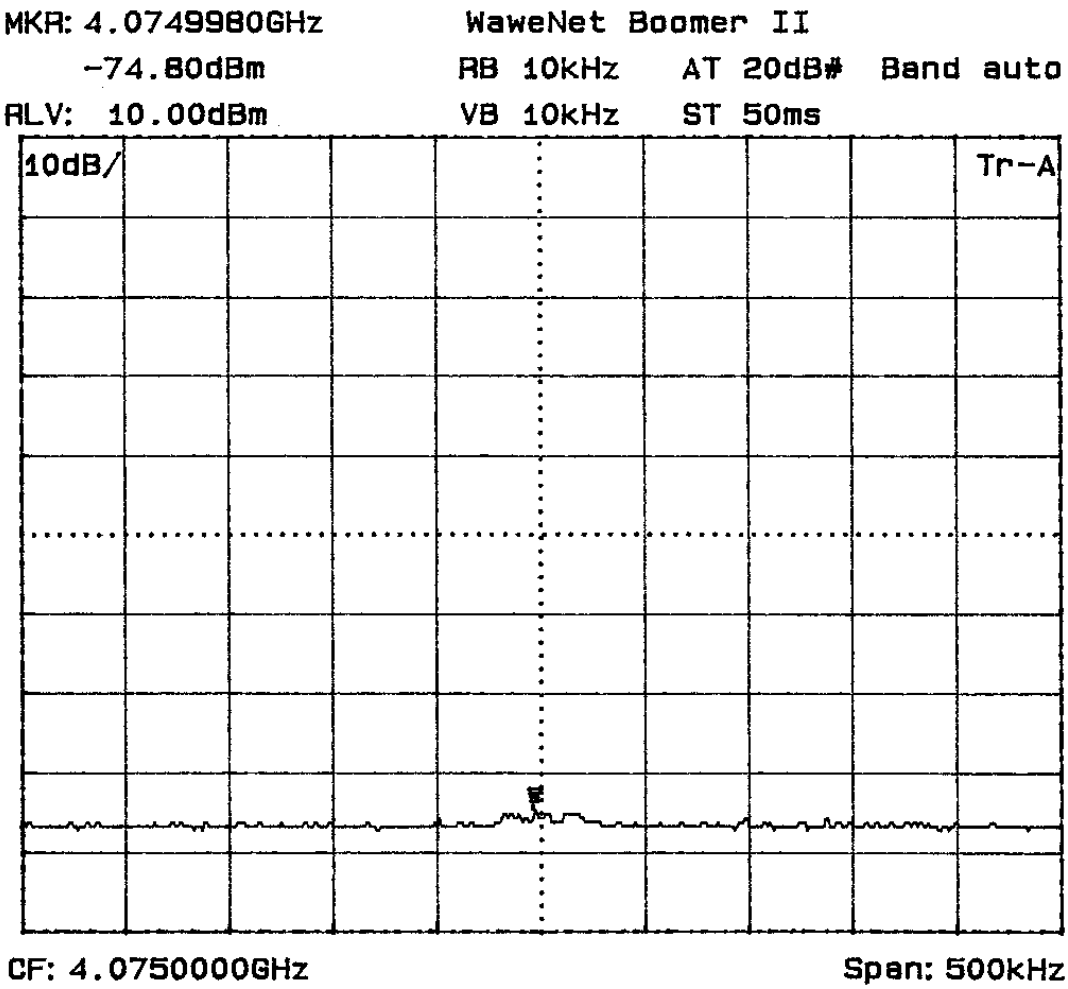

WaveNet Boomer II
Spurious Emissions from Transmitter @ Antenna Terminal
Modulation: MDC 4.8 kbps, Mask G, 5th harmonic

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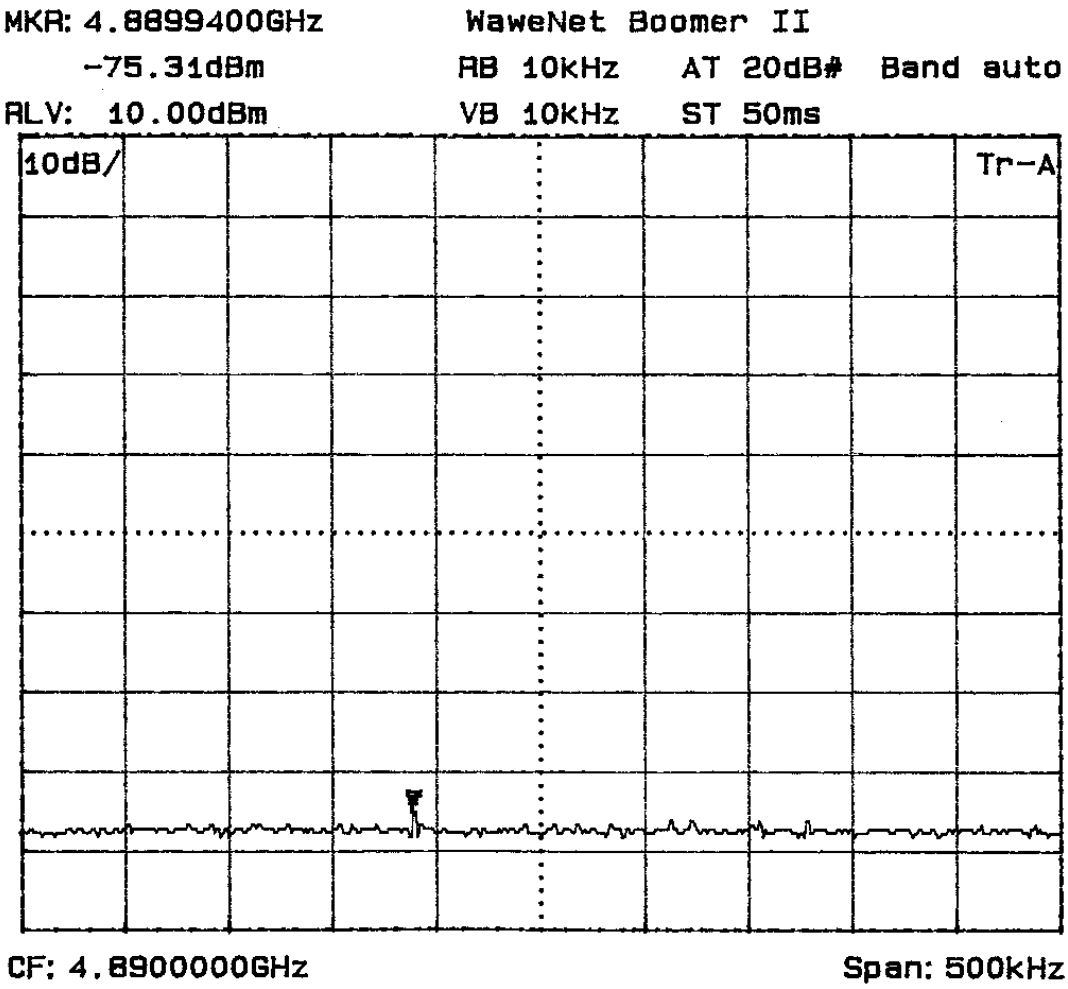

WaveNet Boomer II
Spurious Emissions from Transmitter @ Antenna Terminal
Modulation: MDC 4.8 kbps, Mask G, 6th harmonic

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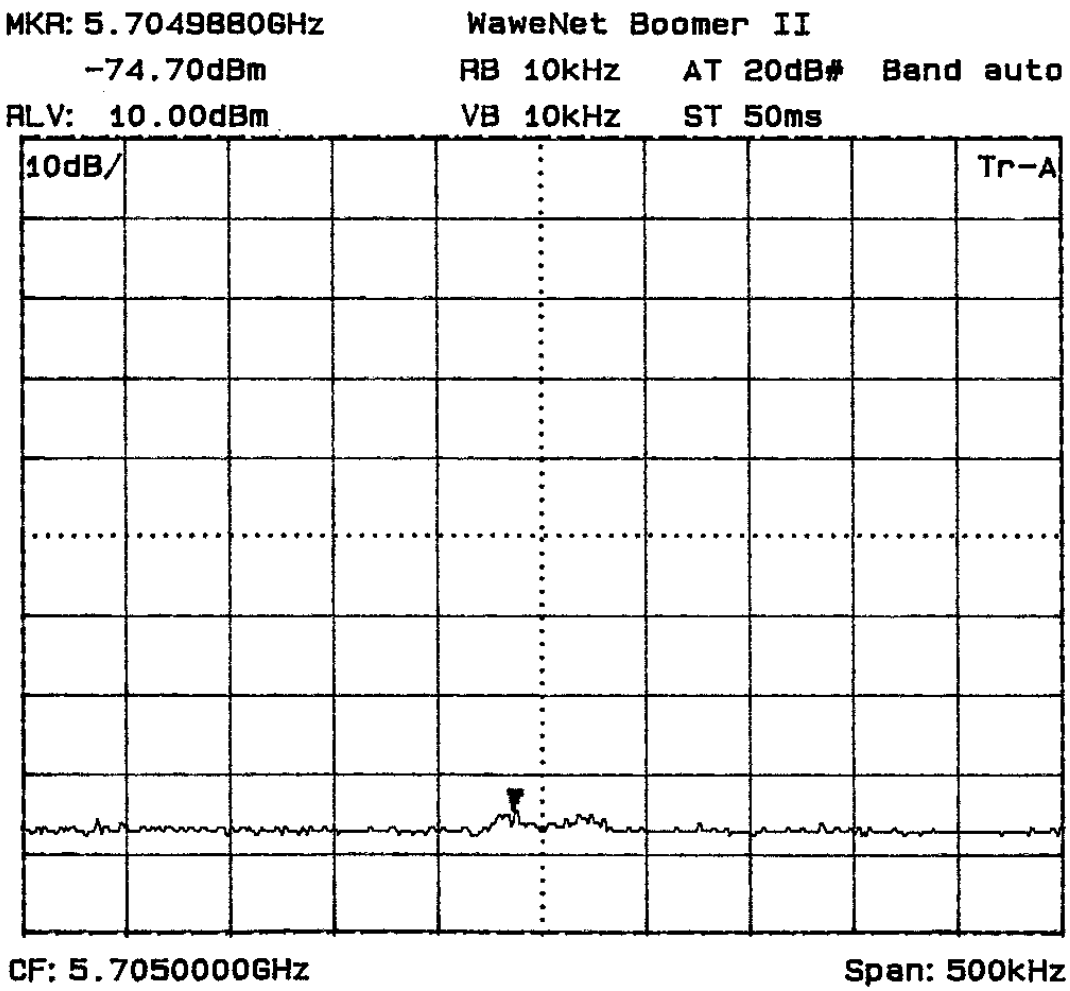

WaveNet Boomer II
Spurious Emissions from Transmitter @ Antenna Terminal
Modulation: MDC 4.8 kbps, Mask G, 7th harmonic

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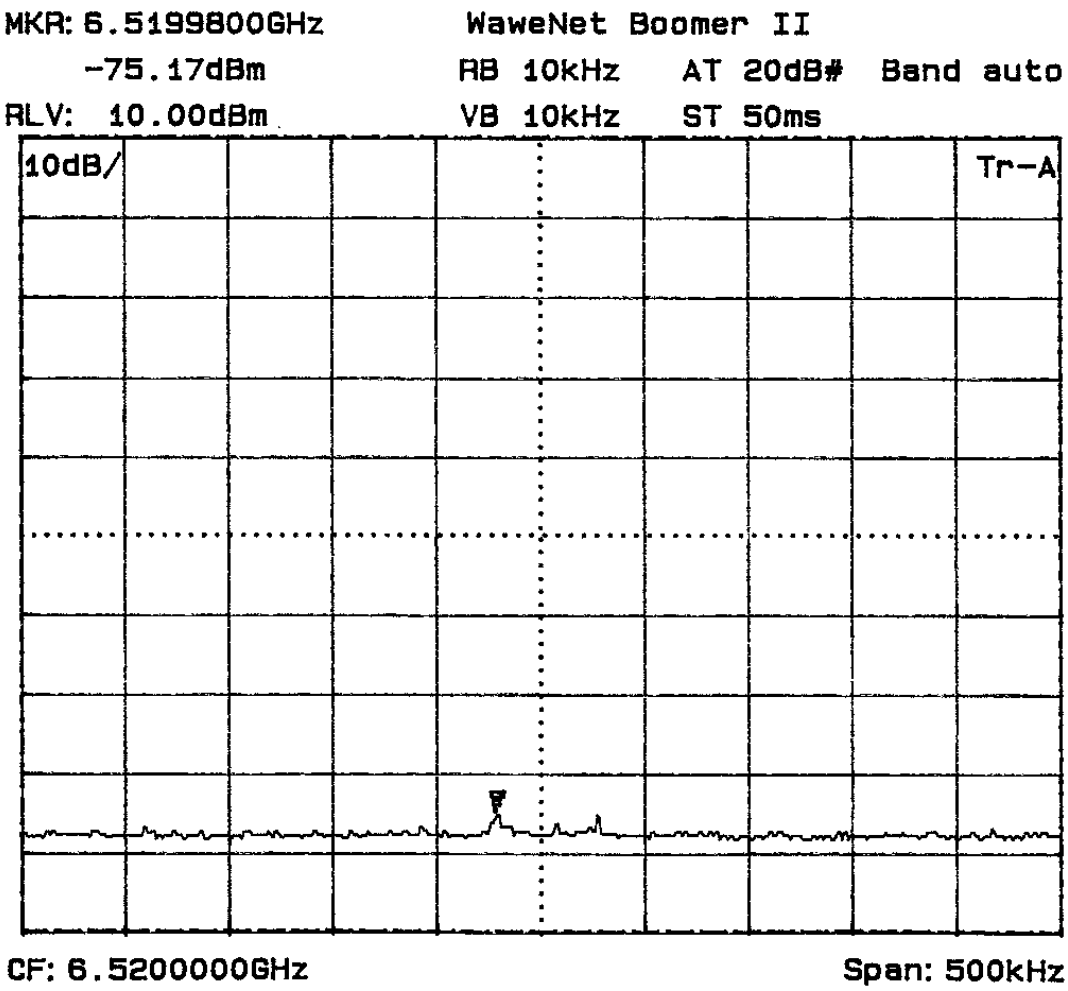

WaveNet Boomer II
Spurious Emissions from Transmitter @ Antenna Terminal
Modulation: MDC 4.8 kbps, Mask G, 8th harmonic

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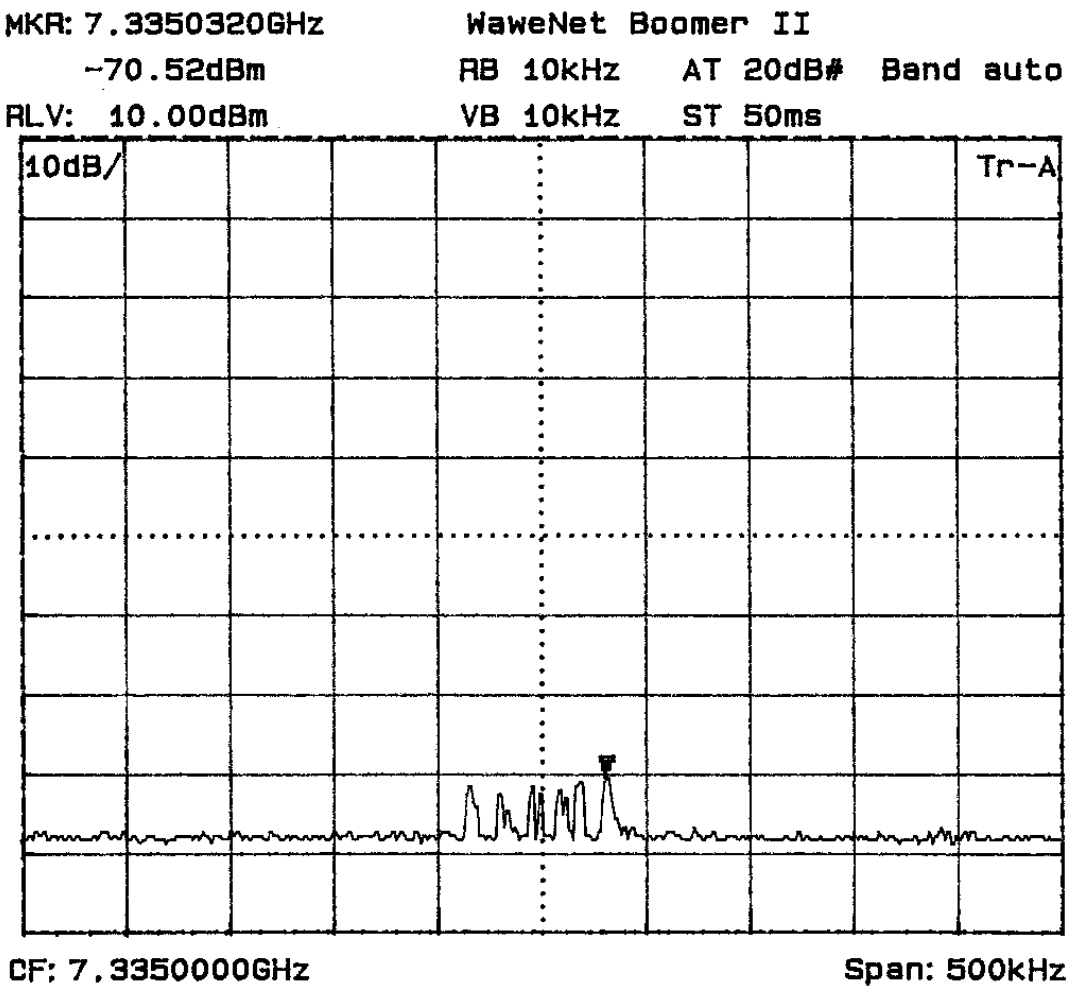

WaveNet Boomer II
Spurious Emissions from Transmitter @ Antenna Terminal
Modulation: MDC 4.8 kbps, Mask G, 9th harmonic

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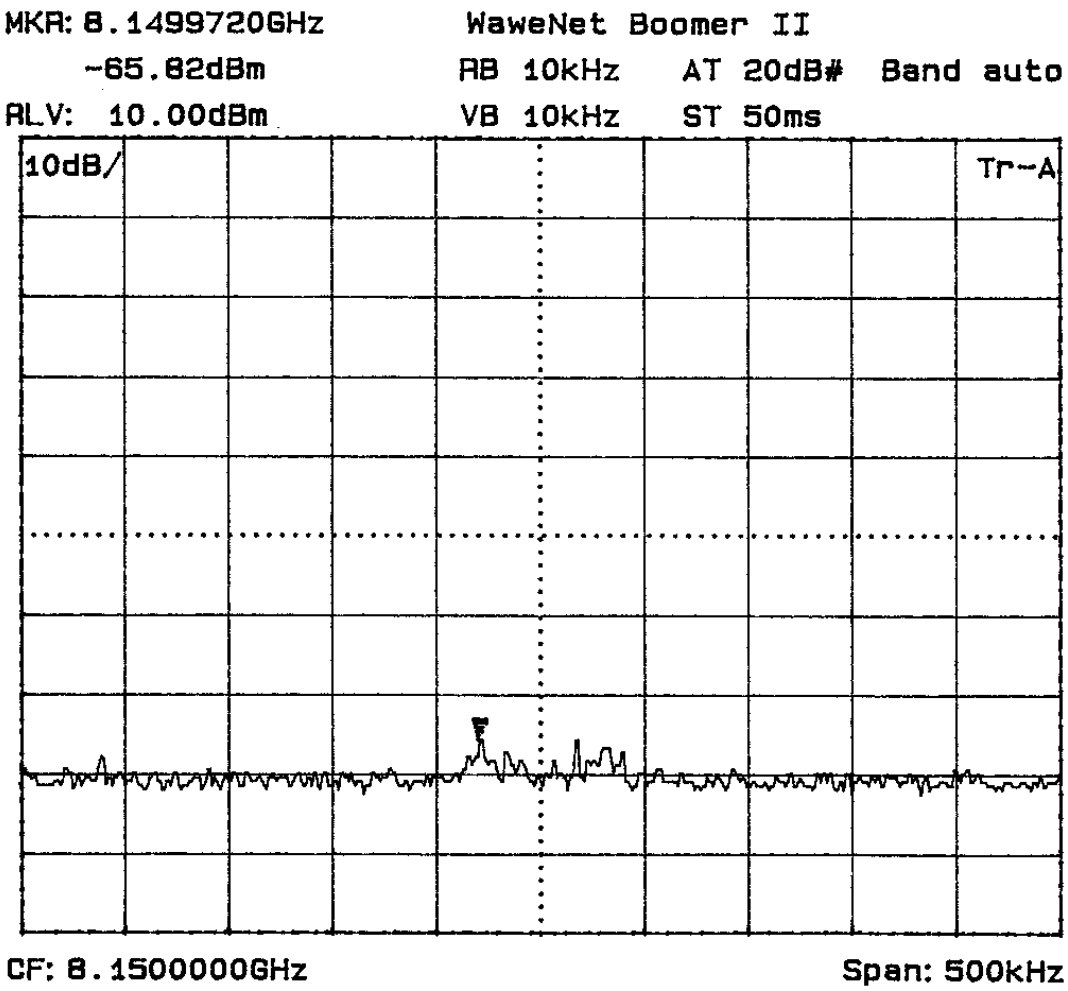

WaveNet Boomer II
Spurious Emissions from Transmitter @ Antenna Terminal
Modulation: MDC 4.8 kbps, Mask G, 10th harmonic

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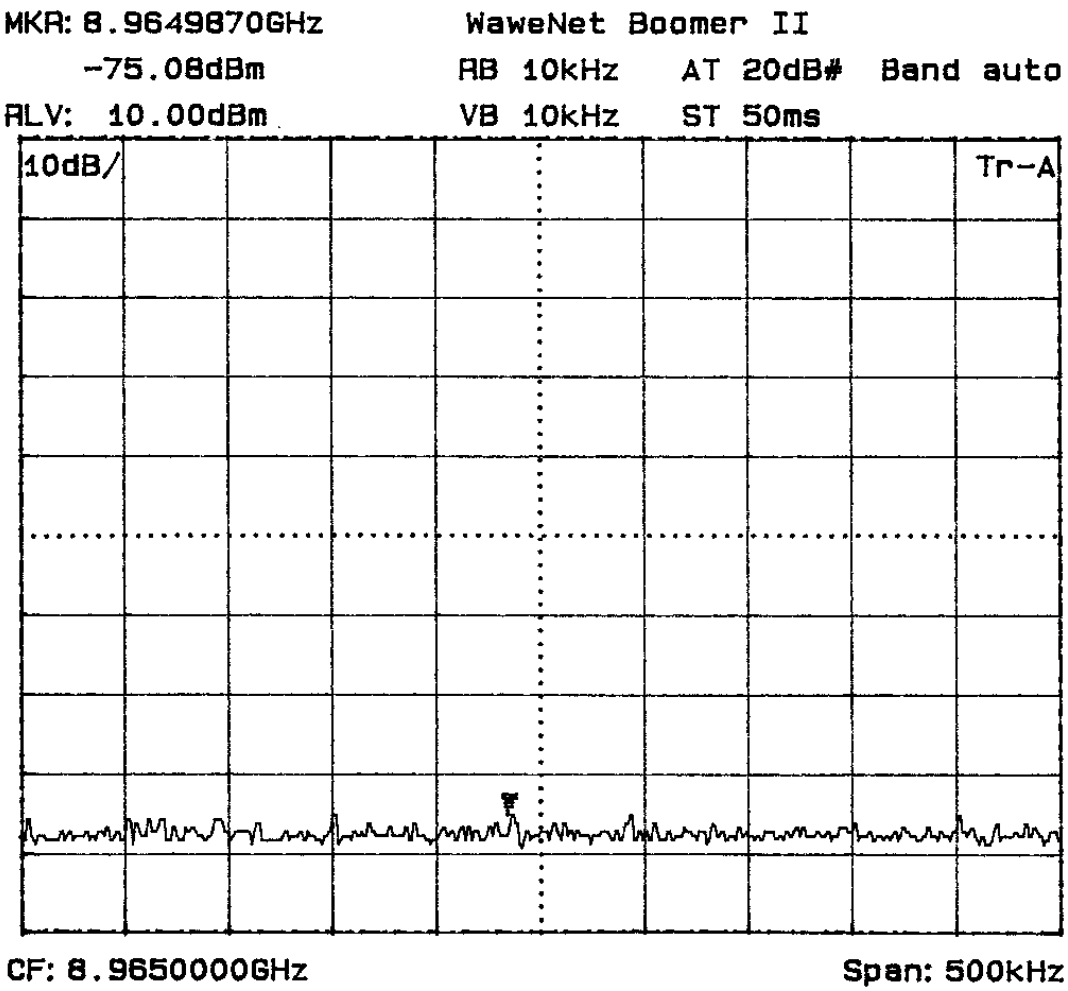

WaveNet Boomer II
Spurious Emissions from Transmitter @ Antenna Terminal
Modulation: MDC 4.8 kbps, Mask G, 11th harmonic

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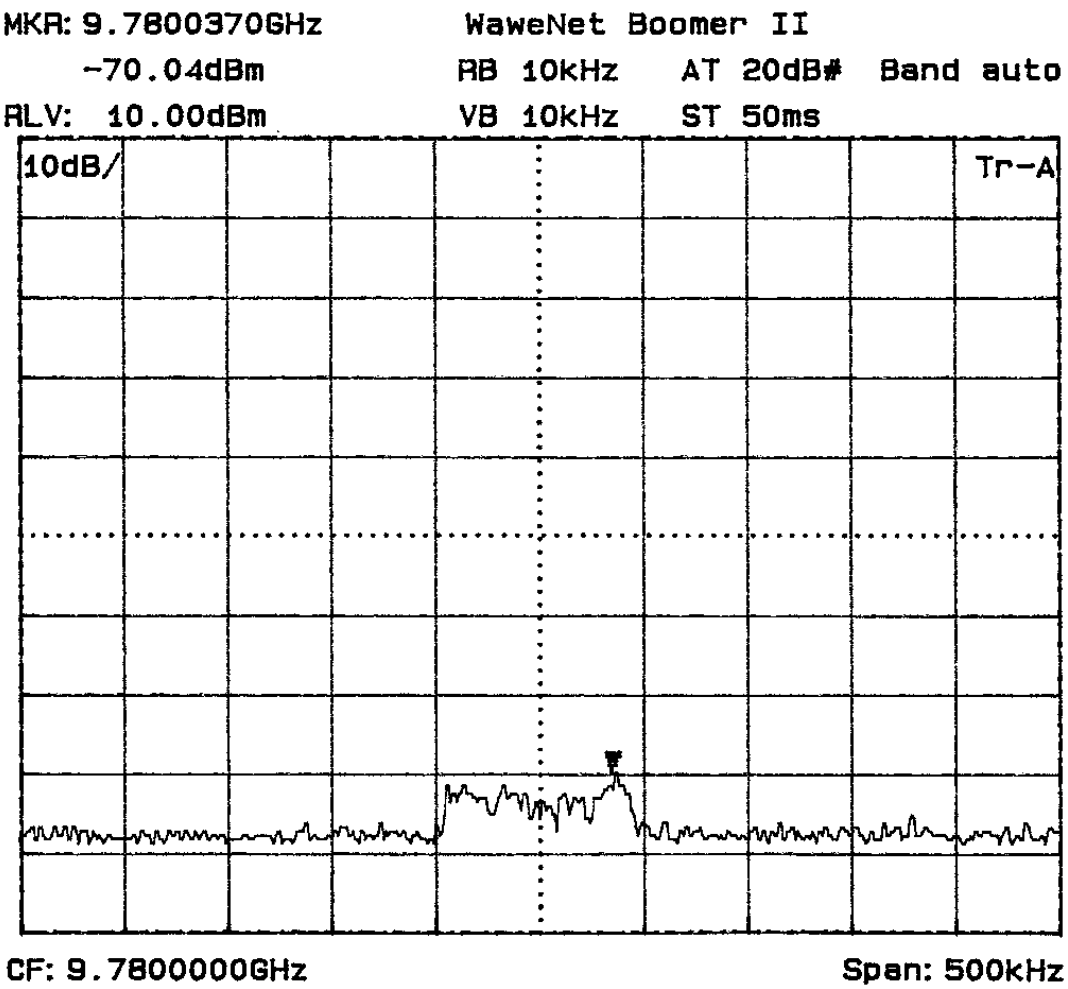

WaveNet Boomer II
Spurious Emissions from Transmitter @ Antenna Terminal
Modulation: MDC 4.8 kbps, Mask G, 12th harmonic

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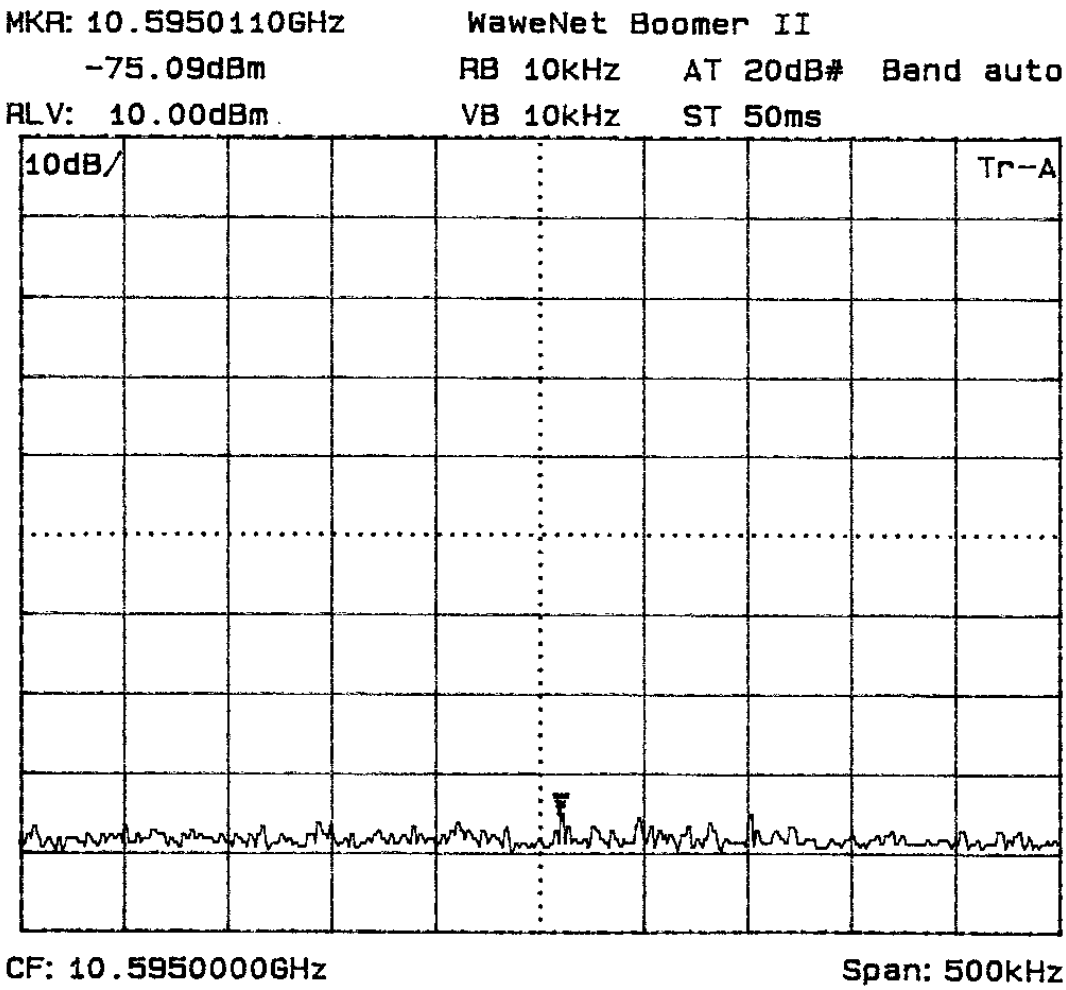

WaveNet Boomer II
Spurious Emissions from Transmitter @ Antenna Terminal
Modulation: MDC 4.8 kbps, Mask G, 13th harmonic

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Plots
Spurious Emissions at Antenna Terminal
Frequency band: 821-824 MHz
Mask H
RD-LAP 9.6 kbps

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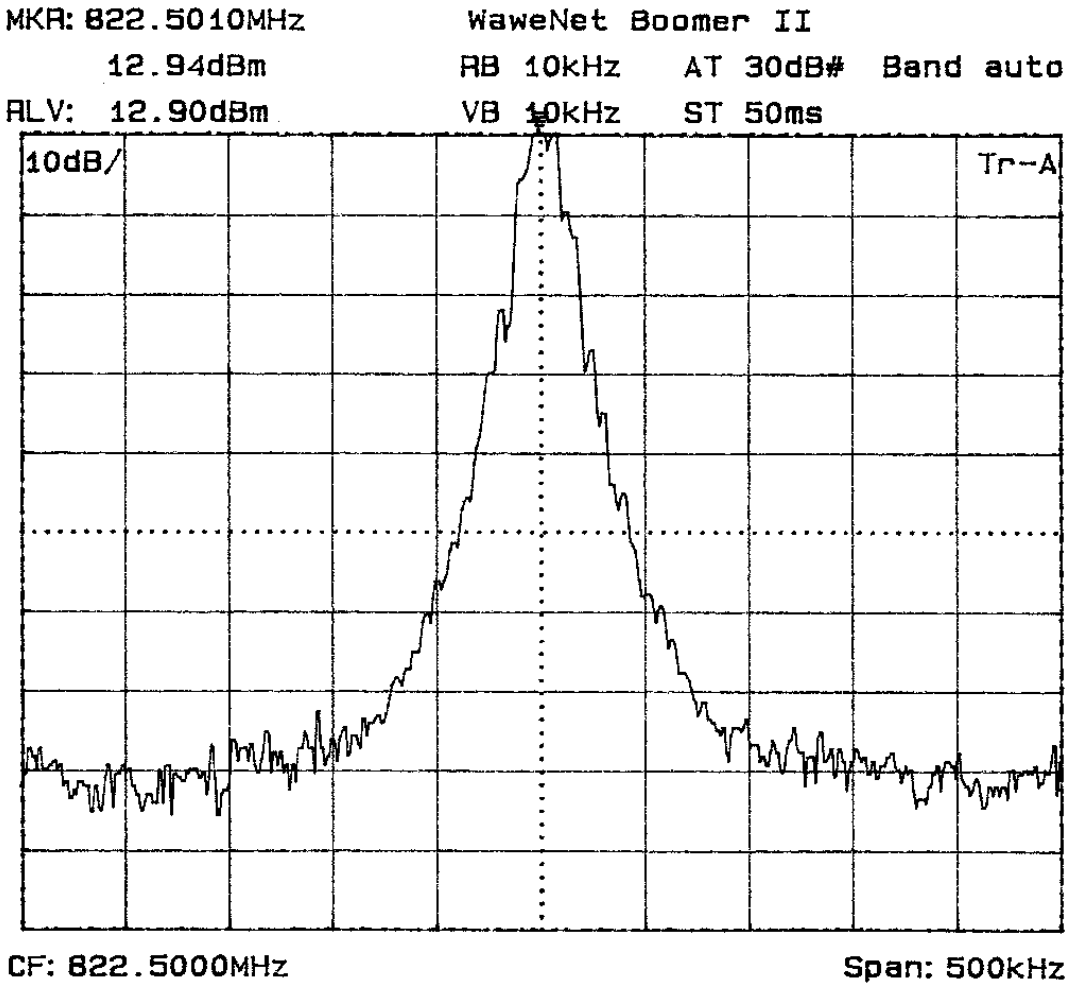

WaveNet Boomer II
Spurious Emissions from Transmitter @ Antenna Terminal
Modulation: RD-LAP 9.6 kbps, Mask H, 1st harmonic (fundamental frequency)

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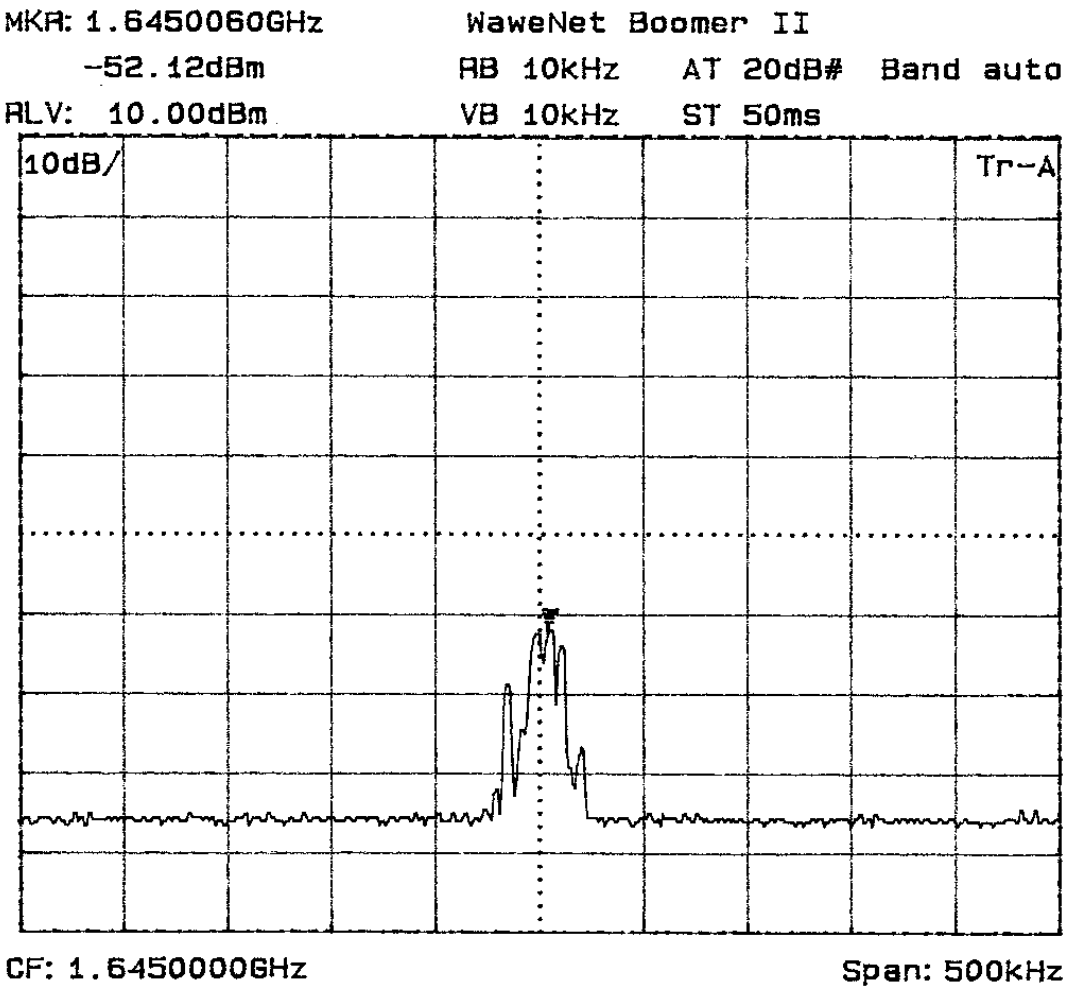

WaveNet Boomer II
Spurious Emissions from Transmitter @ Antenna Terminal
Modulation: RD-LAP 9.6 kbps, Mask H, 2nd harmonic

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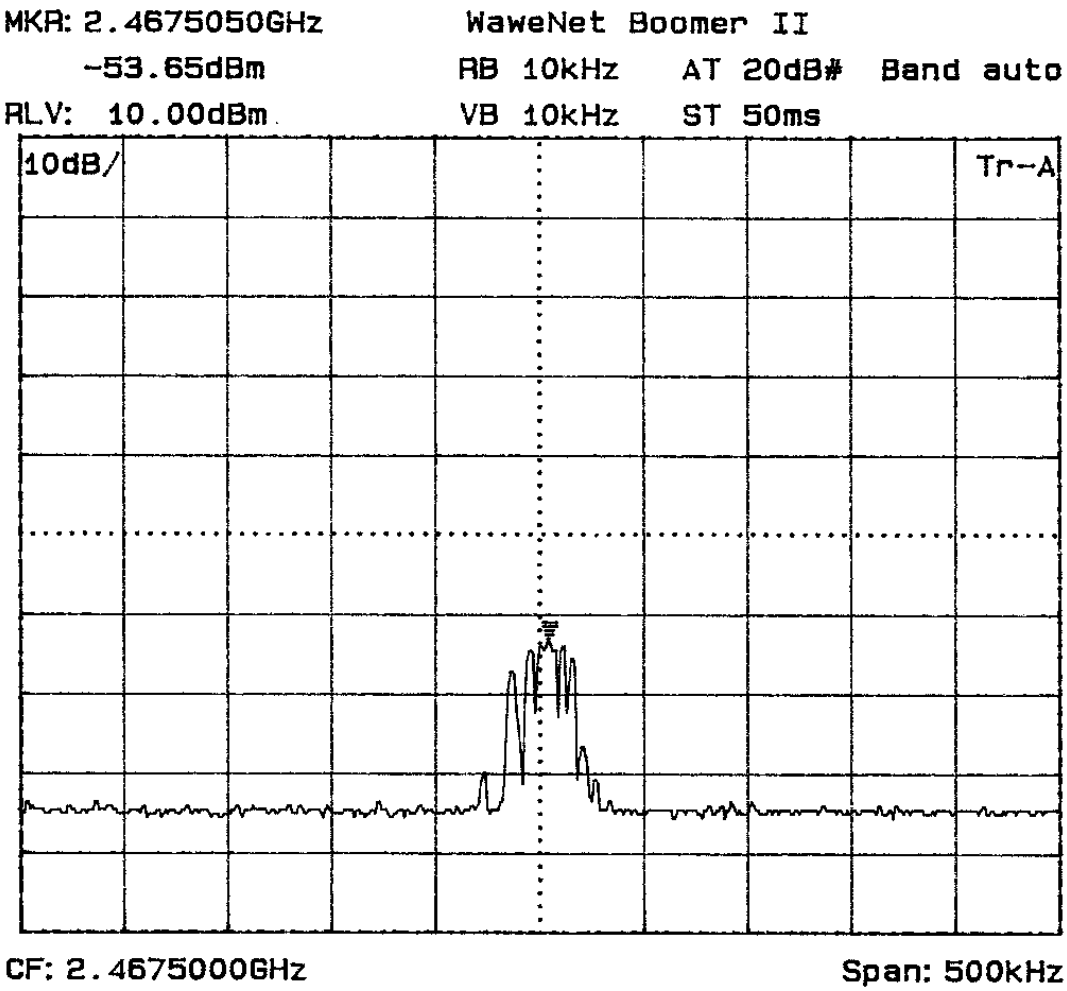

WaveNet Boomer II
Spurious Emissions from Transmitter @ Antenna Terminal
Modulation: RD-LAP 9.6 kbps, Mask H, 3rd harmonic

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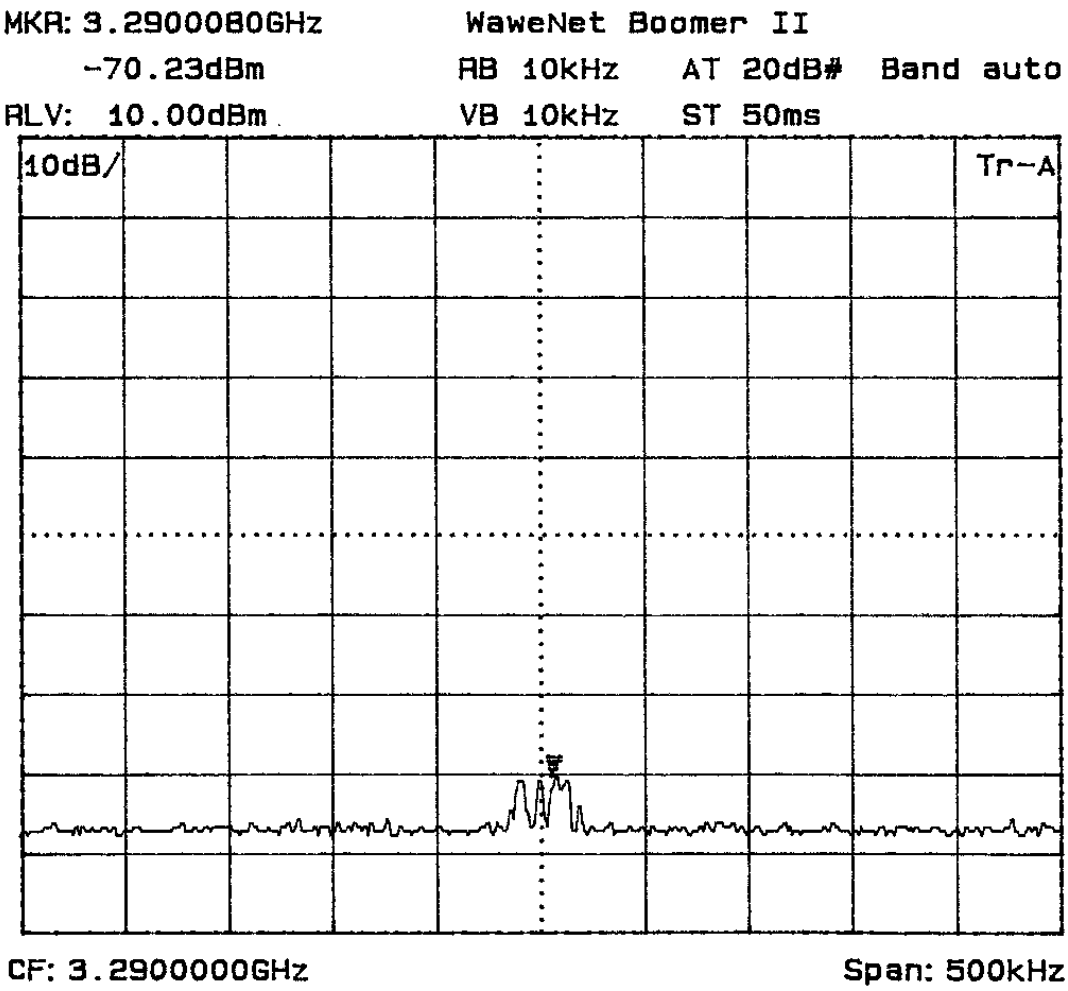

WaveNet Boomer II
Spurious Emissions from Transmitter @ Antenna Terminal
Modulation: RD-LAP 9.6 kbps, Mask H, 4th harmonic

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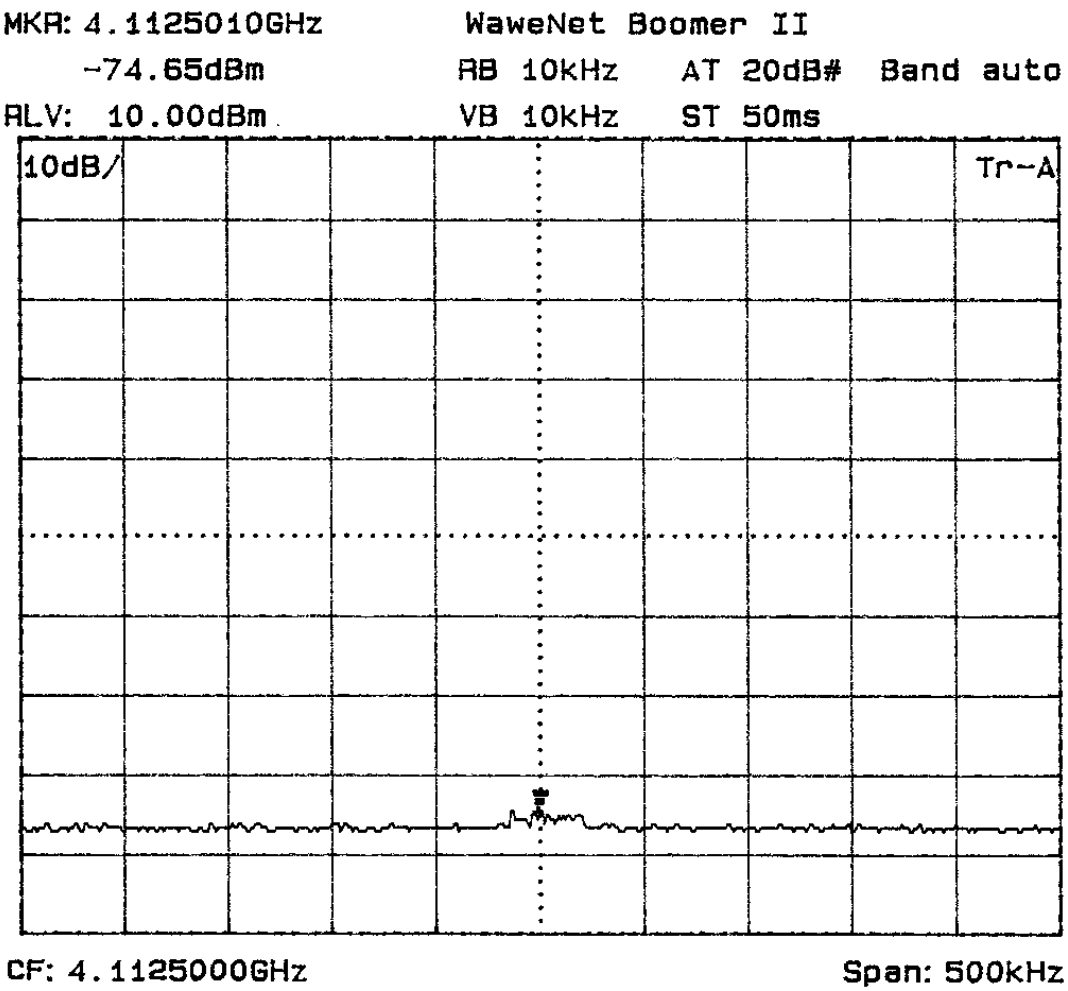

WaveNet Boomer II
Spurious Emissions from Transmitter @ Antenna Terminal
Modulation: RD-LAP 9.6 kbps, Mask H, 5th harmonic

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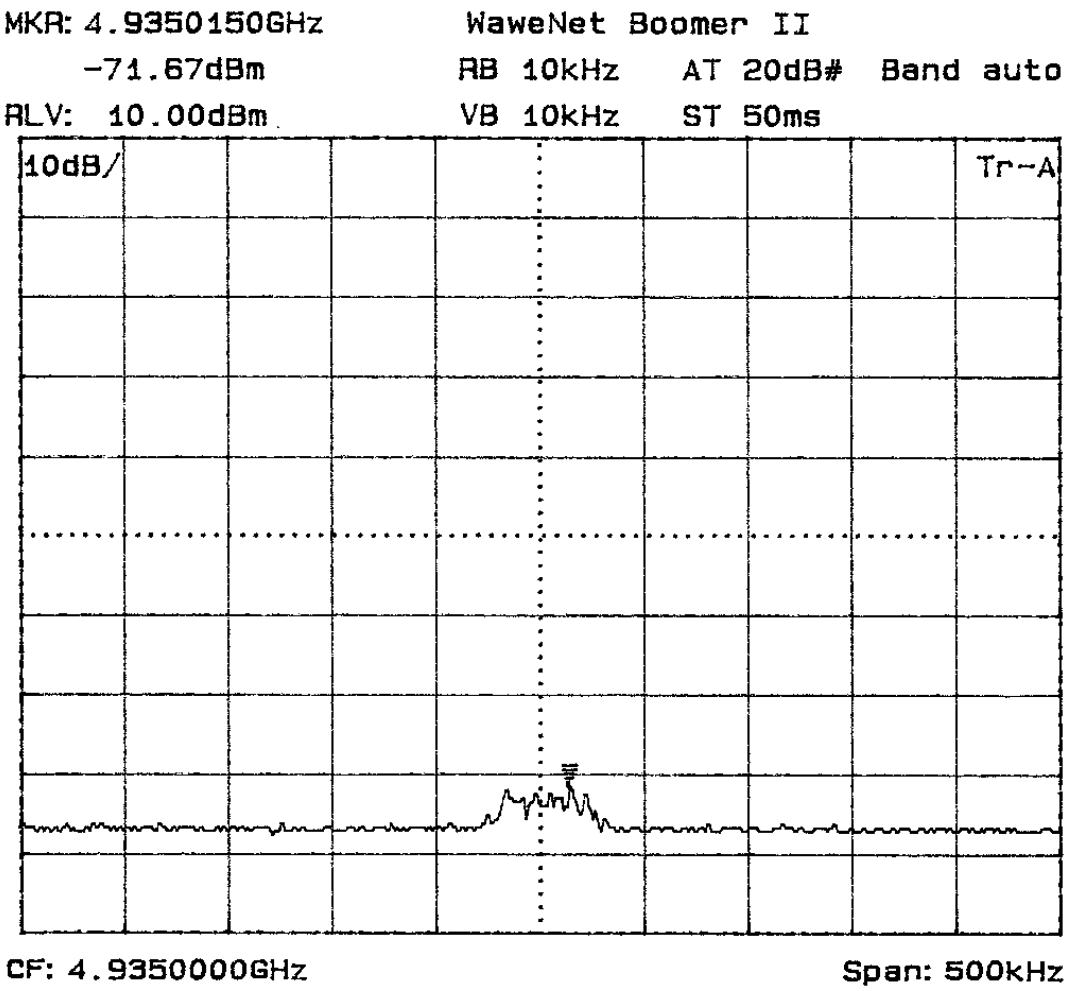

WaveNet Boomer II
Spurious Emissions from Transmitter @ Antenna Terminal
Modulation: RD-LAP 9.6 kbps, Mask H, 6th harmonic

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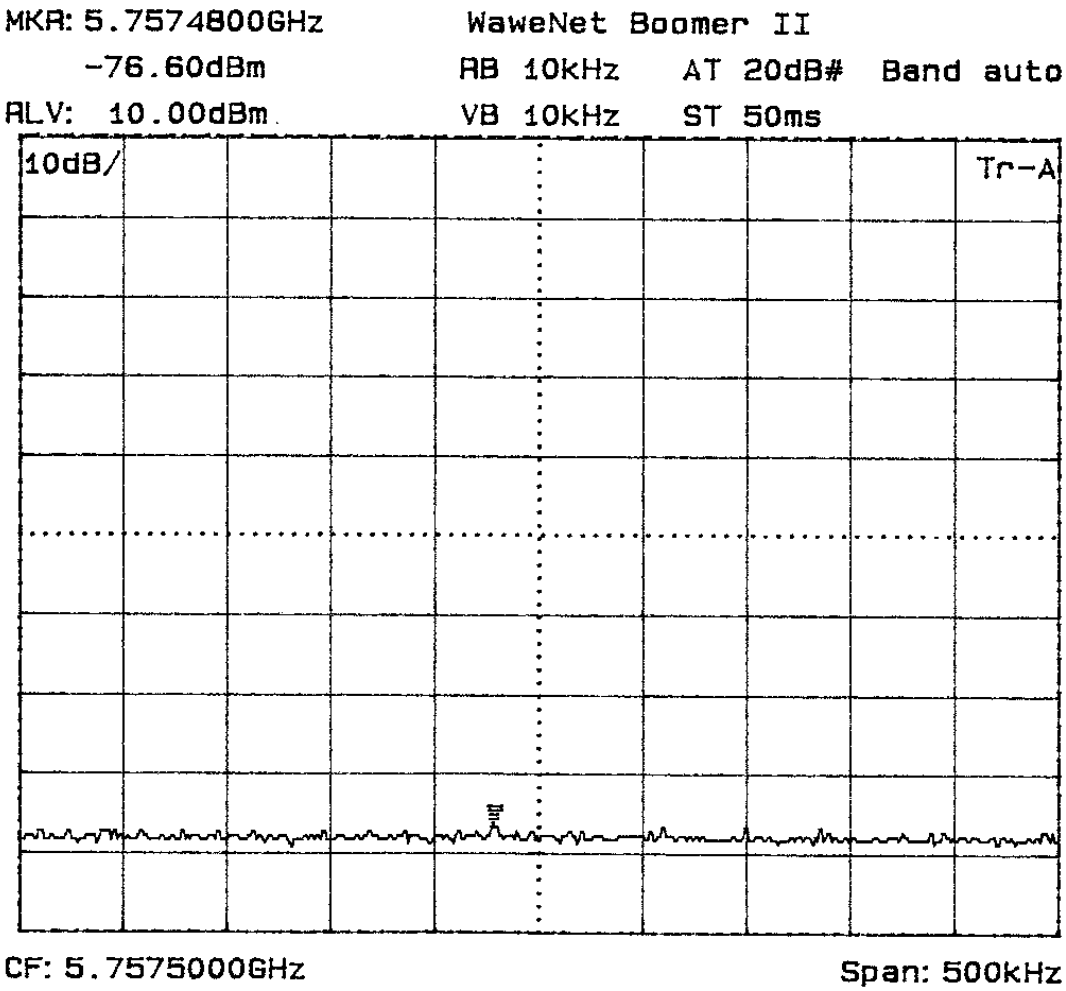

WaveNet Boomer II
Spurious Emissions from Transmitter @ Antenna Terminal
Modulation: RD-LAP 9.6 kbps, Mask H, 7th harmonic

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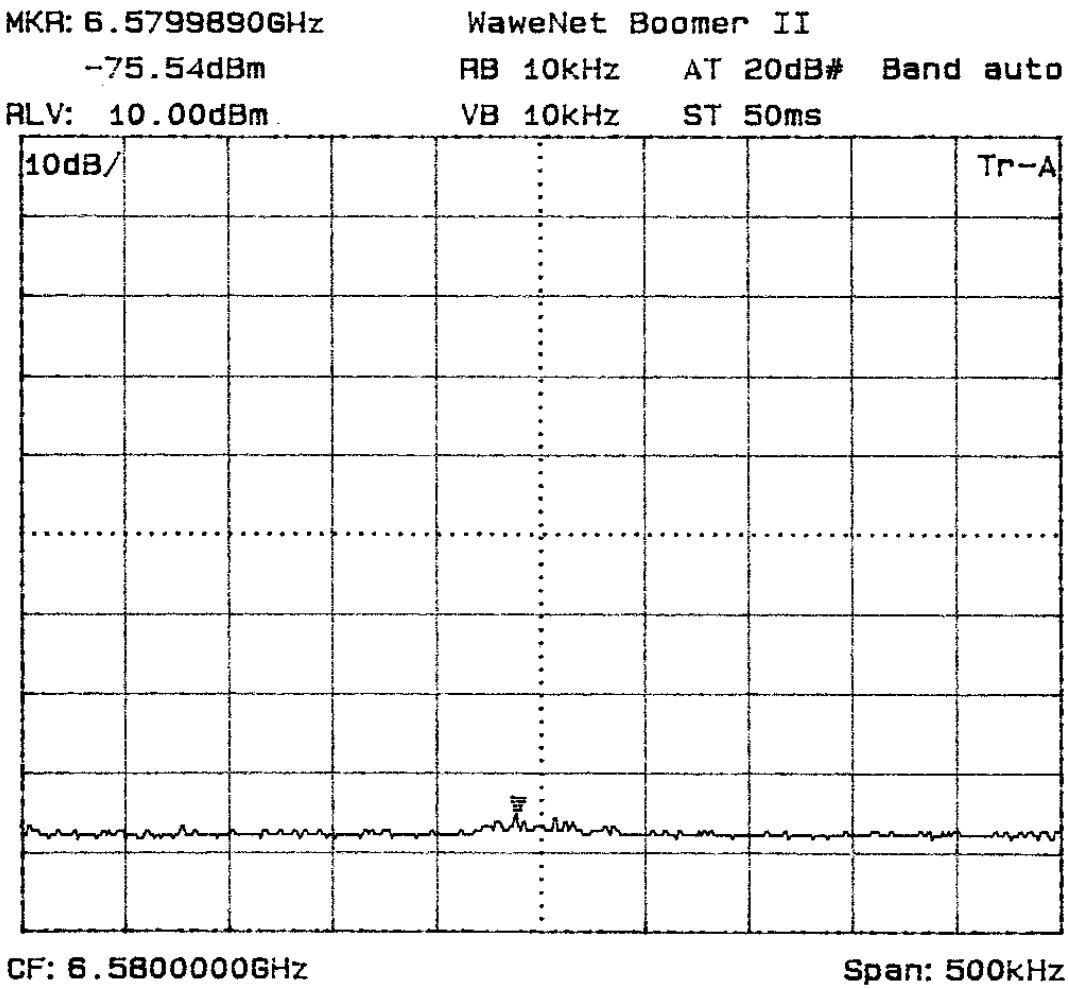

WaveNet Boomer II
Spurious Emissions from Transmitter @ Antenna Terminal
Modulation: RD-LAP 9.6 kbps, Mask H, 8th harmonic

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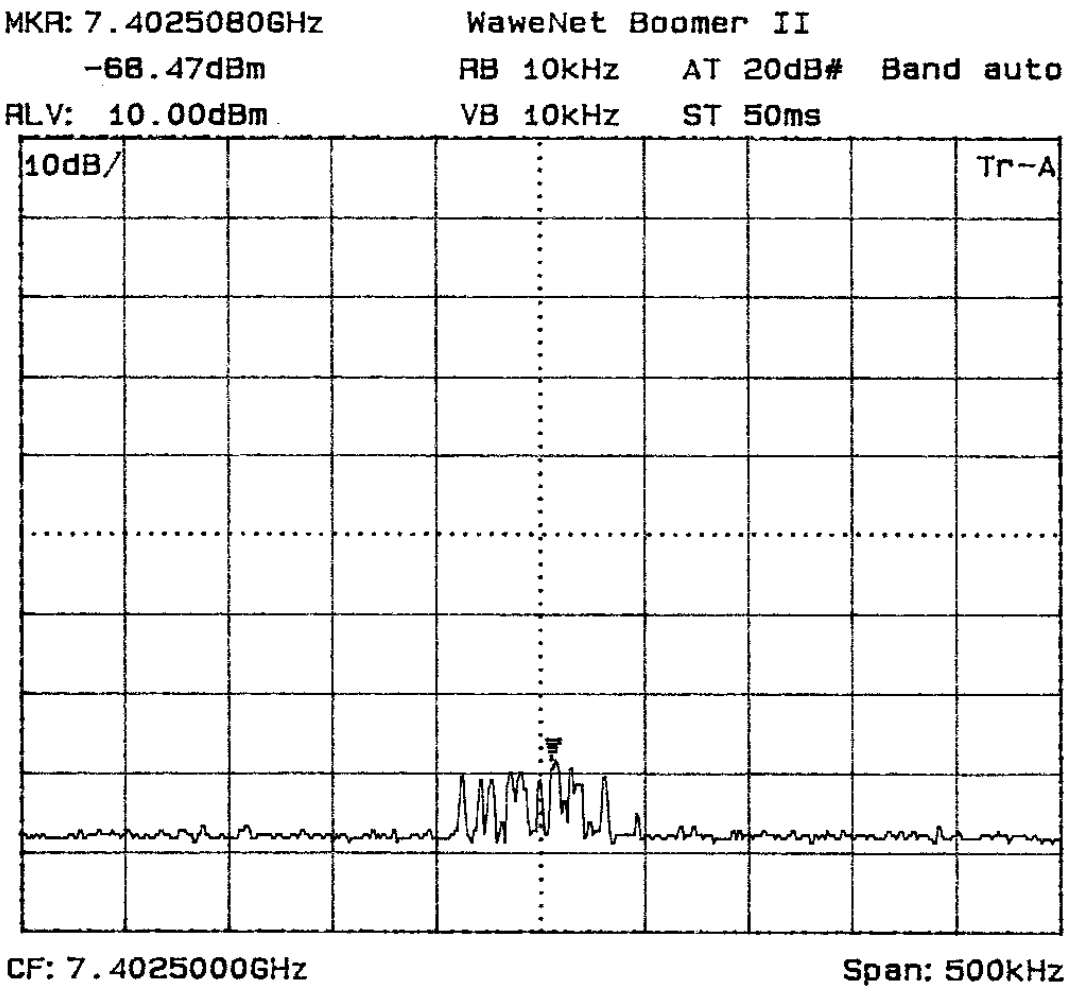

WaveNet Boomer II
Spurious Emissions from Transmitter @ Antenna Terminal
Modulation: RD-LAP 9.6 kbps, Mask H, 9th harmonic

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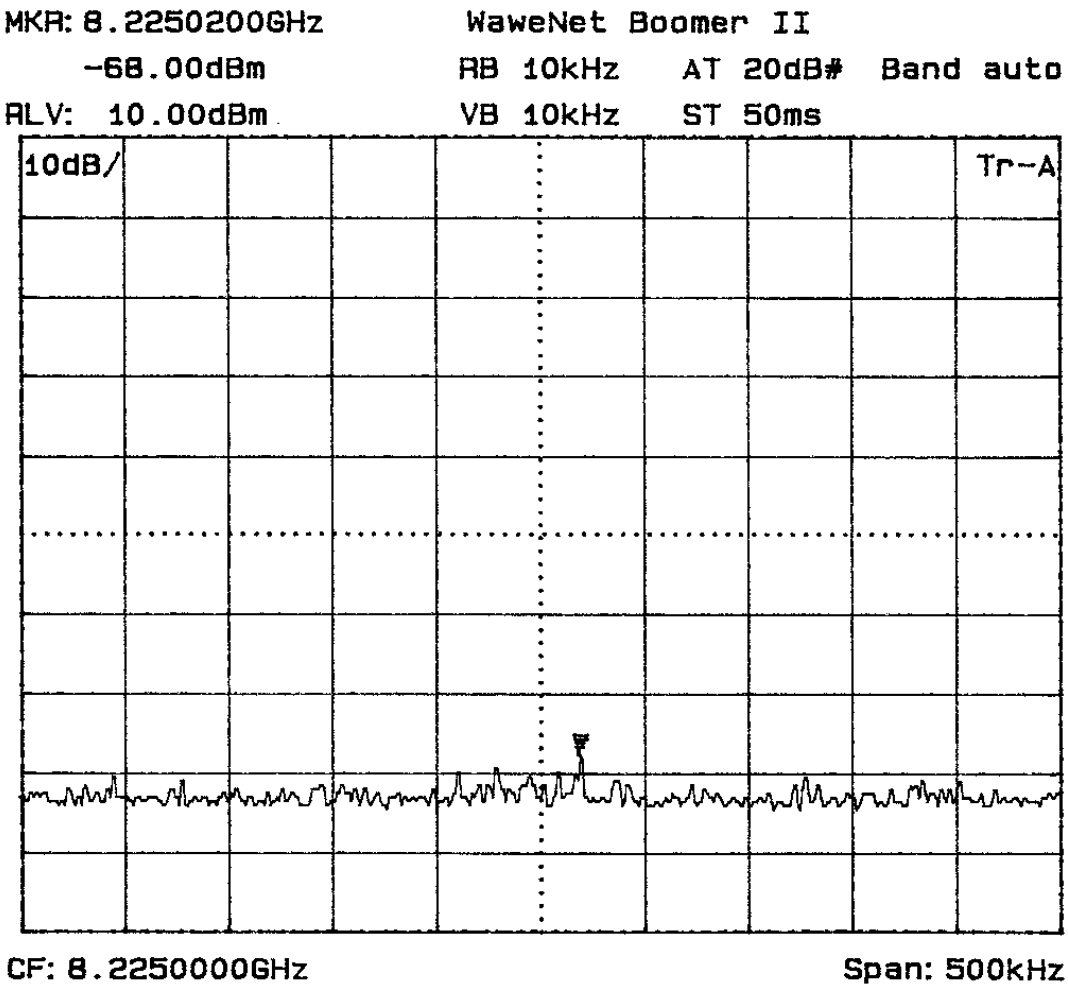

WaveNet Boomer II
Spurious Emissions from Transmitter @ Antenna Terminal
Modulation: RD-LAP 9.6 kbps, Mask H, 10th harmonic

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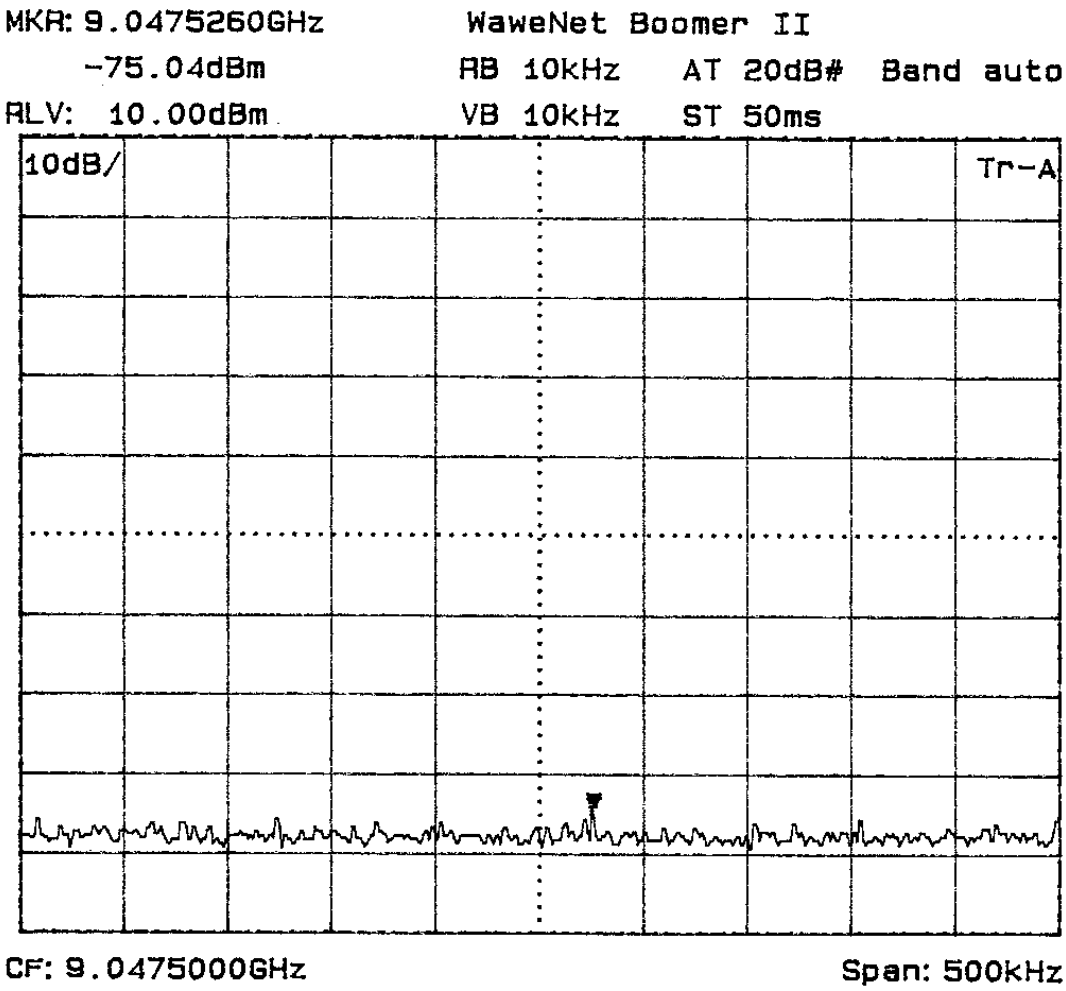

WaveNet Boomer II
Spurious Emissions from Transmitter @ Antenna Terminal
Modulation: RD-LAP 9.6 kbps, Mask H, 11th harmonic

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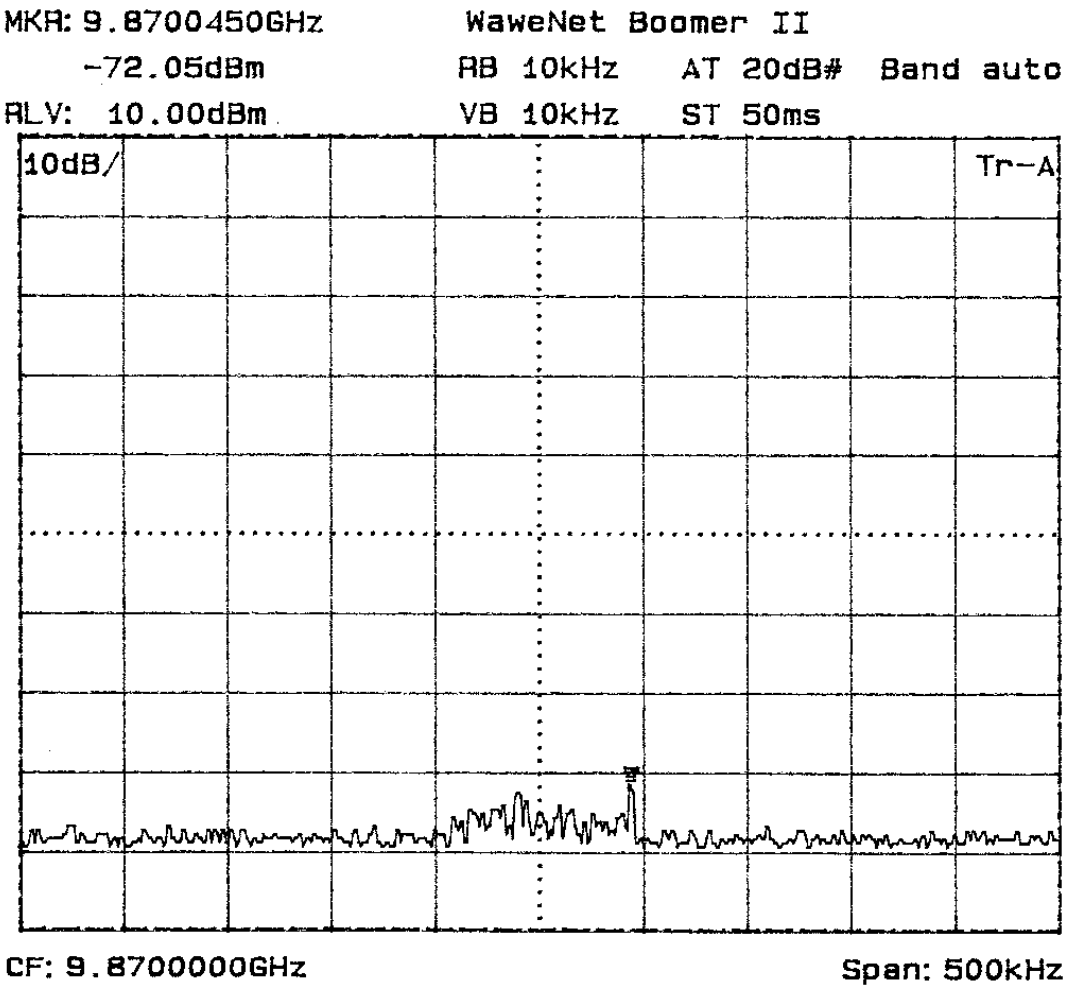

WaveNet Boomer II
Spurious Emissions from Transmitter @ Antenna Terminal
Modulation: RD-LAP 9.6 kbps, Mask H, 12th harmonic

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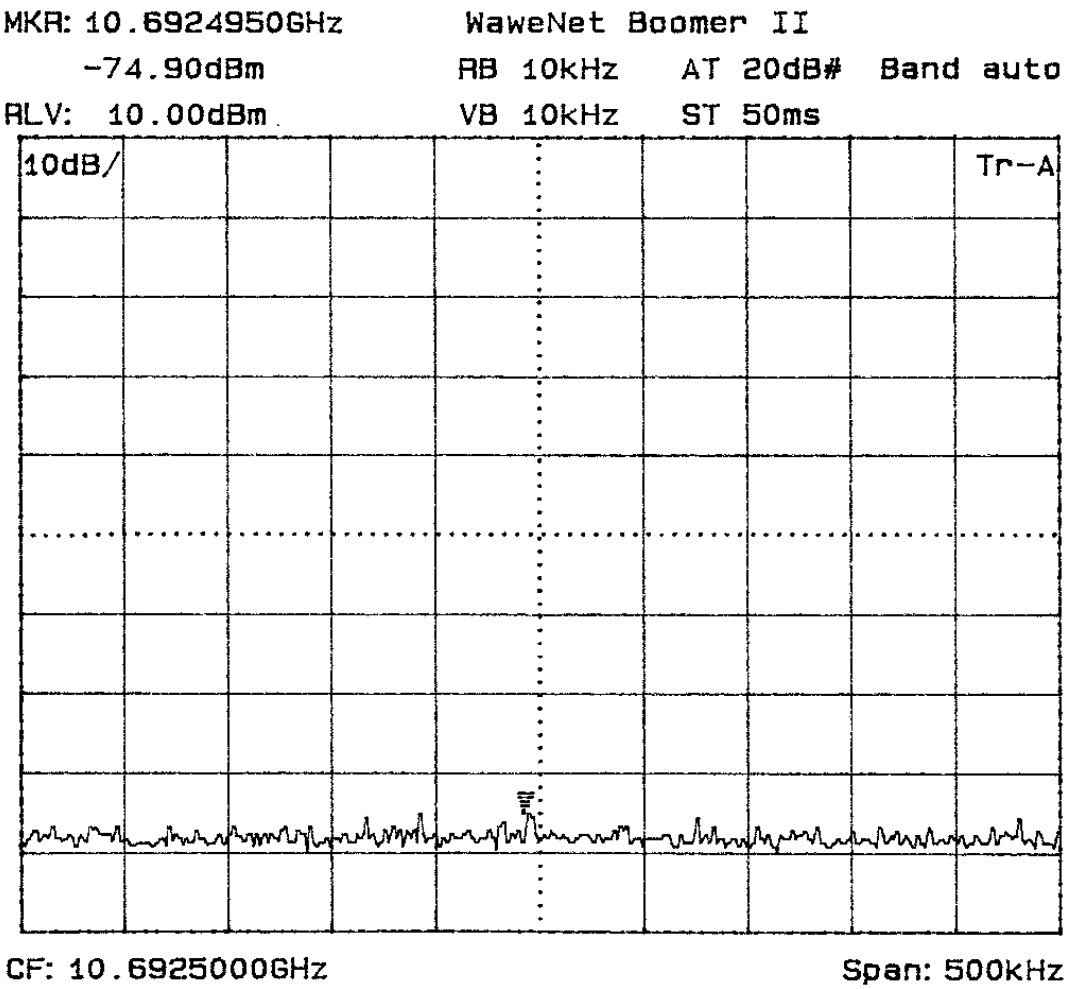

WaveNet Boomer II
Spurious Emissions from Transmitter @ Antenna Terminal
Modulation: RD-LAP 9.6 kbps, Mask H, 13th harmonic

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APPENDIX A
TESTING EQUIPMENT

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List of Equipment used

Description	Manufacturer	Model #	Asset #	Calibration Due Data
Spectrum Analyzer	Anritsu	MS2667C	301386	Dec 10, 2002
Power Meter	HP	HP438A	301417	Nov. 2002
20 dB Attenuator	Narda	4774-20	301533	CBT

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APPENDIX B
PHOTOGRAPHS

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Wireless OEM Modem Module
WaveNet BOOMER-II

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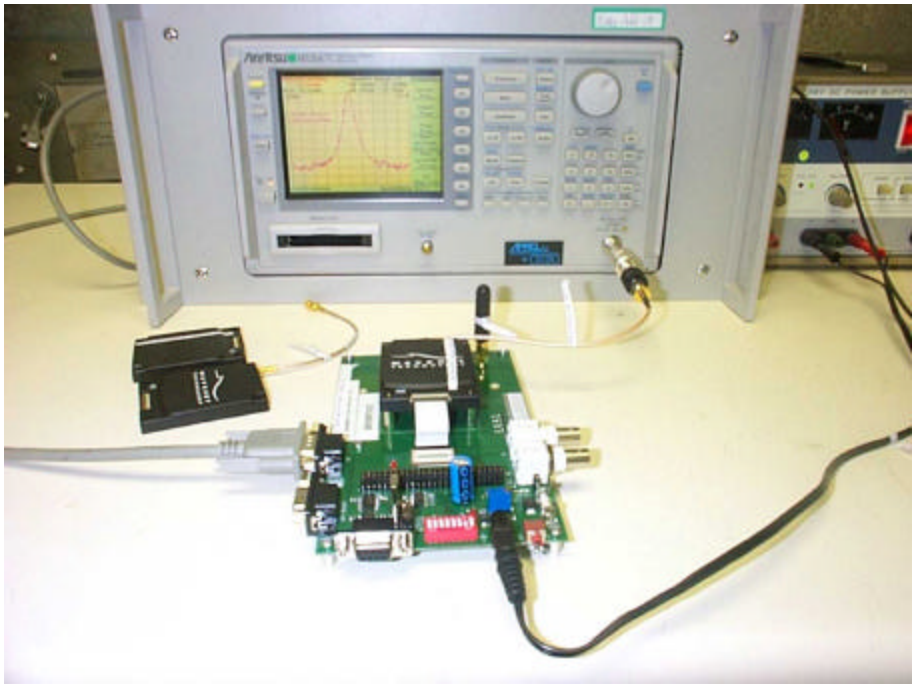

Testing Spurious Radiation from Transmitter @ Antenna Port on WaveNet BOOMER-II Wireless Modem

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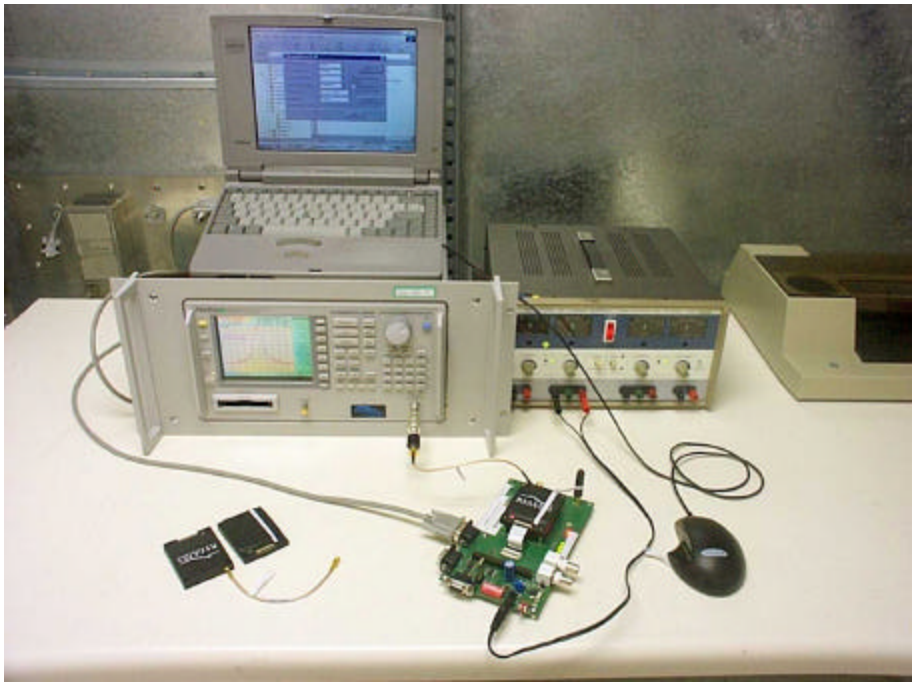

Testing Spurious Emissions from Transmitter @ Antenna Port on WaveNet BOOMER-II Wireless Modem

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