



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

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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
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Date:

Sept. 12, 2002

Submitted by:


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Date:

Sept. 12, 2002

Released by:


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Date:

Sept 12/02.



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

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

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
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AUSTRALIA

Evaluated by: **APREL Laboratories**
51 Spectrum Way
Nepean, Ontario
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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

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

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.* On 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.

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

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

$$C = A+B = -51.61 \text{ dBm} + 20 \text{ dB} = -31.61 \text{ dBm}$$

$$C = -31.61 \text{ dBm}$$

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)

$$D = P_{TX} - [43 + (10 \cdot \log P_{TX(W)})]$$

$$D = 32.62 \text{ dBm} - [43 + (10 \cdot \log 1.932 \text{ W})]$$

$$D = \text{Criteria (reference) level} = -13.0 \text{ dBm}$$

E = Margin (spurious emission below the reference level)

$$E = D - C$$

$$E = (-13.0 \text{ dBm}) - (-31.61 \text{ dBm})$$

$$E = 18.61 \text{ dB}$$

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

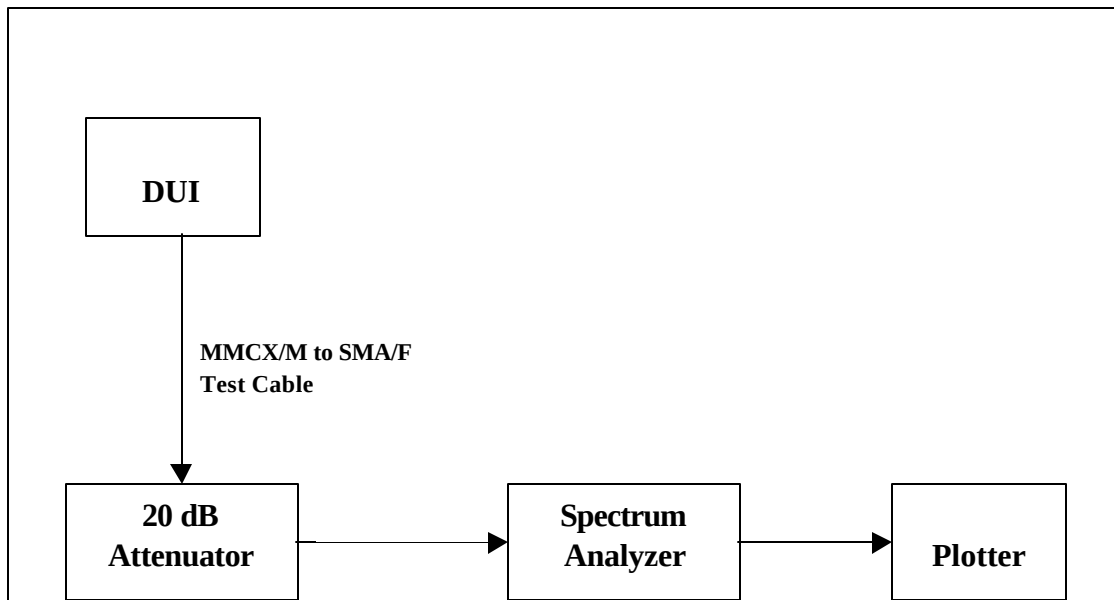


**Figure 1: Set Up
Spurious Emissions at Antenna Terminal**

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.

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.

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.

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.

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.

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.

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.

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.

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.

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.

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.

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

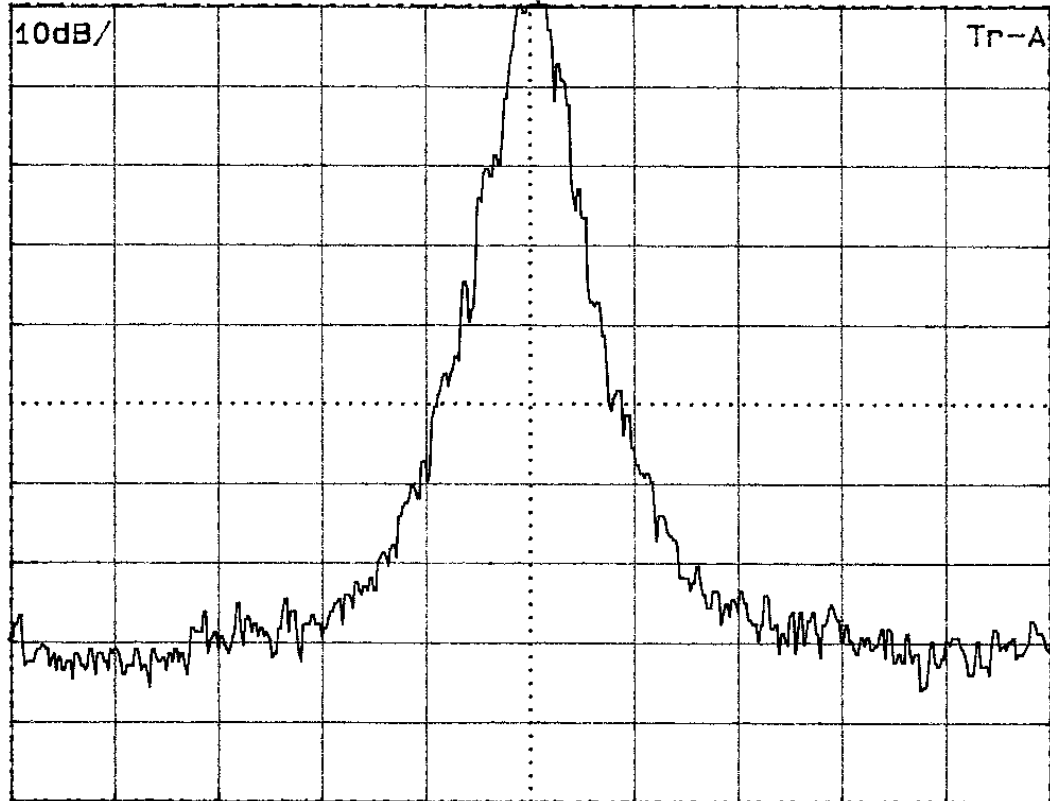
Harmonic No.	Frequency (MHz)	Measured Level (dBm) A	Correction Factor B	Spurious Emission Level (dBm) C	Criteria Level (dBm) D	Margin (dB) E
1	0.8240	12.67	20.00	32.67	-	-
2	1.6480	-53.33	20.00	-33.33	-13.00	20.33
3	2.4720	-56.10	20.00	-36.10	-13.00	23.10
4	3.2960	-71.66	20.00	-51.66	-13.00	38.66
5	4.1200	-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 Raman Date: August, 2002

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

MKR: 815.0060MHz WaweNet Boomer II
 12.94dBm RB 10kHz AT 30dB# Band auto
 RLV: 12.90dBm VB 10kHz ST 50ms

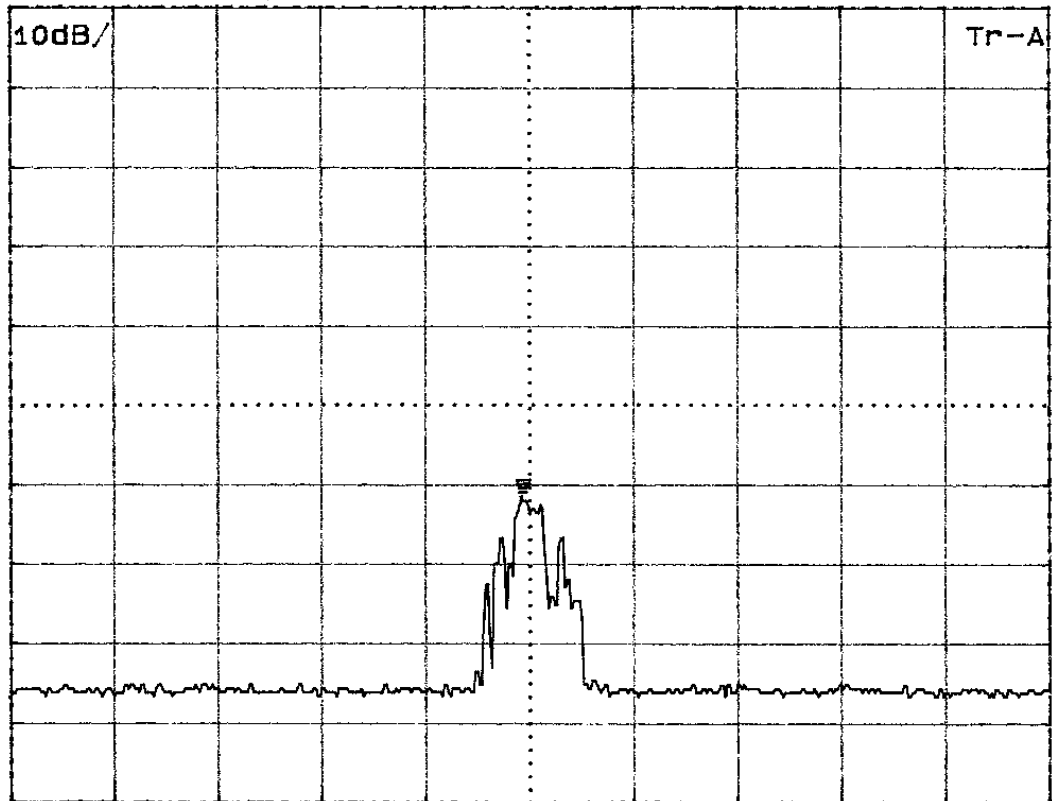


CF: 815.0000MHz

Span: 500kHz

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

MKR: 1.6299980GHz WaweNet Boomer II
-52.10dBm RB 10kHz AT 20dB# Band auto
RLV: 10.00dBm VB 10kHz ST 50ms

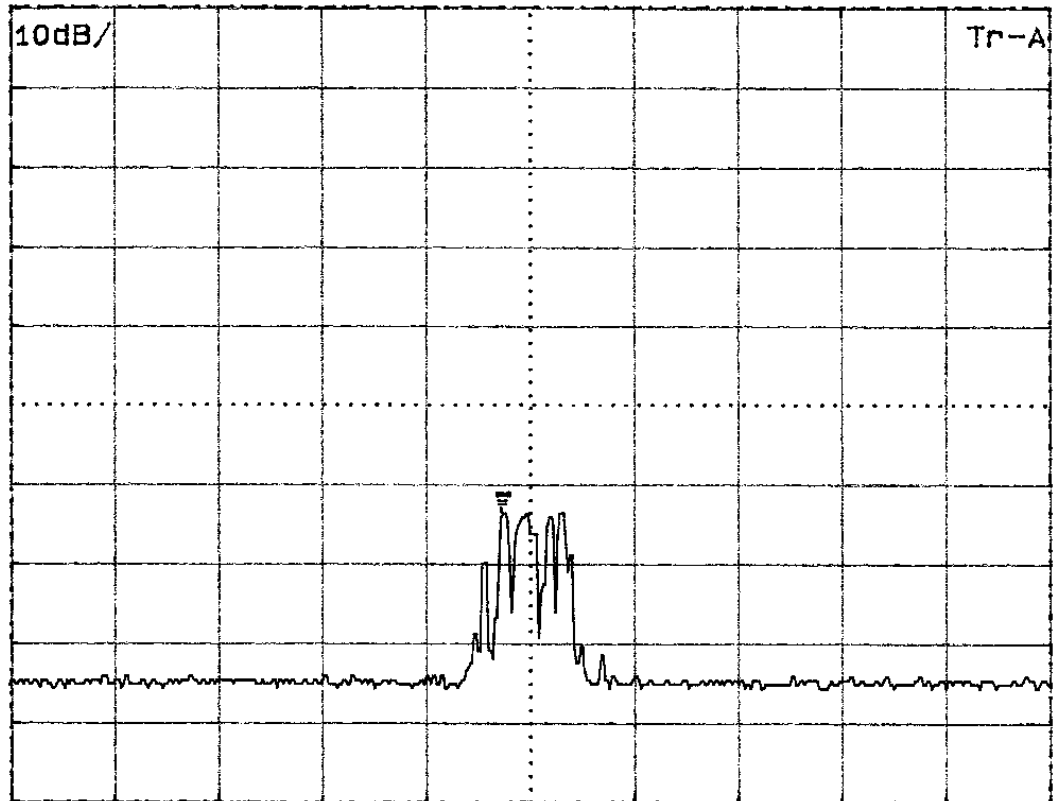


CF: 1.6300000GHz

Span: 500kHz

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

MKR: 2.4449880GHz WaweNet Boomer II
-53.58dBm RB 10kHz AT 20dB# Band auto
RLV: 10.00dBm VB 10kHz ST 50ms

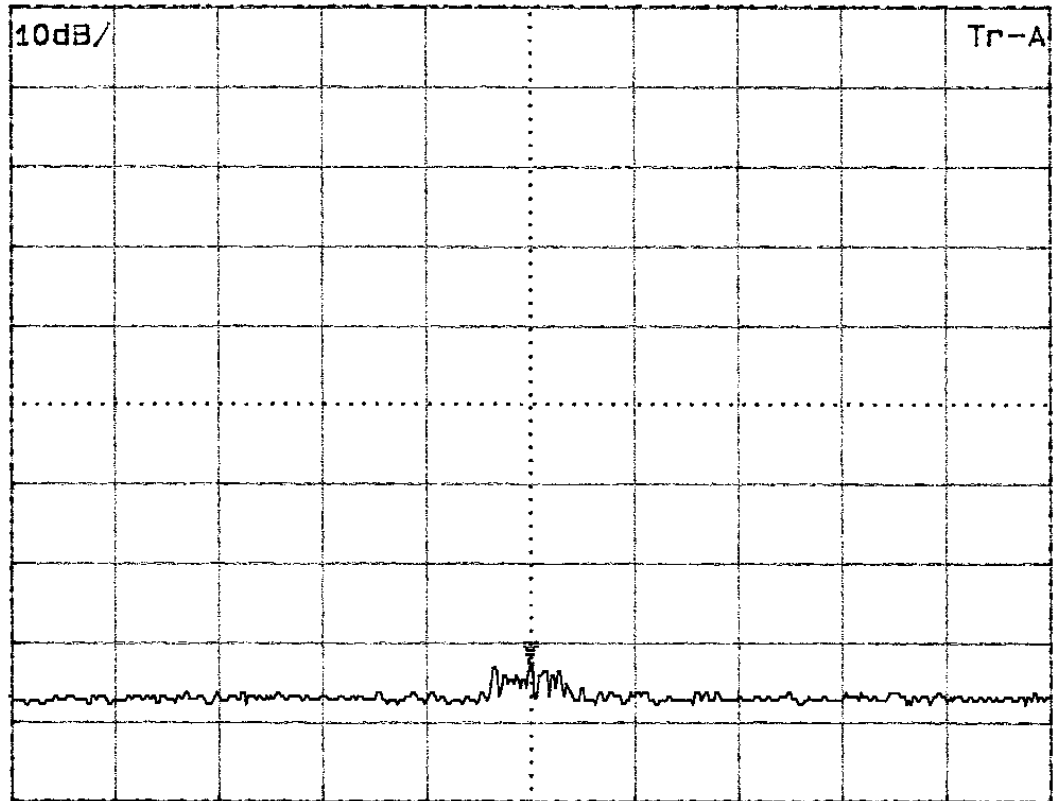


CF: 2.4450000GHz

Span: 500kHz

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

MKR: 3.2600010GHz WaweNet Boomer II
 -72.67dBm RB 10kHz AT 20dB# Band auto
 RLV: 10.00dBm VB 10kHz ST 50ms

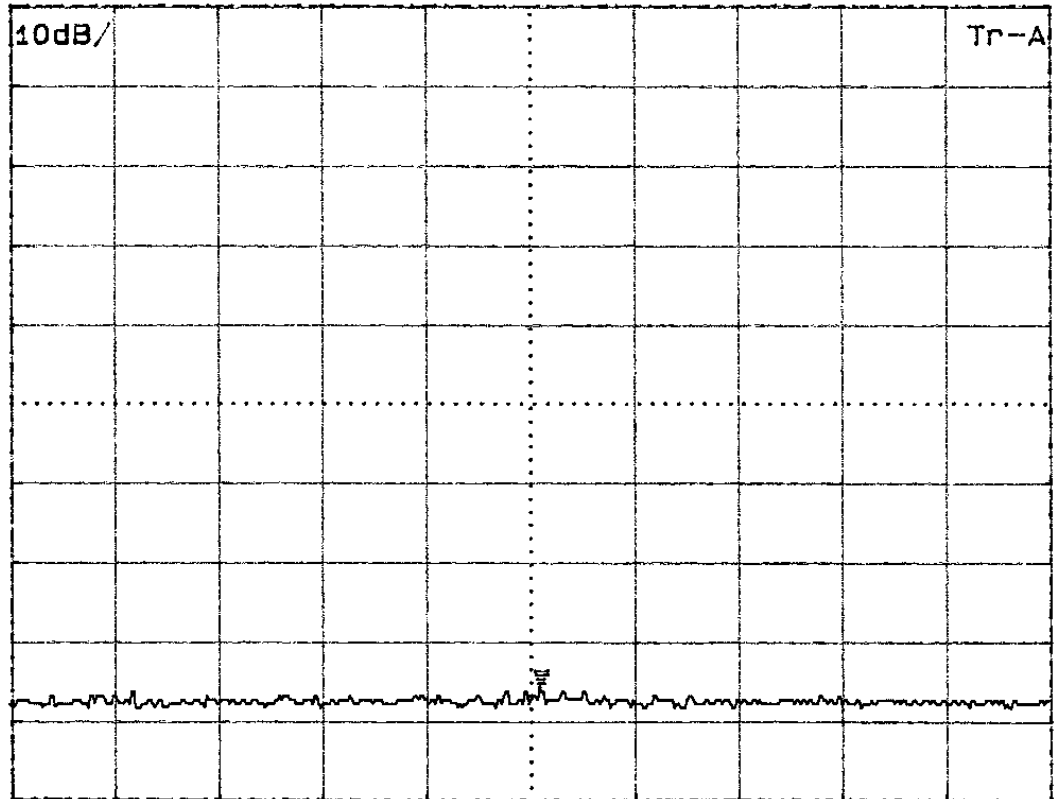


CF: 3.2600000GHz

Span: 500kHz

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

MKR: 4.0750050GHz WaweNet Boomer II
-75.87dBm RB 10kHz AT 20dB# Band auto
PLV: 10.00dBm VB 10kHz ST 50ms

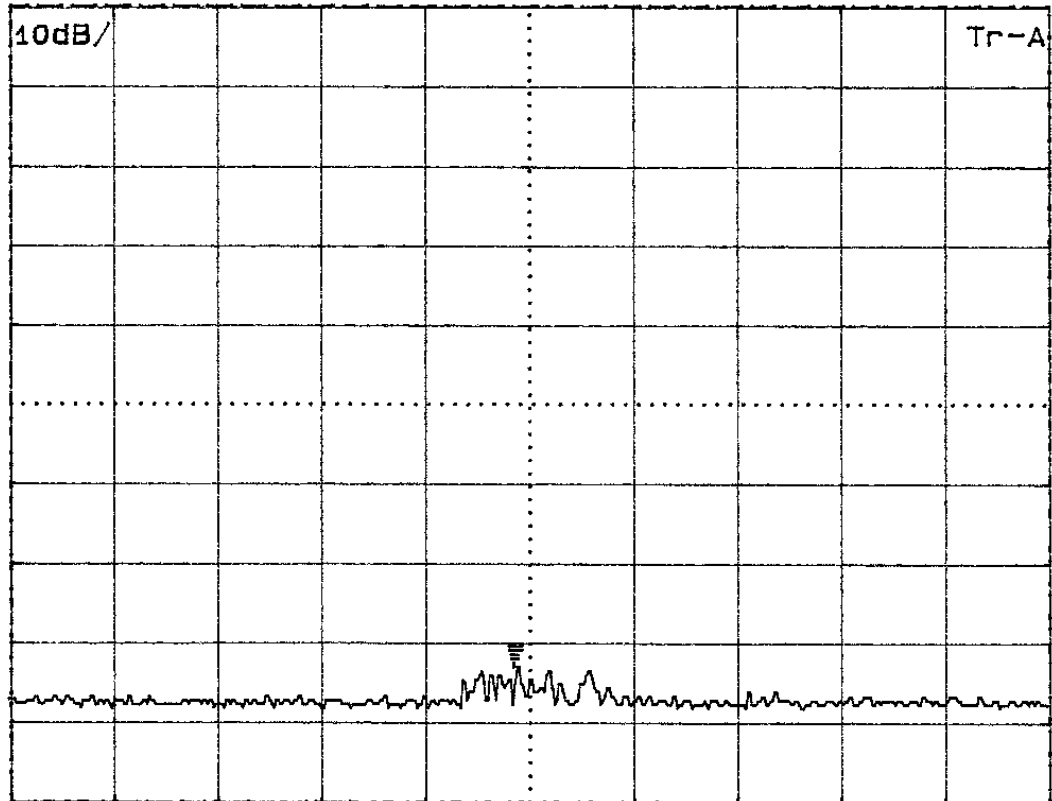


CF: 4.0750000GHz

Span: 500kHz

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

MKR: 4.8899950GHz WaweNet Boomer II
 -73.20dBm RB 10kHz AT 20dB# Band auto
 RLV: 10.00dBm VB 10kHz ST 50ms

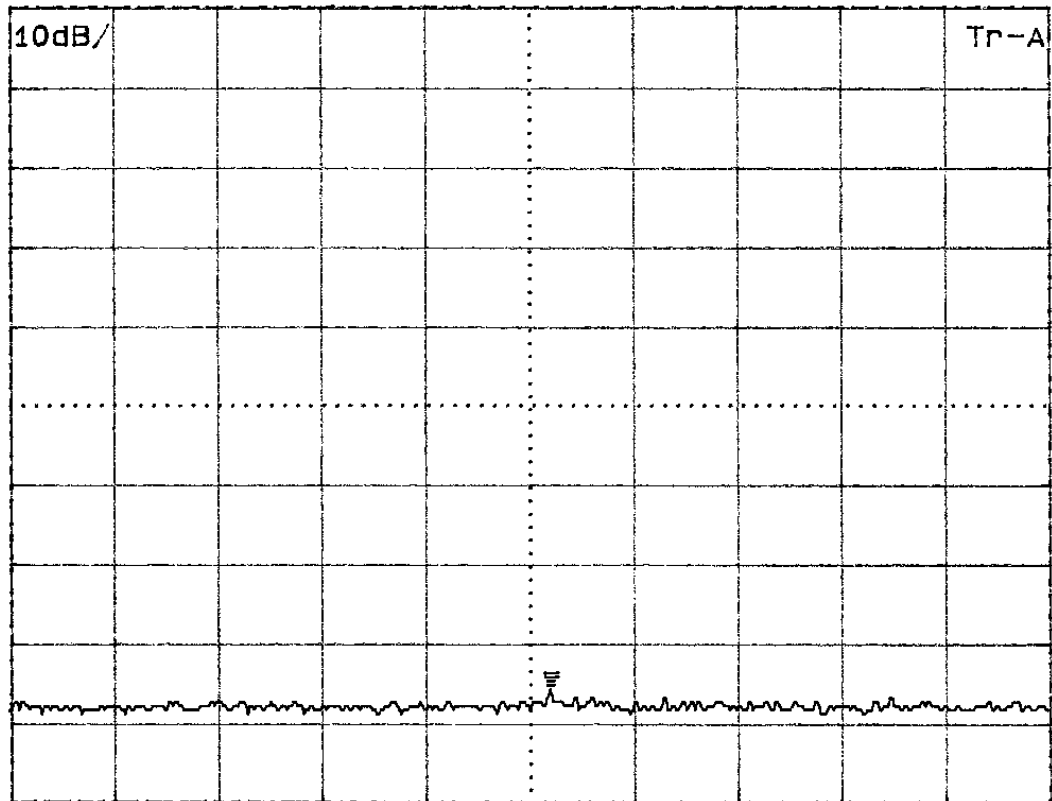


CF: 4.8900000GHz

Span: 500kHz

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

MKR: 5.7050100GHz WaweNet Boomer II
-76.32dBm RB 10kHz AT 20dB# Band auto
RLV: 10.00dBm VB 10kHz ST 50ms

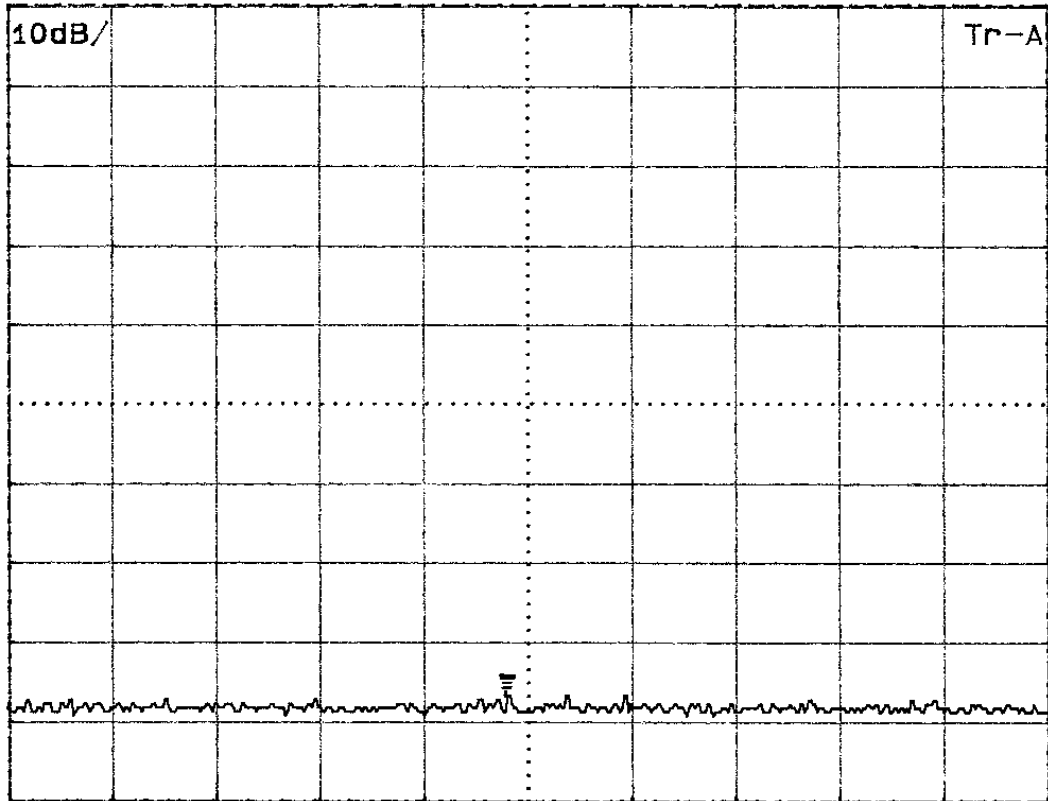


CF: 5.7050000GHz

Span: 500kHz

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

MKR: 6.5199910GHz WaweNet Boomer II
 -76.53dBm RB 10kHz AT 20dB# Band auto
 RLV: 10.00dBm VB 10kHz ST 50ms

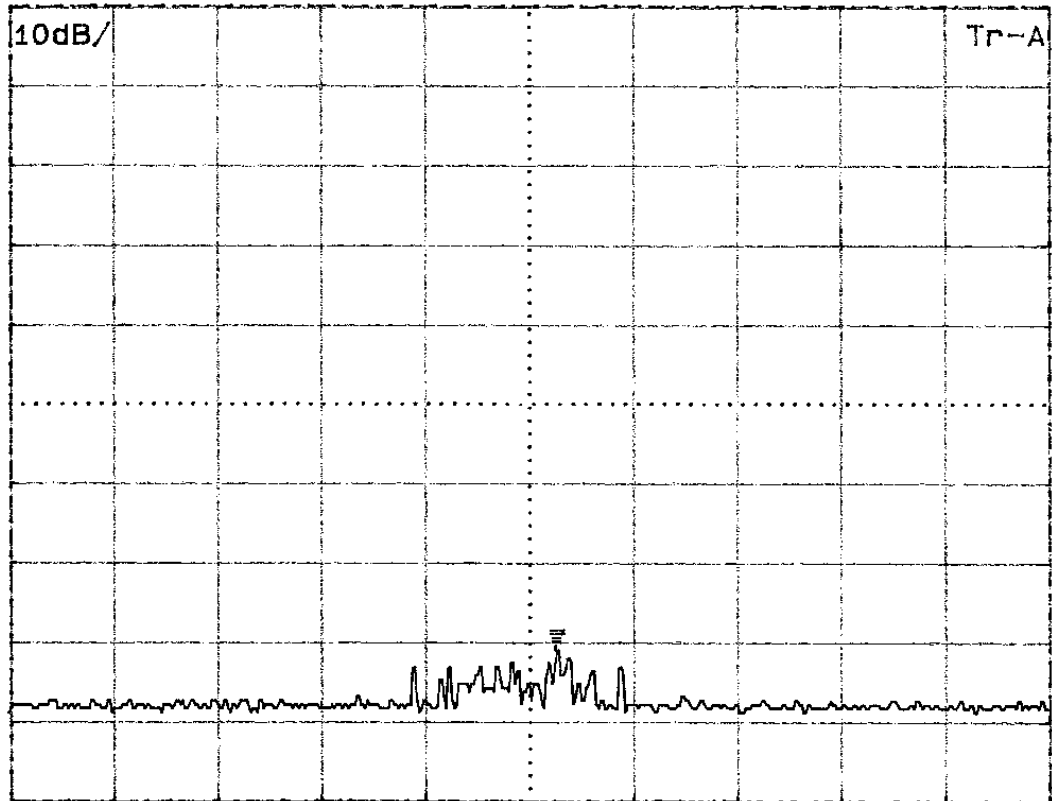


CF: 6.5200000GHz

Span: 500kHz

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

MKR: 7.3350140GHz WaweNet Boomer II
-70.83dBm RB 10kHz AT 20dB# Band auto
RLV: 10.00dBm VB 10kHz ST 50ms

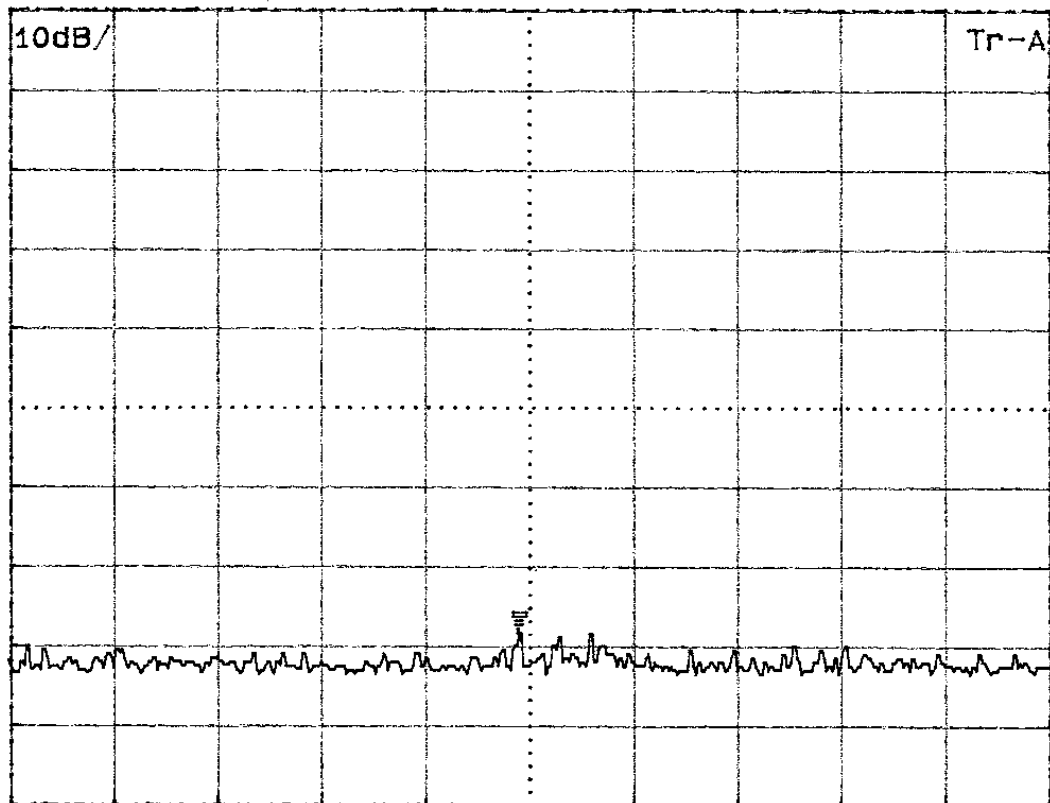


CF: 7.3350000GHz

Span: 500kHz

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

MKR: 8.1499960GHz WaweNet Boomer II
 -68.09dBm RB 10kHz AT 20dB# Band auto
 RLV: 10.00dBm VB 10kHz ST 50ms

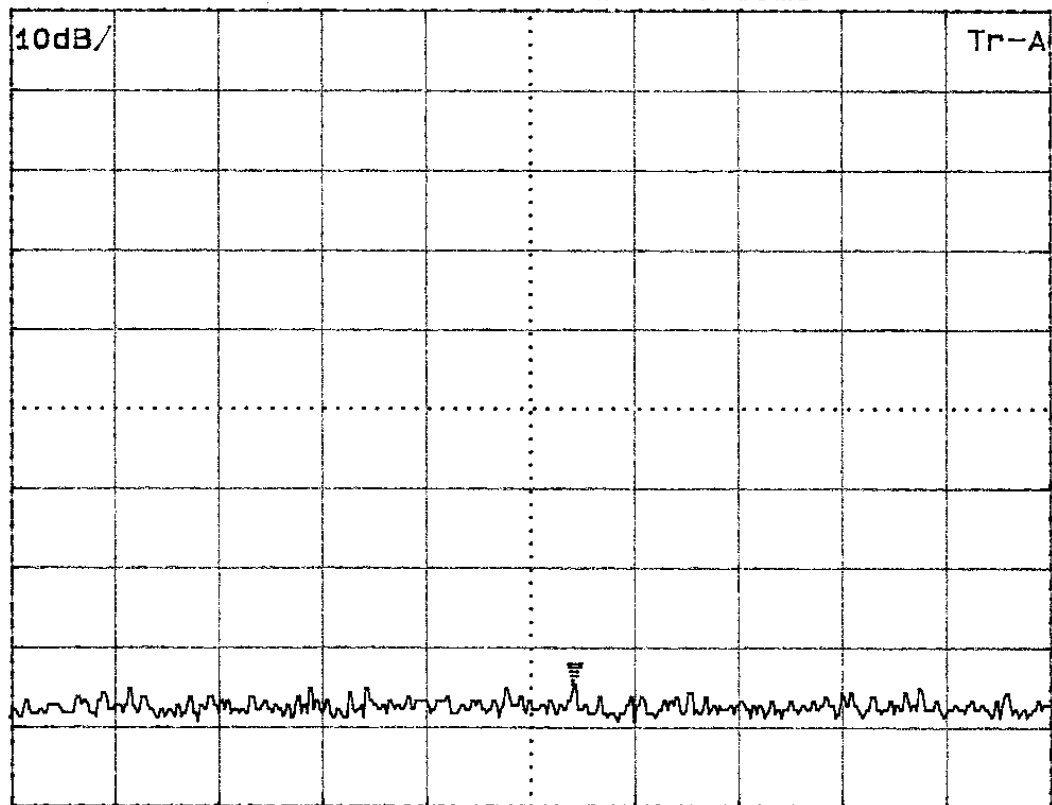


CF: 8.1500000GHz

Span: 500kHz

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

MKR: 8.9650220GHz WaweNet Boomer II
 -74.66dBm RB 10kHz AT 20dB# Band auto
 RLV: 10.00dBm VB 10kHz ST 50ms

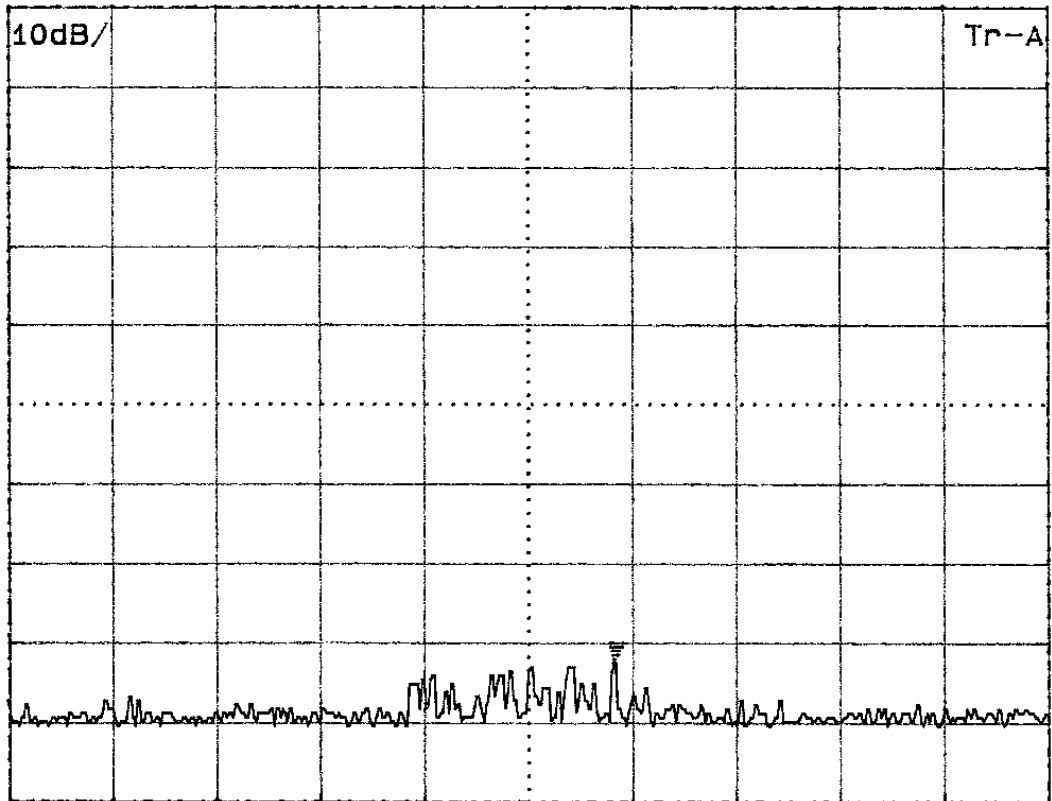


CF: 8.9650000GHz

Span: 500kHz

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

MKR: 9.7800420GHz WaweNet Boomer II
 -72.54dBm RB 10kHz AT 20dB# Band auto
 RLV: 10.00dBm VB 10kHz ST 50ms

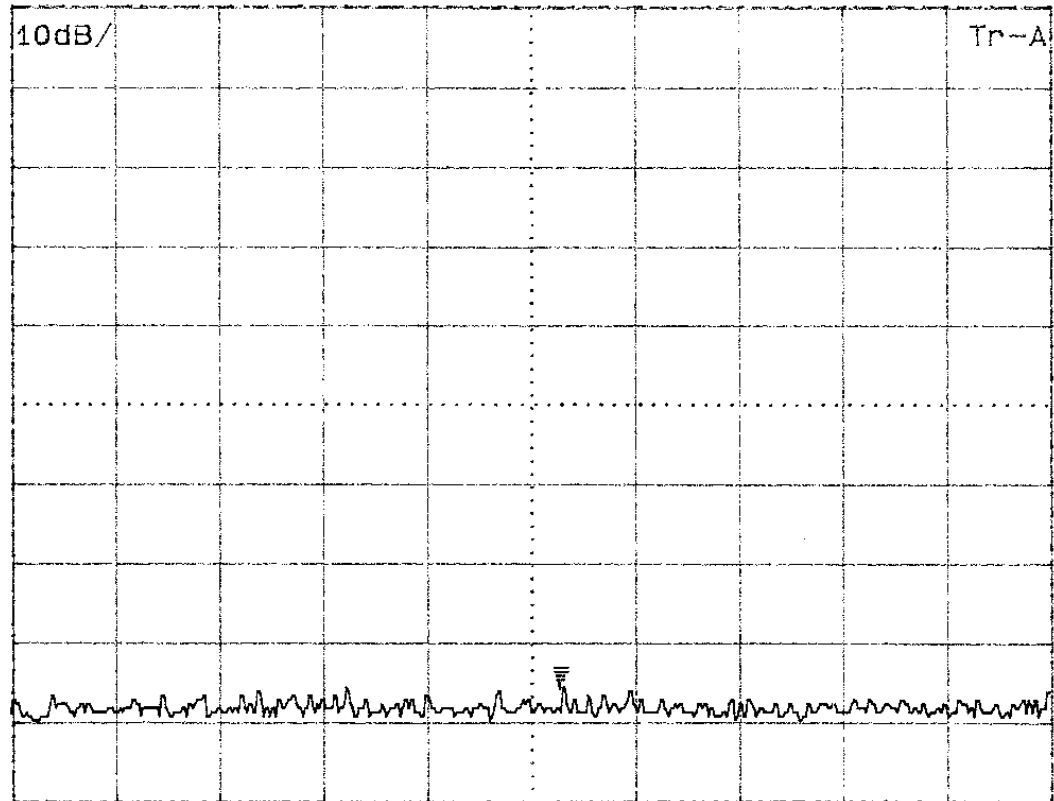


CF: 9.7800000GHz

Span: 500kHz

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

MKR: 10.5950160GHz WaweNet Boomer II
-75.80dBm RB 10kHz AT 20dB# Band auto
RLV: 10.00dBm VB 10kHz ST 50ms



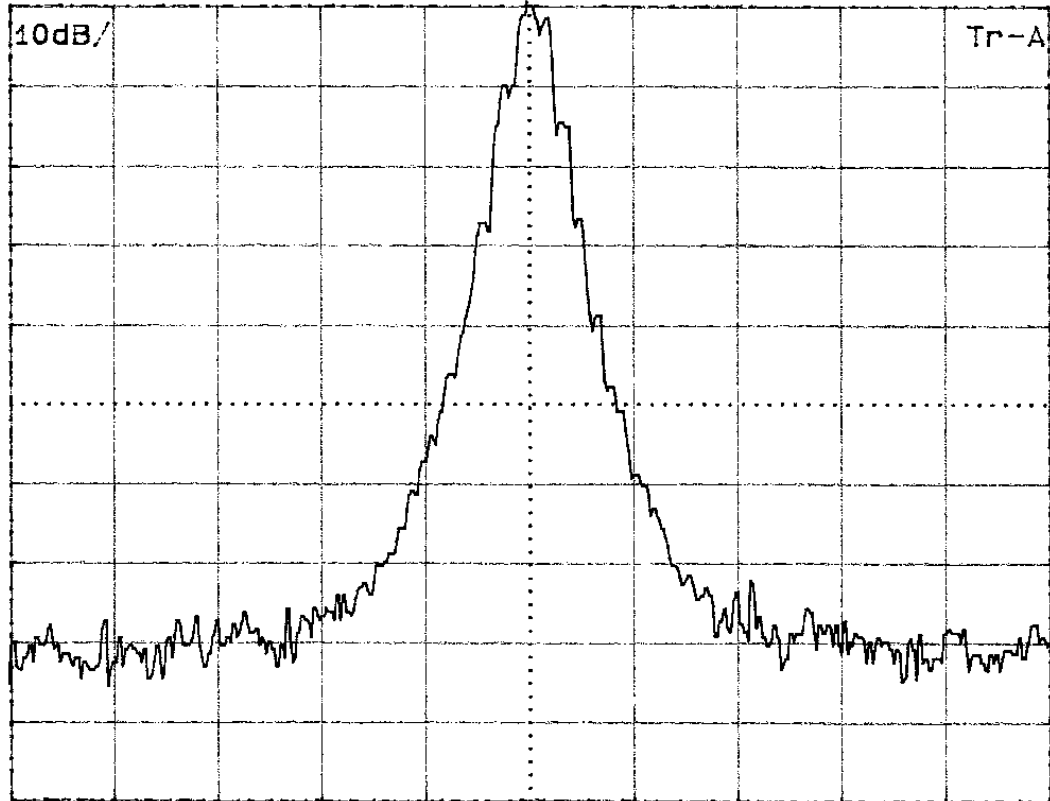
CF: 10.5950000GHz

Span: 500kHz

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

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

MKR: 815.0010MHz WaweNet Boomer II
12.88dBm RB 10kHz AT 30dB# Band auto
RLV: 12.90dBm VB 10kHz ST 50ms

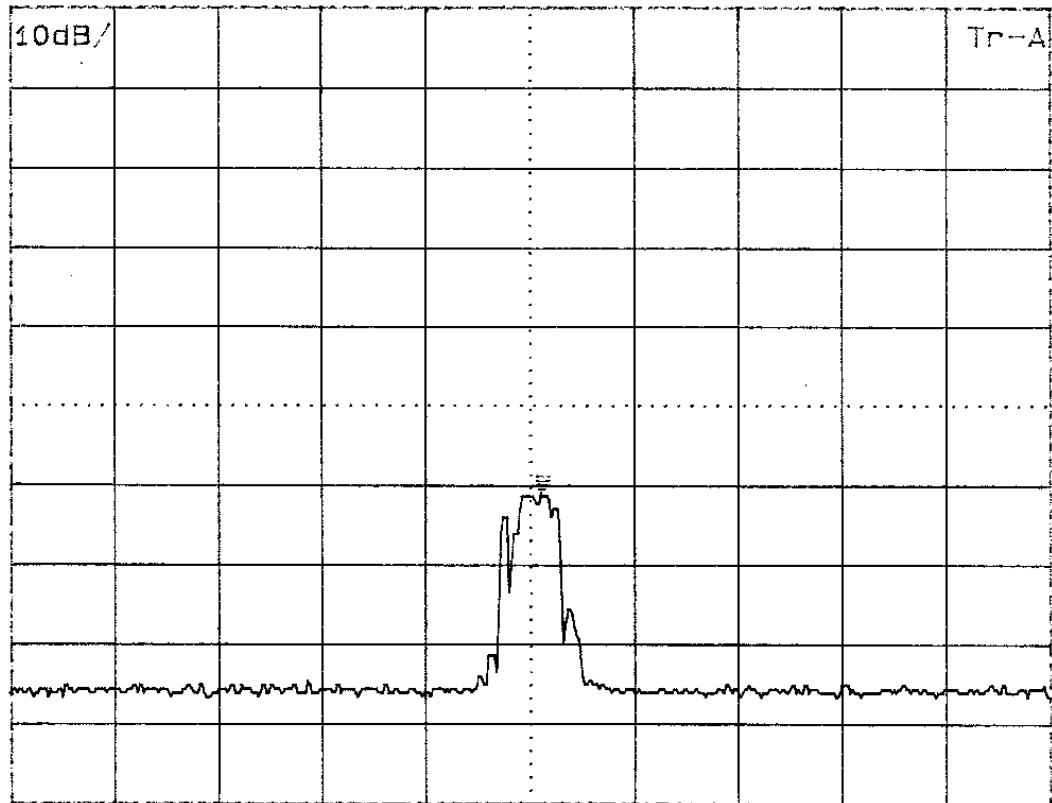


CF: 815.0000MHz

Span: 500kHz

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

MKR: 1.6300070GHz WaweNet Boomer II
 -51.39dBm RB 10kHz AT 20dB# Band auto
 RLV: 10.00dBm VB 10kHz ST 50ms

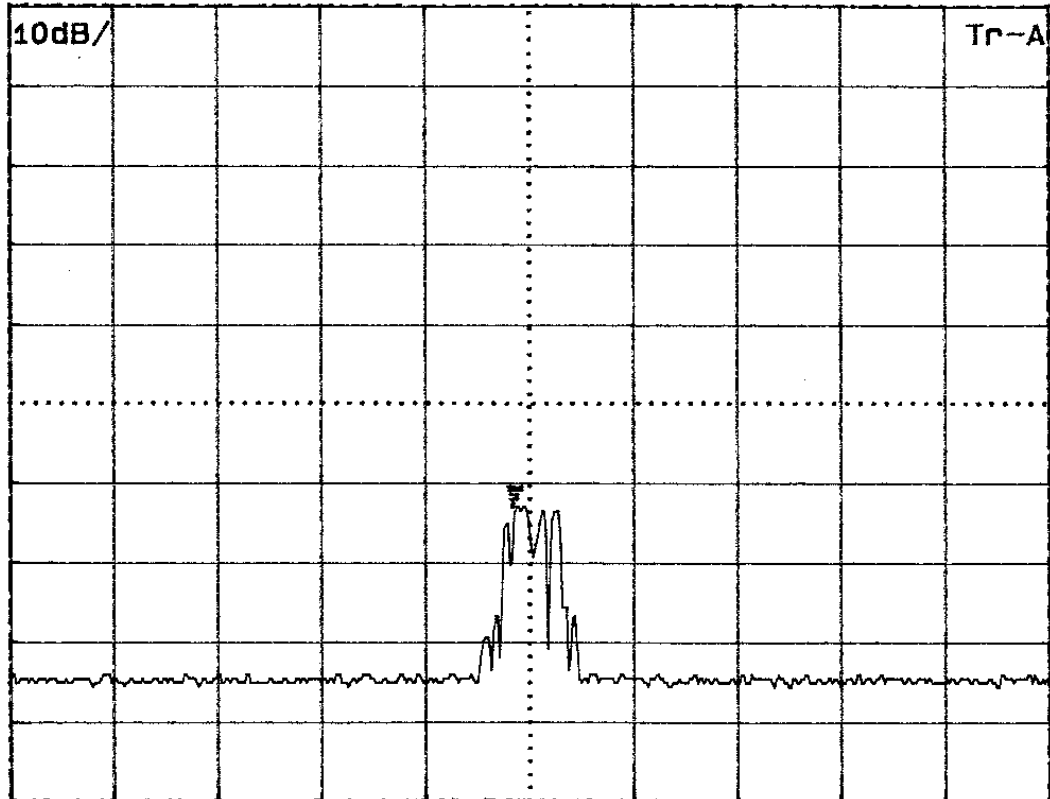


CF: 1.6300000GHz

Span: 500kHz

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

MKR: 2.4449950GHz WaweNet Boomer II
-53.17dBm RB 10kHz AT 20dB# Band auto
PLV: 10.00dBm VB 10kHz ST 50ms

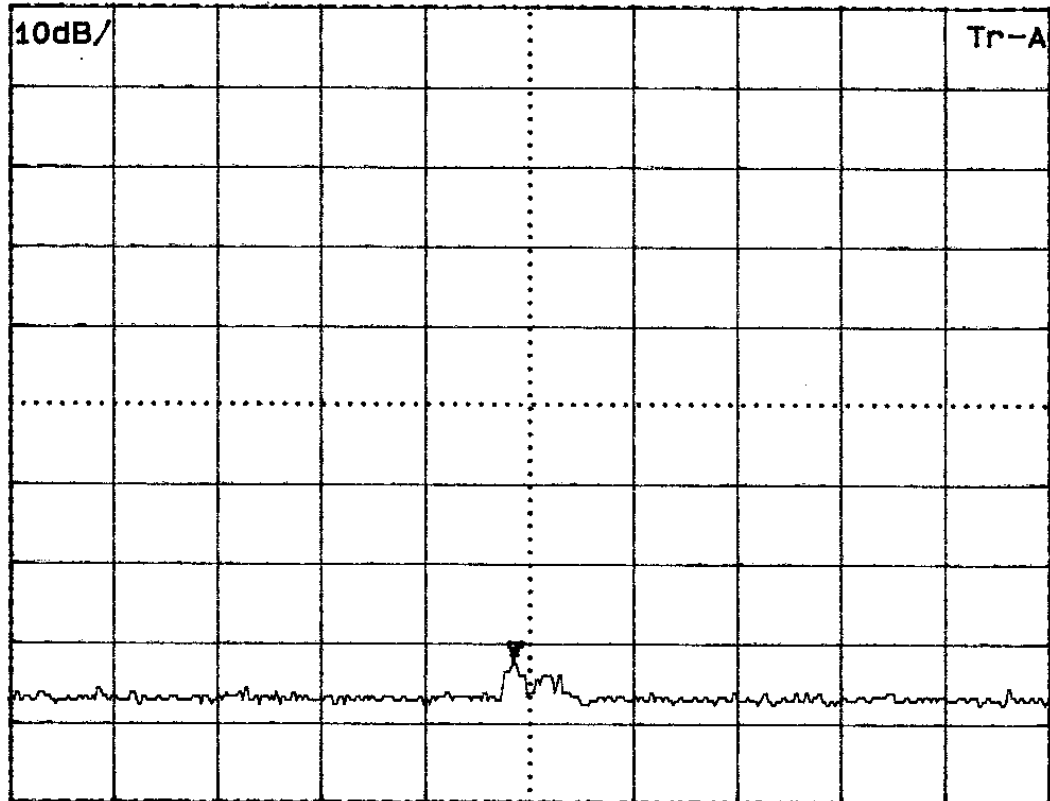


CF: 2.4450000GHz

Span: 500kHz

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

MKR: 3.2599940GHz **WaveNet Boomer II**
-72.67dBm **RB 10kHz** **AT 20dB#** **Band auto**
RLV: 10.00dBm **VB 10kHz** **ST 50ms**

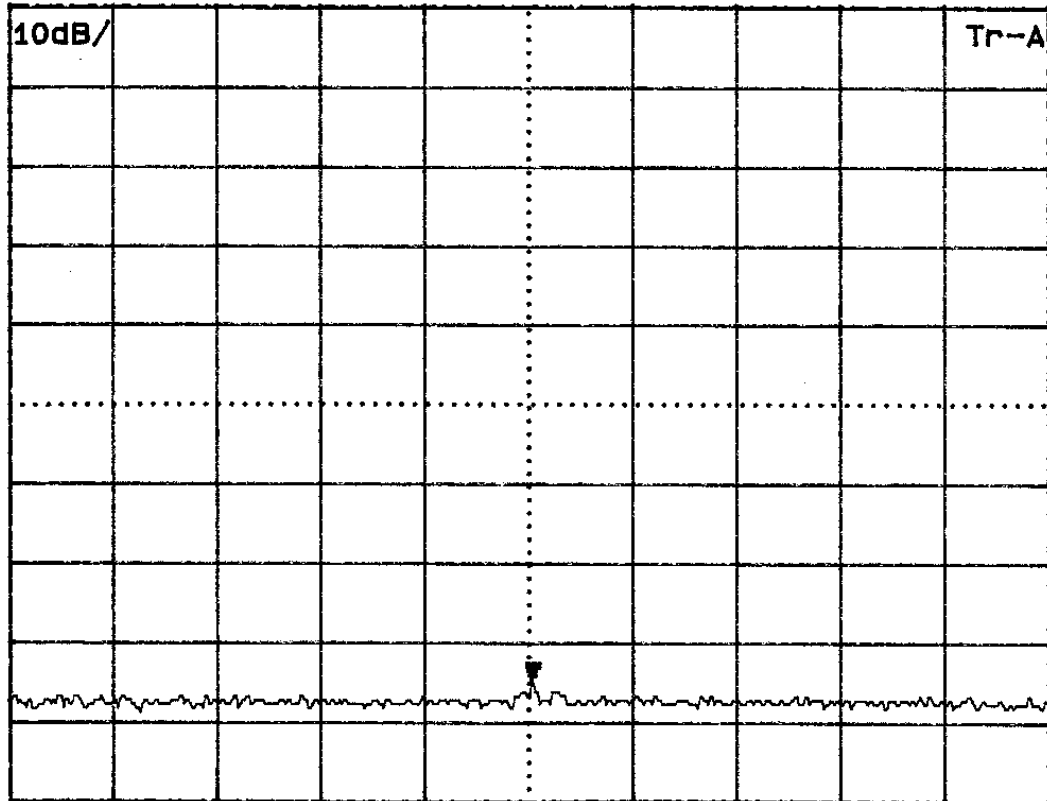


CF: 3.2600000GHz

Span: 500kHz

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

MKR: 4.0750020GHz **WaveNet Boomer II**
-75.05dBm **RB 10kHz** **AT 20dB#** **Band auto**
RLV: 10.00dBm **VB 10kHz** **ST 50ms**

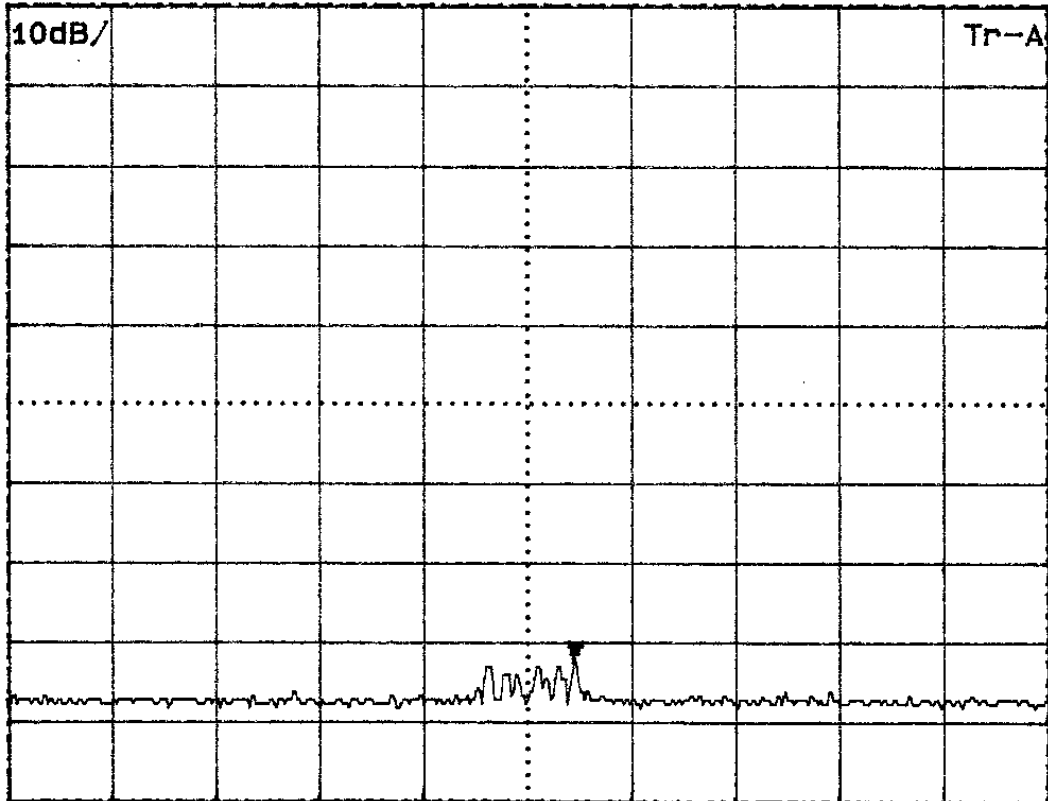


CF: 4.0750000GHz

Span: 500kHz

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

MKR: 4.8900240GHz **WaveNet Boomer II**
-72.67dBm **RB 10kHz** **AT 20dB#** **Band auto**
RLV: 10.00dBm **VB 10kHz** **ST 50ms**

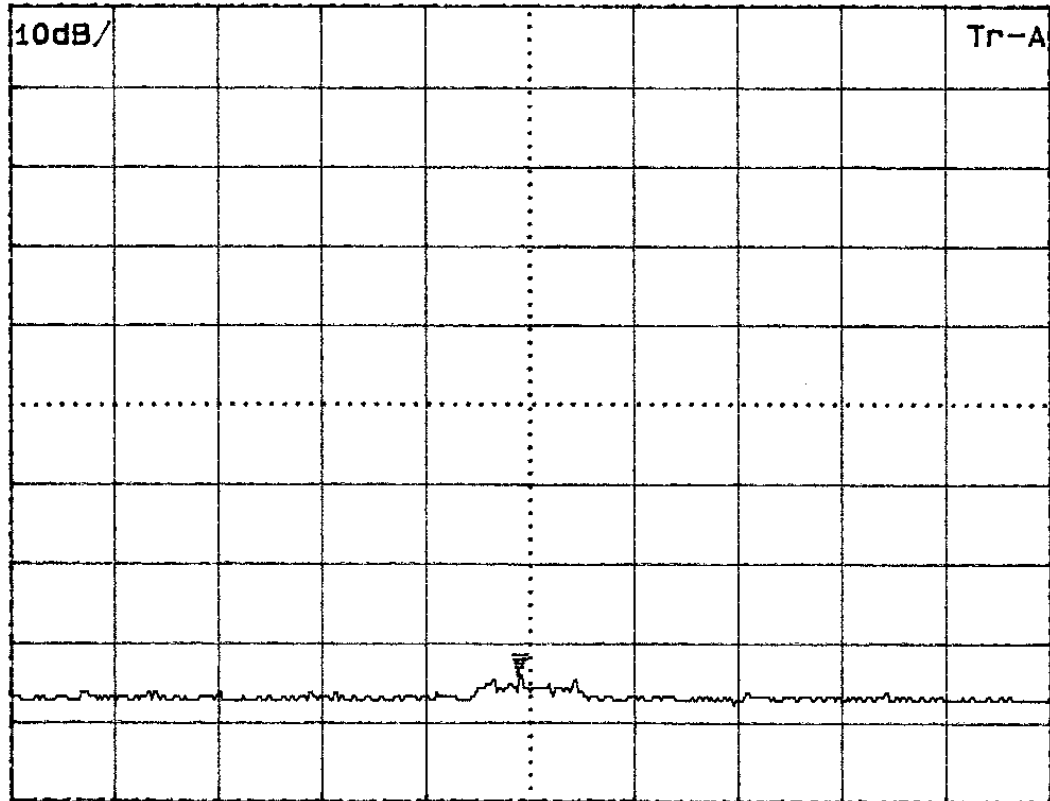


CF: 4.8900000GHz

Span: 500kHz

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

MKR: 5.7049960GHz WaweNet Boomer II
 -74.21dBm RB 10kHz AT 20dB# Band auto
 PLV: 10.00dBm VB 10kHz ST 50ms

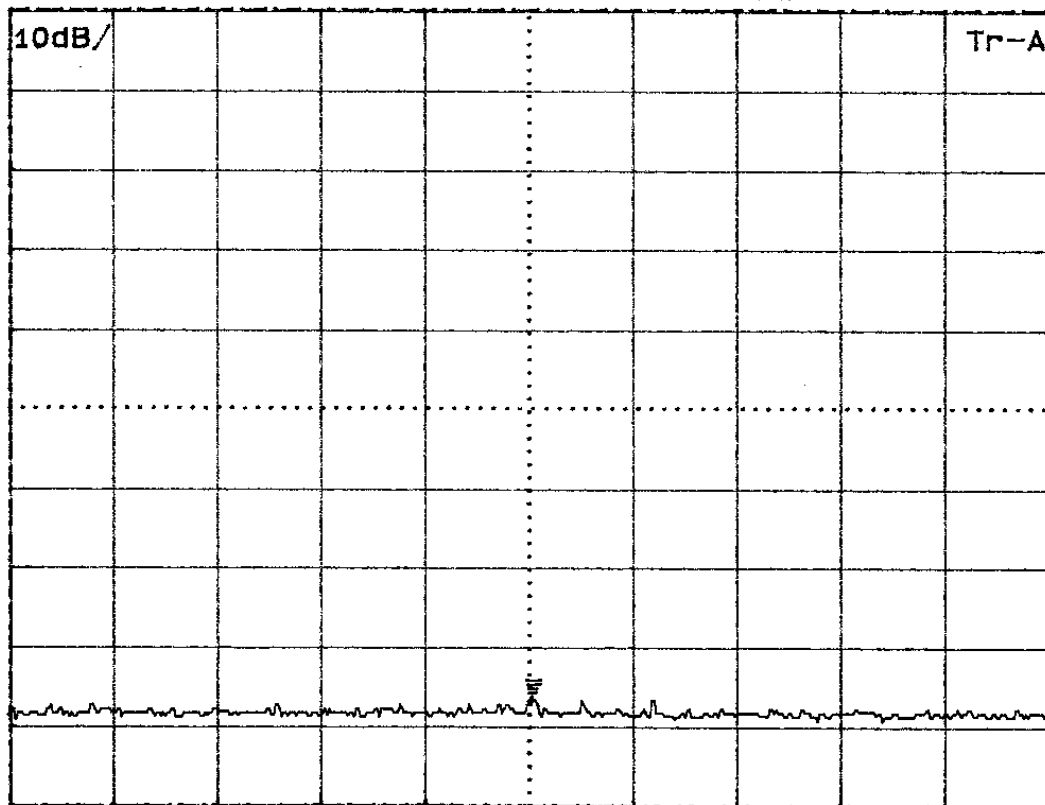


CF: 5.7050000GHz

Span: 500kHz

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

MKR: 6.5200030GHz WaweNet Boomer II
 -76.67dBm RB 10kHz AT 20dB# Band auto
 RLV: 10.00dBm VB 10kHz ST 50ms

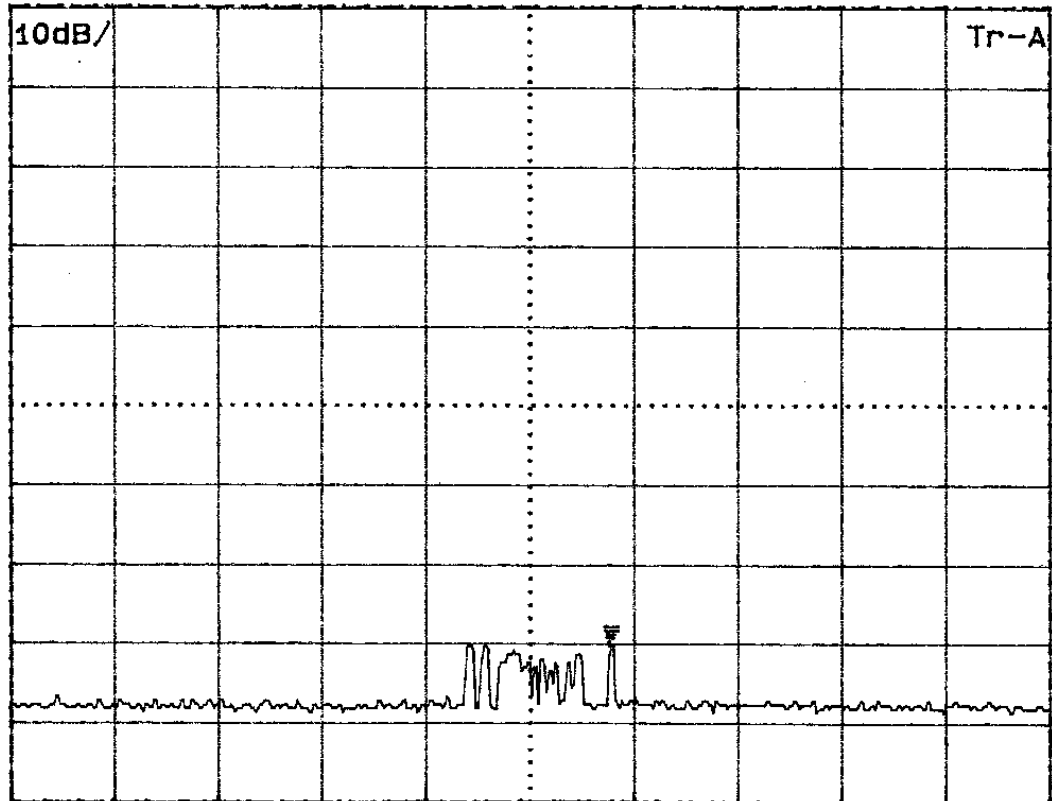


CF: 6.5200000GHz

Span: 500kHz

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

MKR: 7.3350400GHz WaweNet Boomer II
 -70.11dBm RB 10kHz AT 20dB# Band auto
 RLV: 10.00dBm VB 10kHz ST 50ms

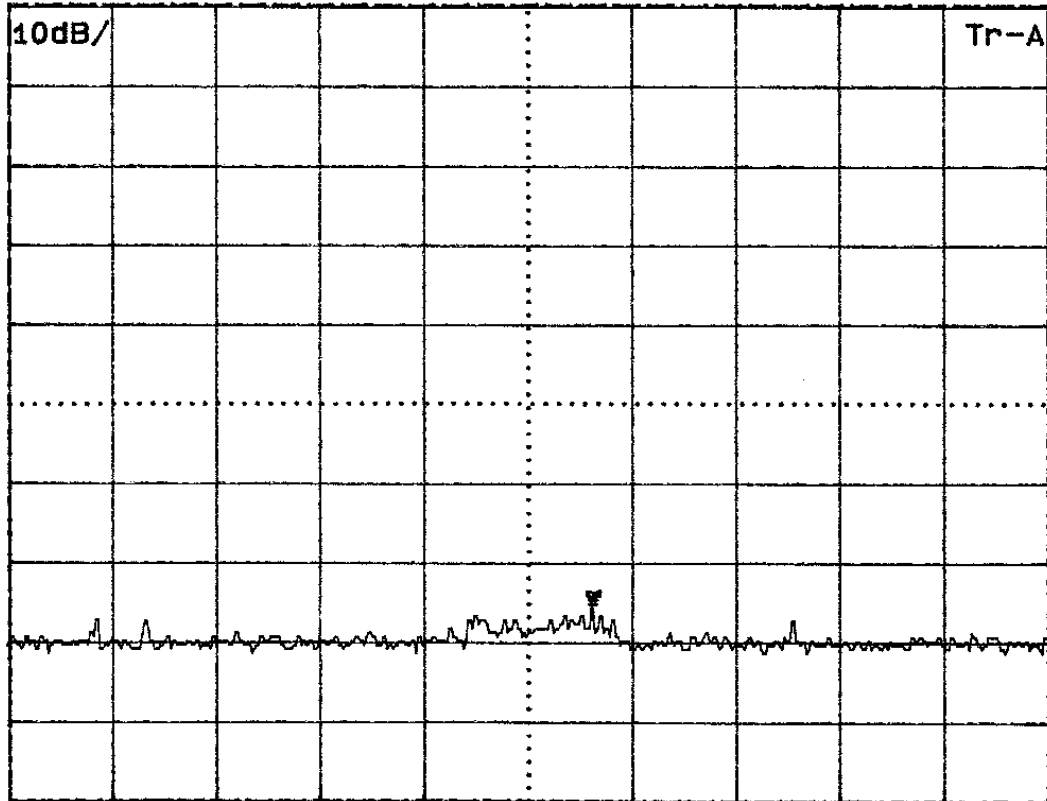


CF: 7.3350000GHz

Span: 500kHz

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

MKR: 8.1500310GHz **WaveNet Boomer II**
-66.43dBm **RB 10kHz** **AT 20dB#** **Band auto**
RLV: 10.00dBm **VB 10kHz** **ST 50ms**

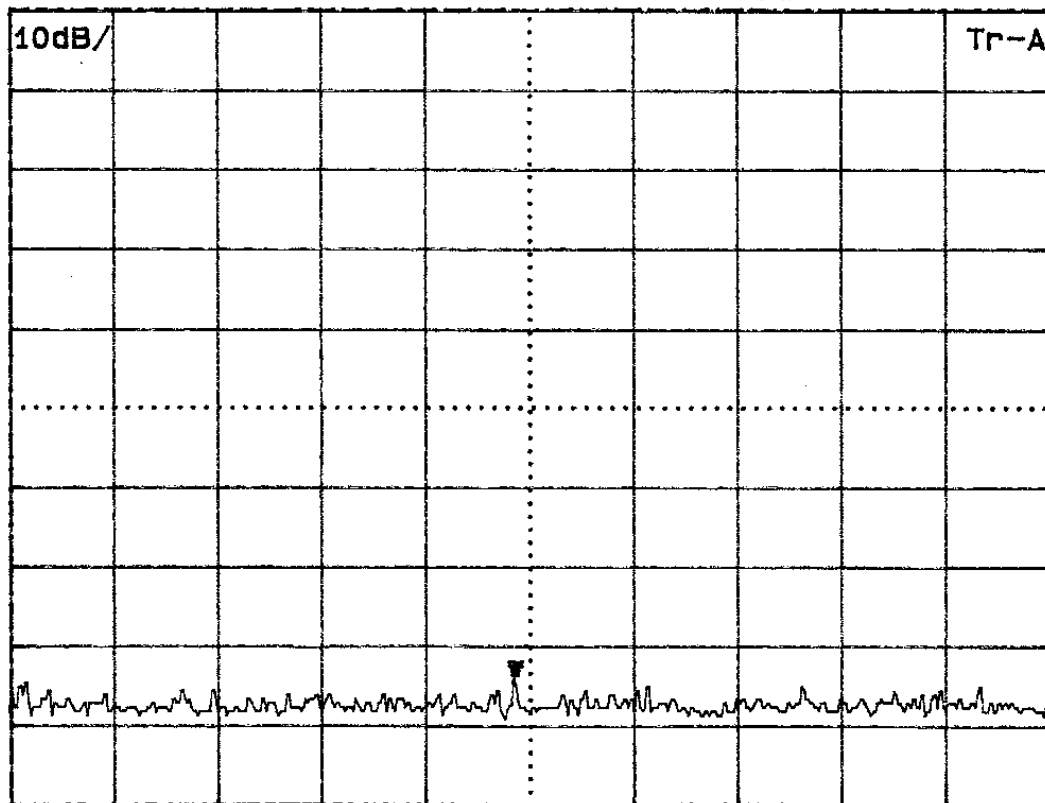


CF: 8.1500000GHz

Span: 500kHz

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

MKR: 8.9649940GHz **WaveNet Boomer II**
-74.35dBm **RB 10kHz** **AT 20dB#** **Band auto**
PLV: 10.00dBm **VB 10kHz** **ST 50ms**

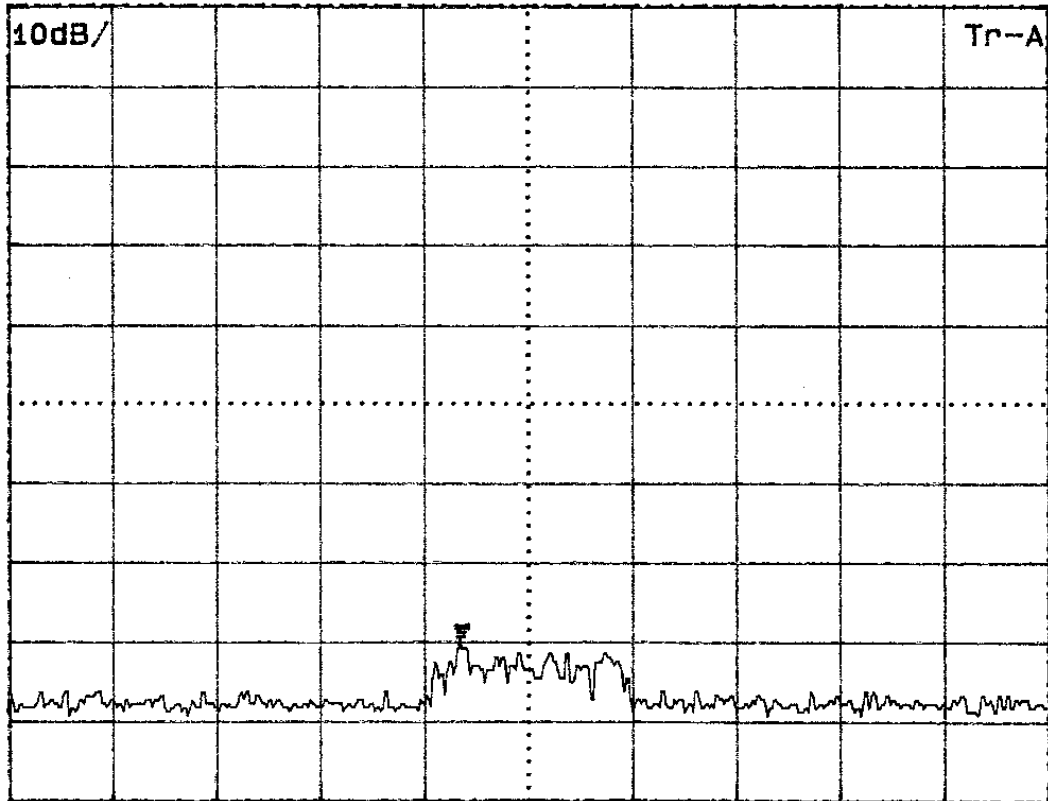


CF: 8.9650000GHz

Span: 500kHz

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

MKR: 9.7799680GHz **WaveNet Boomer II**
-70.62dBm **RB 10kHz** **AT 20dB#** **Band auto**
PLV: 10.00dBm **VB 10kHz** **ST 50ms**

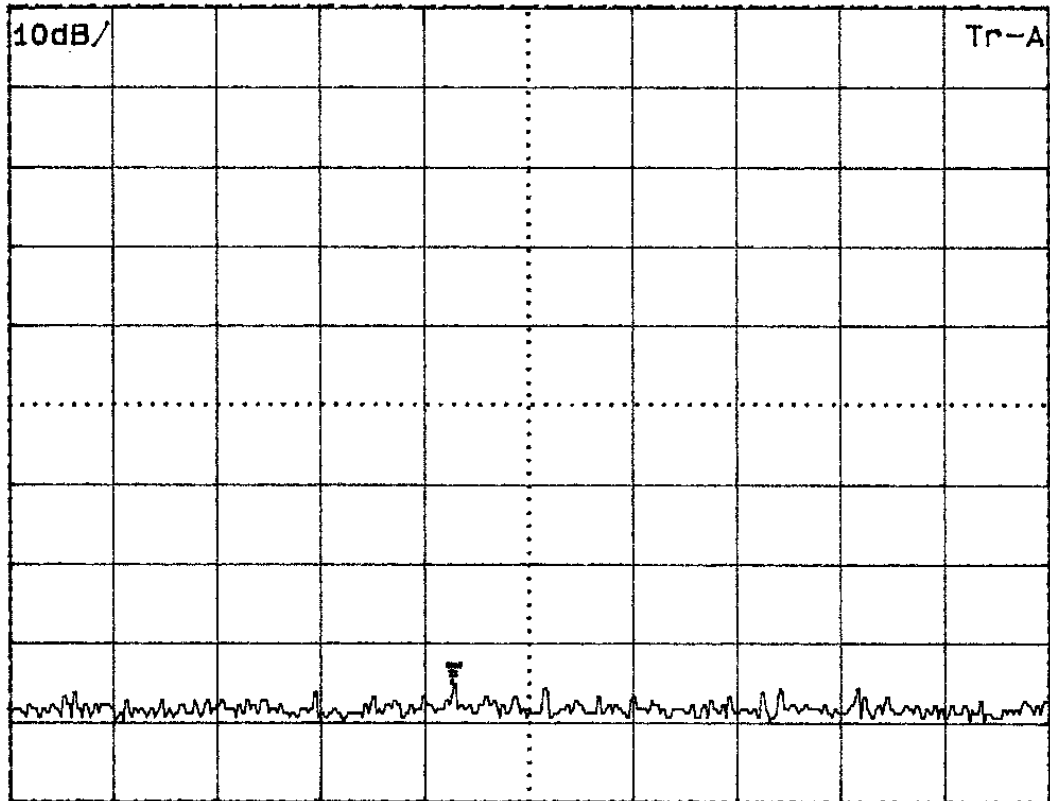


CF: 9.7800000GHz

Span: 500kHz

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

MKR: 10.5949650GHz WaweNet Boomer II
 -75.24dBm RB 10kHz AT 20dB# Band auto
 RLV: 10.00dBm VB 10kHz ST 50ms



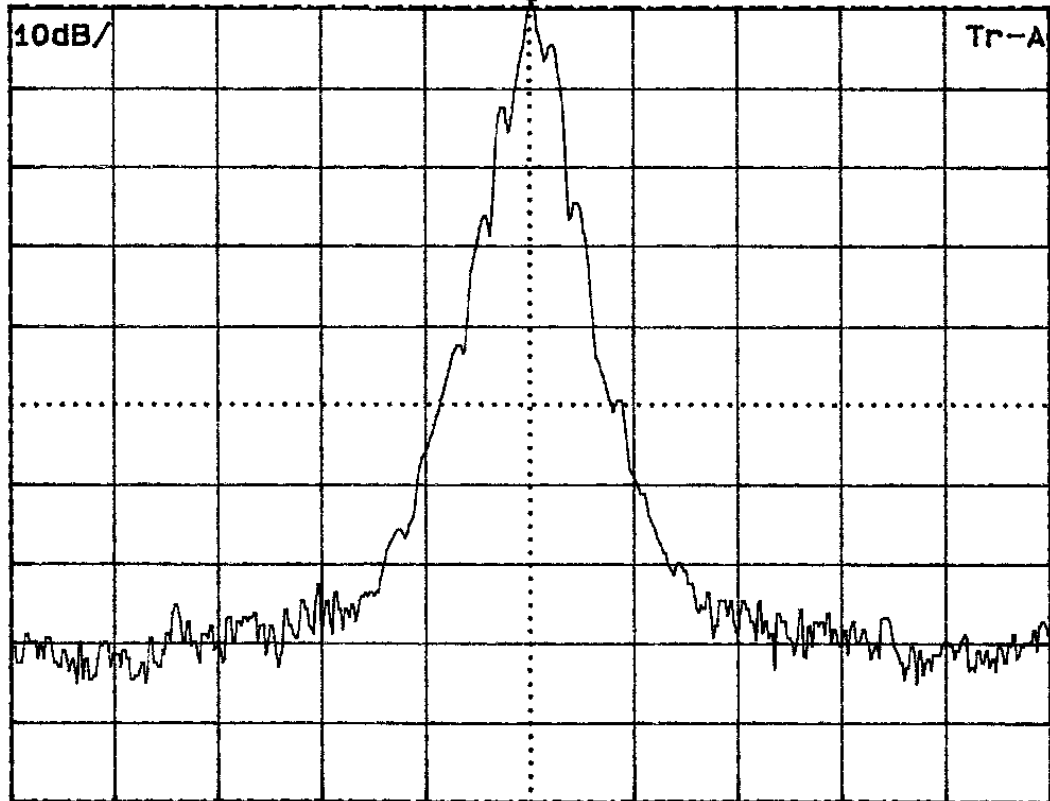
CF: 10.5950000GHz

Span: 500kHz

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

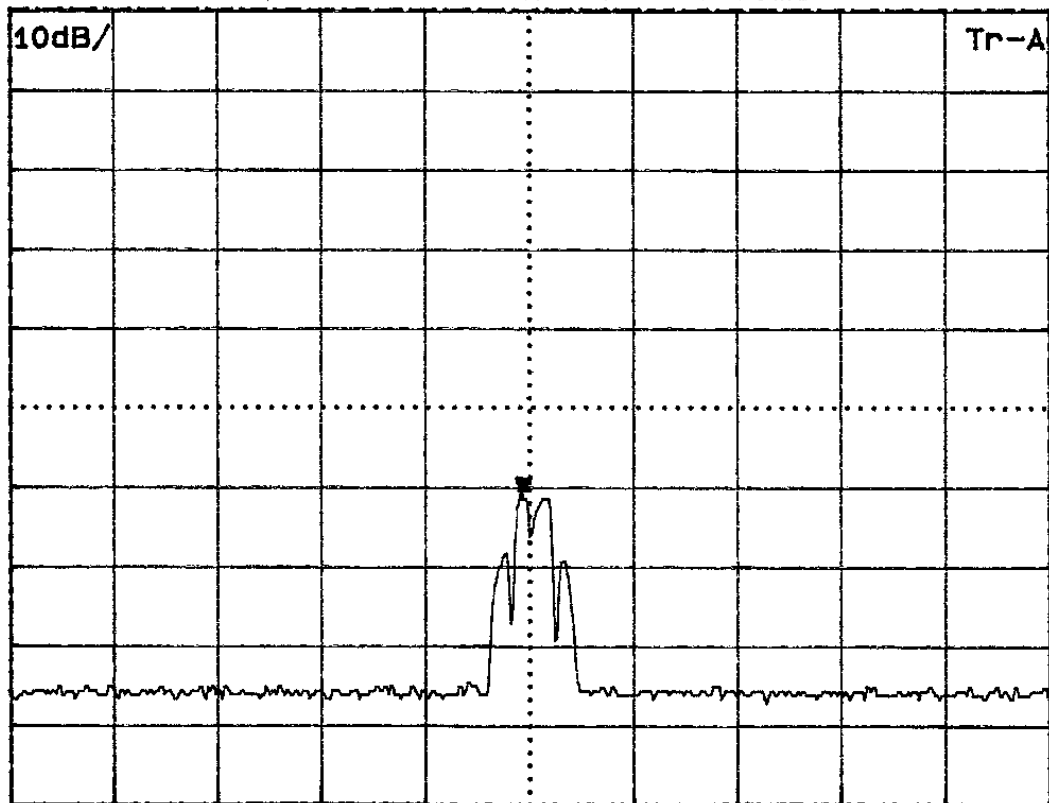
**Plots
Spurious Emissions
at Antenna Terminal - Plots
Frequency Band: 806-821 MHz
Mask G
MDC 4.8 kbps**

MKR: 815.0020MHz WaweNet Boomer II
12.90dBm RB 10kHz AT 30dB# Band auto
RLV: 13.00dBm VB 10kHz ST 50ms



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

MKR: 1.6299980GHz **WaveNet Boomer II**
-51.43dBm **RB 10kHz** **AT 20dB#** **Band auto**
PLV: 10.00dBm **VB 10kHz** **ST 50ms**

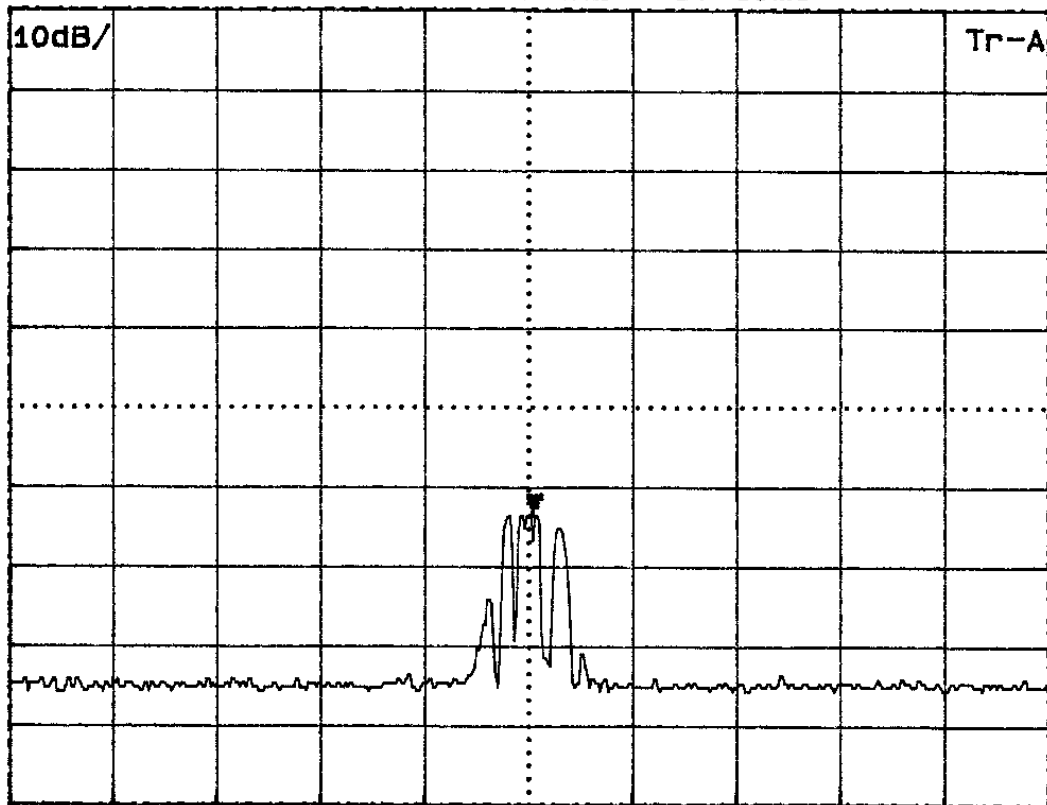


CF: 1.6300000GHz

Span: 500kHz

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

MKR: 2.4450040GHz **WaveNet Boomer II**
-53.51dBm **RB 10kHz** **AT 20dB#** **Band auto**
RLV: 10.00dBm **VB 10kHz** **ST 50ms**

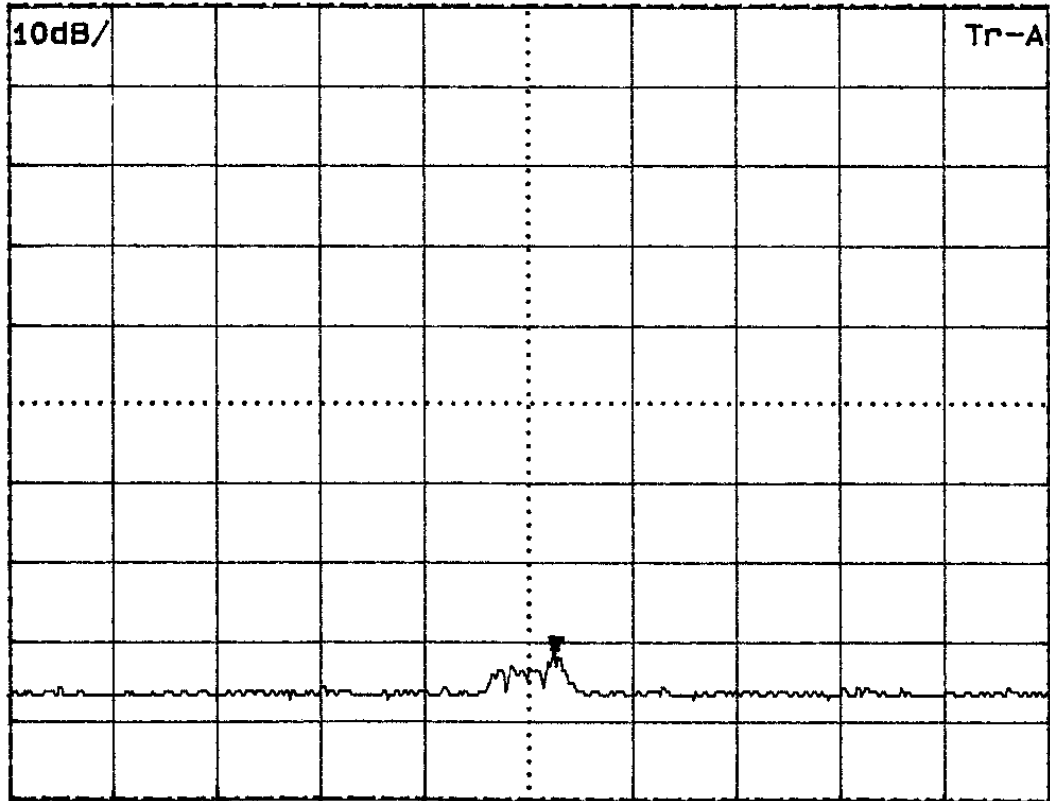


CF: 2.4450000GHz

Span: 500kHz

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

MKR: 3.2600130GHz WaweNet Boomer II
-72.04dBm RB 10kHz AT 20dB# Band auto
RLV: 10.00dBm VB 10kHz ST 50ms

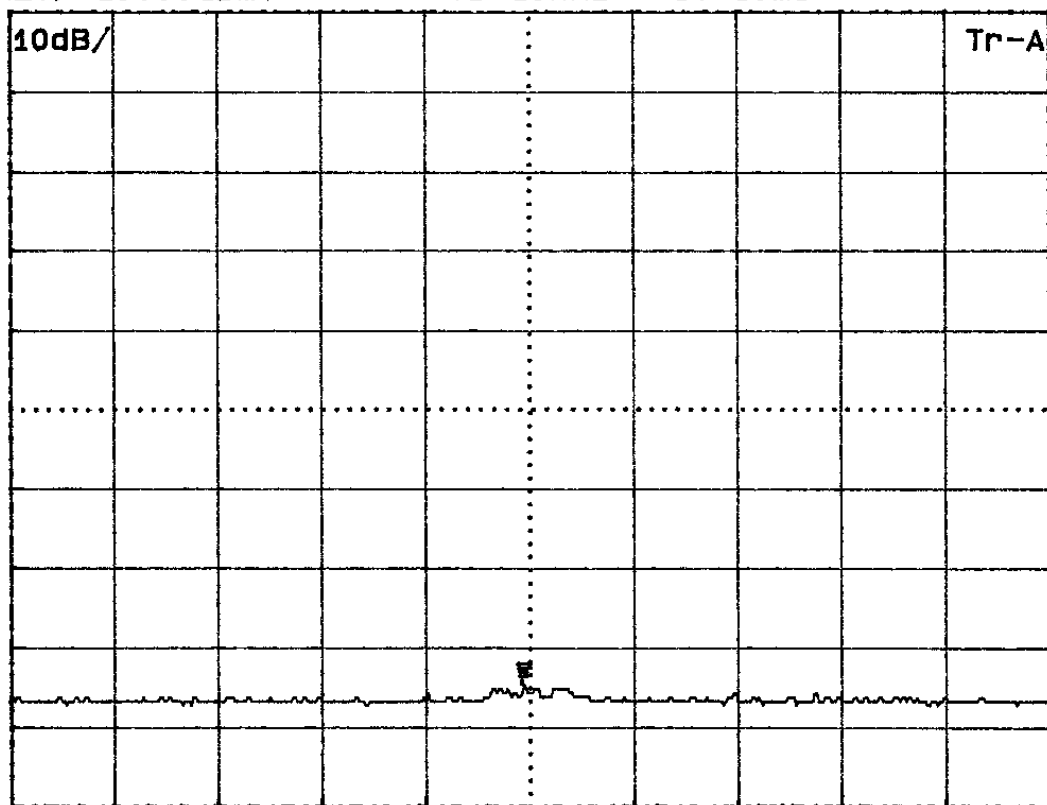


CF: 3.2600000GHz

Span: 500kHz

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

MKR: 4.0749980GHz **WaveNet Boomer II**
-74.80dBm **RB 10kHz** **AT 20dB#** **Band auto**
RLV: 10.00dBm **VB 10kHz** **ST 50ms**

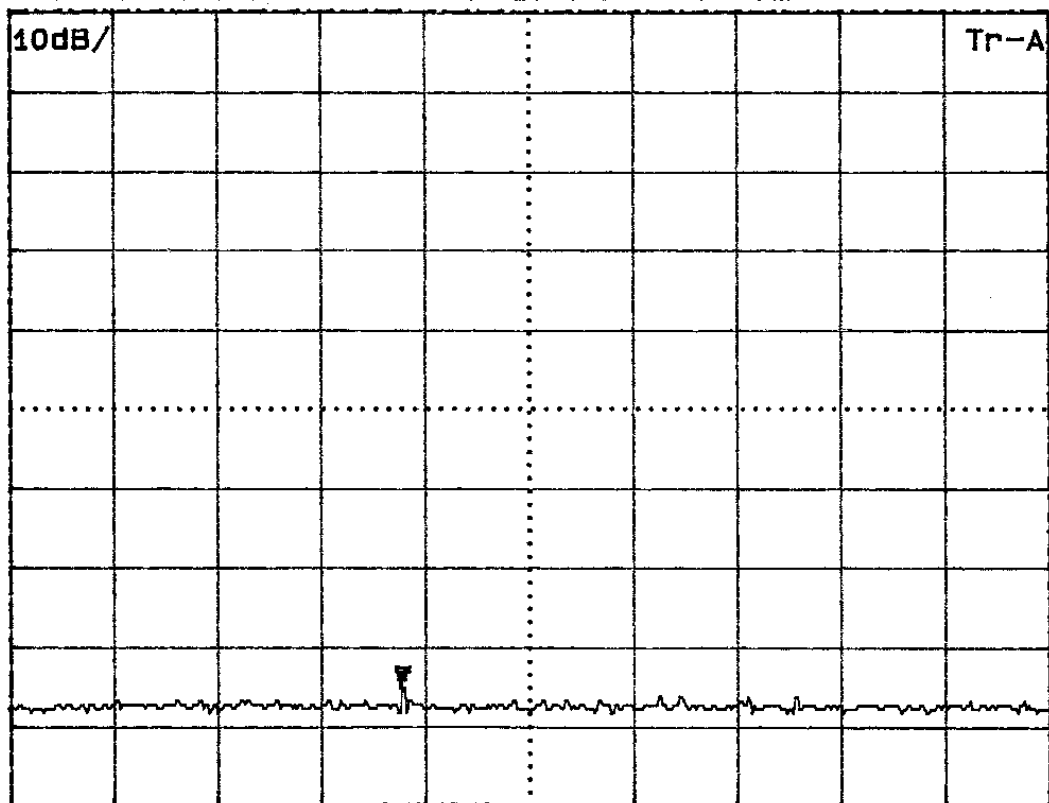


CF: 4.0750000GHz

Span: 500kHz

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

MKR: 4.8899400GHz **WaveNet Boomer II**
-75.31dBm **RB 10kHz** **AT 20dB#** **Band auto**
RLV: 10.00dBm **VB 10kHz** **ST 50ms**

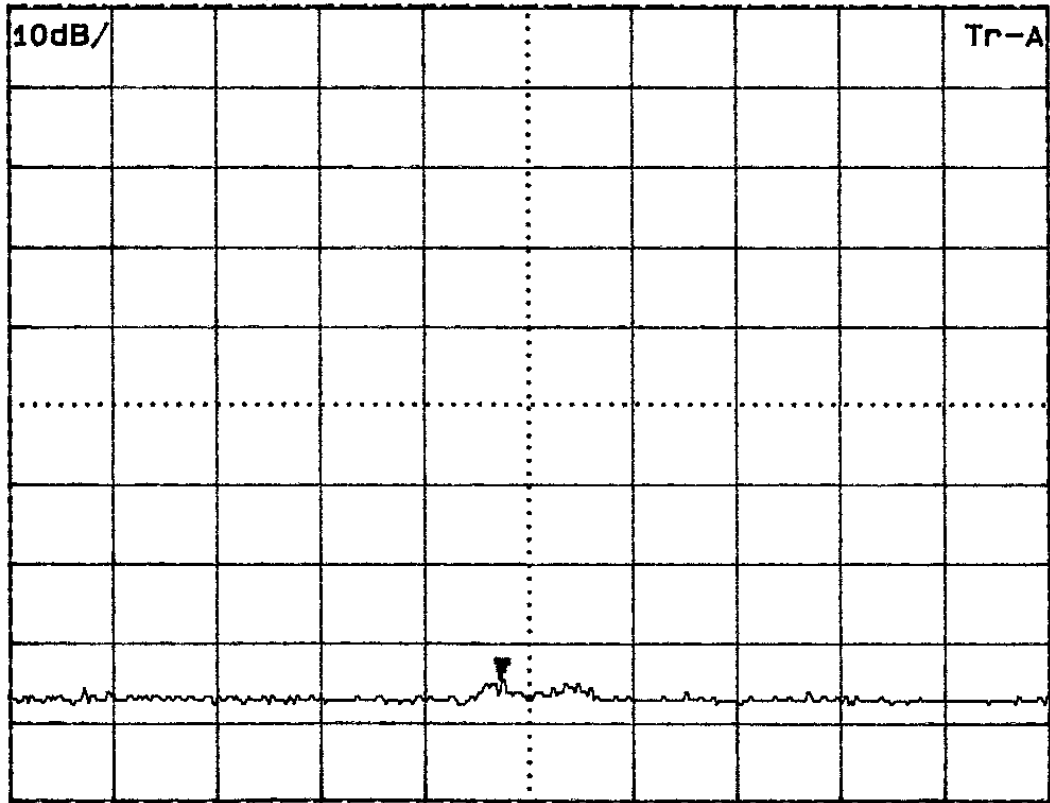


CF: 4.8900000GHz

Span: 500kHz

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

MKR: 5.7049880GHz **WaveNet Boomer II**
-74.70dBm **RB 10kHz** **AT 20dB#** **Band auto**
RLV: 10.00dBm **VB 10kHz** **ST 50ms**

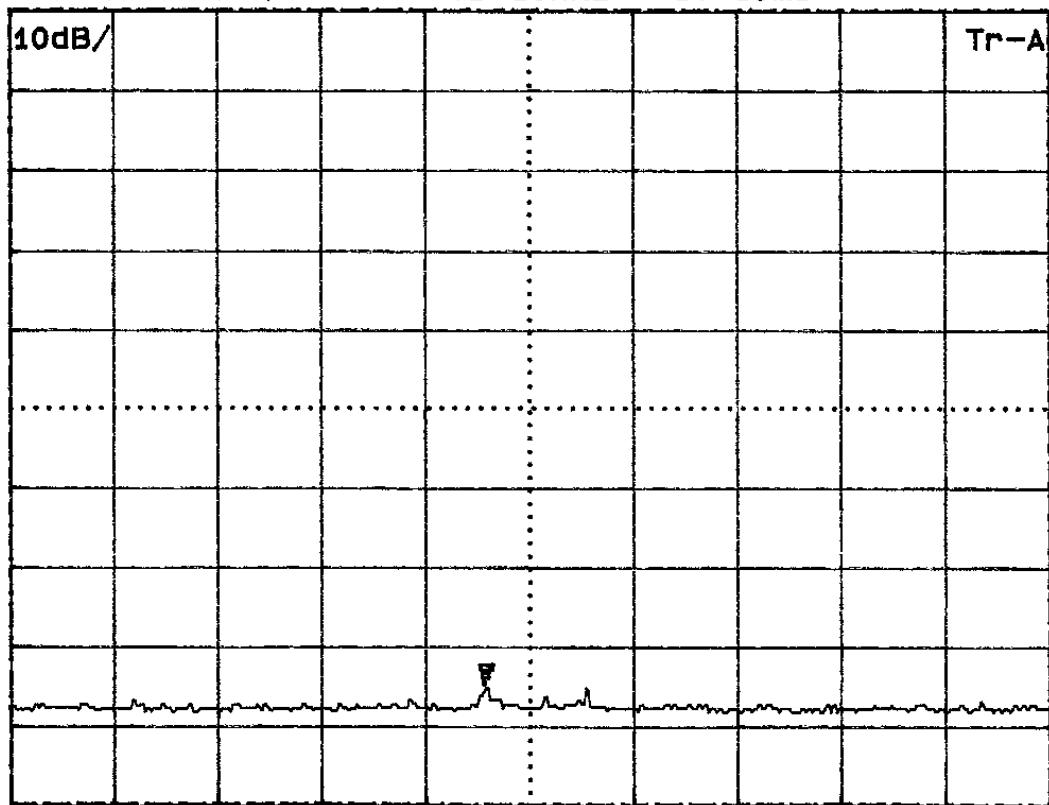


CF: 5.7050000GHz

Span: 500kHz

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

MKR: 6.5199800GHz **WaveNet Boomer II**
-75.17dBm **RB 10kHz** **AT 20dB#** **Band auto**
RLV: 10.00dBm **VB 10kHz** **ST 50ms**

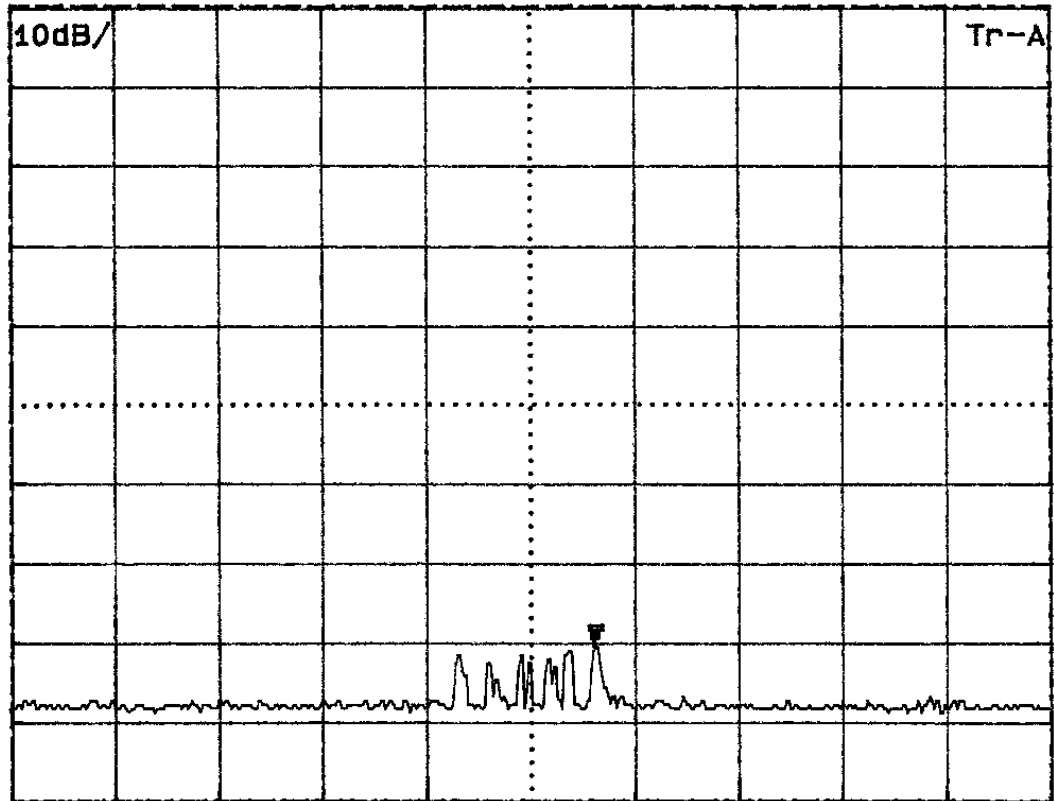


CF: 6.5200000GHz

Span: 500kHz

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

MKR: 7.3350320GHz **WaveNet Boomer II**
-70.52dBm **RB 10kHz** **AT 20dB#** **Band auto**
RLV: 10.00dBm **VB 10kHz** **ST 50ms**

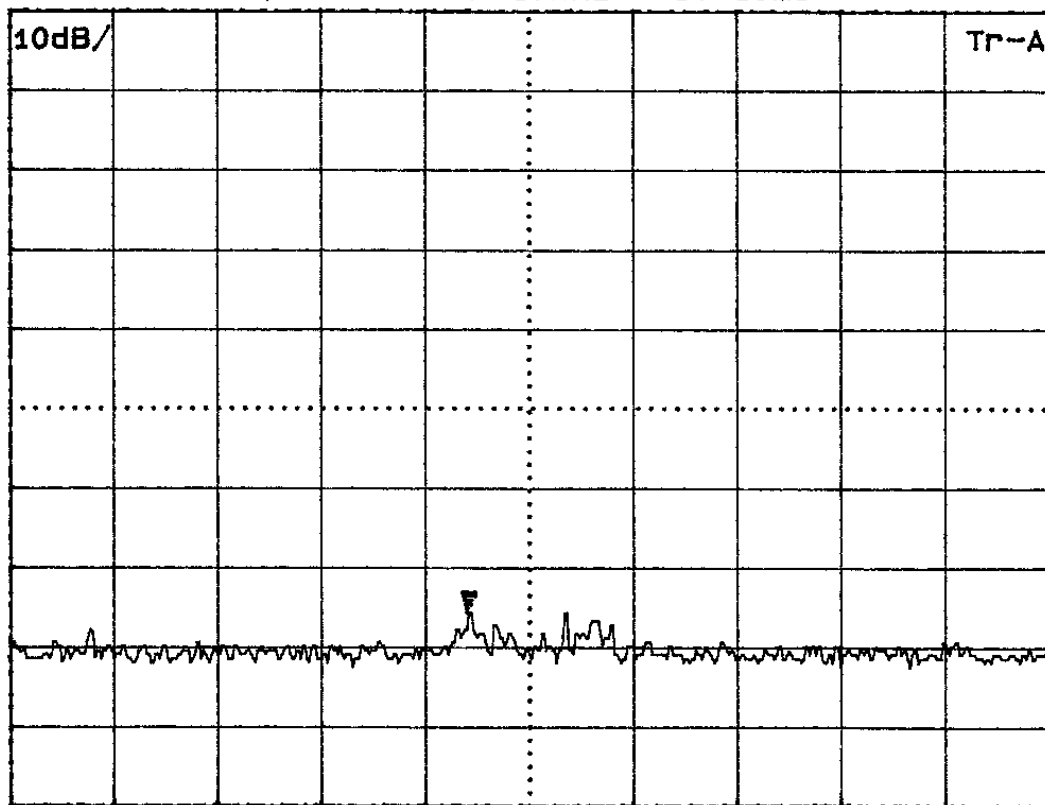


CF: 7.3350000GHz

Span: 500kHz

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

MKR: 8.1499720GHz **WaveNet Boomer II**
-65.82dBm **RB 10kHz** **AT 20dB#** **Band auto**
RLV: 10.00dBm **VB 10kHz** **ST 50ms**

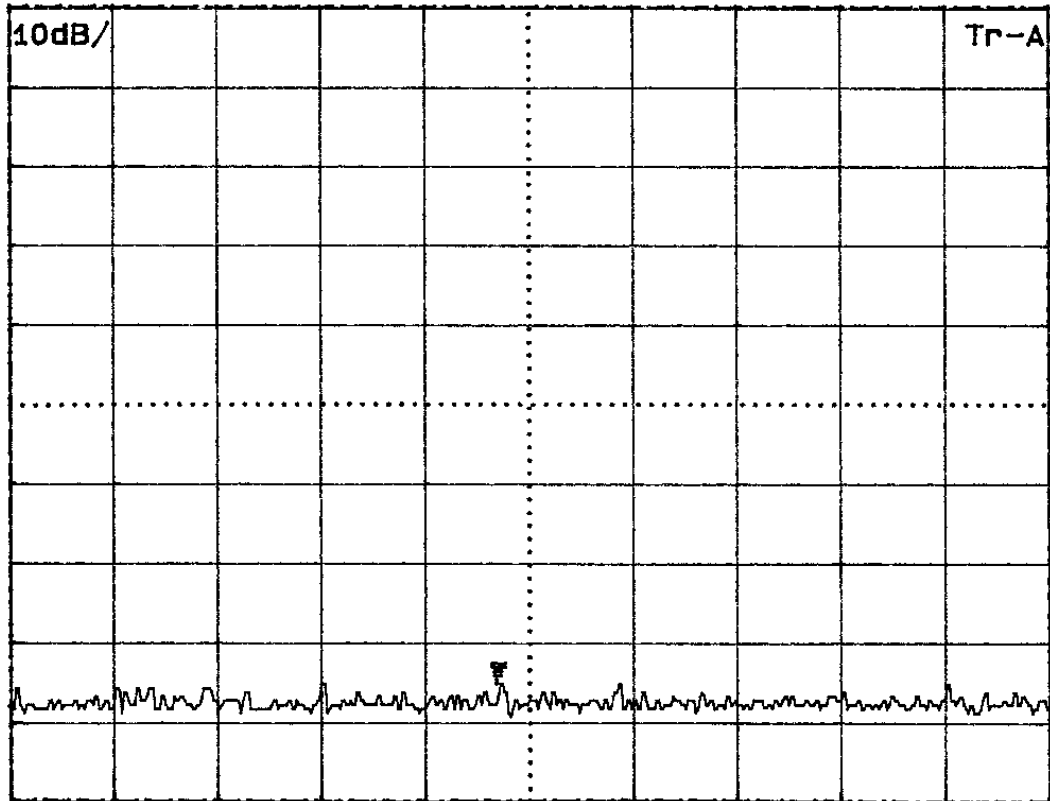


CF: 8.1500000GHz

Span: 500kHz

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

MKR: 8.9649870GHz **WaveNet Boomer II**
-75.08dBm **RB 10kHz** **AT 20dB#** **Band auto**
RLV: 10.00dBm **VB 10kHz** **ST 50ms**

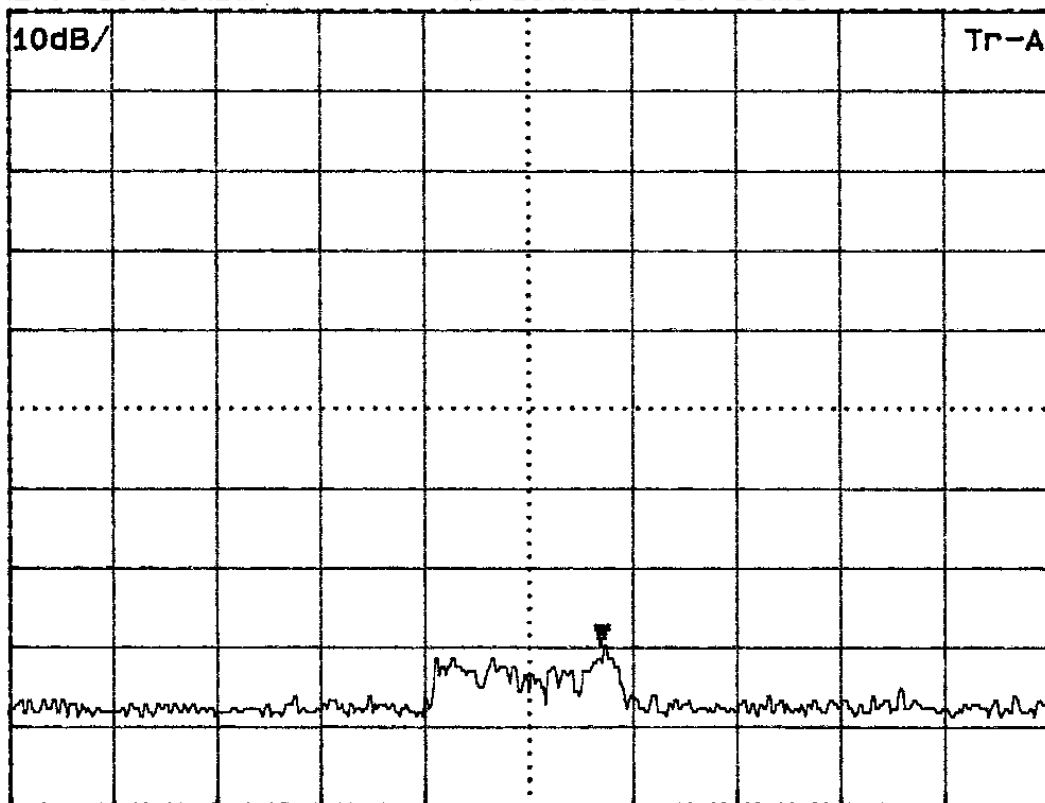


CF: 8.9650000GHz

Span: 500kHz

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

MKR: 9.7800370GHz **WaveNet Boomer II**
-70.04dBm **RB 10kHz** **AT 20dB#** **Band auto**
RLV: 10.00dBm **VB 10kHz** **ST 50ms**

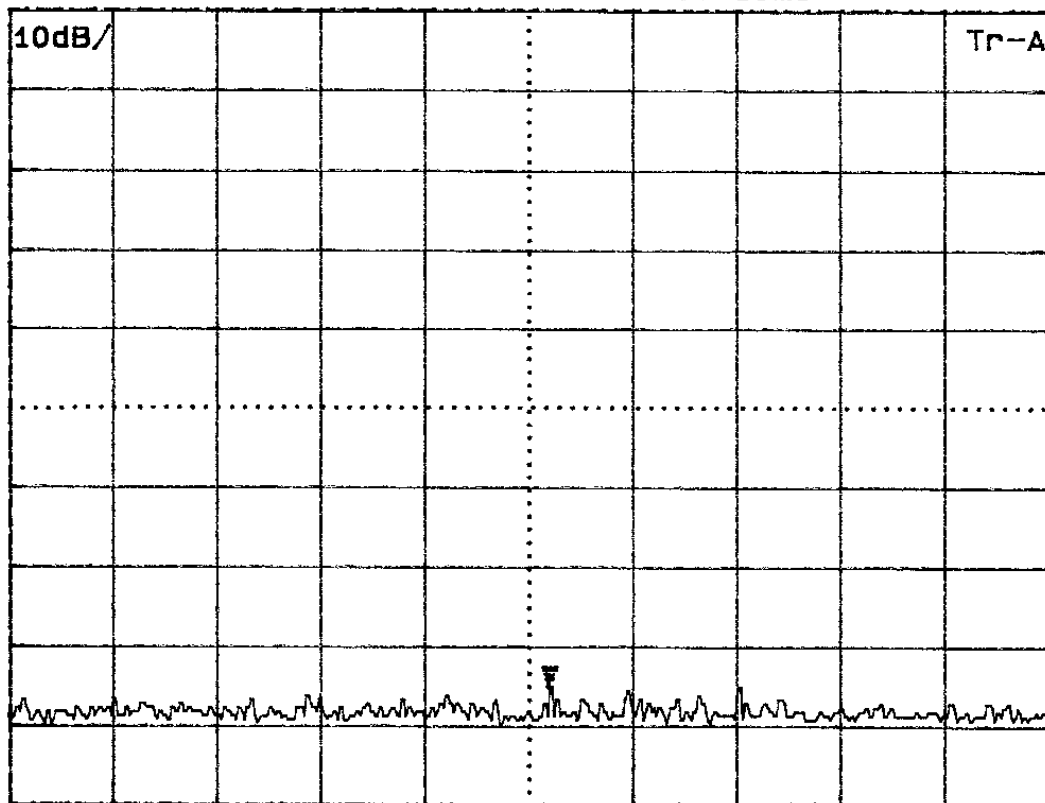


CF: 9.7800000GHz

Span: 500kHz

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

MKR: 10.5950110GHz WaweNet Boomer II
 -75.09dBm RB 10kHz AT 20dB# Band auto
 RLV: 10.00dBm VB 10kHz ST 50ms



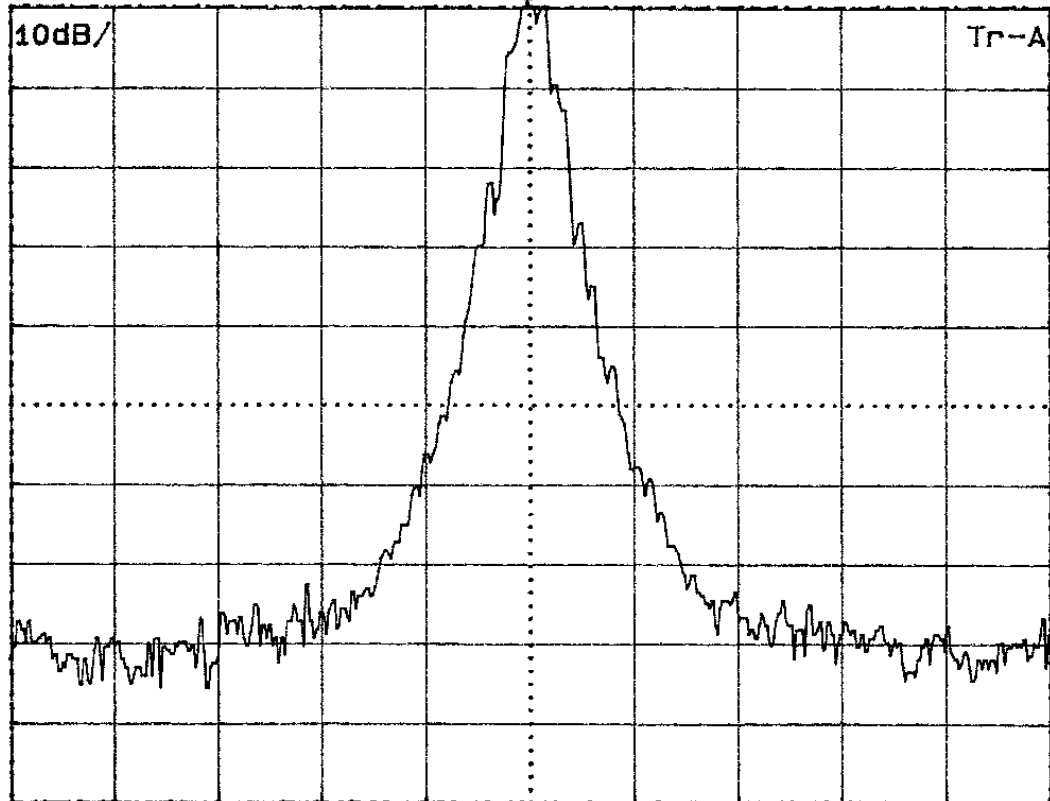
CF: 10.5950000GHz

Span: 500kHz

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

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

MKR: 822.5010MHz WaweNet Boomer II
 12.94dBm RB 10kHz AT 30dB# Band auto
 ALV: 12.90dBm VB 10kHz ST 50ms

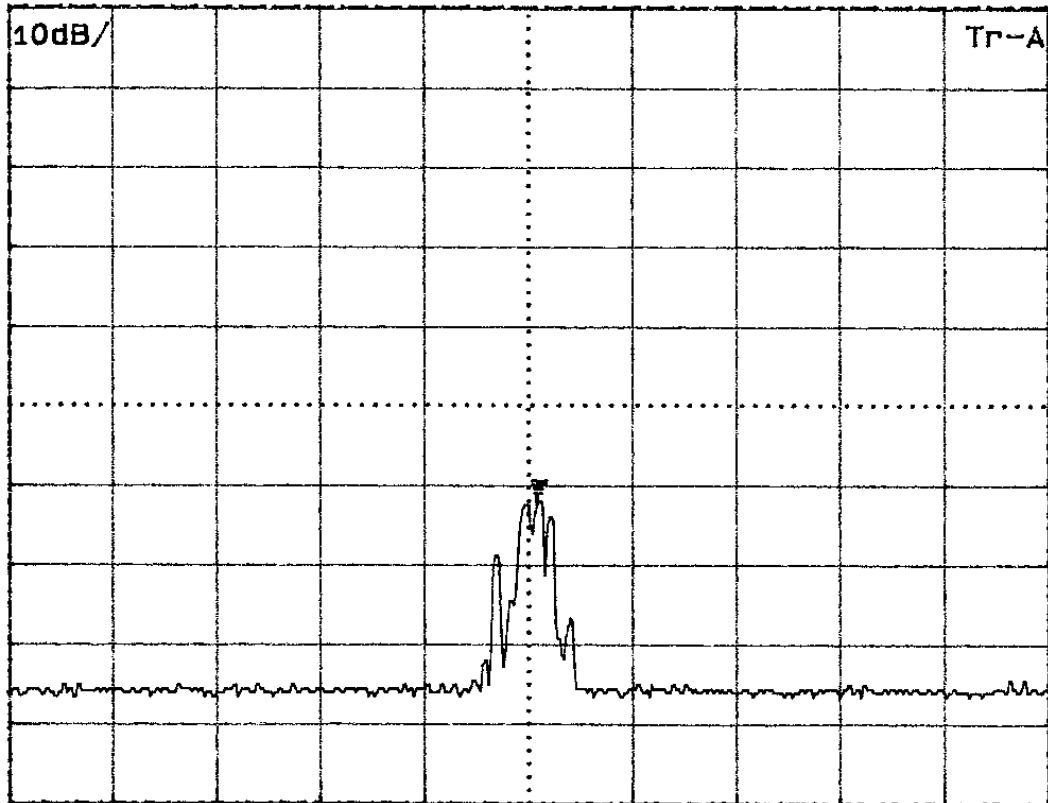


CF: 822.5000MHz

Span: 500kHz

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

MKR: 1.6450060GHz WaweNet Boomer II
-52.12dBm RB 10kHz AT 20dB# Band auto
RLV: 10.00dBm VB 10kHz ST 50ms

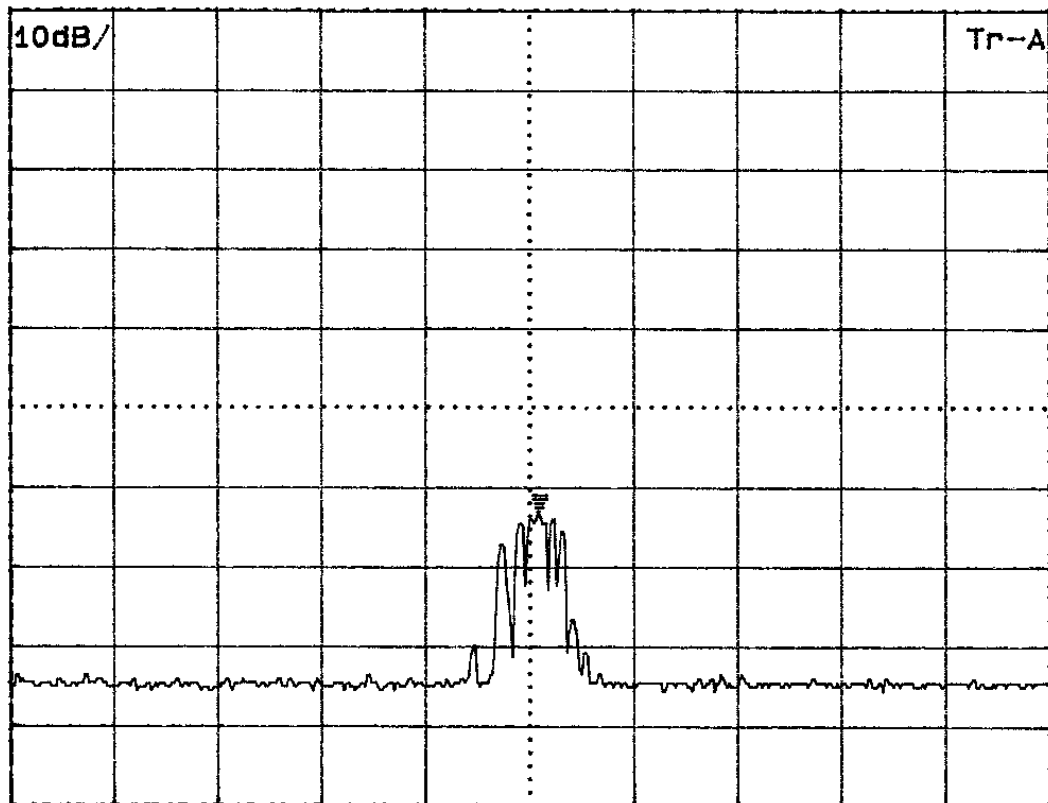


CF: 1.6450000GHz

Span: 500kHz

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

MKR: 2.4675050GHz WaweNet Boomer II
 -53.65dBm RB 10kHz AT 20dB# Band auto
 RLV: 10.00dBm VB 10kHz ST 50ms

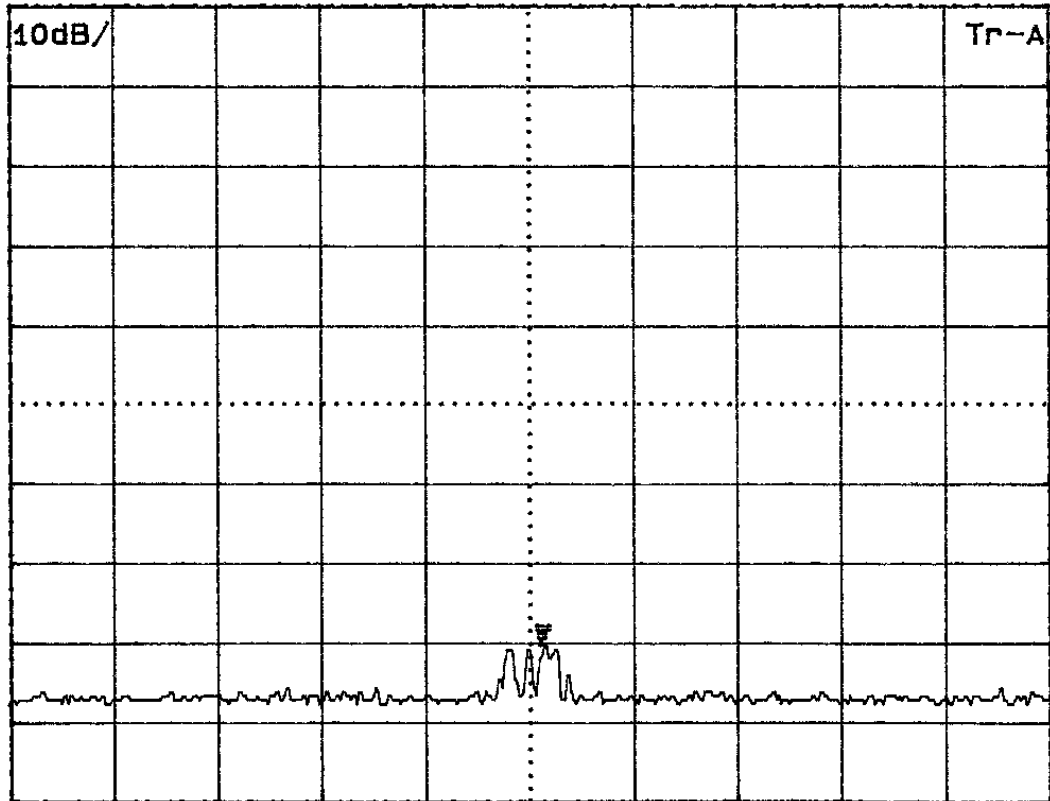


CF: 2.4675000GHz

Span: 500kHz

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

MKR: 3.2900080GHz **WaveNet Boomer II**
-70.23dBm **RB 10kHz** **AT 20dB#** **Band auto**
RLV: 10.00dBm **VB 10kHz** **ST 50ms**

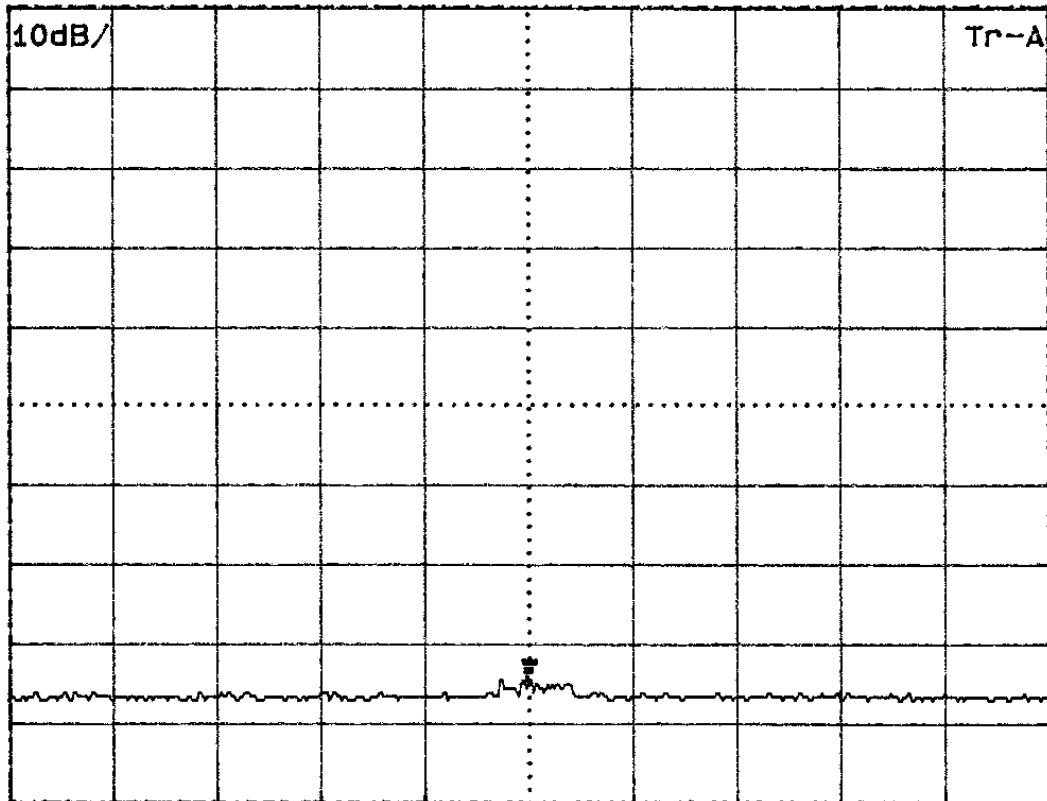


CF: 3.2900000GHz

Span: 500kHz

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

MKR: 4.1125010GHz WaweNet Boomer II
 -74.65dBm RB 10kHz AT 20dB# Band auto
 RLV: 10.00dBm VB 10kHz ST 50ms

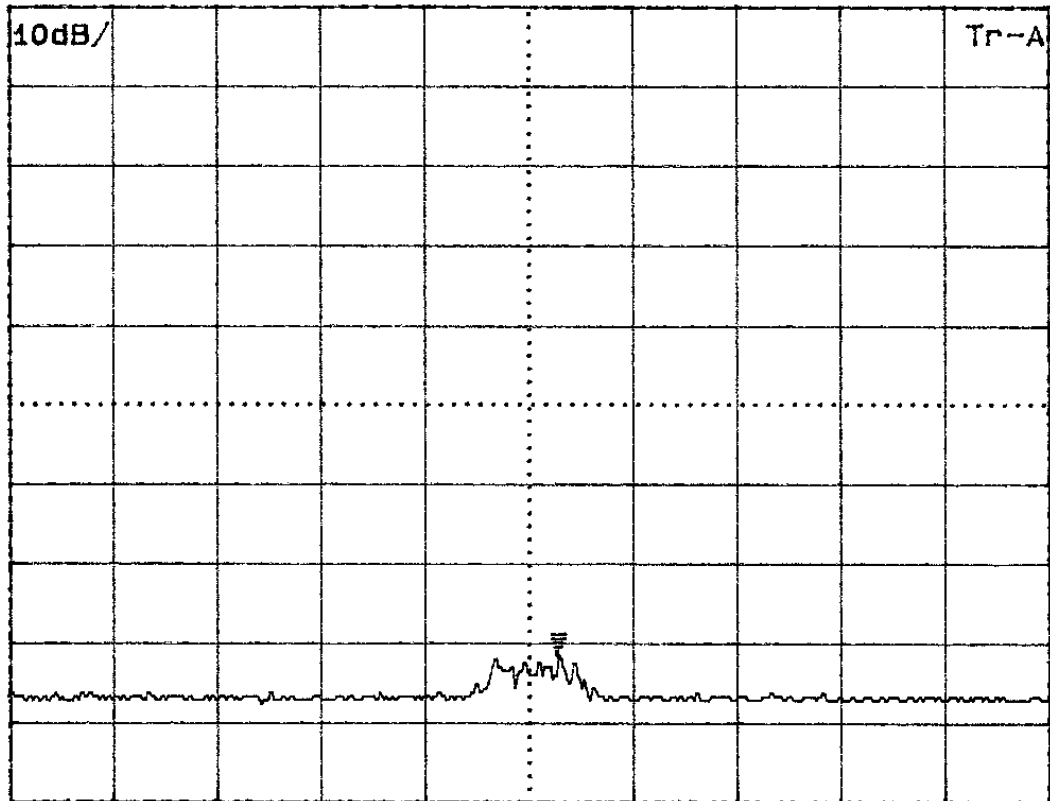


CF: 4.1125000GHz

Span: 500kHz

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

MKR: 4.9350150GHz WaweNet Boomer II
-71.67dBm RB 10kHz AT 20dB# Band auto
RLV: 10.00dBm VB 10kHz ST 50ms

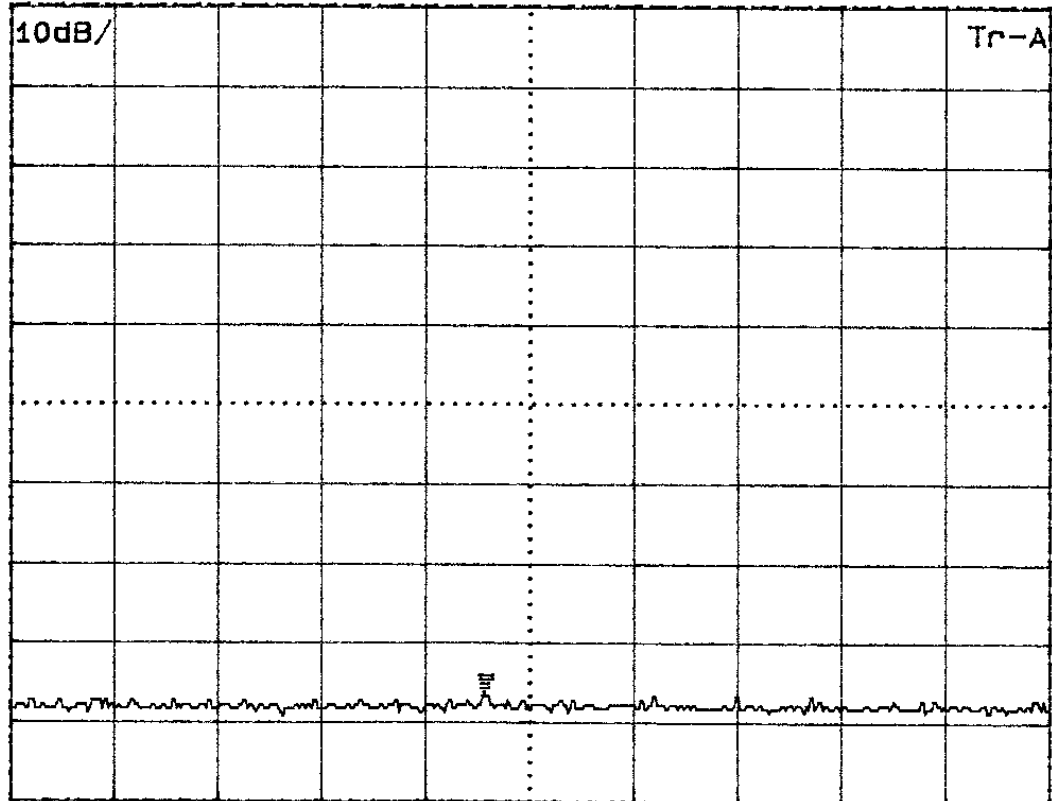


CF: 4.9350000GHz

Span: 500kHz

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

MKR: 5.7574800GHz WaweNet Boomer II
 -76.60dBm RB 10kHz AT 20dB# Band auto
 RLV: 10.00dBm VB 10kHz ST 50ms

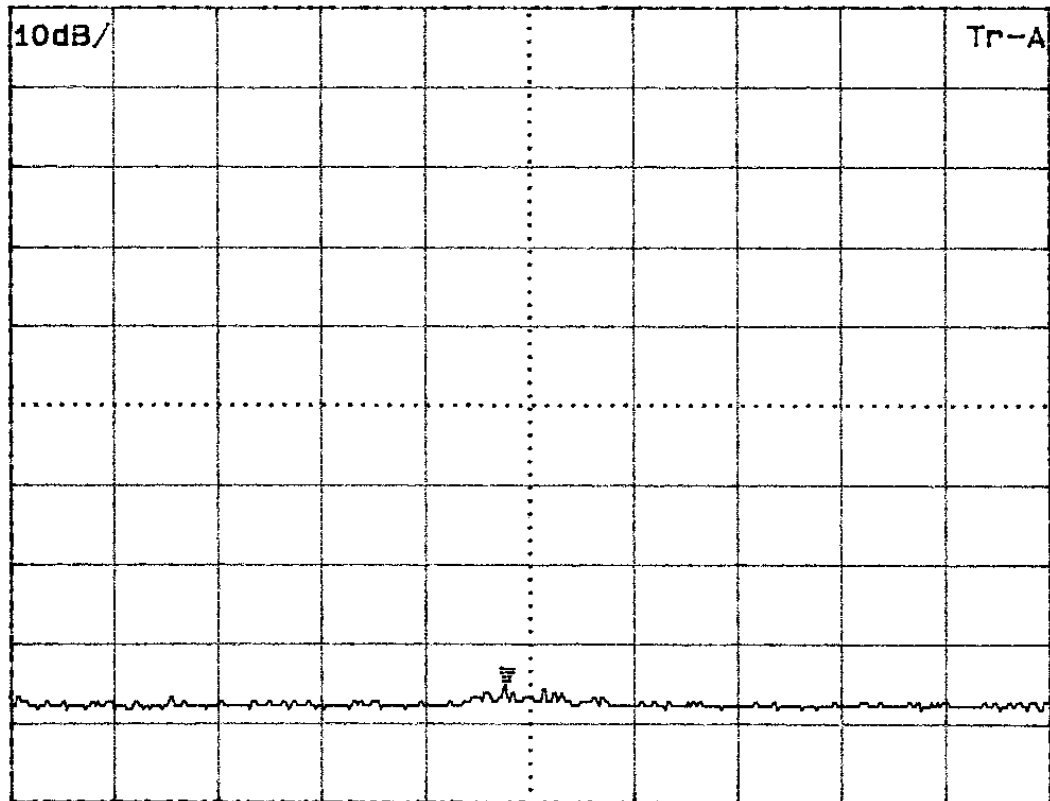


CF: 5.7575000GHz

Span: 500kHz

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

MKR: 6.5799890GHz WaweNet Boomer II
-75.54dBm RB 10kHz AT 20dB# Band auto
PLV: 10.00dBm VB 10kHz ST 50ms

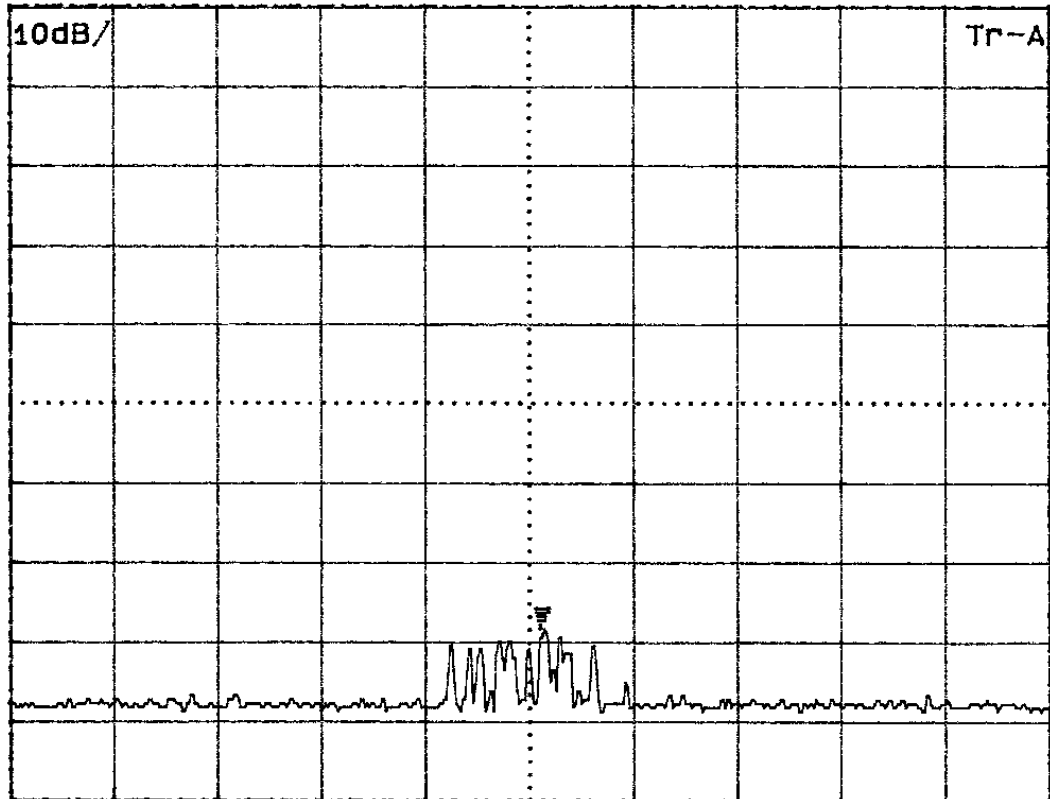


CF: 6.5800000GHz

Span: 500kHz

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

MKR: 7.4025080GHz WaweNet Boomer II
 -68.47dBm RB 10kHz AT 20dB# Band auto
 RLV: 10.00dBm VB 10kHz ST 50ms

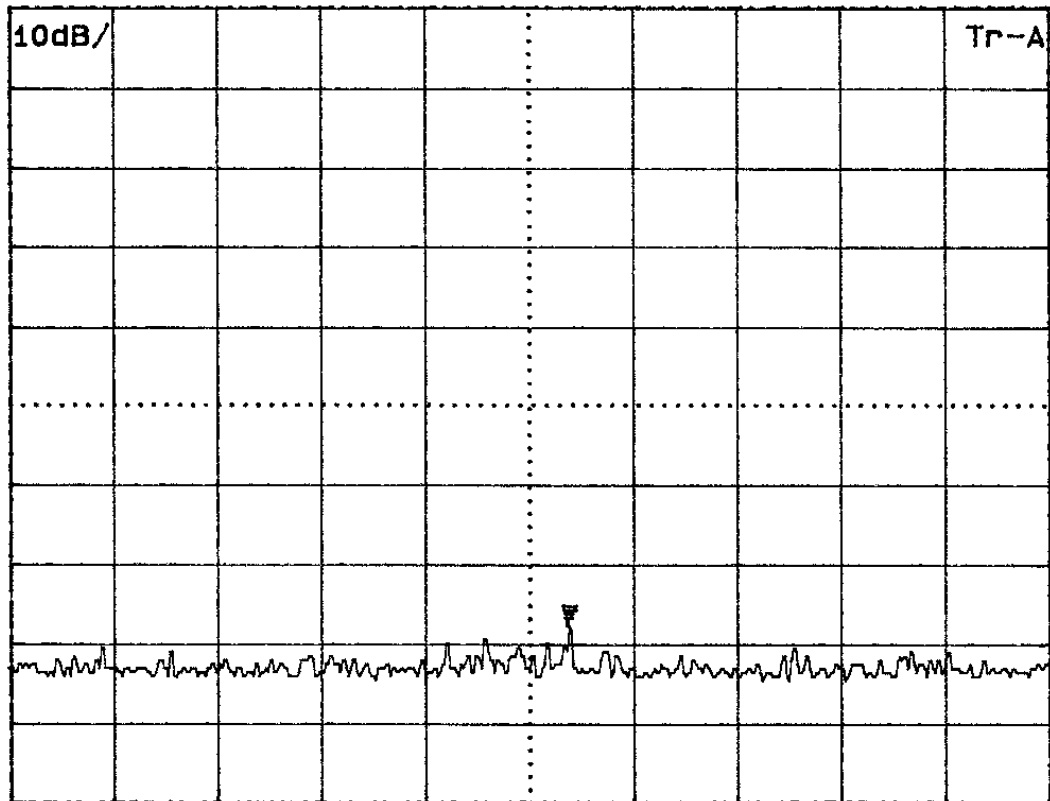


CF: 7.4025000GHz

Span: 500kHz

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

MR: 8.2250200GHz **WaveNet Boomer II**
-68.00dBm **RB 10kHz** **AT 20dB#** **Band auto**
RLV: 10.00dBm **VB 10kHz** **ST 50ms**

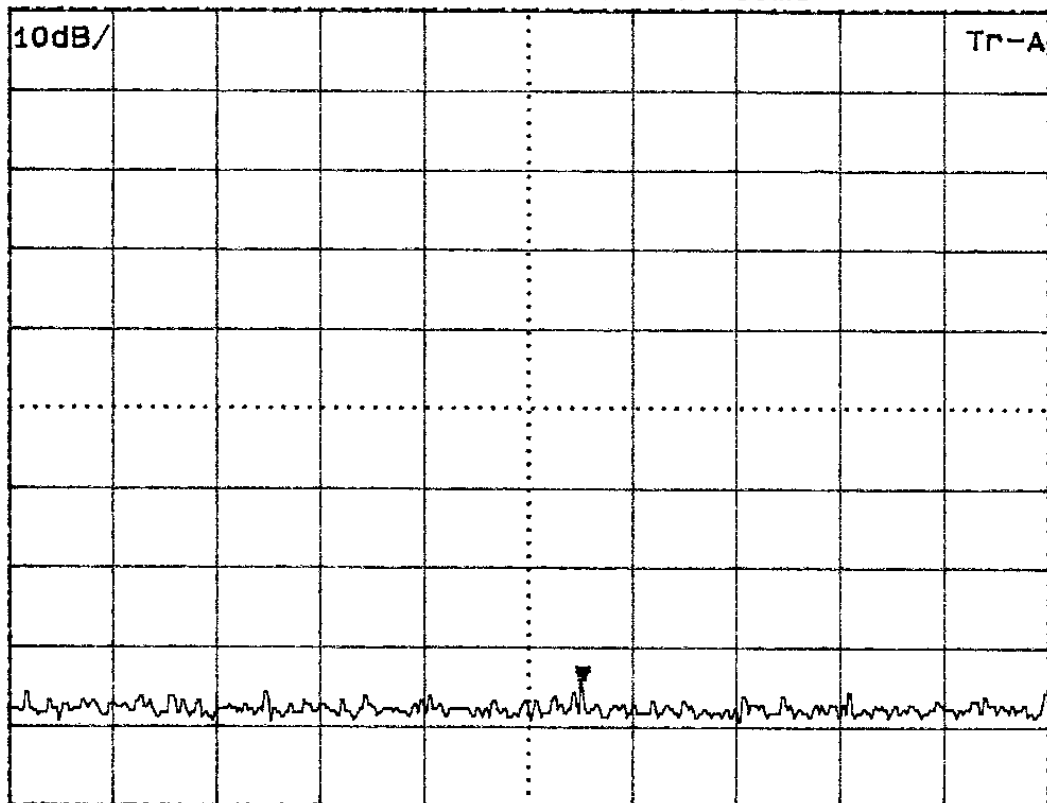


CF: 8.2250000GHz

Span: 500kHz

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

MKR: 9.0475260GHz WaweNet Boomer II
 -75.04dBm RB 10kHz AT 20dB# Band auto
 RLV: 10.00dBm VB 10kHz ST 50ms

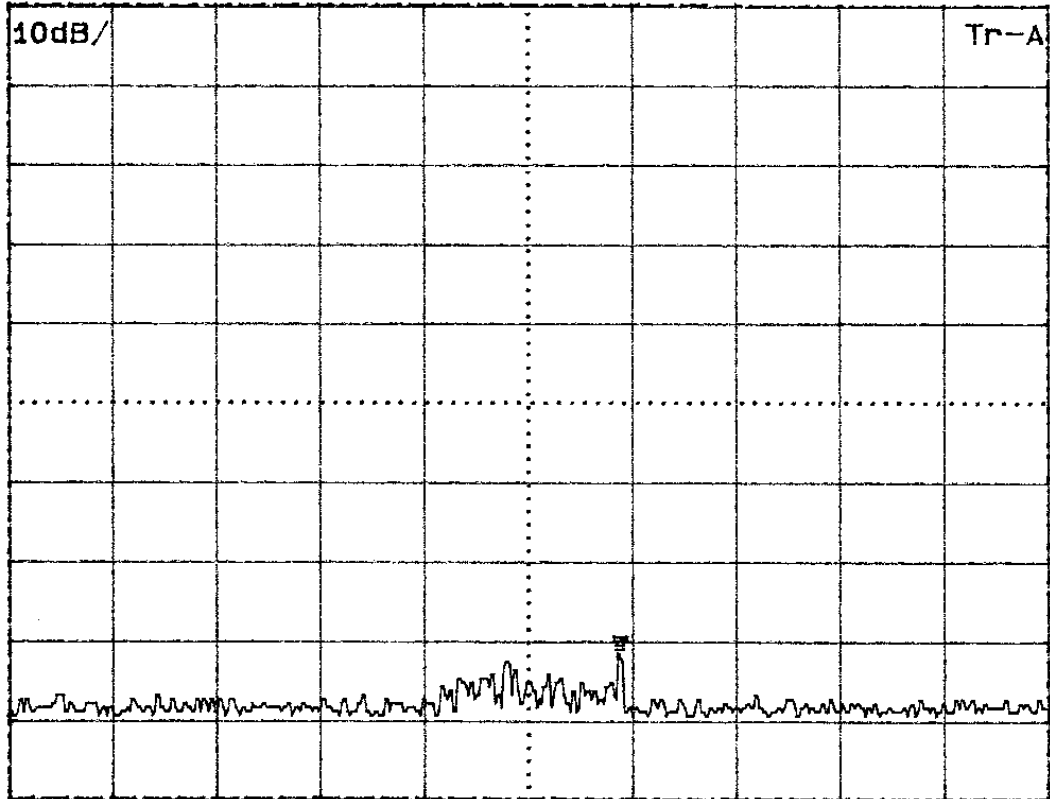


CF: 9.0475000GHz

Span: 500kHz

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

MKR: 9.8700450GHz WaweNet Boomer II
-72.05dBm RB 10kHz AT 20dB# Band auto
RLV: 10.00dBm VB 10kHz ST 50ms

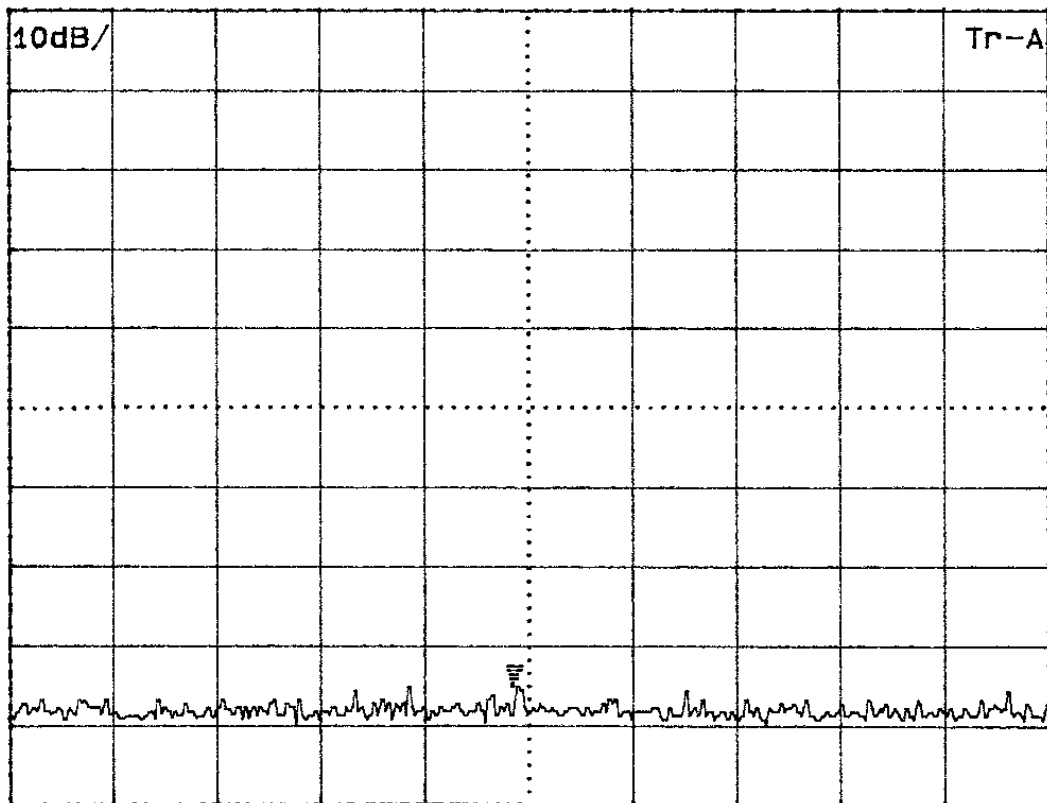


CF: 9.8700000GHz

Span: 500kHz

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

MKR: 10.69249506Hz WaweNet Boomer II
 -74.90dBm RB 10kHz AT 20dB# Band auto
 RLV: 10.00dBm VB 10kHz ST 50ms



CF: 10.69250006Hz

Span: 500kHz

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

APPENDIX A

TESTING EQUIPMENT

List of Equipment used

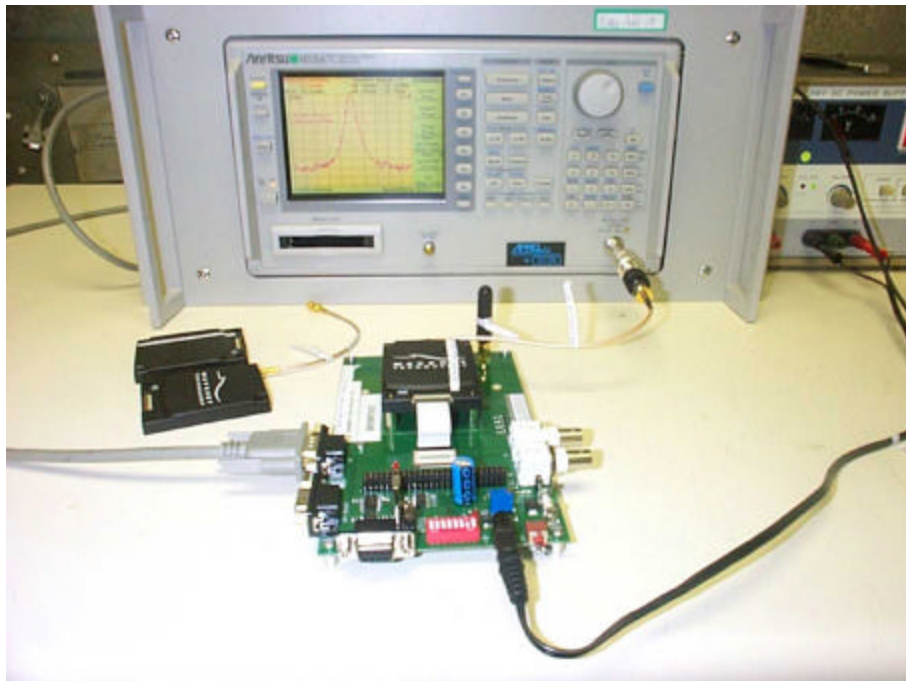
Description	Manufacturer	Model #	Asset #	Calibration Due Data
Spectrum Analyzer	Anritsu	MS2667C	301386	Dec 10, 2002
Power Meter	HP	HP438A	301417	Nov. 2002
20 dB Attenuator	Narda	4774-20	301533	CBT

APPENDIX B

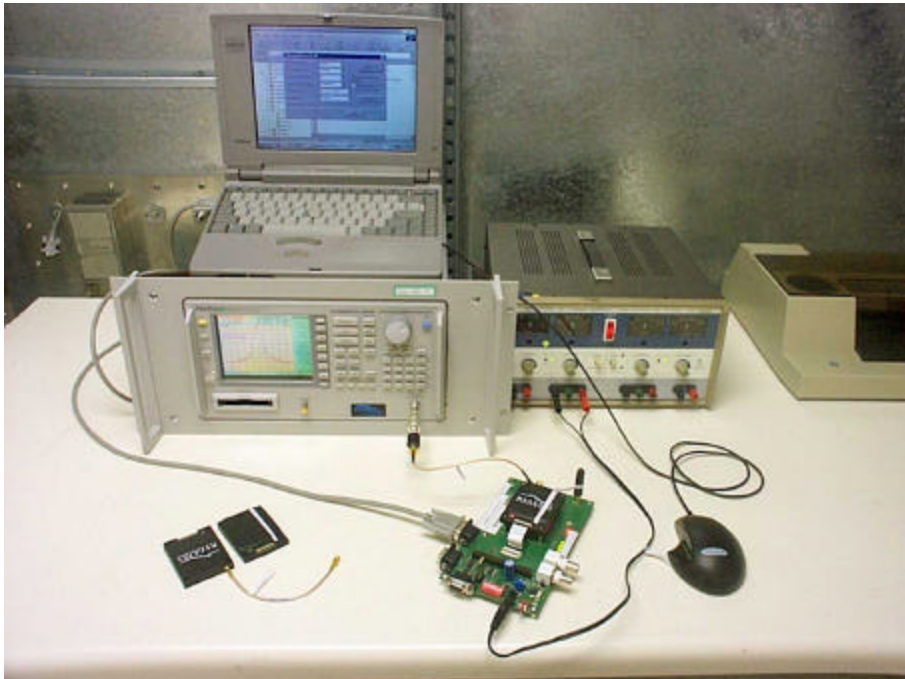
PHOTOGRAPHS



**Wireless OEM Modem Module
WaveNet BOOMER-II**



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



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

FCC ID: PQS-BM28001

Exhibit 2e

Engineering Report on

Frequency Stability (2.1055)



Assessment of Compliance

of

**Device Frequency Stability in accordance with the FCC Rules &
Regulations Parts 2.1055 and 90.213**

Wireless Modem BOOMER II

Wavenet Technologies Pty Ltd.



August 2002

APREL Project No.:WVTB-BoomerII-3922-1

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

Engineering Report

Subject: Assessment of Compliance of Device Frequency Stability
In accordance with
FCC Rules & Regulations Parts 2.1055 and 90.213

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-BoomerII-Modem-3922-1

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

Approved by:


Jay Sarkar

Technical Director, Standards & Certification

Date:

Sept. 12, 2002

Submitted by:

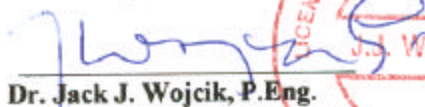

Jay Sarkar

Technical Director, Standards & Certification

Date:

Sept. 12, 2002

Released by:


Dr. Jack J. Wojcik, P.Eng.

Date:

Sept 12/02



FCC ID: PQS-BM28001
Applicant: Wavenet Technologies Pty Ltd.
Equipment: Wireless OEM Modem Module
Model: BOOMER II
Standard: FCC Rules and Regulations Part 2.1055 and 90.213

ENGINEERING SUMMARY

This report contains the results of the Frequency Stability measurement performed on a **Wavenet Wireless OEM Modem Module model BOOMER II**. The measurements were carried out in accordance with the FCC Rules and Regulations Parts 2.1055 and 90.213. The product was evaluated for frequency stability when it was set at the maximum power level.

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).

Frequency stability was measured at the nominal frequencies of 806 MHz, 815 MHz, 821 MHz, 822.5MHz and 824MHz

Frequency was measured with respect to voltage at 3.5 V, 3.8 V, and 4.1 V supply levels at 25°C at 806MHz, 815MHz, 821MHz, 822.5MHz and 824MHz.

Frequency was measured with respect to Temperature at 3.8 V supply with a temperature range of -30° to +60°.

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

Summary of the Results

Test Description	Page No.	Test Set-up Figure No.	Results Summary
Ref. Paragraph 2.1055 and 90213	8	1	Passed

INTRODUCTION

General

This report describes the results of the frequency stability measurement conducted on a Wavenet Technologies Wireless OEM Modem Module model BOOMER II.

Test Facility

The evaluation for the 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 and recognised by the Federal Communications Commissions (FCC).

Standard

The evaluation and analysis were conducted in accordance with FCC Rules and Regulations Parts 2.1055 and 90.213.

Test Equipment

The test equipment used during the evaluation is listed in Table 1 with calibration due dates.

Environmental Conditions

Measurements were conducted in open area test site.

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

This report was written by Jayanta (Jay) Sarkar.

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

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
Development Stage of Unit:	Production

GENERAL SPECIFICATIONS

- Frequency Range:
 - 806.00 to 821.00 MHz (Transmitter)
 - 821.00 to 824.00 MHz (Transmitter)
- Measured ERP
 - 1.828 W (32.62 dBm) at frequency 806 MHz for band 806-821 MHz
 - 1.496 W (31.61 dBm) at frequency 821 MHz for band 821-824 MHz
- Emission Designators Per 47 CFR § 2.201 and §2.202
 - 806.00 to 821.00 MHz: 20K0F1D
 - 821.00 to 824.00 MHz: 12K6F1D
- Antenna Impedance: 50 Ohms

Test: Frequency Stability

Ref: FCC Part 2, Paragraph 2.995, and Part 90, Paragraph 90.213

Criteria: a) 2.5 ppm in 806 to 821 MHz Band
b) 1.5 ppm in 821 to 824 MHz Band

Description: Frequency stability is a measure of the frequency drift due to temperature and supply voltage variations, with reference to the frequency measured at + 25°C and rated supply voltage. The RF carrier frequency shall not depart from the reference frequency in excess of as described above in the criteria.

Set-up: See Figure 6

Conditions: See procedure

Equipment: See Table 1

Procedure: See Section 4

DEVICE FREQUENCY STABILITY

Test Data	Roger Lam	Date	12/07/02	DOC No.	
Approved	Ross Clark	Test unit	S/N #2	File No.	

1. Standards.

FCC CFR 47 Ch 1 rules.

Part 2 Required Measurements

Frequency Stability – Procedure, Temperature variation, Voltage variation.

Part 90 Subpart Technical standards.

90.213 Frequency Tolerance

- (a) Maintain carrier frequency within 2.5ppm of assigned frequency in 806 to 821 MHz band and within 1.5 ppm in 821 to 824 MHz band.
- (b) Verify Maximum Power output used for measurement.

Frequency and Output power are both measured at the same time.

These are measured at 806MHz, 815MHz, 821MHz, 822.5 MHz, and 824 MHz

Frequency is measured with respect to Voltage at 3.5V, 3.8V, 4.1V supply levels at 25°C.

Frequency is measured with respect to Temperature at 3.8V supply with a Temperature range of -30°C to +60°C.

2. Cable calibration

The N type cable and Narda directional coupler used from device port to HP8920 I/P

Loss was 0.8dB. for 806 ~ 824MHz.

A calibrated HP8920A and a stable signal generator were used to measure level change from extra insertion loss of cable assembly.

3. Power and Frequency Measurements

Place: Lab at Wavenet Technology, Perth.

Date: 12 07 02

Instruments

Table 1

Instrument Used	Serial Number	Calibrated on
DC Power Supply Agilent	MY40001704	Agilent 1 01 01
Universal Counter Agilent 53131A	US36134925	Agilent 1 02 01
10MHz OCXO Frequency Reference	Asset No.11112	Agilent 15 05 02
Communications analyser HP8920	3541U000513	Agilent 19 9 01
Signal Generator Marconi	119754/012	Agilent 15 05 02
Directional Coupler 0.3 ~ 1.0GHz Narda	38750	---
Temperature Chamber		
Heraeus Votsch VMT 07/35 Temp. chamber	33287	19/10/98
Temperature probe Fluke80TK	AA00094448	21/02/01
Digital Multimeter Agilent 34461A	US36134925	16/05/01

4. Procedure

The Wavenet Boomer II was placed in the Temperature chamber and connected to the instruments outside. Refer to fig 1. for details of test system.

The probe temperature was used to set the chamber exactly.

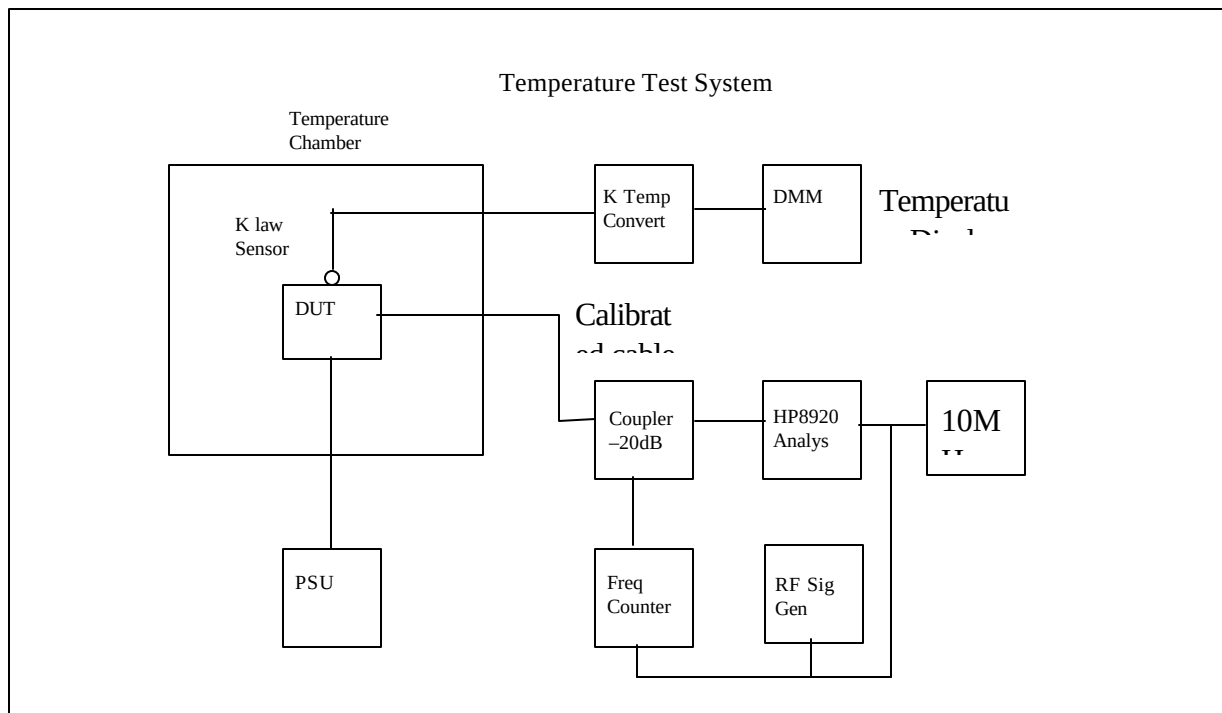
The tests were done once the chamber had stabilised as seen by the Temperature probe. This was 5minutes for the higher temperatures above 0°C and 8 minutes for below 0°C.

The Device was continuously transmitting with a 2 sec TX ON and 8 sec TX OFFcycle.

Modulation was set at RDLAP Symbol Sync (4.8kHz sine wave). (F8 – 6 setting)

The frequency was changed for each 3 frequencies and measurements done for Power and Frequency.

FIGURE 1



Test Set-up

5. Results

806MHz Nominal Frequency at 3.8V

PROBE TEMP	Freq Dev Hz	Freq Dev PPM	O/P Power
-30	682	0.85	33.2
-25	264	0.33	33.2
-20	174	0.33	33.2
-15	240	0.22	33.2
-10	186	0.30	33.2
-5	27	0.23	33.2
0	-58	0.03	33.2
5	-45	-0.07	33.2
10	22	-0.06	33.2
15	52	0.03	33.2
20	143	0.06	33.2
25	10	0.18	33.2
30	-42	0.01	33.2
35	-162	-0.05	33.2
40	-202	-0.20	33.2
45	-265	-0.25	32.1
50	-271	-0.33	33
55	-298	-0.34	33
60	-285	-0.37	32.9

815MHz Nominal Frequency at 3.8V

PROBE TEMP	Freq Dev Hz	Freq Dev PPM	O/P Power
-30	687	0.84	32
-25	265	0.33	32
-20	181	0.22	32
-15	227	0.28	32
-10	190	0.23	32
-5	31	0.04	32
0	-60	-0.07	32
5	-40	-0.05	32
10	27	0.03	32
15	54	0.07	32
20	145	0.18	32
25	8	0.01	32
30	-44	-0.05	32.1
35	-172	-0.21	32.1
40	-209	-0.26	32.1
45	-268	-0.33	32.1
50	-273	-0.33	32.1
55	-301	-0.37	32.1
60	-288	-0.35	32.1

821MHz Nominal Frequency at 3.8V

-30	690	0.84	32.9
-25	274	0.33	32.9
-20	203	0.25	32.9
-15	232	0.28	32.9
-10	204	0.25	32.9
-5	36	0.04	32.9
0	-54	-0.07	32.9
5	32	0.04	32.9
10	32	0.04	32.9
15	56	0.07	33
20	145	0.18	32.9
25	14	0.02	32.9
30	-45	-0.05	32.9
35	-177	-0.22	32.9
40	-205	-0.25	32.9
45	-275	-0.33	32.9
50	-277	-0.34	32.9
55	-304	-0.37	32.9
60	-288	-0.35	33

Output power given in dBm, conducted measurement.

822.5MHz Nominal Frequency at 3.8V

PROBE TEMP	Freq Dev Hz	Freq Dev PPM	O/P Power
-30	695	0.85	32.8
-25	267	0.33	32.8
-20	178	0.22	32.8
-15	242	0.29	32.8
-10	189	0.23	32.8
-5	42	0.05	32.8
0	-60	-0.07	32.8
5	-20	-0.02	32.8
10	20	0.02	32.8
15	58	0.07	32.9
20	145	0.18	32.8
25	8	0.01	32.8
30	-49	-0.06	32.9
35	-162	-0.20	32.9
40	-211	-0.26	32.9
45	-270	-0.33	32.9
50	-277	-0.34	32.9
55	-305	-0.37	32.9
60	-288	-0.35	32.9

824MHz Nominal Frequency at 3.8V

PROBE TEMP	Freq Dev Hz	Freq Dev PPM	O/P Power
-30	695	0.85	32.8
-25	266	0.32	32.8
-20	186	0.23	32.8
-15	250	0.30	32.8
-10	190	0.23	32.8
-5	52	0.06	32.8
0	-60	-0.07	32.8
5	-13	-0.02	32.8
10	25	0.03	32.8
15	60	0.07	32.8
20	143	0.17	32.8
25	12	0.01	32.8
30	-51	-0.06	32.8
35	-154	-0.19	32.8
40	-203	-0.25	32.9
45	-274	-0.33	32.9
50	-278	-0.34	32.9
55	-304	-0.37	32.9
60	-288	-0.35	32.9

Power Output Variation with Supply Voltage

806 to 821MHz band at 25°C

Supply Voltage	Frequency setting	Freq offset Hz	ppm
3.5	806	8	0.01
3.8	806	10	0.01
4.1	806	12	0.01
3.5	815	8	0.01
3.8	815	8	0.01
4.1	815	10	0.01
3.5	821	12	0.01
3.8	821	14	0.02
4.1	821	14	0.02

821 to 824MHz band at 25°C

Supply Voltage	Frequency setting	Freq offset Hz	ppm
3.5	821	12	0.01
3.8	821	14	0.02
4.1	821	14	0.02
3.5	822.5	20	0.02
3.8	822.5	18	0.02
4.1	822.5	18	0.02
3.5	824	14	0.02
3.8	824	12	0.01
4.1	824	13	0.02