FCC ID: PQS-BM29001

Exhibit 2e

Engineering Report on Boomer II 900 MHz

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 (900 MHz)

Wavenet Technologies Pty Ltd.

October 2002

APREL Project No.:WVTB-BoomerII modem-3922-2

51 Spectrum Way Nepean ON K2R 1E6
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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-BM29001**

Equipment: **Wireless OEM Modem Module**

Model: **BOOMER II 900 MHz**

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

Project #: WVTB-BoomerII-Modem-3922-2

Prepared By: **APREL Laboratories,**
Regulatory Compliance Division
51 Spectrum Way
Nepean, Ontario
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Approved by: _____ Date: Oct. 18, 2002
Jay Sarkar
Technical Director, Standards & Certification

Submitted by: _____ Date: Oct. 18, 2002
Jay Sarkar
Technical Director, Standards & Certification

Released by: _____ Date: Oct 18/02
Dr. Jack J. Wojcik, P.Eng.

LICENSED PROFESSIONAL ENGINEER J.J. WOJCIK PROVINCE OF ONTARIO

FCC ID: **PQS-BM29001**
Applicant: Wavenet Technologies Pty Ltd.
Equipment: Wireless OEM Modem Module
Model: BOOMER II 900 MHz
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 900 MHz.** 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 a 900 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 available single band: 896-901 MHz.

Frequency stability was measured at the nominal frequencies of 896 MHz, 899 MHz, and 901 MHz

Frequency and Output power were mesured at the same time

Frequency was measured with respect to voltage at 3.5 V, 3.8 V, and 4.1 V supply levels at 25°C at 896 MHz, 899 MHz, and 901MHz.

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 900 MHz**.**

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.

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 of the main body of the report.

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-BM29001**
Equipment (type): As Marketed	**Wireless OEM Modem Module**
Model:	**BOOMER II 900 MHz**
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-BM29001**
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:	Prototype

GENERAL SPECIFICATIONS

1. Frequency Range: 896 ~ 901MHz
2. Measured ERP: 1.556 W (31.92 dBm)
3. Emission Designator: Per 47 CFR § 2.201 and §2.202 9K8F1D
4. Antenna Impedance: 50 Ohms

Test: Frequency Stability
BOOMER II 900MHz

Standards: CFR 47 Ch 1 rules, FCC Part 2, Paragraph 2.995, and Part 90, Paragraph 90.213

Required measurements: Part 2.995 - frequency stability – Procedure, Temperature variation, Voltage variation

Criteria: Part 90.213 - 1.5 PPM in 896~901 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: Figure 6

Conditions: Section 4

Equipment: Table 1

Procedure: Section 4

DEVICE FREQUENCY STABILITY

Test Data	Roger Lam	Date	24/07/02	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 1.5ppm of assigned frequency in 896 to 901 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 896 MHz, 899 MHz, and 901 MHz.

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

Frequency is measured with respect to Voltage at 3.5V, 3.8V, 4.1V supply levels at 25°C at 896MHz, 899MHz and 902MHz.

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2. Power Measurement

A RF Power meter was connected via coupler directly to Modem for RF power measurements. Loss < 0.1dB.

3. Power and Frequency Measurements

Place: Lab at Wavenet Technology, Perth.
Date: 12/07/02

Instruments Used (Table 1)

Instrument	Serial Number	Calibrated on
DC Power Supply Agilent E3632A	MY40001704	Agilent 1/01/01
Universal Counter Agilent 53131A	US36134925	Agilent 1/02/01
(using external 10 MHz reference from calibrated 10MHz OCXO)		
10MHz OCXO Frequency Reference	Asset No.11112	Agilent 15/05/02
RF Power Meter Agilent E4418B	US39251349	Agilent 23/01/02
RF Power Sensor Agilent E8481H	MY410990444	Agilent 18/01/02
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 900 MHz 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.

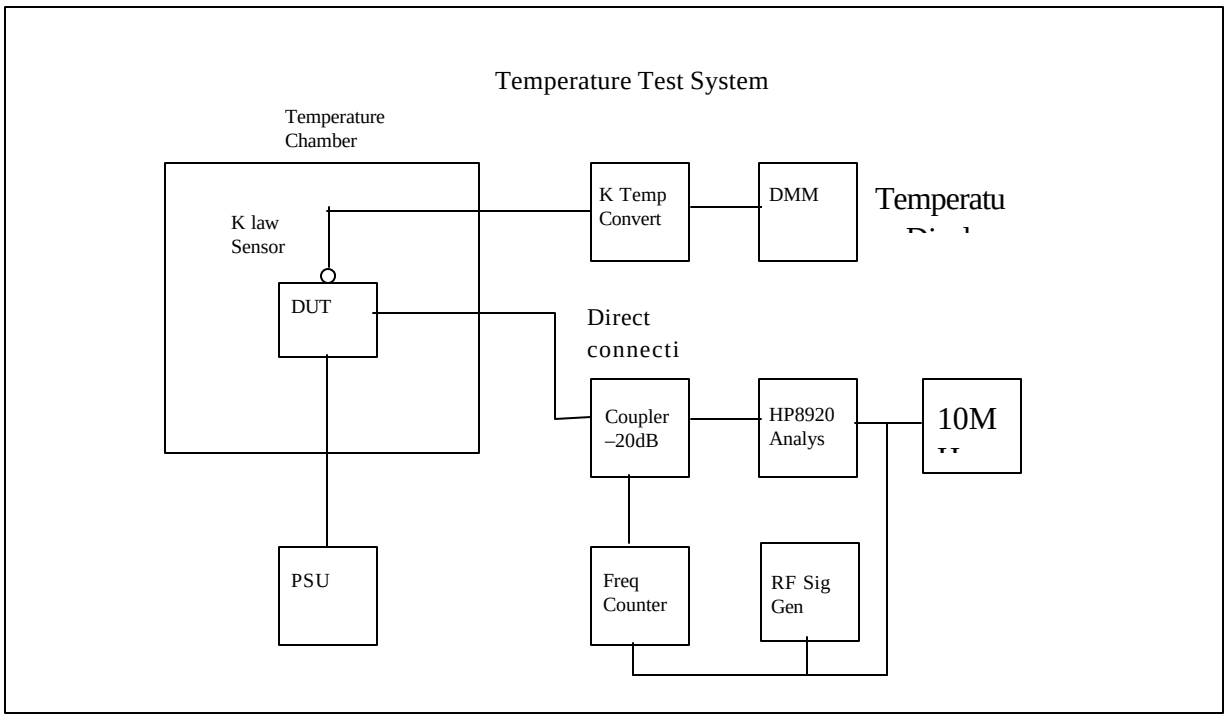
The tests were done once the chamber had stabilised as seen by the Temperature probe. This was 5 minutes for the higher temperatures above 0°C and 8 minutes for below 0°C.

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

Modulation was set at RDLAP Symbol Sync (4.8kHz sine wave).

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

FIGURE 1



Test Set-up

5. Results

896MHz Nominal Frequency at 3.8V

PROBE TEMP	Freq Dev Hz	Freq Dev PPM	O/P Power
-30	420	0.47	33.2
-25	-90	-0.10	33.2
-20	-285	-0.32	33.2
-15	-185	-0.21	33.2
-10	-156	-0.17	33.2
-5	-176	-0.20	33.2
0	-282	-0.31	33.2
5	-175	-0.20	33.2
10	-150	-0.17	33.3
15	24	0.03	33.3
20	109	0.12	33.3
25	28	0.03	33.3
30	172	0.19	33.3
35	160	0.18	33.3
40	172	0.19	33.3
45	130	0.15	33.3
50	107	0.12	33.1
55	-10	-0.01	33.1
60	-87	-0.10	33

899MHz Nominal Frequency at 3.8V

PROBE TEMP	Freq Dev Hz	Freq Dev PPM	O/P Power
-30	425	0.47	33.2
-25	-72	-0.08	33.2
-20	-245	-0.27	33.2
-15	-161	-0.18	33.2
-10	-134	-0.15	33.2
-5	-187	-0.21	33.2
0	-282	-0.31	33.2
5	-160	-0.18	33.2
10	-132	-0.15	33.2
15	26	0.03	33.2
20	115	0.13	33.2
25	25	0.03	33.2
30	178	0.20	33.2
35	168	0.19	33.2
40	158	0.18	33.2
45	140	0.16	33.2
50	108	0.12	33.2
55	-12	-0.01	33.2
60	-89	-0.10	32.1

901MHz Nominal Frequency at 3.8V

PROBE TEMP	Freq Dev Hz	Freq Dev PPM	O/P Power
-30	423	0.47	33.1
-25	-97	-0.11	33.1
-20	-212	-0.24	33.1
-15	-185	-0.21	33.1
-10	-157	-0.17	33.2
-5	-205	-0.23	33.2
0	-263	-0.29	33.2
5	-162	-0.18	33.2
10	-114	-0.13	33.2
15	29	0.03	33.2
20	119	0.13	33.2
25	28	0.03	33.2
30	187	0.21	33.2
35	162	0.18	33.2
40	135	0.15	33.2
45	141	0.16	33.2
50	102	0.11	33.2
55	-19	-0.02	33.2
60	-89	-0.10	33.1

Output power given in dBm,conducted measurement.

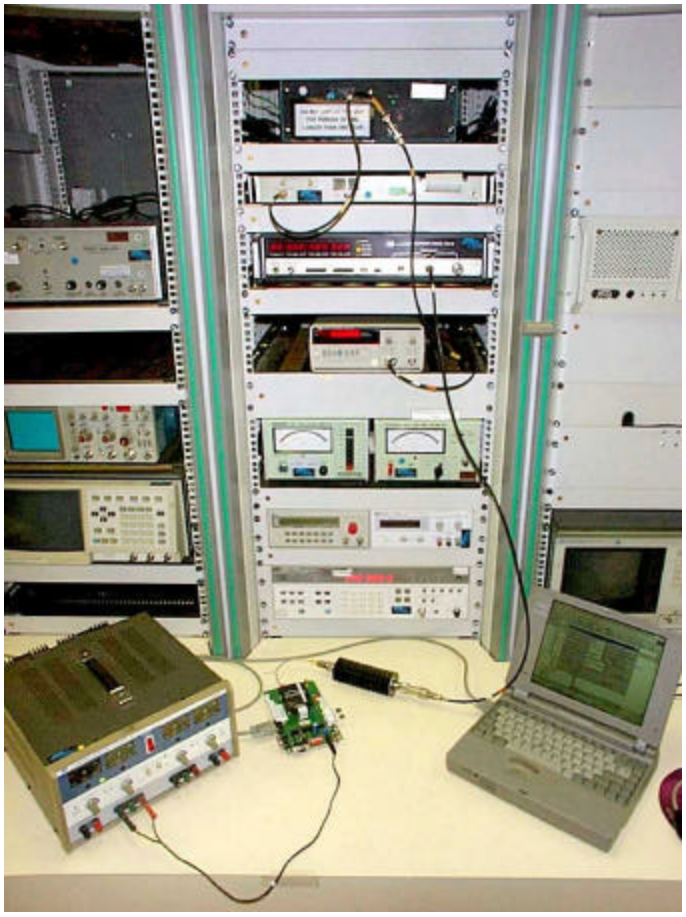
Power Output Variation with Supply Voltage

896 to 901MHz band at 25°C

Supply Voltage	Frequency setting	Freq offset Hz	ppm
3.5	896	25	0.03
3.8	896	25	0.03
4.1	896	26	0.03
3.5	899	33	0.04
3.8	899	35	0.04
4.1	899	38	0.04
3.5	901	28	0.03
3.8	901	28	0.03
4.1	901	28	0.03

APPENDIX

Photographs of the Testing Setup



Testing Frequency Stability on
WaveNet BOOMER-II 900 MHz Wireless OEM Modem Module

Testing Frequency Stability - Instrumentation