

EXHIBITS

- EXHIBIT 1: Letter Requesting Confidentiality under Sec. 0.457(d)
- EXHIBIT 2: Product Description and Operation Overview
- EXHIBIT 3: Information for which Confidentiality is Requested
- Schematics
 - Block Diagrams
 - Theory of Operation
- EXHIBIT 4: Product Photographs
- EXHIBIT 5: User Manual and FCC ID Label
- EXHIBIT 6: RF Hazard Information per Sec. 1.1307
- EXHIBIT 7: Report of Measurements
- EXHIBIT 8: Data Graphs – Emissions Masks
- EXHIBIT 9: Data Graphs - Out of Band Emissions
- EXHIBIT 10: Data Graphs - Cable Modem Signal to RF Module

EXHIBIT 1: Letter Requesting Confidentiality under Sec. 0.457(d)

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Test & Consulting Services for Commercial, Military, International Compliance
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El Granada, CA 94018

24 July 2000

FCC Laboratory
7435 Oakland Mills Road
Columbia, MD 21046

Attention: Application Examiner
 Reviewing Engineer

Re: Request for confidentiality per Section 0.459 of FCC Rules

Applicant: BreezeCom Ltd.

FCC ID: LKT-SUI-MMDS1

To whom it may concern,

Request is hereby submitted, on behalf of my client BreezeCom Ltd., to withhold from public review certain portions of the application for equipment certification for the referenced FCC identifier. In particular, the following sections of the application and report are requested to be kept confidential:

Schematics
Block diagrams
Theory of Operations

Rationale for request for confidentiality:

BreezeCom has invested considerable time and materials in research and development to produce the referenced product. Disclosure of the confidential portions of this application to competitors would give them competitive advantage in developing similar products.

The \$135 fee for confidentiality has been submitted along with the fee for certification. If you have questions or need further information, please contact the undersigned.

Sincerely,

THOMAS N. COKENIAS
EMC Consultant/Agent for BreezeCom

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EXHIBIT 2: Product Description and Operation Overview

The SUI customer premises transceiver made by BreezeCom is a single integrated unit design using a single antenna for both transmit and receive. The radio has a diversity system, so there are two identical antennas, but only one is active at any given time. The transceiver is designed to interface with Ethernet inputs:

SU-I-1D-MMDS: supports single Ethernet input

SU-I-8D-MMDS: supports up to 8 Ethernet workstations/ps's

SU-I-1D-MMDS: supports single Ethernet input

Antennas available for this product:

Standard 2 dBi monopole

6 dBi omni directional antenna with 3m cable

8.5 dBi omni directional wall mount antenna

The SUI operates in the 2500-2586 MHz band.

Data rate is 1Mbps, 2Mbps, or 3Mbps

Modulation is GFSK.

EXHIBIT 3: Information for which Confidentiality is Requested

Schematics

Block Diagrams

Theory of Operation

- refer to separate electronic attachments-

EXHIBIT 4: Product Photographs

-refer to separate electronic attachments-

EXHIBIT 5: User Manual and FCC ID Label

-refer to separate electronic attachments-

EXHIBIT 6: RF Hazard Information Per Sec. 1.1307

For transmitters operating in the 2.150 - 2.162 GHz frequency range, paragraph 1.1310 limits maximum permissible exposure (MPE) to 1 mW/cm² for uncontrolled environments.

The maximum distance from the antenna at which MPE is met or exceeded is calculated from the equation relating field strength in V/m, transmit power in watts, transmit antenna gain, and separation distance in meters:

$$E, \text{V/m} = (\sqrt{30 * P * G}) / d$$

$$\text{Power density, mW/m}^2 = E^2 / 3770$$

$$E \text{ for MPE } 1 \text{ mW/m}^2 = 61.4 \text{ V/m}$$

The SUI transceiver will be used with one of the following antennas, described in the user manual:

2 dBi monopole
6 dBi omni
8.5 dBi “Uni” omni

Calculated MPE distances from power into antenna:

Exposure, mW/cm²:		1.0
P, dBm	G, dBi	MPE Distance, cm
19.0	2.0	3.2
19.0	6.0	5.0
19.0	8.5	6.7

Basis of Calculations:

$$E^2 / 3770 = S, \text{ mW/cm}^2$$

$$E, \text{ V/m} = (P_{\text{watts}} * G_{\text{gain}} * 30)^{0.5} / d, \text{ meters}$$

$$d = ((P_{\text{watts}} * G * 30) / (3770 * S))^{0.5}$$

$$P_{\text{watts}} * G_{\text{gain}} = 10^{(P_{\text{dBm}} - 30 + G_{\text{dBi}}) / 10}$$

The following statement will be included in the users manual and on a label that will be attached to the transceiver:

CAUTION: To comply with FCC RF exposure requirements in section 1.1307, a minimum separation distance of 20 cm is required between this antenna and all persons.

The label is placed on the side of the unit on a **silver label** with 14 point black type.

EXHIBIT 7: Report of Measurements

FCC CERTIFICATION INFORMATION

The following information is in accordance with FCC Rules, 47CFR Part 2.

2.1033(c)1 Applicant: BreezeCom Ltd

2.1033(c)2 FCC ID: LKT-SUI-MMDS1

2.1033(c)3 Installation instructions are found in attached document.

2.1033(c)4 Emission type is **2M00F1D**

2.1033(c)5 Frequency range: 2500-2686 MHz

2.1033(c)6 Range of Operating Power

10-30 dBm

2.1033(c)7 Maximum Power Rating

30 dBm

2.1033(c)8 Applied voltages and currents into the final transistor elements

Refer to schematics accompanying this application

2.1033(c)10 Circuit and Functional Block Diagram, Description of Circuitry

Attached as electronic file.

2.1033(c)11 FCC ID Label

Attached as electronic file.

2.1033(c)12 Product Photographs

Attached as electronic file.

2.1033(c)13 Description of Modulation System

GFSK: 1Mbps/2Mbps/3Mbps configurable

2.1033(c)14 Test Data per 2.1046 – 2.1057**2.1055 RF Output Power Measurements****Measurement equipment used:**

HP 436A RF power meter

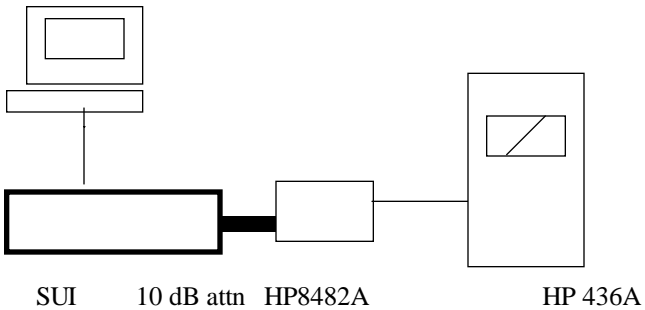
HP 8482A RF power sensor

10 dB attenuator

Low-loss cable, cable adapters

Test Set-up

PC controller

**Test Procedures**

The SUI was set to produce a 3Mbps signal. Power level in dBm was read off the meter.

Test Results

TX, MHz	TX Pout, dBm
2.1056	16.6
2.1055	18.8
2685.5	16.8

Section 2.1047 Modulation Characteristics

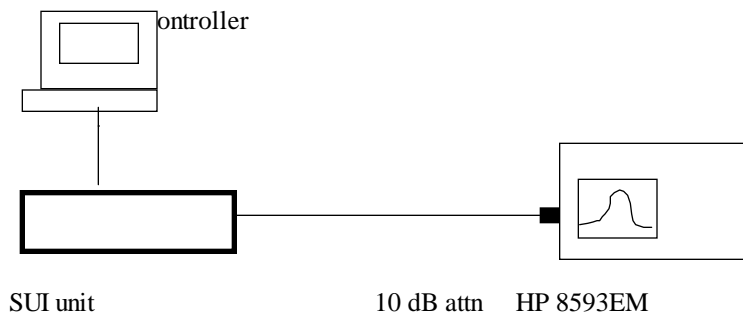
Measurement Equipment Used:

HP 8593 EM spectrum analyzer, 9kHz – 26.5 GHz

10 dB attenuator

Low-loss cable, cable adapters

Test Set-up:



Test Procedures:

The PC programmed the SUI to transmit packets at a 3Mbps rate. The resultant spectrum analyzer signal was recorded.

Test Results

Refer to attached plots.

Section 2.1049 Occupied Bandwidth

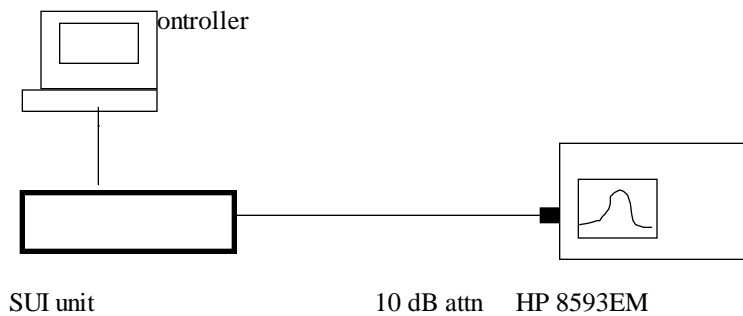
Measurement Equipment Used:

HP 8593 EM spectrum analyzer, 9kHz – 26.5 GHz

10 dB attenuator

Low-loss cable, cable adapters

Test Set-up:



Test Procedures:

Out -of-band emissions limits, digital modulation, section 21.908(a):

At 6MHz channel edge: attenuated -25 dB licensed average 6 MHz channel power

From edge to 250 kHz : attenuated along a slope to at least -40 dB

Beyond 250 kHz removed: attenuated along a slope to at least -60 dB at 3 MHz removed

Per section 21.908(e):

Attenuation in dB (below "flat top") = $A + 10\log(RBW1/RBW2)$

A = attenuation specified (25, 40, 60 dB)

RBW1 = Resolution bandwidth for flat top measurement (relative)

RBW2 = Resolution bandwidth for spectral point measurement (relative)

The transmitter was set to produce a 3Mbps data rate.

Test Results

Refer to attached plots.

Section 2.1051 Spurious and Harmonic Emissions at Antenna Terminals**Measurement Equipment Used:**

HP 8593 EM spectrum analyzer, 9kHz – 26.5 GHz
10 dB attenuator
Low-loss cable, cable adapters

Test Procedures

Section 21.908(e) requires all emissions removed from the channel edge by more than

1. Set spectrum analyzer to TX output center frequency, RES BW = 100 kHz, VID BW = 100 Hz.
2. Use analyzer PEAK SEARCH to find flat top peak.
3. Set DISPLAY LINE to a level 60 dB below flat top peak
4. Record transmitter output spectrum from 1 MHz to 10th harmonic of TX output frequency
5. Plot/photograph spectrum analyzer data

Test Results

Refer to attached plots.

Section 2.1053 Field Strength of Spurious and Harmonic Radiation

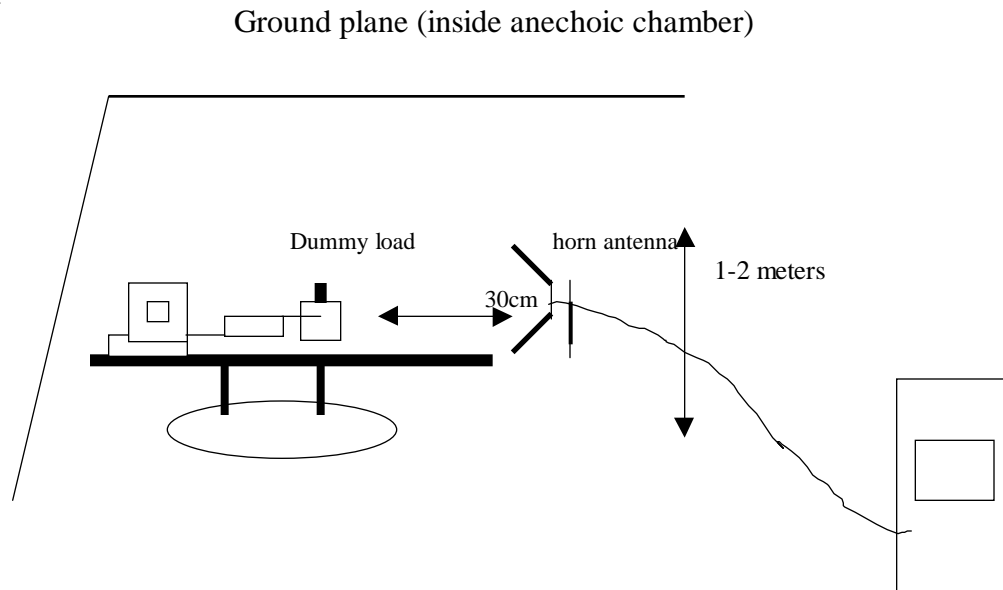
Measurement Equipment Used:

HP 8593 EM spectrum analyzer, 9kHz – 26.5 GHz

EMCO 3115 horn antenna, 1-18 GHz

Low-loss cable, cable adapters

Test Set-Up



Test Procedures

The magnitude of each spurious and harmonic emission detected as being radiated from the EUT must be at a level more than 60 dB below the emission flat top. The antenna output port of the EUT was terminated with a 50 ohm load. With the transmitter operating at full power, the EUT was rotated 360° and the search antenna was raised and lowered in both polarities, all in an attempt to maximize the levels of the received emission for each harmonic and spurious emission up to 10 fo.

Test Results

At a distance of 1m the theoretical field strength produced by 18.8 dBm feeding an isotropic antenna:

$$E@0.3m, \text{ dBuV/m} = (104.8 + P_{\text{dBm}}) \text{ dBuV/m} = 123.5 \text{ dBuV/m}$$

Out of band radiated limits: **123.5 - 60.0 = 63.5 dBuV/m at 30 cm**

All other emissions to 10fo more than 20 dB below limit

Company:	Breezecom										
Model:	Indoor unit (M/N: BS-AU-2.5a)/ Outdoor unit (M/N: AU0RE-2.5a)										
	Maximum Power Output: 17dBm										
F(MHz)	<u>Peak</u>	<u>Average</u>	AF	CL	AMP	DIST	OTHER	TOTAL		LIMIT @ 1M	MARGIN
	dBuv	dBuv	(dB)	(dB)	(dB)	(dB)	(dB)	(dBuV/m)		(dBuV/m)	(dBuV/m)
								<u>PK</u>	<u>AV</u>		<u>PK</u>
<u>f_o = 2600</u>											
5201	48.31		34.2	5.25	-35	0	1	53.76		61.77	-8.01
7801	47.85		37.6	6.83	-35	0	1	58.28		61.77	-3.49
10,401	45.52		38.2	8.05	-35	0	1	57.77		61.77	-4
13002(N.F)	47.85		39.9	8.75	-35	-6	1	56.5		61.77	-5.27
15601(N.F)	49.85		38.2	10.5	-35	-6	1	58.55		61.77	-3.22
18203(N.F.)	50.12		31.3	11.55	-35	-6	0	51.97		61.77	-9.8
20804(N.F.)	49.14		32.4	12.78	-35	-6	0	53.32		61.77	-8.45
23404(N.F.)	50.89		32.8	14	-35	-6	0	56.69		61.77	-5.08
26000(N.F.)	50.25		33.9	15.575	-35	-6	0	58.725		61.77	-3.045

NOTE: All readings in peak mode.

DIST: Measurements were extrapolated to 1 meter distance.

.5 Meters correction factor: **-6.02 dB**

OTHER: High pass filter insertion loss (4.6GHz)

AF: Antenna Factor

DUTY: Duty Cycle correction factor

AMP: Pre-amp gain

CL: CABLE LOSS

ANALYZER BANDWIDTH SETTINGS

	<u>Res Bw:</u>	<u>Video Bw:</u>
Peak(P):	1MHz	1MHz
Average(AV:)	1MHz	10 Hz

2.1055 Frequency Tolerance

Frequency v Temperature

-30 to +50C: +/- .001% limit (10 ppm)

Test Data from BreezeCom (fo = 2600 MHz)

Temp, °C	Frequency	Max	ppm
-30°C	2599.998	-0.002	-0.8
-20°C	2599.996	-0.004	-1.5
-10°C	2599.996	-0.004	-1.5
0°C	2599.990	-0.010	-3.8
10°C	2599.992	-0.008	-3.1
20°C	2599.999	-0.001	-0.4
30°C	2599.989	-0.011	-4.2
40°C	2599.987	-0.013	-5.0
50°C	2599.998	-0.002	-0.8

Frequency v Supply Voltage Variation (test at CCS)

85% - 115%: +/- .001% (10 ppm)

fo = 2600 MHz

Supply voltage	Frequency	Max	ppm
120 VAC (nom)	2599.999	-0.001	-0.4
102VAC (85%)	2599.999	-0.001	-0.4
138 VAC (115%)	2599.998	-0.002	-0.8

Part 15 Digital Device Emissions

EXHIBIT 8: Data Graphs:

Emissions Masks

Antenna Conducted Out of Band

- refer to separate electronic attachment-