

EXHIBITS

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

Thomas N. Cokenias *EMC & Radio Approvals*
Test & Consulting Services for Commercial, Military, International Compliance
P.O. Box 1086
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-IF-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

This product is an MMDS transceiver system, comprising of an indoor unit (IDU) and an outdoor unit (ODU). Data to the IDU is via Ethernet connection. The IDU is connected to the ODU via a single 50 ohm coaxial cable. The cable provides 12 VDC power, management and signal controls, and a 440 MHz IF signal, modulated by the data input.

The IF signal is mixed and translated to the 2500-2686 MHz band by the ODU. The output of the ODU is to a 17 dBi supplied by the manufacturer, or to an antenna provided by customer.

The ODU can be configured either as customer premises equipment/ subscriber unit (CPE/SU) or as a base station transceiver (BST).

There are two types of IDU provided, both have identical IF circuitry, the differences are in packaging and power supply types. The stand-alone unit (AU-NI) is powered from the mains via its own power supply unit. This AU-NI unit is used when the ODU is used as a subscriber unit.

The BS-AU module is designed for insertion into a BS-SH shelf. The BS-SH can hold up to 6 BS-AU modules and either one or two power supply modules. The shelf is powered by -48 VDC. The BS-AU and BS-SH are used with ODUs in base station configurations.

The BS 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:

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

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

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

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
30	17	63.2

Basis of Calculations:

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

$$E, \text{ V/m} = (\text{Pwatts} \cdot \text{Ggain} \cdot 30)^{.5}/d, \text{ meters}$$

$$d = ((\text{Pwatts} \cdot \text{G} \cdot 30)/3770 \cdot \text{S})^{.5}$$

$$\text{Pwatts} \cdot \text{Ggain} = 10^{(\text{PdBm} - 30 + \text{GdBi})/10}$$

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-IF-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

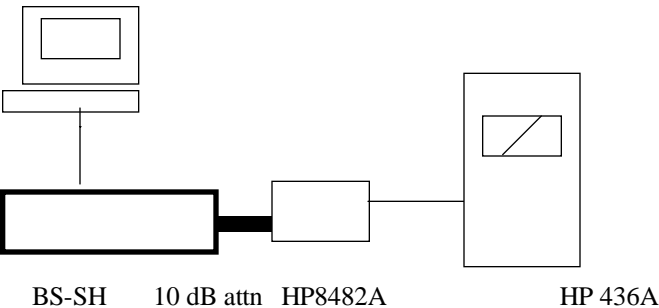
2.1055 RF Output Power Measurements

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
2501.5	28.8
2600.5	29.2
2685.5	29.3

Section 2.1047 Modulation Characteristics

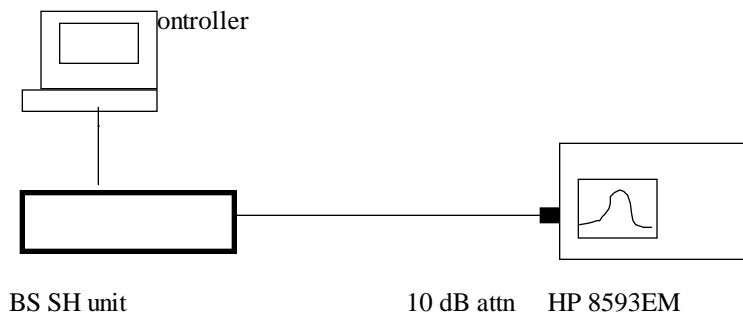
Measurement Equipment Used:

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

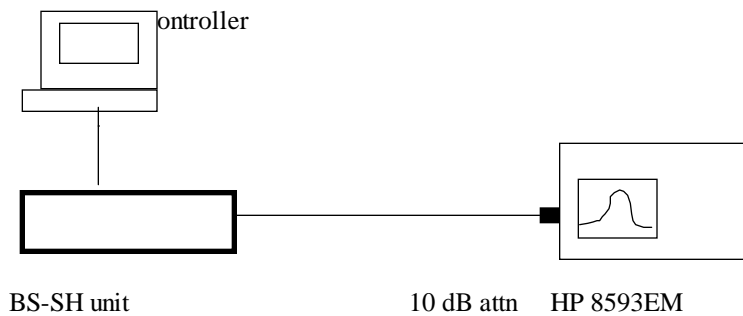
Measurement Equipment Used:

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

Set spectrum analyzer to TX output center frequency,

1. 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
5. Plot/photograph spectrum analyzer data

Test Results

Refer to attached plots.

Section 2.1053 Field Strength of Spurious and Harmonic Radiation

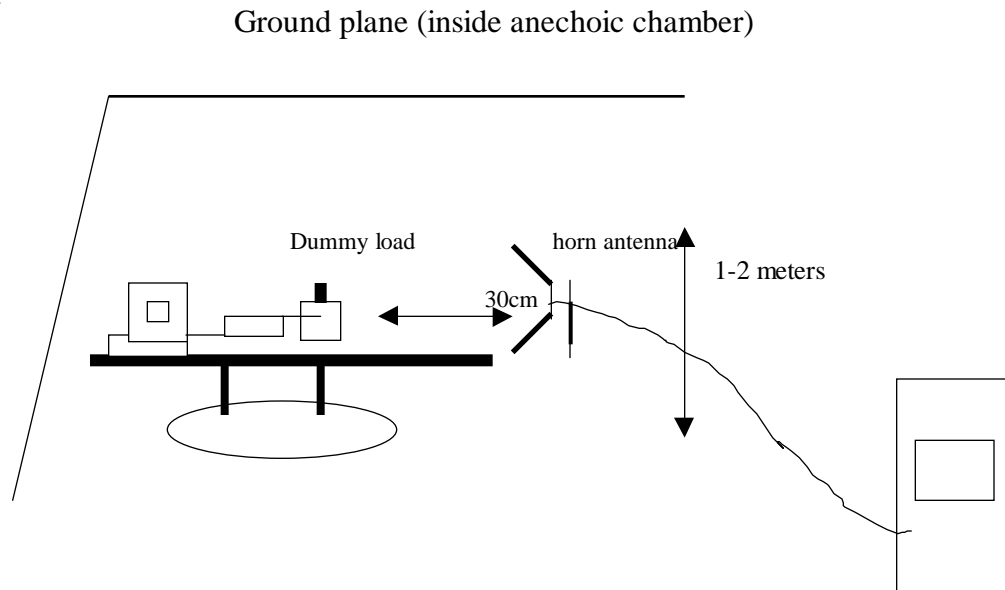
Measurement Equipment Used:

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 30 dBm feeding an isotropic antenna:

$$E@0.3m, \text{ dBuV/m} = (104.8 + P_{\text{dBm}}) \text{ dBuV/m} = 134.8 \text{ dBuV/m}$$

Out of band radiated limits: $134.8 - 60.0 = 74.8 \text{ dBuV/m at } 30 \text{ cm}$

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

Compliance Certification Services									Juan Martinez		
Fcc 21.908; ref: 2.1051									A-site (1 meter)		
Company:	Breezecom										
Model:	Indoor unit (M/N: SU-I-1d1v-2.5a)										
	Maximum Power Output: 30dBm										
F(MHz)	<u>Peak</u>	<u>Average</u>	AF	CL	AMP	DIST	OTHER	<u>TOTAL</u>		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		74.77	-21.01
7801	49.94		37.6	6.83	-35	0	1	60.37		74.77	-14.4
10,401	46.82		38.2	8.05	-35	0	1	59.07		74.77	-15.7
13002(N.F)	52.12		39.9	8.75	-35	0	1	66.77		74.77	-8
15601(N.F)	50.15		38.2	10.5	-35	0	1	64.85		74.77	-9.92
18203(N.F.)	52.18		31.3	11.55	-35	0	0	60.03		74.77	-14.74
20804(N.F.)	53.8		32.4	12.78	-35	0	0	63.98		74.77	-10.79
23404(N.F.)	53.12		32.8	14	-35	0	0	64.92		74.77	-9.85
26000(N.F.)	53.12		33.9	15.575	-35	0	0	67.595		74.77	-7.175

NOTE: All readings in peak mode taken at a 1 meter distance.

DIST: No distance correction was applied to measurements.

Limit is base in 1 meter measurement distance

OTHER: High pass filter insertion loss (4.6GHz)

AF: Antenna Factor

DUTY: Duty Cycle correction factor

AMP: Pre-amp gain

CL: CABLE LOSS

N.F.: Noise Floor Measurements

ANALYZER BANDWIDTH SETTINGS

Res Bw: **Video Bw:**

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	2599.988	-0.012	-4.6
-20°C	2599.990	-.0100	-3.8
-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	2599.996	-0.004	-1.5
30°C	2599.996	-0.004	-1.5
40°C	2599.996	-0.004	-1.5
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

EXHIBIT 8: Data Graphs:

IF Input to ODU

Emissions Masks

Antenna Conducted Out of Band

- refer to separate electronic attachment-