June 21, 1999

Federal Communications Commission
ATTN: Mr. Joe Dichoso & Mr. Kwok Chan

RE: BreezeCom, Ltd.
FCC ID: LKTEAP-10AMP
731 Confirmation Number: EA93721
Correspondence Reference Number: 8256

Mr. Dichoso & Mr. Chan,

This letter is in response to an e-mail that was sent by Mr. Dichoso on June 16, 1999.

Item 1: Larger and clearer photos of the component side of the circuit board for the new 250mW amplifier. The photo submitted is too small.

Response: The requested photograph has been uploaded to the FCC web page as file name {photograph.pdf}. This photograph has also been included at the end of this letter.

Item 2: You will have to get and submit a better version of the schematic of the transceiver from the manufacturer. The one submitted is unacceptable.

Response: The requested schematic has been uploaded to the FCC web page as file name {da669495.pdf}. This version of the schematic has also been included at the end of this letter.

The following items are questions from Mr. Chan.

Item 1: The RF exposure info they have uploaded needs revision. They used the occupation/controlled exposure MPE limit which is not applicable to this device. RF exposure compliance is required for all persons exposed to the transmitter. Controlled limits only apply to work related type of exposure and the exposed persons must have knowledge to control their exposure duration and condition to meet controlled limits. This generally does not apply to bystanders exposed to a transmitter, therefore, uncontrolled/general population limits should be used, 1.0 W/cm^2 at 2.4 GHz. They need to revise the MPE distance estimations and other related issues.

Response: A revised RF exposure was uploaded to the FCC web site using 1.0 W/cm^2 on June 9, 1999. An additional copy has been uploaded to the FCC web site as file name {RFExposure1.pdf}. This version of the RF exposure has also been included at the end of this letter.

Item 2: The antenna list is incomplete. The 2dBi monopole is not listed in the antenna list but described extensively in most of the products. Other antennas are described in other parts of the application not included on the antenna list.

Response: The manufacturer does not intend to sell a 2dBi antenna with the transceiver/AMP configuration. An FCC ID (LKTEAP-10) for the transceiver was obtained earlier that allows the transceiver to be used with other antennas such as the 2dBi antenna.

Item 3: In the user's manual, to the best I can tell, it is indicating the TPA (amplifier) is for European use only. What amplifier is used for this approval to achieve the 250mW and 500mW output? I don't see the related info in the user's manual.

Response: The amp used for the 250 and 500 MHz amp is FCC approved under FCC ID LKTEAP-10.

Item 4: They are using the dwell time defined for DSS to obtain average power. To the best I can tell, RF power generally remains on during frequency hoping for other similar transmitters. For RF exposure purposes, we are interested in the actual RF ON-OFF durations related to the transmission protocol and hardware implementations for determining RF exposure compliance, as required by 2.1091 and 2.1093 of the rules. Peak to average ratios related to processing gain does not qualify for duty factor to time-averaging considerations for RF exposure. A clarification is needed.

Response: The calculation uploaded does not use the dwell time to calculate the exposure. We used the 1.0mW/cm^2 for the exposure calculation and the worst case peak output power measured.

Item 5: It is not clear if all installations for these transmitters will be professionally installed, or only ones with amplifiers or just the outdoors ones. The letter provided in

the filing seems to indicate professional installation for all operations but the users manual does not seem to indicate it that way. A clarification is needed.

Response: The manufacturer has an FCC ID: LKTEAP-10 for the transceiver. The FCC previously certified this device. It is the same unmodified transmitter in-conjunction with the amps/antenna listed in the report that the manufacturer is seeking approval for. All antennas listed and tested in the report will be professionally installed as stated in the report with the transceiver/amp configuration.

Item 6: A BIRD power meter is shown and described for making measurements for setting output power. It is also indicated that peak output is measured. The plug-ins used for the BIRD 43 model measures average power, not peak. I believe the rules require peak output. If average power is used instead of peak output, there could be substantial differences between numbers and what is needed for satisfying the required peak rating especially the description is indicating using an average power meter to set an output of 1W and the rules need peak output. It needs to be clarified.

Response: An HP437B power meter in-conjunction with HP's 8566 spectrum analyzer was used in our lab measures the output power. The manufacturer may have depicted the BIRD power meter in some drawing in the report. If the BIRD power meter is not acceptable, the manufacturer will use a meter that measures peak power instead. Again we measured the peak power using our own HP power meter the results were then correlated on our spectrum analyzer with the res/vid bandwidth set at 3MHz.

Item 7: The operating manual has a PC Card version of this transmitter using retractable antennas for palm top, laptop computes on other handheld devices. For anything operating at closer than 20cm from a person's body, MPE limits do not apply; SAR limit should be used. When the output power is low, operating instructions, warning statements, warning labels or a combination of these may be used to ensure compliance. For certain next to body operating conditions, the only alternative for ensuring compliance may be to perform SAR evaluation. For RF exposure purposes, we need better descriptions for the operating conditions of the PC CARD version of this transmitter to determine what is needed for satisfying or ensuring compliance.

Response: The manual is a general manual. It may contain other certified products with their own approvals. The PC version transmitter was not part of the EUT or the test setup. The manufacturer has previously certified this device and has a grant on it.

Item 8: For other versions of this transmitter, installation procedures supplied to the installers should be included in the filing so that we can determine if they are adequate for satisfying compliance. Please also provide a list of all variations of this transmitter and the associated antennas that will be covered under this application.

Response: Again, the manufacturer has an FCC ID: LKTEAP-10 for the transceiver. All antennas listed and tested in the report will be professionally installed as stated in the report.

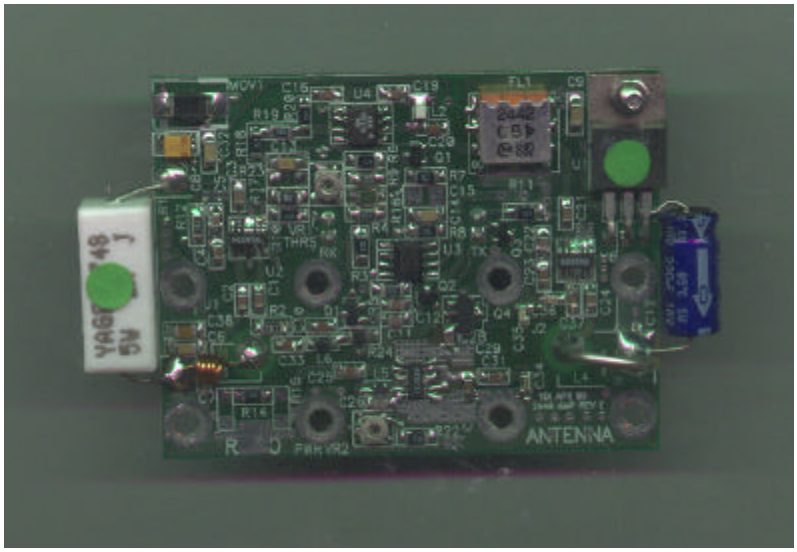
Item 9: They need to indicate the maximum peak output for the transmitter itself (without the amplifier), if it can be operated that way (standalone), so that we can determine RF exposure conditions for standalone use of this transmitter or if it intended for incorporation into other OEM products, etc.

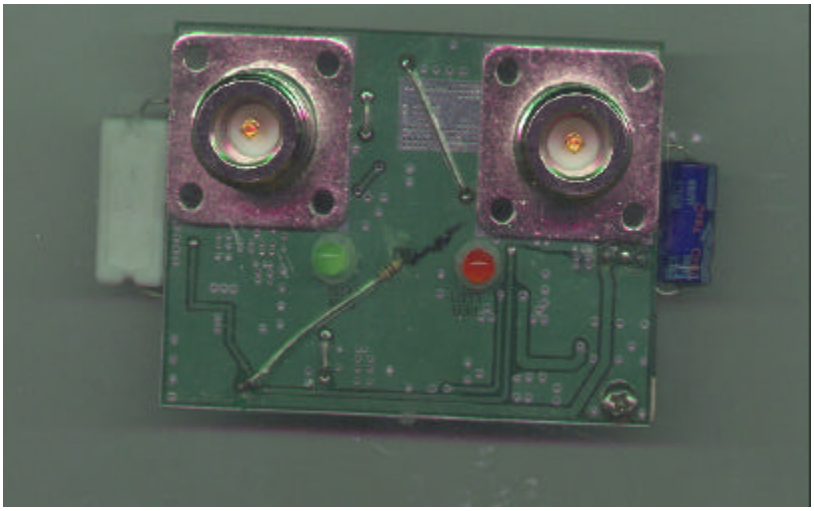
Response: Again the manufacturer has an FCC ID: LKTEAP-10 for the transceiver. It has not been modified or changed. I assume that the exposure for the original granted transceiver with the amp with the referenced FCC ID has already been reviewed before it was originally granted.

Sincerely,
Dixie L. Shetter
Document Control Supervisor

Attachments:
Photographs
RF Exposure
Schematics

Photographs:





RF Exposure Calculations for BREEZECOM'S High Gain Antennas

From FCC 1.1310 table 1A, the maximum permissible RF exposure for a controlled environment is $5mW/cm^2$ (S). In an uncontrolled environment, the maximum exposure is $1mW/cm^{2.}$ Whenever an amplifier is used, the professional installer will be made aware of potential RF exposure. The Installation Manual will contain information concerning RF exposure for the antennas to be installed. It will instruct the Installer to only install the antennas in controlled environment when an amplifier is used.

The Electric field generated for a $1mW/cm^2$ exposure (S) is calculated as follows:

$$S = E^2/Z$$

where:

S = Power density
E = Electric field
Z = Impedance.

$$E = \sqrt{S \times Z}$$

$1mW/cm^2 = 10\ W/m^2$

The impedance of free space is 337 ohms, where E and H fields are perpendicular.

Thus:

$$E = \sqrt{10 \times 377} = 61.4\ V/m$$ which is equivalent to $1mW/cm^2$

Using the relationship between Electric field E, Power in watts P, and distance in meters d, the corresponding Antenna numeric gain G and the Amplifier output power and solving for d,

$$d = \sqrt{\frac{P_{peak} \times 30 \times G}{E}}$$

Example using the Uni 24 directional antenna

1. The Numeric gain G of antenna with a gain specified in dB is determined by:

   $$G = \text{Log}^{-1}(\text{dB gain}/10)$$

   $$G = \text{Log}^{-1}\ 24 = 251.2$$

2. Uni-24 antenna-gain with a gain of 24 dB, the $1mW/cm^2$: distance is:

P = 24 dBm (250 mW worst case)
d = 70.7 cm

Notice in Installation Manual:

While installing and operating this radio frequency device, transmitter / amplifier, and antenna combination the radio frequency exposure limits of 1mW/cm^2 may be exceeded at distances close to the antennas installed. Therefore, when used with an amplifier the antenna must be installed in a controlled environment.

The table below identifies the distances where the 1mW/cm^2 exposure limits may be exceeded during continuos transmission. See the peak power exposure distance for each transmitter/amp/antenna combination.

Antenna Type	**Gain (dBi)**	**Gain** Numeric	**Amp Peak output Power (mW)**	**Peak Power Exposure Distance (cm)**
Uni 24	24	251.2	250	70.7
Uni 21	21	125.9	250	50.1
Uni 18	18	63.1	250	35.4
Uni 16	16	39.8	250	28.1
Uni 16	16	39.8	500	39.8
Uni 13	13	20.0	500	28.2
Omni 12	12	15.8	250	17.7
Omni 8	8	6.3	500	15.8
Omni 6	6	4.0	500	12.6

Note: During normal operation, the transmitter power is about 12 dB less then the peak power since the transmitter is on only a portion of the time. Thus the Exposure Distance are typically approximately ½ of the Peak Distances.