

*RF Exposure
Evaluation*



Maximum Permissible Exposure Evaluation

for

**AIRORLITE COMMUNICATIONS, INC.
Model 50289 Bi-Directional Booster**

**FCC ID: UT650289BAX8800UL
FCC ID: UT650289BAX8800DL**

August 16, 2007

WLL PROJECT #: 9863 9864 MPE

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Maximum Permissible Exposure Test Report

for

FCC ID: UT650289BAX8800UL
FCC ID: UT650289BAX8800DL

1.0 Introduction

This report has been prepared on behalf of AIRORLITE COMMUNICATIONS, INC. MODEL 50289 BI-DIRECTIONAL BOOSTER. This report is for the uplink portion of the system. The uplink receives over the in building/tunnel radiator and boosts the power and then re-transmits over the roof antenna. This report is to show compliance with the RF exposure requirements as defined in FCC §1.1307.

1.1 Requirements

Three different categories of transmitters are defined by the FCC in OET Bulletin 65. These categories are fixed installation, mobile, and portable and are defined as follows:

- **Fixed Installations:** fixed location means that the device, including its antenna, is physically secured at a permanent location and is not able to be easily moved to another location. Additionally, distance to humans from the antenna is maintained to at least 2 meters.
- **Mobile Devices:** a mobile device is defined as a transmitting device designed to be used in other than fixed locations and to be generally used in such a way that a separation distance of at least 20 centimeters is normally maintained between the transmitter's radiating structures and the body of the user or nearby persons. Transmitters designed to be used by consumers or workers that can be easily re-located, such as a wireless modem operating in a laptop computer, are considered mobile devices if they meet the 20 centimeter separation requirement. The FCC rules for evaluating mobile devices for RF compliance are found in 47 CFR §2.1091.
- **Portable Devices:** a portable device is defined as a transmitting device designed to be used so that the radiating structure(s) of the device is/are within 20 centimeters of the body of the user. Portable device requirements are found in Section 2.1093 of the FCC's Rules (47 CFR§2.1093).

For this report the Airolite Communications Inc Booster with 7.1 dBi antenna is under consideration.

The FCC also categorizes the use of the device as based upon the user's awareness and ability to exercise control over his or her exposure. The two categories defined are Occupational/Controlled Exposure and General Population/Uncontrolled Exposure. These two categories are defined as follows:

- **Occupational/Controlled Exposure:** In general, occupational/controlled exposure limits are applicable to situations in which persons are exposed as a consequence of their employment, who have been made fully aware of the potential for exposure and can exercise control over their exposure. This exposure category is also applicable when the exposure is of a transient nature due to incidental passage through a location where the exposure levels may be higher than the general population/uncontrolled limits, but the exposed person is fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area or by some other appropriate means. Awareness of the potential for RF exposure in a workplace or similar environment can be provided through specific training as part of a RF safety program. If appropriate, warning signs and labels can also be used to establish such awareness by providing prominent information on the risk of potential exposure and instructions on methods to minimize such exposure risks.
- **General Population/Uncontrolled Exposure:** The general population / uncontrolled exposure limits are applicable to situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure. Members of the general public would come under this category when exposure is not employment-related; for example, in the case of a wireless transmitter that exposes persons in its vicinity. Warning labels placed on low-power consumer devices such as cellular telephones are not considered sufficient to allow the device to be considered under the occupational/controlled category, and the general population/uncontrolled exposure limits apply to these devices.

Since there are no warnings or training associated with this unit and it can be used by anyone, the AIRORLITE Communications Inc.. Model 50289 Bi-Directional Booster is evaluated to the General Population/Uncontrolled Exposure limits.

1.2 Radio Frequency Radiation Exposure Evaluation

The highest RF output power of the unit was measured is recorded. According to §1.1310 of the FCC rules, the power density limit for General Population/Uncontrolled Exposure is 1mW/cm^2 . As this is a modular approval the MPE shall be calculated at 20cm to show compliance with the power density limit. The following formula was used to calculate the Power Density:

$$S = \frac{PG}{4\pi R^2}$$

Where:

S = Power Density

P = Output Power at the Antenna Terminals

G = Gain of Transmit Antenna (linear gain-isotropic)

R = Distance from Transmitting Antenna

The limit is calculated at the lowest frequency for both the Uplink and the Downlink bands as this provides the *lowest* limit and is therefore the most conservative.

From the test report for Model 50289 Uplink unit, the RF power is limited to 31 dBm at the combiner. The output power for the Model 50289 Downlink is 22.6dBm. The antenna gains for each antenna are fixed at 5.0 dB and are designed for fixed installation.

The results of the MPE calculation are shown below.

Single Transmitter

Frequency 806 MHz

Limit 0.537 mW/cm²

Distance (cm), R = 20 cm

Power (dBm), P = 31 dBm

TX Ant Gain (dB), G = 5 dB

MPE 0.79 mW/cm² **Separation>20 cm**

Minimum Distance: 24.3 cm

Second Transmitter

Frequency 851 MHz

Limit 0.567 mW/cm²

Distance (cm), R = 20 cm

Power (dBm), P = 22.6 dBm

TX Ant Gain (dB), G = 5 dB

MPE 0.11 mW/cm² **Separation<20 cm**

Minimum Distance: 9.0 cm

RESULTS:

TOTAL MPE 1.68 mW/cm² **Separation>20 cm**

Minimum Distance: 25.3

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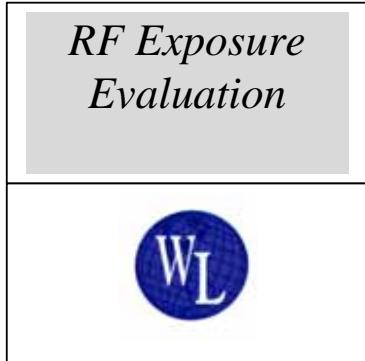
August 2007

Based on the above calculation at 25.3cm the AIRORLITE COMMUNICATIONS, INC. MODEL 50289 BI-DIRECTIONAL BOOSTER MODULE is below the Power Density limit of 1mW/cm². This antenna is roof mounted and therefore will be able to comply with this requirement.

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RF Exposure Test Report
Washington Laboratories, Ltd

August 2007



**Maximum Permissible Exposure Evaluation
for
AIRORLITE COMMUNICATIONS, INC.
Model 50289 Bi-Directional Booster**

FCC ID: UT650289BAX8800DL

August 29, 2007

WLL PROJECT #: 9864

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Maximum Permissible Exposure Test Report

for

FCC ID: UT650289BAX8800DL

1.0 Introduction

This report has been prepared to show compliance with the RF exposure requirements as defined in FCC §1.1307.

1.1 Requirements

Three different categories of transmitters are defined by the FCC in OET Bulletin 65. These categories are fixed installation, mobile, and portable and are defined as follows:

- **Fixed Installations:** fixed location means that the device, including its antenna, is physically secured at a permanent location and is not able to be easily moved to another location. Additionally, distance to humans from the antenna is maintained to at least 2 meters.
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- **Portable Devices:** a portable device is defined as a transmitting device designed to be used so that the radiating structure(s) of the device is/are within 20 centimeters of the body of the user. Portable device requirements are found in Section 2.1093 of the FCC's Rules (47 CFR§2.1093).

For this report the Airolite Communications Inc Booster with Downlink using a "Leaky Coax" antenna with a 60 dB coupling factor is under consideration. The Downlink will be evaluated to the Mobile Device requirement because a separation distance of 20 cm can be maintained..

The FCC also categorizes the use of the device as based upon the user's awareness and ability to exercise control over his or her exposure. The two categories defined are Occupational/

Controlled Exposure and General Population/Uncontrolled Exposure. These two categories are defined as follows:

- **Occupational/Controlled Exposure:** In general, occupational/controlled exposure limits are applicable to situations in which persons are exposed as a consequence of their employment, who have been made fully aware of the potential for exposure and can exercise control over their exposure. This exposure category is also applicable when the exposure is of a transient nature due to incidental passage through a location where the exposure levels may be higher than the general population/uncontrolled limits, but the exposed person is fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area or by some other appropriate means. Awareness of the potential for RF exposure in a workplace or similar environment can be provided through specific training as part of a RF safety program. If appropriate, warning signs and labels can also be used to establish such awareness by providing prominent information on the risk of potential exposure and instructions on methods to minimize such exposure risks.
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Since there are no warnings or training associated with this unit and it can be used by anyone, the AIRORLITE Communications Inc.. Model 50289 Bi-Directional Booster is evaluated to the General Population/Uncontrolled Exposure limits.

1.2 Radio Frequency Radiation Exposure Evaluation

The highest RF output power of the unit was measured is recorded. According to §1.1310 of the FCC rules, the power density limit for General Population/Uncontrolled Exposure is 1mW/cm². As this is a modular approval the MPE shall be calculated at 20cm to show compliance with the power density limit. The following formula was used to calculate the Power Density:

$$S = \frac{PG}{4\pi R^2}$$

Where:

S = Power Density

P = Output Power at the Antenna Terminals

G = Gain of Transmit Antenna (linear gain-isotropic)

R = Distance from Transmitting Antenna

The limit is calculated at the lowest frequency for both the Uplink and the Downlink bands as this provides the *lowest* limit and is therefore the most conservative.

The device is designed for fixed installation.

The results of the MPE calculation are shown below.

Single Transmitter		
Frequency	819	MHz
Limit	0.546	mW/cm ²
Distance (cm), R =	20	cm
Power (dBm), P =	31	dBm
TX Ant Gain (dB), G =	-60	dB
MPE	0.00	mW/cm ² Separation<20 cm
Minimum Distance:	0.0	cm