

# FCC part 15.247 submittal

## Grayhill Inc. Model: NMAWLSAMOCU

### Antenna and MPE considerations

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FINAL TEST DATE: April 1<sup>st</sup>, 2004  
REPORT DATE: April 21<sup>h</sup>, 2004  
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## Table of Contents

<b>OBJECTIVE .....</b>	<b>ERROR! BOOKMARK NOT DEFINED.</b>
<b>OPERATIONAL DESCRIPTION .....</b>	<b>ERROR! BOOKMARK NOT DEFINED.</b>
<b>APPLICABLE DOCUMENTS.....</b>	<b>ERROR! BOOKMARK NOT DEFINED.</b>
<b>DUTY CYCLE CONSIDERATIONS.....</b>	<b>4</b>
<b>ANTENNA CONSIDERATIONS .....</b>	<b>4</b>
<b>RF EXPOSURE CALCULATIONS.....</b>	<b>6</b>
<b>MPE CALCULATION .....</b>	<b>6</b>

## Objective

This document describes the proposed unit's antenna system, TX duty cycle details and MPE considerations. Figures A and B show a real unit as it's worn by the operator.



Figure A – Device Position on The Operator



Figure B – Device Position on The Operator

## Duty Cycle Considerations

This product implements a master-slave transmission protocol for individual hop-slots. Hop slots are 10ms long. The amount of transmit time allocated for the master radio and for slave radios is equal within that 10ms slot. i.e. 5ms.

This device can transmit no more than 10 times in any 700ms period. Thus 5ms x 10 events is 50ms of transmitter time out of any 700ms period, for a duty cycle of 7.2%.

## Antenna Considerations

The antenna position is detailed in Figure C. The drawing shows 9.31cm of distance from the antenna to the torso of the user. The antenna used is an Antenex model DEXC with a custom ordered KR bolt style connection. (see picture below) The KR bolt interface is not a coaxial connector and as such can not be used to attach antennas not shipped with the unit. We propose this connector satisfies 15.203's requirement for a non-standard antenna connector. This antenna is a ¼ wave whip with approximately 0dBi of gain. The antenna is attached with 17.5cm of RG-316 single shielded miniature coax. This coax material is stated by the manufacturer as having a loss of 33dB/100ft at 1GHz. The cable assembly is a minimum of 17.5cm long, which yields 0.18dB of insertion loss.

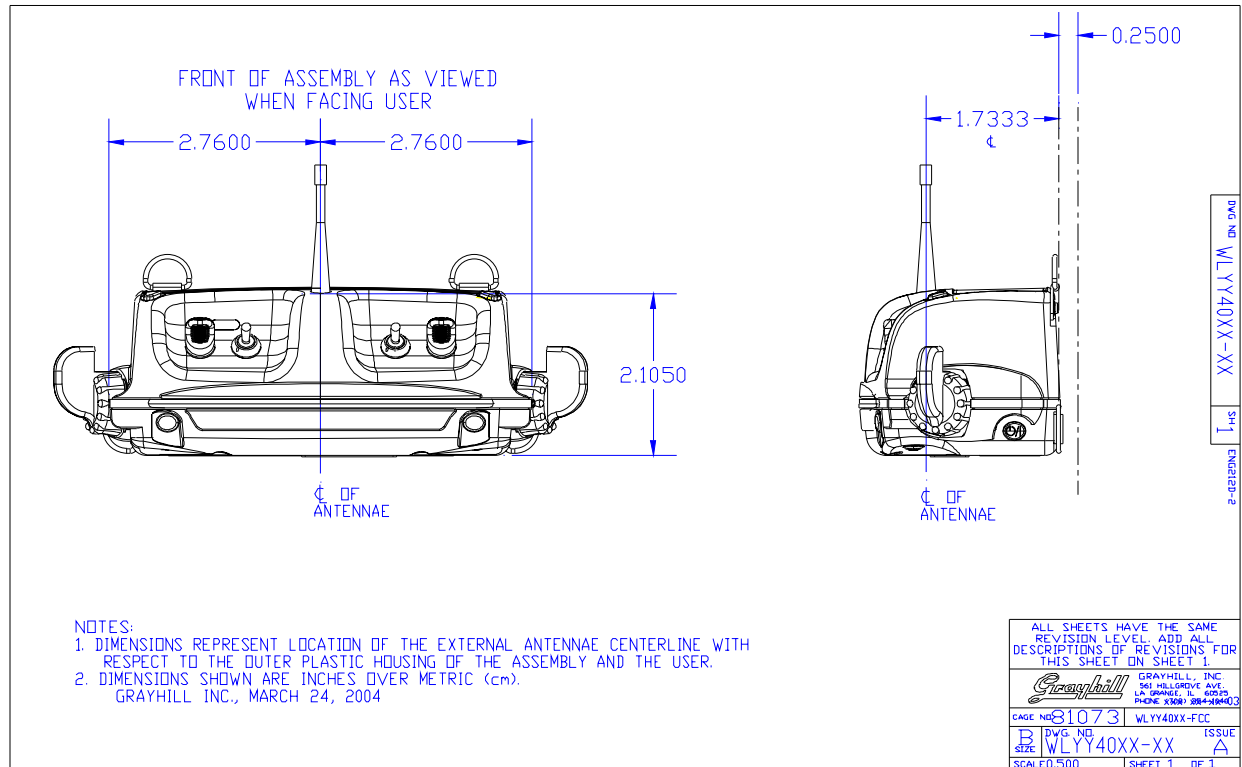


Figure C – Antenna Position on the Device



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## RF Exposure Calculations

This section demonstrates the Maximum Permissible Exposure (MPE) Calculation required for an Intentional Radiator equipment authorization. Because of the mounting method for wearing the device, it is very difficult for an operator to violate the distances cited in this calculation.

### MPE Calculation

Using the formula for power density given on page 18 of OET Bulletin 65 ed. 97-01

Transmitter power:	29.8	dBm
Coax loss:	0.18	dB
Max peak power at antenna input terminal:	29.62	dBm
Max peak power at antenna input terminal:	916.22	mW
Max transmit duty cycle:	7.2	%
(Max peak power)(duty cycle):	65.97	mW
Antenna gain:	0	dBi
Antenna gain:	1	numeric
Prediction distance:	9.31	cm
Prediction frequency:	915	MHz

MPE limit for uncontrolled exposure at prediction frequency: 0.61 mW/cm<sup>2</sup>

Power density at prediction frequency: 0.061 mW/cm<sup>2</sup>

Margin of compliance at 9.31cm: 10.0 dB