



## Engineering Analysis MPE for WCS 2.6 GHz Transceiver

FCC ID: RAR20007001

BelAir Networks

This analysis was performed as part of the FCC certification requirements for spread spectrum devices, according to the requirements of: FCC part 27, and FCC OET Bulletin 65 “Evaluating Compliance with FCC Guidelines for Human Exposure to Radio frequency Electromagnetic Fields”.

- Module RAR20007001 will be mounted in BelAir Networks host units and will be professionally installed (Fixed) to provide a minimum separation distance from all persons as detailed in co-location compliance tables below.
- Module RAR20007001 may be co-located with other modules in BelAir Networks products as shown in the co-location compliance tables below. Worst-case configurations are shown below.
- This device will only be operated according to the exposure conditions described in this application.
- End users and installers will be provided with antenna installation and transmitter operating conditions for satisfying RF exposure compliance.

The measured worst-case transmit power yielding the worst-case EIRP were used for the MPE calculations. Calculations were performed based on FCC OET Bulletin 65. The calculations are performed based on the following formula provided in OET 65:

$$S = \text{EIRP} / (4\pi R^2).$$

Co-location compliance for multiple frequency exposure criteria to the power density exposure limit is detailed in the table below. This calculation is a worst-case analysis since it assumes all devices are continuously transmitting. The device utilizes the 802.16 protocol which operates in time-division duplex (TDD) mode, so the transmit duty cycle can never be 100% in normal operation. It is also assumed that all directional antennas are aligned to point in the same direction so that power from all radios add.



The following table 1 summarizes the minimum distance covering all configurations of RAR20007001 radios in BelAir Networks products using worst case scenarios.

Table 1

Minimum Safety Distance cm (inches)		
Node	16 dBi antenna or 10 dBi antenna	Radios
BelAir100 BelAir100S BelAir100C	26 (10.5 inches)	2 x RAR20007001 or 1 RAR20000003 and 1 RAR20007001
BelAir200	36 (14.5 inches)	4 x RAR20007001 or 1 RAR20000003 and 3x RAR20007001

The following tables outlines the safety distance calculations for the various combinations of antennas and radios, co-located, worst case conditions.

**Case I: 2.6 GHz WCS band, 16 dBi or less ( 10 dBi ), 1 x RAR20007001**

Compliance for one WCS Radio								
Safety Distance:		20 cm		( 7.9 inches )				
Worst-case Total EIRP [dBm]	Max Power Density [mW/cm <sup>2</sup> ]	Maximum Number of Radios	Worst-case Total EIRP [dBm]	Max Power Density [mW/cm <sup>2</sup> ]	Maximum Number of Radios	Total Density for co-located radios [mW/cm <sup>2</sup> ]	Limit: General Population / Uncontrolled Exposure [mW/cm <sup>2</sup> ]	Result
36	0.792	1	0	0.000	0	0.792	1	Complies

**Case II: 2.6 GHz WCS band, 16 dBi or less ( 10 dBi ), 2 x RAR20007001**

Co-location Compliance for two WCS Radios								
Safety Distance:		26 cm		( 10.2 inches )				
Worst-case Total EIRP [dBm]	Max Power Density [mW/cm <sup>2</sup> ]	Maximum Number of Radios	Worst-case Total EIRP [dBm]	Max Power Density [mW/cm <sup>2</sup> ]	Maximum Number of Radios	Total Density for co-located radios [mW/cm <sup>2</sup> ]	Limit: General Population / Uncontrolled Exposure [mW/cm <sup>2</sup> ]	Result
36	0.469	2				0.937	1	Complies



**Case III: 2.6 GHz WCS band, 16 dBi or less (10 dBi), 1 x RAR20007001 and 1 x RAR20000003**

Co-location Compliance for Integrated 802.11b/g & WCS Radios								
Safety Distance:		25 cm		( 9.8 inches )				
Worst-case Total EIRP [dBm]	Max Power Density [mW/cm <sup>2</sup> ]	Maximum Number of Radios	Worst-case Total EIRP [dBm]	Max Power Density [mW/cm <sup>2</sup> ]	Maximum Number of Radios	Total Density for co-located radios [mW/cm <sup>2</sup> ]	Limit: General Population / Uncontrolled Exposure [mW/cm <sup>2</sup> ]	Result
36	0.507	1	35.5	0.452	1	0.959	1	Complies

**Case IV: 2.6 GHz WCS band, 16 dBi (10 dBi), four RAR20007001**

Co-location Compliance for four WCS Radios								
Safety Distance:		36 cm		( 14.2 inches )				
Worst-case Total EIRP [dBm]	Max Power Density [mW/cm <sup>2</sup> ]	Maximum Number of Radios	Worst-case Total EIRP [dBm]	Max Power Density [mW/cm <sup>2</sup> ]	Maximum Number of Radios	Total Density for co-located radios [mW/cm <sup>2</sup> ]	Limit: General Population / Uncontrolled Exposure [mW/cm <sup>2</sup> ]	Result
36	0.244	4				0.978	1	Complies

**Case V: 2.6 GHz WCS band, 16 dBi (Includes 10 dBi), three RAR20007001 and 1 X RAR20000003**

Co-location Compliance for four WCS Radios								
Safety Distance:		36 cm		( 14.2 inches )				
Worst-case Total EIRP [dBm]	Max Power Density [mW/cm <sup>2</sup> ]	Maximum Number of Radios	Worst-case Total EIRP [dBm]	Max Power Density [mW/cm <sup>2</sup> ]	Maximum Number of Radios	Total Density for co-located radios [mW/cm <sup>2</sup> ]	Limit: General Population / Uncontrolled Exposure [mW/cm <sup>2</sup> ]	Result
36	0.244	3	35.5	0.218	1	0.951	1	Complies

The equipment therefore fulfills the requirements on power density for general population/uncontrolled exposure and therefore complies with the requirements of FCC Part 27.52 and FCC Bulletin 65.