FCC ID:CASTMAL3D RF Exposure Calculations

Safe Distance Calculations[1]:

Eq 1: $S = PG / (4 \pi R^2)$

Where:
S = power density in mW per cm^2
P = net power input to the antenna in mW
G= linear gain of antenna
R = distance from the antenna in cm
f = transmitter frequency in MHz

Re-arrange to solve for R:

Eq 2: $R = (PG/(4 \pi S))^{-2}$

Limits:

From CFR 47 1.1301, for controlled environment S = f/300 mW per cm^2

At 896 MHz S = 896/300 = 2.987 mW per cm^2
At 940 MHz S = 940/300 = 3.133 mW per cm^2

Net input power to antenna:

Manufacturer's rated power is 30 Watts.
FCC CFR Pt 90.205 (s) requires an additional 20% allowance: (30/100) x 120 = 36 Watts
Cable loss: 8 feet of recommended RG 58 coaxial cable will reduce the power by 2.0 dB:
Less 2 dB cable loss: 22.7 watts
FCC CFR 47 pt 2.1091 PTT duty cycle power averaging, PTT duty cycle of 50%.

Pnet = 11.35 watts.

Antenna types:

The recommended antennas are a quarter wave whip with a gain of 0dBd, a 5/8 whip with a gain of 3dBd, or a co-linear whip with 5dBd gain:

Antenna Gain, dBd	0	3	5
Antenna Gain, Linear	1.64	3.27	5.19

MPE calculations for these antennas for minimum safe distance are given for the bottom and top of the allocated frequency bands: 896 and 940 MHz:

896 MHz			
Antenna Type	0dBd	3dBd	5dBd
P mW	11350.00	11350.00	11350.00
Linear Gain G	1.64	3.27	5.19
4πS	37.53	37.53	37.53
R=√(PG/4πS)	22.27	31.45	39.62

940 MHz			
Antenna Type	0dBd	3dBd	5dBd
P mW	11350.00	11350.00	11350.00
Linear Gain G	1.64	3.27	5.19
4πS	39.37	39.37	39.37
R=√(PG/4πS)	21.74	30.70	38.68

Results:

Minimum safe Distance Cms, Controlled limit:			
Antenna Gain, dBd	0	3	5
896 MHz	22.3	31.4	39.6
940 MHz	21.7	30.7	38.7

References:

1. FCC OET Bulletin 65 Edition 97-01, *Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields*, p. 19

END