

RADIATION HAZARD ASSESSMENT

Presented here are the analyses pertaining to the emission of non-ionizing radiation by the antenna system(s) requested by this application. These analyses demonstrate how the requested antenna(s) will perform in accordance with the human exposure limits specified by the FCC Office of Engineering and Technology Bulletin No. 65.

The following parameters are used across all calculations.

Human Exposure Limits¹

Parameter	Value	Units	Condition	Symbol
Limit Controlled Environment	50	W/m ²	<=	Plim
Limit Uncontrolled Environment	10	W/m ²	<=	Plim

Constants

Parameter	Value	Units	Symbol
Pi	3.1415927	real	π
Speed of Light	299,792,458	m/s	c

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¹ See OET Bulletin 65: Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields, Edition 97-01 at 67 (1997).

C-Com Fly 981

Basic Inputs

Input Parameter	Value	Units	Symbol
Antenna Diameter	0.98	m	D
Antenna Transmit Gain	41.2	dBi	G
Transmit Frequency	1.430E+10	Hz	f
Power Input to the Antenna	8	Watts	Pbuc
Fixed Loss from Transmitter to Feed	1	dB	Ploss

Calculated Parameter	Value	Units	Symbol	Formula
Total Feed Input Power	6.74	Watts	P	$P_{buc} - P_{loss}$
Antenna Surface Area	0.75	m ²	A	$\pi D^2/4$
Wavelength	0.021	m	λ	c/f
Gain Factor	13182.57	real	g	$10^{(G/10)}$
Antenna Efficiency	0.61	real	η	$g\lambda^2/(\pi^2 D^2)$
Max EIRP	49.49	dBW	E	G+P

Antenna Field Distances

Calculated Parameter	Value	Units	Symbol	Formula
Near-Field Distance	11.45	m	R _{nf}	$D^2/(4\lambda)$
Distance to Far-Field	27.49	m	R _{ff}	$0.6D^2/\lambda$
Distance of Transition Range	11.45	m	R _t	$R_t=R_{nf}$

Power Flux Density

Calculated Parameter	Value	Units	Symbol	Formula	Pass Limit?	
					Controlled	Uncontrolled
Near Field Region	21.85	W/m ²	S _{nf}	$16\eta P/(\pi D^2)$	Yes	No
Far Field Region	9.36	W/m ²	S _{ff}	$gP/(4\pi R_{ff}^2)$	Yes	Yes
Transition Region	21.85	W/m ²	S _t	$S_{nf} \cdot R_{nf}/R_t$	Yes	No
At Main Reflector	35.75	W/m ²	S _{surface}	4P/A	Yes	No
b/w Reflector and Ground	8.94	W/m ²	S _g	P/A	Yes	Yes

Notes:

- Antennas are to be installed in/operated toward areas that are inaccessible to the general public and other untrained personnel.

Intellian v65

Basic Inputs

Input Parameter	Value	Units	Symbol
Antenna Diameter	0.65	m	D
Antenna Transmit Gain	37.7	dBi	G
Transmit Frequency	1.425E+10	Hz	f
Power Input to the Antenna	8	Watts	Pbuc
Fixed Loss from Transmitter to Feed	1	dB	Ploss

Calculated Parameter	Value	Units	Symbol	Formula
Total Feed Input Power	6.74	Watts	P	$P_{buc} - P_{loss}$
Antenna Surface Area	0.33	m ²	A	$\pi D^2/4$
Wavelength	0.021	m	λ	c/f
Gain Factor	5888.44	real	g	$10^{(G/10)}$
Antenna Efficiency	0.63	real	η	$g\lambda^2/(\pi^2 D^2)$
Max EIRP	45.99	dBW	E	G+P

Antenna Field Distances

Calculated Parameter	Value	Units	Symbol	Formula
Near-Field Distance	5.02	m	R _{nf}	$D^2/(4\lambda)$
Distance to Far-Field	12.05	m	R _{ff}	$0.6D^2/\lambda$
Distance of Transition Range	5.02	m	R _t	$R_t=R_{nf}$

Power Flux Density

Calculated Parameter	Value	Units	Symbol	Formula	Pass Limit?	
					Controlled	Uncontrolled
Near Field Region	50.79	W/m ²	S _{nf}	$16\eta P/(\pi D^2)$	No	No
Far Field Region	21.76	W/m ²	S _{ff}	$gP/(4\pi R_{ff}^2)$	Yes	No
Transition Region	50.79	W/m ²	S _t	$S_{nf} * R_{nf}/R_t$	No	No
At Main Reflector	81.26	W/m ²	S _{surface}	4P/A	No	No
b/w Reflector and Ground	20.31	W/m ²	S _g	P/A	Yes	No

Notes:

- Radomes will be used to prevent access to the feed flange and main reflector areas.
- Antennas are to be installed in/operated toward areas that are inaccessible to the general public and other untrained personnel.
- Radiation in the near field/transition regions will meet the exposure limits for controlled environments if antenna is operated below 7.89 watts.

Intellian v85NX

Basic Inputs

Input Parameter	Value	Units	Symbol
Antenna Diameter	0.85	m	D
Antenna Transmit Gain	40.7	dBi	G
Transmit Frequency	1.425E+10	Hz	f
Power Input to the Antenna	8	Watts	Pbuc
Fixed Loss from Transmitter to Feed	1	dB	Ploss

Calculated Parameter	Value	Units	Symbol	Formula
Total Feed Input Power	6.74	Watts	P	$P_{buc} - P_{loss}$
Antenna Surface Area	0.57	m ²	A	$\pi D^2/4$
Wavelength	0.021	m	λ	c/f
Gain Factor	11748.98	real	g	$10^{(G/10)}$
Antenna Efficiency	0.73	real	η	$g\lambda^2/(\pi^2 D^2)$
Max EIRP	48.99	dBW	E	G+P

Antenna Field Distances

Calculated Parameter	Value	Units	Symbol	Formula
Near-Field Distance	8.59	m	Rnf	$D^2/(4\lambda)$
Distance to Far-Field	20.61	m	Rff	$0.6D^2/\lambda$
Distance of Transition Range	8.59	m	Rt	$Rt=R_{nf}$

Power Flux Density

Calculated Parameter	Value	Units	Symbol	Formula	Pass Limit?	
					Controlled	Uncontrolled
Near Field Region	34.65	W/m ²	S _{nf}	$16\eta P/(\pi D^2)$	Yes	No
Far Field Region	14.84	W/m ²	S _{ff}	$gP/(4\pi R_{ff}^2)$	Yes	No
Transition Region	34.65	W/m ²	S _t	$S_{nf} * R_{nf}/R_t$	Yes	No
At Main Reflector	47.52	W/m ²	S _{surface}	4P/A	Yes	No
b/w Reflector and Ground	11.88	W/m ²	S _g	P/A	Yes	No

Notes:

- Antennas are to be installed in/operated toward areas that are inaccessible to the general public and other untrained personnel.

Intellian v240MT – 40 Watts (Minimum)

Basic Inputs

Input Parameter	Value	Units	Symbol
Antenna Diameter	2.4	m	D
Antenna Transmit Gain	47.4	dBi	G
Transmit Frequency	1.425E+10	Hz	f
Power Input to the Antenna	40	Watts	Pbuc
Fixed Loss from Transmitter to Feed	1	dB	Ploss

Calculated Parameter	Value	Units	Symbol	Formula
Total Feed Input Power	38.74	Watts	P	$P_{buc} - P_{loss}$
Antenna Surface Area	4.52	m ²	A	$\pi D^2/4$
Wavelength	0.021	m	λ	c/f
Gain Factor	54954.09	real	g	$10^{(G/10)}$
Antenna Efficiency	0.43	real	η	$g\lambda^2/(\pi^2 D^2)$
Max EIRP	63.28	dBW	E	G+P

Antenna Field Distances

Calculated Parameter	Value	Units	Symbol	Formula
Near-Field Distance	68.45	m	R _{nf}	$D^2/(4\lambda)$
Distance to Far-Field	164.27	m	R _{ff}	$0.6D^2/\lambda$
Distance of Transition Range	68.45	m	R _t	$R_t=R_{nf}$

Power Flux Density

Calculated Parameter	Value	Units	Symbol	Formula	Pass Limit?	
					Controlled	Uncontrolled
Near Field Region	14.66	W/m ²	S _{nf}	$16\eta P/(\pi D^2)$	Yes	No
Far Field Region	6.28	W/m ²	S _{ff}	$gP/(4\pi R_{ff}^2)$	Yes	Yes
Transition Region	14.66	W/m ²	S _t	$S_{nf} * R_{nf}/R_t$	Yes	No
At Main Reflector	34.25	W/m ²	S _{surface}	4P/A	Yes	No
b/w Reflector and Ground	8.56	W/m ²	S _g	P/A	Yes	Yes

Notes:

- Antennas are to be installed in/operated toward areas that are inaccessible to the general public and other untrained personnel.

Intellian v240MT – 125 Watts (Maximum)

Basic Inputs

Input Parameter	Value	Units	Symbol
Antenna Diameter	2.4	m	D
Antenna Transmit Gain	47.4	dBi	G
Transmit Frequency	1.425E+10	Hz	f
Power Input to the Antenna	125	Watts	Pbuc
Fixed Loss from Transmitter to Feed	1	dB	Ploss

Calculated Parameter	Value	Units	Symbol	Formula
Total Feed Input Power	123.74	Watts	P	Pbuc - Ploss
Antenna Surface Area	4.52	m ²	A	$\pi D^2/4$
Wavelength	0.021	m	λ	c/f
Gain Factor	54954.09	real	g	$10^{(G/10)}$
Antenna Efficiency	0.43	real	η	$g\lambda^2/(\pi^2 D^2)$
Max EIRP	68.32	dBW	E	G+P

Antenna Field Distances

Calculated Parameter	Value	Units	Symbol	Formula
Near-Field Distance	68.45	m	Rnf	$D^2/(4\lambda)$
Distance to Far-Field	164.27	m	Rff	$0.6D^2/\lambda$
Distance of Transition Range	68.45	m	Rt	Rt=Rnf

Power Flux Density

Calculated Parameter	Value	Units	Symbol	Formula	Pass Limit?	
					Controlled	Uncontrolled
Near Field Region	46.81	W/m ²	Snf	$16\eta P/(\pi D^2)$	Yes	No
Far Field Region	20.05	W/m ²	Sff	$gP/(4\pi Rff^2)$	Yes	No
Transition Region	46.81	W/m ²	St	$Snf \cdot Rnf/Rt$	Yes	No
At Main Reflector	109.41	W/m ²	Ssurface	4P/A	No	No
b/w Reflector and Ground	27.35	W/m ²	Sg	P/A	Yes	No

Notes:

- Radomes will be used to prevent access to the feed flange and main reflector areas.
- Antennas are to be installed in/operated toward areas that are inaccessible to the general public and other untrained personnel.

Sailor 900

Basic Inputs

Input Parameter	Value	Units	Symbol
Antenna Diameter	1.03	m	D
Antenna Transmit Gain	41.6	dBi	G
Transmit Frequency	1.425E+10	Hz	f
Power Input to the Antenna	8	Watts	Pbuc
Fixed Loss from Transmitter to Feed	1	dB	Ploss

Calculated Parameter	Value	Units	Symbol	Formula
Total Feed Input Power	6.74	Watts	P	$P_{buc} - P_{loss}$
Antenna Surface Area	0.83	m ²	A	$\pi D^2/4$
Wavelength	0.021	m	λ	c/f
Gain Factor	14454.40	real	g	$10^{(G/10)}$
Antenna Efficiency	0.61	real	η	$g\lambda^2/(\pi^2 D^2)$
Max EIRP	49.89	dBW	E	G+P

Antenna Field Distances

Calculated Parameter	Value	Units	Symbol	Formula
Near-Field Distance	12.61	m	R _{nf}	$D^2/(4\lambda)$
Distance to Far-Field	30.26	m	R _{ff}	$0.6D^2/\lambda$
Distance of Transition Range	12.61	m	R _t	$R_t=R_{nf}$

Power Flux Density

Calculated Parameter	Value	Units	Symbol	Formula	Pass Limit?	
					Controlled	Uncontrolled
Near Field Region	19.77	W/m ²	S _{nf}	$16\eta P/(\pi D^2)$	Yes	No
Far Field Region	8.47	W/m ²	S _{ff}	$gP/(4\pi R_{ff}^2)$	Yes	Yes
Transition Region	19.77	W/m ²	S _t	$S_{nf} \cdot R_{nf}/R_t$	Yes	No
At Main Reflector	32.36	W/m ²	S _{surface}	4P/A	Yes	No
b/w Reflector and Ground	8.09	W/m ²	S _g	P/A	Yes	Yes

Notes:

- Antennas are to be installed in/operated toward areas that are inaccessible to the general public and other untrained personnel.