

ATTACHMENT C – Radiation Hazard Analyses for Bismarck

Ka band

RADIATION HAZARD CALCULATIONS FOR 10.0 meter EARTH STATION			
Nomenclature	Formula	Value	Unit
INPUT PARAMETERS			
D = Antenna Diameter		10.00	meters
d = Diameter of Feed Mouth		0.029	meters
P = Max Power into Antenna		200	Watts
n = Apperture Efficiency		66%	
k = Wavelength @ 29.1 GHz		0.0103	meters
CALCULATED VALUES			
A = Area of Reflector	$\pi D^2/4$	78.540	meters ²
l = Length of Near Field	$D^2/4k$	2425	meters
L = Beginning of Far Field	$0.6D^2/k$	5820	meters
G = Antenna Gain @ 29.1 GHz	$n(\pi D/k)^2$	6,129,782	67.9 dBi
a = Area of Feed Mouth	$\pi d^2/4$	0.0007	meters ²
POWER DENSITY CALCULATIONS			
Region	Maximum Power Density in Region		Hazard Assessment (FCC MPE Limit = 5 mW/cm ²)
	Formula	Value (mW/cm ²)	
1 Near Field	$4nP/A$	0.67	< FCC MPE Limit
2 Far Field	$GP/(4(\pi)l^2)$	0.29	< FCC MPE Limit
3 Transition	$\leq N_r$ fld Region	0.67	< FCC MPE Limit
4 Near Reflector Surface	$4P/A$	1.02	< FCC MPE Limit
5 Between Reflector & Ground	P/A	0.25	< FCC MPE Limit
6 Between Subreflector and Feed	$4P/a$	121116.7	> FCC MPE Limit (See Attachment)

Q/V band

RADIATION HAZARD CALCULATIONS FOR 10.0 meter EARTH STATION			
Nomenclature	Formula	Value	Unit
INPUT PARAMETERS			
D = Antenna Diameter		10.00	meters
d = Diameter of Feed Mouth		0.029	meters
P = Max Power into Antenna		200	Watts
n = Apperture Efficiency		55%	
k = Wavelength @ 51.4 GHz		0.0058	meters
CALCULATED VALUES			
A = Area of Reflector	$\pi D^2/4$	78.540	meters ²
l = Length of Near Field	$D^2/4k$	4284	meters
L = Beginning of Far Field	$0.6D^2/k$	10281	meters
G = Antenna Gain @ 51.4 GHz	$n(\pi D/k)^2$	15,936,908	72.0 dBi
a = Area of Feed Mouth	$\pi d^2/4$	0.0007	meters ²
POWER DENSITY CALCULATIONS			
Region	Maximum Power Density in Region		Hazard Assessment (FCC MPE Limit = 5 mW/cm ²)
	Formula	Value (mW/cm ²)	
1 Near Field	$4nP/A$	0.56	< FCC MPE Limit
2 Far Field	$GP/(4(\pi)L^2)$	0.24	< FCC MPE Limit
3 Transition	<= Nr Fld Region	0.56	< FCC MPE Limit
4 Near Reflector Surface	$4P/A$	1.02	< FCC MPE Limit
5 Between Reflector & Ground	P/A	0.25	< FCC MPE Limit
6 Between Subreflector and Feed	$4P/a$	121116.7	> FCC MPE Limit (See Attachment)