HNS License Sub, LLC Application

Exhibit D1

RADIATION CALCULATIONS FOR 5.60 meter EARTH STATION			
Nomenclature	Formula	Value	Unit
INPUT PARAMETERS			
M = Antenna Aperture Major Axis		5.60	meters
m = Antenna Aperture Minor Axis		5.60	meters
d = Diameter of Feed Mouth		0.029	meters
f = frequency		30	GHz
P = Max Power into Antenna		125.0	Watts
n = Aperture Effeciency		51%	
k = Wavelength @ 30.0 GHz		0.0100	meters
CALCULATED VALUES			
A = Area of Reflector	PIxMxm/4	24.630	meters^2
l = Length of Near Field	M^2/4k	785	meters
L = Beginning of Far Field	0.6M^2/k	1883	meters
G = Antenna Gain @ 30 GHz	n(4xPIxA)/k^2	1,580,691	(62.0) 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	1.04	< FCC MPE Limit
2 Far Field	GP/(4(PI)L^2)	0.44	< FCC MPE Limit
3 Transition	<= Nr Fld Region	1.04	< FCC MPE Limit
4 Near Reflector Surface	4P/A	2.03	< FCC MPE Limit
5 Between Reflector & Ground	P/A	0.51	< FCC MPE Limit
6 Between Subreflector and Feed	4P/a	75698.0	> FCC MPE Limit (See Attachment)

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Exhibit D2

RADIATION CALCULATIONS FOR 8.10 meter EARTH STATION			
Nomenclature	Formula	Value	Unit
INPUT PARAMETERS			
M = Antenna Aperture Major Axis		8.10	meters
m = Antenna Aperture Minor Axis		8.10	meters
d = Diameter of Feed Mouth		0.029	meters
f = frequency		30	GHz
P = Max Power into Antenna		200.0	Watts
n = Aperture Effeciency		52%	
k = Wavelength @ 30.0 GHz		0.0100	meters
CALCULATED VALUES			
A = Area of Reflector	PIxMxm/4	51.530	meters^2
l = Length of Near Field	M^2/4k	1641	meters
L = Beginning of Far Field	0.6M^2/k	3939	meters
G = Antenna Gain @ 30 GHz	n(4xPIxA)/k^2	3,371,896	(65.3) 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	0.81	< FCC MPE Limit
2 Far Field	GP/(4(PI)L^2)	0.35	< FCC MPE Limit
3 Transition	<= Nr Fld Region	0.81	< FCC MPE Limit
4 Near Reflector Surface	4P/A	1.55	< FCC MPE Limit
5 Between Reflector & Ground	P/A	0.39	< FCC MPE Limit
6 Between Subreflector and Feed	4P/a	121116.7	> FCC MPE Limit (See Attachment 1)

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Exhibit D3

RADIATION CALCULATIONS FOR 9.20 meter EARTH STATION			
Nomenclature	Formula	Value	Unit
INPUT PARAMETERS			
M = Antenna Aperture Major Axis		9.20	meters
m = Antenna Aperture Minor Axis		9.20	meters
d = Diameter of Feed Mouth		0.029	meters
f = frequency		30	GHz
P = Max Power into Antenna		200.0	Watts
n = Aperture Effeciency		49%	
k = Wavelength @ 30.0 GHz		0.0100	meters
CALCULATED VALUES			
A = Area of Reflector	PIxMxm/4	66.476	meters^2
l = Length of Near Field	M^2/4k	2117	meters
L = Beginning of Far Field	0.6M^2/k	5082	meters
G = Antenna Gain @ 30 GHz	n(4xPIxA)/k^2	4,098,950	(66.1) 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	0.59	< FCC MPE Limit
2 Far Field	GP/(4(PI)L^2)	0.25	< FCC MPE Limit
3 Transition	<= Nr Fld Region	0.59	< FCC MPE Limit
4 Near Reflector Surface	4P/A	1.20	< FCC MPE Limit
5 Between Reflector & Ground	P/A	0.30	< FCC MPE Limit
6 Between Subreflector and Feed	4P/a	121116.7	> FCC MPE Limit (See Attachment 1)

HNS License Sub, LLC Application
Exhibit D4

RADIATION CALCULATIONS FOR 0.66 meter EARTH STATION			
Nomenclature	Formula	Value	Unit
INPUT PARAMETERS			
M = Antenna Aperture Major Axis		13.20	meters
m = Antenna Aperture Minor Axis		13.20	meters
d = Diameter of Feed Mouth		0.029	meters
f = frequency		30	GHz
P = Max Power into Antenna		200.0	Watts
n = Aperture Effeciency		44%	
k = Wavelength @ 30.0 GHz		0.0100	meters
CALCULATED VALUES			
A = Area of Reflector	PIxMxm/4	136.848	meters^2
l = Length of Near Field	M^2/4k	4359	meters
L = Beginning of Far Field	0.6M^2/k	10462	meters
G = Antenna Gain @ 30 GHz	n(4xPIxA)/k^2	7,577,072	(68.8) 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	0.26	< FCC MPE Limit
2 Far Field	GP/(4(PI)L^2)	0.11	< FCC MPE Limit
3 Transition	<= Nr Fld Region	0.26	< FCC MPE Limit
4 Near Reflector Surface	4P/A	0.58	< FCC MPE Limit
5 Between Reflector & Ground	P/A	0.15	< FCC MPE Limit
6 Between Subreflector and Feed	4P/a	121116.7	> FCC MPE Limit (See Attachment 1)