Radiation Hazard Studies (Response to Question 28)

A radiation hazard analysis was conducted in regards to the two antenna types to be employed by Hughes for U.S. gateway links. The analysis was carried out using the predictive methodology identified in OET Bulletin 65 and the results are provided in this Exhibit.

The analysis was based on maximum possible radiation levels for which a maximum RF power at the antenna flange of 635 Watts. This maximum power will only be used for very short periods of time during rainy conditions. Both the time averaging of the RF power received by a human body during a short but intense rain event combined with the unlikely possibility that a person would stand immediately in front of the transmitter during a heavy rain storm construe to make this an unrealistic scenario.

The results shown in the attached Table 1 demonstrate that the average exposure levels for the protection of the general public are exceeded in the case of the 8.1 meter antenna. Yet the average exposure levels for the protection of personnel in controlled areas will be met in the near field, transition field, far field as well as between the reflector and ground. As is typically the case with parabolic antennas, the average exposure level for the protection of the general public is exceeded between the feed horn and the reflector.

Since this large antenna will be mounted on a pedestal, the volume of space between the feed horn and reflector where the limit is exceeded will always be above the head of anyone standing in front of the antenna. Moreover, the earth station will be inside a gated and fenced area with secured access in and around the antenna making it inaccessible to the general public. Technicians responsible for operating on these antennas are trained to shut down and lock out the

transmitter before performing any maintenance work in front of the antenna. Therefore the FCC MPE guidelines for this earth station will be met.

The results shown in Table 2 demonstrate that in the case of the 13.2 m antennas the average exposure levels for the protection of the general public are met for every analyzed area except for the area between the feed horn and the reflector and near the reflector surface. It should be noted, that because these large antennas will be mounted on a pedestal, the volume of space between the feed horn and reflector and near the reflector surface where the limit is exceeded will always be above the head of anyone standing in front of the antenna. Moreover, technicians responsible for operating on these antennas are trained to shut down and lock out the transmitter before performing any maintenance work in front of the antenna. Thus these structures comply with the FCC MPE guidelines.

Table 1
65W Gateway
Call Sign
License Application

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		0.067	meters
f = frequency		28.5	GHz
P = Max Power into Antenna		635.0	Watts
n = Aperture Effeciency		58%	
k = Wavelength @ 28.50 GHz		0.0105	meters
CALCULATED VALUES			
A = Area of Reflector	PIxMxm/4	51.530	meters^2
l = Length of Near Field	M^2/4k	1559	meters
L = Beginning of Far Field	0.6M^2/k	3742	meters
G = Antenna Gain @ 28.50 GHz	n(4xPIxA)/k^2	3,394,268	(65.3) dBi
a = Area of Feed Mouth	PI*d^2/4	0.0035	meters^2

POWER DENSITY CALCULATIONS			
Region	Maximum Power Density in Region		Occupational/Controlled Hazard Assessment (FCC MPE Limit = 5 mW/cm^2)
	Formula	Value (mW/cm^2)	
1 Near Field	4nP/A	2.86	< FCC MPE Limit
2 Far Field	GP/(4(PI)L^2)	1.22	< FCC MPE Limit
3 Transition	<= Nr Fld Region	2.86	< FCC MPE Limit
4 Near Reflector Surface	4P/A	4.93	< FCC MPE Limit
5 Between Reflector & Ground	P/A	1.23	< FCC MPE Limit
6 Between Subreflector and Feed	4P/a	72043.4	> FCC MPE Limit (See Exhibit A)

Table 2
65W Gateway
Call Sign
License Application

RADIATION CALCULATIONS FOR		13.20	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		0.082	meters
f = frequency		28.5	GHz
P = Max Power into Antenna		635.0	Watts
n = Aperture Effeciency		51%	
k = Wavelength @ 28.50 GHz		0.0105	meters
CALCULATED VALUES			
A = Area of Reflector	PIxMxm/4	136.848	meters^2
l = Length of Near Field	M^2/4k	4141	meters
L = Beginning of Far Field	0.6M^2/k	9939	meters
G = Antenna Gain @ 28.50 GHz	n(4xPIxA)/k^2	7,926,220	(69.0) dBi
a = Area of Feed Mouth	PI*d^2/4	0.0053	meters^2

POWER DENSITY CALCULATIONS			
Region	Maximum Power Density in Region		Occupational/Controlled Hazard Assessment (FCC MPE Limit = 5 mW/cm^2)
	Formula	Value (mW/cm^2)	
1 Near Field	4nP/A	0.95	< FCC MPE Limit
2 Far Field	GP/(4(PI)L^2)	0.41	< FCC MPE Limit
3 Transition	<= Nr Fld Region	0.95	< FCC MPE Limit
4 Near Reflector Surface	4P/A	1.86	< FCC MPE Limit
5 Between Reflector & Ground	P/A	0.46	< FCC MPE Limit
6 Between Subreflector and Feed	4P/a	48096.8	> FCC MPE Limit (See Exhibit A)