Radiation Hazard Analysis

Operator:	***SES***		
Location Designation:	***Front Range Earth Station***	*FCC Callsign:*	
County:	***Larmier***	*SES ID:*	
Town:	***Fort Collins***	*STA:*	
State/Zip:	***CO 80521***		

Input Values	*Value*	*Unit*
D = Aperture Diameter	*7.30*	*Meters*
d = Subreflector Diameter	*0.56*	*Meters*
G = Antenna Gain	*64.6*	*dBi*
FCC Designation	*Ka*	*Band*
F = Frequency	*28.000*	*GHz*
P = Transmitter Power Watts:	*150*	*Watts*
R_{ua} = closest point to uncontrolled area	*50*	*meters*
Elevation angle at closest point R_{ua}	*10*	*Degrees*
Height (AGL)	*10.00*	*meters*

Band	*Frequency*
L	*1000-2000*
S	*2000-4000*
C	*4000-8000*
X	*8000-12500*
Ku	*12500-18000*
K	*18000-25500*
Ka	*26500-40000*
O	*40000-50000*
V	*50000-75000*

OET 65 Calculated Values	*Formula*	*Value*	*Unit*
λ= Wavelength	$\frac{c}{F}$	*0.0107*	*meters*
G = Antenna Gain	$10^{(G/10)}$	*2884031.503*	*(W) linear*
η = Apperture Efficiency	$\frac{G\lambda^2/4\pi}{\pi D^2/4}$	*63%*	*percentage*
A = Area of reflector	πR^2	*41.854*	*$meters^2$*
a = area of subreflector	πr^2	*2463.009*	*cm^2*
R_{nf} = Near-Field Region	$\frac{D^2}{4\lambda}$	*1244.263*	*meters*
		216	*Meters AGL*
R_t = Transition Region	$>R_{nf}$	*1244.263*	*>meters*
	$<R_{ff}$	*2986.231*	*<meters*
R_{ff} = Far Field Region	$\frac{0.6D^2}{\lambda}$	*2986.231*	*meters*
		519	*Meters AGL*

Radiation Analysis Zone		*Formula*	*Level*	*Value*	*Exposure Limits*	
					General Public	*Occupational*
					<1mW/cm2	*<5mW/cm2*
1	*Power Subreflector*	$\frac{4P}{a}$	*243.605*	*mW/cm2*	*>FCC MPE See Note 1*	*>FCC MPE See Note 2*
2	*Antenna Surface*	$\frac{4P}{A}$	*1.434*	*mW/cm2*	*>FCC MPE See Note 1*	*<FCC MPE*
3	*Main Reflector Ground*	$\frac{P}{A}$	*0.358*	*mW/cm2*	*<FCC MPE*	*<FCC MPE*
4	*S_{nf} =Near-Field Power Density*	$\frac{4\eta P}{A}$	*0.901*	*mW/cm2*	*<FCC MPE*	*<FCC MPE*
5	*S_t = Max Transition Power Density*	$\leq S_{nf}$	*0.901*	*mW/cm2*	*<FCC MPE*	*<FCC MPE*
6	*S_{ff} = Max Far field Power Density*	$\frac{PG}{4\pi R_{ff}^2}$	*0.386*	*mW/cm2*	*<FCC MPE*	*<FCC MPE*
7	*Off Access Level Near Field*	S_{nf} - 20 dB	*0.00901*	*mW/cm2*	*<FCC MPE*	*<FCC MPE*

Notes

1. *The antenna is installed in a controlled location access is restricted to authorized personnel only. The antenna is marked with RF Radiation Hazard signage.*
2. *Inside the controlled area, MPE levels exceed the MPE exposure for occupational levels. The levels will be reduced to safe MPE by removing power to the transmitters when work is performed on or around the antenna. This area can only be accessed by qualified personnel.*
3. *The field develops 10 meters above ground level at the minimum elevation angle which is not accessable to the general public.*

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Operator:	***SES***		
Location Designation:	***Front Range Earth Station***	*FCC Callsign:*	
County:	***Larmier***	*SES ID:*	
Town:	***Fort Collins***	*STA:*	
State/Zip:	***CO 80521***		

Input Values	*Value*	*Unit*
D = Aperture Diameter	*9.10*	*Meters*
d = Subreflector Diameter	*0.56*	*Meters*
G = Antenna Gain	*66.4*	*dBi*
FCC Designation	*Ka*	*Band*
F = Frequency	*28.000*	*GHz*
P = Transmitter Power Watts:	*150*	*Watts*
R_{ua} = closest point to uncontrolled area	*50*	*meters*
Elevation angle at closest point R_{ua}	*10*	*Degrees*
Height (AGL)	*12.00*	*meters*

Band	*Frequency*
L	*1000-2000*
S	*2000-4000*
C	*4000-8000*
X	*8000-12500*
Ku	*12500-18000*
K	*18000-25500*
Ka	*26500-40000*
O	*40000-50000*
V	*50000-75000*

OET 65 Calculated Values	*Formula*	*Value*	*Unit*
λ= Wavelength	$\frac{c}{F}$	*0.0107*	*meters*
G = Antenna Gain	$10^{(G/10)}$	*4365158.322*	*(W) linear*
η = Apperture Efficiency	$\frac{G\lambda^2/4\pi}{\pi D^2/4}$	*61%*	*percentage*
A = Area of reflector	πR^2	*65.039*	*$meters^2$*
a = area of subreflector	πr^2	*2463.009*	*cm^2*
R_{nf} = Near-Field Region	$\frac{D^2}{4\lambda}$	*1933.522*	*meters*
		336	*Meters AGL*
R_t = Transition Region	$>R_{nf}$	*1933.522*	*>meters*
	$<R_{ff}$	*4640.454*	*<meters*
R_{ff} = Far Field Region	$\frac{0.6D^2}{\lambda}$	*4640.454*	*meters*
		806	*Meters AGL*

Radiation Analysis Zone		*Formula*	*Level*	*Value*	*Exposure Limits*	
					General Public	*Occupational*
					<1mW/cm2	*<5mW/cm2*
1	*Power Subreflector*	$\frac{4P}{a}$	*243.605*	*mW/cm2*	*>FCC MPE See Note 1*	*>FCC MPE See Note 2*
2	*Antenna Surface*	$\frac{4P}{A}$	*0.923*	*mW/cm2*	*<FCC MPE*	*<FCC MPE*
3	*Main Reflector Ground*	$\frac{P}{A}$	*0.231*	*mW/cm2*	*<FCC MPE*	*<FCC MPE*
4	*S_{nf} =Near-Field Power Density*	$\frac{4\eta P}{A}$	*0.565*	*mW/cm2*	*<FCC MPE*	*<FCC MPE*
5	*S_t = Max Transition Power Density*	$\leq S_{nf}$	*0.565*	*mW/cm2*	*<FCC MPE*	*<FCC MPE*
6	*S_{ff} = Max Far field Power Density*	$\frac{PG}{4\pi R_{ff}^2}$	*0.242*	*mW/cm2*	*<FCC MPE*	*<FCC MPE*
7	*Off Access Level Near Field*	S_{nf} - 20 dB	*0.00565*	*mW/cm2*	*<FCC MPE*	*<FCC MPE*

Notes

1. *The antenna is installed in a controlled location access is restricted to authorized personnel only. The antenna is marked with RF Radiation Hazard signage.*
2. *Inside the controlled area, MPE levels exceed the MPE exposure for occupational levels. The levels will be reduced to safe MPE by removing power to the transmitters when work is performed on or around the antenna. This area can only be accessed by qualified personnel.*
3. *The field develops 12 meters above ground level at the minimum elevation angle which is not accessable to the general public.*