RADIATION HAZARD STUDY
Satellite Education Network
Western Illinois University

The satellite facilities at Western Illinois University are mounted on the southwest corner of Memorial Hall in Macomb, Il. The building is a 5 story building. Four of the five stories are used for offices, television studios, and classrooms. The uplink dishes are on the roof of the fourth floor. The fifth floor is to the east / northeast of the uplink dishes. The walls of the fifth floor is concrete block, brick and steel skin construction.

The roof area that the uplink dishes are on is a controlled access area. Access is not available to anyone except maintenance workers. All equipment that would be accessed by these workers is on the east side of the fifth floor structure.

The 6.1 meter Vertex dish is mounted on the Southwest corner of the building. Because of the location of the support steel, the reflector is flush and/or overhangs the edge of the roof. The edge of the reflector is 3 meters above the roof.

The 2.4 meter Vertex dish is approximately 10 meters behind the 6.1 meter dish. It is a fixed dish that is positioned on Galaxy 10R at 123 degrees west. The reflector is accessible from the roof as it is 2 meters from the roof.

RADIATION HAZARD STUDY
Satellite Education Network
Western Illinois University

Region	Radiation Level Mw/cm²	Hazard Assessment
Far Field		
(2.4m Vertex) R_{ff} = 17280 cm²	1.49	Complies with guidelines
(6.1m Vertex) R_{ff} = 111630 cm²	.507	Complies with guidelines
Combined	1.997	Complies with guidelines
Near Field		
(2.4m Vertex) R_{nf} = 30 cm²	3.27	Complies with guidelines
(6.1m Vertex) R_{nf} = 76 cm²	1.08	Complies with guidelines
Combined	4.35	Complies with guidelines
Reflector Surface		
(2.4m Vertex)	1.64	Complies with guidelines
(6.1m Vertex)	.531	Complies with guidelines
Combined	2.171	Complies with guidelines
Transition Region		
(2.4m Vertex)	.04	Complies with guidelines
(6.1m Vertex)	.002	Complies with guidelines
Combined	.042	Complies with guidelines

RADIATION HAZARD STUDY
Satellite Education Network
Western Illinois University

Region	Radiation Level Mw/cm²	Hazard Assessment
Transition Region S_{tr}		
(2.4m Vertex)	3.27	Complies with guidelines
(6.1m Vertex)	1.08	Complies with guidelines
Combined	4.35	Complies with guidelines
Between Antenna and roof		
(2.4m Vertex)	.02	Complies with guidelines
(6.1m Vertex)	.01	Complies with guidelines
Combined	.03	Complies with guidelines
Between Main reflector and feed (Figures are based on power level At the feedhorn.)		
(2.4m Vertex)	163.58	Potential Hazard
(6.1m Vertex)	610.09	Potential Hazard
Combined	Not Physically possible.	The 2 feeds are separated by over 10 meters.

Conclusion:

Based on the above analysis, it is concluded that harmful levels of radiation will not exist in the regions normally occupied by the public or employees of the university. The earth station will be marked with standard radiation hazard warning signs that will described where the potential may exist for hazardous radiation levels. To ensure compliance with the safety limits, the earth station transmitter will be turned off whenever maintenance and repair personnel are required to work in the area where the radiation level exceeds the level recommended by applicable guidelines. The earth station is a secured location with controlled access.

1. Far Field

(2.4m Vertex)
R_{ff} =0.6 x D / γ = 0.6 x (240cm)² / 2cm = 17280 cm

S_{ff} = P x G x 1000 / 4 x π x R² = 74 x 75857.76 x 1000 / 4 x π x 17280² = 1.49 mw/cm²

(6.1m Vertex)
R_{ff} =0.6 x D / γ = 0.6 x (610cm)² / 2cm = 111630 cm

S_{ff} = P x G x 1000 / 4 x π x R² = 155 x 512861 x 1000 / 4 x π x 111630² = .507 mw/cm²

2. Near Field

(2.4m Vertex)
R_{nf} = D² / 4 x γ = 240² / 4 x 2 = 30 cm²

S_{nf} = 16 x E_f x P / π x D² = 16 x .5 x 74000 / π x 240² = 3.27 mw/cm²

(6.1m Vertex)
R_{nf} = D² / 4 x γ = 610² / 4 x 2 = 76 cm²

S_{nf} = 16 x E_f x P / π x D² = 16 x .51 x 155250 / π x 610² = 1.08 mw/cm²

3. Reflector Surface

(2.4m Vertex)
S_{rs}= P / π x R² = 74000 / π x 120² = 1.64 mw/cm²

(6.1m Vertex)
S_{rs}= P / π x R² = 155250 / π x 305² = .531mw/cm²

4. Transition Region

(2.4m Vertex)
$S_{tr} = S_{nf} \times S_{ff} / R = 3.27 \times 1.49 / 120 = .04$ mw/cm²

(6.1m Vertex)
$S_{tr} = S_{nf} \times S_{ff} / R = 1.08 \times .507 / 305 = .002$ mw/cm²

5. Between Antenna and Rooftop

(2.4m Vertex) The bottom of the reflector is 2 meters off the roof.
$S_{rt} = S_{rs}$ / % of diameter of antenna = 1.64 / 83 = .02 mw/cm²

(6.1m Vertex) The bottom of the reflector is 3 meters from the roof.
$S_{rt} = S_{rs}$ / % of diameter of antenna = .531 / 50 = .01 mw/cm²

6. Between Main Reflector and Feed (The highest power level will be at the aperture)

(2.4m Vertex) The diameter of the feed is 24cm
$S_{ap} = P / \pi \times R^2 = 74000 / \pi \times 12^2 = 163.58$ mw/cm²

(6.1m Vertex) The diameter of the feed is 18 cm
$S_{ap} = P / \pi \times R^2 = 155250 / \pi \times 9^2 = 610.09$ mw/cm²