

NBC Temporary Fixed Satellite Earth Station Environmental Impact / Radiation Hazard Study

The attached FCC OET-65 RF Exposure Study analyzes the non-ionizing radiation levels for the proposed Transportable Ku-band Uplink utilizing a 1.5 meter Earth Station Antenna. The Study shows predicted RF power density in areas around the antenna and in the main beam when the Uplink is operating at its maximum power.

The NBC Radio Frequency (RFR) Safety and Health Program establishes Safety Zones for Satellite News Gathering Trucks. In an area designated as a Red Zone, NBC authorized personnel will be allowed to enter the area only after the emitter has been shut down or reduced in power to bring the RF power density in the area below maximum permissible exposure (MPE) limits for general population/uncontrolled environments. Areas are considered in the "Yellow Zone" if they have RF power densities at or above FCC MPE limits for general protection/uncontrolled environments but below the MPE limits for occupational/controlled environments or if they have the potential, should a transmission line leak or multiple on-demand antennas activate, to exceed the MPE limits for general population/uncontrolled environments. Areas where RF power density does not exceed the FCC MPE limits for general population/uncontrolled environments are identified as Green zones.

Only NBC authorized personnel that have received RF safety training, are fully aware, and are able to exercise control over their exposure to RF fields will be allowed in Yellow and Red zones.

The NBC RFR Safety Zones for Remote Operations table defines any area in the main beam of an SNG truck antenna as a Red Zone. Areas where waveguide is exposed (panels open) is considered a Yellow zone. Warning signs attached to the vehicle warn individuals of the potential for hazardous radiation.

RF power densities in the main beam of the antenna are predicted to exceed those specified in 47CFR §1.1310 for uncontrolled/public exposure at distances less than 147 meters from the antenna. At this minimum authorized antenna elevation angle, the main beam will be approximately 16 meters above ground. Operating procedures have been established for operational personnel to verify the antenna is not pointing at any building or populated area prior to energizing the antenna.

Using FCC OET Bulletin 65 methods, off-axis near field power densities are calculated to be below MPE limits for general population/uncontrolled environments specified in 47CFR §1.1310 at distances greater than 1.5 meters from the center of the satellite antenna. The center of the antenna is over 3.12 meters above ground and the antenna will not be used at elevation angles below 5 degrees, so based on the OET-65 calculations, people in areas around the Satellite News Gathering truck will not be exposed to power densities exceeding the MPE limits for general population/uncontrolled environments specified in 47CFR §1.1310.

Doug Lung, May 12, 2005

FCC OET-65 RF Exposure Study - Satellite Uplink Facility
NBC News Burbank 1.5 meter Digital SNG Vehicle

FCC Maximum Permissible Exposure Levels	Source	Units
Public/uncontrolled area exposure limit	47CFR §1.1310	1 mW/cm ²
Occupational/controlled area exposure limit	47CFR §1.1310	5 mW/cm ²

Input Data

Antenna Diameter	datasheet	150.0 cm
Antenna surface area	calculated	17671 cm ²
Feed flange diameter	measured	8.890 cm
Feed flange area	calculated	62 cm ²
Frequency	(entry)	14250 MHz
Wavelength (speed of light = 299,792,458 m/s)	calculated	2.104 cm
Transmit power at flange	datasheet	70000 milliwatts
Antenna gain	datasheet	45.9 dBi
Antenna gain factor	calculated	38905
Height of base of antenna above ground	measured	2.11 m
Height of center of antenna above ground	measured	3.12 m
Minimum Elevation Angle	(entry)	5 degrees
Minimum Elevation Angle	calculated	0.08727 radians

Results calculated using FCC Bulletin OET-65 (Edition 97-01 August 1997)

			FCC Maximum Permissible Exposure (MPE)	
			Uncontrolled	Controlled
Maximum power density at antenna surface	Eq. 11 Pg 27	15.84 mW/cm ²	Potential Hazard	Potential Hazard
Power density at feed flange	Eq. 11 Pg 27	4510.91 mW/cm ²	Potential Hazard	Potential Hazard
Extent of near-field	Eq. 12 Pg 27	2674 cm		
Maximum new-field power density	Eq. 13 Pg 28	12.29 mW/cm ²	Potential Hazard	Potential Hazard
Aperture efficiency	Eq. 14 Pg 28	0.78		
Distance to beginning of far-field	Eq. 16 Pg 29	6416.94 cm		
Power density at end of the transition region	Eq. 17 Pg 29	5.12 mW/cm ²	Potential Hazard	Potential Hazard
Maximum far-field power density	Eq. 18 Pg 29	5.263 mW/cm ²	Potential Hazard	Potential Hazard

Main Beam Far-field region safe exposure distances

Minimum distance for public/uncontrolled exposure	Eq. 18 Pg 29	147.21 meters
Height at minimum antenna elevation angle	calculated	15.95 meters
Horizontal distance	calculated	146.65 meters
Minimum distance for occupational/controlled exposure	Eq. 18 Pg 29	65.84 meters
Height at minimum antenna elevation angle	calculated	8.86 meters
Horizontal distance	calculated	65.58 meters

Off-Axis Near Field/Transition Region safe exposure distances from antenna

(20 dB reduction in power density at distances greater than one antenna diameter from the main beam center.)				
Maximum off-axis near field power density	OET-65 Pg 30			
	Eq. 13 Pg 28	0.1229 mW/cm ²	Below FCC MPE	Below FCC MPE
Public/uncontrolled exposure off-axis distance	Diam/or Eq 17	1.5 meters		
Occupational/controlled exposure off-axis distance	Diam/or Eq 17	1.5 meters		

Off-Axis Far Field safe exposure distances from the antenna

(Based on side lobe attenuation required by FCC 25.209(a)(2))				
Angle off main beam axis (1 to 48 degrees)	(entry)		1 degree(s)	
Off-axis antenna gain factor	OET-65 Pg 30*	1585		
Minimum distance for public/uncontrolled exposure	Eq. 18 Pg 29 **	64.17 meters		

* Gain converted from dBi to linear multiple

** If calculated distance is less than the start of the far field region, the distance to the start of the far field region is used.