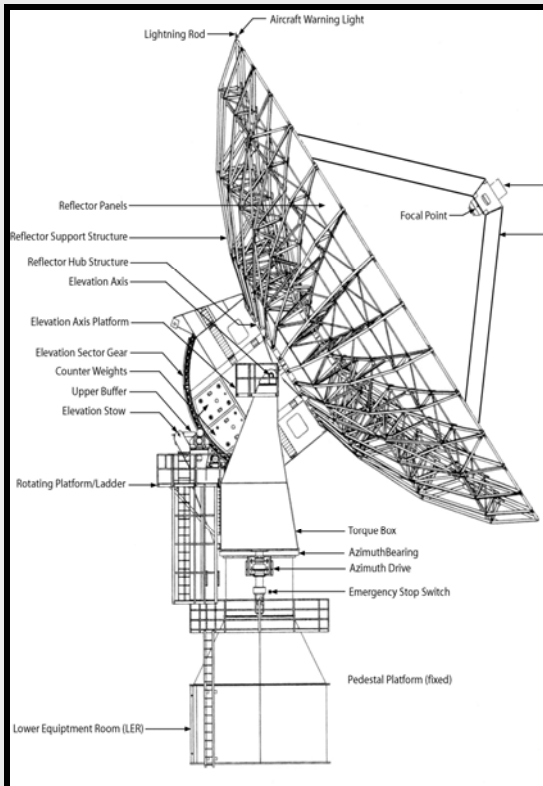




*Morehead State University Space Science Center 21 Meter Space Tracking Antenna*

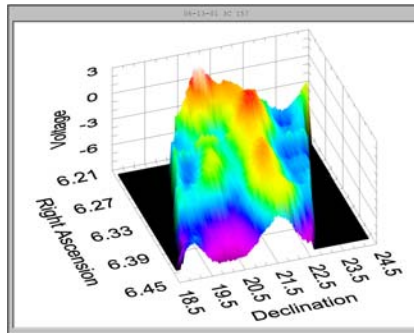


*21 Meter Space Tracking Antenna Overall Engineering Design*

## 21 M Space Tracking Antenna

The Space Science Center at Morehead State University has developed a full motion 21-meter class antenna system which is engaged in a rigorous research program in radio astronomy and also serves as an Earth Station for satellite mission support as well as a test bed for advanced RF systems. The instrument is a unique educational tool that provides an active laboratory for students to have hands-on learning experiences with the intricacies of satellite telecommunications and radio astronomy. The 21 M supports undergraduate research in astrophysics, satellite telecommunications, RF and electrical engineering, and software development. The 21 Meter antenna system became operational in 2006 and currently engaged in radio astronomy research. The 21 M antenna also serves as the primary Earth station for the KySat series of satellites. Radio astronomy research projects include:

- long-term monitoring campaigns (AGNs)
- sky surveys (Dynamic Mapping of HI in the Milky Way)
- transient phenomena (radio afterglow of GRBs)



*21 M Data (3C 157)*



*Control Center at SSC*

Performance Criterion	Specified/Calculated Values
<b>Aperture</b>	L (1.42-1.70 GHz)/KU (11.7-12.2 GHz)
Diameter	21.0 m
Surface Tolerance @ 35 mph	0.166°-0.019° < 0.20° RMS
Aperture Efficiency (%)	55.28%/54.86%
F/D	.363
Locked Rotor Frequency (LRF)	>2Hz
<b>Dynamics</b>	
Az Speed	>3°/sec
E1 Speed	1.5°/sec
Az Acceleration	2°/s <sup>2</sup>
E1 Acceleration	0.5°/sec
Pointing Error L/Ku	0.0090° RMS
Resonance	>2Hz
Range	Azimuth = + 270°, Al. = -2° - 92°
<b>Radio Frequency (RF)</b>	
Antenna Gain L/Ku	48.02/65.82
LNA Temperature	25°K / 70°K
T <sub>sys</sub> (40°)	45° / 70.30°
G/T @ 45°	30.1/44.45
$\Delta S_{min} = \eta A_e \sqrt{\Delta v \Delta t}$	
Assume: Ks=1, $\Delta t = 1s, 10, 100$	
$\Delta v = 3 \times 10^6 Hz$	
HPBW <sub>L</sub>	0.65°
HPBW <sub>Ku</sub>	0.090°