Interóffice

VLB ARRAY MEMO No. 160

National Radio Astronomy Observatory

Very Large Array

December 14, 1982

To: VLBA Antenna Group, VLBA Coordinating Group

From: W. G. Horne

Subject: Slew rates for VLBA antennas

VLBA Memo No. 154 sets forth considerably more stringent requirements on slew rates in both Azimuth and Elevation than has previously been considered for the VLB antenna. I do not attempt to evaluate the need for such requirements but will point out the impact of such requirements on the design of drive and control systems, servo accuracy and structural systems.

(1) For purposes of discussion only let us assume that the antenna configuration is similar to the existing VLA antennas ie a "Yoke end alidade" type rather than a wheel and track antenna.

For the existing VLA antenna the wind torgue constants are:

EL. Tc = 142 Ft. lbg. x (Wind Velocity in MPH)^2
AZ Tc = 174 ft. lbs x (WInd Velocity in MPH)^2

In sheet 2 of Memo 154 the Azimuth and Elev. slew rates for a VLA 34m (which I assume should be 25m) are given as 0.7 deg/sec and 0.3 deg/sec (40°/min and 20°/min) while the VLBA goal is proposed as 12°/sec (720°/min). If the VLBA, has similar design constants as the VLA antenna and the capability of driving in up to 60 MPH wind is held then the Az Axis torgue

$$T = 174(60)^2 = 626,400 \text{ ft. lbs.}$$

$$\text{Reg'd HP} = \frac{T \times N}{5252} = \frac{626{,}400 \;\; \frac{720}{360}}{5252} = 238.5 \text{ H.P.}$$

Even allowing for configuration changes and using 150% for motor load, since the gear reducers are only about 80% efficient, we will require about 200 H.P. per axis compared to the 10 H.P. per axis used on the VLA antennas.