

NORTHEAST RADIO OBSERVATORY CORPORATION
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TO: VLBA Antenna Group and Science Committee

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SUBJECT: Slew and setting rates for VLBA antennas

Several types of VLBI experiments need rapid switching of the antenna from one source to another. For example, in phase reference mapping and astrometry it is desirable to switch between a nearby reference source and the source being studied in a time short compared with the time scale of atmospheric and ionospheric phase fluctuations. The phase error Δ which results from time variations in the atmosphere is approximately

$$\Delta = T\sigma(\tau)$$

where T is the time to switch sources and σ is the Allan standard deviation. For example if it takes 100 seconds to switch sources the error is 10ps (80 degrees at 22 GHz) assuming an Allan standard deviation for the atmosphere of 10^{-7} at 100 sec. If it took only 2 seconds to switch sources the error would be reduced to under 2 degrees of phase at 22 GHz. Another example is a geodetic/astrometric observing program in which it is desirable to observe sources over a wide range of hour angle and declination in a time short compared with time changes in geophysical parameters. Present observing schedules are typically limited by slow moving antennas to less than 20 observations per hour. If all antennas could move in 30 seconds or less this could be increased to 60 observations per hour. We give below some examples of antenna slew and setting times and a suggested goal for the VLBA antenna. Note that the source change time can be significantly reduced by eliminating cable wrap. For example, the Millstone antenna uses rotary joints for R.F. signals.

Antenna	Azmuth slew rate deg/sec	Elevation rate deg/sec	Max source change time sec	Setting time sec	Comments
Haystack 120'	2	2	200	5	Hydraulic drive
Westford 60'	4	3	100	3	Electric drive
Millstone 84'	4	4	45	2	Electric drive no cable wrap
OVRO 130'	0.2	0.2	1800		
VLA 34m	0.7	0.3			
Werthoven 25m	15	15			
VLBA goal	12	12	30	2	

ANTENNA SLEW AND SETTING RATES