

## ALMA Holography CDR – Notes Concerning Tower and Cabling

P.Napier, 2000-Oct-01

The nominal distance from the antenna to the tower has been selected to be 300m (see Appendix 1 of holography meeting minutes <http://www.tuc.nrao.edu/~demerson/holmins7.htm>). From the point of view of cost, tower motion, ease of climbing and FAA regulations it is desirable to keep the tower as short as possible. Quotations for self-supporting towers have been obtained from Rohn Towers, a supplier of radio towers in New Mexico, as follows: 150 ft (46 m) - \$8.4 K, 160 ft (49 m) – \$9.7 K, 190 ft (58 m) – \$11.7 K. These costs are for the tower alone and do not include installation or foundation costs. With respect to tower motion, this contractor was given a goal of ptp motion of 0.5 in (12 mm) in a 20 mph (9 m/s) wind for the 46 m tower. This motion would contribute an error of approximately 20 microns rms surface error to the holography measurement if uncorrected. The contractor thought that such a motion was obtainable but was not willing to do the engineering to be sure without a purchase order. The FAA regulations for towers have been investigated by the VLA Safety Officer (Spargo e-mail of 2000-Feb-23). Towers below 200 ft (61 m) do not require an FAA permit for construction, although the FAA encourages towers in this range to be registered with them. A permit for construction above this limit is not difficult to obtain. Also, towers below 200 ft are not required by the FAA to have warning lights installed on top. However, because the VLA area is used by the USAF for low altitude night-time training flights, the USAF strongly encourages NRAO to provide warning lights and we will do so.

The tower is currently planned to be 50 m high and will be located 300 m from the center of the 100 m E-W interferometer baseline at an azimuth of 160 degrees east of north (see the Test Interferometer layout plans below). In this location the top of the tower subtends an angle and distance from the antenna elevation axis as shown in the table below. The corresponding numbers for a 60 m tower are also shown.

Tower Height	Elevation from East antenna	Elevation from West antenna	Distance from East antenna	Distance from West antenna
50 m	8.5 deg	7.6 deg	290 m	323 m
60 m	10.7 deg	9.4 deg	292 m	325 m

A master manhole for fiber optics and communications cables will be located close to the center of the 100 m interferometer baseline. From this manhole two conduits, each 1.5 in (3.8 cm) in internal diameter and approximately 300 m in length, will run to the holography tower. From this master manhole conduits of the same size will also be available to the ALMA equipment in the VLA control room (distance approximately 280 m) and to the antennas and ALMA test trailer. 110 volt, 60 Hz power will be available at the holography tower.

