

Title: Geometric Configurations for Large Spacecraft Tracking Arrays

Author: D.L. Jones

Abstract: A significant increase in the sensitivity of ground facilities used for spacecraft telemetry reception and navigation can be obtained through the use of large numbers of inexpensive, mass-produced parabolic antennas with diameters of a few meters. Planned arrays for the Deep Space Network (DSN) and for radio astronomy involve up to several thousand small antennas, providing collecting areas approaching a square kilometer. The geometric configuration of arrays intended for spacecraft tracking will differ from those for radio astronomical observations. This paper will explore the configuration constraints and tradeoffs for a prototype DSN array being developed at JPL. The optimum configuration for the 100-antenna prototype array is determined by tradeoffs between cost, maximum baseline length, shadowing, instantaneous sidelobe levels, and ease of atmospheric phase calibration. This research was carried out at the Jet Propulsion Laboratory, California Institute of Technology, under contract with the National Aeronautics and Space Administration.