

Configuration Studies for the DSN Prototype Array

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NASA's Deep Space Network (DSN) is studying the costs and benefits of ground-based radio arrays composed of thousands of small, low cost antennas. Such arrays offer an opportunity to increase the downlink data rates from distant spacecraft by two orders of magnitude or more. To help evaluate the construction, maintenance, and operations cost of large arrays, a prototype array with one hundred 12-meter diameter antennas is being designed at the Jet Propulsion Laboratory. This paper considers the constraints on geometric configurations for the prototype array. These constraints include ease of calibration (particularly corrections for atmospheric phase errors), cost of construction, antenna shadowing at low elevations, interference immunity, precision of angular tracking, and the level of sidelobes in the instantaneous array beam. Candidate configurations that represent reasonable compromises between these constraints will be presented. This work was carried out at the Jet Propulsion Laboratory, California Institute of Technology, under contract with the National Aeronautics and Space Administration.