

21st IAA SYMPOSIUM ON VISIONS AND STRATEGIES FOR THE FUTURE (D4)
Strategies for Rapid Implementation of Interstellar Missions: Precursors and Beyond (4)

Author: Prof. Philip Mauskopf
Arizona State University, United States, mauskopf@asu.edu

COMMUNICATIONS RECEIVER DESIGNS FOR INTERSTELLAR PROBE MISSIONS

Abstract

We describe the designs of the ground station communications receiver system for the Breakthrough Starshot mission and other interstellar probes. Past interplanetary missions within the solar system such as the New Horizons mission to Pluto and the Kuiper belt use the NASA deep space network (DSN), a system of large radio dishes distributed around the world, to downlink data obtained during flybys. The next generation NASA probes such as the Psyche mission will test higher capacity optical communications systems. Future interstellar probes will require larger collecting areas and use of optical communications to overcome the signal loss over interstellar distances. We describe four concepts for large area ground receivers: i) an array of 1 meter diameter low cost incoherently combined reflecting apertures, ii) an array of 1 meter diameter low cost reflecting apertures coherently combined into 50 meter diameter optical receivers, iii) a space-based collecting aperture based on low mass nanophotonic reflectors similar to the Breakthrough Starshot lightsail design and iv) a crowd sourced citizen science initiative to produce small receivers for "backyard" collection of communications signals. We also describe astronomy projects which can be carried out using these receivers.