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TECHNOLOGY DEVELOPMENT FOR BREAKTHROUGH STARSHOT INTERSTELLAR COMMUNICATIONS SYSTEM

Abstract

The Breakthrough Starshot Project is an effort to send the first interstellar probes to nearby star systems and send back scientific data acquired during system transit. We describe the requirements for the communications data link from the Breakthrough Starshot probes given the increase in distance to nearby stars compared to the outer planets of our solar system which places strong constraints on the on-board mass and power for the Starshot communications system. We compare the radio and optical laser-based communications systems in current and upcoming solar system probes, New Horizons and Psyche, to the requirements for Starshot and define Figures of Merit for the communications capability in terms of data downlink rate per unit mass and unit transmit power. Finally, we describe ongoing technology development directed towards meeting the goals for the Starshot communications system including low mass laser-based phased arrays, large area ground receivers and use of novel encoding schemes.