

20th IAA SYMPOSIUM ON VISIONS AND STRATEGIES FOR THE FUTURE (D4)
Innovative Concepts and Technologies (1)

Author: Mr. Wesley Green
Breakthrough Initiatives, United States, wesleygreenoptics@gmail.com

Mr. James Schalkwyk
Breakthrough Initiatives, United States, schalkwyk@breakthrough-initiatives.org

ADVANCEMENTS IN LASER PROPULSION FOR RELATIVISTIC LIGHTSAIL MISSIONS

Abstract

A summary of the Breakthrough Starshot Photon Engine research is given, showing viable paths to create a gigawatt-level, kilometer-scale coherent phased array. This is one of three core technology areas, including lightsail design and communications, required to visit our nearest stars in our lifetime. The Starshot concept uses a ground-based laser to illuminate an orbiting four-meter sail, accelerating it to 20% of the speed of light. The probe collects data and transmits it back to earth in a flyby mission. The first round of research includes advancements in beam control and adaptive optics, fiber amplifiers and nonlinear effects, semiconductor lasers, photonic integrated circuits, and cost estimations. Critical technology areas are highlighted, indicating where advancements are needed in the proceeding rounds of research, and where some technology branches are determined to be incompatible with Starshot.