

Outline: Analyzing interstellar and interplanetary environmental obstacles and design challenges for relativistic laser-propelled spacecraft. This report would be based off of the Breakthrough Starshot proposal put forward by Stephen Hawking and Yuri Milner.

- I. Abstract
 - a. Contextual information
 - b. Description of core problems
- II. Environmental obstacles/challenges to overcome
 - a. Interstellar particles (ISM gas/dust)
 - i. Heating effects (collisions with atoms at 0.2c)
 - ii. ISM particles interactions/chemistry with spacecraft material
 - iii. Lightsail creating drag in ISM
 - b. Interplanetary particles (solar system/Alpha Centauri)
 - c. Cosmic rays
 - d. Other considerations
 - i. Interstellar/interplanetary magnetic field altering trajectory
 - ii. Spacecraft accumulating positive charge in ISM
 - iii. Deflection methods of dust
- III. Design challenges
 - a. Lightsail material
 - i. Reflectivity
 - ii. Mass
 - b. Lightsail stability
 - i. Spherical sail with 4 Gaussian beams provides better stability
 - ii. Sail torques more as “error” accumulates
 - c. Communication (including ground based array)
 - d. Power generation/management
 - e. Guidance and navigation
 - i. Aimed at 1 AU from planet
 - ii. Course corrections/use of star navigation
 - f. Other components/sensors
- IV. Discussion (my ideas based on the researched information)
 - a. Feasibility
 - b. Possible other/more realistic uses for this technology
- V. Conclusion
 - a. Wrap-up key challenges