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Directed Energy Planetary Defense Mission

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ABSTRACT

We discuss the possibilities using directed energy for planetary defense. We discuss the motivation behind and design of a directed energy planetary defense system that utilizes laser ablation of an asteroid to deflecting the orbit sufficient to miss the Earth. The system is called **DE-STARLITE** for **Directed Energy System for Targeting of Asteroids and ExploRation** – LITE as it is a small, stand-on unit of a larger standoff DE-STAR system. This is a stand-on design, with ion engines to propel the spacecraft from low-Earth orbit (LEO) to the near-Earth asteroid (NEA) and then use directed energy to convert the heated spot to effectively become a small rocket that deflects the asteroid. During laser ablation, the asteroid itself becomes the "propellant"; thus a very modest spacecraft can deflect an asteroid much larger than would be possible with a system of similar mission mass using ion beam deflection (IBD) or a gravity tractor. DE-STARLITE is capable of deflecting an Apophis-class (325 m diameter) asteroid with a 15-year targeting time. The mission fits within the rough mission parameters of the Asteroid Redirect Mission (ARM) program in terms of mass and size and has much greater capability for planetary defense than current proposals and is readily scalable to the threat. It can deflect all known threats with sufficient warning.