

Can solar energy be used for asteroid deflection?

The strategies of using solar energy for asteroid deflection have been proposed in past studies. A well-known one is a solar collector, which deflects an asteroid by focusing sunlight onto its surface and sublimating the surface material to generate thrust [2,17].

Can solar sail Mount reflectivity control devices help asteroid de-spin and deflection?

This paper proposed a novel asteroid de-spin and deflection strategy using a solar sail mounting reflectivity control devices (RCDs). The basic concepts of these methods and the dynamical models necessary to analyze the performances were introduced.

How does a spacecraft rendezvous with a hazardous asteroid?

Then, the spacecraft rendezvouses with a hazardous asteroid by using conventional thruster systems or solar-sail propulsion. After the rendezvous, the spacecraft lands on the surface of the asteroid and anchors itself to the asteroid.

Can asteroid de-spin and deflection be performed simultaneously?

It can be inferred from these results that the proposed method is a feasible option to mitigate small asteroids with a diameter of approximately 100m or less within a reasonable time duration. Note that the proposed operation is not necessarily an optimal sequence because asteroid de-spin and deflection can be performed simultaneously.

Why is NASA experimenting with asteroid dimorphos in 2022?

Artist's impression of NASA's DART mission, which collided with the asteroid Dimorphos in 2022 to test planetary defense techniques. Open science data practices help researchers identify asteroids that pose a hazard to Earth, opening the possibility for deflection should an impact threat be identified.

Why should scientists survey asteroid populations?

However, the event underscored the importance of surveying asteroid populations to reveal possible threats to Earth. Sharing scientific data widely allows scientists to determine the risk posed by the near-Earth asteroid population and increases the chances of identifying future asteroid impact hazards in NASA science data.

The mission will verify the possibility of kinetic energy deflection technology to deflect the asteroid orbit, and it's the only NEO defense technology verification mission developed recently around the world (Cheng et al., 2018). ... the spacecraft may be affected by the interference force of other asteroids during the operation. Moreover ...

Asteroids and solar flares present significant threats to planetary security and space operations. This paper proposes an advanced AI-integrated planetary defense system that ...

Electric Solar Wind Sail Kinetic Energy Impactor for Asteroid Deflection Missions 26 January 2016 | The Journal of the Astronautical Sciences, Vol. 63, No. 1 Optimal control of a space-borne laser system for a 100 m asteroid deflection under uncertainties

Tension Control Law for Three-Dimensional Deployment of a Geostationary Space Solar Power Station. 1 Nov 2023 | Journal of Aerospace Engineering, Vol. 36, No. 6 ... Intervening in Earth's climate system through space-based solar reflectors. 1 Jul 2016 | Advances in Space Research, Vol. 58, No. 1 ... Asteroid Deflection; Earth; Patched Conic ...

This paper presents an asteroid deflection method based on a formation of spacecraft each equipped with solar pumped lasers. The use of lasers has already proposed by several authors, although always in conjunction with a nuclear power source (Phipps, 1992, Phipps, 1997, Park et al., 2005).

Space : The European Space Agency's Hera spacecraft is now en route to perform late next year a look-see of the asteroid Dimorphos and its orbiting moonlet Didymos. ...

The emitted laser beam may be widely used in space and terrestrial applications, including free-space optical communication, renewable energy cycle, asteroid deflection, space debris removal ...

The deflection of an asteroid through laser ablation is achieved by illuminating the surface of the asteroid with high intensity laser light. ... on laser ablation for space propulsion. The effects of the energy absorption within the Knudsen layer, the variation of the sublimation temperature with local pressure, the partial recondensation of ...

In 2022, NASA's Double Asteroid Redirection Test (DART) mission became the first to test a practical method of NEO deflection, demonstrating the agency's ability to target and send a ...

This technique uses the asteroid itself as the deflection propellant. The DE-STAR laser system is designed to produce a sufficiently intense spot on the surface of an asteroid to accomplish this in one of two operational modes. One is a complete "stand-off" mode where a large space based phased-array laser directed energy system can interdict

Here we present orbital simulations for a range of near-Earth asteroid impact scenarios for both the stand-off and stand-on systems. Simulated orbital parameters include ...

This paper primarily focuses on a design for a stand-on directed energy planetary defense system called DE-STARLITE. DE-STARLITE is a stand-on system, i.e., it is designed to be delivered to a position that is nearby a threatening asteroid with a modest spacecraft and then work slowly on the threat to change its orbit -STARLITE is suitable for mitigating targets ...

mission -- the first asteroid deflection technology demonstration out of the agency's Planetary Defense Coordination Office (PDCO) -- advanced our ability to address this hazard.

Among the transmission of power over the vast distance of approximately 400 kilometres from space to the surface of the earth, the solar lasers are also used in free-space optical communication [18], asteroid deflection [19], space debris removal [20], and for remote sensing from space. Solar lasers for terrestrial applications are equally ...

Solar Energy (1957) R. Kahle et al. ... Asteroid deflection techniques are essential in order to protect the Earth from catastrophic impacts by hazardous asteroids. Rapid design and optimization of low-thrust rendezvous/interception trajectories is considered as one of the key technologies to successfully deflect potentially hazardous asteroids ...

CONCEPTS FOR NEAR-EARTH ASTEROID DEFLECTION USING SPACECRAFT WITH ADVANCED NUCLEAR AND SOLAR ELECTRIC PROPULSION SYSTEMS Dr. Roger Walker, Dr. Dario Izzo, Cristina de Negueruela, Dr. Leopold Summerer, Dr. Mark Ayre Advanced Concepts Team, European Space Agency, ESTEC, Keplerlaan 1, 2201 ...

It can be used for deflection of asteroids amongst other uses, but it was initially designed to allow us to evaporate ... (Directed Energy Solar Targeting of Asteroids and explo-Ration) proposal, a space-based phased-array laser system which could be used to deflect threatening asteroids, remove space debris, analyze asteroid

To circumvent this problem, this study investigates a novel de-spin method using a solar sail spacecraft that is attached to the surface of an asteroid. In this approach, the solar radiation pressure torque induced by reflectivity control devices on the sail membrane is ...

Preliminary design concepts are presented for large, high-power nuclear and solar electric spacecraft, based on a trade-off analysis of power/ propulsion technology options and ...

The Don Quijote is an asteroid deflection precursor mission, ... Solar sail kinetic energy impactor trajectory optimization for an Asteroid-deflection mission ... to be useful in approximating the necessary laser power with regard to various operation start times for future deflection missions with space-based laser ablation tools provided by ...

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Asteroid deflection space based solar power interference

