NEW YORK CITY COLLEGE OF TECHNOLOGY
Physics Department
Center for Theoretical Physics

Orbital dynamics of a solar sail accelerated by thermal desorption of coatings

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Abstract

For extrasolar space exploration it might be very convenient to take advantage of space environmental effects such as solar radiation heating to accelerate a solar sail coated by materials that undergo thermal desorption at a particular temperature. Thermal desorption is a physical process of mass loss which dominates all other similar processes above temperatures of 300–600 °C. This process can provide additional thrust as heating liberates atoms, embedded on the surface of a solar sail.
Recent studies suggest that 0.1 AU could be an acceptable perihelion distance not compromising the sail optical properties. Our study compares three different scenarios in which thermal desorption may also come beside traditional propulsion systems. In the first proposed scenario the sail is carried as a payload to the perihelion, where it is deployed and undergo thermal desorption to escape the Solar System. The second scenario considers a Jupiter's slingshot to get to the perihelion, whereas the third consists in two steps acceleration by thermal desorption. When the desorption process ends, the sail then escapes the Solar System having the conventional acceleration due to solar radiation pressure.

Light refreshments will be served.