

Electric Propulsion for Spacecraft

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Abstract

Electric propulsion has become a well-established drive technology for satellites and interplanetary scientific missions. Mega-constellations of hundreds or thousands of satellites, like Starlink for global internet coverage, and the successfully accomplished Hayabusa mission to an asteroid and back are prominent examples. The advantage over chemical engines (and the often-applied cold gas engines) is the significantly higher exhaust velocity, allowing them to use much less fuel to achieve the same change in momentum of the spacecraft. Most of the relevant electric thruster types extract ions from a low-temperature plasma that has to be generated aboard, requiring energy for both the plasma and the acceleration of the propellant. This energy is typically provided by solar cells. The lecture will not only provide an overview of common electric rocket engine types, the underlying physics, and areas of application, but also offer insight into diagnostics for electric engines. Challenges and limitations of electric propulsion will be discussed, along with recent developments.