

FAR FUTURE (D4)
Human Exploration Beyond Mars/Interstellar Precursors Missions (1.-D4.3)

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INVESTIGATION OF NUCLEAR ELECTRIC POWERED INTERSTELLAR PRECURSOR MISSIONS

Abstract

Nuclear Electric Propulsion (NEP) is a technology conceptually proposed since the '40s by E. Stuhlinger in Germany. The JIMO mission originally planned by NASA in the early 2000s produced at least two designs for ion thrusters that were planned to be fed by a 20-30 kWe nuclear powerplant. When compared to conventional (chemical) propulsion, the major advantage of NEP in the JIMO context was recognized to be the much higher Isp (lab-tested at up to 15,000 s) and the capability for sustained power generation, up to 8-10 years.

The goal of this paper is to show that current or near term NEP technology enables missions far beyond our immediate interplanetary backyard. In fact, by extending the semi-analytical approach used by Stuhlinger, with reasonable ratios power/mass of the propulsion system (i.e., 0.1 to 0.4 kW/kg), missions to the Kuiper Belt (40 AU and beyond) and even the so-called FOCAL mission (at 540 AU) become feasible with an attractive payload fraction and in times of order 10-15 years.

Further results regarding missions to Sedna's perihelion/aphelion, and to the Oort's cloud will also be presented, showing the constraints affecting their feasibility and mass budget.