

Abstract Submitted
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Study on the Feasibility of Direct Fusion Energy Conversion for Deep-Space Propulsion ALFONSO G. TARDITI, Electric Power Research Institute, GEORGE H. MILEY, University of Illinois-Urbana-Champaign, Urbana, IL, JOHN H. SCOTT, NASA Johnson Space Center, Houston, TX — A significant change in the current space mission capabilities can be achieved with a highly efficient integration of a fusion energy source with an advanced space propulsion thruster, both with low specific mass. With aneutronic nuclear fusion as the high-density primary energy source, this study considers first electric energy extraction from the fusion reaction products via direct energy conversion to recirculate power as required for the operation of the fusion core. Then the beam of remaining reaction products is conditioned to achieve the optimal thrust and specific impulse for the mission. The research is specifically focused on two key issues: (i) Efficiency improvement of a Traveling Wave Direct Energy Converter (TWDEC, [1]) by achieving a higher ion beam density and optimization of the electrode coupling and of the neutralizing electron flow. (ii) A fast-particle kinetic energy-to-thrust conversion process based on collective interaction between ion bunches well separated in space [2]. Computer simulation results and a design for a basic physics experiment currently under development are reported.

[1] H. Momota *et al.*, *Fus. Tech.*, 35, 60(1999)

[2] A. G. Tarditi *et al.* Proc. NETS 2012 Conf., Woodlands, TX (2012)

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