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An electrostatic fusion collider for interstellar propulsion

Thursday 14 August 2025 16:00 (2 hours)

In order to reach the nearest star Proxima Centauri within a century, a distance of 4.224 light-years from our solar system, the average spacecraft velocity needs to be 4.2% of the speed of light. Therefore, according to the rocket equation, the weighted average exhaust velocity needs to be over 1% of the speed of light for reasonable ratios of dry mass to fuel mass. The fusion reactor architecture presented herein consists of an electrostatic charged particle trap that brings two ion beams into collision with equal and opposite momentum. The two fusion channels under consideration for interstellar missions are p/Li7 and He3/He3, utilizing an array of low mass electrodes that minimize interactions with fusion daughters escaping from the collision point and focused to generate thrust. A prototype colliding beam accelerator has been built to determine the viability of achieving collider luminosities commensurate with the requirements of this application. A novel architecture overcomes past Coulomb scattering limitations. Reactor and propulsion system design parameters are presented in this paper along with preliminary prototype operational results with deuterium collisions.

Please consider my poster for contributed oral presentation

No

Would you like to submit this poster in student poster session on Sunday (August 10th)

Yes

Footnotes

Funding Agency

I have read and accept the Privacy Policy Statement

Yes

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