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An Experimental Facility Design of Pulsed Inductive Thrusters

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The BEEMP laboratory in NUDT is now undertaking the research of a promising electric propulsion concept——the pulsed inductive thrusters (PIT). An experimental facility has been set up including a specially-optimized driving coil, a high-voltage pulsed circuit, and a constant-current high-voltage power supply. This paper introduces the design of the experimental facility with special emphasize on the optimization of driving coil geometry. Based on comprehensive study on the electromagnetic properties of the driving coil, a fast calculating method for the mutual inductance between driving coil and plasma load is given. In order to properly predict the performance of a PIT, a 1-D snowplow acceleration model is modified with a LTE plasma model. Combing aforementioned two research efforts, design principles for a pulsed inductive thruster is derived and subsequently an experiment system operated in vacuum is set up following these principles. Primary experiments demonstrate the feasibility of the design and a bright puff of circular plasma is obtained.

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