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The Development of a Solid Fuel Plasma Source for the High Power Helicon[1] IAN JOHNSON, ROBERT WINGLEE, RACE ROBERSON, University of Washington, ADVANCED PROPULSION LABORATORY COLLABORATION — The high power helicon (HPH) is a compact plasma source that generates downstream densities of 10^{18} m^{-3} and directed ion energies greater than 50 eV. To date most of the work on helicons have involved gas fed systems. The problem with gas propellant is that it's expensive to store and the slow propagation through control valves makes it poorly suited for pulsed systems. In order to address both issues a solid propellant helicon using the same technology as pulsed plasma thrusters (PPTs) is being developed. A current pulse ablates a layer of Teflon, creating a plume of roughly 10% plasma and 90% neutrals. PPT electron densities on the order of 10^{19} m^{-3} were measured 20 cm downstream of the Teflon surface when fired at 43 J. The thruster is estimated to ablate 100 μg of propellant per pulse. PPTs are known for their compact nature but the presence of a large neutral cloud reduces the overall ISP and efficiency of the system. The HPH system provides greater than 90% ionization of all ablated material and yields an extremely high ISP thruster with high power and neutral efficiency. Initial testing of the solid fuel HPH has shown comparable results to similar configurations with gas propellant while opening up the opportunity to have very discrete pulses without long ramp-up times.

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