

## Fusion-enabled Pluto Orbiter and Lander

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The Princeton Field Reversed Configuration (PFRC) reactor is the basis for a small nuclear fusion rocket engine for interplanetary exploration. The engine is suitable for fusion power levels between 1 and 10 MW, which makes it ideal for both human and robotic exploration. PFRC, known as Direct Fusion Drive (DFD) in its space propulsion variant, is driven by odd-parity rotating magnetic fields and uses deuterium and helium-3 as fuels. Additional deuterium is introduced into the scrape-off layer on one end of the machine to provide variable thrust. The ionized gas is exhausted through a magnetic nozzle that has additional coils to provide plume steering.

The presentation will cover the Pluto mission in detail including the Pluto orbit entry propulsion phase. The spacecraft design will be presented. The mission launches on a single Delta-IV Heavy or comparable launch vehicle. Cost savings for this and other robotic missions will be discussed.

Details of the reactor design and balance of plant will be given including the recycling of the synchrotron radiation, bremsstrahlung radiation, neutron flux and wall thermal loads using a Brayton cycle power system; the reactor startup system; and the radio frequency and superconducting coil subsystems.