Abstract Submitted
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Proof-of-Principle Experiment for Compact, Energy Efficient Neutron Source: Enabling Technology for Radioactive Waste Transmutation or Sub-Critical Nuclear Reactors[1] ADY HERSHCOVITCH, THOMAS ROSER, Brookhaven National Lab, JOHN SANTARIUS, U Wisconsin Madison — A novel neutron source is proposed for radioactive waste transmutation or sub-critical nuclear reactors; it's based on injecting 125 keV deuterium beam through 1-inch tube filled with magnetized tritium plasma to generate 14 MeV D-T neutrons. T target thickness is chosen to slow the D ions to 75 keV. At the opposite end of the tube D ion energy is recovered. Each ion source and tube forms a module. Larger systems can be formed from multiple units. As a D beam propagates through T plasma, it is slowed down by plasma electrons, which are consequently heated. Electron temperature rises until heating is balanced by energy losses. Equilibrium electron temperature is the crucial parameter, since higher temperature, leads to lower drag on the ion beam; therefore, larger target thickness is needed to slow deuterons to 75 keV; with consequently higher neutron yield. A proof of principle experiment, to determine the equilibrium electron temperature, can be perform by injecting 62.5 keV hydrogen beam into hydrogen plasma target and measure the equilibrium electron temperature with Thomson scattering. To reduce electron equilibration with target ions, electron pre-heating can be done rather efficiently with 2.45 GHz microwaves.

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