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Toward Direct Reaction-in-Flight Measurements JERRY WILHELMY, Retired, TODD BREDEWEG, MALCOLM FOWLER, MATTHEW GOODEN, ANNA HAYES, GENCHO RUSEV, Los Alamos National Laboratory, JOSEPH CAGGIANO, ROBERT HATARIK, EUGENE HENRY, ANTON TONCHEV, CHARLES YEAMAN, Lawrence Livermore National Laboratory, MEGHA BHIKE, KRISHI KRISHICHAYAN, WERNER TORNOW, Triangle Universities Nuclear Laboratory — At the National Ignition Facility (NIF) neutrons having energies greater than the equilibrium 14.1 MeV value can be produced via Reaction-in-Flight (RIF) interactions between plasma atoms and upscattered D or T ions. The yield and spectrum of these RIF produced neutrons carry information on the plasma properties as well as information on the stopping power of ions under plasma conditions. At NIF the yield of these RIF neutrons is predicted to be 4-7 orders of magnitude below the peak 14 MeV neutron yield. The current generation of neutron time of flight (nTOF) instrumentation has so far been incapable of detecting these low-yield neutrons primarily due to high photon backgrounds. To date, information on RIF neutrons has been obtained in integral activation experiments using reactions with high energy thresholds such as ^{169}Tm(n,3n)^{167}Tm and ^{209}Bi(n,4n)^{206}Bi. Initial experiments to selectively suppress photon backgrounds have been performed at TUNL using pulsed monoenergetic neutron beams of 14.9, 18.5, 24.2, and 28.5 MeV impinging on a Bibenzyl scintillator. By placing 5 cm of Pb before the scintillator we were able to selectively suppress the photons from the _-flash occurring at the production target and enhance the n/_signal by ˜6 times.

Jerry Wilhelmy
Retired

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