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Bayesian Inference Model for Neutron Classification ARIA JOHANSEN, ANTON STEPANOV, URI SHUMLAK, University of Washington — The shear-flow stabilized Z-pinch experiment FuZE produces quasi steady-state neutron emission lasting for 10 μs. These neutrons may be created by thermonuclear reactions indicating controlled fusion, or by pinch instabilities. Given the well characterized effects of scattering in plastic scintillators, detecting by photomultiplier tubes, and digitizing by ADCs, a neutron emission function can be estimated by using Bayesian inference in a statistical forward model. The model includes fusion events, scattering, and scintillating detector functions with their associated variance. This gives statistical bounds on what fractions of thermonuclear and beam target produced neutrons are possible with the device, without using neutron time of flight energy measurements. Discretization of the pinch into sectors and time of neutron emission into segments allows for spatiotemporal resolution of the neutron emitting region. This refines the line source model proposed by Mitrani et al, while introducing time dependence to the neutron yield. Using other diagnostic data, the neutron yield may further inform temperature and density profiles of the Z-pinch.

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