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Prototype detectors for measuring poloidal magnetic flux with an ion beam probe T. P. CROWLEY, D. R. DEMERS, P. J. FIMOGNARI, T. D. KILE, Xantho Technologies, LLC — Development of a detector and associated techniques to determine the localized magnetic flux, and therefore poloidal magnetic field and current density profile, in an axisymmetric plasma device is underway. This will provide invaluable information on equilibrium, transport and stability studies of fusion plasmas. A singly charged ion beam is injected into the plasma and the detector located outside the plasma measures doubly charged ions created within a cm-scale sample volume of the plasma. The ions are split into beamlets at the detector. The toroidal angle of the beam's velocity is determined by measuring the fraction of the beamlets that strike detection plates and wires. The corresponding angle is used to determine the beam's toroidal velocity component. Due to canonical momentum conservation, that toroidal velocity is proportional to the poloidal flux function in the sample volume. We have built several prototype detectors and measured the angle of a 45 keV potassium ion beam. The cross-section of the plasma that can be studied will be maximized and system costs will be minimized if the detector has a direct view of the plasma and is operated close to it. However, this subjects the detector to noise due to UV-induced photoelectrons and plasma particles. We have conducted experiments that demonstrate reductions of this noise to facilitate measurement of ion beam signals. Experimental and design results will be presented. (This work is supported by US DoE award no. DE-SC0006077.)

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