Abstract Submitted
for the DPP16 Meeting of
The American Physical Society

Negative ion studies on the RF plasma device MAGPIE HANNAH WILLETT, University of York, JESSE SANTOSO, CORMAC CORR, Australian National University, KIERAN GIBSON, University of York — Neutral beam injection (NBI) systems provide both heating and current drive in tokamak fusion reactors. High energy ($> 1\,\mathrm{MeV}$) neutral beams are produced by neutralising accelerated ions, for which negative ions are used; the neutralisation cross section for positive ions becomes negligible at these energies. This requires very high throughput negative ion sources. Currently this is achieved using inductively coupled plasma sources, which incorporate caesium to improve the production rate. It has been proposed that helicon plasma sources could provide a more efficient, higher throughput method of producing negative ions for NBI, possibly even removing the need for caesium[1]. We report on studies of the negative hydrogen ion population in the MAGPIE helicon device (Australian National University)[2] under a variety of operating conditions. The probe-based laser photodetachment method and Langmuir probes are employed to estimate the negative hydrogen ion density throughout the device. Initial results support the viability of helicon-based negative ion sources.

[1]S. Briefi and U. Fantz. AIP Conference Proceedings, 1515:278283, 2013
[2]B.D. Blackwell et al. Plasma Sources Sci. Technol., 21:055033, 2012

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Date submitted: 15 Jul 2016 Electronic form version 1.4