

**Abstract Submitted for the Twelfth Topical Conference  
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Category Number and Subject:

Theory       Experiment

**Prospects for Charge-Exchange Recombination-Based Measurements on ITER Using a He<sup>0</sup> Diagnostic Neutral Beam,\*** D.M. Thomas, *General Atomics* — Several important measurements in the ITER diagnostic mission, including the primary one of core helium ash density, are expected to be addressed using active spectroscopic techniques.<sup>1</sup> These methods rely on the use of a dedicated diagnostic neutral beam (DNB) which has been optimized for the dual requirements of beam penetration and charge exchange cross section. For hydrogenic beams, this results in an optimal beam energy of ~ 100 keV/AMU. Signal-to noise estimates using realistic geometries and the existing ITER profile and equilibrium data have confirmed the stringent requirements on beam quality and intensity to satisfy the stated ITER measurement precisions.<sup>2</sup> In this paper we consider the use of a neutral helium DNB for making active spectroscopic measurements on ITER, since helium beams offer better penetration in dense plasma for a given energy,<sup>3</sup> and the prospects for given source performance may also be improved.<sup>4</sup> Drawbacks to using helium as the beam species include a more difficult absolute calibration of the beam density profile as well as the fundamental problem of uniquely identifying the source (fusion-based ash, beam core fuelling, or edge DNB neutralizer/source efflux) of the observed He charge-exchange recombination signal.

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<sup>1</sup>E.S. Marmor, in *Diagnostics for Experimental Thermonuclear Fusion Reactors*, ed. P.E. Stott, G. Gorini, and E. Sindoni (New York:Plenum) , p. 281 (1996).

<sup>2</sup>D.M. Thomas, Proc. Workshop for Diagnostics for ITER, Varenna, 1997.

<sup>3</sup>A.A. Korotkov, R.K. Janev, Phys. Plas 3,(5), 1512, 1996.

<sup>4</sup>A. Costley, private communication.

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\_\_\_\_\_  
(Signature of APS member)

D.M. Thomas  
(Same Name Typewritten)

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**General Atomics**  
P.O. Box 85608  
San Diego, CA 92186-5608  
(Address)

(619)455-2403/(619)455-4156  
Phone/Fax

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\_\_\_\_\_  
thomas@gav.gat.com  
Email Address