

Determination of Neutral Beam Energy Fractions from Collisional Radiative Measurements on DIII-D

D.M. Thomas¹, B.A. Grierson², J.M. Munoz Burgos³, and M.A. Van Zeeland¹

¹*General Atomics, San Diego, California, USA*

²*Princeton Plasma Physics Laboratory, Princeton, New Jersey, USA*

³*Oak Ridge Institute for Science Education, Oak Ridge, Tennessee, USA*

Thomas@fusion.gat.com

Neutral beams based on positive ion source technology are a key component of contemporary fusion research. An accurate assessment of the injected beam energy spectrum is important for determining the actual plasma heating and momentum input as well as proper interpretation of beam-based diagnostics. On DIII-D, the main ion charge-exchange spectroscopy system [1] is used to extract well-resolved intensity ratios of the Doppler-shifted D-alpha emission from the full, half, and third energy beam components for a variety of beam operational parameters and fill gases. In conjunction with accurate collisional-radiative modeling, these measurements indicate the assumed species mix and power fractions can vary significantly with time, injection voltage, and other source conditions and should be regularly monitored and updated for the most accurate interpretation of plasma performance from codes such as TRANSP [2] and FIDASYM [3].

[1] B.A. Grierson, et al., submitted to Phys. Plasmas (2011).

[2] A. Pankin, et al., Comput. Phys. Communications **159** (2004) 157.

[3] W.W. Heidbrink, et al., Comm. Comp. Phys. **10** (2011) 716.

This work was supported by the US Department of Energy under DE-FC02-04ER54698, DE-AC02-09CH11466, and DE-AC05-ER23100.