

# High Speed Measurements of Neutral Beam Turn-on and Impact of Beam Modulation on Measurements of Ion Density

B. A. Grierson,<sup>1,\*</sup> K. H. Burrell,<sup>2</sup> B. Crowley,<sup>2</sup> L. Grisham,<sup>1</sup> and J.T. Scoville<sup>2</sup>

<sup>1</sup>*Princeton Plasma Physics Laboratory,  
Princeton University, Princeton, NJ 08543, USA*

<sup>2</sup>*General Atomics, P.O. Box 85608,  
San Diego, CA 92186-5608*

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## Abstract

Modulation of neutral beams on tokamaks is performed routinely, enabling background rejection for active spectroscopic diagnostics, and control of injected power and torque. We find that there exists an anomalous initial transient in the power delivered to the tokamak that is not accounted for by the accelerator voltage and power supply current. Measurements of the charge-exchange and beam photoemission on the DIII-D tokamak [J. L. Luxon, Nucl. Fusion **42**, 614 (2002)] at high speed (200  $\mu$ s) reveals that the energy of the beam neutrals are constant, but the density of beam neutrals displays dramatic variation in the first 2-3 ms following beam turn-on. The impact of this beam density variation on inferred ion densities and impurity transport is presented, with suggested means to correct for the anomalous transient.

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\*Electronic address: bgriers@pppl.gov