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Emittance Analysis of the DIII-D Neutral Beam Source*

N. Lopez, *MIT*; B. Crowley, *GA* — In a high powered neutral beam system ions are extracted from a low temperature plasma, through apertures in the arc chamber, by application of a potential to an external electrode. It has been determined that to increase the beam energy of the DIII-D neutral beam system beyond 95 keV the accelerator must be reconfigured to avoid excessive electrical breakdown in the grid gaps. Deciding exactly what modifications are to be made requires modeling and experimental effort. A basic problem is to find a geometry with which the extracted beam is intense, low divergence, free of aberrations, and does not strike the focusing electrodes. We present the results of modeling proposed reconfigurations to the accelerator geometry and source conditions. The quality of the beam produced from the various accelerator configurations is quantified through metrics such as the beam emittance and the average divergence per beamlet. By comparing the beam quality and power delivered for each proposed reconfiguration an optimal design is selected and recommended.

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