

Abstract Submitted
for the DPP19 Meeting of
The American Physical Society

Off-axis Neutral Beam Current Drive on DIII-D¹ J.M. PARK, ORNL, C.C. PETTY, M.A. VAN ZEELAND, GA, W.W. HEIDBRINK, UCI, C.C. COLLINS, GA, C. HOLCOMB, B. VICTOR, LLNL, K. THOME, GA, B. GRIERSON, PPPL, K. KIM, ORNL, DIII-D TEAM — Off-axis Neutral Beam Current Drive (NBCD) physics is being validated by DIII-D experiments using tilted beams. Off-axis NBCD broadens the current and pressure profiles to improve energy confinement and low-n kink-type ideal-MHD stability, enabling access to reactor relevant $\beta_N > 4$ at fully non-inductive $f_{NI} = 1$ conditions. The off-axis NBCD profiles measured by the magnetic field pitch angles from the motional Stark effect (MSE) diagnostic agree well with modeling using the orbit-following beam-slowing-down Monte Carlo code NUBEAM for H-mode plasmas in a range of discharge conditions without large-scale MHD activities such as Alfvén eigenmodes and sawteeth, showing that the off-axis NBCD efficiency does not decrease with deposition at large minor radius. Projecting to the Compact Advanced Tokamak (CAT) Pilot Plant shows an excellent current drive efficiency with the NBCD peak at $\rho > 0.6$, which aligns well with the high bootstrap current $f_{BS} > 0.8$ operation, maintaining a broad current profile with $q_{min} > 2$. We will report initial results from the NBCD measurement experiment using a newly available 2nd tilted beamline to advance physics understanding of off-axis NBCD for high β_N steady-state scenario development.

¹Work supported by the US DOE DE-AC05-00OR22725, DE-FC02-04ER54698, DE-AC52-07NA27344, DE-AC02-09CH11466

Jin Myung Park
Oak Ridge National Laboratory

Date submitted: 03 Jul 2019

Electronic form version 1.4