Abstract Submitted
for the DPP17 Meeting of
The American Physical Society

Destabilization of counter-propagating TAEs by off-axis, co-current Neutral Beam Injection[1] M. PODESTA', E. FREDRICKSON, M. GORELENKOVA, PPPL — Neutral Beam injection (NBI) is a common tool to heat the plasma and drive current non-inductively in fusion devices. Energetic particles (EP) resulting from NBI can drive instabilities that are detrimental for the performance and the predictability of plasma discharges. A broad NBI deposition profile, e.g. by off-axis injection aiming near the plasma mid-radius, is often assumed to limit those undesired effects by reducing the radial gradient of the EP density, thus reducing the "universal" drive for instabilities. However, this work presents new evidence that off-axis NBI can also lead to undesired effects such as the *destabilization* of Alfvénic instabilities, as observed in NSTX-U plasmas. Experimental observations indicate that counter propagating toroidal AEs are destabilized as the radial EP density profile becomes hollow as a result of off-axis NBI. Time-dependent analysis with the TRANSP code, augmented by a reduced fast ion transport model (known as *kick model*), indicates that instabilities are driven by a combination of radial and energy gradients in the EP distribution. Understanding the mechanisms for wave-particle interaction, revealed by the phase space resolved analysis, is the basis to identify strategies to mitigate or suppress the observed instabilities.

[1]Work supported by the U.S. Department of Energy, Office of Science, Office of Fusion Energy Sciences under contract number DE-AC02-09CH11466

Mario Podesta
PPPL

Date submitted: 14 Jul 2017 Electronic form version 1.4