Plasma Core Fuelling by Cryogenic Pellet Injection in the TJ-II Stellarator

K. J. McCarthy\textsuperscript{a}, N. Panadero\textsuperscript{a}, J. L. Velasco\textsuperscript{a}, J. Hérnandez\textsuperscript{b}, S. Sakate\textsuperscript{b}, D. López Bruna\textsuperscript{a}, R. García\textsuperscript{a}, J. Baldzuhn\textsuperscript{c}, A. Dinklage\textsuperscript{c}, E. Ascasibar\textsuperscript{a}, and TJ-II Team\textsuperscript{a}

\textsuperscript{a}Laboratorio Nacional de Fusión, CIEMAT, Madrid, Spain, \textsuperscript{b}National Institute for Fusion Science, Toki, Gifu, Japan
\textsuperscript{c}Max-Planck-Institut für Plasmaphysik, Greifswald, Germany

Summary

- Pellet penetration depths and ablation profiles for TJ-II are in reasonable agreement with IPADBASE predictions and in good agreement with NGS based modelling, respectively, for both ECRH and NBI.
- Radial particle deposition is well reflected by the Balmer H\textsubscript{\alpha} ablation profile. The radial offset between both is minimal for these LFS injections.
- Full particle distribution about the plasma occurs ~4 ms after injection.
- Subsequently, deposited pellet particles undergo partial diffusion, with enhanced central confinement, arising from neoclassical transport.
- Comparison between net electron gain and pellet particle content gives fuelling efficiency. The tendency observed for fuelling to increase with target plasma density.
- For future studies we need to tailor better pellet size to target plasma parameters (diameter, density, temperature).