TECXY simulations of Ne seeding in JET-DT scenarios

P. Chmielewski\textsuperscript{a}, R. Zagórski\textsuperscript{a}, G. Telesca\textsuperscript{a}, A. Huber\textsuperscript{b}, I. Ivanova-Stanik\textsuperscript{a}, E. Kowalska-Strzęciwilk\textsuperscript{a}, P. Taman\textsuperscript{c}, N. Vianello\textsuperscript{d} and the JET Contributors\textsuperscript{*}

\textsuperscript{a} Institute of Plasma Physics and Laser Microfusion, 01-497 Warsaw, Hery 23, Poland
\textsuperscript{b} Institut fuer Energie-und Klimaforschung-Plasmaphysik Forschungszentrum Juelich GmbH, Juelich, Germany
\textsuperscript{c} CEA, IRFM, F-13108 Saint-Paul-Lez-Durance, France
\textsuperscript{d} Consorzio RFX, Padua, Italy

piotr.chmielewski@ifpilm.pl

Preparation of D-T experiments on JET device raises a question about the mitigation of assumed high power entering the SOL. JET DT scenarios aim to achieve good plasma confinement and the heat loads reduction to the divertor at the same time. Therefore, the divertor corner magnetic field geometry, strike point swiping mode and the impurity seeding are considered to reduce expected high heat fluxes to the divertor plates [1,2].

The aim of the paper is to analyse the influence of the neon impurity seeding on the plasma transport and its efficiency of the power mitigation in the JET tokamak as well as to perform validation of applied edge plasma model.

In this contribution numerical simulations have been performed for two high power (34 MW), neon seeded DD JET discharges in the H-mode with different upstream densities and the same corner divertor configuration prepared as possible candidate for JET DT scenarios [2].

The edge plasma transport have been described by two-dimensional multifluid TECXY code based on Braginskii plasma transport equations with assumed classical parallel transport of the plasma and anomalous perpendicular transport defined by ad hoc heat and particle transport coefficients [3].

TECXY results show impact of the neon seeding on the reduction of the power flowing to the divertor. Scan with the neon concentration carried out for four different upstream densities allow us to determine optimal plasma conditions with the lowest target plate temperature and the lowest effective charge. Results indicate that the highest values of the radiation fraction equal to 0.25 for the neon concentration below 4% are obtained for high upstream densities. Performed studies with use of the TECXY code and they comparison to experimental results give the opportunity to perform validation of applied TECXY edge plasma model and show the optimal range of plasma parameters like the upstream density and neon concentration, for which the radiation power in the SOL is the highest.


* See the author list of E. Joffrin et al., accepted for publication in Nuclear Fusion Special issue 2019, http://doi.org/10.1088/1741-4326/ab2276