Contribution ID: **359** Type: **Poster**

# Analysis and modelling of NTMs dynamics in JET discharges using the European Transport Simulator (ETS) and integrated modelling tools

*Thursday 25 October 2018 14:00 (20 minutes)*

Stability of JET baseline and hybrid scenarios from previous and present experimental campaign is investigated in the framework of the JET1 task on MHD analysis and modeling in support of scenario development. Modeling of Neoclassical Tearing Modes (NTMs) onset and their effect on heavy impurity transport is performed via the European Transport Simulator (ETS), encompassing an NTM module and MHD stability calculation. The present study is aimed to predict plasma stability conditions avoiding the appearance of NTMs which limit the plasma performance and duration in DT scenarios. In addition, the high energy confinement in hybrid discharges can be deteriorated if impurities accumulate towards the plasma centre. The NTM module implemented in the ETS describes the NTM dynamics by a set of equations for the mode width, through a generalized Rutherford equation and frequency. Investigation and validation of the mode trigger models can be performed with this module as well as the analysis of the effects of NTM on electron, ion and impurity transport. Enhanced perpendicular diffusion coefficients around the mode location is modeled by adding a Gaussian perturbation. In JET discharges, this modification has been considered for electron transport coefficient and similarly used to model the enhancement of tungsten diffusion coefficient initially observed around the mode location. ETS simulator is appropriate since it can compute the evolution of impurities in all their ionization states. A first validation of MHD stability models was performed comparing the mode stability parameter using 4 different codes: NTM module in ETS, Delta Prime Calculation Code, 3D quasi-analytic code and TRANSP. Full MHD code MARS is also used for comparison of linear growth rate evaluation of the mode with the stability parameter index calculated by the other codes. MARS is part of the Equilibrium & MHD Stability Workflow and the analysis will make use of the outputs produced by the ETS at some time snapshots. All the results obtained from the MHD analysis via these (transport) codes provide a new modelling investigation of the plasma stability for JET baseline and hybrid discharges. A detailed discussion of the calculations will be reported.

## Country or International Organization

Italy

## Paper Number

TH/P6-26

**Author:** Dr NOWAK, Silvana (IFP - CNR , Milano, Italy)

**Co-authors:** Dr CZARNECKA, Agata (IPPLM - Warsaw, Poland); Dr MERLE, Antoine (EPFL - SPC , Lausanne, Switzerland); Dr MARCHETTO, Chiara (IFP - CNR , Milano, Italy); Dr BRUNETTI, Daniele (IFP - CNR- , Milano, Italy); Dr KALUPIN, Denis (EUROfusion PMU, Garching, Germany); Dr YADYKIN, Dimitriy (Chalmers University of Technology, SE); Dr GIOVANNOZZI, Edmondo (ENEA , Frascati, Roma, Italy); Dr ALESSI, Edoardo (IFP - CNR Milano, Italy); Dr JOFFRIN, Emanuel (CCFE , Abingdon, UK); Dr LAZZARO, Enzo (IFP - CNR, Milano, Italy); Dr POLI, Francesca (PPPL , Princeton, USA); Dr MIRON, Gabriel (NILPRP , Bucharest, Romania); Dr PUCELLA, Gianluca (ENEA , Frscati, Roma, Italy); Dr FALCHETTO, Gloria (CEA - IRFM, St. Paul Lez Durance, France); Dr VLAD, Gregorio (ENEA, Frascati, Roma, Italy); Dr IVANOVA-STANIK, Irena (IPPLM, Warsaw, Poland); Dr MAILLOUX, Joelle (CCFE , Culham, Abingdon, UK); Dr GRAVES, Jonathan (EPFL - SPC , Lausanne, Switzerland); Dr FERREIRA, Jorge (IPFN - IST, Lisboa, Portugal); Dr IMRISEK, Martin (IPP AS CR , Prague, Czechia); Dr BARUZZO, Matteo (CCFE - Culham Science Centre, UK); Dr ROMANELLI, Michele (CCFE , Culham, Abingdon, UK); Dr KRAWCZYK, Natalia (IPPLM, Warsaw, Poland); Dr SAUTER, Olivier (EPFL - SPC , Lausanne, Switzerland); Dr BURATTI, Paolo (ENEA , Frascati, Roma, Italy); Dr STRAND, Par (Chalmers University, Gothenburg, Sweden); Dr HUYNH, Philippe

(CEA-IRFM, St. Paul Lez Durance, France); Dr ZAGORSKI, Roman (IPPLM, Warsaw, Poland); Dr COELHO, Rui (IPFN - IST - UTL , Lisboa, Portugal); Dr FUSCO, Valeria (ENEA, Frascati, Roma, Italy)

**Presenter:** Dr NOWAK, Silvana (IFP - CNR , Milano, Italy)

**Session Classification:** P6 Posters