Contribution ID: **648** Type: **Poster**

# Nonlinear MHD simulations of Quiescent H-mode pedestal in DIII-D and implications for ITER

*Tuesday, 18 October 2016 08:30 (4 hours)*

Non-linear MHD simulations of DIII-D QH-mode plasmas have been performed with the non-linear MHD code JOREK as a first step towards determining whether the physics mechanisms leading to the QH-mode behaviour would be at work in ITER plasmas and thus whether this confinement regime can be considered as an alternative to the controlled Type I ELMy H-mode for ITER high Q operation. In the nonlinear MHD simulations it is found that low n kink-peeling modes (KPM) are unstable and grow to a saturated level, consistent with the physics picture put forward in linear study. The features of the dominant MHD modes found in the simulations of the KPM mode, which are due to its toroidal localization caused by the coupling of harmonics, are in good agreement with the observations of the EHO typically present in DIII-D QH-mode experiments. The influence of a realistic resistive wall in these DIII-D simulations shows that the inclusion of a resistive wall and plasma rotation has an effect on the non-linear KPM evolution. In this work, the non-linear evolution of MHD modes with toroidal mode numbers n from 0 to 20, including both kink-peeling modes and ballooning modes, will be investigated through MHD simulations starting from initial conditions either close to the ballooning or the kink-peeling mode limit in the edge stability diagram, both for DIII-D and ITER plasmas. The identification of the physics mechanisms that lead to the saturation of the KPM and to the appearance of the EHO in DIII-D QH-modes will allow us to evaluate whether this regime is an option for high fusion performance operation at the specific characteristics of ITER plasmas.

## Paper Number

TH/P1-9

## Country or International Organization

France

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**Session Classification:** Poster 1

**Track Classification:** THS - Magnetic Confinement Theory and Modelling: Stability