Abstract Submitted
for the DPP19 Meeting of
The American Physical Society

The kinetic equilibrium reconstruction in TCV with LIUQE/RAPTOR: first real-time demonstration during plasma operation[1]

FRANCESCO CARPANESE, Ecole polytechnique federale de Lausanne, FEDERICO FELICI, OLIVIER SAUTER, CRISTIAN GALPERTI, JEAN-MARC MORET, Ecole polytechnique federale de Lausanne (EPFL), Swiss Plasma Center (SPC), TCV TEAM TEAM — The Kinetic Equilibrium Reconstruction (KER), coupling self-consistently the free-boundary equilibrium code LIUQE to the 1.5D transport code RAPTOR, has been performed for the first time in real-time during TCV plasma operation. RAPTOR can solve predictively the flux surface averaged Ohm's law, the electron heat Te and the particle ne diffusion equations providing self-consistent p(ρ,t) and j(ρ,t) constraints to the free-boundary equilibrium code. An Extended Kalman Filter technique is used to combine the kinetic measurements available in real-time and transport code prediction yielding a robust state estimation of the plasma profiles. During different plasma states (flat central ne, ECCD induced j profile broadening, NTM induced Te drop) the KER is shown to reproduce better the profile modifications when compared to the standard equilibrium reconstruction, where only external magnetic measurements are considered.

[1]This work was supported in part by the Swiss National Science Foundation

Francesco Carpanese
Ecole polytechnique federale de Lausanne (EPFL), Swiss Plasma Center (SPC)

Date submitted: 03 Jul 2019 Electronic form version 1.4