Abstract Submitted
for the DPP19 Meeting of
The American Physical Society

Real-time feedback control of the radiation front location in the TCV tokamak MATTHIJS VAN BERKEL, DIFFER, Eindhoven, NL, TIM RAVENSBERGEN, ARTUR PEREK, DIFFER, CRISTIAN GALPERTI, EPFL-SPC, RICKY VAN KAMPEN, DIFFER, JOOST LAMMERS, Eindhoven University of Technology, OLIVIER FEVRIER, EPFL-SPC, STUART HENDERSON, CCFE, Culham Science Centre, UK, MICHAEL KOMM, Institute of Plasma Physics of the CAS, Czech Republic, DOMINIK BRIDA, IPP Garching, Germany, CHRISTIAN THEILER, BASIL DUVAL, EPFL-SPC, BRYAN LINEHAN, PSFC, MIT, MARCO DE BAAR, DIFFER, THE TCV TEAM, THE EUROFUSION TEAM —
In the detached regime in tokamak divertors, an actuator, often local gas puffing, induces plasma power loss mechanisms, leading to a significant particle and heat flux reduction at the divertor target. Such a detached regime requires real-time plasma monitoring and control of the gas puff actuator. Many existing plasma diagnostics have a low signal-to-noise ratio in detached conditions and/or are not real-time. In this work, we apply real-time acquisition and processing techniques to C-III filtered images from multi-spectral imaging diagnostic MANTIS. The detected location of the C-III emission front is mapped to the poloidal plane using a non-tomographic approach. This emission front is a proxy of divertor cooling, making its deduced position a spatially distributed and attractive controllable quantity. For a dedicated discharge on TCV, we apply system identification to generate a data-driven dynamic model, describing the effect of divertor gas fueling on the emission front location. From this model, a feedback controller was synthesized off-line, and tested on TCV.

Timo Ravensbergen
Eindhoven University of Technology

Date submitted: 02 Oct 2019 Electronic form version 1.4