



Max-Planck-Institut  
für Plasmaphysik

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# Validation of ASTRA and ETS

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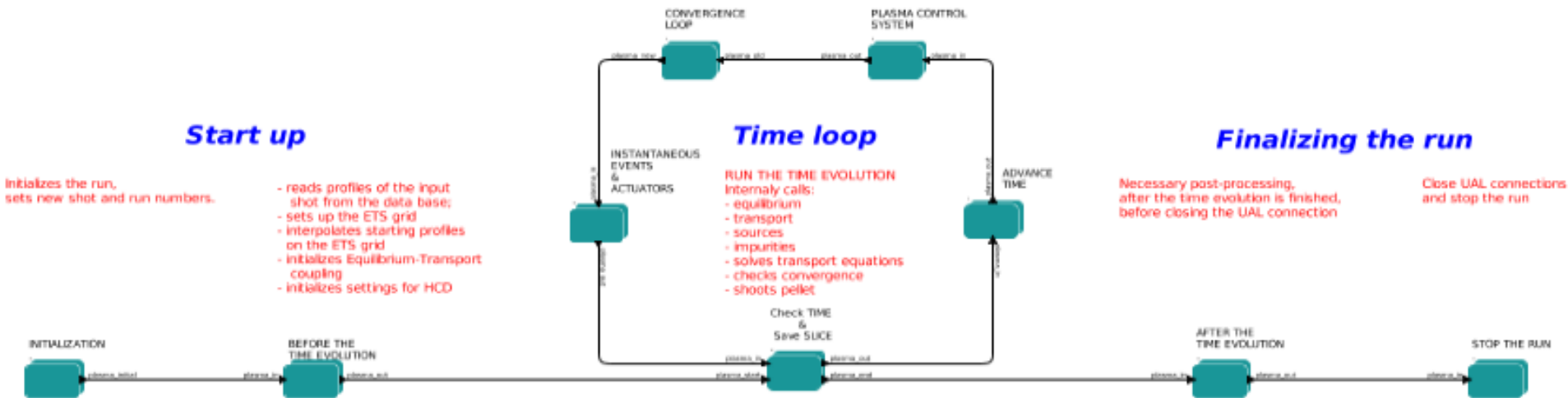
 **EUROfusion**



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# ETS: An overview

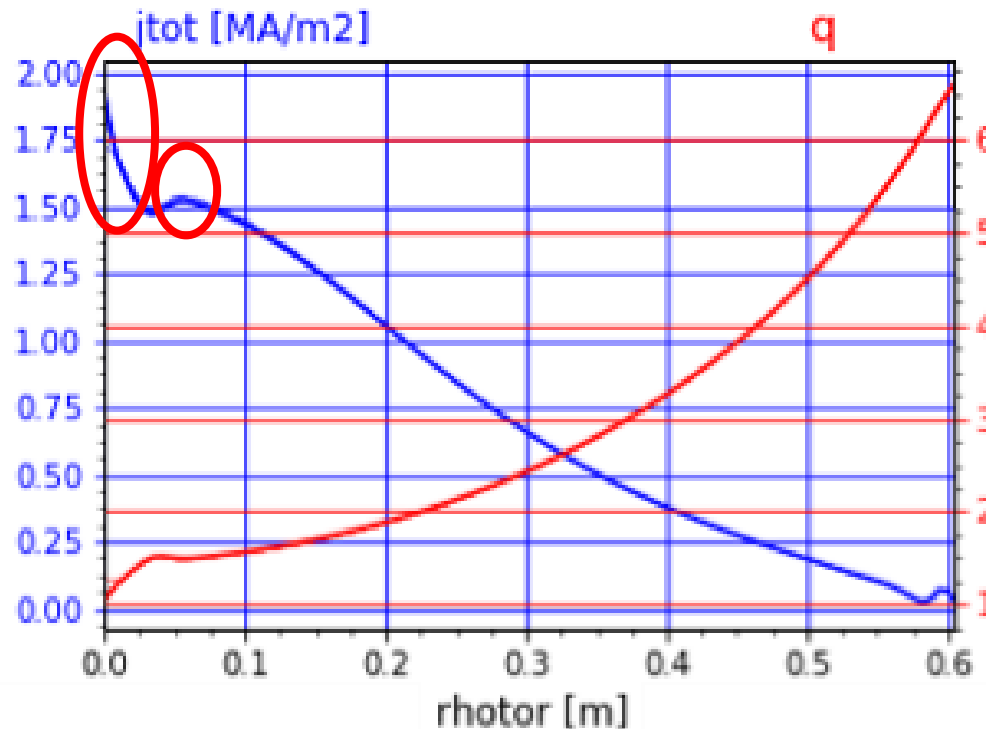
- ETS 5: a 1.5D transport solver for self consistent simulation of plasma discharges (EU-IM framework)
  - Integrated models for transport, MHD evolution, impurities, heating systems, REs, etc.
  - Runaway Fluid (reduced kinetic) and Runaway Indicator
- Can import experimental data input from various machines
  - ASDEX, JET, TCV, ITER, etc.



## Some results with ETS 5

- Preliminary results, stability to be improved
- Thermal quench simulated
  - Enhanced impurity transport to simulate MHD mixing
- Runaway seed in the center
- Different modules used in ETS
  - Impurity evolution and transport
  - NCLASS for neoclassical transport

Current profile just after the end of thermal quench



# ETS: An overview

- ETS 6
  - Developed in IMAS infrastructure based on ETS 5
  - Main focus from 2021
  - Impurity module under development
  - Same runaway models included as ETS 5 + integration of NORSE this year
  - DREAM

