EFDA Task Force
EUROPEAN FUSION DEVELOPMENT AGREEMENT
INTEGRATED TOKAMAK MODELLING

Density simulation in JET HS

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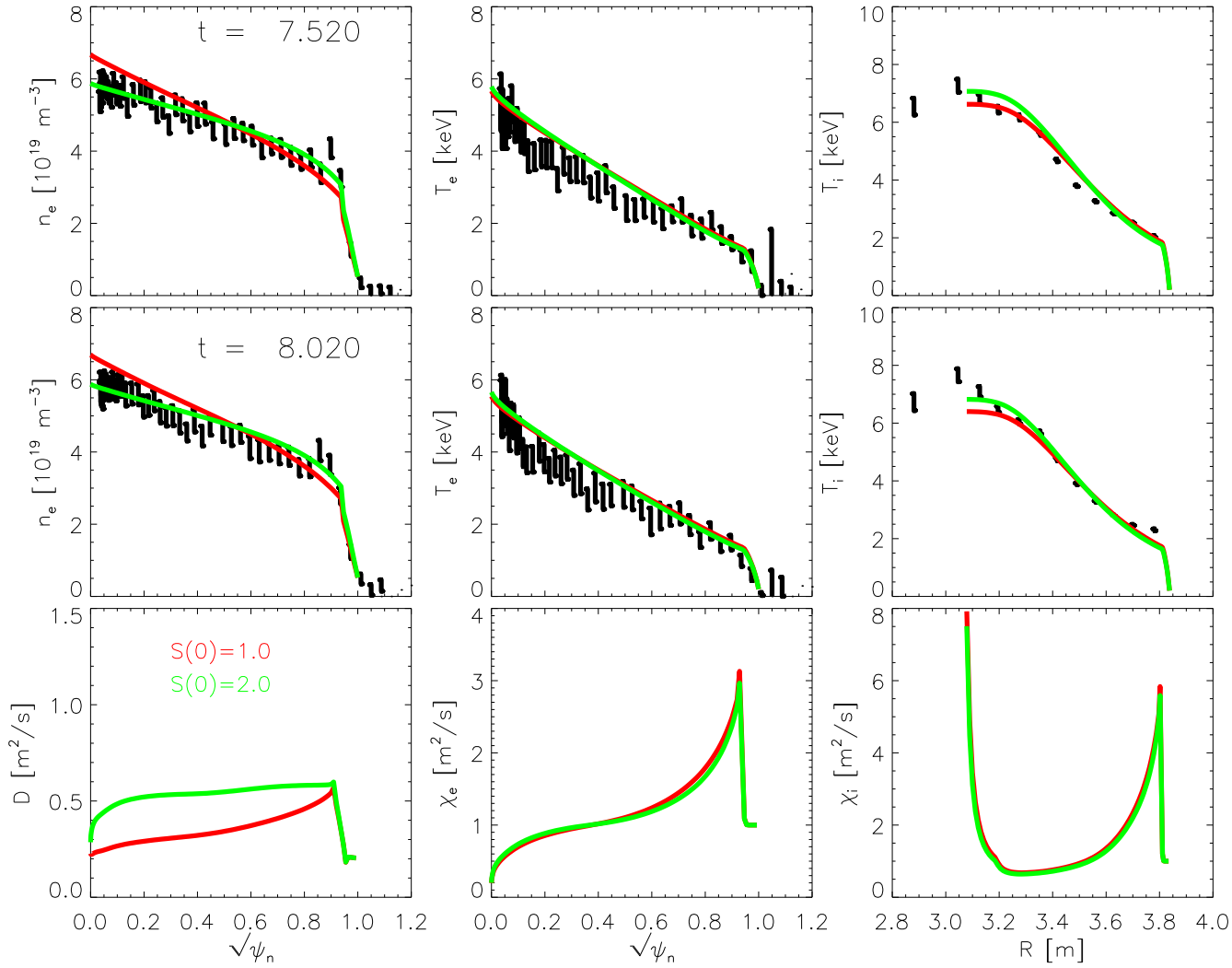
Simulations

- **JETTO fully predictive (ne,Ti,Te, but no rotation).**
- **Bohm/gyro-Bohm transport model.**
- **Particle and energy sources taken from experiment (in particular particle beam source cross checked between PENCIL and NUBEAM and good agreement found).**
- **Four discharges analysed high/low power (18/10 MW), high low triangularity:**
  - 77922 high power, high delta
  - 75225 high power, low delta
  - 75590 low power, high delta
  - 74641 low power, high delta
- **Strategy:**
  - match plasma parameters at top ETB (adjust χ and D inside ETB)
  - match evolution of average density (adjust R)
  - tune D in the core (if necessary) to match density peaking

77922 profiles



Summary of results

Shot	Time (s)	γ_{Exp}	γ_{Sim}	S(0)	χ/D (ETB)
77922	7.5-8.0	1.36	1.40	2.0	5.0
75225	6.0-6.5	1.59	1.58	1.5	7.5
75590	5.8-6.3	1.42	1.45	1.0	15.0
74641	6.0-6.5	1.52	1.51	1.0	15.0

Summary

- **High power shots exhibit core particle higher core particle diffusivity (factor 1.5, 2) with respect to standard Bohm/gyro-Bohm transport model.**
- **Low power shot exhibit higher χ/D inside ETB with respect to high power shots.**
- **In no cases an inward particle pinch had to be invoked to explain the observed level of density peaking.**
- **Triangularity does not seem to be playing a major role (density pedestal height?).**
- **GLF23 simulations (see Irina's paper) also predict density over-peaking. Agreement recovered if ExB stabilisation term is reduced).**
- **QuaLiKiZ analysis of fluxes not conclusive (no clear prediction that an outward particle pinch, which would explain the extra flattening of the density profile, should exist).**
- **Sara Moradi's analysis with GYRO could shed some light to be done at the beginning of June and possibly incorporated in the paper.**