Summary report on ISM WS & ETS CC: ETS benchmarking

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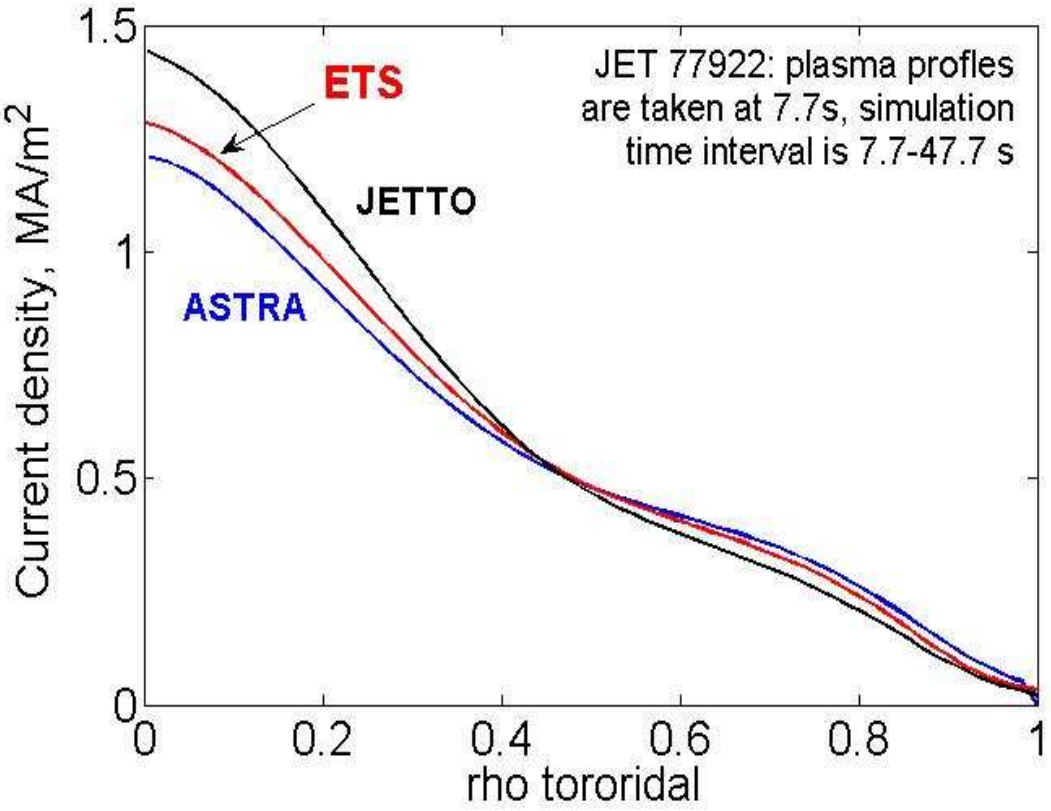
- **ETS V&V (Te, Ti, j, equilibrium) for JET HS 77922**
- **Progress in ETS/impurity simulations**

ETS/ASTRA/JETTO benchmarking for JET HS 77922

ASTRA/ETS/JETTO: current diffusion with Spitzer resistivity and zero bootstrap current



- JET HS 77922, TRANSP run I14 is used for input data;

- TRANSP -> ASTRA

TRANSP->PPFs ->JETTO ->ETS

- prescribed ne, Te & Ti are taken at 7.7s and frozen, Zeff=1

- run for 40 s

- JETTO: ppf dkalupin/seq. 434

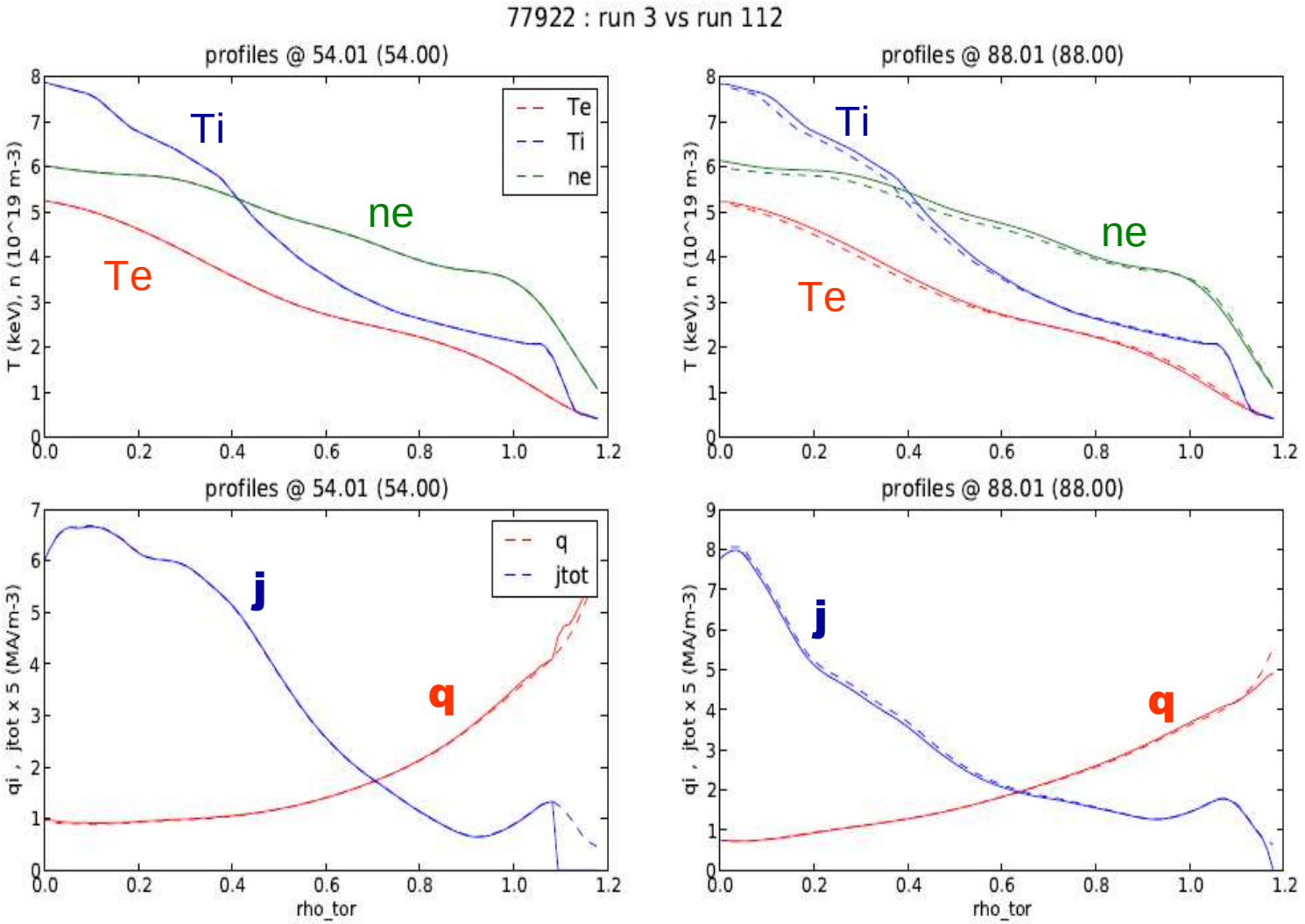
- ASTRA: voits/a620/.res/lf95/ETS77922_j_z1 and

/afs/efda-itm.eu/imp3/user/voitsekh/ASTRA_ETS_test_March2011/ETS77922_j_z1

- ETS: 77922/run 11

ETS/TRANSP benchmarking for JET HS 77922

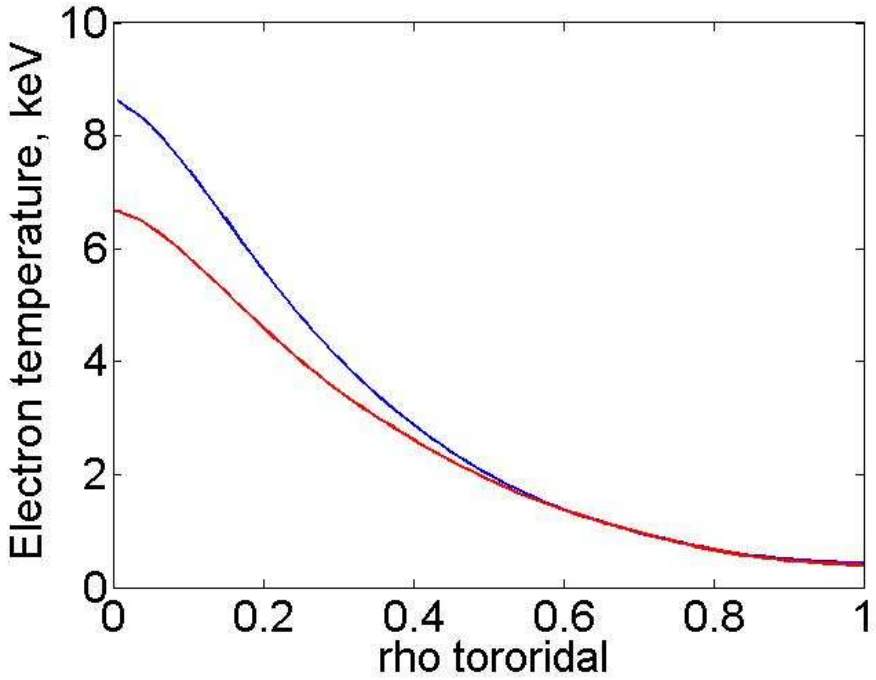
ETS (solid)/TRANSP (dashed): current diffusion with NCLASS resistivity & bootstrap current taken from TRANSP

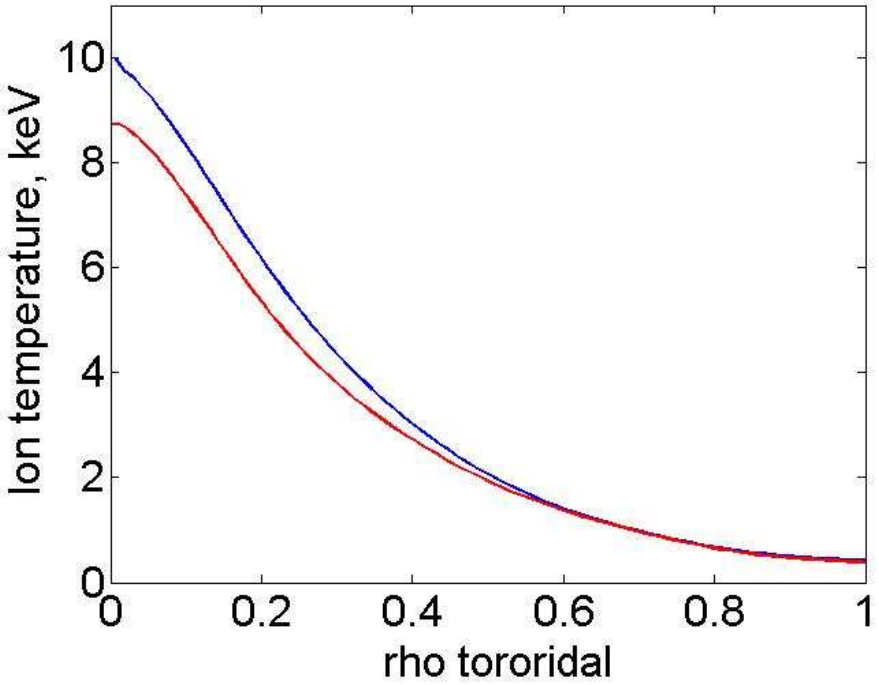


- selected time slice 14 s;
- TRANSP-> ETS CPO
- ETS run 112 for 34 s
- TRANSP run w/o imposed Gaussian current, but its contribution is negligible (checked with ETS)

ETS/ASTRA benchmarking for JET HS 77922

ASTRA/ETS: Te, Ti, j and equilibrium are simulated



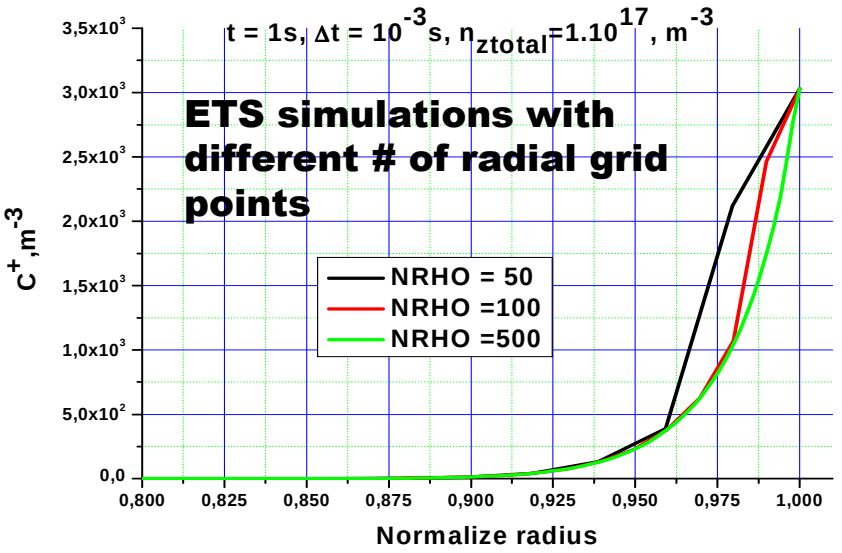


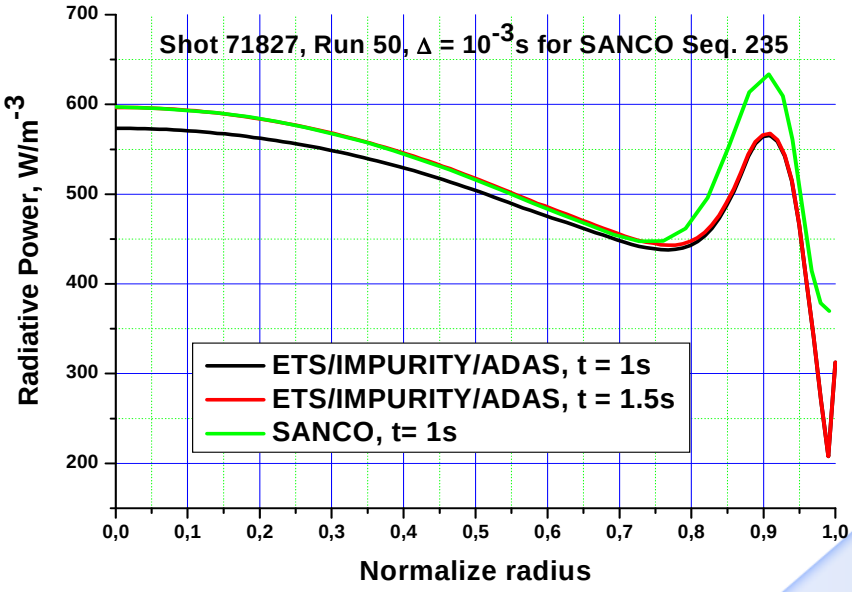
- applied modules: Bohm-gyroBohm thermal transport, Spitzer resistivity, zero bootstrap current;

- no e-i energy exchange in ASTRA, but it is used in ETS

Progress in ETS/impurity simulations

- **Previous ETS-SANCO benchmarking: w/o equilibrium simulations, atomic data from R. Zagorski, no Bremmstr. radiation**
- **Now: equlibrium is simulated by ETS. Ionization, recombination, line radiation and Bremstr. from ADAS**
- **JET #71827 with parabolic profiles: $T_e(0)$=1keV, $T_e(1)$=100eV, $T_e = T_i$, $n_i(0)=8.10^{19}m^{-3}$, $n_i(1)=0.5.10^{19}m^{-3}$. Carbon impurity.**
- **Effects of radial and time step are investigated. Reasonable choice: $\Delta t \geq 10^{-2}$ s, 500 radial grid points**
- **Good ETS-SANCO agreement for C density with high ionization states (3-6), but disagreement for low ionization states (1,2)**
- **Good agreement for core radiative power. Still a discrepancy near the edge, where the C densities with low ionization states are different**





Future actions:

- **Finish benchmarking of Fortran-based ETS WF for thermal transport**
- **Benchmarking of Coppi-Tang model is started (checked with Bruce WF) – CT model to be implemented in two transport WFs and benchmarked**
- **Depending on ETS development: test of NCLASS, GLF23**
- **Impurity:**
  - **discrepancy in the edge radiative power?**
  - **workflow working only for Solver 3 for the moment, other solvers to be used?**
  - **ETS impurity simulations for 77922**