

Integrated modelling of JT-60SA scenarios with the METIS code

G. Giruzzi^{a)}, J.F. Artaud^{a)}, E. Joffrin^{a)}, J. Garcia^{a)}, S. Ide^{b)}
JT-60SA Research Plan contributors and the JT-60SA Team

^{a)} *CEA, IRFM, Saint-Paul-lez-Durance, France*

^{b)} *JAEA, Mukouyama, Naka City, Japan*

Objectives

- use METIS simulations to discuss the JT-60SA reference scenarios
- compare with the results produced by JA codes (TOSCA + ACCOME)

Main results

- all the JT-60SA reference scenarios (8) simulated by METIS
- overall agreement of global parameters with JA results

Modelling of JT-60SA scenarios

- **Motivations:**

- check the main reference scenario parameters of the stationary state
- produce a first evaluation of equilibria and profiles, consistent with the reference global parameters
- produce a first simulation of the time behaviour of the scenario
- technical preparation of full 1.5 D CRONOS simulations
- Basis for various kinds of calculations (MHD, H&CD, etc.)

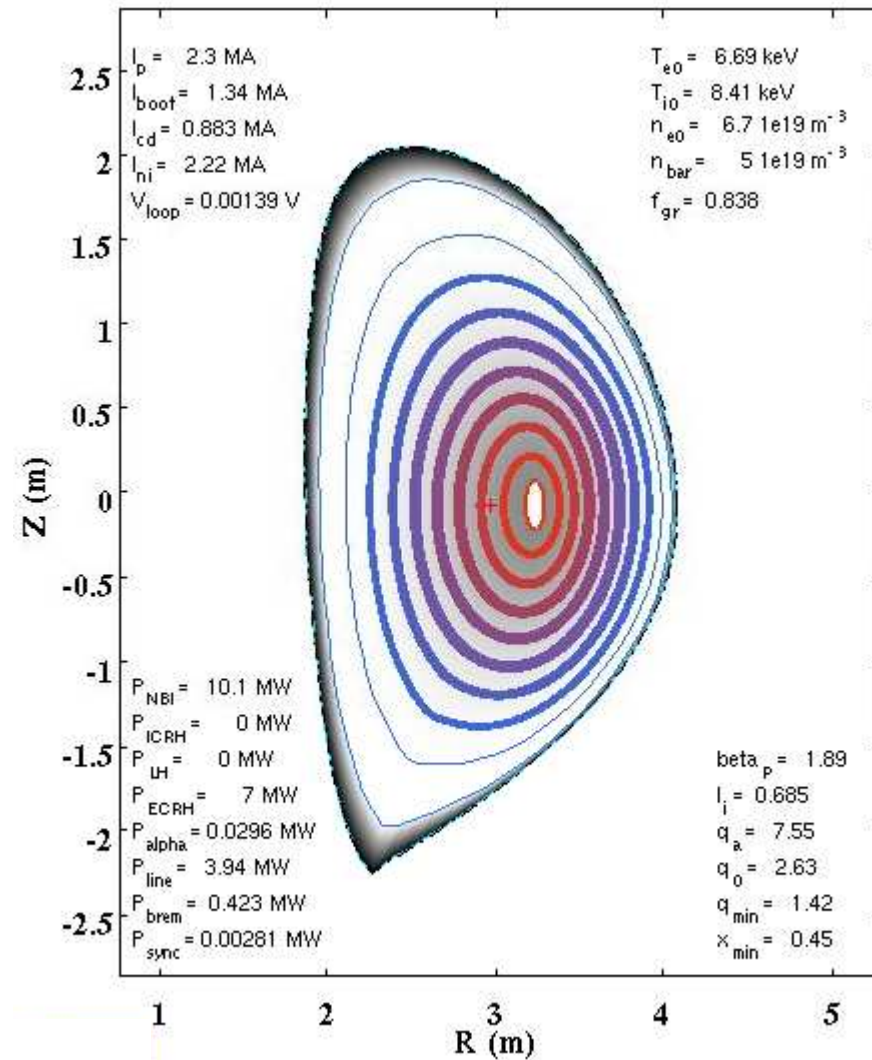
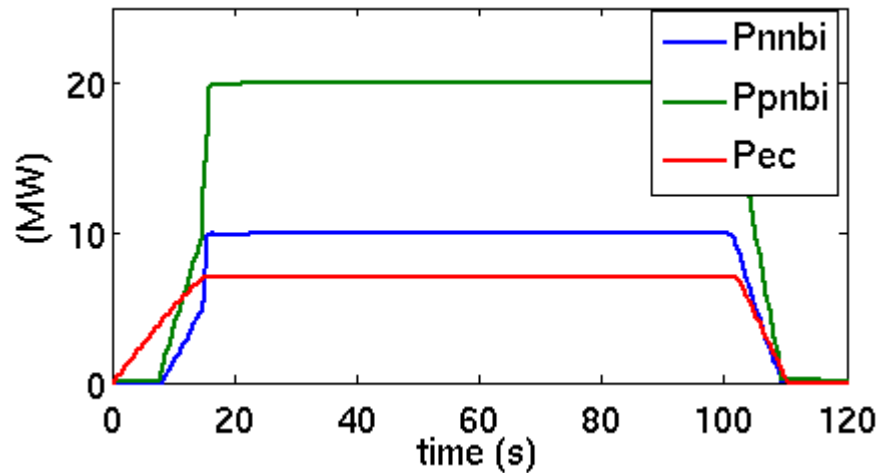
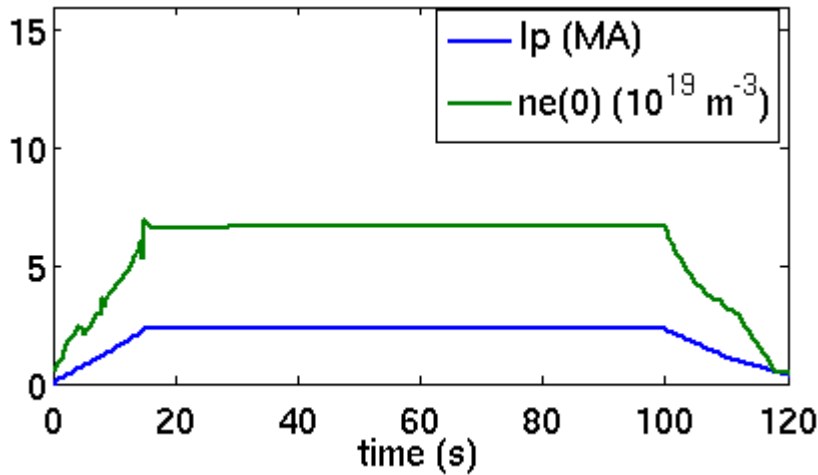
- **Recipe for METIS simulations:**

- set up equilibrium evolution, using separatrices provided by Project Team
- set up the main plasma parameters, heating powers, waveforms, etc.
- produce a density profile consistent with 0D estimates (n_{e0} , $\langle n_e \rangle$, n_{eped})
- chose confinement scaling laws for core and pedestal $\rightarrow T_e, T_i$
- benchmark NBI and ECCD power deposition and driven current profiles with estimates of full codes, if available. Adjust METIS NBI and ECCD parameters to reproduce those at best
- iterate a reasonable number of times ...

METIS simulation of JT-60SA

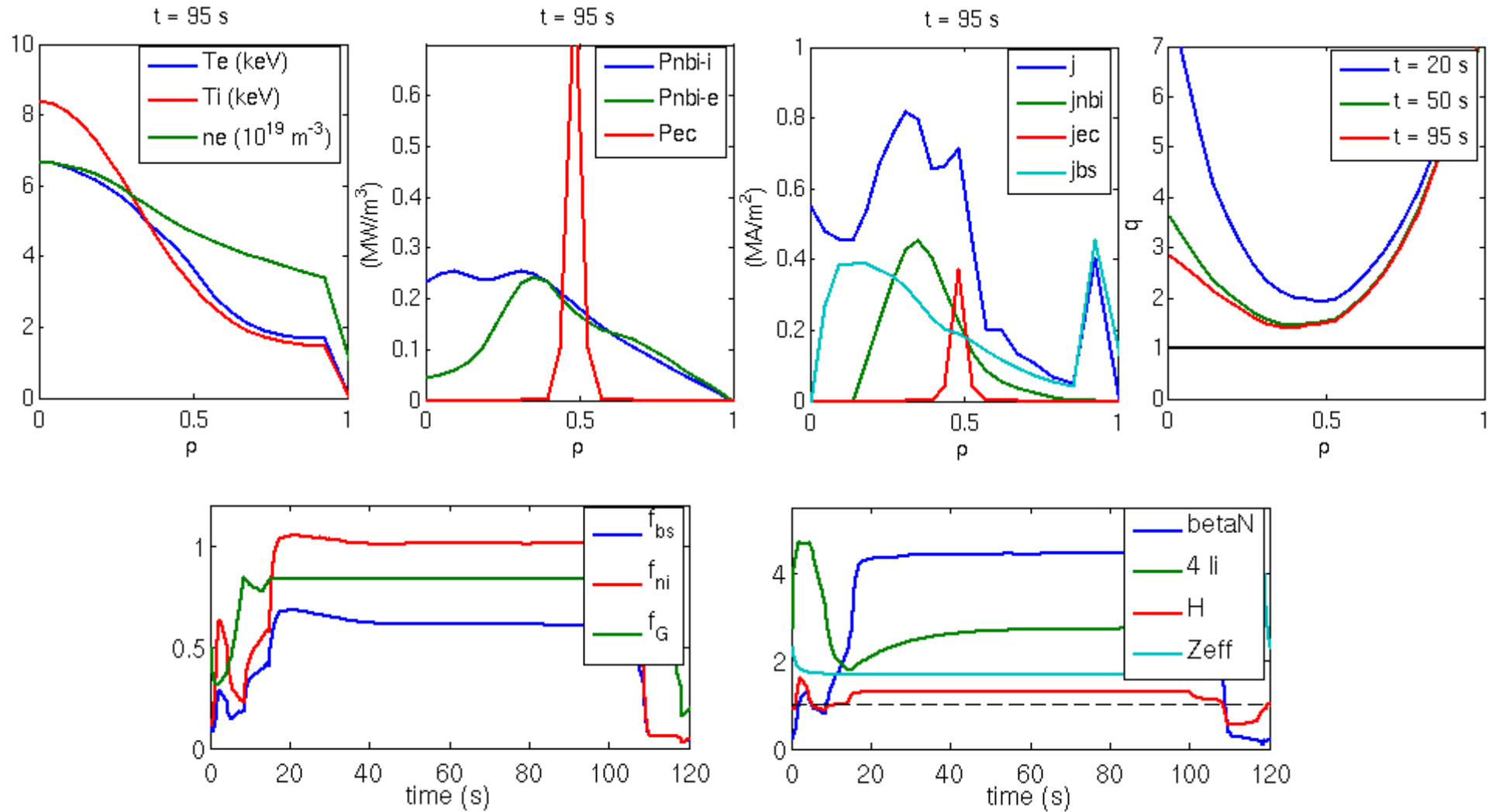
Scenario 5-1 (full CD, H=1.3, $I_p=2.3$ MA) /1

time = 95.7282 s



METIS simulation of JT-60SA

Scenario 5-1 (full CD, H=1.3, $I_p=2.3$ MA)



Conclusions

- All the JT-60SA **reference scenarios** have been simulated by METIS
- **overall agreement** of global METIS results with outputs by JA codes (Tosca + Accome)
- **equilibria** and **profiles** now available for various calculations
- already used for ECCD, NTM
- **time behaviour** to be optimised (ramp-up, ramp-down, H&CD waveforms)
- good starting point for **CRONOS**, **ASTRA** and **JETTO** simulations
- the METIS code is available under **free licence agreement** with CEA
 - standard version (requires Matlab licence)
 - compiled version (Windows, Linux, Mac OS X)