Core Edge Compatibility

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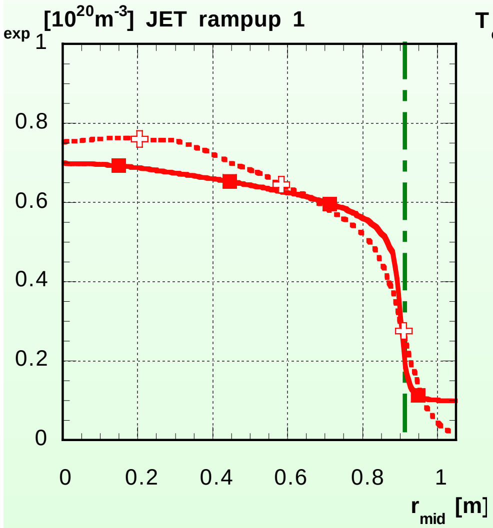
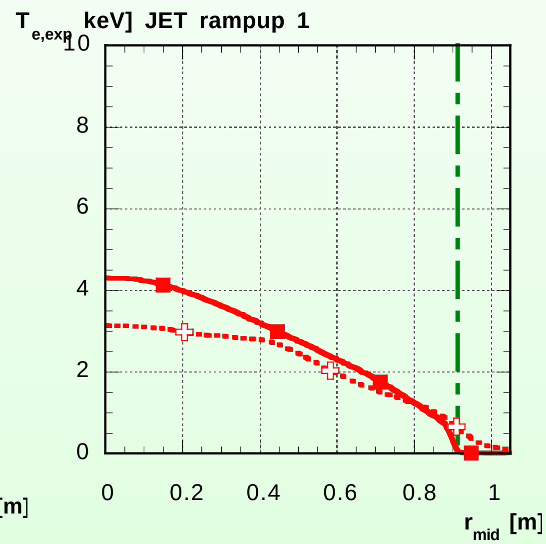
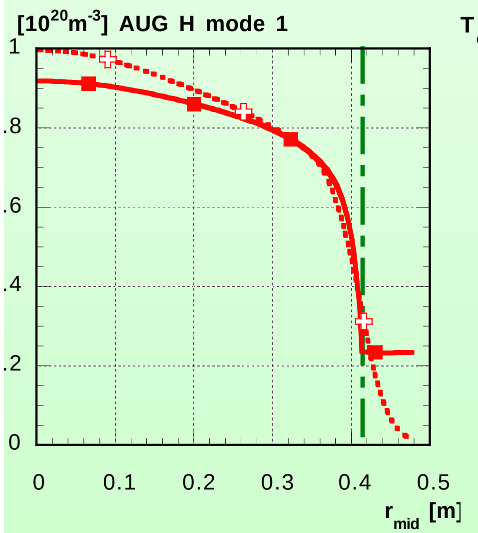
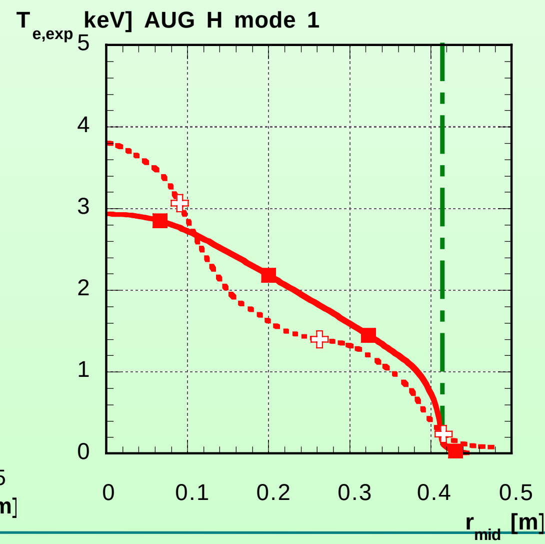
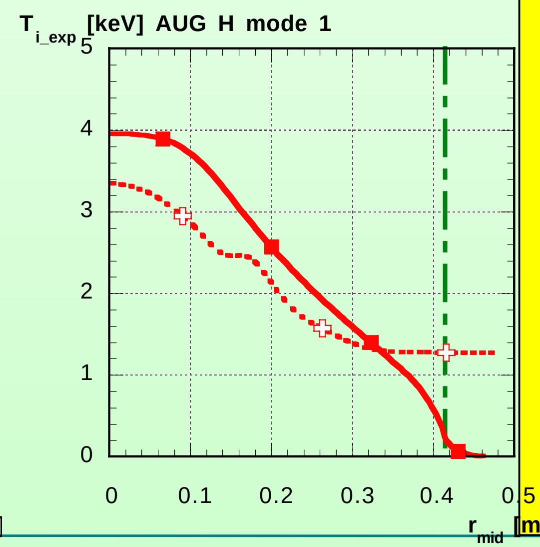
Model - Experimental Profiles (JET and ASDEX-UP)





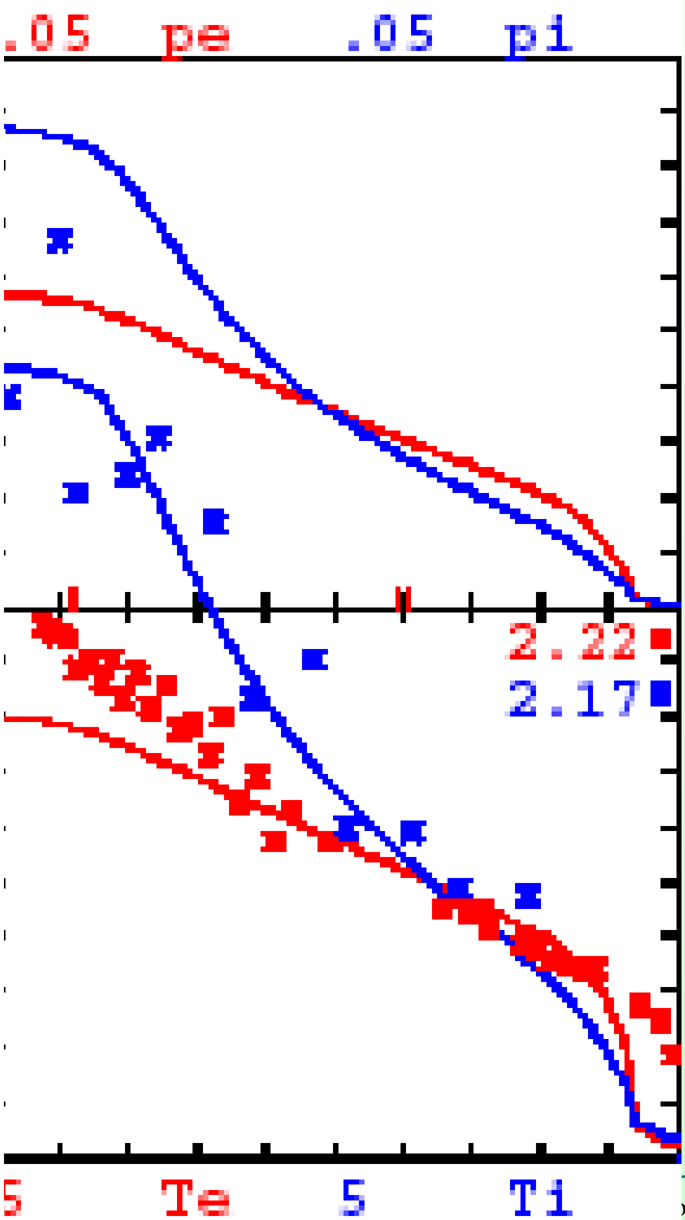




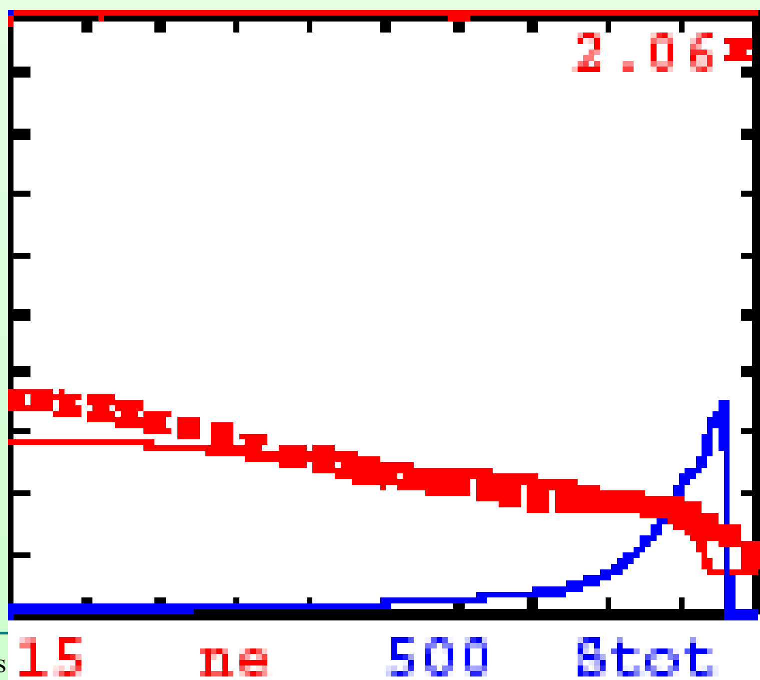


- Calculated (full symbols) and measured (open symbols) Density and temperature (T profiles of a JET 2 MA, 8.3 MW heat H-mode discharge
- Calculated (full symbols) and measured (open symbols) Density and temperature (T Ti) profiles of a ASDEX-UP 1 MA low triangularity H mode discharge

Model - Experimental Profiles (ASDEX-UP)

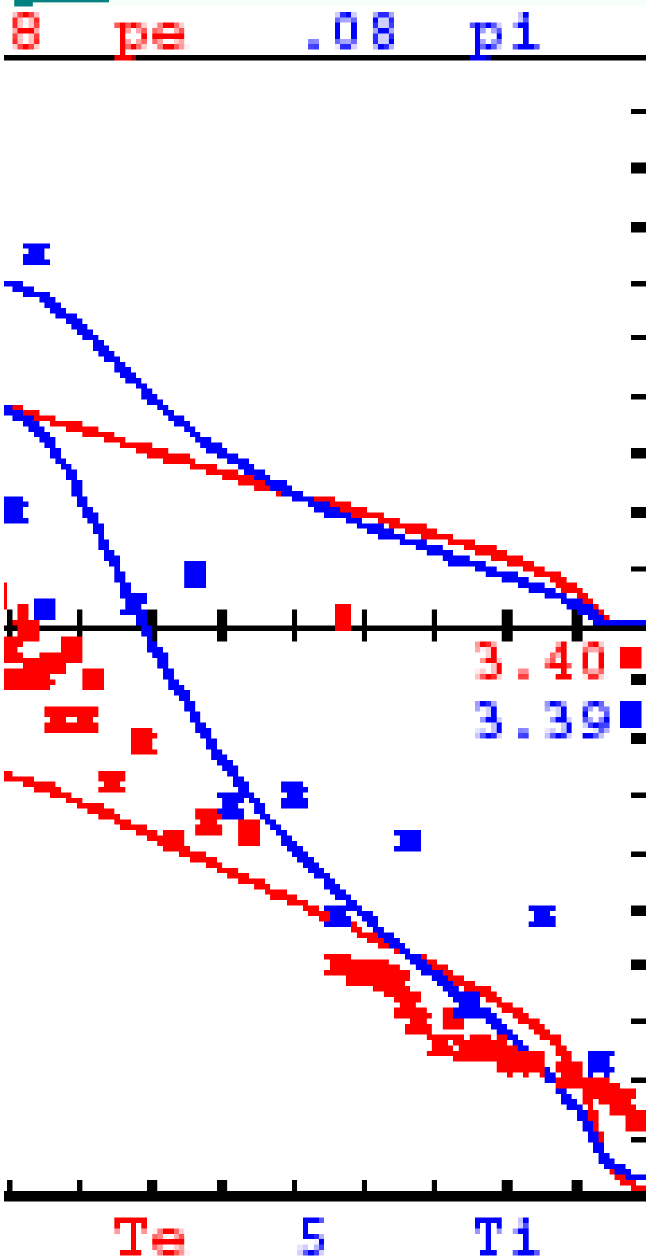


- **Calculated (full symbols) and measured (open symbols) Density and temperature (Te) profiles of a JET 2.5 MA, 8.3 MW heated H-mode discharge**



- Calculated (full symbols) and measured (open symbols) Density and temperature (T Ti) profiles of a ASDEX-UP 1 MA low triangularity H mode discharge

Model - Experimental Profiles (ASDEX-UP)



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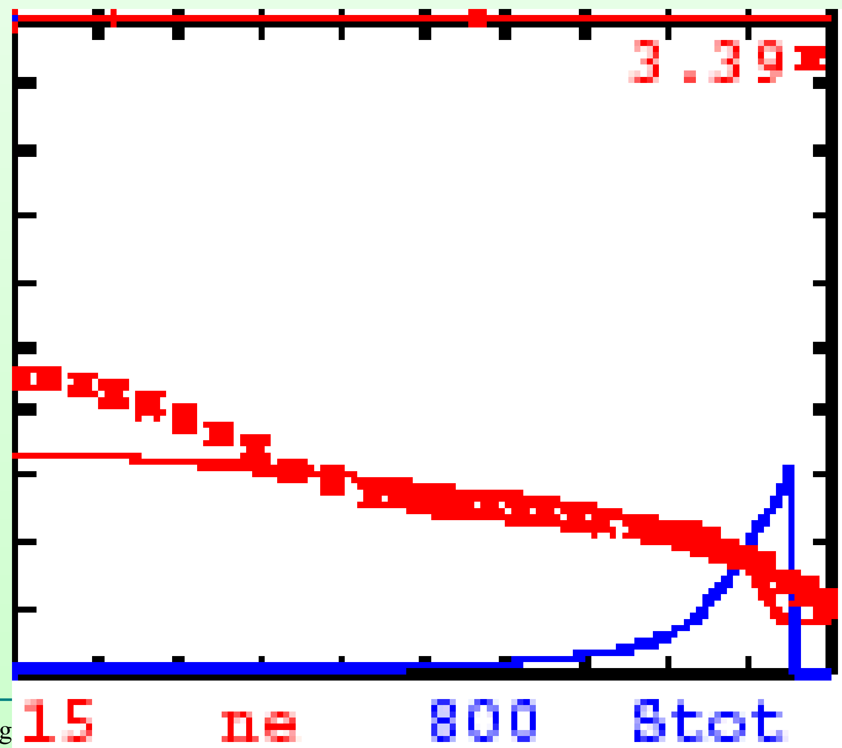

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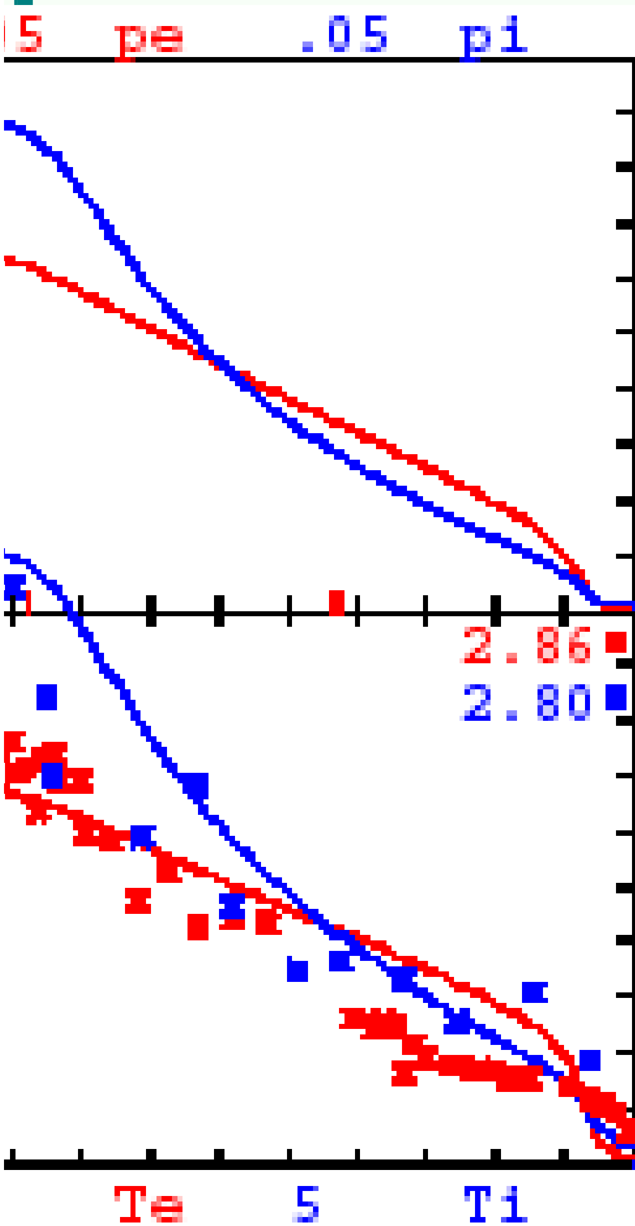
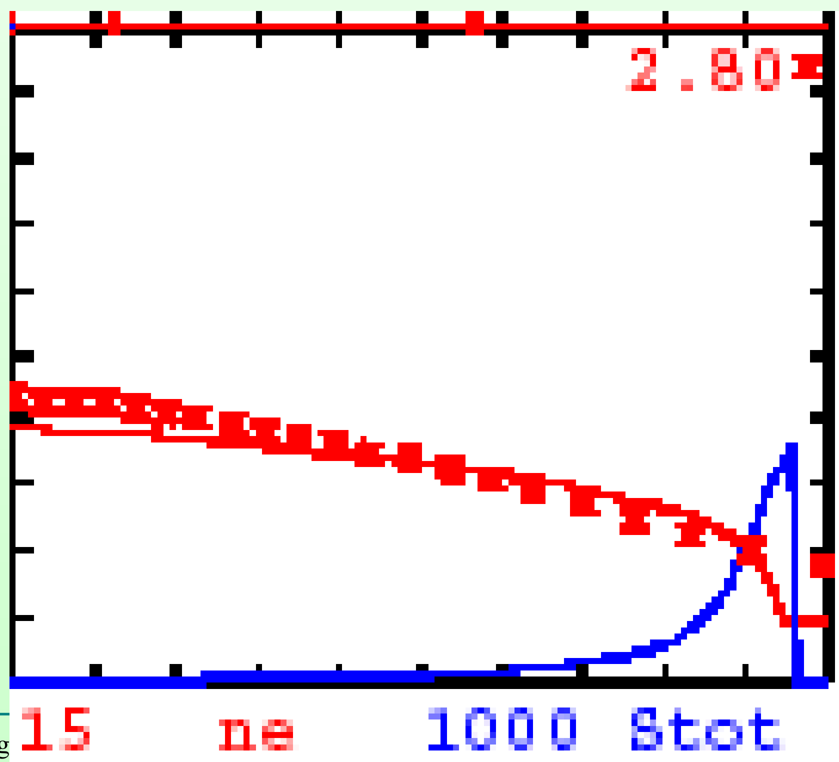
Model - Experimental Profiles (ASDEX-UP)

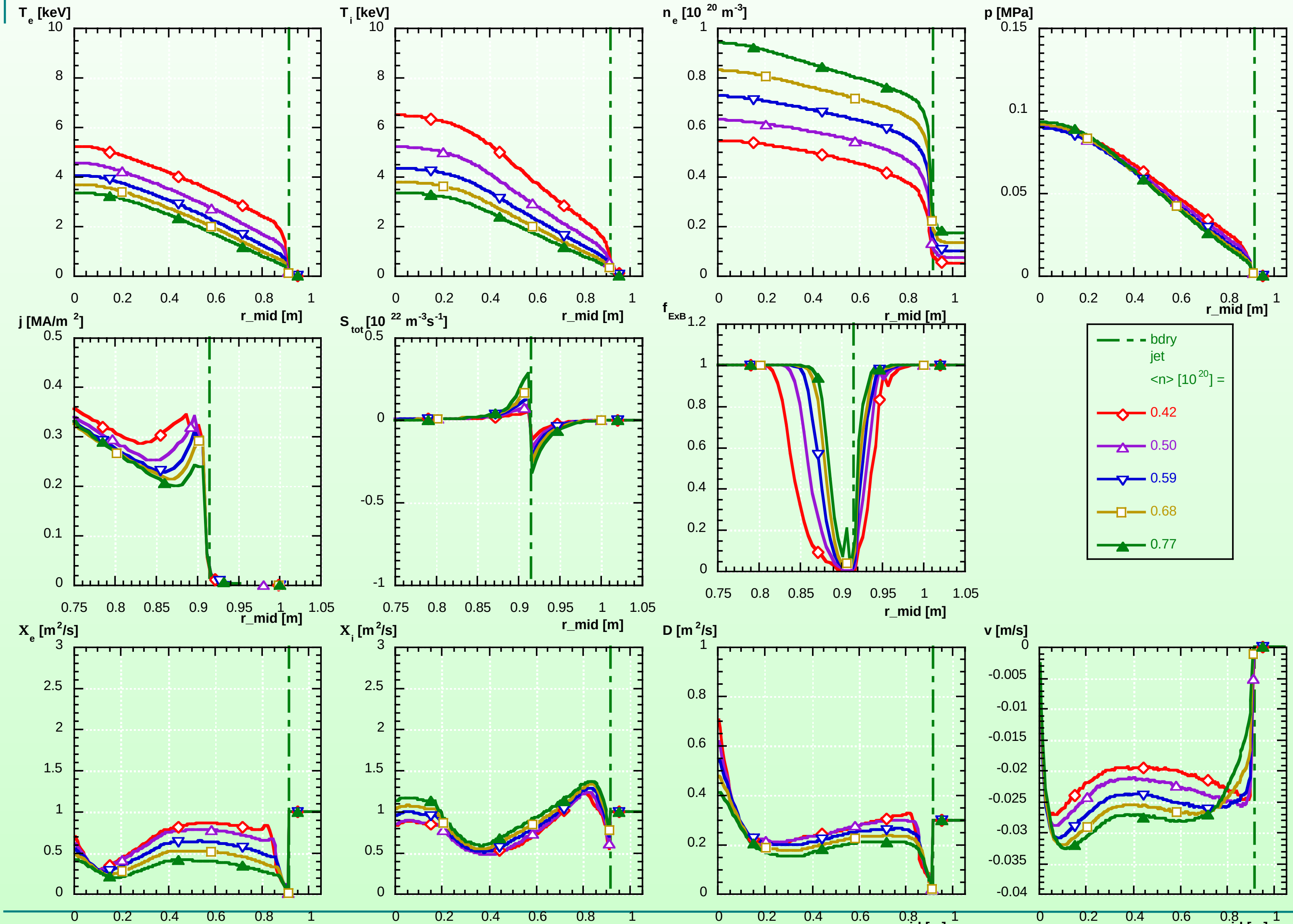


- **Calculated (full symbols) and measured (open symbols) Density and temperature (Te) profiles of a JET 2.5 MA, 8.3 MW heated H-mode discharge**

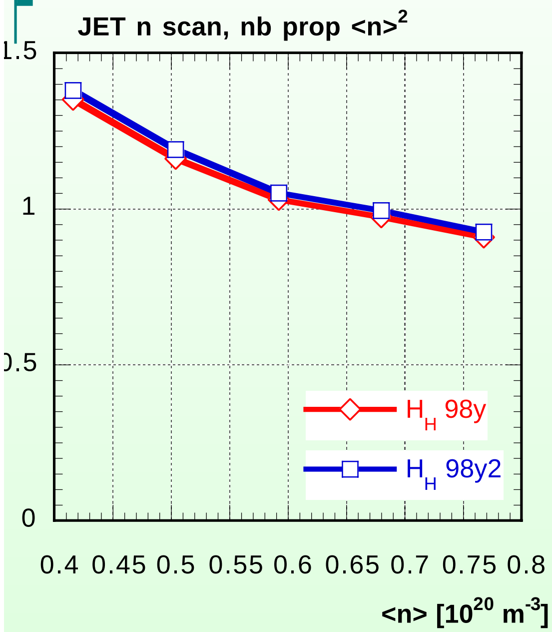


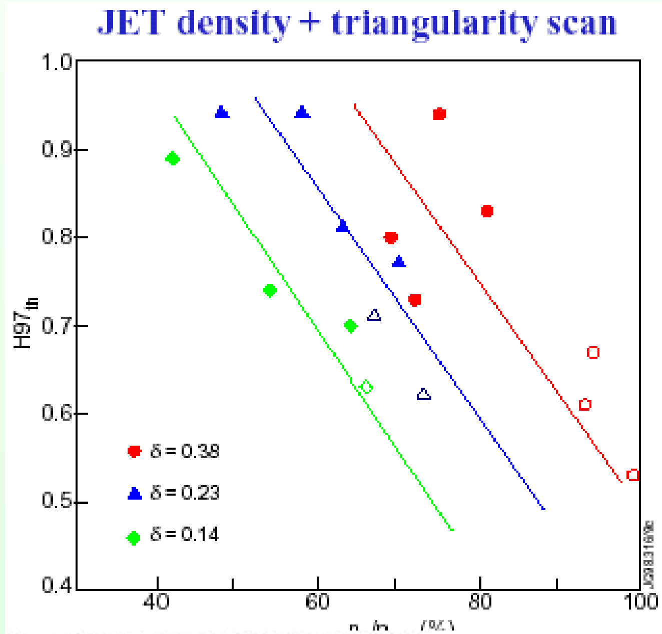
- Calculated (full symbols) and measured (open symbols) Density and temperature (T Ti) profiles of a ASDEX-UP 1 MA low triangularity H mode discharge

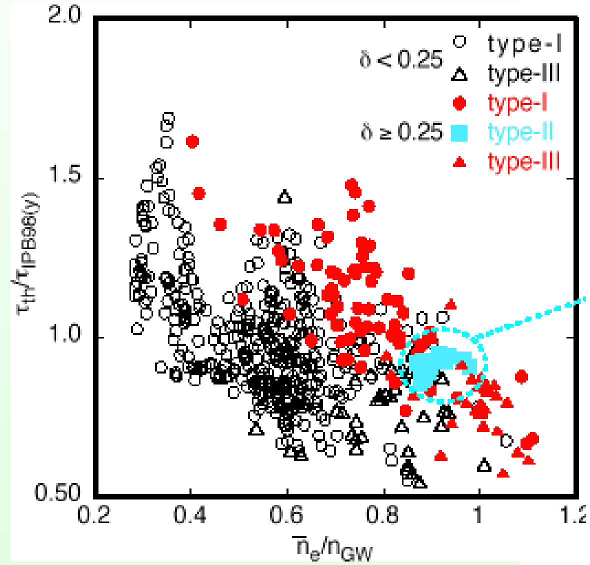
Results of a model density scan for JET (offset nesep prop. to n_{aver}^2)

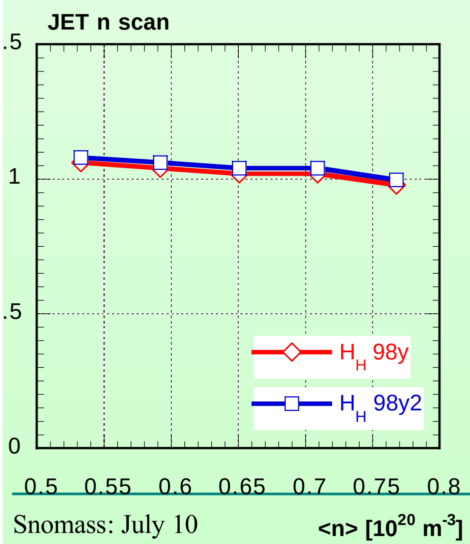


Global behavior of the density scan, comparison to exp.



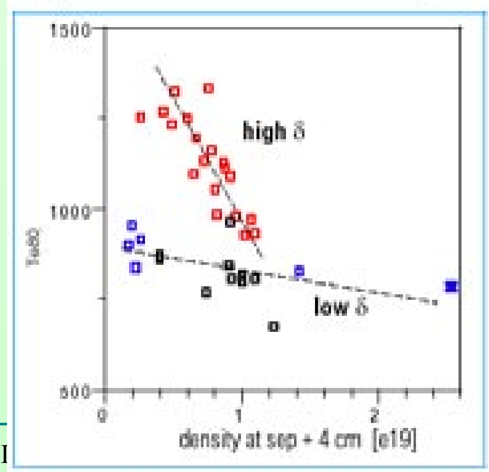






T_{ped} influenced by density in SOL

Edge more sensitive to SOL at high δ ?



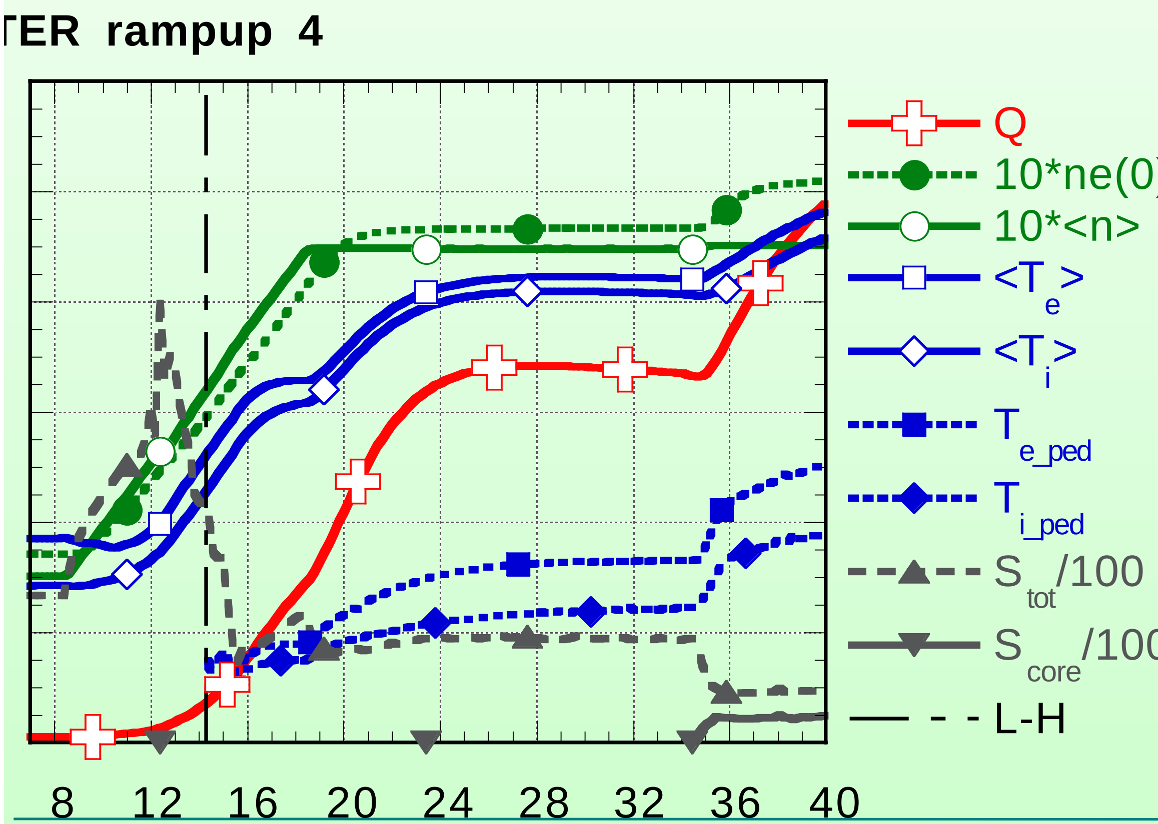
The global energy confinement normalized to scaling relations during density scan for the model (JET) agre well (at least qualitatively) with experimental results from JET (and ASDEX-UP) if the Sep. density is not constant but related to gas puffing or line average density

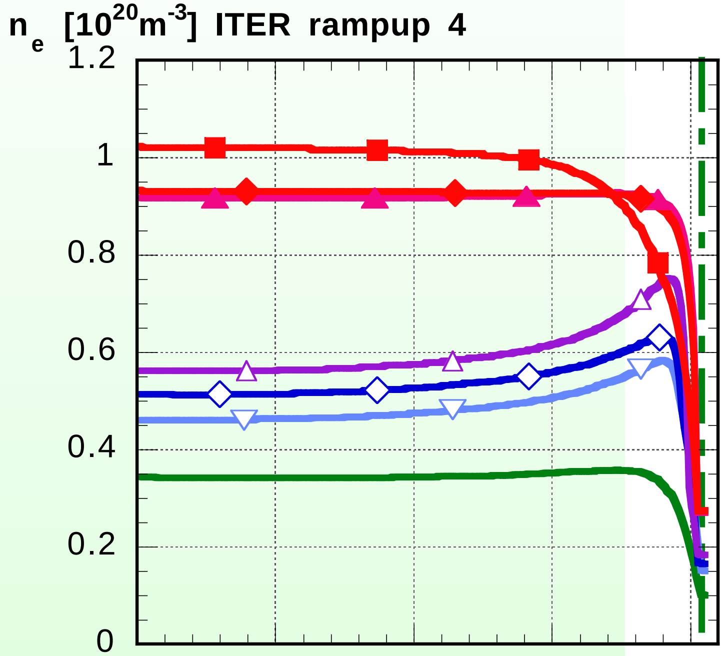
- A power scan shows the expected confinement behavior

The difficulty to fuel the ITER and Demo Plasma by gas puffing alone

In ITER ~9x10^{22}m^{3}s^{-1} by gas puff only needed

low T_{ped} results in Q = 7





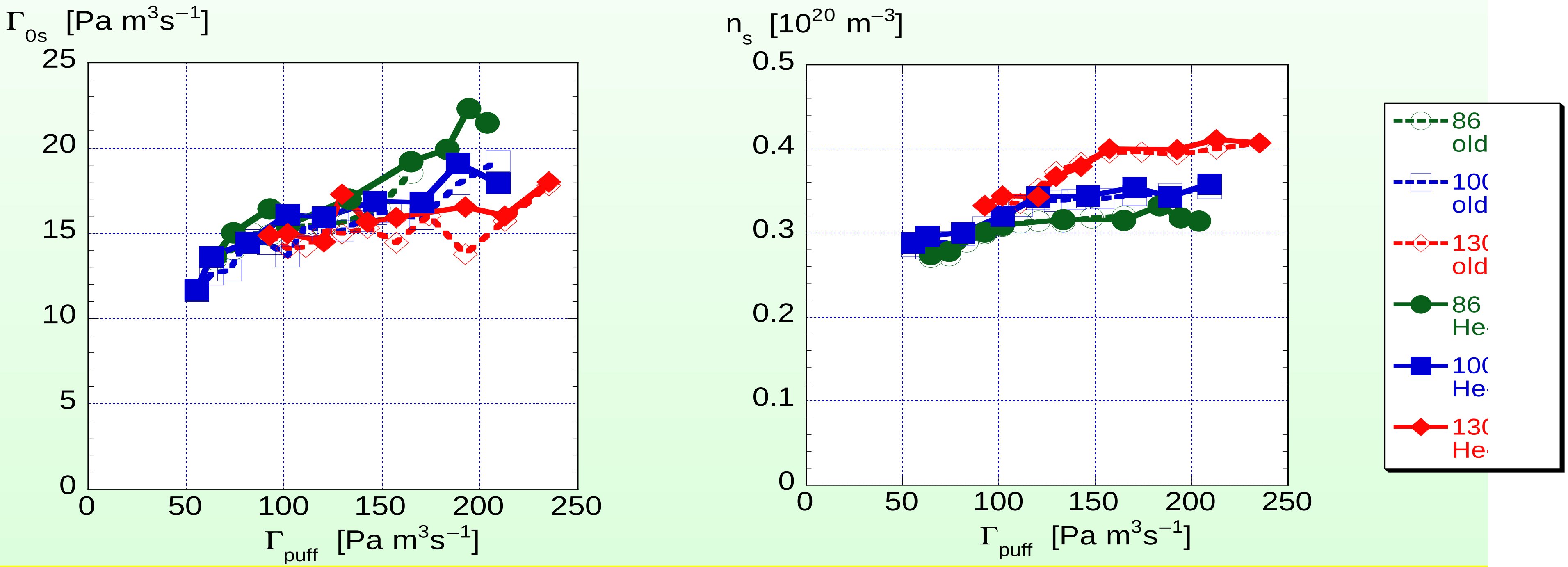
- A combined edge and core fuelling o ~3x10^{22}m^{3}s^{-1} gives better performanc

⇒ **higher T_{ped} results in Q = 1(**

- In ITER B2-EIRENE allows only 1.8x10^{22}m^{3}s^{-1} => not possible to obta required density => needs 8x10^{22}m^{3}s core fuelling in addition !

⇒ **Even higher T_{ped} results in Q = 15**

Compatibility of SOL and core in terms of fuelling and density



- Fuelling across the separatrix and the upstream density saturates with incresed throghput / gas puffing for a given power into the SOL => Screening effect of SOL
- Maximum core fuelling is ~ 15 Pam^{3}s^{-1} (higher values only if outer divertor detaches) => but to achieve the required pedestal density ~ 70 to 80 Pam^{3}s^{-1} are needed

=> Core fuelling by pellets or other means essential also for AT discharges !!