EFDA Task Force Integrated Tokamak Modelling

EUROPEAN FUSION DEVELOPMENT AGREEMENT

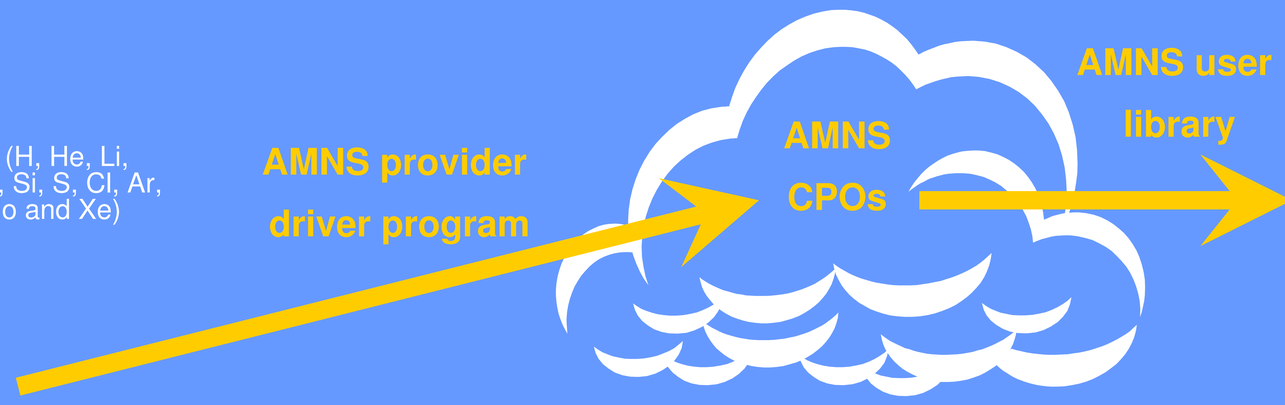
Providing access to Atomic, Molecular, Nuclear and Surface (AMNS) Data for ITM Codes

Goal

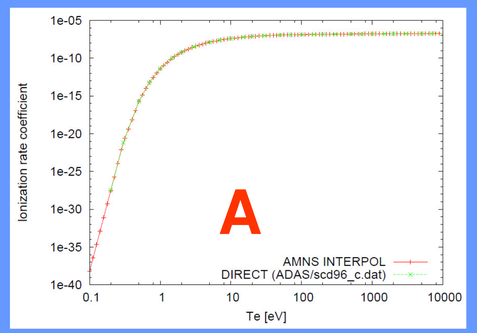
- **Provide the ITM-TF with Atomic, Molecular, Nuclear and Surface data from appropriate sources.**
- **Develop modules which deliver AMNS data in a standardised way to ITM-TF codes.**
- **The system must be such that the provenance of the data used for a particular simulation is recorded to ensure that a simulation can be exactly replicated at a later date.**

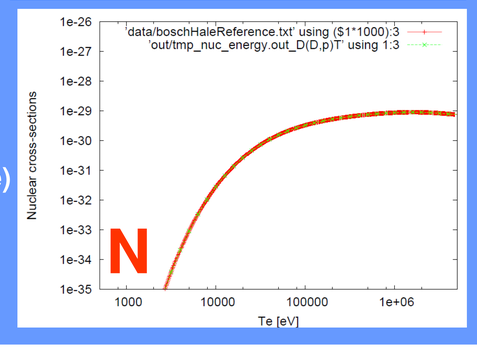
Available data

- ✓ **Atomic data**
  - **ADAS rate coefficients** (H, He, Li, Be, B, C, N, O, F, Ne, Al, Si, S, Cl, Ar, Cr, Fe, Ni, Cu, Ge, Kr, Mo and Xe)
  - **ADAS cross sections**
    - **In progress**
- ➢ **Molecular data**
  - **None yet**
- ✓ **Nuclear data**
  - **Beam-beam cross sections for**
    - D(T,n) ^{4}He
    - D(D,p)T
    - D(D,n)^{3}He
    - D(^{3}He,p)^{4}He
  - **Beam-target**
  - **Thermal**
- ✓ **Surface**
  - **Physical sputtering data (Eckstein)**
    - **In progress**



Comparison of data retrieved via AMNS interface with reference data





Separate provision of AMNS services from the implementation

AMNS implementation

- **Only accessed by a set of defined calls**
- **Implementation by AMNS experts**
- **Different versions can be supported**
- **Different implementations possible**
  - Analytic formulae
  - Table lookup
- **"Old" versions should always be recoverable (even if wrong)**
- **Should become easier to implement "new" data**

Physics code

- **Access to AMNS data only via interface**
  - initialization (2)
  - finalization (2)
  - querying parameters (2)
  - setting parameters (2)
  - getting data (1)
- **Separation between use of the data and the implementation of the data**
- **Code author doesn't need to become an expert in AMNS**
- **Ensures compatibility between codes**

Using this framework ensures

- Version control of data imported to the ITM-TF
- Provenance of data stored in the ITM database
- Data for "production" runs with ITM-TF codes will have AMNS given a stamp of approval by an expert.
- The AMNS data communicated to ITM-TF codes via a standardised interface ensuring coherence between different ITM-TF codes needing the same type of data
- Insulation between data provision and data use

EFDA ITM-TF Expo "The European Integrated Modelling effort : challenges and achievements" – 38th EPS 2011

D. Coster, IPP, L.-G. Eriksson, EC, M. O'Mullane, CCFE, K. Schmid, IPP, V. Kiptily, CCFE, S. Akaslompolo, TEKES, E. Hirvijoki, TEKES, K. Tokesi, HAS, D. Tskhakaya, ÖAW, A. Alberto, CIEMAT, F. Aumayr, ÖAW, K. Dobes, ÖAW, P. Scheier, ÖAW, D. Jaksch, ÖAW, R. Mayo, CIEMAT, V. Stancalie, MEdC, V. Pais, MEdC, and ITM-TF contributors