

FUSION 2023

IAEA's Fusion Activities Department of Nuclear Sciences and Applications (NA)

IAEA TM on
Compatibility Between Coolants and Materials for
Fusion Facilities and Advanced Fission Reactors
October 2023

Matteo Barbarino, Palak Jain, Adam Danilowicz,
Kalle Heinola, Christian Hill

Our activities are focused on the enabling science and technology R&D

- The Agency is the **Convener** for the international fusion community
- We host large-scale events that are driving the fusion agenda including engagement with the **private sector**
- We build **partnerships** with world-renowned institutions
- We **coordinate research activities**
- We support research on fusion by providing and managing important **atomic and plasma physics data**
- We host and manage the **Fusion Portal** and the **Fusion Device Information System**
- We support implementation of **NE** and **NS** activities

The Agency is the Convener for the international fusion community

- The **Fusion Energy Conference** and the **International Fusion Research Council** are two Agency bodies that strongly influence international fusion R&D programs and coordination.
- Both FEC and IFRC continue to expand and evolve their programmes.
 - The IFRC helped establish to the INTOR Group (1978-1987) and ITPA (2001-2006).
 - The FEC changed its name in 1996 and this year features two novelties: the high-level panel and the “Pathways to Fusion” session.

We host large-scale events that are driving the fusion agenda, engaging w/the private sector

- Over the period the last 15 months implemented over **30 events** (TMs, RCMs, consultancy meetings, ICTP schools)
 - *DEMO, Fusion Enterprises, D-T Fuel Cycle, Divertor Concepts, ...*
- We brought together **1000+ participants from 76 Member States**.
- We brought together world-renowned public institutions and private companies (CFS, Eni, FLF, GA, GF, TE,...)
- We published **5 IAEA books + WFO**
 - *2 TECDOCs (Fusion Enterprises, CFNS) + 2 Non serial (AI, World Survey) + 1 textbook*
- We launched and ran a successful Webinar series (**Fusion Breakthroughs**):
 - *5000 participants over 5 webinars*
- We support activities across the Agency (**NE, NS, OLA, TC, SG, NF journal**), we are involved in TMs, consultancy meetings, publications drafting and reviewing, etc.

We build partnerships

- We continue working closely with **ITER Organization** on different activities
 - *IIS2022 and IIS2023, the TM on Plasma Disruptions, ITPA CC, etc.*
- We designated **MIT PSFC** as IAEA Collaborating Centre in the field of AI for Fusion
 - *Schools, CRP, crowdsourcing competitions, etc.*
- We signed Practical Arrangements with **PPPL** in the area of training, education and outreach
 - *SULI course, TSDW, CUWiP, LAWPP*
- We signed Practical Arrangements with **ASIPP** in the area physics, technology, training and education
 - *Planning JEs*
- We renewed Practical Arrangements with **KFE** in the area of atomic, molecular and PMI data.
- We played a key role in the creation of the **CICLOP Group** and we continue to coordinate this activity which has now moved under the IEA TCP
 - *Hosting CICLOP website, database, and organizing the TM on LPO, paper submitted to NFJ*
- We partnered up with **UKAEA** - survey on the D-T Fuel Cycle
- We support **TINT** with their recurring school in the ASEAN region
- We also cooperate with **FuseNET, IEEE, APS, FUSECOM and ICTP**

We coordinate research activities

- **4 active CRPs**
- **100+ public and private partners** on various themes:
 1. Data standardization and **AI benchmarking**
 2. Standardization of **small specimen test techniques**
 3. Ion beam techniques for **materials characterization**
 4. **ICF** physics and technology
 - *MFE physics basis, training and educational activities*

We support research on fusion by providing and managing 7 atomic and plasma physics database

Fusion CRPs: Atomic and Molecular Data

[Poster 2610, Sat.]



Ended:

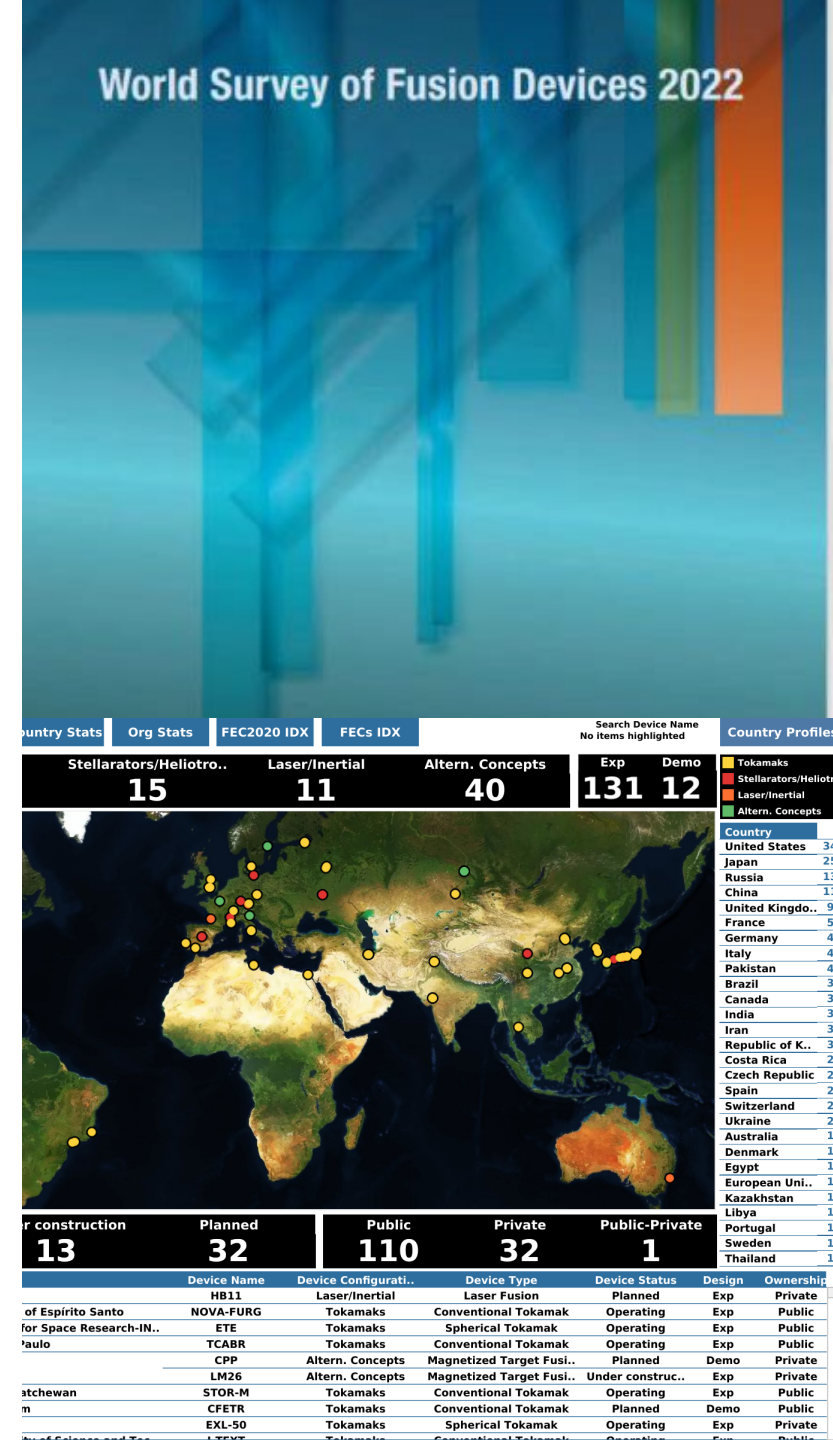
- **CRP F43023 Data for Atomic Processes of *Neutral Beams* in Fusion Plasma (2017 – 23)**
Modelling of penetration and photo-emission for heating and diagnostics
- **CRP F43024 Atomic Data for *Vapour Shielding* in Fusion Devices (2019 – 22)**

Active:

- **CRP F43025 *Hydrogen Permeation* in Nuclear Materials (2021 –)**
Modelling and measurement of permeation of hydrogen isotopes in reactor component materials
- **CRP F43026 Atomic Data for *Injected Impurities* in Fusion Plasmas (2023 –)**
Fundamental data on impurity ions injected for plasma control and diagnostics
- **CRP F43027 *The Formation and Properties of Molecules* in Edge Plasmas (2024 –)**
Properties and behaviour of NH, BH, BeH, etc. and their ions in fusion devices

We host and manage the Fusion Portal and the Fusion Device Information System

- The Fusion Portal continues to be the single access point to the Agency's work in fusion
- Fusion Device Information System (visited over 40,000 times)
- World Survey of Fusion Devices 2022 (top Agency publication in Jan 2023)



Upcoming Agency's publications

1. Physics and technology aspects of the D-T fuel cycle (TECDOC)
2. Considerations for TRL assessment of fusion device components (TECDOC)
3. Fusion-fission synergies (NES)
4. INPRO study on the legal and institutional aspects of fusion facilities (NES)
5. Considerations for radioactive waste management (TECDOC)
6. Regulation (TECDOC)
7. Safety designs assessment (TECDOC)
8. *Li6 availability (TECDOC)*
9. *Decommissioning considerations for D-T tokamaks (TECDOC)*

10+ meetings planned for 2024