

28th Meeting of the Atomic and Molecular Data Centres Network (DCN28)

Report of Contributions

Contribution ID: 1

Type: **not specified**

Status, News, and Trends of AMO Physics in Argentina

Wednesday 1 October 2025 15:30 (15 minutes)

Presentation link: <https://youtu.be/zbs2Gg4G-Lw?si=dBLcJ-KYNsaIFeek>

Author: BARRACHINA, Raul

Presenter: BARRACHINA, Raul

Contribution ID: 4

Type: **not specified**

tbc (Recent data activities at CNR Bari)

Thursday 2 October 2025 12:00 (30 minutes)

Author: Dr LAPORTA, Vincenzo (CNR Bari (Italy))

Presenter: Dr LAPORTA, Vincenzo (CNR Bari (Italy))

Contribution ID: 7

Type: **not specified**

tbc (Recent data activities at KFE)

Wednesday 1 October 2025 12:00 (30 minutes)

Author: SONG, Mi-Young (KFE (Korea))

Presenter: SONG, Mi-Young (KFE (Korea))

Contribution ID: 8

Type: **not specified**

Overview of Atomic, Molecular and PMI Data Activities in Russia in 2023-2025 for Controlled Fusion Research

Thursday 2 October 2025 10:00 (30 minutes)

Activities carried out in Russia during the period from May 2023 until September 2025 on atomic, molecular and plasma-material interaction (PMI) data will be presented, including the development and maintenance of databases, a brief review of original research papers regarding the generation of atomic and PMI data, as well as uses of such data in controlled nuclear fusion research. The most recent Russian conferences predominantly reflecting the progress on PMI data will also be overviewed.

Activities on databases include both those being performed in the framework of the Virtual Atomic and Molecular Data Centre (VAMDC) consortium and those being pursued in Russian institutions beyond that framework.

The original research works on the generation of atomic and PMI data include studies of charge exchange and ionization processes in collisions of W with H^+ , D^+ , T^+ ions, as well as rather extensive studies of sputtering of Tungsten and Beryllium by Hydrogen isotopes and light impurities.

The usage of atomic data in the recent controlled fusion research works in Russia includes studies of plasma parameters on operating tokamak and stellarator devices, namely, Globus-M2 spherical tokamak and L-2M stellarator, as well as studies related to the prospective Tokamak with Reactor technologies, i.e. the TRT project.

The major Russian conferences in 2024-2025 on the interactions of plasmas with materials are the 27th and the 28th International Conferences on Plasma Surface Interaction organized by Moscow Engineering Physics Institute (MEPhI) and the 27th International Conference on Ion-Surface Interactions organized primarily by the Ministry of Science and Higher Education of the Russian Federation.

The overview covers activities pursued at Rosatom's institutions, NRC Kurchatov Institute, at universities such as Peter the Great St.Petersburg Polytechnic University, Novosibirsk State University, Moscow Engineering Physics Institute, and at the institutions of the Russian Academy of Sciences, namely, Ioffe Institute, P.N. Lebedev Physical Institute, G.I. Budker Institute of Nuclear Physics and other organizations. The major frameworks are the Russian Federal project on fusion energy technologies and the participation of Russia in the ITER project.

References

1. C.M. Zwölf, N. Moreau, The VAMDC Species database, Eur. Phys. J. D 78: 83 (2024)
2. V.V. Kazakov et al., "Electronic Structure of Atoms" Information System for Atomic Spectroscopy, Russ. J. Phys. Chem. 98, 828–836 (2024)
3. I.Yu. Tolstikhina, V.P. Shevelko, Formation of W^+ ions in collisions of low-energy H^+ , D^+ , T^+ ions with tungsten atoms in the ITER near-wall plasma, Phys. Plasmas 32, 082508 (2025)
4. P.Yu. Babenko et al., Stopping and scattering of keV-energy atoms in matter, Physics-Uspokhi 67 (10) 1000-1021 (2024)
5. V.S. Mikhailov et al., Sputtering Yields of Beryllium and Tungsten by Various Atoms from Hydrogen to Tungsten, Plasma Phys. Rep. 50, 23–34 (2024)
6. P.Yu. Babenko et al., Dependence of Sputtering Coefficient on Energy and Incidence Angle of Bombarding Particles. Energy Spectrum and Average Energy of Sputtered Particles by the Example of a Tungsten Target, Plasma Phys. Rep. 50, 1056–1065 (2024)

Author: Dr GONCHAROV, Pavel (SPbSTU (Russia))

Presenter: Dr GONCHAROV, Pavel (SPbSTU (Russia))

Contribution ID: 9

Type: **not specified**

tbc (Recent data activities at QEB)

Thursday 2 October 2025 11:30 (30 minutes)

Author: BALLANCE, Connor (Queen's University Belfast (UK))

Presenter: BALLANCE, Connor (Queen's University Belfast (UK))

Contribution ID: **10**

Type: **not specified**

tbc (Recent data activities with ADAS and OPEN-ADAS)

Wednesday 1 October 2025 11:30 (30 minutes)

Author: O'MULLANE, Martin (Strathclyde University (UK))

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Contribution ID: **11**

Type: **not specified**

tbc (Recent data activities with Atomic Spectra Database)

Wednesday 1 October 2025 10:00 (30 minutes)

Author: RALCHENKO, Yuri (University of Maryland (USA))

Presenter: RALCHENKO, Yuri (University of Maryland (USA))

Contribution ID: 12

Type: **not specified**

tbc (Recent activities on ModCR and PLOUTOS codes)

Wednesday 1 October 2025 15:45 (30 minutes)

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Contribution ID: 13

Type: **not specified**

Brief introduction to proposal on "Unifying policies on the management of atomic and molecular data for fusion"

Wednesday 1 October 2025 16:15 (30 minutes)

Author: BORODIN, Dmitriy (Forschungszentrum Jülich GmbH, Institut für Energie- und Klimaforschung IEK-4: Plasmaphysik)

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Contribution ID: 14

Type: **not specified**

Current activities of IAEA Atomic and Molecular Data Unit

Thursday 2 October 2025 09:30 (30 minutes)

Author: HEINOLA, Kalle (IAEA)

Presenter: HEINOLA, Kalle (IAEA)

Contribution ID: 15

Type: **not specified**

Recent Progress of Atomic and Molecular Physics for China Research Association of Atomic and Molecular Data

Wednesday 1 October 2025 14:30 (30 minutes)

China Research Association of Atomic and Molecular Data (CRAAMD) is constituted of about ten groups from universities and Institutes and works on collecting, producing and compiling Atomic and Molecular data (AMdata), which are needed from the related fields of astrophysics, Inertial Confinement Fusion (ICF) and X-ray Laser Research etc.

In the first part of this talk, I will introduce recent activities of China Research Association of Atomic and Molecular Data in the past five years. Then I will present some recent progress of our group in IAPCM on fundamental atomic and molecular physics researches, including the atomic processes in plasma environment, an unexpectedly large quantum interference in the dielectronic and radiative recombination of Be-like highly charged ions, and new modelling of the stopping power of α particles to consider the deflection effects due to multiple scatterings.

Author: GAO, Xiang (IAPCM (China))

Presenter: GAO, Xiang (IAPCM (China))

Contribution ID: 16

Type: **not specified**

Recent research for atomic data and collisional-radiative modeling

Wednesday 1 October 2025 14:00 (30 minutes)

Recent research activities for atomic data and collisional-radiative modeling in Korea Atomic Energy Research Institute, atomic data center are reported. Energy levels, radiative transition probabilities, and electron-impact excitation (EIE) and ionization (EII) for W I was calculated with multi-configuration Dirac-Fock (MCDF) MDFGME code (2024 version). Core-valance (CV) and core-core (CC) electron correlation were considered for configuration interaction of energy levels and the energy accuracies were improved. The radiative transition probabilities by the electron correlation are compared with other available, Hartree-Fock Relativistic (HFR) calculations and MCDF calculation by GRASP code as well as experimental NIST data. The radiative transition probabilities from the different calculations have very large discrepancies from each other and with the experimental data. The EII cross section was calculated Binary encounter Bethe (BEB) model and EIE cross section was obtained by scaled plane wave Born (PWB) approximation. The Maxwellian rate coefficients for EII and EIE are compared with other previous calculational results and discussed. These data are expected to be useful for collisional-radiative modeling for W I which is adopted for the spectroscopic determination of tungsten erosion rate in plasma surface interaction of fusion tokamak. We have also performed measurement and the analysis for the tungsten erosion rate in our plasma beam irradiation facility and are performing it in KSTAR tokamak.

As for collisional-radiative modeling (CRM) activity, we have performed CRM for Ar I and Ar II in low temperature and low density plasma. The effect of considered highly excited levels and the population kinetics processes to the CRM results are presented and discussed in detail with the used atomic data management.

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Presenter: KWON, Duck-Hee (Korea Atomic Energy Research Institute)

Contribution ID: 17

Type: **not specified**

Atomic and Molecular Data Activities at NIFS in 2023-2025

Wednesday 1 October 2025 10:30 (30 minutes)

Atomic and molecular databases and related activities conducted at NIFS during 2023-2025 are reported. Numerical data on collision processes, found in literature, for fusion relevant elements as well as others for various applications such as astrophysics and plasma applications are stored in the databases. Data have been searched by help of working groups by Japanese collaborators. Total number of data record sets in the NIFS Atomic and Molecular Numerical Databases increases to be 1,886,166 which is nearly 15% increase since April, 2023. The data sets in AMDIS EXC, CHART, and AMOL databases are largely increased. Number of database access, counted as number of queries, also increases.

Related research on atomic data and spectroscopy on W, high Z elements such as lanthanides, Kr and BH, has been conducted by NIFS staff and collaborators. Plasma spectroscopy for Large Helical Device (LHD) and compact EBIT (CoBIT) has been carried out and many spectra were obtained. Theoretical calculations on atomic structure, collision cross sections, and collisional-radiative models for those elements and molecules have also been conducted. In addition, plasma parameters were derived from the analysis of the emission spectrum of the hydrogen pellet ablation cloud in LHD experiments. It was revealed that the parameters of the ablation cloud plasma are strongly correlated with the background plasma.

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Presenter: Prof. MURAKAMI, Izumi (National Institute for Fusion Science)

Contribution ID: 18

Type: **not specified**

Study on the Compatibility of Argon Seeding with Helium Exhaust in a Radiative Divertor

Thursday 2 October 2025 10:30 (30 minutes)

The simultaneous management of extreme heat fluxes on divertor targets and the efficient removal of helium (He) ash are critical challenges for steady-state fusion reactor operation. This study investigates the compatibility of the argon (Ar) seeding radiative divertor strategy—a primary heat mitigation technique—with the essential requirement of helium exhaust.

A systematic scan of the argon injection rate was conducted to achieve varying degrees of divertor detachment. The analysis reveals a non-linear relationship between the detachment degree and helium exhaust efficiency, characterized by an optimal window. During the deep energy detachment phase, the neutral pressure in the divertor initially increases, benefiting helium accumulation and compression. However, pushing detachment too far leads to a subsequent drop in neutral pressure, which becomes detrimental to exhaust. This finding underscores that an optimal detachment level must be precisely controlled to balance heat load reduction with efficient ash removal.

In conclusion, this study confirms that compatibility between an Ar-seeded radiative divertor and efficient helium exhaust is achievable. The key to success lies in operating within an optimal window of detachment. This approach simultaneously enables robust heat flux control and maintains high helium exhaust efficiency, providing a crucial integrated solution for the design of next-generation fusion reactors.

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Presenter: YANG, Zhongshi (Institute of Plasma Physics, Chinese Academy of Sciences)