

Dear colleagues,

We are pleased to announce a specialized workshop “***Carbon Burning: Theory, Astrophysics and Experiments***” dedicated to the carbon burning fusion reactions, one of the most intriguing and challenging topics in astrophysics, that will be held in **Padova, Italy** from **30th of June to 2nd of July 2026**. This three-day meeting will bring together the experimental, theoretical, and astrophysics communities to discuss recent advances and future directions in understanding this crucial stellar burning process.

The carbon burning reactions play a pivotal role in multiple astrophysical environments, from the evolution of massive stars to Type Ia supernovae and neutron stars. However, despite decades of study, the reaction mechanism at stellar energies remains poorly understood, with major uncertainties regarding resonance structures, possible hindrance effects, and the extrapolation to the Gamow window.

The workshop will provide a comprehensive view of the carbon burning processes, beginning with their astrophysical importance in stellar evolution, Type Ia supernovae, and in the crust of accreting neutron stars. The program will feature recent advances in direct measurement techniques - including particle spectroscopy, gamma-ray spectroscopy, and particle detection methods - from state-of-the-art facilities. Special emphasis will be placed on innovative approaches to background reduction and the ongoing efforts to push measurements toward the Gamow window.

Complementing the experimental program, the workshop will explore indirect approaches along with diverse theoretical and phenomenological frameworks. Discussions will address key questions including the nature of resonance structures in ^{24}Mg , possible hindrance effects at low energies, molecular states, and the implications for stellar nucleosynthesis and the final fate of stars. The workshop will conclude with a round table discussion to chart future directions and identify the key measurements and theoretical developments needed to achieve consensus on the astrophysical reaction rate.

Registration and Abstract Submission

Registration will open on **30/01/2026**. The fee will amount to **200€** for all the participants. Limited financial support for participants may be available, subject to funding approval currently under review. Further details will be announced in the second circular. Participants are encouraged to submit abstracts for contributed talks. Limited slots for contributed talks will be available, selected to complement the invited program and foster comprehensive discussions.

Important Information:

- Registration opens: **30/01/2026**
- Second Circular: **March 2026**
- Abstract submission deadline: **End of April 2026**
- Workshop dates: **30th June – 2nd July 2026**
- Website: <https://indico.dfa.unipd.it/event/1643>

Venue and Logistics

Detailed information about the workshop location, accommodation options, and local arrangements will be provided in a second circular. We are working to secure a venue that will facilitate both formal presentations and informal discussions among participants.

Contact

For questions regarding the workshop, please contact:

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We look forward to welcoming you to this focused and timely workshop on carbon burning fusion.

The Organizing Committee

Jakub Skowronski (Chair) – Università degli Studi di Padova and INFN Padova

Raffaele Buompane – Università degli Studi della Campania "Luigi Vanvitelli" and INFN Napoli

Antonio Caciolli – Università degli Studi di Padova and INFN Padova

Sandrine Courtin – Université de Strasbourg and CNRS

Federico Ferraro – INFN Laboratori Nazionali del Gran Sasso

Faïrouz Hammache – IJCLab, Orsay

Maria Lugaro – Konkoly Observatory, Research Centre for Astronomy and Earth Sciences, HUN-REN and CSFK HUN-REN, MTA Centre of Excellence

Eliana Masha – HZDR Helmholtz Zentrum Dresden Rossendorf

Xiaodong Tang – Institute of Modern Physics, Chinese Academy of Sciences and Joint Department of Nuclear Physics, Lanzhou University

Aurora Tumino – Università degli Studi di Enna “Kore” and INFN Laboratori Nazionali del Sud