

The 3rd International Workshop on Proton-Boron Fusion

October 2 – 5, 2023



Funded by
the European Union

Monday - October 2, 2023

08:30 – 09:00 | Registration on site

Opening Session (Chair: Lorenzo Giuffrida)

09:00 – 09:10 | **Lorenzo Giuffrida** (ELI Beamlines Facility)
& **Katarzyna Batani** (Institute of Plasma Physics and Laser Microfusion, Warsaw)

09:10 – 09:30 | **Andrew Harrison** (ELI ERIC) & **Daniele Margarone** (ELI Beamlines Facility)

09:30 – 09:40 | **Maria Cristina Falvella** (Italian Embassy)

09:40 – 09:50 | **Vito De Bellis** (Istituto Italiano di Cultura)

Advanced fusion approaches (Chair: Lorenzo Giuffrida)

09:50 – 10:20 | **INVITED LECTURE | Fabio Belloni**
Status, prospects and basic research needs of p-11B fusion

10:20 – 10:40 | **Katarzyna Batani**
Challenges, perspectives and applications of the laser driven proton-boron fusion supported by COST Action PROton BORon Nuclear fusion: from energy production to medical applicatiOns (PROBONO)

10:40 – 11:00 | Coffee Break

Advanced fusion approaches (Chair: Tom Mehlhorn)

11:00 – 11:30 | **INVITED LECTURE | Yongtao Zhao**
A Much-higher-than-predicted Measurement of Proton-Boron Fusion at Extremes

11:30 – 11:50 | **Bing Liu**
ENN's proton-boron fusion research towards fusion energy

11:50 – 12:10 | **Jianqiang Zhu**
The picosecond petawatt program at the National Laboratory on High Power Laser and Physics in China

12:10 – 12:30 | **Yihang Zhang**
Energetic alpha particles generated in resonant proton-Boron reactions in laser-modulated plasmas

12:30 – 13:50 | Lunch Break

Advanced fusion approaches (Chair: Dimitri Batani)

- 13:50 – 14:20 | **INVITED LECTURE | Thomas Mehlhorn**
Fusion Burn and Target Design Criteria for the Proton-Boron Fuel Cycle Driven by Short Pulse Lasers
- 14:20 – 14:50 | **INVITED LECTURE | Richard Magee**
Measurements of p11B alphas in a magnetically confined plasma
- 14:50 – 15:10 | **Georg Korn**
Overview of Marvel Fusion
- 15:10 – 15:30 | **Marius Schollmeier**
Experiment activities towards the validation of a directly driven, nanostructured, mixed-fuel fusion reactor
- 15:30 – 15:50 | **GAP Cirrone**
The FUSION project: p(11B, α) 2α fusion reaction studies for energy production and other applications
- 15:50 – 16:10 | Coffee Break

New experimental results (Chair: Daniele Margarone)

- 16:10 – 16:40 | **INVITED LECTURE | Eric Lerner**
Preparations for and Early Results of pB11 Tests in FF-2B Dense Plasma Focus
- 16:40 – 17:00 | **Roch Kwiatkowski**
Proton-Boron Nuclear Fusion Reactions in the Plasma-Focus Device
- 17:00 – 17:20 | **Daniel Molloy**
Enhanced In-Target Alpha Particle Generation using the kJ LFEX Laser System
- 17:20 – 17:40 | ~~**GAP Cirrone CANCELLED**~~
~~*Investigation of p-11 B Nuclear Fusion Reaction with Optimized Targets and Diagnostics at the PALS Facility in Prague*~~
- 17:40 – 18:00 | **Jingxiang Shen**
Laser shock compression BN EOS measurement up to 1.6 Tpa

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- 18:15 – 19:15 | Welcome Drink

Tuesday - October 3, 2023

Theory and simulations (Chair: Fabio Belloni)

- 09:00 – 09:30 | **INVITED LECTURE | Hartmut Ruhl**
An Ultra-Short Laser Pulse based Direct Drive Nuclear Fusion Concept
- 09:30 – 09:50 | **Thomas Carriere**
Simulations of production of alpha particles sources through proton-boron nuclear reactions initiated by relativistic lasers
- 09:50 – 10:10 | **Gaurav Raj**
Front side ion acceleration in a nano-structured target into the incoming femto-second laser pulse
- 10:10 – 10:30 | **Roberto Versaci**
FLUKA capabilities for the simulation of nuclear reactions of p on B
- 10:30 – 10:50 | **Stavros Moustazis**
Towards p-11B fusion configurations with high Pfus/PBrems ratio
- 10:50 – 11:10 | Coffee Break

Diagnostics (Chair: Dieter H.H. Hoffmann)

- 11:10 – 11:30 | **Jens Hartmann**
Analysis of laser-driven plasma irradiated CR-39 for proton-boron fusion particle yields
- 11:30 – 11:50 | **Gordana Lastovicka-Medin**
R&D on the Silicon Carbide Based Detectors and Instrumentation Characterisation techniques for Ultra-high Dose rate Dosimetry and Nuclear Fusion
- 11:50 – 12:10 | **Fabrizio Consoli**
Advanced Time-of-Flight detection methodologies for fast real-time ion diagnostics in laser-triggered proton-boron experiments

12:10 – 12:30	Giada Petringa <i>CR-39 track detector calibration with H and He beams for future applications in the p-11B fusion reaction</i>
12:30 – 12:50	Christina Weiss <i>Diagnostics for fusion applications based on CVD diamond</i>
12:50 – 14:00	Lunch Break

New results 1 (Chair: Lorenzo Giuffrida)

14:00 – 14:20	Massimiliano Sciscio` <i>Laser-Initiated $11B(p,\alpha)2\alpha$ fusion reactions in petawatt-scale, high-repetition-rate laser facilities</i>
14:20 – 14:40	Marine Huault <i>Laser-driven proton-boron reaction for alpha particles production</i>
14:40 – 15:00	Aldo Bonasera <i>Radioisotopes production using lasers: from basic science to applications</i>
15:00 – 15:20	Katarzyna Batani <i>Generation of radioisotopes using high-repetition, high-intensity lasers</i>
15:20 – 15:40	Coffee Break

15:40 - 17:30 | Poster Session

Timofej Chagovets

High Repetition Rate Target System for Proton-Boron Fusion

Saverio De Luca

Ions stopping power of $p\text{-}^{11}\text{B}$ reaction in laser-generated plasma

Alice Fazzini

Contrast enhancement at ELI-NP allowing for laser interaction with nanostructured fusion targets

Kyle Kenney

High Throughput Processing / Microscopy of SSNTDs for laser-driven pB11 reactions

Howel Larreur

Optimisation of catcher target thickness in laser-driven proton-boron fusion experiments

Ryszard Miklaszewski

Proton-Boron Nuclear Fusion Reactions in the Plasma-Focus Device

Diluka Singappuli

Design of Equation of State experiments on boron nitride in extreme conditions

Martin Speicher

Progress report on the planned Marvel Fusion experimental area at the Centre for Advanced Laser Applications

Gediminas Stankunas

Feasibility Study of Neutronic Analysis and Activity Inventories using Monte Carlo code for the Proton-Boron Fusion Installations

Przemysław Tchórz

Laser-induced, intense multi-MeV proton beam formed through $D(d,p)T$ reaction and its potential application in proton-boron Fusion

Marco Tosca

Nanoparticles of plasma polymerized hexane as targets for laser-driven proton-boron Fusion

Wednesday - October 4, 2023

Targets (Chair: Ion Cristian Edmond Turcu)

- 09:00 – 09:30 | **INVITED LECTURE | Alex Robinson**
Ion Beam Transport in Plasmas at Very High Intensities
- 09:30 – 09:50 | **Antonino Picciotto**
Synthesis of advanced (NH₃-BH₃) ammonia borane targets at FBK for laser driven proton boron fusion experiments
- 09:50 – 10:10 | **Carlos Monton**
Target Fabrication Strategies at General Atomics for Proton-Boron Fusion Experiments
- 10:10 – 10:30 | **Davide Orecchia**
Advancements in Pulsed Laser Deposition of boron-based targets for p-11B studies
- 10:30 – 10:50 | Coffee Break
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Targets (Chair: Antonino Picciotto)

- 10:50 – 11:10 | **Ion Cristian Edmond Turcu**
High Repetition Rate, High Flux, Laser-Driven Alpha-Sources with Proposed Ammonia-Borane Droplet-Targets, Tape-Targets and Disc-Targets
- 11:10 – 11:30 | **Daniel E. Rivas**
Target morphology effects in the interaction of ultra-intense laser pulses with nanostructured boron
- 11:30 – 13:00 | Lunch
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14:00 – 17:00 | COST Meeting

The meeting for invited COST members only.

18:30 – 21:00 |

Dinner Party

Gallery of the Malostranská beseda (on the 3rd floor)
Malostranské náměstí 21, Praha 1

Thursday - October 5, 2023

08:00 – Bus departure to ELI Beamlines Facility - see the meeting point on the web page

Medical applications (Chair: GAP Cirrone)

- 09:00 – 09:10 | **Allen Weeks (ELI ERIC) & Roman Hvězda (ELI Beamlines Facility)**
Introduction
- 09:10 – 09:40 | **INVITED LECTURE | Aleksander Bilewicz**
Medically Important Radionuclides Obtained by Alpha Particle Irradiation
- 09:40 – 10:00 | **Pavel Kundrat**
Is proton boron capture therapy based on intercellular signaling?
- 10:00 – 10:20 | **Marie Davidkova**
Glioblastoma cell response to photon and proton irradiation in the presence of boron compounds
- 10:20 – 10:40 | **Pavel Blaha**
Proton therapy efficacy enhancement by combined use of proton boron fusion and very high dose rate irradiation
- 10:40 – 11:00 | Coffee Break
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New results 2 (Chair: Daniele Margarone)

- 11:00 – 11:30 | **INVITED LECTURE | Valeriia Istokskaia**
A multi-MeV Alpha Particle Source via Proton-Boron fusion driven by a 10-GW Tabletop Laser
- 11:30 – 11:50 | **Bruno Gonzalez-Izquierdo**
Contrast enhancement via second harmonic generation in a PW-level glass laser system for novel laser-driven nanostructured fusion schemes
- 11:50 – 12:10 | **Di Luo**
Experimental study of Proton-boron fusion in a hydrogen-doped-boron target
- 12:10 – 12:30 | **Daniel Ursescu**
Prospective laser characterization developments at the 2x10 PW laser facility of ELI-NP
- 12:30 – 13:40 | Lunch Break

13:40 – 15:30 | ELI Beamlines Facility Tours

15:30 – 15:50 | Coffee Break

15:50 – 16:30 | Closing Session

17:00 | Bus departure - to the city centre (Main Railway Station, metro station "Hlavní nádraží" - the red line C)

17:00 | Bus departure - to the Prague airport

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