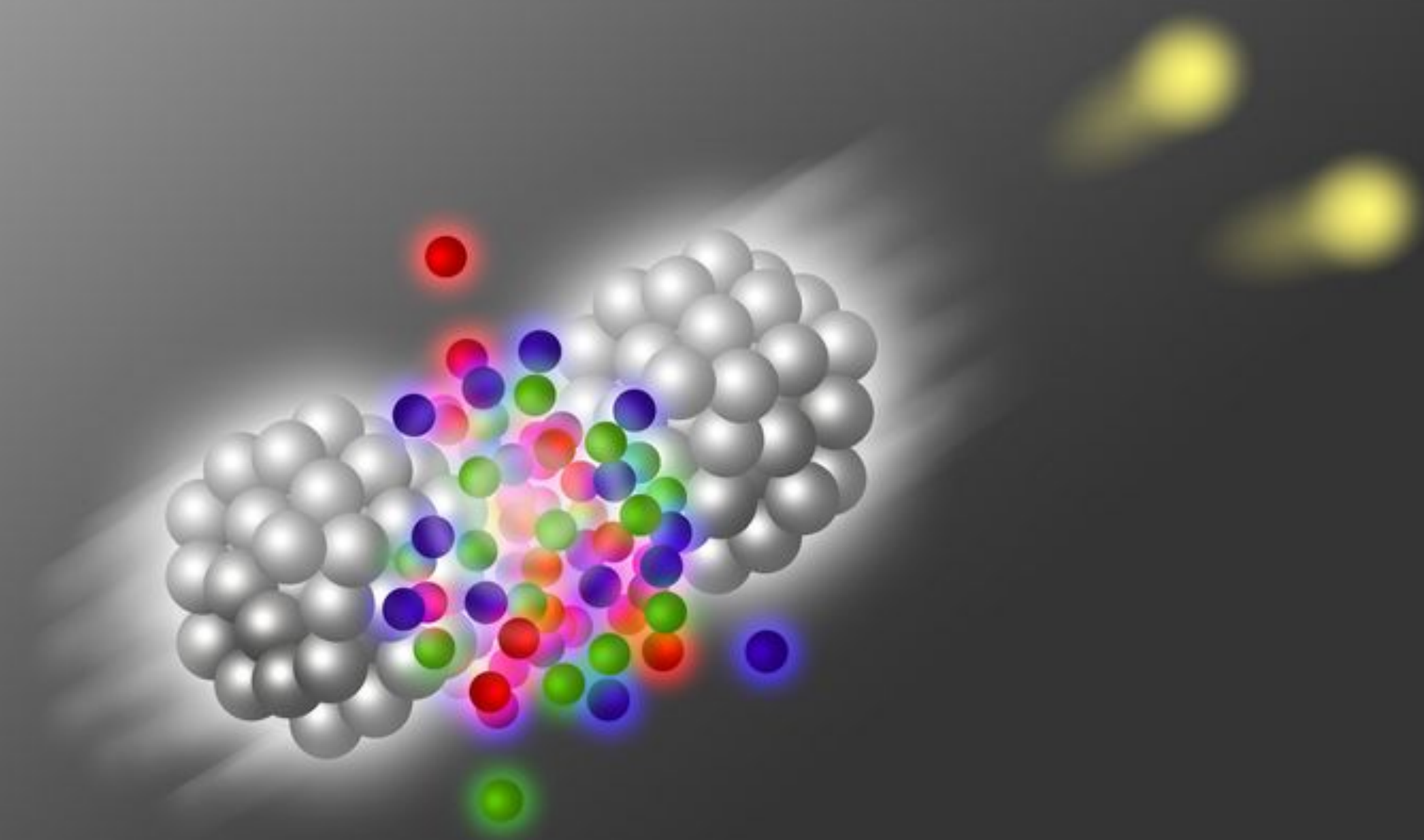
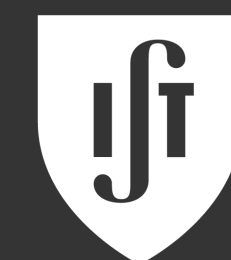


LIP Phenomenology group

2025/2026 Highlights



Liliana Apolinário



TÉCNICO
UNIVERSIDADE
DE LISBOA

Pheno Group

Core Activities

QCD

High-precision studies at the
LHC
NNLO corrections

@ Lisbon

Heavy-Ions

Theoretical development of jet
quenching

Monte Carlo Event Generators

Jet observables as probe of the
QGP

@ Lisbon

BSM

AI and ML techniques as
anomaly detection

Dark matter candidates and
their interactions at colliders

@ Braga

Internal (LHC, NP-Strong, Astroparticles, Big Data) and External Collaborations / Outreach

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QCD

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LHC
NNLO corrections

@ Lisbon

Heavy-Ions

Theoretical development of jet
quenching

Monte Carlo Event Generators

Jet observables as probe of the
QGP

+3 CEEC Candidates 2026 (?)

@ Lisbon

BSM

AI and ML techniques as
anomaly detection

Dark matter candidates and
their interactions at colliders

+1 CEEC from 2025 (declined)

@ Braga

Internal (LHC, NP-Strong, Astroparticles, Big Data) and External Collaborations / Outreach

Funding

Current status and on-going applications

Existent:

FCT Exploratory projects (A. Sadofyev): “Anomalous collective modes in Weyl semimetals” - **50 k€**

FCT ERC-PT A projects (L. Apolinário): “Unveiling the Time Dynamics of Quantum Chromodynamics in the Quark-Gluon Plasma” - **250k €**

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Result of 2025/2026 Applications:

Funded:

Horizon Europe 2030 (L. Apolinário): “JETQCD” within WP3 - **130k€**

Not Funded:

ERC-Consolidator 2025 (L. Apolinário): “Unveiling the Time Dynamics of Quantum Chromodynamics in the Quark-Gluon Plasma” - ChronoQCD (Interview stage, Score: A)

ERC-Consolidator 2025 (A. Sadofyev): “Jet Tomography of QCD Matter” - iJet (Interview Stage, Score: B)

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(To be) Submitted in 2026:

Submitted:

FCT projects (L. Apolinário): QCD-MATTERS: “From Dilute to Dense QCD matter: A coordinated Portuguese Research Program” - **250 k€**

FCT Projects (A. Morais): MultiMess: “Multi-messenger probes of new physics: from gravitational waves to particle colliders” - **250k€**

FCT Projects (J. Pires): QCDtheoryForLHC: “Advancing Precision: Simulating Particle Collisions with High Accuracy at the LHC” - **60k€**

To be submitted:

ERC-Consolidator 2027 (L. Apolinário): “Unveiling the Time Dynamics of Quantum Chromodynamics in the Quark-Gluon Plasma” - ChronoQCD

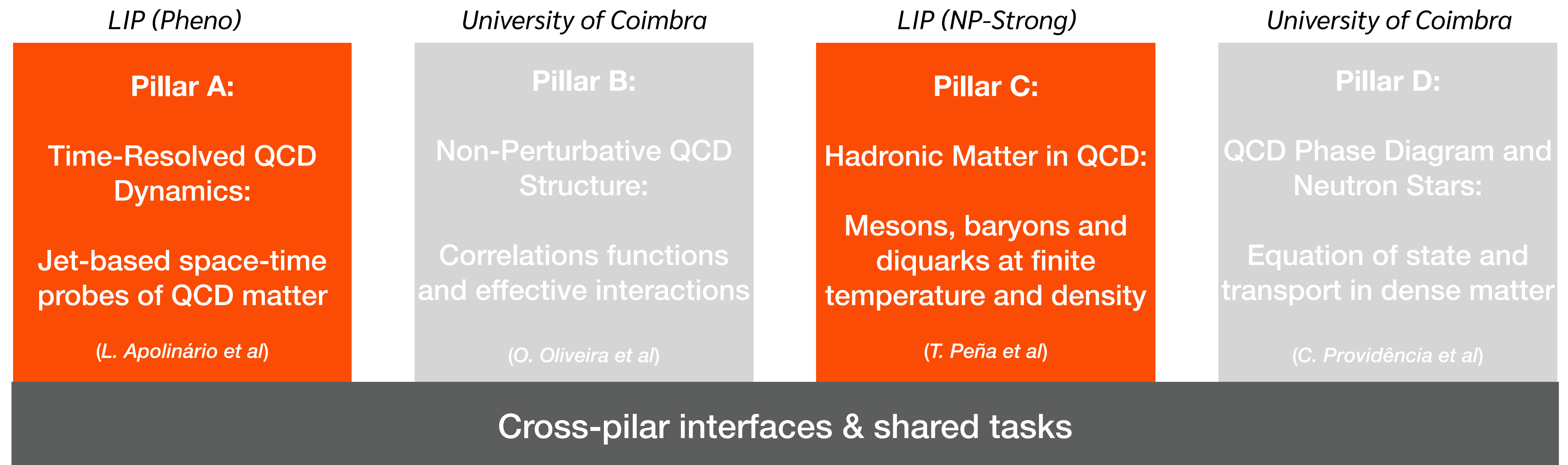
LIP: Pheno & NP-Strong

QCD-MATTERS

*From dilute to dense QCD matter:
A Coordinated Portuguese Research Program*

QCD across regimes:

Perturbative — non-perturbative — few-body — compact matter



Group Members

Members that left and new entries in 2025/2026

Leaving:

Andrey Sadofyev (HI): permanent position @ Bilbao University (Spain)

João Pino (BSM): completed PhD degree
→ *Applying for CEEC within Pheno group*

João Gonçalves (HI): completed PhD degree
→ *PD @ Bonn University*

Daniel Araujo (BSM): completed MSc Degree
→ *Applying for PhD in the group*

Ilda Martins (BSM): completed MSc Degree
→ *Applying for PhD in the group*

**Via FCT ERC-PT A Project*

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→ *Applying for PhD in the group*

Ilda Martins (BSM): completed MSc Degree
→ *Applying for PhD in the group*

Entering:

***Balbeer Singh (HI):** Post-Doc

***Ankita (HI):** Post-Doc (Sep 26)

Afonso Guerreiro (HI): PhD

→ Transition from MsC in the group

Diogo Costa (HI): PhD

→ Transition from MsC in the group

Alexandre Mendonça (HI): MSc

Manuel Ramos Baptista (HI): MSc

**Via FCT ERC-PT A Project*

Scientific Impact

International visibility

30.5 FTEs (7.2 Researchers, 14 PhD, 12 MSc): 17 Published Papers + 6 submitted + ~40 talks/seminars

Selected talks in main conferences

O LIP na Quark Matter 2025



59th Rencontres de Moriond 2025



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59th Rencontres de Moriond 2025



Invited lectures at International PhD schools

FNHP2026
FRONTIERS IN NUCLEAR AND HADRONIC PHYSICS
School at the Galileo Galilei Institute for Theoretical Physics
Florence, February 16 - February 27, 2026

LECTURERS

- L. Apolinario (LIP Lisbon)
Jet Physics in ultra-relativistic collisions
- N. Brambilla (Tech. Univ. of Munich)
Non-Relativistic EFT and Lattice QCD for Heavy Flavor Dynamics
- G. Giacalone (CERN, Geneva)
Nuclear Structure studies through ultra-relativistic collisions
- S. Schlichting (Bielefeld Univ.)
Hydrodynamics and Kinetic Theory: Attractors and Thermalization
- A. Vuorinen (Helsinki Univ.)
Dense matter equation-of-state from colliders to neutron stars

ORGANIZERS

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Ignazio Bombaci (Pisa U.)	Maria Colonna (INFN LNS)
Luigi Coraggio (INFN, Napoli)	Vincenzo Greco (Catania U.)
Elena Santopinto (INFN Genova)	Enrico Viguzzi (INFN Milano)

XV School of the Gravitation and Mathematical Physics Division - SMF
Playa del Carmen, Mex. November 3-7, 2025

The 15th edition of this biennial event brings together experts in gravitation, relativity, and mathematical physics for courses, lectures, and presentations. This year, it is organized in collaboration with the Research Network on New Fundamental Fields in Compact Objects.

To register, please fill out in the registration form:
<https://forms.gle/1wxHFEZDRdmBobEb7>
Deadline for abstract submission: September 5th.

Interested students may apply for partial financial support at the following:
<https://forms.gle/CFuuQmyRyEFdzhzX6>
The deadline for support applications is August 13.

Organizing committee:
Argelia Bernal, Ana Garcia-Perciante, Luisa G. Jaime, Carlos Herdeiro

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Outreach talks @ JorTec 2025, FCT, NOVA and PhysFront IST 2025

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Workshop organisation (2 weeks, 50 participants)



+ Applied for EMMI workshop 2026

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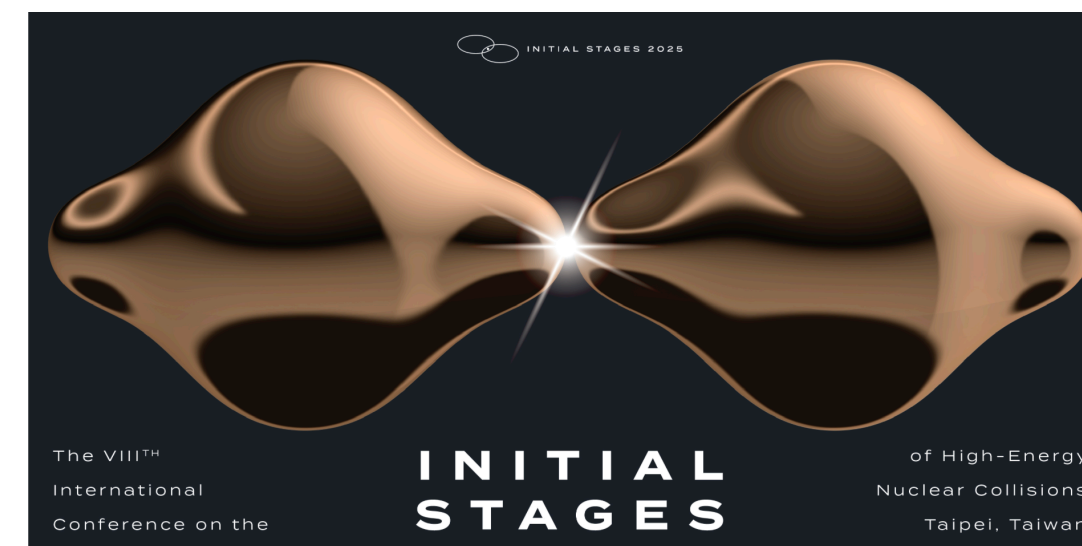


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**IAC Member Hard Probes
(250 participants)**



**IAC Member Initial Stages
(150 participants)**



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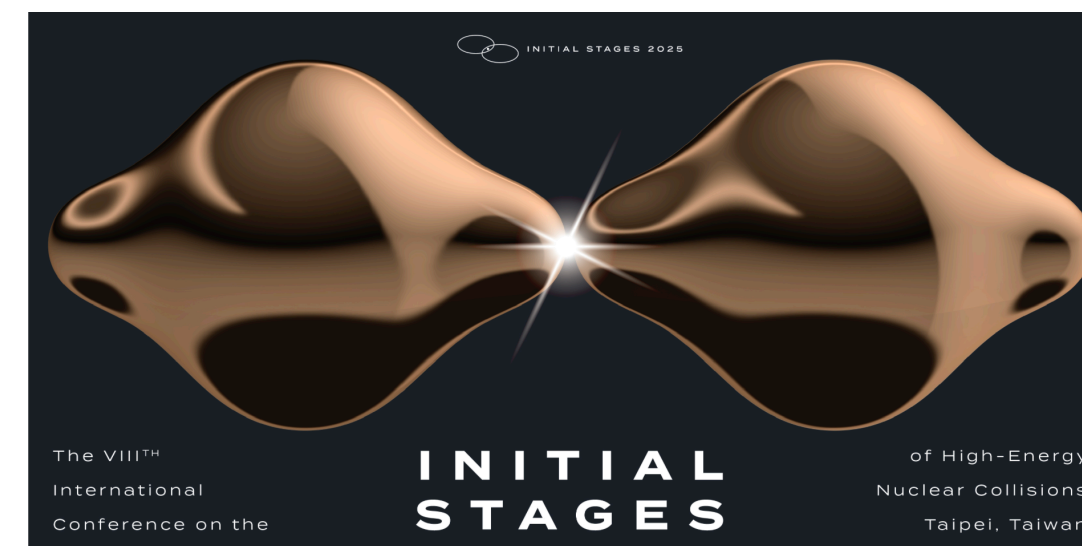


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**Heavy-Ion Theory Convener
(On-going)**

LPCC
LHC Physics Centre at CERN

Main focus:

Preparation of lighter-ion runs for Run 4

1. Onset of collectivity and jet quenching in small systems

Recent light-ion collisions have demonstrated the emergence of jet quenching in O-O and Ne-Ne collisions at the same final-state multiplicities where such an effect is not observed in p-Pb collisions [1]. In parallel, collective flow results down to O-O collisions appear to be remarkably consistent with a hydrodynamic interpretation. Comparison of Ne-Ne and O-O collisions further demonstrate the strong impact of the *shape* of neon [2, 3], implying that reliable *ab initio* nuclear calculations can be effectively used to generate the initial states of these systems [4].

Given the great success of the O-O and Ne-Ne program, the idea of this science case is to repeat such an analysis but decreasing even further the size of the colliding nuclei.

Proposed experiments

The idea is to exploit small nuclei with the same $Z/A = 1/2$. The possibilities are

- Li+Li (A=6) followed by He+He (A=4)
- B+B (A=10) followed by He+He (A=4)
- B+B (A=10) followed by Li+Li (A=6), but they are both solids [second ion injector]
- X+X followed by p-X, to get a handle on nPDF uncertainties

SWOT

Strengths: **Internationally competitive and visible research program** in precision QCD, heavy-ion physics, and BSM phenomenology; strong leadership in several core areas; **proven ability to attract competitive national and European funding**; successful training of early-career researchers with strong international placement.

Weaknesses: **Limited availability of permanent academic positions in theory** at the national level constrains long-term retention of senior expertise; continued dependence on temporary and individual-based funding schemes complicates strategic workforce planning despite sustained scientific success.

Opportunities: Strong interest from high-quality national and international candidates to join the group through competitive calls; recently strengthened **synergies within LIP** (notably with NPStrong, astroparticle physics, and simulation activities); **Potential to act as a national coordination hub for QCD-related research across institutions.**

Threads: **Risk of losing highly trained researchers to permanent positions abroad** due to structural limitations in the national academic system; uncertainty in long-term funding and availability of PhD positions may limit continuity and slow renewal despite a strong pipeline of qualified candidates.

Acknowledgments

