

NA6 - LatticeHadrons

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Co-ordinating institutions:

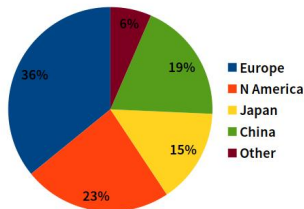
- Trinity College Dublin **MP**
- University of Edinburgh **Luigi del Debbio**
- INFN **Maria-Paola Lombardo**
- Universidad Autónoma de Madrid **Gregorio Herdoíza**
- Johannes Gutenberg-Universität Mainz **Hartmut Wittig**
- Universität Regensburg **Gunnar Bali**

In collaboration with ≈ 35 other institutions across Europe.

This project has received funding from the EU Horizon 2020 research and innovation programme under grant agreement No. 824093

Lattice QCD - European leadership

- **A significant fraction of LQCD research is carried out in Europe**
- **Maintain this leading role and develop better links to experimental groups and other theorists**

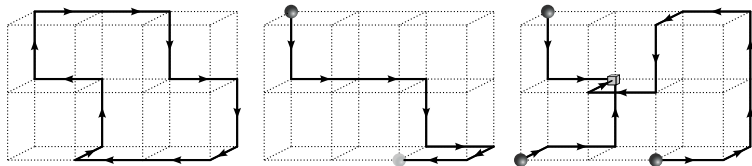


Participants: Lattice 2019 Wuhan

- **International collaborations with researchers in US, Japan, China, Australia, ...**
- **EU networks: EuroPLEx (ITN), Stimulate (EJD), COST actions...**

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Lattice QCD



- **Complete, non-perturbative regularisation of the QCD path integral in limit $a \rightarrow 0$.**
- **Quarks on sites, gluons on links.**
- **Euclidean space-time; dynamical properties such as scattering can be inferred.**
- **Manipulating quark fields a numerical challenge.**
- **Current simulations at physical m_π in $m_\pi L \approx 3 - 5$.**

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Network research themes

- **Network structured around four themes:**

Hadron spectroscopy & structure

- **Hadron spectrum, including resonances**
- **Structure** $g_{A,S,T}$, **pdfs**, ...
- **Exotics:** $\bar{q}Gq$, $\bar{q}\bar{q}qq$, GG

Hadrons under extreme conditions

- **QCD at finite temperature**
- **Hadrons at finite density**
- **Understand the QCD phase diagram**

Hadrons in the SM and beyond

- **Precision QCD and SM parameters**
- **QCD & QED**
- **Strongly-coupled QFTs**

Algorithms for Lattice Hadrons

- **Monte Carlo and related numerical methods**
- **Sign-problems in QCD**
- **LQCD at the exascale**

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Topical workshops (1)

Hadron spectroscopy and structure

August 2020 [3 days] (following Lattice 2020, Bonn)

A topical workshop on lattice calculations related to hadronic resonances, exotic hadrons and the structure of hadrons.

Venue: Universität Regensburg

LOC Chair:

- **G. Bali**

Topical workshops (2)

Hadrons under extreme conditions

Spring 2021 [3 days]

A topical workshop discussing progress in understanding hadrons at extreme temperatures and densities and their experimental signatures. How well is the QCD phase diagram understood?

Venue: Firenze?

LOC Chair:

- **M-P. Lombardo**

Topical workshops (3)

Algorithms for Hadron Physics on the Lattice

September 2021 [3 days]

A topical workshop discussing new numerical techniques to accelerate Monte Carlo calculations on large-scale parallel computers. Are we ready for exascale computing?

Venue: University of Edinburgh

LOC Chair:

- **L. Del Debbio**

Topical workshops (4)

Hadrons in the SM and Beyond

Spring 2022 [3 days]

A topical workshop discussing precision SM theory inputs for BSM searches and the strongly interacting dynamics of theories that could describe new physics.

Venue: Universidad Autónoma de Madrid

Committee:

- **G. Herdoíza**
- **M. García Pérez**
- **A. González-Arroyo**
- **C. Pena**

Milestones & Deliverables

Milestone		Month
MS23	Workshop on hadron spectroscopy & structure	14
MS24	Workshop on hadrons under extreme conditions	20
MS25	Workshop on hadrons in the SM & beyond	36
MS26	Workshop on algorithms for lattice hadrons	28
MS27	Enhanced integration of lattice research	36

Deliverables		Month
D17.1	Report: hadron spectroscopy & structure	20
D17.2	Report: hadrons under extreme conditions	26
D17.3	Report: hadrons in the SM & beyond	36
D17.4	Report: algorithms for lattice hadrons	36
D17.5	White paper: integration of European LFT	36

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STRONG-2020 - connection to EuroHPC



- **EuroHPC: Joint Undertaking by European Commission to enable EU to become world-leading in supercomputing.**
- **Lattice QCD has pioneered supercomputing architectures, applications and programming models.**
- **STRONG-2020 helps “integration of relevant facilities”**
- **Connect the LatticeHadron STRONG-2020 network to EuroHPC activities in the community.**
- **Plan a town-hall meeting for early 2020.**

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Summary

- **Planning now underway for four workshops**
 - **Milestones: MS23 (Aug 2020), MS24 (Spring 2021)**
 - **Deliverables: D17.1 (Oct 2020), D17.2 (Summer 2021)**
- **Ordering of meetings optimised to avoid clashing with other workshops and conferences and maximise benefits of interactions with other networking activity.**
- **Developing EuroHPC connections under consideration. Integrate strong-interaction physics with European exascale computing initiative.**