Letter of intent: proposal template

Please specify an acronym, a project title and the name(s) of the project leader(s)

Lattice Hadron Physics (LHP), Gunnar Bali

In the sections below, please provide details on *(2 pages max.):*

1. Research objectives

Lattice QCD calculations are needed for the full exploitation of the potential of a number of major Hadron Physics infrastructures in Europe and beyond. There will also be exhange and interaction with related theory initiatives. Regarding CERN (in particular AMBER, LHCb and ALICE) as well as MESA Mainz, ELSA Bonn, JLab and planned experiments at FAIR (CBM and PANDA) and BNL (EIC) a number of hadron structure observables, advanced spectroscopy calculations and simulations of QCD under extreme conditions are required. This activity will coordinate efforts by the European Lattice QCD community, support these activities and develop relevant tools. The objectives include

- Data curation and virtual access, in particular activities related to the International Lattice Data Grid (ILDG): Maintenance and development of tools and standards, support of the two regional grids Latfor Data Grid (LDG) for Continental Europe and UK Lattice Field Theory (UKLFT) for the UK, provision of ILDG user training and support, including a help desk and liaison with supercomputing centres and storage element providers for this purpose.

- Extending existing connections between researchers across Europe working in lattice hadron physics: yearly town meetings around the virtual research community "EuroLat" (note that the acronym may change), two focused topical workshops. Encouragement of the exchange of information on new methods, software and results. Staff and student secondments.

- Linking European research groups in lattice field theory to broader expertise in hadron phenomenology. Co-organize two cross-activity workshops, in coordination with other research activities. Support for other impromptu workshops.

- Identification of novel observables amenable to LQCD methods through discussion with other scientists working at the infrastructures or working in support of the infrastructures.

- Supporting/financing of yearly Lattice Practices hands-on training workshops for students and early postdocs, ideally at the centres offering TA, and in coordination with the LaVA (Lattice Virtual Academy) E-learning platform that emanated from the STRONG-2020 NA6 activity.

- Benchmarking of common LQCD kernels on different computer architectures and analysis of emerging HPC architectures with focus on LQCD use cases.

- Research on algorithms.

- Development of optimized community application kernels and porting these to new platforms.

2. Connection to Transnational Access infrastructures (TAs) and / or Virtual Access projects (VAs)

As detailed above, close connections to CERN, ELSA, FAIR and MESA exist. Clearly, there are also relations to LNF activities, related to CERN experiments, Jlab, Belle II, BES III etc.
Being a theory activity, coordination with the ECT* is essential, in particular ECT* already offers VA for LaVA.

3. Estimated budget request

Organizing the proposed meetings, workshops and training events as well as research visits and secondments between teams and to Infrastructures will cost at least Euro 40000 per year.

The ILDG activities, including user support and a help disk as well as the benchmarking and publishing of the results and software research/development/maintenance as a service to the community requires 1 FTE, which amounts to roughly Euro 360000.

We therefore request a total of Euro 520000.

4. Participating and partner institutions

Trinity College Dublin (TCD), INFN, The University of Edinburgh (UEDIN), Johannes-Gutenberg-Universität Mainz (JGU), Universität Regensburg (UREG),
Consejo Superior de Investigaciones Científicas/Universidad Autónoma de Madrid (CSIC/UAM) and others.