

VIPER: Virtual Platform at ECT* and Related facilities

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1 Research objectives

We propose to extend the *Virtual Platforms* activity at ECT* using the expertise gained with LaVA, the Lattice Virtual Academy. LaVA provides training on lattice quantum field theory through a collection of lectures which is continuously updated and enriched. It is a spinoff of STRONG-2020 — see the talks *NA6-Lattice Hadrons* by Mike Peardon at the STRONG-2020 Annual Meeting and by Maria Paola Lombardo at *Present and Future Perspectives in Hadron Physics*. During discussions at LNF, an agreement emerged to continue LaVA under the ECT* umbrella, a collaboration initiated during Gert Aarts' directorship.

LaVa is a model for virtual platforms that complement static, printed lectures and reviews. Discussions with the ECT* Scientific Board have highlighted the interest in extending this concept to other aspects of strong-interaction physics and related areas. The research objectives of this project are to create a new platform following the LaVA model.

We intend to build a second platform, tentatively titled Effective field theory Virtual Academy (EVA), devoted to another topic relevant for hadron physics. EVA would extend LaVA smoothly, as effective field theories (EFTs) serve to analyze and extrapolate lattice data to lower quark masses, larger volumes, and more hadrons. Because EFTs provide the rationale to extend the Standard Model systematically and now underline most *ab initio* approaches to nuclear structure and reactions, this project would facilitate the connections between hadrons and both particle physics and more traditional aspects of nuclear physics.

Eventually other platform topics of interest to hadron physics could be considered as well. The VIPER PIs have expertise also on more phenomenological studies and they can reach out

to other subcommunities. Needless to say, the joint development of different platforms may well lead to cross fertilization.

The PIs comprise researchers heavily involved in LaVA as well as the ECT* current Director, Board Chair, and Board members with expertise on effective field theories. The current version of this Lol, which we hope the Steering Committee for Hadron Physics in Horizon Europe accepts, is an update of the version submitted on June 15, incorporating the enthusiastic support from the ECT* Board during its June 19 meeting. Clearly, input from the Steering Committee and the Nantes assembly will be welcome as well.

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

LaVA is now accessible on the ECT* site as the first example of a new *Virtual Platforms* initiative, <https://www.ectstar.eu/virtual-platforms/>. This initiative was conceived to strengthen the ECT* mission to serve the European community of researchers working on nuclear physics in its broadest sense.

ECT* is recognized as a TA infrastructure by NuPECC, with 32 years of service primarily through the organization of activities (workshops, schools, and collaboration meetings) where new ideas are scrutinized and new research paths planned. TA access is crucial for the in-person interactions that extend well beyond the lecture hall. Continuous VA to the progress that results from in-person activities capitalizes on the resources devoted to TA.

3 Budget request: 50k euros

We foresee one in-person collaboration meeting per year for the four-year duration of the project. The meetings would include the PIs and possible contributors to VIPER, as well as leading researchers who would help shape the topics covered. A natural venue for these collaboration meetings is ECT* itself, but other centers such as Edinburgh and MITP are also possibilities. Short visits to ECT* to coordinate with the staff would take place as well.

Edinburgh would provide matching funds on the order of 5k euros for a meeting. ECT* commits time of its staff for the organization of collaboration meetings and setting the website up, which was precious for LaVA. The budget request assumes expenses at a (low) rate of 100 euros/person-day. It would allow the participation of ~ 20 people for five days per year for collaboration meetings and visits, for a total of 400 person-days. The total direct costs are 40k euros. With 25% in indirect costs, the total budget amounts to 50k euros.

4 Participating and partner institutions

ECT*, Swansea University, Universität Mainz, Universität Regensburg, Universität Bern, University of Edinburgh, Liverpool University, INFN, Universitat de Barcelona, Università di Pavia, Trinity College Dublin, CEA-Saclay.