**Description of the infrastructure**

Name of the infrastructure (and its installations, if applicable):

ECT\*, European Centre for Theoretical Studies in Nuclear Physics and Related Areas

Location (town, country) of the infrastructure:

Villa Tambosi, Trento, Italy,

Director: Gert Aarts; Main Administrator for European funding: Barbara Gazzoli

Web site address: [www.ectstar.eu/](https://www.ectstar.eu/)

Annual operating costs (excl. investment costs) of the infrastructure (€): approx. €1.2M

Description of the infrastructure:

ECT\* is a unique facility for research, collaboration and networking, and training in theoretical nuclear physics and related areas. Established in Trento in 1993 by a concerted action of the European Nuclear Physics community, it is the only Centre of this kind in Europe and is similar in scope to the Institute for Nuclear Theory (INT) in Seattle, which started operating in 1990. Its mission is defined in the Statutes, and entails

* to be a Centre at the frontline of research in theoretical nuclear physics;
* to promote active contacts between theory and experiments, and to related areas of research;
* to further the training of young researchers.

The ECT\* infrastructure consists of the beautiful Villa Tambosi and the adjacent Villa Rustica. Both villas offer ample discussion and office space over several floors. Villa Rustica contains a lecture room for up to 39 participants on the top floor and, at ground level, the main lecture theatre Aula Renzo Leonardi, for up to 70 participants. The latter is currently prepared for hybrid meetings, with in-person and remote participation enabled via the installation of cameras, microphones and screens. Hybrid delivery will start at the end of September 2021, covid permitting.

ECT\* is the home of an active research group in nuclear physics and computational science, currently consisting of 5 permanent researchers and 10 postdocs. In the autumn of 2021, two PhD students will join, working collaboratively with colleagues in the Physics Department at the University of Trento.

Services currently offered by the infrastructure:

The ECT\* scientific programme is built around 3 components:

* Workshops and collaboration meetings, currently about 22 week-long meetings each year
* Training of PhD student and early-career researchers via the Doctoral Training Programme and the TALENT School, each lasting 3-4 weeks
* Visitor programme

Proposals for both workshops and training activities are solicited from researchers in the field and selected by the ECT\* Scientific Board, see below. Visitors apply for extended stays directly to the Director.

The ECT\* administrative staff, currently a team of three, delivers all supporting aspects of the activities. This includes setting up and maintaining the indico webpage and registration, hotel bookings, video links, and all non-scientific requests. The administrative staff is fully available during a workshop or training school, allowing the organisers to focus on the scientific aspects.

ECT\* attracts about 800 participants each year (pre-covid), coming from around the world. It is a globally recognized place for nuclear science in the broadest sense and many participants return every other year or so. Under current covid conditions, workshops are delivered via zoom meetings, allowing more participants to join for meetings. Similarly, the Doctoral Training Programme and TALENT school both attract PhD students from all around the world, enabling a diverse and inclusive environment.

The strength of ECT\* is the openness to explore new topics and the willingness to support ideas which are very much under development or bring together various communities. As examples, the training programme for this year contains

* Doctoral Training Program 2021 on *High-Energy and Nuclear Physics within Quantum Technologies*, a 4-week programme combining lectures on quantum computing with lattice field theory;
* TALENT School 2021 on *Machine Learning applied to Nuclear Physics, Experiment and Theory*, a 2-week hands-on programme training PhD students in the basics of machine learning, with relevance for nuclear physics.

The 2021 workshop programme includes meetings on heavy-ion collisions and new physics, neutron star mergers and nuclear astrophysics, the origin of mass, nuclear physics meets condensed matter physics, fermions in flatland, saturation at the future Electron-Ion Collider, the edge of stability, strangeness, and more. Particular attention is paid that every year workshops bringing together theoretical and experimental colleagues are being supported.

**Description of work**

Modality of access under this proposal:

Users typically visit ECT\* as an organiser or participant in a workshop. It is also possible to join as a visitor, on an individual basis. Workshops usually last one working week, and participants are supported by the ECT\* administrative staff for all practical aspects.

Unit costs are employed to cover all costs related to the running of the workshops in the infrastructure, i.e. use of facilities, running costs, research and professional staff.

Support offered under this proposal:

Participants are supported financially via lunch and coffee breaks, reduced rates at local hotels, and selected workshop dinners. Travel is typically not reimbursed. Participants sign daily declarations for monitoring purposes. ECT\* provides a highly stimulating environment for discussion, not curtailed by administrative duties or other limitations. The availability of discussion rooms and offices enables smaller and larger groups of scientists to develop their research without interruption.

Outreach to new users:

ECT\* announces its calls for proposals on its website and via email shots to individual researchers and research labs around the world. Moreover, the ECT\* Director and members of the ECT\* Scientific Board stimulate researchers to submit proposals in new, underexplored and/or interdisciplinary areas, to ensure a diverse programme of activities.

Bringing together experimental and theoretical researchers is of utmost importance for the field, as it stimulates new developments in both areas. With increased funding tied to this call, ECT\* will be able to increase the number of workshops relating theoretical and experimental research supported each year, creating new opportunities. Workshop proposals tied to this call will be actively solicited and selected workshops will be assigned to this call specificially. These activities will be highlighted on the website, the poster of annual activities and the workshop indico page. Monitoring will be carried out by reporting which workshops are supported by this grant, including the number and origin of participants.

Review procedure under this proposal:

The review and approval of scientific proposals for workshop and training activities is carried out by the ECT\* Scientific Board. Current membership can be found on the ECT\* website. Every five years ECT\* is reviewed by an international review panel.

The annual scientific programme is constructed in a bottom-up approach, inviting proposals from researchers in the field in two calls per year. The ECT\* Scientific Board selects the proposals to be supported. Membership of this Board itself is built upon proposals from the community, enforcing the community-led approach. The Scientific Board consists of esteemed researchers in theoretical and experimental nuclear physics in the broadest sense, as well as the Chair of NuPECC. The Scientific Board, together with the ECT\* Director, plays an important role in steering the direction of ECT\*.

Equality, diversity and inclusion is enacted by stimulating organisers to incorporate these principles in both the composition of the organizing committee, the selection of the participants and the construction of the workshop programme.

*Give a brief general description of the infrastructure to which access is offered. Illustrate, in particular, its state-of-the-art equipment and services offered to users that make it rare or unique in Europe. Outline the areas of research normally supported by the infrastructure, as well as new areas opening to users, if any. If the infrastructure is composed of several installations, describe these including their specific features. If parts of the infrastructure are still under construction, specify the starting date of construction and indicate the date when access can realistically be made available.*

*Describe the services offered by the infrastructure and its research environment, and demonstrate how they will enable scientists to carry out high-quality research, giving examples of relevant scientific achievements it enabled. Demonstrate that there is a widespread interest from users in other countries to conduct research at the infrastructure (or make otherwise use of its services), e.g. by indicating the number of international users currently using the facility per year.*

*Outline how a user, or user group, will be given access to the infrastructure or to its services (e.g.* ***trans-national/virtual****, type of equipment/service used, expected output/deliverables, etc.).*

*For* ***trans-national access*** *indicate the typical execution and duration of work (if access is provided ‘in person’, thus not remotely, indicated the estimated number of days spent at the infrastructure), and, where relevant, how the users will be integrated into the scheduling of the infrastructure and the degree of independence they will experience with respect to the normal research activity of the infrastructure.* *Define clearly, for each installation, the* ***unit of access*** *used to measure the access offered and indicate what is covered and included (e.g. preparatory work, specific training courses) in one unit. This is essential for monitoring the access provided under this project, but also to justify the corresponding costs. Indicate for each installation which modality will be used to declare access costs (on the basis of* ***unit cost****, as* ***actual cost****, or as a* ***combination*** *of the two) and justify your choice.*

*For* ***virtual access****, define clearly, for each installation, the* ***unit of access*** *used to measure the access offered and indicate what is covered and included in one unit. This is essential for monitoring the access provided under the project, but also to justify the corresponding costs. Indicate for each installation which modality will be used to declare access costs (on the basis of* ***unit cost****, as* ***actual cost****, or as a* ***combination*** *of the two) and justify your choice.*

*Describe the scientific, technical and, for trans-national access, logistic support that would be offered to the users. Where relevant, emphasise the quality of the scientific environment in which the users will be working and explain how this might stimulate their research. Explain to what extent such support is already routinely provided to external users.*

*State what measures are taken to attract new potential users (e.g. web page, call for proposals, etc.), including specific user groups such as users coming from SMEs or representing new areas of research, if appropriate. Indicate why and to which extent the EU funding of this trans-national and/or virtual access activity will provide European research teams with new opportunities of access to the infrastructure. Indicate whether the number of trans-national and/or virtual users is expected to increase as a result of this proposal, and how you will monitor such an increase. If trans-national access to the infrastructure is being opened to users other than those from the host country of the infrastructure for the first time, what evidence is there that there will be sufficient demand for the access offered under this proposal?*

*For trans-national access activities, describe the peer review procedure that will be used to select users under this proposal. Outline the composition of the User Selection Panel. Demonstrate that the selection of users will follow the principles of transparency, fairness and impartiality. As the selection will be based on the evaluation of scientific merit of the applications, but with priority to new users and users coming from countries where such infrastructure is not available, indicate any additional selection rule that you would like to add.*

*For virtual access activities, describe how and when the periodical assessment of the services offered to the scientific community will be carried out (e.g. by an international review panel). The corresponding assessment reports must be defined as deliverables to the EC.*