Call for proposals for the use of the EUROfusion High Performance Computer

Deadline for answers (5th cycle) through the EUROfusion Information Management System (https://ims.euro-fusion.org/fp9/): <u>Friday 20th November 2020</u>

Call for proposals for projects using the EUROfusion High Performance Computer for resources available from 15th March 2021* and ending on 28th February 2022.

*the Marconi-Fusion High Performance Computer will be shut down for maintenance and upgrades between 1st March 2021 and 15th March 2021

This Call is open to all Projects that intend to make use of EUROfusion High Performance Computer resources. The proposals must use the appropriate "template_for_applications_(5th Call).docx" and be submitted using the EUROfusion IMS system. Also, leaders of TSVV and ENR projects that make use of EUROfusion High Performance Computer resources must submit a proposal for the usage of the HPC resources in response to this call as detailed in section 5.

1. Scope of simulations in the EUROfusion High Performance Computer

In order to make efficient use of the Marconi-Fusion High Performance Computer, with this call for proposals, we would like to invite scientists and engineers to propose project(s) to be run on this system. Projects shall be relevant to fusion development (ITER & DEMO) in the field of magnetic confinement and primarily deal with numerical simulations in the following areas:

- Plasma turbulence and related transport processes
- Fast particle physics
- Linear, nonlinear and/or extended MHD
- Edge physics
- Heating and current drive
- Integrated modelling of fusion plasmas
- Reactor materials
- Reactor technology

in order to analyse experimental data on fusion plasmas, to prepare scenarios for ITER operation, to predict the performance of ITER, and to contribute to the DEMO (including

HELIAS) design physics basis.

2. Specification of EUROfusion High Performance Computer

The characteristics of the EUROfusion High Performance Computer Marconi-Fusion are as follows.

The **conventional partition (A3)** is based on the INTEL Skylake Technology with a peak performance around 7.5 PFlops, with 2410 nodes. Each node is equipped with 2 x 24-cores Intel Xeon 8160 CPU (Skylake) at 2.10 GHz and 192 GB of DDR4 RAM. The network interconnect is an Omni-Path Architecture (OPA).

The **Advanced partition (C1)** is based on IBM Power9 architecture and Volta NVIDIA GPUs with IBM POWER9 AC922 processors at 2.6-3.1 GHz (2x16 cores) and 4 NVIDIA Volta V100 GPUs accelerators (16 GB of memory per GPU) with Nvlink 2.0 and 256 GB of memory per node. The network interconnect is based on Infiniband EDR with a DragonFly+ topology. The total peak performance of this partition is around 2.5 Pflops, with 80 nodes.

3. Eligibility for proponents and participants in project

The Principal Investigator of each project should be employed by a EUROfusion Beneficiary or its Linked Third Party. In the case of scientists not belonging to such organisations, they can participate in the project only as collaborators and their participation in the project must be covered by a formal agreement. The Principal Investigator should inform the Programme Management Unit about the participation of external scientists and get approval.

4. Proposal and selection

Applications that are particularly suited for use on the EUROfusion High Performance Computer are large, highly scalable parallel applications requiring exceptional computational resources: for the conventional node partition (A3) the minimum requirement suggested are 0.03M node hours per year in parallelized applications, where one node corresponds approximately to 2x24 cores for the conventional node partition.

As an indication from previous allocations to High Performance Computers hosted or organised under EUROfusion, the yearly allocation granted to single projects is expected to be about 0.25 (average) / 1.0 M (maximum) node-hours for the conventional node partition (A3), however, there is no hard limit and projects can receive larger allocations when requested.

Since most of the performance of the Advanced partition (C1) will come from GPUs, the

applicants must prove that their codes are able to scale on GPU architectures.

The proposal should *detail the scientific objectives* of the project, the numerical tools used and the required resources following the attached "template_for_applications (5th Call).docx" (c.f. section 5 for the specific case of E-TASC and ENR projects).

In the proposal, the project leader must describe in detail the justification for the use of the resources requested, by including the information in terms of expected number of runs, number of nodes used, and elapsed time per run and the relationship to the scientific objectives. **Without proper justification of the use of resources the project will be rejected.**

Proposals will be selected according to a peer review process defined by the Allocation Committee; only proposals, which are technically fit for the EUROfusion High Performance Computer, requiring exceptional computational resources will be kept while the final selection will be made according to the scientific and technical merit of the proposals taking into account the following criteria:

    (1) Quality / scientific excellence of the proposal   (Weight: 40% no threshold)

    (2) Impact to the fusion research   (Weight: 30% no threshold)

    (3) Quality, skills, recognised expertise and competences of the team to carry out the proposal, including the outcome of the projects in previous cycles (this will apply to calls for cycle 2 and followings)   (Weight: 20% no threshold)

    (4) Resource management/efficient use of the resources

    (Weight: 10% threshold > 2)

Proposals with one or more evaluations below the threshold of 2 (the range of evaluated values is from 0 to 5) in category (4) will fail. For projects, which are the continuation of a previous cycle of allocation, the peer reviewers will take into account the outcome of that project in making their evaluation. This will be done by making the reports (see section 8) and evaluation reports of related projects available to the referees, which will take these into account in the evaluation process, together with the Project proposal.

5. Computing Resources reserved for EUROfusion Theory and Advanced Simulation Coordination (E-TASC), Advanced Computing Hubs and Enabling Research Projects (ENR).

In preparation for Horizon Europe (FP-9), a coherent and ambitious programme of Theory, Simulation, Verification, and Validation (TSVV) Tasks has been initiated. In this context, a call for participation in 14 TSVV Tasks has been issued in May 2020. These projects have been identified in extensive discussions within the E-TASC Scientific Board and the wider EUROfusion community and leadership. At the EUROfusion HPC Project Committee Meeting (28 September 2020), it has been confirmed that specific resources will be

allocated, without further scientific selection, to the TSVV tasks under E-TASC and ENR projects that will be selected within the Work Plan 2021. Nevertheless, the HPC Project Committee recognises the importance for a sound technical description of the requests so that the HPC Allocation Committee will assess whether the requests match the offered HPC capabilities.

In this context, the leaders of the proposed* TSVV and ENR projects must submit a proposal for the usage of the HPC resources in response to this call providing a technical justification of the requested HPC resources together with the list of the codes to be used (focusing only on the codes that will use most of the HPC resources), i.e. section 2-4 of the template, <u>indicating that the proposal is associated with a specific TSVV and ENR project in the appropriate box.</u> At the time of the selection of the proposals related to the present call, only granted TSVV and ENR projects will be taken into consideration under this context, but non-granted TSVV and ENR projects can be Allocated HPC resources via the usual competitive procedure.

*TSVV and ENR projects selection is still ongoing; therefore if at the time of the call response the projects are still under review and the outcome is not yet known, please indicate that this is the case in the proposal template

6. Presentation and publication of obtained results

All related Publications must follow the EUROfusion publication procedure via the EUROfusion pinboard https://users.euro-fusion.org/publications/. These include that the participants must agree to acknowledge EUROfusion and the EUROfusion High Performance Computer when the results of the projects are presented and published. In the presentations, the EUROfusion logo must be included when the simulation results are shown.

7. Contact points

Successful projects will be implemented on the EUROfusion computer (5th Cycle) starting from 15th March 2021 and ending on 28th February 2022. Questions on the call for proposals should be sent to Duarte Borba, the chairperson of the Allocation Committee (duarte.borba@euro-fusion.org).

8. Reporting

After completion of the project a short-written report (i.e. 1-2 pages) presenting the main results is required and shall be sent to (duarte.borba@euro-fusion.org). The reports will be evaluated by the EUROfusion High Performance Computer Allocation Committee. If applicable, this report will be taken into account when assessing a continuation of the

project.