IFERC Newsletter

IFERC

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Status of CSC activity

Highlights of CSC activity

The objectives of IFERC in BA Phase II are to support ITER, JT-60SA and IFMIF/EVEDA and to consolidate the know-how for the development of future fusion reactors (DEMO). In line with these objectives, F4E together with EUROfusion, and QST continuously promote simulations activities within IFERC-CSC. The CSC effort in 2023 as well as in 2022 includes the following activities:

- The sharing of experience and best practices in the design and operation of HPC centres for fusion users and in the usage of such centres by fusion users (EUROfusion and QST);
- The organization and monitoring of the provision of computer resources to IFERC (by EUROfusion and QST) with the support of the Joint Allocation Committee (JAC) for their allocation;
- The support for fusion research projects including the supply of high-level support for the usage of Marconi100 and Leonardo (EUROfusion) and the supply of support to high priority simulation activities (QST); and
- The analysis and planning of high priority simulation activities in order to identify important issues not sufficiently addressed by the existing projects and, in this case, to make a proposal in order to improve the situation (QST).

As in the previous years, half of the total resources of the high-performance supercomputer JFRS-1 in Rokkasho is provided by QST as JA host contribution for BA simulation projects in FY 2023 (the 4th cycle). Based on the peer review results following the Call for proposals, JAC selected all the projects (27 projects) and allocated all the available resources (about 9 M node-hours) to the projects. In parallel, a portion of Marconi 100 (equivalent of 10 nodes of GPU accelerator)/Leonardo is provided to JA users as EU voluntary contribution. The IFERC HPC follow-up working group monitors the usage of those resources and the allocation of resources performed by JAC.

The simulation projects performed in the 3rd cycle covered the issues relevant to fusion development programmes such as ITER, JT-60SA and DEMO, in line with the IFERC objectives. Other fusion facilities such as MAST (MAST-U), JET, COMPASS, AUG and model configurations are used in order to improve the simulation codes and to perform verification and validation tests through the comparison between simulation results and experimental observations. For example, unmitigated hot Vertical Displacement Events (VDEs) with the JOREK code were compared in detail to the AUG experiments, GENE-TANGO simulations were performed for an AUG H-mode discharge to show a substantial improvement of plasma performances due to energetic particles, the heat load asymmetries between the four targets in double-null discharges in MAST have been analysed by using BOUT++, and the edge plasma profile of COMPASS tokamak was analysed using the GBS code. In all these cases, consistency and good agreement between simulation and experimental observations are reported.

Regarding support for the ITER project, collaborative work has been performed in two high priority areas: modelling of disruptions in ITER and ITER edge/SOL /divertor plasma simulations. Simulations of the Current Quench phase in unmitigated asymmetric hot VDEs have been conducted up to the ITER relevant parameter space. The results prove the adequateness/usefulness of the developed scaling. In divertor studies, a number of SOLPS-ITER simulations of the ITER device have been done, using the 3.0.8 develop code version. The primary goal is to revisit the existing SOLPS4.3 database built in the early 2010s with three major improvements: an update of the physics model, an updated wall contour, and a much more detailed description of the divertor structures.

The COVID-19 pandemic prevented travel between Europe and Japan for a long time, but the situation has been improved. This made possible a visit to the IFERC Rokkasho site of a member of EUROfusion Advanced Computing Hub at Garching for directly supporting Marconi 100 users in Japan and technical exchanges on issues related to use of GPUs in fusion area during one full week from March 27 to March 31, 2023.

(CSC TCs)