IFERC Newsletter

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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 the objectives, F4E together with EUROfusion, and QST continuously promote simulations in IFERC-CSC. CSC activity in 2022 includes:

- 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 (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 (EUROfusion) and the supply of support to high priority simulation activities (QST).
- The analysis and planning of high priority simulation activities in order to identify important issues not sufficiently addressed by existing projects and, in this case, to make proposal in order to improve the situation (QST).

Since the beginning of the BA Phase II (April 2020), half of the total resources of the high-performance supercomputer JFRS-1 in Rokkasho has been provided by QST as a JA host contribution for BA simulation projects. In addition, a portion of Marconi 100 (equivalent of 10 nodes of GPU accelerator) has been provided to JA users as EU voluntary contribution. The IFERC HPC follow-up working group monitors the usage of the resources and the allocation of resources performed by the Joint Allocation Committee (JAC). The JAC, jointly chaired by the co-chairs of the EU and JA, performs also the call for proposals, the selection of simulation projects, and the evaluation of results.

As in previous years, half of HPC resource of JFRS-1 are available to BA simulation projects in FY 2023 (the 4th cycle). Based on the peer review results following the Call for proposals, the JAC selected all the projects (27 projects) and allocated all the available resources (about 9 M node-hours) to the projects. Table-1 shows the distribution of the 1st priority areas specified by Principal Investigators (PIs) of the projects in the 4th cycle.

Category	ITER	JT-60SA	DEMO	IFMIF/ EVEDA	Other fusion facilities
Divertor			1.00		0.67
Edge	1.20	0.20			0.87
Disruption	1.00				
Turbulence	0.39	2.25	2.58		3.58
Fast particles	0.59	0.64	0.50		1.09
Integrated modelling	0.14	1.14			0.14
Heating &CD					
Materials	0.33		2.33	0.33	2.00
Technology	1.00		2.00	1.00	

Table-1: Distribution of the 1st priority areas specified by PIs in the 4th cycle (when N plural areas are selected, 1/N is assigned to each area)

As shown in the table, the 1st priority areas cover key issues for ITER, JT-60SA and DEMO as well as in previous years. “Other fusion facilities” include tokamak configurations such as MAST (MAST-U), JET, COMPASS, AUG and helical configurations such as LHD, W-7X and H-J. Simulation researches in these facilities include physics issues relevant to ITER, JT-60SA, DEMO and IFMIF/EVEDA, or verification and validation tests.

In order to support ITER project, collaborative work has been performed in two high priority areas: unmitigated disruption studies and edge/SOL/divertor simulations in ITER. Regarding the unmitigated disruption studies, asymmetric hot VDEs (Vertical Displacement Events) are simulated with the 3D MHD code JOREK in order to assess the maximum horizontal forces that are expected to act on the ITER vacuum vessel. Simulations of the Current Quench phase in unmitigated VDEs have been achieved for the first time up to the ITER relevant parameter space. The results are important for the preparation of ITER operation. 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 IO collaborators have installed and actively maintain the code, which is also accessible to other users on the JFRS-1 platform. 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 mode, an updated wall contour, and a much more detailed description of the divertor structures.

(CSC TCs)