

IFERC Newsletter



IFERC-N-2016-05, 16 May 2016

International Fusion Energy Research Centre, Rokkasho, Aomori 039-3212, Japan

Meeting

4th CSC (Computational Simulation Centre) review meeting

In conjunction with the 18th IFERC Project Committee meeting, the 4th CSC Review Meeting was held on 15 March 2016. The meeting was hosted by the Tohoku University in Sendai but it was serviced as well by a video-conferencing system. Both European and Japanese researchers presented their findings, directly or remotely.



Naoaki Miyato, deputy CSC leader, presented a statistical analysis of simulation projects in Helios. He started with a brief review of the computing resources of Helios. He then showed the evolution of the successive cycle of projects with a comparison of European and Japanese sides. He presented the variations of the amount of resource requested and the number of peer-reviewed papers produced per category.

Roman Hatzky presented the experience of the High Level Support Team (HLST) on Helios. He chose the REFMULP2 project as an example of the work of HLST. After profiling the code, it was possible to improve the single processor performance by a factor of eight. In addition, a hybrid MPI/OpenMP parallelization concept was implemented. The overall speedup was over 400, meaning that a run which took over four hours to finish originally could run in half a minute.

The presentation of Kenji Imadera from Kyoto University was about global gyrokinetic turbulence simulations. The speaker started with the concept of gyrokinetics and described recent progress in different simulation programs. Then he focused on a new 5D toroidal full-f gyrokinetic code which he and his team developed: GKNET. Using this code, he explained how a momentum source can lead to Internal Transport Barriers (ITB) formation.

Rafael Juarez from UNED (Universidad Nacional de Educación a Distancia) presented an analysis of neutronics for ITER. He explained the main radiological challenges for ITER. He showed how Helios allowed simulations considering large and complex geometries, which helped to reduce the uncertainties due to modelling. With the computer he was able to accurately compute radiation at deep penetration. The simulations helped also to reduce the Shutdown Dose Rates (SDDR) to allow in-situ maintenance operations.

Atsushi Ito from NIFS (National Institute for Fusion Science) presented a talk on reactor material simulation. He showed that for this type of simulation, a multi-scale approach is necessary. In particular, realistic flux and fluence should be employed to reproduce experimental phenomena. To conquer scale gaps, a new hybrid simulation has been developed. Further gap in material structures between experiments and simulation will be solved by meta-modelling.

Stanislas Pamela of CCFE (Culham Centre for Fusion Energy) gave a presentation on non-linear MHD simulation. Recent developments of the JOEUK code were oriented towards the simulation of Edge Localised Modes (ELM). The program was used to simulate several existing devices and the results were compared to corresponding physic experiments. The simulation results are close to quantitative validation.

Duarte Borba, chair of the Standing Committee, finished by presenting an overview of simulation research performed in CSC. He presented the advances in each fusion category. He concluded on the importance of Helios for large scale computations. Its computation capabilities allowed the development of more sophisticated models and more detailed comparison with theory and experiments. It provided almost unique resources for calculations in the area of reactor materials and reactor technologies.

The 4th CSC Review Meeting finished with a word of conclusion from the PC chair David Maisonnier. He was very pleased by the high level of the presentations and by the good usage which is made of the CSC computing tool.

(CSC Leader: Jacques Noé)