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Supercomputer to perform one quadrillion mathematical operations per second in order to crack plasma physics.

The contract for the supply of a high performance supercomputer centre that will perform complex plasma physics calculations has been signed between the Commissariat à l’Energie Atomique et aux Energies Alternatives (CEA) and Bull. The supercomputer is an important milestone of Europe’s contribution to the Broader Approach (BA), an Agreement signed between Europe and Japan to complement the ITER project through various R&D activities which are developed in the field of nuclear fusion. The European participation to the BA is coordinated by Fusion for Energy (F4E), the EU organisation managing Europe’s contribution to ITER. This specific activity is provided by France as a part of its voluntary contribution to the BA.

The supercomputer will be located in Rokkasho, Japan, and will be available to a scientific community of more than 1,000 European and Japanese fusion researchers for the next five years starting from January 2012. With a computational power above 1 Petaflop, the supercomputer will be ranked among the most powerful systems in the world and at least 10 times more powerful than any existing system dedicated to simulations in the field of fusion in Europe and Japan. The supercomputer, with a memory exceeding 280 TB and high speed storage system exceeding 5 PB, will be complemented by a medium term storage system and a pre/post-processing and visualization system.

The operation of the supercomputer will begin with a few high-visibility code runs, otherwise known as “light-house projects” because of the light they are expected to shed with their findings, to test drive the capacities of the supercomputer and achieve maximum performance. During the rest of its exploitation period, European and Japanese researchers will be invited to submit proposals which will be selected according to their importance for the development of ITER and fusion research. The volume of findings stemming from this activity will feed into the plasma codes in preparation for ITER and into the design of the future DEMO reactor.

Background information

What is a Petaflop?

A Petaflop is a measure of a computer's processing speed and can be expressed as a quadrillion floating point operations per second.

What is plasma?

Plasma can be described as an ‘electrically-charged gas’ in which the negatively charged electrons in atoms are completely separated from the positively charged atomic nuclei (or ions).

One of the main requirements for achieving fusion is to heat the plasma particles to very high temperatures.

In ITER, several heating methods will work concurrently to bring the plasma in the core of the machine to 150 million °C. The supercomputer will help fusion scientists to improve the understanding of different plasma parameters.

The Broader Approach Agreement

The Broader Approach Agreement between Europe and Japan is a partnership in the field of fusion energy that currently lasts until 2017 and to which both Parties contribute equally. It aims to complement the ITER project, and accelerate the realisation of fusion energy by carrying out R&D and developing advanced technologies for the future demonstration power reactor, DEMO. The EU resources for the implementation of the Broader Approach represent about €340 million of European investment, mainly in-kind, and are largely provided on a voluntary basis by EU countries, under the coordination of F4E. The supercomputer will also be used for calculations on how structural materials would behave in a fusion reactor in order to enhance their future design.

Fusion for Energy

Fusion for Energy (F4E) is the European Union's organisation responsible for Europe's contribution to ITER. One of the main tasks of F4E is to work together with European industry, SMEs and research organisations to develop and provide a wide range of high technology components together with engineering, maintenance and support services for the ITER project.

F4E supports fusion R&D initiatives through the Broader Approach Agreement signed with Japan and prepares for the construction of demonstration fusion reactors (DEMO).

F4E was created by a decision of the Council of the European Union as an independent legal entity and was established in April 2007 for a period of 35 years.

Its offices are in Barcelona, Spain.

<http://www.fusionforenergy.europa.eu/>

ITER

ITER is a first-of-a-kind global collaboration. It will be the world's largest experimental fusion facility and is designed to demonstrate the scientific and technological feasibility of fusion power.

Fusion is the process which powers the sun and the stars. When light atomic nuclei fuse together to form heavier ones, a large amount of energy is released. Fusion research is aimed at developing a safe, limitless and environmentally responsible energy source.

Europe will contribute almost half of the costs of its construction, while the other six Members to this joint international venture (China, Japan, India, the Republic of Korea, the Russian Federation and the USA), will contribute equally to the rest.

The site of the ITER project is at Cadarache in the South of France.

<http://www.iter.org/default.aspx>

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