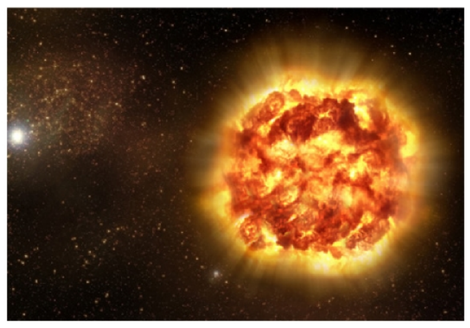
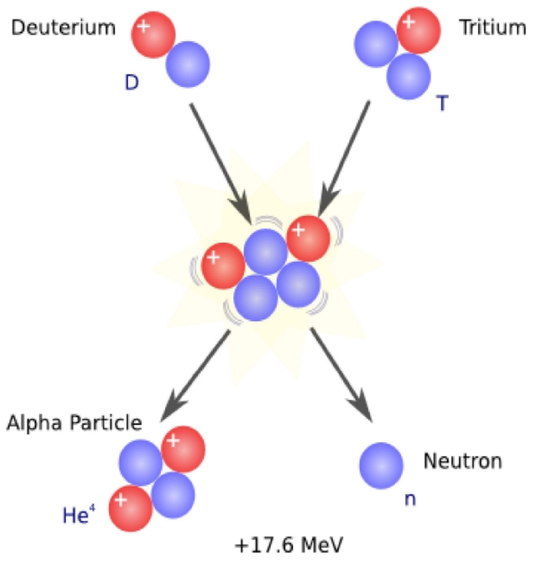
FUSION APPLICATION - ITER

Fusion Energy

Fusion energy is one of the possible solutions to energy problems of current society. It consists of joining two light nuclei into a heavier one, releasing a huge amount of energy. This is the energy source of the stars. In these processes matter is in a state called plasma (gas almost fully ionized).



Typical fusion process with two hydrogen isotopes

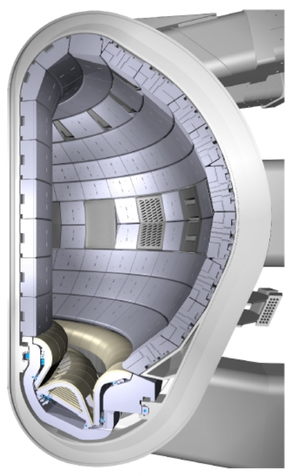


Fusion Reactors

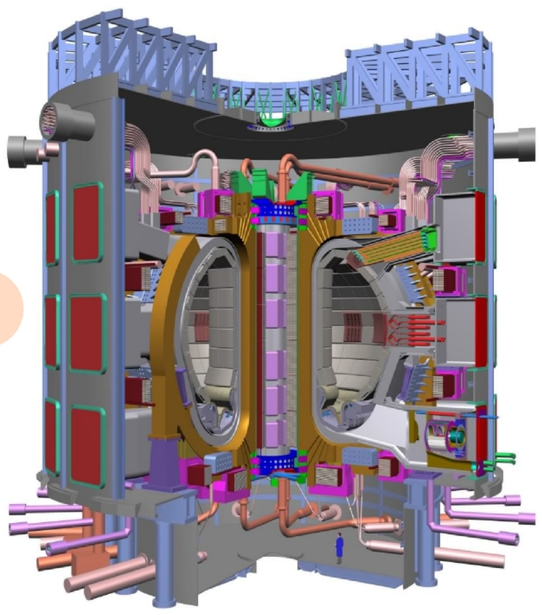
Due to electrical repulsion existing between positive charged atomic nuclei, plasma has to be in a really high temperature so fusion can happen.

Fusion reactors are complex devices which maintain the plasma confined in a magnetic trap.

Nevertheless, fusion energy is not a profitable energy source yet. Next step of fusion community is the construction of ITER reactor in Cadarache, France, in order to demonstrate the viability of this energy.



ITER vacuum chamber cross-section



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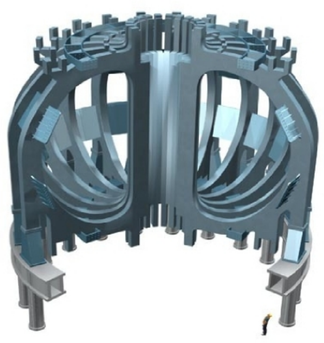


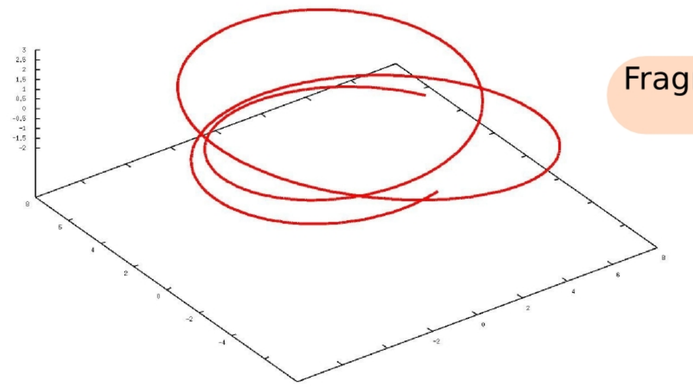
Coils to generate magnetic fields

EGEE

Plasma dynamics is extremelly complex and is not completelly understood yet. With these calculations we plan to simulate the behaviour of plasma inside ITER.

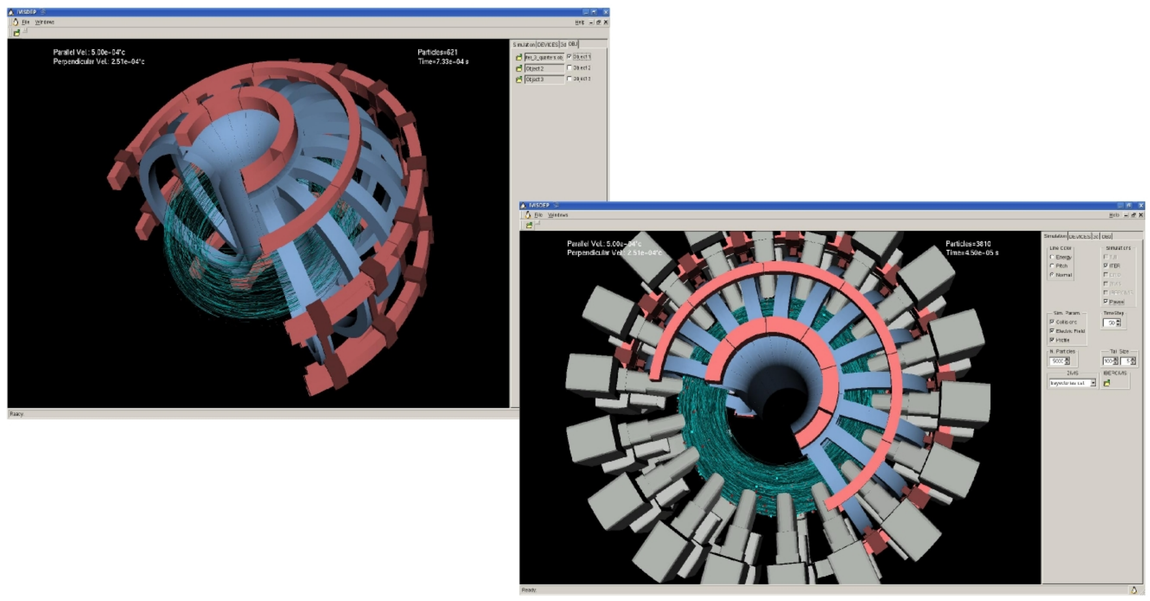
We simulate the independent trayectories of a huge number of nuclei inside the plasma, using the computational grid capabilities, to obtain the physical properties of plasma itself.

The application is ISDEP, developed by CIEMAT, BIFI and UCM.

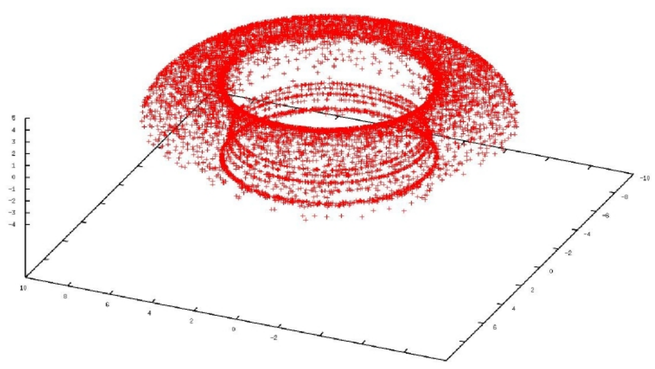


Fragment of a given trayectory

With several trayectories, we get an idea of the aspect of plasma inside the reactor.



Sooner or later, the nuclei inside ITER will escape. Thanks to these simulations we can predict their escape trayectories (in this case, they are escaping in the top of the device).



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