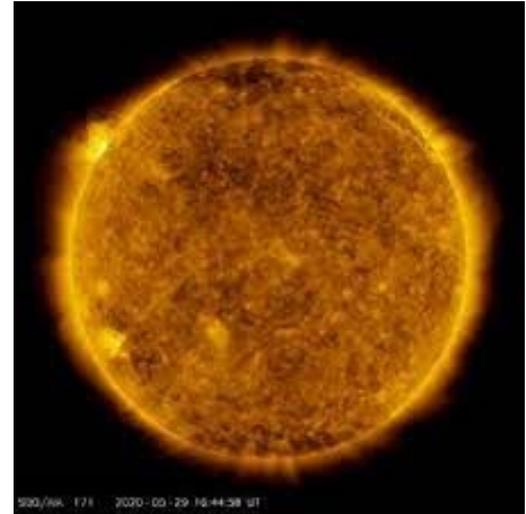


Harnessing the star's energy

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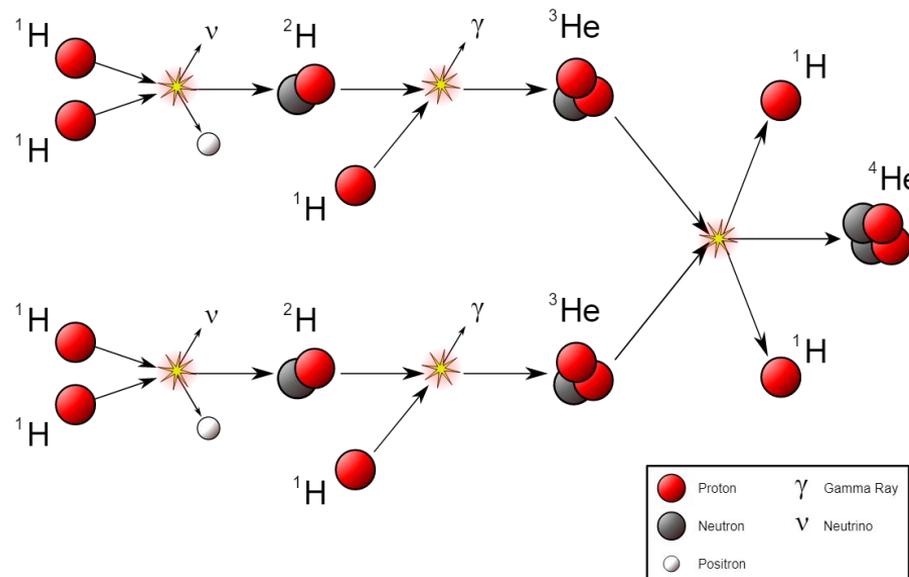
Why harness a star's energy?

- We are currently facing an energy crisis!
- We need reliable sources of energy:
 - wind, solar, water, nuclear energy (fission);
- Our latest innovative way of generating energy is through nuclear fusion.



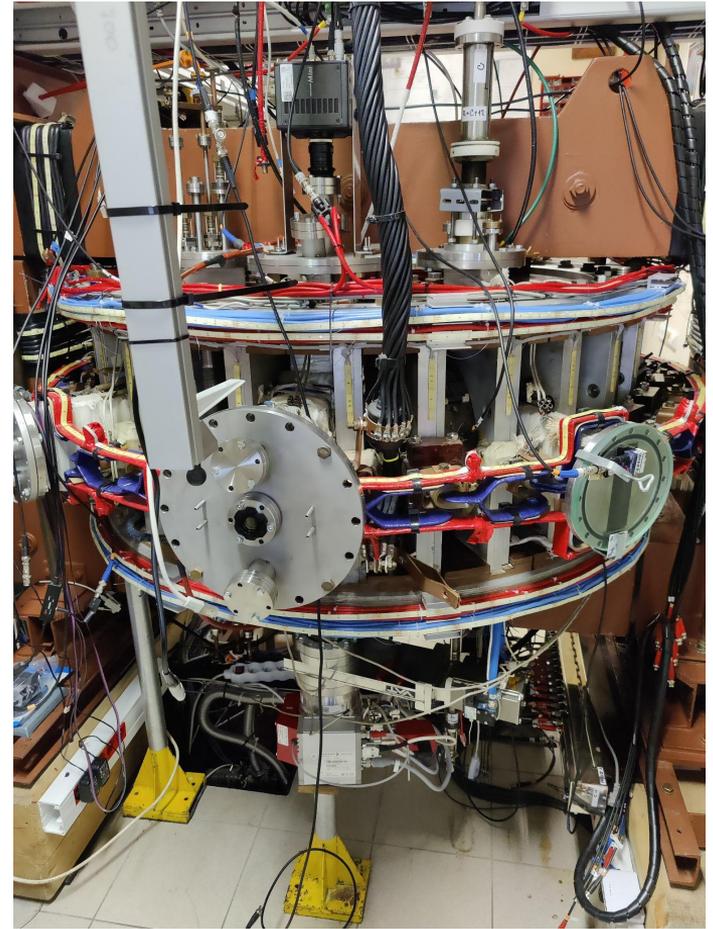
What is nuclear fusion?

- Nuclear fusion happens when two atoms combine to form one heavier atom, producing a lot of energy.
- Most stars generate energy through this process, called the proton-proton chain.



The Tokamak GOLEM

- The Tokamak GOLEM uses electromagnetic fields to produce fusion.
- It is located at the faculty of nuclear physics and engineering at the Czech Technical University.
- Used for educational purpose.

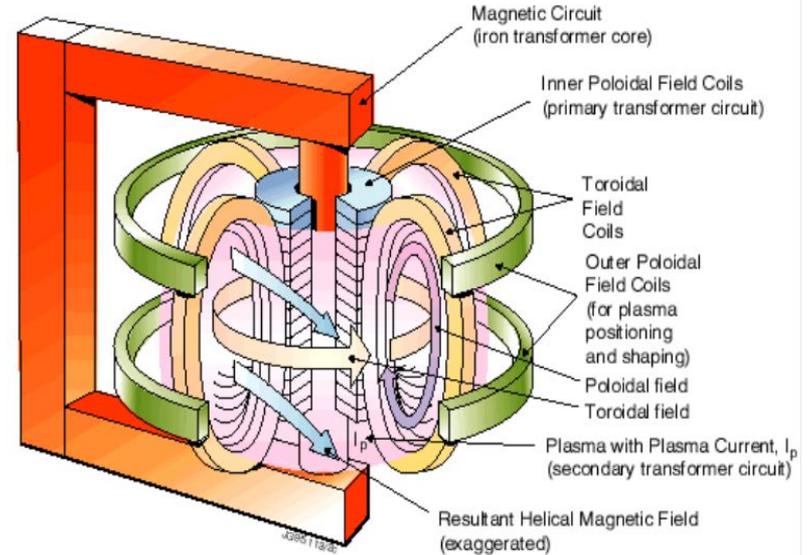


How does it work?

- In order for fusion to occur, hydrogen nuclei need to be brought very close together.
- They need to be at a very high temperature so that they can overcome the repulsive Coulomb force.
- The nuclei are heated by a toroidal electric field, which accelerates them to high speeds.

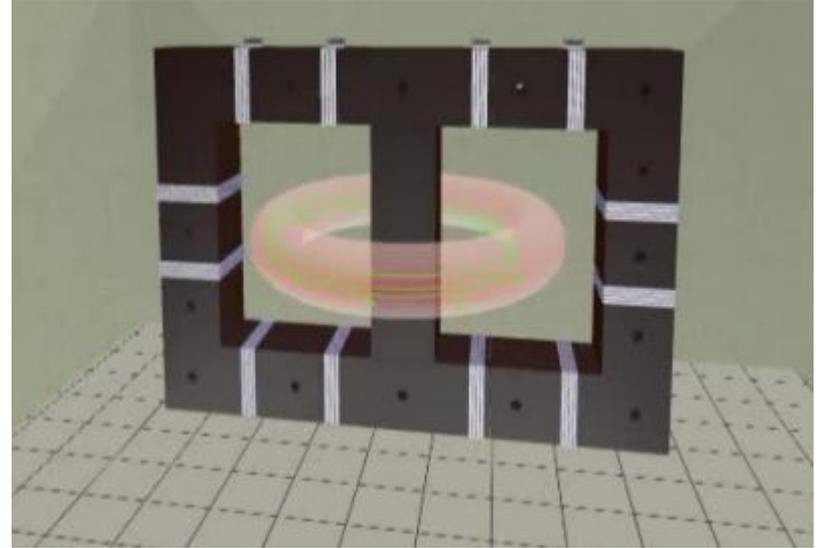
How can we contain the plasma?

- Because the plasma is at such a high temperature, no material on the Earth can withstand contact with it, therefore, we need to find another way to contain it.
- The solution, which Tokamak makes use of, relies on strong toroidal magnetic fields.



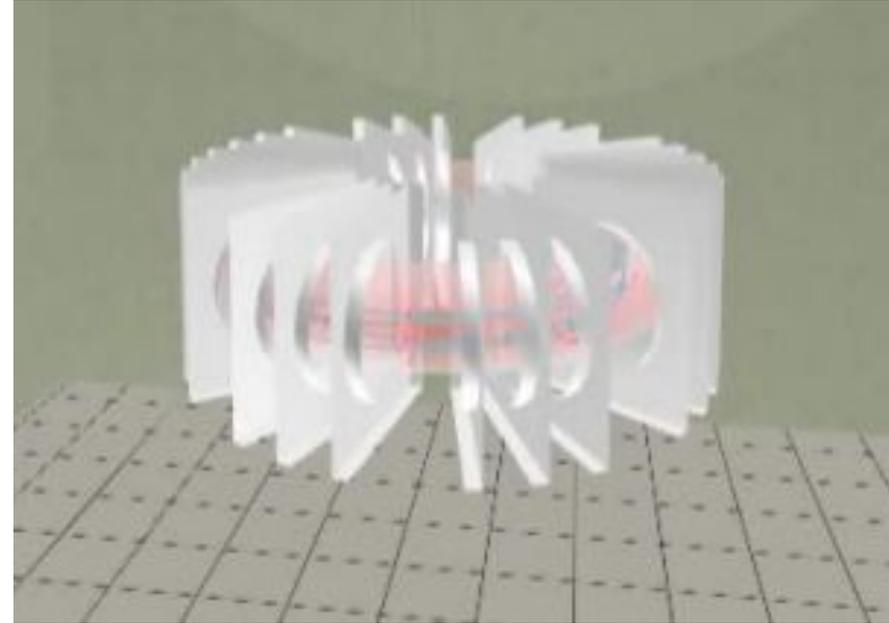
How do we produce the electric fields?

- The Tokamak uses an iron core, which has coils strapped around it leading to the production of an alternating magnetic field, which in turn creates the toroidal electric field needed.



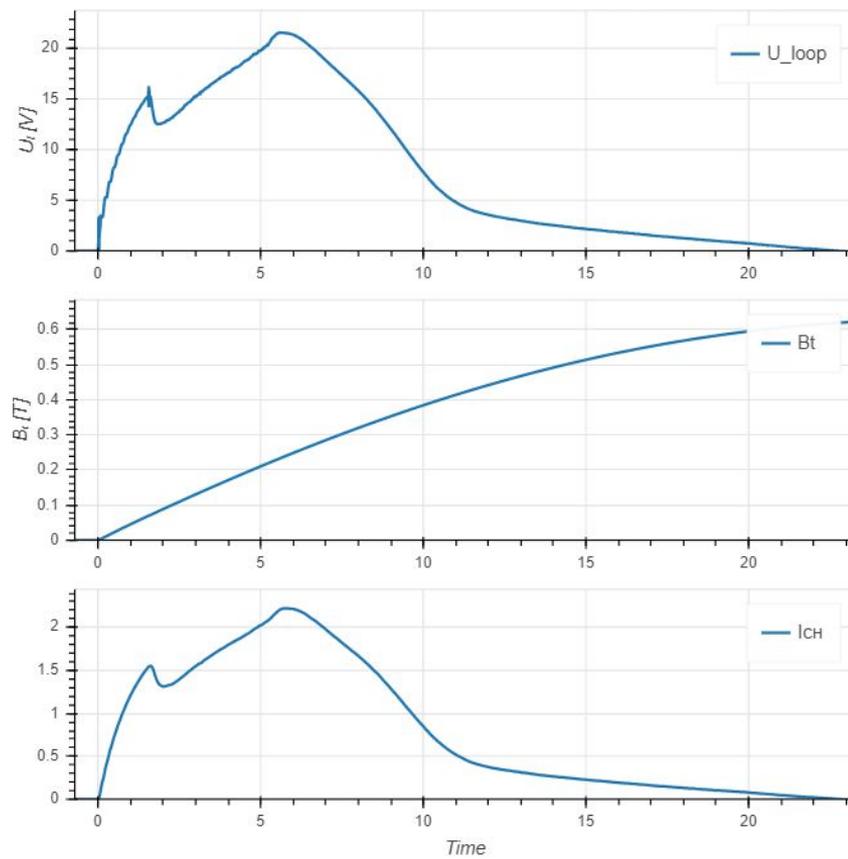
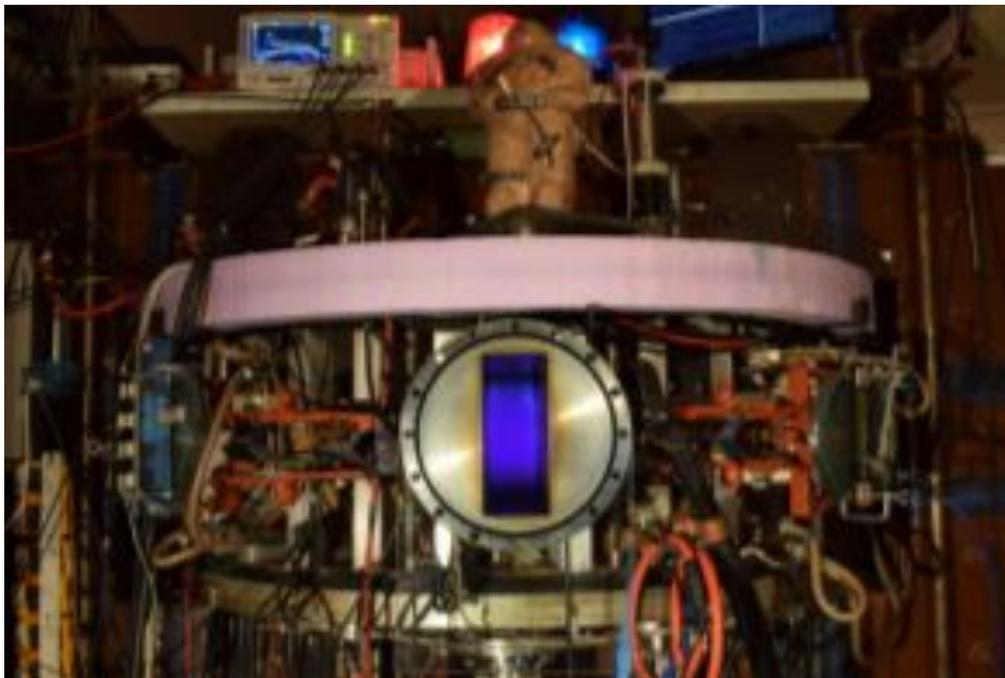
How do we produce the magnetic field?

- In order to protect the Tokamak from the intense heat of the plasma, the main chamber is first vacuumed (around 0.5 mPa) and then, a series of coils around the chamber creates a toroidal magnetic field to contain the plasma.



Our own experience with the Tokamak

- As its purpose is only educational, the Tokamak operates via an online platform, where students from all over the world can schedule their own experiments.
- On the platform, one is able to alter the parameters of the generator, in order to get different results and measurements.
- As a part of our visit we also carried out our own experiments.



Fun Facts :)

- The energy that the Tokamak produces is used to heat water, so in a sense, it is a very big and expensive kettle.
- “The smallest Tokamak with the biggest control room.”
- The Tokamak GOLEM is named after a mythical creature in the Jewish faith, who is said to keep the Tokamak alive and safe.
- There are two other Tokamaks in the Czech Republic, one at the National Institute of Nuclear Physics near Prague, and the other one in Brno.
- In order for you to schedule an experiment, you have to send the faculty a postcard from your city.

Thank you for your attention :)

<http://golem.fjfi.cvut.cz/shots/37985/>

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