

Russian-Italian tokamak «IGNITOR» project

Location: SFT experimental complex in SRC RF «TRINITI», Troitsk.

Initiating organization: NRC «Kurchatov Institute».

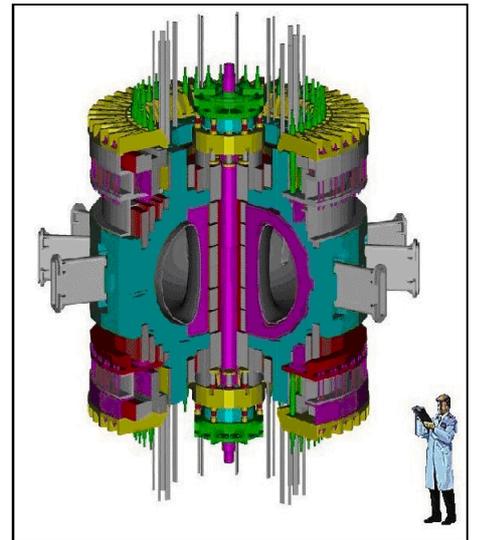
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Project implementation schedule: 2016-2024

Costs of megaproject: ~ 355 million euro

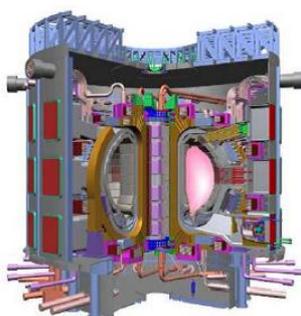
Brief description, main purpose of the creation

The Russian-Italian «IGNITOR» project is aimed at creating a tokamak with a strong magnetic field and a plasma density higher by more than an order of magnitude compared to «classical» tokamaks, in which the ignition of thermonuclear reactions will be achieved by the flowing current with the ohmic heating of the plasma. Such a regime for the realization of the thermonuclear reaction makes it possible to achieve an unlimited increase in the power of thermonuclear energy, which gives a significant advantage, first of all, in geometric dimensions. For comparison, having approximately equal thermonuclear power output, the volume of the vacuum chamber of the international tokamak-ITER reactor is about 100 times bigger than the volume of the vacuum chamber of the «IGNITOR» tokamak.



General view of IGNITOR tokamak

An important feature of the project is the potential to significantly reduce the volume and cost of future thermonuclear power reactors due to a remarkable increase in the specific yield of thermonuclear reactions, since with an increase in the plasma density by an order of magnitude the relative yield of thermonuclear reactions increases by two orders of magnitude.



ITER
(19000 tons)



IGNITOR
(500 tons)

Uniqueness (main advantages)

A unique feature of the «IGNITOR» tokamak is, first of all, its compact size due to the use of ultrastrong magnetic fields and ohmic heating of dense plasma for ignition of a thermonuclear combustion reaction without means of powerful additional plasma heating. The implementation of the «IGNITOR» project will make it possible to create a brand new direction for compact tokamaks, in which thermonuclear reactions will be initiated using an ultrastrong magnetic field and a

powerful current in dense thermonuclear plasma, which will justify the creation of compact and inexpensive energy thermonuclear reactors and neutron sources based on tokamaks.

Scientific and practical significance

When the «IGNITOR» project is implemented, it is expected that Russia and Italy will possess the new technology of controlled thermonuclear fusion and thermonuclear energy, powerful sources of cyclical neutrons, new structural, radiation-resistant and electrotechnical technological materials, robotics, control systems for physical and technological management, and new

technological applications for the industrial sector of the economy. In the course of implementing the «IGNITOR» project it is planned to create an educational center for training of young specialists in the field of controlled thermonuclear fusion and high-tech solutions.

Current state

The Conceptual Design Report (CDR) of the «IGNITOR» tokamak, which contains the physical and technical basis of the «IGNITOR» tokamak, a description of the energy and engineering infrastructure, a preliminary risk and safety analysis and cost estimation, including the cost of developing a technical design report, and a project implementation time schedule. The next stage in the implementation of the «IGNITOR» project is the joint development of Technical Design Report (TDR) with the Italian side starting from 2017.



Conceptual design report of «IGNITOR» tokamak

In July 2017 a working seminar on «IGNITOR» aimed at the development of international scientific and technical cooperation in the field of megascience was held within the framework of the CREMLIN project. In 2017 it is also planned to undertake substantive preparations of an intergovernmental agreement between Russia and Italy on the implementation of the «IGNITOR» project.