Magnetic Field Studies in Toroidal – Poloidal Systems

ID 1342

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In memoriam

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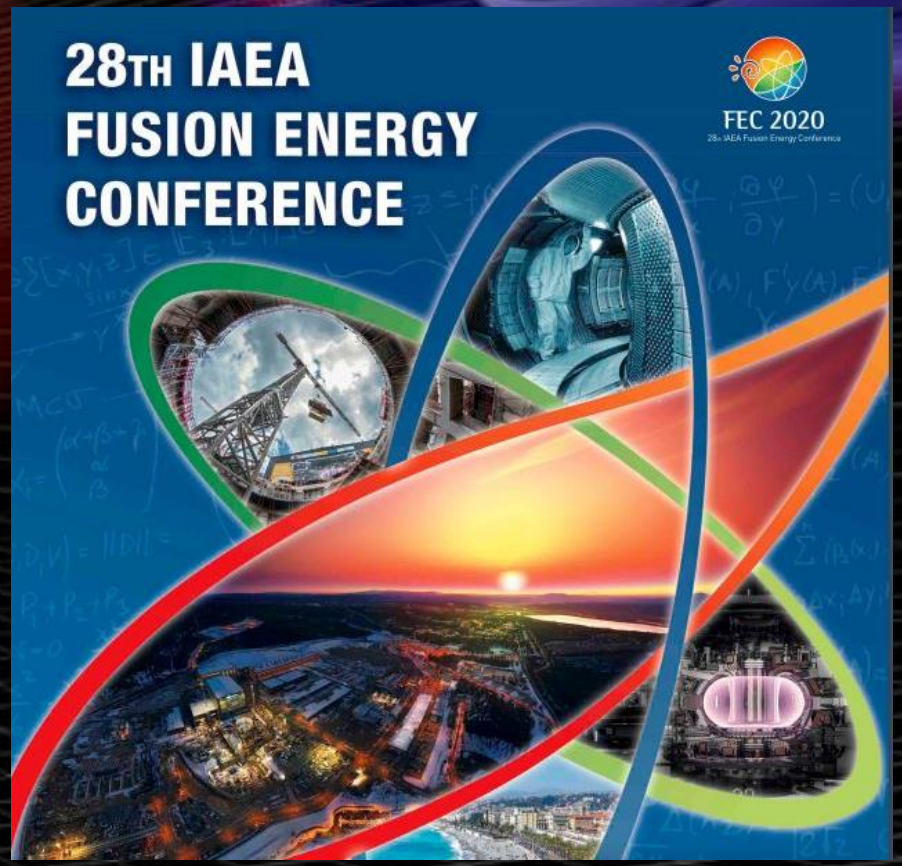

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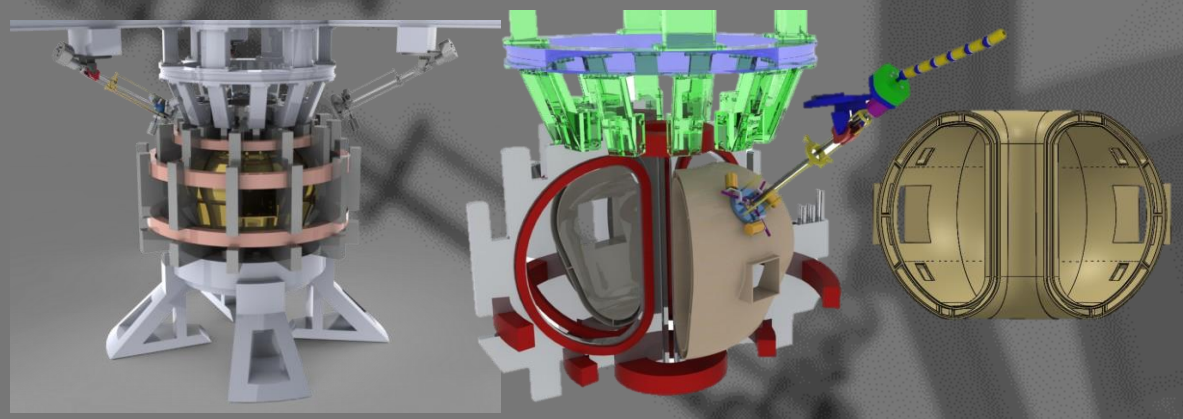
Grupo Investigación Fusión

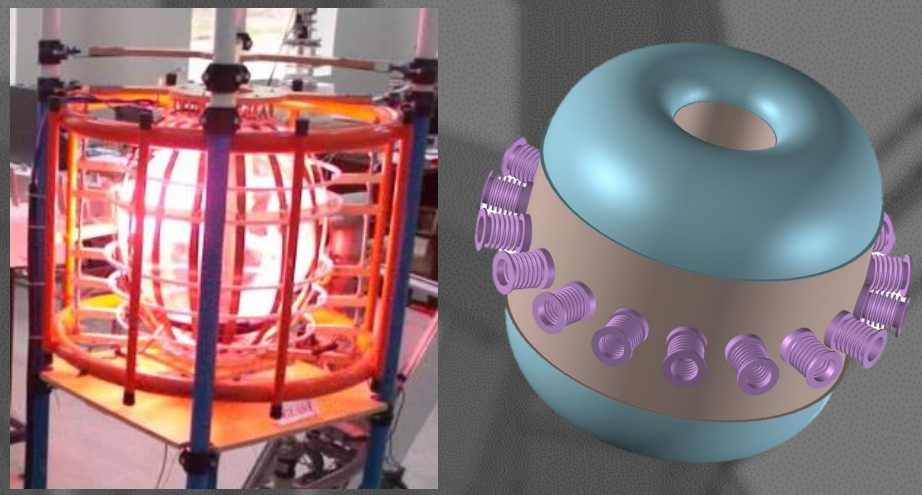
HIGH MAGNETIC FIELD PROGRAM SPHERICAL TOKAMAKS UANL-SPbSU

UANL
UNIVERSIDAD AUTÓNOMA DE NUEVO LEÓN

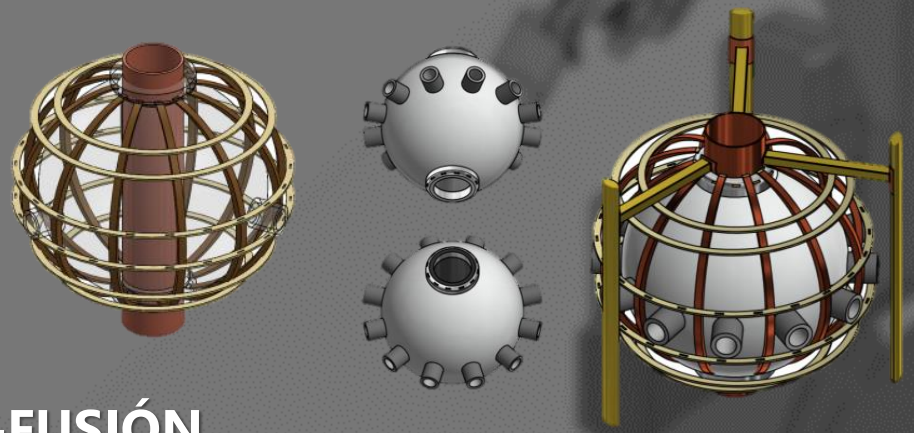
Tokamak "T": GIF-UANL | México
LAR "T" Tokamak | Spherical Tokamak "T"



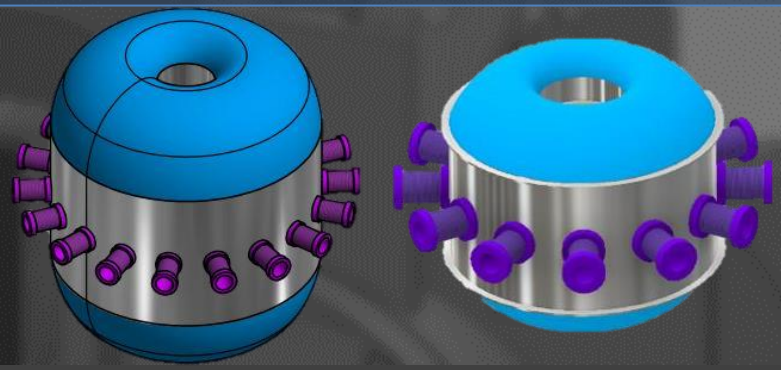
Spherical Tokamaks proposed by the SPbSU: A.B. Mineev – G.M. Vorobyov
Russian Federation



Spherical Tokamaks proposed by the GIF-UANL | México



Spherical Tokamaks developed in the course of our High Magnetic Field Program: 0.5 - 3T
UANL - SPbSU



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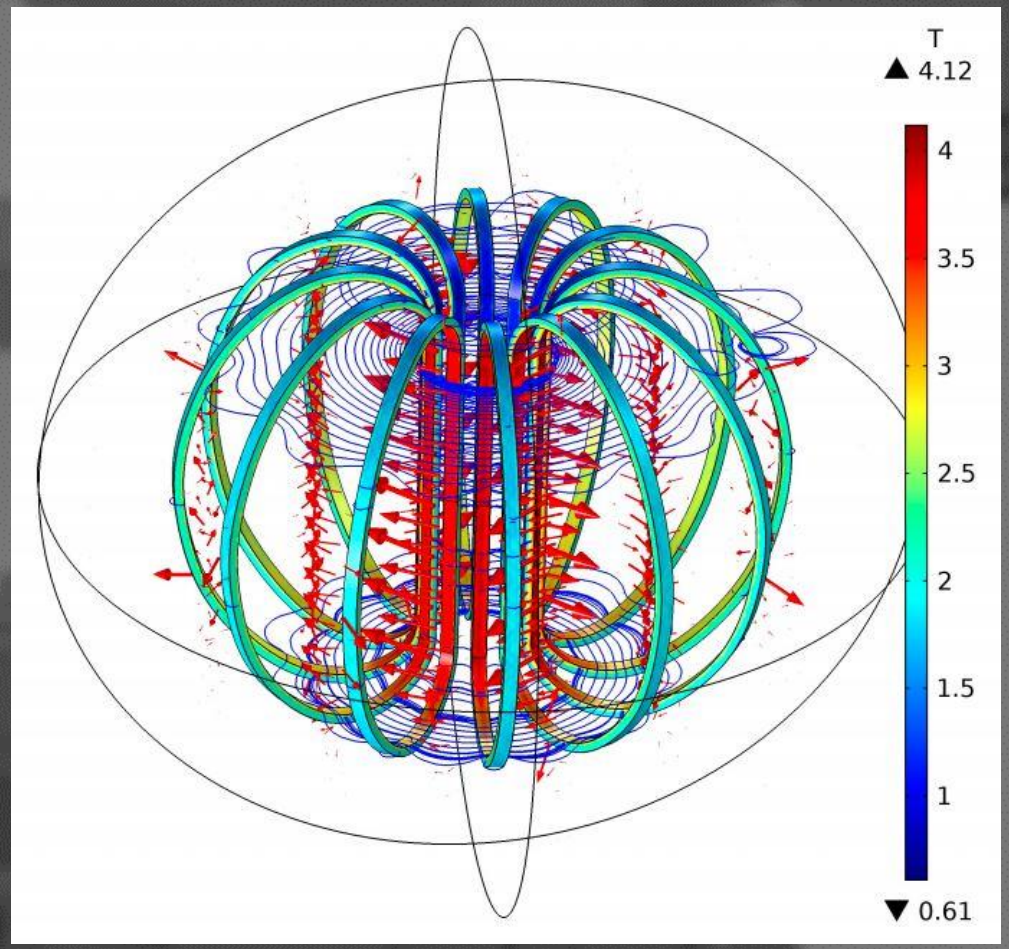
Toroidal magnetic field

Multiple homogenized turns establish a toroidal magnetic system composed by 12 D-shaped coils, 24 turns (N = 288 turns) with a flowing current of 10 kA. The red arrows in the Figure follows the magnetic flux trajectory created to the current inductions.

The magnetic toroidal field reported at 0.41 cm major radius (0.41 m) in this simulation round a value of BT 1.4 T obtained with the general toroidal equation.

Due the existence of a finite number of toroidal coils the obtained field is not totally uniform, in Figure 4 it is possible appreciate in blue lines a oscillation, the ripple, a sinusoidal wave effect in the toroidal field distribution.



Conclusions

Magnetic confinement devices needs enhanced parameters involving: aspect ratio, elongation, triangularity, plasma density, with the aim to obtain desirable high β values.

Engineering aspects involving electrical issues has been presented, defining the future development on refrigerated toroidal cases, and the mechanical stress resistance, these considerations allow recognize the importance of advanced superconductors materials.

A design methodology resume has been presented departing from the D-shaped analysis, developing algorithms to generate interesting shapes used on the toroidal coil, analytical distributions of the toroidal magnetic field with a determinate geometry has been obtained. The use of finite element methods (fem) through comsol software has been presented employing a magnetic field module on stationary study, this provides a 3d view of the magnetic flux density behavior throughout a toroidal arrangement system.
The GIF-UANL researchers recognize that international collaborations have an important aspect to address interesting and complex research topics, the scientific agreement with SPbSU has allowed a correct evolution developing interesting ST configurations. The next step that the GIF-UANL has ahead is the evolution from its Low Aspect Ratio Tokamak "T" to one Spherical Tokamak, called Spherical Tokamak towards “T” (TEA-T) from 1.6 T to 3 T starting with 0.5 T in first stage to the last one, this ST device will reinforce the effort realized in the Tokamak “T”.