

The logo for COMPUMAG 2019 features a stylized 'C' composed of concentric white circles on a blue background. To the right of the 'C', the text 'OMPUMAG 2019' is written in a large, white, sans-serif font. Below this, the text 'July 15-19, 2019 Paris - France' is written in a smaller, white, sans-serif font.

COMPUMAG 2019

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The DTT project: a necessary step for the energy of the future and a challenge for the present numerical electromagnetism. Models, approaches, solutions and open questions.

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The Controlled Thermonuclear Fusion with magnetic confinement is the main scientific challenge for the mid-term solution of the energy problem. The design, construction and management of a fusion machine require diversified skills, from physics to materials science, from mechanical engineering to neutronics; nevertheless, the problems of electromagnetism are certainly among the most complex, numerous and important. In recent years, an international group of Italian-led researchers has proposed the realization of the Divertor Tokamak Test facility (DTT), a medium-size and high-tech fusion device. Aim of DTT is to study, experiment and assess new technologies to construct a very critical component in view of the carrying out of DEMO, the first commercial reactor to be constructed by 2050. The project was approved and funded in 2017 and its construction is planned by 2025. The figures of the project are quite impressive: 500 M€ (more than 80% from Italy) for the investment costs; at least 250 people involved for the operations in the following 20-30 years (50 % professionals, 50 % support personnel).

The talk to the COMPUMAG community will be focused on the illustration of the main electromagnetism problems faced in the project and the numerical solutions adopted. Particular attention will be given to the calculation of the currents induced in the fully 3D passive structures, to the coupled non-linear problems of fluid-dynamic interaction between plasma and conductive structures, to the electromagnetic problems associated with the equilibrium and stability of the plasma, to the problems of designing the superconducting magnets. For each items the mathematical formulation will be discussed, together with the numerical solution adopted and the open questions.

The presentation will also focus on the wide margins of scientific-industrial collaboration open for the international community of numerical electromagnetism and, in addition, the interesting opportunities for the involvement of young researchers.

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