Contribution ID: **137** Type: **Poster**

Conceptual design of ELM control coils for the TCABR tokamak

Wednesday, 17 July 2024 15:40 (1h 30m)

An upgrade of the TCABR tokamak ($R_0 = 0.62$ m, $a \leq 0.18$ m, $I_p \leq 120$ kA and $B_0 \leq 1.1$ T) is being designed to enable the generation of a well controlled environment to assess the impact of resonant magnetic perturbation (RMP) fields on edge localised modes (ELMs). This impact can be investigated over a broad range of (*i*) plasma shapes, (*ii*) RMP coil geometries and (*iii*) perturbed magnetic field spectra. To address this issue, a unique set of in-vessel RMP coils was designed and, in this work, their conceptual design is presented. This set of coils is composed of three toroidal arrays of coils on the low field side and three toroidal arrays of coils on the high field side. Each of these six toroidal arrays is composed of 18 coils, hence, enabling the application of RMP fields with toroidal mode numbers $n \leq 9$ to control/mitigate ELMs. To study dynamical effects of RMP fields of different toroidal mode numbers, all rotating simultaneously with different velocities, each of the 108 RMP coils will be powered independently by power supplies that can provide voltages of up to 4 kV and electric currents of up to 2 kA, with frequencies varying continuously from 0 Hz (DC) to 10 kHz. A set of physical criteria was used to determine the optimal coil geometry and their respective number of turns to reduce the coil currents and voltages during operation with alternate current. The conceptual design of the RMP coils was executed using the so-called vacuum approach and the linear, single-fluid plasma response model implemented in the visco-resistive MHD code M3D-C^1. Work supported by the Ministry of Science, Technology and Innovation: National Council for Scientific and Technological Development - CNPq.

Speaker's Affiliation

Institute of Physics of University of São Paulo

Member State or IGO

Brazil

Primary author: SALVADOR, Felipe (Institute of Physics of University of São Paulo)

Co-authors: Dr KLEINER, Andreas (Princeton Plasma Physics Laboratory); BOUZAN, André (Polytechnic School of University of São Paulo); ORLOV, Dmitriy (University of California San Diego); SEOL, Ellen (Rensselaer Polytechnic Institute); KASSAB JR., Fuad (Polytechnic School of University of São Paulo); PAGANINI CANAL, Gustavo (University of São Paulo); F. SEVERO, Jose Helder (Laboratório de Física de Plasma, Instituto de Física, Universidade de São Paulo); KOT, Natalie (University of Michigan); FERRARO, Nate (Princeton Plasma Physics Laboratory); GALVAO, Ricardo (University of Sao Paulo); RAMOS JR., Roberto (Polytechnic School of University of São Paulo); ASNIS, Yuri (École Polytechnique Féderale de Lausanne)

Presenter: SALVADOR, Felipe (Institute of Physics of University of São Paulo)

Session Classification: Poster Session

Track Classification: Special Session for Physics Topics