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Implementation of the Spherical Tokamak MEDUSA-CR: Stage 1

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The low aspect ratio Spherical Tokamak (ST) MEDUSA (Madison Education Small Aspect Ratio Tokamak) is currently being re-commissioned at the Instituto Tecnológico de Costa Rica, after it was donated by the University of Wisconsin-Madison, USA. The main characteristics of this magnetic confinement device are described as follows: plasma major radius of Ro < 0.14 m, plasma minor radius a < 0.10 m, plasma vertical elongation 1.2, toroidal field at the geometric center of the vessel BT < 0.5 T, plasma current Ip < 40 kA, ne(0) < 2 x 1020 m∧-3, central electron temperature Te(0) < 140 eV, discharge duration is < 3 ms, top and bottom rail limiters, and natural divertor D- shaped ohmic plasmas [1].
Training students and researchers is the main goal as for ST MEDUSA-CR, to merge knowledge between physics and engineering in order to address relevant concepts for spherical and conventional Tokamaks [2].
Currently diverse topics are being addressed in the first engineering stage of the MEDUSA-CR. For the vacuum system design there has been developed the corresponding documentation process of the implementation and testing vacuum, also it is present a new design of the vacuum vessel made of stainless steel. The design, of the new injection system, entirely developed to accomplish the Spherical Tokamak's requirements has been successfully tested. The electric current control of the coils presents a possible upgrade to converting ST MEDUSA-CR to AC mode. Additionally, a MHD equilibrium simulation for the original configuration of the device has been performed using a code named Fiesta; which was facilitated by Geoffrey Cunningham from Culham Centre for Fusion Energy (CCFE).[3, 4]

References
[1] G. D. Garstka, PhD thesis, University of Wisconsin at Madison, September 1997.
[2] V.I. Vargas et al., Progress on Re-commissioning of the Spherical Tokamak MEDUSA in Costa Rica, 23rd IAEA Technical Meeting on the Research Using Small Fusion Devices (23rd TM RUSFD), March 29-31 2017,Santiago, Chile.
[3] V.I. Vargas et al., Re-commissioning of the Spherical Tokamak MEDUSA in Costa Rica, 26th IAEA Fusion Energy Conference (FEC IAEA), 17–22 October 2016, Kyoto, Japan.
[4] V.I. Vargas et al., First engineering stage of the Spherical Tokamak MEDUSA-CR, 16th Latin American Workshop on Plasma Physics (LAWPP), 4-8 September 2017, Mexico City, Mexico

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Author: Prof. MORA-MELÉNDEZ, Jaime (Instituto Tecnológico de Costa Rica)

Co-authors: Mr ARAYA-SOLANO, Alonso (Instituto Tecnologico de Costa Rica); Ms ROJAZ-LOAIZA, Ana Marcela (Instituto Tecnológico de Costa Rica); Mr MONGE, Ignacio (Instituto Tecnologico de Costa Rica); Dr VARGAS-BLANCO, Ivan (Instituto Tecnológico de Costa Rica); Mr ARIAS-BRENES, Jose (Instituto Tecnologico de Costa Rica); Mr ROJAS, Jose (Instituto Tecnologico de Costa RIca); Mr PIEDRA-QUESADA, Nestor (Instituto Tecnologico de Costa Rica)

Presenter: Prof. MORA-MELÉNDEZ, Jaime (Instituto Tecnológico de Costa Rica)

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