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## P4.195 Stress-strain characterization of abs polymer at cryogenic temperatures

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Plasma Laboratory for Fusion Energy and Applications at Instituto Tecnológico de Costa Rica (ITCR) plans the design of SCR-2; a Quasi-Toroidally Symmetric (QAS) two-field period modular Stellarator, aspect ratio  $\sim 5$  formed by 24 modular magnetic coils. SCR-2 coils design is based on ESTELL QAS configuration (project cancelled) [1], supplied by Max Planck Institute for Plasma Physics, Greifswald, Germany.

Among SCR-2 design aspects, superconductive coils (SCC) and an additively manufactured (AM) coils structure stand out. These present engineering challenges, since high precision complex geometries [2][3] and cryogenic environment conditions must be complied at reasonable cost. Besides, AM research for magnetic confinement device construction is not yet a vast study field. Hence, this technique must be regarded for preliminary studies.

First, 77 K stress-strain (SS) tests on AM ABS specimens are carried out at ITCR, considering several manufacturing parameters. These parameters' influence on the results obtained is analyzed using Design of Experiments methodology. In order to perform SS tests, a LN<sub>2</sub> vessel adaptation for an universal testing machine was built. Tests description, results and SCR-2 concept models will be presented. Results from these experiments will be reckoned with so that FEM simulations of a prelusive design for the 3D printed modular coil structure could be performed.

[1] M. Drevlak et al., "ESTELL: A Quasi - Toroidally Symmetric Stellarator", *Contrib. to Plasma Phys.*, vol. 53, no. 6, pp. 459 – 468, 2013.

[2] V.I. Vargas et al, Implementation of Stellarator of Costa Rica 1 SCR 1, in: 26th IEEE Symposium on Fusion Engineering (SOFE), 31 May – 4 June 2015, Austin, TX (USA), IEEE Conference Publications, 2016, pp. 1–6, ISBN: 978-1-4799-8264-6.

[3] V. Queral, "Prospects for Stellarators Based on Additive Manufacturing: Coil Frame Accuracy and Vacuum Vessels", *IEEE Transactions on Plasma Science*, issue 99, pp. 1-7, 2018.

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