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# First Results of the Stellarator of Costa Rica 1 (SCR-1)

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Since 2009, the Instituto Tecnológico de Costa Rica started a research project on stellarators which aims at designing, constructing and implementing the first device of this technology in Latin America. SCR-1 is a small-size, modular stellarator (Major radius=0.238 m, plasma radius=0.059 m, aspect ratio>4.4, expected plasma volume ≈ 0.016 m^3, 10 mm thickness 6061-T6 aluminum vacuum vessel). The magnetic field strength at the center is around 43.8 mT which will be produced by 12 copper modular coils with 4.6 kA-turn each. This field is EC resonant at R_o with a 2.45 GHz as 2nd harmonic, from 2 kW and 3kW magnetrons. SCR-1 was redesigned from UST_1 stellarator.

The SCR-1 has several subsystems: vacuum system, coils system, high current system, EC heating system, gas injection system, control and acquisition system and diagnostics. The vacuum system is mainly composed by the vacuum vessel that was made of aluminum 6061-T6 and was constructed using 3 axis CNC milling machine, and welded with MIG technique. The coil system was made using 3D printing and casting molds. It has 12 modular coils with 6 copper wire turns each, carrying a current of 767.8 A per turn. High current subsystem has two main parts: an industrial battery bank (150 A-h, 120 V), and an electric current regulator base on a buck converter that keep constant current on the coils. The EC heating system has two magnetrons, one of 2kW and the other of 3kW at a frequency of 2.45GHz. Also, an antenna was designed to improve the microwave absorption. The main component of the gas injection system constitutes a mass flow controller of 20 SCCM. The control and acquisition system uses a NI PXIe-8135 2.3 GHz Core i7-3610QE Controller, Win7 (32-bit). The diagnostics included in the SCR-1 are a Langmuir probe (two removable heads, four tips each one), an iHR550 optical spectrometer and a heterodyne microwave interferometer (28 GHz).

Finally, we are going to show the magnetic mapping results using four different methods and local magnetic field measurements. Also, this work presents the results of the VMEC simulation and full-wave simulations using the IPF-FDMC code to develop different electron waves Bernstein heating scenarios. And the main reason is to present the first plasma shots, showing results of electron temperature and density using a Langmuir probe and an optical spectrometer.

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