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FTP/P1-32: Advances in the Electrical , Control Systems, General Analysis of the Coils Design in the Mexican Tokamak Experimental Facility

Tuesday, October 9, 2012 8:30 AM (4 hours)

The Fusion Research Group of the Autonomous University of Nuevo Leon (UANL, Spanish acronyms) presents its advances into the electrical, control systems and its coils design developed toward the Tokamak Experimental Facility[1]. This Research and Development Project (R+D) was approved from the Mexican Education Ministry (UANL-EXB-156). The present electrical and control systems studies are mainly oriented to establish our Magnetic Confinement Facility into our University Campus, with a D-shaped tokamak design with the next main characteristics: major radius 41cm(R), minor radius 18.5cm(a), aspect ratio 2.2162(A), safety factor 1.9552(q), plasma current 277kA (Ip), toroidal field 1.3T (Bt), electronic plasma density 2 - 3x10^13 cm^-3(ne).
The present study at this time is an effective electrical engineering proposal to our University involving studies over the electrical power quality provided by Federal Electricity Commission. We define our parameters in voltage, current, frequency, to implement the correct strategies of electrical supplies in order to protect our facility. The analysis was performed measuring in the five domestic circuits of the University Campus: phase imbalances (current and voltage), harmonic distortion total and individual (voltages and currents of 1-50), transient capture, presentation of the power factor, registration of electrical interruptions and reclosing, measuring and recording quality power systems, crest factors (voltage and current), accurate RMS measurements of voltage and current, presentation of phasor diagrams.
Our tokamak design contains a proposal coils arrangement capable for generate 1.6T, with a coil current range (10,000–30,000 A), short circuit times from 0.3s to 1s. The entirely systems uses Cu like first analysis material. The coils are designed with 3D CAD modeling and after, we apply finite element analysis through the software COMSOL Multiphysics. Our numerical calculus programs run under our SGI Altix XE250 GNU/Linux Platform.
Our computational resources can give us an absolute develop systems involved in our magnetic confinement fusion research line, focused in the stronger application of engineering, technology and science concepts, developing systems and devices into this new form of energy generation.

[1] Mexican Design of a Tokamak Experimental Facility, FTP/P6-36, IAEA FEC 2010.

Country or International Organization of Primary Author

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Collaboration (if applicable, e.g., International Tokamak Physics Activities)

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