Abstract Submitted
for the DPP16 Meeting of
The American Physical Society

The Aneutronic Rodless Ultra Low Aspect Ratio Tokamak CELSO RIBEIRO, University Veritas, Costa Rica — The replacement of the metal centre-post in spherical tokamaks (STs) by a plasma centre-post (PCP, the TF current carrier) is the ideal scenario for a ST reactor. A simple rodless ultra low aspect-ratio tokamak (RULART) using a screw-pinch PCP ECR-assisted with an external solenoid has been proposed in the most compact RULART [Ribeiro C, SOFE-15]. There the solenoid provided the stabilizing field for the PCP and the toroidal electrical field for the tokamak start-up, which will stabilize further the PCP, acting as stabilizing closed conducting surface. Relative low TF will be required. The compactness (high ratio of plasma-spherical vessel volume) may provide passive stabilization and easier access to L-H mode transition. It is presented here: 1) stability analysis of the PCP (initially MHD stable due to the hollow J profile); 2) tokamak equilibrium simulations, and 3) potential use for aneutronic reactions studies via pairs of proton p and boron ^{11}B ion beams in He plasmas. The beams' line-of-sights sufficiently miss the sources of each other, thus allowing a near maximum relative velocities and reactivity. The reactions should occur close to the PCP mid-plane. Some born alphas should cross the PCP and be dragged by the ion flow (higher momentum exchange) towards the anode but escape directly to a direct electricity converter. Others will reach evenly the vessel directly or via thermal diffusion (favourable heating by the large excursion ˜2a), leading to the lowest power wall load possible. This might be a potential hybrid direct-steam cycle conversion reactor scheme, nearly aneutronic, and with no ash or particle retention problems, as opposed to the D-T thermal reaction proposals.

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Date submitted: 16 Jul 2016 Electronic form version 1.4