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ST Formation via Driven Relaxation of a Screw Pinch: Overview and Design Considerations of a Proposed Concept Exploration Experiment S. HSU, X. TANG, M. KOSTORA, T. INTRATOR, G.A. WURDEN, Los Alamos National Laboratory, D. LAZANJA, A. BOOZER, Columbia University — An ST with a plasma center column (PCC) could potentially overcome all the disadvantages of a material column. Along with CHI, a PCC could: (1) form an ST via driven relaxation of a screw pinch (SP), (2) carry inboard TF coil current, (3) assist ST sustainment in combination with rf/NBI, and (4) eliminate neutron shielding and column replacement. Achieving these goals will require considerable research. We propose to study the physics of (1). Our concept is to form a symmetry-axis SP between two electrodes, each coaxial with annular CHI electrodes. By programming SP/CHI electrode currents/voltages, the SP will undergo driven relaxation resulting in an ST-PCC equilibrium. After discussing the project motivation/impact, goals, physics basis/assessment (see poster by X. Tang), and plans for ST-PCC equilibria/stability numerical modeling, we will focus on design considerations/challenges of key hardware systems: (1) SP source consisting of electrodes and axial field coils; (2) CHI electrodes and bias field coils; (3) power supplies; (4) interface between outboard TF windings and SP electrodes; (5) flux-conserving boundary with electrical breaks for SP/CHI electrodes and shape-optimized for equilibrium/stability; and (6) diagnostics for characterizing ST-PCC formation.

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