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Zero-plasma-current equilibria generated by tilted planar coils J.

LI, B. ISRAELI, K. C. HAMMOND, F. A. VOLPE, Columbia University — It is known that a periodic toroidal arrangement of tilted planar coils, combined with vertical field coils, can generate a helical magnetic field. One question, though, is: is this coil-set a generator or an amplifier of rotational transform? In other words, is a finite plasma-current needed? A numerical scan of coil-currents shows that configurations exist, for which no plasma-current is needed, and yet torsatron plasmas of finite volume can be obtained. The case of six tilted circular coils has been examined in great detail because of its relevance to the CIRCUS device operated by Columbia, a generalization of the two-tilted-coil CNT stellarator, also at Columbia. More axisymmetric configurations featuring a higher number of tilted circular coils are also being investigated. The calculations are performed with the aid of a numerical field-line tracer and the VMEC equilibrium solver, slightly modified to reflect the simplicity of the coil geometry: the coils are not discretized; instead, their field is evaluated by means of analytical expressions. This allows for faster calculations and rapid, fine scans of large parameter spaces.

Kenneth Hammond
Columbia University

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