Abstract Submitted
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Uniqueness of Stellarators and Their Design[1] ALLEN BOOZER, Columbia University — Stellarators are unique among all fusion concepts–inertial and magnetic–in not relying on the plasma as a part of the confinement concept. HSX and W7-X demonstrated that radically new stellarator designs actually work. One can computationally determine the best conceptual design and then build a validating experiment rather than driving development by a decades-long experiment based on an extrapolation. Even the design of reactor-scale stellarators seems credible; no known physics issues must be overcome, such as disruption avoidance in tokamaks. Much remains to be computationally explored to make stellarators more attractive and to assure the achievement of fusion. An optimal reactor has rapid transport in the central part of the plasma with the confinement provided by a wide annulus. An unexplored option, http://arxiv.org/abs/1906.06807, is to focus on that annulus by finding a magnetic surface $\vec{x}_s(\theta,\varphi)$ in Boozer coordinates that gives the desired form for the field strength, such as $B_s(\theta - N\varphi)$. This requires two of the three free functions in R,ζ,Z cylindrical coordinates. A single function of θ,φ specifies the external field. Coil designs could be simpler and allow open access to the plasma chamber.

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