New QP/QI symmetric stellarator configurations

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A unique characteristic of the quasi-poloidal/isodynamic transport optimization strategy is that it can lead to stellarators that deviate from the usual "doughnut" shape; i.e., they can have extended relatively straight cylindrical sections of plasma (connected by corner regions). This offers a number of potential design advantages, including simplified coil geometries, novel divertor approaches, low bootstrap current (less potential for ELMs and disruptions), more acceptable wall heat fluxes, and demountable blankets for reactors. The STELLOPT approach has been used to develop optimized configurations of this type for two, three and four field periods; the primary optimization targets used so far have been: effective ripple, J* closure and aspect ratio. From a top view, the two field period device is an extended racetrack with $\iota = 0.2 - 0.25$, $\varepsilon_{eff}^{3/2} = 8 \times 10^{-4} - 3 \times 10^{-3}$ and outboard $R_{max}/R_{min} \sim 3$; $\langle R \rangle / \langle a \rangle$'s in the range of 8 to 20 have been examined so far. The physics characteristics and remaining optimization targets that are under consideration for such devices will be discussed.

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