DIAGNOSTIC SIGHTLINE OPTIMIZATION FOR QPS*

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The Quasi-Poloidal Stellarator (QPS), currently in the R&D and prototyping design phase, is a low-aspect-ratio ($R/a \geq 2.3$), compact stellarator experiment with a non-axisymmetric, near-poloidally-symmetric magnetic configuration. The QPS design parameters are $\langle R \rangle = 0.9$ m, $\langle a \rangle = 0.3$-0.4 m, $B = 1$ T, and a 1.5-s pulse length with 3-5 MW of ECH and ICRF heating power. QPS has a set of 20 modular coils and connecting support structure inside a cylindrical vacuum vessel with rounded top and bottom domes and vertical field and toroidal field coils outside the vacuum vessel. The vacuum vessel has 12 61-cm diameter ports around the horizontal midplane and large oblong ports on the top and bottom ports for access for diagnostics, plasma heating, and utilities. While the vacuum vessel design allows good overall access, the challenge in positioning sight lines for viewing the plasma for various diagnostics was to locate clear paths around the internal components. Additional constraints for power leads, cooling lines, and structure decreased the available locations for diagnostic viewing. 3-D Pro-E models were used to optimize diagnostics views for Thomson scattering, microwave interferometers, ECE, soft x-ray arrays, electron beam mapping, etc.

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