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Physics and engineering drivers for the SPARC divertor shape[1]
A.Q. KUANG, S. BALLINGER, D. GARNIER, M. GREENWALD, J. IRBY, B. LABOMBARD, J. TERRY, MIT PSFC, J. CANIK, T. GRAY, J.D. LORE, M. REINKE, ORNL, D. BRUNNER, A.J. CREELY, CFS, B. LIPSCHULTZ, University of York, M. UMANSKY, LLNL, THE SPARC TEAM — The SPARC divertor shape is being designed primarily for the baseline scenario of a strike point sweep and an advanced divertor mission. Based on empirical scalings, the peak unmitigated divertor parallel heat flux in SPARC is projected to be greater than 10 GW/m^2 [1]. The current baseline scenario for operations employs a ˜1 Hz strike point sweep to spread the heat flux and assumes 50% of P_{SOL} is loss to radiation before reaching the target; the sweep frequency is limited by the central solenoid and poloidal field coil set, and the extent by the divertor surface. SPARC employs long (poloidally) tightly baffled divertors to maximize the swept area and reduces the incident total magnetic field line angle onto the target to ˜1. Furthermore, SPARC is being designed to enable the assessment of an X-point target outer divertor through optimization of coils and providing sufficient divertor volume to encompass the secondary X-point. While the X-point target divertor geometry is only achievable at reduced plasma current (5.7 MA), with an estimated PSOL=22 MW, SPARC still provides a reactor level testbed for the evaluation of this advanced divertor geometry. The design of the divertor is ongoing to ensure a consistent assembly and maintenance scheme is included. [1] Kuang, A.Q., *J. Plasma Phys.* Submitted.

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