# ABSTRACT

We present a series of observations concerning divertor heat flux ($q_{div}$) in the DIII–D tokamak, and show that we can account for many features by assuming that the heat flux flows preferentially along field lines because $\tau_{\|} < \tau_{\perp}$ in the scrape-off-layer. We point out exceptions to this agreement, and explain the discrepancies by means of 2-D effects. We are able to account for ~80% of the discharge input power. The power deposited on the target plate due to enhanced losses during edge-localized modes (ELMs) is < 10% of the total target power in most cases. X–point height scans for lower single-null (LSN) diverted discharges show that the peak heat flux variation is primarily due to flux expansion and secondarily to transport of energy across the magnetic field in the divertor. At the outer strike point, $q_{div,peak} \propto P_{in}(I_p\text{-}I_{p,0})G(g_{in})(1/B_t)^{4/9}B_{div}/B_{mp})f(L_{div},\chi_{\perp})$ where $G$ is a linear function of the inner gap ($g_{in}$ ) over a specified range and $f$ describes cross-field energy transport in the divertor. We present evidence of radial in-out asymmetries (comparing the outer strike point with the inner strike point or center-post) and toroidal asymmetries in $q_{div}$ and examine heat flux peaking due to tile gaps and misalignment of tiles. For magnetically balanced double-null (DN) discharges with downward $\nabla \mathbf{B}$ ion drift, we find that $q_{div}$ is inherently higher in the lower divertor than the upper divertor, having a 3:1 downward bias. We show examples of heat flux reduction by gas puffing deuterium or neon in LSN and DN discharges. We report at least three-fold reduction of the peak heat flux in both the upper and lower divertors of a DN discharge, using $D_2$ puffing.