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Impact of the Radiating Divertor Approach on Future Tokamaks[1]

T.W. PETRIE, A.W. LEONARD, T.C. LUCE, General Atomics, F. TURCO, Columbia U., S.L. ALLEN, M.E. FENSTERMACHER, C.T. HOLCOMB, C.J. LASNIER, LLNL, R.A. MOYER, UCSD, J.G. WATKINS, SNL — We report on recent results that apply the deuterium/neon-based radiating divertor approach to three future tokamak concepts: (1) ITER Baseline plasmas, (2) AT high performance plasmas, and (3) H-mode plasmas that are isolated from their divertor targets (Super X-like). Analysis of H-mode plasmas in the ITER Baseline shape, characterized by $q_{95} = 3.15$, $I/aB = 1.4$, $\beta_N = 2$ in the ITER shape, indicates significant a heat flux reduction (∼2.5x) during both ELMing and between ELM periods and a factor of two increase in radiated power, almost all of which occurs in the divertor/SOL regions. Radiating divertor applied to AT plasmas (e.g., $\beta_N = 3$ and $H_{89p} = 2.4$) is shown to reduce heat flux at least 30%, while at the same time maintaining high performance characteristics. We present our most recent results of studies designed to assess the value of increasing parallel connection length ($L_{||}$) of the outer divertor leg in a radiating divertor environment. Previous experiments have suggested that significant heat flux reduction at the OSP can be possible by increasing $L_{||}$.

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