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Divertor Configurations which Optimize Helium Pumping[1]
JAMES STRACHAN, PPPL, Princeton University — Helium accumulation in DT plasmas is often presumed to be one limitation to the fusion power production. The core helium density has an unavoidable central source and a confinement time which tends to be long as is consistent with the required energy confinement times. Any pumping of the helium can only act to reduce the helium recycling. Within that constraint, however, it is still valuable to efficiently pump helium. Helium pumping can be aided by optimal placement of the helium pump in the divertor. The pump should be on the SOL side of the separatrix displaced into the region where the current of impurity particles enters into the divertor and initially strike the target. A numerical example will be given of helium pumping by the ITER divertor. A factor-of-two reduction in core helium densities is possible by optimal pump placement. One difficulty is the need for low temperatures along the targets to prevent their erosion. On ITER, recycled DT near the strike points is hoped to cool this region. The angle between the separatrix and the target is such that recycled neutrals cause ionization, excitation, and dissociation power losses along the target. The ITER solution constrains the choice of pump locations. Alternatively, the strike point cooling can be achieved by local DT (or low Z impurity) injection at the strike point.

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