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Survey of heating and current drive for K-DEMO[1] DAVID MIKKELSEN, NICOLA BERTELLI, CHARLES KESSEL, FRANCESCA POLI, Princeton Plasmas Physics Laboratory — We present calculations of heating and current drive by neutral beam injection and by RF waves in the ion-cyclotron, lower-hybrid, and electron cyclotron frequency ranges for the steady-state burn conditions in a K-DEMO configuration with Ip=12.3 MA, a=2.1 m, Ro=6.8 m, Bo=7.4 T, ne-bar=1.1E20 /m3, T(0)=40 keV, and Zeff=1.5. Deposition from an ITER-like NBI system was calculated for quasi-tangential geometry with a horizontal beam axis; the axis elevation was scanned from Z=0 (the tokamak midplane) to Z=2.2 m. Peak deposition varies from r/a=0.1-0.65, the CD efficiency is 40-55 A/kW. A scan of ICRH frequency will reveal the windows of high CD efficiency that lie between absorption bands of the ion species (thermal D, T, He, Ar, and W, fast alphas and D). A scan of poloidal location for a 5 GHz lower-hybrid wave launcher varied the current profile shape in the periphery (no driven current for r/a <0.65), and CD efficiency of 40-50 A/kW. The electron cyclotron survey varied the frequency, launcher poloidal location, and the poloidal and toroidal direction of the launched waves. A single frequency and poloidal position can achieve 25 A/kW over nearly the full range r/a=0.13-0.6 with, but up to 50 A/kW at r/a=0.5 is achievable at some locations with higher frequencies.

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