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3D Magnetic Perturbation Effects on Transport in Tokamaks,* T.E. Evans, *GA*; T.L. Rhodes, L. Zeng, *UCSD*; G.R. McKee, *U. Wisc-Madison*; D.M. Orlov, R.A. Moyer, G.R. Tynan, W. Xiao, *UCSD*; R. Nazikian, *PPPL* – Recent experimental results in DIII-D H-mode plasmas, with a constant level of applied n=3 perturbation fields, have revealed dramatic particle, energy and momentum transport changes simply by altering the relative toroidal phase between the intrinsic n=1 and 2 field-errors and the applied n=3 perturbation field. Here, we present a summary of the experimental observations, including changes in the turbulence and MHD behavior in configurations with either constructive or destructive interference between the intrinsic n=1 and 2 fields and the applied n=3 field. A particularly interesting aspect of these results is that the energy confinement increases by ~35% when the intrinsic and applied perturbation fields are relatively well aligned to produce a larger total radial field. Similar increases are seen in the particle and momentum confinement. These observations are compared to a hypothesis connecting the structure of the 3D radial magnetic perturbation field to the changes in transport.

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