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Role of non-thermal electrons in the DIII-D low density stability limit[1] CARLOS PAZ-SOLDAN, N. EIDIETIS, R.J. LA HAYE, E.J. STRAIT, GA, D.L. SHIRAKI, ORNL, R.A. MOYER, E.M. HOLLMANN, UCSD, C.M. COOPER, ORAU — The lowest achievable density in tokamaks is thought to be linearly related to uncorrected error fields, with the limiting instability being n=1 error field penetration (the low-density locked mode). Experiments at DIII-D over the past two decades find that despite various types of optimized error correction, operation below densities of $\sim$ (4-5)x10^{18} m^{-3} yields penetration. Recent experiments show that at similar densities, non-thermal electrons are robustly excited by the Dreicer mechanism. Unexpectedly, locked mode onset in these discharges occurs at similar levels of non-thermal emission intensity, despite application of gas puffing to raise the density. Penetration is preceded by 1) non-thermalization of the electron cyclotron emission, 2) decrease in the bulk electron temperature, 3) anisotropization of the total pressure, and 4) appearance of new structures in synchrotron emission images. These observations will be detailed to assess the degree to which the non-thermal electron population sets the low-density limit.

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