Contribution ID: **3008** Type: **not specified**

O4.106 Turbulence driven widening of the near-SOL power width in H-Mode discharges at ASDEX Upgrade

Thursday, 11 July 2019 17:45 (15 minutes)

See the full abstract here http://ocs.ciemat.es/EPS2019ABS/pdf/O4.106.pdf

Operation of tokamaks with H-Mode characteristics and at high densities is generally foreseen for future high-power fusion systems, including ITER. The ease of access to divertor detachment via impurity seeding scales to first order proportional to (n_sep/n_GW)^2 lambda_q/rho_s,pol [1] with lambda_q being the power width, rho_s,pol = Sqrt(T_sep m_D/e/B_pol), T_sep and n_sep the separatrix temperature and density, respectively. Divertor heat flux data from infra red (IR) from various tokamaks in H-Mode regime scales approximately like rho_s,pol. However, the IR based scaling comes with the restrictions that only low-gas-puff discharges were considered. Here, we extend the low edge density data base with high density plasmas reaching the H-mode density limit by using Thomson-Scattering to measure the electron temperature decay length which will set the near-SOL power width through parallel heat conduction, lambda_Te ~ 7/2 lambda_q. As the principal result we present a generalized power width scaling which reads as lambda_q proportional to rho_s,pol (1 + 2.8alpha_t^1.8) where alpha_t describes a normalized collisionality (alpha_t = 3 10^-18 R q^2 n Z_eff T^-2). The parameter alpha_t describes the relative importance of the interchange effect on drift-wave turbulence as proposed by Scott[2] and is found for our data base to be about inversely proportional to the diamagnetic parameter alpha_d in [3]. This new scaling shows (a) in the limit of low edge densities (alpha_t ~0.15) accurate agreement to the IR based scaling and (b) at elevated separatrix densities (alpha_t ~0.8) that the power width is broadened by a factor of about three albeit accompanied by a confinement degradation to near L-Mode levels. We show that the confinement degradation is dominated by a reduction of the pedestal top pressure. Importantly, plasmas with higher shaping (higher triangularity) show a reduced confinement degradation at the same separatrix densities. We will present the experimental data base, new scaling results and discuss implications for ITER.

References

[1] R.J.Goldston et al, Nuclear Fusion 57, 055015 (2017)
[2] B.D. Scott, Physics of Plasmas 12, 062314 (2005)
[3] B.N.Rogers, J.F.Drake, A.Zeiler, Phys. Rev. Lett. Vol.81, p.4396 (1998)

pppo

Presenter: EICH, T.H. (EPS 2019)

Session Classification: MCF

Track Classification: MCF