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P2.1036 SOL and divertor power decay lengths across all confinement regimes at ASDEX Upgrade

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Understanding how the scrape-off layer (SOL) power decay length q scales with plasma quantities is essential for designing fusion reactors and developing a power exhaust solution. An inter-machine database [1] showed that, in inter-ELM H-mode, q scales approximately inversely with the poloidal magnetic field. Nevertheless, a unified cross-regime (L-mode, Imode and inter-ELM H-mode) and inter-machine q scaling is still missing. A first attempt in trying to find a cross-regime q dependence was done recently at Alcator C-mode [2]. It was found that q exhibits a dependence on the volume-averaged core plasma pressure. In this work a similar attempt is made with AUG data, although now q - inferred by infrared cameras is compared not only to plasma parameters characteristic of the confined region but also to near-SOL decay lengths measured by Thomson scattering.
Amongst all near-SOL decay lengths, q shows a close correlation across all confinement regimes with the near-SOL electron pressure decay length, pe and with the electron temperature decay length, Te. Furthermore, of particular interest is the correlation between q and plasma quantities characteristic of the confined region, as a power exhaust solution should still be accompanied by a large enough plasma confinement. It is observed that q exhibits a dependence on the pedestal top electron pressure and temperature across all confinement regimes. Also, it is found that the volume-averaged core plasma pressure captures the trend of q, albeit it overestimates by a factor two AUG H-mode q.
References
[1] T. Eich et al., Nucl. Fusion 53, 093031 (2013) [2] D. Brunner, B. LaBombard, A.Q. Kuang and J.L. Terry, Nucl. Fusion 58, 094002 (2018)

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