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Fast Imaging of ELM Structure and Dynamics in DIII-D*

J.H. Yu, J.A. Boedo, E.M. Hollmann, R.A. Moyer, D.L. Rudakov, *UCSD*, P.B. Snyder, *GA* – Fast-framing images of CIII and D_α emission in the low-field-side (LFS) plasma boundary of DIII-D show that ELMs are helical filamentary structures that rotate toroidally. The filaments propagate radially outward at v_r~500 m/s during the nonlinear phase, and result in plasma-wall interactions that are poloidally localized within 15 cm of the midplane. The measured mean poloidal width of the filament is 3 cm, and the ELM toroidal mode number *n* ranges from 10 to 35. ELM structure and dynamics vary with plasma density, possibly because ELMs are driven by a peeling type of mode in low density plasmas and are driven by a coupled peeling-ballooning mode in high density. At high collisionality (ν^*_{ped}=0.50), ELMs begin with an unstable filament or group of filaments at the LFS midplane region. Onset of the ELM-induced radiation in the divertor is delayed by as much as 0.8 ms compared to the midplane signals. In low collisionality (ν^*_{ped}=0.25) discharges, the midplane and divertor ELM signals appear simultaneously, possibly suggesting a more poloidally symmetric mode structure.

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