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Dynamic Mode Decomposition (DMD) application to premixed Low Swirl Injector flames[1] PAUL PALIES, United Technologies Research Center, East Hartford, CT, ROBERT CHENG, Lawrence Berkeley National Laboratory, MS 70-108B, 1 Cyclotron Rd., Berkeley, CA 94720, USA, DUSTIN DAVIS, Pratt and Whitney, 400 Main Street, East Hartford, CT 06108, USA, MILOS ILAK, United Technologies Research Center, East Harftord, CT — DMD is implemented and applied to premixed flame image data from the Low Swirl Injector.[2] The data consists of high speed video flame images at three different equivalence ratios, corresponding to low-amplitude oscillation, transient growth, and high-amplitude oscillation regimes. DMD reveals spectra of growth rates and frequencies with corresponding spatial modes, ranked by mode norm. For the low-amplitude oscillation regime, DMD does not capture any dominant mode shapes or frequencies. For the high-amplitude oscillation case, the frequency of the dominant mode and its harmonics match the frequency recorded by pressure measurement. The spatial mode from DMD is used to extract the propagation velocity of perturbations. In the transient regime, DMD captures the growth rate and frequency of the transient mode. The corresponding DMD spatial mode shows a similar shape to the high oscillation case indicating that the transition to a limit cycle is associated with a convective mode. The underlying mechanism of unsteady heat release is identified as induced by a convected wave along the flame front, whose velocity is confirmed by a separate analysis.

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[2]Therkelsen *et al.*, Combustion and Flame, Vol 160 (2), 307-321.

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