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Pressure scaling of a reheat flame structure[1] AKASH RODHIYA, KONDURI ADITYA, Indian Institute of Science Bengaluru, ANDREA GRUBER, SINTEF Norway, JACQUELINE CHEN, Sandia National Laboratories — Longitudinally staged gas turbine combustors have gained significant interest in power generation for their ability to achieve low emissions, high efficiency and fuel flexibility under a wide range of operational conditions. The combustion properties of the so-called reheat flame, stabilized in the second stage combustor, play an important role in achieving the desired operational characteristics. Recently, a 3D direct numerical simulation investigated stabilization of a reheat hydrogen flame at atmospheric pressure in order to characterize the modes of combustion. Since the operating pressure in industrial combustors is between 15 and 30 bar, this work builds upon and proceeds beyond the mentioned earlier effort to understand the pressure scaling effect on the stabilization of the reheat flame using 2D simulations. The computational domain consists of a mixing duct followed by a sudden area-change, into the combustion chamber. Preliminary results show that at higher pressures the flame stabilization location is increasingly sensitive to perturbations in the reactants' pressure/temperature, and can easily transition to an unstable state of combustion characterized by spatial oscillations. Further, the flame structure and the role of auto-ignition are quantified using CEMA.

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