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Assessment of swirl spray interaction in lab scale combustor using time-resolved measurements KUPPURAJ RAJAMANICKAM, Doctoral Student, Mechanical Engineering, Indian Institute of Science, MANISH JAIN, Undergraduate Student, SAPTARSHI BASU, Associate Professor, Mechanical Engineering, Indian Institute of Science — Liquid fuel injection in highly turbulent swirling flows becomes common practice in gas turbine combustors to improve the flame stabilization. It is well known that the vortex bubble breakdown (VBB) phenomenon in strong swirling jets exhibits complicated flow structures in the spatial domain. In this study, the interaction of hollow cone liquid sheet with such coaxial swirling flow field has been studied experimentally using time -resolved measurements. In particular, much attention is focused towards the near field breakup mechanism (i.e. primary atomization) of liquid sheet. The detailed swirling gas flow field characterization is carried out using time -resolved PIV (˜3.5 kHz). Furthermore, the complicated breakup mechanisms and interaction of the liquid sheet are imaged with the help of high-speed shadow imaging system. Subsequently, proper orthogonal decomposition (POD) and dynamic mode decomposition (DMD) is implemented over the instantaneous data sets to retrieve the modal information associated with the interaction dynamics. This helps to delineate more quantitative nature of interaction process between the liquid sheet and swirling gas phase flow field.

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