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Investigation of Laser Ignition Behavior of Iso-octane and Ethanol Blends NATHAN PETERS, PATRINA BAILEY, DESHAWN COOMBS, BENJAMIN AKIH-KUMGEH, Syracuse University — Laser-induced ignition is a promising technology for combustion initiation in gas turbines and internal combustion engines. There is renewed interest in this technology in recent years due to its ability to ignite lean mixtures which are desirable for cleaner combustion. Research in this area has mainly focused on methane combustion. Effects of pressure, temperature, and ignition energy have been studied. Another fuel of practical interest which has not been studied as extensively is iso-octane. Due to the complexities of the laser ignition process, there is still a lot that to be understood, especially during the early stages of ignition. In this work we study the ignition of iso-octane and blends including ethanol, induced by focused light pulse from an Nd:YAG laser emitting at 532 nm. Experiments are carried out in a cylindrical stainless steel vessel, equipped with 6 optical accesses. Schlieren imaging and laser interferometry are used to image the ignition process. We seek to understand the multiphysics of the early stages of ignition including shock wave velocity, plasma to flame kernel transition, and flame kernel quenching under lean conditions.

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