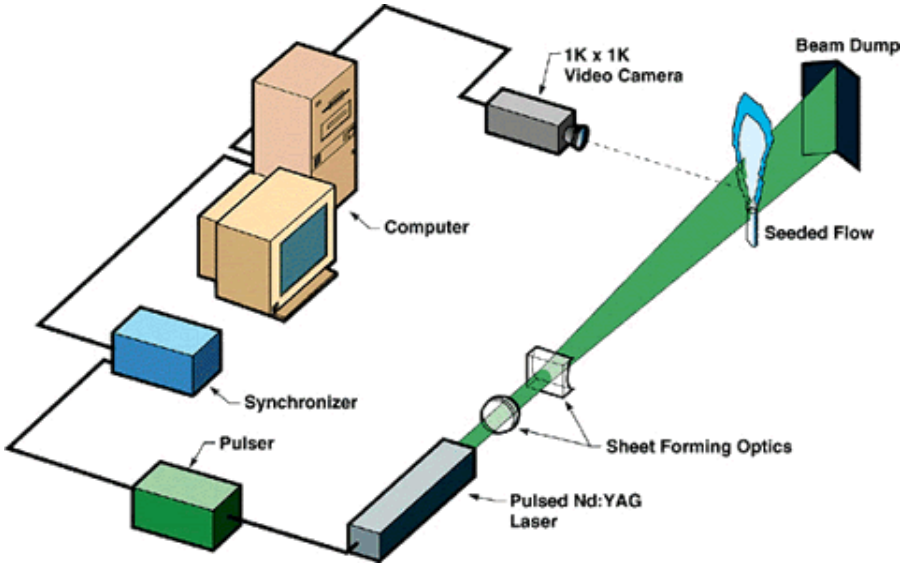
FLAME STABILIZATION

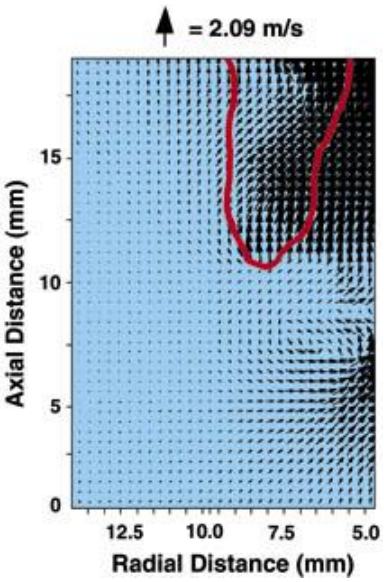
APPLICATION NOTE PIV-002

Courtesy of Sandia Laboratories



Flame stabilization is an issue of considerable importance to turbulent combustor design. Investigation of flame stabilization mechanisms was carried out using a Nd:YAG-based PIV system. The 532 nm output of the laser was formed into a 250 micron thick light sheet and passed through the test section. Particle images were captured using a 1K × 1K CCD camera. The velocity vector field and associated flow properties were calculated from the particle image displacements. The top figure shows the layout of the experimental apparatus.

The second figure shows the instantaneous velocity vector field in the lifted, turbulent CH4-jet flame at a Reynolds number of 7000. The region enclosed by the solid red line and originating from the top of the velocity vector field indicates a high temperature flame zone. The most upstream location of the high-temperature region defines the flame stabilization point. It can be seen that the velocities near the flame stabilization point are significantly reduced and typically less than 0.4 m/sec in the vector field shown. The velocity field in the flame was studied over a range of Reynolds numbers from 7000 to 20,000.



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