Mobile ps-CARS System

Spectral Energies' mobile picosecond-CARS system provides the benefits of non-intrusive, accurate measurements of temperature and species concentrations available to combustors, gas-turbine engines, and other harsh optical environments.

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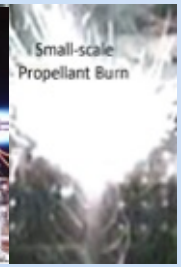
Spec sheets for all products available upon request.

Applications: Measurements of temperature & species concentration in harsh combustion environments



Use of the short ps pulse allows for :

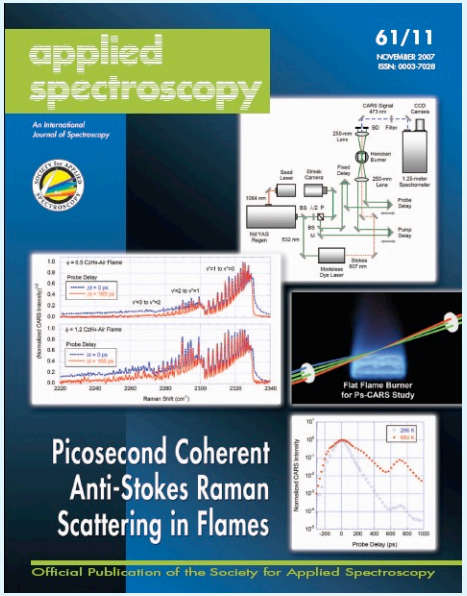
- Time-gated elimination of nonresonant background to improve measurement accuracy
  [S. Roy Appl. Phys. Lett. 87, 264103, 2005]

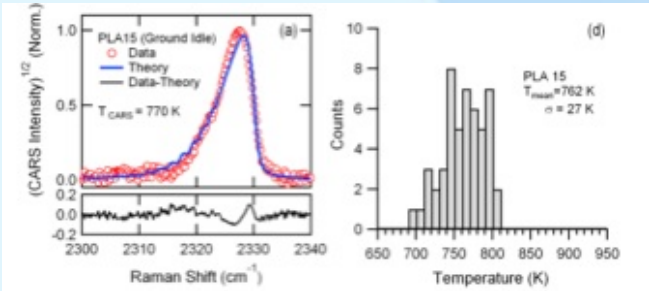
- Achievement of high pulse intensity resulting in high signal-to-noise (SNR) CARS spectra

- Reduction of the required laser energy for CARS measurements, avoiding costly window damage in optical combustors

- Investigation of the collisional and Doppler dependence of signal through time-resolved measurements [Kulatilaka et al. Appl. Phys. Lett. 97, 081112 (2010)].

SYSTEM SPECS		
	Pump & Probe Beam	Stokes Beam
Wavelength	532.2nm	607nm
Energy, pulse	100 mJ	3 mJ
Pulse Width, ps	100	100
Bandwidth, cm^{-1}	0.2	135
Beam quality, M^2	<1.2	1.8
CARS temperature precision +/-2%		
CARS spatial resolution 100 µm		





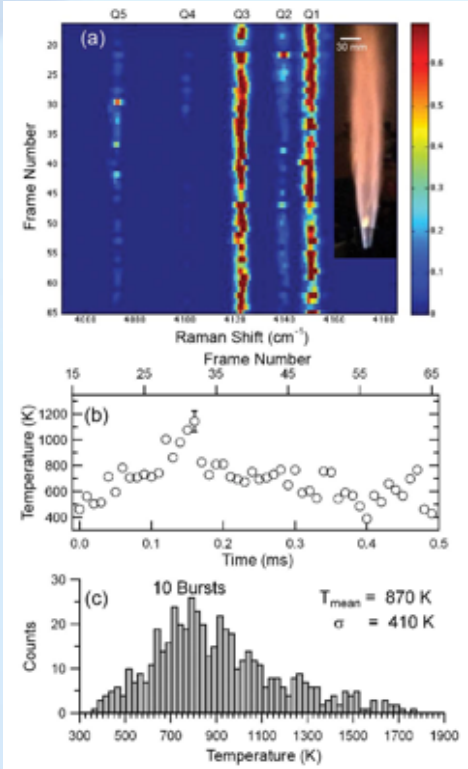
ps N_2-CARS spectra from J85 engine at PLA15 (ground idle mode). [AIAA-2015-1482 (doi:10.2514/6.2015-1482) 2015]

New 100-kHz Ps-CARS Thermometry

- Enabling temperature and species measurements up to 100 kHz to track turbulent subsonic – hypersonic flows

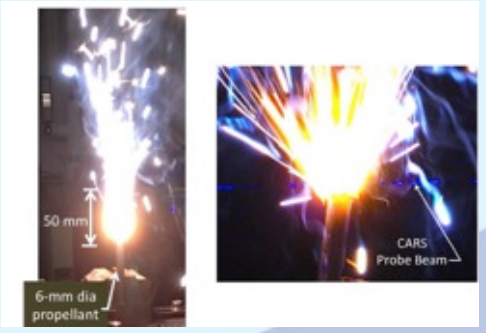
Key component of 100-kHz CARS system:

- **Ps-Burst-Mode Laser**
  - -Max. energy: ~ 55 mJ/pulse @100 kHz (532 nm)
  - -Intensity fluctuation : < 4%
- **OPG/OPA Broadband Solid-state Laser**
  - -Max. energy: ~2.3 mJ/pulse @ 680 nm
  - -Intensity fluctuation : <6%
  - -Spectral fluctuation: <5%

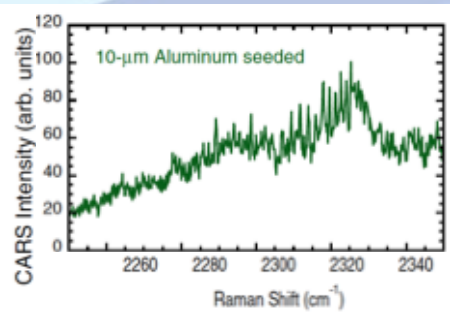


S. Roy, *Opt. Lett.* 41, 5125 (2015)

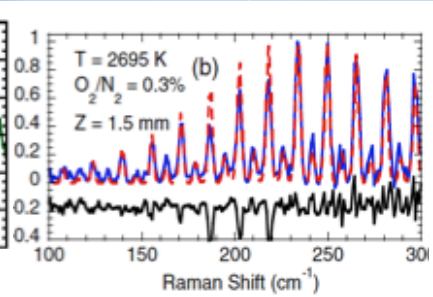
Aluminized propellant strand burner flame



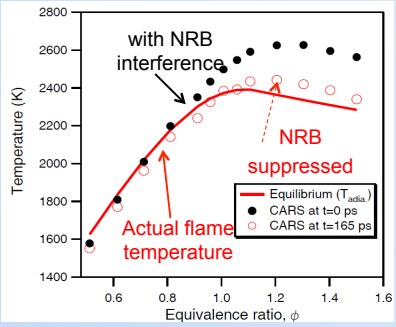
Ns-CARS



Ps/Fs-CARS



S. Kearny, *App. Opt.* 55, 4958, 2016



T. Meyer, *Appl. Spectrosc.*, 61, 2007, pp. 1135.