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REFERENCE :**CORIA Jet Spray Flame database**

OBJECT : Description of the experimental facility and list of data available

1 Description of experimental facilities:

The facility is an atmospheric and open burner based on the geometry of the gaseous KIAI burner [1]. The fuel injection system is composed of a simplex fuel injector (Danfoss, 1.35 kg/h, 80° hollow cone) and an external annular, non-swirling air co-flow, with an inner and outer diameter of 10 and 20 mm respectively. The diameter of the injector orifice is 200 µm (Picture available). Air and liquid fuel (*n*-heptane) mass flow rates are controlled by a thermal and a Coriolis mass flow controllers. The inlet conditions of air and fuel are 6 g/s (T=298 ± 2 K) and 0.28 g/s (T=298 ± 2 K) respectively, which leads to an air bulk velocity of 21.5 m/s. Non-reactive (NRC) and reactive (RC) conditions have been investigated.

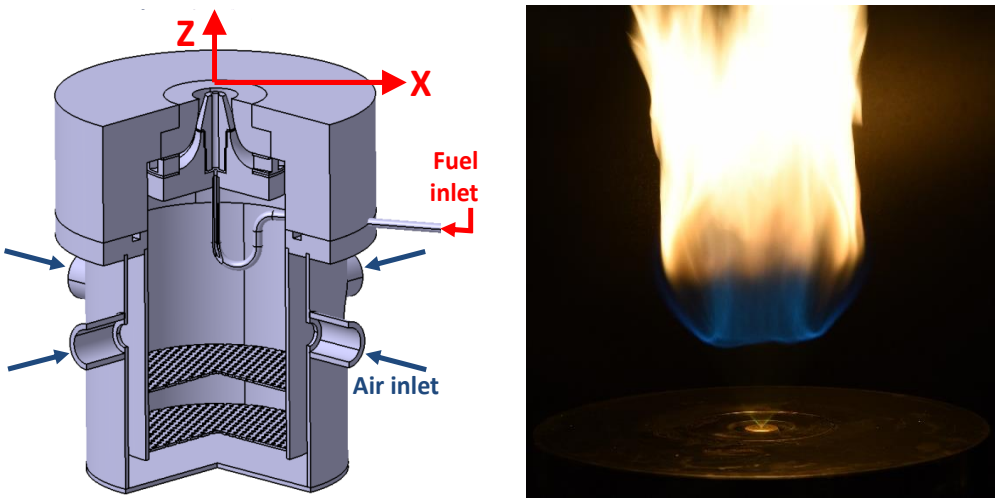

Figure 1 : Left : Sketch of the burner. Right: Typical picture of the jet spray flame.

2 Optical diagnostics:

The local properties of the flow are measured by phase Doppler anemometry (PDA) obtaining size-classified velocity data for fuel droplets and velocity data for the air.The flame structure is investigated by OH-PLIF imaging. Continuous GRT (C-GRT) is applied in order to analyse the spatial distribution of the

mean fuel droplet temperature. The fuel droplet temperature conditioned by the distance to the flame front is obtained by an Instantaneous GRT (I-GRT) coupled with OH-PLIF measurements. High speed particle image velocimetry (HS-PIV) and high speed planar laser induced fluorescence of the hydroxyl radical (HS-OH-PLIF) are simultaneously applied to experimentally characterize flame structure, flow topology and transient phenomena, such as local extinction mechanism, in an *n*-heptane spray jet flame.

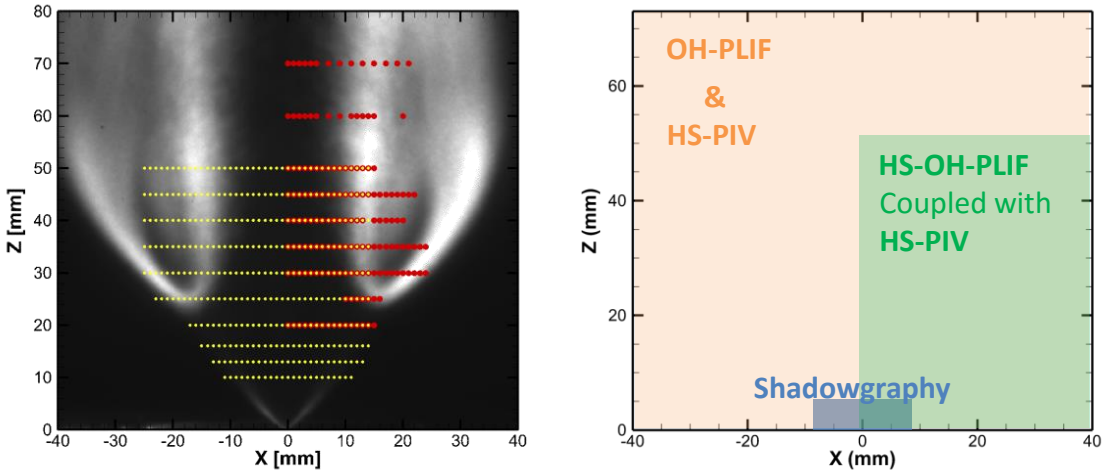

Figure 2: Right: Mesh of PDA (yellow points) and GRT (red points) measurements. Right: Zone for OH-PLIF, shadowgraphy, HS-OH-PLIF techniques.

3 List of available data:

RC: Reactive condition
NRC: Non Reactive condition

Type of data (raw and post-processed)	Technique	Conditions	Mesh	Publication
Fuel droplet / ligaments and conical sheet images - Height of atomization - Droplet sphericity	Microscopic shadowgraphy	NRC	7*5 mm and 2.4*1.8 mm	Not published
Air velocity - X and Z components - 40 000 samples or 30 s acquisition time	PDA	RC/NRC	Z mini = 5 mm Z maxi = 50 mm	Partially published in [2]
Air velocity - *Velocity fields (instantaneous, mean and rms fluctuations)* - *Axial and radial velocities* - *From velocity fields a range of spatial derivatives is calculated such as vorticity, shear tress, turbulent kinetic energy*	HS-PIV	RC/NRC	Figure 2	Not published
Fuel droplet velocity - X and Z component - 40 000 samples or 30 s acquisition time - Conditional average with the droplet diameter.	PDA	RC/NRC	Z mini = 5 mm Z maxi = 50 mm	Partially published in [2]
Fuel droplet distribution size (histograms)	PDA	RC/NRC	Z mini = 5	Partially

and associated statistics (D_{10}, D_{32})			mm Z maxi = 50 mm	published in [2]
Flame shape - OH instantaneous field - Lift height (averaged and Rms) - Radial location of lift (averaged and Rms)	OH-PLIF	RC	Figure 2	Partially published in [2, 3]
Fuel droplet temperature - Temporal average over 400 recordings - Spatial average for all the droplets contained within the measurement volume	C-GRT	RC/NRC	Z mini = 20 mm Z maxi = 70 mm	Partially published in [3]
Fuel droplet temperature - Instantaneous measurement (few ns) - Spatial average for all the droplets contained within the measurement volume (0.92 mm^3) - Data coupled with OH-PLIF measurements in order to provide temperature data conditioned to the flame front location	I-GRT	RC	Radial profile at Z=35 mm	Published in [3]
Dynamics of flame shape - Temporal evolution of 2D OH fields (10 kHz) - Extinction phenomena - Re-ignition phenomena	HS-OH-PLIF	RC	Figure 2	Not published
Ignition probability map - Laser ignition - Constant energy - Statistics over 30 trials - Visualization of the kernel flame development until flame stabilization	Laser induced spark ignition	NRC	Z mini = 5 mm Z maxi = 45 mm	Not published
Turbulence / flame interactions - Flame position coupled to the corresponding velocity field	HS-PIV	RC	Figure 2	Not published
Droplet / flame interactions - Qualitative fuel droplet-reaction zone interactions	HS-OH-PLIF	RC	Figure 2	Not published

These data are made available for the purpose of comparisons with numerical simulations. Information on measurement techniques, boundary condition and experimental uncertainties may be found in different documents provided with results.

References :

[1] M. Cordier, A. Vandel, G. Cabot, B. Renou, A.M. Boukhalfa, Combustion Science and Technology, 185 (2013) 379-407.
[2] F. Shum-Kivan, J. Marrero Santiago, A. Verdier, E. Riber, B. Renou, G. Cabot, B. Cuenot, Proceedings of the Combustion Institute, 2016
[3] A. Verdier, J. Marrero Santiago, A. Vandel, S. Saengkaew, G. Cabot, G. Grehan, B. Renou, Proceedings of the Combustion Institute, 2016