

## **MEDIUM RESOLUTION ( $0.25 \text{ cm}^{-1}$ ) SPECTRUM OF A HYDROGEN FLAME USING IMAGING FOURIER TRANSFORM SPECTROSCOPY (IFTS) AND ITS INVERSION BY THE $\ell$ -DISTRIBUTION APPROACH**

Gilles Parent,<sup>1,\*</sup> Frédéric André,<sup>2</sup> Manuel Kuhni,<sup>2</sup> Zoubir Acem,<sup>1</sup> Mark Norman,<sup>3</sup> Erwann Bodin,<sup>2</sup>  
Cédric Galizzi<sup>2</sup>

<sup>1</sup> Université de Lorraine, CNRS, LEMTA, F-54000, Nancy, France

<sup>2</sup> Univ Lyon, CNRS, INSA Lyon, CETHIL UMR 5008, F-69621 Villeurbanne, France

<sup>3</sup> Telops, 100-2600 Ave Saint-Jean-Baptiste, Québec City, Quebec G2E 6J5, Canada

**ABSTRACT.** A hyperspectral camera was used to measure the emission spectrum of a V-shaped hydrogen flame. Medium resolution ( $0.25 \text{ cm}^{-1}$ ) spectra were obtained. The inversion of experimental spectra was performed using an SPSO algorithm combined with a  $\ell$ -distribution method as forward model. The  $\ell$ -distribution approach was chosen to model the experimental data instead of an LBL method in order to reduce the CPU cost of the inversion process. The maximum errors obtained on preliminary test cases (analysis of high resolution synthetic spectra convolved by a Gaussian instrument function) are less than 1.0 K for temperatures and  $3 \times 10^{-3}$  for species concentrations. Finally, the method was applied to an experimental spectrum. A 1275 K flame temperature and 0.113  $\text{H}_2\text{O}$  molar fraction were obtained. These values are close to those expected for the configuration studied.

---

\*Corresponding Gilles Parent: gilles.parent@univ-lorraine.fr