

Hydrogen week in Toulouse: towards high pressure experiments and simulations

Feb 26th – Feb 29th, 2024

Hybrid meeting - Institut de Mécanique de Fluides
Toulouse, France



The objective of this hydrogen week is to look at the latest results obtained for hydrogen simulations and experiments: the ERC SELECT-H advanced grant at IMFT and CERFACS will be presented on Monday. A specific formation will take place on Tuesday on hydrogen combustion for engineers and PhD students.

Wednesday will focus on the CFD codes comparison workshop (CAW-H2-CFD) undertaken for the CLEAN AVIATION program of the EU where CFD groups will present their computations of the IMFT HYLON swirled hydrogen-air flame at 1 bar.

Thursday will allow to discuss the extension of this exercise to higher pressure data obtained at KAUST and to other diagnostics (NO_x, temperature).

Practical Information

Access – How to Come to the Workshop

By public transportation

From the city centre:

- Take the underground line B to the stop named Palais de justice or the underground line A to Arènes and then, take the tramway (line T1 or T2 at Palais de justice) and get off at the stop named Île du Ramier. Walk ~700 m to your destination.
- Take the bus n°31 to the stop Île du Ramier, then walk to the destination.

From the Toulouse-Blagnac airport:

- Take bus line 31 and get off at Guyenne-Berry stop. Take the tramway (T2) and get off at Île du Ramier, then walk to arrive at your destination.
- Take the shuttle bus AERO (La Navette Aéroport) and get off at the Compans-Caffarelli stop. Take the metro line B and get off at Palais du Justice, and then, take the tramway (line T1 or T2 at Palais de justice) and get off at the stop named Île du Ramier. Walk ~700 m to your destination.

Taxi Information

Capitole Taxi

05 34 250 250

capitole-taxi.com

Reservation by call or via app

La Toulousaine Taxi

05- 61-20 90 00

taxi-de-toulouse.fr

Reservation by call

Taxi Toulouse 31

06-72-87-71-26

taxi-toulouse31.fr

Reservation by call



MONDAY AFTERNOON 14.00-18.00:

The ERC advanced grant SELECT-H

(Safe and reliable Combustion Technologies powered by Hydrogen)

SELECT-H is the third ERC advanced grant on combustion, awarded to IMFT and CERFACS (after INTECOICIS and SCIROCCO). SELECT-H focuses on hydrogen combustion. Monday afternoon will allow to present the project, the target configurations and the first results.

- **16.00** First meeting of the SELECT-H organization board: CERFACS and IMFT seniors

TUESDAY:

A one-day, stand-alone training on H₂ flames for PhD students and engineers

This day of training will focus on recent results on hydrogen flames, important theoretical and experimental results on flame stabilization, transition to detonation and the effects of pressure. It is well suited to researchers with an existing background on combustion (PhD students, engineers engaged in H₂ work)

- **8.30** Welcome and coffee
- **8.45** Presentation of program, courses and demos: T. Poinso, IMFT
- **9.00-9.30** Overview of hydrogen specificities: L. Selle, IMFT
- **9.30-10.00** CFD modeling of hydrogen flames: T. Poinso, IMFT
- **10.00- 10.30** Coffee break
- **10.30-11.15** Hydrogen, from deflagration to detonation. O. Dounia, CERFACS
- **11.15-12.00** Running experiments with hydrogen: T. Schuller, IMFT
- **12.00-14.00** LUNCH
- **14.00-15.00** Running high-pressure experiments with hydrogen, stabilization of hydrogen air flames at all pressures: T. Guiberti, KAUST
- **15.00-15.30** Coffee Break
- **15.30-16.30** CFD tool specificities for H₂ flames and available/recommended models in AVBP for hydrogen/air flames. Q. Douasbin and T. Jaravel, CERFACS
- **16:30-17.30** Discussion on CFD codes for H₂ flames. All

WEDNESDAY:

Work in progress - CAW-H2-CFD workshop of the CLEAN-AVIATION program: computing the HYLON H2-air set up at atmospheric pressure

We will focus on the HYLON IMFT rig. Presentations (15 minutes + 5 minutes for questions) given by the members of the CAW-H2-CFD who have finished a part of or all computations.

- **8.30** Welcome at IMFT
- **8.45** T. Poinsoot (IMFT/CERFACS): presentation of workshop, organization
- **9.00** A. Tyliczszak (CZESTOCHOWA UNIVERSITY OF TECHNOLOGY)
- **9.20** N. Bertier and J. Ruan (ONERA)
- **9.40** A. Van-Bruygom, A. Walker and A. Garmory (LOUGHBOROUGH)
- **10.00** A. Ballotti and A. Andreini (UNIFI)

10.20 BREAK

- **10.50** C. Mehl (IFPEN)
- **11.10** F. Ghioldi and F. Piscaglia (POLIMI)
- **11.30** I. Mir, S. Zhao and P. Boivin (M2P2 MARSEILLE)
- **11.50** J. Massey (CAMBRIDGE)

12.10 LUNCH AND PHOTOGRAPH

- **14.00** L. Palanti and L. Mazzei (ERGON RESEARCH)
- **14.20** W. Jones (IMPERIAL COLLEGE)
- **14.40** M. Vilespsy (IMFT), A. Aniello (IMFT) and N. Rouland (CERFACS)
- **15.00** S. Dillon (EM2C), V. Moureau (CORIA) and R. Mercier (SAFRAN TECH)

15.20 BREAK

- **15.50** D. Bessette, S. Patil (ANSYS), K. Vasudevarao and Y. Zhang (GE)
- **16.10** V.R. Hasti (NORTH CAROLINA STATE)
- **16.30** S. Nambully, R. Kulkarni and D. Lee (CONVERGENT SCIENCE)
- **16.50** Cross comparison of results, future work, presentation at the TNF workshop in Milano.
T. Riou, K. Chaplet, M. Vilespsy, H. Magnes, T. Schuller, T. Poinsoot, T. Guiberti

18.30 END OF DAY

THURSDAY:

Future CFD work – extension of the CAW-H2-CFD workshop to computations of the HYLON set up at high pressure: the KAUST HYLON experiment. Other issues of interest for H2 flames: Nox, thermoacoustics, violent ignition, etc

One key issue for hydrogen flames will be to move to high pressures and to add more detailed diagnostics as well as to investigate unsteady sequences (ignition, quenching, instabilities). This is a significant challenge for experiments but also for CFD.

During the hydrogen week, we will discuss a possible extension of the CAW-H2-CFD workshop to high pressures configurations, for which KAUST is presently building an experimental data base for the HYLON setup of IMFT.

- **9.30-11.00: CFD of hydrogen flames at high pressures: open discussion on possible models and challenges for DNS and LES (T. Poinsot + all)**

11.00 COFFEE BREAK

- **11.30-12.00: A critical issue: from CAD to 3D printing to X tomography to CFD meshes: how to guaranty that CFD experts compute the right geometry for HYLON cases. H. Magnes, S. Marragou, T. Schuller.**

12.00-14.00 LUNCH

- **14.00-15.00 Description of the KAUST high pressure implementation of the IMFT HYLON rig (Marragou / Guiberti / Schuller)**
- **15.00-16.00 Discussion of possible addition of KAUST HYLON in the CAW H2 CFD exercise and of challenges for CFD of H2 air flames at high pressures. Links with TNF and proposed organization for future collaboration.**

16.00 END OF DAY

- **T. Riou, K. Chaplet, M. Vilespy, H. Magnes, T. Schuller, T. Poinsot, T. Guiberti**

18.30 END OF DAY