

ENVIRONMENTALLY-FRIENDLY GAS MIXTURES FOR GASEOUS TRACKING AND TIMING DETECTORS

Minutes of the kick-off meeting

Date	25.11.2022
Location	Virtually via Zoom
Participants	Christian Franck, Marnik Metting van Rijn, Gianluca Rigoletti, Piet Verwilligen, Rob Veenhof, Roberto Guida and Stephen Biagi
Apologies	Archana Sharma and Beatrice Mandelli

The kick-off meeting aimed to define the framework for the collaboration between the ETH Zurich and CERN and to establish the project milestones. It allowed to exchange mutual interests and revealed a symbiotic starting position. The topics discussed include the project timeline, the choice of gases and the structure for the cross-section-determination course.

Content

Subsequent measures

Christian opens the meeting

Round of introduction

Current state of research

- **Gianluca:** *Why are the measurement performed in Argon?* **Christian:** The absence of vibrational degree of freedom in the noble gas argon enables a precise determination of the vibrational scattering cross sections.
- **Gianluca:** *Why are the measurements performed at low pressure (1 kPa)?* **Christian:** Low pressures reduces space-charge effects while increasing the signal-to-noise ratio. **Stephen:** High pressures, however, equilibrate the three body attachment and detachment rate, allowing more accurate values. Lower mixing ratios (0.1 %) are preferred. Measuring at different pressures is of advantage as some gases reveal two- and three-body-attachment effects at different pressures.
- **Roberto:** *System calibration?* Measuring R-134a may yield an interesting comparison with HFO1234ze and does not reveal any significant space-charge effects, and is thus suitable for high pressures. **Christian:** The second PhD student may investigate space-charge effects.

Timeline

- **Stephen:** While the measurement take up to two months, three to four months are required to attain a set of cross-section. The timeline predicting one year for the initial gas including publication is thus reasonable.

Choice of the following gases

- R-134a, for comparison with HFO1234ze, calibration and verification of reference data in CO₂, Helium, Krypton .. Marnik will organise R-134a. If not available in small quantities, he will reach out to Roberto
- C₄F₇N
- HCFO-1224yd AMOREA
- CCl₄

Training

- **Stephen:** Prior approach via Bolsig+ or Magboltz of advantage for beginning Roberto evaluates expense-allowance opportunities, facilitating Stephen to hold a cross-section-determination course at CERN
- Bi- or trilateral video-calls with Stephen, once the first analysed measurements are available (early 2023)
- On-site training at CERN for fine-tuning the cross-section evaluation when measurements concluded (summer 2023).

Data sharing platform

- Indico will be used for project management, upload of slides, minutes etc. Piet and Roberto will follow up on the indico access for external users
- **Christian:** OpenBIS planned as data portal

EPJ review

- **Christian:** Progress of project reported in this review Marnik will hand-in draft suggestions for the article in the beginning of next year
- **Roberto:** Will be updated regularly

The next meetings date will be announced when due (march 2023).