Summary on Discussion Session "Standard Flames"
Discussion Leader: Klaus Peter Geigle, DLR Stuttgart, Germany

Standard flames were defined prior to the 1st LII workshop to provide benchmark data sets as future orientation and further completion (http://www.liiscience.org/target_flames)
- C_2H_4 laminar diffusion (Santoro)
- C_2H_4 laminar diffusion (Gülder), HAB=42 mm, on axis
- C_2H_4 premixed laminar (McKenna), ϕ=2.1, HAB=12 mm

Benefits
- compare results of different measurement approaches from various groups (to either agree or serve better understanding)
- provide a starting point for newcomers in the field
- add data serving to analyze LII signal (for example temperature)
- continuously and ongoing used by LII community
- long list of references, large data sets → create consolidated data sets that might serve LII modelers
- in addition, comprehensive data sets are highly valuable for the soot modelling community, specifically when employing optical diagnostics → link to International Sooting Flame (ISF) Workshop series

Outcome
- focus on defined standard flames (and, in addition, some flames being relatively similar) lead to some joint approaches and, by linking information from different diagnostics, to new knowledge
    - different/varying maturity correlating to soot optical properties; all target flames are identified to differ in soot maturity (specifically diffusion flames vs. premixed) and to vary based on position in the respective flame (with HAB for premixed flames and axis vs. flame wings for diffusion flames)
        - (heated) line-of-sight attenuation at different wavelengths
        - LII response curve
    - Complementarity of different diagnostics for particle sizing
        - LII/Photo Ionization Mass Spec/Scanning Mobility Particle Sizing
- Results from standard flames affect or contribute to most other discussion sessions of this (and earlier) LII workshops; on the other hand, knowledge from those other sessions serves to iterate and optimize existing data in the selected target flames

Deficiencies
- no definition of shroud flow and burner material (McKenna)
- not all McKenna burners are producing homogeneous flames → symmetry tests recommended
- not always identical "standard" conditions used or mentioned when reporting flow rates in publications (0 °C / 20 °C / 21 °C) – for example influence on flame length of diffusion flames

To be considered
- Reported quantities must not be taken as full and final truth – values depend on parameters applied for data analyses, and flames might differ to some amount based on the actual ambient conditions influencing the real flow (not talking about the above listed "standard" conditions
- Yet, **exact** comparisons should be possible when reproducing flame conditions and used parameters → this to be helpful or essential to create a consistent data set for LII/soot modelling

Newly suggested standard soot sources
- CAST / Mini CAST → different versions available! Conditions and device to be defined for standard
- Inverted laminar diffusion flame

Outlook

Further studies in standard flames for an improvement of detailed knowledge of processes related to LII shall be undertaken. This will also serve for better understanding soot formation and oxidation. Publication of measurements performed in standard flames should try to best possibly declare the flame conditions (chosen reference of flow rates, ambient conditions, for McKenna burner in addition burner material and coflow).

Community tasks

- Who (how many groups) are supportive for which of the suggested new standard soot sources
- Identify which conditions / device can be agreed upon
  after listing which have been used so far including advantages/disadvantage