Intercomparison of two reference sampling and measurement systems for aircraft engine non-volatile PM using a small-scale RQL combustor rig burning conventional and sustainable aviation fuels

Lukas Durdina¹, Eliot Durand², Curdin Spirig¹, Jacinta Edebeli¹, Julien Anet¹, Andrew Crayford²

¹ Centre for Aviation, ZHAW School of Engineering, Winterthur, Switzerland
² School of Engineering, Cardiff University, Cardiff, UK

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Approach (see virtual poster for campaign video)

Generic aero engine type combustor  
(rich-burn, quick-quench, lean-burn, RQL)

- 2-6 bar rig pressure
- 6 different fuels
  - Hydrogen content 13.4-15.4%
  - Total aromatics 0-25%
  - Sulphur 0-105 ppm (very low)

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Results

- Agreement of the two systems (without loss correction) on average within 11% for mass and 2% for number across all test conditions and fuels
- Higher scatter at low concentrations
- Size distributions with a wide range of GMD and shapes
- No volatile fraction (even in bimodal distributions)
- Good overall agreement between SMPS and DMS500

![Graphs showing size distributions and correlation between systems](image)
Conclusions and next steps

- Overall a very good agreement of the two systems. Albeit there are still some discrepancies left to be investigated.

- Size distribution measurement is crucial for accurate system loss correction (especially for multimodal distributions and low mass concentrations). Evaluation of the different sizing instruments in progress.

- Next campaign (Jan 2022) to evaluate the systems drift over one year (both systems used in various test campaigns in between).