

Mass Flow Rate Measurements on an advanced GDi Injector

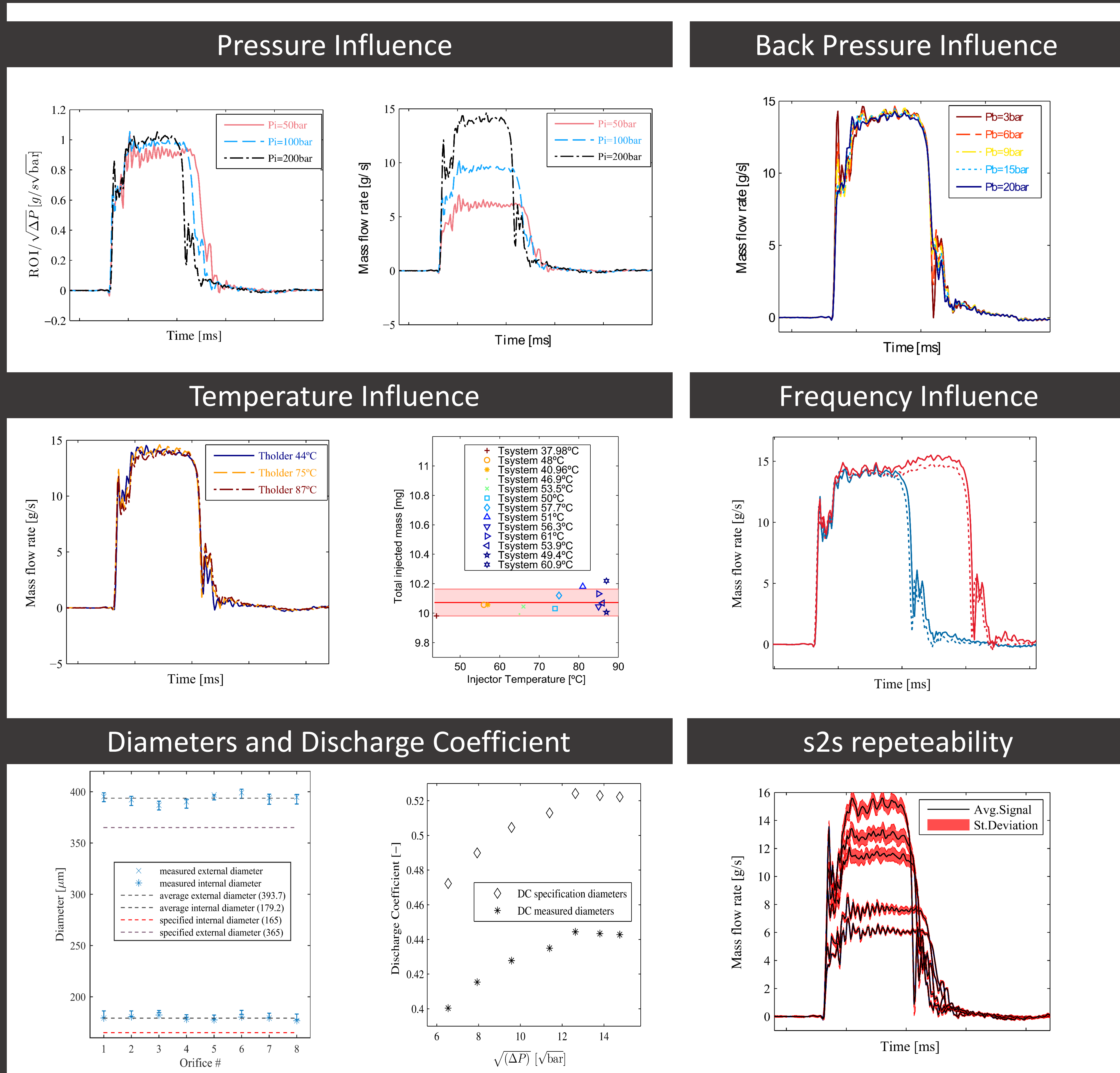
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Introduction

- Stringent emissions regulations compels the evolution of powetrain architectures.
- Direct injection systems are now more affordable given the technology available in the industry.
- The market share of the GDi architecture is expected to keep rising in the future.
- The Engine Combustion Network created a new work group (Spray G) focused on the investigation of GDi.
- This work presents the first approach of ROI measurements of the injector for the Spray G workgroup. (Internal Flow)

Results

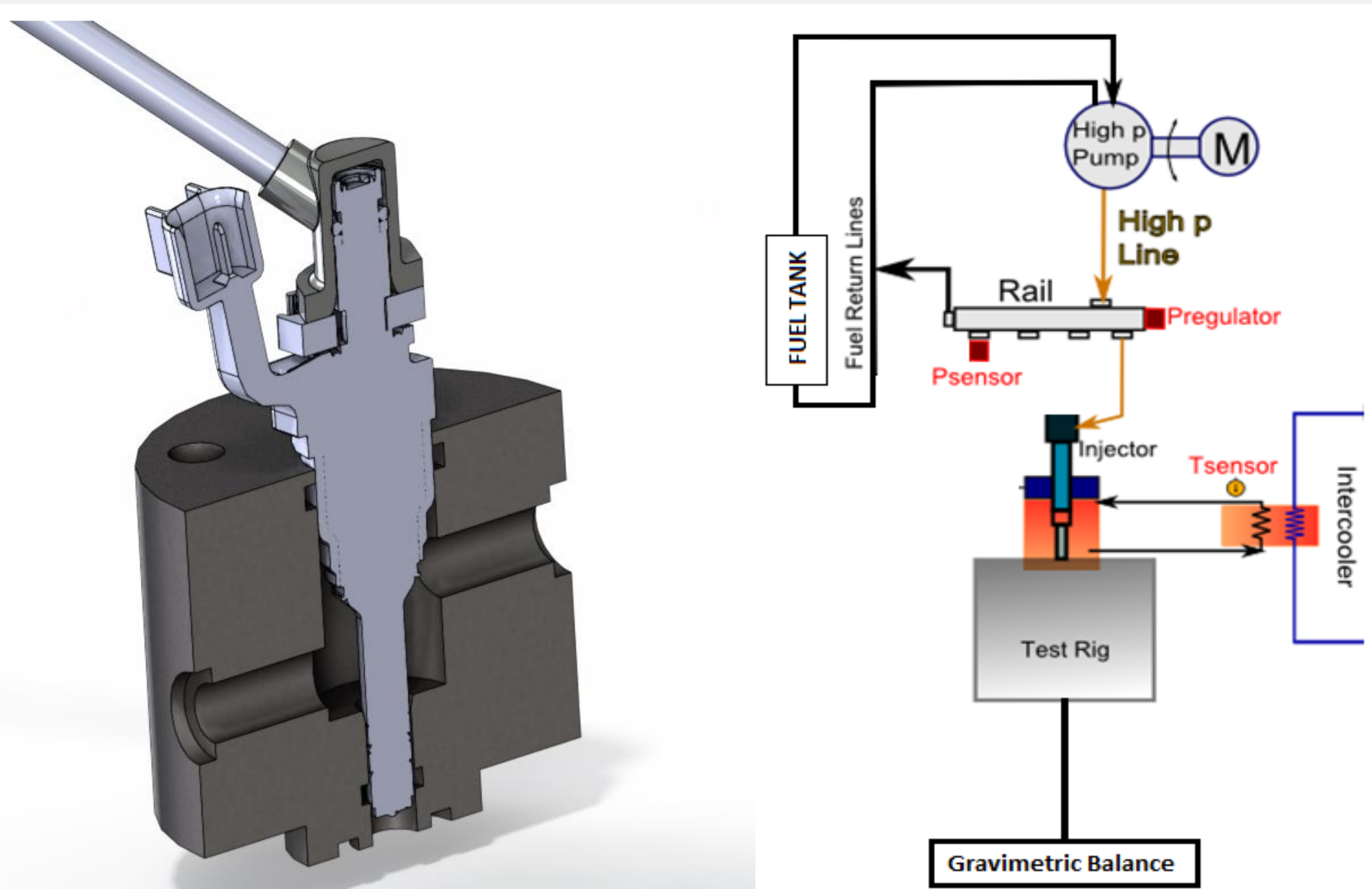


Objectives

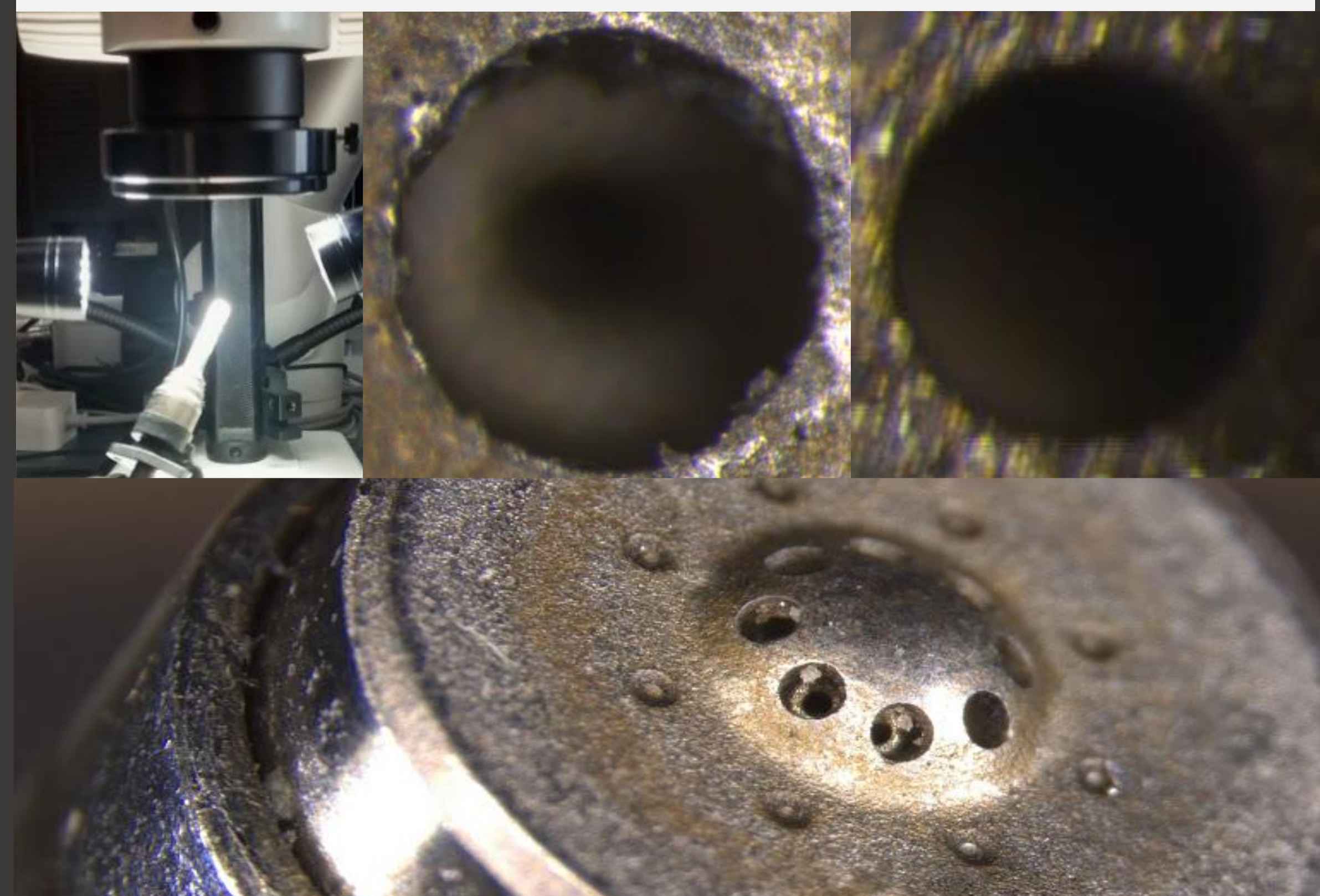
- Establish a repetitive methodology for measuring the injection mass flow rate for GDi injectors.
- Design and fabrication of the parts necessary to adapt a GDi injector to facilities typically used for diesel research.
- Understanding and hydraulic characterization of the injector made for the new Spray G investigation group.

Hardware & Methodology

- Bosch Method corrected with gravimetric balance.
- Temperature is controlled by refrigeration circuits.
- Pressure sensor (kistler) mounted on common rail.
- Highly controllable pump system with independent lubrication.

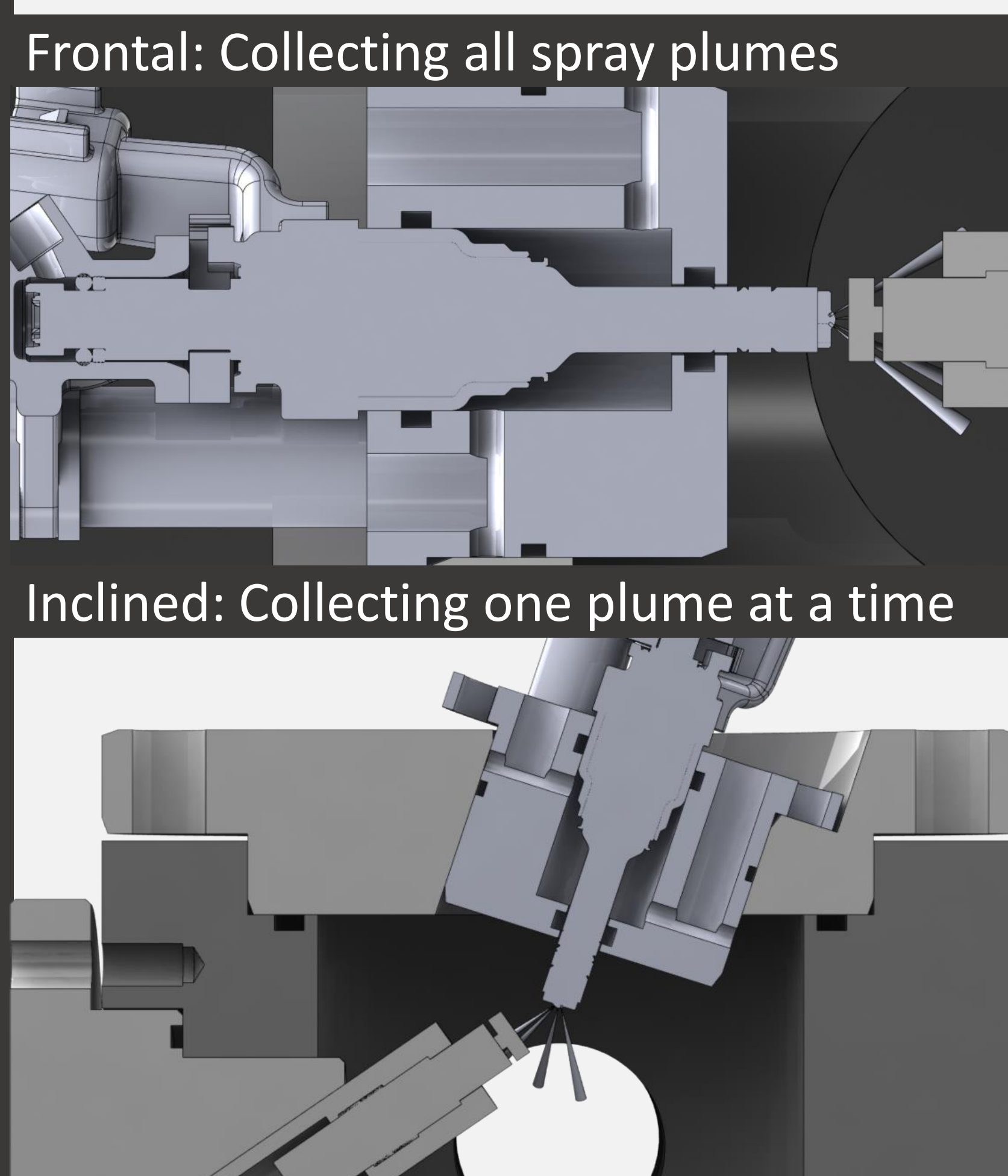


- Delphi injector made for the ECN group.
- High Amplification optical microscope (x80).

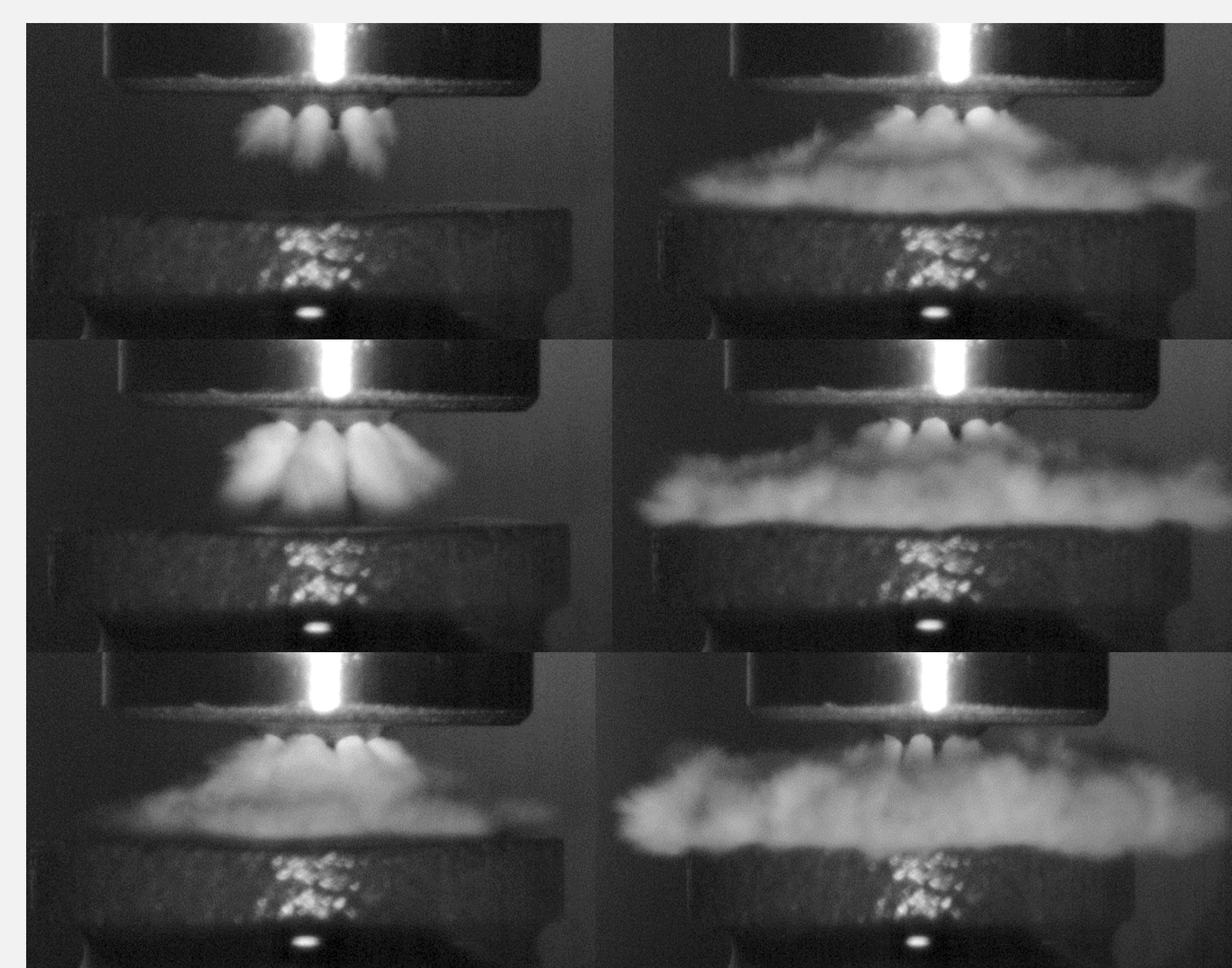


Future Work

CdM Measurements



Validation when using the frontal configuration with high speed camera



Conclusions

- The methodology used for diesel injectors has been applied in GDi achieving high repeatability
- Small injection frequencies (1Hz) slightly affect the Injection Rate. Which can be relevant when performing visualization tests and adjusting models.
- Temperature (in the range studied) does not affect the Injection Rate or total mass injected
- Very small discharge coefficient that requires more understanding. It is now an open discussion topic in the ECN group.
- Future work will provide more insights about the discharge coefficient and the internal flow.