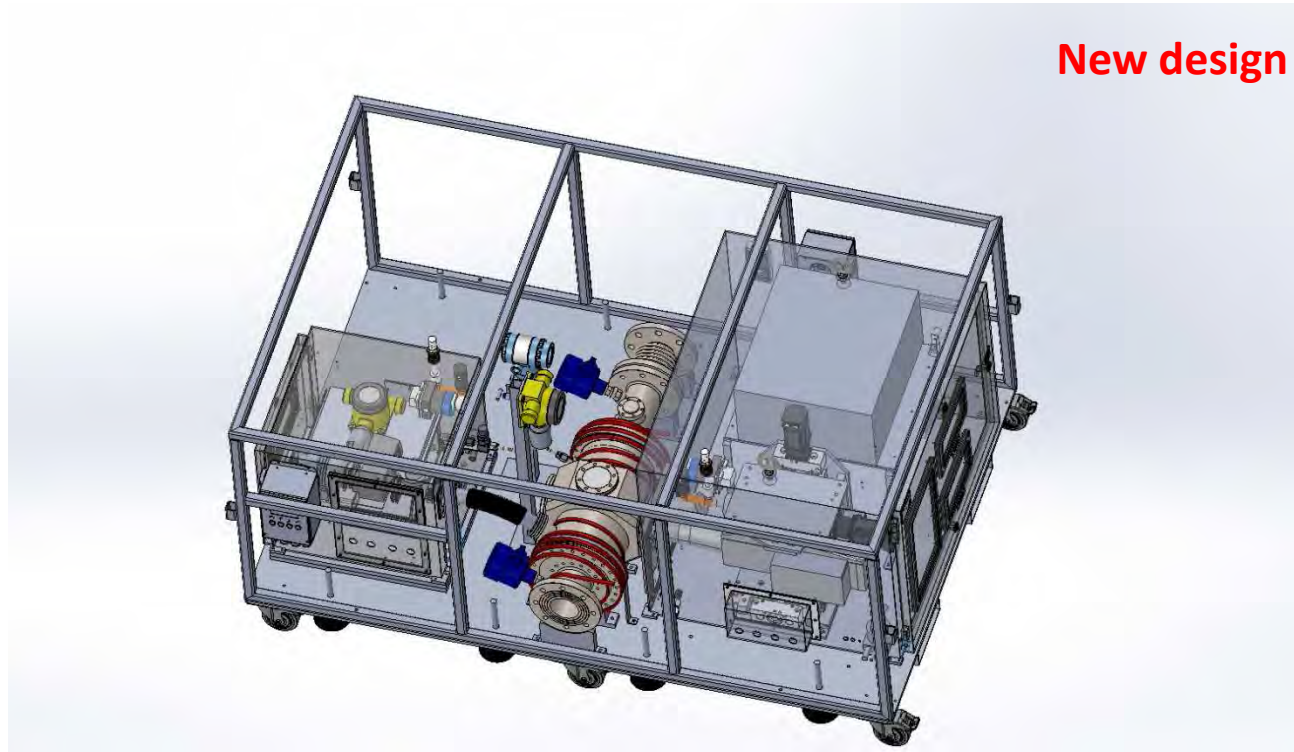


Cryogenic flow rate meas. by LDV

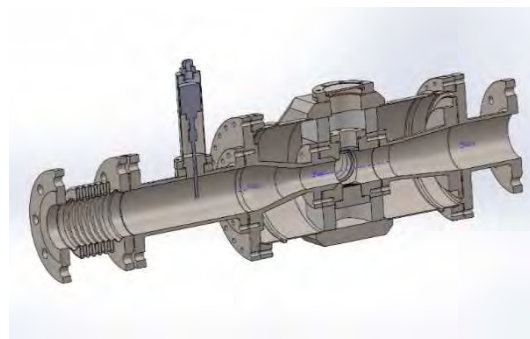
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LDV standard new design : Improvements -- SEEDING

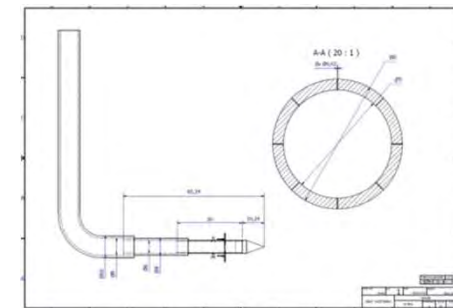
New design



Magnetic seeding



Cavitation seeding

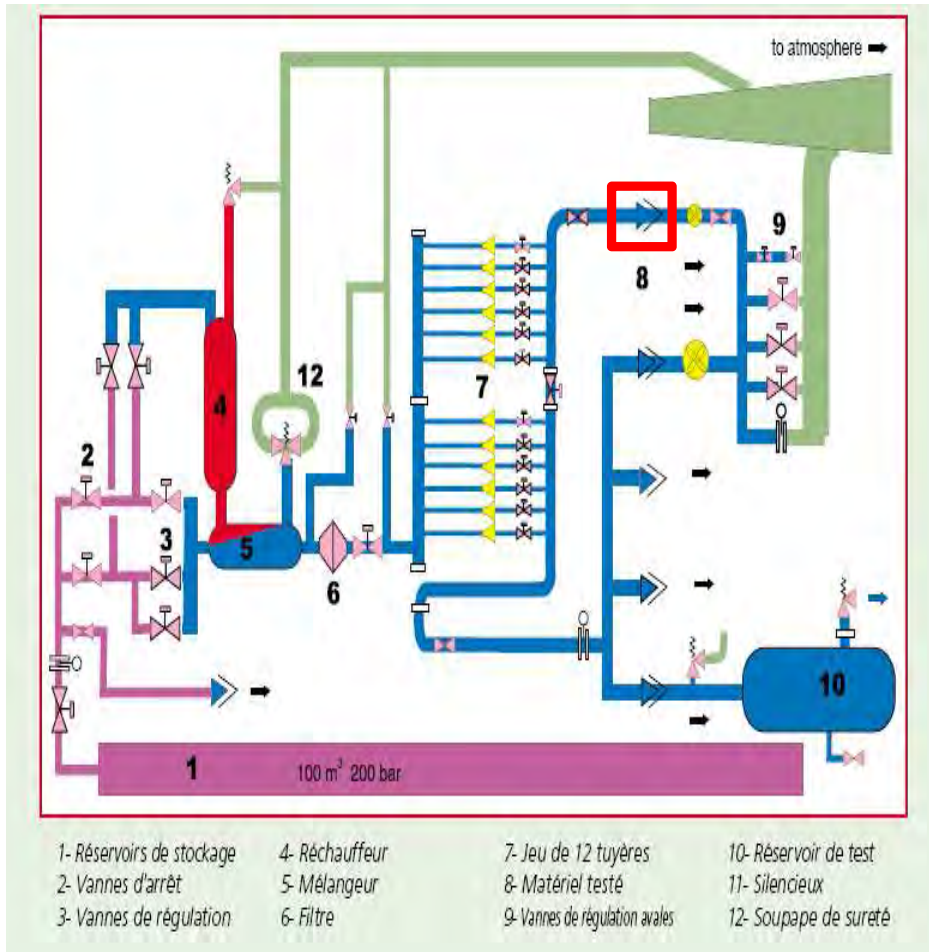


Laser drilling
20 microns

Cryogenic flow rate meas. by LDV

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LDV standard new design : first tests (1/3)



Air tests at 5 and 10 bar

LDV standard new design : first tests (2/3)

Air tests :

- Radial velocity profile at the throat
- Axial velocity profile (on the centreline)

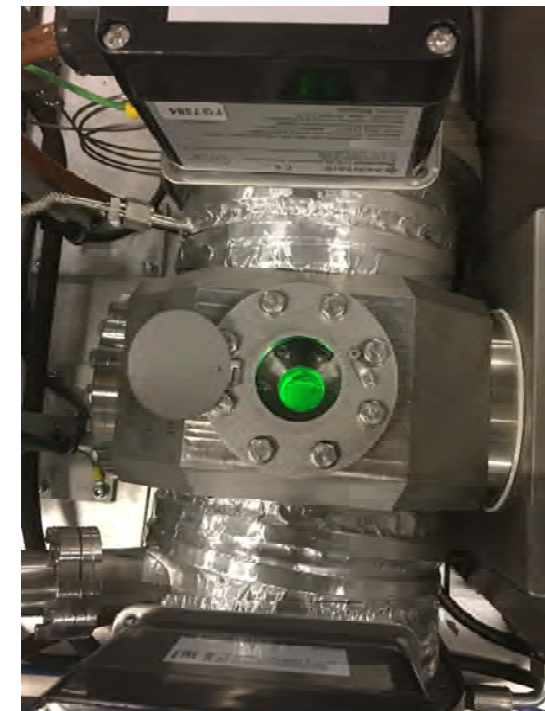
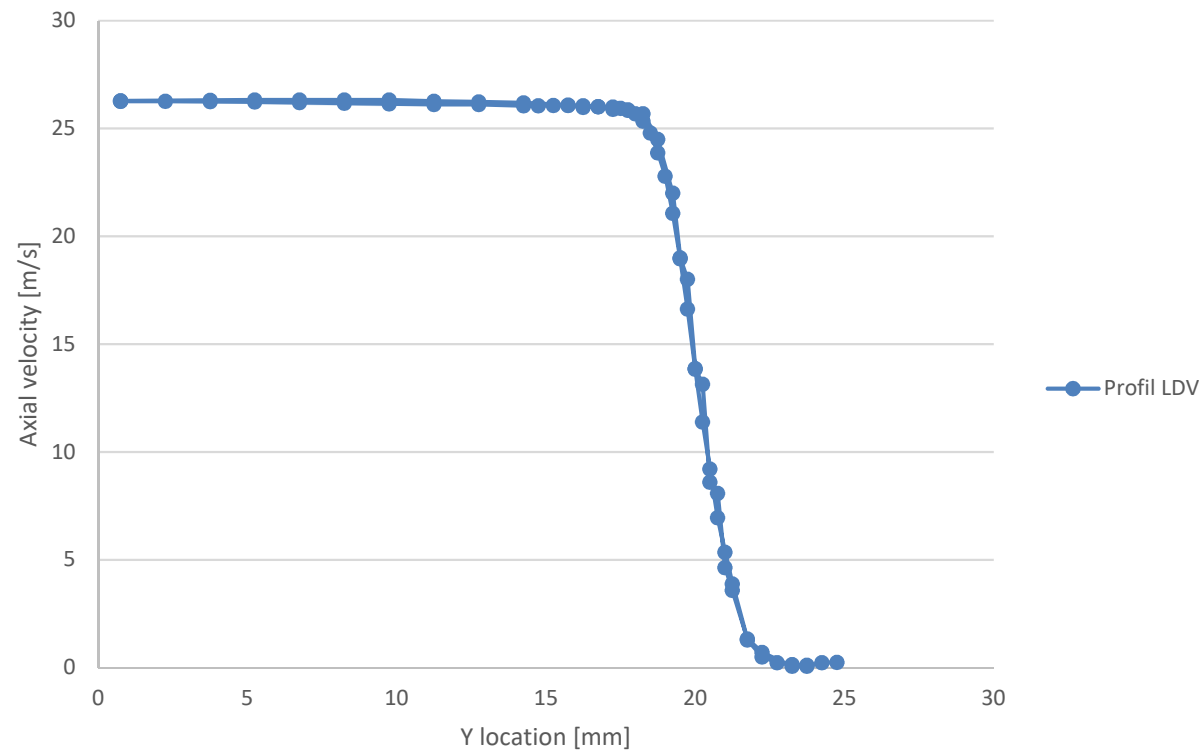
Jet profile is flat

Canonical

Step velocity gradient

No negative velocities

Axial velocity profile at 5 bar - Air test

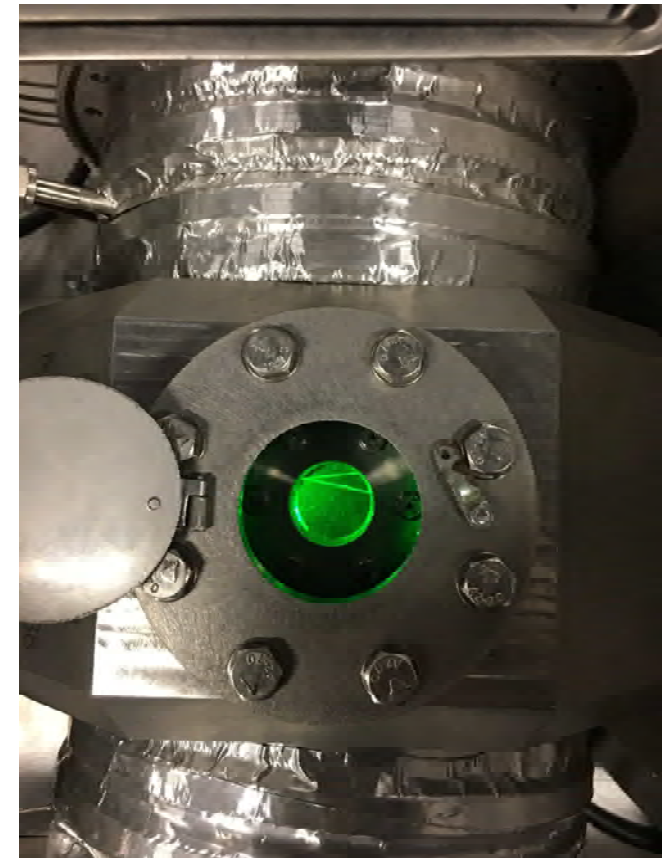
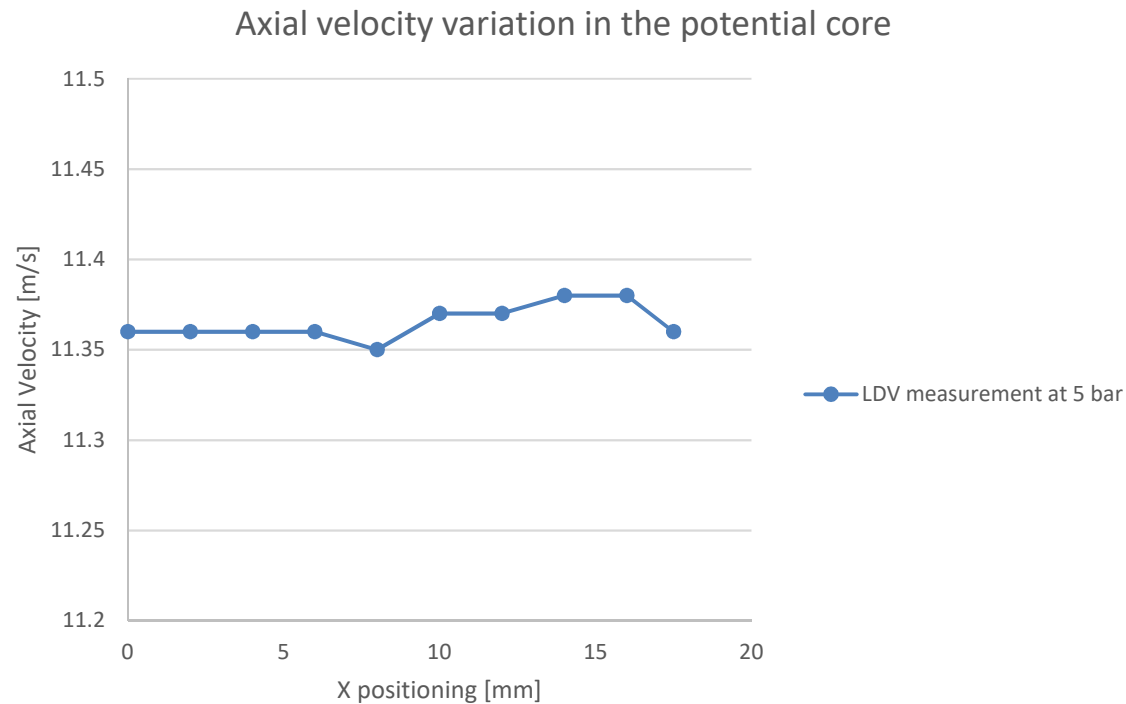


LDV standard new design : first tests (3/3)

Air tests :

- Radial velocity profile at the throat
- Axial velocity profile (on the centreline)

**No decrease along axis
0,08% of Umean velocity
over $x/D=0,43$**



Road map of the presentation

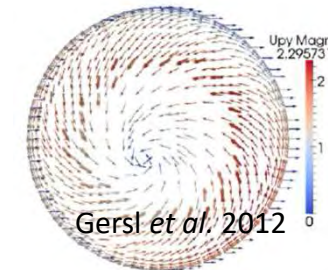
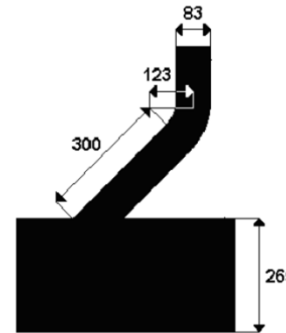
1. **Description of the LDV technique and measuring system**
2. **How it works !**
3. **On-site calibration of cryogenic flow meters**
4. **Uncertainty budget assessment in cryogenic conditions**
5. **LDV standard new design : Improvements / accreditation & first tests**
6. **Conclusions and perspectives**

Cryogenic flow rate meas. by LDV

Conclusions and perspectives

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- Tests on flow perturbations (bend, swirl) in air with the LDV standard



- CESAME wants to perform an accuracy evaluation of the cryogenic flowmeters with and without standard perturbations (previously characterized) (Montoir de Bretagne (Fr), Reganosa (Sp)) and compare with numerical simulation



Flowmeter on-site (bend – no straight pipe before flow meters)



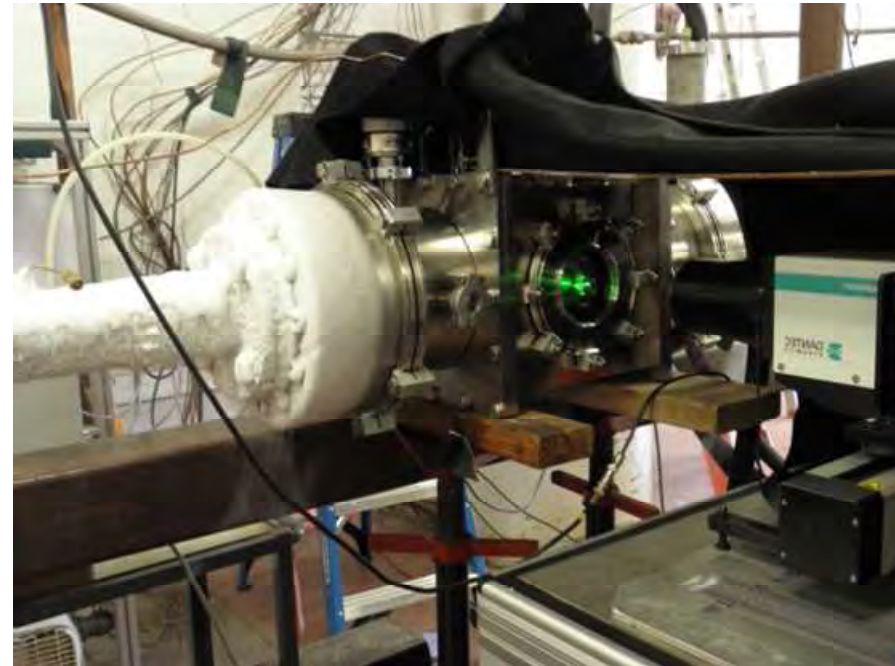
NIST facility - No bend – long straight pipe

- CESAME wants to determine the modification in the extended uncertainty budget due to the standard perturbations (previously characterized)

Cryogenic flow rate meas. by LDV

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Thank you !



Thanks you for your attention
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