Cryogenic flow rate meas. by LDV
LDV standard new design: Improvements -- SEEDING

New design

Magnetic seeding

Cavitation seeding

Laser drilling
20 microns
Cryogenic flow rate meas. by LDV
LDV standard new design : accreditation

Ineris tests :

- Oxygen presence test during the nitrogen purge cycle
- Oxygen removal time
- Pressure resistance test of the enclosures
- Depressurization test
- Methane detection
- Shutdown of electrical power if an increase on the vacuum level is detected
Cryogenic flow rate meas. by LDV
LDV standard new design : first tests (1/3)

Air tests at 5 and 10 bar
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
Air tests:

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

No decrease along axis
0.08% of $U_{\text{mean}}$ velocity over $x/D=0.43$
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

• 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

• CESAME wants to determine the modification in the extended uncertainty budget due to the standard perturbations (previously characterized)
Cryogenic flow rate meas. by LDV

Thank you!

Thanks you for your attention
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