H05 Cryogenic Jet Target for MAGIX: Development and Optimization

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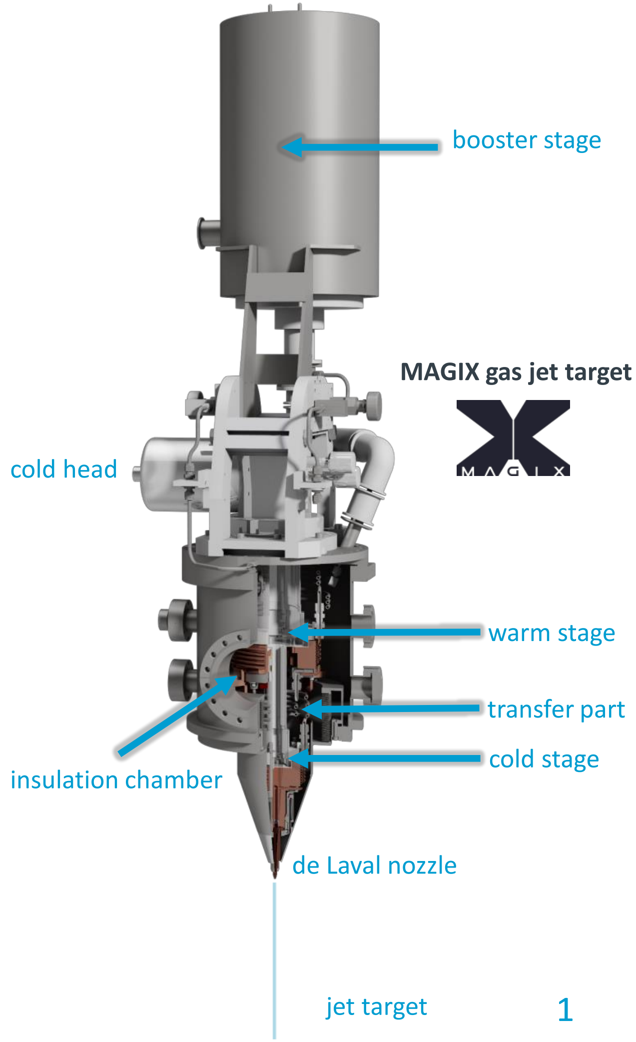
- **Proton radius** still a mystery, even after decades of research?
- **Proton form factors** determination at a high precision through e-p scattering with the **MAGIX experiment** at MESA
- **Background reduction** by delivering the protons through the **windowless** MAGIX gas jet target developed at the University of Münster
- Target thickness of more than **10^{18} atoms/cm^2** at the interaction point, at a temperature of 40 K and a flow rate of 40 l/min when operated with hydrogen
- **Hydrogen gas** is precooled at the **booster stage**, which is then guided at the **dual-stage cold head** to reach the desired temperature
- By the gas expansion through a converging-diverging **de Laval nozzle** (narrowest diameter of 200 µm), continuous **jet target** is generated



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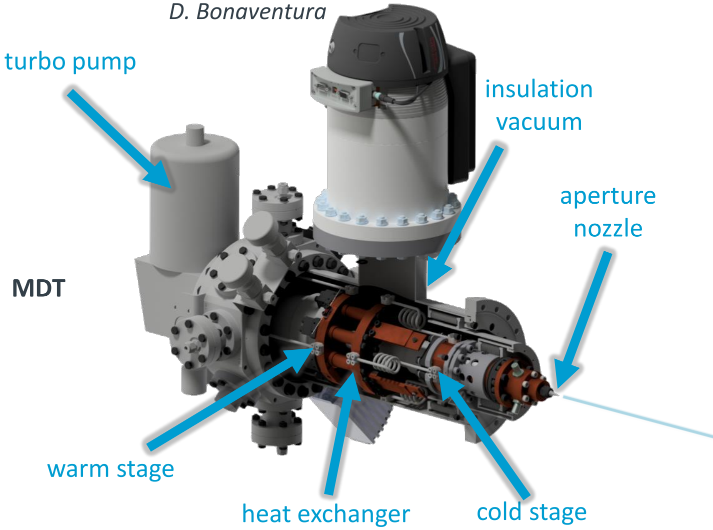
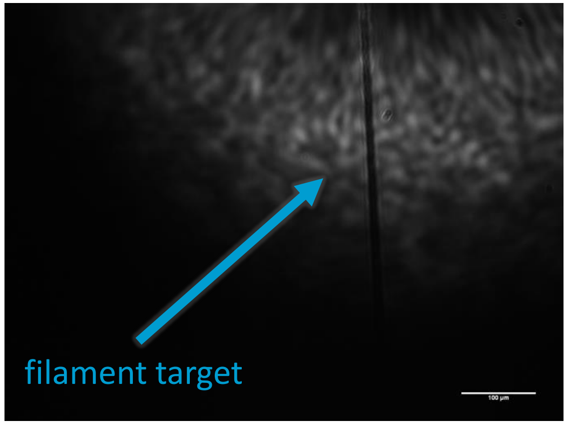
- The **M**ünster **D**roplet **T**arget (**MDT**) uses hydrogen as the target material with a flow rate of 160 ml/min
- Continuous filament jet structures with a maximal target thickness of **4.5 · 10^{19} atoms/cm^{2}** (MAGIX gas jet target reaches 10^{18} atoms/cm^{2}) are generated at a temperature of 16 K and a pressure of 1 bar by using an aperture nozzle with a diameter of 10 µm.
- MDT uses a lower flow rate for the operation, thus providing better **vacuum conditions** (10^{-4} mbar) and enhanced **cooling conditions** (no booster stage needed).
- **Filamentary operation** is proposed to be tested at the A1/MAMI facility

D. Bonaventura



C. Mannweiler, J. Froning, and E. Hausch



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Future goals:

- Development of the target through **numerical simulations** of the **jet formation** in the nozzle and **the jet propagation**
- Optimization of the **stagnation conditions** and **nozzle geometry** through iterative simulations
- Simulations to see if a **filamentary operation** is possible at the MAGIX Gas Jet Target
- Installing and testing of the aperture nozzle at A1/MAMI for further optimization

- **Production** of the newly designed nozzle and **initial testing** at the University of Münster
- **Commissioning** and **installation** of the target at **MESA**

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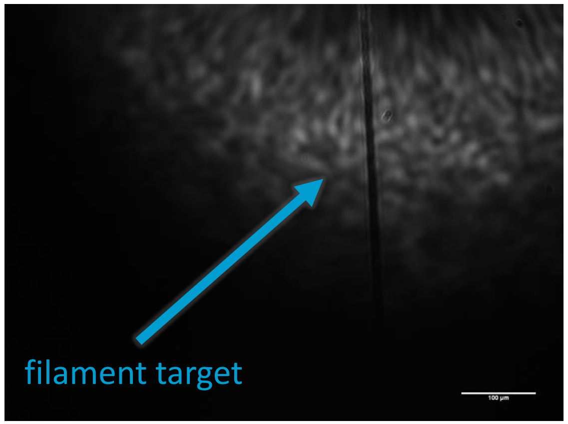

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