

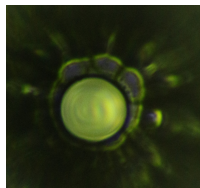
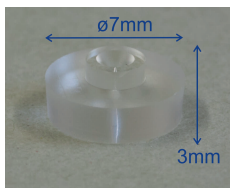
# Extension for Glass Nozzles

Westfälische Wilhelms-Universität Münster, Institut für Kernphysik

PANDA Meeting Bochum, March 1st 2016



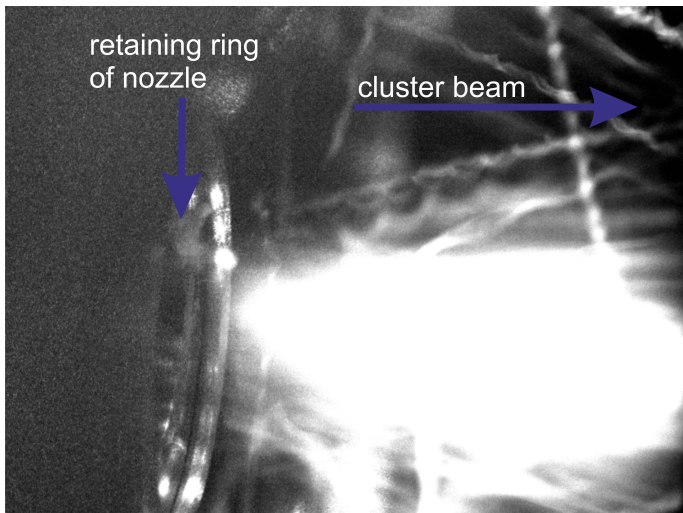
# Glass Nozzle



- Glass nozzle:  $30\ \mu\text{m}$
- Manufactured by selective laser etching of glass
- Vespel<sup>®</sup> is an excellent alternative for indium for sealing (even for the CERN nozzles)

# Initial Measurements with new Nozzles at the $\bar{P}$ ANDA Cluster-Jet Target Prototype: 25 K, 8 bar

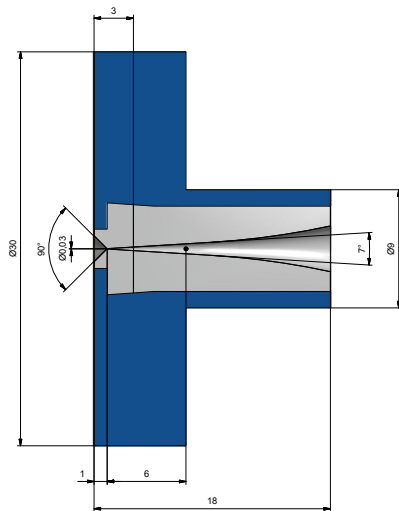
5 cm



# Glass Nozzle

## Extension for Glass Nozzle

- Extension for glass nozzle for a longer outlet zone

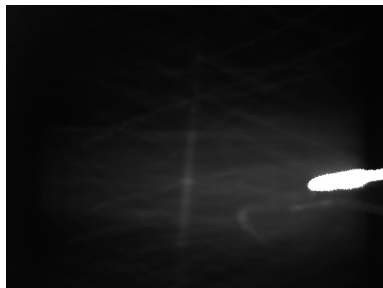




# Glass Nozzle

## Extension for Glass Nozzle

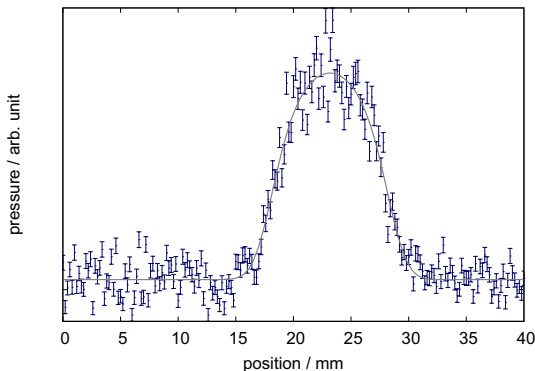
- 1. Extension (narrowest inner diameter:  $\approx 530 \mu\text{m}$ , purified)



# Glass Nozzle

## Extension for Glass Nozzle

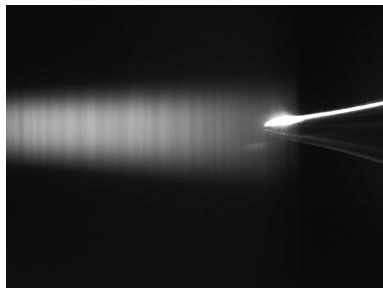
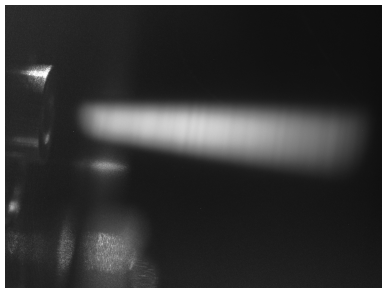
- 1. Extension (narrowest inner diameter:  $\approx 530 \mu\text{m}$ , purified)
- Thickness:  $\approx 2.89 \times 10^{13} \frac{\text{atoms}}{\text{cm}^2}$  (36 K, 17 bar) without adjustments



# Glass Nozzle

## Extension for Glass Nozzle

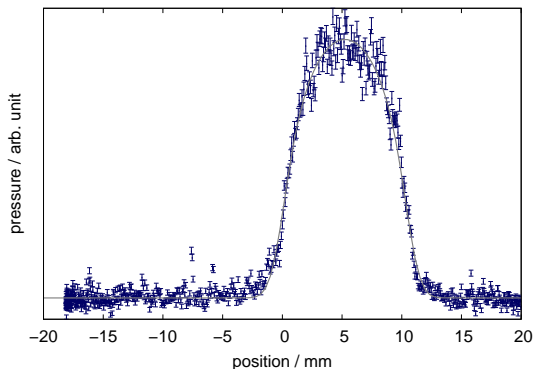
- 2. Extension (narrowest inner diameter:  $280\ \mu\text{m}$ , purified)



# Glass Nozzle

## Extension for Glass Nozzle

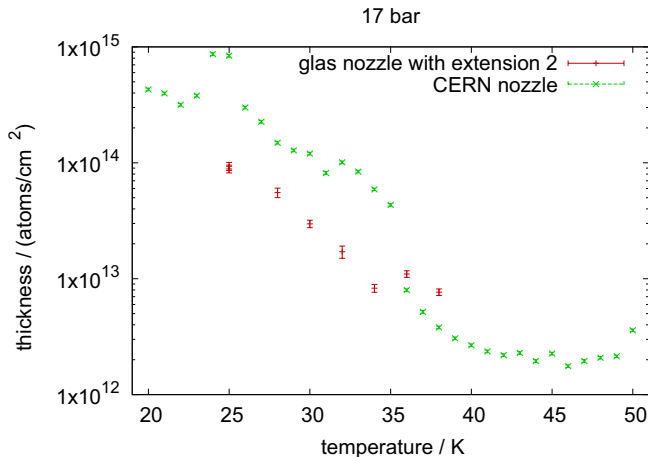
- 2. Extension (narrowest inner diameter: 280  $\mu\text{m}$ , purified)
- Thickness:  $\approx 8.8 \times 10^{13} \frac{\text{atoms}}{\text{cm}^2}$  (25 K, 17 bar) without adjustments



# Glass Nozzle

## Extension for Glass Nozzle

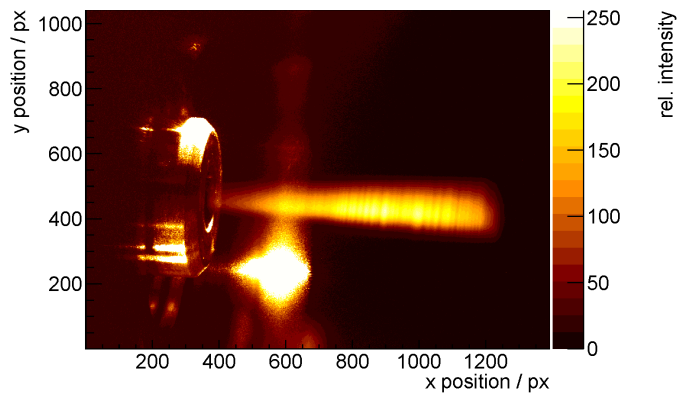
- Glass nozzle (30  $\mu\text{m}$ ) with 2. Extension (280  $\mu\text{m}$ , purified)  
⇒ Without adjustments
- CERN nozzle (28  $\mu\text{m}$ ) (measured by Dr. E. Köhler)



# Glass Nozzle

## Extension for Glass Nozzle

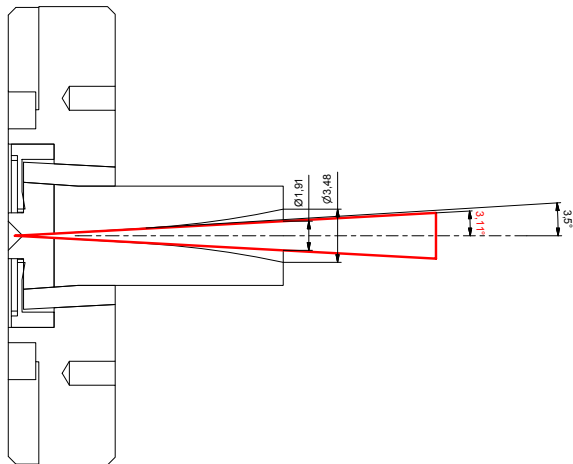
- 2. Extension (narrowest inner diameter:  $280\ \mu\text{m}$ , purified)



# Glass Nozzle

## Extension for Glass Nozzle

- 2. Extension (narrowest inner diameter:  $280\ \mu\text{m}$ , purified)



# Summary & Outlook

## Summary

- Measurements with glass nozzles with different extensions (to enlength the glass nozzle) at the  $\bar{P}$ ANDA cluster-jet target prototype
- Comparision of these with CERN nozzle data
- First analysis of the cluster-jet beam depending on nozzle properties
- Reproducibility of the cluster beam with glass nozzle

## Outlook

- Optimisation of the thickness by adjustment of nozzle tilting system, skimmer, and collimator
- Comparision of these with CERN nozzle data
- Investigation on core beams and their dependence on the nozzle geometry (reproducibility and appearance)
- Studies of different nozzle geometries (length and opening angle) and their influence on the cluster beam