

Design and Developments of the Cluster-Jet Target for \bar{P} ANDA

Ann-Katrin Hergemöller

Westfälische Wilhelms-Universität Münster, Institut für Kernphysik

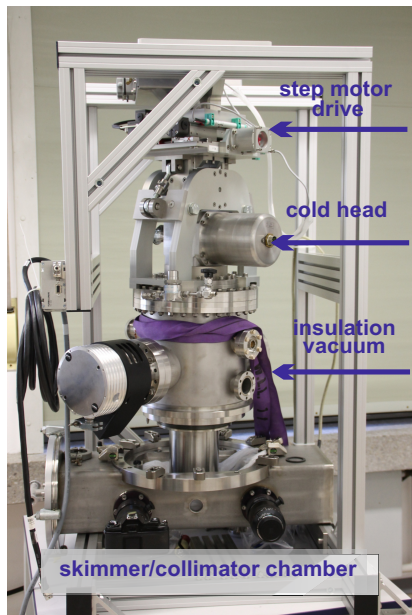
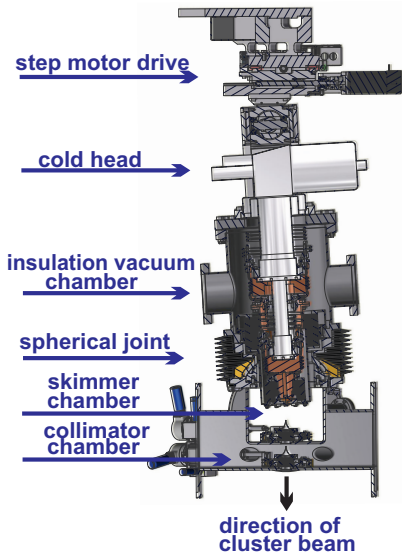
\bar{P} ANDA Meeting Jülich, December 10th 2014



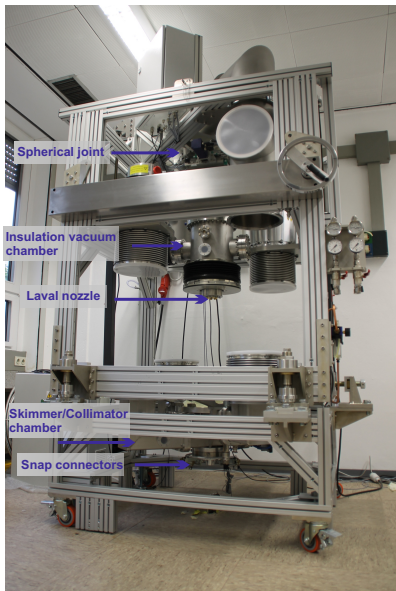
Bundesministerium
für Bildung
und Forschung



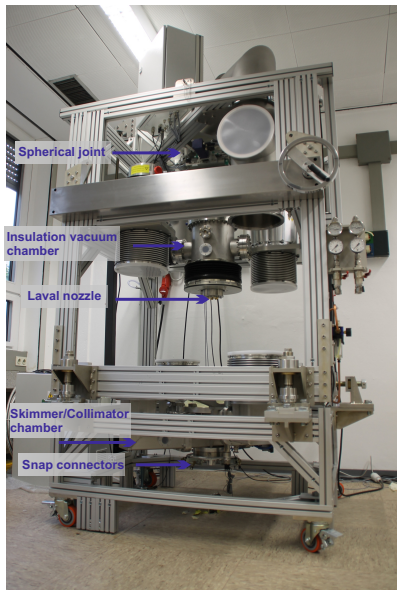
Setup of the new cluster source



Setup of the new cluster source



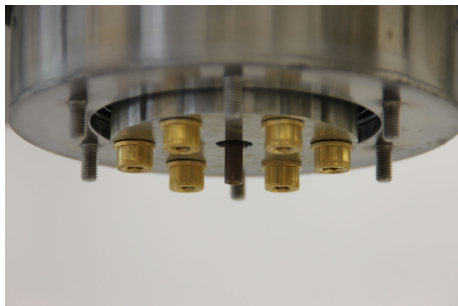
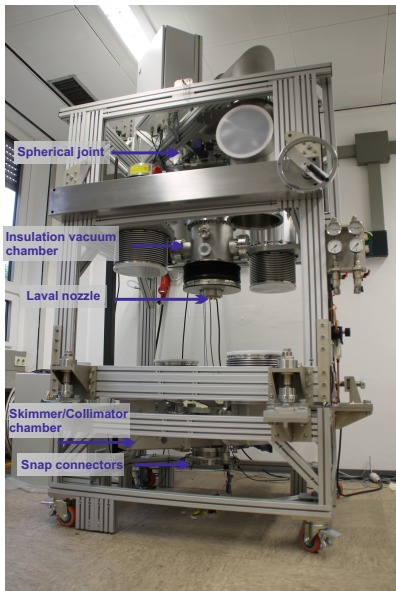
Setup of the new cluster source



Spherical Joint

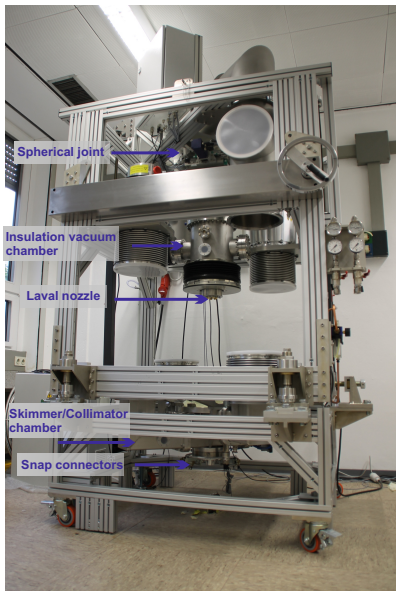
⇒ Stepper motors for moving
successfully set into operation

Setup of the new cluster source



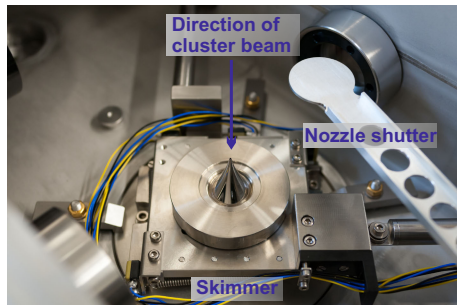
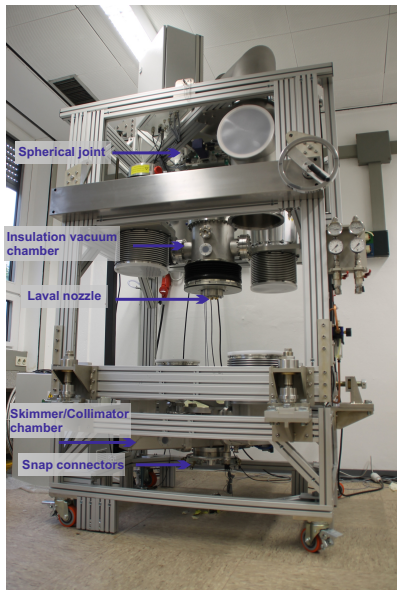
Laval nozzle

Setup of the new cluster source



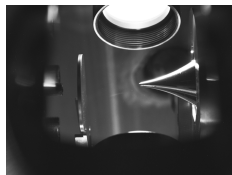
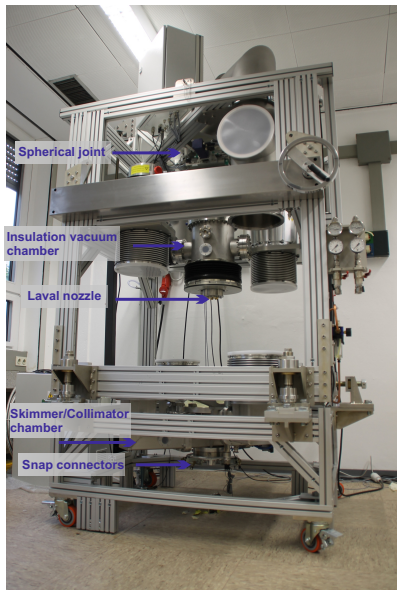
Skimmer/Collimator chamber

Setup of the new cluster source



- Skimmer and collimator installed on xy-table \Rightarrow position adjustable
- Adjustment via two stepper motor devices
- Electrical installation ongoing

Setup of the new cluster source



$f = 28 \text{ mm}$

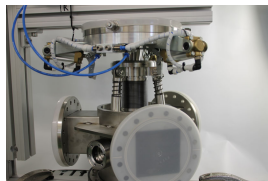
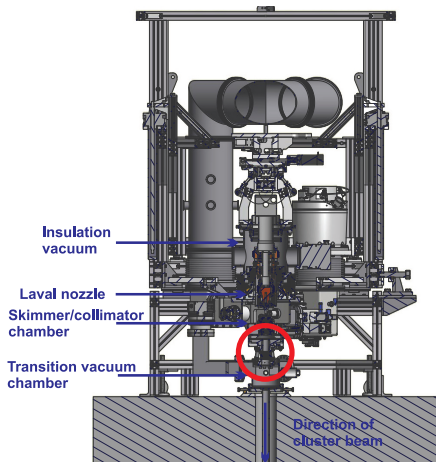


$f = 100 \text{ mm}$

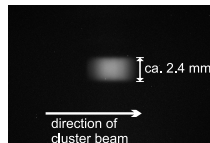
- Two camera ports on opposite sites
- Different objective lenses offer possibility to see:
 - Nozzle, beam and skimmer ($f = 28 \text{ mm}$)
 - Detailed view of beam and skimmer tip ($f = 100 \text{ mm}$)

Installation of further components

Transition Vacuum Chamber



- Separates cluster target vacuum from HESR/ \bar{P} ANDA vacuum
- Offers camera ports for online cluster beam position and thickness monitoring

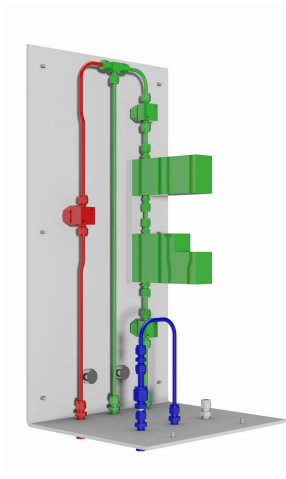


Developed by S. Grieser

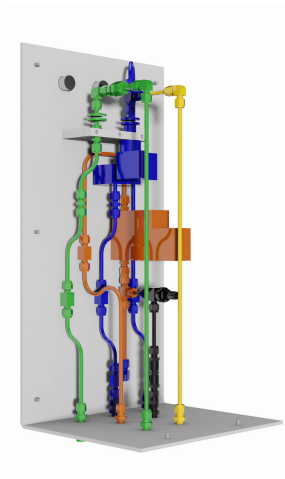
Installation of further components

Gas system and gas control

- Modules for H₂ and N₂ systems



H₂

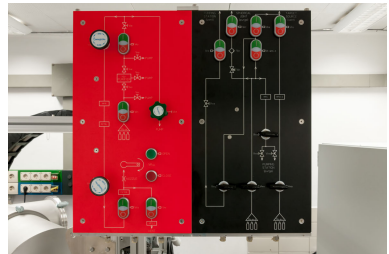
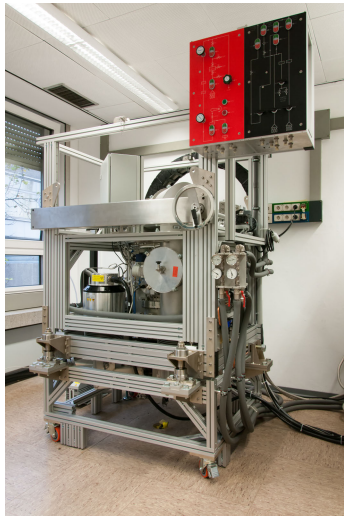


N₂

Installation of further components

Gas system and gas control

- Installation at target support frame



Installation of further components

Electronic Rack



- Electronic rack with 4.5 kW heat exchange device
- Includes all control units of the target:
 - Computer with (temporary) slow control
 - CompactRio
 - Frequency converter of turbo pumps
 - Center3 for pressure monitoring
 - Temperature controller
 - Pressure and gas flow controller

Installation of further components

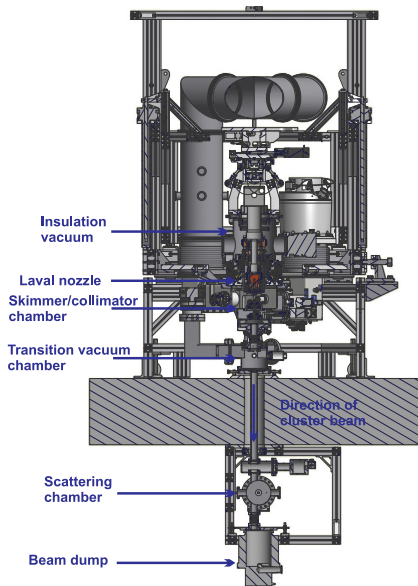
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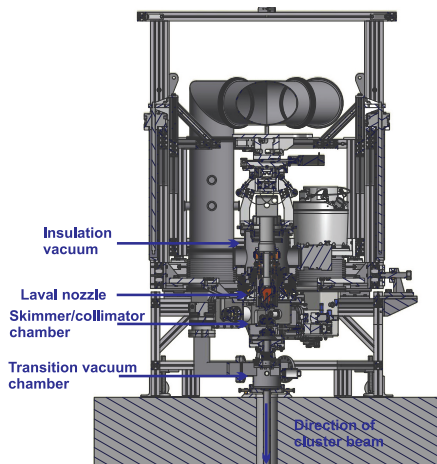
Installation of further components

Scattering Chamber & Beam Dump



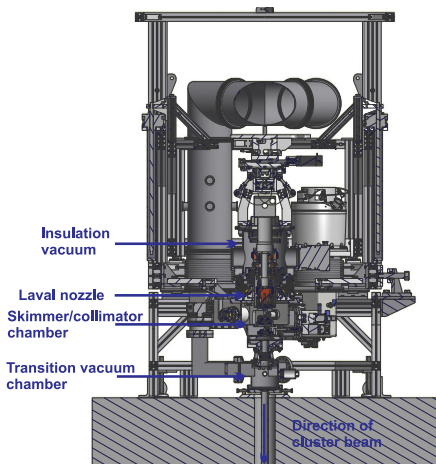
- Setup vertical in full \bar{P} ANDA geometry
- ⇒ 2.1 m between cluster source and interaction point
- Design and construction of a scattering chamber including a scanning rod system
- Installation of a provisional beam dump
- ⇒ Test of cluster beam properties at \bar{P} ANDA interaction point

First Test of Vacuum Conditions

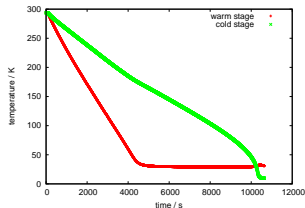


- Test of vacuum conditions in insulation vacuum chamber and skimmer and collimator chamber
- Forepump with $25 \frac{\text{m}^3}{\text{h}}$, provisorily
- Vacuum conditions:
 - Insulation vacuum chamber: $< 10^{-7}$ mbar
 - Skimmer chamber: $\leq 8 \times 10^{-2}$ mbar (pressure of forepump)
 - Collimator chamber: $< 10^{-7}$ mbar

Cooling Test of Cold Head

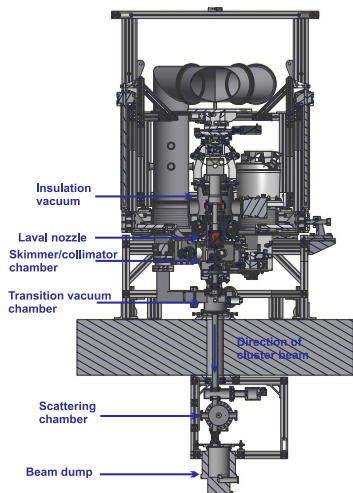


- Cooling test of cold head in cluster source
- Test without gas flow
- Temperatures:
 - Warm stage: ≈ 30 K
 - Cold stage/nozzle: ≈ 9 K
 - Cooling time ≈ 2.5 h



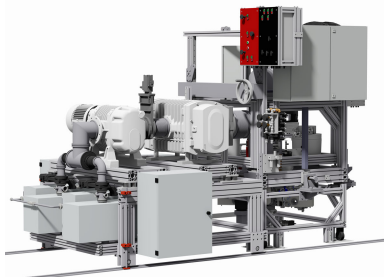
Cooling curve

Setup of the cluster target → Next steps



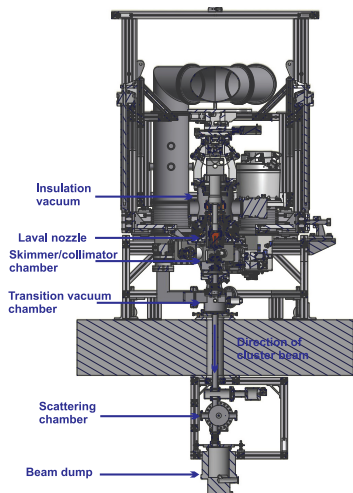
- Final mounting of skimmer/collimator xy-tables and electrical installation
- Integration of snap connectors & transition vacuum chamber
- ⇒ Final Setup of the cluster source
- Installation of the final pumping station in the new laboratory
- ⇒ Integration with the cluster source
- Installation of vertical beam pipes
- Setup of scattering chamber and beam dump
- Setup of (temporary) slow control system for test operation

Setup of the cluster target → Next steps



- Final mounting of skimmer/collimator xy-tables and electrical installation
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Setup of the cluster target → Implementing & Tests



- Further vacuum tests
- Test of mounting system
- Test of the slow control requirements
- Gas supply requirement tests
- Investigation of the target thickness
- Determination of the best settings of skimmer, collimator and spherical joint
- Long term beam stability tests
- Test of different Laval nozzles
- ...

The Cluster-Jet Target for \bar{P} ANDA

- Set up of cluster source still ongoing
 - Integration in target frame
 - Implementing of spherical joint
 - Installation of gas modules
 - Setup of electronic rack
- Next steps:
 - Construction of transition vacuum chamber
 - Final installation of skimmer/collimator xy-tables
 - Design and construction of scattering chamber & beam dump
 - ...
- First tests of vacuum & cooling system successful

Further studies

- Investigations on the cluster mass with MCP's
- Determination of the cluster size by Mie-scattering

The Cluster-Jet Target for \bar{P} ANDA

