Pellet tracking project for the WASA-at-COSY experiment

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The Cooler Synchrotron (COSY)

- Location: Jülich Research Center, Germany
- Circumference: 184 m
- Beam: protons or deuterons
- Beam momentum: 0.3 – 3.7 GeV/c
- Number of particles in beam: ~$10^{11}$
- Luminosity: up to $10^{32}$ cm$^{-2}$s$^{-1}$
• Pellet Target
  • provides frozen pellets of hydrogen or deuterium
  • effective target thickness: $2 - 3 \cdot 10^{15} \text{ cm}^2$

• Central Detector
  • built around the interaction point, covers angles $20^\circ - 169^\circ$
  • provides data for identification of charged particles and photons

• Forward Detector
  • covers angles $3^\circ - 18^\circ$
  • used for identification of charged recoil and scattered particles
Pellet Target

- Pellet size: \( \approx 25 - 45 \mu m \)
- Pellet frequency
  - at the nozzle: 45 – 70 kHz
  - at the interaction point: 2 – 10 kHz
- Pellet velocity: 70 – 100 m/s
- Pellet-pellet distance: \( \approx 5 – 10 \text{ mm} \)
- Pellet stream divergence: \( \sim 0.04^\circ \)
- Pellet stream diameter at beam: 2 – 4 mm
Pellet Tracking

- **Goal:** improving the accuracy of data analysis by precise determination of the interaction vertex
- **Method:** measuring positions and velocities of the pellets before and after the interaction point
- **Means:** lasers and line scan CCD cameras
Pellet Tracking

- pellet velocity spread forces small distance between cameras
- need to adjust Pellet Target parameters to minimize velocity spread <1%
- system needs very precise alignment

Hans Calén et al., Development of Pellet Target Tracking Systems in Uppsala (2010)


Thank You for Your attention