Cluster Target Vertex Zone Visualisation at Storage Rings with MCPs*

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For the future $\overline{\text{P}}$ANDA experiment at FAIR a novel technique to visualise the interaction zone of the cluster-jet target beam and the antiproton beam has been developed. For this purpose in recent tests at the COSY accelerator at FZ Jülich the interaction region of the passing COSY beam through the internal ANKE cluster-jet target was observed for the first time by using a Micro Channel Plate detection system. Initially the detector system was designed and constructed to run adjustment checks and to monitor the $\overline{\text{P}}$ANDA cluster-jet target during operation [1]. However, the installation at the end of the ANKE beam dump demonstrated a completely new possibility to visualise and monitor the interaction region of beam and target at internal target experiments. The passage of the COSY beam through the cluster-jet target ionises the uncharged clusters, which are detected with the MCPs (see Figure 1).

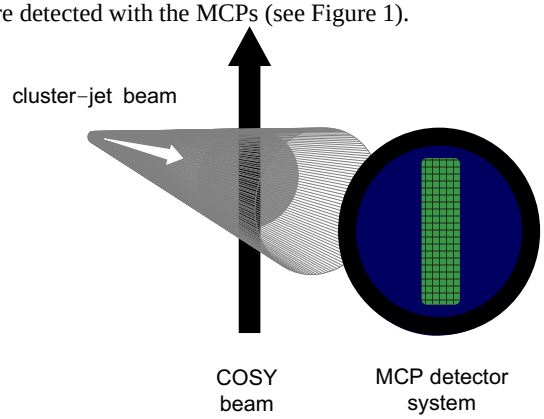

Figure 1: Schematical drawing of the passing COSY beam through the cluster-jet target. The thereby ionised clusters are subsequently detected with the MCPs.

A direct observation of the ionised cluster-jet beam is presented in the following Figures. The abscissa represents the horizontal spatial direction and the ordinate the COSY beam direction. Figure 2 depicts the projection of the interaction zone at COSY beam injection energies and Figure 3 the interaction zone after acceleration, where the influence of the adiabatic cooling is clearly visible (reduced phase space). The shift of the interaction zone induced by switching on a steerer magnet is shown in Figure 4. This new diagnostic tool is particularly suited for quantitative vertex point investigations at internal target experiments.

References

[1] E. Köhler, Cluster-Jet Beam Visualisation with Micro Channel Plates, Annual Report GSI, 2012

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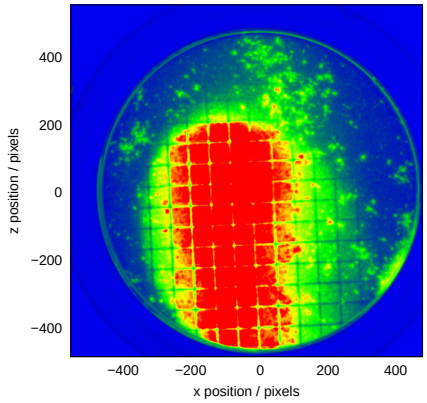

Figure 2: Interaction region at COSY beam injection energies.

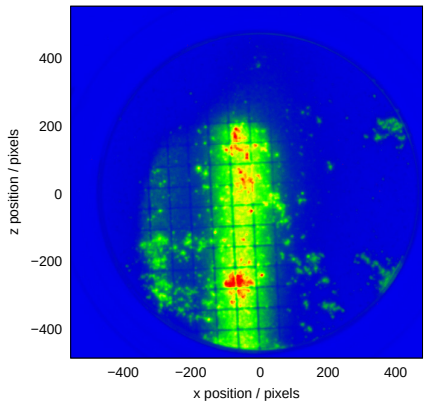

Figure 3: Interaction region after COSY beam acceleration.

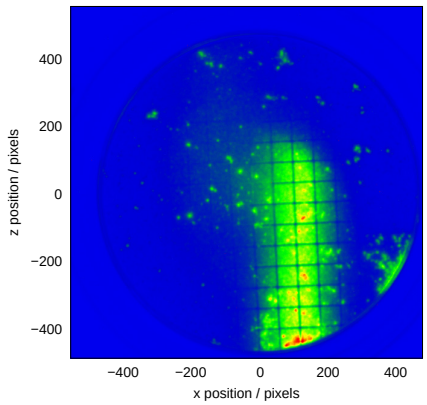

Figure 4: Shift of the interaction region caused by an active steerer magnet.