3rd DITANET School on Beam Diagnostics (Advanced Level), 7 – 11 March, 2011, Stockholm, Sweden

SPATIAL RESOLUTION TEST OF A BPMS: DEPENDENCE ON BEAM ENERGY

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- BPMS to cover the wide range of beam intensities and energies have been the subject of extensive research both from applications and fundamental understanding viewpoints [1-3].
- A BPMS based on the observation of low energy secondary electrons (SE) generated by a beam striking a metallic foil was recently developed at CERN [2,3].
- Inspired by its simplicity and applicability, a similar system was built at Stockholm University. It consists of an aluminum (Al) plate, a grid placed in front of Al, a microchannel plate (MCP), a fluorescent screen (F.S.), a PC, and a CCD camera (Figs. 1 and 2).
- A beam collimator containing a set of circular holes of different diameters and separation between them was built to check the spatial resolution of the system (Fig. 3). Two holes of diameter 1 mm each and separated by 2 mm in the collimator and a proton beam of energy 0.5 and 10 keV, respectively, were used for the measurements. From the entire beam the collimator cuts out well separated and approximately same intensity two beam spots. After passing through the collimator, the beam strikes the Al plate and produces a lot of SE. These low energy electrons are then first accelerated to the gird and then hit the MCP where they get amplified. The cascade of electrons then hit the F.S. and produces flashes of light, which, in turn are captured by a CCD. This CCD is connected to a PC for further storage and analysis of the recorded light intensity profiles. The measurements were performed at Stockholm University (Fig. 4)
- The resolution was tested for different Al plate voltages. The results are shown in Figs. 5, 6, and 7. Two circular images of approximately same diameter (~ 1 mm) with a separation of 2 mm between the beams centers can be clearly seen (Fig. 5). This suggests a spatial resolution of 2 mm of the system.
- The change of resolution (represented by the ratio δ), calculated from the horizontal beam profile, of the BPMS was found to increase with increasing Al plate voltage (Fig. 7).

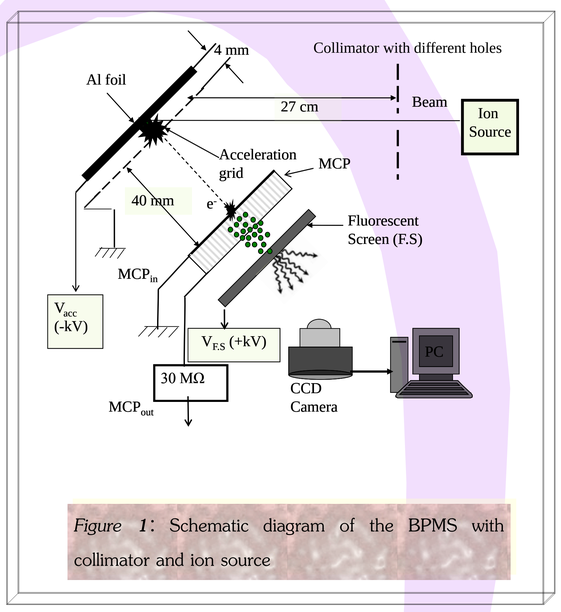

Figure 1: Schematic diagram of the BPMS with collimator and ion source

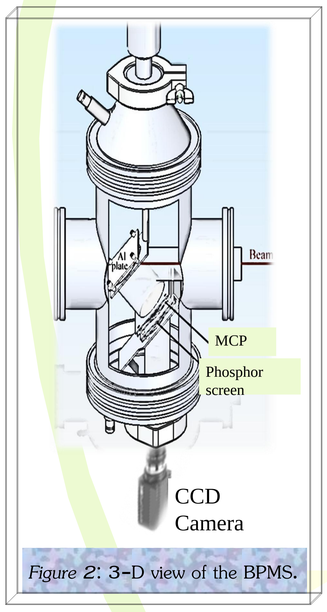

Figure 2: 3-D view of the BPMS.

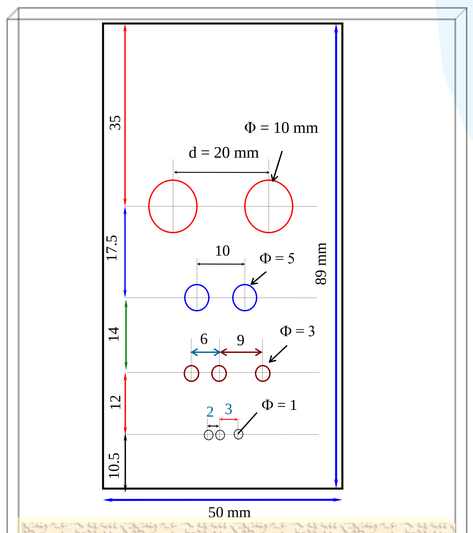

Figure 3: Collimator with circular holes of different diameters (Φ) and separation (d) between them.

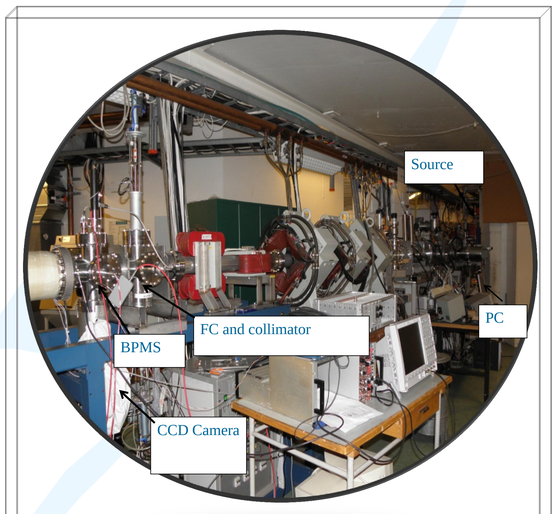

Figure 4: Experimental set-up at the CRYRING facility at Manne Siegbhan Laboratory, Stockholm University

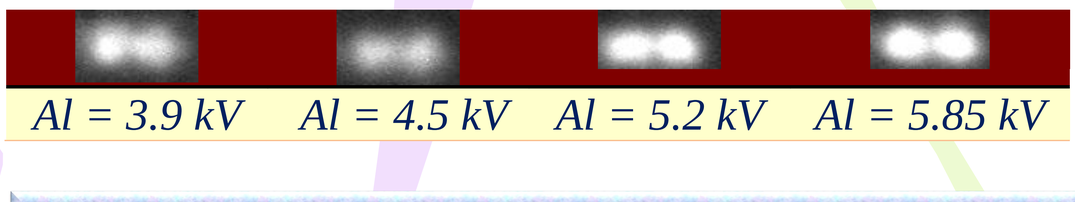

Figure 5: ***Recorded CCD images of the light produced in the F.S. for different al plate voltages for 0.5 keV proton beam***

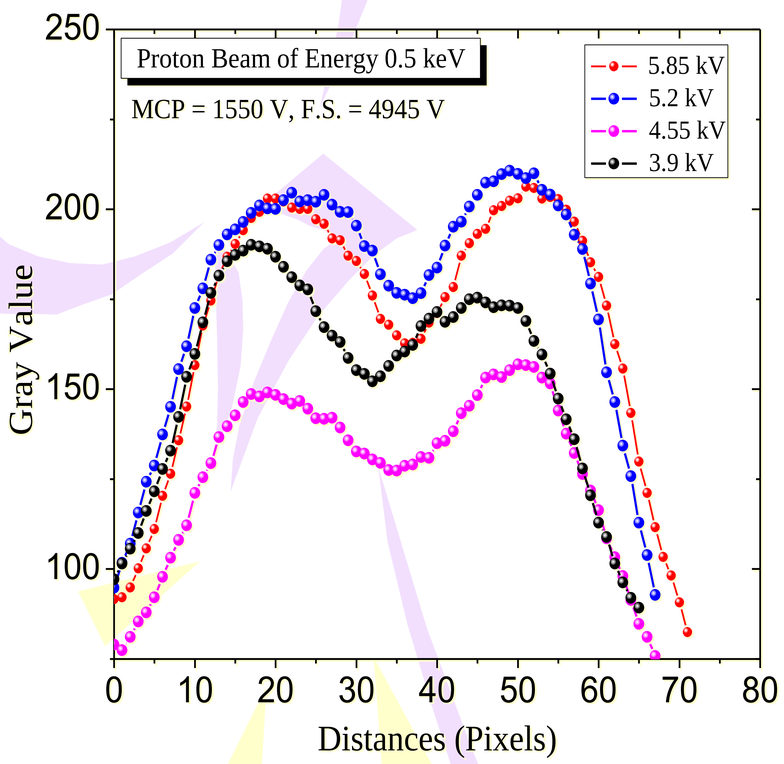

Figure 6: *Corresponding h*orizontal profiles of the images of Fig. 5.

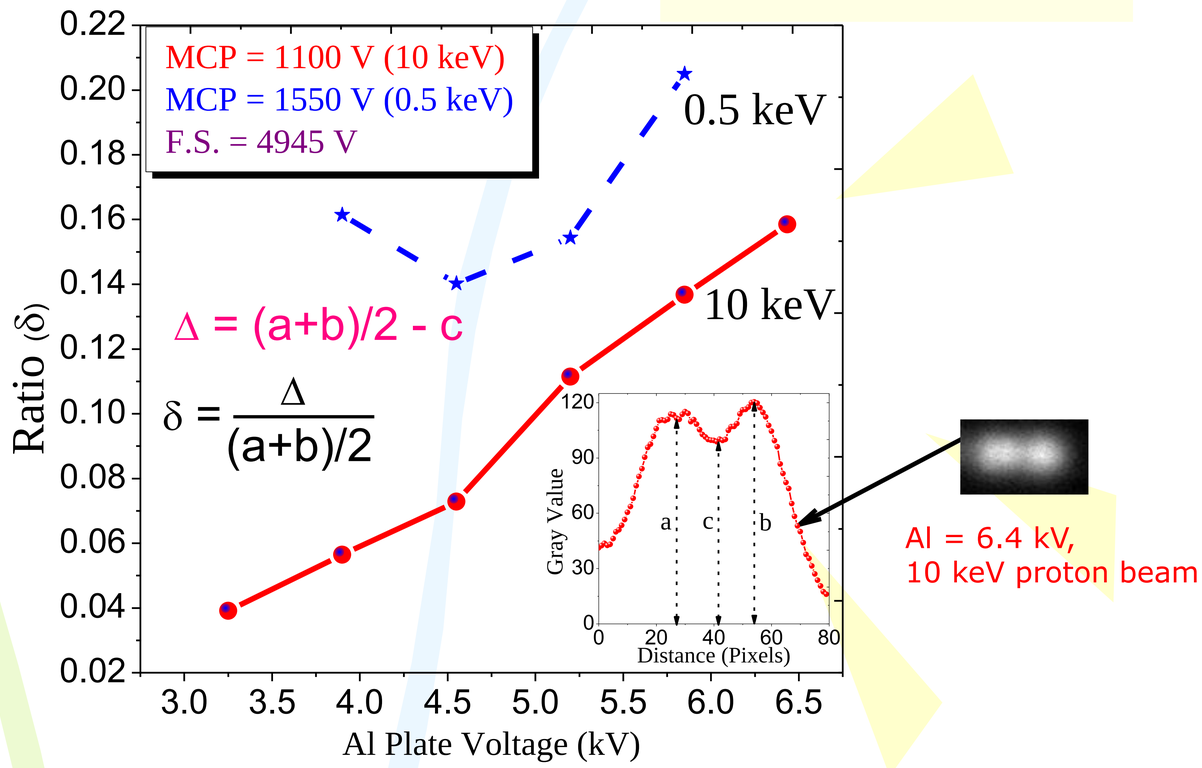

Figure 7: Change of resolution (Ratio δ) vs. Al plate voltage. The inset (red curve) shows the horizontal beam profile. a, b, and c are the heights of two adjacent peaks and the dip between them, respectively, from which the ratio was calculated.

References:
[1] P. Strehl 1992 *Rev. Sci. Instrum.* **63** 2652.
[2] K. Kruglov *et al.* 2002 *Nucl. Inst. Methods Phys. Res. Section A* **441** 595 and references there in.
[3] K. Kruglov *et al.* 2002 *Nucl. Phys. A* **701** 193c
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Acknowledgement The research project was funded by the European Commission within FP7 Marie Curie Initial Training Network DITANET.