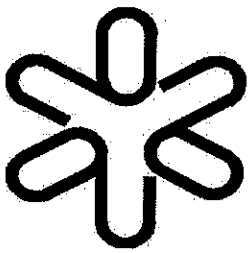

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Tolerances on the Mechanical Adjustment of the Auger Fluorescence Detector

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Abstract

Using a ray-tracing program we estimated the variations of the spot size as a function of the imprecision on the mechanical adjustment of the optical elements. We compare the results when the diaphragm is installed with and without a corrector ring.

1 Introduction

Imprecisions on the mechanical adjustment of the diaphragm, camera and mirror could increase the spot size, and the desired optical resolution of the fluorescence detector (0.5°) [1] could be lost. In addition, we are answering a question made by some people of the Auger collaboration: Does the installation of the corrector ring in the aperture of the Schmidt camera require a higher precision on the mechanical adjustment of the optical elements, in order to keep this high resolution of the detector? Following we will

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show the variations of the spot size considering mechanical imprecisions at the moment of installing the diaphragm, camera and mirror.

2 Description of the Simulation

In order to see how the spot size degrades due to mechanical imprecisions at the moment of installing the diaphragm, camera and mirror, we considered in our ray-tracing program of the Auger fluorescence detector [2], a mechanical imprecision in one of the optical elements, keeping the others in their optimal places and optimal orientations. In each case, we considered the diaphragm with and without corrector ring [3].

We considered at the diaphragm and mirror two kinds of mechanical imprecisions: displacement of the optical element along the mirror axis (fig.1, fig.3) and perpendicular to the mirror axis (fig.2, fig.4). In the mirror we considered variations of the curvature radius (fig. 5) and deviations of the optimal orientation (fig.6).

3 Conclusions

As we can see by our results, the spot size is most sensible when we introduce imprecisions to the position of the PMT's cluster along of the mirror axis and perpendicular to this one. In these cases, the spot size grows rapidly with the displacement of the PMT's system. A small displacement causes a significant lost of the optical resolution, but the presence of the corrector ring doesn't aggravate very much the spot size (fig.3 and fig.4).

Acknowledgments

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References

[1] *The Pierre Auger Observatory - Design Report* (March 1997).

[2] R. Sato *et al*, *Auger Technical Note*, GAP-99-012.

[3] R. Sato *et al*, *Auger Technical Note*, GAP-99-014.

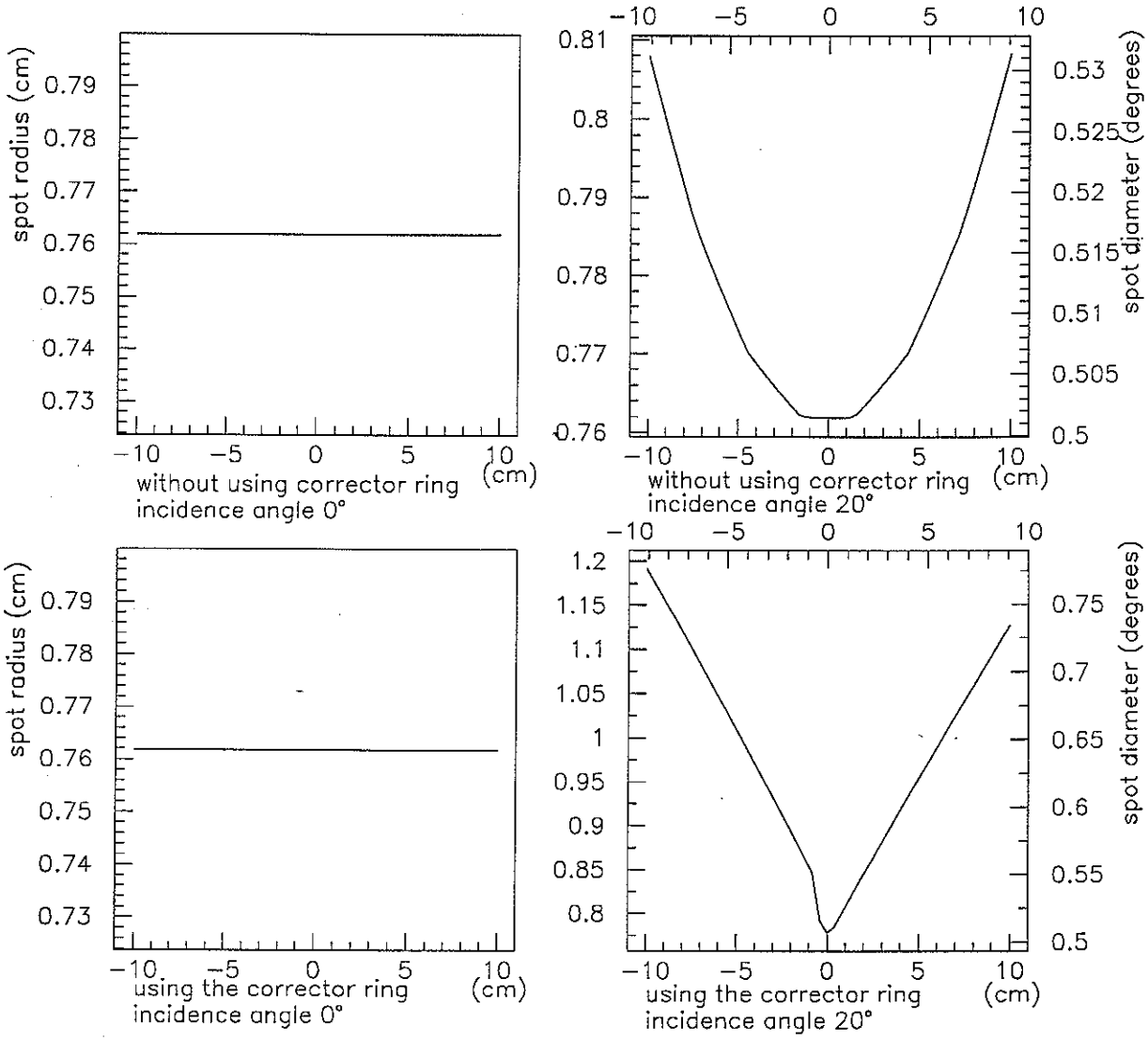

Figure 1: Spot size as a function of the diaphragm displacement along the mirror axis.

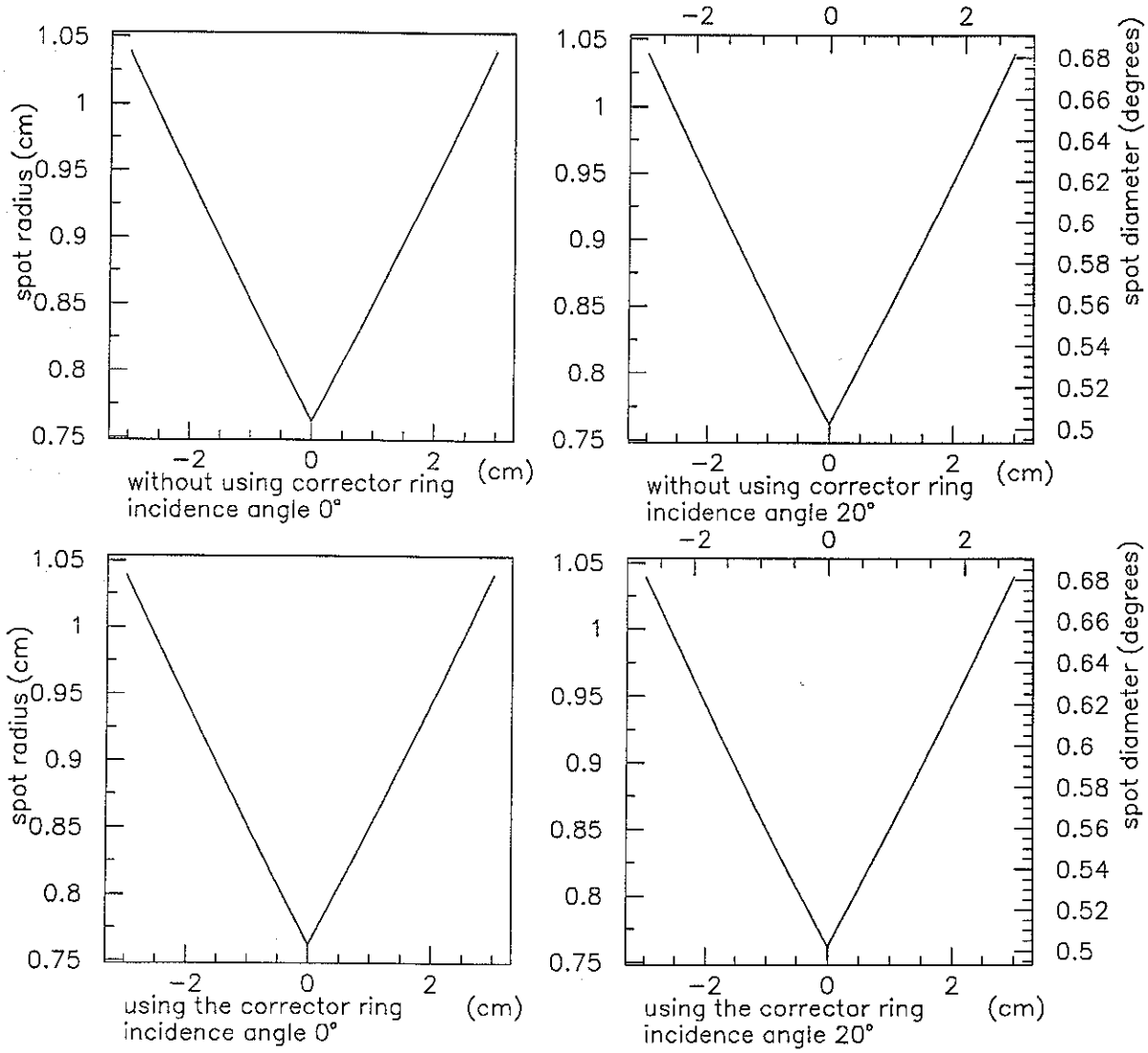

Figure 2: Spot size as a function of the diaphragm displacement perpendicular to the mirror axis.

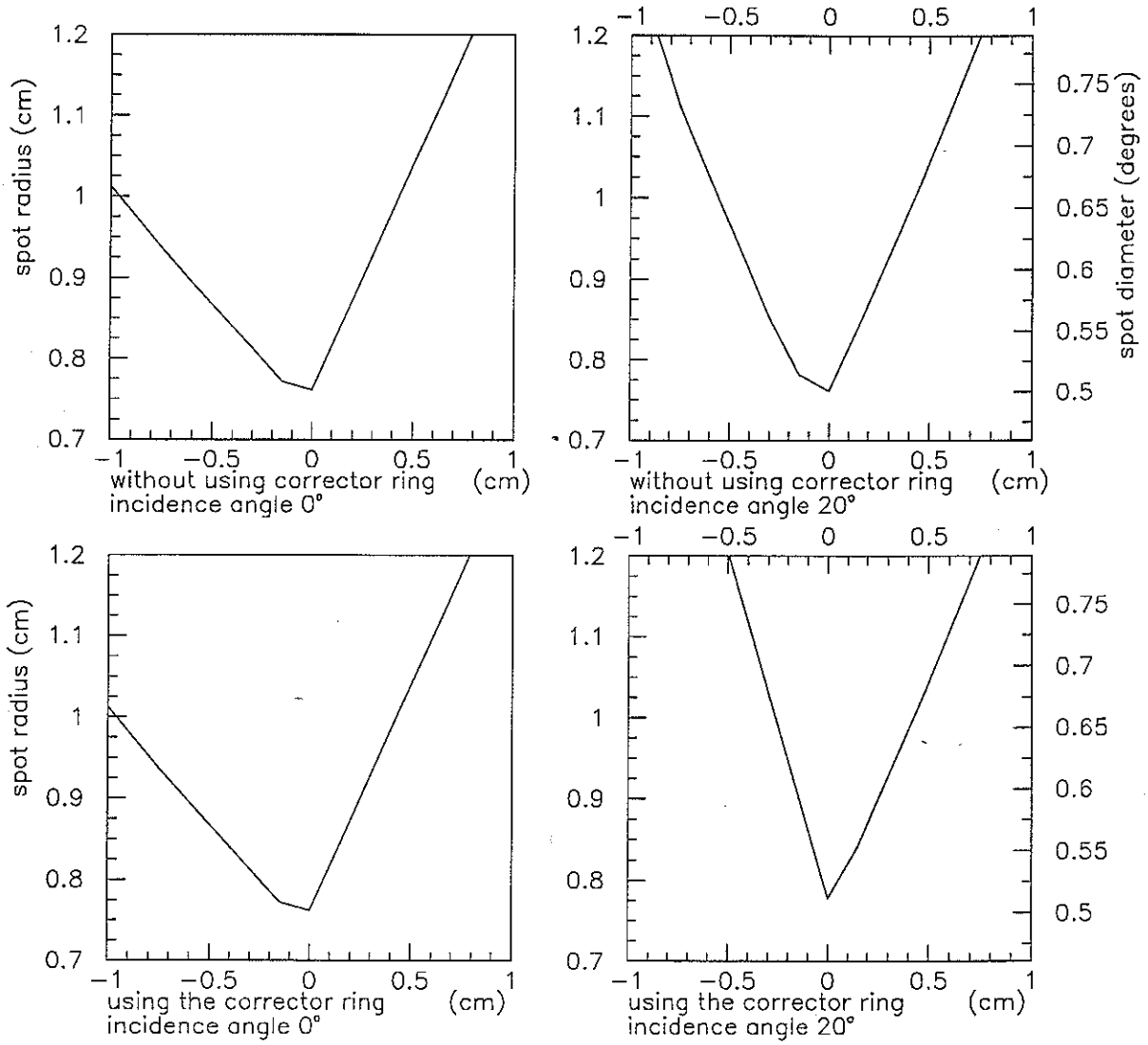

Figure 3: Spot size as a function of the camera displacement along to the mirror axis.

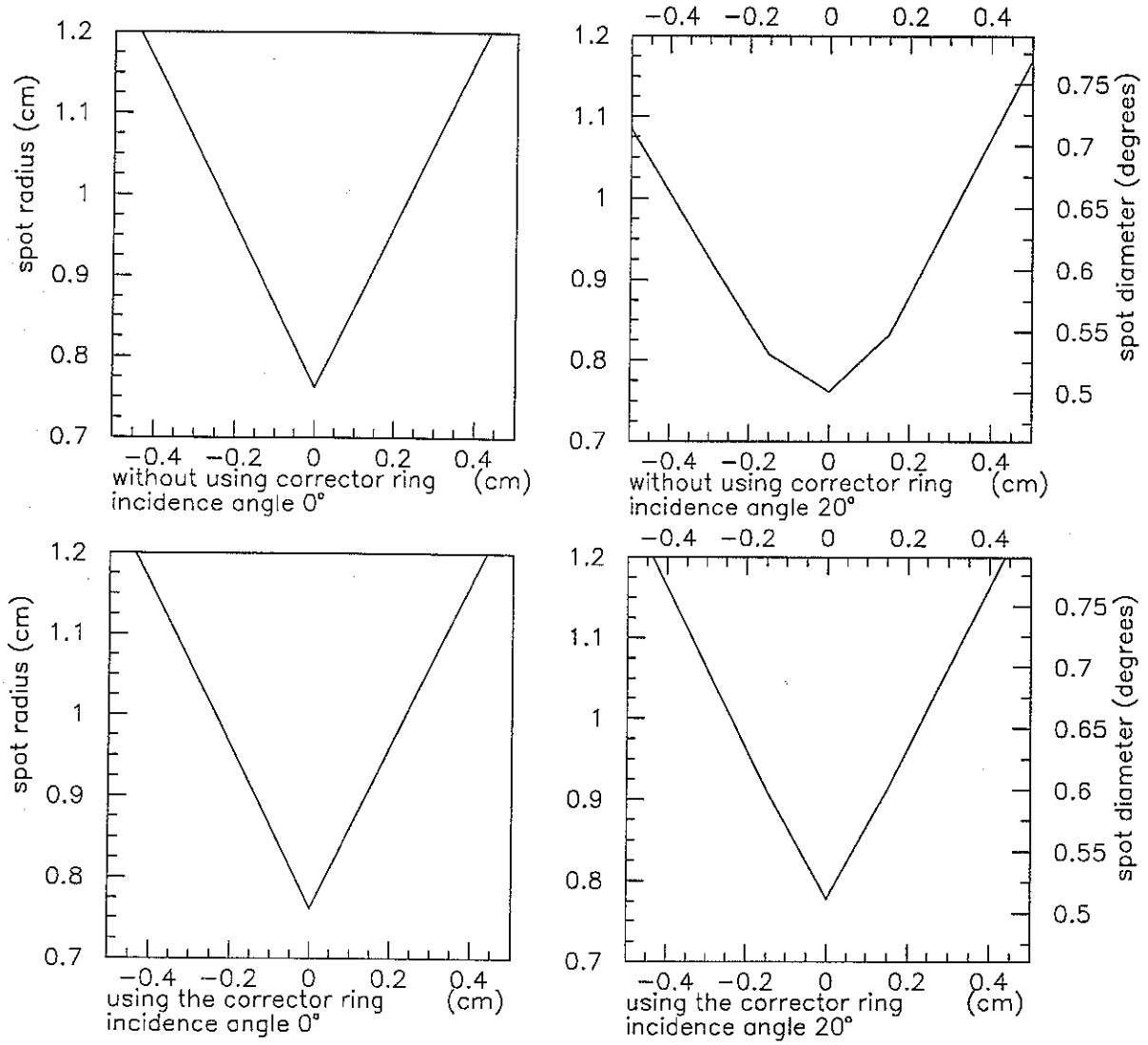

Figure 4: Spot size as a function of the camera displacement perpendicular to the mirror axis.

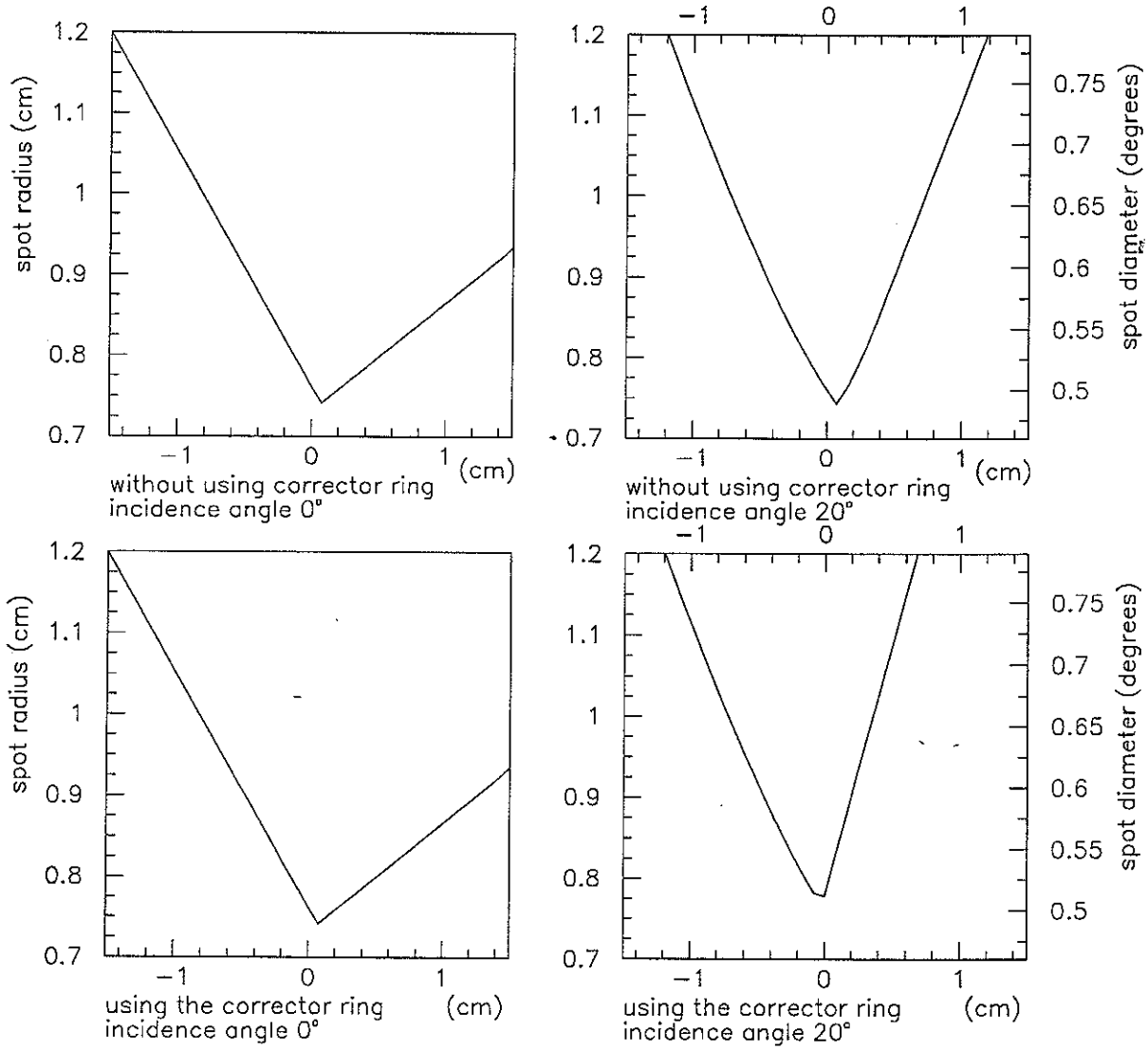

Figure 5: Spot size as a function of the precision in the curvature radio of the mirror.

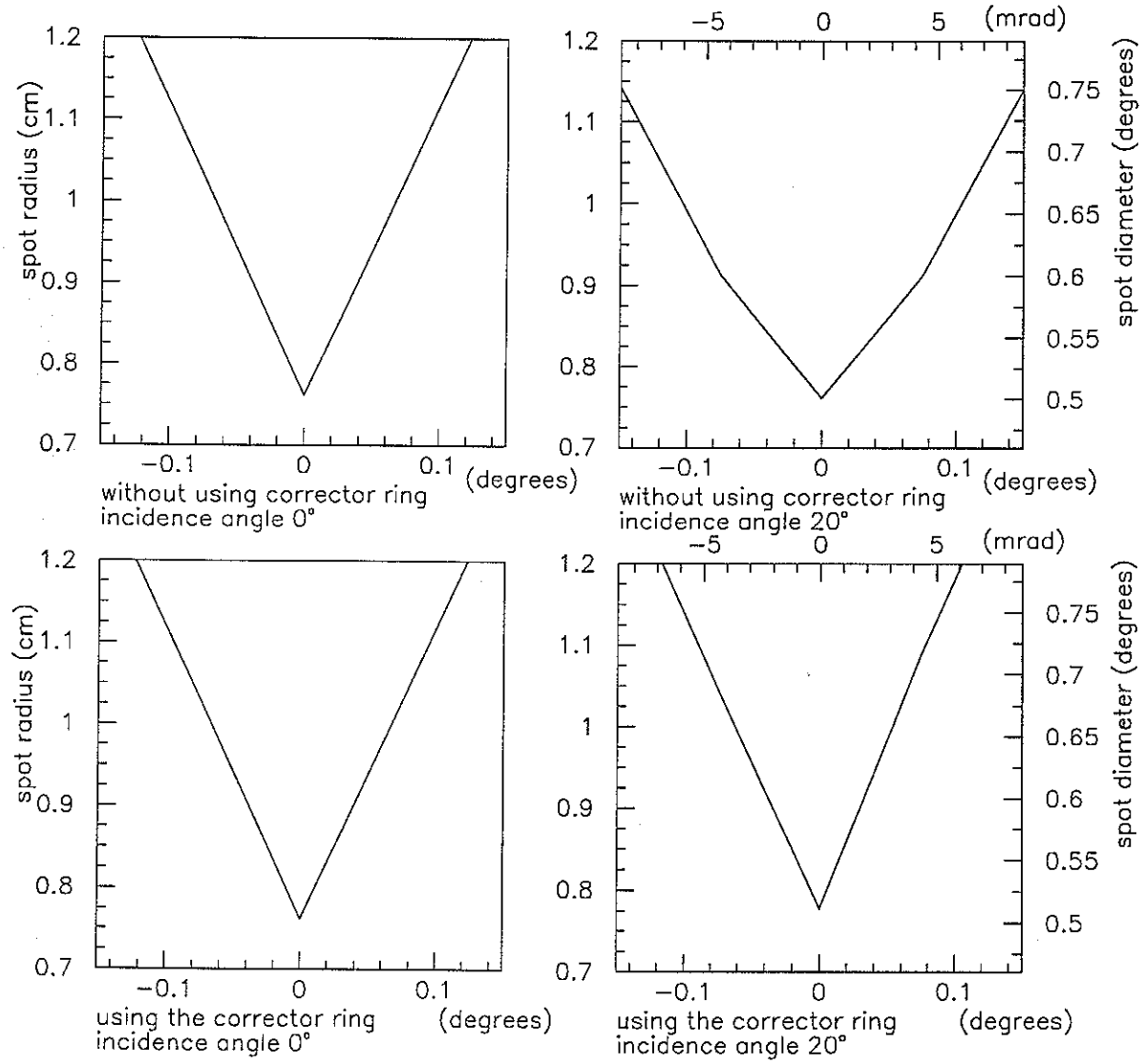

Figure 6: Spot size as a function of the precision in the orientation of the mirror axis.