

# A Water-cooled Compound Refracting Lens as a White Beam Collimator

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## Introduction

The compound refracting lens [1-3] has proven to be a simple and efficient component for focusing and collimating hard x-rays. The vertical angular divergence of typical undulator radiation is around 12  $\mu$ rad full width at half maximum (FWHM) at third-generation synchrotron radiation light sources, while the angular acceptance of an ideal diamond (111) high-heat-load monochromator (HHLM) is about 8.0  $\mu$ rad for x-rays in a range of 20-25 keV. In order to improve the throughput of the diamond HHLM at these energies, a white beam collimator is necessary.

## Methods and Materials

We built such a collimator [4] by using a water-cooled beryllium compound refracting lens.

## Results

A 25% increase in spectral photon flux around 22 keV has been obtained (Fig. 1).

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## References

- [1] B. X. Yang, Nucl. Instrum. Methods A **328**, 578 (1993).
- [2] A. Snigirev et al., Nature **384**, 49 (1996).
- [3] A. Q. Baron et al., J. Synchrotron Rad. **6**, 953 (1999).
- [4] J. Y. Zhao, E. E. Alp, T. S. Toellner, W. Sturhahn, H. Sinn, and D. Shu, Rev. Sci. Instrum. **73**, 1611 (2002).

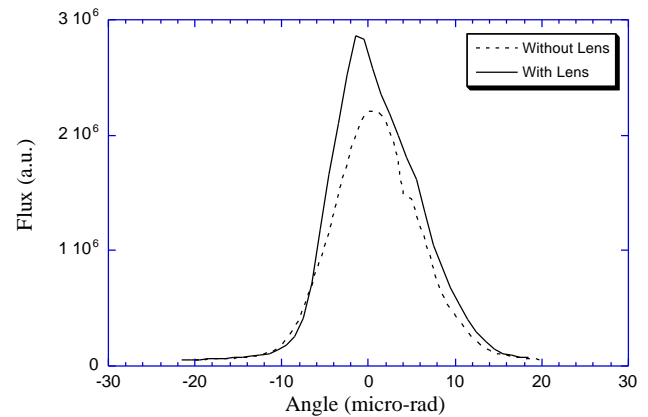


FIG. 1. Angular distribution of the spectral flux of the collimator at 22 keV.