

A versatile tender x-ray beamline 5.3.1 for diversity R&D at the ALS

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Introduction

BL5.3.1 was the first generation slicing beamline for ultrafast science. It has been modified and used as R&D beamline for diversity experiments from novel x-ray optics development, renewable energy research, detector calibration, protein research and chemistry research.

BL5.3.1 layout and end-stations

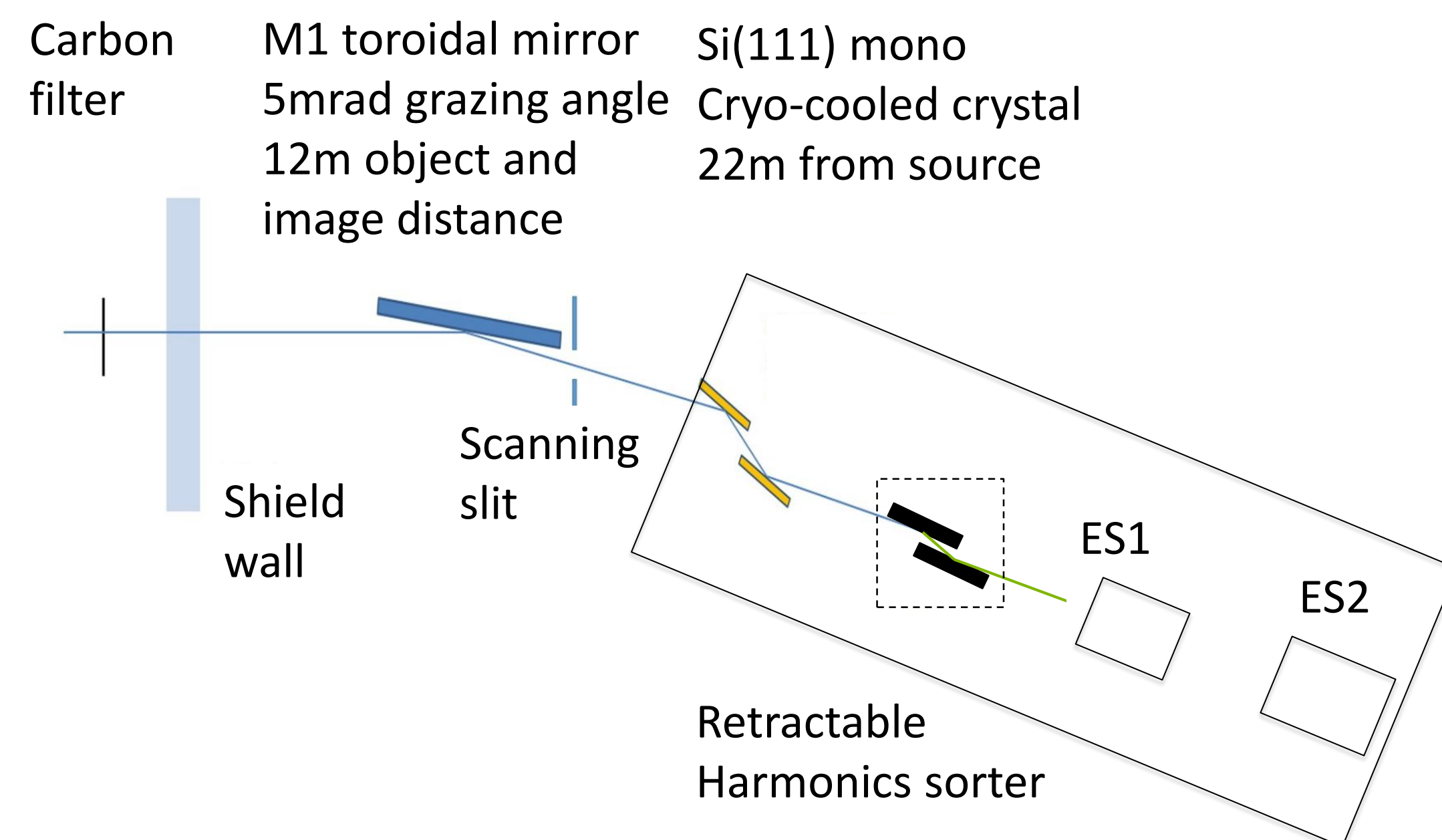


Fig. 1 Schematic of BL5.3.1 layout and end-stations

BL5.3.1 parameters

Energy range: 2.1keV-12.5keV
Focus size: typical 100umx100um
Focal distance: changeable
Flux: $\sim 3.7 \times 10^{12}$ ph/s @5.6keV
Energy resolution: $\sim 0.8\text{eV}@2.5\text{keV}$

Note: 1. BL5.3.1 can vary beam focus and focus distance downstream.

2. BL5.3.1 can delivery both monochromatic beam and white beam.

BL5.3.1 performance measurement

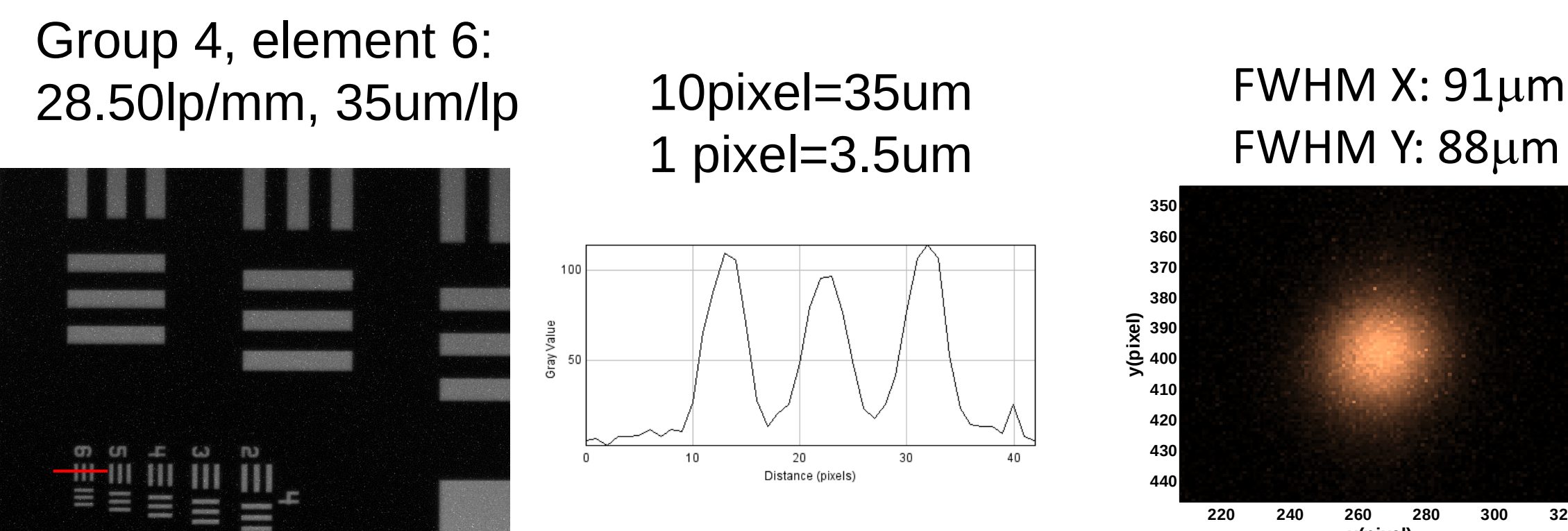


Fig. 2 BL5.3.1 measured beam size at ES1

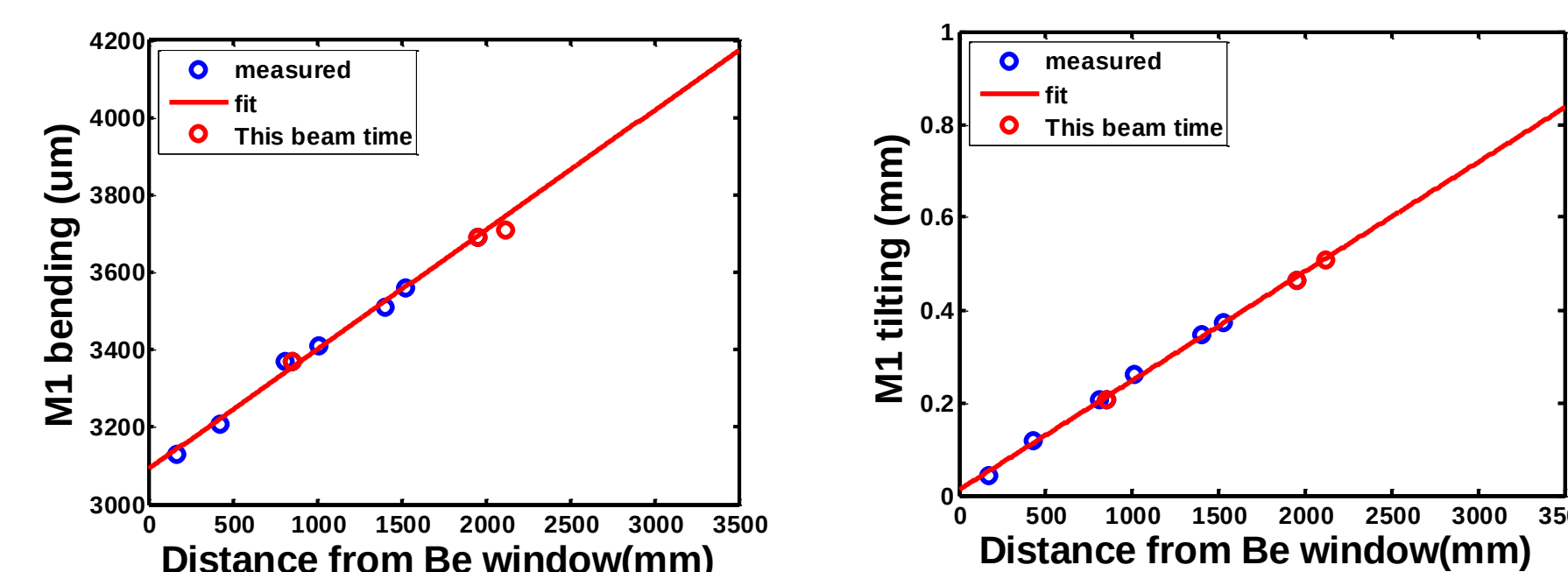


Fig. 3 BL5.3.1 measured parameters for adjustable M1 for focus beam

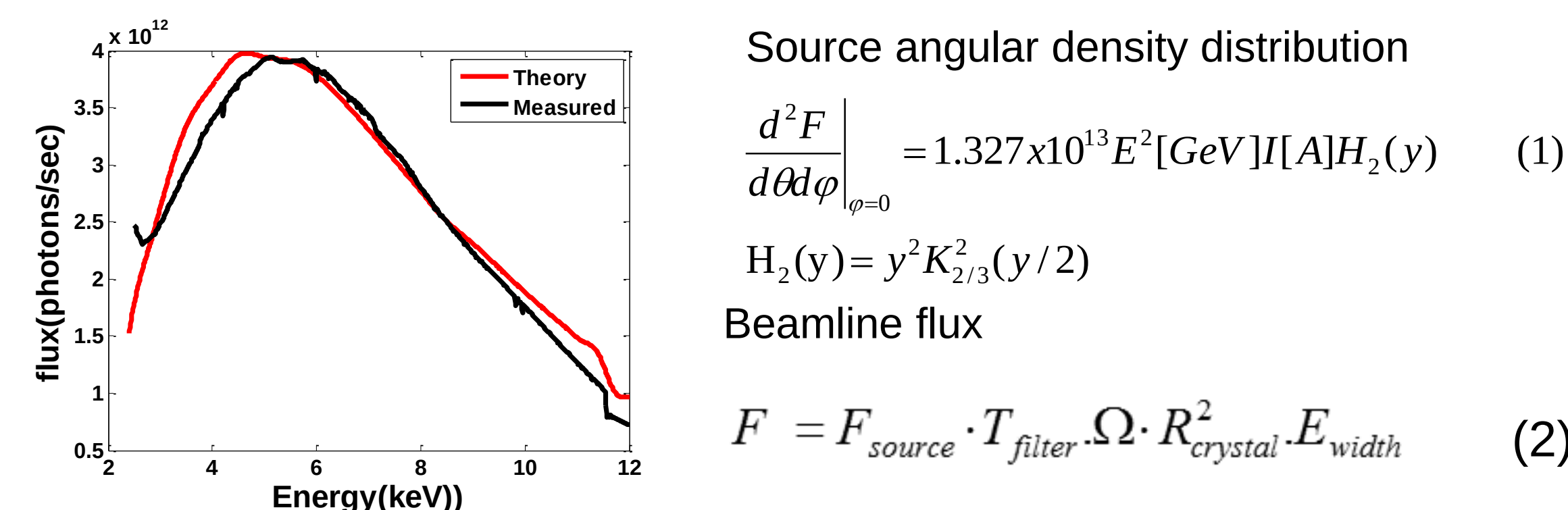


Fig. 4 BL5.3.1 measured flux and comparison with calculation

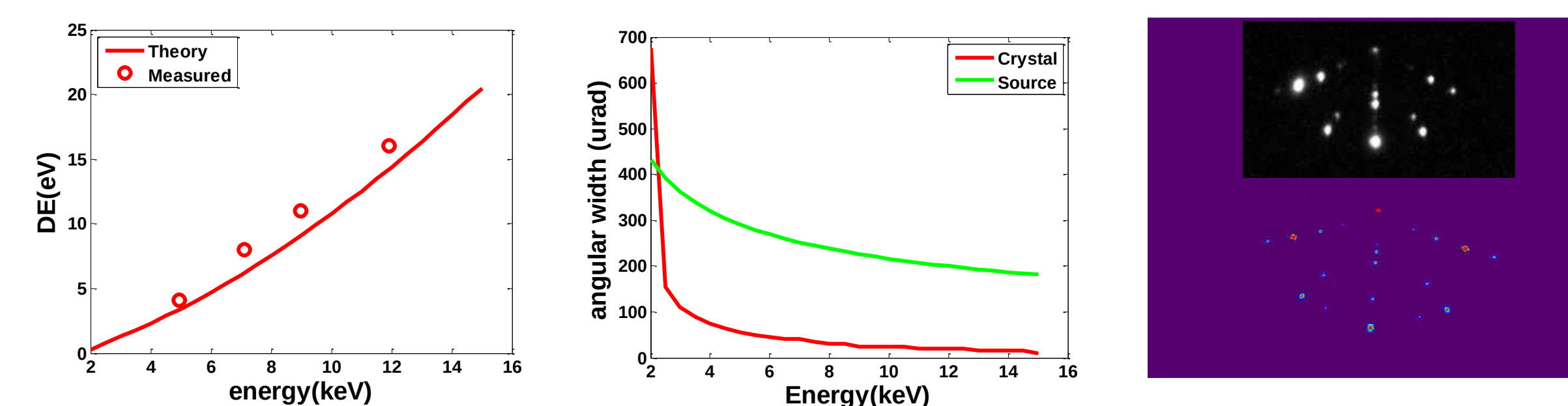


Fig. 5 BL5.3.1 energy resolving power and diffraction pattern from mono

Two mirror harmonics suppressor at BL5.3.1

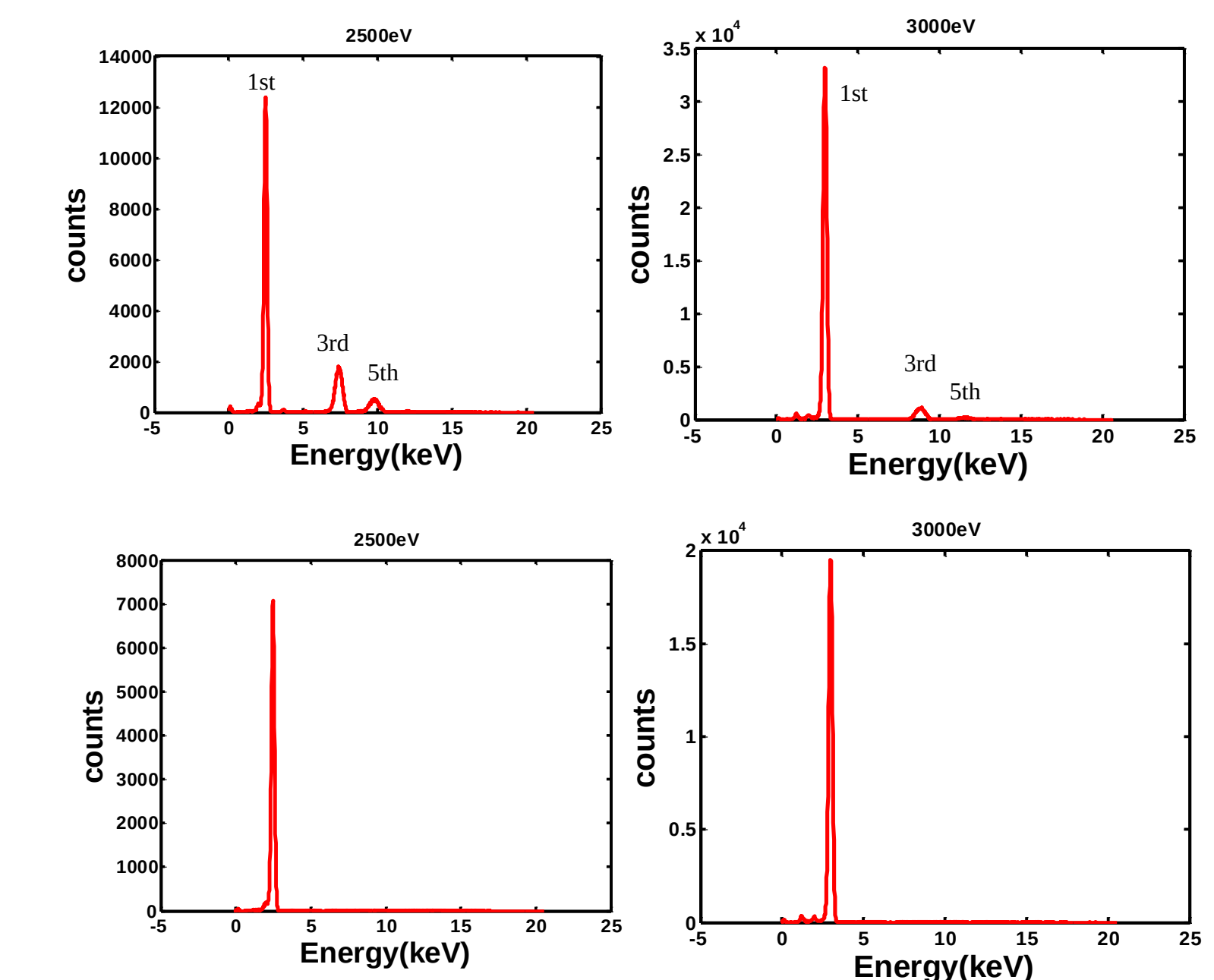


Fig. 6 measured harmonics suppressing efficiency with a suppressing ratio $>10^4$

On-going projects at BL5.3.1

1. Advanced x-ray adaptive Optics R&D for ALS-U and future light source. PI: Lisa A. Poyneer, LLNL, LDRD
2. High QE structured photocathode R&D for detector, PI: Y. Opachich, National Security Technologies, LLC, LDRD
3. White beam x-ray protein footprinting, PI: S. Gupta, C. Ralston, LBNL
4. Novel Li-S battery cell research, PI: J. H. Guo, LBNL
5. High resolution RIXS measurement of UO_2 , PI: D. Shu, LBNL
6. TReXS, A. Hexemer
7. EXAFS, X-ray diffraction for magnetism materials, F. Javier Palomars, CSIC, Spain

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