

## **Fabrication, Metrology, and Performance of Profile-coated K-B Mirrors for Hard X-ray Nanofocusing\***

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Kirkpatrick-Baez (K-B) mirrors can focus a large incident x-ray beam to nanoscale spot size with higher efficiency and larger bandwidth than can other focusing optics. They are typically made of two elliptically figured mirrors mounted in a sequential arrangement. Demagnification, i.e., the ratio of source-to-mirror and mirror-to-image-plane distance, is one of the limiting factors to achieving the ultimate spatial resolution. A focal spot size of <30-nm-diameter was obtained with a K-B mirror pair in a sequential arrangement with a 1-km-long beamline [1], versus 80-100 nm with a typical beamline of 64-m length [2]. A novel arrangement in which two mirrors are mounted orthogonally side by side in a nested (or Montel) arrangement is more compact and provides higher demagnification [3-4]. The concept has been recently tested [4] at the Advanced Photon source with a pair of mirrors made by profile-coating flat Si substrates. A two-dimensional spot size of 150 nm x 150 nm was obtained with both polychromatic and monochromatic x-rays [5]. In this talk, we will highlight recent developments in K-B mirrors for nanofocusing and discuss major challenges to the fabrication and metrology of precisely figured mirrors.

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