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Producing small size parallel x-ray beam by multi-plate crystal cavity with compound refractive lenses S.-Y. CHEN, Physics Department, National Tsing Hua University, Y.-Y. CHANG, M.-T. TANG, YU. STETSKO, National Synchrotron Radiation Research Center, M. YABASHI, Spring-8/RIKEN, H.-H. WU, Y.-R. LEE, National Tsing Hua University, B.-Y. SHEW, National Synchrotron Radiation Research Center, S.-L. CHANG, Physics Department, National Tsing Hua University — To produce a coherent and extremely parallel x-ray source for advanced experiments, multi-plate crystal cavities consisting of compound refractive lenses were prepared on silicon wafers by lithographic techniques. The crystallographic orientation of the crystal is the same as that reported for x-ray resonators (Phys. Rev. Lett. 94, 174801, 2005). X-ray (12 4 0) back diffraction from these monolithic silicon crystal devices clearly showed interference fringes due to cavity resonance through the compound refractive lenses (CRL). However, the expected focusing effect from the CRL was not observed, but rather beam compression was detected. That is, the incident x–ray beam size of about 90μm across the CRL was reduced to 20μm. The beam size remained the same at different positions along the transmitted beam direction. Namely, a small sized parallel x-ray beam was produced. The origin of this beam compression mechanism is believed to be due to the competition between the multiple back reflection of the crystal cavity and the focusing of the CRL, in addition to crystal absorption.

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