Developing a Laue lens for soft gamma-ray astronomy: challenges and promises

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Laue lenses are an emerging technology that will enhance gamma-ray telescope sensitivity by one to two orders of magnitude in selected energy bands of the 100 keV – 1.5 MeV range. This optic would be particularly well adapted to the observation of faint gamma ray lines, as required for the study of Supernovae and Galactic positron annihilation. It could also prove very useful for the study of hard X-ray tails from a variety of compact objects, especially making a difference by providing sufficient sensitivity for polarization to be measured by the focal plane detector. Our group has been addressing the two key issues relevant to improve performance with respect to the first generation of Laue lens prototypes: obtaining large numbers of efficient crystals and developing a method to fix them with accurate orientation and dense packing factor onto a substrate.

Aiming to develop a prototype of an astronomical Laue lens telescope that provides improvements over the first generation of Laue lens prototypes, our group has been addressing the two key issues: obtaining large numbers of efficient crystals and developing a method to fix them onto a substrate with accurate orientation and dense packing factor. I will present the status of Laue lens development (in Berkeley and in the world) and show performance estimates for a couple of Laue lens telescope concepts.