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ORIGINAL ARTICLE

Highly reproducible quasi-mosaic crystals as optical components for a Laue lens

Riccardo Camattari · Alessandro Battelli · Valerio Bellucci · Vincenzo Guidi

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Abstract The realization of a Laue lens for astronomical purposes involves the mass production of a series of crystalline tiles as optical components, allowing high-efficiency diffraction and high-resolution focusing of photons. Crystals with self-standing curved diffraction planes is a valid and promising solution. Exploiting the quasi-mosaic effect, it turns out to be possible to diffract radiation at higher resolution. In this paper we present the realization of 150 quasi-mosaic Ge samples, bent by grooving one of their largest surface. We show that grooving method is a viable technique to manufacture such crystals in a simple and very reproducible way, thus compatible with mass production. Realized samples present very homogenous curvature. Furthermore, with a specific chemical etch, it is possible to fine adjust one by one the radius of curvature of the grooved samples. Realized crystals was selected for the ASI's Laue project, that involves the implementation of a prototype of a Laue lens for hard X- and soft γ-ray astronomy.

Keywords Laue lens · Quasi mosaicity · Grooving method · Laue project

1 Introduction

The detection of hard X-rays plays an increasingly important role in modern astronomy. The instruments currently operating in this part of the electromagnetic spectrum, however, do not use focusing optics, i.e., the measured signal is collected directly on the sensitive part of the detector itself.

R. Camattari · A. Battelli · V. Bellucci · V. Guidi (✉)
Department of Physics and Earth Science, University of Ferrara, Via Saragat 1/c, 44122 Ferrara, Italy
e-mail: guidi@fe.infn.it

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