ESRF	**Experiment title:** New generation of self-standing bent Si and Ge crystals to be used for hard X-rays focalization	**Experiment number**: MA- 3385
Beamline: ID11	**Date of experiment**: from: 24/05/2017 to: 30/05/2017	**Date of report**: 08/09/2017
Shifts: 18	**Local contact(s)**: Thomas Buslaps	*Received at ESRF:*

Names and affiliations of applicants (* indicates experimentalists):

Riccardo Camattari, Marco Romagnoni, Laura Bandiera, Andrea Mazzolari, Enrico Bagli, Vincenzo Guidi

Department of Physics and Earth Sciences, University of Ferrara (Italy)

Report:

We tested several self-standing deformed crystals. In particular, the crystals was manufactured for:

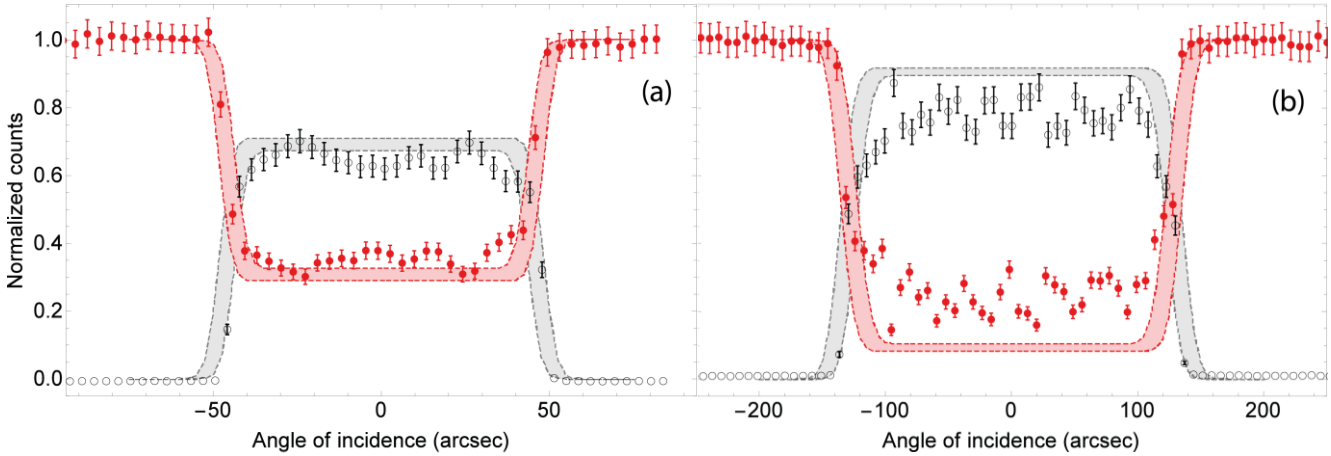
- X-ray focalization through a Laue lens
- charged particle deflector
- hard X-ray production (crystalline undulator)

The goals for the three categories have been largely met. Here we show some preliminary results.

X-ray focalization through a Laue lens

In this experiment, we measured new self-standing silicon and germanium curved samples, bent through carbon fiber deposition [1]. We were interested in checking the quality of the curvature and the diffraction efficiency of the samples. In fact, these two factors are the key parameters needed for the concrete realization of a Laue lens based on bent crystals.

The measurements were performed using a pencil beam 50x50 μm^2 wide and with energy of 140 keV.



Experimental RCs for a 140 keV X-ray beam. a) Si sample. b) Ge sample. Filled red circles correspond to the intensity of the transmitted beam, whereas empty black circles correspond to the intensity of the diffracted beam. Dashed lines represent the theoretical expectations.

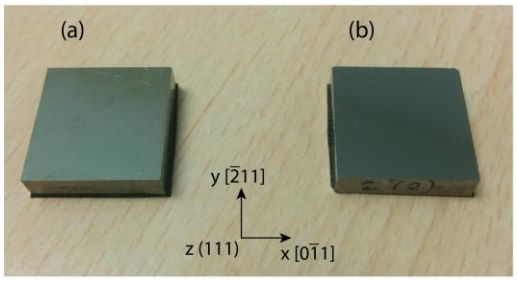
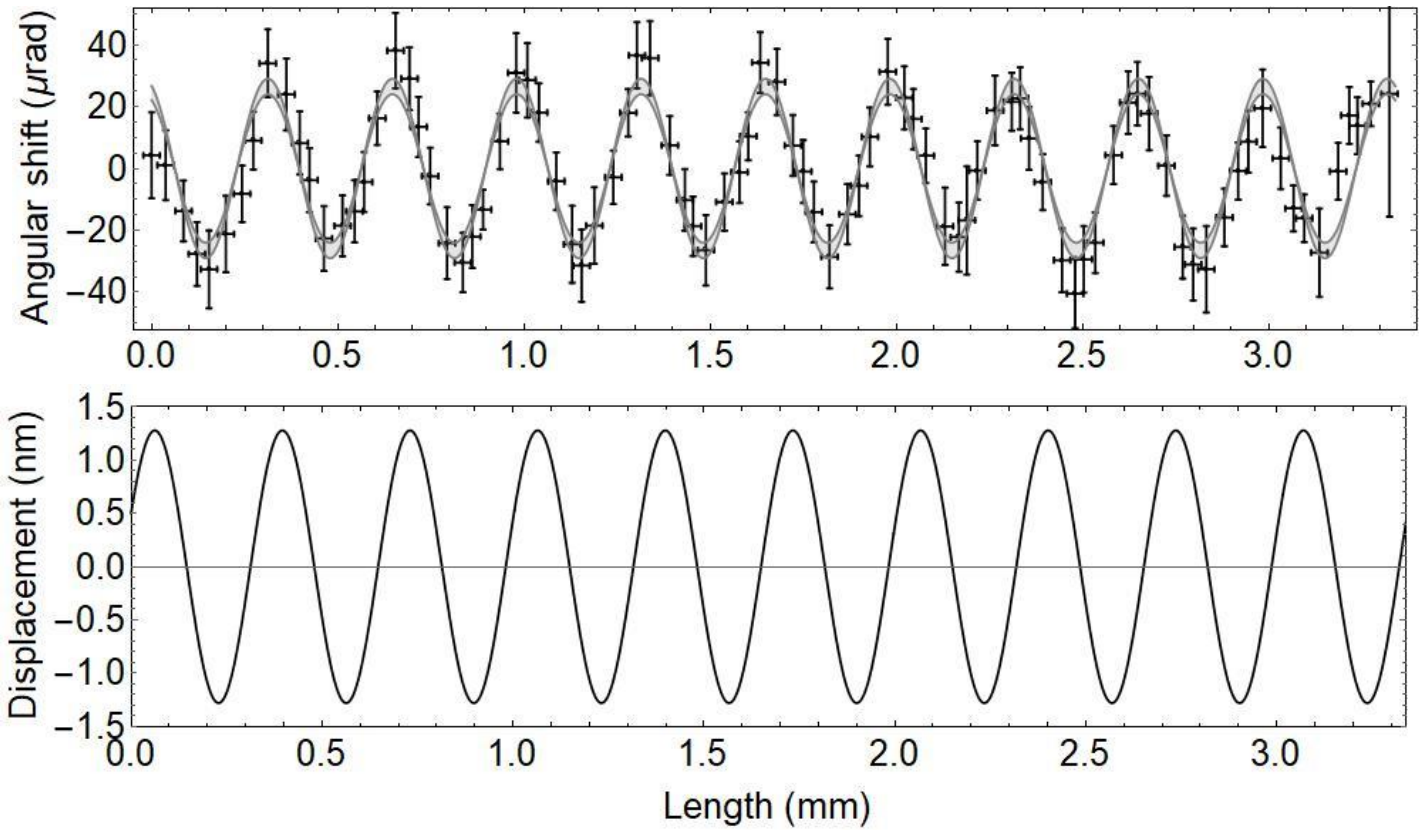


Photo of the manufactured samples, polished side. (a) Ge crystal. (b) Si crystal. The carbon bre lm is visible below the crystals. The crystallographic orientations are highlighted.

Hard X-ray production (crystalline undulator)

We manufactured a silicon crystalline undulator with these characteristics:

Bending method	Grooving [2]
Substrate	Silicon
Length (mm)	3.34
Step (mm)	0.334
Number of period	10
Sample thickness (mm)	0.2



Measurement performed through X-ray diffraction, 100 keV. The angular deformation of the crystalline undulator was measurable with very good resolution. The displacement was obtained by integrating the angular shift.

Reference:

[1] R. Camattari et al., (2015). J. Appl. Cryst. 48, 943–949
[2] R. Camattari et al., Meccanica 48 (2013) 1875–1882