ESRF	**Experiment title:** Topolaminography – Topotomography in Bragg-Geometry	**Experiment number**: MI-1079
Beamline: ID19	**Date of experiment**: from: 09/07/2011 to: 14/07/2011	**Date of report**: 08/01/2013
Shifts: 12	**Local contact(s)**: Lukas Helfen	*Received at ESRF:*

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Report:

As described in the proposal, the experiment aimed on the methodical development of "topo-laminography" - or "diffraction laminography" - i.e. a method combining topographic image formation with laminographic image acquisition, enabling three-dimensional imaging of crystalline defects in laterally extended monocrystalline samples like wafers.

In contrast to previous approaches [1], we employed in addition to Laue transmission – as proposed - also successfully Bragg reflection geometries, which are particularly useful for large flat samples. High resolution imaging of dislocations was enabled by using so-called tomographic weak-beam contrast [2], resulting in projections in good approximation describable by kinematic diffraction theory and highly suited to the tomographic reconstruction algorithms applied.

The results of the methodical development arising from experiment MI-1079 at ID19 were recently published [3]:
Title: Three-dimensional imaging of dislocations by X-ray diffraction laminography
Abstract: Synchrotron radiation laminography with X-ray diffraction contrast enables three-dimensional imaging of dislocations in monocrystalline wafers. We outline the principle of the technique, the required experimental conditions, and the reconstruction procedure. The feasibility and the potential of the method are demonstrated by three-dimensional imaging of dislocation loops in an indent-damaged and annealed silicon wafer.

The measured samples provides differently far emerged dislocation loop networks close by mechanical indentations in silicon wafers after thermal annealing, emulating typical damage induced during mechanical wafer handling in industrial fabrication lines. We expect the ongoing analysis of the measured data to lead to a deeper insight into the defect generation and propagation processes, enabling improved prevention and prediction strategies, and prospectively resulting in additional publications.

References:

[1] W. Ludwig, P. Cloetens, J. Härtwig, J. Baruchel, B. Hamelin, and P. Bastie, J. Appl. Cryst. (2001) **34**, 602
[2] A. Authier, Dynamical theory of X-ray diffraction (Oxford University Press, Oxford, reprinted edition 2002), p. 566
[3] D. Hänschke , L. Helfen, V. Altapova, A. Danilewsky, and T. Baumbach, APL (2012) 101, 244103