Elettra Sincrotrone Trieste

INFN Istituto Nazionale di Fisica Nucleare

POLITECNICO MILANO

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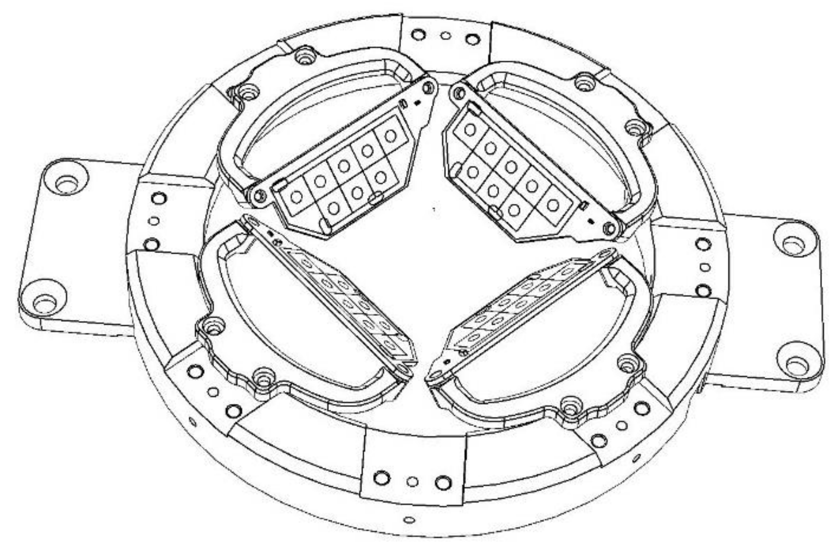
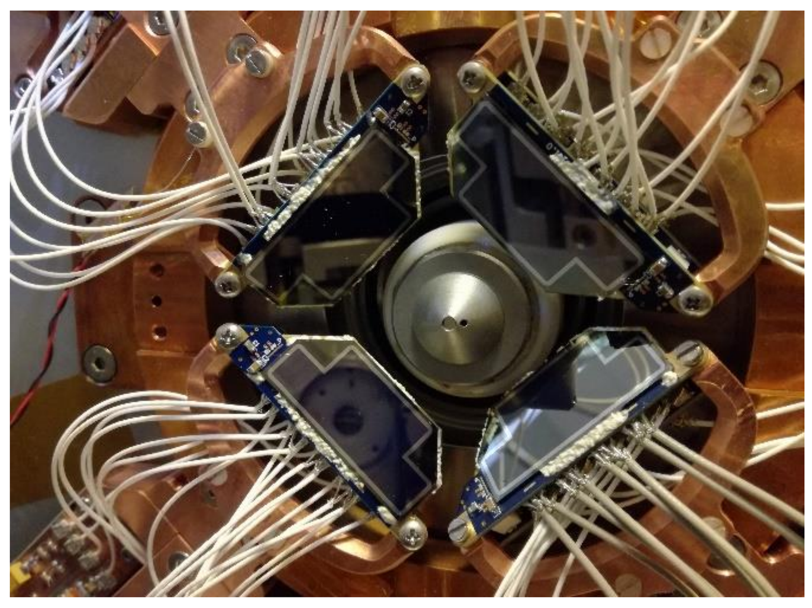
XRF topography information

simulations and data from a novel SDD system

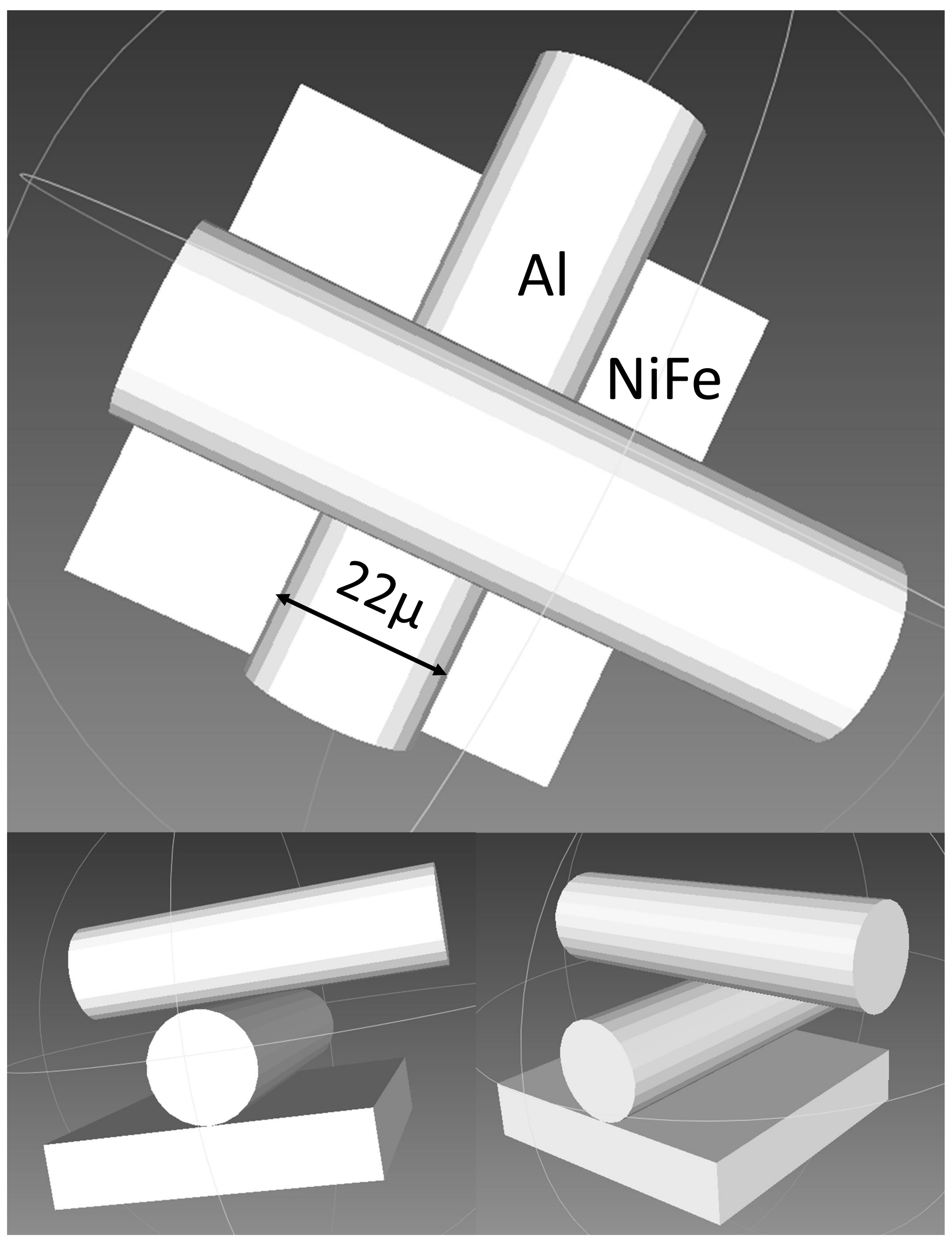
- XRF is one of the most widely used non-destructive techniques for elemental analysis
- XRF emission is an isotropic phenomenon
- Artefacts remain an issue with micro- or nano-X-ray beams
- The angular dependence may be an advantage in some cases

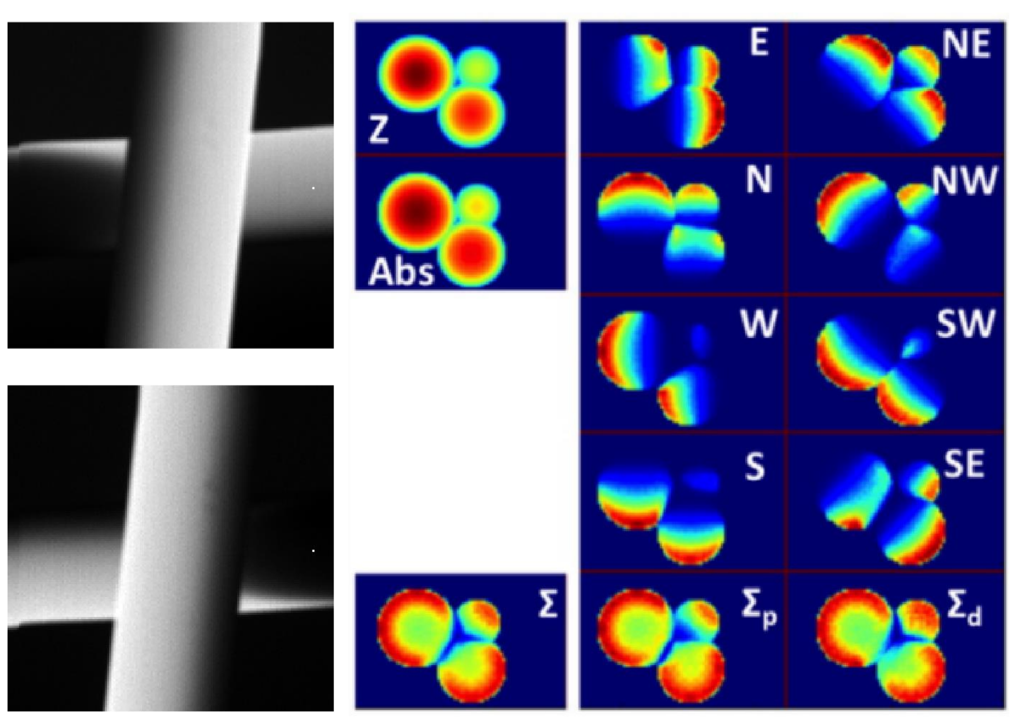
The sample topography and surface roughness play an important role and may cause misleading interpretation if not carefully evaluated.

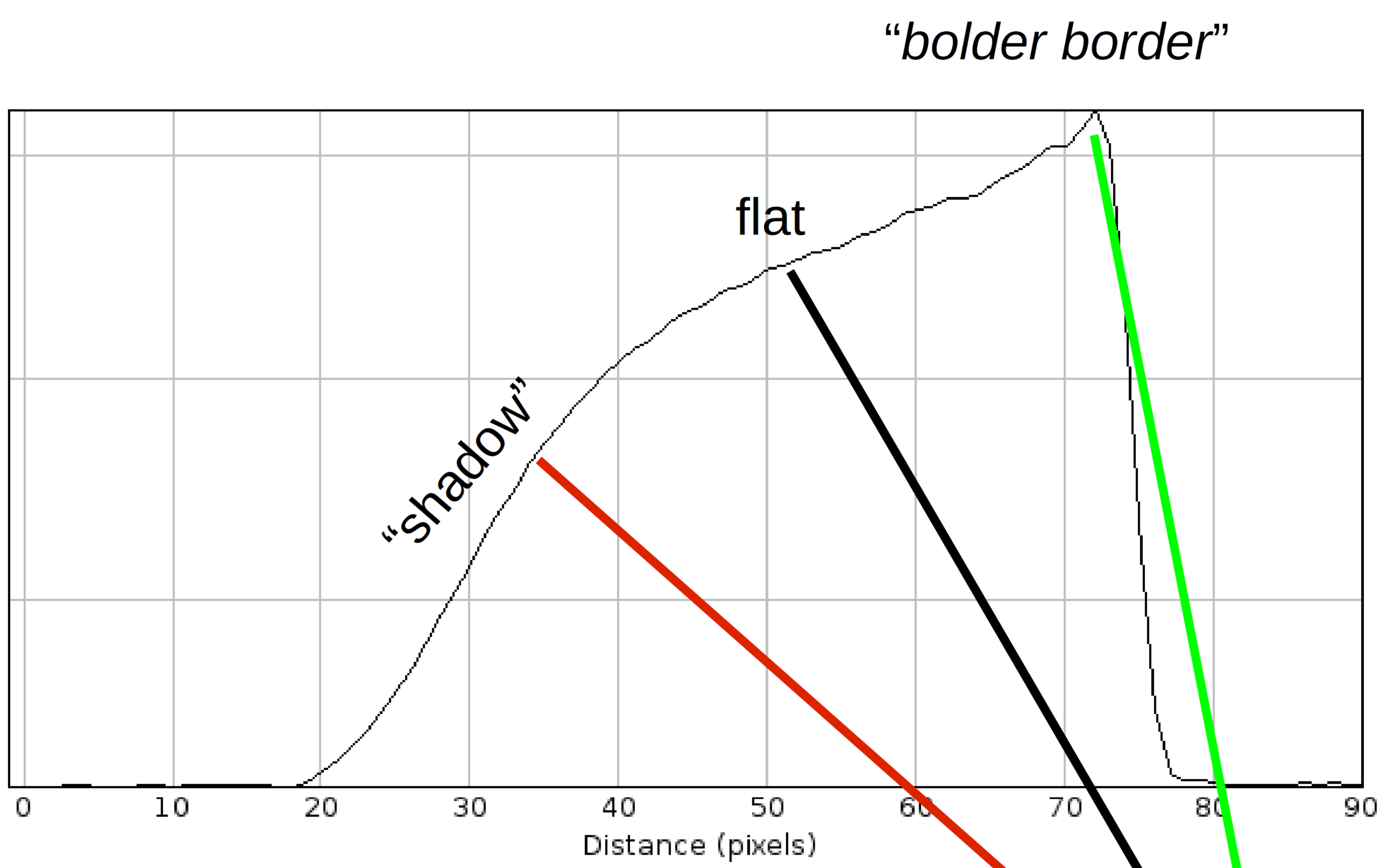


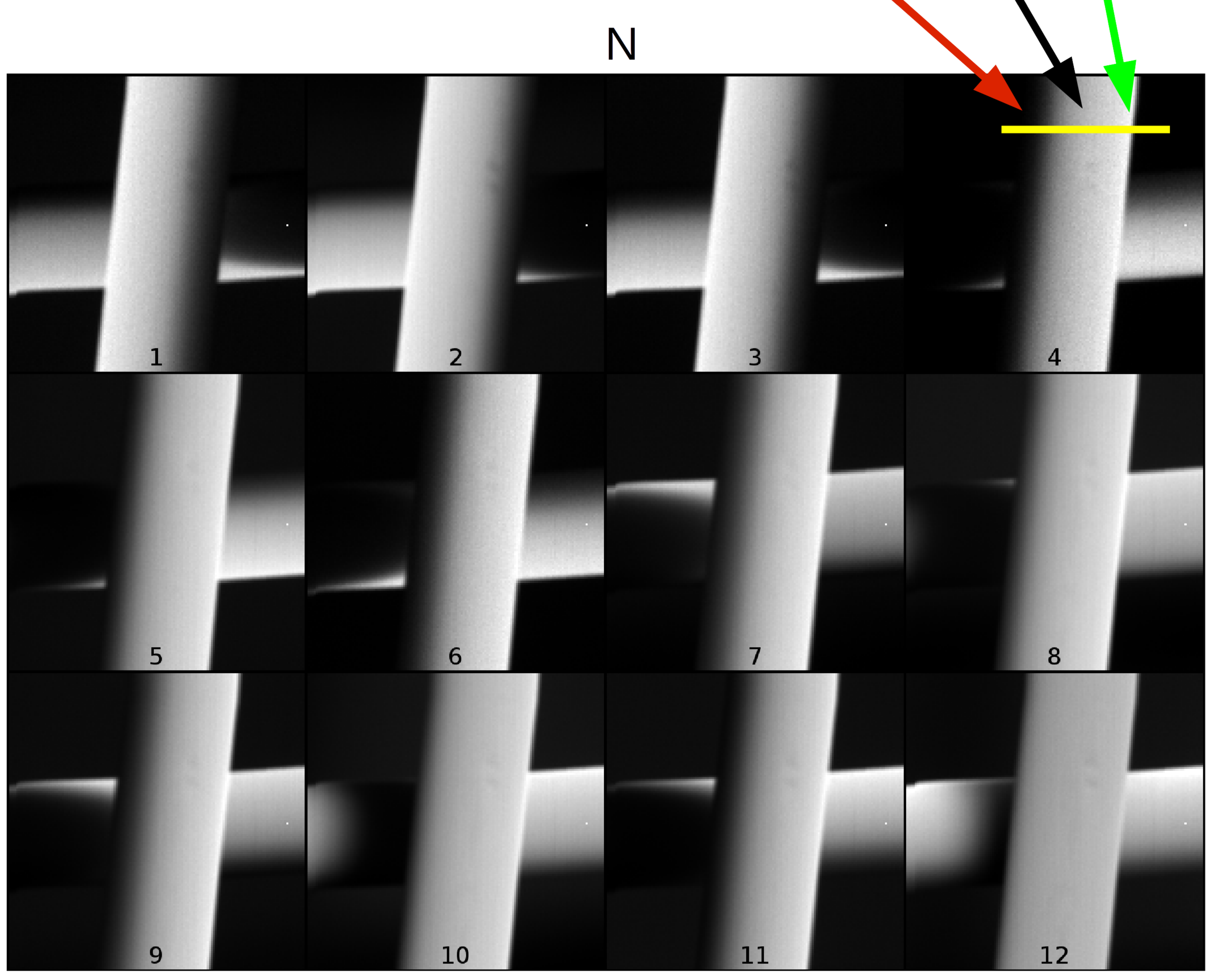


- Novel multi-element silicon drift detector for low energy XRF
- 4 trapezoidal SDD arrays with 8 elements each
- It allows for a very large solid angle
- Data acquired at the **TwinMic** beamline of Elettra Sincrotrone Trieste
- Detectors were tilted by 45°
- Total collection solid angle results in 0.54π steradians
- 27% of the hemisphere on which the sample emits XRF
- 7 times higher than previous setup









- There is clear indication of shadows
- Evident angular dependence
- XRF signal is stronger on the borders
- The borders are illuminated more since they are in angle
- Risk for misinterpretations
- Shadows, Borders and Flat areas need to be normalised
- 3D topography can be revealed with the right model
- Different for each elements
- Impacts almost every XRF scan
- The detector type and geometry is important
- The new detector system can yield topographic information

Experimental and References

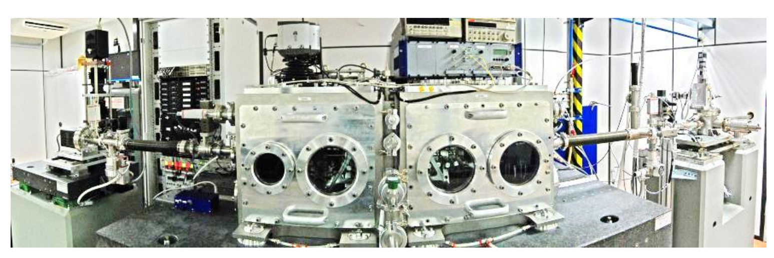
This work presents the latest findings of an ongoing research project on this topic [1]. It presents a simulation framework and the results of a new detector system based on 4 trapezoid sensors, each containing 8 SDD elements [2]. This new XRF system has been tested and optimized on the **TwinMic** beamline (Elettra Sincrotrone Trieste) [3].

[1] F. Billè et al., Spectrochimica Acta B, vol. 122, 2016

[2] J. Bufon et al., Journal of Instrumentation, vol. 13-03, 2018

[3] A. Gianoncelli et al., Synchrotron Radiation, vol. 23, 2016

soft X-ray microscopy TwinMic XRF | STXM | Ptychography | Fullfield | CDI



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