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Polarisation Analysis In Coherent X-ray Scattering Measurements

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Methods using coherent X-ray beams have blossomed with 3rd generation facilities and
are now benefiting from the huge brilliance increase of 4th generation facilities. The interest in combining the REXS contrast with X-ray coherence has been recognised very early [1].
Coherence-based methods rely on the measurement of a portion of the reciprocal space with a 2D detector. Data analysis tools, developed for the vastly dominant case of Thomson scattering, assume a uniform polarisation of the scattered X-rays. This assumption does not hold when REXS is involved, except in a few particular cases, due to its complex polarisation dependence [2]. Extraction of the REXS contrast then requires varying the polarisation of the incident beam and/or analysing the scattered beam, which is routinely done with point detectors but not with 2D detectors.

I will present a few ideas and results about the possibility to perform a polarisation
analysis with a physical analyser and with an algorithmic analyser [3].

REFERENCES
1. F. Yakhou et al., ESRF Newsletter 32, 12-13 (1999), https://www.esrf.fr/Apache_files/Newsletter/NL32.pdf
2. J. P. Hill and D. F. McMorrow, Acta Cryst. A52, 236-244 (1996).
3. M. Di Pietro Martinez et al, Phys. Rev. Lett. 134, 016704 (2025).

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