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## High-precision alignment of an upgraded soft X-ray polarimeter at Diamond Light Source

*Tuesday 16 September 2025 17:00 (1 hour)*

Knowledge of X-ray beam polarisation on a synchrotron beamline is essential, not only for characterising the undulator performance, but also for precise analysis of dichroic and chiral experiments. The upgraded high-precision soft X-ray polarimeter at Diamond Light Source features multiple retarder adjusters to allow precise concentricity and angular alignment to the analyser. A novel offline alignment procedure has been developed, achieving 69  $\mu\text{m}$  horizontal and 17  $\mu\text{m}$  vertical concentricity alignment, as well as 4  $\mu\text{rad}$  yaw and 9  $\mu\text{rad}$  pitch alignment. Compared to the original version of the instrument, the vertical concentricity alignment improved by 14 $\times$  and the yaw alignment improved by 18 $\times$  \*. The procedure uses a laser diode to mimic the X-ray beam and a hexapod to align the analyser. Concentricity alignment relies on monitoring the intensity as the laser beam is cropped by plane mirrors on the retarder and analyser stages. Angular alignment is achieved by measuring the retarder and analyser rotation vectors using an autocollimator. The improved alignment allows the polarimeter to meet the stringent requirements for complete polarisation measurement above 1 keV.

### Footnotes

\* "High-precision soft x-ray polarimeter at Diamond Light Source", H Wang et al, Rev. Sci. Instrum 82, 12, 123301 (2011) <https://doi.org/10.1063/1.3665928>

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