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Single-shot spectrometer usage for I-zero normalization for Bragg-diffraction investigations with pink beam

At FELs, Bragg diffraction experiments are usually performed with monochromatic beam, whose bandwidth is smaller than the acceptance of the Bragg peak under investigation. This enables straightforward normalization of the measured Bragg peak intensity by detecting the FEL pulse intensity with a "scalar"detector (e.g. a diode measuring the scattering from a thin foil). In certain FEL applications, however, the bandwidth markedly exceeds the acceptance of the Bragg peak under investigation. In this case, the normalization can be achieved by integrating the spectrum measured by a "vector detector", typically named single-shot spectrometer, after multiplication with a suitable windowing function.

We have performed experiments at the SwissFEL ARAMIS hard x-ray beamline exploiting the "broadband mode"(bandwidth > 0.005), characterized by a substantial temporal/photon energy chirp, and the "sub-fs mode"(bw ~ 0.002), characterized by one to few FEL temporal spikes. In both cases, the bandwidth markedly exceeded the acceptance of the Bragg peak under investigation. Here, we report on our work assessing the windowing function from the measured per-pulse spectra and Bragg peak intensities, focusing on the emerged problems and discussing possible improvements on the spectrometer.

Journal of Synchrotron Radiation Special Issue: will you submit your contribution?

no

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