CSI

The instrument will exploit high coherent flux for coherent imaging techniques (CDI, CCI, ptychography) with nm spatial resolution as well as XPCS with time resolution down to the bunch separation of 2 ns. In combination with dedicated sample environments, this will enable the study of nanoscale heterogeneity in quantum and functional materials as well as dynamics in disordered systems. The instrument will strongly profit from the orders of magnitude larger coherent flux at BESSY III, which will not only result in orders of magnitude better time and spatial resolution, but also boost throughput to a regime where energy landscape mapping becomes possible (e.g., by voxel-resolved sum-rule-compatible spectroscopy as a function of applied field). Ongoing and expected progress in detector development will be employed to utilise this flux. Versatile sample environments, e.g. high magnetic fields, will be enabled by a beamline design that eliminates optics (e.g., zone plates) from the experimental endstation. On-site labs and user support will be provided to prepare samples for masked-based imaging, to extend time-resolved imaging of stochastic dynamics to a large user community.

Instrument	CSI *(Coherent Scattering & Imaging)*
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Source(s)	Undulator Cryo-IVUE31 (500-4000 eV, fully variable polarisation)
Beamline capabilities	• Energy range: 500 eV – 2000 eV • Resolving power: > 5000 • Spot size: 2 × 2 µm^2 (or larger, if desired) • Coherent Flux: ≥10^{13} ph/s
Techniques	• Masked-based Coherent Diffraction Imaging, CDI (2 nm lateral resolution; possibility of HERALDO-based 3D imaging) • Coherent Correlation Imaging, CCI (down to µs time-resolved imaging of stochastic dynamics; spatial resolution as above) • XPCS in SAXS and WAXS geometry (down to 2 ns time resolution) • Scanning micro-SAXS and Magnon Momentum Microscopy • Ptychography, laminography (2 nm lateral resolution, 10 nm in z) The instrument will have instrumentation optimised for wide-angle scattering experiments and for experiments in transmission.
Sample environment	• Magnetic fields up to 7 T, adjustable vector field (in transmission) • Magnetic fields up to 2 T (WAXS geometry) • Electrical currents: DC to 40 GHz • Laser for pump-probe experiments (50 fs, 100 mJ/cm^2) • Temperature range 2-500 K; fast sweeping capability