

## **Two-colour options for the SASE3 beamline of the European XFEL**

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The European XFEL, presently under construction in Hamburg, will include a soft X-ray SASE undulator, called SASE3, allowing for lasing between the Carbon K edge (about 250 eV) and 3keV in the fundamental, with pulse durations tuneable from 100 fs down to a few femtoseconds as a function of the electron beam charge. In this contribution we consider a scenario where a single chicane for the electron beam and a mirror delay line for the photon beam are replacing one undulator segment, which can be re-located at the beginning of the undulator line. This simple installation would allow for the production of two-colour soft X-ray SASE pulses with tuneable delays in the range from -200fs to +200fs. We explore the potential of the high-repetition rate, which will be available for users at the European XFEL, coupled with these two-colour capabilities for scientific applications in the soft X-ray regime. In particular, we consider different options for pump-probe experiments in the gas phase, where element-selective resonant excitations can provide unique information e.g. on non-linear processes and molecular fragmentation dynamics with the help of coincidence studies.