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Coherent free-electron laser light with circular polarization at Fe L edge

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Variable polarization is a required feature of light sources employed to investigate the properties of matter. The possibility to select light polarization is, in particular, attractive for those experiments, which aim at exploring the local symmetry of the sample under scrutiny, e.g., the chirality of a molecule, or the presence of a net atomic magnetic moment. Moreover, several spectroscopic methods rely on the opportunity to choose a well-defined light polarization. Harmonic emission from an undulator can be successfully used to extend the tuning range of a free electron laser (FEL) beyond the fundamental wavelength range supported by the available electron beam energy and undulator parameters. For planar undulators, on-axis harmonic emission is known to be possible for odd harmonics. Instead, for circularly polarized undulators harmonic emission occurs off-axis, preventing to extend the polarization control toward shorter wavelengths. For variable polarization undulators, it has been demonstrated that a special magnetic field configuration can be found, allowing to produce on-axis harmonics with a substantial degree of circular polarization [C. Spezzani et al., PRL107,084801 (2011)]. Recent experiments at the FERMI free-electron laser have shown that such a scheme can be used to reach the Fe L edge photon energy, i.e. 707 eV, with circularly polarized pulses allowing to perform dichroic experiments on magnetic specimens. We report here the obtained results

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Footnotes

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