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Research Opportunities with X-Ray Four-Waves Mixing Capability with FELs

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Four-waves mixing techniques (FWM), based on third-order non-linear photon-matter interaction, have been used as a very powerful methodology in the optical and recently in the XUV domains to uncover dynamics inaccessible by linear (one-dimensional) spectroscopy. The latter provides information about the frequencies absorbed by the molecule, but lacks detail about the individual transitions and their coupling. The coherent and multi-wave nature of the FWM technique has pushed forward basic scientific understanding as well as in the development of new technologies.

X-rays FELs provide an opportunity to extend FWM since they provide atomic specificity as well as temporal and spatial resolution. We will propose possible FWM experiments as well as discuss the experimental requirements.

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