Abstract Submitted
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Observation of strong nonlinear interactions in parametric down conversion of x-rays into ultraviolet radiation[1] OR SEFI, SASON SOFER, EDWARD STRIZHEVSKY, Bar-Ilan University, BLANKA DETLEFS, European Synchrotron Radiation Facility, STEVE COLLINS, Diamond Light Source , SHARON SHWARTZ, Bar-Ilan University — Nonlinear interactions between x-rays and long wavelengths can be used as a powerful atomic scale probe for light-matter interactions and for physics of valence electrons. This probe can provide novel microscopic information in solids that is inaccessible by any existing method, hence to advance the understanding of many phenomena in condensed matter physics. However, thus far, reported x-ray nonlinear effects are very small and their observation required tremendous efforts. Here we report the observation of unexpected strong nonlinearities in parametric down-conversion (PDC) of x-rays to long wavelengths in gallium arsenide (GaAs) and in lithium niobate (LiNbO3) crystals, with efficiencies that are about 4 orders of magnitude stronger than the efficiencies measured in any crystals studied before. These strong nonlinearities cannot be explained by any known theory and indicate on possibilities for the development of a new spectroscopy method that is orbital and band selective. In this work we demonstrate the ability to use PDC of x-rays to investigate the spectral response of materials in a very broad range of wavelengths from the infrared regime to the soft x-ray regime.

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