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High harmonics from solids probe Angstrom scale structure
YONG SING YOU, DAVID REIS, SHAMBHU GHIMIRE, SLAC - Natl Accelerator Lab — The basic microscopic mechanism for the high harmonics generation (HHG) in isolated atoms and molecules has been understood in the 90's. Since then the gas harmonics have been utilized widely in ultrafast x-ray science, from attosecond pulse generation to imaging molecular orbitals of the target molecule [1]. In contrast, the solid-state harmonic generation mechanism is currently being investigated [2,3,4,5,6] following the recent experimental discovery in zinc oxide crystal [7]. In particular, because of the fundamental differences, attributed to the high density and periodicity of the crystal, it was not clear if the solid-state harmonics could be used to reveal bonding structures in crystals. Here we report our experimental results on generation of XUV harmonics in single crystal MgO subjected to the field strengths on the order of 1V/Å without damage. High harmonics in MgO show strong crystal orientation dependence as well as a strong laser ellipticity dependence. By exploiting these unique characteristics, we demonstrate that XUV harmonics from bulk crystals can probe Angstrom scale electronic structure of the crystal. **References**
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Shambhu Ghimire
SLAC - Natl Accelerator Lab

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