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Spatiotemporal Properties of Solid State Harmonics[1] CHRISTOPHER ABADIE, MENGXI WU, METTE GAARDE, Louisiana State University - Baton Rouge — As shown by recent experiments, high-order harmonics can be generated in a transparent crystal by a high intensity infrared laser beam. We investigate the spatial and temporal properties of such harmonics by calculating the harmonic spectrum at many different points in space spanning the laser focus and then transforming to the far field. Each harmonic spectrum is calculated by solving the time-dependent Schrdinger equation for an electron in a periodic potential to find the laser-driven electron current that gives rise to the harmonic radiation. We find two distinct contributions to the harmonic radiation in the far-field distribution, and by using a spatial filter we isolate the central contribution. After performing a back-transformation to the near-field, we find that the filtered integrated spectrum is much cleaner than the original as it shows stronger peaks at odd harmonics. We find that the spatial filter also works as a temporal filter, so that the sub-cycle harmonic time profile after filtering is dominated by one burst of light per half-cycle of the laser field. Our results suggest that many of the techniques used to control the spatiotemporal properties of high order harmonics from gases can also be applied to harmonics from solids.

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