Schemes for Generating of Two-Color Ultrashort Pulses for Laser-Plasma Acceleration

A Kovács[1], P Gaál[1], T Gilinger[2], and K Osvay[1,2,3]

[1]*National Laboratory for Cooperative Technologies, University of Szeged, Szeged, Hungary*
[2]*National Laser-Initiated Transmutation Laboratory, University of Szeged, Szeged, Hungary*
[3]*Dept. of Optics and Quantum Electronics, University of Szeged, Szeged, Hungary*
Contact Email: kovacs.adam.04@szte.hu

The characteristics of laser-matter interactions strongly depend on the driving laser pulse, especially the peak intensity, the temporal shape, and the wavelength. It was first found for table-top X-ray generation assemblies that the use of two pulses, preferably at different wavelengths but synchronized to each other, may enhance the coupling of laser energy to plasma, resulting in the increase of the generation efficiency. A similar effect was shown for high-harmonic generation, as well as for laser-plasma acceleration of electrons and ions at relativistic intensities. However, despite the enthusiasm for wide-range simulations, the practical challenges related to linear dispersion, nonlinear spectral phase modulation, timing issues, and low transmission prevent the scheme from spreading in experimental laboratories.

In this paper, we introduce two schematics for generating second harmonics from Ti:Sa laser pulses, along with their timing and dispersion management. These techniques are robust and easy to keep aligned, while they exhibit low loss.