SPECTRON'S PHASE PECULIARITIES: NUMERICAL STUDY

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The spectron pulse, which images its spectrum, is known as a one shaped in the "far zone of dispersion" in the temporal analogy of Fraunhofer diffraction [1-3]. The spectron shaping is known in its applications as dispersive Fourier transformation (DFT) [4-6] or in real-time Fourier transformation [7-10]. DFT, maps the spectrum of an optical pulse to a temporal waveform due to chromatic dispersion, thus allowing a single-pixel photodetector to capture the spectrum at a scan rate significantly beyond what is possible with conventional space-domain spectrometers.

The objective of our research is the study of spectron's phase pecularities, to find optimal conditions under which the DFT method works for the phase also i.e. the conditions under which the phase of spectron pulse images the spectral phase, along with amplitude. In our numerical studies, we have examined three different cases. In the first case, we have taken two-peak pulses by summing Gaussian / super Gaussian pulses with various amplitudes and time shifts. In the second case, we have given phase to the spectrum of the initial pulse, such as sine or cosine, with various amplitudes and frequencies. We have examined also the case of initially self-phase modulated pulse (e.g. Gaussian) in the entrance of dispersive medium. The research has shown that in the first case of two-peak pulses the requested dispersion for the phase-mimicking is the same as for the amplitude. We have also found that the spectron pulse intensity minimums are decreasing when the peak values of intensity of initial pulse are close to equal. In the second case, we have found that for the phase-mimicking the request of dispersion is less strict than for the amplitude. The opposite of that has been observed for pulses with strong self-modulation.

The results of our studies on the spectron's phase peculiarities can be prospective for a pulse spectral phase temporal imaging and measurement [11], and for femtosecond pulse complete characterization, alternatively to spectral interferometry.

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