Diploma thesis abstract

Ultrashort laser pulses in the mid-infrared range generated by guided-wave optical parametric amplification

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In the diploma work modern method of generation of the ultrashort MIR-pulses based on optical parametric amplification in the hollow waveguide filled with xenon is studied. On a basis of experimentally verified numerical simulation the qualitative analysis of physical processes leading to the few-cycle pulse generation has been performed. It is shown that the key processes that lead to ultrashort pulse generation are the effect of self-phase and cross-phase modulation (SPM and XPM), self-steeping of the pump pulse and group velocity walk-off on the optical parametric amplification of the MIR-pulse in the waveguide. The effects of SPM and XPM induced by the pump pulse lead to the time-dependence of instantaneous frequencies of the pulses. It results in the non-stationary phase matching in single point and therefore in effective few-cycle pulse generation. Mid-infrared pulses are of a great interest for applications in femtosecond spectroscopy of molecular media.