**Final qualifying work for the degree of Bachelor of Physics**

# High order harmonic generation by mid-infrared femtosecond laser pulses in gaseous media

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## ANNOTATION

In final qualifying work results of experimental researches aiming to study the filamentation and high order harmonics generation from high-power ultrashort pulses in the mid infrared range in gaseous media, in particular, in atmospheric air are presented. New specific features of high-power laser pulses filamentation in the atmospheric air have been demonstrated with using the unique laser system that generates sub-100-fs 3.9-μm pulses with energy about 30 mJ. The angle-resolved spectra of converted pump radiation have been researched in conditions of filamentation and high order harmonics generation. These spectra have revealed the complex off-axial beam dynamics. It has established that this dynamics is defined by strong scaterring and by blue shift of signal field and it's components because of ionization-induced refraction. Also, the opportunity of high order optical harmonics generation in molecular nitrogen with various gas pressures and energies of initial ultrafast mid infrared pulse has been showed in the regime of pre-filamentation.