Diploma thesis abstract
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Efficient Conversion of Subterawatt Radiation of Ti:Sapphire Laser System into Wavelength Range 300–400 nm.

We compare two different methods of conversion of femtosecond Ti:Sapphire laser system radiation into wavelength range 300–400 nm. The first, direct supercontinuum generation in fused silica and LiF under the influence of second harmonic radiation of Ti:Sapphire laser system. And, the second, optical parametric amplification of supercontinuum in visible and subsequent frequency doubling of amplified radiation.

In the case of direct supercontinuum generation, the conversion efficiency into the region 300–385 nm amounted to 30% for LiF, vary from 0.1% to 15% for different spectral sections with 10 nm bandwidth. Energy of second harmonic radiation was about 350 uJ.

Optical parametric amplification was carried out both in collinear and noncollinear geometry in 3 mm thickness BBO crystal. In noncollinear scheme it was achieved ultrabroadband amplification of supercontinuum in the region 550–750 nm. The conversion efficiency was raised up to 20% by means of narrowband pump ($\Delta\lambda \approx 0.5$ нм) with energy about 350 uJ. Subsequent generation of second harmonic from amplified supercontinuum radiation carried out in 1 mm thickness BBO crystal. Efficiency of the frequency doubling varied from 1% to 30% depending on wavelength in region 300–370 nm. Spectral bandwidth of second harmonic radiation did not exceed 1 nm.

It was estimated the possibility of scaling the parameters of converter, based on the optical parametric amplification of supercontinuum, on a case of use the fundamental radiation with peak capacity 0.5 TW.

In a final part it was assessed the efficiency of direct laser excitation of nuclear isomer ^{229m}Th($3/2^+$, 3.5±0.5 eV) by means obtained source of UV radiation. According to these estimations the maximum number of isomeric nuclei exited per second in 10 mg sample of thorium can amount to 10^9.