Nuclear photonics with table top femtosecond laser

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Nuclear photonics is one of new rapidly developing areas of scientific research at the intersection of nuclear and atomic physics as well as accelerator and laser physics [1]. Most frequently large-scale linear accelerators or rings are used, while large PW lasers with plasma based accelerators came into play last decade. At the same time modern table top femtosecond lasers deliver enough peak power and intensity at a much higher repetition rate, thus enabling a much higher average current. Energies of accelerated electrons amount to 10-100 MeV thus being enough for a wide variety of nuclear processes including photonuclear reactions, etc.

This paper presents our recent experimental results on photonuclear reactions with different targets using table top 2 TW 50 fs 10 Hz laser. We produce well collimated electron bunches with electron energies up to 20 MeV, bunch charge 0.1-1 nC [2]. Different diagnostics were used to detect the full neutron yield and the neutron's spectra.

[1] Nedorezov V G, Rykovanov S G and Savel'ev A B 2021 *Physics Uspekhi* **64**(12) 1214–1237

[2] Ivanov K A, Tsymbalov I N, Gorlova D A, Shulyapov S A, Starodubtseva E M, Zavorotnyi A Y, Samsonov A V, Pavlov A I, Volkov R V and Savel'ev A B 2024 *Bulletin of the Lebedev Physics Institute* **54**(5) 312 – 324