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## Scaling of sub-nanosecond gain-switched lasers to subjoule energy level

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In 1989-2001 J Zayhowski with collaborators from MIT investigated simple alternative to mode-locking method for generation of subnanosecond pulses in Nd: YAG, Ti: Sapphire and some other laser crystals. They developed a batch of gain-switched microchip lasers, having cavity length less than 10 mm, and obtain generation of single pulses in near IR range with energy ~$10^{-5}$ J and duration 300-900 ps, using for pumping pulsed subnanosecond radiation of other lasers. No any additional results related to this problem were found in literature until 2018. Last year's laser medical market shows considerable demand in lasers for tattoo removal. Such lasers must possess relatively high pulse energy level, ~0.1 J or larger, and produce subnanosecond pulses at 1…10 Hz. Following to this demand, with the goal to develop budget tattoo removal lasers, we investigated high energy gain-switched generation of Ti: Sapphire crystals in short laser cavity, using for pumping pulses with nanosecond duration instead subnanosecond, because available pulse energy and laser damage threshold for nanosecond pulses are larger. Using second harmonic of multimode Q-switched Nd: YAG laser with pulse duration ~4 ns, we obtain generation at central wavelength 790 nm with maximum pulse energy 0.3 J, available pulse duration from 400 to 1000 ps and repetition rate from 1 to 10 Hz. At present time it is highest level of characteristics, available from tattoo removal lasers, radiating at 700-800 nm. In our presentation we shall consider the main physical factors, that restrict energy and minimum pulse duration, and solutions, which allow reduction of the influence of these factors and further improvement of laser performance.

### Biography

Aleksandr Tarasov worked at Vavilov State Optical Institute, Leningrad, USSR from 1972 to 1989. He received there PhD degree in 1984. From 1989 to 2000 he worked at the Institute of Nuclear Problems, Minsk, Belarus. Since 2002 he is working at Laseroptek, South Korea, as Principal Research Scientist. He is a Recipient of 1982 USSR Leninski Komsomol Prize. He has published more than 70 papers at USSR and international scientific journals. He is a Member of Optical Society of America.

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