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HiLASE Centre is pleased to invite you to attend the seminar of:

Dr. Usman K. Sapaev

Tashkent State Technical University, Uzbeskistan

The laser, created at the beginning of the second half of the last century, led to the rapid development of a new branch of physics - *Nonlinear Optics*. After P. Franken[1] announced the first experiment on the second harmonic generation of laser radiation in quartz, it became clear that in order to obtain highly efficient harmonics, it is necessary to fulfill the condition of phase matching for interacting waves in nonlinear media.

At the initial stage of the development of Nonlinear Optics, N. Bloembergen[2] et al., proposed several methods for creating a phase-matching condition for optical waves in anisotropic media. One of them was the "*Quasi- Phase-Matching*" (QPM). The QPM can be created in anisotropic crystals, in which there is a periodicity of the direction of the optical axis of crystal from layer to layer. The period of QPM crystals must be chosen equal to the coherent length of the interacting optical waves. In particular, the optical axis must be turned by 180^0 degrees from layer to layer. By this way almost all of the frequency conversion processes can be efficiently realized by choosing the accurate length of the domains. However, for many years, researchers did not pay attention to this method. The main reason for that was the difficulty for creating such crystals in practice.

However, over the past 20 years, the technology for growing QPM crystals has developed. Such crystals are becoming more and more employed in frequency convertors. Nowadays, they can be found in almost all research laboratories. In this regard, we can find many both theoretical and experimental works on this topic in the scientific journals. Moreover, it is interesting to note that today obtaining ultra-short high intensity laser pulses ("*chirped*") also is well developed. We can conclude that today the development of both obtaining short laser pulses and QPM crystals is of particular interest to researchers to expand the spectral region of laser radiation.

In this way this talk will present theoretical studies on various frequency conversion processes in nonlinear optical media using $\chi^{(2)}$ and $\chi^{(3)}$ nonlinearities based on QPM interaction of optical waves.The main emphasis will be put on obtaining the following: *nonlinear pulse shaping*, *nonlinear pulse compression*, *high efficient harmonic generation* etc. Incident laser pulses were tested such as transform limited pulses, CW radiation, *chirped laser pulses* etc.

When: Wednesday, 04/09/2019 at 10:30

Where: Seminar room, HiLASE Centre

1 P. A. Franken, A. E. Hill, C. W. Peters, and G. Weinreich Generation of Optical Harmonics Phys. Rev. Lett. 7, 118 –1961
2 Armstrong J.A., Bloembergen N., Ducuing J., Pershan P.S. Interactions between Light Waves in a Nonlinear Dielectric // Physical Review. 1962., Vol. 127., P. 1918

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