# 武汉物数所理论交叉学术交流系列报告

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# P-wave superfluidity of lattice fermions

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**About the speaker:**

Prof. Shlyapnikov is Director of Research at CNRS, LPTMS, Orsay , France, and Professor in Univ. Of Amsterdam. His work on the theory of quantum gases was awarded by the Humbioldt Prize (Germany) in 1999, by the Kurchatov Prize (Russia) in 2000, and by the International Bose-Einstein condensation Prize in 2011. He got the European Research Award in 2013. He published about 140 papers which have received more than 9400 citations and H-index of 48.

**Abstract:**

I will discuss the emergence of p-wave superfluidity of identical atomic fermions in a two-dimensional optical lattice. The optical lattice potential manifests itself in an interplay between an increase in the density of states on the Fermi surface and the modification of the fermion-fermion interaction (scattering) amplitude. The density of states is enhanced due to an increase of the effective mass of atoms. In deep lattices the scattering amplitude is strongly reduced compared to free space due to a small overlap of wavefunctions of fermion sitting in the neighboring lattice sites, which suppresses the p-wave superfluidity. However, for moderate lattice depths the enhancement of the density of states can compensate the decrease of the scattering amplitude. Moreover, the lattice setup significantly reduces inelastic collisional losses, which allows one to get closer to a p-wave Feshbach resonance. This opens possibilities to obtain the topological px + ipy superfluid phase, especially in the recently proposed subwavelength lattices. I will demonstrate this for the two-dimensional version of the Kronig-Penney model allowing a transparent physical analysis.

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