The Abdus Salam International Centre for Theoretical Physics

International Conference on Multi-Condensate Superconductivity and Superfluidity in Solids and Ultra-Cold Gases
14 - 18 May 2018 (Trieste, Italy)

Superconductivity in restricted geometries. The cases of CuxTiSe2, β-Bi2Pd & (LaSe)1.14(NbSe2)

Peter SAMUELY
Institute of Experimental Physics, Slovak Academy of Science,
P. J. Safarik University, Kosice, Slovak Republic

Recent measurements indicate that charge density waves in CuxTiSe becomes incommensurate near the onset of superconductivity at x ≈ 0.04 and collapse to domains. The question arises if superconductivity is also confined in domain walls and reveals unconventional character. We address the question of the superconducting order parameter by several experimental means (specific heat, STM/STS, magnetometry) on the series of crystals from underdoped to overdoped regime. The results will be discussed. Moreover, we have observed a transverse Meissner effect in CuxTiSe2 single crystals. For tilted magnetic fields vortices remain aligned with the ab planes up to a certain field completely and above this field they are still partially locked in the planes forming a staircase structure. These results indicate the existence of a modulation of the vortex core energy/energy gap along the c axis.

Recently, β-Bi2Pd has attracted interest due to controversial results about the origin of superconductivity, where there are some indications on a multigap superconductivity, topologically protected surface states, as well as a standard conventional superconductivity. We will address this questions by several probes and at high pressures.

Recently discovered Ising superconductors with strong spin-orbit coupling of a special type in monolayer TM dichalcogendides not only break all limits of the critical magnetic fields but more importantly they can be utilized in producing the still elusive Majorana fermions with a magnetic field as a tuning control parameter. I will discuss possible Isisng superconductivity in fully 3D albeit very anisotropic (LaSe)1.14(NbSe2).