凝縮系物理学ゼミナール

Condensed Matter Seminar

Location: **Room 413**, School of Science Bldg. 5 (理学 5 号館 413 号室)

Date: **13:30-15:00**, Wednesday, 29 May 2019

“Multiorbital ferroelectric superconductivity in doped $SrTiO_3$”

Speaker:

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Abstract:

A lot of exotic superconducting state emerge close to other ordered phases, such as anisotropic superconductivity in cuprates. Although previous studies have mainly focused on the superconductivity close to magnetic instability, the ferroelectric (FE) counterpart is recently receiving increased attention since such superconductivity was reported in doped $SrTiO_3$ (STO). STO is a unique compound which exhibits both quantum paraelectricity and superconductivity. The superconducting transition temperature is enhanced in the vicinity of the FE critical point [1-3]. Moreover, recent experiments suggest the coexistence of superconductivity and ferroelectricity in doped STO [2,4]. These results imply a cooperative correlation between superconductivity and ferroelectricity against a long-held belief that they should be incompatible.

In this talk, we present that STO can be a platform of the FE superconductivity which is characterized by a FE transition in the superconducting state [5]. By analyzing a multiorbital model for t_{2g} electrons, we investigate the interplay of superconductivity and FE order in bulk STO. It is shown that the FE superconductivity is realized through two different mechanisms which rely on the intrinsic spin-orbit coupling [6]. First, the FE superconducting state is stabilized by the Lifshitz transition in dilute carrier density regimes [7]. Second, the FE superconductisng state is stabilized under a Zeeman magnetic field. Furthermore, we show that the FE superconductivity is strongly affected by the multiorbital effect, and thus a topological Weyl superconducting state is realized in the FE superconducting STO.

References:

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