

凝縮系物理学ゼミナール

Condensed Matter Seminar

(※ seminar is held online via zoom)

Date: **13:30-15:00**, Wednesday, 7 July 2021

“Geometric properties of Bloch electrons in iron-based superconductors”

Speaker:

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Abstract:

In the periodic crystal system, the energy dispersion and the Bloch wave function in wave space determine the feature of the system. The Berry connection and Berry curvature represent the geometry of the Bloch electrons and appear in the various physical phenomena. The importance of these in physics is well known in the materials which have nontrivial-band structures, i.e. topological materials.

While Berry curvature is defined as the imaginary part of the quantum geometric tensor, the real part of the quantum geometric tensor is the “quantum metric” which represents the distance between two adjacent states [1]. Recent studies reveal that quantum metric appears in the nonlinear photocurrent [2,3], electric quadrupole moments [4,5,6], and superfluid weight [7,8]. In particular, the effect to the superfluid weight from the quantum metric has been studied intensively, and its importance in topologically nontrivial flat-bands [7], which appear in the artificial quantum system [7,9,10,11], is clarified. However, the natural compounds in which quantum metric has an important role have ever been proposed.

In this seminar, we propose a new platform, in which the quantum metric has an important role, namely “*iron-based superconductor*”. Calculating the thermodynamic quadrupole moments [12] and superfluid weight [13] in iron-based superconductors, we show the significant contribution of the quantum metric to physics.

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