

凝縮系物理学インフォーマルセミナー Condensed Matter Seminar

Location: Room 413, School of Science Bldg. 5 (理学 5 号館 413 号室)
Time and date: 13:30 – 15:00, Wednesday, 24 December 2014

Heavy Electron Quasicrystals and Quasiperiodic Model with Oblique Superlattice

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Abstract:

Quasicrystals is receiving attention again in many contexts such as topological insulator, quantum criticality, soft matter, quantum quasicrystals, and so on. One of the hot topic is heavy electron systems in quasicrystals. In the quasicrystal $\text{Yb}_{15}\text{Al}_{34}\text{Au}_{51}$, quantum criticality of valence fluctuations emerges and the criticality is quite robust against pressure, while this robustness is not seen in its approximant crystals [1,2]. On the other hand, the connection between topological insulators and quasicrystals is also drawing attention recently [3].

In this seminar, I would like to talk about two topics, (1) Valence transition in one dimensional quasiperiodic Anderson model, and (2) Topological properties of 2D lattice model with obliquely introduced linear-shaped potential. (1) We consider the one-dimensional quasiperiodic Anderson model, which has quasiperiodically ordered impurities. We used density matrix renormalization group (DMRG) method, and we treated the effect of quasiperiodicity for quantum criticality of valence fluctuation. (2) We consider 2D square lattice with obliquely introduced periodic potential. We obtain there exists edge-localized states between the bulk energy bands, and this property can be explained by topological number.

Reference:

- [1] K. Deguchi et al., Nature Materials **11**, 1013 (2012).
- [2] S. Watanabe and K. Miyake, J. Phys. Soc. Jpn. **83**, 061006 (2014).
- [3] Y. E. Kraus et al., Phys. Rev. Lett. **109**, 106402 (2012).