

# 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, 18 October 2017

### “Magnetic hexadecapole order and magnetopiezoelectric metal state in BaMn<sub>2</sub>As<sub>2</sub>”

Speaker:

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Abstract:

Recently, odd-parity multipole order in solid has been discussed a lot. In this exotic ordered state, various emergent phenomena such as FF superconductivity, magnetoelectric effect arise from the entanglement between spin, orbital, and sublattice [1].

In this work, we identify that the magnetic hexadecapole ordering is realized in BaMn<sub>2</sub>As<sub>2</sub>, a related material of the Iron-based 122 family [2]. Its seemingly simple antiferromagnetic order breaks both of space-inversion symmetry and time-reversal symmetry, implying odd-parity magnetic multipole order. The identification is supported by group-theoretical approach based on Landau's theory of phase transitions and also by examining the electronic state in microscopic models.

Furthermore, we discuss the electromagnetic responses such as magnetoelectric effect, antiferromagnetic Edelstein effect, and current-induced nematicity. Especially, current-induced nematicity is an exotic phenomena characterizing odd-parity magnetic multipole ordering in the itinerant system, hole-doped BaMn<sub>2</sub>As<sub>2</sub> [3].

References:

[1] Y. Yanase, J. Phys. Soc. Japan 83, 14703 (2014).; S. Sumita and Y. Yanase, Phys. Rev. B 93, 224507 (2016).

[2] Y. Singh, M.A. Green, Q. Huang, A.Krevssig, R. J. McQueeney, D. C. Johnston, and A. I. Goldman, Phys. Rev. B 80, 100403 (2009); Y. Singh, A. Ellern, and D. C. Johnston, Phys. Rev. B 79, 094519 (2009).

[3] HW and Y. Yanase, Phys. Rev. B, 96, 064432 (2017).