

Condensed Matter Physics Seminar Series

Synthesis and exploration of new topological magnetic texture in frustrated magnets

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Frustrated magnets can host complex spin textures, leading to unconventional electromagnetic responses. Magnetic frustration may also promote topologically nontrivial spin states such as skyrmions, while experimentally skyrmions have largely been observed in noncentrosymmetric materials or interfacial symmetry-broken heterostructures [1]. Recently, we have demonstrated a new design principle to discover the emergence of a Bloch-type skyrmion state in a centrosymmetric triangular-lattice magnet Gd_2PdSi_3 [2], and observed a giant topological Hall response, enhanced by nanometric skyrmions size. We also explore rare-earth-based layered semimetals with spin moiré superlattices, where multiple incommensurate spin modulations are superimposed to generate a periodic exchange potential, as in the crystallographic moiré superlattices due to twist or lattice mismatch. We observed the field-induced transitions to multiple-q spin moiré states accompanied by significant resistivity changes and large suppression of the Hall response in EuAg_4Sb_2 [3], induced by the reconstructed Fermi surface in the spin moiré potential.

Time permitting, I will talk about the recent exploration of new rare earth intermetallics that exhibit unconventional magnetic structures and anomalous magnetotransport properties [4,5].

Dr. Takashi Kurumaji graduated with a B.S. in applied physics from the University of Tokyo (Japan) in 2010. He received his M.S. from the University of Tokyo, where he also received his Ph.D in 2014. From 2014 to 2017, Dr Kurumaji was a postdoctoral researcher at RIKEN Center for Emergent Matter Science in Japan, working with Dr. Yoshinori Tokura. From 2017 to 2020, he was working as a postdoctoral researcher with Dr. Joseph G. Checkelsky at MIT, and from 2020 to 2023 he was a research associate at University of Tokyo working with Dr. Takahisa Arima. Since September 2023, he has become a Research Professor of PMA at Caltech. Dr. Kurumaji's research is centered on the synthesis, discovery, and characterization of novel magnetic materials. He has made key contribution to establishing design principle of magnetic skyrmions and multiferroics. In 2022, he was awarded the Japan Physics Society Young Scientist Award in the field of strongly correlated electron systems.

**Friday, May 16th at 10am
4-330 PAB**