

School Seminar (2015-27)

School of Materials Science & Engineering

“Quantum criticality and topology in strongly correlated systems”

Prof. Moon, Eun-Gook
(Dept. of Physics, KAIST)

2015. 09. 18. (Fri.) 14:00
APRI 1F, Auditorium Hall

Quantum criticality and topology in strongly correlated systems

Eun-Gook Moon
KAIST

Fathoming correlated electron systems is one of the cutting edge areas in modern condensed matter physics. Interplay between many electrons provides a new route to access novel phases and their applications, so-called quantum materials and their application, which generates active research in recent theory and experiment. In this talk, we discuss role of quantum criticality and topology to understand strongly correlated systems. Application to real materials and current status in experiments are also discussed.

EUN-GOOK MOON

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EDUCATION

Harvard University *May 2011*
Ph. D. in Physics
Advisor : Subir Sachdev
Thesis title : Superfluidity in Strongly Correlated Systems.

Seoul National University *Feb 2005*
B.S. in Physics

PROFESSIONAL ACTIVITIES

Assistant Professor Jun. 2015 -

- Korea Advanced Institute of Science and Technology

Kadanoff Center Fellow Aug. 2014 - May. 2015

- Research on interplay between strong correlation and topology

Postdoctoral Researcher Aug. 2011 - Jul. 2014
with Prof. Cenke Xu and Leon Balents *University of California at Santa Barbara*

- Research on strongly correlated systems : spin liquids, topological phases, and non-Fermi liquids

Research Fellow 2006 -2011
with Prof. Subir Sachdev *Harvard University*

- Research on high temperature superconductivity and ultra-cold atom.

FELLOWSHIPS AND AWARDS

the Kadanoff Center Fellowship	2014 ~ 2017
the Samsung Scholarship	2006 ~ 2010
the Purcell Fellowship	2006
the Korea Foundation for Advanced Students Scholarship	2005
the Seoul National University Scholarship	2004
the Best Squad-leader Honor Prize	2003
the Best Experimental Physics Student	1999

SERVICES

Referee of Nature Physics, Physical Reviews (X, Letters, B), and Journal of Physics A.

Revierwer of Swiss National Science Foundation.

PUBLICATION

1. *Superfluid-insulator transitions of the Fermi gas with near-unitary interactions in a periodic potential*,
E. G. Moon, P. Nikolic, and S. Sachdev, Physical Review Letters 99, 230403 (2007).
2. *Ab initio study of dihydrogen binding in metal-decorated polyacetylene for hydrogen storage*,
H. Lee, W. Choi, M. Nguyen, M. Cha, **E. G. Moon**, and J. Ihm, Physical Review B 76, 195110 (2007).
3. *Radio frequency spectroscopy of a strongly imbalanced Feshbach-resonant Fermi gas*,
M. Veillette, **E. G. Moon**, A. Lamacraft, L. Radzihovsky, S. Sachdev, and D.E. Sheehy, Physical Review A 78, 033614 (2008).
4. *Competition between spin density wave order and superconductivity in the underdoped cuprates*,
E. G. Moon and S. Sachdev, Physical Review B 80, 035117 (2009).
5. *Quantum-critical pairing with varying exponents*,
E. G. Moon and A. V. Chubukov, Journal of Low Temperature Physics(Focused edition), 161, 263 (2010).
6. *Quantum critical point shifts under superconductivity: the pnictides and the cuprates*,
E. G. Moon and S. Sachdev, Physical Review B 82, 104516 (2010).
7. *The underdoped cuprates as fractionalized fermi liquids : transition to superconductivity*,
E. G. Moon and S. Sachdev, Physical Review B 83. 224508 (2011).
8. *Exciton condensations in thin film topological insulator*,
E. G. Moon and C. Xu, European Physics Letter 97, 66008(2012).
9. *Competition between superconductivity and nematic order : anisotropy of superconducting coherence length*,
E. G. Moon and S. Sachdev, Physical Review B 85. 184511 (2012).
10. *Skyrmions with quadratic band touching fermions: A way to achieve charge 4e superconductivity*,
E. G. Moon, Physical Review B 85. 245123 (2012).
11. *Exotic continuous quantum phase transition between Z_2 topological spin liquid and Neel order*,
E. G. Moon and C. Xu, Physical Review B 86. 214414 (2012).
12. *Theory of topological quantum phase transitions in 3D noncentrosymmetric systems*,
B.J. Yang, M. Bahramy, R. Arita, H. Isobe, **E. G. Moon** and N. Nagaosa, Physical Review Letters 110. 086402 (2013).
13. *Non-Fermi liquid and topological states with strong spin-orbit coupling*,
E. G. Moon, C. Xu, Y. B. Kim, and L. Balents, Physical Review Letters 111. 206401 (2013).
14. *Quantum criticality of topological phase transitions in 3D interacting electronic systems*,
B.J. Yang, **E. G. Moon**, H. Isobe, and N. Nagaosa, Nature Physics 10, 774 (2014).
15. *Observation of symmetry protected Fermi node in a 3D strongly correlated semimetal*,
T. Kondo, M. Nakayama, R. Chen, **E. G. Moon**, *et. al.*, submitted.
16. *A New Type of Quantum Criticality in the Pyrochlore Iridates*,
L. Savary, **E. G. Moon**, and L. Balents, Phys. Rev. X, 4, 041027.
17. *Non-Fermi Liquid in Dirac Semi-metals*,
E. G. Moon, and, Y. B. Kim, arXiv:1409.0573.

18. *Competing Orders and Anomalies*,
E. G. Moon, arXiv:1503.05199.
19. *Nodal Ring Semi-metal with Long-range Coulomb Interaction*,
Y. Huh, **E. G. Moon**, and Y. B. Kim, arXiv:1506.05105.
20. *Novel Quantum Criticality in Two Dimensional Topological Phase Transitions*,
G. Cho, and **E. G. Moon**, arXiv:1508.03777.