

Intercontinental binodal Workshop

Flat bands and high-order Van Hove singularities

May 27 - June 7, 2024

All times in the workshop program refer to Korean Standard Time (KST)

Program

Monday, May 27

- 11:00 – 12:30 Registration
- 12:30 – 14:00 Lunch
- 15:00 – 15:15 Opening address
- 15:15 – 15:30 Coffee Break
- 15:30 – 16:00 Jörg Schmalian, Karlsruhe Institute of Technology, Germany
Pairing at a single Van Hove point
- 16:00 – 16:30 Kam Teun Law, HKUST, Hong Kong
Josephson diode effect and flat band superconductivity with quantum metric in moiré materials
- 16:30 – 16:45 Coffee Break
- 16:45 – 17:15 Youichi Yanase, Kyoto University, Japan
Generation, modulation, and enhancement of superconductivity by quantum geometry
- 17:15 – 17:45 Eva Andrei, Rutgers University, USA
Moiré x Moiré: self-alignment, topology and quasi-crystals
- 17:45 – 18:15 Dinner break
- 18:15 – 18:45 Rahul Nandkishore, University of Colorado at Boulder, USA
Parquet RG near high order Van Hove singularities
- 18:45 – 19:15 Francisco Guinea, IMDEA Materials Institute, Spain / DICP
Superconductivity in graphene stacks
- 19:15 – 19:45 Mark Greenaway, Loughborough University, UK
Out-of-equilibrium magnetophonon resonance phenomena in graphene
- 19:45 – 20:15 Yang Zhang, University of Tennessee, USA
Maximally localized Wannier functions, interaction models, and fractional quantum anomalous Hall effect in twisted bilayer MoTe₂

Tuesday, May 28

10:00 – 12:30 Discussions

12:30 – 13:30 Lunch

13:30 – 15:30 Poster session

15:30 – 16:00 Nicolas Regnault, École Normale Supérieure de Paris, France
Moiré fractional phases of matter

16:00 – 16:30 Jeil Jung, University of Seoul, Korea
Layer pseudospin magnetism and electric field induced anomalous Hall effects in rhombohedral multilayer graphene

16:30 – 16:45 Coffee Break

16:45 – 17:15 Roderich Moessner, MPIPKS, Germany
Where the current flows in a Chern insulator

17:15 – 17:45 Raquel Queiroz, Columbia University, USA
Quantum geometry and its relation to linear response

17:45 – 18:15 Dinner break

18:15 – 18:45 Ipsita Mandal, Shiv Nadar Institution of Eminence, India
Taming the QFT at Quantum Critical Points

18:45 – 19:15 Shahal Ilani, Weizmann Institute of Science, Israel
Electron-Phonon and Electron-Phason Coupling in Twisted Bilayer Graphene

19:15 – 19:45 Xiaodong Xu, University of Washington, USA
Progress in fractional quantum anomalous hall effect

19:45 – 20:15 Siddharth Parameswaran, University of Oxford, UK
Kekule orders and Berry-frustrated exciton condensates in moire materials

Wednesday, May 29

10:00 – 12:30 Discussions

12:30 – 14:00 Lunch

14:00 – 15:30 Discussions

15:30 – 16:00 Ali Yazdani, Princeton University, USA
Visualizing correlated electronic states in flat bands

16:00 – 16:30 Moon Jip Park, Hanyang University, Korea
Magic angle of moire magnetic materials

16:30 – 16:45 Coffee Break

16:45 – 17:15 Thomas Weitz, University of Göttingen, Germany
Correlated phases at a tunable van-Hove singularity in Bernal bilayer graphene

17:15 – 17:45 Elena Bascones, Spanish National Research Council, Spain
Cascades: The unconventional state of twisted bilayer graphene

17:45 – 18:15 Dinner break

18:15 – 18:45 Michael Scherer, Ruhr University Bochum, Germany
Competing orders at higher-order Van Hove points

18:45 – 19:15 Walter Metzner, MPI FKF, Germany
Marginal Fermi liquid behavior at the onset of $2K_F$ density wave order in two-dimensional metals with flat hot spots

19:15 – 19:45 Andreas Rost, University of St Andrews, UK
Flat band phenomena approaching the vHs in $Sr_3Ru_2O_7$

19:45 – 20:15 Nicholas Hine, University of Warwick, UK
Ab Initio Modelling of Twisted Bilayers and Heterostructures of 2D Materials

Thursday, May 30

10:00 – 12:30 Discussions

12:30 – 14:00 Lunch

14:00 – 15:30 Discussions

15:30 – 16:00 Gil Young Cho, POSTECH, Korea
*First Landau Level Physics in Second Moiré Band of 2.1-
Twisted Bilayer MoTe₂*

16:00 – 16:30 Jun-Won Rhim, Ajou University, Korea
*Quasi-localization and Wannier Obstruction in Partially Flat
Bands*

16:30 – 16:45 Coffee Break

16:45 – 17:15 Claudia Felser, MPI CPfS, Germany
Magnetic Kagome lattice: topology and frustration

17:15 – 17:45 Haim Beidenkopf, Weizmann Institute of Science, Israel
*High-Order Van Hove Singularity Generation and
Pomeranchuk Instability in a Kagome Metal*

17:45 – 18:15 Dinner break

18:15 – 18:45 Titus Neupert, University of Zurich, Switzerland
Fractional topological insulators in Moire materials

18:45 – 19:15 Bodgan A. Bernevig, Princeton University, USA
*Topological Heavy Fermion Theory for Twisted Bilayer
Graphene*

19:15 – 19:45 Stephen Wilson, UCSB, USA
*Unconventional charge correlations and lattice instabilities in
kagome metals*

19:45 – 20:15 Andreas Schnyder, MPI FKF, Germany
Topological superconductivity near van Hove fillings

Friday, May 31

- 10:00 – 12:30 Discussions
- 12:30 – 14:00 Lunch
- 14:00 – 15:30 Discussions
- 15:30 – 16:00 Gertrud Zwicknagl, TU Braunschweig, Germany
Field-induced Lifshitz transitions: Probe of heavy fermion band structure
- 16:00 – 16:30 Bo Yang, Nanyang Technological University, Singapore
Quantum Geometry in Topological Bands: Chern Insulators from Landau Level Description and Beyond
- 16:30 – 16:45 Coffee Break
- 16:45 – 17:15 Andrey Chubukov, University of Minnesota Minneapolis, USA
Unconventional discontinuous transitions in a 2D system with spin and valley degrees of freedom
- 17:15 – 17:45 Hilary Noad, MPI CPfS, Germany
Thermodynamic measurements across a uniaxial-pressure-tuned Lifshitz transition in Sr_2RuO_4
- 17:45 – 18:15 Dinner break
- 18:15 – 18:45 Clifford Hicks, University of Birmingham
Interactions across momentum space in Sr_2RuO_4
- 18:45 – 19:15 Coffee Break
- 19:15 – 19:45 Peter Wahl, University of St. Andrews, UK
Low energy electronic structure in strontium ruthenates: interplay of surface distortions with Van Hove singularities
- 19:45 – 20:15 Dmitri Efremov, IFW Dresden, Germany
Impact of high order of van Hove singularities on the competition of charge and spin degrees of freedom

Monday, June 3

- 11:30 – 12:30 Alexei Andreanov, IBS PCS
Flatbands: construction and effects of perturbations
- 12:30 – 14:00 Lunch
- 14:00 – 15:00 Discussions
- 15:00 – 16:00 Mikito Koshino, Osaka University, Japan
Exploring Moiré 2D Materials and Topological Quasicrystals
- 16:00 – 17:30 Break & Discussions
- 17:30 – 18:30 Dinner

Tuesday, June 4

- 11:30 – 12:30 Pilkyung Moon, New York University Shanghai, China
Quasicrystalline resonant states and nonlinear Landau fan diagram in van der Waals superlattices
- 12:30 – 14:00 Lunch
- 14:00 – 15:00 Discussions
- 15:00 – 16:00 Young Woo Son, KIAS, Korea
Interplay between stacking orders, interlayer interactions and nonlocal Coulomb interaction in twisted layered systems
- 16:00 – 17:30 Break & Discussions
- 17:30 – 18:30 Dinner

Wednesday, June 5

- 11:30 – 12:30 Carlo Danieli, ISC-CNR, Italy
Fine-tuning and detuning flat bands
- 12:30 – 14:00 Lunch
- 14:00 – 15:00 Discussion
- 15:00 – 16:00 Rudolf Roemer, University of Warwick, UK
Quantum engineering for compactly localized states in disordered Lieb lattices
- 16:00 – 16:30 Break
- 16:30 – 17:30 Poster Session @PCS Lounge
- 17:30 – 18:30 Banquet

Thursday, June 6

- 11:30 – 12:30 Tomoki Ozawa, Tohoku University, Japan
Introduction to the Quantum Metric
- 12:30 – 14:00 Lunch
- 14:00 – 15:00 Justin Song, Nanyang Technological University, Singapore
*Non-reciprocal quantum matter: quantum geometry and
Kramers degeneracy*
- 15:00 – 16:00 Break & Discussions
- 16:00 – 17:00 Xi Dai, HKUST, Hong Kong
Electrical Breakdown of Excitonic Insulators
- 17:00 – 17:30 Break
- 17:30 – 18:30 Dinner

Friday, June 7

11:00 – 12:15 Poster Session @PCS Lounge

12:15 – 12:30 Closing remark

12:30 – 14:00 Lunch

14:00 – 16:00 Discussion