

MATHEMATICS OF CONDENSED MATTER AND BEYOND

February 22–25, 2021

Condensed matter physics is an important source of challenging mathematical problems. Models of superconductivity, Bose-Einstein condensates, and liquid crystals involve linear and non-linear versions of the Schrödinger equation. Their study requires sophisticated analytical tools coming from different areas of applied mathematics, with several established research groups contributing worldwide.

The conference will bring together experts and young scholars to share their most recent ideas and results. It will be hosted virtually by the Center for Advanced Mathematical Sciences at the American University of Beirut (CAMS, AUB) whose mission is the promotion of mathematical sciences in the Middle East region.

Through its mix of state of the art local and international contributions, the conference offers a unique opportunity to mathematicians/physicists in Lebanon and their PhD students.

The event is an integral part of a stream of activities within the **CAMS Thematic Program in Mathematical Physics 2020-2021**: Spectral theory, Semi-Classical Analysis, and Condensed Matter Physics.

Organized by

Michele Correggi, Politecnico di Milano, Italy

Ayman Kachmar, Lebanese University, Lebanon

Wafaa Assaad, Lebanese University, Lebanon

Monday, February 22, 2021

- 10:45 – 11:00 **Opening**
- 11:00 – 12:00 **Jakob Yngvason**
(Vienna University, Austria)
Emergence of Haldane Pseudo-Potentials in Systems with Short-Range Interactions
- 12:00 – 13:00 **Xingbin Pan**
(Chinese University of Hong Kong (Shenzhen), China)
On Maxwell-Stokes System
- 13:00 – 15:00 **Lunch break**
- 15:00 – 16:00 **Douglas Lundholm**
(Uppsala University, Sweden)
Emergence of Anyons from Polarons and Angulons
- 16:00 – 17:00 **Horia Cornean**
(Aalborg University, Denmark)
Extending the Bulk-Edge Correspondence to Positive Temperatures
- 17:00 – 17:30 **Break (chat room)**
- 17:30 – 18:30 **Maher Zerzeri**
(Université Sorbonne Paris Nord, France)
Trapped Trajectories and Asymptotic of Resonances
- 18:30 – 19:30 **CONTRIBUTED TALKS**
- Federico Luigi Dipasquale**
(Università di Verona, Italy)
Topological Properties of Minimizers in Landau-de Gennes Theory of Nematic Liquid crystals
- Giulia Basti**
(Gran Sasso Science Institute, Italy)
A New Second Order Upper Bound for the Ground State Energy of Dilute Bose Gases
- Alessandro Olgiati**
(University of Zurich, Switzerland)
Stability of the Laughlin Phase in Presence of Interactions

Tuesday, February 23, 2021

- 11:00 – 12:00 **Mikael Persson Sundqvist**
(Lund University, Sweden)
The Ground State of the Pauli operator
- 12:00 – 13:30 **CONTRIBUTED TALKS**
- Marcel Schaub**
(Ludwig Maximilians Universität, Germany)
The BCS Functional in a Weak Homogeneous Magnetic Field - its Critical Temperature and Microscopic Derivation of Ginzburg-Landau Theory
- Niels Benedikter**
(Università degli Studi di Milano, Italy)
Describing Quantum Correlations in the Fermi Liquid by Bosonization
- Marco Olivieri**
(KIT, Karlsruhe, Germany)
Isomerization reactions for pseudo relativistic molecules
- Shahnaz Farhat**
(Université de Rennes 1, France)
The Motion of Charged Particles in a Tokamak
- 13:30 – 15:00 **Lunch break**
- 15:00 – 16:00 **Konstantin Pankrashkin**
(Oldenburg University, Germany)
Spectral Analysis of a Diffusion Operator with Random Jumps from the Boundary
- 16:00 – 17:00 **Peter Sternberg**
(Indiana University, USA)
Variational Models for Phase Transitions in Liquid Crystals Based Upon Disparate Values of the Elastic Constants
- 17:00 – 17:30 **Break (chat room)**
- 17:30 – 18:30 **Zaher Hani**
(University of Michigan, USA)
On the Rigorous Foundations of the Wave Turbulence Theory
- 18:30 – 19:30 **Stephen Gustafson**
(University of British Columbia, Canada)
Chiral Magnetic Skyrmions of 2D Landau-Lifshitz Equations

Wednesday, February 24, 2021

- 11:00 – 12:00 **Bernard Helffer**
(Université de Nantes, France)
Spectral Theory for the Bloch-Torrey Operator
- 12:00 – 13:30 **CONTRIBUTED TALKS**
- Davide Fermi**
(Università di Roma 'La Sapienza', Italy)
Magnetic perturbations of Aharonov-Bohm and 2-body anyonic Hamiltonians
- Domenico Monaco**
(Sapienza University of Rome, Italy)
(De)localized Wannier functions for quantum Hall systems
- Badreddine Benhella**
(Universidad del País Vasco & Université de Bordeaux, France) *Quantum Con inement induced by Dirac operators with anomalous magnetic*
- Léo Morin**
(Université de Rennes 1, France)
Spectral Asymptotics for the Semiclassical Bochner Laplacian
- 13:30 – 15:00 **Lunch break**
- 15:00 – 16:00 **Emanuela Giacomelli**
(LMU Munich, Germany)
On the Corner Contribution to Surface Superconductivity
- 16:00 – 17:00 **Marco Cicalese**
(Technical University of Munich, Germany)
Does the N-clock Model Approximate the XY-Model?
- 17:00 – 17:30 **Break (chat room)**
- 17:30 – 18:30 **Radu Ignat**
(Université Paul Sabatier & IUF, Institut de Mathématiques de Toulouse, France)
Domain Walls with Nonlocal Interaction and their Renormalized Energy in Thin Ferromagnetic Films

Thursday, February 25, 2021

- 11:00 – 12:00 **Etienne Sandier**
(Université Paris Est, France)
Vortex Filaments in the 3D Ginzburg-Landau Model
- 12:00 – 13:00 **Nicolas Rougerie**
(Unité de Mathématiques Pures et Appliquées, ENS Lyon, France)
Semi-Classical Limit for Almost Fermionic Anyons
- 13:00 – 15:00 **Lunch break**
- 15:00 – 16:00 **Nicolas Raymond**
(Université d'Angers, France)
On the Dirac Bag Model in Strong Magnetic Fields
- 16:00 – 17:00 **Siamak Taati**
(American University of Beirut, Lebanon)
Quasicrystal Phases in a Finite-Range Lattice Gas Model
- 17:00 – 17:30 **Break (chat room)**
- 17:30 – 18:30 **Pavel Exner**
(Academy of Sciences, Prague)
On the Spectrum of Spiral Quantum Waveguides