SFB 1432

Colloquium

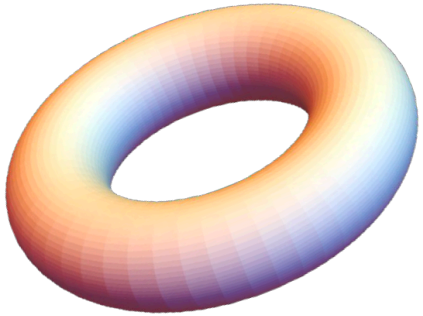
Universität Konstanz

Jan 11, 2024
Talk at 15:15
in P 603
refreshment afterwards

Dr. Bruno Mera

IST & IT Lisboa (PT)

From Quantum Geometry to Kähler Bands: Moiré Materials and Beyond



$$g + i\omega = \langle du_{\mathbf{k}} | (1 - |u_{\mathbf{k}}\rangle\langle u_{\mathbf{k}}|) | du_{\mathbf{k}} \rangle$$

This colloquium aims to provide a pedagogical introduction to the topic of quantum geometry, i.e., the geometry of families of quantum states. Beginning with a foundational introduction to quantum geometry, we delve into the specific case of Bloch bands, unraveling the inequalities that emerge relating the quantum metric and the Berry curvature, the saturation of which implies holomorphicity and gives rise to the concept of* Kähler band*. The discussion finds direct applications to twisted bilayer graphene in the chiral limit, where the saturation of these inequalities plays a pivotal role in stabilizing fractional Chern insulating phases.

Highlighting the significance of these insights, we draw connections to the existence of an algebra of projected density operators. Intriguingly, this algebra mirrors the Girvin-MacDonald-Platzman (GMP) algebra found in the Fractional Quantum Hall Effect (FQHE). This exploration not only sheds light on the quantum geometry of materials like twisted bilayer graphene but also underscores the broader implications for understanding and predicting novel quantum phases.

Contact:
O. Zilberberg, 5619

SFB 1432