

Correlated Quantum Nonlinearities

Justin CW Song

Division of Physics and Applied Physics, School of Physical and Mathematical Sciences, Nanyang

Technological University, Singapore 637371

Email: justinsong@ntu.edu.sg

Quantum nonlinear responses have recently emerged as sensitive markers of Bloch band quantum geometry; while most often viewed through the lens of the dynamics of single-particle, real quantum materials consist of a soup of interacting many particles. In this talk, we will describe how electron interactions contribute to quantum geometric nonlinear responses both from interband transition activated nonlinear optics (e.g., exciton enabled nonlinearities) as well as intraband metallic transport (e.g., nonlinear hall effects). We find a rich landscape of collective quantum geometry and the strikingly strong impact of electron interactions on nonlinear response.

**** This work was supported by Singapore Ministry of Education (MOE) Academic Research Fund Tier 2 grant (MOE-T2EP50222-0011) and Tier 3 grant (MOE-MOET32023-0003) “Quantum Geometric Advantage”**