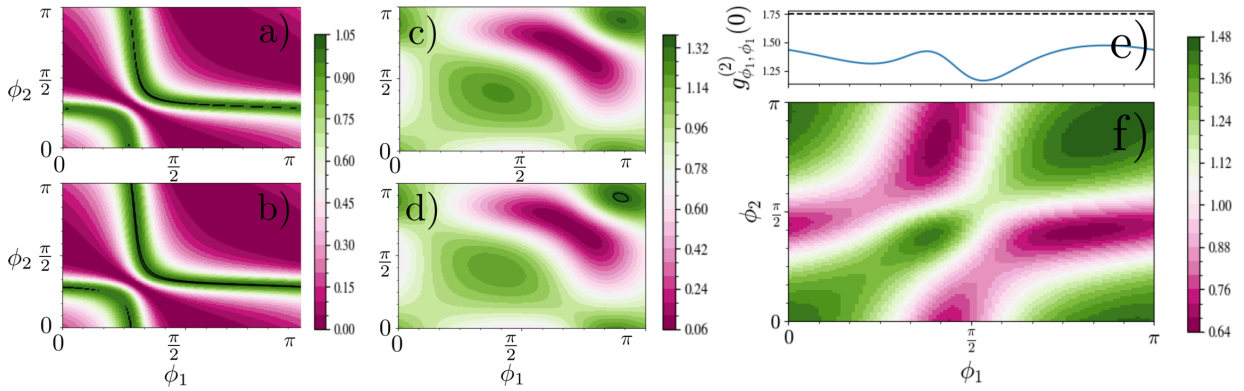
ФАКУЛТЕТСКИ НАУЧЕН СЕМИНАР
„ФИЗИКАТА ДНЕС“

КОГА: 26.11.2024 г., 16:15 до 17:15 часа
КЪДЕ: Зала А301, Физически факултет на СУ „Св. Кл. Охридски“

ТЕМА: Witnessing coherent quantum transport with photon correlation asymmetry

Лектор: Dr. Charlie Nation, University of Exeter, UK.



Резюме: Transport processes in molecular systems such as photosynthetic pigments are thought to host quantum coherent environmentally enhanced transport, though experimental proofs are lacking. In this talk I summarize a possible approach to observe the central mechanisms of coherent quantum transfer in such systems via experimental methods achievable in the near term. A crucial function of the environment in enabling enhanced transfer efficiency is enducing directionality in excitation flow, characterised by the violation quantum detailed balance (QDB). We observe in a prototype vibronic dimer model, that the way in which QDB is violated indeed differs between the incoherent and coherent environmental processes enabling transport, with increased contribution from the coherent process aiding faster transport but reducing directional bias. We thus observe a balance between coherent and incoherent processes maximises directional flow over the short timescales involved in exciton transport with

biologically relevant conditions. We finally show that the QDB violation, whilst not directly observable in itself for such emitters, may be witnessed through the time-asymmetry of two-colour photon correlations, and that these observable correlations are extremely sensitive to vibrational mode coupling and resonance to exciton energy gaps, present in such systems, yielding a potential route to experimental verification in realistic molecular systems.

За лектора: Dr. Charlie Nation is a Postdoctoral Research Fellow at the University of Exeter, working broadly on quantum computing and optomechanical quantum technologies in the group of Luca Dellantonio. He received his PhD for work with Diego Porras (now at CSIC Madrid) from the University of Sussex in 2020, for work in quantum chaos and random matrix theory. He then held a Postdoctoral Fellowship in quantum biology at University College London, in the group of Prof. Alexandra Olaya-Castro, where he worked on characterising quantum coherence in biomolecules with strongly coupled environments via modelling of photon correlation experiments.