Charge density waves in quantum materials

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The charge density wave (CDW), the ununiform distribution of itinerant charge density, has been found and studied in various low-dimensional systems for decades. Despite extensive investigations, the many characteristics of CDW remain unknown; a microscopic mechanism other than the Pierls instability is required, and how CDW intertwines with other competing phases, particularly with the superconductivity, should be investigated. Furthermore, the recent compelling evidence has cast light on the unexpected aspect of CDW, additional symmetry breakings that accompany or occur concurrently with the CDW transition. In this talk, I will discuss various aspects of CDWs in different quantum materials, i) the additional symmetry breaking in CDW phase of 1T-$TiSe_2$ and CsV_3Sb_5 systems, which are footprinted in the intensity of angle-resolved photoemission spectroscopy, ii) the possible role of CDW fluctuation on Cooper pairing, which is accomplished by analyzing the low-energy electronic structure of 2H-$TaSe_2$.