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Strong-coupling charge order in $NbSe_2$ FELIX FLICKER, JASPER VAN WEZEL, University of Bristol UK — The emergence of charge density wave (CDW) order in $NbSe_2$ has been surrounded by controversy ever since its discovery several decades ago. Because of the absence of any clear nesting in the Fermi surface, various alternative driving forces for CDW formation have been suggested, from nested saddle points to phonon-driven scenarios. Recently, the availability of high-precision experimental data has raised additional questions: different experimental techniques observe different electronic gap sizes, the gap itself has been reported to be asymmetric and centered well above the Fermi energy, and unexpected local fluctuations of the charge order have been observed far above the critical temperature. We resolve all of these seemingly conflicting observations in a model that takes into account both the electronic structure and the strong, momentum-dependent, coupling to phonon modes. We show that this model can explain the recent controversial observations by scattering and ARPES experiments as well as by local probes like scanning tunneling spectroscopy. This model provides for the first time a consistent description of the entire range of experimental results and presents a complete picture of the CDW in $NbSe_2$ as a prototypical example of strong-coupling charge order.

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