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**Extensions of the Momentum Average approximation** MONA BERCIU, LUCIAN COVACI, University of British Columbia — We consider a well studied problem, the formation of polarons. Even for the simplest electron-phonon interaction (the Holstein model), an exact solution is only known in the asymptotic limits of zero coupling or zero free-electron bandwidth. A simple analytical approximation that turns out to be accurate for all coupling strengths (the Momentum Average approximation) has only been found recently. We discuss the extension of this method to various other situations in which polaron physics might be important. We show how the Momentum Average approximation can be used in answering questions regarding coupling of electrons to multiple phonon branches, formation of polarons in the presence of magnetic fields and the existence of multiple electron bands.

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