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The Green's Function of the 1D Breathing-Mode Polaron GLEN GOODVIN, MONA BERCIU, University of British Columbia — We apply the Momentum Average approximations MA(0) and MA(1) to study the properties of the one-dimensional breathing-mode polaron. The results are analytical, numerically trivial to evaluate, exact for both zero bandwidth and for zero electron-phonon coupling, and are accurate everywhere in parameter space. Comparison with recent numerical data confirms this accuracy. We also show that by applying MA as a variational method with a suitably chosen enlarged subspace, we can obtain extremely high accuracy for both ground state and higher energy state properties. With only a slight increase in computational effort this allows us to obtain ground state and momentum-dependent results well within 0.1% error of the exact numerical data currently available. Although this work specifically looks at the breathing-mode model, we demonstrate that MA is applicable to all momentum dependent electron-phonon coupling models, and its accuracy can always be improved by systematically improving the approximation itself or by working in an enlarged variational subspace.

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