The density matrix renormalization group as a solver for cluster perturbation theory CHUN YANG, ADRIAN FEIGUIN, Northeastern Univ — Cluster Perturbation Theory (CPT) provides an approximation for the single particle Green's function of strongly correlated models in the thermodynamic limit by coupling clusters of small size using a variation of strong coupling perturbation theory. The method itself cannot account for the effects of symmetry breaking, such as in the presence of antiferromagnetic long range order, since it relies on the exact solution of clusters that are too small. The DMRG method provides a path toward a more reliable application of the CPT in the presence of long range order since it is able to calculate the single particle Green's function of an infinite (very large) one dimensional chain, or ladder. By coupling these chains and ladders in the perpendicular direction using CPT we recover the spectral functions of the 2D lattice in the thermodynamic limit. A remarkable advantage of this approach is that unlike small clusters, the one-dimensional systems are already {\it infinite}. We can study the effects of the onset of long range order and its spectral signatures by extending our study to multi-leg ladders..

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