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Pairing, Phase Transitions and Nuclear Level Densities STEFAN ROMBOUTS, KRIS VAN HOUCKE, KRIS HEYDE, Ghent University — In a nuclear medium two protons or two neutrons can form a bound pair. Together with the average interactions with other nucleons this leads to the mean-field plus pairing Hamiltonian as a schematic model for correlations in nuclei. This Hamiltonian can be solved exactly even in large model spaces, using algebraic techniques or using quantum Monte Carlo methods (QMC). We will highlight two recent developments: the extension of the exactly solvable Richardson-Gaudin models to a more general separable pairing interaction, and a new QMC algorithm which is free of sign problems also for odd particle numbers. Combining algebraic solutions at low excitation energies with QMC results at high energies, we obtain accurate estimates of nuclear level densities, particularly in the region where a pairing phase transition might occur. Furthermore we can now evaluate symmetry-projected level densities, for specific parity and angular momentum. Results for Fe and Sn isotopes will be presented.

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