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ADIABATIC APPROXIMATION AND NON-ADIABATIC CORRECTIONS OF VERY HIGH-ORDERS

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Prospects for higher order perturbation theory in evaluating non-adiabatic corrections to the adiabatic energy levels are investigated by performing calculations on a series of two-dimensional anharmonically coupled oscillators. The convergence properties of the perturbation series are demonstrated for different harmonic frequencies and magnitude of perturbation. It is found that the perturbation series corresponding to the adiabatic levels which are away from intersections can be summed accurately, by means of the Pade summation technique, even in the case of "giant" couplings. The proposed "non-degenerate" perturbation theory procedure may also provide accurate results even in the case of intersecting energy levels. It fails to converge only in the regions which are close to the crossing points. Out of these regions, it converges safely, especially when using high-accuracy arithmetics, and provides thus basis for relatively accurate interpolating over the crossing regions.