Interaction between virtual states and resonance states in electron-polyatomic collisions

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We interpret the resonances in low-energy electron-polyatomic scattering with the help of a two-channel analytically solvable model. The model, which treats two partial-wave Hamiltonians with different l values coupled by a long range dipole interaction, is a generalization of similar single-channel models that have previously been used to interpret the low-energy behaviour of electron scattering by polar molecules.

The model allows us to study the effect of bending and stretching on both resonances and virtual states. We do this by tracking the poles of S-matrix in the complex k-plane as a function of bend and stretch.

The connection between resonant and virtual states is found to display a different topology in the case of a polyatomic molecule than it does in diatomic molecules. In a polyatomic molecule, these states1 may have a conical intersection and consequently acquire a Berry phase along a closed path in the two-dimensional vibrational motion.

References

W. Vanroose, C. W. McCurdy, T. N. Rescigno, Phys. Rev. A **66** 0327xx (2002)