THE EMERGENCE OF A SINGLE FRAME AND EFFECTS ON QUANTUM STATES AND LEVELS FOR ROTOR-ROTOR INTERACTIONS

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The theory of transformation between Body Oriented Angular (BOA) states and Lab Weakly Coupled (LWC) states was introduced by Chang and Fano[a] for treating interacting electron-diatomic rotor models of Hydrogen molecular Rydberg ions. It was extended in order to investigate more general rotor -excitation dynamics[b]. Here it is extended further to consider models of fluxional or "floppy" rotor-rotor systems. Rotor-rotor dynamics involves three frames (or four if the Lab is counted) that may be understood using classical, semi-classical and quantum approaches. It has found the third frame emerges when the coupling between rotors becomes very strong. The theory was extended to include the dynamics of symmetry effects in connecting LWC to BOA limits. Symmetry relations also help to understand the energy level and state frame transformation effects due to a "locking" or correlation of the two rotors. This includes unitary tableau schemes for finding rovibronic statistical weight for the total nuclear spin states and to investigate permutational properties of the individual nuclei in either the LWC or BOA limit as well as in between where most likely states are.

[a] E.S. Chang and U. Fano Phys Re. A6, p.173 (1972).

[b] W.G. Harter, C.W. Patterson, and F.J. da Paixao, Rev. Mod. Phys. 50 p. 37(1978).