

Tunneling Dynamics and Symmetry in Simple Hydrogen Compounds

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Hydrogen is the classic example for the importance of tunneling in spectroscopy and reaction dynamics. Tunneling by motion of hydrogen in Ammonia isotopomers is a classic textbook case [1], but still of interest today [2], and quite generally one expects tunneling processes to be important, whenever hydrogen is involved.

In the lecture we will concentrate on the subtle interplay between time dependent tunneling dynamics and symmetry properties of “nonrigid” hydrogen compounds in spectroscopy [3] and reaction dynamics [4]. Indeed, this interplay provides one interesting route to study fundamental symmetry breakings including parity violation [5-7] and tests for more fundamental symmetry violations such as the hypothetical CPT symmetry breaking [8, 9]. We will discuss current experimental and theoretical efforts on suitable chiral molecules and molecular complexes with hydrogen tunneling towards the study of such phenomena [5-12]. If time permits, we shall discuss, how even the very concept of molecular symmetry can be related to time dependent tunneling quantum dynamics.

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