SEMINAIRE ISMO

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Probing wave-particle duality in photoionization of polyatomic molecules

Coherent superposition of quantum objects (electrons) from spatially separated nucleon centers leading to the well-known Young-type interference pattern has been observed unambiguously for photoionization of H_2 and core-ionization of N_2. Similarly, following ionization from a core molecular orbital the wave associated with the ionized electron often gets partially scattered in the surrounding molecular potential, which then interferes with the initial wave giving rise to diffraction effects. However, for electron emission from a delocalized molecular orbital both phenomena can co-exist and it becomes hard to differentiate the two. An efficient method to study these effects can be studying the cross section ratios of different vibrational levels ("v-ratios") in the same electronic state of the molecule under investigation. According to the Franck-Condon principle, in absence of any diffraction or interference effect (as well as any shape-resonance), the v-ratios should essentially be an energy independent constant. However, a significant departure from the Franck-Condon values has been noted in the photon energy dependence of the v-ratios in cases of di- and polyatomic molecules.

In this talk, we will elaborate some new results showcasing the diffraction and interference effects for inner-valence photoionization of CH_4 molecule and valence photoionization of CO_2 molecule and how that fits into the overall research activities.

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