ENTANGLED PHOTON SPECTROSCOPY OF MOLECULES

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In this talk, I will discuss the growing field of entangled-photon spectroscopy as related to molecular systems. An entangled state is represented by a wavefunction, describing a group of particles, which cannot be factored into separate states of individual particles. For photons, these correlations lead to non-classical light-matter interactions, creating new opportunities for spectroscopic techniques. For example, second-order processes with two entangled photons, such as two-photon absorption or sum frequency generation, occur at a linear rate with a cross section that should be close to that of one-photon classical processes. However, early results in the field have produced conflicting measurements as to its magnitude. I will discuss the role of excited state dephasing and time-ordering for entangled photon interactions and their role in producing conflicting interaction cross sections for the same molecule on different experimental setups. I will also briefly remark on other interesting prospects of entangled photons, such as their ability to break the temporal-spectral Fourier transform limit. For instance, few-femtosecond spectroscopy is predicted to be possible with entangled light sources of MHz linewidths.