Abstract Submitted
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Quantum control of the normal modes of benzene with ultrafast laser pulses[1] PETRA SAUER, Texas A&M University, YUSHENG DOU, Nicholls State University, BEN TORRALVA, Livermore National Laboratory, ROLAND ALLEN, Texas A&M University — Remarkable innovations in laser technology have made it possible to create laser pulses with ultrashort durations (below 100 femtoseconds) and ultrahigh intensities (above 1 terawatt per cm^2). To understand the behavior of complex molecules and materials in this new regime of physics, chemistry, biology, and materials science requires innovative techniques which complement experiment and standard theory, and which can treat situations in which conventional approximations like the Born- Oppenheimer approximation, the Franck-Condon principle, and Fermi's golden rule are no longer valid. In this talk we describe a method that we are developing, semiclassical electron-radiation-ion dyanmics (SERID), which can be used to perform simulations of the coupled dynamics of electrons and nuclei in an intense radiation field. We have employed this technique in studying the normal modes of benzene, and the possibility of controlling these modes by optimizing the laser pulses that are applied to the molecule. Animations will be shown of particular normal modes, including the breathing and beating modes, illustrating their symmetries and other properties, and of the photodissociation of benzene when the laser pulse exceeds a threshold intensity.

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Roland Allen
Texas A&M University

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