Structure and field-induced dynamics of small helium clusters

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Small helium clusters are peculiar few body quantum systems. The helium dimer has a single weakly bound state of a huge spatial extent. About 80% of its probability distribution resides in the classically forbidden tunneling region [1]. This is why such objects are termed “quantum halos”. The helium trimer has two bound states, excited one of which is of Efimov nature [2]. We utilize laser-triggered Coulomb explosion imaging for measuring spatial probability distributions of these quantum objects. Application of an additional laser pulse in a pump-probe manner allows us to observe the structural picosecond response dynamics of small helium clusters upon interaction with a strong laser field.
The results on $He_2$ [3], $He_3$ as well as HeNe dimer will be discussed.

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