Ultrafast many-body electron dynamics in a strongly correlated ultracold Rydberg gas

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Many-body correlations govern a variety of important quantum phenomena such as the emergence of superconductivity and magnetism in condensed matter. Understanding quantum many-body systems is thus one of the central goals of modern sciences. Here we demonstrate a new pathway towards this goal by generating a strongly correlated ultracold Rydberg gas with a broadband picosecond laser pulse. We have applied our ultrafast and ultrahigh-precision coherent control [1-8] to this strongly correlated Rydberg gas, and have successfully observed and controlled its many-body electron dynamics on the attosecond timescale [9]. Our approach will offer a versatile platform to observe and manipulate nonequilibrium dynamics of strongly correlated quantum many-body systems on the ultrafast timescale.

References

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