Rydberg-state spectroscopy in thermal media and its applications

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We will discuss the Rydberg-state atom, EIT, quantum sensor, and quantum-state manipulation. Rydberg-atom spectroscopy has a few practical applications, including the measurement of atomic interactions between atoms and the sensitive detection of DC to THz external electric fields. The EIT feature, characterized by a narrow and high contrast, can be used to gather valuable information about interactions through external electric fields or Rydberg atoms. The performance of high-contrast Rydberg EIT can be improved by adjusting the laser intensities and medium's optical density [1, 2]. The small size of the Rydberg EIT system combined with strong light field intensity and long light-matter interaction make it possible to perform ultralow-light-level laser spectroscopy and precision measurement using Rydberg states [3]. This study has made significant advancements in using highly excited Rydberg states for dipole-dipole interactions, laser frequency stabilization, and traceable detection as a quantum sensor. In the future, the goal is to use thermal Rydberg atoms to create multiple quantum bits and gates in compact devices.

References:

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