Contribution ID : **28** Type : **In person**

Radio fields sensing based on Rydberg atoms

Tuesday, 23 July 2024 11:20 (25)

Rydberg-atom-based electric fields sensing is a surge of hot issue because of the potential performance of ultra-high sensitivity, wide-bandwidth and intrinsic traceability. In this topic, the progress of quantum sensing of radio fields is introduced in turn, including Rydberg-atom-based electric meter, atomic superheterodyne receiver based on microwave-dressed Rydberg atoms. The Rydberg-atom-based atomic superheterodyne receiver, conceptualized as a novel RF electric field sensor, has significantly enhanced sensitivity, potentially surpassing the classical noise limit. The Rydberg-atom superheterodyne allows SI-traceable measurements, reaching uncertainty levels of 10−8 V⊠cm−1. Moreover, the enhancing sensitivity using Mach-Zehnder interferometer are introduced. By the measuring the full atomic complex susceptibility, 12 dB SNR enhancement of microwave electric field sensing were achieved on the optimum frequency detuning of probe laser. The superheterodyne technology also enables the phase and frequency detection of microwave electric fields. Using L-shape beam array, Rydberg-atom phased array detection was demonstrated. To sensing Doppler frequency shift, sub-mHz frequency precision was reached. And this technique has been extended to the measurement of MHz electric fields, yielding enhanced sensitivity—an improvement by one order of magnitude compared to prior studies.

Primary author(s) : ZHANG, Linjie (Institute of laser spectroscopy, Shanxi university State Key Laboratory of Quantum Optics and Quantum Optics Devices)

Presenter(s) : ZHANG, Linjie (Institute of laser spectroscopy, Shanxi university State Key Laboratory of Quantum Optics and Quantum Optics Devices)