

Abstract Submitted
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Ultrahigh-sensitive sensor based on giant Lamb shift in a strongly coupled plasmonic-emitter system ZEYANG LIAO, YUWEI LU, RENMING LIU, XUE-HUA WANG, School of Physics, Sun Yat-Sen University, Guangzhou, 510275, China — Lamb shift is one of the most important quantum effects in quantum electrodynamics (QED). However, it is usually very small in the normal vacuum and is hard to be detected. Here, we show that due to the tightly confined vacuum field the photonic Lamb shift of a quantum emitter near a plasmonic nanostructure can be huge. Instead of measuring the emission of the quantum emitter itself, we show that the amplified Lamb shift of the emitter can also be observed from the absorption spectrum of the plasmonic structure which couples to the quantum emitter. Furthermore, we show for the first time that the Lamb shift can be used to precisely measure the emitter position and dipole orientation which may find important applications as a high sensitive sensor.

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