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Lamb Shift in the Near Field of Hyperbolic Metamaterial Half Space[1] NAI JING DENG, KIN WAH YU, The Chinese University of Hong Kong — Hyperbolic metamaterials give a large magnification of the density of states in a specific frequency ranges, and has motivated various applications in emission lifetime reduction, strong absorption, and extraordinary black body radiation, etc. The boost of vacuum energy, which is proportional to the density of states, is expected in hyperbolic metamaterial. We have studied the Lamb shift in vacuum-hyperbolic-metamterial half spaces and shown the non-trivial role of vacuum energy. In our calculation, the easy-fabricated multilayer structure is employed to generate a hyperbolic dispersion relation. The spectrum of hydrogen atoms is calculated with a perturbation method after quantizing the half spaces with a complete mode expansion. It appears that the shift of spectrum is mainly contributed by the terahertz response of materials, which has been well described and predicted in both theories and experiments.

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