

# Effects of nonlocality of the interaction of a muon with a nucleus on the lamb shift in muonic atoms

Gainutdinov R., Mutygullina A., Vasil'ev A.  
*Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia*

---

## Abstract

We investigate effects of nonlocality in time of the interaction of a muon with a nucleus, which is caused by the polarization of electronic vacuum on the Lamb shift in muonic atoms. The vacuum-polarization corrections to the energy levels of heavy muonic atoms are calculated with and without taking into account the nonlocality of the interaction. The results of the calculations show that the nonlocal corrections to vacuum-polarization contribution to the Lamb shift are comparable with the Kallen-Sabry correction that is of order  $\alpha^2(Z\alpha)$ .

<http://dx.doi.org/10.1117/12.801756>

---

## Keywords

Lamb shift, Muonic atoms, Nonlocal interaction, Vacuum polarization