

The proton size: status and perspectives

Paul Indelicato

Ecole Normale Supérieure, Paris (France)

In a recent experiment, we have obtained a very accurate proton charge distribution radius by measuring the Lamb shift in the 2s level of muonic hydrogen[1]. The value we found, while roughly 10 times more accurate than the one derived from either hydrogen spectroscopy or electron-proton elastic scattering, is 4% lower, 5 standard deviations away. I will show the results of the experiment and describe the latest theoretical evaluations of the muonic hydrogen Lamb shift. I will discuss possible reasons and implications of the large disagreement between the different methods. I will also show preliminary results on the Zemach radius (convolution of the charge and magnetic moment distributions), deduced from the 2s hyperfine structure.

[1] The size of the proton, R. Pohl, A. Antognini, F. Nez, F.D. Amaro, F. Biraben, J.M.R. Cardoso, D.S. Covita, A. Dax, S. Dhawan, L.M.P. Fernandes, A. Giesen, T. Graf, T.W. Hänsch, P. Indelicato, L. Julien, C.-Y. Kao, P. Knowles, E.-O.L. Bigot, Y.-W. Liu, J.A.M. Lopes, L. Ludhova, C.M.B. Monteiro, F. Mulhauser, T. Nebel, P. Rabinowitz, J.M.F. dos Santos, L.A. Schaller, K. Schuhmann, C. Schwob, D. Taqqu, J.F.C.A. Veloso and F. Kottmann. *Nature* 466, 213-216 (2010).