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The proton radius puzzle

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In 2010 the proton charge radius was extracted for the first time from muonic hydrogen, a bound state of a muon and a proton. The value obtained was five standard deviations away from the regular hydrogen extraction. Taken at face value, this might be an indication of a new force in nature coupling to muons, but not to electrons. It also forces to reexamine our understanding of the structure of the proton.

In this talk I will describe an ongoing theoretical research effort that seeks to address and resolve this “proton radius puzzle”. In particular, I will present a reevaluation of the proton structure effects, correcting 40 years of such calculations, and the development of new effective field theoretical tools that would allow to directly connect muonic hydrogen and muon-proton scattering.

Primary author: Prof. PAZ, Gil (Wayne State University)

Presenter: Prof. PAZ, Gil (Wayne State University)

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