Towards a precision measurement of charge radii of light nuclei

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Precise knowledge of nuclear properties such as charge and Zemach radii, as well as nuclear polarizabilites; are key for a better understanding of nuclear forces, the determination of fundamental physical constants, tests of bound-state QED and searches for New Physics. In this talk I will present QUARTET (QUAntum inteRacTions with Exotic aToms), a new experiment which aims to improve the charge radii of light nuclei from ^{6}Li to ^{22}Ne by up to an order of magnitude [1]. To accomplish this we will employ metallic magnetic calorimeters for x-ray spectroscopy of low-lying states in muonic atoms. These detectors offer for the first time the combined capability of a high quantum efficiency, high resolving power, and broadband capacity [2]. I will discuss the importance of these radii for benchmarking *ab initio* nuclear theory, as well as their interface with the next generation of precision measurements in light Helium-like ions [3, 4, 5].

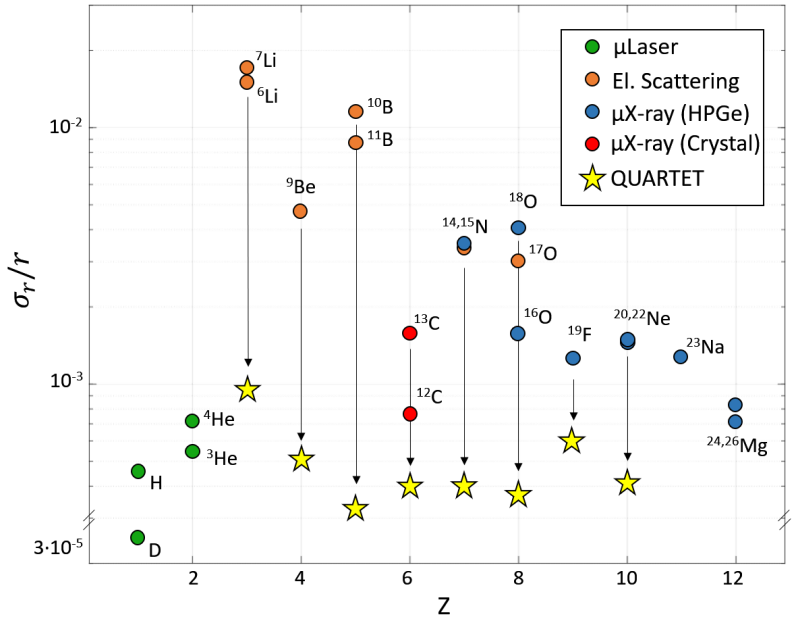

Figure 1: Current status and precision goals for charge radii of light stable nuclei.

[1] A. Antognini, *et al.*, arXiv:2210.16929 (2023).
[2] T. Sikorsky, *et al.*, Phys. Rev. Lett. 125, 142503 (2020).
[3] H. Guan, *et al.*, Phys. Rev. A, 102, 030801(R) (2020).
[4] X. Qi, *et al.*, Phys. Rev. A, 107, L010802 (2023).
[5] K. Mohr, *et al.*, Atoms, 11,1 (2023).