

Charge Radii of Nuclei by EUV and X-ray Spectroscopy of Highly Charged Ions

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Electron beam ion traps (EBITs) have proven to be a valuable tool for the spectroscopy of highly charged ions over the past few decades. Na-like and Mg-like ions are especially interesting in the context of nuclear charge radii sensitivity due to the enhanced overlap of their ground-state wave functions with the nucleus. Their strong 3s–3p emission can be measured with high precision experimentally in the extreme ultraviolet and x-ray spectral ranges. A careful assessment of the uncertainties in advanced atomic structure calculations makes these measurements competitive with standard nuclear charge radii determination techniques. We report on this method for determining the absolute nuclear charge radius of medium to high atomic number elements. The measurement utilizes only a few million ions stored in an ion trap, which is advantageous for measurements involving small quantities of sample nuclei. Preparations are underway to apply the technique to radioactive nuclei.

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