Recent advances in the study of the Bohr-Weisskopf effect - New measurements and an improved theoretical description *

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The Bohr-Weisskopf effect (BWE) arises from both the spin/orbital composition and the finite radial/angular distribution of nuclear magnetization. As such, this atomic observable could provide important new information on nuclear structure and structural evolution. Although this effect was first described by A. Bohr and V. Weisskopf some 75 years ago [1], measurement of this observable has for the most part been limited to stable isotopes. Indeed, for many years, atomic spectroscopists such as myself have tried to avoid systems in which this effect could be visible. This aversion has predominantly been driven by the added complexity in extracting the 'bread and butter' observables of laser spectroscopy in radioactive nuclei [2]. In recent years, this field of research has seen renewed interest. A new compilation of all known hyperfine anomalies was published in 2023 [3], the first observation of the BWE in a molecular system has recently taken place [4], and atomic theory has developed to the point where meaningful calculation of the relevant parameters is ensured [5]. At CERN-ISOLDE an ERC project led by M. Kowalska aims to extend measurement of the BWE to radioactive nuclei across the nuclear chart. In this contribution, the physics behind the BWE will be explored, along with recent experimental techniques, results, future objectives, and theoretical developments. In summary, as every sailing physicist knows, it is far more important to measure the Speed Over Ground (SOG) as opposed to Speed Through the Water (STW). Here, both will be explored.

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