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Laboratory measurements of K-shell transitions in highly charged iron ions RENÉ STEINBRÜGGE, Texas A&M University, Max Planck Institute for Nuclear Physics, JAN K. RUDOLPH, Giessen University, Max Planck Institute for Nuclear Physics, SVEN BERNITT, JOSÉ R. CRESPO LÓPEZ-URRUTIA, Max Planck Institute for Nuclear Physics — The x-ray spectra of celestial sources show a plethora of features originating from highly charged ions. These can be used to determine the flow, temperatures, and abundances of elements in the star, which are needed to benchmark-stellar evolution models. However, the underlying atomic transition data of the ions are often only known by theoretical calculations, thus testing them in laboratory measurements is crucial. We present our measurements of energies, natural linewidths[1], radiative and Auger decay rates[2] for K-shell transitions in He-like to F-like iron ions. In this experiments, an electron beam ion trap was used to create a target of highly charged ions, which were resonantly excited by monochromatic light from the PETRA III synchrotron radiation source. Fluorescence was observed while simultaneously detecting photoionization by the change in the ionic charge state. This method, combined with the high resolution of the monochromator used, yields uncertainties on the ppm-level for the excitation energies and below 10% for the linewidths and transition rates, thus providing a valuable benchmark for atomic theory.

[1]J. K. Rudolph et al., Phys. Rev. Lett. 111, 103002 (2013)
[2]R. Steinbrügge et al., Phys. Rev. A 91, 032502 (2015)

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