High-precision calculation of the structure of astrophysically relevant Fe ions

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The dynamics of astrophysical objects, such as coronal plasmas, stellar winds, outflows, and accretion disks can be studied using the Doppler shifts and widths of emission lines of highly charged *Fe* ions, recorded by space observatories. High-precision calculations of these systems may be important for astrophysical research: as an example, velocities of astrophysical objects relative to the observer may be determined once the frequency in the emitter (ionic) frame is well known from theoretical calculations or from experiments [1-4].

In the work, accurate calculations of the visible and x-ray transition energies in highly charged $^{56}_{26}Fe$ ions with charge numbers from 13+ to 16+ are presented. Relativistic electron correlation calculations are performed within the framework of the configuration interaction method with Dirac-Fock-Sturmian basis functions [5] and within the framework of the Multi-Configuration Dirac-Fock method [6]. For the $3p_{3/2} \rightarrow 3p_{1/2}$ green magnetic dipole transition in aluminium-like *Fe*, we take into account quantum electrodynamic effects by employing an effective screening potential [7]. The results are compared to electron beam ion trap measurements.

References:
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