ACCURATE NEW ATOMIC DATA AND ITS APPLICATIONS: LABORATORY ASTROPHYSICS AT IMPERIAL COLLEGE LONDON

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We report on recent results from the Imperial College Spectroscopy Laboratory, in particular new accurate atomic data for astrophysics applications. The importance of accurate atomic data, for example oscillator strengths, for analyses of modern astrophysical spectra has been highlighted for many years, in particular for the line rich iron group elements seen in stellar spectra. The Imperial College team continues to provide accurate wavelengths, atomic energy levels, hyperfine structure data and oscillator strengths, measured using high resolution Fourier transform spectrometry (visible-VUV) at Imperial College, and also in collaboration with other groups such as Lund Observatory, the group of J.Lawler at Wisconsin and the team of G. Nave at the NIST quantum measurement division.

We have been measuring a range of Fe I and Fe II oscillator strengths for the SDSS III/APOGEE and Gaia-ESO Galactic evolution surveys [1-4]. With the term analysis, and new accurate energy levels and wavelengths for V I and V II completed [5], we have recently published our measurements of V I oscillator strengths in the UV - IR (304-2000 nm) combining branching fractions measured by FTS and level lifetimes from the Lund Laser center [6]. Our new study for Co III, with applications for hot stars, has given order of magnitude improvement in wavelengths and energy levels, with 734 classified lines, uncertainty of strong lines ~ 0.004 cm^{-1}, and 287 of 288 levels have been revised [7].

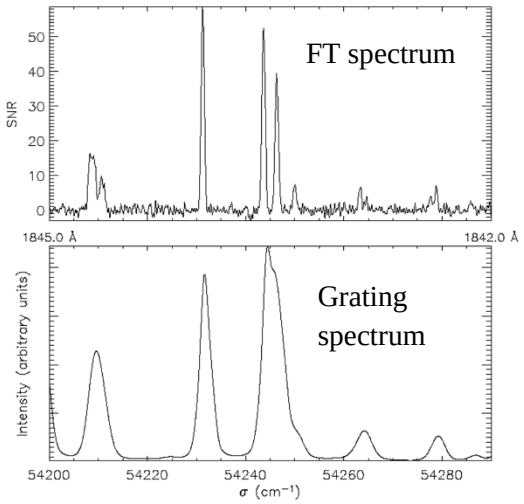

Figure 1: A section of Co III spectrum recorded using a Penning discharge lamp by FTS (top) and Grating (bottom) [7]

Term analyses of Mn I, Mn II, Ni II and Cr I are underway in collaboration with NIST, with new and revised energy levels being found using a combination of FTS and also grating spectroscopy at wavelengths beyond the FTS cut-off in the VUV. A study of Co II hyperfine structure is close to completion.

References

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