Empirical Verification of the Fe II Oscillator Strengths in the FUSE Bandpass

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abstract

We report empirical determinations of atomic oscillator strengths, or $f$-values, for 11 ground-state transitions of Fe II in the wavelength range 1050–1150 Å. We use ultraviolet absorption line observations of interstellar material towards stars in the Galaxy and the Magellanic Clouds taken with FUSE, the Goddard High Resolution Spectrograph on-board the Hubble Space Telescope, and the Far Ultraviolet Spectroscopic Explorer. We derive absolute oscillator strengths by a combination of the apparent optical depth, component fitting, and curve-of-growth fitting techniques. Our derived oscillator strengths are generally in excellent agreement with recent theoretical calculations by Raassen & Uylings using the orthogonal operator technique. However, we identify three of the eleven transitions studied here whose $f$-values seem to be incompatible with these calculations, by as much as a factor of two. We suggest revisions to these $f$-values based upon our analysis.
\( \mu \) Columbae

\( \log N = 14.29 \pm 0.02 \)
\( b = 12.9 \pm 0.2 \)
\[ \log N = 14.49 \pm 0.02 \]

\[ b = 6.6 \pm 0.2 \]
δ Orionis

\[ \log N = 14.08 \pm 0.03 \]
\[ b = 10.3 \pm 1.3 \]