Accurate VUV laboratory measurements of Fe III transitions for astrophysical applications.

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Abstract

We report preliminary measurements of Fe III branching fractions covering the wavelength range 1150 to 2500Å. Spectra of iron-neon Penning discharge lamps between 1600 and 2500Å were recorded at Imperial College (IC) using Fourier transform spectroscopy (FTS). Deuterium standard lamps provided a radiometric calibration of the spectra. These spectra are the first radiometrically calibrated measurements of a doubly-ionized element using vacuum ultraviolet FTS. The FTS measurements were extended down to 1150Å using high-resolution grating spectroscopy at the National Institute of Standards and Technology (NIST). Phosphor image plates were used as detectors, and the spectra were radiometrically calibrated with a deuterium lamp. These detectors have a linear intensity response with a dynamic range of at least 10000, enabling us to measure branching fractions of doubly-ionized spectra down to 1150Å or below.

Accurate branching fractions have been determined for all transitions from the upper level $^7\mathrm{P}_j$, including the intercombination branches. These will be combined with lifetimes to yield oscillator strengths. The spectral range of the new laboratory measurements corresponds to recent HST/STIS observations of sharp-lined B stars and of Eta Carinae. The new improved atomic data can be applied to abundance studies and diagnostics of astrophysical plasmas.

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