

§6. Comparison of the Satellite Lines of H-like and He-like Spectra

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The two kinds of theoretical atomic data by MZ method with Z expansion¹⁾ and AUTOLSI method with intermediate coupling²⁾ for the wavelengths and the dielectronic and inner shell satellite lines of H-like ions and He-like Fe, Ca and S ions are compared in a form of the synthetic spectra. The agreement is rather good within 20% for main satellite lines.

The dielectronic satellite lines are important for plasma diagnostics to derive the electron temperature in plasmas from the X-ray spectra. The dielectronic satellite lines have been calculated by several authors. Itikawa et al(1995) reviewed and recommended the atomic data of excitation, ionization and recombination for He-like S, Ca and Fe ions.

Generally agreement is within 10% for the strong satellite lines and 20% for $n = 3$ and $n = 4$ satellite lines, except for the dielectric satellite lines B-like Fe ions which differs more than 30%. The derived electron temperature from Safronova data is about 10% larger than that by Cornille's data for the Fe He-like spectra.

Highly resolved X ray spectra of He like S XV, Ca XIX and Fe XXV ions from solar flares have been measured by Bragg crystal spectrometer flown on the Yohkoh satellite. We show the examples of the analysis using the two sets of data by Safronova and Cornille for the flares of September 6, 1992 (Kato et al(1993)).

The wavelengths obtained from observed spectra are the relative values which depend on the position of the flare on the Sun since the wavelength has been set for the flare at the center of the Sun. The ion ratio $n(\text{B})/n(\text{Li})$ derived by the data by Cornille is 0.5 which is larger than that by Safronova by about factor of two. This is due to the difference of the B-like dielectronic satellite

lines near 1.878Å.

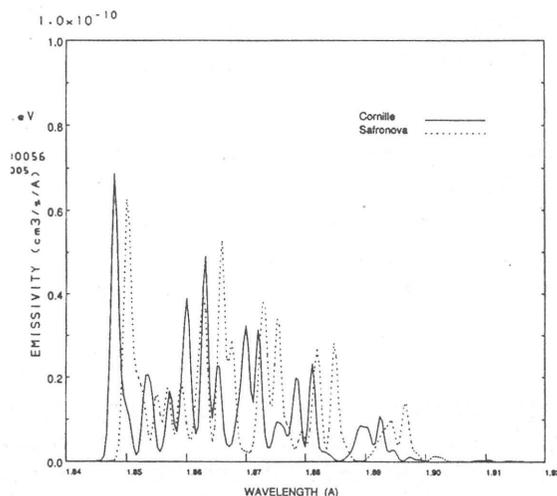


Fig.1 Comparison of the dielectronic satellite lines of Li, Be, B and C-like Fe ions including excitation lines.

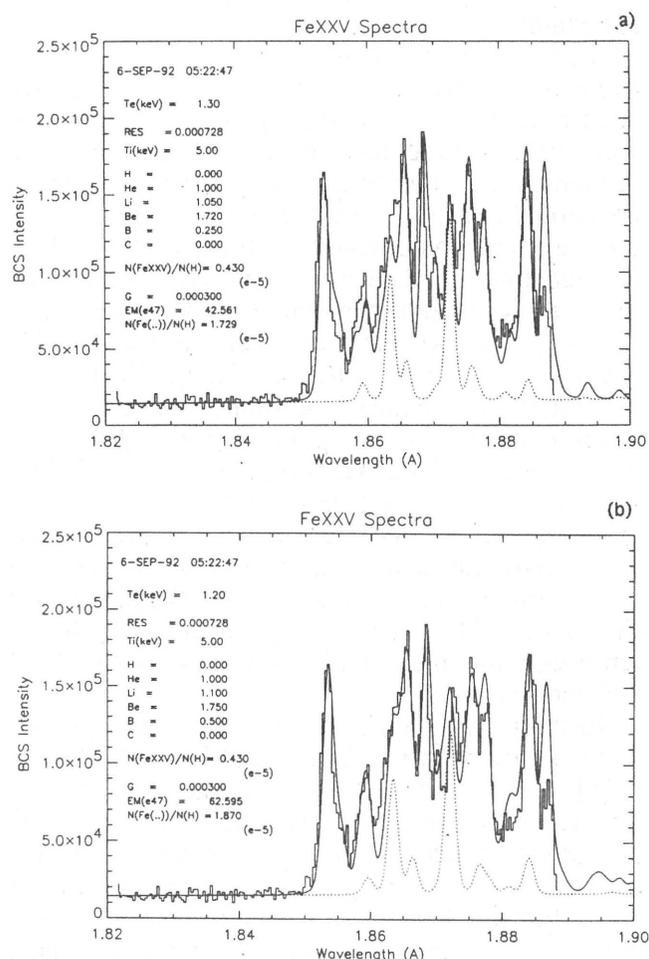


Fig.2 Comparison of the fit with two atomic data for Fe XXV X-ray spectra. (a) Safronova, (b) Cornille data.

- 1) Vainshtein and Safronova, ADNDT, 21 (1978)49
- 2) TFR group, Dubau and Loulergue, J. Phys. B, 15 (1981) 1007
- 3) Itikawa, Kato, Sakimoto, ISAS Report, 654 (1995)