LABORATORY DATA ON ATOMIC SPECTRA FOR EXTREME ULTRA-VIOLET SOLAR SPECTROSCOPY (*)

by B. EDLÉN

(Fysiska Institutionen, Lund, Suède)

RÉSUMÉ. — *A partir des observations du spectre XUV solaire, on estime l'importance relative des différents éléments à différents niveaux d'ionisation. En dehors de H et He, on n'a à considérer que* 3 *groupes d'éléments* : (*C, N, O*) ; (*Ne, Mg, Si, Fe*) *et* (*Na, Al, Si, Ar, Ca, Ni*) ; *les abondances relatives de ces trois groupes décroissent d'un ordre de grandeur de l'un à l'autre, tous les autres éléments étant encore un ordre de grandeur moins abondants. On ne peut s'attendre à observer les raies des atomes faiblement ou moyennement ionisés que pour les éléments les plus abondants. La présence de raies de l'atome Fe XVII, qui est du type Ne suggère de ne pas exclure* a priori *les états d'ionisation très élevés.*

On en déduit que la discussion des résultats de laboratoire peut se limiter aux atomes contenant de 1 *à* 18 *électrons. On passe en revue les résultats concernant ces séquences isoélectroniques.*

La conclusion est que si les données nécessaires sont bien connues pour les 10 *premières séquences, il reste un travail considérable à faire en laboratoire en ce qui concerne les autres séries.*

ABSTRACT. — *Expected relative prominence of elements and ionization stages is estimated from existing recordings of the solar XUV spectrum. The following* 3 *groups of elements, apart from H and He, need be considered* : (*C, N, O*), (*Ne, Mg, Si, Fe*), (*Na, Al, S, Ar, Ca, Ni*), *the relative abundance descending by approximately an order of magnitude from one group to the next, and all other elements being at least another order of magnitude less abundant. Lines of low and medium stages of ionization are expected only from most abundant elements. The observed presence in the solar spectrum of lines from the neon-like Fe XVII suggests that very high stages of ionization must not be* a priori *excluded.*

These considerations indicate that a discussion of laboratory data may be confined to atomic systems containing from 1 *to* 18 *electrons. Observed data on these* 18 *isoelectronic sequences, and the possibilities of their extrapolation, are reviewed. It is concluded that required data for the first* 10 *sequences are well in hand, but considerable laboratory work remains to be done on the third-period sequences.*

A comprehensive paper is being prepared for later publication.

Резюме. — Исходя из наблюдений солнечного спектра X U V, оценено относительное число различных элементов с различными ионизационными уровнями. Помимо H и He, достаточно рассматривать лишь 3 группы Элементов : (C, N, O), (Ne, Mg, Si, Fe) и (Na, Ae, Si, Ar, Ca, Ni) ; относительные обилия этих трех групп убывают на один порядок от одной к другой, все остальные элементы будучи еще менее обильными на один порядок. Наблюдения линий слабо или средне ионизованных атомов можно ожидать лишь для самых обильных элементов, Наличие линий атома Fe XVII, являющегося типа Ne, подсказывает, что не должно a priori исключать очень высокие ионизационные состояния.

Отсюда выведено, что обсуждение лабораторных результатов может быть ограничено атомами, содержащими от 1 до 18 электронов. Просмотрены результаты относящиеся к этим изоэлектронным рядам снимков.

Заключение следующее : если необходимые данные хорошо известны для первых 10 рядов, то, что касается других рядов, предстоит большая работа в лаборатории.

Discussion

L. H. ALLER. — Does not configuration interaction produce great difficulties in line strength calculations ? In fact, is there any means of computing f-values for configuration interaction ?

B. EDLÉN. — Configuration interaction complicates the calculation of line strengths, but the problem can be mastered as shown, for example, by GARSTANG's (1962) treatment of Fe XIV.

L. GOLDBERG. — Why is it difficult to observe the resonance lines of Fe XIV in the laboratory ?

B. EDLÉN. — The spectrum of iron from a laboratory light source capable of producing Fe XIV does not seem to have been investigated as yet in the region of the $3s^2\,3p - 3s3p^2$ transitions with predicted wavelengths from 250 to 370 Å. The spectrograph used in my early studies of the iron spectra was limi-

(*) In agreement with the Executive Committee of the Symposium and Dr B. EDLÉN and also to avoid multiplying publications it has been decided to publish only an abstract of this paper. A more complete article on this subject is being written for *Space Science Reviews*.

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ted to the region below 250 Å. In the region of the $3s^2\ 3p - 3s^2\ 3d$ transition, around 220 Å, the observed spectrum from the undamped vacuum spark was so complicated by the great number of lines from the corresponding $3p - 3d$ transitions of the lower ionization stages of iron that a reliable identification of the Fe XIV lines was not possible. It seems that other light sources, for instance the Zeta machine, can produce a narrower selection of ionisation stages and thus improve the conditions for an analysis. Two of the « Zeta » lines can be tentatively identified with $^2P_{1/2} - {}^2D_{3/2}$ and $^2P_{3/2} - {}^2D_{5/2}$ of $3s^2\ 3p - 3s^2\ 3d$.

Mrs E. P. SMITH. — I would like to inquire of Dr. EDLÉN whether the lines observed in the laboratory and attributed to Fe XIV agree in wavelength with the prediction by GARSTANG.

B. EDLÉN. — The lines due to the transitions $3s^2\ 3p - 3s\ 3p^2$ and $3s^2\ 3p - 3s^2\ 3d$ in Fe XIV, for which GARSTANG has predicted the wavelengths, have not been yet identified with certainty in a laboratory spectrum. A very tentative identification of two « Zeta » lines would indicate an agreement to about 3 Å in the case of $3s^2\ 3p - 3s^2\ 3d$.

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