THE EXPECTED BEHAVIOUR OF THE HYDROGEN LYMAN LINES IN SOLAR FLARES*

Z. ŠVESTKA**
Space Science Department, ESTEC, Noordwijk, The Netherlands

and

L. D. DE FEITER
The Astronomical Institute, Utrecht, The Netherlands

While the merging of the higher lines of the Balmer series emitted by solar flares is solely determined by the electron density, the merging of the high Lyman lines is determined both by the electron density, through Stark broadening of the line absorption coefficient, and by the total number of hydrogen atoms in the flare, through the effect of self-absorption. Preliminary results of model calculations indicate that two or more intensity measurements, each midway between two consecutive lines of the Lyman series (lines 3–4, 4–5, 5–6) allow the determination of the column density of hydrogen atoms in the ground state provided that the electron density is known. One can believe that in between the Lyman lines only the flare elements contribute to the measured intensity since excited interflare matter of much lower electron density produces line profiles of substantially smaller width. Thus the data in between the lines can be reasonably compared to the N_e values deduced from high members of the Balmer series.

DISCUSSION

H.J. Kunze: When calculating your line profiles you considered essentially broadening only due to charged particle fields. However, as we heard in the previous talks, solar flares are strongly non-thermal plasmas, so substantial contributions to the broadening from wave fields are possible. Could this be important in your considerations?

L. D. De Feiter: The observations reported earlier refer to the high-energy flare, where the temperatures are in excess of 10^6 K. The hydrogen emission, reported upon in this paper, is emitted by flare regions at a temperature of about 10^4 K. Although non-thermal Doppler broadening may play a role also in those low-temperature regions, we believe that its contribution is small as compared to the broadening by Stark effect.

* The final paper will be submitted to *Solar Physics*.
** Senior Visiting Scientist to ESTEC, 1971–1972.

Space Science Reviews **13** (1972) 824.