PAPER 15

DETECTION OF THE SPECTRAL LINE OF DEUTERIUM FROM THE CENTRE OF THE GALAXY ON THE WAVE-LENGTH OF 91·6 CM.

G. G. GETMANZEV, K. S. STANKEVITCH AND V. S. TROITZKY
Gorky State University, U.S.S.R.

As was shown by I. S. Shklovsky, a radio spectral line from interstellar deuterium on $\lambda_D = 91{\cdot}6$ cm. ($f_D = 327{\cdot}38424$ Mc./s.) may be expected [1]. According to Shklovsky the difference between the effective temperature T_{eff} in this line and outside it must be of the order of $1/500\ T_{\text{eff}}$ in the direction of the galactic centre, if the concentration of deuterium equals 10^{-3} that of hydrogen. In this case, contrary to the emission by hydrogen, an absorption line is expected. As T_{eff} equals about 300° the depth should be of the order of 0·6°.

For measurements of this spectral line an aerial consisting of a 4-metre paraboloid with a half-wave dipole located in its focus was used. The time constant of the arrangement is about 90 sec. The noise factor $N \sim 10$ was measured by means of a standard generator. The width of the high-frequency band was about 15 kc./s., and the fluctuation threshold of the sensitivity of the arrangement T_{min}, expressed in the aerial temperature, is about 4°.

In the process of the observations the frequency of the second heterodyne was varied smoothly in an interval near f_D. These observations embrace the period of time from October 1954 till June 1955 inclusive. About fifty-three records were obtained during this period. As the expected effect is less than the value of T_{min}, the ordinates for a great number of individual records are averaged. The resulting mean curve is a typical record of a radio absorption line. The width of the line contour determined from the mean curve is of the order of 30 kc./s. The effective temperature, corresponding to the 'depth of the line', determined from the records, equals 2°5 (probable limits 1°5 to 4°5). This value corresponds to a concentration of the deuterium of about 1/300 atom./cm.^{3} in the direction towards the centre of the Galaxy.

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Monochromatic radiation near f_D was absent when the aerial was directed to the pole of the Galaxy. This result might be interpreted in the sense that the concentration of deuterium in the direction to the galactic poles is much less than in the direction to the galactic centre, which seems to be quite natural.

REFERENCE

[1] Shklovsky, I. S. *A.J. U.S.S.R.* **29**, 144, 1952.

*Discussion**

Pawsey: Corresponding observations were attempted in Sydney by G. J. Stanley and R. Price in 1954. They used an 80-ft. diameter paraboloid directed near to the zenith (declinations around $-34°$) and examined several regions near the galactic centre. Their results were negative but since their estimated uncertainty in intensity was a degree or so the results were not inconsistent with those reported by Getmanzev and his colleagues. (Note dated 24 October 1955.)

Hey: We are also attempting to detect the deuterium line at the Radar Research Establishment (Malvern, England). We have suffered from a certain amount of interference but the results indicate no absorption line of more than $1/2°$ K. aerial temperature in a direction near the galactic centre. Our aerial has a beam-width of approximately 10°, and owing to certain limitations due to the position of the site and the aerial beam-width we are making observations with a fixed aerial direction such that the galactic equator crosses the axis of the beam about 5° from the galactic centre. More observations are needed before we can be quite definite. (Note dated 8 November 1955.)

* These data were not given in detail at the symposium but were submitted in later correspondence, as noted. [*Editor.*]

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