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PHYSICS OF IONIZED GASES UNIT

Annual Report for 1966

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Much progress has been made in the investigations over the last year. The apparatus has been developed to the stage where as much as 8 microamperes of protons can be obtained at a target in the ultra-high vacuum analysing end of the system, at pressures as low as 10^{-8} torr. Under these circumstances, the limit to the vacuum is set by the gas contributed by the beam itself. These conditions are an order of magnitude better than any previously reported.

Mr. Cawthron has made observations of the secondary emission of electrons from a platinum target upon which the beam impinges. The target could be heated to drive off all adsorbed gas, and measurements were taken while the target was at red heat, and at intervals after the heating was cut off. The results indicate a slow contamination of the target, the emission reaching a higher, steady value after some minutes. It is difficult to analyse the observations except on the assumption that there is an effect of temperature upon the emission, a result hitherto denied. Further work with targets which can be heated and cooled rapidly is necessary to make certain that a temperature effect exists, and rapid recording on a cathode ray oscillograph must replace the present electrometers. If a temperature effect is established, it will have important repercussions upon the theory of the process, and upon the cathode mechanisms of the glow and arc discharges in gases.

The equipment required for observation of the charge exchange process with protons in atomic hydrogen is being assembled. By making the scattering volume totally enclosed in a chamber cooled with liquid helium, and by using cryopumping on the chamber so that there are no collisions other than in the scattering volume, it should be possible to carry out clean experiments, the results of which can be compared, with confidence, with theoretical predictions. This apparatus should be in operation early next year.

Publications

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- Oliphant, M. L. - "The Two Ernests" - Part 1 - Physics Today. Vol. 19, No. 9, (1966).
- Oliphant, M. L. - "The Two Ernests" - Part 2 - Physics Today. Vol. 19, No. 10, (1966).
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