ly. On the other hand, the situation investigated here may have a valid application to the tenuous plasma of the sun's corona and possibly these simple types of Vlasov instabilities have some connection with solar prominences.

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PROTON GYROMAGNETIC RATIO

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The proton precession frequency has been measured in a 12-gauss magnetic field supplied by a precision solenoid. The technique used was a variation of the free precession methods of Hahn[1] and of Packard and Varian.[2] The sample consisted of a 2-cm diameter sealed glass sphere containing distilled water. It was polarized in a 5000 gauss field and then shot through a forty-foot pneumatic tube into the center of the solenoid. After arrival about two seconds later the magnetization was still large and lay along the direction of the solenoid field. A short pulse at the resonance frequency of about 52.5 kilocycles/sec was then applied perpendicular to the solenoid axis. This pulse left the magnetization perpendicular to the field direction and precessing about it. The precession frequency was obtained by measuring the period for a given number of cycles of the signal induced in a pickup coil surrounding the sample. The Q of the pickup coil was kept low to prevent radiation damping and possible associated frequency shifts.[3,4] The average period over a three second time interval could be measured to $1:10^7$ with this method.

The solenoid[5] used in this experiment consisted of a single-layer helical winding in a lapped groove on a fused silica form. The value of the magnetic field was calculated from the carefully measured geometry of the solenoid and the current through it. The only critical dimension was the pitch, which could be measured to about 1 ppm. Extensive efforts were made to prevent errors due to slightly magnetic materials used in or near the solenoid. The components of the earth's field perpendicular to the solenoid axis were cancelled out and the solenoid current was reversed between measurements to average out the component of the earth's field along the axis. In order to avoid magnetic field gradients and man-made perturbations, the experiment was carried out at the Fredericksburg Magnetic Observatory of the U. S. Coast and Geodetic Survey.

In the final measurements with the apparatus the scatter was usually less than 1 ppm. Most of this was due to short-term variations in the earth's field and in the current through the solenoid. For protons in water the preliminary result that has been obtained in terms of the NBS electrical standards is $\gamma_p = (2.67515 \pm 0.00001) \times 10^4$ gauss^{-1} sec^{-1}. Benzene was found to give a result 1.9 ± 0.2 ppm higher. The accuracy of the result will be increased somewhat when further measurements on the solenoid pitch are available and when more checks on other possible sources of small systematic errors have been made. Measurements with a second precision solenoid on a Pyrex form are also under way.

When the above preliminary value is combined with the results of recent determinations of the NBS ampere in absolute measure,[5,6] the result for water, uncorrected for diamagnetism,[7] is $\gamma_p = (2.67513 \pm 0.00002) \times 10^4$ gauss^{-1} sec^{-1}. This value differs somewhat from the widely used value of $\gamma_p = (2.67523 \pm 0.00006) \times 10^4$ gauss^{-1} sec^{-1} obtained by Thomas, Driscoll, and Hipple[8] using the value for the NBS ampere as given at the time of their experiment. Both measurements are in disagreement with a value of $\gamma_p = (2.67549 \pm 0.00008) \times 10^4$ gauss^{-1} sec^{-1} published recently by Wilhelmy.[9]

Recently Cohen and DuMond[10] have given corrections to their 1955 set of adjusted values of the atomic constants[11] for a revised theoretical estimate of the anomalous moment of the electron. However, if the present value of the proton gyromagnetic ratio were used instead of the value obtained by Thomas, Driscoll, and Hipple, the values of a number of the constants in the 1955 adjustments of Cohen, DuMond, Layton, and Rollett[11] and of Bearden and Thomsen[12] would be changed by about twice the quoted uncertainties. The values given should thus be regarded as uncertain to about this degree.

In view of the necessary choice of weights for the various measurements of the proton gyromagnetic ratio and the preliminary nature of the present result, it does not seem desirable to calculate improved values for the atomic constants at this time. It is interesting to note, however, that the present value of the gyromagnetic ratio, when combined with the average of the available proton cyclotron resonance results,[13] gives a value for the Faraday which is about half-way between the values obtained from the iodine and the silver voltameters.[11,12] A new complete adjustment of the constants should be delayed until a number of relevant experiments now under way are completed. At that time the value of the ampere as maintained by the national laboratories will probably be one of the quantities to be adjusted.

We would like to express our thanks to the many people at NBS who have contributed to this experiment. In particular we would like to thank L. Costrell who designed the electronic apparatus and R. D. Cutkosky and L. M. Branscomb who collaborated on the early part of the experiment. We are very much indebted to the U. S. Coast and Geodetic Survey for permission to carry out the experiment at the Fredericksburg Magnetic Observatory, and to Mr. R. E. Gebhardt and the members of the Observatory staff for their active cooperation. We should also like to thank M. Packard and A. L. Bloom of Varian Associates for valuable information on free-precession measurements in the earth's field.

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GAMMA-RAY BRANCHING AND SOME SPIN AND PARITY ASSIGNMENTS IN B^{11}

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Recent measurements have been made with the Chalk River electrostatic accelerator on the gamma-ray branching of the lower states of B^{11} populated in the reactions $Be^9(He^3,p\gamma)B^{11}$ [1] and $Li^7(\alpha,\gamma)B^{11}$.[2] Figure 1 shows the gamma-ray decay schemes obtained principally from the $Be^9(He^3,p\gamma)B^{11}$ reaction. In this set of experiments the gamma spectrum from each level was separated from the others by coincidences measured with the appropriate proton group. A small CsI proton counter resolved the proton groups to the levels up to the one at 8.92 Mev with the exception of the doublet at 6.76-6.81 Mev. This doublet has been resolved using a double-focussing "Kellogg" magnetic spectrometer. The gamma rays were detected in a 5 in. diam ×4 in.

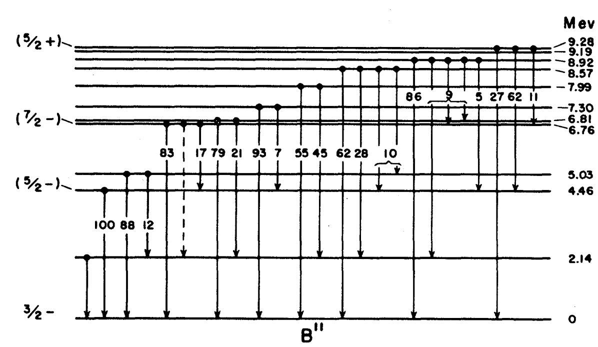

FIG. 1. Gamma-ray branching in B^{11}. The levels up to 8.92 Mev were obtained from the reaction $B^9(He^3,p\gamma)B^{11}$. The 9.28-Mev level was obtained from the reaction $Li^7(\alpha,\gamma)B^{11}$.