Furthermore it was found that Rb^{91} has an isomeric state. Both these states of Rb^{91} (half-lives 100 sec and 14 min, respectively) decay to the well-known Sr^{91} 9.7 hr which again decays to the 60-day and the 50-min isomers of Y^{91}. All these radioactivities were found in the samples of mass number 91.

A more detailed account of the experiments will be published elsewhere.[2]

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The Nuclear Magnetic Moment of I^{129}

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THE nuclear resonance of long-lived radioactive I^{129} has been observed in a nuclear induction apparatus of the type originated by F. Bloch and similar to that recently described by Proctor.[1] The sample contained 33 mg of total iodine, as iodide, in a hydrazine solution. The iodine was isolated from fission products by one of the authors (G. H.). The I^{129} content was estimated to be 80 percent, the remainder being stable I^{127}. Heavy water was added to the solution, and all frequency ratio measurements were relative to deuterium. No magnetic catalyst was added. Frequency measurements were made with a Signal Corps type BC-221 frequency meter calibrated with harmonics from an external 100 kc, crystal-controlled oscillator which in turn was compared with WWV at 10 Mc. Frequency measurements made at nominal fields of 9500 and 12,200 gauss gave

$$\nu(I^{129})/\nu(D)=0.86744\pm0.0001.$$

Measurements were also made on I^{127}, but, since the resonance was weak in the original sample, a separate, chemically similar solution was used with a larger amount of I^{127} added. Measurements at nominal fields of 7500 and 9300 gauss gave

$$\nu(I^{127})/\nu(D)=1.30337\pm0.0002.$$

Measurements on I^{127} were also made in a sodium iodide solution and were not significantly different from the above.

Using Levinthal's[2] deuteron-to-proton frequency ratio of 0.1535059, the above ratios yield the following frequency ratios relative to the proton:

$$\nu(I^{129})/\nu(H)=0.13316$$
$$\nu(I^{127})/\nu(H)=0.20007_5.$$

With an iodine diamagnetic correction of 0.545 percent,[3] a spin of 7/2 for I^{129} [4] and 5/2 for I^{127},[5] and a value of 2.79268 nuclear magnetons[6] for the proton moment, these ratios give the following values of nuclear magnetic moments, in units of the nuclear magneton

$$\mu(I^{129})=+2.6173\pm0.0003$$
$$\mu(I^{127})=+2.8090\pm0.0004$$
$$\mu(I^{127})/\mu(I^{129})=1.0732.$$

The indicated estimated accuracy of the above values does not include the uncertainty in the diamagnetic correction. The sign of the I^{129} magnetic moment was obtained by comparison with I^{127} and D which are known to be positive.[1]

A previous measurement[7] of the nuclear magnetic moment of I^{129} made by microwave spectroscopy gave 2.74 ± 0.14 nuclear magnetons, which is consistent with the above value. The I^{127} results can conveniently be compared with published data in terms of the ratio of the I^{127} frequency to the proton frequency. Pound's[8] ratio for I^{127} relative to Na^{23}, 0.75664 ± 0.0002, has been converted to the ratio relative to the proton by using Bitter's[9] Na^{23}-to-proton ratio of 0.26450 ± 0.000026. This ratio and the ratio relative to the proton determined by Zimmerman and Williams[10] are compared below with the ratio obtained in this work.

$\nu(I^{127})/\nu(H)$	
0.20013 ± 0.00005	Pound
0.20003 ± 0.00007	Zimmerman and Williams
$0.20007_5\pm0.00003$	This work.

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‡ Work performed under contract with the AEC.

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Evidence Concerning the Reaction $p+p\rightarrow\pi^{+}+d$*

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THE mesons produced by protons on protons have been reported[1,2] by various observers. The strong forward high energy peak in the cross section found in the early work indicated that a deuteron may be produced in the reaction. The shape of the peak and the energetics of the reaction have given further evidence that this is the case.[3,4]

We have observed the reaction $p+p\rightarrow\pi^{+}+d$ by coincidence counting technique. By using a magnetic field to determine the momentum of the particles and finding the range of both in aluminum, we have essentially identified the reaction products by measuring the masses of both the meson and deuteron.

The arrangement is shown in Fig. 1. The 340-Mev external proton beam of the Berkeley cyclotron strikes a 1-inch thick polyethylene target. Typical trajectories are shown for the meson and deuteron in the forward direction. The orbits were located by using a wire with known current and tension. Each counter

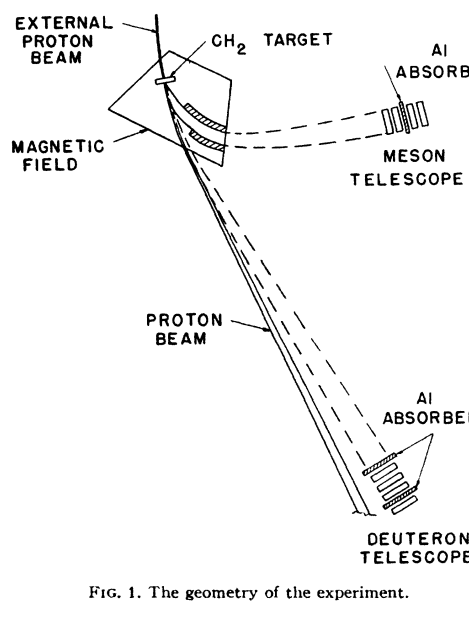

FIG. 1. The geometry of the experiment.