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SUMMARY OF THE RESEARCH PROGRESS MEETING

May 12, 1949

H. P. Kramer

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INFORMATION DIVISION
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Univ. of California
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Controlled Atmosphere for a Spectrographic Source. J. Conway.

The spectrographic analysis of the rare earth elements by means of the conventional apparatus is impeded by the blanketing of the region from 3200-4200 Å by heavy cyanogen bands. The search for a method of shielding the plates from these bands without removing the desired spectral lines has resulted in a successful apparatus.

A gas-tight arc stand has been developed that is equipped with a variable speed motor that automatically adjusts the separation of the electrodes. The enclosed space is filled with oxygen gas at 2 lbs. per square inch above atmospheric pressure. It was found best to retain the conventional copper electrodes taking proper care to protect them from corrosion when a spectrographic analysis of elements contained in solution is undertaken.

The Use of a Magnet in Scattering Experiments. J. Hadley.

An apparatus has been set up for the magnetic analysis of charged particles emanating from a target exposed to the 200 Mev neutron beam that is produced in the 184-inch cyclotron on a 2 inch beryllium target. The arrangement is shown in Fig. 1. Charged particles are ejected from the target, pass through a counter into a magnetic field of 15000 gauss and after being deflected into a circular path appropriate to their charge and momentum again register on a counter that is in coincidence with the first tube.

Very narrow counting tubes are used instead of collimators that might introduce uncertainties due to slit penetration. It is desired to avoid the use of absorbers as much as possible since the manner of interaction of highly energetic

charged particles with the atoms of absorbers is not sufficiently well known. However, because of the small ionization that fast particles produce, it would be necessary to increase the sensitivity of the counting circuits correspondingly and if this is done, one conjures the likelihood of spurious counts.

Another difficulty that is encountered in the use of a magnetic field for energy discrimination is that at high energies the resolving power of the magnet is very poor. It was suggested from the audience that this trouble might be cured by using a number of counters placed side by side rather than employing one counter and thus making the measurements depend completely on the resolving power of the magnet.

Such a scheme it was felt would also contribute toward the solution of a further problem in connection with the apparatus: the extremely low counting rate and consequent poor statistics. It was found that at a scatter angle of 30°, at the poorest magnet resolution, and with the full intensity beam, the counting rate was only one count every two seconds.

If the performance of the apparatus can be improved sufficiently it is contemplated to extend the measurements made by H. York, et al. on secondary particles produced in various materials to the higher neutron energy.

Some Meson Work with the Deflected Proton Beam. C. Richman.

An experiment is being run to measure the distribution as to angle and energy of mesons produced in a carbon target by the 350 Mev proton beam from the 184-inch cyclotron. As can be seen in Fig. 2, the mesons that are produced enter wells sunk into a block of Pb along discrete radii from the target. Each one of these wells contains a photographic plate that records the mesons impinging on it. If a complete count is made and the beam is integrated the equipment also serves to furnish data for a calculation of the cross section for meson production. Ultimately it would be desirable for the advancement of theory to perform the experiment with a hydrogen

target in order to obtain the meson cross section and distributions for proton-proton interaction.

The figure indicates the complete shielding of the apparatus. That the shielding is successful was borne out by the results of a 2 hour run made without the target. The plates came out very clean.

Next a seven hour run with the target in position was performed. The density of meson tracks was about one track per mm^2. However, the run was unsatisfactory because the background from scattered protons was so considerable that only the plates placed at angles greater than 90° could be read without difficulty and the plates at 10° and 20° were completely useless. Upon examination of the beam by means of a photographic plate directly exposed to the incoming protons, it was found that its outline was not sharply defined. This fuzziness was thought to be due to the fact that the beam was striking the collimating block. The geometry was changed and plates that were exposed in the forward direction after this alteration had been made were much clearer and can be read with some work.

The plate exposed at 115° was hurriedly counted and a total of 98 meson tracks were counted. 27 of these culminated in a star, 17 indicated the decay of a π meson into a μ meson, 41 were virgin tracks, and 13 stopped only after they had left the emulsion. A calculation based on the empirical relation that the number of negative π mesons is to the number of star producing mesons as 1.37 is to 1, yields the value 1.5 for the ratio of negative to positive π mesons. The average energy of the mesons that were observed is about 30 Mev.

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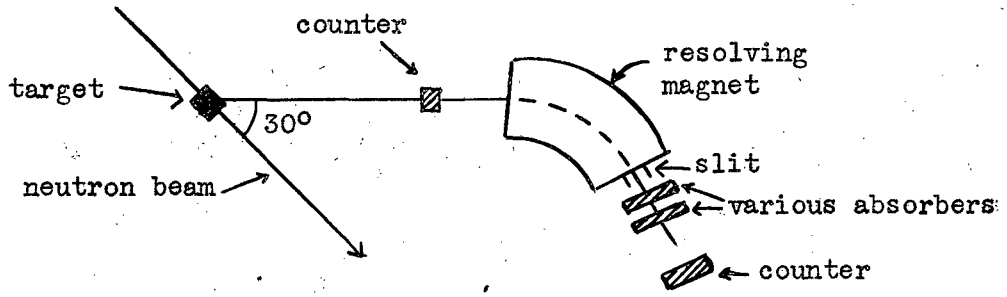
counter
target
30°
neutron beam
resolving
magnet
slit
various absorbers
counter

Fig. 1

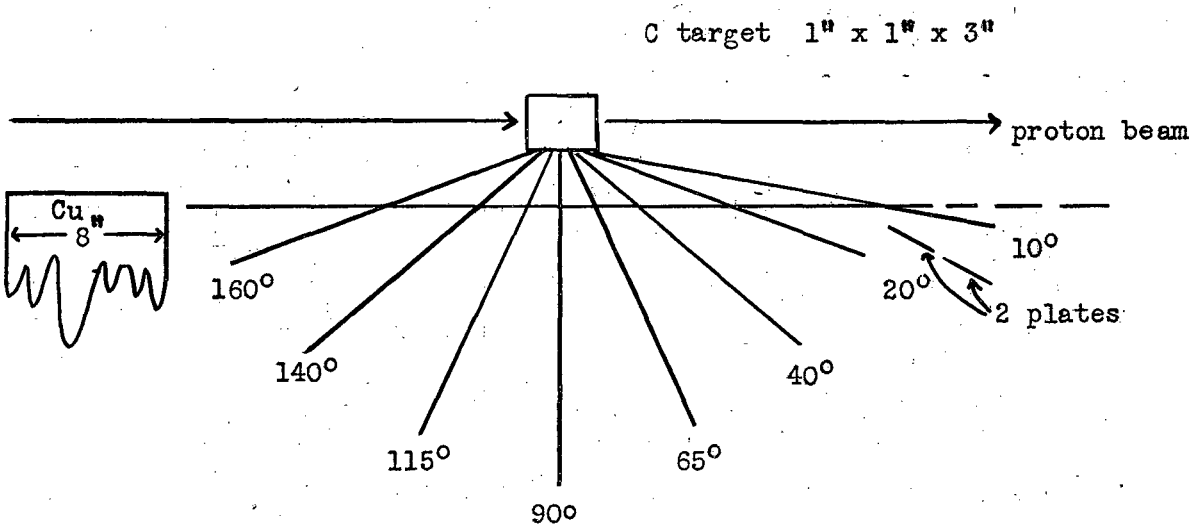
C target 1" x 1" x 3"
proton beam
Cu
8"
160°
140°
115°
90°
65°
40°
20°
10°
2 plates

Fig. 2