Title
SUMMARY OF THE RESEARCH PROGRESS MEETING OF MARCH 9, 1950

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Henry P. Kramer

March 17, 1950

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March 17, 1950

Modified Time of Flight Spectrograph. W. Glenn.

The design of the present time of flight mass spectrograph is similar to that of the isotron devised some time ago by Smythe and Wilson for isotope separation. However, the spectrograph will employ the time of flight principle only for the isotopic analysis of small samples. When the ionic current that traverses the chamber is less than 0.1 microampere, the space charge effects are negligible.

The instrument is sketched in Fig. 1. Ions are emitted at thermal velocities from the sample under investigation which is coated on an electrically heated element. By virtue of an electric field between the source and the first grid the ions are accelerated into a tube two feet in length. Ions that have traversed the length of the tube must pass through a two-grid discriminator before they register on an electrometer.

Separation of ions according to mass is achieved as follows: a saw-tooth voltage superimposed on a d.c. voltage is applied to the source. This causes the emitted ions to be bunched at the first grid which is maintained at ground potential. The frequency of the saw-tooth voltage is so adjusted that the transit time from the first to the second grid for the desired ions is an integral multiple of the period. Because of differences in transit time ions of different masses separate in the tube and arrive at different times at the second grid. The third grid is maintained at a positive potential which discriminates against positive ions attempting to traverse the gap between the second and the third grid. However, at times corresponding to the minimum of the

saw-tooth voltage a pulse appears on the third grid which allows those ions to pass whose transit time is an integral multiple of the period of the saw tooth. In order to eliminate all but the ions of the desired mass, the saw-tooth voltage and the corresponding pulses are frequency modulated in such a way that a frequency cycle is repeated at periods that correspond to the transit time of the desired ions.

The circuit design makes possible the independent control of the slope of the saw tooth and the frequency by means of a variable resistor that changes the d.c. voltage and a tuning capacitor which alters the period. Thus the instrument can very quickly be set for different masses and the adjustments are calibrated linearly with the mass. An oil diffusion pump makes possible a rapid evacuation of the tube.

The device has been used successfully to separate Rb 85 and 87 with a resolution of 1/3 mass unit at mass 85. An attempt will be made to improve the geometry of the apparatus by the use of an arc ion source and a slit system and klystron grids to such an extent that 80 percent of the desired ions that are emitted by the source will be collected.

P-P Scattering at 32 Mev and 340 Mev. Theoretical. P. Noyes.

The range of this presentation is identical with the contents of "The Proton-Proton Interaction" by R. S. Christian and H. P. Noyes, December 23, 1949, UCRL-554. For this reason the conclusion of the above report is reproduced verbatim:

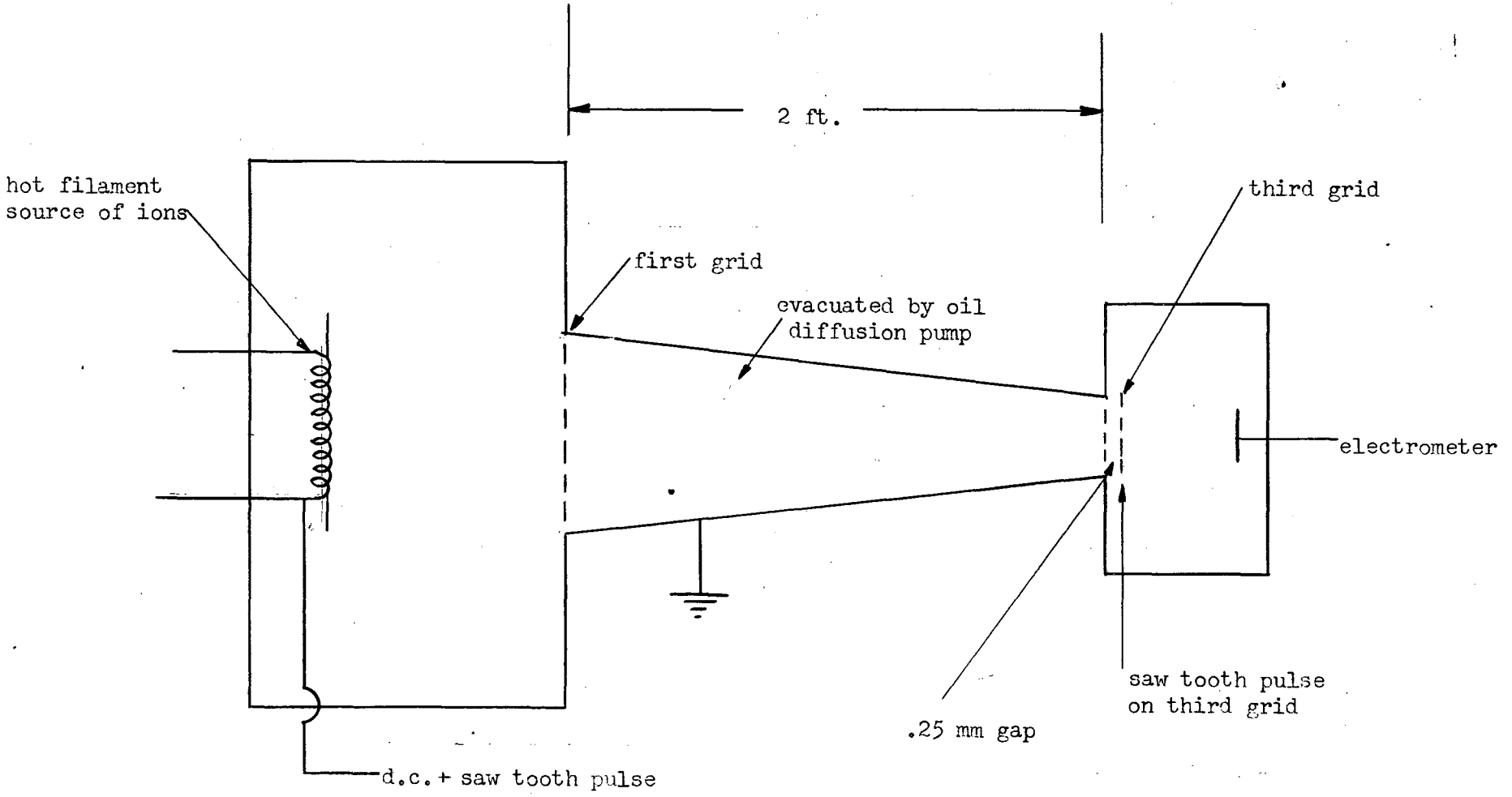
"We have shown that it is possible to fit all the present p-p data by means of a shallow central potential for the singlet states and a singular tensor potential for the triplet states.

"Quite apart from the potential models assumed, however, even the most casual comparison of the p-p data at 32 Mev with the n-p data at 40 Mev and, especially a comparison of the 340 Mev p-p data with the 280 Mev n-p data shows

that nuclear scattering is charge dependent. In particular, there is definite evidence in the n-p scattering data that large tensor scattering does not occur in the odd parity states.

"It is possible that the radial dependences found necessary for p-p scattering would be acceptable for the n-p scattering even though the exchange behavior is different. A definite statement regarding this must await detailed calculations, however.

"Finally we must take notice of the fact that no large repulsive forces have shown up in either the n-p or the p-p system of sufficient magnitude to account for nuclear saturation if saturation is to be predicted from two body forces. In both cases they would have been very easily detected, independent of the potential model assumed."



Modified Time of Flight Spectrograph
Fig. 1