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Radiation Laboratory

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Henry P. Kramer

November 17, 1950

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Measurement of the Half-Life of AcC' . N. Spiess.

AcC' (Po^{211}) occurring as a member of the $\text{Ac}(4n+3)$ series is one of the few naturally radioactive bodies whose half-life had not heretofore been measured. Following a suggestion by A. Ghiorso, R. F. Leininger and the speaker have measured this half-life by taking advantage of the fact that At^{211} is more volatile at high temperatures than its K-capture daughter Po^{211} .

Bismuth was bombarded with alpha-particles at energies below the threshold for the $(\alpha, 3n)$ reaction so that only the reaction $\text{Bi}^{209}(\alpha, 2n)\text{At}^{211}$ gave quantitative yield. The astatine was distilled from the target onto a platinum ribbon filament. The filament was located on a small carriage moving on tracks so that, directly on driving the astatine off the filament by a high-power pulse, the filament with its residue of Po^{211} could be placed into proximity with an ionization chamber linked through a scale of 64 to a Brush recorder. The traces were very pure exponentials and gave for the half-life the value 0.52 ± 0.02 sec. The α -energy was found to be 7.4 Mev.

Cloud Chamber Pictures of the Meson Beam. W. Powell.

The positive meson beam that has been made available by the efforts of the group under C. Richman has been channeled out of the block house at the 184-inch cyclotron and allowed to pass through a cloud chamber. The geometry of this situation is indicated in the sketch of Fig. 1.

The 55 Mev positive mesons that entered the cloud chamber could be identified by noting their $H\beta$ on both sides of a 1/4-inch lead plate

placed along the diameter of the chamber. In particular, these mesons can be easily distinguished from electrons of the same H^0 because such electrons are close to the threshold for ionization whereas the corresponding mesons produce quite heavy tracks and the fact that whereas electrons radiate continuously and thus change the curvature of the tracks, mesons, instead, undergo many small angle coulomb scatters. The filling gas for the cloud chamber was argon.

In each frame, 10 mesons are observed on the average. Thus far 120 frames have been taken. In these 120 pictures, four $\pi^+-\mu^+$ decay events were observed. Considering the time of flight from the target through the cloud chamber, this corresponds roughly to what one expects. 3 μ^+ -mesons have been observed to decay to electrons. One further event of interest is a star produced by a positive meson of energy less than 50 Mev. Three prongs in addition to the incident track were observed. One of these is identified as the track of a proton with energy between 50 and 80 Mev, coming off at approximately right angles to the direction of the incident track.

Suggestions for experiments to be performed with this arrangement were welcomed.

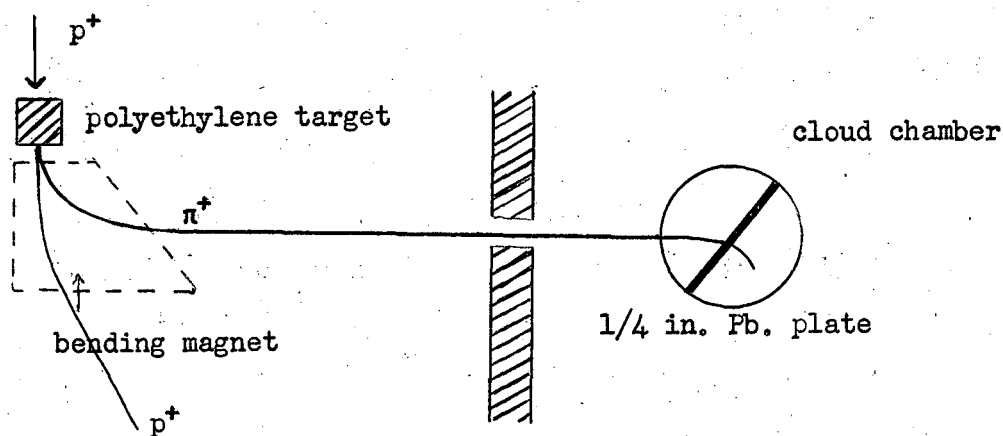


Figure 1

Retarded Nuclear Forces and the Bound State. D. Druckey.⁺

'Abstract for the December 1950 Meeting of the American Physical Society at UCLA.'

The description of a bound state is formulated in interaction representation using plane wave normal modes. For this, an invariant counting technique is devised. Approximate forms of the "interaction Hamiltonian" and the resulting energy-momentum four vector operators are obtained from a particular coupling model by application of perturbation theory and the correspondence limit. The "Schrodinger equation" takes the form of an eigen value equation, $P_\mu \Psi = p_\mu \Psi$ where P_μ and p_μ are respectively operator and eigen value, and Ψ is the state functional. In order that the P_μ commute, it proves necessary that the space like surfaces over which Ψ is defined be hyper-planes. This restriction does not destroy the covariance of the formalism, however. Solution of the Schrodinger equation may be effected by reducing from second to primary quantized form. This yields a set of integral equations with the energy and momentum of the compound system as eigen values. Equations for the deuteron will be presented.

⁺Part of this work was performed under an AEC Fellowship.