= 32 min).[1] To observe the new isotopes, a tin foil enriched with Sn^{112} (52.3%) was irradiated in a cyclotron by 21-Mev α particles. The foil and the chemically separated tellurium and antimony fractions were investigated with end-window counters and with a one-channel scintillation γ spectrometer. In the tellurium fraction containing elemental tellurium (precipitated by tin chloride) there was observed an activity with T = 6 min belonging to the new isotope Te^{115} formed in the reaction $Sn^{112}(\alpha, n)Te^{115}$.

In order to make a positive identification of this isotope, we carried out a fractional separation (in intervals of 5 min) of the isotope Sb^{115} (T = 32 min) by precipitating the antimony with hydrogen sulfide from the solution containing the tellurium. After the activity of the antimony decreased, it was found that the half-life of Te^{115}, which is the parent of Sb^{115}, is 6.0 ± 0.5 min.

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ON NEW STRANGE PARTICLES

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THE Gell-Mann systematics of elementary particles[1] provides for the possibility of the existence of as yet unknown baryons and mesons, in particular of particles Z^+ (T = 0, S = +1, baryon number N = 1) and D^+ (T = 0, S = +2, N = 0). At the present time there are strong arguments which indicate that the Z^+ baryon does not exist. In fact, if the mass of the Z^+ baryon is such that it can decay by the scheme $Z^+ \to \pi + N$, then it would have been found already without difficulty, and if its mass is close to that of the nucleon, it could be formed along with the Λ particle in a reaction of the type $p + n \to Z^+ + \Lambda^0$, which is excluded by the experiments.[2]

At the conference on high-energy particle physics in Kiev, Wang Kang-Ch'ang and his co-workers[3] reported an interesting event of the interaction of a π meson in a bubble chamber, which can be interpreted by assuming the existence of a new particle — a D particle with mass ~ 750 Mev, which decays by the scheme

$$D^+ \to K + \pi \begin{cases} K^0 + \pi^+ \\ K^+ + \pi^0. \end{cases}$$

If we identify this particle with the positive meson of strangeness +2 predicted by Gell-Mann, then the lifetime expected for the hypothetical D particle is of the order of 10^{-10} sec. In fact, the isotopic spin of the ($K\pi$) system can be $1/2$ or $3/2$, so that the selection rule $\Delta T = 1/2$ cannot hinder the decay, as it does in the case of the decay of the K^+ meson.

It is assumed below that the lifetime of the hypothetical D particle does not exceed a few times 10^{-10} sec, so that it is not possible to get collimated beams of these particles by ordinary methods. Therefore it is desirable to look for new methods for detecting these particles. A special property of the new particle, which distinguishes it from all the well known particles, is that it decays with the emission of a K meson. This property can be used in the following way. Let us think of a target bombarded by high-energy particles. In the vacuum near the target K mesons will be produced by the decay of D particles, and these mesons can be registered after they have passed through a collimator that does not point toward the target. This method is reminiscent of that of Garwin, in which strange particles were studied by registering the γ rays from the decay of π^0 mesons emitted "in vacuum" by strange particles (cf. e.g. reference 2).

The ratios of the intensities of K and π mesons from the target and from the "vacuum" near the target are respectively characterized, roughly speaking, by the fractions of interactions in the target that lead to the production of the strange particles and the relative probabilities for production of D particles and ordinary strange particles. It is clear that if the probability of production of D particles is minute, then $(K/\pi)_{vac} \ll (K/\pi)_{targ}$.

If, for example, we assume that the number of D mesons produced is $\sim 10^{-4}$ of the number of interactions produced in the target by protons of energy ~ 10 Bev, and the number of K mesons is $\sim 10^{-2}$ of this number of interactions, then about 1 percent of the total K-meson beam has the D-particle nature. At a distance of several meters from the target the intensity of the K mesons that are of pure π-meson (sic) character, i.e., that are obtained under conditions in which the detector cannot see the target, will be $\sim 100\,\alpha$ times smaller than the intensity of the K mesons from the target. The factor α ($\gtrsim 10$) takes account of the loss of intensity caused by the fact that the K mesons from the D particles are emitted at some distance from the target.

Let us consider first the emission of K^0 mesons from D particles. As is well known, half of the neutral K mesons (K_2^0) have a lifetime $\sim 10^{-7}$ sec,[4] and can be detected at a distance of several meters from the target of the proton synchrotron under conditions of good collimation that assure that the detector cannot see the target. The shielding of the detector from the target must be massive. Unfortunately, the efficiency of detection of K_2^0 mesons is small, but calculation shows that with a proton synchrotron that has high intensity ($10^{10} - 10^{11}$ protons/pulse) the experiment is feasible with registration of the K_2^0 mesons by means of a large decay Wilson chamber, bubble chamber, or emulsion chamber. In the experimental arrangement we are considering the target is not visible, and therefore the main background will be due to photons from the decay of the π^0 mesons emitted by strange particles and to neutrons from the decay of strange particles.

It is convenient to secure registration of K_2^0 mesons in photographic plates by using the capacity of the K_2^0 mesons to produce hyperfragments.[5] Whatever method is used, one must measure the ratio K_2^0/π^0 from the target and from vacuum.

The registration of the K^+ mesons from D^+ particles ($D^+ \rightarrow K^+ + \pi^0$) decaying near the target is possible by means of an emulsion chamber or by electronic methods for registering particles. In this case also the criterion for the existence of D particles must be found in comparable values of $(K^+/\pi)_{targ}$ and $(K^+/\pi)_{vac}$.

In the planning of such experiments attention must be given to the fact that the K meson from the decay of a D particle with mass 750 Mev can be emitted at a large angle with the direction of the parent D particle only if the latter has a small energy. This complicates the problem of making the target invisible to the K-meson detector if the decaying D particles have energies larger than say 100 Mev (for $E_D = 100$ Mev the limiting angle of emission of K mesons is close to 43°, and the limiting angle decreases rapidly with decrease of the energy of the D mesons). We note, however, that the emission of "slow" mesons at large angles in collisions of protons with complex nuclei must be a relatively frequent phenomenon. We can judge this from the analogy with the case of emission of K^0 mesons at angle 90° by protons of energy 6 Bev (the average energy of the K^0 mesons is close to 50 Mev).[5] We remark that favorable conditions for the experiment correspond to a K-particle collimator that looks at a region near the target and above (or below) it. This arrangement decreases the background from the walls of the chamber and also is a convenient way to make possible the observation of K particles emitted at angles $\gtrsim 45°$ with the direction of the D particles.

In conclusion we remark that if the D^+N forces are attractive, D^+ particles must form D nuclei, in which the D particle lives in nuclear matter up to its (quasi-free) decay. This is due to the fact that even in the presence of several nucleons there is no possibility of the D particle's experiencing strong-interaction processes.

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