for detection of delayed radiation. By counting delayed coincidences in a small height interval against pulse height, a measurement of the spectrum of the delayed radiation is obtained. Figure 2 shows the result of such a measurement.

The scale of the pulse height dial *B*as calibrated in energy units by using the *K* and *L* internal conversion lines of the 132-kev transition from the decay of the 22μsec. metastable state in Ta^{181*} and the *K* internal conversion line of the 247-kev transition from the decay of the 8×10^{-8} sec. metastable state in Cd^{111*}.[2] The latter isomeric state was detected using sources of Cd^{111*} (48 min.) produced by (n,γ) reaction on a sample of enriched Cd^{110}.

The solid curve is the conversion electron spectrum obtained after subtraction of the Compton electron distribution produced by the γ-rays and x-rays. The *K* and *L* conversion lines at 87 and 140 kev correspond to a (150±10) kev transition. From the energy and half-life of this isomeric state the transition is probably electric octupole radiation or a combination of electric octupole and magnetic quadrupole radiation. It appears from this curve that no other γ-rays follow in cascade with the decay of Lu^{177*}.

The half-life of Yb^{177} as listed in the table of isotopes[3] ranges from 1.9 to 3.5 hr. A conventional half-life determination is complicated by the presence of the daughter activity Lu^{177} (6.9 day) and the Yb^{175} (100 hr.) present in the sources. By counting delayed coincidences at a fixed delay as a function of time, the coincidence rate decreases according to the decay of Yb^{177}. The decay was observed for 6 hr. and the half-life of Yb^{177} appears to be (1.8±0.1) hr.

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Remarks on Non-local Spinor Field

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IN a recent letter to the editor,[1] it was shown that quantized non local fields could be so constructed as to represent assemblies of particles with the definite mass and radius. In a paper, which will appear very soon,[2] detailed account is given together with the elucidation of most of the points, on which the author was not very sure when he wrote the above letter.[1] However, there is still one point, which seems to the author to be unsatisfactory. Namely, in the case of non-local spinor field, we assumed the commutation relation

$$\beta_\mu[x^\mu, \psi]+\lambda\psi=0 \tag{1}$$

between the space-time operators x^μ and the non-local spinor operator ψ, in addition to the commutation relation

$$\gamma^\mu[p_\mu, \psi]+mc\psi=0 \tag{2}$$

between ψ and the space-time displacement operators p_μ. Further' we assumed that γ^μ, β_μ, which were matrices with four rows and columns, were defined by

$$\left.\begin{array}{llll}\gamma^1=i\rho_2\sigma_1, & \gamma^2=i\rho_2\sigma_2, & \gamma^3=i\rho_2\sigma_3, & \gamma^4=\rho_3\\ \beta_1=\rho_3\sigma_1, & \beta_2=\rho_3\sigma_2, & \beta_3=\rho_3\sigma_3, & \beta_4=-i\rho_2\end{array}\right\}. \tag{3}$$

Now the difficulty was that, in contrast to (2), the relation (1) was not invariant with respect to the improper Lorentz transformation with the determinant -1, but was to change itself into the form

$$\beta_\mu[x^\mu, \psi]-\lambda\psi=0. \tag{4}$$

In the paper mentioned above,[2] a way of removing this difficulty was indicated, but was very unsatisfactory in that the number of components of the spinor ψ was to be increased from 4 to 8 without any immediate physical interpretation for the extra degree of freedom. It came to the author's notice very recently that the following alternative way was far more acceptable in that no extra components of the spinor were introduced. Namely, we take advantage of the antisymmetric tensor of the fourth rank with the components $\epsilon_{\kappa\lambda\mu\nu}$ which are $+1$ or -1 according as $(\kappa, \lambda, \mu, \nu)$ are even or odd permutations of (1, 2, 3, 4) and 0 otherwise.[3] Further we take into account the relations

$$i\beta_\nu=\gamma^\kappa\gamma^\lambda\gamma^\mu, \tag{5}$$

where $(\kappa, \lambda, \mu, \nu)$ are even permutations of (1, 2, 3, 4). Then (1) can be written in the form

$$\tfrac{1}{6}\sum_{\kappa\lambda\mu\nu}\epsilon_{\kappa\lambda\mu\nu}\gamma^\kappa\gamma^\lambda\gamma^\mu[x^\nu, \psi]+i\lambda\psi=0, \tag{6}$$

which is obviously invariant with respect to the whole group of Lorentz transformations. However, the invariance of (6) can be proved more explicitly by transforming ψ, while the matrices γ^μ are assumed to retain their prescribed forms as defined by (3) independent of the coordinate system. Namely, we can associate a linear transformation

$$\psi'=S\psi \tag{7}$$

with each of the Lorentz transformation

$$x_\mu'=a_{\mu\nu}x_\nu, \tag{8}$$

where S is a matrix with four rows and columns satisfying the relations

$$S\gamma^\mu S^{-1}=a_{\nu\mu}\gamma^\nu. \tag{9}$$

If we insert (7), (8) and (9) in (6) and take advantage of the fact that $\epsilon_{\kappa\lambda\mu\nu}$ are components of a tensor of the fourth rank, we obtain the commutation relation

$$\tfrac{1}{6}\sum_{\kappa\lambda\mu\nu}\epsilon'_{\kappa\lambda\mu\nu}\gamma^\kappa\gamma^\lambda\gamma^\mu[x'^\nu, \psi']+i\lambda\psi'=0, \tag{10}$$

which has the same form as (6).

It should be noticed, however, that the relation (6) is to be regarded as a unification of (1) and (4) rather than the mere reproduction of (1), because (6) must be identified with (4) in the coordinate system, which is connected with the original coordinate system by an improper Lorentz transformation with the determinant -1.

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Detection of Radioactive Atoms in the Air with Nuclear Emulsions

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IT has been shown recently[1] that atoms of a radioactive deposit remaining in the air from the decay of radon can be collected together with the dust from the air on a very small surface area of a glass plate. This is done by allowing air saturated with water vapor to flow (e.g., in a Owens-Běhounek dust-counter[2]) with a considerable velocity through a small jet toward this glass. This was demonstrated by exposing the glass in contact with a nuclear emulsion and by finding many tracks of alpha-particles after development of the plate in the small region, corresponding to the position of the dust-spot on the glass. We explained this phenomenon by at least partial adsorption of atoms of active deposit on dust particles.

New experiments with low activities of the air revealed that this method of collection of radioactive atoms from the air can be