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至急

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$2740(\Delta w+1)^2$ years
The table at the top of the page 478 of I,
τ_x for $Z=1$ should
be replaced by
$2740(\Delta w+1)$ year
owing to the ~~fact~~
existence of only
one K electron,
as reported by
[illegible]

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Supplement to "On the Theory of the -Disintegration and the allied Phenomenon".

(Proc.Phys.-Math.Soc. Japan 17,467,1935)

By Hideki Yukawa and Shoichi Sakata.

In the paper with the above title, we calculated, in conformity with the original theory of Fermi, the probability of the transformation of an isobar of atomic number Z into another of atomic number Z-1, with the absorption of the electron in K state, provided that the difference of the masses of the isobars are larger than $-mc^2 + \mu c^2$, ~~in conformity with Fermi~~s

Similar calculation can be performed also according to the modified theory of Konopinski and Uhlenbeck,[1] the result of which will be accounted for in this short supplement.

In this case, the perturbation term in the wave equation of the light ~~perturbing field acting on the light~~ particle due to the change of the atomic number of the nucleus should be written in the form

instead of ~~the corresponding~~ the corresponding expression (3) in I, where

other notations being the same as in I.

(1) E. J. Konopinski and G. F. Uhlenbeck, Phys. Rev. 48, 7, 1935.

If the absolute value and the direction of the nuclear spin do not change during the transformation, U_0 should be the function of r only, while $\vec{U}$ should have the form $\frac{\vec{r}}{r}U'(r)$, the proof being similar to that in Fermi's case. The perturbed wave equation thus becomes

from which we obtain the expression

instead of (17) in I.

After some calculations, the probability of the transformation of the isobar Z with the emission of the positron becomes

provided that ΔW is larger than $mc^2+\mu c^2$,

whereas that with the absorption of the K electron becomes

provided that ΔW is larger than $-mc^2+\mu c^2$

In these expresstions the factors

and

appear respectively in place of

and

in the corresponding expressions (27) and (32) in I.

The ratio $\sigma = \frac{P_+}{P_\kappa}$ in this case depends on the perturbing potentials U_6, $\vec{U}$ due to the nuclear transition, in contrast with the previous case.

If the neutrino mass is zero, i.e. $\kappa=0$, the above expressions become

their ratio

being now independent of the detailed structure of the nucleus.

From the above general expressions, we can obtain the numerical values of the mean life time of the isobar Z for special values of Z and ΔW. We can, however, see readily that the essential change of the results in comparison with the previous case, because the expressions (27″) and (32″) become essentially the same with (27) and (32) in I, if we identify differs from (27) and (32) in I only by the presence of the factor $\frac{1}{3}$ in $\frac{1-\delta}{2}\left|\int \frac{\vec{U}}{3} d\vec{x}\right|^2$ and $(\Delta W-\varepsilon_+)^2$ and $(\Delta W+\delta)^2$ respectively, so we can hardly expect the essential change of the results in comparison with the previous case, as ΔW the factors $(\Delta W-\varepsilon_+)^2$ and $(\Delta W+\delta)^2$ largely compensate to each other.

in I and neglect the factors (w-) and (w+) in (27″) and (32″) respectively, which are the quantities of the order of 1% in ordinary case.

Thus the conclusions previously arrived at remains to hold good ~~in~~ for the present case too.

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