

Mean Life of Slow Mesotrons

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The author recently described¹ an experiment which enabled him to detect the disintegration electrons emitted by mesotrons at the end of their range.

This is a preliminary report of new results obtained with an improved arrangement which was designed to measure a decay curve of mesotrons at rest.

The set-up may be briefly described as follows. A fourfold coincidence counter set defines a beam of mesotrons, which impinges upon a block of iron 10 cm thick and 2.5 cm wide. A battery of anticoincidence counters, placed below the iron, selects the events in which a mesotron is absorbed. It is found that a fraction of these absorption processes is associated with the emission of a particle from the absorber. This particle may be a disintegration electron, or possibly a scattered mesotron.

A system of circuits simultaneously records the numbers n_1 , n_2 and n_3 of such particles emitted within, respectively, 36, 3.1 and 1.2 microseconds after the passage of the primary mesotron. It is found that many of the particles are delayed, which is expected to be the case for the disintegration electrons, but not, of course, for scattered mesotrons.

The conditions of the experiment are such that n_1 , n_2 and n_3 are affected by a "background" due to undelayed processes (scattered mesotrons + showers) which, however, is identical (not statistically) for all three; hence the differences are significant. Since we can safely assume that all mesotrons have decayed within 36 microseconds, we may write:

$$(n_1 - n_2)/(n_1 - n_3) = \exp(-1.9 \times 10^{-6}/\tau).$$

¹F. Rasetti, Phys. Rev., in press.

The results for 207 hours of counting are $n_1 = 170$, $n_2 = 142$, $n_3 = 119$. This yields:

$$\tau = 3.1 \pm 1.5 \text{ microseconds.}$$

So far the accuracy of the present measurement's rather poor; its interest lies rather in affording a determination of the mean life that is more direct and less dependent upon accessory hypotheses than the one deduced from the atmospheric absorption effect.

The measurements are being continued in order to increase the statistical accuracy of the result. An investigation of the important point-whether all slow mesotrons or only the positive ones emit a disintegration electron² – is also being planned.

²S.Tomonaga and G. Araki, Phys. Rev., **58**, 90 (1940).