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Dependence of mass in comparison to full width of mesons

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Collaboration

Abstract content

It is known that the lifetime of relativistic particles depends on their energy. For example, the lifetime of muons in cosmic rays increases to $\gamma = (1-\beta^2)^{-1/2}$ times. Based on uncertainty principle, for the short-lived particles the lifetime is determined from the full width ($\Gamma = \hbar/\tau$) of energy distribution of the decaying particles. Currently the dependence of the lifetime of elementary particle from its mass (rest energy) was not determined, although was established the dependence of the lifetime on the particle from the type of fundamental interaction. We regard the mass of mesons in comparison to their full width (lifetime) using the Review of Particle Physics [1]. Figure shows that most of mesons were located inside range, upper edge of which varied periodically. Maximum values of mass relates to each other as 1, 2, 3, and possibly 6 with a period near to 2 GeV. Any mesons have not been found in mass range from 6300 to 9400 Mev. The estimated range of mass for $f_o(500)$ light unflavored meson does not coincide with a present dependence and should be revised in our opinion. The similar distribution has been obtained for baryons. This uneven distribution of mesons and baryons explains the discrete distribution of the particles' mass and energy in the Universe. The results may be useful to clarify range of mass for the new searching particles.

[1] Olive K.A et al. Review of particle Physics. Chinese Physics C, Vol. 38, No. 9 (2014) 090001.

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