Composite Bosons Mass Formula

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A new formula is proposed to approximate the mass of a charged pion and phi meson. We only obtained an approximate relation to compute the mass in MeV measuring scale.

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Mr. Yukawa in 1935 proposed in his theory[1] that the strong interaction is mediated by a heavy particle which is known as pion. It was then discovered in 1947 by Cecil Frank Powell with predicted mass range. Mr. Asim Orhan Barut in 1979[2] drawn our attention by proposing the rest mass formula to calculate the muon mass and extending it to other leptons by introducing "n" quantum number be added to the rest mass of leptons. In this note we have offered a Barut like formula to compute the mass of not leptons but strongly interacting mesons, here we calculate the mass of pion and phi meson. Barut's formula for muon rest mass is given as

$$M_\mu = M_e\left(\frac{3}{2}\alpha^{-1} + 1\right)$$

Which very well agrees with experiments. α is the fine structure constant and M_e is the mass of an electron= 0.511 MeV. Barut's extension of his formula to other leptons (tau) is

$$M_\tau = M_\mu + \frac{3}{2}\alpha^{-1}n^4 M_e$$

Simply introducing SU(3) gauge group of color charge a somehow Barut like formula can be extracted to calculate the pion mass given by

$$M_{\pi^\mp} = M_e\left(\frac{2}{3}C_q\alpha^{-1} - \frac{1}{2}\right)$$

Where C_q is the overall fixed color charge parameter of strong interaction = 3

Other equation to calculate phi meson is given by

$$M_\varphi = M_\mu + \frac{100}{23}M_e C_q \alpha^{-1}$$

The mass of muon is 105.65 MeV. The 3rd and 4th formula for both mesons mass agrees satisfactorily well with experiments. From our calculation we obtains the values as follows

$M_{\pi^\mp} = 139.7\ MeV$

$M_\varphi = 1019.02\ MeV$

References

*These ideas are developed during a visit to Presidency University, Calcutta

[1] Yukawa, H. (1935). "On the Interaction of Elementary Particles" (PDF). *Proc. Phys.-Math. Soc. Jpn*. **17** (48).

[2] A.0. Barut, Lepton Mass Formula Phys. Rev. Lett. Vol 42 Number 19, 7th May 1979 Page 1251