A brief critique of vixra 1709.0386

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Abstract

Contrary to the author's account, the "sum of squares" equation of vixra 1709.0386 has been recorded and analyzed in *at least* one publication prior to his submission. We also object to his interpretation of this equation.

The Standard Model reveals a puzzling relationship between the masses of bosons (M_b), fermions (M_f) and the vacuum expectation value of the Higgs scalar (v). It is referred to as the "sum of squares" equation and it reads

$$\sum_b M_b^2 = \sum_f M_f^2 = \frac{v^2}{2} \tag{1}$$

The main purpose of this short note is to set the record straight. The "sum of squares" equation has been known for a while, without receiving a convincing theoretical interpretation. As far as version [v2] of [1] is concerned, the reference list is incomplete and the author apparently decided not to update it, despite being notified about the existence of prior publications.

Unfortunately, simply elevating (1) to the level of a "conjecture" does not bring us any closer to understanding its root cause.

The author states that (1) arises from individual probabilities summing up to unity. This is pointing in the wrong direction on several counts:

1. Firstly, the vacuum expectation value of the Higgs boson is associated with the mechanism of spontaneous symmetry breaking in the electroweak sector. As such, it cannot be naively linked to a quantum probability, but rather to the *scale* where electroweak interaction becomes relevant.

2. Secondly, there is no *explicit* symmetry between bosons and fermions in the Standard Model that could directly motivate (1).

3. Related to the previous point, adopting the view that "... *Yukawa couplings can be understood as primordial probability amplitudes of the different modes excited by the Mexican Hat potential*" does not explain why the overall sum of probabilities is *equally divided* among gauge bosons, the Higgs scalar and fermions.

The origin of the "sum of squares" equation is explored in [2], where it is found to stem from the multifractal structure of the Standard Model near the electroweak scale. Rather than denoting probabilities, the ratios of particle masses to (v) define the *complete set of local scales* generating the multifractal set.

References

[1] http://vixra.org/pdf/1709.0386v2.pdf

[2] Goldfain E., "*Introduction to Fractional Field Theory*", Aracne Editrice, Rome, 2015. A copy of this reference can be located at:

https://www.researchgate.net/publication/278849474_Introduction_to_Fractional_Field_Theory_consolidated_version