A New Simple Formula Approximating the Reciprocal Value of the Fine Structure Constant

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Abstract:

A simple algebraic formula is presented that approximates the reciprocal value of the fine-structure constant to a discrepancy of less than 2 parts per billion.

The reciprocal value of the fine-structure constant, 137.035999206, occurs repeatedly throughout the masses of subatomic particles, nuclear physics, and atomic physics. It is a pure number without any units because it relates to a ratio between mass-energy and electrical energy. The large value of this of this number is puzzling. Many attempts have been made over decades to uncover how this number arises. There has been an underlying suspicion among many physicists that there is a mathematical or geometrical structure within this number that may lead to an understanding of its origin.

Like many others, I have tried hundreds of permutations and combinations involving rational and irrational numbers, square and cube roots, trigonometric functions, and other constants without success. Recently, I discovered a formula with simple numbers that gives a very close approximate to the most recent experimental observation of the reciprocal value of the fine-structure constant. This formula also has a very intriguing pattern using the numbers 2 and 9. I am not offering any explanation for this formula other than it works. Someone might be able to identify this formula as part of a mathematical series which would then lead to an understanding of how it arises.

proposed formula
consists of three components:

$$[\,2^7 + 9\,] \;+\; \frac{(2)(9)}{2^9} \;+\; \frac{1}{2\,(\,2^9 + 9^2\,)}$$

The values add up in the following pattern.

contributions:

$[\,2^7 + 9\,] = 137$

$\frac{(2)(9)}{2^9} = 0.03515625$

$\frac{1}{2\,(\,2^9 + 9^2\,)} = 0.008431703$

calculated: 137.035999420
currently: 137.035999206

Discrepancy: less than 2 parts per billion

The most recent value was determined in 2020.