Determination of the Number of Eigenstates between the State of Proton and Planck State Using 1-D Quantum Harmonic Oscillator

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Properties of elementary particles and their structure are some of the most discussed recent topics in physics. These particles are now considered as the smallest building blocks of matter in the universe. In this model, a new hypothesis is proposed that the elementary particles are not ‘elementary/point-like’, but always inner-structured. Elementary particles like quarks are decaying into smaller particles, so there should be some underlying activities that force them to decay. The huge difference in the rest-masses of muon and electron necessitate an inner-mass structure, which could be attributed to their mass difference. To prove the hypothesis, this model shows that there’s a number of energy eigenstates between the protons state and its vacuum state. Since the vacuum state is not accessible, instead the state of Planck wave was chosen. Thus, the number of energy quanta existing between the proton and Planck state is determined. Each quantum of energy can describe an inner particle state and their energy values can be determined with 1-D Quantum Harmonic Oscillator, obtained by applying annihilation operator several times on the Planck state, high energy state just after the Big-Bang. The model calculation shows that there could be 38 energy states (inner particles) inside the proton state. Surprisingly, this approach will help to understand the cosmological constant problem by reducing its huge discrepancy. This will possibly allow us to measure the quarks mass and radius more precisely as masses of some bound state particles are dependent on the precision of the constituent masses.