Two-vortex structure of electron, nonlocality and Dirac equation

S. C. Tiwari

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The dimensionless electromagnetic coupling constant $\alpha=e^2 /\hbar c$ may have three interpretations: as the well known ratio between the electron charge radius e^2/mc^2 and the Compton wavelength of electron $\lambda_c= \hbar /mc$, as a ratio of two angular momenta since Planck constant has the dimension of angular momentum, and two flux quanta e and hc/e. The anomalous part of the electron magnetic moment together with the unified picture of the three interpretations of α is suggested to have deep physical significance. The electric charge is proposed to be a new quantum of flux such that a two-vortex structure of electron is envisaged. In analogy with quantum conditions we postulate sub-quantum conditions applicable in a region of the order of λ_c replacing $\hbar$ by a universal constant $f=e^2 /2\pi c$ and apply it to Dirac equation in internal space that gives rise to the anomalous magnetic moment of electron. Dirac spinor and 2-spinor representation for vortex structure of electron in the single particle Dirac framework are discussed. The role of sub-quantum rules and the internal variables for developing the present ideas is also debated. A critical discussion on the past attempts to give fundamental importance to magnetism and flux quantum is given to delineate the new ideas in the present work.

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