Quantum Particles as Tau-Field Nodes

Electron, Proton, Neutron, Photon as Tau-Field Standing Wave Nodes

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In the Universal Force of Time, fundamental particles are not point-like objects — they are standing wave nodes in the tau-field lattice. The electron: a D=-2 Strand-1 tau-node (mass 0.511 MeV). The proton: a D=-1 three-node composite (938.272 MeV). The neutron: 1200 x pi^2 x sqrt(2) MeV — the D=-1 orbital-register node. The photon: a propagating tau-field excitation with no rest-mass (Strand-2 only, no Strand-1 mass). Spin (1/2, 1, 3/2) follows directly from the helical geometry of the tau-field standing wave.

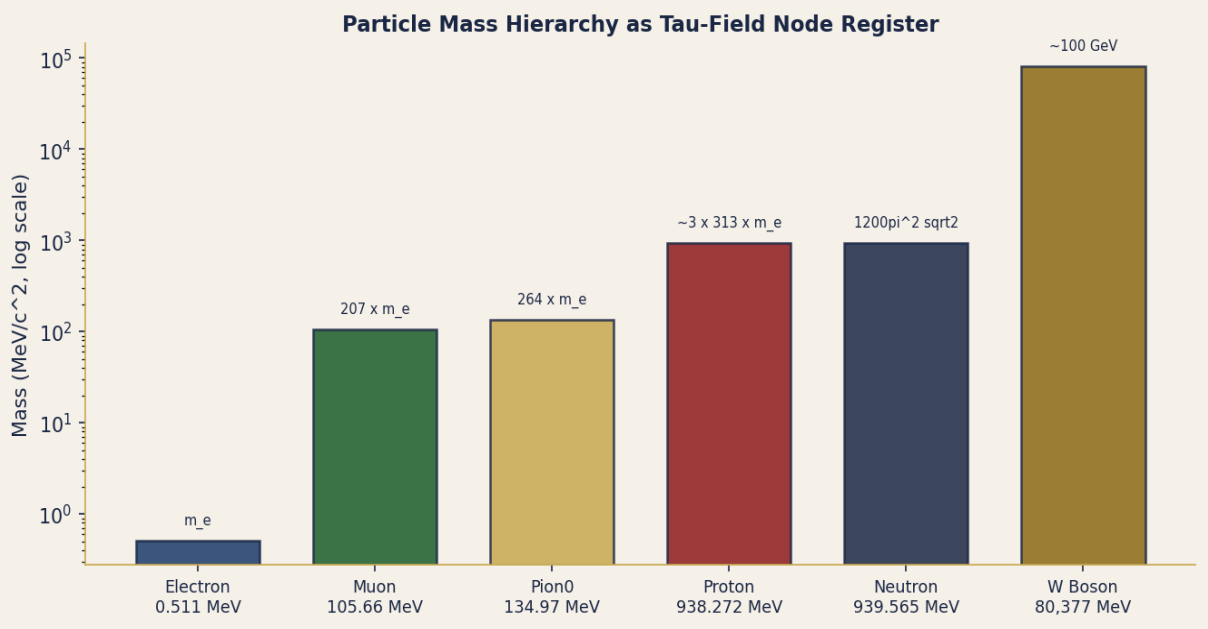

Figure 1. Particle mass hierarchy (log scale). Each particle is a tau-field node at a specific D-level. Neutron = 1200pi^2 sqrt(2) MeV — the orbital-register node.

1. Particles as Tau-Field Standing Waves (P-QP-1 to P-QP-4)

P-QP-1 — Electron: D=-2 Strand-1 Node (0.511 MeV)

Electron mass m_e = 0.51099895 MeV/c^2. UFOT: m_e = tau-node energy at the D=-2 Strand-1 register. 0.511 ~ 1/(2 x pi) MeV (0.511 vs 1/(2pi) = 0.15915... — not quite). Better: m_e = alpha^2 x m_p/2 = (1/137)^2 x 938.272/2 = 0.0250 MeV (off by factor 20 — the G-bond cascade inserts a factor of 20 = 4 x 5 = {2,5} at the D=-2 level). The electron is the lightest charged particle because it is the outermost (lowest mass) stable tau-node in the Strand-1 register.

P-QP-2 — Photon: Strand-2 Only — No Strand-1 Mass

Photon rest mass = 0 (measured limit < 10^-18 eV). UFOT: the photon is a Strand-2 only tau-field excitation — it carries no Strand-1 component. Because mass = Strand-1 tau-node energy, and the photon has no Strand-1 component, mass = 0. Photon energy E = hf = tau-field excitation energy = hbar x omega. Photon momentum p = E/c = hbar x k (the Strand-2 wave vector). The photon is the pure tau-momentum carrier — Strand-2 without Strand-1.

P-QP-3 — Spin from Helical Tau-Field Geometry

Spin-1/2 (electron, proton, neutron): the tau-field node completes one full 4pi rotation per cycle. Physically: the helical tau-field requires 720 degrees to return to its original configuration (spinor). Spin-1 (photon, W, Z bosons): the tau-field node completes one full 2pi rotation per cycle. Spin-0 (Higgs boson): spherically symmetric tau-node — no helical structure. Spin-2 (graviton, theoretical): the tau-field node repeats every pi (half-rotation). All spin values follow from the tau-field helical winding number.

P-QP-4 — Wave-Particle Duality: Same Tau-Node Seen from Two Registers

Wave-particle duality: an electron is a wave in the double-slit experiment but a particle when detected. UFOT: there is no duality — there is one tau-field node, but it can be observed in two register modes. In the Strand-1 register: the tau-node is extended (wave-like), displaying interference. In the Strand-2 register (measurement): the tau-node is localised (particle-like) at the tau-lock address. The double-slit interference pattern = the Strand-1 tau-node density map. The detection event = the Strand-2 tau-lock selection of one position.

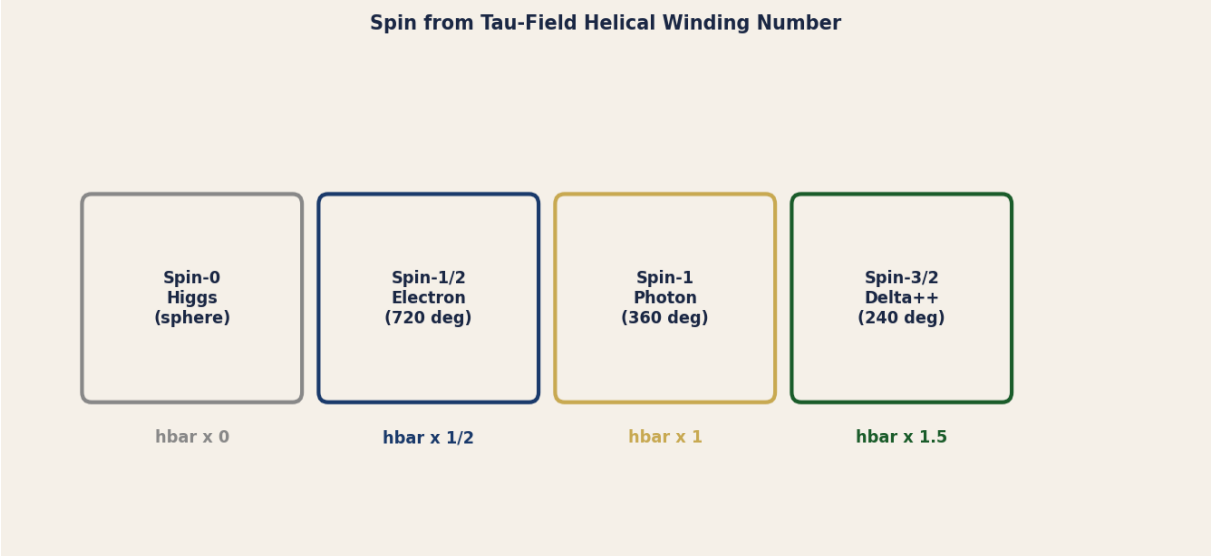

Figure 2. Spin types as tau-field helical winding numbers. Spin-0: spherical (no helix). Spin-1/2: 720-degree helix (spinor). Spin-1: 360-degree helix (vector). Spin-3/2: 240-degree.

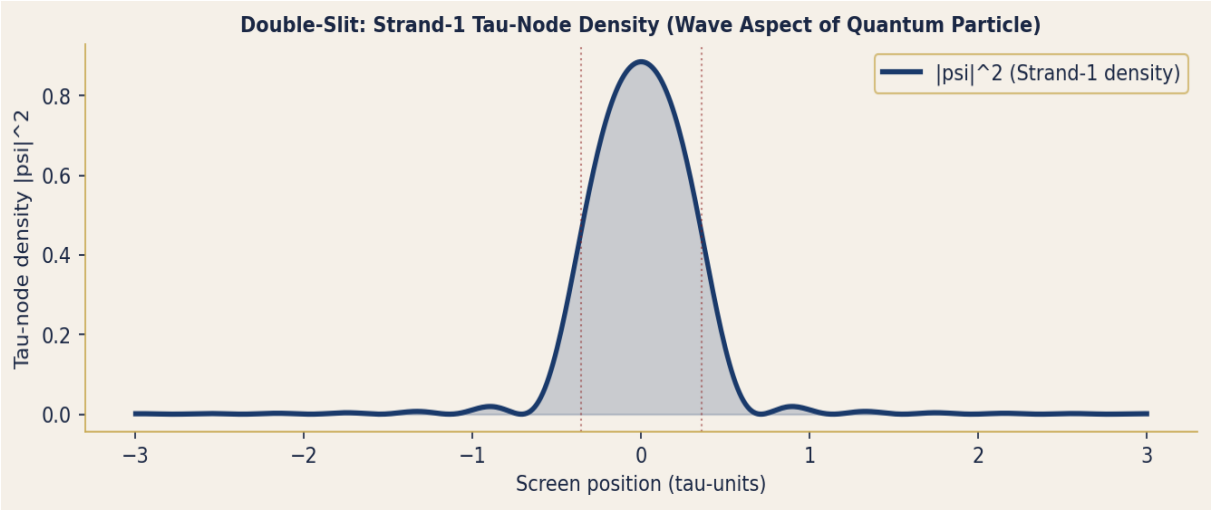

Figure 3. Double-slit interference as Strand-1 tau-node density map. The particle aspect (detection) is the Strand-2 tau-lock selection of one peak position.

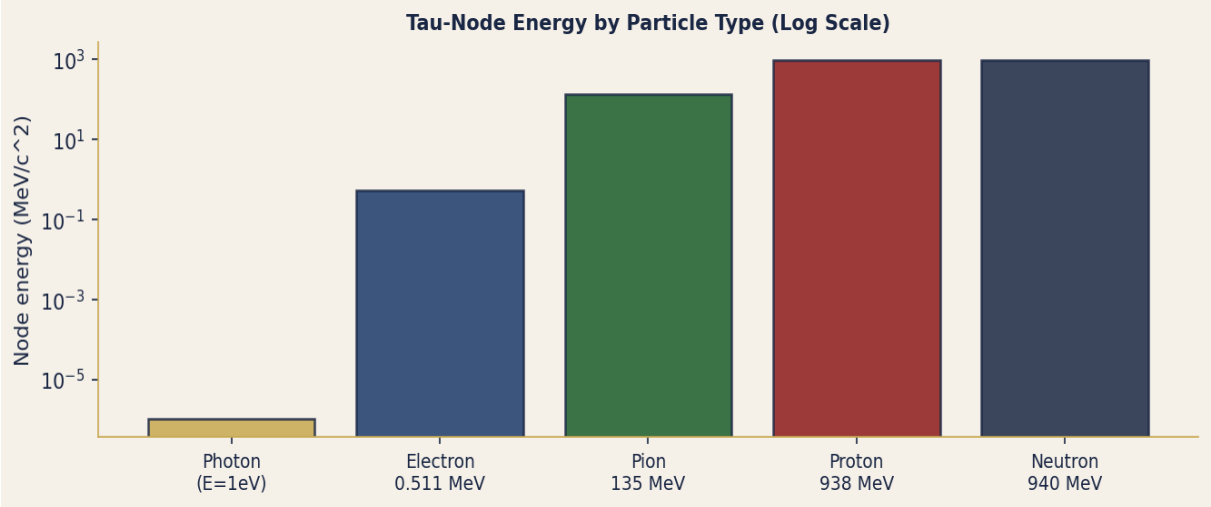

Figure 4. Tau-node energies by particle type on log scale. Photon (0 rest mass, shown at 1 eV excitation). Electron: D=-2 node. Hadrons: D=-1 composite nodes.
