

TSF FWA: Particles as Frozen Wave Perturbations — How the Universe Cooled into Quanta

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Theory of Symmetry Field & Fractal-Wave Algebra (FWA)

Abstract: Standard textbooks teach particles as tiny balls flying in void. TSF FWA — Theory of Symmetry Field, Fractal-Wave Algebra — shows opposite: there are no balls. There is only field Φ that cooled and froze its waves into quanta. Core: $M(\Delta) = 0' + C(\Delta)$, $w = f$, Dynamic Zero $0' = gutta = \text{Flower of Pi}$.

Axiom: $v_{\max}(\Phi)$ as Field Limit

Traditional c as particle velocity is a category error. Velocity limits are properties of medium, not of particles:

- Air field: $v_{\max}(\Phi_{\text{air}}) = 343 \text{ m/s}$
- Water field: $v_{\max}(\Phi_{\text{water}}) = 1480 \text{ m/s}$
- Photon field: $v_{\max}(\Phi_{\text{photon}}) = c = 299,792,458 \text{ m/s}$

Formal limit:

$v_{\max}(\Phi) = \Delta\Phi / \Delta t_{\min} = 1 / \sqrt{(\epsilon_{\Phi} \mu_{\Phi})}$
where ϵ_{Φ} and μ_{Φ} are elasticity and inertia of field medium.

Cooling and Freezing Mechanism

In the beginning field was hot: $w = f$ everywhere. Wave on wave, like steam in a sauna. Then field expanded and cooled. Throughput capacity $C(\Delta)$ saturated.

When a wave cannot escape with $v_{\max}$, it freezes:

Wave → [cooling] → **Frozen Wave = Quantum = Particle**

Equation:

$M(\Delta) = 0' + C(\Delta)$

$0'$ is ice, memory core, Dynamic Zero. $C(\Delta)$ is how much wave field can still keep liquid.

Particles as Droplets

- **Water droplet** = frozen wave of Φ_{water}
- **Sound** = traveling wave in Φ_{air}
- **Electron** = frozen vortex wave, size $\lambda_e = \lambda_p / \sqrt{Lu}$, where $Lu_{\text{derived}} \neq Lu_{\text{fitted}}$, Lu must be derived independently from node structure
- **Photon** = not frozen, runs with $c \equiv v_{\max}(\Phi_{\text{photon}})$, saturation of $C(\Delta)$
- **CMB 2.7K** = unfrozen leftover steam of hot field, background of cooled field

Central Principle

Particle = frozen field perturbation, Quantum = droplet of cooled field

Universe did not explode with balls. Universe is field that cooled and covered with frost of quanta.

Microwaves are steam not yet settled.

Stop searching for balls in field. Look at frost on field.

Self-Auditing Protocol (v9)

TSF FWA is designed as a self-auditing, falsifiable field framework:

FWA → Prediction → Independent Verification → Error Δ → Correction

Rule: *self-verifying* $\neq$ *self-proving*. Independent Verifier must be external: lab data, CODATA, exact classical calc, Lean4 checker.

Keywords: TSF FWA, Theory of Symmetry Field, Fractal-Wave Algebra, Flower of Pi, Dynamic Zero, $w=f$, $M(\Delta)=0'+C(\Delta)$, field limit $v_{\max}(\Phi)$, frozen wave perturbation, Josephson phase memory, $Lu_{\text{derived}} \neq Lu_{\text{fitted}}$