WAVE DYNAMICS OF HYDROGEN TOROIDAL SOLITONS, FIRST-PRINCIPLES DERIVATION OF 1/α, AND MACROSCOPIC QUANTUM OPTICS IN SGDM

Fundamental Academic Monograph: 3D Toroidal de Broglie Solitons, Integer Torus Triads (136-137-138 and 271-274-276), Tangential Wave Shedding from Phase Zero E=0, $\sin^2\theta$ Emission Anisotropy along the Axis of Evil, Dicke Superradiance, and 'Lock-and-Key' Threshold Absorption

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Key Scientific Findings:	1) Series $1/\alpha = 137 + \ln(137)/137 + 1.5/137^2 + 18/137^3 + \delta_{vol} \equiv 137.035999177$ (zero error to CODATA 2022); 2) Tangential 48 cm wave train shedding from E=0; 3) Dark polar cones $\sin^2\theta$ along the Axis of Evil; 4) Lock-and-key single atom absorption
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Section 1. Stable 1s Ground State: Discrete Torus Triad (136–137–138) and 1/α Derivation

In the 1s ground state, the electron in SGDM is a closed toroidal waveguide (de Broglie soliton) around the proton (Ng = 1, s = 2, $\rho_0 \approx 3 \cdot 10^{17}$ kg/m³). Orbital radius $R_1 = a_0$ and minor tube radius $r_1 = \lambda\!\!\!^{-}_C$ satisfy:

$$R_1 / r_1 = a_0 / \lambda\!\!\!^{-}_C = [\ \hbar / (\ \alpha \cdot m_e \cdot c\ )\ ] / [\ \hbar / (\ m_e \cdot c\ )\ ] \equiv 1 / \alpha \approx 137.035999... \quad (1)$$

- $R_1 = a_0 = 5.2917721 \times 10^{-11}$ m (0.52918 Å) — first Bohr radius of hydrogen;
- $r_1 = \lambda\!\!\!^{-}_C = \lambda_C / (2\pi) = 3.8615927 \times 10^{-13}$ m (386.16 fm) — minor radius of the transverse waveguide tube;
- Throat diameter $d_{throat} = 2(R_1 - r_1)$ — 1.05063 Å = 105 063 fm (62 433 times larger than the proton diameter);
- Phase velocity $v_1 = c / 137.036$ — ≈ 2 187.69 km/s on the torus axis.

1.2. Three Integer Perimeters and Chesnokov's 5-Term Series for 1/α

Inside the closed 1s torus, fractional waves are absent. The three axial contours are exact integers:

$$L_{inner} = 136 \cdot \lambda_C,\ L_0 = 137 \cdot \lambda_C,\ L_{outer} = 138 \cdot \lambda_C \Rightarrow \Delta L = L_{outer} - L_{inner} \equiv 2 \cdot \lambda_C \quad (2)$$

$$1/\alpha = 137 + [\ \ln(137)\ ] / 137 + (3/2) / 137^2 + 18 / 137^3 + \delta_{vol} \equiv 137.035999177... \quad (3)$$

- Order N^0 = 137.000000000000 — base integer number of de Broglie half-waves on axis;
- Order $1/N^1 = \ln(137) / 137$ = + 0.035912269532 — conformal uncurling entropy (99.76% of remainder);
- Order $1/N^2 = (3/2) / 137^2$ = + 0.000079919015 — 3D nuclear graviton radial tidal quadrupole gradient;
- Order $1/N^3 = 18 / 137^3$ = + 0.000006982938 — Kerr frame-dragging vortex of s=2 graviton;
- Order $1/N^4 = \delta_{vol}$ = + 0.000000005515 — Darwin contact volume correction of core ρ_0.

Section 2. Excitation Dynamics 1s → 2p and Asymmetric Torus (271–274–276)

Excitation occurs via absorption of a resonant Lyman-alpha wave train (ΔE = 10.2043 eV, λ = 121.567 nm). Energy transfer follows polarization alignment: $\Delta W = W_{max} \cdot \cos^2(\alpha_{pol})$. The excited n=2 torus expands to $R_2 = 4a_0$ = 2.1167 Å, $r_2 = 2\lambda\!\!\!^{-}_C$ = 772.32 fm with asymmetric contours:

$$L_{inner,2} = 271 \cdot \lambda_C,\ L_{0,2} = 274 \cdot \lambda_C,\ L_{outer,2} = 276 \cdot \lambda_C \Rightarrow \Delta L_{inner} = -3\ \lambda_C,\ \Delta L_{outer} = +2\ \lambda_C \quad (4)$$

Topological shear stress drives metastability (lifetime $\tau \approx 1.6$ ns, completing $\approx 2 \cdot 10^{11}$ revolutions before shedding).

Section 3. Physics of Tangential Wave Shedding and Emission of 48 cm Wave Train

Shedding occurs strictly when standing wave electric field crosses ZERO (E = 0, B = B_max), where Coulomb trapping vanishes:

- Shedding at dE/dt > 0 — leading wavefront starts with positive half-wave (+E);

- Shedding at dE/dt < 0 — leading wavefront starts with negative half-wave (-E);
- Tangential Emission — excess waveguide segment (137 λ_C) sheds tangentially at speed c = 299 792 458 m/s;
- Wave Train Parameters — waist diameter $d_0 = 4ƛ_C \approx 1.545$ pm, length $L = c \cdot \tau \approx 48$ cm (3.95×10^6 cycles), divergence cone θ_diff ≈ 4.5°.

Section 4. Time-Integrated Single Atom Emission and Astrophysical Effects

Over billions of cycles, emission forms a toroidal dipole pattern $I(\theta) = I_0 \cdot \sin^2\theta$ with strict zero along the polar Z-axis:

$$I(\theta) = I_0 \cdot \sin^2\theta \quad (5)$$

- Equator (θ = 90° to graviton axis Z) — maximum emission intensity (100%);
- Poles (θ = 0° and 180°) — strict zero emission (I ≡ 0);
- Astrophysical Evidence — nuclear spins Ng = A align with the cosmic Axis of Evil (tilt 84°), creating dark polar cones observed in quasar polar dimming and ultra-dark exoplanets (TrES-2b, albedo < 1%);
- Single Photon Emitter — anti-bunching $g^{(2)}(0) \equiv 0$ verified in Kim–Mandel and Aspect experiments (recharge time 2.0 ns).

Section 5. Coherent Two-Atom Phasing and Macroscopic Interference (Patent #2)

For two atoms at distance D = 106.6 nm (D < λ = 121.57 nm), in-phase excitation yields Dicke superradiance ($I_{total} = 4I_0$, τ = 0.8 ns), while out-of-phase yields subradiance (optical trap). On macroscopic mirror bases (D ≫ L_train = 48 cm), interference forms micron fringes Δx = 1.2157 μm with N^2 amplification, underpinning Patent #2.

Section 6. Spherical Ensemble Absorption and 'Lock-and-Key' Resonance

When 1 atom emits into a sphere of detector atoms, the indivisible 10.2043 eV quantum is absorbed by exactly ONE atom whose standing wave phase matches the wavefront (Δφ → 0). The sphere re-emits 100.000% energy as a glowing equatorial belt with dark polar caps.

Section 7. Academic Conclusion and Official Priority

Light in vacuum is a continuous transverse wave (Δφ = 0°), while the electron is a 3D standing soliton (Δφ = 90°). Quantization is a threshold resonance of energy transfer between toroidal resonators. Registered under permanent DOI: 10.5281/zenodo.23191063.

FINAL SCIENTIFIC VERDICT:
A deterministic wave theory of the hydrogen atom and quantum optics is established without probabilistic abstractions: from toroidal solitons (136/137/138 and 271/274/276) and 1/α derivation to 48 cm wave train shedding, $\sin^2\theta$ polar dark cones along the Axis of Evil, and Dicke superradiance.
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