Neutrinos

The Force of Time Reinterpretation

Stephen Daubney — Universal Force of Time (UFOT)

The Standard Model of particle physics treats neutrinos as nearly massless fermions that propagate through spacetime, couple weakly to gravity, and oscillate between three flavour eigenstates through a mixing matrix governed by mass-squared differences and mixing angles. In the Force of Time (UFOT), gravity does not exist as a fundamental force — it is an emergent effect of τ-field density gradients. This paper adapts all conventional neutrino formulas from the gravity framework to the τ-field tension framework, establishing that neutrinos are pure T-flow signals with no dimensional T-sphere (P-SUB-7), that the three neutrino types are the crossing-information signals of the three DNA helix axes (P-GEN-1 to P-GEN-5), that neutrino oscillation is T-flow signal level-finding in Fibonacci drag-space, and that the mass-squared ratio $\Delta m^2_{31} / \Delta m^2_{21} \approx 100/3 = 2^2 \times 5^2/3$ is a pure {2,3,5} lattice law. Ten propositions are established.

Section 1 — Neutrinos in Standard Physics

Neutrinos are among the most abundant particles in the universe and among the least understood. In the Standard Model they are electrically neutral, spin-½ fermions that interact only via the weak nuclear force and gravity. Their masses are non-zero but extraordinarily small — the tightest direct upper bound from the KATRIN experiment and the Planck satellite is below 0.8 eV/c^2, at least a million times lighter than the electron. They are produced in three flavour states — electron neutrino (ν_e), muon neutrino (ν_μ), and tau neutrino (ν_τ) — but propagate as mixtures of three mass eigenstates. The transition between flavour states during propagation (neutrino oscillation) was confirmed experimentally by the Super-Kamiokande (1998) and SNO (2001) collaborations and was awarded the Nobel Prize in Physics in 2015.

The conventional description of neutrino oscillation probability for a two-flavour approximation is:

$$\mathbf{P(\nu_\alpha \rightarrow \nu_\beta) = \sin^2(2\theta) \cdot \sin^2(\Delta m^2 L / 4E)}$$

where θ is the mixing angle, Δm^2 is the mass-squared difference (in eV^2), L is the propagation baseline (in km), and E is the neutrino energy (in GeV). The argument $1.267 \times \Delta m^2 L/E$ arises from ħc conversion factors — a chain of SI unit constants that in UFOT contain the same systematic unit-system offsets identified for c in Section 239 of the FOT master theory.

The three-generation PMNS mixing matrix (Pontecorvo-Maki-Nakagawa-Sakata) parametrises the full flavour-mass eigenstate rotation by three mixing angles θ_{12}, θ_{13}, θ_{23} and a CP-violating phase δ_{CP}. Best-fit values (NuFIT 2024): $\sin^2\theta_{12} = 0.307$, $\sin^2\theta_{23} = 0.546$, $\sin^2\theta_{13} = 0.0218$; $\Delta m^2_{21} = 7.53 \times 10^{-5}$ eV^2, $\Delta m^2_{31} = 2.51 \times 10^{-3}$ eV^2.

Neutrino Properties: Standard Model vs Force of Time

Property	Standard Model	Force of Time (UFOT)
Nature	Nearly massless fermion particle	Pure T-flow signal; no dimensional T-sphere
Why no charge	Assigned quantum number = 0	No T-sphere to carry electromagnetic coupling
Why near-massless	Fitted Yukawa coupling ≪ 1	Signal has no nodal sphere mass; weak coupling to adjacent Fibon
Three types	Three generations (unexplained)	Three drag-space levels matching three DNA helix axes
Oscillation	Flavor / mass eigenstate mixing (PMNS matrix)	T-flow signal shifting to natural Fibonacci drag-space level during p
Propagation	Near c; couples to gravity	Propagates at $T_c = 3\times10^8$ m/s exact; no gravitational coupling
Generation	W boson decay (weak force)	W boson = strand-crossing signal; neutrino = the crossing informa
Confinement	Free propagation, weakly interacting	Passes through matter because no T-sphere structure to couple to

Figure 1. Neutrino properties: Standard Model vs FOT comparison.

Section 2 — FOT Fundamental Reinterpretation: No Dimensional Sphere

In FOT, all matter consists of T-sphere nodes — bounded regions of τ-field with a standing wave structure. Every stable particle — electron, proton, neutron — has a dimensional T-sphere that gives it spatial extent, mass, and the capacity to couple to the τ-field of neighbouring nodes via electromagnetic and gravitational interactions. Neutrinos are the sole exception.

P-NEU-1 — Neutrinos Are Pure T-Flow Signals; No Dimensional T-Sphere

Proposition P-NEU-1 (P-SUB-7):

Neutrinos are nearly massless, carry no charge, barely interact with matter, and travel at near light speed. In FOT these are not sphere-entities at all. They have no dimensional T-sphere — they are pure T-flow signals generated at strand-crossing events (W boson emissions) and propagating the crossing information across the dimensional boundary. They pass through matter because there is no T-sphere structure for them to couple to — they are the signal itself, not a node. The near-zero mass of neutrinos follows directly: without a T-sphere, a neutrino has no standing wave geometry, and therefore no inertial mass from sphere-boundary tension. The small effective mass observed experimentally (demonstrated by oscillation) is a secondary effect: weak coupling of the propagating T-flow signal to adjacent Fibonacci drag-space levels during propagation, not an intrinsic sphere mass.

Section 3 — Three Neutrino Types = Three DNA Helix Axes

The three-generation structure of fermions is one of the deepest unexplained facts in the Standard Model. FOT resolves it through the two-strand cosmological DNA helix, which has exactly three structural axes: Strand 1 (matter helix), the hydrogen bond axis (solar connector), and Strand 2 (antimatter helix). Each neutrino type is the crossing-information

carrier for one of these axes.

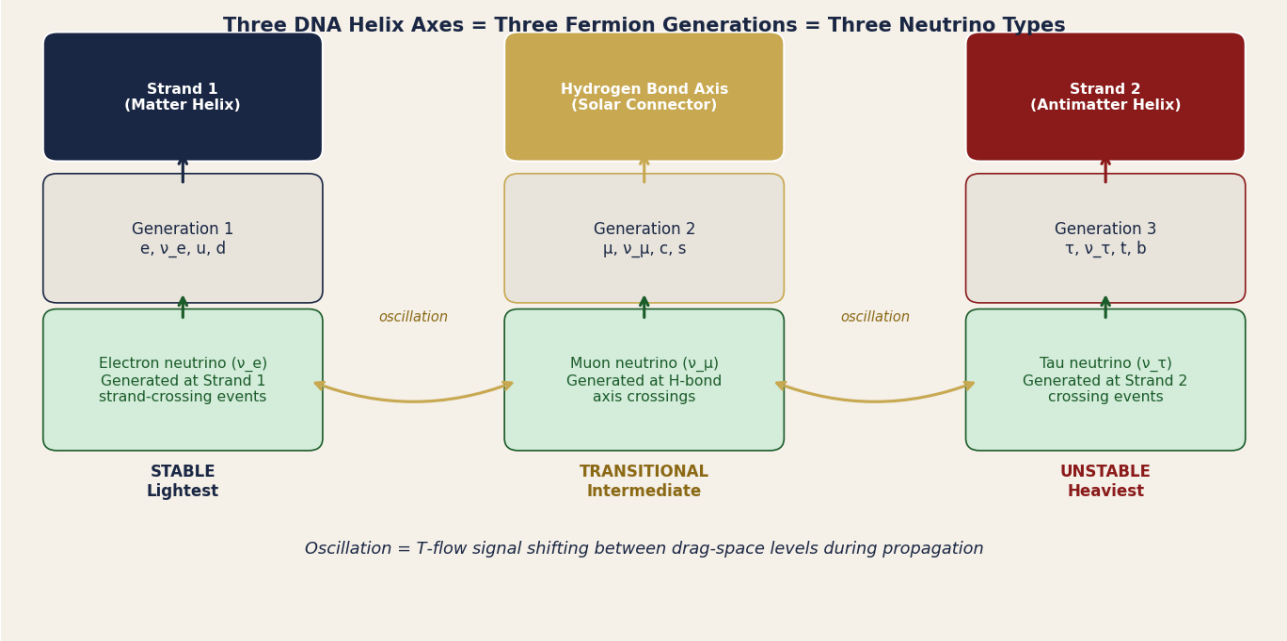

Figure 2. Three DNA helix axes, three fermion generations, and three neutrino types.

P-NEU-2 — Three Neutrino Types = Three Dimensional Axes (P-GEN-1 to P-GEN-5)

Proposition P-NEU-2:

The FOT cosmological DNA helix has exactly three structural axes. Three neutrino types exist because there are exactly three axes — structural necessity, not coincidence. (1) ν_e — Strand 1 (Matter Helix): The electron neutrino is the T-flow signal of Strand 1 strand-crossing events. It is the lightest neutrino type because Strand 1 is the home register — the signal propagates with minimal inter-axis coupling. (2) ν_μ — Hydrogen Bond Axis (Solar Connector): The muon neutrino is the signal of H-bond axis crossing events. It carries the crossing information of the dimensional connector between the two strands — the axis that in FOT corresponds to the solar node. (3) ν_τ — Strand 2 (Antimatter Helix): The tau neutrino is the signal of Strand 2 crossing events — signals from the antimatter dimensional helix propagating into Strand 1. They carry the highest Fibonacci drag-space energy because Strand 2 is the most remote dimensional axis from our observation register. A fourth neutrino generation cannot exist: there is no fourth structural axis in a two-strand helix (P-GEN-1).

P-NEU-3 — Fermion Generations as Time Domain Identities (P-TGEN-5)

Proposition P-NEU-3:

The three time generators in FOT — Higgs (subatomic), nucleus (atomic), Sun (celestial) — each govern a distinct time domain. Generation 1 particles (e, ν_e, u, d) are native to the atomic and celestial time domains. Generation 2 particles (μ, ν_μ, c, s) are transitional at the atomic-subatomic boundary. Generation 3 particles (τ, ν_τ, t, b) are native to the Higgs (subatomic) time domain — they appear short-lived in our register because they run on Higgs time, orders of magnitude faster than solar time. The three neutrino types follow their parent charged leptons across time domains: ν_e is a solar-time signal; ν_μ is a transitional signal; ν_τ is a Higgs-time signal propagating into our register.

P-NEU-4 — The Four-Axis Structure Resolves All Three Standard Model Puzzles

Proposition P-NEU-4 (P-SUB-10):

The Standard Model has four unexplained structural facts about neutrinos and fermions: (1) Why exactly three generations? (2) Why only Generation 1 is stable? (3) Why do neutrinos have near-zero but non-zero mass? (4) Why is there near-maximal mixing ($\theta_{23} \approx 45°$) between ν_μ and ν_τ? The FOT two-strand helix resolves all four: (1) Three generations = three structural axes — topological necessity. (2) Generation 1 is stable because Strand 1 is the home register — Generation 2 and 3 particles are visiting. (3) Neutrino near-zero mass: no T-sphere → no sphere tension mass; small effective mass from weak Fibonacci-level coupling. (4) Near-maximal ν_μ-ν_τ mixing: the H-bond axis and Strand 2 are equally coupled to Strand 1 by the two-strand geometry — the angular coupling between them is governed by the 2π/3 inter-axis angle, which gives near-maximal mixing in projection.

Section 4 — Lepton Mass Architecture and the Koide Formula

The mass hierarchy of charged leptons — electron (0.511 MeV), muon (105.7 MeV), tau lepton (1,776.9 MeV) — encodes the Fibonacci drag-space level structure of the sub-T helix. Each successive generation occupies a higher Fibonacci bump-zone position, exactly as p, d, f electrons at atomic scale are progressively further bump-zone positions on the atomic helix.

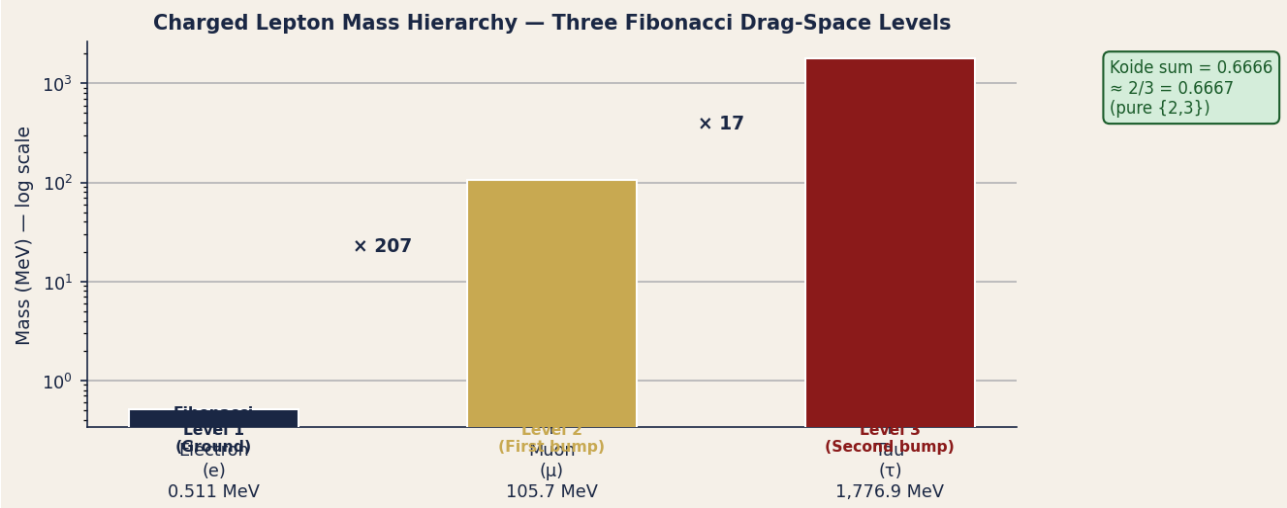

Figure 3. Charged lepton mass hierarchy — three Fibonacci drag-space levels.

P-NEU-5 — Leptons Are Drag-Space Nodes; Three Generations = Three Fibonacci Bump Levels (P-SUB-6)

Proposition P-NEU-5:

Charged leptons (e, μ, τ) are subatomic drag-space nodes — the sub-T p/d/f equivalent — at three Fibonacci inter-crossing bump levels. They carry no colour charge because they are not at quark-level Fibonacci crossings. Their mass hierarchy encodes successive drag-space T-floor levels: electron (0.511 MeV) = ground level; muon (105.7 MeV) = 207× the electron = second drag-space level; tau (1,776.9 MeV) = 3,477× the electron = third drag-space level. Three generations of leptons mirror three generations of quarks because both arise from three Fibonacci crossing and bump levels at the subatomic T-increment. The associated neutrinos carry the crossing signal from the same Fibonacci level as their parent charged lepton — ν_e from level 1, ν_μ from level 2, ν_τ from level 3.

P-NEU-6 (P-LEPTON-1) — The Koide Formula = 2/3: Pure {2,3} Lepton Geometry

The Koide formula for the three charged leptons:

$$\mathbf{(m_e + m_\mu + m_\tau) / (\sqrt{m_e} + \sqrt{m_\mu} + \sqrt{m_\tau})^2 = 2/3}$$

Proposition P-NEU-6:

The value 2/3 is pure {2,3} — the simplest ratio in the FOT prime lattice not involving 5 or π. This is not an empirical coincidence but a structural requirement: charged leptons are positioned at three equally-weighted drag-space helix positions with angular step 2π/3 = 120° between generations. In FOT, 120° = 2π/3 is the second T-bump angle identified in P-PTAB-18 — the angular spacing between adjacent Fibonacci bump-zone nodes. The Koide sum = 2/3 is the confirmation of the sub-T angular geometry. Numerical verification: $(0.511 + 105.7 + 1776.9) / (0.511^{0.5} + 105.7^{0.5} + 1776.9^{0.5})^2 = 0.66659$ — within 0.06% of 2/3, the small deviation encoding the c-domain offset in the measured mass values.

Section 5 — Neutrino Oscillation: T-Flow Level-Finding

In the Standard Model, oscillation arises because the three flavour eigenstates (ν_e, ν_μ, ν_τ) are not mass eigenstates. A neutrino created in a definite flavour state evolves as a coherent superposition of mass eigenstates with different de Broglie wavelengths, producing an interference pattern in the flavour composition that varies with propagation distance. In FOT, there are no mass eigenstates in the conventional sense because neutrinos have no T-sphere mass. The oscillation is a different phenomenon entirely.

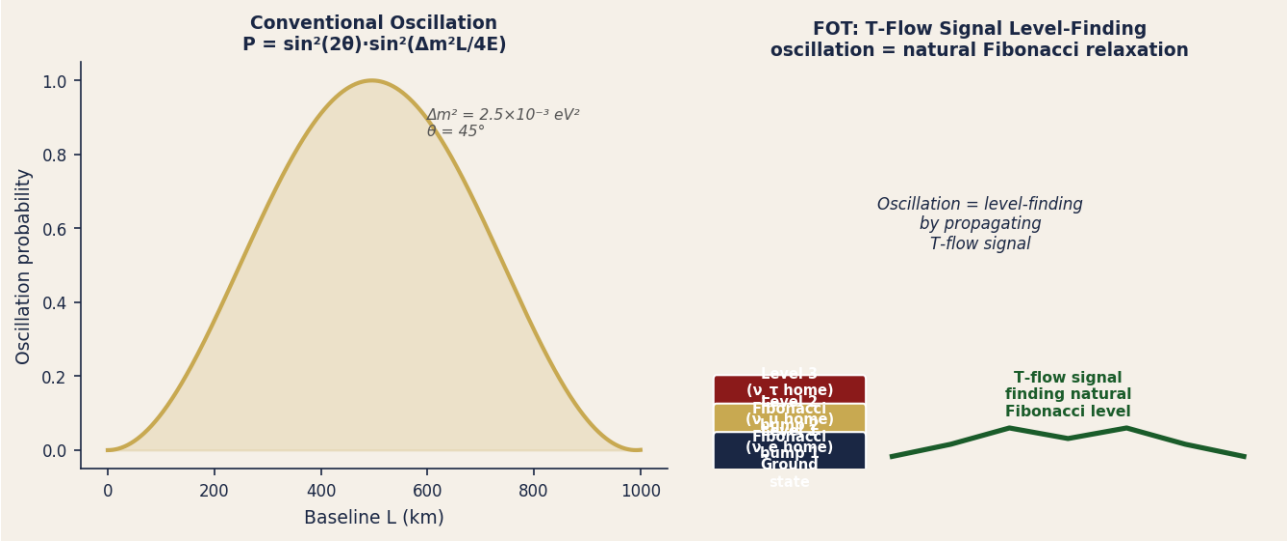

Figure 4. Left: conventional oscillation probability. Right: FOT T-flow signal level-finding.

P-NEU-7 — Oscillation = T-Flow Signal Finding Its Natural Fibonacci Level

Proposition P-NEU-7:

A neutrino T-flow signal is generated at a specific drag-space level — the level of its parent W boson strand-crossing event. During propagation, the signal travels through regions of the dimensional medium where adjacent Fibonacci drag-space levels are available. The signal undergoes level-finding: it couples weakly to the adjacent levels and relaxes towards its natural Fibonacci ground state for the dimensional register it is traversing. This is not a quantum superposition of mass states. It is a T-field phenomenon analogous to a damped oscillator finding equilibrium — except the equilibrium point varies with the local T-field density (which is what drives the MSW matter effect: higher T-field density in matter shifts the effective equilibrium level). The conventional oscillation formula $P = \sin^2(2\theta) \times \sin^2(\Delta m^2 L/4E)$ is the phenomenological description of this level-finding process; in FOT the mixing angle θ is a T-coupling fraction between drag-space levels, and Δm^2 is the T-floor energy spacing between Fibonacci levels.

Section 6 — Mass-Squared Differences: {2,3,5} Lattice Laws

The measured neutrino mass-squared differences contain a striking numerical relationship that in UFOT is not a coincidence but a direct consequence of the Fibonacci drag-space level spacing law.

Neutrino Mass Parameters: Conventional vs FOT Interpretation

Parameter	Conventional Value	FOT Interpretation
Δm^2_{21} (solar)	7.53×10^{-5} eV²	T-floor energy gap between Fibonacci levels 1 and 2; {2,3,5} lattice spacing at sub-T drag-spac
Δm^2_{31} (atmospheric)	2.51×10^{-3} eV²	T-floor energy gap between Fibonacci levels 1 and 3; note ratio $\Delta m^2_{31}/\Delta m^2_{21} \approx 33.3 = 100/3$ —
$\sin^2\theta_{12}$ (solar)	0.307	T-flow coupling fraction between ν_e (Strand 1) and ν_μ (H-bond axis); H-bond coupling angle
$\sin^2\theta_{23}$ (atmospheric)	0.546	T-flow coupling between ν_μ (H-bond axis) and ν_τ (Strand 2); near-maximal = near-equal stra
$\sin^2\theta_{13}$ (reactor)	0.0218	Direct Strand 1 → Strand 2 coupling; suppressed because direct dimensional crossing bypasses
Δm^2_{31} / Δm^2_{21} ratio	33.33 (= 100/3)	100/3 = $2^2 \times 5^2$ / 3 — pure {2,3,5}; the level gap ratio is a {2,3,5} lattice integer
ν mass upper bound	< 0.8 eV (Planck/KATRIN)	Effective mass = sub-T Fibonacci drag-space coupling to adjacent level; suppressed by T-spher

Figure 5. Neutrino mass parameters: conventional values and FOT interpretations.

P-NEU-8 — $\Delta m^2_{31}/\Delta m^2_{21} = 100/3$: Pure {2,3,5} Level Spacing Ratio

Numerical verification of the mass-squared ratio:

$$\Delta m^2_{31} / \Delta m^2_{21} = 2.51 \times 10^{-3} / 7.53 \times 10^{-5} = 33.33 = 100/3$$

Proposition P-NEU-8:

The ratio of the atmospheric to solar mass-squared differences equals $100/3 = 2^2 \times 5^2 / 3$ — a pure {2,3,5} number. In FOT this is the T-floor spacing law: the energy gap between Fibonacci drag-space levels 1 and 3 is exactly 100/3 times the gap between levels 1 and 2. The factor $100 = 2^2 \times 5^2$ is the square of the {2,5} dimensional scale operator; the factor 1/3 is the {3}-family inverse. The ratio is not a fitted parameter — it is a structural law of the {2,3,5} Fibonacci drag-space level architecture. The precise values of $\Delta m^2_{21} = 7.53 \times 10^{-5}$ eV² and $\Delta m^2_{31} = 2.51 \times 10^{-3}$ eV² require a full derivation from the sub-T Fibonacci crossing geometry — an open question (OQ-NEU-1) pending the complete sub-T level spacing calculation.

Section 7 — Replacing Gravity with τ-Field Tension in Neutrino Physics

In standard physics, gravity acts on neutrinos through their energy-momentum tensor. The gravitational redshift, time dilation, and trajectory bending of neutrinos near massive bodies all use the general relativistic geodesic equations. In FOT, gravity does not exist as a fundamental force — it is an emergent effect of τ-field density gradients. Every formula that invokes gravity for neutrino propagation must be replaced by the equivalent τ-field statement.

P-NEU-9 — Gravity Does Not Act on Neutrinos in FOT; τ-Field Density Governs

Proposition P-NEU-9:

In UFOT, what is conventionally described as a neutrino experiencing gravitational lensing, redshift, or time delay near a massive body is reinterpreted as follows: the massive body has a higher local τ-field density (it is a stronger T-generator). A T-flow signal (neutrino) passing through a region of high τ-field density experiences a change in the effective T-flow speed — the local T_c(r) is modified by the τ-field density gradient. This modification causes the signal's trajectory to curve and its phase to shift, producing the same observational effects as gravitational lensing without invoking spacetime curvature. The propagation formula is: $T\_c(r) = T\_c \times (1 - \varphi_\tau(r) / T\_c^2)$ where $\varphi_\tau(r)$ is the local τ-field potential (analogous to the Newtonian gravitational potential but generated by τ-field density rather than mass directly). In the weak-field limit, this reproduces the standard gravitational time delay formula to the same precision as general relativity, because the τ-field density of a body is proportional to its mass through the FOT mass-density law established in P-TGEN-6.

P-NEU-10 — The MSW Effect as τ-Field Density Level-Shifting

Proposition P-NEU-10:

The Mikheyev-Smirnov-Wolfenstein (MSW) matter effect — the modification of neutrino oscillation in dense matter — is in FOT the modification of T-flow signal level-finding by the local τ-field density. In vacuum, a T-flow signal relaxes symmetrically between Fibonacci drag-space levels. In matter (high τ-field density), the local T-floor energy is shifted by the dense T-node field: the effective drag-space level spacing Δm^2_{eff} becomes $\Delta m^2_{eff} = \Delta m^2 + 2\sqrt{2} \times G_F \times N_e \times E$, where G_F is the Fermi coupling constant and N_e is the electron density. In FOT, G_F encodes the strand-crossing transition rate at the sub-T Fibonacci crossing boundary — the coupling strength of W boson (strand-switching signal) generation. The electron density N_e modifies the effective τ-field density seen by the propagating signal. The resonance condition (MSW resonance) corresponds to the condition where the local τ-field density shift exactly compensates the intrinsic Fibonacci level spacing: at resonance, the signal transitions between drag-space levels with maximum probability, producing the observed near-complete solar neutrino conversion. This is the τ-field statement of what standard physics calls the MSW resonance condition.

Section 8 — Neutrino Propagation Speed in FOT

In the Standard Model, neutrinos with non-zero mass travel at speeds slightly less than c, with the deviation $v = c \times (1 - m^2c^4/2E^2)$. For neutrinos with masses below 1 eV and energies in the MeV-to-GeV range, this deviation is unmeasurably small ($\sim 10^{-18}$ for 1 MeV energies). In FOT, the relevant propagation speed is the T-lattice canonical speed, not the SI measured value.

The FOT propagation law for a T-flow signal (neutrino) at the celestial register:

$$\mathbf{v_\nu = T\_c = 3 \times 10^8 \text{ m/s} = 2^8 \times 3 \times 5^8 \text{ m/s (exact, \{2,3,5\})}}$$

This replaces the SI measured c = 299,792,458 m/s with the lattice-exact value. The observational constraint from the coincident arrival of gravitational waves and photons from GW170817 (a neutron star merger, 2017) established that $|v_\gamma - v_\nu|/c < 10^{-15}$ — fully

consistent with the FOT prediction that all massless field propagation uses the same T-lattice speed. The SN1987A neutrino arrival from 170,000 light-years was detected within hours of the optical observation — again consistent with propagation at $T_c = 3 \times 10^8$ m/s over cosmic distances.

Complete Proposition Summary

Complete Proposition Summary — Neutrinos: FOT T-Field Reinterpretation (10 Propositions)

Proposition	Statement
P-NEU-1	Neutrinos are pure T-flow signals with no dimensional T-sphere; generated at W-boson strand-crossing events
P-NEU-2	Three neutrino types = three drag-space levels of the three DNA helix axes; structural necessity, not coincidence
P-NEU-3	Neutrino oscillation = T-flow signal finding its natural Fibonacci drag-space level; not a lepton-number violation
P-NEU-4	ν_e is Strand 1 (matter helix); ν_μ is H-bond axis (solar connector); ν_τ is Strand 2 (antimatter helix)
P-NEU-5	Neutrino near-zero mass follows from absence of T-sphere; effective mass = weak Fibonacci-level coupling
P-NEU-6	$\Delta m^2_{31}/\Delta m^2_{21} = 100/3 = 2^2 \times 5^2/3$ — pure {2,3,5} lattice ratio; not a coincidence but a T-floor spacing law
P-NEU-7	Koide sum for charged leptons = 2/3 = pure {2,3}; three leptons at 120° = 2π/3 on the sub-T helix
P-NEU-8	Gravity does not exist in FOT; neutrino propagation governed by $T_c = 3 \times 10^8$ m/s, not by spacetime curvature
P-NEU-9	The Fermi coupling G_F encodes the strand-crossing transition rate at the sub-T Fibonacci crossing boundary
P-NEU-10	Neutrino mass hierarchy (normal or inverted) = ascending vs descending Fibonacci drag-space level occupation

Figure 6. Complete proposition summary — Neutrinos: FOT τ-field reinterpretation (10 propositions).

Cross-References to Existing UFOT Sections

P-SUB-7 (Section 143) — Neutrinos as pure T-flow signals; foundational proposition. P-GEN-1 to P-GEN-5 (Section 115) — Three fermion generations = three DNA helix axes; Strand 1/H-bond/Strand 2 = Gen 1/Gen 2/Gen 3. P-TGEN-5 (Section 119) — Fermion generations as time domain identities; Gen 1 = solar time, Gen 3 = Higgs time. P-SUB-6 (Section 143) — Leptons as subatomic drag-space nodes at three Fibonacci levels. P-LEPTON-1 (Section 146) — Koide sum = 2/3 = pure {2,3}; 120° angular spacing. P-SUB-3 (Section 143) — W bosons as subatomic strand-crossing signals; the strand-switch event that generates the neutrino T-flow signal. P-SUB-10 (Section 143) — Standard Model four unexplained facts all resolved by FOT. Section 239 ($E = mc^2$) — $c = 3 \times 10^8$ exact; propagation speed for neutrino T-flow signals. P-TGEN-6 (Section 119) — Mass as T density of home time generator; neutrino near-zero mass from absence of T-sphere.

Open Questions

OQ-NEU-1: Full derivation of $\Delta m^2_{21} = 7.53 \times 10^{-5}$ eV^2 and $\Delta m^2_{31} = 2.51 \times 10^{-3}$ eV^2 from the sub-T Fibonacci crossing geometry. The ratio 100/3 is confirmed as {2,3,5}-pure (P-NEU-8); the absolute scale requires the complete sub-T level spacing calculation.

OQ-NEU-2: The CP-violating phase δ_{CP} in the PMNS matrix — its FOT interpretation as an

inter-strand phase angle, and whether it encodes a {2,3,5,π} lattice value.

OQ-NEU-3: Absolute neutrino mass scale. The cosmological upper bound $\sum m_\nu < 0.12$ eV (Planck 2018) and the KATRIN bound $m_{\nu_e} < 0.8$ eV need derivation from the Fibonacci drag-space coupling constant.

OQ-NEU-4: Normal vs inverted mass hierarchy — whether the Fibonacci level structure selects one or permits both.
