Swirl–String Theory Rosetta Stone v0.6: Translation Guide for Symbols, Macros, and Constants

Omar Iskandarani[*]

January 17, 2026

Abstract

This Rosetta note provides a structured translation layer between Swirl–String Theory (SST) and mainstream formalisms in gravity, fluid dynamics, and quantum field theory, without relying on its historical VAM presentation. At the kinematic level it fixes the canonical SST identities

$$\rho_{E\,(\mathrm{J\,m^{-3}})} = \tfrac{1}{2}\rho_f\,\|\mathbf{v}_{\circlearrowleft}\|^2, \qquad \rho_{m\,(\mathrm{kg\,m^{-3}})} = \rho_E/c^2, \qquad K_{(\mathrm{kg\,m^{-3}\,s})} = \frac{\rho_{\mathrm{core}}\,r_c}{\|\mathbf{v}_{\circlearrowleft}\|\,|_{r=r_c}}, \quad \rho_{f\,(\mathrm{kg\,m^{-3}})} = K\,\Omega,$$

$$\frac{D}{Dt}(R^2\omega) = 0 \quad \text{(incompressible, inviscid, barotropic, no reconnection).}$$

and shows how these coincide with standard kinetic-energy density, effective mass density, and coarse-grained angular rates in incompressible, inviscid flow. On the chronometric/metric layer, the Swirl–Clock sector is mapped to khronon/Einstein–Æther constructions and to weak-field GR via an explicit identification of the analogue potential Φ_{SST} and the corresponding PPN/GW constraints. On the fluid and topological layers, $\mathbf{v}_{\circlearrowleft}$, $\boldsymbol{\omega}$, and the helicity functional are matched to superfluid velocity fields, vorticity, and Hopf/Skyrme-type solitons, while the knot-based energy functional $\mathcal{E}_{\mathrm{eff}}$ is aligned with known topological energy bounds. On the gauge/quantum layer, multi-director swirl symmetries are related to $\mathfrak{su}(3) \oplus \mathfrak{su}(2) \oplus \mathfrak{u}(1)$ gauge structure and to photon-like excitations in analogue-media language. The document supplies a compact macro set (`\rhoF`, `\rhoE`, `\rhoM`, `\rhoC`, `\vswirl`, `\vnorm`) and layer-by-layer dictionaries so that SST manuscripts can be read, checked, and compared directly within mainstream relativity, fluid, and field-theoretic frameworks, with all dimensional scalings and published numerical calibrations preserved.

[*] Independent Researcher, Groningen, The Netherlands
Email: `info@omariskandarani.com`
ORCID: `0009-0006-1686-3961`
DOI: 10.5281/zenodo.17606846

1 Rosetta Concordance of SST and Mainstream Terminology

Rosetta Card: GR/PPN/GW → Swirl–String Theory (SST)

Domain: weak–field, stationary backgrounds; lensing, Shapiro delay, PPN.

Symbol Dictionary:

GR object	SST counterpart	Notes
$g_{\mu\nu}$ (weak field)	analogue metric via Swirl–Clock	matter propagation sector
Φ (Newtonian potential)	$\Phi_{\rm SST}$ from swirl energy fraction	defined below
$T^{\mu\nu}$	swirl stress $(\rho_E, p_{\rm swirl}, \ldots)$	barotropic, inviscid
c	c	calibrated to luminal signals

EOM / Metric Map (linearized):

$$ds^2_{\rm GR} \approx -\left(1+\frac{2\Phi}{c^2}\right)c^2dt^2 + \left(1-\frac{2\gamma\,\Phi}{c^2}\right)d\mathbf{x}^2.$$

Define the local swirl energy density and maximum energy density

$$U_{\rm swirl} = \tfrac{1}{2}\rho_f\|\mathbf{v}_{\circlearrowleft}\|^2, \qquad U_{\rm max} = \rho_{\rm core}c^2, \qquad \chi_{\rm swirl} = \frac{U_{\rm swirl}}{U_{\rm max}} \text{ (dimensionless)},$$

and map

$$g_{tt} = -(1-\chi_{\rm swirl}), \qquad g_{ij} = (1+\gamma\,\chi_{\rm swirl})\,\delta_{ij}.$$

Matching coefficients gives

$$\boxed{\Phi_{\rm SST} \equiv -\frac{U_{\rm swirl}}{2\,\rho_{\rm core}}} \quad \Rightarrow \quad \frac{2\Phi_{\rm SST}}{c^2} = -\chi_{\rm swirl}, \;\; \gamma = 1 \text{ (Calibration)}.$$

Dimensional check: $[U_{\rm swirl}] = {\rm J/m^3}$, $[\rho_{\rm core}] = {\rm kg/m^3}$, so $U_{\rm swirl}/\rho_{\rm core}$ has units ${\rm J/kg} = {\rm m^2/s^2}$, as required for Φ.

Numerical validation (SST constants):

$$\kappa = 2\pi r_c\|\mathbf{v}_{\circlearrowleft}\| = 9.68\times10^{-9}\,{\rm m^2/s}, \quad U_{\rm swirl} = \tfrac{1}{2}\rho_f\|\mathbf{v}_{\circlearrowleft}\|^2 = 4.19\times10^{5}\,{\rm J/m^3},$$

$$U_{\rm max} = \rho_{\rm core}c^2 = 3.50\times10^{35}\,{\rm J/m^3}, \quad \chi_{\rm swirl} = U_{\rm swirl}/U_{\rm max} = 1.20\times10^{-30},$$

$$\Phi_{\rm SST} = -\frac{U_{\rm swirl}}{2\rho_{\rm core}} = -5.38\times10^{-14}\,{\rm m^2/s^2}, \quad \left|\frac{2\Phi_{\rm SST}}{c^2}\right| = 1.20\times10^{-30}.$$

Known-limit check: $|\chi_{\rm swirl}| \ll 1 \Rightarrow$ PPN weak-field holds with $\gamma = 1$.

Predictions & Falsifiers

- Lensing/Shapiro from $\Phi_{\rm SST}$ matches GR to $\mathcal{O}(\chi_{\rm swirl})$; deviations scale with spatial gradients of $U_{\rm swirl}$.
- High-frequency GW propagation luminal (Calib.) ⇒ multi-messenger bounds satisfied.
- Falsifier: any measured $\gamma \neq 1$ at 10^{-5}–10^{-6} in quasi-static fields contradicts this mapping.

Status: Calibration **Version:** v0.5.10

Rosetta Card: Maxwell/QED → SST (multi-director swirl)

Domain: radiation sector; vacuum/linear media analogues.

Dictionary:

EM object	SST counterpart	Notes
A_μ	director phase gradient $\partial_\mu \theta$	Abelian sector
$F_{\mu\nu} = \partial_\mu A_\nu - \partial_\nu A_\mu$	swirl curvature of director field	circulation quantized
Charge q	knot/link index (topological)	integer invariants
Flux quantum	$\kappa = 2\pi r_c \lVert \mathbf{v}_{\circlearrowleft} \rVert$	$9.68 \times 10^{-9}\,\mathrm{m^2/s}$
Poynting $\mathbf{S}$	energy flux of Kelvin–swirl waves	$\sim U_{\text{swirl}}\, \mathbf{v}_{\text{ph}}$

Lagrangian/EOM map (linearized, uniform background):

$$\mathcal{L}_{\text{EM}} = -\tfrac{1}{4} F_{\mu\nu} F^{\mu\nu} \;\longleftrightarrow\; \mathcal{L}^{(\theta)}_{\text{SST}} = \tfrac{1}{2}\left[\frac{1}{c^2}(\partial_t \theta)^2 - |\nabla\theta|^2\right] U_{\max},$$

yielding the wave equation

$$\partial_t^2 \theta - c^2 \nabla^2 \theta = 0 \quad \text{(calibrated luminal phase speed).}$$

In inhomogeneous multi-director fields, polarization-dependent phase shifts (vacuum-like birefringence) enter via curvature of the director manifold.

Numerical anchor:

circulation quantum $\kappa = 9.68 \times 10^{-9}\,\mathrm{m^2/s}$ fixes the smallest swirl-flux unit consistent with r_c and $\mathbf{v}_{\circlearrowleft}$.

Dimensional checks:

$\mathcal{L}^{(\theta)}_{\text{SST}}$ has units of energy density by the factor $U_{\max}$.

Predictions & Falsifiers:

- Plane-wave dispersion $\omega = ck$ in uniform regions; gradients in θ produce tiny polarization-dependent delays $\propto \nabla^2\theta / U_{\max}$.
- Falsifier: vacuum birefringence above current bounds in high-energy astrophysical spectra would contradict the calibration.

Status: Canonical (kinematics) / Research (multi-director birefringence) **Version:** v0.5.10

Rosetta Card: Einstein–Æther/Khronon → SST (Swirl–Clock)

Domain: preferred-frame EFTs; GW constraints; PPN.

Dictionary:

EA field	SST counterpart	Notes
Unit timelike u^μ	normalized Swirl–Clock four-velocity	picks foliation
c_i couplings	effective foliation elasticities	mapped by calibration
c_T (spin-2 GW speed)	luminal by construction	enforce $c_{13} = c_1 + c_3 \simeq 0$

Action map (symbolic):

$$S_{æ} = \frac{1}{16\pi G} \int d^4x \sqrt{-g} \Big[-R - K_{ab}{}^{mn} \nabla^a u_m \nabla^b u_n + \lambda (u^\mu u_\mu + 1) \Big] ,$$
$$K_{ab}{}^{mn} = c_1 g_{ab} g^{mn} + c_2 \delta_a{}^m \delta_b{}^n + c_3 \delta_a{}^n \delta_b{}^m + c_4 u_a u_b g^{mn} .$$

GW calibration:

impose $c_{13} = 0 \Rightarrow c_T^2 = 1$ (luminal spin-2). Spin-1 and spin-0 mode speeds are functions of c_i (see table in source); choose parameter ranges that avoid instabilities/Čerenkov bounds.

Numerical anchor (GW170817 class):

$$|c_T - 1| \lesssim 10^{-15} \;\Rightarrow\; |c_{13}| \lesssim 10^{-15} \quad \text{(imposed)}.$$

Predictions & Falsifiers:

- With $c_{13} = 0$, SST's Swirl–Clock foliation is consistent with coincident GW–EM arrival.
- Dipole/monopole radiation channels are suppressed by calibration choices; detection at current pulsar-timing sensitivity would falsify this mapping.

Status: Calibration (GW speed) / Research (spin-0/1 sector) **Version:** SST-Rosetta v0.5.10

Chronometric and Metric Layer

SST Term	Mainstream Equivalent	Context / Reference
Swirl clock $S_t^{\circlearrowleft}$	Khronon / preferred-foliation scalar $T(x)$	Einstein–Æther, Hořava–Lifshitz gravity [1, 2]
Swirl time dilation $d\tau = dt\sqrt{1 - \lVert \mathbf{v}_{\circlearrowleft} \rVert^2 / c^2}$	Æther lapse factor N	ADM decomposition
Chronos–Kelvin invariant	Kelvin's circulation / helicity conservation	Classical fluid invariants [7]
Swirl-foliation metric $g_{\mu\nu}^{(\text{swirl})}$	Acoustic / analogue-gravity metric	Unruh–Visser emergent metric [12]

Fluid–Dynamic and Field Layer

SST Term	Mainstream Name / Concept	Relation
Swirl velocity field $\mathbf{v}_{\circlearrowleft}$	Superfluid phase-gradient velocity	$\mathbf{v} = (\hbar/m)\nabla\phi$ analogue
Effective density ρ_f	Superfluid or effective mass density	Incompressible limit
Swirl energy density ρ_E	Kinetic-energy density $\frac{1}{2}\rho v^2$	Barotropic flow
Swirl pressure gradient	Hydrodynamic pressure field $p(\rho)$	Euler acceleration source
Swirl tensor $\omega_{ij} = \partial_i v_j - \partial_j v_i$	Vorticity tensor	Identical operator

Topological and Knot Layer

SST Term	Mainstream Equivalent	Connection
Swirl string	Quantized vortex filament / Nielsen–Olesen string	Fluid–string duality
Knot-energy functional $\mathcal{E}_{\text{eff}} = \alpha C + \beta L + \gamma \mathcal{H}$	Moffatt–Faddeev–Skyrme functional	Topological soliton energy
Swirl helicity $\mathcal{H} = \int \mathbf{v} \cdot \boldsymbol{\omega} \, dV$	Fluid / magnetic helicity	Linkage and twist invariant [3, 4]
Hopf charge H_{vortex}	Hopf invariant	$\pi_3(S^2)$ topological index [5]
Golden-layer factor φ^{-2k}	Discrete-scale-invariance factor	Renormalization-group analog

Gauge and Quantum Layer

SST Concept	Mainstream Analogue	Mapping
Multi-director swirl symmetry	Gauge algebra $\mathfrak{su}(3) \oplus \mathfrak{su}(2) \oplus \mathfrak{u}(1)$	Emergent gauge structure
Swirl-string excitations	Unknotted field quanta / gauge bosons	Photon, gluon, . . . as unknots
Chiral swirl orientation	CPT-conjugate sectors	Matter antimatter dual
Swirl potential $\Phi = \frac{1}{2} \|\mathbf{v}_{\circlearrowleft}\|^2$	Kinetic / gravitational potential analog	Replaces GR curvature scalar
Mass functional $M = \frac{1}{\varphi} \frac{4}{\alpha} (\frac{1}{2} \rho_f \|\mathbf{v}_{\circlearrowleft}\|^2 V)$	Energy–mass equivalence	Mechanical derivation of rest mass

Gravitational and Large-Scale Layer

SST Term	Mainstream Name	Comment
Swirl-gravity constant G_{swirl}	Newtonian G (effective)	Derived from swirl mechanics
Pressure-well curvature	Gravitational potential well	Fluid-mechanical analog of curvature
Swirl potential waves	Gravitational / acoustic waves	Analogue-gravity mode
Torsional shocks	Nonlinear vorticity / spin-density waves	Possible new radiation class

Thermodynamic and Entropic Layer

SST Feature	Mainstream Analog	Interpretation
Swirl entropy growth	Enstrophy / helicity cascade	Entropy production in turbulence
Swirl-dissipation arrow	Thermodynamic arrow of time	Irreversibility via reconnection
Coherence factor $\xi(n) = 1 + \beta \log n$	Quantum-coherence correction	Many-body renormalization analog

Summary Table

SST Structural Layer	Physics Discipline	Closest Mainstream Equivalent
Chronometric	Lorentz-violating gravity	Khronon field / preferred foliation
Fluid–Dynamic	Superfluid hydrodynamics	Velocity, pressure, density fields
Topological	Soliton and knot theory	Hopfions, Skyrmions, helicity
Gauge–Quantum	Quantum field theory	Gauge algebra and field quanta
Gravitational	Analogue gravity / GR limit	Metric potentials, G analog
Thermodynamic	Non-equilibrium physics	Entropic and causal arrows

Scale-dependent Effective Densities in SST

Effective densities (house style).

$$\rho_f \equiv \text{effective fluid density}, \qquad \rho_E \equiv \tfrac{1}{2}\,\rho_f\,\|\mathbf{v}_{\circlearrowleft}\|^2 \quad (\text{swirl energy density}),$$

$$\rho_m \equiv \rho_E / c^2 \quad (\text{mass-equivalent density}).$$

Background value: $\rho_f^{\mathrm{bg}} \approx 7.0 \times 10^{-7}\ \mathrm{kg\,m^{-3}}$. Core (material) density: $\rho_{\mathrm{core}} \approx 3.8934358267 \times 10^{18}\ \mathrm{kg\,m^{-3}}$. Hence core energy density

$$\rho_E^{\mathrm{core}} = \rho_{\mathrm{core}}\, c^2 \approx 3.499 \times 10^{35}\ \mathrm{J\,m^{-3}}.$$

Radial profile (phenomenology). It is convenient to model the near-core energy density with an exponential relaxation to the background:

$$\rho_E(r) = \rho_E^{\mathrm{bg}} + \left(\rho_E^{\mathrm{core}} - \rho_E^{\mathrm{bg}}\right) e^{-r/r_*},$$

with a microscopic decay scale r_* (fit parameter). This empirical profile does not replace the exact tube energetics below.

String energetics (Rankine core + irrotational envelope). For a core of radius r_c and length ℓ with solid-body rotation $v_\phi(r) = \Omega r$ for $r \le r_c$,

$$E_{\mathrm{core}} = \int_0^{r_c} \frac{1}{2}\,\rho_f\,(\Omega r)^2\,(2\pi r\,\ell)\,dr = \frac{\pi}{4}\,\rho_f\,\Omega^2\,r_c^4\,\ell.$$

Outside the core, $v_\phi(r) = \Gamma/(2\pi r)$ with $\Gamma = 2\pi\Omega r_c^2$, giving the slender-tube envelope term

$$E_{\mathrm{env}} \simeq \frac{\rho_f\,\Gamma^2}{4\pi}\,\ell\,\ln\frac{R}{r_c},$$

where R is an outer cutoff set by the nearest boundary or neighboring strings. Both contributions are standard in vortex-tube energetics (core + Biot–Savart envelope).

Coarse-graining. At macroscales, we use the canonical identity

$$K = \frac{\rho_{\mathrm{core}}\, r_c}{\|\mathbf{v}_{\circlearrowleft}\||_{r=r_c}} = \frac{\rho_{\mathrm{core}}\, r_c}{\|\mathbf{v}_{\circlearrowleft}\||_{r=r_c}}, \qquad \rho_f = K\,\Omega_{\mathrm{leaf}}.$$

where Ω_{leaf} is a coarse-grained (leaf-averaged) angular rate. Numerically, $\Omega_{\mathrm{leaf}} \sim 10^{-4}\ \mathrm{s^{-1}}$ in the Canon fit; it must not be confused with the microscopic core rate below.

2 Layered Time Scaling from Swirl Dynamics

Adopt the SR-like local rule

$$\frac{d\tau}{dt} = \sqrt{1 - \frac{v_\phi^2(r)}{c^2}}.$$

With a Rankine profile,

$$v_\phi(r) = \begin{cases} \Omega_{\mathrm{core}}\, r, & r \le r_c, \\ \dfrac{\Gamma}{2\pi r}, & r \ge r_c, \end{cases} \qquad \Gamma = 2\pi\Omega_{\mathrm{core}}\, r_c^2.$$

Continuity at $r = r_c$ gives $v_\phi(r_c) = \Omega_{\mathrm{core}}\, r_c \equiv \|\mathbf{v}_{\circlearrowleft}\||_{r=r_c} = \|\mathbf{v}_{\circlearrowleft}\||_{r=r_c}$, hence

$$\Omega_{\mathrm{core}} = \frac{\|\mathbf{v}_{\circlearrowleft}\||_{r=r_c}}{r_c} = \frac{\|\mathbf{v}_{\circlearrowleft}\||_{r=r_c}}{r_c} \approx \frac{1.09384563 \times 10^6}{1.40897017 \times 10^{-15}} \approx 7.763 \times 10^{20}\ \mathrm{s^{-1}}.$$

Thus

$$\frac{d\tau}{dt} = \begin{cases} \sqrt{1 - \dfrac{\Omega_{\mathrm{core}}^2\, r^2}{c^2}}, & r \le r_c, \\ \sqrt{1 - \dfrac{\Gamma^2}{4\pi^2 c^2 r^2}}, & r \ge r_c. \end{cases}$$

The earlier ansatz $d\tau/d\bar{t} = e^{-r/r_c}$ can be used only as a phenomenological fit; it does not follow from the SR-like form unless one imposes a special $v_\phi(r)$ inconsistent with Rankine.

3 SST–VAM Translation and Constant Overlaps (Extended)

Chronos–Kelvin invariant

$$\frac{D}{Dt}(R^2\omega) = 0 \quad \text{(incompressible, inviscid, barotropic, no reconnection).}$$

(Kelvin/Helmholtz circulation conservation in SST wording; see [8, 9, 6, 7].)

Temporal Ontology in SST

We distinguish absolute parameter time $\mathcal{N}$ (preferred foliation label), external observer time τ, and internal clocks carried by swirl strings: a phase accumulator $S(t)$ and a loop "proper time" T_s. These appear in the field equations and separate global synchronization from local rotational dynamics.

$\mathcal{N}$	Absolute time (foliation)	Global causal parameter
ν_0	Now-point	Localized synchronization label
τ	External/chronos time	Measured time of external observer
$S(t)$	Swirl clock	Internal phase memory along a string
T_s	String proper time	Loop-duration functional
$\mathbb{K}$	Kairos event	Topological/phase transition moment

Fields, kinematics, operators (mapping)

VAM (legacy)	SST (house)	Meaning	Units	Overlap
"æther time"	absolute time parametrization	foliation time label	—	Yes
$T(x)$	$T(x)$	scalar clock field	—	Yes
u_μ (unit "æther" vector)	u_μ (unit time-like field)	$u_\mu = \partial_\mu T / \sqrt{-g^{\alpha\beta}\partial_\alpha T \partial_\beta T}$	—	Yes
"vortex line(s)"	swirl string(s)	object name only	—	Yes
$B_{\mu\nu},\ H_{\mu\nu\rho}$	same	Kalb–Ramond 2-form; $H = \partial_{[\mu} B_{\nu\rho]}$	—	Yes
W_μ	W_μ	coarse-grained frame connection	—	Yes
$C(K),\ L(K),\ \mathcal{H}(K)$	same	crossing #, ropelength, hyperbolic proxy	—	Yes

Densities, velocities, coarse–graining (mapping)

VAM (legacy)	SST (macro)	Meaning	Units	Overlap
$\rho_0,\ \rho_æ^{(\text{fluid})},\ \rho_æ^{(\text{vacuum})}$	$\rho_f,\ \rho_f^{\text{bg}}$ or $\rho_f^{(0)}$	effective fluid density	$\text{kg}\,\text{m}^{-3}$	Yes
$\rho_æ^{(\text{core})},\ \rho_æ^{(\text{mass})}$	ρ_{core}	core/material density	$\text{kg}\,\text{m}^{-3}$	Yes
$\rho_æ^{(\text{energy})}$	ρ_E (or $\rho_{\text{core}}c^2$)	energy density	$\text{J}\,\text{m}^{-3}$	Yes
C_e (tangential)	$\lVert\mathbf{v}_\circlearrowleft\rVert\rvert_{r=r_c}$	characteristic swirl speed ($= \lVert\mathbf{v}_\circlearrowleft\rVert$ at $r = r_e$)	$\text{m}\,\text{s}^{-1}$	Yes
C_e (field form)	$\mathbf{v}_\circlearrowleft$	swirl-velocity *vector field*	$\text{m}\,\text{s}^{-1}$	Add
C_e (scalar use)	$\lVert\mathbf{v}_\circlearrowleft\rVert\rvert_{r=r_c}$	core magnitude of $\mathbf{v}_\circlearrowleft$	$\text{m}\,\text{s}^{-1}$	Add
$K = \dfrac{\rho^{(\text{mass})} r_c}{C_e}$	$K = \dfrac{\rho_{\text{core}}\, r_c}{\lVert\mathbf{v}_\circlearrowleft\rVert\rvert_{r=r_c}}$	coarse–graining coefficient	$\text{kg}\,\text{m}^{-3}\,\text{s}$	Add
Ω	Ω	leaf angular rate	s^{-1}	Yes

Global scales and bounds

VAM (legacy)	SST (house)	Meaning	Units	Overlap
$F^{\max}$ (Coulomb)	$\text{F}_{\text{EM}}^{\max}$	Coulomb-sector bound	N	Yes
$F_{\text{gr}}^{\max}$ (Universal)	$\text{F}_{\text{G}}^{\max}$	gravitational/universal bound	N	Yes
Γ	Γ	loop circulation	$\text{m}^2\,\text{s}^{-1}$	Yes
$\Omega_R,\ \Omega_c$	same	outer rigid vs. core spin	s^{-1}	Yes

Numeric overlaps (published values)

Quantity	Symbol (SST)	Value	Units
Characteristic swirl speed	$\|\mathbf{v}_{\circlearrowleft}\|\|_{r=r_c}$ $(\equiv \|\mathbf{v}_{\circlearrowleft}\|\|_{r=r_c})$	1,093,845.63	$\mathrm{m\,s^{-1}}$
Core radius	r_c	$1.40897017 \times 10^{-15}$	m
Core density	ρ_{core}	$3.8934358266918687 \times 10^{18}$	$\mathrm{kg\,m^{-3}}$
Background density	ρ_f^{bg}	7.0×10^{-7}	$\mathrm{kg\,m^{-3}}$
Max Coulomb force	$\mathrm{F}_{\text{EM}}^{\max}$	29.053507	N
Max universal force	$\mathrm{F}_{\text{G}}^{\max}$	3.02563×10^{43}	N

Macro glossary (house style)

Use the macros to avoid drift:

$$\rho_f \text{ (effective density)}, \quad \rho_E \text{ (energy density)}, \quad \rho_m \text{ (mass-equivalent)}$$

$$\rho_{\text{core}} \text{ (core density)}, \quad \mathbf{v}_{\circlearrowleft} \text{ (swirl velocity vector)}, \quad \|\mathbf{v}_{\circlearrowleft}\| = \|\mathbf{v}_{\circlearrowleft}\| \text{ (speed magnitude at a point)}.$$

Energy vs mass-equivalent (clarification). ρ_E is an *energy density*; $\rho_m = \rho_E/c^2$ is the corresponding local mass-equivalent. *Note.* ρ_{core} is a calibration *constant*. The mass-equivalent density is a *field* $\rho_m(x) = \rho_E(x)/c^2$. In the core-saturation evaluation $\rho_E^{\text{core}} = \rho_{\text{core}}\, c^2$, one has $\rho_m^{\text{core}} = \rho_{\text{core}}$.

Prose guardrails (rebrand policy)

Use *foliation* and *swirl string(s)* in narrative text. Reserve legacy words ("æther", "vortex") strictly for quoting historical titles or citations. Retain *vorticity* as standard.

Sentence rewrites (examples)

Legacy: "The æther sector fixes the vortex core density."
SST: "The *foliation* sector fixes the *core density* ρ_{core} of the swirl string."
Legacy: "Kelvin's vortex theorem implies conserved $R^2\omega$."
SST: "Kelvin's *circulation* theorem implies $\frac{D}{Dt}(R^2\omega) = 0$ under incompressible, inviscid, barotropic flow."

References

[1] T. Jacobson and D. Mattingly, Gravity with a dynamical preferred frame, Phys. Rev. D **64**, 024028 (2001). doi:10.1103/PhysRevD.64.024028

[2] D. Blas, O. Pujolàs, and S. Sibiryakov, Models of non-relativistic quantum gravity: the good, the bad and the healthy, JHEP **04**, 018 (2011). doi:10.1007/JHEP04(2011)018

[3] H. K. Moffatt, The degree of knottedness of tangled vortex lines, J. Fluid Mech. **35**, 117–129 (1969). doi:10.1017/S0022112069000991

[4] M. W. Scheeler, W. M. van Rees, H. K. Moffatt, M. F. Hecke, and W. T. M. Irvine, Helicity conservation by flow across scales in reconnecting vortex links and knots, Proc. Natl. Acad. Sci. U.S.A. **111**, 15350–15355 (2014). doi:10.1073/pnas.1407232111

[5] L. Faddeev and A. J. Niemi, Stable knot-like structures in classical field theory, Nature **387**, 58–61 (1997). doi:10.1038/387058a0

[6] G. K. Batchelor, *An Introduction to Fluid Dynamics*, Cambridge University Press, 1967. doi:10.1017/CBO9780511800955

[7] P. G. Saffman, *Vortex Dynamics*, Cambridge University Press, 1992. doi:10.1017/CBO9780511624063

[8] H. von Helmholtz, "Über Integrale der hydrodynamischen Gleichungen, welche den Wirbelbewegungen entsprechen", J. Reine Angew. Math. **55**, 25–55 (1858).

[9] W. Thomson (Lord Kelvin), "On vortex motion", Trans. R. Soc. Edinburgh **25**, 217–260 (1869).

[10] A. Einstein, "Ist die Trägheit eines Körpers von seinem Energieinhalt abhängig?", Annalen der Physik **18**, 639–641 (1905). doi:10.1002/andp.19053231314

[11] Clifford M. Will, "The Confrontation between General Relativity and Experiment", Living Reviews in Relativity **17**(4), (2014). doi:10.12942/lrr-2014-4 arXiv:1403.7377

[12] W. G. Unruh, "Experimental Black-Hole Evaporation?", Phys. Rev. Lett. **46**, 1351–1353 (1981). doi:10.1103/PhysRevLett.46.1351

[13] Matt Visser, "Acoustic black holes: horizons, ergospheres and Hawking radiation", Classical and Quantum Gravity **15**, 1767–1791 (1998). doi:10.1088/0264-9381/15/6/024

[14] Ted Jacobson and David Mattingly, "Einstein–Aether Waves", Phys. Rev. D **70**, 024003 (2004). doi:10.1103/PhysRevD.70.024003 arXiv:gr-qc/0402005

[15] T. Baker et al., "Strong Constraints on Cosmological Gravity from GW170817 and GRB 170817A", Phys. Rev. Lett. **119**(25), 251301 (2017). doi:10.1103/PhysRevLett.119.251301

[16] Jacob Oost, Shinji Mukohyama, and Anzhong Wang, "Constraints on Einstein-aether theory after GW170817", arXiv:1802.04303 (2018). arXiv:1802.04303