SST Rosetta: VAM-to-SST Translation Guide for Symbols, Macros, and Constants

Omar Iskandarani[*]

September 25, 2025

Abstract

This note provides a rigorous nomenclature concordance between the legacy VAM presentation and the Swirl–String Theory (SST) house style. It establishes a one-to-one mapping of symbols and terminology while preserving the underlying kinematics, operators, and calibrated constants. In particular, it fixes the canonical SST equalities

$$\rho_E = \tfrac{1}{2}\,\rho_f\,\|\mathbf{v}_{\circlearrowleft}\|^2, \qquad \rho_m = \rho_E/c^2, \qquad K = \frac{\rho_{\mathrm{core}}\,r_c}{\|\mathbf{v}_{\circlearrowleft}\|\,|_{r=r_c}} = \frac{\rho_{\mathrm{core}}\,r_c}{\|\mathbf{v}_{\circlearrowleft}\|\,|_{r=r_c}}, \quad \rho_f = K\,\Omega,$$

and records that all published numerical values for $\|\mathbf{v}_{\circlearrowleft}\|\,|_{r=r_c}$ (defined here as $\|\mathbf{v}_{\circlearrowleft}\|\,|_{r=r_c}$), r_c, ρ_{core}, the background density, and the sectoral force bounds carry over unchanged. The document includes compact translation tables (fields/kinematics/operators; densities/velocities/coarse–graining; global scales) and a minimal macro layer (`\rhoF`, `\rhoE`, `\rhoM`, `\rhoC`, `\vswirl`, `\vnorm`) to prevent notation drift in large projects. Legacy wording is restricted to historical citations; narrative prose adopts the neutral SST vocabulary (e.g., *foliation*, *swirl string*) without altering the mathematics. Compatibility is ensured both for standalone use (title page + metadata) and for modular inclusion (`\providecommand` guards and no additional package requirements). The result is a drop-in "translation guide" that guarantees dimensional consistency, unambiguous symbol usage, and reproducible cross-referencing across manuscripts that span the VAM→SST transition.

[*] Independent Researcher, Groningen, The Netherlands
Email: `info@omariskandarani.com`
ORCID: `0009-0006-1686-3961`
DOI: 10.5281/zenodo.16980376

1 SST–VAM Translation and Constant Overlaps (Extended)

Canonical equalities (SST form)

$$\rho_E = \tfrac{1}{2}\rho_f\,\|\mathbf{v}_\circlearrowleft\|^2, \qquad \rho_m = \rho_E/c^2,$$
$$K = \frac{\rho_{\text{core}}\,r_c}{\|\mathbf{v}_\circlearrowleft\|\,|_{r=r_c}} = \frac{\rho_{\text{core}}\,r_c}{\|\mathbf{v}_\circlearrowleft\|\,|_{r=r_c}}, \qquad \rho_f = K\,\Omega.$$

Dimensional check

$$\begin{aligned}
[\rho_f] &= \ \mathrm{kg\,m^{-3}}\\
[\|\mathbf{v}_\circlearrowleft\|] &= \ \mathrm{m\,s^{-1}}\\
[\rho_E] &= \ \mathrm{J\,m^{-3}}\\
[\rho_m] &= \ \mathrm{kg\,m^{-3}}\\
[K] &= \ \mathrm{kg\,m^{-3}\,s}
\end{aligned}$$

Chronos–Kelvin invariant (added for completeness)

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

(Kelvin/Helmholtz circulation conservation in SST wording; see [1, 2, 3, 4].)

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
ρ_0, $\rho_{æ}^{(\text{fluid})}$, $\rho_{æ}^{(\text{vacuum})}$	ρ_f, ρ_f^{bg} or $\rho_f^{(0)}$	effective fluid density	$\mathrm{kg\,m^{-3}}$	Yes
$\rho_{æ}^{(\text{core})}$, $\rho_{æ}^{(\text{mass})}$	ρ_{core}	core/material density	$\mathrm{kg\,m^{-3}}$	Yes
$\rho_{æ}^{(\text{energy})}$	ρ_E (or $\rho_{\text{core}}c^2$)	energy density	$\mathrm{J\,m^{-3}}$	Yes
C_e (tangential)	$\|\mathbf{v}_\circlearrowleft\|\,|_{r=r_c}$	characteristic swirl speed ($= \|\mathbf{v}_\circlearrowleft\|$ at $r = r_e$)	$\mathrm{m\,s^{-1}}$	Yes
C_e (field form)	$\mathbf{v}_\circlearrowleft$	swirl-velocity *vector field*	$\mathrm{m\,s^{-1}}$	Add
C_e (scalar use)	$\|\mathbf{v}_\circlearrowleft\|\,|_{r=r_c}$	core magnitude of $\mathbf{v}_\circlearrowleft$	$\mathrm{m\,s^{-1}}$	Add
$K = \dfrac{\rho^{(\text{mass})}r_c}{C_e}$	$K = \dfrac{\rho_{\text{core}}\,r_c}{\|\mathbf{v}_\circlearrowleft\|\,|_{r=r_c}}$	coarse–graining coefficient	$\mathrm{kg\,m^{-3}\,s}$	Add
Ω	Ω	leaf angular rate	$\mathrm{s^{-1}}$	Yes

Global scales and bounds

VAM (legacy)	SST (house)	Meaning	Units	Overlap
$F^{\max}$ (Coulomb)	$\mathrm{F}_{\mathrm{EM}}^{\max}$	Coulomb-sector bound	N	Yes
$F_{\mathrm{gr}}^{\max}$ (Universal)	$\mathrm{F}_{\mathrm{G}}^{\max}$	gravitational/universal bound	N	Yes
Γ	Γ	loop circulation	$\mathrm{m^2\,s^{-1}}$	Yes
Ω_R, Ω_c	same	outer rigid vs. core spin	$\mathrm{s^{-1}}$	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	$\mathrm{F}_{\mathrm{EM}}^{\max}$	29.053507	N
Max universal force	$\mathrm{F}_{\mathrm{G}}^{\max}$	3.02563×10^{43}	N

Macro glossary (house style)

Use the macros to avoid drift:

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

ρ_{core} (core density), $\mathbf{v}_{\circlearrowleft}$ (swirl velocity vector), $\|\mathbf{v}_{\circlearrowleft}\| = \|\mathbf{v}_{\circlearrowleft}\|$ (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 $\rho_E^{\mathrm{core}} = \rho_{\mathrm{core}}\, c^2$, one has $\rho_m^{\mathrm{core}} = \rho_{\mathrm{core}}$.

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 $\dfrac{D}{Dt}(R^2\omega) = 0$ under incompressible, inviscid, barotropic flow."

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

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

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

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

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.

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 sect
Φ (Newtonian potential)	Φ_{SST} from swirl energy fraction	defined below
$T^{\mu\nu}$	swirl stress $(\rho_E, p_{\text{swirl}}, \ldots)$	barotropic, inviscid
c		calibrated to luminal sig

EOM / Metric Map (linearized):

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

Define the local swirl energy density and maximum energy density

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

and map

$$g_{tt} = -(1 - \chi_{\text{swirl}})^2, \qquad g_{ij} = (1 + \gamma\,\chi_{\text{swirl}})\,\delta_{ij}.$$

Matching coefficients gives

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

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

Numerical validation (your constants):

$$\kappa = 2\pi r_c \|\mathbf{v}_{\circlearrowleft}\| = 9.68 \times 10^{-9}\,\text{m}^2/\text{s}, \quad U_{\text{swirl}} = \tfrac{1}{2}\rho_f \|\mathbf{v}_{\circlearrowleft}\|^2 = 4.19 \times 10^5\,\text{J/m}^3,$$

$$U_{\max} = \rho^2_{\text{core}} = 3.50 \times 10^{35}\,\text{J/m}^3, \quad \chi_{\text{swirl}} = U_{\text{swirl}}/U_{\max} = 1.20 \times 10^{-30},$$

$$\Phi_{\text{SST}} = -\frac{U_{\text{swirl}}}{2\rho_{\text{core}}} = -5.38 \times 10^{-14}\,\text{m}^2/\text{s}^2, \quad \left|\frac{2\Phi_{\text{SST}}}{2}\right| = 1.20 \times 10^{-30}.$$

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

Predictions & Falsifiers

- Lensing/Shapiro from Φ_{SST} matches GR to $\mathcal{O}(\chi_{\text{swirl}})$; deviations scale with spatial gradients of U_{swirl}.
- High-frequency GW propagation luminal (Calib.) $\Rightarrow$ 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:** Rosetta v0.1

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	$\kappa = 2\pi r_c \lVert \mathbf{v}_\circlearrowleft \rVert$	$9.68 \times 10^{-9}\,\mathrm{m}^2/\mathrm{s}$
Poynting $\mathbf{S}$	energy flux of Kelvin–swirl waves	$\sim U_{\mathrm{swirl}}\,\mathbf{v}_{\mathrm{ph}}$

Lagrangian/EOM map (linearized, uniform background):

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

yielding the wave equation

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

In inhomogeneous multi-director fields, polarization-dependent phase shifts (vacuum-like birefringence) enter via curvature of the director manifold.
Numerical anchor: circulation quantum $\kappa = 9.68 \times 10^{-9}\,\mathrm{m}^2/\mathrm{s}$ fixes the smallest swirl-flux unit consistent with r_c and $\mathbf{v}_\circlearrowleft$.
Dimensional checks: $\mathcal{L}^{(\theta)}_{\mathrm{SST}}$ has units of energy density by the factor $U_{\max}$.
Predictions & Falsifiers

- Plane-wave dispersion $\omega = k$ 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:** Rosetta v0.1

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):

$$S = \frac{1}{16\pi G}\int d^4x\sqrt{-g}\Big[-R - K_{ab}{}^{mn}\nabla^a u_m \nabla^b u_n + \lambda(u^\mu u_\mu + 1)\Big],$$

$$K_{ab}{}^{mn} = c_1 g_{ab} g^{mn} + c_2 \delta_a{}^m \delta_b{}^n + c_3 \delta_a{}^n \delta_b{}^m + c_4 u_a u_b g^{mn}.$$

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:** Rosetta v0.1

References

[1] H. von Helmholtz. Über integrale der hydrodynamischen gleichungen, welche den wirbelbewegungen entsprechen. *J. Reine Angew. Math.*, 55:25–55, 1858.

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

[3] G. K. Batchelor. *An Introduction to Fluid Dynamics*. Cambridge University Press, 1967.

[4] P. G. Saffman. *Vortex Dynamics*. Cambridge University Press, 1992.