SST–VAM Translation

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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

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

and records that all published numerical values for $\mathbf{v}_{\circlearrowleft}$, 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.

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1 SST–VAM Translation and Constant Overlaps (Extended)

Canonical equalities (SST form)

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

Dimensional check

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

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.

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	$\mathrm{kg\,m^{-3}}$	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
ρ_E	ρ_E	$\frac{1}{2}\,\rho_f\,\|\mathbf{v}_{\circlearrowleft}\|^2$	$\mathrm{J\,m^{-3}}$	Yes
ρ_m	ρ_m	ρ_E/c^2	$\mathrm{kg\,m^{-3}}$	Yes
C_e (tangential)	v_s	characteristic swirl speed ($= \|\mathbf{v}_{\circlearrowleft}\|$ at $r = r_c$)	$\mathrm{m\,s^{-1}}$	Yes
r_c	r_c	core radius	m	Yes
$K = \dfrac{\rho^{(\text{mass})}r_c}{C_e}$	$K = \dfrac{\rho_{\text{core}}r_c}{v_s}$	coarse–graining coefficient	$\mathrm{kg\,m^{-3}\,s}$	Yes
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
$\Omega_R,\ \Omega_c$	same	outer rigid vs. core spin	$\mathrm{s^{-1}}$	Yes

Numeric overlaps (published values)

Quantity	Symbol (SST)	Value	Units
Characteristic swirl speed	v_s	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	$F_{\mathrm{EM}}^{\max}$	29.053507	N
Max universal force	$F_{\mathrm{G}}^{\max}$	3.02563×10^{43}	N

Macro glossary (house style)

Use the macros to avoid drift:

ρ_f (effective density), ρ_E (energy density), ρ_m (mass-equivalent), ρ_{core} (core density), $\mathbf{v}_{\circlearrowleft}$ (swirl speed)

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."

Scale-dependent Effective Densities in SST

Effective densities (house style).

$\rho_f \equiv$ effective fluid density, $\rho_E \equiv \frac{1}{2}\rho_f \|\mathbf{v}_{\circlearrowleft}\|^2$ (swirl energy density), $\rho_m \equiv \rho_E/c^2$ (mass-equivalent

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 $r \le r_c$,

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

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

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

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

$$K = \frac{\rho_{\text{core}}\,r_c}{v_s}, \qquad \rho_f = K\,\Omega_{\text{leaf}}.$$

where Ω_{leaf} is a coarse-grained (leaf-averaged) angular rate. Numerically, $\Omega_{\text{leaf}} \sim 10^{-4}\,\text{s}^{-1}$ 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,

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

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

$$\Omega_{\text{core}} = \frac{v_s}{r_c} \approx \frac{1.09384563 \times 10^6}{1.40897017 \times 10^{-15}} \approx 7.763 \times 10^{20}\ \text{s}^{-1}.$$

Thus

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

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.

References