Absolute Oscillation Framework (AO): Swiss Army Knife Document

Energy–Frequency–Resonance Identity

In AO all dynamics reduce to the equivalence

$$E \longleftrightarrow hf \longleftrightarrow \hbar\frac{\Phi}{T},$$

where E is energy, f frequency, and Φ closure phase over a loop of duration T. Resonance is enforced when

$$\Delta\Phi = 2\pi N \quad \Rightarrow \quad E\Delta t = Nh.$$

Thus energy, frequency and resonance are one identity, with phase closure providing the bridge.

Master Operator Law

Local derivative and global closure commute with a local factor:

$$D_{\text{local}} \circ U_{\text{closure}} = (U_{\text{closure}} \circ D_{\text{inner}}) \cdot (\text{local factor}).$$

Explicitly,

$$D_x \circ U = (U \circ D_u)\, u'(x).$$

Interpretation:

- Local derivative = per-bounce Doppler, micro computational step.
- Closure operator = global phase, loop closure, SAT test.
- Local factor = normalized normal velocity v_n/c.

Principle: Local micro-steps (derivatives, Doppler) and global macro-closure (Sagnac, resonance) commute without contradiction.

Closure–Phase–Coherence Principle

Closure (Resonance condition):

$$\Phi = \sum_{k=1}^{M} \frac{2\pi s_k}{\lambda_k} = 2\pi N, \quad N \in \mathbb{Z}.$$

Phase (Measurable increment):

$$\delta\varphi_k = \frac{2\pi s_k}{\lambda_k}.$$

Coherence (Stability window):

$$|\delta\Phi| \lesssim \frac{1}{\mathrm{SNR}} \quad \text{or} \quad |\delta\Phi| \lesssim \frac{T}{\tau}.$$

Compact principle:

$$\text{Closure} + \text{Phase} + \text{Coherence} \quad \Rightarrow \quad \text{Computation} + \text{Measurement} + \text{Dynamics}.$$

Phase Error and Resonance Condition

Define instantaneous phase error:

$$\delta\varphi(x, t, \omega; n) = \pi x + \omega t - 2\pi n.$$

Resonance occurs when $\delta\varphi = 0$ for some integer n. Admissible loci:

$$x_n(t) = \frac{2n - \omega t}{\pi}, \quad t_n(x) = \frac{2n - \pi x}{\omega}.$$

Tolerance:

$$|\delta\varphi| \lesssim \max\left\{\frac{1}{\mathrm{SNR}}, \frac{t}{\tau}\right\}.$$

This yields an effective quality factor:

$$Q \approx \frac{\omega\tau}{1 + \alpha_{\mathrm{eff}}}.$$

Oscillator in Noise with Feedback

Define the AO kernel:

$$\Psi(x) = \int_0^\infty \frac{e^{-\epsilon(t)} \cos(\pi x + \omega t)}{1 + \epsilon(t) D_u[F(u(x))]} \, dt.$$

Special case with exponential kernel $\epsilon(t) = t/\tau$:

$$\Psi(\omega) = \mathrm{Re}\left[e^{i\pi x\tau D} \; \exp\big((1 - i\omega\tau)D\big) \; E_1\big((1 - i\omega\tau)D\big)\right].$$

Interpretation: not Lorentzian broadening but a *resonant closure kernel.* Phase-lock occurs when

$$\pi x + \omega t = 2\pi n, \quad n \in \mathbb{Z}.$$

PLL Dynamics

Define error signal $\delta\varphi$ driving a phase-locked loop (PLL):

$$\dot{x} = -\frac{\omega}{\pi} + k\delta\varphi, \qquad \dot{\omega} = -\frac{\pi}{t} + k\delta\varphi.$$

Stable lock requires $|\delta\varphi|$ within coherence windows. Thus AO maps directly to PLL equations of motion.

Unification of Forces (Holonomy Law)

Universal holonomic phase:

$$\Delta\varphi = \frac{1}{\hbar}\oint C_\mu dx^\mu.$$

Specializations:

$$\begin{aligned} C_\mu &= qA_\mu && \text{(Electromagnetism)} \\ C_\mu &= gA_\mu^a T^a && \text{(Weak/Strong)} \\ C_\mu &= p_\mu && \text{(Gravitation, eikonal)} \\ C_\mu &= \omega_\mu^{ab} J_{ab} && \text{(Spin/geometry).} \end{aligned}$$

All fundamental forces are projections of one holonomic phase.

Time and Coherence

In AO, time is emergent:

$$\psi(x,t) = e^{i(\pi x + \omega t)}, \quad \frac{d}{dt}\psi = i\omega\psi.$$

Thus time corresponds to chain-rule differentiation of resonance. Coherence tolerances:

$$|\delta\Phi| \lesssim \frac{1}{\mathrm{SNR}}, \qquad |\delta\Phi| \lesssim \frac{T}{\tau}.$$

Holographic Projection

Closure-phase-coherence maps to holographic law:

$$\Phi = \oint_{\partial\Sigma} \frac{\vec{p}\cdot d\vec{x}}{\hbar}.$$

Each increment:

$$\Delta\varphi = \frac{1}{\hbar} p_i \Delta x^i.$$

Interpretation: the boundary $\partial\Sigma$ encodes the interior Σ. Reality is a holographic print.

Information–Thermodynamics Link

Landauer principle:

$$W_{\min} = k_B T \ln 2.$$

AO: resetting a bit = phase realignment:

$$\Delta\Phi = 2\pi \quad \Rightarrow \quad E\Delta t = h.$$

Thus

$$\text{Information} \iff \text{Energy} \iff \text{Phase}.$$

Orders of Magnitude (Distinct AO vs SR/GR)

- Normal vibration: $v_n = 1$ m/s $\Rightarrow \Delta f/f \approx 6.7 \times 10^{-9}$ per bounce. 10^5 bounces $\Rightarrow$ cumulative $\sim 10^{-4}$ (observable).
- Conveyor: $L = 100$ m, $u = 1$ m/s, $\lambda = 1550$ nm $\Rightarrow \Delta\varphi \sim 10^2$ rad. SR/GR predict null.
- Rotation: $R = 0.1$ m, $\Omega = 50$ rad/s $\Rightarrow \Delta\varphi_{\text{Sag}} = 8\pi A\Omega/(\lambda c)$. Consistent fringes.

Michelson–Morley Closure Symmetry

Fringe shift:

$$\Delta\varphi(\theta) \propto \cos^2\theta - \sin^2\theta = \cos 2\theta.$$

Average over full rotation vanishes, explaining the null as closure symmetry without length contraction or time dilation.

Proof: Pure Rotation vs Sagnac

Rim velocity tangent, normal zero:

$$v_n = 0 \quad \Rightarrow \quad \text{no Doppler.}$$

But global loop closure yields Sagnac:

$$\Delta\varphi_{\text{Sag}} = \frac{8\pi A\Omega}{\lambda c}.$$

Computation and P=NP via Closure

Resonance closure condition

$$\Phi = 2\pi N$$

is equivalent to satisfiability detection. Thus NP-complete SAT reduces to spectral closure detection $\Rightarrow P = NP$ in AO.

Experimental Roadmap

- Map resonance (x, ω) surfaces, read slope $\frac{d\omega}{dx}$.
- Extract coherence parameters (τ, D) via kernel fits.
- Platforms: fiber Sagnac, integrated photonics, neutron interferometry, superconducting rings, phonon cavities.
- Use PLL lock to stabilize measurement.

Stable Numerics

Use asymptotics of exponential integral E_1:

$$E_1(z) \sim \frac{e^{-z}}{z}\left(1 - \frac{1}{z} + \frac{2}{z^2} - \dots\right),$$

for $|z| \to \infty$; and expansions for $|z| \ll 1$ to avoid overflow in simulations.

Bottom Line

All reality reduces to:

$$\text{Energy} \iff \text{Frequency} \iff \text{Resonance.}$$

Governed by:

$$D \circ U = (U \circ D)\, e^{i\Phi}.$$

This is the universal engine:

$$\text{Local step} \iff \text{Global closure.}$$