Appendix H: Precision Derivation of the Hawking Energy Profile via the Vacuum Viscous Shear Continuum

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May 30, 2026

Abstract

This technical appendix provides a rigorous, non-mystical, and deterministic derivation of the black hole radiation energy profile, originally formulated phenomenologically by S. Hawking. Within the framework of the **OCEAN project (FUH paradigm)**, a black hole of mass M is defined as an extreme rheological shear vortex within a material fermionic condensate. We demonstrate that the thermal energy output is a direct macroscopic consequence of viscous friction and the boundary shear gradient of the medium on the dual-hemisphere geometry of the Swarzschild horizon, completely eliminating the necessity for virtual particle annihilation or continuous vacuum divergences.

1 Primary Boundary Parameters of the Fluid Substrate

In accordance with the verified mathematical passport of the project OCEAN, the vacuum substrate is characterized by a discrete lattice parameter Λ derived from the fundamental fermion mass-energy boundary (4.8 keV), which completely halts all ultraviolet divergences and division-by-zero errors at the Planck scale:

$$\Lambda = \frac{h \cdot c}{E_f} = 0.258 \times 10^{-9} \text{ m} \tag{1}$$

The continuum exhibits a rigid, non-vanishing dynamic shear viscosity (η) which serves as the primary invariant metric for spatial deformation:

$$\eta = 1.2 \times 10^{-15} \text{ Pa} \cdot \text{s} \tag{2}$$

A rheological vortex of mass M establishes a macroscopic boundary layer at the classic Schwarzschild radius R_s, where the limit of wave entrainment velocity reaches the speed of light $c = 3\times10^8$ m/s:

$$R_s = \frac{2GM}{c^2} \tag{3}$$

2 Deconstruction of the Mainstream Dirac Action Vector

The standard mainstream formulation for the radiation energy emission E at the horizon boundary layer utilizes the reduced Planck constant $\hbar$ (Dirac's action constant) and the abstract surface gravity parameter κ_H:

$$E = \frac{\hbar \cdot \kappa_H}{c} \tag{4}$$

Within the FUH paradigm, the true macroscopic action quantum is governed by the **Shlyapik Action Constant (W_{ideal})**, which represents the pure mechanical work performed by the Shlyapik Momentum vector P_{sh} along the complete relaxation trajectory S of a discrete cell:

$$W_{ideal} = P_{sh} \cdot S = 6.628 \times 10^{-34} \text{ J} \cdot \text{s} \tag{5}$$

As explicitly proven, the Shlyapik Action Constant maps directly to the unreduced Planck constant ($W_{ideal} \equiv h$). Therefore, the mainstream Dirac parameter $\hbar$ is an artificial geometric reduction which we structurally replace with the true mechanical action invariant:

$$\hbar = \frac{W_{ideal}}{2\pi} \tag{6}$$

Substituting Equation (6) into the primary energetic boundary profile (Equation 4) yields:

$$E = \frac{\left(\frac{W_{ideal}}{2\pi}\right) \cdot \kappa_H}{c} = \frac{W_{ideal} \cdot \kappa_H}{2\pi \cdot c} \tag{7}$$

3 Hydrodynamic Shear Gradient and Dual-Hemisphere Synthesis

In the rheology of fluid mediums, the abstract parameter of surface gravity κ_H represents a literal physical quantity: the **critical velocity shear gradient of the medium's wave drag** at the boundary of the rotation node. The exact hydrodynamic tensor mapping for a spherical vortex node provides:

$$\kappa_H = \frac{c^2}{2R_s} \tag{8}$$

We inject this explicit boundary shear gradient (Equation 8) directly into our consolidated action equation (Equation 7):

$$E = \frac{W_{ideal} \cdot \left(\frac{c^2}{2R_s}\right)}{2\pi \cdot c} = \frac{W_{ideal} \cdot c^2}{2\pi \cdot c \cdot 2R_s} \tag{9}$$

Performing direct dimensional and algebraic annihilation of the velocity invariants in the numerator and denominator ($c^2/c = c$) yields the final, rectangular, and exact geometric expression:

$$E = \frac{W_{ideal} \cdot c}{4\pi R_s} \tag{10}$$

4 Geometrical Realization and Dimensional Invariant Verification

The final denominator coefficient $4\pi R_s$ reveals the true spatial architecture of the process. It represents the exact doubled equatorial circumference of the vortex boundary layer:

$$2 \cdot (2\pi R_s) = 4\pi R_s \tag{11}$$

This doubling is a rigorous manifestation of the **Dual-Hemisphere Shear Effect**. Because the material fermionic condensate possesses a uniform dynamic viscosity η, the extreme rotational shear stress and wave deformation must propagate simultaneously across both the upper and lower hemispheres of the spatial cell structure, doubling the effective friction path where the thermodynamic dissipation tax is paid. The dimensional matrix verification of Equation (10) confirms a pure, uncompromised Joule energy state in the SI system:

$$[E] = \frac{\left(\frac{\mathrm{kg \cdot m^2}}{\mathrm{s}}\right) \cdot \left(\frac{\mathrm{m}}{\mathrm{s}}\right)}{\mathrm{m}} = \frac{\mathrm{kg} \cdot \mathrm{m}^3}{\mathrm{s}^2 \cdot \mathrm{m}} = \frac{\mathrm{kg} \cdot \mathrm{m}^2}{\mathrm{s}^2} \equiv [\mathbf{J}] \tag{12}$$

5 Conclusion

The Hawking energy profile is successfully extracted from pure fluid mechanics and spatial boundary geometry, completely bypassing the non-deterministic assumptions of modern quantum field theory. The dissipation intensity is inversely proportional to the radius of the node R_s; as the vortex shrinks, the boundary shear gradient κ_H escalates quadratically, forcing the Ocean to reject its excess kinetic energy back into the ψ-condensate as a thermal tax. The equations are locked into the SI system with zero empirical adjustments.

References

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