

Addendum 281: The Observation Boundary

Dirichlet at both ends: derivation, retraction,
and the settled P07 spectrum (OI-280-1 closed)

TOE Corpus

2026-06-10

Skill: gap-closure v1.1 — **Outcome:** Case B+ (two independent corpus arguments + data selection; prose retraction recorded) — **Closes:** OI-280-1; retires TBS P007_1, P007_2 — **Verifier:** `verify_P281.py` — all PASS

Abstract

A280 established that P07’s published accuracy and its stated boundary interpretation are incompatible (the muon prediction degrades $9.1\times$ under the claimed mixed conditions) and filed the choice as OI-280-1. The Dirichlet condition $\psi(0) = \psi(1) = 0$ is here derived twice over. (i) *Substrate inheritance*. The observation amplitude ψ is a field over the same density substrate whose perturbation theory the corpus has already settled: P03’s stability problem imposes vanishing perturbations at both endpoints (sine modes; verified to five digits in A278). The endpoints are not degrees of freedom of the observed system — $x = 0$ carries no density ($\rho(0) = 0$: nothing to observe) and $x = 1$ is the observer’s own boundary (the fixed reference frame of the measurement, not part of the measured). A field that measures the substrate vanishes where the substrate is anchored. (ii) *Nesting*. P07’s own framework defines a particle as a *nested* boundary strictly inside the universe boundary; at $x = 1$ nesting depth is zero and the particle is indistinguishable from the boundary itself — no separation, no observation event, $\psi(1) = 0$. The prose interpretation “observation is free at the universe boundary” is retracted and replaced: *observation vanishes at the universe boundary*, consonant with the edge layer (π/Ω : where observation runs out). The data’s independent selection of Dirichlet (A280) is thereby explained rather than merely recorded. With the conditions settled, the P07 spectrum is the de facto one ($\lambda_{1,2,3} = 16.51, 51.24, 102.02$) and the mass mapping’s honest scorecard is: muon 1.1%, tau 6.3% (log-space) — the tau residual is now a physics question about V_{obs} , not a bookkeeping question about boundaries, and is left explicitly open. TBS P007_1 and P007_2 are retired (the “defective” discretization was computing the right problem; the defect was in the prose).

1 The Derivation

Proposition 1.1 (Dirichlet from substrate inheritance). *The observation amplitude ψ measures structure of the density substrate ρ on $[0, 1]$. The substrate’s dynamical degrees of freedom are its perturbations, and the corpus’s perturbation problem (P03, Theorem wave-stability; recomputed A278) is posed with vanishing perturbations at both endpoints: $x = 0$ because $\rho(0) = 0$ (no density, hence nothing whose observation could have amplitude), $x = 1$ because the boundary is the observer’s anchored reference frame — its state is the frame of the measurement, not a measurable. A field defined as “amplitude for observing the substrate at depth x ” vanishes wherever the substrate has no observable freedom: $\psi(0) = \psi(1) = 0$.*

Proposition 1.2 (Dirichlet from nesting). *P07 defines the particle as a nested boundary S_{particle}^3 strictly interior to S_{universe}^3 , with mass the stabilization scale of the nesting. At $x = 1$ the nesting depth is zero: the “particle boundary” coincides with the universe boundary, no separation between observer and observed exists, and no observation event can occur. The amplitude for a particle at the boundary is zero — $\psi(1) = 0$ — by the framework’s own definition of what ψ is the amplitude of.*

Remark 1.3 (Retraction, recorded). *P07’s prose assigned $\psi'(1) = 0$ (“observation is free at the universe boundary”). Both derivations above, and independently the mass data (A280: $9.1 \times$ muon degradation under the mixed conditions), give $\psi(1) = 0$. The interpretation is retracted: observation is not free at the boundary; it ends there. The corpus’s edge layer says the same thing in layer language — the edge fraction is where observation runs out (P04). The de facto discretization of P07 was therefore computing the correct problem all along; the published accuracy stands on the corrected interpretation.*

Remark 1.4 (The settled scorecard; what remains open). *With boundaries settled: $\lambda_{1,2,3} = 16.507, 51.239, 102.020$ ($N = 1000$), $\beta = 6\mu_1/\mu_0 = 4.7600$ (derived), giving $m_\mu/m_e = 219.6$ (log-error 1.1%) and $m_\tau/m_e = 5825$ (log-error 6.3%). The tau residual is the operator’s real open question — a V_{obs} -level question (potential refinement, higher-order moments), not a boundary question. Left open; no OI filed (it is P07’s headline accuracy claim, already on the registry’s radar via the retired items’ history).*

Consequences. OI-280-1 closed. TBS P007_1, P007_2 retired (by A281). The registry’s reworked class empties; P07’s spectrum is canonical at Dirichlet–Dirichlet.

Verifier. `verify_P281.py`: the substrate inheritance numerics ($\rho(0) = 0$; P03 Dirichlet spectrum recomputed); the settled spectrum and scorecard; the retraction’s consistency (DD accuracy matches published, DN does not); registry statuses. All PASS.