Apeiron Variant B / O049: Canonical Model Specification

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1. Contract and precedence

This specification defines the publication object and its inherited conventions at 060. It is a source-bound operational specification of the local Variant-B realization, not a new microscopic action, a replacement for all ancestral proofs or an executable full-response implementation. The scientific claim is SCIENTIFIC FEASIBILITY GO = TRUE in the declared local scope; AP1_GO = FALSE. The complete quantitative response remains RAW_RESPONSE_EVALUATOR_METHOD_LIMIT. [E01-E05]

The 058-060 reviews control current status and scope. Earlier technical records supply only the definitions and results explicitly carried forward by those reviews. In particular, an older technical document's closing status paragraph cannot override its later reviewed status. Publication version 2.0 is a document version, not a checkpoint 061 or a new scientific result.

2. Symbols, units and domains

Symbol	Definition or use	Bound convention
g, a	Metric and scale factor	Spatially flat homogeneous background
t	Cosmic time unless explicitly stated otherwise	Natural units
η	Conformal time	Retarded response advances in increasing η
τ	−η for the local O049 window	Not the old v7.13 numerical time
N	ln a	Original N-clock used in response norms
H	Cosmic Hubble rate	Positive expanding branch
U, Hcal	dN/dη = aH	Conformal expansion factor
σ, θ	Effective scalar fields	Mass dimension one
h	mχ²(σ,θ)	Same fixed portal function and derivatives
χ	Portal field	One positive quasifree Hadamard state
k	External comoving wave number	Feasibility band [5/8,5/4]; numerical θ test k = 1
q, p	Internal momentum legs	p = k − q in the matrix contraction; distinct from output labels q and p

Symbol	Definition or use	Bound convention
Σ_049,0	Complete selected covariance at original slice 0	Exact recursive state name
P_i[z]	Compatible initial prefix	Three actual portal initial jets
R_i	Given compatible tangent remainder	Separate N1 data; not the unperturbed smooth remainder
Λ	Existing mass normalization	No newly fitted scale

The construction retains conformal Planck units with the inherited renormalized Planck normalization. Dimensions are $[\eta] = M^{-1}$, $[k] = [q] = [\Lambda] = [H] = M$, $[N] = [a] = 1$, $[\sigma] = [\theta] = M$. The common response window is $\eta \in [-1/125, 0]$. The broader homogeneous existence interval $0 \le \tau \le 1/10$ is not the joint quantitative response domain. Neither time interval is automatically a redshift interval or an astronomical age. [E09, E12, E22]

3. Physical source prescription

3.1 Fixed Variant-B choice

The physical source is Q_target. The old difference Δ_alt = Q_alt − Q_target is a comparison only. It must not be re-added to Q_target to generate the published B response.

For the portal operator $P\chi = -\Box + h$, E019 defines

```
Q_B = Q_Had[S;g,h] + Q_Ward/anomaly[g,h] + Q_finite[g,h].
```

These three terms are one correlated renormalized variation. The local conservation completion is determined from the same regulator/subtraction operation. It is not an extra physical source selected to improve a test. The common scalar-metric source triplet is ρ_q, p_q, C_q, with

```
dρ_q/dt + 3H(ρ_q+p_q) = (dh/dt) C_q / 2.
```

The ordinary local terms, regulator/anomaly contributions, full state dependence, nonlocal memory and initial/contact operations are kept together. The structural definition does not assert numerical evaluation of their entire sum. [E23, E24]

3.2 Finite C016/C018 convention

The source keeps the inherited finite mass/EH normalization. Its covariant representation uses $T_{r^2}(V_{PV} - V_{ref})$, $T_{r^1}(U_F - U_{ref})$, the designated M5 term once and the transported frozen curvature values. The Taylor projections remove the associated reference-polynomial ambiguity. No continuous EH formula is substituted as a new normalization target. [E23]

The local comparison in C018 uses $\delta V = -R_D$ and $\delta U = -R_E$; these are comparison remainders, not free model parameters. It gives

```
δC = −2R_D′ + 2R R_E′,
δρ = −R_D + 6R_E H² + 6H R_E′ dh/dt,
δp = R_D − 2R_E(2 dH/dt+3H²)
     −2[R_E″(dh/dt)²+R_E′ d²h/dt²] −4H R_E′ dh/dt.
```

Primes in these expressions differentiate with respect to h; R without a subscript is scalar curvature. These formulas describe only the designated local projection of the comparison. They are not the entire Δ_alt and must not replace the full physical source. [E25]

The correlated EH end term is

```
B_ini/final = 6a³H(d0+d1h),
δB = 6a³[3H(d0+d1h)δln a + (d0+d1h)δH + Hd1δh].
```

Its density-matrix representation factor is distinguished from a physical change of state. It supplies no new population or independent surface energy. Renormalized finite curvature values do not erase bare UV subtraction, anomaly, Euler/Box or endpoint terms. [E23-E25]

3.3 Fixed reference versus mathematical cutoffs

E019's auxiliary UV multiplier is $(1-\exp(-L_{UV}^2 s))^3$ with coefficients (1,−3,3,−1). Here L_UV labels the mathematical subtraction cutoff, to distinguish it from the state-selection prefix L = 2^198. It is not a new physical scale and does not change the bound renormalization scale μ. The original EH normalization at μ is preserved. [E23]

4. State selection and unperturbed transport

The sole current witness is O049.L2p198.FIRST-FINITE-STRICT-RAW-CELL-1.v2. The native selector begins with the fixed O029-family domain and L = 2^198. At each repair stage it enumerates trial pairs by increasing sum of support and precision indices, accepting the first finite strictly certified RAW-CELL-1 attempt. The exact repair and Gram equations, rather than interval midpoints, define the state. [E10]

This is a uniquely named full covariance, not a finite list of saved moments. Each finite repair step terminates within the specified constructive argument. The algorithm does not establish the absolutely smallest physically admissible support, nor an already bounded cost for the complete response evaluator. The identity O049 = O047 was established after the V2 selection freeze and applies to the full covariance. [E10, E11]

At i = −1/125, use the same unperturbed symplectic history:

```
Σ_i(q) = T_q(i,0) Σ_049,0(q) T_q(i,0)^T,
W_i = Σ_i + iJ/2.
```

The transported reference plus the transported smooth remainder equals the full covariance. An early instantaneous vacuum substitution is inadmissible. The unperturbed anchor is not a perturbed final-state constraint. Saved prefix α, β, n_IR, κ^2 and moment intervals remain available in E28, but that query explicitly did not select all completion indices. [E12, E28]

5. Response object, conventions and data class

The response includes the retarded kernel and the separate initial-state drive. The six scalar outputs are (ρ, q, p, π_amp, J_σ, J_θ); the raw calculation has six source columns and 36 blocks. The inherited order is full source variation, Ward verification, then GI projection and constraint elimination. A chosen fluid ansatz for separate density, pressure and anisotropic stress is not a substitute. [E21, E27]

The primitive ResponseSpec uses one CTP operator convention. For the evaluated AQ representation, the later row-first convention and source-column factors fixed by E12/E27 control the signs. The retarded commutator convention is $+i\,\Theta(\eta-\eta')$ with the designated row and column

vertices; source metric factors belong to their columns. It must not be mixed with the primitive sign notation without that conversion. The source-time measure and Wick factors are included exactly once. [E12, E22, E27]

The current non-flat θ object is a compatible paired-data operator:

```
δΣ_i = P_i[z] + R_i,
δJ_A,c = δJ_A,fixed-state + D_A H_V[P_i[z]] + D_A H_V[R_i].
```

The allowed data obey the inherited positivity/CCR/Hadamard-tangent, geometric/field-jet, dynamical compatibility and finite-rest conditions. R_i is supplied separately. No unique source-only preparation map is claimed. The isolated fixed-state non-flat contract is retained only as a historical failed subproblem. [E01, E15, E16, E20]

The explicit vertex term (δD_A)Σ uses the unvaried full covariance. Terms of the form (δD_A)H_V[δΣ_i] would be second order and do not enter this linear response.

6. Common renormalization and numerical composition

Use the shared regulator before any finite part. The first complete portal initial-log coefficient of the retarded term cancels against that of the compatible prefix. The finite conversion G0_AK = G0_3D−k²/(12π²) stays bound to the same convention. The finite prefix includes its bulk and both required ends. [E16]

For the designated approximate θ calculation:

```
Response_A = F056,finite,A + H_P,AK,A + DC1_A + M_A(R_i).
```

The finite old sector includes the direct Ω words, full source chains and initial ends, complete SC4 boundary, state_net with its r0 and IBP boundaries, the direct state AQ map and finite B, each once. Intermediate incomplete maps are not current components. The prefix's alternative distributional-forcing representation is not an additional summand. [E05, E16]

DC1 uses the actual r(s) = E_D(s)−E_D(0), bound to the same endpoint value and appropriate transports. Its defect is −δL ΔC in place of the earlier defect −δL C_B. The correction belongs to this approximate computation, not to an already exact prefix a second time. The R_i channel retains V_B, not an unverified replacement by the corrected prefix profile. [E05, E17, E20]

7. Norm and permitted numerical output

The original C_N^6 source/output balls control dimensionless test functions and their first six N derivatives, including actual nonzero endpoint jets. For the θ source, δθ = Λ f_N; for the output pairing, g_η = U g_N. The six output dimensions are d_A = (4,3,4,4,3,3). The DO2 remainder kernel includes 1/(2π²), dN = U dη and Λ^(−d_A) once. [E05, E20, E22]

Without a concrete R_i, valid numerical output would consist of six source intervals S_A[f,g] and six enclosed linear functionals M_A[g](R_i). This would be an affine response representation. It would not be six already evaluated physical total numbers.

For an approximation K̃_A, require the bound contract

```
η_A ≥ sup_g ess sup_(q,n) ||K_A[g]−K̃_A[g]||_nuclear/(1+q),
|(M_A−M̃_A)(R_i)| ≤ η_A N1(R_i).
```

η_A is an error radius. A norm test does not choose a physical remainder of norm one. An arbitrary finite momentum cutoff does not control the N1 ball unless its tail or asymptotic operator

contribution is handled. [E20]

Stored history/profile errors and production errors have different roles. Vi/AK finite parameter intervals already exist; their future evaluation width belongs in the numerical parameter/rounding/quadrature account. It is not a newly open physical normalization freedom. WT/WL Ward budgets are not raw-row production tolerances. [E19, E26, E29-E31]

8. Numerical status and single-time contract

Quantity	At 060
Complete raw response values	Six null entries: not computed
Quantitative response decision	null: undecided
Finite-regulator retarded-action identity	Algebraically established for 6 × 6 vertices
Full renormalized numerical equivalence	Not certified
Uniform operator coverage	Not certified
SINGLE_TIME_ROUTE_READY	FALSE
Production/reference/convergence runs in 060	None
Required production runtime/memory bounds	Unknown; not zero-cost

The single-time matrices and drive are specified in Preprint §8 and E05 §2. They reformulate the retarded action with complete common inputs. They do not supply those inputs or complete the required renormalized numerical limit. Input entries I01-I14 in E06 provide the detailed data-to-evaluator boundary. [E03-E06]

9. Canonical acceptance boundary

SCIENTIFIC FEASIBILITY GO remains the inherited local FEASIBILITY_GO under the 054 criteria. The corrected θ-source Ward PASS is restricted to the specified k = 1 problem. Complete quantitative raw response, extended stability, physical M1 connection and prediction release remain open. AP1_GO is FALSE. [E01-E05, E09]

No part of this document permits substitutions of old R195 modes, a fixed-rho baseline for the general current non-flat problem, historical ORANGE status, or an AP1_GO-078 label as current evidence. Earlier source documents retain their original bytes and historical closing statements. SOURCES.md records the retained technical scope of each reference.

This source-bound specification is reviewable independently of the older publication overlay, but is intentionally not described as a self-contained executable cosmology. The missing full evaluator is a scientific gap explicitly preserved by the specification.