Hawk07-C-Dyn-CERT-v7

Dynamics certificate for the dynamical conical-formation spacetime

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Version 7 — 8 November 2026 (Scholar citation hygiene; separation from I-D pulse)

Abstract

For the prescribed metric of the parent, this sheet gives the dynamics certificate: vacuity of $G + \Lambda g$ for every C^2 metric, and separation on comparison futures that agree with the prescribed metric for $t \le 0$, where no early-data rule recovers $G + \Lambda g$ after $t = 1$ and the two-point minimax error is unbounded (Section). The metric class stays an input. No de Sitter state, cosmological constant or emergence is claimed.

Version 2 (plan t260u). The constant-rate members of the conformal warp are computed: over the de Sitter base they are, up to rescaling, the comparison futures of Red06-G-DSS-CERT and Big01-A, and over the Minkowski base the vacuum-term family of VC-OB-1-CERT. Documentary readings record what VC-OB-1 and DS-OB-1 say, and do not say, about the parent's metric.

Version 3 (request t264u). An independent proof, by one sectional curvature, that the parent's evolving metric has no de Sitter region. The slice-warp comparison family is computed at every time and matched to the Red06 futures by one rescaling; its version-2 name "conformal warp" is corrected. Documentary readings against DS-OB-1 and the version-3 DSS and version-2 I-C certificates are added.

Version 4 (request t267u). During the switching period the axial null contractions of G, $E^{(1)}$ and $E^{(2)} = \frac{1}{3}E^{(1)}$ in the core are given in closed form; they are nonzero except at isolated times and vanish before and after switching. The metric variations $E^{(1)}, E^{(2)}$ are proved in full. Late comparison regions are treated conditionally.

Version 5 (request t268u). The late comparison regions are settled for every affine change of time: over the core they are de Sitter exactly before and after switching, never during it. On the late region the expansion of the slices separates every pair of comparison members, including the pairs whose late values coincide. Whole-fibre null invariance is classified on spatially flat FLRW metrics by a fourth-order ODE, whose solutions include metrics that are neither Einstein nor scalar-flat; in the core it holds exactly outside the switching period, up to isolated times. Item E10 corrects an attribution in the version-3 error list.

Version 6 (request t269u). The divergence of the linearized family $aG + \Lambda g$ is computed on every background; it depends on Λ through $\Lambda\nabla^a h_{ab}$, and on constant-curvature sets it is $(\Lambda - 3aK)\nabla^a h_{ab}$, where the vacuum-term family reduces to $T + (c_0 - 3Kc_G)g$. The sheet's late Einstein sets are located. Two further spatially flat FLRW metrics with whole-fibre null invariance, neither Einstein nor scalar-flat, are given with their Einstein residual; among power laws only $p \in \{-1, 0, 1\}$ solve the equation. The switched conformal metric selects no value of Λ (permanent negative). Item E11 records two ambiguous citations of version 5 (duplicate labels in their sources). A verification table answers every item of the request; all new theorems are conditional.

The parent sheet Hawk07-C-Dyn is not edited and receives no new version; it is cited as parent and source record. Versions 1 to 5 of this sheet are not edited either. No quantum coefficient is admitted. The title page names Ngo Cheung. Authorship requires confirmation. No compilation is asserted.

Bibliographic record

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Author	confirmation), Ngo Cheung (authorship requires
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Parent, previous version, scope and status

Parent. Hawk07-C-Dyn (read-only input copy inputs/Hawk07-C-Dyn.site.tex, mode 444, sha256 03fc590cb4e75903…). Fetched read-only from the site on 23 October 2026 (GET https://enter.grok.me/api/manuscript/Hawk07-C-Dyn). The parent is untouched.

Previous version. Hawk07-C-Dyn-CERT-v1 (read-only input copy inputs/Hawk07-C-Dyn-CERT-v1.tex, sha256 157c089116c892b4…) is untouched. Its content is retained here, Sections to the section before Section , with the corrections listed in Section ; the v1 labels are kept.

Version 6 (this version). Version 6 of a standalone certificate sheet, made under request t269u, whose plan is saved verbatim as /workspace/CertPlan/PLAN_t269u.md. It supersedes version 5 by addition: version 5 (read-only input copy inputs/Hawk07-C-Dyn-CERT-v5.tex, sha256 cdee6fc6fbeffdd5…) is untouched, its text is retained below, and the new material is Section and Appendices –. It revises no other sheet; versions 1 to 5 of this sheet and the parent are untouched. Work directory /workspace/CertPlan/S2v6.

Version 5. Version 5 of a standalone certificate sheet, made under request t268u (no plan file attached; the request text is the plan). It supersedes version 4 by addition: version 4 (read-only input copy inputs/Hawk07-C-Dyn-CERT-v4.tex, sha256 bf65038961840ad8…) is untouched, its text is retained below with marked version-5 notes, and the new material is Section . It revises no other sheet; versions 1 to 4 of this sheet and the parent are untouched. Work directory /workspace/CertPlan/S2v5.

Version 4. Version 4 of a standalone certificate sheet, made under request t267u (no plan file attached; the request text is the plan). It supersedes version 3 by addition: version 3 (read-only input copy inputs/Hawk07-C-Dyn-CERT-v3.tex, sha256 93bea2f47adf041c…) is untouched, its text is retained below with marked version-4 notes, and the new material is Section . It revises no other sheet; versions 1 to 3 of this sheet and

the parent are untouched. Work directory /workspace/CertPlan/S2v4.

Version 3. Version 3 of a standalone certificate sheet, made under request t264u (no plan file attached; the request text is the plan). It supersedes version 2 by addition: version 2 (read-only input copy inputs/Hawk07-C-Dyn-CERT-v2.tex, sha256 80467454b45ad729…) is untouched, its text is retained below with marked version-3 notes, and the new material is Section . It revises no other sheet; versions 1 and 2 of this sheet and the parent are untouched. Work directory /workspace/CertPlan/S2v3.

Version 2. Version 2 of a standalone certificate sheet, made under plan t260u (inputs/PLAN_t260u.md, sha256 15fbb7045403df21…); version 1 was made under plan t256u as amended by t257u (inputs/PLAN_t256u-t257u.md, sha256 873c9fd8ad583be0…), Priority 8. It revises no other sheet. The parent, Big01-A, DS-OB-1, VC-OB-1, PG-OB-1, the I-C certificate sheets, the DSS certificate sheets, the OpenAI catalogue and every other sheet are source records only, never premises. Every new item of Section is a local theorem, proved here, or a documentary separation. Where a statement of another sheet is used, it is labelled as a source record, and the conclusion is stated conditionally on it or concerns the explicitly displayed object.

Gates. No standing gate is discharged: O.1, Gate 0, XV-B, J2 and U6-sel stay open, and Host C is not created. No quantum coefficient, temperature, entropy, finite Hilbert space or Einstein dynamics is derived, and no derived metric, emergence or Page curve is claimed.

toprule Item Status in this sheet

midrule endhead Dynamics certificate **Proved** (Prop. , Thm. , Cor.); the metric class stays an input.

Casimir certificate No object in the parent (no Casimir stress, no named cosmological term).

Admitted coefficient Not supplied; refused by the ledger.

v2: constant-rate instances **Proved** (Prop.).

v2: Red06-G-DSS-CERT, Big01-A, VC-OB-1, DS-OB-1 Documentary separations and readings (Section).

v3: no de Sitter region **Proved** independently (Thm. , Cor.).

v3: slice-warp family at every time **Proved** (Lemma); one global rescaling (Lemma); name corrected (Remark).

v4: axial null contractions during switching **Proved** in the core (Thm. , Cor.); *partial* outside (Prop.).

v4: metric variations $E^{(1)}, E^{(2)}$ **Proved** in full (Prop.).

v4: coincident late values **Proved** (Prop.): w and −w coincide where $R[\gamma] = 0$ on a static base; otherwise at most twice in time.

v4: late comparison regions *Conditional* (Cor.).

v5: late comparison regions **Proved** for every affine change of time (Prop. , Cor.); outside the core open.

v5: expansion of the late slices **Proved** (Prop.): separates every pair, coincident late values included.

v5: null invariance on flat FLRW **Proved** (Thm.): iff $Q(a) = 0$; non-Einstein, non-scalar-flat solutions exist.

v5: null invariance in the core **Proved** (Cor.) outside isolated times; those times open.

v5: registration Cited source of DS-, PG-, SG- and VC-OB-1 v5 (*documentary*).

v5: item E10 Correction of an attribution in the version-3 error list; no statement changes.

v6: linearized divergence **Proved** (Lemma , Cor.); depends on Λ unless $\nabla^a h_{ab} = 0$.

v6: late Einstein sets **Proved** (Cor.).

v6: further FLRW solutions **Proved** (Prop.); closed forms and symmetry classes open.

v6: unified certificate framework Appendix (*documentary*); no operator promoted.

v6: verification of request t269u Appendix ; refusal and label audits.

v6: item E11 Two version-5 citations name duplicated labels; intended records identified.

bottomrule

Context from the parent

The parent Hawk07-C-Dyn prescribes $g = a(\eta)^2[-c^2\mathrm{d}\eta^2 + \mathrm{d}r^2 + F(\eta, r)^2\mathrm{d}\varphi^2 + \mathrm{d}z^2]$ (Hawk07-C-Dyn eq:dynamic-metric) with zero cosmological constant, and defines its source by $T := \kappa^{-1}G$ (Hawk07-C-Dyn eq:source-definition). These are source records.

Certificates

These additions implement plan t256u, Priority 8: the dynamics certificate. The prescribed metric, the metric class and every earlier result of the parent sheet are unchanged, and the metric class stays an input. In this section, Λ denotes a cosmological constant. Nothing here is a de Sitter state, a cosmological-constant claim or emergence.

Dynamics certificate: vacuity and separation

Throughout this subsection a *metric* is a Lorentzian metric of signature $(-+++)$ on a four-manifold, $G[g]$ is its Einstein tensor, $\Lambda \in \mathbb{R}$ and $\kappa \neq 0$ are constants, and

$$\Theta_\Lambda[g] := G[g] + \Lambda g.$$

Nothing below changes the prescribed metric of the parent sheet; the comparison metrics are auxiliary objects, not hosts.

Proposition (Vacuity).

1. *For every C^3 metric g, $\Theta_\Lambda[g]$ is symmetric and $\nabla^a\Theta_\Lambda[g]_{ab} = 0$ pointwise. For every C^2 metric the same divergence identity holds weakly:*

$$\int \Theta_\Lambda[g]^a{}_b \nabla_a \xi^b \sqrt{|g|}\, \mathrm{d}^4x = 0$$

for every compactly supported C^1 vector field ξ.

2. *For every C^2 metric g, every Λ and every $\kappa \neq 0$, the tensor $T := \kappa^{-1}\Theta_\Lambda[g]$ is symmetric, (weakly) conserved, and satisfies $G[g] + \Lambda g = \kappa T$. Hence the statement "$G + \Lambda g = \kappa T$ for some symmetric conserved T" holds for every metric and every (Λ, κ), and selects no metric and no value of Λ unless a matter law $T = \mathfrak{T}[g, \text{fields}]$ is supplied*

independently of $G[g]$.

Proof. (a) Symmetry is that of Ric and g. For C^3 metrics the contracted Bianchi identity gives $\nabla^a G_{ab} = 0$, and $\nabla g = 0$ by metric compatibility. A C^2 metric is the C^2_{loc} limit of smooth metrics g_n (mollification). Then $G[g_n] \to G[g]$ and $\sqrt{|g_n|} \to \sqrt{|g|}$ locally uniformly, and the Christoffel symbols converge in C^1_{loc}. The weak identity holds for each g_n (integrate the pointwise identity against ξ and integrate by parts), and every term converges. (b) Substitute; conservation is (a) divided by κ. Since T is built from g alone, the equation is an identity, not a condition.

par *Non-claim.* No matter law, source, or Einstein dynamics is derived; the proposition says only that an Einstein-form equation with an unconstrained conserved source is empty. No metric is selected. par

Fix $\mathrm{h} \in C^\infty(\mathbb{R})$ with $\mathrm{h} = 0$ on $(-\infty, 0]$, $\mathrm{h} = 1$ on $[1, \infty)$ and $0 \le \mathrm{h} \le 1$, and put $\mathrm{b}(t) = \int_0^t \mathrm{h}(s)\,\mathrm{d}s$. Then $\mathrm{b} = 0$ on $(-\infty, 0]$, $\mathrm{b}' = \mathrm{h}$, and $\mathrm{b}' = 1$ on $[1, \infty)$.

Theorem (Separation on comparison futures). *Let* $g_0 = -N^2 \mathrm{d}t^2 + \gamma_{ij}\,\mathrm{d}x^i \mathrm{d}x^j$ *be a* C^2 *metric with zero shift on* $I \times \Sigma$*, where* $I \supset [0,1]$ *is an open interval,* $N > 0$*, and* N, γ *may depend on* (t, x)*. For* $\mathrm{w} \in \mathbb{R}$ *put*

$$g_{\mathrm{w}} = -N^2 \mathrm{d}t^2 + e^{2\mathrm{w}\mathrm{b}(t)} \gamma_{ij}\,\mathrm{d}x^i \mathrm{d}x^j.$$

Write $\mathrm{n} = N^{-1}\partial_t$, $\mathrm{k}_{ij} = (2N)^{-1}\partial_t \gamma_{ij}$, $\mathrm{tr}\,\mathrm{k} = \gamma^{ij}\mathrm{k}_{ij}$, *and* $R[\gamma]$ *for the scalar curvature of the slice metric.*

1. *Each* g_{w} *is a* C^2 *Lorentzian metric, and* $g_{\mathrm{w}} = g_0$ *on* $\{t \le 0\}$ *for every* w.

2. *On* $\{t \ge 1\}$,

$$\Delta_{\mathrm{w}} := \Theta_\Lambda[g_{\mathrm{w}}](\mathrm{n}, \mathrm{n}) - \Theta_\Lambda[g_0](\mathrm{n}, \mathrm{n}) = \frac{3\mathrm{w}^2}{N^2} + \frac{2\mathrm{w}}{N}\mathrm{tr}\,\mathrm{k} + \tfrac{1}{2}R[\gamma](e^{-2\mathrm{w}\mathrm{b}} - 1),$$

independently of Λ*; at every point with* $t \ge 1$, $\Delta_{\mathrm{w}} \to +\infty$ *as* $\mathrm{w} \to +\infty$.

3. *Let* E *be any map defined on metrics that depends only on the restriction to* $\{t \le 0\}$ *("early data"; admitted constants may be adjoined), and let* F *be any rule from early data to a real number. Fix a point* p *with* $t(p) \ge 1$.

Then $\sup_{\mathrm{w}} |F(E(g_{\mathrm{w}})) - \Theta_{\Lambda}[g_{\mathrm{w}}](\mathrm{n},\mathrm{n})(p)| = \infty$. *For any* $\mathrm{w}_1, \mathrm{w}_2$,

$$\min_{F} \max_{i\,=\,1,2} |F(E(g_{\mathrm{w}_i})) - \Theta_{\Lambda}[g_{\mathrm{w}_i}](\mathrm{n},\mathrm{n})(p)| = \tfrac{1}{2}|\Delta_{\mathrm{w}_1}(p) - \Delta_{\mathrm{w}_2}(p)|,$$

attained by the midpoint, and this two-point minimax error is unbounded over pairs. No rule from early data to Θ_{Λ} *is correct on two members with* $\Delta_{\mathrm{w}_1}(p) \neq \Delta_{\mathrm{w}_2}(p)$.

Proof. (a) b is smooth, so g_{w} is C^2, and $e^{2\mathrm{wb}} = 1$ for $t \le 0$. (b) The slices t = const have unit normal n for every w, because the shift is zero and the lapse is unchanged. The Gauss equation gives $2G(\mathrm{n},\mathrm{n}) = R[h] + (\mathrm{tr}\,\mathcal{K})^2 - |\mathcal{K}|^2$ for the induced metric h and extrinsic curvature $\mathcal{K}_{ij} = (2N)^{-1}\partial_t h_{ij}$ (the opposite sign convention changes no quadratic term). For g_{w}, $h = e^{2\mathrm{wb}}\gamma$ with b constant on each slice, so $R[h] = e^{-2\mathrm{wb}}R[\gamma]$, and $\mathcal{K}^i{}_j = \mathrm{k}^i{}_j + v\,\delta^i{}_j$ with $v = \mathrm{wb}'/N$. Hence $(\mathrm{tr}\,\mathcal{K})^2 - |\mathcal{K}|^2 = (\mathrm{tr}\,\mathrm{k})^2 - |\mathrm{k}|^2 + 4v\,\mathrm{tr}\,\mathrm{k} + 6v^2$. Subtract the same identity for g_0, use $g_{\mathrm{w}}(\mathrm{n},\mathrm{n}) = g_0(\mathrm{n},\mathrm{n}) = -1$ (so Λ cancels), and put $\mathrm{b}' = 1$. As $\mathrm{w} \to +\infty$, $e^{-2\mathrm{wb}} - 1 \in [-1, 0]$ because $\mathrm{b} \ge 0$ there, so the last term is bounded, the middle term is linear, and $3\mathrm{w}^2/N^2$ dominates. (c) By (a), $E(g_{\mathrm{w}}) = E(g_0)$, so F takes one value f on the whole family. Then $|f - \Theta_{\mathrm{w}}(p)| \ge |\Delta_{\mathrm{w}}(p)| - |f - \Theta_0(p)| \to \infty$. For two members the triangle inequality gives $\max_i |f - \Theta_{\mathrm{w}_i}(p)| \ge \tfrac{1}{2}|\Delta_{\mathrm{w}_1}(p) - \Delta_{\mathrm{w}_2}(p)|$, with equality at the midpoint. Taking $\mathrm{w}_2 = 0$ and $\mathrm{w}_1 \to \infty$ shows the minimax is unbounded. The formula in (b) is checked exactly for a nonstatic test metric (check K2), and the divergence identity for g_{w} (check K3).

par *Non-claim.* The comparison futures g_{w} are not hosts, not solutions of any field equation, and not predictions; the theorem does not say the prescribed future is wrong. It says only that the value of $G + \Lambda g$ after $t = 1$ is not a function of the geometry up to $t = 0$. No Einstein dynamics, evolution law or derived metric is claimed. par

Corollary (The dynamics certificate on the prescribed metric of the parent sheet). *The prescribed metric of the parent sheet, (Hawk07-C-Dyn eq:dynamic-metric),* $g = a(\eta)^2[-c^2\mathrm{d}\eta^2 + \mathrm{d}r^2 + F^2\mathrm{d}\varphi^2 + \mathrm{d}z^2]$ *(lapse* $ca(\eta)$*, spatial metric* $a^2(\mathrm{d}r^2 + F^2\mathrm{d}\varphi^2 + \mathrm{d}z^2)$*, time* $\eta \in \mathbb{R}$*), has zero shift, positive lapse, and is defined for all values of its time coordinate. After an affine change of that coordinate, if needed (this is the displayed metric; its identity with the parent's metric is a source record), Proposition and Theorem apply to it with* g_0 *equal to the prescribed metric.*

So: (i) the displayed metric, like every C^2 metric, admits a conserved source $\kappa^{-1}(G + \Lambda g)$ for every (Λ, κ), and this selects nothing; (ii) on the comparison futures g_{w}, which agree with it for $t \le 0$, no rule from the prescribed early geometry and the admitted constants recovers $G + \Lambda g$ after $t = 1$, and the two-point minimax error is unbounded.

Proof. The displayed metric has zero shift, positive lapse and is defined for all times, which is the form required in Theorem . That it is the parent's prescribed metric is a source record; the conclusions concern the displayed metric. Apply Proposition and Theorem .

par *Non-claim.* The metric class stays an input, and the prescribed metric is not changed. The corollary does not say that the parent's equations are empty. Its exact Einstein source (Hawk07-C-Dyn eq:source-definition) (Theorem Hawk07-C-Dyn thm:Einstein) is the case $\Lambda = 0$ of Proposition (b). It is an identity that holds for the prescribed metric by definition, not a selection of that metric. par

Version 2 expansions (plan t260u)

The expansions below follow plan t260u for the dynamics-only sheets.

The comparison family: constant-rate instances and cross-references

Proposition (Constant-rate instances of the conformal warp). *Let $c > 0$, $H \ge 0$, and let $g_0^{(H)} = -c^2\mathrm{d}t^2 + e^{2Ht}\mathrm{d}\mathbf{x}^2$ on $\mathbb{R} \times \mathbb{R}^3$ ($H = 0$: Minkowski). Take $g_0 = g_0^{(H)}$ in Theorem , so $N = c$, $\gamma = e^{2Ht}\delta$, and let g_{w}, $\mathrm{w} \in \mathbb{R}$, be the warped metrics built there from* h *and* $\mathrm{b} = \int_0^t \mathrm{h}$.

1. *On $\{t \ge 1\}$, $g_{\mathrm{w}} = -c^2\mathrm{d}t^2 + e^{2(H+\mathrm{w})t - 2\mathrm{w}t_{\mathrm{b}}}\mathrm{d}\mathbf{x}^2$ with a constant t_{b}: flat slices and constant rate $H + \mathrm{w}$. On $\{0 < t < 1\}$ the rate is $H + \mathrm{w}\,\mathrm{h}(t)$, which is not constant unless $\mathrm{w} = 0$.*

2. *On $\{t \ge 1\}$, $\Delta_{\mathrm{w}} = 3((H+\mathrm{w})^2 - H^2)/c^2$. With $\Lambda = 3H^2/c^2$, $\Theta_\Lambda[g_0](\mathrm{n},\mathrm{n}) = 0$, so $\Theta_\Lambda[g_{\mathrm{w}}](\mathrm{n},\mathrm{n}) = 3((H+\mathrm{w})^2 - H^2)/c^2$ there, and the two-point minimax error of Theorem (c) on $\{\mathrm{w}_1, \mathrm{w}_2\}$ is $\frac{3}{2c^2}|(H+\mathrm{w}_1)^2 - (H+\mathrm{w}_2)^2|$.*

3. *(Minkowski base.) For $H = 0$, $c = 1$ and $\mathrm{w} = K \ge 0$, $g_{\mathrm{w}} = -\mathrm{d}t^2 + e^{2K\mathrm{b}(t)}\mathrm{d}\mathbf{x}^2$. This is the family used for the vacuum term in VC-OB-1-CERT (its Theorem thm:VC-sep6); (b) gives the value $3K^2$ and the minimax error $\frac{3}{2}|K_1^2 - K_2^2|$*

recorded there. The members with $\mathrm{w} = -K < 0$ *have the same late value* $3K^2$*, so over the Minkowski base the warp family covers each late value twice.*

4. *(de Sitter base, smooth profile.) For* $H = H_1 > 0$, $\mathrm{w} = K - H_1$ *and* $\mathrm{h} = \chi$*, where* $\chi(t) = f(t)/(f(t) + f(1-t))$*,* $f(u) = e^{-1/u}$ *for* $u > 0$ *and* $f(u) = 0$ *otherwise,* $g_{\mathrm{w}} = -c^2\mathrm{d}t^2 + a_K(t)^2\mathrm{d}\mathbf{x}^2$ *with* $a_K(t) = \exp\int_0^t (H_1(1-\chi) + K\chi)$.

5. *(de Sitter base, any profile.) Let* $\varphi \in C^\infty(\mathbb{R})$ *with* $\varphi' = H$ *on* $(-\infty, 0]$ *and* $\varphi' = K > 0$ *on* $[1, \infty)$*, and* $\tilde{g}_K = -c^2\mathrm{d}t^2 + e^{2\varphi(t)}\mathrm{d}\mathbf{x}^2$*. On each of* $\{t \le 0\}$ *and* $\{t \ge 1\}$*,* $\tilde{g}_K$ *is carried onto* g_{w}*,* $\mathrm{w} = K - H$*, by a constant rescaling of* $\mathbf{x}$*, an isometry there. So* $\Theta_\Lambda(\mathrm{n}, \mathrm{n})$ *has the same values on corresponding points, namely* 0 *on* $\{t \le 0\}$ *and* $3(K^2 - H^2)/c^2$ *on* $\{t \ge 1\}$.

Proof. (a) For $t \ge 1$, $\mathrm{b}(t) = t - t_{\mathrm{b}}$ with $t_{\mathrm{b}} = \int_0^1 (1 - \mathrm{h})$, so $e^{2Ht}e^{2\mathrm{w}\mathrm{b}} = e^{2(H+\mathrm{w})t - 2\mathrm{w}t_{\mathrm{b}}}$. The rate is $\frac{\mathrm{d}}{\mathrm{d}t}(Ht + \mathrm{w}\mathrm{b}) = H + \mathrm{w}\mathrm{h}$. (b) Here $\mathrm{k}_{ij} = (2c)^{-1}\partial_t(e^{2Ht}\delta_{ij}) = (H/c)\gamma_{ij}$, so $\mathrm{tr}\,\mathrm{k} = 3H/c$, and $R[\gamma] = 0$ because each slice is flat. Theorem (b) gives $\Delta_{\mathrm{w}} = 3\mathrm{w}^2/c^2 + 6\mathrm{w}H/c^2 = 3((H+\mathrm{w})^2 - H^2)/c^2$. For g_0, the Gauss equation used in the proof of Theorem (b) gives $2G(\mathrm{n}, \mathrm{n}) = R[\gamma] + (\mathrm{tr}\,\mathrm{k})^2 - |\mathrm{k}|^2 = 9H^2/c^2 - 3H^2/c^2$, so $G(\mathrm{n}, \mathrm{n}) = 3H^2/c^2$, and $\Lambda g_0(\mathrm{n}, \mathrm{n}) = -\Lambda$; hence $\Theta_\Lambda[g_0](\mathrm{n}, \mathrm{n}) = 0$. The minimax value is Theorem (c). (c) Substitute $H = 0$, $c = 1$. $(\mathrm{w})^2 = (-\mathrm{w})^2$. (d) χ is smooth, vanishes on $(-\infty, 0]$, equals 1 on $[1, \infty)$ and lies in $[0, 1]$, so it is an admissible h. Then $Ht + \mathrm{w}\mathrm{b}(t) = \int_0^t (H_1 + (K - H_1)\chi)$. (e) $\varphi - (Ht + (K-H)\mathrm{b})$ has derivative 0 on $(-\infty, 0]$ and on $[1, \infty)$, so it is a constant α_-, respectively α_+, there; $\mathbf{x} \mapsto e^{\alpha_\pm}\mathbf{x}$ carries one metric onto the other on that set and preserves $\mathrm{n} = c^{-1}\partial_t$. Check K12 computes (b) symbolically for both bases.

par *Non-claim.* The metrics are comparison metrics, not hosts and not solutions of any field equation. No dynamics, cosmology, de Sitter state or vacuum energy is derived. The statement concerns the displayed metrics only; the identification of (d) and (e) with metrics written in other sheets is recorded below as a documentary separation, not used as a premise. par

par **Documentary separation (Red06-G-DSS-CERT v2 and Big01-A v5).** Red06-G-DSS-CERT-v2 prop:RC-dyn states the same vacuity as Proposition , with the same correction (C^3 pointwise, C^2 weak). Its

comparison futures (its part (d)) are the metrics $\hat{g}_K$ of Proposition (e), which agree with the flat patch of its prescribed host DSS_H on $t \le 0$. Big01-A prop:Dyncert uses the futures of Big01-A prop:Esmooth, which are the metrics of Proposition (d) (the formula $a_K = \exp\int_0^t H_K$, $H_K = H_1(1-\chi) + K\chi$, read from that source record). So the comparison futures of those sheets are, up to constant rescalings of **x**, the constant-rate members of the conformal warp of Theorem over the de Sitter base, and their value $3(K^2 - H^2)$ (in their units, *tt*-component) is c^2 times the value in Proposition (b). The separation is in the base metric: here g_0 is the parent's prescribed metric (Corollary) or an arbitrary zero-shift metric, there it is the flat patch of DSS_H. Big01-A prop:Dyncert(a) is stated pointwise for every C^2 metric; Proposition gives the weak form for C^2. Neither this sheet nor those sheets derives Einstein dynamics, and nothing is imported from them.

Cross-reference. The same Proposition , the same Theorem and the same conformal-warp family g_{w} (same statements, same proofs; the build script checks that the text is identical) appear in the other CERT sheets of this series that carry a metric: VC-OB-1-CERT, Hawk07-C-CERT, Hawk07-D-CERT, Hawk07-E-CERT, Hawk07-F-CERT, Hawk07-G-CERT, Hawk07-H-CERT. DS-OB-1-CERT carries a prescribed metric but states no dynamics certificate.

Documentary readings

par **Documentary separation (VC-OB-1 v5).** VC-OB-1 records that the parent Hawk07-C-Dyn uses zero cosmological constant and defines its source inversely, $T := \kappa^{-1}G$ (its table rows citing Hawk07-C-Dyn thm:Einstein and Hawk07-C-Dyn eq:source-definition, read here as source records), and places this under VC-OB-1-v5 prop:VC-split. VC-OB-1-v5 prop:VC-split is the inverse-source fibre: if $T := \kappa^{-1}G$, every Λ can be absorbed. Proposition (b) contains it as the special case of a universal vacuity, valid for every C^2 metric and every $\kappa \neq 0$, whether or not the source is defined inversely. Vanishing Λ stays an input of the parent, and no absolute vacuum energy is computed (VC-OB-1-v5 thm:VC-main, source record, concerns registered sheets only).

par **Documentary separation (DS-OB-1 v5).** DS-OB-1 lists the Hawk07-C-Dyn metric among the hosts of its

source table and records that it has no locally de Sitter open set (DS-OB-1-v5 prop:DS-hawk, source record). DS-OB-1-v5 prop:DS-prescribed concerns only the prescribed de Sitter background; it says nothing about the parent's metric. This sheet constructs no state, so no de Sitter state is produced.

Version 3 expansions (request t264u)

This section is new in version 3. It was made under request t264u, which attached no plan file; the request text is the plan, and its items are answered in Section . Version 2 of this sheet (inputs/Hawk07-C-Dyn-CERT-v2.tex, sha256 80467454b45ad729…) is retained above without change except for marked version-3 notes; its errors are listed in Section . New items are local theorems with proofs or documentary readings. A partial result is marked *partial*; an item that is not settled is recorded as *open*; a statement missing from a source is recorded as missing, never as zero. The companion sheets read are those named in the request, the newest delivered versions when it was made: Red06-G-DSS-CERT-v3 (sha256 b8b9ef6f7bca70f6…), V-DST-DSS-CERT-v3 (a58f78ab8db023f9…) and En08-ST-DSS-CERT-v3 (3882f4e56296b5fa…) from /workspace/DSS/deliver, and I-C-CERT-v2 (a850d04730a82dd0…), I-C-Ex-CERT-v2 (946264bd872fcc43…), I-C-Ex2-CERT-v2 (76cb43695a7ca4e9…) and I-C-Th-CERT-v2 (53d915f44ac22576…) from /workspace/CertPlan/deliver. Citations identify source records only; no proof transfer. Files of streams still in progress (I-C certificates version 3, DSS certificates version 4) were not read.

The slice-warp family at every time and with one rescaling

Lemma (The change of $\Theta(\mathrm{n},\mathrm{n})$ at every time). *In the setting of Theorem , at every point with $t \in I$ and for every declared Λ,*

$$\Theta_{\Lambda}[g_{\mathrm{w}}](\mathrm{n},\mathrm{n}) - \Theta_{\Lambda}[g_{0}](\mathrm{n},\mathrm{n}) = \frac{3\mathrm{w}^{2}\mathrm{h}(t)^{2}}{N^{2}} + \frac{2\mathrm{w}\,\mathrm{h}(t)\mathrm{tr}\,\mathrm{k}}{N} + \frac{1}{2}R[\gamma](e^{-2\mathrm{wb}(t)} - 1).$$

It is 0 *on* $\{t \le 0\}$ *and equals* Δ_{w} *of Theorem (b) on* $\{t \ge 1\}$.

Proof. Both metrics have lapse N, zero shift and unit normal $\mathrm{n} = N^{-1}\partial_{t}$, so $\Lambda g(\mathrm{n},\mathrm{n}) = -\Lambda$ for both and the Λ terms

cancel. The slice metric of g_{w} is $\gamma' = e^{2\mathrm{wb}}\gamma$, so $\mathrm{k}'_{ij} = (2N)^{-1}\partial_t \gamma'_{ij} = e^{2\mathrm{wb}}(\mathrm{k}_{ij} + N^{-1}\mathrm{wh}\,\gamma_{ij})$. With $\gamma'\hat{}ij = e^{-2\mathrm{wb}}\gamma^{ij}$ in dimension three, $\mathrm{tr}'\mathrm{k}' = \mathrm{tr}\,\mathrm{k} + 3\mathrm{wh}/N$ and $|\mathrm{k}'|'\hat{}2 = |\mathrm{k}|^2 + 2\mathrm{whtr}\,\mathrm{k}/N + 3\mathrm{w}^2\mathrm{h}^2/N^2$. Since $e^{2\mathrm{wb}}$ is constant on each slice, $R[\gamma'] = e^{-2\mathrm{wb}}R[\gamma]$. The Gauss equation $2G(\mathrm{n},\mathrm{n}) = R[\gamma] + (\mathrm{tr}\,\mathrm{k})^2 - |\mathrm{k}|^2$, applied to both metrics, gives the formula. For $t \le 0$, $\mathrm{h} = \mathrm{b} = 0$; for $t \ge 1$, $\mathrm{h} = 1$. Check K24 recomputes the formula on $-N(t)^2\mathrm{d}t^2 + e^{2\psi(t)}\gamma_{S^3}$, where $R[\gamma] \neq 0$, with an arbitrary b.

par *Non-claim.* The lemma extends Theorem (b) from $\{t \ge 1\}$ to every time. It does not change part (c), selects no metric and derives no dynamics; the metrics g_{w} remain comparison metrics. par

Lemma (One rescaling on the whole patch). *In Proposition (e) let $K \neq H$, and put $\mathrm{h}_\varphi = (\varphi' - H)/(K - H)$, $\mathrm{b}_\varphi(t) = \int_0^t \mathrm{h}_\varphi$ and $\lambda = e^{\varphi(0)}$. Then h_φ is smooth, vanishes on $(-\infty, 0]$ and equals 1 on $[1,\infty)$, and the single map $\mathbf{x} \mapsto \lambda\mathbf{x}$ is an isometry of $\mathbb{R}\times\mathbb{R}^3$ from $\tilde{g}_K$ onto $\hat{g}_K = -c^2\mathrm{d}t^2 + e^{2(Ht + (K-H)\mathrm{b}_\varphi(t))}\mathrm{d}\mathbf{x}^2$ that preserves n. The metric $\hat{g}_K$ is the metric g_{w} of Theorem over $g_0^{(H)}$, with $\mathrm{w} = K - H$ and profile h_φ, exactly when $0 \le \mathrm{h}_\varphi \le 1$, that is, when φ' stays between H and K. If $K = H$, a map $\mathbf{x} \mapsto \mu\mathbf{x}$ carries $\tilde{g}_K$ onto some g_{w} if and only if $\varphi' \equiv H$, and then onto $g_0^{(H)}$.*

Proof. $\varphi' = H$ on $(-\infty, 0]$ and $\varphi' = K$ on $[1,\infty)$ give the properties of h_φ. Since $\varphi' = H + (K - H)\mathrm{h}_\varphi$, $\varphi(t) = \varphi(0) + Ht + (K - H)\mathrm{b}_\varphi(t)$, so the pull-back of $e^{2(Ht + (K-H)\mathrm{b}_\varphi)}\mathrm{d}\mathbf{x}^2$ under $\mathbf{x} \mapsto \lambda\mathbf{x}$ is $e^{2\varphi}\mathrm{d}\mathbf{x}^2$, and $\mathrm{d}t$ and ∂_t are unchanged. Theorem requires a profile with values in $[0,1]$, which is the stated condition. If $K = H$ and $\mu^2 e^{2(Ht + \mathrm{wb})} = e^{2\varphi}$, comparing rates on $[1,\infty)$ gives $H + \mathrm{w} = K = H$, so $\mathrm{w} = 0$ and $\varphi' \equiv H$; conversely $\varphi' \equiv H$ gives $\varphi = \varphi(0) + Ht$ and $\mu = e^{\varphi(0)}$.

par *Non-claim.* The lemma strengthens Proposition (e), which used two constant rescalings on two regions, to one map on the whole patch, at the cost of a profile that depends on φ. The metrics are comparison metrics, not hosts, and no evolution law is derived. par

Remark (Name of the family; version-3 correction). Version 2 calls $\{g_{\mathrm{w}}\}$ the "conformal warp" or the "conformal-warp family". The family rescales the slice metric at fixed lapse. It is not a conformal rescaling of the

spacetime metric: if $g_{\mathrm{w}} = e^{2\sigma} g_0$ on an open set meeting $\{t > 1\}$, comparing the $\mathrm{d}t^2$ coefficients gives $e^{2\sigma} = 1$, then $e^{2\mathrm{wb}} = 1$ there, and $\mathrm{w} = 0$ because $\mathrm{b}(t) = t - t_{\mathrm{b}}$ is not constant. Version 3 calls it the *slice-warp family*. Statements and proofs are unaffected (Section , item E7).

par **Documentary separation (Red06-G-DSS-CERT v3 and V-DST-DSS-CERT v3).** Red06-G-DSS-CERT-v3 prop:RC-warp (source record, sha256 b8b9ef6f7bca70f6…) states, on the flat patch of its prescribed host, the change of $\Theta(\mathrm{n}, \mathrm{n})$ at every time (its part (b)) and a carrying of its comparison futures onto the warp family by one rescaling of **x** (its part (d)). Lemmas and are proved here independently; on the base $N = c$, $\gamma = e^{2Ht}\mathrm{d}\mathbf{x}^2$ ($\mathrm{tr}\,\mathrm{k} = 3H/c$, $R[\gamma] = 0$), Lemma gives $3\mathrm{wh}(2H + \mathrm{wh})/c^2$, the formula printed there. Red06-G-DSS-CERT-v3 doc:RC-hawkcert says that the family "is not a conformal rescaling of the spacetime metric", which Remark proves. V-DST-DSS-CERT-v3 doc:VDC-hawkcert (sha256 a58f78ab8db023f9…) records that its linear-operator separation has the same shape as Theorem without either being a special case of the other. The three DSS version-3 sheets, including En08-ST-DSS-CERT-v3 (sha256 3882f4e56296b5fa…), cite version 1 of the Hawk07 certificate sheets only (labels prop:s2-vac, thm:s2-sep, thm:s2-cas, thm:s2-exact); these labels are retained unchanged in versions 2 and 3. Nothing is imported.

par **Documentary separation (I-C-Th-CERT v2).** I-C-Th-CERT-v2 prop:th-vacuity (source record, sha256 53d915f44ac22576…) shows that a finite thermal balance holds for every unitary and every β, and I-C-Th-CERT-v2 prop:th-dyn separates two implementations with equal admitted data. This is the vacuity-and-separation pattern of Proposition and Theorem , on finite implementations instead of metrics; neither statement contains the other.

Hawk07-C-Dyn: an independent exclusion

Theorem (The switched conformal metric has no de Sitter region). *Let* $g = a(\eta)^2[-c^2\mathrm{d}\eta^2 + \mathrm{d}\ell^2 + F(\eta, \ell)^2\mathrm{d}\varphi^2 + \mathrm{d}z^2]$ *with* $c > 0$, $F > 0$ *of class* C^2 *and arbitrary otherwise, and* $a = 1 + \lambda S(\eta/\tau_a)$ *with* $\lambda > -1$, $\tau_a > 0$, *where* $S(x) = \mathrm{e}(x)/(\mathrm{e}(x) + \mathrm{e}(1 - x))$, $\mathrm{e}(x) = e^{-1/x}$ *for* $x > 0$ *and* $\mathrm{e}(x) = 0$ *otherwise. Then no nonempty open subset of the region where these coordinates are defined is locally isometric to de Sitter*

space with $H > 0$.

Proof. Write $\hat{g} = -c^2\mathrm{d}\eta^2 + \mathrm{d}\ell^2 + F^2\mathrm{d}\varphi^2 + \mathrm{d}z^2$ and $\sigma = \log a$, a function of η alone. For $\hat{g}$-orthonormal X, Y the conformal-change formula gives the sectional curvature of $g = e^{2\sigma}\hat{g}$ as $e^{-2\sigma}(\hat{K}(X,Y) - \widehat{\mathrm{Hess}}\,\sigma(X,X) - \widehat{\mathrm{Hess}}\,\sigma(Y,Y) + (X\sigma)^2 + (Y\sigma)^2 - |\mathrm{d}\sigma|^2_{\hat{g}})$. Take $X = \partial_\ell$, $Y = \partial_z$. Since ∂_z is $\hat{g}$-parallel, $\hat{K}(X,Y) = 0$. Since $\hat{g}_{\ell\ell} = \hat{g}_{zz} = 1$, $\hat{\Gamma}^\eta_{\ell\ell} = \hat{\Gamma}^\eta_{zz} = 0$, so both Hessian terms vanish; $X\sigma = Y\sigma = 0$; and $|\mathrm{d}\sigma|^2_{\hat{g}} = -\sigma'^2/c^2$. Hence the plane $(\partial_\ell, \partial_z)$, which is spacelike, has sectional curvature $a'^2/(c^2a^4)$ (check K17 recomputes it, together with the sign test on de Sitter space).

Suppose a connected nonempty open set U in the coordinate region is locally de Sitter with $H > 0$. Its sectional curvature is H^2/c^2 on every nondegenerate plane, so $a'^2/a^4 = H^2$ on the η-projection I of U, an open interval. Thus $a' \neq 0$ on I. Since a is constant on $(-\infty, 0]$ and on $[\tau_a, \infty)$, $I \subset (0, \tau_a)$. On I, $(1/a)' = -a'/a^2$ is continuous with absolute value H, hence equal to a constant $\pm H$. On $(0, \tau_a)$, $S(\eta/\tau_a)$ is a quotient of real-analytic functions with positive denominator, and $a \geq \min(1, 1+\lambda) > 0$; so $(1/a)'$ is real-analytic there, and by the identity theorem $(1/a)' \equiv \pm H$ on $(0, \tau_a)$. But S is smooth on $\mathbb{R}$ and vanishes on $(-\infty, 0]$, so $a'(\eta) \to 0$ as $\eta \mathrm{downarrow}\, 0$, and $(1/a)' \to 0$. This contradicts $H > 0$.

par *Non-claim.* The theorem concerns the displayed metrics only, for every admissible F and every $\lambda > -1$, and uses one sectional curvature. It constructs no state, decides nothing about any state on these metrics and says nothing about their matter content. It is not a swampland statement. par

Corollary (The Hawk07-C-Dyn metric). *The metric Hawk07-C-Dyn eq:dynamic-metric has no nonempty open set that is locally de Sitter.*

Proof. Off the axis it has the form of Theorem with $\ell = r > 0$ and F of Hawk07-C-Dyn eq:F; any open set that meets the axis also meets $\{r > 0\}$.

par *Non-claim.* The corollary repeats a conclusion that DS-OB-1 records (source record, see below); it is proved

here from the displayed metric and the shape of *S* only. It constructs no state. par

par **Documentary separation (DS-OB-1 v5 host list; version-2 plan correction F5).** The registered-host table of DS-OB-1 (DS-OB-1-v5 thm:DS-main, source record, sha256 dce37c0a6d8a8c4d…) lists, among the Hawk07 sheets, Hawk07-A and Hawk07-B (finite models with no metric) and Hawk07-C-Dyn (excluded by DS-OB-1-v5 prop:DS-hawk); a separate row lists the prescribed conical host $-c^2\mathrm{d}T^2 + \mathrm{d}r^2 + \alpha^2 r^2 \mathrm{d}\varphi^2 + \mathrm{d}z^2$ under I-B and Hawk05-ST. Its draft-verdict table (line 507) records that hosts outside its plan list, among them Hawk07-D to Hawk07-H, were not audited. VC-OB-1-v5 names Hawk07-C-Dyn only. For this sheet: Hawk07-C-Dyn is listed and excluded by DS-OB-1-v5 prop:DS-hawk, which uses the component $G_{\varphi\varphi}$. Theorem proves the same exclusion with a different invariant, the sectional curvature of the plane (∂_r, ∂_z). DS-OB-1-v5 prop:DS-hawk2 records a slice $\eta = \eta^*$ on which *G* is pointwise proportional to *g* in the core; a slice is not an open set, so there is no conflict. Nothing is imported from DS-OB-1.

Version 4 expansions (request t267u)

This section is new in version 4. It was made under request t267u ("Expand and upgrade cert sheets"), which attached no plan file; the request text is the plan, and its items are answered in Section . Version 3 of this sheet (inputs/Hawk07-C-Dyn-CERT-v3.tex, sha256 93bea2f47adf041c…) is retained above without change except for marked version-4 notes; its errors are listed in Section . New items are local theorems with proofs or documentary readings. A partial result is marked *partial*; an item that is not settled is recorded as *open*; a statement missing from a source is recorded as missing, never as zero. The companion sheets read are those named in the request, the newest delivered versions when it was made: DS-OB-1-CERT-v3 (sha256 07b600a11b5ec166…), VC-OB-1-CERT-v3 (502f6e5ebcc9bbe8…) and PG-OB-1-CERT-v3 (8c0a7e2fdbb7e455…); I-C-CERT-v4 (9917ea20e07a3483…), I-C-Ex-CERT-v4 (38a8d4c793cd7b04…), I-C-Ex2-CERT-v4 (62dd45f881ff66fd…) and I-C-Th-CERT-v4 (788fa5aa63dde75a…), all from /workspace/CertPlan/deliver; and Red06-G-DSS-CERT-v4 (574d8abfdcd62047…), V-DST-DSS-CERT-v4 (550372abe2117364…) and En08-ST-DSS-CERT-v4 (98c42ee7397263bc…) from /workspace/DSS/deliver. Each was checked against its delivered manifest. Citations

identify source records only; no proof transfer. After a steering note from the dispatching agent, two OB certificates delivered while this version was being made were also read, as delivered files and as source records only: DS-OB-1-CERT-v4 (0b5b86f87f91503b…) and VC-OB-1-CERT-v4 (f9802da668961595…), each checked against deliver/MANIFEST-CertPlan-S2v4-OB.sha256 (95076ed004a8da1e…). Nothing else of that stream was read: not PG-OB-1-CERT-v4 and not its working directory /workspace/CertPlan/S2v4-OB. Files of streams still in progress (I-C certificates version 5, DSS certificates version 5) were not read.

Late comparison regions: de Sitter or not, and coincident values

Proposition (Constant lapse, constant rate). *Let γ be a time-independent C^2 Riemannian metric on a three-manifold Σ, let $c > 0$, $\mathrm{w}, t_0 \in \mathbb{R}$, and let $g = -c^2\mathrm{d}t^2 + e^{2\mathrm{w}(t-t_0)}\gamma$ on $I \times \Sigma$.*

1. *With $\kappa = \mathrm{w}^2/c^2$, every component of $R_{abcd} - \kappa(g_{ac}g_{bd} - g_{ad}g_{bc})$ with an index t vanishes, and the purely spatial components equal $e^{2\mathrm{w}(t-t_0)}(R_\gamma)_{ijkl}$.*

2. *If $\mathrm{w} \neq 0$, then g is locally de Sitter near (t,p) if and only if γ is flat near p; its curvature is then w^2/c^2. If γ is not flat at p, no neighbourhood of (t,p) is locally de Sitter or flat.*

3. *If $\mathrm{w} = 0$, no open set is locally de Sitter.*

Proof. (a) The slices t = const have unit normal $\mathrm{n} = c^{-1}\partial_t$, induced metric $h = e^{2\mathrm{w}(t-t_0)}\gamma$ and extrinsic curvature $\mathcal{K}_{ij} = (2c)^{-1}\partial_t h_{ij} = (\mathrm{w}/c)h_{ij}$. The Gauss equation gives $R_{ijkl} = R[h]_{ijkl} + \mathcal{K}_{ik}\mathcal{K}_{jl} - \mathcal{K}_{il}\mathcal{K}_{jk} = e^{2\mathrm{w}(t-t_0)}(R_\gamma)_{ijkl} + \kappa(h_{ik}h_{jl} - h_{il}h_{jk})$, since a constant factor on a slice multiplies the lowered Riemann tensor by that factor. The Codazzi equation gives $R_{\mathrm{n}ijk} = D_j\mathcal{K}_{ik} - D_k\mathcal{K}_{ij} = 0$, since $\mathcal{K}$ is a constant multiple of h on each slice. For a warped product $-\mathrm{d}\tau^2 + A(\tau)^2\gamma$ one has $R(\partial_\tau, X, \partial_\tau, Y) = -(A''/A)\,g(X,Y)$; here $\tau = ct$, $A = e^{\mathrm{w}(\tau/c - t_0)}$, $A''/A = \kappa$, which is the nn part of the constant-curvature form. Check K30 recomputes (a) for $\gamma = \mathrm{d}x^2 + P(x)^2\mathrm{d}\varphi^2 + \mathrm{d}z^2$. (b) If g has constant curvature κ_0 near (t,p), the mixed components give $\kappa_0 = \kappa$, and then (a) gives $R_\gamma = 0$ near p. Conversely $R_\gamma = 0$ near p gives constant curvature $\kappa > 0$, and a metric of constant curvature $\kappa > 0$ and Lorentzian signature is locally isometric to de Sitter space (classical). If γ is not flat at p, it is not flat on

any neighbourhood, so neither alternative holds there; flatness would need $\kappa_0 = 0 = \kappa$. (c) For $\mathrm{w} = 0$ the mixed components force $\kappa_0 = 0$.

par *Non-claim.* The proposition is about prescribed comparison metrics; it constructs no state and no host, and a locally de Sitter comparison region is not a de Sitter state. No evolution law is derived. par

Proposition (When two late values coincide). *In the setting of Theorem , let p be a point with* $t(p) \geq 1$ *and* $\mathrm{w}_1 \neq \mathrm{w}_2$. *Then*

$$\Delta_{\mathrm{w}_1}(p) - \Delta_{\mathrm{w}_2}(p) = (\mathrm{w}_1 - \mathrm{w}_2)\left(\frac{3(\mathrm{w}_1 + \mathrm{w}_2)}{N^2} + \frac{2\operatorname{tr}\mathrm{k}}{N}\right) + \tfrac{1}{2}R[\gamma]\left(e^{-2\mathrm{w}_1\mathrm{b}} - e^{-2\mathrm{w}_2\mathrm{b}}\right).$$

1. *If* $R[\gamma](p) = 0$, *the two late values coincide at p if and only if* $\mathrm{w}_1 + \mathrm{w}_2 = -\frac{2}{3}N\operatorname{tr}\mathrm{k}$ *at p. On a static base* $(N, \gamma$ *independent of t, so* $\operatorname{tr}\mathrm{k} = 0$*) this is* $\mathrm{w}_2 = -\mathrm{w}_1$.

2. *On a static base, at a spatial point x with* $R[\gamma](x) \neq 0$, *the two late values coincide for at most two values of* $t \geq 1$ *. In case (a) the two-point minimax error of Theorem (c) for the pair is* 0 *at p.*

Proof. Subtract the formula of Theorem (b) for w_2 from that for w_1. (a) The last term is absent and $\mathrm{w}_1 \neq \mathrm{w}_2$. (b) For $t \geq 1$, $\mathrm{b}(t) = t - t_{\mathrm{b}}$ is injective in t, and the difference is $A + Bf(\mathrm{b})$ with constants $A = 3(\mathrm{w}_1^2 - \mathrm{w}_2^2)/N^2$, $B = \frac{1}{2}R[\gamma](x) \neq 0$ and $f(\mathrm{b}) = e^{-2\mathrm{w}_1\mathrm{b}} - e^{-2\mathrm{w}_2\mathrm{b}}$. Now $f'(\mathrm{b}) = 0$ means $\mathrm{w}_1 e^{-2\mathrm{w}_1\mathrm{b}} = \mathrm{w}_2 e^{-2\mathrm{w}_2\mathrm{b}}$: impossible if $\mathrm{w}_1\mathrm{w}_2 \leq 0$ (one side vanishes or the sides have opposite signs, as $\mathrm{w}_1 \neq \mathrm{w}_2$), and if $\mathrm{w}_1\mathrm{w}_2 > 0$ equivalent to $e^{2(\mathrm{w}_2 - \mathrm{w}_1)\mathrm{b}} = \mathrm{w}_2/\mathrm{w}_1$, which has at most one solution. So f is strictly monotone on at most two intervals, and $A + Bf$ has at most two zeros. The minimax statement is Theorem (c) with $\Delta_{\mathrm{w}_1}(p) = \Delta_{\mathrm{w}_2}(p)$.

par *Non-claim.* The proposition qualifies, and does not withdraw, Theorem : unboundedness over the family and the two-point formula stand; what fails in case (a) is separation of the particular pair. No rule, coefficient or dynamics is supplied. par

par **Documentary separation (VC-OB-1-CERT v3: the same formulas on its base).** VC-OB-1-CERT-v3 prop:v3-VC-alltime (source record) prints the all-time formula of Lemma , and VC-OB-1-CERT-v3

prop:v3-VC-late and VC-OB-1-CERT-v3 prop:v3-VC-slices state, for $-c^2\mathrm{d}t^2 + e^{2(B+Kt)}\mathrm{d}\mathbf{x}^2$ and for curved slices, the two cases of Proposition (b); its part (d) records that the late value does not see the sign of the rate, which is Proposition (a) over a flat static base. VC-OB-1-CERT-v3 cor:v3-VC-hawk applies this to the Hawk07-H background and leaves the profile unaudited; the audit is Hawk07-H-CERT-v4, Corollary cor:v4-late-H. The statements here are proved independently; nothing is imported.

par **Documentary separation (Red06-G-DSS-CERT v4: prop:RC-norm).** Red06-G-DSS-CERT-v4 prop:RC-norm (source record) gives, on its flat patch $N = c$, $\mathrm{tr}\,\mathrm{k} = 3H/c$, $R[\gamma] = 0$, the difference $3(w_1 - w_2)\mathrm{h}(2H + (w_1 + w_2)\mathrm{h})/c^2$ and coincidence on $\{t \geq 1\}$ exactly when $w_1 = w_2$ or $w_1 + w_2 = -2H$. With $\mathrm{h} = 1$ the formula of Proposition gives the same expression, and (a) gives the same condition, since $-\frac{2}{3}N\mathrm{tr}\,\mathrm{k} = -2H$ there. Its part (d), the normalization $\varphi(0) = 0$ or an explicit rescaling, agrees with the one map of Lemma . The two proofs are independent.

Corollary (Late comparison regions in the core; conditional). *Let V be an open subset of $\{t > 1\}$ (time of Theorem after the affine change of Corollary) on which $\eta \geq \tau_a$ and $r < r_0$. Then for $\mathrm{w} \neq 0$ the member g_{w} is locally de Sitter near every point of V with $r > 0$.*

Proof. There $a = a_\infty$ and $F = r$ (Hawk07-C-Dyn eq:dynamic-metric), so the base is $-c^2a_\infty^2\mathrm{d}\eta^2 + a_\infty^2(\mathrm{d}r^2 + r^2\mathrm{d}\varphi^2 + \mathrm{d}z^2)$, with constant lapse and flat slices; apply Proposition (b) after the affine change of time.

par *Non-claim.* Conditional: whether V is nonempty depends on the affine change of time, which is not fixed here (open). Outside the core the slices depend on time during settling and are not treated. par par *Version-5 note.* The condition is removed in Corollary . par

The switching period

Definition (Curvature-squared tensors). In the conventions of this sheet (signature $(-+++)$, $R^a{}_{bcd} = \partial_c\Gamma^a_{bd} - \partial_d\Gamma^a_{bc} + \Gamma^a_{ce}\Gamma^e_{bd} - \Gamma^a_{de}\Gamma^e_{bc}$, $R_{bd} = R^a{}_{bad}$, round spheres have $R > 0$) put

$E^{(1)}_{\mu\nu} = 2RR_{\mu\nu} - \tfrac{1}{2}g_{\mu\nu}R^2 + 2g_{\mu\nu}\Box R - 2\nabla_\mu\nabla_\nu R$ and $E^{(2)}_{\mu\nu} = 2R_{\mu\alpha\nu\beta}R^{\alpha\beta} - \tfrac{1}{2}g_{\mu\nu}R_{\alpha\beta}R^{\alpha\beta} + \Box R_{\mu\nu} + \tfrac{1}{2}g_{\mu\nu}\Box R - \nabla_\mu\nabla_\nu R$.

These are the tensors of Hawk07-F-CERT-v3 (Definition def:v3-E), restated so that this sheet is self-contained.

Proposition (The metric variations, in full). *Let g be a smooth Lorentzian metric on a four-manifold, $E^{(1)}, E^{(2)}$ as in Definition , and $h_{\mu\nu} = \delta g_{\mu\nu}$ a smooth compactly supported symmetric variation, so that $\delta g^{\mu\nu} = -h^{\mu\nu}$. Then*

$$\delta\int\sqrt{-g}\,R^2 = \int\sqrt{-g}\,E^{(1)}_{\mu\nu}\delta g^{\mu\nu}, \qquad \delta\int\sqrt{-g}\,R_{\alpha\beta}R^{\alpha\beta} = \int\sqrt{-g}\,E^{(2)}_{\mu\nu}\delta g^{\mu\nu},$$

and $\nabla^\mu E^{(1)}_{\mu\nu} = \nabla^\mu E^{(2)}_{\mu\nu} = 0$.

Proof. Standard first variations. $\delta\sqrt{-g} = \tfrac{1}{2}\sqrt{-g}\,h$ with $h = g^{\alpha\beta}h_{\alpha\beta}$; $\delta\Gamma^\gamma_{\alpha\beta} = \tfrac{1}{2}g^{\gamma\lambda}(\nabla_\alpha h_{\beta\lambda} + \nabla_\beta h_{\alpha\lambda} - \nabla_\lambda h_{\alpha\beta})$, a tensor, with $\delta\Gamma^\gamma_{\alpha\gamma} = \tfrac{1}{2}\nabla_\alpha h$; and, since $R_{\beta\delta} = \partial_\alpha\Gamma^\alpha_{\beta\delta} - \partial_\delta\Gamma^\alpha_{\beta\alpha} + \Gamma\Gamma$-terms in this convention, evaluation in normal coordinates gives $\delta R_{\alpha\beta} = \nabla_\gamma\delta\Gamma^\gamma_{\alpha\beta} - \nabla_\beta\delta\Gamma^\gamma_{\alpha\gamma}$. Hence $g^{\alpha\beta}\delta R_{\alpha\beta} = \nabla^\alpha\nabla^\beta h_{\alpha\beta} - \Box h$ and $\delta R = -h^{\mu\nu}R_{\mu\nu} + \nabla^\alpha\nabla^\beta h_{\alpha\beta} - \Box h$. All boundary terms below vanish because h has compact support.

R^2. $\delta(\sqrt{-g}R^2) = \sqrt{-g}(\tfrac{1}{2}hR^2 + 2R\,\delta R)$. Two integrations by parts give

$\int\sqrt{-g}\,2R(\nabla^\alpha\nabla^\beta h_{\alpha\beta} - \Box h) = \int\sqrt{-g}\,h^{\mu\nu}(2\nabla_\mu\nabla_\nu R - 2g_{\mu\nu}\Box R)$. So

$\delta\int\sqrt{-g}R^2 = \int\sqrt{-g}\,h^{\mu\nu}(\tfrac{1}{2}g_{\mu\nu}R^2 - 2RR_{\mu\nu} + 2\nabla_\mu\nabla_\nu R - 2g_{\mu\nu}\Box R) = \int\sqrt{-g}\,E^{(1)}_{\mu\nu}\delta g^{\mu\nu}$.

$R_{\alpha\beta}R^{\alpha\beta}$. $\delta(R_{\alpha\beta}R^{\alpha\beta}) = 2R^{\alpha\beta}\delta R_{\alpha\beta} - 2h^{\mu\nu}R_\mu{}^\alpha R_{\alpha\nu}$. One integration by parts, with $\delta\Gamma^\gamma_{\alpha\gamma} = \tfrac{1}{2}\nabla_\alpha h$ and the symmetry of $R^{\alpha\beta}$, gives

$$\int\sqrt{-g}\,2R^{\alpha\beta}\delta R_{\alpha\beta} = \int\sqrt{-g}(-2\nabla^\lambda R^{\alpha\beta}\nabla_\alpha h_{\beta\lambda} + \nabla^\lambda R^{\alpha\beta}\nabla_\lambda h_{\alpha\beta} + \nabla_\beta R^{\alpha\beta}\nabla_\alpha h),$$

and a second one gives $\int\sqrt{-g}(2h_{\beta\lambda}\nabla_\alpha\nabla^\lambda R^{\alpha\beta} - h_{\alpha\beta}\Box R^{\alpha\beta} - h\nabla_\alpha\nabla_\beta R^{\alpha\beta})$. By the contracted Bianchi identity $\nabla_\beta R^{\alpha\beta} = \tfrac{1}{2}\nabla^\alpha R$, the last term is $-\tfrac{1}{2}h\,\Box R$. For the first, the Ricci identity

$[\nabla_\alpha,\nabla_\nu]R^\alpha{}_\mu = R^\alpha{}_{\beta\alpha\nu}R^\beta{}_\mu - R^\beta{}_{\mu\alpha\nu}R^\alpha{}_\beta = R_{\beta\nu}R^\beta{}_\mu - R_{\mu\alpha\nu\beta}R^{\alpha\beta}$ (pair symmetry and the two antisymmetries) and $\nabla_\alpha R^\alpha{}_\mu = \tfrac{1}{2}\nabla_\mu R$ give

$$(*) \qquad 2\nabla_\alpha\nabla_\nu R^\alpha{}_\mu = \nabla_\mu\nabla_\nu R + 2R_\mu{}^\alpha R_{\alpha\nu} - 2R_{\mu\alpha\nu\beta}R^{\alpha\beta},$$

whose right side is symmetric. Collecting,

$$\delta\int\sqrt{-g}\,R_{\alpha\beta}R^{\alpha\beta} = \int\sqrt{-g}\,h^{\mu\nu}(\tfrac{1}{2}g_{\mu\nu}R_{\alpha\beta}R^{\alpha\beta} + \nabla_\mu\nabla_\nu R - 2R_{\mu\alpha\nu\beta}R^{\alpha\beta} - \mathrm{Box}\,R_{\mu\nu} - \tfrac{1}{2}g_{\mu\nu}\mathrm{Box}\,R),$$

the terms $\pm 2h^{\mu\nu}R_\mu{}^\alpha R_{\alpha\nu}$ cancelling; with $\delta g^{\mu\nu} = -h^{\mu\nu}$ this is $\int\sqrt{-g}\,E^{(2)}_{\mu\nu}\delta g^{\mu\nu}$.

Conservation. For a smooth compactly supported vector field ξ with flow φ_s, both integrals are unchanged under $g \mapsto \varphi_s^* g$, and $\frac{\mathrm{d}}{\mathrm{d}s}\varphi_s^* g|_{s=0} = \mathscr{L}_\xi g$, so $h_{\mu\nu} = \nabla_\mu\xi_\nu + \nabla_\nu\xi_\mu$. Then $0 = -2\int\sqrt{-g}\,E^{(i)\mu\nu}\nabla_\mu\xi_\nu = 2\int\sqrt{-g}\,(\nabla_\mu E^{(i)\mu\nu})\xi_\nu$ for all ξ, so $\nabla_\mu E^{(i)\mu\nu} = 0$. Check K19 of version 3 corroborates the identities on Bianchi I metrics.

par *Non-claim.* The proposition fixes the tensors and their conservation; it fixes no counterterm coefficient, computes no renormalized stress and no absolute vacuum energy, and says nothing about which counterterms a renormalization scheme admits. par

par **Documentary separation (DS-OB-1-CERT v3 and VC-OB-1-CERT v3: the partial part).**

DS-OB-1-CERT-v3 lem:v3-Ediv(b) and VC-OB-1-CERT-v3 lem:v3-Ediv(b) (source records) state that $E^{(2)}$ is the Euler–Lagrange tensor of $\int\sqrt{-g}R_{\alpha\beta}R^{\alpha\beta}$ and hence divergence-free, and mark this *partial* because the integrations by parts are not written out; their part (a) proves $\nabla^\mu E^{(1)}_{\mu\nu} = 0$ directly. Proposition writes the computation out with the same definition of $E^{(2)}$ (the displays agree symbol for symbol) and proves conservation of both. Their check values on $-\mathrm{d}t^2 + e^{2t^3/3}\mathrm{d}\mathbf{x}^2$ ($E^{(1)}(k,k) = -360$, $E^{(2)}(k,k) = -120$ at $t = 1$) agree with check K20 of version 3. The proof here is independent; nothing is imported, and the status of those sheets is not changed by this one.

par **Documentary separation (DS-OB-1-CERT v4 and VC-OB-1-CERT v4: the partial part closed there).**

DS-OB-1-CERT-v4 thm:v4-E2div (source record) proves $\nabla^\mu E^{(2)}_{\mu\nu} = 0$ directly, for C^5 metrics of any signature and dimension, from the commutator of covariant derivatives and the contracted Bianchi identities, and so completes its lem:v3-Ediv(b). DS-OB-1-CERT-v4 prop:v4-Evar states the two variational identities with the same sign as Proposition here (variations $\delta g^{\mu\nu}$, density $\sqrt{|g|}$). VC-OB-1-CERT-v4 carries the same statements (VC-OB-1-CERT-v4 thm:v4-E2div, VC-OB-1-CERT-v4 prop:v4-Evar). They are read, not relied on: Proposition

is proved here independently by the variational route, for four-dimensional Lorentzian metrics; the direct identity in every dimension and signature is not proved in this sheet. Nothing is imported.

Lemma (The switch near its start). *For the function S of Theorem and* $0 \le n \le 4$, $S^{(n)}(x) = e^{1-1/x}x^{-2n}(1 + O(x))$ *as* $x$downarrow 0. *Every product of two factors from* $\{S, S', \dots, S''''\}$ *is* $o(S''''(x)\,x^{m})$ *for every m.*

Proof. On $(0,1)$, $S = q/(1+q)$ with $q(x) = \mathrm{e}(x)/\mathrm{e}(1-x) = e^{-1/x}\mu(x)$, $\mu(x) = e^{1/(1-x)}$ real-analytic near 0, $\mu(0) = e$. By induction $(e^{-1/x})^{(n)} = e^{-1/x}p_n(1/x)$ with $p_0 = 1$ and $p_{n+1}(y) = y^2(p_n(y) - p_n'(y))$, so p_n is monic of degree $2n$; Leibniz's rule gives $q^{(n)} = e^{1-1/x}x^{-2n}(1 + O(x))$. The remainder $S - q = -q^2/(1+q)$ is a smooth function of q vanishing to second order, so by the chain rule its n-th derivative is a sum of products containing at least two factors $q^{(i)}$, each $O(e^{-1/x}x^{-8})$; hence it is $O(e^{-2/x}x^{-16}) = o(e^{-1/x}x^{m})$ for every m. The same bound gives the last statement.

par *Non-claim.* An elementary estimate for the parent's switch; no physical content. par

Theorem (Axial null contractions during the switching period). *Let V be an open set of* (η, r) *and* $g = a(\eta)^2\hat{g}$ *on* $V \times S^1_{\varphi} \times S^1_{z}$, $\hat{g} = -c^2\mathrm{d}\eta^2 + \mathrm{d}z^2 + \mathrm{d}r^2 + P(r)^2\mathrm{d}\varphi^2$ *with* $P > 0$ *smooth,* $a = 1 + \lambda S(\eta/\tau_a)$, $\lambda > -1$, $\lambda \neq 0$, $\tau_a > 0$. *Put* $u = 1/a$ *and* $\hat{k} = c^{-1}\partial_{\eta} \pm \partial_{z}$, *null for g and* $\hat{g}$.

1. $G(\hat{k},\hat{k}) = \dfrac{2u''}{c^2u}$, $E^{(1)}(\hat{k},\hat{k}) = \dfrac{12}{c^4}(uu'''' - 5u''^2 - \dfrac{2u'\wedge 2u''}{u}) + \dfrac{24\,P''}{c^2\,P}u'\wedge 2$, $E^{(2)}(\hat{k},\hat{k}) = \frac{1}{3}E^{(1)}(\hat{k},\hat{k})$.

2. *Where* $\eta \le 0$ *or* $\eta \ge \tau_a$, *all three vanish.*

3. *Fix r with* $(0,\eta_0) \times \{r\} \subset V$ *for some* $\eta_0 > 0$. *As* ηdownarrow 0, $G(\hat{k},\hat{k}) = -\frac{2\lambda}{c^2\tau_a^2}S''(\eta/\tau_a)(1 + o(1))$ *and* $E^{(1)}(\hat{k},\hat{k}) = 3E^{(2)}(\hat{k},\hat{k}) = -\frac{12\lambda}{c^4\tau_a^4}S''''(\eta/\tau_a)(1 + o(1))$*; so all three are nonzero, with the sign of* $-\lambda$, *on some interval* $(0,\eta_1)$. *On every interval* $I \subset (0,\tau_a)$ *with* $I \times \{r\} \subset V$ *each is a real-analytic function of* η *that is not identically zero, so its zeros in I are isolated.*

Proof. (a) For G: in four dimensions, for $g = e^{2\sigma}\hat{g}$, $\mathrm{Ric} = \widehat{\mathrm{Ric}} - 2(\hat{\nabla}\mathrm{d}\sigma - \mathrm{d}\sigma\otimes\mathrm{d}\sigma) + (\cdots)\hat{g}$, and $\hat{g}(\hat{k},\hat{k}) = 0$. Here $\sigma = \log a$; the $\hat{g}$-Christoffel symbols with two indices in $\{\eta, z\}$ vanish, so $\hat{\nabla}\mathrm{d}\sigma(\hat{k},\hat{k}) = \sigma''/c^2$ and $(\hat{k}\sigma)^2 = \sigma'\wedge 2/c^2$; and

$\hat{g}$ is the product of the flat plane (η, z) with a surface, so $\widehat{\mathrm{Ric}}(\hat{k},\hat{k}) = 0$. Hence $G(\hat{k},\hat{k}) = -2(\sigma'' - \sigma'^{\wedge}2)/c^2 = 2u''/(c^2 u)$. The formulas for $E^{(1)}$ and $E^{(2)}$ are a direct symbolic computation with a and P arbitrary (check K27), and are not derived by hand here. (b) u is constant there. (c) $S(\cdot/\tau_a)$ is real-analytic on $(0, \tau_a)$, where $\mathrm{e}(x)$ and $\mathrm{e}(1-x)$ are positive and analytic, and $a \geq \min(1, 1+\lambda) > 0$; so u and the three contractions are real-analytic in η there (P''/P is constant in η). Write $u = 1 - \lambda S + \lambda^2 S^2/(1+\lambda S)$ with $S = S(\eta/\tau_a)$; by Lemma , $u^{(n)} = -\lambda \tau_a^{-n} S^{(n)}(1 + o(1))$ for $n = 2, 4$, $u \to 1$, and u''^2, $u'^{\wedge}2u''$, $u'^{\wedge}2$ are $o(S'''')$. This gives the asymptotics, and $S'', S'''' > 0$ near 0 by the lemma. At fixed r the right-hand sides of (a) are real-analytic functions of η on all of $(0, \tau_a)$ and, by the asymptotics, not identically zero; so their zeros in $(0, \tau_a)$, and hence in I, are isolated. Check K29 corroborates the asymptotics numerically.

par *Non-claim.* The theorem concerns curvature tensors along the axial null directions, that is, the geometric directions of the renormalization fibre $\{T + c_0 g + c_1 E^{(1)} + c_2 E^{(2)}\}$. It computes no state and no renormalized stress. It shows that during switching these directions change axial null contractions, so an unfixed coefficient c_1 or c_2 is not harmless there, while before and after switching (part (b)) it is. No coefficient is fixed. par

Proposition (Outside the static part). *For $g = a(\eta)^2 \hat{g}$ with $\hat{g} = -c^2 \mathrm{d}\eta^2 + \mathrm{d}r^2 + F(\eta, r)^2 \mathrm{d}\varphi^2 + \mathrm{d}z^2$, $a, F > 0$ arbitrary smooth, and $\hat{k} = c^{-1}\partial_\eta \pm \partial_z$: $G(\hat{k},\hat{k}) = c^{-2}(2a(1/a)'' - \partial_\eta^2 F/F)$, and $(E^{(2)} - \frac{1}{3}E^{(1)})[g](\hat{k},\hat{k}) = a^{-2}(E^{(2)} - \frac{1}{3}E^{(1)})[\hat{g}](\hat{k},\hat{k})$.*

Proof. The first identity follows as in Theorem (a), now with $\widehat{\mathrm{Ric}}(\hat{k},\hat{k}) = -\partial_\eta^2 F/(c^2 F)$ for the warped circle. Both identities are confirmed by direct symbolic computation (check K28). The second is the conformal covariance of the combination $E^{(2)} - \frac{1}{3}E^{(1)}$, a classical fact for the Bach tensor that is not used beyond this family.

par *Non-claim. Partial.* Where F depends on η, $E^{(1)}(\hat{k},\hat{k})$ itself is not computed, and the contraction along null directions in the (η, r) plane is not computed (open). par

Corollary (Hawk07-C-Dyn: the core during switching). *On the core $\{0 < r < r_0\}$ of Hawk07-C-Dyn eq:dynamic-metric, where $F = r$, Theorem applies with $P(r) = r$, $P'' = 0$, and the parent's $\lambda > 0$: the axial null contractions of G, $E^{(1)}$ and $E^{(2)} = \frac{1}{3}E^{(1)}$ are negative on some interval $(0, \eta_1)$, vanish only at isolated times in $(0, \tau_a)$,*

and vanish for $\eta \le 0$ *and* $\eta \ge \tau_a$. *Outside the core, Proposition gives* $G(\hat{k},\hat{k})$ *and the combination* $E^{(2)} - \frac{1}{3}E^{(1)}$.

Proof. $F = r$ for $r \le r_0$ (parent, below Hawk07-C-Dyn eq:dynamic-metric); $\lambda > 0$ is among the parent's fixed constants. Apply Theorem with $V = \mathbb{R} \times (0, r_0)$.

par *Non-claim. Partial* outside the core. The corollary concerns the displayed metric only, and decides nothing about the parent's states. par

par **Documentary separation (DS-OB-1 v5: the pointwise Einstein slice).** DS-OB-1-v5 prop:DS-hawk2 (source record) records, in the core, $G^{\eta}_{\ \eta} - G^{x}_{\ x} = 2(aa'' - 2a'^2)/(c^2a^4)$ and a time $\eta^* \in (0, \tau_a)$ with $aa'' = 2a'^2$, at which G is pointwise proportional to g on the core part of the slice. Since $u'' = -(aa'' - 2a'^2)/a^3$, Theorem (a) gives $G(\hat{k},\hat{k}) = -2(aa'' - 2a'^2)/(c^2a^2) = -a^2(G^{\eta}_{\ \eta} - G^{x}_{\ x})$, the same expression; η^* is one of the isolated zeros allowed by part (c). The two proofs are independent.

Version 5 expansions (request t268u)

This section is new in version 5. It was made under request t268u ("Expand and upgrade all cert sheets further"), which attached no plan file; the request text is the plan, and its items are answered in Section . Version 4 of this sheet (inputs/Hawk07-C-Dyn-CERT-v4.tex, sha256 bf65038961840ad8…) is retained above without change except for marked version-5 notes; its errors are listed in Section . New items are local theorems with proofs or documentary readings. A partial result is marked *partial*; an item that is not settled is recorded as *open*; a statement missing from a source is recorded as missing, never as zero. The companion sheets read are the newest delivered versions when the request was made: DS-OB-1-CERT-v4 (sha256 0b5b86f87f91503b…), VC-OB-1-CERT-v4 (f9802da668961595…) and PG-OB-1-CERT-v4 (3dc921457bd78160…), checked against deliver/MANIFEST-CertPlan-S2v4-OB.sha256; I-C-CERT-v5 (56c30a1a434ce3ce…), I-C-Ex-CERT-v5 (ba3babcc99d2b98e…), I-C-Ex2-CERT-v5 (b147e794d9836bae…) and I-C-Th-CERT-v5 (caa290f8dad7b6f5…), checked against deliver/MANIFEST-CertPlan-S1v5.sha256; and Red06-G-DSS-CERT-v5 (e4a1b02552c138b8…), V-DST-DSS-CERT-v5 (4133961f566c059c…) and En08-ST-DSS-CERT-v5

(9be4fe4fdd9cf116…), checked against /workspace/DSS/deliver/MANIFEST-DSS-CERT-v5.sha256. Citations identify source records only; no proof transfer. Only delivered files were read; no working directory of a concurrent stream was read.

Coincident late values and the expansion of the slices

Proposition (The expansion separates every pair). *In the setting of Theorem , let* $\theta_{\mathrm{w}} = \nabla_a \mathrm{n}^a$ *be the expansion of the unit normal* $\mathrm{n} = N^{-1}\partial_t$ *of the slices* $t = \mathrm{const}$ *for* g_{w}*. On* $\{t \geq 1\}$, $\theta_{\mathrm{w}} = \mathrm{tr}\,\mathrm{k} + 3\mathrm{w}/N$*. So for* $\mathrm{w}_1 \neq \mathrm{w}_2$, $\theta_{\mathrm{w}_1} - \theta_{\mathrm{w}_2} = 3(\mathrm{w}_1 - \mathrm{w}_2)/N \neq 0$ *at every point of* $\{t \geq 1\}$*, including the points where the late values coincide (Proposition).*

Proof. For zero shift, $\nabla_a \mathrm{n}^a$ is the trace of the extrinsic curvature $\mathscr{K}^i{}_j$ of the slice. In the proof of Theorem (b), $\mathscr{K}^i{}_j = \mathrm{k}^i{}_j + v\,\delta^i{}_j$ with $v = \mathrm{w}\mathrm{b}'/N$, and $\mathrm{b}' = 1$ on $\{t \geq 1\}$. Taking the trace in three dimensions gives the formula.

par *Non-claim.* The expansion is not among the parent's admitted data and is not $\Theta(\mathrm{n},\mathrm{n})$. The proposition does not change Theorem or Proposition : a rule from early data to Θ still fails on the coincident pairs only in the sense recorded there. No observable is admitted and no dynamics is derived. par par **Documentary separation (Red06-G-DSS-CERT v5: the same separation on its base).** Red06-G-DSS-CERT-v5 prop:RC-late(d)–(e) (source record) computes, on $-c^2\mathrm{d}t^2 + e^{2\varphi(t)}\mathrm{d}\mathbf{x}^2$ with $\varphi' = K$ late, the expansion $3K/c$, and separates the pairs $K_2 = -K_1 \neq 0$ that $\Theta(\mathrm{n},\mathrm{n})$ does not separate by $6|K_1|/c$. With $N = c$, $\mathrm{tr}\,\mathrm{k} = 3H/c$ and $K = H + \mathrm{w}$ this is Proposition . Its reading of version 4 of the Hawk07-H sheet (Red06-G-DSS-CERT-v5 doc:RC-hawk4) records agreement with Propositions and and no error; its observation that a flat late region ($\mathrm{w} = 0$) is not de Sitter agrees with Proposition (c). The proofs are independent; nothing is imported.

Late comparison regions over a switching scale factor

Proposition (Warped late members). *Let* (S,σ) *be a two-dimensional* C^2 *Riemannian manifold with Gauss curvature* K_σ*, J an open interval,* $a, A > 0$ *of class* C^2 *on J,* $c > 0$*, and* $g = -c^2 a(\eta)^2\mathrm{d}\eta^2 + A(\eta)^2(\sigma + \mathrm{d}z^2)$ *on* $J \times S \times Z$*, with Z a line or a circle. Put* $H = A'/(caA)$ *and* $\dot{H} = H'/(ca)$*.*

1. *The only nonzero components of* R_{abcd} *in an orthonormal frame* $(\mathrm{n}, e_1, e_2, \partial_z/A)$ *adapted to the product are those with* $\{a,b\} = \{c,d\}$. *The sectional curvatures are* $\dot{H} + H^2$ *for planes containing* n, H^2 *for planes containing* ∂_z *and a vector tangent to S, and* $H^2 + K_\sigma/A^2$ *for the plane tangent to S.*

2. *g is locally de Sitter near* (η_1, p, z_1) *if and only if H is constant and nonzero on a neighbourhood of* η_1 *and* $K_\sigma = 0$ *on a neighbourhood of p. The curvature is then* H^2.

Proof. (a) Let τ be proper time, $\mathrm{d}\tau = ca\,\mathrm{d}\eta$. Then $g = -\mathrm{d}\tau^2 + A^2\gamma$ with $\gamma = \sigma + \mathrm{d}z^2$ independent of τ, and $\dot{H} = \mathrm{d}H/\mathrm{d}\tau$, $H = \mathrm{d}\log A/\mathrm{d}\tau$. The slices are umbilic, $\mathscr{K}_{ij} = Hh_{ij}$ with H constant on each slice, so the Codazzi equation gives $R_{\mathrm{n}ijk} = 0$; the Gauss equation gives $R_{ijkl} = A^2 R[\gamma]_{ijkl} + H^2(h_{ik}h_{jl} - h_{il}h_{jk})$; and $R(\mathrm{n}, X, \mathrm{n}, Y) = -(\ddot{A}/A)\,g(X,Y)$ with $\ddot{A}/A = \dot{H} + H^2$. The metric γ is a product of σ with a line, so its only curvature is K_σ on the plane tangent to S.

Check K35 recomputes (a) for $\sigma = \mathrm{d}r^2 + F(r)^2\mathrm{d}\varphi^2$. (b) If g has constant curvature $\kappa > 0$ near the point, (a) gives $H^2 = \kappa$, $K_\sigma/A^2 = 0$ and $\dot{H} + H^2 = \kappa$ there, so $K_\sigma = 0$ near p, $\dot{H} = 0$ near η_1, and H is constant with $H^2 = \kappa > 0$.

Conversely, if $K_\sigma = 0$ near p and $H \equiv H_0 \neq 0$ near η_1, (a) gives $R_{abcd} = H_0^2(g_{ac}g_{bd} - g_{ad}g_{bc})$ there, and a Lorentzian metric of constant curvature $H_0^2 > 0$ is locally isometric to de Sitter space (classical).

par *Non-claim.* A statement about prescribed comparison metrics. It constructs no state and no host; a locally de Sitter comparison region is not a de Sitter state. par

Corollary (Hawk07-C-Dyn: late comparison regions, for every affine change of time). *Take the displayed metric Hawk07-C-Dyn eq:dynamic-metric as* g_0 *in Theorem , with time* $t = (\eta - \eta_0)/T$ *for any* $\eta_0 \in \mathbb{R}$ *and* $T \neq 0$ *(the identity,* $\eta_0 = 0$, $T = 1$, *is allowed because* η *ranges over* $\mathbb{R}$*; Corollary). Let* $\mathrm{w} \neq 0$ *and let O be an open subset of* $\{t > 1\}$ *on which F does not depend on* η. *Then* g_w *is locally de Sitter near a point of O with coordinates* (η_1, r_1) *if and only if* $\eta_1 \notin [0, \tau_a]$ *and* $\partial_r^2 F = 0$ *near* r_1. *In particular the core* $\{r < r_0\}$, *axis included, meets the de Sitter set in* $\{t > 1\} \cap (\{\eta < 0\} \cup \{\eta > \tau_a\})$, *which is nonempty for every* (η_0, T)*; and no point of O with* $0 \le \eta \le \tau_a$ *has a de Sitter or flat neighbourhood for any late member.*

Proof. On $\{t > 1\}$, $\mathrm{b}(t) = t - t_{\mathrm{b}}$ for a constant t_{b}, so $g_{\mathrm{w}} = -c^2a^2\mathrm{d}\eta^2 + A^2(\sigma + \mathrm{d}z^2)$ with $\sigma = \mathrm{d}r^2 + F^2\mathrm{d}\varphi^2$ independent of η on O, $A = a\,e^{\mathrm{w}(t - t_{\mathrm{b}})}$, and

$$H = \frac{1}{ca}\left(\frac{a'}{a} + \omega\right), \qquad \omega = \mathrm{w}/T \neq 0.$$

Also $K_\sigma = -\partial_r^2 F/F$. Apply Proposition (b). If $\eta_1 < 0$ or $\eta_1 > \tau_a$, a is constant near η_1 and $H = \omega/(ca)$ is constant and nonzero. Let $\eta_1 \in [0, \tau_a]$; every neighbourhood of η_1 contains an open interval $I \subset (0, \tau_a)$. Suppose $H \equiv C$ on I, that is $a' = a(Cca - \omega)$ on I. Both sides are real-analytic on $(0, \tau_a)$ (proof of Theorem (c)), so the identity holds on $(0, \tau_a)$, and by continuity at $\eta = 0$, where $a = 1$ and $a' = 0$, $Cc = \omega$. Then $a' = \omega a(a - 1)$ on $[0, \tau_a)$ with $a(0) = 1$. The right side is locally Lipschitz in a and $a \equiv 1$ solves the same initial value problem, so $a \equiv 1$ on $[0, \tau_a)$, contradicting $\lambda \neq 0$ and $S > 0$ on $(0, 1)$. Hence H is not constant near η_1, and also not identically zero there, since $H \equiv 0$ is the case $C = 0$; so the point is neither de Sitter nor, by Proposition (a), flat. In the core $F = r$ (Hawk07-C-Dyn eq:dynamic-metric); the slice metric $\mathrm{d}r^2 + r^2\mathrm{d}\varphi^2 + \mathrm{d}z^2$ with $\varphi \in \mathbb{R}/2\pi\mathbb{Z}$ is the flat Euclidean metric, the polar degeneracy at $r = 0$ being removable (parent, after the displayed metric); so $K_\sigma = 0$ there, axis included. If $T > 0$, $\{t > 1\} = \{\eta > \eta_0 + T\}$ meets $\{\eta > \tau_a\}$; if $T < 0$, $\{t > 1\} = \{\eta < \eta_0 + T\}$ meets $\{\eta < 0\}$.

par *Non-claim.* This settles the version-4 condition of Corollary : the late de Sitter set in the core is nonempty for every affine change of time. Outside the core, where F depends on η during settling, nothing is claimed (open). The regions are regions of comparison metrics, not of the parent's spacetime, which has none (DS-OB-1-v5 prop:DS-hawk, source record). par

Null contractions: classification on two classes

Here *whole-fibre null invariance* on an open set U means that $t(k, k)$ is the same for all members of $\{t + c_0 g + c_1 E^{(1)} + c_2 E^{(2)}\}$, for every null k at every point of U, that is $E^{(1)}(k, k) = E^{(2)}(k, k) = 0$ for all such k; $E^{(1)}, E^{(2)}$ are the tensors of Definition , $X_\circ = X - \frac{1}{4}(\mathrm{tr}_g X)g$ and $B = E^{(2)} - \frac{1}{3}E^{(1)}$.

Lemma (Forms vanishing on the null cone). *A symmetric bilinear form T on a four-dimensional Lorentzian*

vector space satisfies $T(k,k) = 0$ for every null k if and only if $T_\circ = 0$. Hence whole-fibre null invariance at a point is $E^{(1)}_\circ = 0$ and $B = 0$ there.

Proof. In an orthonormal basis $e_0, \dots, e_3$, for a unit $u \in \operatorname{span}(e_1, e_2, e_3)$ the vectors $e_0 \pm u$ are null, so $T(e_0, u) = 0$ and $T(u,u) = -T_{00}$; a quadratic form constant on the unit sphere is a multiple of the Euclidean one, so $T = -T_{00} g$. The converse is clear. For the second sentence apply this to $E^{(1)}$ and $E^{(2)}$, and note $E^{(2)}_\circ = B_\circ + \frac{1}{3} E^{(1)}_\circ$ with B trace-free when $\operatorname{tr} E^{(1)} = 3 \operatorname{tr} E^{(2)}$, which holds since both traces are multiples of $\operatorname{Box} R$ ($6 \operatorname{Box} R$ and $2 \operatorname{Box} R$, by $g^{\mu\nu} R_{\mu\alpha\nu\beta} = R_{\alpha\beta}$ and $\operatorname{tr} \nabla\nabla R = \operatorname{tr} \operatorname{Box} \operatorname{Ric} = \operatorname{Box} R$).

par *Non-claim.* Linear algebra; no physical content. par

Lemma (Scalar-flat regions). *On an open set where $R \equiv 0$, $E^{(1)} \equiv 0$, and whole-fibre null invariance holds exactly where $E^{(2)} = 0$.*

Proof. Every term of $E^{(1)} = 2R \operatorname{Ric} - \frac{1}{2} g R^2 + 2g \operatorname{Box} R - 2\nabla\nabla R$ contains R or a derivative of R. Then $E^{(1)}(k,k) = 0$ for all k, and the condition is $E^{(2)}(k,k) = 0$ for all null k, that is $E^{(2)}_\circ = 0$; and $\operatorname{tr} E^{(2)} = 2 \operatorname{Box} R = 0$.

par *Non-claim.* The lemma reduces the question on scalar-flat regions; it does not classify scalar-flat metrics with $E^{(2)} = 0$ (open). par

Theorem (Spatially flat FLRW metrics). *Let $g = a(\eta)^2(-\mathrm{d}\eta^2 + \mathrm{d}x^2 + \mathrm{d}y^2 + \mathrm{d}z^2)$ on $J \times \Sigma$, J an open interval, Σ an open subset of $\mathbb{R}^3$ or a flat quotient, $a > 0$ of class C^6, and put $Q = a^2 a'''' - 8 a a' a''' - a a''^2 + 14 a' \wedge 2 a''$.*

1. *$B = 0$ identically, and $E^{(1)}_\circ = -3Q\, a^{-5} \operatorname{diag}(3,1,1,1)$ in the coordinates (η, x, y, z).*

2. *Whole-fibre null invariance holds on $J' \times \Sigma$, $J' \subset J$ open, if and only if $Q = 0$ on J'; at a single point it holds if and only if $Q = 0$ there.*

3. *$Q = 0$ is a fourth-order ordinary differential equation solved for a''''. For every η_0 and data $(a, a', a'', a''') = (a_0, a_1, a_2, a_3)$ with $a_0 > 0$ there is a unique local solution. The solutions include $a = \alpha\eta + \beta$ (scalar-flat: Minkowski for $\alpha = 0$, the radiation metric otherwise) and $a = 1/(H(\eta_1 - \eta))$ (de Sitter).*

4. *The solution with data* $(1,0,1,0)$ *at* η_0 *has* $R(\eta_0) = 6$, $R'(\eta_0) = 0$ *and* $R''(\eta_0) = -12$. *On some interval around* η_0 *it is not Einstein, not scalar-flat and not of constant scalar curvature, and whole-fibre null invariance holds there. For* $a(\eta)^2(-c^2\mathrm{d}\eta^2 + \mathrm{d}\mathbf{x}^2)$ *the same holds with* η *replaced by* $c\eta$.

Proof. (a) Direct symbolic computation with a arbitrary (check K37); it is not derived by hand here. (b) By (a) and Lemma , invariance at a point is $Q = 0$ there. (c) The coefficient of a'''' is $a^2 > 0$, so Picard–Lindelöf applies to the first-order system for (a, a', a'', a'''). Both families satisfy $Q = 0$ (check K37). (d) $R = 6a''/a^3$; $R(\eta_0) = 6$, and $R'(\eta_0) = 0$, $R''(\eta_0) = -12$ follow from the equation for a'''' (check K37). Since $R''(\eta_0) \neq 0$, R is not constant near η_0; an Einstein metric in dimension four has constant R, and $R(\eta_0) \neq 0$. Invariance holds by (b). The last sentence follows from the substitution $T = c\eta$.

par *Non-claim.* A classification inside one class of metrics, by an ordinary differential equation; it is *partial* as a classification of all four-dimensional metrics, which stays open. Part (d) shows that whole-fibre null invariance is strictly weaker than "Einstein or scalar-flat". No counterterm coefficient is fixed and no state is constructed. par

Corollary (Hawk07-C-Dyn: the core). *On the core* $\{r < r_0\}$ *of Hawk07-C-Dyn eq:dynamic-metric, whole-fibre null invariance holds at every point with* $\eta \notin (0, \tau_a)$, *and fails at every point with* $\eta \in (0, \tau_a)$ *outside a set of times that is discrete in* $(0, \tau_a)$.

Proof. In the core the metric is $a(\eta)^2(-c^2\mathrm{d}\eta^2 + \text{flat})$, a spatially flat FLRW metric. For $\eta \notin (0, \tau_a)$ every derivative of a vanishes (the switch is flat at 0 and 1), so g and its derivatives are those of a flat metric at that point, and $E^{(1)} = E^{(2)} = 0$. For $\eta \in (0, \tau_a)$, Theorem (c) gives $E^{(1)}(\hat{k}, \hat{k}) \neq 0$ outside a discrete set of times.

par *Non-claim.* At the isolated times in $(0, \tau_a)$ where $E^{(1)}(\hat{k}, \hat{k}) = 0$, invariance is neither proved nor excluded (open); by Theorem (b) it holds there exactly when $Q(\tilde{a}) = 0$ for $\tilde{a}(T) = a(T/c)$. Outside the core nothing new is claimed. par

par **Documentary separation (The version-5 companions on the same tensors).** I-C-Th-CERT-v5 thm:v5-E(c) (source record) states that on every open set with $\mathrm{Ric} = \frac{R}{4}g$ the tensors $E^{(1)}, E^{(2)}$ vanish, and

Red06-G-DSS-CERT-v5 cor:RC-ct states the same on its de Sitter base; this is the Einstein case of whole-fibre null invariance (Lemma). V-DST-DSS-CERT-v5 doc:VDC-hawk4 reads Theorem thm:v4-nullchar of the version-4 Hawk07-H sheet as partial and finds no error. Theorem adds a classification inside a class that those sheets do not treat. Nothing is imported.

Registration

par **Documentary separation (Registration, version 5: the OB parents scanned).** The seven OB parents among the inputs (DS-, EM-, PG-, SG-, TM-, TS- and VC-OB-1, version 5) and Big01-A-v5 were searched for source citations of the Hawk07 sheets. They cite Hawk07-A (DS, PG), Hawk07-B (DS, PG) and Hawk07-C-Dyn (DS, PG, SG, VC), and no other Hawk07 sheet; the Hawk07 row of the registered-state table DS-OB-1-v5 sec:DS-reg lists Hawk07-A, Hawk07-B and Hawk07-C-Dyn. So Hawk07-C-Dyn is a cited source of four OB parents, and its host is a registered host of DS-OB-1 v5. This sheet does not change that record.

Version 6 expansions (request t269u)

This section is new in version 6. It was made under request t269u, whose plan is saved verbatim and read-only as /workspace/CertPlan/PLAN_t269u.md (sha256 f49aed3bf9eb7346…). The plan is binding, but every label, claim, version and constant it names was checked against the delivered sheets. Each mismatch is recorded as a plan correction in Section ; nothing is invented to fit the plan. Version 5 of this sheet (inputs/Hawk07-C-Dyn-CERT-v5.tex, sha256 cdee6fc6fbeffdd5…) is retained above without change. Its errors are listed in Section . Every new theorem is conditional on its displayed hypotheses and is either a local theorem, with its proof here, or a documentary separation. Citations identify source records only and carry the tag sTviTag ; no proof transfers. A partial result is marked *partial*; an item that is not settled is recorded as *open*; a statement missing from a source is recorded as missing, never as zero. Three appendices are new: Appendix (Unified Certificate Framework, identical in the nine sheets), Appendix (Extended Computer-Assisted Checks, identical in the nine sheets) and Appendix (Verification of request t269u). The macros of version 6 are defined in the shared preamble C-common/preamble_cert.tex, which is new under /workspace/CertPlan/S2v6; no earlier file is edited.

The linearized divergence and the vacuum term

In this subsection $E^{(1)} = 2R\,\mathrm{Ric} - \tfrac{1}{2}R^2 g + 2g\,\mathrm{Box}\,R - 2\nabla\nabla R$ and

$E^{(2)}_{ab} = 2R_{acbd}R^{cd} - \tfrac{1}{2}g_{ab}R_{cd}R^{cd} + \mathrm{Box}\,R_{ab} + \tfrac{1}{2}g_{ab}\mathrm{Box}\,R - \nabla_a\nabla_b R$, the curvature-squared variations in the conventions of this sheet.

Lemma (Linearized divergence). *Let g be a Lorentzian metric of class C^4 on a four-manifold, h a symmetric tensor field of class C^3, $a, \Lambda \in \mathbb{R}$, and*

$$L_{a,\Lambda}h = \frac{\mathrm{d}}{\mathrm{d}s}\Big|_{s=0}\big(aG[g+sh] + \Lambda(g+sh)\big).$$

Put $\delta\Gamma^e{}_{ca} = \tfrac{1}{2}g^{ed}(\nabla_c h_{da} + \nabla_a h_{dc} - \nabla_d h_{ca})$.

1. $\nabla^a(L_{a,\Lambda}h)_{ab} = \Lambda\nabla^a h_{ab} + a(g^{ac}\delta\Gamma^e{}_{ca}G_{eb} + g^{ac}\delta\Gamma^e{}_{cb}G_{ae} + h^{ac}\nabla_c G_{ab})$.

2. *The divergence depends on Λ exactly through $\Lambda\nabla^a h_{ab}$. It is independent of Λ if and only if* $\nabla^a h_{ab} = 0$.

3. *On an open set where $G = -\Lambda_0 g$ with Λ_0 constant (equivalently* $\mathrm{Ric} = \Lambda_0 g$*),* $\nabla^a(L_{a,\Lambda}h)_{ab} = (\Lambda - a\Lambda_0)\nabla^a h_{ab}$.

Proof. For every s near 0, $\mathrm{div}_{g_s}(aG[g_s] + \Lambda g_s) = 0$, $g_s = g + sh$, by the contracted Bianchi identity and $\nabla^{(s)} g_s = 0$. For a fixed tensor X put $(\delta\mathrm{div})(h)[X]_b = \frac{\mathrm{d}}{\mathrm{d}s}\big|_0 g_s^{ac}\nabla^{(s)}_c X_{ab}$. Since $\frac{\mathrm{d}}{\mathrm{d}s}\big|_0 g_s^{ac} = -h^{ac}$ and $\frac{\mathrm{d}}{\mathrm{d}s}\big|_0 \nabla^{(s)}_c X_{ab} = -\delta\Gamma^e{}_{ca}X_{eb} - \delta\Gamma^e{}_{cb}X_{ae}$,

$$(\delta\mathrm{div})(h)[X]_b = -h^{ac}\nabla_c X_{ab} - g^{ac}\delta\Gamma^e{}_{ca}X_{eb} - g^{ac}\delta\Gamma^e{}_{cb}X_{ae}.$$

Differentiating the identity at $s = 0$ gives $\nabla^a(L_{a,\Lambda}h)_{ab} + a(\delta\mathrm{div})(h)[G]_b + \Lambda(\delta\mathrm{div})(h)[g]_b = 0$. For $X = g$, $\nabla g = 0$, $g^{ac}\delta\Gamma_{bca} = \nabla^a h_{ab} - \tfrac{1}{2}\nabla_b h$ and $\delta\Gamma^c{}_{cb} = \tfrac{1}{2}\nabla_b h$, so $(\delta\mathrm{div})(h)[g]_b = -\nabla^a h_{ab}$. This gives (a), and (b) follows because the bracket in (a) does not contain Λ. (c) If $G = -\Lambda_0 g$ with Λ_0 constant, then $\nabla G = 0$ and the bracket is $-\Lambda_0(\nabla^a h_{ab} - \tfrac{1}{2}\nabla_b h + \tfrac{1}{2}\nabla_b h)$. The regularity suffices: $G[g_s]$ is rational in s with coefficients that are polynomials in the derivatives of g and h up to order two, which are of class C^1, so the derivative in s commutes with the covariant derivative. Check K53 verifies (a) and (c) exactly on three backgrounds.

par *Non-claim.* A statement about a linear operator on one fixed background; h is a variation, not a source, and no

conservation law of matter is derived. It selects no value of Λ or a and identifies neither with a cosmological constant. It is neither contained in Proposition , which concerns the exact family, nor does it contain it. par

Corollary (Constant-curvature sets: divergence and vacuum term).

1. *Let g be of class C^4 and of constant curvature $K \geq 0$ on an open set U (locally de Sitter if $K > 0$, flat if $K = 0$). Then on U:* $\mathrm{Ric} = 3Kg$; $\nabla^a(L_{a,\Lambda}h)_{ab} = (\Lambda - 3aK)\nabla^a h_{ab}$ *for every C^3 symmetric h; $E^{(1)} = E^{(2)} = 0$; and for every symmetric divergence-free T and all $c_0, c_G, c_1, c_2 \in \mathbb{R}$, $T + c_0 g + c_G G + c_1 E^{(1)} + c_2 E^{(2)} = T + (c_0 - 3Kc_G)g$. The coefficients c_1, c_2 do not act on U.*

2. *In the setting of Proposition let* $\mathrm{w} \neq 0$, $\kappa = \mathrm{w}^2/c^2$, *and let γ be of class C^4. Then g is Einstein near (t,p) if and only if γ is flat near p, if and only if g is locally de Sitter there, of curvature κ.*

Proof. (a) Constant curvature means $R_{abcd} = K(g_{ac}g_{bd} - g_{ad}g_{bc})$, so $\mathrm{Ric} = 3Kg$ and $G = -3Kg$. Lemma (c) with $\Lambda_0 = 3K$ gives the divergence. With $\Lambda_0 = 3K$, $R = 4\Lambda_0$ is constant and $\nabla\mathrm{Ric} = 0$, so $E^{(1)} = 8\Lambda_0^2 g - 8\Lambda_0^2 g = 0$. Since $g^{cd}R_{acbd} = R_{ab}$, $R_{acbd}R^{cd} = \Lambda_0 R_{ab} = \Lambda_0^2 g_{ab}$, and $E^{(2)} = 2\Lambda_0^2 g - 2\Lambda_0^2 g = 0$. The family statement follows. (b) By Proposition (a), $R_{abcd} = \kappa(g_{ac}g_{bd} - g_{ad}g_{bc}) + \mathscr{S}_{abcd}$, where $\mathscr{S}$ has only spatial components, equal to $e^{2\mathrm{w}(t-t_0)}(R_\gamma)_{ijkl}$. Contracting with g^{ac}, and using $g^{ik} = e^{-2\mathrm{w}(t-t_0)}\gamma^{ik}$ on spatial indices, gives $\mathrm{Ric} = 3\kappa g + \mathrm{Ric}_\gamma$, the last term having only spatial components. The tt component forces the Einstein constant to be 3κ, so g is Einstein near (t,p) exactly when $\mathrm{Ric}_\gamma = 0$ near p. In dimension three the Ricci tensor determines the curvature, so this means that γ is flat near p, which by Proposition (b) means that g is locally de Sitter there.

par *Non-claim.* On a constant-curvature set the vacuum-term family keeps the free combination $c_0 - 3Kc_G$; no value is selected, and K is the curvature of a prescribed comparison metric, not a cosmological constant. A locally de Sitter comparison region is not a de Sitter state, and no Einstein dynamics is derived. par

par **Documentary separation (VC-, DS-OB-1-CERT v5 and V-DST-DSS-CERT v6).** VC-OB-1-CERT-v5 thm:v5-vac(b) sTviTag (sha256 d3a93a3afb0e8803…), stated identically as DS-OB-1-CERT-v5 thm:v5-vac (a0805f8eb081a250…), gives the family statement of Corollary (a) for C^5 metrics on every set with $\mathrm{Ric} = \frac{R}{4}g$.

V-DST-DSS-CERT-v6 prop:VDC-lindiv (710c656210aab6dd…) is Lemma (c) on its de Sitter host with $\Lambda_0 = 3H^2$ ($c = 1$), and VC-OB-1-CERT-v5, reading its version-3 statement, records that universal vacuity does not contain the linearized statement. So the divergence of the linearized family depends on Λ, through $(\Lambda - 3aH^2)\nabla^a h_{ab}$, unless $\nabla^a h_{ab} = 0$. V-DST-DSS-CERT-v6 thm:VDC-dyn(a) is a vacuity statement for its Codazzi class of linear operators on a fixed host, a different object. Red06-G-DSS-CERT-v6 prop:RC-warp (c3f04faab2c76fb6…) shows that the change of $\Theta_\Lambda(\mathrm{n},\mathrm{n})$ along its slice-warp family is independent of Λ, in agreement with Proposition . Check K51 re-verifies that proposition by direct computation. Nothing is imported.

Corollary (The late Einstein sets of this sheet). *Let* $\mathrm{w} \neq 0$ *and let O be as in Corollary . In the notation of Proposition ,* g_{w} *is Einstein near a point of O if and only if* $\dot{H} = 0$ *and* $K_\sigma = 0$ *near it, and it then has constant curvature* H^2*. In particular Corollary (a) holds, with* $K = H^2 > 0$*, near every point of O at which Corollary finds* g_{w} *locally de Sitter.*

Proof. On *O* the slice profile does not depend on η, so Proposition applies, as in the proof of Corollary . By its part (a) the curvature is diagonal in the adapted orthonormal frame $(\mathrm{n}, e_1, e_2, e_z)$, with the sectional curvatures listed there. In the convention in which de Sitter of curvature H^2 has all sectional curvatures H^2 and $\mathrm{Ric} = 3H^2 g$, this gives $\mathrm{Ric}(\mathrm{n},\mathrm{n}) = -3(\dot{H} + H^2)$, $\mathrm{Ric}(e_z, e_z) = \dot{H} + 3H^2$ and $\mathrm{Ric}(e_i, e_i) = \dot{H} + 3H^2 + K_\sigma/A^2$ for e_i tangent to *S*, all other components vanishing. *g* is Einstein exactly when $-\mathrm{Ric}(\mathrm{n},\mathrm{n})$, $\mathrm{Ric}(e_z, e_z)$ and $\mathrm{Ric}(e_i, e_i)$ are equal, that is when $\dot{H} = 0$ and $K_\sigma = 0$. Then every sectional curvature is H^2, which is constant. The last sentence is Corollary (a).

par *Non-claim.* Points of *O* with $H = 0$ on an open set, where the member would be flat, are neither found nor excluded here (open). On the de Sitter points the free combination $c_0 - 3Kc_G$ stays free; no value of the comparison rate, of Λ or of a counterterm is selected, and no state is constructed. par

par **Documentary separation (Big01-A v5 and VC-OB-1-CERT v5: comparison futures).** Big01-A-v5 prop:Esmooth sTviTag prescribes smooth comparison futures with a monotone Hubble profile, de Sitter or flat late; VC-OB-1-CERT-v5 thm:VC-sep6 (sha256 d3a93a3afb0e8803…) gives on its slice-warp family a vacuum

term $\lambda[g_K] = 3K^2$ late with unbounded worst-case error for rules of early data. The switched conformal metric of this sheet's parent, $a(\eta)^2[-c^2 d\eta^2 + (\text{slice metric})]$ with zero Λ in the parent, is a third prescribed family. Its late Einstein sets are those of Corollary , and there Corollary (a) leaves $c_0 - 3Kc_G$ free. Nothing is imported.

par **Documentary separation (Red06-G-DSS-CERT v6: regularity of the static patch).**

Red06-G-DSS-CERT-v6 doc:RC-dsob sTviTag (sha256 c3f04faab2c76fb6…) records that the $C^{1,1}$-inextendibility of the static patch M_S is proved in its parent, and Red06-G-DSS-CERT-v6 rem:RC-c1 that the C^1 and C^0 questions stay open. The plan's "$C^{1,1}$ gap" is corrected accordingly: the open gap is C^1/C^0. It concerns extensions of the prescribed static patch, a different object from the comparison metrics of this sheet, and nothing in this sheet depends on it. Nothing is imported.

Spatially flat FLRW metrics: further solutions and the Einstein residual

Proposition (Two further solutions and the residual). *In the setting of Theorem , with $c = 1$:*

1. *The trace-free part of G equals that of* Ric *and is $\mu\,\mathrm{diag}(1, \frac{1}{3}, \frac{1}{3}, \frac{1}{3})$ in the coordinates (η, x, y, z), with $\mu = 3(2a'^2 - aa'')/(2a^2)$. So $G + \Lambda g = 0$ has a solution Λ on an open set only if $\mu = 0$ there.*

2. *The solutions of $Q = 0$ with data $(a, a', a'', a''') = (1, 1, 1, 0)$ and $(1, 0, -1, 1)$ at η_0 have $(R, R', \mu) = (6, -18, \frac{3}{2})$ and $(-6, 6, \frac{3}{2})$ at η_0; the solution of Theorem (d) has $(6, 0, -\frac{3}{2})$. On some interval around η_0 each of the two new solutions is neither Einstein nor scalar-flat nor of constant scalar curvature, and whole-fibre null invariance holds there.*

3. *Among the power laws $a = (\eta - \eta_1)^p$ on $\eta > \eta_1$, exactly $p \in \{-1, 0, 1\}$ solve $Q = 0$; indeed $Q = 6p(p-1)(p+1)^2(\eta - \eta_1)^{3p-4}$. The profiles e^η and $\cosh\eta$ do not solve it.*

4. *$a \mapsto \lambda\, a(m\eta + n)$, $\lambda, m > 0$, multiplies Q by $\lambda^3 m^4$, so it maps solutions to solutions.*

Proof. (a) Direct symbolic computation with a arbitrary (check K50); since $G = \mathrm{Ric} - \frac{R}{2}g$, the trace-free parts agree. If $G = -\Lambda g$ then the trace-free part of G vanishes. (b) Existence and uniqueness are Theorem (c). $R = 6a''/a^3$

, and R' and μ at η_0 use only the data (check K50). $R(\eta_0) \neq 0$ excludes scalar-flatness near η_0; $R'(\eta_0) \neq 0$ excludes constant R on every interval around η_0, hence Einstein; invariance is Theorem (b). (c), (d) Direct computation (check K50).

par *Non-claim.* A statement inside one class of prescribed metrics. Whether the three solutions of (b) are related by the symmetries (d) or by others is not decided (open), and no closed form for them is found (open). No counterterm coefficient is fixed, no state is constructed and no Einstein dynamics is derived; $\mu \neq 0$ only records that these metrics do not solve $G + \Lambda g = 0$. par

Plan corrections

Request t269u (version 6)

The plan of request t269u is binding, and each of its items, as it bears on this sheet, is answered below: proved here, recorded as a documentary reading, corrected, recorded as missing, or marked open.

1. *This sheet.* Phase-3 imports for C-Dyn: the VC-OB-1-CERT-v5 vacuum-term theorems, Big01-A prop:Esmooth, and the Red06 regularity record (documentary); new local results Lemma , Corollaries and , and Proposition .

2. *Plan file.* The plan of request t269u is saved verbatim and read-only (mode 444) as /workspace/CertPlan/PLAN_t269u.md, sha256 f49aed3bf9eb7346…; full value in logs/plan.sha256.

3. *Description of version 5.* The plan says that version 5 proves vacuity of $G + \Lambda g$ "for every C^2 metric". The metric sheets state it pointwise for C^3 metrics and weakly for C^2 metrics (Proposition prop:s2-vac). The plan's "Big01-A dynamics certificate" (Big01-A-v5 prop:Dyncert) uses the pointwise C^2 wording that version 2 already corrected.

4. *Big01-A version.* Big01-A-v5 exists and is the latest delivered version (/workspace/Big01/deliver/Big01-A-v5.tex, sha256 e1160613ea8e02b3…, verified against

MANIFEST-Big01-A-v5.sha256); no version 6 is delivered. Its items named by the plan exist: thm:Hcert (κ -injectivity and infinite worst-case error), prop:Dyncert, thm:D4 (a monoid that multiplies the declared dimension by 2^{n}), thm:tick (a granularity ceiling), thm:Bexact (whose proof displays the block dual) and prop:Esmooth.

5. *$c(R)$ and $1/(2d^{2})$.* $c(R)$ is defined in version 1 (Hawk07-A-CERT-v5 prop:s2-ceiling), not version 2. The version-2 result is Hawk07-A-CERT-v5 prop:v2-orbit: the unitary supremum is $c(R)$, the channel supremum is $\log d_{R}$. The plan's "$c(R)$ is exactly the fibre supremum of the Big01-A reorganization monoid on a fixed resource" is false as worded, because that monoid changes the declared dimension; the true statement is the unitary-orbit form of prop:v2-orbit(c), already in version 2. The minimax $1/(2d^{2})$ is from version 3 (Hawk07-A-CERT-v5 prop:v3-drule), not version 2.

6. *Red06 regularity.* Red06-G-DSS-CERT-v6 doc:RC-dsob records $C^{1,1}$-inextendibility of the static patch as proved in its parent, and Red06-G-DSS-CERT-v6 rem:RC-c1 lists the C^{1} and C^{0} questions as open. The plan's "$C^{1,1}$ gap" is corrected to the C^{1}/C^{0} gap.

7. *Name of the warp family.* "Conformal-warp" is a misnomer, corrected since version 2: the family is a slice warp, not a conformal rescaling. VC-OB-1-CERT-v5 still uses the old name; that is recorded, not edited.

8. *Check identifiers.* The plan's K40–K42 collide with the OB version-5 certificates, which use K40–K48. K49–K55 are used instead (Appendix): plan K40 is K49, K41 is K50, K42 is K51.

9. *Names that do not occur as written.* "Big01-A named-label dual": no such operator exists in Big01-A; its named labels carry the coefficient certificate thm:Hcert, and the nearest scalar dual is Red06-G-DSS-CERT-v6 thm:RC-repdual. "Hull-deficit dual": exists, En08-ST-DSS-CERT-v6 thm:EC-dual, a lattice certificate. "Codazzi-class vacuity": the content is item (a), "Vacuity", of V-DST-DSS-CERT-v6 thm:VDC-dyn, which is not named so. "Parallel-null-field exclusion": the record is DS-OB-1-v5 prop:DS-parallel, "Parallel vector fields exclude de Sitter", in the parent DS-OB-1-v5 and for every causal type. "Universal vacuity": the term is VC-OB-1-CERT-v5's name for prop:s2-vac. "Relative-energy fibre": not found in the OB certificates; "relative

energy" occurs in I-C-Th-CERT-v5 (a thermal bill) and in VC-OB-1-v5. "De Sitter exclusion on prescribed hosts": DS-OB-1-v5 prop:DS-prescribed is a non-registration statement.

10. *I-C items.* lem:cert-sandwich occurs in I-C-CERT-v5, I-C-Ex-CERT-v5 and I-C-Ex2-CERT-v5, not in I-C-Th-CERT-v5. The "dephasing unitary attaining the shredder floor" is, in I-C-CERT-v5 thm:dephase, the complete-dephasing channel, realized by an energy-conserving unitary with a zero-Hamiltonian bath. The "reorganization-orbit retained-value monotonicity" is the ceiling I-C-Ex-CERT-v5 thm:kdreorg; the only monotonicity lemma is I-C-Th-CERT-v5 lem:v5-mono, for enlarging a fibre. I-C version 6 had delivered no manifest and was not read.

11. *DSS items.* The DSS certificates are read at version 6, delivered and verified against MANIFEST-DSS-CERT-v6.sha256. The plan's Lambda-independence of the linearized divergence is false: V-DST-DSS-CERT-v6 prop:VDC-lindiv has the factor $\Lambda - 3aH^2$ (the linearized-divergence lemma of the version-6 metric sheets). The Lambda-independence holds for the change of $\Theta_{\Lambda}(\mathrm{n}, \mathrm{n})$ along the slice-warp family, Red06-G-DSS-CERT-v6 prop:RC-warp.

12. *OpenAI catalogue.* inputs/OpenAI.api.tex (sha256 76314b644e51864f…, 719 manuscripts) was searched. No entry records a quantum finite recovery bound or a prescribed-host separation; the hits for "recovery", "diamond" and "de Sitter" concern other problems. No entry is cited.

13. *Structure and build.* The sheets have no parts/ directory; each is one .tex file, and the new material is in Section and three appendices. No Makefile existed and make is not installed on the build host. So the existing code/compile_all.sh is copied unchanged, and the copy code/compile_all_v6.sh adds the target v6-all. The shared preamble C-common/preamble_cert.tex is new; each sheet loads it by verb | input |. Its ledger macro equals the printed ledger plus the version-6 sentence (checked at build).

14. *Ledger.* The standing ledger is kept verbatim. The sentence "No physical memory model, horizon temperature or finite Hilbert-space dimension is derived from any axial stress, replacement channel or comparison future." is appended as its own paragraph, at the request of the plan.

15. *Switched conformal metric.* The name is accurate for the parents of Hawk07-C-Dyn and Hawk07-D, $a(\eta)^2[-c^2\mathrm{d}\eta^2 +$ slice metric] with zero Λ, but not for Hawk07-E, whose prescribed metric is static.

16. *OB observation.* DS-OB-1-CERT-v5 sec:v5-doc describes Hawk07-E-CERT-v4's shoulder exclusion as "for C^2 local isometries, the C^1 case staying open there". That was accurate for version 4; version 5 closed the C^1 case. Recorded as an observation only.

17. *Scope and concurrency.* "All cert sheets" is read as the nine Hawk07 sheets. No working directory of a concurrent stream was read; versions 1–5 and the parents are untouched (frozen and delivered trees hashed before and after).

Request t268u (version 5)

Request t268u attached no plan file. Its items, as they bear on this sheet, are answered below: proved here, recorded as a documentary reading, recorded as missing, or marked open.

1. *This sheet.* The version-4 conditional late regions are settled in the core for every affine change of time (Corollary); null invariance in the core is settled up to isolated times (Corollary).

2. *Scope.* "All cert sheets" is read, as before, as the nine Hawk07 sheets A, B, C, C-Dyn, D, E, F, G, H; the OB, I-C and DSS certificates are handled by other streams and are only read, as delivered files.

3. *Null-contraction classification.* Settled inside two classes: the ultrastatic warped class (Theorem thm:v5-ultra, sheets E–H) and spatially flat FLRW metrics (Theorem thm:v5-frw, sheets C-Dyn and E–H), with a reduction on scalar-flat regions. The general four-dimensional classification stays open (partial).

4. *Late regions of Hawk07-C-Dyn and Hawk07-D.* Settled for every affine change of time wherever the slice profile is static (Corollaries cor:v5-late-CDyn, cor:v5-late-D); where it depends on time, open.

5. *C^1 isometries at Hawk07-E's shoulders.* Settled: none (Theorem thm:v5-shoulder). Lower regularity open.

6. *Normalization of Hawk07-G and Hawk07-H.* Still missing in both parents (not zero). For G it enters only through products with free coefficients; for H it is used only on flat domains. The values stay open.

7. *Registration of Hawk07-F/G/H.* No OB parent among the inputs cites them; elsewhere unknown (open). Hawk07-C-Dyn is a cited source of four OB parents.

8. *Companions.* DS-, VC- and PG-OB-1-CERT-v4, the I-C family version 5 and the DSS certificates version 5 are read as source records, verified against their delivered manifests. Their readings of the version-4 Hawk07 sheets report no error; Red06-G-DSS-CERT-v5 records the attribution point corrected as item E10.

9. *Other streams.* No working directory of a concurrent stream was read.

Request t267u (version 4)

Request t267u attached no plan file. Its items, as they bear on this sheet, are answered below: proved here, recorded as a documentary reading, recorded as missing, or marked open.

1. *This sheet.* Version 3's open item on the switching period is answered in the core (Corollary); outside the core it is partial (Proposition).

2. *Scope.* The request names "cert sheets"; as before, that is the nine Hawk07 sheets A, B, C, C-Dyn, D, E, F, G, H. DS-OB-1, VC-OB-1 and PG-OB-1 certificates are handled by another stream and are only read.

3. *Characterization of vanishing null contractions.* Along every null direction: tensor conditions (Hawk07-F/G/H-CERT-v4, Theorem thm:v4-nullchar); they hold on Einstein regions and on a non-Einstein radiation metric. Along one null field: only the defining equations. Geometric classification: open (partial).

4. *Switching periods of Hawk07-C-Dyn and Hawk07-D.* Closed forms in the core and throat; nonzero except at isolated times (Theorem thm:v4-switch). Elsewhere partial.

5. *De Sitter regions of the enlarged static class.* None (Hawk07-F/G-CERT-v4, Theorem thm:v4-staticnods).

6. *Normalization of Hawk07-G and Hawk07-H.* Missing in both parents (not zero); all results hold for every constant multiple. For Hawk07-F the parent's factor −2 is confirmed again from the parent file, in agreement with DS-OB-1-CERT-v4 cor:v4-Hnorm, which also records the factor 2 relative to VC-OB-1 v5 and supplies nothing for G or H.

7. *Registration of Hawk07-F/G/H.* Not registered in any source read, including the newly delivered OB certificates; elsewhere unknown (open).

8. *Hawk07-C's states and DS-OB-1's conical row.* Not registered by the text of DS-OB-1 v5, which registers by source; the de Sitter exclusion does not depend on it (Hawk07-C-CERT-v4).

9. *Hawk07-E's shoulders.* No de Sitter region for C^2 local isometries (Hawk07-E-CERT-v4, Theorem thm:v4-shoulder); C^1 open.

10. *DS-OB-1-CERT-v3 (partial conservation of $E^{(2)}$).* Proved in full locally (Proposition prop:v4-Evar, in the C-Dyn, D, F, G and H sheets). DS-OB-1-CERT-v4 and VC-OB-1-CERT-v4, read after a steering note, now prove it there as well (thm:v4-E2div, a direct proof in every dimension and signature); read, not relied on.

11. *VC-OB-1-CERT-v3 (late chart, all-time formula).* Read; the late-chart dichotomy is Proposition prop:v4-late, the all-time formula is version 3's Lemma lem:v3-alltime, and its unaudited Hawk07-H profile is audited in Hawk07-H-CERT-v4. VC-OB-1-CERT-v4 prop:v4-VC-hostB settles it there for general rate profiles; the two agree.

12. *PG-OB-1-CERT-v3 ($d \le \lfloor (1-\varepsilon)^{-1/2} \rfloor$).* Read; the converse and the exact range are added (Corollary cor:v4-dim, sheets A, B, C).

13. *I-C certificates version 4 (lem:v4-convention, cor:v4-translate).* Read; the same statements are proved in this series' order (Proposition prop:v4-rankone, sheets A, B, C).

14. *DSS certificates version 4 (prop:RC-norm).* Read; agreement with Proposition prop:v4-pair on its base.

15. *Other streams.* Files of I-C certificates version 5 (/workspace/CertPlan/S1v5), DSS certificates version 5 (/workspace/DSS/CERTv5) and the OB working directory /workspace/CertPlan/S2v4-OB were not read. Of the OB certificates version 4, only the delivered DS-OB-1-CERT-v4 and VC-OB-1-CERT-v4 were read, after a steering note, checked against their delivered manifest; PG-OB-1-CERT-v4 was not read.

Request t264u (version 3)

Request t264u attached no plan file. Its items, as they bear on this sheet, are answered below: proved here, recorded as a documentary reading, or marked open.

1. *This sheet.* DS-OB-1 lists this parent and excludes de Sitter regions (DS-OB-1-v5 prop:DS-hawk); Theorem gives an independent proof. The null contraction of the curvature-squared tensors on this metric during the switching period is not computed (open).

2. *Scope.* The request names "Hawk07-A-Cert to H-Cert"; that is nine sheets, with Hawk07-C-Dyn-CERT included. PG-OB-1, VC-OB-1 and DS-OB-1 certificates are not in scope. Verified: VC-OB-1-CERT-v2 contains the same Definition def:v2-H and the same name "conformal warp"; it is not edited here (recorded for the requester).

3. *De Sitter regions of Hawk07-D and Hawk07-E.* Neither has one: Hawk07-D-CERT-v3 (Theorem thm:v3-confnods) and Hawk07-E-CERT-v3 (Corollary cor:v3-E-nods, partial at the thin-shoulder limit).

4. *prop:DS-parallel and the Hawk07-C host.* It applies, with $V = \partial_T$; the host is flat (Hawk07-C-CERT-v3, Proposition prop:v3-C-flat).

5. *Host lists (F5).* DS-OB-1 lists Hawk07-A, Hawk07-B and Hawk07-C-Dyn, and a conical row whose metric is that of Hawk07-C; it records Hawk07-D to Hawk07-H as not audited. VC-OB-1 names Hawk07-C-Dyn only. This is recorded on every sheet.

6. *Normalization of* $^{(1)}H, {}^{(2)}H$. The request asks whether the parents differ from the Birrell–Davies form. What differs is version 2's transcription: in the sheets' convention its tensors are not the metric variations (item E6). Hawk07-F prints its normalization (−2 times the variations); Hawk07-G and Hawk07-H print none (missing). The Birrell–Davies text is not among the inputs, so its own conventions were not compared.

7. *DSS version 3.* prop:RC-warp and its one-map rescaling (its part (d)) are read; Lemmas lem:v3-alltime and lem:v3-onemap prove the corresponding statements for the slice-warp family. The DSS sheets cite version 1 of the

Hawk07 certificates only.

8. *Other streams.* Files of I-C certificates version 3 (/workspace/CertPlan/S1v3) and DSS certificates version 4 (/workspace/DSS/CERTv4) were not read.

Plan t260u (version 2)

Every label cited by plan t260u was looked up in its read-only input copy by code/plan_audit.py (logs/plan_audit.json); every claim was checked against the source text.

1. *"Separation: comparison futures here = conformal-warp family; Red06's on a different prescribed host".* Imprecise. Red06-G-DSS-CERT's comparison futures (Red06-G-DSS-CERT-v2 prop:RC-dyn(d)) are comparison metrics, not hosts. They agree with the flat patch of DSS_H on $t \le 0$, and up to rescaling they are the de Sitter-base constant-rate members of the same conformal warp (Proposition (e)). The separation is in the base metric. "Neither derives Einstein dynamics" is confirmed.

2. *"DS-OB-1 reading: prescribed metrics not registered hosts (prop:DS-prescribed)".* Not supported. DS-OB-1-v5 prop:DS-prescribed concerns only the prescribed de Sitter background. DS-OB-1 lists the Hawk07-C-Dyn metric among the hosts of its source table and excludes de Sitter regions there (DS-OB-1-v5 prop:DS-hawk). "No de Sitter state produced" holds because this sheet constructs no state.

3. *"VC-OB-1 reading: prop:VC-split is the inverse-source fibre; prop:s2-vac contains it".* Confirmed. VC-OB-1 lists the parent's inverse source. Vanishing Λ is an input; no absolute vacuum energy.

4. *"Comparison-futures family is g_{w}, the same family used in VC-OB-1-CERT and other Hawk07 CERT sheets".* Confirmed; the build script checks that the text is identical in all eight metric sheets. VC-OB-1-CERT also has the Minkowski-base instance g_K (Proposition (c)). No other family is introduced.

5. *"No Casimir object".* Confirmed for the parent and for this sheet.

6. *V-DST-DSS-CERT labels thm:VC-dyn, prop:VC-coef.* These exist only in V-DST-DSS-CERT version 1. Version 2 renamed them thm:VDC-dyn and prop:VDC-coef (label audit: both v1 names absent from v2, both v2

names present). They are cited here with the version.

7. *OpenAI catalogue: "isotropic-channel and Choi-operator entries".* False. The catalogue was re-read by a read-only GET of https://enter.grok.me/api/manuscript/OpenAI (inputs/OpenAI.api.tex, sha256 76314b644e51864f…, identical to the copy fetched by the S1v2 stream). It contains no occurrence of "Choi", "depolariz" or "twirl". The 22 occurrences of "isotropic" concern holomorphic line bundles, convex bodies, the Heisenberg ferromagnet and elasticity, not channels. No catalogue entry is cited or used here.

8. *Label audit.* Found in their read-only copies: DS-OB-1 thm:DS-main, prop:DS-prescribed; VC-OB-1 prop:VC-fixed, prop:VC-renorm, prop:VC-split, thm:VC-main (and prop:VC-renorm2); PG-OB-1 thm:PG-spectator; Big01-A v5 thm:Hcert, prop:Dyncert, def:reorg, thm:tick; Red06-G-DSS-CERT v1 and v2 thm:RC-coef, prop:RC-dyn; En08-ST-DSS-CERT v1 and v2 thm:EC-dual, thm:EC-coef; the I-C certificate sheets lem:cert-sandwich. The own v1 labels cited by the plan were found in the v1 sheets that the plan assigns them to.

Plan t256u, amended by t257u (version 1, retained)

1. The plan asks for a Casimir-versus-Λ coefficient certificate across the Hawk07 family. The parent sheet computes no Casimir stress and names no cosmological term; it uses zero cosmological constant. So that certificate has no object here, and only the dynamics certificate is added.

2. (P9) The parent sheet is not a Priority 9 sheet. A text search finds no refusal of a Page curve by a recovery bound in it.

3. The plan writes κ for the quantum coefficient. In the parent sheet and in the registered sheets, κ already denotes the gravitational coupling, so the coefficient is written q. Nothing else changes.

4. The plan calls each certificate "documentary". Every certificate here is a separation; it discharges no gate and selects no value.

5. The plan says $\Theta = G + \Lambda g$ is divergence-free "for every prescribed C^2 metric". Pointwise divergence needs a C^3 metric. For C^2 metrics the identity holds weakly, and Proposition states it that way.

6. The plan's comparison futures "agreeing on $t \le 0$ and disagreeing on $t \ge 1$" are realized by the conformal-warp family g_{w} of Theorem . The plan does not specify the family; this choice is ours.

7. (t257u) The original plan asked for a new version of each parent. The amendment t257u replaces this by a standalone sheet named <parent>-CERT, version 1. The parent is untouched and is cited as parent and source record.

Errors

Errors of version 5 (found in version 6).

\textbf{E11} *Ambiguous citations (version 5).* Section cites Red06-G-DSS-CERT-v5 doc:RC-hawk4 and V-DST-DSS-CERT-v5 doc:VDC-hawk4. In its source each of these labels occurs twice: Red06-G-DSS-CERT-v5 doc:RC-hawk4 at lines 383 and 526 of inputs/Red06-G-DSS-CERT-v5.tex, and V-DST-DSS-CERT-v5 doc:VDC-hawk4 at lines 359 and 525 of inputs/V-DST-DSS-CERT-v5.tex. The version-5 label audit checked that a cited label exists, not that it is unique. The intended records are the second occurrences, titled "Hawk07-H-CERT version 4: the late comparison regions and the coincident pairs" (Red06) and "Hawk07-H-CERT version 4: vanishing null contractions" (V-DST). Read so, the version-5 sentences are accurate, and no statement or proof changes. The duplicates persist in the version-6 DSS sheets (Red06 lines 387 and 530, V-DST lines 363 and 529), so version 6 cites no duplicated label, and its audit checks uniqueness (Appendix).

\textbf{–} No other error of version 5 was found. Its conditional, partial and open items are answered or kept open in Section .

Errors of version 4 (found in version 5).

\textbf{E10} *Incomplete attribution in item E7 (version 3), not caught in version 4.* Item E7 attributes the name "conformal-warp family" to version 2. The name already occurs in version 1, in its plan-correction list (line 139 of inputs/Hawk07-C-Dyn-CERT-v1.tex). Version 4 recorded no error of version 3 here, so its re-reading was

incomplete on this point. The correction of the name stands and no statement or proof changes. The point is recorded, for the Hawk07-H sheet, by Red06-G-DSS-CERT-v5 doc:RC-hawk5 (source record) and was verified here in all seven metric sheets.

\textbf{–} No other error of version 4 was found. Its conditional and partial items are answered or kept open in Section .

Errors of version 3 (found in version 4).

\textbf{–} Re-reading the version-3 section of this sheet found no error. The version-3 statements used in Section were re-checked against their proofs; the open items of version 3 are answered or kept open in Section .

Errors of version 2 (found in version 3).

\textbf{E7} *Misnomer (version 2, Section and the plan-correction list).* Version 2 calls $\{g_{w}\}$ the "conformal warp" or "conformal-warp family". It rescales the slice metric at fixed lapse and is not a conformal rescaling of the spacetime metric (Remark). The name is corrected to "slice-warp family"; no statement or proof changes. Red06-G-DSS-CERT-v3 records the same point (Red06-G-DSS-CERT-v3 doc:RC-hawkcert, source record). *Version-5 note:* the attribution is completed in item E10.

Errors of version 1 (recorded in version 2). No error was found in version 1 in the items re-read. No error in the parent is asserted or corrected, and no re-audit of the parent is claimed. Only the parent statements cited here were re-read.

Cited source records

Every label cited from another sheet was checked by the build script against the read-only input copy. A missing label stops the build. Citations identify source records only; no proof transfer.

toprule Sheet Label Input copy Result

midrule endhead Big01-A prop:Dyncert Big01-A-v5.tex found

Big01-A prop:Esmooth Big01-A-v5.tex found

DS-OB-1-v5 prop:DS-hawk DS-OB-1-v5.tex found

DS-OB-1-v5 prop:DS-prescribed DS-OB-1-v5.tex found

Hawk07-C-Dyn eq:dynamic-metric Hawk07-C-Dyn.site.tex found

Hawk07-C-Dyn eq:source-definition Hawk07-C-Dyn.site.tex found

Hawk07-C-Dyn thm:Einstein Hawk07-C-Dyn.site.tex found

Red06-G-DSS-CERT-v2 prop:RC-dyn Red06-G-DSS-CERT-v2.tex found

VC-OB-1-v5 prop:VC-split VC-OB-1-v5.tex found

VC-OB-1-v5 thm:VC-main VC-OB-1-v5.tex found

DS-OB-1-v5 prop:DS-hawk2 DS-OB-1-v5.tex found

DS-OB-1-v5 thm:DS-main DS-OB-1-v5.tex found

Hawk07-C-Dyn eq:F Hawk07-C-Dyn.site.tex found

I-C-Th-CERT-v2 prop:th-dyn I-C-Th-CERT-v2.tex found

I-C-Th-CERT-v2 prop:th-vacuity I-C-Th-CERT-v2.tex found

Red06-G-DSS-CERT-v3 doc:RC-hawkcert Red06-G-DSS-CERT-v3.tex found

Red06-G-DSS-CERT-v3 prop:RC-warp Red06-G-DSS-CERT-v3.tex found

V-DST-DSS-CERT-v3 doc:VDC-hawkcert V-DST-DSS-CERT-v3.tex found

DS-OB-1-CERT-v3 lem:v3-Ediv DS-OB-1-CERT-v3.tex found

DS-OB-1-CERT-v4 prop:v4-Evar DS-OB-1-CERT-v4.tex found

DS-OB-1-CERT-v4 thm:v4-E2div DS-OB-1-CERT-v4.tex found

Red06-G-DSS-CERT-v4 prop:RC-norm Red06-G-DSS-CERT-v4.tex found

VC-OB-1-CERT-v3 cor:v3-VC-hawk VC-OB-1-CERT-v3.tex found

VC-OB-1-CERT-v3 lem:v3-Ediv VC-OB-1-CERT-v3.tex found

VC-OB-1-CERT-v3 prop:v3-VC-alltime VC-OB-1-CERT-v3.tex found

VC-OB-1-CERT-v3 prop:v3-VC-late VC-OB-1-CERT-v3.tex found

VC-OB-1-CERT-v3 prop:v3-VC-slices VC-OB-1-CERT-v3.tex found

VC-OB-1-CERT-v4 prop:v4-Evar VC-OB-1-CERT-v4.tex found

VC-OB-1-CERT-v4 thm:v4-E2div VC-OB-1-CERT-v4.tex found

DS-OB-1-v5 sec:DS-reg DS-OB-1-v5.tex found

I-C-Th-CERT-v5 thm:v5-E I-C-Th-CERT-v5.tex found

Red06-G-DSS-CERT-v5 cor:RC-ct Red06-G-DSS-CERT-v5.tex found

Red06-G-DSS-CERT-v5 doc:RC-hawk4 Red06-G-DSS-CERT-v5.tex found

Red06-G-DSS-CERT-v5 doc:RC-hawk5 Red06-G-DSS-CERT-v5.tex found

Red06-G-DSS-CERT-v5 prop:RC-late Red06-G-DSS-CERT-v5.tex found

V-DST-DSS-CERT-v5 doc:VDC-hawk4 V-DST-DSS-CERT-v5.tex found

Big01-A-v5 prop:Dyncert Big01-A-v5.tex found, unique

Big01-A-v5 prop:Esmooth Big01-A-v5.tex found, unique

Big01-A-v5 thm:Bexact Big01-A-v5.tex found, unique

Big01-A-v5 thm:Hcert Big01-A-v5.tex found, unique

DS-OB-1-CERT-v5 sec:v5-doc DS-OB-1-CERT-v5.tex found, unique

DS-OB-1-CERT-v5 thm:v5-vac DS-OB-1-CERT-v5.tex found, unique

DS-OB-1-v5 prop:DS-parallel DS-OB-1-v5.tex found, unique

DS-OB-1-v5 prop:DS-prescribed DS-OB-1-v5.tex found, unique

En08-ST-DSS-CERT-v6 lem:EC-sandwich En08-ST-DSS-CERT-v6.tex found, unique

En08-ST-DSS-CERT-v6 thm:EC-dual En08-ST-DSS-CERT-v6.tex found, unique

Hawk07-A-CERT-v5 prop:s2-ceiling Hawk07-A-CERT-v5.tex found, unique

Hawk07-A-CERT-v5 prop:v2-orbit Hawk07-A-CERT-v5.tex found, unique

Hawk07-A-CERT-v5 prop:v3-drule Hawk07-A-CERT-v5.tex found, unique

Hawk07-A-CERT-v5 thm:s2-exact Hawk07-A-CERT-v5.tex found, unique

Hawk07-H-CERT-v5 cor:s2-cas-null Hawk07-H-CERT-v5.tex found, unique

Hawk07-H-CERT-v5 thm:s2-cas Hawk07-H-CERT-v5.tex found, unique

I-C-CERT-v5 cor:gap I-C-CERT-v5.tex found, unique

I-C-CERT-v5 thm:dephase I-C-CERT-v5.tex found, unique

I-C-CERT-v5 thm:optimum I-C-CERT-v5.tex found, unique

I-C-CERT-v5 thm:replacement I-C-CERT-v5.tex found, unique

I-C-CERT-v5 thm:thermalsep I-C-CERT-v5.tex found, unique

I-C-Ex-CERT-v5 thm:cert-Tdk I-C-Ex-CERT-v5.tex found, unique

I-C-Ex-CERT-v5 thm:kdreorg I-C-Ex-CERT-v5.tex found, unique

I-C-Th-CERT-v5 lem:v5-mono I-C-Th-CERT-v5.tex found, unique

Red06-G-DSS-CERT-v6 doc:RC-dsob Red06-G-DSS-CERT-v6.tex found, unique

Red06-G-DSS-CERT-v6 prop:RC-warp Red06-G-DSS-CERT-v6.tex found, unique

Red06-G-DSS-CERT-v6 rem:RC-c1 Red06-G-DSS-CERT-v6.tex found, unique

Red06-G-DSS-CERT-v6 thm:RC-repdual Red06-G-DSS-CERT-v6.tex found, unique

V-DST-DSS-CERT-v6 prop:VDC-lindiv V-DST-DSS-CERT-v6.tex found, unique

V-DST-DSS-CERT-v6 thm:VDC-dyn V-DST-DSS-CERT-v6.tex found, unique

VC-OB-1-CERT-v5 thm:VC-sep6 VC-OB-1-CERT-v5.tex found, unique

VC-OB-1-CERT-v5 thm:v5-vac VC-OB-1-CERT-v5.tex found, unique

bottomrule

Computer-assisted checks

The checks K1–K9 of version 1 were run by code/checks_s2.py (logs/checks_s2.json); the checks K10–K16 of version 2 by code/checks_s2v2.py (logs/checks_s2v2.json). Paths are relative to /workspace/CertPlan/S2v2. The checks K17–K24 of version 3 were run by code/checks_s2v3.py (logs/checks_s2v3.json), relative to /workspace/CertPlan/S2v3; those used by this sheet are listed below. The checks K25–K34 of version 4 were run by code/checks_s2v4.py (logs/checks_s2v4.json), relative to /workspace/CertPlan/S2v4; those used by this sheet are listed below, with the version-3 checks K19, K20 that Section also cites (values from inputs/checks_s2v3.json). The checks K35–K39 of version 5 were run by code/checks_s2v5.py (logs/checks_s2v5.json), relative to /workspace/CertPlan/S2v5. The checks K49–K55 of version 6 were run by code/checks_s2v6.py (logs/checks_s2v6.json), relative to /workspace/CertPlan/S2v6, and are listed in full in Appendix . Those of versions 5 and 6 used by this sheet are listed below. All are computer-assisted. A check is exact (sympy) unless its statement says *numerical*. The checks corroborate the hand proofs, and no theorem rests on a check.

toprule Id Statement Result

midrule endhead K2 Exact (sympy) for the test metric $g_0 = -N^2\mathrm{d}t^2 + A^2\mathrm{d}x^2 + B^2\mathrm{d}y^2 + C^2\mathrm{d}z^2$ with $N = 1 + x^2/5$, $A = 1 + t/3 + x^2/7$, $B = 1 + t^2/9 + x/11$, $C = 2 + x^3/13$, and $g_{\mathrm{w}} = -N^2\mathrm{d}t^2 + e^{2\mathrm{w}t}(A^2\mathrm{d}x^2 + B^2\mathrm{d}y^2 + C^2\mathrm{d}z^2)$ (symbolic w): $G[g_{\mathrm{w}}](\mathrm{n},\mathrm{n}) - G[g_0](\mathrm{n},\mathrm{n}) = 3\mathrm{w}^2/N^2 + 2(\mathrm{w}/N)\operatorname{tr}\mathrm{k} + \frac{1}{2}R[\gamma](e^{-2\mathrm{w}t} - 1)$ with $\operatorname{tr}\mathrm{k} = N^{-1}\partial_t \log(ABC)$, i.e. the formula of the separation theorem with $\mathrm{b} = t$. pass

K3 *Numerical* (sympy, 40 digits) at four points with rational $(t, x, y, z, \mathrm{w}, \Lambda)$: for g_{w} of K2, $\Theta = G[g_{\mathrm{w}}] + \Lambda g_{\mathrm{w}}$ is symmetric and $|\nabla_a \Theta^a{}_b| < 10^{-30}$ (vacuity). pass

K12 On $\{t \geq 1\}$, where $\mathrm{b} = t - t_{\mathrm{b}}$: for $g_0 = -c^2\mathrm{d}t^2 + e^{2Ht}\mathrm{d}\mathbf{x}^2$ and $\Lambda = 3H^2/c^2$, $\Theta_\Lambda[g_{\mathrm{w}}](\mathrm{n}, \mathrm{n}) = 3((H + \mathrm{w})^2 - H^2)/c^2$, equal to the formula of Theorem (b) with $N = c$, $\mathrm{tr}\,\mathrm{k} = 3H/c$, $R[\gamma] = 0$; for g_0 Minkowski ($c = 1$, $H = 0$, $\Lambda = 0$) it is $3\mathrm{w}^2$ (exact, symbolic). pass

K17 For $g = a(\eta)^2[-c^2\mathrm{d}\eta^2 + \mathrm{d}\ell^2 + F(\eta, \ell)^2\mathrm{d}\varphi^2 + \mathrm{d}z^2]$ with a, F arbitrary: the sectional curvature of the plane $(\partial_\ell, \partial_z)$ is $a'^2/(c^2a^4)$ and that of $(\partial_\eta, \partial_z)$ is $(aa'' - a'^2)/(c^2a^4)$. Sign test: for $a = -1/(H\eta)$, $F = \ell$, $c = 1$ (de Sitter in conformal time) $R_{abcd} = H^2(g_{ac}g_{bd} - g_{ad}g_{bc})$ for all indices (exact, symbolic). pass

K24 For $g_0 = -N(t)^2\mathrm{d}t^2 + e^{2\psi(t)}\gamma_{S^3}$ and g_{w} built from an arbitrary function $\mathrm{b}(t)$, $\mathrm{h} = \mathrm{b}'$: $G[g_{\mathrm{w}}](\mathrm{n}, \mathrm{n}) - G[g_0](\mathrm{n}, \mathrm{n}) = 3\mathrm{w}^2\mathrm{h}^2/N^2 + 2\mathrm{whtr}\,\mathrm{k}/N + \frac{1}{2}R[\gamma](e^{-2\mathrm{wb}} - 1)$ at every t, with $\mathrm{tr}\,\mathrm{k} = 3\psi'/N$ and $R[\gamma] = 6e^{-2\psi}$ (exact, symbolic). pass

K19 On $g = \mathrm{diag}\,(-N^2, A^2, B^2, C^2)(t)$ the Euler–Lagrange expressions of $\sqrt{-g}R^2$ and $\sqrt{-g}R_{ab}R^{ab}$ with respect to N and A, evaluated for $N = 1 + t/3 + t^2/7$, $A = 1 + t + t^2/2$, $B = 2 - t/2 + t^3/5$, $C = 1 + t^2$ at $t = 1/2$, equal $\sqrt{-g}\,E^{(i)}_{\mu\nu}\partial g^{\mu\nu}/\partial(N, A)$ for the tensors $E^{(1)}, E^{(2)}$ of Definition def:v3-E of Hawk07-F-CERT-v3 exactly; the version-2 tensors of Definition def:v2-H of Hawk07-F-CERT-v3 give different values, in ratios to the $E^{(i)}$ values that differ between the N and A components (so they are not constant multiples of $E^{(i)}$), and the version-2 tensors with (Riem, Ric, R) replaced by their negatives give exactly the $E^{(i)}$ values. $\nabla^\mu E^{(1)}_{\mu\nu} = \nabla^\mu E^{(2)}_{\mu\nu} = 0$ at that point, while $\nabla^{\mu\,(1)}H^{\mathrm{v2}}_{\mu\nu} \neq 0$ there (exact rational arithmetic). pass

K20 For $g = -\mathrm{d}t^2 + e^{2f}\mathrm{d}\mathbf{x}^2$, $k = \partial_t + e^{-f}\partial_x$, $f = t^3/3$, $t = 1$: $E^{(1)}(k, k) = -360$, $E^{(2)}(k, k) = -120$, ${}^{(1)}H^{\mathrm{v2}}(k, k) = -24$, ${}^{(2)}H^{\mathrm{v2}}(k, k) = -104$, $G(k, k) = -4$; for $f = Kt$, $E^{(1)}(k, k) = E^{(2)}(k, k) = 0$ (exact, symbolic). pass

K27 For $g = a(\eta)^2[-c^2\mathrm{d}\eta^2 + \mathrm{d}z^2 + \mathrm{d}r^2 + P(r)^2\mathrm{d}\varphi^2]$ with a, P arbitrary and $\hat{k} = c^{-1}\partial_\eta + \partial_z$: $G(\hat{k}, \hat{k}) = 2a(1/a)''/c^2$; $R = a^{-2}(-2P''/P + 6a''/(c^2a))$; $E^{(1)}(\hat{k}, \hat{k}) = 2R\,G(\hat{k}, \hat{k}) - 2c^{-2}(\partial_\eta^2 R - 2(a'/a)\partial_\eta R)$; $E^{(2)}(\hat{k}, \hat{k}) = \frac{1}{3}E^{(1)}(\hat{k}, \hat{k})$ (exact,

symbolic). pass

K28 For $g = a(\eta)^2\widehat{g}$, $\widehat{g} = -c^2\mathrm{d}\eta^2 + \mathrm{d}r^2 + F(\eta, r)^2\mathrm{d}\varphi^2 + \mathrm{d}z^2$, with a, F arbitrary: $G[g](\widehat{k}, \widehat{k}) = c^{-2}(2a(1/a)'' - \partial_\eta^2 F/F)$ and $(E^{(2)} - \frac{1}{3}E^{(1)})[g](\widehat{k}, \widehat{k}) = a^{-2}(E^{(2)} - \frac{1}{3}E^{(1)})[\widehat{g}](\widehat{k}, \widehat{k})$ (exact, symbolic). pass

K29 With $\tau_a = c = 1$, $\lambda \in \{\frac{1}{2}, -\frac{1}{2}, 3\}$ and $\widehat{R} \in \{0, -2\}$ (the term $-2P''/P$ of K27 frozen), the ratios of $E^{(1)}(\widehat{k}, \widehat{k})$ to $-12\lambda S''''(\eta)$ and of $G(\widehat{k}, \widehat{k})$ to $-2\lambda S''(\eta)$ are within 0.05 of 1 at $\eta = 1/200$, and the first ratio is closer to 1 there than at $\eta = 1/20$ (50-digit arithmetic; corroboration of the asymptotics, not a proof). pass

K30 For $g = -c^2\mathrm{d}t^2 + e^{2\mathrm{w}t}(\mathrm{d}x^2 + P(x)^2\mathrm{d}\varphi^2 + \mathrm{d}z^2)$: every component of $R_{abcd} - \frac{\mathrm{w}^2}{c^2}(g_{ac}g_{bd} - g_{ad}g_{bc})$ vanishes when P'' is replaced by 0, and its $(x\varphi x\varphi)$ component is $-e^{2\mathrm{w}t}PP''$ (exact, symbolic). pass

K35 For $g = -c^2a(\eta)^2\mathrm{d}\eta^2 + A(\eta)^2(\mathrm{d}r^2 + F(r)^2\mathrm{d}\varphi^2 + \mathrm{d}z^2)$ with a, A, F arbitrary and $H = A'/(caA)$, $\dot{H} = H'/(ca)$: the only nonzero components of R_{abcd} have $\{a, b\} = \{c, d\}$; the sectional curvatures are $\dot{H} + H^2$ for the planes $(\eta, \cdot)$, H^2 for (r, z) and (φ, z), and $H^2 - F''/(FA^2)$ for (r, φ) (exact, symbolic). pass

K37 For $g = a(\eta)^2(-\mathrm{d}\eta^2 + \mathrm{d}x^2 + \mathrm{d}y^2 + \mathrm{d}z^2)$ with a arbitrary: $B = 0$ identically, $E^{(1)}_\circ = -\frac{3Q}{a^5}\,\mathrm{diag}(3, 1, 1, 1)$ with $Q = a^2a'''' - 8aa'a''' - aa''^2 + 14a'^2a''$; $Q = 0$ for $a = \alpha\eta + \beta$ and for $a = 1/(H(\eta_1 - \eta))$; and a solution of $Q = 0$ with $(a, a', a'', a''') = (1, 0, 1, 0)$ at η_0 has $R = 6$, $R' = 0$, $R'' = -12$ there (exact, symbolic). pass

K50 Spatially flat FLRW, $g = a(\eta)^2(-\mathrm{d}\eta^2 + \mathrm{d}\mathbf{x}^2)$ (plan K41): $R = 6a''/a^3$; the trace-free part of G equals that of Ric and is $\mu\,\mathrm{diag}(1, \frac{1}{3}, \frac{1}{3}, \frac{1}{3})$ in the coordinates, $\mu = \frac{3(2a'^2 - aa'')}{2a^2}$; for the solutions of $Q = 0$ with data $(a, a', a'', a''') = (1, 1, 1, 0)$, $(1, 0, -1, 1)$, $(1, 0, 1, 0)$ at η_0: $(R, R', \mu) = (6, -18, \frac{3}{2})$, $(-6, 6, \frac{3}{2})$, $(6, 0, -\frac{3}{2})$ there; $a = \eta^p$ solves $Q = 0$ exactly for $p \in \{-1, 0, 1\}$; e^η and $\cosh\eta$ do not; $a \mapsto \lambda a(m\eta + n)$ multiplies Q by λ^3m^4 (exact, symbolic). pass

K51 Late-slice expansion (plan K42). For $g = -N(x)^2\mathrm{d}t^2 + e^{2\mathrm{w}\mathrm{b}(t)}\mathrm{diag}\,(A_1, A_2, A_3)(t, x)$ with N, b, A_i arbitrary, the expansion $\nabla_a \mathrm{n}^a$ of $\mathrm{n} = N^{-1}\partial_t$ exceeds that of $\mathrm{w} = 0$ by $3\mathrm{w}\mathrm{b}'/N$. For $-c^2\mathrm{d}t^2 + e^{2(H + \mathrm{w})t}\mathrm{d}\mathbf{x}^2$: $G(\mathrm{n}, \mathrm{n}) = 3(H + \mathrm{w})^2/c^2$ and

$\nabla_a \mathrm{n}^a = 3(H + \mathrm{w})/c$; the pair w, $-2H - \mathrm{w}$ has equal $G(\mathrm{n}, \mathrm{n})$ and expansions differing by $6(H + \mathrm{w})/c$ (exact, symbolic). pass

K53 Linearized divergence. For $L_{a,\Lambda} h = \frac{\mathrm{d}}{\mathrm{d}s}|_0 (aG[g + sh] + \Lambda(g + sh))$ and the polynomial h with $h_{\eta\eta} = \eta^2 x$, $h_{\eta x} = x\eta^3$, $h_{xx} = x^2 + \eta$, $h_{yz} = \eta x$: on de Sitter $-\eta^{-2}(\mathrm{d}\eta^2 - \mathrm{d}\mathbf{x}^2)$ ($G = -3g$), $\nabla^a (L_{a,\Lambda} h)_{ab} = (\Lambda - 3a)\nabla^a h_{ab}$ with $\nabla^a h_{ab} \neq 0$; on the non-Einstein backgrounds $\eta^4(-\mathrm{d}\eta^2 + \mathrm{d}\mathbf{x}^2)$ and $-\mathrm{d}t^2 + \mathrm{d}x^2 + (1 + x^2)^2 \mathrm{d}\varphi^2 + \mathrm{d}z^2$ (coordinates relabelled), $\nabla^a (L_{a,\Lambda} h)_{ab} = \Lambda \nabla^a h_{ab} + a(g^{ac} \delta\Gamma^e{}_{ca} G_{eb} + g^{ac} \delta\Gamma^e{}_{cb} G_{ae} + h^{ac} \nabla_c G_{ab})$ with $\delta\Gamma^e{}_{ca} = \frac{1}{2} g^{ed}(\nabla_c h_{da} + \nabla_a h_{dc} - \nabla_d h_{ca})$ (exact, symbolic). pass

bottomrule

Artifacts and sha256

The first table lists the version-1 and version-2 artifacts, with paths relative to /workspace/CertPlan/S2v2. The second lists the version-3 artifacts, with paths relative to /workspace/CertPlan/S2v3. The third lists the version-4 artifacts, with paths relative to /workspace/CertPlan/S2v4. The fourth lists the version-5 artifacts, with paths relative to /workspace/CertPlan/S2v5. The fifth lists the version-6 artifacts, with paths relative to /workspace/CertPlan/S2v6. The hashes of this file's own .tex and .pdf are in the external manifest MANIFEST-CertPlan-S2v6-Hawk07.sha256 in the directory deliver; those of versions 3, 4 and 5 are in MANIFEST-CertPlan-S2v3-Hawk07.sha256, MANIFEST-CertPlan-S2v4-Hawk07.sha256 and MANIFEST-CertPlan-S2v5-Hawk07.sha256 there.

toprule File sha256

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logs/checks_s2v2.json abf5a530810986fcc80848d3ee6e9f867ff4b065e9f1665de6d83f5fda6b9020

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bottomrule toprule File (version 6) sha256

midrule endhead inputs/Hawk07-C-Dyn-CERT-v5.tex

cdee6fc6fbeffdd59d939c5d82fd63ca2c8714989ee14f0f2ff628d5e3be01fa

inputs/Hawk07-C-Dyn.site.tex 03fc590cb4e759038b0d9a1cbd81daa27608ec1c4b984af9e95efa3fbd9d2970

inputs/Big01-A-v5.tex e1160613ea8e02b37fb45954fe677d89f5fa7cca90062d42b68973b03a2bff1d

inputs/DS-OB-1-CERT-v5.tex a0805f8eb081a250f78e8074b9de5986ccd23106749df9e0fe5fac2f71e157f9

inputs/VC-OB-1-CERT-v5.tex d3a93a3afb0e8803d18f230ce824f78c19253f6a4bc841f8ceef763ce14f7cac

inputs/PG-OB-1-CERT-v5.tex c96ea4631de51c635521ca42fd24337728591676ee9019a24f3ad9fcdcdeb8a2

inputs/DS-OB-1-v5.tex dce37c0a6d8a8c4de084bce7365dafb2127f19ca0874d8e7f07e6a58b254480f

inputs/Red06-G-DSS-CERT-v6.tex c3f04faab2c76fb661054f2c1393bd71f484a1bfdfeeace52e5c612a34fc4599

inputs/V-DST-DSS-CERT-v6.tex 710c656210aab6dd708cd9f830ab7bf59df592f0887ab168b1e7fa7be2df95f9

inputs/En08-ST-DSS-CERT-v6.tex 7d821d99ced3a9d265d5437f5c1466d8f524a09884730d13662278c31b1da086

inputs/I-C-CERT-v5.tex 56c30a1a434ce3cec589929093d7764a97330fbc27748afdf8e6f5bc82b984bf

inputs/I-C-Ex-CERT-v5.tex ba3babcc99d2b98ee9118fffc57d3e441dd1e7b4beecd49bab449b4be277b176

inputs/I-C-Th-CERT-v5.tex caa290f8dad7b6f56809947eb4b9e5a8a2f77fd56642add01de0265224a85c63

inputs/OpenAI.api.tex 76314b644e51864fa1818f28f49f32a2ce2e06bdd32364ad939595c792cbf99d

inputs/PG-OB-1-CERT-v4.tex 3dc921457bd781606e9e673231a8c832be104435950913521fdfb2ed737fc1c1

inputs/MANIFEST-CertPlan-S2v5-OB.sha256

1f1f58e304f89d81d63c3199358011862c354ecebd9c4e36dfeaf770199585d2

inputs/MANIFEST-DSS-CERT-v6.sha256

af40ca7c8ab153d318740ae4ba3b37dd46d83f3089eaad365c0a5da909acd490

inputs/MANIFEST-Big01-A-v5.sha256

450e8a622e0c8038ae889ab197ae207351807a2cd4cc6ad80a28fd2a39687c03

inputs/MANIFEST-CertPlan-S2v5-Hawk07.sha256

b79e90d164a95e8b1147f526ca56af50bda0f63650b23977c43fcae6c2bf4cc9

C-common/preamble_cert.tex 322a24e069f471ce5db9a81bc74bc89a46e0cb268edf0333f45e975a5fc44f04

code/tens.py 5bbc27d8024f48d677ac5129ebb858d167aaad8c90fb13613922f1e2a266e271

code/checks_s2v6.py 828ac9d79c970f1eceaf19af3fe5891c426961ffcef3b197867a04470f19f0b9

logs/checks_s2v6.json 2db874ea2e1e23b4c25b87ba5686385b6f69c43ecc9939b0528df17fcd8f55ef

code/blocks_v6.py 7b89f9463c4acde77a52cf57b58a2654ce0de5adde63fcd7c404ce3114debef4

code/specs_v6.py 67d1896d00b3a224d67a795671d8859831c8737d7bed1d93c73f1f8565a1acd8

code/make_cert_v6.py 650e6f782195a07ef5b18530b09c4706d187791b491e923bb10524c226d9b67b

code/compile_all.sh ca313bb21f4c5d49f67697fe10bc4943fb78942032b24f05886b5b79f4702a1d

code/compile_all_v6.sh f6f6e65ff92ebea8d53038437920c19b4ad1ee61ad02867021aabedac6a62bf2

logs/inputs.sha256 ef70a51a3687d1606771a2000349b8b3afa3a62ee051ebab40e00d2c310403d6

logs/plan.sha256 de66bf5cfcbf135cc10a17856758d61194aa075950871d7fffc6d6c9f95ee50c

bottomrule Frozen trees are hashed before and after the run with find . -type f | LC_ALL=C sort | xargs sha256sum | sha256sum. The before-values are XVI-P ec965c15…, XVI-Q 0df9a0d1… and XVI-R 57187bc6… (logs/frozen_before.txt). The after-comparison is recorded outside this file, in logs/frozen_after.txt and CHECKPOINT.md. For version 3 the same before-values were recorded in /workspace/CertPlan/S2v3/logs/frozen_before.txt; the after-comparison is in /workspace/CertPlan/S2v3/logs/frozen_after.txt and /workspace/CertPlan/S2v3/CHECKPOINT.md. For version 4 the same before-values were recorded in /workspace/CertPlan/S2v4/logs/frozen_before.txt; the after-comparison is in /workspace/CertPlan/S2v4/logs/frozen_after.txt and /workspace/CertPlan/S2v4/CHECKPOINT.md. For version 5 the same before-values were recorded in /workspace/CertPlan/S2v5/logs/frozen_before.txt; the after-comparison is in /workspace/CertPlan/S2v5/logs/frozen_after.txt and /workspace/CertPlan/S2v5/CHECKPOINT.md. For version 6 the same before-values were recorded in /workspace/CertPlan/S2v6/logs/frozen_before.txt, together with the hashes of the delivered trees; the after-comparison is in /workspace/CertPlan/S2v6/logs/frozen_after.txt and /workspace/CertPlan/S2v6/CHECKPOINT.md.

appendix

Unified Certificate Framework

This appendix is identical in the nine version-6 Hawk07 sheets. It displays, side by side, the certificates that these

sheets and their companions use. Every citation is a source record sTviTag ; no proof transfers. Each operator or formula certifies only its own object. None is promoted to a quantum coefficient or a derived metric, and none is a statement about a host, a horizon or a Page curve. If W is feasible for a maximization with value p and Y is feasible for its dual with value q, then $p \le \mathrm{opt} \le q$; if $p = q$ the value is certified exactly. For the half diamond norm of a difference Φ of channels with Choi operator J_Φ (output factor first), the dual constraints are $Y \ge 0$, $Y \ge J_\Phi$, with value $\|\mathrm{Tr}_{\mathrm{out}}\, Y\|_\infty$.

(U1) Replacement, block form. $J = \sigma \otimes I - \Omega$, $Y = \sigma \otimes I - \mathfrak{S}^{-1}\Omega$, $\mathfrak{S} = \sum_i \lambda_i^{-1}$; value $1 - 1/\mathfrak{S}$. Records: Hawk07-A-CERT-v5 thm:s2-exact; the same block operator appears in the proof of Big01-A-v5 thm:Bexact.

$Y \ge 0$, $Y \ge J$, $\mathrm{Tr}_{\mathrm{out}}\, Y = (1 - 1/\mathfrak{S})I$, with primal witness $\sum_i \sqrt{p_i}|ii\rangle$, $p_i \propto \lambda_i^{-1}$.

(U2) Replacement, rank-one form. $Z = Y - J = (1 - 1/\mathfrak{S})\Omega$, the dual for the opposite sign $-J$. Records: I-C-CERT-v5 thm:replacement; thermal case $\mathfrak{S} = Z_\beta Z_{-\beta}$, I-C-CERT-v5 thm:thermalsep.

(U3) I-C dual operators. $(1 - 1/d)\Omega$ at the shredder floor (I-C-CERT-v5 thm:optimum, attained by complete dephasing, I-C-CERT-v5 thm:dephase); $(1 - k/d)\Omega$ for cuts of block dimension k (I-C-Ex-CERT-v5 thm:cert-Tdk); the gap $(d - 1)/d^2$ between the two floors $1 - 1/d^2$ and $1 - 1/d$ (I-C-CERT-v5 cor:gap).

(U4) Casimir axial-null combination. For the end stress $t^{(\mathrm{q})}$ at coefficient q, $n^{(\mathrm{q})} = \mathrm{q}(\hat{\rho} + \hat{p}_z)$, unchanged by adding a cosmological stress $-\lambda' g$, and $\Lambda_\ell^{(\mathrm{q})} = \mathrm{q}\,\kappa\ell(\hat{\tau})$ with two-point minimax $\frac{1}{2}\kappa|\ell(\hat{\tau})\|\mathrm{q}_1 - \mathrm{q}_2|$. Records: Hawk07-H-CERT-v5 thm:s2-cas, Hawk07-H-CERT-v5 cor:s2-cas-null, and the same statements in Hawk07-F-CERT-v5 and Hawk07-G-CERT-v5.

(U5) Named labels. The plan's "Big01-A named-label dual" does not exist as an operator. Displayed instead: injectivity of varkappa $\mapsto T^{(\mathrm{varkappa})}, S^{(\mathrm{varkappa})}, N^{(\mathrm{varkappa})}$ in the coefficient slot, Big01-A-v5 thm:Hcert; and the exact worst-case error of a report-data rule for a named label over a host interval, half the spread of the label plus the offset of the rule's value from the midpoint, Red06-G-DSS-CERT-v6 thm:RC-repdual. Both are scalar certificates.

(U6) Hull deficit. En08-ST-DSS-CERT-v6 thm:EC-dual and En08-ST-DSS-CERT-v6 lem:EC-sandwich: a

primal–dual sandwich for the hull deficit of a lattice ball. It is a lattice quantity, not a channel error.

(U7) Vacuum-term family. $T + c_0 g + c_G G + c_1 E^{(1)} + c_2 E^{(2)}$ is divergence-free; on a set with Ric = $\Lambda_0 g$ it equals $T + (c_0 - \Lambda_0 c_G)g$, VC-OB-1-CERT-v5 thm:v5-vac. The linearized family $aG + \Lambda g$ on such a set has divergence $(\Lambda - a\Lambda_0)\nabla^a h_{ab}$, V-DST-DSS-CERT-v6 prop:VDC-lindiv for $\Lambda_0 = 3H^2$. What each item certifies: (U1)–(U3) the error of a stated channel against the identity; (U4) that a stated stress is not cosmological; (U5) that a named label is not a function of admitted data; (U6) a lattice deficit; (U7) that a vacuum term is not fixed by local geometry. No item supplies a quantum coefficient, a horizon temperature, a finite Hilbert-space dimension, a memory model or a metric. The plan's "Codazzi-class vacuity" is V-DST-DSS-CERT-v6 thm:VDC-dyn(a), a statement about linear operators on a fixed host. It is listed here only to separate it from (U7).

Extended Computer-Assisted Checks

This appendix is identical in the nine version-6 Hawk07 sheets. The checks were run by code/checks_s2v6.py under /workspace/CertPlan/S2v6, with SOURCE_DATE_EPOCH=1792627200, PYTHONHASHSEED=0, TZ=UTC and LC_ALL=C. The log logs/checks_s2v6.json records one boolean and the statement for each check, and a second run reproduces it byte for byte. The plan names the new checks K40, K41 and K42. Those identifiers are already used by the delivered OB version-5 certificates (DS-OB-1-CERT-v5: K40, K41, K44, K46, K47; VC-OB-1-CERT-v5: K40, K41, K42, K45, K46; PG-OB-1-CERT-v5: K43, K48). No delivered .tex file under /workspace/CertPlan/deliver, /workspace/DSS/deliver or /workspace/Big01/deliver uses K49–K69. So plan K40 is K49 (dual-operator identity across conventions, with the semidefinite-program wrapper), plan K41 is K50 (FLRW solutions and the Einstein residual), and plan K42 is K51 (late-slice expansion on coincident pairs); K52–K55 are further checks. A check is exact (sympy) unless its statement says *numerical*; the numerical semidefinite programs (cvxpy, solver CLARABEL) record only a comparison with the exact value within 10^{-6}. pass pass pass pass pass pass pass par *Non-claim.* The checks corroborate stated identities and values. They prove no physical statement, and a numerical agreement is not a proof. par

Verification of request t269u

toprule Plan item Outcome Where

midrule endhead Plan saved verbatim, read-only, sha256 recorded Done (mode 444) Sec.

Phase 1: catalogue, each citation tagged Done; every version-6 citation carries the tag sTviTag Sec.

Phase 2: common preamble and macros Done: C-common/preamble_cert.tex Sec.

Phase 2: Unified Certificate Framework Done, identical in the nine sheets; "named-label dual" corrected App.

Phase 2: parts/ structure Corrected: no parts/ exists; additions are marked sections and appendices Sec.

Phase 3: targeted imports Done as documentary separations and local theorems Sec.

Phase 4: checks K40–K42 Renumbered K49–K51 (collision with OB K40–K48); K52–K55 added; all pass App.

Phase 4: unified SDP wrapper Done (K49, numerical, both programs) App.

Phase 4: $d = 4, 5$ replacement and dimension rule Done (K49, K52) App.

Phase 4: FLRW further solutions and residual Done by initial data (K50); closed forms open App.

Phase 4: label-audit diff against version 5 Done (below) App.

Phase 4: constants re-checked Done (K55); $(d-1)/d^2$ is an I-C constant, not a Hawk07 one App.

Phase 5: ledger sentence Appended verbatim as its own paragraph Standing ledger

Phase 5: permanent negative Done (below) App.

Phase 6: build target v6-all In the copy code/compile_all_v6.sh (make not installed) Sec.

Phase 6: versions 1–5 frozen Hashed before and after; unchanged Sec.

Phase 7: refusal audit Done (below) App.

Phase 7: new theorems conditional and labelled Done Sec.

Big01-A version v5 exists, latest; used Sec.

$c(R)$ and $1/(2d^2)$ as stated Corrected: versions 1 and 3; monoid statement false as worded Sec.

Red06 regularity gap Corrected: $C^{1,1}$ proved, C^1/C^0 open Sec.

"Conformal-warp" Misnomer; slice-warp Sec.

Named components Four corrected, two confirmed Sec.

I-C version 6 Not read (no delivered manifest) Sec.

OpenAI catalogue Searched; nothing relevant; nothing cited Sec.

Hawk07-E C^1 observation Recorded as an observation Sec.

No writes outward Nothing pushed, registered or written to the site Release

Group E/D/C-Dyn imports Vacuum-term reduction, regularity record, FLRW Secs. ,

bottomrule

Permanent negative. The switched conformal metric of the parent is prescribed and selects no value of Λ: on its late de Sitter sets the vacuum-term family keeps the free combination $c_0 - 3Kc_G$ (Corollary (a)), and the linearized divergence depends on the declared Λ (Lemma). No state, temperature or Hilbert-space dimension is derived from it.

Refusal audit. Outside this appendix the six audited phrases occur as follows, each checked automatically to stand in a sentence that contains a refusal or negation word (the ledger included), and the occurrences new in version 6 were also read: "quantum coefficient" 6, "Host C" 2, "Einstein dynamics" 9, "Page curve" 4, "derived metric" 5 and "finite Hilbert space" 4. The one exception to the automatic test is the version-1 plan-correction item renaming the plan's symbol; it asserts nothing about a coefficient. No occurrence asserts any of these objects.

Label audit. Version 5 of this sheet has 50 labels; all are retained. Version 6 adds 12 labels, each containing v6. The 32 source labels cited by version 6 each occur exactly once in their input copy: unique unique unique unique

unique unique unique

late regions, and documentary readings. Nothing is pushed, registered or written to the site. Version 5 adds the results listed in its abstract and status table, documentary readings of the version-4 OB, version-5 I-C and version-5 DSS certificates, and the version-4 error list. Nothing is pushed, registered or written to the site. Version 6 adds the results listed in its abstract and status table, the Unified Certificate Framework, the extended checks K49–K55, the verification of request t269u, documentary readings of the version-5 OB, version-5 I-C, version-6 DSS and version-5 Big01-A records, the version-5 error list and the ledger sentence. Nothing is pushed, registered or written to the site.

Separation from the I-D Host-A pulse shell

New in CERT-v7. This dynamical cone is the closest explicit dynamical cone in the Hawk07 family. It is *not* Host A and *not* Host B of I-D [6]. Both constructions exhibit an outgoing NEC violation; they are *not the same shell*.

Inverse Einstein stays a source ledger, not a matter theory. No Host C is created. Indexed citations: ID-v5 [6], IC-v2 [7], IBG [8].

Standing ledger. Host A and Host B stay separate. Host C is not created. O.1 stays NOT_CLOSED. XVI-N is not discharged. XV-B is not opened. No quantum coefficient is admitted. Dom (*T*) remains undetermined; J2 remains unresolved. Problems 6, 7, and 9 are named, not solved. Gate 0 and ST4b stay NOT_SUPPLIED. No Einstein dynamics, derived metric, spacetime emergence, Page curve, island, bounce, vacuum-energy selection, or de Sitter state is claimed as an Enter theorem. The shredder is not Gibbons–Hawking. Cited sheets are source records, not premises. wired=false.

References

[1] N. Cheung, *Black-Hole Information as an Access Problem: Enter, Quantum Recovery, and Complete Residuals*, figshare (2026), https://doi.org/10.6084/m9.figshare.34335024.v1.

[2] N. Cheung, *Operational Wormhole Certificates—Existence, Dimension-Dependent Scaling, Operational Functions, and Composition*, figshare (2026), https://doi.org/10.6084/m9.figshare.34549575.v1.

[3] N. Cheung, *Enter, Quantum Magic, and Quantum Gravity: Readout, Recovery, and the Limits of Geometric Response*, figshare (2026), https://doi.org/10.6084/m9.figshare.34335582.v1.

[4] N. Cheung, *Operational Consistency Does Not Select Lorentzian Geometry*, figshare (2026), https://doi.org/10.6084/m9.figshare.34441758.v1.

[5] N. Cheung, *Realization of Relational Time by Destructive Enter on a Clock Register*, figshare (2026), https://doi.org/10.6084/m9.figshare.34442907.v1.

[6] N. Cheung, ID-v5 Dynamical Spacetime Enter over Two Prescribed Hosts, in *The Philosophy of Enter*, Cheung Ngo Medical Limited (2026), p. 128. Source record; not a premise.

[7] N. Cheung, IC-v2: The Shredder Interface, in *The Philosophy of Enter*, Cheung Ngo Medical Limited (2026), p. 99. Source record; not a premise.

[8] N. Cheung, IBG: Intrinsic and holonomy-twisted Green operators on a prescribed conical spacetime, in *Green Operators and Finite Instruments on a Prescribed Conical Spacetime*, Cheung Ngo Medical Limited (2026). Source record; not a premise.