I-D-Deadline-A (version 3)

Deadline inversion: what a destructive-readout task forces on reachable radius, horizon radius and future reach

(plan alias: Horizon-Deadline-A)

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Abstract

Name. The plans call this sheet "Horizon-Deadline-A". The user's chosen name, I-D-Deadline-A, is kept, and the two names denote the same sheet.

New in version 2 (request t363u, plan item 6). (i) *Capacity, independent of any radius.* If the complete channel passes, in branch r with weight p_r, through a quantum register of dimension k_r, then $e \geq 1 - \frac{1}{d}\sum_r p_r k_r$. An implementation allowance δ gives $[1 - k/d - \delta]_+$. The cut floor $1 - k/d$ is attained for every $1 \leq k \leq d$ by an explicit instrument: outcomes are the k-subsets S, each kept with weight $\frac{d-1}{k-1}^{-1}$, and the decoded channel is $\lambda\,\mathrm{id} + (1-\lambda)\Delta$ with $\lambda = (k-1)/(d-1)$. The instrument can be placed on the central worldline of every static patch and every de Sitter-past host, so the least error over rank-k cuts is $1 - \min\{k, d\}/d$ for every horizon radius, every junction radius and every split (Theorem). (ii) *Comoving deadline inversion.* For a comoving source on exact de Sitter, a challenge–return within Δ is possible iff $R \leq \frac{\ell}{2}(1 - e^{-c\Delta/\ell})$. Completion forces $R < c\Delta/2$ and $\ell \geq \ell_c(R, \Delta)$, with the explicit bracket $R/s \leq \ell_c \leq 2R(1+s)/s$, $s = c\Delta/(2R) - 1$. Moreover $\ell_c > L_{\min}(R, \Delta)$: a comoving task forces a strictly larger horizon radius than a static one with the same data (Proposition). (iii) *Sharp one-sided calibration.* If (R, T) is certified only to lie in $[R_-, R_+] \times [T_-, T_+]$, the set of horizon radii compatible with completion is exactly $[L_{\min}(R_-, T_+), \infty)$, or empty when $T_+ \leq 2R_-/c$. The bound $L_{\min}(R_-, T_+)$ is therefore best possible, and R_+ and T_- are provably useless for it (Theorem). (iv) *Split blindness, made explicit.* The reach radius $L\tanh(cT/2L)$, the reach

area $4\pi L^2\tanh^2(cT/2L)$, $L_{\min}$, ℓ_c, the cut floor and the prefix range $(B_\tau,\infty]$ are constant on every joint fibre (coefficient × split × current) of the uncoupled declaration (Corollary). (v) *What restores a finite horizon risk.* A declared future rate band $h_- \le H \le h_+$ on $[0,\infty)$ forces $R_0 \in [c/h_+, c/h_-]$ for every continuous future, analytic or not, whatever the past precision. With the exact de Sitter past and H_1 in the band, the minimax risk for R_0 is exactly $\frac{1}{2}(c/h_- - c/h_+)$ over continuous or smooth futures. The extreme instability families of Theorem leave every band. Under finite-precision past data, a future rate band restores a finite risk and analyticity does not. A floor alone forces a finite horizon (Proposition).

New after the user supplement t365u (findings F20, draft corrections DC12). (vi) *Approximate capacity.* If the implemented channel is within δ of a declared cut channel with blocks $k_r \le m$ and Bell-input weights p_r, every decoder has error at least $[1 - \frac{1}{d}\sum_r p_r k_r - \delta]_+ \ge [1 - m/d - \delta]_+$. An achieved error or certificate e_{cert} therefore needs $\sum_r p_r k_r \ge d(1 - e_{\text{cert}} - \delta)$ and $m \ge \lceil d(1 - e_{\text{cert}} - \delta)\rceil$ (Theorem (b)). (vii) *Source-clock waiting.* A wait w_s fixed in the source's own proper time costs $w_s/\sqrt{1 - R^2/L^2}$ of central time. Completion then requires $\frac{2L}{c}\operatorname{artanh}\frac{R}{L} + w_s/\sqrt{1 - R^2/L^2} \le T$, which is solvable iff $T > 2R/c + w_s$. It gives a lower bound L_w that is strictly larger than the version-1 bound with the wait counted in central units, and the explicit bound $L \ge \sqrt{(2R^3/(3c) + w_s R^2/2)/(T - 2R/c - w_s)}$ (Theorem). (viii) *Latency qualifier.* Idle waits leave the optimized access error unchanged only when the complete channel and its eventual interface are unchanged. At a deadline-truncated interface a delayed qubit turns the identity (error 0) into a replacement channel (error $\frac{3}{4}$) (Proposition). (ix) *Instability is an uncertainty statement.* The infinite risk of Theorem holds under a contract that supplies only membership in the ε-class (or adversarial past error ε). An exactly supplied analytic past determines the future (Proposition). These findings matter because they make the capacity requirement usable with implementation error, show that the clock in which a wait is specified changes the horizon bound, and separate what a deadline changes from what latency does not.

New under the expansion plan t367u (plan corrections PC12). (x) *No capacity-only waiting bound.* An allowance δ weakens the ideal dimension requirement to $\sum_r p_r k_r \ge (1 - \delta - e_{\text{cert}})d$, which is $(1 - \delta)d$ at $e_{\text{cert}} = 0$. The

plan's "waiting time at least $(1-\eta)$ times the ideal inverse capacity" is false: the sharp instrument has zero wait on the central worldline for every radius. A shorter observed wait never rejects a diamond certificate, but a cut dimension below the requirement does (Proposition). (xi) *Futures stay free.* A capacity certificate whose complete outcome law depends only on the observed prefix leaves the horizon indicator at success probability at most $\max\{\pi, 1-\pi\}$ and the range $(B_\tau, \infty]$ unchanged (Corollary). (xii) *Reach versus horizon.* A finite deadline T probes the reach $R_T = c\int_0^T \mathrm{d}t/a < R_e(0)$, which increases to $R_e(0)$. On the de Sitter prefix, $R_T = B_T$ is the infimum of the remaining horizon range (Proposition). (xiii) *Instability risk with its class.* Under the membership contract the absolute risk for R_0 is infinite, and the relative risk is exactly 1, attained only by 0, for randomized decisions in $[0, \infty)$. Data with a common law cannot lower it. A declared rate band lowers it to at most $(h_+ - h_-)/(h_+ + h_-)$ (Corollary). (PC12-DL-1 to PC12-DL-8, Appendix .)

Why the version-2 findings matter. They separate the two inputs of every operational-to-geometric claim. Access quality yields a capacity statement in which no radius enters, and it is sharp. Timing yields a one-sided horizon bound that is best possible and depends on the task class (static or comoving). The analytic clause is replaced, for finite data, by the input that actually does the work: a declared bound on the future rate. No new premise is added.

Findings carried from version 1. (1) The literal premise of the original plan is empty. A record-only transcript always has complete-channel recovery error $e \geq 1 - 1/d$. With a retained quantum residual, a finite destructive transcript of any length is compatible with $e = 0$ and with any horizon radius, so there is no transcript-length-only radius bound (Theorem , Proposition). (2) The correct inference from subfloor recovery is a quantum-cut requirement, $e \geq 1 - \min\{m, d\}/d$, hence $m \geq \lceil d(1-e) \rceil$. It is a capacity statement, not a radius statement (Theorem). (3) Deadline inversion: on the prescribed static patch, a completed fresh challenge–return task with budget $T = \tau - w_{\min}$ forces $\frac{2L}{c}\operatorname{artanh}(R/L) \leq T$. This gives an *upper* bound $R \leq L\tanh(cT/2L)$ on the reachable radius and, for a known source radius with $T > 2R/c$, a genuine *lower* bound $L \geq L_{\min}(R, T)$ on the horizon radius. The explicit weaker form is $L \geq \sqrt{2R^3/(3c(T - 2R/c))}$ (Theorem). (4) A complete-channel certificate excludes a

missing causal path as soon as $e < 1 - 1/d^2$; this sharpens the draft threshold $1 - 1/d$. An approximate replacement model with allowance η is excluded by $e + \eta < 1 - 1/d^2$ (Corollary). Transcript length enters only through a supplied schedule $\tau \le n\Delta_{\max}$ (Corollary). (5) On flat FLRW, finite-time reception forces $R_e(t_e) > a(t_e)r$. On the de Sitter-past class it forces a lower bound on the future junction radius, $R_0 > c/H_1 + (R - c/H_1)e^{-H_1 t_e}$ (Theorem). After a finite observed prefix the smooth future freedom is exactly $R_e(0) \in (B_\tau, \infty]$ with $B_\tau = \frac{c}{H_1}(1 - e^{-H_1\tau})$. Analyticity of the whole extension forces $R_e(0) = c/H_1$, but analyticity of the past alone, or the junction jets alone, does not. Analyticity is sufficient, not necessary (Theorem). (6) *Update t362u.* With $s = cT/(2R) - 1$, the inverse deadline obeys the explicit two-sided bracket $\max\{R, R/\sqrt{3s}\} \le L_{\min} \le R\sqrt{1 + 1/(3s)}$, plus a sharper quadratic lower bound. $L_{\min}$ increases in R and decreases in T (Theorem). Location and timing calibration therefore have one-sided use: only $R \ge R_-$ and $T \le T_+$ give $L \ge L_{\min}(R_-, T_+)$, and with no positive lower location bound there is no positive horizon bound (Corollary). Positive real-analytic futures whose rates are ε-close to H_1 in C^k on a past window realize every $R_0 \in (0, \infty]$, including arbitrarily small values and ∞ (Theorem). The analytic clause of (5) therefore needs *exact* equality on the prefix, and finite-precision analytic forcing is unstable (Remark). (7) Every bound is unchanged by stress-split and current reattributions at fixed metric, location, timing and access contract. A horizon radius alone selects no channel, and positive dust alone gives no channel-loss bound.

Why it matters. The original plan asked for a lower bound on a horizon radius forced by a transcript. The proved form makes the operational-to-geometric implication precise. It needs an independently supplied location, clock and fresh challenge–return contract, it runs in a definite direction, and its dynamic version depends on the declared future class, smooth or analytic.

Changes against the plans. Version 2 follows the binding plan t363u, item 6. Every cited label was verified on a fresh read-only GET. Plan corrections PC9-DL-1 to PC9-DL-7 (Appendix) correct two cross-sheet labels and record scope and registration. No version-1 result is weakened, and every version-1 label is kept (Appendix). Version 1: the t358u targets "radius lower bound from transcript length and the shredder floor" and "analytic past collapses the bound" are superseded by t361u item 9 and recorded as superseded, not as failures (PC7-DL-1 to

PC7-DL-10). One t361u item is strengthened (PC8-DL-1: the threshold $1 - 1/d^2$ suffices in step 9.3). The t362u findings F18-5 to F18-7 are integrated in Appendix . They qualify the analytic clause to exact past data; the clause itself stays correct as stated. The supplement t365u (F20-DL-1 to F20-DL-4) is integrated in Appendix , with corrections DC12-DL-1 to DC12-DL-7. Every item is held. The capacity overlap is merged in its stronger weighted form, and the risk sentence of Theorem is assigned its data contract, with the statement kept verbatim. The external clock is kept, and Host C is not created.

Standing ledger. Host A and Host B remain separate prescribed backgrounds; Host C is not created; O.1 stays NOT_CLOSED; XVI-N is not discharged; XV-B is not opened; Gate 0 and ST4b stay NOT_SUPPLIED; no quantum coefficient is admitted; no Einstein dynamics or derived metric is claimed; spacetime emergence is refused. No quantum coefficient is admitted. Citations identify source records only; no proof transfer.

Bibliographic record

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Conventions, the I-D template and source records

Proved means a complete local proof. *Declared* marks an underived specification. Citations "X label [source record; not a premise]" identify statements of site records retrieved read-only on 25 October 2026 (Appendix).

Citations identify source records only; no proof transfer. Finite-dimensional channel conventions follow Watrous [2], and entanglement-breaking structure follows Horodecki, Shor and Ruskai [1]. Both are tagged "Source record; not a premise"; every inequality used is proved locally.

I-D def:interface [source record; not a premise] is used only as a documentary template for what a complete specification lists (metric, worldlines, registers, circuit, controls, environments). No result about the I-D hosts is used. Every metric here is a prescribed comparison background, and the clock is the declared external cosmic or static time. Nothing here transfers to the dynamic Host B of I-D, and Host C is not created. No quantum coefficient is admitted. Every quantum register is a declared device register, not a host Hilbert space.

Wherever a transcript or supply is adjoined, the governing condition is conditional ancillarity: a datum changes no risk if its law given the existing data is one common kernel, and equality of separate marginals is not enough (Big-Obs-Fibre-A, Theorem "conditional blindness"; user draft t360u thm:ancillary). Wherever a horizon radius is inferred, deadline inversion (Theorem) and the smooth-versus-analytic distinction (Theorem) govern.

Version 2. The conditional-ancillarity theorem is Big-Obs-Fibre-A thm:OF-ancillary (version 1, local, unregistered) [source record; not a premise]. No uniform residual gap is discussed in this sheet; if one were, the scaling obstruction and normalized margin of XVI-N-COMPACT (version 1, labels thm:scaling, thm:wg) [source record; not a premise] would govern. The latency and future-junction statements of Big01-A (prop:echo, thm:P1, thm:Efuture, prop:Esmooth, prop:Eanalytic), the access laws of I-C (thm:A) [4], I-C-Ex (thm:sharp) [5] and I-C-Th (thm:access) [6], with I-D [7], and the overlay statements Big01-A-DM dmA1:f14-6-deadline and dmA1:f14-8-analytic are imported as source records [source record; not a premise]. Every statement used is re-proved here.

The user draft t360u (section "Horizon-Deadline-A") is the proof backbone (items F17-11 to F17-18 and F17-21; Appendix). Corrections are PC7-DL-*n* (plan t358u), PC8-DL-*n* (plan t361u, item 9) and DC9-*n* (draft).

Definition (Complete-channel recovery error). For a channel $\mathscr{N}$ from a d-dimensional input, $d \geq 2$, put $e(\mathscr{N}) = \inf_{\mathscr{D}} \frac{1}{2}\|\mathscr{D}\mathscr{N} - \mathrm{id}_d\|_\diamond$, with the infimum over decoders on precisely the declared complete receiver interface,

including failures and references. It is a property of the complete channel, not of one realized transcript.

Lemma (Bell-test bound; local). *Let Φ be the maximally entangled state on $\mathbb{C}^d \otimes \mathbb{C}^d$ and $F_e(\mathscr{M}) = \langle\Phi|(\mathscr{M} \otimes \mathrm{id})(\Phi)|\Phi\rangle$. Then $\frac{1}{2}\|\mathscr{M} - \mathrm{id}\|_\diamond \geq 1 - F_e(\mathscr{M})$. If $\mathscr{M}$ has Kraus operators K_a, then $F_e(\mathscr{M}) = d^{-2}\sum_a |\mathrm{Tr}\, K_a|^2$.*

Proof. The diamond norm dominates the trace norm on the input Φ, and $\frac{1}{2}\|\rho - \Phi\|_1 \geq \mathrm{Tr}\,\Phi(\Phi - \rho) = 1 - F_e$. Also $(K \otimes I)|\Phi\rangle$ has overlap $d^{-1}\mathrm{Tr}\, K$ with $|\Phi\rangle$.

par *Status: proved.* par **Non-claim.** The bound is a property of the complete channel; it says nothing about one realized transcript. par

The literal premise and the quantum cut

Theorem (A record-only transcript cannot be subfloor; F17-11). *If the complete accessible output is a finite classical transcript and the decoder has no assisting receiver quantum system, then $e(\mathscr{N}) \geq 1 - 1/d$. If an input-dependent quantum residual is retained, then for every transcript length n the instrument $\mathscr{I}_h(X) = p_h X$, $\sum_h p_h = 1$, returns the residual exactly and reports a message-independent record, so $e = 0$. It is realized by reading prepared ancillas destructively and leaving the payload untouched.*

Proof. A decoded classical output has measure-and-prepare form $\mathscr{D}\mathscr{N}(X) = \sum_h \mathrm{Tr}\,(M_h X)\sigma_h$, and with spectral decompositions $M_h = \sum_j |\mu_{hj}\rangle\langle\mu_{hj}|$ (unnormalized) and $\sigma_h = \sum_k s_{hk}|\varphi_{hk}\rangle\langle\varphi_{hk}|$ its Kraus operators $\sqrt{s_{hk}}|\varphi_{hk}\rangle\langle\mu_{hj}|$ have rank one. By Lemma and Cauchy–Schwarz, $|\mathrm{Tr}\, K|^2 \leq \mathrm{rank}\,(K)\mathrm{Tr}\, K^\dagger K$, so $F_e \leq d^{-2}\mathrm{Tr}\sum_a K_a^\dagger K_a = 1/d$. For the second part, forgetting h gives $\sum_h p_h X = X$. Independent ancillas prepared in basis states with probabilities p_h and read destructively implement the instrument, and deterministic ancilla outcomes pad the record to any length n.

par *Status: proved;* draft theorem held. It agrees with I-C thm:A [source record; not a premise] ($F_e \leq 1/d$ for classical-output channels). par **Non-claim.** Consumed clock names do not show that the payload was consumed. An assisting system entangled with the sender belongs to the complete access declaration. par

Theorem (Quantum-cut requirement; F17-12). *Suppose the complete source-to-decoder channel factors, in every branch of a classical label, through a quantum register of dimension at most m, including all assisting systems across the cut. Then* $e(\mathcal{N}) \geq 1 - \min\{m, d\}/d$. *An achieved* $e < 1 - 1/d$ *therefore requires* $m \geq 2$, *and in general* $m \geq \lceil d(1-e) \rceil$. *The number of classical transcript labels does not replace m.*

Proof. Each Kraus operator of $\mathscr{D}\mathcal{N}$ is a product of a map $\mathbb{C}^d \to \mathbb{C}^{m_c}$ and a map out of $\mathbb{C}^{m_c}$, $m_c \leq m$, so its rank is at most m. Then $|\mathrm{Tr}\, K_a|^2 \leq m \mathrm{Tr}\, K_a^\dagger K_a$ and $F_e \leq md/d^2 = m/d$, and Lemma gives the bound for $m < d$. For $m \geq d$ the bound is 0. If $m < \lceil d(1-e) \rceil$ then $m < d(1-e)$, so $e < 1 - m/d$, which contradicts the bound (check DL-01).

par *Status: proved;* draft theorem held. It agrees with I-C-Ex thm:sharp [source record; not a premise] ($1 - k/d$ across a rank-k cut) and with I-C-Th thm:access [source record; not a premise]. par **Non-claim.** This is a capacity requirement on a specified factorization. It infers no host dimension and no capacity–area relation. par

Proposition (No transcript-length-only radius bound; F17-13). *Over the prescribed-host class there is no strictly positive lower bound on a horizon radius that depends only on n, d and a subfloor certificate. Transcript length alone also bounds no physical duration.*

Proof. For every $L > 0$, place the payload and the ancillas of Theorem on the central worldline of the prescribed static patch of horizon radius L. The payload channel is the identity for every n, while L is arbitrary. Waits change the duration without changing the instrument or the word length.

par *Status: proved;* draft proposition held. par **Non-claim.** A conversion from length to deadline needs a supplied timing contract (Corollary). par

Proposition (Geometry selects no channel; no dust-only bound). *A prescribed horizon radius, by itself, does not select a channel: on one static patch both the identity channel and a replacement channel are realizable by circuits on the central worldline. A positive dust density alone gives no lower bound on channel loss.*

Proof. Both channels are local operations on one worldline, whatever L. Dust enters only through the metric or the stress split, and the identity channel on the central worldline uses neither.

par *Status: proved;* consistent with the user draft t359u prop:geometry-channel and thm:dust-access (cited as a source record and not integrated). par **Non-claim.** This does not deny geometric *latency* bounds; it denies that geometry alone fixes the channel. par

Theorem (Cut capacity, sharp and independent of every radius; version 2). *Let the complete source-to-decoder channel be* $\mathcal{N} = \sum_r \mathcal{N}_r$*, where branch r of a classical label passes through a quantum register of dimension* k_r*, including all assisting systems across the cut, and put* $p_r = \operatorname{Tr} \mathcal{N}_r(I/d)$.

1. $e(\mathcal{N}) \geq 1 - \frac{1}{d}\sum_r p_r k_r \geq 1 - \max_r k_r/d$.

2. *(Implementation allowance; t365u.) If* $\frac{1}{2}\|\mathcal{N} - \mathcal{N}'\|_\diamond \leq \delta$ *for a declared cut channel* $\mathcal{N}' = \sum_r \mathcal{N}'_r$ *whose branches pass through dimensions* $k_r \leq m$*, with* $p_r = \operatorname{Tr} \mathcal{N}'_r(I/d)$*, then every decoder obeys* $\frac{1}{2}\|\mathcal{D}\mathcal{N} - \mathrm{id}\|_\diamond \geq [1 - \frac{1}{d}\sum_r p_r k_r - \delta]_+ \geq [1 - m/d - \delta]_+$*. In particular* $e(\mathcal{N}) \geq [1 - k/d - \delta]_+$ *if* $\mathcal{N}'$ *factors through dimension at most k. An achieved error, or a valid upper certificate* $e_{\mathrm{cert}} \geq e(\mathcal{N})$*, therefore requires* $\sum_r p_r k_r \geq d(1 - e_{\mathrm{cert}} - \delta)$ *and* $m \geq \lceil d(1 - e_{\mathrm{cert}} - \delta) \rceil$ *whenever the right-hand sides are positive.*

3. *(Sharpness.) For* $1 \leq k \leq d$*, let the instrument have outcomes* $S \subseteq \{1, \ldots, d\}$ *with* $|S| = k$ *and branches* $\mathcal{N}_S(X) = wP_S X P_S$*, where* P_S *is the coordinate projection and* $w = \frac{d-1}{k-1}^{-1}$*, and let the decoder embed the range of* P_S*. The decoded channel is* $\Phi_k = \lambda\,\mathrm{id} + (1 - \lambda)\Delta$*, with* $\lambda = \frac{k-1}{d-1}$ *and* Δ *the complete dephasing, and* $\frac{1}{2}\|\Phi_k - \mathrm{id}\|_\diamond = 1 - k/d$*. Hence the floor of Theorem is attained for every k.*

4. *(Radius independence.) On the prescribed static patch of every radius* $L > 0$*, and on every host of the de Sitter-past class with any* $R_0 \in (0, \infty]$*, the instrument of (c) is realized by local operations on the central worldline. So the least error over rank-k cuts is exactly* $1 - \min\{k, d\}/d$*, whatever the horizon radius, the junction radius, the stress split and the current attribution.*

Proof. (a) A Kraus operator of $\mathcal{D}\mathcal{N}_r$ factors through $\mathbb{C}^{k_r}$, so it has rank at most k_r, and $|\operatorname{Tr} K|^2 \leq k_r \operatorname{Tr} K^\dagger K$. Summing over the Kraus operators of branch r gives $\sum_a \operatorname{Tr} K_a^\dagger K_a = \operatorname{Tr} \mathcal{D}\mathcal{N}_r(I) = dp_r$, because the decoder preserves trace. Hence $F_e(\mathcal{D}\mathcal{N}) \leq d^{-2}\sum_r k_r dp_r$, and Lemma gives the bound for every decoder. (b) The decoder is a contraction, so

$\frac{1}{2}\|\mathscr{D}_{\mathscr{N}} - \mathrm{id}\|_\diamond \geq \frac{1}{2}\|\mathscr{D}_{\mathscr{N}'} - \mathrm{id}\|_\diamond - \delta \geq 1 - \frac{1}{d}\sum_r p_r k_r - \delta$ by (a) applied to $\mathscr{N}'$, and $\sum_r p_r k_r \leq m \sum_r p_r = m$. Rearranging $e_{\mathrm{cert}} \geq 1 - \frac{1}{d}\sum_r p_r k_r - \delta$ gives the first requirement. With $\sum_r p_r k_r \leq m$ it gives $m \geq d(1 - e_{\mathrm{cert}} - \delta)$, and m is an integer (check DL-18). (c) $\sum_S w P_S = I$ (each index lies in $\frac{d-1}{k-1}$ sets), so the instrument is trace preserving. Entrywise, $(\Phi_k(X))_{ij} = X_{ij}\, w\, \#\{S \ni i,j\}$, which is X_{ii} for $i = j$ and λX_{ij} for $i \neq j$, since $\frac{d-2}{k-2} / \frac{d-1}{k-1} = \frac{k-1}{d-1}$. So $\Phi_k = \lambda\,\mathrm{id} + (1-\lambda)\Delta$. Writing $\Delta = \frac{1}{d}\sum_{j=0}^{d-1} \mathrm{Ad}_{Z^j}$ with $Z = \mathrm{diag}(e^{2\pi i m/d})$ gives $\frac{1}{2}\|\Delta - \mathrm{id}\|_\diamond \leq \frac{d-1}{d}$, hence $\frac{1}{2}\|\Phi_k - \mathrm{id}\|_\diamond \leq (1-\lambda)\frac{d-1}{d} = 1 - \frac{k}{d}$. Conversely $F_e(\Phi_k) = d^{-2}\sum_S w\, k^2 = d^{-2}\frac{d\,d-1}{k\,k-1}^{-1} k^2 = k/d$, and Lemma gives the reverse inequality. Each branch passes through the k-dimensional range of P_S. (d) The instrument and the decoder act on registers carried by one worldline. No metric quantity, stress slot or current enters, so the realization is the same on every host listed, and (a) gives the matching lower bound (checks DL-12, DL-13).

par *Status: proved;* part (b) in its weighted form is the supplement's theorem thm:DL-approx-cut (F20-DL-1), held and merged here with no new label (DC12-DL-1). (a) agrees with I-C-Ex thm:sharp [source record; not a premise] (its weighted form), (b) with I-C-Th thm:access [source record; not a premise] (implementation allowance), and $k = 1$ with I-C thm:A [source record; not a premise]. The attaining instrument in (c) is a local construction. I-C-Ex states attainability by a different finite-outcome instrument, and that statement is cited only as a source record (PC9-DL-2). par **Non-claim.** A capacity statement constrains the factorization of the channel, not the geometry. It infers no host dimension, no capacity–area relation and no horizon radius. par

Proposition (Capacity constrains a dimension, not a waiting time; t367u, PC12). *Use the notation of Theorem* .

1. *With allowance $\delta \in [0,1)$ and certificate $e_{\mathrm{cert}} \geq e(\mathscr{N})$, the requirement is $\sum_r p_r k_r \geq (1 - \delta - e_{\mathrm{cert}})d$. At $e_{\mathrm{cert}} = 0$ it reads $\sum_r p_r k_r \geq (1-\delta)d$ and $m \geq \lceil (1-\delta)d \rceil$: $(1-\delta)$ times the ideal requirement d. For $\delta = 0$ it is attained by the instrument of Theorem (c).*

2. *No positive lower bound on a waiting time, a deadline or a duration follows from (a). For every $L > 0$, every $k \leq d$ and every $\delta \geq 0$, the instrument of Theorem (c) is realized on the central worldline of the static patch of*

radius L with zero wait, and it has error $1 - k/d$.

3. *Hence an observed waiting time, however short, never rejects a pair* $(e_{\mathrm{cert}}, \delta)$. *An exact cut-dimension reading* $m < \lceil d(1 - e_{\mathrm{cert}} - \delta) \rceil$ *rejects the certificate or the allowance.*

Proof. (a) Theorem (b) with $e_{\mathrm{cert}} = 0$. Attainment at $\delta = 0$, $k = d$ is part (c) there. (b) Theorem (d), together with Proposition : waits change durations without changing the instrument, so zero wait is admissible. (c) A rejection needs a datum incompatible with (a). Every waiting time is compatible by (b), and a cut dimension below the bound is incompatible by Theorem (b) (check DL-22).

par *Status: proved;* t367u item 6.1, rejected as stated and corrected (PC12-DL-1). The plan's "$(1 - \eta)$ times the ideal inverse capacity" waiting bound is false. The true $(1 - \delta)$ factor multiplies a dimension, and its extrapolation ("a shorter waiting time rejects the certificate") is rejected too (PC12-DL-2). par **Non-claim.** The allowance and the certificate are supplied premises. A waiting-time bound needs a supplied timing contract and a location, as in Theorems and , not a capacity. par

Remark (Documentary cross-reference to Access-Gap-A; version 2). Proposition and Theorem (d) are documentary companions of Access-Gap-A ag:prop:noselect and ag:thm:dust (version 1, local, unregistered) [source record; not a premise]. The first records that, on one fixed host, located circuits give errors 0, $1 - 1/d$ and $1 - 1/d^2$, so no function of R_0 alone determines the error. The second records that the sharp dust-only lower bound in a k-block access class is $1 - k/d$, independent of the dust. The plan names these prop:noselect and thm:dust; the sheet labels carry the prefix ag: (PC9-DL-1). Neither sheet uses the other as a premise.

Deadline inversion on the static patch

Declaration (Located fresh challenge–return task). Prescribe

$\mathrm{d}s^2 = -(1 - R^2/L^2)c^2\mathrm{d}t^2 + (1 - R^2/L^2)^{-1}\mathrm{d}R^2 + R^2\mathrm{d}\Omega^2$, $0 \le R < L$, with the central proper time t as the external clock. A source sits at a separately known radius $R > 0$. A challenge leaves the centre at $t = 0$, the payload may be released only after the source receives it, and the output must be back at the centre by $t = \tau$. All control and

payload influence travels on future causal curves, no payload information was exported earlier, and all assisting registers, channels and failures are included. A lower bound $w_{\min} \geq 0$ on device waiting, in central-clock units, is supplied. Put $T = \tau - w_{\min}$.

par *Status: declaration.*

Theorem (Deadline inversion; F17-14). *For the located task, completion requires*

$$F_R(L) := \frac{2L}{c}\operatorname{artanh}\frac{R}{L} \leq T.$$

For known L this gives the upper bound $R \leq L\tanh(cT/2L)$ *on reachable radius. For known* $R > 0$*, a finite L satisfying exists iff* $T > 2R/c$*. Then there is a unique* $L_{\min}(R,T) > R$ *with* $F_R(L_{\min}) = T$*, and completion forces the horizon lower bound* $L \geq L_{\min}(R,T)$*. Equivalently* $L_{\min} = R/x_*$*, where* $x_* \in (0,1)$ *solves* $\operatorname{artanh}(x_*)/x_* = cT/(2R)$*. The explicit weaker bound is*

$$L \geq \sqrt{\frac{2R^3}{3c\,(T - 2R/c)}}.$$

A one-way source-to-centre task needs only $\frac{L}{c}\operatorname{artanh}(R/L) \leq T$.

Proof. Radial null curves obey $|\mathrm{d}R/\mathrm{d}t| = c(1 - R^2/L^2)$, and causal curves are no faster in R. Each leg therefore takes at least $\int_0^R \mathrm{d}r/(c(1 - r^2/L^2)) = \frac{L}{c}\operatorname{artanh}(R/L)$. Two legs plus waiting give , and inverting the increasing map $R \mapsto F_R(L)$ gives the bound on R. For fixed R, $F_R(L) \to \infty$ as Ldownarrow R and $F_R(L) \to 2R/c$ as $L \to \infty$. With $x = R/L$, $F_R'(L) = \frac{2}{c}(\operatorname{artanh} x - x/(1 - x^2)) < 0$, because $\frac{\mathrm{d}}{\mathrm{d}x}(x/(1 - x^2) - \operatorname{artanh} x) = 2x^2/(1 - x^2)^2 > 0$ and the difference vanishes at 0. Since F_R is strictly decreasing from ∞ to $2R/c$, the existence, uniqueness and lower-bound claims follow. The series $\operatorname{artanh} x \geq x + x^3/3$ gives $F_R(L) \geq 2R/c + 2R^3/(3cL^2)$, and with this gives (checks DL-02, DL-03).

par *Status: proved;* draft theorem held. With $L = c/H$, is Big01-A prop:echo [source record; not a premise] ($T(R) = \frac{2}{H}\operatorname{artanh}(HR/c)$), and the reach bound is Big01-A-DM dmA1:f14-6-deadline(b) (local) [source record; not a premise], $R_{\max} = H^{-1}\tanh(H\tau/2)$, in units $c = 1$. par **Non-claim.** The metric and source position are inputs. The null integration uses no stress decomposition. No identity transfers this metric to I-D's dynamic Host B. par

Theorem (Two-sided explicit bracket for the inverse deadline; F18-5). *Let $T > 2R/c$ and $s = \frac{cT}{2R} - 1 > 0$. Then*

$$\max\{R, \frac{R}{\sqrt{3}s}\} \le L_{\min}(R,T) \le R\sqrt{1 + \frac{1}{3s}},$$

*and the sharper lower bound $L_{\min}(R,T) \ge R/\sqrt{\min\{1, (\sqrt{25 + 180s} - 5)/6\}}$ holds. The lower bound $R/\sqrt{3}s$ coincides with . The inverse $L_{\min}$ is strictly increasing in R and strictly decreasing in T, and both brackets give $L_{\min}/R \to 1$ as $s \to \infty$ and $L_{\min} \sim R/\sqrt{3}s$ as s*downarrow 0.

Proof. Put $y = (R/L)^2 \in (0,1)$. Since $F_R(L) = \frac{2R}{c}\operatorname{artanh}(x)/x$ with $x = R/L$, the equation $F_R(L) = T$ reads $s = \sum_{n\ge 1} y^n/(2n+1)$. Termwise, $y/3 \le s \le \sum_{n\ge 1} y^n/3 = y/(3(1-y))$ and $s \ge y/3 + y^2/5$. The first gives $y \le 3s$. The second gives $y \ge 3s/(1+3s)$. The third gives $3y^2 + 5y - 15s \le 0$, that is $y \le (\sqrt{25 + 180s} - 5)/6$. With $y < 1$ and $L = R/\sqrt{y}$ these are the stated bounds. Moreover $2R^3/(3c(T - 2R/c)) = R^2/(3s)$, since $T - 2R/c = 2Rs/c$. For monotonicity, $\partial_R F_R(L) = 2/(c(1 - R^2/L^2)) > 0$ and $\partial_L F_R(L) < 0$ (Theorem), so the implicit-function formula gives $\partial_R L_{\min} > 0$ and $\partial_T L_{\min} = 1/\partial_L F < 0$. As $s \to \infty$ the upper bound tends to R. As s*downarrow 0 the ratio of the two outer bounds tends to 1 (checks DL-07, DL-08).

par *Status: proved;* draft theorem held. The lower bound coincides with the sheet's explicit bound (DC10-7). par

Non-claim. The bracket concerns the declared static task. It is not a bound from transcript length. par

Corollary (One-sided use of location and timing calibration; F18-6). *Suppose independent calibration certifies $R \ge R_- > 0$ and an available central budget $T \le T_+$. If the task completes, then $T_+ > 2R_-/c$ and $L \ge L_{\min}(R_-, T_+)$. For several separately certified tasks on the same static host, $L \ge \max_j L_{\min}(R_{j,-}, T_{j,+})$. An upper location bound $R \le R_+$ or a lower budget bound $T \ge T_-$ contributes nothing to this lower bound. Without a positive lower location calibration there is no positive horizon lower bound: $L_{\min}(R_-, T_+) \to 0$ as R_-*downarrow 0 *at fixed T_+.*

Proof. Completion gives $F_R(L) \le T \le T_+$. Monotonicity in the source radius gives $F_{R_-}(L) \le F_R(L)$, and $F_{R_-} > 2R_-/c$, so $T_+ > 2R_-/c$. Then Theorem with (R_-, T_+) applies. Several tasks give several valid bounds. If only $R \le R_+$ and $T \ge T_-$ are known, the true R may be arbitrarily small and T arbitrarily large, so by the last assertion the true $L_{\min}(R,T)$ may be arbitrarily close to 0, and no positive lower bound follows. Finally the upper bracket gives

$L_{\min}(R_-, T_+) \le R_-\sqrt{1 + 1/(3s_-)}$ with $s_- = cT_+/(2R_-) - 1 \to \infty$ (check DL-09).

par *Status: proved;* draft corollary held, with the explicit observation that $T_+ \le 2R_-/c$ contradicts completion (DC10-8). par **Non-claim.** Location and timing calibrations are supplied premises, not consequences of the transcript or of the readout quality. par

Theorem (Sharp one-sided calibration; version 2). *Suppose independent calibration certifies only that the true source radius and central budget of a completed located task lie in* $\mathscr{C} = [R_-, R_+] \times [T_-, T_+]$, *with* $0 < R_- \le R_+$ *and* $0 < T_- \le T_+ < \infty$. *Then the set of horizon radii L for which completion is possible for some* $(R, T) \in \mathscr{C}$ *with* $R < L$ *is*

$$\Lambda(\mathscr{C}) = \begin{cases} [L_{\min}(R_-, T_+), \infty), & T_+ > 2R_-/c, \\ \varnothing, & T_+ \le 2R_-/c. \end{cases}$$

Consequently $L \ge L_{\min}(R_-, T_+)$ *is the best possible valid lower bound, and it does not depend on* R_+ *or* T_-. *At known L, the best possible upper bound on the reachable radius is* $L\tanh(cT_+/2L)$, *which depends on* T_+ *only.*

Proof. If $L \in \Lambda(\mathscr{C})$ is witnessed by (R, T), then $F_{R_-}(L) \le F_R(L) \le T \le T_+$, since $F_R(L)$ increases in R (Theorem). Then $T_+ > 2R_-/c$, and $L \ge L_{\min}(R_-, T_+)$ because F_{R_-} decreases strictly in L (Theorem). Conversely, for $L \ge L_{\min}(R_-, T_+) > R_-$ the pair $(R_-, T_+) \in \mathscr{C}$ has $F_{R_-}(L) \le F_{R_-}(L_{\min}) = T_+$, and radial null legs with waiting realize completion. No bound larger than $L_{\min}(R_-, T_+)$ is valid, since $L = L_{\min}(R_-, T_+)$ itself is compatible. The reach statement is the same argument for $R \mapsto F_R(L)$ at fixed L, with $\sup_{T \le T_+} L\tanh(cT/2L) = L\tanh(cT_+/2L)$ attained at T_+ (check DL-14).

par *Status: proved;* the formal sharp form of Corollary (t363u item 6.5; held). par **Non-claim.** The certified box is a supplied premise. Sharpness is relative to the declared static task class, and other task classes (Proposition) have different inverse maps. par

Corollary (What a recovery certificate contributes; F17-15). *Under a located-circuit contract in which the absence of a causal source-to-receiver path implies a replacement channel* $\mathscr{R}(X) = \mathrm{Tr}(X)\omega$, *a complete-channel certificate* $e(\mathscr{N}) < 1 - 1/d^2$ *excludes that absence; in particular the draft's* $e < 1 - 1/d$ *suffices. If* $\frac{1}{2}\|\mathscr{N} - \mathscr{R}\|_\diamond \le \eta$ *for some replacement channel, then* $e(\mathscr{N}) \ge 1 - d^{-2} - \eta$. *The two-leg bound additionally needs the fresh*

challenge–return requirements.

Proof. For a decoded replacement channel, $(\mathscr{D}\mathscr{R} \otimes \mathrm{id})(\Phi) = \omega' \otimes I/d$, whose Bell overlap is $d^{-2}\mathrm{Tr}\,\omega' = d^{-2}$. By Lemma its error is at least $1 - d^{-2}$, which is the contrapositive. Since $\mathscr{D}$ is a contraction, $\frac{1}{2}\|\mathscr{D}\mathscr{N} - \mathrm{id}\|_\diamond \geq \frac{1}{2}\|\mathscr{D}\mathscr{R} - \mathrm{id}\|_\diamond - \eta \geq 1 - d^{-2} - \eta$ (check DL-04).

par *Status: proved;* draft corollary held and sharpened (DC9-6, PC8-DL-1). It agrees with Big01-A thm:Bexact [source record; not a premise], where the exact replacement error is $1 - 1/S$ with $S \geq d^2$. par **Non-claim.** A favourable realized outcome is not a complete-channel certificate. The identity channel and replacement by proj 0 return the same state on the input proj 0, yet their recovery errors differ. Independent channel verification is required. par

Corollary (When transcript length may enter; F17-16). *If an external schedule also guarantees $\tau \leq n\Delta_{\max}$, then a completed located task satisfies $L \geq L_{\min}(R, T_n)$ with $T_n = n\Delta_{\max} - w_{\min} > 2R/c$. A minimum time per step alone does not give this. All bounds of this section are unchanged by stress and current reattributions that fix the metric, location, timing, channel and access contract.*

Proof. $F_R(L) \leq \tau - w_{\min} \leq T_n$, so Theorem applies with the budget T_n. Since F_R is decreasing, $L_{\min}(R, \cdot)$ is decreasing, and $L_{\min}(R, T_n) \leq L_{\min}(R, T)$ is the weaker bound. No quantity in the implication depends on the split or the current attribution (Big01-A-DM dmA1:f14-6-deadline(c) [source record; not a premise]).

par *Status: proved;* draft corollary held. par **Non-claim.** The schedule is a supplied premise, not a consequence of the transcript. par

Theorem (A source proper-time wait gives a stronger deadline inverse; t365u, F20-DL-2). *In Declaration , suppose in addition that the source must wait at least $w_s \geq 0$ of its own proper time, between receiving the challenge and releasing the payload, and let $w_{\min}$ cover only the remaining waits in central-clock units, so $T = \tau - w_{\min}$. Then completion requires*

$$G_R(L) := \frac{2L}{c}\operatorname{artanh}\frac{R}{L} + \frac{w_s}{\sqrt{1 - R^2/L^2}} \leq T.$$

G_R is strictly decreasing on (R, ∞), from ∞ to $2R/c + w_s$. A finite $L > R$ satisfying exists iff $T > 2R/c + w_s$. Then there is a unique $L_w(R, T, w_s)$ with $G_R(L_w) = T$, and completion forces $L \geq L_w$. If $w_s > 0$, then $L_w > L_{\min}(R, T - w_s)$: counting the wait in central units, as Theorem does with $w_{\min} = w_s$, gives a strictly weaker bound. Explicitly,

$$L \geq \sqrt{\frac{2R^3/(3c) + w_s R^2/2}{T - 2R/c - w_s}},$$

which reduces to at $w_s = 0$. The requirement $L > R$ remains in force.

Proof. For a static worldline at radius R, the metric of Declaration gives $d\tau_s = \sqrt{1 - R^2/L^2}\, dt$, and the central worldline has unit lapse, so t is the central proper time. A source wait of w_s therefore lasts $w_s/\sqrt{1 - R^2/L^2}$ in t. The two null legs cost at least $F_R(L)$ (Theorem), which gives . F_R decreases strictly in L, and $(1 - R^2/L^2)^{-1/2}$ decreases in L, so G_R decreases strictly. As Ldownarrow$R$, $G_R \to \infty$, and as $L \to \infty$, $G_R \to 2R/c + w_s$. The existence, uniqueness and lower-bound claims follow. If $w_s > 0$, then $G_R(L) > F_R(L) + w_s$ for every L. At $L = L_{\min}(R, T - w_s)$ this gives $G_R > T$, so $L_w > L_{\min}(R, T - w_s)$. With $x = R/L$, $\operatorname{artanh} x \geq x + x^3/3$ and $(1 - x^2)^{-1/2} \geq 1 + x^2/2$ give $G_R(L) \geq 2R/c + w_s + (2R^3/(3c) + w_s R^2/2)/L^2$. Combined with this yields (check DL-19).

par *Status: proved;* supplement F20-DL-2 held (DC12-DL-3). Version 1 declares waits in central-clock units, so Theorem stays valid as stated. This theorem covers waits fixed in the source's proper time and shows that their redshift strengthens the bound. The explicit form reduces to Theorem at $w_s = 0$ (DC12-DL-7). par **Non-claim.** The wait, the source radius and the clock are supplied premises. Nothing is said about how a device realizes its wait. No transcript length enters, and no field equation is used. par

Proposition (Latency independence has a fixed-channel qualifier; t365u, F20-DL-3).

1. *Inserting idle waits into a protocol does not change its optimized access error if the complete source-to-receiver channel and its eventual output interface stay the same.*

2. *At a receiver interface truncated at a deadline this can fail. For $d = 2$, let an ideal wire deliver the qubit at time t_a, and let the declared receiver hold only a fixed initialized register before t_a. The deadline channel is a*

replacement channel with optimized error exactly $1 - 1/d^2 = \frac{3}{4}$ *before* t_a*, and the identity with error* 0 *after* t_a*.*

3. *One-way eventual access and fresh challenge–return completion by a deadline are therefore different tasks. The waits in the proof of Proposition fall under (a).*

Proof. (a) By Definition , e is an infimum over decoders on the declared interface of a function of the complete channel. If both are unchanged, so is e. (b) Before t_a the receiver's output does not depend on the input, so the channel is $\mathscr{R}_\omega(X) = \mathrm{Tr}\,(X)\omega$, and every decoded version is again a replacement channel. By the proof of Corollary , each has error at least $1 - 1/d^2$. The decoder that discards and prepares I/d attains it: with the Weyl operators $W_{ab} = X^a Z^b$, $\mathscr{R}_{I/d} = d^{-2}\sum_{a,b} \mathrm{Ad}_{W_{ab}}$, so $\mathscr{R}_{I/d} - \mathrm{id} = d^{-2}\sum_{(a,b)\neq(0,0)} (\mathrm{Ad}_{W_{ab}} - \mathrm{id})$. Each term has half diamond norm at most 1, which gives at most $(d^2 - 1)/d^2$. After t_a the channel is the identity. (c) follows from (a) and (b) (check DL-20).

par *Status: proved;* supplement F20-DL-3 held (DC12-DL-4). The value $1 - 1/d^2$ agrees with Corollary , and with Big01-A thm:Bexact [source record; not a premise] at $S = d^2$. par **Non-claim.** "Access error is independent of latency" is valid only under the fixed-channel qualifier. Any radius inference still needs the located fresh-task contract, one-sided calibrations and the inversion of Theorem . par

Corollary (Split and current blindness, explicit; version 2). *Let* $D(\kappa, \sigma, j) = (h, s(\kappa), r(j))$ *be the data map of the uncoupled declaration of Big05-A-DM dmA5:f14-1-joint [source record; not a premise], whose fibres are* $s^{-1}(z) \times \mathscr{S} \times \{r = w\}$*, at fixed host* h*, location, timing and access contract. Then the reach radius* $R_{\max} = L\tanh(cT/2L)$*, the reach area* $4\pi L^2 \tanh^2(cT/2L)$*,* $L_{\min}(R, T)$*, the bracket ,* $\ell_c(R, \Delta)$ *of Proposition , the cut floor* $1 - \min\{k, d\}/d$ *and the prefix range* $(B_\tau, \infty]$ *are constant on every such fibre. Adjoining to the existing data any transcript whose conditional law given those data is one common kernel on the fibre (conditional ancillarity) changes no minimax risk of a split or current target.*

Proof. Each listed quantity is a function of $(L, R, T, \Delta, H_1, \tau, d, k)$, that is, of the metric, the location, the timing and the access contract, all of which are fixed on a fibre. The reach area is $4\pi R_{\max}^2$. The last sentence is

Big-Obs-Fibre-A thm:OF-ancillary [source record; not a premise], re-proved there: simulate the added transcript from the existing data with the common kernel (check DL-15).

par *Status: proved;* it expands Big01-A-DM dmA1:f14-6-deadline(b),(c) [source record; not a premise], stated there in units $c = 1$ with $R_{\max} = H^{-1}\tanh(H\tau/2)$ (PC9-DL-3). par **Non-claim.** Blindness is a property of the declared uncoupled product. A coupled declaration in which a split enters the metric or the circuit is not covered. par

Corollary (Capacity certificates leave horizon futures free; t367u, PC12). *Let a capacity experiment produce a certificate e_{cert}, possibly adaptive and randomized, together with any record. Suppose its complete outcome law depends on the host only through the prefix $a|_{(-\infty,t_1]}$ and is common on the joint split–current fibre.*

1. *For the event-horizon indicator $E = 1[R_e < \infty]$ and two smooth futures agreeing up to t_1 with $E = 1$ and $E = 0$, under prior π on the first, every rule using the certificate succeeds with probability at most* $\max\{\pi, 1-\pi\}$.

2. *On the de Sitter prefix of Theorem (with $t_1 = \tau$), adjoining the certificate leaves the range $(B_\tau, \infty]$ of $R_e(0)$, and every risk on it, unchanged. Imposing the capacity bound of Theorem excludes no future, because it holds with equality on every such host.*

3. *All of this is constant on the joint split–current fibre.*

Proof. (a) Both futures give the rule the same probability p of answering $E = 1$, so the success probability is $\pi p + (1-\pi)(1-p) \le \max\{\pi, 1-\pi\}$. (b) The certificate law is common on futures with a common prefix, so the endpoint lower bounds persist. Theorem (d) realizes the sharp instrument on every host of the class, whatever R_0. (c) R_e and E are functionals of the metric (Corollary) (check DL-23).

par *Status: proved;* t367u item 6.4, held (PC12-DL-4). Part (a) agrees with Big06-B thm:B6B2-futures(a) [source record; not a premise], and (c) with thm:B6B2-futures(d) and Big01-A-DM dmA1:f14-6-deadline(c) [source record; not a premise]. par **Non-claim.** No future is forecast and no horizon is selected. A certificate whose law depends on the future is a different contract and is not covered. par

Dynamic reach, future freedom and analyticity

Theorem (Finite-time reach and future junction data; F17-17). *On the prescribed flat metric* $-c^2\mathrm{d}t^2 + a(t)^2(\mathrm{d}r^2 + r^2\mathrm{d}\Omega^2)$*, a signal emitted at* (t_e, r) *reaches the centre by* $t_o > t_e$ *only if* $r \le \int_{t_e}^{t_o} c/a$*. An instantaneous challenge and return to a comoving source needs* $2r$ *within the conformal budget. If the future is complete and* $R_e(t_e) = a(t_e)\int_{t_e}^{\infty} c/a \in (0,\infty]$*, finite-time reception implies* $R_e(t_e) > a(t_e)r$*; it does not show that* R_e *is finite. On the de Sitter-past class* $a = e^{H_1 t}$ *for* $t \le 0$*, with* $R_0 = c\int_0^{\infty} 1/a$ *and* $t_e \le 0$*, reception of a source at proper distance* $R = a(t_e)r$ *forces*

$$R_0 > \frac{c}{H_1} + (R - \frac{c}{H_1})e^{-H_1 t_e}.$$

For a comoving source on exact de Sitter of radius $\ell = c/H$*, one-way reception within* Δ *is possible iff* $R \le \ell(1 - e^{-c\Delta/\ell})$*. The right side is strictly increasing in* ℓ *with supremum* $c\Delta$*, so for* $R < c\Delta$ *it forces* $\ell \ge \ell_*(R,\Delta)$*, the unique root.*

Proof. Causality gives $|\dot{r}| \le c/a$, and integration gives the first inequality; two legs cover $2r$. The tail $\int_{t_o}^{\infty} c/a > 0$ gives the strict inequality, also when the value is infinite. On the de Sitter-past class, $R_e(t_e) = \frac{c}{H_1}(1 - e^{H_1 t_e}) + R_0 e^{H_1 t_e}$ (Theorem 's splitting at 0), and $R_e(t_e) > R$ rearranges to . For de Sitter, $a(t_e)\int_{t_e}^{t_e+\Delta} c\, e^{-Ht}\mathrm{d}t = \ell(1 - e^{-c\Delta/\ell})$. With $u = c\Delta/\ell$, $\frac{\mathrm{d}}{\mathrm{d}\ell}[\ell(1 - e^{-u})] = 1 - (1+u)e^{-u} > 0$, and the limit as $\ell \to \infty$ is $c\Delta$ (check DL-05).

par *Status: proved;* draft theorem held; and the one-way de Sitter bound are added. They agree with Big01-A thm:Efuture(a) and thm:P1(a) [source record; not a premise]. par **Non-claim.** The lower bound concerns the declared future junction datum. It is not a lower bound from transcript length, and it uses no field equation. par

Proposition (Finite-deadline reach is not the event-horizon radius; t367u, PC12). *On the metric of Theorem with* $a(0) = 1$ *and a complete expanding future, put* $R_T = c\int_0^T \mathrm{d}t/a$ *for a central reception deadline* $T > 0$*.*

1. *A signal emitted at* $t = 0$ *from proper distance* R *reaches the centre by* T *iff* $R \le R_T$*.*

2. $R_T < R_e(0)$ *for every* T*,* R_T *is strictly increasing, and* $R_T$uparrow$R_e(0) \in (0,\infty]$ *as* $T \to \infty$*.*

3. *On the prefix $a = e^{H_1 t}$, $t \le \tau$, of Theorem with $T = \tau$, $R_T = B_\tau = \frac{c}{H_1}(1 - e^{-H_1 T})$. So R_T is exactly the infimum of the range $(R_T, \infty]$ that the observed prefix leaves for $R_e(0)$. A finite-deadline task bounds the reach and gives only the one-sided bound $R_e(0) > R$.*

Proof. (a) Theorem : a radial null ray is the fastest. (b) The tail $c\int_T^\infty \mathrm{d}t/a$ is positive, and $c/a > 0$. Monotone convergence gives the limit. (c) Integrate $e^{-H_1 t}$ on $[0, T]$, and Theorem (check DL-24).

par *Status: proved;* t367u item 6.5, corrected (PC12-DL-5). The reach is defined and proved here. Access-Gap-A version 1 (local, unregistered) has no finite-deadline label. Its related record is the non-claim of ag:prop:noselect [source record; not a premise]: round-trip deadlines do not enter one-way access errors. The plan's Big-Pred-A is a local sheet in progress, is not frozen, and is not cited. par **Non-claim.** The deadline, the location and the future are declared. The reach is a property of the prescribed metric on $[0, T]$, not of any channel, and it identifies no horizon. par

Proposition (Comoving deadline inversion; version 2). *On exact de Sitter of radius $\ell = c/H$ in the flat chart, let a comoving source be at proper distance $R > 0$ from the central comoving observer when the challenge leaves, with instantaneous reflection and central budget $\Delta > 0$. Then:*

1. *the challenge–return task completes within Δ iff $R \le \frac{\ell}{2}(1 - e^{-c\Delta/\ell})$, and the least round-trip time is $T_{\mathrm{com}}(R) = -\frac{\ell}{c}\ln(1 - 2R/\ell)$ for $R < \ell/2$;*

2. *completion forces $R < c\Delta/2$ and $\ell \ge \ell_c(R, \Delta)$, the unique root of $\frac{\ell}{2}(1 - e^{-c\Delta/\ell}) = R$;*

3. *with $s = c\Delta/(2R) - 1 > 0$, $R/s \le \ell_c(R, \Delta) \le 2R(1 + s)/s$;*

4. *for $0 < R < \ell/2$, $e^{HT_{\mathrm{com}}} - e^{HT_H} = 2x^2/((1 - x)(1 - 2x)) > 0$ with $x = R/\ell$ and $T_H = \frac{2\ell}{c}\operatorname{artanh}(R/\ell)$. Consequently $\ell_c(R, \Delta) > L_{\min}(R, \Delta)$: the comoving task forces a strictly larger horizon radius than the static task of Theorem with the same (R, Δ) and no waiting.*

Proof. (a) In conformal time $\eta = -e^{-Ht}/H$, causal curves obey $c|\mathrm{d}\eta| \ge |\mathrm{d}\mathbf{x}|$. The comoving distance is $r = Re^{-Ht_0}$, and a reflected signal needs $c(\eta(t_0 + \Delta) - \eta(t_0)) \ge 2r$, with equality for radial null legs. Since

$c(\eta(t_0+\Delta)-\eta(t_0)) = \ell e^{-Ht_0}(1-e^{-c\Delta/\ell})$, the condition is the stated one. Solving it with equality for Δ gives T_{com}. (b) With $u = c\Delta/\ell$, $\frac{\mathrm{d}}{\mathrm{d}\ell}[\frac{\ell}{2}(1-e^{-u})] = \frac{1}{2}(1-(1+u)e^{-u}) > 0$. The map rises from 0 (as $\ell \to 0$) to $c\Delta/2$ (as $\ell \to \infty$), which gives the root and the equivalence. (c) Put $y = 2R/\ell$ and $\varphi(y) = -\ln(1-y)/y$, so that $T_{\mathrm{com}} = \frac{2R}{c}\varphi(y)$ and $1+\frac{y}{2} \le \varphi(y) \le \frac{1}{1-y}$ on $(0,1)$ (termwise from $\sum_{n\ge 1} y^{n-1}/n$). At ℓ_c, $\varphi(y_c) = 1+s$. The lower estimate gives $y_c \le 2s$, and the upper estimate gives $y_c \ge s/(1+s)$. Then use $\ell_c = 2R/y_c$. (d) $e^{HT_{\mathrm{com}}} = 1/(1-2x)$, $e^{HT_H} = (1+x)/(1-x)$, and $(1-x)-(1+x)(1-2x) = 2x^2$. At $\ell = \ell_c$ one has $R < \ell_c/2$, so $F_R(\ell_c) = T_H < T_{\mathrm{com}} = \Delta = F_R(L_{\min}(R,\Delta))$. Since F_R decreases strictly in L, $\ell_c > L_{\min}$ (check DL-16).

par *Status: proved;* (a) and (d) agree with Big01-A thm:P1(b)–(d) [source record; not a premise], and the static comparison uses Big01-A prop:echo [source record; not a premise]. The inversion (b)–(c) is new here (PC9-DL-7). par **Non-claim.** The comoving and static tasks are different declared task classes on one prescribed background. Neither inversion is a lower bound from transcript length, and no field equation is used. par

Theorem (Future freedom after a finite observed prefix; F17-18). *Fix $H_1 > 0$, $\tau \ge 0$ and the prescribed prefix $a(t) = e^{H_1 t}$ for $t \le \tau$. Among positive smooth expanding extensions with no further rate or energy restriction, $R_e(0)$ takes exactly the range $(B_\tau, \infty]$, $B_\tau = \frac{c}{H_1}(1-e^{-H_1\tau})$. All these futures can agree with the prefix to every order at $t = \tau$, so they give identical past-only experiment laws under a complete common local-process contract. If the whole extension is real analytic on one connected time domain containing the prefix and the future, then $a = e^{H_1 t}$ and $R_e(0) = c/H_1$. Analyticity of the past alone, or equality of all junction jets, does not imply this. Analyticity is sufficient, not necessary: smooth non-analytic extensions with $R_e(0) = c/H_1$ exist. If $h_- \le \dot{a}/a \le h_+$ on $[0,\infty)$ with $\tau = 0$, then $R_e(0) \in [c/h_+, c/h_-]$.*

Proof. Split the integral: $R_e(0) = B_\tau + e^{-H_1\tau}R_e(\tau)$ with $R_e(\tau) \in (0,\infty]$. This excludes values $\le B_\tau$. For realization, let ζ be a smooth nondecreasing switch, zero for $s \le 0$, positive for $s > 0$, and equal to 1 for $s \ge s_1$. Put $B(s) = \int_0^s \zeta$, and set $a_K(\tau+s) = e^{H_1\tau}\exp(H_1 s + (K-H_1)B(s))$, $K > 0$. Its rate $(1-\zeta)H_1 + \zeta K$ is positive, and the flatness of ζ at 0 matches all jets. The tail $\mathcal{I}(K) = c\int_0^\infty e^{-H_1 s-(K-H_1)B(s)}\mathrm{d}s$ is continuous and strictly decreasing in K. It tends to 0 as

$K \to \infty$ by dominated convergence and behaves like a positive multiple of $1/K$ as Kdownarrow0, so every finite tail value occurs. For an infinite tail, use the rate $(1-\zeta)H_1 + \zeta H_1/(1+H_1 s)$, whose scale factor is eventually proportional to $1 + H_1 s$, so $\int 1/a$ diverges. In the analytic case, $a - e^{H_1 t}$ is analytic on a connected domain and vanishes on an open set, so it vanishes identically. The jet-matched smooth family shows that jets alone do not suffice. For non-necessity, take smooth bumps $\varphi_1, \varphi_2 \geq 0$, not identically zero, with $\operatorname{supp}\varphi_2 \subset (\tau, \tau+1)$ and $\operatorname{supp}\varphi_1 \subset (\tau+1, \tau+2)$, and the rate $H_{\lambda,\varepsilon} = H_1 + \varepsilon\varphi_1 - \lambda\varphi_2$ for $0 \leq \lambda \leq \lambda_0 := H_1/(2\max\varphi_2)$ and $\varepsilon \geq 0$; it is positive and matches all jets at τ. Put $\rho(\lambda,\varepsilon) = R_e(0)$, which is continuous and strictly increasing in λ. Then $\rho(\lambda_0, 0) > c/H_1$, since the rate is strictly below H_1 on a set of positive measure and never above it; and for $\varepsilon > 0$, $\rho(0,\varepsilon) < c/H_1$. By continuity in ε, some $\varepsilon > 0$ has $\rho(\lambda_0,\varepsilon) > c/H_1$, and the intermediate value theorem gives $\lambda_* \in (0,\lambda_0)$ with $\rho(\lambda_*,\varepsilon) = c/H_1$. This expanding extension differs from $e^{H_1 t}$ on $(\tau, \tau+2)$, so it is not analytic. The rate bracket follows from $e^{h_- s} \leq a(s) \leq e^{h_+ s}$ (check DL-06).

par *Status: proved;* draft theorem held, with the non-necessity example and the rate bracket added. It agrees with Big01-A prop:Esmooth, prop:Eanalytic and prop:E [source record; not a premise], and with Big01-A-DM dmA1:f14-8-analytic [source record; not a premise]. par **Non-claim.** The analytic conclusion is a restriction on the future class, not a consequence of readout quality or clock consumption, and it needs exact equality with $e^{H_1 t}$ on the prefix (Theorem). Additional energy or rate conditions can shrink the range. There is no transfer to a different dynamic host. par

Theorem (Finite-precision analytic forcing is unstable; F18-7). *Fix $H_1 > 0$, a past interval $[-T_0, 0]$, an integer $k \geq 0$ and a tolerance $\varepsilon > 0$. Consider positive real-analytic expansion rates H on $\mathbb{R}$, with $a(0) = 1$ and $\|H - H_1\|_{C^k([-T_0,0])} < \varepsilon$.*

1. *There are such rates with $R_0 = c\int_0^\infty a^{-1}$ smaller than any prescribed $\rho > 0$, and such rates with $R_0 = \infty$.*

2. *Every value $R_0 \in (0,\infty]$ is realized by some such rate. Hence finite-precision, finite-order past data do not inherit the exact analytic conclusion of Theorem . Over analytic futures ε-close on the past, the risk for R_0 (or for $R_e(t)$, $t \leq 0$) is infinite, exactly as over smooth futures.*

Proof. Take $M > 0$ large and $\eta = M^{-(k+3)}$. Put $H_{+,\lambda} = H_1 + \lambda M \eta e^{Mt}$ and $H_{-,\lambda} = H_1(1 - \lambda\eta e^{Mt}/(1 + \eta e^{Mt}))$ for $\lambda \in [0,1]$. Both are positive, real analytic and equal to H_1 at $\lambda = 0$, and they have scale factors

$$a_{+,\lambda} = \exp(H_1 t + \lambda\eta(e^{Mt} - 1)), \qquad a_{-,1} = \exp[H_1 t - \frac{H_1}{M}\log\frac{1+\eta e^{Mt}}{1+\eta}].$$

On $t \le 0$ the j-th derivative of $H_{+,\lambda} - H_1$ is $\lambda\eta M^{j+1} e^{Mt}$, of modulus at most $\eta M^{k+1} = M^{-2}$ for $j \le k$. The function $u \mapsto u/(1+u)$ composed with $u = \eta e^{Mt} \le \eta$ has j-th t-derivative at most $c_k M^j \eta$, so the H_- family is within $c_k H_1 M^k \eta = c_k H_1 M^{-3}$. For M large both families are ε-close for every λ.

(a) For $t \ge 0$, $a_{+,1} \ge \exp(\eta(e^{Mt} - 1)) \ge 1$. Split at $t_M = M^{-1}\log(1/\eta)$ and substitute $e^v = \eta e^{Mt}$ beyond it:

$$\int_0^\infty a_{+,1}^{-1} \le t_M + \frac{e^\eta}{M}\int_0^\infty e^{-e^v}\mathrm{d}v = \frac{(k+3)\log M}{M} + \frac{e^\eta}{M}\int_0^\infty e^{-e^v}\mathrm{d}v \to 0.$$

Also $\log a_{-,1} \to -(H_1/M)\log(\eta/(1+\eta)) < \infty$ as $t \to \infty$, so $a_{-,1}$ is bounded and $\int_0^\infty a_{-,1}^{-1} = \infty$.

(b) On the + family, $1/a_{+,\lambda} \le e^{-H_1 t}$ for $t \ge 0$. Dominated convergence makes $\lambda \mapsto R_0(+,\lambda)$ continuous on $[0,1]$, from c/H_1 down to $R_0(+,1)$, which is below any prescribed ρ for M large. On the $-$ family with $\lambda \in [0,1)$, $H_{-,\lambda} \ge H_1(1-\lambda)$, so dominated convergence again gives continuity. $R_0(-,\lambda)$ is nondecreasing in λ, and by monotone convergence it tends to $\int_0^\infty c\, a_{-,1}^{-1} = \infty$ as λuparrow 1. By the intermediate value theorem every value in $[R_0(+,1),\infty)$ occurs, and ∞ occurs at $\lambda = 1$. Since $R_0(+,1)$ can be made smaller than any $\rho > 0$, every value in $(0,\infty]$ occurs. Finally, for $t \le 0$, $R_e(t) = a(t)\int_t^\infty c/a \ge a(t)R_0$, which is infinite for $a_{-,1}$, while it is finite for the + family (checks DL-10, DL-11).

par *Status: proved;* the draft theorem held for (a). Part (b), every value, is added (DC10-9). par **Non-claim.** There is no conflict with the identity theorem: these futures approximate the de Sitter past without equalling it. The exact supply "equality on an open interval plus analyticity on one connected domain" is much stronger than any finite-precision past datum. No energy condition is imposed on these comparison families, and no transfer to I-D's Host B is asserted. par

Remark (Reconciliation with Theorem). The analytic clause of Theorem remains correct as stated, because its

hypothesis is exact: $a = e^{H_1 t}$ on the whole prefix, and analyticity on one connected domain. Theorem shows that this hypothesis is not stable. Replacing exact equality by any finite-precision, finite-order closeness of the rate on a past window restores the full range $(0, \infty]$, even inside the analytic class. Analytic rigidity is therefore a property of an exact supply, not of finite data, and it adds nothing to a horizon-radius inference drawn from finite-precision operational records (DC10-10).

Proposition (Analytic instability is an uncertainty statement before it is a risk statement; t365u, F20-DL-4). *A class of positive real-analytic rates with $\|H - H_1\|_{C^k([-T_0, 0])} < \varepsilon$ does not, by that fact alone, define a common data law. Two contracts differ.*

1. *If the data supply only membership in this class, or permit adversarial past-reading error of size ε in $C^k([-T_0, 0])$, all members can share the displayed reading $H_{\text{obs}} = H_1$. The finite values R_0 realized in the class are unbounded, so the minimax absolute risk for R_0 (and for $R_e(t)$, $t \le 0$) on that reading fibre is infinite. No loss at $R_0 = \infty$ is needed.*

2. *If the exact analytic rate on a past open interval is supplied, the identity theorem determines the rate on $\mathbb{R}$, hence R_0. Closeness of many such rates to H_1 does not make their exact readings equal. The risk sentence of Theorem is a statement under contract (i).*

Proof. (i) For each member, the reading error $H_1 - H$ is admissible, so every member displays H_1. By Theorem (b), every finite $R_0 \in (0, \infty)$ occurs. Two accounts with the same reading and finite values R_0, R_0' force every rule to have worst-case error at least $|R_0 - R_0'|/2$, and this is unbounded. For $R_e(t) = c/H_1(1 - e^{H_1 t}) + R_0 e^{H_1 t}$ multiply by $e^{H_1 t} > 0$. (ii) Two real-analytic functions on $\mathbb{R}$ that agree on an open interval agree on $\mathbb{R}$, and a and R_0 are determined by the rate and $a(0) = 1$ (check DL-21).

par *Status: proved;* supplement F20-DL-4 held. It fixes the data contract of the last sentence of Theorem , which is kept verbatim (DC12-DL-5). The upper bound of Proposition (c) holds under either contract. Big-Rad-Current-A version 2 carries the same qualification for its Remark rem:RC-unstable; neither sheet uses the other as a premise.

par **Non-claim.** Neither contract is realized by a described instrument. The supply of an exact analytic function is an idealization, and finite operational records are never of that kind. par

Proposition (A future rate band, not analyticity, restores a finite horizon risk; version 2). *Let* $0 < h_- \le h_+ < \infty$.

1. *If a positive continuous rate satisfies* $h_- \le H \le h_+$ *on* $[0,\infty)$*, then* $R_0 = c\int_0^\infty a^{-1} \in [c/h_+, c/h_-]$ *(with* $a(0) = 1$*). This holds for analytic and non-analytic futures alike, and whatever the precision of the past data.*

2. *Assume in addition the exact de Sitter past* $a = e^{H_1 t}$ *on* $t \le 0$*, with* $H_1 \in [h_-, h_+]$*. Over continuous futures (*$a = e^{Kt}$ *on* $t \ge 0$*,* $K \in [h_-, h_+]$*) every value in* $[c/h_+, c/h_-]$ *occurs. Over* C^∞ *futures with rates in the band, values arbitrarily close to* c/h_+ *and to* c/h_- *occur. In both classes the minimax absolute risk for* R_0 *is exactly* $\frac{1}{2}(c/h_- - c/h_+)$*, and for* $R_e(t)$*,* $t \le 0$*, it is* $\frac{1}{2}(c/h_- - c/h_+)e^{H_1 t}$.

3. *The families* $H_{+,\lambda}$*,* $\lambda \in (0,1]$*, and* $H_{-,1}$ *of Theorem leave every band, since* $H_{+,\lambda} \to \infty$ *and* $H_{-,1} \to 0$ *as* $t \to \infty$*. The rates* $H_{-,\lambda}$ *with* $\lambda < 1$ *tend to* $H_1(1-\lambda)$*, and they obey a band only if* $h_- \le H_1(1-\lambda)$*, in agreement with (a). Over analytic futures that are ε-close on a past window and obey the band, the risk for* R_0 *is at most* $\frac{1}{2}(c/h_- - c/h_+)$.

4. *A floor alone (*$H \ge h_-$ *on* $[0,\infty)$*) forces* $R_0 \le c/h_- < \infty$*, so a horizon exists, for smooth non-analytic futures as well.*

Proof. (a) $e^{-h_+ s} \le 1/a(s) = \exp(-\int_0^s H) \le e^{-h_- s}$; integrate. (b) $a = e^{Kt}$ gives $R_0 = c/K$, which is continuous at the junction and has rate K in the band. For smoothness use $H_\varepsilon = H_1(1 - \chi(t/\varepsilon)) + K\chi(t/\varepsilon)$ with the smooth step χ of Big01-A prop:Esmooth. It is a convex combination of H_1 and K, hence in the band, and equals H_1 on $t \le 0$. Moreover $|\int_0^t H_\varepsilon - Kt| \le |H_1 - K|\varepsilon$, so $R_0 \in \frac{c}{K}[e^{-|H_1-K|\varepsilon}, e^{|H_1-K|\varepsilon}]$. By (a) the range lies in $[c/h_+, c/h_-]$, and its infimum and supremum are the endpoints. The interval lemma gives half the width, and the $R_e(t)$ statement follows from $R_e(t) = c/H_1 + (R_0 - c/H_1)e^{H_1 t}$ (Theorem). (c) $H_{+,\lambda} = H_1 + \lambda M\eta e^{Mt} \to \infty$, $H_{-,1} = H_1/(1+\eta e^{Mt}) \to 0$, and $H_{-,\lambda} \to H_1(1-\lambda)$. The bound follows from (a) and the midpoint rule. (d) This is (a) with $h_+ = \infty$: $1/a \le e^{-h_- s}$ (check DL-17).

par *Status: proved;* (d) agrees with Big01-A-DM dmA1:f14-8-analytic(b) [source record; not a premise] (PC9-DL-4), and (a) with Big06-A prop:DM-v2-horizon(i) as recorded in Big-Obs-Fibre-A. The analytic clause of Theorem is Big01-A prop:Eanalytic(a) and Big01-A-DM dmA1:f14-8-analytic(a) [source record; not a premise].

par **Non-claim.** The rate band is a declared premise on the future, not a consequence of past data or of any field equation. Within the band, analytic futures may realize only part of $[c/h_+, c/h_-]$, and only an upper bound on their risk is claimed. par

Corollary (The instability risk with its exact class; t367u, PC12). *Under contract (i) of Proposition , consider randomized rules with decisions in* $[0,\infty)$ *and relative loss* $|\widehat{Y}/Y - 1|$.

1. *For* R_0 *the absolute risk is infinite, and the relative risk is exactly* 1*, attained only by* 0*. With decisions confined to* $(0,\infty)$ *the relative risk is infinite. For* $R_e(t)$*,* $t < 0$*, the relative risk is* 1*, and every constant in* $[0, 2b_t]$ *attains it, where* $b_t = \frac{c}{H_1}(1 - e^{H_1 t})$.

2. *Adjoining any datum whose complete law is common across the class leaves (a) unchanged. This covers the split and current coordinates and further copies of the displayed past reading.*

3. *Restricting the class by a declared rate band* $h_- \le H \le h_+$ *on* $[0,\infty)$ *lowers the risks for* R_0 *to at most* $\frac{1}{2}(c/h_- - c/h_+)$ *(absolute) and* $(h_+ - h_-)/(h_+ + h_-)$ *(relative). Under contract (ii) both are* 0.

Proof. (a) By Theorem (b) every $R_0 \in (0,\infty)$ occurs on the common reading fibre. For two values $\ell < u$ on the fibre, weighting them by $\ell/(\ell + u)$ and $u/(\ell + u)$ gives every rule weighted loss $(\mathbb{E}|\widehat{Y} - \ell| + \mathbb{E}|\widehat{Y} - u|)/(\ell + u) \ge (u - \ell)/(u + \ell)$. This tends to 1 as ℓdownarrow 0 and $u \to \infty$. The decision 0 has loss exactly 1. If $\widehat{Y} > 0$ with positive probability, the loss $\widehat{Y}/R_0 - 1$ is unbounded as R_0downarrow 0. $R_e(t) = b_t + R_0 e^{H_1 t}$ ranges over (b_t, ∞), and a constant $y \ge 0$ has supremum loss $\max\{|y/b_t - 1|, 1\}$. (b) Endpoint lower bounds persist under a common law. (c) Proposition (a) confines R_0 to $[c/h_+, c/h_-]$, and the midpoint and the harmonic midpoint give the two bounds, with $\tanh(\frac{1}{2}\ln(h_+/h_-)) = (h_+ - h_-)/(h_+ + h_-)$. Contract (ii) determines R_0 (check DL-25).

par *Status: proved;* t367u item 6.3, corrected (PC12-DL-3). The plan's "analytic-instability risk of 1 holds only for

the complete common process; a host-functional restriction can lower it" is corrected as follows. The absolute risk is infinite, and the relative risk is 1 with the class stated. The qualifier is the observation contract. Data with a common law cannot lower the risk. A restriction of the future class (a rate band) or an exact analytic supply can. par **Non-claim.** The band and the contracts are declarations. No finite operational record supplies an exact analytic function, and no future is selected. par

Main theorem

Theorem (Operational-to-geometric implication, proved form). *Under a declared located task with independently supplied location, clock and fresh challenge–return contract:*

1. *a record-only transcript is never subfloor, and subfloor recovery forces a quantum cut of rank* $\geq \lceil d(1-e) \rceil$*, not a radius;*

2. *completion forces* $R \leq L\tanh(cT/2L)$ *and, for* $T > 2R/c$, $L \geq L_{\min}(R,T)$*, with the two-sided bracket . Only a lower location bound and an upper budget bound can be used, giving* $L \geq L_{\min}(R_{-},T_{+})$*;*

3. *a certificate* $e < 1 - 1/d^2$ *excludes a missing causal path, and* $e + \eta < 1 - 1/d^2$ *excludes an η-approximate replacement;*

4. *on FLRW, reception forces* $R_e(t_e) > a(t_e)r$ *and the junction bound . The future freedom after a prefix is* $(B_\tau, \infty]$ *for smooth futures and* $\{c/H_1\}$ *for whole-extension analytic futures;*

5. *all bounds are split- and current-blind;*

6. *exact analytic forcing is unstable: under finite-precision past data, analytic futures realize every* $R_0 \in (0,\infty]$*;*

7. *version 2: the cut floor is sharp for every k and independent of every radius (Theorem). The comoving task forces* $\ell \geq \ell_c(R,\Delta) > L_{\min}(R,\Delta)$ *(Proposition).* $L_{\min}(R_{-},T_{+})$ *is the best possible bound from a certified box (Theorem). All bounds are constant on the joint fibres (Corollary). A declared future rate band restores the finite risk* $\frac{1}{2}(c/h_{-} - c/h_{+})$ *that analyticity cannot provide under finite-precision past data (Proposition). After t365u: with implementation allowance δ the capacity requirement is* $\sum_r p_r k_r \geq d(1 - e_{\text{cert}} - \delta)$ *(Theorem (b)). A source*

proper-time wait strengthens the inverse to $L \geq L_w > L_{\min}(R, T - w_s)$ *(Theorem). Latency changes access only through the channel or interface (Proposition). The infinite instability risk belongs to the membership contract (Proposition). After t367u: capacity bounds no waiting time (Proposition). Prefix-only certificates leave futures free (Corollary). A finite deadline probes* $R_T < R_e(0)$ *(Proposition). The instability risk is infinite (absolute) and* 1 *(relative, class stated), and only a band or an exact analytic supply lowers it (Corollary). The external clock is kept, and Host C is not created.*

Proof. Theorems , , , , , , and Corollaries , , ; for (g), Theorems , , , Propositions , , , and Corollary ; after t367u, Propositions , and Corollaries , .

par *Status: proved.* par **Non-claim.** No spacetime emergence, no removal of the external clock, no quantum coefficient and no Einstein dynamics. No result is transferred to I-D's dynamic Host B. par

appendix

Crosswalk: plan steps to results

toprule Plan step Content Result Verdict

midrule endhead t363u 6.1 import prop:echo, thm:P1, thm:Efuture, prop:Esmooth, prop:Eanalytic Sec. ; Prop. held (PC9-DL-7)

t363u 6.2 cut-rank bound as capacity, independent of radius (thm:A, thm:sharp, thm:access) Thm. held (PC9-DL-2)

t363u 6.3 expand split-blind and analytic clauses (dmA1:f14-6-deadline, dmA1:f14-8-analytic) Cor. , Prop. held (PC9-DL-3, 4)

t363u 6.4 cross-reference prop:noselect, thm:dust Rem. corrected (PC9-DL-1 labels)

t363u 6.5 one-sided calibration as formal statement Thm. held (PC9-DL-6)

t363u cross ancillarity; deadline inversion; smooth vs analytic Sec. ; Cor. held

t362u bracket; one-sided calibration; analytic instability Thm. , Cor. , Thm. held

t361u 9.1 residual: no length-only bound; pure subfloor impossible Thm. , Prop. held

t361u 9.2 two-leg bound; inversions; $(T - 2R/c)^{-1/2}$ Thm. held

t361u 9.3 $e < 1 - 1/d$ certificate; $e + \eta < 1 - 1/d^2$ Cor. held, sharpened (PC8-DL-1)

t361u 9.4 T_n; reattribution blindness Cor. held

t361u 9.5 FLRW strictness; $(B_\tau, \infty]$; analytic c/H_1 Thms. , held

t361u 9.6 no Host B transfer Sec. held

t358u 3.1 recall sources App. held

t358u 3.2 destructive instrument; payload near/beyond horizon Thm. corrected (PC7-DL-3)

t358u 3.3 radius lower bound from length and floor Thm. , Prop. superseded (PC7-DL-4, 5)

t358u 3.4 split independence Cor. held

t358u 3.5 analytic past collapses to c/H_1 Thm. superseded (PC7-DL-8)

bottomrule

Plan corrections

PC7-DL-1 (name) Plan name "Horizon-Deadline-A"; the sheet keeps the name I-D-Deadline-A.

PC7-DL-2 (scope) The I-D Host A/B results are not used. I-D def:interface is a documentary template only.

PC7-DL-3 (corrected) The literal premise "a transcript with error below $1 - 1/d$" is empty for record-only access. With a quantum residual it carries no geometric content. The valid inference is the quantum-cut requirement (Theorems ,).

PC7-DL-4 (superseded by t361u) Direction: the task bounds the reachable radius from above and the horizon radius from below, and only with supplied location and timing contracts.

PC7-DL-5 (superseded by t361u) No bound depends on transcript length alone (Proposition). Length enters only through $\tau \le n\Delta_{\max}$.

PC7-DL-6 (record) The latency (Big01-A prop:echo, thm:P1) and access laws (I-C thm:A, I-C-Ex thm:sharp, I-C-Th thm:access, Big01-A thm:Bexact) were verified on the site records listed in Appendix .

PC7-DL-7 (corrected) Split independence holds for the latency and access bounds at fixed metric and contract. Neither a horizon radius nor positive dust alone gives a channel bound (Proposition).

PC7-DL-8 (superseded by t361u; PC5-5) "Analytic past" must be "analytic on the whole connected extension". It is sufficient, not necessary. A finite smooth prefix leaves $(B_\tau, \infty]$, not the full range (Theorem).

PC7-DL-9 (direction) All implications are necessary conditions for completion, not sufficient ones.

PC7-DL-10 (boundary) The external clock is kept, and Host C is not created.

PC8-DL-1 (strengthened) t361u step 9.3, "$e < 1 - 1/d$ excludes absence of a causal path", holds and is not sharp: $e < 1 - 1/d^2$ already suffices (Corollary).

PC9-DL-1 (label) The plan's Access-Gap-A prop:noselect and thm:dust are ag:prop:noselect and ag:thm:dust in Access-Gap-A version 1 (local, unregistered; site GET 404). They are cited in that form (Remark).

PC9-DL-2 (scope) I-C thm:A concerns classical-output channels. I-C-Ex thm:sharp states attainability "by a finite-outcome instrument", and its own construction is not reproduced. Theorem (c) proves attainability locally with a different, explicit instrument.

PC9-DL-3 (units) Big01-A-DM dmA1:f14-6-deadline uses $c = 1$ and writes $R_{\max} = H^{-1}\tanh(H\tau/2)$. With $L = c/H$ and $T = \tau$ this is $L\tanh(cT/2L)$.

PC9-DL-4 (scope) Big01-A-DM dmA1:f14-8-analytic(b) needs a declared future rate floor. It is imported as Proposition (d), and it is not a consequence of past data (Theorem).

PC9-DL-5 (record) The overlays Big01-A-DM and Big05-A-DM now answer the read-only site GET (HTTP

200). They are byte-identical to the local version-2 overlays used in version 1, and the site records are used.

PC9-DL-6 (already present) The one-sided calibration corollary was Corollary . Version 2 adds the sharp formal statement (Theorem): only $R \geq R_{-}$ and $T \leq T_{+}$ are usable, and the resulting bound cannot be improved.

PC9-DL-7 (scope) Big01-A thm:P1 concerns comoving receivers on exact de Sitter, which is a task class different from the static patch. Its inversion (Proposition) is a separate result, not a strengthening of Theorem .

Integration of the user draft t360u (F17, DC9)

Draft findings_t360u.tex, sha256 652d5f7b6031a5156ed93709c358779def1445d9c0344cafad3de7fee05f8551, section "Horizon-Deadline-A" and its row of "Exact release". toprule Item Draft statement Here Verdict

midrule endhead F17-11 record-only premise empty; residual instrument Thm. held

F17-12 cut-rank bound Thm. held

F17-13 no length-only bound Prop. held

F17-14 deadline inversion; $L_{\min}$; explicit bound Thm. held

F17-15 causal certificate Cor. held, sharpened

F17-16 length–clock budget Cor. held

F17-17 FLRW reach Thm. held, extended

F17-18 finite-prefix freedom; analytic rigidity Thm. held, extended

F17-21 release row Horizon-Deadline-A abstract; Thm. held

bottomrule

DC9-6 (strengthening) The certificate threshold $1 - 1/d$ can be weakened to $1 - 1/d^2$.

DC9-7 (extension) Added: the junction bound , the one-way de Sitter bound with ℓ_*, the non-analytic example with $R_e(0) = c/H_1$, the rate bracket and Proposition .

DC9-8 (editorial) The citation disclaimer sentence, the author line and the alias note are added. The draft's web-search comment lines are not reproduced; the external works are cited directly with tracking parameters removed.

Integration of the user findings t362u (F18, DC10)

Draft findings_t362u.tex, sha256 c4d87c50fb879f5bc06f2d007c0cfae9a9a704f35f255c841065aa3b1211d6d0, section "Horizon-Deadline-A: explicit inverse brackets and instability of finite-precision analytic forcing" (draft labels thm:inverse-bracket, cor:uncertain-deadline, thm:analytic-instability). toprule Item Draft statement Here Verdict

midrule endhead F18-5 two-sided bracket; sharper lower bound; monotonicity Thm. held

F18-6 one-sided use of R_{-}, T_{+}; several tasks; degeneration Cor. held

F18-7 analytic futures ε-close on the past with small or infinite R_0 Thm. (a) held

F18-7' reconciliation with the analytic clause Rem. held (clause kept, qualified)

bottomrule

DC10-7 (consistency) The bracket's lower bound $R/\sqrt{3}s$ is the sheet's explicit bound .

DC10-8 (completion) $T_{+} \le 2R_{-}/c$ contradicts completion. Upper location and lower budget bounds contribute nothing.

DC10-9 (strengthening) Every $R_0 \in (0, \infty]$ is realized by analytic futures ε-close on the past (interpolation in λ).

DC10-10 (reconciliation) Theorem 's analytic clause needs exact equality on the prefix. It is not contradicted; it is shown to be unstable.

DC10-11 (editorial) The draft's author line, ledger and citation disclaimer are supplied.

Integration of the user supplement t365u (F20, DC12)

Supplement findings_t365u_B.tex, "Ten-Sheet Version-2 Supplement", sha256 41ebf0aff2e67c3b7d501d1cbe69d13b0ff76a9a85e5c53cc7f5c0dd29e64a8f (bundled in sources/), section "I-D-Deadline-A: approximate capacity and source-clock waiting". Each item is proved again here and checked. The supplement's bibliography keys are not copied. toprule Item Supplement statement Here Verdict

midrule endhead F20-DL-1 weighted capacity with allowance δ; $\sum p_r k_r \geq d(1 - e_{\mathrm{cert}} - \delta)$, $m \geq \lceil d(1 - e_{\mathrm{cert}} - \delta) \rceil$ Thm. (b) held; merged in weighted form (DC12-DL-1, 2)

F20-DL-2 source proper-time wait; existence iff $\tau > 2R/c + w_s$; explicit bound Thm. held; comparison with version 1 added (DC12-DL-3, 7)

F20-DL-3 latency independence only for a fixed channel; deadline counterexample $\frac{3}{4}$ versus 0 Prop. held; attainment of $\frac{3}{4}$ proved (DC12-DL-4)

F20-DL-4 instability: uncertainty before risk; membership versus exact analytic supply Prop. held; scope of Thm. (DC12-DL-5)

bottomrule

DC12-DL-1 (merge) thm:DL-approx-cut overlaps Theorem (a),(b). Version 2 had the allowance only with a single rank k. Part (b) now carries the stronger weighted form with δ and the rearranged requirements, and the single-rank form is kept as a special case. No new label.

DC12-DL-2 (precision) The weights $p_r = \mathrm{Tr}\,\mathcal{N}_r'(I/d)$ belong to the declared cut channel $\mathcal{N}'$, not to the implemented channel. The supplement writes them this way, and (b) keeps that convention.

DC12-DL-3 (new; version~1 unchanged) Version 1 declares the wait $w_{\min}$ in central-clock units, so Theorem stays correct. Theorem treats a wait fixed in source proper time. It shows that the redshift factor strictly strengthens the bound, $L_w > L_{\min}(R, T - w_s)$, and it combines the two kinds of wait through $T = \tau - w_{\min}$. The

supplement states the case $w_{\min} = 0$.

DC12-DL-4 (completed) The supplement states the deadline-channel error $\frac{3}{4}$. The lower bound comes from the Bell test, and the attaining decoder (prepare I/d, Weyl twirl) is added in Proposition (b).

DC12-DL-5 (scope) The last sentence of Theorem (infinite risk over analytic futures ε-close on the past) is a statement under the membership/adversarial-reading contract of Proposition (i). The statement is kept verbatim, and its reading is fixed here. Under exact analytic supply the analytic clause of Theorem applies.

DC12-DL-6 (not copied) The supplement's source keys (AccessRecords and others) are replaced by the verified labels of Appendix . Its evidence boundary states that nothing was rerun there; every item is rerun here (checks DL-18 to DL-21).

DC12-DL-7 (consistency) The explicit bound reduces to at $w_s = 0$. The existence threshold $T > 2R/c + w_s$ reduces to that of Theorem at $w_s = 0$.

Integration of the expansion plan t367u (PC12)

Plan PLAN_t367u_ten-v2-expand.md, sha256 a5a801bb7aa8a5a3923c593292bbce7f78ce98ea0c41854d8ed15483c7af9adf, section 6 and the cross-cutting requirements (bundled in sources/ with its note). The note records that the plan's middle sections could not be compared verbatim with the request record. Each item is therefore checked against the sheet, the supplement t365u and the source records. All additions are insertions. toprule Plan item Content Here Verdict

midrule endhead 6.1 waiting time $\geq (1 - \eta) \times$ ideal inverse capacity Prop. ; Thm. (b) rejected; corrected form (PC12-DL-1)

6.2 source proper-time inverse as a corollary of thm:DL-inverse Thm. held (an extension; PC12-DL-6)

6.3 instability risk 1 only for the complete common process Cor. ; Prop. corrected (PC12-DL-3)

6.4 split-blind deadline statements; futures non-identifying after the capacity bound Cor. ; Cor. held (PC12-DL-4)

6.5 horizon radius versus finite-time reach R_T Prop. held; sources corrected (PC12-DL-5)

6.x explicit waiting bound in η; a shorter wait rejects the certificate Prop. (b),(c) rejected (PC12-DL-2)

cross labels, joint-law hypotheses, insertion only App. held (PC12-DL-7, 8)

bottomrule

PC12-DL-1 (rejected; corrected form) "A channel only η-close to a perfect cut still forces a waiting time at least $(1-\eta)$ times the ideal inverse capacity" is false. Theorem (d) and Proposition realize every capacity value with zero wait on the central worldline. The proved statement is about dimension: $\sum_r p_r k_r \geq (1-\delta-e_{\mathrm{cert}})d$, with the factor $(1-\delta)$ at $e_{\mathrm{cert}} = 0$ (Proposition).

PC12-DL-2 (rejected) There is no explicit waiting bound as a function of η and the capacity, so a shorter observed wait rejects nothing. The valid rejection uses a cut-dimension reading.

PC12-DL-3 (corrected) The instability risk is infinite in absolute loss, and its relative value 1 is stated with its class (decisions in $[0,\infty)$, attained only by 0). The qualifier is the observation contract of Proposition . Data with a common law cannot lower the risk. A future rate band or an exact analytic supply can (Corollary).

PC12-DL-4 (held) Big06-B thm:B6B2-futures(a),(d) and Big01-A-DM dmA1:f14-6-deadline(c) [source record; not a premise] exist. Their content is re-proved for prefix-only capacity certificates in Corollary .

PC12-DL-5 (sources corrected) Access-Gap-A version 1 has no finite-deadline distinction. Its only related record is the non-claim of ag:prop:noselect, under which round-trip deadlines do not enter one-way access errors. Big-Pred-A is a local sheet in progress, is not frozen, returns 404 on the site, and is not cited. The reach R_T is defined and proved locally (Proposition).

PC12-DL-6 (placement) The plan calls the source proper-time inverse a corollary of thm:DL-inverse. It is an extension: it reduces to that theorem at $w_s = 0$ and is strictly stronger for $w_s > 0$. It stays a theorem (Theorem).

PC12-DL-7 (labels verified) A fresh read-only GET on 25 October 2026 returned bytes identical to the bundled Big01-A-DM and Big06-B snapshots. thm:B6B2-futures and dmA1:f14-6-deadline exist, and ag:prop:noselect

exists in the bundled local Access-Gap-A version 1. The plan's "Access-Gap-A finite-deadline distinction" has no label (PC12-DL-5).

PC12-DL-8 (cross-cutting) Every new result states its common-law or prefix-only hypothesis, and every relative value 1 states its class. No v1 statement is changed, and no ledger status changes.

Capacity on both Series-ID carriers

New in version 3. The radius-independent capacity floor $1 - k/d$ (and its weighted / approximate forms) is stated for *both* Series-ID carriers: the axis-filled cylindrical geometry and the two-ended compact-axial toroidal bridge. The statement is the same access law on each declared carrier; it does not identify the carriers, and it does not transfer a conical kernel. The de Sitter past remains a *declared comparison*, not Host A and not Host B. Split blindness is retained.

Version 1 to version 2

Every version-1 label, statement and proof is kept unchanged, apart from the added clause (g) of Theorem and its proof reference. Version-1 tex sha256: 900857f7f8f52fc1cbec094b8b3aafcc2ce2df08f0626dc99ab3d793fe166e2b (frozen; bundled as sources/I-D-Deadline-A-v1.tex). toprule Version-1 result Version-2 status

midrule endhead Lem. , Thms. , kept; Thm. added

Props. , kept; Rem. added

Thms. , , Cor. kept; Thms. , added

Cors. , kept; Cor. , Prop. added

Thm. kept; Prop. added

Thms. , , Rem. kept; Props. , added; contract of the risk sentence of Thm. fixed (DC12-DL-5)

Thm. kept; clause (g) added

bottomrule

Source records and label audit

Version 2. A fresh read-only GET on 25 October 2026 (request t363u) returned the same bytes for every site record listed below. It also returned HTTP 200 for the overlays Big01-A-DM (4150268c87e3d746bf3829798022891668a95ae620ac646a1439420adc256de9) and Big05-A-DM (0cfaecac9b3444521207b0d860ad0f10642e5c24fe851df770bb986a8ec71e6b), byte-identical to the local version-2 overlays (PC9-DL-5). Version-2 labels verified on these snapshots: prop:echo, thm:P1, thm:Efuture, prop:Esmooth, prop:Eanalytic (Big01-A); thm:A (I-C); thm:sharp (I-C-Ex); thm:access (I-C-Th); dmA1:f14-6-deadline, dmA1:f14-8-analytic (Big01-A-DM); dmA5:f14-1-joint (Big05-A-DM). Local unregistered companion sheets (site GET 404), version 1: Access-Gap-A (ag:prop:noselect, ag:thm:dust; d45ba0d98e710f19e063b67f33aa6b8a2f98462b951a9fc60f3d461318b132e7), Big-Obs-Fibre-A (thm:OF-ancillary; 19718ca469154a14631a3f807a0dabe76e7111428e55f383f7d5e8f21a9c0b79), Big-Rad-Current-A (rem:RC-unstable; 63c216492fa073757c27b56d765e3e3ef1729c0a1d8b770788ebd5edef3cf851). XVI-N-COMPACT is named only through the cross-cutting rule.

t367u. Big06-B version 2, d1ba926d54b619500a7283b062543792e382047043df521f6e138bc8400daf6b (fresh GET, byte-identical to the bundled snapshot), is cited for thm:B6B2-futures (Corollary).

Version 1. Site records (read-only GET, 25 October 2026): Big01-A version 7, 7d3989b447c4a0dd282b1ffeb97eb38d1b303986b82be3130d8db7a5e952169a; I-C version 2, d6535e00b845bfcf005d90efa39cb4092f0118a4177c0613809efa83ceb2bf8b; I-C-Ex version 2, 6ed93b495d1ea4a0603b5f22cdb12102e5497656b365b7b1a2d248a161f568e2; I-C-Th version 1, 7f00a82de1601261625dce6bd0e8c104fcb1192d9845417c827d37d289fef2f0; I-D version 5, b87e0d92b2c78f2500ba9622e0fb57a8ae4d345fbb88074026e1518fdcd1fdbb. Local unregistered: Big01-A-DM version 2, 4150268c87e3d746bf3829798022891668a95ae620ac646a1439420adc256de9. I-D-B, I-D-C, I-C-B and I-C-Ex-B returned HTTP 404 and are not used. Labels checked: prop:echo, thm:P1, thm:Bexact, thm:Efuture,

prop:E, prop:Esmooth, prop:Eanalytic (Big01-A); thm:A (I-C); thm:sharp, def:cut (I-C-Ex); thm:access (I-C-Th); def:interface, thm:instrument (I-D); dmA1:f14-6-deadline, dmA1:f14-8-analytic (Big01-A-DM). The user draft t359u (sha256 000b3f956c6d8c299369664f31f77088fd9661f83c2d2bc8e5dfe94690f5801b) is cited for prop:geometry-channel and thm:dust-access only.

Checks

The program checks_I-D-Deadline-A-v2.py (an extension of the frozen version-1 program, which is kept in backup/) verifies the cut-rank and replacement bounds on random Kraus channels, the monotonicity of F_R, $L_{\min}$ and the explicit bound, ℓ_*, B_τ and the smooth-family tail limits. It also checks the labels, ledger and required sentences, with negative controls and mutations. Version 2 adds checks DL-12 to DL-17 and the version-2 label audit, the t365u integration adds checks DL-18 to DL-21, and the t367u plan adds checks DL-22 to DL-25. Results are in checks_I-D-Deadline-A-v2.json.

Closing ledger

Standing ledger. Host A and Host B remain separate prescribed backgrounds; Host C is not created; O.1 stays NOT_CLOSED; XVI-N is not discharged; XV-B is not opened; Gate 0 and ST4b stay NOT_SUPPLIED; no quantum coefficient is admitted; no Einstein dynamics or derived metric is claimed; spacetime emergence is refused. No quantum coefficient is admitted. Citations identify source records only; no proof transfer.

References

[1] M. Horodecki, P. W. Shor and M. B. Ruskai, Entanglement breaking channels, *Reviews in Mathematical Physics* **15** (2003), 629–641. Source record; not a premise.

[2] J. Watrous, *The Theory of Quantum Information*, Cambridge University Press, 2018. Source record; not a premise.

[3] N. Cheung, Big01-A: Horizon-Bounded Capacity on a Prescribed de Sitter Host, in *The Finite Box and What*

Must Be Supplied for: Capacity, Access and Futures, Cheung Ngo Medical Limited (2026). Source record; not a premise.

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

[5] N. Cheung, IC-Ex-v2: Sharp Access Bounds, Residual Capacity, and Nine Extensions of Destructive Enter, in *The Shredder Philosophy: Destructive Readout and Classical Access*, Cheung Ngo Medical Limited (2026), p. 50. Source record; not a premise.

[6] N. Cheung, I-C-Th: Thermal and reservoir accounting for destructive Enter, in *The Shredder Philosophy: Destructive Readout and Classical Access*, Cheung Ngo Medical Limited (2026). Source record; not a premise.

[7] 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.

[8] N. Cheung, Big01-A-DM and Big05-A-DM (version 2 overlays), in *The Finite Box and What Must Be Supplied for: Capacity, Access and Futures*, Cheung Ngo Medical Limited (2026). Source record; not a premise.

[9] N. Cheung, Access-Gap-A, Big-Obs-Fibre-A and Big-Rad-Current-A (version 1), Cheung Ngo Medical Limited (2026). Source record; not a premise.

[10] User findings drafts t360u and t359u. Source record; not a premise.

[11] Expansion plan t367u, PLAN_t367u_ten-v2-expand.md. Source record; not a premise.

[12] User supplement t365u, Ten-Sheet Version-2 Supplement. Source record; not a premise.

[13] User findings t362u, Ten-Sheet Supplement: Additional Findings. Source record; not a premise.