D3 Charge-Frame AdS4 Parent and Quantum Hamiltonian Closing Record

A universal-lapse null theorem and an STF propagation template

Z. Paz · ORCID 0009-0003-1690-3669 V3.0 2026

STF D3 Charge-Frame, AdS_4 Parent, and Quantum-Hamiltonian Closing Record

---

V3.0 final standalone consolidation: from the selector no-go to a coefficient-exact parent and a verified finite-rank quantum frontier

Z. Paz

Version 3.0 — 25 August 2026

S
closu

This
supe
Char
Sele
Reco
Conc
V2.0
stan
this l
every
audit
the r
histo
corre
realiz
cond
cons
unatt

alter
silen

The
docu
closi
cons
new
colle
post-
comp
five-l
the fa
litera
uplift
repla
D3/D
pare
and r
magr
pure
trunc
the lo
sourc
exac
coeff
matc
corre
sourc
core,
ident
the ra
the fi
quan
prog
rigid-
stopp

No n
oper
oper
prom
cons
final
four
disjo

1. **de**
coef
resu
analy
com
mac
prov
obst
limit
prop
oper

with
requ

The
close
that

Abstract

V2.0 established a scoped selector no-go. A determinant-one D3 duality metric gives the reciprocal unordered symmetric-square spectrum

$$\{\alpha^{-1}, 1, \alpha\},$$

but the audited integral, energetic, compactification, Schwinger–Keldysh, duality-wall and primitive real-structure mechanisms do not derive the ordered retarded/advanced charge frame. The surviving local route was a level-one inverse-S BF wall with a spherical $SU(2)_R$ compensator, conditional on a physical action and ultraviolet parent.

The post-V2.0 program first supplied that action locally. A compact differential-character lock has full topological Dirac rank and zero local mode. An opposite-mass D3/D5 defect pair induces the primitive mixed matrix

$$X = \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$$

without diagonal or local gravitational parity terms. A finite spectator D3 segment between NS5 branes supplies the compact multiplier, and an exact ten-dimensional projector calculation leaves four real supercharges after the spherical spin/R twist. This is a genuine local Hanany–Witten module. It is not a literal flat spherical brane: fixed-charge D3 and D5 energies are radial-monotone, free NS5 endpoints do not hold a noncollapsed tube, antipodal flat-space kappa projectors have no common Killing spinor, and freezing the radius violates the normal Ward equation.

The correct parent replacement is the exact half-BPS Type-IIB family

$$AdS_4 \times S^2_H \times S^2_C \times \Sigma.$$

Its global boundary supplies the intrinsic cylinder $\mathbb{R}_t \times S^2$, and its minimal good selector theory is three-dimensional $\mathcal{N} = 4, U(1)$ SQED with three hypermultiplets,

$$\rho = [1,1,1], \qquad \hat{\rho} = [2,1], \qquad e = 1.$$

The aligned target and regulator masses preserve the primitive parity factorization

$$X + X - X = X.$$

The unit boundary monopole cannot be filled by a smooth source-free linearized Abelian Cartan field on the global-AdS_4 spatial ball. Stokes' theorem forces zero flux and the singular representative has energy diverging as $1/\epsilon$. This is a flux-sector obstruction, not a non-Abelian no-go. Smooth fixed-AdS_4 nonlinear cores exist, and the universal half-maximal theorem together with the explicit DEG generalized frame establishes a nonlinear pure $D = 4, \mathcal{N} = 4, SO(4)$ consistent truncation around every DEG solution. The ordinary forced quintet is therefore not a Type-IIB truncation obstruction. The missing mass triplets are instead localized D5 displacement fields with

$$m_\Phi^2 L^2 = -2, \qquad (\Delta_-, \Delta_+) = (1, 2).$$

The smooth closed-string matter-section route fails as formulated, and a rank-complete smooth $SU(3)$ flavor extension exceeds the six-multiplet half-maximal bound. The localized route is the correct one. Its classical DEG throat fixes a positive logarithmic slope,

$$g_{F,\mathrm{bare}}^{-2}(r) = \kappa_F |\log r| + C_F + o(1),$$

but not C_F. Hence a coefficient-complete action derived from the bare singular throat fails. Exact S^3 data repair the quadratic coefficient and correct the physical current algebra from a positive $U(3)$ block to $\mathfrak{su}(3) \oplus \mathfrak{u}(1)_{\mathrm{top}}$. With

$$P = I - \frac{1}{3}\mathbf{1}\mathbf{1}^T,$$

the exact match is

$$H_m = \frac{3\pi^2}{4} P, \qquad \tau_F = \frac{3}{2} P, \qquad g_{4,F}^{-2} = \frac{3}{16} P,$$

and

$$g_{4,\mathrm{top}}^{-2} = \frac{1}{4} - \frac{2}{\pi^2} > 0.$$

The exact $SU(2)_C$ normalization is

$$C_T = 54 - \frac{192}{\pi^2}, \qquad g_C^{-2} = \frac{9}{64} - \frac{1}{2\pi^2}.$$

For the retained benchmark $M/m = 4$, $mL = 1$, this fixes

$$\alpha_{\mathrm{eff}}^2 = \frac{392\pi^2}{9\pi^2 - 32} = 68.0824797716085.$$

The corrected fixed-AdS_4 boundary problem uses

$$\phi(r) = \frac{\alpha}{r} + \frac{\beta}{r^2} + \cdots,$$

not a constant Higgs value. It has the exact zero-source core

$$w_0(r) = \frac{1}{\sqrt{1 + r^2}}, \qquad \phi_0 = 0, \qquad \frac{E_0}{4\pi} = \frac{3\pi}{8},$$

and a regular high-source solution at the coefficient-fixed α_{eff}. The holographically renormalized fixed-source radial quadratic form has no negative eigenvalue at all three tested resolutions. This is a reduced nonlinear seed, not a backreacted ten-dimensional solution.

The exact constant-mass generating functional is also known. Through sixth order,

$$F = \log 16 + \frac{3\pi^2}{8} p_2 - \frac{3\pi^4}{128} p_2^2 + \pi^6 \left(\frac{11}{3840} p_2^3 - \frac{1}{320} p_3^2 \right) + O(m^8).$$

It does not uniquely reconstruct a local nonlinear action because constant sources do not separate contact and exchange contributions. The protected four-point tensor is exact,

$$\mathbf{G}_{\mathrm{TQM}} = \left(8, 0, \frac{40}{9}, -8, 0 \right),$$

but the topological projection erases every $\mathcal{A}$-type and long $\mathcal{L}$-type block. A universal commuting D5 DBI quartic tensor is known at leading order, yet its coefficient depends on an independent open-string scale and the finite three-D5 throat has no controlled classical curvature expansion. A rank lift can preserve the primitive level through $(n, n, 2n-1)$, but the same one-node DEG selector necessarily retains singleton NS5 throats and cannot become uniformly classical without changing the quiver representation.

The surviving exact continuation is therefore quantum. The physical target is the ordinary finite-source two-Cartan kernel

$$K^{IJ}_{q_C=-1}(\omega; m, \zeta), \qquad I, J = 1, 2,$$

in external $SU(2)_C$ flux $q_C = -1$, dynamical SQED flux $p_{\mathrm{dyn}} = 0$, a distinct-mass chamber and small nonzero FI parameter. The zero-source request for one isolated neutral $SU(3)$-adjoint pole is ill posed because the conformal wall has noncompact ungapped loci. The cohomological B-twist Hamiltonian is not the ordinary non-BPS Hamiltonian.

The finite-rank architecture has nevertheless been verified. Coulomb-gauge Hodge reduction and exact Gauss-law solution give a positive Coulomb kernel on globally neutral states. Raw charged-harmonic projections fail by local gauge leakage, while the Feshbach resolvent gives the exact projected closure. The persistent separated counterterm problem has rank seven; two pure gravitational contacts complete the continuous absolute-stress problem to rank nine after explicit scheme choices; parity-odd contacts form an integer affine lattice. A globally neutral Fock enumerator, Hermitian matrix assembler and two-source Lanczos/Stieltjes engine pass dense-resolvent, positivity and moment-sum tests. Their displayed spectrum is benchmark-only.

The last audit fixes the microscopic representation assignment and the remaining ambiguity. Hypermultiplet bosons are $(\mathbf{2}_H, \mathbf{1}_C)$ and therefore have scalar bundle degrees $(0,0,0)$; the triplet source and vector scalars are $(\mathbf{1}_H, \mathbf{3}_C)$ with degrees $(0,-1,+1)$. The ordinary lowest degeneracies are consequently $(1,1,1)$ and $(1,2,2)$, whereas protected holomorphic triplet counts are $(1,0,2)$. The spatial flux alone does not fix the ordinary Hessian: rigid-supergravity auxiliary and temporal data can vary while q_C stays fixed.

The exact closing verdict is

V2.0 audited direct selector routes	**CLOSED/SCOPED**,
exact massless DEG parent and pure nonlinear gauge truncation	**GO**,
quadratic $SU(3) \oplus U(1)_{\mathrm{top}}$ and $SU(2)_C$ coefficients	**EXACT**,
coefficient-fixed reduced monopole core	**GO**,
finite-rank Gauss/Feshbach/counterterm/Lanczos machinery	**VERIFIED**,
physical finite-source SQED kernel	**OPEN**,
nonlinear open--closed source action and Einstein backreaction	**OPEN/PAUSED**,
complete D3/D5/NS5 mass--monopole STF parent	**NOT ESTABLISHED**.

This is a positive closure: the parent was replaced, the protected normalizations were made exact, the reduced nonlinear seed survived those normalizations, and the remaining quantum computation has a tested architecture. It is not a microscopic uplift claim and not a framework-wide no-go.

---

1. Editorial architecture

This V3.0 synthesis retains the V2.0 house discipline and adds three rules required by the enlarged record.

Choice 1 — inherited theorems are not rederived

V2.0's reciprocal channel theorem, fourfold endpoint minimum, charge-order correction, compactification/SK no-selection results, real-structure obstruction, local inverse-S wall, Euler obstruction and bundle-level $SU(2)_R$ compensation are treated as fixed inputs. The present paper states their current grades and follows the surviving route.

Choice 2 — replacement is not reversal

The intrinsic AdS_4 boundary cylinder does not rescue the failed material D3 sphere in flat space. It replaces that realization by a different exact Type-IIB parent. Both statements remain true.

Choice 3 — field-category statements are explicit

The pure DEG generalized frame is a closed-string truncation. The D5 displacement is an open-string worldvolume field. A smooth generalized section, a localized brane source, a renormalized boundary current, and a finite Hamiltonian degree of freedom are not interchangeable descriptions.

Choice 4 — exact coefficients, reduced solutions and uplifts are distinct

An exact CFT two-point coefficient is not an all-order local action. A regular fixed-background monopole is not an Einstein solution. A pure consistent truncation is not a localized mass deformation. Each receives its own grade.

Choice 5 — protected data and ordinary spectra are distinct

Localization, a twisted index, protected TQM and a cohomological Hamiltonian are exact in their domains. None is called an ordinary Lorentzian finite-frequency kernel unless the corresponding injectivity and reality conditions pass.

Choice 6 — implementation passes are not physical predictions

The neutral Fock dimensions, benchmark Hamiltonian entries and Lanczos kernel exercise the actual code path. Their numerical values are not SQED poles, residues or continuum weights.

Choice 7 — obstruction and open door use disjoint ledgers

A failed source-free sphere does not close flux-supported curved branes. A failed smooth D5 section does not close localized branes. A non-injective protected projection does not close non-protected correlators. A missing rigid background is not a spectral instability.

Choice 8 — closure is an editorial stopping rule

This line stops at a natural frontier. The final section does not prescribe another immediate derivation. It records what a future reopening would have to supply.

---

2. V2.0 baseline retained without status inflation

The baseline consists of four fixed statements.

2.1 Reciprocal representation theorem

For

$$\mathcal{M}(\tau)=\frac{1}{\tau_2}\begin{pmatrix}|\tau|^2 & \tau_1\\ \tau_1 & 1\end{pmatrix},\qquad \det\mathcal{M}=1,$$

the symmetric square of $\sqrt{\mathcal{M}}$ has reciprocal unordered spectrum. At the declared CP-even benchmark $\tau=i\alpha^{-1}$,

$$\operatorname{spec}\operatorname{Sym}^2\sqrt{\mathcal{M}}=\{\alpha^{-1},1,\alpha\}.$$

This is invariant data, not an ordered selector.

2.2 Exact orientation fork

In the fixed doublet (F_D,F), the first coordinate is D1/magnetic and the second is F1/electric. Positive advanced-electric orientation gives $K=I$; positive retarded-electric orientation gives

$$K=-J=\begin{pmatrix}0 & -1\\ 1 & 0\end{pmatrix}.$$

The ordered outer weights reverse even though the unordered spectrum agrees.

2.3 Scoped selector no-go

For the mechanisms actually tested, integrality and pairing do not select a frame; the stated balanced endpoint energies have exactly four minima $\{\pm I,\pm J\}$; the published CICY construction is not a direct D3 parent; its audited ambient O3/O7 descent is obstructed; static dP_5 data and standard SK doubling do not label retarded/advanced charge columns; a duality wall implements rather than selects its label; and primitive closure reversal is not integrally conjugate to ordinary D3 time reversal.

2.4 Conditional construction at the V2.0 frontier

The normalized Hopf cup supplies a primitive level-one local inverse-S BF wall. The natural spherical torus bundle fails by the unit half-Euler class, and a degree-one $SU(2)_R$ Hopf texture cancels that bundle obstruction. At V2.0 the physical representation, Ward/Dirac completion, anomaly inflow, ultraviolet origin and inverse-coupling region were open.

The post-V2.0 work begins exactly there.

---

3. From the bundle compensator to a local brane module

3.1 Compact topological lock

Let L be the wall spin line and let $\mathcal{B}$ be the retained compact $U(1)_R$ connection. The differential-character action

$$\mathcal{W}_{\text{lock}}=\exp\left[2\pi i\int_W \hat{c}\smile(\widehat{\mathcal{B}}+\widehat{L})\right]$$

has local form

$$I_{\text{lock}} = \frac{1}{2\pi} \int_W c \wedge (F_{\mathcal{B}} + F_L)$$

and imposes $\widehat{\mathcal{B}} = -\widehat{L}$ including integral, torsion and flat data. Combined with the inverse-S block, the topological matrix is $X \oplus X$, is unimodular, has signature zero and full primary spatial Dirac rank eight, and carries no local wall mode. When every field is varied, the improved local Ward identity closes and the added topological noise is zero.

The minimal source-free D3 vector multiplet cannot supply the independent R-connection. Its six scalar target is S^5, in which the selected S^2 texture is contractible. A frozen background leaves an $F_{\mathcal{B}} J_{\mathcal{B}}$ force. Thus the worldvolume-only route fails, while the enlarged compact lock is a conditional local go.

3.2 D3/D5 parity pair

The D3/D5 defect gives a real microscopic infrared generator. For the two Dirac components

$$(q_c, q_b; m) = (1, +1; +m), \qquad (1, -1; -m),$$

one obtains

$$\Delta K = \frac{1}{2} \sum_s \operatorname{sgn}(m_s) q_s q_s^T = X.$$

The diagonal levels and local gravitational parity coefficient cancel. Identifying c with either existing D3 channel makes the three-field matrix singular, so c must remain an independent compact spectator. The finite-mass determinant is not exactly topological: positive parity-even terms scale as $1/|m|$, and absorptive/noise weight begins above $|\omega| = 2|m|$. The pure lock is the strict infrared limit.

3.3 Hanany–Witten spectator and projector

A finite D3 segment in x^6 between NS5 branes supplies the independent compact three-dimensional $U(1)$. A D5 crossing supplies one $\mathcal{N} = 4$ hypermultiplet. The exact IIB projector algebra leaves eight real supercharges before the twist and four after

$$\Gamma_{1234}\epsilon = \epsilon, \qquad (\Gamma_{12} + \Gamma_{34})\epsilon = 0.$$

The doublet therefore sees $\mathcal{B} + \omega_L$. In the window

$$E \ll |m|, \qquad E \ll g_3^2, \qquad E \ll M_{\text{KK}},$$

the local infrared lock is derived. This is the strongest local pass of the flat normal-bundle branch.

3.4 Literal flat spherical uplift fails

For the source-free fixed-charge spherical D3 ansatz,

$$E_3(R) = L_6 \sqrt{\mathcal{D}^2 + (4\pi\tau_3)^2(R^4 + b^2)},$$

so $dE_3/dR > 0$ for every $R > 0$. D1/F1 flux and spherical D5 tension do not change the sign. The free NS5 boundary conditions are incompatible with a smooth noncollapsed profile, and antipodal flat-space D3 projectors have opposite sign. The breathing radius is a physical positive-kinetic mode; the neutral collapse apex is rank-changing; freezing a positive radius leaves a normal Ward force.

The intrinsic topological twist remains valid. What fails is its promotion to extrinsic stabilization in a source-free flat background.

---

4. The AdS_4 parent replacement

4.1 Exact parent class and good quiver

The D'Hoker–Estes–Gutperle family

$$AdS_4 \times S^2_H \times S^2_C \times \Sigma$$

is a fully backreacted half-BPS Type-IIB parent with D5/NS5 source regions, three- and five-form flux, sixteen supercharges and geometrized $SU(2)_H \times SU(2)_C$ R symmetry. Its global conformal boundary is the required $\mathbb{R}_t \times S^2$ cylinder; in the interface presentation the corresponding defect is totally geodesic.

The one-hyper local spectator is an ugly isolated node. The minimal good completion is

$$U(1) \text{ with } N_f = 3, \qquad \rho = [1,1,1], \quad \hat{\rho} = [2,1], \quad e = N_f - 2N_c = 1.$$

One target triplet mass and two opposite-orientation regulator triplets give

$$K_0 = X, \qquad K_+ = X, \qquad K_- = -X, \qquad K_{\text{total}} = X.$$

The exact massless parent class and the primitive good-quiver embedding pass. The simultaneous mass and unit-monopole deformation does not follow merely from the conformal solution.

4.2 Linearized Cartan fill is obstructed

The compactified global-AdS_4 spatial slice is B^3. A smooth source-free Abelian Cartan field obeys

$$\int_{S^2_\infty} F_C = \int_{B^3} dF_C = 0.$$

A line bundle of Chern number -1 on ∂B^3 does not extend over the ball, and the singular Cartan representative has

$$E_{\text{Cartan}}(\epsilon, R) = \frac{\pi p^2}{2g_C^2}\left(\frac{1}{\epsilon} - \frac{1}{R}\right).$$

The unit flux is a different quantized bundle sector, not an infinitesimal normalizable fluctuation of the vacuum. The smooth source-free linearized Cartan branch therefore fails.

4.3 Non-Abelian core mechanism and the quintet correction

A degree-minus-one adjoint direction can evade the Abelian theorem only by vanishing at a core while off-Cartan gauge components regularize the field. A fixed-AdS_4 Yang–Mills–triplet surrogate produced smooth finite-energy cores and a positive tested radial fixed-boundary Hessian. It also exposed

$$\text{Sym}^2(\mathbf{3}) = \mathbf{1} \oplus \mathbf{5},$$

and the regulator even-sector source

$$m^2+M^2+(-M)^2=m^2+2M^2>0.$$

Thus the naive field list $\{g, A^a_C, \Phi^a\}$ is not closed by ordinary harmonic symmetry alone. Importing flat Bogomolny equations unchanged into global AdS_4 also leaves a curvature remainder.

The later truncation theorem changes the scope of this result. Every DEG solution admits the pure half-maximal gravitational-multiplet truncation, and the explicit generalized frame gives pure $D=4, \mathcal{N}=4, SO(4)$-gauged supergravity. The ordinary quintet is resummed by generalized metric and form-field companions. Therefore:

$$\boxed{\text{naive ordinary-harmonic minimal ansatz: FAIL;}\qquad \text{pure nonlinear DEG } SO(4) \text{ truncation: PASS.}}$$

4.4 Pure-sector magnetic forks

The known regular spherical BPS family becomes pure AdS_4 with zero gauge field at the required equal-coupling point. The static spherical supersymmetric minimal-magnetic lapse has no horizon and retains its central singularity. The regular supersymmetric horizon is hyperbolic. A cold spherical magnetic horizon is non-supersymmetric and absorptive.

These statements close the cited shortcuts, not every possible spherical non-Abelian solution of the full localized theory.

---

5. Localized D5 matter and the source-junction fork

5.1 The displacement is a localized current-multiplet scalar

The DEG harmonic functions describe the $OSp(4|4)$-invariant sphere-singlet family. A D5 displacement is an $SU(2)_C$ triplet and is not a tangent vector within that family. The D5 DBI–WZ spectrum gives

$$m_\Phi^2 L^2=-2, \qquad \Phi(z,x)=z\,m(x)+z^2 v(x)+\cdots.$$

The partition $\rho=[1,1,1]$ is a multiplicity-three D5 stack at the conformal point, not three already-separated stacks. The source is the adjoint boundary value

$$\Phi^3_{(0)}=\mathrm{diag}(m,M,-M).$$

A full $SU(3)$ flavor-current sector requires eight vectors, exceeding the six matter-vector-multiplet limit of the audited smooth half-maximal construction. A diagonal Cartan subsector is algebraically consistent but not uniformly gapped: omitted root masses vanish at coincidences and at the conformal point.

Hence the smooth closed-string section route and the rank-complete smooth flavor extension fail as formulated. The correct field content is a localized bulk-plus-D5 parent.

5.2 Classical throat result

At a regulated D5 source,

$$\mathcal{I}_F(r)=32\pi d|\log r|,$$

and flux quantization fixes the positive logarithmic slope of g_F^{-2}. The conformal background DBI density instead vanishes as $r^2|\log r|^2$, so background tension subtraction does not remove the quadratic logarithm. A local $\mathrm{Tr}\, F^2$ counterterm cancels the cutoff dependence but leaves an arbitrary finite coefficient.

The finite-cutoff gauge system has positive DBI sign and constant Yang–Mills constraint rank. The failure is coefficient matching, not a ghost or Dirac-rank jump:

$$\boxed{\text{bare classical coefficient-complete localized parent: FAIL;} \qquad \text{renormalized source EFT with external matc}}$$

5.3 Exact quadratic SCFT matching

For $U(1)$, $N_f = 3$ SQED,

$$Z_{S^3}(m_i, \eta) = \int_{-\infty}^{\infty} d\sigma\, e^{2\pi i \eta \sigma} \prod_{i=1}^{3} \frac{1}{2\cosh \pi(\sigma + m_i)}.$$

At the conformal point $Z = 1/16$, and the real-mass Hessian is

$$H = \frac{3\pi^2}{4} P.$$

The common mass $\mathbf{1}$ is null and removable by shifting σ. It is neither a positive flavor direction nor a ghost. The physical parity-even flavor algebra is $\mathfrak{su}(3)$; the ninth current is topological. In the declared Maxwell convention,

$$g_{4,F}^{-2} = \frac{3}{16} P, \qquad g_{4,\mathrm{top}}^{-2} = \frac{1}{4} - \frac{2}{\pi^2}.$$

For the raw source $(m, M, -M)$,

$$P(m, M, -M)^T = \left(\frac{2m}{3}, M - \frac{m}{3}, -M - \frac{m}{3}\right)^T,$$

and

$$F^{(2)} = \frac{\pi^2}{4} m^2 + \frac{3\pi^2}{4} M^2.$$

The $(+, +, -)$ parity chamber is retained for $M > m > 0$, but the parity-even sphere Hessian does not itself derive X.

---

6. Coefficient-fixed conformal-source monopole core

6.1 Correct boundary condition

The earlier constant-Higgs boundary condition was appropriate to a conventional Higgs vacuum, not an $m^2 L^2 = -2$ AdS source. The corrected fixed-source problem is

$$\left[(1 + r^2) w'\right]' = \frac{w(w^2 - 1)}{r^2} + w\phi^2,$$

$$\left[(1 + r^2) r^2 \phi'\right]' = 2w^2\phi - 2r^2\phi,$$

with

$$w(0)=1,\quad \phi(0)=0,\qquad w=\frac{c}{r}+O(r^{-2}),\quad \phi=\frac{\alpha}{r}+\frac{\beta}{r^2}+O(r^{-3}).$$

The exact zero-source core and energy are

$$w_0=(1+r^2)^{-1/2},\qquad \phi_0=0,\qquad \frac{E_0}{4\pi}=\frac{3\pi}{8}.$$

Regular nodeless solutions were found for five nonzero sources. The raw BF bulk radial form has one negative direction, but the counterterm required by the same fixed-source variational principle removes it. The renormalized form has zero negative directions in the three tested discretizations.

6.2 Exact $SU(2)_C$ normalization

The protected stress-tensor coefficient and the generator conversion give

$$C_T=54-\frac{192}{\pi^2},\qquad \tau_{C,\epsilon}=\frac{C_T}{48},\qquad g_C^{-2}=\frac{\tau_{C,\epsilon}}{8}=\frac{9}{64}-\frac{1}{2\pi^2}.$$

Consequently,

$$g_C^2Z_F=\frac{12\pi^2}{9\pi^2-32}.$$

At $M/m=4$, $mL=1$,

$$\alpha_{\rm eff}^2=g_C^2Z_FL^2\left(\frac{2m^2}{3}+2M^2\right)=\frac{392\pi^2}{9\pi^2-32}.$$

The former $g_C=1$ value $49/8$ remains a valid declared numerical benchmark but is superseded as the physical coefficient-matched amplitude. A new solve at $\alpha_{\rm eff}=8.251210806397356$ is regular and passes the same three-resolution renormalized radial sign test.

6.3 Exact scope

The result is

$$\boxed{\text{matched reduced conformal-source monopole seed: GO.}}$$

It does not establish nonspherical or time-dependent stability, a nonlinear supersymmetric D5 source action, an Einstein solution, a localized DBI–WZ junction, or a ten-dimensional uplift.

---

7. Nonlinear data and the classical-identifiability boundary

7.1 Exact constant-mass functional

For traceless masses, the exact residue formula determines the full constant-mass generating functional. Two exact rays give

$$Z_A(t)=\frac{1}{16\cosh(\pi t)\cosh^2(\pi t/2)},\qquad Z_B(t)=\frac{1}{16\cosh^2(3\pi t/2)}.$$

Their invariant expansion is

$$F = \log 16 + \frac{3\pi^2}{8} p_2 - \frac{3\pi^4}{128} p_2^2 + \pi^6 \left(\frac{11}{3840} p_2^3 - \frac{1}{320} p_3^2 \right) + O(m^8).$$

The quartic and sextic coefficients are exact integrated nonlinear data. They do not identify an off-shell local action. Neutral scalar and gravitational exchange remain for commuting Cartan sources, and field redefinitions move strength between contact and exchange vertices without changing the integrated functional.

7.2 Protected flavor tensor

The real adjoint-pair decomposition is

$$\mathbf{8} \otimes \mathbf{8} = \mathbf{1}_s \oplus \mathbf{8}_s \oplus \mathbf{27}_s \oplus \mathbf{8}_a \oplus (\mathbf{10} \oplus \overline{\mathbf{10}})_a.$$

The identical-source, Cartan-resolved and full-adjoint flavor observation ranks are $1, 3, 5$. The exact protected data are

$$C_J = 6, \qquad \lambda_{8_a}^2 = 4, \qquad \lambda_{27}^2 = \frac{20}{27},$$

and

$$\mathbf{G}_{\mathrm{TQM}} = \left(8, 0, \frac{40}{9}, -8, 0 \right).$$

The flavor algebra closes, but protected line correlators depend only on ordering. All $\mathcal{A}$-type and long $\mathcal{L}$-type blocks vanish. The protected projection therefore has an infinite non-protected kernel.

7.3 Leading commuting D5 quartic

For

$$A^a{}_b = \lambda F^a{}_b, \qquad S^a{}_b = \lambda^2 D^a \Phi^I D_b \Phi^I,$$

the determinant fixes the universal leading quartic tensor. For one aligned scalar and $F = 0$,

$$\sqrt{\det(1+S)} = 1 + \frac{\lambda^2}{2} X - \frac{\lambda^4}{8} X^2 + O(\Phi^6).$$

The background ordering is unambiguous, and the local derivative-quartic stress is fixed once its coefficient is supplied. Quadratic matching gives

$$Z_F = \mathcal{N}_{\mathrm{loc}} \lambda_{\mathrm{loc}}^2 = \frac{3}{16},$$

while the quartic depends on $\mathcal{N}_{\mathrm{loc}} \lambda_{\mathrm{loc}}^4 = Z_F \lambda_{\mathrm{loc}}^2$. Thus Z_F and g_C do not fix it. For traceless 3×3 masses,

$$\mathrm{tr}\, \mathcal{M}^4 = \frac{1}{2} (\mathrm{tr}\, \mathcal{M}^2)^2,$$

so the two exact mass rays have quartic observation rank one and separate only at sixth order. Geometric/WZ terms, closed exchanges and finite source matching remain absent, and a three-D5 throat has no demonstrated small-curvature control.

7.4 Rank-lift gate

Large flavor multiplicity and primitive level one are compatible in principle:

$$(n_0, n_+, n_-) = (n, n, 2n-1) \quad \Longrightarrow \quad K_{\mathrm{odd}} = X.$$

But the one-node family

$$\rho = [1^{N_f}], \qquad \hat{\rho} = [N_f - 1, 1]$$

has dominance margin one and two singleton NS5 stacks. Making every five-brane stack large changes the quiver into a long multi-node theory with unit-rank end links. The same one-node selector cannot acquire uniform classical DEG control without changing the microscopic representation and recomputing every CFT coefficient.

The finite $U(1), N_f = 3$ quantum functional is therefore the honest exact continuation.

8.
8
Let I wher
In th integ an in
8
An u
1. a p conta fallof posit
The the u
8
For c
the e each lift. It
This Eucli cross
$\boxed{\text{seve}}$
This other

9. The finite quantum target

9.1 Unit-flux harmonic scaffold

Let the external R-flux be

$$q_C = \frac{1}{2\pi}\int_{S^2} F_C^3 = -1.$$

The triplet weights $s = 0, +1, -1$ have line-bundle degrees

$$n = sq_C = 0, -1, +1.$$

For a scalar monopole harmonic,

$$j = \frac{|n|}{2} + k, \qquad -D_{S^2}^2 = j(j+1) - \frac{n^2}{4}.$$

The aligned Cartan source is neutral and admits an ordinary $j = 0$ mode. The off-Cartan partners begin at $j = 1/2$. The flux therefore does not remove the target mass source; it changes the Hilbert space through which that source propagates.

The required ordinary quadratic functional is

$$W_q^{(2)} = \frac{1}{2}\sum_{\ell m}\int \frac{d\omega}{2\pi}\, m_{\ell m}^A(-\omega) P_{AB}\mathcal{K}_{q,\ell}(\omega) m_{\ell m}^B(\omega).$$

Its metric variation supplies the source stress. The exact S^3 Hessian, C_T, protected TQM and twisted index do not determine $\mathcal{K}_{q=-1,\ell}(\omega)$ or its metric response. A protected boson–fermion supertrace is non-injective on the ordinary spectrum, and positive spectral measures can share static and ultraviolet moments while differing at finite frequency.

9.2 The symmetric-point pole is not well posed

At $m = \zeta = 0$, the twisted SQED reduction has noncompact Higgs, Coulomb and mixed zero-mode loci. There is no unique isolated normalizable lowest neutral $SU(3)$-adjoint excitation. The physical cylinder Hamiltonian, the cohomological localization Hamiltonian and a Gaussian oscillator benchmark are different operators. Positive cohomological eigenvalues move under Q-exact rescaling and cannot be used as non-BPS spectroscopy.

Generic distinct masses and a small nonzero FI parameter regulate the problem but break $SU(3) \to U(1)^2$. For the benchmark traceless source

$$\left(\frac{2}{3}, \frac{11}{3}, -\frac{13}{3}\right),$$

the six root splittings are

$$3, 3, 5, 5, 8, 8.$$

They are equivariant weights, not pole energies. The correct observable is

$$\boxed{K_{q_C=-1}^{IJ}(\omega; m, \zeta), \qquad I, J = 1, 2,}$$

with finite distinct masses, small ζ, the cutoff removed before the strong-coupling limit, $\zeta \to 0$ only after the ordinary spectrum is defined, and $m \to 0$ only if a uniform threshold bound survives.

9.3 External and dynamical fluxes

The unit q_C flux belongs to the external $SU(2)_C$ R bundle. It is not flux of the dynamical SQED $U(1)$. For the vacuum two-point function without a dynamical monopole insertion, the declared dynamical sector is

$$p_{\text{dyn}} = \frac{1}{2\pi}\int_{S^2} f = 0.$$

This distinction is required for the Hamiltonian construction and remains fixed throughout the closing ledger.

---

10. Hamiltonian architecture and verified computational machinery

10.1 Gauss-law-resolved physical Hilbert space

In Coulomb gauge on S^2,

$$A_i = A_i^T + \nabla_i\chi, \qquad \nabla^i A_i^T = 0, \qquad H^1(S^2) = 0.$$

Solving Gauss' law removes the longitudinal field and gives

$$Q_{\text{gauge}} = \rho_{00} = 0,$$

$$H_C = \frac{e^2R^2}{2}\sum_{\ell=1}^{\infty}\sum_{m=-\ell}^{\ell}\frac{\rho_{\ell m}^{\dagger}\rho_{\ell m}}{\ell(\ell+1)} \succeq 0.$$

The remaining basis contains transverse photon modes, neutral vector multiplet modes and globally gauge-neutral matter states. A raw finite charged-harmonic space is not gauge invariant: multiplying a highest-weight spin-L mode by a $Y_{1,1}$ gauge parameter produces a nonzero spin-$L+1$ component.

10.2 Feshbach closure

For a retained physical projector P_Λ and $Q_\Lambda = 1 - P_\Lambda$,

$$P_\Lambda(z-H)^{-1}P_\Lambda = [z - H_{PP} - \Sigma_\Lambda(z)]^{-1},$$

$$\Sigma_\Lambda(z) = H_{PQ}(z-H_{QQ})^{-1}H_{QP}.$$

The bare $P_\Lambda H P_\Lambda$ matrix is not the exact low-energy Hamiltonian. The Hamiltonian and the composite moment-map sources must be matched together. The Schur/Feshbach identity and the failure of the naive projected resolvent have been checked to machine precision.

10.3 Finite-N_f truncation and limit order

A finite energy basis is constructible and a neutral Gaussian benchmark is positive and cutoff-convergent. No finite angular or particle-number sector is dynamically closed: the integrated source reaches a $J=0$ pair channel in every angular shell, interactions leak beyond the one-particle cutoff, and finite $N_f = 3$ mixes particle-number sectors. Existing controlled QED$_3$ lightcone truncations work in different geometry and at large N_f, where some of this mixing simplifies.

The strong-coupling limit $e^2R \to \infty$ is nonuniform at fixed cutoff. Cutoff removal with Ward, supersymmetry and current normalizations restored must precede the IR limit. No physical pole or residue has been reported.

10.4 Counterterm rank and contact lattice

The persistent parity-even separated directions can be written

$$\mathbf{c}_{\text{sep}} = (c_A, c_H, c_V, c_\zeta, z_F, z_C, z_T)^T.$$

They are fixed by gauge Ward restoration, hyper/vector/FI tuning and the exact Z_F, g_C^{-2}, C_T normalizations. In dual coordinates, the separated matching matrix is I_7 and has rank seven.

Two additional continuous local gravitational contacts,

$$c_0 S^{\text{susy}}_{\text{cosmo}}, \qquad c_R S^{\text{susy}}_{\text{EH}},$$

are invisible to exact separated data. Hence the exact-data-only absolute source/stress matrix has rank seven and nullity two. The explicit scheme conditions

$$\langle T_{\mu\nu}\rangle^{\text{contact}}_{m=\zeta=0} = 0, \qquad c_R^{\text{finite}} = 0$$

give rank nine. Parity-odd contacts are quantized and form an affine integer Chern–Simons lattice, not continuous null directions. The three hypermultiplets allow a gauge-invariant parity-symmetric zero dynamical-level representative.

In the generic mass chamber, projected linear and quadratic spurions span all three real-symmetric 2×2 directions. Through $O(E)$, six functions are allowed; a symmetric-point calibration sees only identity directions and leaves four anisotropic functions. In the declared shell model the universal tail falls as J^{-1} and the anisotropic tail as J^{-3}. These powers are architecture checks, not physical pole shifts.

10.5 Neutral Fock and Lanczos engine

The statistics-aware enumerator imposes

$$Q_{\text{gauge}}|\Psi\rangle = 0$$

before assembling a Hamiltonian. In the declared lowest-orbital benchmark, raw basis sizes $(44, 119, 339)$ reduce to neutral sizes $(14, 27, 45)$ at $E_{\max}R = 3, 4, 5$. The largest two-source problem has three-dimensional Krylov spaces. At $\omega R = 0.73$, the benchmark kernel

$$K_{\text{bench}}(i\omega) = \begin{pmatrix} 0.76986048 & 0.05198849 \\ 0.05198849 & 0.60782072 \end{pmatrix}$$

agrees with dense diagonalization to Frobenius error 8.014×10^{-16}, is positive semidefinite and satisfies its high-frequency moment sum rule to 3.919×10^{-11}.

Every displayed energy, vertex and kernel entry is a code fixture. The verified content is exact Gauss projection, nested bases, Hermitian assembly, positive Coulomb form, independent Cartan sources, dense/Lanczos agreement, spectral positivity and the moment identity.

10.6 Representation correction and the final rigid-background gate

In the convention $SU(2)_A = SU(2)_H$, $SU(2)_B = SU(2)_C$,

$$\text{hypermultiplet bosons} : (\mathbf{2}_H, \mathbf{1}_C), \qquad \text{triplet source/vector scalars} : (\mathbf{1}_H, \mathbf{3}_C).$$

Therefore the physical hypermultiplet scalar degrees are $(0, 0, 0)$ with lowest degeneracies $(1, 1, 1)$. The triplet degrees are $(0, -1, +1)$, with ordinary lowest degeneracies $(1, 2, 2)$ and holomorphic counts

$(1, 0, 2)$. The earlier $(1, 2, 2)$ flavor fixture was attached to the wrong physical label; its code-path conclusions survive because it was explicitly benchmark-only.

The B-twisted action

$$S_B = \int BF(A) + Y d_A X$$

is cohomological with Q-exact stress. It does not define the positive Hermitian pole Hamiltonian. Even within an $\mathcal{N} = 2$ subalgebra, a constant rigid-background shift of $(V, H, A^{(R)})$ preserves the spatial flux while changing temporal covariant derivatives and scalar potentials. Thus

$$\boxed{q_C = -1 \text{ alone does not determine the ordinary Hessian.}}$$

The physical $\mathcal{N} = 4$ rigid completion, Lorentzian reality conditions and self-adjoint time generator must be specified before the verified engine can compute a physical kernel.

---

11. Derived and coefficient-exact register

The following table is the positive theorem/coefficient ledger. No row in this table is merely a benchmark fixture.

ID	RESULT	GRADE	EXACT SCOPE
D-1	Reciprocal unordered D3 symmetric-square spectrum	**THEOREM / V2 RETAINED**	Given the D3 sector and declared $\tau = i\alpha^{-1}$
D-2	Advanced-electric $K = I$, retarded-electric $K = -J$	**CONDITIONAL THEOREM / V2 RETAINED**	Fixed charge convention and positive orientation
D-3	Local inverse-S BF level and compact R-lock matrices	**DERIVED**	Fixed smooth topological sector
D-4	D3/D5 parity pair induces primitive X	**THEOREM**	Strict-IR parity-odd determinant
D-5	Hanany–Witten spectator/projector module	**LOCAL PASS**	Planar brane array and controlled IR window
D-6	Exact massless DEG D3/D5/NS5 parent class	**SOURCE-SUPPORTED PASS**	Conformal parent, not mass/monopole deformation
D-7	$U(1), N_f = 3$ is the minimal good primitive quiver	**THEOREM**	$\rho = [1, 1, 1], \hat{\rho} = [2, 1]$
D-8	$X + X - X = X$ with no inserted counterterm	**THEOREM**	Declared triplet orientations

ID	RESULT	GRADE	EXACT SCOPE
D-9	Pure nonlinear $D=4,\mathcal{N}=4,SO(4)$ DEG truncation	**THEOREM / EXPLICIT PASS**	Pure gravitational multiplet
D-10	D5 displacement has $m^2L^2=-2$, $(\Delta_-,\Delta_+)=(1,2)$	**THEOREM / SOURCE-SUPPORTED**	Localized D5 current multiplet
D-11	D5 throat fixes the positive logarithmic slope	**DERIVED THEOREM**	Bare regulated quadratic source term
D-12	$H_m=(3\pi^2/4)P$, $\tau_F=(3/2)P$, $Z_F=(3/16)P$	**COEFFICIENT-EXACT**	Faithful traceless flavor sector
D-13	$g_{4,\mathrm{top}}^{-2}=1/4-2/\pi^2$	**COEFFICIENT-EXACT**	Independent topological current
D-14	$C_T=54-192/\pi^2$, $g_C^{-2}=9/64-1/(2\pi^2)$	**COEFFICIENT-EXACT**	Declared non-Abelian generator basis
D-15	$\alpha_{\mathrm{eff}}^2=392\pi^2/(9\pi^2-32)$	**DERIVED, BENCHMARK-CONDITIONAL**	$M/m=4, mL=1$
D-16	Exact zero-source core and $E/(4\pi)=3\pi/8$	**THEOREM**	Reduced fixed-AdS_4 action
D-17	Regular coefficient-fixed high-source core	**NUMERICALLY DERIVED**	Fixed AdS_4, spherical, renormalized fixed-source sector
D-18	Exact constant-mass residue functional and p_2,p_3 expansion	**THEOREM / DERIVED**	Traceless constant sources
D-19	Five real $SU(3)$ adjoint-pair channels and exact protected tensor	**THEOREM / DERIVED**	Protected TQM sector
D-20	Universal leading commuting D5 DBI quartic tensor	**DERIVED / LIMITED**	Leading disk/two-derivative background tensor
D-21	Primitive large-block identity $(n,n,2n-1)\mapsto X$	**THEOREM**	Parity-anomaly multiplicities
D-22	Seven-component Euclidean lift of one labeled long scalar superblock	**THEOREM / CONSTRUCTED**	One $\Delta>1$ block direction
D-23	Unit-flux harmonic and flavor-Cartan scaffold	**THEOREM**	External $q_C=-1$, declared $p_{\mathrm{dyn}}=0$
D-24	Gauss-law Coulomb Hamiltonian and exact Feshbach resolvent	**THEOREM**	Declared Coulomb-gauge physical sector
D-25	Separated matching rank seven; scheme-completed	**THEOREM IN DECLARED LOCAL**	Continuous parity-even counterterms

ID	RESULT	GRADE	EXACT SCOPE
	rank nine	**CLASS**	

12. Verified machinery register

The following objects are ready for reuse. Their verification does not upgrade uncomputed physics.

ID	MACHINERY	VERIFIED CONTENT	EXPLICIT NON-CLAIM
M-1	V2.0 selector checker	Spectrum, minima, compactification/SK/wall/real-structure/globalization ledgers	No unconditional selector
M-2	Ten-dimensional Hanany–Witten Clifford/projector harness	Projector squares, commutators, chirality product, supercharge counts	No curved spherical embedding
M-3	Fixed-AdS_4 shooting and residual engine	Exact seed, five source solutions, coefficient-fixed high-source solution, step refinement	No Type-IIB solution
M-4	Holographically renormalized radial sign audit	Counterterm-completed fixed-source radial forms at three resolutions	No full Lorentzian stability theorem
M-5	Exact S^3 quadrature/residue machinery	Flavor/FI Hessians, nonlinear rays and invariant expansion	No unique local action
M-6	$SU(3)$ projector and crossing engine	Five projectors, recoupling, ranks, protected tensor	No long-block spectrum
M-7	Euclidean long-block companion constructor	Seven geodesic components and one-block injectivity	No causal UTC/SLCMC pass
M-8	Monopole-harmonic and field-assignment tables	Correct degrees, ordinary and holomorphic lowest counts	No ordinary frequencies
M-9	Gauss/Hodge/Coulomb reducer	Globally neutral physical basis architecture	No completed finite-N_f Hamiltonian
M-10	Feshbach/Schur effective-Hamiltonian harness	Exact projected resolvent and operator-matching need	No SQED self-energy coefficients
M-11	Counterterm design/rank system	Rank-7 separated and rank-9 scheme-completed matching, contact lattice	No loop coefficients
M-12	Neutral Fock enumerator	Nested, statistics-aware, exactly neutral bases	Current mode energies are fixtures

ID	MACHINERY	VERIFIED CONTENT	EXPLICIT NON-CLAIM
M-13	Two-source Lanczos/Stieltjes engine	Dense agreement, positivity, moment sum, Krylov compression	Displayed kernel is not physical SQED data

13. Scoped proven-obstruction register

Every row states the proposition that failed. Adjacent, untested routes are not part of the obstruction.

ID	TESTED PROPOSITION	RESULT	SCOPE BOUNDARY
O-1	The V2.0 audited direct mechanisms select the ordered D3 frame	**NO SELECTION / FAIL**	Exact V2.0 class only
O-2	Ordinary source-free D3 fields generate the compact R-lock	**FAIL**	Bulk-assisted or defect parents excluded from claim
O-3	Finite-mass D3/D5 determinant is exactly pure BF with zero noise	**FAIL**	Strict IR BF term survives
O-4	Literal source-free flat spherical Hanany–Witten uplift is static and supersymmetric	**FAIL**	Curved/RR-supported/calibrated backgrounds remain open
O-5	Unit boundary Cartan flux is a smooth source-free linearized vacuum mode	**FAIL / THEOREM**	Non-Abelian core, source, bolt, horizon and second boundary excluded
O-6	Ordinary $\{g, A_C, \Phi\}$ harmonic ansatz closes by symmetry	**FAIL**	Not a no-go for the pure generalized truncation
O-7	Flat Bogomolny equations import unchanged into global AdS_4	**FAIL**	Curved supergravity BPS systems remain open
O-8	Cited equal-coupling regular spherical BPS family gives a nontrivial magnetic core	**FAIL / TRIVIAL LIMIT**	Other ansätze not excluded
O-9	Cited static spherical supersymmetric magnetic branch gives a regular horizon	**FAIL**	Hyperbolic and non-BPS branches distinct

ID	TESTED PROPOSITION	RESULT	SCOPE BOUNDARY
O-10	D5 triplets are smooth deformations of the invariant DEG harmonic family	**FAIL**	Localized/distributional brane geometry not excluded
O-11	Rank-complete smooth half-maximal $SU(3)$ flavor extension fits in six matter multiplets	**FAIL**	Smaller symmetry or localized fields remain open
O-12	Cartan-only flavor completion is uniformly gapped through D5 coincidence	**FAIL**	It remains an algebraically consistent separated-chamber EFT
O-13	Bare singular DEG throat fixes a finite coefficient-complete local D5 action	**FAIL**	Exact-CFT or microscopic matching remains open
O-14	Exact constant-mass data alone reconstruct a unique local nonlinear action	**FAIL / NON-INJECTIVE**	Resolved correlators or microscopic action remain open
O-15	Protected TQM/localization restores continuous non-protected kinematics	**FAIL / PROJECTION KERNEL**	Full non-protected CFT data remain open
O-16	Restricted Hopf data plus one scalar, or one channel-blind Penrose class, form an injective companion	**FAIL**	Unrestricted channel-resolved UTC remains open
O-17	One scalar AdS resolvent is a complete long $OSp(4\|4)$ superblock lift	**FAIL**	Seven-component lift passes Euclideanly
O-18	Z_F and g_C fix the physical D5 quartic coefficient	**FAIL**	Independent open-string scale and matching required
O-19	Two exact mass rays independently identify the quartic action	**FAIL / RANK ONE**	Sixth order separates p_3^2
O-20	Selected finite three-D5 throat is a controlled exact classical DBI regime	**FAIL / UNCONTROLLED**	Higher-charge different parents remain open
O-21	Same one-node selector can make the complete DEG brane system uniformly classical by rank lift	**FAIL**	Higher-rank different theories remain open
O-22	Known protected data determine the unit-flux physical kernel and metric response	**FAIL / NON-INJECTIVE**	Ordinary non-BPS computation remains open

ID	TESTED PROPOSITION	RESULT	SCOPE BOUNDARY
O-23	One isolated lowest neutral $SU(3)$-adjoint pole exists at $m = \zeta = 0$	**FAIL AS POSED**	Finite-source Cartan kernel is well posed
O-24	Cohomological/localization Hamiltonian yields ordinary non-BPS pole energies	**FAIL / CATEGORY ERROR**	Physical Lorentzian Hamiltonian remains open
O-25	Raw finite charged-harmonic space is locally gauge invariant	**FAIL**	Gauss-resolved physical truncation passes
O-26	Bare PHP gives the exact projected resolvent	**FAIL**	Feshbach closure passes
O-27	Symmetric-point calibration fixes every generic-chamber counterterm	**FAIL**	Full chamber rank/matching architecture passes
O-28	Flux $q_C = -1$ alone fixes the ordinary twisted-sphere Hessian	**FAIL / UNDERDETERMINED**	Full rigid background may fix it
O-29	Previous $(1, 2, 2)$ flavor fixture is the microscopic hyper-scalar spectrum	**FALSE / SUPERSEDED**	Engine verification survives; physical input must change

None of O-1 through O-29 is a framework-wide STF no-go.

14. Self-correction and supersession ledger

V2.0 preserved seventeen earlier corrections. They remain binding: the correct CICY data and string corner; the failed audited O3/O7 descent; the D1/F1 coordinate order; the advanced/retarded orientation fork; the corrected minimum gaps; the static-compactification and SK no-selection statements; the distinction between wall implementation and wall selection; the benchmark rather than compactification-derived coupling; the primitive real-structure obstruction; the linear differential-cohomology degree failure; the invalid time-only sky equator; the half-Euler globalization obstruction; the unique compensator; and the distinction between bundle cancellation and a physical parent.

The post-V2.0 correction ledger is:

ID	EARLIER STATEMENT OR INFERENCE	CORRECTION	WHAT SURVIVES
C3-1	Ordinary source-free D3 fields might supply the R-lock	The vector multiplet has no dynamical $SU(4)_R$ connection; its selected scalar texture is contractible in S^5	Enlarged compact differential-character lock

ID	EARLIER STATEMENT OR INFERENCE	CORRECTION	WHAT SURVIVES
C3-2	The compact lock might be exact at finite defect mass	Parity-even dynamics and above-threshold noise are unavoidable	Quantized primitive BF term in the strict IR
C3-3	Either existing D3 channel could serve as the multiplier c	The merged matrix is singular	Independent spectator D3 zero mode
C3-4	The planar projector/twist implied a global flat spherical brane	Intrinsic spin/R cancellation does not stabilize the extrinsic embedding	Local Hanany–Witten module and four-supercharge twist
C3-5	The one-hyper spectator was the isolated interacting parent	$U(1)$ with one hyper is ugly	Minimal good $U(1), N_f = 3$ quiver
C3-6	The unit monopole should first appear as a linearized vacuum mode	It lies in a disconnected quantized bundle sector	Nonlinear non-Abelian core fork
C3-7	The forced ordinary quintet threatened the full Type-IIB gauge truncation	The explicit generalized DEG frame closes the pure nonlinear $SO(4)$ sector	Quintet remains a valid warning against naive harmonic ansätze
C3-8	Differentiate the invariant DEG harmonic family to obtain D5 triplets	The displacement is a localized D5 open-string field transverse to that family	Pure DEG truncation plus localized source
C3-9	$\rho = [1, 1, 1]$ meant three already-separated D5 stacks	It is one multiplicity-three stack at the conformal point	Three mass eigenvalues after adjoint splitting
C3-10	The localized quadratic current block was positive $U(3)$	The common mass is null; the physical algebra is $\mathfrak{su}(3) \oplus \mathfrak{u}(1)_{\text{top}}$	Full traceless current metric and separate topological current
C3-11	Background subtraction would fix the finite D5 coefficient	The bare throat fixes only the logarithmic slope	Exact-CFT renormalized matching
C3-12	The D5 scalar should approach a constant at the AdS boundary	Its standard source falls as α/r	Correct conformal-source core
C3-13	A nonzero asymptotic Higgs magnitude is needed for a smooth core	Pure AdS Yang–Mills has the exact $(1 + r^2)^{-1/2}$ core	Smooth nonzero-source family
C3-14	One negative raw BF radial eigenvalue meant instability	The mandatory fixed-source counterterm changes the sign count	Three-resolution renormalized radial pass
C3-15	$g_C = 1$ supplied the physical source amplitude	It was a declared benchmark; exact R-	Earlier solve remains a benchmark; high-

ID	EARLIER STATEMENT OR INFERENCE	CORRECTION	WHAT SURVIVES
		current matching fixes g_C	source physical solve added
C3-16	Exact finite-mass localization might directly determine a nonlinear local action	It determines an on-shell integrated functional with a contact/exchange kernel	Exact nonlinear coefficients remain valid constraints
C3-17	A protected four-point tensor supplied the needed nonzero kinematics	Topological restriction erases continuous cross-ratios and all long blocks	Exact protected channel tensor remains valid
C3-18	One unrestricted scalar Penrose class might lift the erased sector	A complete long block has seven spin/ R-resolved components and crossing mixes flavor channels	Seven-component Euclidean lift; UTC/SLCMC remains open
C3-19	Quadratic current matching fixed the commuting DBI quartic	The quartic depends on an independent open-string scale	Universal tensor survives without coefficient inflation
C3-20	Equal large mass blocks were the only rank lift	$(n, n, 2n-1)$ preserves primitive level one	Same one-node uniform-control obstruction remains
C3-21	The symmetric conformal wall had one isolated lowest adjoint pole	Noncompact zero modes make that request ill posed	Finite-source two-Cartan kernel in a declared chamber
C3-22	The external R monopole was the dynamical SQED magnetic sector	q_C and p_{dyn} are distinct bundles	Vacuum target fixed to $p_{\mathrm{dyn}} = 0$
C3-23	A finite charged-harmonic cutoff was an honest gauge truncation	Local gauge multiplication leaks above the cutoff	Gauss-resolved physical energy basis
C3-24	A tuned finite Hamiltonian could use an untuned projected source	Feshbach matching applies to composite sources as well	Joint Hamiltonian/operator matching architecture
C3-25	The benchmark $(1, 2, 2)$ oscillator pattern described three hyper flavors	It is the triplet-component pattern; hyper scalar flavors have $(1, 1, 1)$	Enumeration and Lanczos code-path pass
C3-26	The B-twist field complex or spatial flux fixed ordinary frequencies	Cohomological data and q_C leave rigid auxiliaries and temporal couplings unfixed	Correct bundle/cohomology tables and a precise physical-background gate

15. Complete register of doors that remain open

This section is intentionally separate from Section 13. An entry here is not evidence of viability; it records a construction that has not been closed by the proved obstructions.

15.1 Active doors at the closing frontier

The twelve rows below are denoted A-1 through A-12 in order for the reproducibility dependency graph.

DOOR	CURRENT STATUS	WHAT WOULD BE REQUIRED TO ENTER IT
Physical $\mathcal{N}=4$ rigid background on $\mathbb{R}\times S^2$	**OPEN — FIRST HAMILTONIAN PREREQUISITE**	Specify $(g, A_C, V, H, C, \ldots; \mathcal{V}_m, \mathcal{V}_\zeta)$; test the minimal $H=V=C=0$ candidate; verify all four desired 1d supercharges, Lorentzian reality, self-adjoint time translation, temporal Wilson-line/κ fixing, and the UV coupling trajectory
Complete microscopic twisted mode tables	**OPEN / DEPENDS ON RIGID BACKGROUND**	Derive bosonic, fermionic, transverse-vector, ghost and auxiliary Hessians; use corrected $SU(2)_H \times SU(2)_C$ assignments; diagonalize in scalar/spinor/vector monopole harmonics
Microscopic vertices and source tensors	**OPEN**	Compute all spherical Gaunt/Clebsch tensors, Coulomb densities, cubic/quartic vertices and two Cartan composite-source matrices in the chosen regulator
Regulator coefficient extraction	**CONDITIONAL GO — ARCHITECTURE VERIFIED**	Evaluate one-loop and highest-divergent-order maps to the seven separated conditions; impose the two gravitational scheme conventions and a parity contact-lattice representative; include joint Feshbach/HTET Hamiltonian and source corrections
Physical finite-source two-Cartan kernel	**OPEN / CONDITIONAL GO**	Insert physical spectra/vertices into nested neutral bases, extrapolate poles/residues/continuum with cutoff removal, then take $e^2R\to\infty$, $\zeta\to 0$, and only conditionally $m\to 0$ in the declared order
Mixed metric response and finite quantum 1PI functional	**OPEN**	Differentiate the renormalized kernel with respect to the metric, carry the contact scheme consistently, and determine the nonlocal stress/exchange contribution needed by Einstein equations
Seven-component Lorentzian UTC/SLCMC companion	**OPEN ALTERNATIVE**	Continue all seven long-block components with common R/A and supersymmetric boundary conditions; close the full $SU(3)$ crossing orbit; prove protected cancellation, companion injectivity, reality and spectral positivity

DOOR	CURRENT STATUS	WHAT WOULD BE REQUIRED TO ENTER IT
Exact non-protected $SQED_3$ correlator/bootstrap route	**OPEN INDEPENDENT**	Determine long dimensions/OPE data or the continuous correlator, a complete exchange/contact quotient and, for a classical local action claim, a controlled bulk-EFT factorization such as a large parameter and gap
Nonlinear localized D5 supersymmetric action	**OPEN**	Supply a regulated non-Abelian DBI–WZ/source action with its open-string scale, geometric/WZ terms, fermionic/auxiliary completion, finite counterterm multiplet, off-shell stress and Ward identity; match all exact S^3 data
Backreacted four-dimensional mass–monopole solution	**OPEN / PAUSED**	Obtain a valid nonlinear stress from the quantum or microscopic route; solve Einstein–Yang–Mills–current equations; test regularity/horizons, supersymmetry or controlled non-BPS status, full constraints and nonspherical stability
Localized ten-dimensional D3/D5/NS5 uplift	**OPEN / ULTIMATELY DECISIVE**	Combine the pure DEG uplift with the localized D5 junction; solve distributional Type-IIB equations; verify Killing spinors, Page/linking data, flux quantization, five-brane regularity, anomaly inflow, global Ward closure and the infrared X limit
Higher-rank classical DEG parent with the same effective selector	**OPEN DIFFERENT PARENT**	Choose new partitions, prove decoupling of extra nodes/non-Abelian sectors, retain primitive X, establish uniform loop/curvature control, and recompute Z_F, g_C and α_{eff} rather than importing finite-theory values
Other magnetic fillings	**OPEN ALTERNATIVES**	For a new nonlinear core, bolt, worldline, second boundary, hyperbolic horizon or controlled non-BPS spherical horizon, specify topology/source content and redo BPS, Ward, noise, boundary and STF-interpretation audits

15.2 Legacy V2.0 doors retained

The AdS_4 replacement became the preferred developed route, but the following V2.0 alternatives were not converted into failures:

The twenty-two rows below are denoted L-1 through L-22 in order in the closing register.

LEGACY ROUTE	STATUS	REQUIRED REOPENING DATUM
Nonambient or birational Ω-odd involution of the #7447 quotient	**UNEXPLORED**	Explicit involution, Ω action, fixed loci, resolution, tadpoles and D3 spectrum
O5-type use of the regular $F = +1$ quotient symmetry	**UNEXPLORED**	Consistent projection, charges, tadpoles and endpoint map

LEGACY ROUTE	STATUS	REQUIRED REOPENING DATUM
Nongeometric heterotic/Type-IIB dual of the monad model	**UNEXPLORED**	Integral charge/moduli/spectrum dictionary to a D3 F1/D1 lattice
Fourier–Mukai/Mukai selection of a D3 plane	**UNEXPLORED**	A physical integral functor selecting one primitive rank-two plane
Different compact geometry or free quotient	**UNEXPLORED**	Ω-odd data, visible D3 sector and causal endpoint attachment
Flux-stabilized dP_5 benchmark vacuum	**UNEXPLORED**	Flux integers, moduli/tadpoles, kinetic matrix and RG matching
Exact global dP_5 Wilson–'t Hooft lattice	**OPEN / NOT COMPUTED**	Center quotients, Stückelberg reduction, magnetic lattice and mixing
Proper index-two dyonic closure parent	**UNEXPLORED DIFFERENT PARENT**	New endpoint action and treatment of primitive electric matter outside the image
Physical $\mathbb{Z}_2$ saturation of the closure lattice	**OPEN ALTERNATIVE**	Spin/quadratic refinement or discrete-B-field origin and revised ordered channels
Nonfactorizing SK/charge defect	**UNEXPLORED**	Gauge-invariant influence functional, diagonal normalization, PSD noise and integral map
Propagating non-topological interface	**UNEXPLORED**	Complete wall action, stress, constraints, anomaly and noise
Different seven-brane word with true S monodromy	**UNEXPLORED**	Global monodromy, tadpoles, D3 intersection and closure attachment
Degree-three gerbe kernel	**UNEXPLORED**	Integral pushforward, gauge invariance, rank-two retention and physical carrier
Higher-form or KK carrier	**UNEXPLORED**	Ten-dimensional field inventory, projection, harmonic expansion and constraint audit
Relative differential class/anomaly-inflow completion	**OPEN**	Quantized relative cocycle, inflow, edge sector and anomaly cancellation
Framed or toroidal activation wall	**TOPOLOGICAL PASS / PHYSICAL OPEN**	Dynamics producing $\ell = 0$ with the required source geometry
Open wall patches with edge modes	**UNEXPLORED**	Overlap action, edge constraints, Ward closure and PSD noise
Different covariant sky-loop selector	**UNEXPLORED**	A nonvanishing spacelike datum, global zeros/turning points and rank audit
Monodromic half-duality compensator	**OPEN**	$c_1 = -2$, chiral defects, half-charge soldering and inflow

LEGACY ROUTE	STATUS	REQUIRED REOPENING DATUM
Sourced D1–D3 monopole compensator	**OPEN NONMINIMAL**	D1 source, stress/tadpoles, line operators and renewed selector audit
Dynamical $SU(2)_R$ texture	**OPEN**	Full sigma-model/brane action, Hessian, modes, stress and noise
Composite normal-bundle $SU(2)_R$ twist outside the developed DEG route	**PARTLY TESTED / OPEN IN OTHER PARENTS**	A curved microscopic source, complete Ward/Dirac/anomaly system and inverse-coupling region
Full F-theory duality/R twist	**OPEN ALTERNATIVE**	Seven-brane/defect geometry, duality and R lines, chiral inflow and Lorentzian spherical realization

15.3 Doors explicitly not reopened by this closing paper

The following failed propositions remain failed and are not entries in the open register: the primitive transparent same-coupling V2.0 branch; the literal source-free flat spherical Hanany–Witten uplift; the smooth source-free linearized Cartan fill; the smooth rank-complete D5 flavor section; the finite coefficient claimed from the bare D5 throat; a unique local action from constant-mass/protected data alone; the same one-node uniform classical rank lift; the symmetric-point isolated pole; raw charged-harmonic projection; and a unique ordinary Hessian inferred from q_C alone.

---

16. What is not established

This final consolidation does **not** establish:

1. an unconditional microscopic ordered D3 charge selector beyond the scoped V2.0 conclusions;
2. a literal material spherical D3/NS5/D5 solution in flat ten-dimensional space;
3. the complete global form of the $PSU(3) \times U(1)_{\text{top}}$ symmetry including every line and disorder operator;
4. a smooth generalized-section realization of the localized D5 displacement multiplet;
5. a coefficient-complete local D5 action derived from the bare singular supergravity throat;
6. an exact all-order non-Abelian D5 DBI–WZ action;
7. a unique local quartic, sextic or all-order source potential;
8. a field-redefinition-independent contact/exchange split from the current exact integrated or protected data;
9. a complete non-protected SQED$_3$ spectrum or correlator;
10. a Lorentzian crossing-covariant UTC/SLCMC companion;
11. a large-N, sparse-spectrum or large-gap classical bulk-EFT limit of the selected finite theory;
12. a physical $\mathcal{N} = 4$ rigid background on $\mathbb{R} \times S^2$ with all auxiliary and temporal data fixed;

13. the complete microscopic bosonic, fermionic, vector, ghost and auxiliary mode tables in that background;
14. numerical values of the regulator counterterms in a specified cutoff;
15. a regulator-independent physical SQED pole, residue, threshold or continuum density;
16. the ordinary finite-source kernel $K^{IJ}_{q_C=-1}(\omega; m, \zeta)$;
17. its full metric variation or a coefficient-complete quantum stress tensor;
18. full Lorentzian stability of the coefficient-fixed monopole core;
19. a backreacted four-dimensional Einstein solution;
20. a nonlinear supersymmetric mass-plus-monopole D5 junction;
21. a localized ten-dimensional uplift of that junction;
22. complete D3/D5/NS5 Page, tadpole, endpoint, junction, normal-bundle, duality and gravitational anomaly inflow in the deformed solution;
23. absence of all open-string, closed-string, brane or horizon absorptive channels;
24. the activated split-leg memory map in the selected AdS_4 parent;
25. an asymptotically flat or cosmological translation of the parent;
26. a framework-wide STF go;
27. a framework-wide STF no-go.

---

17. Exact current status and positive closing assessment

The line ends with three accomplished layers and one deliberately unclaimed layer.

17.1 What is derived and coefficient-exact

The D3 response theorem and selector no-go are preserved. The surviving route acquired a real local brane mechanism, then a correct exact global parent replacement. The massless DEG background and its pure nonlinear $SO(4)$ truncation are established. The primitive good-quiver factorization is exact. The physical quadratic current algebra and all coefficients needed by the reduced source are exact:

$$\boxed{Z_F = \frac{3}{16}, \quad g_{4,\mathrm{top}}^{-2} = \frac{1}{4} - \frac{2}{\pi^2}, \quad g_C^{-2} = \frac{9}{64} - \frac{1}{2\pi^2}, \quad C_T = 54 - \frac{192}{\pi^2}.}$$

The exact mass functional and protected four-point tensor are also known. The corrected reduced equations have an exact zero-source core and a regular coefficient-fixed high-source core. These statements are not dependent on the benchmark Hamiltonian fixtures.

17.2 What machinery is verified

The program has passed every architecture test required before a physical finite-N_f diagonalization: external/dynamical flux separation, monopole-harmonic and flavor representation tables, Coulomb-gauge Hodge reduction, Gauss-law neutrality, positive Coulomb form, exact Feshbach closure, counterterm and contact ranks, nested neutral Fock enumeration, Hermitian two-source matrix assembly, Lanczos/dense equivalence, spectral positivity and moment sums. The Euclidean seven-component long-block lift also provides a concrete non-protected companion on one labeled block.

17.3 What remains open

The missing data are no longer an unnamed “UV completion.” They are the physical rigid $\mathcal{N} = 4$ background, the resulting microscopic mode and vertex tensors, the matched finite-source ordinary kernel and its metric response, or an independent nonlinear localized DBI–WZ source action. Only after one of those stress routes passes can the Einstein and ten-dimensional junction problems be graded.

17.4 Final verdict

$$\boxed{\begin{array}{c}\text{selector mechanisms audited in V2.0: closed at their statedscope,}\\ \mathrm{AdS}_4 \text{ parent replacement and pure nonlinear gauge sector:go,}\\ \text{quadratic current normalizations: coefficient-exact,}\\ \text{coefficient-fixed reduced monopole seed: go,}\\ \text{finite-rank quantum/Hamiltonian architecture: verified,}\\ \text{physical finite-source kernel and nonlinear source stress:open,}\\ \text{backreacted localized Type-IIB mass--monopole parent: notestablished.}\end{array}}$$

This is the natural positive stopping point. The line has replaced a failed flat spherical realization with the correct AdS_4 parent, converted every available protected normalization into exact coefficients, preserved a regular nonlinear seed at the resulting strong source, and reduced the remaining quantum problem to a verified but not yet physically populated Hamiltonian pipeline. Its failures are sharply scoped. Its open doors are explicit. Nothing further is required for an honest closing record.

---

18. Reproducibility

The companion NumPy-only checker

`stf_d3_ads4_quantum_hamiltonian_closing_record_v3_checks.py`

does not rerun every historical solver. It verifies the closing invariants and the consistency of the four final registers:

- reciprocal and primitive matrix identities;
- the flavor projector, exact Hessian/current coefficients and null center;
- the topological current and $SU(2)_C$ normalizations;
- the coefficient-fixed source amplitude;
- the exact zero-source core equation and energy;
- the exact nonlinear mass-functional coefficients on both rays;
- the five $SU(3)$ channel dimensions and protected vector;
- the primitive rank-lift identity;
- external-flux degree, ordinary-degeneracy and holomorphic-count tables;
- positive Coulomb eigenvalues with the gauge zero mode removed;
- an exact Feshbach/Schur resolvent identity and failure of bare projection;
- rank seven, rank $7/9$, and scheme-completed rank nine;
- the recorded neutral-basis/Lanczos benchmark checks;

- disjointness of the derived, machinery, obstruction and open-door IDs;
- acyclicity of the active-door dependency graph.

All assertions must pass in one run. The expected final line is

```
All V3.0 closing-record NumPy assertions passed.
```

Session-paper source index

The session papers listed below, together with their NumPy reproducibility scripts and manifests, are preserved in full in the project research repository. They are not separately published; this closing record is their standalone consolidation. The V2.0 baseline is published at papers/charge-frame.

V2.0 baseline

1. Z. Paz, *STF D3 Charge-Frame Selector No-Go Record and Conditional Parent*, V2.0.

Local lock and parent replacement

2. Z. Paz, *STF D3 R-Twist Topological Lock and Worldvolume Obstruction*, V1.0.
3. Z. Paz, *STF D3/D5 Parity Pair and Normal-Bundle UV-Lift Audit*, V1.0.
4. Z. Paz, *STF Hanany–Witten Spectator Brane and Spherical Twist Audit*, V1.0.
5. Z. Paz, *STF Spherical Hanany–Witten DBI–WZ Force-Balance Audit*, V1.0.
6. Z. Paz, *STF AdS_4 D3/D5/NS5 Primitive-Lock Replacement Audit*, V1.0.
7. Z. Paz, *STF AdS_4 Mass–Monopole Gate and Non-Abelian Fork*, V1.0.
8. Z. Paz, *STF AdS_4 Non-Abelian Core Closure and Surrogate Shooting Audit*, V1.0.
9. Z. Paz, *STF AdS_4 Half-Maximal Truncation and Magnetic Fork*, V1.0.
10. Z. Paz, *STF AdS_4 D5 Displacement Source and Localized $U(3)$ Parent Audit*, V1.0.
11. Z. Paz, *STF Regulated DEG D5 Source Junction and Logarithmic Throat Obstruction*, V1.0.

Exact coefficients, nonlinear data and classical-control gates

12. Z. Paz, *STF Exact S^3 Flavor-Current Matching and Renormalized D5 Parent*, V1.0.
13. Z. Paz, *STF Matched AdS_4 Conformal-Source Monopole Core*, V1.0.
14. Z. Paz, *STF Exact $SU(2)_C$ R-Current Matching and Coefficient-Fixed Core*, V1.0.
15. Z. Paz, *STF Exact S^3 Nonlinear Functional and Local-Action Underdetermination Audit*, V1.0.
16. Z. Paz, *STF SQED$_3$ Moment-Map Four-Point Identifiability and Protected-Projection Audit*, V1.0.
17. Z. Paz, *STF Commuting-Cartan D5 DBI–WZ Quartic Source and Stress Audit*, V1.0.
18. Z. Paz, *STF Unrestricted Twistor SQED$_3$ Channel-Lift Audit*, V1.0.
19. Z. Paz, *STF DEG Rank-Lift Primitive Selector and Weak-Curvature Gate*, V1.0.

Quantum-parent and Hamiltonian program

20. Z. Paz, *STF SQED$_3$ Unit-Flux Mixed Stress–Moment-Map Kernel Audit*, V1.0.

21. Z. Paz, *STF SQED$_3$ Unit-Flux Hamiltonian Pole and Chamber Well-Posedness Audit*, V1.0.

22. Z. Paz, *STF SQED$_3$ Unit-Flux Finite-N Hamiltonian Truncation and IR-Limit Gate*, V1.0.

23. Z. Paz, *STF SQED$_3$ Gauss-Law-Resolved Hamiltonian Truncation and Feshbach-Closure Audit*, V1.0.

24. Z. Paz, *STF First Long Scalar Singlet AdS-Block Lift and UTC Audit*, V1.0.

25. Z. Paz, *STF SQED$_3$ Twisted-Sphere Counterterm Rank and Contact Lattice Audit*, V1.0.

26. Z. Paz, *STF SQED$_3$ Unit-Flux Three-Cutoff Schur Counterterm Rank Audit*, V1.0.

27. Z. Paz, *STF SQED$_3$ Globally Neutral Fock Basis and Lanczos Assembly Audit*, V1.0.

28. Z. Paz, *STF SQED$_3$ B-Twist Field Assignment and Rigid-Background Ambiguity Audit*, V1.0.

Selected primary references

1. E. D'Hoker, J. Estes and M. Gutperle, *Exact Half-BPS Type IIB Interface Solutions I* and *II*.
2. B. Assel, C. Bachas, J. Estes and J. Gomis, *Holographic Duals of $D = 3, \mathcal{N} = 4$ Superconformal Field Theories*.
3. O. Aharony, L. Berdichevsky, M. Berkooz and I. Shamir, *Near-Horizon Solutions for D3-Branes Ending on 5-Branes*.
4. A. Hanany and E. Witten, *Type IIB Superstrings, BPS Monopoles, and Three-Dimensional Gauge Dynamics*.
5. D. Gaiotto and E. Witten, *S-Duality of Boundary Conditions in $\mathcal{N} = 4$ Super Yang–Mills Theory*.
6. E. Malek, *Half-Maximal Supersymmetry from Exceptional Field Theory*.
7. D. Rovere and C. Sterckx, *How to Uplift Non-Maximal Gauged Supergravities*.
8. O. DeWolfe, D. Z. Freedman and H. Ooguri, *Holography and Defect Conformal Field Theories*.
9. A. Kapustin, B. Willett and I. Yaakov, *Nonperturbative Tests of Three-Dimensional Dualities*.
10. C. Closset, T. T. Dumitrescu, G. Festuccia, Z. Komargodski and N. Seiberg, *Contact Terms, Unitarity, and F-Maximization in Three-Dimensional Superconformal Theories*.
11. C.-M. Chang, M. Fluder, Y.-H. Lin, S.-H. Shao and Y. Wang, *3d $\mathcal{N} = 4$ Bootstrap and Mirror Symmetry*.
12. M. Dedushenko, S. S. Pufu and R. Yacoby, *A One-Dimensional Theory for Higgs-Branch Operators*.
13. K. Skenderis, *Lecture Notes on Holographic Renormalization*.
14. A. Karch, A. O'Bannon and K. Skenderis, *Holographic Renormalization of Probe D-Branes in AdS/CFT*.
15. R. C. Myers, *Dielectric-Branes*.
16. E. A. Bergshoeff, A. Bilal, M. de Roo and A. Sevrin, *Supersymmetric Non-Abelian Born–Infeld Revisited*.
17. I. Heemskerk, J. Penedones, J. Polchinski and J. Sully, *Holography from Conformal Field Theory*.
18. A. L. Fitzpatrick and J. Kaplan, *AdS Field Theory from Conformal Field Theory*.
19. E. Hijano, P. Kraus, E. Perlmutter and R. Snively, *Witten Diagrams Revisited: The AdS Geometry of Conformal Blocks*.
20. T. Cohen, N. Farnsworth, M. Houtz and M. A. Luty, *Hamiltonian Truncation Effective Theory*.

21. N. Anand, E. Katz, Z. U. Khandker and M. T. Walters, *Nonperturbative Dynamics of $(2+1)d$ ϕ^4-Theory from Hamiltonian Truncation*.

22. C. Closset, T. T. Dumitrescu, G. Festuccia and Z. Komargodski, *Supersymmetric Field Theories on Three-Manifolds*.