# Altermagnetism in a new light, read through Fundamental Density Theory: one carrier, a twist in place of the bias, and an isotope channel in the splitting

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Target: Zhaoju Yang, "Altermagnetism in a new light", News & Views, *Nature Physics*, doi:10.1038/s41567-026-03532-9 [1]. The record prints no publication date ("Published online: xx xx xxxx", SC-08, L95, right column) and no arXiv identifier.

**Abstract**

Zhaoju Yang's News & Views [1] relays the report by Chen and colleagues of a photonic crystal of yttrium iron garnet elements under a staggered magnetic bias, in which modes of opposite circular polarization split in a momentum-dependent way at zero net magnetization. Fundamental Density Theory (FDT) reads that record through its seven invariants. In the manuscript's reading the lattice's photons are open strokes of the one carrier of I-2, the two circular polarizations two senses of turning of a stroke's grades, the bias on each element the helical density gradient of P-5, and the injected lattice a driven nodal architecture (P-2). On the record's own inputs FDT returns the splitting it relays, an identity map that corroborates no invariant; the data are accepted in full, and the readings of intrinsic electron spin and of the magnetic field as an independent entity are declined. The manuscript states three predictions: a staggered twist of tapered garnet elements with no magnet produces a sign-changing reciprocity-odd splitting (T-1); a uniform twist produces a net one (T-2); the splitting under the magnets carries a density channel of positive input sign between element sets grown from $^{57}$Fe and from $^{54}$Fe (T-3). T-1 and T-2 are existence predictions and T-3 a sign prediction, each decided by an exact sign-flip permutation rule. A helical-window shift of the $^{57}$Fe nuclear lines is retired as inert, and an aperture reading of the isofrequency contours for want of a map.

## 1 Framework

### 1.1 The record, its status and the citation convention

The record is Yang's commentary [1]; source_status: review. It comments on the paper of Chen, Zheng, Li and Qiu [2], its reference 3 (SC-94, L100–L101, right column), and it relays that paper's results; the paper itself is not in the record, and nothing is taken from it beyond the record's words. Verb discipline, declared once: *measured*, *observed* and *reported* are used for the record's results only, each as the commentary relays it and with the record's own verb; *derived*, *estimated*, *reconstructed* and *illustrative-assumed* serve everything else. The record prints no value of a physical quantity — no frequency, splitting, field, dimension, temperature or uncertainty — and no momentum but the axis label "0" under the lower panel of its Fig. 1b (NG-04, L49, right column). Every number below is a core value or an input row U-nn, external or investigator-chosen, and nothing is read off the figure.



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A citation names a record-claim row SC-nn (a record locus with its verbatim words), its physical line Lnn and its column, as in (SC-14, L20–L22, left column). SA-nn names a locus at which the record's data under-determine its reading or, for SA-31 to SA-35, an observable for which a core clause supplies what the consensus calculation lacks; U-nn names an input the record does not print, and NG-nn a row of the notation guard. Every sentence or cell that says what the manuscript reads of the record carries the label "the manuscript's reading" and is never attributed to the record or to the cited paper. FDT is a true extension of general relativity and quantum mechanics: it agrees with their data without reservation, declines their interpretations where the invariants read the same record differently, and diverges only where a core clause supplies an additional source, a constitutive input or a changed observable dictionary (core Use items 2, 5 and 6).

### 1.2 One substance, one chain, one strand rate (0.1, 0.1a, 0.1d)

FDT has one substance, the omnium: matter = energy = spacetime (0.1). Write $E$ for energy, $m$ for mass, $c$ for the strand rate, $\varepsilon_0$ and $\mu_0$ for the omnium's response coefficients, $d$ and $t$ for a length and a time, and, for a pattern quantised in mode $q$, $E_q$, $m_q$, $\omega_q$, $T_q$ and $\ell_q$ for its energy, mass, angular frequency, kept time and Compton length, with $\hbar$ and $h$ Planck's constants and $\pi$ the circle constant. The chain is one state read four ways, and its bridges are constants of the medium, always displayed (0.1a):

$$\begin{aligned} &\frac{E}{m} = c^2 = \frac{1}{\varepsilon_0\mu_0} = \left(\frac{d}{t}\right)^2, \\ &E_q = m_q c^2 = \hbar\omega_q, \qquad T_q = \frac{2\pi}{\omega_q} = \frac{h}{E_q}, \qquad \ell_q = cT_q = \frac{h}{m_q c}, \end{aligned} \tag{1}$$

with $d/t = c = 299\,792\,458\,\mathrm{m\,s^{-1}}$ exactly. The Compton length $\ell_q$ is never a support radius. With $E$ quantised and $c$ constant, the discreteness lands in the rest masses of confined patterns and in the null periods and paths at the locked ratio $\ell_q/T_q = c$, bounded below by the floor $d_{\min} = 2\ell_P$, $t_{\min} = 2t_P$ ($\ell_P$, $t_P$ the Planck length and time), a one-sided infimum and no lattice of intervals (0.1a). The strand rate $c$ is derived (0.1d): the two responses give $c^2 = 1/(\varepsilon_0\mu_0)$, the space–time conversion and, squared, the matter–energy conversion. A closed pattern's strand runs at $c$ on a helix, $v^2 + u^2 = c^2$ (translation $v$, circulation $u$); its inertia $E/c^2$ carries the stress of its closure; its translation share $v^2/c^2$ is kinematic and equals an exterior compactness only for a pattern held on the exterior branch. Light runs at $c$ because it is an open stroke: $c$ is the rate of the one stroke, and there is no empty background (0.1d). In general relativity $d$ and $t$ adjust according to mass–energy; the metric $g$, written $g_{\mu\nu}$ with its indices, is that adjustment at the scale of bodies, and no background metric lies beneath the patterns (0.1a).

### 1.3 The force law and driven observables (I-1)

With $G$ Newton's constant, $F$ the force between two bodies and $\alpha_1$, $\alpha_2$ their per-body exterior cross-centre inputs $\alpha_i(d) = R_{s,i}/d$ at separation $d$, with $R_{s,i}$ the Schwarzschild radius of body $i$'s total gravitating energy and $R_{\mathrm{b},i}$ its configuration (support) radius, the force law holds always, at all scales, for two bodies:

$$F = \frac{c^4}{4G}\,\alpha_1\alpha_2, \qquad 0 < \alpha_i < 1 \implies F < F_{\max} = \frac{c^4}{4G}. \tag{2}$$

On I-1's declared domain, two nonoverlapping spherical supports at monopole order with $R_{\mathrm{b},i} \geq R_{s,i}$ and $d \geq R_{\mathrm{b},1} + R_{\mathrm{b},2}$, the law reduces exactly to $F = G\mathcal{M}_1\mathcal{M}_2/d^2$, each $\alpha_i$ built from that body's

total gravitating energy $\mathcal{M}_i$ (0.5). The interval ladder stays unconflated: $0 < \alpha < 1$ is universal, $F < F_{\max}$ holds wherever the inputs occupy that interval, and $F \leq F_{\max}/4$ is the only pair-domain statement. The truncated-cone elements of T-1 and T-2 are not spherical, the record prints no shape for its "pillars" (SC-47, L52, right column; SA-29), and no multipole remainder of the closed-form pair expression is written here (O-5). No map from a charge or a circulating charge to an I-1 input is written here (O-6), and no I-1 number is computed for the lattice, the record giving no mass, size or spacing (SC-68, L89–L90, left column; SA-19).

Two passages of I-1 govern the record's measurements, quoted whole: "A *driven* observable (induced magnetisation, rectified signal, rate) vanishes at zero drive and never 'recovers' the static force. The force lives in the isolated static functional; measured dynamics are a separate causal convolution $A(t) = \int \chi_A(t - t')F_{12}(t')\,dt'$, and the susceptibility maps force $\rightarrow$ observable — it is not the force law." And: "At condensed-matter compactness the bare law returns a small number ($\sim 10^{-41}$ N): a correct prediction, not a wrong-tool symptom — and not the measured binding scale, which is reached only through a declared response kernel (rate $\neq$ force)." The figure in the second passage is the core's. In the manuscript's reading the record's field maps (SC-70, L91–L92, left column; SA-20) are driven observables of the injected lattice, zero at zero injection; a branch frequency is a spectral position and a splitting the difference of two, and neither is written as an I-1 force or as recovering one.

### 1.4 One carrier, two senses of turning (I-2)

I-2's identity is displayed as the core prints it:

$$\text{photon} = \text{graviton} = \text{gluon} = \text{phonon} = \text{magnon}, \tag{3}$$

"the same spin-1 excitation of the density field, at different density / geometry regimes". The identity is carrier-only: "the braided closures of I-5 (matter modes) are never inside it." With $\omega$ a stroke's angular frequency, $\lambda$ its wavelength and $\bar{\lambda}$ the radius of the helix on which its grades turn, I-2's sentences on the open stroke read, whole:

> An open stroke's run does not circulate: it carries the whole rate as translation, $v = c$, $u = 0$, and keeps no time. Its grades turn about the run on a helix of radius
>
> $$\bar{\lambda} = \hbar c/E = c/\omega = \lambda/2\pi$$
>
> its momentum $E/c$ carries its spin $\hbar$ at that radius (spin 1)

In the manuscript's reading the record's photons are open strokes, and its "left and right circular" polarization states (SC-58, L77–L78, left column; SA-15) are two senses of turning of a stroke's grades. The record prints no axis for that turning, and the manuscript assigns it none. The designs of Section 5 fix their two senses in the laboratory frame: a sense about a fixed laboratory axis reverses when the run reverses, and a sense about the run ("Its grades turn about the run") does not. The record's "spin-like degree of freedom" (SC-41, L68–L76, left column; SA-14), its "analogue" (SC-10, L12–L16, left column; SA-01) and its "analogous" (SC-32, L53–L54, left column; SA-09) stay its words, attributed. Its "wider class of bosonic systems" (SC-83, L77–L78, right column; SA-25) is read, in the manuscript's reading, only through the carrier names of I-2's identity; no closed pattern enters it.

I-2 places the magnetic regime of the carrier in one clause: "the magnon is the stroke through a helical density gradient (P-5)". In the manuscript's reading, inside a biased element the stroke runs through a helical density gradient, and the dependence of the elements' "response to electromagnetic

waves" on "an applied magnetic field" (SC-38, L65–L66, left column; SA-11) is where the record meets that clause. The reading assigns the splitting no magnitude and no sign, and "magnon" names a regime of the one carrier, never a second carrier.

### 1.5 The three faces of I-3, the atlas and the chart inventory

I-3 has three faces. With $G_{\mu\nu}$ the Einstein tensor, $T_{\mu\nu}$ the stress tensor and $\kappa$ the Einstein coupling, the field equation stands unchanged and every $\alpha$ is downstream of its solution:

$$G_{\mu\nu} = \kappa T_{\mu\nu}, \qquad \kappa = \frac{8\pi G}{c^4}, \qquad \kappa\, F_{\max} = 2\pi. \tag{4}$$

With $r_f$ the field-point radius, $R_s = 2G\mathcal{M}/c^2 = \mathcal{M}c^2/(2F_{\max})$ the Schwarzschild radius of the total gravitating energy $\mathcal{M}$, $\sigma$ the branch tag, $r_c$ the finite-core cutoff, $\alpha_\sigma$ the branch-tagged density coordinate, $\alpha_{\text{ext}}$ and $\alpha_{\text{int}}$ its values on the exterior and the interior branch, $\infty$ the unbounded far end of the exterior branch, $X_{\text{ext}}$ the gap odds, $d\ell_{\text{opt}}$ the optical line element in areal coordinates and $d\mathcal{S}^2$ the line element of the unit sphere, the exact optical-metric face and the branch-tagged split read

$$d\ell^2_{\text{opt}} = \frac{dr_f^2}{(1-\alpha_{\text{ext}})^2} + \frac{r_f^2\, d\mathcal{S}^2}{1-\alpha_{\text{ext}}}, \tag{5}$$

$$\alpha_\sigma = \left(\frac{R_s}{r_f}\right)^\sigma : \qquad \alpha_{\text{ext}} = \frac{R_s}{r_f} \quad (\sigma = +1,\ R_s < r_f < \infty), \qquad X_{\text{ext}} = \frac{R_s}{r_f - R_s}, \tag{6}$$
$$\alpha_{\text{int}} = \frac{r_f}{R_s} \quad (\sigma = -1,\ r_c \le r_f < R_s).$$

Generalised Snell's law is the Fermat jump law of the metric (5) with its exact index. Each $\alpha_\sigma$ is a ratio of two curvatures built from two lengths fixed before any observation is consulted; it lies in $(0, 1)$ because its evaluation radius lies on its branch, and it is never compactified again. Containment holds: given the same stress tensor and data, FDT and general relativity solve the same equation and return the same curvature.

The chart inventory is declared here, once, at first use, and every token keeps its application at every use (the table below).

| token | application | evaluation and use here |
|---|---|---|
| $\alpha_{\text{ext}}$ $(\sigma = +1)$ | A-1 compactness, geometric warrant | field point $r_f$, configuration radius $R_{\text{b}}$, gravitating source $R_s$; an element's own window $\alpha_{\text{ext}} = \mathcal{M}c^2/(2F_{\max}r_f)$ with $\mathcal{M}$ the element's ledger (Eq. 10); the exterior compactness of a garnet nucleus, its fold at its gravitational $R_s$ |
| $\alpha_{\text{int}}$ $(\sigma = -1)$ | A-1 compactness, geometric warrant | the interior chart of a $^{57}$Fe or $^{54}$Fe nucleus, read with its skin at the fold, skin radius $R_{\text{room}}$ from data (U-02); no transfer map to the exterior atlas |
| $\beta_\sigma = \alpha_\sigma/(1+\alpha_\sigma)$ | A-2 compactification, geometric warrant | computational chart only, never a force, optical or density slot; no use here |
| $\alpha_{\text{ovl}}$ | A-3 overlap, no warrant | token and range only: no value, threshold, ordering, sign or trajectory (O-2) |
| $\alpha_{\text{conf}}$ | A-4 confinement, no warrant | I-5's cone-position axis; token and range only: no value, threshold, ordering, sign or trajectory (O-3) |
| $\alpha_{\text{mode}}$ | A-5 mode manifestation, no warrant | a naming token for I-2's regimes; it ranks nothing and spaces nothing, with no value or ordering |
| $\alpha_{\text{core}} \to 1^-$ | saturation diagnostic | the skin value of a nucleus's interior chart, P-3's pinning site; schematic only |

The element's own window carries 0.1c's sentence: "A laboratory pattern's window is small ... and the small number is a correct reading (I-1)". A nucleus of the garnet is carried by two charts, both declared: the exterior atlas of the nucleus, its fold at its gravitational $R_s$, and the interior chart, read with its skin at the fold and its skin radius $R_{\text{room}}$ taken from data (U-02); no transfer map between them is displayed, and none is used. P-3's clause is quoted from "the site's saturation coordinate": "the site's saturation coordinate is not the exterior compactness of the same nucleus ($\ll 1$ for a laboratory nucleus); declare both charts whenever both appear." P-3's clamp is a nucleus; the apparatus of T-1 and T-2 that turns an element is always written *torsion clamp*. Every interior datum of such a nucleus is a profile-weighted mean with its probe weight named, a point value is never read off a mean, and no interior profile is written here (O-4). The record's "probes" (SC-69, L90–L91, left column; SA-20) inject; they are never the probe of I-3's probe weight.

### 1.6 The quantum face and the cylindrical lift (I-4)

I-4's quantum face, quoted from "QM is helical geodesics":

> QM is helical geodesics on truncated density cones. The wavefunction $\psi = A\,e^{i\varphi}$ is the projection of a helix onto the plane normal to the cone axis; "superposition" is ignorance of the helical phase $\varphi_0$ at observation. The universe is deterministic; there are no probability amplitudes.

The three layers stay apart: exact in model (the pair algebra on its declared domain); containment (general relativity reduces to $G\mathcal{M}_1\mathcal{M}_2/d^2$ in the weak-field slow-motion limit, its expansion order stated); and the layer of the FDT source programme and of each claimed divergence, which holds T-1 to T-3. Mode content is written in the cylindrical lift: complex mode equations are the two-dimensional projection of three-dimensional helical transport, and in cylindrical coordinates the helical phase is fixed. With $\psi$ the projected amplitude, $A$ its modulus, $\varphi_h$ the helical phase (the $\varphi$ of the quote), $\varphi_0$ its value when the injection clock starts, $\mathbf{B} = e_1 e_2$ the unit bivector of the plane of turning, $e_1$ and $e_2$ orthonormal vectors of that plane, the lift reads

$$\psi = A\,e^{i\varphi_h}, \qquad \varphi_h(t) = \varphi_0 - \omega t, \qquad i \;\longleftrightarrow\; \mathbf{B}, \qquad e^{\mathbf{B}\varphi_h} = \cos\varphi_h + \mathbf{B}\sin\varphi_h, \tag{7}$$

the last equality following term by term from $\mathbf{B}^2 = e_1e_2e_1e_2 = -1$. The rotor $e^{\mathbf{B}\varphi_h}$ is the single-angle phase rotor, distinct from a half-angle spinor rotor; its exponent is dimensionless, no density token sits in a multivector slot, and the quantity lives on the $\varphi$ axis at fixed field identity, with no strand count on a mode. In the manuscript's reading the two circular polarization states are the two senses of the rotor, $e^{+\mathbf{B}\varphi_h}$ and $e^{-\mathbf{B}\varphi_h}$; the record's "phase-controlled probes" (SC-69, L90–L91, left column; SA-20) fix a relative helical phase at injection, and the phase winding of a mode about one of the record's "chiral phase vortices" (SC-63, L83–L84, left column; SA-17) is a winding on the $\varphi$ axis at fixed field identity, never a helix count.

### 1.7 Braids, confinement and the two iron nuclei (I-5, I-5b)

I-5 is quoted twice: "Matter is *braided photon helices*: closed topological loops formed from $n$ open helical strands of the spin-1 excitation of I-2." And: "There are no intrinsic particle masses or properties: charge, colour, flavour, generation and mass are all derived — $n$ sets the topological invariants, confinement sets the mass." Mass is a confinement eigenvalue. With $\Omega$ the confinement domain, $B$ its boundary data, $n$ the braid configuration, $\chi$ the orientation, $t$ the position on the

inside/outside chart, $u_q$ the mode $q$ and $\omega_q$ its eigenvalue, the confinement eigenproblem, with $D$ the confinement operator, stands as the core prints it:

$$D(\Omega, B; n, \chi, t)\, u_q = \omega_q\, u_q, \qquad m_q c^2 = \hbar \omega_q. \tag{8}$$

No form of $D$, its domains, boundary data or spectrum is written here (O-9); no mass formula, no anchor radius and no address for any named particle is written, and the two held-out mass ratios of I-5 are carried in the status ledger as targets. The fermion class is cited as I-5 prints it, $\nu_F = B_s \bmod 2$, with $B_s$ the nested turning-class degree, not $n \bmod 2$ (O-11).

In the manuscript's reading the electrons of the record's "fermionic" "systems" (SC-30, L50–L51, left column; SA-08) are closed $n = 3$ braids of the excitation whose open strokes are its photons (SC-32, L53–L54, left column), and no matter mode is placed inside I-2's carrier-only identity. In the same reading the nuclei of $^{57}$Fe and $^{54}$Fe in the garnet are two patterns (0.1b: "A nucleus is one pattern") that differ in closure content by three $n = 2$ closures, the neutron as I-5 lists it, and the 14.4 keV transition of the $^{57}$Fe nucleus (U-27) is a change of mode of one pattern at fixed closures; no form of $D$ is written for either nucleus (O-9).

### 1.8 The bounded map (I-6)

The bounded map is the form $b = X/(1+X)$ applied to a positive odds $X$, and every use names its application A-1 to A-5 (0.4, I-6); the open interval $0 < \alpha < 1$ is universal, its ends one-sided limits. The only bounded-map use here is A-1, the atlas of Eq. (6) and the interior chart of the inventory, for an element's own window and for a nucleus's two charts. The record's "zero net magnetization" (SC-39, L66–L67, left column; SA-12) stays its design statement, in its words; a net magnetization is signed and dimensionful, and I-6 keeps it out of every map: "Map inputs are dimensionless and nonnegative". It is never a density and never an $\alpha$.

### 1.9 Density equivalence and an element's ledger (I-7)

Mass, energy, temperature and pressure enter one $R_s$, and isotope, thermal and pressure shifts are one mechanism (I-7). With $M$ the rest mass, $P$ the pressure, $V$ the volume, $T$ the temperature, $a$ the radiation energy-density constant and $\sigma_{\mathrm{SB}}$ the flux constant, which never enters the mass, the total gravitating energy reads

$$\mathcal{M} = M + \frac{E}{c^2} + \frac{PV}{c^2} + \frac{aT^4V}{c^2} + \ldots, \qquad a = \frac{4\sigma_{\mathrm{SB}}}{c}, \qquad R_s = \frac{2G}{c^2}\,\mathcal{M}, \tag{9}$$

every non-rest contribution carried by the one stress tensor and entering once; gravitational binding is read from the solved geometry and never added as a separate local term (0.5). Every channel of the record's elements enters once (0.1c: "each channel enters $\mathcal{M}$ once (I-7)"). With $M_{\mathrm{el}}$ an element's rest mass, $\mathsf{m}$ its held moments and $\mathsf{B}$ the magnetic field where they sit, $E_{\mathrm{ind}}$ the energy of the moments the field induces, "the work of inducing them included", $E_{\mathrm{inj}}$ the injected field energy, $E_{\mathrm{tor}}$ the torsion's stored elastic work (in T-1 and T-2 only), $P$ the ambient pressure, which T-3 holds fixed, $V_{\mathrm{el}}$ the element's volume and $T$ its temperature, an element's ledger $\mathcal{M}_{\mathrm{el}}$ is

$$\mathcal{M}_{\mathrm{el}} = M_{\mathrm{el}} + \frac{-\sum \mathsf{m}\cdot\mathsf{B} + E_{\mathrm{ind}} + E_{\mathrm{inj}} + E_{\mathrm{tor}}}{c^2} + \frac{PV_{\mathrm{el}}}{c^2} + \frac{aT^4V_{\mathrm{el}}}{c^2}. \tag{10}$$

No number is printed for any entry: the record gives no mass, field, volume, pressure or temperature for its elements (SC-68, L89–L90, left column; SA-19).

### 1.10 Settlement, the two readings and the helical window (0.1a, 0.1c)

0.1a is quoted: "Events do not commute, and a process run backward is never the mirror of the forward event." The record's "breaking time-reversal symmetry locally" (SC-40, L68, left column; SA-13) stays its classification of its biased lattice, in its words. The premise of the consensus comparators of T-1 and T-2 — the time-reversal symmetry of a structure whose static magnetization averages to zero over its domains — is the consensus calculation's and is attributed to it; the record prints no statement about its lattice without the bias. The reciprocity of such structures (U-01) [7] is consensus data, external to the record, and is accepted in full.

With $g_{\mu\nu}$ the metric, $\mathfrak{m}$ the clock factor, $\mathcal{U}^\mu$ a pattern's four-velocity in the time its own clock keeps, $\nabla_{\mathcal{U}}$ the covariant rate of change along its path and $\mathfrak{P}^{\mu\nu}$ the projector across it, a pattern's kept time and thread length rescale together with the density it crosses (0.1c):

$$g_{\mu\nu} \longmapsto \mathfrak{m}^2 g_{\mu\nu}, \qquad \nabla_{\mathcal{U}}\,\mathcal{U}^\mu = -\mathfrak{P}^{\mu\nu}\partial_\nu \ln \mathfrak{m}, \qquad \mathfrak{P}^{\mu\nu} = c^2 g^{\mu\nu} + \mathcal{U}^\mu \mathcal{U}^\nu. \tag{11}$$

On the pattern's own clocks and rulers nothing changes, and $d/t = c$ on the spot; the bookkeeper reads the acceleration toward slower clocks. Moving at constant speed, on the pattern's own clocks and rulers, through a density gradient is gravity: the extended equivalence principle. A slow pattern reads the lapse and a stroke the optical metric, the factor of two of I-3. The clock factor is no $\alpha$, no odds and no bounded output, it stands in no force, optical or density slot, and a conformal clock factor never bends a null path.

Beside the gravitational window, 0.1c gives a helical window to "a pattern whose rest energy depends on where it sits in a twist". With $E_0$ the pattern's rest energy outside every twist, its held moments $\mathsf{m}$, the field $\mathsf{B}$ where they sit and $E_{\mathrm{ind}}$ the energy of the moments the twist induces, the work of inducing them included,

$$E = E_0 + E_{\mathrm{ind}} - \sum \mathsf{m}\cdot\mathsf{B}, \qquad \mathcal{M} = \frac{E}{c^2}, \qquad \mathfrak{m} = \frac{E}{E_0}. \tag{12}$$

In this window $\mathfrak{m}$ belongs to the pattern, and a uniform twist turns a held moment and pushes nothing. 0.1c reads the window between neighbours, quoted from "Copies of one pattern, turned alike": "Copies of one pattern, turned alike, share $E/E_0$, its gradient and its torque, so at one point the twist is invisible among them; it is read between neighbours (I-3a), between patterns whose $E/E_0$, fall or torque differ at one point — a clock the pattern carries runs on the lapse and on its own rest energy where it sits — or against a reference path (Use 7)." The helical window is a closed pattern's: an element, a nucleus, an electron. In the manuscript's reading a mode of the lattice is a nodal pattern of the driven density field whose strokes are open, and an open stroke "keeps no time" (I-2), so no $E/E_0$ and no clock factor is written for a stroke or for a mode. In the same reading the paired arrangements and the paired element sets of Section 5 are comparisons of the kind the quoted sentence names (Use item 7).

### 1.11 Nodal architecture, the density cone and the twist (P-2, P-4, P-5)

P-2 is quoted from "Energy injection" through "dimension-independent).": "Energy injection (acoustic, electromagnetic, thermal, parametric) excites standing density waves; the loci where the transverse density gradient vanishes ($\nabla\alpha = 0$) are the nodal lines and surfaces — the density geodesics — and excitations migrate to and lock into them as sand collects on the nodes of a vibrating plate (plate → volume → sweetline; dimension-independent)." Its last sentence: "By I-2 the same nodal structure appears in every carrier window; mode geometry is set by the boundary conditions (the clamps, P-3), not by the medium." In the manuscript's reading the injected lattice

(SC-69, L90–L91, left column; SA-20) is a driven standing-wave system, its modes nodal patterns in P-2's sense, and the "square lattice of pillars" (SC-47, L52, right column; SA-29) an arrangement of P-3's clamps, the boundary conditions that set the mode geometry. The record's "crystal symmetry" and "magnetic order" (SC-23, L37–L38, left column; SA-06) stay its account, with its "originates from".

P-4's first sentence: "The truncated density cone at a point is the local light cone: the causal aperture is set by the density through the I-3 reading, the flat special-relativistic cone is the uniform-density idealisation, and refraction, lensing and horizon formation are one phenomenon." In the manuscript's reading the record's "propagation of electromagnetic waves" in "periodic structures" (SC-33, L54–L55, left column; SA-10) is refraction in a periodically structured medium, one phenomenon with lensing. P-4's $n_{\mathrm{cone}} = (1-\alpha_\sigma)^{-1/2}$ is its candidate assignment carrying the aperture, "not a lensing index (I-3)", and it enters no number here (O-8).

P-5 is quoted whole: "A magnetic field is a macroscopic helical density gradient of the omnium: the bivector grade of the density field coherently aligned along an axis; vortex lines are bivector topological defects. Imposing a physical twist (torsion, helical geometry) on a material *is* establishing a magnetic field; mechanical vorticity and magnetic moments are different grade projections of one density-gradient topography, with no carrier exchange (I-2). Quantitative twist → moment forms are derived in-manuscript through I-1/I-2 with a declared kernel." In the manuscript's reading the bias on each element of the record's lattice is a helical density gradient, and the "two sublattices" "with opposite magnetic bias" (SC-39, L66–L67, left column; SA-12) carry its two orientations; "zero net magnetization" stays the record's statement, in its words. The record's contrast — a bias "externally imposed" (SC-85, L80, right column; SA-26) against orders that "emerge intrinsically" (SC-86, L81–L82, right column; SA-26) — is where T-1 and T-2 stand. No kernel is declared here, so the twist enters those blocks with neither magnitude nor sense.

### 1.12 Notation guard

The record's symbols that meet reserved FDT tokens, and the symbols the manuscript adds, are renamed on every surface (the table below). One symbol carries one meaning: a bare $\alpha$ is the curvature ratio, $n$ the strand count, $\sigma$ the branch tag (or $\sigma_{\mathrm{SB}}$), $\kappa$ the Einstein coupling, $X$ the odds, $D$ the confinement operator, $\Omega$ the confinement domain and $a$ the radiation constant; $\omega$ is an angular frequency throughout.

| record token | record meaning | manuscript name and guard |
|---|---|---|
| kx, ky (NG-01 to NG-04: L59, L28, L34, L49, right column) | the momentum axes of Fig. 1b | $\mathfrak{k}_x$, $\mathfrak{k}_y$, the components along the caption's axes of a mode's lattice wavevector $\vec{\mathfrak{k}}$ (the record's "momentum"), the label of a nodal pattern; the designs' wavevectors $\vec{\mathfrak{k}}_1$, $\vec{\mathfrak{k}}_2$ of magnitude $\mathfrak{k}_0$; never the $k$ of I-2's stroke or of a closed pattern's phase, and never I-5's $k_{nq}$ |
| a, b (NG-05 to NG-08: L51, L55, L10, L23, right column) | the panel letters of Fig. 1 | "panel a", "panel b" in roman text; $a$ is $4\sigma_{\mathrm{SB}}/c$; $b$ is 0.4's bounded output, I-6's bounded diagnostic, 0.1a's force fraction and I-3's and I-3a's impact parameter |
| X (NG-09: L98–L99, right column) | the journal name "Phys. Rev. X" | kept in the bibliography's roman text; $X$ is 0.4's odds |
| D, J, T, P, R, M, S, L (NG-10, NG-11: L98–L104, right column) | authors' initials in the reference list | kept in the bibliography's roman text; $D$ is I-5's confinement operator, $J$ 0.4's angular momentum, $T$ I-7's temperature, $P$ its pressure, $R$ 0.2's $R_s$, $M$ 0.5's $M$, $S$ I-7's sensitivities $S_i$, L I-4's layers |

| | | |
|---|---|---|
| 0 (NG-04: L49, right column) | the label printed between kx and ky under the lower panel of Fig. 1b | "zero momentum" in words where the manuscript needs it; no closed value of an $\alpha$ is written |
| left, right circular polarization (NG-12: L10–L12, right column) | the record's two polarizations | LCP and RCP abbreviate them |
| (none; added; NG-13) | branch frequencies; splittings; twist angle; hand arrangements; contrasts; bounds and scales; magnetic fields | $\omega_{\mathrm{LCP}}$, $\omega_{\mathrm{RCP}}$; $\mathfrak{W}$, $\mathfrak{W}_{\mathrm{odd}}$, $\mathfrak{W}_{\mathrm{alt}}$, $\mathfrak{W}_{\mathrm{net}}$, $\mathfrak{W}_{\mathrm{bias}}$; $\Theta_{\mathrm{tw}}$; the hand arrangements $(+-)$, $(-+)$, $(++)$, $(--)$, sign pairs and no letter; $\mathfrak{y}_{\mathrm{alt}}$, $\mathfrak{y}_{\mathrm{net}}$, $\mathfrak{y}_{\mathrm{isot}}$ and their means; $\mathfrak{b}_{\mathrm{amb}}$, $\mathfrak{c}_{\mathrm{isot}}$, $\mathfrak{h}_{\mathrm{tw}}$, $\mathfrak{h}_{\mathrm{isot}}$; $\mathsf{B}$ for every magnetic field, 0.1c's field included ($B$ is I-5's boundary data, $B_n$ its braid group, $B_s$ its turning class, and bold $\mathbf{B}$ the unit bivector of the rotor); the core's fraktur letters are never reused |
| (none; added; NG-14) | the two iron isotopes | $^{57}$Fe and $^{54}$Fe |

## 2 System chart

The record's objects, and the iron nuclei it does not name, stand beside the manuscript's reading of each (the table below); every reading cell is the manuscript's reading, never the record's or the cited paper's.

| record object | record words (row, locus, column; verb) | the manuscript's reading | invariant |
|---|---|---|---|
| photons and their circular polarization | "circular polarization provides a spin-like degree of freedom" (SC-41, L68–L76, left; stated) | the manuscript's reading: open strokes; two senses of turning of a stroke's grades, no axis assigned | I-2, I-4 |
| the garnet elements | "yttrium iron garnet elements" "biased by patterned permanent magnets" (SC-68, L89–L90, left; reported) | the manuscript's reading: closed patterns, each with its own window $\alpha_{\mathrm{ext}}$ and its ledger (Eq. 10) | I-3, I-7 |
| the staggered bias | "two sublattices" "with opposite magnetic bias" (SC-39, L66–L67, left; reported) | the manuscript's reading: a helical density gradient in two orientations | P-5 |
| the elements' response | "depends on an applied" "magnetic field" (SC-38, L65–L66, left; stated) | the manuscript's reading: the stroke through a helical density gradient | I-2, P-5 |

| | | | |
|---|---|---|---|
| the injected lattice and its maps | "They injected" and "mapped the electro-" "magnetic fields" (SC-69, SC-70, L90–L92, left; reported) | the manuscript's reading: a driven nodal architecture; driven observables, zero at zero injection | P-2, I-1 |
| the band structure and the splitting | "reconstructed" (SC-72, L93–L94, left); "observed" (SC-73, L94–L95, left) | the manuscript's reading: spectral positions and their difference, no force | I-1, I-4 |
| the phase vortices | "chiral phase vortices" (SC-63, L83–L84, left; simulated) | the manuscript's reading: a winding on the $\varphi$ axis at fixed field identity | I-4 |
| the electrons | "electrons carry intrinsic spins" (SC-30, L50–L51, left; stated) | the manuscript's reading: closed $n = 3$ braids, no intrinsic property | I-5 |
| the iron nuclei | the record names none | the manuscript's reading: two patterns, P-3's clamps, each on two declared charts | P-3, I-3, I-5 |
| the photonic crystal | "propagation of electromagnetic waves can be controlled" (SC-33, L54–L55, left; stated) | the manuscript's reading: refraction in a periodically structured medium | P-4 |
| the classification | "breaking time-reversal symmetry locally" (SC-40, L68, left; reported) | the record's classification, kept; settlement does not mirror (0.1a) | 0.1a |

# 3 Observation map

Each row of the map is anchored to the record's own statement with its verb class (the table below). The record prints no value of a physical quantity but the axis label "0" (NG-04, L49, right column), so every row is a statement and no row carries a number.

| cluster | record statement (row, locus, column; verb class) | the manuscript's reading | step |
|---|---|---|---|
| A | "Jianfeng Chen and colleagues3 have now reported" a photonic analogue (SC-14, L20–L22, left; reported) | the manuscript's reading: the relayed result of the cited paper | identity map |
| A | "they observed momentum-dependent split-" "ting between modes of opposite circular polarization" (SC-15, SC-16, L22–L25, left; observed) | the manuscript's reading: a difference of two spectral positions of open-stroke modes | identity map |
| A | "The team predicted that such a lattice should support" the splitting (SC-57, L76–L77, left; predicted) | the manuscript's reading: the cited paper's expectation, kept with "should" | identity map |
| A | "Numerical simulations revealed" two "branches with opposite circular polarizations" (SC-59, SC-60, L79–L80, left; simulated) | the manuscript's reading: two polarization branches, never the branches of core 0.3 | identity map |
| A | "chiral phase vortices, indicating that the polarization state was locked" (SC-63, SC-64, L83–L85, left; simulated) | the manuscript's reading: a $\varphi$-axis winding; "indicating" the record's inference | identity map |

| | | | |
|---|---|---|---|
| B | “mapped the electro-” “magnetic fields across the lattice in real space” (SC-70, L91–L92, left; reported) | the manuscript’s reading: driven observables, zero at zero injection | identity map |
| B | “the measured electromagnetic fields” (SC-71, L92–L93, left; measured) | the manuscript’s reading: the one measured quantity of the chain | identity map |
| B | “the team reconstructed the” “photonic band structure” (SC-72, L93–L94, left; reconstructed) | the manuscript’s reading: a Fourier reconstruction of a driven response | identity map |
| B | “observed momentum-dependent polarization splitting consistent with theoretical calculations” (SC-73, L94–L95, left; observed) | the manuscript’s reading: the relayed agreement, “consistent with” the record’s words | identity map |
| C | “These symmetries relate electronic states of opposite spin at distinct momenta, allowing their energies to differ” (SC-27, L44–L45, left; stated) | the manuscript’s reading: a permission, no size | attributed |
| C | “They arranged these elements in two sublattices” “with opposite magnetic bias, preserving zero net magnetization” (SC-39, L66–L67, left; reported) | the manuscript’s reading: two orientations of one helical density gradient | reading (P-5) |
| D | “relied on gyromag-” “netic materials and an externally imposed magnetic bias, whereas” (SC-84, SC-85, L79–L80, right; stated limitation) | the manuscript’s reading: the place of T-1 and T-2 | reading (P-5) |
| D | “This suggests that the phenomenon may be realized across a much” “wider class of bosonic systems” (SC-83, L77–L78, right; outlook) | the manuscript’s reading: the carrier names of I-2 only | reading (I-2) |

**Cluster A: the relayed splitting.** The record reports, predicts, simulates and observes, each as relayed, a momentum-dependent splitting of its lattice’s two circular polarizations under “zero net magnetization” (SC-39, L66–L67, left column; SA-12), the report and the observation at (SC-14 to SC-16, L20–L25, left column; SA-03), the prediction at (SC-57, SC-58, L76–L78, left column; SA-15) and the simulation at (SC-59 to SC-66, L79–L87, left column; SA-16 to SA-18). Corroboration statement: invariant named, none, each step being the identity map of Use item 2; precision, none, the record printing no value of the splitting and no agreement figure (SA-21); falsifier, a reconstructed band structure of the biased lattice with no momentum-dependent left–right splitting, which would contradict the relayed observation and no invariant.

**Cluster B: the measurement chain.** Circularly polarized light is injected using “phase-controlled probes” and the fields are mapped “across the lattice in real space” and the band structure is reconstructed from their Fourier transform (SC-69 to SC-72, L90–L94, left column; SA-20). Corroboration statement: invariant named, I-1’s driven-observable clause, applied and not tested; precision, none printed, the record giving no resolution, window or sampling; falsifier, none in this record.

**Clusters C and D: account, design, assessment and outlook.** The standfirst’s “now reproduces” and “as a spin analogue” are attributed whole (SC-10, L12–L16, left column; SA-01); the classes of magnets keep “often”, “therefore”, “typically”, “bridge” and “cancel globally” (SC-18 to SC-21, L27–L35, left column; SA-04, SA-05); the definition of altermagnets keeps its citations [3, 4] (SC-11, SC-12, L17–L19, left column; SA-02), the account its “originates from” (SC-23, L37–L38, left column; SA-06), the symmetry argument its “allowing” and “Consequently” (SC-27, SC-28,

L44–L46, left column; SA-07), and the platform its citations [5, 6] (SC-33, L54–L55, and SC-37, L64, left column; SA-10, SA-11). The record's "establish", "reveal", "showed" and "can arise whenever" (SC-74, L96; SC-78, L103–L105; SC-80, SC-81, L106–L109, left column; SA-22, SA-23, SA-24), its "However", "relied on" and "whereas" (SC-84, SC-85, L79–L80, right column; SA-26), its "remains an open question" (SC-88, L84, right column; SA-27) and its "may reveal", "If so" and "could evolve" (SC-89, SC-90, L85–L87, right column; SA-28) are its own. Corroboration statement for both clusters: invariant named, none, the manuscript's readings at P-2, P-3, P-5 and I-2 being labelled; precision, none printed; falsifier, none in this record. The record's "interactions between electrons" (SC-86, L81–L82, right column) stay its phrase; I-2 reads every interaction as curvature plus geodesic motion, with no carrier exchange.

# 4 Cone-position translation

In the manuscript's reading the elements, the iron nuclei and the electrons of the garnet take their places on the charts of the inventory, and none receives a value. Each element sits on the exterior branch of its own atlas with a small own window, $\alpha_{\mathrm{ext}}$ of A-1; the record gives no mass or size, so no value is written. Each iron nucleus of the garnet sits on two charts, the exterior compactness of A-1, far below the seam of that chart and never written as a number, and the interior chart with its skin at the fold, where P-3's saturation diagnostic $\alpha_{\mathrm{core}} \to 1^{-}$ marks the pinning site schematically. The electrons of the garnet stand on I-5's confinement axis, the A-4 token $\alpha_{\mathrm{conf}}$, with no value, no ordering and no address (O-3). The overlap of neighbouring elements carries the A-3 token $\alpha_{\mathrm{ovl}}$ only, with no value and no threshold (O-2). The open strokes have no cone position: "photon" and "magnon" are regimes of the one carrier, named by the A-5 token $\alpha_{\mathrm{mode}}$, which ranks nothing and spaces nothing. The record's isofrequency contours "near zero in momentum space" (SC-52, L56–L57, right column; SA-30) are band-structure contours; I-3 places high density and high energy at the tip of a density cone, and no map from those contours to a density cone is written here (O-8).

# 5 Predictions

The blocks below state predictions general relativity and quantum mechanics do not make, each where a core clause supplies what the consensus calculation lacks. Each names its candidate and SA row first and carries its referent, defining condition, comparator, precision criterion, channel signs, decision rules and ablation test point; a number the record does not print is a U-nn row, and an apparatus it does not name is external.

## 5.1 Common definitions

The constructions are the manuscript's own, on the record's lattice (SC-68, L89–L90, left column; SA-19) measured as the record describes (SC-69 to SC-72, L90–L94, left column; SA-20). The vector $\vec{\mathfrak{k}}$ is a mode's lattice wavevector, the record's "momentum". The frequencies $\omega_{\mathrm{LCP}}(\vec{\mathfrak{k}})$ and $\omega_{\mathrm{RCP}}(\vec{\mathfrak{k}})$ are the angular frequencies of the left and the right circular polarization branch of the reconstructed band structure at $\vec{\mathfrak{k}}$, the sense of the polarization fixed in the laboratory frame by the phasing of the probes. The splitting is $\mathfrak{W}$, its reciprocity-odd part $\mathfrak{W}_{\mathrm{odd}}$; with $\vec{\mathfrak{k}}_1$ and $\vec{\mathfrak{k}}_2$ two wavevectors of one magnitude $\mathfrak{k}_0$ (U-03), along the caption's two momentum axes "kx and ky" (SC-53, L57–L61, right column), the sign-changing part is $\mathfrak{W}_{\mathrm{alt}}$ and the net part $\mathfrak{W}_{\mathrm{net}}$, each factor

$\frac{1}{2}$ averaging two readings, where

$$\begin{aligned} \mathfrak{W}(\vec{\mathfrak{k}}) &= \omega_{\mathrm{LCP}}(\vec{\mathfrak{k}}) - \omega_{\mathrm{RCP}}(\vec{\mathfrak{k}}), & \mathfrak{W}_{\mathrm{odd}}(\vec{\mathfrak{k}}) &= \tfrac{1}{2}\big[\mathfrak{W}(\vec{\mathfrak{k}}) + \mathfrak{W}(-\vec{\mathfrak{k}})\big], \\ \mathfrak{W}_{\mathrm{alt}} &= \tfrac{1}{2}\big[\mathfrak{W}_{\mathrm{odd}}(\vec{\mathfrak{k}}_1) - \mathfrak{W}_{\mathrm{odd}}(\vec{\mathfrak{k}}_2)\big], & \mathfrak{W}_{\mathrm{net}} &= \tfrac{1}{2}\big[\mathfrak{W}_{\mathrm{odd}}(\vec{\mathfrak{k}}_1) + \mathfrak{W}_{\mathrm{odd}}(\vec{\mathfrak{k}}_2)\big]. \end{aligned} \tag{13}$$

The scale $\mathfrak{W}_{\mathrm{bias}}$ is the magnitude of $\mathfrak{W}_{\mathrm{alt}}$ of a lattice under the patterned permanent magnets, measured in the design's own frame: for T-1 and T-2 that of their own lattice, its tapered elements untwisted in their torsion clamps, fixed before the first session; for T-3 that of each element set (U-06). The record prints no pair of momenta between which its splitting changes sign (SC-61, SC-62, L81–L83, left column): the two directions lie along the caption's axes where $\mathfrak{W}_{\mathrm{bias}}$ there exceeds the frame's reading error (U-05), and are otherwise the pair of directions of magnitude $\mathfrak{k}_0$ for which $\mathfrak{W}_{\mathrm{bias}}$ is largest, fixed before a design's first reading, for T-3 on the element sets of natural iron read before the first pair (U-04).

The statistic of every block is the mean of twelve contrasts, and its null distribution is the set of means obtained by flipping the signs of the twelve contrasts in every combination. The sizes are exact (U-15): of the $2^{12} = 4096$ equally likely sign assignments ($p$ the fraction of them whose mean is at least as extreme as the observed one), $p \le 0.0027$ two-sided admits the 10 most extreme ($10/4096 = 0.0024$) and $p \le 0.00135$ one-sided the 5 most extreme ($5/4096 = 0.0012$). No Monte Carlo figure and no power is printed.

### 5.2 T-1: a staggered twist in place of the staggered bias

T-1 carries the divergence candidate DC-1 and discriminates SA-31, the record's statement that the findings "relied on gyromag-" "netic materials and an externally imposed magnetic bias" (SC-84, SC-85, L79–L80, right column). Its warrant is P-5, an additional source: its clauses "A magnetic field is a macroscopic helical density gradient of the omnium" and "Imposing a physical twist (torsion, helical geometry) on a material *is* establishing a magnetic field".

*Referent.* The record's lattice (SC-68, L89–L90, left column; SA-19) inside a magnetic shield (external), its "patterned permanent magnets" removed and its elements replaced by truncated-cone elements of yttrium iron garnet, end cross-section ratio 2, wide end down (U-07), the two sublattices' elements differing in their surroundings or in the orientation of a non-circular cross-section (U-08). Each element sits in a non-magnetic torsion clamp that carries no current while it is turned or held and whose two identical ends are turned by $+\Theta_{\mathrm{tw}}/2$ and $-\Theta_{\mathrm{tw}}/2$ about the element axis, with the twist angle $\Theta_{\mathrm{tw}} = \pm 1^{\circ}$, its sign the hand, for elements slender enough to take it elastically (U-09). The hand arrangements on the record's "two sublattices" (SC-39, L66–L67, left column) are $(+-)$, the hand $+$ on the first and $-$ on the second, and $(-+)$, the two exchanged. The sense of the polarization is taken about the direction of the element axes (U-10).

*Admission and symmetry.* The lattice is admitted only where $\mathfrak{W}_{\mathrm{alt}}$ of its untwisted elements under the patterned magnets changes by more than the frame's reading error (U-05) when the magnets of the two sublattices are exchanged. An operation of the lattice that carries $(+-)$ onto $(-+)$ with $\mathfrak{W}_{\mathrm{alt}}$ unchanged — a translation of the first sublattice onto the second is one — makes the contrast below vanish in every theory; an axial bias on elements tapered one way transforms under it as the hand does, so in the consensus calculation, where $\mathfrak{W}_{\mathrm{alt}}$ changes sign when every magnet is reversed, that exchange leaves $\mathfrak{W}_{\mathrm{alt}}$ under the magnets as it is. A uniformly twisted element of uniform section carries no net axial field: a twofold axis across the element keeps the twist and reverses an axial field; the design therefore tapers the elements.

*Observable and design.* The observable is $\mathfrak{W}_{\mathrm{alt}}$, and the contrast of a session, $\mathfrak{y}_{\mathrm{alt}}$, is half the

difference of its readings under the two arrangements:

$$\mathfrak{y}_{\mathrm{alt}} = \tfrac{1}{2}\big[\mathfrak{W}_{\mathrm{alt}}(+-) - \mathfrak{W}_{\mathrm{alt}}(-+)\big]. \tag{14}$$

There are twelve sessions (U-11). Before each, the elements are degaussed inside the shield by a decaying alternating field that starts above their saturation field and whose starting polarity is set by a fair coin drawn before the session, which randomises the sign of the residual domain state the degaussing leaves. In each session $\mathfrak{W}_{\mathrm{alt}}$ is read under $(+-)$ and under $(-+)$, in an order set by a second fair coin drawn before the session, which randomises the sign of a drift between the session's two readings.

*FDT input.* By P-5 the imposed twist establishes a magnetic field, and that field biases each element. The mirror through a tapered element's axis reverses the hand and an axial field and keeps the taper, so the field's axial part is odd in the hand, and the staggered hands bias the two sublattices oppositely, as the record's magnets do; the elements' response to a magnetic field is the record's (SC-38, L65–L66, left column; SA-11). P-5's last sentence ("Quantitative twist → moment forms are derived in-manuscript through I-1/I-2 with a declared kernel") assigns neither magnitude nor sense, and no kernel is declared here: T-1 is an existence prediction.

*Comparator, solved.* The comparator is zero within the ambient leak. In the consensus calculation, with the static magnetization of every element averaging to zero over its domains at every point of it, the permittivity and permeability tensors of every element are symmetric whatever its taper and twist, and the structure is reciprocal (U-01) [7]: each band at $\vec{\mathfrak{k}}$ has a partner at $-\vec{\mathfrak{k}}$ at the same frequency with the opposite laboratory-frame sense of circular polarization. The defining condition then solves as

$$\omega_{\mathrm{LCP}}(-\vec{\mathfrak{k}}) = \omega_{\mathrm{RCP}}(\vec{\mathfrak{k}}) \implies \mathfrak{W}(-\vec{\mathfrak{k}}) = -\mathfrak{W}(\vec{\mathfrak{k}}) \implies \mathfrak{W}_{\mathrm{odd}} \equiv 0 \implies \mathfrak{y}_{\mathrm{alt}} = 0 \tag{15}$$

at every wavevector and for every hand arrangement, its premise the consensus calculation's. A residual domain state enters $\mathfrak{y}_{\mathrm{alt}}$ with a sign the degaussing coin randomises. A uniform ambient field left by the shield enters the contrast through terms odd in the hand, bounded by $\mathfrak{b}_{\mathrm{amb}}$, which is fixed before the first session as the larger of two bounds, one for each twist candidate's contrast, both from the measured response of that contrast to uniform test fields along three axes, each held from the degaussing through the readings, and the shield's measured residual (U-12). The first session starts only with $\mathfrak{b}_{\mathrm{amb}}$ at or under its design ceiling $0.04\,\mathfrak{W}_{\mathrm{bias}}$ (U-13).

*Channels and the sign each gives the contrast* (the table below).

| channel | sign it gives $\mathfrak{y}_{\mathrm{alt}}$ |
|---|---|
| the twist's field (P-5) | one sign in every session, its sense unassigned (the test two-sided) |
| the residual domain state | a sign the degaussing coin sets |
| a drift between the two readings | a sign the order coin sets |
| the ambient leak | one sign in every session, inside the interval from $-\mathfrak{b}_{\mathrm{amb}}$ to $+\mathfrak{b}_{\mathrm{amb}}$ |
| everything else the taper, the twist and the torsion clamp do to the elements | zero, $\mathfrak{W}_{\mathrm{odd}}$ vanishing by reciprocity |

*Precision criterion.* Each contrast is half the difference of two readings of one session, so a term common to the two readings cancels within the session; the residual domain state and the drift take the signs their coins set, and the ambient leak is carried by its bound, so the test rests on sign symmetry and the bound and on no variance estimate, and the covariance of a session's two readings enters through the contrast itself.

*Statistic and decision rules.* The statistic is the twelve contrasts, tested by the two-sided sign-flip permutation test over all $2^{12} = 4096$ flips. Detection: the two-sided test of the twelve contrasts rejects at $p \leq 0.0027$ (U-15; size 10/4096 with no twist field and no ambient leak: the sign of every other term is a fair coin's). Attribution: a detection is read as the field P-5 assigns to the imposed twist when, in addition, the mean contrast lies outside the interval from $-\mathfrak{b}_{\mathrm{amb}}$ to $+\mathfrak{b}_{\mathrm{amb}}$ and the two-sided test of the contrasts, every one shifted by $\mathfrak{b}_{\mathrm{amb}}$ against the sign of the mean, rejects at $p \leq 0.0027$ (U-15); with no twist field such a reading has probability at most 10/4096 wherever the leak lies within its bound. Exclusion: a contrast of magnitude $\mathfrak{h}_{\mathrm{tw}} = 0.1\,\mathfrak{W}_{\mathrm{bias}}$ or more (U-14) is excluded when $\mathfrak{b}_{\mathrm{amb}} < \mathfrak{h}_{\mathrm{tw}}$, the mean contrast lies between $-(\mathfrak{h}_{\mathrm{tw}} - \mathfrak{b}_{\mathrm{amb}})$ and $+(\mathfrak{h}_{\mathrm{tw}} - \mathfrak{b}_{\mathrm{amb}})$, and the two-sided tests of the contrasts shifted by $+(\mathfrak{h}_{\mathrm{tw}} - \mathfrak{b}_{\mathrm{amb}})$ and by $-(\mathfrak{h}_{\mathrm{tw}} - \mathfrak{b}_{\mathrm{amb}})$ both reject at $p \leq 0.0027$ (U-15), a false exclusion having probability at most 5/4096 wherever the leak lies within its bound. The result is inconclusive otherwise.

*Ablation test point*, an instantiated effect. With $\mathfrak{b}_{\mathrm{amb}}$ at its ceiling, the FDT input in place sets every one of the twelve contrasts at $\mathfrak{h}_{\mathrm{tw}}$ above the comparator's zero, the attribution rule testing the shifted values $\mathfrak{h}_{\mathrm{tw}} - \mathfrak{b}_{\mathrm{amb}}$, and the input ablated sets them at zero. The threshold is the largest mean that one sign flip among the twelve equal values the rule tests leaves short of rejection, the attribution rule's: T-1 test point: $\mathfrak{h}_{\mathrm{tw}} = 0.1\,\mathfrak{W}_{\mathrm{bias}}$ against 0, threshold $\mathfrak{b}_{\mathrm{amb}} + 5(\mathfrak{h}_{\mathrm{tw}} - \mathfrak{b}_{\mathrm{amb}})/6 = 0.09\,\mathfrak{W}_{\mathrm{bias}}$. The difference exceeds the threshold, so the decision rule separates the FDT input from its ablation.

### 5.3 T-2: a uniform twist and a net splitting

T-2 carries the divergence candidate DC-2 and discriminates SA-32, the record's statement that "In ferromagnets, spins align to produce a net magnetic moment" "and spin-split electronic bands" (SC-17, L26–L27, left column). Its warrant is P-5, an additional source, with the two clauses quoted in T-1.

*Referent, design, comparator, channels and statistic* are those of T-1: the same lattice inside the same shield, its tapered elements in their torsion clamps (U-07 to U-10), admitted as there because $\mathfrak{W}_{\mathrm{bias}}$ sets this block's scales; twelve sessions (U-11), each preceded by the degaussing whose starting polarity a fair coin drawn before the session sets, which randomises the sign of the residual domain state, and read in an order a second fair coin drawn before the session sets, which randomises the sign of a drift between the two readings. A translation between the sublattices leaves the contrast below as it is, and every operation of the lattice keeps the hand and the sense together or reverses both, so none makes it vanish. The two hand arrangements are uniform: $(++)$, the hand $+$ on every element, and $(--)$, the hand $-$ on every element.

*Observable.* The observable is $\mathfrak{W}_{\mathrm{net}}$, and the contrast of a session, $\mathfrak{y}_{\mathrm{net}}$, is half the difference of its readings under the two uniform arrangements:

$$\mathfrak{y}_{\mathrm{net}} = \tfrac{1}{2}\big[\mathfrak{W}_{\mathrm{net}}(++) - \mathfrak{W}_{\mathrm{net}}(--)\big]. \tag{16}$$

*FDT input*, as T-1: one hand on every element is one sense of field on every element, and P-5 assigns it neither magnitude nor sense; T-2 is an existence prediction. *Comparator*, as T-1: the reciprocity of Eq. (15) sets $\mathfrak{W}_{\mathrm{odd}}$ to zero at every wavevector, so $\mathfrak{y}_{\mathrm{net}} = 0$ in the consensus calculation, within the ambient leak, whose term lies inside the same $\mathfrak{b}_{\mathrm{amb}}$ (U-12) under the same ceiling (U-13). The channels and their signs are those of the table of T-1, with $\mathfrak{y}_{\mathrm{net}}$ in place of $\mathfrak{y}_{\mathrm{alt}}$, and so is the precision criterion.

*Statistic and decision rules*, in T-1's words with $\mathfrak{y}_{\mathrm{net}}$ and the uniform twist: the twelve contrasts under the two-sided sign-flip permutation test over all $2^{12} = 4096$ flips; detection at $p \leq 0.0027$ (U-15; size 10/4096 with no twist field and no ambient leak); attribution when, in addition, the

mean lies outside the interval from $-\mathfrak{b}_{\mathrm{amb}}$ to $+\mathfrak{b}_{\mathrm{amb}}$ and the test of the contrasts shifted by $\mathfrak{b}_{\mathrm{amb}}$ against the sign of the mean rejects at $p \le 0.0027$ (U-15; probability at most 10/4096 with no twist field wherever the leak lies within its bound); exclusion of a contrast of magnitude $\mathfrak{h}_{\mathrm{tw}}$ or more when $\mathfrak{b}_{\mathrm{amb}} < \mathfrak{h}_{\mathrm{tw}}$, the mean lies between $-(\mathfrak{h}_{\mathrm{tw}} - \mathfrak{b}_{\mathrm{amb}})$ and $+(\mathfrak{h}_{\mathrm{tw}} - \mathfrak{b}_{\mathrm{amb}})$ and the tests of the contrasts shifted by $\pm(\mathfrak{h}_{\mathrm{tw}} - \mathfrak{b}_{\mathrm{amb}})$ both reject at $p \le 0.0027$ (U-15; false exclusion at most 5/4096 wherever the leak lies within its bound); inconclusive otherwise.

*Ablation test point*, an instantiated effect, as T-1, with $\mathfrak{b}_{\mathrm{amb}}$ at its ceiling and every contrast at $\mathfrak{h}_{\mathrm{tw}}$ with the input in place and at zero with it ablated: T-2 test point: $\mathfrak{h}_{\mathrm{tw}} = 0.1\,\mathfrak{W}_{\mathrm{bias}}$ against 0, threshold $\mathfrak{b}_{\mathrm{amb}} + 5(\mathfrak{h}_{\mathrm{tw}} - \mathfrak{b}_{\mathrm{amb}})/6 = 0.09\,\mathfrak{W}_{\mathrm{bias}}$. The difference exceeds the threshold, so the decision rule separates the FDT input from its ablation.

### 5.4 T-3: an isotope channel in the splitting under the magnets

T-3 carries the divergence candidate DC-3 and discriminates SA-33, the record's "periodic system containing magnetic elements" "whose response to electromagnetic waves depends on an applied" "magnetic field" (SC-37, SC-38, L64–L66, left column). Its warrant is I-7, a constitutive input: the Discriminator, quoted whole, "For purely density-coupled equilibrium observables, a heavier isotope → larger $R_s$ → higher $\alpha$ → **larger** response — opposite in sign to conventional reduced-mass scaling."

*Referent.* The record's lattice under its permanent magnets (SC-68, L89–L90, left column; SA-19), with twelve pairs of element sets (U-17) cut from yttrium iron garnet grown from iron enriched in $^{57}$Fe and from iron enriched in $^{54}$Fe, enrichment at least 95 %, with one yttrium and one oxygen source (U-16). The two growths of a pair run back to back in one furnace, in an order set by a fair coin drawn before the pair, which randomises the sign of a furnace drift; the two sets of a pair are read in turn in the one lattice frame under the one set of magnets, in an order set by a second fair coin drawn before the pair's first reading, which randomises the sign of a drift between the two readings.

*Observable.* The observable is $\ln \mathfrak{W}_{\mathrm{bias}}$ of each set, written $\ln \mathfrak{W}_{\mathrm{bias}}(^{57}\mathrm{Fe})$ and $\ln \mathfrak{W}_{\mathrm{bias}}(^{54}\mathrm{Fe})$ for the two sets of a pair, and the pair difference $\mathfrak{y}_{\mathrm{isot}}$ is

$$\mathfrak{y}_{\mathrm{isot}} = \ln \mathfrak{W}_{\mathrm{bias}}(^{57}\mathrm{Fe}) - \ln \mathfrak{W}_{\mathrm{bias}}(^{54}\mathrm{Fe}). \tag{17}$$

*FDT input.* I-7's Discipline 2 reads: "A sign prediction competing with geometric, electronic or inertial channels is written as a sensitivity-weighted sum $\delta \ln O = \sum_i S_i\, \delta \ln x_i$ with every $S_i$ defined (held-fixed variables stated). The density-channel **input** sign is the FDT discriminator; the **observable** sign is $\mathrm{sgn}(\prod S_i)$", and it is fixed only once the sensitivities are established. With $O = \mathfrak{W}_{\mathrm{bias}}$, $x_i$ the channel coordinates, $x_{\mathrm{dens}}$ the density channel's coordinate and $S_i$ the mean, over $\ln x_i$ along the isotope substitution, of the sensitivity $\partial \ln O / \partial \ln x_i$ of $\ln O$ to $\ln x_i$ with every other coordinate held fixed, the finite isotope change, written with $\Delta$, reads

$$\mathfrak{y}_{\mathrm{isot}} = \Delta \ln \mathfrak{W}_{\mathrm{bias}} = \sum_i S_i\, \Delta \ln x_i, \qquad x_{\mathrm{dens}} = \alpha_{\mathrm{ext}} = \frac{\mathcal{M}_{\mathrm{el}} c^2}{2 F_{\max} r_f} \quad (P,\ r_f \text{ and packing fixed}), \tag{18}$$

the density channel's coordinate $x_{\mathrm{dens}}$ the A-1 window of the element, on its exterior branch, moved by the substitution through $\mathcal{M}_{\mathrm{el}}$ of Eq. (10) at fixed geometry. I-3's chart discipline 5 is quoted: "Fixed-geometry perturbations (isotope substitution: $P$, $r$, packing all fixed) move compactness only; pressure-trajectory maps do not apply to them." The mass coordinate is the element's ledger, never built from the observable predicted. In the manuscript's reading the Discriminator's "larger response" is a larger $\mathfrak{W}_{\mathrm{bias}}$; in the same reading $\mathfrak{W}_{\mathrm{bias}}$ is an equilibrium observable, a difference of

two spectral positions independent of the injected amplitude, and it is not "purely density-coupled": its geometric, electronic and inertial channels are the other terms of the sum. The density channel's input sign is positive; the observable sign, $\mathrm{sgn}(\prod S_i)$, is fixed once the sensitivities are established, and T-3's one-sided rules take it as positive on that reading: T-3 is a sign prediction.

*Comparator.* Each pair's consensus isotope shift of $\ln \mathfrak{W}_{\mathrm{bias}}$ — the heavier isotope's zero-point lattice change, the phonon channel of conventional reduced-mass scaling, the hyperfine channel of the $^{57}$Fe nuclear moment ($^{54}$Fe carries none), and that pair's residual composition, microstructure (crystal orientation, density) and dimension differences — lies inside the preregistered interval from $-\mathfrak{c}_{\mathrm{isot}}$ to $+\mathfrak{c}_{\mathrm{isot}}$, $\mathfrak{c}_{\mathrm{isot}} = 0.01$ (U-18). Reduced-mass scaling enters only as this comparator channel.

| channel | sign it gives $\mathfrak{y}_{\mathrm{isot}}$ |
|---|---|
| the density channel (I-7) | its input sign positive (the Discriminator) |
| the consensus channels | of either sign, each pair's sum inside the interval from $-\mathfrak{c}_{\mathrm{isot}}$ to $+\mathfrak{c}_{\mathrm{isot}}$ |
| the furnace drift | a sign the growth-order coin sets |
| the reading drift | a sign the reading-order coin sets |

*Precision criterion.* Each pair difference subtracts two sets read in one frame under one set of magnets, so a term common to the two readings cancels within the pair; the drifts take the signs their coins set, and the consensus channels are carried by their bound, so the test rests on sign symmetry and the bound and on no variance estimate.

*Statistic and decision rules.* The statistic is the twelve pair differences, tested by one-sided sign-flip permutation tests over all $2^{12} = 4096$ flips. Detection: the one-sided test of the residuals $\mathfrak{y}_{\mathrm{isot}} - \mathfrak{c}_{\mathrm{isot}}$ rejects upward at $p \le 0.00135$ (U-15) (size at most 5/4096 wherever every pair's consensus shift lies in the interval). Exclusion: a density-channel contribution of $\mathfrak{h}_{\mathrm{isot}} = 0.05$ or more in $\ln \mathfrak{W}_{\mathrm{bias}}$ (U-19) is excluded when the one-sided test of $\mathfrak{y}_{\mathrm{isot}} - (\mathfrak{h}_{\mathrm{isot}} - \mathfrak{c}_{\mathrm{isot}})$ rejects downward at $p \le 0.00135$ (U-15; false exclusion at most 5/4096 wherever every pair's consensus shift lies in the interval). The result is inconclusive otherwise. Attribution: a detection is read as the density channel when it stands with $\mathfrak{c}_{\mathrm{isot}}$ kept for the phonon and hyperfine channels, which no measurement of the pairs bounds, and added to the bound recomputed from the pairs' measured lattice parameters, compositions, microstructures and element dimensions (external measurements), each propagated through a sensitivity measured on the same lattice with element sets of natural iron before the first pair.

*Ablation test point*, an instantiated effect, the comparator's value at the interval's upper end. With the FDT input in place every pair difference stands at $\mathfrak{c}_{\mathrm{isot}} + \mathfrak{h}_{\mathrm{isot}}$, its residual at $\mathfrak{h}_{\mathrm{isot}}$; with the input ablated the pair difference stands at $\mathfrak{c}_{\mathrm{isot}}$, its residual at zero. The threshold is the largest mean that one sign flip among the twelve equal residuals leaves short of rejection: T-3 test point: residuals $\mathfrak{h}_{\mathrm{isot}} = 0.05$ against 0, threshold $5\mathfrak{h}_{\mathrm{isot}}/6 = 0.04$. The difference exceeds the threshold, so the decision rule separates the FDT input from its ablation.

### 5.5 Retired candidates

Two candidates are retired, each named once. DC-4 (SA-34), a clock the $^{57}$Fe nucleus carries in the bias read through the six Mössbauer line positions, is retired as inert: its doubled held term $2|\mathsf{m} \cdot \mathsf{B}|/E_0$ at 100 T (U-26) is $1 \times 10^{-17}$ of the transition energy against the threshold $1 \times 10^{-14}$, and its content stands in the convergence statement. DC-5 (SA-35), P-4's aperture reading of the record's isofrequency contours, is retired with no map: the core supplies no map from the aperture assignment to a band dispersion, and no constitutive derivation of $c_{\mathrm{eff}}$, P-4's effective, chart-dependent aperture speed, or of $n_{\mathrm{cone}}$ is written here (O-8).

## 6 Cross-domain

The three blocks carry their clauses into neighbouring platforms with no second mechanism. In the manuscript's reading P-5's twist is a magnetic bias in every material whose response depends on an applied magnetic field, and the reciprocity-odd splitting of T-1 and T-2 separates it from a reciprocal structure on the comparator's zero. I-7 makes one mechanism of isotope, thermal and pressure shifts, and the pair design of T-3 is the form any density-coupled equilibrium observable of a lattice takes. P-2's nodal architecture is one reading for every carrier window, and in the manuscript's reading the record's "wider class of bosonic systems" (SC-83, L77–L78, right column; SA-25) is read only through the carrier names of I-2's identity — photon, graviton, gluon, phonon, magnon — regimes of one carrier. The record's "optical frequencies" and "integrated photonic platforms" (SC-87, SC-88, L82–L84, right column; SA-27) stay its question, and the clauses carry no scale.

## 7 System-level reading (exploratory)

*Scope.* This section re-describes, in-sample, one statement the record relays; its observable is labelled X-1, it is not counted with the predictions, and it carries no number; for its winding the record prints none.

*X-1. Observable:* the winding of the relative helical phase of the two circular components about the core of one of the record's "chiral phase vortices" (SC-63, L83–L84, left column; SA-17), in the simulated modes the record relays. *Defining condition:* with $\varphi_{\mathrm{rel}}$ the relative helical phase of the two circular components on the $\varphi$ axis and $\mathcal{C}$ a closed loop about the vortex core in the plane of the lattice, with $\oint_{\mathcal{C}}$ the sum once around it, the winding $w$ is

$$w = \frac{1}{2\pi} \oint_{\mathcal{C}} d\varphi_{\mathrm{rel}}, \tag{19}$$

an integer at fixed field identity. *Comparator:* the same winding of the same simulated field in the consensus reading, identical because the field is one; the step is an in-sample re-description and corroborates no invariant. In the manuscript's reading the winding is a $\varphi$-axis quantity of the cylindrical lift (Eq. 7), and the record's "indicating that the polarization state was locked" "to the propagation direction" (SC-64, L84–L85, left column; SA-17) stays its own inference.

*Guards.* The winding is never a helix count, never a fixed $n$ and never a strand count on a mode (I-2, I-5). The record's "vortices" are phase vortices of modes and are never P-5's vortex lines. No number is printed, and X-1 is counted with nothing.

## 8 Convergence statement

On the record's own inputs and dictionary — two sublattices with opposite bias (SC-39, L66–L67, left column; SA-12), elements whose response depends on an applied magnetic field (SC-38, L65–L66, left column; SA-11), circular polarization as its "spin-like degree of freedom" (SC-41, L68–L76, left column; SA-14), the team's prediction (SC-57, L76–L77, left column; SA-15), the simulation (SC-59, SC-60, L79–L80, left column; SA-16) and the Fourier reconstruction (SC-71, SC-72, L92–L94, left column; SA-20), beside the symmetry argument it gives for "electronic states of opposite spin" (SC-27, L44–L45, left column; SA-07) — FDT returns what the record relays: a momentum-dependent splitting between the two circular polarizations under "zero net magnetization". Each step is the identity map of Use item 2 and corroborates no invariant; the record prints no value of a

physical quantity but the axis label "0" (NG-04, L49, right column), and the manuscript adds none to its results. For the same stress tensor and data FDT returns the curvature general relativity returns (I-3 containment), and the consensus reciprocity of a structure whose static magnetization averages to zero over its domains (U-01) [7] is accepted in full: it is the comparators' zero of T-1 and T-2.

Two readings of the record are declined, each once. The standard account reads spin as an intrinsic property of the electron, and the record states it so: "electrons carry intrinsic spins" (SC-30, L50–L51, left column; SA-08). FDT reads the electron as a closed $n = 3$ braid of the one excitation, with "no intrinsic particle masses or properties" (I-5), and the record's data are accepted in full. The standard account reads the magnetic field as an independent entity, and the record's elements are those "whose response to electromagnetic waves depends on an applied" "magnetic field" (SC-38, L65–L66, left column; SA-11). FDT reads that field as "a macroscopic helical density gradient of the omnium" (P-5), and the dependence itself is kept as the record's constitutive statement.

The helical window adds nothing measurable to the $^{57}$Fe nuclear lines of a biased element, the content of the retired DC-4. Read against a single-line source outside any field (external), the $^{57}$Fe nucleus of one garnet element in the bias runs its transition on its own $E/E_0$ where it sits (0.1c: "a clock the pattern carries runs on the lapse and on its own rest energy where it sits"), with $|E/E_0 - 1| = |E_{\mathrm{ind}} - \mathsf{m} \cdot \mathsf{B}|/E_0$ taken at its held term (U-20). The isomer shift, hyperfine field and quadrupole shift of the consensus fit take up any factor common to the six lines, so the input is read through the two ground sublevels' difference, $2|\mathsf{m} \cdot \mathsf{B}|/E_0$ of the 14.4 keV transition energy (U-27). With the ground-state moment 0.0906 nuclear magnetons (U-21), the nucleus's rest energy $E_0 = 56.921\,\mathrm{u}\,c^2$, its mass the atom's 56.935 u (U-22) less 26 electron masses of $5.486 \times 10^{-4}$ u (U-23), that is $5.30 \times 10^{10}$ eV at 931.494 MeV per u (U-24), the nuclear magneton $3.152 \times 10^{-8}\,\mathrm{eV\,T^{-1}}$ (U-25) and the field at the site bounded by 100 T (U-26), external constants and an external bound, U-23 to U-25 from [8] and U-22 from [9], the held term gives $2|\mathsf{m} \cdot \mathsf{B}|/E_0 \leq 1.1 \times 10^{-17}$, against the threshold of three times the precision of the difference of two line positions, each $0.001\,\mathrm{mm\,s^{-1}}$ and uncorrelated (U-28), $3\sqrt{2} \times 0.001\,\mathrm{mm\,s^{-1}}$ over $c$, or $1 \times 10^{-14}$ in fractional energy. The consensus line positions, which carry the hyperfine energies, are recovered at that precision.

Declining a reading is not a divergence. The divergences of this analysis are T-1 to T-3, each standing where P-5 or I-7 supplies an additional source or a constitutive input the consensus calculation lacks, and none rests on $\alpha$, a chart or a branch tag alone.

## 9 Status ledger

Every item to be derived that the manuscript touches, every held-out target, every prediction block and every token of the inventory without warrant is stated once, here (the table below); the abstract's count of predictions is read off the T-rows.

| item | status | statement |
|---|---|---|
| O-1 | to be derived (O-1) | the finite-core cutoff $r_c$, the regular core chart, or the outward phase-transfer law; touched by the interior branch $r_c \le r_f < R_s$ of the atlas |
| O-2 | to be derived (O-2) | a geometrically constructed odds for the overlap-contrast application (A-3); the token $\alpha_{\mathrm{ovl}}$ carries no value |
| O-3 | to be derived (O-3) | a canonical odds for the confinement application (A-4); the token $\alpha_{\mathrm{conf}}$ carries no value |
| O-4 | to be derived (O-4) | the local profile $\rho_{\mathrm{loc}}(r_f)$ from the omnium constitutive law with boundary, surface and core data, reducing to the measured nuclear profile; the iron nuclei's interior charts |
| O-5 | to be derived (O-5) | multipole and tidal remainders of the closed-form pair expression, and the reading they give of the band $R_H < r_f < R_s$ outside a rotating source's horizon; the overlap complex; how P-4's many-cone settlement signs a pair it does not join; the non-spherical elements |
| O-6 | to be derived (O-6) | the maps from a charge, a circulating charge or a colour seat to an I-1 input; derivation of the seat table from cone geometry; the gluon octet's dynamics; the elements' moments |
| O-8 | to be derived (O-8) | the constitutive derivation of $c_{\mathrm{eff}}$ / $n_{\mathrm{cone}}$ and its reconciliation with lensing; $n_{\mathrm{cone}}$ is P-4's candidate assignment; DC-5 |
| O-9 | to be derived (O-9) | the confinement operator $D$, its domains, boundary data and spectrum; every mass ratio, including the two held-out targets; the electrons and the iron nuclei |
| O-11 | to be derived (O-11) | $\nu_F$ on the exact framed closures; the odd-parity absorption proof; proof that the spinorial class is nontrivial; $\nu_F = B_s \bmod 2$ cited as I-5 prints it |
| targets | held-out | held-out targets of a derived $D$, never FDT outputs: $m_p/m_e = 1836.15267343$ and $(m_\mu/m_e)^2 = 4.2753 \times 10^4$ |
| T-1 | prospective existence test | a staggered twist produces $\mathfrak{y}_{\mathrm{alt}} \neq 0$; existence only, no kernel declared (P-5); convergence value $\mathfrak{y}_{\mathrm{alt}} = 0$ (U-01) |
| T-2 | prospective existence test | a uniform twist produces $\mathfrak{y}_{\mathrm{net}} \neq 0$; existence only, no kernel declared (P-5); convergence value $\mathfrak{y}_{\mathrm{net}} = 0$ (U-01) |
| T-3 | prospective sign test | a density channel of positive input sign in $\mathfrak{y}_{\mathrm{isot}}$; the observable sign $\mathrm{sgn}(\prod S_i)$ fixed once the sensitivities are established, the one-sided rules taking it as positive; convergence value each pair's consensus shift inside $\pm\mathfrak{c}_{\mathrm{isot}}$ |
| DC-4 | retired, inert | the helical-window bound of the convergence statement |
| DC-5 | retired, no map | no map from the aperture to a band dispersion (O-8) |
| exploratory | in-sample | the winding of the system-level reading, uncounted |
| A-3, A-4, A-5 | Range-only tokens | $\alpha_{\mathrm{ovl}}$, $\alpha_{\mathrm{conf}}$, $\alpha_{\mathrm{mode}}$: token and range only, no value, threshold, ordering, sign or trajectory |

# 10 Conclusions

In the manuscript's reading Yang's record describes one carrier in a lattice of closed patterns: two senses of turning of an open stroke's grades, a helical density gradient for the bias of each garnet element, and a driven nodal architecture whose field maps are driven observables. On the record's own inputs FDT returns the splitting it relays, an identity that corroborates no invariant; the record's data stand in full, and the standard account's readings of intrinsic electron spin and of the magnetic field as an independent entity are declined once each. FDT, a true extension of general relativity and quantum mechanics, diverges where P-5 and I-7 supply what the consensus calculation lacks: a staggered twist of tapered elements with no magnet (T-1), a uniform twist (T-2), and an isotope channel in the splitting under the magnets (T-3), each decided by an exact sign-flip rule against a comparator the consensus calculation fixes (T-1, T-2) or a preregistered

interval bounds (T-3).

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