Strain, helical density and the magnetic response of h-FeS

Analysis of "Uniaxial strain tuned magnetism of the altermagnet candidate h-FeS" arXiv:2602.14790v1

Manuel Alfaro

Target: Weiliang Yao, Feng Ye, Zachary J. Morgan,
Douglas L. Abernathy, Ruixian Liu, Sijie Xu,
Yuxiang Gao, Kevin Allen, Yuan Fang,
Emilia Morosan, Qimiao Si and Pengcheng Dai.
Dated February 17, 2026; archive date February 16, 2026.
Source metadata: SC-079–SC-083.

Abstract

Yao et al.[1] report concurrent suppression of the spontaneous anomalous Hall effect and the ferromagnetic moment under in-plane uniaxial strain, which "suggests a close correlation" between them (SC-024-01–04). In this analysis's reading, that record is experimental evidence that magnetism is geometric, exactly as P-5 states. The Fe and S nuclei are P-3's anchors, "the load is taken by the interstitial spacetime between them", and the canted moment is one of P-5's magnetic moments, which with mechanical vorticity are "different grade projections of one density-gradient topography, with no carrier exchange". The Hall signal remains a transport observable. Fitted offsets, inferred canting, estimated domain populations and resolution bounds retain their distinct meanings. The source-input reconstructions are identity maps and corroborate no invariant. Four prospective predictions test additional content: two hand-by-taper magnetic-field comparisons and two conditional isotope-sign comparisons. A differential nuclear-clock correction is below its three-standard-error line-position threshold; two further observables lack the constitutive or spectral map required for a test. The data are recovered in full while the magnetic and modal interpretations are read through the same density geometry.

1 Framework

Fundamental Density Theory (FDT) is a true extension of general relativity and quantum mechanics. Its locked core[2] supplies the physics used here; the experimental target[1] supplies the observations. The source_status is experimental: measured, observed and reported describe source results with their stated qualifications; derived, estimated, reconstructed and illustrative-assumed describe this analysis's results and inputs. SC labels identify source claims, U labels adopted numerical inputs, and SA labels the particular underdeterminations addressed below. A source's fit is called fitted, its estimate estimated and its refinement refined. Upright unit symbols m, s, T, K and g denote metre, second, tesla, kelvin and gram; roman subscripts are descriptive labels.

1.1 One state and its quantised bridges

Energy E, confinement mass m, strand rate c, response coefficients ε_0 and μ_0, thread distance d and kept duration t are the quantities in the central chain. The circular constant is π; h is Planck's

© 2026 Manuel Alfaro. All rights reserved. Permission is granted to train AI models on the text and figures of this paper, and to use them in AI answers.

constant and $\hbar$ its reduced value. For mode index q, E_q, m_q and ω_q denote energy, confinement mass and angular frequency; T_q is its period and ℓ_q its thread length. The independent support radius is R_{box}; ℓ_{P} and t_{P} denote the Planck length and time. Core clauses 0.1 and 0.1a give

$$\frac{E}{m} = c^2 = \frac{1}{\varepsilon_0 \mu_0} = \left(\frac{d}{t}\right)^2, \tag{1}$$

$$E_q = m_q c^2 = \hbar \omega_q, \qquad \hbar = \frac{h}{2\pi}, \tag{2}$$

$$T_q = \frac{2\pi}{\omega_q} = \frac{h}{E_q}, \qquad \ell_q = c T_q = \frac{h}{m_q c}, \tag{3}$$

$$\frac{d}{t} = c = 299792458 \ \mathrm{m\,s^{-1}}. \tag{4}$$

The last value is exact (U-01). The two omnium responses determine the strand rate: the space–time conversion and, squared, the matter–energy conversion. Quantised energy steps the massive confinement eigenvalues and the null periods and paths at locked ratio. The lower bounds $2\ell_{\mathrm{P}}$ and $2t_{\mathrm{P}}$ are one-sided infima, never a lattice spacing. The continuous curvature chart below is a chart over this discrete content. The Compton thread length in Eq. (3) is never the support radius.

Core 0.1a states: "The four terms of the chain adjust simultaneously: the omnium settles matter, energy and spacetime by one global optimisation, never one term at a time." It also states: "The global optimisation is solved at every step, from the state the system is in; the expected behaviour is not necessarily the evolving system's optimum. Events do not commute, and a process run backward is never the mirror of the forward event. Responses are system-wide and many-to-many (I-5b's reclosure is one), never one-to-one, particle by particle; I-1's pair expression stays exact on its declared domain (I-1, I-4)." The core names no objective for that optimisation. The anisotropy free energy below remains the source's method.

Translation speed v and circulation speed u resolve the strand's motion; $\mathfrak{s}$ denotes its translation share. Here ω is angular frequency, the unindexed counterpart of the mode frequency. The open stroke's helix radius is $\bar{\lambda}$, its wavelength $\mathfrak{l}_{\mathrm{wave}}$ and its wave number k. Core 0.1d and I-2 give

$$v^2 + u^2 = c^2, \qquad \mathfrak{s} = v^2/c^2, \tag{5}$$

$$\bar{\lambda} = \frac{\hbar c}{E} = \frac{c}{\omega} = \frac{\mathfrak{l}_{\mathrm{wave}}}{2\pi}, \qquad \omega = ck. \tag{6}$$

A closed pattern's inertia includes the stress of closure, as required by the von Laue balance. Its share is kinematic; it equals exterior compactness only for a pattern held on that branch. An open stroke runs straight at the strand rate and keeps no time; its grades turn on the helix at $\pi/4$. Its energy travels along the run. A closed pattern's phase rate ω/k and run $d\omega/dk$ multiply to c^2; their inequality is a distinction between rates. Only the open stroke has equal rates at every frequency.

1.2 Notation guard

The table below defines the source-to-analysis translation before the quantities enter equations. A font change distinguishes a physical quantity; an index distinguishes evaluations of that same quantity. Source cell angles and reciprocal-space indices are written in words or roman labels.

Source role	Manuscript quantity and reserved meaning
Domain shares; cell angles	$\mathfrak{v}_p$, including $\mathfrak{v}_{\mathrm{I}}$, $\mathfrak{v}_{\mathrm{II}}$, $\mathfrak{v}_{\mathrm{III}}$, are shares. Cell angles are in words. Curvature alone uses α (NG-01).
Cell angles; neutron prefactor	b_{m} is scattering length per Bohr magneton; β_σ is computational compactness and γ the Lorentz factor (NG-02).
Fit width; conductivity	$\mathsf{w}_{\mathrm{erf}}$ is the error-function width; s_{ij} the conductivity tensor. σ is the branch tag and σ_{SB} the thermal flux constant (NG-03).
Field; canting coefficient	B is magnetic field, $\mathsf{B}_{\mathrm{app}}$ applied field, k_{c} the canting-intensity coefficient. B is confinement boundary data (NG-04).
Cell; fit coefficients	$\mathfrak{a}, \mathfrak{c}$ are lattice lengths; $\mathsf{c}_1, \mathsf{c}_2$ anisotropy coefficients; d_p domain amplitudes. a is radiation density constant; c remains strand rate (NG-05).
Time reversal; temperature	T is time reversal. $T, T_{\mathrm{M}}, T_{\mathrm{N}}$ are temperature, Morin and Néel temperatures; T_q remains a period (NG-06).
Reciprocal indices; anisotropy	Miller labels (H,K,L) are roman; L is their displayed last index. $\mathcal{K}_{\mathrm{an}}$ is anisotropy energy (NG-07–08).
Hall and vacancy coefficients	$\mathcal{R}_{\mathrm{H}}, \mathcal{R}_{\mathrm{S}}$ are Hall coefficients, R_{v} half the vacancy splitting. Radius symbols retain geometric meanings (NG-09).
Spin and thermal factors	$\mathbf{S}_j$, $\mathbf{S}_{\perp j}$ and $\Delta\mathbf{S}_{\mathrm{c}}$ are site spin, transverse projection and canting component; W_j is a Debye–Waller exponent. S_i denotes sensitivity; $\mathfrak{b}_{\mathrm{th}}$ is Boltzmann's constant, distinct from wave number k (NG-10).
Resistivity; magnetization	$\varrho_{yx}, \Delta\varrho_{yx}, \varrho_{\mathrm{A}}$ are Hall resistivities; $\mathfrak{M}$ is magnetization. M is rest mass (NG-11–12).
Structure factor; free energy	F_{M} is magnetic structure factor; $\mathcal{F}$ is source free energy; F remains force (NG-13).
SOC; angles	$\mathfrak{g}_{\mathrm{so}}$ is spin–orbit strength, l_z residual orbital angular momentum; $\mathfrak{t}$ is moment angle from the c axis, $\mathfrak{d}$ canting from the plane. The X-ray wavelength and diffraction angle are named in words (NG-14–16).
Diffraction quantities	$\mathbf{Q}, \mathsf{Q}_z$ are wave vector and axial component; $\mathsf{I}_{\mathrm{M}}, \mathsf{I}_0$ are intensity and background; A, A' proportionality constants; $\mathsf{h}_{\mathrm{erf}}$ gap-fit amplitude; $\mathsf{g}_j, \mathsf{f}_j, \mathbf{r}_j, \mathsf{r}_0$ are site factor, form factor, position and electron radius (NG-17).
Composition; units	$\mathfrak{x}$ is Fe occupancy; fit quality and displacements are named in words. μ_{B} is Bohr magneton; micro and ohm are upright unit symbols (NG-18–19).
Added controls	$\mathfrak{p}_{\mathrm{in}}, \mathfrak{p}_{\mathrm{out}}$ are Poisson ratios, $\mathfrak{u}$ axial strain, $\mathcal{Y}$ Young's modulus, Θ_{tw} twist angle, M_{Fe} iron rest mass, $\mathsf{B}_{\mathrm{c}}, \mathsf{B}_0$ field centre and zero crossing, q their contrast (NG-20).

1.3 Chart inventory and the three geometric faces

Newton's constant is G, the force ceiling $F_{\max}$, Einstein coupling κ, total gravitating mass $\mathcal{M}$, Schwarzschild scale R_s and field radius r_f. The branch tag σ is positive for exterior and negative for interior; r_c is the interior cutoff. The branch-tagged ratios $\alpha_{\mathrm{ext}}, \alpha_{\mathrm{int}}, \alpha_\sigma$ are A-1 atlas coordinates. Their evaluations refer explicitly to the sample source, an Fe nucleus as source, or the interior configuration. The gap odds $X_{\mathrm{ext}}, X_{\mathrm{int}}, X_\sigma$ belong to the same A-1 application. Core

0.2–0.4 and I-3 give

$$F_{\max} = \frac{c^4}{4G}, \qquad \kappa = \frac{8\pi G}{c^4}, \qquad \kappa F_{\max} = 2\pi, \tag{7}$$

$$R_s = \frac{2G\mathcal{M}}{c^2} = \frac{\mathcal{M}c^2}{2F_{\max}}, \tag{8}$$

$$\alpha_\sigma = \left(\frac{R_s}{r_f}\right)^\sigma, \qquad 0 < \alpha_\sigma < 1, \tag{9}$$

$$\alpha_{\text{ext}} = R_s/r_f, \quad \sigma = +1, \quad r_f > R_s, \tag{10}$$

$$\alpha_{\text{int}} = r_f/R_s, \quad \sigma = -1, \quad r_c \le r_f < R_s, \tag{11}$$

$$X_{\text{ext}} = \frac{R_s}{r_f - R_s}, \qquad X_{\text{int}} = \frac{r_f}{R_s - r_f}, \qquad \alpha_\sigma = \frac{X_\sigma}{1 + X_\sigma}. \tag{12}$$

The A-2 computational coordinate $\beta_\sigma = \alpha_\sigma/(1+\alpha_\sigma)$ has a geometric transform. A-3 overlap contrast, A-4 confinement position and A-5 carrier-regime tokens have only their open ranges here: no values, thresholds, ordering, signs or trajectories transfer to them. They enter no numerical result (O-2, O-3, O-9). The schematic skin diagnostic $\alpha_{\text{core}} \to 1^-$ is distinct from exterior nuclear compactness. Neither a saturation endpoint nor a central cutoff value is assigned (O-1). For A-1 the seam at $\alpha_\sigma = 1/2$ lies at $2R_s$ externally and $R_s/2$ internally. The Clifford torus is that seam within the three-sphere support, not the skin fold where the truncated cones meet apex circle to apex circle.

The metric is $g_{\mu\nu}$, the Einstein tensor $G_{\mu\nu}$ and the source stress tensor $T_{\mu\nu}$; μ, ν are tensor indices. Optical distance is ℓ_{opt}, angular solid-angle element $d\mathsf{o}^2_{\text{ang}}$, and r the areal radius in that metric. The exact optical index is n_{opt}, the ray angle θ; labels on these quantities specify the two media at a jump. The isotropic weak-field index is n_{iso}, causal-aperture assignment n_{cone}, and non-optical computational density index n_{dens}. Here $O(\cdot)$ denotes expansion order, not an observable or an owed-item identifier. Core I-3 supplies all three faces:

$$G_{\mu\nu} = \kappa T_{\mu\nu}, \tag{13}$$

$$d\ell^2_{\text{opt}} = \frac{dr^2}{(1-\alpha_{\text{ext}})^2} + \frac{r^2 d\mathsf{o}^2_{\text{ang}}}{1-\alpha_{\text{ext}}}, \tag{14}$$

$$\mathsf{n}_{\text{opt},1} \sin\theta_1 = \mathsf{n}_{\text{opt},2} \sin\theta_2, \tag{15}$$

$$\mathsf{n}_{\text{iso}} = 1 + \alpha_{\text{ext}} + O(\alpha^2_{\text{ext}}), \qquad \mathsf{n}_{\text{cone}} = (1-\alpha_\sigma)^{-1/2}, \tag{16}$$

$$\mathsf{n}_{\text{dens}} = (1-\beta_\sigma)^{-1/2}. \tag{17}$$

The field equation is unchanged; compactness is downstream of its source and solution. Identical stress tensor, cosmological terms, boundary and initial data and gauge give identical curvature in FDT and GR. The Snell jump uses the exact index of Eq. (14). Its radial term supplies the factor of two in leading deflection relative to a lone square-root scalar. The aperture index and the computational density index never replace that optical metric; the aperture's constitutive form enters no number here (O-8).

1.4 Force, response and the bounded input

For the pair reduction, $\mathcal{M}_i$ is each body's gravitating mass, $R_{s,i}$ its Schwarzschild scale, $R_{\text{b},i}$ its support radius and d_{12} their centre separation. The A-1 exterior cross-centre evaluation is

$\alpha_{\mathrm{ext},i}(d_{12}) = R_{s,i}/d_{12}$; $\lambda_i = \mathcal{M}_i/d_{12}$ is the mass-per-distance reading. I-1 is universal; its spherical pair reduction is

$$F = \frac{c^4}{4G}\alpha_{\mathrm{ext},1}\alpha_{\mathrm{ext},2}, \tag{18}$$

$$F = G\lambda_1\lambda_2 = \frac{G\mathcal{M}_1\mathcal{M}_2}{d_{12}^2} = F_{\max}\alpha_{\mathrm{ext},1}\alpha_{\mathrm{ext},2}, \tag{19}$$

$$R_{\mathrm{b},i} \geq R_{s,i}, \qquad d_{12} \geq R_{\mathrm{b},1} + R_{\mathrm{b},2}. \tag{20}$$

The supports are nonoverlapping spheres at monopole order. The universal open interval gives $F < F_{\max}$ wherever the force inputs occupy it. The stronger $F \leq F_{\max}/4$ belongs to this pair domain; equality needs equal saturated supports in contact. I-4's L1 is this exact algebra, L2 the weak-field slow-motion GR reduction at leading Newtonian order, and L3 the FDT source programme and each claimed divergence. Disjoint supports alone imply no weak-field expansion. No multipole, rotating, overlap or dynamical reduction is inserted here (O-5). No map from charge, circulating charge or colour seat to the force input is inserted (O-6).

I-1 states: "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)." It also states: "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." In this quoted notation $A(t)$ is a driven response, χ_A its causal susceptibility and F_{12} the static pair-force input. The changes of Hall intercept and ferromagnetic residual vanish at zero applied load. Their piezomagnetic ratio is a response coefficient, never a force or a spin-wave energy. A causal kernel is integrable over the actual drive history; its units are observable per force per time. No response amplitude follows from the bare force alone.

For an A-1 gap-odds update, x denotes a dimensionless nonnegative increment, $X_{\sigma,0}$ initial odds and $\alpha_{\sigma,0}$ their initial bounded value. I-6 gives

$$X_\sigma = X_{\sigma,0}(1+x), \qquad \alpha_\sigma(x) = \frac{\alpha_{\sigma,0}(1+x)}{1+\alpha_{\sigma,0}x}, \tag{21}$$

$$\alpha_\sigma(x) - \alpha_{\sigma,0} = \frac{\alpha_{\sigma,0}(1-\alpha_{\sigma,0})x}{1+\alpha_{\sigma,0}x}. \tag{22}$$

Already bounded compactness is never compactified again. The exterior and interior mean-density ordering is $q_\sigma = \alpha_\sigma^{3\sigma}$, with q_σ a mean-density proxy; it is distinct from the local profile. An odds increase lowers this proxy on the interior branch. A signed twist carries polarity in an orientation sign, never in a negative odds input. Domain fractions remain shares, not compactness.

1.5 Clocks, neighbours and the one carrier

The clock factor $\mathfrak{m}$, four-velocity $\mathcal{U}^\mu$ of the pattern in the time kept on its own clock, normalized by $g_{\mu\nu}\mathcal{U}^\mu\mathcal{U}^\nu = -c^2$, the covariant rate of change $\nabla_{\mathcal{U}}$ along its path, and $\mathfrak{P}^{\mu\nu} = c^2 g^{\mu\nu} + \mathcal{U}^\mu\mathcal{U}^\nu$, c^2 times the projector orthogonal to $\mathcal{U}^\mu$, express the two readings of core 0.1c: a pattern free of every force in the rescaled metric is read by the bookkeeper, on $g_{\mu\nu}$, with the acceleration of Eq. (23). The held moment is $\mathbf{m}$, induced-energy term E_{ind} and reference rest energy E_0; z is

position along the field gradient.

$$g_{\mu\nu} \longmapsto \mathfrak{m}^2 g_{\mu\nu}, \qquad \nabla_{\mathcal{U}}\mathcal{U}^\mu = -\mathfrak{P}^{\mu\nu}\partial_\nu \ln \mathfrak{m}, \tag{23}$$

$$E = E_0 + E_{\text{ind}} - \sum \mathbf{m}\cdot\mathsf{B}, \qquad \mathfrak{m} = E/E_0, \tag{24}$$

$$\mathcal{M} = E/c^2, \qquad \mathcal{M}\frac{d^2 z}{dt^2} = -\partial_z E. \tag{25}$$

Kept time and thread length rescale together, preserving the strand rate. Moving at constant speed on a pattern's own clocks and rulers through a density gradient is gravity; the bookkeeper reads acceleration toward slower clocks. A slow pattern reads the lapse and a stroke the optical metric. For a perfect-form medium at zero net conserved count the temperature fixes the medium's common rescaling; with conserved count and fixed entropy per count its enthalpy per count does so. This is its flow reading, not the frequency of a clock it carries: that clock's thermal shift is its own thermal-motion time dilation. A conformal rescaling leaves null paths unchanged.

The bookkeeper's gravitational flow from rest far away has speed $c\sqrt{\alpha_{\text{ext}}}$ and acceleration $G\mathcal{M}/r_f^2$. Rotation adds a swirl whose half-curl is the gyroscope's frame drag at leading Lense–Thirring order, on constant-own-time slices flat to that order. The gravitational flow's four-velocity is irrotational; that slice rotation is not a medium's vorticity. The flow reading applies at every size. For neighbours, the velocity-gradient trace, antisymmetric part and trace-free symmetric part read expansion, vorticity and shear (I-3a). An extended pattern's skin against its centre path supplies a neighbour comparison; its quadrupole moment reads the tide and the trace reads density.

In the helical window the clock factor belongs to the pattern, its own rest-energy ratio. Patterns whose held and induced moments summed per unit energy differ along the field gradient fall differently where they sit. Universality of free fall stands in the gravitational window, where the monopole clock factor belongs to the point. A uniform twist, a uniform level of the clock factor, turns a held moment and pushes nothing. Core 0.1c states: "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)." No gravitational compactness is assigned to a magnetic moment to calculate that push.

I-2 follows from the central chain: photon, graviton, gluon, phonon and magnon are the one spin-one stroke read in different density and geometry regimes of the one medium (0.1b), never different substances. "There are no independent force carriers. 'Mediation' is a coordinate artifact; interactions are curvature plus geodesic motion." In particular, "the magnon is the stroke through a helical density gradient (P-5)". Matter is a closed braid of these strokes, not another member of their identity.

1.6 Confinement and the density channels

The confinement domain Ω and boundary data B are a pattern's own support and wall; n is strand count, χ orientation and $\mathsf{j}_{\text{chart}}$ position on the inside/outside chart. The core's chart-position argument is written with a descriptive subscript to distinguish it from elapsed time. The operator is D and u_q its mode; I-5 gives

$$D(\Omega, B; n, \chi, \mathsf{j}_{\text{chart}})u_q = \omega_q u_q, \qquad m_q c^2 = \hbar\omega_q. \tag{26}$$

No form of the operator, its domains, boundary data or spectrum is written here (O-9). Electron patterns are $n = 3$ braids. Same-n configurations change confinement within their class; different-n configurations require topological rebraiding. The electron/proton pair is the same class in different rooms; the lepton-generation route between box modes and higher same-parity strand counts remains open. The ratios m_p/m_e and $(m_\mu/m_e)^2$, with p, e, μ naming proton, electron and muon confinement masses, remain independent targets in the status table. The support radius is fixed independently of the mass; no Compton substitution, mass formula or absolute particle address enters.

Pressure P, volume V, radiation constant a and thermal flux coefficient σ_{SB} define the I-7 mass accounting:

$$\mathcal{M} = M + \frac{E}{c^2} + \frac{PV}{c^2} + \frac{aT^4V}{c^2} + \cdots, \qquad a = \frac{4\sigma_{\mathrm{SB}}}{c}. \tag{27}$$

Here E is non-rest stored energy for this decomposition; the total rest-energy use in Eq. (24) is identified by its explicit E_0 term. Elastic work and exchange/interaction compression enter the stored-energy term once. Hydrostatic load pressure enters the small direct pressure term once; lattice compression changes geometry. Held-moment energy and the induced moments with the work of inducing them enter the same stored-energy term once. Radiation uses a, never the flux coefficient alone; binding energy is read from the solved geometry. The source's applied field and field-induced AFM magnetization supply these magnetic entries (SC-090; SC-ADD-05–06); read by 0.1c, the uniform applied field is a uniform twist, a uniform level of the clock factor, which turns a held moment and pushes nothing. No numerical exchange or induced-energy function is supplied. Temperature's radiation partial at fixed geometry is positive on the exterior branch; the total direction also depends on heat capacity, expansion and pressure work.

For observable $\mathcal{O}$ and independent channel coordinates x_i, define S_i as $\partial \ln \mathcal{O}/\partial \ln x_i$ with all other coordinates, pressure, radius and packing held fixed as appropriate to that channel. I-7's discriminator states: "For purely density-coupled equilibrium observables, a heavier isotope $\rightarrow$ larger $R_s \rightarrow$ higher $\alpha \rightarrow$ larger response—opposite in sign to conventional reduced-mass scaling." Its discipline states: "A sign prediction competing with geometric, electronic or inertial channels is written as a sensitivity-weighted sum $\delta \ln \mathcal{O} = \sum_i S_i \delta \ln x_i$ with every S_i defined (held-fixed variables stated). The density-channel input sign is the FDT discriminator; the observable sign is $\mathrm{sgn}(\prod_i S_i)$ and stays conditional until the sensitivities are established." The curvature coordinate in the isotope calculation is the Fe-source exterior A-1 evaluation at fixed pressure, radius and packing. For a finite path, its amplitude is $\Delta \ln \mathcal{O} = \int \sum_i S_i \, d \ln x_i$ along that path. A local sensitivity times a span is not substituted for this integral.

2 System chart table

The skin radius R_{room} is an independent empirical input; none is supplied numerically for the Fe nucleus (U-18). A probe weight w and field f define $\langle f \rangle_w = \int w f \, dV / \int w \, dV$ with finite nonzero denominator. Every interior observation below is such a weighted mean, never a point compactness.

Object and application	Evaluation	Meaning and observation window
Crystal source, A-1	$\alpha_{\text{ext}} = \mathcal{M}c^2/(2F_{\max}r_f)$	Small gravitational window, a correct reading of the sample's gravitating energy. It supplies no magnetic response kernel.
Fe nucleus as source, A-1	Exterior R_s/r_f	Its gravitational fold is at its Schwarzschild scale; no laboratory skin radius is substituted for that fold.
Fe nuclear configuration, A-1	Interior r_f/R_s; skin at fold	Interior chart uses the independent skin radius. No transfer map to the exterior radius is supplied. Low-strand closures sit toward the dilute centre; the binding clamp sits at the dense skin.
Computational A-2	$\beta_\sigma = \alpha_\sigma/(1+\alpha_\sigma)$	Transform only; it replaces no force, optical or density input without its inverse.
Magnetic ordering, A-3	Open-range token	Néel ordering is an overlap instance. No overlap threshold or sign is imported into compactness.
Confinement A-4; mode A-5	Open-range tokens	No numerical position, trajectory or ordering connects orbital energies or carrier names to these tokens.
Nuclear clamp	$\alpha_{\text{core}} \to 1^-$	Schematic skin diagnostic only, never a value for an interior mean or a laboratory exterior field.

The local density is highest at the skin on both sides of a bound configuration; an exterior mean-density proxy and an interior local profile are different quantities. No local profile is calculated here (O-4). The exterior density cone has high energy and density at its tip, low energy and density at its rim. The interior rim is the dilute centre; the two cones meet at their truncated apex circles. A zero-energy band vertex is not copied onto that density-cone tip.

3 Observation map

3.1 Sample identities and probe weights

The source's composition is close to $Fe_{0.93}S$ (SC-084, L46). The probes do not sample interchangeable objects. Hall transport weights the current path through contacted approximate thin cuboids (SC-ADD-19, SC-115, L504–505); the record prints no cuboid thickness, the length that normalises the Hall resistivity. The c-axis moment is the VSM signal with sample and device minus the device-only signal (SC-122, L556); the device contribution is appreciable for the approximately 8.7 mg sample (SC-058-01–02). The six magnetic Bragg intensities weight in-plane domain orientations through the neutron projection factors. The gap weights the coaligned array's scattering intensity; its approximately 19.5 g mass and approximately one-degree mosaic are source settings (SC-066-01–03; SC-148). XRD occupancy weights the selected fragment, and EDS weights a cleaved surface, not the entire transport path (SC-076-01–02; SC-198).

The table below keeps each reported Morin temperature with its specimen and inference.

Specimen	Temperature (K)	Source meaning
Main Hall crystal	≈ 156	Transport referent; SC-016-01, L123.
Characterization crystal	~ 159	Susceptibility drop; SC-110, L448.
Additional magnetization crystal	≈ 178	Repeated strain response; SC-059-03.
Strain-diffraction crystal	≈ 181	Bragg anomaly; SC-060-04.
Field-diffraction crystal	about 188	Susceptibility estimate; SC-143, L673.
INS array	150–200	Bragg-inferred range; SC-066-02.

The main Hall data were obtained from a separate sample; the supplementary Hall measurement uses the magnetization specimen (SC-195; SC-057-01–03; SC-077-01–03). The common strain device and estimation method establish comparability of method, not one common strain across the runs (SC-120–121). The transport modulus is approximately 20 GPa, determined from acoustic phonon dispersion (SC-117, L508). The diffraction estimate instead cites the source's reference for the modulus (SC-127, L585); that distinct provenance is retained. I-3's observation-region rule is operative at the precision of these named probe weights: an inference of a point density from any one of these averages would violate the rule. The sample separation itself is an identity map and corroborates no invariant.

3.2 Hall transport and the ferromagnetic residual

Define ϱ_{raw} as the contact voltage converted to resistivity before antisymmetrization, and $\mathfrak{M}_{\mathrm{AF}}$ as the fitted high-field AFM contribution. Define $\mathfrak{M}_{\mathrm{FM}}$ as the ferromagnetic residual after that subtraction. The source's Eq. (S1) and high-field fit (SC-019-01) become, with the notation guard applied,

$$\varrho_{yx}(\mathsf{B}) = \frac{\varrho_{\mathrm{raw}}(+\mathsf{B}) - \varrho_{\mathrm{raw}}(-\mathsf{B})}{2}, \tag{28}$$

$$\varrho_{yx}(\mathsf{B}) = \mathcal{R}_{\mathrm{H}}\mathsf{B} + \Delta\varrho_{yx}, \qquad \mathsf{B} > 2\ \mathrm{T}, \tag{29}$$

$$\mathfrak{M}_{\mathrm{FM}} = \mathfrak{M} - \mathfrak{M}_{\mathrm{AF}}. \tag{30}$$

The equations trace respectively to SC-118, SC-093–096 and SC-022-01–03. The Hall slope combines ordinary and conventional anomalous terms; it does not separate them. The intercept is a fitted spontaneous contribution. The source's representative fit is at 160 K without applied strain (SC-096). The record prints no numerical fitted intercept. The source's displayed Hall and moment offsets are plotting conventions, never intercept or canting measurements (SC-091–092). The magnetic high-field subtraction window is unspecified, and its covariance with the residual is not supplied.

The source says the strain dependence of $\mathcal{R}_{\mathrm{H}}$ "suggests that the overall electronic band structure is not dramatically affected" by the size of the applied strain (SC-021-01–03, L151–153). That inference retains both its qualifier and its degenerate slope input. It says, "Assuming" $\Delta\varrho_{yx}$ is a signature of altermagnetism, its systematic suppression "suggests" that altermagnetism "can be effectively tuned" by an in-plane strain (SC-020-01–03). Canting suppression is inferred from the residual moment: the source's "these results indicate" keeps that inference distinct from angular metrology (SC-023-01–04). Its AFM differential slope is reported as unaffected above and below the Morin transition (SC-ADD-01–03).

Based on the level of strain it applied, "estimated to be approximately" 100 MPa, the source determines the piezomagnetic coefficient of h-FeS to be approximately 10^{-3} $\mathrm{G\,MPa^{-1}}$ at 160 K; both prints stay with the magnetization run (SC-ADD-06, SC-026-01–03, L164–167). The approximately 0.08% Hall strain stays with the supplementary Hall run on the same specimen

(SC-057-02). No stress is inferred from that Hall-strain print. For the source's conventional ferromagnetic relation, the anomalous resistivity is

$$\varrho_{\mathrm{A}} = \mathcal{R}_{\mathrm{S}} \mu_0 \mathfrak{M}. \tag{31}$$

This is SC-102–103, not a microscopic response kernel. The source estimates the magnitude of $\mathcal{R}_{\mathrm{S}}$ as order $100\,\mu\Omega\,\mathrm{cm\,T^{-1}}$ (SC-098); absent Hall ordinates prevent an independent numerical reconstruction. Returning fitted offsets or a linear residual from their original inputs is the identity map and corroborates no invariant. The P-5 reading of the co-suppression has qualitative precision; its prospective falsifier is a controlled twist comparison below, with a stated detection and exclusion scale.

3.3 Domain estimates and the canting blind spot

For magnetic diffraction, $\widehat{\mathbf{Q}}$ is the wave-vector direction, p a domain label and j a site label. Here $\mathbf{S}_{p,1}$ is the first-site spin in domain p, and the superscript "total" denotes domain-summed intensity. The transverse spin projection and intensity model of Eqs. (S2)–(S8), SC-128–138, are

$$\mathbf{S}_{\perp j} = \mathbf{S}_j - \widehat{\mathbf{Q}}(\widehat{\mathbf{Q}} \cdot \mathbf{S}_j), \tag{32}$$

$$\mathsf{I}_{\mathrm{M}}(\mathbf{Q}) = \mathsf{A}\,|\mathsf{F}_{\mathrm{M}}(\mathbf{Q})|^2\,, \tag{33}$$

$$\mathsf{I}_{\mathrm{M}}^{\mathrm{total}}(\mathbf{Q}) = \sum_{p=\mathrm{I,II,III}} \mathsf{d}_p \left[|\mathbf{S}_{p,1}|^2 - (\widehat{\mathbf{Q}} \cdot \mathbf{S}_{p,1})^2 \right], \tag{34}$$

$$\mathfrak{v}_p = \frac{\mathsf{d}_p}{\mathsf{d}_{\mathrm{I}} + \mathsf{d}_{\mathrm{II}} + \mathsf{d}_{\mathrm{III}}}. \tag{35}$$

This estimate ignores tiny canting and assumes equal g-factor, form factor and Debye–Waller factor across the six peaks (SC-133–135). The ideal nuclear structure factor vanishes at these reflections (SC-032-01–02). The two model Fe sites are at fractional coordinates $(0,0,0)$ and $(0,0,0.5)$ (SC-132). The source estimates, from integrated intensities,

$$(\mathfrak{v}_{\mathrm{I}}, \mathfrak{v}_{\mathrm{II}}, \mathfrak{v}_{\mathrm{III}})_{\mathrm{free}} = (0.31(4), 0.33(4), 0.36(4)), \tag{36}$$

$$(\mathfrak{v}_{\mathrm{I}}, \mathfrak{v}_{\mathrm{II}}, \mathfrak{v}_{\mathrm{III}})_{\mathrm{strained}} = (0.02(4), 0.49(3), 0.49(3)). \tag{37}$$

These are SC-029-03 at L191 and SC-029-04 at L192. The first strained share is consistent with zero; all shares belong to the closed probability simplex, not the open curvature interval. The source says the changes "can be well accounted for" by strain-induced redistribution of in-plane magnetic domains above the Morin transition (SC-196–197), and that the domain aligned along the strain direction is "strongly suppressed" (SC-034-01–05). The source does not resolve its exact disappearance.

The superscript "cant" denotes the canting-only intensity; its Eq. (S9), SC-139, has the factor

$$\mathsf{I}_{\mathrm{M}}^{\mathrm{cant}} = \mathsf{k}_{\mathrm{c}} |\Delta \mathbf{S}_{\mathrm{c}}|^2 \left(1 - \frac{\mathsf{Q}_z^2}{|\mathbf{Q}|^2}\right) [2 + 2\cos(\pi \mathsf{L})]. \tag{38}$$

At odd integer Miller index its last factor cancels exactly within this ideal model. The more general moment-ratio estimate uses the order $10^{-3}\mu_{\mathrm{B}}$ c-axis component and approximately $3\mu_{\mathrm{B}}$ local moment (SC-062-01–02). Let $\mathfrak{q}_{\mathrm{cant}}$ denote their squared ratio; the reconstruction is

$$\mathfrak{q}_{\mathrm{cant}} \simeq (10^{-3}/3)^2 \simeq 1 \times 10^{-7}. \tag{39}$$

The one significant figure follows the two approximate inputs. For the reported intensities 3128 and 1096 with errors 293 and 33 in arbitrary units (SC-141–142), the relative errors are

$$293/3128 \simeq 0.094, \qquad 33/1096 \simeq 0.030. \tag{40}$$

These errors are orders above the canting estimate; the exact odd-index cancellation further sharpens the blind spot at the specified reflections. The source's null diffraction change cannot measure the small canted component. The fraction and intensity reconstructions are identity maps and corroborate no invariant. At P-3's qualitative level they read a boundary-driven redistribution; an independently resolved canting change without the predicted magnetic comparison would discriminate that reading.

3.4 Excitations, crystallography and the anisotropy model

Define $\mathsf{I}(E,T)$ as the gap-fit scattering intensity, $\mathfrak{b}_{\mathrm{th}}$ as Boltzmann's constant, and E_{gap} as the fitted gap energy. The source's Eq. (S11), SC-149 and SC-067-01–03, is

$$\mathsf{I}(E,T) = \mathsf{I}_0 + \mathsf{h}_{\mathrm{erf}}\ \mathrm{erf}\left(\frac{E-E_{\mathrm{gap}}}{\mathsf{w}_{\mathrm{erf}}}\right)\frac{1}{1-\exp[-E/(\mathfrak{b}_{\mathrm{th}}T)]}. \tag{41}$$

It has four fit parameters: background, amplitude, width and gap. The source finds a fitted gap of 8.3(3) meV at 8 K filled in at 250 K (SC-036-02, L217). The array's transition range is an intensity-weighted ensemble range, not a single-crystal gap trajectory. With improved energy resolution, the spin-wave gap above the Morin transition "is found" to be smaller than 0.5 meV, which "corresponds to the energy resolution at zero energy transfer" (SC-037-01–03, L222–224). The text cites Fig. 4(g), whereas Table IV assigns 0.5 meV at incident energy 15 meV to Fig. 4(h); Fig. 4(g) uses 4 meV at 60 meV (SC-190–192). The high-energy spectrum extends to approximately 80 meV (SC-068-01); its splitting search has 5 meV zero-transfer resolution at 150 meV incident energy (SC-193). The source states that it does not observe clear signatures of magnon splitting and that experiments with improved energy resolution and/or enhanced statistical quality "may therefore be required" (SC-068-04–06). No numerical splitting exclusion follows from that statement.

In the manuscript's reading, the acoustic phonon dispersion and the dispersive spin waves in the same spectra are one carrier in two regimes (I-2; SC-117; SC-035-01–02). The mode name remains "magnon" or "spin wave" where the source uses it. At the printed resolution the data are recovered by the source fit, an identity map that corroborates no invariant. A separately measured isotope shift outside the joined comparator interval below is the quantitative falsifier of the I-7 sign reading.

The refined unstrained fragment has lattice lengths 3.4519(1) and 5.7619(3) Å at nominal 275 K, and 3.4380(2) and 5.7624(5) Å at 100 K (SC-074-01–04; SC-112). Independent propagation of the printed lattice errors gives

$$(\mathfrak{c}/\mathfrak{a})_{275\,\mathrm{K}} = 1.6692(1), \qquad (\mathfrak{c}/\mathfrak{a})_{100\,\mathrm{K}} = 1.6761(2). \tag{42}$$

No strained coordination is measured on that fragment (SC-076-01–02). The EDS atomic percentages are 48.26 for Fe and 51.74 for S (SC-188; SC-187), whose ratio rounds to 0.93 (SC-055-01; SC-187–188). These crystallographic and compositional reconstructions are identity maps, not new evidence for an invariant.

The source "discuss[es] the origin" of strain-tuned canting in terms of "subtle strain-induced changes" in local coordination (SC-042-01–03). It writes that "When a uniaxial strain is applied,

the local C_3 symmetry of the FeS_6 octahedron is broken", that the partially quenched orbital angular momentum "is further reduced, thereby lifting the remaining orbital degeneracy", and that this additional "quenching of the orbital angular momentum naturally weakens the effectiveness of SOC", "leading to a reduction of the spin canting and, consequently, a suppression of the spontaneous AHE"; it says the behaviour "re-manifests" the Jahn–Teller effect (SC-044-01–05, SC-045-01–02, SC-ADD-17–18, L252–260; SC-046-01–04). Those remain its model and discussion; no doublet splitting magnitude is printed. Write $\mathsf{J}_{\mathrm{so}} = \mathfrak{g}_{\mathrm{so}}\mathsf{l}_z$ for the positive effective spin–orbit energy in its easy-plane model. The coefficients $\mathsf{c}_1, \mathsf{c}_2$ are positive and $\mathcal{K}_{\mathrm{an}}$ is positive in that regime (SC-162–163). Its Eqs. (S17)–(S19), SC-160–168, become

$$\mathcal{F}(\mathfrak{t}) = -\mathsf{c}_1 \mathfrak{b}_{\mathrm{th}} T \ln\cosh\left[\frac{2(\mathsf{J}_{\mathrm{so}}\cos\mathfrak{t} + \mathsf{R}_{\mathrm{v}})}{\mathfrak{b}_{\mathrm{th}} T}\right] + \mathsf{c}_2 \mathcal{K}_{\mathrm{an}} \cos^2\mathfrak{t}, \tag{43}$$

$$\frac{\mathsf{c}_2 \mathcal{K}_{\mathrm{an}}}{\mathsf{c}_1 \mathsf{J}_{\mathrm{so}}} \cos\mathfrak{t} = \tanh\left[\frac{2(\mathsf{J}_{\mathrm{so}}\cos\mathfrak{t} + \mathsf{R}_{\mathrm{v}})}{\mathfrak{b}_{\mathrm{th}} T}\right], \tag{44}$$

$$\sin\mathfrak{d} \simeq \frac{2\mathsf{R}_{\mathrm{v}}}{\mathsf{c}_2 \mathcal{K}_{\mathrm{an}} \mathfrak{b}_{\mathrm{th}} T/(\mathsf{c}_1 \mathsf{J}_{\mathrm{so}}) - 2\mathsf{J}_{\mathrm{so}}}. \tag{45}$$

The angle $\mathfrak{d}$ is the complement of $\mathfrak{t}$, measured from the plane. Differentiation of the first line gives the second for the non-axial stationary branch; linearizing the hyperbolic tangent gives the third. The denominator must remain positive and the canting small; no parameter values determine an angle here. Within that domain, decreasing residual orbital momentum decreases the small positive canting and increasing temperature also decreases it, as the source states. No source free energy is promoted to an omnium objective. This rederivation is an identity map and corroborates no invariant. The I-5 reading is that the orbital states are confinement eigenmodes; its spectral falsifier requires an independently specified operator (O-9).

3.5 Symmetry and a forward field history

The source's conductivity constraints retain their stated domains (SC-152–159; SA-69–71). In the paramagnet time reversal forbids spontaneous AHE. Above the Morin transition the single-domain group is $2'm'm$; its remaining horizontal mirror under in-plane strain still permits the axial Hall response. Below the transition the group is $\bar{6}'2m'$; the two strain directions reduce it to $2m'm'$ or $m'2m'$, allowing the respective off-plane antisymmetric entries but no in-plane spontaneous linear AHE. The source says an in-plane second-order nonlinear AHE "may appear" under strain (SC-071-01–02); no magnitude is supplied. The supplementary domain-I direction is printed as [110], whereas the main discussion uses $[1\bar{1}0]$; this notation difference is retained, not silently repaired (SC-155; SC-034-03; SC-199).

The field-diffraction sequence is zero field after returning from −3.5 T, then 1.25 and 3.5 T at 220 K (SC-145; SC-144). Only about half the reciprocal plane was accessible (SC-063-02). The source considers rotation about the c axis unlikely, says the scenario of a rotation about the a axis "can also be ruled out" because the intensities expected for its axial state at two reflections, approximately 1.7 times larger than those of the planar states, are clearly contradicted by the data at 1.25 T, and calls a first-order transition "more likely" (SC-065-01–05, SC-146–147, SC-ADD-15–16, L691–693, L695–698). The first-order transition remains a scenario, not a resolved intermediate trajectory. These are two states reached in one forward history; the source's time-reversal operation relating ideal states is not a reversed physical event. In the manuscript's reading the simultaneous redistribution of domain shares and the distortion with quenching are each one system-wide settlement (0.1a). The symmetry reconstruction is an identity map; it corroborates no invariant. Its null serves as the conventional comparator for the neighbour comparisons below.

4 Cone-position translation

P-5 states: "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." P-3 states: "Loading a material (pressure, strain, energy injection) does not compress the anchors; the load is taken by the interstitial spacetime between them, whose packing density changes by $-\Delta V/V$, the load's relative volume change: upward under pressure and compression, downward in the mean under tension." It also fixes the two-chart discipline: "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."

In this manuscript's reading the Fe and S nuclei are those anchors. The canted moment is one of P-5's magnetic moments; the spontaneous Hall signal remains a transport observable. The two Fe sites with alternating S octahedra are neighbours not turned alike, and their alternation is where the twist is read (SC-005-01–02; SC-132). That is the manuscript's geometry, not an additional source observation. Charge-carrier density counts mobile electron patterns; mass density counts rest mass per volume; neither is the omnium's local density. Magnetic domains denote orientations, never confinement domains. The crystal field in the orbital model is not the applied magnetic field.

Let p_{ax} be the positive compressive axial stress and e_{el} the stored elastic energy per volume. A diagonal small strain has axial component $\mathfrak{u}$ and transverse components $-\mathfrak{p}_{\mathrm{in}}\mathfrak{u}$ and $-\mathfrak{p}_{\mathrm{out}}\mathfrak{u}$. Taking the determinant to first order derives

$$\mathfrak{u} = -\mathsf{p}_{\mathrm{ax}}/\mathcal{Y}, \qquad \frac{\Delta V}{V} = (1 - \mathfrak{p}_{\mathrm{in}} - \mathfrak{p}_{\mathrm{out}})\mathfrak{u} + O(\mathfrak{u}^2), \tag{46}$$

$$\mathsf{e}_{\mathrm{el}} = \frac{\mathsf{p}_{\mathrm{ax}}^2}{2\mathcal{Y}}, \qquad P = \mathsf{p}_{\mathrm{ax}}/3. \tag{47}$$

The pressure is the positive hydrostatic part of this uniaxial compressive stress. For both Poisson ratios taken as 0.3 (U-15–16), the magnetization-run estimate approximately 100 MPa (SC-026-01–03) and approximately 20 GPa (SC-117) give

$$\mathfrak{u} \simeq -0.5\%, \qquad -\Delta V/V \simeq 0.2\%. \tag{48}$$

These derived strains each carry one significant figure; the determinant's omitted terms leave that digit unchanged. For the separate Hall-run strain approximately -0.08% (SC-057-02), the same assumed Poisson ratios give

$$-\Delta V/V \simeq 0.03\%. \tag{49}$$

This is an interstitial packing change, not a point density or a stress inferred for that run.

Define $\mathsf{V}_{\mathrm{cell}}$ as the hexagonal cell volume, $\mathsf{u}_{\mathrm{mass}}$ as atomic mass unit and $\mathfrak{r}_{\mathrm{mass}}$ as crystal rest-mass density. Here M_{S} is sulfur rest mass. The two formula sites, Fe occupancy and lattice lengths in Table I give

$$\mathsf{V}_{\mathrm{cell}} = \frac{\sqrt{3}}{2}\mathfrak{a}^2\mathfrak{c}, \tag{50}$$

$$\mathfrak{r}_{\mathrm{mass}} = \frac{2(\mathfrak{x}M_{\mathrm{Fe}} + M_{\mathrm{S}})}{\mathsf{V}_{\mathrm{cell}}} \simeq 4.67(2)\ \mathrm{g\,cm^{-3}}. \tag{51}$$

The adopted masses are $55.845\mathsf{u}_{\mathrm{mass}}$ and $32.06\mathsf{u}_{\mathrm{mass}}$, with $\mathsf{u}_{\mathrm{mass}} = 1.66053906660 \times 10^{-27}$ kg (U-07–09). The source occupancy is 0.924(7) (SC-074-02); its error dominates the propagated density error, assuming independent refinement errors. The precision is that of the reconstruction, not a measured density. At the magnetization-run stress, the dimensionless elastic-energy fraction of the packing change is

$$\frac{\mathsf{e}_{\mathrm{el}}}{\mathfrak{r}_{\mathrm{mass}} c^2(-\Delta V/V)} \simeq 3 \times 10^{-13}. \tag{52}$$

This one-figure result uses the one-figure stress, modulus and packing inputs. It enters the stored-energy channel once. The small direct pressure fraction is $P/(\mathfrak{r}_{\mathrm{mass}} c^2)$ and the thermal fraction is $aT^4/(\mathfrak{r}_{\mathrm{mass}} c^2)$; each moves exterior compactness through its own sensitivity. They are not compared to the Hall-run strain and are not assigned an observable sign without the corresponding derivative. Exchange/interaction compression at the source's exchange interactions also enters the stored-energy channel, without a numerical function (SC-043-01–04).

For the oscillator lift, ψ is the projected mode, $\mathfrak{A}_{\mathrm{mode}}$ its amplitude, ϕ_h helical phase and ϕ_0 initial phase. The orthonormal plane basis is e_1, e_2, and $\mathbf{B}_{\mathrm{Cl}} = e_1 e_2$ is its unit bivector, distinct from magnetic field and confinement boundary data. The imaginary unit is i, and e is the base of the natural exponential; the phase exponent is dimensionless. I-4 states: "QM is helical geodesics on truncated density cones. The wavefunction $\psi = \mathfrak{A}_{\mathrm{mode}} e^{i\phi_h}$ is the projection of a helix onto the plane normal to the cone axis; 'superposition' is ignorance of the helical phase ϕ_0 at observation. The universe is deterministic; there are no probability amplitudes." Only the amplitude and phase typography in this quotation is expanded to preserve the notation guard. The cylindrical and Clifford lift is

$$\phi_h(t) = \phi_0 - \omega t, \qquad \psi = \mathfrak{A}_{\mathrm{mode}} \exp(i\phi_h), \tag{53}$$

$$i \longleftrightarrow \mathbf{B}_{\mathrm{Cl}} = e_1 e_2, \qquad \exp(\mathbf{B}_{\mathrm{Cl}} \phi_h). \tag{54}$$

This is a single-angle phase rotor, distinct from a half-angle spinor rotor. The source's spin-wave phases move on this phase axis at fixed field identity; no strand count is assigned to a mode. The dispersion is an angular frequency until multiplied by $\hbar$ to give energy. Strain changes the Fe pattern's support and boundary data; its orbital levels are eigenmodes of that support. No confinement-coordinate value follows from a gap or a lattice ratio (O-3, O-9).

5 Predictions

Each comparison below adds a specified FDT input to a conventional null or joined interval. The force law and compactness coordinates alone create no divergence. The comparisons read neighbouring preparations or a preparation against a reference path; their conventional common response cancels or their conventional odd response vanishes. All apparatus additions and design settings below are investigator-chosen, not measurements in the source. For statistical uncertainty, $\mathfrak{e}_{\mathrm{err}}$ denotes a standard error, $\mathfrak{z}_{\mathrm{test}}$ a critical multiplier and $\mathfrak{H}_{\mathrm{test}} = \mathfrak{z}_{\mathrm{test}} \mathfrak{e}_{\mathrm{err}}$ the decision threshold. The probability p_{flip} is the exact sign-flip tail probability; ϵ_j denotes a sign choice for bar index j, and $\overline{\mathsf{q}}$ the bar-average contrast.

5.1 T-1: ordered-phase twist interaction

DC-1 discriminates SA-25: the source's small low-field hysteresis loop above the Morin transition supplies the ordered-phase referent (SC-025-01–02), but no static mechanical-twist comparison isolates an additional field. P-5 supplies that additional source. This is an existence prediction,

conditional by construction: neither a twist magnitude nor its absolute sense is fixed without the I-1/I-2 response kernel (O-6). The manuscript reads the tapered load as grading interstitial packing and the twist as winding that gradient.

Twelve truncated-cone h-FeS bars are cut from crystals grown by the source's chemical-vapour-transport method (SC-051-01). Their axes follow the crystal c axis within 1°, end diameters are 0.60 and 0.85 mm, length 3 mm and cross-section ratio approximately 2 (U-21–24, U-94). An external torsion–load insert is added to the source's PPMS VSM (SC-109). Identical end clamps rotate by $+\Theta_{\mathrm{tw}}/2$ and $-\Theta_{\mathrm{tw}}/2$ about c without added axial displacement; the twist is $\Theta_{\mathrm{tw}} = \pm 1°$ (U-25). An axial force gives mean compressive stress 30 MPa, graded along c by the taper (U-26). The loop centre B_{c} is measured at 250 K, above every reported sample Morin temperature, after the source's AFM linear subtraction (U-28; SC-022-01–03). The centre is half the sum of the two field-axis zero crossings of that residual loop.

Each bar is mounted wide end up and wide end down, with its volume centroid on the clamps' mid-plane and at the magnet centre in both mountings. The narrow end is gripped 0.34 mm deeper (U-27). A fair coin drawn before the bar's first mounting fixes the mounting order and randomises the sign of any between-mounting change in the laboratory-fixed hand-odd actuator term (U-29). At each mounting another fair coin chooses the four-loop order $+--+$ or $-++-$ (U-30). These orders cancel drift linear in loop number; the coin randomises drift curvature that differs between mountings. Both hands' two loops are averaged before differencing. The laboratory field sign convention is identical in the two mountings: a field along crystal +c reads negative in the wide-end-down mounting. The load-off runs use the same bars, zero axial force, both hands, both mountings and the same coins (U-31).

Superscripts + and − denote the twist hand and subscripts up and down the mounting. Define $\mathsf{B}_{\mathrm{cross},+}$ and $\mathsf{B}_{\mathrm{cross},-}$ as the two loop crossings; # counts sign assignments. The defining centre and contrast conditions, derived from those averages, are

$$\mathfrak{M}_{\mathrm{FM}}(\mathsf{B}_{\mathrm{cross},\pm}) = 0, \qquad \mathsf{B}_{\mathrm{c}} = (\mathsf{B}_{\mathrm{cross},+} + \mathsf{B}_{\mathrm{cross},-})/2, \tag{55}$$

$$\mathsf{q}_j = \frac{1}{4}\left[(\mathsf{B}_{\mathrm{c}}^{+} - \mathsf{B}_{\mathrm{c}}^{-})_{\mathrm{up},j} - (\mathsf{B}_{\mathrm{c}}^{+} - \mathsf{B}_{\mathrm{c}}^{-})_{\mathrm{down},j}\right], \tag{56}$$

$$p_{\mathrm{flip}} = 2^{-12}\#\left\{\epsilon \in \{-1,+1\}^{12} : \left|\sum_j \epsilon_j \mathsf{q}_j\right| \geq \left|\sum_j \mathsf{q}_j\right|\right\}. \tag{57}$$

Here $\mathsf{B}_{\mathrm{cross},\pm}$ are the two crossings and # is the number of sign assignments satisfying the inequality. There are $2^{12} = 4096$ assignments (U-21, U-33); shared terms remain shared before the contrast is taken.

The conventional comparator is zero. Hand, taper and load are time-even; time reversal reverses moment and field, centring each static consensus loop at zero field. For each ordered domain the source group $2'\mathrm{m}'\mathrm{m}$ carries a primed vertical mirror: the printed domain has the $(1\bar{1}0)$ mirror with translation $(0, 0, 1/2)$ followed by T, and the other two have its three-fold images (SC-070-01–03; SG-15). This operation reverses hand at fixed taper and keeps the c-axis moment and field on the conical bar, forbidding its hand-odd moment. In a uniform cylinder the unprimed horizontal mirror already forbids a hand-odd axial field; the taper is therefore essential to the geometric comparison, while the conventional primed-mirror null remains. Laboratory-fixed hand-even actuator, mounting and position terms cancel in the hand difference. The hand-odd actuator term cancels in the mounting difference to second order about the shared centroid.

The co-varying-channel signs are explicit: the proposed helical field is hand-odd and taper-odd; static offsets are hand-even; the shared actuator field is hand-odd and taper-even; a between-mounting change is randomised by the mounting coin; curvature of drift is randomised by the

loop-order coin. The load-on minus load-off contrast is required for attribution to the load-graded part.

Detection means $p_{\mathrm{flip}} \leq 0.0027$ (U-33). Exclusion of an interaction of 0.5 mT or more requires the mean between -0.5 and $+0.5$ mT and both sign-flip tests after shifts by $+0.5$ and -0.5 mT to reject at that same criterion (U-43). The result is inconclusive otherwise. Attribution to the load-graded helical density gradient requires the per-bar load-on minus load-off difference to reject zero by the same test; the load-off contrasts are reported beside it, since P-5 assigns a field to twist alone.

The numerical null uses independent Gaussian loop scatter 0.5 mT and remanent-field reset 0.3 mT per loop, mounting offset 1 mT, linear drift 0.2 mT per loop, common and per-bar hand-odd actuator terms 0.3 and 0.2 mT, and taper-odd position term 0.3 mT (U-34–40, U-96). The contrast variance follows the actual coefficients: four loop contributions in each mounting, all of absolute weight one eighth. It gives a per-bar scatter of about 0.21 mT (U-49); offsets cancelled by design contribute zero covariance-weighted variance. The generic continuous symmetric null has size $10/4096 \simeq 0.0024$ and the one-sided exclusion boundary at most $5/4096 \simeq 0.0012$ (U-48). Separate nuisance trials add a 0.3 mT between-mounting actuator change or 0.1 mT per loop squared curvature in one mounting (U-41–42). The mounting and loop coins are retained in those trials and separately removed to expose the bias they prevent. The attribution trial has a 0.3 mT load-independent twist field, shared coins and differing run nuisances (U-44, U-51). The numerical results and their binomial errors are given after T-2.

For a transparent conditional test point, every bar contrast is set to the design exclusion scale 0.5 mT (U-43); this instantiates an effect, not a derived twist amplitude. In Eq. (58), $\mathfrak{e}_{\mathrm{err}}$ is the permutation standard error and $\mathfrak{z}_{\mathrm{test}}$ its critical multiplier. The permutation standard error is the root-sum-square of the contrasts divided by the bar count. At this equal-contrast point (U-21, U-43) the critical permutation multiplier and threshold are

$$\mathfrak{e}_{\mathrm{err}} = 0.5/\sqrt{12}\ \mathrm{mT}, \qquad \mathfrak{z}_{\mathrm{test}} = 5/\sqrt{3}, \qquad \mathfrak{H}_{\mathrm{test}} = 5(0.5)/6\ \mathrm{mT}. \tag{58}$$

The instantiated mean exceeds that boundary; ablating the helical field gives zero contrast. This supplies a detectable instantiated comparison without assigning a material kernel.

5.2 T-2: paramagnetic twist interaction

DC-2 discriminates SA-69, the source's paramagnetic time-reversal null (SC-069-01–02). The additional P-5 field is tested through the zero crossing rather than a remanent loop. This existence prediction is conditional by construction, with no numerical twist coefficient or absolute field sense assigned (O-6).

The referents are twelve truncated-cone h-FeS bars from the source growth method, c-aligned within 1°, with end diameters 0.60 and 0.85 mm, approximately twofold area ratio and length 3 mm (U-21–24, U-94; SC-051-01–03). The external high-temperature torsion–load VSM insert is held at 650 K (U-45), above the source's cited approximately 600 K Néel temperature (SC-008-01). Its identical end clamps rotate by $+\Theta_{\mathrm{tw}}/2$ and $-\Theta_{\mathrm{tw}}/2$ with $\Theta_{\mathrm{tw}} = \pm 1°$ and no axial displacement (U-25). Mean axial compression is 30 MPa, graded by the taper (U-26). Sweeps cover ± 20 mT (U-46); B_0 is the applied laboratory field at which the c-axis magnetization vanishes. A local linear fit returns this zero crossing independently of the comparator's symmetry argument.

Both wide-end-up and wide-end-down mountings keep the volume centroid at the clamp mid-plane and magnet centre, with the narrow end gripped 0.34 mm deeper (U-27). A fair coin drawn before each bar's first mounting randomises mounting order and the sign of between-mounting hand-odd actuator changes (U-29). A fair coin drawn at each mounting selects four sweeps in

order $+--+$ or $-++-$ (U-30); linear drift cancels and unequal drift curvature is randomised. Each hand's two sweeps are averaged, the field sign remains the laboratory sign in both mountings, and a crystal +c field is negative for the wide-end-down mounting. Load-off runs have zero axial force, both hands and mountings, the same bars and the same coins (U-31).

The defining condition and solved interaction are

$$\mathfrak{M}(\mathsf{B}_0) = 0, \tag{59}$$

$$\mathsf{q}_j = \frac{1}{4}\left[(\mathsf{B}_0^{+} - \mathsf{B}_0^{-})_{\mathrm{up},j} - (\mathsf{B}_0^{+} - \mathsf{B}_0^{-})_{\mathrm{down},j}\right]. \tag{60}$$

The paramagnet preserves time reversal, which keeps the static bar and reverses its moment; its conventional crossing is zero in each condition. A transverse twofold in the uniform bar also reverses an axial field at fixed hand. The taper and twist define the manuscript's extra helical-density-gradient comparison between prepared neighbours. Residual field shared by all conditions cancels; remanent field reset independently per sweep enters the variance. Hand-even mounting and position terms cancel in the hand difference, hand-odd shared actuator terms in the mounting difference about the centred geometry. The proposed field is hand-odd and taper-odd; actuator changes and drift curvature have exactly the two coin controls just stated.

Detection uses all 4096 sign flips and $p_{\mathrm{flip}} \le 0.0027$ (U-33). An interaction at least 0.5 mT is excluded only if the mean lies between -0.5 and $+0.5$ mT and both shifted tests reject at that criterion (U-43); otherwise the result is inconclusive. Attribution to the load-graded field requires the same-bar load-on minus load-off contrasts to reject zero at the same criterion, with the load-off contrasts reported beside them. The zero-crossing scatter is 0.5 mT and per-sweep remanence scatter 0.3 mT; all mounting, drift, common and per-bar actuator, position and nuisance-change settings are those individually stated for T-1 (U-34–42, U-96). The generic symmetric-null size is 10/4096, and the exclusion boundary at most 5/4096 (U-48). The same conditional equal-contrast test point is 0.5 mT per bar, with threshold 5(0.5)/6 mT from Eq. (58) (U-43); ablation sets the extra field and mean contrast to zero.

For both twist blocks the null trials number 20000, each nuisance trial 4000, the exclusion trials 100000 and the attribution trials 40000 (U-47). The numerical experiment uses PCG64 state 20261103 (U-99). The source supplies no instrument error model for these proposed inserts; these are illustrative-assumed distributions. The table below gives numerical trial frequencies, with standard error from the binomial variance, and separates randomised designs from deliberate removal of a coin.

Trial	Frequency and sampling error
Symmetric null, either twist block	0.0025 ± 0.0003
Between-mounting change, coin retained	0.0025 ± 0.0008
Curvature in one mounting, coin retained	0.0028 ± 0.0008
Between-mounting change, coin removed	0.139 ± 0.005
Curvature, loop-order coin removed	0.008 ± 0.001
No effect, exclusion succeeds	0.9974 ± 0.0002
Boundary effect, false exclusion	0.0012 ± 0.0001
Shared-coin load attribution null	0.0020 ± 0.0002

The covariance-weighted load-on minus load-off scatter is 0.29 mT for the stated independent run errors. The comparison benchmarks are U-49–51; their frequencies are distinct from material measurements. In each trial the full loop-level model is reduced through the displayed contrast; no independent-error substitution erases a shared nuisance.

5.3 T-3: isotope sign of the low-temperature gap

DC-3 discriminates SA-36: the fitted array gap does not determine an isotope response (SC-036-01–02). I-7 supplies a positive density-input change; this manuscript reads its larger response as a larger gap under positive density sensitivity. The prediction is conditional by construction and its sign, not its magnitude, is the FDT result.

Crystals are grown from ^{54}Fe and ^{57}Fe powders of at least 95% enrichment, one powder grade and common sulfur and iodine batches (U-52), using the source's growth method (SC-051-01–03). There are eight growth pairs, one crystal per growth, two back-to-back growths in one furnace per pair (U-53). A fair coin drawn before each pair chooses their isotope order and randomises the sign of the between-growth furnace drift (U-54). Each crystal's occupancy is measured by the source's single-crystal XRD method on the relevant specimen, not borrowed from a bulk mean (SC-076-01–02; U-61). An external far-infrared antiferromagnetic-resonance measurement at 8 K returns the zero-wave-vector gap for each crystal (U-55), independently of the source array fit and the conventional interval.

Define $\mathsf{y}_{\mathrm{g},j}$ as the heavy-minus-light logarithmic gap difference in pair j, $\mathfrak{C}_{\mathrm{g}}$ as its conventional contribution and $\mathfrak{D}_{\mathrm{g}}$ as the additional density contribution. The measurement solves the resonance condition $E_{\mathrm{gap}} = \hbar\omega_{\mathrm{res}}$, where ω_{res} is the independently measured resonance frequency. Define $S_{\mathrm{g},\alpha}$ as the gap log-sensitivity to exterior compactness with other channel coordinates fixed; isotope subscripts select the heavy and light Fe-source evaluations, and $E_{\mathrm{gap},54,j}, E_{\mathrm{gap},57,j}$ are their measured gap energies in pair j. For an Fe-source A-1 exterior coordinate at fixed pressure, radius and packing, the finite density-path contribution is

$$\mathsf{y}_{\mathrm{g},j} = \ln(E_{\mathrm{gap},57,j}/E_{\mathrm{gap},54,j}), \tag{61}$$

$$\mathfrak{D}_{\mathrm{g}} = \int_{\ln \alpha_{\mathrm{ext},54}}^{\ln \alpha_{\mathrm{ext},57}} S_{\mathrm{g},\alpha}\, d\ln \alpha_{\mathrm{ext}}, \qquad S_{\mathrm{g},\alpha} > 0. \tag{62}$$

No gap is fed back into a mass coordinate to predict itself. The path condition is a declared positive-sensitivity scope (U-97), not a measured derivative.

Let $S_{\mathrm{g},V}$ be the gap log-derivative with respect to volume at fixed isotope mass and occupancy, $S_{\mathrm{g},\mathfrak{x}}$ the gap log-derivative with respect to occupancy at fixed mass and volume, and η_{g} the conventional reduced-mass coefficient at fixed geometry. Here V_{zp} denotes the zero-point volume input, and each channel enters as its integral along the pair's light-to-heavy path, on which each coordinate moves monotonically. The comparator joins the signs of all three channels:

$$\mathfrak{C}_{\mathrm{g}} = \int S_{\mathrm{g},V}\, d\ln V_{\mathrm{zp}} - \int \eta_{\mathrm{g}}\, d\ln M_{\mathrm{Fe}} + \int S_{\mathrm{g},\mathfrak{x}}\, d\mathfrak{x}. \tag{63}$$

The investigator bounds are $|S_{\mathrm{g},V}| \le 20$, $-3\times10^{-4} \le \Delta\ln V_{\mathrm{zp}} \le 0$, $0 \le \eta_{\mathrm{g}} \le 0.1$, $\Delta\ln M_{\mathrm{Fe}} = 0.0541$, $|S_{\mathrm{g},\mathfrak{x}}| \le 5$, and $|\Delta\mathfrak{x}| \le 0.004$ (U-56–61). The mass benchmark is logarithmic, not the fractional mass increase; actual isotope assays replace it for incomplete enrichment. Volume and composition have either sign, conventional reduced mass has nonpositive sign, and the additional density path has positive sign only under the stated sensitivity condition. Adding the three bounds and rounding outward in steps of 0.01 gives (U-62)

$$\mathfrak{C}_{\mathrm{g}} \in [-0.04, +0.03]. \tag{64}$$

The additional channel is thereby compared with the entire conventional interval, not one arbitrarily fixed comparator.

Define $\mathfrak{y}_{g,j} = \mathsf{y}_{g,j} - 0.03$ and its mean $\overline{\mathfrak{y}}_g$; $\mathfrak{e}_g$ is the sample standard deviation of the eight residuals (U-63). Write $\mathfrak{H}_g$ for the gap decision threshold. Detection, at the one-sided Gaussian three-standard-deviation rate 0.00135, uses Student's critical value 4.530 for seven degrees of freedom (U-53, U-64):

$$\overline{\mathfrak{y}}_g > \mathfrak{H}_g, \qquad \mathfrak{H}_g = 4.530\,\mathfrak{e}_g/\sqrt{8}. \tag{65}$$

The threshold includes sample covariance through the paired differences and their empirical scatter. It is not the INS resolution. An added positive density contribution 0.17 in log gap is excluded when $\overline{\mathfrak{y}}_g + \mathfrak{H}_g < 0.10$ (U-78). The arithmetic is $0.17 = 0.10 + 0.07$, the last quantity being the full conventional interval width; this protects exclusion even at its lower endpoint (U-78). Otherwise the result is inconclusive.

For attribution, the composition term is recomputed from the measured mean pair occupancy difference $\overline{\Delta\mathfrak{x}}$ plus three standard errors before repeating detection. Define $\mathfrak{e}_{\Delta\mathfrak{x}}$ as the pair occupancy error. With per-crystal occupancy error 0.007 adopted from the source's 0.924(7) refinement (U-81; SC-074-02), the pair error and mean allowance are

$$\mathfrak{e}_{\Delta\mathfrak{x}} = \sqrt{2}(0.007) \simeq 0.01, \qquad 3\mathfrak{e}_{\Delta\mathfrak{x}}/\sqrt{8} \simeq 0.01. \tag{66}$$

These are design error conventions (U-82), not new refinement precision. The upper comparator uses $5(|\overline{\Delta\mathfrak{x}}| + 3\mathfrak{e}_{\Delta\mathfrak{x}}/\sqrt{8})$ in place of its composition bound, with the same outward rounding and the other two channels retained (U-60, U-82). Only a detection surviving that replacement is attributed to the density channel.

The numerical error model has per-crystal log-gap scatter 0.02, measurement scatter 0.002 and between-growth drift 0.01, whose sign is the growth coin (U-65–67, U-96). A separate drift trial raises the last value to 0.03 (U-67). There are 2000000 trials at the comparator upper endpoint and for the false-exclusion boundary, and 400000 for no-density exclusion (U-75). The table after T-4 gives their frequencies and sampling errors. The ablation is the block's own computation at its exclusion contribution (U-78): at the comparator's upper end the expected mean residual $\overline{\mathfrak{y}}_g$ is 0.17 with the positive density contribution 0.17 in place and 0 with that contribution at its consensus value zero, a difference of 0.17 against the design value $4.530 \times 0.0301/\sqrt{8} \simeq 0.048$ of $\mathfrak{H}_g$ in Eq. (65), where $0.0301 \simeq \sqrt{2(0.02^2 + 0.002^2) + 0.01^2}$ is the error model's pair-difference scatter (U-53, U-64–67, U-96–97; I-7). That instantiation supplies no predicted gap amplitude.

5.4 T-4: isotope sign of the Néel temperature

DC-4 discriminates SA-09, whose approximately 600 K Néel scale is cited from earlier work rather than measured as an isotope dependence (SC-009-01–02). I-7's positive density-input change is read here as a higher ordering temperature when its corresponding sensitivity is positive. This is conditional by construction; the temperature amplitude is a path integral, not a fitted number from the cited scale.

The material design uses the same ^{54}Fe and ^{57}Fe powders of at least 95% enrichment, one powder grade, common sulfur and iodine batches, eight back-to-back growth pairs in one furnace and one crystal per growth (U-52–53; SC-051-01–03). The referents are the crystals of T-3. A fair coin drawn before each pair chooses growth order and randomises the sign of furnace drift (U-54). Each occupancy is measured by single-crystal XRD on the corresponding crystal (SC-076-01–02). An external neutron apparatus measures the (0,0,1) magnetic Bragg intensity versus temperature for each crystal, applying the source's Morin-transition intensity method to the Néel transition (SC-066-02). The defining observable is the temperature at which the fitted ordered Bragg contribution vanishes on heating, with a common fit family and resolution-convolved background

established independently of the isotope contrast. That measurement, not the comparator input, returns T_{N}.

Define $\mathsf{y}_{\mathrm{N},j}$ as the heavy-minus-light log-temperature difference, $\mathfrak{C}_{\mathrm{N}}$ its conventional part, $\mathfrak{D}_{\mathrm{N}}$ its density contribution and $S_{\mathrm{N},\alpha}$ its log-sensitivity to Fe-source exterior A-1 compactness at fixed pressure, radius, packing and other channel coordinates; $T_{\mathrm{N},54,j}, T_{\mathrm{N},57,j}$ denote the two measured transition temperatures in pair j. The equations are

$$\mathsf{y}_{\mathrm{N},j} = \ln(T_{\mathrm{N},57,j}/T_{\mathrm{N},54,j}), \tag{67}$$

$$\mathfrak{D}_{\mathrm{N}} = \int_{\ln \alpha_{\mathrm{ext},54}}^{\ln \alpha_{\mathrm{ext},57}} S_{\mathrm{N},\alpha}\, d\ln \alpha_{\mathrm{ext}}, \qquad S_{\mathrm{N},\alpha} > 0. \tag{68}$$

Define $S_{\mathrm{N},V}$ as the ordering-temperature log-volume sensitivity at fixed mass and occupancy, $S_{\mathrm{N},\mathfrak{x}}$ its occupancy derivative at fixed mass and volume, and η_{N} the conventional reduced-mass coefficient. Their joined comparator, each channel its integral along the pair's light-to-heavy path, on which each coordinate moves monotonically, is

$$\mathfrak{C}_{\mathrm{N}} = \int S_{\mathrm{N},V}\, d\ln V_{\mathrm{zp}} - \int \eta_{\mathrm{N}}\, d\ln M_{\mathrm{Fe}} + \int S_{\mathrm{N},\mathfrak{x}}\, d\mathfrak{x}. \tag{69}$$

The bounds are $|S_{\mathrm{N},V}| \le 5$, $0 \le \eta_{\mathrm{N}} \le 0.05$ and $|dT_{\mathrm{N}}/d\mathfrak{x}| \le 200$ K (U-68–70), with the same $[-3\times10^{-4}, 0]$ volume interval, 0.0541 mass log-change and 0.004 occupancy bound (U-57, U-59, U-61). Dividing the occupancy-temperature slope by the cited approximately 600 K scale gives its log-sensitivity convention (SC-009-01–02; U-70). Outward rounding to 0.01 (U-62) yields

$$\mathfrak{C}_{\mathrm{N}} \in [-0.01, +0.01]. \tag{70}$$

Volume and occupancy shifts have either sign, reduced mass is nonpositive and the extra density path is positive under the declared condition. No pressure-trajectory mapping is applied to fixed-geometry isotope substitution.

Let $\mathfrak{y}_{\mathrm{N},j} = \mathsf{y}_{\mathrm{N},j} - 0.01$ be the residual, $\overline{\mathfrak{y}}_{\mathrm{N}}$ its mean and $\mathfrak{e}_{\mathrm{N}}$ its sample standard deviation (U-71). Write $\mathfrak{H}_{\mathrm{N}}$ for the ordering-temperature decision threshold. Detection at one-sided rate 0.00135 (U-53, U-64) uses

$$\overline{\mathfrak{y}}_{\mathrm{N}} > \mathfrak{H}_{\mathrm{N}}, \qquad \mathfrak{H}_{\mathrm{N}} = 4.530\, \mathfrak{e}_{\mathrm{N}}/\sqrt{8}. \tag{71}$$

The same seven-degree-of-freedom Student criterion (U-64) preserves the paired design. A positive density contribution 0.04 in log temperature is excluded when $\overline{\mathfrak{y}}_{\mathrm{N}} + \mathfrak{H}_{\mathrm{N}} < 0.02$ (U-79). The arithmetic is $0.04 = 0.02 + 0.02$, a detection margin plus the full interval width (U-79). Otherwise the result is inconclusive. Attribution replaces the composition term by $(200/600)(|\overline{\Delta\mathfrak{x}}| + 3\mathfrak{e}_{\Delta\mathfrak{x}}/\sqrt{8})$ and repeats detection with the other channels and outward rounding retained (U-70, U-81–82; SC-009-01–02). The three-standard-error occupancy allowance is 0.01, from the per-crystal 0.007 convention; it is not replaced by the smaller acceptance bound (U-81–82).

Per-crystal log-temperature scatter is 0.0025, measurement scatter 0.0005 and coin-signed drift 0.001; a separate trial uses drift 0.0036 (U-72–74, U-96). Trial counts are 2000000 for upper-end detection and false exclusion, and 400000 for no-density exclusion (U-75). The ablation is the block's own computation at its exclusion contribution (U-79): at the comparator's upper end the expected mean residual $\overline{\mathfrak{y}}_{\mathrm{N}}$ is 0.04 with the positive density contribution 0.04 in place and 0 with that contribution at its consensus value zero, a difference of 0.04 against the design value $4.530 \times 0.00374/\sqrt{8} \simeq 0.0060$ of $\mathfrak{H}_{\mathrm{N}}$ in Eq. (71), where $0.00374 \simeq \sqrt{2(0.0025^2 + 0.0005^2) + 0.001^2}$ is the error model's pair-difference scatter (U-53, U-64, U-72–74, U-96–97; I-7). That instantiation supplies no predicted temperature amplitude. The paired crystals are the neighbours; their

shared batch and measurement protocol cancel common responses while the joined intervals retain uncancelled volume, inertia and composition contributions.

The table below gives numerical frequencies for the isotope designs, using the stated paired Gaussian errors and coin-signed drifts; the error is the binomial standard error.

Trial	Gap	Néel temperature
Upper endpoint, nominal drift	0.00135 ± 0.00003	0.00130 ± 0.00003
Upper endpoint, enlarged drift	0.00197 ± 0.00003	0.00186 ± 0.00003
Centre, nominal drift	< 0.000002	< 0.000002
Density bound present, false exclusion at lower endpoint	0.00136 ± 0.00003	0.00138 ± 0.00003
No density, exclusion at upper endpoint	0.99896 ± 0.00005	> 0.99999

The centre entries and the event-free Néel exclusion result use one-sided 95% binomial zero-event bounds (U-100); absence of an event is not a zero population rate. Reference numerical benchmarks are U-76–80. The enlarged-drift rows demonstrate the price of non-Gaussian paired errors even with the coin; those rows require an updated criterion before a detection is claimed or an exclusion is used at the nominal error rate.

Other candidates. DC-5 at SA-10 is retired because the differential ^{57}Fe clock correction evaluated below is below its three-standard-error line-position threshold. DC-6 at SA-50 is retired because no map from the omnium local profile to the near-surface share of canted moment is supplied (O-4); a depth-resolved probe against uniform bulk magnetization has no calculated comparator departure. DC-7 at SA-45 is retired because no confinement spectrum gives the strain-induced Fe-ion orbital-doublet splitting for resonant inelastic X-ray scattering against the strained ligand-field computation (O-9).

6 Cross-domain reading

The geometry connects boundary clamps, magnetic response and wave modes without importing a threshold between charts. P-2 reads standing-wave structure as nodal architecture set by boundary conditions; strain changes those conditions between the Fe and S nuclear anchors. In the manuscript's reading, the orbital states are confinement eigenmodes of the Fe pattern's own support (I-5), and the acoustic phonon dispersion and the dispersive spin waves in the same spectra are one carrier in two regimes (I-2; SC-117; SC-035-01–02). The magnon is the stroke through a helical density gradient (P-5). The isotope comparisons keep pressure, radius and packing fixed for their density input; the loading calculation instead changes the interstitial volume. These are different paths in one mass accounting, with every energy channel entering once.

The observation-region rule also separates an Fe nuclear skin from a macroscopic specimen surface. A nuclear radius measurement, if supplied, would be a skin-weighted second moment with its own probe weight; it would not give a uniform interior density. No numerical nuclear radius enters here (U-18). The sample's exterior gravitational reading remains small and correct, while its magnetic response is a helical-window neighbour comparison. The force and curvature laws stand at both sizes; their unprovided response maps enter no numerical magnetic amplitude (O-4, O-6).

7 System-level reading (exploratory)

The scope is one in-sample observable formed from the source's fitted domain shares. It adds no prospective prediction and assigns no compactness to a magnetic domain.

X-1: domain concentration. Define $\mathsf{C}_{\mathrm{dom}}$ as the sum of squared domain shares and $\mathsf{C}_{\mathrm{equal}}$ as its equal-share comparator (U-98). Its observable, defining condition and comparator are

$$\mathsf{C}_{\mathrm{dom}} = \sum_{p=\mathrm{I,II,III}} \mathfrak{v}_p^2, \qquad \mathsf{C}_{\mathrm{equal}} = 1/3. \tag{72}$$

The comparator $\mathsf{C}_{\mathrm{equal}}$ is the value for three equal shares, not an equilibrium prediction. Define $\mathsf{C}_{\mathrm{free}}$ and $\mathsf{C}_{\mathrm{strained}}$ as the free and strained evaluations. The reported shares in Eqs. (36)–(37) yield

$$\mathsf{C}_{\mathrm{free}} = 0.33 \pm 0.01, \qquad \mathsf{C}_{\mathrm{strained}} = 0.48 \pm 0.04. \tag{73}$$

These labels denote the two evaluations of the same observable. For propagation, the covariance matrix $\mathcal{C}_{pq}^{(v)}$ satisfies $\sum_q \mathcal{C}_{pq}^{(v)} = 0$ because the shares sum to unity. Its diagonal entries are the squared printed share errors; for three shares the off-diagonal entries follow from those row sums. For $\mathsf{C}_{\mathrm{free}}$ and $\mathsf{C}_{\mathrm{strained}}$ the subscripts denote the evaluations in the two load conditions. The propagated variance is $4\sum_{pq} \mathfrak{v}_p \mathcal{C}_{pq}^{(v)} \mathfrak{v}_q$. This reconstructs a covariance under exact normalization; the source supplies no independent covariance matrix. The precision therefore comes from the fitted marginal errors and that constraint; uncertainties are rounded outward at the displayed resolution, and results retain at most the input shares' significant figures. The larger concentration reads redistribution towards two dominant shares, not a change in the strand count of matter or a local density maximum.

Guards. The input and output are in-sample, and the map corroborates no invariant. The diagnostic is a concentration of domain shares in their simplex; it has no A-1, A-3 or A-4 threshold. Its comparator, normalization and covariance assumption are fixed before comparing its two evaluations.

8 Convergence statement

On the source's inputs and observable dictionary, the Hall antisymmetrization and fit, the magnetic linear subtraction, the domain-intensity fit, the error-function fit, the canting-to-intensity estimate, the Hall proportionality, the symmetry constraints, the anisotropy model and the EDS ratio return exactly their source meanings. They are identity maps, each corroborating no invariant. The printed values not reconstructible from supplied ordinates remain the source's fitted or estimated values with their original precision. The neutron resolution bounds remain bounds; the source's claim that co-suppression "suggests a close correlation" remains that claim (SC-024-01–04). FDT accepts the measured record without reservation. I-3 separately guarantees equal curvature from the same stress tensor and data; I-4's L2 reduction is the stated weak-field slow-motion leading order, not a label for these fit identities.

For SA-06 the source writes that spontaneous AHE "originates from an effective magnetic field associated with time-reversal symmetry breaking and alternating spin polarization, rather than from a net magnetization as in a simple ferromagnet" (SC-006-01–04, L56–59). FDT declines that independent-field reading and reads the magnetic field as the helical density gradient of P-5,

retaining the Hall transport data. For SA-15 the source's results "demonstrate that" the strain-reduced spontaneous AHE is correlated with suppressed spin canting, "both of which are rooted in SOC and associated magnetoelastic coupling" (SC-015-01–04, L103–106). FDT declines separate coupling mechanisms as the root and reads the magnetic moments and mechanical vorticity as different grade projections of one density-gradient topography, with no carrier exchange (P-5, I-2), retaining the co-suppression. For SA-40 the source calls μ_0 "the vacuum permeability" in its Hall relation (SC-040-03, L221). FDT declines the empty-background reading and takes μ_0 as an omnium response coefficient in the strand-rate chain (0.1, 0.1d), retaining that relation. For SA-67 the source fits an error function multiplied by the Bose factor (SC-067-01–03, L736, L737, L746). FDT declines detailed balance and microscopic reversibility as a reading of that fitted factor and reads each process as the noncommuting, system-wide, many-to-many settlement of its actual starting state (0.1a), retaining the fitted spectrum.

The prospective divergences have explicit added inputs: the P-5 twist field or the positive I-7 density channel under its sensitivity condition. Removing the extra field returns zero hand-by-taper contrast; removing the isotope density contribution returns the joined conventional intervals. No curvature ratio or branch relabelling alone changes an observable.

For the nuclear-clock comparison, an external ^{57}Fe Mössbauer absorber at 250 K is compared with a single-line source outside any field (U-83). The transition energy is 14.4 keV (U-84). The six consensus line positions include isomer, hyperfine and quadrupole shifts; they absorb a factor common to all lines (U-92). Only the two ground sublevels' differential clock factor survives that fit. Define $\mathbf{m}_{\mathrm{nuc}}$ as the magnitude of the held ground-state nuclear moment, $E_{0,\mathrm{nuc}}$ the nuclear rest energy and $\mathfrak{D}_{\mathrm{clock}}$ the surviving fractional correction. The held-term scope sets induced energy to zero for this evaluation (U-92), and core 0.1c gives

$$\mathfrak{D}_{\mathrm{clock}} = \frac{2\mathbf{m}_{\mathrm{nuc}}|\mathsf{B}|}{E_{0,\mathrm{nuc}}}. \tag{74}$$

The adopted ground-state moment is 0.0906 nuclear magnetons, the nuclear magneton is $3.15245125844 \times 10^{-8}$ eV T^{-1}, the atom mass is 56.935 atomic mass units and the electron mass is 0.000548579909065 atomic mass units (U-85–87, U-12, U-11). Subtracting the masses of 26 electrons gives the nuclear mass approximately 56.921 atomic mass units and rest energy approximately 5.30×10^{10} eV (U-87–88). The field bound is 100 T (U-89). At that bound the derived differential factor is

$$\mathfrak{D}_{\mathrm{clock}} \lesssim 1 \times 10^{-17}. \tag{75}$$

Let $\mathsf{v}_{\mathrm{line}}$ denote the adopted line-position precision 0.001 mm s^{-1} (U-90). The dimensionless three-standard-error criterion $\mathfrak{H}_{\mathrm{clock}}$ (U-91) is

$$\mathfrak{H}_{\mathrm{clock}} = 3\mathsf{v}_{\mathrm{line}}/c \simeq 1 \times 10^{-14}. \tag{76}$$

For DC-5 the ablated departure is zero and the surviving correction lies below this threshold. The nucleus's transition uses its own rest energy in the field where it sits; the carrier medium's temperature is not substituted for that clock's rate. The common fit and the differential comparison recover the conventional line positions at the stated precision.

9 Status ledger

The table states the remaining physical inputs and the scope of each result once.

Item	Status and binding content
O-1	Owed: the finite-core cutoff, the regular core chart, or the outward phase-transfer law. No cutoff value enters.
O-2	Owed: a geometrically constructed odds for the overlap-contrast application (A-3).
O-3	Owed: a canonical odds for the confinement application (A-4).
O-4	Owed: the local profile from the omnium constitutive law with boundary, surface and core data, reducing to the measured nuclear profile. The magnetic depth-profile candidate has no map.
O-5	Owed: 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. Here R_H denotes the rotating horizon radius.
O-6	Owed: the maps from a charge, a circulating charge or a colour seat to an I-1 input; derivation of the A-two seat table from cone geometry; the gluon octet's dynamics. Twist response amplitudes require a declared kernel.
O-8	Owed: constitutive derivation of the causal-aperture speed and index and reconciliation with lensing.
O-9	Owed: the confinement operator, its domains, boundary data and spectrum; every mass ratio, including the held-out targets. Orbital-doublet splitting has no calculated spectrum.
A-3, A-4, A-5	PROVISIONAL tokens and open ranges only; no value, ordering, threshold, sign or trajectory is used. A-1 and A-2 alone have the displayed geometric warrant.
T-1	Prospective; conditional by construction, P-5 existence test. Conventional hand-by-taper loop-centre contrast is zero.
T-2	Prospective; conditional by construction, P-5 existence test. Conventional paramagnetic zero-crossing contrast is zero.
T-3	Prospective; conditional by construction, positive gap sensitivity. Convergence is the joined conventional log-gap interval.
T-4	Prospective; conditional by construction, positive ordering-temperature sensitivity. Convergence is the joined conventional log-temperature interval.
Mass targets	Held out: $m_p/m_e = 1836.15267343$ and $(m_\mu/m_e)^2 = 4.2753 \times 10^4$ (U-19–20). No mass is fitted to set a support radius.
Source reconstructions	In-sample identity maps: Hall fit, linear subtraction, domain fit, gap fit, intensity estimate, Hall relation, symmetry, anisotropy, lattice and EDS arithmetic; they corroborate no invariant.
X-1	In-sample concentration of fitted shares with normalization-constrained covariance; excluded from the predictions.
Core commitments	The simultaneous settlement, local-density orientation, observation-region rule and P-5 magnetic reading are POSITED in the core; their algebraic uses and limits are distinguished above. The perfect-form medium clock reading is CONDITIONAL on that stress form and count constraint.

10 Conclusions

The source's concurrent suppression of the AHE and ferromagnetic moment under in-plane uniaxial strain "suggests a close correlation" (SC-024-01–04). In this manuscript's reading it is experimental evidence that magnetism is geometric, exactly as P-5 states. The Fe and S nuclei are P-3's anchors, "the load is taken by the interstitial spacetime between them", and the canted moment is one of P-5's magnetic moments, which with mechanical vorticity are "different grade projections of one density-gradient topography, with no carrier exchange". The Hall signal remains the transport observable. The source discusses subtle coordination changes as the ori-

gin of its canting response; its unstrained fragment refinement supplies no strained coordination measurement (SC-042-01–03; SC-076-01–02).

The quantitative reconstruction preserves fitted, estimated and resolution-limited content. Its identity maps corroborate no invariant. The four prospective comparisons instead test added content with independent observables: ordered and paramagnetic twist contrasts, a low-temperature isotope gap shift and an isotope Néel-temperature shift. Their covariance, nuisance randomisation, exclusions and attribution tests specify where that content is distinguishable. The nuclear-clock correction is below its three-standard-error line-position threshold; magnetic depth and orbital spectra require the explicit maps named in the status ledger.

References

[1] W. Yao et al., "Uniaxial strain tuned magnetism of the altermagnet candidate h-FeS," arXiv:2602.14790v1, February 17, 2026, including Supplemental Material.

[2] Fundamental Density Theory, *Core invariants*, locked version 6.3, clauses 0.1–0.6, I-1–I-7, P-1–P-5 and Use.