Sliding-mode saturation and two-pulse amplification in T_d-WTe_2: an FDT reading of the record, with five predictions

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Target: J. G. Horstmann, C. Emeis, A. Caviezel, Q. N. Meier, N. Wyler, T. Lottermoser, F. Caruso and M. Fiebig, "Coherent phonon control beyond amplitude saturation in a sliding ferroelectric", *Nature Physics*, doi:10.1038/s41567-026-03491-1; received 18 December 2025, accepted 10 September 2026 (SC-001, SC-003, SC-004, SC-006). No arXiv identifier is printed in the record.

Abstract

Horstmann et al. [1] drive the interlayer-sliding mode of the sliding ferroelectric T_d-WTe_2 with 0.83-eV pump pulses and read it by time-resolved second-harmonic generation (trSHG) at room temperature; the source is experimental, with first-principles calculations. We analyse it through Fundamental Density Theory (FDT), from its locked core of seven invariants. The record reports that "the sliding-mode amplitude initially increases with fluence, then reaches a maximum around an absorbed fluence of $\mathsf{F}_{\mathrm{sat}} \approx 1.6\,\mathrm{mJ\,cm^{-2}}$, and even declines at higher excitation levels" (SC-114, SC-115, SC-116, L250–L254) and that, comparing double-pulse SHG traces at a pump–pump delay of zero and of two periods, "for equal total optical energy, sequential optical excitation yields up to 50% higher sliding amplitudes" (SC-203, SC-204, L373–L375). In the manuscript's own reading, labelled as such, the record is experimental evidence of five core concepts at the clauses that exist: every step is a system-wide settlement (0.1a), one carrier (I-2), standing density waves excited by energy injection (P-2, P-3), a driven observable that is not the force law (I-1), and two rotors of one mode (I-4); each reading is the identity map on the record's own inputs and corroborates no invariant. FDT recovers the data and declines three readings (linear displacive excitation, mirror-event decay, interfering probability amplitudes). It makes five predictions GR and QM do not make: an isotope-signed sliding frequency (T-1) and transition temperature (T-2) from the density channel of I-7, a domain-odd Kerr rotation of the sliding circulation (T-3) and a twist-induced Kerr rotation of twisted bilayers (T-4) from P-5, and an outer van der Waals gap narrowed by the skin's packing (T-5, from 0.6), each with its executed size, power and decision rules.

1 Framework

1.1 Source, verbs and citations

The source is experimental, with first-principles calculations: trSHG on bulk crystals, and density functional, Wannier electron–phonon and time-dependent Boltzmann calculations [1] (source_status: experimental). The verb discipline is declared once: measured, observed and reported name the source's results; derived, estimated, reconstructed and illustrative-assumed name everything else. FDT is a true extension of general relativity and quantum mechanics, and this analysis says so in the indicative: it agrees with their data without reservation and declines their interpretations where the invariants read the same record differently. A citation (SC-095, L199) names a row of the claims ledger and the record line of its verbatim fragment; U-rows are the ledger's non-source inputs with provenance; SA-01 to SA-112 are the record's under-determinations, each with its locus; DC-1 to DC-5 are the divergence candidates. The Supplementary Information is not part of the record.

1.2 Chart inventory and the three faces of I-3

The chart inventory is declared once, at first use (I-3 chart discipline 1). The density coordinate is a ratio of two curvatures built from two lengths the physics fixes before any observation is consulted,

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R_s from the source's total gravitating energy and r_f from the declared evaluation radius (0.3); every token is branch-tagged and names its application, as the table below lists.

token	application (odds → bounded)	warrant	here
α_{ext}, $\sigma = +1$	A-1 compactness, $X_{\text{ext}} \to \alpha_{\text{ext}}$	yes	the crystal's own window: field-point evaluation at a declared r_f, configuration evaluation at R_{b}, source evaluation through R_s
α_{int}, $\sigma = -1$	A-1 compactness, $X_{\text{int}} \to \alpha_{\text{int}}$ on $r_c \le r_f < R_s$	yes	the nuclei's interior charts; no value of the finite-core cutoff r_c is written (O-1)
β_σ	A-2 compactification, $\beta_\sigma = \alpha_\sigma/(1+\alpha_\sigma)$	yes	computational chart only, never a force, optical or density slot; no value
α_{ovl}	A-3 overlap or contrast; PROVISIONAL	no	token and range only: no value, threshold, ordering, sign or trajectory (O-2)
α_{conf}	A-4 confinement; PROVISIONAL	no	token and range only, the cone-position axis of I-5: no value, threshold, ordering, sign or trajectory (O-3)
α_{mode}	A-5 mode manifestation; PROVISIONAL	no	a naming token for the regimes of I-2; it ranks and spaces nothing; no value
$\alpha_{\text{core}} \to 1^-$	saturation diagnostic of P-3	schematic	the W and Te nuclei as pinning sites; no value

Actual density orders by $q_\sigma = \alpha_\sigma^{3\sigma}$, never by a raw coordinate (0.4), and no untagged value is written. The field equation is unchanged and the coordinate is downstream of its solution (I-3): a branch-tagged α_σ parameterises an on-shell spherical solution after the tensor equation and its source are specified. With $G_{\mu\nu}$ the Einstein tensor, $T_{\mu\nu}$ the stress tensor, $\kappa = 8\pi G/c^4$ the Einstein coupling (G Newton's constant, c the strand rate), $R_s = 2G\mathcal{M}/c^2$ the Schwarzschild radius of the total gravitating energy $\mathcal{M}$, r_f the field radius, r_c the finite-core cutoff, $\sigma = +1$ (-1) the exterior (interior) branch tag, X_{ext} the gap odds of A-1, ℓ_{opt} the optical length of the exact optical metric in areal coordinates, $\Omega_\perp$ the solid angle, and n_1, n_2 the exact indices and θ_1, θ_2 the angles to the normal on the two sides of a jump, the three faces read

$$
\begin{aligned}
&G_{\mu\nu} = \kappa\, T_{\mu\nu}, \qquad \alpha_\sigma = (R_s/r_f)^\sigma, \qquad X_{\text{ext}} = \frac{R_s}{r_f - R_s},\\
&\alpha_{\text{ext}} = R_s/r_f \quad (R_s < r_f < \infty), \qquad \alpha_{\text{int}} = r_f/R_s \quad (r_c \le r_f < R_s),\\
&\mathrm{d}\ell_{\text{opt}}^2 = \frac{\mathrm{d}r_f^2}{(1-\alpha_{\text{ext}})^2} + \frac{r_f^2\,\mathrm{d}\Omega_\perp^2}{1-\alpha_{\text{ext}}}, \qquad n_1 \sin\theta_1 = n_2 \sin\theta_2,
\end{aligned}
$$

the last generalised Snell's law in the exact index form. Containment (I-3): given the same stress tensor, cosmological terms, initial and boundary data and gauge, FDT and general relativity solve the same equation and return the same curvature, and the coordinate alone never produces a divergence; the crystal's own gravitational window is the curvature of general relativity, a small number in the system chart. A bound configuration is carried by two charts, both declared: the exterior atlas of the source, with its fold at its gravitational R_s, and the interior chart of the configuration, with its skin at the fold and its skin radius from data; no transfer map between them is displayed, and none is used.

The bounded map is the form $b = x/(1+x)$ applied to a named positive odds (0.4), and every use names its application (I-6). With α_0 the value before an odds-enhancing update x, the canonical response and the A-1 application read

$$
\alpha(x) = \frac{\alpha_0\,(1+x)}{1+\alpha_0\,x} \quad (x \ge 0), \qquad \alpha_{\text{ext}} = \frac{X_{\text{ext}}}{1+X_{\text{ext}}};
$$

linearity lives in the odds variable, and the open interval $0 < \alpha < 1$ holds with $\alpha \to 0^+$ and $\alpha \to 1^-$ as one-sided limits only. No response is run through the map: the record's SHG amplitude, dampings and frequency shifts are signed or dimensionful responses, never densities (I-6 item 4).

Observation-region rule (I-3): every consensus datum about an interior is a profile-weighted mean with the probe weight named. For the record's SHG the weight is the depth profile w_{pr} of second-harmonic generation in the skin, the record writing that "the measured SHG signal originates predominantly from <50 nm below the surface" (SC-333, L667–L668); for a quantity y over the probed volume V the record's datum is

$$\langle y \rangle_{w} = \frac{\int w_{\mathrm{pr}}\, y \,\mathrm{d}V}{\int w_{\mathrm{pr}} \,\mathrm{d}V},$$

so no point value is read off a mean and no single compactness is defined by one. Every SHG datum below is such a mean.

1.3 Notation guard

The record's symbols that collide with reserved tokens are renamed on every surface, quotations included, as the two tables below list; one symbol carries one meaning across the file.

record token (row)	record meaning	manuscript name	guard
$\alpha_{\mathrm{p1,p2}}$ (NG-01)	relative polarization angle of the pumps	Θ_{pp}	the curvature ratio of 0.3
γ in Eq. 1 (NG-02)	the coupling of the last term	c_{AB}	the boost factor of 0.1d
γ_s, $(\Delta\gamma/\Delta A)_s$ (NG-03, NG-04)	fitted damping, its slope	r_{s}, $(\Delta\mathsf{r}/\Delta\mathsf{A})_{\mathrm{s}}$	as above
γ_ν (NG-05)	the damping rate of Eq. 2	r_ν	as above
Ω_ν, β (NG-06)	dressed frequency; its positive fitting parameter	$\tilde{\omega}_\nu$, k_{dr}	the domain of I-5; the output of A-2
τ_s, $\Delta\tau_p$ (NG-07 to NG-09)	lifetime; pump and probe durations	t_{s}; d_{p}, d_{pr}	the stroke duration of 0.1a
$\theta(\Delta t)$ (NG-10)	the step of Eq. 4	$\mathsf{H}(\cdot)$	the Snell angle of I-3
D_ν, D_ν^{dp} (NG-10, NG-11)	the driving terms	$\mathcal{D}_\nu$, $\mathcal{D}_\nu^{\mathrm{dp}}$	the confinement operator of I-5
n, m (NG-12, NG-13)	band indices	b, b'	the strand count; a mass
F, F_{Td} (NG-02, NG-14)	free energy	$\mathcal{F}$, $\mathcal{F}_{\mathrm{T_d}}$	the force of I-1
F, F_{sat}, F_p (NG-09, NG-15, NG-16)	absorbed fluence; the probe's fluence	F, $\mathsf{F}_{\mathrm{sat}}$; F_{pr}	as above
P, P_z (NG-17)	polarization	$\mathcal{P}$, $\mathcal{P}_z$	the pressure of I-7

record token (row)	record meaning	manuscript name	guard
Q_{A_1}, Q_{B_1}, Q_0, Q_ν, $Q_{\max}$ (NG-17 to NG-19)	amplitudes, adimensional	Q, same subscripts	the charge of I-5; the rates of I-6
g, g_ν, g_{nm} (NG-12, NG-20)	electron–phonon coupling	g, g_ν, $\mathsf{g}_{\mathsf{bb}'}$	the metric $g_{\mu\nu}$
T_{elec}, T_{sat}, T_{exc}; T_s (NG-21 to NG-24)	temperatures; a period	the T of I-7, roman subscripts; the period as $1/f_s$	the kept time of 0.1a
A_s; A_1, B_1 (NG-03, NG-36)	SHG amplitude; mode labels	A_{s}; roman A_1, B_1	the amplitude of I-4; boundary data
Δf_{elec}, f_{nk} (NG-13, NG-25)	distribution change; occupation	$\Delta\mathsf{o}_{\mathrm{elec}}$, o_{bk}	f_s stays a frequency
focal lengths f (NG-26)	lenses	in words	as above
ε_{nk}, μ (NG-28)	band energy; chemical potential	E_{bk}, E_{ch}	the coefficients ε_0, μ_0
q (NG-29)	phonon wave vector	$\mathbf{k}_{\mathrm{ph}}$	the density order q_σ
I_{SHG}, $\Delta I_{\mathrm{shift}}$ (NG-30, NG-31)	SHG intensity; equilibrium shift	$\mathsf{I}_{\mathrm{SHG}}$, $\Delta\mathsf{I}_{\mathrm{shift}}$	none needed
Γ_2^-, Γ_4^+, zone points (NG-29, NG-32)	representations; zone labels	roman labels	the framing curve of I-5; the odds X
crystal axes (NG-33 to NG-35)	a, b, c directions	in words	$a = 4\sigma_{\mathrm{SB}}/c$; the strand rate c
mode index (NG-19)	the index of Eq. 2 to Eq. 4	kept as an index	the linking numbers of I-5
W, LA, RG630, Ry (NG-37 to NG-42)	element and labels	roman text	L-numbers are record loci

The core's own letters keep the core's meanings (E an energy, $\hbar$ and h Planck's constants, ω an angular frequency, λ a wavelength, k a wave number, t a time and, inside the I-5 eigenproblem, the position on the inside/outside chart as the core prints it, k_B Boltzmann's constant). The design symbols are defined in their blocks: $\mathfrak{d}$ (a contrast; $\mathfrak{d}'$ that of T-2), q_K and ϖ (Kerr readings), C_P (the Barnett term), v_K (rotation per tesla), $\mathfrak{g}_\mathrm{G}$ (a Grüneisen parameter), s_gap (outer-gap relaxation), u_0 (displacement amplitude), z_pr (probe depth weight), M_f (formula mass), $\mathcal{T}_1$, $\mathcal{T}_2$, $\mathcal{T}_5$ (Student statistics) and s (a standard deviation, subscripted by what it scatters); κ is Einstein's coupling and $\mathfrak{e}$ the stroke direction of I-3, so neither names a design quantity.

Homonyms stay the record's words: "shear mode" and "intralayer shearing" (SA-14; the shear of I-3a is the symmetric trace-free part of a deviation map); "topologically" and "topology" (SA-16, SA-62, SA-86: band topology, never the topological integer of I-5); "group" (SA-25: a space group, never the braid group B_n); "mediated" (SA-15, SA-75, SA-101; I-2 has no mediation); "force" and "driving force" (SA-42, SA-103; never the force of I-1); "temperature" (the T of I-7, never a clock factor of a solid); "decay" (SA-77: the record's damping, never the loop unwinding of I-5b nor the particle decay I-5 renames); "wave packets" (I-4).

1.4 The chain, its bridges and the strand rate

FDT has one substance, the omnium: matter, energy and spacetime (0.1). With E an energy, m a mass, ε_0 and μ_0 the omnium's response coefficients, d a distance and t a time, and for a pattern q with energy E_q, mass m_q, angular frequency ω_q, kept time T_q and thread length ℓ_q ($h = 2\pi\hbar$ Planck's constant), the chain is one state read four ways, its bridges displayed (0.1a):

$$E/m = c^2 = 1/(\varepsilon_0\mu_0) = (d/t)^2, \qquad E_q = m_q c^2 = \hbar\omega_q,$$
$$T_q = 2\pi/\omega_q = h/E_q, \qquad \ell_q = c\,T_q = h/(m_q c), \qquad d/t = c = 299792458,$$

the last in metres per second, exactly, and ℓ_q the Compton length, never a support radius. With E quantised and c constant the discreteness lands in the rest masses of confined patterns, the confinement eigenvalues of the massive leg only (no form of their operator is written here, O-9), and in the null periods and paths at the locked ratio $\ell_q/T_q = c$, bounded below by $2\ell_P$ (with $\ell_P = \sqrt{\hbar G/c^3}$ and $t_P = \ell_P/c$) and $2t_P$ as a one-sided infimum (0.1a); $\alpha_\sigma(r_f)$ is a continuous chart over discrete content. The constant c is the strand rate of the omnium, 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, $v^2 + u^2 = c^2$ with translation v and circulation u; its inertia E/c^2 carries the stress of its closure (von Laue), and its translation share v^2/c^2 is kinematic, equal to α_ext only for a pattern held on the exterior branch. The open stroke runs straight at c and keeps no time, its grades turning on a helix of radius $\bar{\lambda} = c/\omega$ standing at $\pi/4$; a closed pattern's phase rate ω/k exceeds its run $\mathrm{d}\omega/\mathrm{d}k$, their product is c^2, and $\pi/4$ is the equality of the two rates, which only the open stroke has (I-2).

1.5 The force law, the eigenproblem and the mass ledger

For two bodies $i = 1, 2$ at separation d, with per-body exterior inputs $\alpha_i = R_{s,i}/d$ built from each body's total gravitating energy $\mathcal{M}_i$ through its Schwarzschild radius $R_{s,i}$, and F_max the force ceiling, the universal force law holds always and at all scales (I-1):

$$F = \frac{c^4}{4G}\,\alpha_1\alpha_2, \qquad 0 < \alpha_i < 1 \;\Rightarrow\; F < F_\mathrm{max} = \frac{c^4}{4G}.$$

On the declared domain of two nonoverlapping spherical supports at monopole order, $R_{\mathrm{b},i} \geq R_{s,i}$ and $d \geq R_{\mathrm{b},1} + R_{\mathrm{b},2}$, the reduction $F = G\mathcal{M}_1\mathcal{M}_2/d^2$ is exact, not an asymptote; the domain qualifies the closed form, never the coordinate's universality. The interval ladder keeps three statements apart: $0 < \alpha < 1$ is universal; $F < F_\mathrm{max}$ holds wherever the inputs occupy that interval; $F \leq F_\mathrm{max}/4$ is the pair-domain statement alone, its equality needing contact of saturated

equal supports. Nonspherical, overlapping or dynamical configurations, the layered crystal among them, take derived evaluations through multipoles and the overlap complex, and none is written here (O-5).

Matter is braided photon helices (I-5): closed loops of n open helical strands of the spin-1 excitation of I-2, with identity fixed by two orthogonal axes, the helix count n (the class) and the confinement position (the mass within a class, the token of A-4). For a pattern confined to a domain Ω with boundary data B, braid configuration n, orientation χ and position t on the inside/outside chart, with mode u_q, eigenvalue ω_q and confinement operator D, mass is a confinement eigenvalue:

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

No form of the operator D, its domains, boundary data or spectrum is written here (O-9), nor any mass formula, anchor radius or absolute address for a named particle; the two held-out mass ratios are carried in the status ledger as tests. The record's electrons are $n = 3$ closures: their occupation changes, the pump's excitation and the relaxation after it, stay inside the $n = 3$ class with no re-braiding, a change of mode at fixed n and an intra-family eigenmode relaxation (the manuscript's reading of SA-45 and SA-67); no rate of that relaxation and no decay kernel is written here (O-12).

Density equivalence (I-7): mass, energy, temperature and pressure enter the same R_s, each channel once, through the total gravitating energy (0.5). With M the rest mass, E the non-rest energy, P the pressure, V the volume, T the temperature and a the radiation energy-density constant, σ_{SB} the flux constant that never enters $\mathcal{M}$,

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

with $a = 7.566 \times 10^{-16}\,\mathrm{J\,m^{-3}\,K^{-4}}$ (0.2). A named channel states where it enters and is entered once; isotope, thermal and pressure shifts are one mechanism.

1.6 The two readings and the cylindrical lift

The two readings stand wherever a target carries gravity, a gradient, a medium in motion, a curvature or a tide (0.1c, I-3a). A pattern's kept time and thread length rescale together with the density it crosses, by a positive clock factor $\mathfrak{m}$ that keeps $d/t = c$; written for the metric $g_{\mu\nu}$ the rescaling is conformal, and the bookkeeper reads the pattern's four-velocity $\mathcal{U}^\mu$, with $g_{\mu\nu}\mathcal{U}^\mu\mathcal{U}^\nu = -c^2$ and the projector $\mathfrak{P}^{\mu\nu} = c^2 g^{\mu\nu} + \mathcal{U}^\mu\mathcal{U}^\nu$, accelerating toward slower clocks:

$$d \mapsto \mathfrak{m}\, d, \qquad t \mapsto \mathfrak{m}\, t, \qquad g_{\mu\nu} \mapsto \mathfrak{m}^2 g_{\mu\nu}, \qquad \nabla_{\mathcal{U}}\mathcal{U}^\mu = -\mathfrak{P}^{\mu\nu}\partial_\nu \ln \mathfrak{m}.$$

On the pattern's own clocks and rulers nothing changes: moving at constant speed 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. For a stress tensor of perfect form, and on that premise, a medium's clock factor is its temperature at zero net conserved count and its enthalpy per count with a conserved count and fixed entropy per count: the reading of its flow, never the rate of a clock the medium carries; the clock factor is never a compactness and bends no stroke. A curvature, a tide or a density gradient is read between neighbours, two patterns or a pattern and a reference path, an extended pattern's skin against its own centre path among them (its $l = 2$ moment reads the surrounding tide, its trace is density); no single pattern reads one. A laboratory pattern's gravitational window $\alpha_{\mathrm{ext}} = \mathcal{M}c^2/(2F_{\max} r_f)$ is small and a correct reading. The bookkeeper's reading is a flow at every size: patterns falling from rest far away move at $c\sqrt{\alpha_{\mathrm{ext}}}$ and fall at exactly $G\mathcal{M}/r_f^2$; a rotating source adds a swirl, and the frame drag a gyroscope reads is the flow's local rotation, half the curl of the swirl, at leading order the Lense–Thirring precession;

the gravitational window's flow is irrotational, and the frame drag is never a medium's vorticity. A pattern whose rest energy depends on where it sits in a twist (P-5) takes that energy as its clock factor, the helical window: $\mathfrak{m}$ is its rest energy where it sits, the energy of its held and induced moments in the twist's field and the work of inducing them included, over its rest energy outside every twist; that energy over c^2 is its total gravitating energy, and its slow limit is the gradient force. There the clock factor belongs to the pattern, so patterns whose held and induced moments, summed per unit energy, differ along the field's gradient fall differently where they sit, while the universality of free fall stays the gravitational window's, where at monopole order the clock factor belongs to the point; a uniform twist turns a held moment and pushes nothing, and a twist is read between neighbours or against a reference path. The record measures no gravity, curvature or tide; the gradients and the medium in motion this analysis reads, the sliding layers' circulation (T-3), the twist (T-4) and the skin (T-5), are each read between neighbours or against a reference path.

The cylindrical lift is the framework's own for oscillator content (I-4). Complex mode equations are the two-dimensional projection of three-dimensional helical transport; cylindrical coordinates fix the helix phase, $\varphi_h(t) = \varphi_0 - \omega t$, and ignorance of φ_0 at observation is superposition. In Clifford form $i \leftrightarrow \mathbf{B} = \mathbf{e}_1\mathbf{e}_2$ and $e^{\mathbf{B}\varphi_h}$ is the single-angle phase rotor, distinct from a half-angle spinor rotor, with a dimensionless exponent; no density token stands in a multivector slot, and the lift runs on the φ-axis only, with a fixed field identity and no strand count on a mode.

2 System chart

The record's patterns stand on their charts as the table below lists. The formula unit of the record's crystals, WTe_2 of natural isotopic composition (the record names no enrichment, SC-304, L639), has $M_\mathrm{f} = 183.84 + 2 \times 127.60 = 439.04\,\mathrm{u}$ (U-14, U-49 [13]); its window is evaluated at the interlayer spacing $d_\mathrm{bulk} = 0.70\,\mathrm{nm}$ (U-44), a declared field radius, with the constants of U-01 to U-08 [11].

pattern	chart and clause	evaluation	reading
one formula unit	A-1, exterior; 0.1c	$\mathcal{M} = 439.04\,\mathrm{u} = 7.29 \times 10^{-25}\,\mathrm{kg}$ at $r_f = 0.70\,\mathrm{nm}$ (U-44): $\alpha_\mathrm{ext} = 1.5 \times 10^{-42}$	"the small number is a correct reading (I-1)"; the curvature of GR (I-3)
two neighbouring formula units	I-1 pair domain: spherical supports of radius $d_\mathrm{bulk}/2$ in contact	$F = F_\mathrm{max}\alpha_1\alpha_2 = G\mathcal{M}^2/d_\mathrm{bulk}^2 = 7.2 \times 10^{-41}\,\mathrm{N}$	a correct small number, never the interlayer restoring force (O-5)
the probed skin	I-3 observation-region rule	$80 \times 40\,\mu\mathrm{m}^2$ to $<50\,\mathrm{nm}$ (SC-337, SC-333): $V \le 2 \times 10^{-16}\,\mathrm{m}^3$	every SHG datum a mean weighted by w_pr
absorbed pump energy	I-7, entered once	at $1.6\,\mathrm{mJ\,cm^{-2}}$ over $80 \times 40\,\mu\mathrm{m}^2$ (SC-116, SC-337): $E = 5.1 \times 10^{-8}\,\mathrm{J}$, $E/c^2 = 5.7 \times 10^{-25}\,\mathrm{kg}$	one entry, whatever it becomes
radiation term of the skin	I-7, $a = 4\sigma_\mathrm{SB}/c$	$T = 295\,\mathrm{K}$ (U-43): $aT^4V/c^2 \le 2 \times 10^{-38}\,\mathrm{kg}$	never the electrons' energy
electrons	I-5, $n = 3$; A-4 token	occupation changes on the crystal's modes	intra-family; no address
pump, probe, SHG, sliding stroke, acoustic branches	I-2; A-5 names regimes	0.83 eV; 1.55 eV (SC-325); 3.10 eV; $hf_s = 0.99\,\mathrm{meV}$; TA and LA	one spin-1 excitation in different regimes
W and Te nuclei	P-3 pinning sites; two charts	$\alpha_\mathrm{core} \to 1^-$, schematic	the clamps of the mode's geometry

The second harmonic of the 1.55-eV probe is the record's 400-nm band-pass line, $hc/400\,\mathrm{nm} = 3.10\,\mathrm{eV}$ (SC-334, L673), and the pump's helix radius is $\bar{\lambda}_\mathrm{p} = \lambda_\mathrm{p}/2\pi = 0.24\,\mu\mathrm{m}$ for $\lambda_\mathrm{p} = 1.5\,\mu\mathrm{m}$ (SC-319, L649).

3 Observation map

Each row of the table below is anchored to an equation, figure or section of the record, with its verb class from the ledger; the clusters after it close with their identity-map statements.

record item (rows, lines)	anchor	verb class	reading
SHG drop within 500 fs, oscillation at f_s (SC-104, SC-105, L222–L224)	Fig. 1c,d	measured	one carrier (I-2); weight w_{pr} (I-3)
rise, maximum near $\mathsf{F}_{\mathrm{sat}} \approx 1.6\,\mathrm{mJ\,cm^{-2}}$ and decline of A_{s} (SC-114, SC-115, SC-116, L250–L254)	Fig. 1e	fitted	a driven observable (I-1)
long-lived shift toward Pnma and softening (SC-109 to SC-111, L243–L246)	Fig. 1f	fitted	load in the interstitial (P-3); no frequency off a temperature (0.1c)
state-resolved drive of both signs (SC-127 to SC-135, SC-140 to SC-145, L270–L284)	Fig. 2a; Eq. 3	calculated	one settlement (0.1a)
$T_{\mathrm{sat}} = 3100\,\mathrm{K}$ mapped to $\mathsf{F}_{\mathrm{sat}} = 1.6\,\mathrm{mJ\,cm^{-2}}$ (SC-150, SC-151, L285–L286)	Fig. 2b	calculated	identity map (Use item 2)
two-pulse gain up to 50 % at equal total energy (SC-203, SC-204, L373–L374)	Fig. 3d, f	fitted	one settlement (0.1a); two rotors (I-4)
suppression for delays up to ∼2 ps (SC-213, SC-214, L390–L391)	Fig. 3e	fitted	intra-family relaxation (I-5)
damping linear in A_{s}, slope rising with fluence (SC-251 to SC-254, L474–L477)	Fig. 4b	fitted	one settlement; one carrier (0.1a, I-2)
frequency softening with amplitude (SC-266 to SC-268, L458–L460)	Fig. 4a	fitted	no frequency off a temperature (0.1c); rotors (I-4)
oscillator, drive, two drives, dressed frequency (SC-347, SC-353, SC-367, SC-340)	Eq. 1 to Eq. 4	model	a susceptibility (I-1); one settlement (0.1a)
near-surface polarization; antiparallel sliding (SC-069 to SC-072, L181–L184)	main text	cited	between neighbours (Use item 7)

The record's model, renamed, anchors the clusters. Eq. 1 expands the free energy $\mathcal{F}$ about its minimum $\mathcal{F}_{\mathrm{T_d}}$ in the sliding amplitude $\mathsf{Q}_{\mathrm{A_1}}$ and the intralayer-shear amplitude $\mathsf{Q}_{\mathrm{B_1}}$, with mode frequencies $\omega_{\mathrm{A_1}}$, $\omega_{\mathrm{B_1}}$ and the coupling c_{AB} (SC-092, L185); Eq. 2 drives the adimensional amplitude Q_ν of mode ν, of frequency ω_ν and damping rate r_ν, by $\mathcal{D}_\nu(t)$ (SC-347, L663); Eq. 3 writes that drive with the coupling $\mathsf{g}_\nu^{\mathsf{bb}}(\mathbf{k},0)$ and the occupation change $\Delta\mathsf{o}_{\mathsf{bk}}(t)$ of band b at wave vector $\mathbf{k}$ (SC-353, L674); Eq. 4 adds two drives, $\mathcal{D}_\nu^{\mathrm{dp}}$, at the delay Δt through the step H (SC-367, L704); the dressed frequency $\tilde{\omega}_\nu$ carries the positive fitted parameter k_{dr} (SC-340, SC-341, L719–L720):

$$\mathcal{F} = \mathcal{F}_{\mathrm{T_d}} + \omega_{\mathrm{A_1}}^2 \mathsf{Q}_{\mathrm{A_1}}^2 + \omega_{\mathrm{B_1}}^2 \mathsf{Q}_{\mathrm{B_1}}^2 + \mathsf{c}_{\mathrm{AB}}\, \mathsf{Q}_{\mathrm{A_1}} \mathsf{Q}_{\mathrm{B_1}}^2,$$

$$\partial_t^2 \mathsf{Q}_\nu + \mathsf{r}_\nu\, \partial_t \mathsf{Q}_\nu + \omega_\nu^2 \mathsf{Q}_\nu = \mathcal{D}_\nu(t), \qquad \mathcal{D}_\nu(t) = -\frac{2\omega_\nu}{\hbar} \sum_{\mathsf{bk}} \mathsf{g}_\nu^{\mathsf{bb}}(\mathbf{k},0)\, \Delta\mathsf{o}_{\mathsf{bk}}(t),$$

$$\mathcal{D}_\nu^{\mathrm{dp}}(t;\Delta t) = \mathcal{D}_\nu(t) + \mathcal{D}_\nu(t-\Delta t)\, \mathsf{H}(\Delta t), \qquad \tilde{\omega}_\nu = \omega_\nu - \mathsf{k}_{\mathrm{dr}} |\mathsf{Q}_\nu|.$$

Eq. 1 prints no $\frac{1}{2}$ on its quadratic terms, no energy scale and no cubic or quartic term in $\mathsf{Q}_{\mathrm{A_1}}$, so for the adimensional amplitude the printed $\mathcal{F}$ has the dimension of a squared frequency (SA-28). Eq. 2 gives Eq. 3's "driving force" the dimension s^{-2}, with g an energy: never a force of I-1, and the word stays the record's (SA-103). The record's "$\mathsf{Q}_{\mathrm{A_1}} \propto \sqrt{(\mathcal{P}-\mathcal{P}_z)^2}$" (SC-093, L194) is the magnitude $|\mathcal{P}-\mathcal{P}_z|$, which carries no sign while the sliding coordinate is signed; it is never a signed identity (SA-29).

3.1 One settlement, every step (0.1a)

The positioning quotes 0.1a's paragraph "Every step is a system-wide settlement" whole: "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 the optimisation (author ruling 2026-10-17): an analysis that names one — a total shear, an action, an energy — writes it as its own reading."

The record's drive is one sum over every electronic state's occupation change (Eq. 3, SA-103), with contributions of both signs: "In this picture, the effective lattice response in our measurements is governed by a competition between two opposing contributions: coupling to low-energy electronic states drives the lattice towards the high-symmetry Pnma configuration, whereas coupling to higher-lying states favours motion in the opposite direction" (SC-139 to SC-143, L289, L270–L274; SA-47); in the manuscript's own reading, labelled, that sum is one system-wide, many-to-many settlement. The record's outlook that "our results point towards a dynamical extension of the DECP picture, where the photo-induced driving force evolves with the time- and energy-dependent carrier distribution rather than arising from an instantaneous displacement of the equilibrium nuclear positions" (SC-280 to SC-284, L488–L497; SA-83) is read as each step settled "from the state the system is in". The two-pulse gain at fixed energy (SA-64, SA-65) is read as "the expected behaviour is not necessarily the evolving system's optimum", the expected behaviour being, in the manuscript's reading, that one pulse carrying the whole energy moves the mode at least as far as two, which the system, settled each step from the state it is in, does not do; the record's own "expected behaviour in coherent control experiments without amplitude saturation" (SC-228, SC-229, L365–L366; SA-58) keeps its own sense, a fitted line. The record's DFT, EPW and TDBE (SC-314, L649; SC-356, L683–L684) are its method, and its "lowest-energy route" (SC-088, L176; SA-27) its computation: 0.1a names no objective. The static limit $\mathsf{Q}_{\max,\nu}$ is the record's quantity, "an upper theoretical limit to the maximum lattice displacement that the crystal can undergo for a given electronic excitation" (SC-364, SC-365, L697–L699; SA-106); a drive switched on suddenly peaks at twice it when undamped (the manuscript's arithmetic for Eq. 2). Eq. 4 adds two drives each computed as if the other pulse were absent (SA-107), while the record's account, "This behaviour most likely arises because double-pulse excitation—unlike a single strong pulse—avoids electronic temperatures above T_{sat} and thus minimizes the population of higher-lying electronic states that drive the sliding mode in the opposite direction" (SC-206 to SC-208, L379–L382; SA-66), needs the second pulse to meet the electrons the first left; both stay the record's, and the difference is read at 0.1a, labelled. Identity map: the reading returns the record's own sum, signs and traces, and corroborates no invariant; precision, "up to 50%" at one figure; falsifier, a two-pulse amplitude at equal total energy that exceeds the single pulse's at no delay.

3.2 One carrier (I-2)

The positioning quotes I-2's identity, photon = graviton = gluon = phonon = magnon = "the same spin-1 excitation of the density field, at different density / geometry regimes", and its sentences: "There are no independent force carriers. 'Mediation' is a coordinate artifact; interactions are curvature plus geodesic motion. The identity is carrier-only: the braided closures of I-5 (matter modes) are never inside it." The pump at 0.83 eV (SC-320, L650), the probe at 1.55 eV (SC-325, L656), its second harmonic at 3.10 eV, the sliding stroke at 0.24 THz (SC-095, L199), whose quantum is $hf_s = 0.99$ meV, and the acoustic branches (SC-383 to SC-385, L445–L447; SA-72) are one spin-1 excitation in different regimes. The energy passes from the optical to the lattice regime through the occupation of the electrons, $n = 3$ closures (I-5), never through an exchanged carrier; the record's "mediated" stays its word, in "a form of anharmonic coupling mediated by coherent nuclear motion" (SC-054, L160; SA-15), in "This behaviour indicates that damping is mediated by the coherent vibrational amplitude" (SC-246, SC-247, L469–L470; SA-75), and where the source reports Eq. 2's damping as the "damping rate mediated by phonon–phonon interactions" (SC-349, L667; SA-101). Identity map: the record's photon energies and frequency return themselves;

precision, two figures in 0.24 THz; falsifier, a lattice response launched with no change of the electrons' occupation.

3.3 A driven standing wave (P-2, P-3)

The positioning quotes P-2: "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"; "Readings: eigenstates, phonon modes and orbitals are nodal patterns of the driven density field"; and "mode geometry is set by the boundary conditions (the clamps, P-3), not by the medium". It quotes P-3: "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." The coherent sliding motion is read as a standing density wave the electromagnetic injection excites, its amplitude set by the injection's timing (SA-63, SA-66), its geometry by the stacking of the W and Te pinning sites (P-3); P-2's "the medium" is the omnium, never the record's crystal. The orbitals the pump "depopulates" "between neighbouring layers" (SC-064, SC-065, L174–L175; SA-19) and the long-lived shift that "shifts the equilibrium position Q_0 towards the centrosymmetric Pnma configuration" (SC-110, SC-111, L244–L246; SA-36) are read as the load taken by the interstitial between the anchors; the record prints no $\Delta V/V$, so no number is attached. Identity map: the record's frequency and shift return themselves; precision, two figures in 0.24 THz, the shift carrying no number; falsifier, a sliding period that changes with the injection's timing at fixed geometry and fixed amplitude, the record's sliding-mode frequency softening as the amplitude increases (SC-266 to SC-268, L458–L460).

3.4 The driven observable (I-1)

The positioning quotes I-1's bullet: "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 $A(t) = \int \chi_A(t - t')\, F_{12}(t')\, \mathrm{d}t'$, and the susceptibility maps force $\rightarrow$ observable — it is not the force law." And its sentences: "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)." Eq. 2's oscillator maps the record's drive of Eqs. 3–4 (SA-101, SA-103, SA-107) to Q_ν through its Green function, a susceptibility and never the force law, and the drive stands in no F_{12} slot. The SHG amplitude A_s vanishes at zero drive; its saturation and decline are properties of the drive, of the oscillator's fluence-dependent response (SA-36, SA-52) and of the SHG transduction (SA-38), never of a force law. The bare law at the crystal's compactness returns the system chart's correct small number, 7.2×10^{-41} N, never the interlayer restoring force of the sliding mode, which only a declared response kernel reaches; none is declared here, so no number of I-1 is written for that force (SA-01), and no amplitude, damping, frequency or shift is written as a force of I-1. The record's frame, "The breakdown of Hooke's law marks the onset of nonlinear behaviour: when displacements become large, restoring forces weaken and Hookean proportionality fails" (SC-013, SC-014, L17–L19), is the record's: the core's one spring is the helical window's (0.1c, "its second derivatives the spring"), the deviation of neighbours of I-3a runs in the gravitational window and, on the premise of perfect form, in the medium window, the core calls neither a spring, and none of them is the interlayer restoring force of a solid, whose shear stress lies outside perfect form.

The SHG amplitude stays an SHG amplitude in every sentence (SA-05, SA-38, SA-50, SA-55), the amplitude of the SHG modulation normalised to the SHG signal at a negative pump–probe delay, as the record states for Fig. 4a (SC-376, L444) and prints in the ordinate of Fig. 1d (NG-31, L122), and likewise in the manuscript's reading of Fig. 1e, which prints no normalisation (SC-159,

L142): the record prints no map from the SHG amplitude to a displacement. In the manuscript's own arithmetic, for an SHG intensity quadratic in the polar displacement measured from Pnma the modulation per unit oscillation is proportional to the equilibrium's distance from Pnma, so it falls as the long-lived shift approaches Pnma, and part of the fall of A_s can be transduction. The rise, maximum and decline are never read through the bounded map, which is monotone and belongs to a named application only (I-6). Identity map: A_s returns itself; precision, two figures in "≈ 1.6"; falsifier, an SHG modulation present at zero drive.

3.5 Two rotors of one mode (I-4)

The positioning quotes I-4's paragraph "The quantum face." whole: "QM is helical geodesics on truncated density cones. The wavefunction $\psi = Ae^{i\varphi}$ 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." With the cylindrical lift, the two pulses' oscillations are two rotors of one mode on the φ-axis, $\varphi_h(t) = \varphi_0 - \omega t$, φ_0 fixed by each pulse's arrival, adding at the phase difference $\omega\Delta t$: in phase when $\omega\Delta t$ is a whole number of turns at the frequency the mode runs between the pulses (SA-56). The record's 8.3 ps (SC-227, L364) is two periods $1/f_s$ at 0.24 THz, $2/f_s = 8.3$ ps (SA-61); its delays of Fig. 3b, 4.28, 5.78 and 6.53 ps (SC-236 to SC-238), are 1.0, 1.4 and 1.6 periods at 0.24 THz, the manuscript's arithmetic, and at the dressed frequency of large amplitudes (Fig. 4a, 0.21 to 0.23 THz, SC-388) their phases differ. No strand count stands on a mode; "vibrational wave packets" (SC-209, L383; SA-66) and "nuclear wave packets" (SC-249, L472; SA-76) stay the record's words, and the standard account's reading of them is declined in the convergence statement. Identity map: the delays and periods return themselves; precision, two figures; falsifier, a delay dependence that does not follow the phase difference at the running frequency.

3.6 Read between neighbours (Use item 7) and the probe weight (I-3)

The positioning quotes Use item 7's first two sentences for what they cover: "Curvature is read between neighbours (0.1c, I-3a). A reading of curvature, a tide or a density gradient is a comparison of neighbouring patterns, or of a pattern with a reference path — an extended pattern's skin against its own centre path among them (I-3a); a pattern carries none at a point, because its clocks and rulers adjust with the density it crosses." The polarization of "Van der Waals sliding ferroelectrics" (SC-034, L45, a cited statement, refs 16–21) "arises from the relative displacement of adjacent layers" (SC-036, L47; SA-10), and the SHG reads such a relative displacement, which the manuscript reads as a comparison of neighbouring layers, its own labelled reading; Use item 7 and I-3a read curvature, a tide or a density gradient between neighbours, and none of these is read off the polarization. The record's "potential energy surface" and "landscape" carry no curvature in the sense of I-3a. Its "the effective polarization in bulk $\mathrm{T_d}$-$\mathrm{WTe_2}$ is dominated by near-surface contributions" (SC-071, SC-072, L183–L184, cited; SA-22) is a statement about the probe weight w_pr, and every SHG datum is a mean weighted by it (SA-32, SA-92). Identity map: corroborates no invariant; precision, no number is read; falsifier, an SHG signal insensitive to the relative displacement of adjacent layers.

4 Cone-position translation

The record's energy and temperature coordinates live on its own charts, and none translates to a cone position, as the table below lists. The two axes of I-5 stay apart: the class is $n = 3$ for every electron of the record, and the confinement position is the A-4 token, token and range only, with no value, ordering or trajectory written (O-3). The record's "higher-lying" and "higher-energy" states (SC-138, SC-143, SC-135) are higher modes of the same $n = 3$ closures on the crystal's modes; no address and no mass is written, and no band energy stands under a compactness header (I-3 chart discipline 2 and 3).

record coordinate (rows)	its chart	translation
energies $E - E_F$ from -2.0 to $2.0\,\mathrm{eV}$ in Fig. 2a (SC-171) and the 4-eV window of the TDBE (SC-361)	band energy	none; the A-4 token carries no value
T_{elec}, T_{sat}, T_{exc} (SC-128 to SC-131, SC-150, SC-359)	temperature of I-7	a channel of $\mathcal{M}$, entered once; no clock factor of the solid
"higher-lying electronic states" (SC-138, SC-143)	the crystal's modes	same $n = 3$ class, a higher mode
the carriers' relaxation (SC-213 to SC-217)	time	intra-family eigenmode relaxation; no rate written (O-12)

5 Predictions

Five blocks follow, one per candidate DC-1 to DC-5; no candidate is retired. Each names its candidate and the under-determination it discriminates first, and carries its referent, observable, design, FDT input, comparator, statistic with its executed numbers and its three rules. A number the record does not print is a U-row, an apparatus it does not name is external, and design values are set exactly, so derived figures carry the digits of the record's inputs. The Student statistic is one-sided at the three-sigma rate 0.00135 (U-10), with the quantile 4.530 at seven degrees of freedom (U-11 [9]); the permutation tests run over all relabelings [10]; every size and power is executed with the design's own noise model, the Student statistics' exactly, as a sum over the coin draws of noncentral Student tails, the permutation tests' sizes exactly over all relabelings, and their powers by Monte Carlo.

5.1 T-1: an isotope-signed sliding frequency

Candidate DC-1; the block discriminates SA-30, the record's single sliding frequency "$\omega_{\mathrm{A}_1}/2\pi := f_s = 0.24\,\mathrm{THz}$" (SC-095, L199), which leaves the frequency's mass channels undetermined. Warrant: I-7, a constitutive input. The Discriminator, whole: "For purely density-coupled equilibrium observables, a heavier isotope $\rightarrow$ larger R_s $\rightarrow$ higher α $\rightarrow$ larger response — opposite in sign to conventional reduced-mass scaling." Discipline 2, whole: "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 $\mathrm{sgn}(\prod_i S_i)$ and stays conditional until the sensitivities are established."

Referent: eight pairs of $\mathrm{T_d}$-$\mathrm{WTe_2}$ crystals, one of each pair grown from tellurium enriched to at least 99 % in ^{130}Te, the other from tellurium enriched to at least 99 % in ^{126}Te (U-15), natural tungsten, one growth route and one stoichiometry target, the two of a pair grown back to back, each crystal's Te content measured (external); exfoliated and mounted as the record's (SC-305, SC-306, L640–L641). Design: the two of a pair are measured back to back at one stage temperature, in an order a fair coin draws before each pair, randomising the sign of a drift between the two measurements. Observable: f_s from the record's single-pulse trSHG at its lowest absorbed fluence, $0.4\,\mathrm{mJ\,cm^{-2}}$ (SC-109, L243), each crystal's fluence matched to the other's; the pair contrast is $\mathfrak{d}_i = \ln f_s(^{130}\mathrm{Te}) - \ln f_s(^{126}\mathrm{Te})$, $i = 1, \ldots, 8$.

FDT input: the density channel enters $\delta \ln f_s$ as $S_{\mathrm{dens}}\, \delta \ln \alpha_{\mathrm{ext}}$, with α_{ext} the crystal's A-1 window moved by the substitution at fixed P, r_f and packing (I-3 chart discipline 5). Since $\alpha_{\mathrm{ext}} = \mathcal{M}c^2/(2F_{\max} r_f)$, at fixed r_f the move is $\Delta \ln \alpha_{\mathrm{ext}} = \Delta \ln \mathcal{M} = \Delta \ln M_{\mathrm{f}}$, the mass coordinate built from the isotope masses, never from the frequency it predicts (Discipline 3). With S_{dens} the derivative of $\ln f_s$ with respect to $\ln \alpha_{\mathrm{ext}}$ at fixed P, r_f and packing, S_M that with respect to $\ln M_{\mathrm{f}}$ at a fixed interlayer force constant, S_V that with respect to the zero-point volume $\ln V_{\mathrm{zp}}$ at fixed mass and δ_{anh} the anharmonic remainder, the sum and the density channel's contribution

$\Delta_{\mathrm{dens}} \ln f_s$, the path integral of S_{dens} between the two endpoints, read

$$\delta \ln f_s = S_{\mathrm{dens}}\, \delta \ln \alpha_{\mathrm{ext}} + S_M\, \delta \ln M_{\mathrm{f}} + S_V\, \delta \ln V_{\mathrm{zp}} + \delta_{\mathrm{anh}},$$
$$\Delta_{\mathrm{dens}} \ln f_s = \int_{\ln \alpha_{\mathrm{ext}}(^{126}\mathrm{Te})}^{\ln \alpha_{\mathrm{ext}}(^{130}\mathrm{Te})} S_{\mathrm{dens}}\, \mathrm{d} \ln \alpha_{\mathrm{ext}}.$$

For the nominal compositions $M_{\mathrm{f}}(^{130}\mathrm{Te}) = 443.65\,\mathrm{u}$ and $M_{\mathrm{f}}(^{126}\mathrm{Te}) = 435.65\,\mathrm{u}$ (U-12, U-13, U-14 [12, 13]), the span of the path integral is $\Delta \ln M_{\mathrm{f}} = \ln[(183.84 + 2 \times 129.906222748)/(183.84 + 2 \times 125.9033109)] = 0.018210$, the W weight's last figure moving it by 4×10^{-7}. The manuscript reads "larger response" as a higher frequency, its own reading, so $S_{\mathrm{dens}} > 0$ along the path and the contribution is positive; no clause fixes its magnitude. The block is a sign test resting on that declared positive sensitivity; every shift here is logarithmic, kept apart from the fractional shift it approximates.

Comparator (the consensus calculation, attributed): the same sum without the density channel, its terms in the table below. The rigid-layer inertial term is $-\frac{1}{2}\Delta \ln M_{\mathrm{f}} = -0.009105$; the zero-point volume term runs from 0 to $-8 \times (-1.5 \times 10^{-4}) = +0.0012$ (U-17, U-18); the enrichment's mass uncertainty is ± 0.0001 in $\Delta \ln M_{\mathrm{f}}$ and ± 0.00005 in $\ln f_s$ (U-16); the anharmonic term is mass-independent in the classical limit at room temperature and enters at the 10^{-6} level (U-19). Rounded outward, the comparator is -0.0092 to -0.0078 in $\ln f_s$.

channel	sensitivity, held fixed	move	contribution to $\mathfrak{d}$
density (I-7)	$S_{\mathrm{dens}} > 0$ at fixed P, r_f, packing (manuscript's reading)	+0.018210	positive, no magnitude
rigid-layer inertia	$S_M = -1/2$ at fixed force constant	+0.018210	−0.009105
zero-point volume (U-17, U-18)	$S_V = -\mathfrak{g}_{\mathrm{G}}$, $\mathfrak{g}_{\mathrm{G}}$ from 0 to 8, at fixed mass	-1.5×10^{-4} to 0	0 to +0.0012
anharmonic (U-19)	mass-independent (classical limit)	none	10^{-6} level
enrichment (U-16)	mass uncertainty	±0.0001	±0.00005
sum without density			−0.0092 to −0.0078

Statistic: one-sided Student t of the eight pair differences against the comparator's upper end. The pair difference's scatter is $\sqrt{s_1^2 + s_2^2 - 2\,\mathrm{Cov}}$, s_1 and s_2 the two crystals' scatters, with Cov = 0 between them (independent growths and fits), each crystal carrying a fit error 0.0010, a crystal scatter 0.0010 and a fluence-matching error 0.0004 in $\ln f_s$, the pair a drift of 0.0002 with the coin's sign (U-20): a per-pair scatter of 0.0021. With $\bar{\mathfrak{d}}$ the mean and $s_{\mathfrak{d}}$ the sample standard deviation of the eight contrasts, the defining condition and its solution at the design scatter are

$$\mathcal{T}_1 = \frac{\sqrt{8}\,(\bar{\mathfrak{d}} + 0.0078)}{s_{\mathfrak{d}}} > 4.530, \qquad \bar{\mathfrak{d}} > -0.0078 + 0.0033 = -0.0045.$$

Executed, exactly: size 0.00135 at the upper end, 0.00010 at the centre and 4×10^{-6} at the lower end; the drift doubled gives 0.00135; power 0.75, 0.94 and 0.99 at a contribution 0.004, 0.005 and 0.006 above the upper end (U-21).

Rules. Detection: the one-sided t rejects. Exclusion: an FDT-sign density-channel contribution of 0.007 in $\ln f_s$ above the interval's lower end (U-21) is excluded when the one-sided t of the pair differences below that bound, -0.0022, rejects at 0.00135 (executed: false exclusion 0.00135 with the truth at the bound; exclusion 0.978 with no density channel at the interval's upper end, 0.999 at its lower end). Inconclusive otherwise. Attribution: a detection is read as the density channel when it survives with each pair difference corrected by the pair's measured Te-content difference times the measured dependence of $\ln f_s$ on Te content (external).

Ablation, instantiated at the power point 0.005 above the upper end (U-21): with the density channel in place the expected pair difference is -0.0028; with S_{dens} at its consensus value 0 it is the comparator's upper end, -0.0078; the difference, 0.0050, exceeds the block's threshold $4.530\, s_{\mathfrak{d}}/\sqrt{8} = 0.0033$, so the input carries the block.

5.2 T-2: an isotope-signed transition temperature

Candidate DC-2; the block discriminates SA-17, the record's bound for "the Td polymorph of WTe_2 (stable for temperatures $T < 565\,\mathrm{K}$)" (SC-058, SC-059, L165–L166), printed without a reference number and silent on any isotope dependence. Warrant: I-7, a constitutive input, the Discriminator and Discipline 2 as quoted in T-1. Referent: the crystals of T-1 after their frequency measurement.

Observable: the Td $\rightleftharpoons$ 1T′ transition temperature T_{tr} as the midpoint of its onsets on heating and on cooling at $2\,\mathrm{K\,min^{-1}}$ (U-23). The phases "are not related by a group–subgroup relationship" (SC-080, SC-081, L163–L164, a cited statement, Ref. 40; SA-25), so the transition is first order, each onset carries a kinetic (attempt-rate) isotope term that moves the two onsets apart, and the midpoint cancels its symmetric part. T_{tr} is read from the DSC peak and from the loss and return of the static SHG in the record's probe geometry (SC-327 to SC-330, L660–L664), each crystal corrected to the pair's mean Te content by the measured dependence of the onset on Te content (external); the record's 565 K is the evaluation point, and the pair contrast is $\mathfrak{d}'_i = \ln T_{\mathrm{tr}}(^{130}\mathrm{Te}) - \ln T_{\mathrm{tr}}(^{126}\mathrm{Te})$.

FDT input: as T-1, over the same span $\Delta \ln \alpha_{\mathrm{ext}} = 0.018210$, with S'_{dens} the derivative of $\ln T_{\mathrm{tr}}$ with respect to $\ln \alpha_{\mathrm{ext}}$ at fixed P, r_f and packing; the manuscript reads "larger response" as a higher transition temperature, its own reading, so the contribution is positive and its magnitude unfixed: a sign test resting on that declared positive sensitivity. With S_{WK} the derivative of $\ln T_{\mathrm{tr}}$ with respect to $\ln M_{\mathrm{f}}$ at fixed force constants and Te content, δ_{Te} the Te-content residual and δ_{kin} the antisymmetric part of the kinetic (attempt-rate) term, the sum reads $\delta \ln T_{\mathrm{tr}} = S'_{\mathrm{dens}}\,\delta \ln \alpha_{\mathrm{ext}} + S_{\mathrm{WK}}\,\delta \ln M_{\mathrm{f}} + \delta_{\mathrm{Te}} + \delta_{\mathrm{kin}}$.

Comparator (consensus premise, attributed): a phase equilibrium is independent of the isotopic masses in the classical limit, the kinetic factor of the partition function being the same in both phases, so the equilibrium's isotope channel at 565 K is the quantum Wigner–Kirkwood correction [6, 7], $|\Delta \ln T_{\mathrm{tr}}| \le 3 \times 10^{-4}$ (U-24), beside the Te-content residual $\pm 3 \times 10^{-4}$ (U-25): -0.0006 to $+0.0006$ in $\ln T_{\mathrm{tr}}$. The kinetic term's antisymmetric part, which the midpoint keeps, is under 10^{-5} in $\ln T_{\mathrm{tr}}$ for a nucleation barrier diverging at equilibrium while each pair's hysteresis is under 40 K, that pair's bound (U-26), so the largest of the eight lies inside the interval's last figure; half the pair's difference in hysteresis width bounds the same part only for the true widths, both kinetic shifts being outward, and the eight measured half-differences, which carry the widths' DSC noise, widen nothing.

channel	sensitivity, held fixed	contribution to $\mathfrak{d}'$
density (I-7)	$S'_{\mathrm{dens}} > 0$ at fixed P, r_f, packing (manuscript's reading)	positive, no magnitude
classical equilibrium	classical part of S_{WK}: the same kinetic factor in both phases	0
quantum correction (U-24)	quantum part of S_{WK}: Wigner–Kirkwood at 565 K	within $\pm 3 \times 10^{-4}$
Te-content residual (U-25)	δ_{Te}, after the measured correction	$\pm 3 \times 10^{-4}$
kinetic, antisymmetric (U-26)	δ_{kin}, kept by the midpoint	under 10^{-5}
sum without density		-0.0006 to $+0.0006$

Statistic: as T-1 on the eight pair differences $\mathfrak{d}'_i$ of $\ln T_{\mathrm{tr}}$, with $\bar{\mathfrak{d}}'$ their mean and $s_{\mathfrak{d}'}$ their sample standard deviation, against the upper end. A DSC reproducibility 0.3 K, a crystal scatter after the Te-content correction 0.5 K and a drift 0.1 K with the coin's sign, at 565 K (U-27), give a per-pair scatter of 0.0015 in $\ln T_{\mathrm{tr}}$; the defining condition and its solution are

$$\mathcal{T}_2 = \frac{\sqrt{8}\,(\bar{\mathfrak{d}}' - 0.0006)}{s_{\mathfrak{d}'}} > 4.530, \qquad \bar{\mathfrak{d}}' > 0.0006 + 0.0024 = 0.0030.$$

Executed, exactly: size 0.00135 at the upper end, 5×10^{-5} at the centre and 8×10^{-7} at the lower end; the drift doubled gives 0.00135; power 0.82, 0.93 and 0.98 at 0.0030, 0.0035 and 0.0040 above the upper end (U-28).

Rules. Detection: the one-sided t rejects. Exclusion: an FDT-sign density-channel contribution of 0.005 in $\ln T_{\mathrm{tr}}$ above the interval's lower end (U-28) is excluded when the one-sided t of the pair differences below that bound, +0.0044, rejects at 0.00135 (executed: false exclusion 0.00135 with the truth at the bound; exclusion 0.967 with no density channel at the interval's upper end, 0.999 at its lower end). Inconclusive otherwise. Attribution: the values carry the Te-content correction already, and a detection is read as the density channel when the DSC and the static-SHG determinations each reject.

Ablation, instantiated at the power point 0.0035 above the upper end (U-28): with the density channel in place the expected pair difference is 0.0041; with S'_{dens} at its consensus value 0 it is the upper end, 0.0006; the difference, 0.0035, exceeds the block's threshold $4.530\, s_{\mathfrak{d}'}/\sqrt{8} = 0.0024$.

5.3 T-3: a domain-odd Kerr rotation of the sliding circulation

Candidate DC-3; the block discriminates SA-23, the record's cited "Owing to antiparallel interlayer sliding between adjacent layers and electronic screening" (SC-069, SC-070, L181–L182, Ref. 19), which leaves the circulation of that sliding unread. Warrant: P-5 with I-3a, an additional source: P-5's "mechanical vorticity and magnetic moments are different grade projections of one density-gradient topography, with no carrier exchange (I-2)", and I-3a's three projections, whole: "The deviation map $\nabla\mathcal{U}$ of a family of patterns splits into a trace (expansion: density, by continuity), an antisymmetric part (vorticity: the bivector grade, the mechanical circulation whose magnetic projection is that of P-5) and a symmetric trace-free part (shear: the tidal stretch and compression)."

Referent: sixteen single-domain regions of the record's crystals (SC-304 to SC-306, L639–L641), eight of each polar sign, the sign read by SHG interference with a reference (external), excited as the record's single pulse at $1.6\,\mathrm{mJ\,cm^{-2}}$ (SC-116, L254). The family of layers slides antiparallel, neighbour against neighbour: its deviation map has an antisymmetric part, a circulation of alternating sense from gap to gap, whose probe-weighted mean over the skin is that of the uncompensated near-surface gaps, the manuscript's reading of the projections of I-3a, read between neighbours (Use item 7).

Observable and design: the non-reciprocal Kerr rotation of a probe at the record's 45° incidence (SC-327, L660), in a plane of incidence containing the in-plane axis normal to the sliding direction, read by a zero-area Sagnac loop [5] retracing the probe path, its two counter-propagating beams reaching the sample at one instant, blind to birefringence and natural optical activity (external) and to the mode's reciprocal modulation except through its residual-delay term, taken at f_s in quadrature with the SHG displacement oscillation and averaged per region. The beams' arrival is equalised until the mode's reciprocal modulation of the reflection, differenced over the residual delay, varies from region to region within the 2-nrad region-to-region scatter (U-33), as part of it; its domain-odd part per domain, which the opposite polar faces of the + and − regions admit and the domain contrast keeps, is half the contrast's change per unit arrival offset, read at a known offset of either sign, times the residual delay. The contrast $\mathfrak{d}_{\mathrm{P}}$ is the mean over the eight + regions minus that over the eight − regions, in which every domain-independent term cancels, the laboratory-fixed rotation included.

FDT input: the circulation has a magnetic projection (P-5); its magnitude is the manuscript's to derive through I-1 and I-2 with a declared kernel, and with none (no map from a circulating charge to an input of I-1 is written here, O-6) the block is an existence prediction; no clause fixes its sign.

Comparator: the rotation (Barnett [4]) term of the same circulation, C_{P}, in Kerr units through the same geometry's rotation per tesla in a static applied field, v_{K} up to $3\,\mu\mathrm{rad\,T^{-1}}$ (U-29). The circulation's probe-weighted mean is $2\pi f_s \mathsf{u}_0/(2\mathsf{z}_{\mathrm{pr}})$ for an interlayer displacement amplitude u_0 up to 2 pm and a probe depth $\mathsf{z}_{\mathrm{pr}} = 25\,\mathrm{nm}$ (U-30, U-31): a curl of $6.0\times10^{7}\,\mathrm{s^{-1}}$, whose rotation rate, half the curl, $3.0\times10^{7}\,\mathrm{s^{-1}}$, is a spin–rotation field of $1.7\times10^{-4}\,\mathrm{T}$ at the electron's gyromagnetic ratio $1.76\times10^{11}\,\mathrm{s^{-1}\,T^{-1}}$ (U-09), and with the orbital coupling, twice the spin's (U-32), an equivalent field $3.4\times10^{-4}\,\mathrm{T}$: C_{P} is at most 1.1 nrad per domain, rounded outward, of either sign, the interval −1.1 to

+1.1 nrad. The electrons' own magnetization linear in the sliding velocity, which the one mirror of $Pmn2_1$ that the cleavage surface keeps admits along the same in-plane axis, and the residual-delay term's domain-odd part enter the domain contrast in the same quadrature: comparator terms beside the Barnett term, whose sizes, a surface-slab calculation and a measured offset response (external), widen the interval before the shifted tests run. The executed figures are the Barnett interval's: the size at either end and the power beyond the widened end are unchanged by construction for the slab term, and the offset term, read at a known offset of either sign ten times the residual delay so that its reading error is 0.1 nrad (U-34) in the contrast against the contrast's 1.8-nrad scatter, adds 0.3 % to the contrast's variance and leaves the power at 5 nrad per domain unchanged (U-34; 3×10^5 trials, the same draws). These terms are the block's co-varying channels, each of either sign and bounded jointly by the widened interval; the block's scope is the domain-odd quadrature channel alone.

Statistic: a two-sided permutation test of $\mathfrak{d}_{\mathrm{P}}$ over all $\binom{16}{8} = 12870$ domain relabelings, run on the contrasts shifted by each end of the comparator interval; rejection when both shifted tests give $p \le 0.0027$ and the two shifted contrasts carry one sign, each test's exact size being $34/12870 = 0.0026$ and the rule's, with the truth at either end of the interval, one tail's, $17/12870 = 0.0013$. A reading error 3 nrad and a region-to-region scatter 2 nrad (U-33) give a per-region scatter of 3.6 nrad and a scatter of $\mathfrak{d}_{\mathrm{P}}$ of 1.8 nrad; at that scatter the defining condition is solved by

$$|\mathfrak{d}_{\mathrm{P}}| > 2 \times 1.1 + 3.0 \times 1.8 = 7.6 \text{ nrad}.$$

Executed: a laboratory-fixed term of 30 nrad (U-33) cancels in every contrast; the rule's size is one tail's, 0.0013, with the comparator's truth at either end, that end's shifted test being an exact permutation null whose rejection with the contrast's sign forces the other's, and smaller inside the interval; power 0.74, 0.94 and 0.99 at a projection of 4, 5 and 6 nrad per domain (U-34) with the comparator at its upper end (3×10^5 trials each).

Rules. Detection: both shifted permutation tests give $p \le 0.0027$ with the two shifted contrasts of one sign. Exclusion: a magnetic projection of 10 nrad per domain beyond the comparator interval (U-34) is excluded when the contrasts shifted by the interval's end plus that size give one-sided $p \le 0.00135$ in both tails, of exact size $17/12870$ (executed: 1.00 with no projection, false exclusion 0.0013 at the interval's end plus 10 nrad, that end's one-tailed test being an exact permutation null; the exclusion with no projection in 4000 trials). Inconclusive otherwise. Attribution: a detection is read as the projection of the sliding circulation when the same statistic at a negative pump–probe delay, with no coherent motion, returns no detection.

Ablation, instantiated at a projection of 5 nrad per domain (U-34) with the comparator at its upper end: with the projection in place $\mathfrak{d}_{\mathrm{P}} = 12.2$ nrad; with the projection at its consensus value 0, the Barnett term alone at its upper end, it is 2.2 nrad; the difference, 10 nrad, exceeds the block's threshold of three standard deviations of $\mathfrak{d}_{\mathrm{P}}$, 5.4 nrad.

5.4 T-4: a twist-induced Kerr rotation of twisted bilayers

Candidate DC-4; the block discriminates SA-85, the record's outlook that "a natural next step is to extend it to ferroelectric bi- or trilayers. In these technologically promising systems, sliding motion is predicted to be governed by modified interlayer interactions" (SC-288 to SC-290, L505–L507), which prints no observable for a twisted stack. Warrant: P-5, an additional source, its twist sentence whole: "Imposing a physical twist (torsion, helical geometry) on a material *is* establishing a magnetic field".

Referent: sixteen twisted WTe_2 bilayers at one twist angle, 5°, eight of each hand, hBN-encapsulated on one substrate type, and four aligned (0°) controls (U-36, external), at room temperature and zero applied field. Observable: the polar Kerr rotation at 1550 nm (U-36) by a zero-area Sagnac interferometer [5], blind by construction to reciprocal effects.

Design: each device is read in two orientations, turned over together with its substrate, transparent at the probe wavelength, and read through it, the order by a fair coin drawn before its first

reading. The bilayer is never turned alone: its two identical layers keep an in-plane two-fold axis, so the bilayer turned over alone is itself and admits no field along the normal, while the stack's asymmetry, substrate below and encapsulation above, admits one, which the chip turned over reverses against the beam; the substrate's Faraday rotation enters the turned reading alike for both hands and cancels in the hand contrast. Per device $\mathsf{q}_\mathrm{K} = \frac{1}{2}(\varpi_\mathrm{n} - \varpi_\mathrm{t})$, with ϖ_n and ϖ_t the normal and turned readings, in which the laboratory-fixed terms, the instrument's offset and the Earth's field along the beam, cancel. The hand contrast compares neighbours of opposite hand against the turned reading as reference path (Use item 7), and the comparator's deviation vanishes, there being no medium in it.

FDT input: the twist establishes a magnetic field (P-5); in the manuscript's reading its sense is set by the hand relative to the stack's asymmetry, so turning the chip over reverses it against the beam. P-5's sentence assigns neither magnitude nor sense, and no twist-to-moment form with a declared kernel is written here (O-6): an existence prediction. Comparator: zero, a nonmagnetic, time-reversal-invariant structure rotating no polarization non-reciprocally, whatever its twist (the consensus premise, attributed). Single-channel scope: the hand-odd non-reciprocal channel alone.

Statistic: $\mathfrak{d}_\mathrm{K}$, the mean q_K of one hand minus that of the other, by a two-sided permutation test over all 12870 hand relabelings, rejection at $p \le 0.0027$, of exact size 0.0026. A reading error 20 nrad, an offset re-set per reading of 50 nrad, a laboratory-fixed term of 100 nrad and an offset drift of 10 nrad with the coin's sign (U-37) give a per-device contrast scatter of 38.4 nrad and a scatter of $\mathfrak{d}_\mathrm{K}$ of 19.2 nrad; the defining condition is solved by

$$|\mathfrak{d}_\mathrm{K}| > 3.0 \times 19.2 = 58 \text{ nrad}.$$

Executed: the size is the exact 0.0026, the comparator's readings being exchangeable across devices (noise, offset and coin-ordered drift alike); power 0.34, 0.7 and 0.9 at 30, 40 and 50 nrad per hand (U-38; 3×10^5 trials each).

Rules. Detection: $p \le 0.0027$. Exclusion: a rotation of 100 nrad or more per hand (U-38) is excluded when, the contrasts shifted by that size against the hand, both one-sided tails give $p \le 0.00135$ (executed: 1.00 with no effect; false exclusion 7 and 5 in 4000 trials at plus and minus that size, against the exact one-tail size $17/12870 = 0.0013$). Inconclusive otherwise. Attribution: a detection is read as the twist's field when the hand-even part, the mean q_K of the sixteen twisted devices, agrees with the four aligned controls' mean q_K within three standard errors of their difference, one standard error being 21 nrad under the stated noise model, the controls' values reported beside it.

Ablation, instantiated at 50 nrad per hand (U-38): with the field in place $\mathfrak{d}_\mathrm{K} = 100$ nrad; with the comparator's zero it is 0; the difference, 100 nrad, exceeds the block's threshold, 58 nrad.

5.5 T-5: an outer van der Waals gap narrowed by the skin's packing

Candidate DC-5; the block discriminates SA-22, the record's cited "the effective polarization in bulk T_d-WTe_2 is dominated by near-surface contributions" (SC-071, SC-072, L183–L184, Ref. 19), which leaves the surface's own structure unread. Warrant: 0.6, a constitutive input, the local profile "densest at the skin on both branches"; no form of its profile function is written (O-4).

Referent: eight freshly exfoliated cleavage surfaces of the record's crystals, prepared as the record's (SC-304 to SC-307, L639–L642). Observable: the relative change of the outermost van der Waals gap, $\mathsf{s}_\mathrm{gap} = (d_{12} - d_\mathrm{bulk})/d_\mathrm{bulk}$, with d_{12} the outermost gap and d_bulk the bulk interlayer spacing, from crystal-truncation-rod fits [8] of surface X-ray diffraction at room temperature (external); the outer gap is read against the bulk gaps of the same crystal, its skin against its own interior (Use item 7).

FDT input: the crystal read as a bound configuration with its skin at its surface, the manuscript's reading; at fixed areal mass a denser skin is a narrower outer gap, the manuscript's map, so the sign is the profile of 0.6 read through that map, and no magnitude is given: a sign prediction resting on that map. Comparator: the van der Waals-corrected relaxation of the same slab across functionals

at the observable's room temperature, the outer gap's thermal expansion in excess of the bulk gap's taken from the slab's quasi-harmonic free energy, −0.008 to +0.008 (U-39). Single-channel scope: the skin's packing alone, against the comparator's span.

Statistic: one-sided Student t of the eight values against the interval's lower end, at 0.00135 with the quantile 4.530. A fit error 0.003 and a surface-to-surface scatter 0.004 (U-40) give a per-surface scatter of 0.0050, with Cov = 0 between any two of the eight surfaces (separate cleaves and separate rod fits); with $\bar{\mathsf{s}}$ the mean and s_{s} the sample standard deviation of the eight values,

$$\mathcal{T}_5 = \frac{\sqrt{8}\,(-0.008 - \bar{\mathsf{s}})}{s_{\mathsf{s}}} > 4.530, \qquad \bar{\mathsf{s}} < -0.008 - 0.0080 = -0.016.$$

Executed, exactly: size 0.00135 at the lower end and below 10^{-10} at the centre and at the upper end; power 0.80, 0.94 and 0.99 at a contraction of 0.010, 0.012 and 0.014 beyond the lower end (U-41).

Rules. Detection: the one-sided t rejects. Exclusion: an FDT-sign contraction of 0.030 below the interval's upper end (U-41) is excluded when the one-sided t of the eight values above that bound, −0.022, rejects at 0.00135 (executed: false exclusion 0.00135; exclusion 0.986 with no skin term at the interval's lower end, 1.000 at its upper end). Inconclusive otherwise. Attribution: a detection is read as the skin's packing when it survives the removal of surfaces with an oxide coverage above 1 % (U-41; photoemission, external).

Ablation, instantiated at a contraction 0.012 beyond the lower end (U-41): with the skin term $\mathsf{s}_{\mathrm{gap}} = -0.020$; with it at its consensus value 0 the expectation is the lower end, −0.008; the difference, −0.012, exceeds in magnitude the block's threshold $4.530\, s_{\mathsf{s}}/\sqrt{8} = 0.0080$.

6 Cross-domain

T-1 and T-2 read one mechanism of I-7 through one substitution: the span $\Delta \ln \alpha_{\mathrm{ext}} = 0.018210$ enters an oscillator frequency and a phase equilibrium alike, so the two outcomes are one test of the density channel's input sign in two observables. T-3 and T-4 read the two faces of P-5, a circulation's magnetic projection and a helical geometry's field, both by non-reciprocal Kerr rotation and both as comparisons whose consensus deviation cancels or vanishes (Use item 7). T-5 reads the skin on which every SHG datum of the record is weighted (I-3). The record writes that its results "suggest that such saturation behaviour is a general characteristic of sliding ferroelectrics" (SC-119, SC-120, L259–L261; SA-40) and that "we expect the sequential excitation scheme demonstrated here for WTe_2 to be broadly applicable to other systems" (SC-286, SC-287, L501–L503; SA-84); the five designs carry to any sliding ferroelectric with enrichable constituents, polar domains, a cleavable surface or a twistable bilayer, their comparators recomputed for that material.

7 System-level reading (exploratory)

Scope: this section holds one exploratory observable, never counted with the predictions; every number in it is an in-sample re-description of the record, and its comparator is the record's own model.

X-1: the order of an unequal pump pair	
observable	the sliding amplitude after the second pulse of an unequal pair, the strong pulse first against the weak pulse first, at one delay, the record's 8.3 ps (SC-227), and one combined absorbed fluence, the record's 2.1 mJ cm^{-2} (SC-222)
defining condition	the order asymmetry: the amplitude with the strong pulse first minus that with the weak pulse first, at equal combined fluence and delay
comparator	the record's Eq. 2 to Eq. 4 with each pulse's own drive, Eq. 4 as printed adding one drive twice (SA-107), under which the order changes the first pulse's damping during the delay and, with the dressed frequency (SA-109), the frequency the mode runs at between the pulses
reading	0.1a's "Events do not commute": the settlement from the state the system is in makes the order a variable of its own

Guards: X-1 is not a prediction and enters no count; its comparator carries the record's fitted dressed frequency, an in-sample parameter (SA-109); no objective is named for the settlement (0.1a); the asymmetry is never read through the bounded map, an SHG amplitude being a response and not a density (I-6).

8 Convergence statement

On the record's own inputs and dictionary FDT returns the values those inputs give, the limiting map by which this analysis recovers the consensus data (Use item 2). The fits return their own parameters (SA-36, SA-52, SA-58, SA-69, SA-70, SA-71, SA-76, SA-109); the calculations return their own outputs (SA-06, SA-26, SA-27, SA-42, SA-45, SA-49, SA-50, SA-53, SA-54, SA-55, SA-57, SA-72, SA-102); and the derived values recompute: $2/f_s = 8.3\,\mathrm{ps}$ (SA-61), $hc/\lambda_\mathrm{p} = 0.83\,\mathrm{eV}$ (SA-88), the probe's 1.55 eV against hc/λ_pr at the one figure of 0.8 µm (SA-89) and 5000 pulses at 1 kHz in 5 s (SA-94). Each step is the identity map and corroborates no invariant; the record's "close agreement" (SC-148, L282; SA-50) is an agreement in shape on two axes, and its "corroborated by ab initio calculations" (SC-200, SC-201, L394–L395; SA-111) rests on a simulation carrying a parameter fitted to the record's own data, an in-sample reading. A print that differs from what its own inputs give is the record's own, kept apart: 0.82 eV and 0.83 eV (SC-101, L217; SC-320, L650; SA-33); the printed period $2\pi/f_s$, 26 ps, against the period $1/f_s = 4.2\,\mathrm{ps}$ (SC-203, L373; SA-64); 2000 K below and 4000 K above $T_\mathrm{sat} = 3100\,\mathrm{K}$ against the printed "above and below" (SC-129, L277; SC-150; SA-43); "Figs. 2c" (SC-303, L637; SA-87); the probe's $2.8\,\mathrm{mJ\,cm^{-2}}$ under the pump's symbols (SC-325, L656; SA-90); 2.1, 2.2 and $4.1\,\mathrm{mJ\,cm^{-2}}$ (SC-376, SC-386; SA-71); the magnitude $|\mathcal{P} - \mathcal{P}_z|$ (SA-29); and the dimensions of Eq. 1 (SA-28).

Every channel once (I-7, 0.5, 0.1c). The probed volume's mass ledger is $\mathcal{M} = M + E/c^2 + PV/c^2 + aT^4V/c^2 + \ldots$ with $a = 4\sigma_\mathrm{SB}/c$: the absorbed pump energy enters once, as E/c^2, $5.7 \times 10^{-25}\,\mathrm{kg}$ per pulse in the column under the probe spot at $1.6\,\mathrm{mJ\,cm^{-2}}$, whatever it becomes, the electrons' heat (T_exc, T_elec), the coherent mode or the lattice's heat, and never a second time. The thermal term aT^4V/c^2 is the radiation term at the record's room temperature (SC-309, L645; SA-93), at most $2 \times 10^{-38}\,\mathrm{kg}$ for the probed skin at 295 K (U-43), never the electrons' energy (SA-104). The record's fixed combined fluence fixes the deposited energy, entered once, and not its sharing in time between electrons and lattice, which the record's own mechanism makes depend on the delay (SA-73). 0.1c is quoted: "The medium's clock factor is the reading of its flow: it rescales the metric in which the flow is free, never the time kept by a clock the medium carries — that clock runs on the lapse where it sits, and its thermal shift is the time dilation of its own thermal motion." No frequency (SA-36, SA-79) is read off a temperature.

Declined readings (Use item 6), once each, in two sentences. SA-02, at 0.1a: the record writes that displacive excitation of coherent phonons [2], "the principal mechanism for launching structural motion, typically assumes that lattice-driving forces scale linearly with the photo-excited carrier density" (SC-016 to SC-018, L22–L24), and its summary states that "the linear relationship between excited-carrier density and coherent vibrational amplitude assumed in DECP" "is an oversimplification" (SC-277, SC-278, L481–L483); the standard account reads the drive as one share per excited carrier. FDT reads the drive as settled from the distribution the electrons are in, as Eq. 3's sum is, never one share per carrier, by 0.1a's "from the state the system is in" and "never one-to-one, particle by particle"; the record's amplitudes are accepted in full. SA-77, at 0.1a and I-2: the record considers "a Klemens process" (SC-255, L481 [3]) "as the most probable decay mechanism for the sliding mode" and cites that "Stimulated phonon decay has been predicted to strongly enhance optical-phonon damping under non-equilibrium conditions, with the decay rate of the optical phonon governed by the populations of the optical and acoustic modes" (SC-258 to SC-260, L485–L488, ref. 59), a rate the standard account writes with a decay and its reverse at one matrix element, two mirror events read particle by particle (attributed to the standard account, never to the record's words). FDT reads the damping as the system-wide, many-to-many settlement of the lattice's state, the optical and acoustic branches one carrier (I-2), by 0.1a's "Events do not

commute, and a process run backward is never the mirror of the forward event."; the record's fitted dampings and slopes are accepted in full. SA-112, at I-4: the standard account reads the record's "under equilibrium conditions, where nuclear wave packets remain centred at their equilibrium positions irrespective of temperature" (SC-248 to SC-250, L471–L473) and "For in-phase excitation, the two vibrational wave packets launched by the double-pulse sequence interfere constructively" (SC-209, SC-210, L383–L384) as probability amplitudes whose superposition interferes, a reading declined here and attributed to it. FDT reads the motion as rotors of one mode, $\varphi_h(t) = \varphi_0 - \omega t$, superposition being ignorance of φ_0 at observation, by I-4, for which the universe is deterministic and the declined reading's amplitudes stand nowhere; the record's two-pulse amplitudes are accepted in full. The body declines nothing a second time.

Divergences stand only where a core clause supplies what the consensus calculation lacks: a constitutive input (T-1 and T-2 from I-7, T-5 from 0.6) or an additional source (T-3 and T-4 from P-5), never the coordinate, a chart or a branch tag alone (Use item 2).

9 Status ledger

The status of everything this analysis touches stands once, in the table below; the abstract's prediction count is read off its T-rows.

row	the core's words, or the block's status	status here, or the convergence value
O-1	the finite-core cutoff r_c, the regular core chart, or the outward phase-transfer law	owed; touched by the interior domain of the chart inventory
O-2	a geometrically constructed odds for the overlap-contrast application (A-3)	owed; the A-3 token carries range only
O-3	a canonical odds for the confinement application (A-4)	owed; the A-4 token carries range only
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	owed; T-5 carries a sign and no profile
O-5	multipole and tidal remainders of the closed-form pair expression; the overlap complex	owed; no interlayer restoring force is written
O-6	the maps from a charge, a circulating charge or a colour seat to an I-1 input	owed; T-3 and T-4 are existence predictions
O-9	the confinement operator D, its domains, boundary data and spectrum; every mass ratio, including the two held-out targets	owed; the eigenproblem is displayed with no form of D
O-12	the phase-exchange rates and the decay kernel, spectrum, chirality and rates	owed; no damping or relaxation rate is derived
held-out	$m_p/m_e = 1836.15267343$ and $(m_\mu/m_e)^2 = 4.2753 \times 10^4$, held-out targets	carried as tests, never outputs
T-1	prospective sign test; declared positive sensitivity (DC-1, SA-30)	-0.0092 to -0.0078 in $\ln f_s$
T-2	prospective sign test; declared positive sensitivity (DC-2, SA-17)	-0.0006 to $+0.0006$ in $\ln T_{\mathrm{tr}}$
T-3	prospective existence test (DC-3, SA-23)	-1.1 to $+1.1$ nrad per domain
T-4	prospective existence test (DC-4, SA-85)	zero
T-5	prospective sign test; the skin profile read through the gap map (DC-5, SA-22)	-0.008 to $+0.008$
in-sample	the record's corroboration by a simulation with a fitted parameter (SA-111); its agreement in shape (SA-50); the exploratory observable of the system-level reading	never counted
PROVISIONAL	the tokens α_{ovl} (A-3), α_{conf} (A-4), α_{mode} (A-5)	token and range only
CONDITIONAL	the medium's clock factor, on a stress tensor of perfect form (0.1c)	premise stated

10 Conclusions

In the manuscript's own reading, labelled as such, the record of Horstmann et al. [1] is experimental evidence of five core concepts at the clauses that exist: its drive, one sum over every state's occupation change with contributions of both signs, is the settlement of 0.1a, "from the state the system is in"; its pump, probe, harmonic, sliding stroke and acoustic branches are one carrier (I-2); its sliding motion is a standing density wave the electromagnetic injection excites (P-2), its geometry set by the pinning sites (P-3); its SHG amplitude is a driven observable, not the force law (I-1); and its two pulses' oscillations are two rotors of one mode (I-4). Each reading is the identity map on the record's own inputs and corroborates no invariant. Where a core clause supplies what general relativity and quantum mechanics lack, five blocks stand (T-1 to T-5), each with its executed size, power and decision rules, each discriminating an under-determination of the record.

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