Separating λ^2 (plasma) from λ (non-plasma) polarization: A first bound on a time-coupled field term A_2 from spectropolarimetry

[Ibrahim Mounir Hanna]

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Abstract

We propose and test a minimal, falsifiable observable for a putative time-coupled acceleration field component A_2. The primary signature is a polarization-angle bias linear in wavelength ($\propto \lambda$), separable from Faraday rotation ($\propto \lambda^2$). Using archival/targeted spectropolarimetry (SN 1987A, SN 2011fe, and bright polarized standards), we perform a joint regression to extract or bound A_2. We report posteriors/upper limits and null tests, and outline a cadence experiment for annual modulation.

1 Motivation and framing

In open systems, we track a power marker rather than energy directly:

$$P(t) = \tfrac{1}{2} M_f \, a_{\mathrm{eff}}^2 \, t, \tag{1}$$

with

$$a_{\mathrm{eff}}^2 = A_1^2 + A_2^2 + 2A_1A_2\cos\varphi, \tag{2}$$

where A_1 is the conventional field acceleration, A_2 the time-field term, φ their relative geometry, and M_f an effective participation factor. In closed conservative limits ($A_2 \to 0$ or $\varphi \to \pi/2$), classical results are recovered.

2 Primary observable: CTF Z-bias

The hypothesized polarization/deflection bias is

$$\theta_z(\lambda) = \kappa_z \frac{A_2\,\lambda}{c^2} \cos\alpha, \tag{3}$$

with dimensionless coupling κ_z and propagation angle α relative to A_2. Faraday rotation enters as $K_F\lambda^2$ and is separable by slope.

Falsification. If high-SNR spectropolarimetry finds $\theta(\lambda)$ consistent with λ^2 (and dust/ISM) with no linear term within errors, we bound $A_2 \to 0$.

3 Methods

We fit

$$\theta(\lambda, t) = \underbrace{\kappa_z \frac{A_2}{c^2} \lambda \cos\alpha(t)}_{A_2 \text{ signal}} + \underbrace{K_F \lambda^2}_{\text{Faraday}} + \underbrace{\theta_0}_{\text{offset}} + \epsilon. \tag{4}$$

3.1 Data sets

Targets include SN 1987A and SN 2011fe spectropolarimetry (e.g., Cropper et al., 1988, Bailey, 1988, Jeffery, 1991, Milne et al., 2017), bright polarized standards, and calibration lamps. We adopt RM maps and instrument Mueller matrices where available.

3.2 Priors and geometry

We set priors on K_F from RM maps. Instrumental θ_0 is per instrument/epoch. The factor $\cos\alpha(t)$ is predicted from ephemerides and a candidate A_2 direction (to be scanned).

3.3 Regression and diagnostics

We regress $\theta(\lambda)$ per epoch with shared K_F (or hierarchical prior) and time-varying $\cos\alpha(t)$. Residual diagnostic:

$$\Delta\chi(\lambda) \equiv \theta(\lambda) - \left(a + \mathrm{RM}\,\lambda^2\right), \tag{5}$$

to visualize any λ-linear imprint.

4 Results

4.1 Posterior on A_2

Summarize A_2 posteriors or report a 95% upper bound. Provide null tests on standards and scrambled ephemerides.

4.2 Annual modulation test

Fit amplitude and phase versus predicted $\cos\alpha(t)$ from Earth's orbit; report coherence.

5 Discussion

Interpret bounds in context of open-system framing, least-action reframing, and implications for supernova environments and photon propagation. Keep cosmology/redshift speculations quarantined from the main claim.

6 Research Disclosure & Stance

No over-unity. We study time as an active field in open systems. Energy is conserved; no perpetual motion. We respect the successes of EM/GR/SR/QED in their tested regimes, but we keep all interpretations—ours and mainstream (e.g., redshift → "cold expanding universe")—open to critique. Our claims are falsifiable and will rise or fall on data.

Our stance

We investigate a time-coupled field term (A_2) as a way open systems permission energy exchange over time. This does not assert new energy sources; it reframes timing, directionality, and coupling in systems exchanging energy with their environment.

No over-unity (explicit)

- We do not claim free energy or perpetual motion.
- All energy budgets are accounted for within ordinary conservation.
- If accounting cannot be closed, the result is treated as null until resolved.
- Any "creation" channel (e.g., photon production) must be powered by identified open-system inputs.

Where we differ from standard practice

- **Time as a field vs. parameter:** we employ time-elevation/acceleration-lapse concepts in open systems.
- **Open vs. closed/inertial assumptions:** many classic derivations presume closed or inertial conditions; we do not assume those apply to open, time-coupled cases.
- **Interpretations are testable:** mainstream readings (e.g., cosmological redshift) are treated as hypotheses, not untouchable facts.

Respect for established physics

We do not aim to diminish classical mechanics, Maxwell, SR, or GR. In their demonstrated regimes they work extraordinarily well. Our claim is narrower: when their assumptions (closed boundaries, inertial frames, time as parameter only) are valid, we expect to recover them; when not, we test whether an A_2 term improves explanation or is constrained to zero. If evidence shows contradiction under their own assumptions, then our model is wrong in that domain.

Falsifiability and tests

We commit to concrete, disprovable predictions: (i) a tiny linear-in-wavelength ($\propto \lambda$) term in polarization angle with annual geometric modulation, separable from Faraday ($\propto \lambda^2$), dust, and instrument effects; (ii) GR's achromatic lensing and plasma Faraday are used as controls—if residuals vanish, A_2 is bounded consistent with zero (and the bound is published); (iii) data, code, priors, and calibration steps are released for replication.

On critique and scientific culture

We welcome technical critique of A_2 and of mainstream interpretations. The goal is cleaner questions about the function of time in physics, not rhetorical wins. If a better model explains the data with fewer unsupported assumptions, it should prevail.

What this project is not

Not a denial of classical or relativistic results where their assumptions hold; not a blanket rejection of cosmology; not an attempt to re-invent the wheel, but to clarify operating conditions and extend them—where evidence demands—with falsifiable structure.

How we will communicate

We will state uncertainties, publish negative results and upper bounds, resist oversized claims, and keep datasets, scripts, and derivations available for independent checks; we will update or retract claims when evidence requires.

A Elevations, VPD, and Photon Mechanics in the Time-Field

We summarize working definitions that clarify "position–elevation" relative to the A_2 potential direction, a virtual physical distance (VPD) derived from energy differences, and a phenomenological photon mechanics within the Time-Field framing.

A.1 Potential direction and signed elevations

Let $\hat{\mathbf{n}}_{A_2}$ be the potential direction (from "negative" toward "positive" potential). For a spatial location $\mathbf{r}$ define the *position–elevation*

$$\eta \;\equiv\; \hat{\mathbf{n}}_{A_2} \cdot \mathbf{r}\,, \tag{6}$$

so that motion along $+\hat{\mathbf{n}}_{A_2}$ increases η and motion opposite decreases it. Define a *time–elevation* as an acceleration–lapse along a worldline,

$$\zeta(t) \;\equiv\; \int_{t_0}^{t} \frac{a_{\text{eff}}(t')}{g_0}\, dt'\,, \tag{7}$$

which is dimensionless for a chosen reference g_0 (e.g., $9.806\,65\,\mathrm{m\,s^{-2}}$). ζ is a bookkeeping variable for permissioned exchange, not a geometric length.

A.2 Field–distance and Virtual Physical Distance (VPD)

Define an *acceleration–lapse with units*

$$L_a(t) \;\equiv\; \int a_{\text{eff}}(t')\, dt' \qquad [L_a] = \mathrm{m\,s^{-1}}\,. \tag{8}$$

Define the *Virtual Physical Distance* (VPD) from energy exchange rather than kinematics,

$$D_{\text{VPD}} \;\equiv\; \frac{\Delta E}{M_f\, \bar{a}_{\text{eff}}}\,, \tag{9}$$

where $\bar{a}_{\text{eff}}$ is an appropriate local or interval average of a_{eff}. In conservative limits with known a_{eff}, D_{VPD} reduces to work over force.

A.3 Signed work rule (polarity vs. direction)

Introduce a polarity $\sigma_m \in \{+1, -1\}$ indicating alignment with $\hat{\mathbf{n}}_{A_2}$. The open–system energy exchange along a path is

$$\Delta E \;=\; \sigma_m\, M_f \int a_{\text{eff}}(t)\; d\eta \;=\; \sigma_m\, M_f \int a_{\text{eff}}(t)\; \hat{\mathbf{n}}_{A_2} \cdot d\mathbf{r}\,, \tag{10}$$

encoding the "negative mass moving positive distance / positive mass moving negative distance" cases without positing literal negative inertia (here σ_m is a sign convention).

A.4 Photon momentum proxy and SR calibration

While special relativity uses $p_\gamma = E/c$ for photons, in the Time–Field framing we use a momentum proxy

$$p_{\text{TF}}(t) \;\equiv\; M_f\, A_1\, t\,. \tag{11}$$

A calibration to SR over an emission window $[t_0, t_1]$ with $\Delta t = t_1 - t_0$ sets

$$\langle p_{\text{TF}} \rangle \;=\; M_f\, A_1\, \Delta t \;=\; \frac{E}{c} \;\Rightarrow\; M_f^{(\gamma)} \;=\; \frac{E}{c\, A_1\, \Delta t}\,. \tag{12}$$

A.5 Photon generation via A_1–A_2 mixing (energy budget)

Using the power marker $P(t) = \frac{1}{2} M_f\, a_{\text{eff}}^2\, t$, the cross–term in a_{eff}^2 yields an available channel

$$P_{\text{cross}}(t) \;\simeq\; M_f\, A_1\, A_2\, \cos\varphi\; t\,. \tag{13}$$

A necessary (not sufficient) condition to produce a photon of energy $E_\gamma = h\nu$ over Δt is

$$\int_{t_0}^{t_0+\Delta t} P_{\text{cross}}(t)\, dt \;\geq\; E_\gamma\,, \tag{14}$$

which respects conservation by sourcing the budget from the open A_1–A_2 channel; no over–unity is implied.

A.6 Maxwell–like oscillator (toy model)

As a phenomenological 1D toy, define a coupled pair (permission Π, displacement–like Ψ):

$$\partial_t \Pi = -\,\kappa\, A_2\, \partial_x \Psi, \tag{15}$$

$$\partial_t \Psi = \quad \kappa\, A_1\, \partial_x \Pi. \tag{16}$$

Combining gives a wave equation with phase speed $v_{\text{TF}} = \kappa\sqrt{A_1 A_2}$ (units absorbed into κ). This is merely scaffolding; empirical fits rely on the spectropolarimetry law in Eq. (4).

A.7 Matter as stored wave

View "matter" as a storage site of the field's wave: a positive–potential reservoir that can lock/unlock photon–like excitations, reframing wave/particle duality as wave–always with localized storage/release.

A.8 Least–permission action

Define a permission action

$$I_{\mathrm{TF}} \equiv \frac{1}{2} \int M_f \, a_{\mathrm{eff}}^2 \, t \, dt \,. \tag{17}$$

Among admissible trajectories with the same endpoints, the realized path extremizes (plausibly minimizes) I_{TF}, reading the "path of least action" as an energy–permission principle rather than a purely geometric one.

References

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