MODEL CARD — CED-008

Audit ID: CED-008
Paper: *Generalized G-inflation: Inflation with the most general second-order field equations*
Authors: Kobayashi, Yamaguchi, Yokoyama (2011)
Status: Pre-audit (no diagnostics run)

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1. Declared Aim (Author-Stated)

To construct the most general single-scalar inflationary theory yielding **second-order field equations**, avoiding Ostrogradsky instabilities, and to analyze its background and perturbative dynamics within a controlled EFT framework.

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2. Claimed Mechanism

- Inflation driven by a scalar field with **nonminimal derivative couplings** to gravity.
- Acceleration arises from explicit terms in the action (Horndeski functions Gi(ϕ,X)G_i(\phi, X)Gi(ϕ,X)).
- Stability ensured by restricting to regions without ghost or gradient instabilities.

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3. Degrees of Freedom

Fundamental:

- Metric gμvg_{\mu\nu}gμv
- Scalar field ϕ\phiϕ

No emergent or horizon-defined degrees of freedom introduced.

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4. Action-Level Structure

General Horndeski action:

S=∫d4x−g∑i=25Li(ϕ,X)S = \int d^4x \sqrt{-g} \sum_{i=2}^5 \mathcal{L}_i(\phi, X)S=∫d4x−gi=2∑5Li(ϕ,X)

- All couplings specified at the Lagrangian level.
- No phenomenological stress–energy inserted post hoc.
- Inflation sourced by explicit dynamics.

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5. Regime of Validity (Declared)

- Classical background + linear perturbations.
- EFT validity below cutoff scale.
- Stability conditions imposed:
    - no ghosts,
    - no gradient instabilities,
    - subluminal propagation often assumed.
- Results not claimed outside these bounds.

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6. Cosmological Claims

- Sustained inflation without fine-tuned potential.
- Modified consistency relations.
- Distinct perturbation signatures *within regime*.

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7. Conservation & Closure

- Energy–momentum conservation explicit via diffeomorphism invariance.
- Field equations closed without auxiliary exchange terms.

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8. Author-Acknowledged Limits

- Breakdown outside stability region.
- EFT cutoff limits predictivity.
- Strong coupling possible in parts of parameter space.