Paper 040

Solar-System and Binary Timing Bounds on Jefimenko-Style Cogravity

A parameterized observational program for translational mass currents and retarded-source corrections

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Abstract

This proposal turns Jefimenko-style cogravity into an observational parameter program. It introduces source, force, and propagation parameters for the Maxwell-like mass-current equations, then maps them to precession, light-deflection, ranging, ephemeris, and binary-timing residuals. The paper argues that observable residuals and equivalence classes are safer than field-name debates, because weak-field gravitoelectromagnetic variables are convention-dependent. The deliverable is a bounds ledger that tells laboratory experiments which parameter space remains worth testing.

Status. Draft manuscript for review and revision. This paper is not an empirical claim of new physics or field-ready technology. It is a structured proposal, theory note, protocol, or application architecture intended to be auditable, falsifiable, and publishable with source.

Contents

1 Problem

If a Jefimenko-style cogravity term is real at the stated normalization, the best constraints may already come from celestial mechanics, spacecraft tracking, gyroscope precession, and light-deflection timing. The problem is to build an observational parameter dictionary before proposing expensive laboratory searches.

The paper proposed here does not fit data directly. It specifies the parameters, observables, degeneracies, and kill criteria needed for a later fit against ephemerides, binary timing, and frame-dragging measurements.

2 Model

Introduce a parameterized gravity/cogravity system

$$\nabla \cdot \mathbf{g} = -4\pi G\rho, \tag{1}$$
$$\nabla \cdot \mathbf{K} = 0, \tag{2}$$
$$\nabla \times \mathbf{g} = -\partial_t \mathbf{K}, \tag{3}$$
$$\nabla \times \mathbf{K} = -\beta_S \frac{4\pi G}{c_g^2}\mathbf{J} + \frac{1}{c_g^2}\partial_t \mathbf{g}, \tag{4}$$

with force law

$$\mathbf{a} = \mathbf{g} + \beta_F \mathbf{v} \times \mathbf{K}. \tag{5}$$

The observable cogravity amplitude often enters as $\beta = \beta_S \beta_F$, while c_g controls the retarded-source convention. The strict Jefimenko normalization is $(\beta_S, \beta_F, c_g) = (1, 1, c)$.

For a rotating body with angular momentum $\mathbf{L}$, the dipole expression gives

$$\mathbf{K}(\mathbf{r}) \simeq -\beta_S \frac{G}{2c_g^2 r^3}\left(3\hat{\mathbf{r}}(\mathbf{L}\cdot\hat{\mathbf{r}}) - \mathbf{L}\right), \tag{6}$$

up to convention choices. For a translating source, the leading field contains

$$\mathbf{K}_s \simeq -\beta_S \frac{GM}{c_g^2}\frac{\mathbf{v}_s \times \mathbf{R}}{R^3}. \tag{7}$$

These fields should be fit through observables, not treated as coordinate-invariant objects.

3 Claims

Claim 1 (Observable residuals are safer than field names)**.** *Gravitoelectromagnetic variables are convention-dependent in weak-field general relativity. A cogravity bounds paper should fit timing residuals, precession rates, range residuals, and astrometric deflections rather than arguing over field labels.*

Claim 2 (Rotational and translational mass currents should be separated)**.** *Frame-dragging-like observables constrain rotating mass currents. Moving-body light deflection, spacecraft tracking, and ephemeris residuals constrain translational mass currents. The parameters may be correlated but should not be assumed identical before the fit.*

Claim 3 (Degeneracy is a publishable result). *If β cannot be separated from a PPN parameter, a coordinate convention, or a source-model nuisance parameter, that degeneracy should be published as an observational equivalence class rather than hidden.*

Claim 4 (Solar-system bounds set the laboratory target). *Laboratory experiments should state the region of (β, c_g) parameter space that remains interesting after observational constraints. Otherwise a tabletop search may only rediscover a region already excluded or convention-dependent.*

4 Evidence Plan

A later data paper should assemble four residual families.

Gyroscope and satellite precession. Use frame-dragging and geodetic-precession measurements to constrain rotational mass-current amplitudes.

Light-deflection and time-delay by moving bodies. Use VLBI and ranging observables where translational mass current contributes to timing or angular deflection.

Planetary and spacecraft ephemerides. Inject parameterized cogravity accelerations into orbit fits and measure whether residuals improve, degrade, or remain degenerate.

Binary timing. Use compact binary systems as strong moving-mass-current laboratories, with caution that the linear flat-background model may be outside its safe regime.

The fit product should be a posterior over β_S, β_F, c_g, and nuisance parameters, plus an equivalence-class report explaining which combinations are actually observable.

5 JMP0X1B Implementation Surface

A public bounds ledger can be expressed as

```
record ObservableFamily { data_product, residual_type, source_model, nuisance }
record CogravityParameter { beta_source, beta_force, c_g, convention }
record BoundResult { posterior, degeneracies, excluded_region, fit_digest }
fn fit_bounds(family, params) -> BoundResult effects{Audit, Statistics}
```

The ledger should distinguish source data, derived residuals, priors, ephemeris version, and theory convention.

6 Release and Review Plan

The proposal release should include a parameter dictionary and synthetic examples. A later empirical release should include scripts for at least one public residual family, fit logs, posterior files, and a table of degeneracies. A claim of exclusion must state whether it excludes the Jefimenko normalization, a convention-specific weak-field mapping, or only a chosen effective parameterization.

7 Open Questions

- Which observations cleanly distinguish β_S from β_F?
- Can translational cogravity be bounded without importing a coordinate convention that fixes the answer?
- What is the safest weak-field map between this model and PPN parameters?
- Which laboratory bounds remain meaningful after solar-system constraints are imposed?

8 Conclusion

This paper turns one part of the gravity/cogravity idea into a named, reviewable work package. Its value does not depend on treating the framework as established physics. The value is the disciplined reduction of a speculative field analogy into equations, invariants, bounds, null tests, and release artifacts that can be audited and either extended or killed.

References

References

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