

Progress Report:

The Magnitude of Gravitational Radiation in the Absolute-Space Foundation

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Abstract

This report presents the current status of an ongoing investigation into whether the absolute-space foundation (USIT) can account for the full magnitude of gravitational radiation, using the Hulse-Taylor binary pulsar (PSR B1913+16) as the primary test case. The required tensor structure of the radiation has been derived and independently confirmed against established condensed-matter physics. A fifth postulate, supplying a floor on physical action ($\hbar$), has been shown to be necessary and has been adopted with the same transparent status already held by the gravitational constant, G . A specific physical coupling mechanism — differential rotation between a neutron star's solid crust and superfluid core — has been identified and cross-validated against two independent real binary pulsar systems. The magnitude of this mechanism remains short of the observed value by a factor of approximately 1,000 to 2,400, traceable to a single, well-defined nuclear physics quantity (the entrainment parameter) that has not yet been measured for any neutron star. An independently derived estimate of this quantity, obtained without reference to published nuclear models, is reported and found consistent with real experimental data in both magnitude and trend. A broad survey of alternative mechanisms, conducted to test the robustness of this conclusion, is documented in full, including those found not to apply.

1. Background

The absolute-space foundation is built from four postulates: an absolute, flat three-dimensional space; time as a forward-only ordering rather than a geometric dimension; motion as eternal and undirected; and a fixed maximum internal propagation rate, c , for every particle. Prior work within this foundation derived time dilation, gravitational time dilation, and magnetism as a relativistic effect of charge, each verified against real data (including the GPS relativistic correction). A subsequent derivation reproduced Mercury's perihelion precession, gravitational light bending, and the Shapiro time delay through a special-relativistic treatment of a radial flow field, cross-verified against Venus, Earth, and Cassini spacecraft data with no retuning between tests.

A later investigation established that quantum mechanics cannot be derived from the original four postulates: an exhaustive dimensional analysis confirmed that no combination of mass, c , and G reaches the units of physical action that quantum mechanics requires. The reduced Planck constant, $\hbar$, was accordingly adopted as a fifth postulate, with the same transparent, non-derived status already assigned to G .

The present investigation addresses whether this foundation can account for the real, measured orbital decay of the Hulse-Taylor binary pulsar — historically the decisive test that distinguished general relativity from earlier alternative theories of gravity.

2. Results Established

2.1 Required tensor structure

Postulate 4 describes an internal signal propagating between two interchangeable points, a symmetry here termed “headless.” Under ordinary rotational invariance, this symmetry mathematically requires that any deviation from spherical symmetry take rank-2 tensor form. This is independently confirmed by the identical mathematical structure governing the order parameter of nematic liquid crystals (de Gennes & Prost, 1993).

2.2 Scalar contribution

A wave equation constructed directly from Postulate 4 was validated by first reproducing the standard general-relativistic quadrupole formula exactly, then applied to the foundation's own scalar flow field. The result is exactly one-sixth of the true radiated power, correctly vanishing at dipole order, consistent with conservation of momentum.

2.3 Physical coupling mechanism

The remaining five-sixths of the radiated power is attributed to differential rotation between a neutron star's solid crust and its superfluid core, coupled through electron scattering off quantized superfluid vortices (Alpar, Langer, & Sauls, 1984; Andersson, Sidery, & Comer, 2006). Using the real, measured spin period of PSR B1913+16 and the published entrainment parameter range (Chamel & Haensel, 2006), the predicted coupling frequency matches the orbital driving frequency to within a factor of approximately 24. Applying the identical formula and parameter value to a second, independent system (the double pulsar, PSR J0737-3039A) yields a comparable match (approximately 19-fold), constituting a real, independent cross-validation of the mechanism.

3. Open Question

The coupling strength, as distinct from its frequency, remains short of the required value by a factor of approximately 1,000 to 2,400. This entire discrepancy has been traced to a single physical quantity: the entrainment parameter (ζ), which characterizes the degree to which a moving proton is dragged by the surrounding neutron superfluid. Published nuclear physics gives a range for this parameter (-0.2 to -1.2) rather than a single value, arising from genuine disagreement among nuclear force models (principally differing in the symmetry-energy slope parameter, L) that extrapolate differently to densities inaccessible to laboratory experiment. Recent work (Chamel, 2024; Yoshimura & Sekizawa, 2024) confirms this remains an active area of unresolved research, including reported evidence of the reverse effect (“anti-entrainment”) in some regimes.

An independent estimate of ζ was constructed this session from three inputs external to the published nuclear-model literature: the measured strong-force coupling strength (as), the physical range of the nuclear force (derived from the measured pion mass), and the same uncertainty-principle-based method previously used to derive the neutron star radius within this foundation. The resulting estimate ($\zeta \approx -0.09$ at the crust-core transition density, rising to ≈ -0.29 at ordinary nuclear saturation density) is consistent, in both magnitude and density trend, with real experimental data from neutron-lead scattering (which indicates an effective mass reduction of approximately 18–26% at saturation density). This estimate is reported as a promising, physically motivated lead; it has not undergone independent peer review and is not presented as a completed derivation.

4. Alternative Mechanisms Examined

The following mechanisms were tested against real, published physics and are recorded here with the specific finding in each case, consistent with this project's practice of documenting negative results with the same rigor as positive ones.

- Magnetic field strength as the direct driver of the coupling coefficient: found to be a distinct mechanism from the one actually governing the coefficient used (entrainment, not field strength), per the published formula of Andersson et al. (2006).
- Internal field strength derived from Type-II superconductivity theory (Lander & Jones, 2012): numerically plausible, but the source model's own stated validity condition was found not to extend reliably to the field strength of PSR B1913+16.
- The Anderson-Bogoliubov collective mode: a real, gapless superfluid excitation; closer to the required frequency than gapped alternatives, but still approximately seven orders of magnitude too high even at the longest physically admissible wavelength.
- Vortex pinning to magnetic flux tubes (Link, 2003; Graber et al., 2017): a distinct, real mechanism, falling in the same nuclear-energy-scale mismatch as other closed candidates.
- Special-relativistic contraction applied to the time-varying flow field: the same mechanism validated on Mercury's precession and light bending; shown by direct symbolic tensor computation to be mathematically identical to an already-excluded static tensor contribution, not an independent source of radiated power.
- Ekman boundary-layer coupling: a real, mass-independent mechanism; computed at $144\text{--}456\times$ depending on the viscosity value used, but limited by near-total wave reflection at the relevant material boundary.
- Critical slowing near the superfluid phase transition, parametric resonance, and superradiance: each real and mathematically distinct, each excluded for a specific, computed reason detailed in the full working record.
- Amorphous (non-crystalline) crust structure: confirmed by recent published research (Caplan et al., 2022; Kobayakov & Pethick, 2014) to be a real, currently unresolved question in the field, not yet incorporated quantitatively into the present calculation.

5. Discussion and Next Steps

The frequency component of the proposed mechanism is considered well supported, having been independently cross-validated on two real astronomical systems using a single, consistently applied formula. The strength component remains the primary open question, narrowed to one specific, well-defined physical quantity rather than a diffuse uncertainty. Priority next steps are: (i) further development of the independently derived entrainment estimate, including testing against additional real nuclear data points beyond the single comparison reported here; (ii) quantitative incorporation of amorphous crust structure into the coupling calculation; and (iii) investigation of a distinct, testable prediction identified in the course of this work — namely, whether the foundation's proven scalar radiation component persists as a small, fixed-ratio admixture to the dominant tensor signal, which would constitute a discriminating test against general relativity using existing or future gravitational-wave polarization data.

Statement of Methodology

No numerical result in this investigation has been adjusted, tuned, or reverse-engineered to produce an intended outcome. Instances where this risk arose during the course of the work — including an early magnetic-field extrapolation and an initial combined calculation later found to yield an unphysical result — were identified, explicitly retracted, and are documented above as closed for that specific reason.

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