

Comparative Epistemology

R.O.M. vs. P.P.K.

Anton Rize

antonrize@willrg.com *

October 2025

This document is an addition to [https://willrg.com/documents/WILL_RG_I.pdf – sec : Msin\(i\)](https://willrg.com/documents/WILL_RG_I.pdf – sec : Msin(i))

1 Comparative Epistemology: R.O.M. vs. Parameterized Post-Keplerian Formalism

The operational capacity to extract absolute 3D orbital geometry (inclination i) and systemic scale from 1D timing or spectroscopic data is an established milestone in modern astrophysics, formalized via the Parameterized Post-Keplerian (PPK) approach [1]. While R.O.M. and PPK achieve identical operational closure - breaking the Keplerian mass-inclination degeneracy - their ontological foundations and mathematical structures are fundamentally different.

The Post-Keplerian (PPK) Paradigm: Perturbative Materialism

The PPK formalism operates within a substance-based ontology. It postulates an absolute metric spacetime governed by component masses (m_1, m_2) and the gravitational constant (G).

- **Methodology:** It utilizes a flat Newtonian Keplerian orbit as a foundational baseline. Relativistic invariants, such as the periastron advance ($\dot{\omega}$) and the time dilation/gravitational redshift amplitude (γ), are introduced as microscopic perturbations to this baseline.
- **Dimensional Dependence:** The extraction of the inclination angle ($\sin i$) requires solving a coupled system of equations heavily saturated with dimensional constants (G, c) and absolute mass values.
- **Epistemic Status:** Gravity and mass are treated as a priori fundamental physical causes that distort a pre-existing spacetime.

Relational Orbital Mechanics (R.O.M.): Dimensionless Geometric Closure

R.O.M. rejects the perturbative baseline and the materialist dimensional necessity. It treats the orbital system not as matter moving through space, but as a closed, self-referential algebraic topology.

- **Methodology:** There is no flat-space baseline. The secular phase shift ($\Delta\varphi$) and the systemic geometric tension (Z_{sys}) are intrinsic, governing structural elements derived strictly from the divergence of the dimensionless relational projections (β, κ).
- **Dimensional Independence:** The exact closure theorem ($\kappa^2 = 2\beta^2$) bypasses the Mass Function entirely. The 3D orientation (i) is extracted directly from the ratio of the semi-amplitude invariant (K_i) and the pure systemic kinematic projection (β), requiring zero knowledge of M or G .
- **Epistemic Status:** Mass (kg) and absolute metric distances (m) are proven to be derivative epistemic artifacts. They are emergent algebraic consequences of pure dimensionless optical and chronometric ratios, not their physical causes.

Conclusion

The PPK formalism demonstrates that general relativistic effects break Newtonian degeneracies, securing its validity through rigorous parameterization. R.O.M. absorbs this operational triumph but excises the dimensional redundancy. By eliminating G and M from the generative algebraic chain, R.O.M. establishes that gravitational systems are pure holographic manifestations of dimensionless energy-spacetime symmetries.

*This work is archived on Zenodo: ,

References

- [1] Thibault Damour and Nathalie Deruelle, *General relativistic celestial mechanics of binary systems. II. The post-newtonian timing formula*, *Annales de l'I.H.P. Physique théorique* **44**(3), 263–292 (1986).