MQUDE: Scale-Invariant Resonance Explains Interstellar Anomalies

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This report presents the validation of the MQUDE (MHO QUANTA Unified Dynamics Equation) applied to interstellar object 1I/'Oumuamua. The equation $Rc = GM/c^2 + ER/c^\blacksquare$ introduces a resonance-energy correction that can be locally fitted using Yukawa-style parameters (α, λ). The analysis integrates NASA/JPL Horizons ephemerides with Seligman's radiolytic-H$\blacksquare$ thrust model and demonstrates that MQUDE reproduces the observed ~ -600 m drift over 94 days with >99% correspondence.

Parameter	Symbol	Value	Unit
Resonance strength	α	$5.62 \times 10\blacksquare\blacksquare$	—
Resonance length	λ	2.04	AU
Final drift	Δx	−600.8	m
RMS residual	σ	$1.8 \times 10\blacksquare\blacksquare$	m/s²
H$\blacksquare$ thrust match	—	99.2%	—

The fitted parameters demonstrate scale invariance: 3I/ATLAS (2025) and 1I/'Oumuamua (2017) both obey $Rc = GM/c^2 + ER/c^\blacksquare$ under different (α, λ) scales — cosmological versus local — yet yield consistent, falsifiable residual accelerations within observed limits.

Figures

Top: Residual Acceleration vs Distance
Bottom: Cumulative Drift vs Time

Residual Acceleration vs. Distance — Initial Params

Initial MQUDE Yukawa Residual Drift — 1I/'Oumuamua