Gravitational Photon Echo Using Thorium-229 Nuclear Clock Transition

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We theoretically investigate gravitationally induced photon echoes based on the 8.4 eV Thorium-229 nuclear clock transition on Earth. A height difference between two Thorium-229-doped targets produces a measurable gravitational frequency shift between their nuclear absorption lines. With a coherence on the timescale of seconds, we explore gravity-driven photon echoes generated either within a single target or among multiple spatially separated samples. We further discuss schemes for the manipulation and storage of these gravitationally induced photon echoes [1].

References

[1] W-T Liao and S Ahrens, arXiv:2507.00533 (2025)