

## Quantum Decoherence Is (Alas) Just Paper Noise [\[1\]](#)[\[2\]](#)[\[3\]](#)

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The deeper problem in proposing experiments to explore the boundaries of quantum and classical mechanics is that assuming xyzt coordinates accurately model the physical universe is a horrifyingly wrong way to express any quantum mechanical problem. To be fair, xyzt frameworks are also horrifyingly bad ways to express relativity and quantum field theory.

More specifically, any math model that assumes irreversible causality (history) can exist within any openly defined xyzt coordinate system instantly violates both special relativity and the speed of light limit. We learned that xyzt frameworks don't work over a century ago — some fellow named Albert, I think [\[4\]](#) — but we didn't want to believe it because space and time are built into our brains, and provide nifty shortcuts for most problems.

The deeper metrics — the ones that must replace the impossible and inherently paradoxical xyzt coordinates of nearly all quantum math and physics models — are 4-volume metrics with loop-completion causality. These are new — last week [\[5\]](#) — but are just the full 4D elaboration of relativistically invariant time•length areas in special relativity. I've been calling them lidar awareness units (LAUs or LAUs) since their defining feature is how much information a lidar (or other) pulse can acquire within a finite length of time. Each such acquisition closes a loop, and it's that closure that creates irreversible causality. It's all very bottom-up and has nothing to do with decoherence.

Nicely, there's no such thing as spooky action using loop closure metrics, but there's also that issue of [decoherence disappearing along with spookiness](#). In loop-closure causality, decoherence becomes an unnecessary overelaboration of loop closures into the surrounding finite (and largely fictional) xyzt coordinates and the observer responsible for closing the loop. Notably, that observer may be as small as a single atom or particle [\[6\]](#).

[While the LAU idea is only a week old,] I'm already seeing some nice potential for loop closure metrics to bring readily accessible technology and deep quantum physics a lot closer, likely with some nice experimental implications.

Even my name for these — lidar awareness units — reflects this connection. Intense illumination of a lau shuts down quantum activity for all observers in that region, not just in one inertial frame.

Condensed matter is a seething froth of multi-scale LAUs, and so has essentially zero chance of being quantum. Only broader external paths remain open for quantum behavior, such as in double-slit interference, and even then only with great difficulty.

Curiously, Einstein in 1905 [\[4\]](#) pointedly at the importance of the loop-closure metrics when he refused to define the speed of light as measurable by anything other than light going outbound and then returning from a mirror. The lidar awareness unit simply captures this concept in more detail for an entire 4D volume.



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## References

- [1] T. Bollinger comment on Jan 26, 2024 on a Sabine Hossenfelder video [2]: <https://youtu.be/1x-vKpaR2LI&lc=Ugxil-VR3SyI3Q9Y7114AaABAg>
- [2] S. Hossenfelder, *Can Everything Make Quantum Jumps? Clever New Experiment Wants to Find Out*, Sabine Hossenfelder (YouTube) **2024**, 0126 [Jan 26] (2024). <https://youtu.be/1x-vKpaR2LI>. Discusses a paper on quantum boundaries [3].
- [3] D. Das, D. Home, H. Ulbricht, and S. Bose, *Mass-Independent Scheme to Test the Quantumness of a Massive Object*, *Physical Review Letters* **132** (3), 30202 (2024). <https://journals.aps.org/prl/abstract/10.1103/PhysRevLett.132.030202>. The paper proposes using harmonic oscillators to search for quantum behaviors in arbitrarily massive, nominally “classical” objects.
- [4] A. Einstein, *On the Electrodynamics of Moving Bodies* [English translation], *Annalen der Physik* **17** (10) 891-921 [Jun.] (1905). <http://fisica.ufpr.br/mossanek/etc/specialrelativity.pdf>
- [5] T. Bollinger, *The Causality Sharing Metric: Lidar Awareness Units (LAUs)*, *Apabistia Notes* **2024**, 01210917 [Jan. 21] (2024). <https://sarxiv.org/apa.2024-01-21.0917.pdf>
- [6] T. Bollinger, *Photons as Observers and the Emergence of Scale*, *Apabistia Notes* **2023**, 04211715 [Apr. 21] (2023). <https://sarxiv.org/apa.2023-04-21.1715.pdf>

