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Non-geodesic timelike observers and the ultra-local limit

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In the ultralocal limit along timelike geodesics, any geometry is perceived as Bianchi I. It is shown that, in general, this limit does not extend to non-geodesic timelike observers. We discuss exceptions, including particles with variable mass, test particles in Einstein frame scalar-tensor gravity, and self-interacting dark matter.

[Based on R. Saadati, L. Valsan & V. Faraoni 2025, Eur. Phys. J. C 85, 176 (arXiv:2408.00871)]

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