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Theoretical Constraints on Boostless Amplitudes and Cosmological Correlators

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Flat space theories of spinning particles must obey nontrivial consistency conditions that follow from locality, unitarity and gauge invariance. These conditions are especially powerful in the case of Lorentz invariant theories of massless particles, where they have been used to derive the gravitational equivalence principle, among other interesting results. In a recent paper, we have shown that even if we drop the assumption of boost invariance, as long as all particles are assumed to propagate at the speed of light, similar conclusions still apply and the gravitational interactions pass consistency tests only if they are Lorentz invariant. This result should be kept in mind when considering Lorentz violations in theories defined on the Minkowski background, and perhaps also in the study of the early universe, where boost invariance is broken by the expanding space.

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