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Experimental Options for the Role of Dynamic Torsion in General Relativity

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Abstract : The experimental search for spin coupling in General Relativity via torsion has been inconclusive. In this work, further experimental avenues to test dynamic torsion are proposed and evaluated. In the extended theory, by relaxing the torsion free condition on the metric connection, general relativity is reformulated to relate the spin density of particles to a new quantity, the torsion tensor. In torsion theories, the spin tensor and torsion tensor are related in much the same way as the stress-energy tensor is related to the metric connection. Similarly, as the metric is the field associated with the metric connection, fields can be associated with the torsion tensor resulting in a field that is either propagating or static. Experimental searches for static torsion have thus far been inconclusive, and currently, there have been no experimental tests for propagating torsion. Experimental tests of propagating theories of torsion are proposed utilizing various spin densities of matter, such as interfaces in superconducting materials and plasmas. The experimental feasibility and observable bounds are estimated, and the most viable candidates are selected to pursue in detail in a future work.

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