Midsummer theory seminar

3:30, Tuesday, July 7, 2009, RLM 7.112

Refreshments: Pizza and soft drinks

Implications of the quantum phase on relativity

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The quantum phase requires projective representations that are equivalence classes of the unitary representations of the central extension of the group. The Weyl-Heisenberg group is a central extension of the abelian translation group on extended phase space. We determine the largest symmetry group whose projective representations define a quantum mechanics with Heisenberg commutation relations. Special relativistic quantum mechanics describing single particle inertial states is given in terms the projective representation of the inhomogeneous Lorentz group. However, the Heisenberg nonabelian relations must be added in by hand after the fact. Requiring that the above largest symmetry group leave invariant a Born orthogonal metric results in a relativity theory of noninertial states in which proper time is affected also by noninertial motion that includes the Weyl-Heisenberg group. The small interaction limit includes special relativistic quantum mechanics but also contains another type of matter that embodies energy. In the small velocity limit, this is described by another central element, like standard mass, that has dimensions of tension, and interacts with standard matter only through a noninerital generalization of spin. This is in the experimentally accessible regime.