



# *E I N L A D U N G*

Lunchseminar

zum Vortrag

von

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über

***„Relativistic quantum reference frames:  
the operational meaning of spin“***

**Abstract:**

The spin is the prime example of a qubit. Encoding and decoding information in the spin qubit is operationally well defined through the Stern-Gerlach set-up in the non-relativistic (i.e., low velocity) limit. However, an operational definition of the spin in the relativistic regime is missing. The origin of this difficulty lies in the fact that, on the one hand, the spin gets entangled with the momentum in Lorentz-boosted reference frames, and on the other hand, for a particle moving in a superposition of velocities, it is impossible to “jump” to its rest frame, where spin is unambiguously defined.

In this talk, I will introduce a quantum reference frame transformation corresponding to a ‘superposition of Lorentz boosts,’ allowing us to transform to the rest frame of a particle that is in a superposition of relativistic momenta with respect to the laboratory frame. This enables us to first move to the particle’s rest frame, define there the spin measurements (via the Stern-Gerlach experimental procedure), and then move back to the laboratory frame. In this way, we find a set of ‘relativistic Stern-Gerlach measurements’ in the laboratory frame, and a set of observables satisfying the spin  $su(2)$  algebra. This operational procedure offers a concrete way of testing the relativistic features of the spin, and opens to the possibility of devising quantum information protocols for spin in the special-relativistic regime.

**Zeit: Mittwoch, 10.04.2019, 13.00**

**Ort: Arbeitsgruppe Gravitation, Währinger Straße 17,  
Common room, first floor**

gez.: P. T. Chrusciel, D. Fajman