

A Non-BRST Approach to Gauge Field Theories*

Lars Brink¹

*Department of Fundamental Physics, Chalmers University of Technology
S-412 96 Göteborg, Sweden*

ABSTRACT

Gauge field theory is usually used to describe particles with spins higher than $1=2$. The gauge invariance represented in terms of the BRST invariance is often crucial for studying the quantum properties of those theories. Yet there is a another very different formulation sometimes called the light-cone gauge approach or the light-front approach used to study quantum properties, where the only symmetries present in the theory are the Poincaré symmetry and perhaps some global external symmetries. There are no unphysical degrees of freedom in the fields. The elementary particles are related to the irreducible representations of the Poincaré algebra. In this formulation of quantum field theory one can extend these representations to depend also on a coupling constant. The representations then become non-linear and contain the interaction terms which are shown to have strong uniqueness. Extending the algebra to supersymmetry it is shown that two field theories stick out, $N = 4$ Yang-Mills and $N = 8$ Supergravity and their higher dimensional analogues. I also discuss string theory from this starting point.

* Lecture presented at the 4th Calimanesti meeting on QFT and Hamiltonian Systems, October 16-21, 2004.

¹ tfeb@fy.chalmers.se