

Contribution Title: ON SINGULAR REDUCTION, QUANTIZATION AND
THE OBSERVABLE ALGEBRA FOR GAUGE MODELS
Authors: G. Rudolph, M. Schmidt
Presenting author: Rudolph G.
Affiliation: Institute for Theoretical Physics, University of Leipzig
E-mail: rudolph@rz.uni-Leipzig.de
Invited speaker:
YRS seminar: NO

The models under consideration are obtained from lattice approximation of nonabelian gauge theories. First, we formulate them on the classical level as Hamiltonian systems, endowed with a (gauge) symmetry and with a natural momentum map related to the Gauss law. We discuss singular Marsden-Weinstein reduction, which yields the stratified reduced phase space, for two examples [1].

Next, we shortly recall previous results [2] on the structure of the field and observable algebras of these models. The building blocks of the bosonic part of the field algebra are crossed product C^* -algebras yielding a unique (generalized) Schrödinger representation, whereas the matter field component is an ordinary CAR-algebra. The observable algebra is the algebra of gauge invariant operators satisfying the Gauss law. Its irreducible representations are labeled by global colour charge.

Then, we show how to implement the stratified structure on quantum level [3], using the generalized Bargmann-Segal transform for compact Lie groups developed by Hall and the concept of a costratified Hilbert space proposed by Huebschmann. We discuss a simple, exactly solvable example and show, in particular, that the vacuum of the theory concentrates on one of the singular strata.

Finally, we prove for the same toy model [4] that the observable algebra is a C^* -algebra generated by unbounded elements (obtained from geometric quantization of classical invariants) in the sense of Woronowicz.

- [1] E.Fischer, G.Rudolph and M.Schmidt, *J. Geom. Phys.* 57 (2007) 1193–1213
- [2] J.Kijowski, G.Rudolph, *J. Math. Phys.* Vol. 46, 032303 (2005)
- [3] J.Huebschmann, G.Rudolph and M.Schmidt, *Commun. Math. Phys.* 286, 459-494 (2009)
- [4] G.Rudolph, M.Schmidt, *J. Math. Phys.* 50, 052102 (2009)