QUANTIZATIONS IN POSITIVE CHARACTERISTIC AND APPLICATIONS

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1. Preliminary program

The plan is to have six-seven lectures.

0) Basics on quantizations.

1) Quantizations via Hamiltonian reduction.

2) Frobenius constant quantizations: examples and constructions.

3) Derived equivalences from quantizations. Splitting bundles. Applications to representation of semisimple Lie algebras in positive characteristic.

4) Applications to Procesi bundles and Macdonald polynomials.

5*) – time and energy permitting. Applications to constructing Cohen-Macaulay modules and to Harish-Chandra $(\mathfrak{g}, K)$-modules.

2. Prerequisites

Algebraic geometry – the first three sections of Hartschorne's book should be mostly sufficient. Some knowledge of derived categories and derived functors. Basic understanding of reductive algebraic groups and semisimple Lie algebras and of their representations.

3. References

For the introductory lectures: 0 and 1 two possible references are:

V. Ginzburg, *Lectures on D-modules*, available here.

P. Etingof, *Lectures on Calogero-Moser systems*, available here

The first can be used for a discussion of the rings/sheaves of (twisted) differential operators, the second discussed quantizations and Hamiltonian reduction.

The original papers that will be (partially) covered include (roughly, in order of appearance):

R. Bezrukavnikov, I. Mirkovic, D. Rumynin, arXiv:0205144.

R. Bezrukavnikov, M. Finkelberg, V. Ginzburg, arXiv:0312474.

R. Bezrukavnikov, D. Kaledin, arXiv:0401002.

R. Bezrukavnikov, M. Finkelberg, arXiv:1208.3696.