

## The Low-Dimensional Algebraic Cohomology of the Virasoro Algebra

The main focus of this presentation lies on the proof of the one-dimensionality of the third algebraic cohomology of the Virasoro algebra with values in the adjoint module. Because we are working with pure algebraic cohomology, our results are valid for any concrete realization of the Witt and the Virasoro algebra.

The talk starts with a brief introduction of the Witt and the Virasoro algebra. In a second step, the Chevalley-Eilenberg cohomology of Lie algebras is described, including the description of tools for computing this cohomology, such as the Hochschild-Serre spectral sequence. The proof of our main result consists of two parts. The first part consists in proving that the third algebraic cohomology of the Virasoro algebra with values in the Witt algebra is isomorphic to the third cohomology of the Witt algebra with values in the adjoint module. This proof uses the Hochschild-Serre spectral sequence. The second part consists in proving the one-dimensionality of the third algebraic cohomology of the Witt and the Virasoro algebra with values in the trivial module. Although the second part uses elementary algebra, the proof per se is not elementary, but somewhat intricate. This is joint work with Martin Schlichenmaier.

The vanishing of the third algebraic cohomology of the Witt algebra with values in the adjoint module, as well as the vanishing of the first algebraic cohomology of the Witt and the Virasoro algebra, have already been proven by Ecker and Schlichenmaier. The vanishing of the second algebraic cohomology of the Witt and the Virasoro algebra was shown by Schlichenmaier, see also Fialowski.