

On Lie algebras over a field of characteristic 2

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Lie algebras over fields of characteristic 0 or $p > 3$ were recently classified, but over field of characteristic 2 or 3 there are only partial results up to now. S. Skryabin proved that any finite dimensional simple Lie algebra over a field of characteristic 2 has toroidal rank ≥ 2 .

The toroidal rank $t(L)$ of a Lie 2-algebra L over a field k of characteristic 2 is the maximal dimension of an abelian subalgebra with basis $\{t_1, \dots, t_n\}$ such that $t_i^{[2]} = t_i, i = 1, \dots, n$, where $n = t(L)$.

The simple Lie 2-algebras of finite dimension over a field k of characteristic 2 and toroidal rank 2 were classified by A. Premet and A. Grishkov. The toroidal rank 3 case is much more difficult and the classification of the simple Lie 2-algebras over a field k of characteristic 2 and toroidal rank 3 which contains a Cartan subalgebra of dimension 3 is still an open problem. The main obstacle is the lack of examples.

In this talk we will show an example of a simple Lie 2-algebra of dimension 31 and of toroidal rank 3. We expect that this example and the techniques used in the work will be useful for the construction of other simple Lie 2-algebra of toroidal rank 3 containing a CSA of dimension 3.

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