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Partial Classification of Irreducible Modules for Loop-Witt Algebras

Consider the Lie algebra of the group of diffeomorphisms of a n -dimensional torus which is also known as the derivation algebra of the Laurent polynomial algebra A over n commuting variables, denoted by $Der A$. In this paper we consider the Lie algebra $(A \rtimes Der A) \otimes B$ for some commutative associative unital algebra B over $\mathbb{C}$ and classify all irreducible modules for $(A \rtimes Der A) \otimes B$ with finite dimensional weight spaces under some natural conditions. In particular, we show that Larsson's constructed modules of tensor fields exhaust all such irreducible modules for $(A \rtimes Der A) \otimes B$.

Keywords: Witt algebra, Virasoro algebra, current algebra.

MSC: 17B65, 17B68, 17B67.