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The solenoidal-Virasoro algebra and its Harish-Chandra modules.
Abstract

Let $\mathbf{A} = \mathbb{C}[t_i, t_i^{-1}, \ 1 \leq i \leq n]$ be the algebra of Laurent polynomials in n-variables and let $\mathbf{W}_\mu = \mathbf{A}d_\mu$ be the solenoidal Lie algebra introduced by Y. Billig and V. Futorny, where $\mu = (\mu_1, \ldots, \mu_n) \in \mathbb{C}^n$ is generic and

$$d_\mu = \sum_{i=1}^n \mu_i t_i \frac{d}{dt_i}.$$

In this paper, we prove the existence and the uniqueness of universal central extension of $\mathbf{W}_\mu$. Such extension will be called the solenoidal Virasoro algebra and will be denoted by $\mathbf{Vir}_\mu$. Then we study the Harish-Chandra modules of $\mathbf{Vir}_\mu$. We establish three classes of Harish-Chandra modules: the highest weight modules, the lowest weight modules and the cuspidal modules. In the case $n = 1$, our results coincide with the well known V. Kac conjecture which is proved by O. Mathieu.

Y.Billig,V.Futorny Classification of simple cuspidal modules for solenoidal Lie algebras, Isr.J.Math. 222(2017), 109-123. O.Mathieu, Classification of Harish-chandra modules over the Virasoro algebra, Invent.Math.107(1992),225-234.