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The solenoidal Heisenberg-Virasoro Lie algebra and its Harish-Chandra modules.

Abstract

Let $\mathbf{A} = \mathbb{C}[t_i, t_i^{-1}, 1 \leq i \leq n]$ and $\mathbf{W}_\mu = \mathbf{A}d_\mu$ the solenoidal Lie algebra introduced in [?], where $\mu = (\mu_1, \dots, \mu_n) \in \mathbb{C}^n$ is generic and $d_\mu = \sum_{i=1}^n \mu_i \frac{d}{dt_i}$. We consider the semi-direct product Lie algebra $\mathbf{WA}_\mu := \mathbf{W}_\mu \times \mathbf{A}$. We prove existence and unicity of the universal central extension of \mathbf{WA}_μ and we call it the solenoidal Virasoro algebra \mathbf{HVir}_μ . Then we study Harish-Chandra modules of \mathbf{HVir}_μ and we establish that we have three classes: highest weight modules, lowest weight modules and cuspidal modules. In $n = 1$, our results coincide with R. Lü and K. Zhao [?]. We provide a theorem generalizing Kac conjecture [?, ?] proved by Mathieu [?].