Extensions of nilpotent Lie algebras of type 2

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The study and description of the structure of complex Lie algebras with nilradical a nilpotent Lie algebra of type 2 can be attacked by using $\mathfrak{sl}_2(\mathbb{C})$-representation theory. Our results will be applied to review the classifications given in [5] and [1] of the Lie algebras with nilradical the 3-dimensional Heisenberg Lie algebra and the quasiclassical free nilpotent algebra $\mathfrak{n}_{2,3}$. The 5-dimensional Lie algebra $\mathfrak{n}_{2,3}$ is one of two free nilpotent algebras admitting an invariant metric as it is proven in [2]. According to [4], quasiclassical algebras let construct consistent Yang-Mills gauge theories.

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