This article studies abelian gauge theories on a particular noncommutative space, the so-called $\mathbb{R}^3_\lambda$ space which is initially introduced in [1] as a deformation of the fuzzy sphere [2] to a three-dimensional noncommutative space. (λ denotes a noncommutative parameter, with $1/\lambda \to \infty$ leading to commutative limits.) As described in the article, studies on $\mathbb{R}^3_\lambda$ have been made by many researchers and, recently, it is reported one-loop calculations are feasible in gauge theories on $\mathbb{R}^3_\lambda$ [3]. This article is a sequel to lines of these developments and presents explicit calculations of one-loop 2-point and 4-point functions for some gauge invariant action on $\mathbb{R}^3_\lambda$.

While the properties of $\mathbb{R}^3_\lambda$ itself may be well investigated, at least to the reviewer, it is not very clear whether $\mathbb{R}^3_\lambda$ really defines as a three-dimensional noncommutative space. For example, the matrix realization of $\mathbb{R}^3_\lambda$, as defined in Eq (2.4) in the article, is a direct sum of the spin-j matrix realizations of the $SU(2)$ algebra. The constraint $\mathcal{R}_2$ in Eq (2.2) should be imposed on these matrices otherwise one can not properly carry out mode expansions of a function (or an operator) on the noncommutative space $\mathbb{R}^3_\lambda$. In section 3 the authors execute one-loop calculations using the mode expansions but the reviewer finds the above mentioned point obscure and could not understand the results well.

References

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