Review of: "Graded Quantum Noise in Quantum Field Theories"

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Potential competing interests: No potential competing interests to declare.

In the present article, the author discusses the following things:

1. A $\mathbb{Z} \times \mathbb{Z}$ graded tensor product is defined in Hilbert space.

2. Using Timothy Eyre's work for $\mathbb{Z}2$-grading, a $\mathbb{Z} \times \mathbb{Z}$-graded quantum stochastic process in the sense of Hudson and Parthasarathy is constructed. It is demonstrated that these processes satisfy commutation relations of $\mathbb{Z} \times \mathbb{Z}$-graded super Lie algebras.

3. A $\mathbb{Z} \times \mathbb{Z}$ graded quantum stochastic differential equation along the lines of Hudson and Parthasarathy is formulated by utilizing the graded tensor product between the system Hilbert space and the noise Boson Fock space.

4. A method based on counting process non-demolition measurements for $\mathbb{Z} \times \mathbb{Z}$ noise, which generalizes Belavkin's quantum filter for such $\mathbb{Z} \times \mathbb{Z}$-graded quantum stochastic differential equations, is formulated.

5. The use of Lagrangian and Hamiltonian techniques to integrate graded quantum stochastic noise into quantum field theory and quantum gravity has been discussed.

6. Several approximation formulas for the quantum field theory correction to the propagator due to quantum stochastic noise have been generated. From such corrected propagators, formulas for adjustments to particle masses due to noise have been constructed.

The article is certainly worth attention. So, I recommend its publication, but I have the following questions and suggestions for it.

1. As the author talks about graded quantum noise in string theory, I would suggest the author elaborate on what the role of this algebra is in the BV quantisation method and BRST symmetries. What role the BRST charge plays in the construction of it.
2. The article should be arranged in proper order.
3. Calculations should be reverified, and typos should be corrected (e.g., eqn(229)).
4. Language should be improved, as at some places it is confusing (e.g., the second last and last line of Section 1 are confusing in meaning).
5. Results should be highlighted.