

Modified Wightman function and Unruh effect in nonlocal field theories

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Abstract

The nonlocal field theory commonly requires a minimal length, and so it appears to formulate the nonlocal theory in terms of the doubly special relativity which makes the speed of light and the minimal length invariant simultaneously [1, 2]. We set up a generic nonlocal model having the same set of solutions as the local theory but allowing Lorentz violations due to the minimal length. It is exactly corresponding to the model with the modified dispersion relation in the doubly special relativity. For this model, we calculate the modified Wightman function and the rate of response function by using the Unruh-DeWitt detector method [3]. It turns out that the Unruh effect should be corrected by the minimal length related to the nonlocality in the regime of the doubly special relativity. However, for the Lorentz-invariant limit, it is shown that the Wightman function and the Unruh effect remain the same as those of the local theory [4, 5].

References

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