

Twist deformations of quantum field products and applications

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Abstract

Field operators in normal order can be understood as operators multiplied with a graded-commutative product, the normal product, and therefore they form a symmetric superalgebra. On the other side, the decomposition of a normal product of field operators into all its possible components is a well known graded-commutative coproduct. Altogether, field operators in normal order form a symmetric Hopf superalgebra.

Using two appropriate Green functions as Laplace pairings, we can then apply two twist deformations to the normal product to obtain the time-ordered product and the operator product. The Hopf formalism allows to give closed formulas for the vacuum expectation values of iterated products, and for the Wick expansion of time-ordered and operator products. In particular, if we restrict to consider creation and annihilation operators, we can easily solve the problem of finding normal products adapted to a given state, as posed by W. Kutzelnigg and D. Mukherjee.

References

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