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Spin wave Feynman diagram vertex computation package
ALEXANDER PRICE, Georgia Regents University, PHILIP JAVERNICK, University of North Carolina at Chapel Hill, TRINANJAN DATTA, Georgia Regents University — Spin wave theory is a well-established theoretical technique that can correctly predict the physical behavior of ordered magnetic states. However, computing the effects of an interacting spin wave theory incorporating magnons involve a laborious by hand derivation of Feynman diagram vertices. The process is tedious and time consuming. Hence, to improve productivity and have another means to check the analytical calculations, we have devised a Feynman Diagram Vertex Computation package. In this talk, we will describe our research groups effort to implement a Mathematica based symbolic Feynman diagram vertex computation package that computes spin wave vertices. Utilizing the non-commutative algebra package NCAlgebra as an add-on to Mathematica, symbolic expressions for the Feynman diagram vertices of a Heisenberg quantum antiferromagnet are obtained. Our existing code reproduces the well-known expressions of a nearest neighbor square lattice Heisenberg model. We also discuss the case of a triangular lattice Heisenberg model where non collinear terms contribute to the vertex interactions.

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