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Progress and Challenge of Lattice Quantum Finite Elements (QFE) on Spheres

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Extending lattice field to ultraviolet complete quantum field theory on any smooth Riemann manifolds is a challenging problem. By adapting element methods (FEM) and Regge geometry one recovers classical (IR) solution in the continuum. However to correctly handle UV divergences requires new counter terms to construct a what we call a "Quantum Finite Elements" (QFE) discrete Lagrangian on the simplicial complex. These UV counters for 2d phi 4th theory and free fermions on the two sphere (S2) have been tested numerically to high precession against the exact Ising solution. Methods to generalize the QFE construction to radial quantized 3d super renormalizable theories on R x S2 and challenges for asymptotical free 4d gauge theories on R x S3 will be presented.

Title

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