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Lattice Field Theory On Curved Manifolds – The Affine Conjecture

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Lattice radial quantization on cylinders ($\mathbb{R} \times \mathbb{S}^{d-1}$), potentially offers a powerful new approach for strong coupling conformal or near conformal field theories, including gauge theories under considerations for Beyond the Standard Model (BSM) composite Higgs and Dark Matter physics. A general solution for any triangulated (or simplicial) lattice manifold was formulated by Regge in 1960 for the Einstein Hilbert action or any classical field theory. However the lattice spacing (edge length) introduces a noisy UV cut-off that obstructs quantization. Our solution for the 2d Ising CFT on a 2 sphere using an analytic local affine map to the tangent planes on geometrically smoothed Regge manifold suggests a general strategy or Affine Conjecture. A sequence of geometrical investigations and numerical tests are proposed for non-integrable systems such as phi 4th theories and gauge and fermionic theories on 3d spherical, 4d cylindrical and dual Anti de Sitter manifolds.

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