

Abstract Submitted
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Volume dynamics and quantum gravity HAL HAGGARD, University of California, Berkeley — Polyhedral grains of space can be given a dynamical structure. In recent work it was shown that Bohr-Sommerfeld quantization of the volume of a tetrahedral grain of space results in a spectrum in excellent agreement with loop gravity. Here we present preliminary investigations of the volume of a 5-faced convex polyhedron. We give for the first time a constructive method for finding these polyhedra given their face areas and normals to the faces and find an explicit formula for the volume. In particular, we are interested in discovering whether the evolution generated by this volume is chaotic or integrable which has important consequences for loop gravity: If the classical volume generates a chaotic flow then the corresponding quantum spectrum will generically be non-degenerate and the volume eigenvalue continues to act as a good label for spin network states. On the other hand, if the volume flow is classically integrable then the degeneracy of the corresponding quantum spectrum will have to be lifted by another observable. We report on progress distinguishing these two cases. Either of these outcomes will impact the direction of future research into volume operators in quantum gravity.

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