Quantizing the Bosonic String on a Loop Quantum Gravity Background

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We write down an action for a bosonic string propagating in a bulk background whose geometry is specified in terms of connection and tetrad (or "vierbein") variables

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I. INTRODUCTION

"Quantum gravity" refers to the broad enterprise dedicated to finding a complete, consistent theory in which quantum mechanics coexists peacefully with general relativity. There are two major approaches to quantum gravity which are widely recognized for their success in describing various aspects of physics at the Planck scale. The first is string theory, the quantum theory of a one dimensional object which is said to contain within it a complete description of all particles, forces and their interactions, including gravity. However, where precisely in the vast space of effective field theories which can possibly arise as in the low energy limit of a conjectured "M-Theory", our Universe with its collection of particles, forces and coupling constans, exists, is still a matter of vigorous debate. One of the primary criticisms of string theory is its apparent lack of "background independence". This is more general than the principle of *general covariance* which states that physics should be independent of the choice of co-ordinates. Background independence is the statement that any *quantum* theory of gravity - which, presumably, should provide a description not only of classical spacetimes, but also of fluctuating, semiclassical geometries and those in the deep quantum regime which do not have any sensible description in terms of any Riemannian geometry - should provide a description of physics which is independent, not only of the choice of co-ordinates, but also of the choice of background manifold on which those co-ordinates live.

II. MODIFIED POLYAKOV ACTION

III. EQUATIONS OF MOTION

IV. PHYSICAL IMPLICATIONS

V. DISCUSSION

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Appendix A

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