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Quantization of a causal diamond in 2+1 dimensional gravity RODRIGO ANDRADE E SILVA, TED JACOBSON, University of Maryland, College Park — We develop the reduced phase space quantization of a "causal diamond" in pure 2+1 dimensional gravity with a negative cosmological constant. The system is defined as the domain of dependence of a spacelike topological disc with fixed boundary length. After removing all gauge redundancy, the phase space is found to be the cotangent bundle of $Diff^{+}(S^1)/PSL_2(R)$, where $Diff^{+}(S^1)$ denotes the group of orientation-preserving diffeomorphisms of the circle. The physical degrees of freedom represent the possible shapes of causal diamonds that can have the topological disc as a Cauchy surface. Because this phase space does not admit a global system of coordinates, a generalization of the standard canonical quantization is required – in particular, since the configuration space is a homogeneous space for a Lie group, we apply the group-theoretic quantization scheme developed by Isham. There are strong indications that the Hilbert space of the associated quantum theory is given by wavefunctions on some coadjoint orbit of the Virasoro group, with labels in irreducible unitary representations of the corresponding little group.

Rodrigo Andrade e Silva
University of Maryland, College Park

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