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The spectrum of quantum states of BTZ black hole formed by a collapsing dust shell.

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We perform canonical analysis of an action in which 2+1-dimensional gravity with negative cosmological constant is coupled to cylindrically symmetric dust shell. The resulting phase space is finite dimensional having geometry of $SO(2,2)$ group manifold. Replacing the Poisson brackets by commutators results in the algebra of observables which is a quantum double $D(SL(2)_q)$. Deformation parameter q is real when the total energy of the system is below the threshold of a black hole formation, and a root of unity when it is above. Inside the black hole the spectra of the shell radius and time operator are discrete and take on a finite set of values. Transition amplitudes between these states are everywhere finite, including the central singularity.

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