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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.

Primary author(s) : Dr. STARODUBTSEV, Artem (St. Petersburg state university); ANDRIANOV, aleksandr (Sankt-Peterburg State University)

Presenter(s) : Dr. STARODUBTSEV, Artem (St. Petersburg state university); ANDRIANOV, aleksandr (Sank-t-Peterburg State University)

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