
85f:83029 83C45 83C75 83F05

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Quantum cosmological singularities.

Phys. Rev. D (3) **28** (1983), *no.* 10, 2402–2413.

The authors study quantum cosmological singularities in the context of dust-filled Friedmann-Robertson-Walker universes [M. Ryan , Hamiltonian cosmology, Springer, New York, 1972]. They show that whether quantum collapse occurs is determined by the classical choice of time.

They consider two choices of time: one related to matter clocks and "slow" in the sense that the corresponding classical dynamics is incomplete; the other determined by the geometry and "fast", i.e., giving rise to a complete classical dynamics.

In the slow-time gauge, the quantum models are shown to avoid the singularity. In the geometric-time gauge, the singularity is not avoided by quantum fluctuations. This analysis agrees with related results by Misner, Nutku, and others (as quoted by Ryan [op. cit.]).

The authors finally conjecture that this behaviour is generic and holds true for more general models; the unitary slow-time quantum dynamics would always be nonsingular, while the unitary fast-time quantum dynamics would always lead to collapse.

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