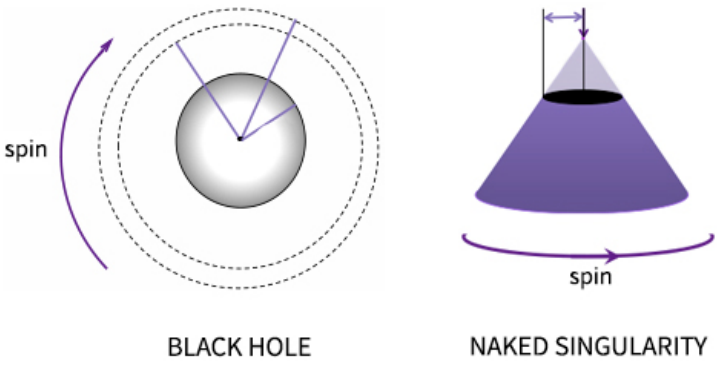
QUANTUM DRESSES FOR NAKED SINGULARITIES

Researchers from the CECs' Theoretical Physics Lab have recently demonstrated that quantum effects can explain why there are no naked singularities in nature. These results confirm – in a particular case – the "cosmic censorship" conjecture, proposed by R. Penrose almost 50 years ago.



Cristián Martínez and Jorge Zanelli , CECs researchers, along with Marc Casals and Alessandro Fabbri , in Brazil and France respectively, investigated one of the rarest objects predicted by Einstein's general relativity: Naked singularities.

Such naked singularities are objects that differ from black holes on a very distinctive feature: they lack event horizons. In the case of a black hole, the event horizon prevents receiving information from the singularity. In the absence of an event horizon, an observer is exposed to information emerging from the naked singularity. The existence of singularities, is a challenge in itself, because those are regions where the space-time curvature and the concentration of energy become infinite, allowing for the violation of fundamental laws of nature, such as energy conservation or the relations of cause and effect.

In their recently published works in *Physics Letters B*[1] and *Physical Review Letters*[2], Martínez, Zanelli and collaborators examine rotating black holes and a naked singularities in two spatial dimensions, to which quantum effects are added. They observe that when these quantum effects are included naked singularities acquire an event horizon, while black holes loose an interior region where naked singularities and closed timelike curves would exist, leaving only the external horizon with the singularity inside.

These results support the “cosmic censorship” conjecture, outlined by Roger Penrose in 1968, according to this, naked singularities should not exist in the universe aside from the Big Bang.

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[1] Quantum dress for a naked singularity, Physics Letters B. https://doi.org/10.1016/j.physletb.2016.06.044

[2] Quantum Backreaction on Three-Dimensional Black Holes and Naked Singularities. Physical Review Letters DOI: https://doi.org/10.1103/PhysRevLett.118.131102