

Abstract Submitted
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A simple non-singular black hole model MANASSE MBONYE,
Rochester Instit of Technology — We present a new and simple model of a non-singular black hole (NSBH) as an end result of gravitational collapse. The matter density grows from $\rho_m=0$, at the matter boundary surface R inside the Schwarzschild horizon, to a maximum $\rho=\rho_{max}$ at a well defined position $0 < r_{\rho_{max}} < R$. For $0 < r < r_{\rho_{max}}$ the matter fluid progressively transitions into a de Sitter-like fluid with a density ρ_d that monotonically grows to maximize as ρ_{max} at $r=0$. In the process the matter fluid density ρ_m falls, toward $\rho_m=0$. The resulting picture resembles that of a first order phase transition in which a well defined mixed- phase system is set up in the inner core, $0 < r < r_{\rho_{max}}$, of the black hole. In this mixed-phase region the net 2-fluid density is constrained to be both constant and maximum. The net fluid pressure p is initially matter-like positive in the outer region but eventually assumes negative enough values to offset singularity formation at the center. The model predicts the de Sitter-like fluid constitutes about 5.5% of the total mass. We show however that only about 24% of this fluid provides the needed anchoring against singularity formation. At all the fluid interfaces the fields are well behaved, and satisfy the required junction conditions. We feel that the model offers a simple but yet logical working picture, in leu of a complete quantum gravity theory, of how matter at high densities might coexist in a mixed-phase with singularity avoiding fields.

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