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Beyond black holes, ultra-strong gravity spacetimes

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The area of spatially stable marginally trapped surfaces (MTS) has a bound that depends on the minimum of a particular component of the Einstein tensor. I will prove that any spacetime containing spatially stable MTSs with area approaching the bound acquire universal properties generically. In particular, they possess marginally trapped tubes foliated by MTS of spherical topology, composed of a dynamical horizon portion and a timelike membrane portion that meet at a preferred round sphere S with constant Gaussian curvature and the maximal area. All such marginally trapped tubes change signature at S , and they develop towards the past with increasing area without limitation. A future singularity also arises. This has particular relevance in the presence of a positive cosmological constant Λ , as then the minimum value is universal and given by Λ itself. These “ultra-massive” spacetimes are more powerful than black holes, as they produce a collapsing universe with no event horizon. They can even overcome the repulsive force of the cosmological constant. Examples and implications will be discussed.

Primary author: MARTIN SENOVILLA, Jose Maria (Istituto Nazionale di Astrofisica (INAF))

Presenter: MARTIN SENOVILLA, Jose Maria (Istituto Nazionale di Astrofisica (INAF))

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