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A Semi-classical Spacetime Region with Maximum Entropy

Wednesday, 29 November 2023 17:00 (15 minutes)

We consider a 4D spherically-symmetric static spacetime region as a collection of quanta in the semi-classical Einstein equation and study the entropy including the self-gravity. For sufficiently excited states, we estimate the entropy in a WKB-like method considering the non-locality of entropy and local consistency with thermodynamics and find its upper bound. The saturation condition uniquely determines the entropy-maximized spacetime as a dense configuration with near-Planckian curvatures and a surface just outside the Schwarzschild radius, and the metric is a non-perturbative solution for Planck constant, leading to the species bound. The maximum entropy then saturates the Bousso bound and coincides with the Bekenstein-Hawking formula. Thus, the Bousso bound in this class of spacetime is verified by constructing the saturating configuration that has no horizon and stores information inside. [arXiv: 2309.00602 (ver2)]

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