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Holographic Entanglement Entropy in the FLRW Universe

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We compute a holographic entanglement entropy via Ryu-Takayanagi prescription in the three-dimensional Friedmann-Lemaître-Robertson-Walker universe. We consider two types of holographic scenarios analogous to the static patch holography and the half de Sitter holography, in which the holographic boundary is timelike and placed in the bulk. We find in general that the strong subadditivity can be satisfied only in the former type, and in addition, the holographic boundary has to fit inside the apparent horizon. Also, for the universe filled with an ideal fluid of constant equation of state w<−1, the condition is sharpened as that the holographic boundary has to fit inside the event horizon instead. These conditions provide a necessary condition for the dual quantum field theory to be standard and compatible with the strong subadditivity. This talk is based on the paper arXiv:2504.10457.

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