



Hyperscaling violation geometry

Yang Lei

Context

- 1. The entanglement entropy
- 2. Motivation of hyperscaling violation
- 3. The singularity

Ryu-Takayanagi

- Calculating entanglement entropy from the gravity side

$$S = \frac{\gamma_A}{4G}$$

- Usually, the entanglement entropy satisfies the area law.

Hyperscaling violation

- **We find some systems which do not obey area law - logarithmic violation - Fermi surface arxiv: 1111.1023**
- **What's the gravitational dual?**
- **Hyperscaling violation geometry.**

$$ds^2 = \frac{1}{z^2} \left(- \frac{dt^2}{z^{\frac{2d(\gamma-1)}{d-\theta}}} + z^{\frac{2\theta}{d-\theta}} dz^2 + dx_i^2 \right)$$

Singularity in Lifshitz like spacetime

- **arxiv: 1111.1243**
- **There is a singularity in Lifshitz spacetime - divergent tidal force.**
- **Infalling observer will feel uncomfortable.**

Singularity in hyperscaling violation geometry

- **arxiv: 1210.1231**
- **arxiv: 1112.2702**

$$ds^2 = -r^m dt^2 + \frac{dr^2}{r^n} + r^2(dx^2 + dy^2)$$