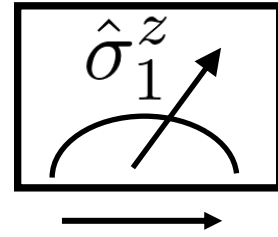**P20.** Measurement-only dynamical phase transition of topological and boundary order in toric code and gauge-Higgs models

Institute for Solid State Physics, The University of Tokyo, Takahiro Orito

# Projective measurement

Entangled state (Bell state)

 $\hat{\sigma}_1^z$

Product state

$$|\Psi\rangle = \frac{1}{\sqrt{2}}(|\uparrow_1\uparrow_2\rangle + |\downarrow_1\downarrow_2\rangle)$$
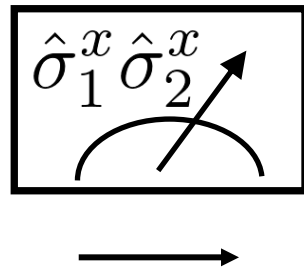
$$|\Psi\rangle = |\uparrow_1\uparrow_2\rangle \text{ or } |\Psi\rangle = |\downarrow_1\downarrow_2\rangle$$

Does any measurement reduce entanglement?

Product state

 $\hat{\sigma}_1^x\hat{\sigma}_2^x$

Entangled state (Bell state)

$$|\Psi\rangle = |\uparrow_1\uparrow_2\rangle$$

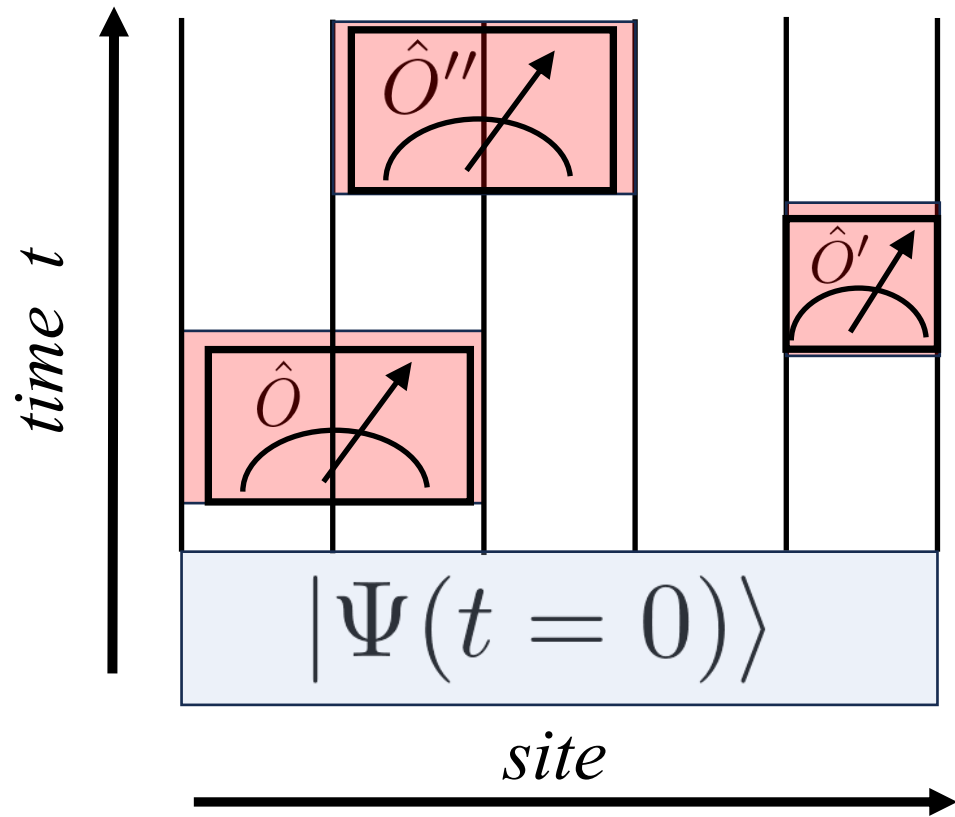$$|\Psi\rangle = \frac{1}{\sqrt{2}}(|\uparrow_1\uparrow_2\rangle + |\downarrow_1\downarrow_2\rangle)$$

or

$$|\Psi\rangle = \frac{1}{\sqrt{2}}(|\uparrow_1\uparrow_2\rangle - |\downarrow_1\downarrow_2\rangle)$$
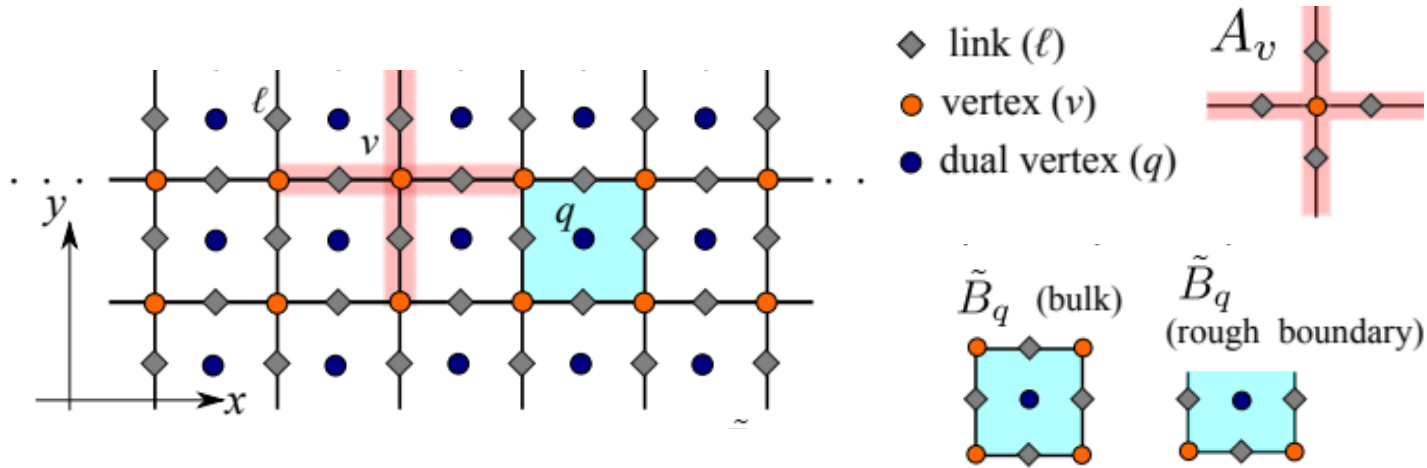
Measurement can induce entanglement

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# Quantum circuit

# Toric code like circuit



Measurement induces "dynamics"

### Target

Non-equilibrium behavior of toric code like circuit and topological and boundary order

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