

Title: Complexity

Date: Jul 21, 2016 02:30 PM

URL: <http://pirsa.org/16070071>

Abstract:



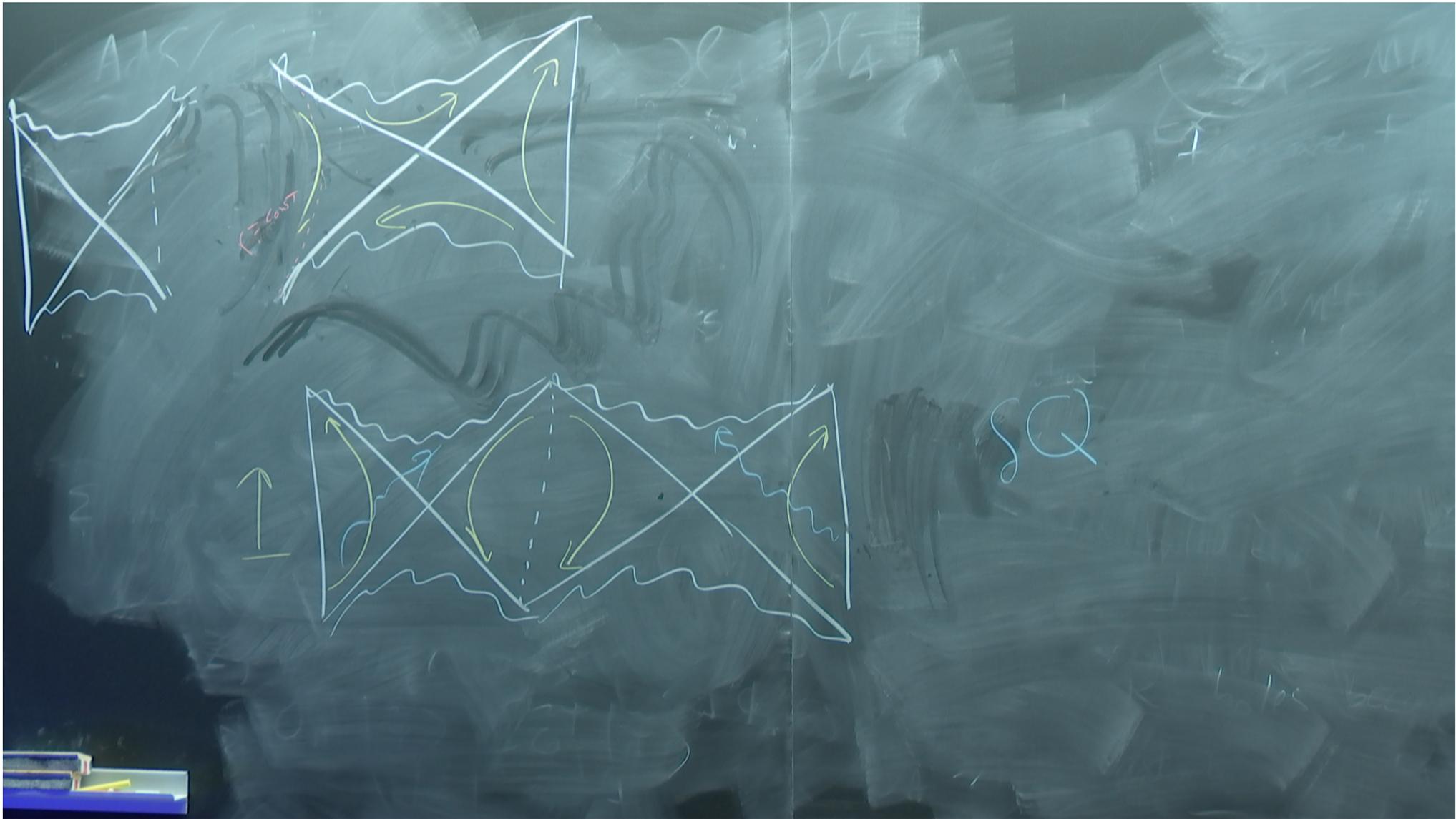
$$t_* = \frac{\beta}{\sum_i c_i} \log S$$

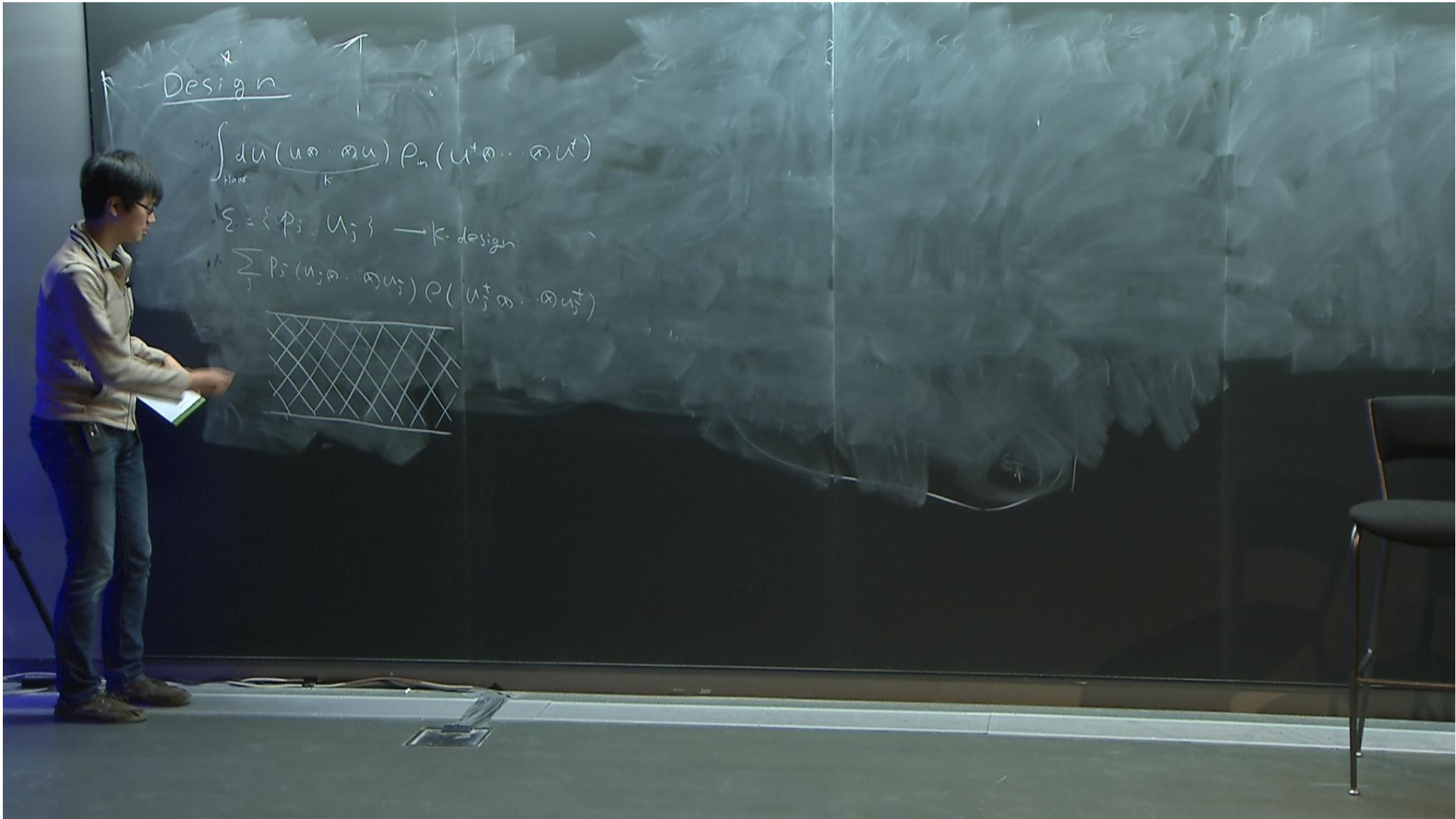
$$V(t) = \frac{t}{2} + \log \left( 1 + e^{t_w t - t_*} \right)$$

$$t < t_w - t_*$$

$$V(t) = -\frac{t}{2} + t_w t - t_*$$

1 equilibrium

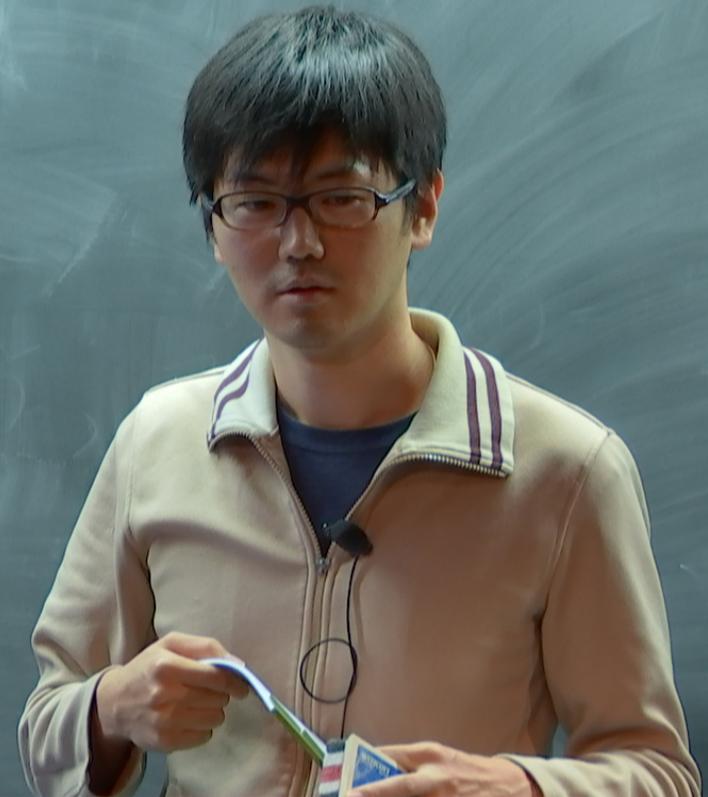




Out-of-Time Ordered correlators

$$\langle A_1(t) B_1(t) A_2(0) B_2(t) A_3(0) \dots A_k(0) B_k(t) \rangle_{\mathcal{E}}$$

2k-point OTO correlators



Out-of-Time Ordered Correlators

$$\langle A_1(0) B_1(t) A_2(0) B_2(t) A_3(0) \dots A_k(0) B_k(t) \rangle_{\Sigma}$$

2k-point OTO correlators

• Frame Potential

$$F = \frac{1}{|\Sigma|^2} \sum_{u, v \in \Sigma} |\text{Tr}(u^\dagger v)|^{2k} \quad \text{minimized iff } \Sigma \text{ is } k\text{-design}$$

Out-of-Time Ordered Correlators

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2k-point OTO correlators

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Out-of-Time Ordered Correlators

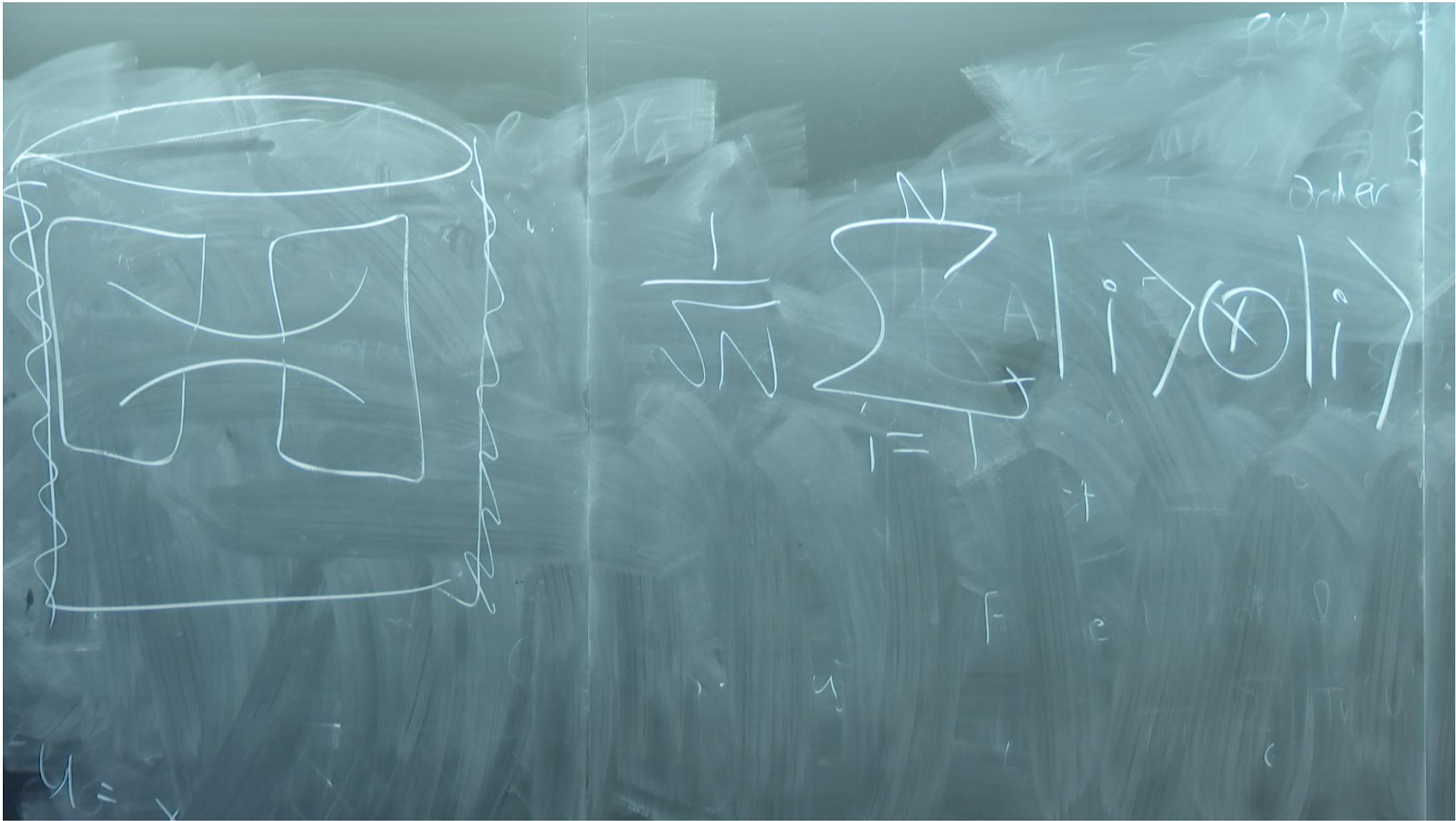
$$\left\langle A_1(0) B_1(t) A_2(0) B_2(t) A_3(0) \cdots A_k(0) B_k(t) \right\rangle_{\mathcal{E}} \Big|_{\mathcal{D}}$$

Average of

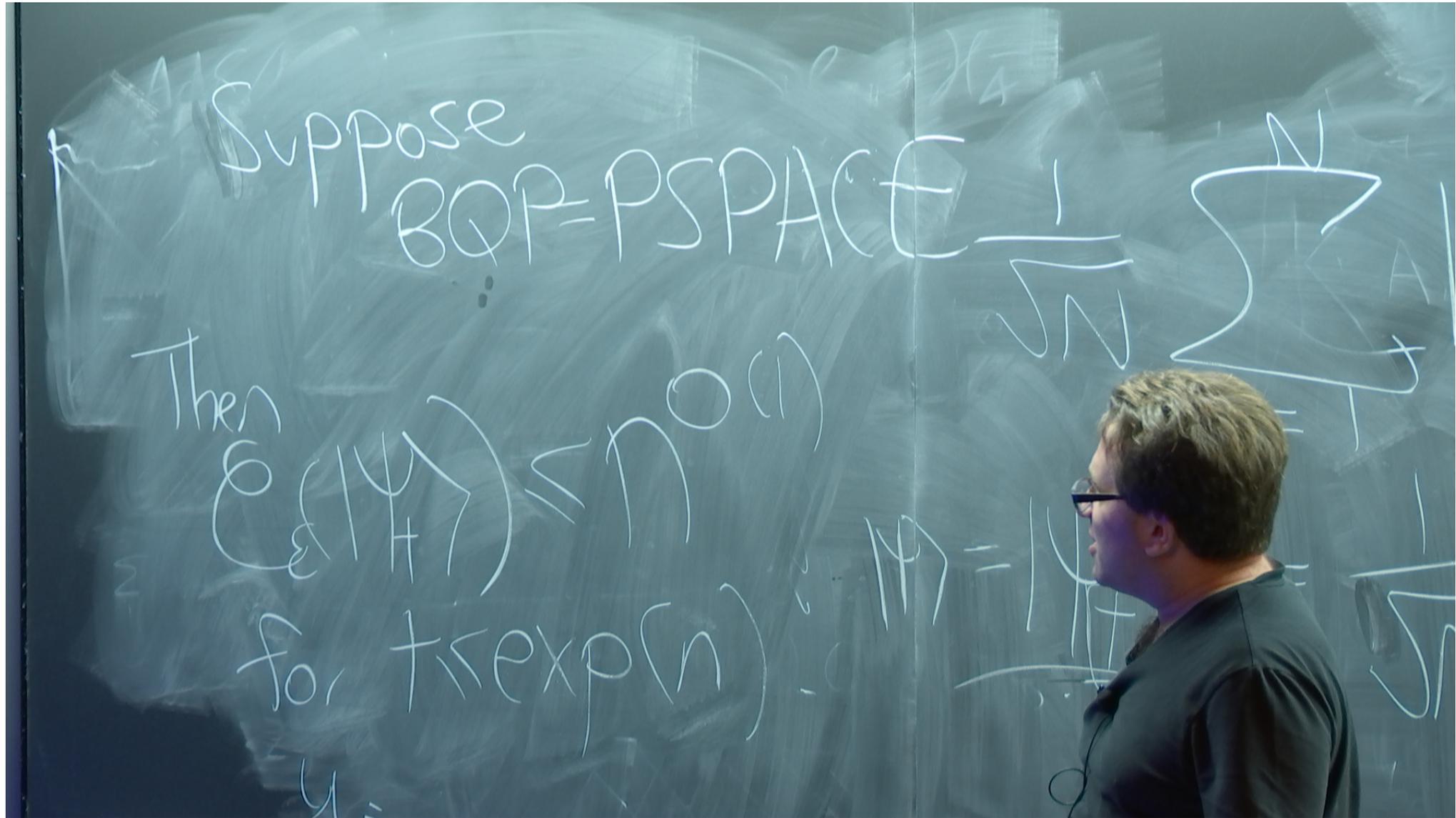
2k-point OTO correlators

• Frame Potential

$$F = \frac{1}{|\mathcal{E}|^2} \sum_{u, v \in \mathcal{E}} |\text{Tr}(u^\dagger v)|^{2k} \quad \text{minimized iff } \mathcal{E} \text{ is } k\text{-design.}$$







Proof: Suppose  $C_{\epsilon}(|\psi\rangle) \leq n^{O(\epsilon)}$

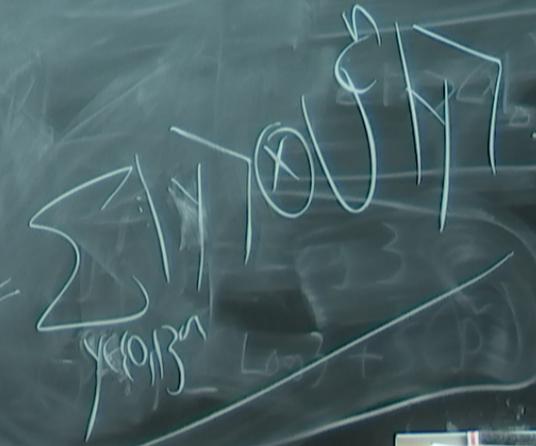
Let  $L \in PSPACE$

Want to decide if  $x \in L$

A.2004:  $PP = PostBQP$

PostBQP/poly

description of circuit that prepares  $|\psi\rangle$



Measure  
Postselect

1st register.  
 $y = \sum x$