Classical Simulation of Quantum Systems

Lectures 5 & 6

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Frank Verstraete, University of Vienna

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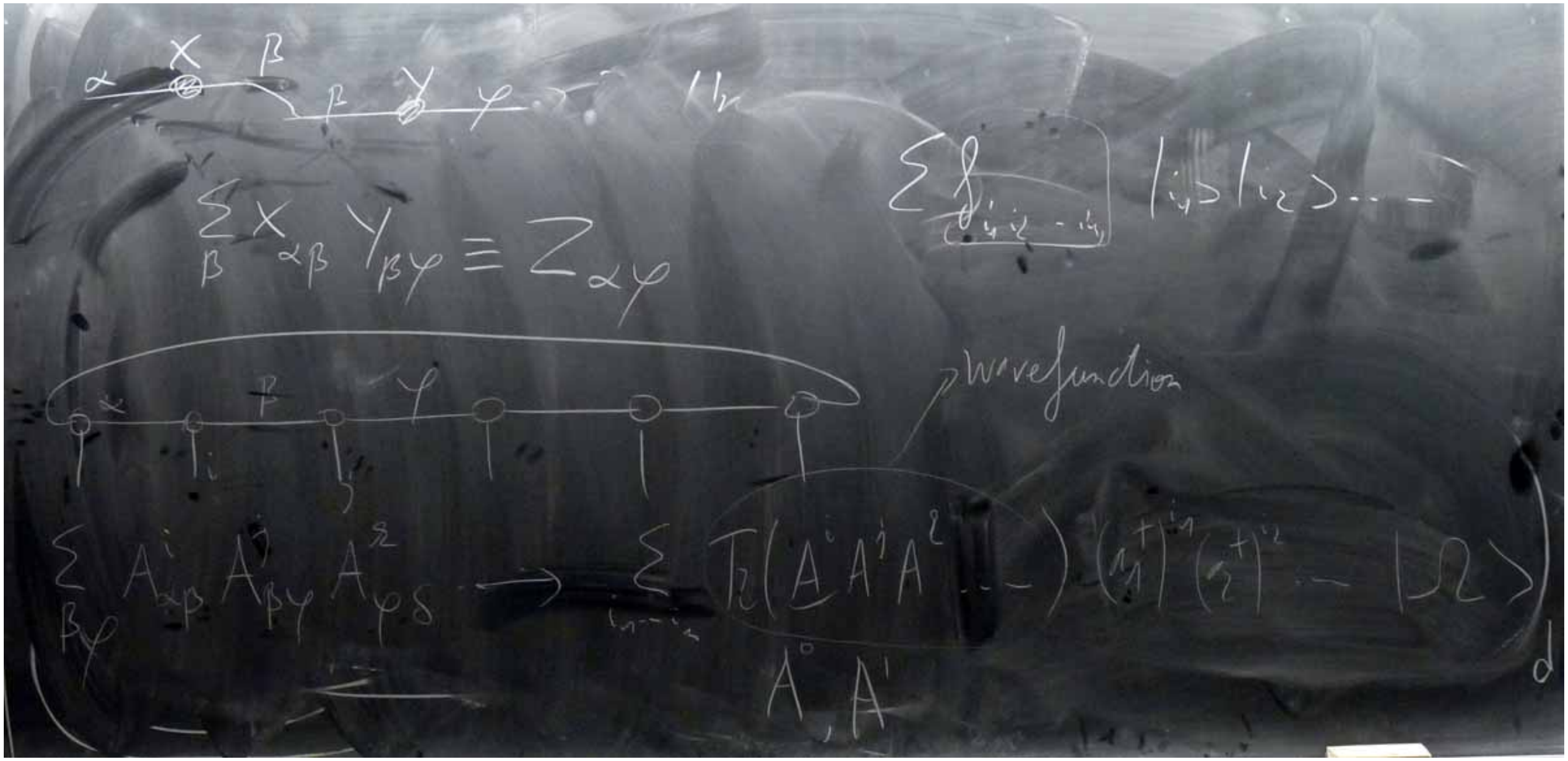
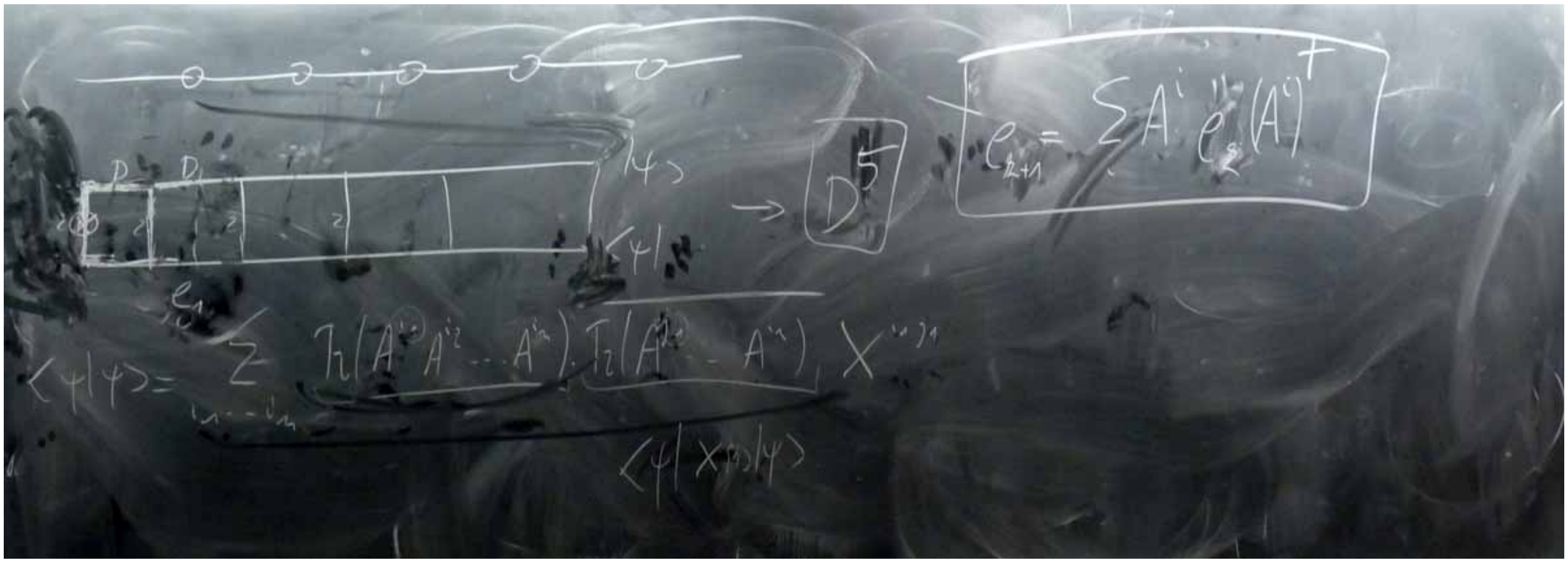
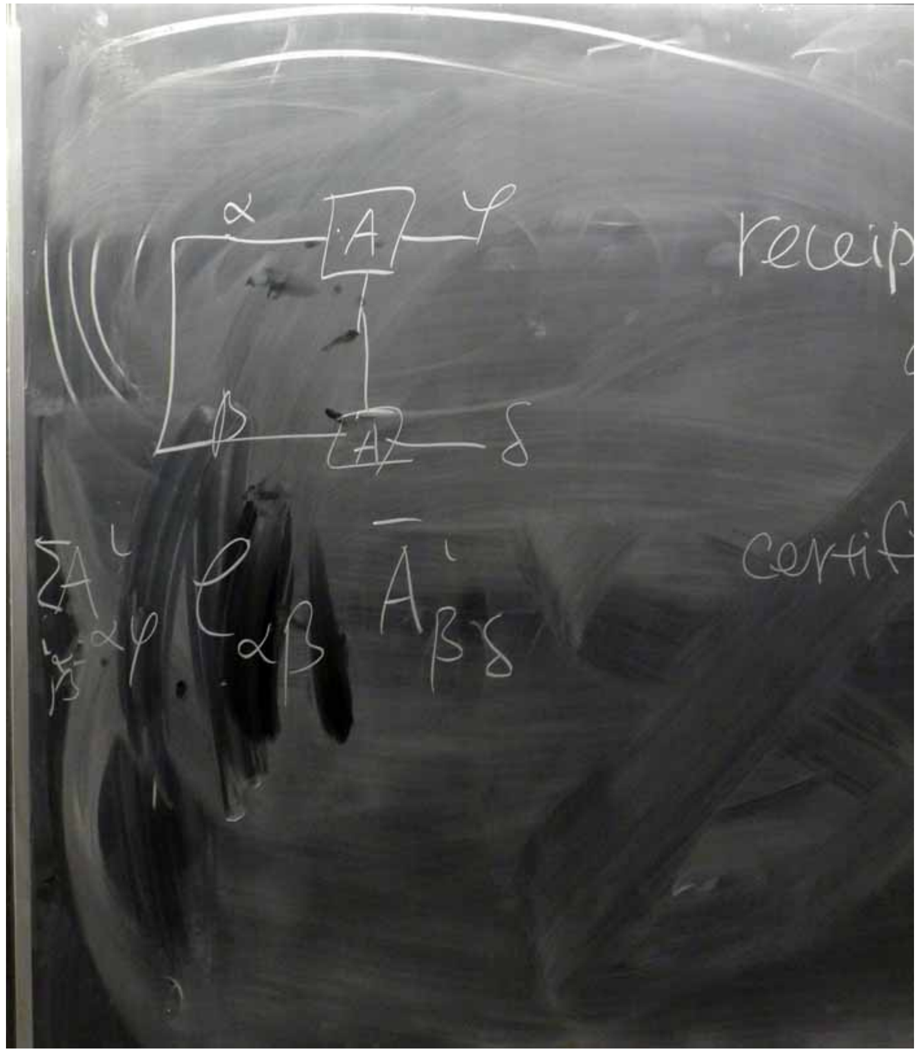
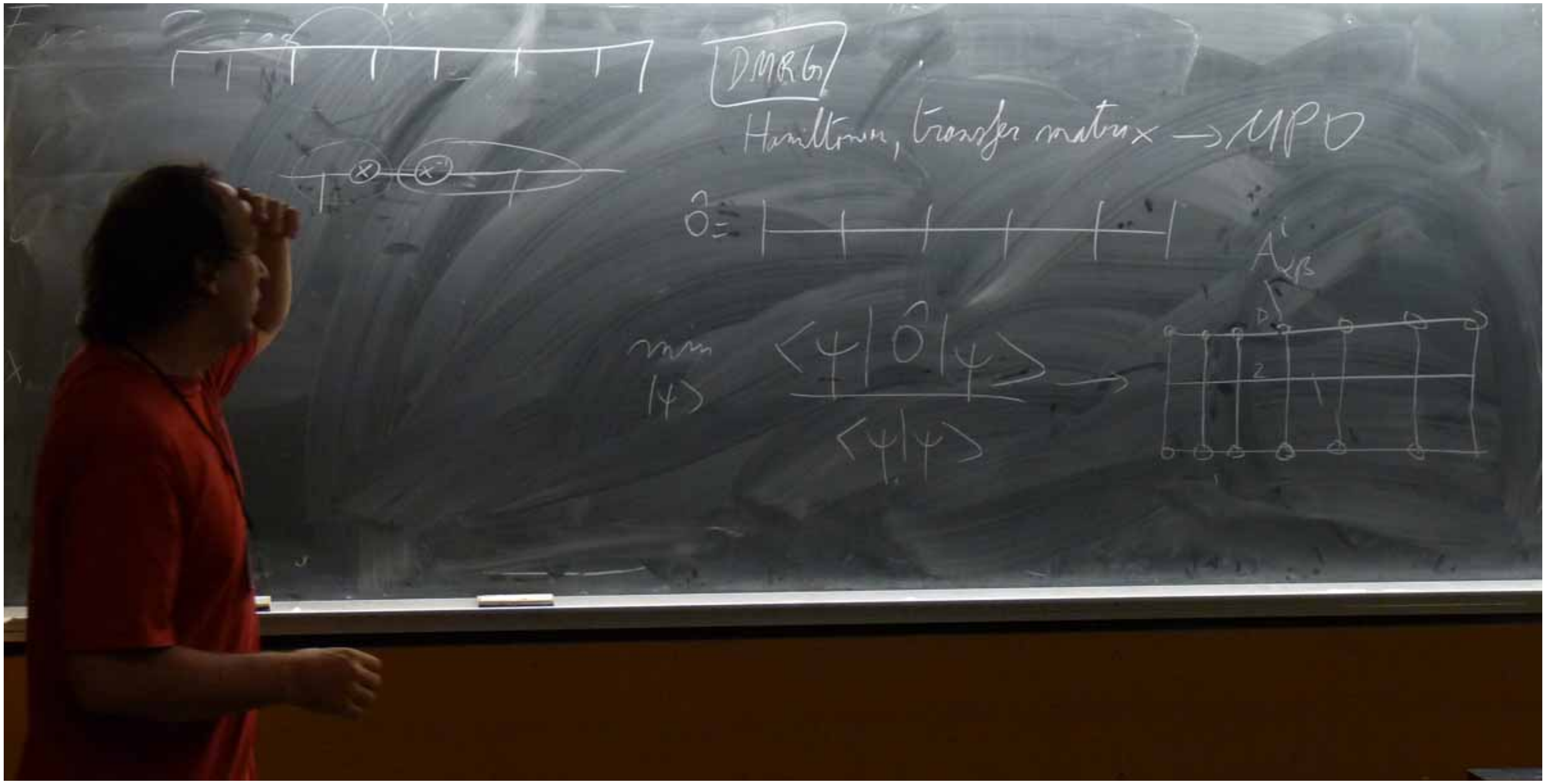


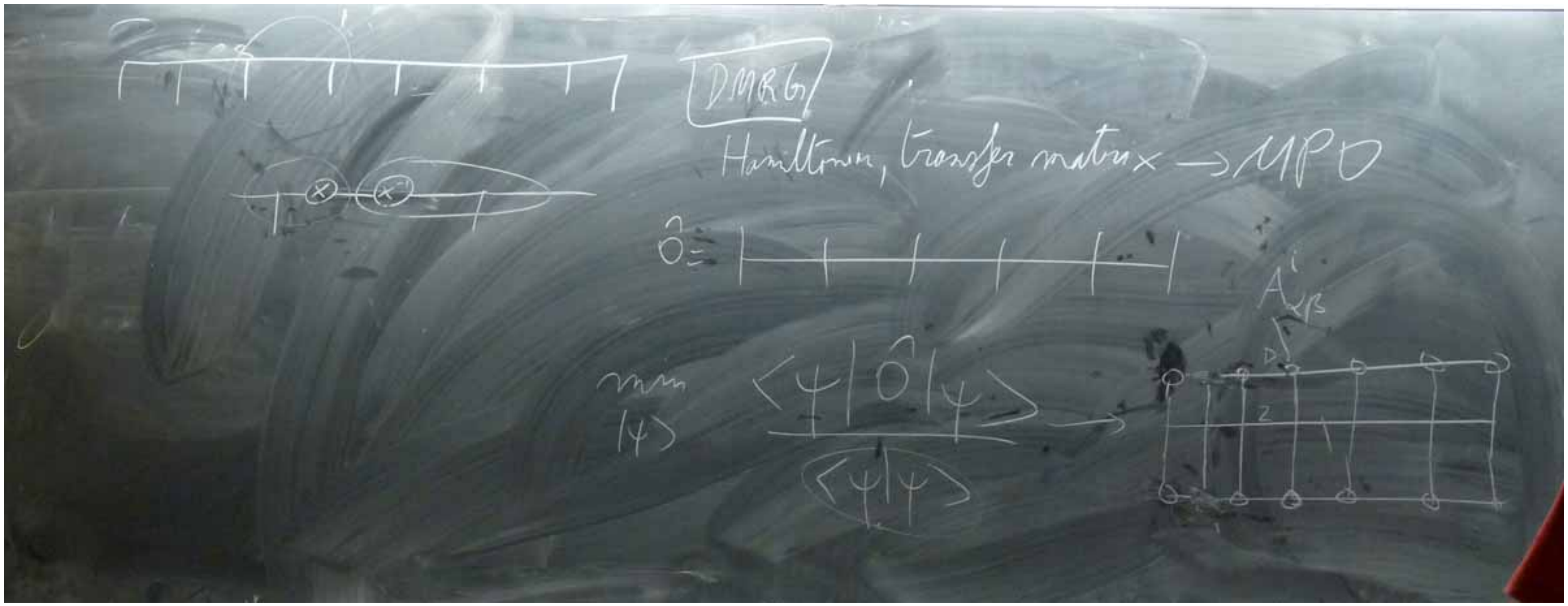
Σ X Y ≡ Z
wavefunction

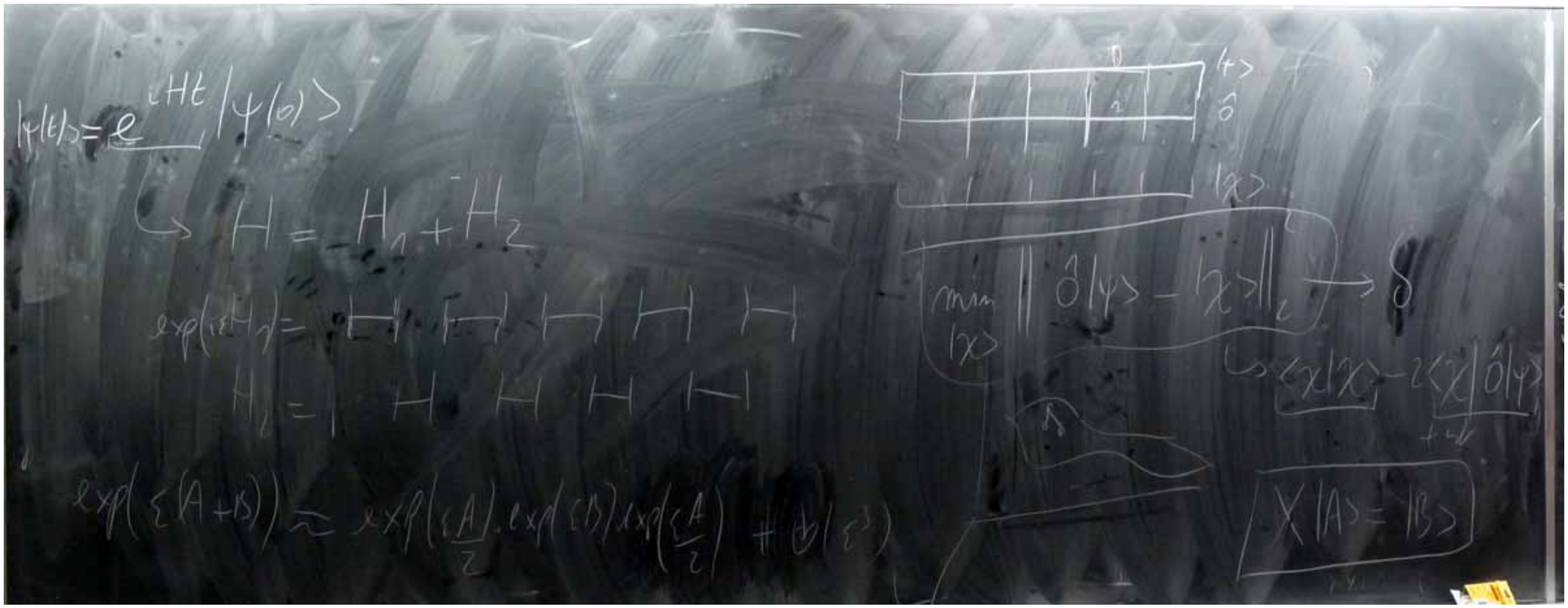

|ψ⟩
⟨ψ|
D5
ρk+1 = Σ Ai ρk (Ai)†
⟨ψ|ψ⟩ = Σ Tr(Ai1 Ai2 ... Ain) Tr(A ... A) X
⟨ψ|X(n)|ψ⟩


α
A
φ
β
A
δ
receip
certif



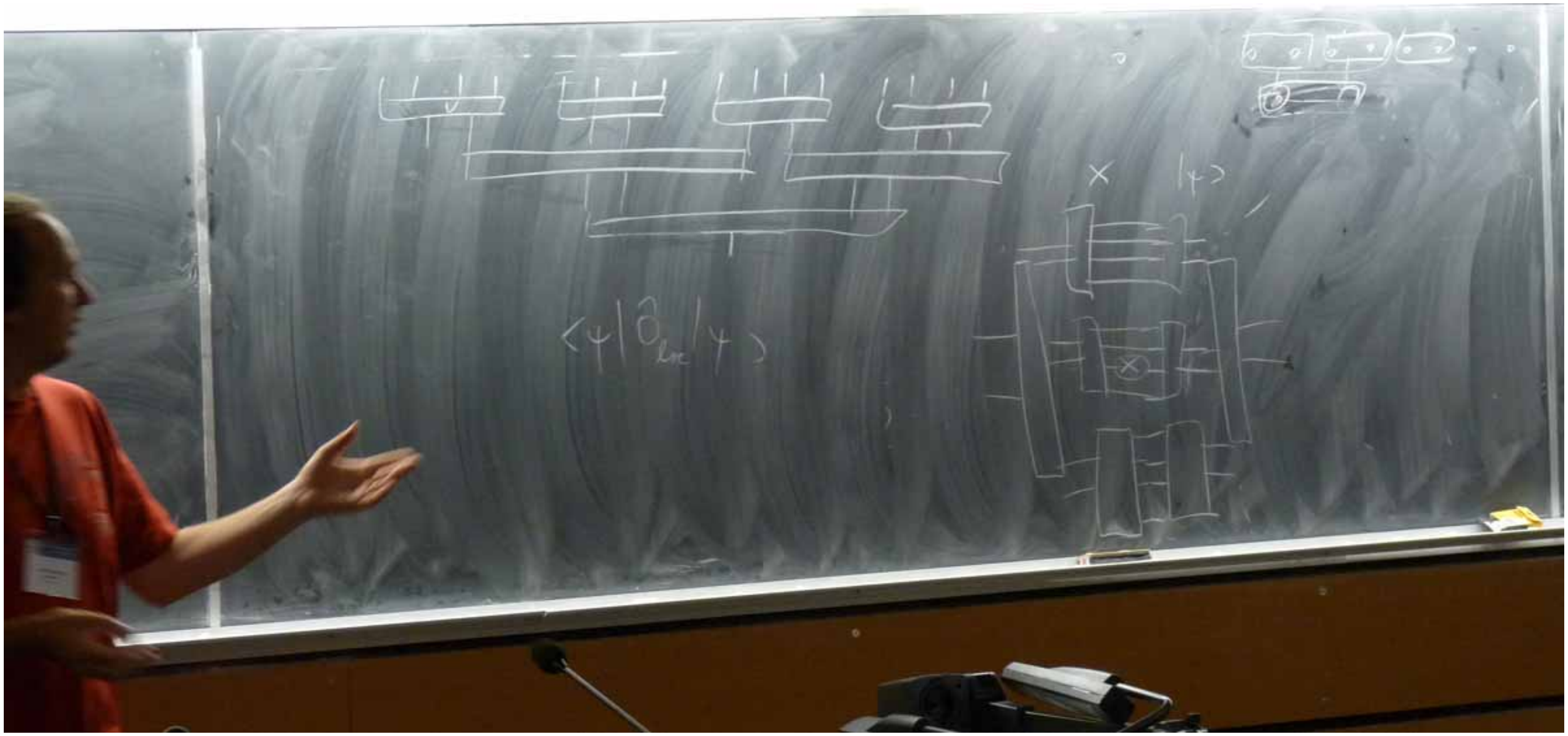
DMRG
Hamiltonian, transfer matrix → MPO
Ô=
⟨ψ|Ô|ψ⟩ / ⟨ψ|ψ⟩
|ψ⟩


DMRG
Hamiltonian, transfer matrix → MPO
Ô =
⟨ψ|Ô|ψ⟩
⟨ψ|ψ⟩
|ψ⟩
$A^i_{\alpha\beta}$


|ψ(t)> = e^{iHt}|ψ(0)>
H = H_1 + H_2
exp(iεH_1) =
H_2 =
exp(ε(A+B)) ≈ exp(εA/2) exp(εB) exp(εA/2) + O(ε^3)
|ψ>
Ô
|χ>
min_{|χ>} || Ô|ψ> − |χ> ||_2 → δ
<χ|χ> − 2<χ|Ô|ψ>
X|A> = |B>

PEPS
D^5
D^3
D^10
AREA


H = Σ J_i S_i S_{i+1}
J_0 >> J_1, J_2


⟨ψ| O_loc |ψ⟩
|ψ⟩

⟨ψ|O_loc|ψ⟩
× |ψ⟩