Title: Integrable systems and vacua of N=2* theories

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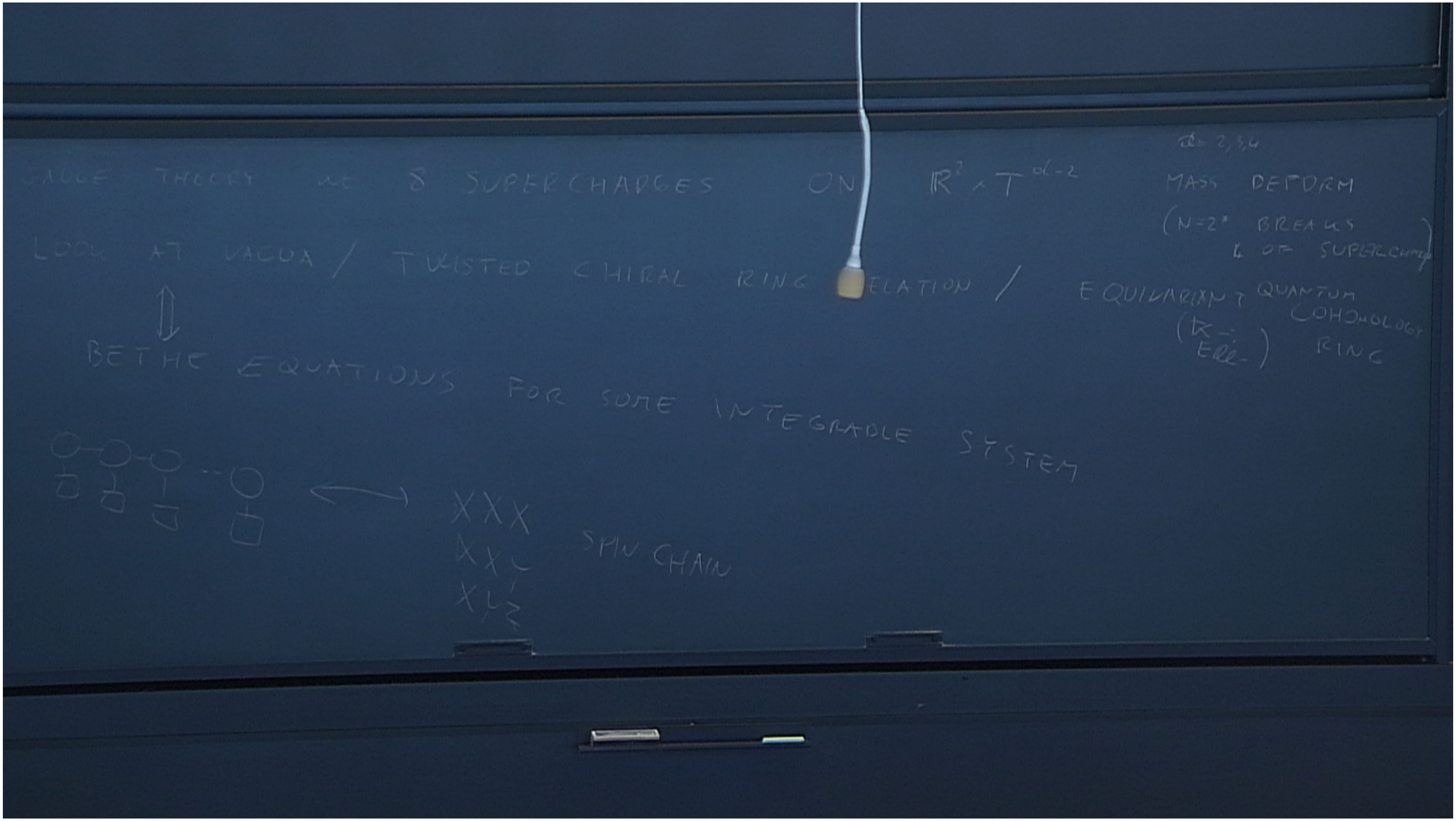
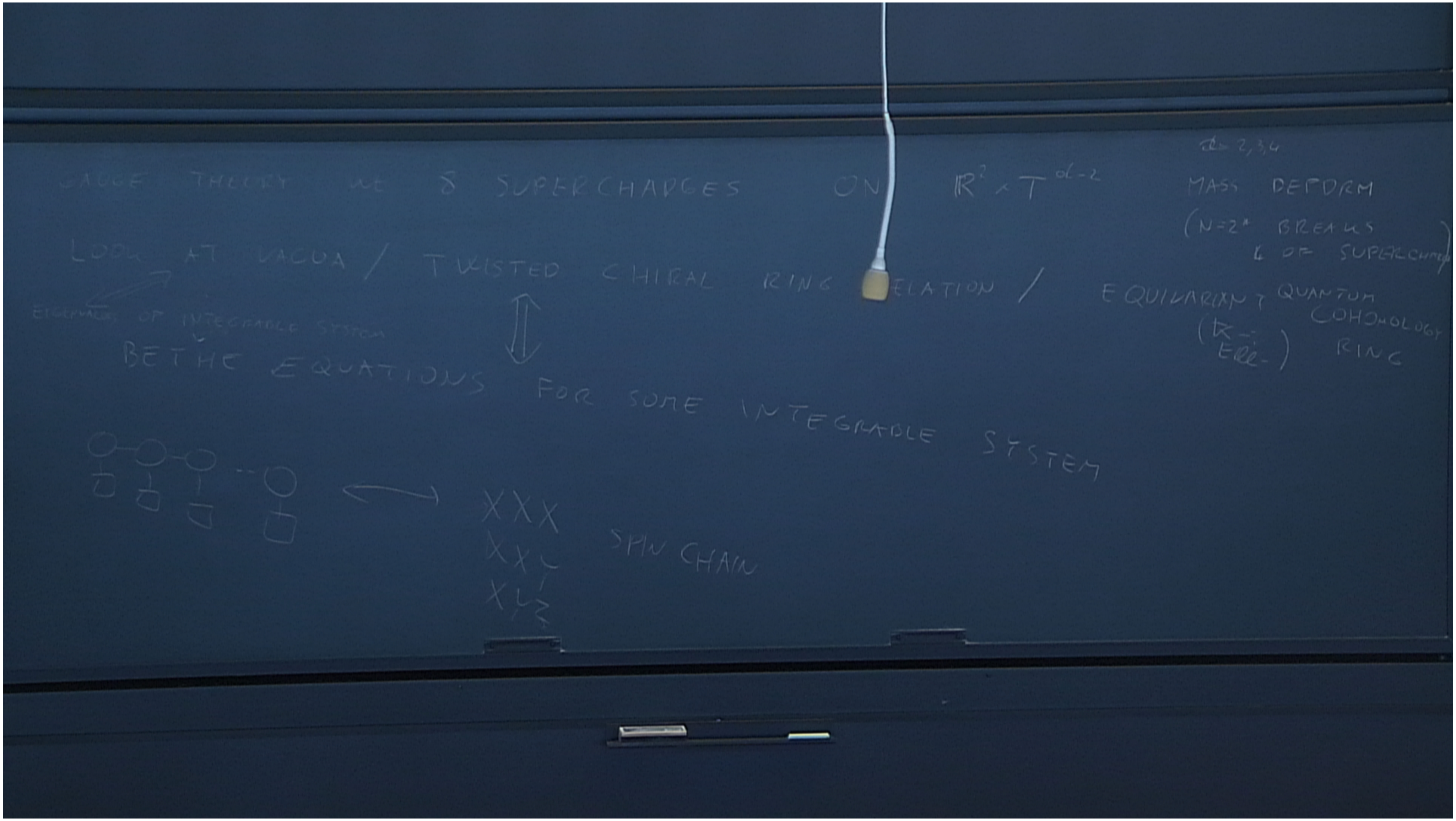
Abstract:


d = 2,3,4
THEORY w 8 SUPERCHARGES ON R² × T^(d-2)
MASS DEFORM
(N=2* BREAKS 4 OF SUPERCHARGES)
LOOK AT VACUA / TWISTED CHIRAL RING RELATION / EQUIVARIANT QUANTUM COHOMOLOGY RING
BETHE EQUATIONS FOR SOME INTEGRABLE SYSTEM
XXX
XXZ
XYZ
SPIN CHAIN


GAUGE THEORY WE 8 SUPERCHARGES ON R² x T^(d-2)
d = 2,3,4
MASS DEFORM
(N=2* BREAKS 4 OF SUPERCHARGES)
LOOK AT VACUA / TWISTED CHIRAL RING RELATION / EQUIVARIANT QUANTUM COHOMOLOGY RING
EIGENVALUES OF INTEGRABLE SYSTEM
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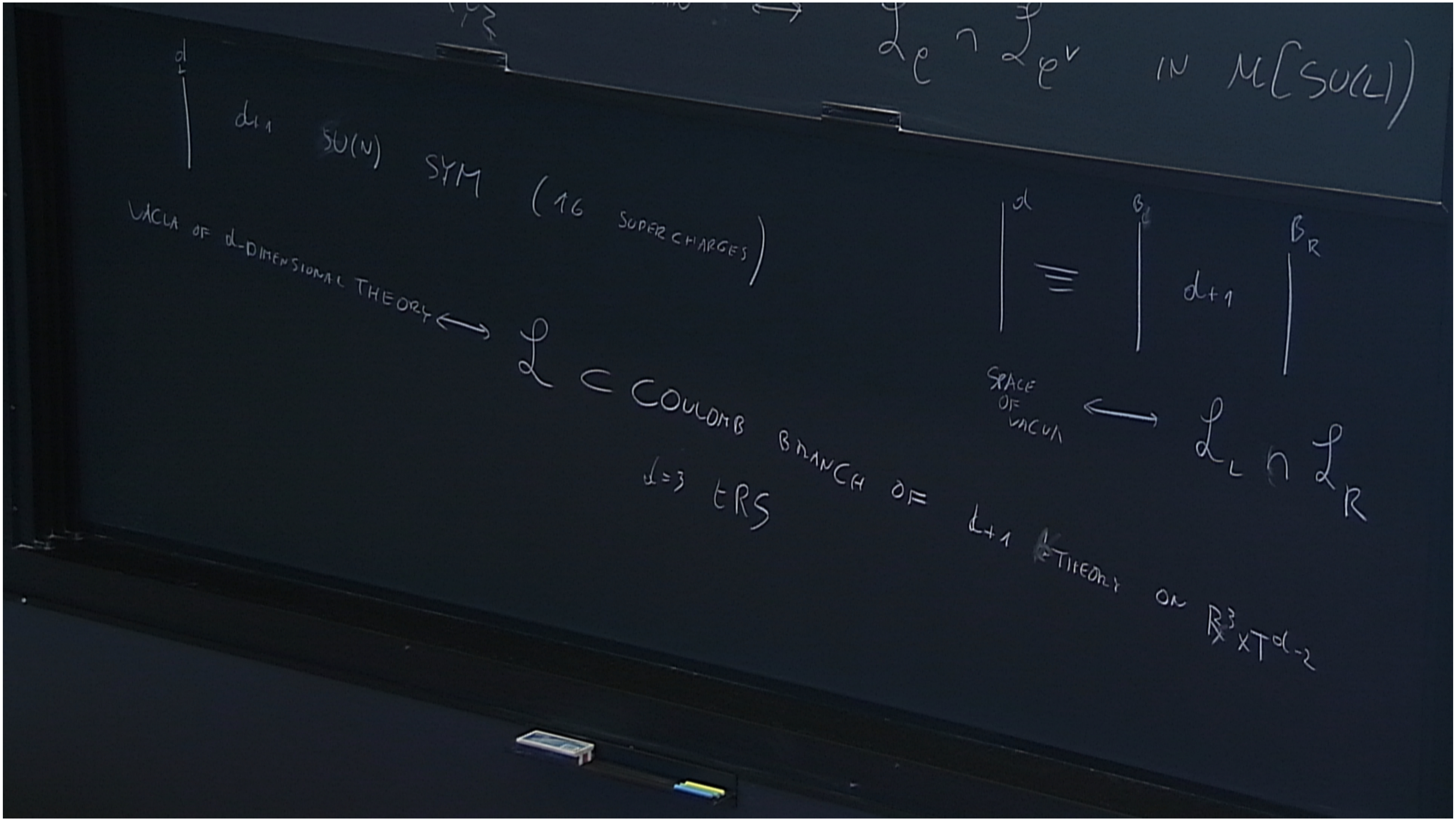
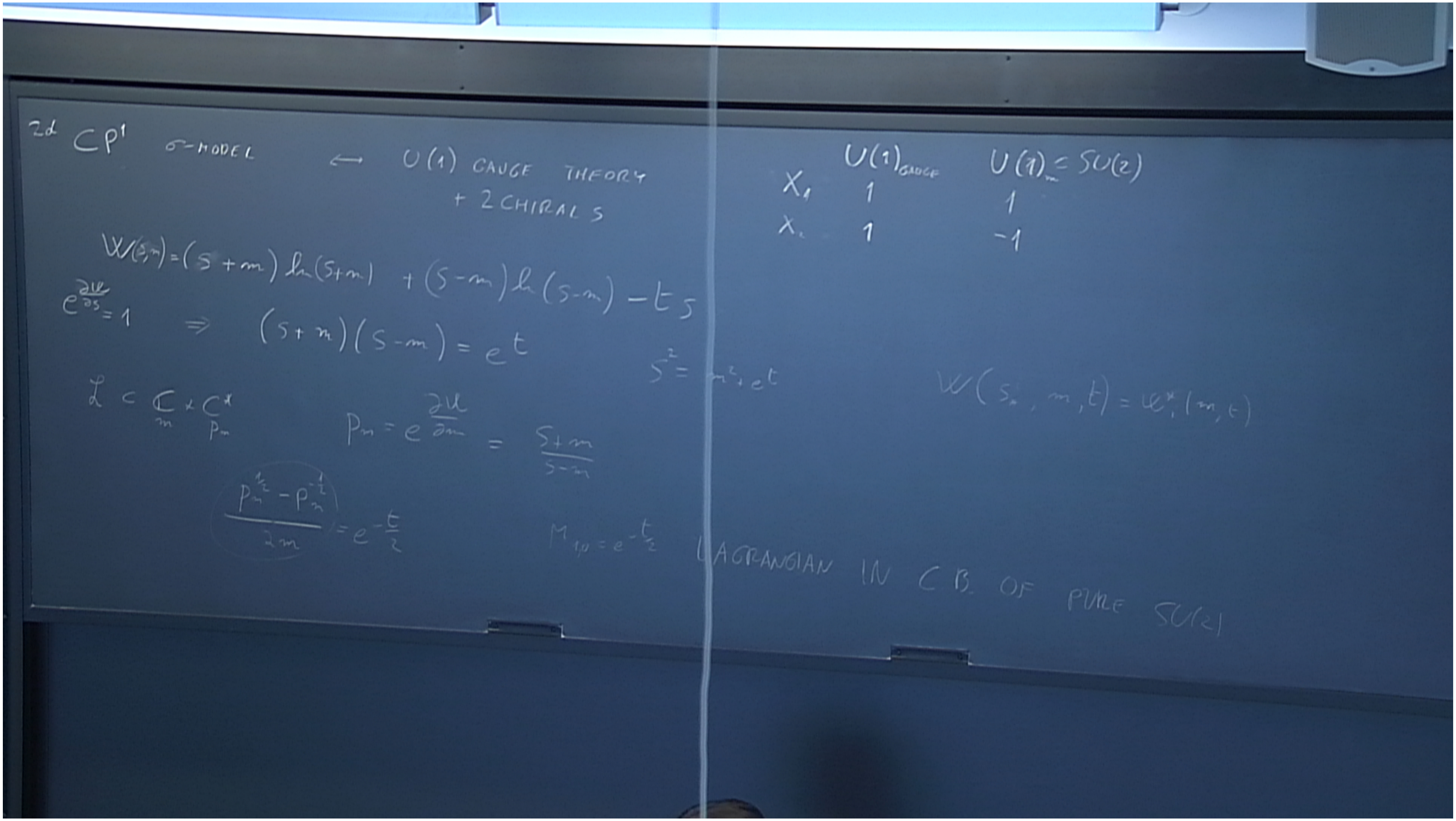
SPIN CHAIN


IN M(SU(2))
d+1 SU(N) SYM (16 SUPERCHARGES)
VACUA OF d-DIMENSIONAL THEORY ⟷ 𝓛 ⊂ COULOMB BRANCH OF d+1 THEORY ON ℝ³ × T^{d-2}
d=3 ERS
d
d+1
B_R
SPACE OF VACUA ⟷ 𝓛_L ∩ 𝓛_R


2d CP¹ σ-MODEL ⟷ U(1) GAUGE THEORY
+ 2 CHIRALS
U(1) GAUGE   U(1) = SU(2)
X1 1 1
X2 1 -1
W(s,m) = (s+m) ln(s+m) + (s-m) ln(s-m) - ts
(s+m)(s-m) = e^t
s² = m² + e^t
W(s*, m, t) = W*(m, t)
LAGRANGIAN IN C.B. OF PURE SU(2)

$P_m = e^{\frac{\partial \mathcal{U}}{\partial m}} = \frac{S+m}{S-m}$

$\frac{P_m^{\frac{1}{2}} - P_m^{-\frac{1}{2}}}{2m} = e^{-\frac{t}{2}}$

$M_{1,0} = e^{-\frac{t}{2}}$

$P_t = \frac{\partial \mathcal{U}}{\partial t} = S$

$\hat{\mathcal{D}}$ · DIFFERENCE EQN. FOR J-FUNCT

LAGRANGIAN $\mathcal{L}$ IN C.B. OF PURE SU(2)

GIVENTAL, TELEMAN

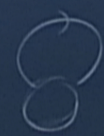
$T^* CP^1 \longleftrightarrow$

$e^{\frac{\partial \mathcal{U}}{\partial S}} = 1 \Rightarrow \left[(S+\epsilon)^2 - m^2\right] = \left[(S-\epsilon)^2 - m^2\right] e^{t}$

$P_m = \frac{S^2 - (\epsilon+m)^2}{S^2 - (m-\epsilon)^2}$

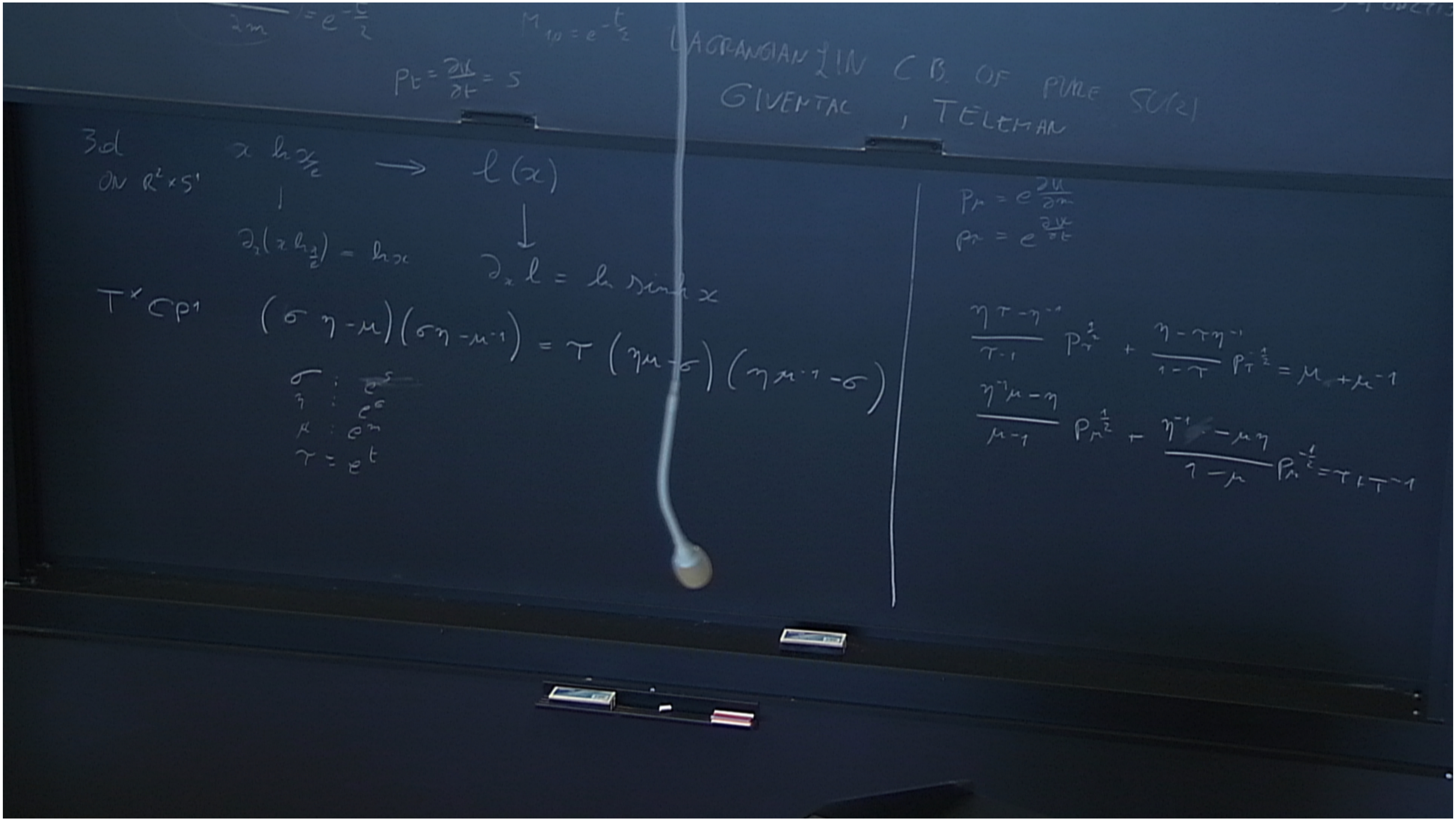
	$U(1)_g$	$U(1)_m \subset SU(2)$	$U(1)_\epsilon$
X_1	1	1	1
X_2	1	-1	1
Y_1	-1	-1	1
Y_2	-1	1	1
Φ	0	0	-2

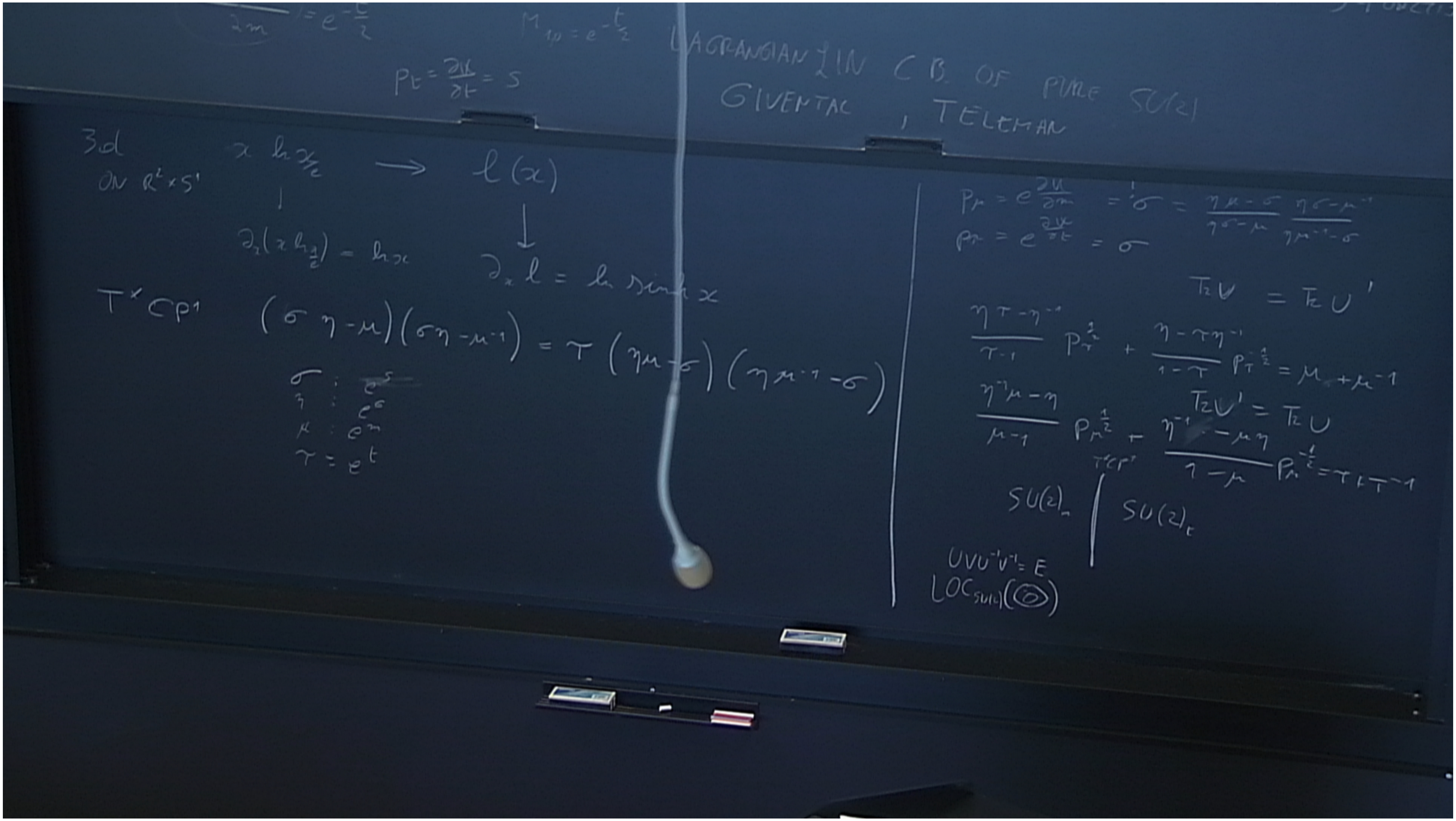
$W^{\text{NOT TWISTED}} = \Phi X \cdot Y$

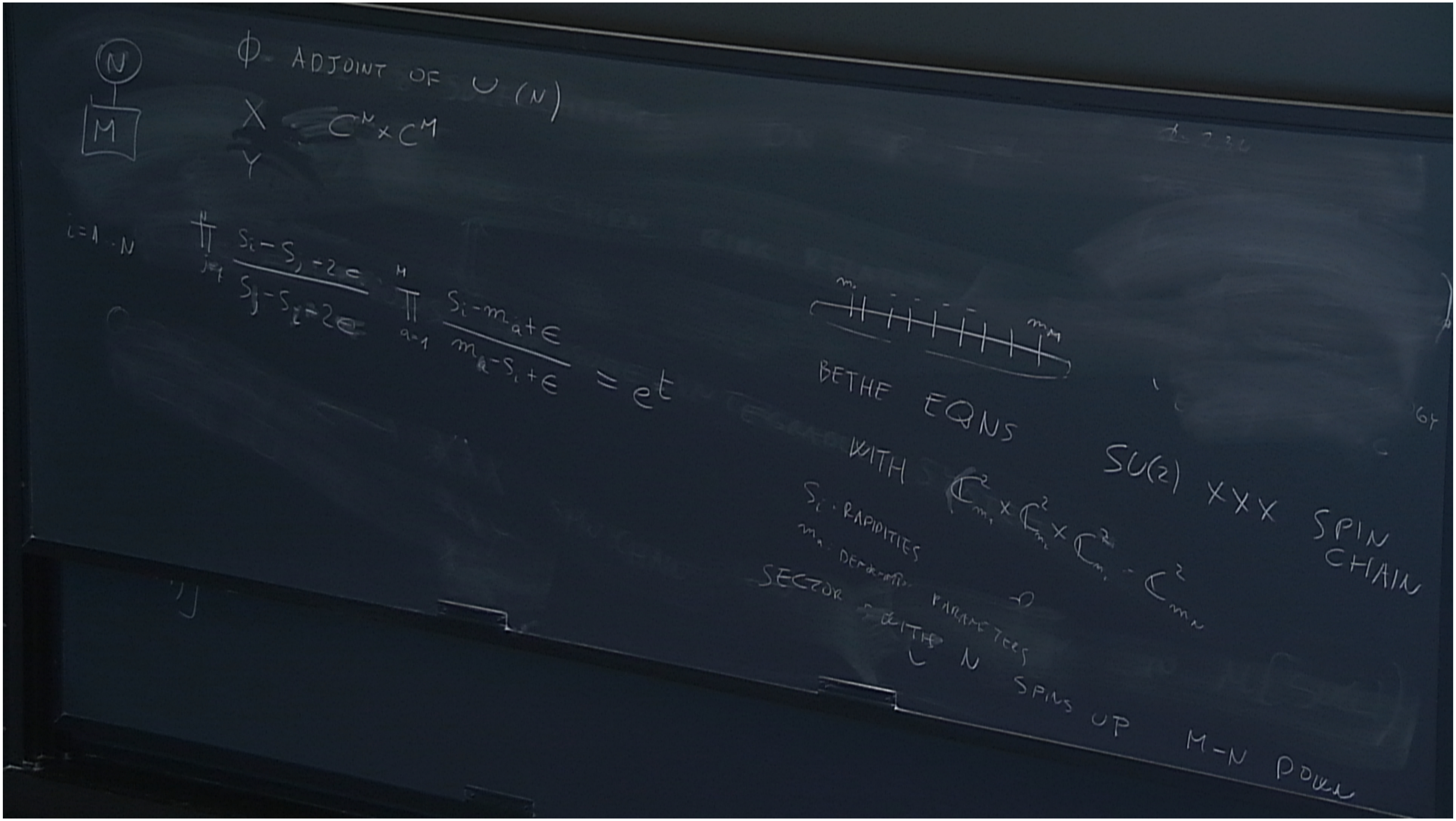


$$\boxed{\frac{(m-\epsilon) P_m^{\frac{1}{2}} + (m+\epsilon) P_m^{-\frac{1}{2}}}{2m}} = e^{\frac{t}{2}} + e^{-\frac{t}{2}}$$

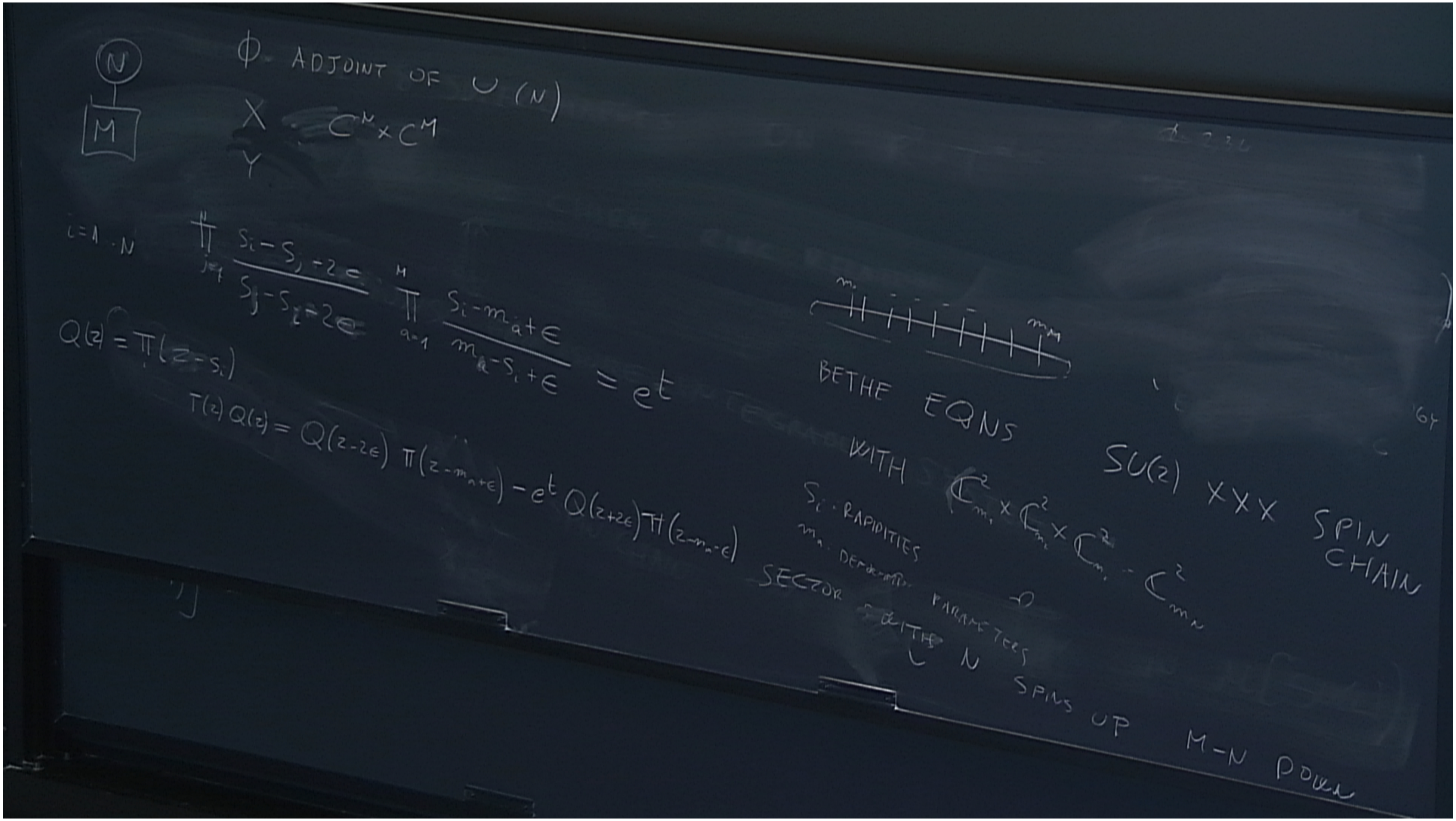
LAGRANGIAN IN C.B. OF 3d SU(2) + Adj OF MASS ϵ

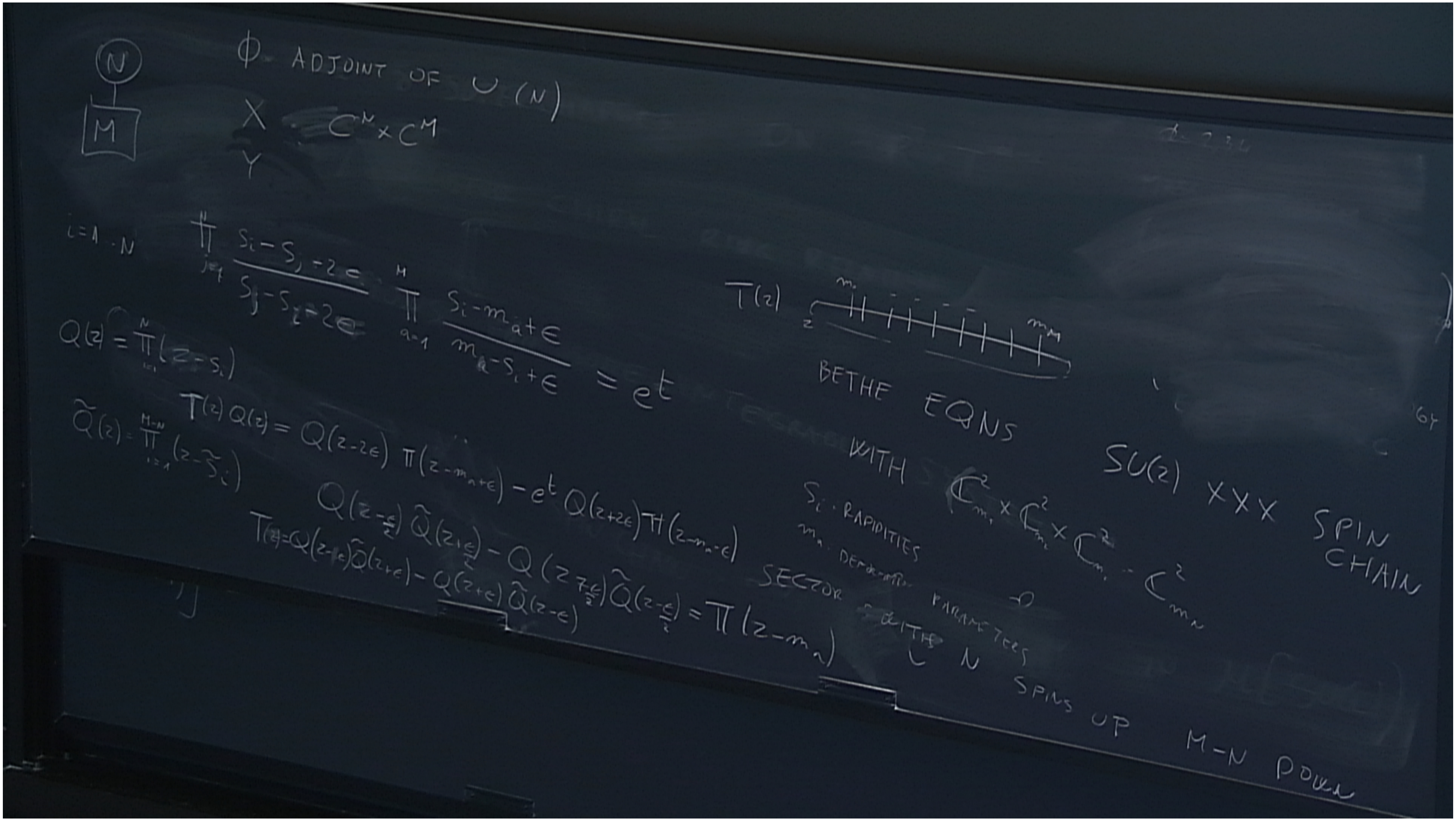

LAGRANGIAN IN C.B. OF PURE SU(2)
GIVENTAL , TELEMAN
3d
ON R²×S¹
T*CP¹

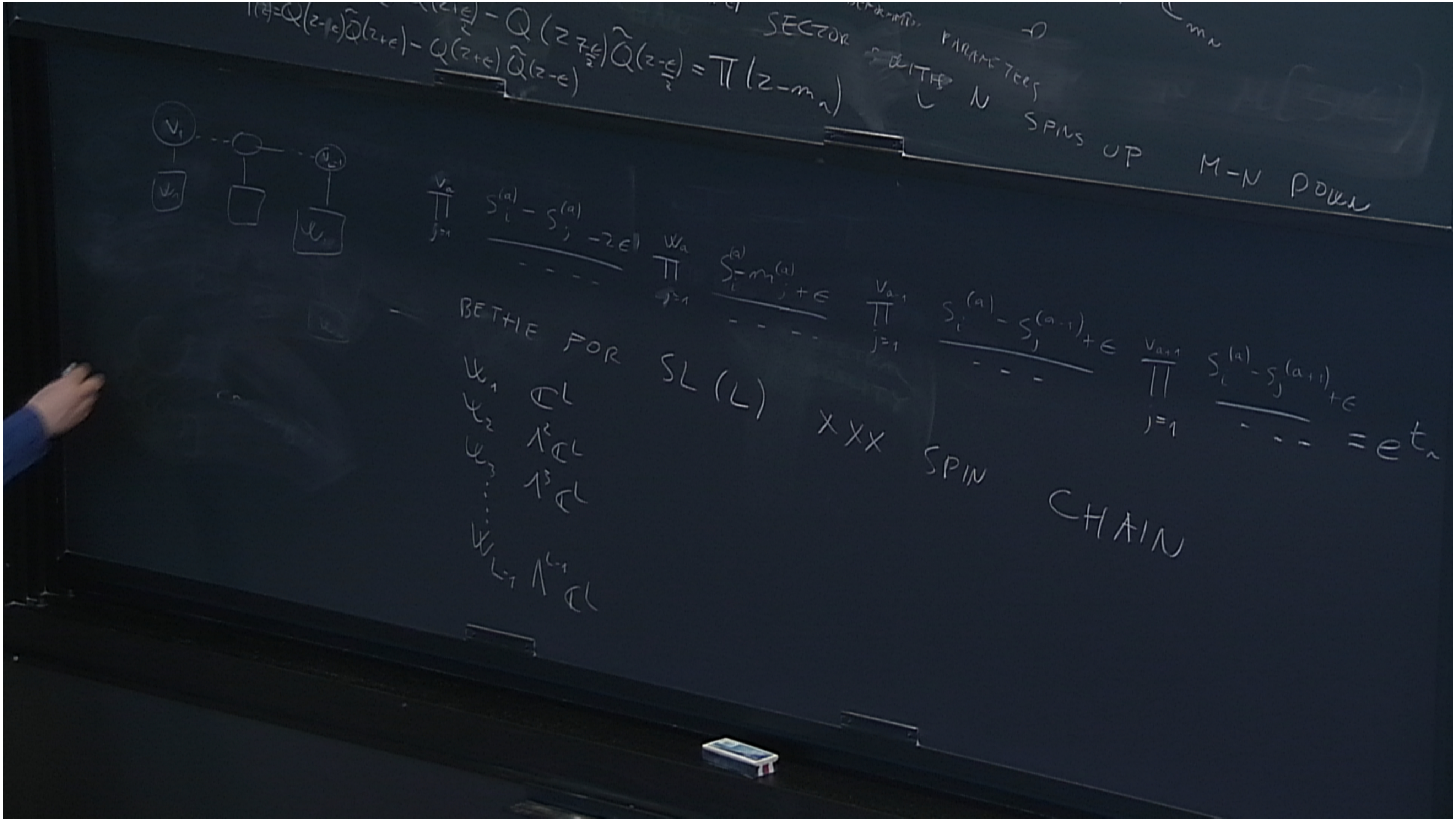

LAGRANGIAN L IN C.B. OF PURE SU(2)
GIVENTAL , TELEMAN
3d
ON R²×S¹
T*CP¹
SU(2)
SU(2)
UVU⁻¹V⁻¹ = E
LOC

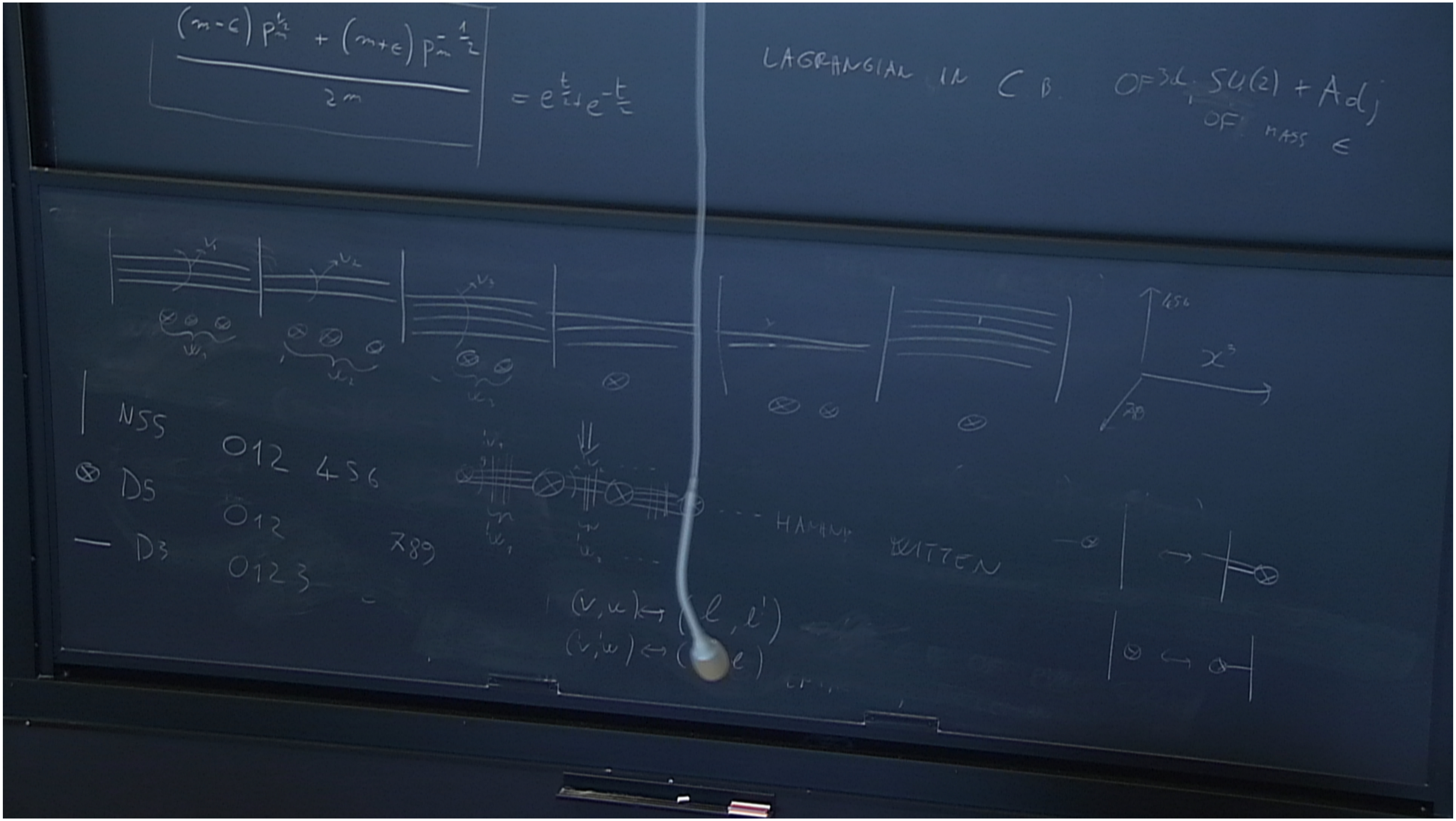


N
M
Φ ADJOINT OF U(N)
X, Y $C^N \times C^M$
$i = 1 \ldots N$
$\prod_{j\neq i}^{N} \frac{s_i - s_j - 2\epsilon}{s_j - s_i - 2\epsilon} \prod_{a=1}^{M} \frac{s_i - m_a + \epsilon}{m_a - s_i + \epsilon} = e^t$
m_1 m_M
BETHE EQNS
WITH $\mathbb{C}^2_{m_1} \times \mathbb{C}^2_{m_2} \times \mathbb{C}^2_{m_3} \cdots \mathbb{C}^2_{m_M}$
SU(2) XXX SPIN CHAIN
s_i - RAPIDITIES
m_a - DEFORMATION PARAMETERS
SECTOR WITH N SPINS UP M−N DOWN


N
M
ϕ ADJOINT OF U(N)
X C^N × C^M
Y
i=1..N
Q(z) = ∏(z − s_i)
T(z) Q(z) = Q(z−2ε) ∏(z − m_a + ε) − e^t Q(z+2ε) ∏(z − m_a − ε)
BETHE EQNS
WITH
SU(2) XXX SPIN CHAIN
s_i · RAPIDITIES
SECTOR
N
SPINS UP
M−N DOWN


N
M
φ - ADJOINT OF U(N)
X , Y - C^N × C^M
i = 1 .. N
T(z)
BETHE EQNS
WITH C²_{m_1} × C²_{m_2} × C²_{m_3} ... C²_{m_M}
SU(2) XXX SPIN CHAIN
S_i : RAPIDITIES
SECTOR
N SPINS UP
M-N DOWN


SECTOR
PARAMETERS
WITH N
SPINS UP
M−N DOWN
BETHE FOR SL(L)
XXX SPIN
CHAIN


LAGRANGIAN IN C B OF 3d SU(2) + Adj
OF MASS ∈
NS5 012 456
D5 012 789
D3 0123
HANANY WITTEN