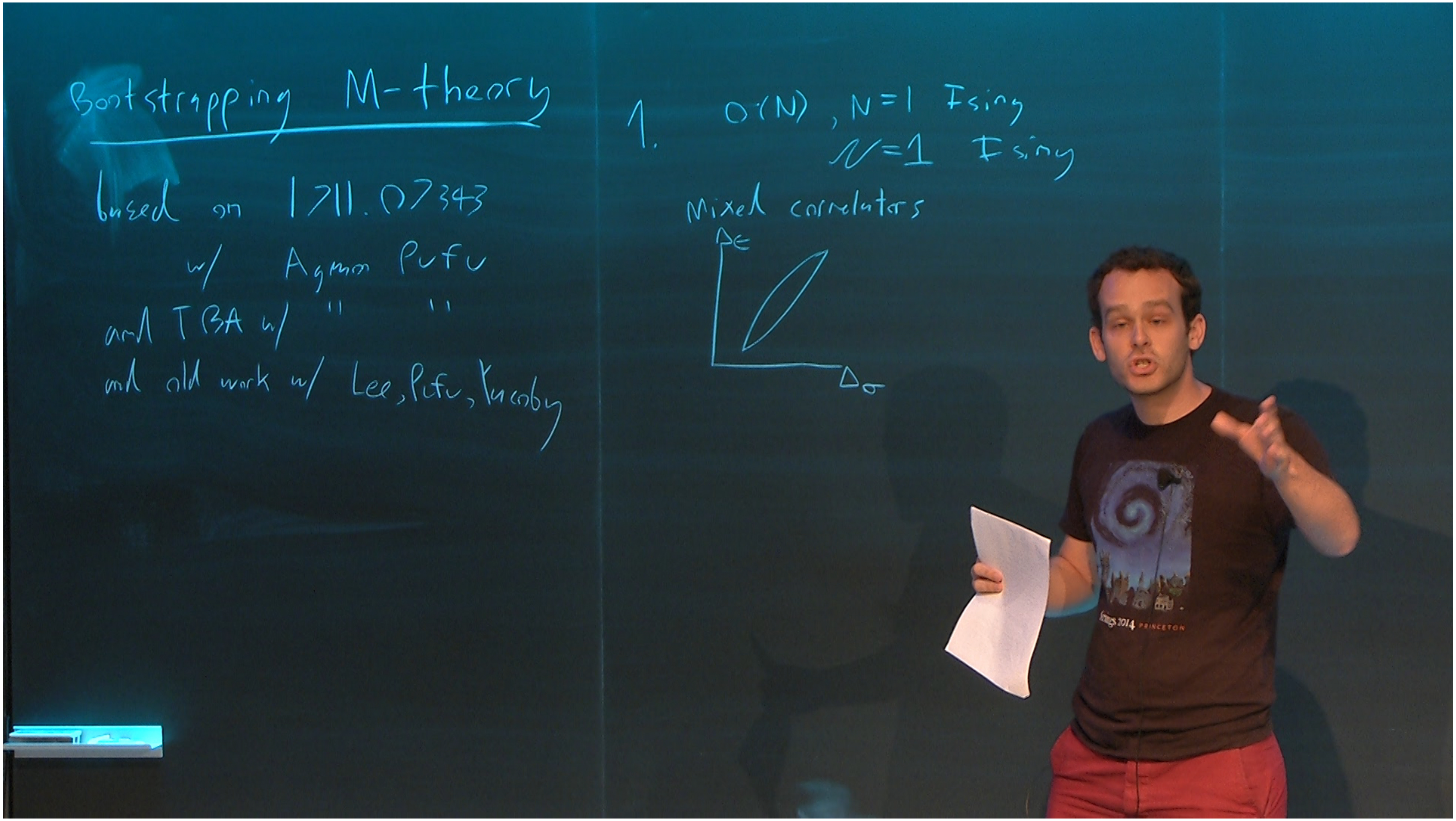
Title: Precision Islands for ABJM theory from Mixed Correlator Bootstrap

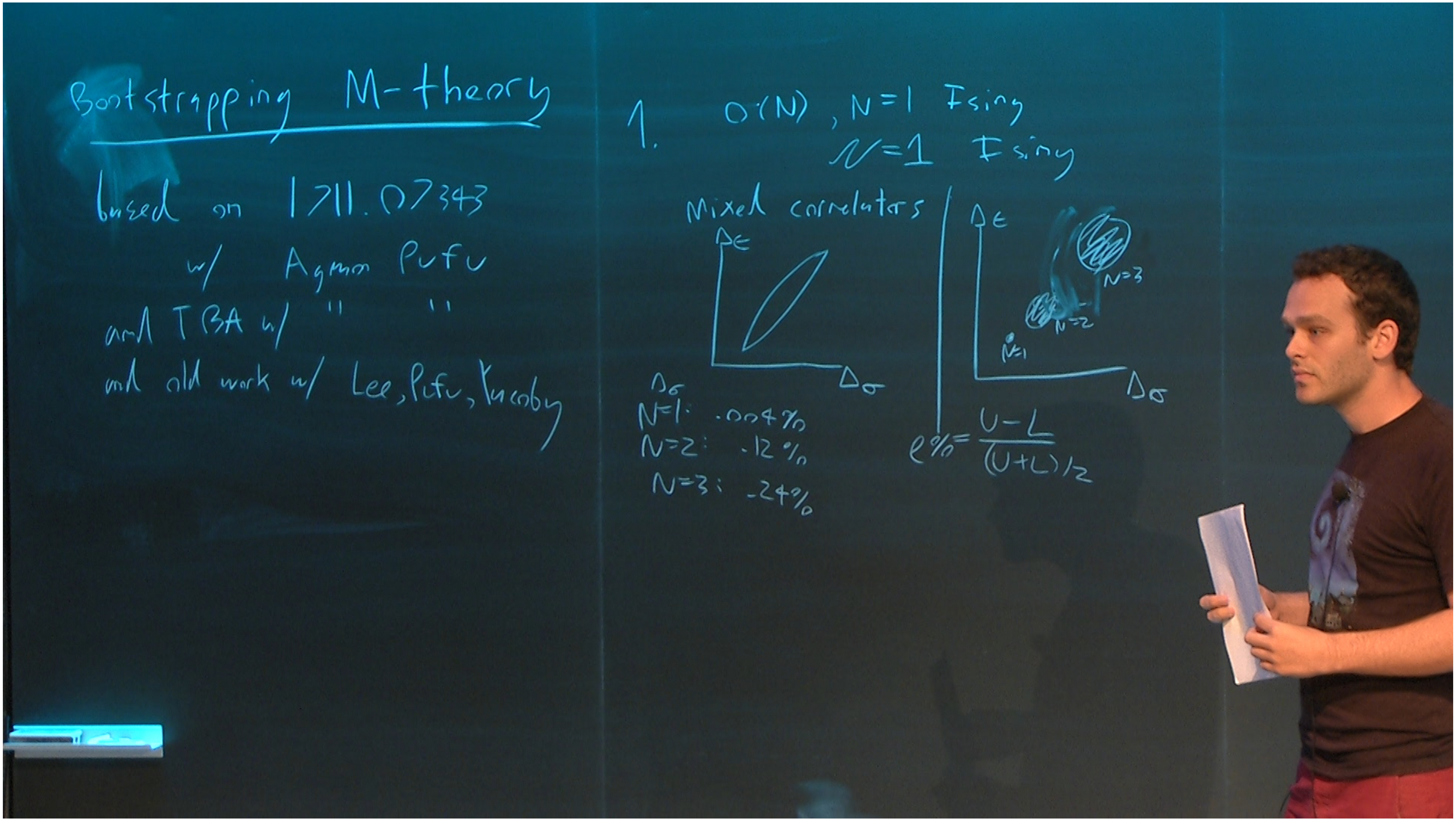
Speakers: Shai Chester

Collection: Bootstrap 2019

Date: July 19, 2019 - 11:30 AM

URL: http://pirsa.org/19070060

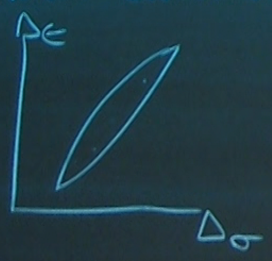

Bootstrapping M-theory
based on 1711.07343
w/ Agmon Pufu
and TBA w/ " "
and old work w/ Lee, Pufu, Yacoby
1. O(N), N=1 Ising
$\mathcal{N}=1$ Ising
Mixed correlators
Δ_ϵ
Δ_σ
Strings 2014 PRINCETON

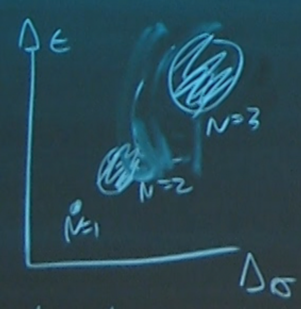

Bootstrapping M-theory
based on 1711.07343
w/ Agmon Pufu
and TBA w/ " "
and old work w/ Lee, Pufu, Yacoby
1. O(N), N=1 Ising
N=1 Ising
Mixed correlators
Δε
Δσ
N=1: .004%
N=2: .12%
N=3: .24%
N=3
N=2
N=1
e% = (U−L)/((U+L)/2)

1. $O(N)$, $N=1$ Ising

$\mathcal{N}=1$ Ising

Mixed correlators





Δ_σ

$N=1$: .004%

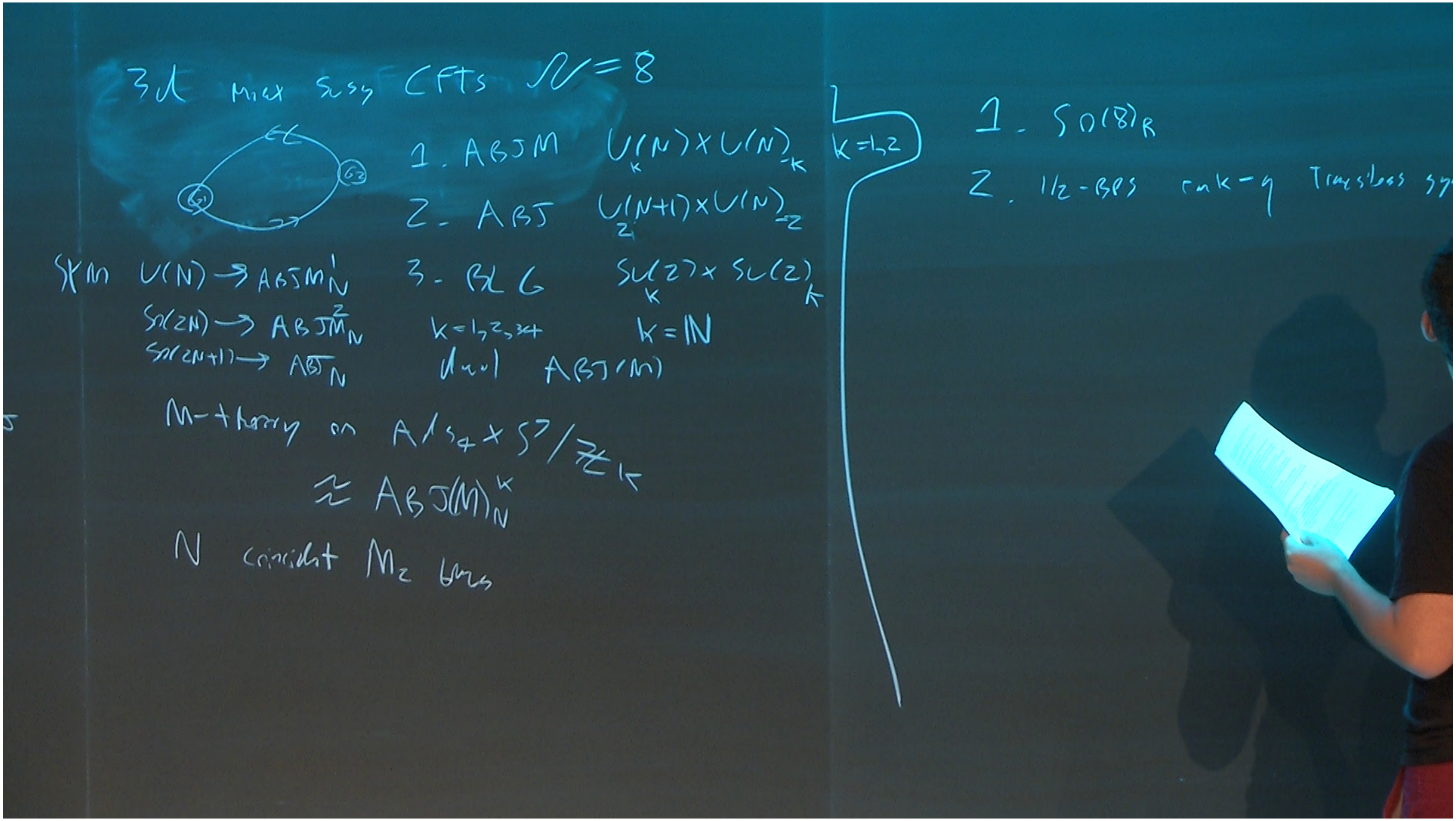
$N=2$: .12%

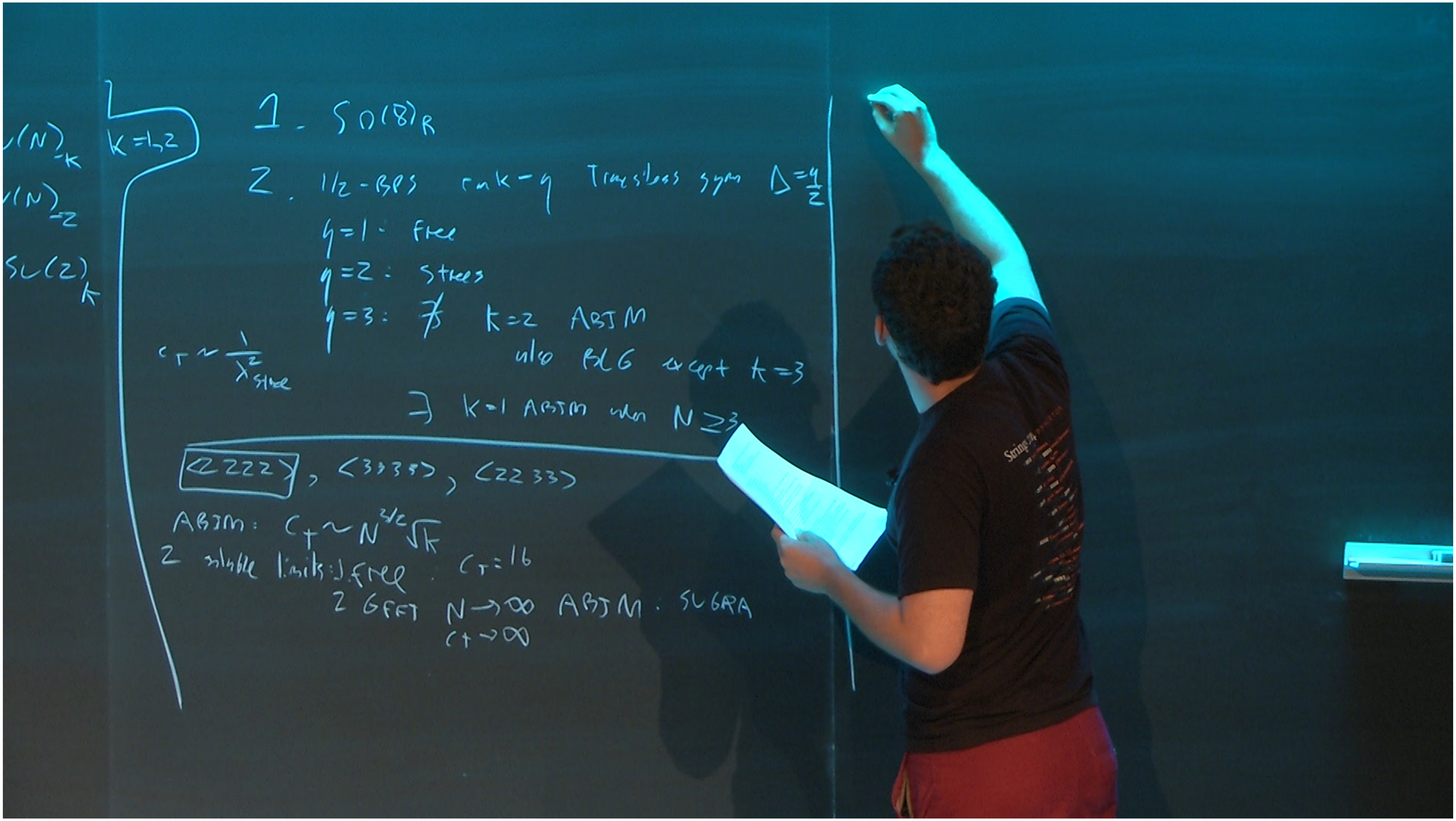
$N=3$: .24%

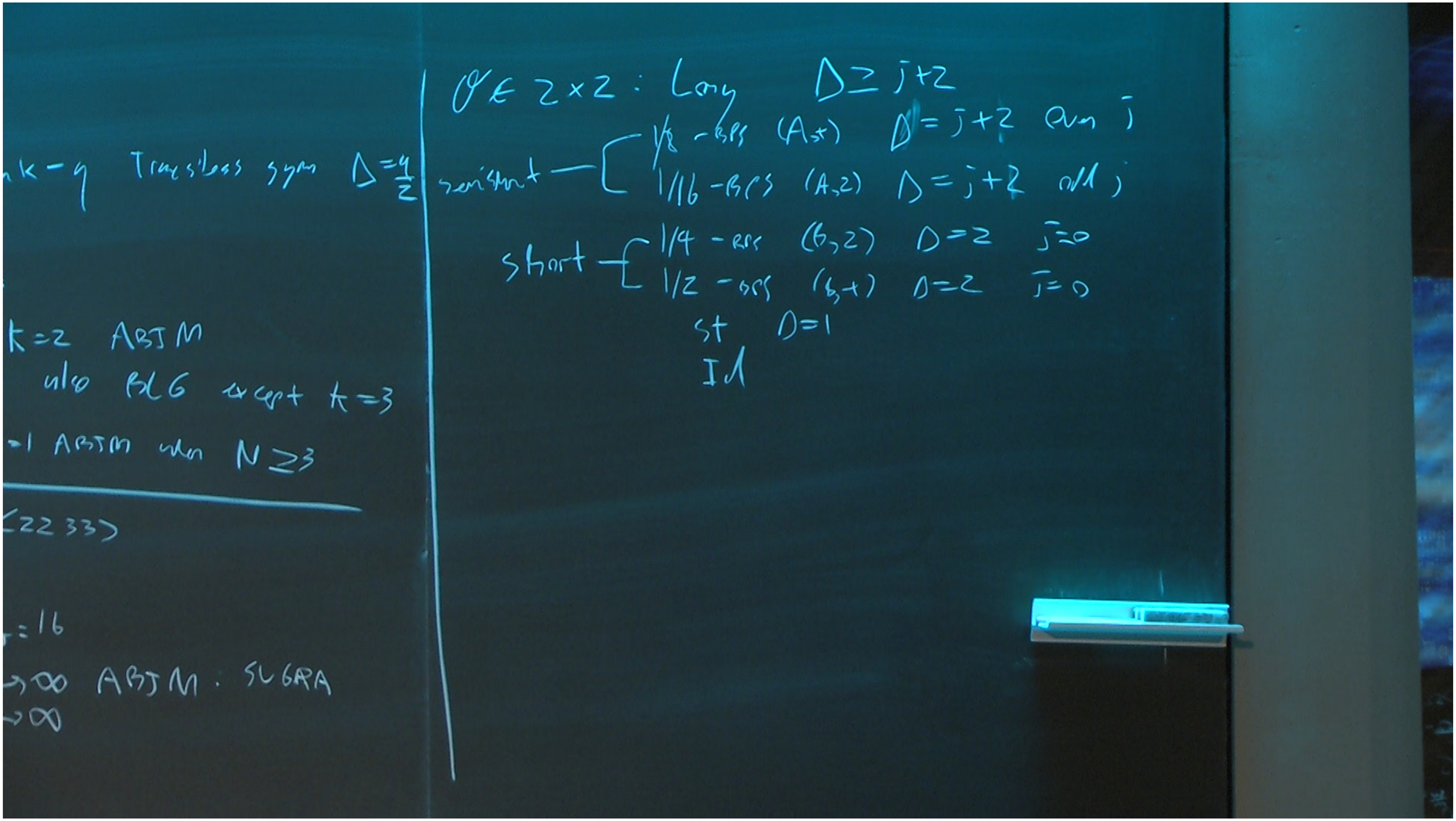
$$e\% = \frac{U-L}{(U+L)/2}$$

2. Extremal Functional

$$c_T \sim \frac{1}{\lambda^2_{\text{stress}}} \quad \text{min}$$


3d max susy CFTs N=8
1. ABJM U(N)_k x U(N)_-k
2. ABJ U(N+1)_2 x U(N)_-2
3. BLG SU(2)_k x SU(2)_k
k=1,2,3,4 k=N
dual ABJ(M)
U(N) → ABJM^1_N
M-theory on AdS_4 x S^7/Z_k
≃ ABJ(M)^k_N
N coincident M2 branes
k=1,2
1. SO(8)_R
2. 1/2-BPS rank-4


k = 1, 2
1. SO(8)_R
2. 1/2-BPS rank-q
q = 1 : free
q = 2 : stress
q = 3 : k = 2 ABJM
also BLG except k = 3
∃ k = 1 ABJM when N ≥ 3
<2222>, <3333>, <2233>
ABJM: c_T ~ N^{3/2} √k
2 soluble limits: 1. free c_T = 16
2. GFFT N → ∞ ABJM: SUGRA
c_T → ∞


nk-4 Traceless sym $\Delta=\frac{4}{2}$
k=2 ABJM
also BLG except k=3
=1 ABJM when $N\geq 3$
<2233>
=16
$\to\infty$ ABJM : SUGRA
$\to\infty$
$\mathcal{O}\in 2\times 2$: Long $\Delta\geq j+2$
semishort — 1/8-BPS $(A,+)$ $\Delta=j+2$ even j
1/16-BPS $(A,2)$ $\Delta=j+2$ odd j
short — 1/4-BPS $(B,2)$ $\Delta=2$ $j=0$
1/2-BPS $(B,+)$ $\Delta=2$ $j=0$
st $\Delta=1$
Id

...ing

$N=3$

$N=2$

Δ_σ

L

$(L)/2$

$\mathcal{N}=8$

$\langle zzzz \rangle = \sum_M \lambda_M^2 G_M$

$G_M = \sum_{\Delta,\ell \in M} A \, g_{\Delta,\ell}$

$\mathcal{N}=8$ Wall - 1/2-BPS - Moln, Gulht Sinkitdev

k

$k=N$

$SO(8)$: 6 crossing equations (m)

(only 2 SUSY) 1 $(z, \bar{z})$

1 (z, α)

1. So

2. 1/2 -

$q=1$

$q=2$

$q=3$

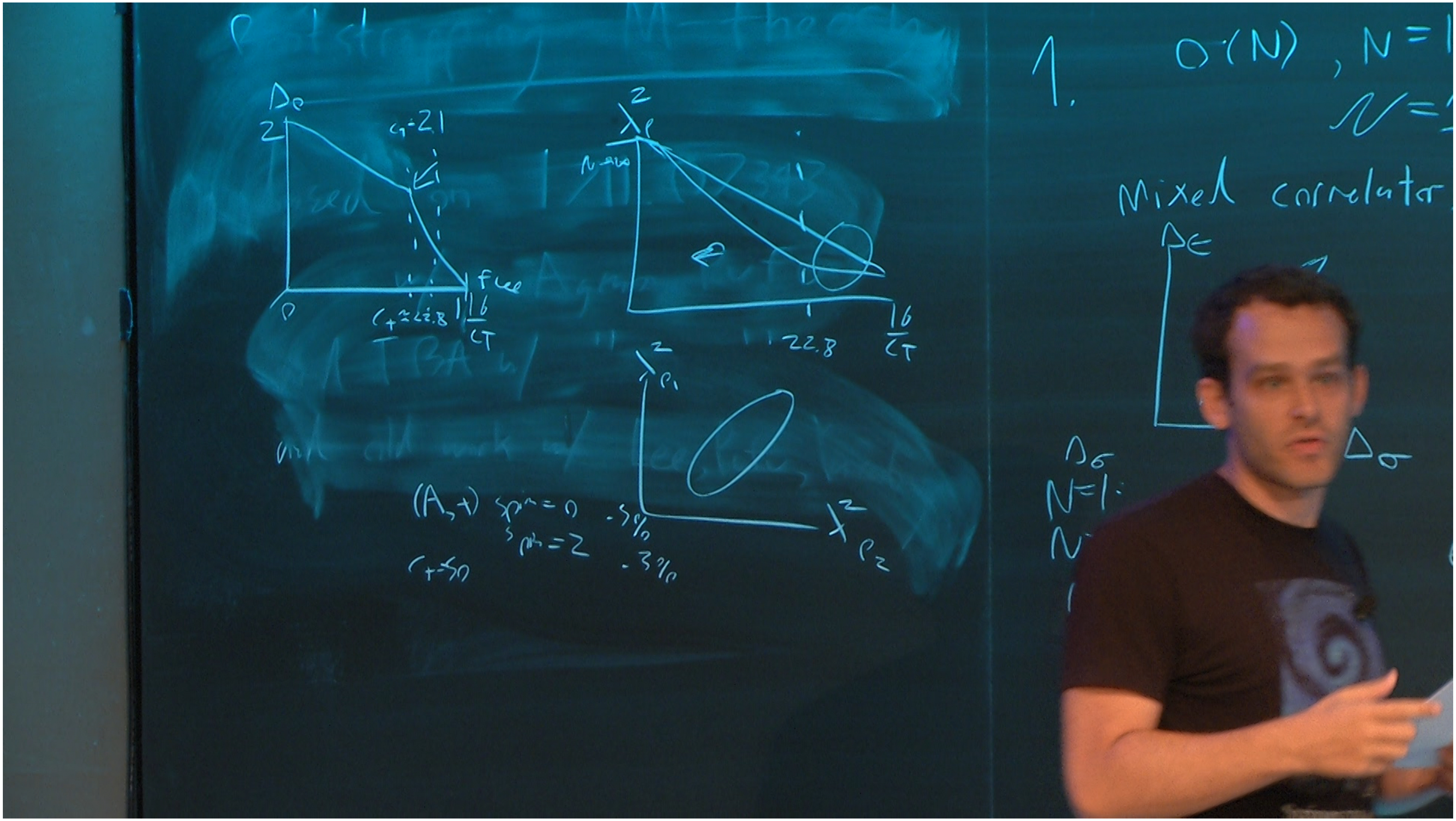
$c_T \sim \frac{1}{\lambda^2_{stress}}$

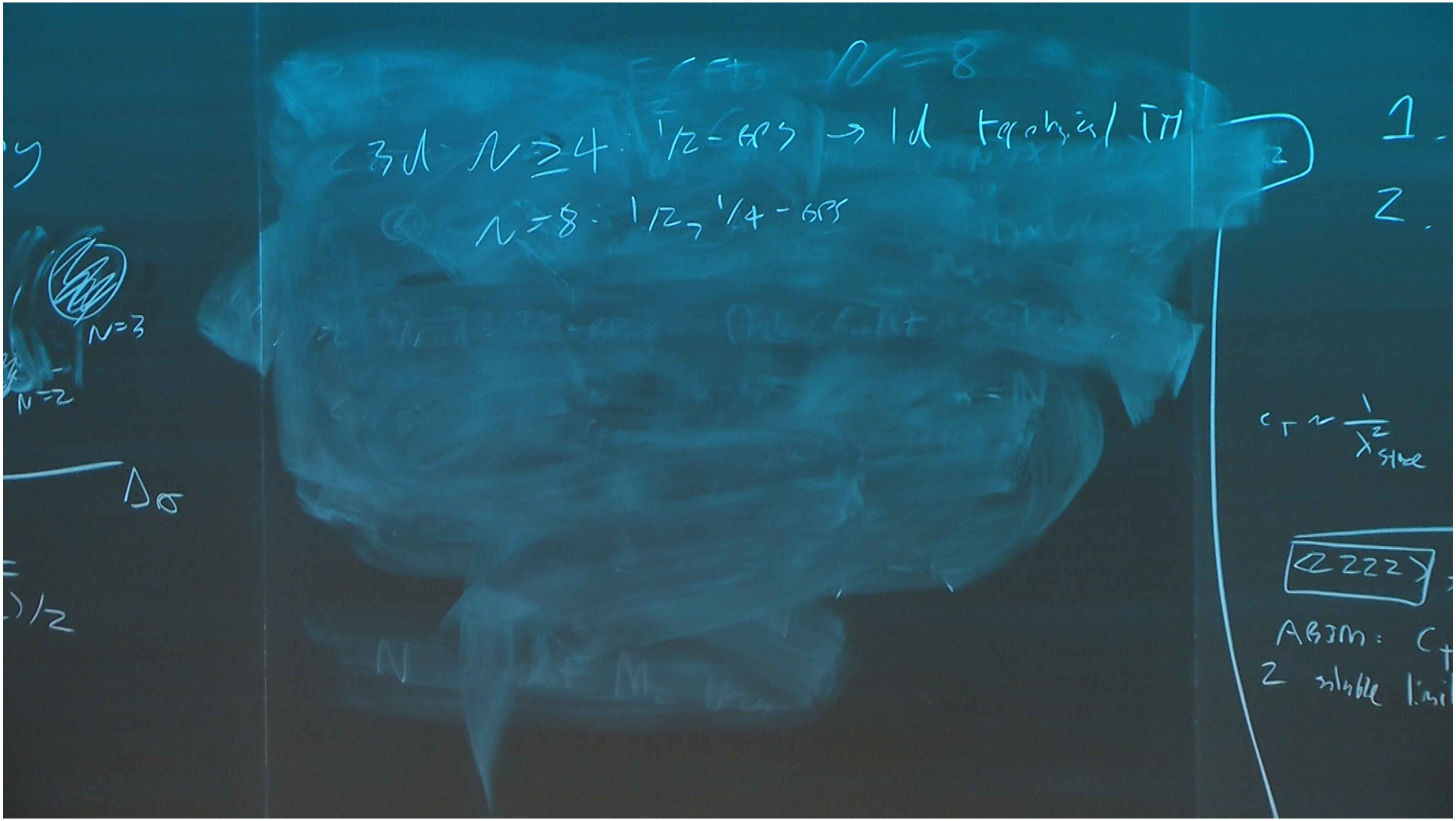
$\boxed{\langle zzzz \rangle}$, $\langle 33$

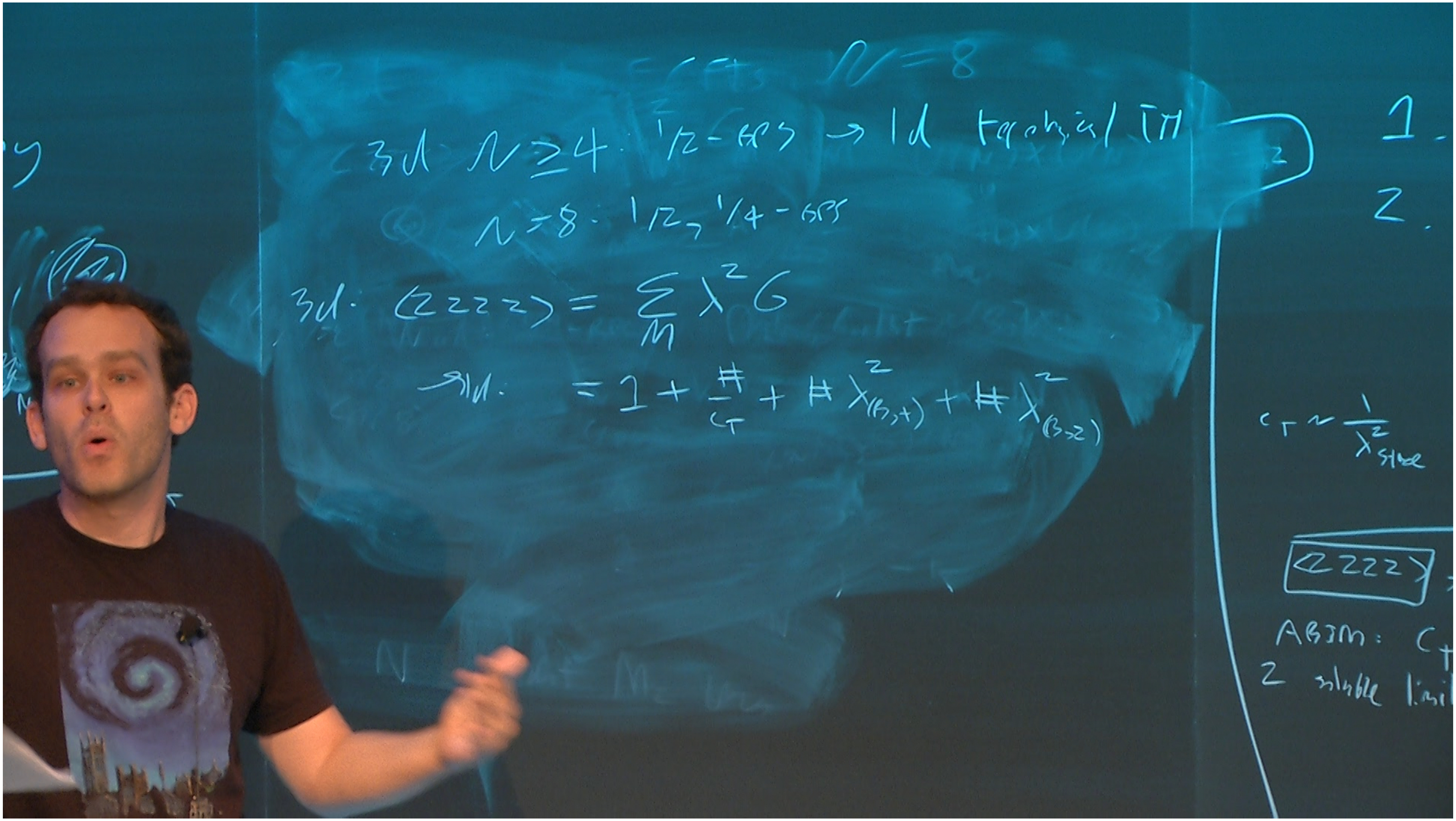
ABJM: $c_T \sim N^2$

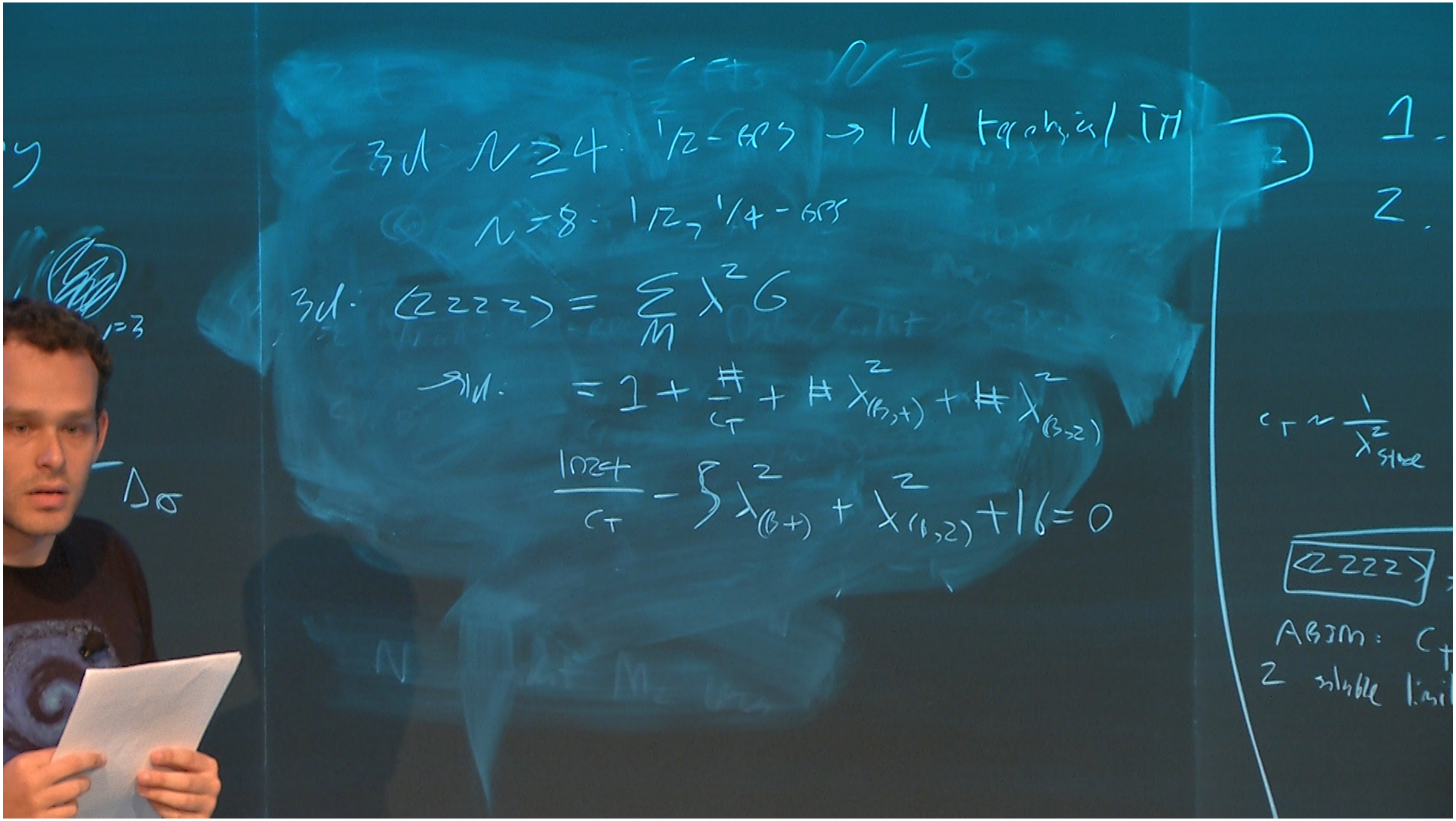
2 soluble limits: 1. free

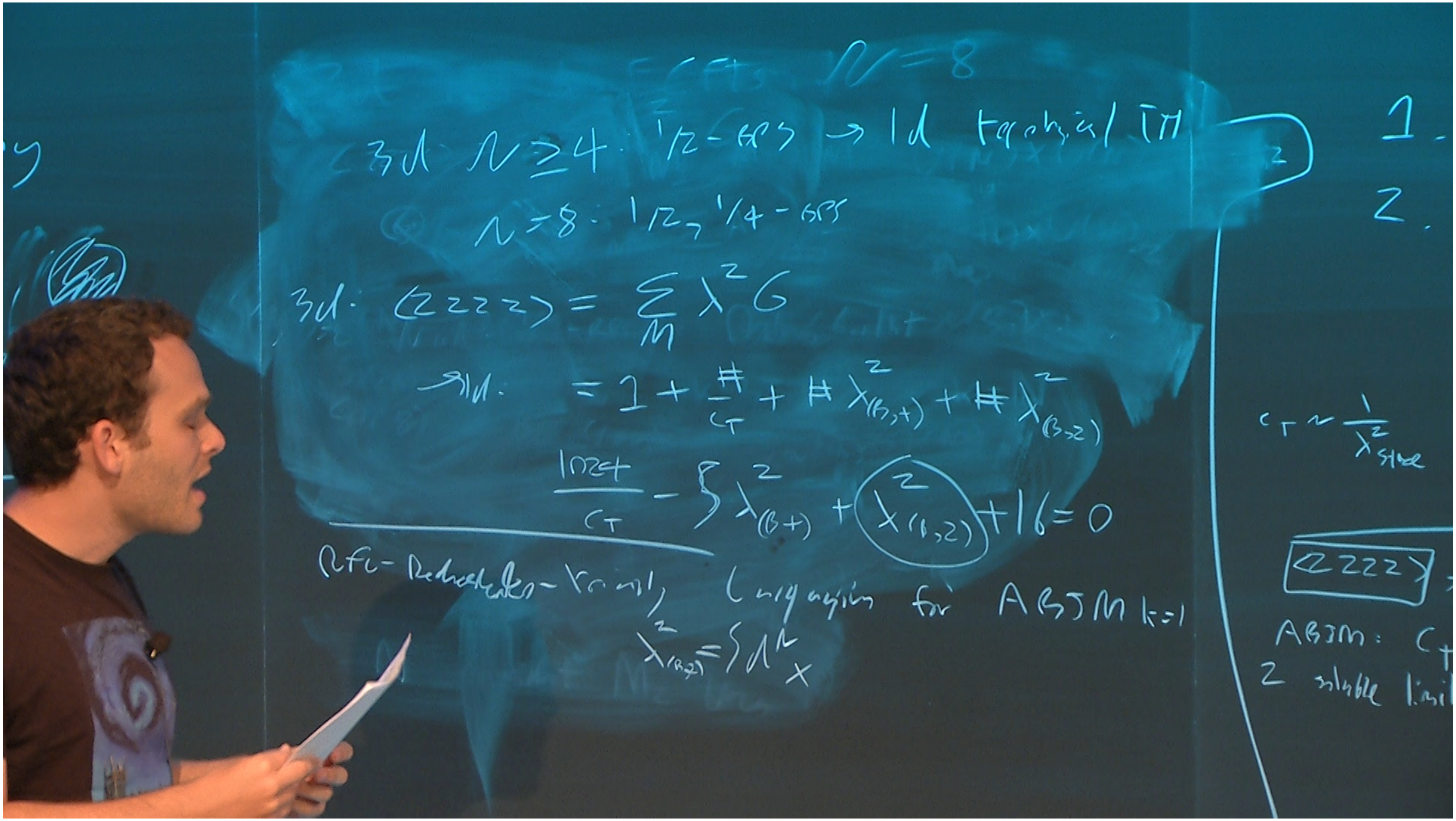
2 G




3d N ≥ 4: 1/2-BPS → 1d topological QM
N = 8: 1/2, 1/4-BPS
N=3
N=2
1.
2.
⟨2222⟩
ABJM:
2 stable limi


3d $\mathcal{N} \geq 4$: 1/2-BPS → 1d topological TFT
$\mathcal{N}=8$: 1/2, 1/4-BPS
3d: $\langle zzzz \rangle = \sum_M \lambda^2 G$
$= 1 + \frac{\#}{c_T} + \# \lambda^2_{(B,+)} + \# \lambda^2_{(B,2)}$
1.
2.
$c_T \sim \frac{1}{\lambda^2_{stress}}$
$\langle zzzz \rangle$
ABJM: c_T
2 sizable limit


3d N ≥ 4 : 1/2-BPS → 1d topological QM
N = 8 : 1/2, 1/4-BPS
3d: ⟨zzzz⟩ = Σ_M λ² G
3d: = 1 + #/c_T + # λ²_(B,+) + # λ²_(B,2)
1024/c_T − 5 λ²_(B+) + λ²_(B,2) + 16 = 0
⟨zzzz⟩
ABJM:
1.
2.


3d N ≥ 4 : 1/2-BPS → 1d topological QM
N = 8 : 1/2, 1/4-BPS
3d : ⟨zzzz⟩ = Σ_M λ² G
= 1 + #/c_T + # λ²_(B,+) + # λ²_(B,2)
1024/c_T − 5 λ²_(B+) + λ²_(B,2) + 16 = 0
for ABJM k=1
c_T ~ 1/λ²
⟨zzzz⟩
ABJM :
2 stable limi

3d $\mathcal{N} \geq 4$: 1/2-BPS → 1d topological QM

$\mathcal{N} = 8$: 1/2, 1/4-BPS

3d: $\langle zzzz \rangle = \sum_M \lambda^2 G$

3d: $= 1 + \frac{\#}{c_T} + \# \lambda^2_{(B,+)} + \# \lambda^2_{(B,2)}$

$$\frac{1024}{c_T} - 5\lambda^2_{(B,+)} + \lambda^2_{(B,2)} + 16 = 0$$

Chester-Dedushenko-Yacoby, Localization for ABJM $k=1$

$\lambda^2_{(B,2)} = \int d^N x$

(Pestun-Marino-Nosaka): $F(m)$ on S^3 3d

to $\forall$ 1/N S^1 1d

1.

2.

$c_T \sim \frac{1}{\lambda^2_{\text{stress}}}$

$\boxed{\langle zzzz \rangle}$

ABJM: c_T

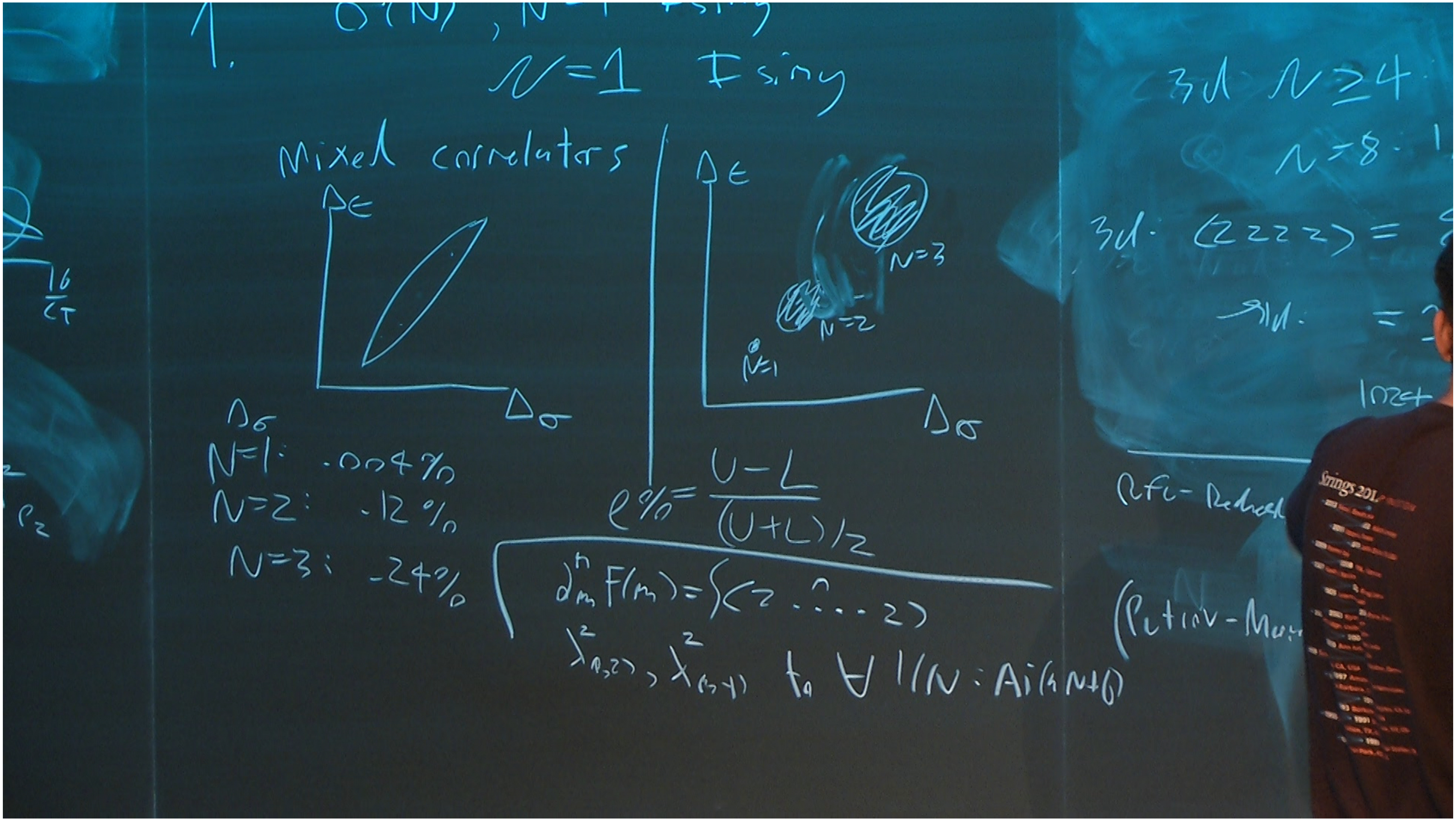
2 soluble limit

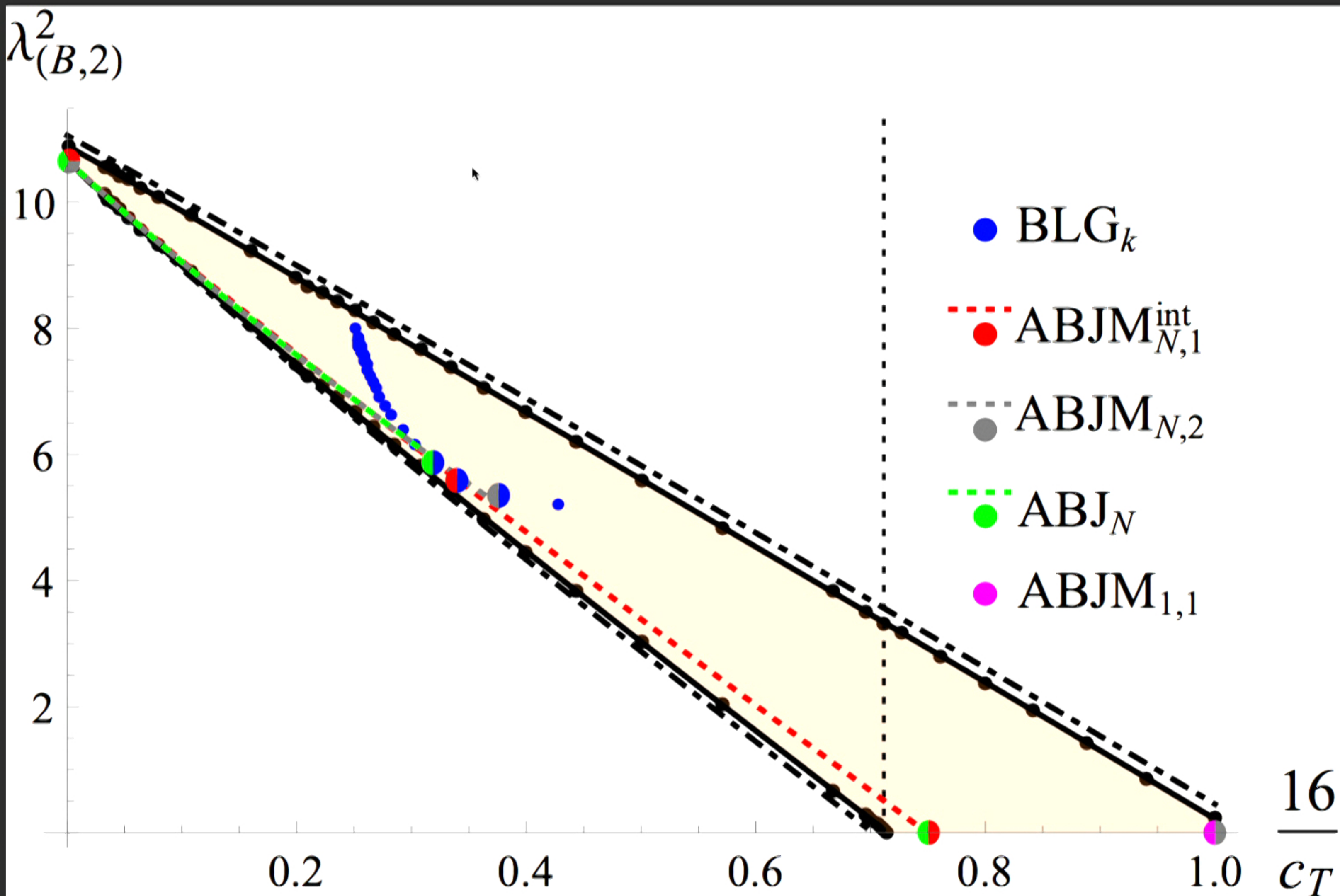
$N=3$

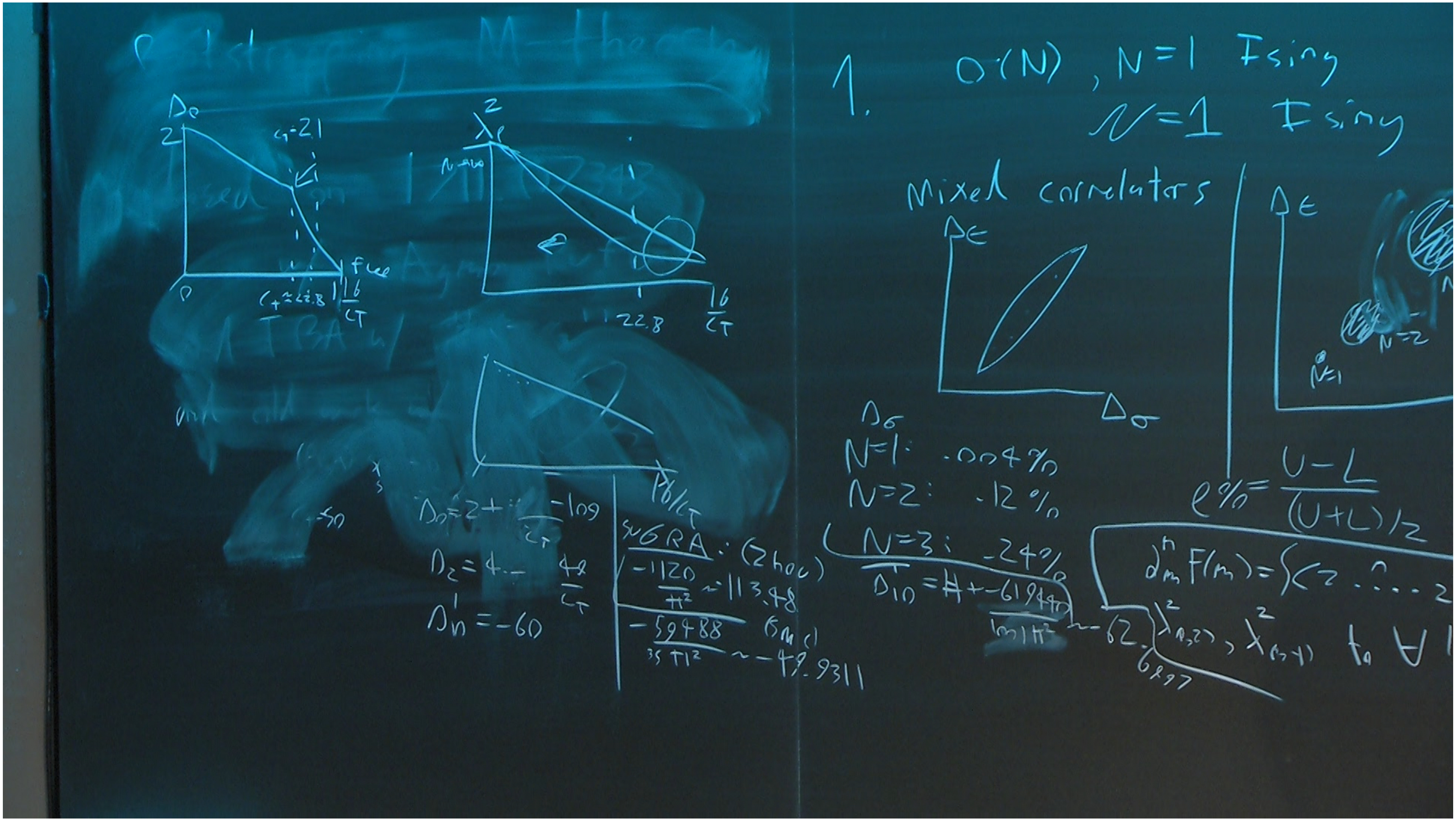
$N=2$

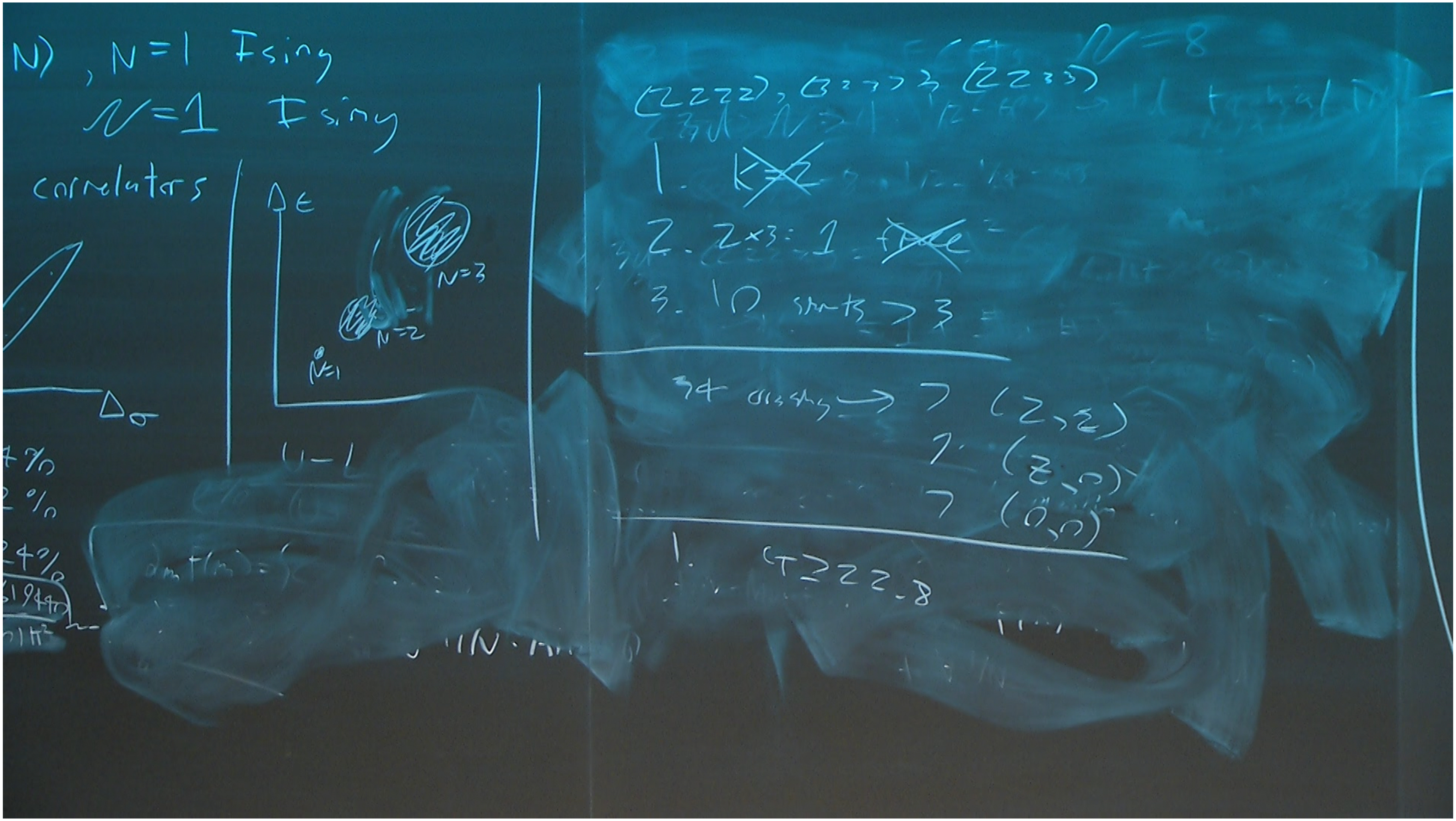
Δ_σ

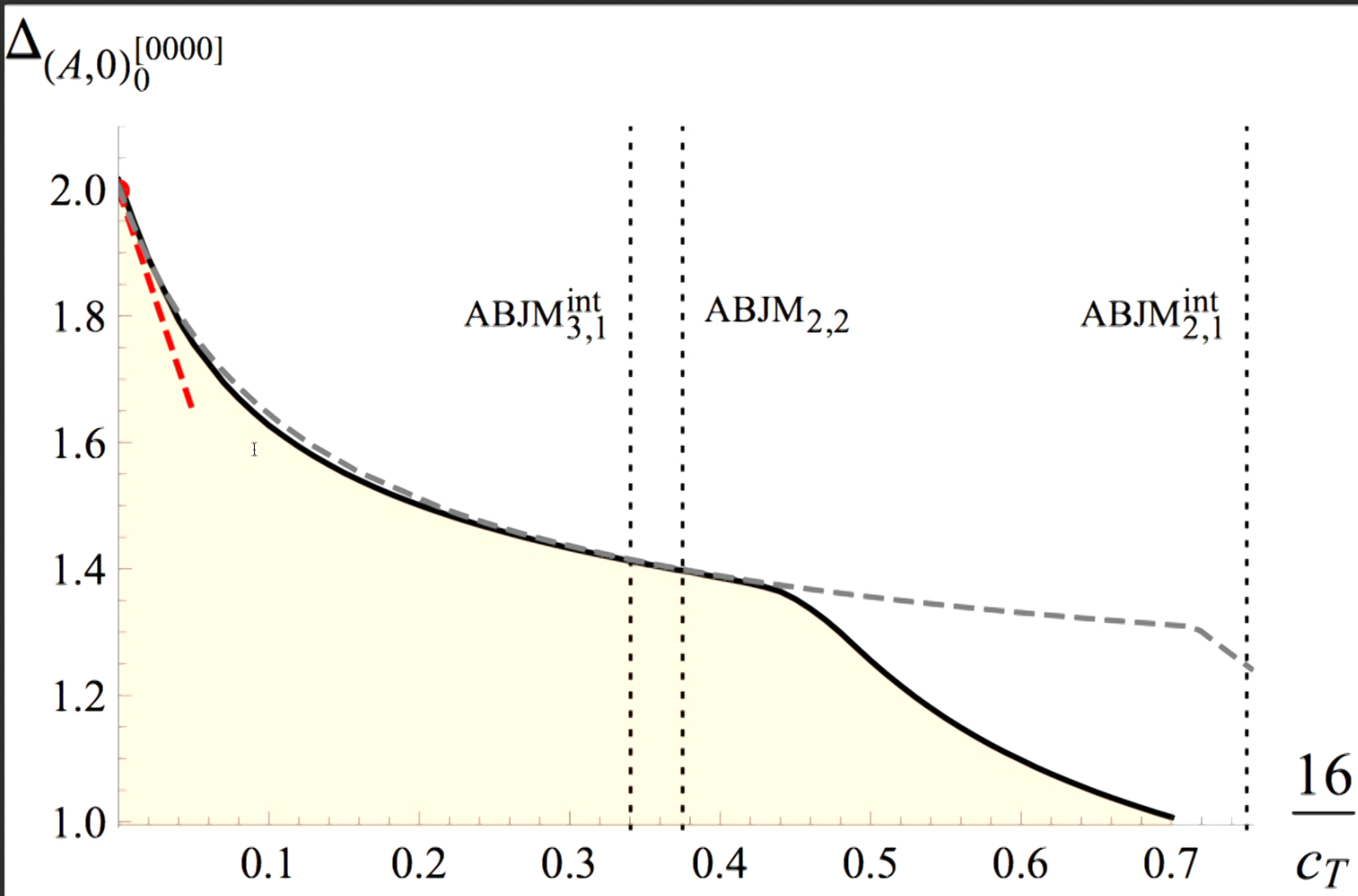
$)/2$


N=1 Ising
Mixed correlators
Δε
Δσ
N=1: .004%
N=2: .12%
N=3: .24%
N=3
N=2
N=1
e% = (U−L)/((U+L)/2)
3d N≥4
N=8
3d: ⟨2222⟩ =
Interest
RG-Reduced
(Putin-Mur
Strings 201

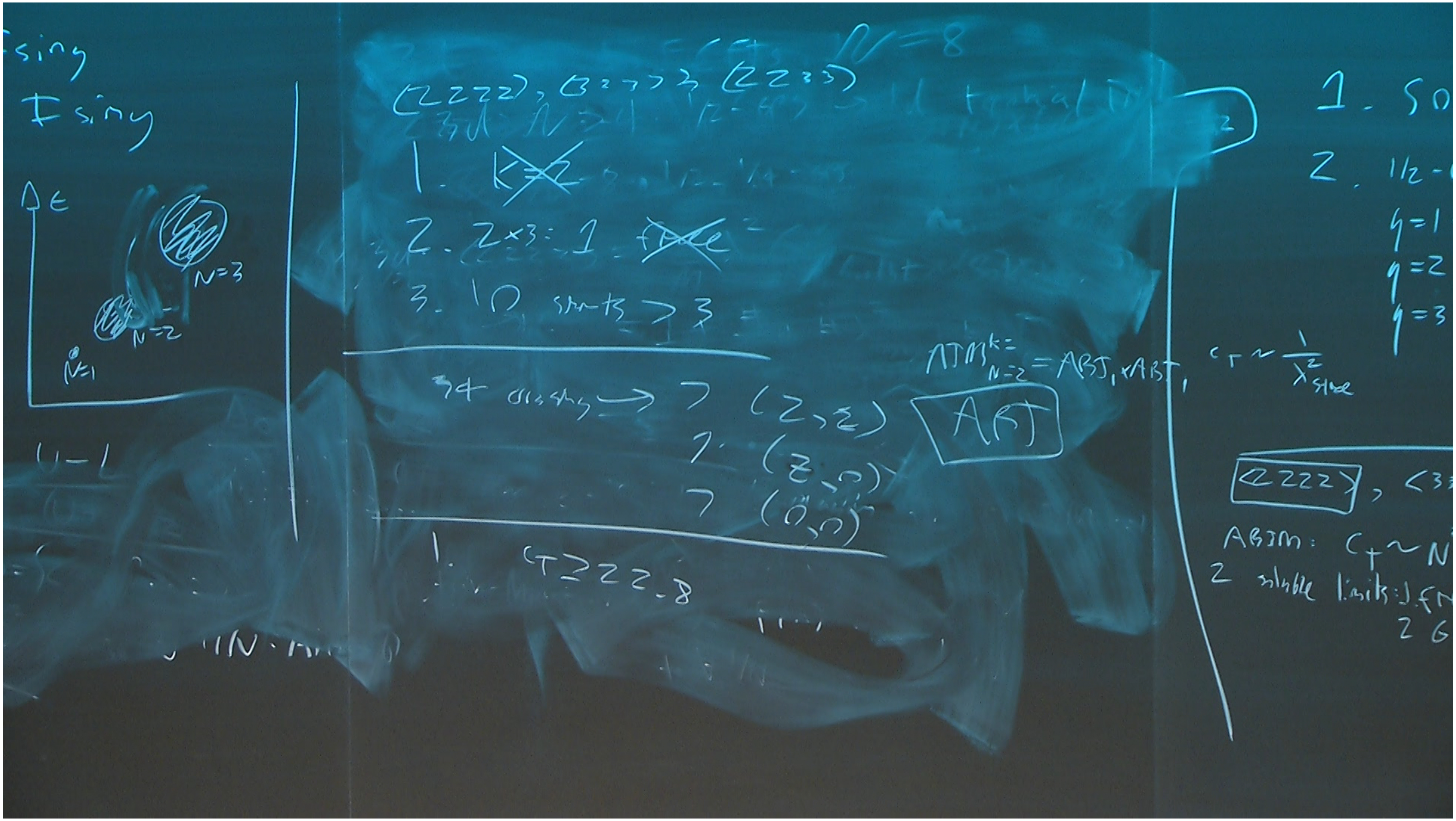

$\lambda^2_{(B,2)}$
10
8
6
4
2
0.2
0.4
0.6
0.8
1.0
$\frac{16}{c_T}$
BLG_k
$\text{ABJM}^{\text{int}}_{N,1}$
$\text{ABJM}_{N,2}$
ABJ_N
$\text{ABJM}_{1,1}$

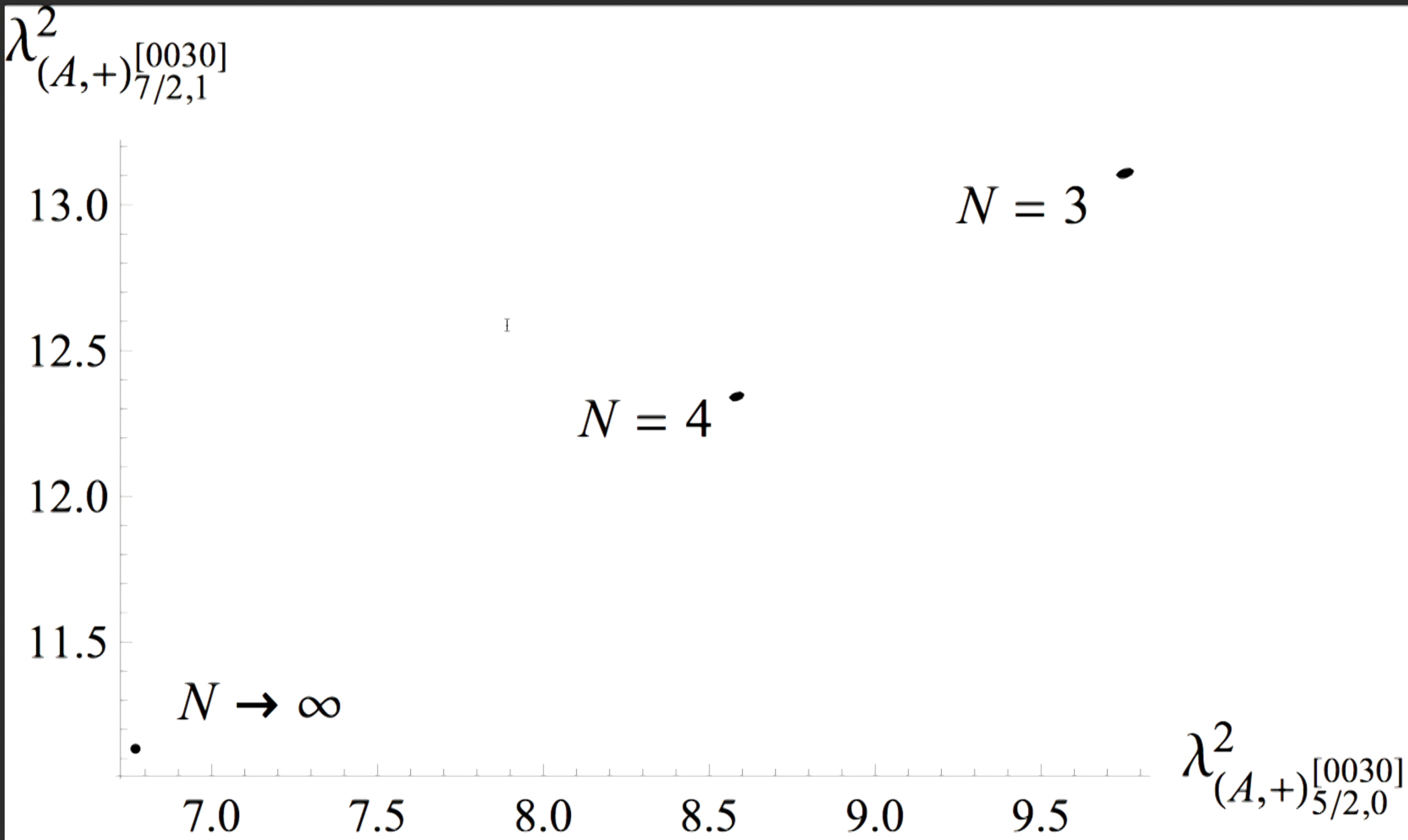

1. O(N), N=1 Ising
N=1 Ising
Mixed correlators
Δσ
N=1: .004%
N=2: .12%
N=3: .24%
e% = (U−L) / ((U+L)/2)
free
22.8
SUGRA: (2 hou)
−1120
−113.48
−49.9311
Δ'n = −60
N=2
N=1


N=1 Ising
N=1 Ising
correlators
N=3
N=2
N=1
2. 2×3=1
3. 10 states > 3
7 (Z,Z)
7 (Z,0)
7 (0,0)

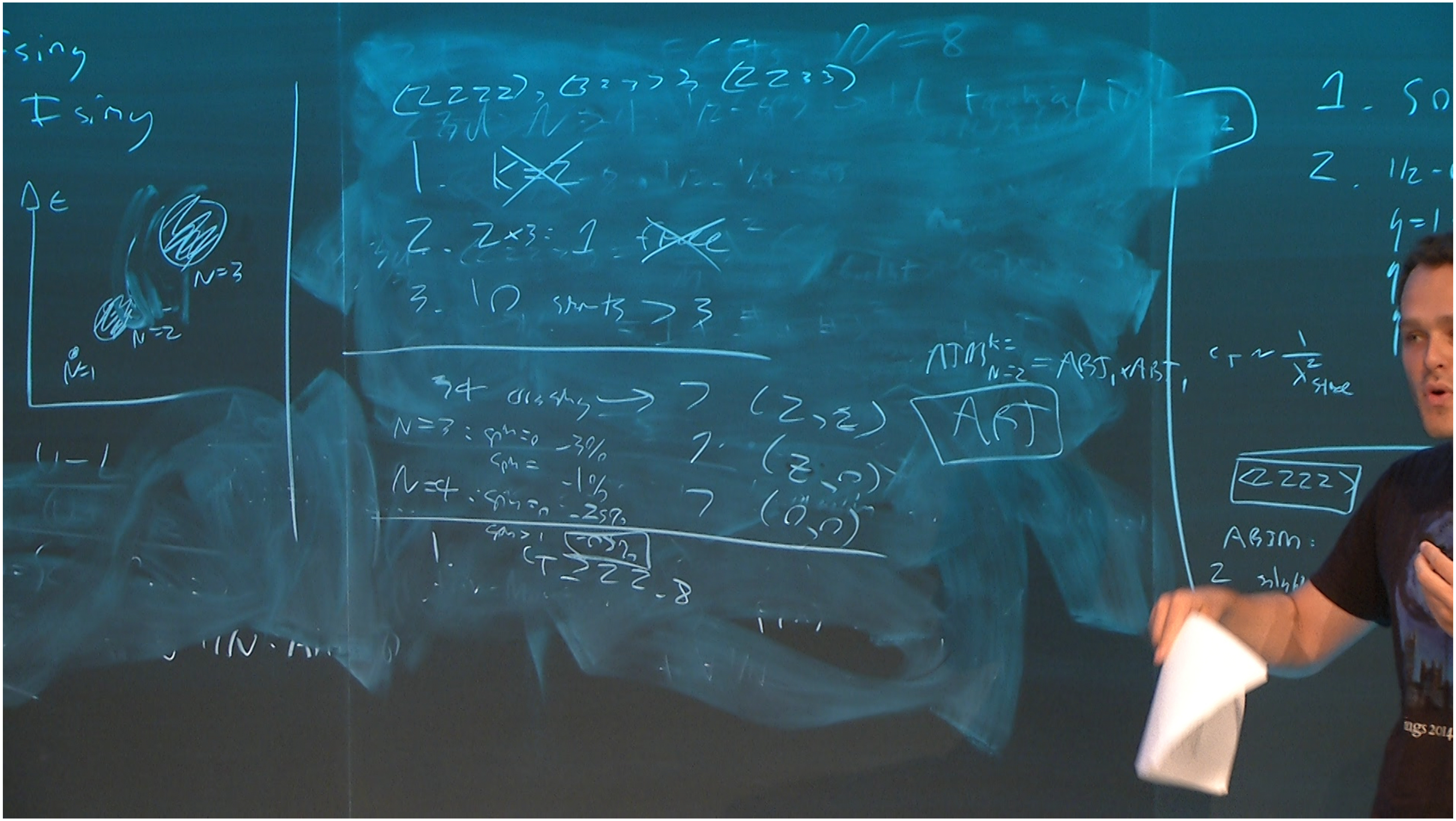


$\Delta_{(A,0)_0^{[0000]}}$
2.0
1.8
1.6
1.4
1.2
1.0
$\mathrm{ABJM}_{3,1}^{\mathrm{int}}$
$\mathrm{ABJM}_{2,2}$
$\mathrm{ABJM}_{2,1}^{\mathrm{int}}$
0.1
0.2
0.3
0.4
0.5
0.6
0.7
$\frac{16}{c_T}$


Ising
N=3
N=2
N=1
ABJM
2 stable limits



$\lambda^2_{(A,+)^{[0030]}_{7/2,1}}$
13.0
12.5
12.0
11.5
$N = 3$
$N = 4$
$N \to \infty$
7.0
7.5
8.0
8.5
9.0
9.5
$\lambda^2_{(A,+)^{[0030]}_{5/2,0}}$


Ising
N=3
N=2
ABT
ABJM: