

Title: Where is String Theory

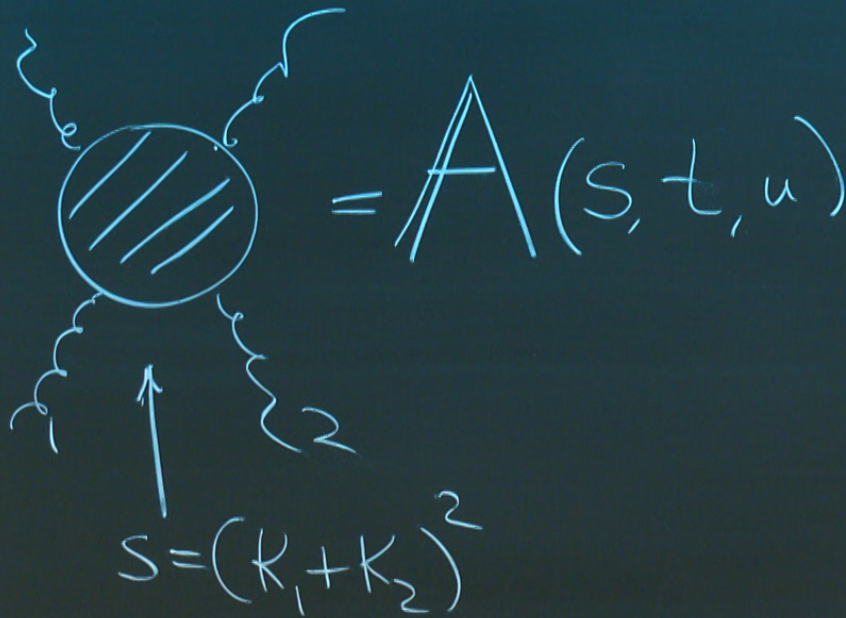
Speakers: Pedro Vieira

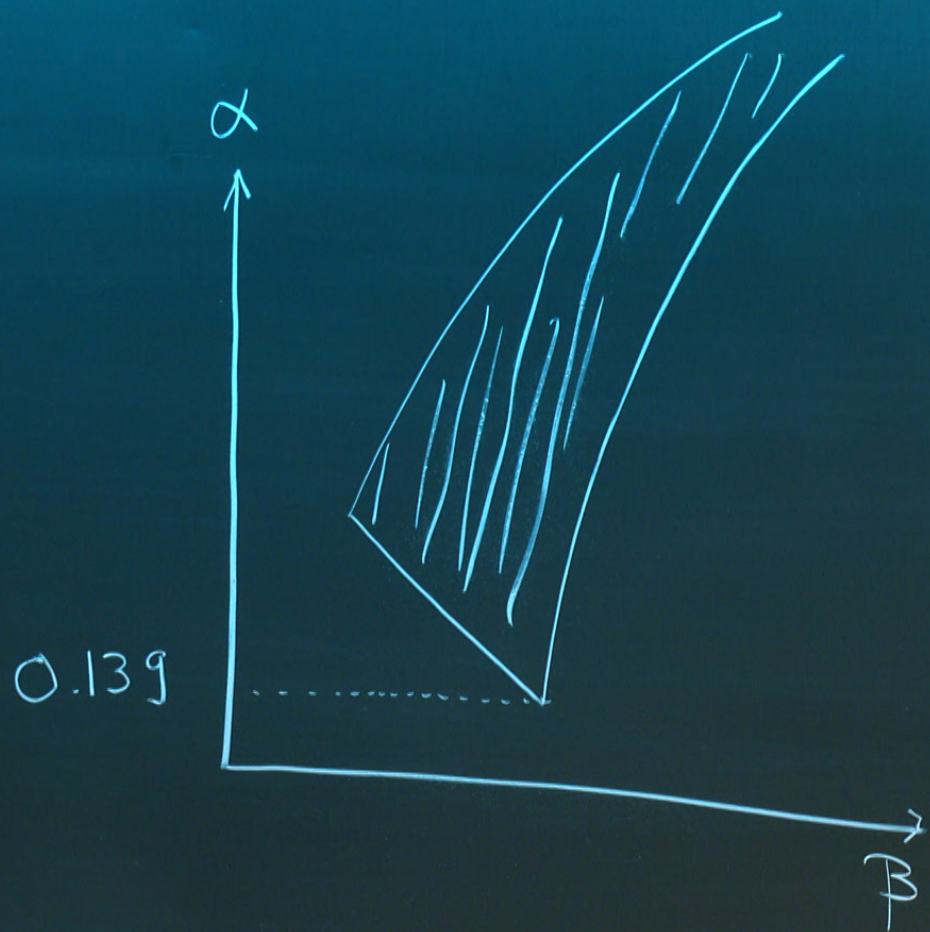
Collection: Puzzles in the Quantum Gravity Landscape: viewpoints from different approaches

Date: October 25, 2023 - 10:10 AM

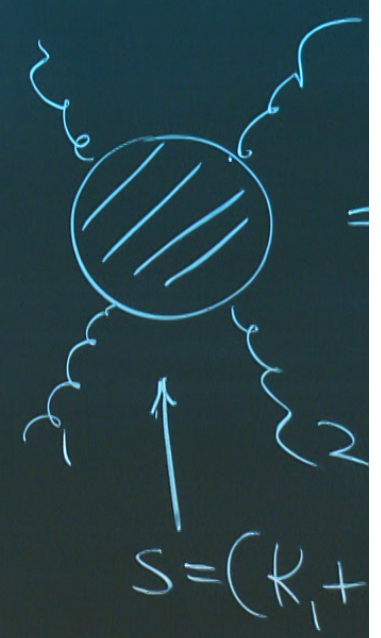
URL: <https://pirsa.org/23100066>

UV completions of max SUSY SUGRA in $d \geq 5$

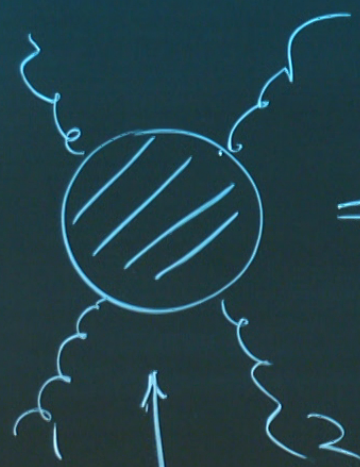




UV com



UV completions of max SUSY SUGRA in $d \geq 5$ dim



A Feynman diagram showing a central shaded circle with diagonal lines. Four wavy lines extend from the circle, representing external particles. An arrow points from the equation below to the circle.

$$= A(s, t, u) = \underbrace{R^4}_{\text{tensor}} \left(\underbrace{\frac{1}{stu}}_{\text{Low E SUGRA}} \right)$$

$$s = (k_1 + k_2)^2$$

SUGRA in $d \geq 5$ dim

$A(s, t, u)$

$$\frac{1}{stu}$$

+ UV completion

Low E
SUGRA

$l_P^6 \alpha$

$d \geq 5$ dim

$A(s, t, u)$

+ UV completion

$l_P^6 \propto$

+ $l_P^{d-2} f(s, t, u)$

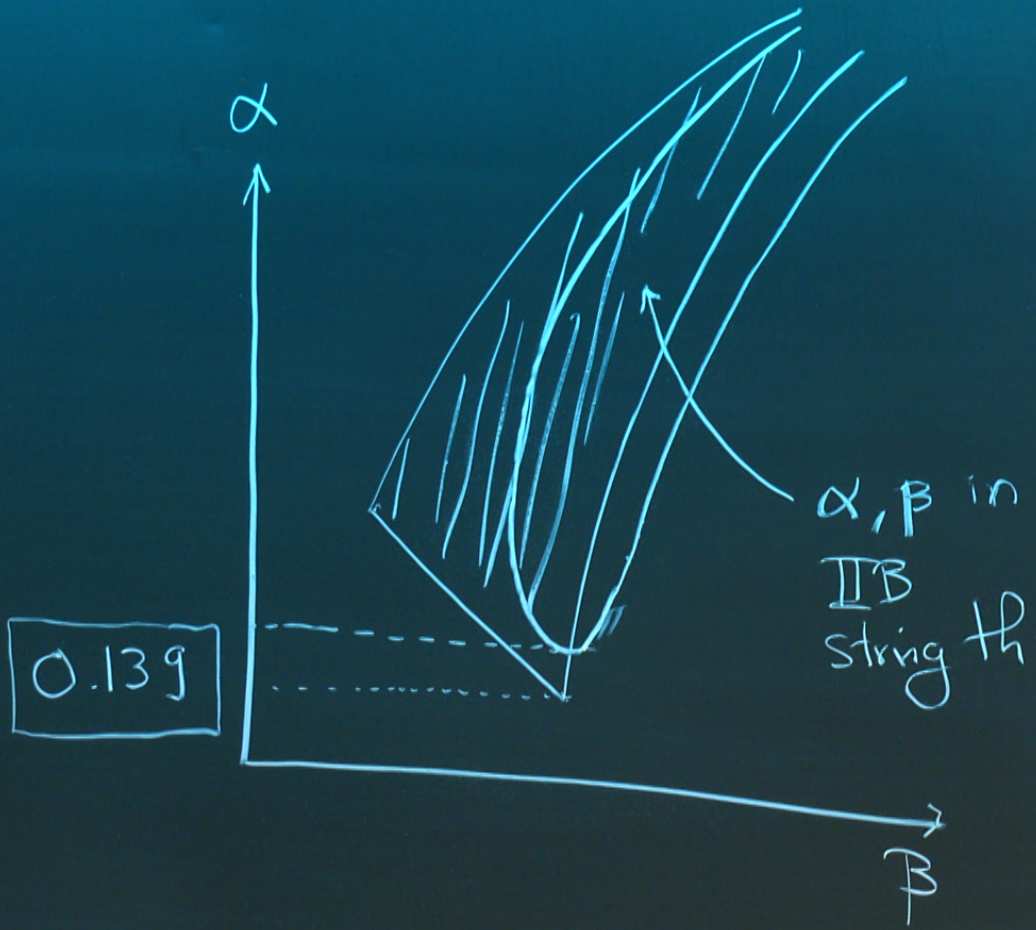


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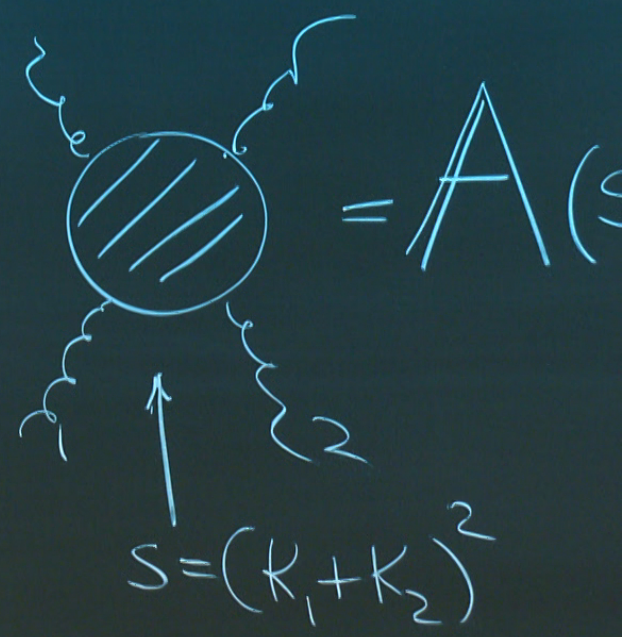
$$\int_P^6 \alpha + \int_P^{d-2} f(s, t, u) + \beta \int_P^{10} (u^2 + s^2 + t^2) + \text{const}$$



"Where
ω/



UV completions of



UV completions of max SUSY SUGRA



$$= A(s, t, u)$$

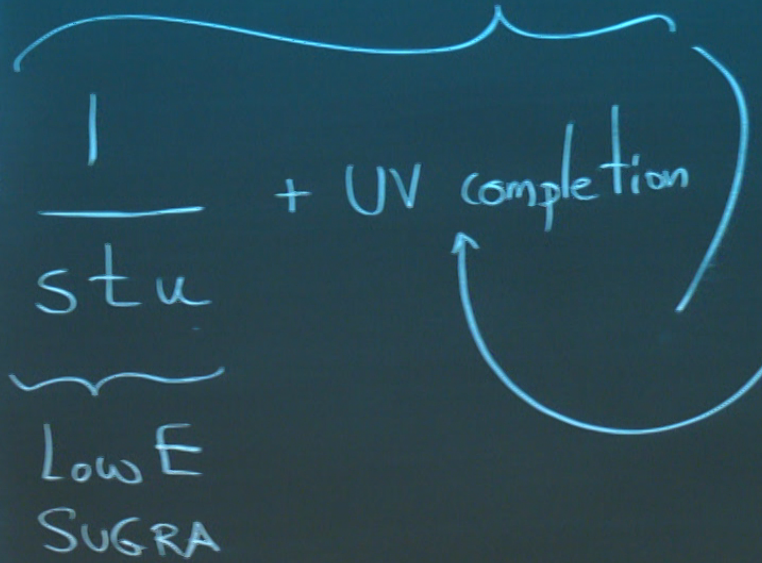
$$= R^4$$

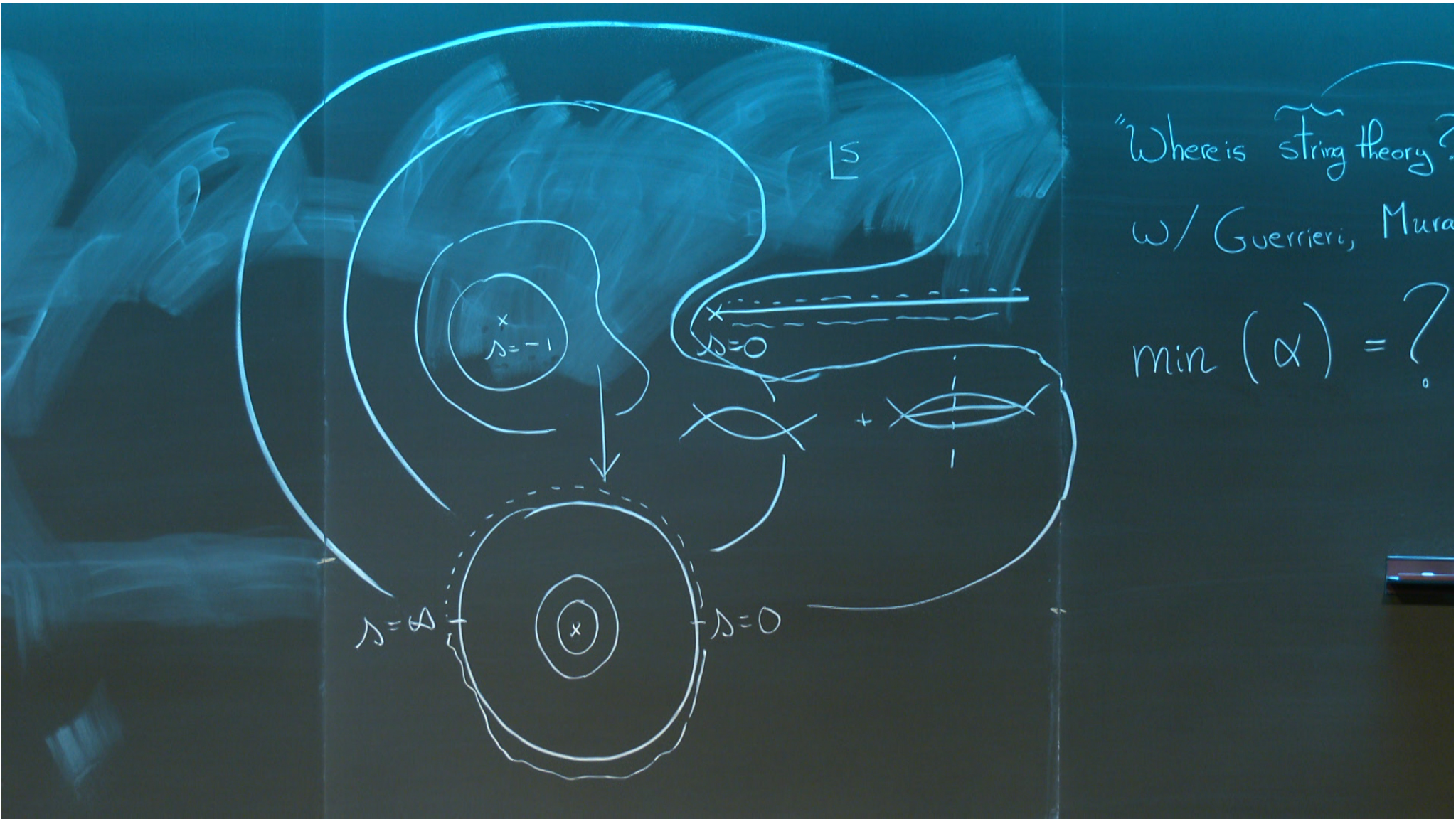
tensor

$$s = (k_1 + k_2)^2$$

1. Ansatz
 2. Physics
- min(α in ansatz)
physics

$A(s, t, u)$

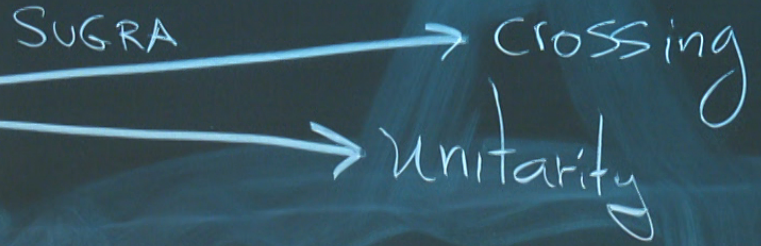




ons of max SUSY SUGRA in $d \geq 5$ dim

$$A(s, t, u) = \underbrace{\mathbb{R}^4}_{\text{tensor}} \left(\underbrace{\frac{1}{stu}}_{\text{Low E SUGRA}} + \sum_{n, m, k}^{\infty} \underbrace{\rho(s)^n \rho(t)^m \rho(u)^k}_{\text{Sym}} \underbrace{C_{nmk}}_{\text{Crossing}} \right)$$

- 1. Ansatz
- 2. Physics
min(α in ansatz)
physics





$$P_{\text{rob}}(s) = |S(s)|^2 \leq 1$$

$$1 + \int_{-\infty}^{\infty} S^{\frac{d/2+2}{2}} dz (1-z^2)^{\frac{d/2-2}{2}} \oint_{\Gamma} (z)^x$$

$$A(s, -s^{\frac{1+z}{2}}, -s^{\frac{1-z}{2}})$$

ons of max SUSY SUGRA in $d \geq 5$ dim

$$A(s, t, u) = \underbrace{R^4}_{\text{tensor}} \left(\underbrace{\frac{1}{stu}}_{\text{Low E SUGRA}} + \sum_{n, m, k}^N \rho(s)^n \rho(t)^m \rho(u)^k \underbrace{C_{nmk}}_{\text{Sym}} \right)$$

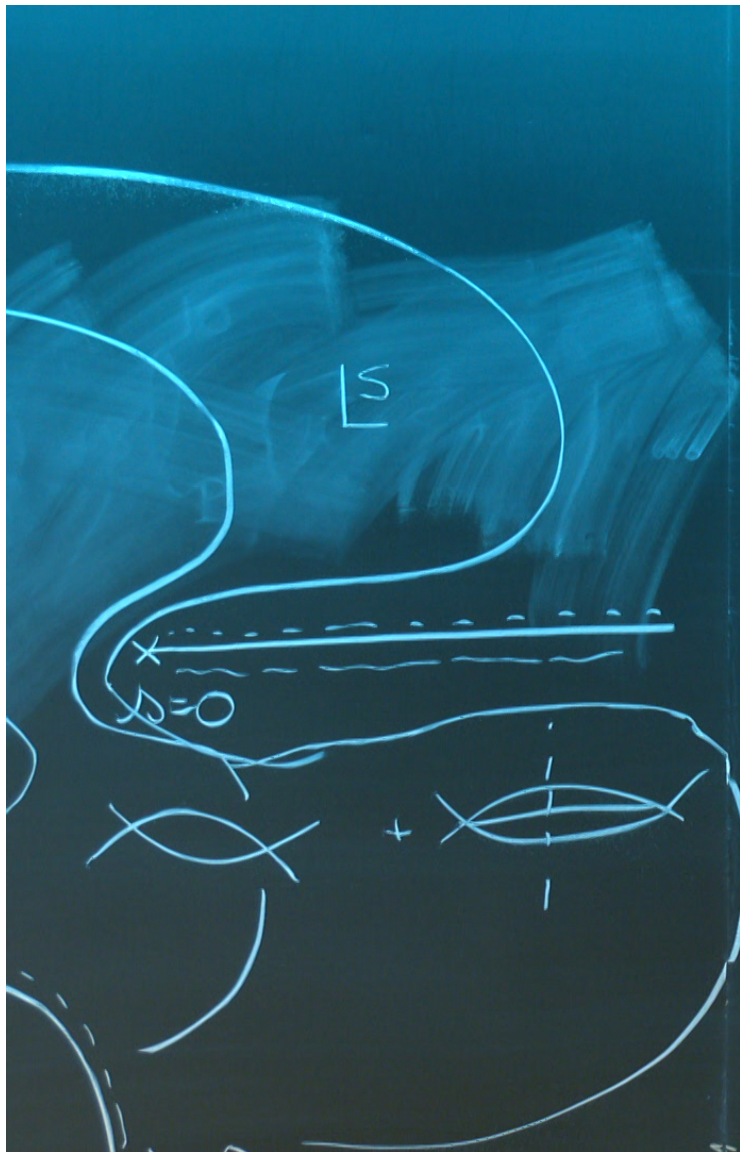
1. Ansatz
2. Physics

min(α in ansatz)
 [Physics] ← * for

$l = 0, 2, 4, \dots, L$
 $\Delta E \Delta p_{\text{grid}}$

crossing ✓

unitarity



$$\text{Prob (s)} = |S(s)| \leq 1 \quad *$$

$$1 + i\sqrt{s} \int_{-1}^1 dz (1-z^2)^{d/2-2} \times A(s, -s \frac{1+z}{2}, -s \frac{1-z}{2})$$

of max susy SUGRA

$l >$

$(s, t, u) = \mathbb{R}^4$

tensor

$\frac{1}{stu} + \sum_{n,m,k} \rho(s)^n \rho(t)^m \rho(u)^k \underbrace{C_{nmk}}_{\text{Sym}}$

Low E SUGRA

1. Ansatz

2. Physics

min(α in ansatz)

[Physics]

* for $l=0, 2, 4, \dots, L$

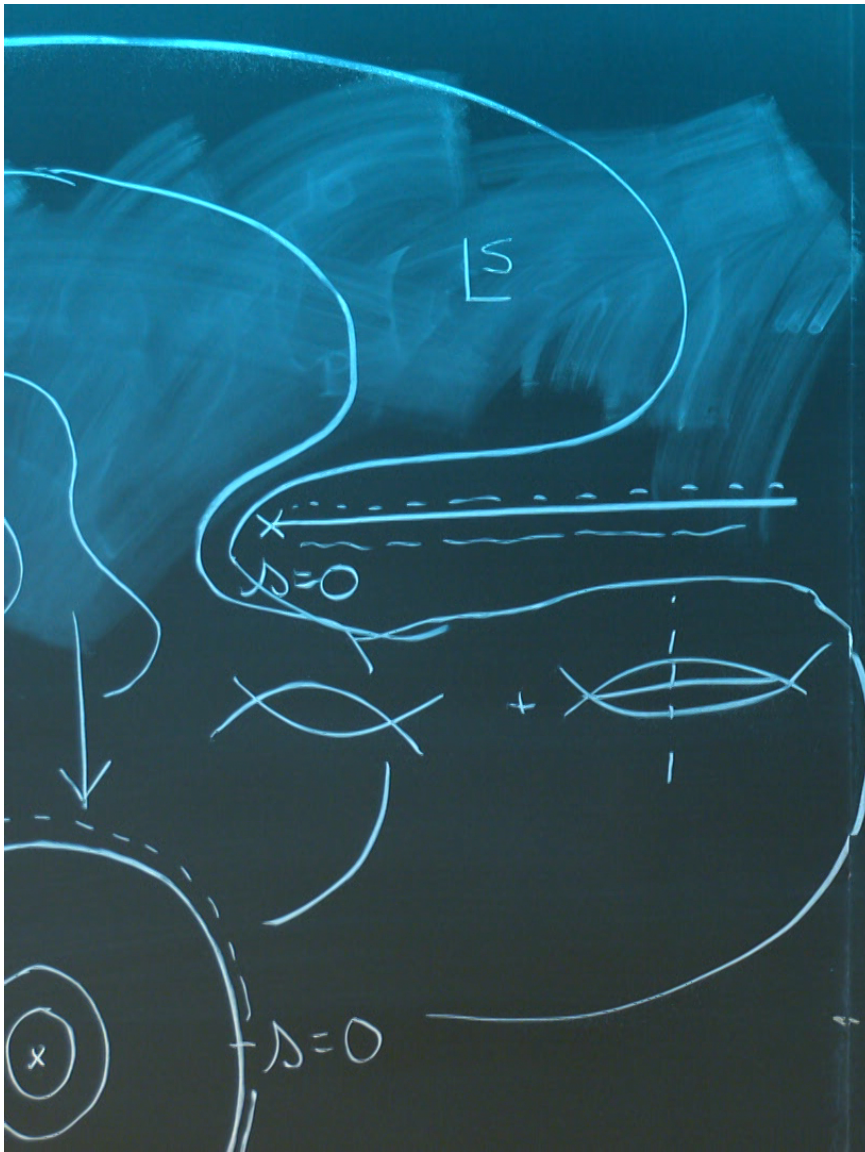
$\Delta E \in \Delta_{\text{grid}}$

Crossing

Unitarity

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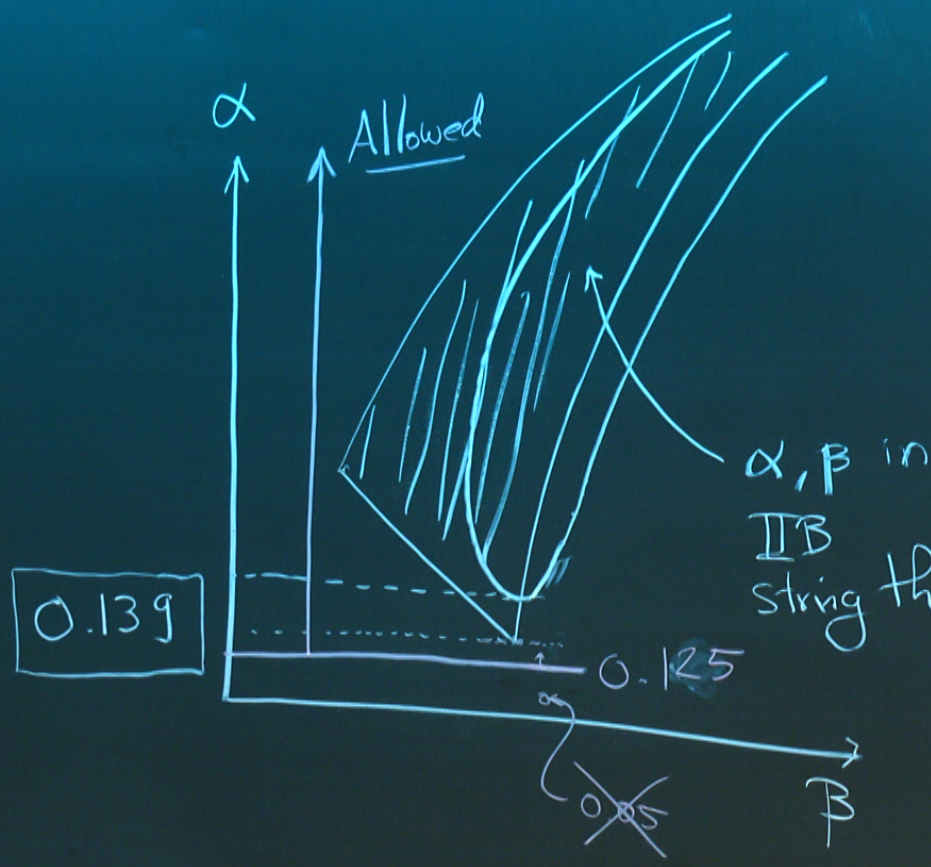


$$\text{Prob}(s) = |S(s)|^2 \leq 1 \quad *$$

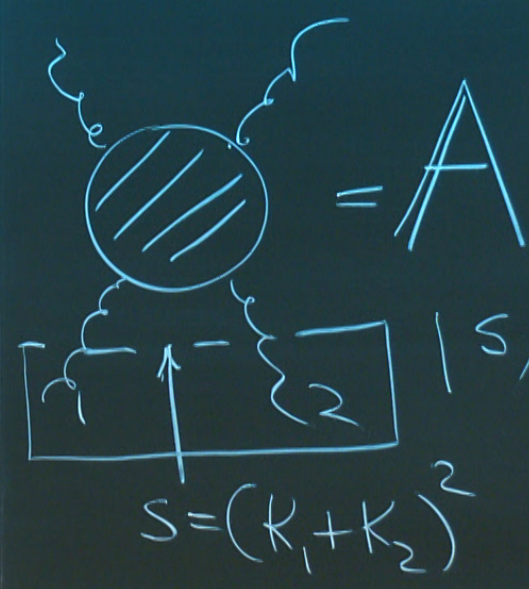
$$1 + \text{tid} \int_S^{\alpha} dz (1-z^2)^{d/2-2} \int_{\text{cos} \theta}^{\alpha} \frac{1}{l} \left(\frac{z}{l} \right)^x$$

$$\times A(s, -s^{\frac{1+z}{2}}, -s^{\frac{1-z}{2}})$$





UV completions



0- What are the outstanding challenges which quantum approaches in cosmology are facing? (RB)

1- Where do you see progress as most likely and/or imminent in understanding the quantum aspects of cosmology?

How should we focus our intellectual/experimental/observational resources to address our puzzles in quantum cosmology?

How do you see as promising areas of collaboration/synergy?