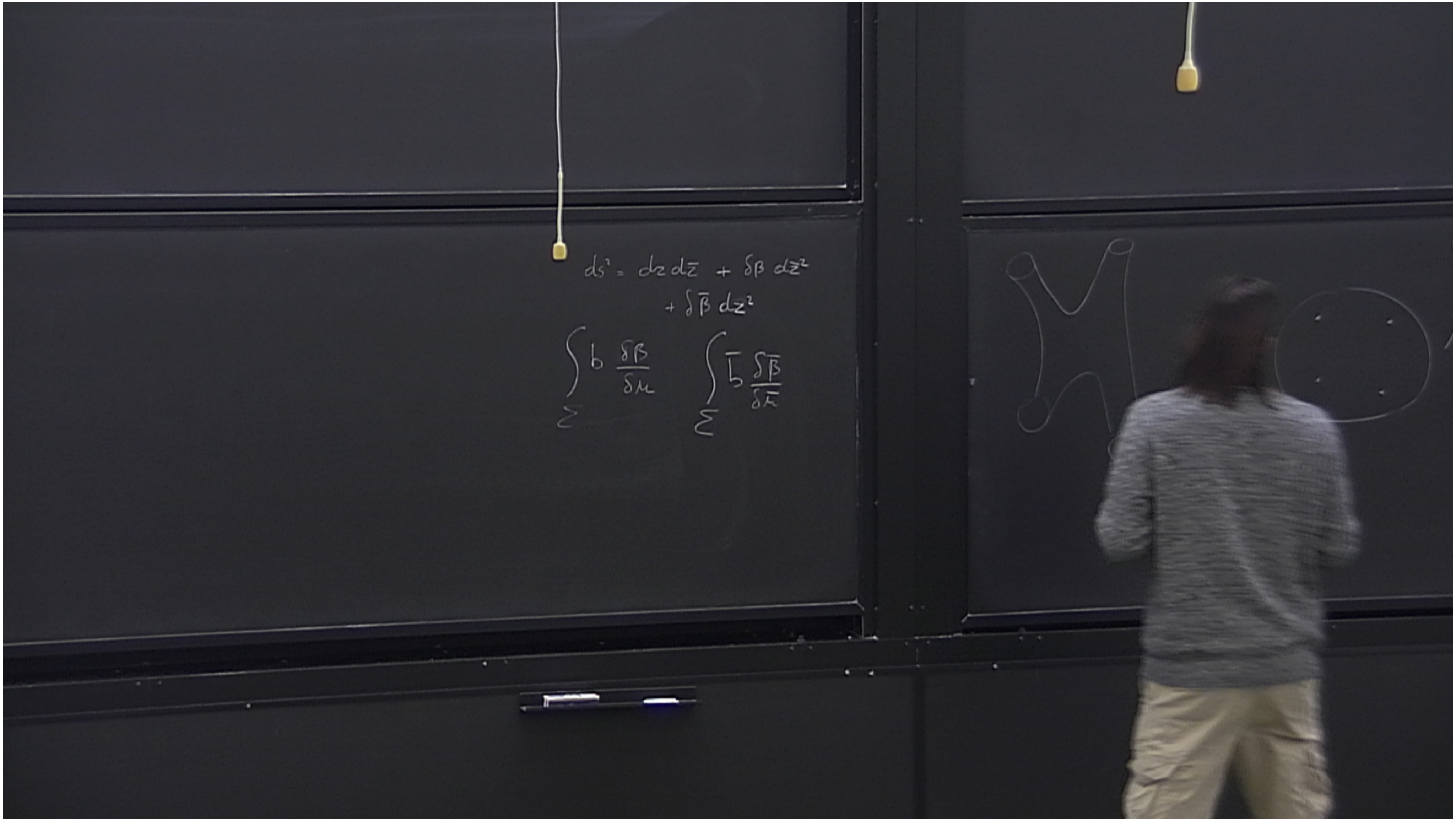
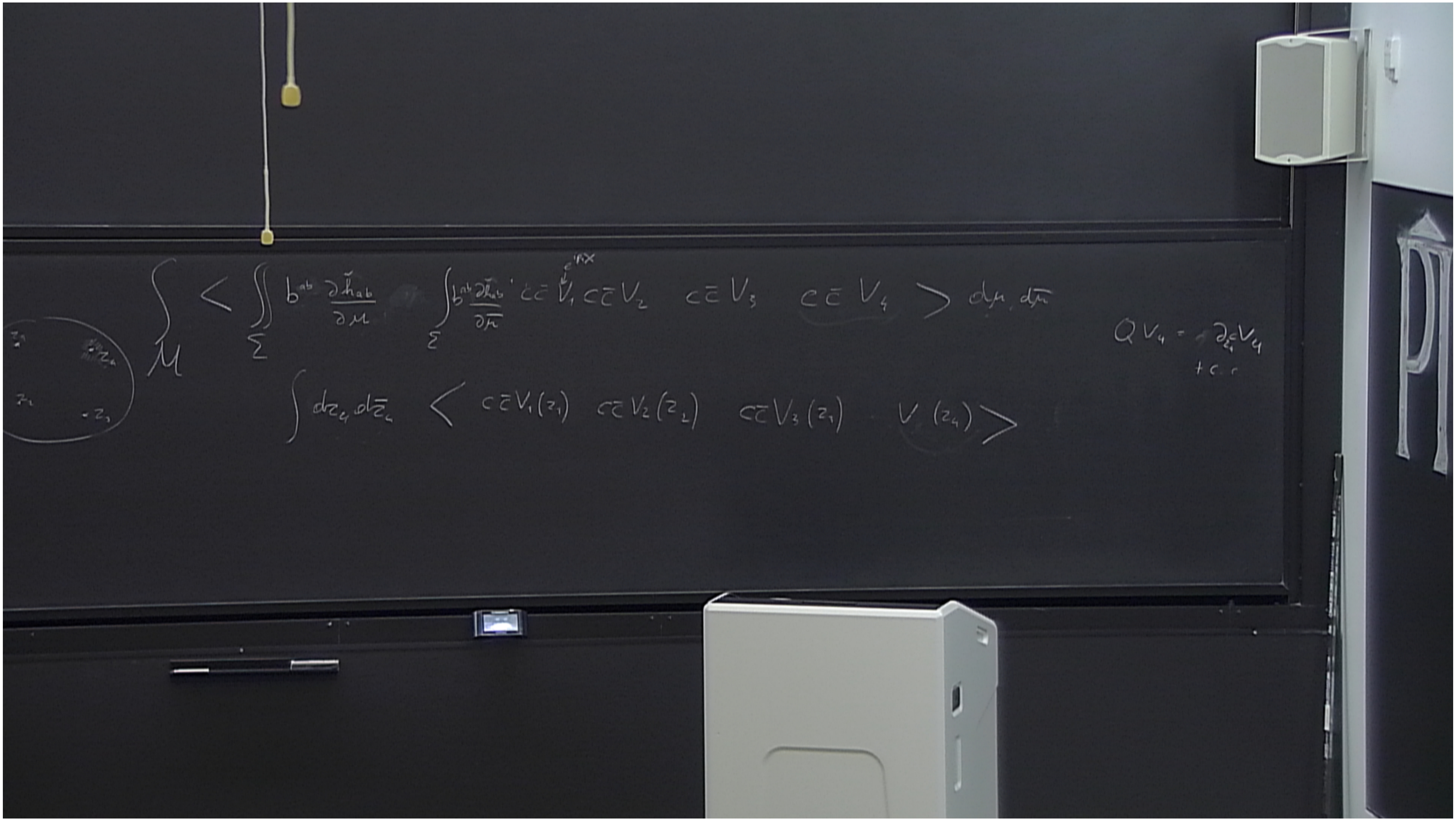
Title: PSI 2015/2016 String Theory - Lecture 10

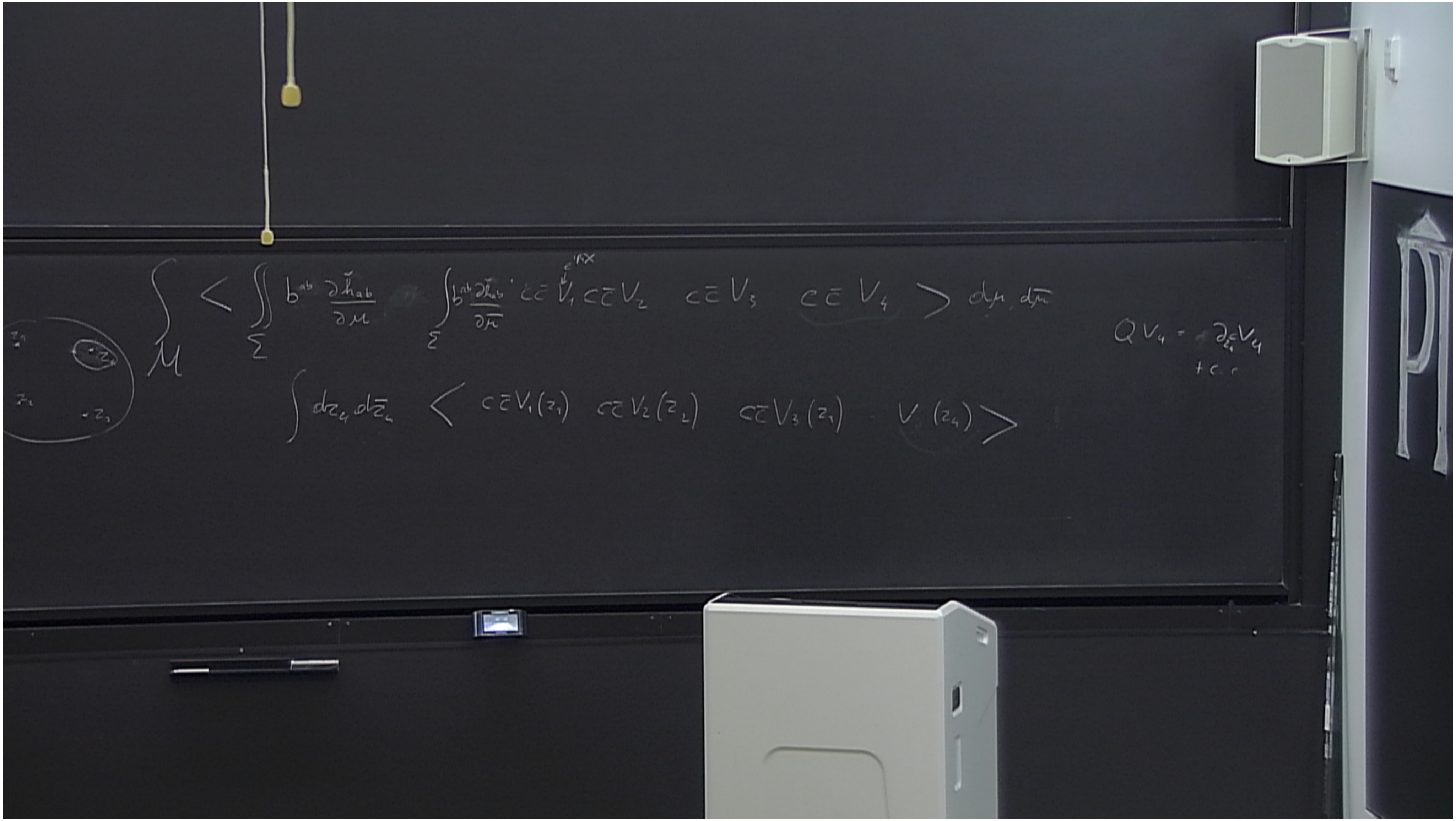
Date: Feb 12, 2016 10:15 AM

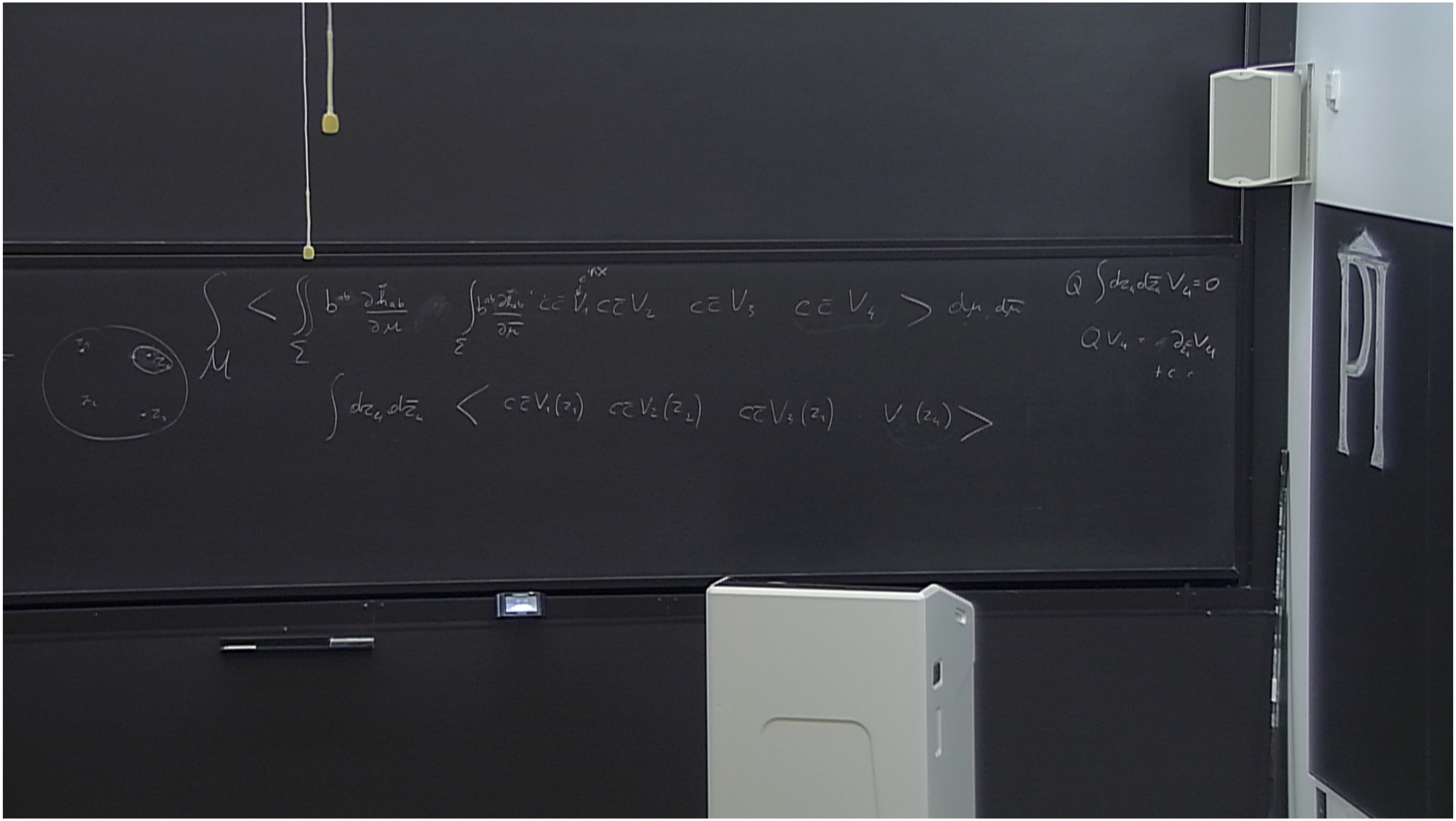
URL: http://pirsa.org/16020044

Abstract:

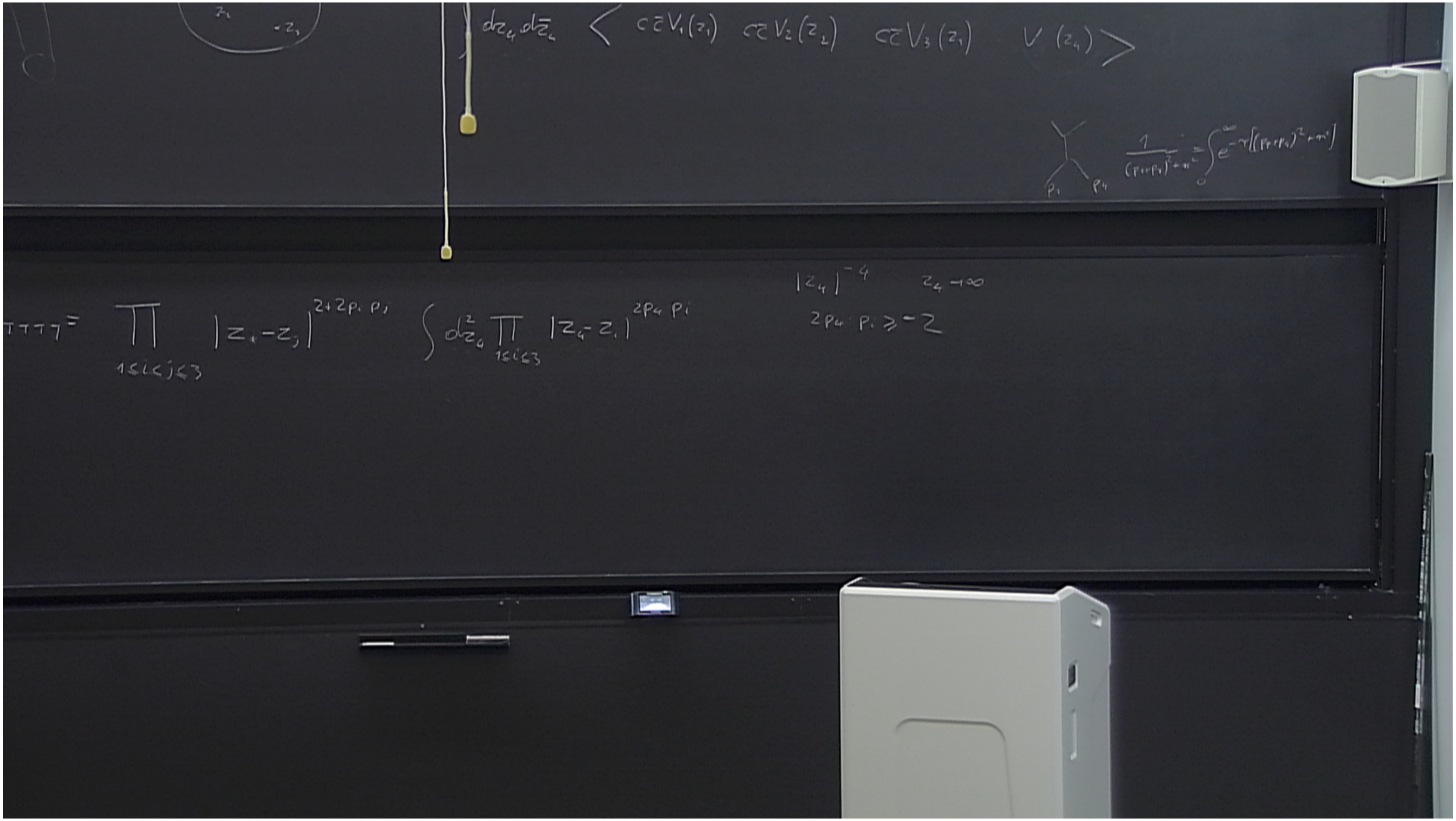

$ds^2 = dz\,d\bar{z} + \delta\beta\, d\bar{z}^2$
$+ \delta\bar{\beta}\, dz^2$
$\int_\Sigma b \frac{\delta\beta}{\delta m}$
$\int_\Sigma \bar{b} \frac{\delta\bar{\beta}}{\delta\bar{m}}$

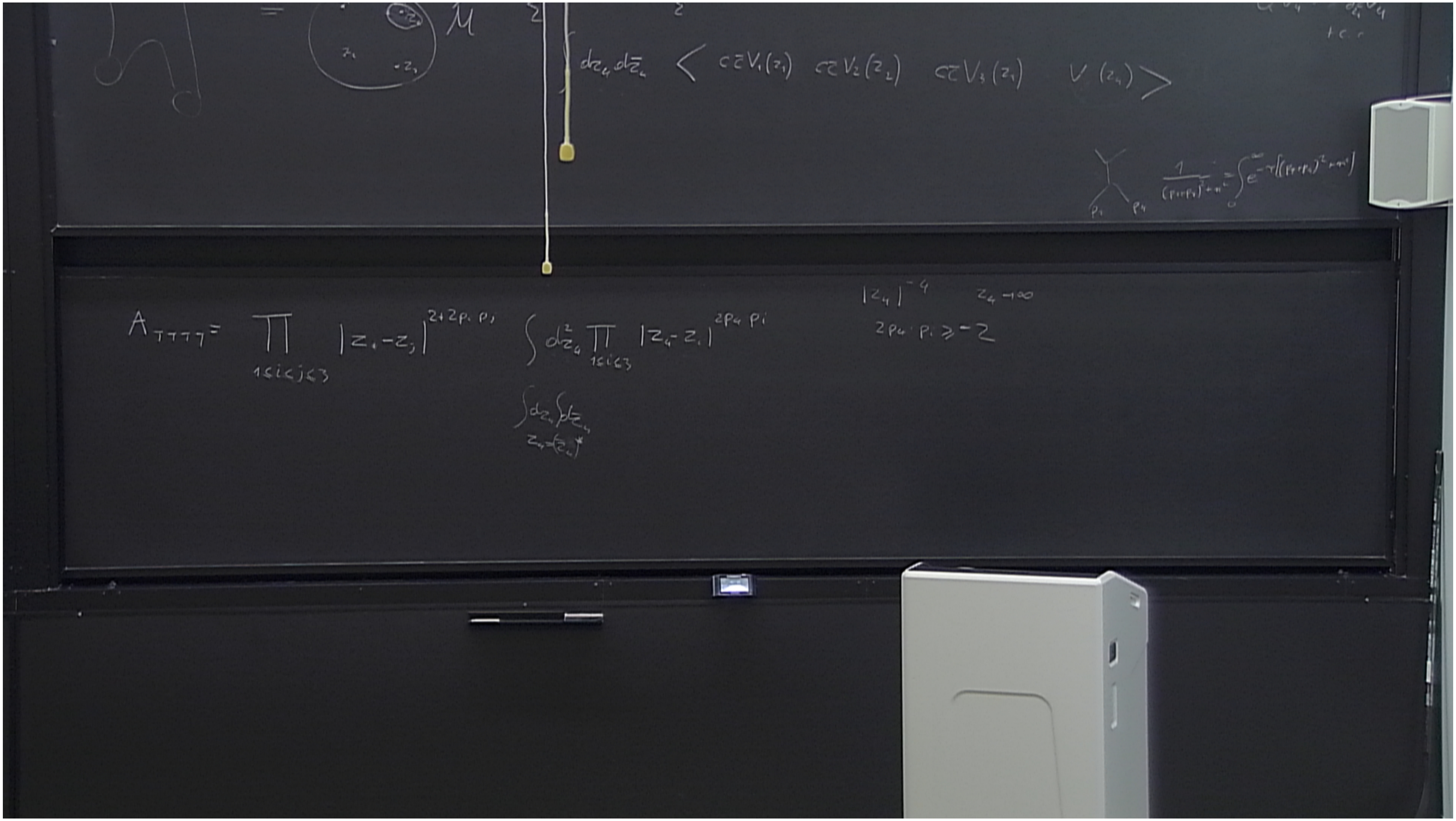

$\int_{\mathcal{M}} \langle \iint_{\Sigma} b^{ab} \frac{\partial h_{ab}}{\partial \mu} \int_{\Sigma} b^{ab} \frac{\partial \bar{h}_{ab}}{\partial \bar{\mu}} \, c\bar{c} V_1 \, c\bar{c} V_2 \, c\bar{c} V_3 \, c\bar{c} V_4 \rangle \, d\mu \, d\bar{\mu}$
e^{ipX}
$Q V_4 = \partial_{\bar{z}_4} V_4 + c.c$
$\int dz_4 \, d\bar{z}_4 \langle c\bar{c} V_1(z_1) \, c\bar{c} V_2(z_2) \, c\bar{c} V_3(z_3) \, V_4(z_4) \rangle$
z_1 z_2 z_3 z_4


$\int_{\mathcal{M}} \langle \iint_{\Sigma} b^{ab} \frac{\partial \hat{h}_{ab}}{\partial \mu} \int_{\Sigma} b^{ab} \frac{\partial \hat{h}_{ab}}{\partial \bar{\mu}}\, c\bar{c}V_1\, c\bar{c}V_2\, c\bar{c}V_3\, c\bar{c}V_4 \rangle\, d\mu\, d\bar{\mu}$
e^{ipX}
$\int dz_4\, d\bar{z}_4 \langle c\bar{c}V_1(z_1)\, c\bar{c}V_2(z_2)\, c\bar{c}V_3(z_3)\, V(z_4) \rangle$
$QV_4 = \partial_{\bar{z}_4} V_4$
$+ c.c.$
z_1
z_2
z_3
z_4

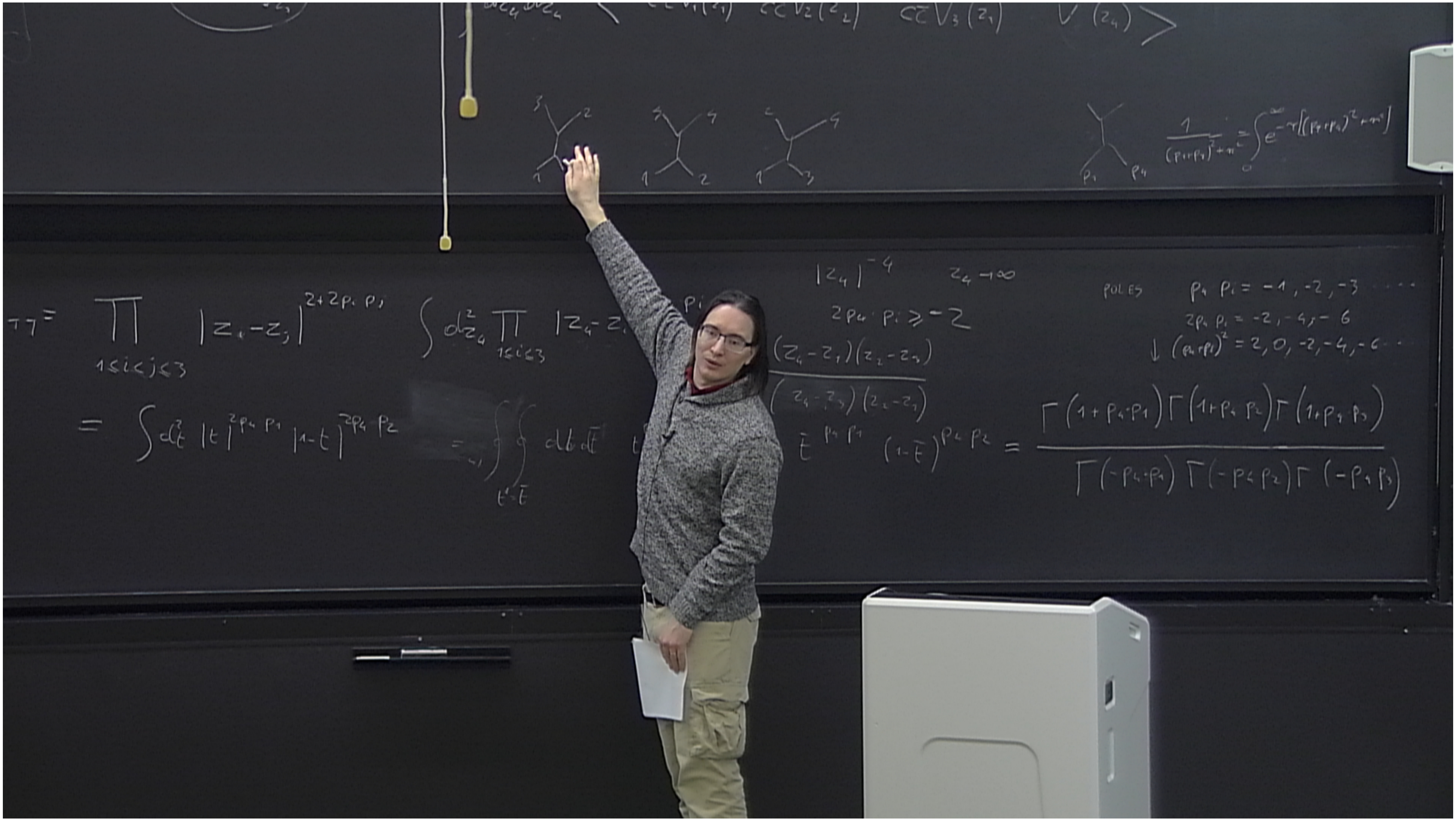


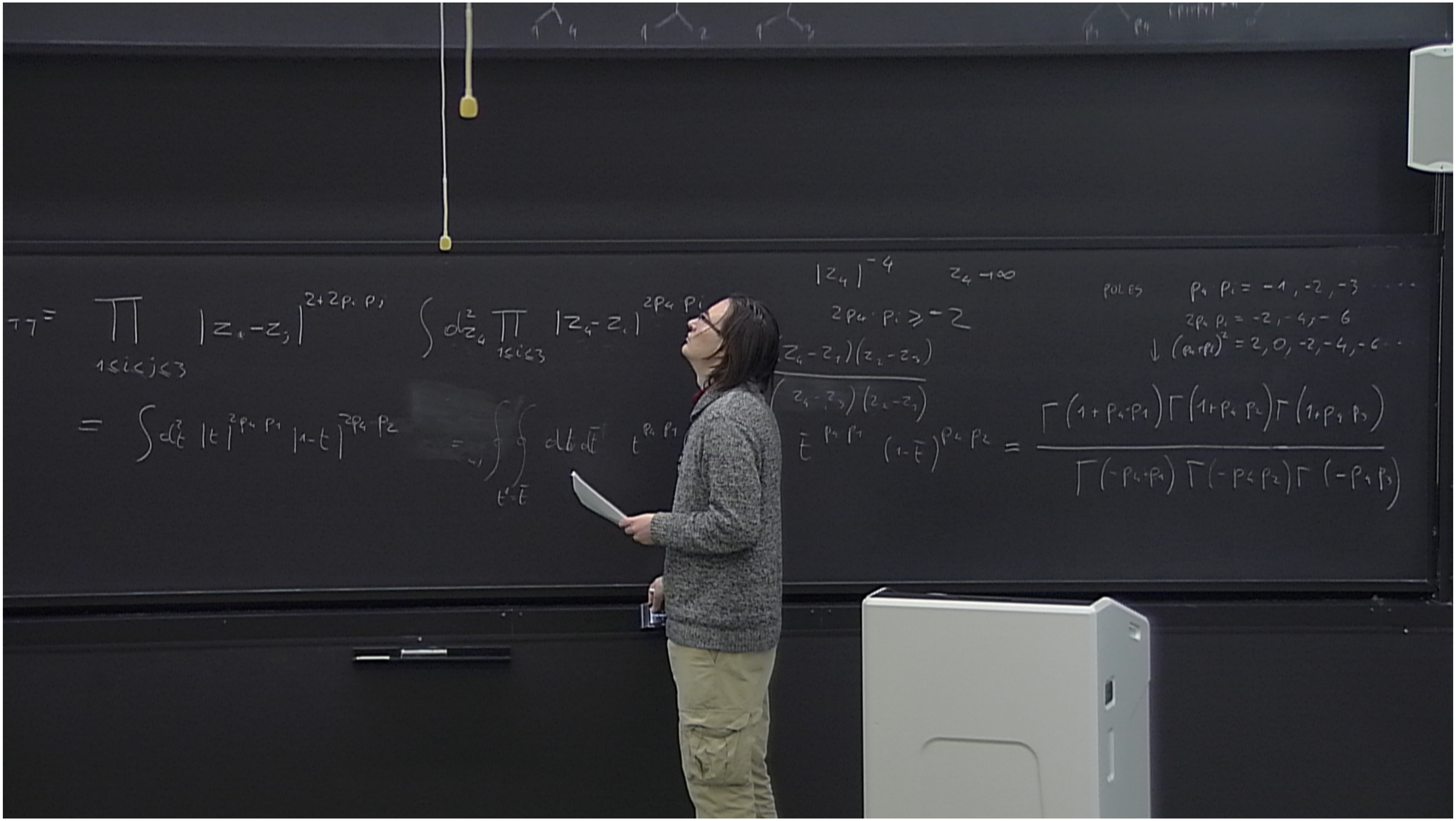
$\int_{\mathcal{M}} \langle \int_\Sigma b^{ab} \frac{\partial h_{ab}}{\partial \mu} \int_\Sigma b^{ab} \frac{\partial \bar{h}_{ab}}{\partial \bar{\mu}} \, c\bar{c} V_1 \, c\bar{c} V_2 \, c\bar{c} V_3 \, c\bar{c} V_4 \rangle \, d\mu \, d\bar{\mu}$
e^{ikX}
$\int dz_4 \, d\bar{z}_4 \langle c\bar{c} V_1(z_1) \, c\bar{c} V_2(z_2) \, c\bar{c} V_3(z_3) \, V(z_4) \rangle$
$Q \int dz_4 \, d\bar{z}_4 \, V_4 = 0$
$Q V_4 = \partial_{z_4} c V_4$
$+ c.c.$


dz4 dz̄4 < cc̄V1(z1) cc̄V2(z2) cc̄V3(z3) V(z4) >
|z4|^-4
z4 → ∞
2p4 · pi ≥ −2
1≤i<j≤3
1≤i≤3



∫ dz₄ dz̄₄ < cc̄V₁(z₁) cc̄V₂(z₂) cc̄V₃(z₃) V(z₄) >
|z₄|^-4 z₄ → ∞
2p₄ · pᵢ ≥ -2
A_TTTT = ∏_{1≤i<j≤3} |zᵢ - zⱼ|^{2+2pᵢ·pⱼ} ∫ d²z₄ ∏_{1≤i≤3} |z₄ - zᵢ|^{2p₄·pᵢ}
∫dz₄ ∫dz̄₄
z₄ = (z̄₄)*




POLES
$p_4 \cdot p_i = -1, -2, -3$
$2p_4 \cdot p_i = -2, -4, -6$
$2p_4 \cdot p_i \geq -2$
$z_4 \to \infty$

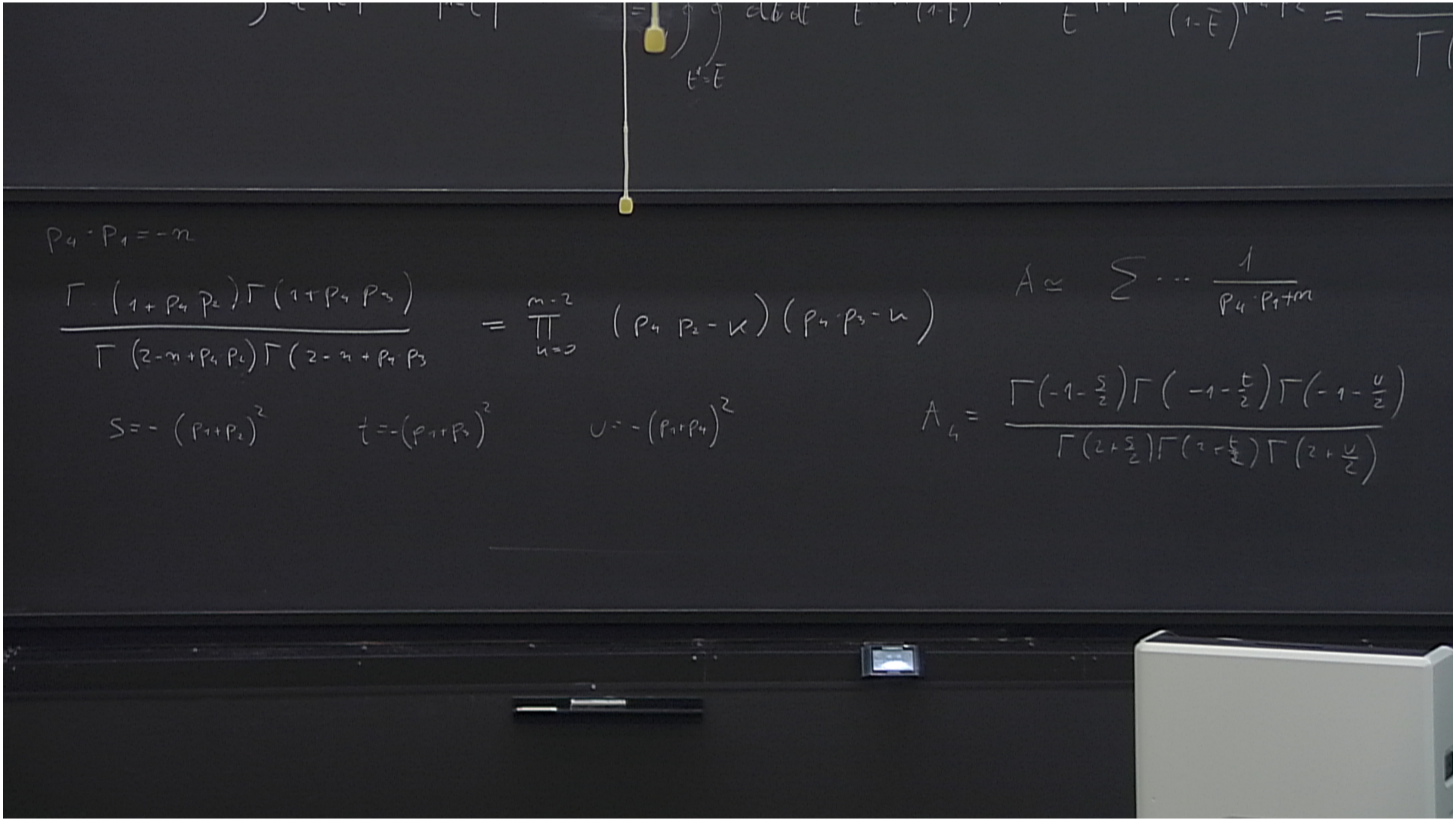
$p_4 \cdot p_1 = -n$

$$\frac{\Gamma(1+p_4 \cdot p_2)\,\Gamma(1+p_4 \cdot p_3)}{\Gamma(2-n+p_4 \cdot p_2)\,\Gamma(2-n+p_4 \cdot p_3)} = \prod_{k=0}^{n-2} (p_4 \cdot p_2 - k)(p_4 \cdot p_3 - k)$$

$t' = \bar{t}$

$p_4 \cdot p_1 = -n$

$$\frac{\Gamma(1+p_4 \cdot p_2)\,\Gamma(1+p_4 \cdot p_3)}{\Gamma(2-n+p_4 \cdot p_2)\,\Gamma(2-n+p_4 \cdot p_3)} = \prod_{k=0}^{n-2} (p_4 \cdot p_2 - k)(p_4 \cdot p_3 - k)$$


$p_4 \cdot p_1 = -n$
$\frac{\Gamma(1+p_4 \cdot p_2)\Gamma(1+p_4 \cdot p_3)}{\Gamma(2-n+p_4 \cdot p_2)\Gamma(2-n+p_4 \cdot p_3)} = \prod_{k=0}^{n-2} (p_4 \cdot p_2 - k)(p_4 \cdot p_3 - k)$
$A \simeq \sum \cdots \frac{1}{p_4 \cdot p_1 + n}$
$s = -(p_1+p_2)^2$
$t = -(p_1+p_3)^2$
$u = -(p_1+p_4)^2$
$A_4 = \frac{\Gamma(-1-\frac{s}{2})\Gamma(-1-\frac{t}{2})\Gamma(-1-\frac{u}{2})}{\Gamma(2+\frac{s}{2})\Gamma(2+\frac{t}{2})\Gamma(2+\frac{u}{2})}$

$$p_4 \cdot p_1 = -n$$

$$\frac{\Gamma(1+p_4\cdot p_2)\,\Gamma(1+p_4\cdot p_3)}{\Gamma(2-n+p_4\cdot p_2)\,\Gamma(2-n+p_4\cdot p_3)} = \prod_{k=0}^{n-2} (p_4\cdot p_2 - k)(p_4\cdot p_3 - k)$$

$$s = -(p_1+p_2)^2 \qquad t = -(p_1+p_3)^2 \qquad u = -(p_1+p_4)^2$$

$$A \simeq \sum \dots \frac{1}{p_4\cdot p_1 + n}$$

$$A_4 = \frac{\Gamma(-1-\frac{s}{2})\,\Gamma(-1-\frac{t}{2})\,\Gamma(-1-\frac{u}{2})}{\Gamma(2+\frac{s}{2})\,\Gamma(2+\frac{t}{2})\,\Gamma(2+\frac{u}{2})}$$

$$s,t,u \to \infty \quad \sim e^{-s\ln s - t\ln t - u\ln u}$$