

Title: Regulating Eternal Inflation with the UV/IR connection

Date: Jun 16, 2010 04:30 PM

URL: <http://pirsa.org/10060018>

Abstract: I will discuss a recent proposal to regulate the infinities of eternal inflation by relating a late-time cutoff in the bulk to a short-distance cutoff on the conformal boundary of the spacetime.

ing Eternal Inflation with the UV/IR Connection

w/ Bousso Leichenauer Rosenhaus



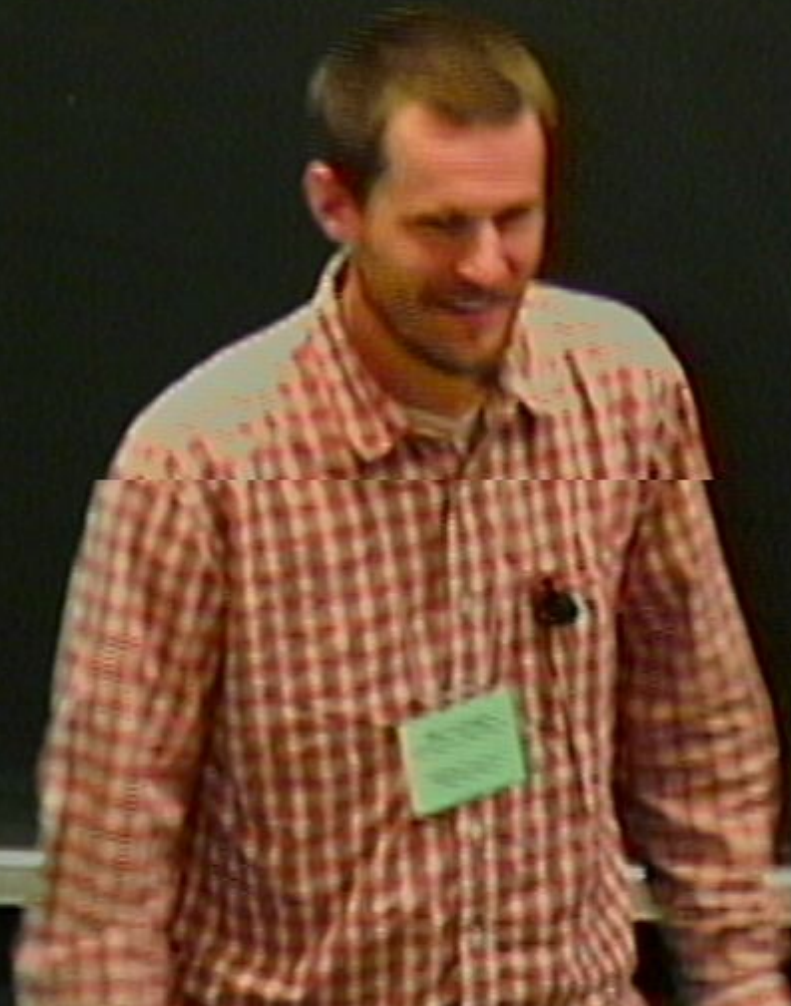
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Regulating Eternal Inflation with the UV/IR Connection w/ Boosso Leichenauer Rosenhaus

Outline: I. Introduction:

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Outline: I. Introduction: Predictions from String Theory $\leftrightarrow$
Dynamics of Eternal Inflation
Insensitive to initial conditions

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 $\rightarrow$ cutoff dependent

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Measure Problem: ∞ Volume
II. "New lightcone time" $\rightarrow$ cutoff dependent

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- consequences $\rightarrow$ cutoff dependent

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- universal features

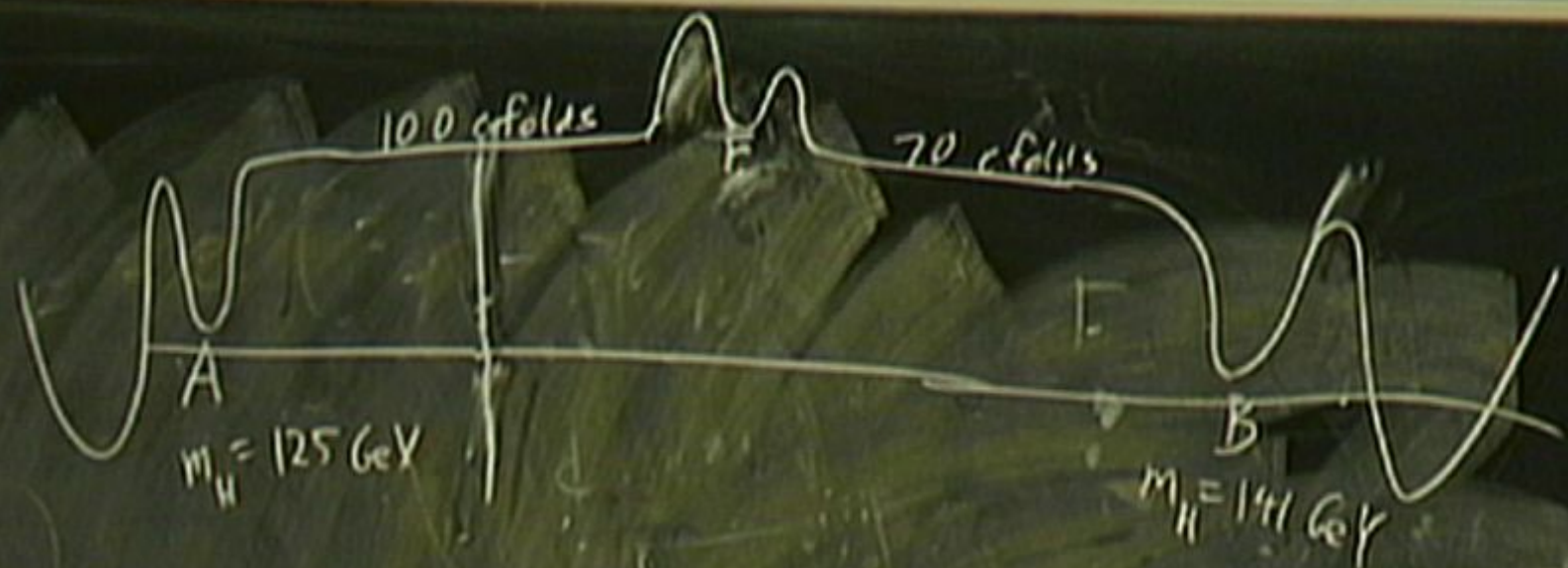
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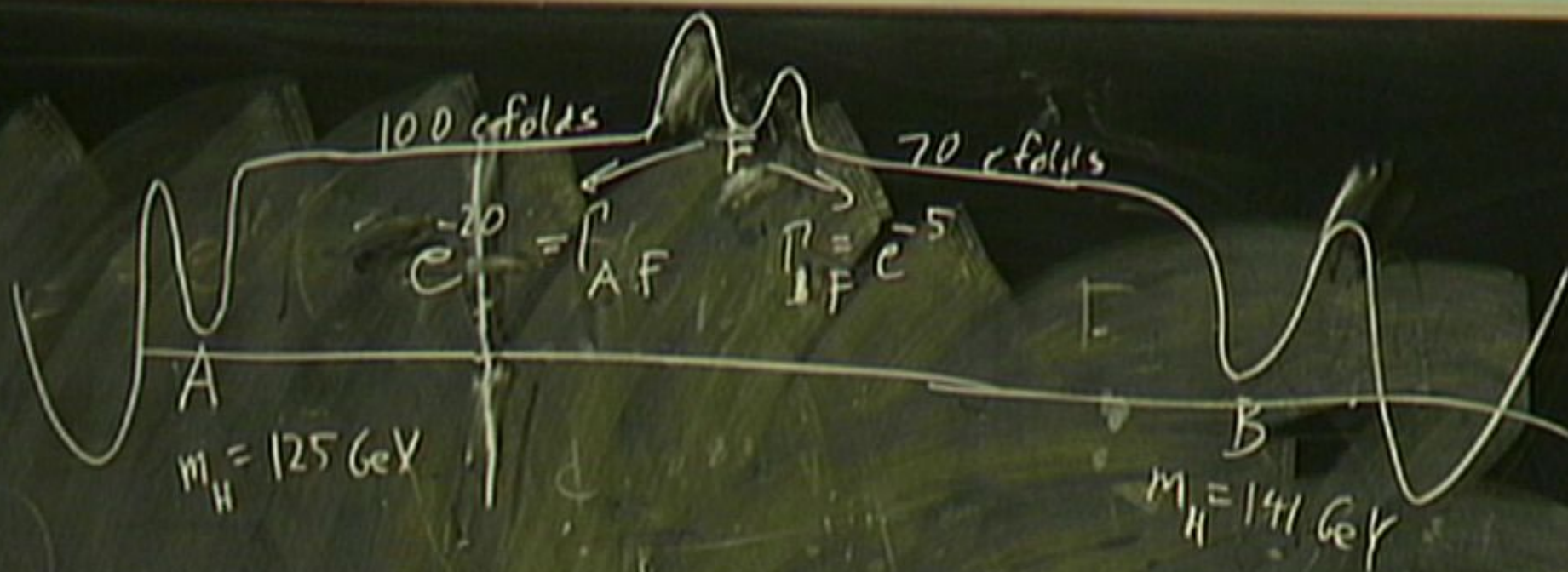
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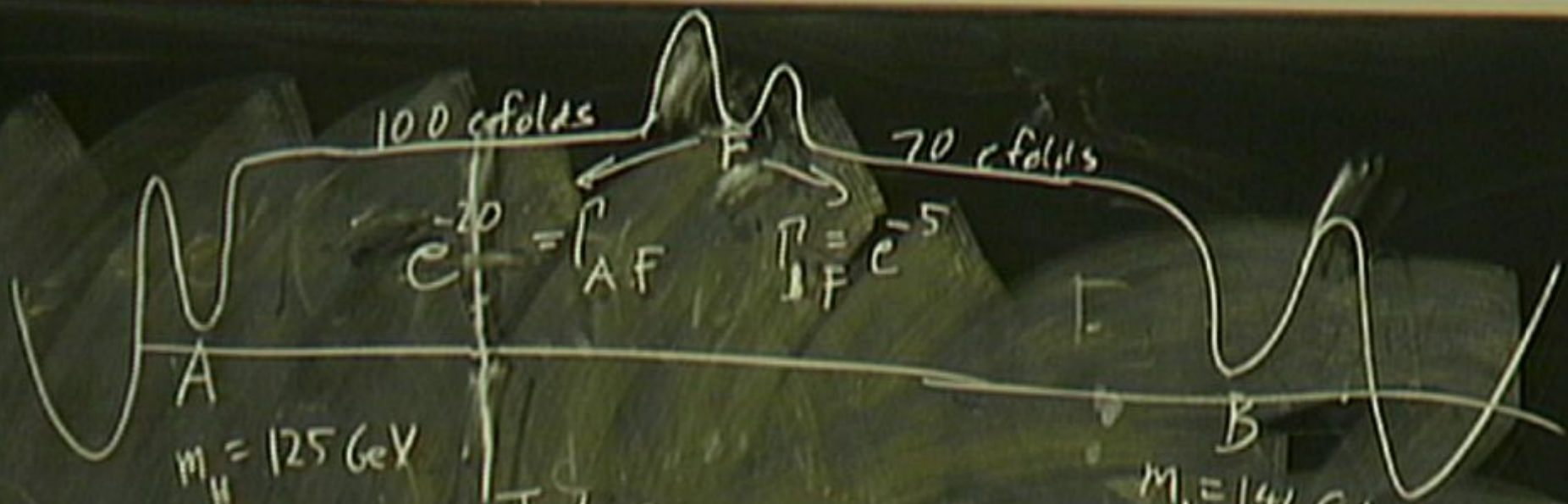
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III. $\rightarrow$ to other cutoffs
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IV Issues & future

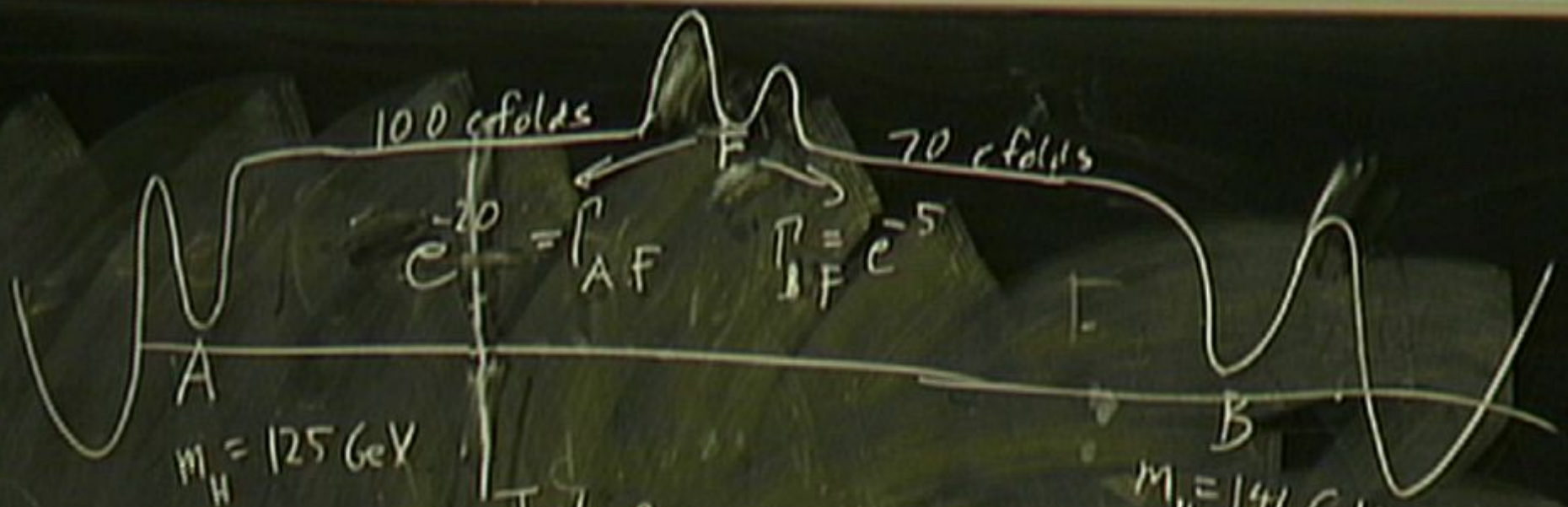






Initial cond's: Finite prob. to eternally inflate

- a) A
- b) B
- c) D

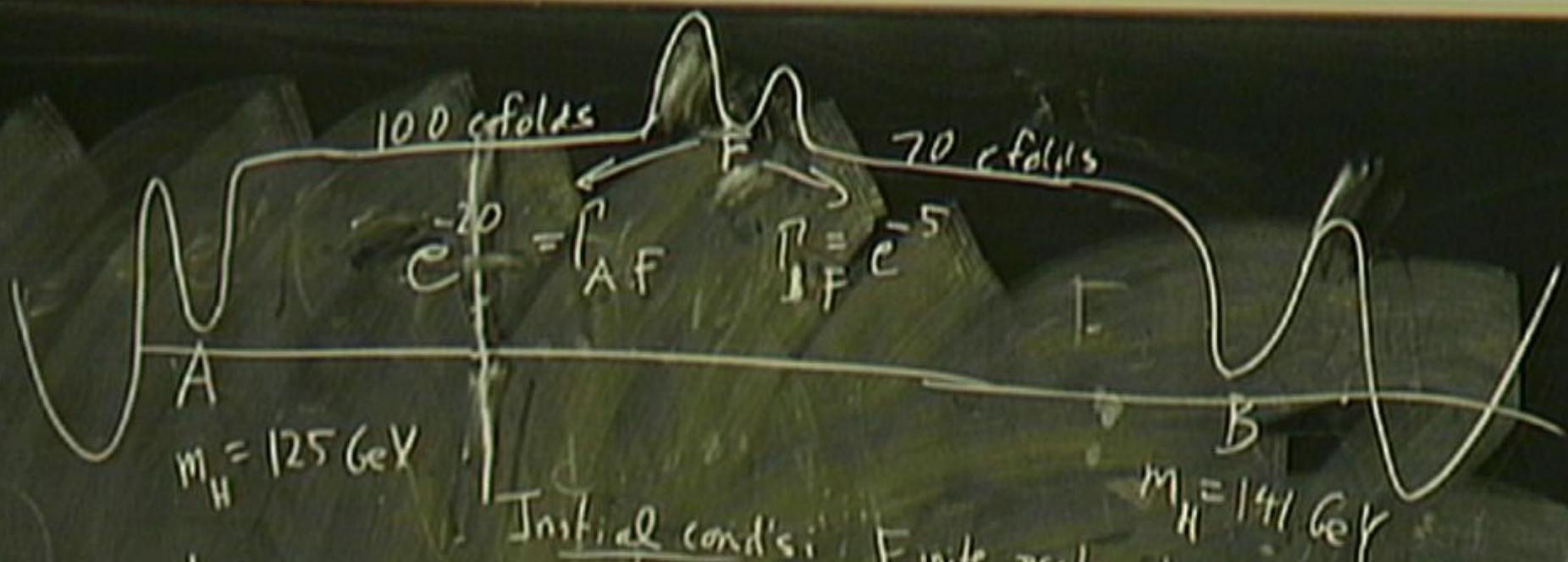


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c) Depends on initial conditions

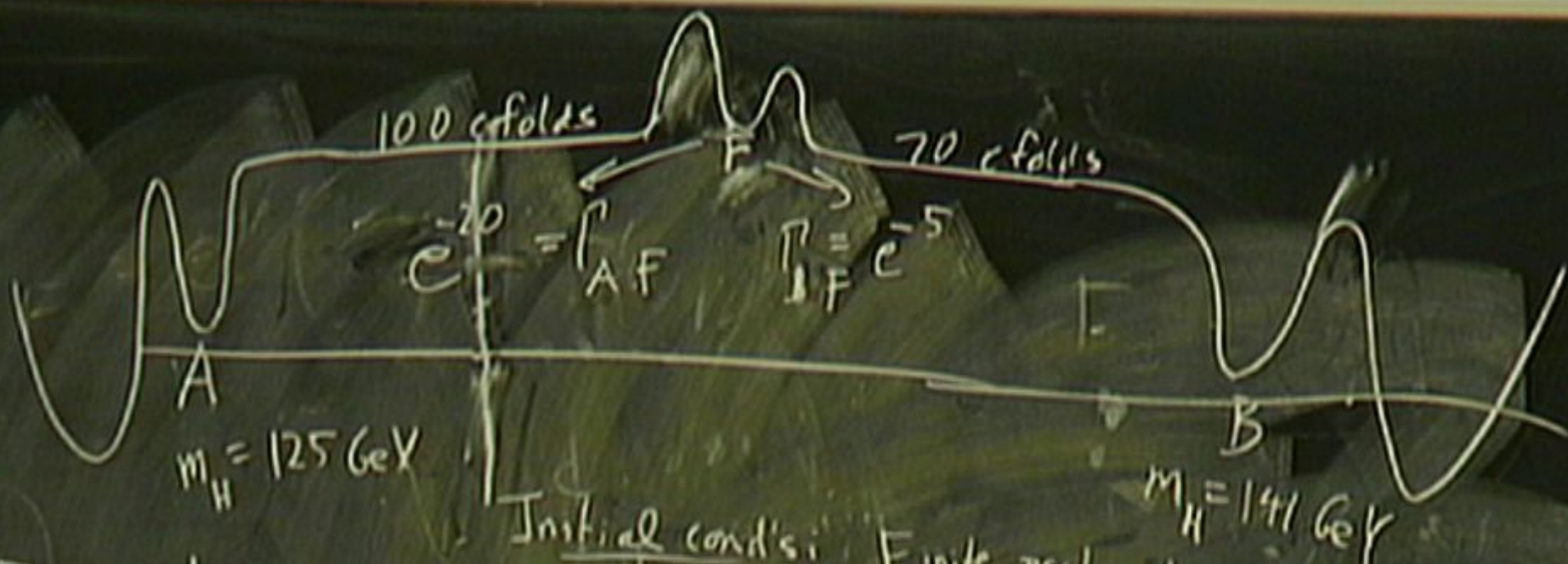
d) LHC sees superposition



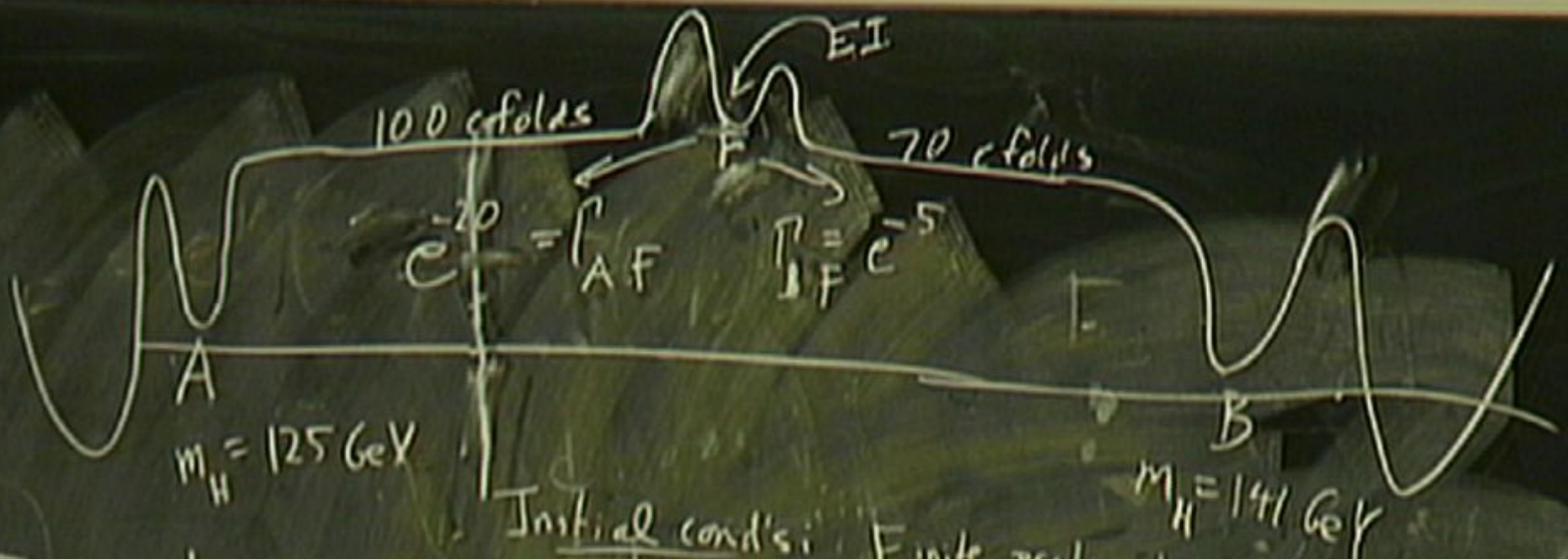
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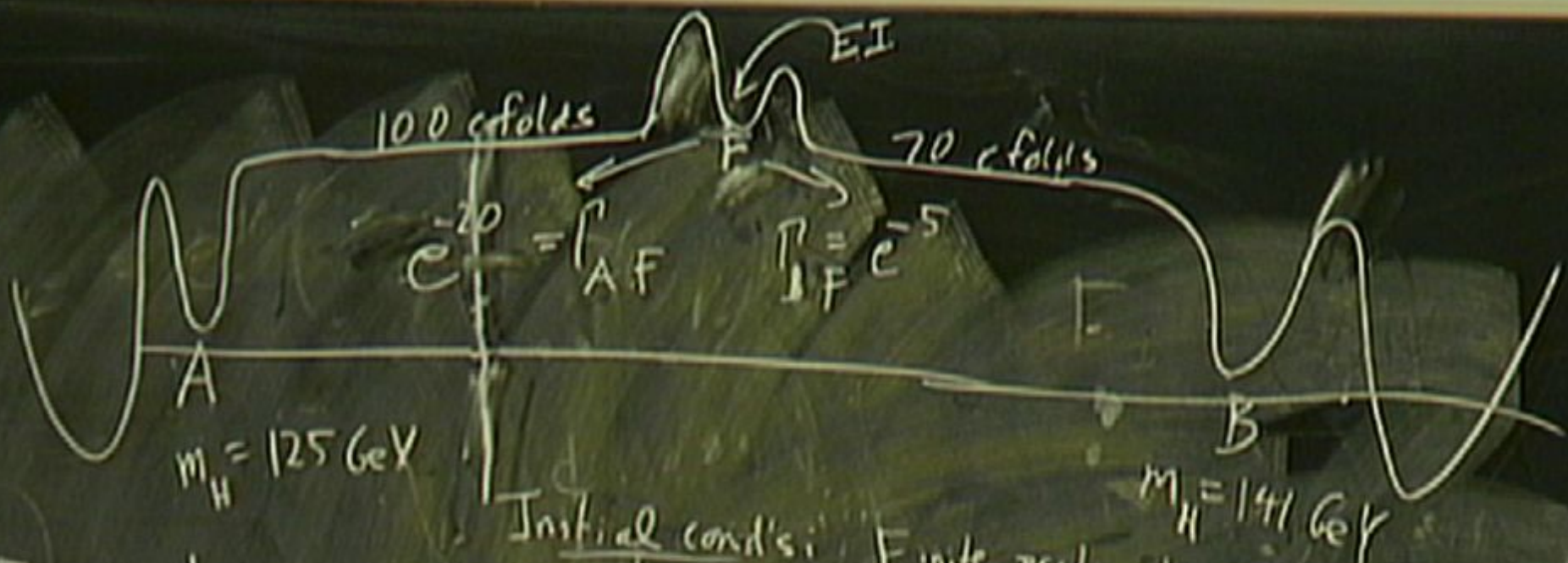


- 5 a) A
- 4 b) B
- c) Depends on initial conditions
- d) LHC sees superposition



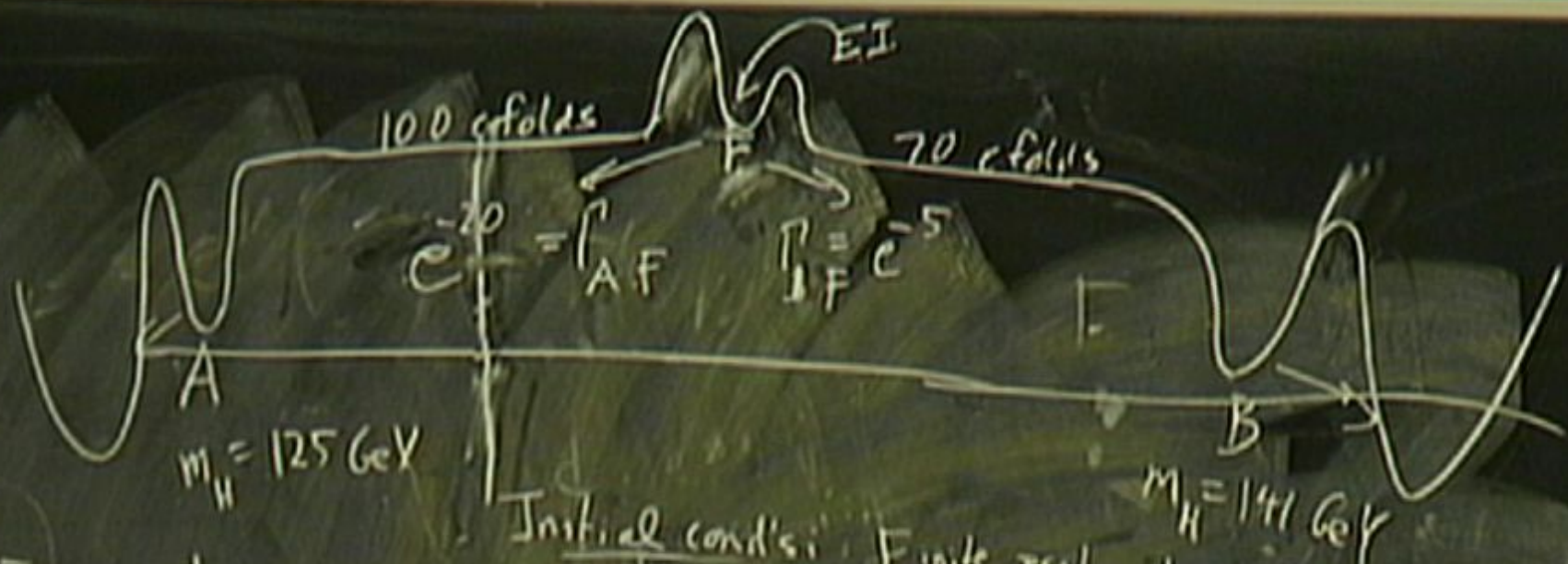
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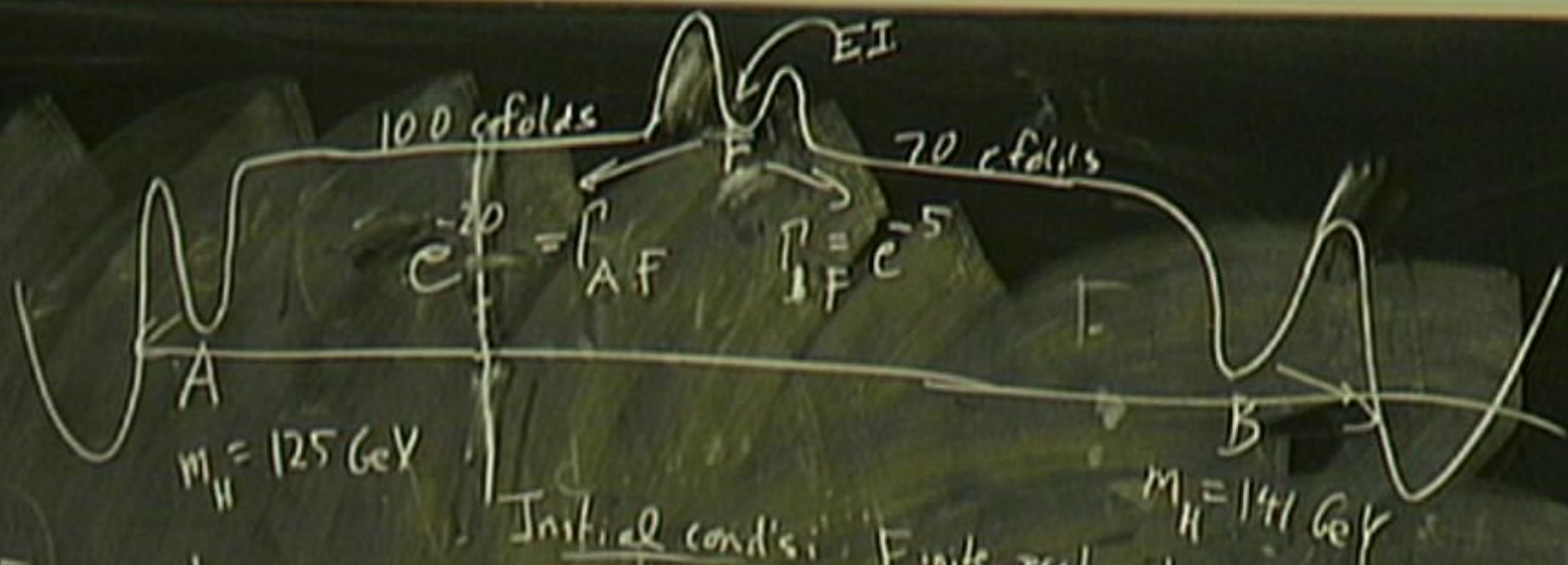
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B

Independent of Initial Conditions

- 1) Finite volume initial conditions
- 2) Finite probability to eternally inflate
- 3) Choose reasonable time coordinate

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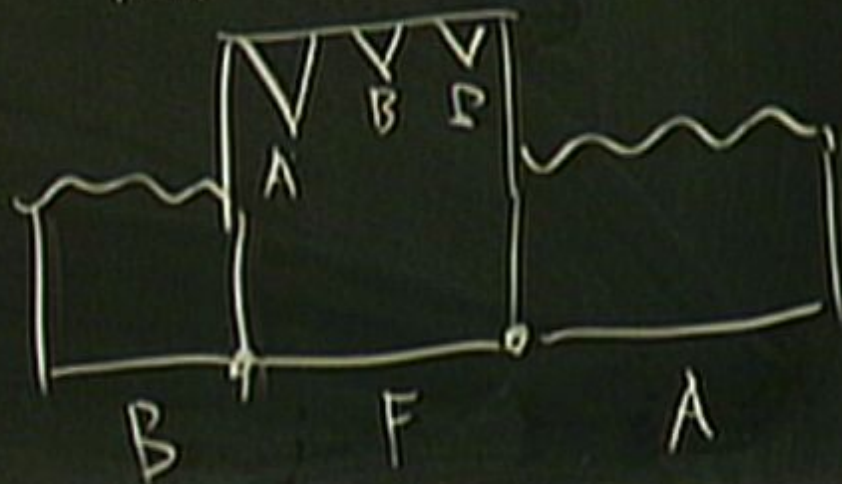
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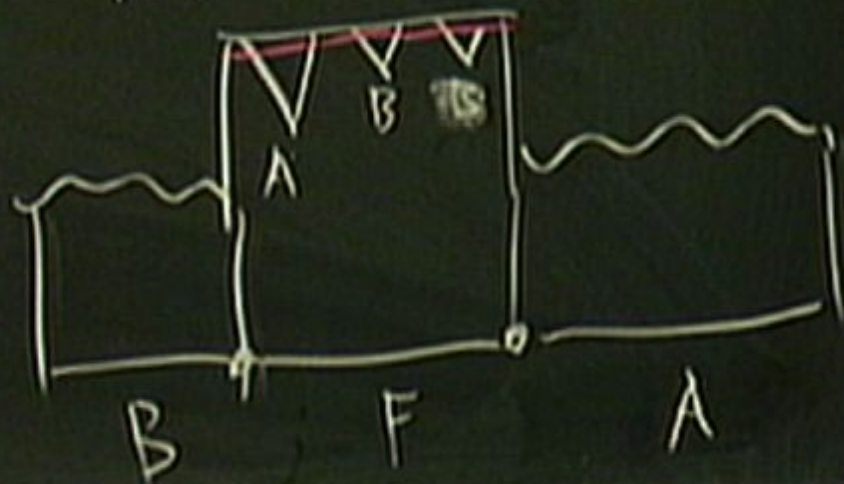


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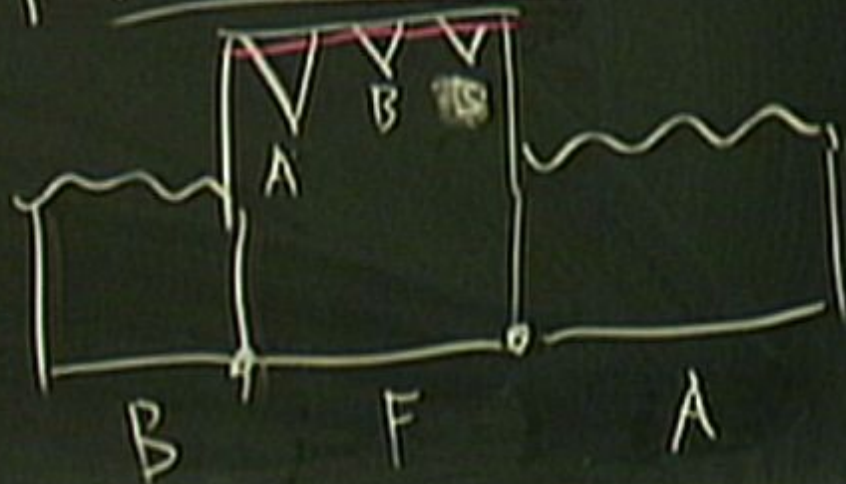
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$$\lim_{t \rightarrow \infty} \frac{N_A}{N_B} \rightarrow C_{AB}$$

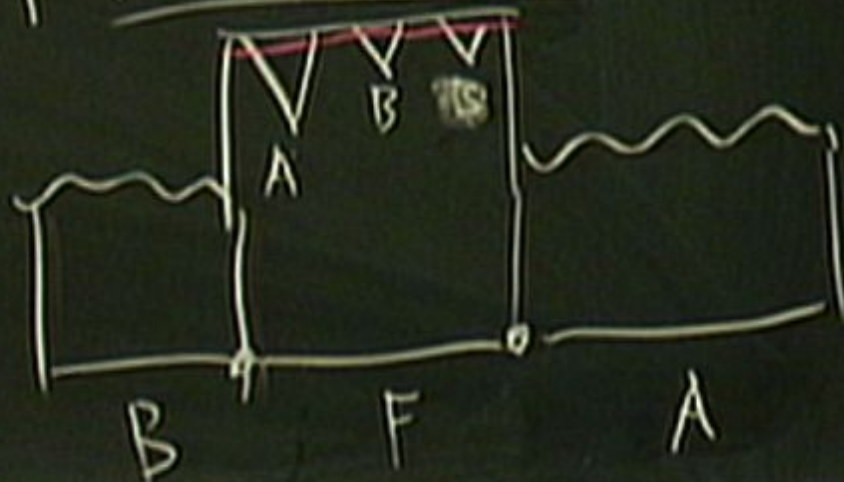


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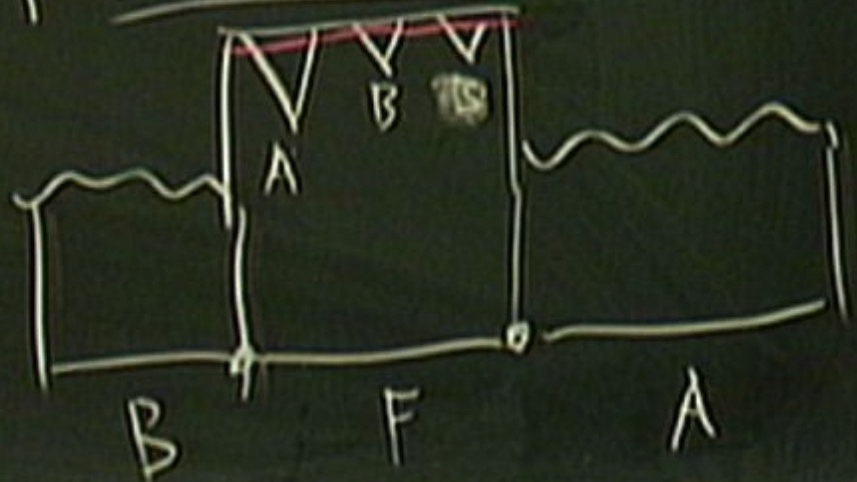


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$$\frac{\Gamma_A F}{\Gamma_B}$$

independent of
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Understand
Steady-State
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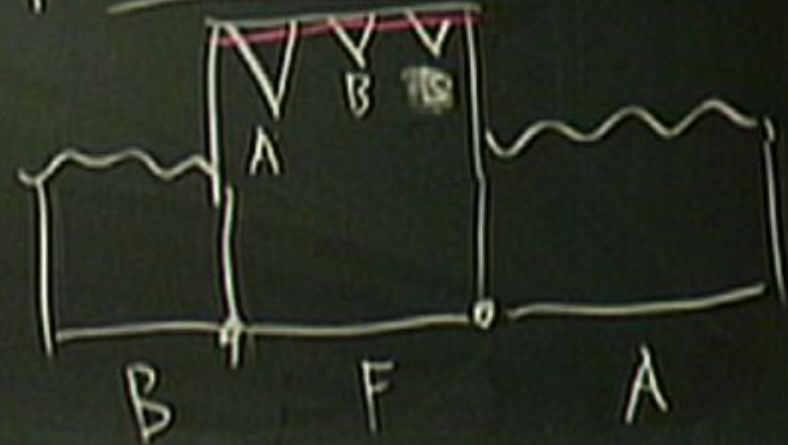
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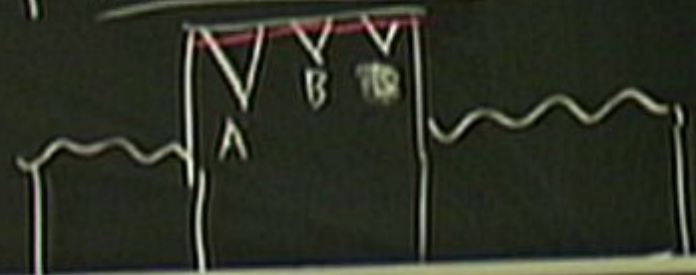


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$$\lim_{t \rightarrow \infty} \frac{N_A}{N} \rightarrow C_{AF}$$

Predictions: can't
P

eternal inflation

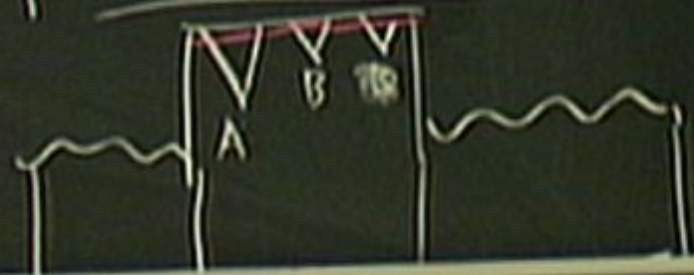
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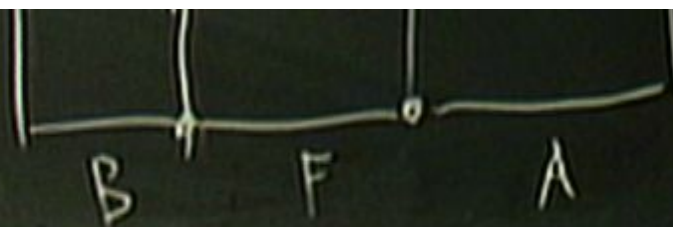


$$\lim_{t \rightarrow \infty} \frac{N_A}{N} \rightarrow C_{AB}$$

Prediction: can't

$$\frac{P_{141}}{P_{125}} = \frac{N_{141}}{N_{125}}$$

$$\lim_{t \rightarrow \infty} \frac{N_A}{N_B} \rightarrow C_{AB}$$



Predictions: cont

$$\frac{P_{141}}{P_{125}} = \frac{N_{141}}{N_{125}}$$

Prediction: cont

$$\frac{P_{141}}{P_{125}} = \lim_{n \rightarrow \infty} \frac{N_{141}}{N_{125}}$$

Predictions: cant

$$\frac{P_{141}}{P_{125}} = \lim_{N \rightarrow \infty} \frac{N_{141}}{N_{125}}$$

P_{125}

N_{125}

Does prob prediction for
 m_H make sense

Predictions cant

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In principle, no different from
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Two differences: 1) Technical contd |

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$$t \rightarrow \infty \quad N_B \quad A B$$

Prediction: cont

$$\frac{P_{141}}{P_{125}} = \lim \frac{N_{141}}{N_{125}}$$

$$N_{125}$$

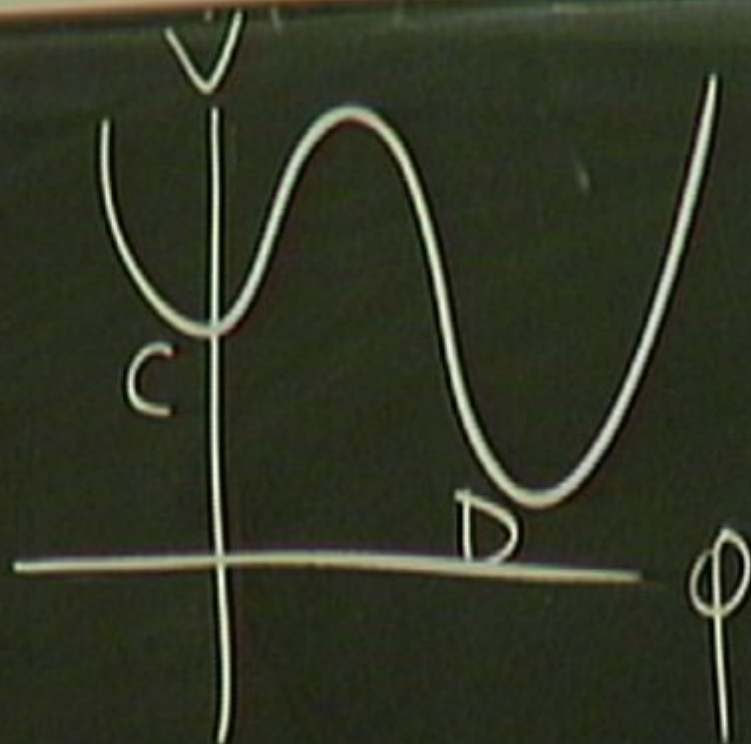
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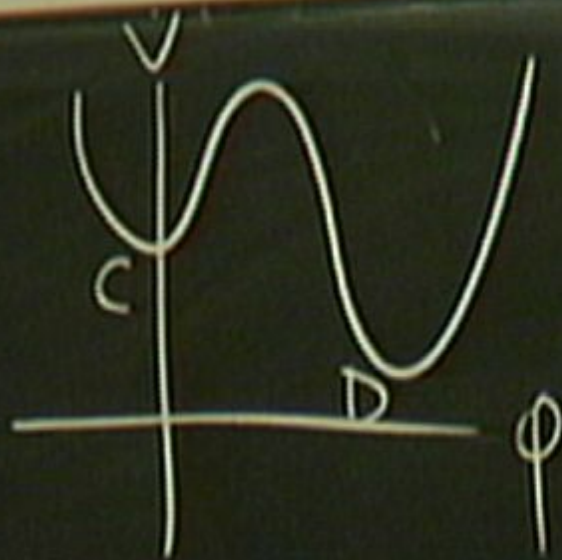
Two differences: 1) Technical cont'd
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Problem: $\lim \frac{N_A}{N_B}$

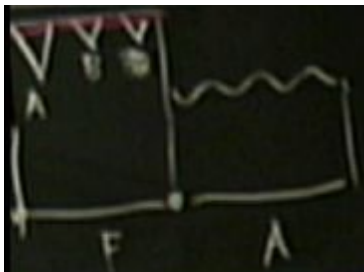
depends on choice of cutoff



$$\frac{V_C}{V_D}$$



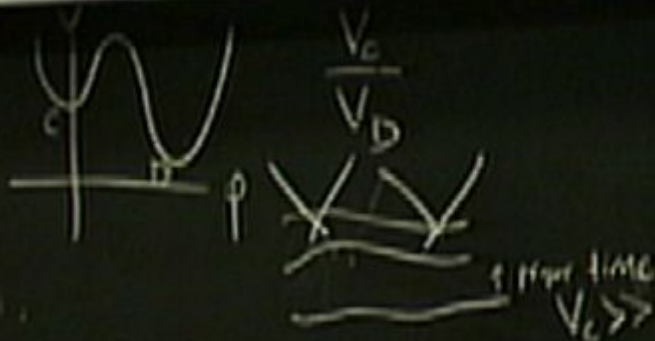
↑ proper time

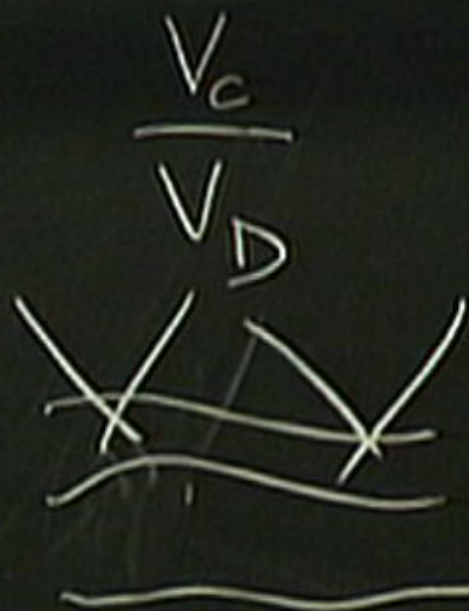
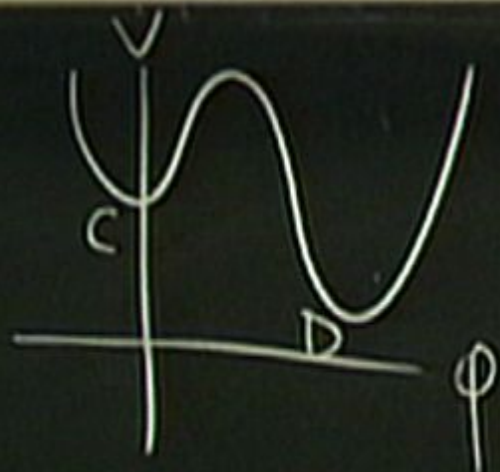


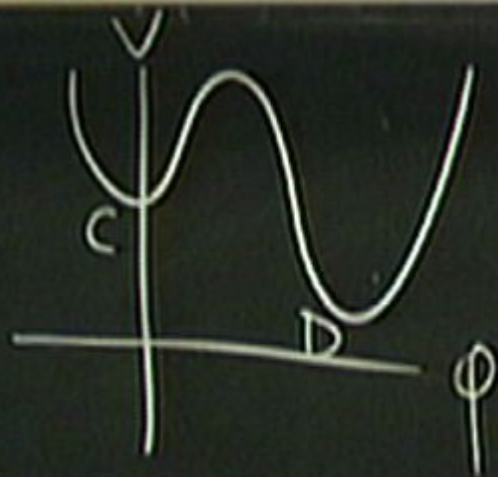
rate production for
rate sense

rate, is different from
= 5 CMB

linear control
for of predictions
of cutoff





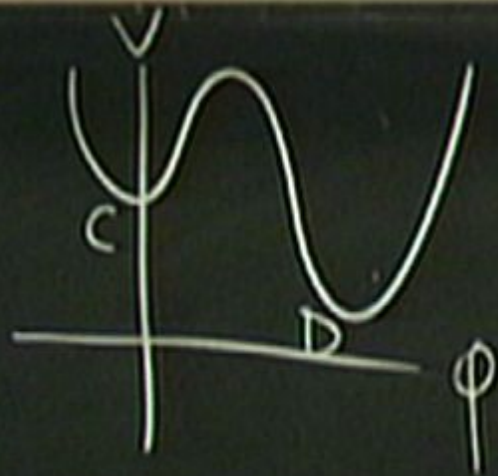


↑ proper time

$$V_c \gg V_D$$

scale factor time

$$dt_{sf} = H dt$$



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$$V_C \gg V_D$$

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$$dt_{sf} = H d\tau$$

$$V_D \gg V_C$$

II. Proposal

MS/CFT $\leftrightarrow$ impert + desc lines on bandary of spacetime

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AdS/CFT $\leftrightarrow$ nmpert desc lives on boundary of spacetime



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UV cutoff on bdy $\longleftrightarrow$ late time (IR) cutoff in bulk

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UV cutoff on bdy $\longleftrightarrow$ late time (IR) cutoff in bulk

Events included below cutoff if
 V of future lightcone $> V_0$

~~$V_c \gg V_D$~~
 scale factor time
 $dt = H^{-1} da$

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take $V_0 \rightarrow 0$

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$$\cancel{V_C} > \cancel{V_D}$$

scale factor time

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But metric only defined up to

$$\tilde{g}_{ab} = \Omega^2(x^a) g_{ab}$$

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Proposal: $R = \text{const}$

Events included below cut-off if

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$$\text{take } V_0 \rightarrow 0$$

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Fixes ambiguity

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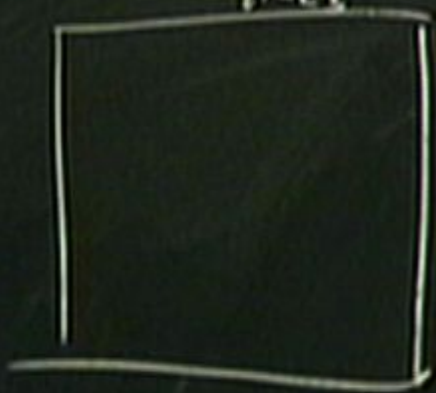
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$$d\Omega^2$$



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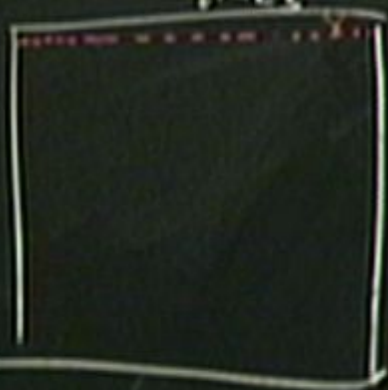
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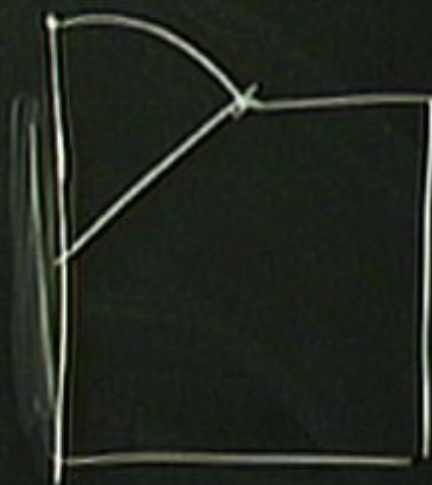
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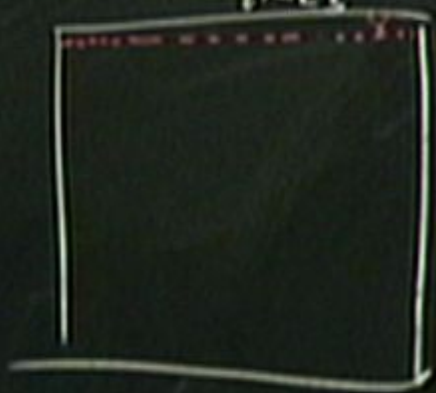
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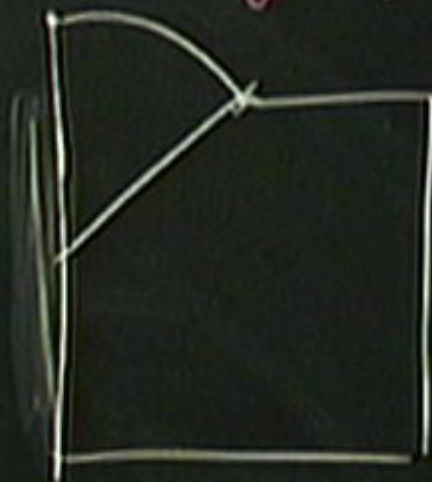
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Fixes ambiguity

ds^2



$$ds^2 = dr^2 + r^2 d\Omega^2$$



But metric only defined up to

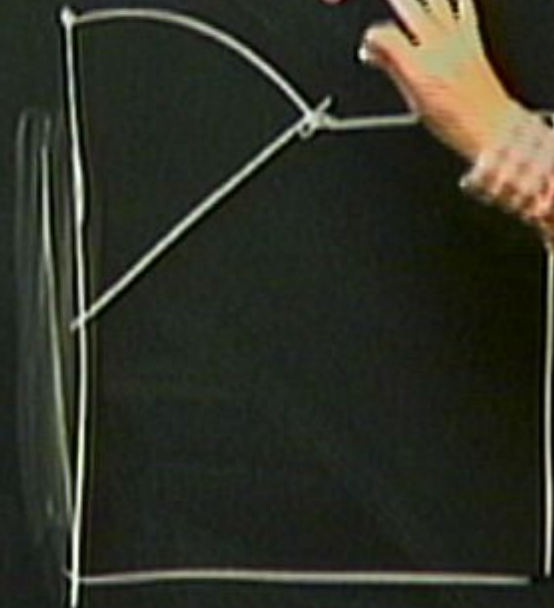
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Fixes ambiguity
 $d\Omega^2$



$$ds^2 = dp^2 + r^2(\rho) d\Omega_2^2$$



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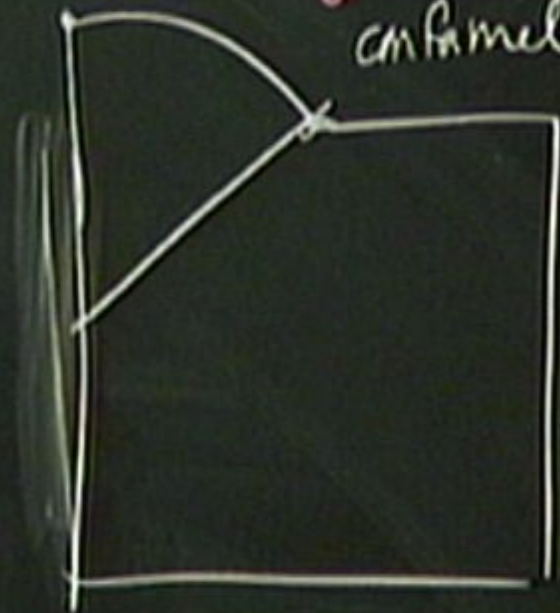
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conformal to S_3



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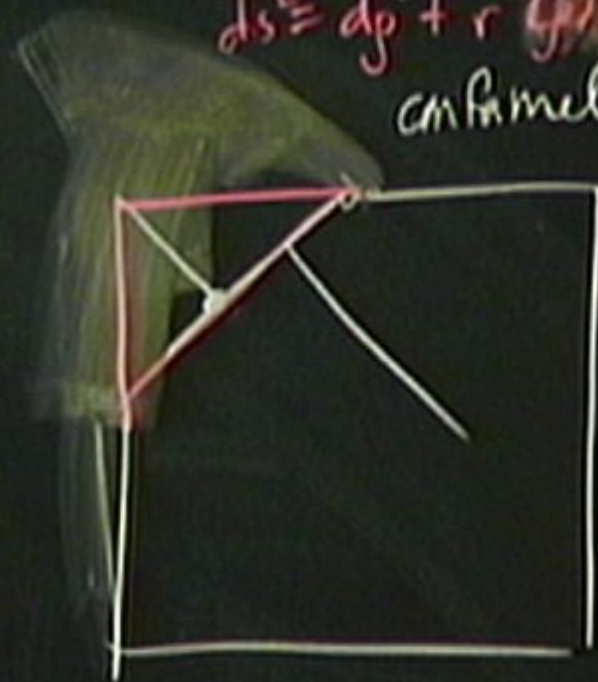
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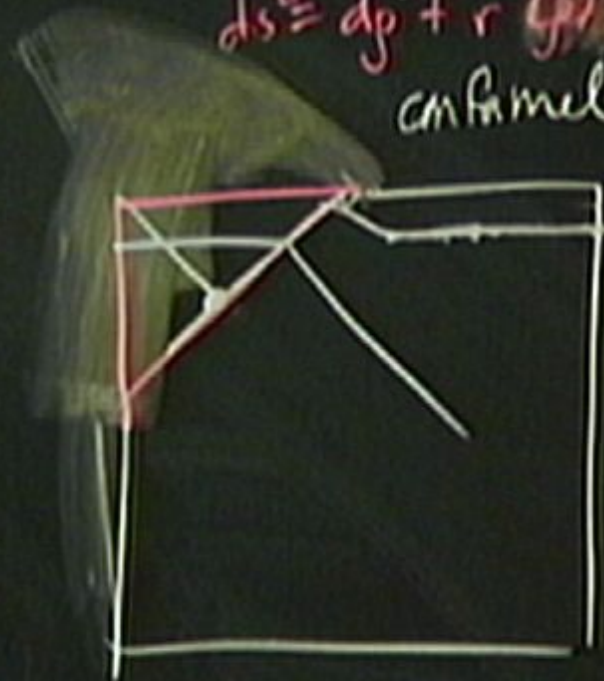
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$$ds^2 = dp^2 + r^2(\rho) d\Omega_2^2$$

conformal to S_3



Proposal: $R = \text{const}$

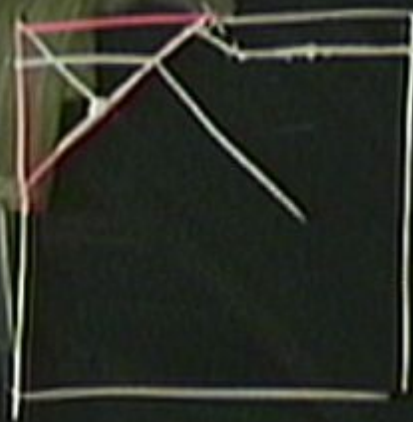
Fixes ambiguity

$$d\Omega^2$$



$$ds^2 = dt^2 + r^2(t) d\Omega_3^2$$

conformal to S_3



Homogeneous FRW $\leftrightarrow$ bdy rand sphere

Proposal: $R = \text{const}$

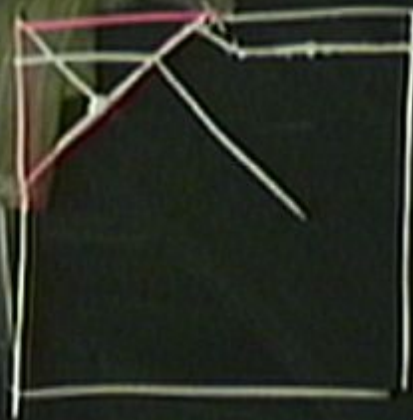
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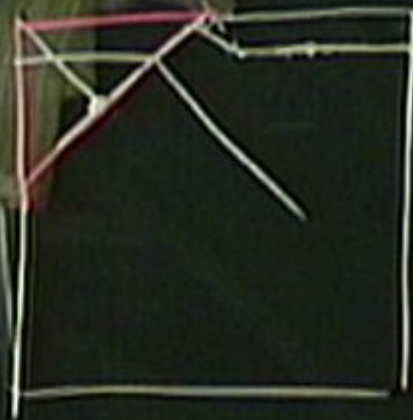
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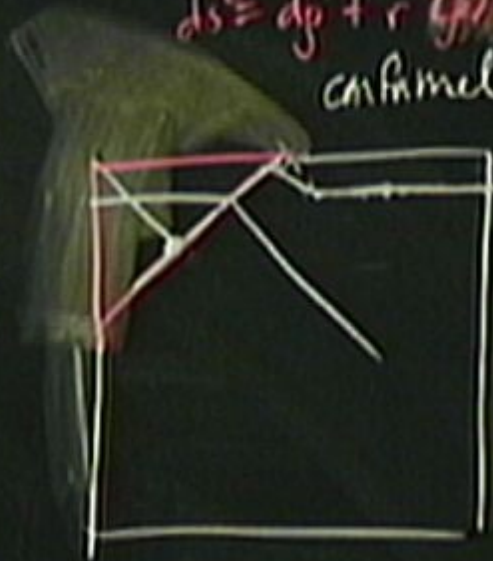
$$ds^2$$



Attractor behavior

$$ds^2 = dp^2 + r^2(p) d\Omega_2^2$$

conformal to S_3



Homogeneous FRW $\leftrightarrow$ bdy rand sphere

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- Tests

- How to go beyond phenomenology