

Title: TBA

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URL: <http://pirsa.org/15040181>

Abstract:

Twisted Supergravity (string theory?) + its quantization

Supergravity has local SUSY

Gauge diffs. + local SUSY

$\Rightarrow$  there are bosonic ghosts

non-zero bosonic ghost.

Examples, consider II B SUGRA on  $\mathbb{R}^{10}$

What are equations of motion, with bosonic ghosts?

- Ordinary fields (e.g. RR fields) satisfy usual EOM

- Ghost,  $q$ , must be a generalized killing spinor

-  $q = 0$  ( $S$  includes a term  $\int [q, q] q^\dagger$ )

Bosonic ghost fields  $\leftrightarrow$  generator of local susy  
(spinors)

Example Consider a field theory that can be coupled to  
SUGRA. If we put theory in SUGRA background  
w. bosonic ghost  $\Leftrightarrow$  adding supercharge  $Q$   
to BRST operator

$Q_B$  has a term  $Q + \dots$

Twisting of a field theory

Consider type IIB on  $\mathbb{R}^{10}$

$g = \text{flat}$   
other fields are zero.

32 SUSYs preserve this

2 are  $SU(5)$  invariant

R-sym.  $sl(2, \mathbb{C})$  rotates these

$\Rightarrow$  unique non-zero  $SU(5)$ -inv.  $\langle \sigma_j \rangle$  up to R-sym

round

This twist of type IIB is "BCOV theory",  
it's the string-field theory for  
top' B-model

Conjecture Let's do the same for  
string theory.

(Bosonic ghosts  $\cong$  states of string theory)

This twist of type IIB is top' B-model  
string.

CAUTION

Evidence:

D-brane on  $\mathbb{R}^4 \subseteq \mathbb{R}^{10} \rightsquigarrow N=4$  YM on  $\mathbb{R}^4$   
 $N=4$  has a twist described by holomorphic CS  
on  $\mathbb{C}^{2/3} =$  theory living on a brane  $\mathbb{C}^2 \subseteq \mathbb{C}^5$   
in top B-model.

Baulieu D9 brane gauge theory has a twist which  
is hCS on  $\mathbb{C}^5$ , i.e. gauge theory for brane in  
B-model.

B model.

Fields of BCWV on  $X$ , CY 5-fold

Take  $\oplus \Omega^{0,i}(X, \wedge^j TX) =: PV^{ji}(X)$

$\Omega$ , hol. volume form gives  $PV^{ji} \simeq \Omega^{5-j+i}$

$\Rightarrow$  operators  $\partial, \bar{\partial}$  on  $\oplus PV^{ji}$

Fields  $\text{Ker } \partial \subseteq \oplus PV^{ji}$

parity is  $i+j \pmod 2$

Action is  $\int \alpha \bar{\partial} \partial' \alpha + \int \alpha \wedge \alpha$

where } picks out  $pV^{SSS}(x) = \Omega^{OSS}(x, \Lambda^S T x)$   
 $\approx \Omega^{OSS}(x, \Lambda^S T x) = \Omega^{SSS}(x)$

$PV^{1,1}$  def. of complex str, part of metric.

## Quantization of BCOV

Theorem (C. Li)

$\exists$  a unique quantization of coupled BCOV  
and holomorphic CS (open string) on  $\mathbb{C}^5$   
where use  $g(N/N)$  on open string sector  
 $\Rightarrow \exists$  a natural quantization of BCOV

BV kernel  $\overline{\Pi} = (\partial \omega) \delta_{\text{diag}}$  in  $t^0 \otimes t^0$  part

Propagator is  $(\partial \omega) (\partial^{-1} \omega) \delta_{\text{diag}}$

Important point

Fields (with descendants) of BCOV

$\simeq$  (Single traces local deformations  
of hCS action on  $(1^5)$ , BRST operator)

CAUTION

DO NOT LEAN ON THE BOARD  
DO NOT WRITE ON THE BOARD

Claim

$\bigoplus_{h+n=R} \mathcal{O}_{g,h,n}$  has no cohomology.

$\mathcal{O}_{g,0,n}$



$\mathcal{O}_{g,1,n}$



closed BRST  
(linearized)

open  
+ closed

Total complex has no cohomology

Total complex is

$$\Omega^{x,y}(X)((t)) \text{ diff. } \bar{\partial} + t\partial$$

$$\bigoplus_{k \in \mathbb{Z}} \left\{ t^k \Omega^{x,y} \xrightarrow{\partial} t^{k+1} \Omega^{x,y} \rightarrow t^{k+5} \Omega^{x,y} \right\}$$

So cohomology is  $H^i(X)((t))$   $X = \mathbb{C}^5$ ,  $\mathbb{C}((t))$

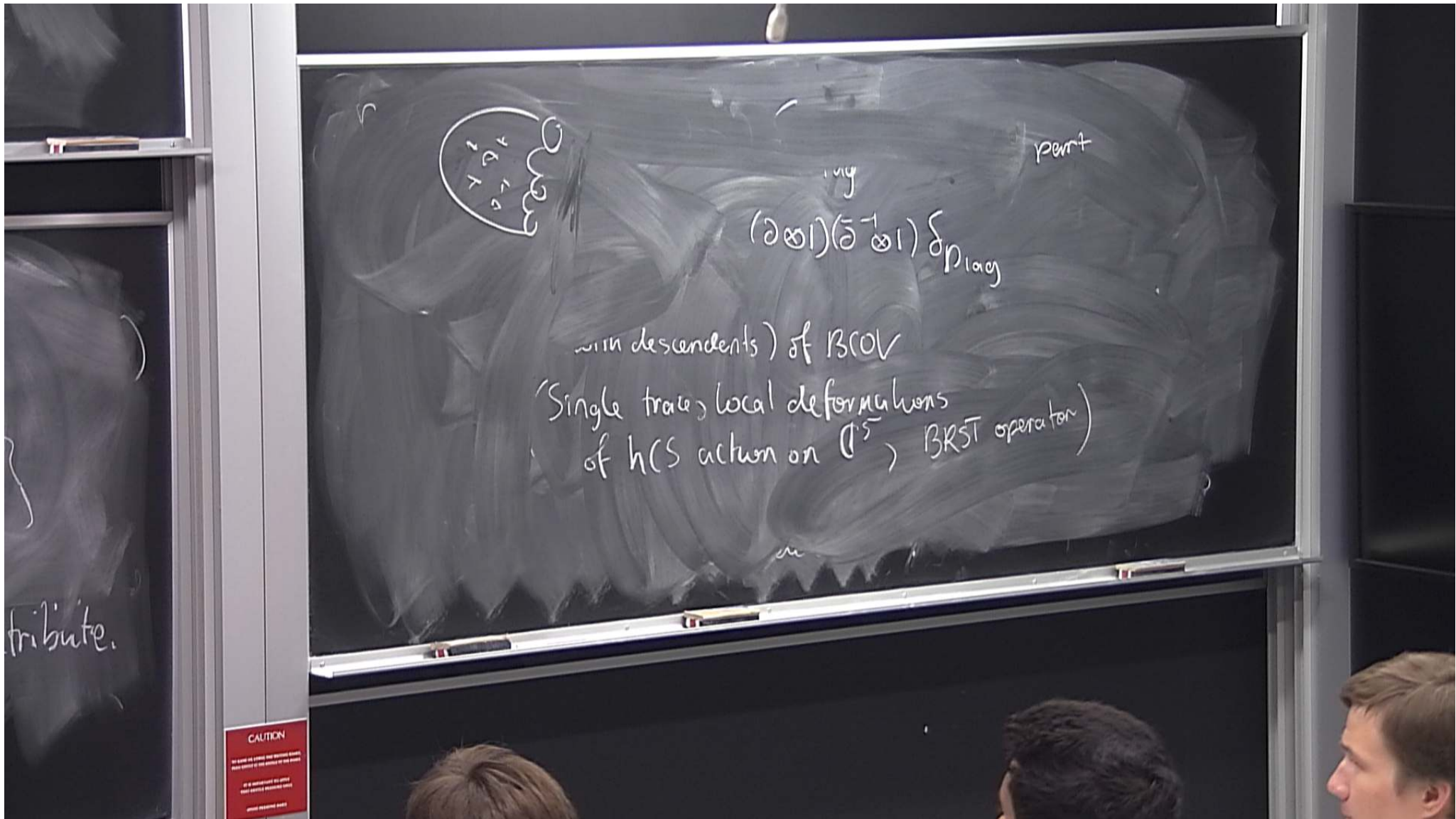
These Lagrangians don't scale correctly to contribute.

CAUTION

DO NOT TOUCH THE BOARD  
OR THE BOARD AT THE END OF THE BOARD

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$$(\partial \otimes 1)(\partial^{-1} \otimes 1) \delta_{\text{diag}}$$

with descendants) of BCOV

(Single trace, local deformations of hCS action on  $(1^5)$ , BRST operator)

tribute.

CAUTION  
DO NOT USE CHALK OR MARKERS ON THIS BOARD  
IF IT IS NECESSARY TO USE CHALK OR MARKERS, PLEASE ASK THE TA FOR A BOARD IN THE ADJACENT ROOM.