

### Problem set # 1

1. Generalize the equations we wrote down in class for the case of a fundamental string ending on a D5 brane.

Please include:

i) The source equation

ii) The term in the action which indicates the interaction between the bulk gauge field and the field strength which is localized on the brane:

Generalize this for the following cases:

a. A fundamental string ending on a D $p$  brane for  $p=-1, \dots, 9$ .

b. A D $p$  brane ending on a NS five brane.

c. An M2 brane ending on M5 brane

d. A D $p$  brane ending on D( $p+2$ ) brane.

Discuss the world-volume interpretation of the equations you write down for each case.

2. A reminder on the 5 superstring theories and 11 $d$  supergravity

a. Write down the massless field content for each of these 6 theories.

b. Count the number of degrees of freedom for each massless field and write them as irreducible representations of the little group.

c. Verify that the number of bosonic degrees of freedom is equal to the number of fermionic degrees of freedom.