then expand the transverse coordinates to the brane around the values for this classical solution. For this we use normal coordinates. Thus we write

$$\begin{aligned} \rho &= \bar{\rho} + \alpha'^{\frac{3}{2}} \widetilde{\rho}\,, \\ y^{\hat{a}} &= \alpha'^{\frac{3}{2}} \widetilde{y}^{\hat{a}}\,, \\ \theta^{A} &= \alpha'^{\frac{3}{2}} \Theta^{A}\,, \end{aligned} \tag{3.2}$$

where $\widetilde{\rho}, \widetilde{y}^{\hat{a}}, \Theta^A$ represent the fluctuations and α' is the membrane tension. Thus the action (2.10) gets the following expansion as a power series in α':

$$\mathcal{L} = \sum_{n=0}^{\infty} \alpha'^{\frac{3(n-2)}{2}} \mathcal{L}_{(n)}\,, \tag{3.3}$$

with

$$\mathcal{L}_{(0)} = 0 = \mathcal{L}_{(1)}\,, \tag{3.4}$$

and we are to recover the singleton action from the order 1 term

$$\mathcal{L}_{(2)} \;=\; \frac{1}{4\bar{\rho}} \eta^{IJ} \partial_I \widetilde{\rho}\, \partial_J \widetilde{\rho} + \bar{\rho} \eta^{IJ} \partial_I \widetilde{y}^{\hat{a}}\, \partial_J \widetilde{y}^{\hat{b}} \delta_{\hat{a}\hat{b}} - 2\, \bar{\rho}^3\, \bar{\Theta}^A \hat{\sigma}^i \partial_I \Theta^A \delta_i^I\,. \tag{3.5}$$

The final step is to send the brane to the boundary of AdS. The boundary of AdS lies at

$$\bar{\rho} \to \infty \qquad \text{and} \qquad \bar{\rho} \to 0\,, \tag{3.6}$$

which is a conformally compactified Minkowski space (see one of the appendices in [5]). It is already clear from the form of the action (3.5) that in order to take one of these limits one has to rescale the fields $\widetilde{\rho}, \widetilde{y}^{\hat{a}}$ and Θ^A. In fact, a proper analysis of the supersymmetry variation, which we do not present here but can be found in [5], shows us that these rescalings have to be done according to

$$\lambda = \bar{\rho}^{\frac{3}{2}} \Theta^A, \quad \widetilde{P} = \frac{\widetilde{\rho}}{\sqrt{\bar{\rho}}}, \quad \widetilde{Y}^{\hat{a}} = \sqrt{\bar{\rho}} \widetilde{y}^{\hat{a}}. \tag{3.7}$$

Using the notation

$$Y^{\underline{A}} \equiv \left\{ \frac{\widetilde{P}}{4}, \frac{\widetilde{Y}}{2} \right\}\,, \tag{3.8}$$

the action (3.5) becomes

$$\mathcal{L} = 4\, \eta^{IJ}\, \partial_I Y^{\underline{A}} \partial_J Y^{\underline{A}} - 2\, \bar{\lambda}^A \hat{\sigma}^I \partial_I \lambda^A\,. \tag{3.9}$$

Clearly, this action has the right form to become the singleton action. Yet, for generic values of $\bar{\rho}$ it does not. To see this, let's look at the dilatation symmetry of the action (2.10). The transformation (2.13) can only become a symmetry of the action (2.10) if we place the brane at the boundary.

So we conclude that the singleton is found after putting the brane at the boundary of the Anti–de Sitter space and that the singleton field theory describes the centre of mass degrees of freedom of the $M2$ brane.

Acknowledgement P. T. is grateful P. Claus and D. Sorokin for useful discussions during the conference.