1 Introduction

For about a year now, there has been a revival of interest in supergravity vacua of the form

$$AdS \times \mathcal{M}\,, \tag{1.1}$$

where AdS is an anti–de Sitter space and $\mathcal{M}$ a compact Einstein manifold. This revival started after Maldacena's conjecture [1] of duality between Kaluza–Klein supergravity theories in the bulk of anti–de Sitter space and conformal field theories on the boundary,

$$\text{KK on } AdS \text{ / CFT on } \partial AdS\,. \tag{1.2}$$

Since the proposal by Gubser, Klebanov, Polyakov and Witten for this duality [2], some work is being done with the scope of testing this conjecture of holography. This has brought the whole research area of branes and AdS representations from the eighties back alive.

Of particular interest in testing this AdS/CFT duality is the singleton problem. Representations of AdS algebras have been studied extensively in the past [3]. They are characterized by a lowest energy and the total angular momentum. Most of them have a Poincaré analogue, except for some ultra–short representations which are referred to as singleton representations. The most considerable property of these singletons is that they can not be formulated as a field theory on the bulk of the AdS space. Yet, singleton actions exist, but can only be formulated if the singleton fields are restricted to live on the boundary of AdS. It has also been known for a long time how to get these singleton actions and what they describe: namely, they describe the small fluctuations of a brane at *the end of the universe* [4]. All this has been known for about ten years. Still, the singleton has not been constructed explicitly from the brane until recently. It is clear that an explicit realization of this singleton at the end of the universe is an important ingredient for testing the AdS/CFT conjecture.

Thus, to find the singleton from the super membrane one has to do the following:

1. Consider the super membrane action that is invariant with respect to κ supersymmetry.

2. Expand this action around a classical solution.

3. Send it to infinity.

As far as the first step is concerned, membrane actions in an explicit background of $AdS_4 \times S^7$ have been constructed by our collaboration [5] and others [6]. Here, we will overview the construction of the membrane action and the derivation the singleton action in this background, as it was done in [5]. However, before carrying out this programme let us point out that the singleton theory that is retrieved on this space is quite trivial and doesn't yield a proper test for the AdS/CFT correspondence. Therefore one has to consider the singleton problem on other non–trivial backgrounds. Suitable backgrounds for this are given if one replaces the sphere by other coset manifolds G/H. A complete classification of these backgrounds for $D = 11$ is already know and these spaces have been thoroughly studied in the eighties [7]. They are in one–to–one correspondence with the