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A free field realization of SU(2) boundary CFT

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D-branes are dynamical objects that are considered as essential as the strings themselves in modern string theory. One may think a D-brane as the surface where the endpoints of an open string are attached. A propagating string sweeps out a two-dimensional manifold called the world-sheet. From the perspective of an open string, a D-brane is a boundary to this manifold.

The world-sheet description of string theory involves the use of conformal field theory (CFT), in particular boundary CFT in the case of open strings. D-branes can be understood as boundary states in a boundary conformal field theory.

An important open problem is to determine the allowed D-branes in a given string background. The answer to this question in a generic background is beyond the scope of the current knowledge, but there are special cases, like D-branes on group manifolds, where the problem can be addressed.

In this work we analyze D-branes on a SU(2) group manifold. We employ a free field realization (also known as the Wakimoto realization) of the $SU(2)_k$ current algebra and construct the boundary states in this formalism. The method allows us to compute correlation functions without the need to solve often complicated Knizhnik–Zamolodchikov equations. We find that the boundary states fall into two distinct classes and identify them with the A- and B-type branes that have been previously found by Maldacena, Moore and Seiberg.