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Existence of the $D0$-$D4$ Bound State: a Proof.

We consider the quantum mechanical system describing the low energy dynamics of a $D0$-brane in the presence of a $D4$-brane. This system is obtained by dimensionally reducing $d = 6$, $N = 1$ supersymmetric gauge theory with gauge group $U(1)$ and a single charged hypermultiplet. We present a proof of the existence of a normalizable ground state for this system. The proof is based on a deformation method. (Received October 04, 2004)