Homotopy types of gauge groups related to certain 7-manifolds

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Let $X$ be a path-connected pointed topological space and let $G$ be a topological group. Given a principal $G$-bundle over $X$, $P \to X$, the gauge group is the group of $G$-equivariant automorphisms of $P$ that fix $X$. The study of the topology of gauge groups when $X$ is a low dimensional manifold has played a prominent role in mathematics and mathematical physics over the last thirty years. In 2011, however, Donaldson and Segal established the mathematical set-up to construct gauge theories using principal $G$-bundles over high dimensional manifolds. In this talk I will present some results on the homotopy theory of gauge groups when $X$ is a manifold that arises as the total space of a $S^3$-bundle over $S^4$ and $G$ is a simply connected simple compact Lie group.