Abstract

In 2+1 dimensions, there are exotic objects called anyons obeying fractional statistics. They can be elegantly described by charged particles which interact via a gauge field with the Chern-Simon kinetic term, and are found to be relevant in the fractional quantum Hall effect. In this type of theories, there exists a special set called self-dual systems, which is simpler to analyze yet still manifests clearly various nontrivial features of anyons. In this thesis, I want to explore various aspects of self-dual Chern-Simons Higgs systems. Expanding the previous works on the system with abelian feature, I investigate the systems with a $SU(3)$ gauge symmetry in detail, which is one of the simplest systems exhibiting full-fledged nonabelian features. Moreover, self-dual systems usually have an underlying $N = 2$ supersymmetry. Here, extending the $N = 2$ supersymmetry, I find the general Maxwell Chern-Simons Higgs models with the maximal $N = 3$ supersymmetry. Furthermore, I investigate the quantum nature of these selfdual systems, especially the one-loop correction to the Chern-Simons coefficient. Finally I conclude with discussion of various issues and implications of the result.