## Abstract

In this thesis I address the problem of designing a stongly dipolar superfluid based on weakly bound magnetic molecules confined in two-dimensions. I study the effect of dipolar interactions in the molecular stability and the physics of two-dimensional superfluids, discussing the role of the system density in determining both the critical temperature of the BKT transition and the loss rates. Starting from this analysis, I obtain a realistic set of parameters to be used in our experiment to realize a two-dimensional superfluid made of strongly dipolar $Dy_2$ molecules. This new kind of dipolar system can be produced experimentally starting from a dysprosium BEC, already available in the Dysprosium Laboratory of CNR-INO and LENS in the group of Prof. G. Modugno, where the experimental part of this thesis had been carried out. In particular, I have built a new high power laser source for infrared light, which I used to realize a one-dimensional optical lattice. The latter will be used for the two-dimensional confinement needed for the experiment.