

## **Master's thesis – track Theoretical Physics**

### ***'Dilute $O(1)$ Loop Model on a Strip and the $qKZ$ Equations'***

#### **Abstract:**

This thesis is devoted to the study of the integrable dilute  $O(1)$  loop model on a semi-infinite strip with different boundary conditions. We focus on the ground state of the transfer matrix of the model. It can be shown that the ground state eigenvector components satisfy a set of  $q$ -difference equations, known in the literature as the quantum Knizhnik-Zamolodchikov equations. For the dense  $O(1)$  loop model this property was used to develop a scheme for computing the components and the normalization of the ground state vector. This was done for different boundary conditions in a series of papers. We use a similar approach for the dilute  $O(1)$  model on a strip. We present the results for the case of periodic boundary conditions and all possible boundary conditions coming from solutions of the reflection equation. The  $R$ -matrix of the model factorizes when the ratio of its arguments is equal to the cubic root of unity; this property allows to write a new type of recursion relations which is not present in the case of the dense loop model. This new set of relations plays a crucial role in the present work. We also discuss some relations between the ground states of the model with different boundary conditions.