

Scientific report for the visit of Dr. Mirta Rodriguez to Technische Universitaet Muenchen from 29.5.2005 to 8.6.2005.

Fermionic atom laser

We are studying theoretically the properties of an atomic beam out coupled from a cloud of fermionic atoms propagating in the gravitational field.

The purpose of the visit was to continue with calculations we had started before, exchange ideas and summarize the results.

During the visit we developed completely analytical formulas for the total current and the out coupled wave function in a 1 dimensional situation. To obtain analytical formulas we used the generating functions of the Hermite polynomial that are the complicated part of the initial wave functions.

The out coupled atoms propagate in the 3 dimensional space even if the initial configuration is a one dimensional fermionic cloud. The out coupling is done with rf fields of fixed frequency which enforce out coupled functions with a fixed energy. During this visit we have formulated the 3 dimensional total current and the out coupled wave functions using energy convolutions of the one dimensional wave functions and the transverse functions. We have analyzed the results, trying to specify for which parameters the one dimensional analytical results are sufficient.

We plan to continue working along this lines and keep the collaboration between the visitor and the host.

We intend to collect the results obtained during this visit in a publication within the next months.