

# Bogoliubov theory of 1D anyons in a lattice

Monday 2 September 2024 17:00 (2 hours)

In a one-dimensional lattice anyons can be defined via generalized commutation relations containing a statistical parameter, which interpolates between the boson limit and the pseudo-fermion limit. The corresponding anyon-Hubbard model is mapped to a Bose-Hubbard model via a fractional Jordan-Wigner transformation, yielding a complex hopping term with a density-dependent Peierls phase. Here we work out a corresponding Bogoliubov theory. To this end we start with the underlying mean-field theory, where we allow for the condensate a finite momentum and determine it from extremizing the mean-field energy. With this we calculate various physical properties and discuss their dependence on the statistical parameter and the lattice size. Among them are both the condensate and the superfluid density as well as the equation of state and the compressibility. Based on the mean-field theory we then analyse the resulting dispersion of the Bogoliubov quasi-particles, which turns out to be in accordance with the Goldstone theorem. In particular, this leads to two different sound velocities for wave propagations to the left and the right, which originates from parity breaking.

## References

## Short bio (50 words) or link to website

<https://www-user.rhrk.uni-kl.de/~apelster>

## Relevant publications (optional)

## Career stage

Postdoc

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