A multi-particle superconductor?

Gareth Conduit
Thomas Whitehead
Exact diagonalization for 2:1 system

\[
\frac{S_{\uparrow}/S_{\downarrow}}{N_{\uparrow}/N_{\downarrow}} = 2
\]

2:1 instability

FFLO
Analytical result for 2:1 system

\[ \frac{S_\uparrow}{S_\downarrow} = 2 \]

2:1 instability

FFLO
Exact diagonalization for S:1 system

The graph shows the binding energy per critical species particle as a function of \( \frac{N_\uparrow}{N_\downarrow} \cdot \frac{S_\downarrow}{S_\uparrow} \) for different values of \( S_\uparrow/S_\downarrow \):
- \( S_\uparrow/S_\downarrow = 1 \) (gray line)
- \( S_\uparrow/S_\downarrow = 2 \) (blue line)
- \( S_\uparrow/S_\downarrow = 3 \) (light blue line)
- \( S_\uparrow/S_\downarrow = 4 \) (green line)

The binding energy increases as \( \frac{N_\uparrow}{N_\downarrow} \cdot \frac{S_\downarrow}{S_\uparrow} \) increases, reaching a peak at \( \frac{N_\uparrow}{N_\downarrow} \cdot \frac{S_\downarrow}{S_\uparrow} = 1 \) and then decreases.