Three-particle Force from Lattice Simulations

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in preparation...

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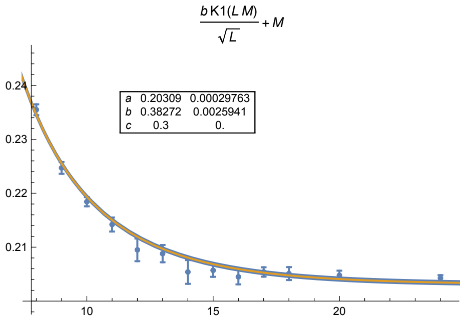
Seattle, February 9, 2018

One-Particle Energy

Complex φ^4 Theory:

$$S = \sum_x \left(-\kappa \sum_\mu (\varphi_x^* \varphi_{x+\mu} + c.c.) - \lambda(|\varphi_x|^2 - 1)^2 + |\varphi_x|^2 \right)$$



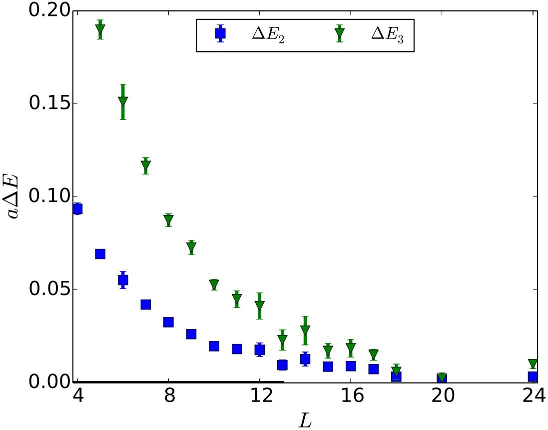
- $\chi^2/dof = 12.5/15$
- $aM = 0.20309(30)$
- Precise determination of $M(L)$

Two and Three-Particle Energies

→ Use volume-dependent mass: $\Delta E_{2(3)} = E_{2(3)} - 2(3)M(L)$

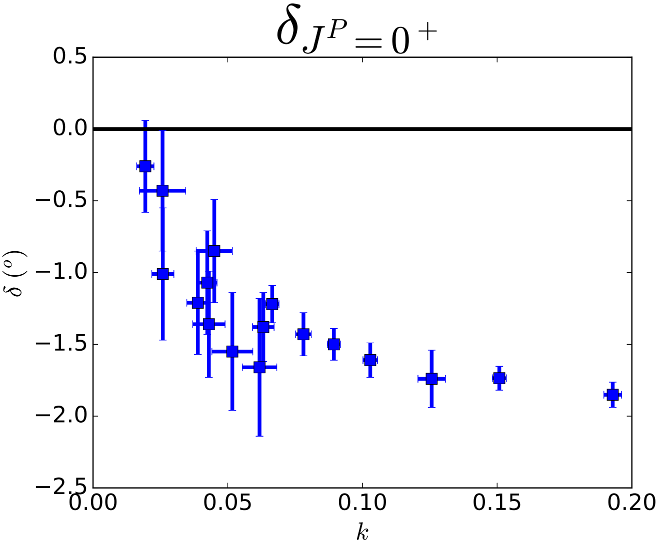
Exponential terms further suppressed by $\mathbf{L^2}$.

(See A. Rusetsky's talk)



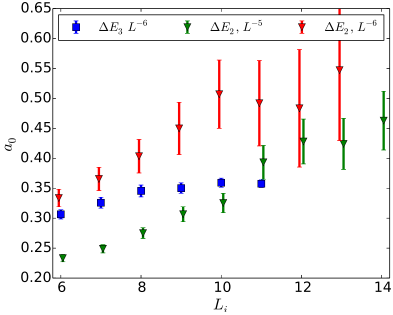
Phase Shift: Checking Perturbability

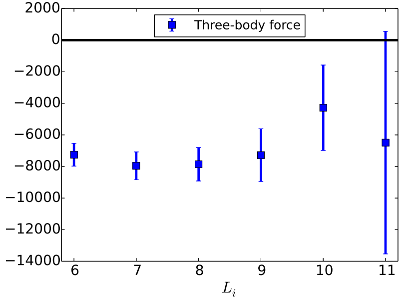
$\rightarrow$ Lüscher Method: $\cot \delta_0 = \frac{Z_{00}(1,q^2)}{\pi^{3/2} q}$



Three-Particle Force (Preliminary)

$\rightarrow$ Fit $\Delta E_{2/3}$ to order L^{-6}
Obtain scattering length (a_0) and three-body force $\Delta E_3 \supset -\frac{c}{L^6}$





Conclusion

- One needs small volumes to increase sensitivity, where $ML \sim 2$.
- Use volume-dependent mass, $M(L)$, for a better suppression of exponential terms.
- Three-body Force seems to be present and measurable.
- Still some fit instability $\rightarrow$ fitting strategy?