

Mass Reweighting

May 5, 2022

We show the pion mass measured through reweighting. We compare the results for 10^3 and 10^4 measurements.

1 m_π

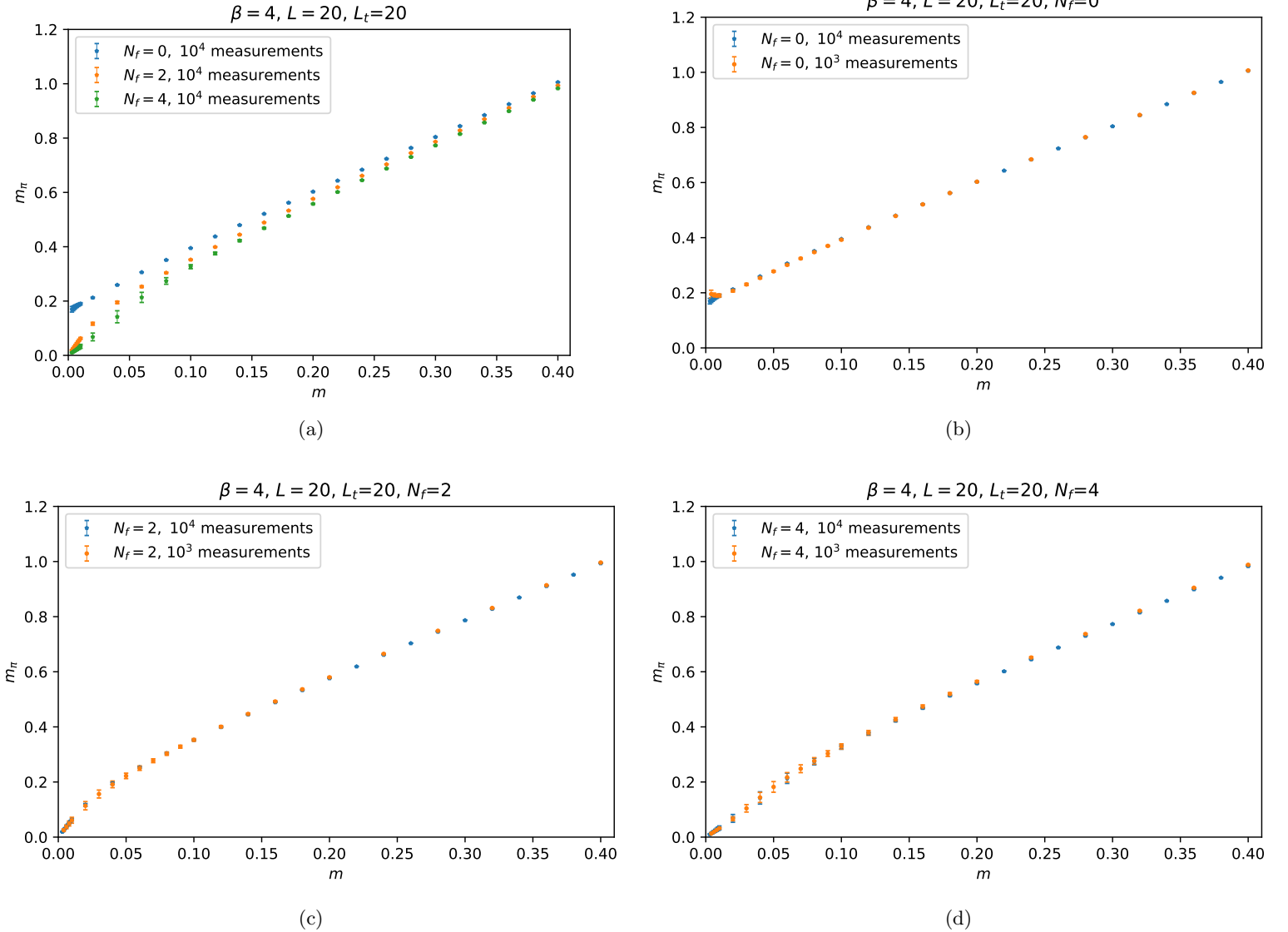
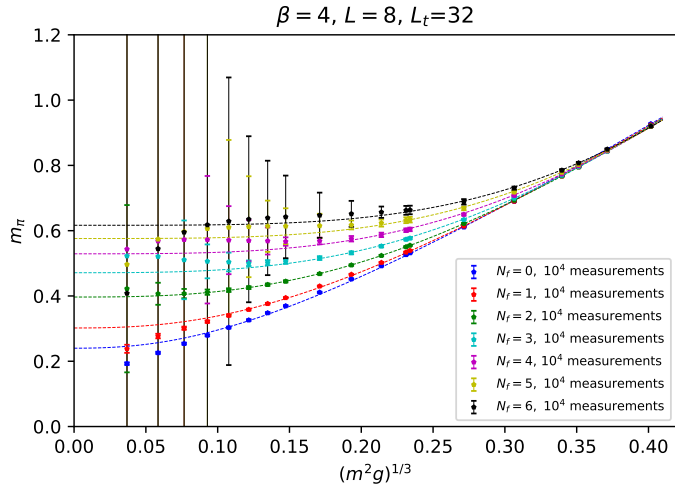
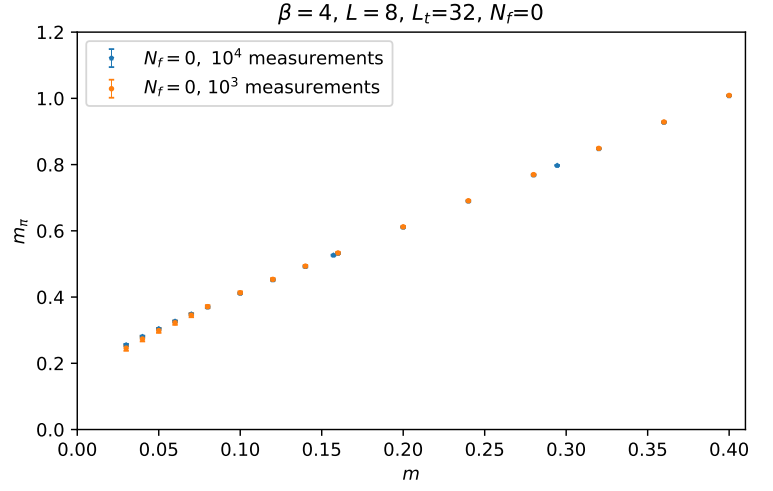


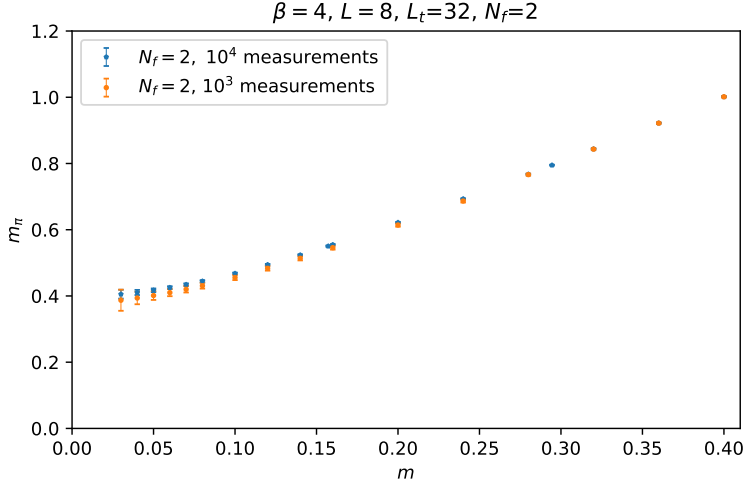
Figure 1: Pion mass as a function of the degenerate fermion mass for different flavors



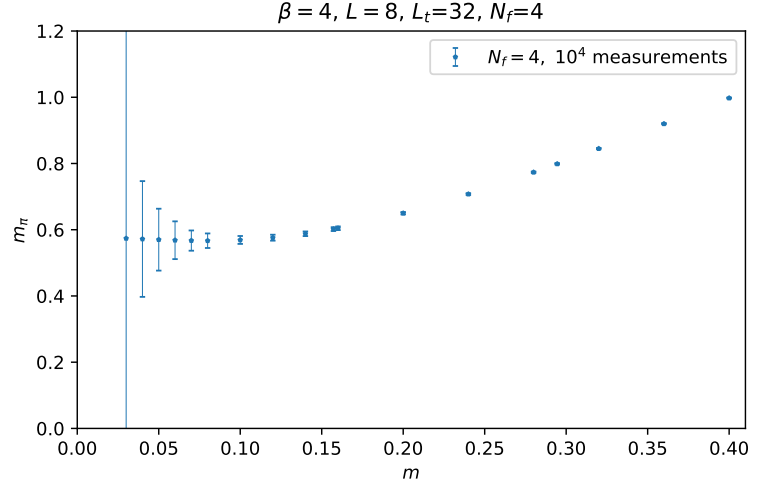
(a)



(b)



(c)



(d)

Figure 2: Pion mass as a function of the degenerate fermion mass for different flavors

Next we show the pion mass as a function of $(m^2 g)^{1/3}$. In order to extrapolate the pion mass we fitted a function of the form $m_\pi = \sqrt{a + b x^c}$, with $x = (m^2 g)^{1/3}$ and a, b, c fitting parameters. We only fit the region $x > 0.076$.

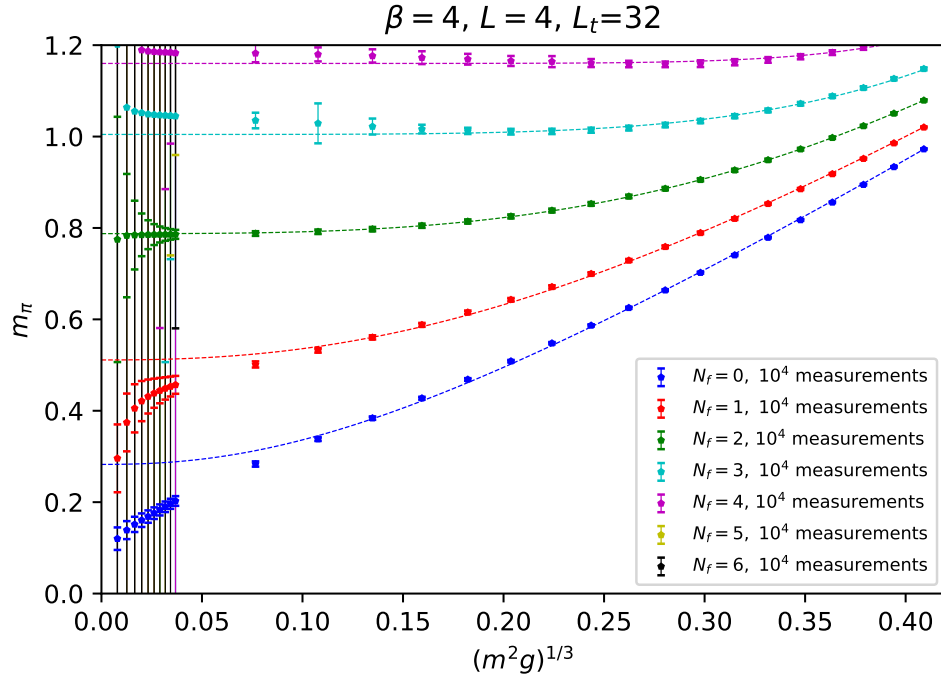


Figure 3: Pion mass as a function of the degenerate $(m^2 g)^{1/3}$ for different flavors. $L = 4, L_t = 32$.

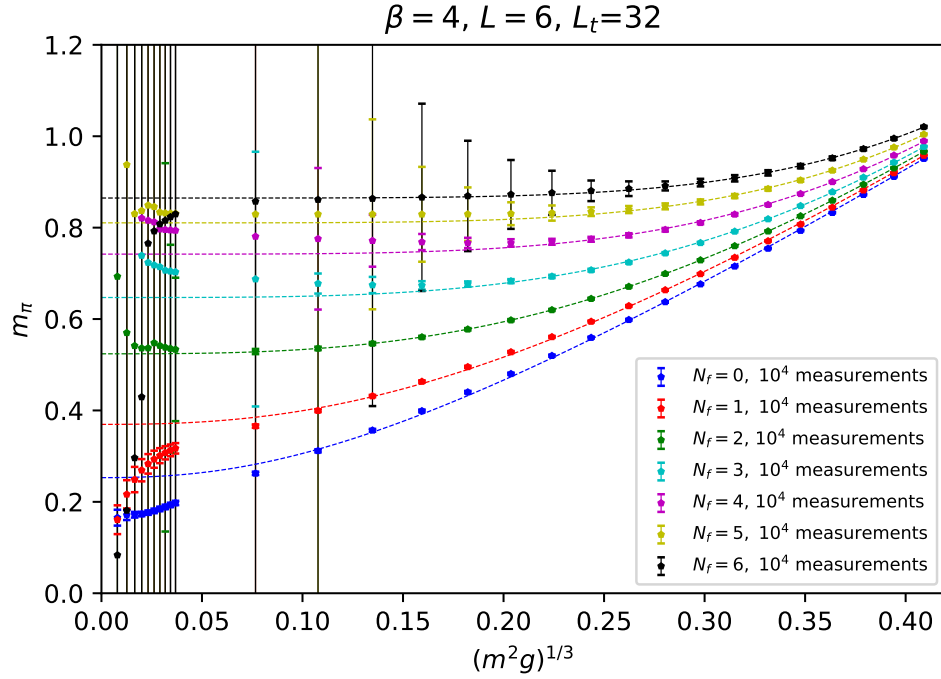


Figure 4: Pion mass as a function of the degenerate $(m^2 g)^{1/3}$ for different flavors. $L = 6, L_t = 32$.

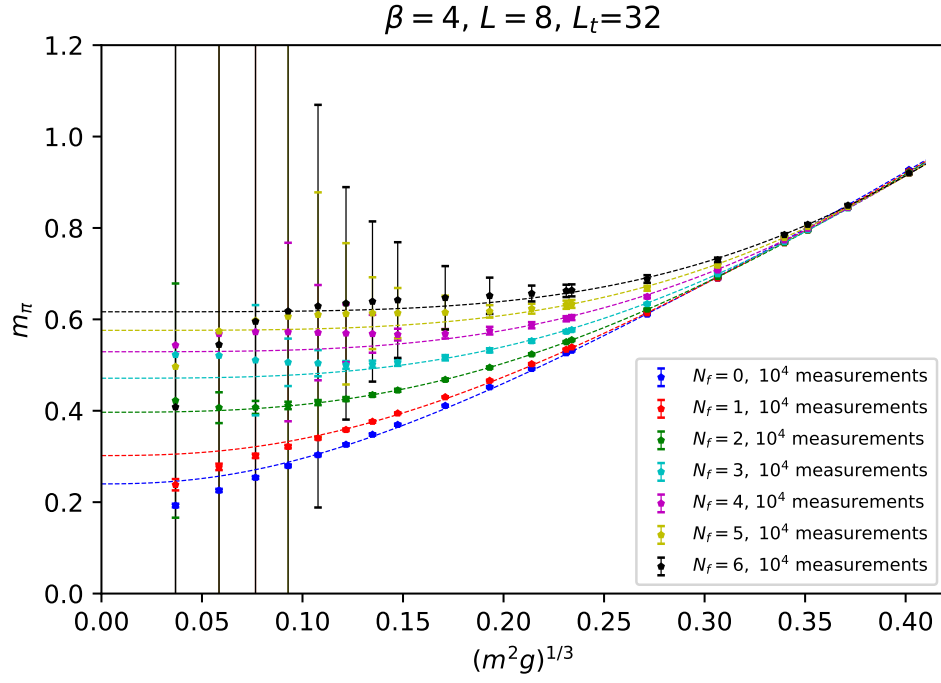


Figure 5: Pion mass as a function of the degenerate $(m^2 g)^{1/3}$ for different flavors. $L = 8, L_t = 32$.

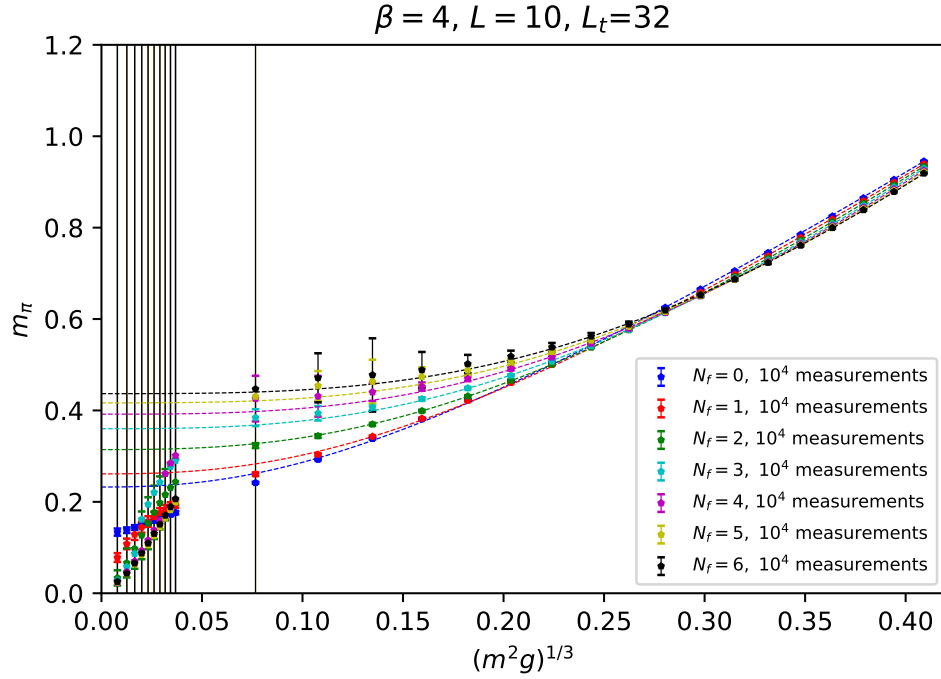


Figure 6: Pion mass as a function of the degenerate $(m^2 g)^{1/3}$ for different flavors. $L = 10, L_t = 32$.

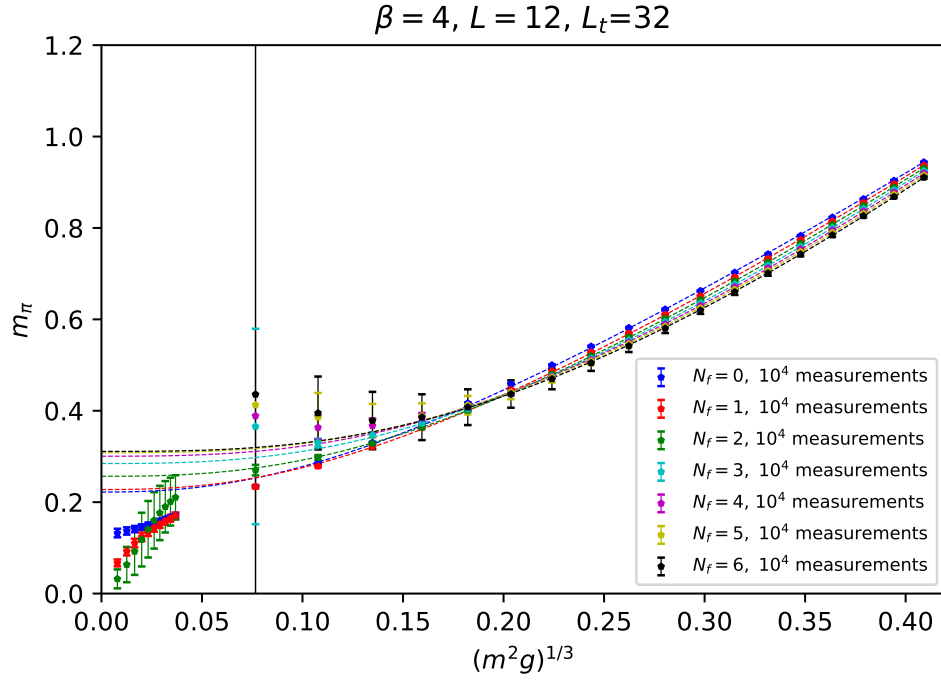


Figure 7: Pion mass as a function of the degenerate $(m^2 g)^{1/3}$ for different flavors. $L = 12, L_t = 32$.

2 F_π

We show the residual pion mass m_π^R as a function of the spatial size L and fit a function proportional to $1/L$ to obtain F_π .

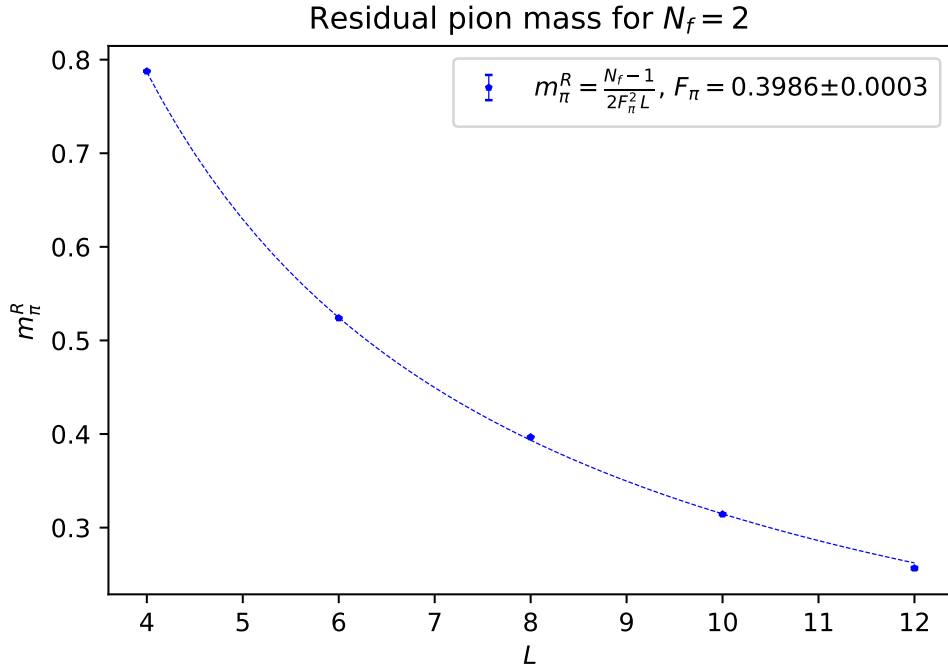


Figure 8: $N_f = 2$; $1/\sqrt{2\pi} = 0.39894\dots$

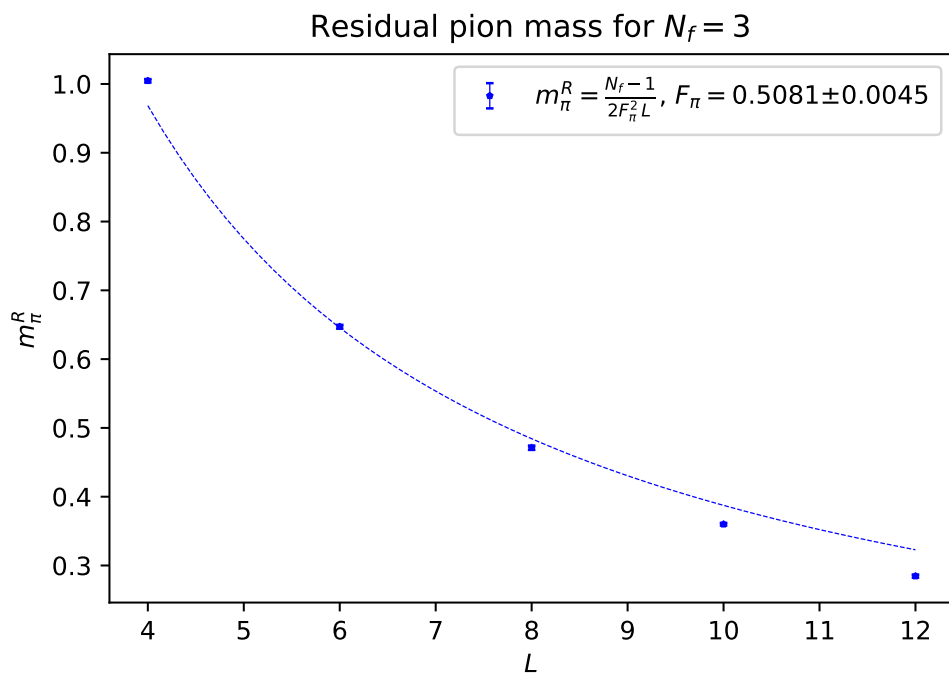


Figure 9: $N_f = 3$

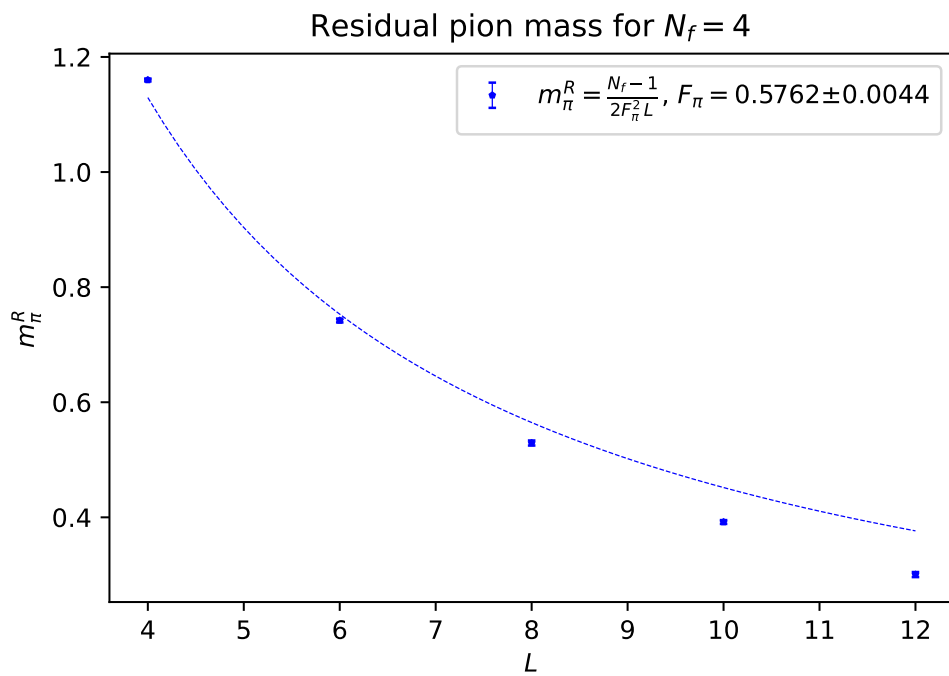


Figure 10: $N_f = 4$

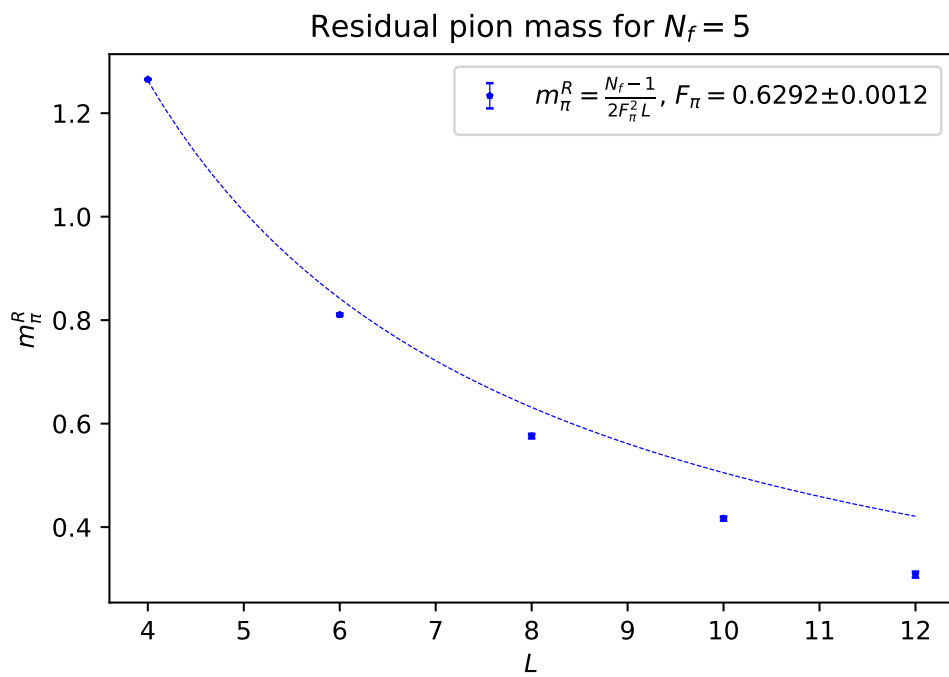


Figure 11: $N_f = 5$

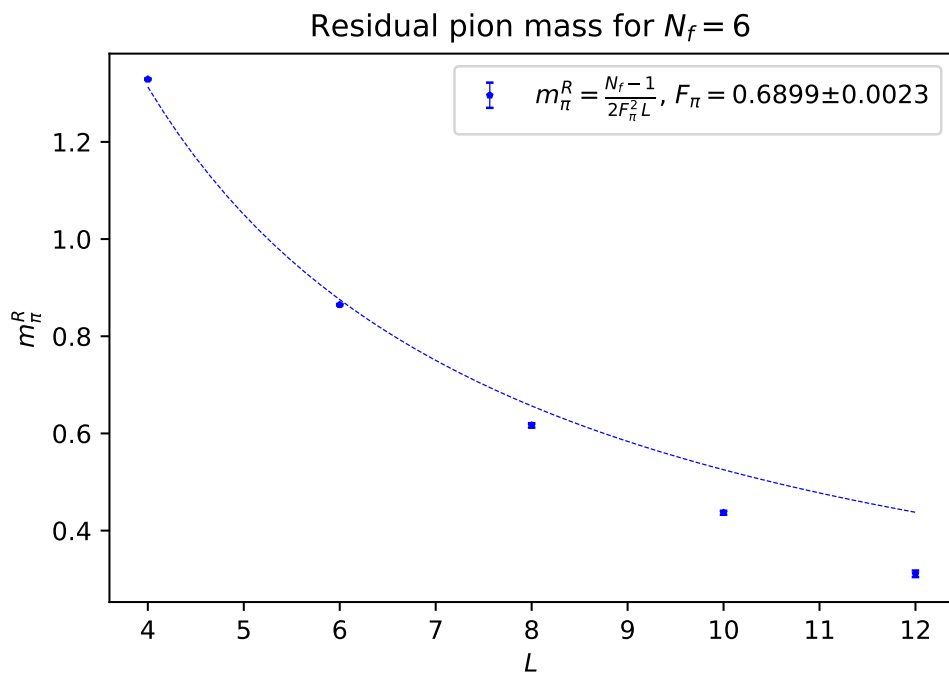
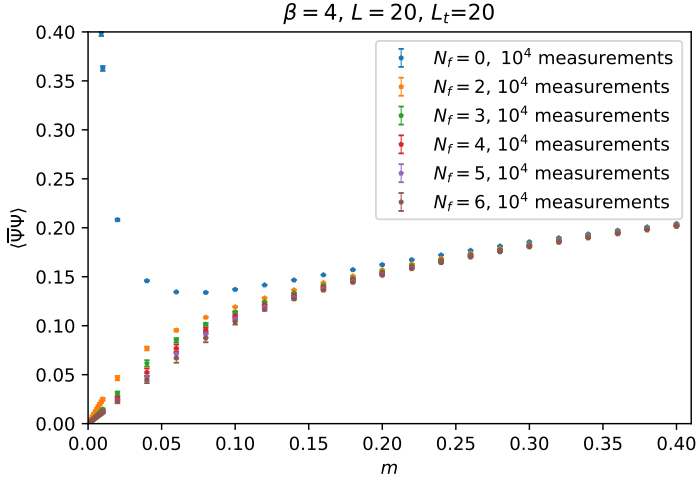


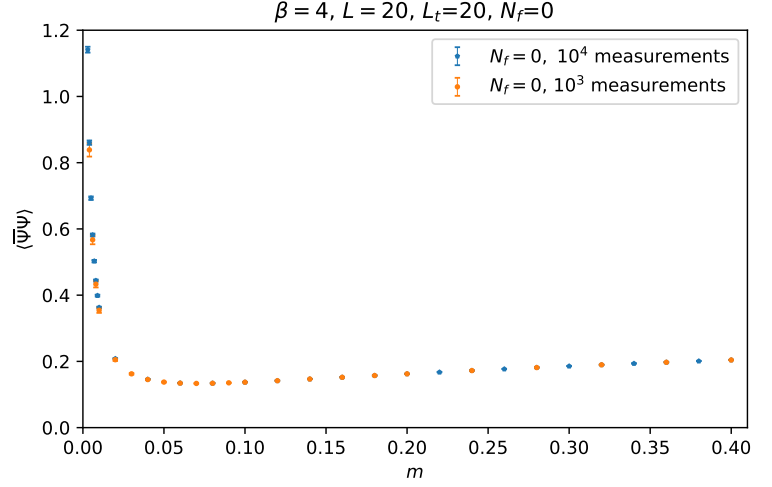
Figure 12: $N_f = 6$

3 $\langle \bar{\psi}\psi \rangle$

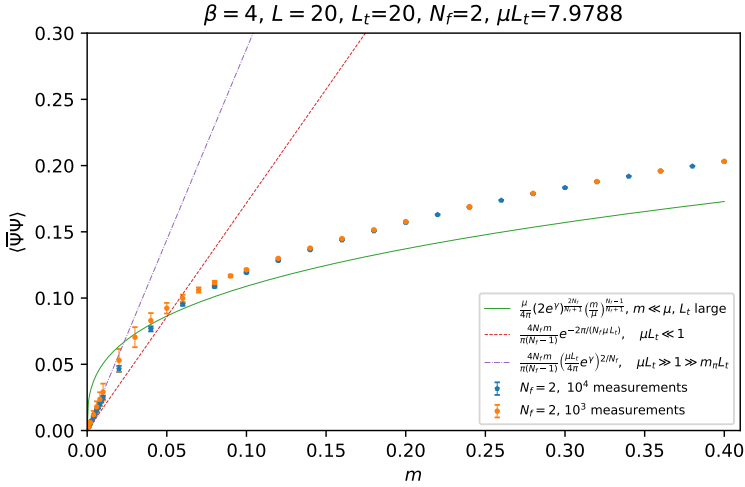
We show the chiral condensate for a 20x20 lattice together with some predictions, valid in different regimes, for N_f flavors that are written in eqs. (13), (15) and (16) of ref. [1].



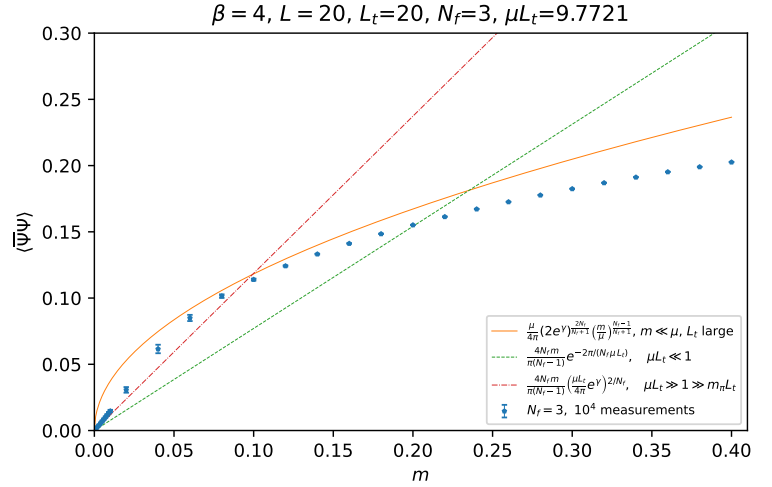
(a)



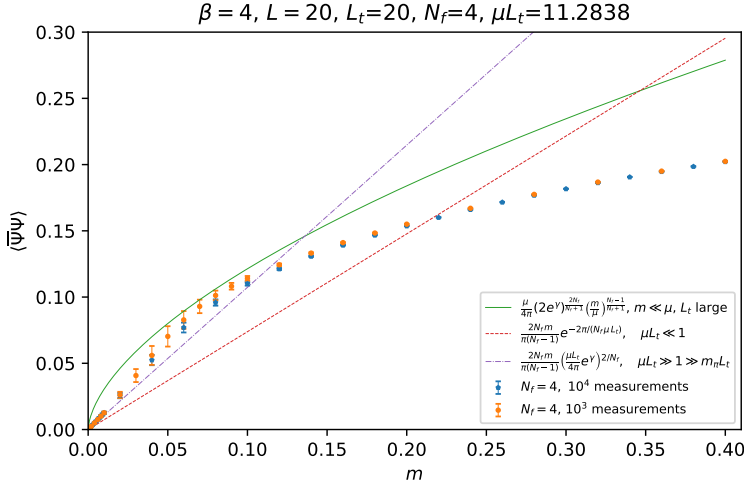
(b)



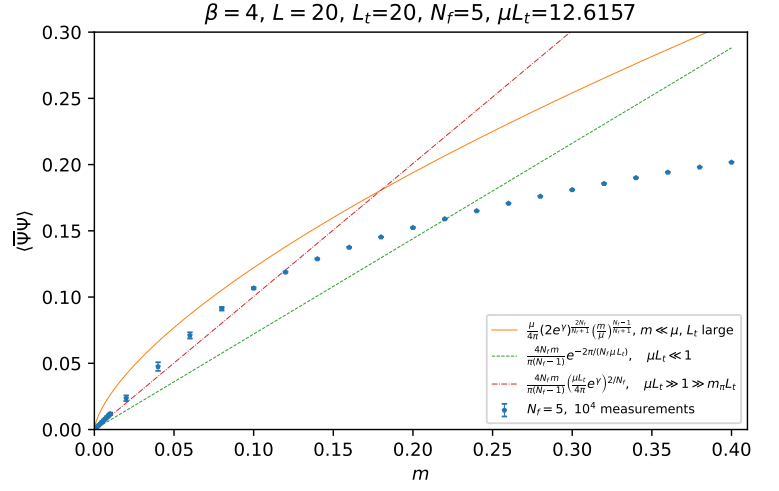
(c)



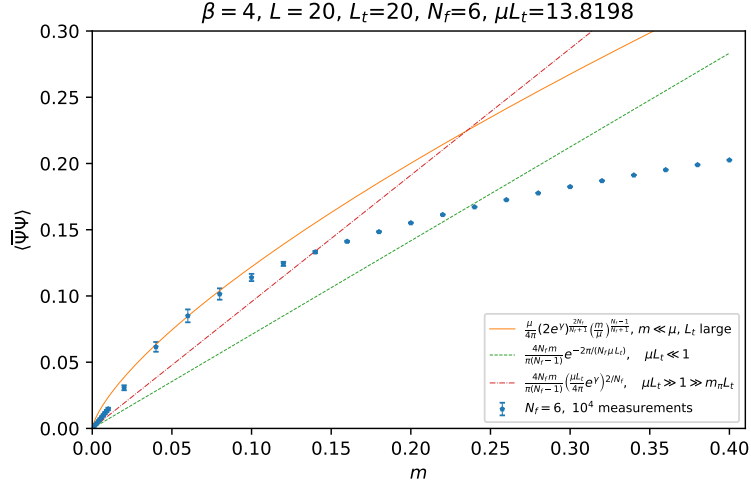
(d)



(e)



(f)



(g)

Figure 13: Chiral condensate as a function of the degenerate fermion mass for different flavors

References

- [1] J. E. Hetrick, Y. Hosotani, and S. Iso. Interplay between mass, volume, vacuum angle and chiral condensate in N flavor QED in two-dimensions. *Phys. Rev. D*, **53**, 1996. arXiv:hep-th/9510090.