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M_π predictions

Different predictions, obtained through Hosotani's equations, of the pion mass for different volume sizes (L=10,12, 16) are shown.
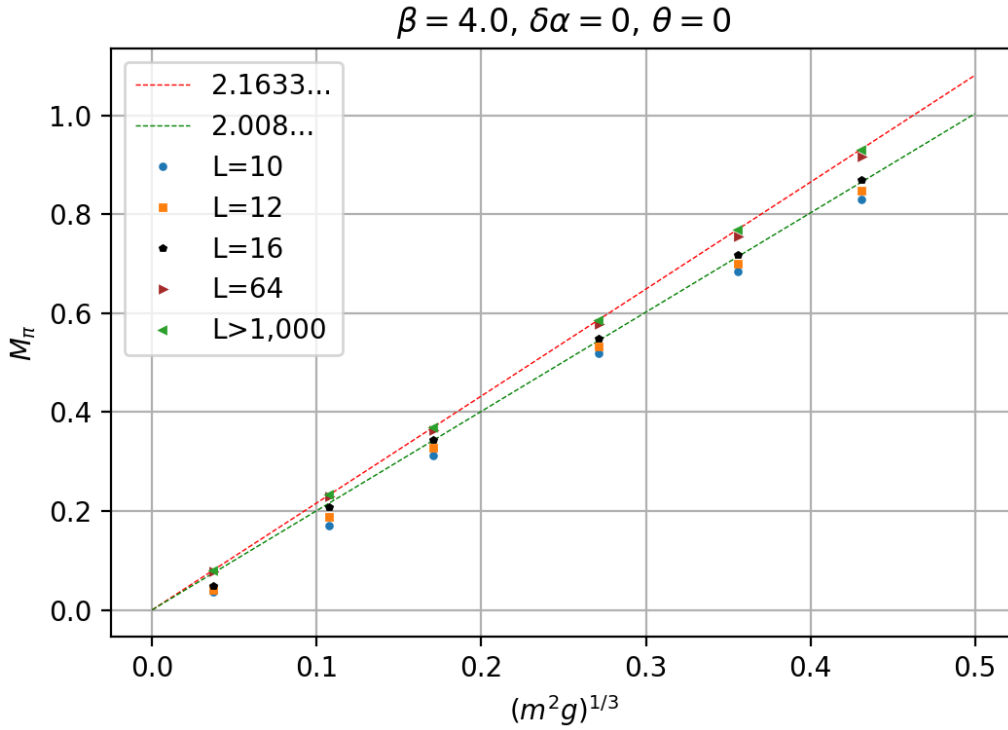

Figure 1: M_π vs. $(m^2 g)^{1/3}$

When $L > 1,000$, the result of M_π using Hosotani's equations gets closer to the semi-classical prediction, rather than the prediction by Smilga. Some values are in the following table:

m	M_π (Smilga)	M_π (Semi-classical)	M_π (Hosotani)
0.01	0.07398	0.07970	0.07965
0.05	0.21631	0.23303	0.23290
0.1	0.34336	0.36992	0.36959
0.2	0.54506	0.58721	0.58695
0.3	0.71422	0.76946	0.76901
0.4	0.86522	0.93214	0.93148

Table 1: Different values of M_π when $L > 1,000$

Some other plots of the pion mass as a function of L and $T = \frac{1}{L}$ for $m = 0.05, 0.1$ are shown.
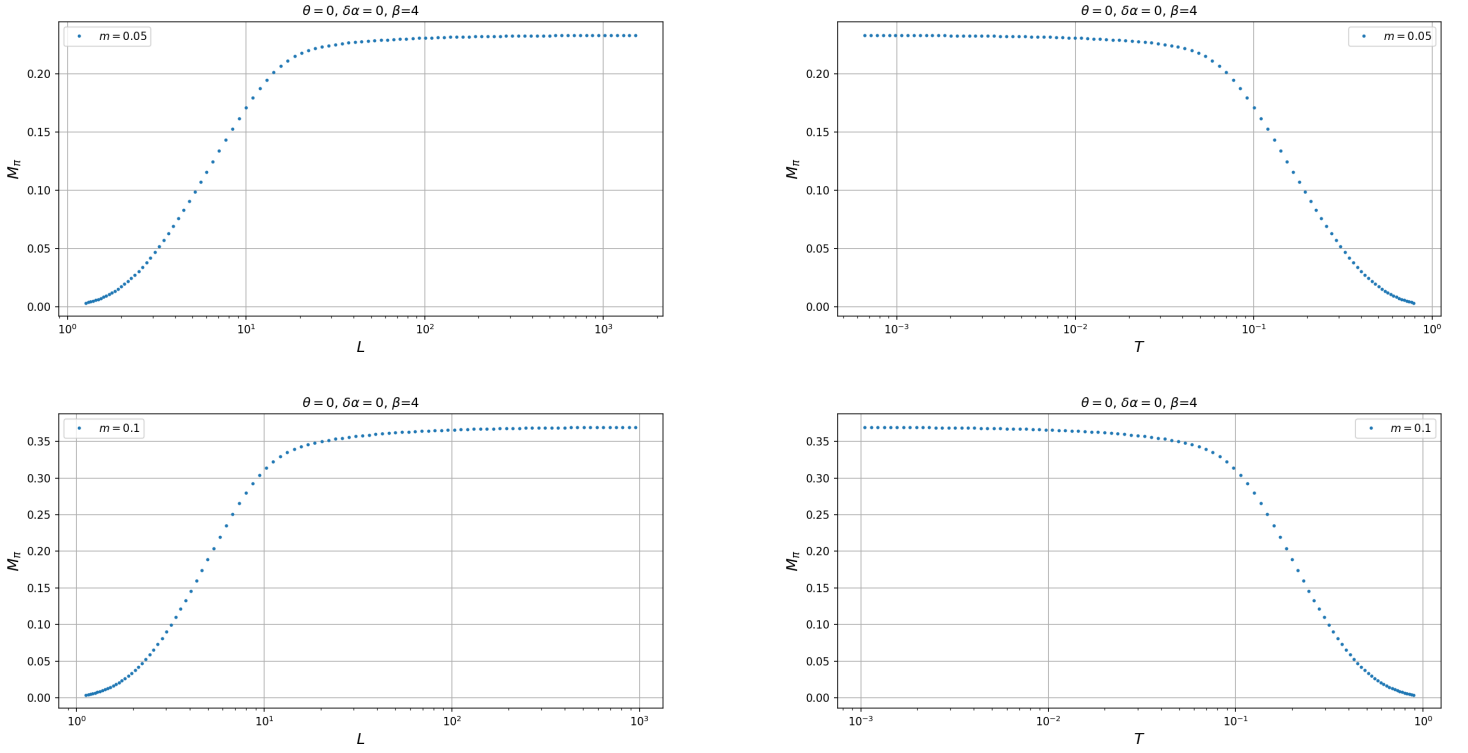

Figure 2: M_π as a function of L on the left hand side and M_π as a function of T on the right hand side

Low statistics results

The following results were obtained through several simulations on different lattices: 64×10, 64×12 and 64×16 with the parameters:

|	
N_{space}	64
Ntherm	1000
Nmeasure	1000
Trajectory Steps	10
Nsteps	10
β	4

Table 2: All the simulations were performed with this parameters.

Variance stands for the var option in the masscoll program and Chi squared for the χ^2 option. $g = \frac{1}{\sqrt{\beta}} = \frac{1}{\sqrt{2}}$.
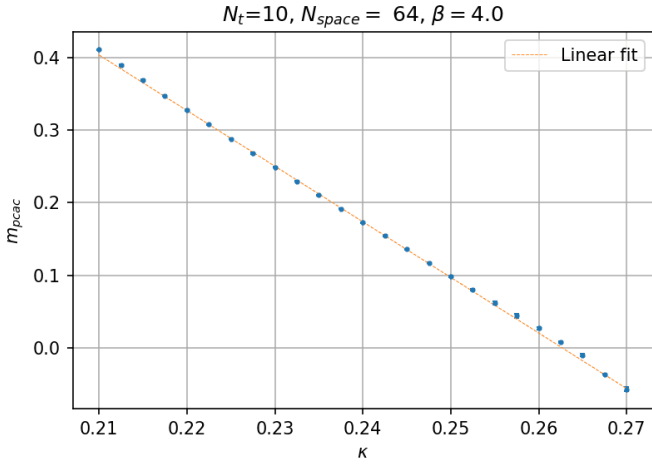
(a) Fermion mass using PCAC relation, $\kappa_c = 0.26273 \pm 0.00168$
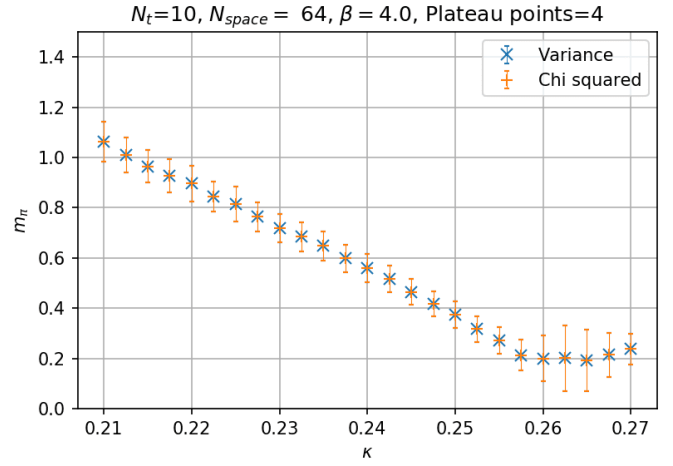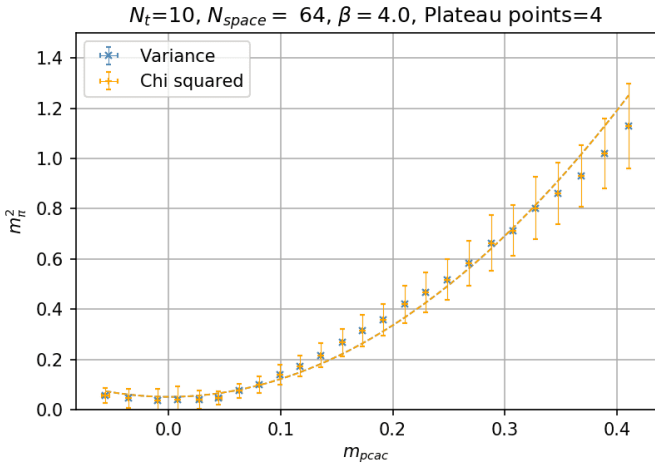
(b) Pion mass as a function of κ.

(c) m_π^2 vs. m_{pcac}. A function of the form $a + bx^2$ was fitted, the coefficients are $a = 0.05092 \pm 0.00616$, $b = 7.12154 \pm 0.20359$, $m_\pi = 0.22565 \pm 0.01365$ for variance and $a = 0.05092 \pm 0.00616$, $b = 7.12154 \pm 0.20359$, $m_\pi = 0.22565 \pm 0.01365$ for chi squared

(d) Smilga prediction. Only $m_{pcac} > 0$ is considered.

(e) m_π vs. m_{pcac}.
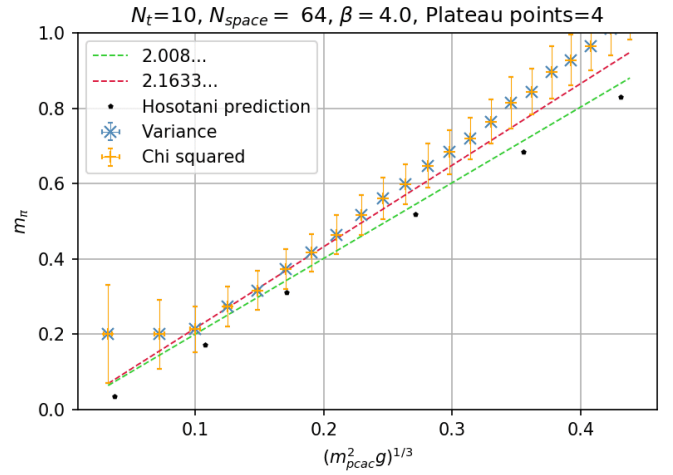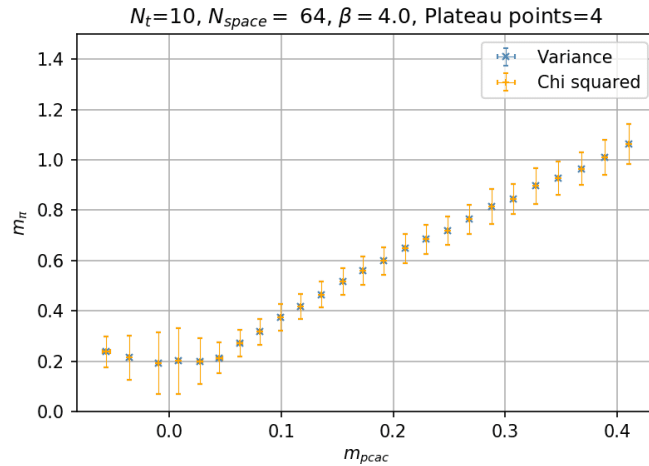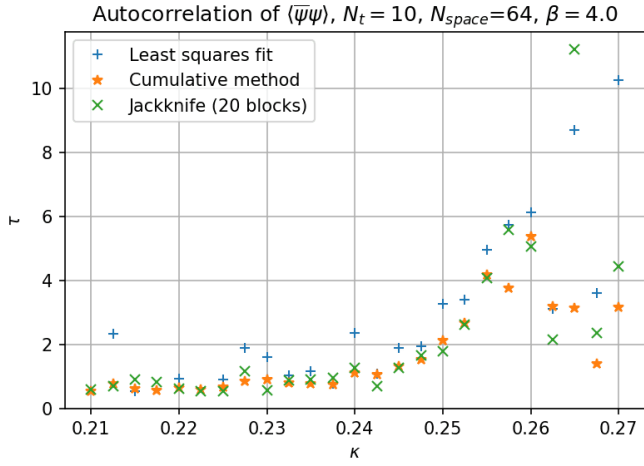
(f) Autocorrelation of $\langle \overline{\psi}\psi \rangle$
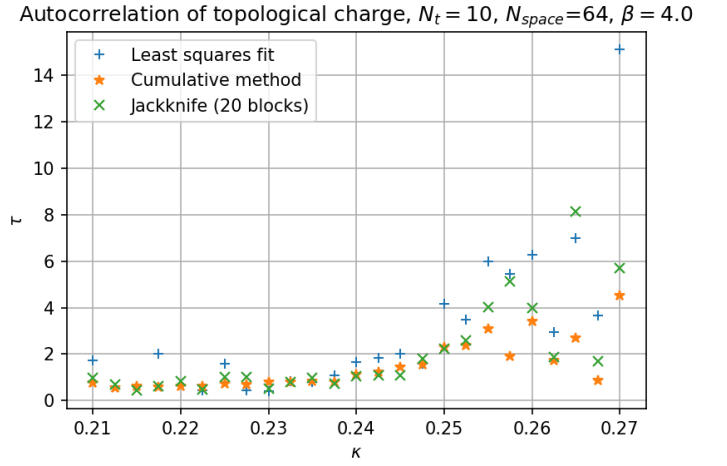
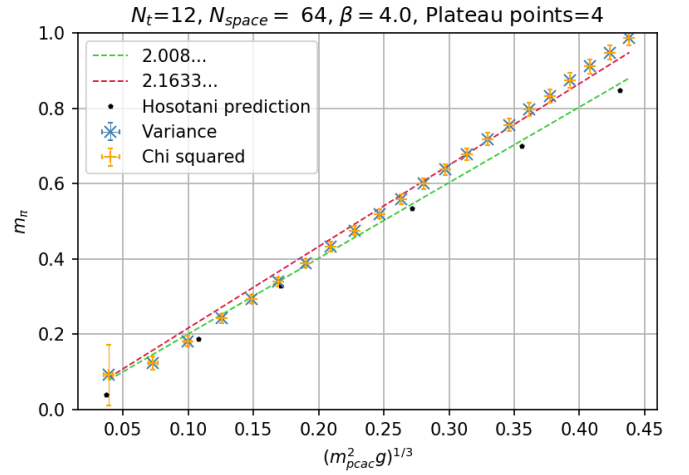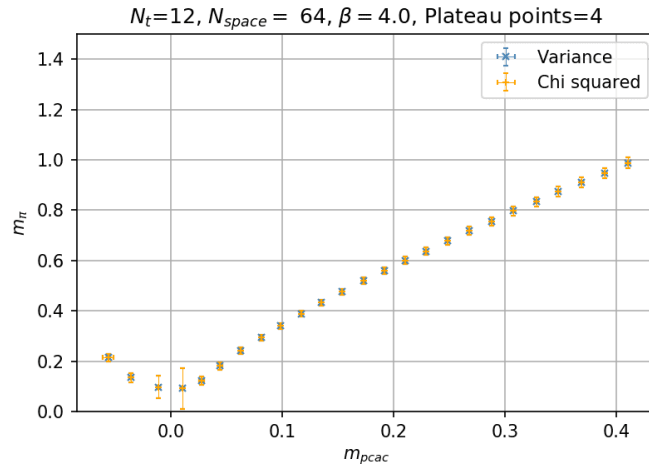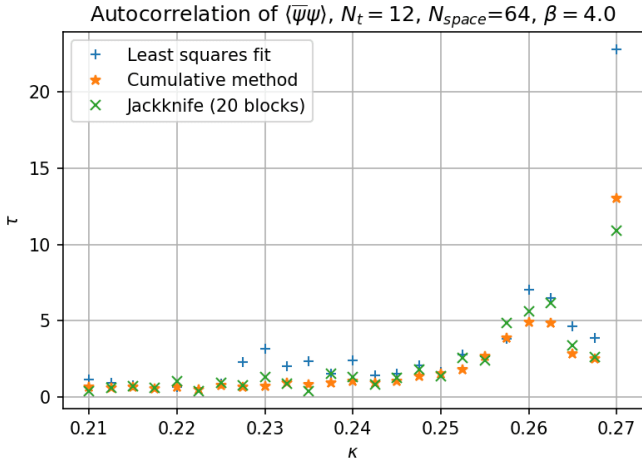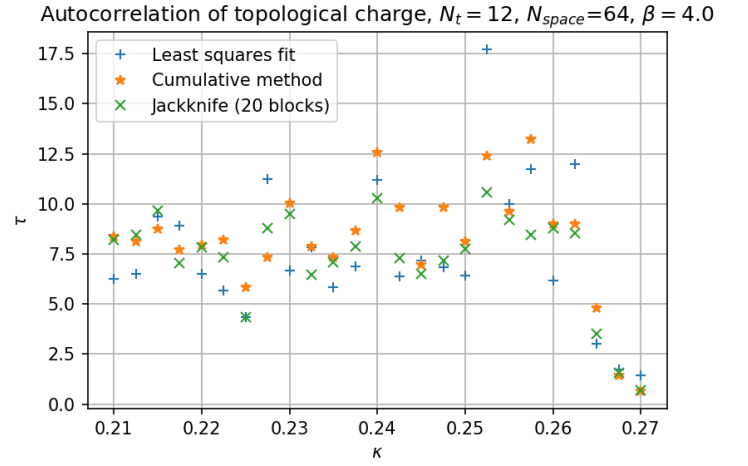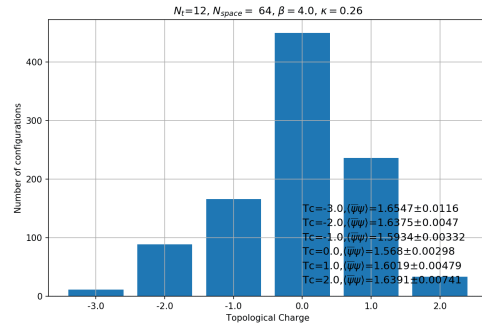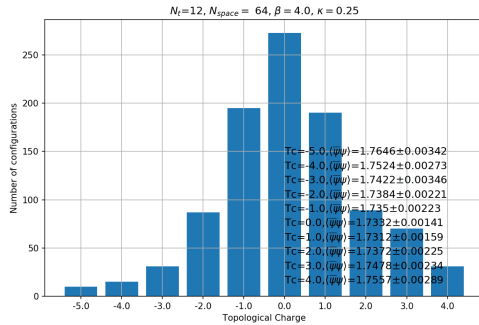(g) Autocorrelation of the topological charge
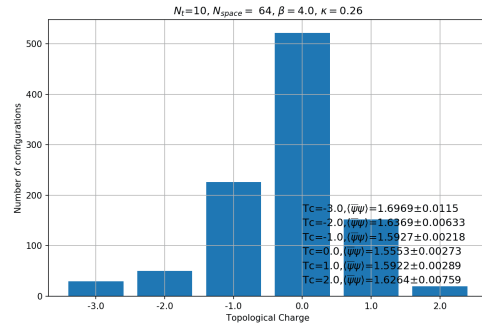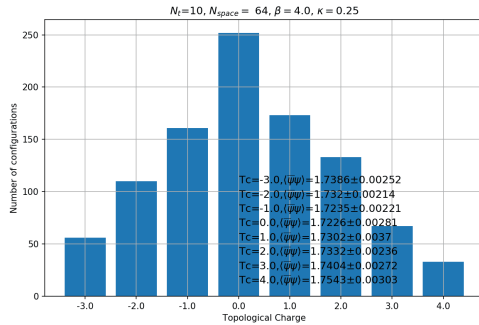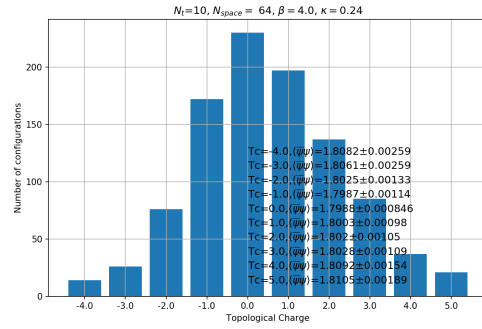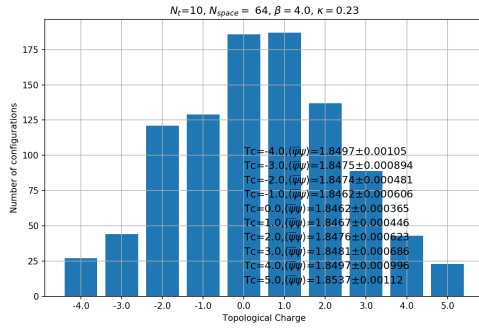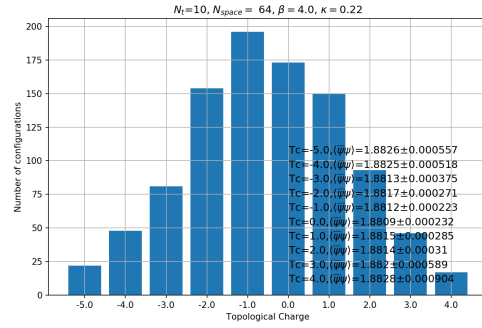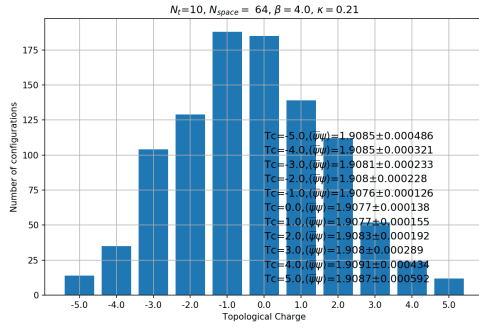
Figure 3: Number of configurations vs. topological charge on a 64×10 lattice.
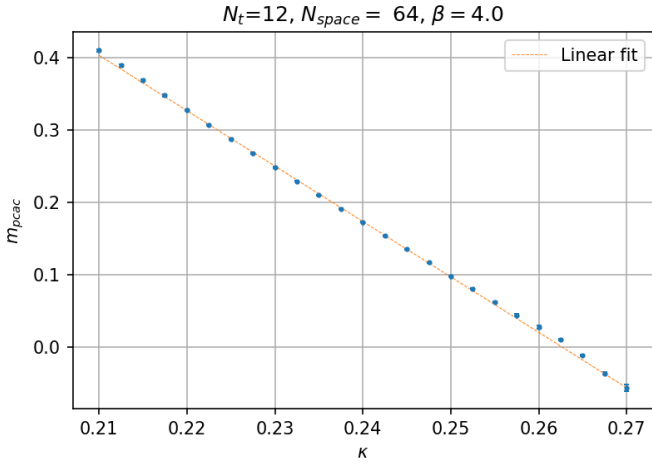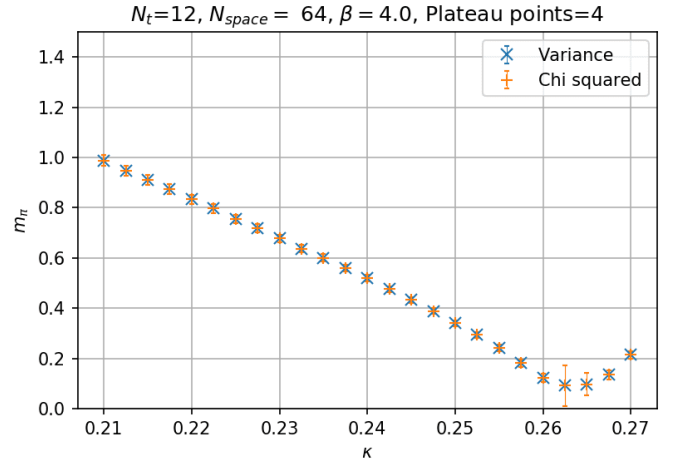
64x12

(a) Fermion mass using PCAC relation, $\kappa_c = 0.26273 \pm 0.00168$

(b) Pion mass as a function of κ.

(c) m_π^2 vs. m_{pcac}. A function of the form $a + bx^2$ was fitted, the coefficients are $a = 0.05092 \pm 0.00616$, $b = 7.12154 \pm 0.20359$, $m_\pi = 0.22565 \pm 0.01365$ for variance and $a = 0.05092 \pm 0.00616$, $b = 7.12154 \pm 0.20359$, $m_\pi = 0.22565 \pm 0.01365$ for chi squared

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(f) Autocorrelation of $\langle\overline{\psi}\psi\rangle$

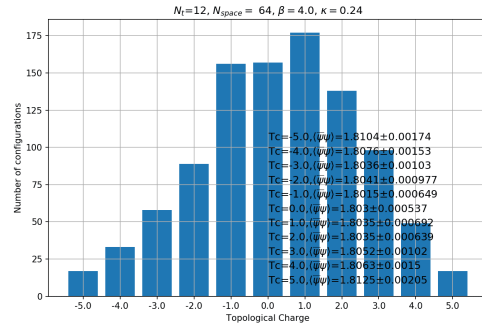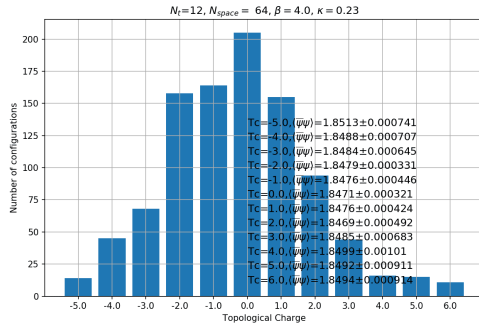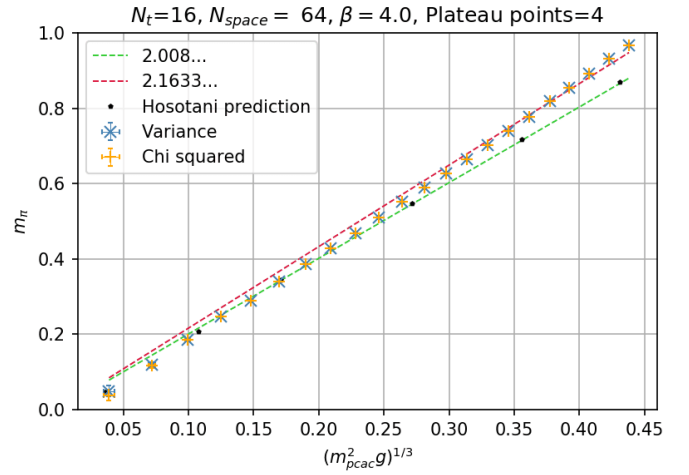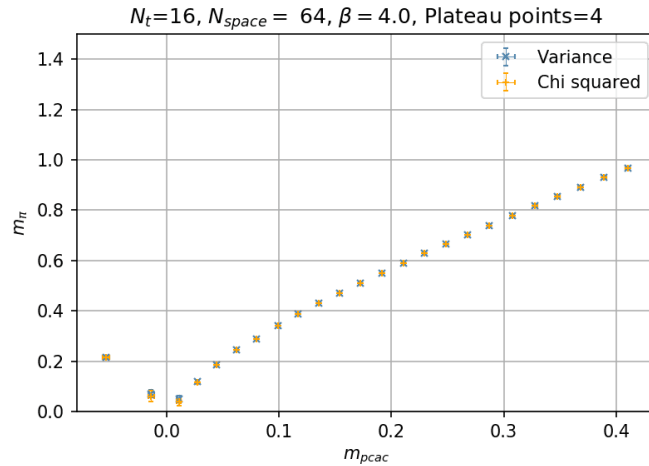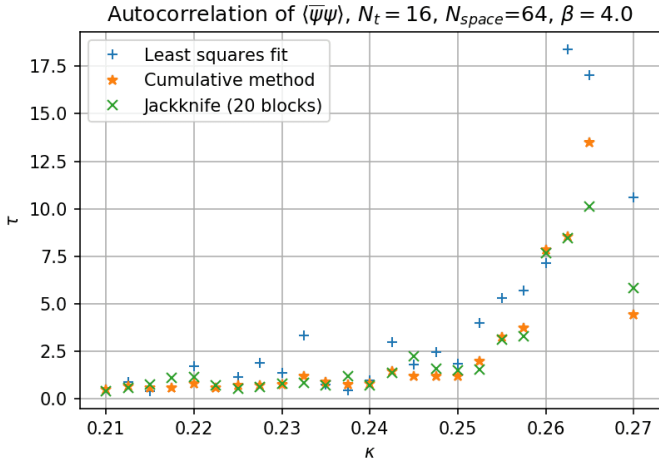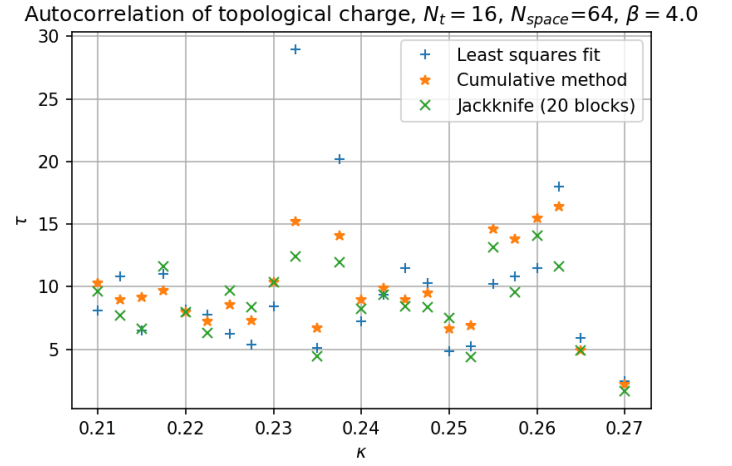(g) Autocorrelation of the topological charge
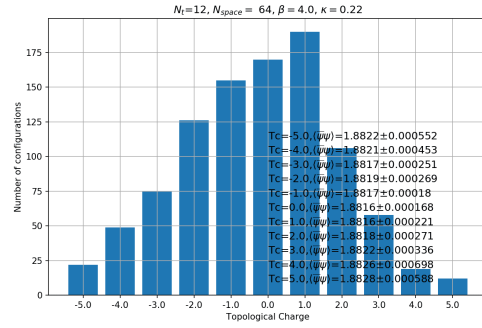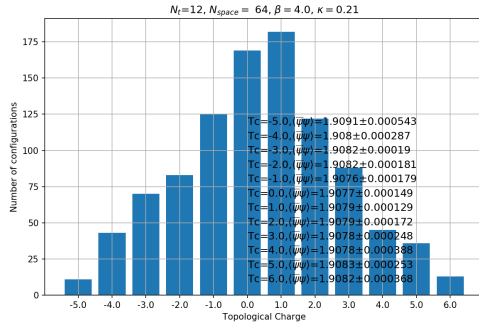
Figure 4: Number of configurations vs. topological charge on a 64×12 lattice.
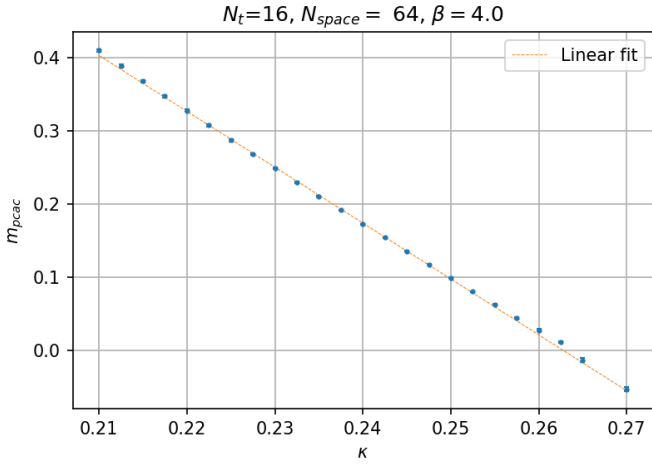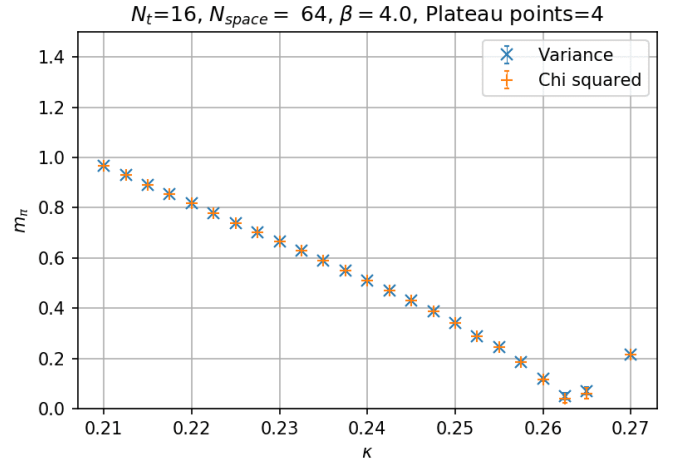
64x16

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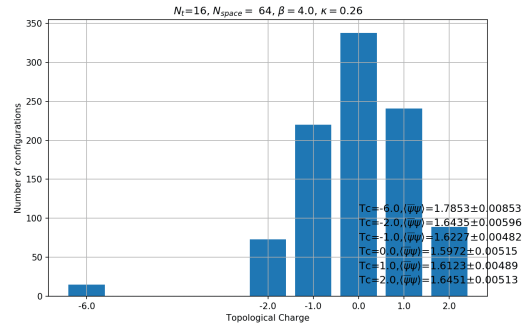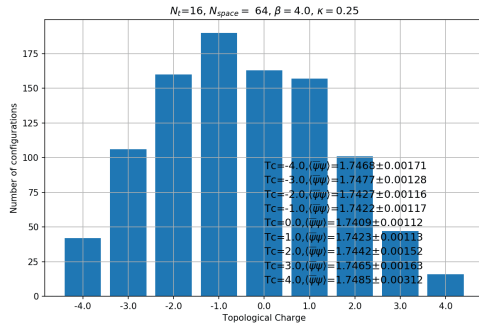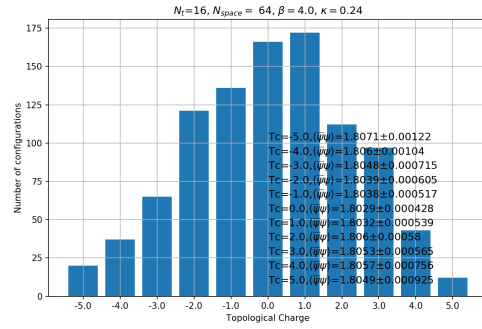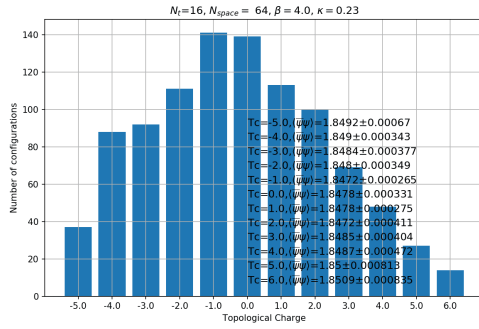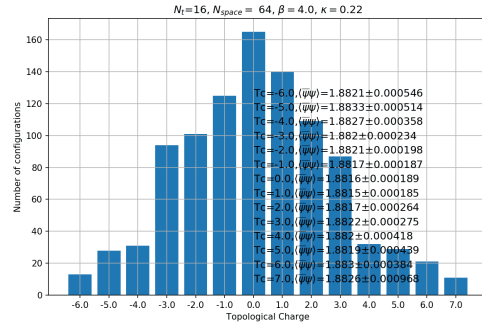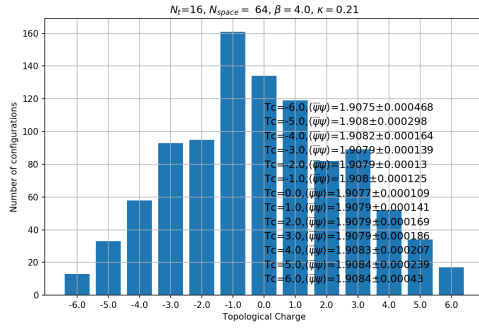(g) Autocorrelation of the topological charge

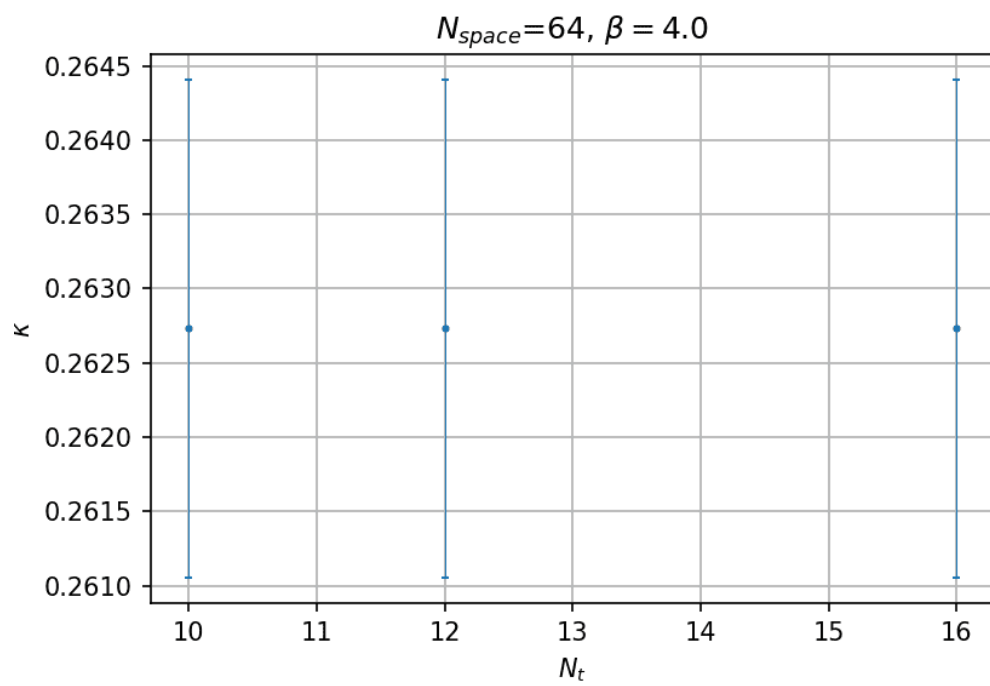Figure 5: Number of configurations vs. topological charge on a 64×16 lattice.

Figure 6: Kappa critical as a function of the time extension.