

PHMC at $\beta = 3.8$

ETM Collaboration



Outline

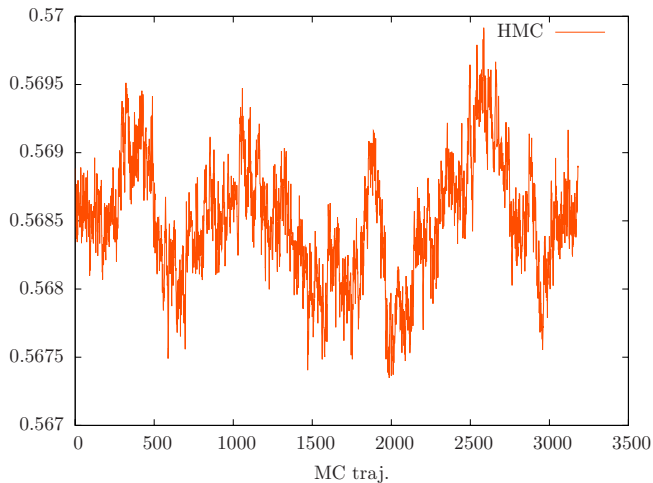
- ▶ Simulation : HMC, $N_f = 2$, $\beta = 3.8$, $\mu = 0.0060$
 - ▶ Long-range fluctuations
 - ▶ Difficult error estimate in m_{PCAC}
 $\rightsquigarrow$ tuning to maximal twist
- ▶ PHMC?

$N_f = 2$, HMC

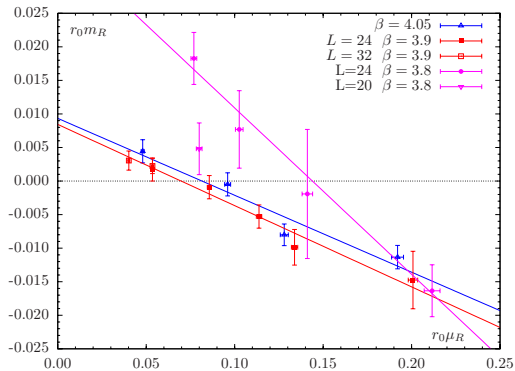
Ensemble	$L^3 \times T$	β	$a\mu_q$	κ	$\tau_{\text{int}}(P)$	$\tau_{\text{int}}(am_{\text{PS}})$	τ
A_1	$24^3 \times 48$	3.8	0.0060	0.164111	190(44)	8(2)	1.0
A_2			0.0080		172(80)	10(2)	1.0
A_3			0.0110		130(50)	6(1)	1.0
A_4			0.0165		40(12)	6(1)	1.0
A_5			0.0060		250(100)	5(1)	1.0
B_1	$24^3 \times 48$	3.9	0.0040	0.160856	47(15)	7(1)	0.5
B_6	$32^3 \times 64$		0.0040		37(11)	2.8(3)	0.5
C_1	$32^3 \times 64$	4.05	0.0030	0.157010	18(4)	7(1)	0.5

τ_{int} in units of traj. length 0.5

HMC : plaquette



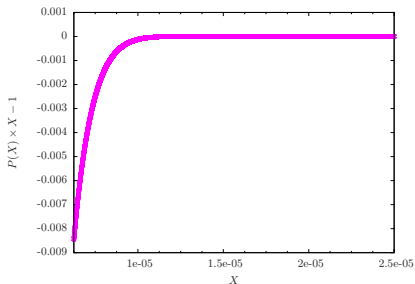
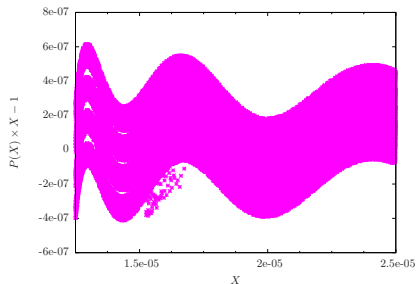
tuning



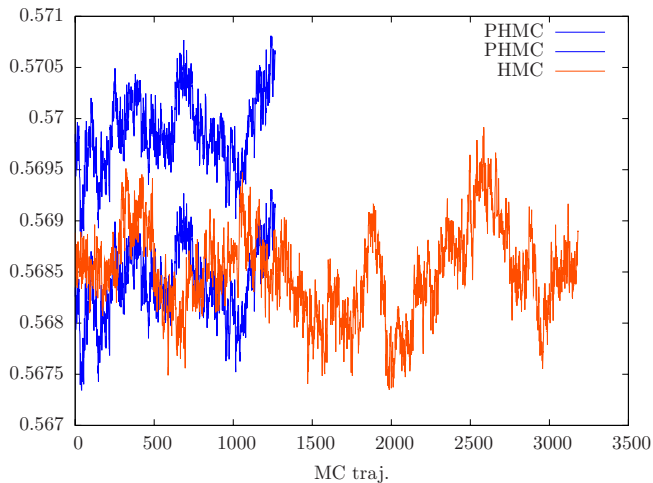
PHMC

► Simulation : PHMC, $N_f = 2$, $\beta = 3.8$, $\mu = 0.0060$, $L = 24$

- improvements in the implementation
- degree polynomial: 2304
- precision: 1.7×10^{-7}
- $\lambda_{\min}/\lambda_{\max} = 0.7 \times 10^{-5}$
- $\lambda_{10}/\lambda_{\max} \sim 2 \times \lambda_{\min}/\lambda_{\max} \sim \epsilon$
- approximation interval : $[1.25 \times 10^{-5}; 1]$



HMC and PHMC: plaquette

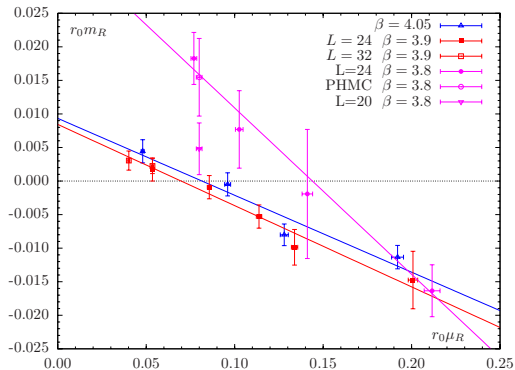


HMC and PHMC

Algo.	$\langle P \rangle$	$\tau_{\text{int}}(P)$	m_{PCAC}	$\tau_{\text{int}}(P)$	m_{PS}	$\tau_{\text{int}}(am_{\text{PS}})$	f_{PS}	$\tau_{\text{int}}(af_{\text{PS}})$
HMC ₁	0.56840(15)	61(30)	0.0019(4)		0.1852(09)	~ 16	0.0770(08)	
HMC ₂	0.56866(19)	66(30)	-	-	-	-	-	-
PHMC	0.56846(11)	47(22)	0.0016(6)	~ 20	0.1841(14)	~ 4	0.0797(11)	~ 12

Measurements: Pla_q: 1000 traj.
 fermionic obs. : PHMC : 400-1300 traj, every 8 traj. (of length 1)
 HMC : 3582 traj. and 590 meas.

tuning



f_{PS} 