

Status February 2006

C. Urbach
ETM Collaboration

The University of Liverpool
Institute for Theoretical Physics
Dept. of Mathematical Sciences

Florence 01/07

Outline

Status of the Runs

Some First Physics

$$\beta = 3.8$$

μ	$L^3 \times T$	status	N_{traj}	N_{meas}
0.006	$20^3 \times 48$	finished	8000	900
0.009	$20^3 \times 48$	finished	5000	2000
0.012	$20^3 \times 48$	finished	5000	2000
0.015	$20^3 \times 48$	finished	5000	1300
0.018	$20^3 \times 48$	not started	-	-

$$\beta = 3.9$$

μ	$L^3 \times T$	status	N_{traj}	N_{meas}
0.0040	$24^3 \times 48$	finished	10000	1800
0.0064	$24^3 \times 48$	finished	5000	2500
0.0085	$24^3 \times 48$	finished	5000	2100
0.0100	$24^3 \times 48$	finished	5000	1300
0.0150	$24^3 \times 48$	finished	5000	1400
0.0040	$32^3 \times 64$	finished	5000	1363

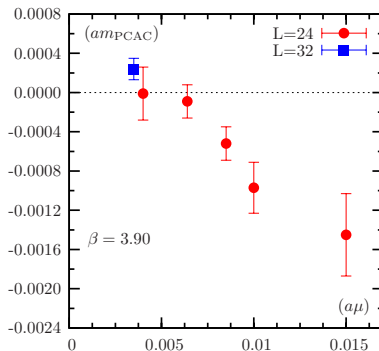
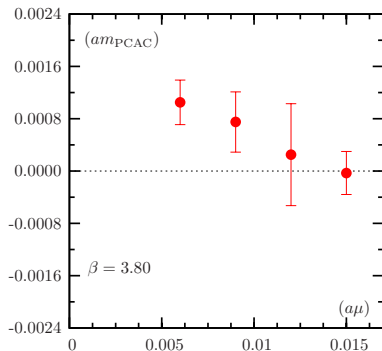
$$\beta = 4.05$$

μ	$L^3 \times T$	status	N_{traj}	N_{meas}
0.003	$32^3 \times 64$	finished	5000	1350, 500
0.006	$32^3 \times 64$	finished	5000	400
0.008	$32^3 \times 64$	running	3000	180
0.012	$32^3 \times 64$	running	2500	410

Plaquette Autocorrelation Times

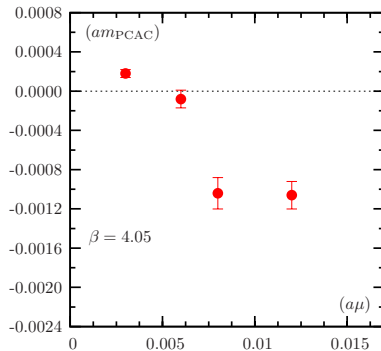
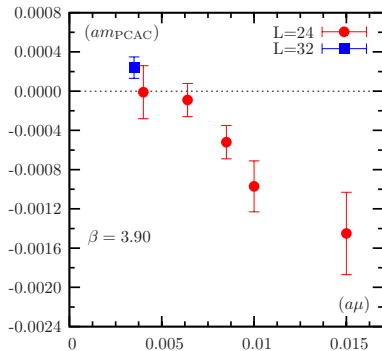
β	L	$a\mu$	$\tau_{\text{int}}(P)$
3.8	20	0.006	96(32)
3.8	20	0.012	45(13)
3.9	24	0.004	58(17)
3.9	32	0.004	37(11)
3.9	24	0.010	15(4)
4.05	32	0.003	56(23)
4.05	32	0.006	14(4)

Tuning to full twist



- Do we have to correct for deviations at $\beta = 3.8$?

Tuning to full twist



Check for FS effects

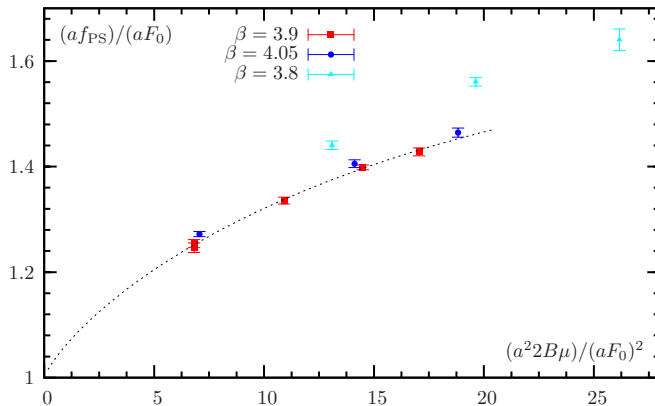
At $\beta = 3.9, \mu = 0.004$ we have two volumes:

$24^3 \times 48$ and $32^3 \times 64$

L	af_{PS}	am_{PS}	am_{PCAC}	N_{traj}
24	0.06531(40)	0.13587(68)	-0.00001(27)	5000
24	0.06470(29)	0.13660(52)	+0.00029(20)	8000
32	0.06619(49)	0.13369(25)	+0.00024(11)	5000

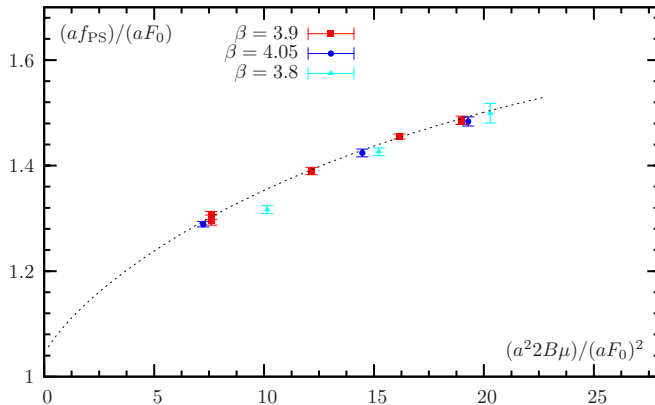
Chiral Fits

Separate chiral fits at each lattice spacing



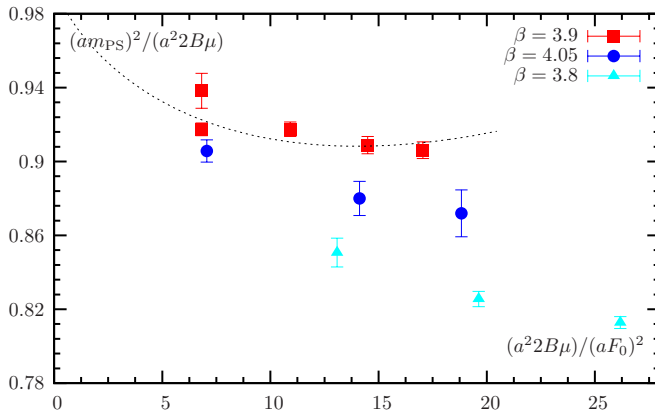
Chiral Fits

Combined chiral fit of the 3 lattice spacings



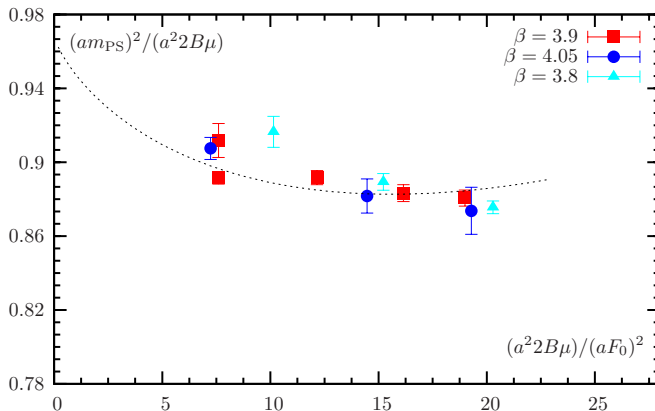
Chiral Fits

Separate chiral fits at each lattice spacing



chiral Fits

Combined chiral fit of the 3 lattice spacings



Fit Results

combined fit of $\beta = 3.9$ and $\beta = 4.05$:

$$a_{\beta=3.9} = 0.087(2) \text{ fm}, \quad a_{\beta=4.05} = 0.068(3) \text{ fm}$$

$$\bar{l}_3 = 3.46(9), \quad \bar{l}_4 = 4.54(16)$$

$$F = 121.2(4) \text{ MeV}$$

$$\chi^2/\text{dof} = 12.4/10$$

Fit Results

combined fit of the 3 lattice spacings (preliminary)

$$a_{\beta=3.8} = 0.098 \text{ fm}, \quad a_{\beta=3.9} = 0.084 \text{ fm}, \quad a_{\beta=4.05} = 0.066 \text{ fm}$$

$$\bar{l}_3 = 3.70, \quad \bar{l}_4 = 4.74$$

$$F = 121 \text{ MeV}$$

$$\chi^2/\text{dof} = 119/16$$

Fit Results

combined fit of the 3 lattice spacings (preliminary)

β	r_0/a	a [fm]	r_0 [fm]	$2B_0$ [fm ⁻¹]
3.8	4.2	0.098	0.41	62.5
3.9	5.2	0.084	0.44	59.5
4.05	6.5	0.066	0.43	58.8

Obtain ratios of Z-factors (Z_P):

$$\frac{B_0(\beta = 3.8)}{B_0(\beta = 3.9)} = 1.05, \quad \frac{B_0(\beta = 3.9)}{B_0(\beta = 4.05)} = 1.01$$

Neutral Pion and others

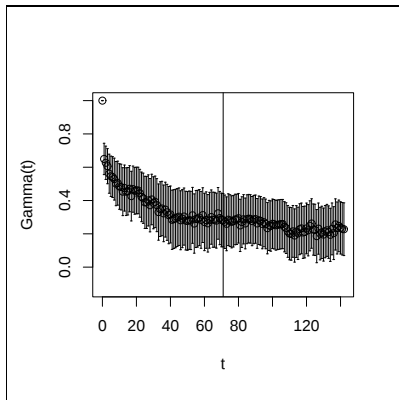
	k	$a\mu = 0.004$	$a\mu = 0.0085$
am_{PS}^0	0	0.111(06)	0.167(09)
	1	0.322(18)	0.320(50)
am_{η}	0	0.522(74)	0.436(68)
	1	0.621(19)	0.528(18)

- ▶ Momentum $k = 0$ and $k = 1$ results consistent
- ▶ η_2 mass increasing with decreasing $a\mu$
- ▶ $\beta = 4.05$ still in initial state, but preliminary result for m_{PS}^0 =splitting suggests that it decreases like a^2

Autocorrelation Times

$$\beta = 4.05, \mu = 0.003 \Gamma_{f_{\text{PS}}}(t):$$

ts 0 and 32; every 5 traj.



ts random; every 10 traj.

