

RBC-UKQCD DWF Ensembles

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1 Introduction

The gauge and fermion (G+F) action abbreviations used are:

- DWF = domain wall fermions
- MDWF = Mobius domain wall fermions,
- GMDWF = G-parity Mobius domain wall fermions,
- W = Wilson gauge action
- I = Iwasaki gauge action
- ID = Iwasaki plus Dislocation Suppressing Determinant Ratio (DSDR) gauge action.
- WE = Wilson plus Dislocation Enhancing Determinant (DED) gauge action.
- o following time extent = open boundary conditions in time

The total light quark mass (in lattice units) is $m_l + m_{\text{res}}$ and the total strange quark mass is similarly $m_s + m_{\text{res}}$.

2 2+1 flavor ensembles

Dynamical 2+1 flavor domain wall fermion ensembles by the RBC and UKQCD collaborations. (Ensembles 13 and 14 were produced by the RBC and HotQCD collaborations.)

Early ensembles with heavy pions								
Ens.	Action	$1/a$	Lattice	m_l	m_s	m_{res}	m_π	Size
	(F+G)	(GeV)	volume	(in lattice units)			(MeV)	(fm)
1	DWF+I	1.785(5)	$24^3 \times 64 \times 16$	0.005	0.04	0.00308	340	2.6
2	DWF+I	1.785(5)	$24^3 \times 64 \times 16$	0.01	0.04	0.00308	432	2.6
3	DWF+I	1.785(5)	$24^3 \times 64 \times 16$	0.02	0.04	0.00308	560	2.6
4	DWF+I	1.785(5)	$24^3 \times 64 \times 16$	0.03	0.04	0.00308	670	2.6
5	DWF+I	2.383(9)	$32^3 \times 64 \times 16$	0.004	0.03	0.000664	303	2.6
6	DWF+I	2.383(9)	$32^3 \times 64 \times 16$	0.006	0.03	0.000664	360	2.6
7	DWF+I	2.383(9)	$32^3 \times 64 \times 16$	0.008	0.03	0.000664	412	2.6
8	DWF+ID	1.378(7)	$32^3 \times 64 \times 32$	0.0042	0.045	0.00184	246	4.6
9	DWF+ID	1.378(7)	$32^3 \times 64 \times 32$	0.001	0.045	0.00184	171	4.6

Table 1: Early ensembles with heavy pions.

Ensembles including those with physical pions								
Ens.	Action	$1/a$	Lattice	m_l	m_s	m_{res}	m_π	Size
	(F+G)	(GeV)	volume	(in lattice units)			(MeV)	(fm)
10	MDWF+I	1.730(4)	$48^3 \times 96 \times 24$	0.00078	0.0362	0.000614	139	5.5
11	MDWF+I	2.359(7)	$64^3 \times 128 \times 12$	0.000678	0.02661	0.000314	139	5.4
12	DWF+I	3.15(2)	$32^3 \times 64 \times 12$	0.0047	0.0186	0.000631	371	2.0
13	MDWF+ID	0.98(4)	$32^3 \times 64 \times 24$	0.00022	0.05960	0.00217	117	3.8
14	MDWF+ID	2.02(1)	$32^3 \times 64 \times 24$	0.00478	0.03297	0.00447	401	6.2
15	GMDWF+ID	1.37(1)	$32^3 \times 64 \times 12$	0.0001	0.045	0.00184	141	4.6
16	MDWF+ID	0.98(4)	$32^3 \times 64 \times 24$	0.00107	0.0850	0.00217	137	6.4
17	MDWF+ID	0.98(4)	$24^3 \times 64 \times 24$	0.00107	0.0850	0.00217	137	4.8
18	MDWF+ID	0.98(4)	$48^3 \times 64 \times 24$	0.00107	0.0850	0.00217	137	9.6
19	MDWF+ID	1.37(1)	$32^3 \times 64 \times 12$	0.0001	0.045	0.00189	141	4.6
20	DWF+I	2.785	$48^3 \times 96 \times 12$	0.002144	0.02144	0.000968	267	3.5
21	MDWF+I	2.708	$32^3 \times 64 \times 12$	0.00054	0.02132	0.000233	140	2.3
22	MDWF+I	2.708	$96^3 \times 192 \times 12$	0.00054	0.02132	0.000233	140	6.9
23	MDWF+I	2.708	$48^3 \times 96 \times 12$	0.002144	0.02144	0.000236	232	3.5
24	GMDWF+ID	1.723	$40^3 \times 64 \times 12$	0.0003	0.0342	0.00101	135	4.6
25	GMDWF+ID	2.068	$48^3 \times 64 \times 12$	0.00074	0.02775	0.000276	135	4.6

Table 2: Ensembles including those with physical pions.

Ensembles probing effects near physical pion ensembles								
Ens.	Action	$1/a$	Lattice	m_l	m_s	m_{res}	m_π	Size
	(F+G)	(GeV)	volume	(in lattice units)			(MeV)	(fm)
26	MDWF+I	1.73	$32^3 \times 64 \times 24$	0.0025	0.0362	0.00063	208	3.7
27	MDWF+I	1.73	$24^3 \times 48 \times 32$	0.0055	0.0368	0.00046	284	4.0
28	MDWF+I	1.73	$32^3 \times 64 \times 24$	0.0025	0.05	0.00065	210	3.9
29	MDWF+I	1.74	$24^3 \times 48 \times 24$	0.0049	0.0362	0.00062	279	3.8
30	MDWF+I	2.37	$32^3 \times 64 \times 12$	0.00372	0.0257	0.00030	281	3.8
31	MDWF+I	1.76	$24^3 \times 48 \times 8$	0.002356	0.03366	0.00415	307	4.2
32	MDWF+I	1.73	$32^3 \times 64 \times 24$	0.00078	0.0362	0.00061	139	2.6
33	MDWF+I	1.73	$64^3 \times 96 \times 24$	0.00078	0.0362	0.00061	139	5.2
34	MDWF+I	1.74	$32^3 \times 64 \times 24$	0.0049	0.0362	0.00062	279	5.1
35	MDWF+I	3.50	$48^3 \times 192 \times 12$	0.0026	0.0176	0.00014	280	3.8
36	MDWF+I	≈ 3.50	$128^3 \times 288 \times 12$				≈ 140	≈ 5.1

Table 3: Ensembles probing effects near physical pion ensembles

3 2+1+1 flavor ensembles

2+1+1 flavor ensembles									
Ens.	Action	$1/a$	Lattice	m_l	m_s	m_c	m_{res}	m_π	Size
	(F+G)	(GeV)	volume	(in lattice units)				(MeV)	(fm)
1f	MDWF+WE	3.1	$32^3 \times 64 \times 32$	0.0001	0.0186	0.243	0.0008	160	1.7
2f	MDWF+WE	3.1	$80^2 \times 96 \times 192 \times 32$	0.0001	0.0186	0.243	0.0008	160	4.1
3f	MDWF+I	1.75	$24^3 \times 48 \times 24$	0.0049	0.0362	0.6679	0.00067	280	3.8
4f	MDWF+I	1.75	$24^3 \times 48 \times 24$	0.0049	0.0362	0.5	0.00067	280	3.8
5f	MDWF+I	1.75	$24^3 \times 48 \times 24$	0.0049	0.0362	0.35	0.00079	284	3.9
6f	MDWF+I	2.37	$32^3 \times 64 \times 12$	0.00372	0.0257	0.4539	0.00030	280	3.9
7f	MDWF+W	≈ 3	$96^3 \times 192 \times 16$	0.00046	0.0232	0.279	≈ 0.0004	≈ 140	4.5
8f	MDWF+W	≈ 4	$128^3 \times 288 \times 12$	0.00049	0.0158	0.191	≈ 0.00006	≈ 140	4.5
PROPOSED									
9f	MDWF+W	≈ 5	$160^3 \times 324 \times 12$	0.000378	0.0114	0.1445	≈ 0.00004	≈ 140	4.5

Table 4: 2+1+1 flavor ensembles. Ensembles 7f and 8f are not fully thermalized, so parameters are subject to change.