US site report

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US resources

machine	architecture	CPU cores	accelerators
BNL USQCD 1/2 rack	BG/Q	8192	—
ALCF "Mira"	BG/Q	786432	—
OLCF "Titan"	Cray XK7	299088	18688 K20
TACC "Stampede"	Dell C8220	102400	6400 Phi
NCSA "Blue Waters"	Cray XE6 + XK7	396032	4224 K20

▶ 3 BG/Q racks at BNL for exclusive use by RBC
▶ USQCD INCITE grants: 290 M hrs at ALCF and 140 M hrs at OLCF
▶ Individual science collaborations have access to Stampede and Blue Waters as well as other NSF founded facilities

MILC: HISQ $N_f = 2 + 1 + 1$

- ▶ Strange and charm close to physical value
- ▶ Variable u/d-quark masses down to physical value (0.04 m_s)
- ▶ Box sizes greater than 3.2 pion Compton wavelengths
- ▶ Four lattice spacings with each three different u/d-quark masses:
  (0.15 fm, 0.12 fm, 0.09 fm, 0.06 fm) $\times$ (0.04 m_s, 0.1 m_s, 0.2 m_s)
- ▶ Three volumes for use in finite-volume studies:
  $a \approx 0.12$ fm and $m_l = 0.1 m_s$ with box sizes 3.2, 4.3, and 5.4 pion Compton wavelengths
- ▶ Generation of $a \approx 0.045$ fm and $m_l = 0.02 m_s$ started
- ▶ Once complete, lattices will be stored at NERSC and Fermilab, intended mark-up for the ILDG metadata catalog
- ▶ Resources: ALCF BG/Q, Blue Waters

Hadron Spectrum Collaboration: anisotropic clover $N_f = 2 + 1$

- $m_\pi \approx 230$ MeV, anisotropy $\xi \approx 3.5$ ($a_s \approx 0.125$ fm, $a_t \approx 0.035$ fm)
- $32^3 x256$: total: 11506 traj. (incl. thermalization) in two streams
  Resource: OLCF and ALCF BG/P, LLNL BG/P, NERSC (Hopper)
  Status: generation complete, analysis on-going
- $40^3 x256$: total: 6562 traj. (incl. thermalization) in five streams
  Resource: OLCF JaguarPF and Titan (a few traj. on Blue Waters)
  Last $O(3000)$ trajectories generated on Titan fully on GPUs using
  QDP-JIT+QUDA+Chroma

JLabQCD: isotropic clover $N_f = 2 + 1$

- ▶ Isotropic clover fermion action with one iteration stout-link smearing
- ▶ Tree-level tadpole-improved Symanzik gauge action
- ▶ Non-perturbatively tuned c_{SW}
- ▶ $O(1000)$ to $O(10000)$ configurations per ensemble:

$a \approx 0.13$ fm	$M_\pi =$300 to 800 MeV	$48^3 \times 96$ to $16^3 \times 48$
$a \approx 0.10$ fm	$M_\pi =$800 MeV	$48^3 \times 64$ to $16^3 \times 48$
$a \approx 0.09$ fm	$M_\pi =$800 MeV	$16^3 \times 48$
$a \approx 0.08$ fm	$M_\pi =$450 to 800 MeV	$32^3 \times 96$ to $16^3 \times 48$

- ▶ If resources available, extension to physical pions
- ▶ Currently ILDG mark-up not intended
- ▶ Resources: NERSC, Kraken, ALCF BG/P, OLCF

RBC-UKQCD: (M)DWF $N_f = 2 + 1$

- BNL lattice archive moved to Columbia University
  (new website in progress; files are accessible via scp and globus online)
- Existing ensembles will be marked-up/made publicly available on ILDG
$24^3 \times 64 \times 16$	$a \approx 0.11$ fm	DWF+I
$32^3 \times 64 \times 16$	$a \approx 0.08$ fm	DWF+I
$32^3 \times 64 \times 32$	$a \approx 0.14$ fm	DWF+ID
- Currently generated ensembles
$48^3 \times 96 \times 24$	$a \approx 0.11$ fm	MDWF+I	physical M_π, 1300 therm. MDTU
$64^3 \times 128 \times 12$	$a \approx 0.08$ fm	MDWF+I	physical M_π, 1400 therm. MDTU
$32^3 \times 64 \times 24$	$a \approx 0.18$ fm	MDWF+ID	physical M_π
$32^3 \times 64 \times 12$	$a \approx 0.06$ fm	DWF+I	$M_\pi \approx 380$ MeV
- Resources: ALCF BG/Q and BG/Qs at UoE and BNL

USBSM: SU(3) gauge group and $N_f = 8$ staggered

- ▶ Staggered fermions improved with one step nHyp link-smearing
- ▶ Adjoint plaquette action at $\beta_F = 5.0$ and $\beta_A = -\beta_F/4$
- ▶ Truncate at least 300 MDTU for thermalization
- ▶ Resource: ALCF BG/P, evolution now performed in FUEL (qhmc)

masses	$64^3 \times 128$	$48^3 \times 96$	$32^3 \times 64$	$24^3 \times 48$	$16^3 \times 32$
0.002	70				
0.003	185				
0.004	252	1 152			
0.006		1 170			
0.008		1 755	3 024		
0.010		2 250	6 792	3 012	
0.015			3 018	10 074	
0.020				10 074	3 000
0.030					3 000
0.040					3 000
0.050					3 000

LSD: SU(3) gauge group with domain-wall fermions

- Iwasaki gauge action
- $L_s = 16$, $M_5 = 1.8$
- Ordered and/or disorderd starts
- Additional ensembles e.g. fixed m_f at different β
- $O(500)$ to $O(5000)$
- Resources BG/L and BG/Q at LLNL
- Restricted access at present

N_f	$\left(\frac{L}{a}\right)^3 \times \frac{T}{a}$	β	m_f
2	$24^3 \times 48$	2.7	[0.01:0.005:0.03]
	$32^3 \times 64$	2.7	[0.005:0.005:0.03]
6	$16^3 \times 32$	2.1	[0.01:0.005:0.045]
	$32^3 \times 64$	2.1	[0.005:0.005:0.03]
8	$16^3 \times 32$	1.95	[0.015:0.005:0.05]
	$32^3 \times 64$	1.95	[0.01:0.005:0.03]
10	$16^3 \times 32$	1.95	[0.01:0.005:0.06]
	$32^3 \times 64$	1.95	[0.005:0.005:0.03]