

muon $g-2$ proposals

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muon $g-2$ related proposals

QCD + QED Ensemble for the Muon $g-2$	MILC	36.8 M Jpsi core-hrs
Muon $g-2$ Hadronic Vacuum Polarization from four flavors of sea quarks using the HISQ action	Fermilab Lattice HPQCD MILC	519 K gpu-hrs 20 M Jpsi core-hours
QCD + QED studies using Twist-Averaging	RBC	59 M Jpsi core-hrs
Exclusive Study of $(g - 2)_\mu$ HVP and Nucleon Form Factors with Distillation	RBC	46.7 M Jpsi core-hrs
Precise scale setting for $(g - 2)_\mu$	RBC	47 M Jpsi core-hrs
Total (5) cluster		209.5 M Jpsi core-hrs
Total (1) gpu		519 K gpu-hrs

Motivation

- muon $g-2$ experiment, theory High priority for DOE
- 3-4 σ discrepancy between experiment and SM
- Fermilab E989 running, 1st results \lesssim 1 year. Goal: improve 4 \times over BNL
- Lattice calculations critical
 - HVP: sub-percent required to match/check dispersive results
 - HLbL: solid 10-20% error good enough,
no other model independent method / result available

QCD + QED Ensemble for the Muon $g-2$

Participants: A. Bazavov, C. Bernard, C. DeTar, S. Gottlieb, U.M. Heller,
J. Komijani, J. Laiho, R. Li, Y. Liu, J. Osborn, R. Sugar,
D. Toussaint, R. Van de Water

compute request: 36.8 M Jpsi core-hrs on Fermilab clusters (BNL Skylake and KNL)]

storage request: 1281 TB tape, 0.45 TB disk

Proposed calculations

- 1+1+1+1 flavors, physical masses, HISQ ensemble
- 0.15 fm lattice spacing
- QCD+QED gauge fields, QED non-compact
- Compute $O(\alpha)$ contributions to HVP contribution to muon $g-2$
- Available to USQCD members

Muon $g-2$ Hadronic Vacuum Polarization from four flavors . . .

Participants: C. DeTar, C. Davies, A. X. El-Khadra, S. Gottlieb, A. S. Kronfeld, J. Laiho, G. P. Lepage, Y. Liu, P. B. Mackenzie, C. McNeile, E. T. Neil, J. N. Simone, R. Sugar, D. Toussaint, A. Vaquero, R. S. Van de Water, Shuhei Yamamoto

compute request: 20 M JPsi core-hrs on Fermilab clusters, 519 gpu-hrs on BNL IC

storage request: 62 TB tape

Proposed calculations

- Compute HVP on HISQ physical point ensembles
- Use deflation, truncated solver, LMA methods
- QED corrections on new $1+1+1+1$ flavor, 0.15 fm ensemble, 2000 configs
- disconnected diagram $2+1+1$ flavor, 0.12 fm ensemble, 50 configs
- connected diagram, $2+1+1$ flavor, 0.15 fm ensemble, 8000 configs

QCD + QED studies using Twist-Averaging

Investigators: Mattia Bruno (BNL, co-PI), Xu Feng (Peking University),
Taku Izubuchi (BNL/RBRC), Luchang Jin (UConn/RBRC),
Christoph Lehner (BNL, PI), Aaron Meyer (BNL)

Collaborators: Tom Blum (UConn), Norman Christ (CU), Chulwoo Jung (BNL),
Chris Sachrajda (Southampton), Amarjit Soni (BNL)

compute request: 59 M JPsi core-hrs on JLab or BNL KNL clusters

storage request: 80 TB disk

Proposed calculations

2+1 flavor, physical point Möbius DWF, 2.38 GeV, 64^3 ensemble (RBC/UKQCD)

- Compute $O(\alpha)$ corrections to HVP, quark (hadron) masses, f_π , $\tau \rightarrow$ hadrons
- Perturbative QED framework
- Stochastic (importance) sampling method (*c.f.* HLbL calculation)
- FV controlled by twist averaging ($\approx \infty$ volume photons)
- +48l results from current allocation to take continuum limit
- 4d props available to members for non-competing projects

Exclusive Study of $(g - 2)_\mu$ and Nucleon Form Factors with Distillation

Investigators: A. S. Meyer (PI), M. Bruno, T. Izubuchi, Y. C. Jang, C. Jung, and C. Lehner

compute request: 46.7 M JPsi core-hrs on JLab or BNL KNL clusters

storage request: 50 TB disk

Proposed calculations

2+1 flavor, physical point, Möbius DWF, 1.73 GeV, 48^3 ensemble (RBC/UKQCD)

- Use distillation (60 vecs) + AMA (2000 vecs) + GEVP (3+ states)
- Compute multiple $\pi\pi$ -state contributions to correlation functions
 - reconstruct exclusive channel, long distance contributions to a_{μ}^{HVP}
- Compute nucleon form factor relevant to nucleon decay, ν oscillations
- more operators, correlation functions possible with saved (half-)perambulators
- perambulators available to members for non-competing projects

Precise scale setting for $(g - 2)_\mu$

Investigators: Mattia Bruno(PI), Taku Izubuchi,
Christoph Lehner, Aaron Meyer

Collaborators: Thomas Blum, Norman Christ, Luchang Jin,
Chulwoo Jung, Chris Kelly, Amarjit Soni

compute request: 47 M JPsi core-hrs on JLab or BNL KNL clusters

Proposed calculations

2+1 flavor, physical point, Möbius DWF, 1.73 GeV, 48^3 ensemble (RBC/UKQCD)

- Compute Ω^- mass to per-mille precision
- Use distillation (60 modes) + AMA (2000 low modes) + GEVP
- Measure on every timeslice (96) , 15 configs
- large basis of operators, optimize smearing function
- perambulators available to members for non-competing projects