

CLS 2+1 Data status

Gunnar Bali for CLS

>cls

Coordinated Lattice Simulations (CLS)

∃ CLS people at (non-exclusive list)

- ▶ HU Berlin
- ▶ U Bern
- ▶ RU Bochum
- ▶ CERN
- ▶ TU Darmstadt
- ▶ JU Kraków
- ▶ U Ljubljana
- ▶ JGU Mainz
- ▶ UA Madrid
- ▶ U Milano Bicocca
- ▶ U Münster
- ▶ SDU Odense
- ▶ U Regensburg
- ▶ U Roma I + II
- ▶ BU Wuppertal
- ▶ DESY Zeuthen

Coordinated generation of gauge ensembles using openQCD

<https://luscher.web.cern.ch/luscher/openQCD/>

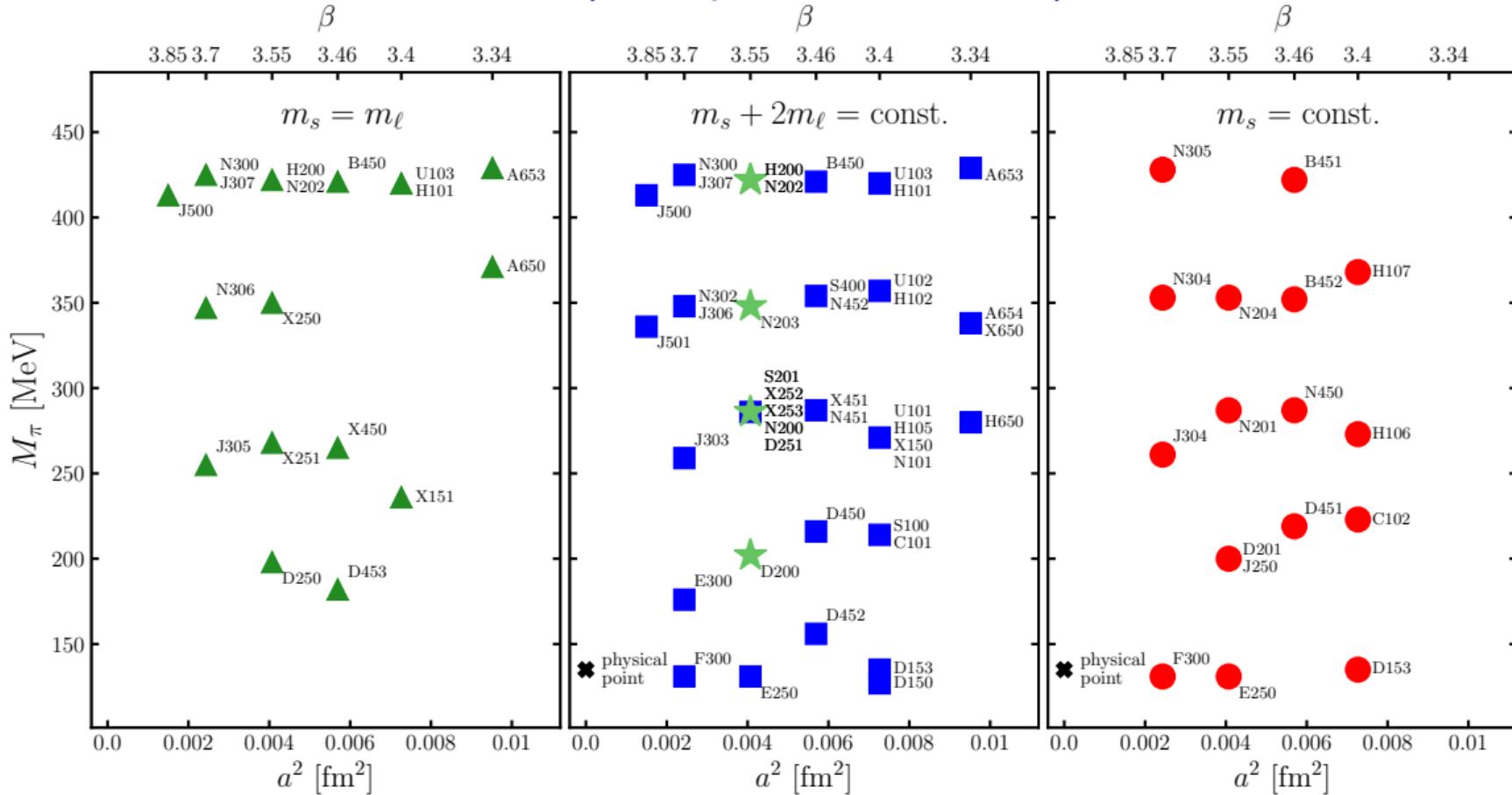
[M Lüscher, S Schaefer, 1206.2809].

$N_f = 2 + 1$ flavours of non-perturbatively order-a improved Wilson fermions on tree-level Symanzik improved glue.

CLS ensembles

- ▶ Open boundary conditions in time for $a < 0.06$ fm, open or (anti-)periodic otherwise.
- ▶ Two reweighting factors to the target action required (small twisted mass term for $N_f = 2$ part to stabilize the simulation and rational approximation of $(D_s^\dagger D_s)^{1/2}$).
- ▶ At present 6 lattice spacings: $a = (0.098 \searrow 0.039)$ fm.
- ▶ $LM_\pi \gtrsim 4 +$ smaller, $M_\pi = (420 \searrow 130)$ MeV, $48 \cdot 24^3 \leq TL^3/a^4 \leq 256 \cdot 128^3$.
- ▶ 2000 – 15000 MDU, depending on the autocorrelation time.
- ▶ Ensembles along $m_s + 2m_\ell = \approx$ physical, $m_s = m_\ell$ and $m_s \approx$ physical.
- ▶ ≥ 65 ensembles exist (plus deprecated ones).
- ▶ As of 3.4.2025, 23:35 CEST: 156185 gauge configurations, 1576.4 TB.
- ▶ Stored redundantly at DESY Zeuthen and U Regensburg.

Overview of CLS ensembles (\star : uploaded to ILDG)



Timeline and ILDG status

- ▶ 2013: start of CLS 2+1.
- ▶ 2013 decision: ensembles and reweighting factors can be made available upon request for non-competing projects.
- ▶ November 2015: Commitment to make ensembles available on ILDG, decision to publish a first set of ensembles for general use and to discuss policies (e.g., embargo times) at a future meeting.
- ▶ Status: 5 ensembles (9 replica) uploaded to ILDG:
`mc://ldg/cls/nf21/RUNID` with `reweightingEstimators` in config XML.
Further ensembles covered by the 2015 decision are being prepared for upload.
- ▶ Policy and further upload decisions expected at the next CLS meeting in September 2025.
- ▶ Problem: long term storage elements (with middleware configured to accept authorization through Oauth2 tokens) and sufficient bandwidth.
At present 1.6 PB of CLS data alone, and this will increase!