

# Heavy Quark Diffusion from 2+1 Flavor Lattice QCD with 320 MeV Pion Mass (PUNCH4NFDI use case)

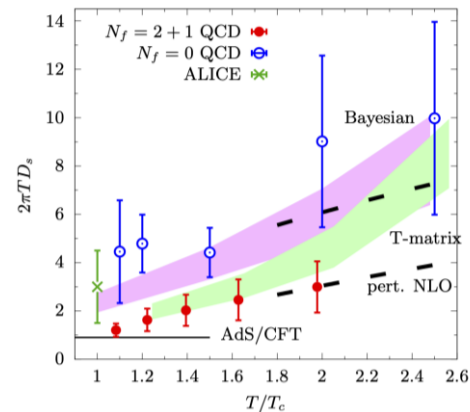


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Goal: Perform the analysis on PUNCH platform. Combine workflow, raw data, additional metadata, simulation and analysis software to a Research Product.

Gauge configurations generated on supercomputers with  $N_f = 2+1$  at pion mass 320 MeV using SIMULATEQCD, a multi-GPU C++ code public & published : <https://github.com/LatticeQCD/SIMULATEQCD> [arXiv:2306.01098](https://arxiv.org/abs/2306.01098)



- Computing resources used :
- Bielefeld GPU cluster
  - JUWELS at GCS@FZJ
  - Marconi 100 at CINECA

First results on heavy quark diffusion coefficients using dynamical light quarks from lattice!!

<https://doi.org/10.1103/PhysRevLett.130.231902>

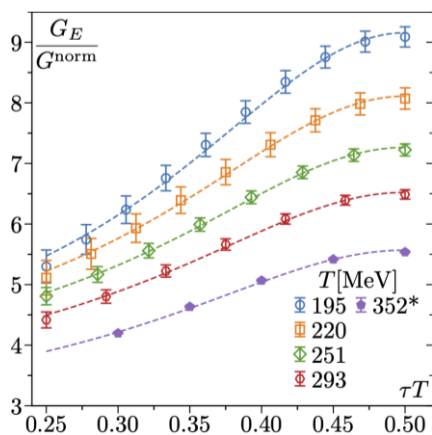
Raw Gauge configurations used to calculate Observable of interest : **chromo-electric correlator** ( $G_E$ ) for various Temperatures. All Measured data public & published: <https://doi.org/10.4119/unibi/2979080>

First success: Complete workflow including: sampling, bootstrapping, interpolation & continuum extrapolation implemented as a single bash/python script already runs as a container on:

**Compute4Punch**

Lattice Toolbox : Collection of Python tools developed at Bielefeld (Public):

<https://github.com/LatticeQCD/LatticeToolbox>



Planned & Ongoing activities :

- Migration of the bash script to a user friendly Jupyter Notebook – with the aim of running it on Compute4PUNCH
- Metadata of the datasets used in this workflow will be designed and extracted
- Use Storage4PUNCH for data and metadata catalog for storing metadata

FINAL GOAL : Publish the entire project as a Digital Research Product (DRP) on the PUNCH Science Data Platform (SDP)