Welcome to the workshop **Glueballs and Charmonium: Lattice QCD, Experiment and Phenomenology**!

Francesco Knechtli, Tomasz Korzec, Mike Peardon

ECT*, Trento, Italy, 2-6 March 2026

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FOR 5269

The Research Unit FOR 5269



Future Methods for Studying Confined Gluons in QCD

https://for5269.desy.de/

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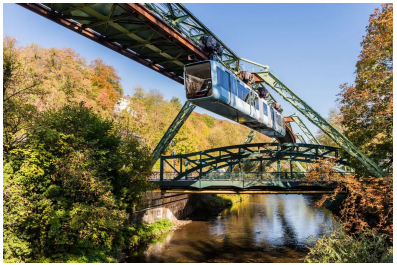

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125th anniversary of the start of operations on March 1st, 1901

FOR 5269: who we are

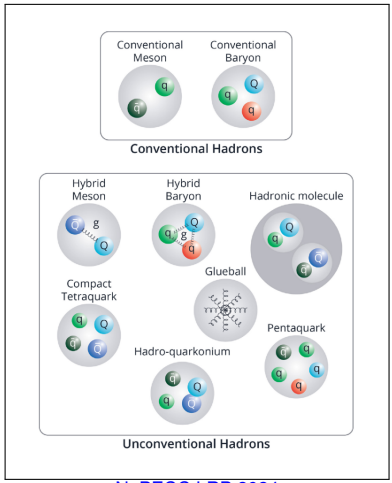
We are lattice QCD physicists and numerical analysts. We develop new numerical techniques for lattice QCD to study systems like charmonium and glueballs in full QCD.

Projects (2026-2030)

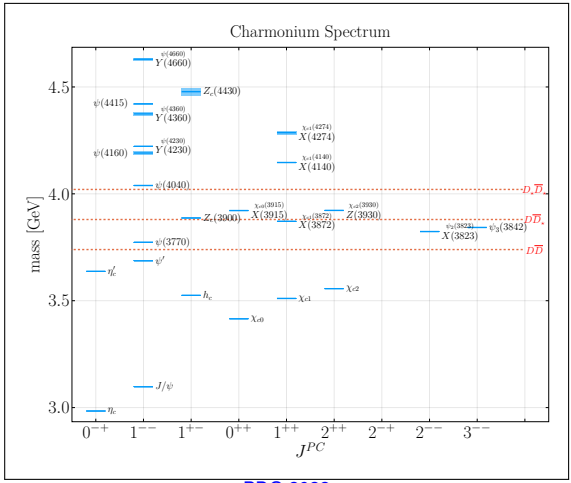
- P1: "The confined gluon: precision spectroscopy with charm quarks"
  PI's: F. Knechtli, T. Korzec, U. Wuppertal
- P2: "The confined gluon: glueball spectroscopy in the full QCD vacuum"
  PI: S. Schaefer, DESY, Zeuthen
- P3: "Monte Carlo sampling of gluons by molecular dynamics"
  PI: M. Günther, U. Wuppertal
- P4: "Computing quark propagators in a gluon background"
  PI's: A. Frommer, K. Kahl, U. Wuppertal
- P5: "The confined gluon: radiative decays of charmonium"
  PI: S. Collins, U. Regensburg
- Mercator Fellow: M. Peardon, Trinity College Dublin



Motivation



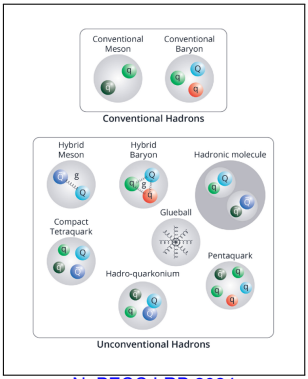
NuPECC LRP 2024



PDG 2022

$\eta(2370)$ BESIII, Phys. Rev. Lett. 132(18) (2024)

Motivation



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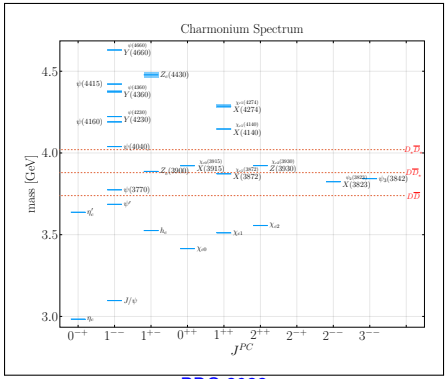

PDG 2022

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"Theorists play an essential role in interpreting experimental results but also in providing input and predictions for new experiments. To match experimental progress, sophisticated approaches need to be developed. In lattice QCD, the rapid evolution of computational techniques and hardware calls for new algorithms and software." Nuclear Physics European Collaboration Committee (NuPECC) Long Range Plan 2024

The workshop at ECT*



Topics: glueball spectroscopy, charmonium spectroscopy, charmonium radiative decays, D-meson scattering and charmonium exotics, experimental status from BESIII and Belle II, Born Oppenheimer Effective Field Theory, coupled-channel scattering, static limit of heavy quarks. **We envisage:**

- discussions with other groups working on lattice QCD and
- connections to experiment and phenomenology

Questions to be answered:

- How can lattice QCD help experiments identifying glueballs?
- What is the input lattice QCD can provide to effective theories?
- How do we learn about the internal mechanics of exotic states? ...