Panel discussion on: **“Classical-simulation methods in HEP: what can they ultimately achieve and what is the limit?”**

Panelists: **Mari-Carmen Banuls, Paulo Bedaque, Karl Jansen, Yannick Meurice, Erez Zohar**

SLACK poll questions:

- Do you believe that there are problems in HEP that require quantum hardware to solve them? [Y/N]
- You are given a significant portion of an Exascale supercomputer. Do you see a roadmap toward reliably determining the QCD phase diagram? [Y/N]
- If we never get a quantum computer, what is the classical method you would bet on for real-time and finite-density systems in 2 and 3 spatial dimensions? [MC/TN/Both/None (it will remain open)]

1) You are given a significant portion of an Exascale supercomputer. How far can the current solutions to mitigating sign and signal-to-noise problem take you? Do you see a roadmap toward QCD? What are the main roadblocks?

2) If we never get a quantum computer, what is the classical method you would bet on for real-time and finite-density systems?

3) What opportunities do you see in classical Monte Carlo (LQCD) as well as tensor-network simulations to inform quantum simulations and vice versa? Can we learn from similar interplays for condensed matter problems?

4) Do you see any role for entanglement in quantum Monte Carlo (LQCD) simulations of gauge theories? Can new insights on the structure of quantum correlations be utilized to improve diagnostics and computational capabilities of Monte Carlo methods?

5) In your view, what is the first concrete quantum advantage case in HEP? What is the timeline and what are the roadblocks?