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# Novel lattice simulations for transport coefficients in quenched QCD

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Transport coefficients, such as the temperature-dependent shear and bulk viscosities, are essential QCD ingredients in the hydrodynamical description of relativistic heavy-ion collisions. While the equation of state by now is known with high precision from lattice simulations, the extraction of the transport coefficients from Euclidean simulations is extremely challenging. In particular, the corresponding Kubo formula requires the evaluation of a spectral function at vanishing momentum, and hence a reliable spectral reconstruction from Euclidean data at low frequencies. In standard lattice simulation at finite temperature this reconstruction is based on the discrete Matsubara frequencies, and is -in practice- exponentially hard: the thermal part of the low frequency information is hidden in the thermal decay of the Euclidean data at large frequencies.

In order to overcome this limitation, we apply the novel approach for thermal fields on the lattice [1] to gauge fields [2]. The formalism operates in a non-compact imaginary time domain that leads to continuous imaginary time frequencies. The quantum evolution is formulated as an initial value problem and the thermal initial conditions are supplied by a standard lattice simulation.

We present results for the energy momentum tensor in SU(2) Yang-Mills theory and SU(3) quenched QCD, which show excellent convergence to the standard results at finite Matsubara frequencies. From the correlation functions, we extract the relevant spectral functions using the Bayesian BR method [3] and determine the shear and bulk viscosity over entropy ratios. The imaginary time data in the present novel approach are precise enough to allow for a conclusive discussion of transport peaks in the spectral functions. Results are presented for the confined and deconfined phase.

[1] J.M. Pawlowski, A. Rothkopf, arXiv:1610.09531
[2] J.M. Pawlowski, A. Rothkopf and F. Ziegler (in progress)
[3] Y.Burnier, A.Rothkopf, PRL 111, 182003 (2013)

## Content type

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## Collaboration

## Centralised submission by Collaboration

Presenter name already specified

**Primary author:** ZIEGLER, Felix (Heidelberg University)

**Co-authors:** PAWLOWSKI, Jan M. (University of Heidelberg); ROTHKOPF, Alexander (Heidelberg University)

**Presenter:** ZIEGLER, Felix (Heidelberg University)

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