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Taking the ratio between shear viscosity and electric conductivity of QGP

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The transport coefficients of strongly interacting matter are currently subject of intense studies due to their relevance for the characterization of the Quark-Gluon Plasma produced in ultra-relativistic heavy-ion collisions.
One of the main results of heavy ions collision at relativistic energy experiments is the very small shear viscosity to entropy density ratio of the Quark-Gluon Plasma, close to the conjectured lower bound eta/s=1/4\pi for systems in the infinite coupling limit. Another key transport coefficient, but less studied than shear viscosity, is the electric conductivity that represents the response of a system to an applied external electric field.
In heavy Ion Collisions very high electromagnetic fields are expected to be generated with a decay time depending on the value of the electric conductivity and their impact on pressure isotropization depending on the \eta/s of the plasma.

We discuss the connection between shear viscosity and electric conductivity and explain why the ratio $(\eta/s)/(\sigma_{el}/T)$ supplies a measure of the quark to gluon scattering rates whose knowledge would allow to significantly advance in the understanding of the QGP phase.
We also predict that the ratio should increase near the critical temperature contrary to the flat behaviour predicted by a conformal theory.
We show that $(\eta/s)/(\sigma_{el}/T)$, independently on the running coupling $\alpha_s(T)$,
should increase up to about $\sim$ 20 for $T \to T_c$, while it goes down to a nearly flat behavior around $\simeq$ 4 for $T \geq 4\,T_c$.
Therefore we in general predict a stronger T dependence of σ_{el}/T with respect to η/s as $T \to T_c$.

[1] A. Puglisi, S. Plumari and V. Greco, arXiv:1407.2559

[2] A. Puglisi, S. Plumari and V. Greco, Phys.Rev. D90 (2014) 11, 114009

[3] S. Plumari, A. Puglisi, F. Scardina and V. Greco, Phys.Rev. C86 (2012) 054902

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