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# Numeric exploration of Non-trivial emergent phenomena in Quark-Gluon Plasma

With the ultimate goal of analysing probe quarks in a Quark-Gluon Plasma via the AdS/CFT correspondance, we explore here the motion of fundamental strings in a curved target spacetime. Specifically, our goal will
be a target space of AdS5 –Schwarzschild, which under the correspondance is dual to a conformal field theory approximating Quantum Chromodynamics. We will model both the case of a heavy, on-mass-shell quark, corresponding to a string with endpoints fixed at the horizon of a black hole and at the boundary of AdS spacetime, as well as a light, off-mass-shell quark, which corresponds to a string with one endpoint fixed on the horizon and the other free to fall. In either case, modes on the string are excited by the black hole, giving rise to motion of the endpoints of the string, dual to the Brownian motion of the probe quarks in the boundary theory.
We will begin with the analytic results for the equations of motion of these strings under the relavent boundary conditions, where available in the cases of flat and AdS3 –Schwarzschild target spacetimes, and make
use of tools built into Wolfram Mathematica to numerically solve the same equations of motion in the remaining case. This will allow comparison between the numeric and analytic cases, allowing us to verify the results of the numeric simulations. Once agreement has been established, we will extend this to the cases for which there are no analytic solutions, and interpret the results thereof. Finally, we will then be able to extract observables relevant to the behaviour of the probe quarks from these solutions.

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MSc

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