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Finite-⊠ corrections to Wilson line correlators

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In high-energy heavy-ion collisions, a quark-gluon plasma is produced. One way to study this exotic type of matter is to analyze the effect it has on high-energy partons traversing it. This leads to a rich phenomenology that commonly is referred to as jet quenching. High-energy partons propagating in the hot and dense medium mainly experience transverse momentum broadening which leads to additional radiative energy loss. The theoretical description of the main mechanisms behind these phenomena has been well known for some time. One effect the medium has on partons propagating through it, is that their color continuously rotates, an effect that is encapsulated in a Wilson line along their trajectory. When calculating observables, one typically has to deal with traces of two or more medium-averaged Wilson lines. These are usually dealt with in the literature by invoking the large- limit, but exact calculations have been lacking in many cases. In our work [1], we show how correlators of multiple Wilson lines appear, and develop a method to calculate them to all orders in . Specifically, we will focus on the trace of four Wilson lines, which we develop a differential equation for. We will then generalize this calculation to a product of an arbitrary number of Wilson lines, and show how to do the exact calculation numerically, and even analytically in the large- limit.
Even though these results are derived in the context of high- jet processes, they are quite general and can be used in other situations where Wilson line correlators appear.

[1] J. H. Isaksen and K. Tywoniuk, "Wilson line correlators beyond the large-Nc,"7 2021 https://arxiv.org/abs/2107.02542

Primary authors: ISAKSEN, Johannes Hamre (University of Bergen); Prof. TYWONIUK, Konrad (University of Bergen)

Presenter: ISAKSEN, Johannes Hamre (University of Bergen)

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