



# Implementation of Q-Pythia v8

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# Objective


- Modify the final state parton shower in the C++ simulator PYTHIAv8

# Motivation

- Technical motivation
- Get insight on the differences in FSR introduced by the use of different ordering variables for the shower.

# Things to do

- Modification of the DGLAP splitting functions
- Consideration of energy degradation of the parton, and its position inside the medium to compute the medium characteristics that the radiating parton sees.

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- The modification is due to the fact that heavy ion collision in final state radiation FRS takes place inside the extended colored medium which affects the parton branching.
  - These may considered the origin of the medium induced energy loss which was observed at RHIC

- The medium effects are introduced as an additive contribution to the standard vacuum splitting functions.
- $g \rightarrow gg, q(q^-) \rightarrow gq(q^-)$

$$P_{\text{tot}}(z) = P_{\text{vac}}(z) \longrightarrow P_{\text{tot}}(z) = P_{\text{vac}}(z) + \Delta P(z, \mathbf{k}_T^2, \hat{q}, L, E).$$

$$t \simeq \mathbf{k}_T^2 / [z(1-z)] \quad \omega_c = \hat{q} L^2 / 2.$$

- The medium modify splitting function are computed through their relation to the single-gluon radiative spectrum obtained in formalism for medium induced gluon radiation.


$$\Delta P(z, t, \hat{q}, L, E) \simeq \frac{2\pi t}{\alpha_s} \frac{dI^{\text{med}}}{dzdt}.$$



# Energy degradation and computation of the parton position

- Include the  $kT^2$  dependence.
- Implement energy degradation varies during the shower evolution, and the modification of the medium parameters along the cascade



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- The space time picture of the shower used in the previous works will be used

# Conclusion

- The benefits of this work reside in the introduction in the event generator of medium effects required for the analysis and interpretation of jets measurements in heavy-ion collisions that are under development at RHIC, and will be one of the topics in the heavy-ion program at the LHC.

# References

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