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Photon production from the Color Glass Condensate in the pA collisions

Tuesday, 29 September 2015 16:30 (2 hours)

I will talk about our calculation of the photon spectrum in the pA collision using the Color Glass Condensate framework. We used a systematic expansion in terms of the proton source ρ_p and succeeded in obtaining a full analytical formula for the photon
emission from virtual quarks that scatter multiply with dense
gluonic fields:
\begin{equation}
\eqalign
{
\frac{dN}{d^2 p_{\perp}dy} &= \frac{g^2 Q^2}{16\pi^2}\left[\prod_{i=1}^6\int \frac{d^2 q_{i\perp}}{(2\pi)^2}\right]\big\langle {\rm tr}{c}[U({\bf p}\perp + {\bf q}{1\perp}-{\bf q}{2\perp})\rho_p(-{\bf q}{1\perp}-{\bf q}{2\perp})U^\dagger(-{\bf q}{2\perp} - {\bf q}{3\perp})]\\
&\times{\rm tr}{c}[U(-{\bf q}{5\perp} - {\bf q}{6\perp})\rho^\dagger_p(-{\bf q}{4\perp}-{\bf q}{5\perp})U^\dagger({\bf p}{\perp} + {\bf q}{4\perp})] \big\rangle \mathcal{T}(\{{\bf q}{i\perp}\},{\bf p}{\perp},y)~,
}
\end{equation}
where $\mathcal{T}(\{\mathbf{q}_{i\perp}\},\mathbf{p}_\perp,y)$ is an explicitly calculated function.
The expectation value over the Wilson line product is calculated in the McLerran-Venugopalan model through which the photon spectrum is characterized by the saturation scale.
The production of photons from virtual quarks considered here is of order $\mathcal{O}(\rho_p)$, while the bremsstrahlung process
$q \to q\gamma X$ seems to be the leading contribution parametrically. However, the bremsstrahlung process should involve also the real quark distribution function in the initial state that brings in theoretical uncertainties, but our formula is free from such external input and closed within the McLerran-Venugopalan model. I will also discuss some of the kinematical properties
and where the virtual quark contribution that we calculated would
become relevant to experiments.

On behalf of collaboration:

NONE

Primary authors: Prof. FUKUSHIMA, Kenji (Tokyo University); Dr BENIC, Sanjin (Tokyo University)

Presenter: Dr BENIC, Sanjin (Tokyo University)

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