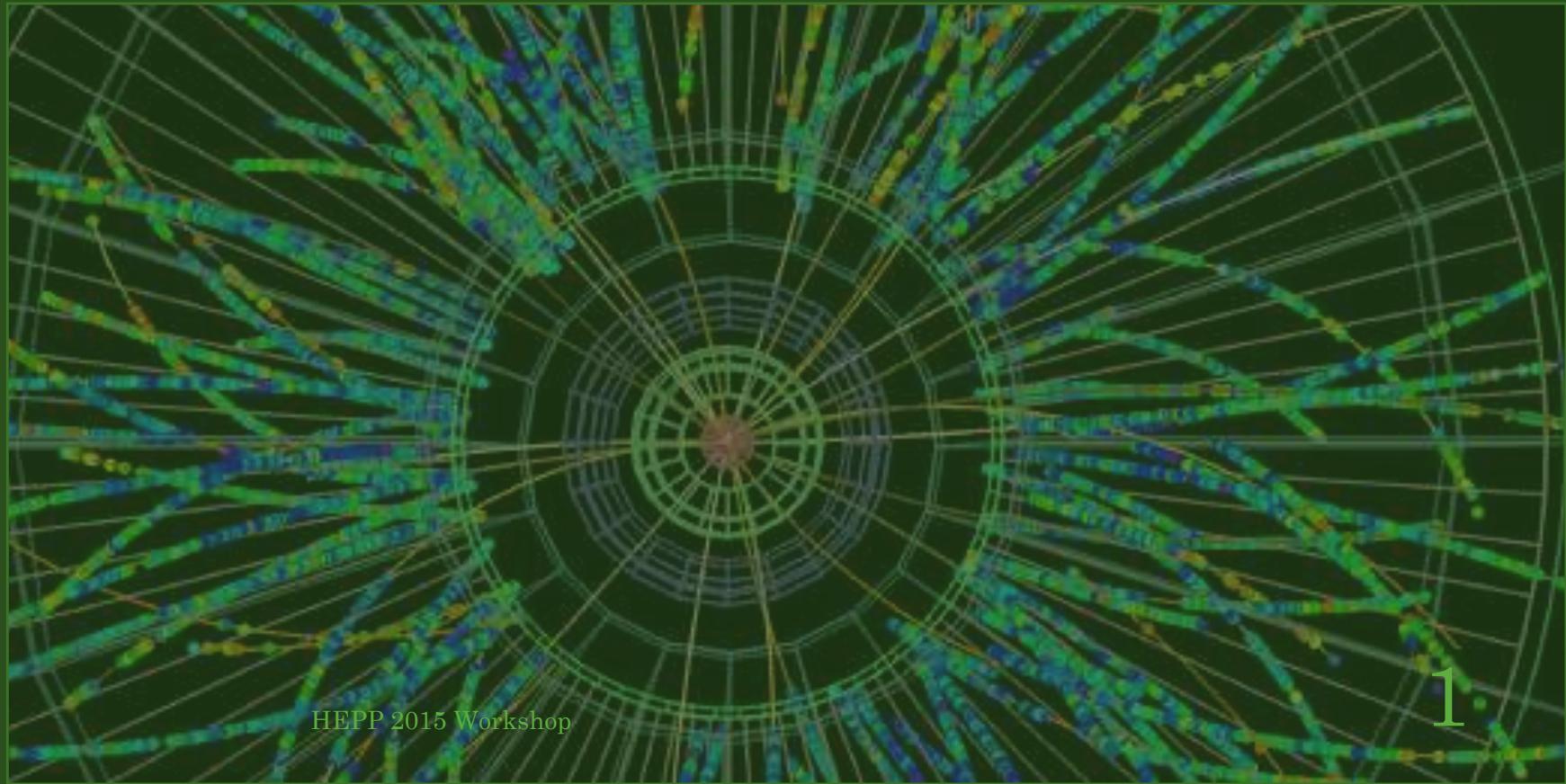


Isobel Kolb   
University of Cape Town

2015-02-11

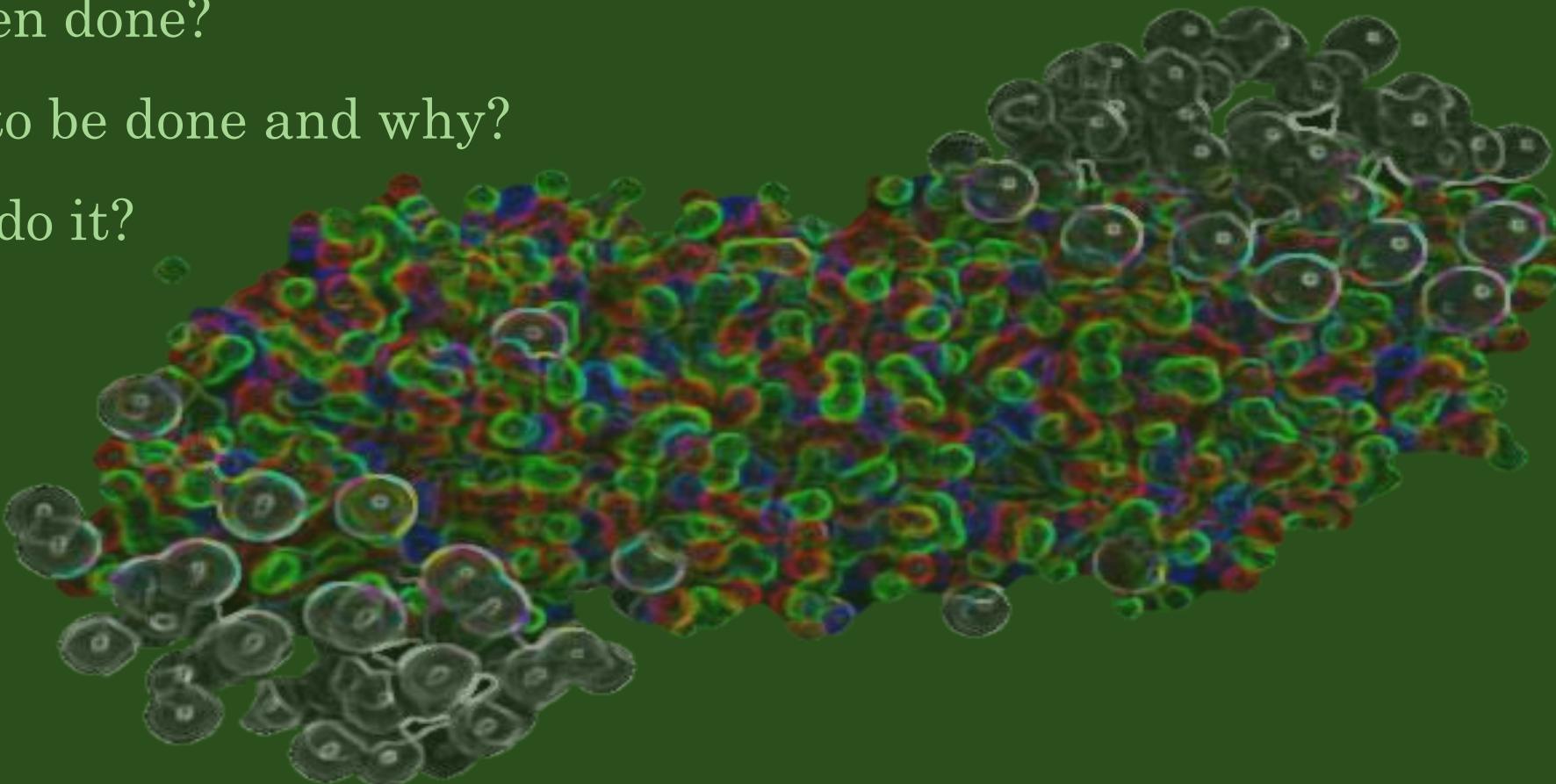
# Short Path Length Energy Loss in the QGP from pQCD



HEPP 2015 Workshop

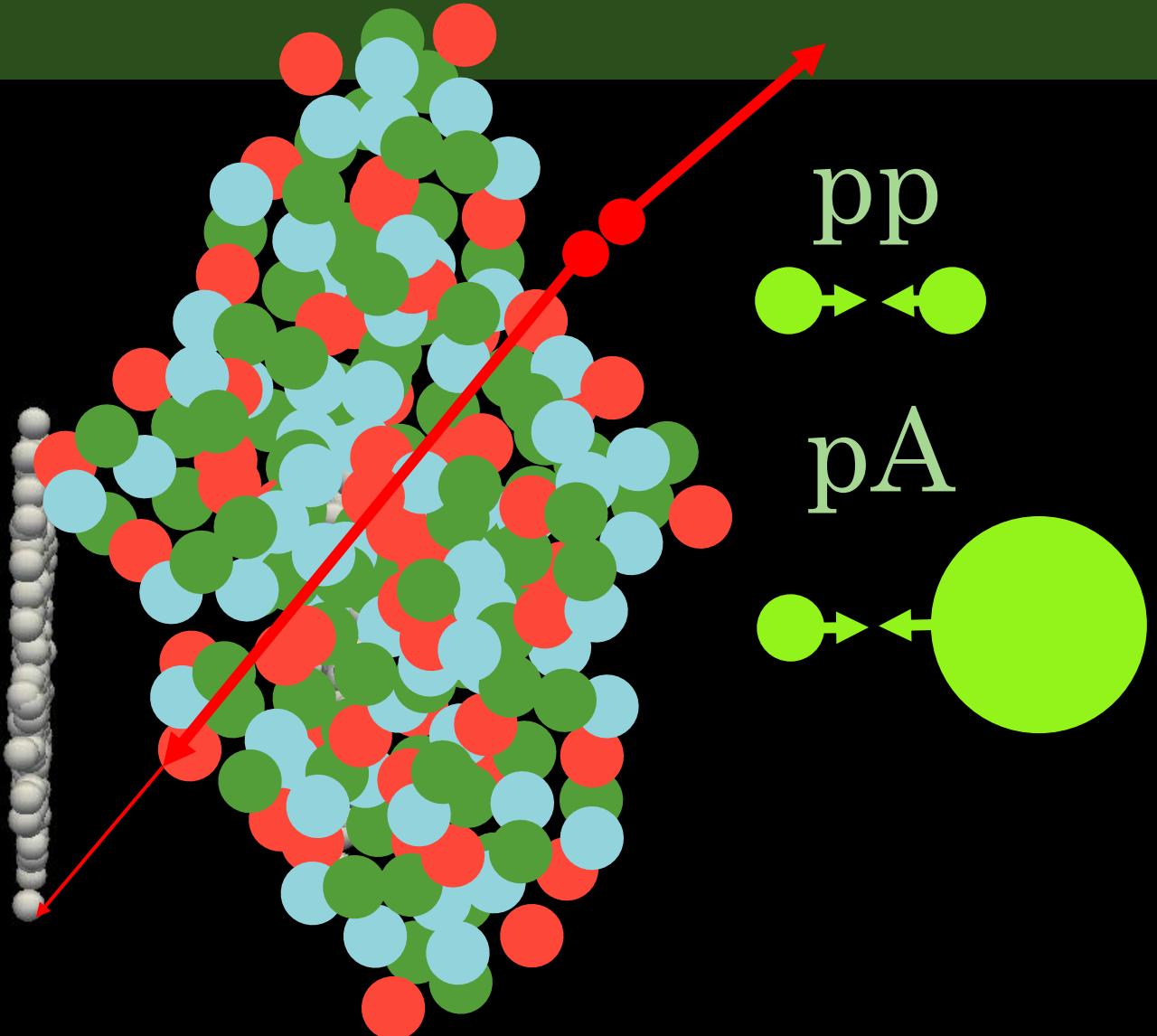
# Outline

- Why Heavy Ions
- What has been done?
- What needs to be done and why?
- How will we do it?

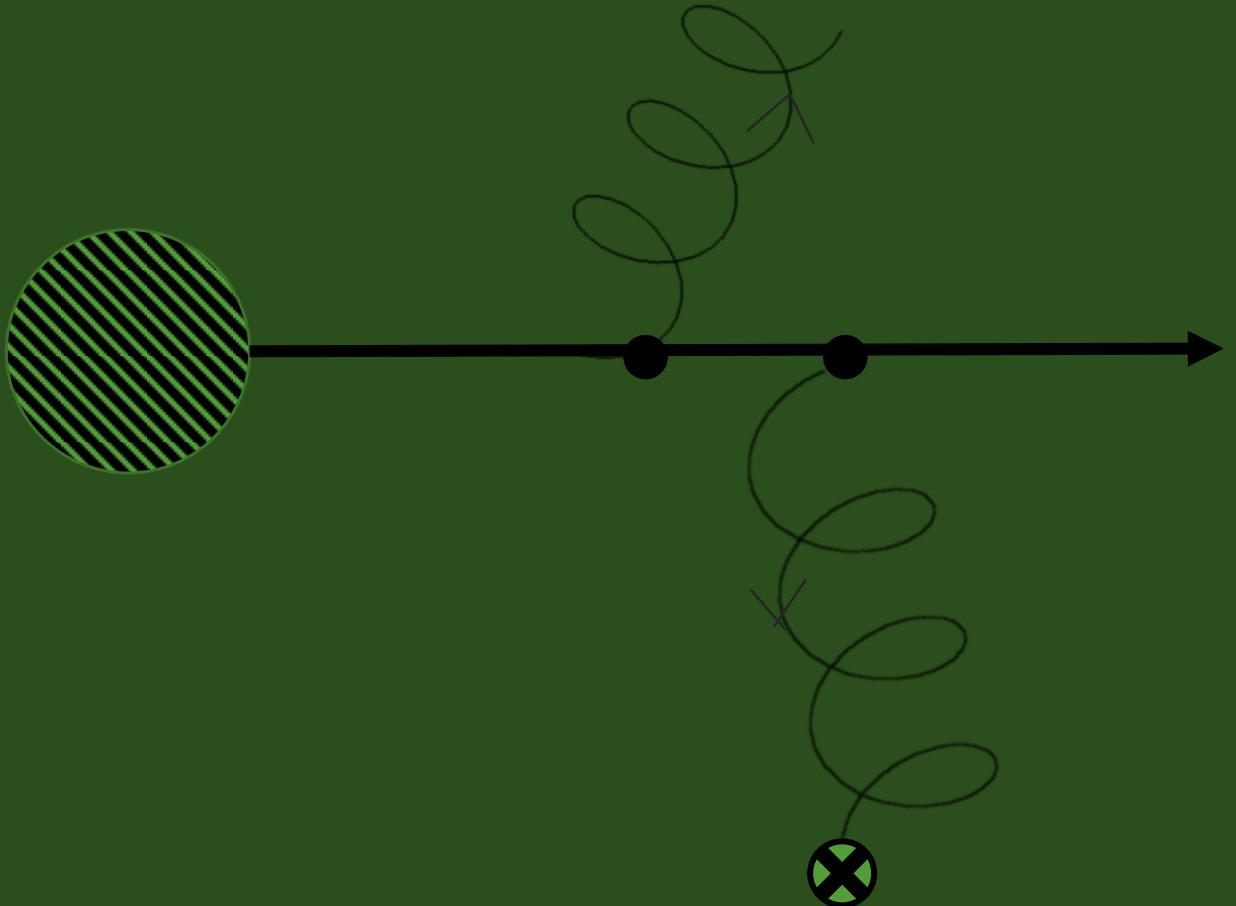


*X*  
*Y*  
*Z*

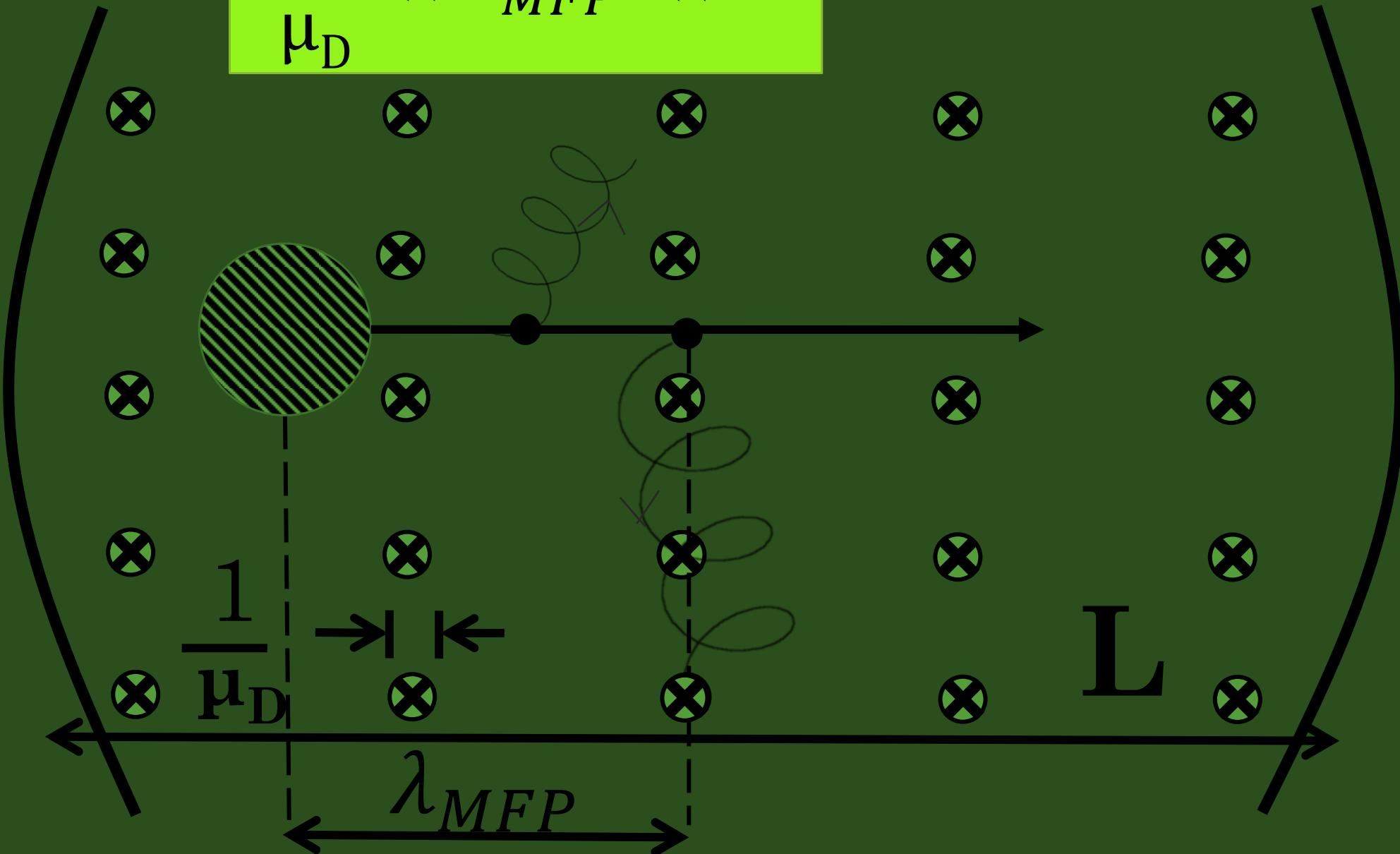
MADAi.us



# The current state of affairs



$$\frac{1}{\mu_D} \ll \lambda_{MFP} \ll L$$



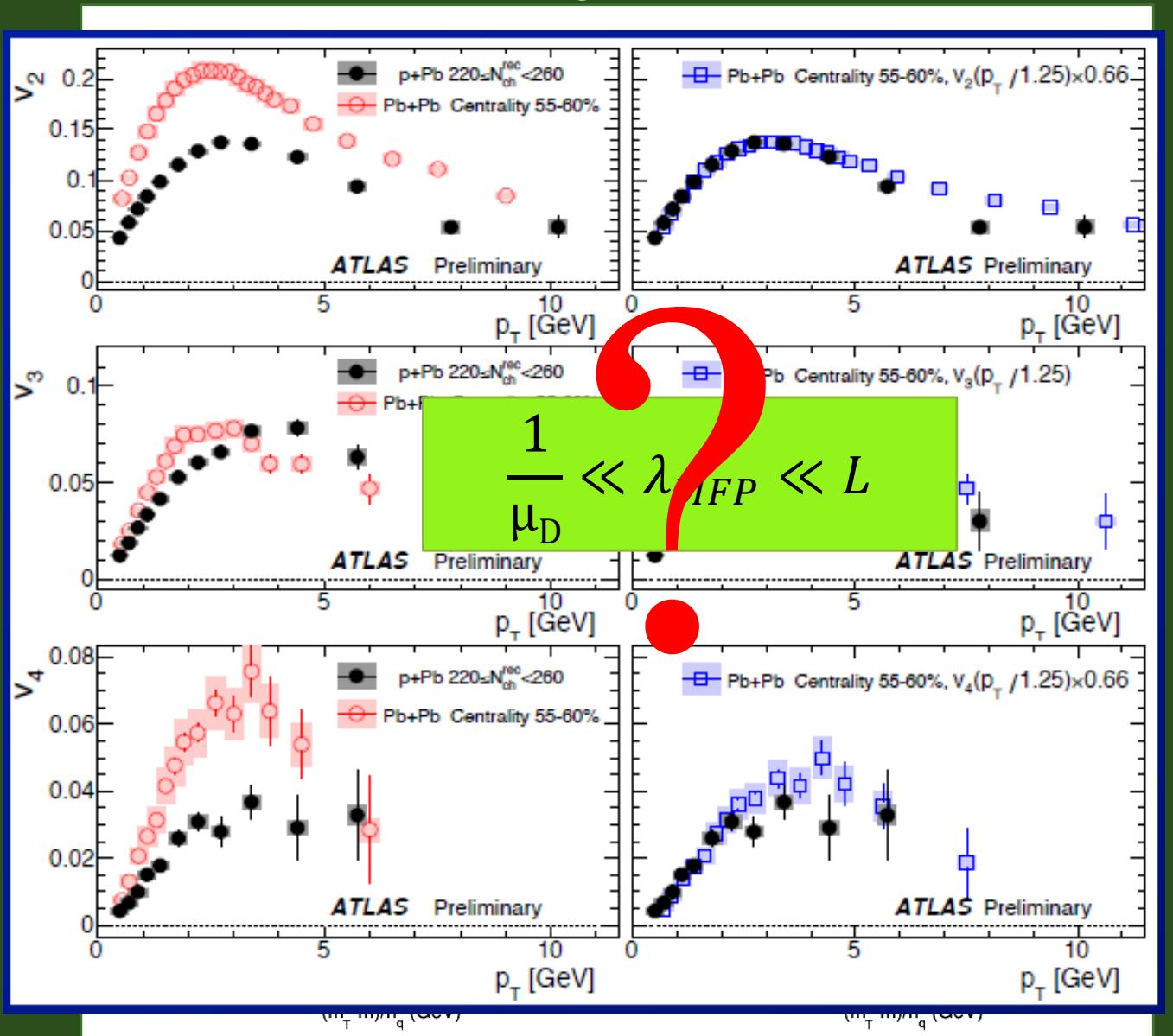
Observed  
Expected

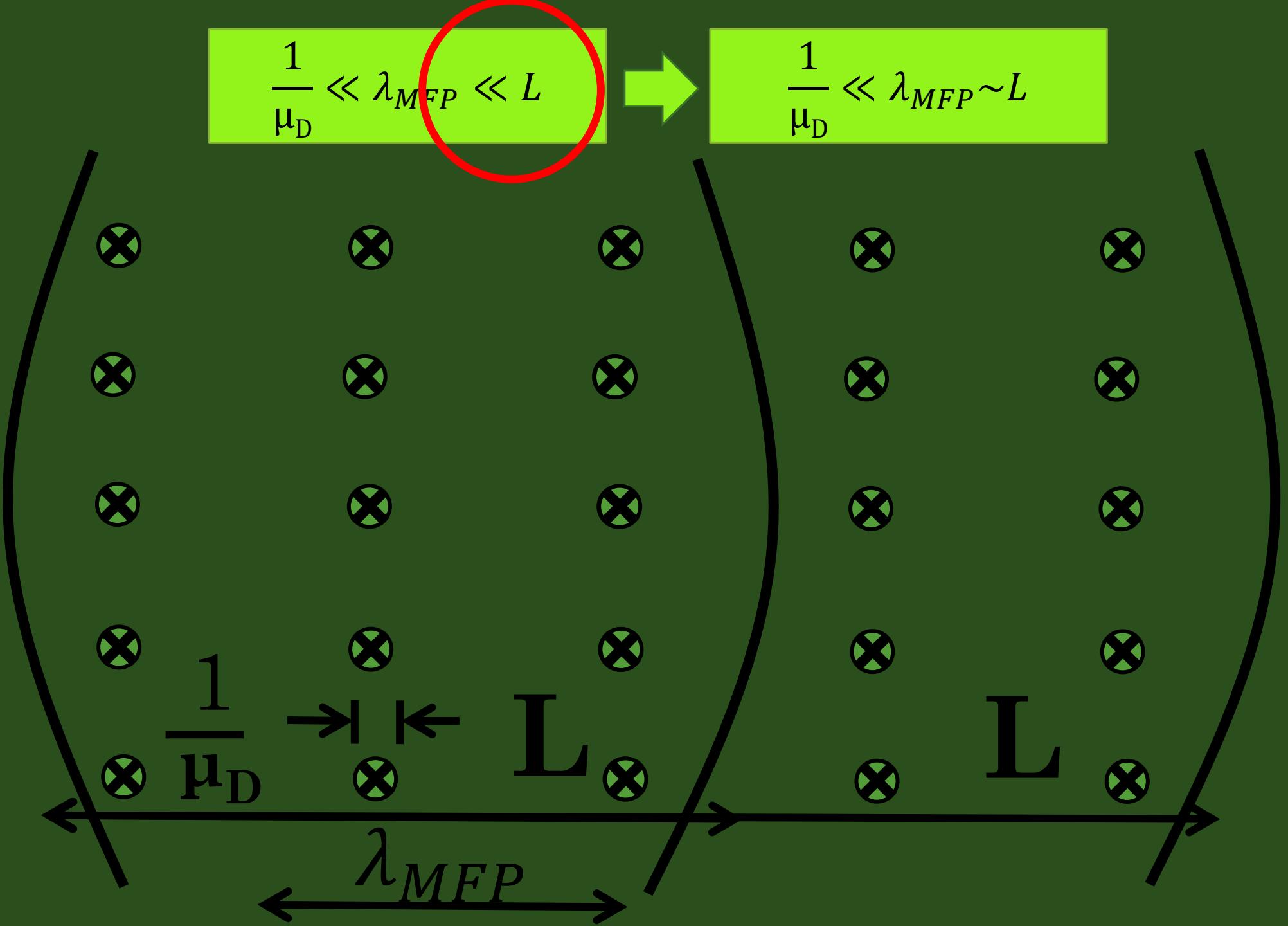


[memegenerator.net](http://memegenerator.net)

# What needs to be done and why?

- Recent evidence for QGP in p-A
- But the system is small – original assumptions don't hold
- Relax length scale.





# How will we do it?

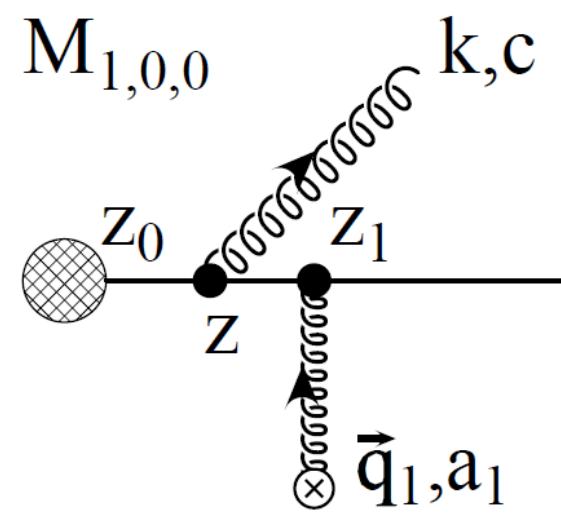
## REACTION OPERATOR APPROACH TO NON-ABELIAN ENERGY LOSS

### Heavy Quark Radiative Energy Loss in QCD Matter

Magdalena Djordjevic and Miklos Gyulassy

#### From Quark-Gluon Plasmas I: Formalism

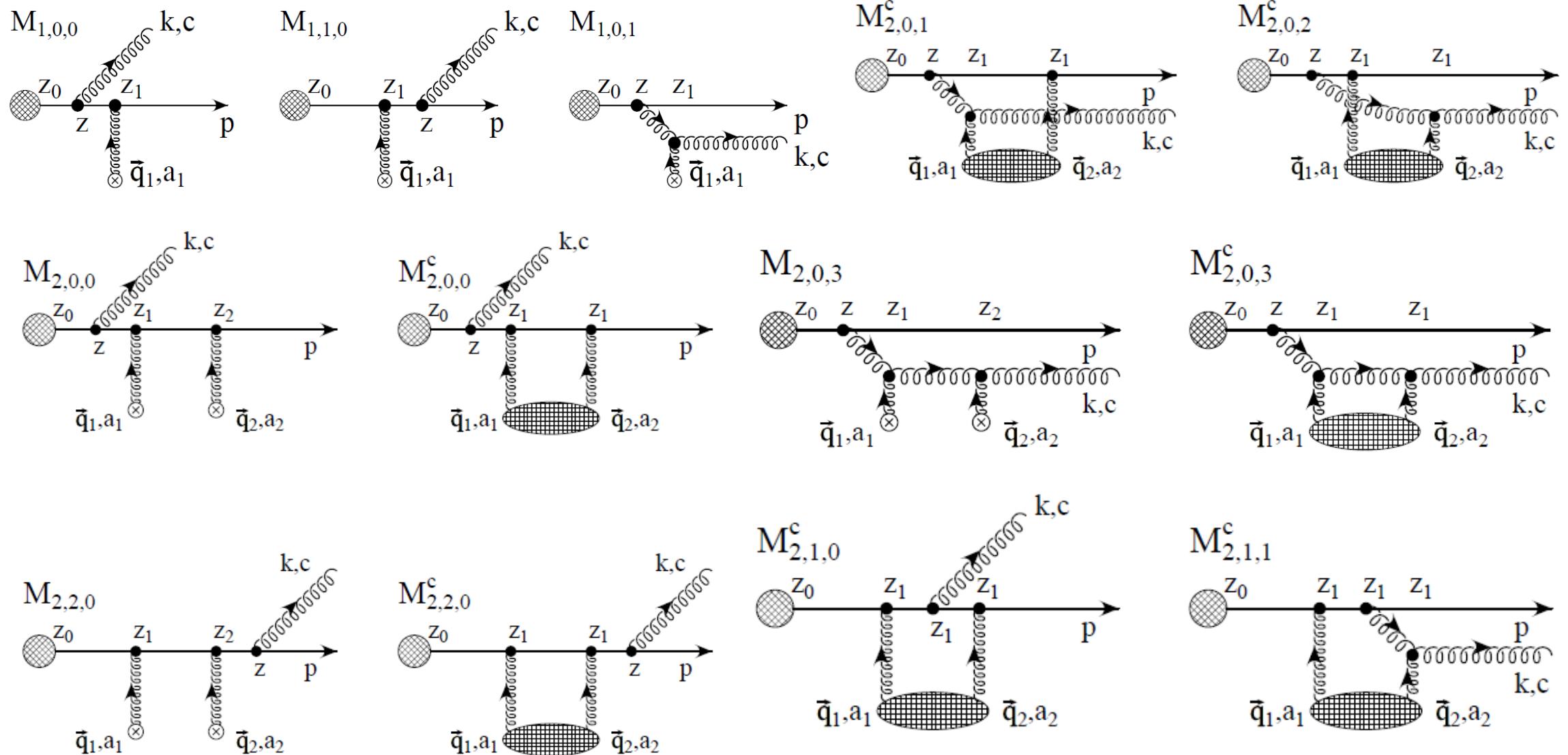
M. Gyulassy<sup>a</sup>, P. Lévai<sup>a,b</sup>, I. Vitev<sup>a</sup>



$$\begin{aligned}
 M_{1,0,0} &= \int \frac{d^4 q_1}{(2\pi)^4} i J(p + k - q_1) e^{i(p+k-q_1)x_0} (ig_s)\epsilon_\alpha (2p - 2q_1 + k)^\alpha \times \\
 &\quad \times i\Delta_M(p - q_1 + k) i\Delta_M(p - q_1) (2p - q_1)^0 V(q_1) e^{iq_1 x_1} T_{a_1} a_1 c \\
 &\approx J(p + k) e^{i(p+k)x_0} (-ig_s a_1 c T_{a_1}) 2E \int \frac{d^2 \mathbf{q}_1}{(2\pi)^2} e^{-i\mathbf{q}_1 \mathbf{b}_1} I_2,
 \end{aligned}$$

$$I_2(p, k, \mathbf{q}_1, z_1 - z_0) = \int \frac{dq_{z1}}{2\pi} \frac{\epsilon_\alpha (2p - 2q_1 + k)^\alpha}{(p - q_1 + k)^2 - M^2 + i\epsilon} \frac{1}{(p - q_1)^2 - M^2 + i\epsilon} v(\vec{q}_1) e^{-iq_{1z}(z_1 - z_0)}.$$





# So, off to work!