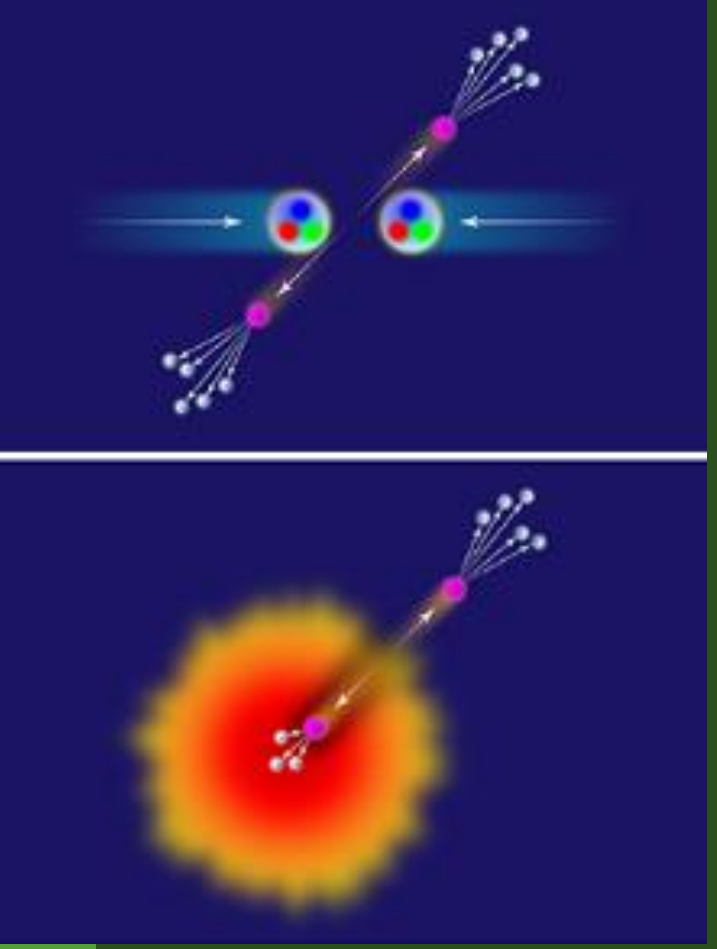
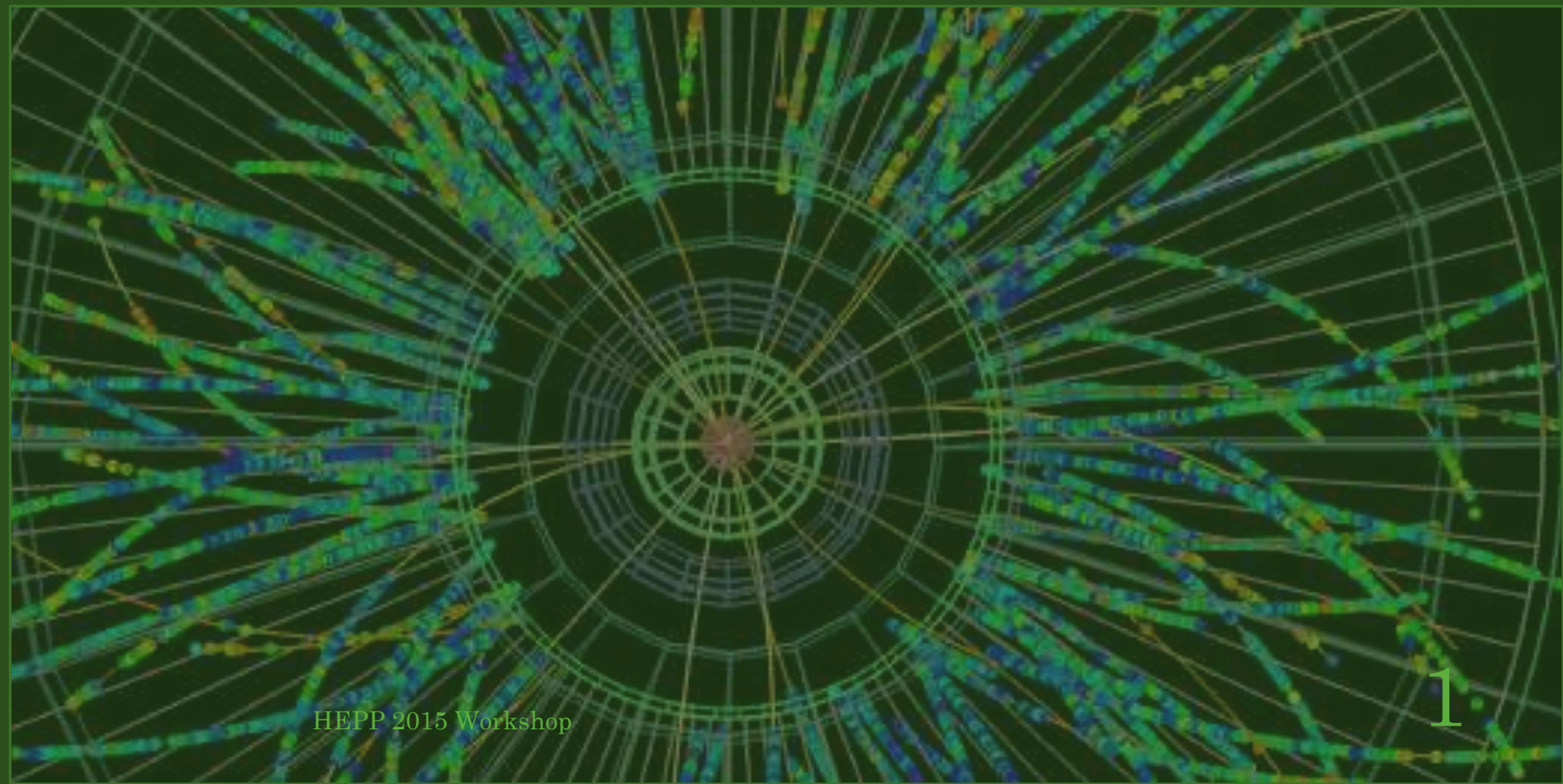


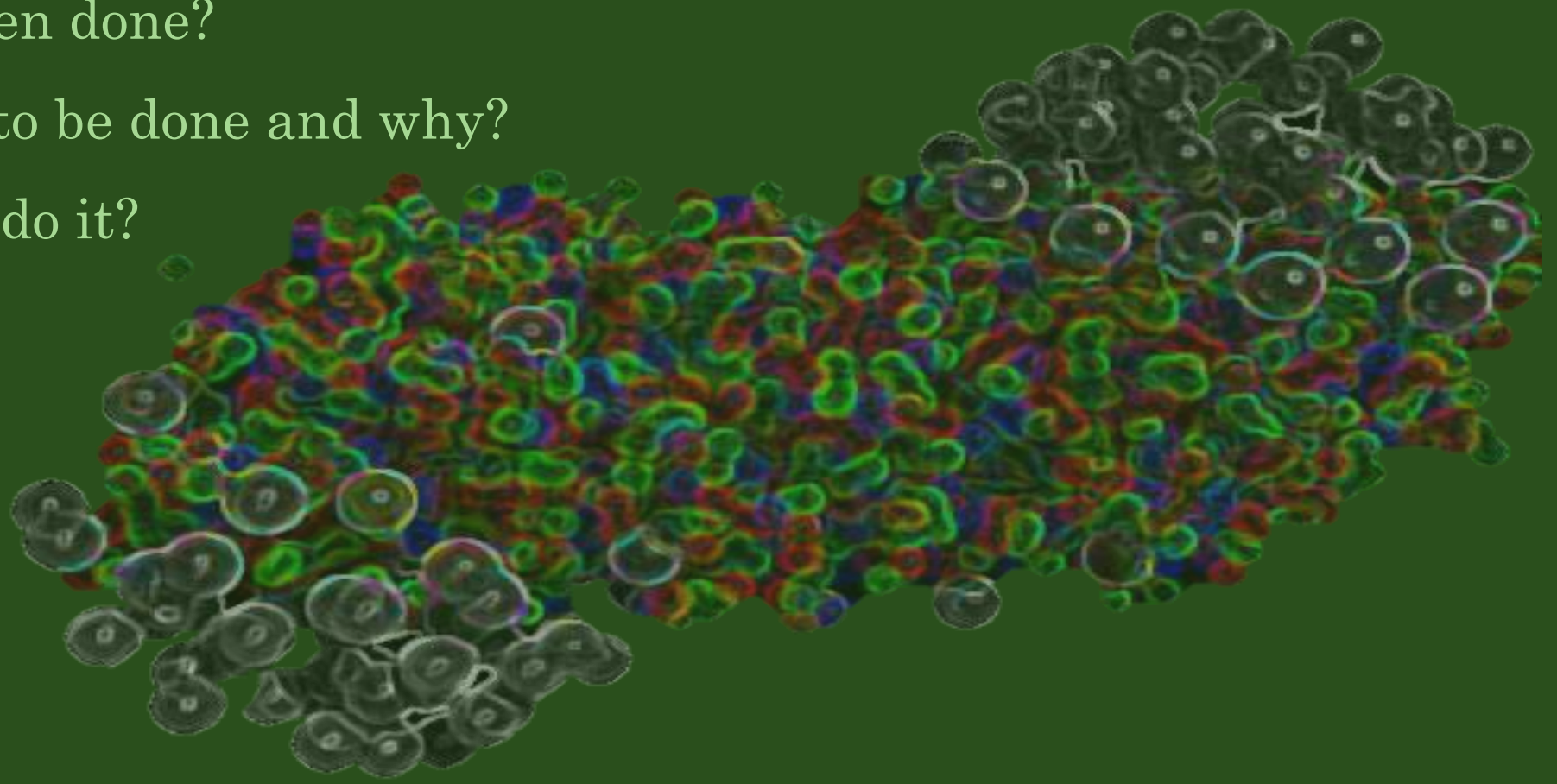
Short Path Length Energy Loss in the QGP from pQCD

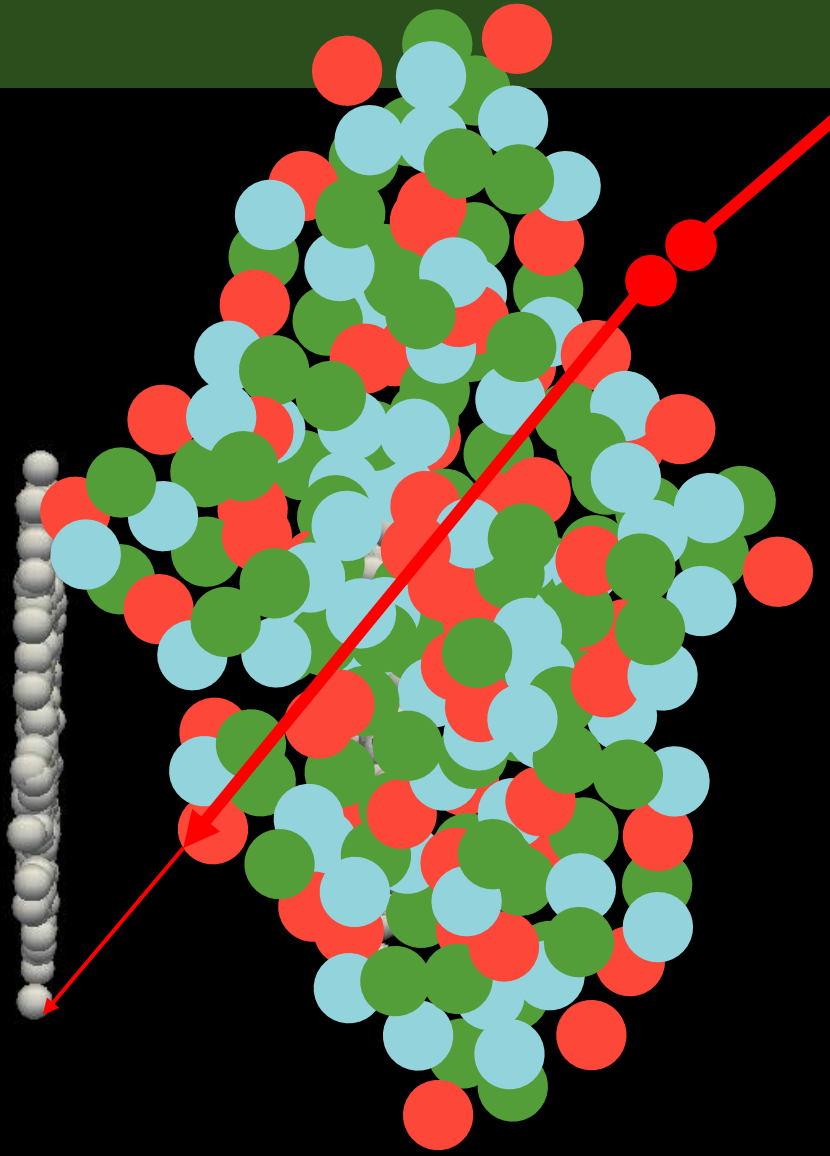
Isobel Kolbé
University of Cape Town



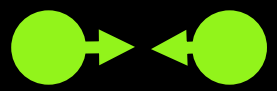
Outline

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

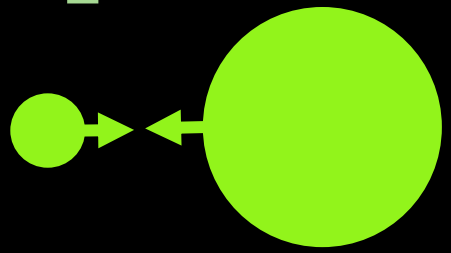




pp

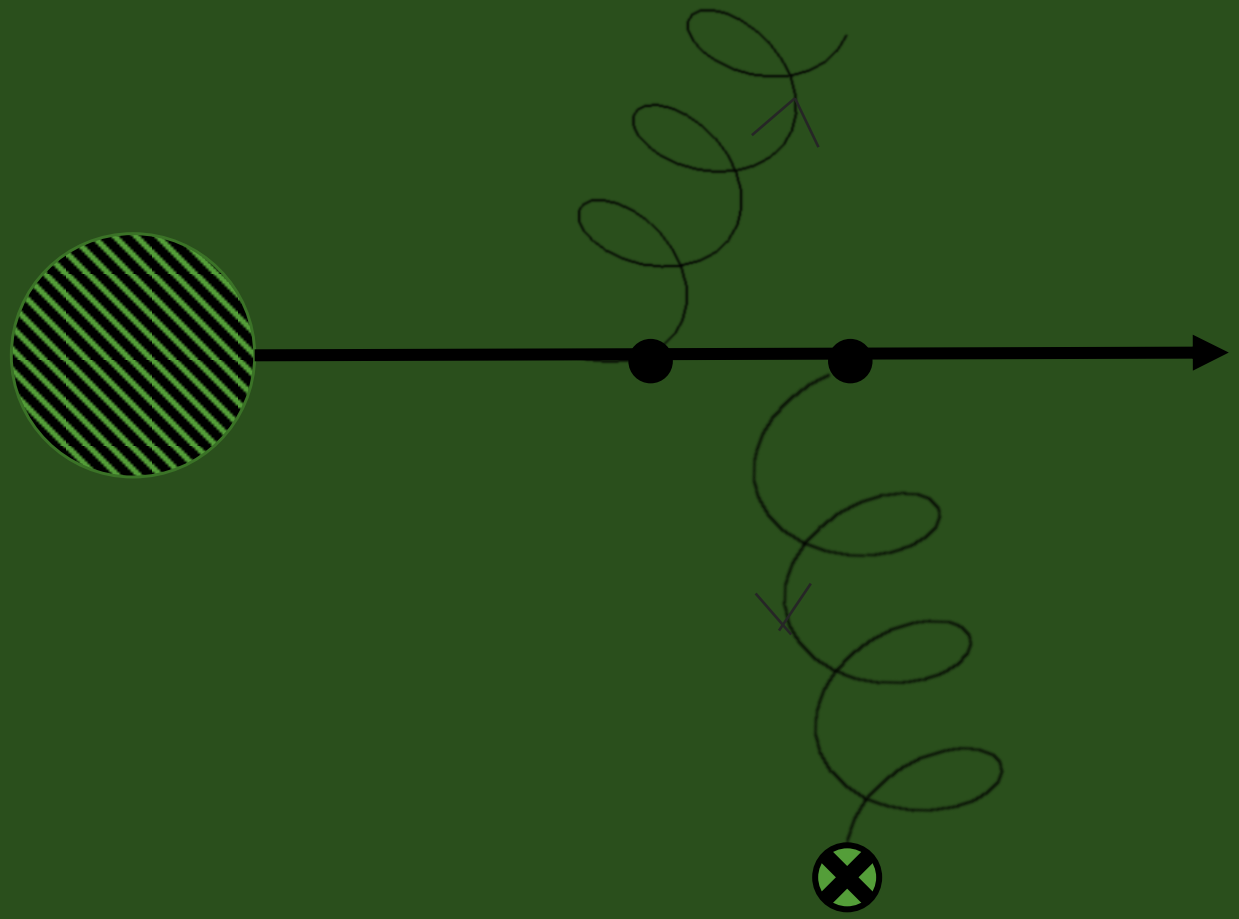


pA

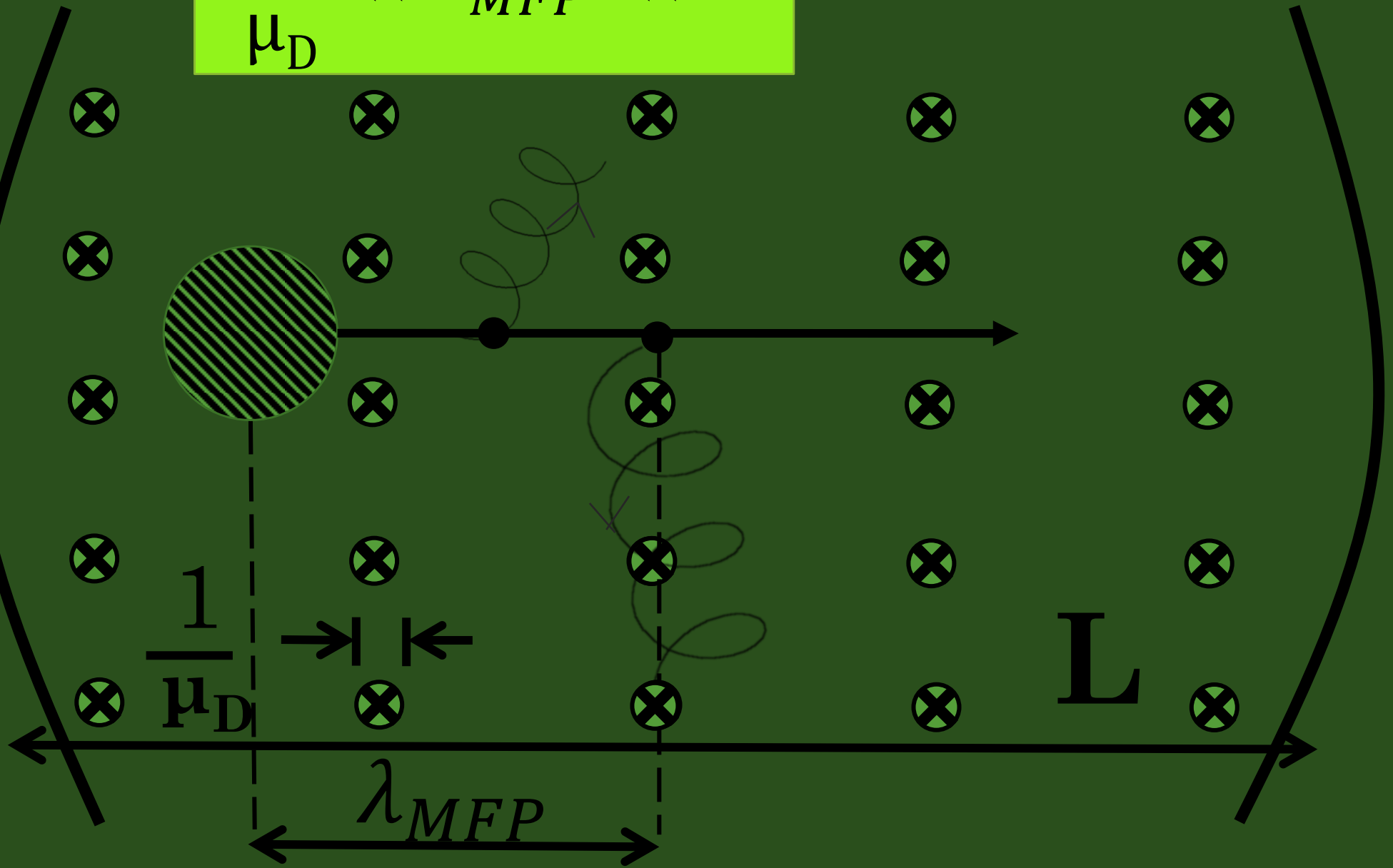


MADAI.us

The current state of affairs



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

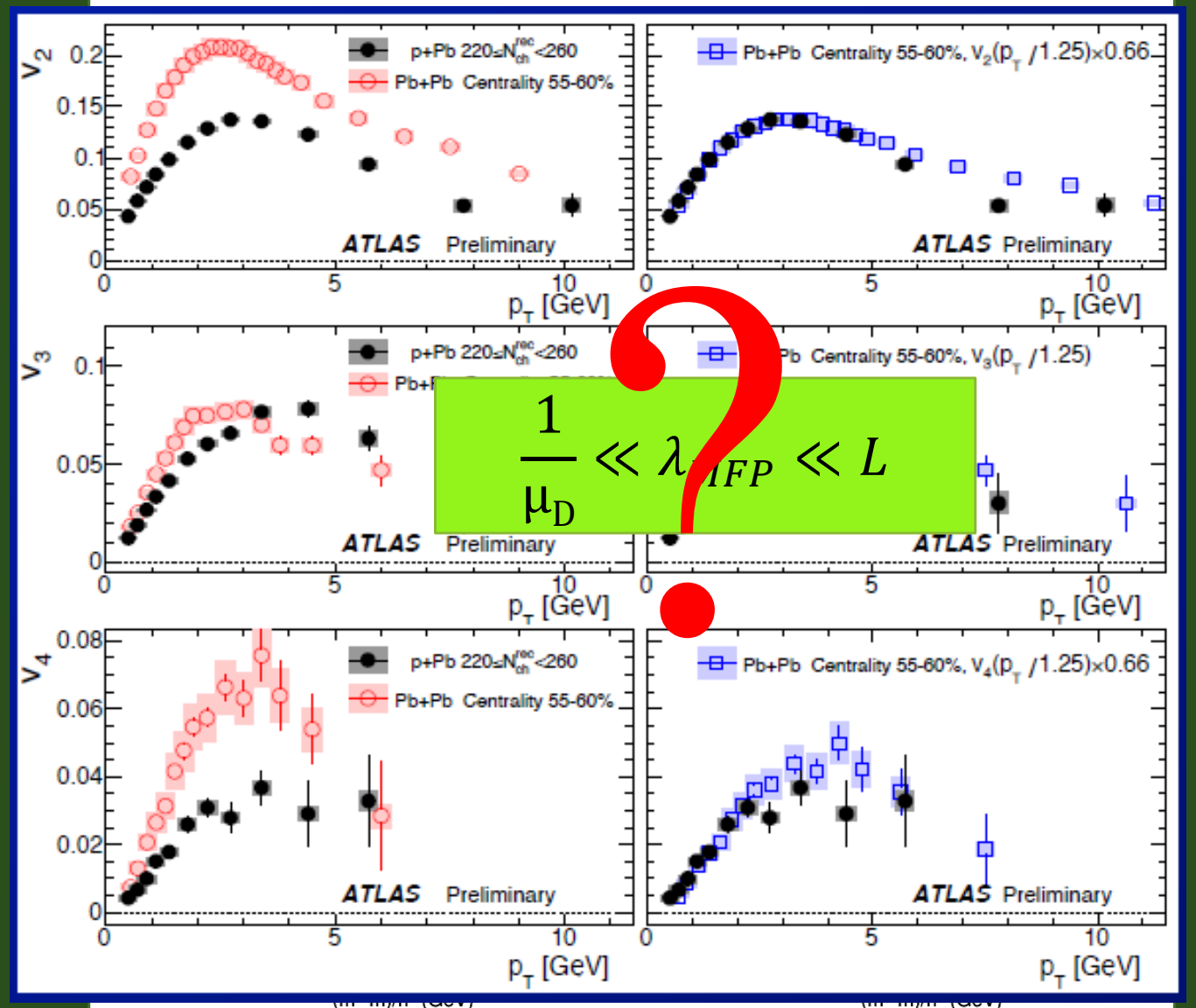


Observed

Expected

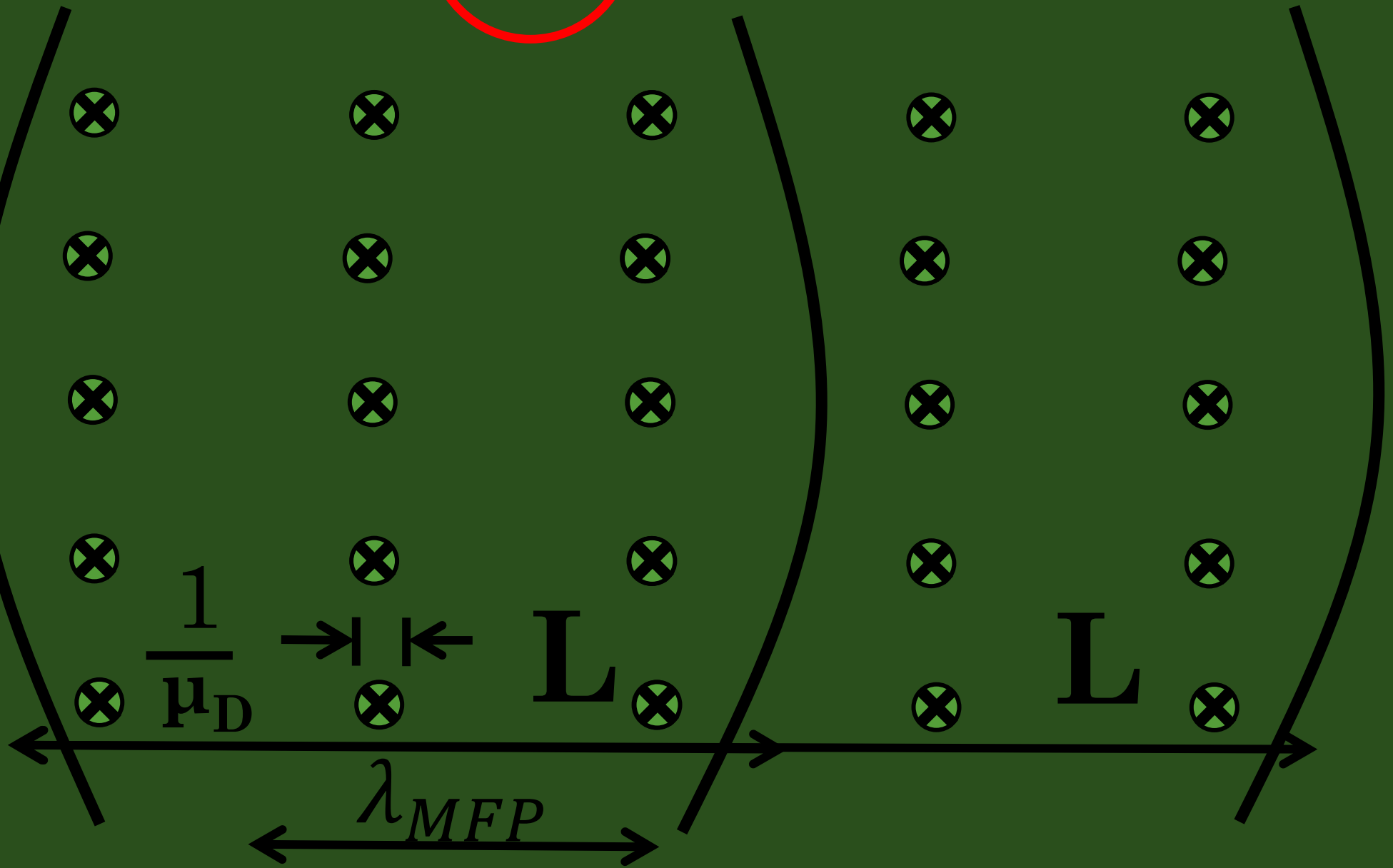
What needs to be done and why?

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

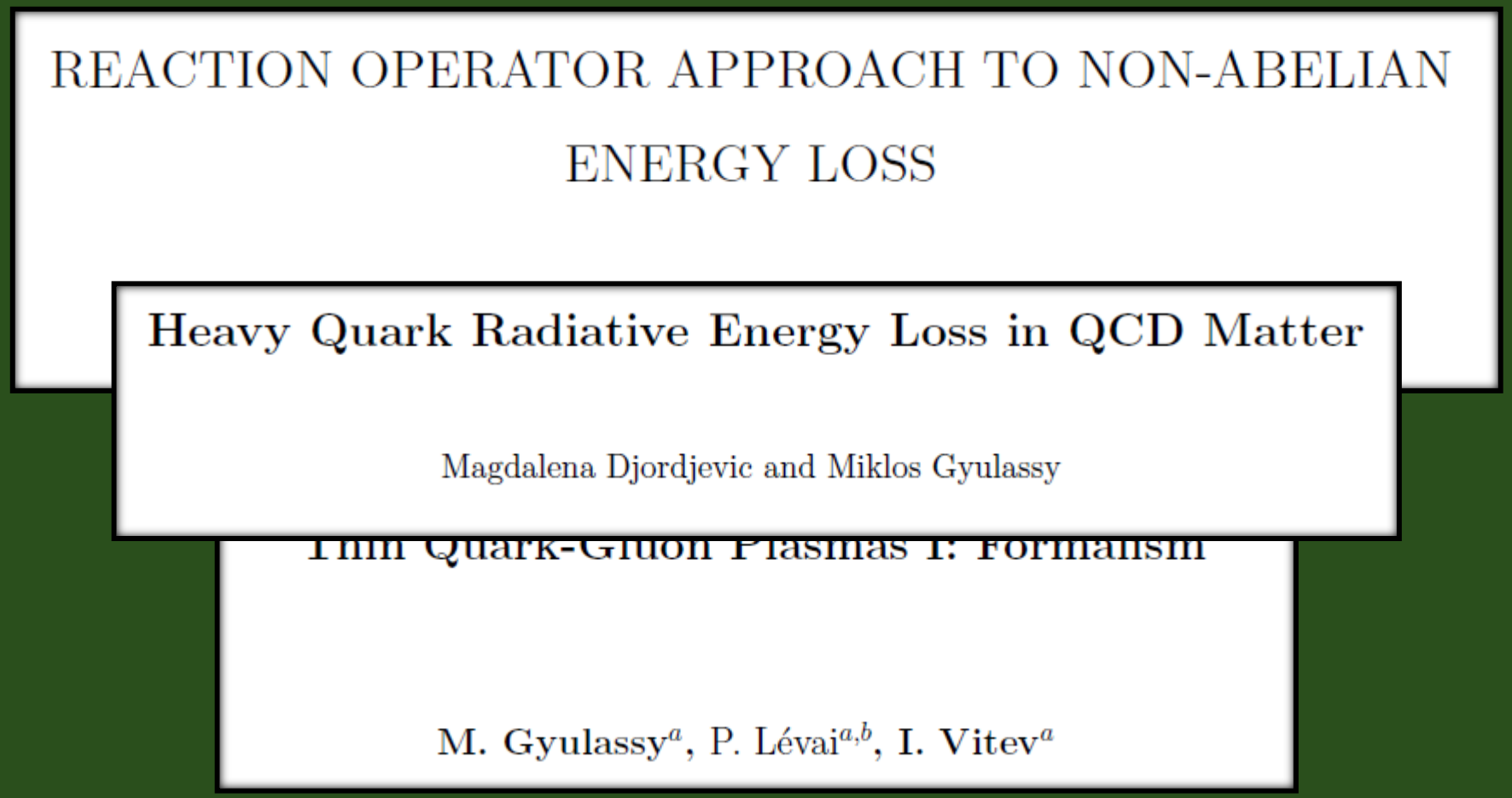


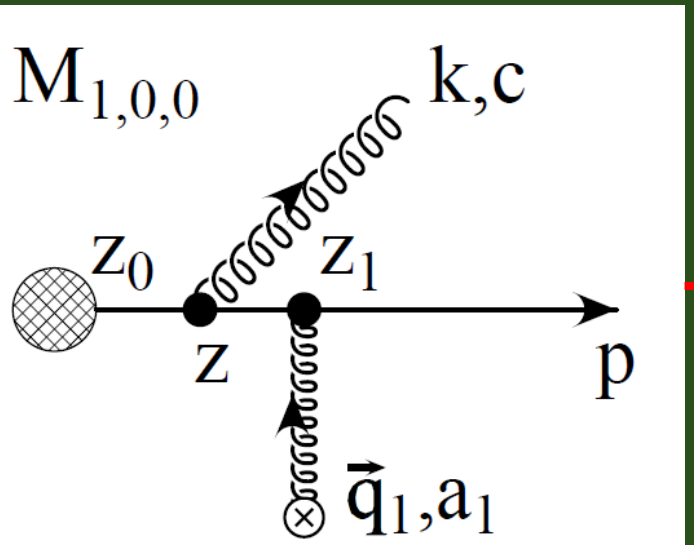
$$\frac{1}{\mu_D} \ll \lambda_{MFP} \ll L$$

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



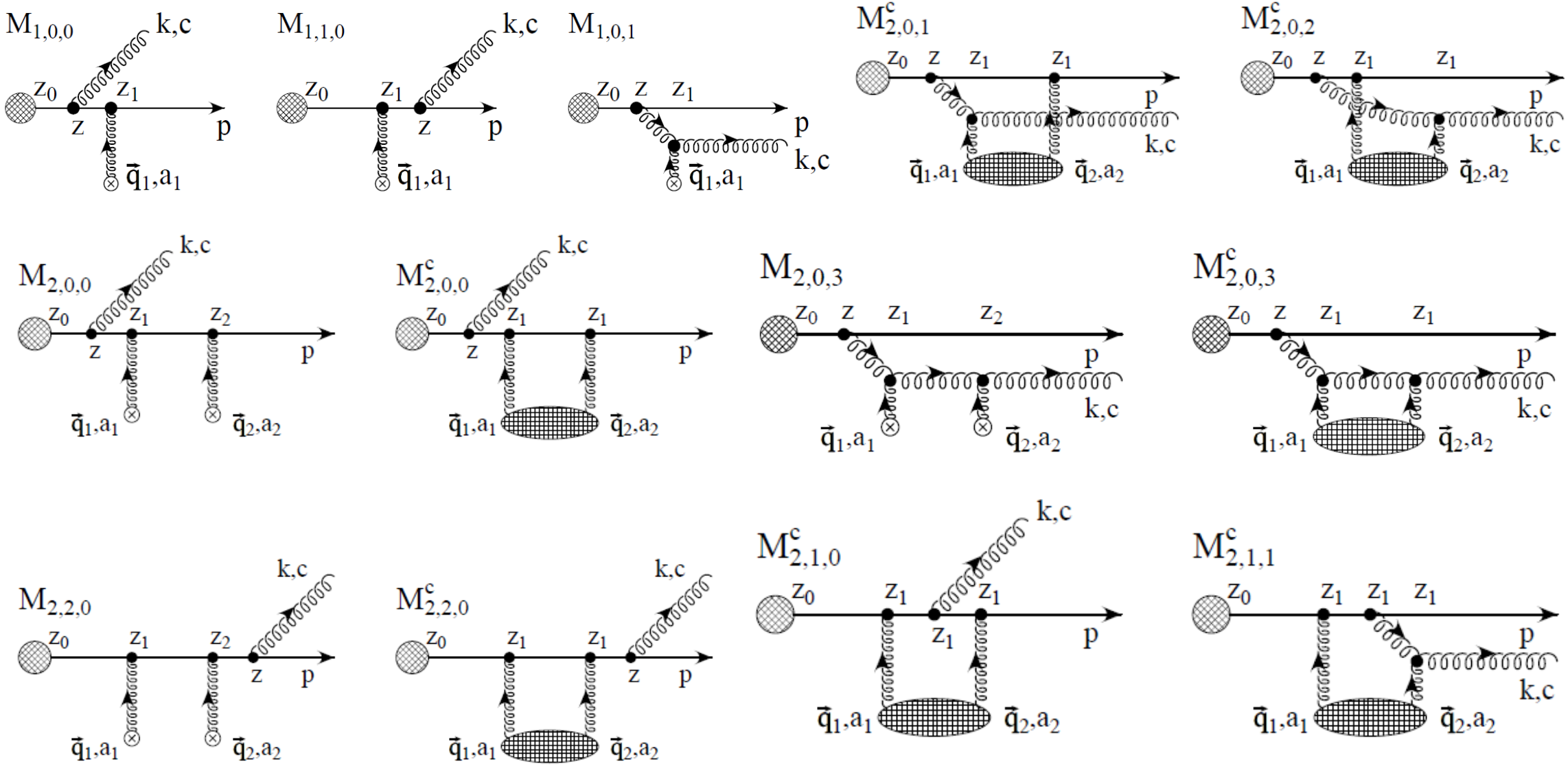
How will we do it?





$$
\begin{aligned}
M_{1,0,0} &= \int \frac{d^4q_1}{(2\pi)^4}\, iJ(p+k-q_1)e^{i(p+k-q_1)x_0}\ (ig_s)\epsilon_\alpha(2p-2q_1+k)^\alpha \times \\
&\quad \times i\Delta_M(p-q_1+k)i\Delta_M(p-q_1)(2p-q_1)^0 V(q_1)e^{iq_1x_1}T_{a_1}a_1c \\
&\approx J(p+k)e^{i(p+k)x_0}(-ig_sa_1cT_{a_1})2E\int \frac{d^2\mathbf{q}_1}{(2\pi)^2}e^{-i\mathbf{q}_1\mathbf{b}_1}I_2,
\end{aligned}
$$

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


$M_{1,0,0}$
$M_{1,1,0}$
$M_{1,0,1}$
$M^c_{2,0,1}$
$M^c_{2,0,2}$
$M_{2,0,0}$
$M^c_{2,0,0}$
$M_{2,0,3}$
$M^c_{2,0,3}$
$M_{2,2,0}$
$M^c_{2,2,0}$
$M^c_{2,1,0}$
$M^c_{2,1,1}$
k,c
p
$\bar{q}_1,a_1$
$\bar{q}_2,a_2$

So, off to work!