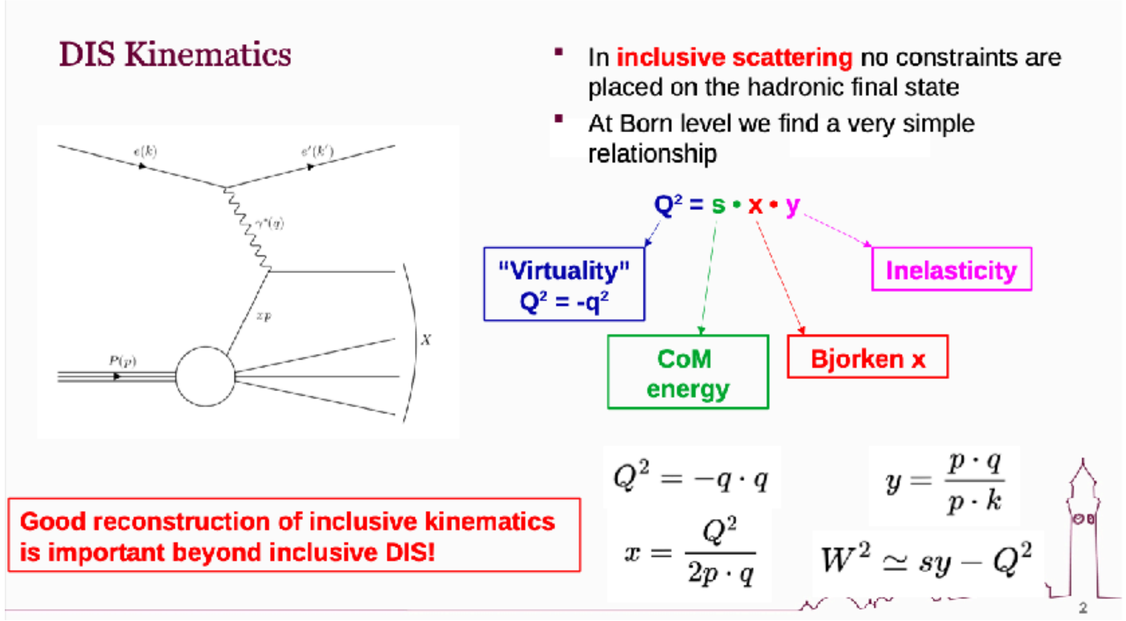
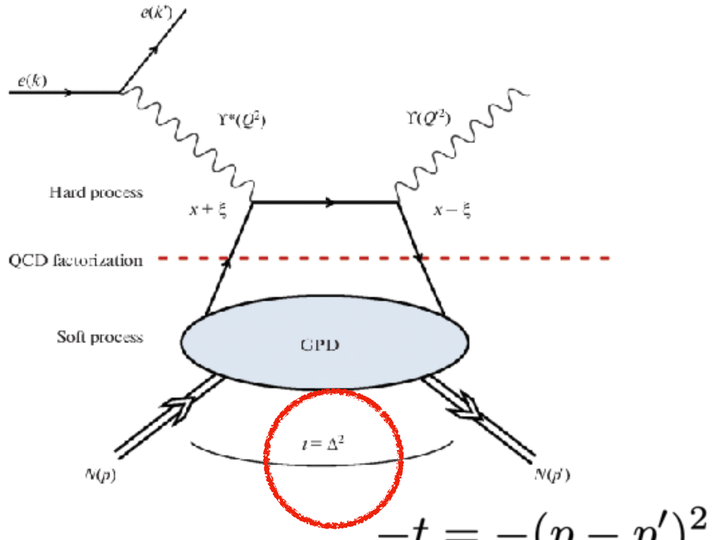
Mandelstam t for Exclusive/Diffractive/Tagging (EDT)

Stephen Maple (Birmingham) (Frascati 2025)





$$-t = -(p - p')^2$$

- Access to x, Q^2, y , W, x, ν(=p.q/M) via inclusive kinematics discussed in Frascati EDT work fest
- At work fest there was discussion about what would be useful for EDT

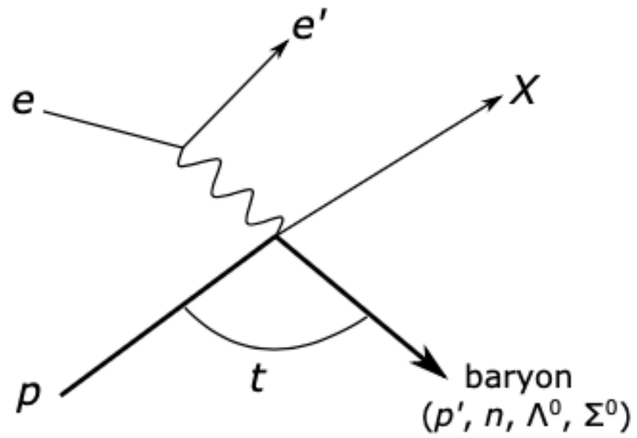
- -t is crucial
- Getting some t reconstruction in eicrecon could be a very useful addition for analysers as a good first/next step
- Many final results rely on t (eg cross section versus t)

- Exclusive convenors will give work fest summary on Friday at ePIC general meeting

- Several ways to reconstruct -t
- Different t-reconstructions superior for different reactions/ analyses and coverages of detectors
- t in analysis at the moment bespoke to reaction and analysers test different t-methods in their analysis

- Note: Also other variables used depending on analysis/reaction (eg u, s, x_ν…more…) but t likely the best next step if we are moving forward with this

Document from Miguel Arratia (UC Riverside) and tRECO Convention



M. Arratia (UCR)

Class name	Observables used	Example(s)
BABE	$p^{\mu}_{\rm BA}$, $p^{\mu}_{\rm BE}$	$-t = (p^{\mu}_{\rm BA} - p^{\mu}_{\rm BE})^2$ or $t = \lvert\vec{p}^{\,\rm T}_{\rm BA}\rvert^2$
eX	$p^{\mu}_{\gamma^*}$, $p^{\mu}_{\rm X}$	$-t = (p^{\mu}_{\gamma^*} - p^{\mu}_{\rm X})^2$ or $t = \lvert\vec{p}^{\,\rm T}_{\rm X} + \vec{p}^{\,\rm T}_{e'}\rvert^2$

- $p^{\mu}_{\rm BA}$: outgoing baryon 4-momentum.
- $p^{\mu}_{\rm BE}$: incoming proton beam momentum.
- $p^{\mu}_{\gamma^*}$: difference between incoming and scattered electron 4-momentum.
- $p^{\mu}_{\rm X}$: 4-momentum of the rest of final state.

Plus ***many*** more methods than this….

- Miguel Arratia has proposed and is developing tRECO naming convention document
- Goal: establish naming convention for different methods of t-reconstruction

- Contact him for more info or to add to the document or sign up to the document (miguela@ucr.edu)

- Will be discussed at forthcoming EDT meetings

- Many methods
  - (eg 7 so far, but more might be available)
  - Could start with one or two methods?