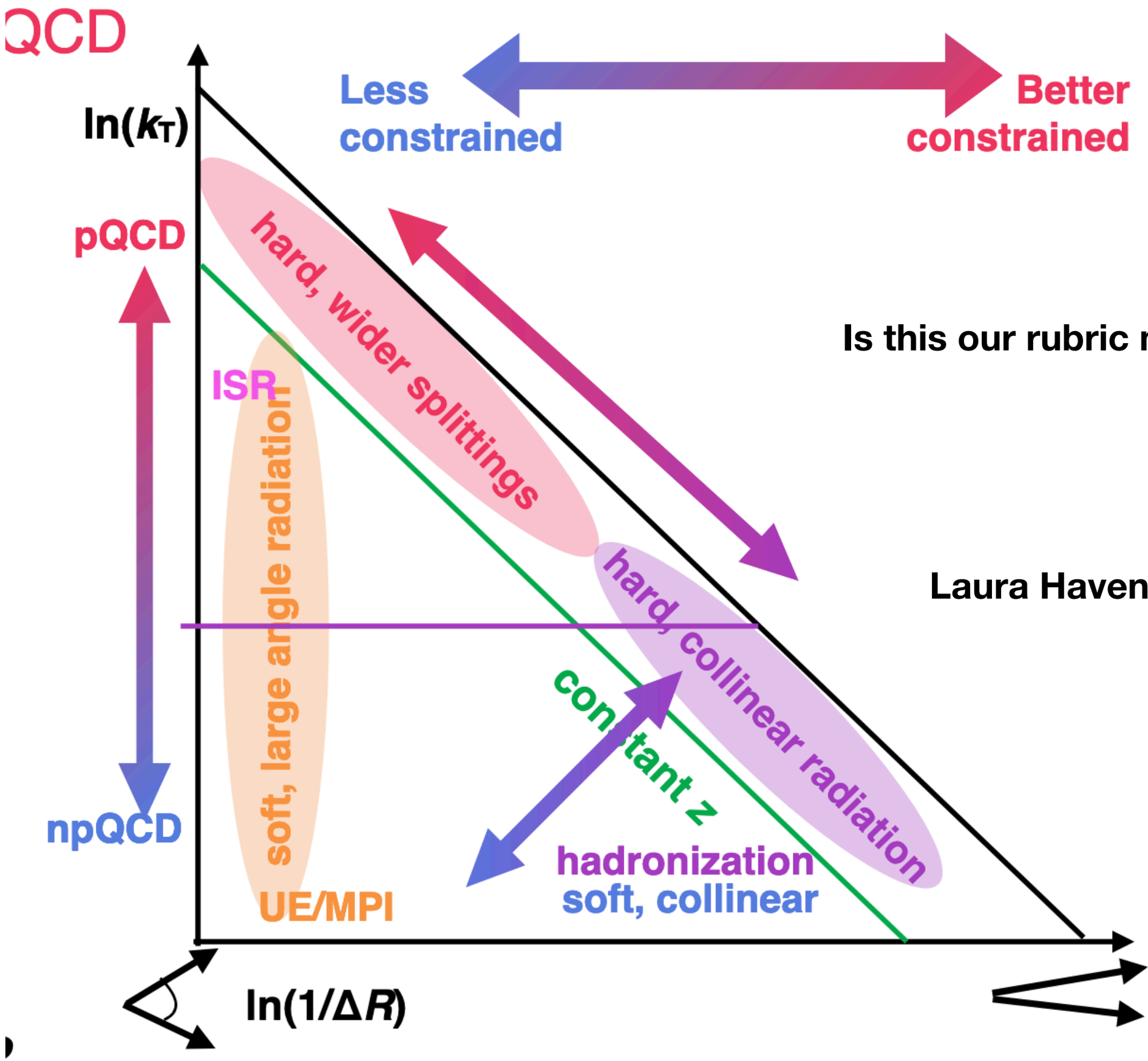
Day 1 Discussion session

CFNS Workshop on Advancing
non-perturbative QCD via energy flows

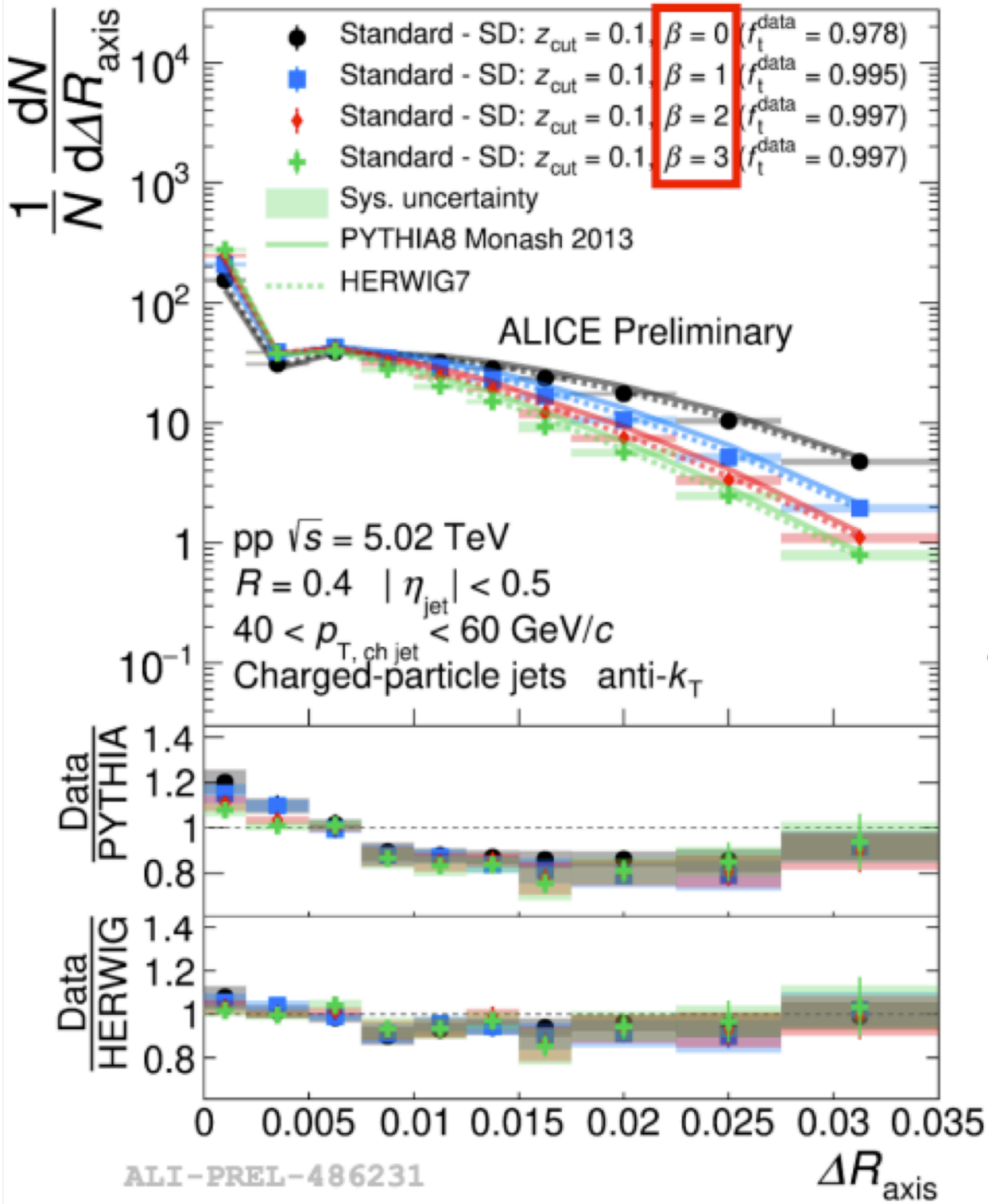
Sept 19th, 2022

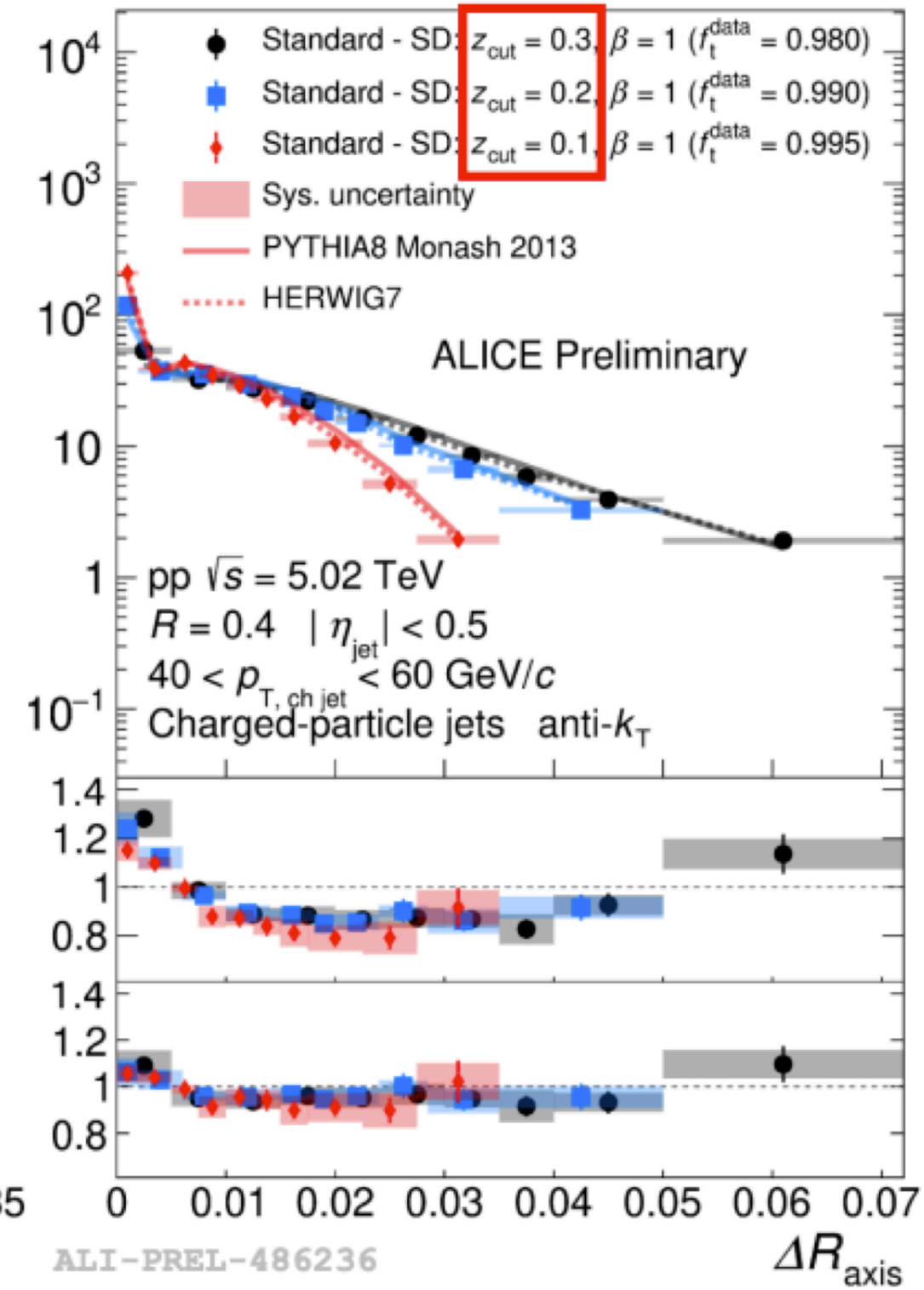
Raghav Kunnawalkam Elayavalli (he/them)
Vanderbilt University

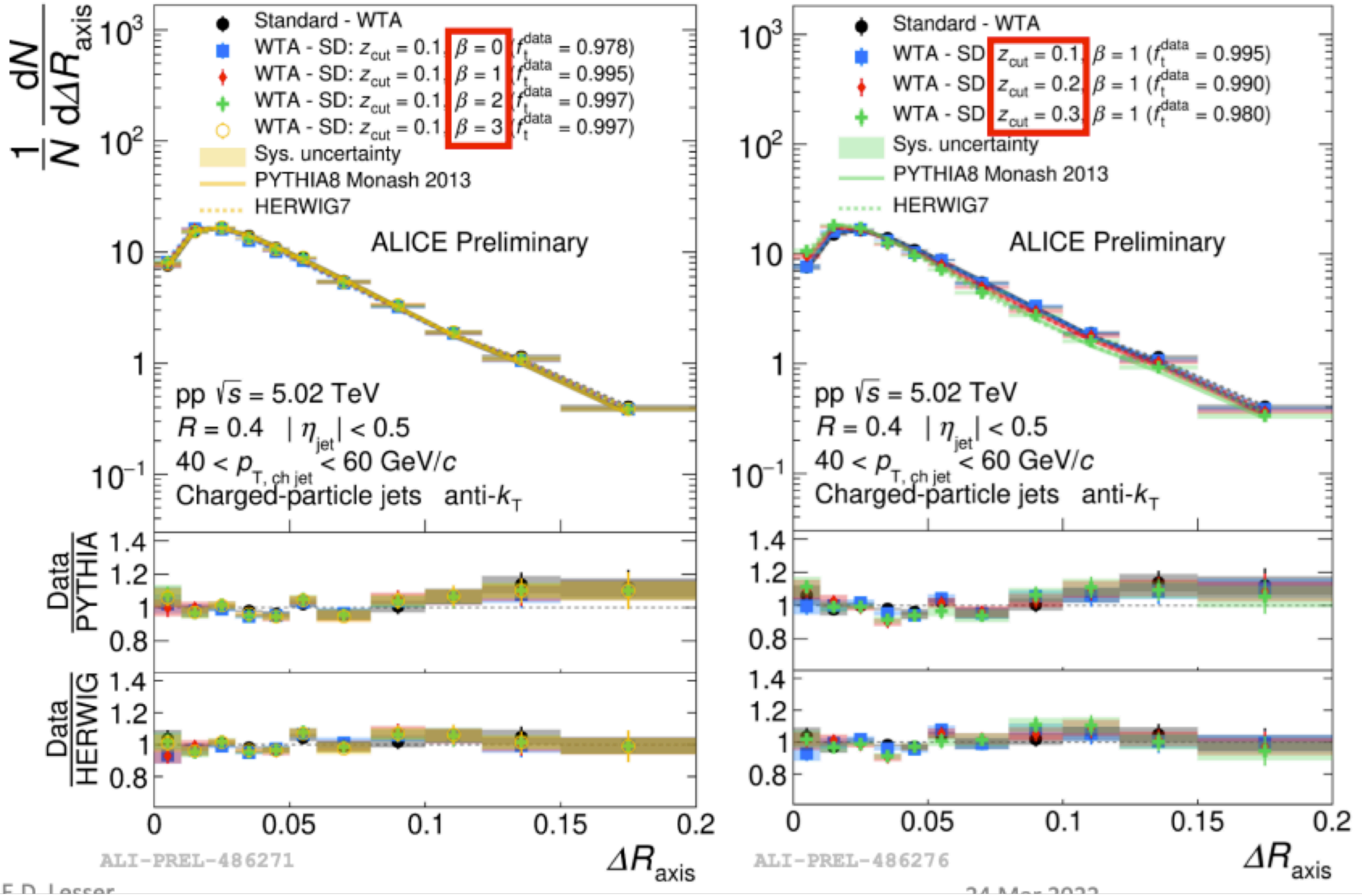


Is this our rubric now?

Laura Havener (Yale)


Standard - SD: z_{cut} = 0.1, β = 0 (f_t^{data} = 0.978)
Standard - SD: z_{cut} = 0.1, β = 1 (f_t^{data} = 0.995)
Standard - SD: z_{cut} = 0.1, β = 2 (f_t^{data} = 0.997)
Standard - SD: z_{cut} = 0.1, β = 3 (f_t^{data} = 0.997)
Sys. uncertainty
PYTHIA8 Monash 2013
HERWIG7
ALICE Preliminary
pp $\sqrt{s}$ = 5.02 TeV
R = 0.4 $|\eta_{jet}| < 0.5$
40 < $p_{T, ch jet}$ < 60 GeV/c
Charged-particle jets anti-k_T
$\frac{1}{N}\frac{dN}{d\Delta R_{axis}}$
Data / PYTHIA
Data / HERWIG
ΔR_{axis}
ALI-PREL-486231


Standard - SD: z_{cut} = 0.3, β = 1 (f_t^{data} = 0.980)
Standard - SD: z_{cut} = 0.2, β = 1 (f_t^{data} = 0.990)
Standard - SD: z_{cut} = 0.1, β = 1 (f_t^{data} = 0.995)
Sys. uncertainty
PYTHIA8 Monash 2013
HERWIG7
ALICE Preliminary
pp $\sqrt{s}$ = 5.02 TeV
R = 0.4 $|\eta_{jet}| < 0.5$
40 < $p_{T, ch jet}$ < 60 GeV/c
Charged-particle jets anti-k_T
ΔR_{axis}
ALI-PREL-486236


$\frac{1}{N}\frac{dN}{d\Delta R_{axis}}$
Standard - WTA
WTA - SD: $z_{cut} = 0.1$, $\beta = 0$ ($f_t^{data} = 0.978$)
WTA - SD: $z_{cut} = 0.1$, $\beta = 1$ ($f_t^{data} = 0.995$)
WTA - SD: $z_{cut} = 0.1$, $\beta = 2$ ($f_t^{data} = 0.997$)
WTA - SD: $z_{cut} = 0.1$, $\beta = 3$ ($f_t^{data} = 0.997$)
Sys. uncertainty
PYTHIA8 Monash 2013
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Charged-particle jets anti-k_T
Data / PYTHIA
Data / HERWIG
ΔR_{axis}
ALI-PREL-486271
Standard - WTA
WTA - SD: $z_{cut} = 0.1$, $\beta = 1$ ($f_t^{data} = 0.995$)
WTA - SD: $z_{cut} = 0.2$, $\beta = 1$ ($f_t^{data} = 0.990$)
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Sys. uncertainty
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pp $\sqrt{s}$ = 5.02 TeV
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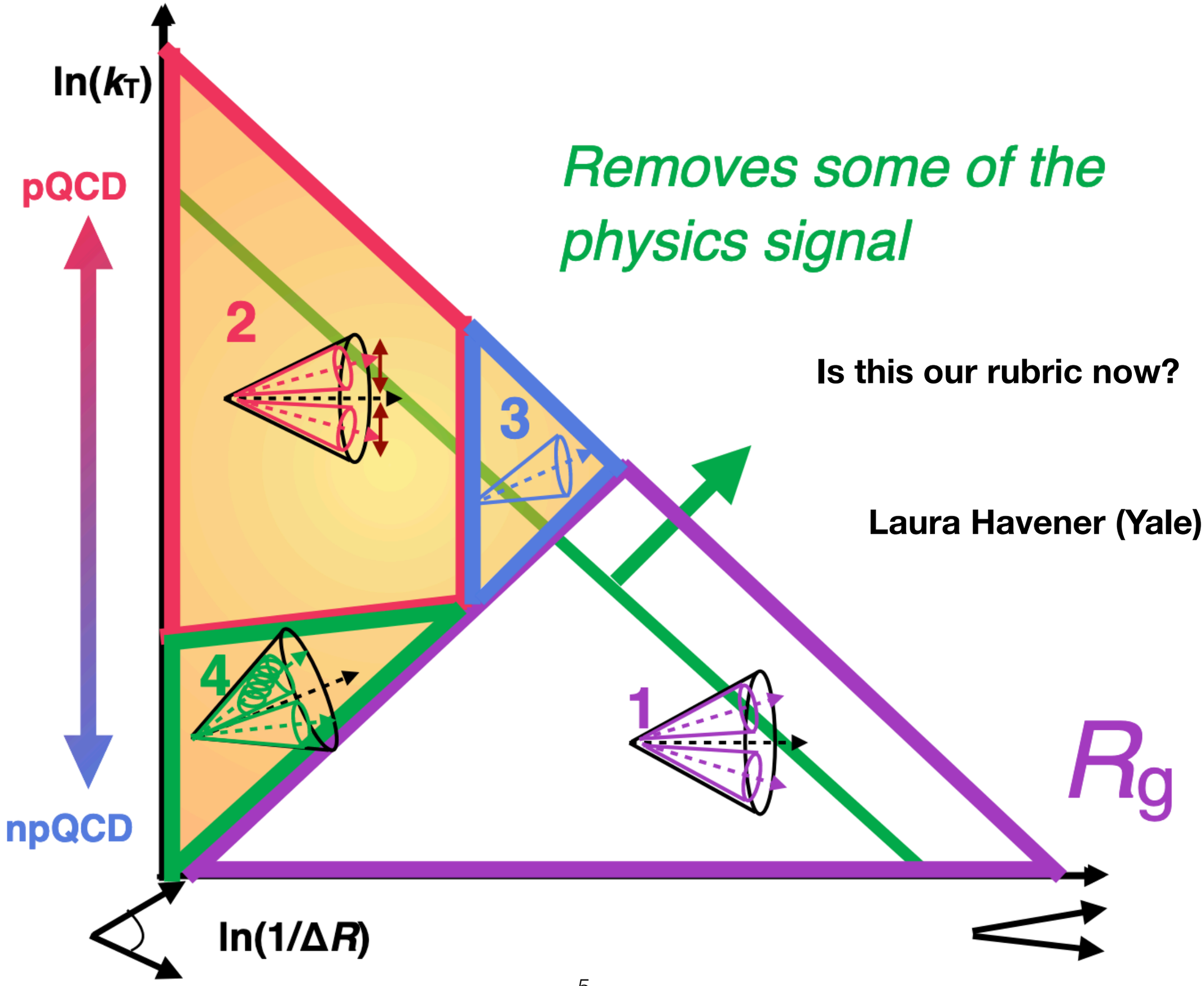
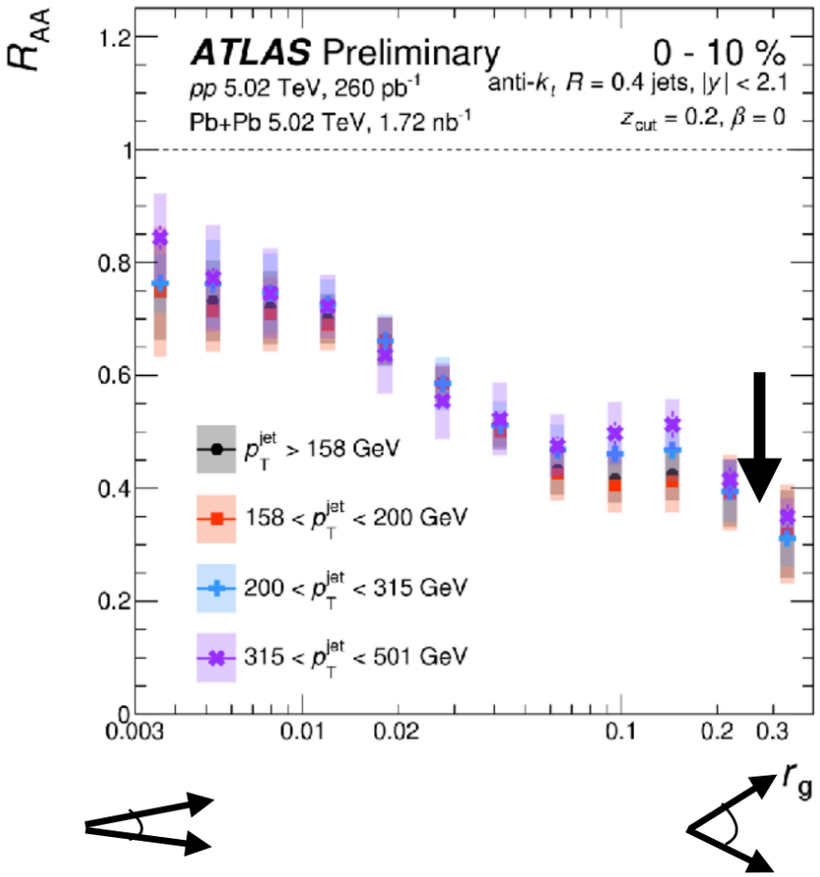
Charged-particle jets anti-k_T
ΔR_{axis}
ALI-PREL-486276

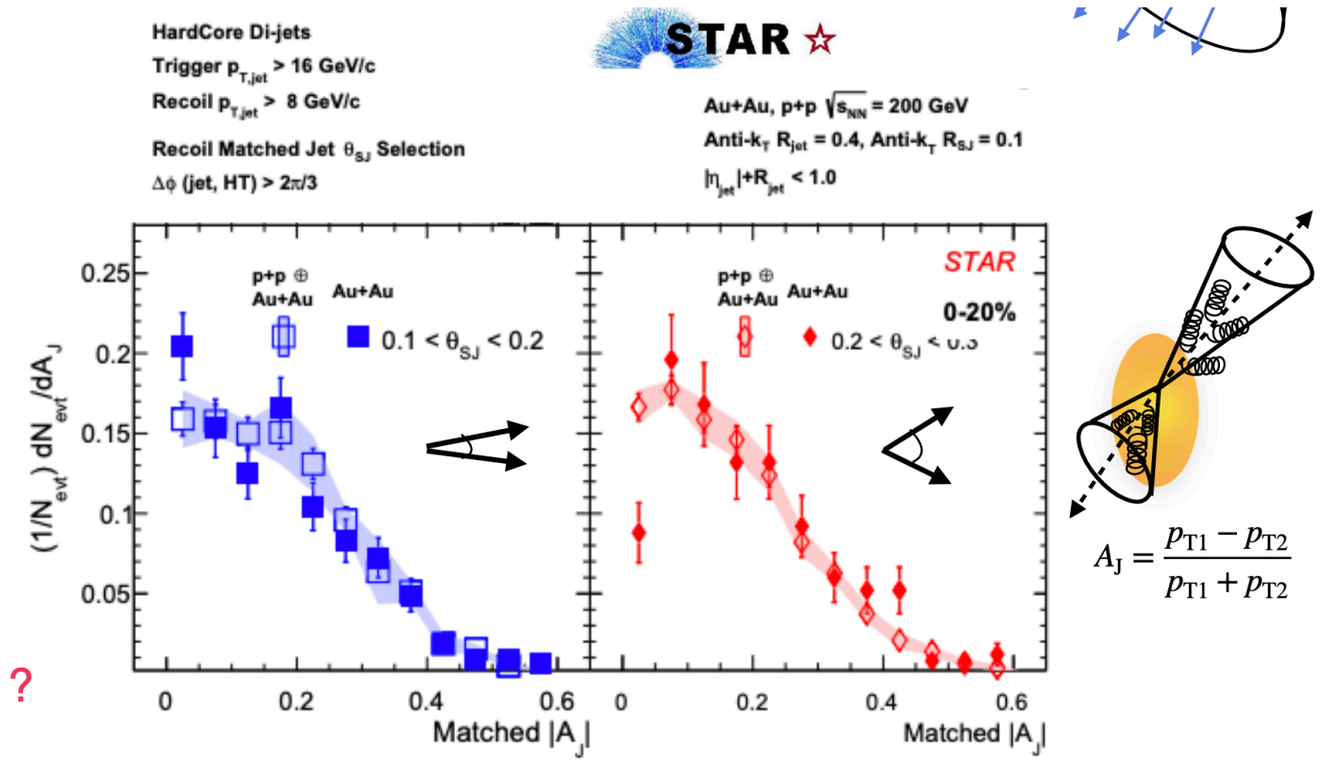


Removes some of the physics signal

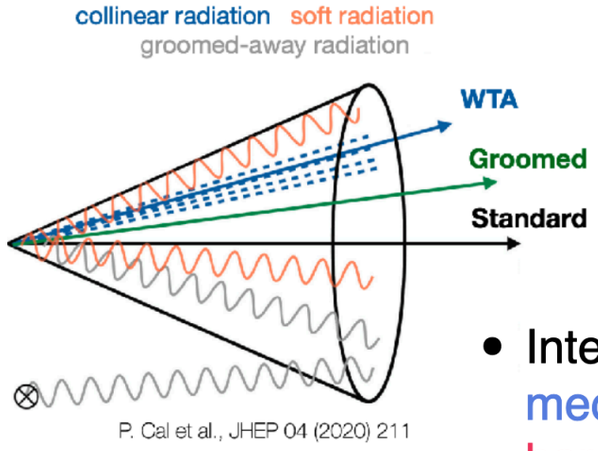
Is this our rubric now?

Laura Havener (Yale)





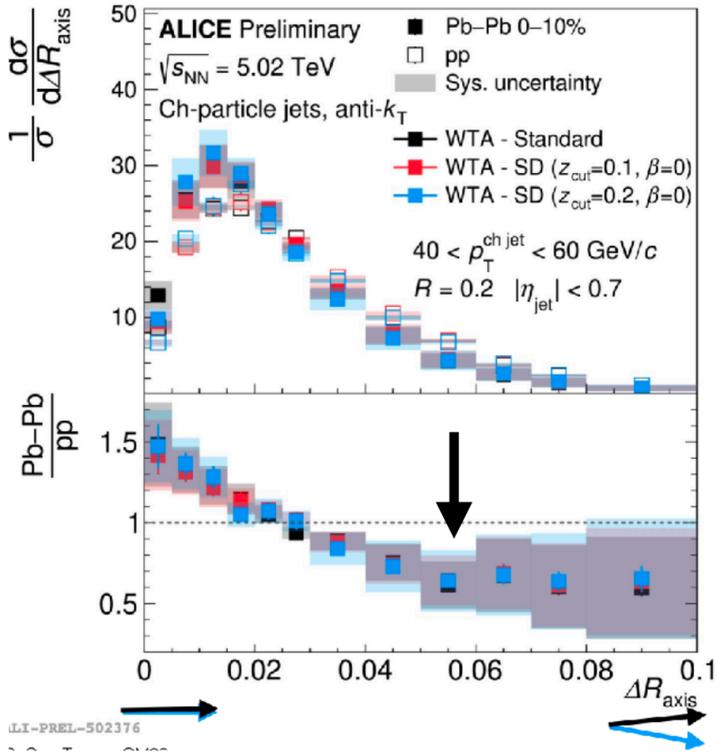
$$A_J = \frac{p_{T1} - p_{T2}}{p_{T1} + p_{T2}}$$

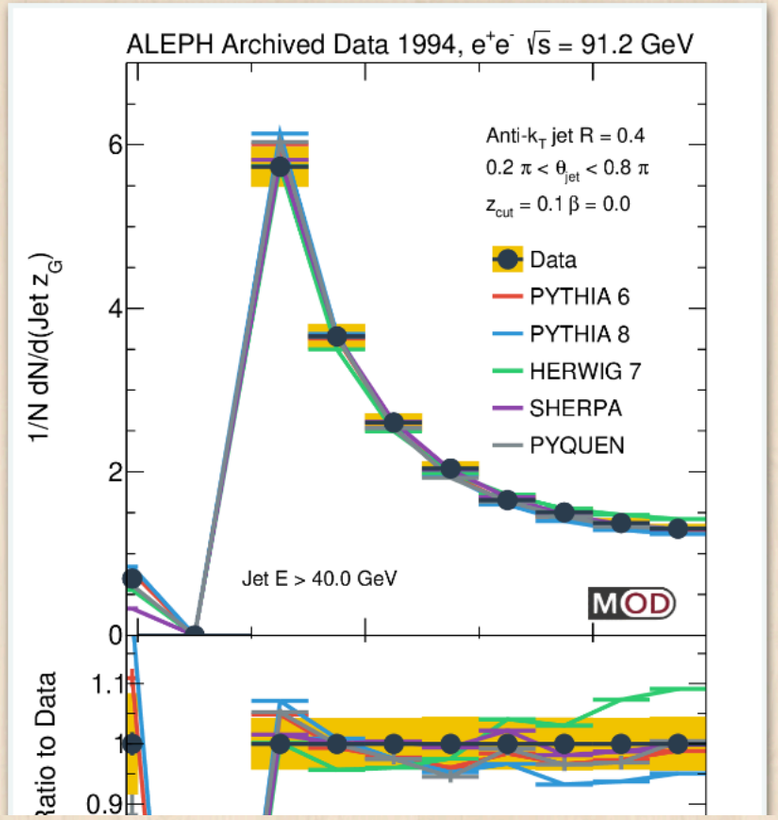


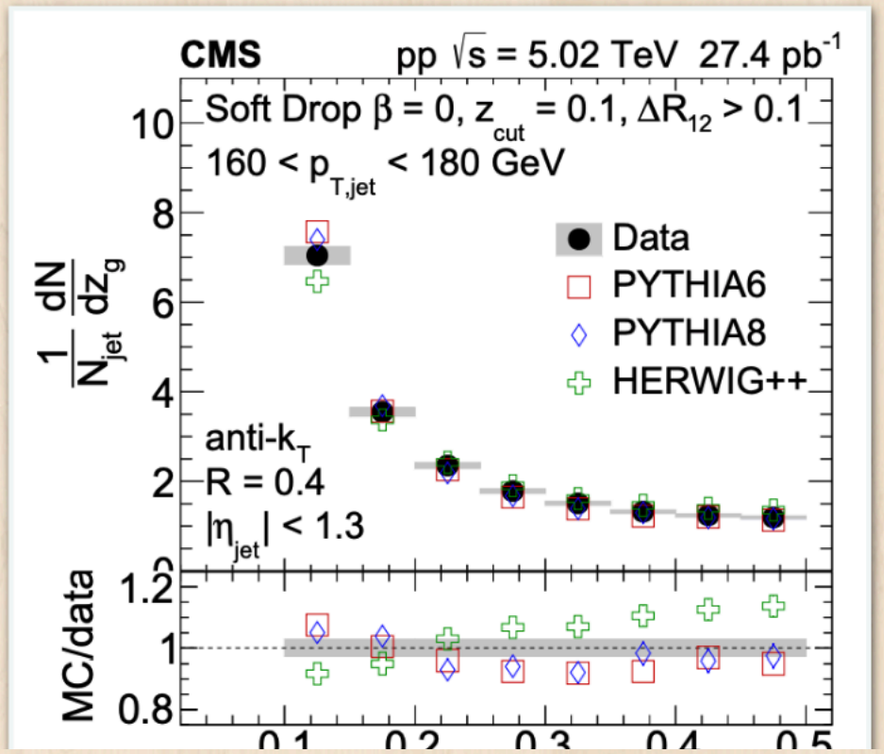
$$: \Delta R_{\text{axis}} = \sqrt{(y_2 - y_1)^2 + (\varphi_2 - \varphi_1)^2}$$

- Interplay between np medium response and hard core modification

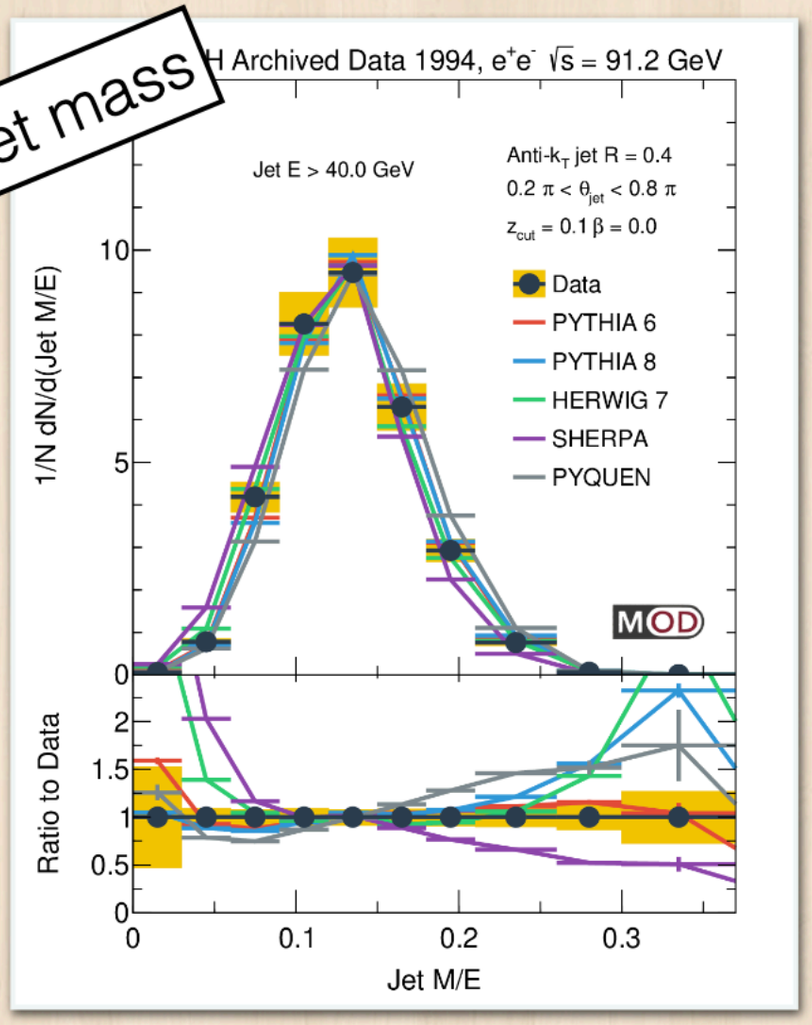
- Not sensitive to grooming: does not change jet direction



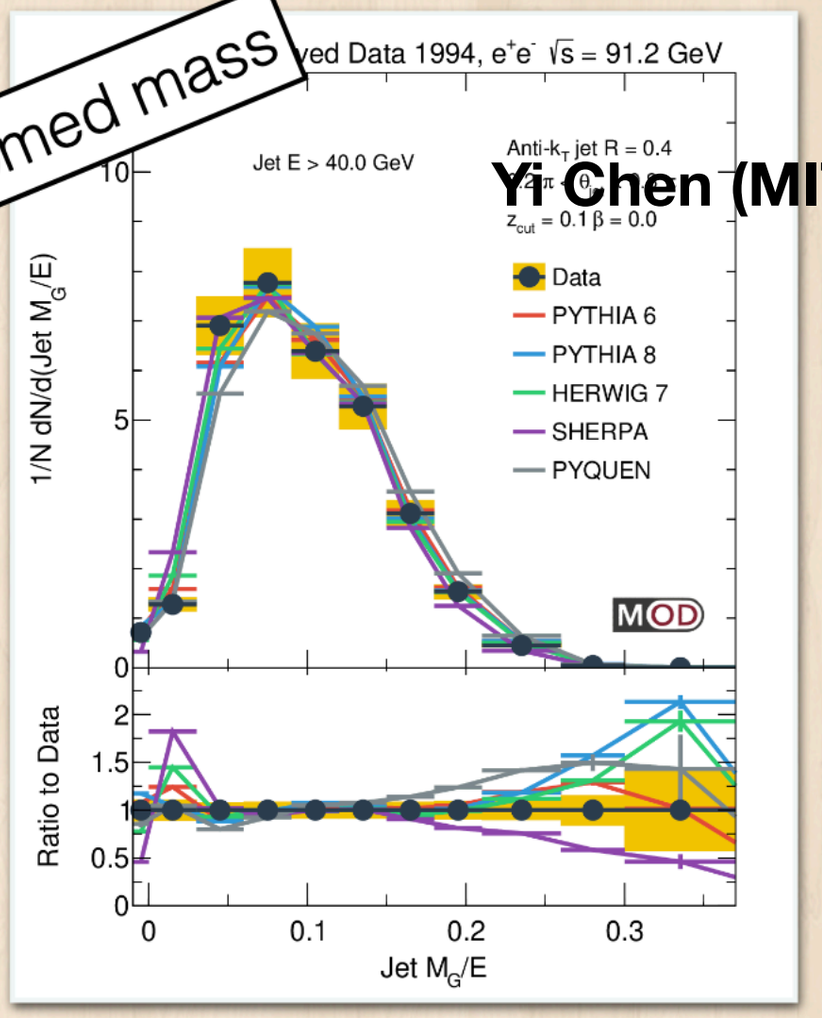




Full jet mass



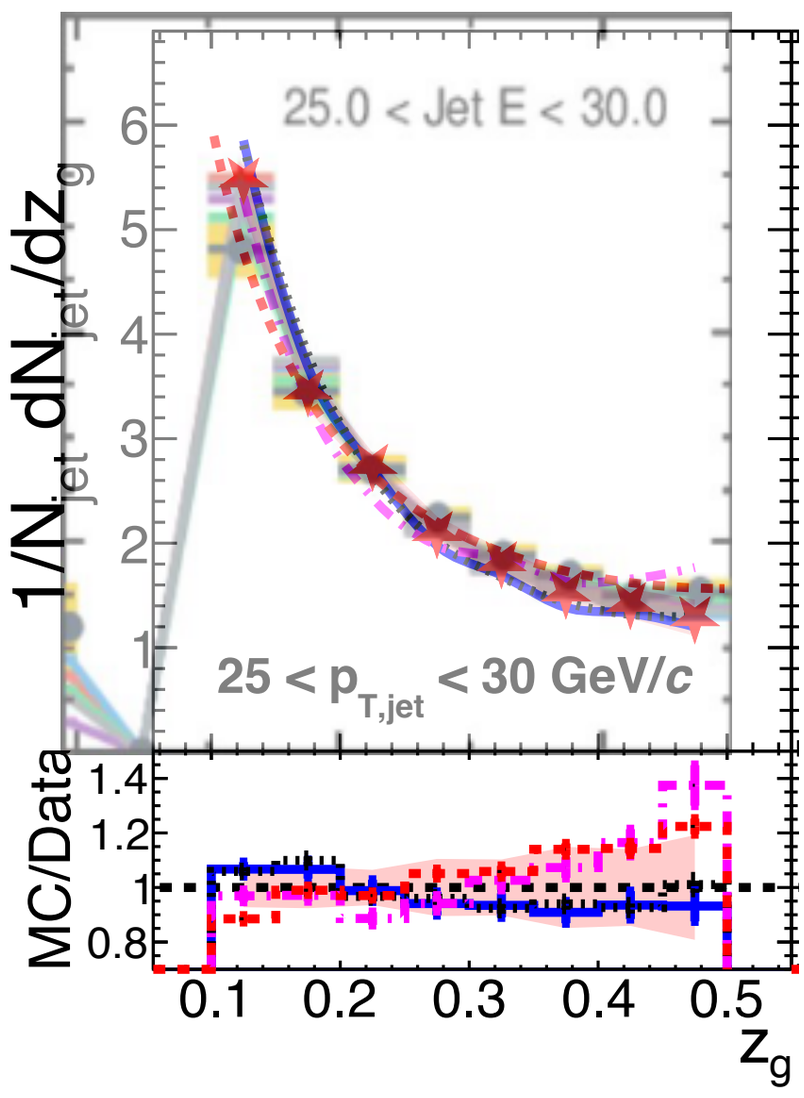
Groomed mass

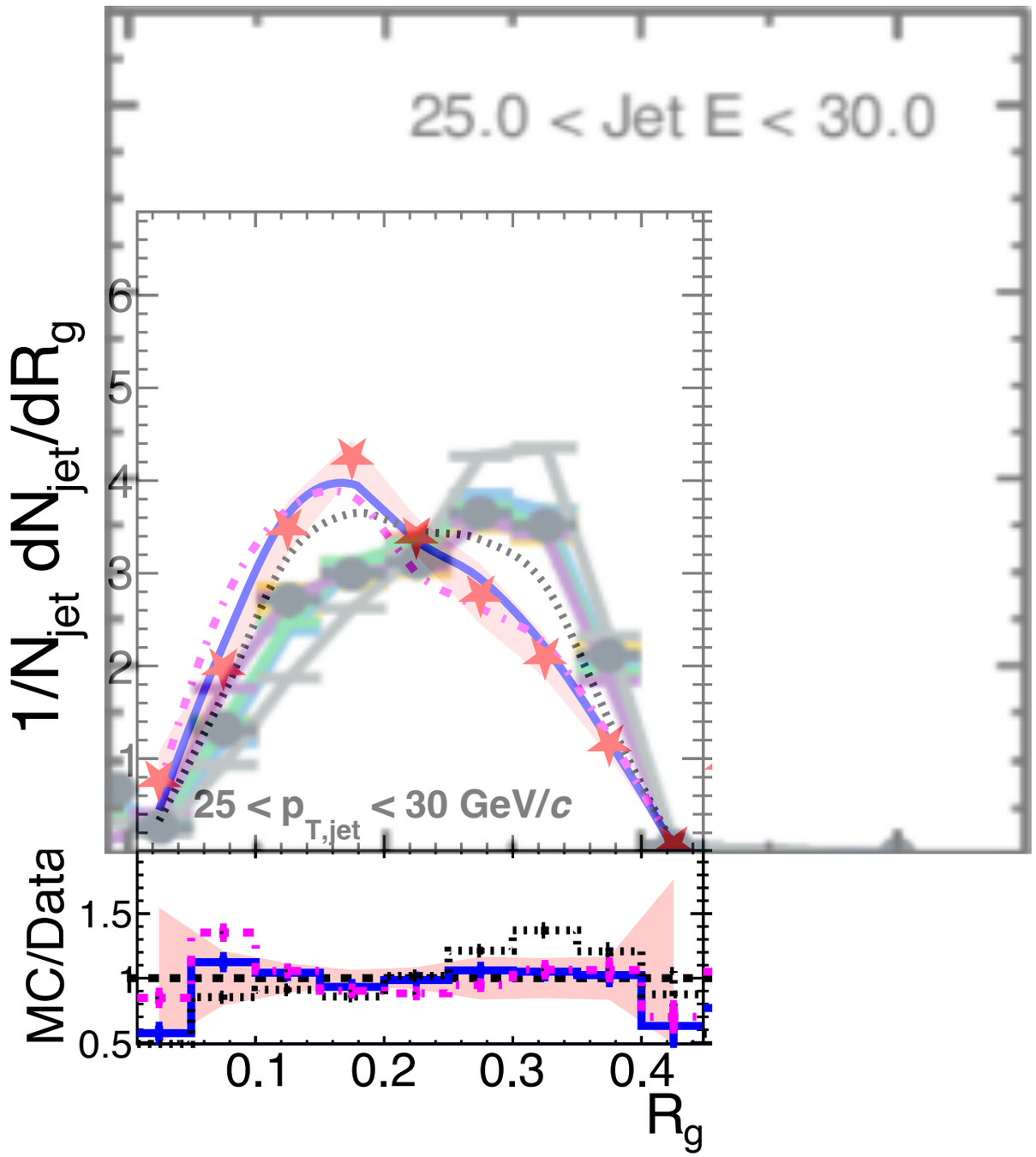


Yi Chen (MIT)

Comparing STAR vs ALEPH

Yi Chen (MIT)

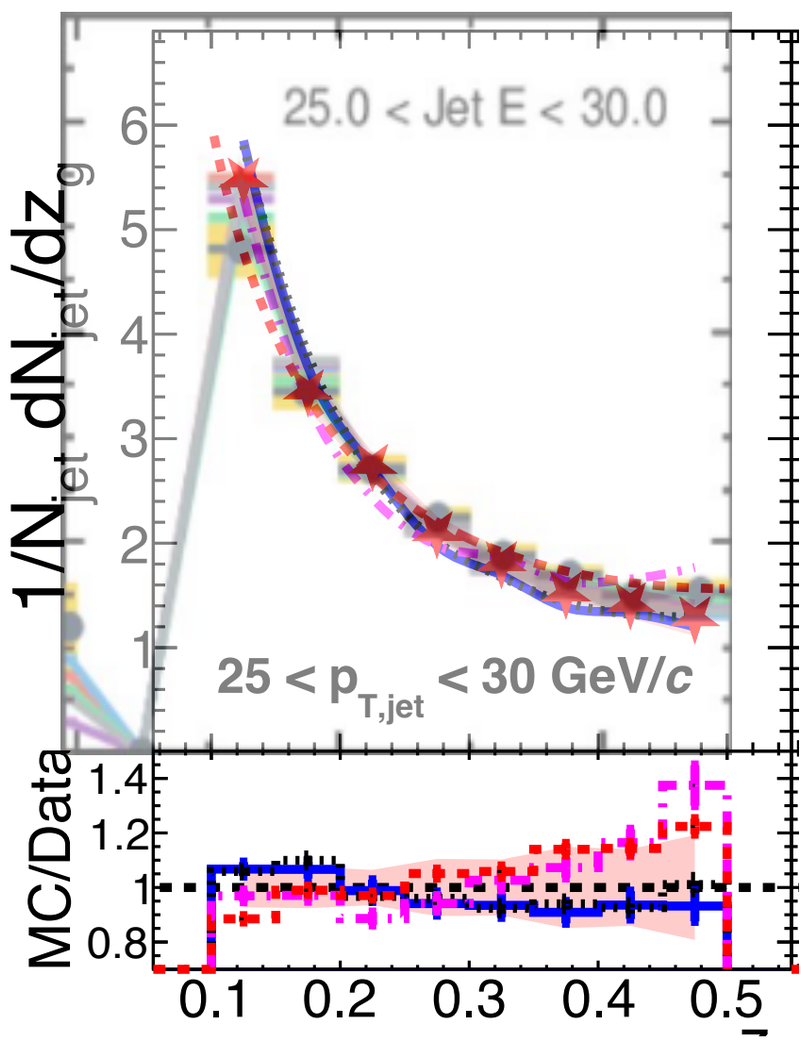


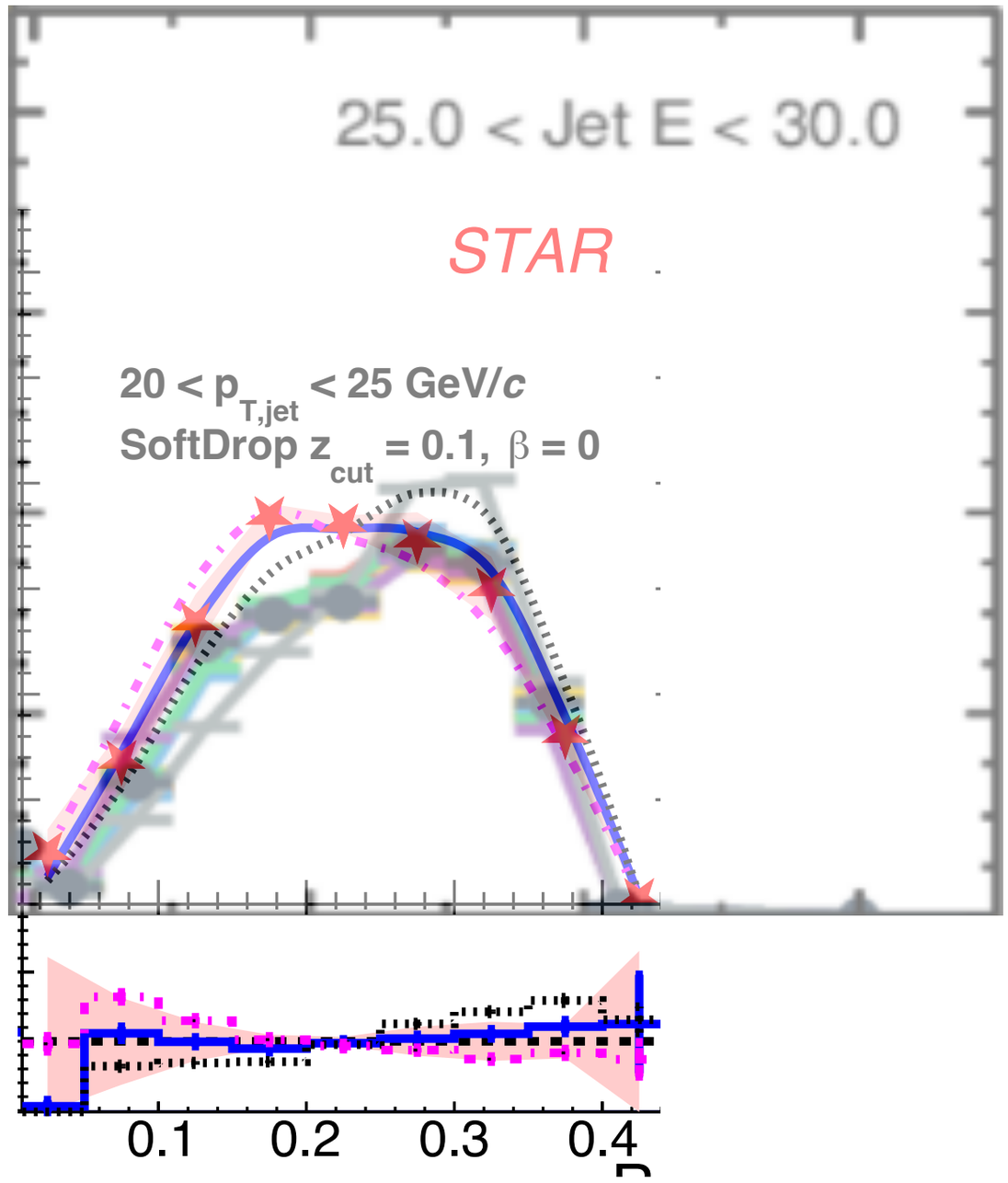


Is the comparison apples to apples?

Comparing STAR vs ALEPH

Yi Chen (MIT)

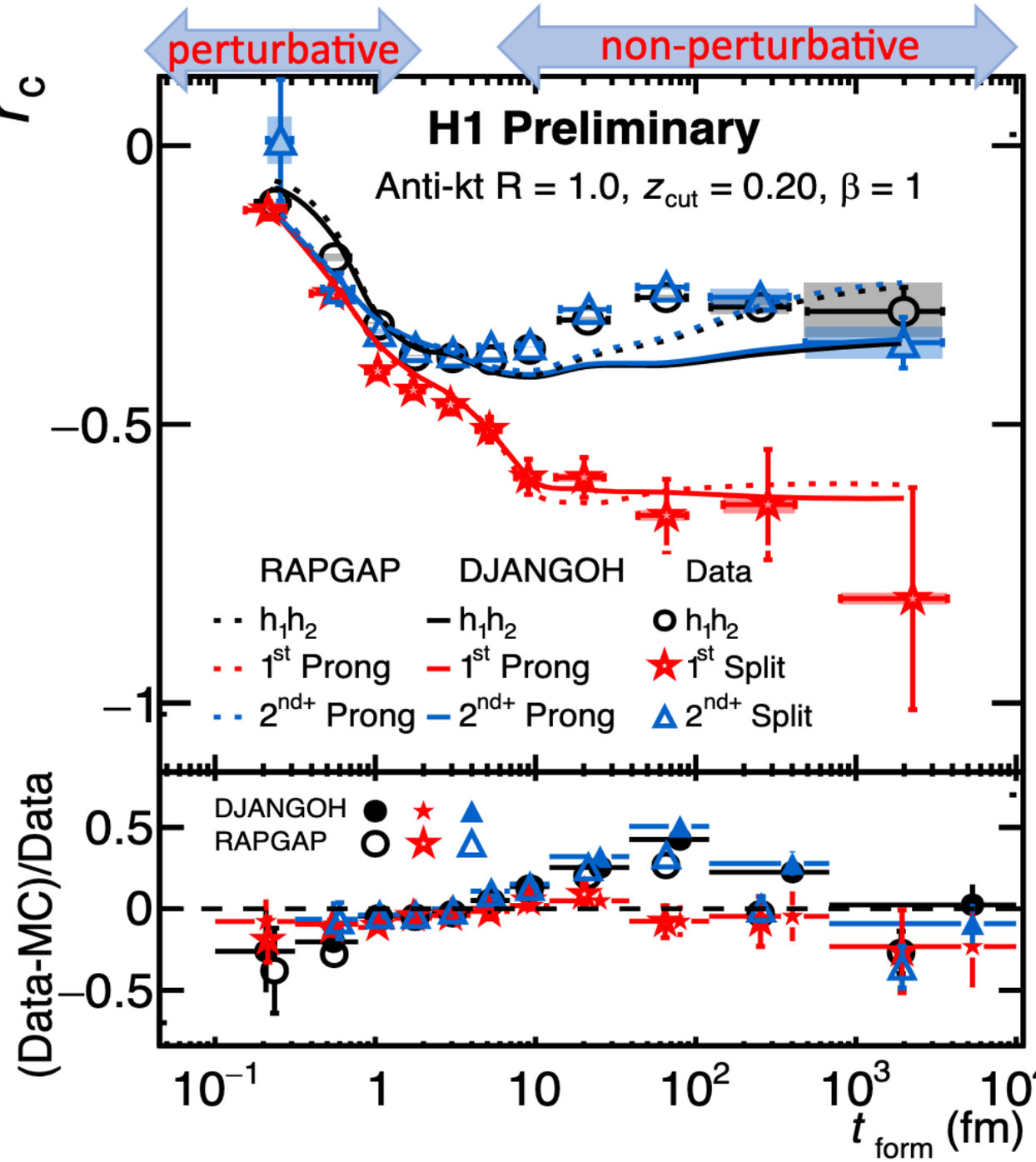




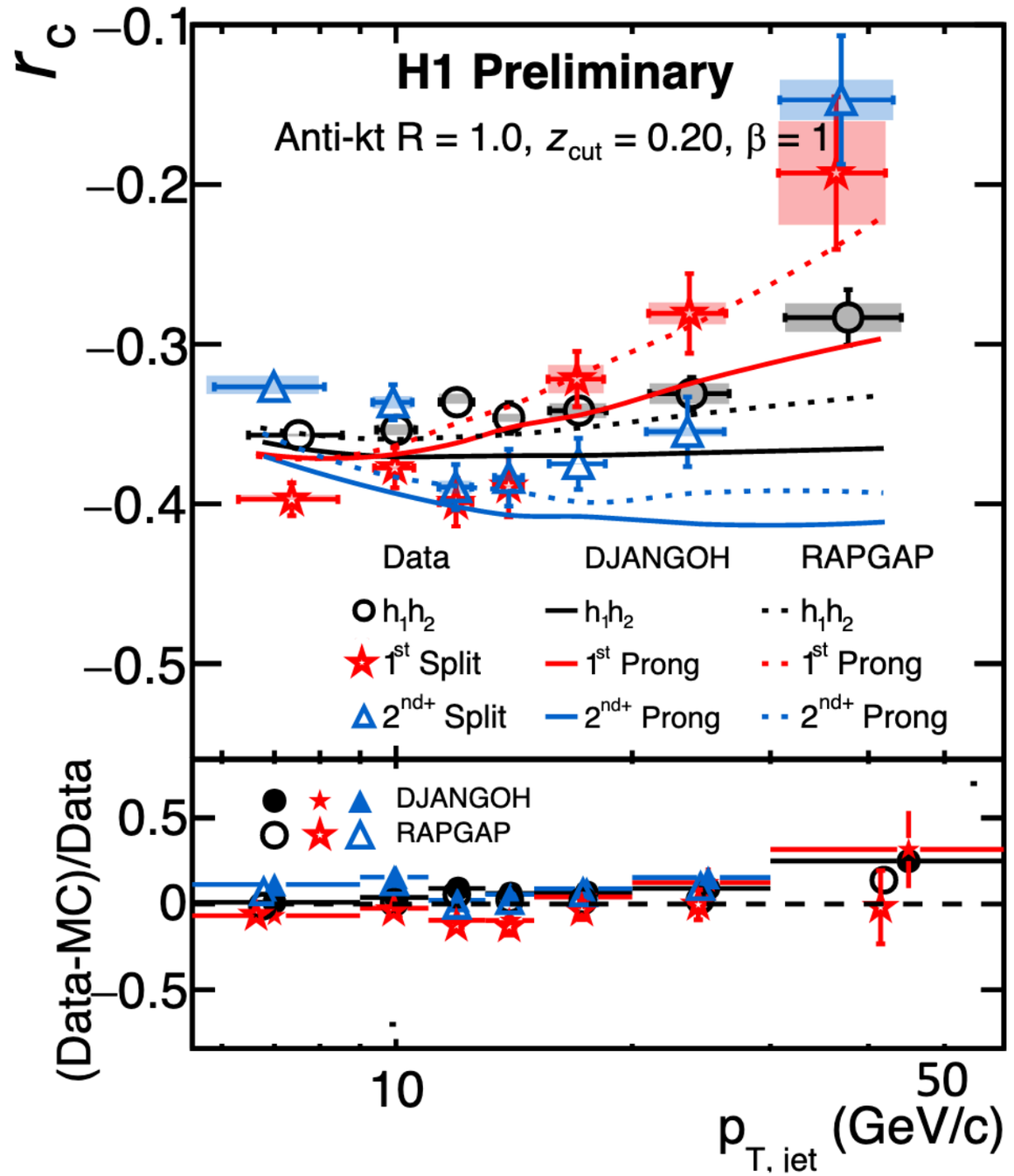
These jets in pp collisions have a $\langle M \rangle \approx 3$ GeV/c^2 plus there's hadronic component!

time

$$r_c \equiv \frac{N_{CC} - N_{C\bar{C}}}{N_{CC} + N_{C\bar{C}}}$$



$$r_c \equiv \frac{N_{CC} - N_{C\bar{C}}}{N_{CC} + N_{C\bar{C}}}$$



Mriganka Mondal (NISER)

- What does it take to identify a particular jet topology in the shower and in the particle production?

- What part of the jet can theorists calculate and what parts are completely ‘random’?

- Vacuum = prob (parton shower) + random (hadronization)

- Medium = prob (parton shower) +/x fluc/prob (energy loss) + random? (Hadronization)

- Which is more important - MC reproducing data or theory reproducing data.. what will come first?

- Also how do we quantify non-perturbative ness in the jet that is NOT hadronization … is this a reasonable question to ask?

- Where does RHIC and LHC feature here? And where does EIC come into play?