



STRONG-2020 ANNUAL MEETING (2022)
NA3 REPORT: JET-QGP INTERACTIONS



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 824093

NA3 GOALS AND PLANS

- Theory-experiment collaboration on probing the QGP with jets
- Main goal: survey/benchmark of *observables*:
 - Large number of potential jet shape/structure observables
 - Identify observables that are sensitive to specific aspects of parton energy loss
- One parton energy loss model as main reference
- Provide public tools for the above

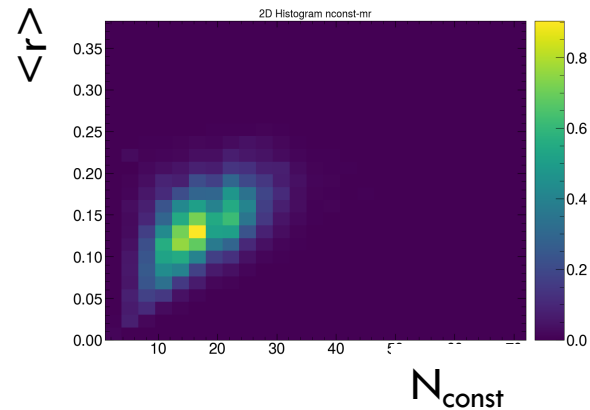
ACTIVITIES

- Previous period: series of online lectures to review jet observables and physics inputs
- Previous period: reference model selected: JEWEL (milestone)
 - Well-documented; clear physics picture in model
 - Clear connection to analytical calculations
 - Made available in a Docker container for portability/ease of use
- Current period: survey of observables complete
 - Paper submission delayed: found and fixed bug in last round of internal discussion
 - Need to update text; manuscript ready for submission
- Next steps:
 - Meeting(s) to discuss results
 - Extensions of survey under discussion: e.g. more powerful machine learning tools, other jet quenching models, thermal background

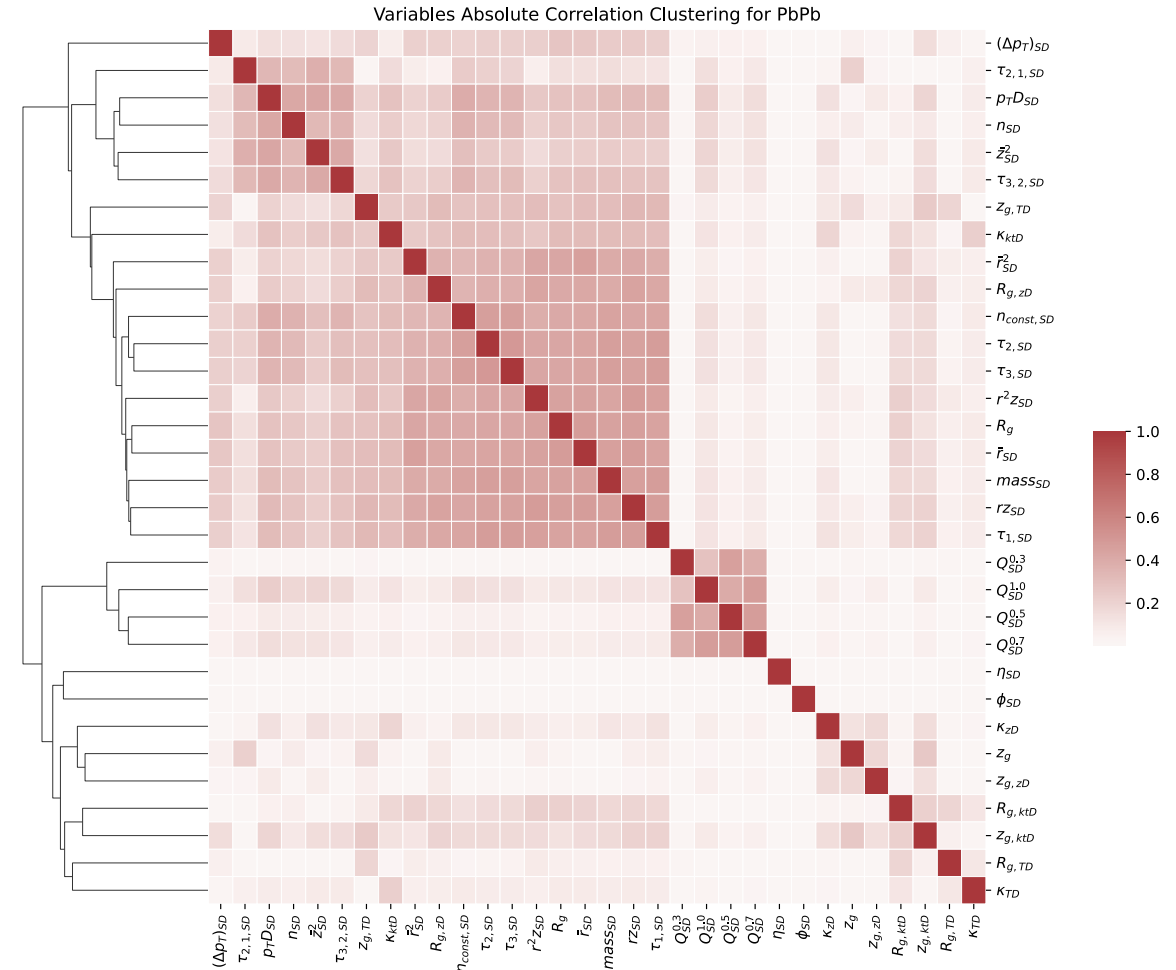
SURVEYING JET OBSERVABLES

Surveying jet observables:

- Map correlations to find independent sets
 - Linear correlations: Principle Component Analysis
 - Non-linear: Deep-learning Autoencoder
- 3 main categories of observables
 - Angularities
 - Dynamical grooming measures
 - Jet charge (not sensitive to quenching)
- 5-7 principle components cover most quantities



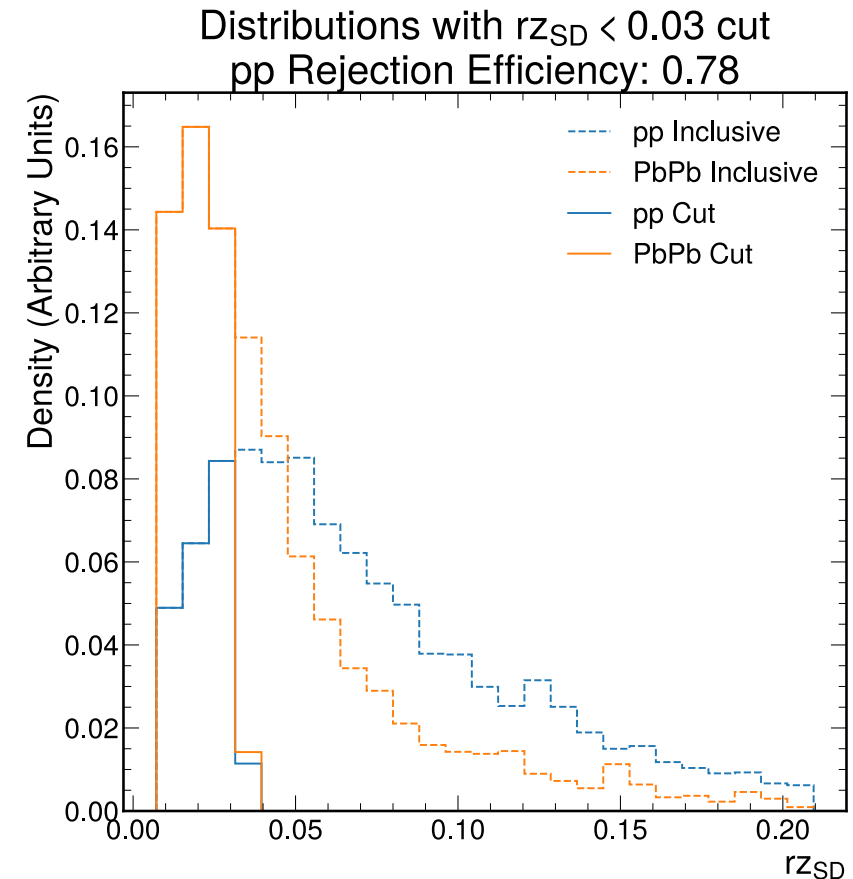
Linear correlations between variables: PCA



SENSITIVITY TO JET QUENCHING

Sensitivity to jet quenching

- 4-5 promising variables identified
- Large overlap in sensitivity
- Reach full sensitivity with 1-2 variables



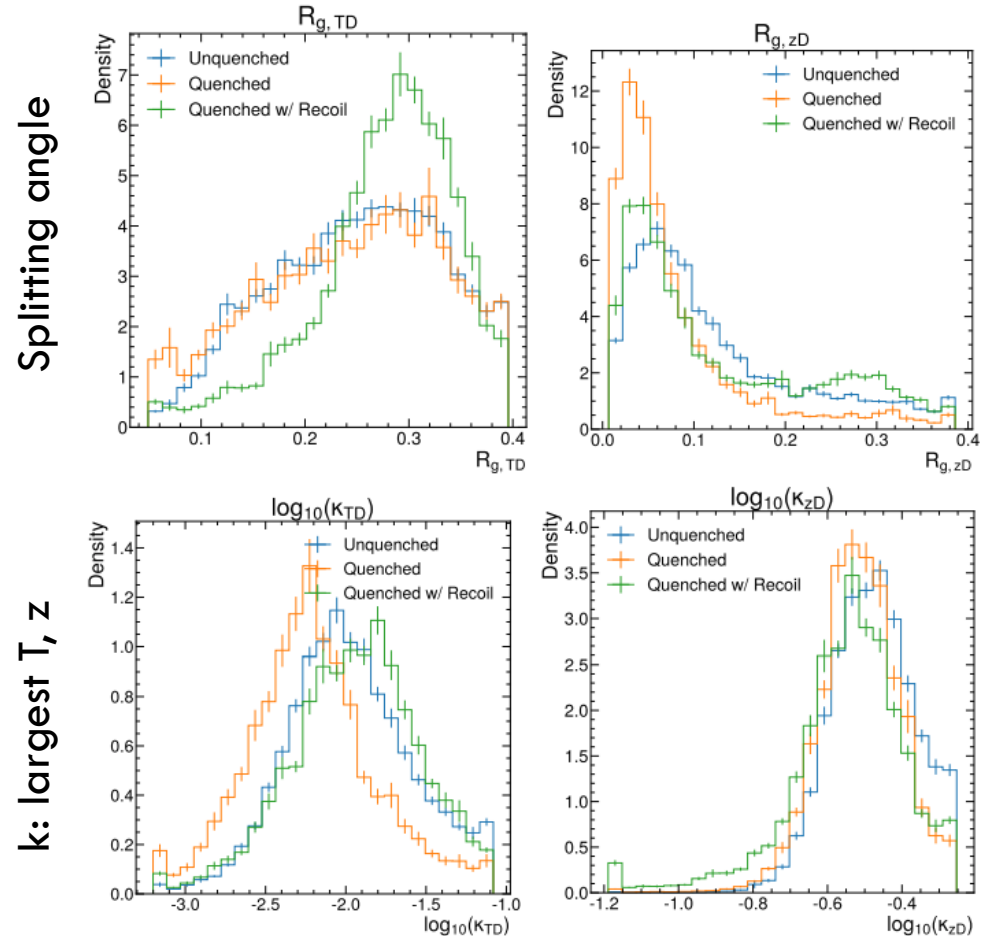
IMPACT OF JEWEL RECOIL

JEWEL recoil:

- Keep track of radiated energy, medium recoil
- Introduces soft background
- Background subtracted with new constituent-based algo
- Find more large-angle splittings
- *Subject for future study*

Bkg sub: Milhano and Zapp, arXiv: [2207.14814](https://arxiv.org/abs/2207.14814)

Dynamical grooming



PLANNING AND RESOURCES

The NA3 WG would welcome an additional extension of the grant period

Had planned for 2x1 year postdoc + several meetings

- 1 year postdoc realised
- Meetings postponed due to pandemic
- Currently working on solution to hire another postdoc for 1 year (combined with other grants)

Would enable:

- Completion final deliverables
- Organisation of 1 or 2 networking meetings

Qualified candidates relative sparse – expect some to be available 1st half of 2023