Probing the QGP with Jet Observables

‘Networking Activity’ of STRONG-2020 program

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Organisational/funding: STRONG-2020

http://www.strong-2020.eu/

- Funding acquired as part of European Union project ‘STRONG-2020’
  - 3 years postdoc — call out; looking at candidates
  - Funding for meetings/workshops (with caveats)
- Main deliverable/promise:
  - Report on jet observables — benchmark sensitivity to relevant physics processes

Goal/idea of the project

Emphasis on benchmarking observables, not benchmarking models

1. Define default model
   - Need switches for some of the underlying physical mechanisms
   - Or: set of models with different assumptions?
2. Define list of observables
   - Choose/define ‘detector cuts’
3. Evaluate observables to decide sensitivity to mechanisms, medium density etc

Goal for today

- Initial discussion
- Organise next steps: meeting format and workshop timing/planning
  - Originally planned a 2-day in-person meeting; need to move online for now
  - Preference for a few long meetings or multiple short (e.g. every few weeks)?
  - Time frame for face-to-face meeting: late fall?

Selecting physical cuts for event generation

- pseudo-rapidity range for each object
- transverse momentum cuts
- …

Selecting an event-generator

- Two possible strategies (not mutually exclusive):
  - Top-down: Select 1 generator which allows to switch interesting physics effects on/off
  - Bottom-up: Select 2 or 3 generators and use benchmarking to identify differences (and find out what causes them)
- List of candidates:
  - JEWEL
    - No obvious ‘knobs to turn’ ?
  - JETSCAPE
    - Pb-Pb tune presented at QM2019
  - Hybrid model
    - Publicly available? Which versions(s)
  - …

Event-generators: physics content

- Path length dependent energy loss: included in most models
- Energy loss fluctuations: included — do models differ?
- Coherence/resolution effects
- Radiative, elastic energy loss
- Heavy flavor energy loss
- Recoil/medium response/soft fragments
  - Models use different approaches (and language) here
  - Intrinsically soft physics?
- Hadronisation effects: recombination? Baryon production?
- Medium density profile — different approaches; not a main concern for now?

Collect input on which are most important/interesting

Selecting observables

- Collect a list of existing measurements; may need to prioritise:
  - R_{AA} jet, hadrons, v_2, A_j, fragment distributions, jet shape variables, subjet observables, groomed jet mass
- And think of new ones
  - Systematically explore angularities $p_T^a\ \theta^b$?
  - Machine-learning type observables, e.g. jet images
  - ….
- Evaluate robustness against background?