‘The strong interaction at the frontier of knowledge: fundamental research and applications’

NA3-Quark-Gluon Plasma characterisation with jets (Jet-QGP) [WP14]

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STRONG-2020 Kick-off meeting

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NA3-Quark-Gluon Plasma characterisation with jets (Jet-QGP)

Objectives:

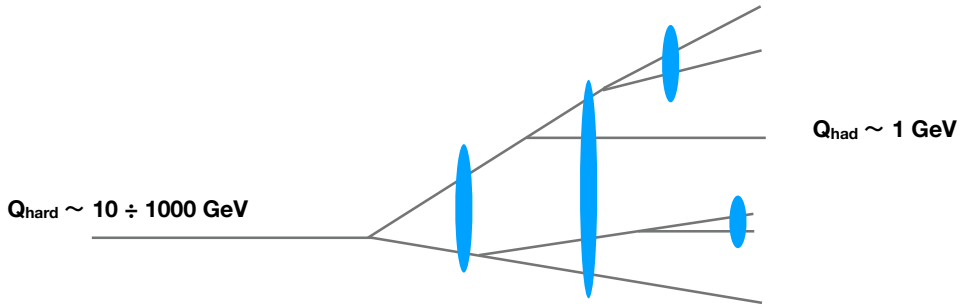
Establish a theory/phenomenology/inter-experiment working group, with synergies with related communities (most notably, machine learning/data science and high-energy pp physics) to:

- develop and deploy novel experimental and theoretical techniques and tools for jet physics in heavy ion collisions;
- enhance the impact of the European groups in the worldwide heavy-ion jet programme.

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

Jets in HI collisions

- hard processes take place concurrently with soft bulk production responsible for QGP creation
  - hard parton showering [jet development] occurs within QGP
- vacuum baseline known to high accuracy
- unlike **all** other QGP probes, jets are intrinsically multi-scale
- sensitivity to specific QGP scales explored through specific jet observables



multiple spatial scales

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The activities of the working group are organized in two **inter-related** and **concurrent** tasks:

[Task 1]

Reference implementation of jet-QGP dynamics in a full heavy-ion simulation

[Task 2]

Selection of jet substructure observables sensitive to specific scales/features of jet-QGP interaction

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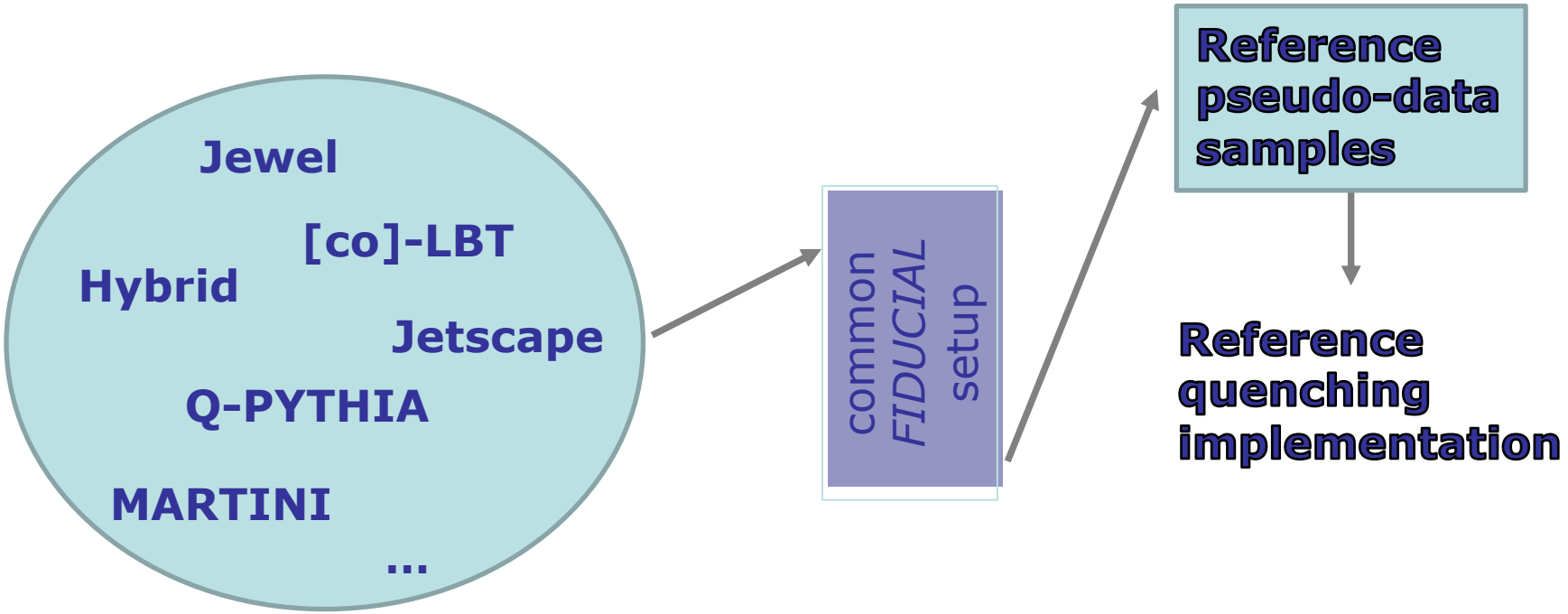
[Task 1]

Reference implementation of jet-QGP dynamics in a full heavy-ion simulation



several [many] successful models :: very different physical input

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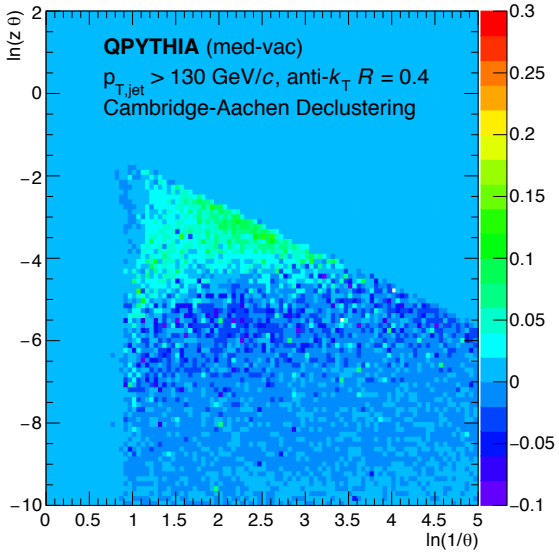
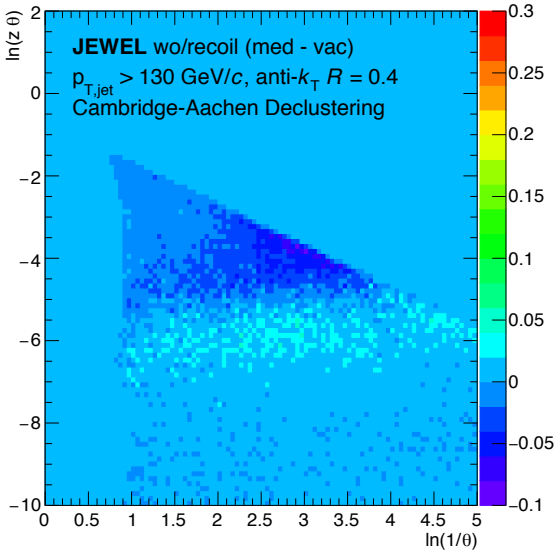
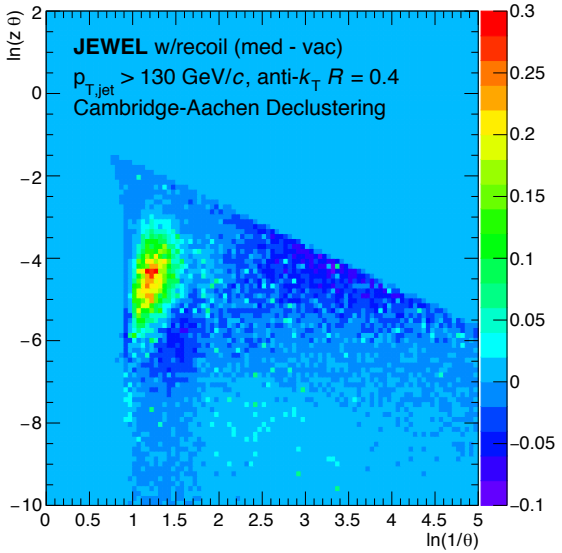
[Task 2]

Selection of jet substructure observables sensitive to specific scales/features of jet-QGP interaction







endow jets with a history [clustering tree] to explore sensitivity to scales

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Update on progress

- Search for postdoctoral researcher [responsible for bulk of simulation and work] underway :: expected to start Jan 2020
- First WP annual meeting scheduled for 5-7 Feb 2020 in Lisbon
  - Discuss and validate definition of reference implementation [common fiducial setup]
  - Widen participation to new institutes
  - ~30 participants expected
- Participating institutions [enlarged from proposal due to people's movement]:
  - Charles University (Czech Republic); Nuclear Physics Institute of the Czech Academy of Sciences (Czech Republic); IPhT, CEA-Saclay (France); École Polytechnique, Paris (France); LPTHE (France); **Nikhef** (The Netherlands); U. Bergen (Norway); **LIP** (Portugal); U. Barcelona (Spain); U. Santiago de Compostela (Spain); U. Birmingham (UK); CERN; University of Oxford (UK); Lund University (Sweden)

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NA3: Deliverables

- Deliverables due for Reporting Period 1 (18 months, June 2019-November 2020): D14.1 is due M8 (January 2020) and D14.2 is due M14 (July 2020)

Deliverable Number[14]	Deliverable Title	Lead beneficiary	Type[15]	Dissemination level[16]	Due Date (in months)[17]
D14.1	Reference model implementation	39 - LIP	Other	Public	8
D14.2	Reference data samples	39 - LIP	Other	Public	14

- D14.1 'Reference model implementation'. Software providing reference implementation of jet-QGP dynamics in a full heavy-ion simulation as Monte-Carlo event-generator based on combination of existing tools.

on-track
:: preliminary version to be delivered on-time
:: final version to be validated during Feb 2020 [M9]

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NA3: Deliverables

- D14.2 ‘Reference data samples’. Benchmark Monte-Carlo datasets generated using the reference model execution for the evaluation of the sensitivity of observables to the underlying physical mechanisms.

on-track
:: possible delays if adopted reference model implementation leads to time consuming simulations
:: preliminary version of reference model implementation is SIMPLE
:: hiring delays of postdoctoral researcher can delay delivery

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NA3: Milestones

- MS15 corresponding to D14.1 has to be achieved M8
- prelim version will made available in public repository my M8
- Final version [validated by WP meeting] will be public M9

Milestone number[18]	Milestone title	Lead beneficiary	Due Date (in months)	Means of verification
MS15	Delivery of D14.1	39 - LIP	8	Software in public repository

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