


COYOTE

LhC Tune and cOmbine heavY iOn experimenTal rEsults

(nee HonexComb,
Heavy Ion Experimental Combination)

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LHCTuneAndCombine

The basic idea

- Honexcomb was a platform part of the Strong2020 project born to combine experimental results in the field of Heavy Ion Physics and estabilish cross-collaboration discussions. The project was quite successful (2 papers, 1 poster, several activities)
- We would like to propose a similar scheme but strenghtened by the previous experience
- BASIC IDEA:
  - To combine results from the main four LHC experiments, *mainly* in the field of Heavy Ions
    - Four co-chairs, one per experiment, plus two chairs from theory
  - To setup a common platform to present and discuss the results

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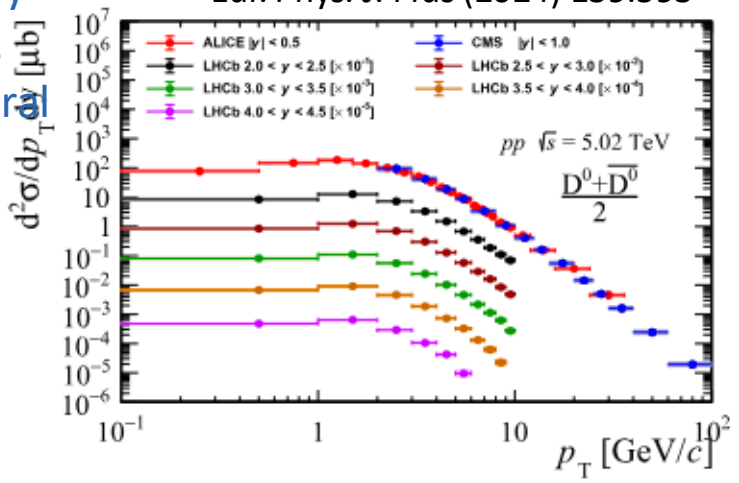

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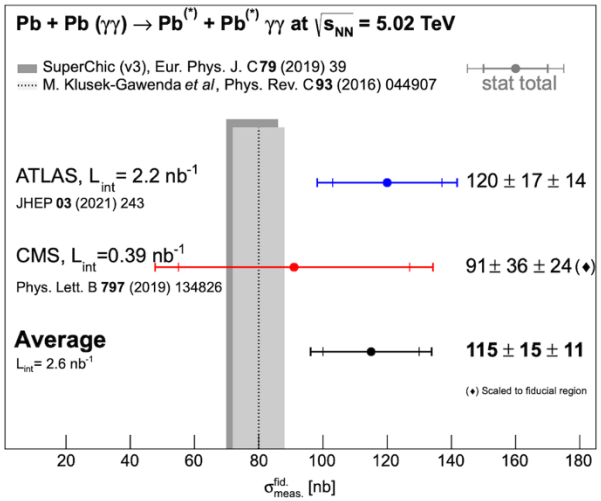
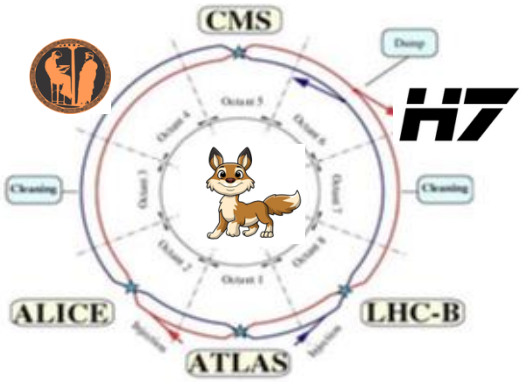
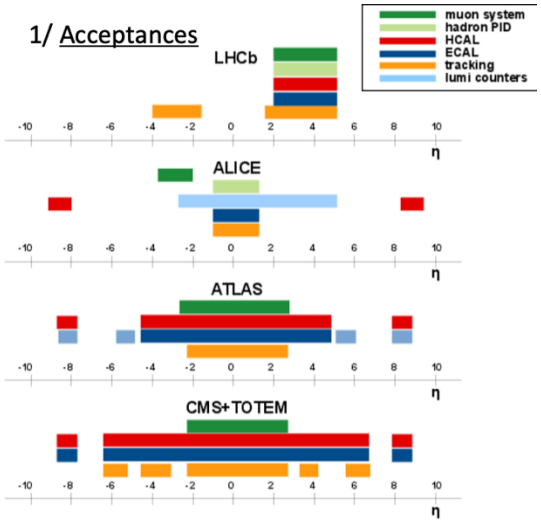
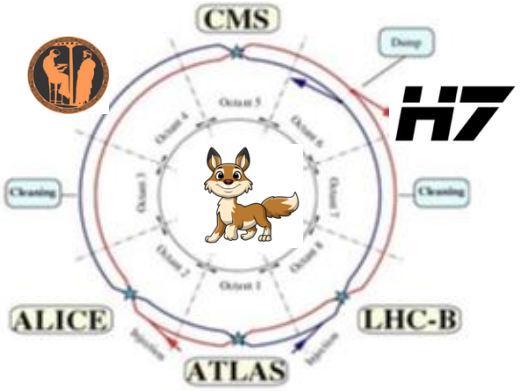


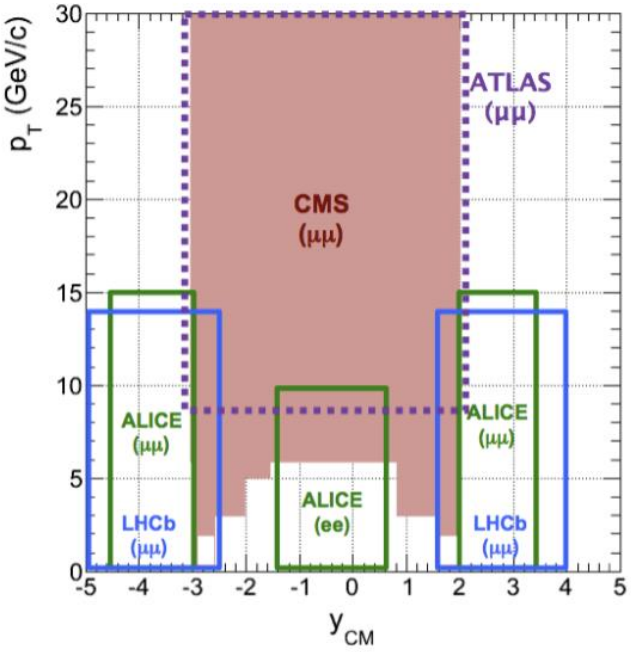


Complementarity

- Acceptance
  - The experiments cover complementary regions of rapidities and pT







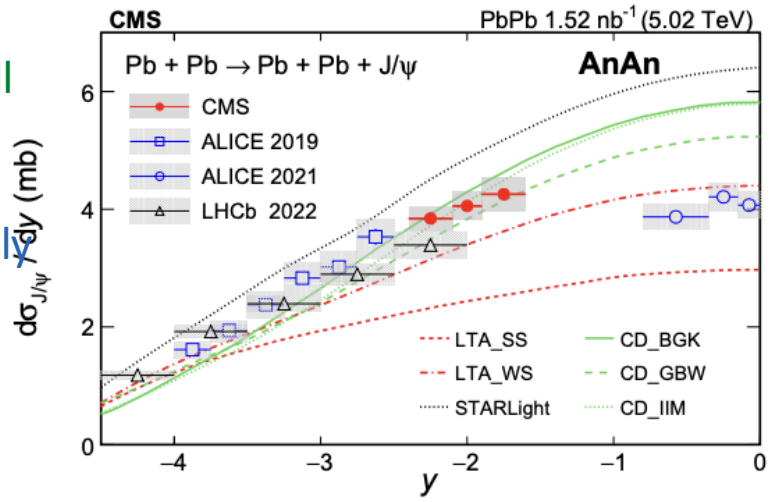
- Performances
  - Some better equipped for precise hadron PID (LHCb, ALICE)
- Bandwidth and triggering
- Synergy with the theorists involved in MC generators essential

What did we learn and what there is still to do

- There is a lot of interest in the subject
- It is possible to work together concentrating on each other's strong points
- We learn from each other
- We miss combination or even comparison papers
- Having the right simulation and tuning is **crucial**
- Sometimes it is hard to find theory predictions

TO DO: a lot!

- Identify common observable to measure, and/or to measure against
- Define Monte Carlo tunes which are valid for all experiments, for each collision system so they can be shared
- Setup statistical tools for combination, especially analyses with low statistics
- Better and common pp references



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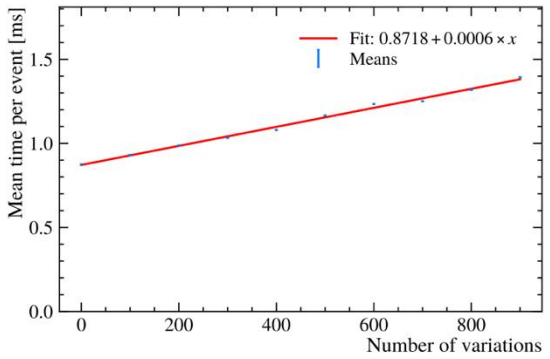
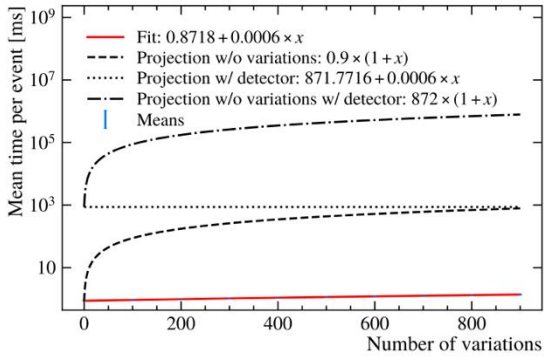
What did we learn and what there is still to do

- There is a lot of interest in the subject
- It is possible to work together concentrating on each other's strong points
- We learn from each other
- We miss combination or even comparison papers => lack of menpower
- Having the right simulation and tuning is **crucial** => MC also need people
- Sometimes it is hard to find theory predictions => improve communication

TO DO: a lot!

- Identify common observable to measure, and/or to measure against
- Define Monte Carlo tunes which are valid for all experiments, for each collision system so they can be shared
- Work on reducing the theory uncertainties
- Setup statistical tools for combination, especially analyses with low statistics
- Better and common pp references



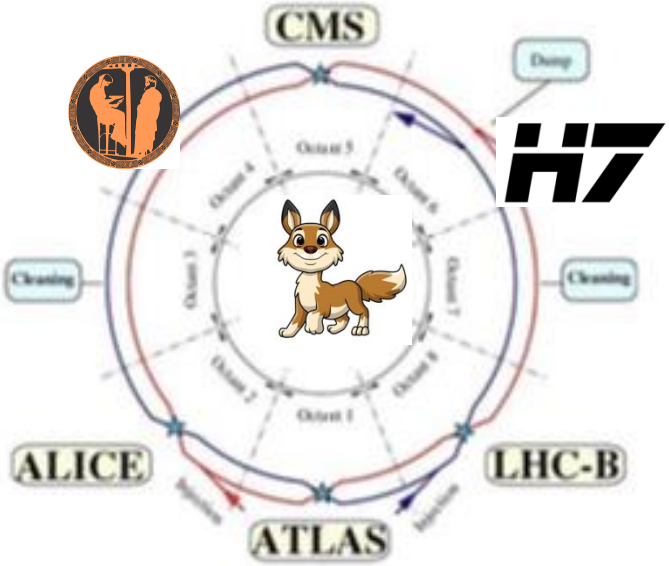


https://arxiv.org/pdf/2505.00142

What do we ask

- One person per experiment/MC
  - Can be post-doc / PhD students
  - Possibly changing experiment, better if at CERN or going often
  - At least 4 of the 6 proponents involved in the hiring process

- A possible set of physics topics
  - Common multiplicity variables
  - Jets
  - Quarkonia and quarkonia feed-down
    - Benchmark measurement to perform and cross-check the tuning



=> Many interested people (do not list them all)

=> Good timing !!

  - Use run 3 and prepare for run 4 data

Main activities

- Postdocs/students will meet once a month to discuss the basis and progress of common work
  - Comparison of methods, event selections, centrality/multiplicity,

    real time simulation/data comparison on the fly, definitions, beam requests, etc.
  - Perform comparative studies of physics results, combine them (with proper statistical tools), think of (new) common publications
  - Discussion of the next running strategies…
- Clear task assignments and timescale

  => One publication per postdoc/1.5y would be a success

  => Need for open forum to be discussed
- **Unique place of interactions with MC theorists**
  - N.B. we have on board members of the only two ML hadronisation groups, HADML and MLHAD, as well as authors of Pythia and Herwig.
- Think about the long-term idea of cross-collaboration analyses

  and data preservation (DPHEP initiative)
- Revitalise the LHC HI group **=> ONLY PUBLISHED RESULTS USED**

Budget

- 5/4 postdocs + 1/2 PhD
  - Possible exploring co-funding, co-supervision
  - Travel can be minimal on own funds

Year of contract	1st	2nd	3rd	4th	Total
Postdoc salary UniCA	53	53	-	-	106
Postdoc salary IFJPAN	45	45	-	-	90
Postdoc salary AGH	45	45	-	-	90
Postdoc salary EP	53	53	-	-	106
PhD salary UJ	25	25	28	28	106
PhD salary LU	85	85	85	85	340
Total	838 k€.				

Table 1: Funds requested in k€.

The End