

Experiment-Theory Interface for the Heavy-Ion Community

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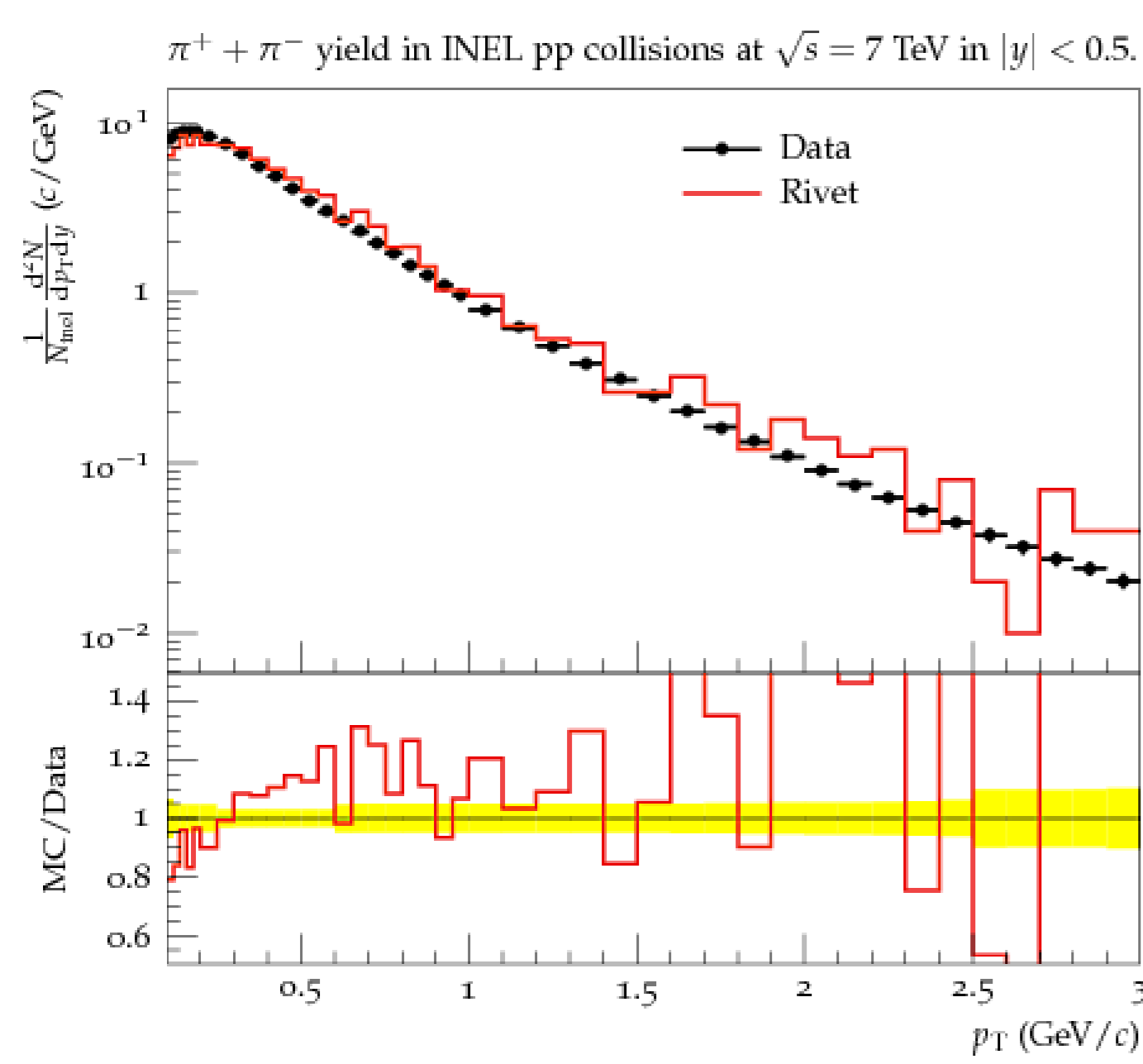
INTRODUCTION

The comparison of experimental data and theoretical predictions is crucial for our understanding of the mechanisms for particle production in hadron collisions at the LHC. In order to help with this, a system for event generator validation and tuning called Rivet and a project called MCPLOTS were developed.

Up to now, they do not fulfil the requirements of many of the heavy-ion analyses, which usually require calibration steps, comparisons of AA and pp collisions, and/or binning in global event observables. Significant extensions were made to adapt this software to the needs of such analyses. We present the first prototype of an experiment-theory interface intended to be used by the whole heavy-ion community.

RIVET

Rivet (Robust Independent Validation of Experiment and Theory) is a **generator-independent analysis framework** used as a system for validation and tuning of event generators.



An example of the plot produced using the Rivet framework [EPJC 75 (2015) 226]

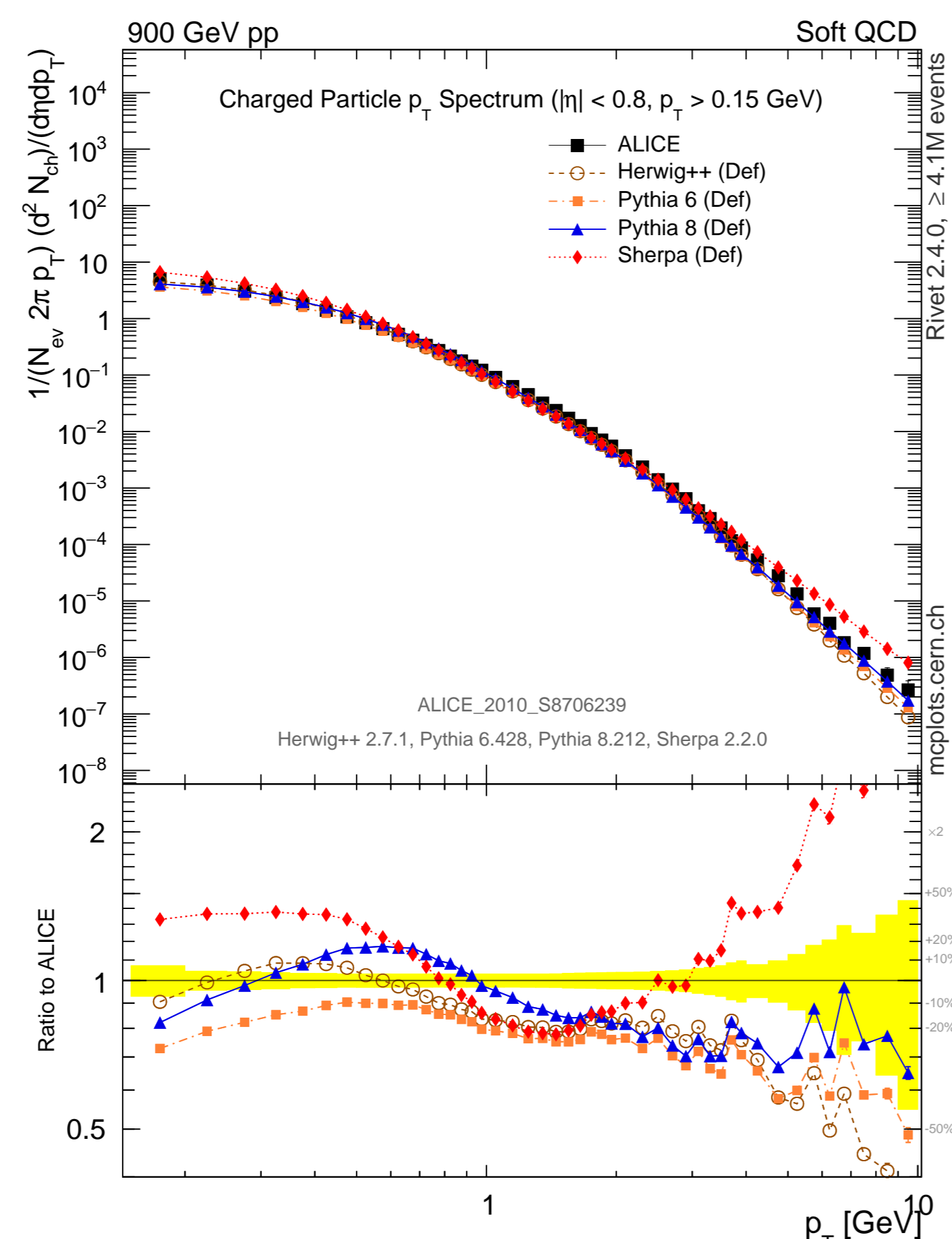
It provides:

- ▶ a large **set of experimental analysis algorithms** together with the published data
- ▶ a **fast and direct comparison** of different generators and experimental data
- ▶ a possibility for the **preservation of the analysis algorithms**

MCPLOTS

The **MCPLOTS** project is a **particle physics resource based on volunteer computing**. Its main objective is to enable anyone to quickly get an idea of how well a particular model describes various data sets. Main features:

- ▶ provides a simple online repository of plots in a form of a web site: <http://mcplots.cern.ch/>
- ▶ uses **LHC@HOME** framework for cloud computing
- ▶ relies on the Rivet analysis tool, the HEPDATA database and a number of the most common MC event generators

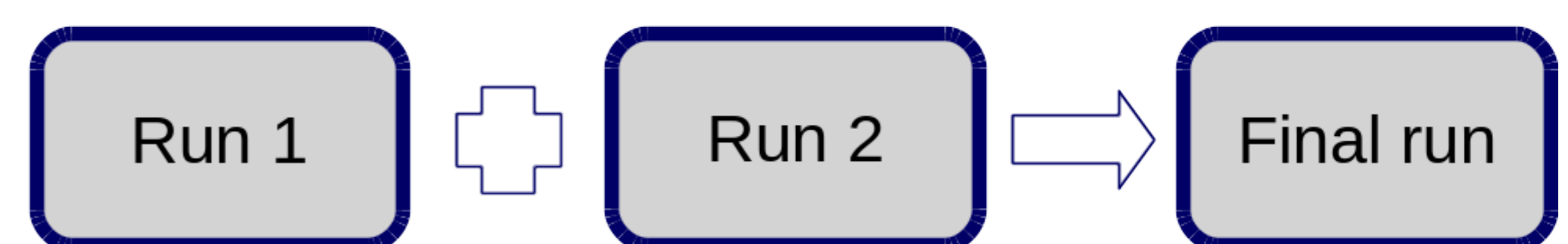
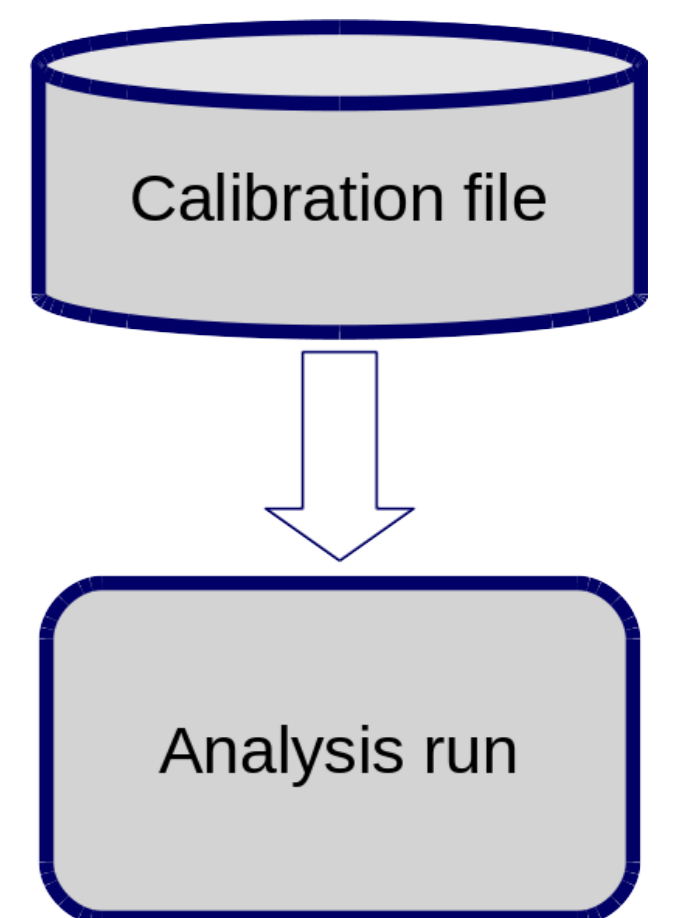


An example of a plot produced using the MCPLOTS framework [Phys.Lett. B693 (2010) 53-68]

HEAVY-ION EXTENSIONS

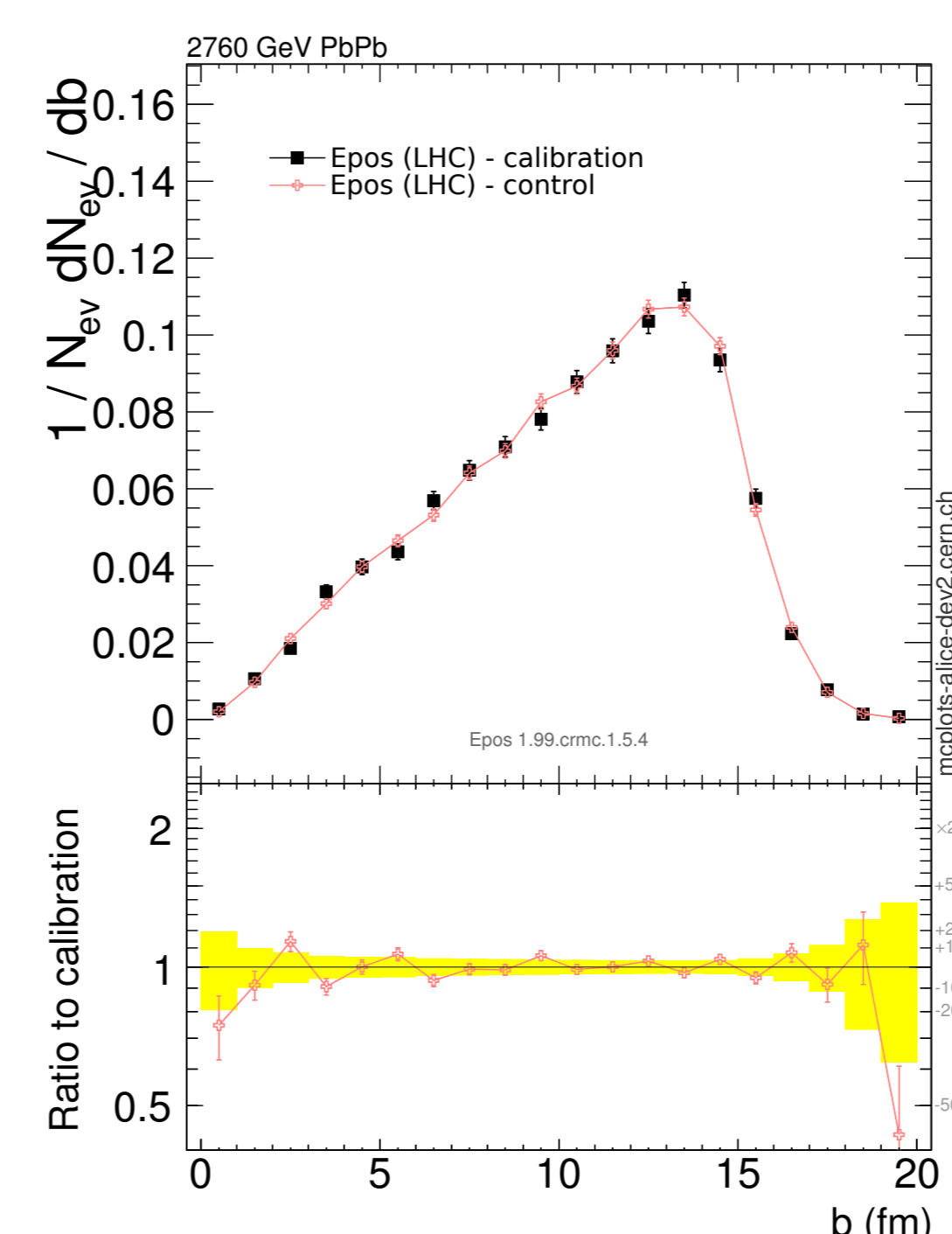
A number of functionalities were developed and introduced in Rivet and MCPLOTS:

- ▶ providing calibration files for the analysis to calculate global event observables
- ▶ presenting plots with different bins in centrality, thrust etc.
- ▶ producing on-the-fly histograms to increase statistics or to control the correctness of calibration histograms
- ▶ running an analysis with provided input files from the previous runs, e.g. to create AA/pp ratio

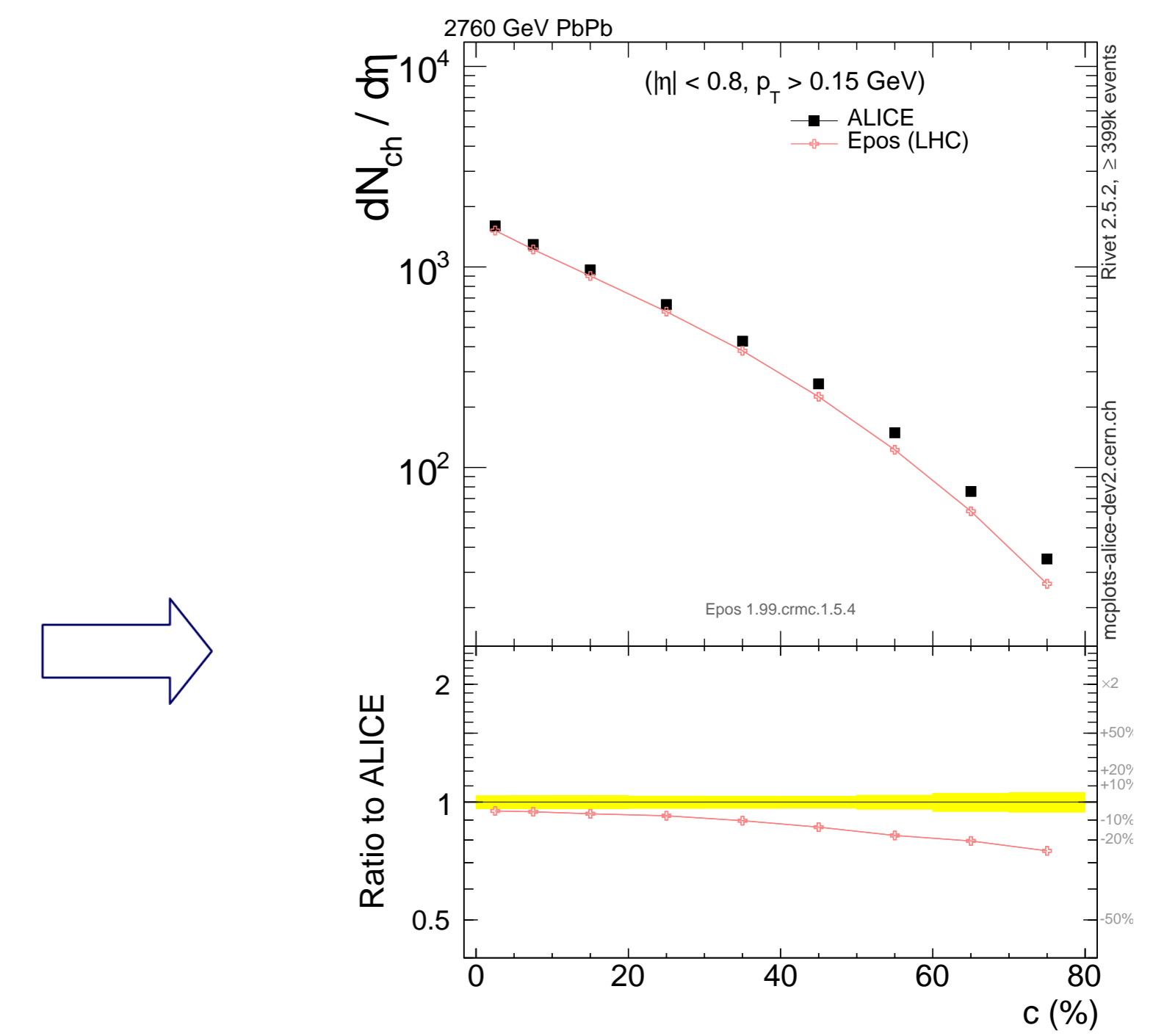


RESULTS

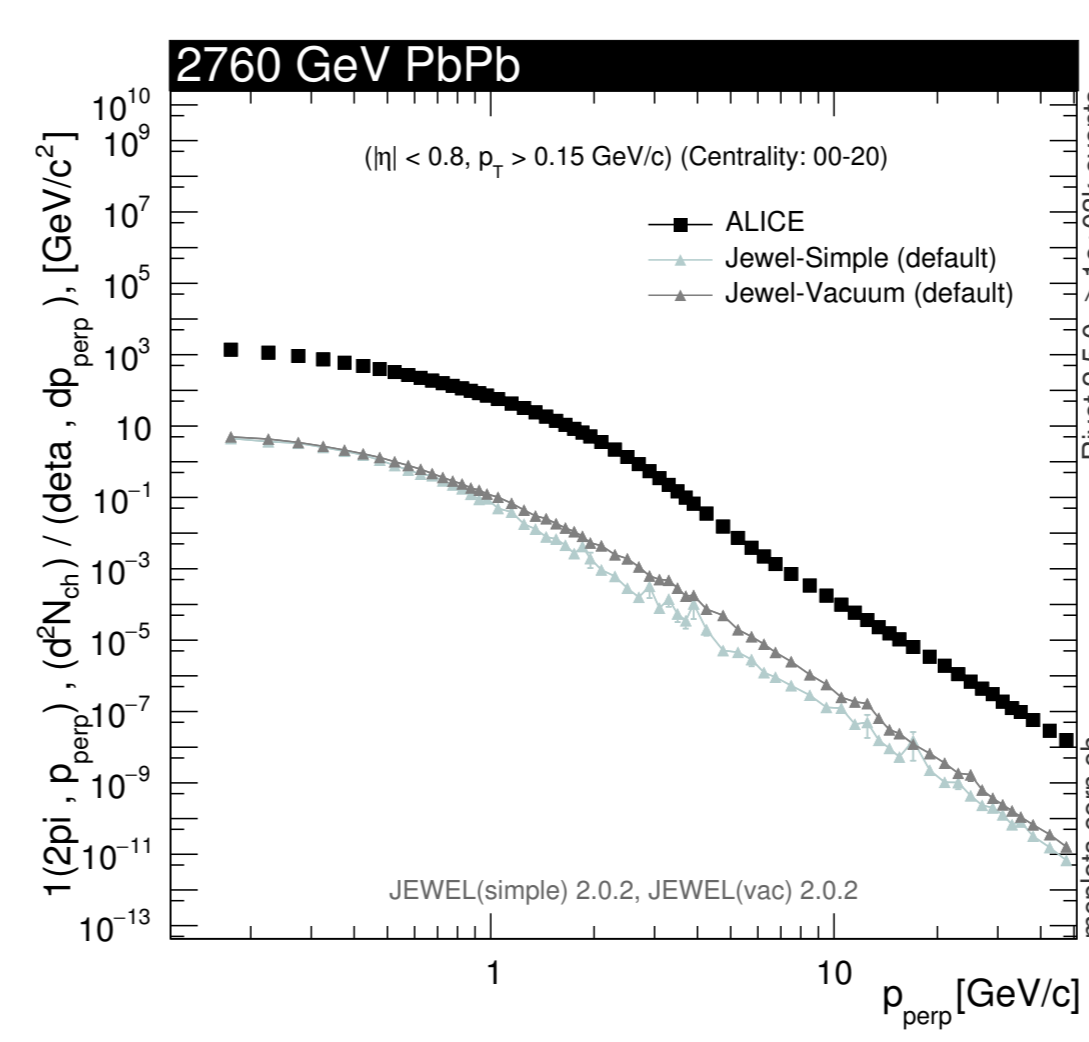
The current status of the development of Rivet already enables the preparation of the first heavy-ion analyses. The development version of MCPLOTS was prepared and several analyses were introduced in order to test the new heavy-ion functionalities.



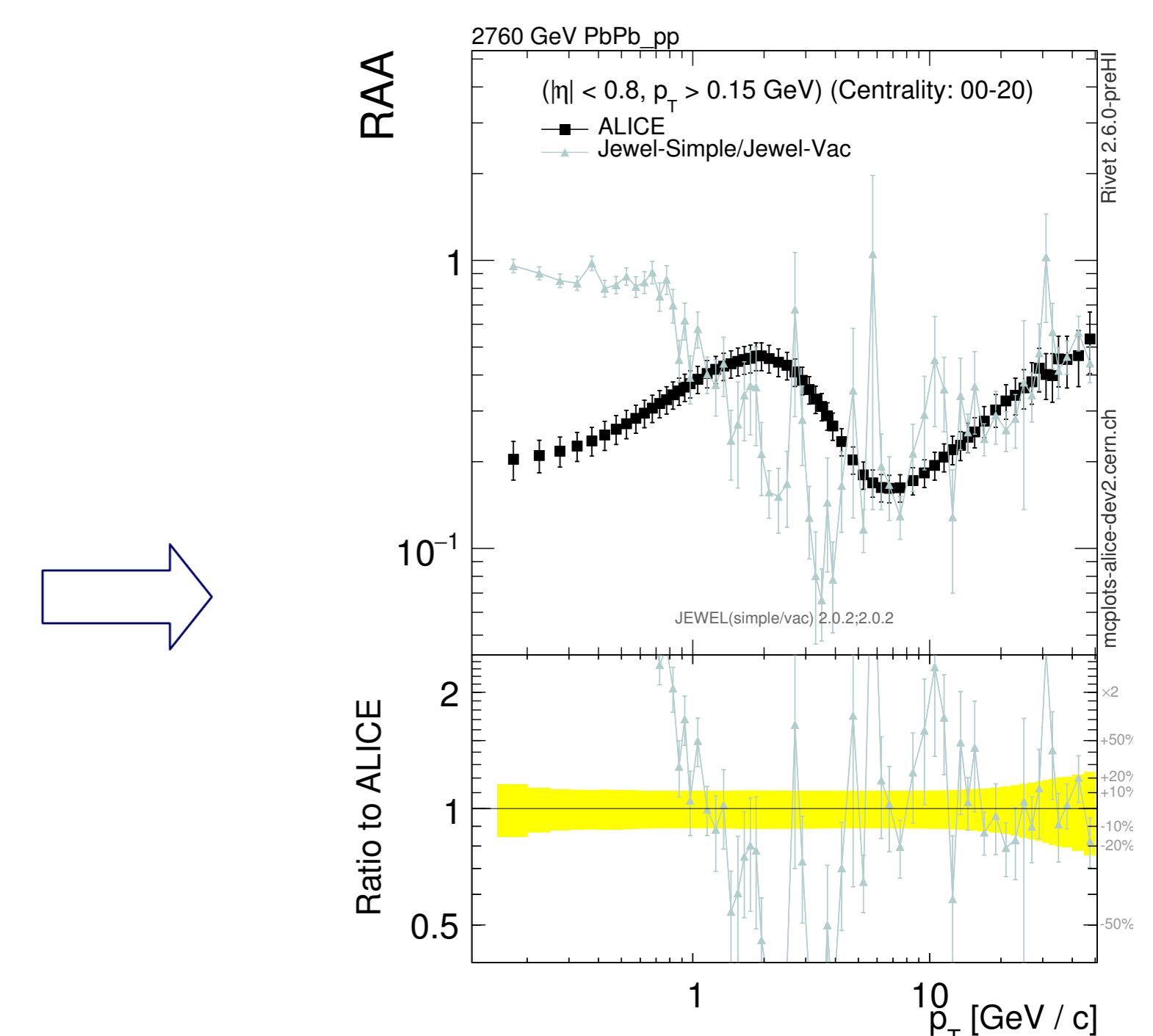
An example of calibration and control histogram: impact parameter distribution



Results for the analysis with calibration file used as an input [Phys. Rev. Lett. 106 (2011) 032301]



An example of the first and the second run used for creating a ratio



Third run with the output from the first and second run used as an input [Phys.Lett. B720 (2013) 52-62]

SUMMARY

The first prototype of the experiment-theory interface for the heavy-ion community is prepared. It is already possible to run the first heavy-ion analyses using this framework and the integration of the proposed changes into the official Rivet and MCPLOTS software is ongoing. The future version of this project is intended to include more analyses with other heavy-ion specific aspects.