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## ***STRONG-2020***

*“The strong interaction at the frontier of knowledge: fundamental research and applications”*

*has received funding from the European Union’s Horizon 2020 research and innovation program (10 MEuro)  
since mid 2019*

*<http://www.strong-2020.eu/>*

But suffers practically since the beginning from the CORONA restrictions which made **many activities impossible**

STRONG-2020 supports three activities:

- ❑ Transnational access (FAIR/ ELSA/COSY/MAMI but also ECT\*)  
support of people for experiments or workshops at these places
- ❑ Joint research activities  
to bundle detector, accelerator and software development of the different partners/infrastructures
- ❑ Networks  
to allow for the communication/ exchanges/workshops between the different participating research laboratories

One of these networks is [NA7-Hf-QGP: Quark-Gluon Plasma characterisation with heavy flavour probes](#)

It has 30 participating theory groups and about 20 experimental groups

## This network deals with all what is important for heavy quark physics

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- initial conditions in pp, pA and AA collision
- cold nuclear matter effects in pA
- formation of a QGP in pp(?) and AA collision
- interaction of heavy quarks with the QGP
- hadronisation
- final (hadronic) interactions

One of the primary **goals of our** network:

**Improvement of the theoretical interpretation of the pp, pA and AA data**

10 months of postdoc (5 months theory, 5 months experiment)

After inquiry of theoretical and experimental groups: **RIVET may be a good starting point**  
(although originally designed for pp collision)

First [workshop on 8.4. 2021](#) (for exchange of ideas and identification of problems)

<https://indico.cern.ch/event/1022351/>

Participants :

code owners (UrQMD, PHSD, EPOS, SMASH, ANGANTYR, Catania)

RIVET development teams for HI collisions from ALICE, CMS, LHCb, HADES and Christine

The next meeting is planned when we can meet here in Europe again in person.

**The results:**

Despite being developed for pp collisions, theory as well as experiment consider RIVET as a **good starting point** for HI coll.

The application of RIVET by the theory groups for HI has created **quite a number of problems** which have been solved by a very appreciated collaboration with the experimental RIVET development teams.

Before starting with a further development of RIVET for HI collisions **a couple of questions have to be addressed**

How do we want to compare theory with experiment (in the perspective to reduce the error bars?)

- ❑ How to adapt RIVET to the complexity of heavy ion collisions
  - on which level we want to compare data?  
(weak decay reconstruction, double hits, resonance decay, unknown hadronic cross sections...)
- ❑ How to model centrality dependence and/or collective variables (and no models)?  
centrality dependence (simulation of the 0° counter)
- ❑ How to deal with experimental extrapolations  
(for example:  $\gamma$ -distribution based on integration of a (only partially measured)  $p_t$  distribution)?
- ❑ Comparison should be made only with observed quantities  
Quantities like  $N_{\text{part}}$  or  $b$  should not be part of an analysis
- ❑ What information does the codes have to /can provide (disc space, running time)?  
HEPMC too heavy,  
in codes with hydro not even possible  
has at least to be adapted (disc space) or better Oscar format (ideas)

- ❑ How to accommodate **observables which can only be calculated perturbatively** (like photons, dilepton) ?
- ❑ How to assure **quality control**?
  - theoretical models have parameters and complicated input files
  - C++ files can be modified
- ❑ How to deal with **models not adapted for RIVET**?

These questions can be solved by discussions between the code owner and the RIVET development teams

There are some additional issues which need a broader part of the community to be solved:

How to deal with preliminary data? Scientific discussions (conferences, proceedings etc) are based on new, preliminary data. What is the sense of a RIVET analysis a long time later and only for the records?

The very experimentally oriented RIVET analysis raises also the questions of the place of the theory groups in the comparison of data with theory.

Theory needs data for further analysis and development of the transport approaches before the final RIVET analysis is done.

To get funded it needs also theory/experiment comparison beyond the common graphs in experimental papers.

These questions have been addressed but presently no solution is found.