

Pheno :: 2022 highlights

LIP Advisory Committee, 27 Apr 2022

Progress in Particle and Nuclear Physics 127 (2022) 103990



Review

Heavy quarks and jets as probes of the QGP

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ARTICLE INFO

Article history:
Available online 2 September 2022

Keywords:
Quark-Gluon Plasma
Jets
Heavy-flavor
Quarkonia

ABSTRACT

Quark-Gluon Plasma (QGP), a QCD state of matter created in ultra-relativistic heavy-ion collisions, has remarkable properties including, for example, a low shear viscosity over entropy ratio. By detecting the collection of low-momentum particles that arise from the collision, it is possible to gain quantitative insight into the created matter. However, its fast evolution and thermalization properties remain elusive. Only the usage of high momentum objects as probes of QGP can unveil its constituents at different wavelengths. In this review, we attempt to provide a comprehensive picture of what was, so far, possible to infer about QGP given our current theoretical understanding of jets, heavy-flavor, and quarkonia. We will bridge the resulting qualitative picture to the experimental observations done at both the LHC and RHIC. We will focus on the phenomenological description of experimental observations, provide a brief analytical summary of the description of hard probes, and an outlook towards the main difficulties we will need to surpass in the following years. To benchmark QGP-related effects, we will also address nuclear modifications to the initial state and hadronization effects.

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the status of jet and heavy quark Physics in QGP after two LHC runs
[th/ph/exp review]

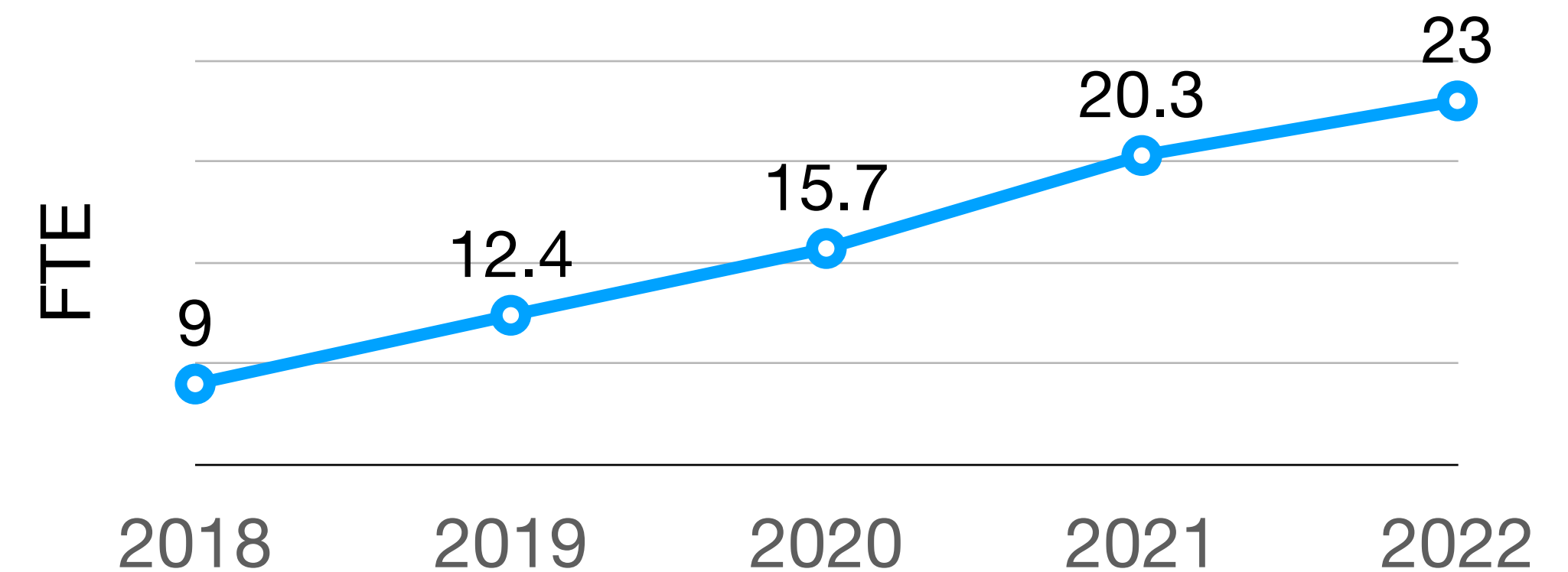
+ diversified portfolio of publications [with large synergy with CC on Simulation and Big Data]

Maria Ramos [first PhD in the group, Jan 2022]

:: best thesis 2022 award from School of Sciences of U.Minho

Guilherme Guedes [second PhD in the group, Sep 2022]

[8 PhD ongoing; 6 MSc concluded, 5 ongoing]



steady sustained growth since group creation

PHENO SWOT

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STRENGTHS

- Internationally recognised and very active research of high impact
- Growing number of students being trained in the group across the different research topics
- Demonstrated ability to seek competitive National/European funding

WEAKNESSES

- Insufficient critical mass to physics addressed by experimental groups at LIP
- Most of the senior members still depend on temporary contracts

OPPORTUNITIES

- Increasing ability to attract PhD students in the framework of the PT-CERN Grants
- Large growing network of international collaborators

THREATS

- Uncertainty in the ability to retain current precariously employed researchers and corresponding risk in demoting established activity areas within the group.
- Reduction of available PhD grants and consequently reduction in ability to attract students.