

Referee report on the Project ATLAS (JINR participation)

(referee Antonio Ereditato; antonio.ereditato@lhep.unibe.ch)

The report given to the Program Advisory Committee of JINR on 19th June 2019 outlines the present status of the operation, maintenance and physics analysis activities being carried out by the JINR researchers in the framework of the CERN LHC ATLAS experiment and deals with the plans in view of the future activities to be carried out in the years 2020-2024. The detector upgrade work is not included here: it refers to a different project. The referee notes that there is overlap between the participants in the two projects, with 27 FTEs over 44 people involved in the upgrade activities.

The LHC and the ATLAS experiment have performed extremely well in the last years, collecting a large amount of data at record energy and luminosity. This allowed the Collaboration to produce a wealth of data analyses and scientific publications. The JINR ATLAS group (as derived from the presented document) includes 70 people out of which 50 from DLNP, 10 from LIT and 10 from VBLHEP. The number of FTEs (excluding those included in the upgrade project but also in the list of the present proposal) is 29.

The JINR group played an important role over many years with relevant contributions to detector construction and operation (Muon System, Liquid-Argon Calorimeter, Barrel Tile Calorimeter, Inner Detector, Magnets, Trigger TDAQ and GRID computing infrastructure), as well as on the data taking and analysis. For the latter, 29 journal publications were declared to be produced with JINR member contributions (2015-2019). From the official ATLAS data base of Active Authors, 6 JINR members each contributed to at least 3 publications: these authors can be considered as very active. The list of talks given at conferences in the same period is 25. No mention is given to student theses.

The service work carried out by the JINR group can be summarized by stating that the group fulfilled its obligations in terms of Operation Tasks (OTs) for the Class 1 and Class 2 groups (shifts), while only about 50% of the Class 3 group (expert operation) was accomplished. However, it seems that some corrective actions have been taken.

As far as the software and analysis activities proposed for the next period (2020-2024) one can note, in particular, Standard Model subjects:

- 1) Proton and structure functions. The JINR people have been pioneering these studies mostly in relation to the strange and charm sea contributions. Gluon momentum distributions will be addressed as well.
- 2) Heavy hadrons. This will mostly include physics of b flavored hadrons.
- 3) Measurement of Z bosons.
- 4) Bose-Einstein correlations.

As far as Higgs physics is concerned, the JINR group will address Higgs production in conjunction with heavy quarks. This will be complemented by a continued search for additional heavy bosons, SUSY and micro black holes, as far as exotics are concerned.

Although involved in many analyses with a nominally high number of FTEs, the referee is not explicitly informed about the number and the type of scientific responsibilities (coordination, convenership etc.). More information would be desirable about the work of the mentioned 14 young scientists and 12 postdocs.

The referee considers that the proposed activities for the next years are relevant and compelling. However, it would be probably better to concentrate the data analysis effort on fewer subjects where the JINR group could have a leadership role with a visible impact within the ATLAS collaboration. In this way, one could fully exploit the huge potential of a large and well-organized group such as JINR-ATLAS. Another item of concern is the lack of perspectives for the future involvement of students and young researchers and the increasing average age of the JINR contingent. Finally, it would be better to identify data analysis subjects for which the planned upgrade activities (muon system and calorimeters) play a crucial role, in order to design a comprehensive, coordinated and visible contribution of the two groups.

The budget request is globally adequate, but one could afford a fine tuning. In particular, one should have more information about the relation between the requested 300k\$ per year and the number of 34 active authors and the planned scheme for Class 3 tasks. In the same way, the referee would like to know how the funding profile is aligned with the periods within/without the LHC shutdown. Lastly, it would be desirable to have a clear picture of the specific duties/tasks of each of the team members, beyond the mere information on their FTE fraction.

The referee proposes to approve and grant funding for the first two years of the project and to unblock the second (third) part(s) only after a thorough and successful review of the first phase of the project (2020-2021).



Prof. Dr. Antonio Ereditato