

Referee report on the Project CMS (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 CMS 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 contribution is not firmly established, and it is currently subject of negotiations with the CMS collaboration.

The LHC and the CMS 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 CMS group (as derived from the presented document) includes 70 people out of which 2 from the management, 35 from VBLHEP (27 FTEs), 19 from LIT (3.8 FTEs), 7 from BLTP (0.7 FTEs) and 7 from DLNP (1.1 FTEs). The total number of FTEs is 32.9. It is a matter of concern that the 14 people from BLTP and DLNP are present at the total level of 1.8 FTEs: one should seriously reconsider the future role and impact of the two subgroups.

The JINR CMS group played an important role over many years with relevant contributions to detector construction and operation (Inner endcap calorimeter and Forward Muon Station), as well as on the data taking and analysis. For the latter, 7 journal publications were declared to be produced with JINR member contributions (2015-2018). The list of talks given at conferences in the period (2014-2016) is rather large, 43. Two PhD student theses have been accomplished and 20 including Bachelor and Master works.

The service work carried out by the JINR group can be summarized by stating that in 2017-2018 a total of 268 shifts were done, over an unknown total number of shifts. The group has also been active with data certification and with the regional operation center (ROC) at JINR.

The JINR-CMS group has been working on the R&D for Phase 1 and Phase 2 upgrades (forward muon stations, endcap muon system electronics, low voltage distribution boards, electronics test stands, and radiation hard studies). The work on Phase 1 included the upgrade of the endcap hadronic calorimeter, by replacing HPDs with SIPMTs. This work will be likely extended for Phase 2, also including optimization of calorimeter segmentation and reconstruction algorithms. More R&D work is being carried out on scintillator prototypes for the hadronic endcap to cope with the expected increase in the dose. The report presents a long list of details of the R&D activities.

As far as the planned data analysis activities, the JINR group intends to mainly address muon pair production (Drell-Yan). Although mentioned in the report, it is not clear to the referee which have been and will be the JINR contributions to the search for physics beyond the SM

and to the studies on the Higgs. On the other hand, there have been clear contributions on jet production studies, which will likely be continued.

As far funding is concerned, pending a final agreement on the future contributions, there are fixed shares such as fees per author that must be taken into account. In this respect, in recent years there has been a strong reduction of the number of authors (from 60 to 22) to cope with shortage of funding. The final balance of expenses in 2017-2019 seems to indicate a cost not completely commensurate to the scientific deliverables, in particular with the number of scientific publications driven by the JINR group. The present funding request can be fine-tuned. Also this must be repeated when a clear picture of the future activities will be available and an efficient internal reorganizations set in place, including a proper balance between the different laboratories.

In summary, the referee would like to see a few data analysis subjects to be addressed in the next years by the group, such to provide visibility to the group and attract young researchers and students. This will probably require a thorough internal discussion and an optimization of the person power resources. This issue is also closely related to the upgrade contributions which will be eventually decided.

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