Referee report on the Project "Upgrade of the ATLAS Detector"

(JINR participation)

The LHC Upgrade program is very well motivated by prospects of the full exploitation of the physics accessible with a total luminosity of 3 ab^{-1}. The large luminosity will allow to probe into signatures of new physics predicted by models such as SUSY in the multi-TeV region. Large data sample will allow precision measurements of the Higgs couplings, studying of rare channels (e.g. $H \rightarrow \mu\mu$) and the Higgs self-coupling. Measurement of the weak boson scattering cross-section remains rather important for BSM physics, as well as searches for heavy resonances.

The increased instantaneous luminosity at the HL-LHC results in average number of p-p interactions per bunch crossing ~ 200, which requires detectors to operate at high trigger rates and after exposure to large particle fluences. It is also worth noting that many components of the detectors are already 10-15 years old and will be approaching the end of their lifetimes. That is why some systems of the ATLAS detector would need to be upgraded in order to coop with high trigger rates and occupancies, to maintain good performance in tracking, flavor tagging and in precisely reconstructing the full range of physics objects (leptons, jets, E^{T}_{miss}) over large acceptance.

The ATLAS Phase-II Upgrade project includes replacement of the inner detector by a new all-silicon tracker, installation of a new trigger system with 500 kHz rate and a new readout for calorimeters and muon spectrometer. The Phase-I and Phase-II activities are carrying out in parallel. The JINR group is participating in the upgrade of the muon spectrometer and calorimeters from the beginning and since then has achieved rather good results. I would mention the construction and commissioning of the workshop for production of the Micromegas chambers. This important event marks the appearance in Dubna a new detector technology which could be applicable in the experiments at NICA. Interesting results were obtained in the radiation tests of the diamond sensors and new scintillators. Further developments of the Timepix detectors based on GaAs:Cr materials also may find many useful applications.

The JINR group has presented the project which includes activities in various areas of the ATLAS Upgrade. The responsibilities taking by the group in the detector development are realistic, although challenging. It is not clear for me how the required production rate in the DLNP micromegas workshop will be achieved. There is no slippage in tight schedule of the muon quadruplets production.

In general, the project is aimed at very important improvements of the ATLAS detector, it is based on 25 years of the group involvement in the detector development and maintenance. It is well balanced in terms of requested resources and the personnel. So, I would recommend the project continuation for the next 3 years.

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