**Report**

on the Project “Upgrade of the ATLAS detector”, Theme 02-0—1081-2009/2019,

*Project Leader – Alexander Cheplakov (VBLHEP)*

*Deputy Project Leader – Alexi Gongadze (DLNP)*

ATLAS is one of four major experiments at the LHC. It is a general-purpose particle physics experiment run by an international collaboration and, together with CMS, is designed to exploit the full discovery potential and the huge range of physics opportunities that the LHC provides. The largest volume detector ever built for a particle collider, ATLAS has the dimensions of a cylinder, 46m long, 25m in diameter, and located 100m below ground. The detector is a many-layered instrument designed to detect some of the tiniest yet most energetic particles ever created on earth. It consists of six different detecting subsystems wrapped concentrically in layers around the collision point to record the trajectory, momentum, and energy of particles, allowing them to be individually identified and measured. A huge magnet system bends the paths of the charged particles so that their momenta can be measured as precisely as possible.  
 The JINR group will be involved in the ATLAS upgrade projects upgrading the Muon Spectrometer and Calorimeters both in Phase-I, and in the later Phase II High Luminosity (HL-LHC) era*.*  The Group completed its job during the previous (2015-2017) period and has presented plans for the 2019-2021. The strategy of the Phase-I is to provide operation at peak instantaneous luminosities of up to 2.2 x 1034 cm-2 s-1 by enhancing trigger capabilities to meet also future Phase-II requirements. Let me remind that a total integrated luminosity of 3000 fb-1 is expected in 2035, that should provide possibilities to probe rare decays of the Higgs boson, improving considerably our knowledge about its self-coupling in the multi-TeV region. The HL-LHC will probe the deviations from Higgs couplings with respect to to the Standard Model up to a few percent. Also, it will enable measurements rare Higgs decays and production modes, such as H🡪Zγ, μμ and ttH to study production of Higgs pairs. Dubna’s ATLAS group seems to be prepared to this challenge. The JINR group contributed substantially to the development of the digital trigger electronics, baseplanes, testing and producing TILE calorimeter scintillators.   
 Although affiliated at JINR’s VBLHEP and DLNP laboratories, the group collaborates actively with the local IBR-2 reactor, where irradiation programs included tests of various components of the mini-FCal candidates. Furthermore, radiation tests of the HEC baseplane prototypes were performed in several runs at IBR-2.   
 The Project members are actively collaborating with many partners, e.g. by participating in the HiLum-1 and HiLum-2 experiments at the U-70 accelerator of the IHEP in Protvino or Nanjing University in China in testing single-crystal sensors. The JINR group will test the performance of various module schematics developed at CEA, France. In 2018 a mock-up of the HEC cryogenic electronics will be constructed. In collaboration with TRIUMF, Canada, it will allow to test electronics at conditions similar to those at ATLAS.   
 The JINR group proposed to use radiation hard scintillators in the “hot” area of the ATLAS detectors and provide new scintillator slabs for the renewal of MBTS. It participated also in the design and bench tests of the new readout electronics for the TILE hadron calorimeter, called Demonstrator.  
 It is important to note that a novel micromegas technology was brough to JINR by the group involved in the challenging project of the Muon Spectrometer modernization. New detectors may be used successfully in the in-house experiments in Dubna. Other technologies from the ATLAS upgrade program look also promising.   
 The DUBNA-ATLAS group counts 44 persons with reasonable partition: 27 physicists, 13 engineers and 4 technicians. Most of them are experienced experts, engaged in the project for many years.   
 Hereby, I acknowledge the impressive performance of the Dubna group during the past 2015-2017 period. I am supporting the aspirations of the authors for the next 3 years (2019-2021) with highest priority and requested resources.



Laszlo Jenkovszky, BITP (Kiev), PAC member, jenk@bitp.kiev.ua