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To those who may concern

Geneva, 06/07/2021

## **Report on the test of high performance RPCs assembled at USTC needed for the ATLAS upgrade**

In order to cope with the high instantaneous luminosity delivered by the HL-LHC accelerator, the ATLAS detector is undergoing the needed two-stage upgrades. For the muon trigger system in the barrel region, a layer of RPC chambers will be added in the inner barrel stations to increase the system selectivity and overall efficiency. The new RPC chambers are required to have increased rate capability and time resolution corresponding to the higher trigger rate in HL-LHC operation. A pilot exploration has been carried out in the BIS78 region.

The team from the University of Science and Technology of China, Shan Dong University and Shanghai Jiao Tong University, made important contributions to the design of the RPC detector and the Front End Electronics. The prototypes are constructed and extensively tested at CERN. The thin-gap RPC (1 mm gas gap), equipped with the new generation of low noise FEE, can sustain a rate higher than 1 kHz/cm<sup>2</sup>, with a time resolution better than 500 ps and efficiency higher than 95%. The spatial resolution of ~ 1 cm can also be achieved by the strip pitch of ~ 2.5 cm.

During the research and developments of the RPC technology, the feasibility of achieving a higher spatial resolution was considered. This is indeed possible but is not required in the current design of the phase II for the considerations of costs and compatibility with the current readout system.

The team has also contributed significantly to the production and test of the BIS78 RPC singlets. In total, 4 RPC singlets have been built independently by the team. The test results show that the performances of all of the singlets meet the requirements for the upgrade and two of them have been installed in the ATLAS system.

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