Resistive Plate Chambers installed for the new layer added to CMS muon system at CERN

A fourth station — called RE4 (Resistive Plate Chambers for the Fourth End-Cap)— will be added to the CMS endcap muon system during the ongoing LHC Long Shutdown (LS1 – 2013-2014). The CMS muon system consists of three different sub-detectors: RPCs (Resistive Plate Chambers), DT (Drift Tubes)and CSC (Cathode Strip Chambers). The endcap region is made of CSCs and RPCs in the first three disks and RPCs will be installed in the fourth disk as part of the RE4 project. The construction of the RE4 is an international project carried out by teams from institutes in Belgium, Bulgaria, China, Colombia, Finland, Georgia, India, Italy, Korea, Mexico and Pakistan as well as from CERN.

CERN plays an important role in the chamber construction and testing at the RPC laboratory located in building 904 at Prevessin where many physicists, engineers, technicians and students from around the world are working together, alongwith the assembly sites in Belgium (University of Ghent) and India (NPD-BARC). RE4 consists of 72 super-modules, each of which is made by two RPCs (Fig. 1), for a total of 144 double-gap RPCs. Nineteen institutions involved with the RPCs cover all the tasks and have been working very hard since the beginning of 2012, in order to complete the project by the end of 2014. These tasks are distributed among the following countries: Korea is responsible for the construction of 660 gas gaps and 10 chambers. Pakistan, Italy and Finland are working on the front-end electronics, DAQ and power system while India (NPD-BARC) is building and characterizing 50 RPCs, apart from fabricating 200 cooling sets (MD&PDD-BARC) for the entire collaboration. Bulgaria, Mexico and Georgia are responsible for super-module assembly and testing. India, Italy and Pakistan are building

Fig. 1 : The Super Module Assembly

Fig. 2 : The recently installed, positive side of the RE4, 100 metres below the ground, at Point 5 (CMS at the LHC facility) in Cessy, France is approximately 15 metres in diameter, weighing close to 5 tons

the chamber services (gas, cooling and cabling). China provides the readout strips, mechanical frame boxes and participates in the chamber construction and testing at CERN. A large international team will work on the installation and commissioning of the full system. So far, the three assembly sites have produced 72 RPC detectors, corresponding to 36 super-modules; these were installed earlier in December 2013 (Fig. 2 – positive side of endcap). The production for the second endcap disk (negative side) started in September 2013 and is almost getting completed. The installation and commissioning of the same is scheduled during middle of 2014.