Nuclear Instruments and Methods in Physics Research A 602 (2009) 658–664

Contents lists available at ScienceDirect

Nuclear Instruments and Methods in Physics Research A

journal homepage: www.elsevier.com/locate/nima

# Construction and tests of the MRPC detectors for TOF in ALICE

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ARTICLE INFO

Available online 24 December 2008

*Keywords:*
ALICE
MRPC
Strip
Module
Supermodule
Front-End ASIC (FEA)
FEA controller (FEAC)

ABSTRACT

CERN-LHC (Large Hadron Collider) accelerator facility will provide heavy ions (Pb–Pb) collisions with a center-of-mass (CM) energy of about 5.5 TeV per nucleon pair. In the extreme conditions of temperature and energy density created in such collisions, a transition from hadronic matter towards a deconfined state of quarks and gluons is predicted by Quantum Chromodynamics (QCD) calculations on the lattice. The Time Of Flight (TOF) detector system of the ALICE (A Large Ion Collider Experiment) apparatus, is presently progressing in the assembling process at LHC at CERN. The TOF, in combination with the other central tracking detectors of ALICE provides an excellent Particle IDentification (PID) in the momentum range 0.2−2.5 GeV/$c$ for K/$\pi$ and up to 4 GeV/$c$ for K/p. The ALICE TOF is a barrel detector consisting of double-stack Multigap Resistive Plate Chamber (MRPC) strips, equipped with readout pads. The MRPC is characterized by an intrinsic time resolution below 50 ps and an efficiency over 99%. The assembling procedures, the tests of mechanics, cooling system and electronics of the 8 m long TOF "supermodules", together with the performance tests before installation in the experimental area, will be presented.



## 1. Introduction

In ultra-relativistic heavy-ion collisions, temperature and energy densities are expected to be large enough to lead to the transition from hadronic matter to a deconfined state of quarks and gluons predicted by QCD [1]. The results from the first fixed target experiments at the CERN SPS have given a first indication that a weakly interacting system of quarks and gluons, like an ideal gas, is formed during the collision [2]. Following the experimental observations at the RHIC collider, a strongly interacting system of quarks and gluons, like an ideal liquid, could be created during the collisions [3]. The study of the deconfined phase of the matter can be pursued with LHC, where the available energy in the collision will be a factor 30 greater than the one at RHIC. The ALICE (A Large Ion Collider Experiment) [4] is the CERN-LHC experiment specifically designed for the study of heavy ion collisions. The Time Of Flight (TOF) detector system is a large-area array of gaseous detectors that covers the central pseudo-rapidity region ($|\eta| \leqslant 0.9$). It is devoted to PID in the intermediate momentum range (few hundred MeV/$c$ to few GeV/$c$). It has a modular structure corresponding to 18 sectors in the azimuthal angle $\varphi$ ($0^\circ \leqslant \varphi \leqslant 360^\circ$) and to five segments in the longitudinal coordinate along the beam axis $z$. The whole device is located inside a cylindrical shell with an internal radius of 370 cm and an external radius of 399 cm. The basic detector of the TOF system is the MRPC (Multigap Resistive Plate Chamber) "strip" [5] (a cross-section of a MRPC strip in Fig. 1), providing excellent time resolution (below 50 ps) and efficiency (above 99%). With this

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doi:10.1016/j.nima.2008.12.075

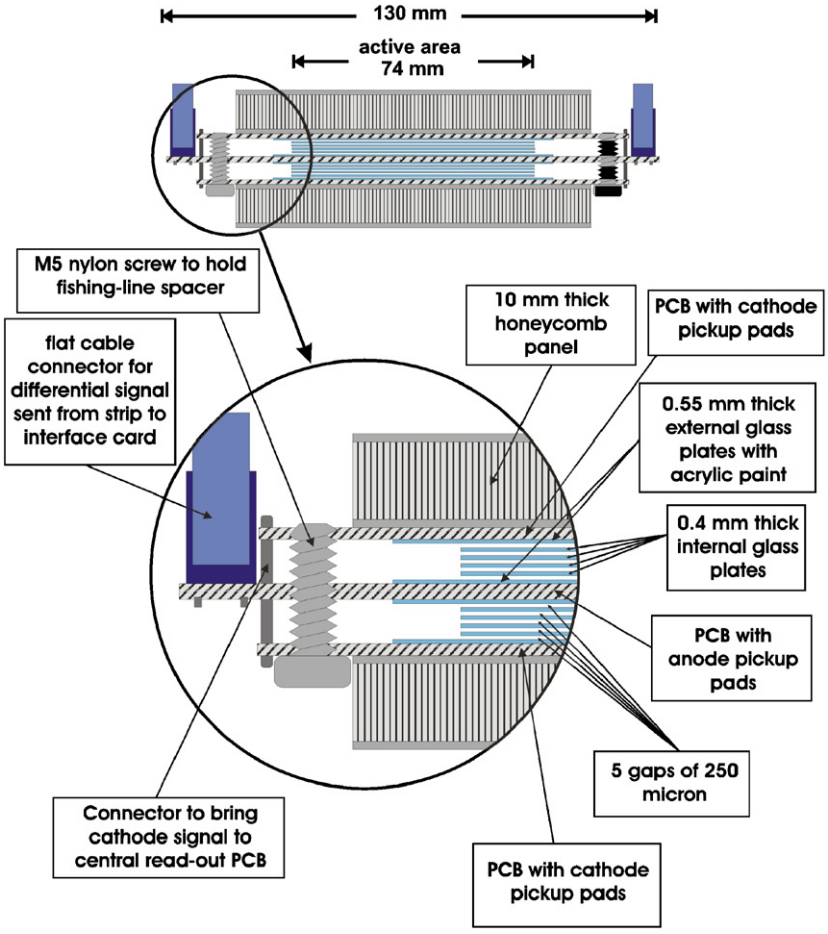


**Fig. 1.** Cross-section of ALICE TOF MRPC strip.

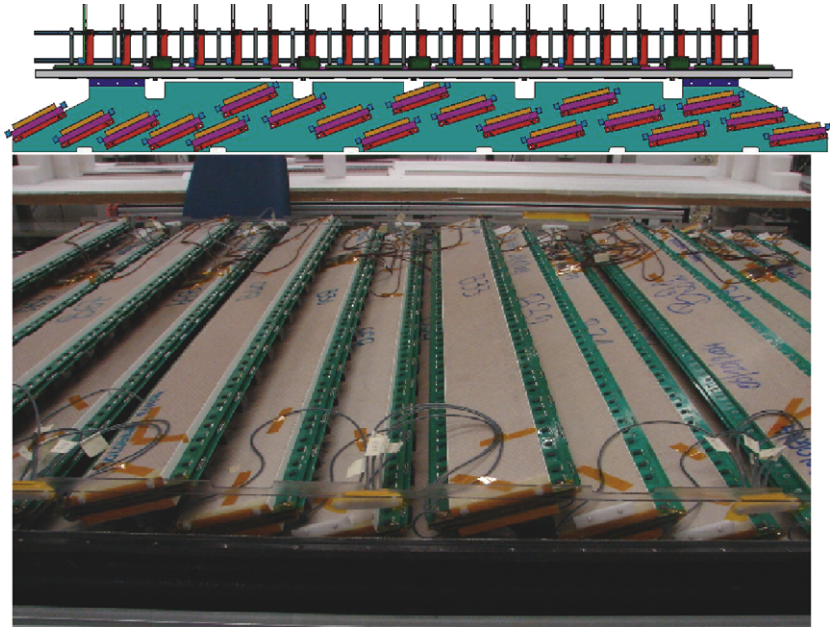

**Fig. 2.** A scheme and a picture of tilted geometry for TOF MRPC strips, in an intermediate module.