# A new type of RPC with very low resistive plates

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PM2018 - 14<sup>th</sup> Pisa Meeting on Advanced Detectors, 27 May- 02 June 2018, La Biodola, Isola d'Elba, Italy

#### Introduction

Triple GEM (Gas Electron Multiplier) detectors will be used in the first two stations of the CBM (Compressed Baryonic Matter) muon chamber (MUCH) at the future Facility for Antiproton and Ion Research (FAIR) in Darmstadt, Germany. Given the interaction rate of 10 MHz the expected particle flux on the first station of CBM-MUCH will be about 3.1 MHz/cm<sup>2</sup>. Maximum particle flux on the 3<sup>rd</sup> and 4<sup>th</sup> stations of the CBM-MUCH have been estimated to be 15 kHz/cm<sup>2</sup> and 5.6 kHz/cm<sup>2</sup>, respectively, for central Au-Au collisions at 8 AGeV. Single gap Resistive Plate Chamber (RPC) is one of the most widely used detector technologies for trigger and tracking in high energy physics experiments. Rate handling capacity of RPC can be increased using low resistive electrode plate and operating the RPC in the avalanche mode. We are exploring the possibility of using RPCs for the 3<sup>rd</sup> and 4<sup>th</sup> stations of CBM-MUCH. In that direction a very low resistive plate has been used to build a RPC prototype and it is tested in avalanche mode. The detailed method of building of the RPC, set-up, measurement and the first test results are presented in this poster.

### Highlights of the new RPC

- 1. Material: carbon-loaded Polytetrafluoroethylene (PTFE) commonly known as Teflon.
- 2. This particular sample is 25% carbon-filled
- 3. Bulk resistivity of  $10^5\,\Omega\text{-cm}$
- 4. Plate size: 150 mm x 150 mm x 1 mm

### Fabrication of the prototype





Components





Copper Pick-up strips



Complete RPC

5. Gas gap: 2 mm

- 6. Surface resistivity: 20 k $\Omega$ / $\Box$
- 7. No graphite coating

### **Experimental set-up**



Gas: 100% R-134a
Charge sensitive preamplifier (VV50\_2): Gain: 2 mV/fC, τ: 300 ns
9 plastic scintillators are used for triggering cosmic muons

## Electronic circuit for efficiency measurement

## V-I characteristics Noise rate Vs. voltage



#### Summary and outlook

A Single gap RPC is fabricated with very low resistive plate called carbon-loaded Polytetrafluoroethylene (PTFE) commonly known as Teflon. The prototype is built without any oil coating inside. The novelties in fabrication of this prototype are use of very low resistive plates and electrodes without graphite coating. We have used 100% R-134a as the sensitive gas for the chamber. A charge sensitive preamplifier with gain 2 mV/fC and shaping time 300 ns is used for signal collection. The motivation of using a low resistive plate is to improve the rate capability. The V-I characteristics, variation of noise rate and efficiency as a function of applied voltage are studied with cosmic ray. At a voltage of 4 kV an efficiency ~50% is achieved.