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A new way to enhance rate capability of MRPC

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The multi-gap Resistive Plate Chamber (MRPC) has been used in many high energy physics and nuclear experiments in the last decade, such as ALICE and STAR. The MRPC usually works in the condition where the particle flux is under 1 kHz/cm^2 , so normal commercial glass ($\rho \approx 10^{12} \Omega \cdot \text{cm}$) can be used. But with the increasing of beam energy and final state particles, the rate capability of MRPC has to be enhanced accordingly. One normal way is to decrease the bulk resistivity ρ of the resistive plate, as the low resistive glass developed by Tsinghua University for the CBM experiment. Alternatively, the surface of the electrode is also a possible path for the neutralization of the avalanche charges, as schematically shown in Fig.1.

Recently, we managed to carry this method out by coating a Diamond-Like-Carbon (DLC) layer on the surface of the normal glass. DLC, applied by magnetically controlled sputtering method, has very good physical and chemical stability. The surface resistivity can be changed easily. A series of DLC-coated glass with different resistivity have been tested in our lab. We have also made some MRPC prototypes and tested them with cosmic ray. Some preliminary results, including the signal shape, the efficiency and time resolution have been achieved. More research is ongoing to improve the design and performance of this new high rate MRPC with resistive surface.

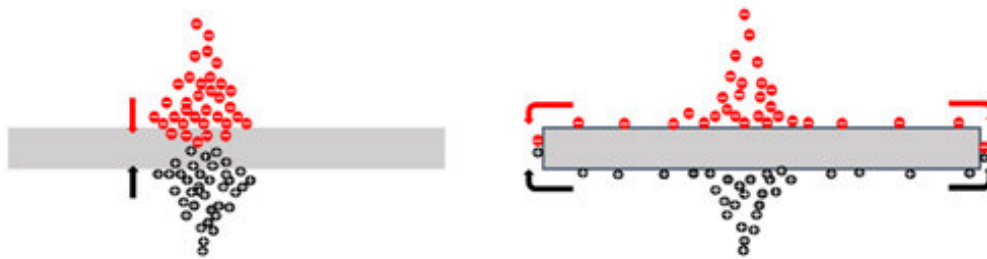


Figure 1: enter image description here

Fig.1. Two paths for the neutralization of the avalanche charges.

Primary author: Mr WANG, Xinjian (University of Science and Technology of China)

Co-authors: Prof. SUN, Yongjie (University of Science and Technology of China); Prof. ZHOU, Yi (University of Science and Technology of China)

Presenter: Mr WANG, Xinjian (University of Science and Technology of China)

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