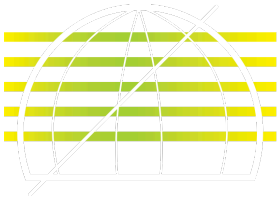

RPC 2022

Contribution ID: **50** Type: **Oral**

# Development of ultra-low mass and high-rate capable RPC based on Diamond-Like Carbon electrodes for MEG II experiment

*Tuesday 27 September 2022 14:50 (25 minutes)*

A novel background identification detector is under development for the MEG II experiment, aiming at further sensitivity improvement in the $\mu \to e\gamma$ decay search. This detector needs to detect MIP positrons in a low-momentum high-intensity muon beam. Extremely low-mass design of radiation length of 0.1% is required because the muon beam of 28 $\mathrm{MeV}/c$ passes through the detector. In addition, high rate capability of up to 4 $\mathrm{MHz/cm^2}$ is required because the penetrating muon beam is at $10^8$ /s in total.
This detector is Resistive Plate Chamber based on Diamond-Like Carbon electrodes (DLC-RPC). It has thin-film resistive electrodes based on DLC coating for low-mass design. A high efficiency for MIP of 85% and a good timing resolution of 200 ps have already been achieved with a small prototype detector.
In this study, DLC-RPC performance particularly in the high-rate muon beam and its scalability are studied. Avoiding voltage drop at high rate, segmented HV supply with 1 cm pitch and low DLC resistivity of 10 M /sq are designed to fulfill rate capability requirement of 4 $\mathrm{MHz/cm^2}$. The segmentation is also necessary for scalability. We produced and tested new prototype detector with the segmented HV supply and the low DLC resistivity. High rate capability of first prototype detector will be presented. Moreover, the construction and performance of improved prototype detector will be presented.

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**Session Classification:** New detector ideas