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## A Novel Anti-Aging TBS MRPC For CBM-TOF

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The Compressed Baryonic Matter (CBM) experiment is an ongoing high-rate fixed-target experiment at the Facility for Antiproton and Ion Research (FAIR) in Germany. The Time-of-Flight (TOF) system in the CBM experiment subjects Multi-gap Resistive Plate Chambers (MRPCs) to flux rates ranging from several hundred Hz/cm<sup>2</sup> to 25 kHz/cm<sup>2</sup>. In such high-rate environments, traditional MRPCs with fishline spacers experience aging effects due to the extremely strong electric field and insufficient gas exchange near the fishlines, leading to ionization of the working gas and the formation of deposits, thereby affecting the performance of MRPCs. To address this issue, we propose a novel solution by replacing traditional fishline spacers with cylindrical thermal bonding spacers (TBS) as support structures, based on MRPC3, one of the CBM-TOF components, developing a new type of TBS MRPC detector. We tested the detector's performance under cosmic rays. And particularly, we conducted comparative testing with traditional MRPCs, focusing on the performance of the TBS MRPC in high flux environments under X-ray irradiation. Furthermore, we performed a microscopic study using scanning electron microscopy (SEM) to inspect the glass electrodes before and after irradiation. The research results suggest that, under high irradiation flux environments, the TBS MRPC detector shows better anti-aging performance compared to traditional MRPCs with fishline spacers. Based on the research, the TBS MRPC is expected to be used in the future CBM experiment.

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