

Proportional Counter array (PCa) - a new MPGD structure

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Many novel structures of the micro-pattern gaseous detector (MPGD) have been developed to adapt to different application needs since the advent of the MPGD technology. In this report we present a new MPGD structure and its preliminary test results. The new structure consists of an array of grooves, with an anode micro-strip placed at the bottom of each groove, and metal plated on the side walls. When setting the metalized wall to the ground potential, just the same as readout pad, the electric field around the micro-strips, which is analog to anode wire, is significantly improved. Therefore, this structure combines the merits of proportional counter and micro-strip gaseous counter (MSGC). For this new type of gaseous detector, we call it proportional counter array (PCa). PCa can be fabricated readily with standard PCB process, which effectively reduces the production cost and operation difficulty. It's suitable for easy manufacturing and fast readout in large-area applications, where the requirements on spatial resolution and material budget are loose, while new structure featuring low cost and mass production are favored. The gas gain, ion feedback and collection efficiency of PCa structure with various geometric parameters are studied, by simulation and by experimental test. The results show very promising features of PCa: gas gain $>5 \times 10^4$, low ion feedback $<10^{-3}$, high collection efficiency and spatial resolution of $\sim 1\text{mm}$. Significant charging-up effect is observed, which is cured by coating highly resistive DLC layers to the dielectric surfaces.

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