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## A Kind of Electrostatic Focusing MCP-PMT

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In order to meet the needs of JUNO, we design and manufacture a kind of electrostatic focusing MCP-PMT which has very low radioactive background by introducing pure raw materials and controlling melting and artificial fine blowing process. This MCP-PMT has high photon detection efficiency which results from using transmission photocathode and reflection photocathode simultaneously, and the total quantum efficiency reaches approximately 30%. Good design of focusing electrode and appropriate distribution of voltage can ensure 95% photoelectrons entering the surface of MCP. The electron multiplication system consists of 4 MCPs that each of the two pieces of MCP is a component, by optimizing the voltages of each MCP and the gaps between MCPs, the gain obtained is greater than 107 and the peak to valley ratio of single photoelectron is about 2. For anode optimization, we design two kinds of configuration to reduce signal ringing, the one is metal mesh and plate, the other is micro-strip line. Finally, by using signal cable which impedance matches the anode, we obtain very single photoelectron signal.

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