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## The Performance Test of the 20 inch PMTs for JUNO

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The JUNO (Jiangmen Underground Neutrino Observatory) designed to build an underground lab on the location of JiangMen in south China as a generic underground national lab for many applications. The new promising neutrino programs request the higher performance of the detectors, especially the photo detector PMT (Photomultiplier Tube), need effectively large area, high quantum efficiency.

It is proposed to increase the photoelectron detection efficiency of the PMT used in neutrino experiment. The researchers in IHEP designed a new type of MCP-PMT. The small MCP unit instead of the large Dynode, the transmission photocathode and the reflection photocathode were assembled in the same glass shell to form nearly  $4\pi$  photocathode effective area to enhance the efficiency of the photoelectron detecting.

Some researchers and engineers in institutes and companies in China come together to manufacture and research this type of PMT based on the MCPs. After three years R&D work, except successfully producing the 8 inch prototypes, the 20 inch one also produced at the end of 2014. The characteristics of the photocathode was carefully researched by testing the I-V curve, the QE- $\lambda$ , and the QE-map for the 8/20 inch area photocathode uniformity. Also we measured the charge spectrum to confirm its ability for the single photoelectron spectrum.

The detailed will be described in this formal poster.

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