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Performance evaluation of new photodetectors for Hyper-Kamiokande

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We have been developing new photodetectors for the Hyper-Kamiokande (Hyper-K) detector, which is proposed as a next generation Megaton class water Cherenkov detector.
There are three candidate photodetectors; One is a 20-inch venetian blind dynode type PMT (R3600) which is used in Super-Kamiokande. Second is a newly developed box and line dynode type PMT which has a better collection efficiency and timing response than R3600. The other one, a large-aperture Hybrid Photo-Detector (HPD), is also newly developed and uses an avalanche diode instead of dynodes to multiply photoelectrons. Compared to PMT, the HPD has a simpler structure, better collection efficiency, better timing response, and better single photoelectron charge resolution.
A high quantum efficiency (QE) is a common option for the three candidates and it was applied for the R3600 at first. The high-QE R3600 has 30 % QE at maximum peak, 1.4 times higher than that of the R3600 used in Super-Kamiokande.
In order to evaluate the performance and usability of the candidate photodetectors, we perform a long-term test with a 200-ton water Cherenkov detector located in Kamioka mine. The progress of the long-term test of 8-inch HPDs and high-QE R3600s will be reported. The status of R & D of the 20-inch box & line PMTs and 20-inch HPDs will be also presented. We plan to choose the photodetectors for Hyper-K in 2016.

Author: Mr SUDA, Yusuke (Department of Physics, University of Tokyo)

Co-authors: Dr TAKETA, Akimichi (Earthquake Research Institute, University of Tokyo); Dr TANAKA, Hidekazu (Kamioka Observatory, Institute for Cosmic Ray Research, University of Tokyo); Prof. AIHARA, Hiroaki (Department of Physics, University of Tokyo); Prof. YOKOYAMA, Masashi (Department of Physics, University of Tokyo); Prof. SHIOZAWA, Masato (Kamioka Observatory, Institute for Cosmic Ray Research, University of Tokyo); Dr SUZUKI, Masatoshi (Hamamatsu Photonics K.K.); Ms HIROTA, Seiko (Department of Physics, Kyoto University); Dr NAKAYAMA, Shoei (Kamioka Observatory, Institute for Cosmic Ray Research, University of Tokyo); Dr OHMURA, Takayuki (Hamamatsu Photonics K.K.); Prof. NAKAYA, Tsuyoshi (Department of Physics, Kyoto University); Dr NISHIMURA, Yasuhiro (Research Center for Cosmic Neutrinos, Institute for Cosmic Ray Research, University of Tokyo); Dr KAWAI, Yoshihiko (Hamamatsu Photonics K.K.); Prof. HAYATO, Yoshinari (Kamioka Observatory, Institute for Cosmic Ray Research, University of Tokyo); Mr OKAJIMA, Yuji (Department of Physics, Tokyo Institute of Technology)

Presenter: Mr SUDA, Yusuke (Department of Physics, University of Tokyo)

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