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Enhanced light collection with photon trap

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We investigate the performance of photon traps for enhancing the light collection efficiency within the Hyper-Kamokiokande detector. Cerenkov photons enter the trap by going through a dichroic mirror transmitting UV and blue light and reflecting green light. Some Cerenkov photons are detected directly by a PMT while the others are absorbed in a wavelength shifting plate that reemit green photons. Green photons are confined within a box by the dichroic mirror and regular broad band mirrors covering the other walls. A large fraction of the green photons eventually hit the PMT are detected. Our simulations show that the overall detection efficiency of a 1x1m2 trap with a 12" PMT in the center exceeds the detection efficiency of a 20" PMT. However, the timing resolution is very significantly impaired. We will show the performances of the trap and discuss how it could be used in the context of Hyper-Kamiokande.

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