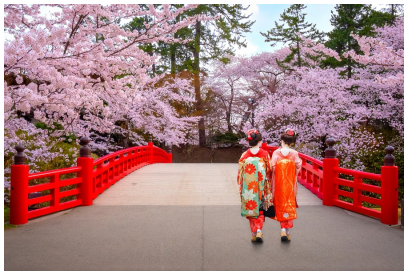

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A Noise Reduction Analysis of Photomultiplier Tubes for Neutron Tagging at Super-Kamiokande

In this poster, I report the efficient noise rejection method for improvement of a neutron tagging by developing photomultiplier tubes (PMTs) noise simulation with noise investigation.

Super-Kamiokande (Super-K) is a large water Cherenkov detector to observe Cherenkov rings by large aperture PMTs. The reconstruction performance can be degraded by a noise from a thermal electron and scintillation light, where the latter caused by radioactive contaminations of PMTs. A neutron tagging at Super-K, detecting low-energy gamma rays from a neutron capture, is affected by the noise as well.

I investigated noise hit charge and time structure from Super-K measured data. Then, I implemented the scintillation light and after pulse into the detector simulation as the PMT hit noise. The realistic noise simulation allows to develop a noise reduction analysis for each PMT based on characteristics of the scintillation hit noise.

An average of the Super-K PMT noise hit in 2020 was evaluated to be about 6 kHz. This simulation revealed that scintillation light accounts for 2 kHz of noise hit rate.
An improvement of a neutron tagging by developing PMT noise reduction analysis is presented.

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