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## Time Synchronization Schemes for the Future Hyper-Kamiokande Experiment

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On the strength of a double Nobel prize-winning experiment (Super)Kamiokande and an extremely successful long-baseline neutrino program, the third generation Water Cherenkov detector, Hyper-Kamiokande, is being developed by an international collaboration as a leading worldwide experiment based in Japan. Hyper-Kamiokande will be able to measure with the highest precision the leptonic CP violation, will have excellent capability to search for proton decay and ability to precisely test the three-flavor neutrino oscillation paradigm in conjunction with a strong astrophysical program.

The Hyper-Kamiokande detector will be hosted in the Tochibora mine, about 295 km away from the J-PARC proton accelerator research complex in Tokai, Japan and will be the largest underground water Cherenkov detector with a 68 m diameter and 72 m height cylindrical tank, approximately 8 times larger fiducial volume than Super-Kamiokande. It will be equipped with about 50,000 photo-sensors. Synchronization of the timing of each PMT signal is crucial for precise measurement of the timing of photon arrival. In Hyper-Kamiokande, timing resolution of the photo-sensor is expected to be sub-nanosecond and the jitter less than 100 ps. The CERN designed White Rabbit protocol and a full custom FPGA based solution are under evaluation to reach this objective. This contribution will show the architectural solutions envisaged for the experiment and will focus on the R&D program comparing the solutions under evaluation and showing the first measures conducted on the prototypes.

### Minioral

Yes

### IEEE Member

No

### Are you a student?

No

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