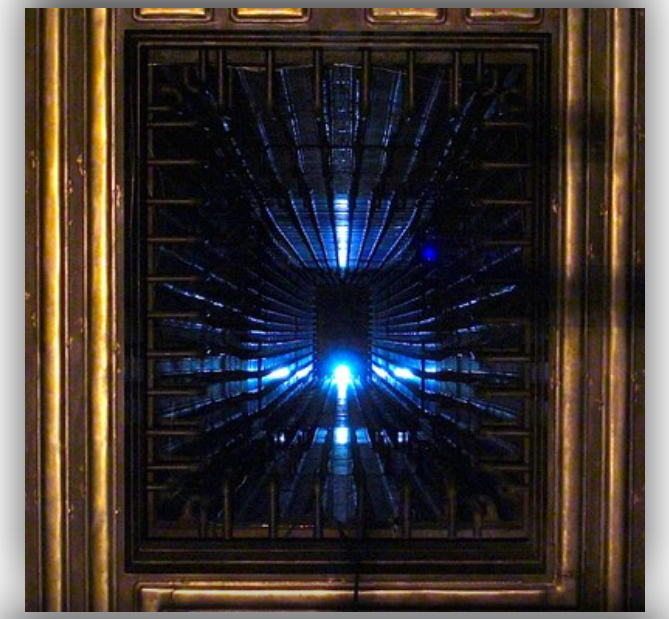
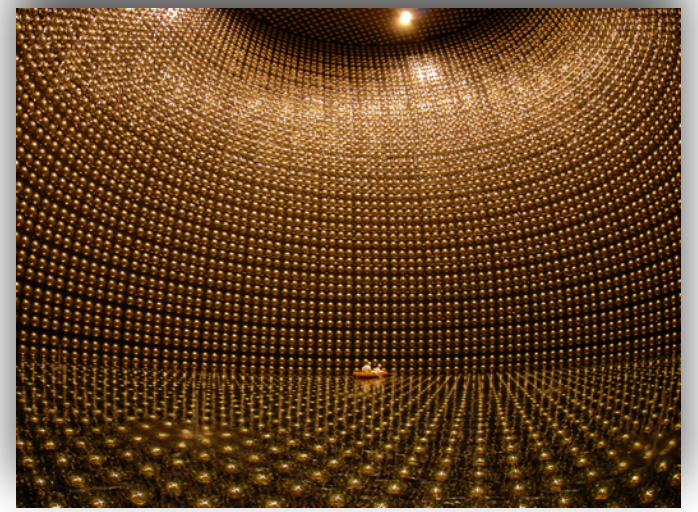
TRIUMF

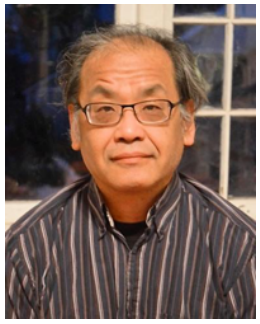
TRIUMF and Long Baseline Neutrino Projects

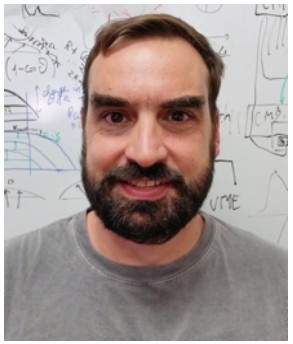




Mark Hartz

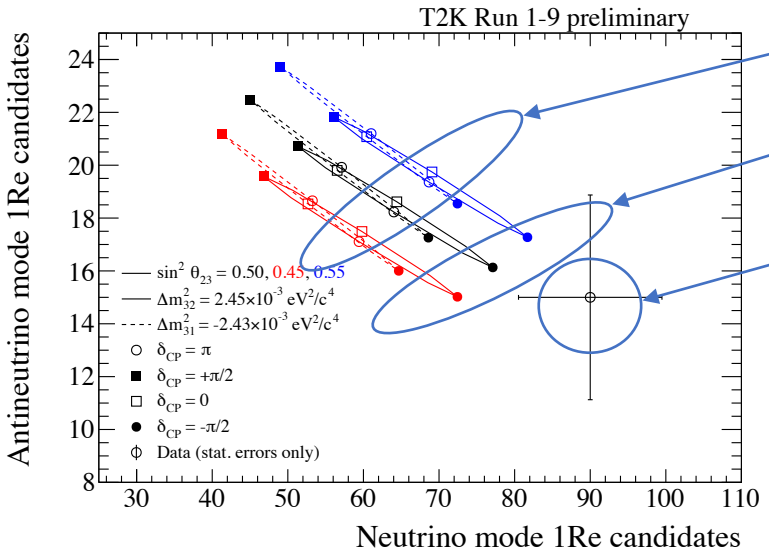
TRIUMF ACOT, April 8, 2018





T2K Neutrino and Antineutrino Results

T2K presented results with full statistics through 2018 at a KEK seminar in January 2019

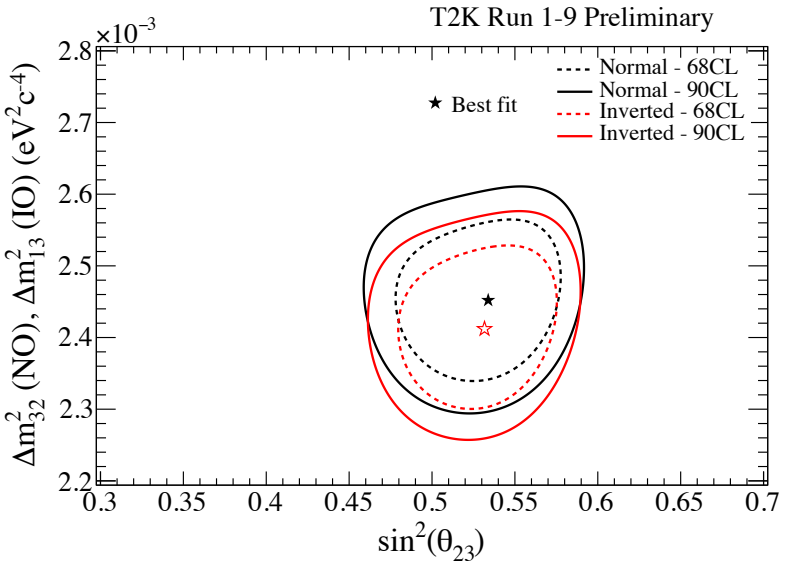


CP conservation hypothesis

CP violating hypothesis

Data gives 2σ indication of CP violation.

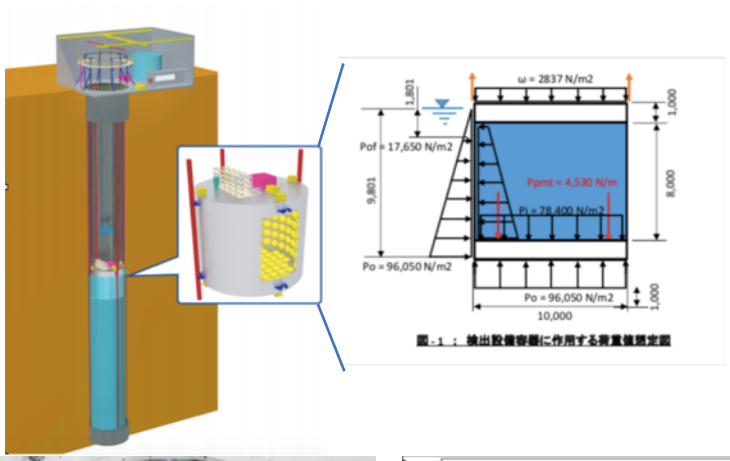
Excess beyond maximal CP violation hypothesis is still consistent with statistical fluctuation



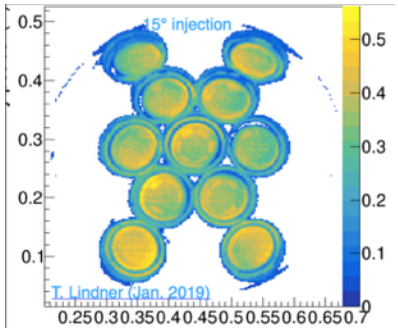
T2K data continues to prefer a value for θ_{23} consistent with maximal mixing (θ_{23}=45°)

NOvA prefers non-maximal mixing

Hyper-K/NuPRISM (IWCD) and Super-K

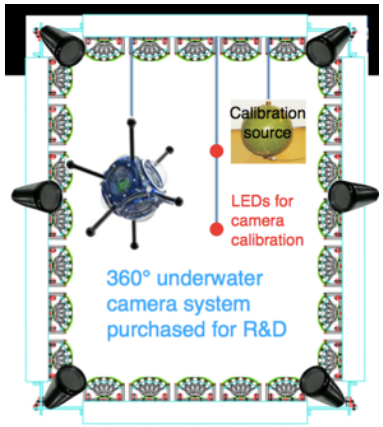


Collaborating with Japanese colleagues on site selection, facility and detector design for the Intermediate Water Cherenkov Detector (NuPRISM) for Hyper-K



Successful optical and hydrostatic pressure tests of the prototype multi-PMT photo detection modules built at TRIUMF

Design updates for second generation prototypes are ongoing



Development of photogrammetry calibration system for photo sensor and calibration source positioning

System for deployment in Super-K is being built

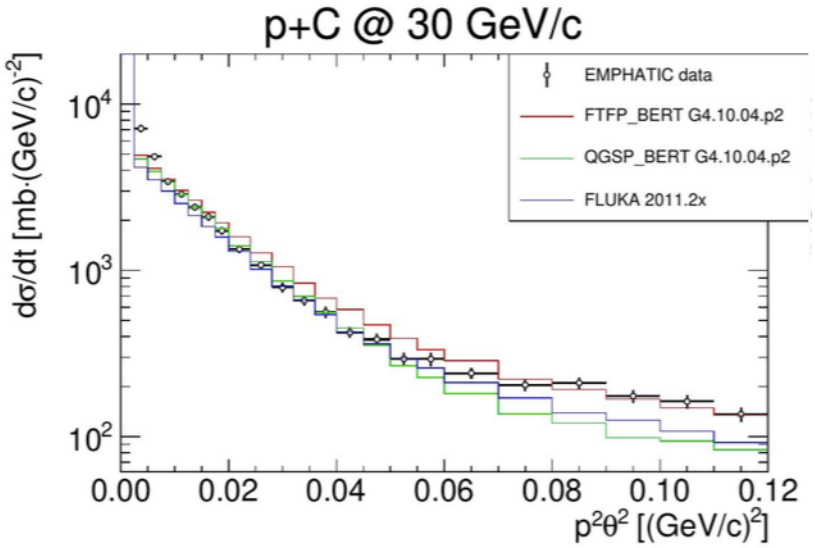
Planned contribution for IWCD and Hyper-K

Super-K taking data after successful upgrade; involved in ongoing calibrations.

Analysis Efforts

TRIUMF and U. Vic. have organized a workshop on machine learning at U. Vic. on April 15-17

Launching point for efforts to apply machine learning to Super-K, Hyper-K, IWCD



First results from EMPHATIC are being prepared for publication

Measurement of forward scattering cross sections show no model agrees with data over full kinematic range

Analysis by TRIUMF postdoc M. Pavin

Funding Status

We plan a CFI request to build multi-PMTs for the IWCD

- NOI at Regina submitted, total requests similar to expected envelope

- Preparing application for internal review at University of Victoria

NSERC group (Hyper-K/T2K/Super-K/EMPHATIC) and RTI (build IWCD test experiment) grant applications submitted in September

- Review at TRIUMF in December appeared to go well

- Results …

KEK/J-PARC funded for 4 months of operation (2 neutrino) in FY2019

- 10 oku-yen allocated to continue work on Main Ring power upgrade

Preparation of Hyper-K budget to be submitted in June is ongoing

- Hyper-K meeting on May 8,9 to finalize design that goes into budget

- Planning panel of neutrino scientist formed to give advice on roadmap from T2K to Hyper-K within budget boundary conditions

Summary

T2K has analyzed all data collected through 2018, showing results with a 2σ preference for CP non-conservation in January 2019. T2K running time will be significantly reduced through FY2021 as the accelerator power upgrade takes priority. In FY2019, ~$10M was allocated towards the power upgrade. Preparation of the budget request for Hyper-K continues with NuPRISM (IWCD) and multi-PMTs considered as primary areas for international contributions. The Hyper-K Canada group continues development of NuPRISM, multi-PMTs and calibration systems for Hyper-K, and a CFI application for multi-PMT contributions to NuPRISM is under preparation. The Hyper-K Canada group is also initiating efforts to apply machine learning techniques for event reconstruction in Hyper-K, NuPRISM and Super-K. After its upgrade, the Super-K detector is operational and the leak rate has been reduced to an undetectable level. The analysis of the first hadron production data from the EMPHATIC experiment is completed and a publication is under preparation.