Latest Measurement of the Appearance of Tau Neutrinos in the Flux of Atmospheric Neutrinos at Super-Kamiokande

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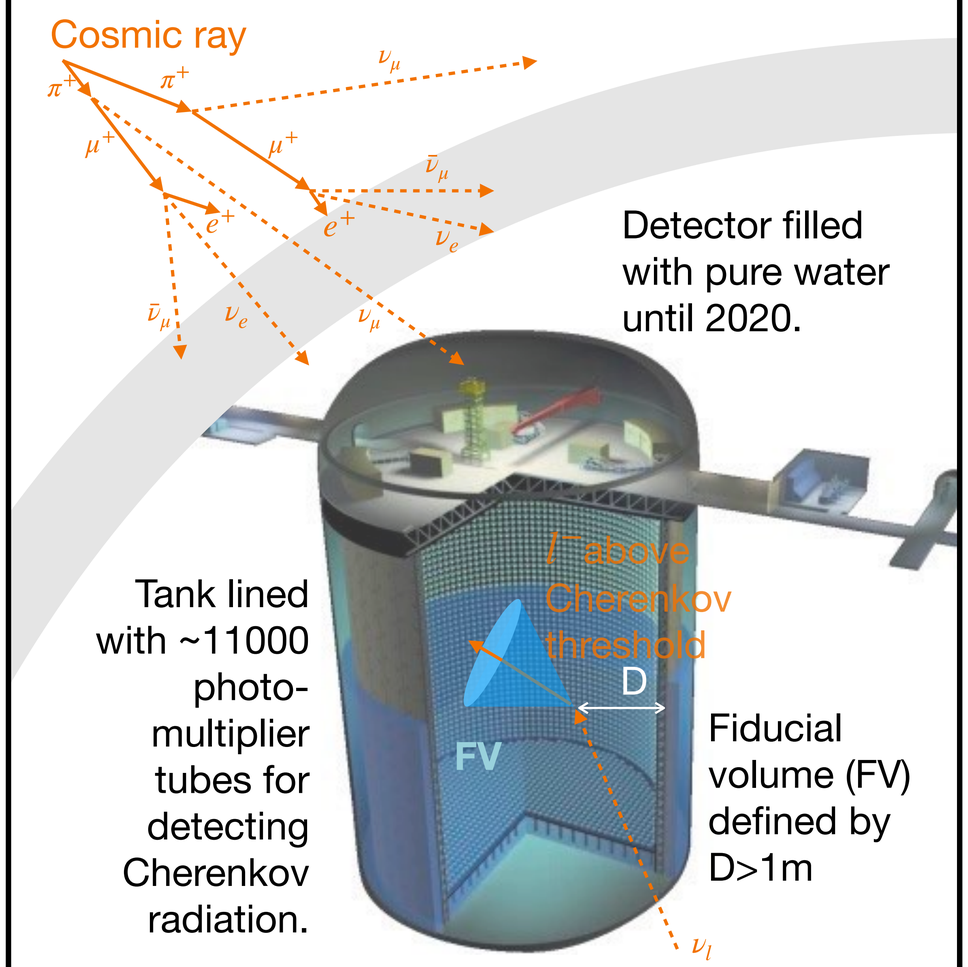
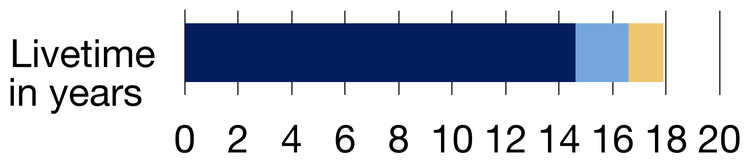
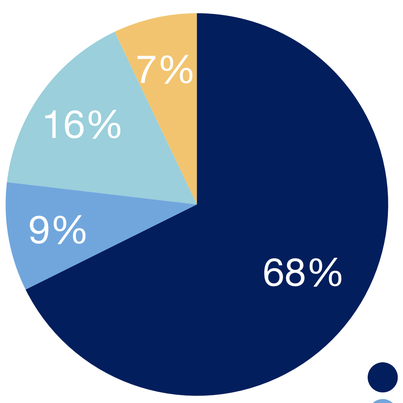
SUPER-KAMIOKANDE (SK)

Located in Japan, recording data since 1996. Recognised by the 2015 Nobel Prize for discovering neutrino oscillations in the flux of atmopsheric neutrinos.





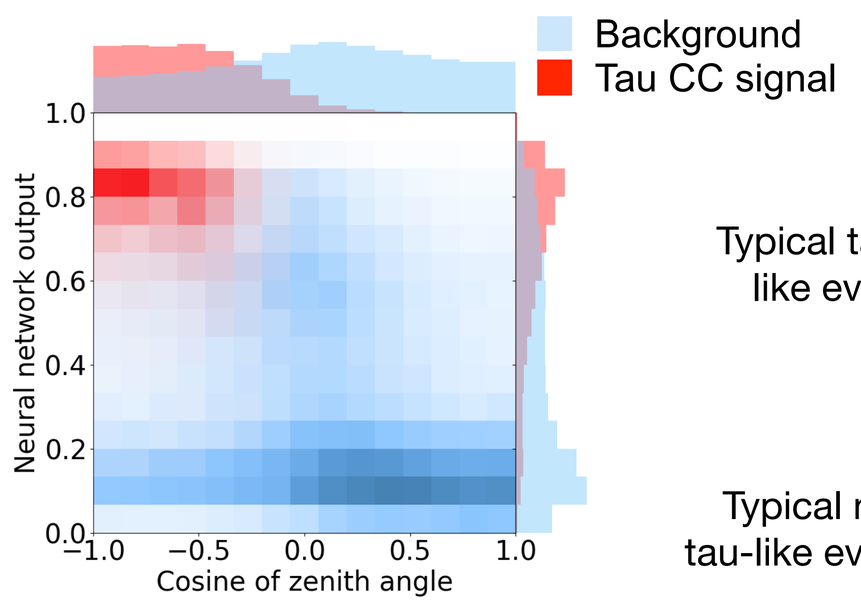


50% more exposure

since the last published results (2018) [1]

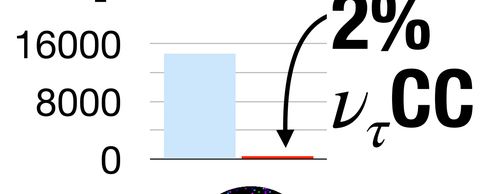
METHODOLOGY

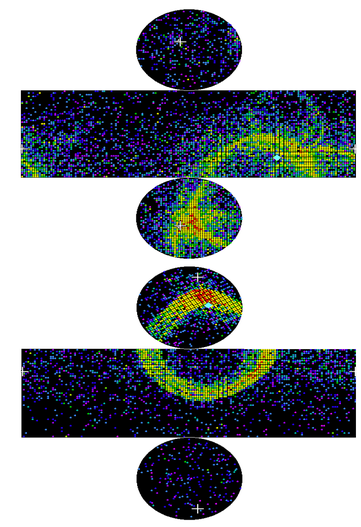
Neural network to separate ν_τ charged current (CC) interactions from the background of atmoshpericneutrino interactions.



Multi-GeV events

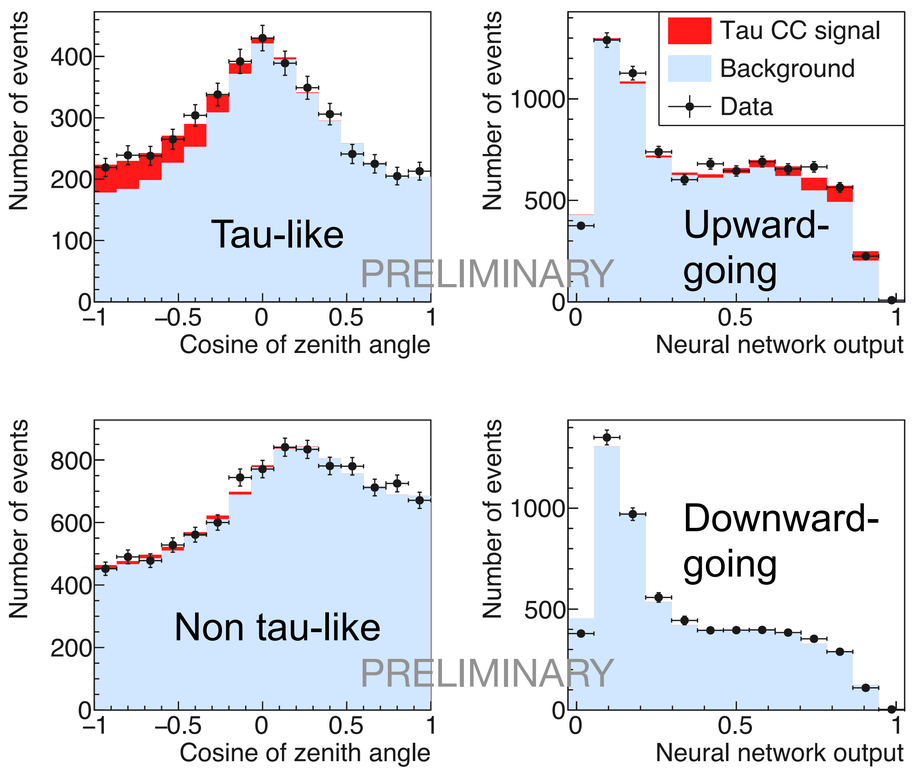
484.2 kT.years exposure





RESULTS

Extended maximum likelihood fit accounting for 54 systematic uncertainties, assuming normal neutrino mass-ordering.



428±92 tau neutrinos observed.

4.8σ

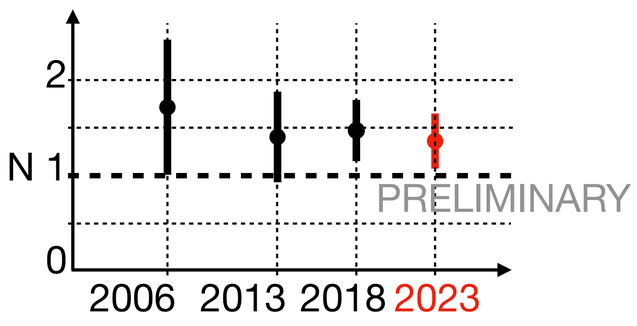
exclusion of the hypothesis of no tau neutrino appearance.

CONCLUSIONS AND WAY FORWARD

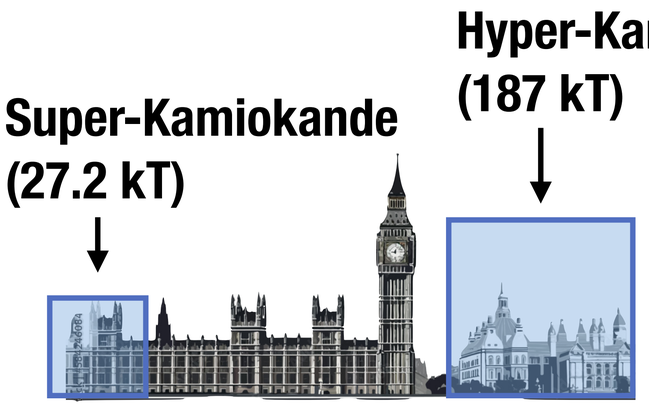
Tau neutrino appearance is characterised by

tau normalisation, N = 1.36±0.29

N=1: perfect agreement of data with prediction model based on standard three-flavor oscillation theory.



SK analyses over the years



We expect increase in the precision of measuring tau normalisation.

Improvements in analysis techniques also underway.

ACKNOWDEGMENTS National Science Centre, Poland (UMO-2018/30/E/ST2/00441)

REFERENCES [1] Z. Li et al. Phys. Rev. D 98, 052006 (2018) [3] K. Abe et al. arXiv:1805.04163 (2018)
[2] K. Abe et al. Phys. Rev. Lett. 97, 171801 (2006), K. Abe et al. PRL 110, 181802 (2013)