



CSU PHYSICS COLLOQUIUM

Search for Charge-Parity Violation in Neutrino Oscillations and Recent T2K Results

**Speaker: Walter Toki
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4:00 PM Monday, November 6, 2017

Refreshments at 3:45 PM

Location: 120 Engineering (Hammond Auditorium)

Abstract

Since the first evidence of neutrino oscillations were published in the $\nu_\mu \rightarrow \nu_e$ appearance mode from the T2K (Tokai to Kamioka) experiment in 2011 and in the $\nu_e \rightarrow \nu_e$ disappearance mode from reactor experiments in 2012, the experimental neutrino community has focused on a major search for Charge-Parity (CP) violation in neutrino oscillations. The measurements from T2K compare the oscillation rates of $\nu_\mu \rightarrow \nu_e$ and to anti- $\nu_\mu \rightarrow$ anti- ν_e . If the CP symmetry is conserved then these probabilities are equal, otherwise there is CP violation. The T2K experiment recently analysed results on their combined data sets taken with equal amounts of neutrino and antineutrino beam flux that was logged from 2010 to late spring 2017. T2K finds statistical evidence in the data that CP is not conserved with 2 standard deviations confidence level.

In this talk, the C and P symmetries and how CP violation would appear in neutrino oscillations are explained. The recent T2K results are presented and finally the outlook of this measurement with the future T2K data will be discussed.

Bio

Professor Toki received his undergraduate degree from UC Berkeley and his PhD from M.I.T. He worked at CERN and at SLAC where he was co-spokesperson of the Mark III experiment which produced important charmonium, charm, and tau particle physics results. Then he was co-spokesperson of the BES collaboration which produced the precision tau mass. He came to CSU in 1992 to start the HEP research group. He worked with Profs. Wilson and Harton on the Babar experiment at SLAC which observed CP violation in B meson decays in 2002. In 2005, Toki joined the DUSEL proposal for an underground laboratory at Henderson Mine and he wrote with Chang Kee Jung a proposal to develop a prototype underground water Cerenkov detector at the Henderson Mine. Toki joined the T2K collaboration in January 2006 and has taken responsibilities for the US Pizero detector construction at CSU and Stony

Brook, managing the T2K near detector and co-leading the Pizero detector operation. He has led the CSU T2K research group working with CSU Profs. Wilson, Berger and Buchanan. He has had sabbatical and research leaves in 2008-9, 2011-12 and 2016-17 working on the T2K experiment in Japan.

Toki was elected in 2005 an APS fellow for his contributions to tau, charm, charmonium, and B physics. In 2012 he was elected a Japan Society for the Promotion of Science Fellow for his T2K work. In 2016, he and his CSU group members received the Breakthrough Prize in Fundamental Physics (awarded to entire T2K collaboration) for the discovery of electron neutrino appearance oscillations. In April 2017, he received the CSU Scholarship Impact Award that is one of the top annual honors for accomplishment in research at CSU.