

## A study of time variations of solar neutrino flux using 5,804 live days of Super-Kamiokande data

We report a study of time variations of solar Neutrino flux using 5,804 live days of Super-Kamiokande data. The data used in this analysis were obtained from 31 May 1996 to 30 May 2018. The measured exact time of high-yield solar neutrino events for 22 calendar years of accumulated data allows for studying solar neutrino modulations with unprecedented precision. The measured time variation of solar neutrino fluxes is consistent with the Kepler constants of eccentricity ( $1.53 \pm 0.35\%$ ) and perihelion shift ( $1.5 \pm 13.5$  days) as preliminary results. Periodic modulations of the solar neutrino flux are probed using a 5-day interval data set. Lomb-Scargle periodogram and maximum likelihood methods are applied to search for potential periodic modulations in the solar neutrino fluxes. We found no statistically significant implication of periodicity other than annual modulation in the observed solar neutrino data. We release the 5-day interval Super-Kamiokande solar neutrino data in this report.

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