Contribution ID: **575** Type: **Poster**

HEALPix-based Analysis of Burst Neutrinos for Supernova Direction Reconstruction at Super-Kamiokande

Friday, 21 June 2024 17:30 (2 hours)

Super-Kamiokande (SK) has the powerful capability of independently determining the supernova (SN) pointing direction from the burst neutrinos. These produce a 3-d distribution of outgoing charged leptons around the neutrino flux direction in the water volume. A new, novel SN direction reconstruction method developed for SK uses HEALPix as a data structure for analyzing the reconstructed burst events to extract the SN direction. Burst events are mapped to pixels on the HEALPix sphere according to their directions. Gaussian smoothing is applied to the sparse event distribution to produce a smooth 3-d angular distribution without altering the pixel resolution. The resulting event-loaded HEALPix sphere has a peak in the direction of the neutrino flux from the electron elastic scatter (ES) events. The SN direction is then found from the ES peak centroid. The pixel size and smoothing parameters were optimized to maximize angular resolution and minimize failure rate for bursts at a range of distances. The HEALPix-based method has better angular resolution than the previous SK direction fitter and is significantly faster, with a computation time of a few seconds. This improves the ability of SK to provide an accurate SN pointing direction before the arrival of the shock breakout radiation. This poster describes the new method and the resulting performance.

Poster prize

No

Given name

Barry

Surname

Pointon

First affiliation

BCIT

Second affiliation

TRIUMF

Institutional email

barry_pointon@bcit.ca

Gender

Male

Collaboration (if any)

Super-Kamiokande

Primary author: POINTON, Barry (BCIT)

Presenter: POINTON, Barry (BCIT)

Session Classification: Poster session and reception 2

Track Classification: Supernova neutrinos