

Exploring Fourier Deconvolution for Tau Neutrino Detection in IceCube

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IceCube Bootcamp 2019



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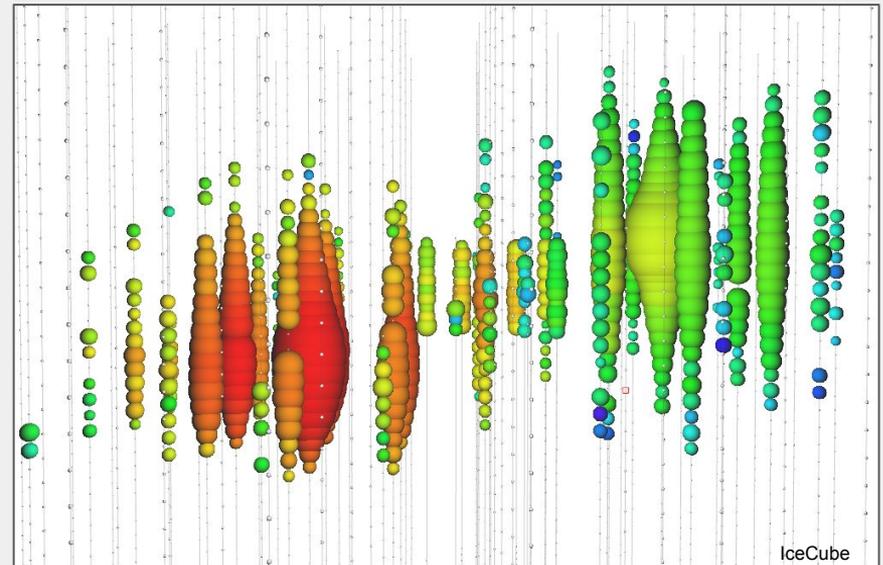
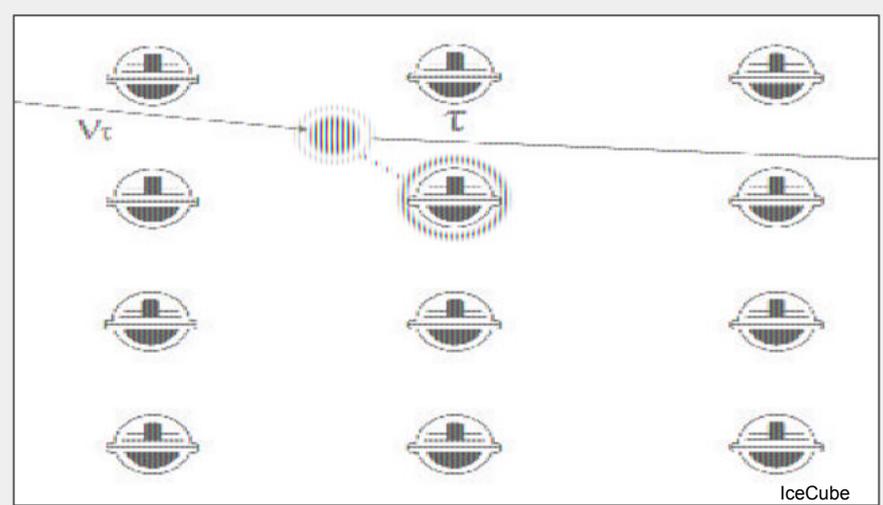
Tau Neutrino Detection

Mechanism

- Tau neutrino \longrightarrow Tau lepton (Cascade)
- Tau lepton: decay length of 50m/PeV (Track)
- Tau lepton \longrightarrow Hadrons (Cascade)

Double Bang

- Detector topology
- Difficult to resolve
 - 125 m between strings
 - Scattering effects from ice



Fourier Deconvolution of Double Pulse Waveforms

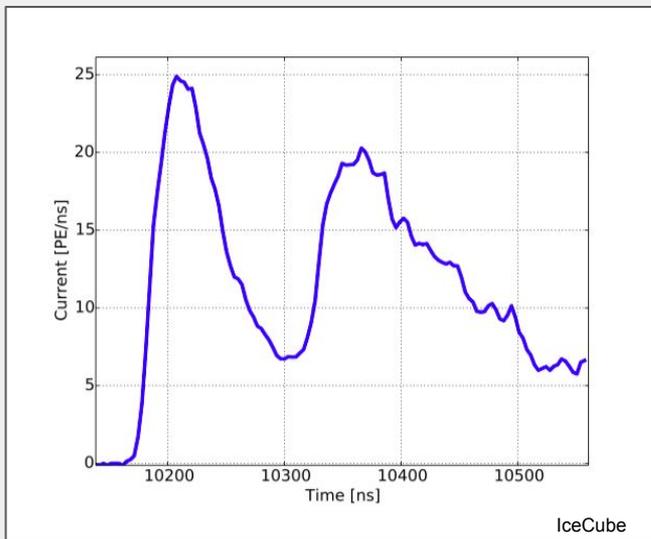
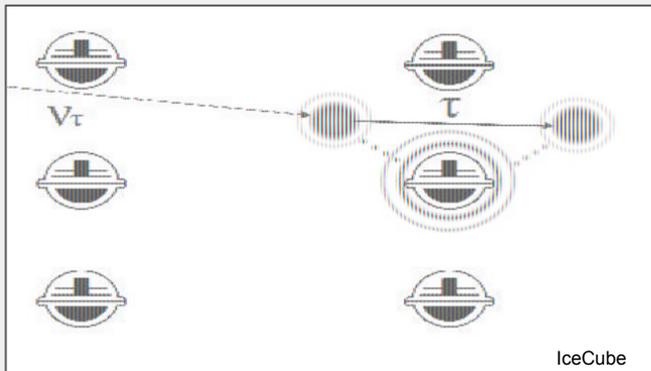
Double Pulse

- Two distinct pulses of light in the waveforms of individual DOMs
- Goal: Differentiate Double Pulse from scattering effects due to ice

Fourier Deconvolution

- Mathematical method of disentangling two signals
 - Scattering signal
 - Tau signal

Use simulated cascade events to study scattering effect

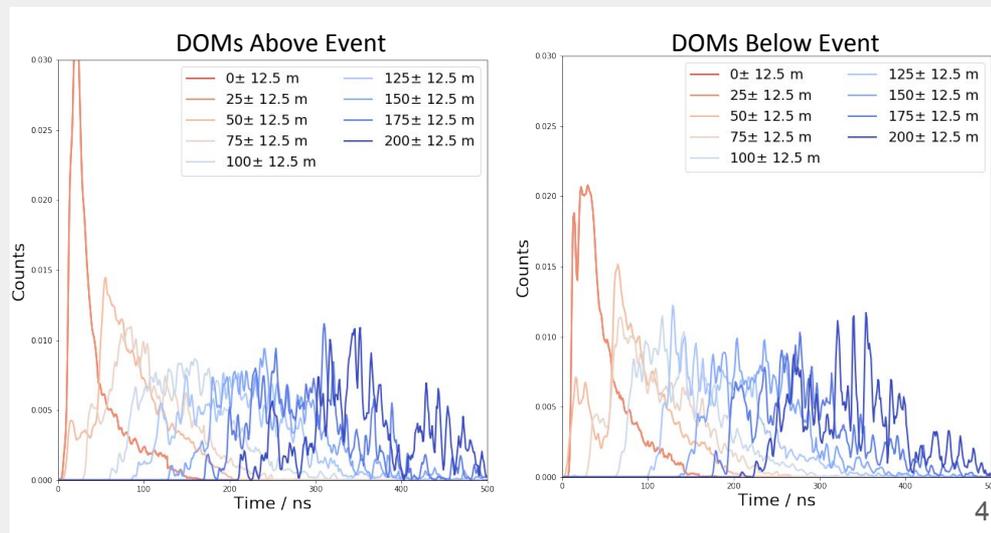
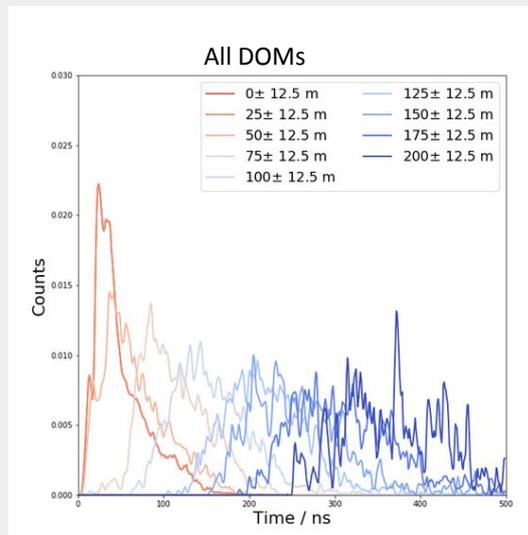
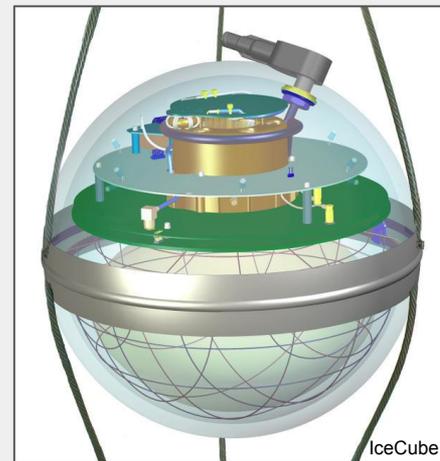


Current and Future Work

341 simulated cascade events

Energy: $1e5$ GeV - $8.5e3$ GeV

Sum waveforms in 50 m intervals
from primary event center



Thank you!

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