

Waveform Reconstruction Pipeline and Performance in TRIDENT



李政道研究所
TSUNG-DAO LEE INSTITUTE



TRIDENT
海 | 铃 | 计 | 划

Neutrino event topology in TRIDENT

$\nu_\mu \rightarrow$ Track-like events

$\nu_e \rightarrow$ Single Cascade

$\nu_\tau \rightarrow$ Double Cascade

TRIDENT simulation

Early

Photon arrival time

Late

Waveform Reconstruction Pipeline and Performance in TRIDENT



Neutrino event topology in TRIDENT

High photon multiplicity in some PMTs

$\nu_\mu \rightarrow$ Track-like events

$\nu_e \rightarrow$ Single Cascade

$\nu_\tau \rightarrow$ Double Cascade

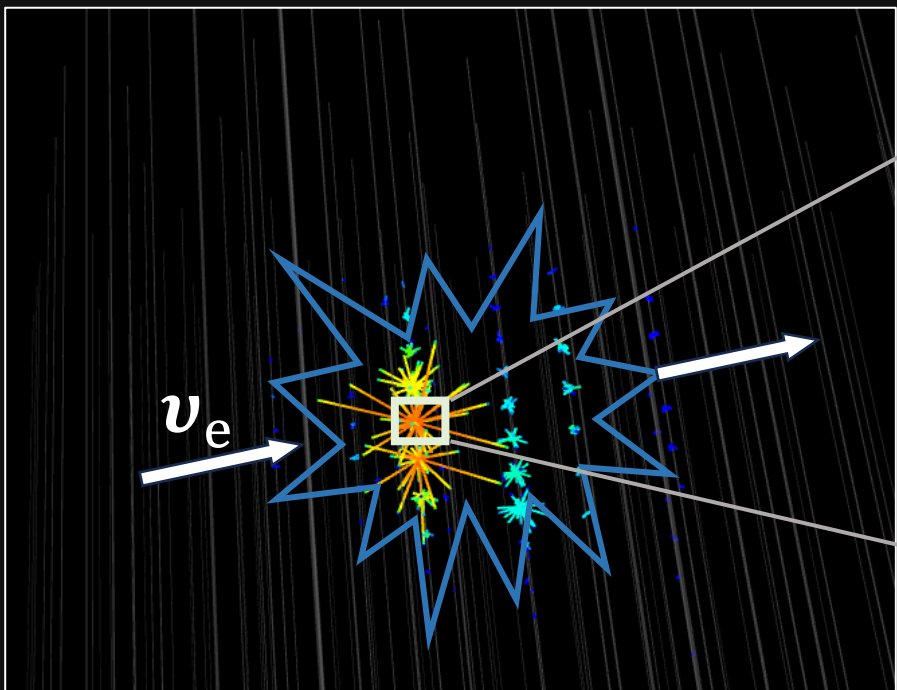
TRIDENT simulation

Early

Photon arrival time

Late

Waveform Reconstruction Pipeline and Performance in TRIDENT



hDOM: 31 PMTs + 21 SiPMs

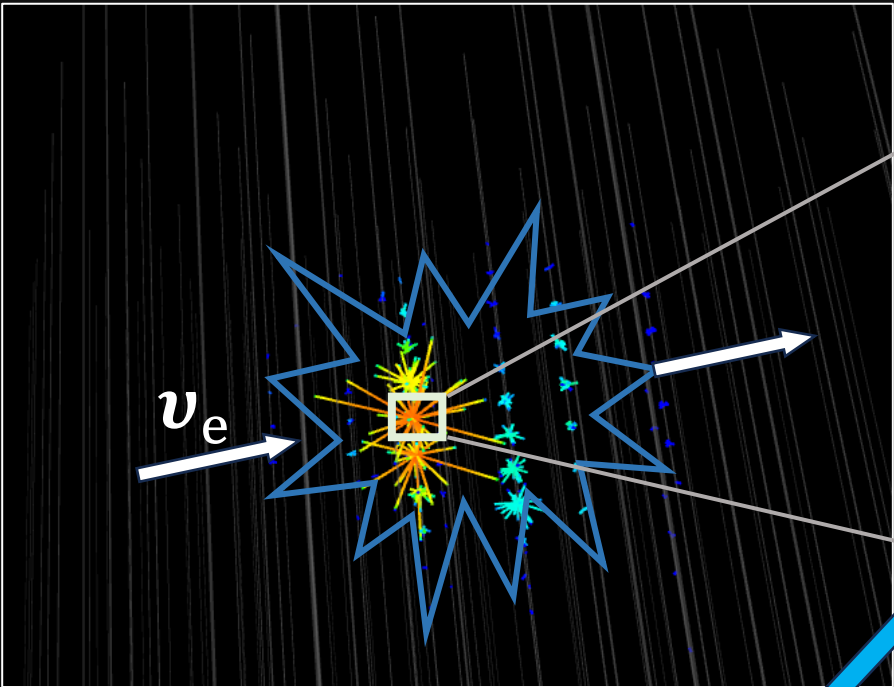


3" PMT : ns-level timing precision

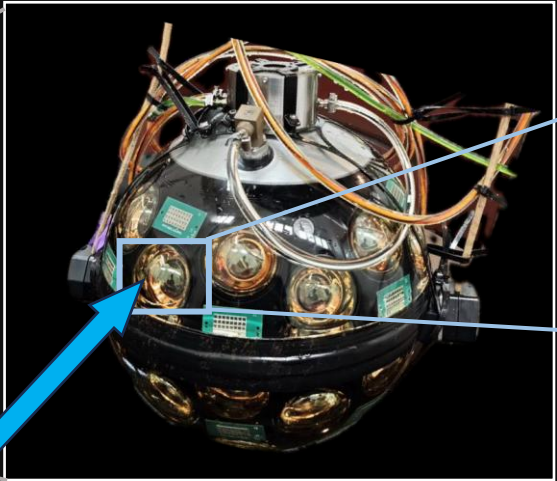


ADC Electronics

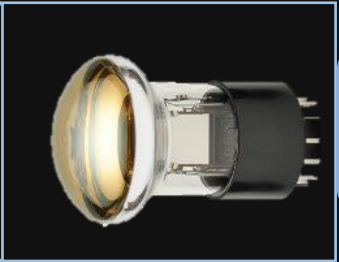
Waveform Reconstruction Pipeline and Performance in TRIDENT



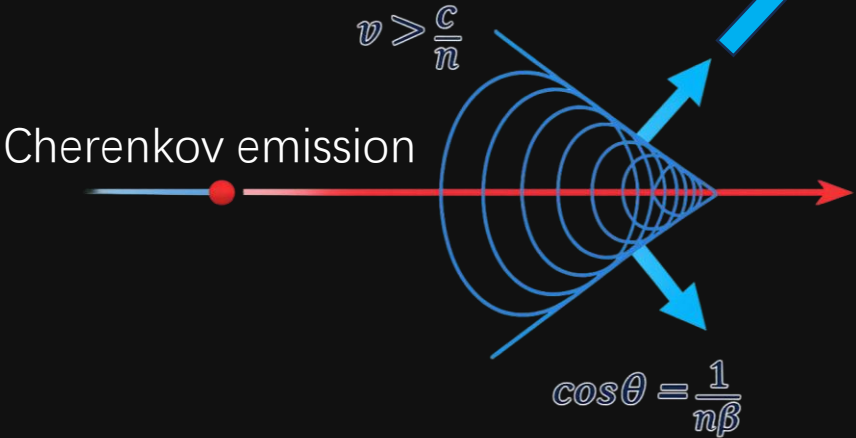
hDOM: 31 PMTs + 21 SiPMs



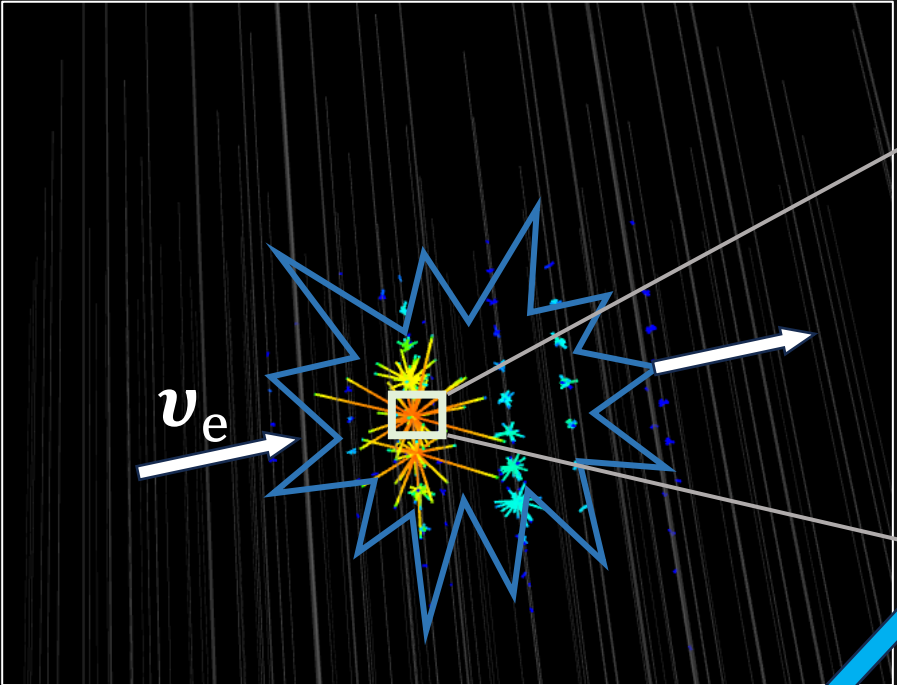
3" PMT : ns-level timing precision



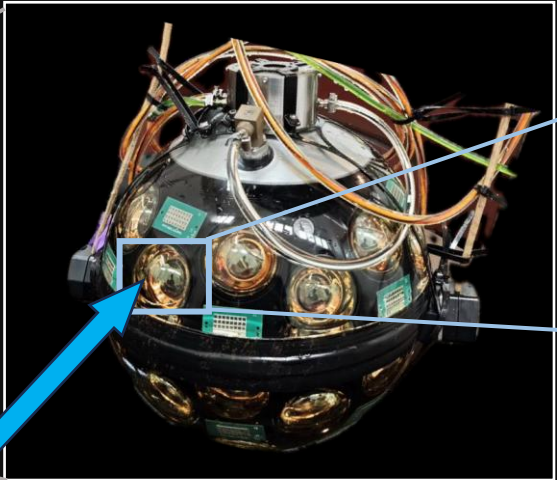
ADC Electronics



Waveform Reconstruction Pipeline and Performance in TRIDENT



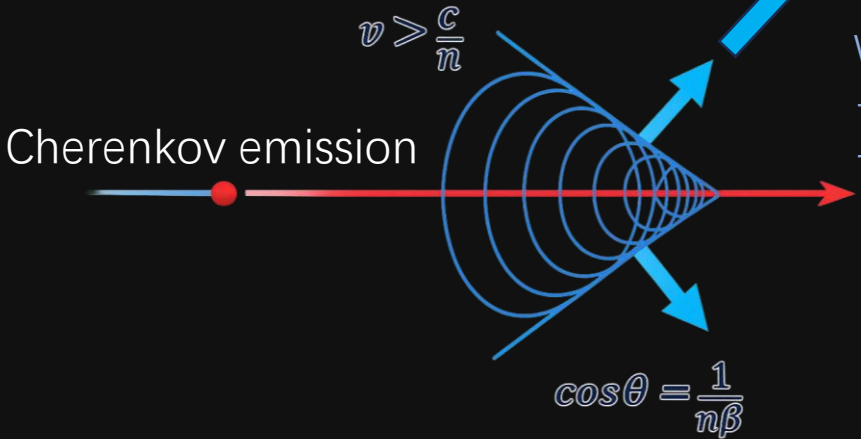
hDOM: 31 PMTs + 21 SiPMs



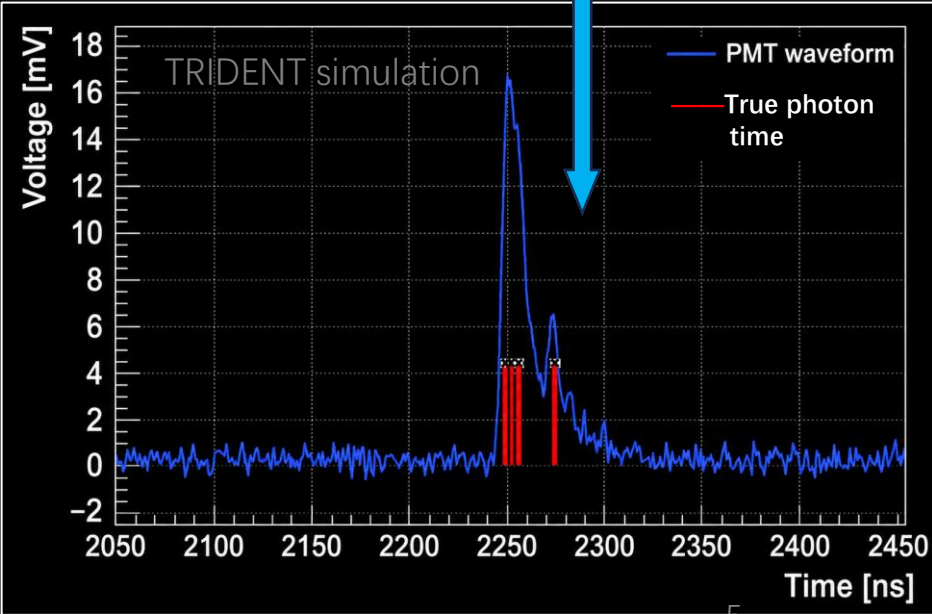
3" PMT : ns-level timing precision



ADC Electronics



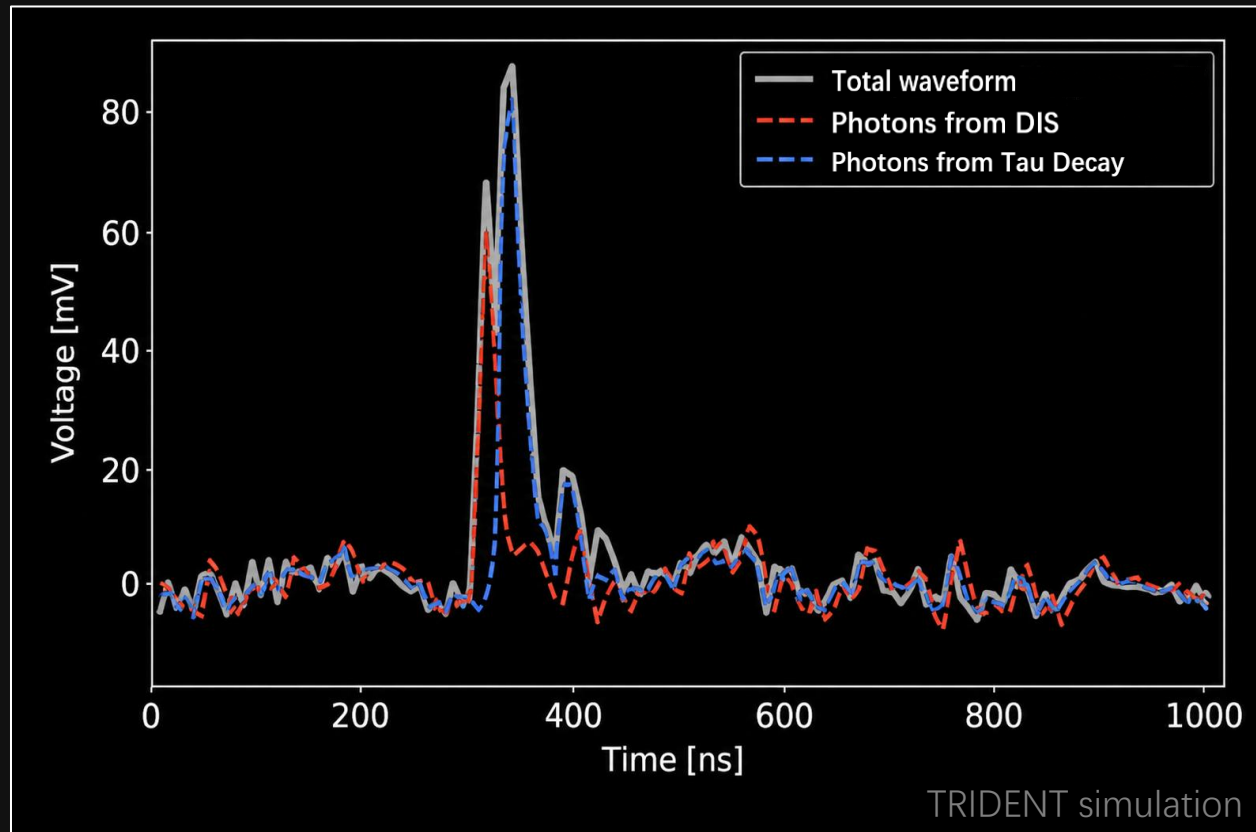
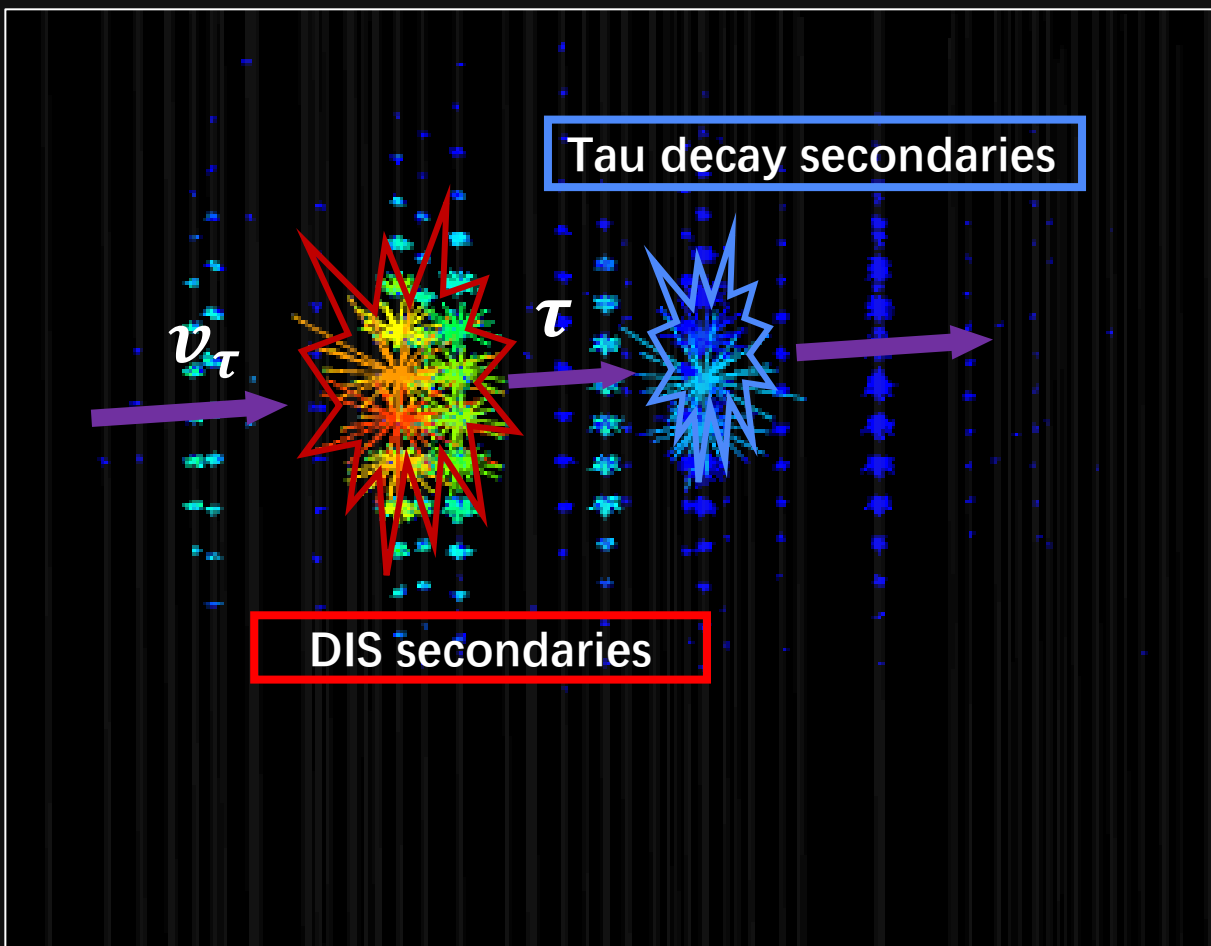
- Waveforms:
- precise photon arrival times
 - improved multi-photon separation



Waveform Reconstruction Pipeline and Performance in TRIDENT



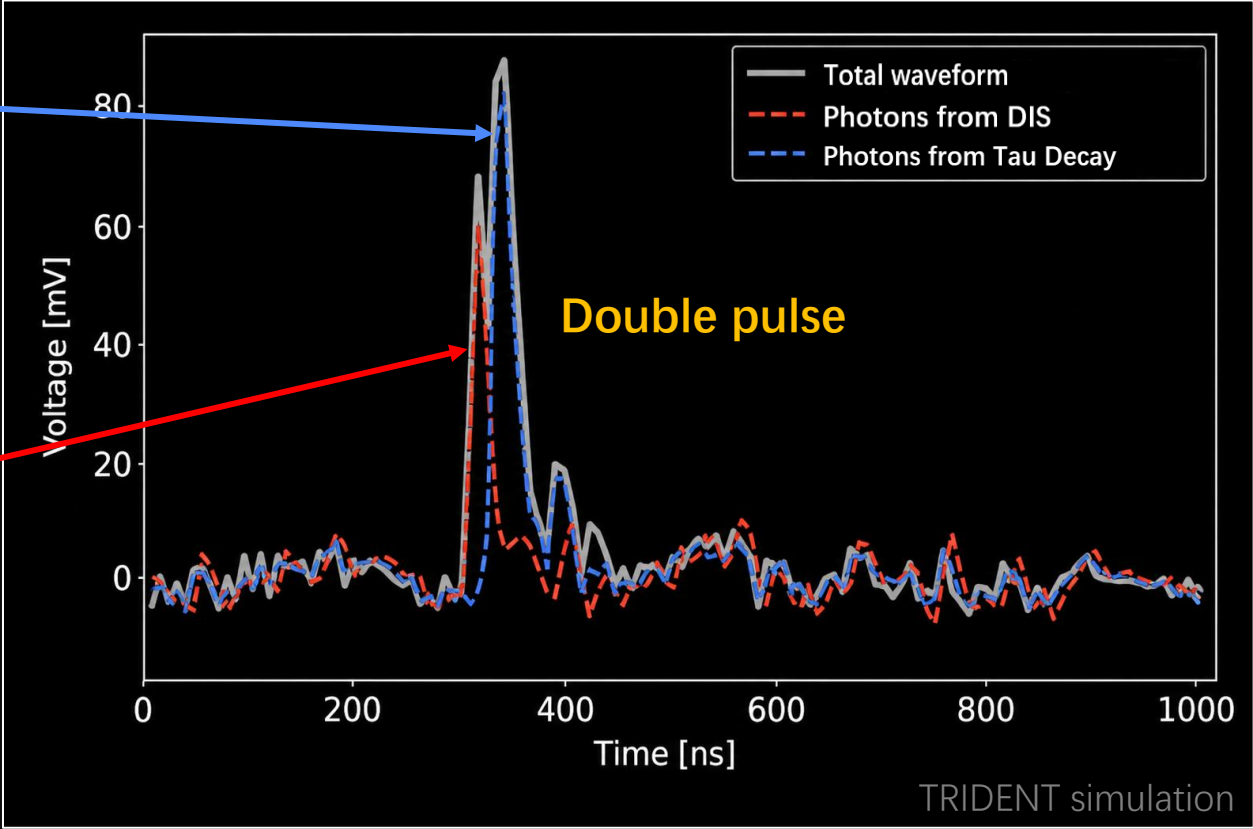
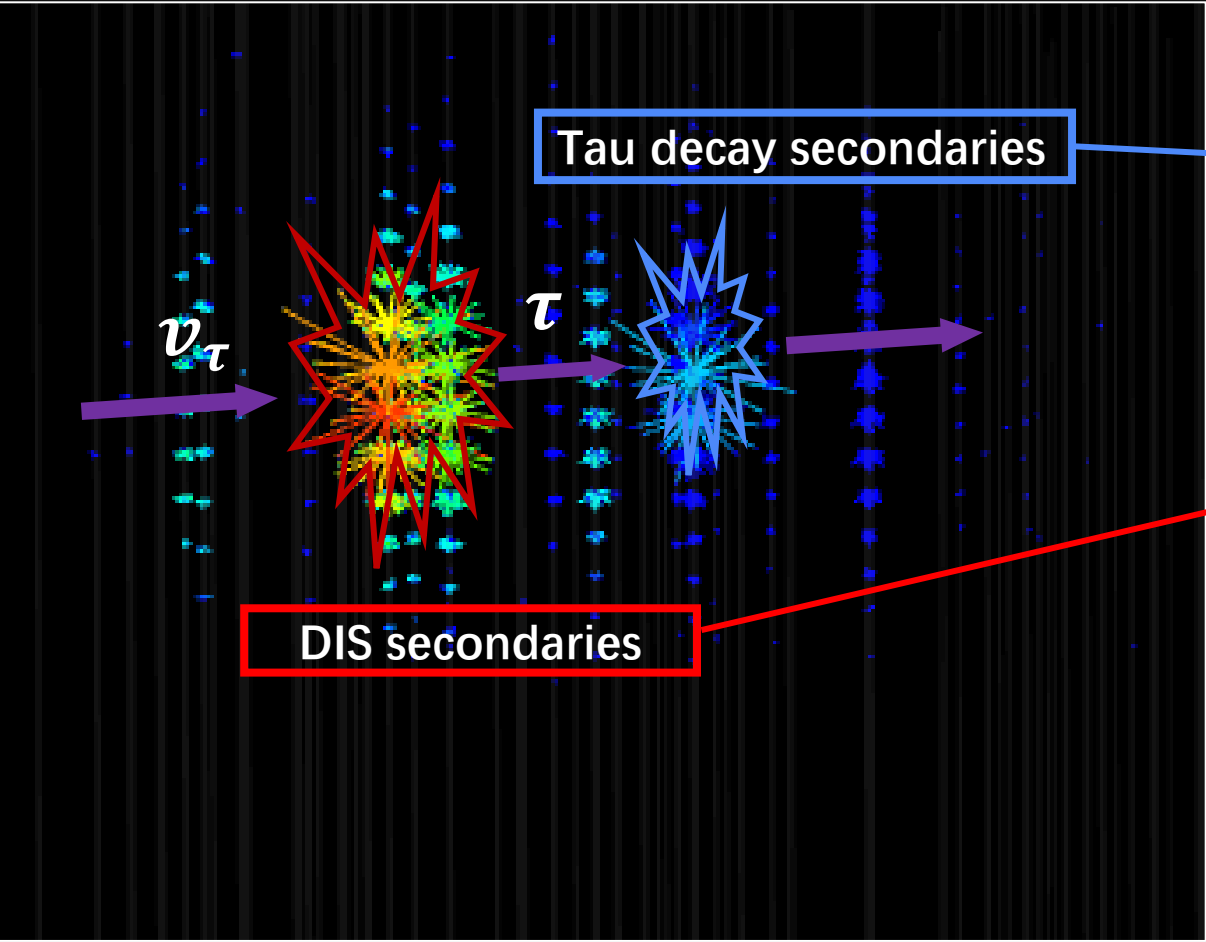
Double pulse structure for ν_τ identification



Waveform Reconstruction Pipeline and Performance in TRIDENT



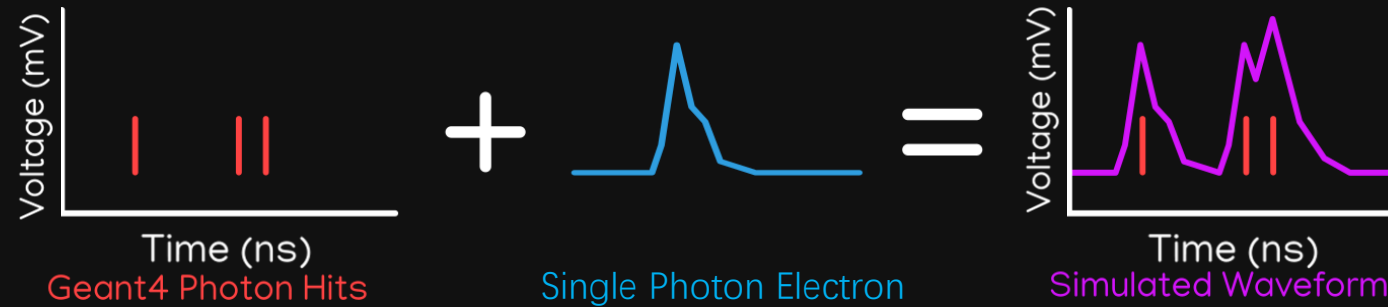
Double pulse structure for ν_τ identification



Current Waveform Simulation and Reconstruction Pipeline

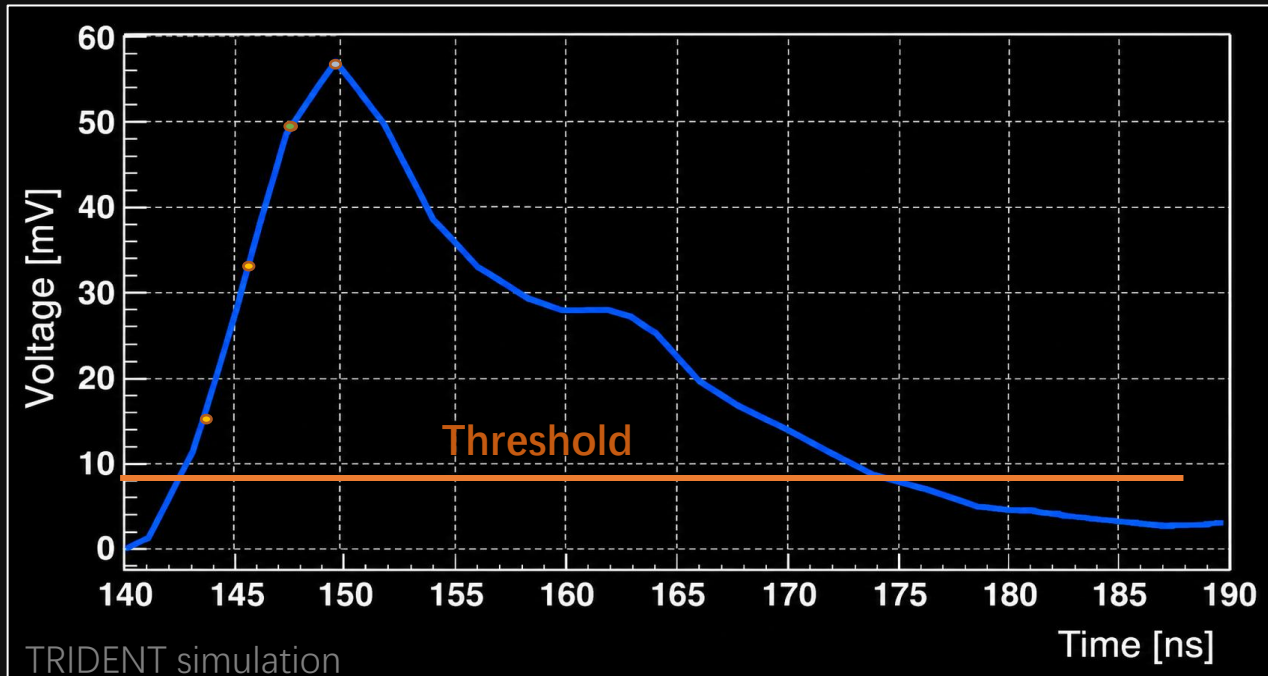


Waveform Emulator



Fast waveform reconstruction → T&Q information

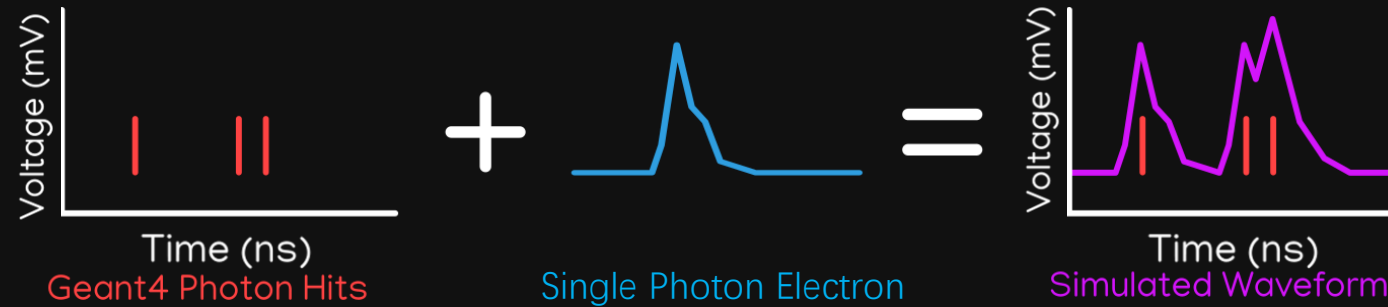
1. Threshold selection



Current Waveform Simulation and Reconstruction Pipeline

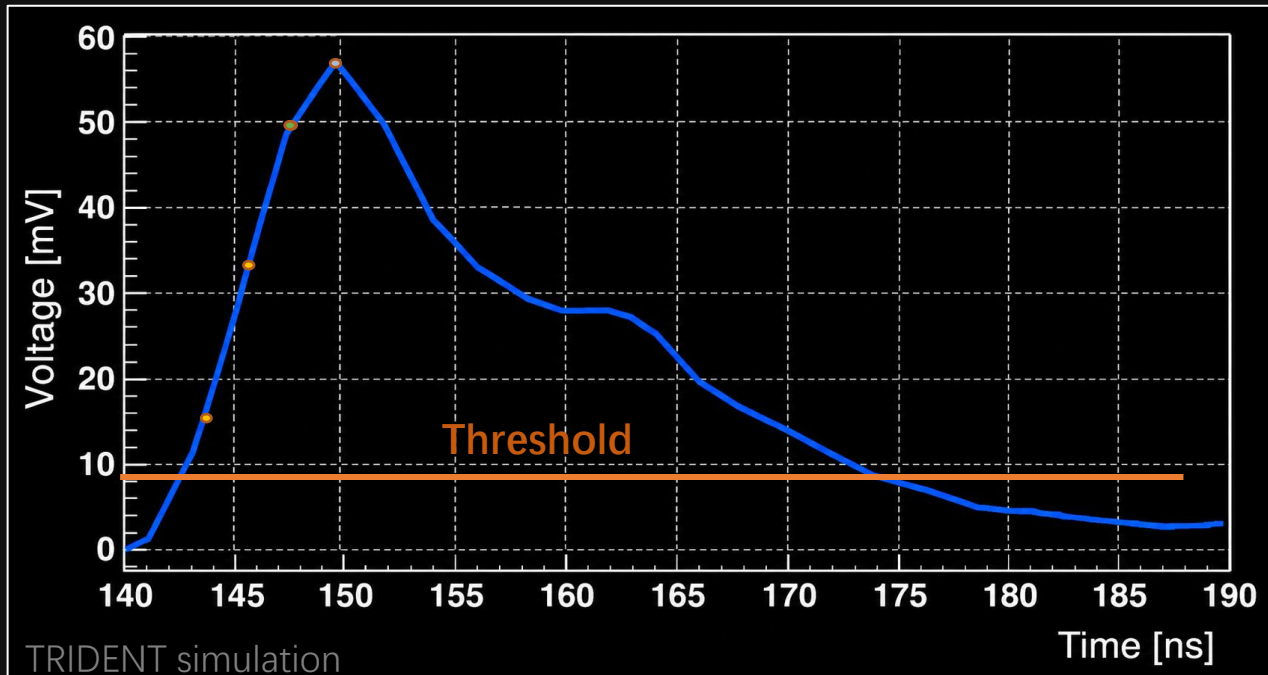


Waveform Emulator



Fast waveform reconstruction → T&Q information

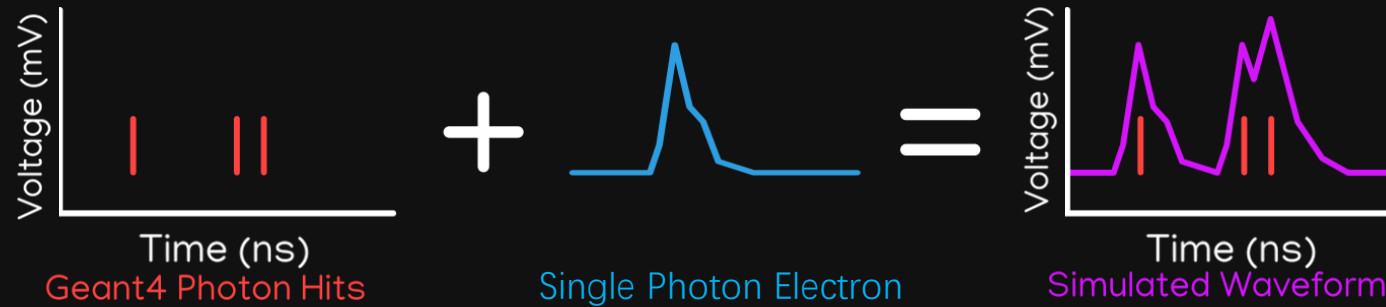
1. Threshold selection
2. Pulse finding



Current Waveform Simulation and Reconstruction Pipeline

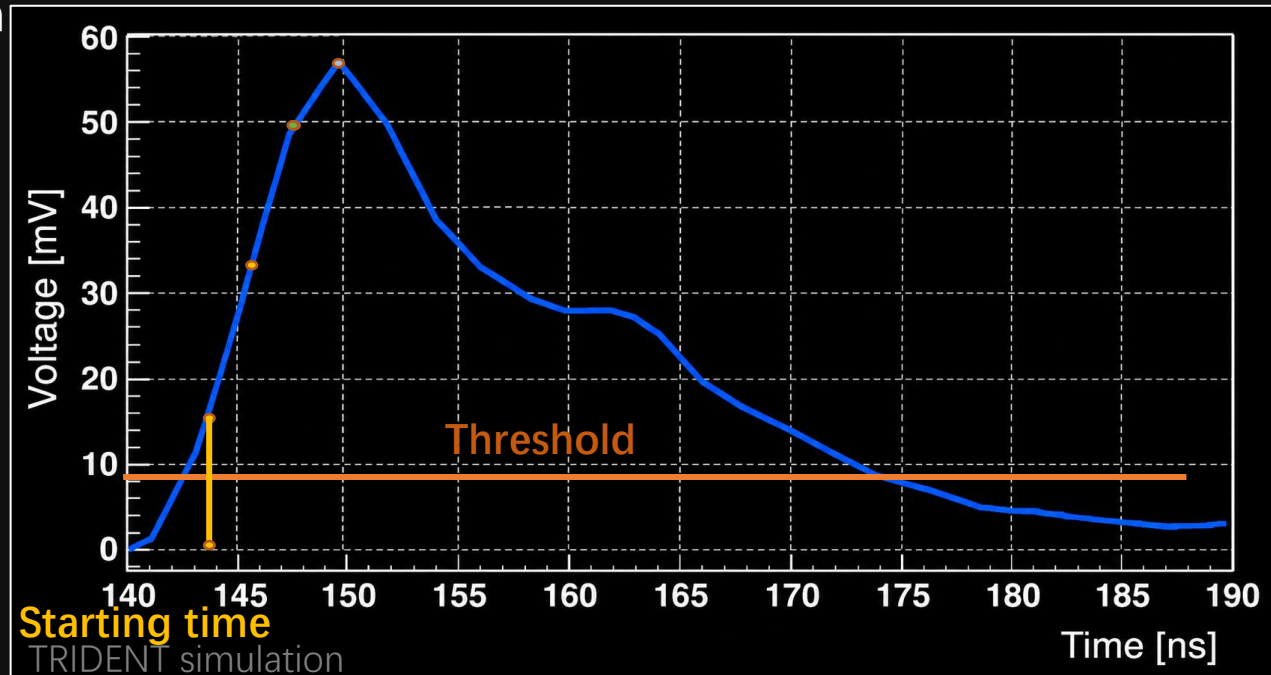


Waveform Emulator



Fast waveform reconstruction → T&Q information

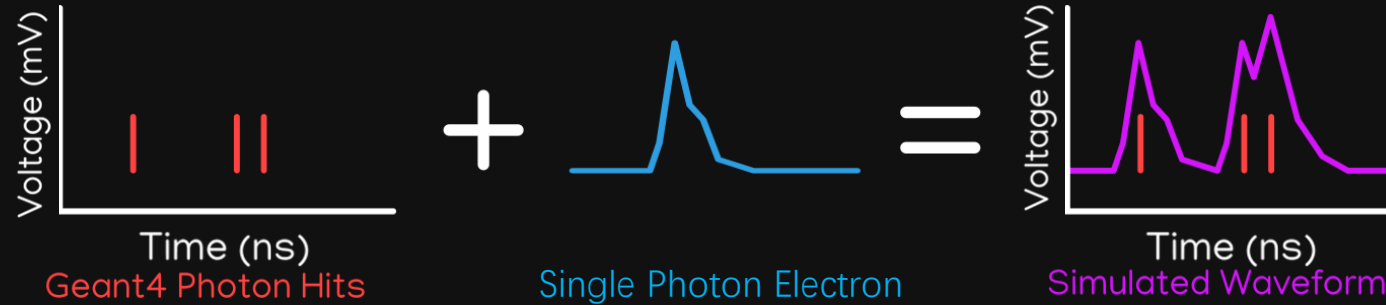
1. Threshold selection
2. Pulse finding
3. Time extraction:
Starting Time



Current Waveform Simulation and Reconstruction Pipeline

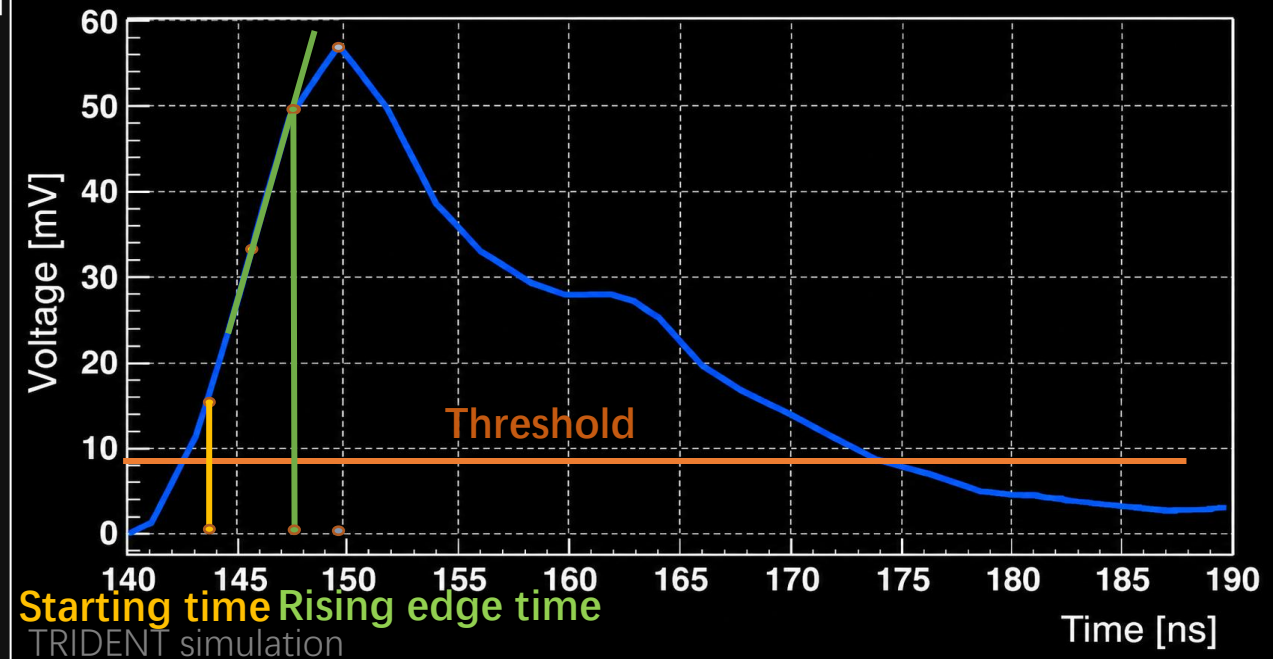


Waveform Emulator



Fast waveform reconstruction → T&Q information

1. Threshold selection
2. Pulse finding
3. Time extraction:
Starting Time
Rising edge time



Current Waveform Simulation and Reconstruction Pipeline

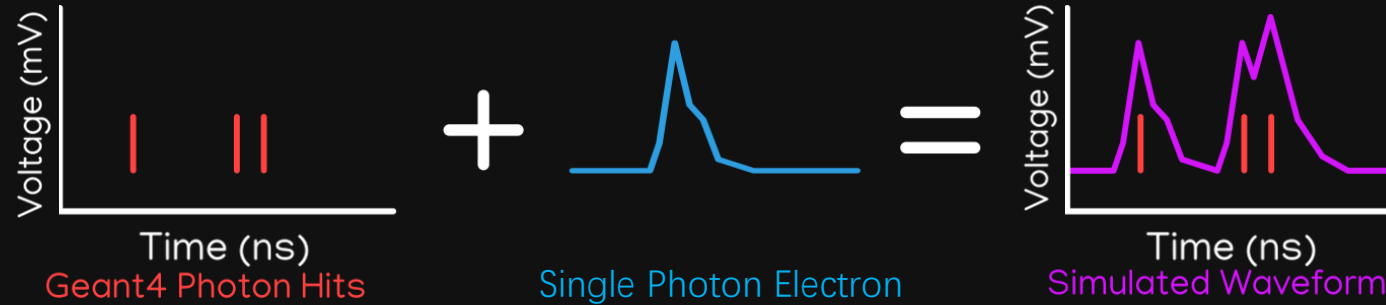


李政道研究所
TSUNG-DAO LEE INSTITUTE



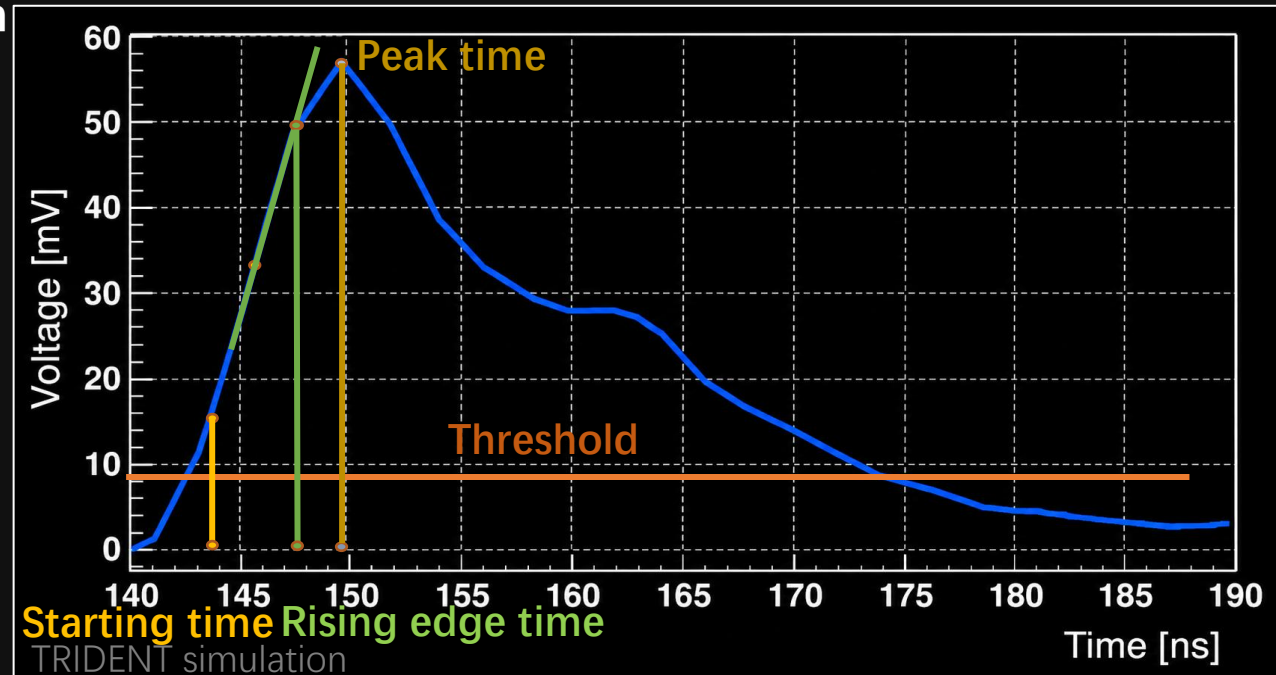
TRIDENT
海 | 铃 | 计 | 划

Waveform Emulator



Fast waveform reconstruction → T&Q information

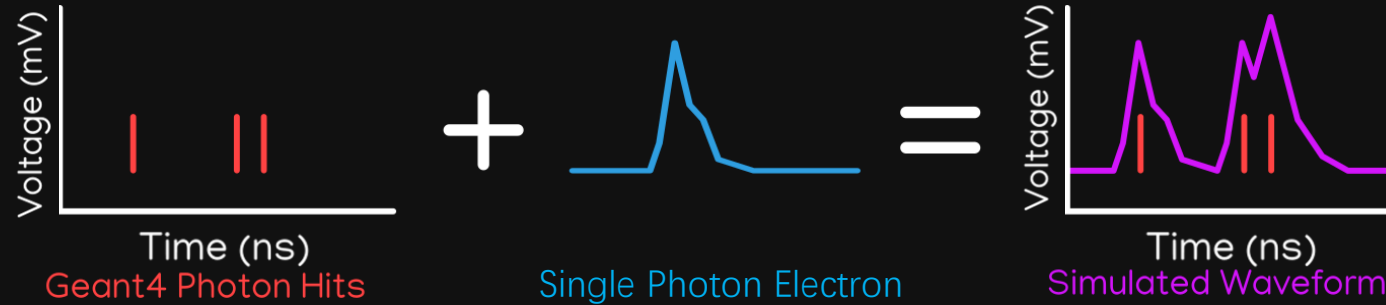
1. Threshold selection
2. Pulse finding
3. Time extraction:
 - Starting Time
 - Rising edge time
 - Peak Time



Current Waveform Simulation and Reconstruction Pipeline



Waveform Emulator



Fast waveform reconstruction → T&Q information

1. Threshold selection
2. Pulse finding
3. Time extraction:
 - Starting Time
 - Rising edge time
 - Peak Time
4. Charge integration

