

**SBS Meeting**  
**Simulated HCal-J Time Resolution**

Brian Quinn, Vahe Mamyán

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# Simulated HCal time resolution using TDC

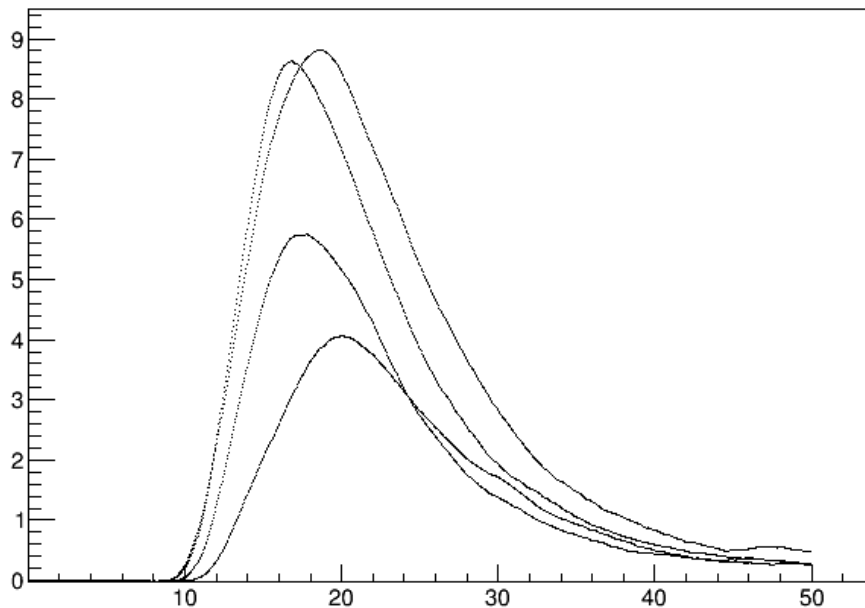
Threshold at 10% of the signal

Time walk correction applied

Time resolution  $\sim 0.7$  ns

## Simulated sample waveforms

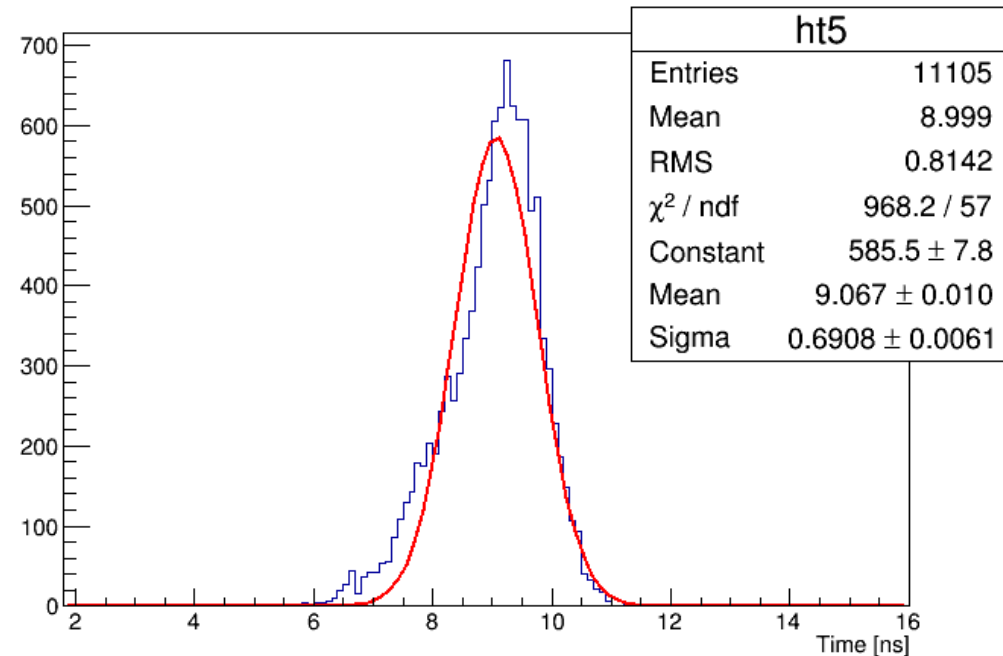
HCal signal



Time [ns]

## Neutron momentum 4.8 GeV/c

HCal hit time distribution



Time [ns]

# Simulation of FADC

Form the HCal signal.

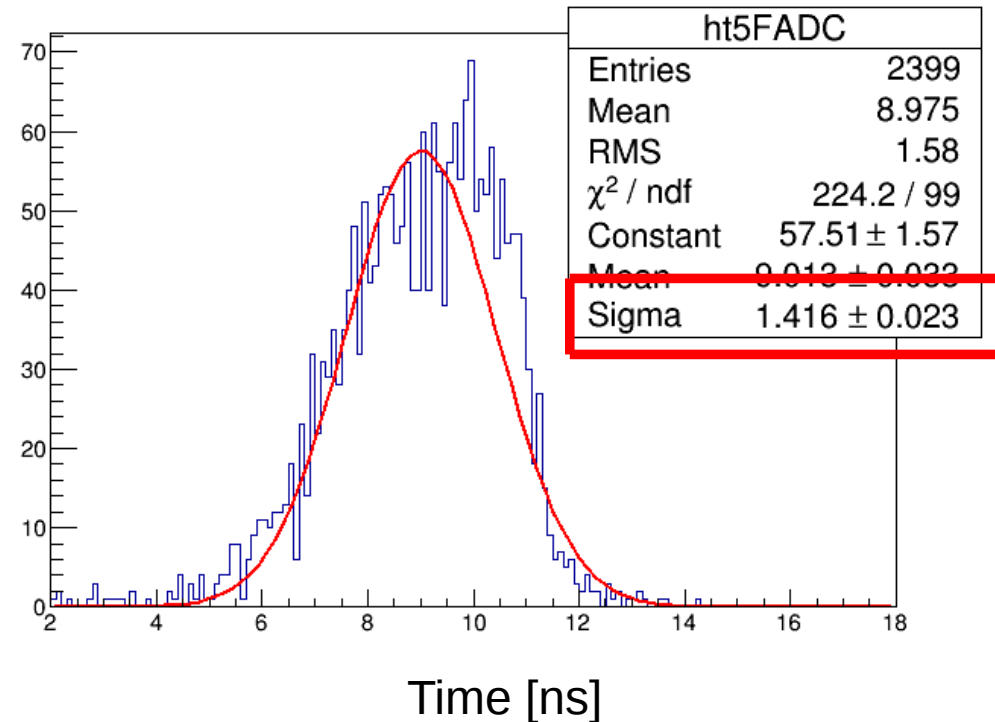
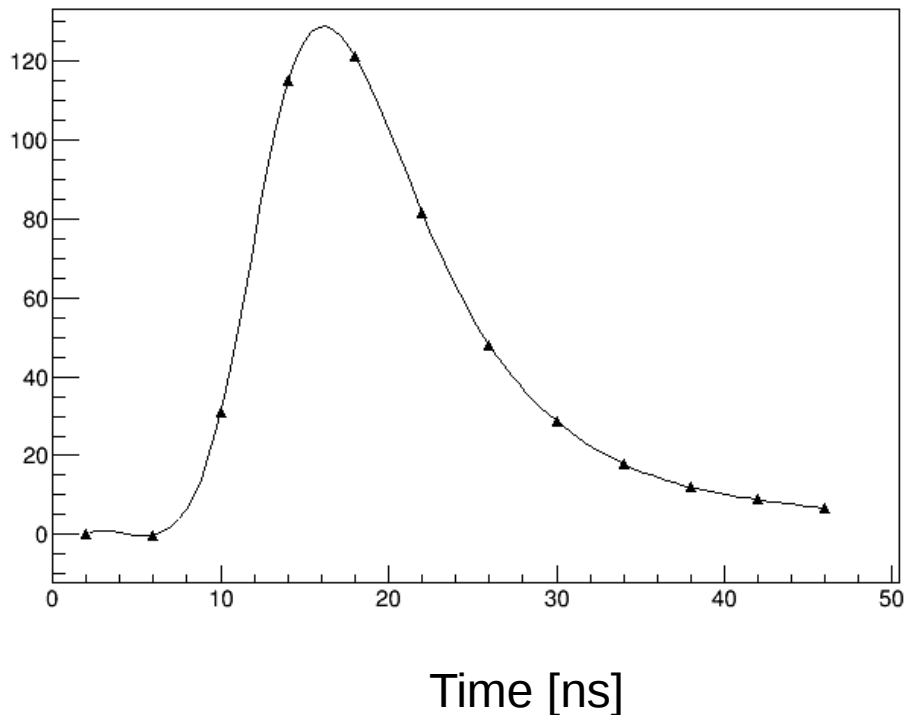
Integrate the signal in 4 ns bins by choosing random start time in 0-4ns interval.

Make a spline using integrals.

Extract time of signal at 10% of average amplitude.

Apply time walk correction.

HCal hit time distribution 4.85 GeV/c neutrons



# Time resolution with FADC and NN

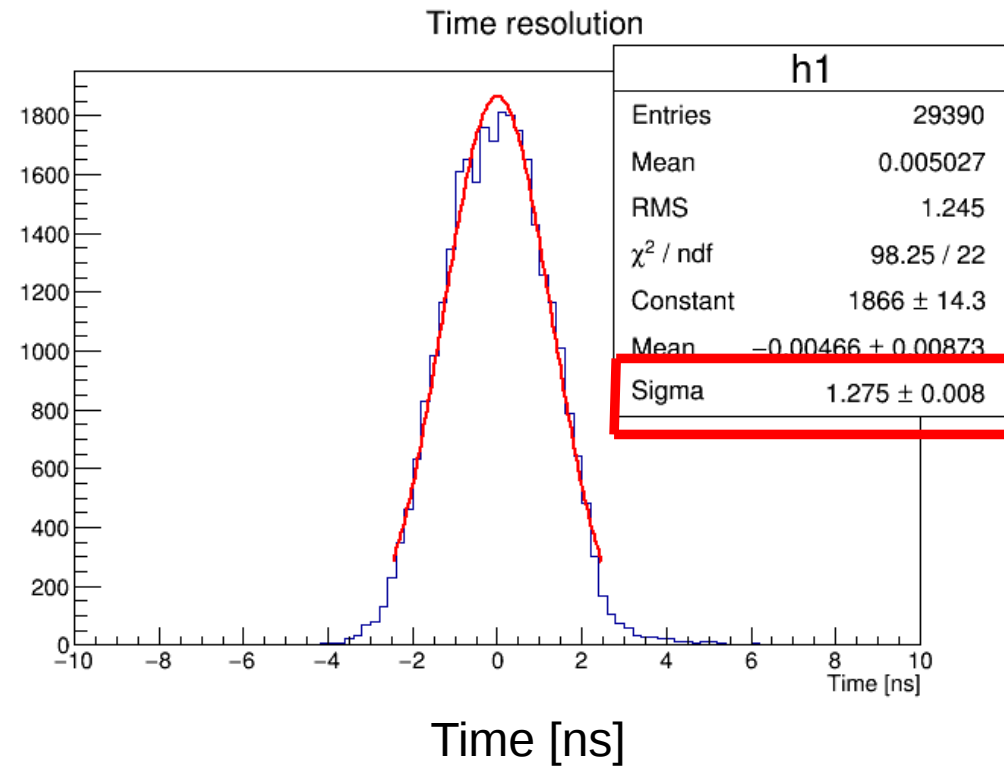
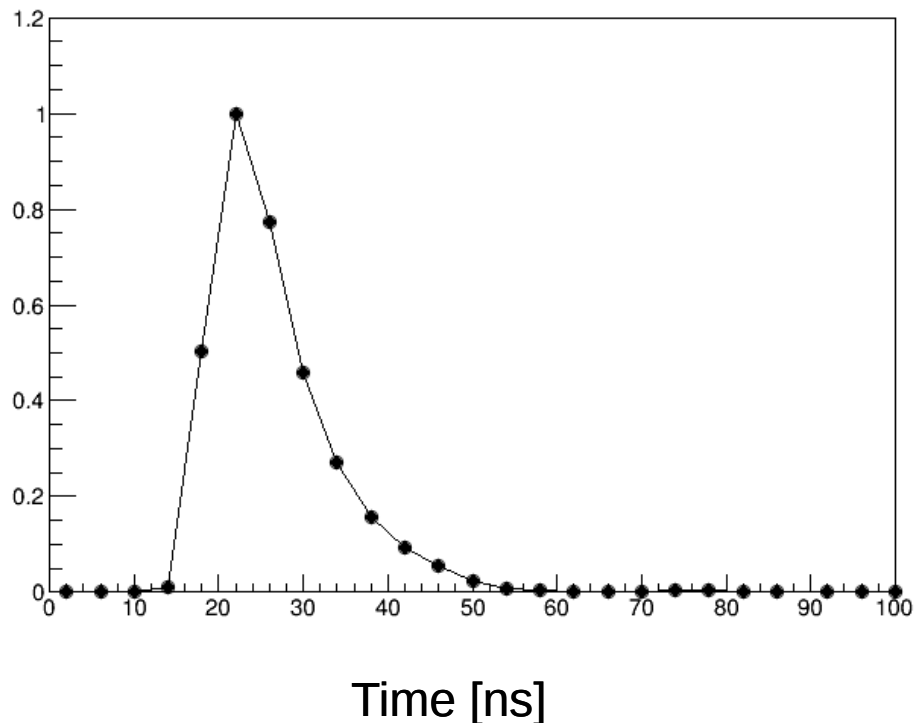
Use Neural Network to predict time resolution.

Generate neutrons with momentum range 0.5 – 10 GeV/c.

Input 25 amplitudes [4 ns bins 100 ns range] into NN.

Train the NN.

Use the trained NN to predict HCal hit time. **Hit time and NN reconstructed time difference**



# Summary

HCal time resolution with TDC is  $\sim 0.7$  ns.

HCal time resolution with FADC and NN is  $\sim 1.3$  ns.

TDC is needed to have the best time resolution HCal can give.