Mid Report of NSCL Neutron Detector Experiment Simulation

2017.11.21.Tue

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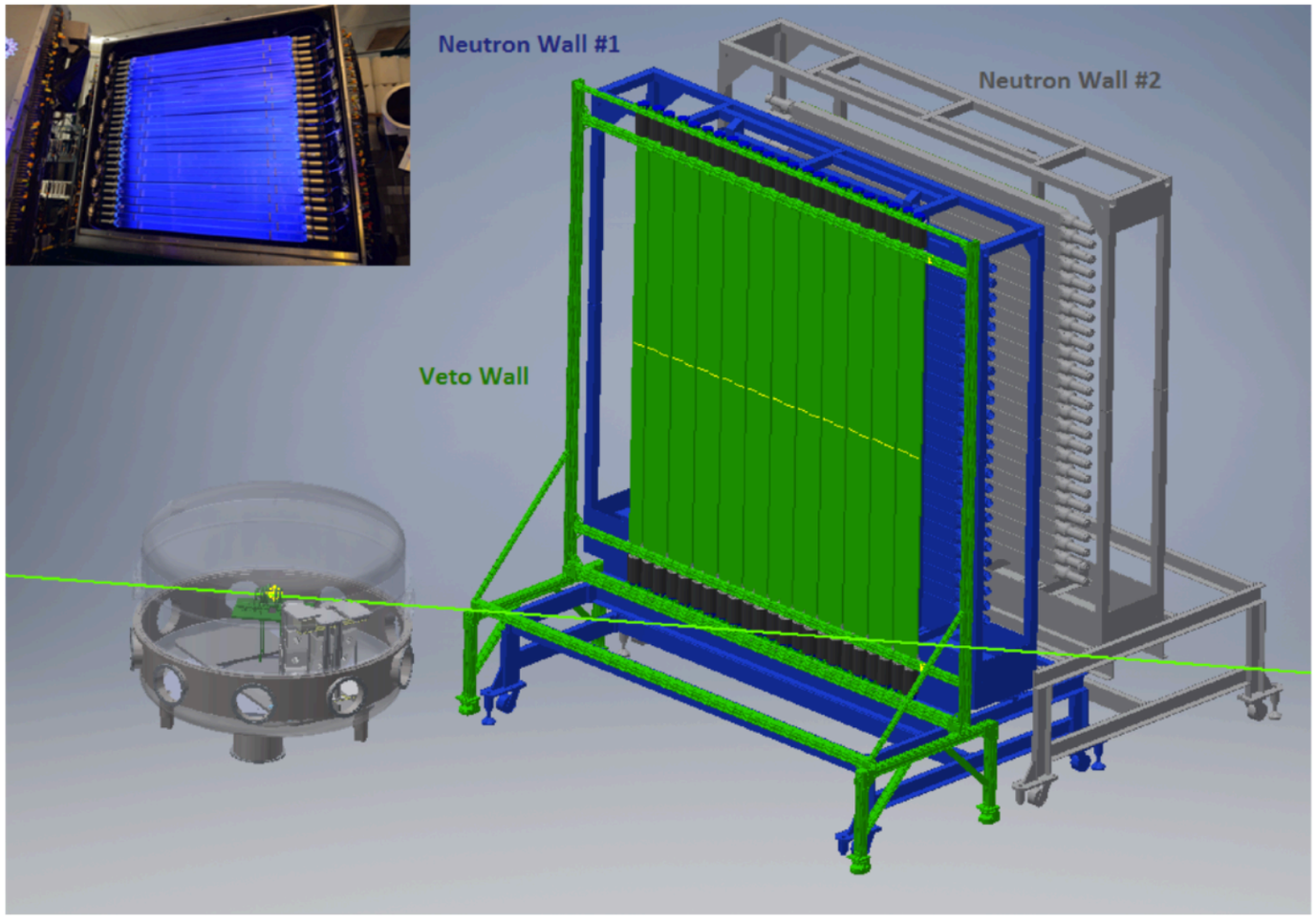
NSCL Neutron Detector
(LANA : Large Area Neutron Array)



Picture and Cartoon from NSCL site

Pictured by me (2017.07)

Purpose of NSCL Neutron Detect Experiment and Experimental Detail

- Charged particle can be detected with standard charged particle detector but neutrons are difficult.
- Goal : Clean high quality neutron spectra without charged particle contamination

1. 50 and 100 AMeV deuteron beams on CH2 target

Emission of recoiled proton by d+p reaction and n & p from deuteron break up

-> Test to determine the performance of the veto wall and its effect on neutron detection

2. 120 AMeV 40Ca beam on 5mg/cm^2 Au target

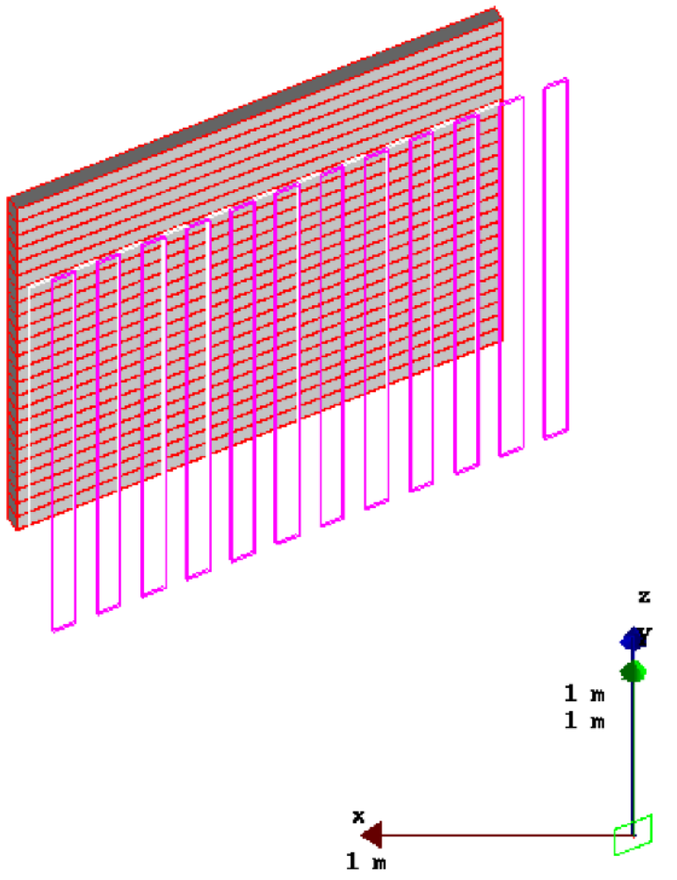
Generate n and charged particles in heavy ion collisions

-> To evaluate the performance of the veto wall in a real heavy ion reaction environment

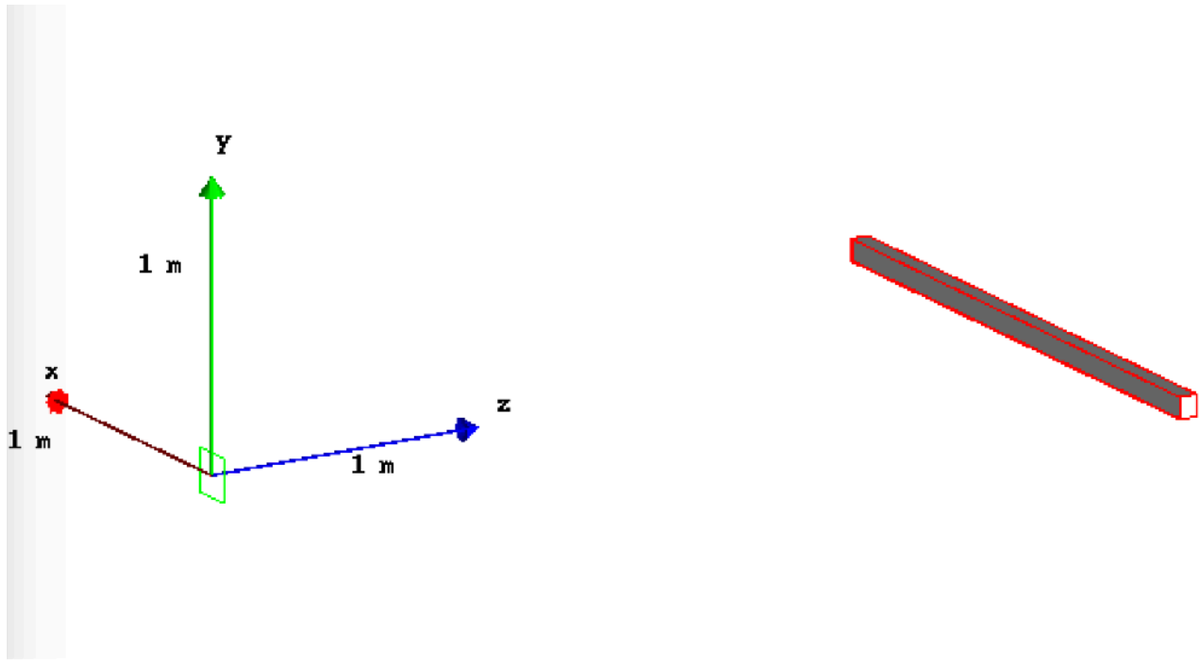
Primary beam	E/A (MeV/u)	Preparation time (hr)	Secondary beam	E/A (MeV/u)	Tuning time (hr)	Beam on target (hr)	Purpose
^{16}O	150	12	d	100	5	16	shake down
			d	100		16	test of CPV + LANA
			d	50	5	16	test of CPV + LANA
^{40}Ca	140	12	^{40}Ca	120	3	12	test of CPV + LANA with HIC
Total		24			13	60	**Total Request: 97 hours**

Table 1: Breakdown of beam request. Note that the primary beam development for the ^{40}Ca beam could be combined with the corresponding time in e14030.

Simulation by Geant 4



25 Neutron Array(behind) and 25 Veto Wall(front)



A Neutron bar for simulation practice

Simulation Process

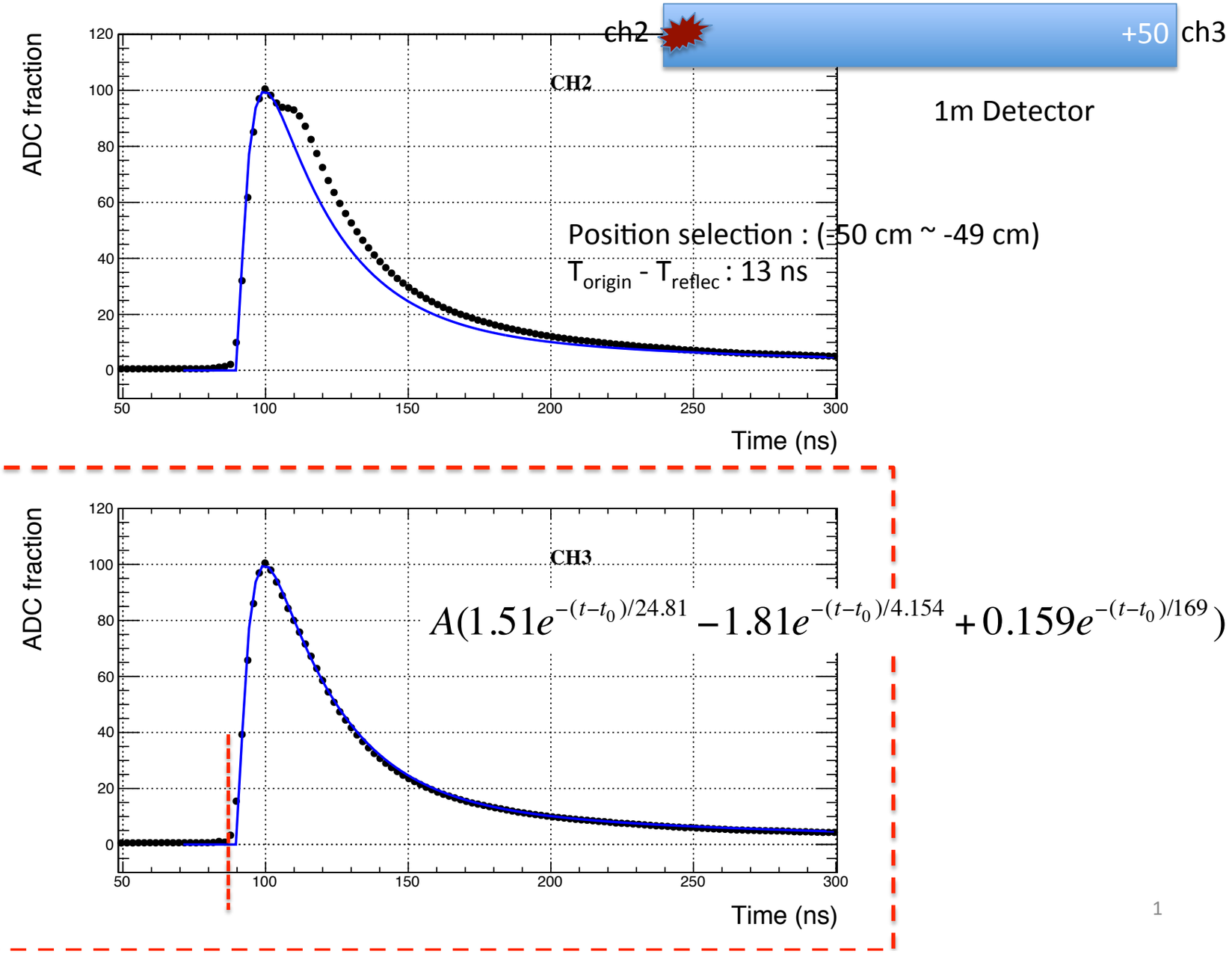
1.Hit 100 MeV Neutron beam directly to Single Neutron bar

2. Draw X-position to Energy deposition histograms event by event

3. Change dimension of X-axis : Position -> Time

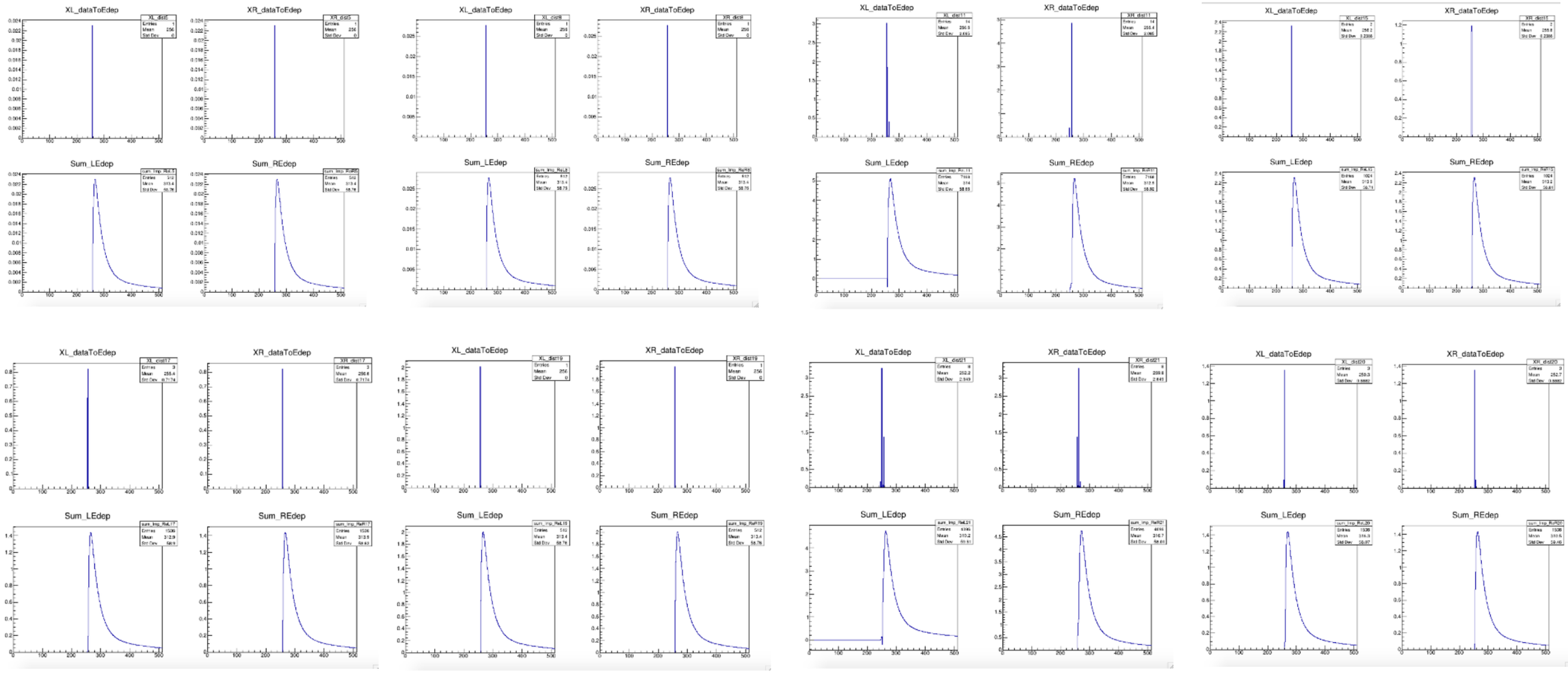
4. Convolution with RCNP electronics Impulse Response

RCNP Impulse Response by Hyun ha Sim

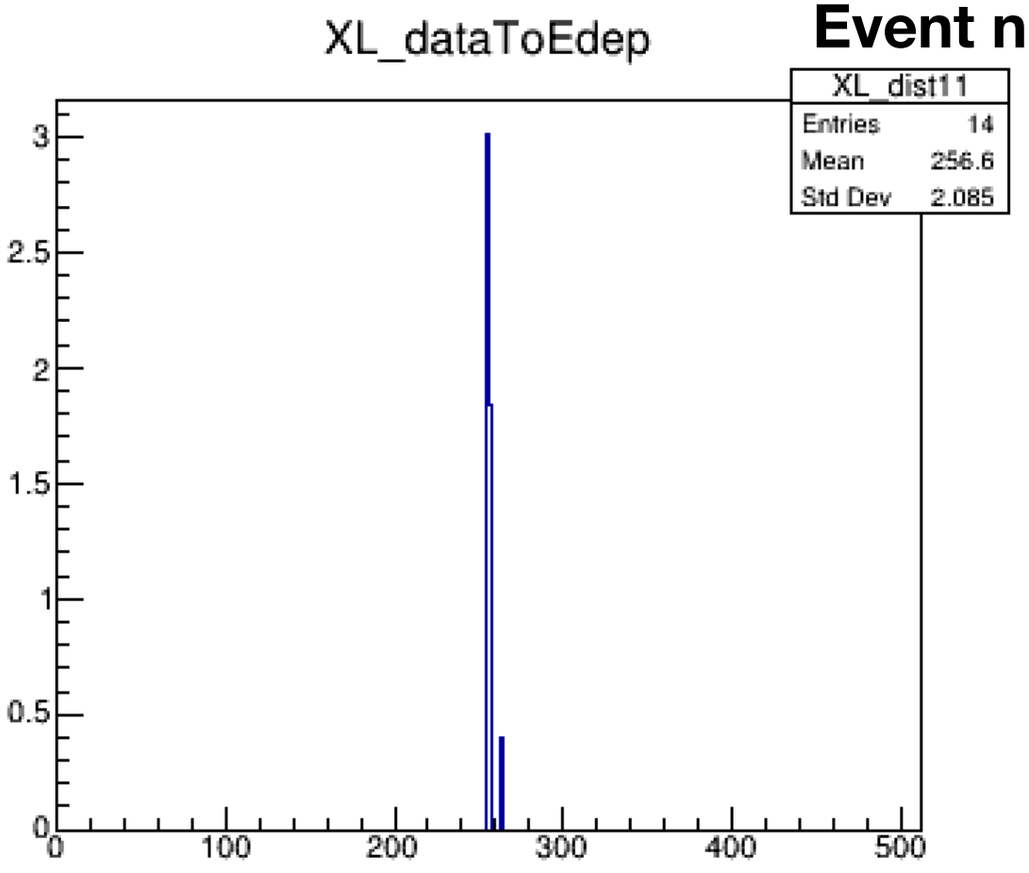


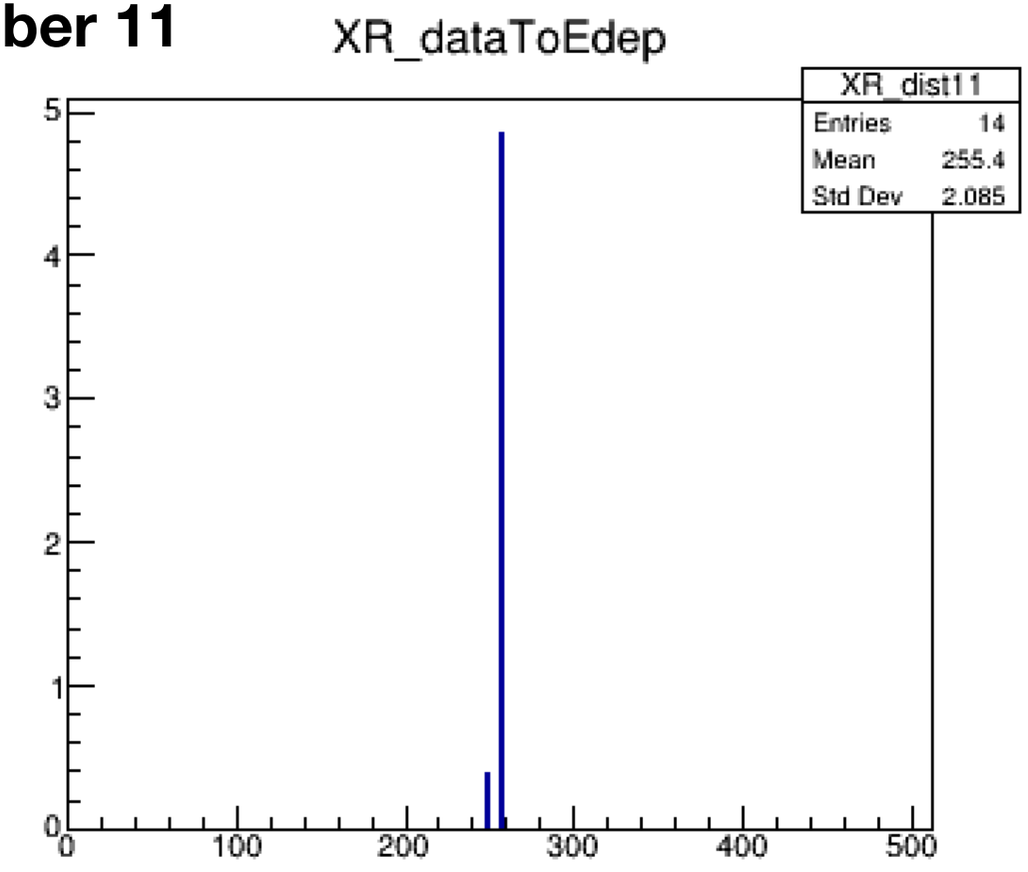
1

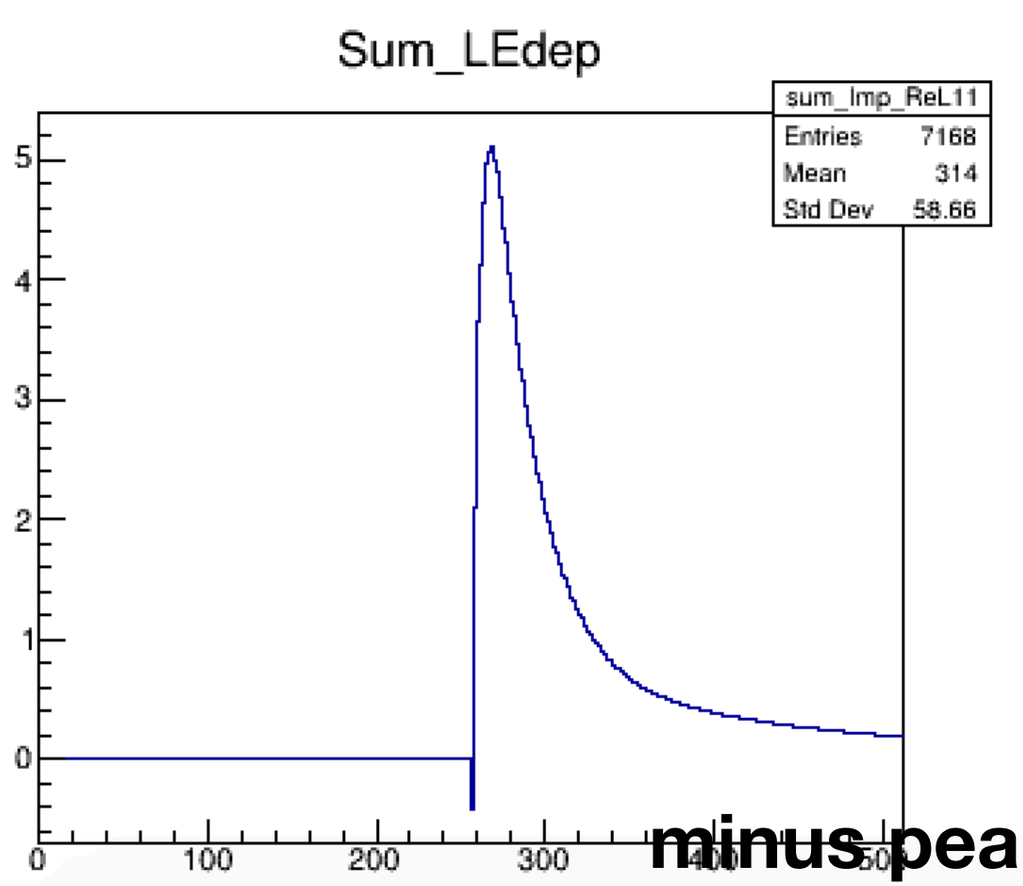
11 Nonzero Energy deposit among 30 events

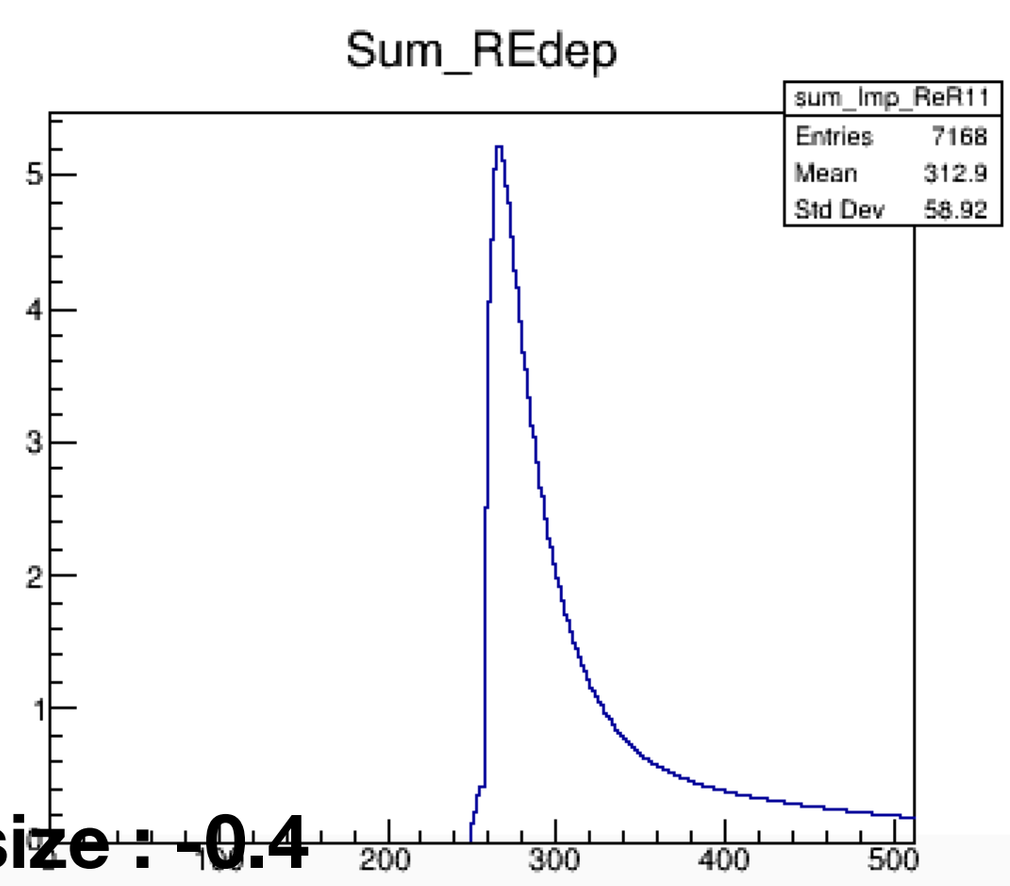


Event number 11









minus peak size : -0.4

Future Plans

1. Remove minus peak appear in event 11 and 21.

2. After finish single simulation, go back to multi layer simulation.

3. Consider about deuteron and CH2 target collision.

4. Study more about back ground physics.