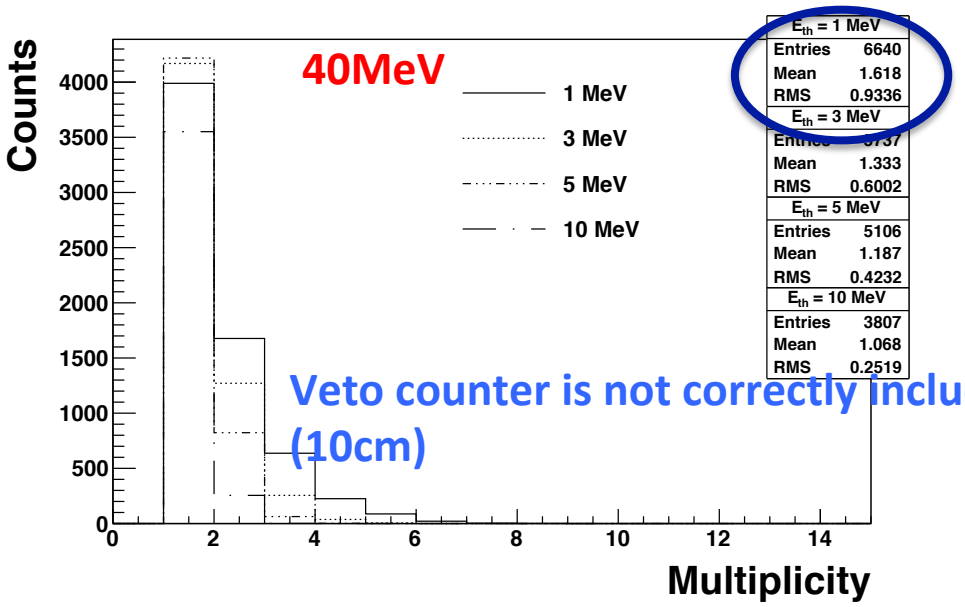
Q1 : total number of fired detector is underestimated?

Q2 : at low energy (~ 40 MeV) why efficiency is low ?

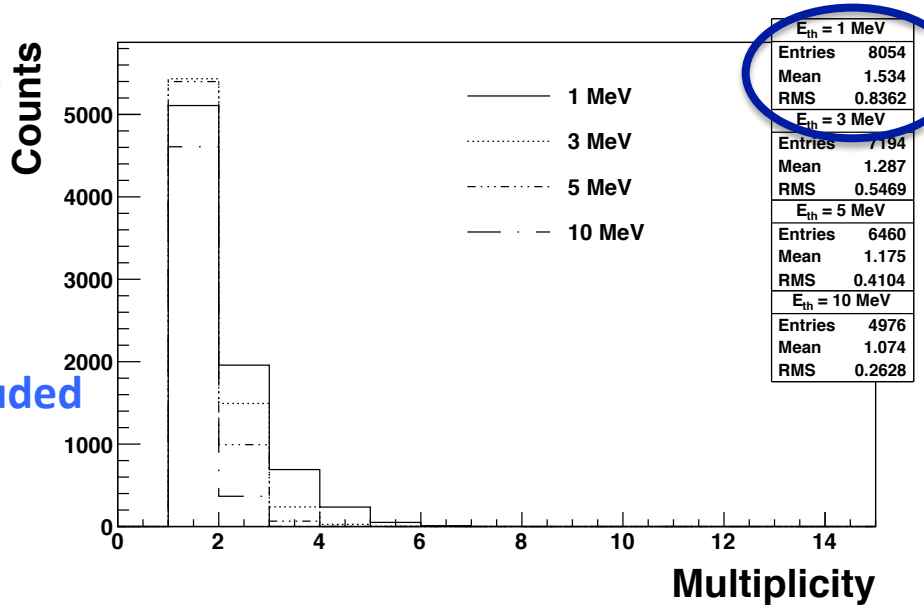
Q3 : arrival time(from origin to fired detector) distribution is correct?

Multiplicity(number of fired detector)

Condition :
Neutron energy : 40 MeV
Number of events : 10000
Distance : 10 m
Gap between station : 60 cm



New calculation without veto counter



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NUCLEAR INSTRUMENTS & METHODS IN PHYSICS RESEARCH Section A

A large area detector for high-energy neutrons

LAND Collaboration

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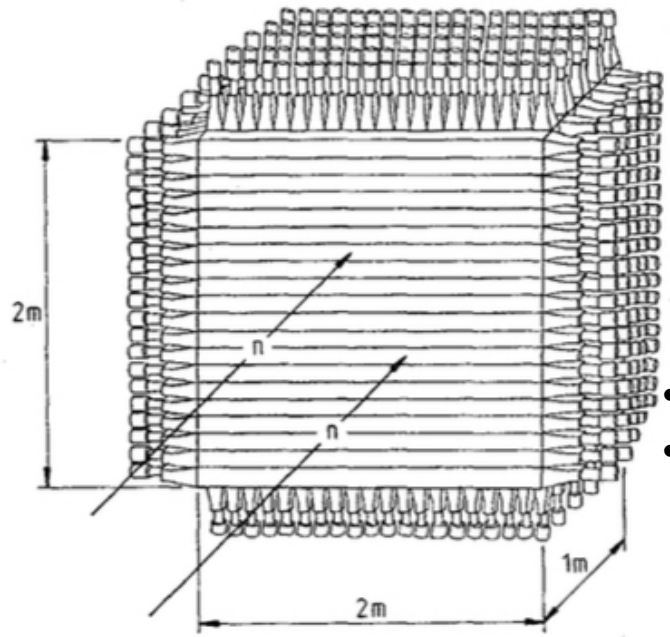

Fig. 4. Sketch of the full neutron detector (without veto detector).

- Full detector : 200 paddles of 200cm* 10cm *10cm
- Each paddle : 11 sheets of iron(two outer ones are 2.5 mm thick, the others are 5mm thick) and 10 sheets of 5mm thick scintillator

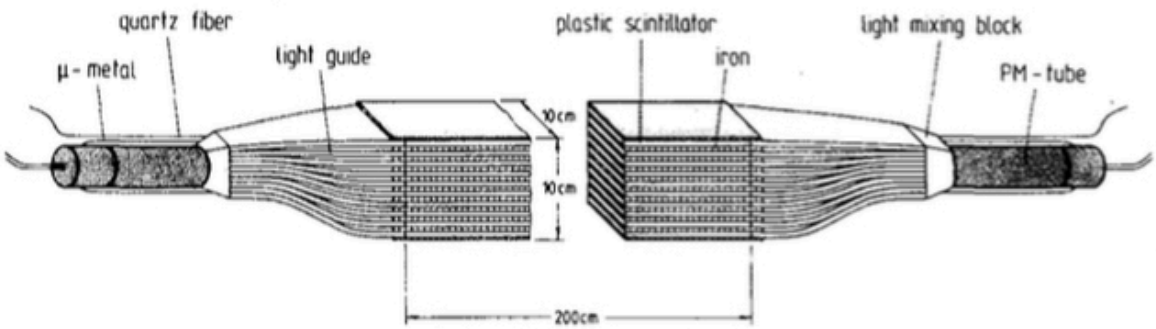

Fig. 5. Sketch of one neutron detector paddle. The layer structure is shown together with the bent light guide strips, light mixing blocks, quartz glass fibers, and photomultipliers.

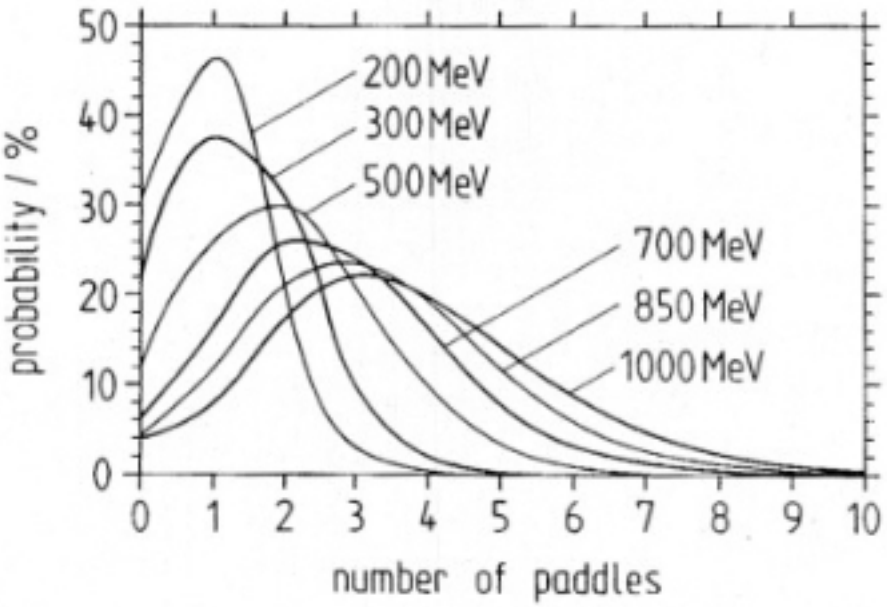

Fig. 14. Simulated probability distribution of the paddle multiplicity resulting from monoenergetic neutrons impinging on LAND with indicated energies.

Depending on the neutron energy, a mean paddle multiplicity of 1-4 is observed

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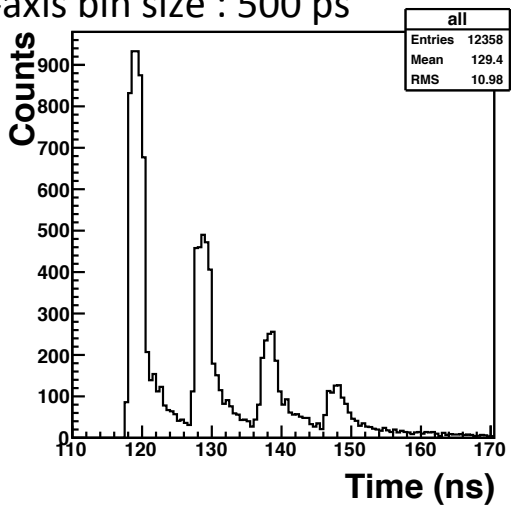
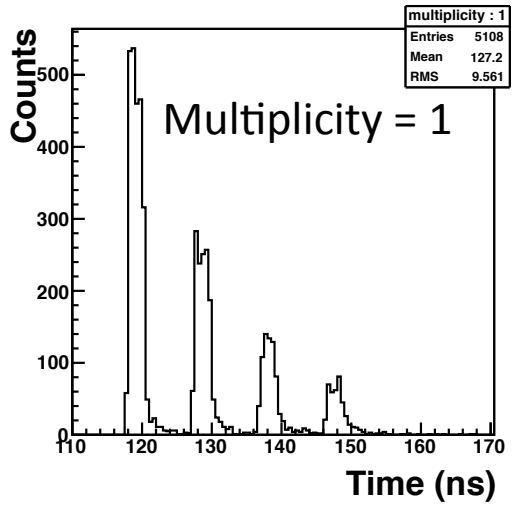
Average number of subdetectors of LAND : Nhit 1.2 for 70MeV, Nhit 5.1 for 1050 MeV

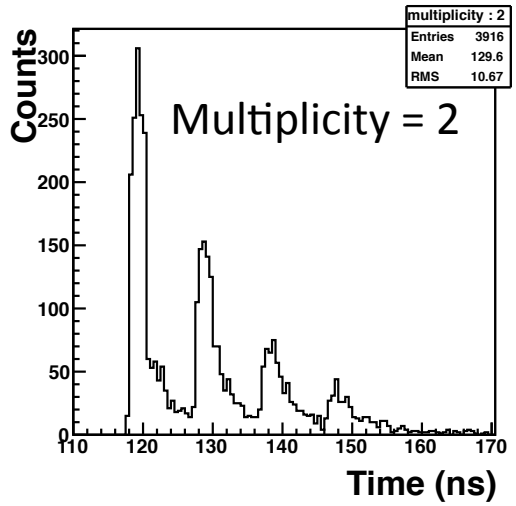
Arrival time with different multiplicity

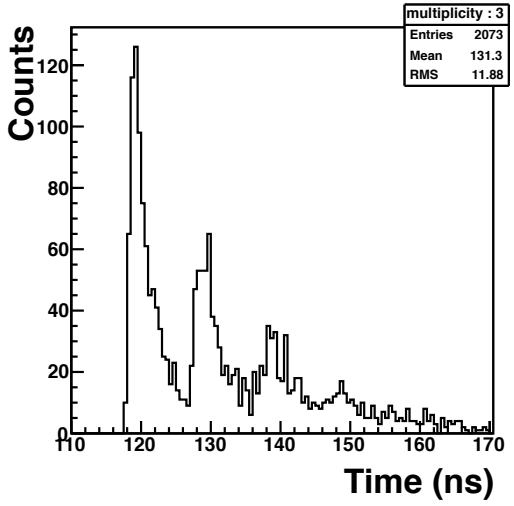
Neutron energy : 40 MeV
Detector threshold : 1 MeV
Distance : 10m
Gap between stations : 60 cm
X-axis bin size : 500 ps

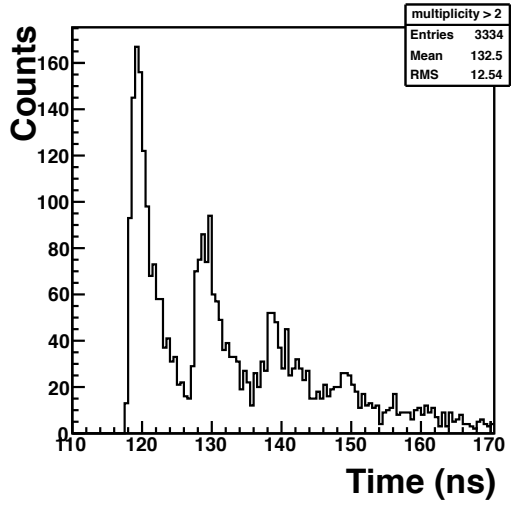
backscattering events are not included

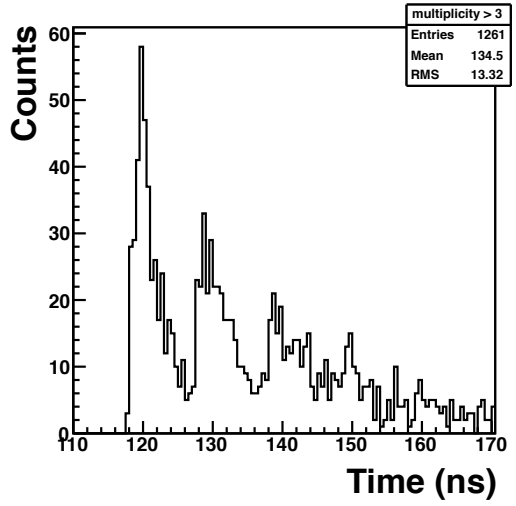








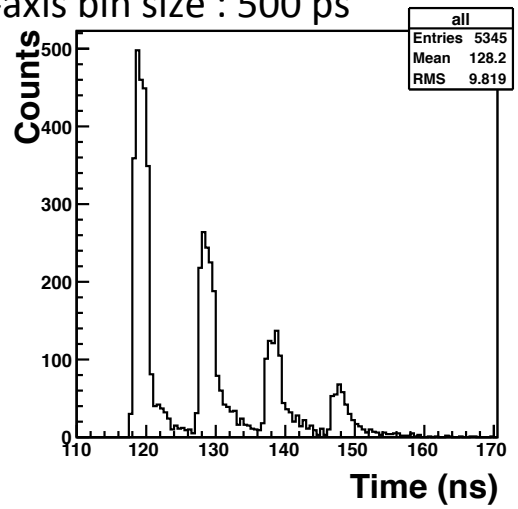


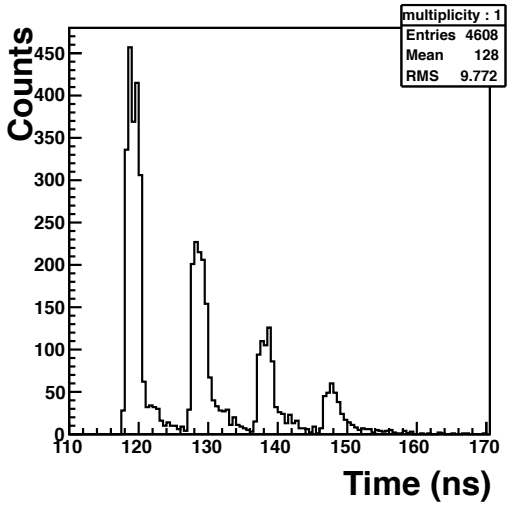


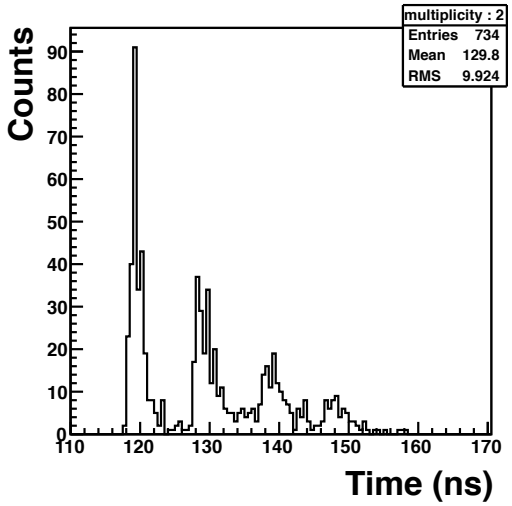
Arrival time with different multiplicity

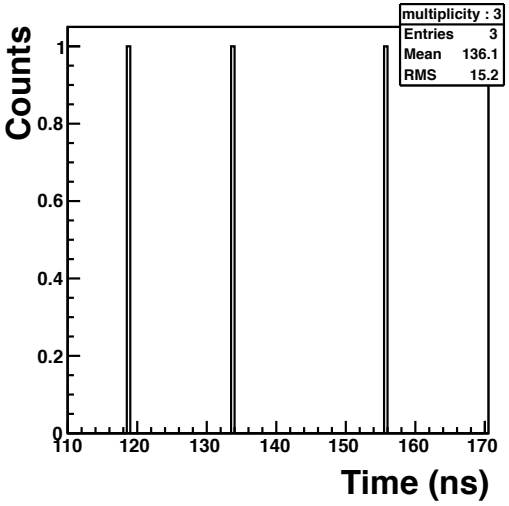
Neutron energy : 40 MeV
Detector threshold : 10 MeV
Distance : 10m
Gap between stations : 60 cm
X-axis bin size : 500 ps

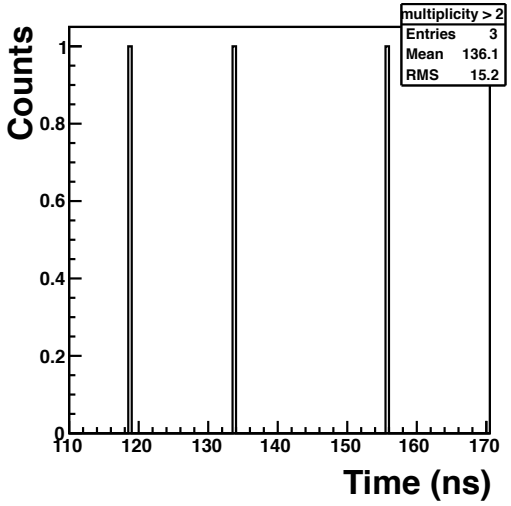
backscattering events are not included

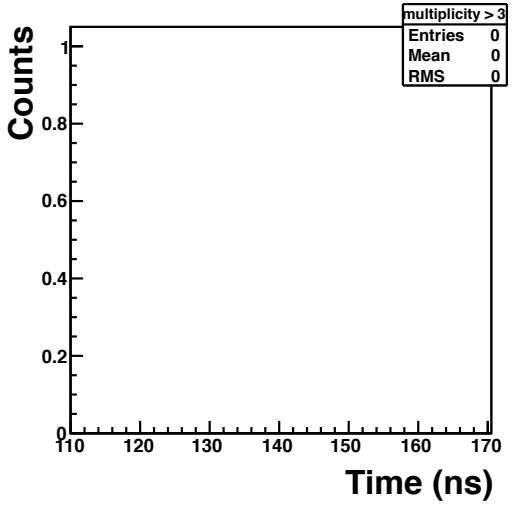






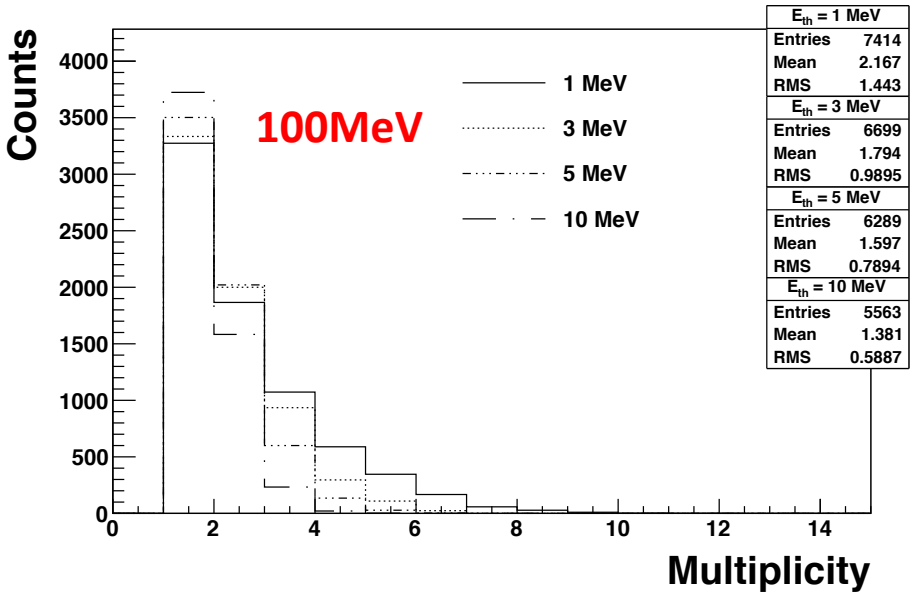




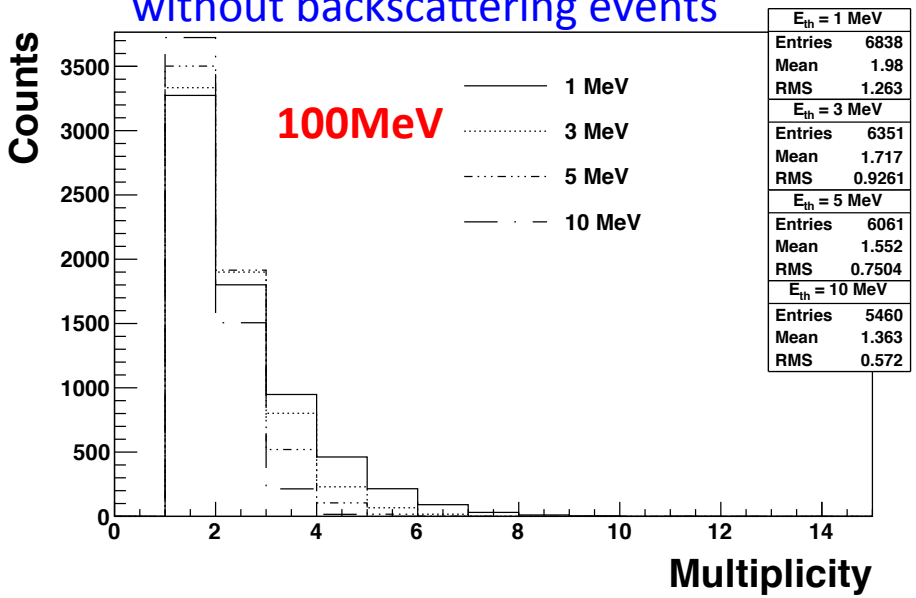


Multiplicity with different threshold

Condition :
Neutron energy : 100 MeV
Number of events : 10000
Distance : 10 m
Gap between station : 60 cm



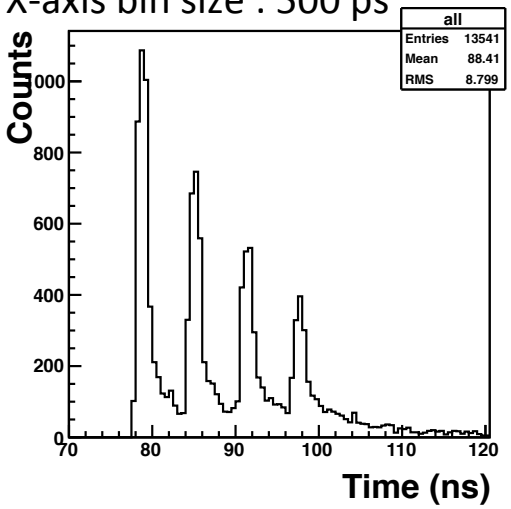
without backscattering events

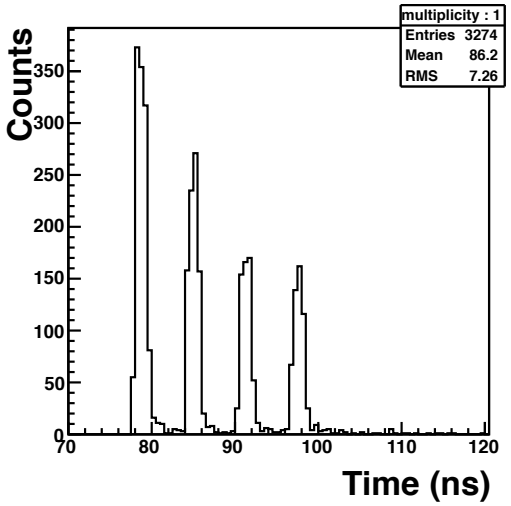


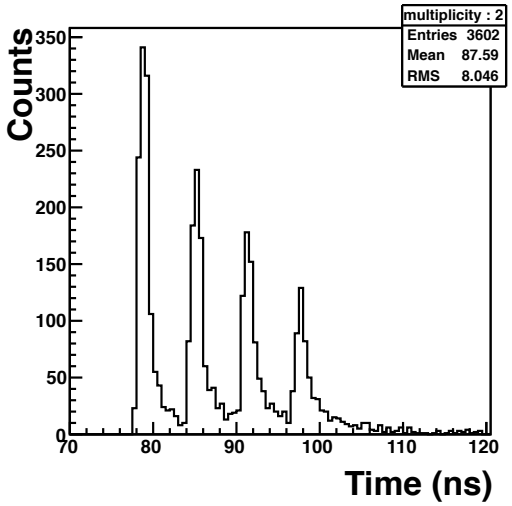
Arrival time with different multiplicity

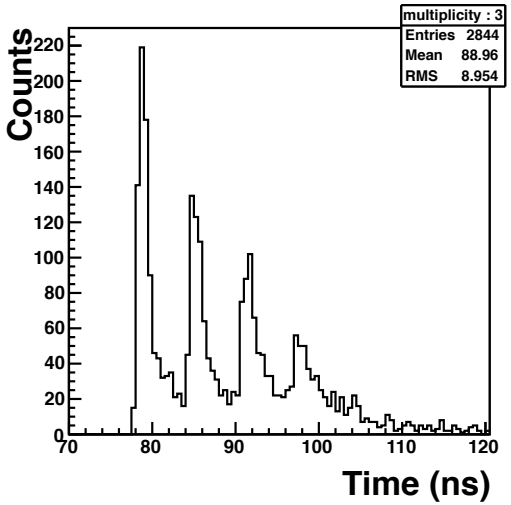
Neutron energy : 100 MeV
Detector threshold : 1 MeV
Distance : 10m
Gap between stations : 60 cm
X-axis bin size : 500 ps

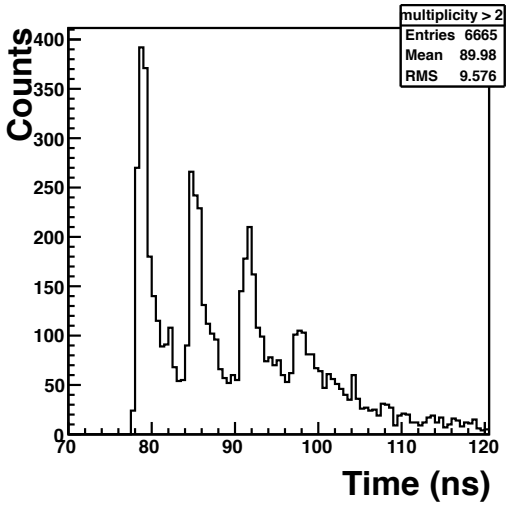
backscattering events are not included

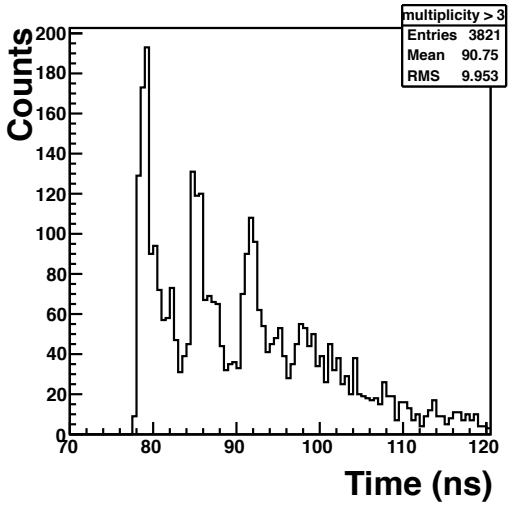








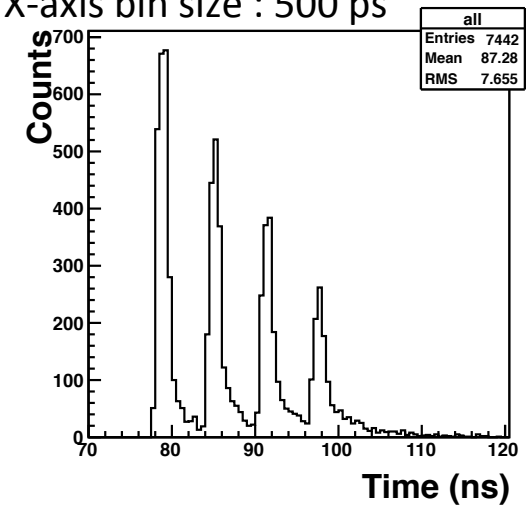


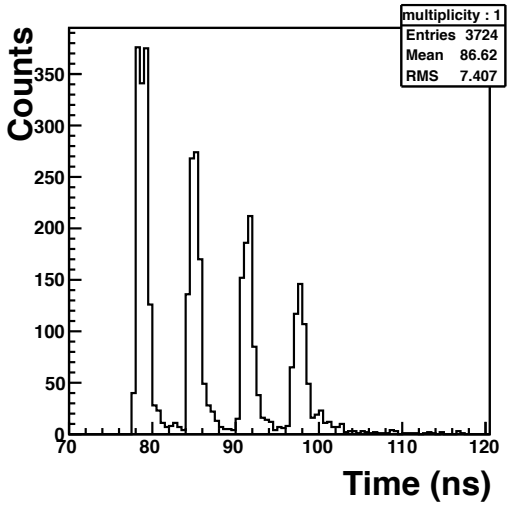


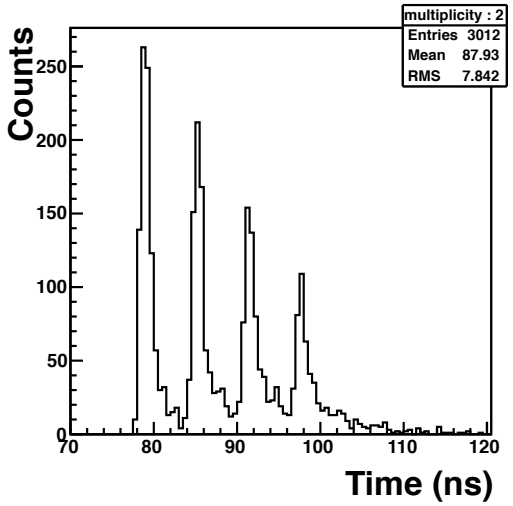
Arrival time with different multiplicity

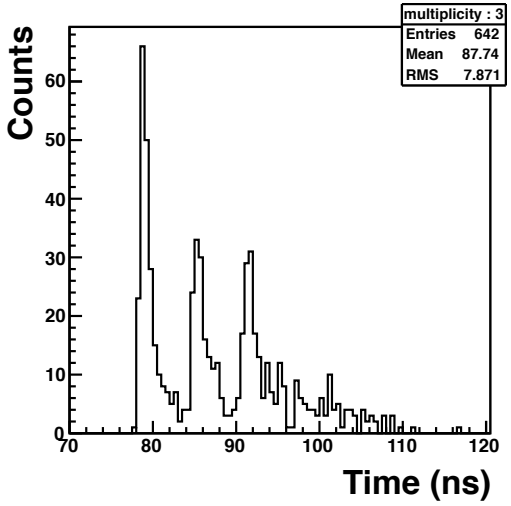
Neutron energy : 100 MeV
Detector threshold : 10 MeV
Distance : 10m
Gap between stations : 60 cm
X-axis bin size : 500 ps

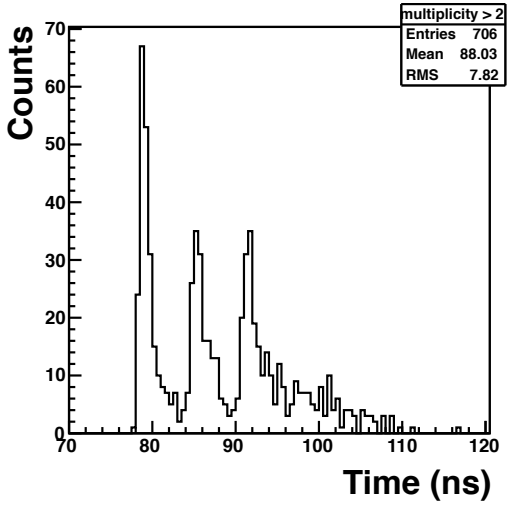
backscattering events are not included

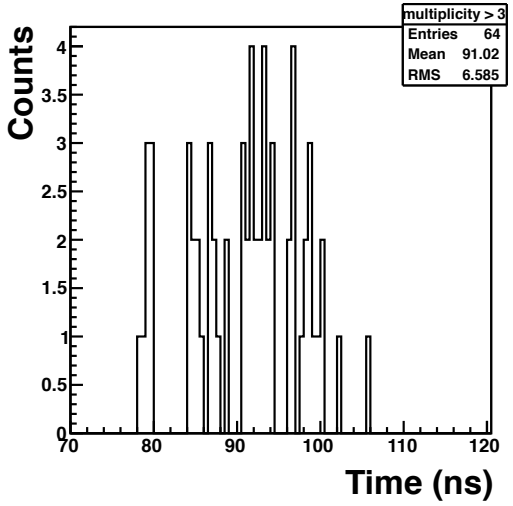












Plan

Separation efficiency calculation with different multiplicity

Time condition

1：time condition　same station : 5ns , different station : 10~15 ns
2：method function by using arrival time distribution
3　calculate least time from d/v