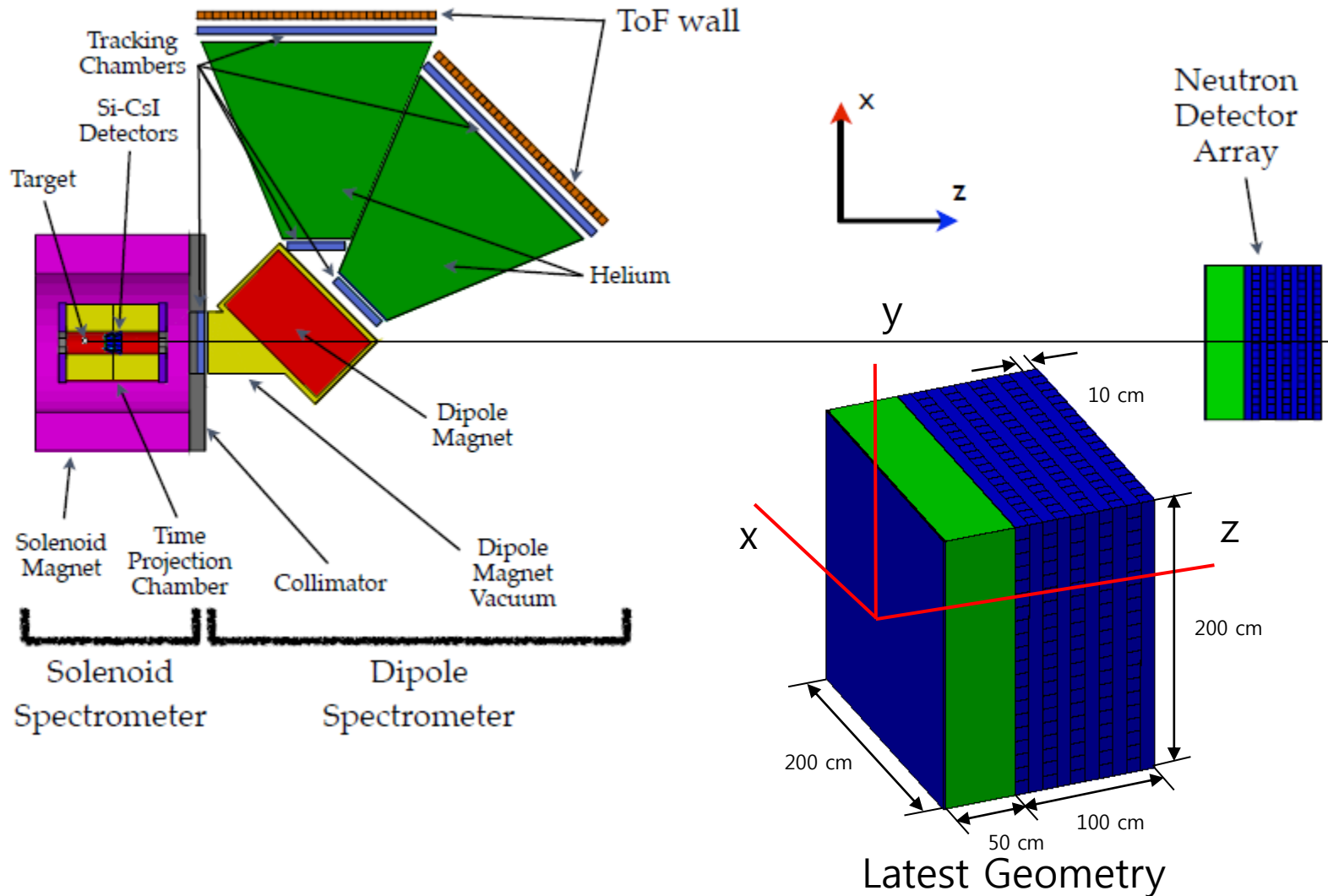


# Multi-hit analysis of LAND (Large Acceptance Neutron Detector)

고려대학교  
핵물리 연구실  
주은아

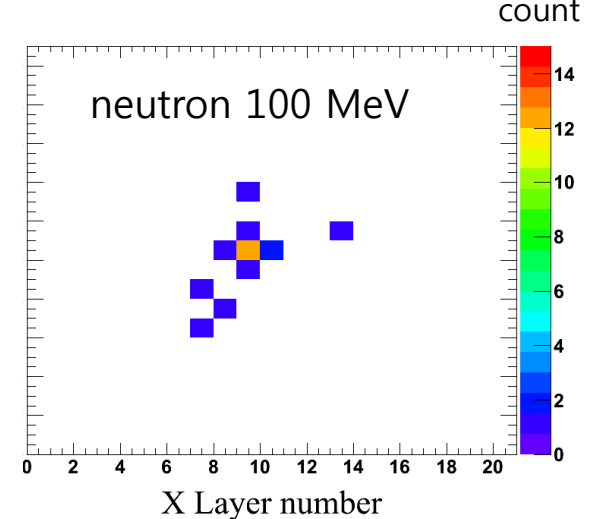
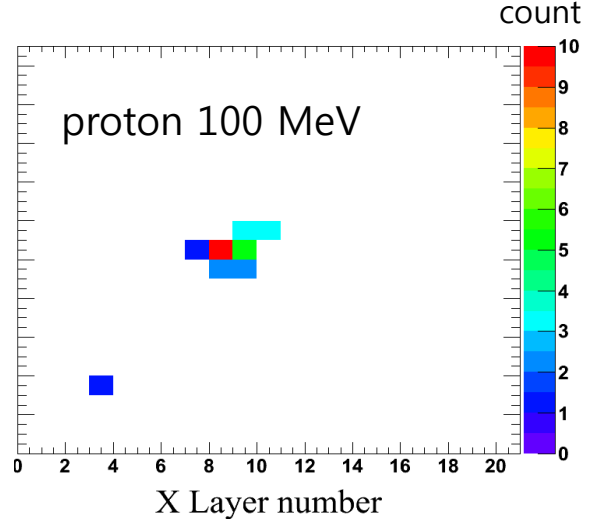
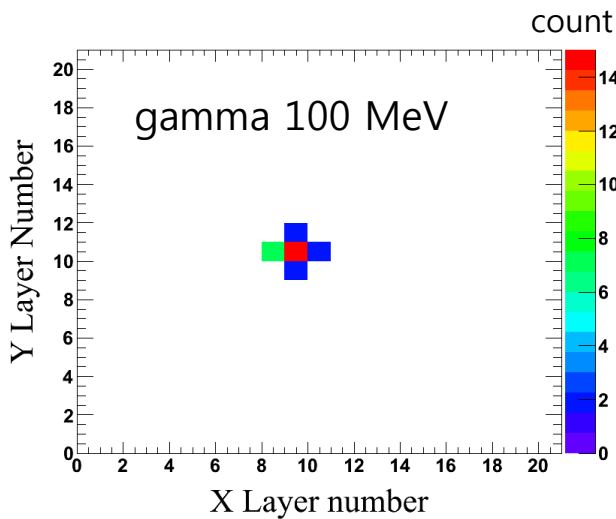
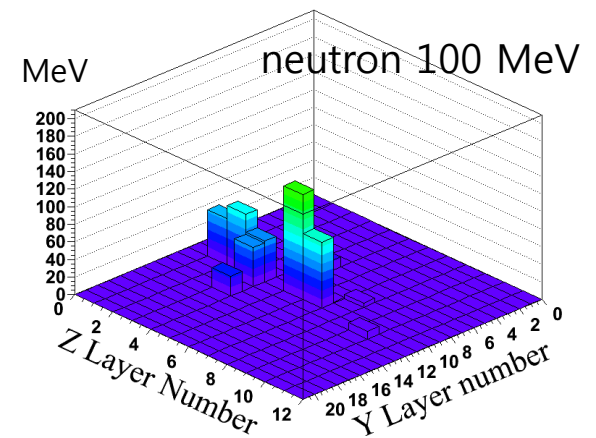
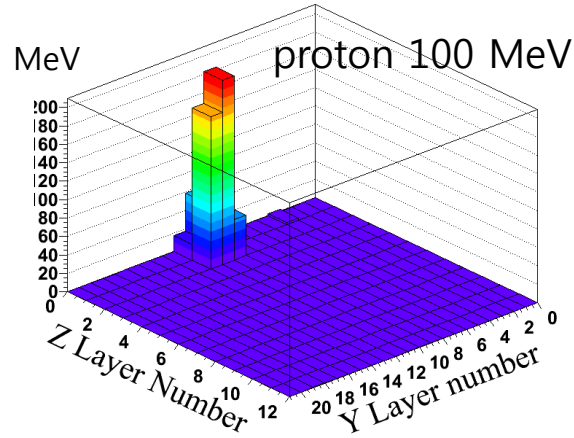
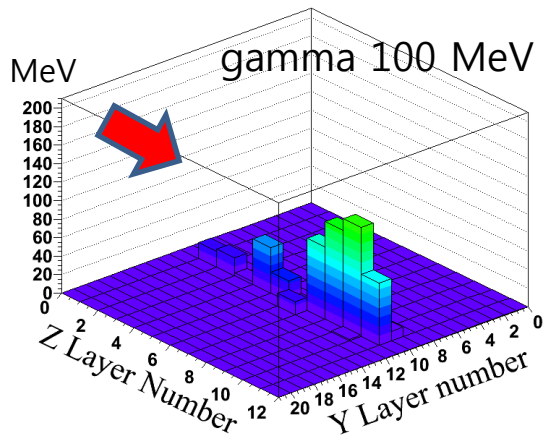
# LAND (Large Acceptance Neutron Detector) in LAMPS



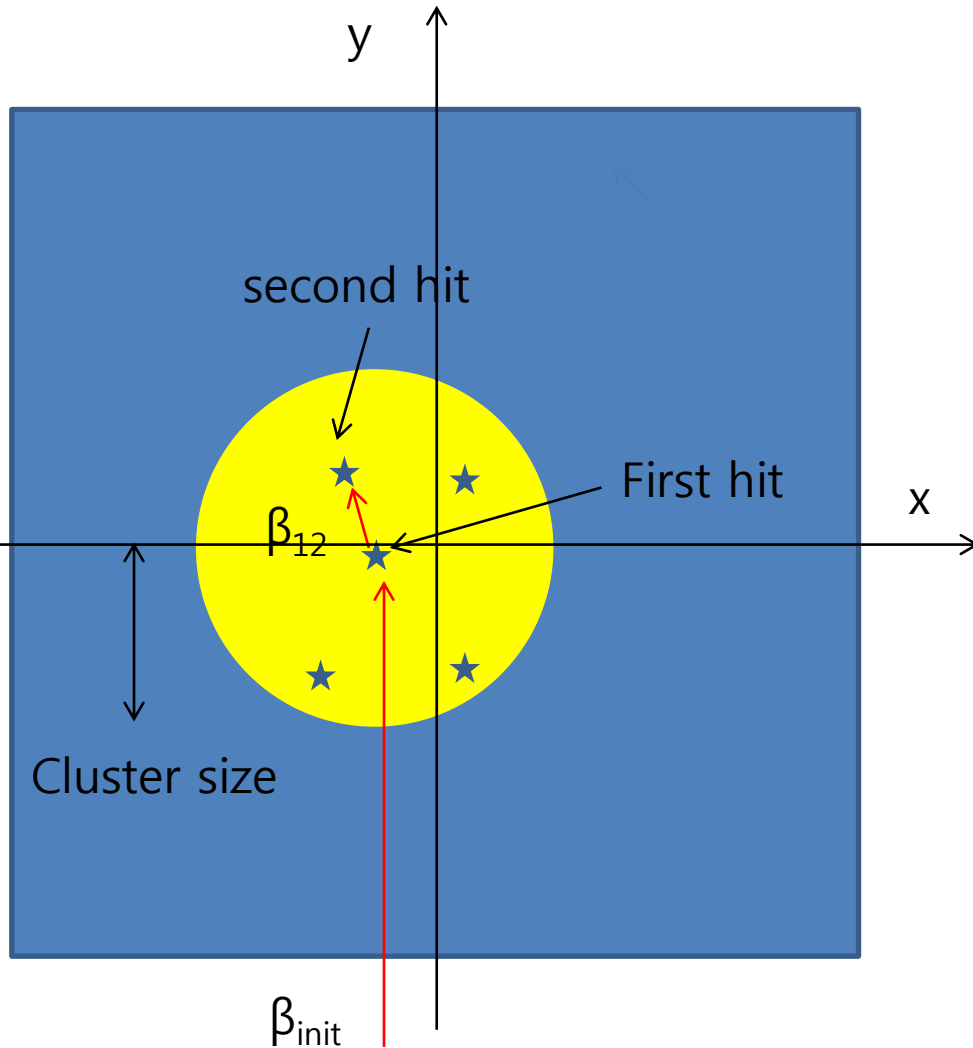
# Difficulties in measuring the multi-hit neutron

- Neutron deposit energy randomly
  - hit position is disordered
- One neutron can leave more than one hit in the detector.
  - The number of hits increasing when energy of neutron increasing
- Several neutron hits from one neutron cannot be clearly distinguished from real several neutrons until now.

# Neutron, proton, gamma beam profiles

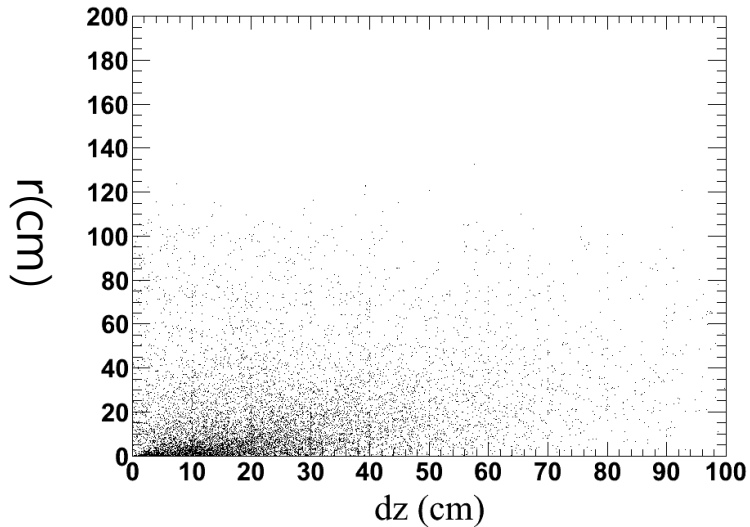


# Multi-hit algorithm



1. Find the first hit (by hit time information)
2. Determine the cluster around the first hit
3. Find the second hit and calculate the velocity  $\beta_{12}$
4. Compare  $\beta_{12}$  to incident velocity of neutron  $\beta_{init}$  (by first hit time and detector position)
5. If  $\beta_{12}$  is larger than  $\beta_{init}$ , discard the hit information.
6. Repeat the procedure with third hit

# Neutron detector cluster size

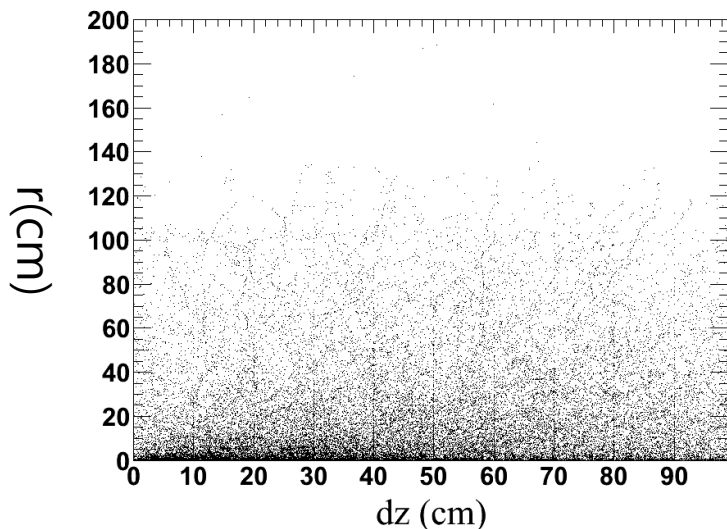


30 MeV

-10000 neutrons

-Total means hits over threshold(1MeV)

There is two cluster sizes:  
1. Geometrical cluster size  
2. Hit number that one neutron remain



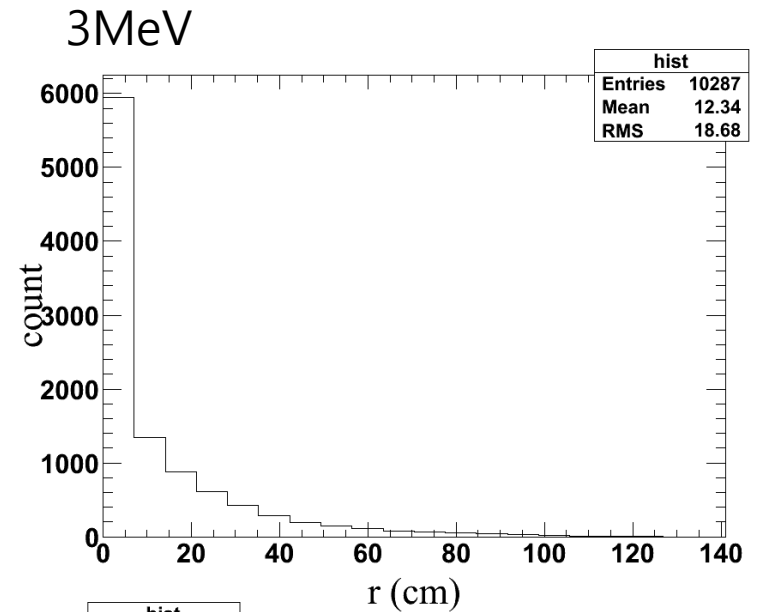
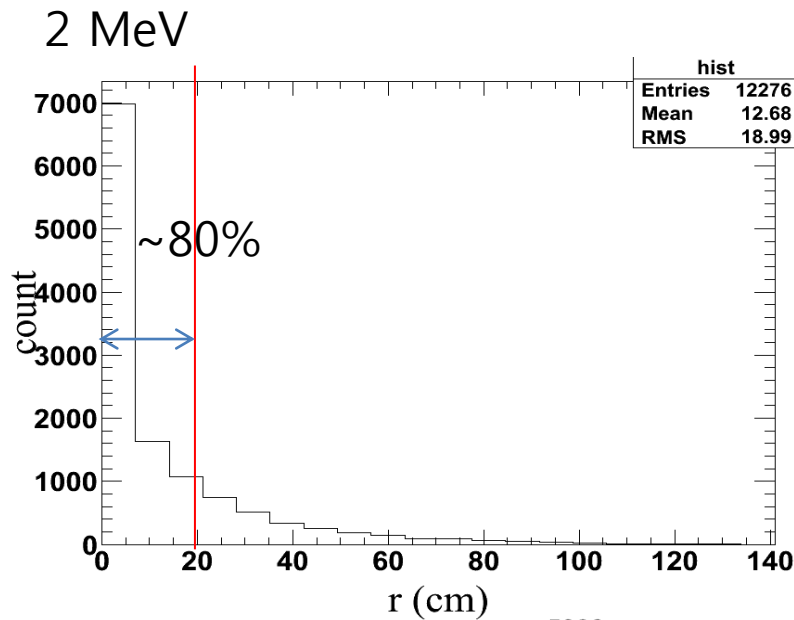
150 MeV

$$r = \sqrt{(x - x_0)^2 + (y - y_0)^2}$$

$x, y$  : hit position

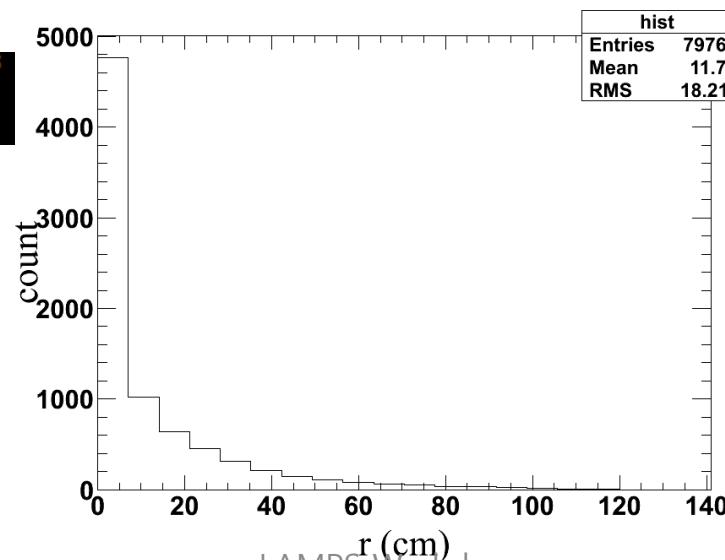
$x_0, y_0$  : neutron incident position

# Cluster size of 30 MeV neutron



```
ratio in_20cm/total : 0.775578
in_20cm : 9521
total : 12276
```

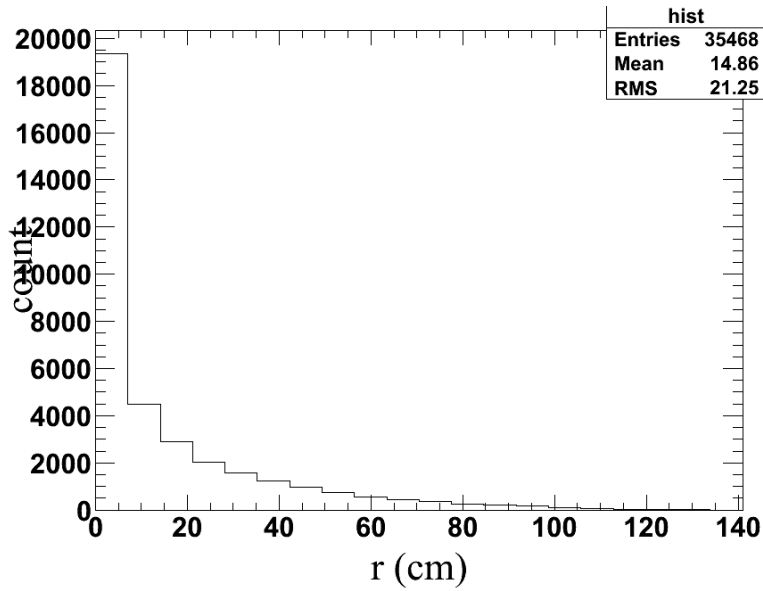
```
ratio in_20cm/total : 0.781666
in_20cm : 8041
total : 10287
```



5MeV

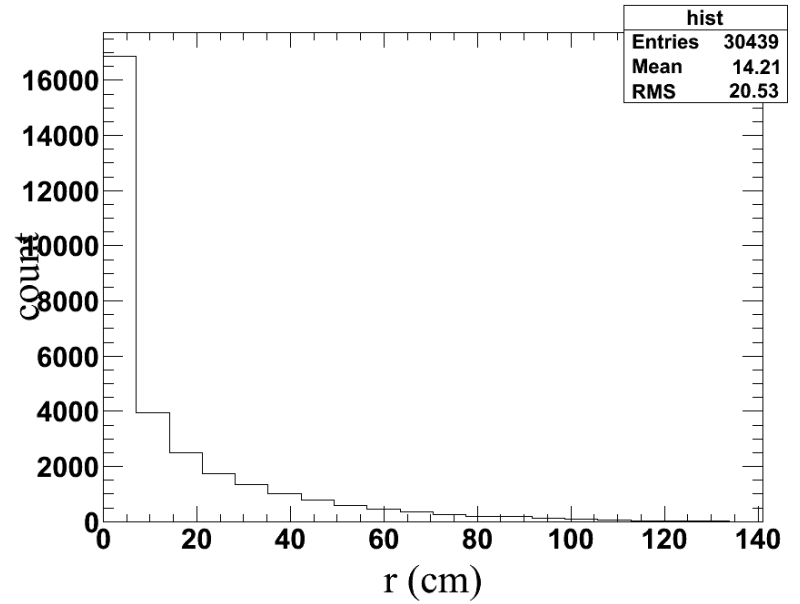
```
ratio in_20cm/total : 0.792126
in_20cm : 6318
total : 7976
```

# Cluster size of 150 MeV neutron



2MeV

```
ratio in_20cm/total : 0.741824  
in_20cm : 26311  
total : 35468
```



3MeV

```
ratio in_20cm/total : 0.753671  
in_20cm : 22941  
total : 30439
```



# problems

- Cluster size is still too large
- The shape of histogram is very similar though threshold energy become larger
  - Although the threshold become larger, the geometrical cluster size is almost same.
- First hit may not be placed the center of the cluster