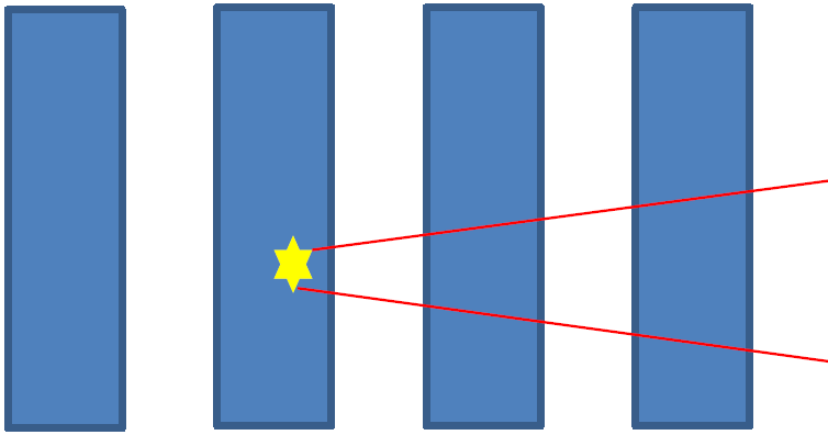
Neutron Detector Simulation
2013 / 08 / 30



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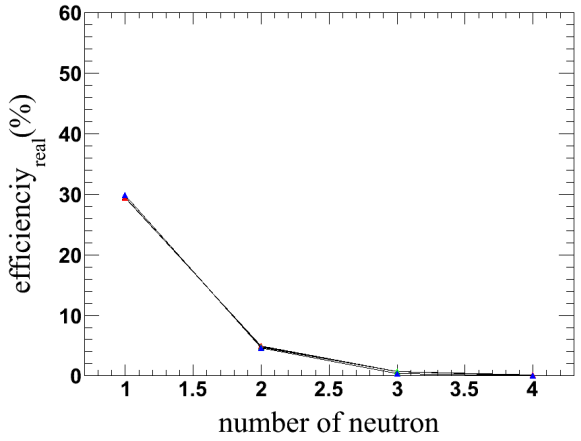
The Number of Stacks & Real Efficiency

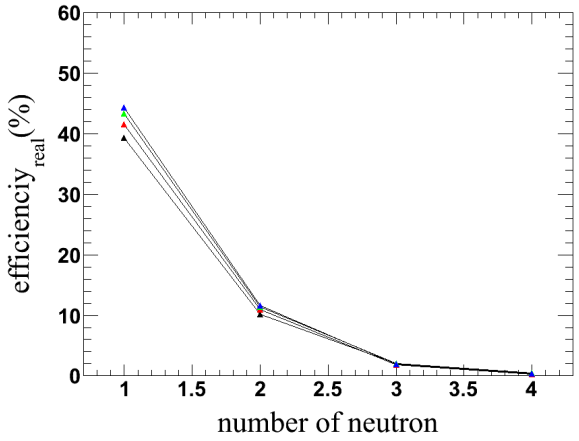
Real Efficiency(%) = (# of well recognized)/(# of event-Null event) * (1-fake rate) * 100

Neutron Energy : 100 ~ 300 MeV, Time Resolution : 0.3 ns

2 stack, 60cm gap

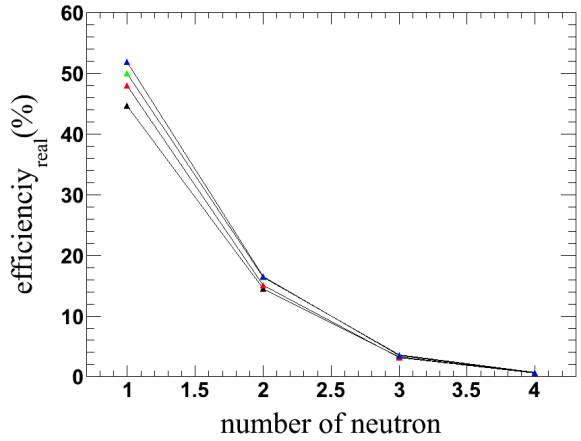


4 stack, 60cm gap

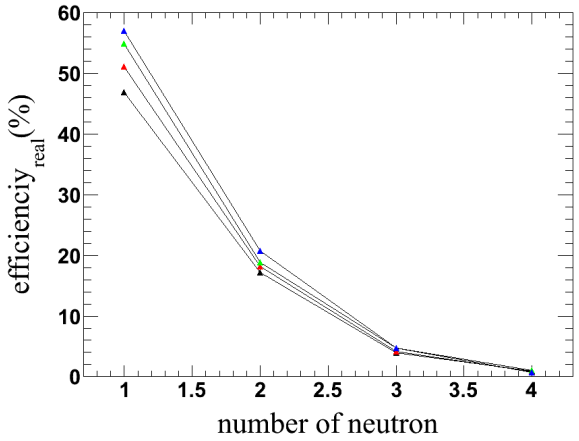


Black : 3 MeV,
Red : 5 MeV,
Green : 7 MeV,
Blue : 10 MeV

6 stack, 60cm gap



8 stack, 60cm gap

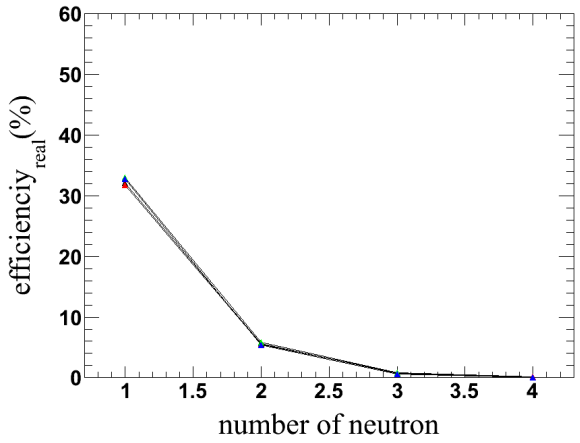


The Number of Stacks & Real Efficiency

Real Efficiency(%) = (# of well recognized)/(# of event-Null event) * (1-fake rate) * 100

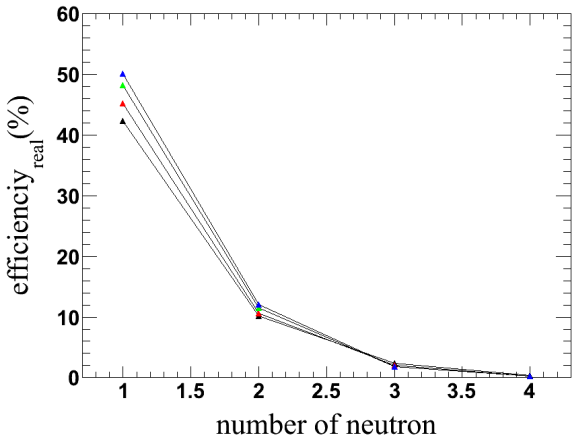
Neutron Energy : 100 ~ 300 MeV, Time Resolution : 0.3 ns

2 stack, 40cm gap

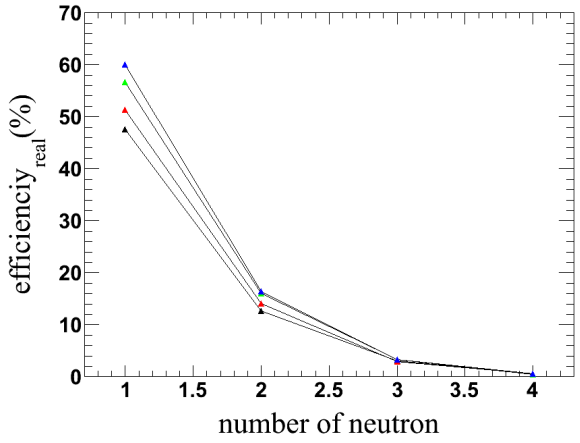


Black : 3 MeV,
Red : 5 MeV,
Green : 7 MeV,
Blue : 10 MeV

4 stack, 40cm gap

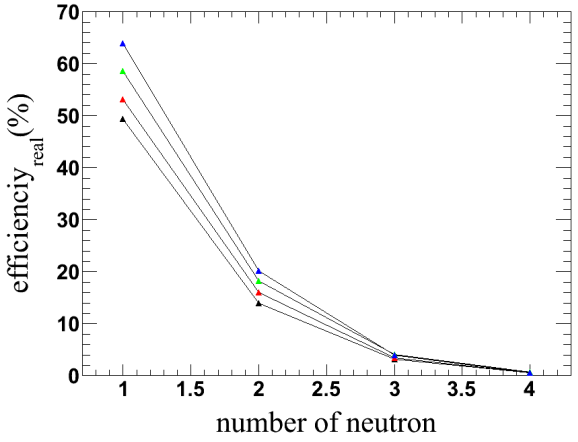


6 stack, 40cm gap



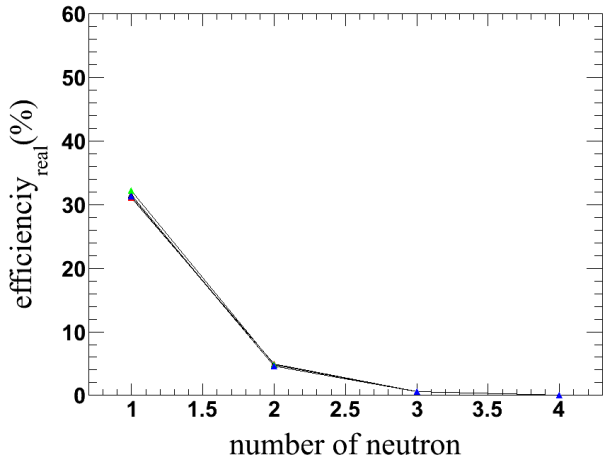
" Is detector resolution small enough? "

8 stack, 60cm gap

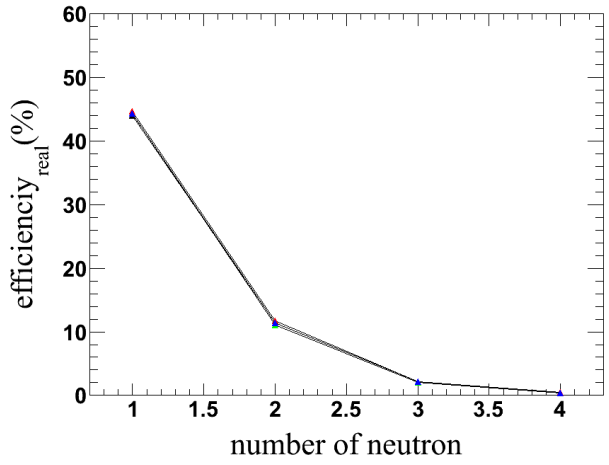


Time Resolution & Real Efficiency

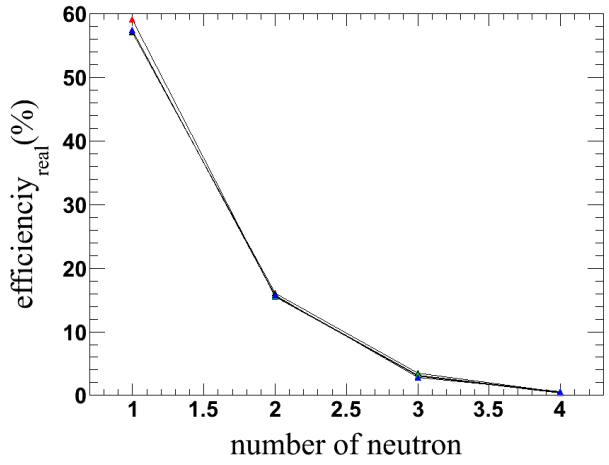
2 stack



4 stack



6 stack



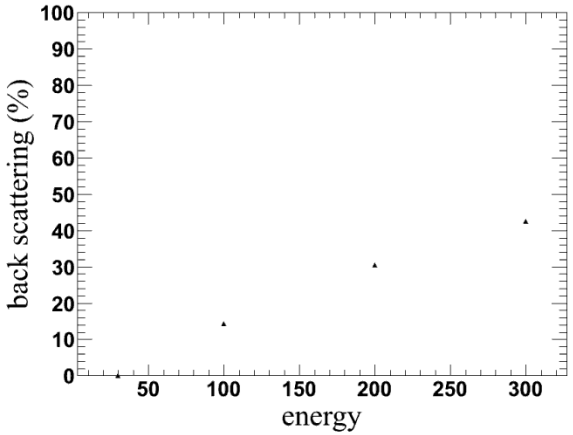
Black : 0.25 ns, Red : 0.30 ns, Green : 0.35 ns, Blue : 0.50 ns,
Neutron Energy : 100 ~ 300 MeV,
Threshold : 10 MeV,
Gap : 60 cm
- Effect on real efficiency is insignificant.

The Number of Stacks & Back Scattering

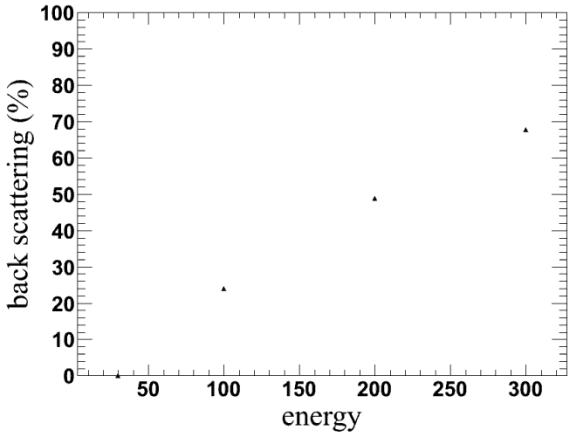
(Back Scattering)/(non-zero event num)

Time Resolution : 0.3 ns

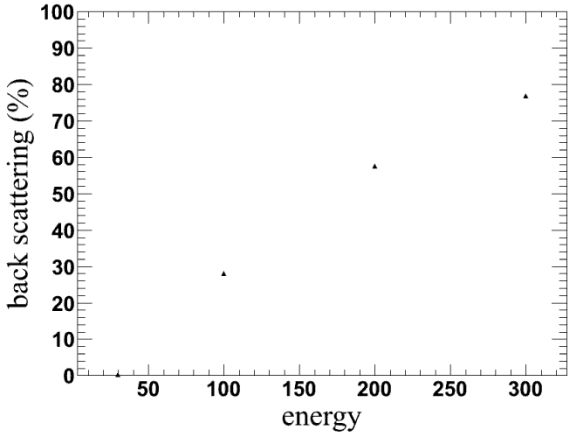
2 stack, 60cm gap, 10 MeV threshold



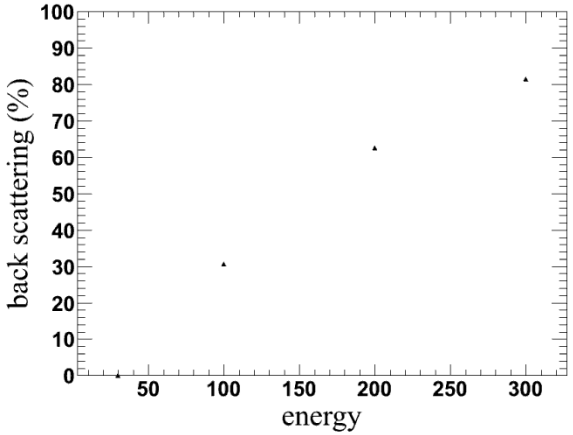
4 stack, 60cm gap, 10 MeV threshold



6 stack, 60cm gap, 10 MeV threshold



8 stack, 60cm gap, 10 MeV threshold

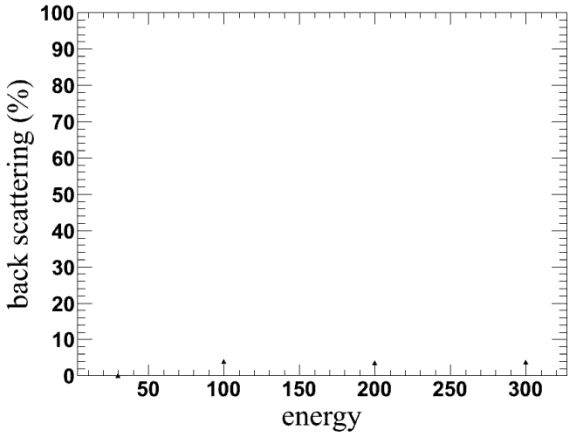


The Number of Stacks & Back Scattering

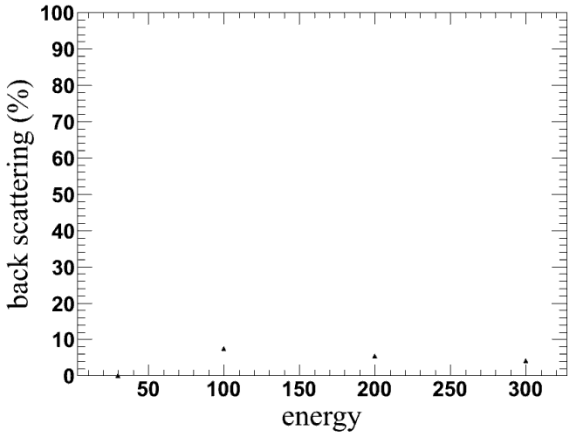
(Back Scattering)/(total over threshold hit)

Time Resolution : 0.3 ns

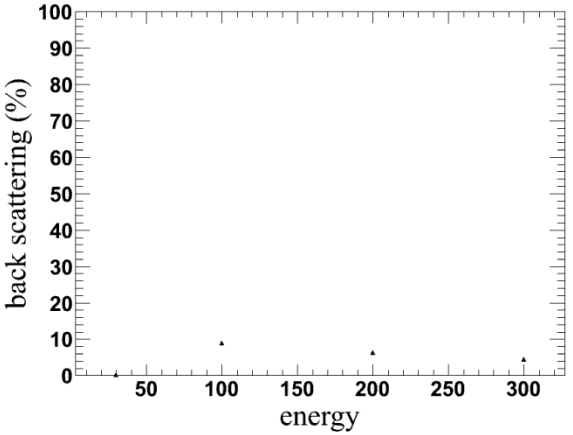
2 stack, 60cm gap, 10 MeV threshold



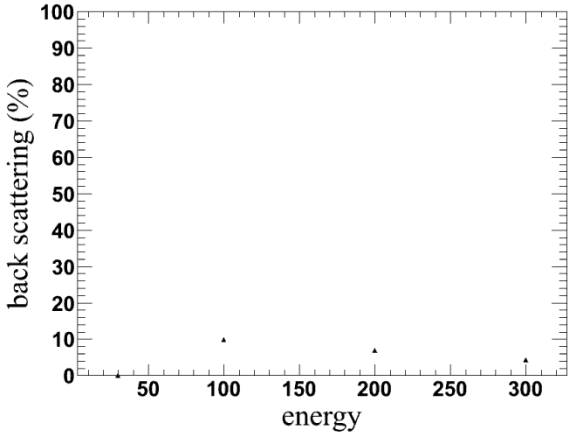
4 stack, 60cm gap, 10 MeV threshold



6 stack, 60cm gap, 10 MeV threshold



8 stack, 60cm gap, 10 MeV threshold



Conclusion

- For 1 neutron, real efficiency is getting better as the number of stack is increased.

- But, when it comes to many neutrons, it is not efficient enough that increasing the number of stack.

- Shortening the gap between stacks is also increases real efficiency, but if detector resolution is not small enough, it will be useless.

- Time resolution is not significant for real efficiency. (=< 0.50 ns)

Conclusion

- Need to find alternative way to increase efficiency for many neutrons(>=2).

  (Ex. bar detector + block detector?)