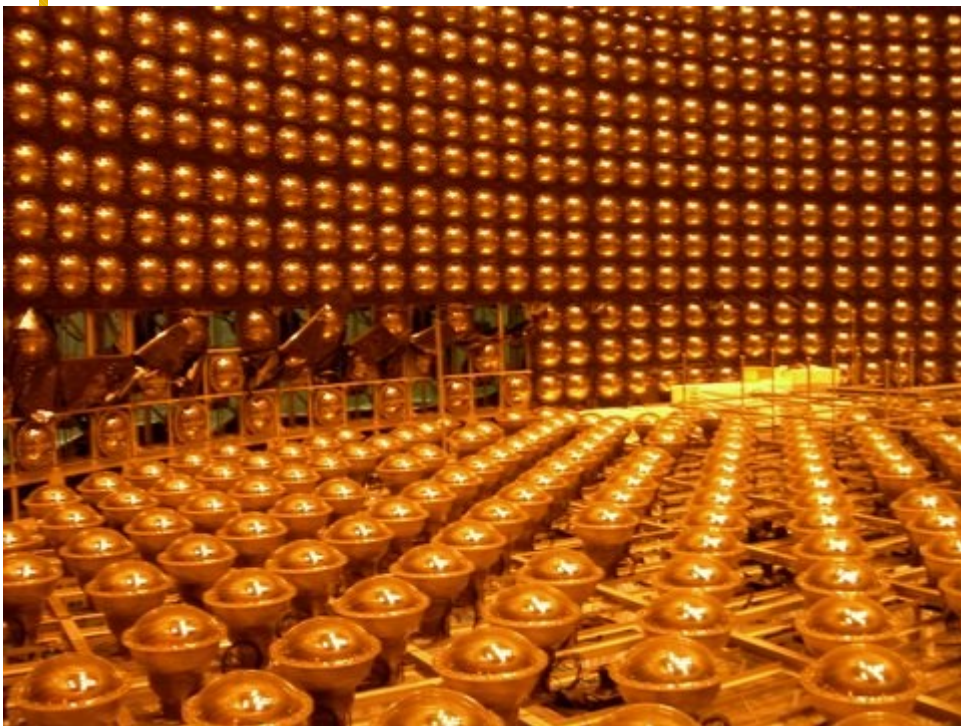


Study of 20% versus 40% photo-coverage of water Cherenkov detector



Fanny Dufour, Boston University

2nd T2KK workshop, July 14, 2006

Outline

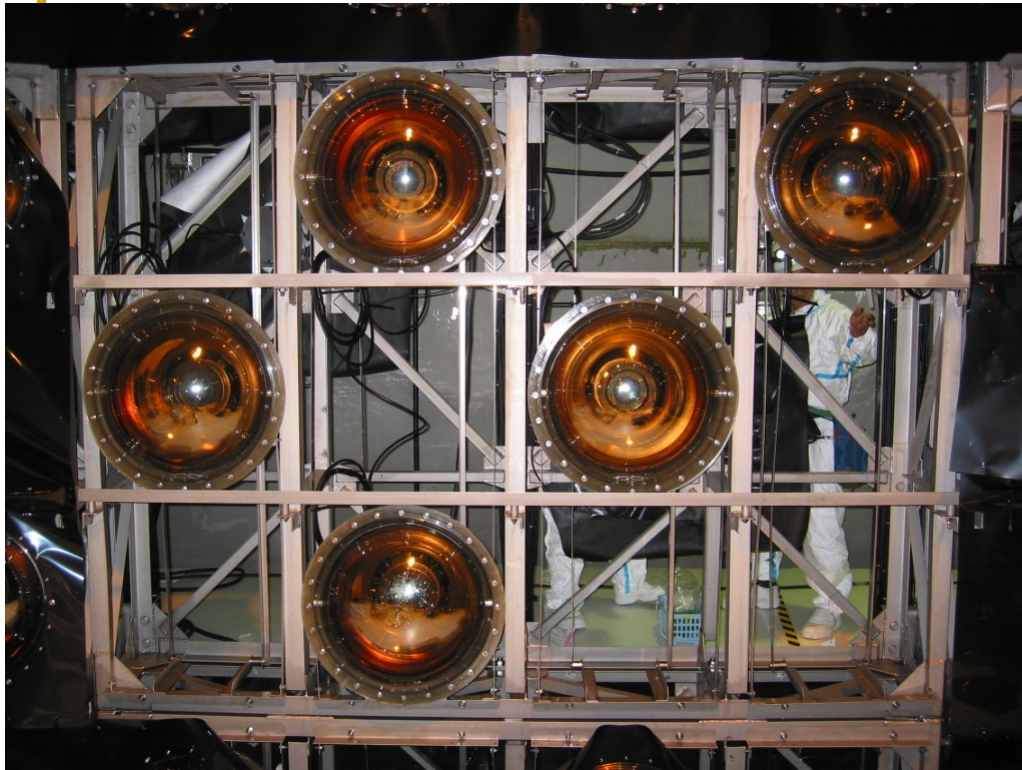
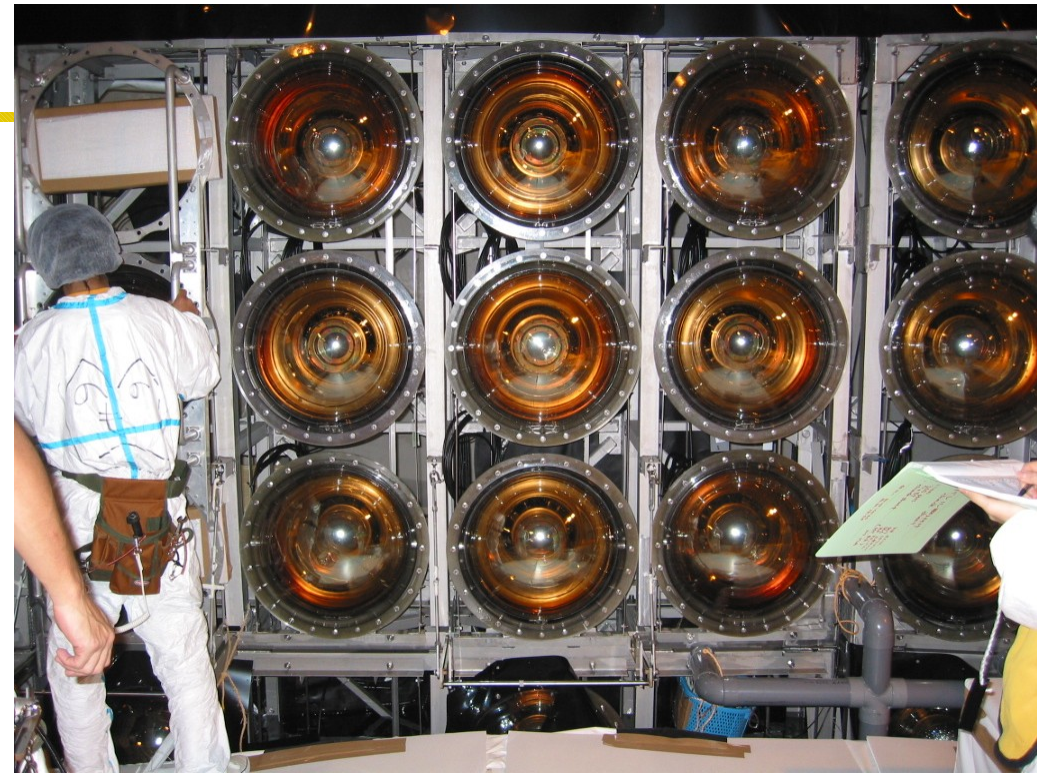


*Explained the likelihood yesterday
see that talk for reference*

- Introduction
- Example of event display for SK-I and SK-II
- Efficiency tables

Introduction

Before the accident (and now after reconstruction)
PMT covered 40%
of the tank. → SK-I



After the accident in 2001, PMT
were repositioned evenly and
covered 20% of the surface of
the tank → SK-II

Event display SK-I

Super-Kamiokande

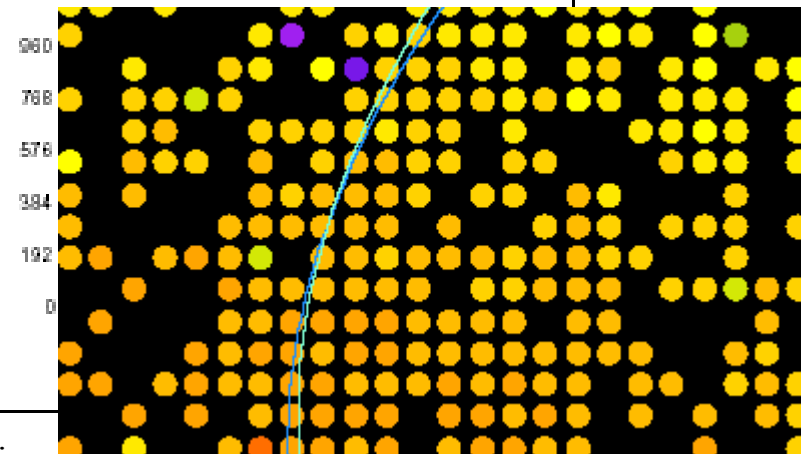
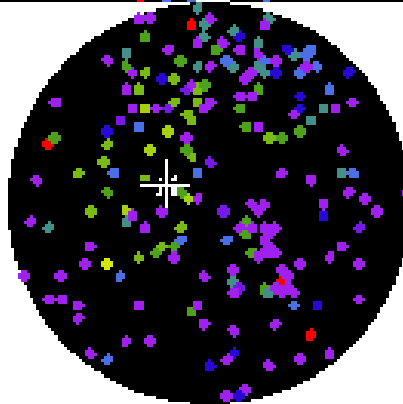
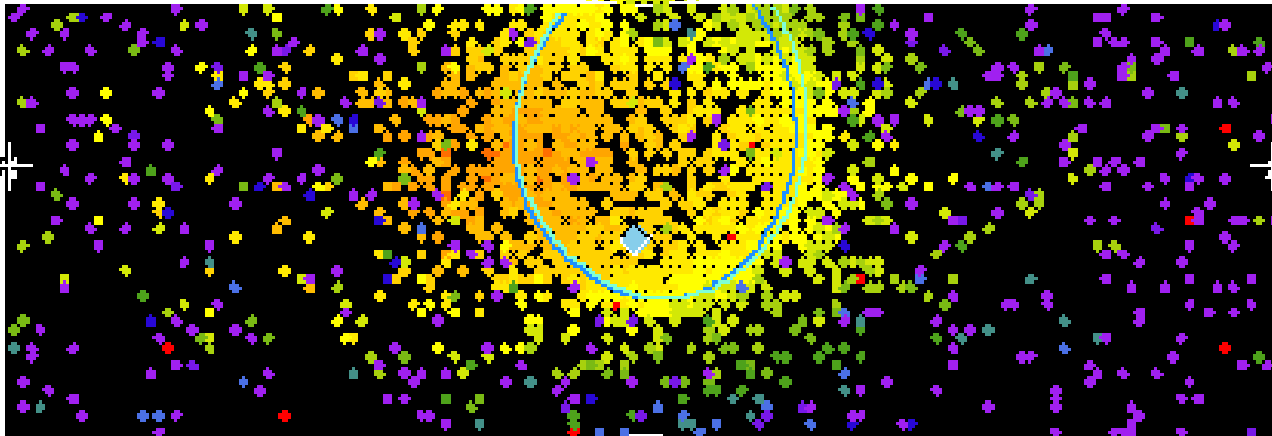
Run 999999 Sub 1 Ev 178
03-04-10.11.50.38
Inner: 3407 hits, 4220 pE
Outer: 1 hits, 0 pE (in-time)
Trigger ID: 0x01
D wall: 1285.6 cm
FC e-like, p = 673.6 MeV/c

ν_e event: 673.6 MeV/c

Every spot is occupied.

Time (ns)

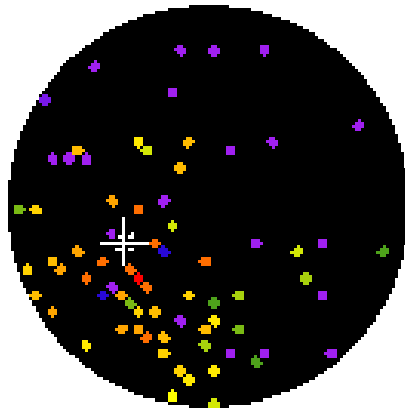
- ▲ < 946
- ▲ 946- 953
- ◆ 953- 960
- ◆ 960- 967
- ◆ 967- 974
- ◆ 974- 981
- 981- 988
- 988- 995
- 995-1002
- ◆ 1002-1009
- ◆ 1009-1016
- ◆ 1016-1023
- 1023-1030
- 1030-1037
- 1037-1044
- ▲ >1044



Event display SK-II

Super-Kamiokande

Run 999999 Sub 2 Ev 9605
05-02-29.15.11.54
Inner: 1048 hits, 0 pE
Outer: 1 hits, 0 pE (in-time)
Trigger ID: 0x01
D wall: 917.8 cm
PC n-like, p = 510.8 MeV/c

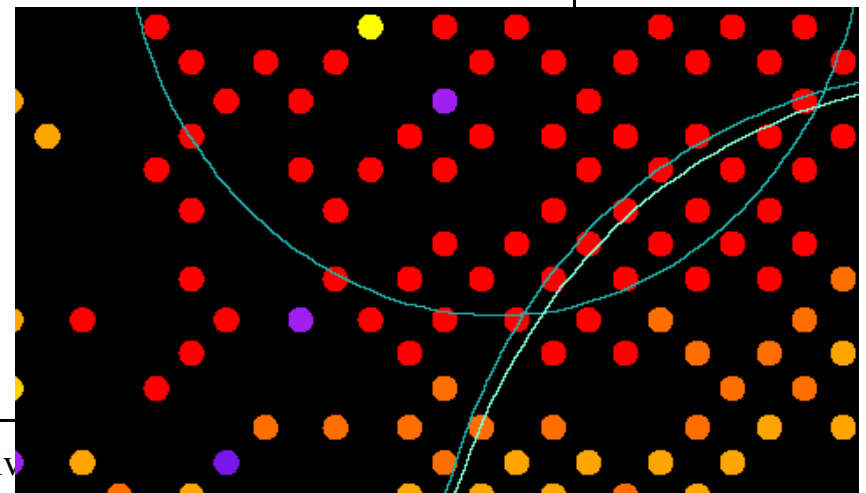
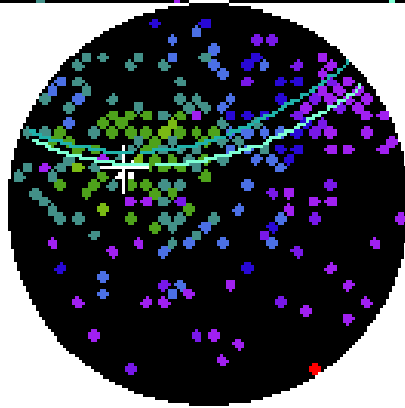
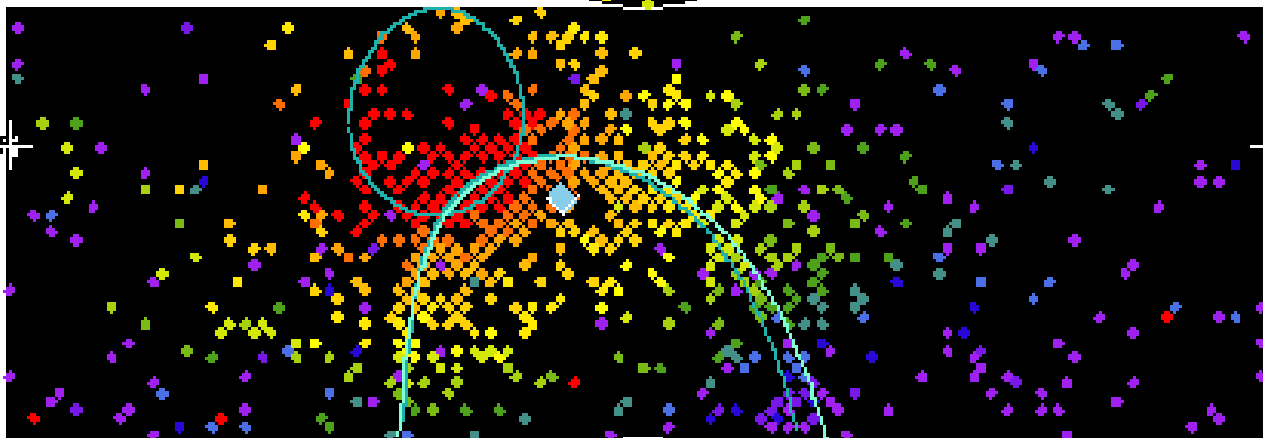


NC event: π^0 520.5 MeV/c
1ring found 513.5 MeV/c
1ring missed 24.3 MeV/c

Only every other spot is occupied.

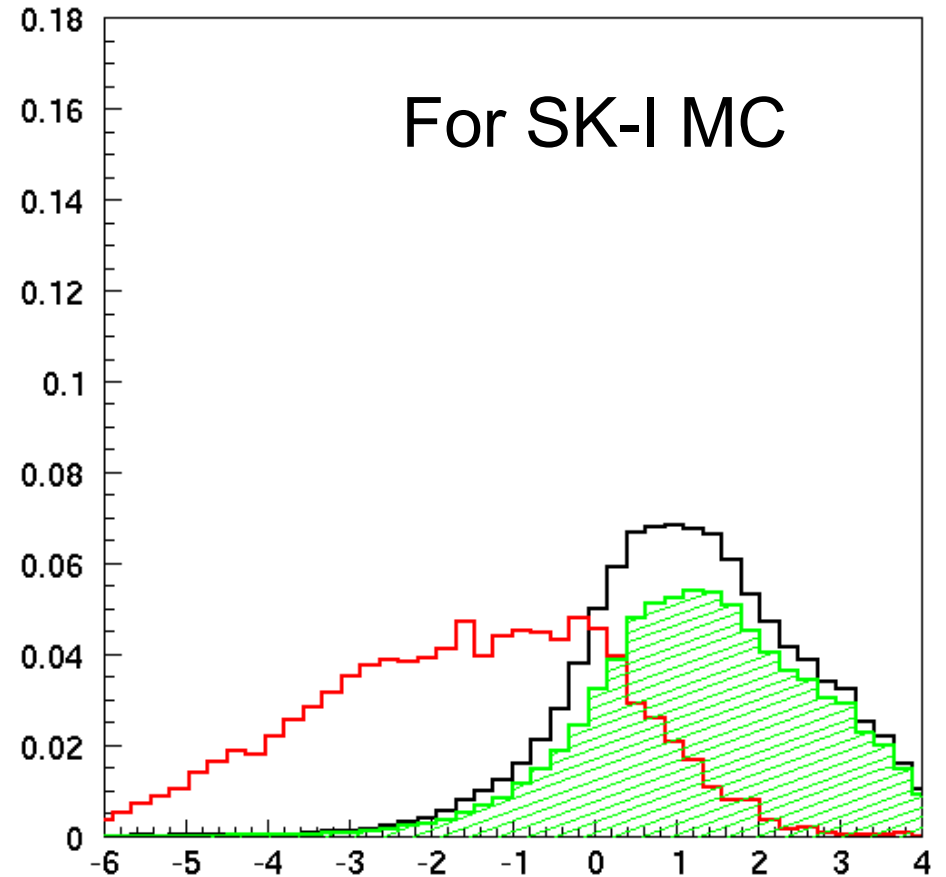
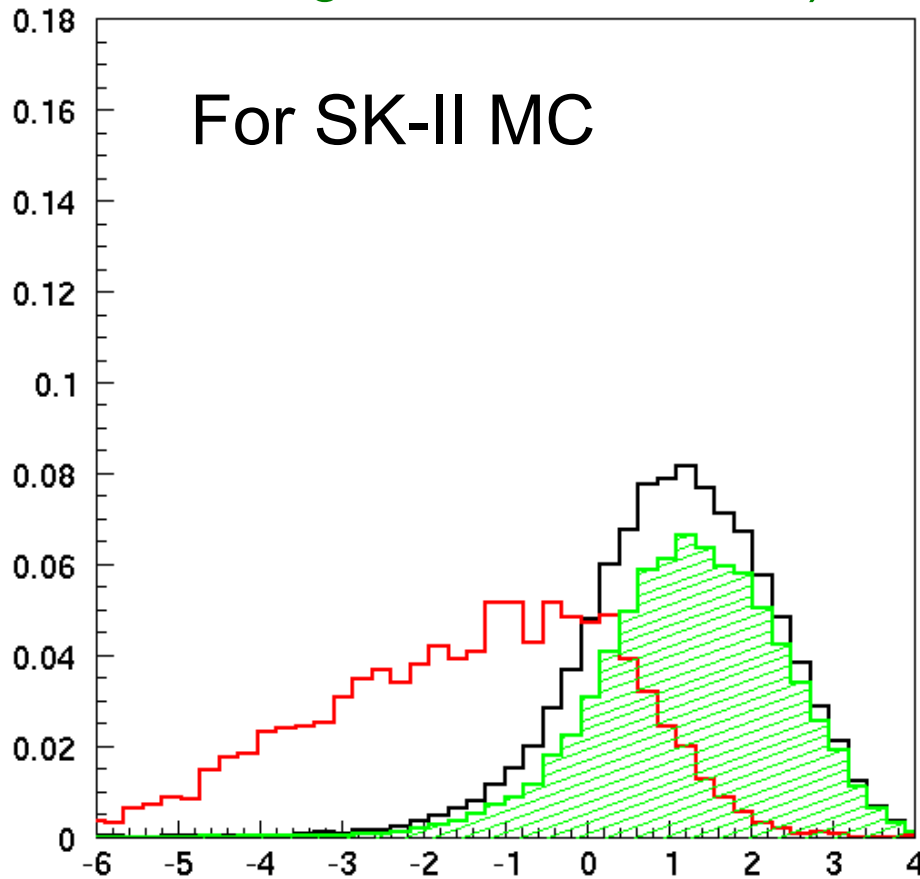
Time(ns)

- ★ < 966
- ★ 966- 972
- ★ 972- 978
- ★ 978- 984
- ★ 984- 990
- ★ 990- 996
- ★ 996-1002
- ★ 1002-1008
- ★ 1008-1014
- ★ 1014-1020
- ★ 1020-1026
- ★ 1026-1032
- ★ 1032-1038
- ★ 1038-1044
- ★ 1044-1050
- ★ >1050



Likelihood results

Running on 100 yr
of SK-I MC and
60 yr of SK-II MC
(ATM sample since T2K wasn't
generated for SK-II)



Not much difference!

Efficiency tables

Rec Enu 0~0.35 0.35~0.85 0.85~1.5 1.5~

SK-I:

NC	9.9%	21.3%	23.6%	34.7%
v_e CC	90.5%	83.7%	79.6%	76.4%

SK-II:

NC	14.2%	21.5%	24.3%	37.0%
v_e CC	92.4%	84.8%	84.2%	73.6%

NB v_μ CC is still under study

NB: As in yesterday talk, the efficiency is the efficiency of the likelihood only, it doesn't include the precuts.

(ie. eff= # of selected events/ # of events which pass precuts)

↳ not total # of events

Conclusions

*Concerning the likelihood analysis:
(the efficiency doesn't include the precuts)*

Using a 20% photo-coverage gives similar results than a 40 % photo-coverage.

At worst (i.e. in higher energy bin)

$S = 76.4 \% \rightarrow 73.6\%$

$B = 34.7 \% \rightarrow 37.0\%$



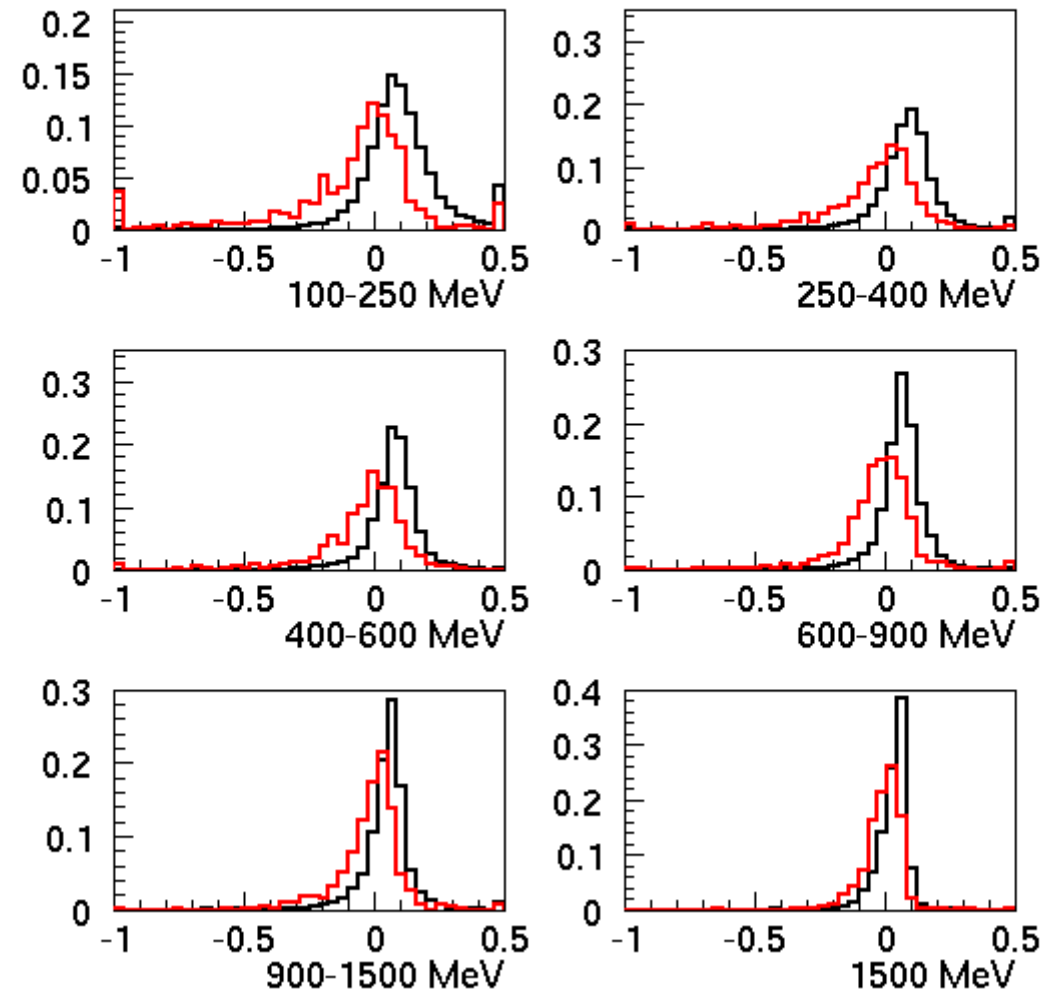
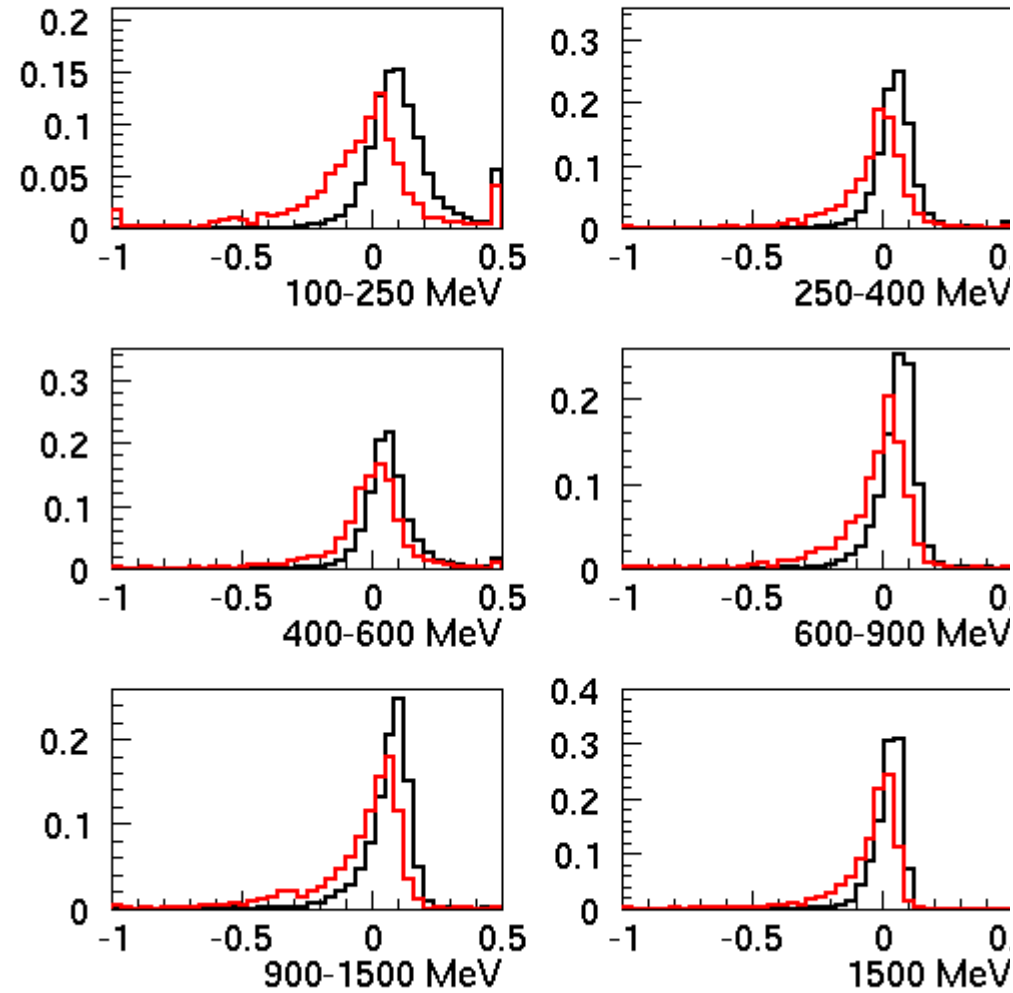
backups...



Differences:

cos(open)

cos(open)

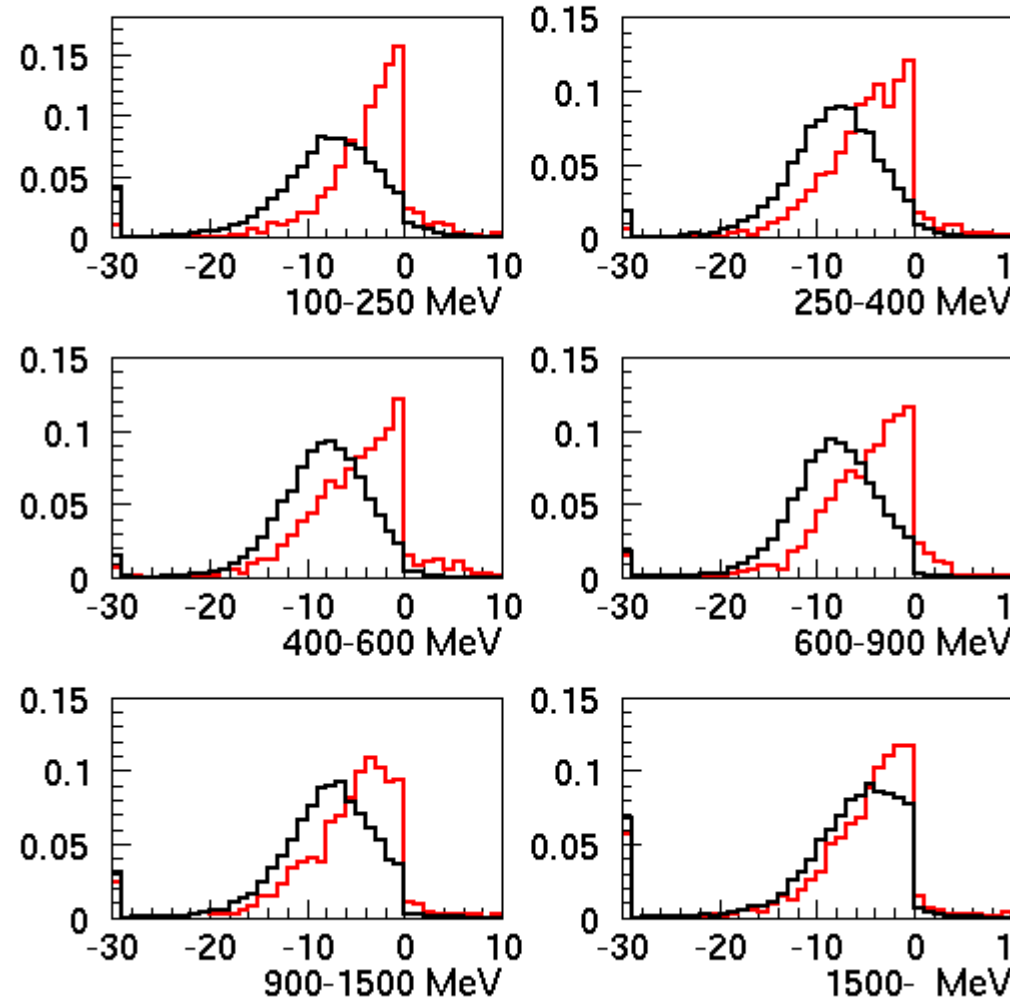


SK-1

SK-2

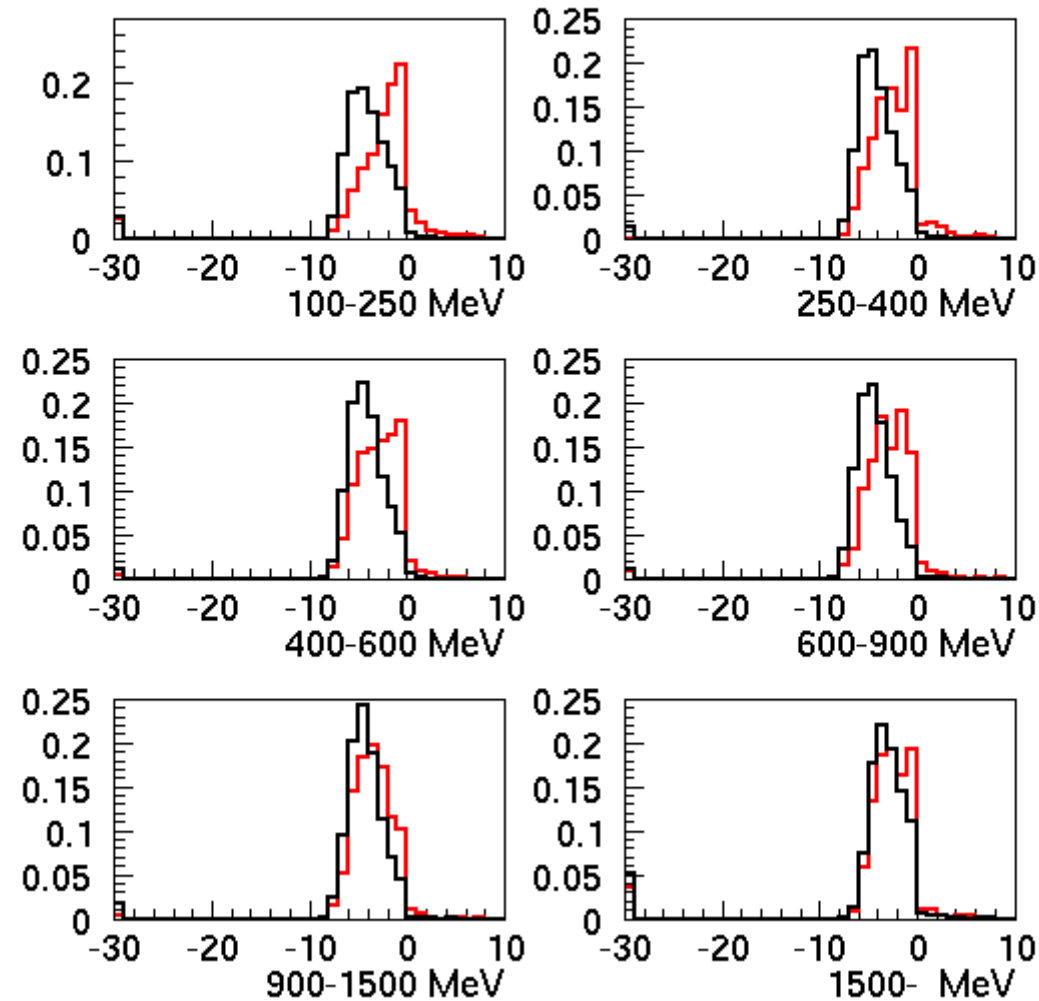
Differences:

ring parameter (dlfct)



SK-1

ring parameter (dlfct)



SK-2 would need new binning

Efficiency tables

Rec Enu 0~0.35 0.35~0.85 0.85~1.5 1.5~

SK-I:

v_{μ} CC

NC

v_e CC

Not available right now!

SK-II:

v_{μ} CC

NC

v_e CC

0.1%

0.2%

0.2%

0.2%

1.3%

5.2%

8.6%

10.3%

84.1%

81.8%

81.7%

76.3%

NB: Those efficiencies are the efficiency of the precuts and the efficiency of the likelihood combined