Status of the 2km reconstruction software

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Goal

- After all the changes + re-tuning of the 2KM water Cherenkov simulator, the reconstruction software needs to be tuned
- As a first step, simulate isotropic, mono-energetic e- and μ- in the whole tank

- During the previous meeting I explained why it's necessary to modify the PID code @ 2KM

Today I will :
* show the status of the latest version of the PID code
* of ring counting
* of AFIT & MSFIT vertex reconstruction

Seplib patterns

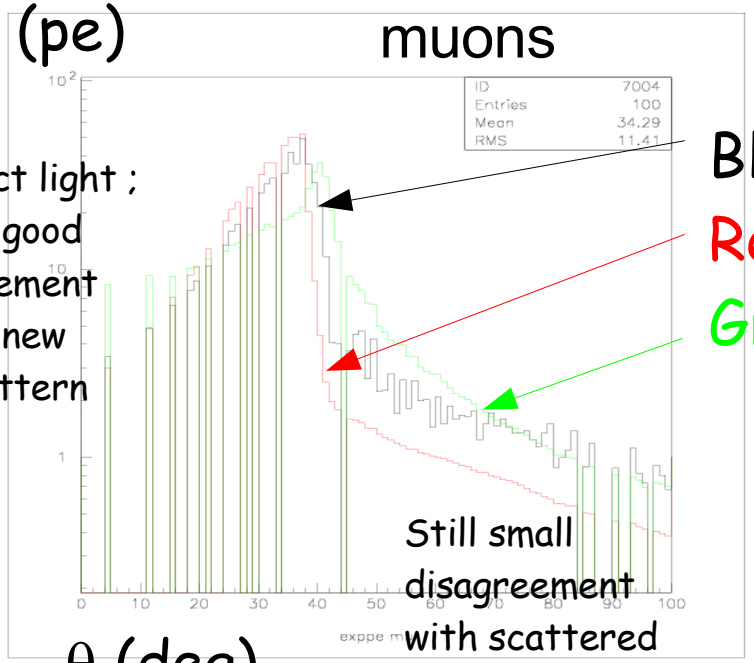
In seplib/spfinalsep.F (routine for final ring separation & momentum determination) **other patterns are used**.

They are based on GEANT3 tabulated output.

They show good agreement with G4-1kton MC output which means that G4 output is close to G3 output

Q (pe)

muons



Direct light ; very good agreement with new μ pattern

θ (deg)

Still small disagreement with scattered light but much better

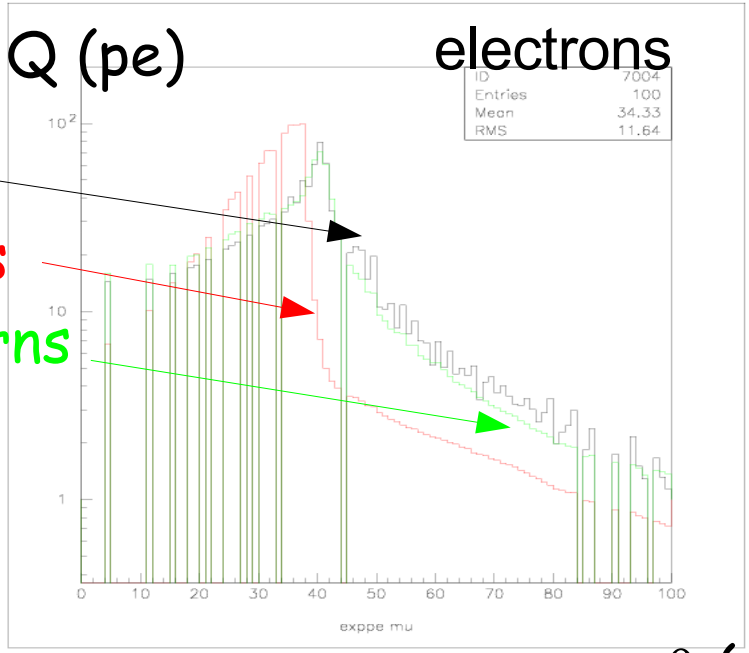
Black : G4

Red : μ patterns

Green : e patterns

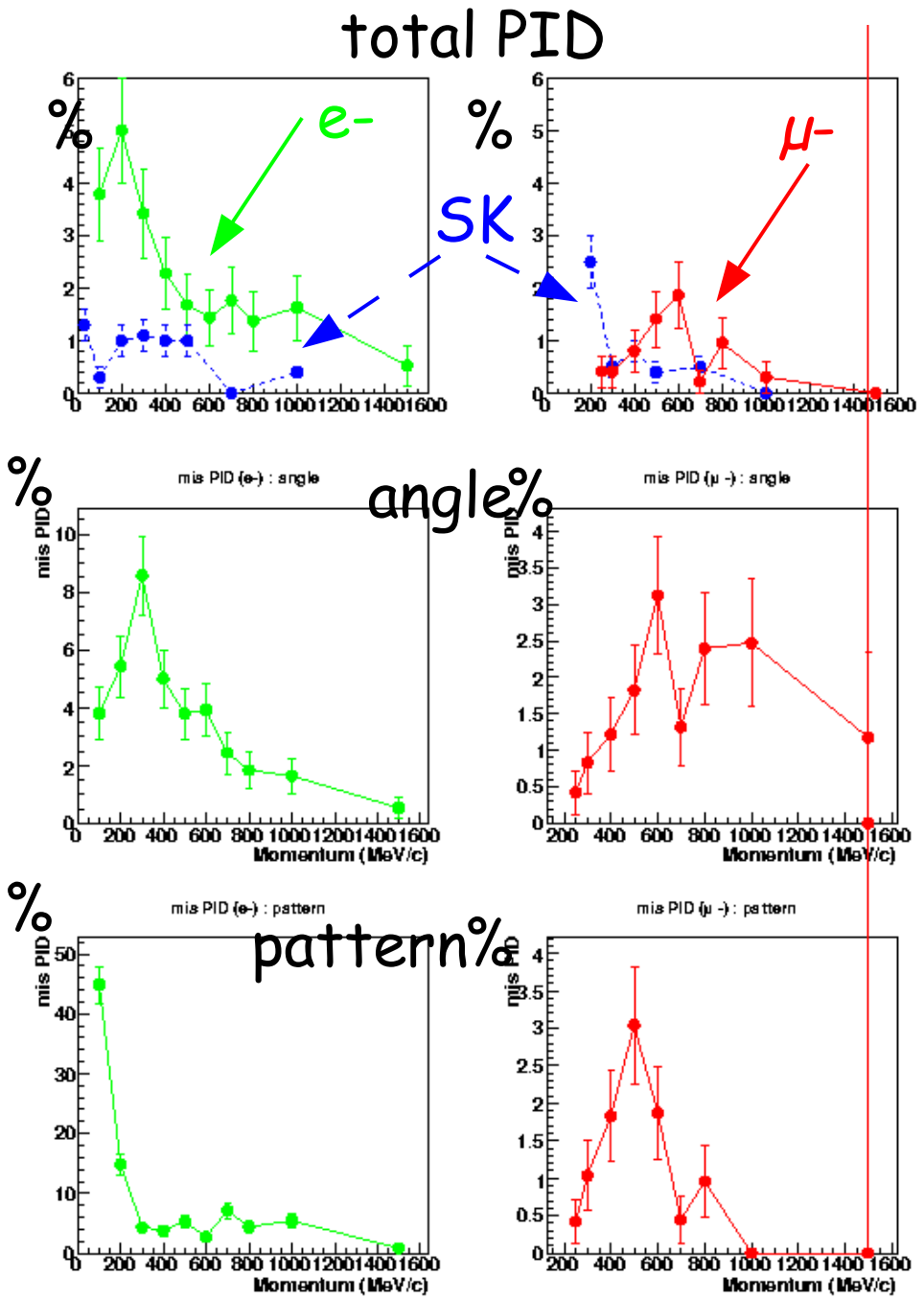
Q (pe)

electrons



θ (deg)

PID



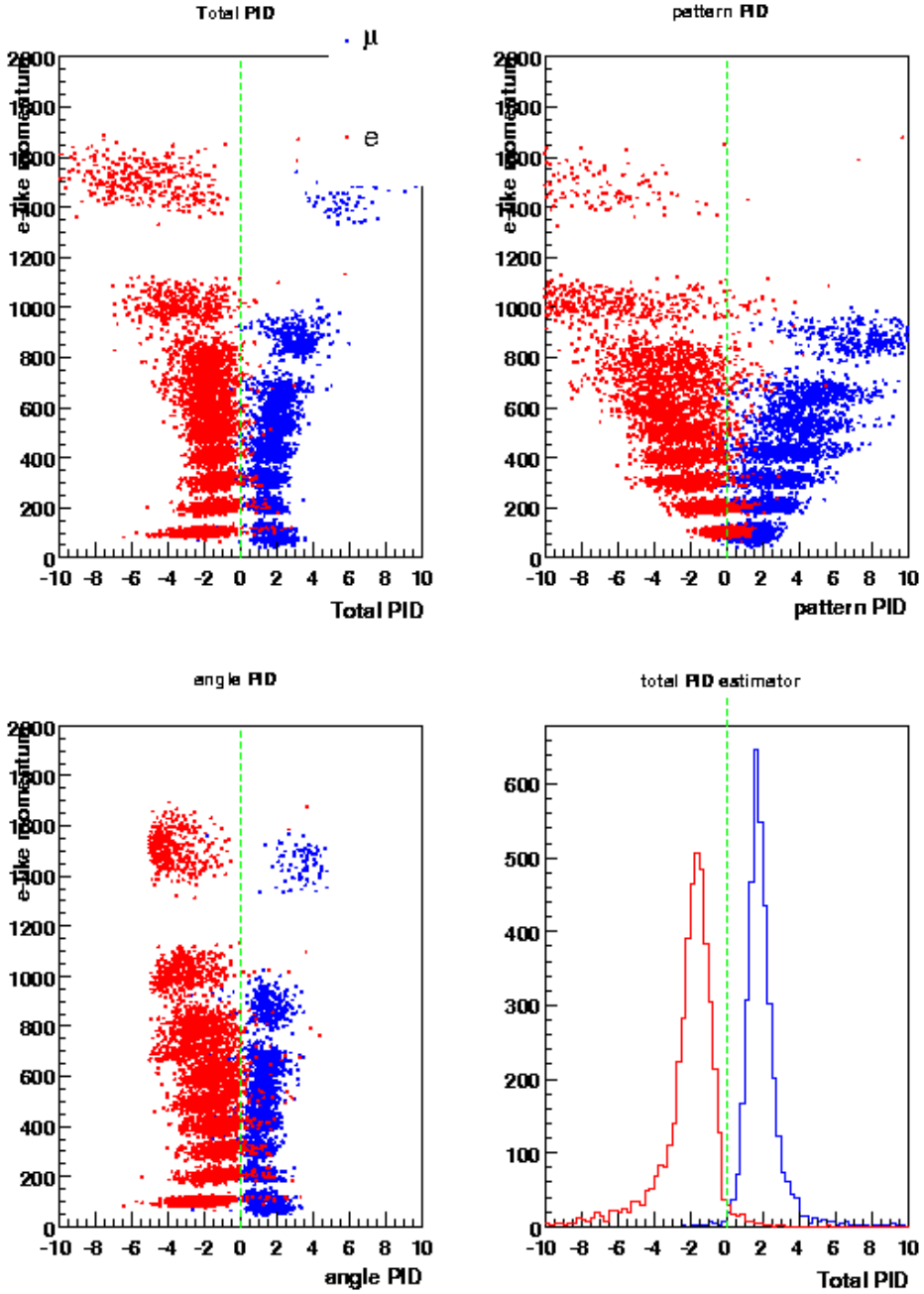
use seplib patterns during the PID fit and fit the angle at the same time

----> Use consistent patterns to get pattern PID and angle PID
Apply full reconstruction and check the mis-PID level

- full 100t FV is used + the cuts are not shifted (first time)
- mis-ID OK for μ
- for e- need a little more work

high pattern mis-ID for low e. electrons

PID estimators vs visible energy



100t FV vs 56t FV

100 tons

56 tons

e-

μ-

total PID

angle PID

pattern PID

SK

%

mis PID

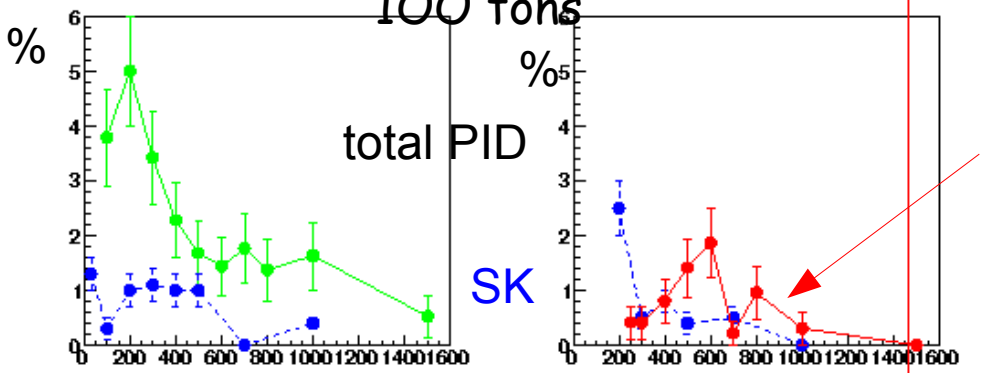
Momentum (MeV/c)

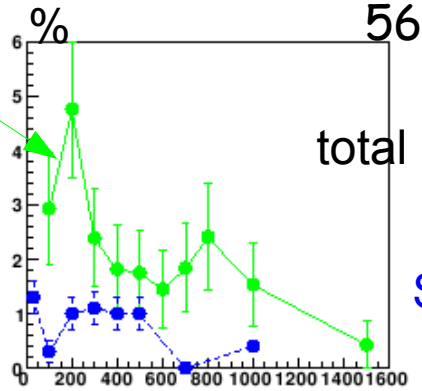
mis PID (e-) : angle

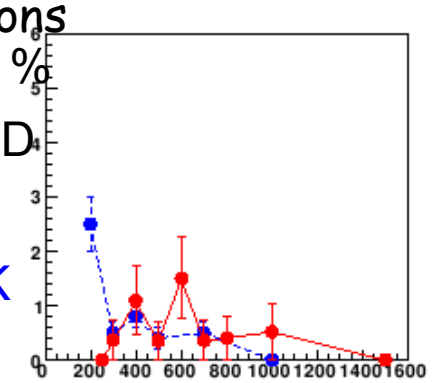
mis PID (μ -) : angle

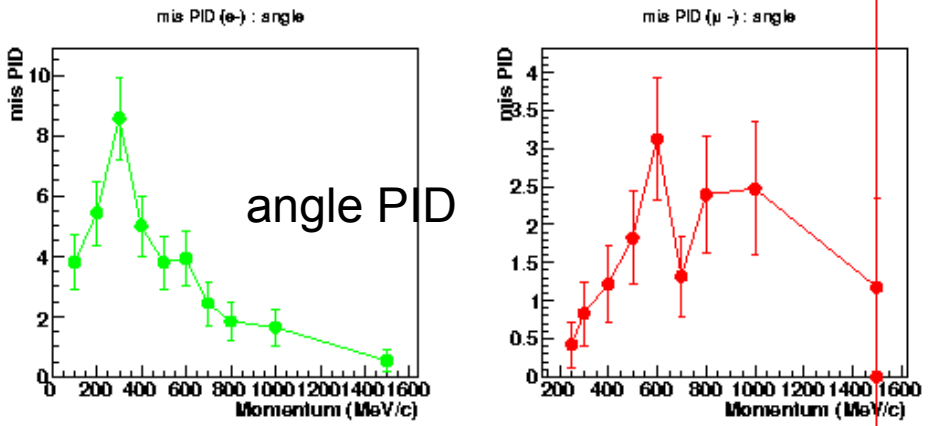
mis PID (e-) : pattern

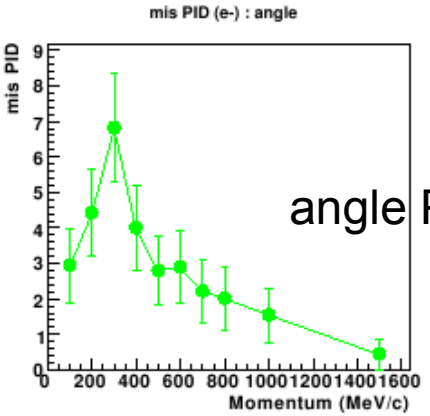
mis PID (μ -) : pattern

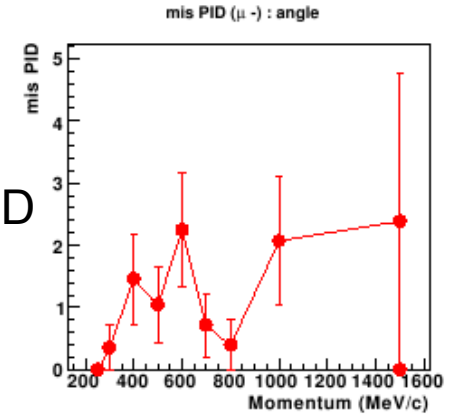


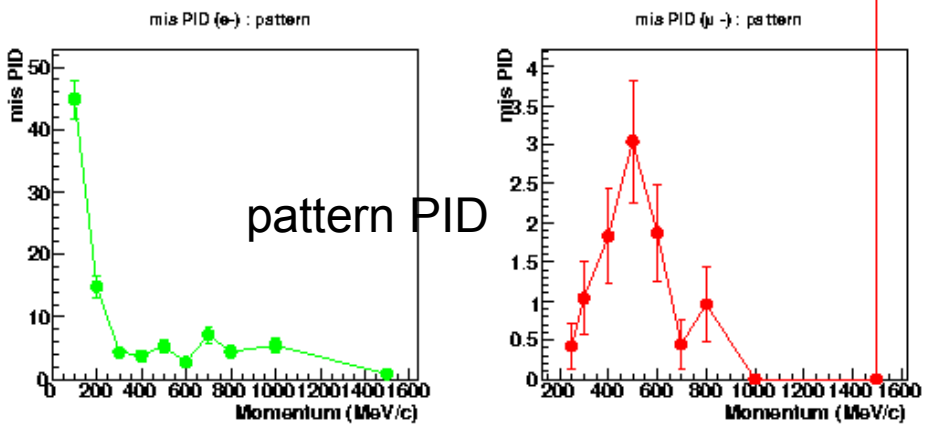


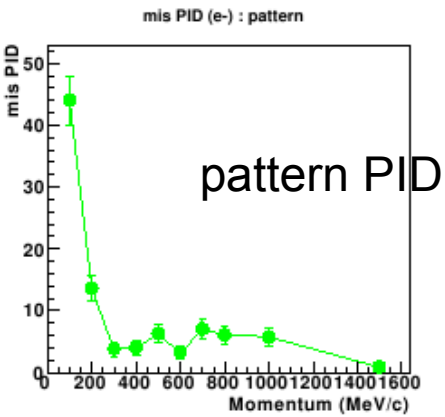


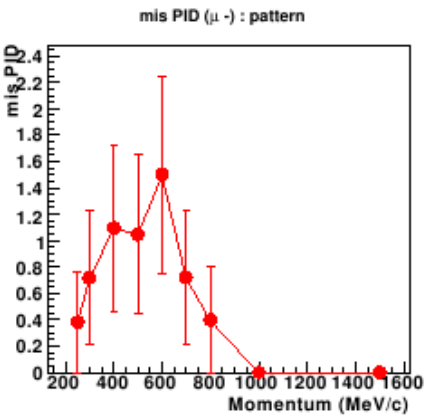










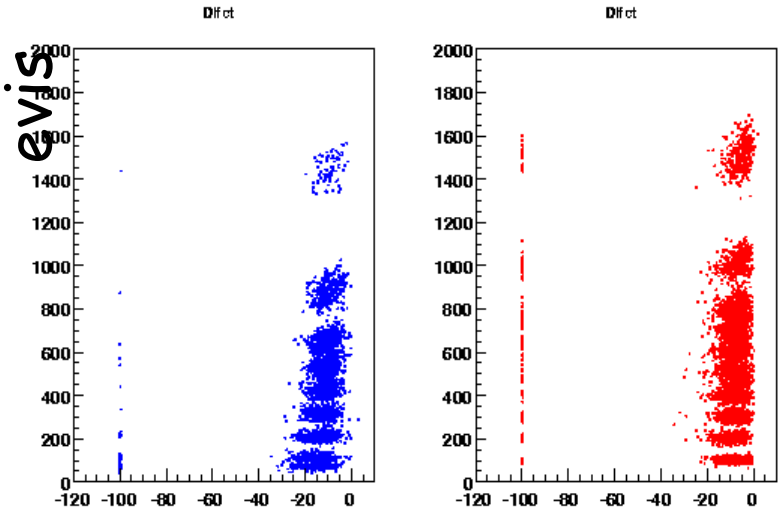


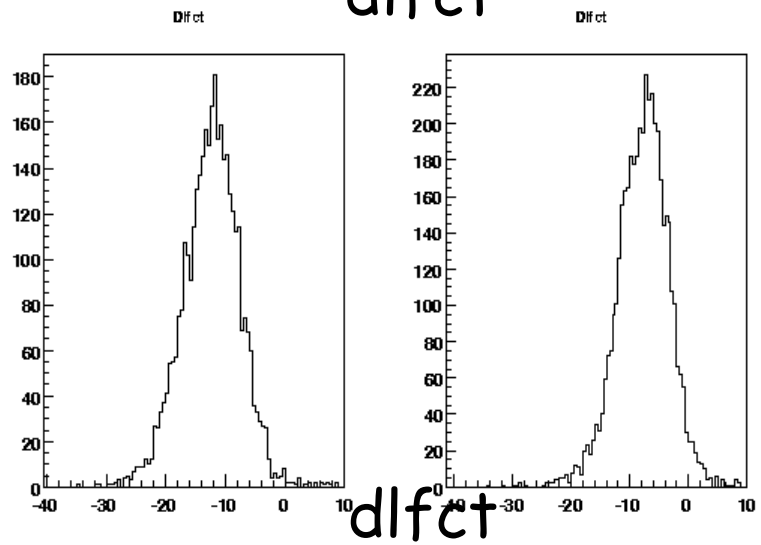
Ring counting

1Ring/Multi-ring cut position same as in march 2005

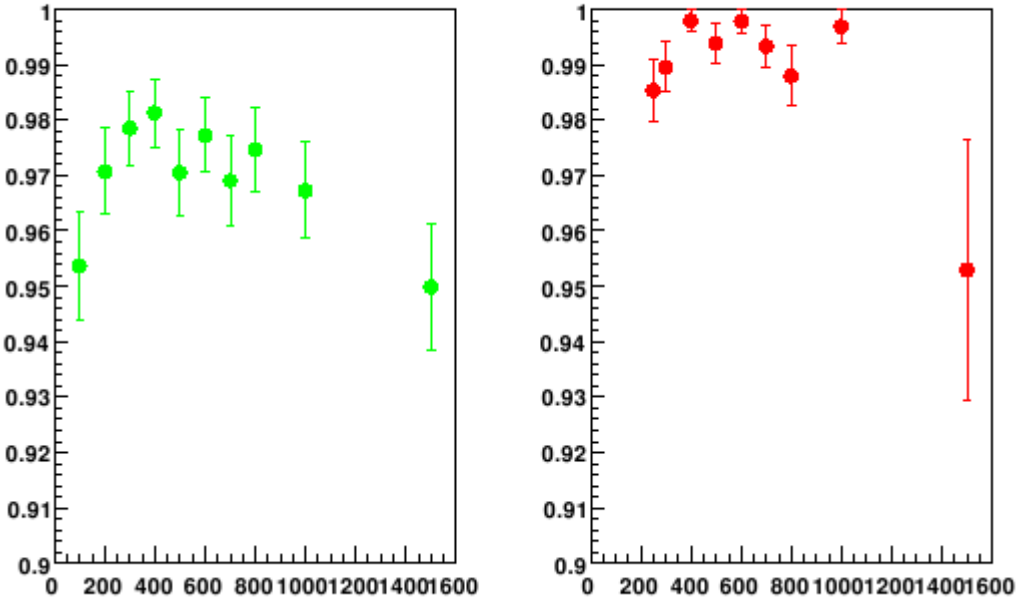
Checked with monoenergetic single-ring e/μ events

Will be checked with neutrino events in the next few days



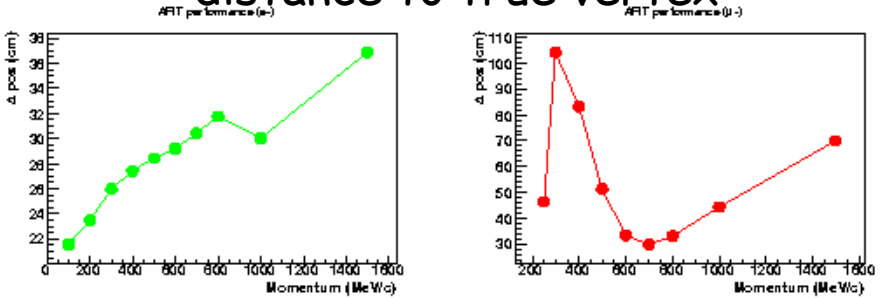


ring counting efficiency

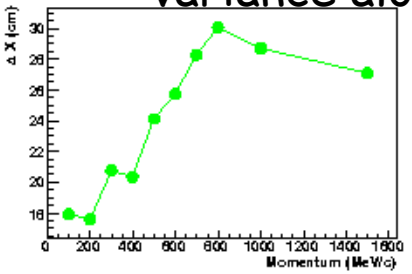


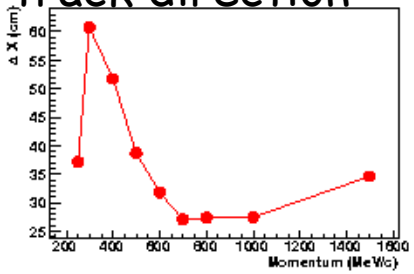
AFIT

distance to true vertex

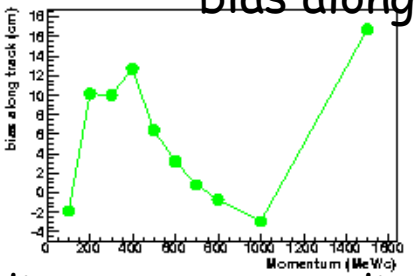


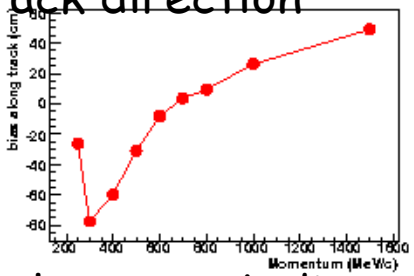
variance along track direction



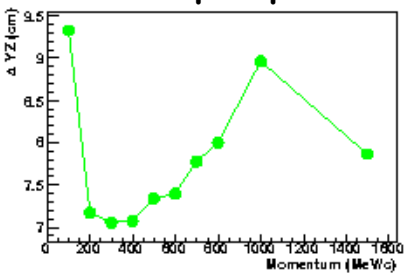


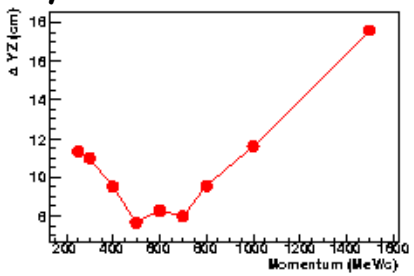
bias along track direction





distance perpendicularly to track direction





- vertex fitter called at the beginning of the reconstruction (before ring counting and PID)
- good performance a must to get correct PID : vertex bias along track must not be too large
- modifications to Cherenkov edge finding algorithm by Okumura-san

MSFIT

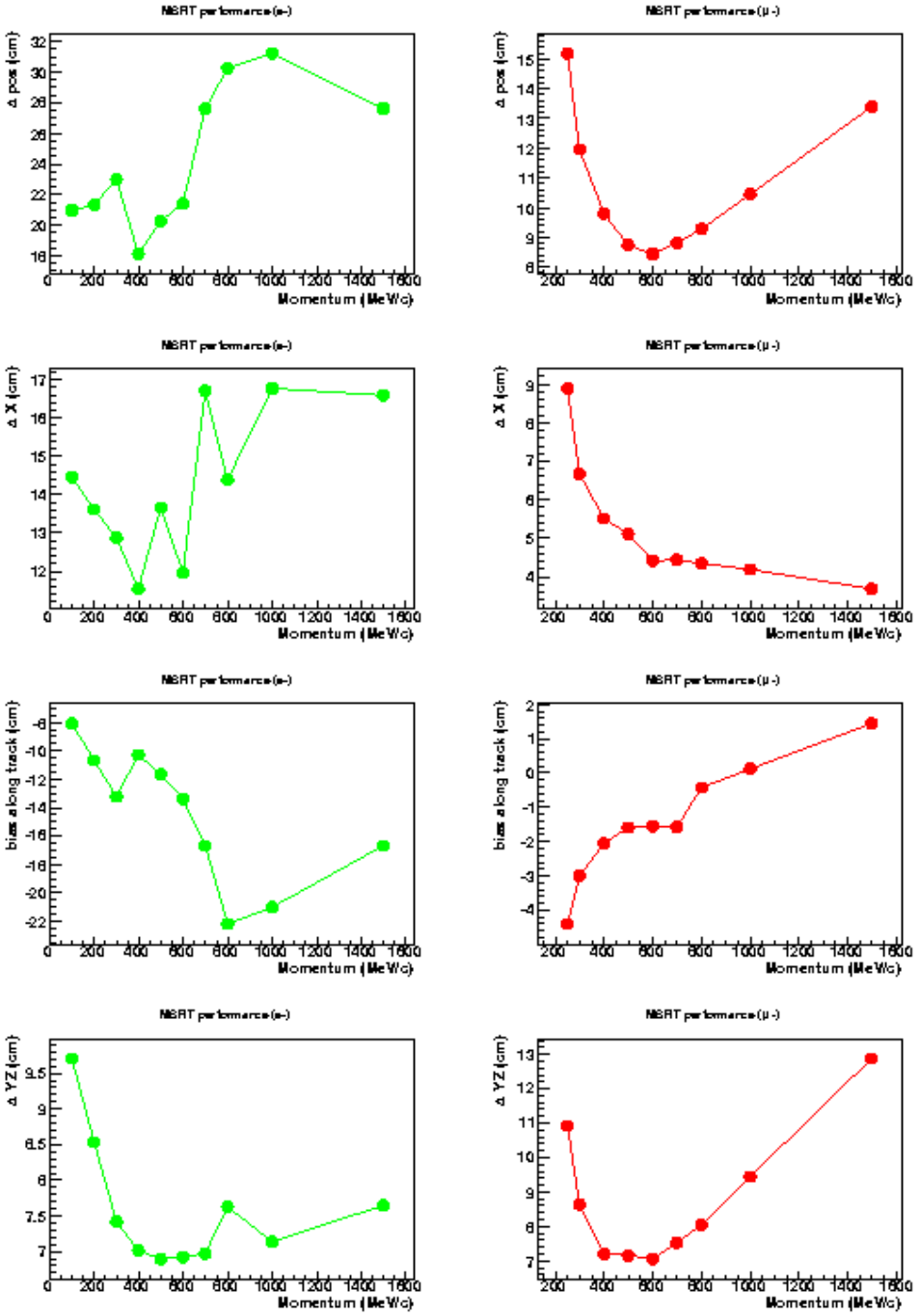
Final vertex fitter, uses PID info and likelihood

In the 2KM code we iterate

PID->MSFIT->PID->MSFIT

to get better PID performance

negative bias along track for e-



Schedule for the MC production

After all νe appearance cuts, ~ 300 MC νμ events/simulated T2K year left to study the BG

AT THE MOMENT WE HAVE 0.3 yrs of T2K beam @ 2KM TO DO THE ANALYSIS (using feb05 GEANT4 MC & reconstruction)

At Kashiwa (icrcals* cluster), with 100 CPUs, it takes

~12h to generate 250,000 νμ events & 48h to reconstruct them

We also need 500,000 MC νe events to study intrinsic beam BG -> 180 hours

GOAL : have everything ready for the meeting in January 06 with enough statistics

Running full time in november & december --> ~7 T2K years

Need to finalize the reconstruction software in the next week or two.

Conclusion

- improved behaviour of PID @ 2KM -> acceptable for μ, needs to be improved for e-.
- related to AFIT vertex biases -> to be checked with Okumura-san
- Needs to be finalized within the next fortnight to be able to get enough MC statistics @ 2KM for the coming collaboration meeting