TPOL offline analysis
--review for collaboration meeting--

Tokyo Metropolitan University

Osamu Ota

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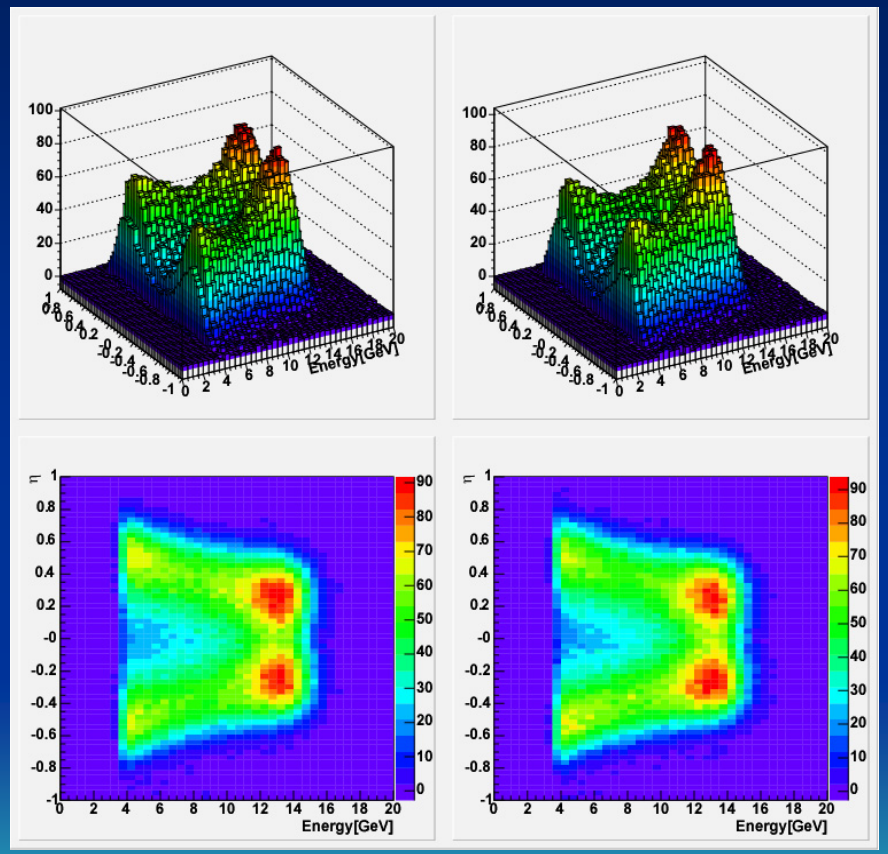
- Review
  - Fitting method
  - η range dependence
  - Table scan
  - Systematic check
- Some new results

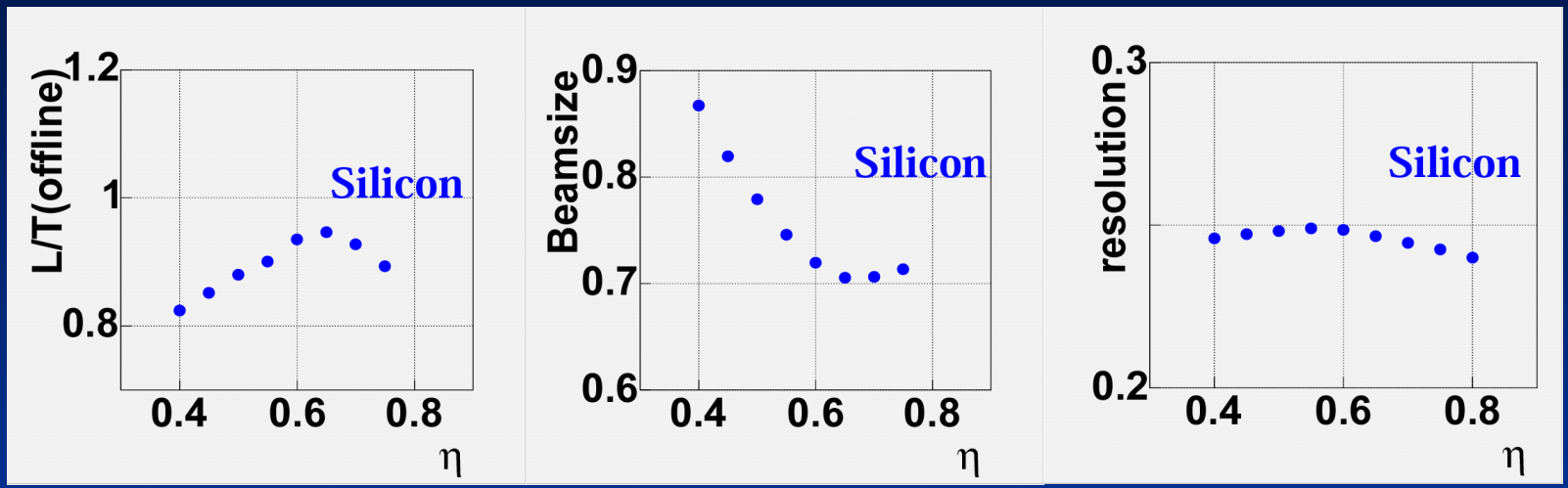
Fitting method

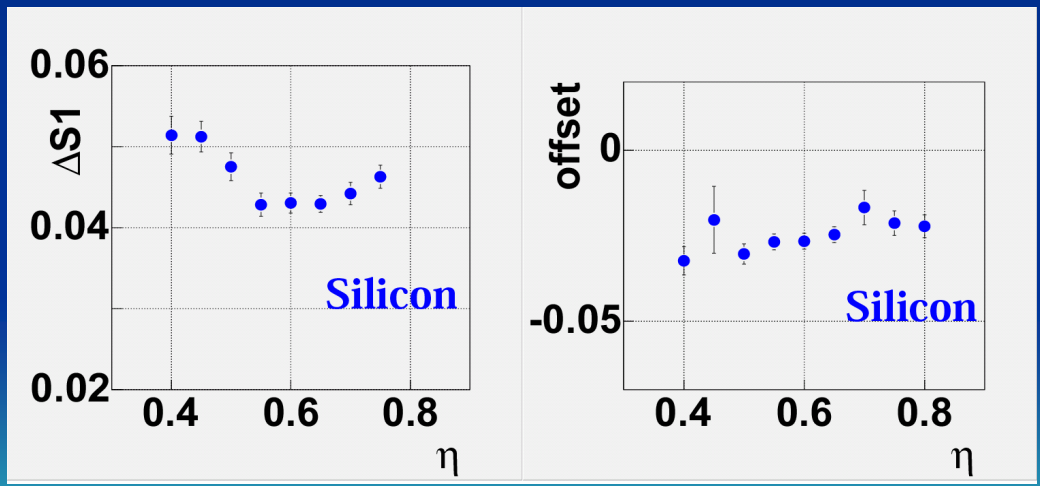
- Fit to 2D compton X-section.
- Parameters
  - η -y transformation
  - Calibration of CAL
  - Energy resolution of CAL
  - Distance IP to CAL
  - Beam size
  - Laser linear component etc…

LEFT RIGHT



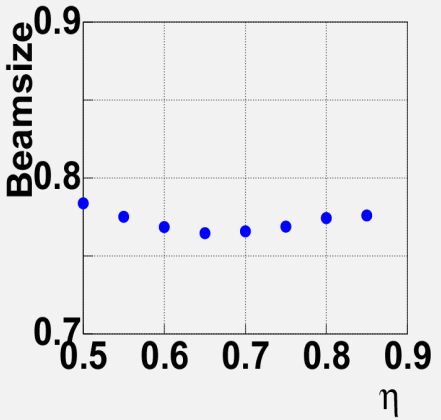
η range dependence 1 (d0:free)

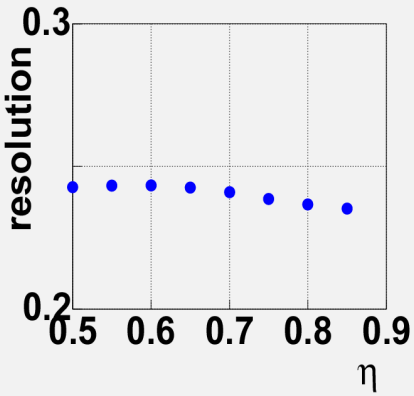


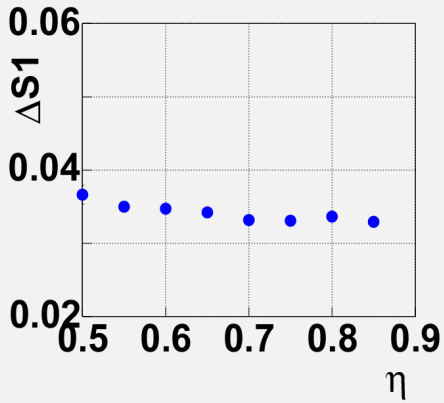


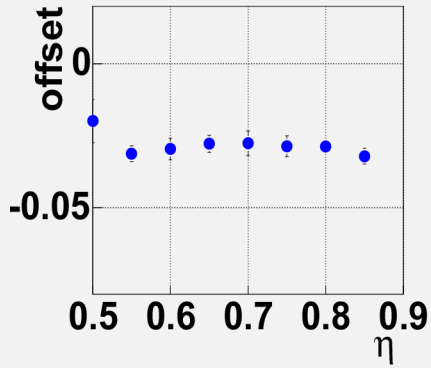
With d0(distance IP to CAL) free, fitting method was unstable.

η range dependence 2 (d0:fix to 65m)









Obtained parameters from offline fitting are stable against η range.
→This fitting method work.

Comparing with LPOL,
→LPOL/TPOL ~1.11

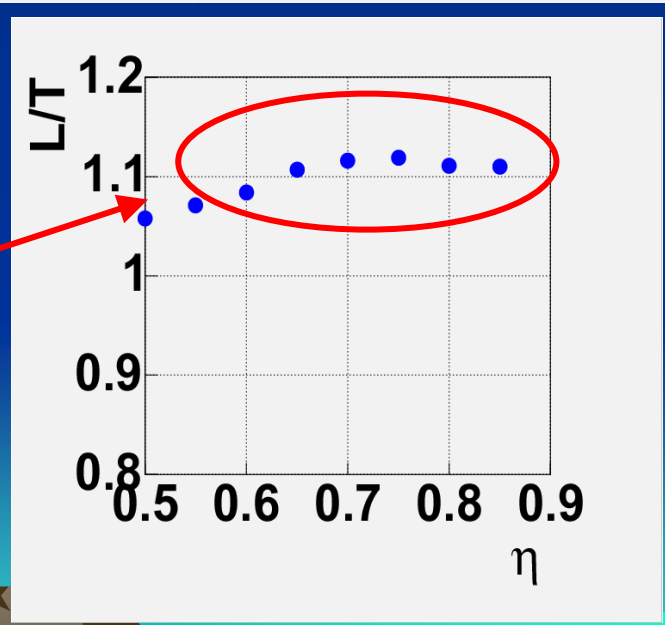
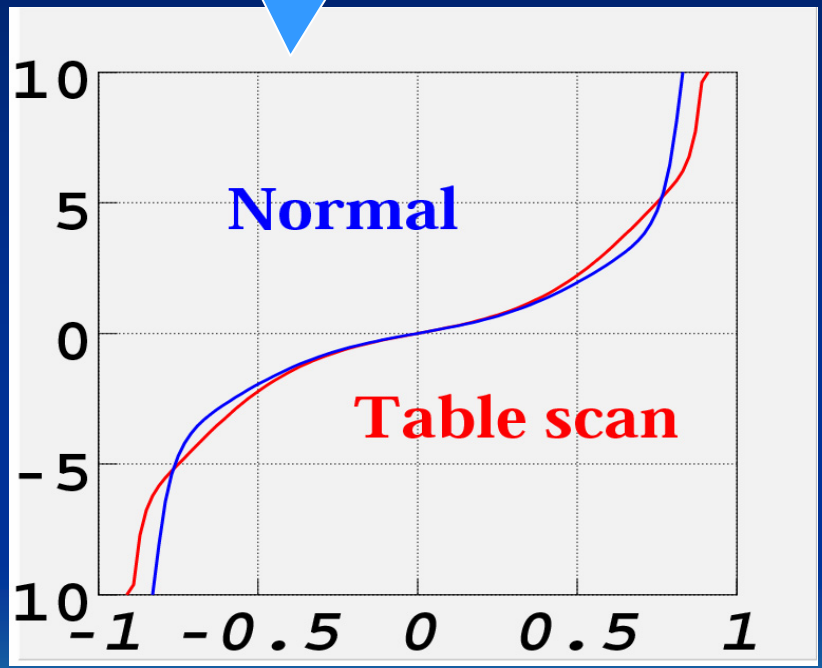


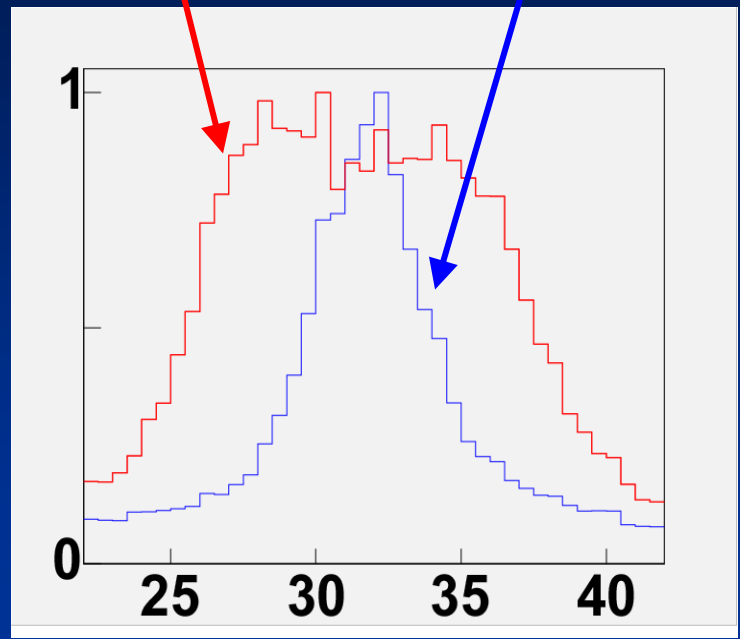
Table scan

- Purpose
  - To increase large y (large η) events.
    - Polarization, in principle, is sensitive to y asymmetry.
  - To reduce events which do not reflect right position of compton gamma.
    - Back scatter from CAL.
    - Entering with some angle due to pre-radiator.

May cause the possible beam bias to η -y curve.

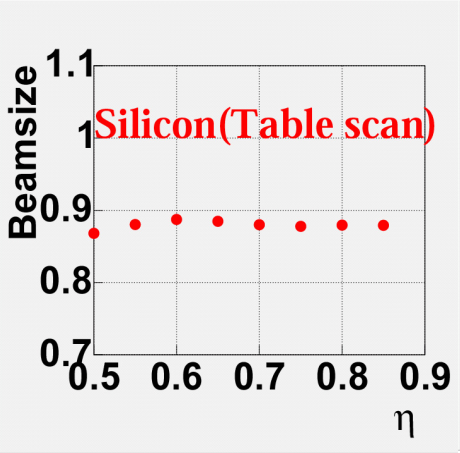
Two η -y curves are different from each other.

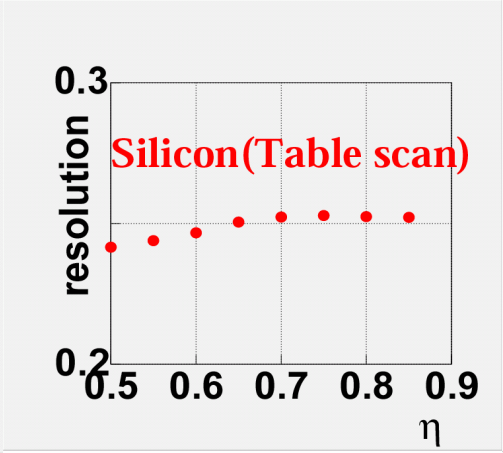


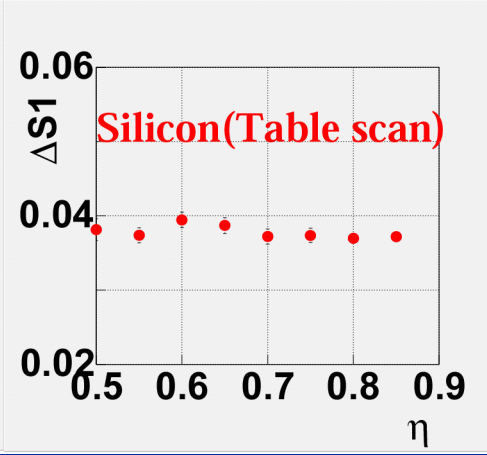


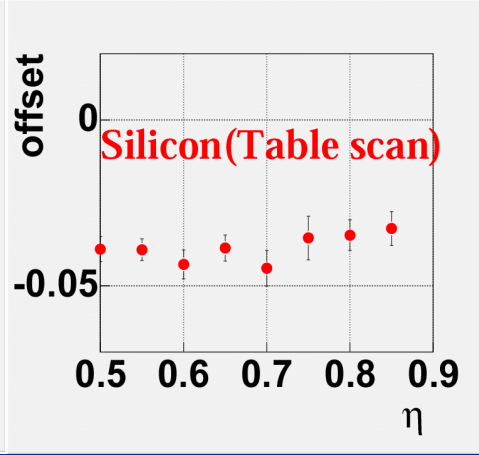
Check to see if the difference of two curves affects to the polarization.

η range dependence 3 (Table scan)









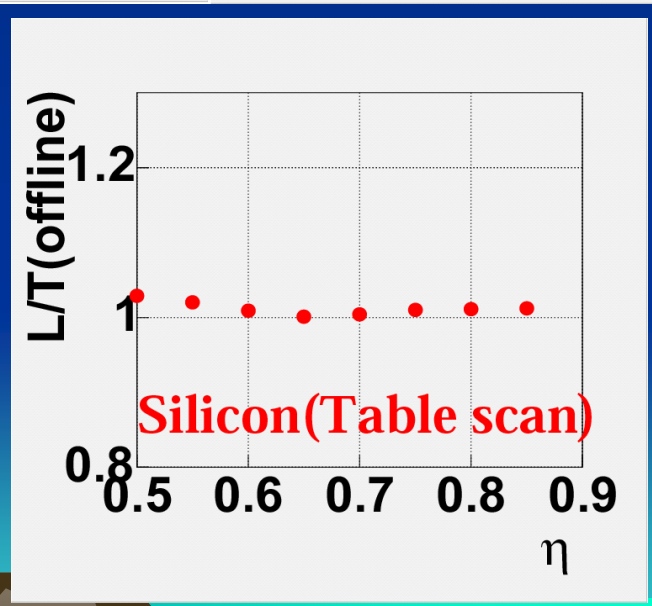
- With η -y curve from table scan, the fitting method is also stable.

- Comparing with LPOL,

→LPOL/TPOL ~1.03

→LPOL/TPOL ~1.11(Normal)

→Error due to difference in the two curves ~8%



Other systematic checks

	Normal	Table scan
η range (0.6< η <0.85::nominal η =+/-0.7)	-1.17%	-0.68%
Calibration of CAL	-0.09%	-0.29%
Beam offset	0.18%	0.19%
Distance IP to CAL	0.63%	0.49%
Energy resolution	0.45%	-1.75%
	1.41%	1.97%

Systematic error is ~2.0% except the difference in the η -y curve (Normal and Table scan)

Short summary

- Offline fitting method is unstable, unless d0(distance IP to CAL) is fixed.
  →fixed to 65m.
- The η -y curve seems to be sensitive to the beam profile.
  - Gaussian beam (Normal), Flat beam (Table scan)
- Systematic uncertainty except due to difference in the η -y curve is ~2.0%
- Large difference between Normal and Table scan.
  - L/T~1.11(Normal)
  - L/T~1.03(Table scan)

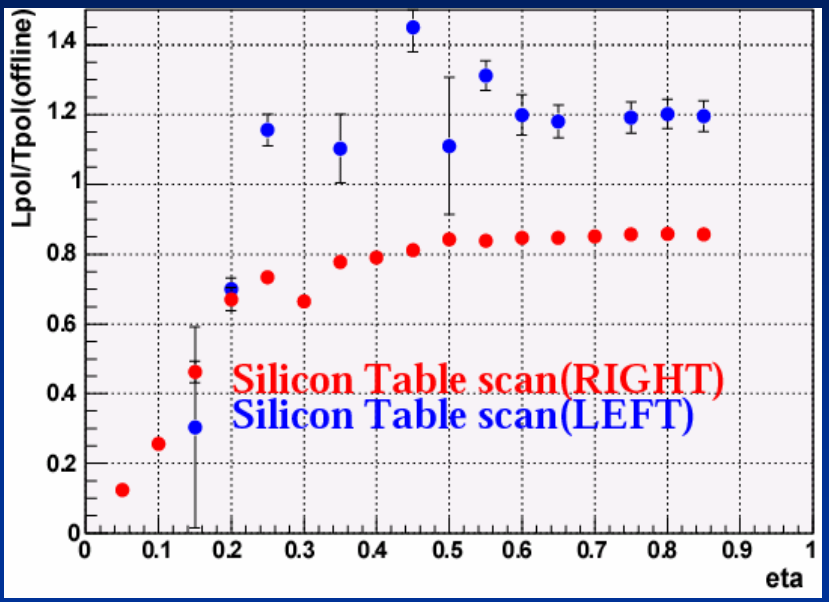
Some new results

- Check some parameters to find reasonable η range.
  - L/T against η range, laser right and left respectively.
  - Laser linear component against η range
  - Energy resolution, the effects of calorimeter miscalibration.
- η -y curve
  - Comparing Table scan with Normal by MC(Geant3)

work by James Sully

L/T from RIGHT & LEFT 1

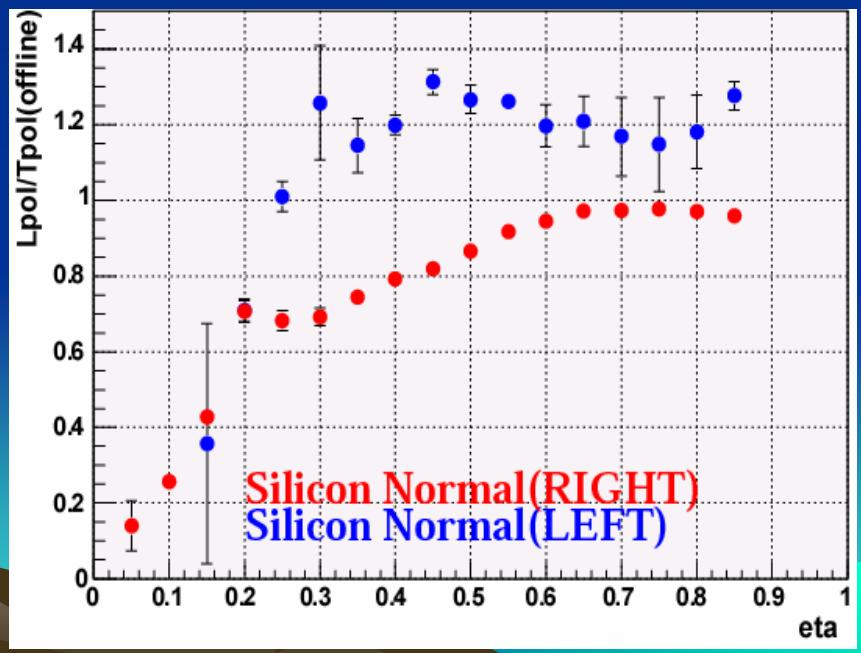
--25th.Feb.2004--



- L/T vs η
- Laser RIGHT & LEFT

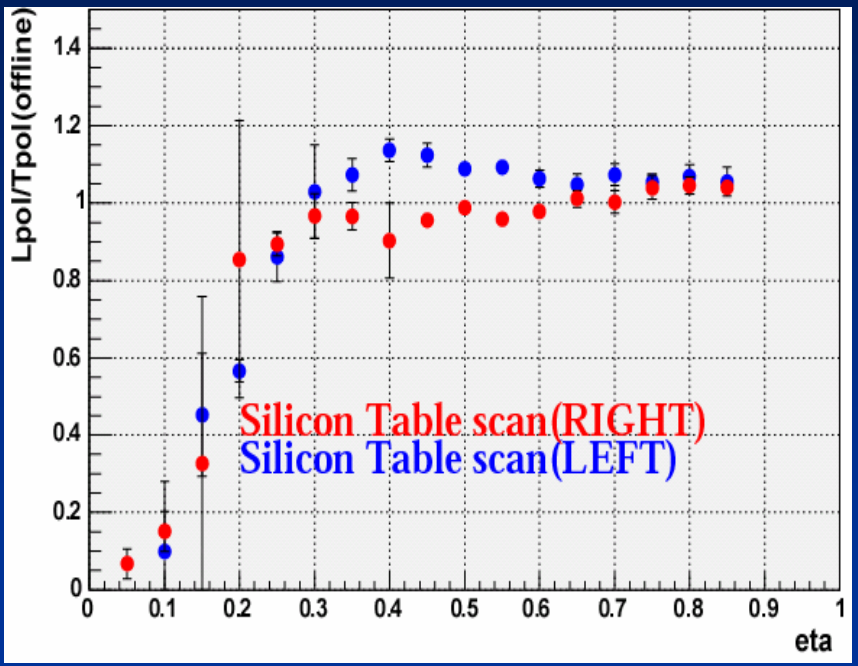
Silicon (Table scan)

Silicon (Normal)



L/T from RIGHT & LEFT 2

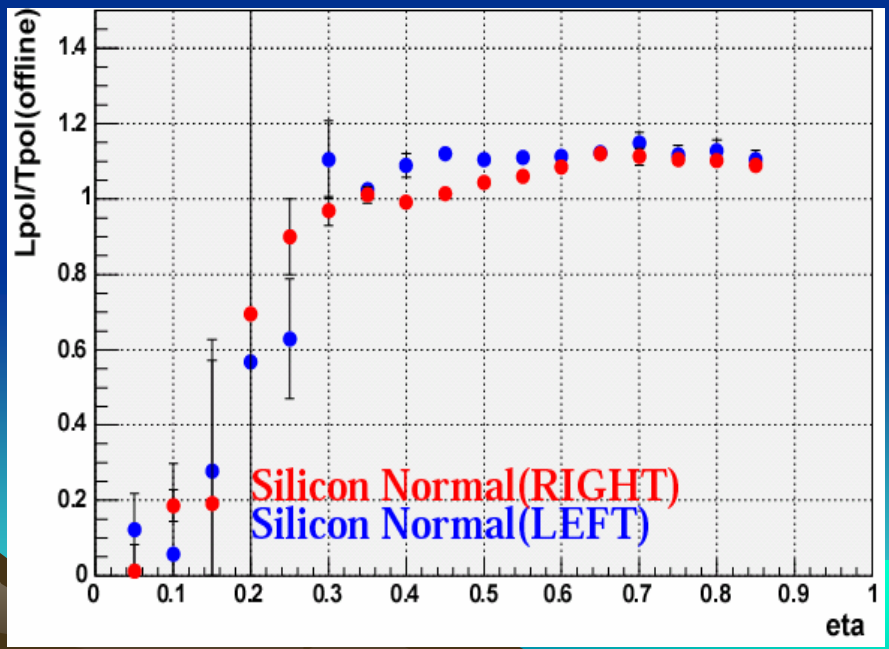
--31st.Jan.2004--



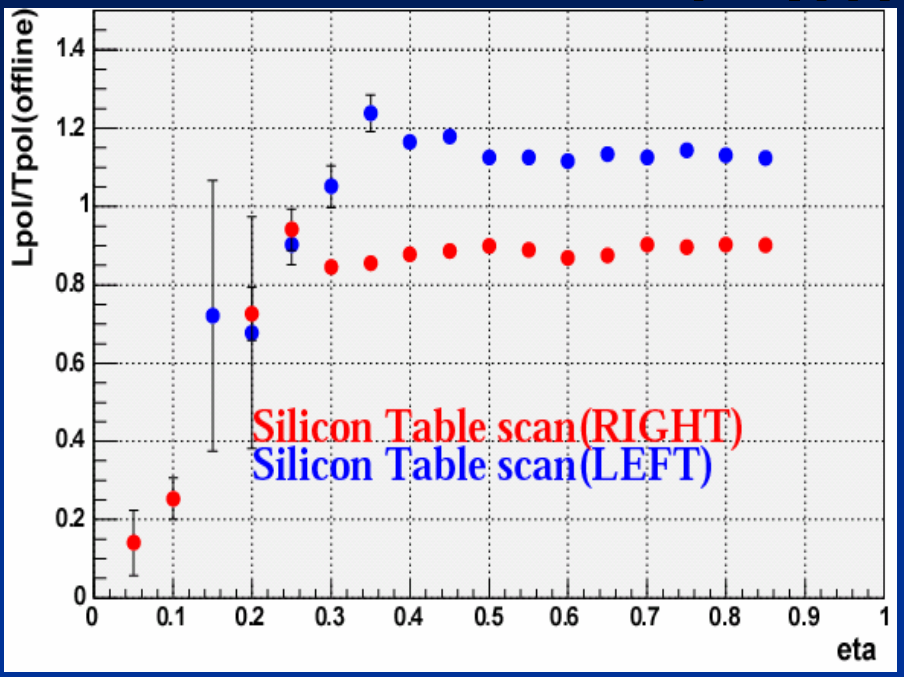
- L/T vs η
- Laser RIGHT & LEFT

Silicon (Table scan)

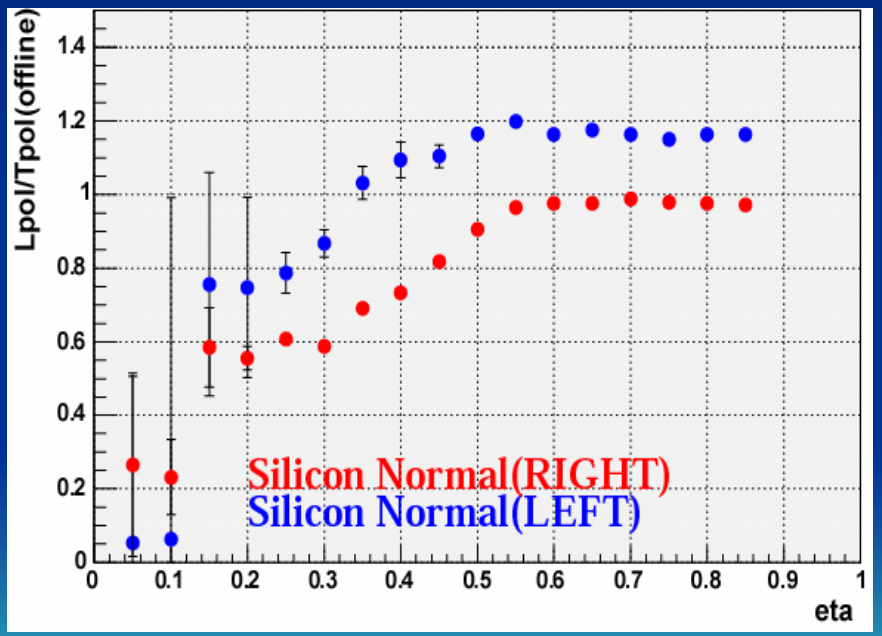
Silicon (Normal)



L/T from RIGHT & LEFT 3
--1st.Mar.2004--



- L/T vs η
- Laser RIGHT & LEFT



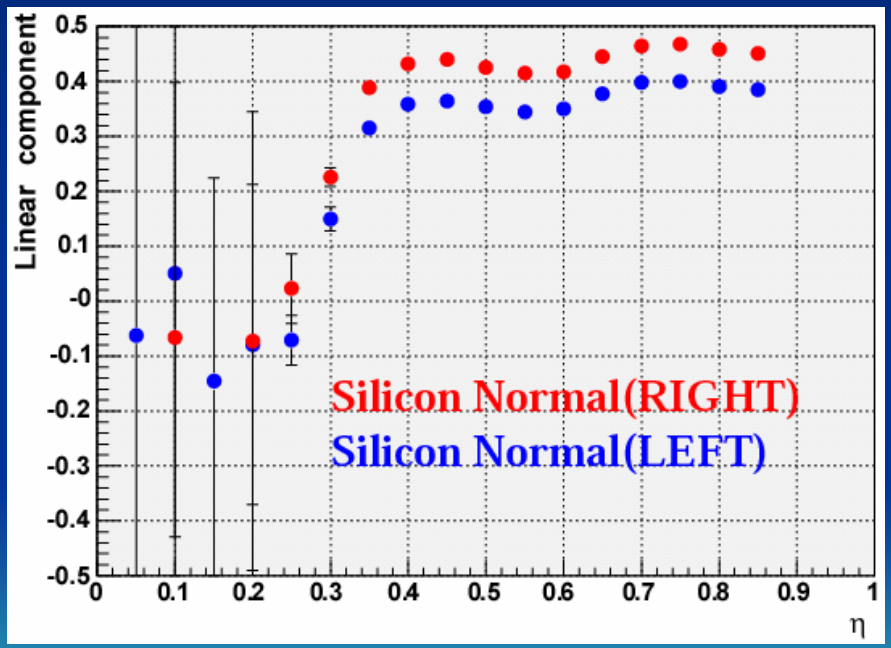
Silicon (Table scan)
Silicon (Normal)

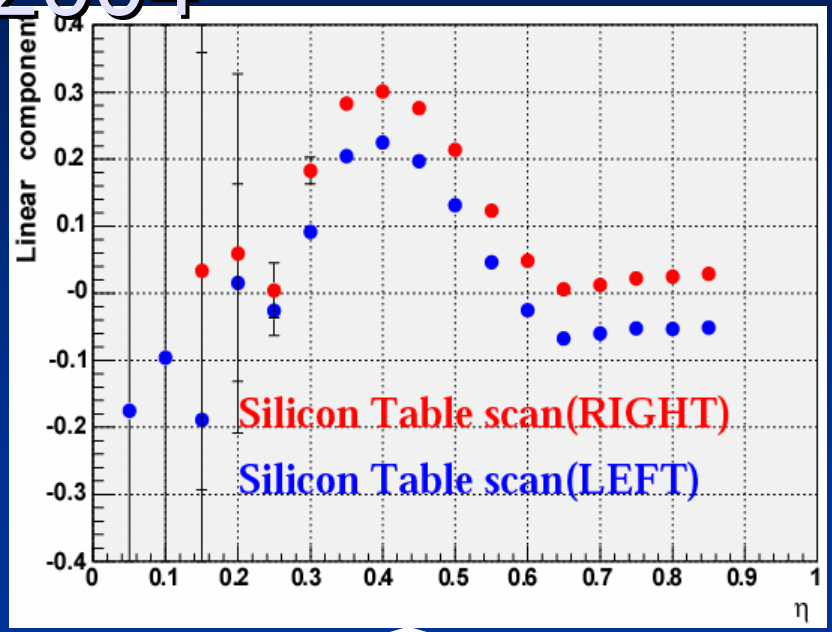
Three data sample have same trend, that is, always LEFT is larger than RIGHT. But, do not understand the reason yet.

Laser linear component(S1) from RIGHT & LEFT

--25th.Feb.2004--

- Linear component vs η
- Laser RIGHT & LEFT





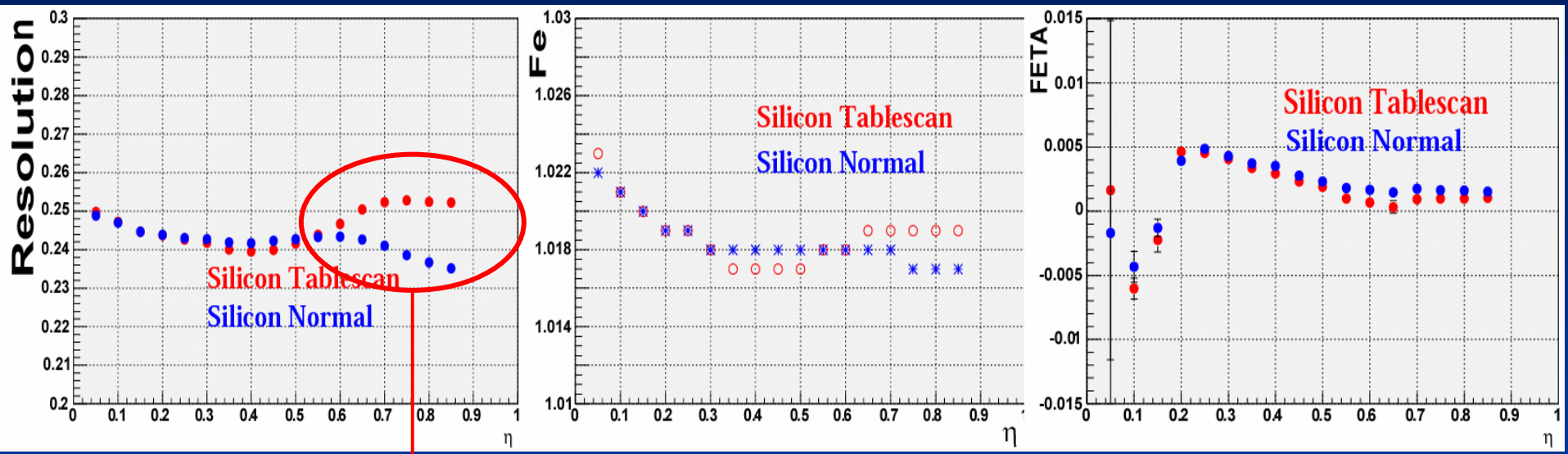
Silicon (Table scan)

Silicon (Normal)

Other data sample(31st.Jan.2004, 1st.Mar.2004) have same trend, not understand the reason yet too.

Other parameters vs η range

resolution FE FETA

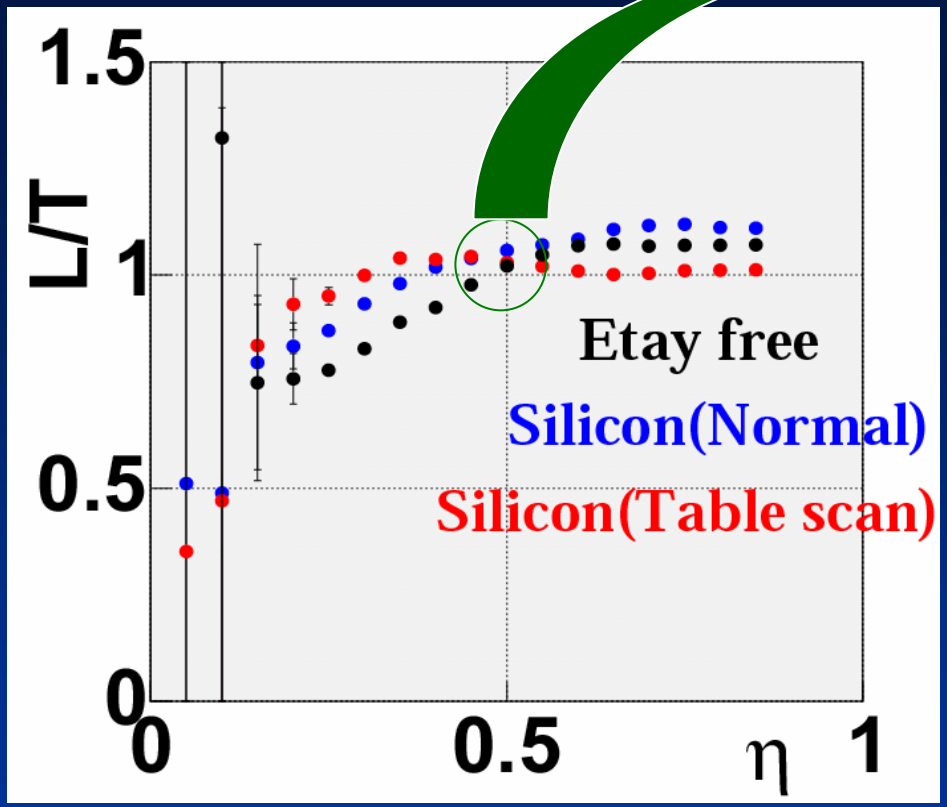


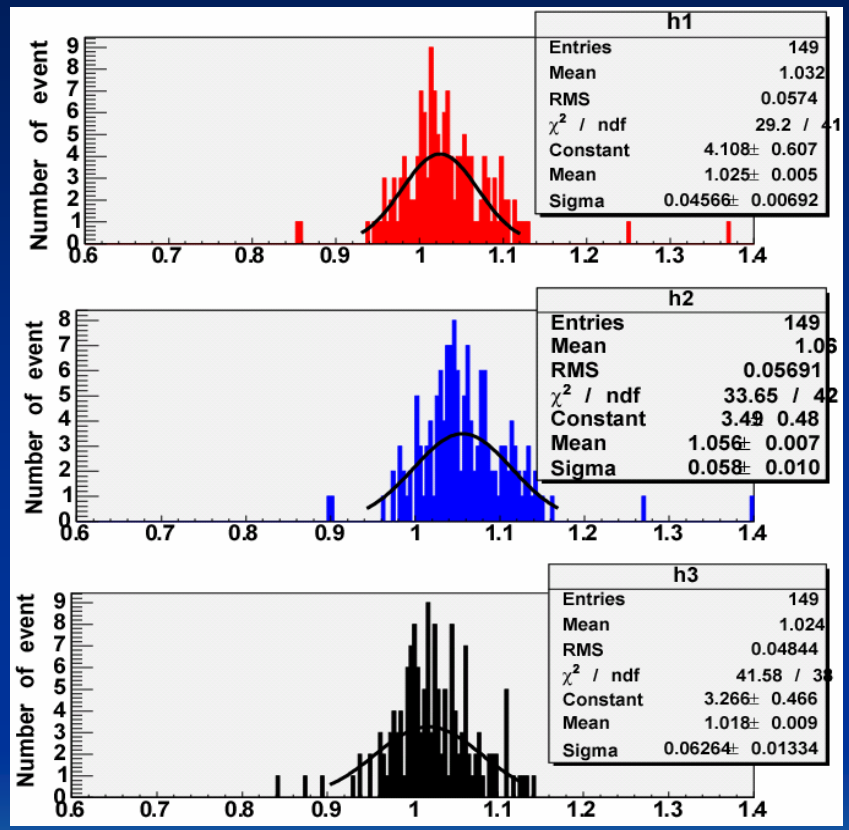
Not understand yet

$$U = (\mathrm{FE} \times (1 + \mathrm{FETA})) \times U\_calo$$

$$D = (\mathrm{FE} \times (1 - \mathrm{FETA})) \times D\_calo$$

Resolution can be fixed to the results CERN test beam, and η range can be less than 0.6. For example with $-0.5 < \eta < 0.5$, next slide……





L/T=1.025(Table scan)

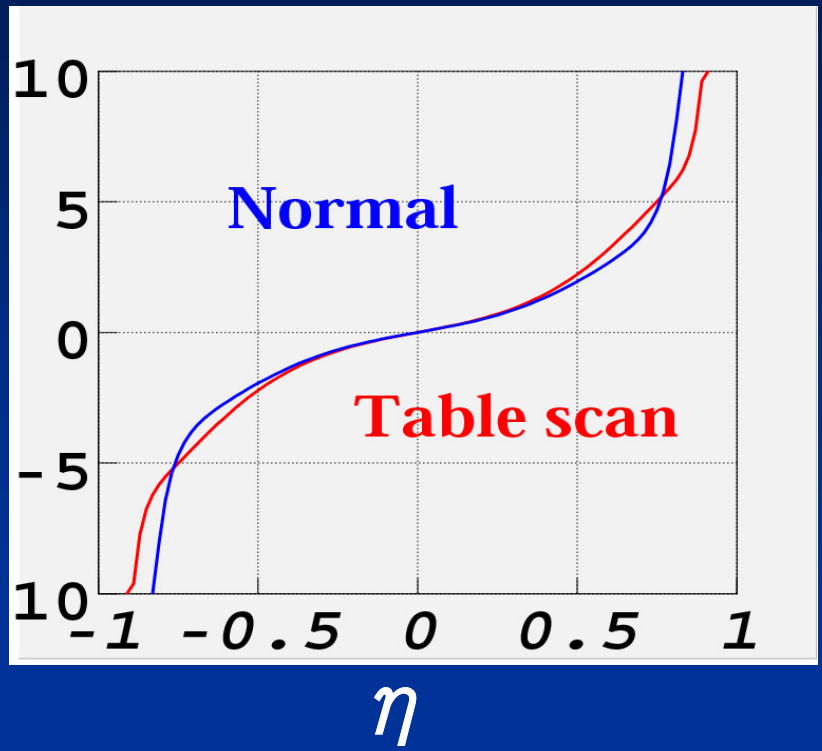
L/T=1.056(Normal)

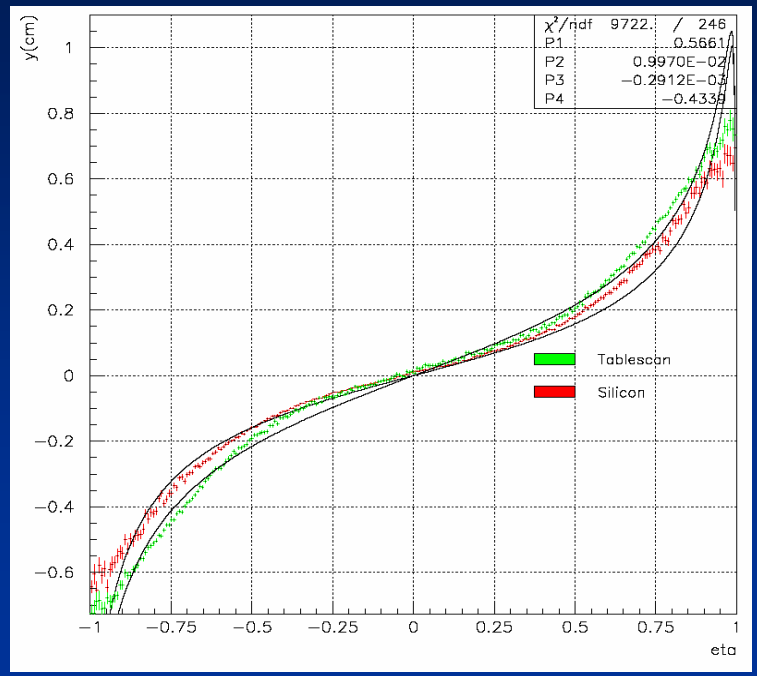
L/T=1.018(Free)

If η range is ok for -0.5< η <0.5, systematic uncertainty from η -y curve itself is small,~3%

→Study is needed with more statistics.

η -y curve





MC can reproduces the trend to the difference between Table scan and Normal.
(although MC can not reproduces absolute value exactly…)

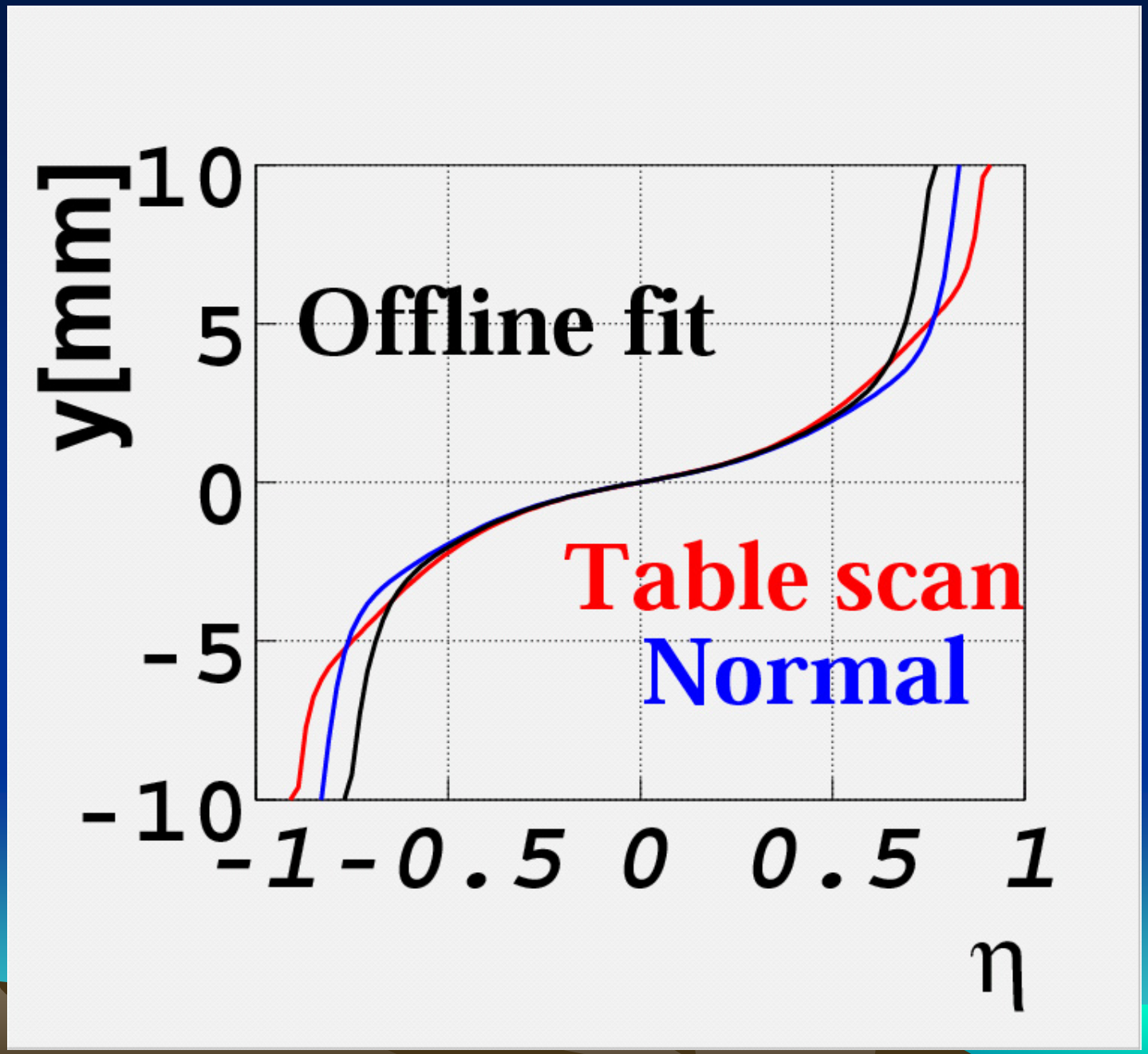
Summary & Future 1

- Polarization from fitting method is sensitive to the shape of η -y curve itself.
  - Sensitive to the beam profile.
  - To check that, MC is essential. Thanks to James, we are getting start to understand the difference.
  - For cross check, I need to restart MC with Geant4…
- To find best η range for fitting, a lot of parameters were checked against η range.
  - At present, there are strange fluctuation in polarization against η range from laser right and left respectively .

Summary & Future 2

- Offline program can run on the ZEUS batch machine.
  - It still takes 1 minute for fitting 1 minute data.
  - Depends on the number of parameters (free/fix) and η range.
- Try to make pull distribution to see if the fitting work fine.
- To estimate uncertainty of η -y curve from Table scan, we need to take special run for table scan as soon as possible.

Extra slides


Offline fit
Table scan
Normal
y[mm]
10
5
0
-5
-10
-1
-0.5
0
0.5
1
η