Brief report of the beam test at KEK-LINAC

2010/02/18

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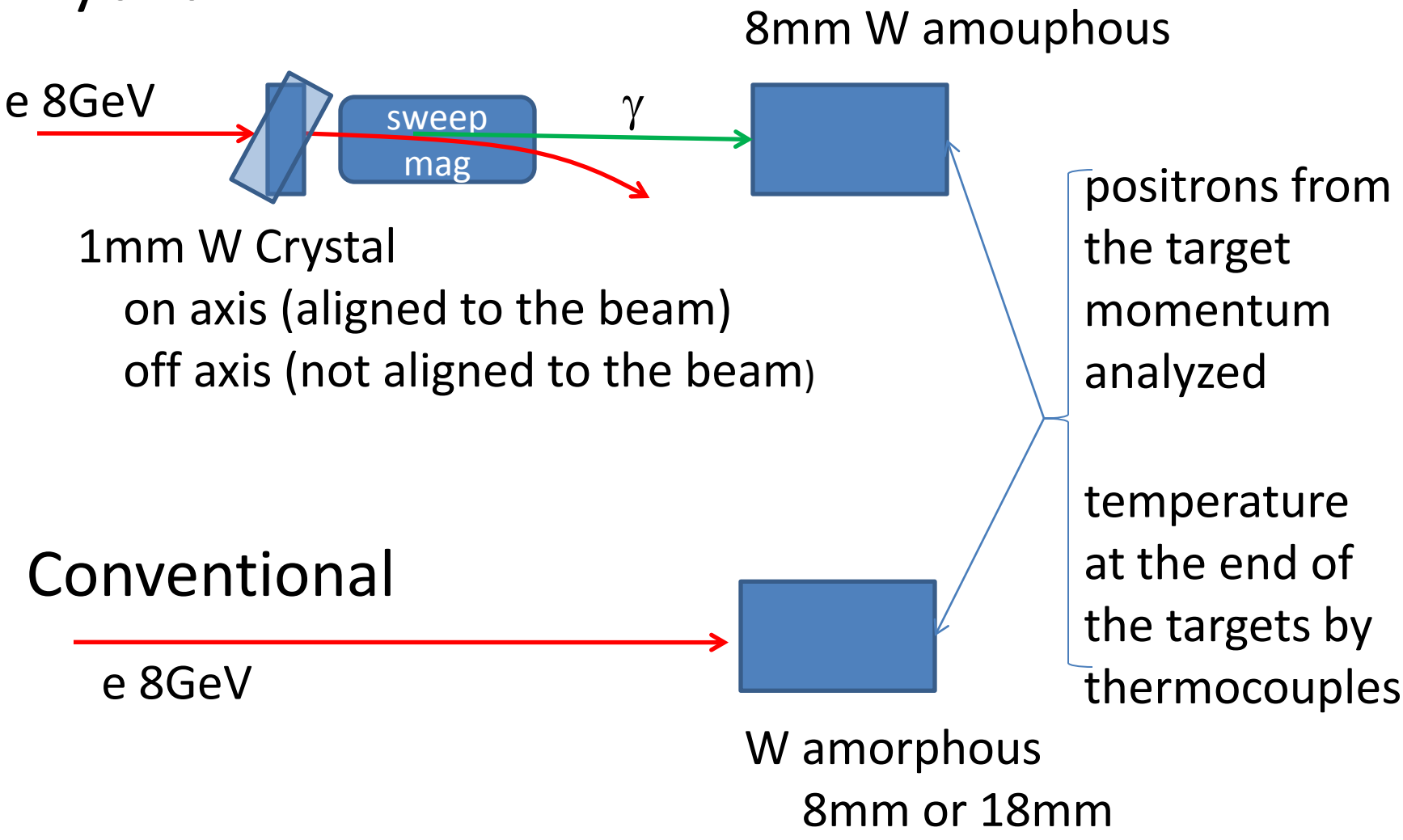
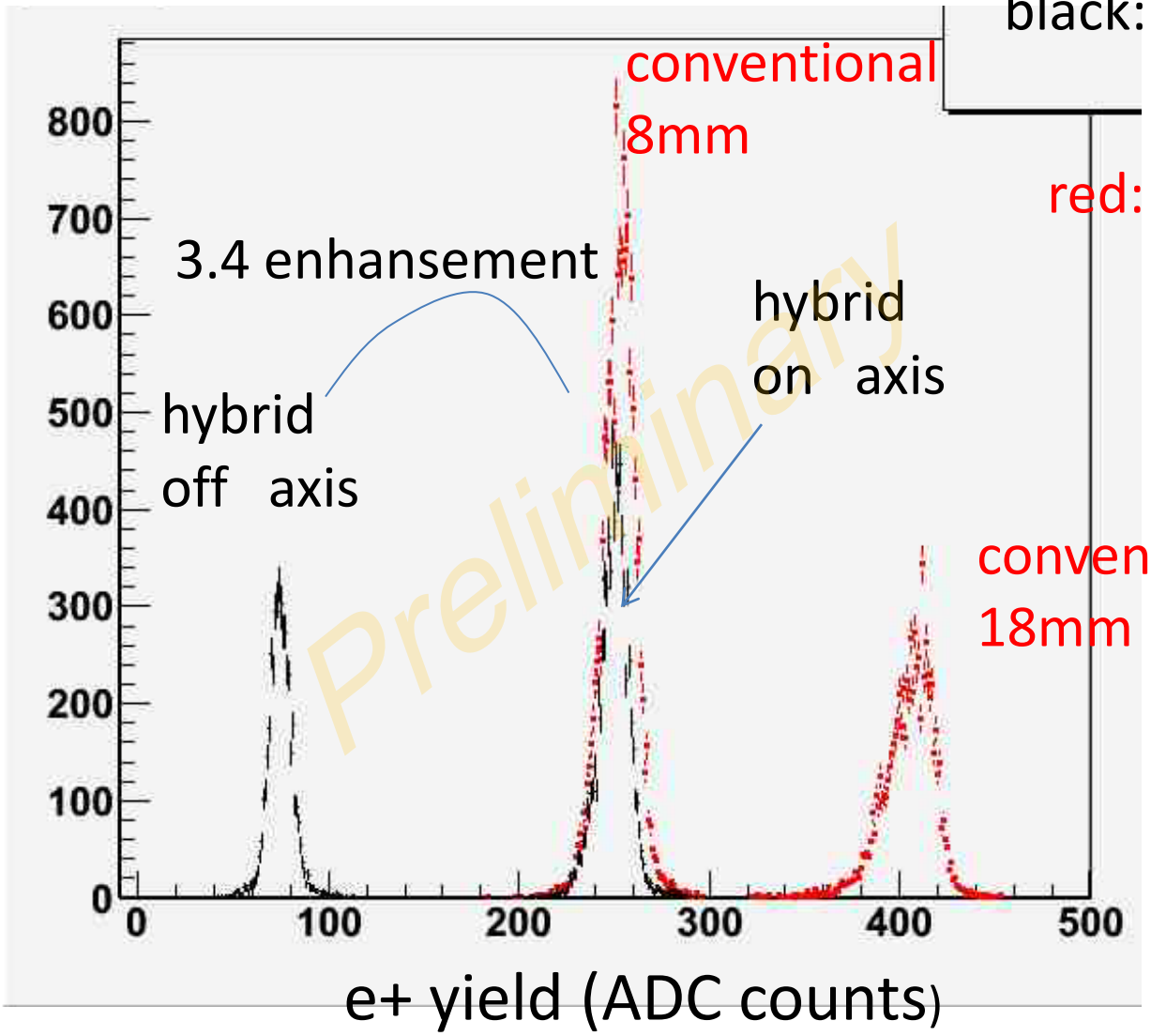
data shown today

- Hybrid



- Conventional

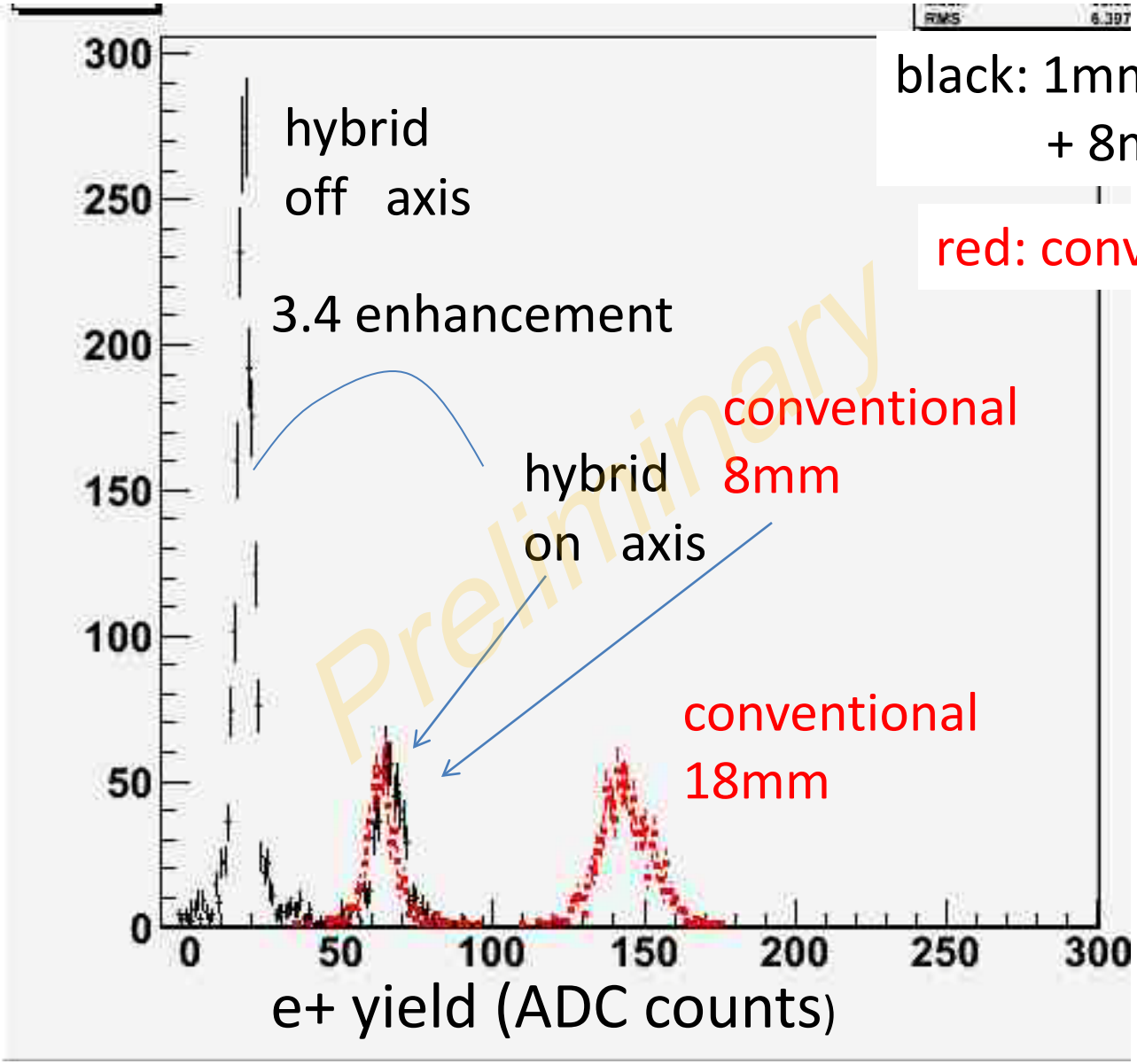
e+ yield (20MeV)



black: 1mm W crystal
+ 8mm W amorphous

red: conventional

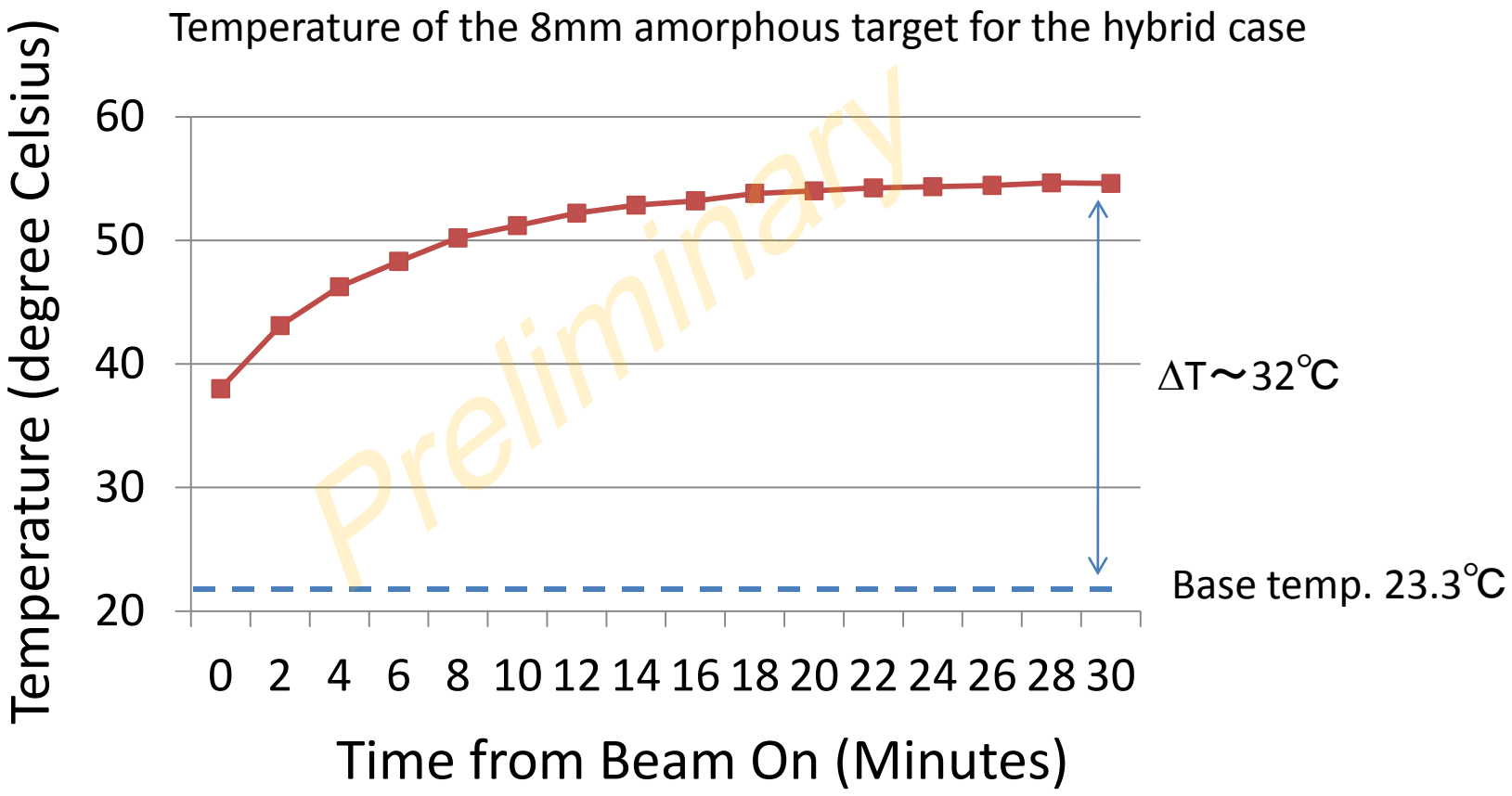
e+ yield (10MeV)



black: 1mm W crystal
+ 8mm W amorphous

red: conventional

Temperature Measurement



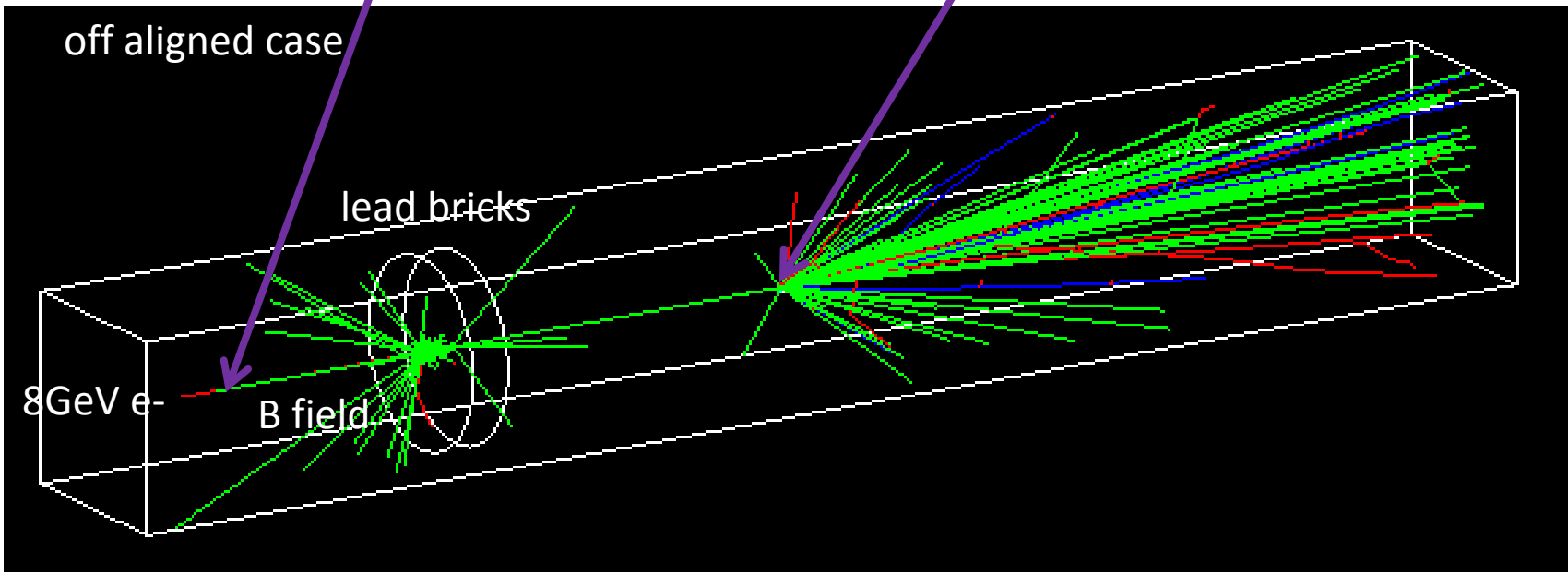
How they look like

- e+ detected in hybrid configration
  - on axlis/off axis ～3.5
- hybrid on axis and conventional with 8mm W
  - e+s are almost same
  - temparature rise of amorphous targets
  - hybrid 32.1 ℃
  - conventional 24.7℃
- e+ at 20 MeV and 10MeV
  - 20MeV/10MeV ～ 3.9

Can we understand the these?

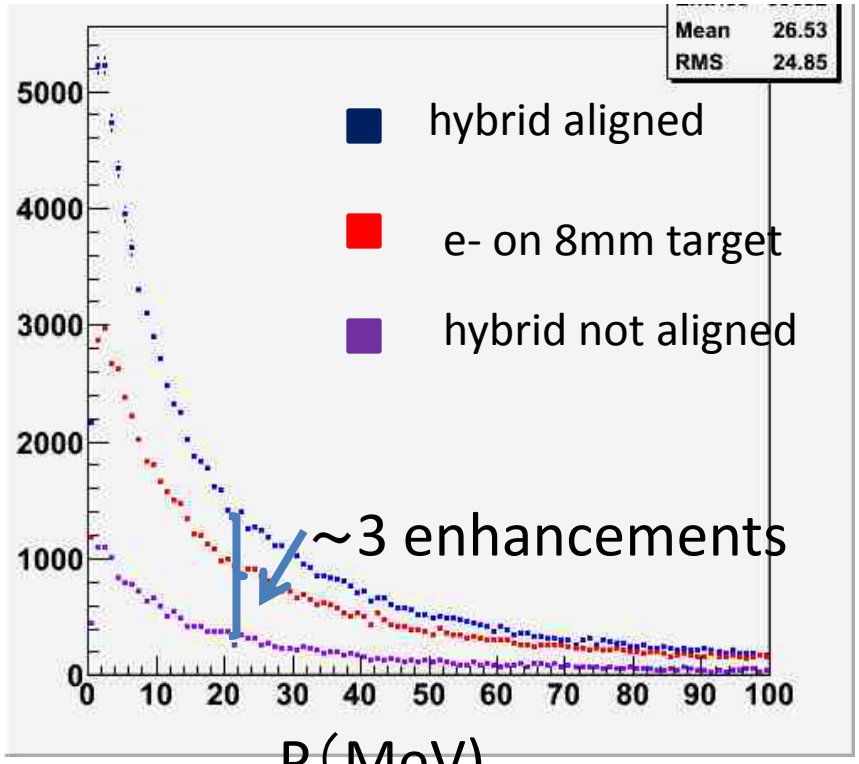
Geant4 Simulation

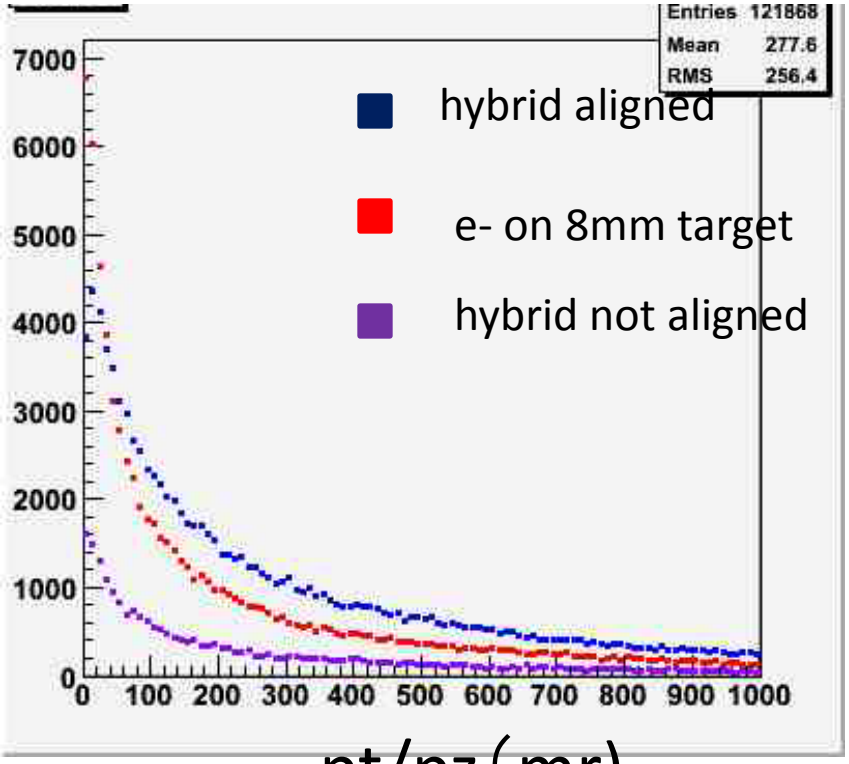
- γs from crystal
  - put simulation date to Geant4
- crystal off aligned
  - 8GeV e- to 1mm amorphous + 8mm amorphous



G4 simulation: ALL e+ from targets

corresponds to 1000 e- injunction





hybrid v.s. conventional

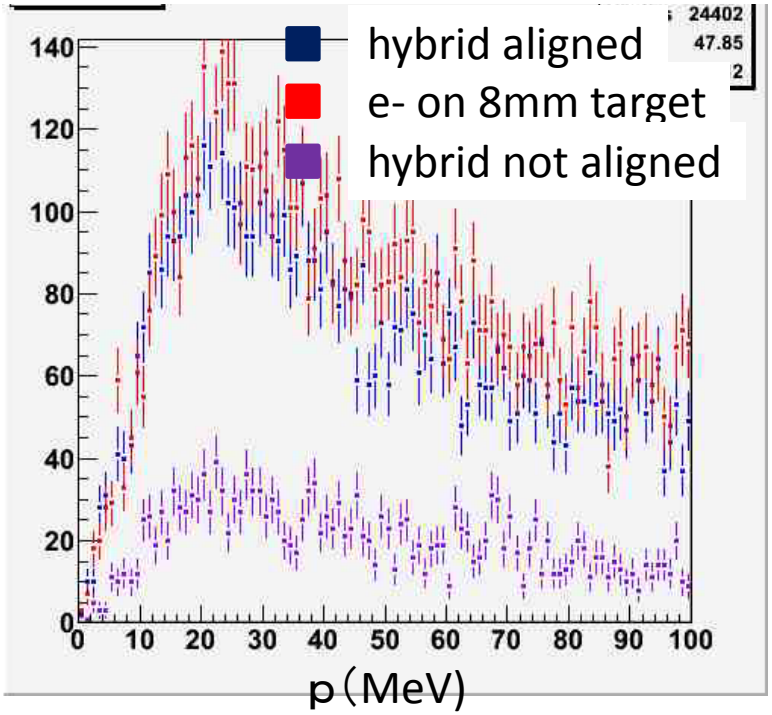
total number of e+ is larger for hybrid (factor 2)

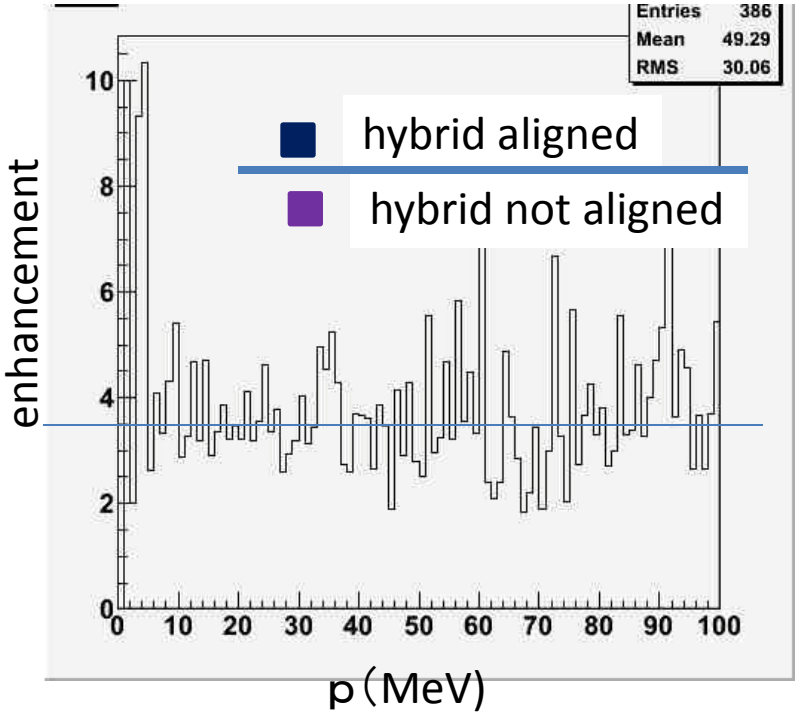
-> larger dEdX and then larger temperature rise for hybrid

lager angular distribution fof hybrid

# of e+ in detector depends on acceptance of the detection system

e+ after acceptance cut pt/pz＜50mr





# of e+ is same for hybrid and conventional → consistent with the experiment

deffernece for on/off aligned crystal is about factor 3 →almost same as the exp.

e+ yield at 20MeV and 10Mev

factor 2 ~ 3 difference by simulation

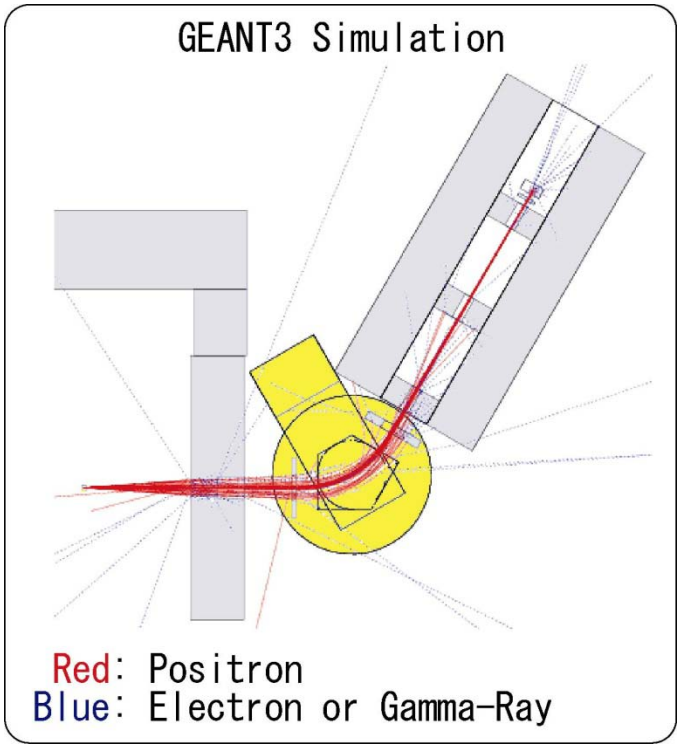
←→ factor 4 difference in the exp.

no discrepancy as
the detection system
has p dependent acceptance

acceptance of the spectrometer has been studied with Geant simulation by colleagues of Tokyo Metropolitan University

$$\delta P \delta\Omega = \Delta P \Delta\Omega \frac{N_1}{N_0}$$

Positron Momentum Pe+ (MeV/c)	Acceptance $\times 10^{-4}$ (MeV/c・Sterad.)
5	1.08±0.03
10	2.47±0.07
15	3.80±0.10
20	4.81±0.12



$0 \leq \theta \leq 0.08, \quad 0 \leq \phi \leq 2\pi,$
$0.8\ P_0 \leq P \leq 1.2 P_0$

Status and outlook

- Experimental data could be understood (at least quantatively)
- need to understand acceptance of the detection system
  - almost done but need to re-comfirm
- how we undersntand dedx, pedd and temparature
  - hybrid and conventional with the 8mm
    - total energy deposit by simulation： 422.1MeV/214.9～2.0
    - measured temperature rise： 32.1/24.7～1.3
  - need more liable way to measure temperature
    - thermocouples works
    - 2 dimensional distribution by IR thermometer?
    - reasonable insulation between target and holders?
    - numerical calculation of heat transfer

next beam time on April 10 , 11