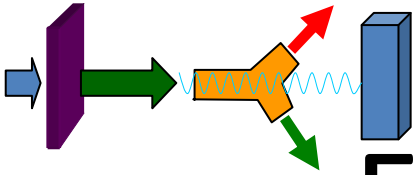


First test of hybrid target

Status of the experiment at KEKB for the hybrid targets

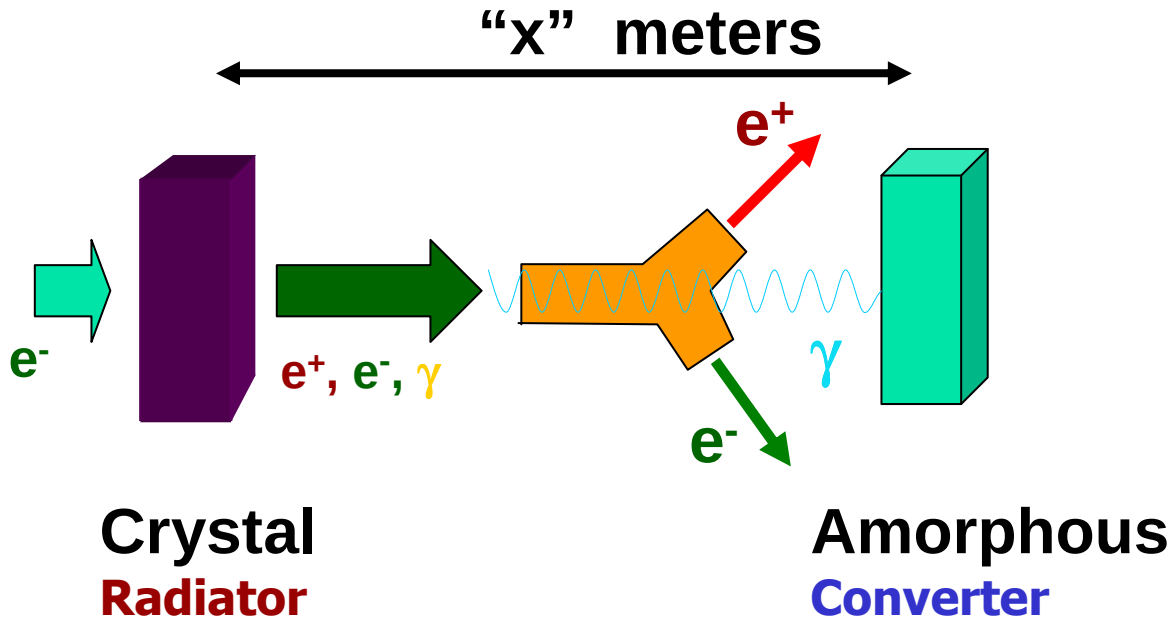
Junji Urakawa instead of T.Takahashi

KEK

Positron Workshop Durham
28 October 2009

POSITRON SOURCES USING CHANNELING FOR ILC & CLIC

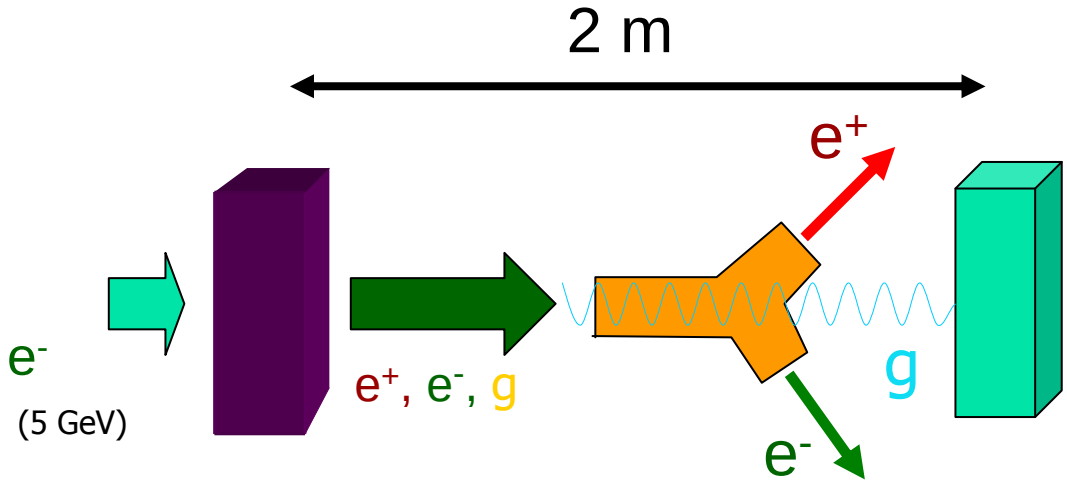
- **THE BASIC SCHEME FOR ILC & CLIC**



Only the photons are impinging on the converter: that limits the energy deposition in the amorphous target. The yield is less than if the particles coming from the crystal were also impinging on the amorphous target

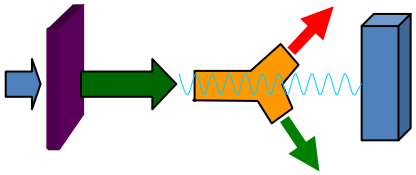
POSITRON SOURCES USING CHANNELING FOR ILC & CLIC

- **PROPOSED POSITRON TARGET FOR CLIC**



PEDD can be well below damage threshold for CLIC

With an incident beam of 2.34 10^{12} e-/pulse, we expect 2.1 10^{12} e+/pulse at 270 MeV (pulse of 156 ns)
Or 6.7 10^{9} e+/bunch



300Hz generation for ILC

Advanced Conventional e+ Source for ILC

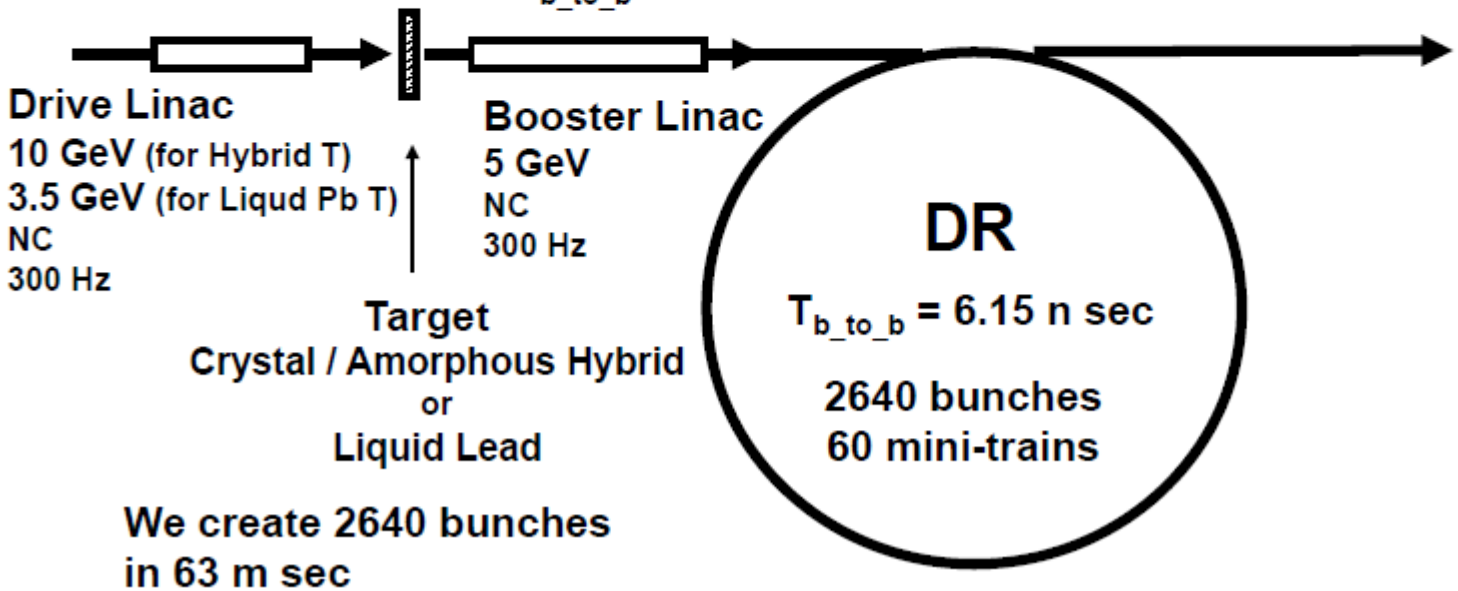
Crystal/Amorphous Hybrid Target or Liquid Lead Target
Normal Conducting Drive and Booster Linacs in 300 Hz operation

e+ creation

20 triplets, rep. = 300 Hz
- triplet = 3 mini-trains with gaps
- 44 bunches/mini-train, $T_{b\_to\_b}$ = 6.15 n sec

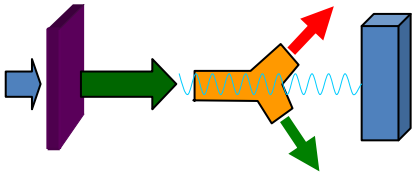
go to main linac

2640 bunches/train, rep. = 5 Hz
- $T_{b\_to\_b}$ = 369 n sec

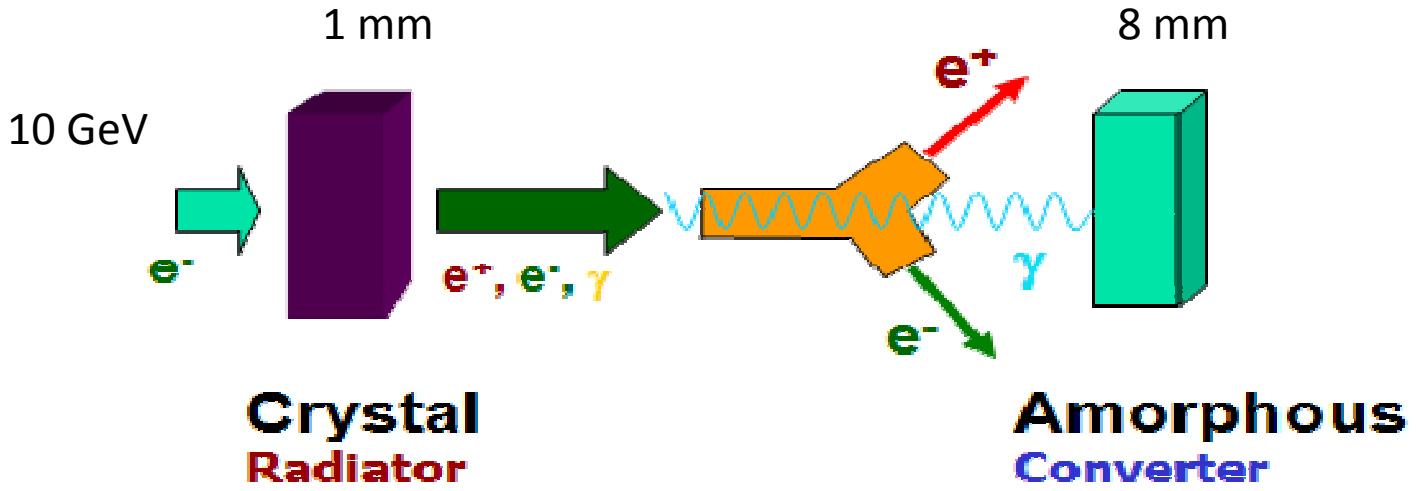


We create 2640 bunches
in 63 m sec

Time remaining for damping = 137 m sec

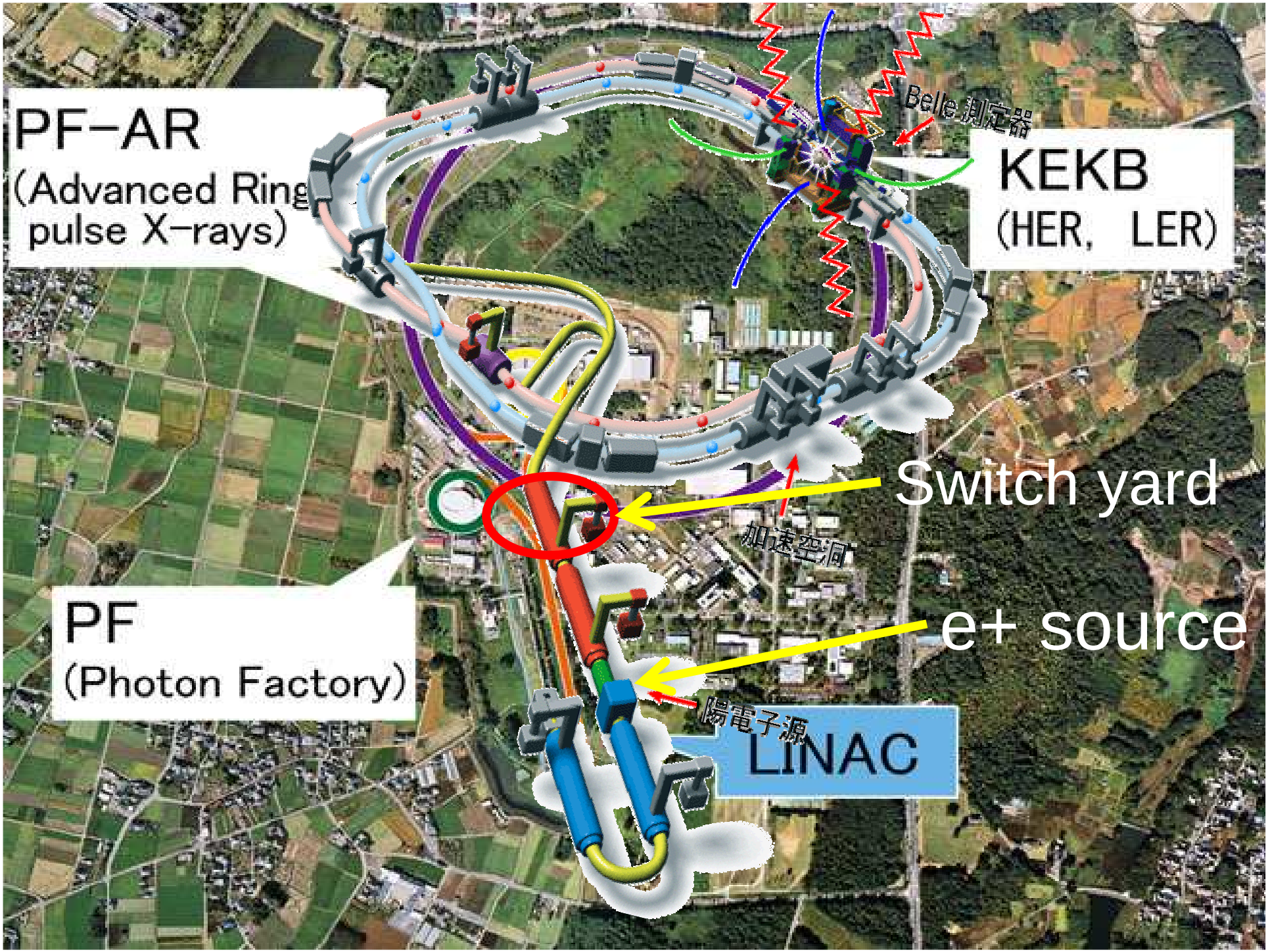


Hybrid Target for the ILC

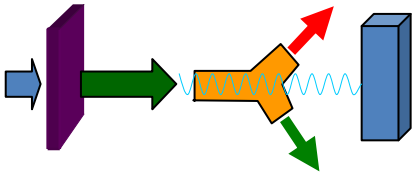


- KEKB LINAC
  - E(beam) : 8GeV
  - Bunch Charge: ~nC
  - Repetition : up to 50Hz (may limited by radiation safety)

Good place for the test
(except for muti-bunch operation)


PF-AR
(Advanced Ring
pulse X-rays)
Belle 測定器
KEKB
(HER, LER)
Switch yard
加速空洞
e+ source
PF
(Photon Factory)
陽電子源
LINAC

Set up Site
Looking up from Down stream



A TEST at KEKB LINAC

JFY2009

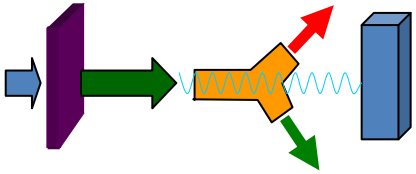
1 To Demonstrate

- **positron yield with the hybrid system**
- **heat reduction by hybrid target**

w/ a real beam (angular divergence, alignment) and crystal (mosicity),,,

JFY2010~

2. **Detail investigation toward the positron source**
   - **momentum distribution,**
   - **angular distribution of e+**

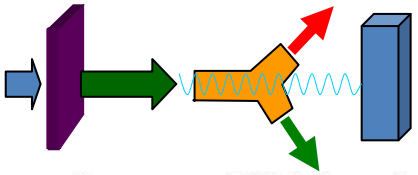


Status and Preliminary results of first beam test

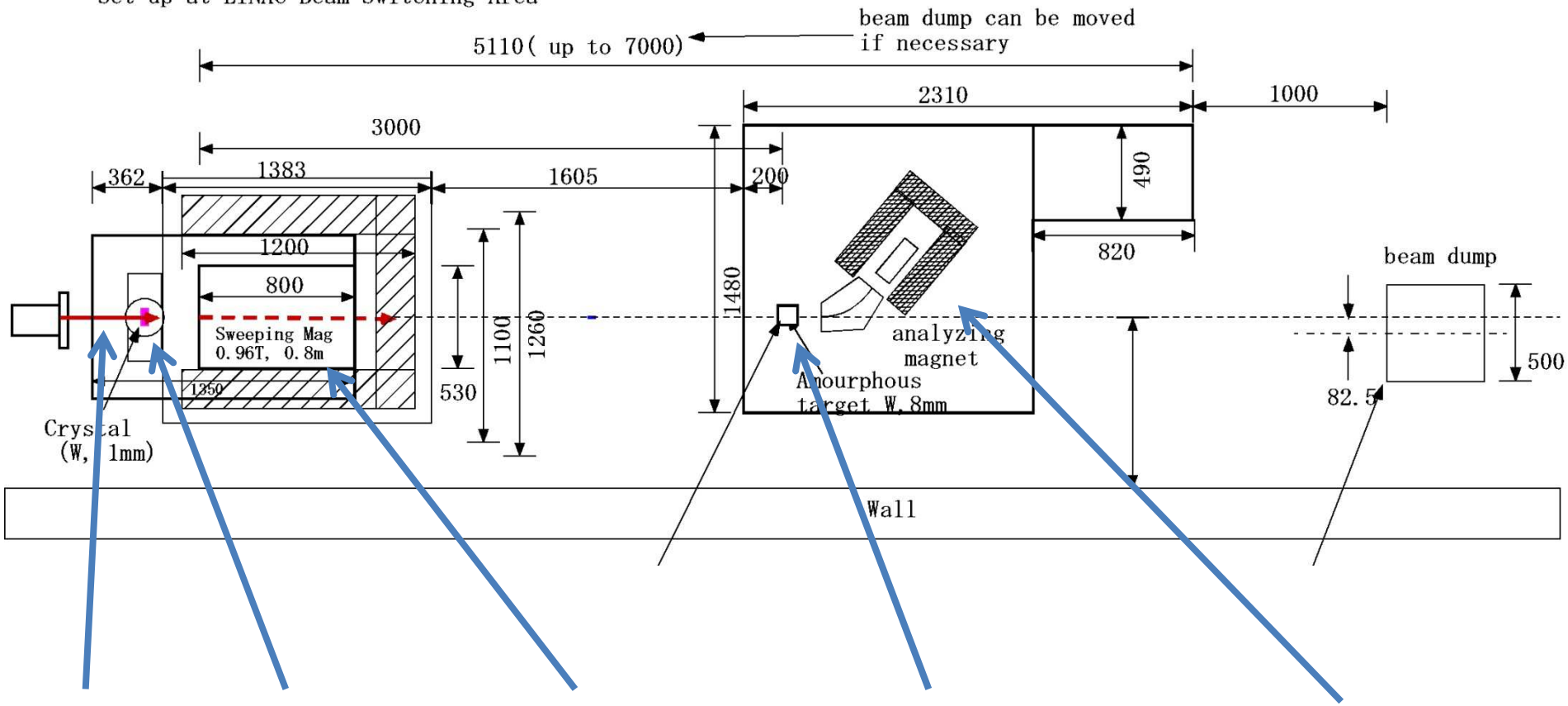
September 21 – 23 2009

All results shown in the following slides are preliminary

Setup



Set up at LINAC Beam Switching Area



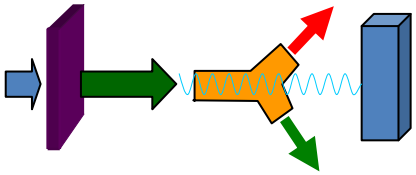
8GeV e-

1mm
W crystal

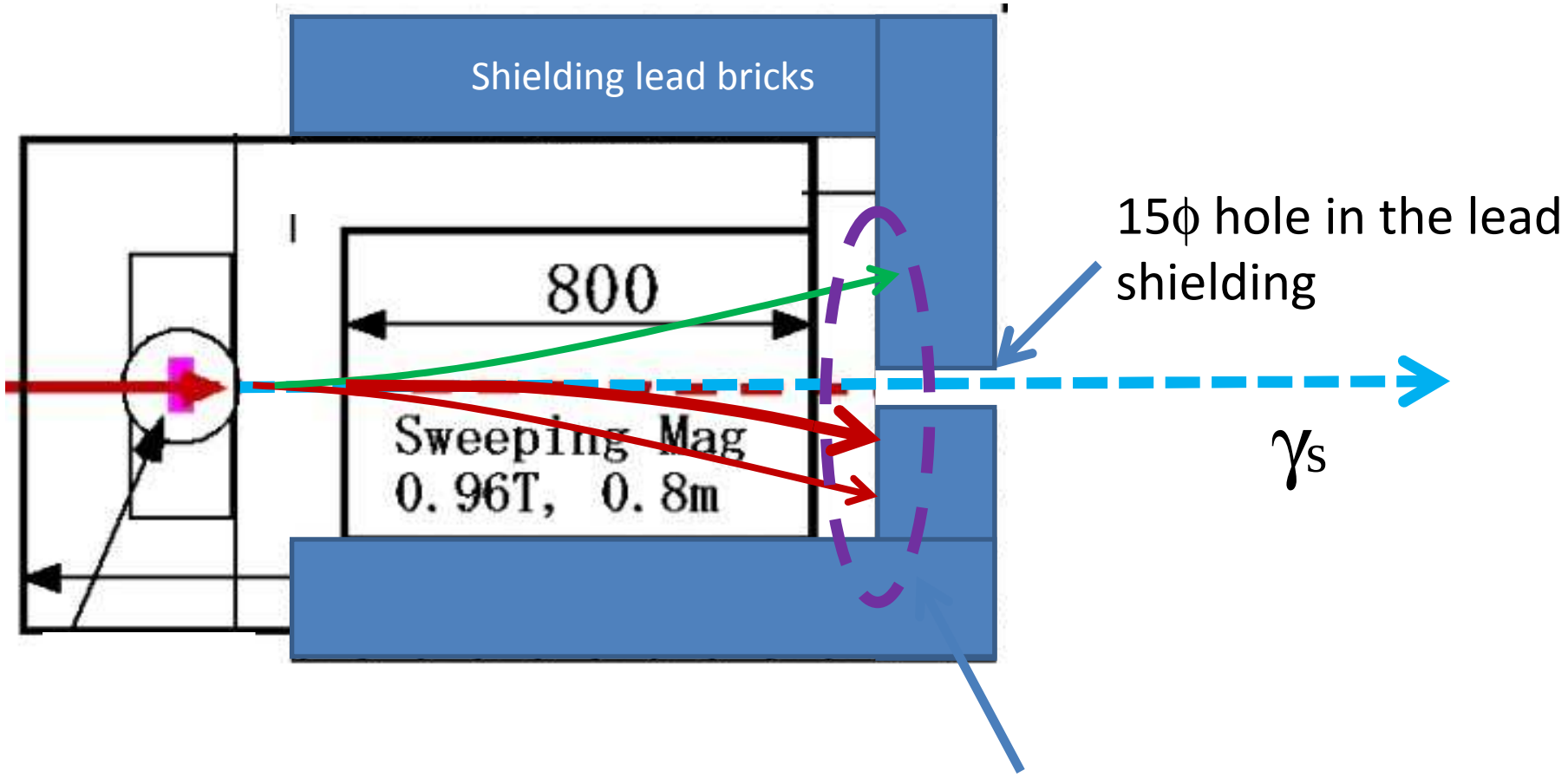
Sweeping Magnet
0.96T 0.75m

amorphous W
0.4 mm
8 mm

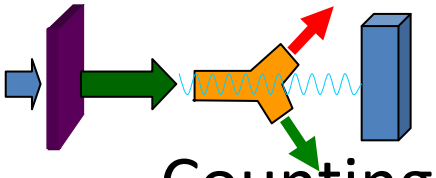
Analyzing magnet
5 ~ 20MeV



Around the magnet



All charged particles are
dumped here when the Sweeping magnet ON



Data Acquisition

Counting room

Beam Area

ADC

e+ detector

e+

PM

Beam current

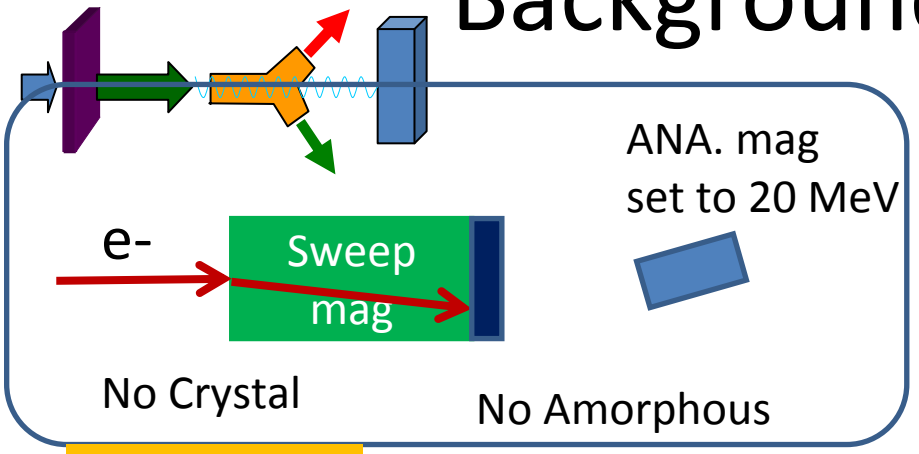
Gate

motor Controller

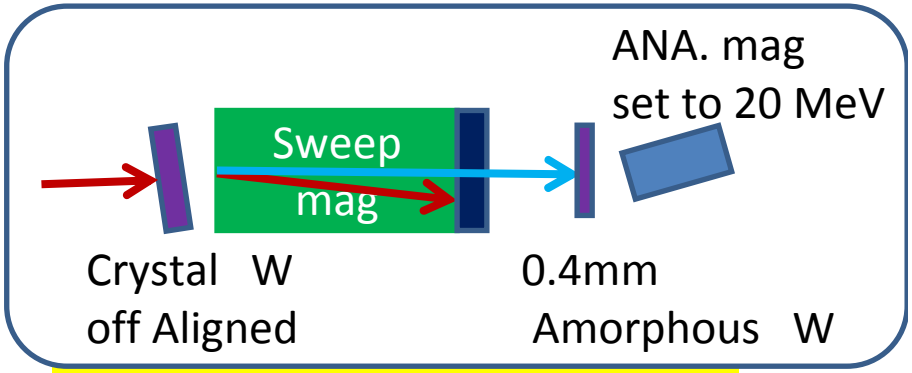
e-

Goniometers to
Align Crystal

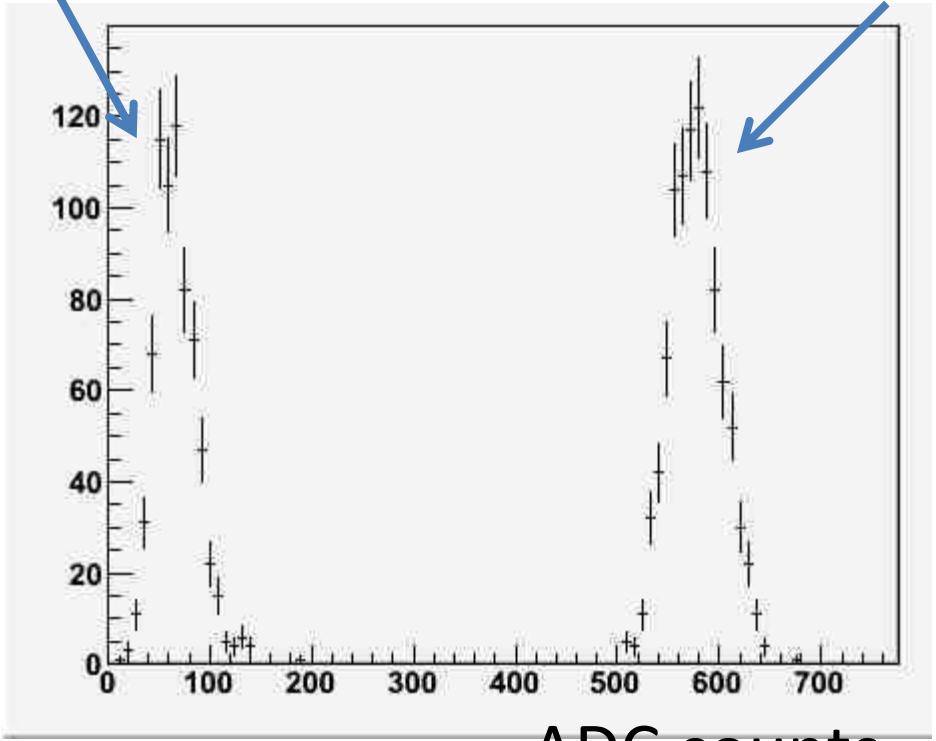
Background conditions



background

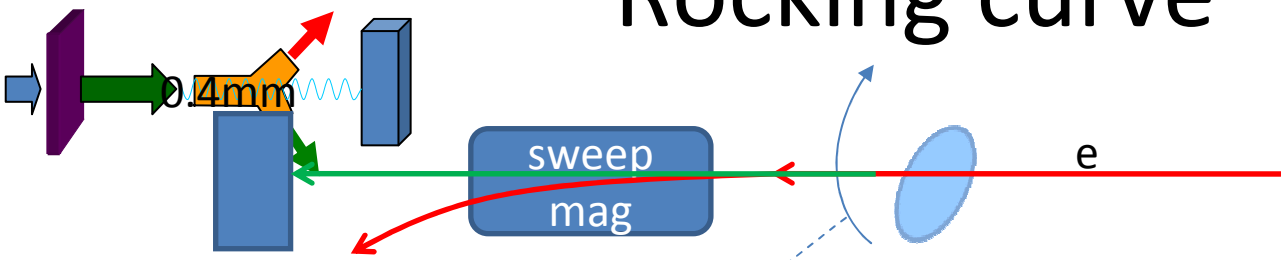


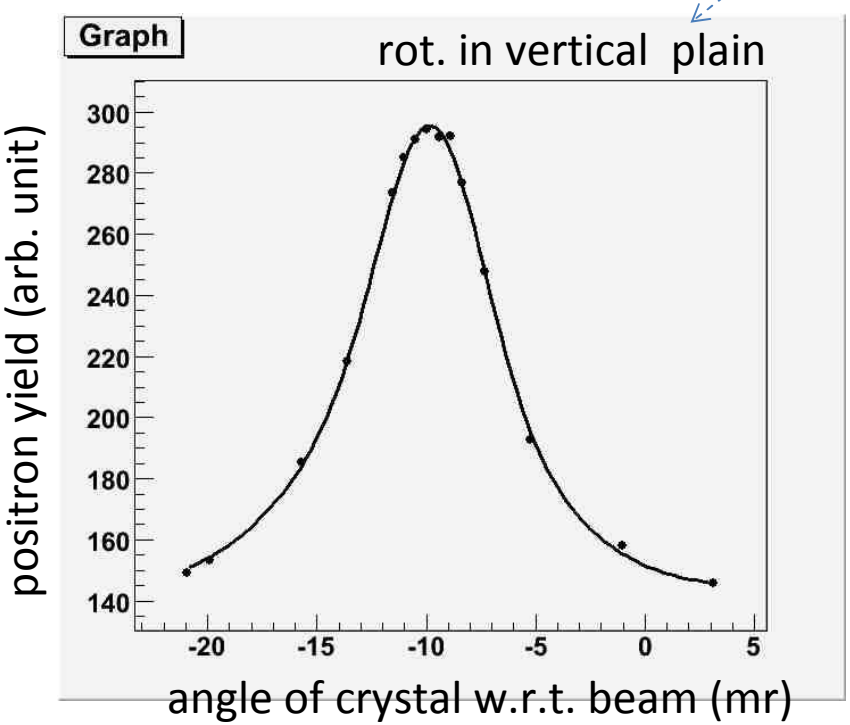
e+ of the least yield condition



Signal is well separated from background even with thin converter

Rocking curve





$$f(\theta) = Ae^{-\frac{(\theta-\langle\theta\rangle)^2}{2\sigma_1^2}} + Be^{-\frac{(\theta-\langle\theta\rangle)^2}{2\sigma_2^2}} + Const$$

$$\sigma_1 = 2.27 \pm 0.06$$

$$\sigma_2 = 4.86 \pm 0.2$$

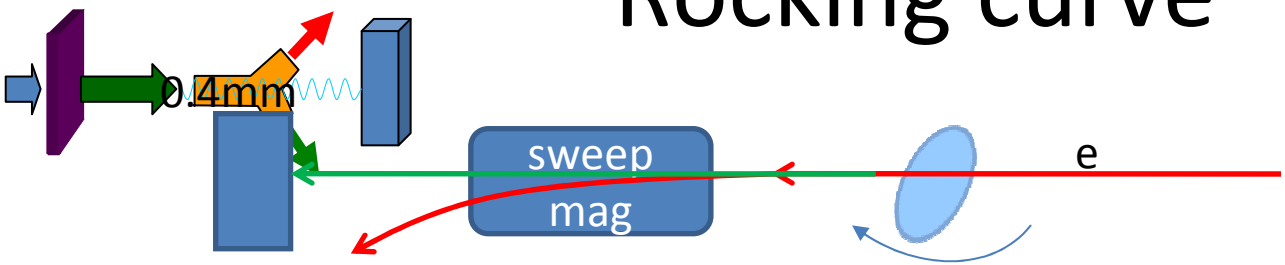
$$const = 144.4 \pm 1.1$$

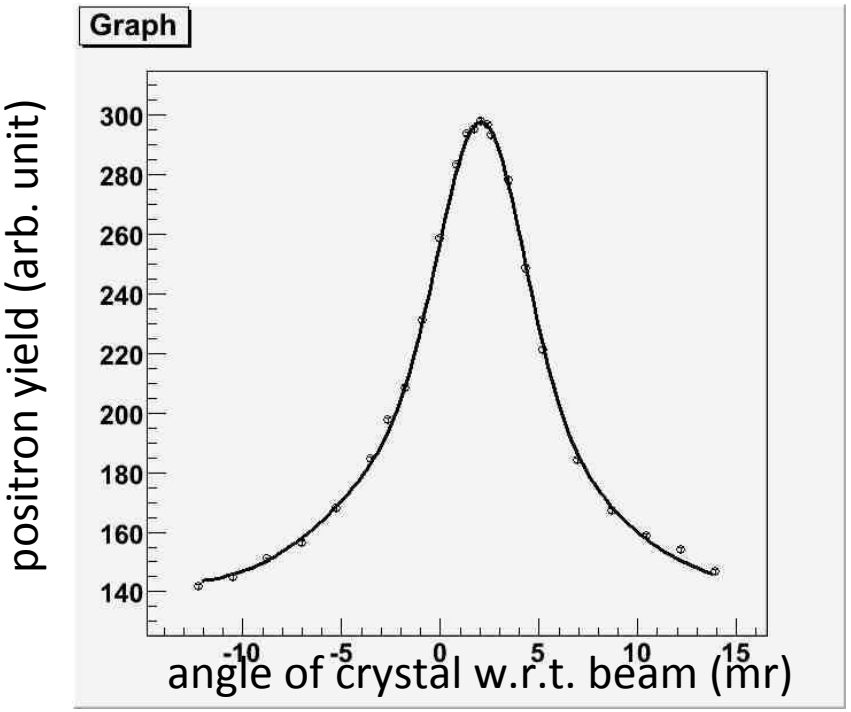
Well fitted by two Gaussians

Channeling + CB?

Narrower component is still x 4 wider than the critical angle

Rocking curve





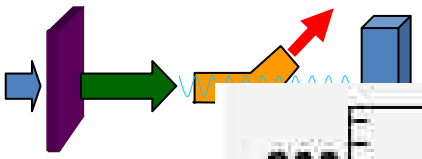
$$f(\theta) = Ae^{-\frac{(\theta-\langle\theta\rangle)^2}{2\sigma_1^2}} + Be^{-\frac{(\theta-\langle\theta\rangle)^2}{2\sigma_2^2}} + Const$$

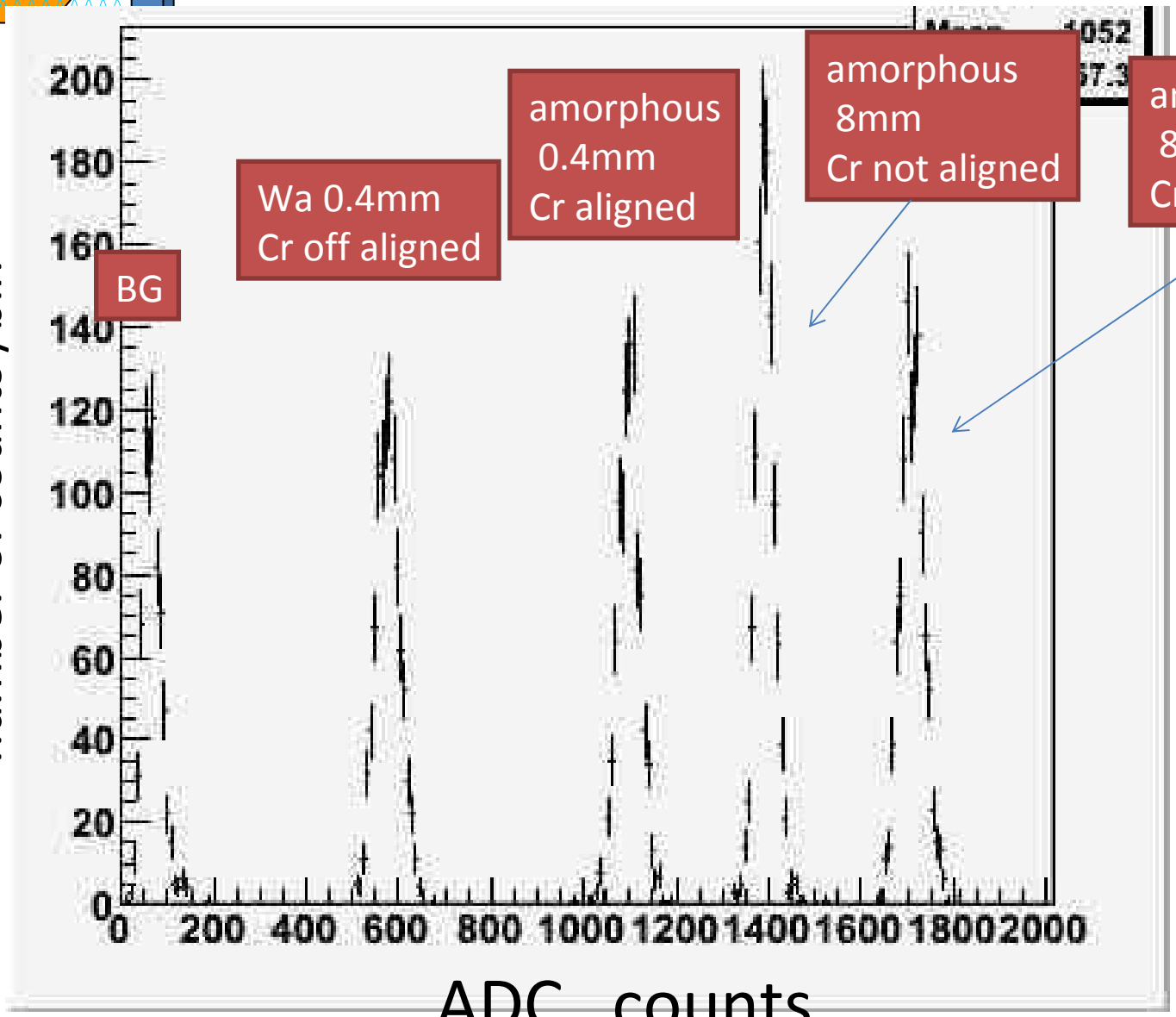
$$\sigma_1 = 2.07 \pm 0.04$$

$$\sigma_2 = 5.3 \pm 0.2$$

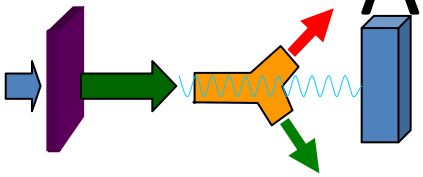
$$const = 141 \pm 1$$

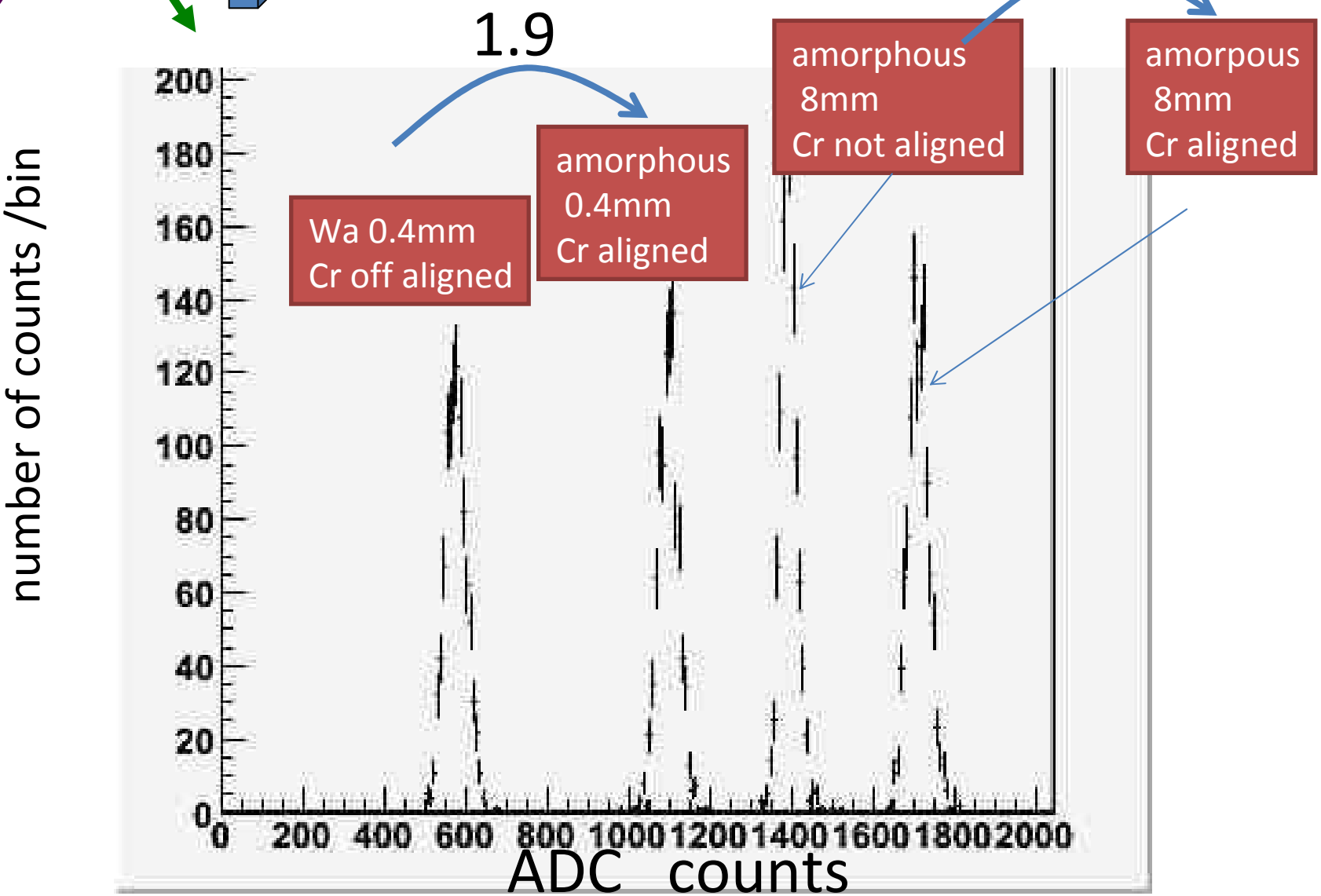
data looks likes..



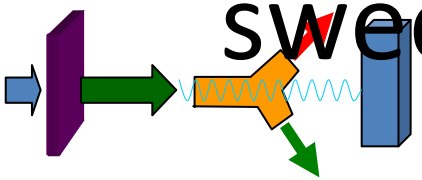


After BG substraction

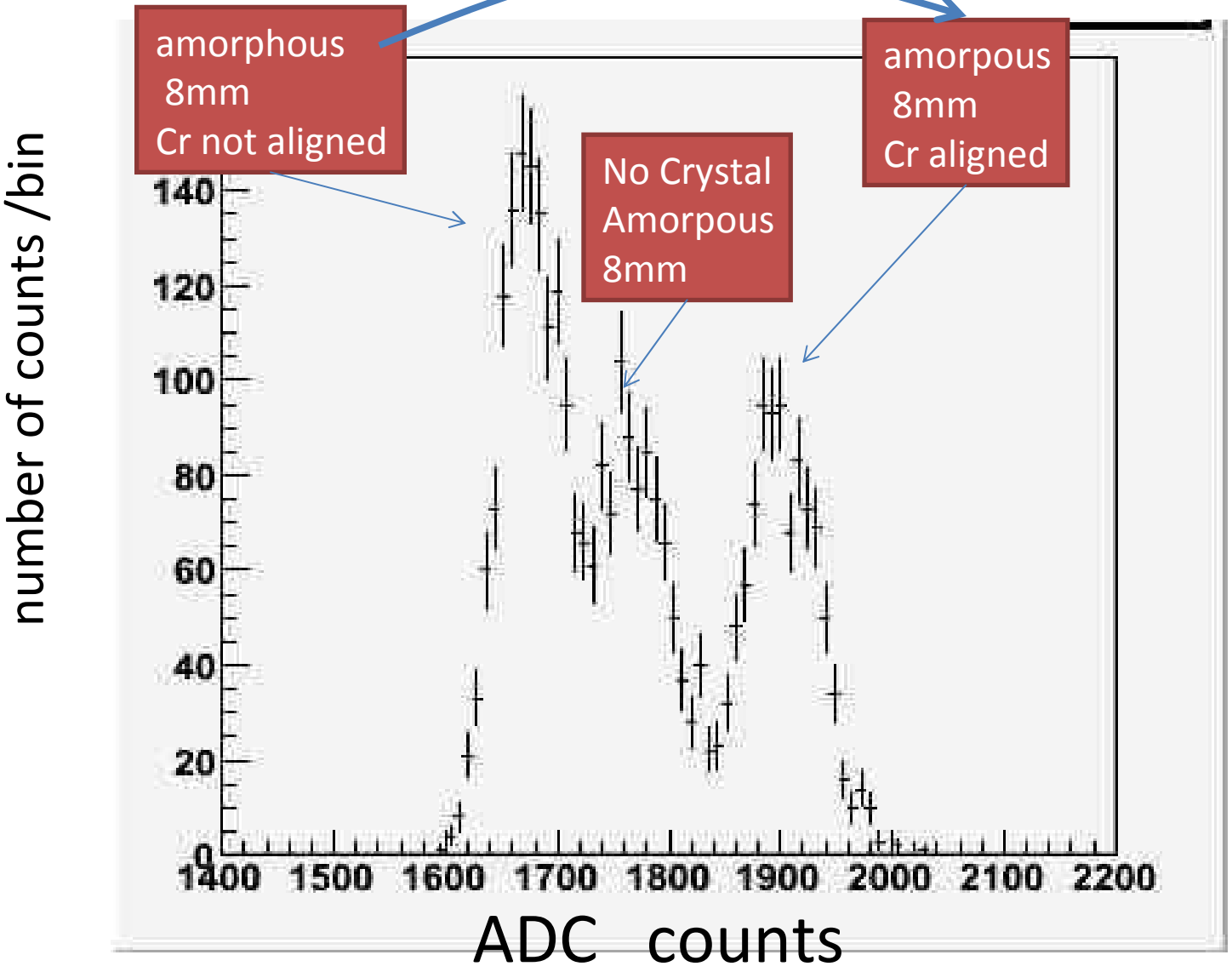


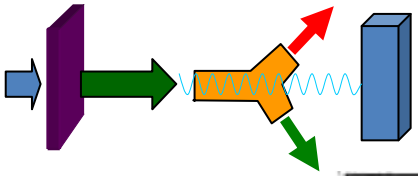


sweeping magnet OFF

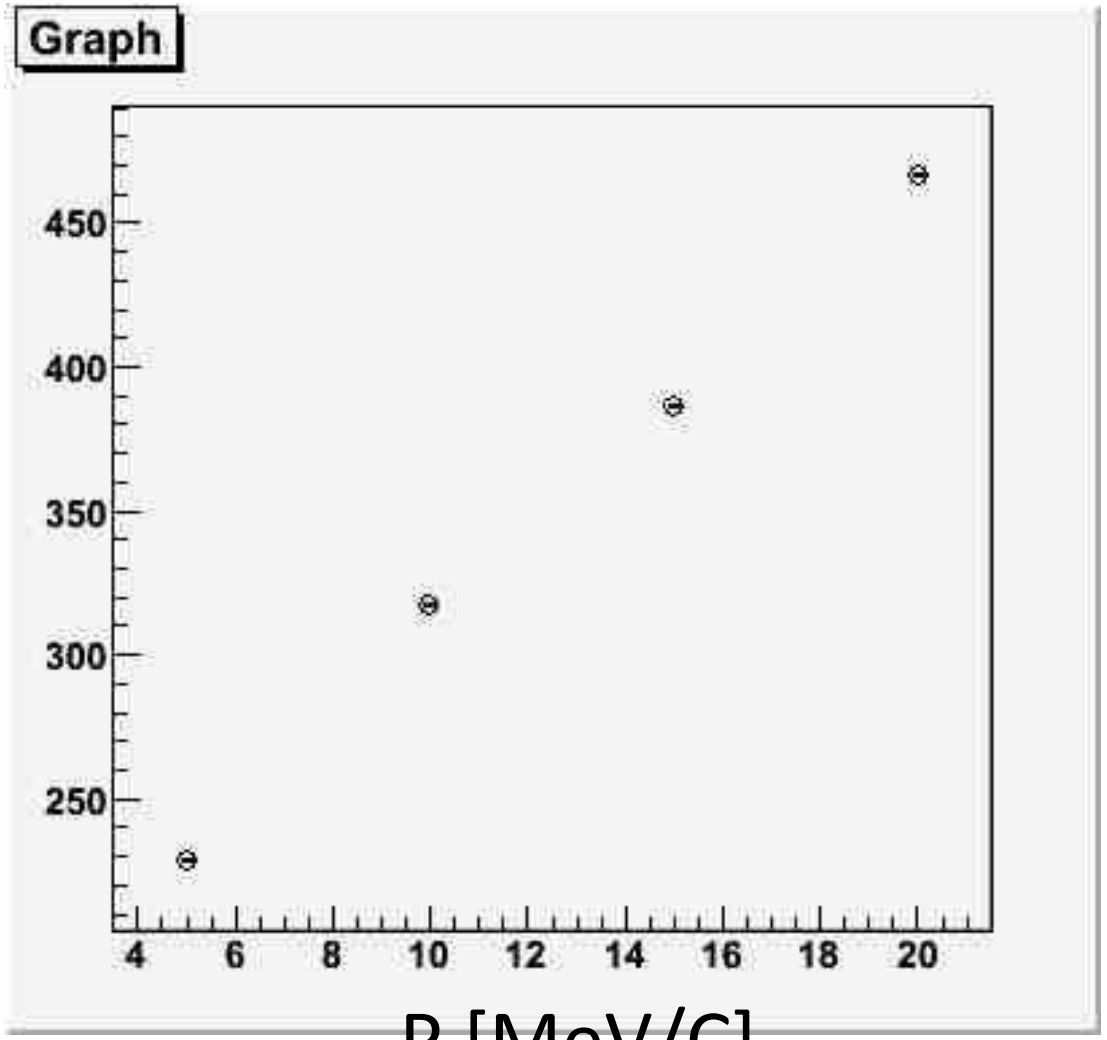


1.07



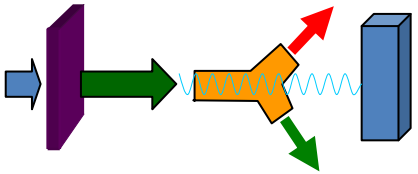


Momentum dist.



Data was taken under various conditons

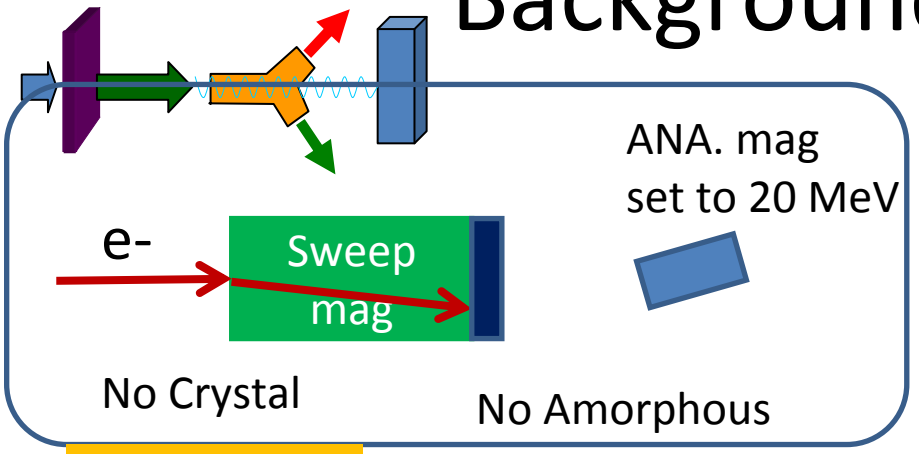
Crystal	amorphous	Sweep mag	Ana mag
NO	NO	on	20MeV
aligned	0.4mm	on	20MeV
not alinged	0.4mm	on	20MeV
not alinged	NO	on	20MeV
aligned	8mm	on	20MeV
not alinged	8mm	on	20MeV
not alinged	NO	on	20MeV
aligned	NO	on	20MeV
off	NO	on	20MeV
aligned	8mm	off	20MeV
not alinged	8mm	off	20MeV
aligned	NO	off	20MeV
not alinged	NO	off	20MeV
off	8mm	off	20MeV
NO	NO	off	20MeV
on	8mm	on	15MeV
〃	8mm	on	10MeV
〃	8mm	on	5MeV



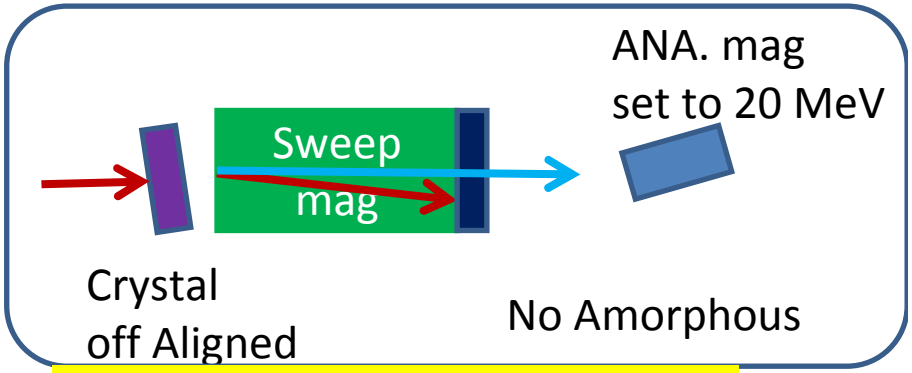
Summray

- Set up works !
  - Very small backgound
  - DAQ seems good enough
- already have
  - many to be analyzed
  - worth to compare with simulation
  - some quantitative results in this workshop
- Hope temperature data in next run (Jan. 2010)

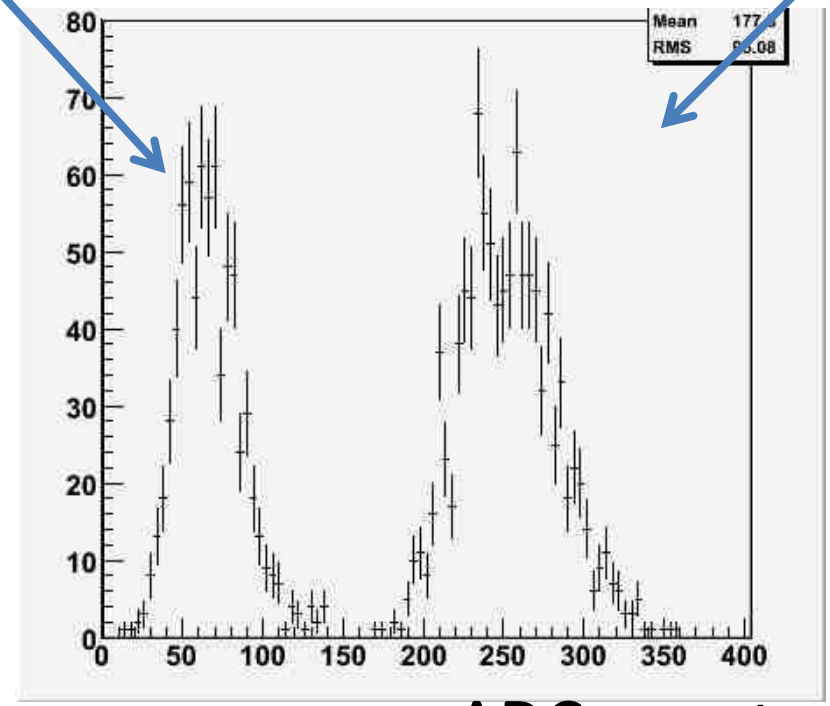
Background conditions



background



e+ of the least yield condition



ADC counts

Signal is well separated from background even with NO converter