

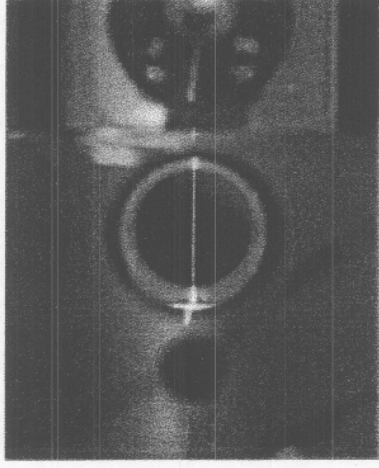
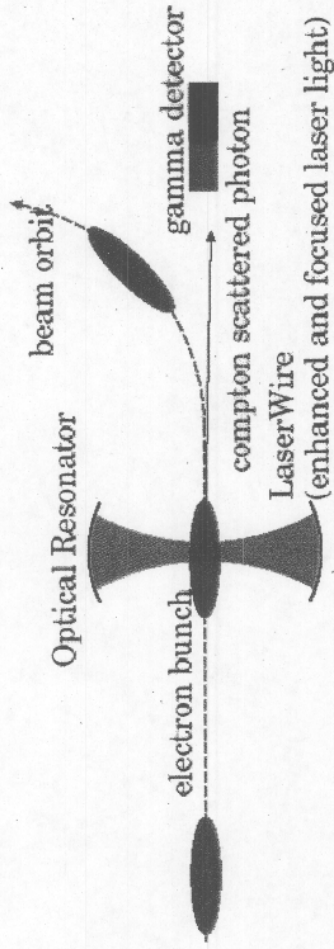
Laserwire monitor for multi-bunch beams

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Kyoto university , KEK, NIRS,JNC,ISSP

- introduction
- setup and cavity operation
- signal / background
- time resolution and multibunch electronics
- multibunch measurement

■ introduction

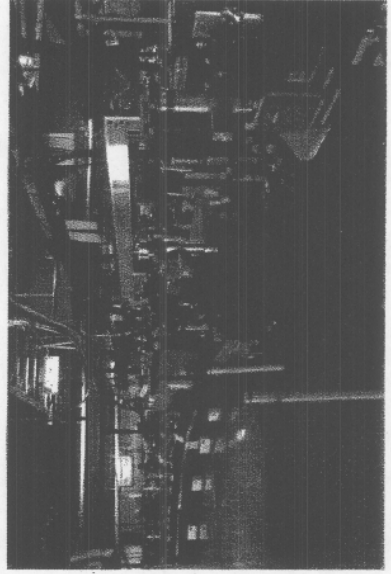
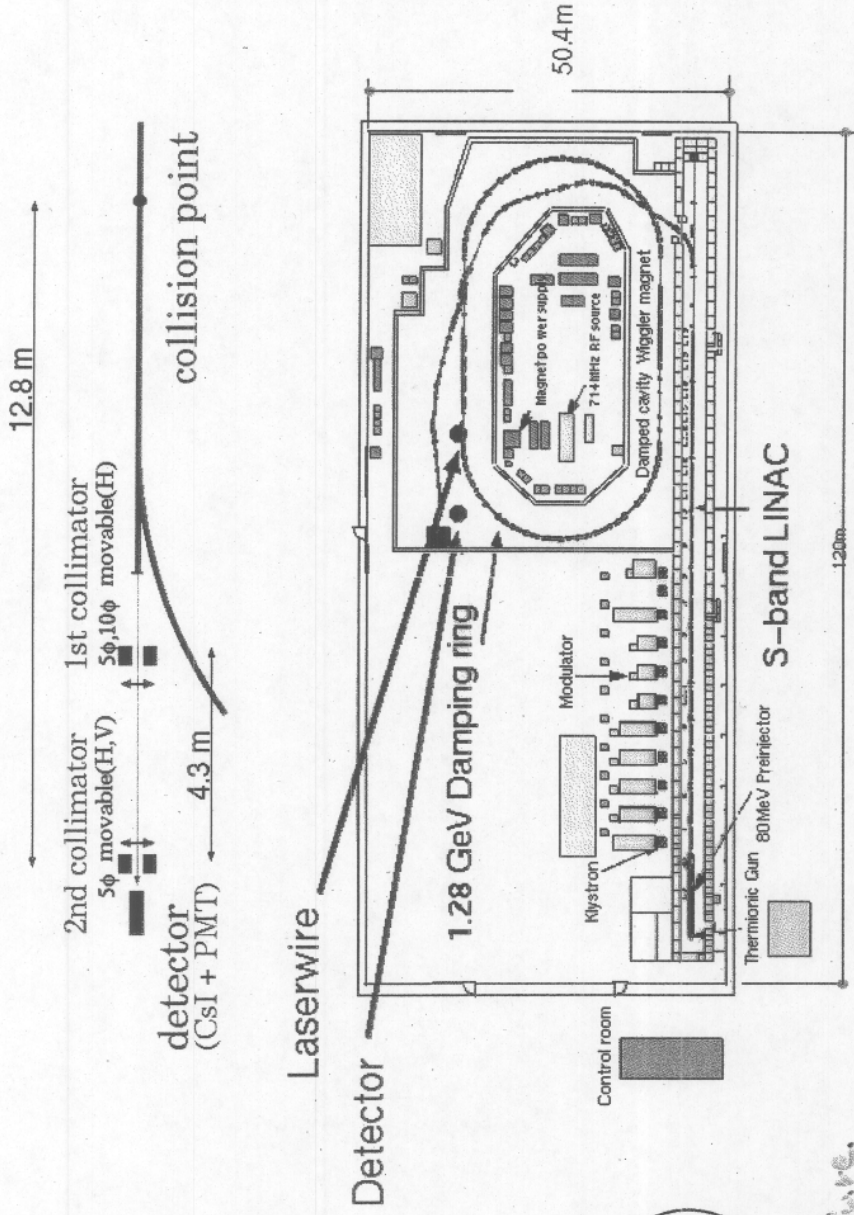
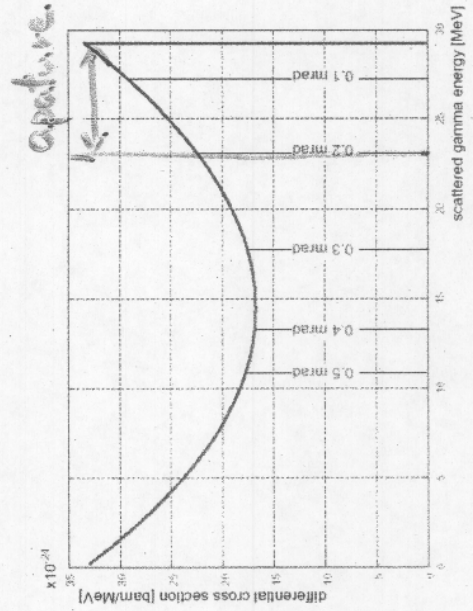
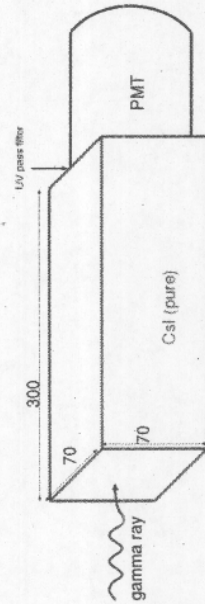


- scan by thin and intense laser
- use optical cavity and CW laser
- single gamma ray counting
- multi bunch measureable

bunch ID for each γ ray

■ setup(1)

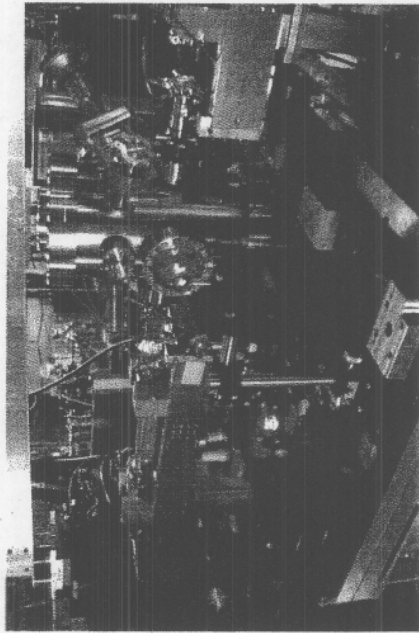
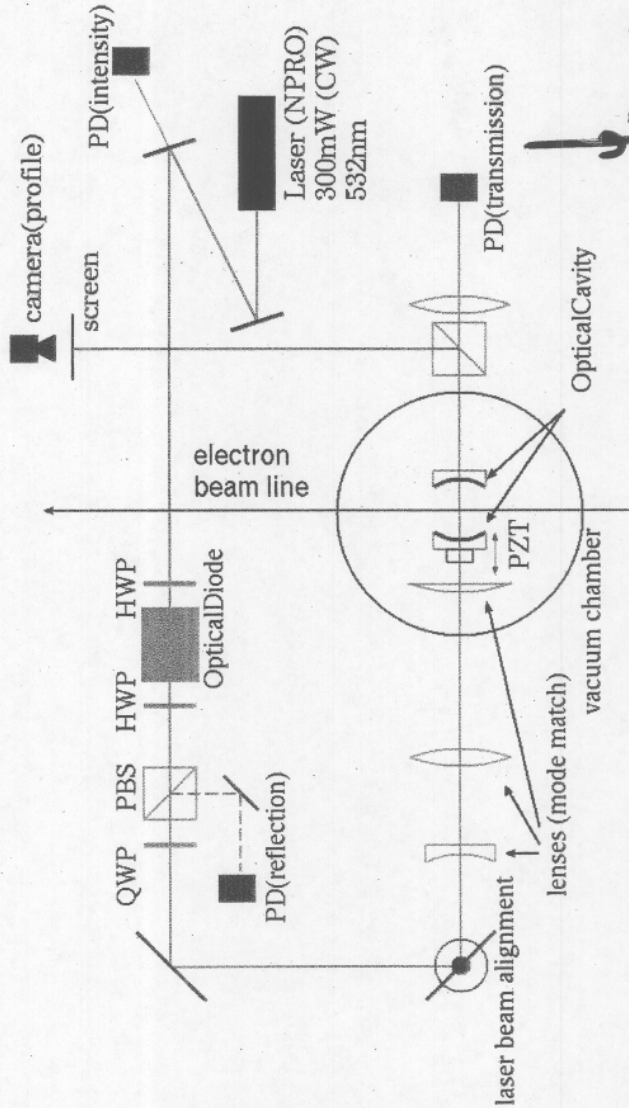
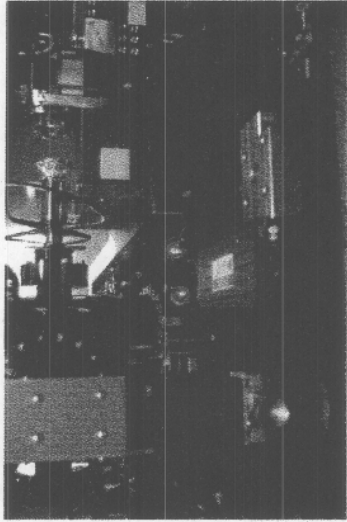
- CsI + PMT
- Energy $23\text{MeV} \sim 28\text{MeV}$



ISG8

■ setup(2)

- placed on movable table
- laser (300mW, CW, green)
(*Lightwave model 142.*)



feedback!

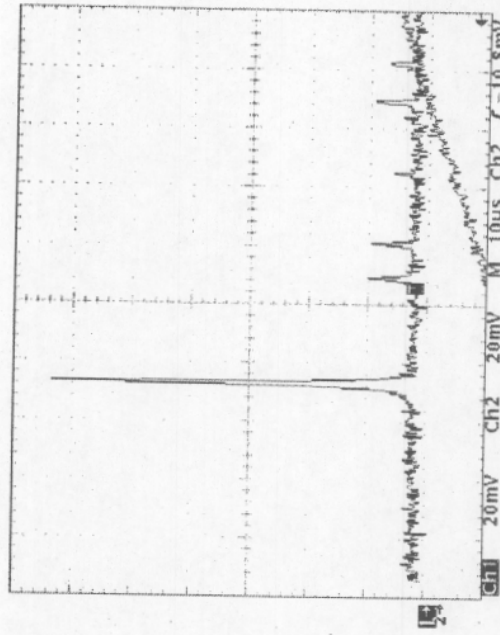
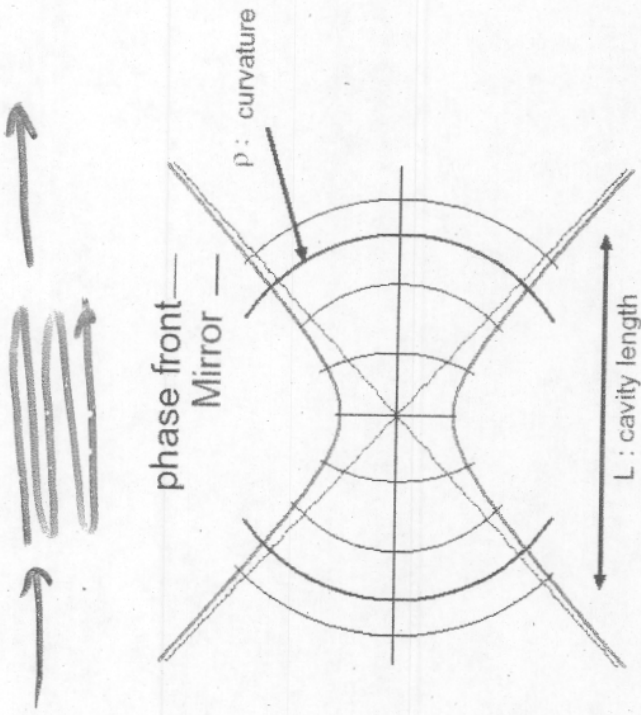
optical cavity

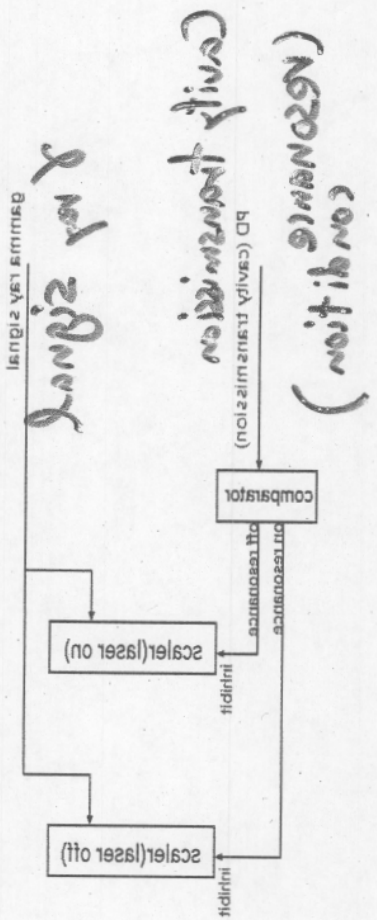
- mirror specification

reflectance	99% (front) 99.9% (end)
curvature	20.00 ± 0.02 mm

- cavity specification

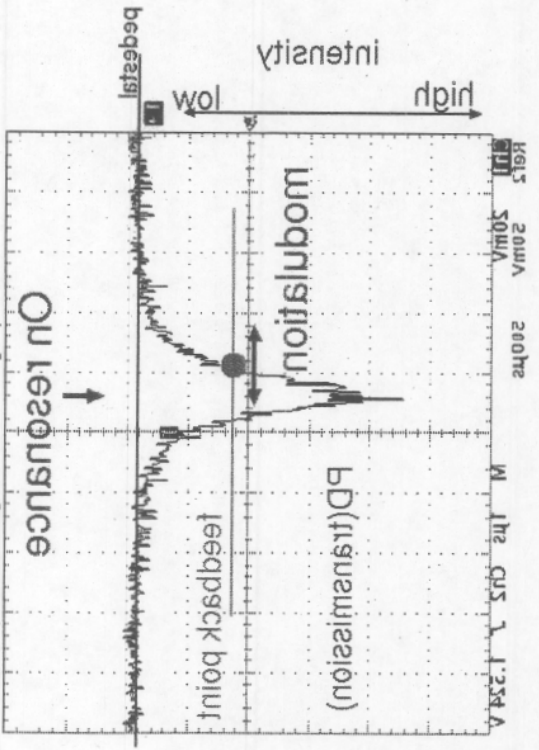
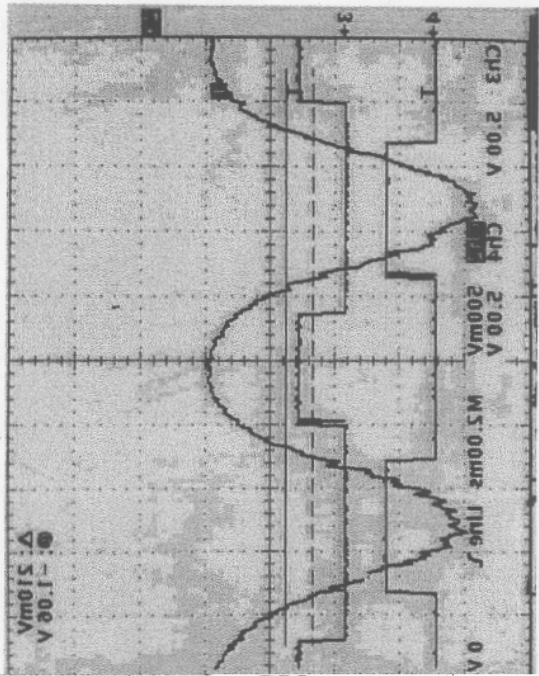
transmittance	22% (on resonance)
reflectance	42% (on resonance)
finesse	480 ± 20
power gain	470 ± 30
waist size	6.0 ± 0.1 μm (σ)



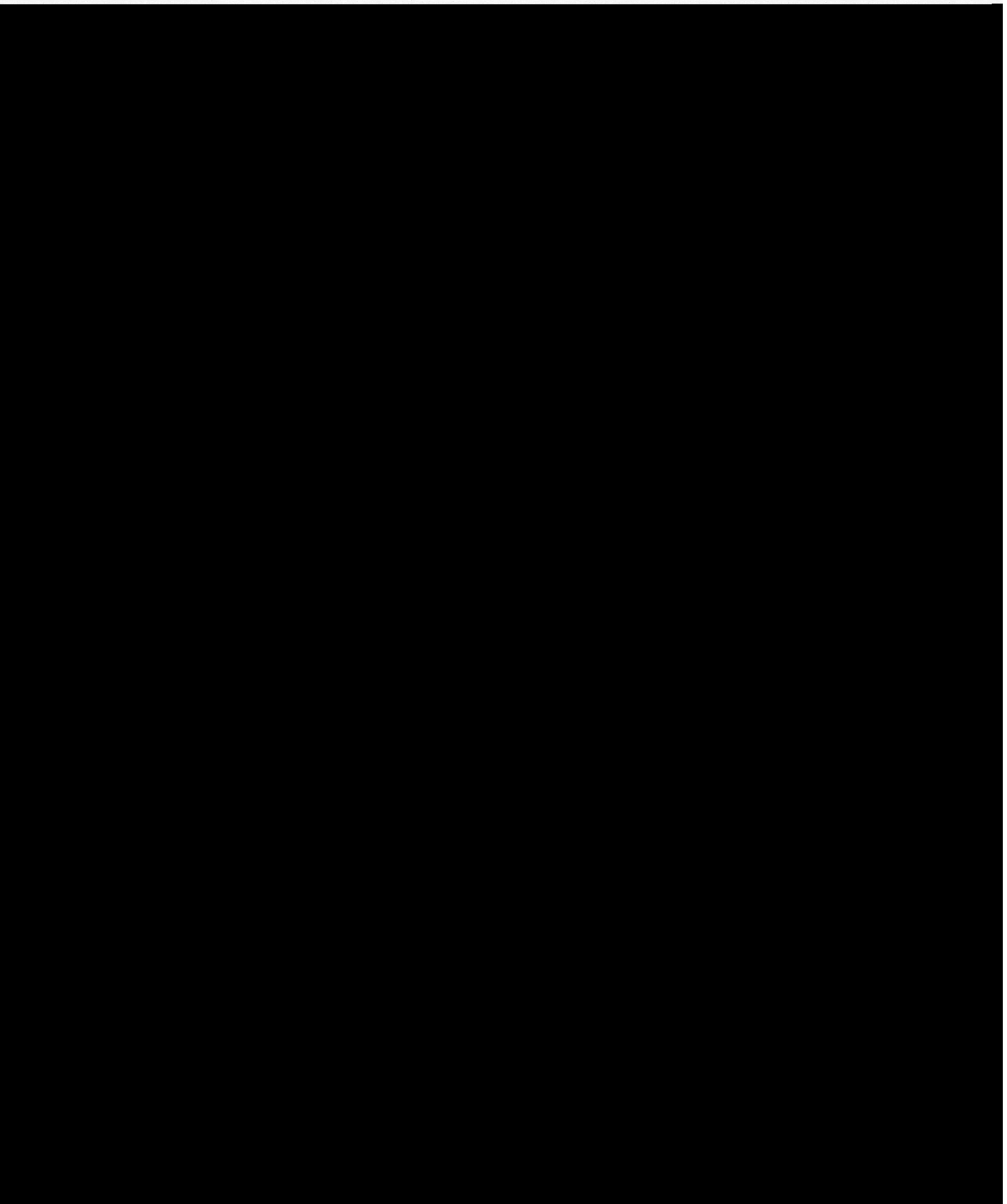


condition

- DAD control by cavity
- duty (on 1/3, off 1/3) (laser on/off)
- modulate cavity length
- cavity length feedback
- use cavity transmission



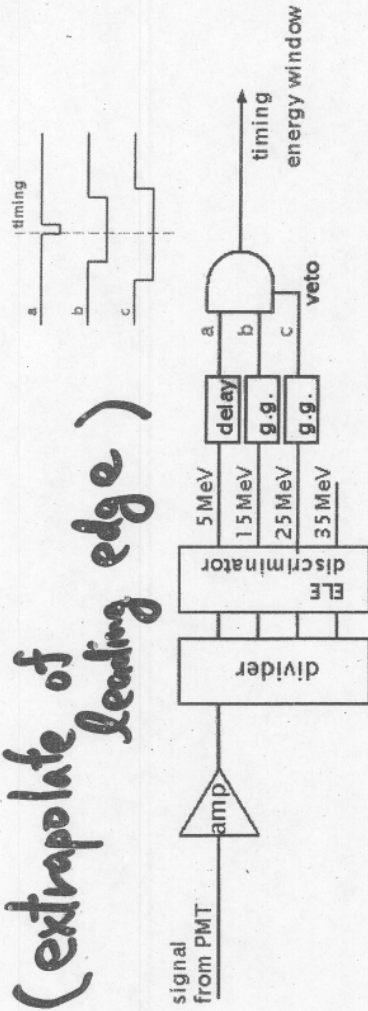
optical cavity operation (feedback on/off)



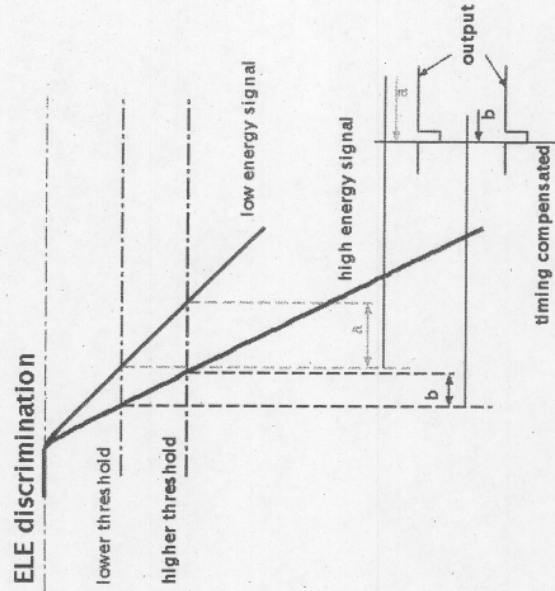
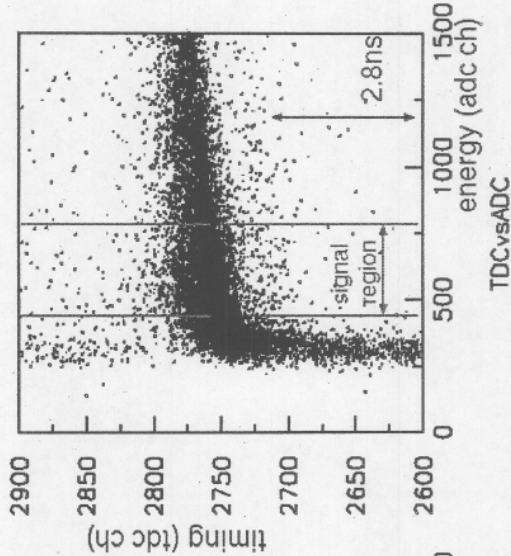
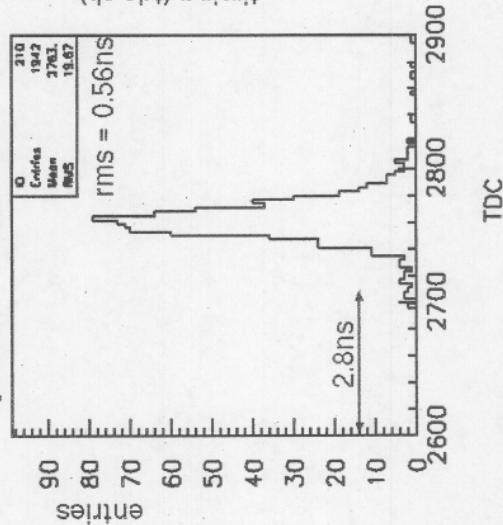
■ detector time resolution

- ELE discriminator (extrapolate of leading edge)

- energy window
15 MeV ~ 25 MeV

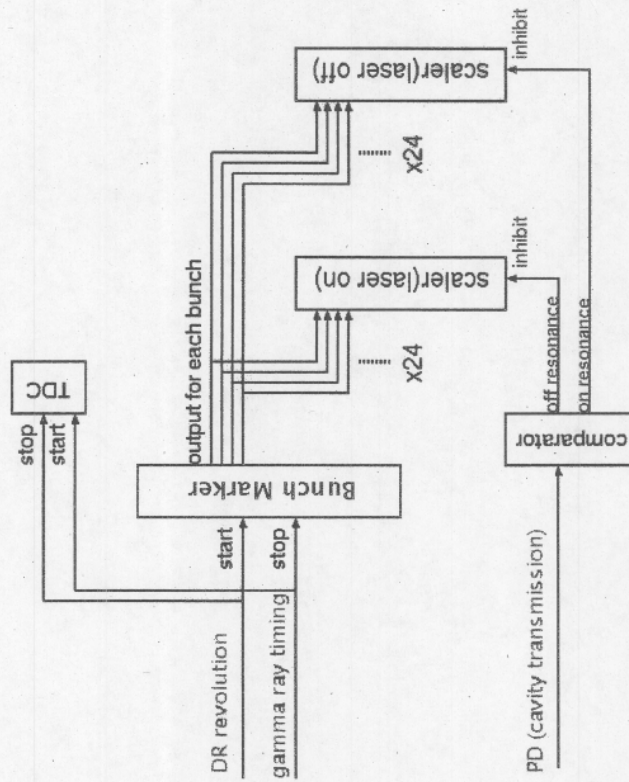


time resolution

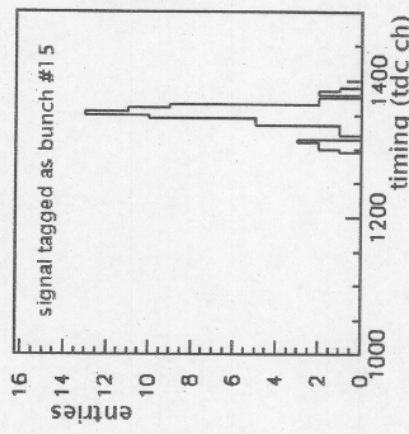
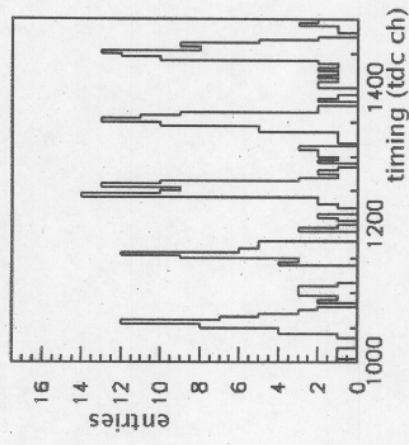
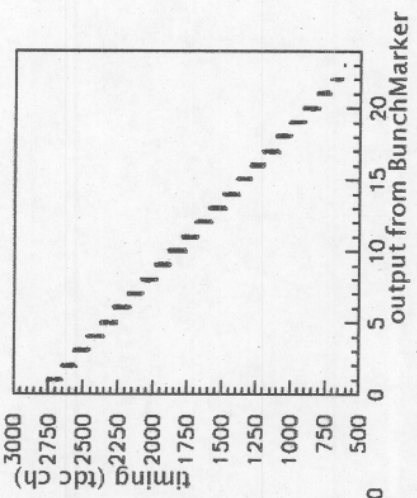
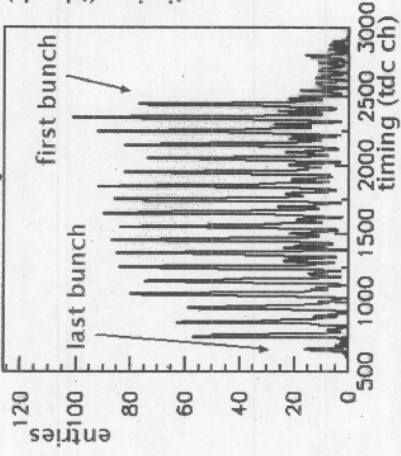


multi bunch detection

- bunch ID by front end (bunch marker)



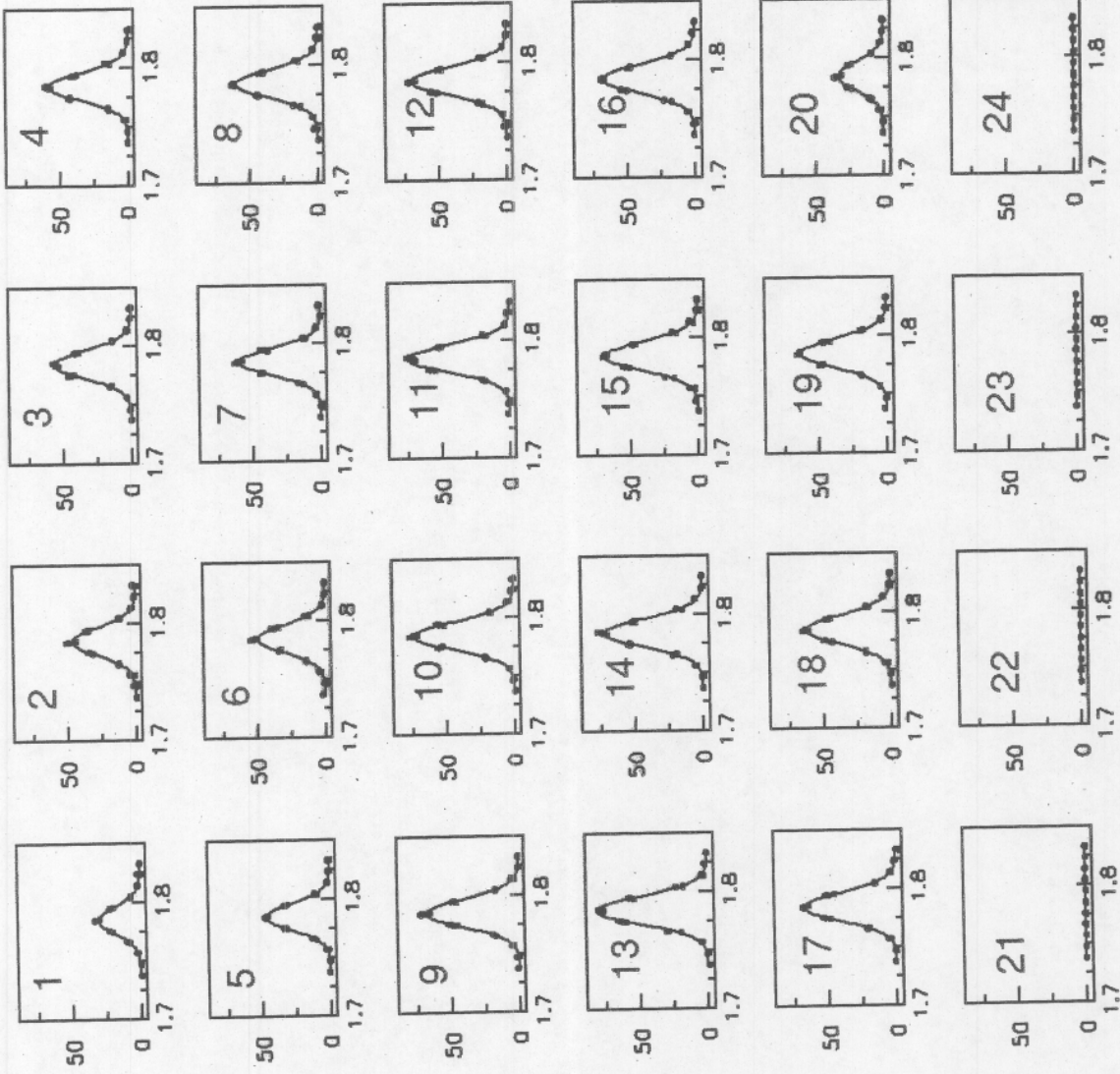
time spectrum



#15 output

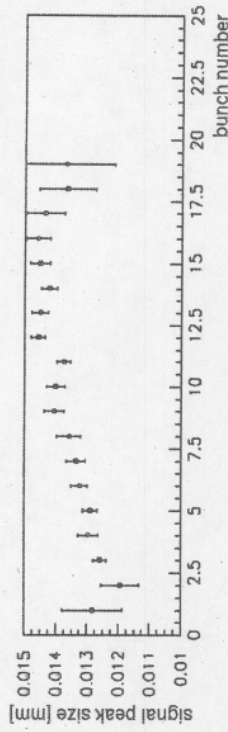
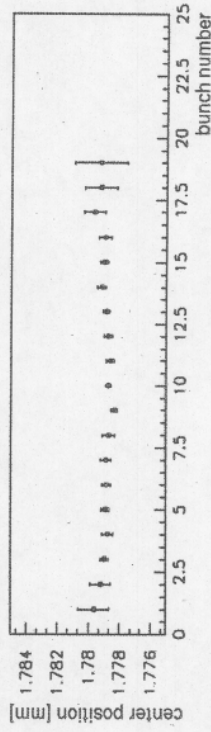
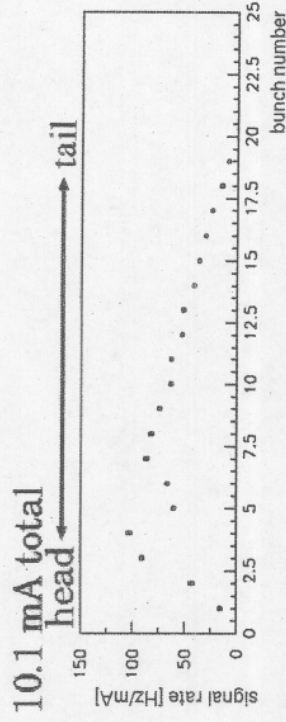
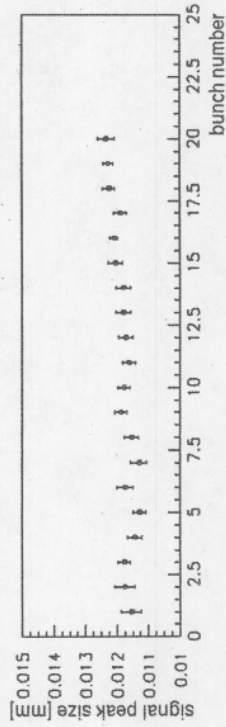
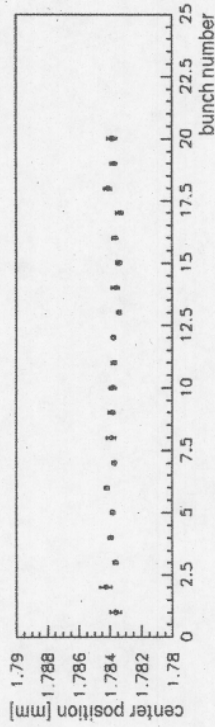
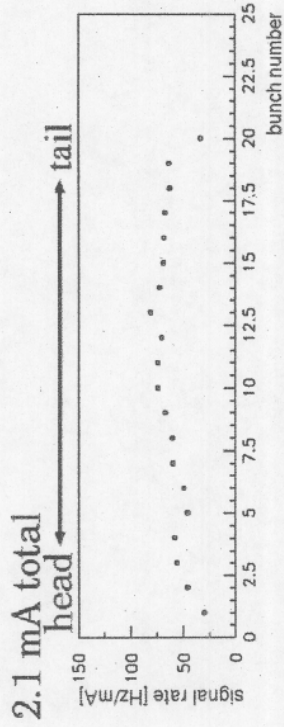
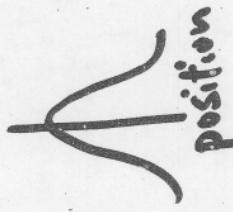
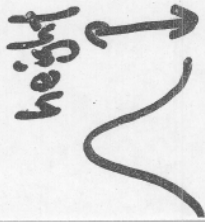
■ multibunch data

- data from each scaler channel
- 24 profiles for 1 scan



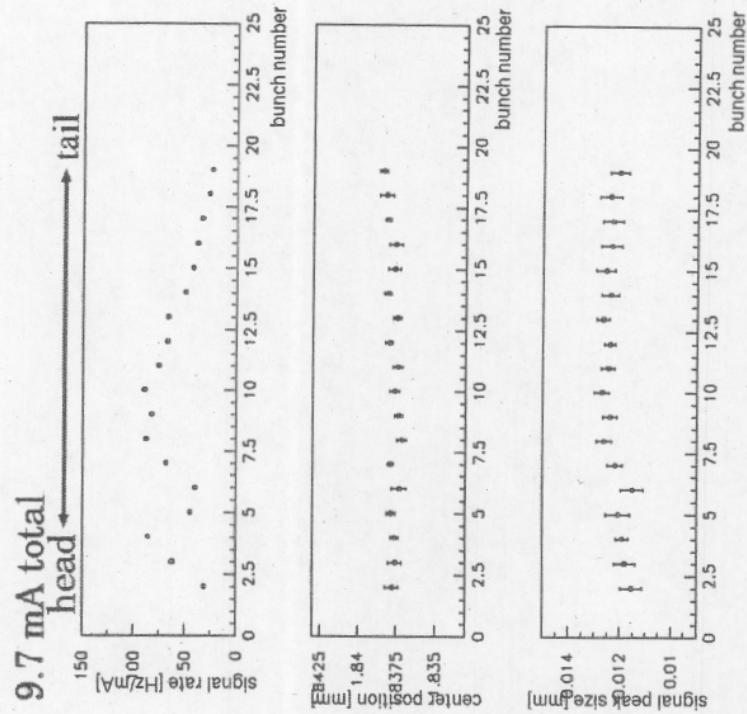
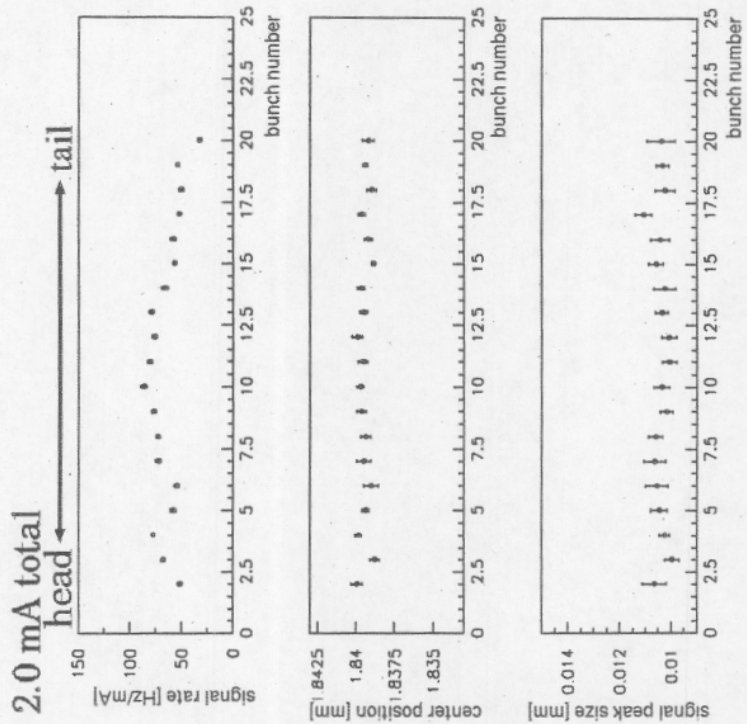
■ example

- 1 example of bunch by bunch measurement
- peakheight, position, peaksize for each bunch



■ example

- another example



■ summary

- laser power upgraded
 - laser: 100mW \rightarrow 300mW
 - cavity gain: 220 \rightarrow 470
- laser size reduced
 - 7.25 μ m \rightarrow 6.0 μ m
- signal / background improved to 4 / 1
 - fast data taking (15min.)
- detector time resolution optimized
- multibunch measurement started