Beam halo measurement in ATF ext. line (slides from ATF weekly meeting June/2005)

This is just a confirmation:
no new information presented.

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Topics

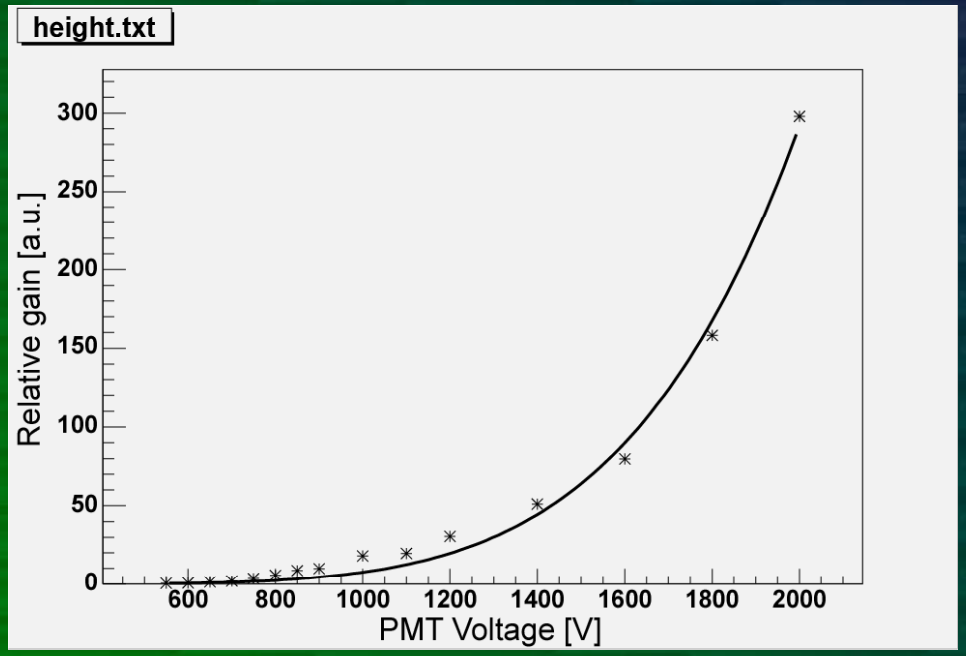
1. Setup
2. Gain Calibration
3. Charge Distribution
    1. Typical Distribution (Horizontal / Vertical)
    2. Distribution Function of Halo
    3. Dependence on (center) beam size
    4. Dependence on ring pressure
4. Summary

Setup

- Measurement was done May ~ June 2005
- Using ext. line wire scanners(MW0~4X)
  - Beam size: 10~20um (V) 100~200um (H)
  - Measure halo charge by raising PMT. Voltage (~600V for normal operation, ~2000V for halo measurement)

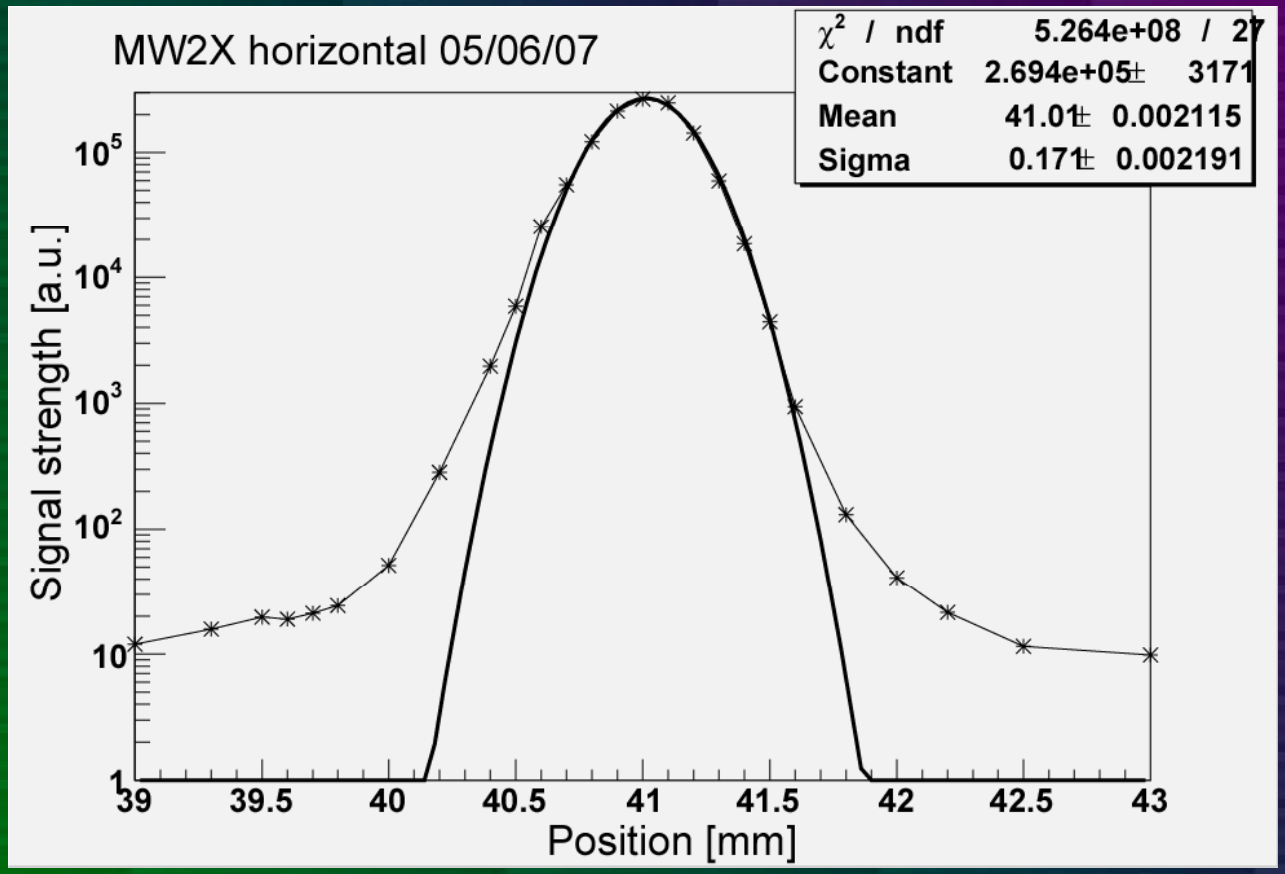
Gain Calibration

- Using wire-scanning signal itself
  (use tail of the beam for high gain)



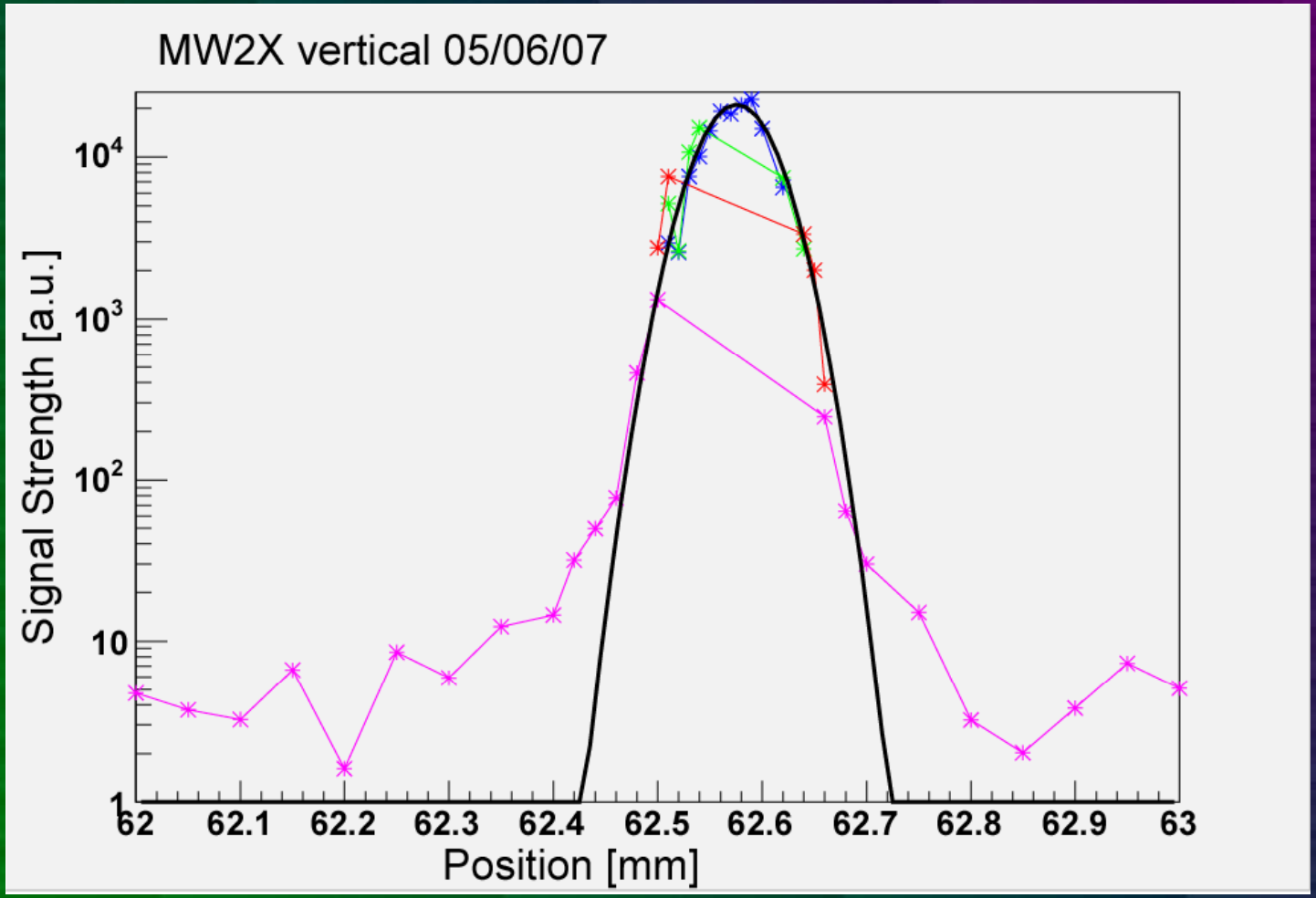
$G \sim V^{5.28}$

Horizontal Distribution

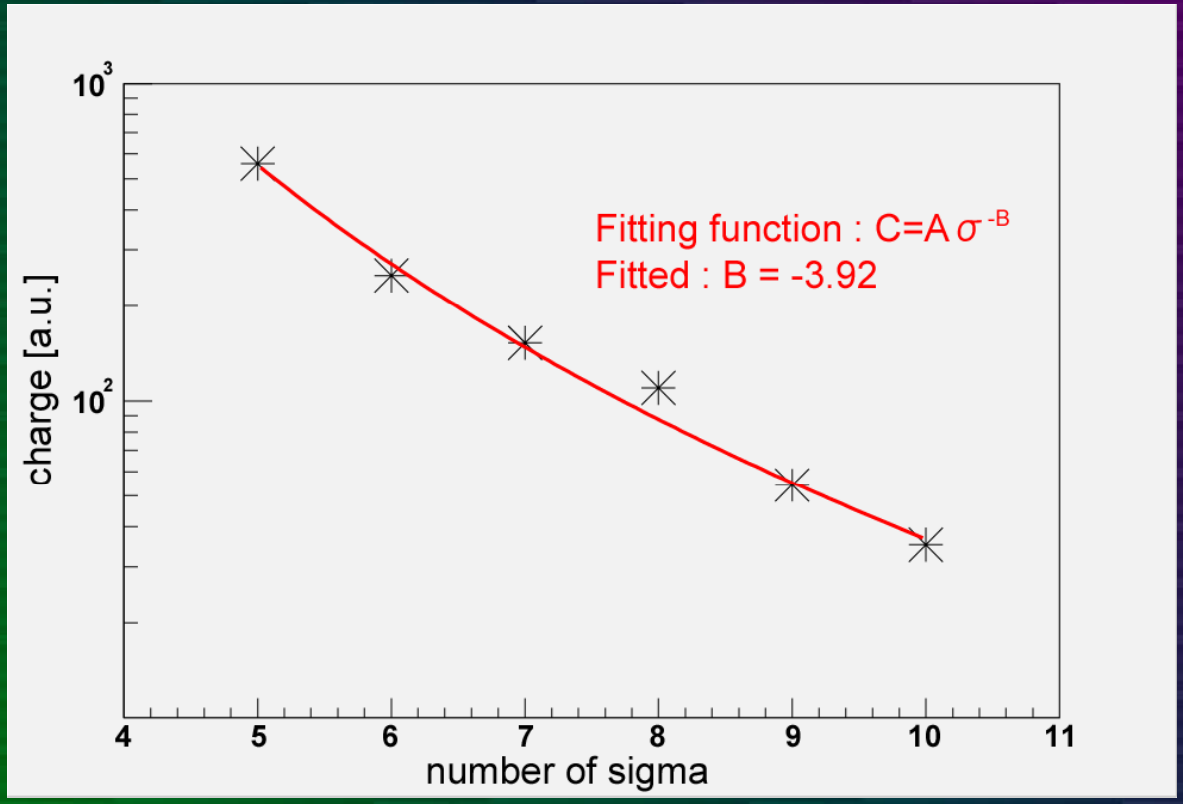


Gaussian center and broader tail (> 3 sigma)

Vertical distribution

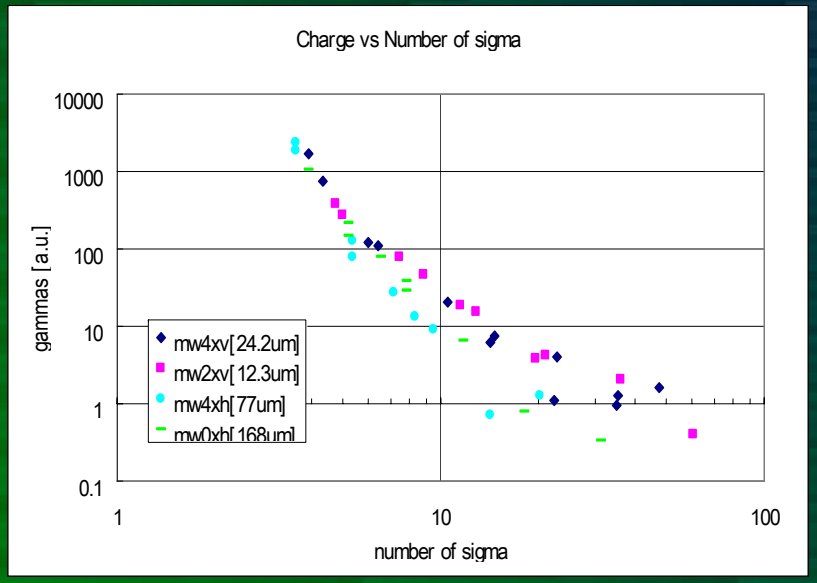


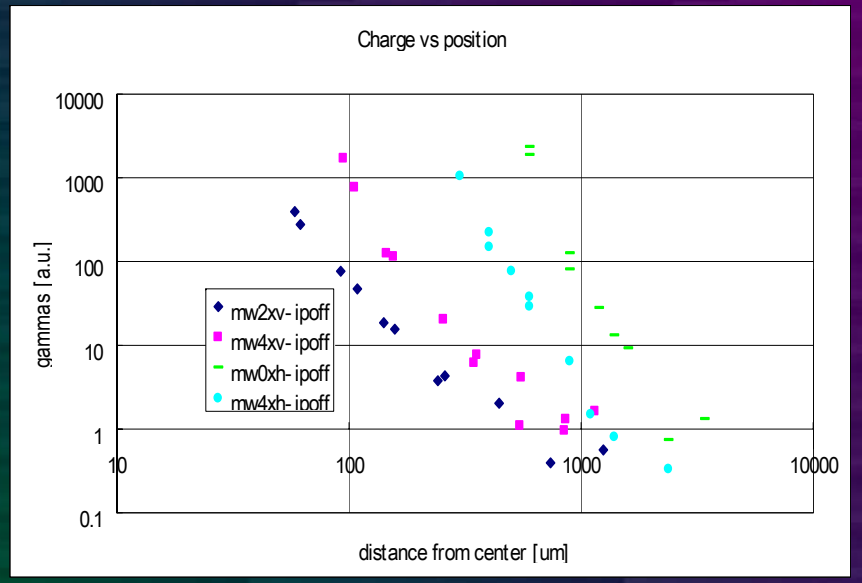
Distribution of beam halo



Gaussian distribution damps a factor of 1000 for every sigma, but it only damps ~$\sigma^{-3\sim5}$

Dependence on beam size

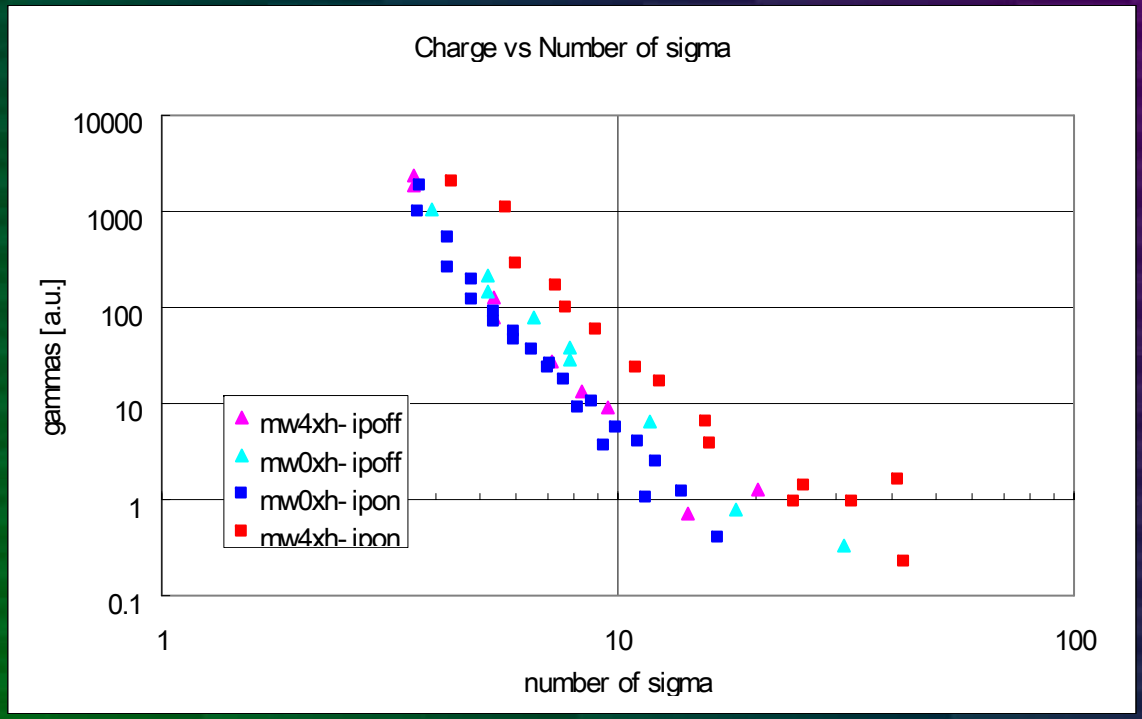




Distribution of beam halo depends on number of sigma rather than absolute distance from center
(i.e.,if beam center is expanded, halo is also expanded)

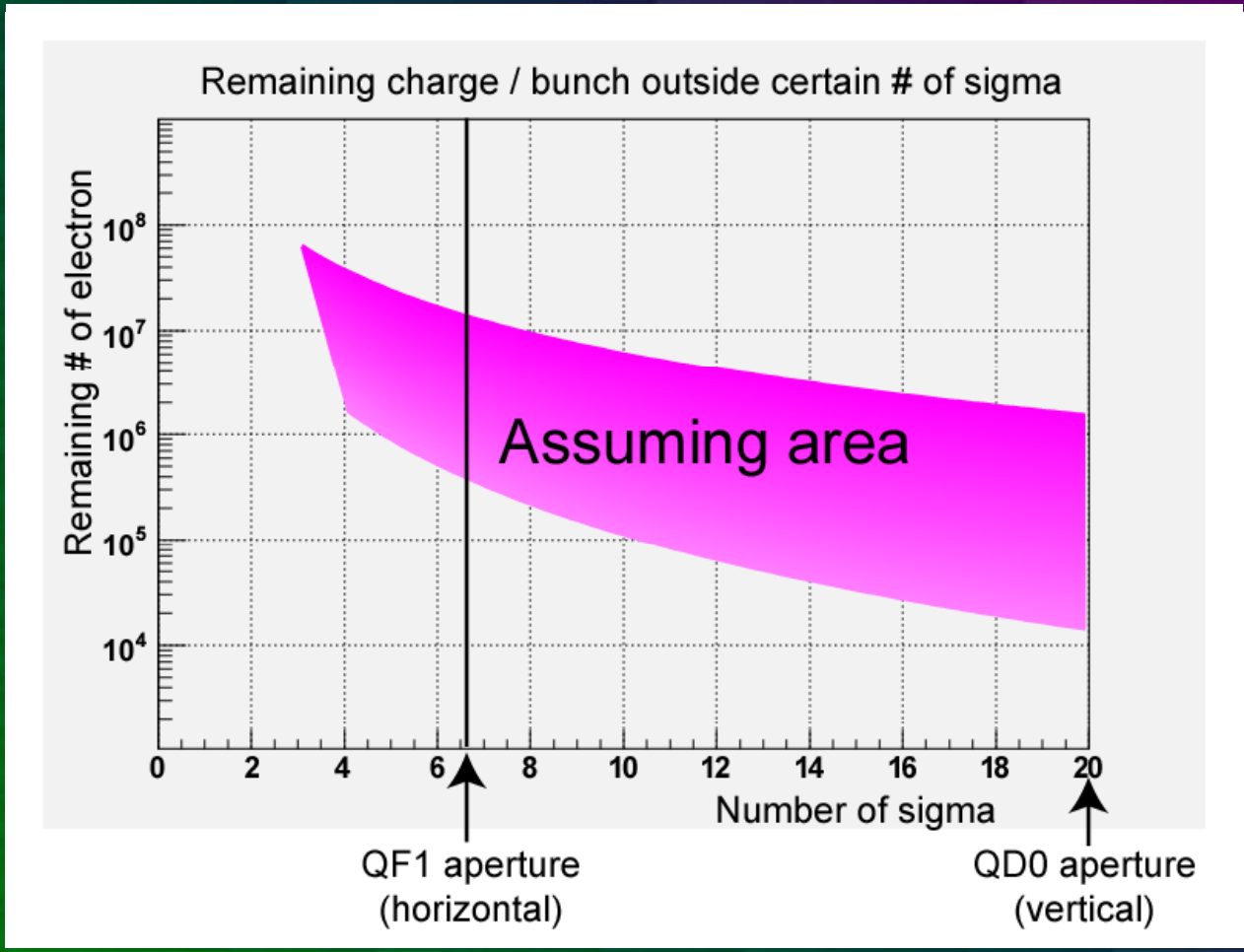
Dependence on DR. pressure

IP on : 4×10^{-7} Pa, IP off : 1×10^{-6} Pa



No significant difference observed.
(may need more precise analysis or measurement)

Charge of halo (extrapolation)



Assuming Gaussian for center area ($\sigma < 3\sim5$)

$\sigma^{-3\sim-5}$ distribution for outer area

Without collimators

Summary

- Charge distribution of beam halo ($\sigma > 3\sim5$) is not gaussian like, but power function like. ($\sigma^{-3\sim-5}$)
- If center beam size become wider, halo beam size become wider (proportional dependence)
- No dependence observed by DR. pressure difference.