

Laser status

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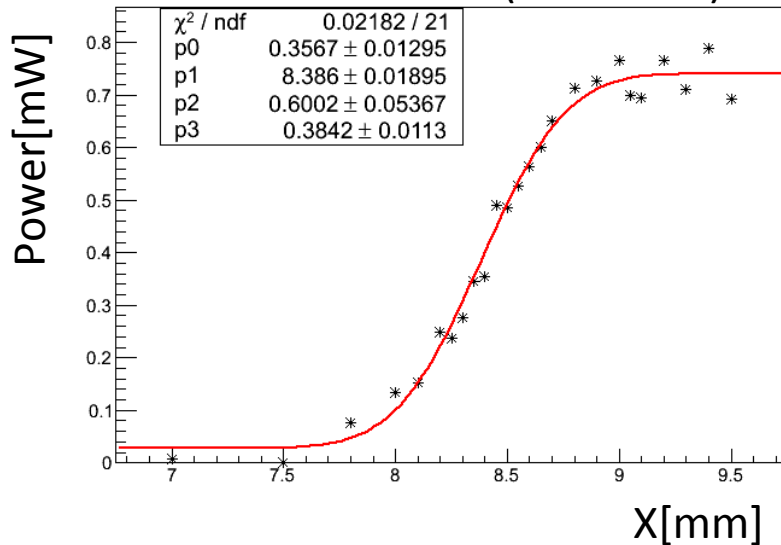
(I'm sorry for talking in Japanese)

Information

- Last laser profile measurement by knife-edge method in September at KEK was not good
 - Data was not fitted by propagation of 266nm- gaus-beam ,because set-up and method was not perfect
 - Bad set-up; not aligned collimator, length between knife and sensor (2~3cm), thickness of knife(1~2mm), iris(Φ 1mm), thermal drift of power sensor
- At hiroshima, I was trying to
 - measure the laser profile perfectly, changing set-up and adding measuring point
 - reproduce the set-up in Sep. and get data
 - compare the results between under perfect set-up and reproduced set-up in Sep.
 - calculate diffraction effect of bad set-up in Sep.

result at KEK in September (without chamber)

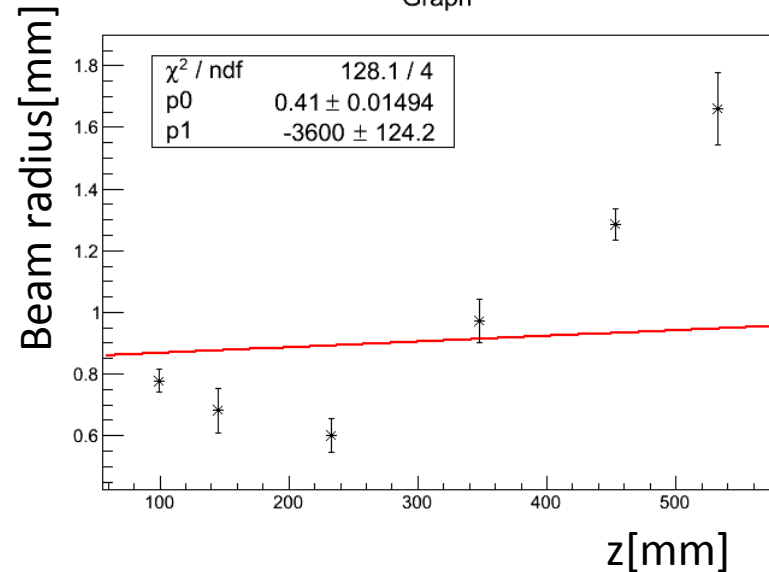
Graph (z=233mm)



↑ example data of knife-edge,
fitting by error function

P2 means beam radius[mm]
at $1/e^2$ (2σ)

Graph



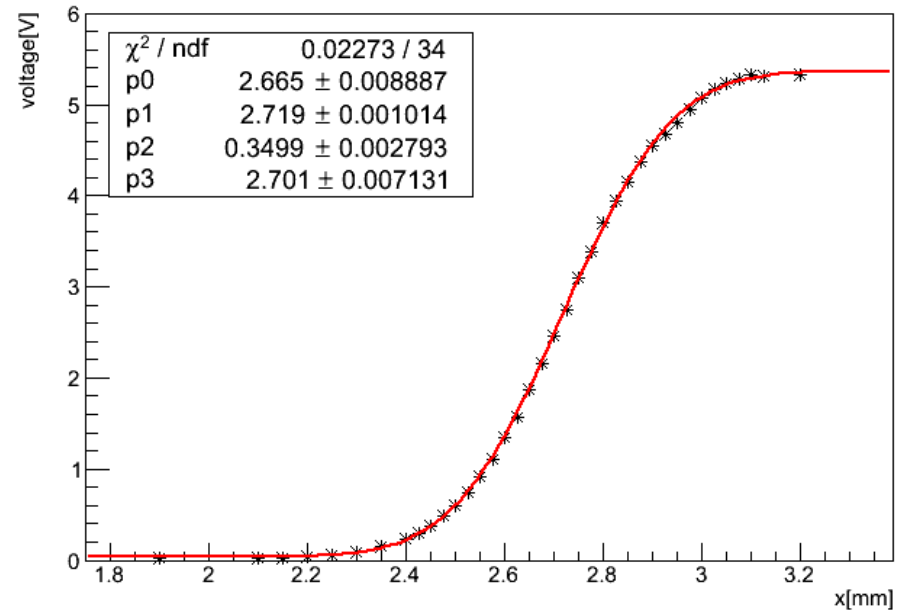
↑ propagation of estimated beam radius
, fitting by propagation of 266nm- gaus-beam

- there are power fluctuation
- number of data is not enough
- data was not fitted by propagation of 266nm- gaus-beam ,because set-up was not perfect

(We conclude that collimator is not aligned well and iris causes diffraction)

measurement the laser profile perfectly, changing set-up at Hiroshima

z=292mm, photo detector,reference



↑ P2 means beam
radius[mm] at $1/e^2$ (2σ)

$$\text{fitfunc.} = p_0 \text{Erf}\left(\frac{\sqrt{2}(x - p_1)}{p_2}\right) + p_3$$

$$\text{Erf}(x) = \frac{2}{\sqrt{\pi}} \int_0^x e^{-t^2} dt$$

He-Ne laser $\lambda:632.8\text{nm}$

Z[mm]

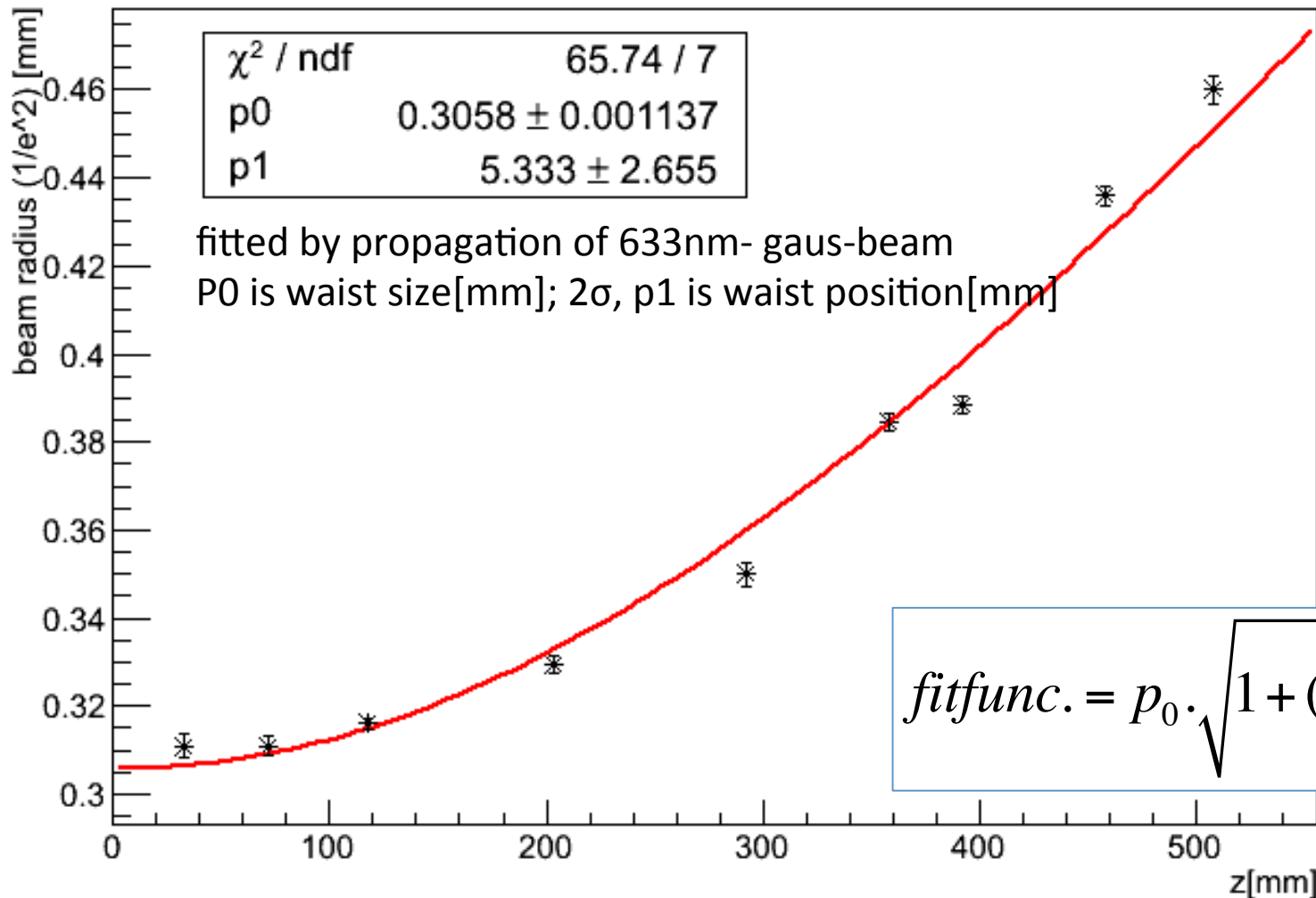
$\Delta x[\text{mm}] \Leftrightarrow$ Knife (black) Thickness:0.4mm

Photo detector

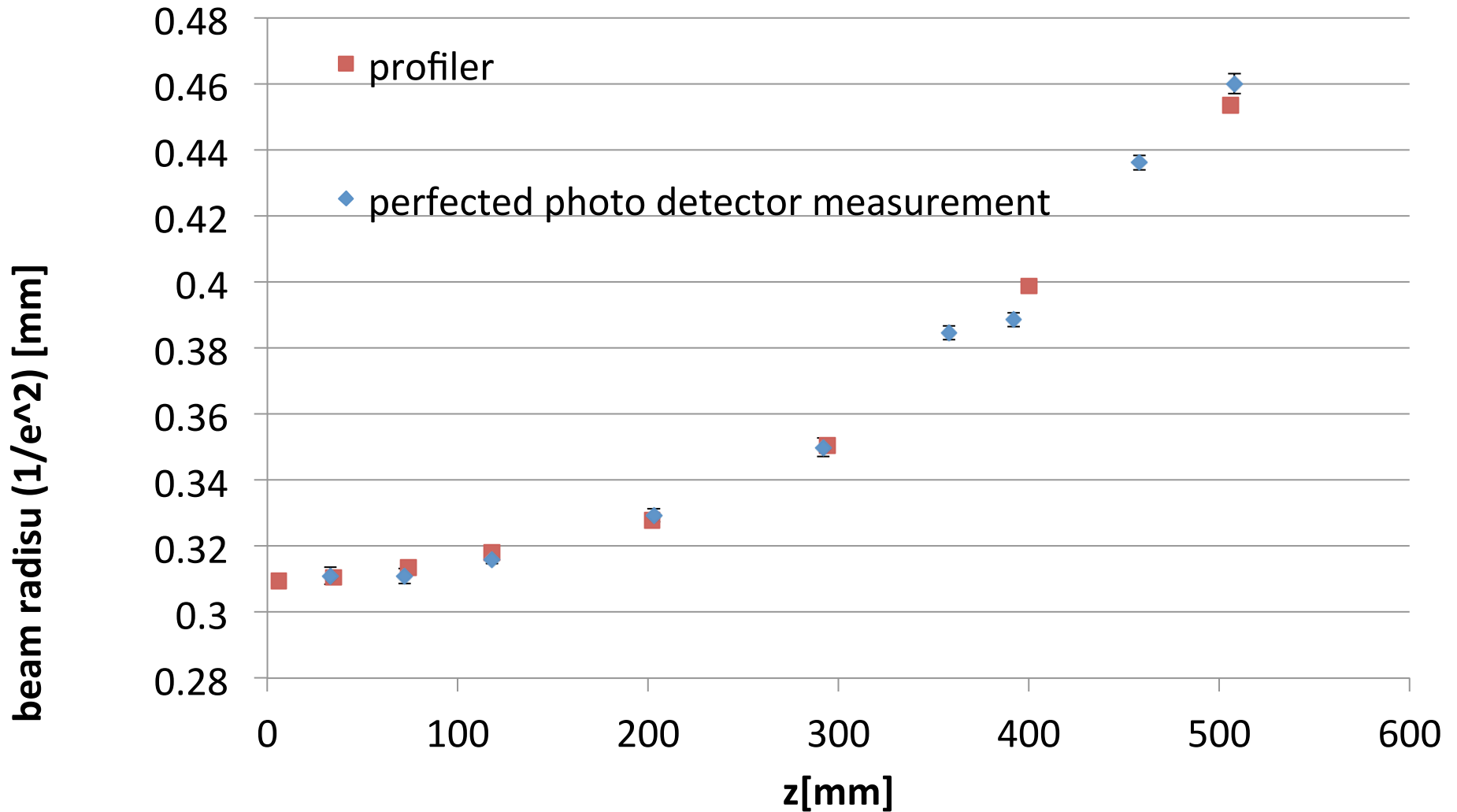
oscilloscope

measurement the laser profile perfectly, changing set-up at Hiroshima

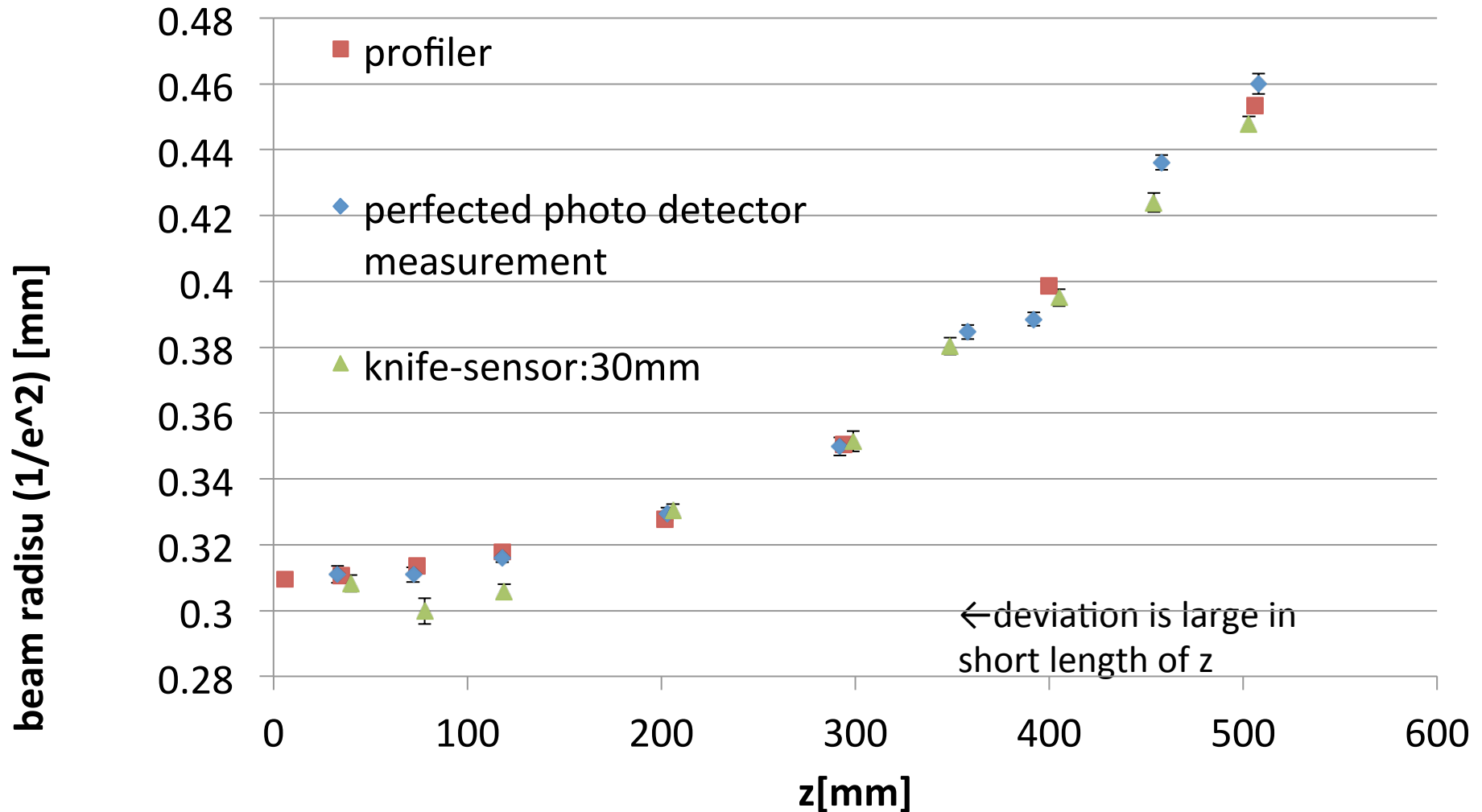
z v.s. omega, reference



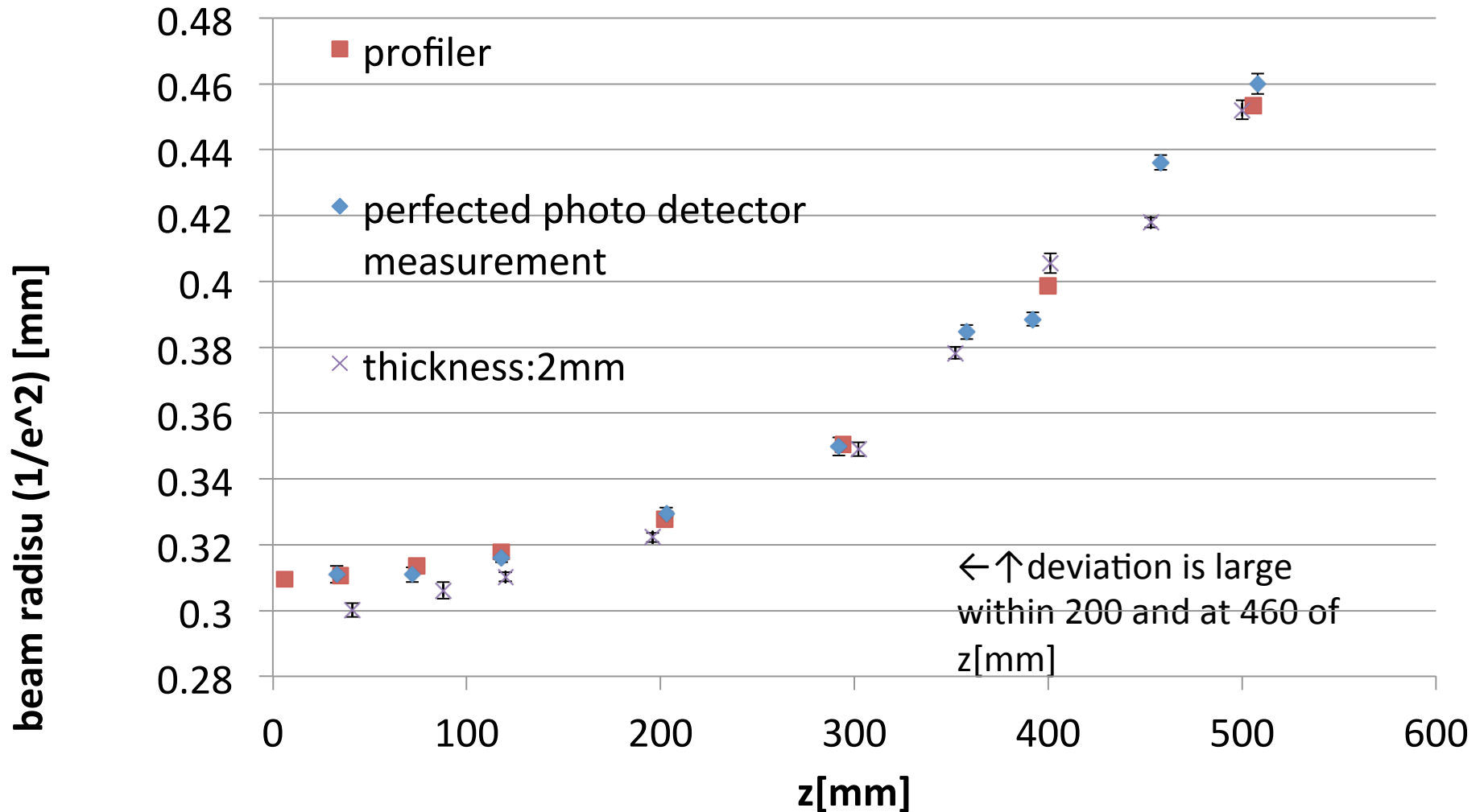
Comparison between data by using knife-edge perfectly and using profiler



I Reproduced set-up in September and got data for length from knife to sensor



I Reproduced set-up in September and got data for thickness of knife



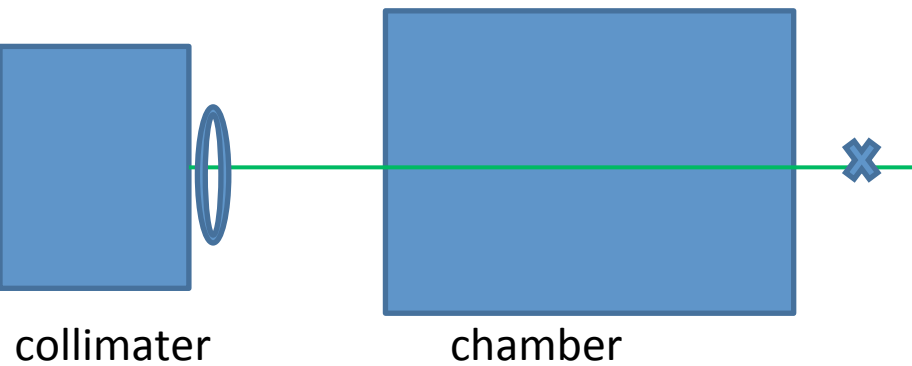
Summary and plan

- At KEK in September, influence of length from knife to sensor and thickness of knife is smaller, but not aligned collimator and iris may cause unsure laser propagator
- We will align collimator, measure profile, deal with iris on next week
- Then, we will take laser data with field shaper and wire-gate in Nov. and/or Dec.

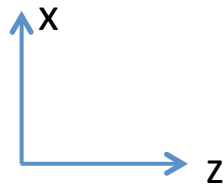
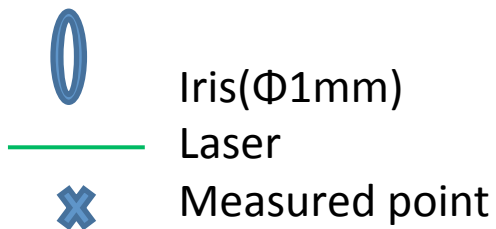
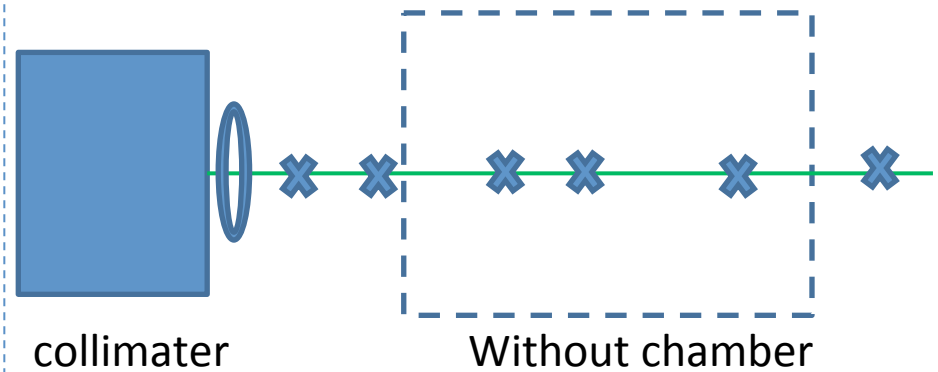
backup

Information about experiment at KEK in July

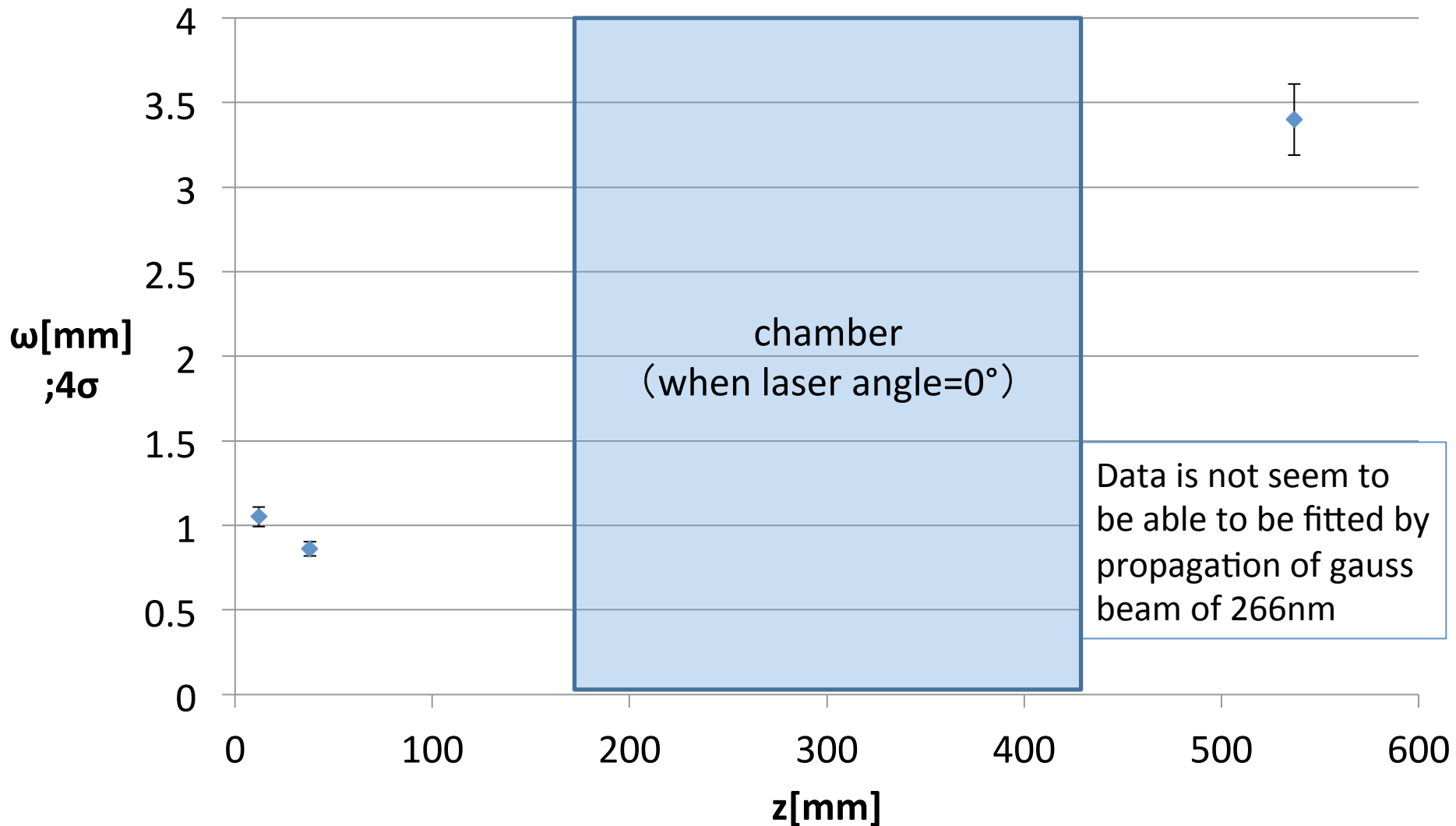
(case)



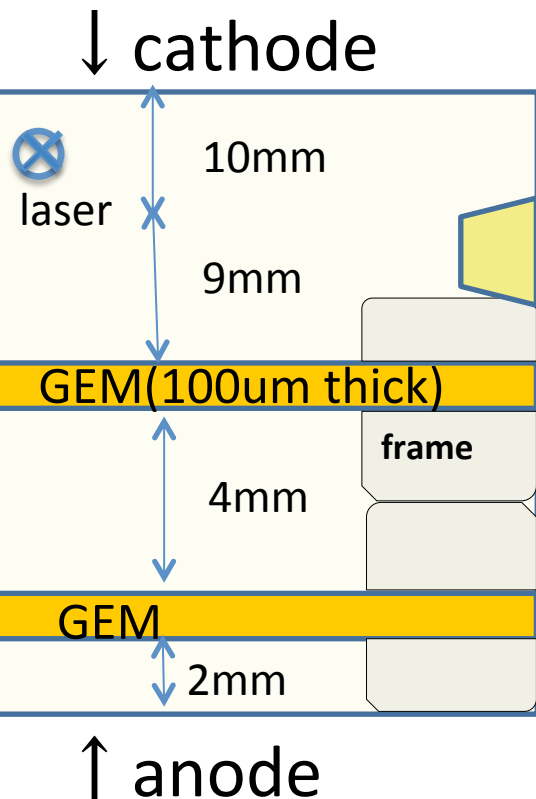
(case2)



Result of propagation without using iris in July



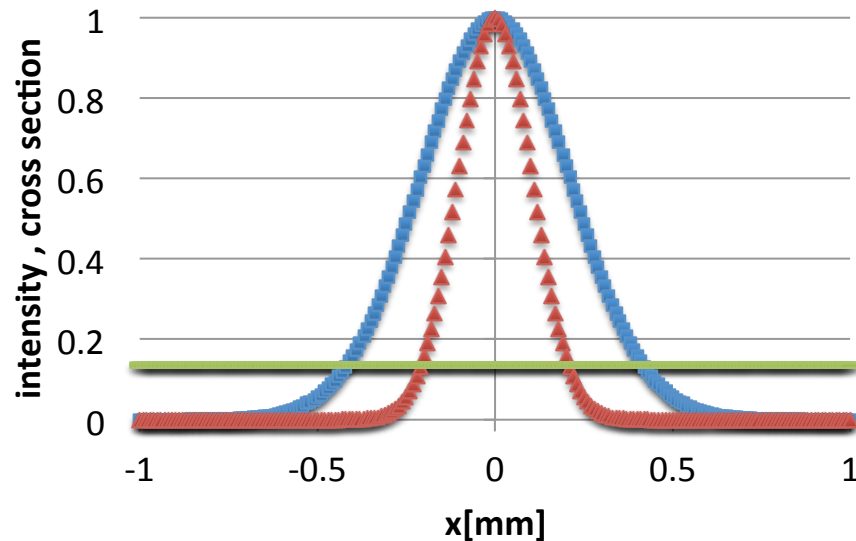
High voltage



	(2012DESY)	(yatsukawa)	(2014)
C-plane	1882V (Ed:187V/cm)	1882V (Ed:230V/cm)	1822V (Ed:230V/cm)
FS-C	1792V (187V/cm)	1652V (230V/cm)	1592V (187V/cm)
FS-A	1661V (380V/cm)	1491V (230V/cm)	1461V (187V/cm)
GEM-C-C	1585V (380V/cm)	1445V (230V/cm)	1385V (380V/cm)
GEM-C-A	1230V (Et:900V/cm)	1090V (Et:1025V/cm)	1030V (Et:875V/cm)
GEM-A-C	870V	680V	680V
GEM-A-A	540V (Ei:2700V/cm)	350V (Ei:1775V/cm)	350V (Ei:1775V/cm)
Anode	0V	0V	0V

Assumption of ionization process

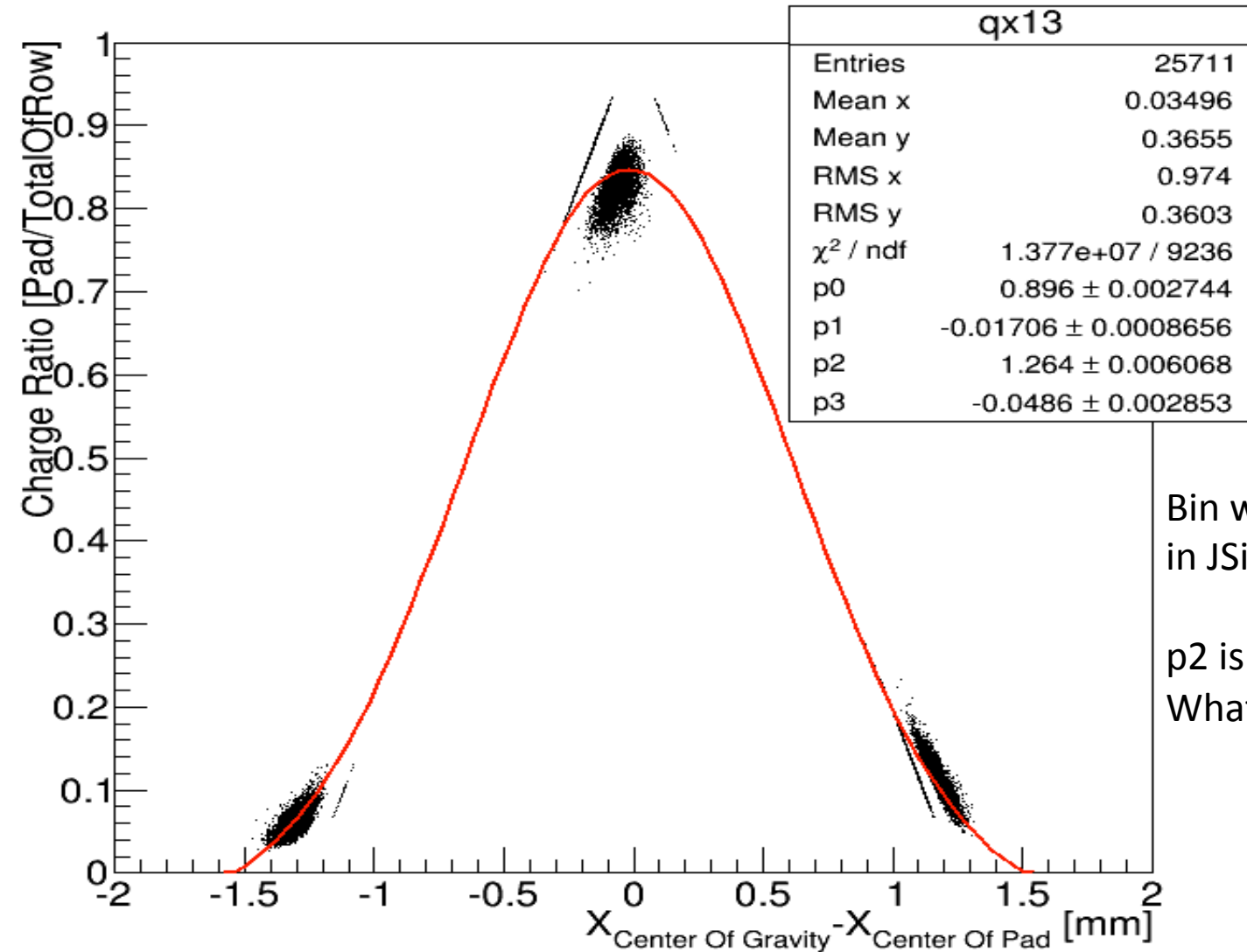
- ~~According to ogawa san's analysis, estimated width of laser from laser test in July is 0.58mm (not true)~~
- Otherwise, waist size of laser is 0.415mm(2σ) according to manual of collimator
- Assuming that ionization process is 4-photon absorption, width measured with chamber should be half of actual laser width



- intensity distribution of laser of 0.83mm width(4σ), according to manual of collimator
- ▲ ionization cross section (assuming 4-photon absorption process)
- line of $1/e^2$

PRF

(laser angle is 0deg, pad row is 13)



Bin width should be changed
in JSimpleTrackFitter.cxx

p2 is 2σ [mm].
What is sub-line?

Calculation of width of ionization (example)

$$\sigma_{PR}^2 = \sigma_i^2 + D^2 \cdot z + \sigma_{PRF}^2 + \sigma_{FP}^2 + \frac{h^2 \cdot \tan^2 \phi}{12}$$

$$\sigma_{PR}^2 = 632^2 [um]$$

$$D^2 \cdot z \approx (313^2 \cdot 0.5) + (310^2 \cdot 0.7) + (342^2 \cdot 0.2) = 374^2 [um]$$

$$\sigma_{PRF}^2 \approx (419^2 \cdot 0.4) + (474^2 \cdot 0.2) = 339^2 [um]$$

$$\sigma_{FP}^2 \approx \frac{1200^2}{12} = 346^2 [um]$$

$$\frac{h^2 \tan^2 \phi}{12} = 0$$

$$\therefore \sigma_i^2 = 157^2 [um]$$