

# *Initial beam size commissioning for ATF2*

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## *Initial beam size commissioning*

It is difficult to measure the beam size above 350nm with Sintake monitor.

How to achieve under 350nm beam size at IP

- One idea to use IP-BPM was proposed by Glen White yesterday.
- It is convenient to have the beam size monitor with 350nm resolution and with wide dynamic range around IP.
- This monitor should be as fast as possible.

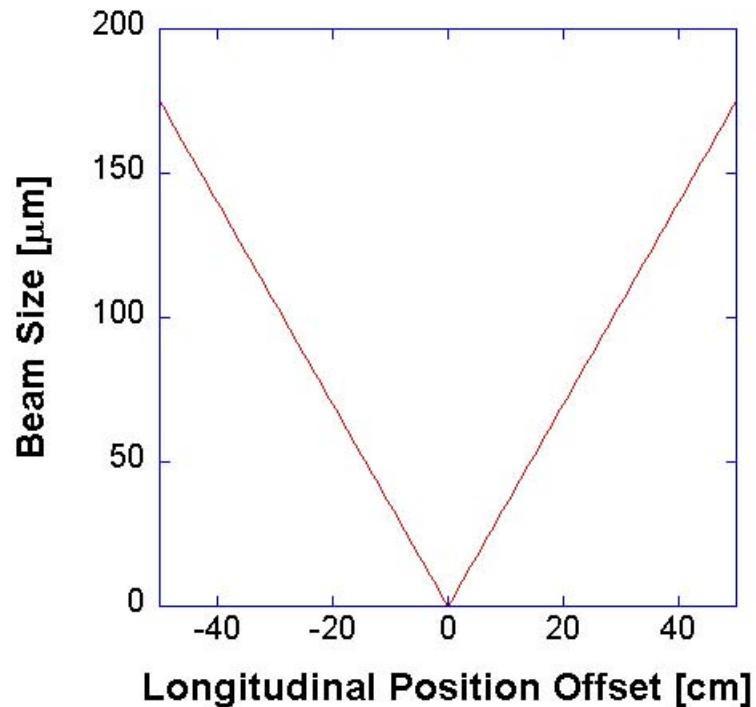
Candidates for the Beam size monitor.

- Carbon wire scanners  
Well-developed devices and wide dynamic range,  
but **pure resolution** (1micron )
- Honda BSM ( presented by Y.Honda yesterday)  
**Good resolution**, but **not wide dynamic range** ( 1.2-0.3micron ? )

*We cannot put the BSM at IP,  
because we will put the Shintake monitor at IP*

*- Where to put the BSM  
with a few hundred resolution??*

*Beam size profile around IP*

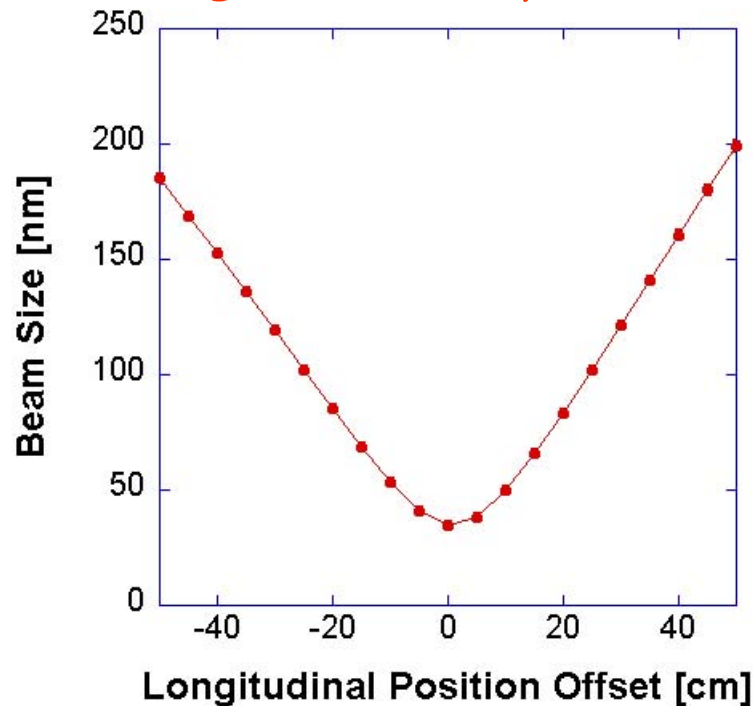


*If you put the 2<sup>nd</sup> IP BSM at  $s=20\text{cm}$ ,  
 $\sigma_y = 50\text{micron}$ .*

*We don't have any beam size information  
from BSM.*

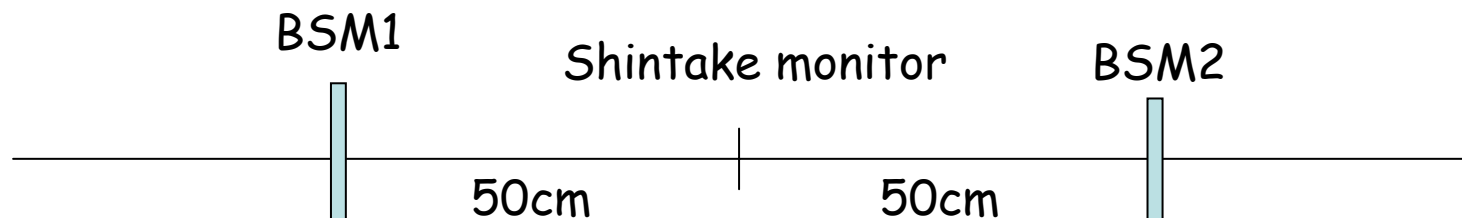
However, we can make the beam size small at non-IP location by changing the strength of *the final doublet, QF1 and QD0*.

- *No change for sextupole field.*



The vertical beam size at  $s=\pm 50\text{cm}$  is **180nm**.

It is possible to minimize the nonlinear field around IP by using BSM at  $s=\pm 50\text{cm}$ .

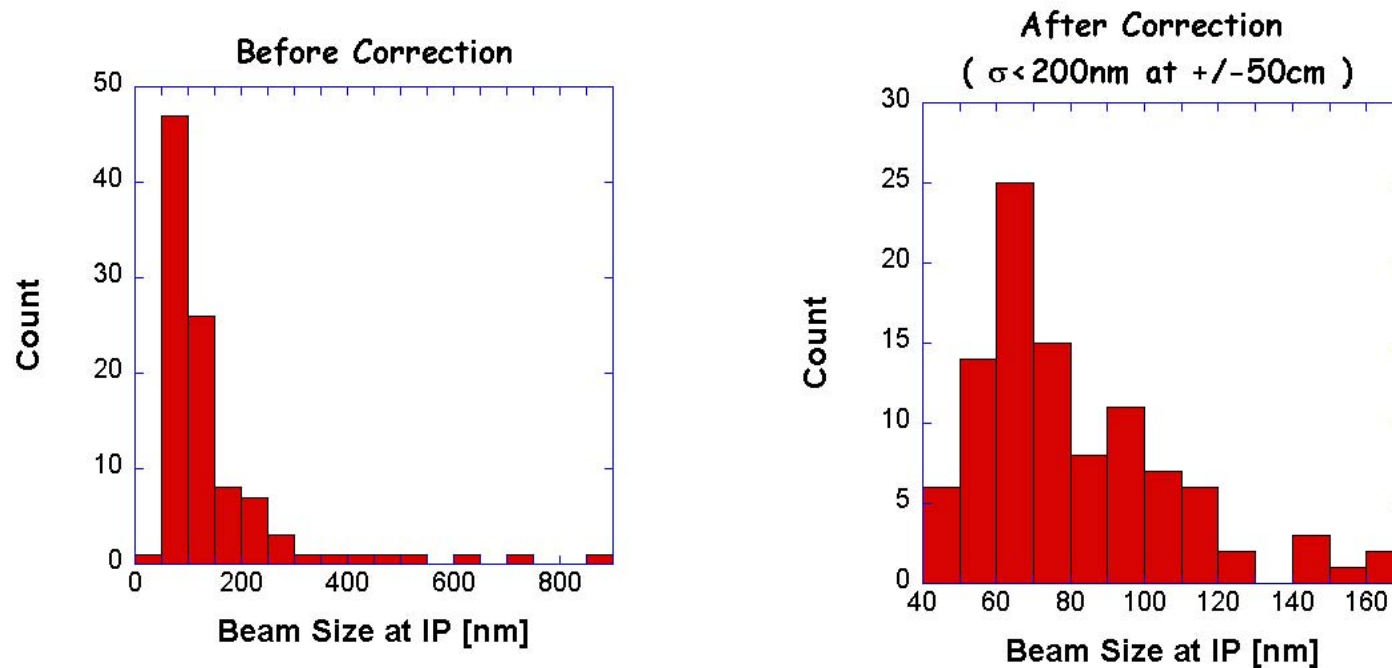


# Simple simulation of beam size tuning

## Assumed errors

- 1% strength errors for all quads and sexts
- No misalignments

- QF1 and QD0 fields are set to be  $a_x=a_y=0$  at  $s=\pm 50\text{cm}$ .
- Sextupole fields were optimized with BSM with 200nm resolution at  $s=\pm 50\text{cm}$ .
- QF1 and QD0 fields are set to be  $a_x=a_y=0$  at  $s=0$  and measure the beam size.



We can achieve *comparable beam size to the resolution of both side of BSMs.*

## *Beam position scan for beam size measurement.*

- *Carbon wire scanner needs the beam scan, but Shintake monitor and Honda monitor groups said not to use at the presentation in yesterday.*

### **Methods 1; *by using sweeping magnet***

**Advantage : *Easy to operate***

***Easy to calibrate***

**Disadvantage : *We need additional device at crowded location.***

### **Methods 2; *by using magnet mover.***

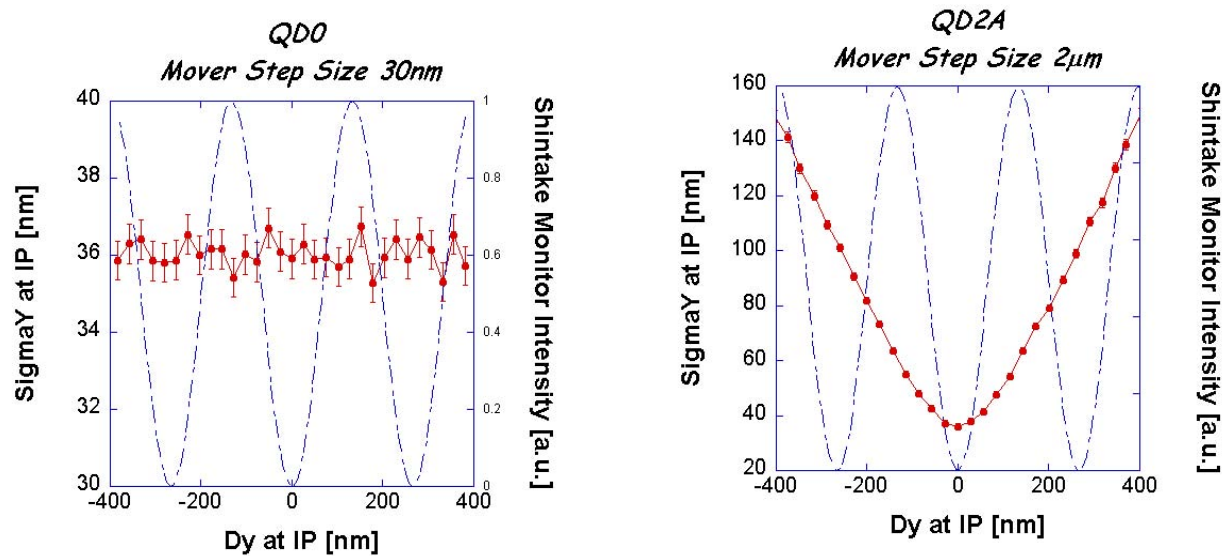
**Advantage : *No additional devices***

**Disadvantage : *We need careful calibration***

***and take care of beam size enhancement.***

# *Simulation results of the vertical position scan by magnet mover*

*Example of the beam size enhancement by mover scan*



*Beam size is very sensitive for magnet position of some quads.*

## *Simulation results of the vertical position scan by magnet mover*

Magnet Name	Step (Dy = 30nm)	Scan Range ( < 40nm )
QF5	400nm	+/- 850nm
QF5A	300nm	+/- 4000nm
QD4	200nm	+/- 3000nm
QD4A	200nm	+/- 2000nm
QD2B	300nm	+/- 450nm
QF3	2000nm	+/- 50nm
QD2A	2000nm	+/- 50nm
QF1	100nm	+/- 2200nm
QD0	30nm	+/- 2100nm

*Some magnets are narrow scan range.*

*Some magnets are required very small step size for scanning.*

*Other magnets has step size errors from beam optics ...*



## *Discussion*

### 1) BSM around IP

- Enough space to put BSM around IP ?
- Should we prepare the additional BSM, Carbon wire scanners (1micron resolution), Honda monitor for the ATF2 commissioning ?

### 2) Vertical beam position scan at IP

- Enough space to put sweeping magnet between QD0 and IP ?
- Should we prepare the sweeping magnet, or use the vertical mover of quads for vertical position scan?