Plan in summer shutdown

Magnet

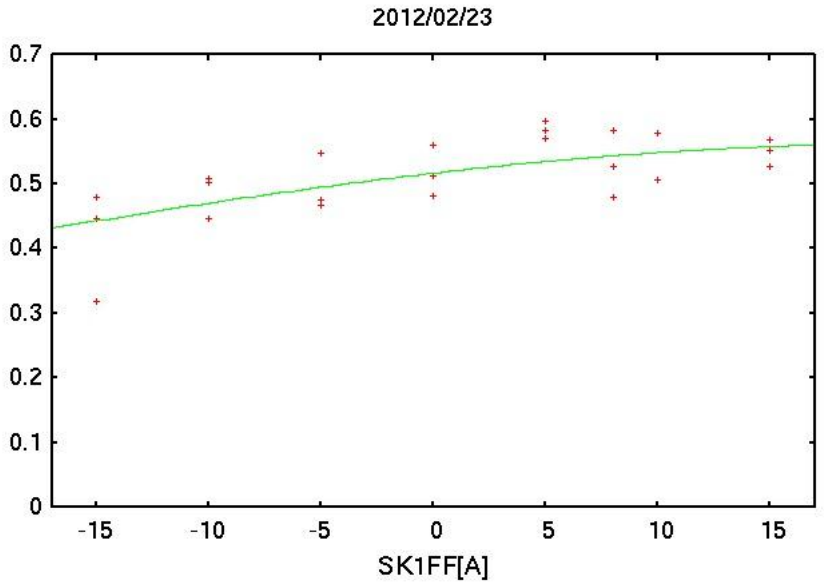
-SF1FF

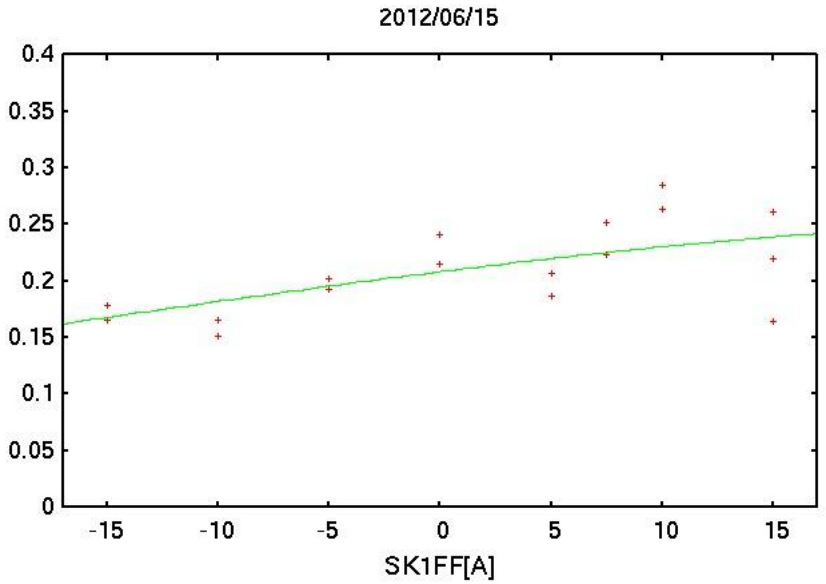
-Swap of QEA magnet

- Multipole field of Final Doublet

IP-BSM improvement

Correction of Skew Sextupole Field





We measured same response of SK1FF strength scan in Feb. and June 2012.

(Minimum SK1FF was around 20A ; design was 5A)

Had we better to replace the SK1FF to stronger one ??

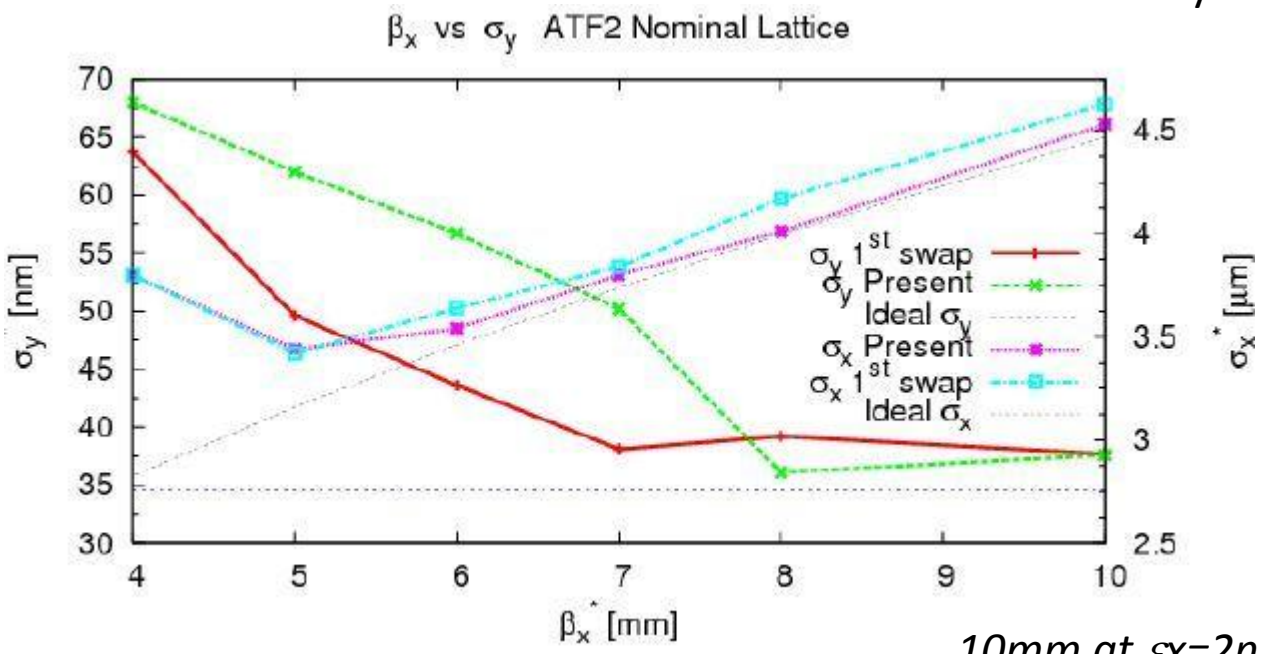
Alignment Tolerance for SK1FF by Edu Marin

$\Delta\sigma = \sqrt{\sigma^2 - \sigma_0^2} = 12nm$ *for 2.5x1 optics*

K = -0.4 m^{-3}	X offset	Y offset	Tilt
5 % $\Delta\sigma_y$	-525 µm	3 mm	400 mrad

QEA Magnet Swapping for ATF2 beamline

by Edu Marin



1 SWAP		
QM12FF	-->	QF9BFF
QD2BFF	-->	QF5AFF
QM13FF	-->	QF9AFF
QF19X	-->	QF5BFF
QM15FF	-->	QD4BFF
QD10BFF	-->	QD10AFF
QF17X	-->	QD6FF
QM11FF	-->	QD4AFF
QF7FF	-->	QD8FF

10mm at εx=2nm

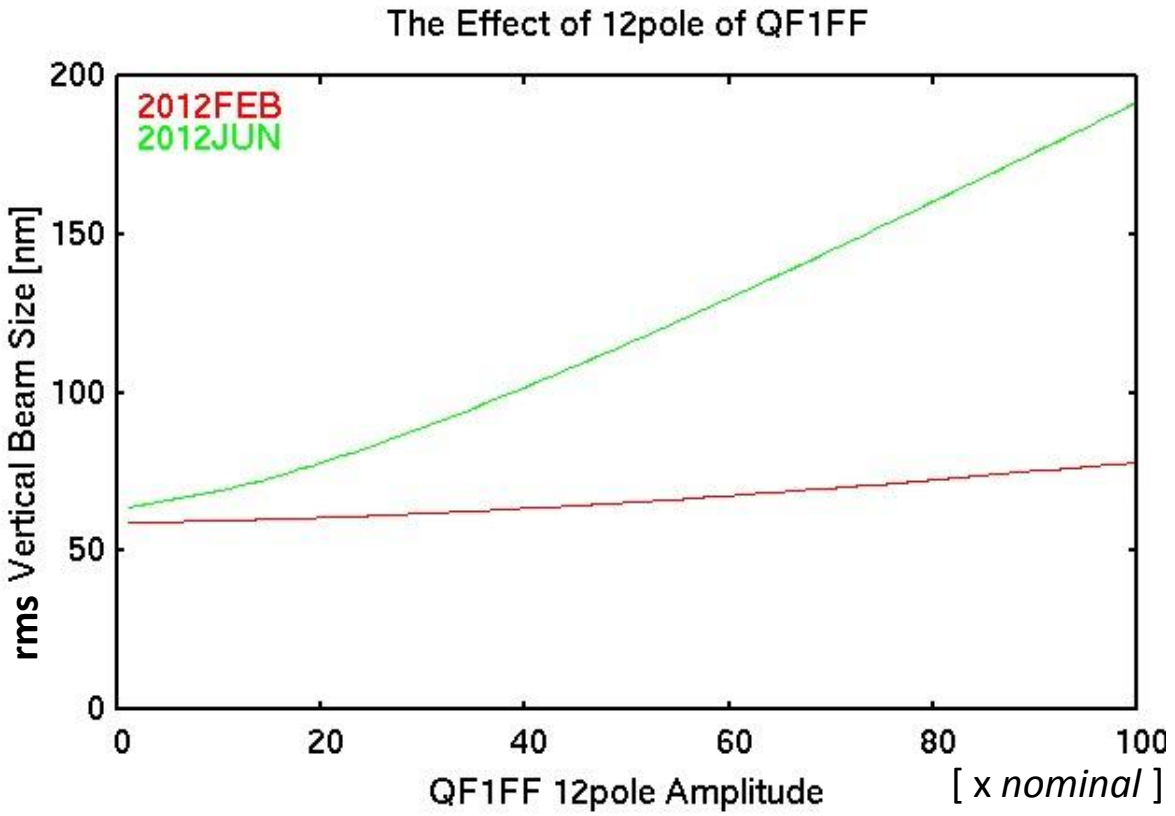
15mm at εx=3nm

20mm at εx=4nm

for same beam size at quads

The Effect of Multipole Error

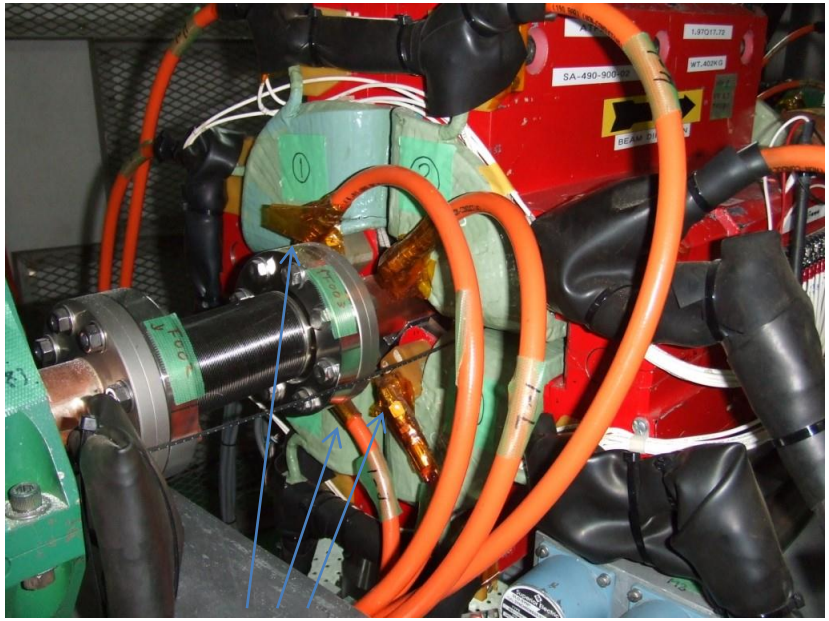
Example ; 12pole of QF1FF



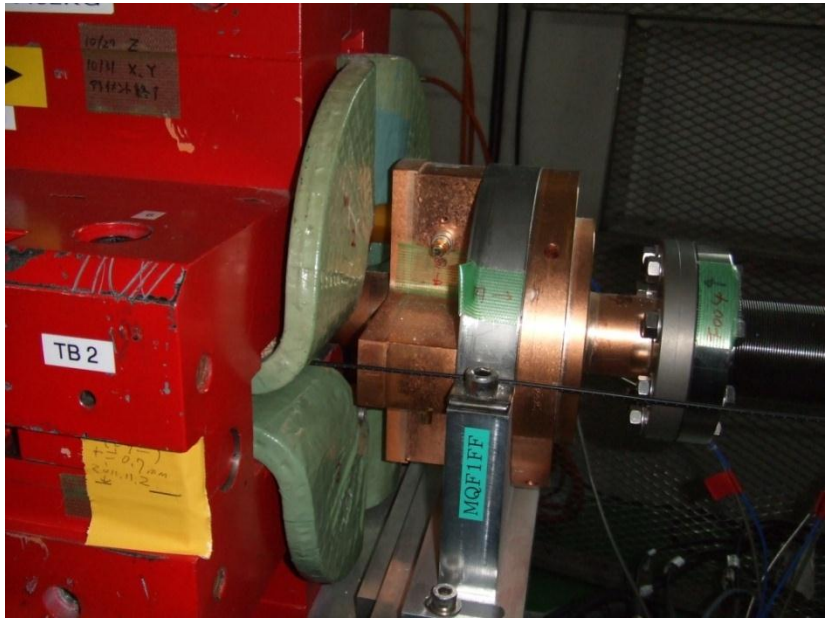
εx=2.0nm, βx=40mm, εy=20pm, βy=0.10mm
56nm rms emittance (44.7nm at linear) at nominal multipole errors

εx=3.0nm, βx=28mm, εy=20pm, βy=0.16mm
65nm rms emittance (56.6nm at linear) at nominal multipole errors

Magnetic Material around Final Doublet



Connector of cooling water (Iron)
Connector of magnet is stainless steel



Feed through of S-band BPM
(Kovar)

	Magnetic Field
QF1FF	*150-200Gauss*
QD0FF	*300-350Gauss*

There is a possibility to make a multipole error for these component.

C. Spencer said "magnetic field measurement in SLAC used same connector for cooling water." But, maybe not put the S-band BPM for the magnetic field measurement.

Difficulties	Solutions
Reproducibility of a laser path: A Laser is not well adjusted to the design path because there is no reference to guide it. A laser travels 10cm high from the vertical table. Non-negligible mismatch toward the IP happens very often after the adjustment of the laser orbit.	**Well defined references near the optical elements:** Put reference lines on the base plates, pedestals etc., to enable the alignment of optical element and traveling laser.
Significant spot size difference at IP between upper and lower lasers. Path length is not same because of the chicane for fringe phase control. It introduces the different waist position; i.e., no ideal crossing.	**Match the path length of upper and lower lasers.** It will be done by adding a drift space that created by an image flopping mirrors.
Concern on the small beam tuning: Changing the crossing angle was done by two sets of rotatable stage and mirror on it. Searching a beam (laser wire, z scan) is done by adjusting the angle of this mirror. Sharing this mirror for different crossing mode lead a retuning every time because it was changed during the previous mode.	**Change the crossing-angle handling concept.** • Remove the rotator and introduce a mirror on a linear mover to select the crossing mode. • Independent mirror adjustment for each crossing mode. • Fixed reducer setting. • Introduce focal lens movers.

Other problems of IP-BSM

Most of the problems were already presented yesterday,
and we will discuss in tomorrow discussion session

1. Alignment of optical components on the vertical table are different from the design.
   - Laser injection angle is different from 2-8degree mode and 30degree mode.
   - When the rotator is rotated, the laser position at the mirror on the rotator is change.
   - Upper path for 174degree mode is not seen in the screen of 2-30degree mode.
   (no reference line to put the optical components)
2. The focal points for upper path and lower path are different.
3. The collision angle is different from design.
   - Laser is not on the center of lens for 30degree mode.
4. The laser paths for lower angle mode are not kept in higher angle mode measurement.
5. Rotator move unexpected direction sometimes.
6. The effect of Dove Prism
   - If the injected laser has divergence, the focal point is shifted.
   - If the injected laser has angle, the image is rotated.
   - The reduction of maximum modulation

IP-BSM Status in 2012 Spring Operation

The maximum modulation of IP-BSM in 2-8degree mode

The maximum modulation for 2-8 degree mode
was changed from 60-80% to 50% from end of March.

In March 2012, we replaced the rear-mirror of IP-BSM laser.
After that the laser spot size was increased twice at the exit of laser.

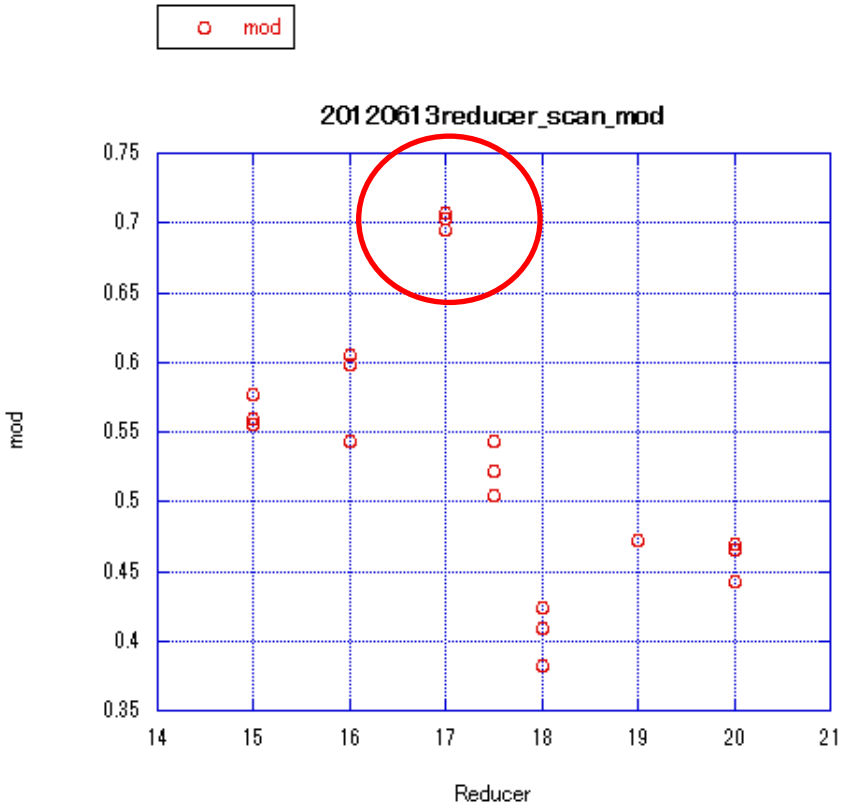
From the middle of March, we had measured 3times more than 60% modulations.

1. 80%(04/26) ; half of the lower path laser light did not go to IP by drift.
   After the realignment of laser path, the modulation was decreased to less than 60%.

2. 83% (06/06) ; only the laser path of 2-8degree mode was made.
   After making 30 degree mode (laser path for 2-8 degree mode also changed),
   the modulation was decreased to less than 60%.

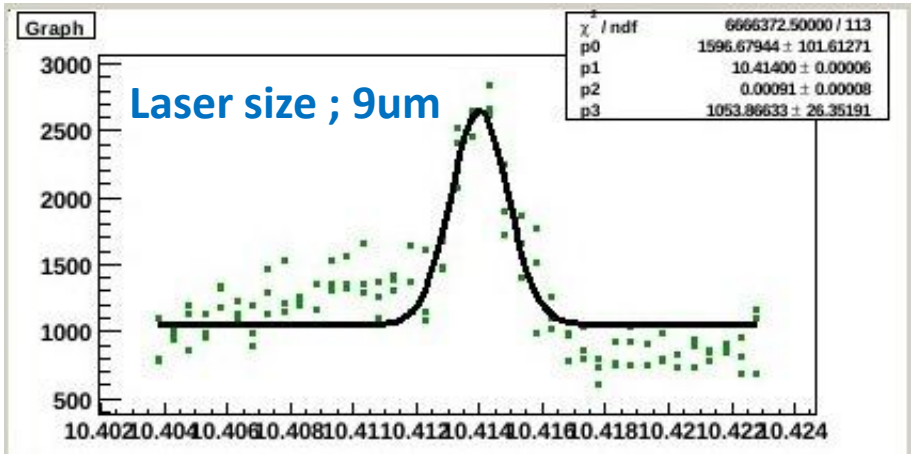
3. 80%(6.3degree mode), 90%(4.0degree mode) 6/13-6/14

IP-BSM setting in 6/13-6/14

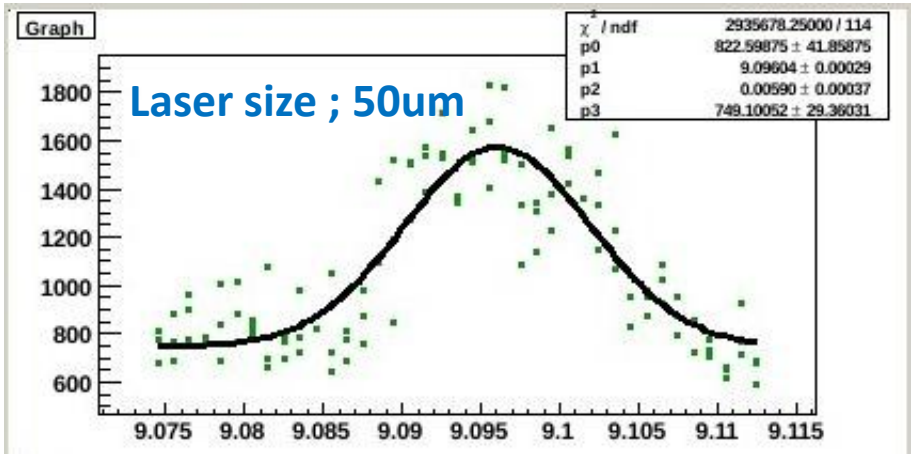


Very narrow optimum setting

Beam profile of upper path



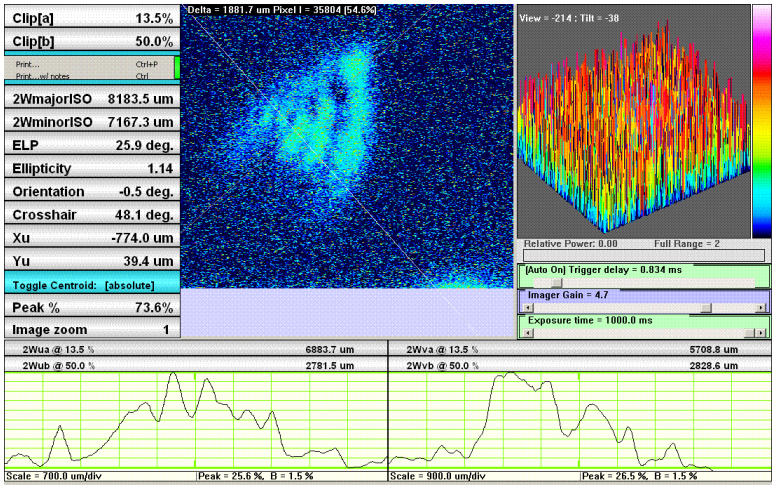
Beam profile of lower path

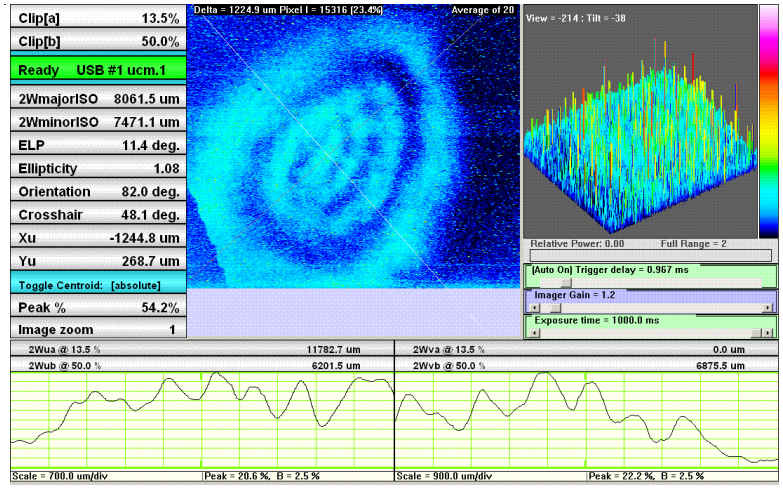


Very large unbalance of laser pfofile at this setting.

We did not understand how to optimize the setting of IP-BSM

Laser Profile of IP-BSM laser





Before rear mirror replacement

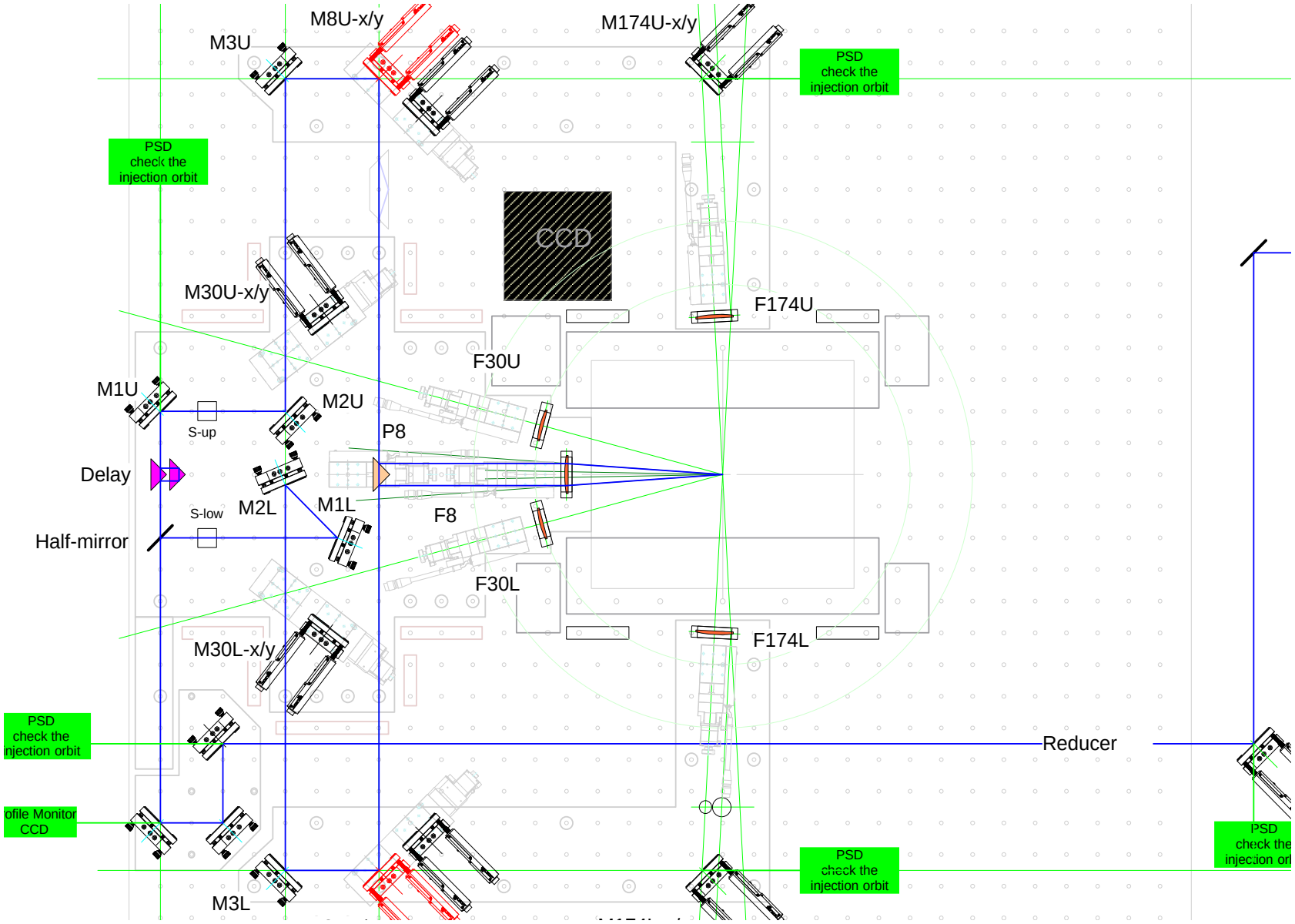
Optical components were broken by sharp peak of laser profile.

After rear mirror replacement

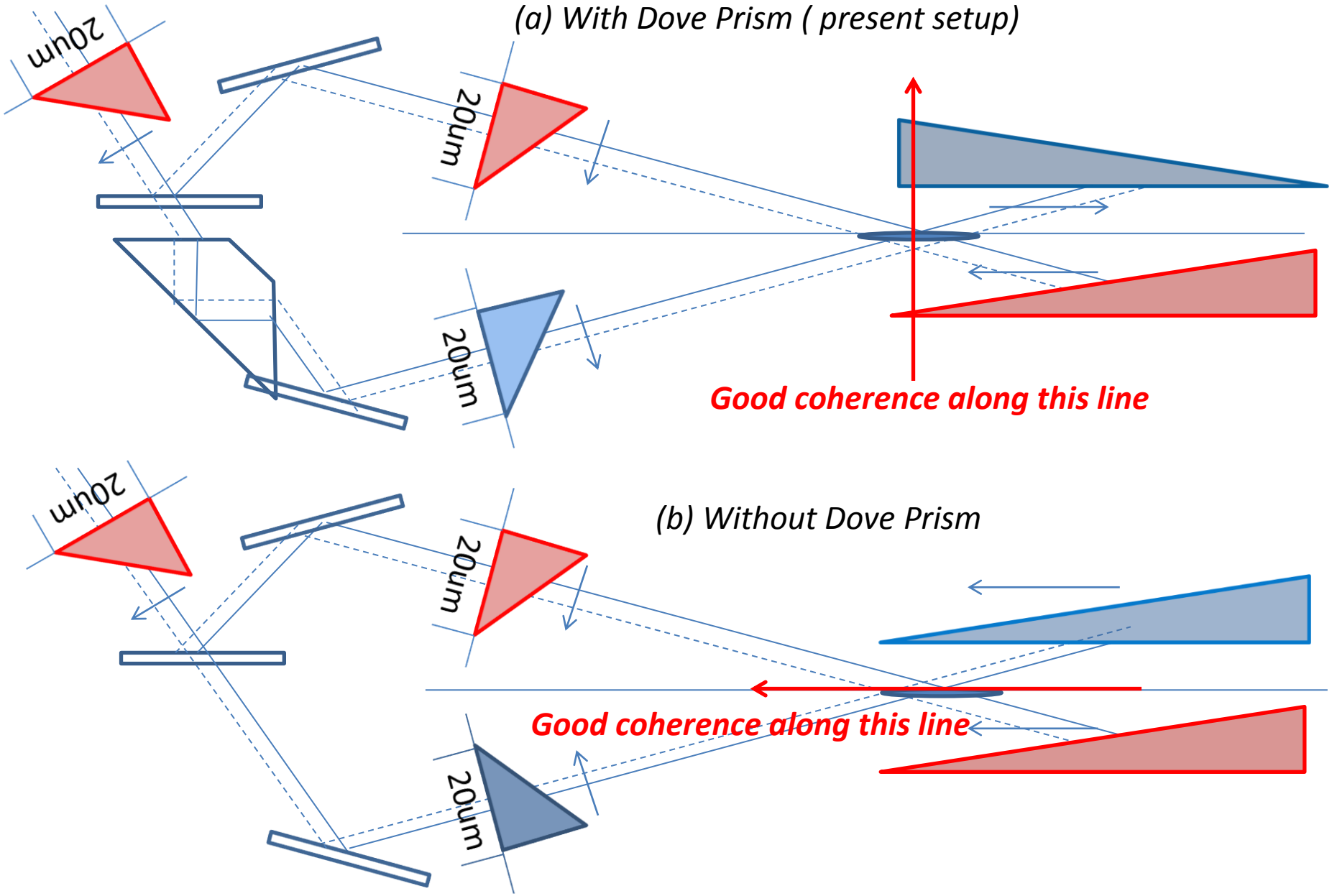
Beam profile was increased
No sharp peak

Strong Focus -> short Rayleigh length
-> Large Profile Imbalance in between 2 laser path

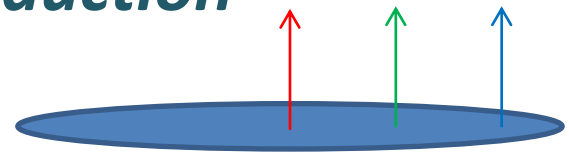
Weak Focus -> small beam size at optical component
-> risk to break optical component


M3U
M8U-x/y
M174U-x/y
PSD
check the
injection orbit
PSD
check the
injection orbit
CCD
M30U-x/y
F174U
F30U
M1U
M2U
S-up
P8
Delay
S-low
M2L
M1L
F8
Half-mirror
F30L
F174L
M30L-x/y
PSD
check the
injection orbit
Reducer
ofile Monitor
CCD
PSD
check the
injection orbit
M3L
PSD
check the
injection orbit

Schematic Layout of 30 degree mode collision

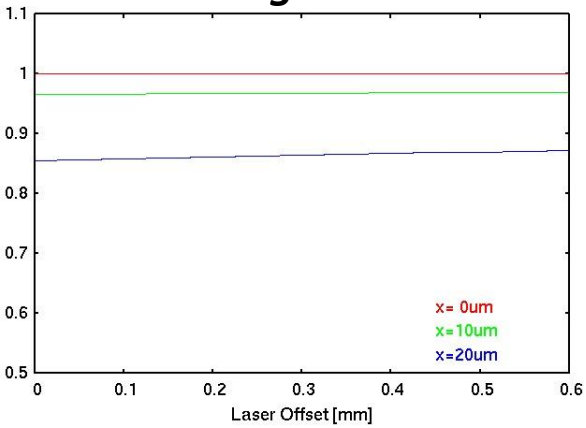


Modulation Reduction

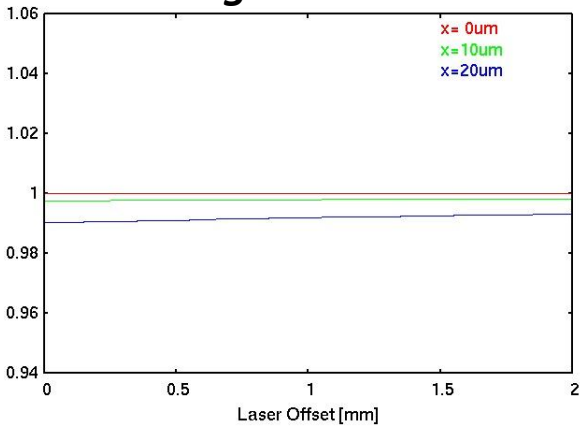


(a) With Dove Prism (present setup)

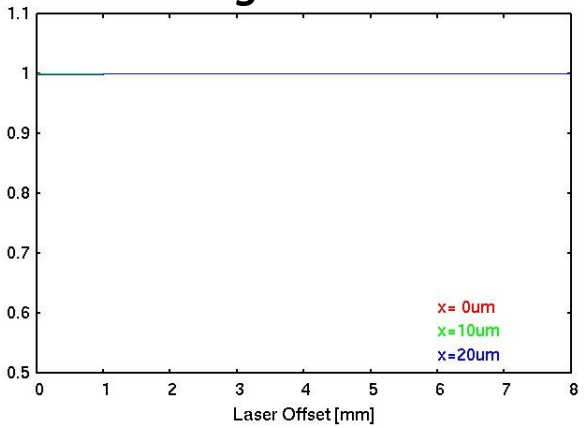
30degree mode



8degree mode

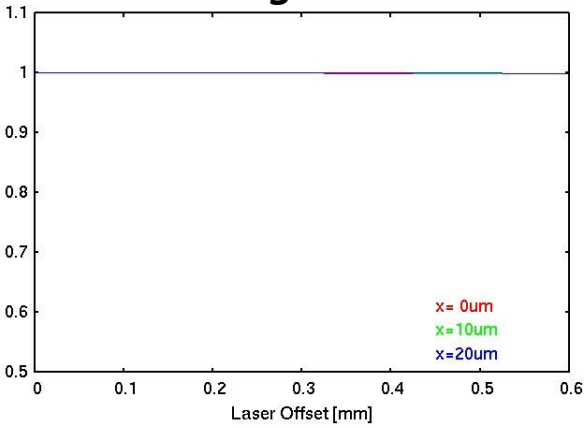


2degree mode

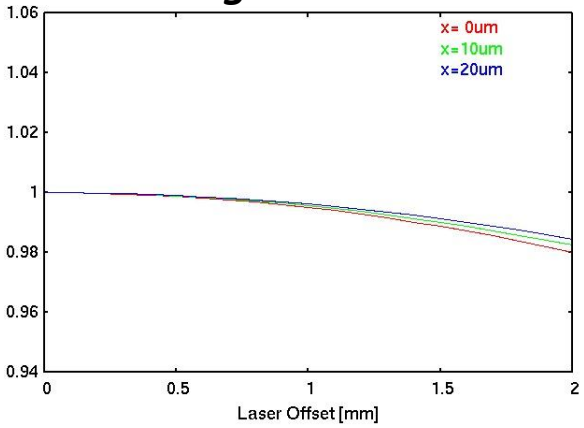


(b) Without Dove Prism

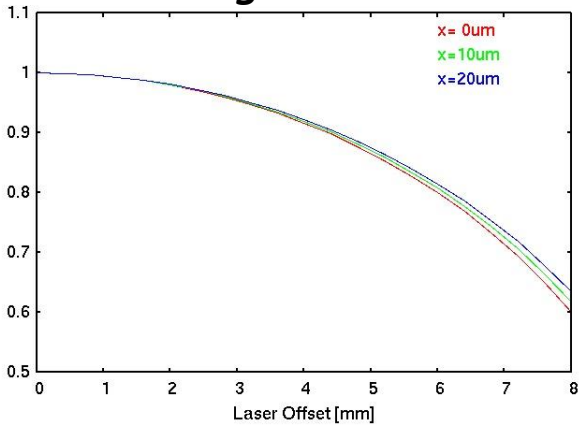
30degree mode



8degree mode



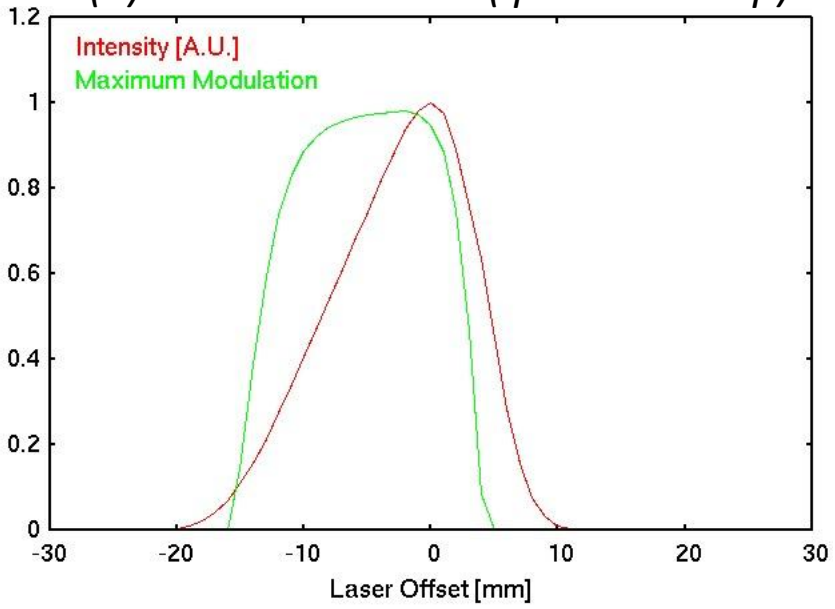
2degree mode



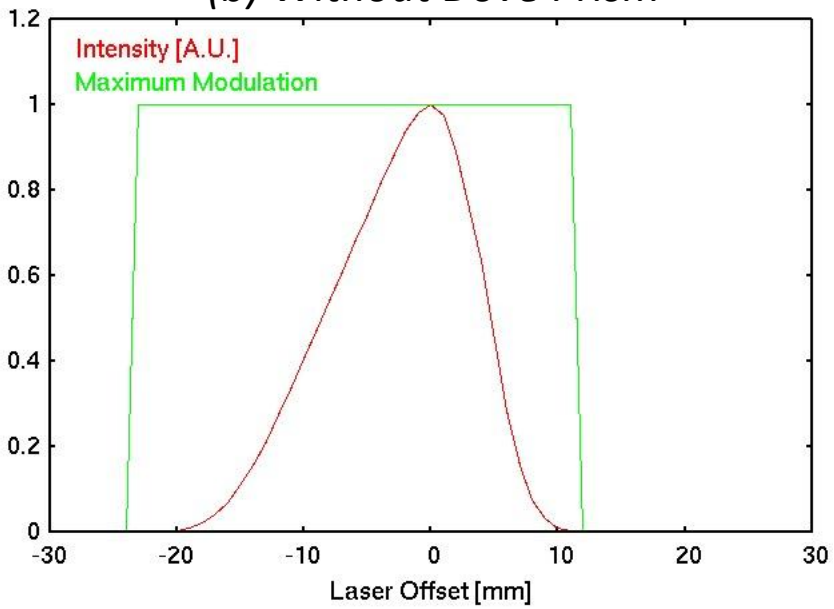
Calculation of Modulation Reduction by Comboluted the Beam Profile for 30degree mode

-Laser position is fixed to intensity maximum.
-Laser full width is assumed 20um.
-Horizontal beam size is assumed to 10um rms.
-Calculate the response to shift the injected laser position

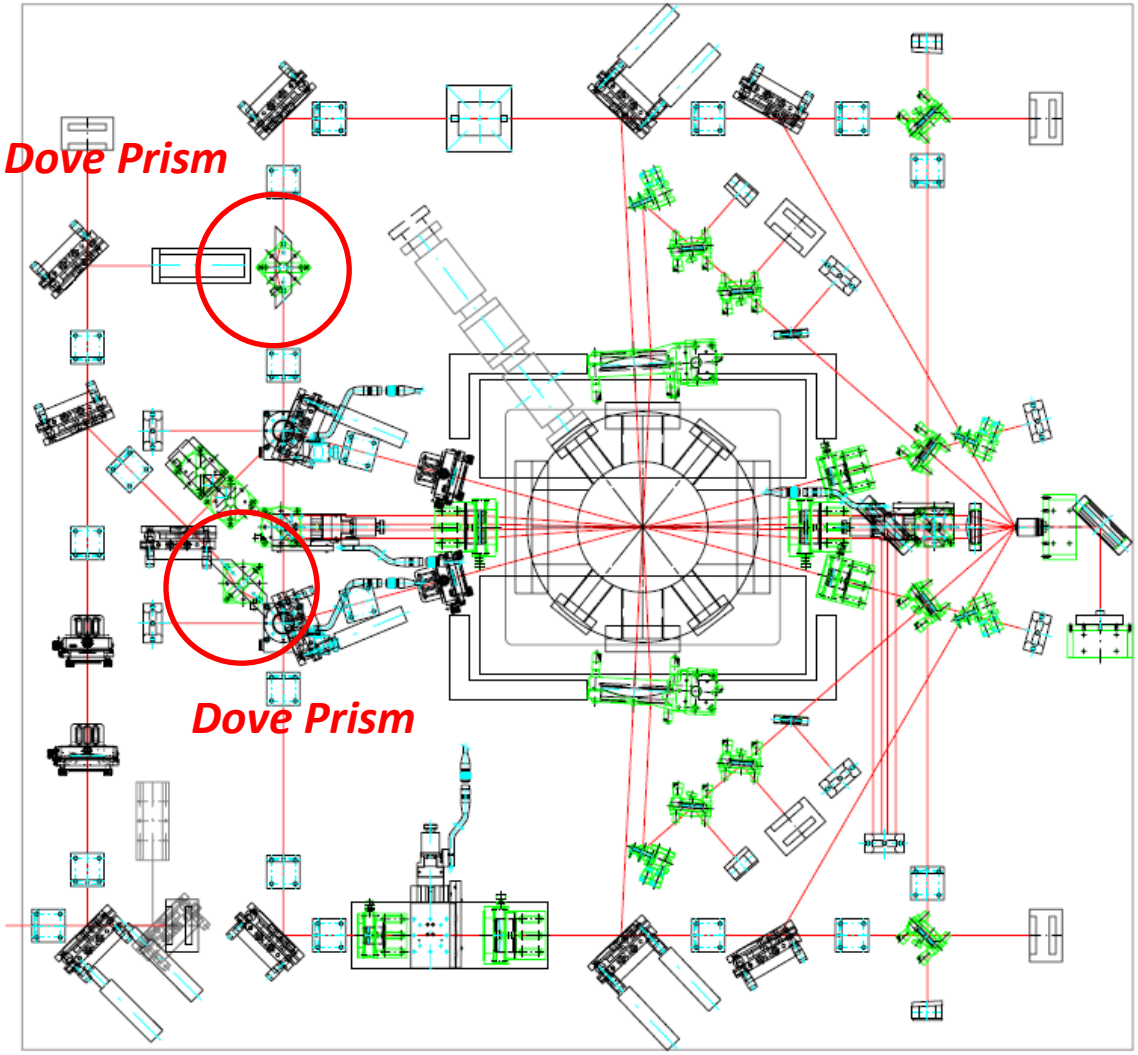
(a) With Dove Prism (present setup)

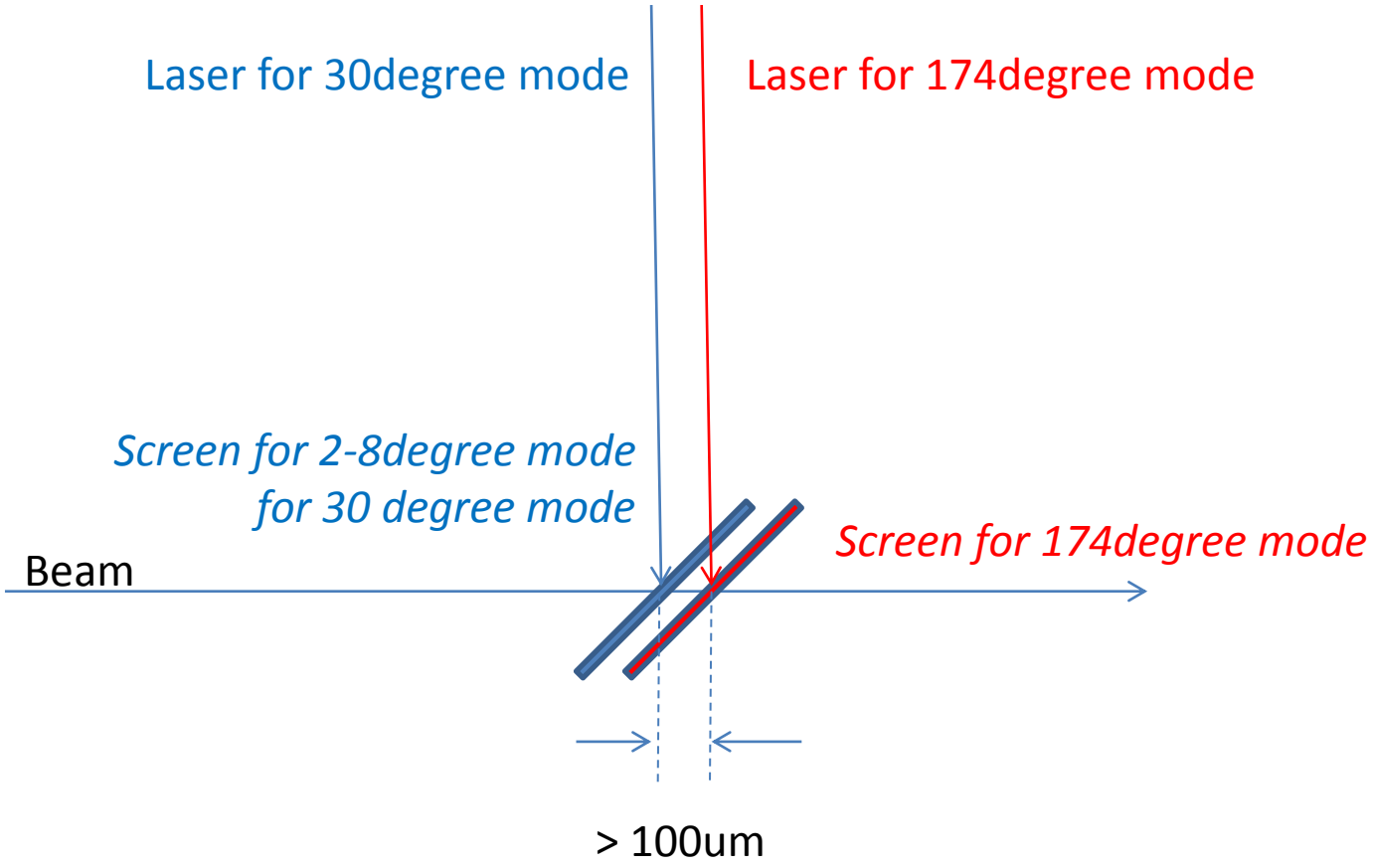


(b) Without Dove Prism



We'd better to remove the Dove prism for 30degree mode.


Dove Prism
Dove Prism



We can not see every laser paths with same screen.

Therefore, we prepare to 2 screens (for 2-30degree mode and 174degree mode)

Upper path for 174 degree mode is design to see 30 degree mode screen