Requirements from IPBSM procedures and discussion of compatibility issues

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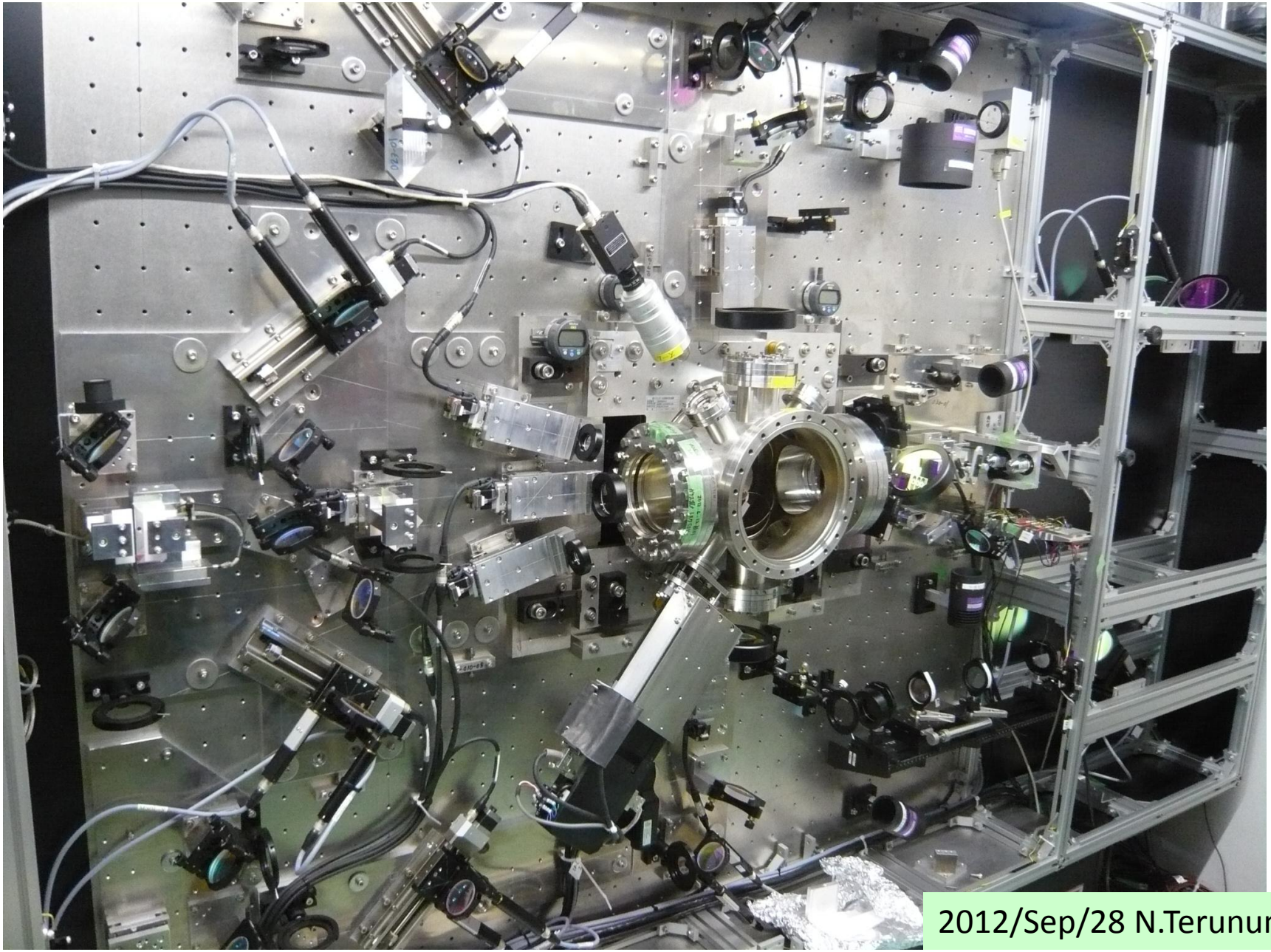
Modification of the IPBSM required in 2012

- From the results of the small-beam trials before summer 2012, we decided to modify the IPBSM system.
- It brings the reconsideration on the new IP chamber especially for the extension for viewports.
- Manufacturing of the extension chamber was canceled.

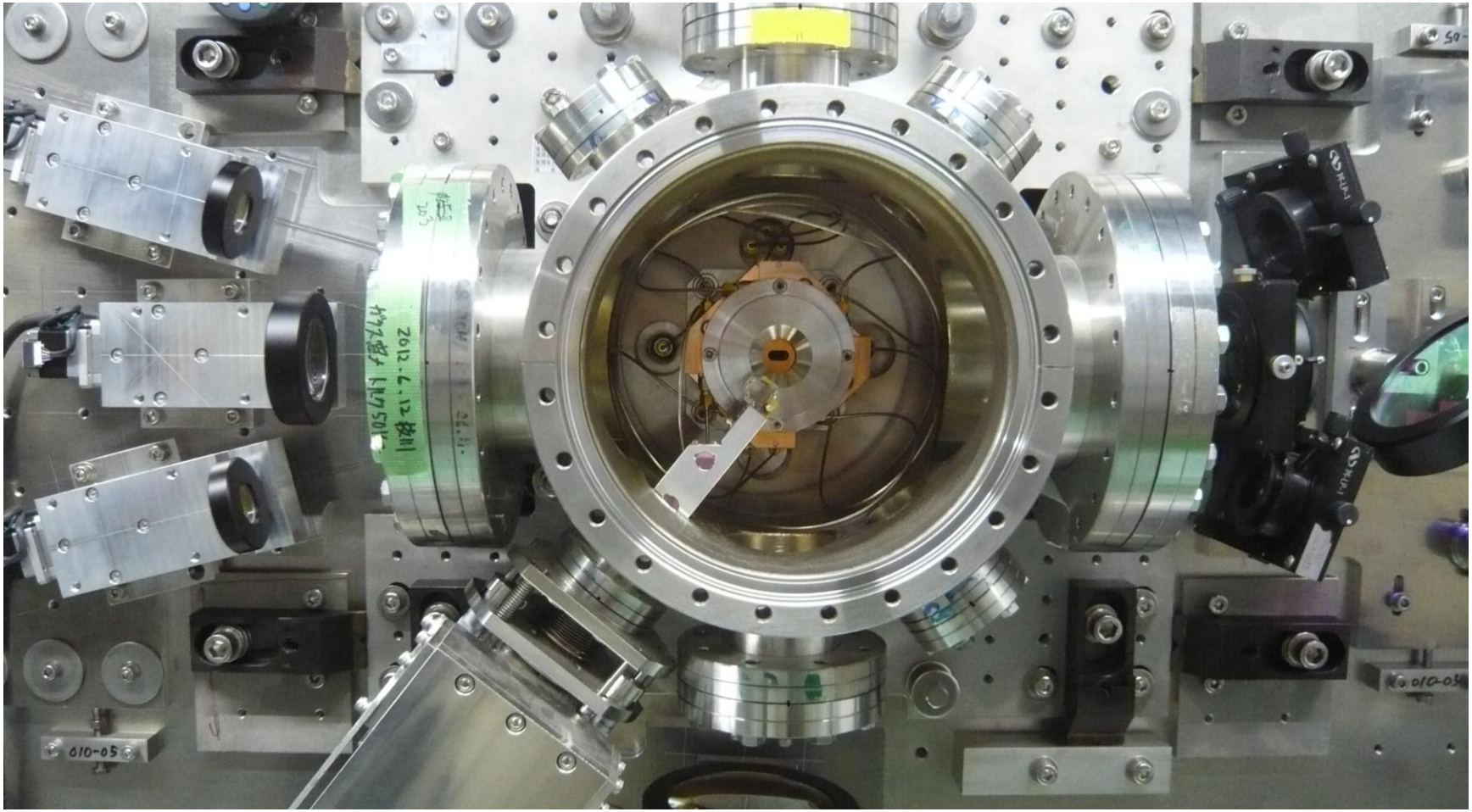
- Laser injection to the IP had to be rigidly defined.
  - Lasers should be adjusted on the reference line marked on the base plate. It has to be checked every time before the beam operation.
  - This adjustment should be done by two points on the reference line with a significant distance before the focal lens.

New IPBSM system at IP



2012/Sep/28 N.Terunuma

IP devices; 2012/Aug/23



IP-BPM Chamber Installation: definition of the IP

Alignment

Which is a reference to define the IP?

- Final Doublet; i.e. e^- beam … all magnets on the mover
  - movable. it can not be a reference.
- IP vertical table … fixed on the floor
  - should be a reference but there is a several mm offset from presently realized optimum FD orbit
- IPBPM … should be on the beam
  - initially aligned by the IP chamber ~ less than 0.5 mm
  - piezo mover ~ +-150 um?
- BSM … lasers should point the IP.
  - Whole BSM system on the vertical table have to be adjusted to the IP by keeping the relative geometry of optical components.

IP-BPM Chamber Installation: Procedure

The IP-BSM vertical table should be a reference of an alignment.

Coping the present optimum beam axis to the references on the vertical table is necessary.

The offset between the table center and a beam may be several mm.

The IP chamber should be positioned for this offset.

The BSM system will be adjusted to the IP chamber reference line.

Essential tools for IPBSM: IP Screen

IP Screen

The screen have to be aligned to **have the IP on the surface**.

The initial alignment in situ should be done without a beam.

The BSM laser can not use to define the IP. It should be pointed to the defined IP.

The tool to define the IP by IPBPM block is needed as done on the present BPM.

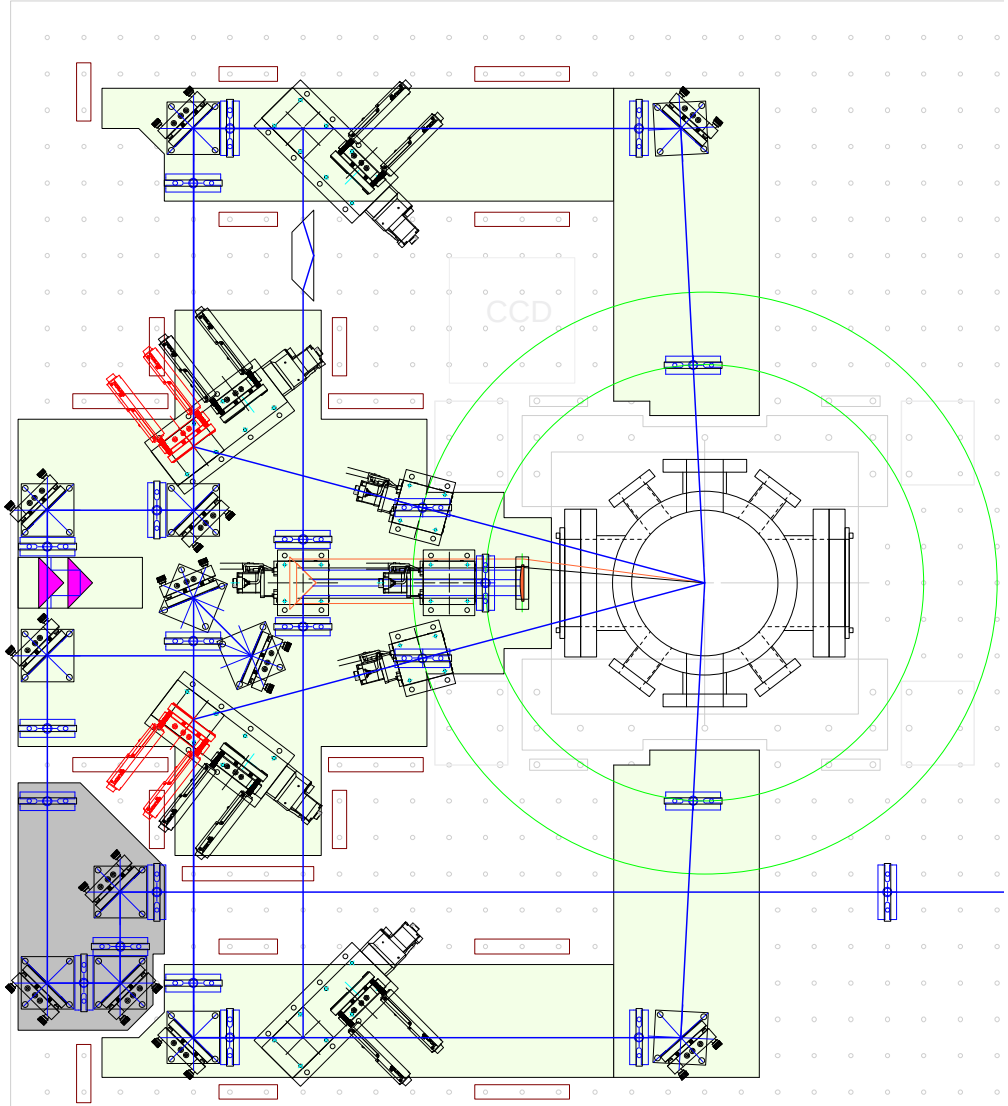
Two lasers, 30 degree mode, points the defined IP on this tool, and can memory the crossing condition. Remove the tool for IP definition.

Insert the screen and adjust to have a laser crossing point on the surface, transverse and longitudinal.

We have to put hand in the chamber to do this. Second BPM have to be dismounted from the chamber.

Relative Alignment

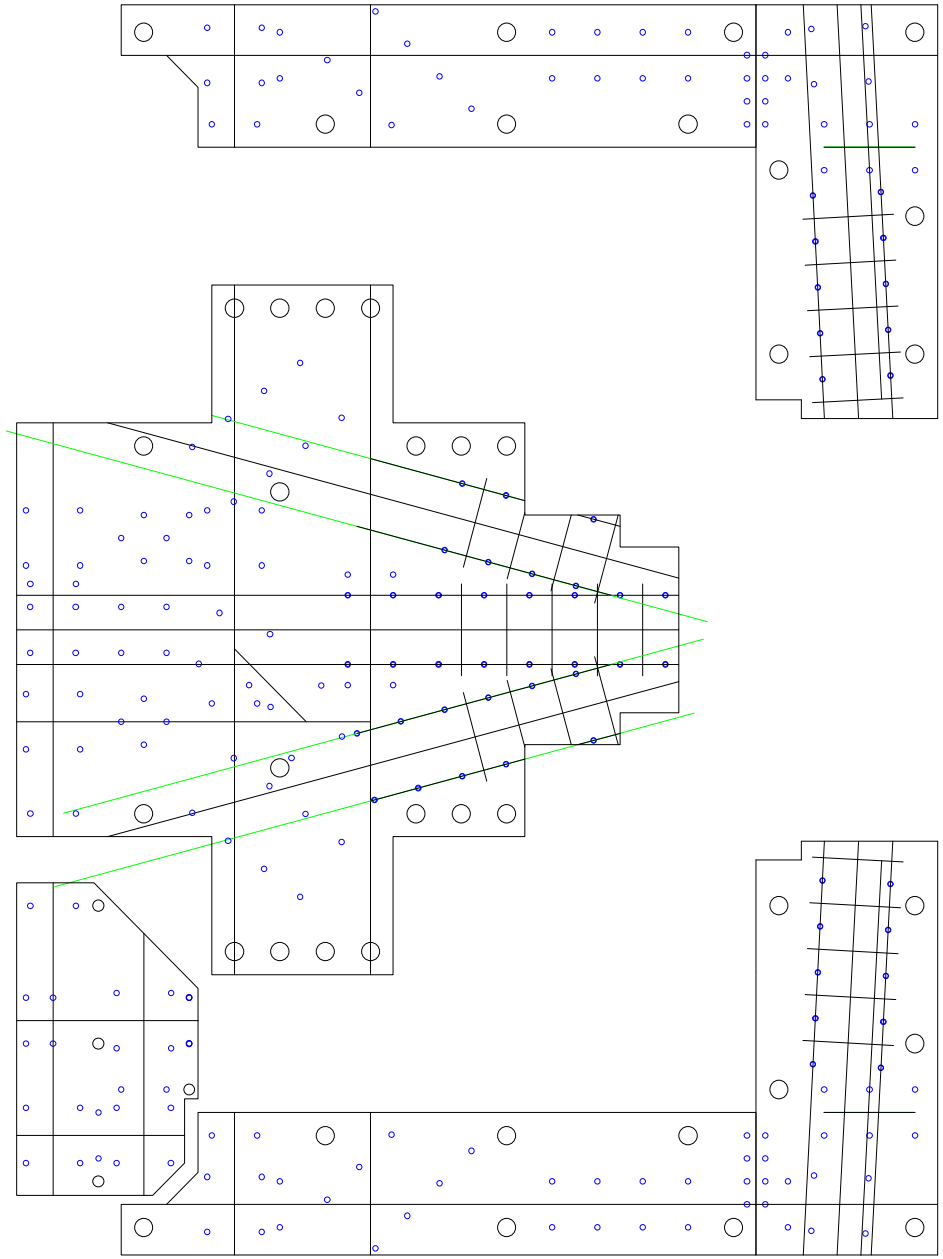
- BSM and IP(BPM) -



For a beam, the reference to the IP is the center of IP-BPM.
IP-BPM is mounted in the vacuum chamber and it may be near the center of chamber.
The alignment of a chamber on the vertical table is not well defined because we can not copy the BPM center on the chamber surface.

Therefore we have to align the BSM toward the IP(-BPM) by directory checking IP by lasers.

This relative alignment will be fixed by future upgrade of IP chamber with new BPMs.

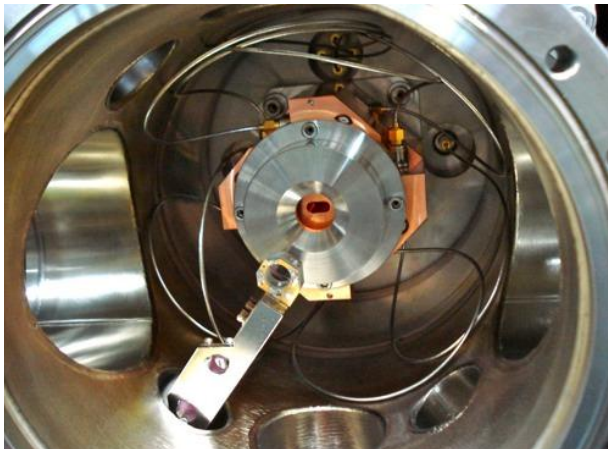


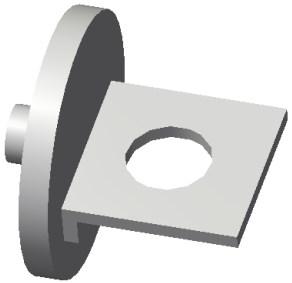
New Base Plates

Mount each devices that should be move together to adjust the relative position to IPBPM; i.e., electron beam.

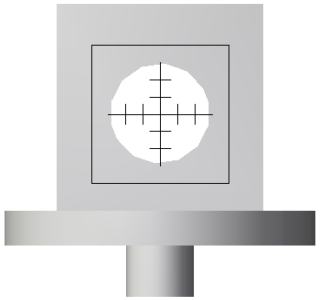
Explicitly define the laser path by reference lines.

Laser Alignment to IP





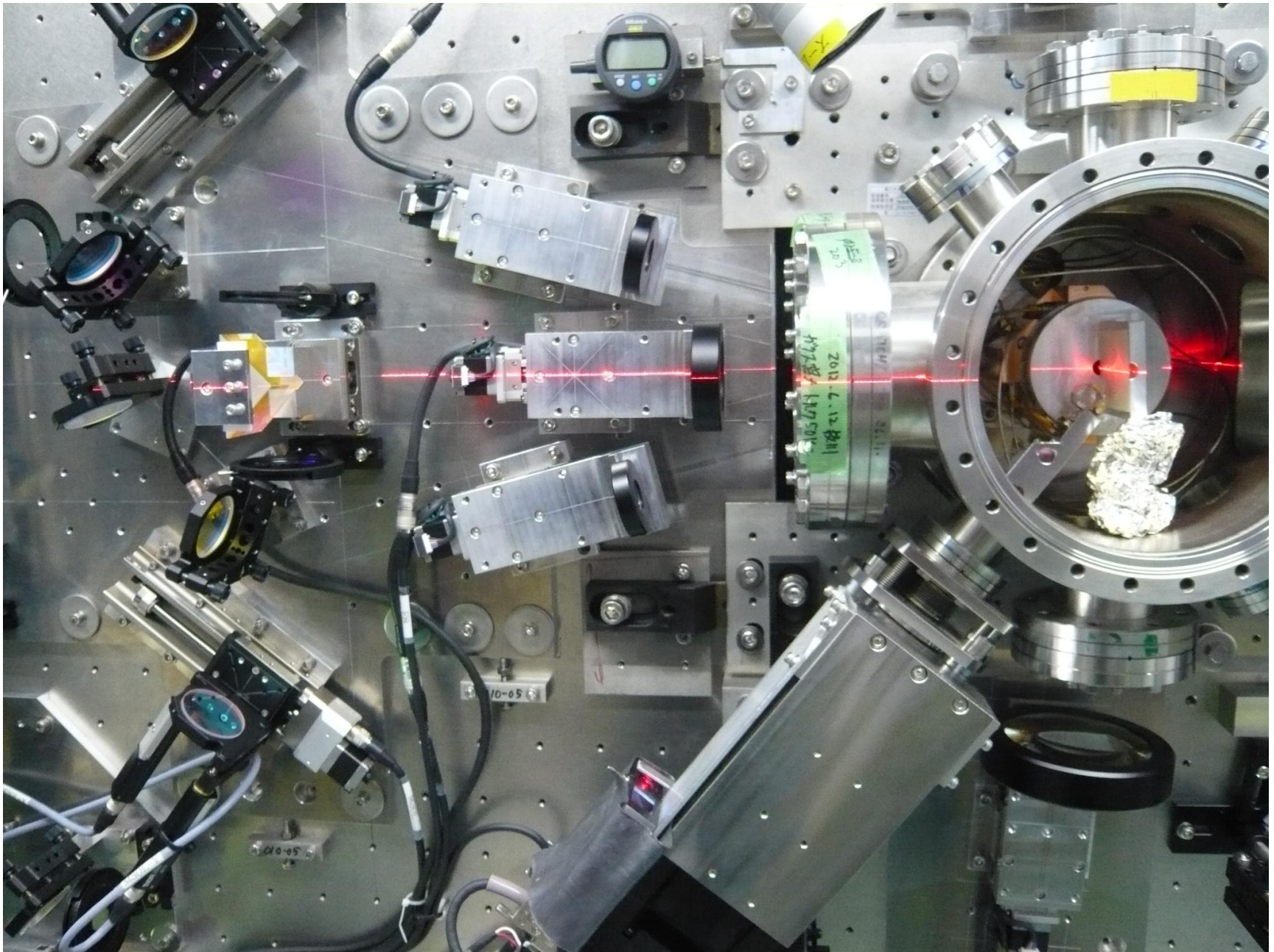
Target at IP



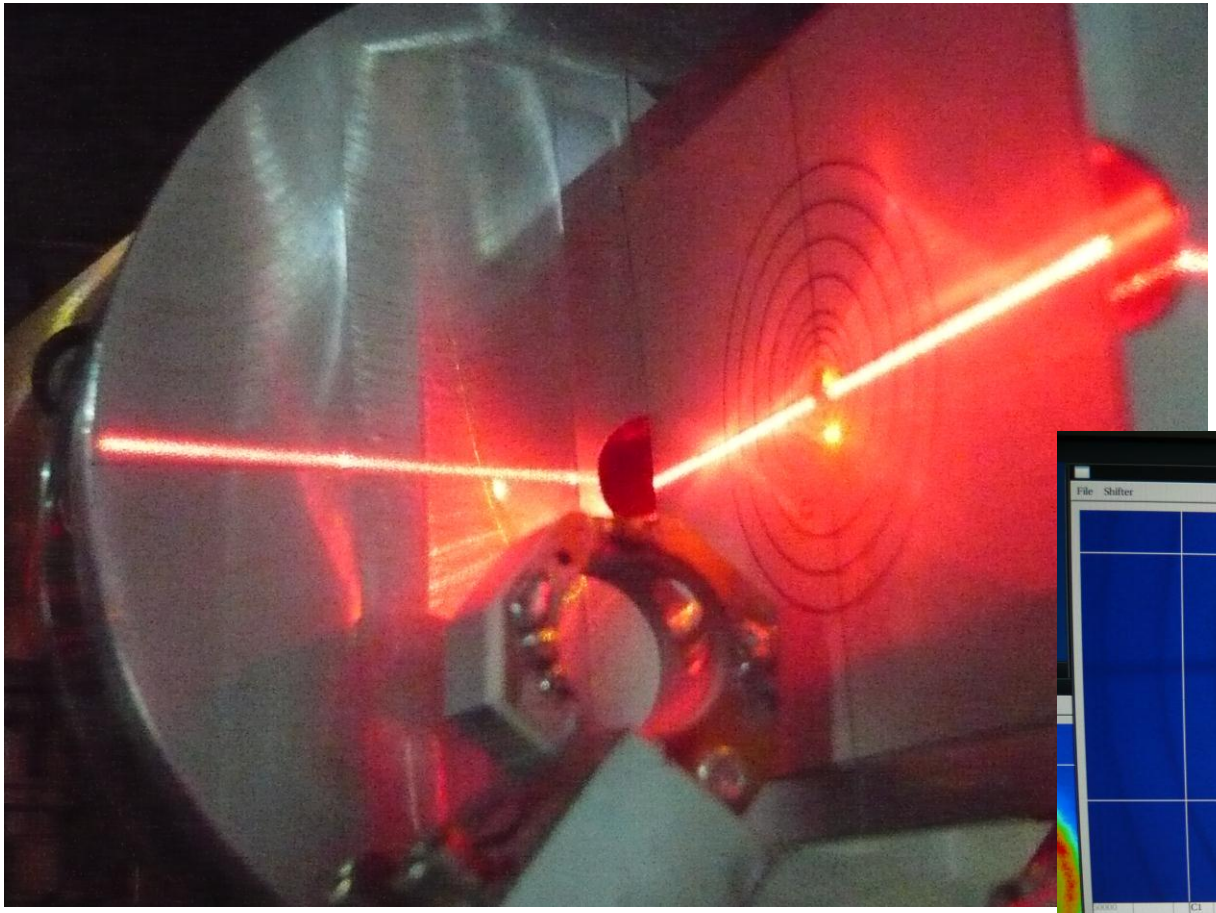
1. Adjust a laser path as designed on the vertical table.
2. Define the IP by putting a target on the alignment guide of the IPBPM.
3. A laser hits the target then find the displacement.
4. Adjust the base-plate position to minimize the displacement.

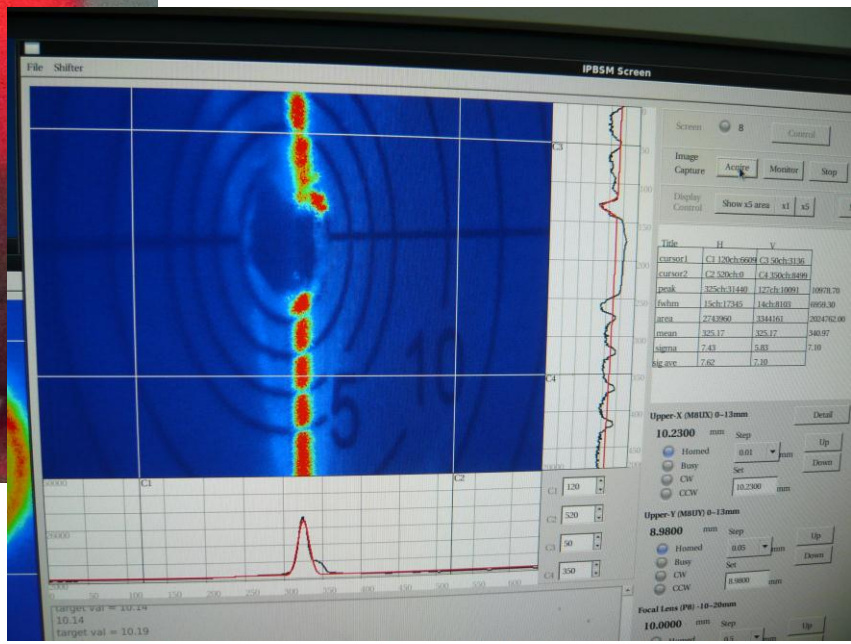
Lasers will be guided to IP within 1 mm or less.
A sheet target can be used in the alignment of two lasers for 174 degree mode.

Alignment

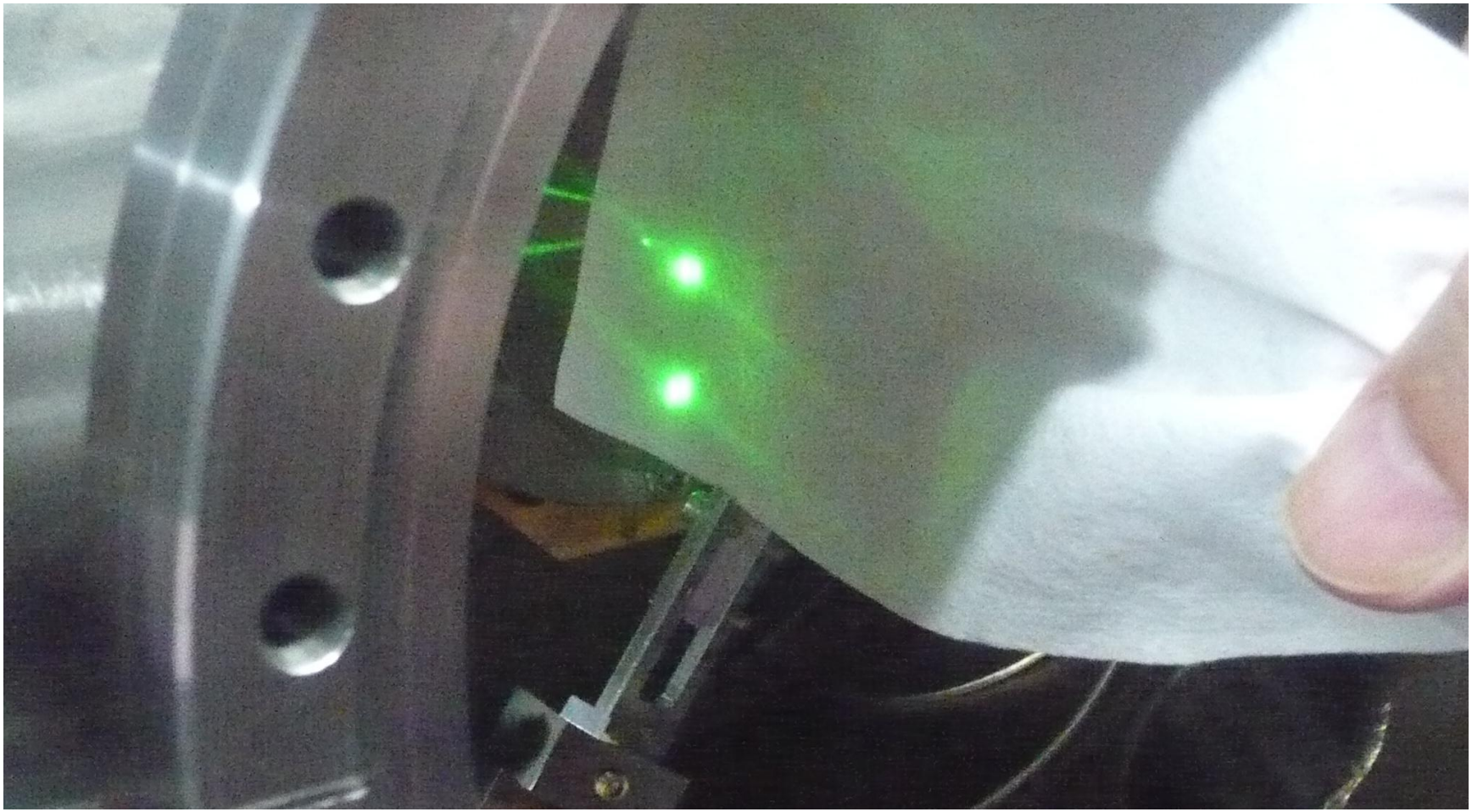


Example of alignment at IP

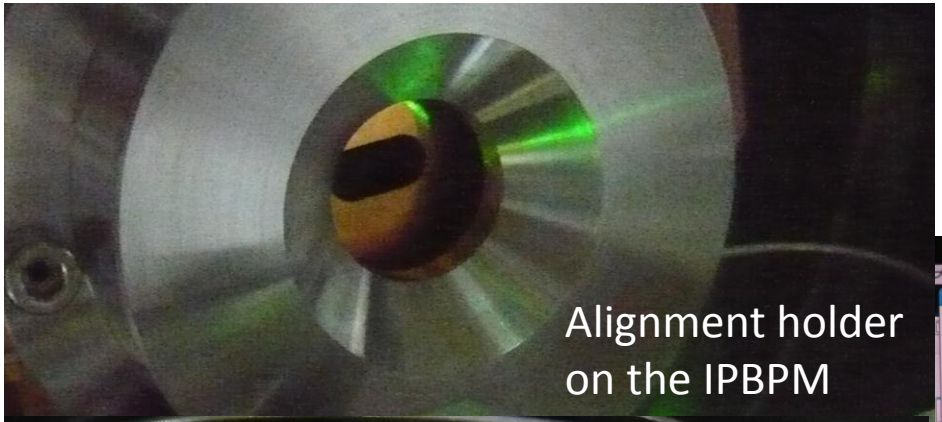


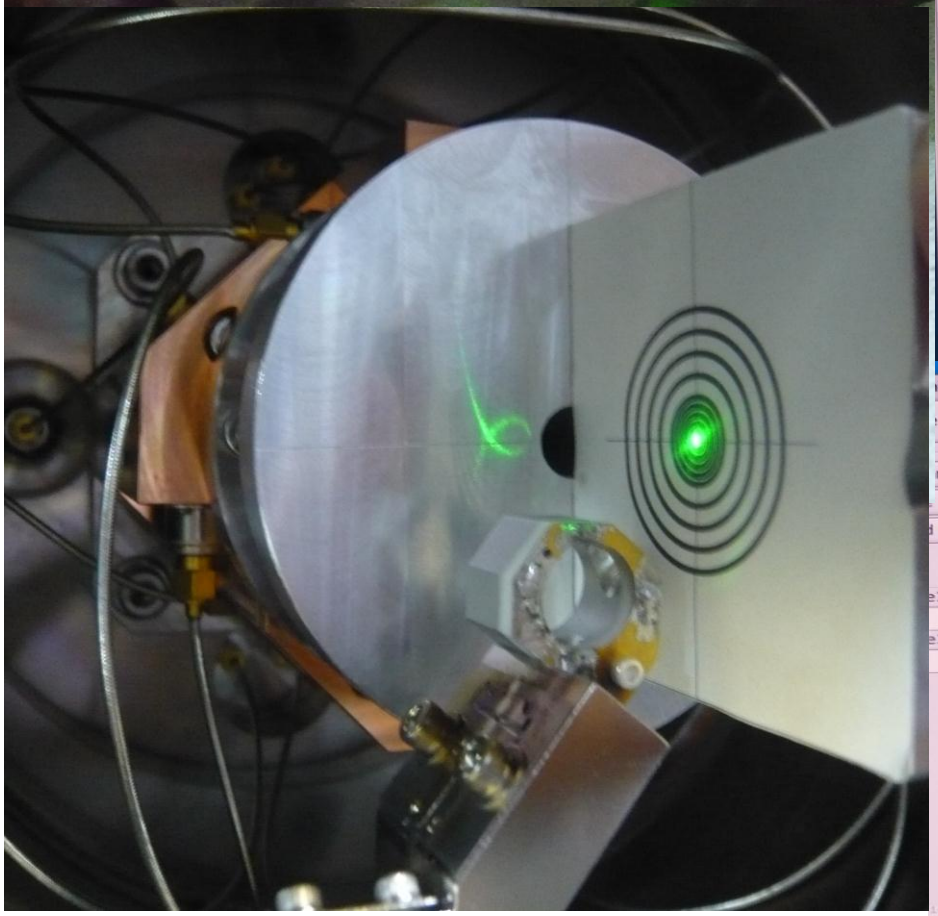


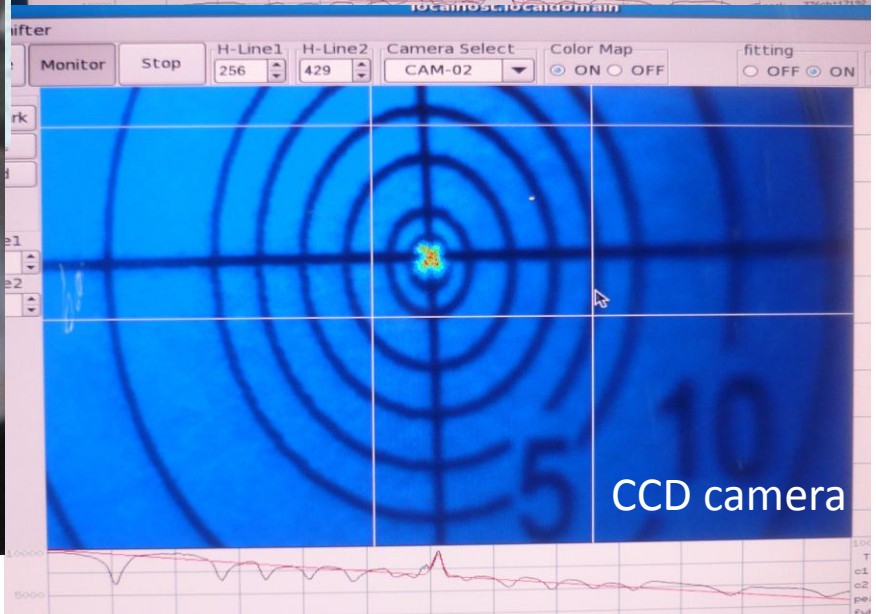
Two lasers injected to the IP: 30 degree mode



Alignment Target at IP



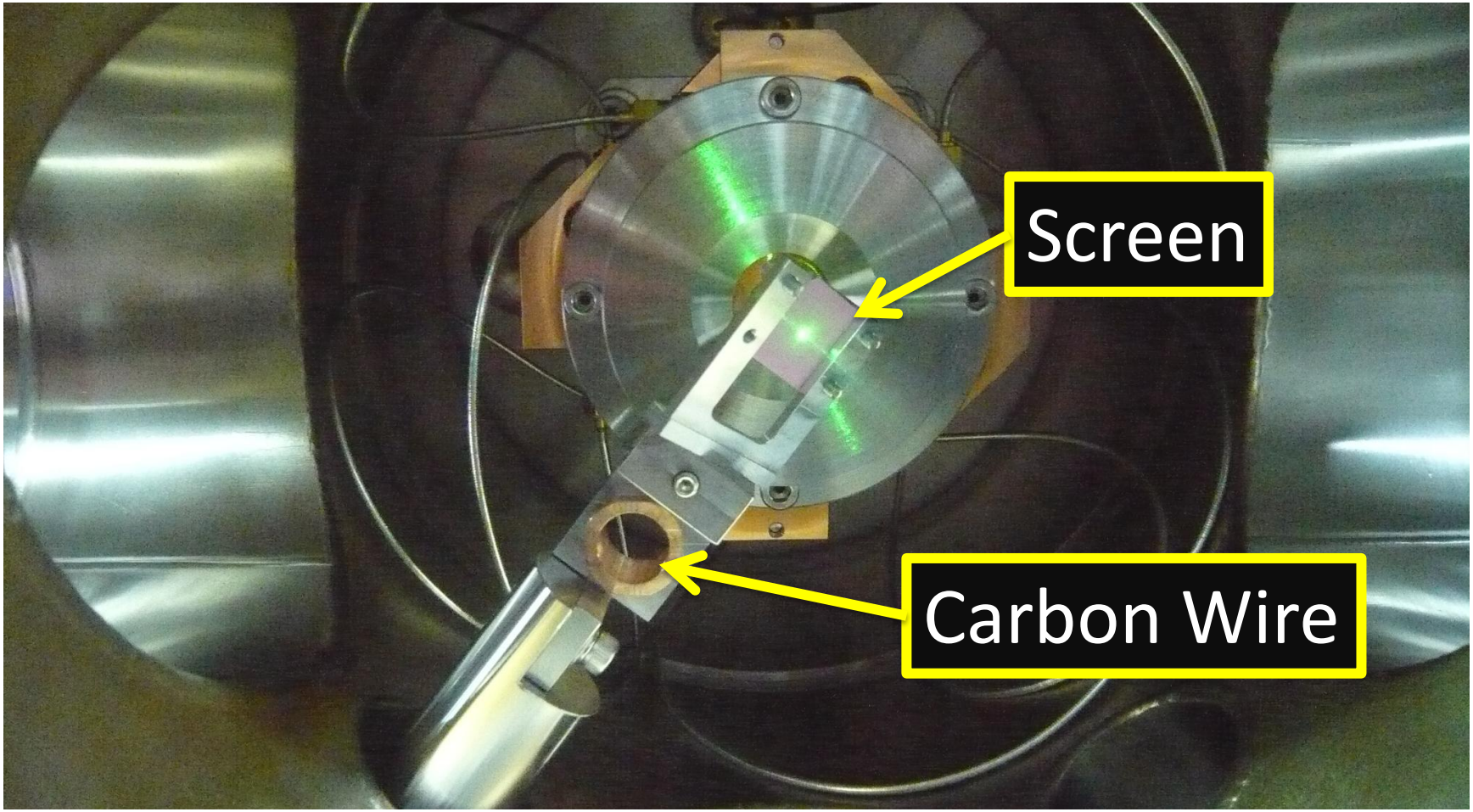


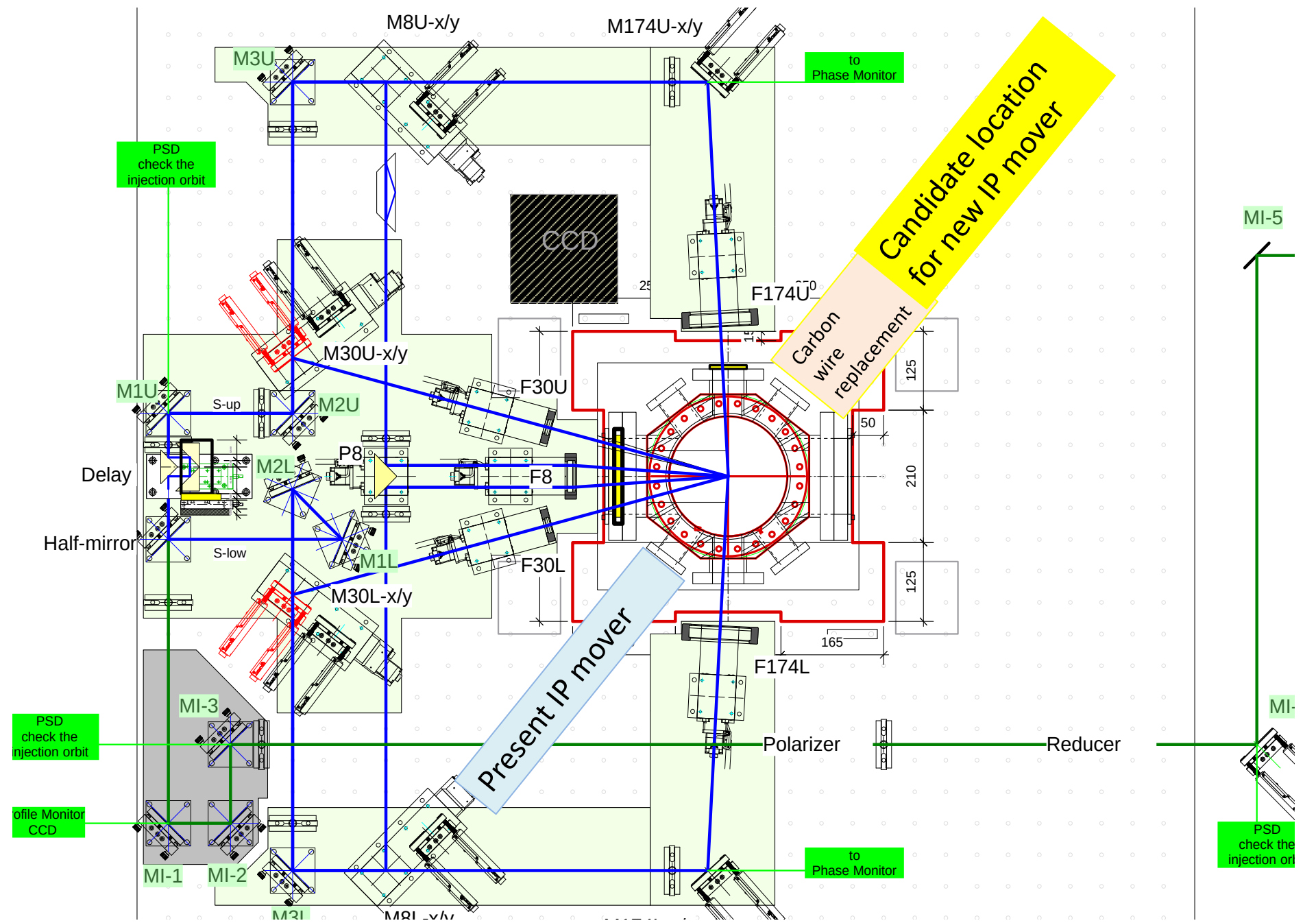


Maintenance of the IP devices

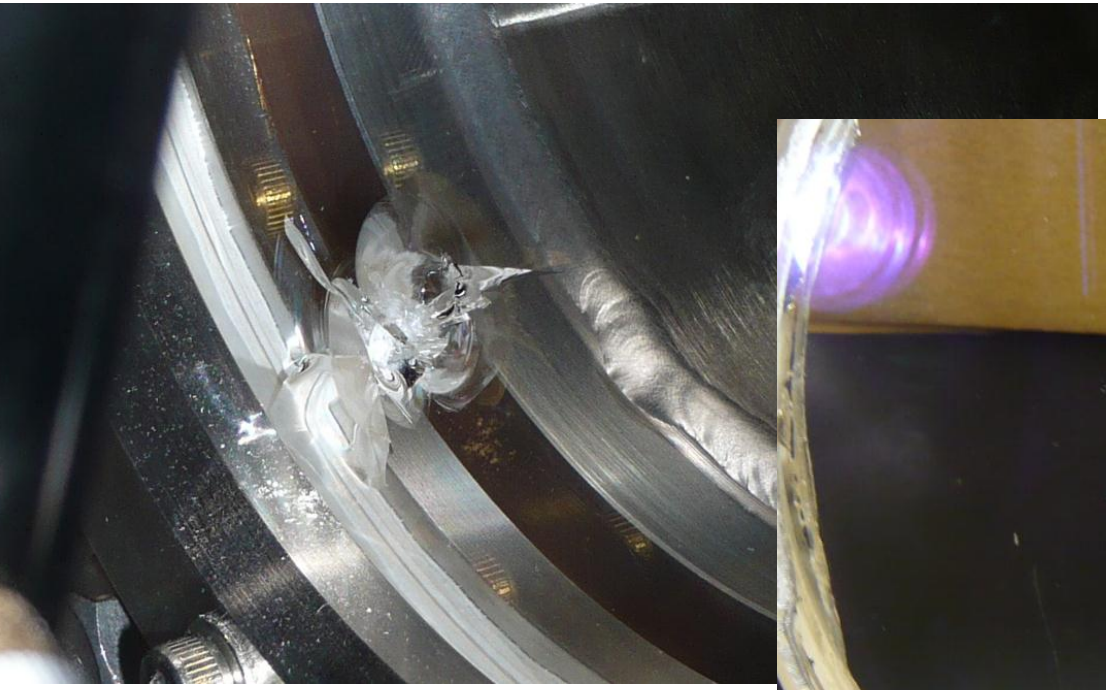
- Carbon Wire
  - It is necessary during the initial beam tuning.
  - Wires will be cut when a beam becomes smaller than 1 um. Frequently replacement of the broken wires is required.
  - **We can not put a hand into the new IP chamber.**
  - **Need other place to exchange the wire without dismounting the IP mover!**
- Viewport
  - Damages due to the high power laser
  - low power → low Compton signal,…

IP target (screen & Carbon wire)




M8U-x/y
M174U-x/y
M3U
to
Phase Monitor
PSD
check the
injection orbit
CCD
Candidate location
for new IP mover
Carbon
wire
replacement
F174U
MI-5
M30U-x/y
M1U
S-up
M2U
F30U
P8
F8
Delay
M2L
Half-mirror
S-low
M1L
F30L
M30L-x/y
125
50
210
125
165
F174L
Present IP mover
MI-3
PSD
check the
injection orbit
Polarizer
Reducer
MI-
ofile Monitor
CCD
MI-1
MI-2
to
Phase Monitor
PSD
check the
injection orl

Maintenance

Viewport Damages!

We expect the replacement of the viewport when it is needed.