iKAGRA初期アラインメント手順
Initial Alignment Procedure for iKAGRA

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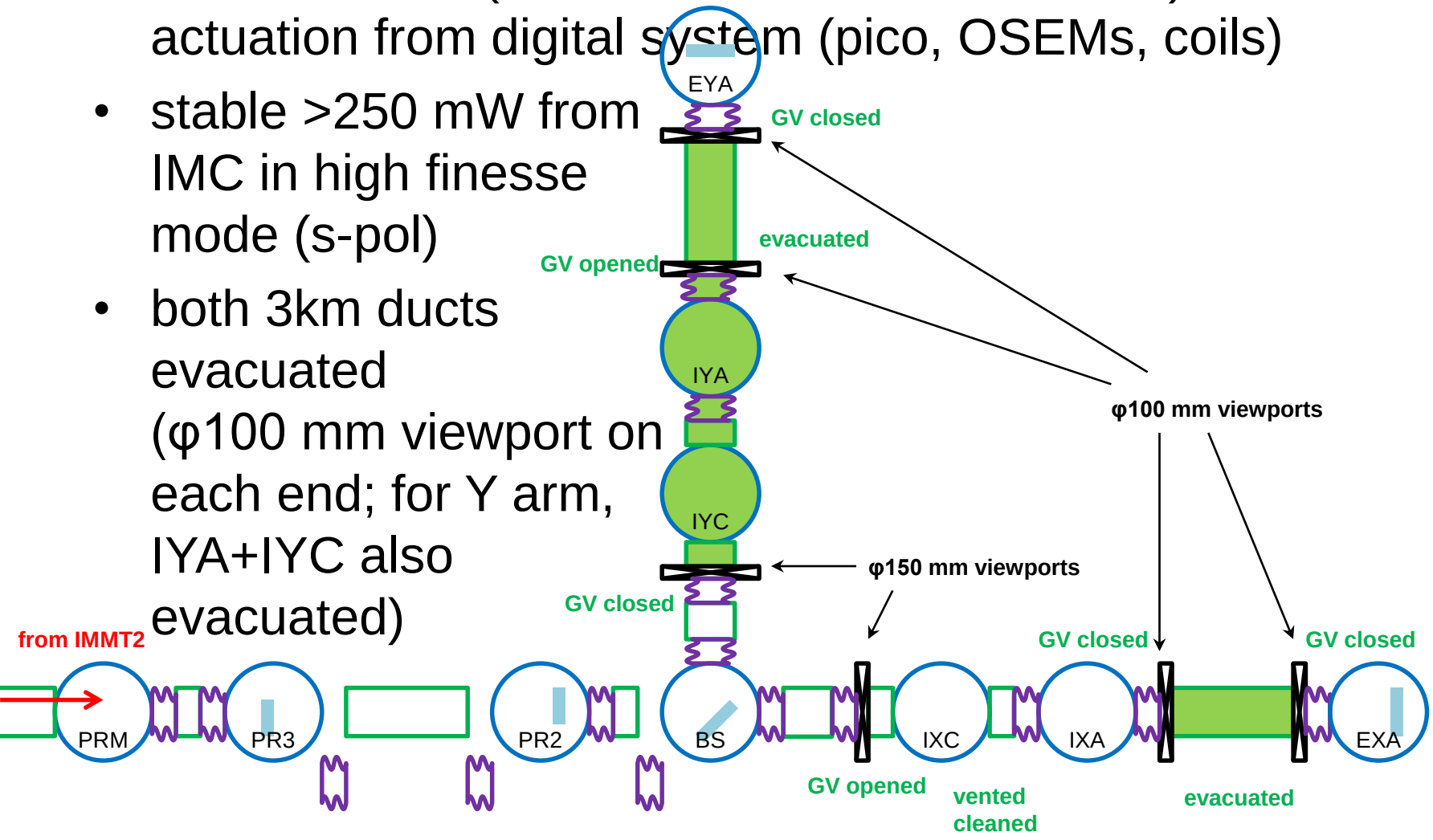
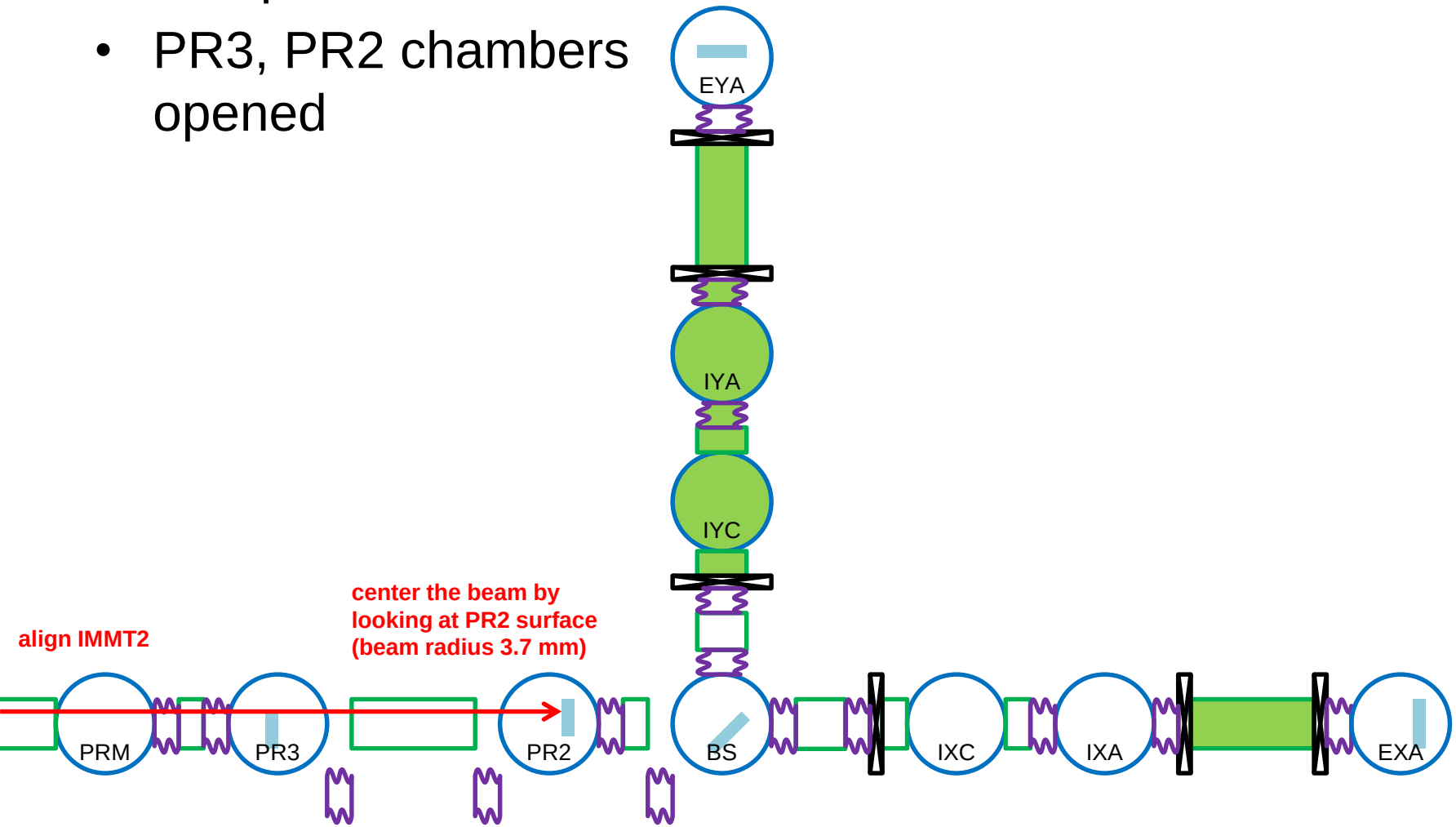
Expected Situation on Mar 2

- All the mirrors (PR2, PR3, BS, ETMX, ETMY) installed with actuation from digital system (pico, OSEMs, coils)
- stable >250 mW from IMC in high finesse mode (s-pol)
- both 3km ducts evacuated (φ100 mm viewport on each end; for Y arm, IYA+IYC also evacuated)



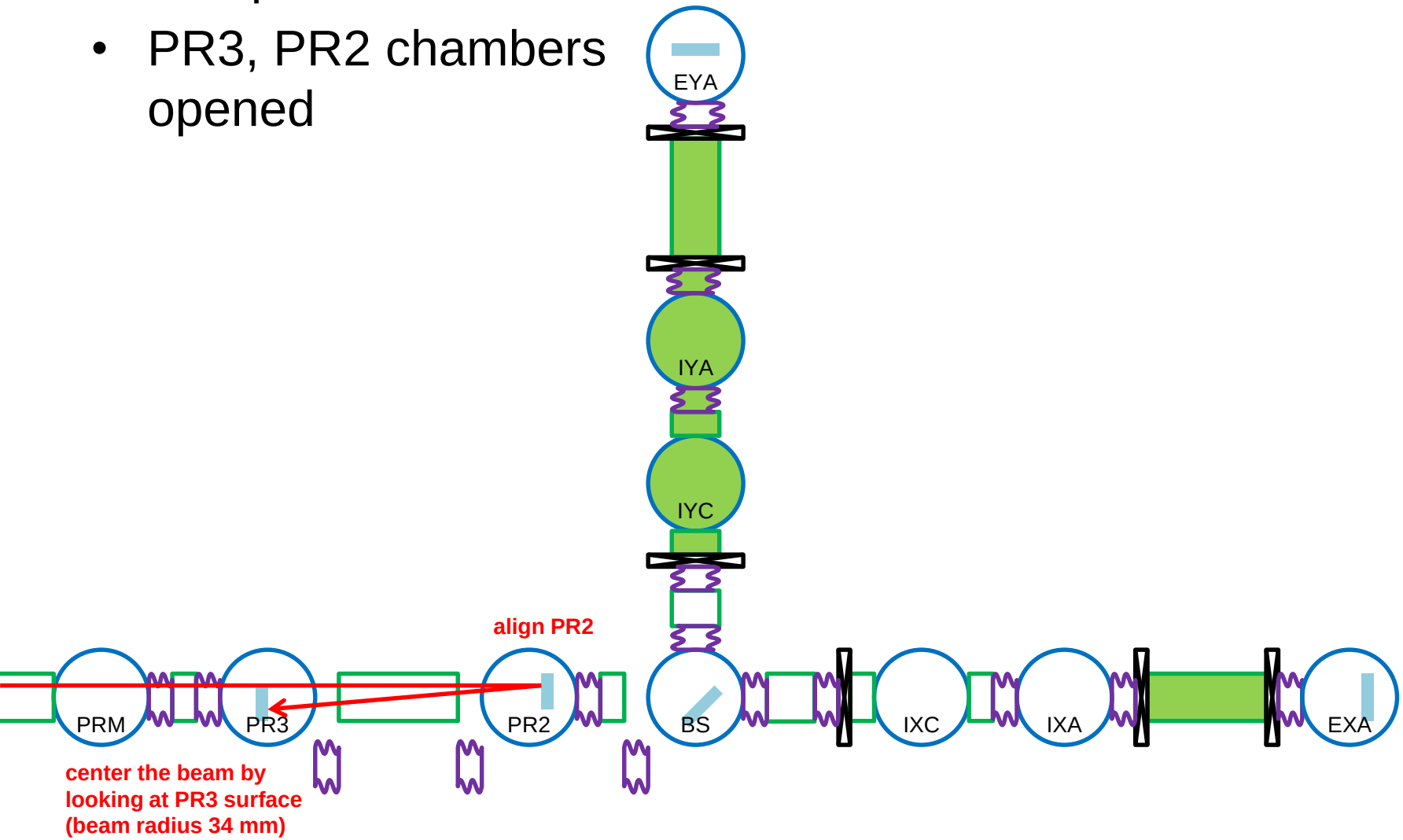
IMMT2 Alignment (Mar 3)

- Use picomotors on IMMT2 to center the beam on PR2
- PR3, PR2 chambers opened



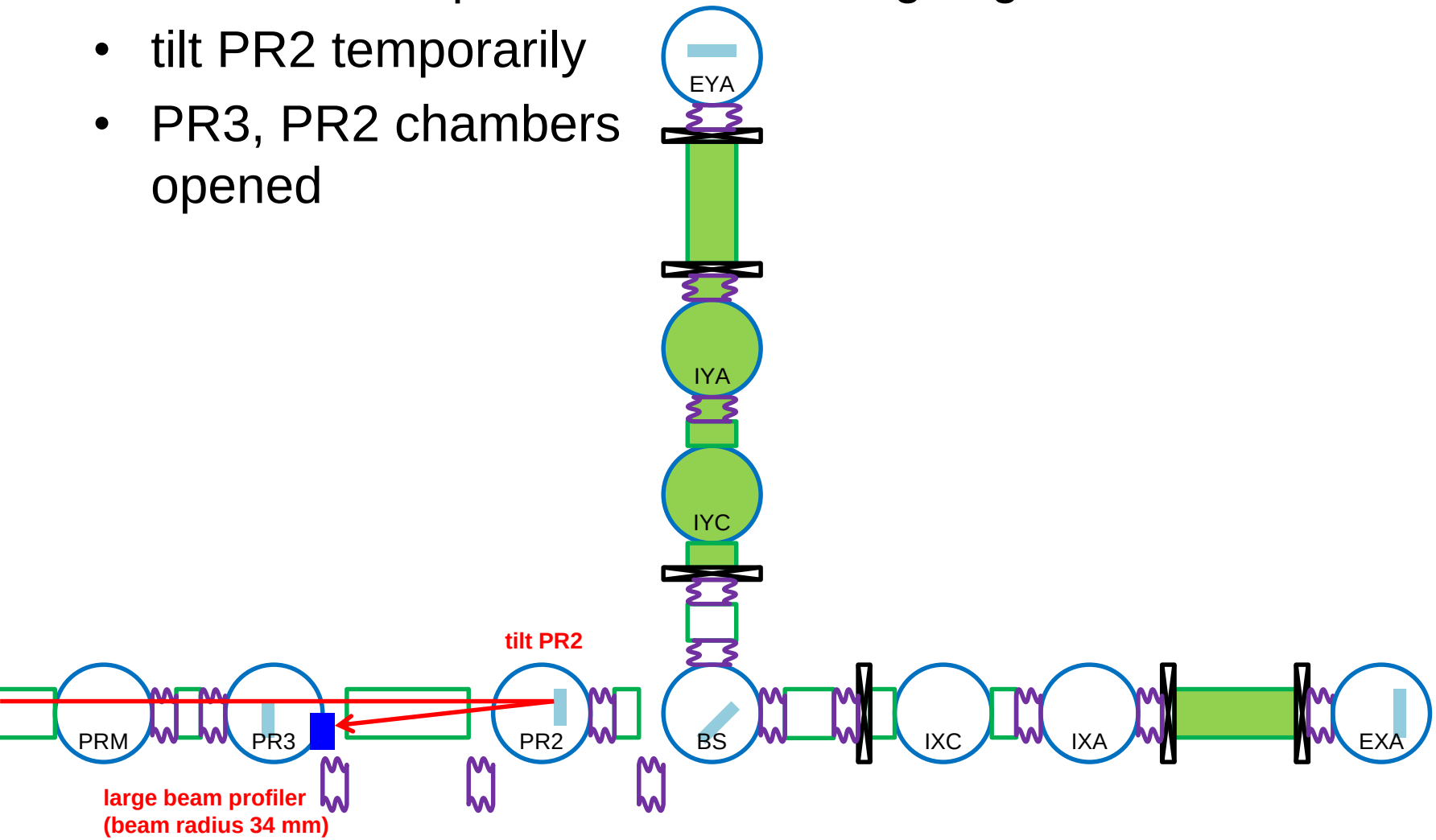
PR2 Alignment (Mar 3)

- Use picomotors on PR2 to center the beam on PR3
- PR3, PR2 chambers opened



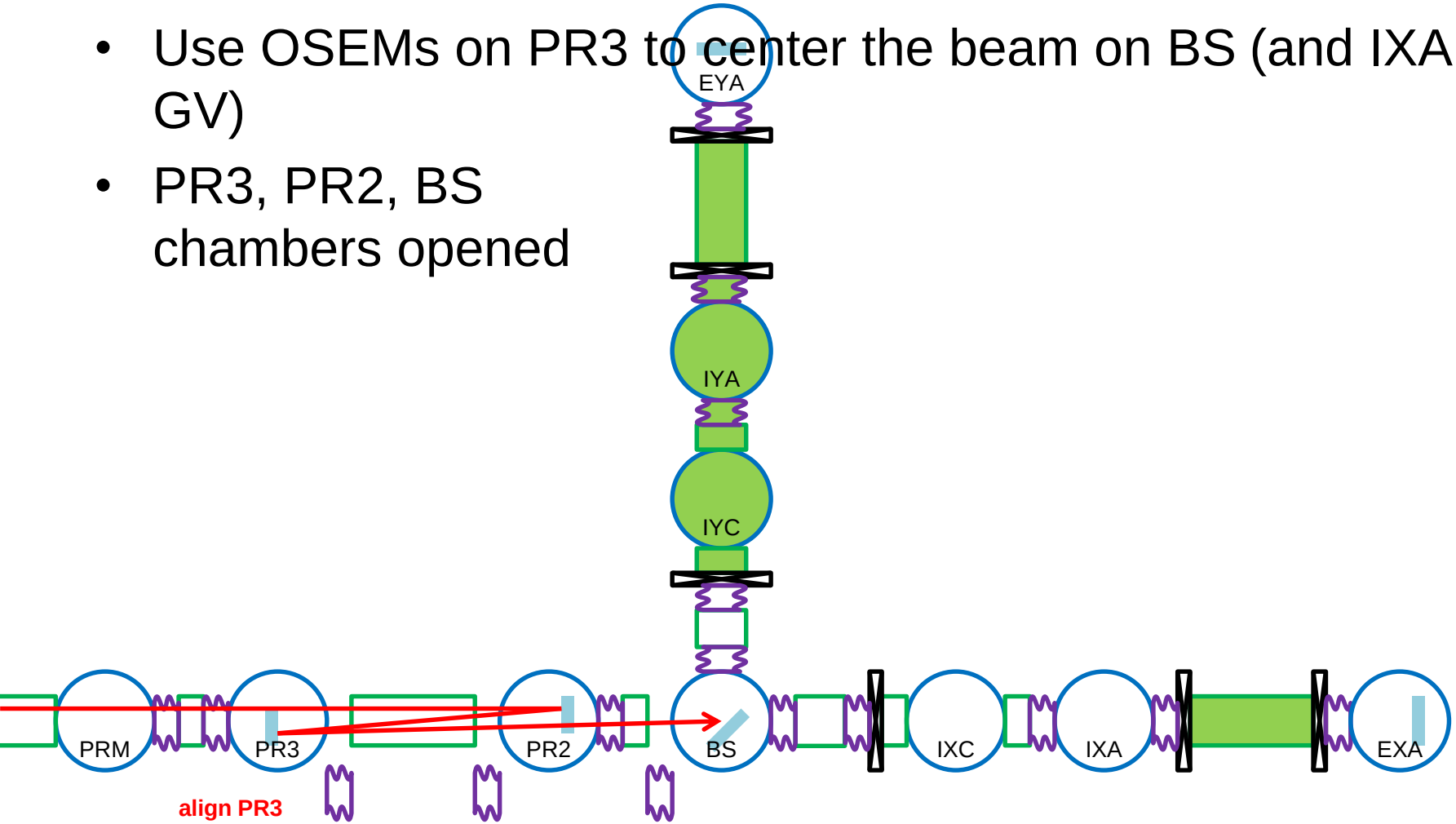
Beam Profiling at PR3 (Mar 3)

- Measure the profile of the beam going to PR3
- tilt PR2 temporarily
- PR3, PR2 chambers opened



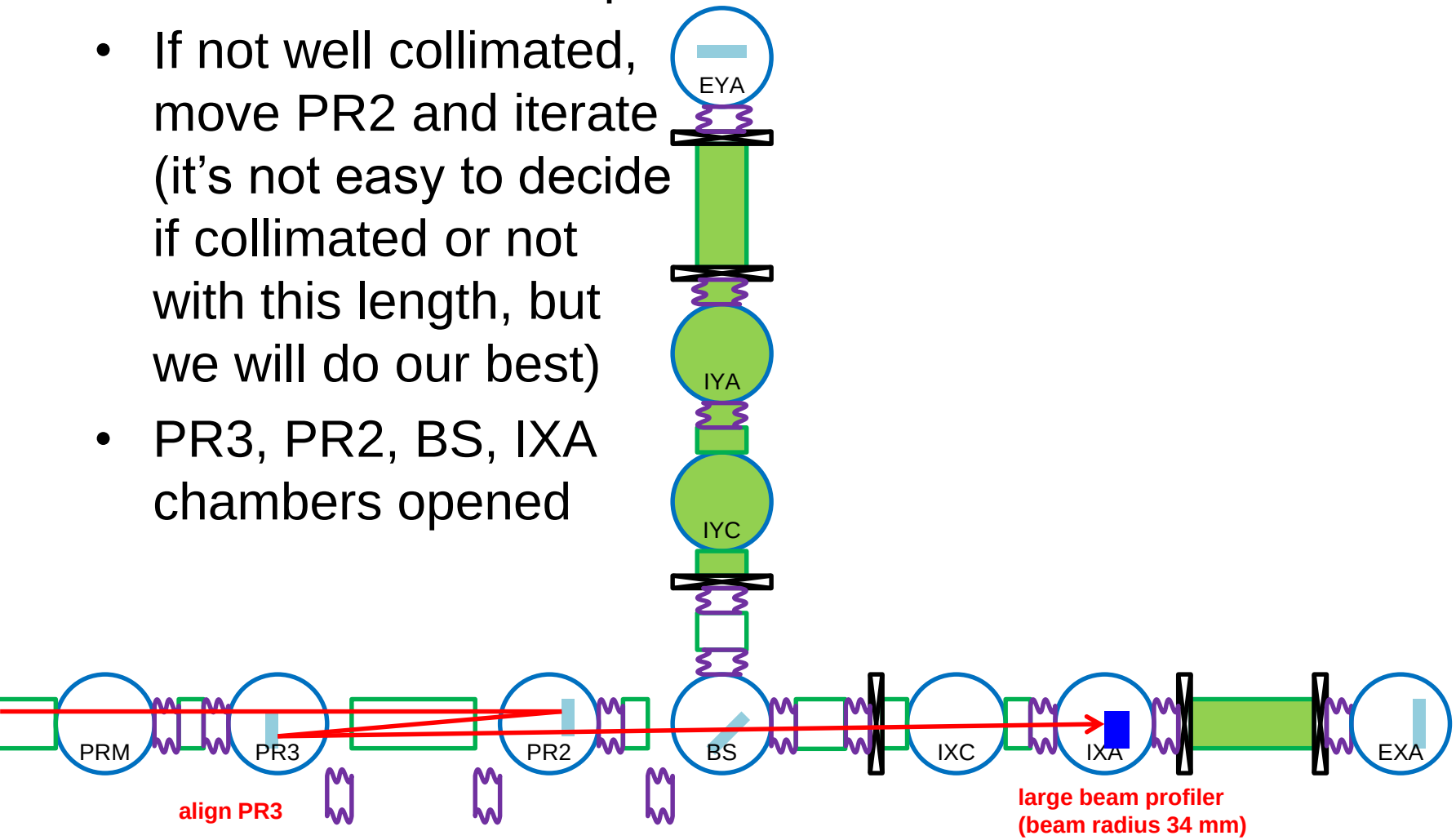
PR3 Alignment (Mar 4)

- Peel PR3 first contact
- Use OSEMs on PR3 to center the beam on BS (and IXA GV)
- PR3, PR2, BS chambers opened



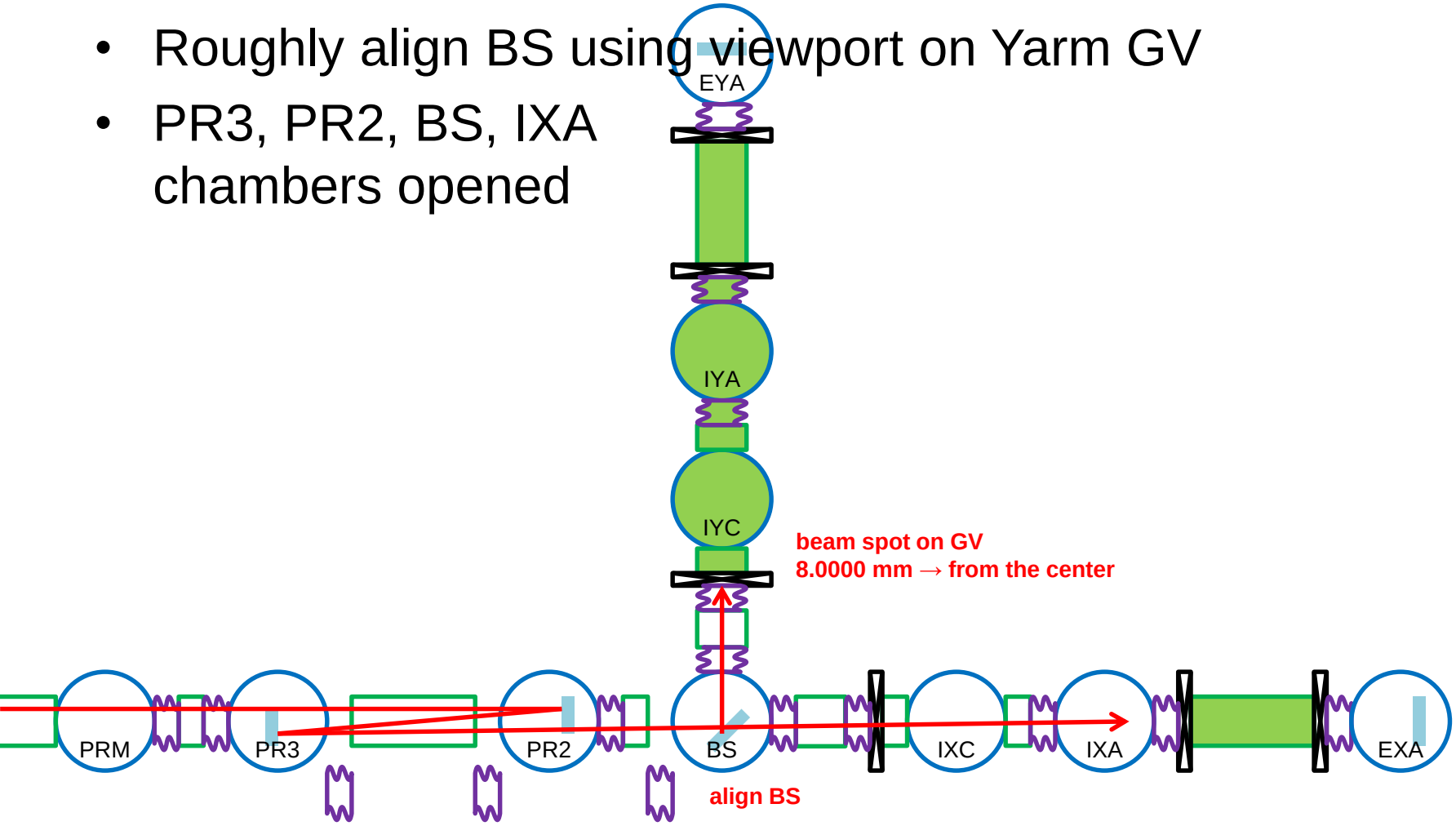
Beam Profiling at IXA (Mar 4)

- Measure the beam profile at IXA
- If not well collimated, move PR2 and iterate (it's not easy to decide if collimated or not with this length, but we will do our best)
- PR3, PR2, BS, IXA chambers opened



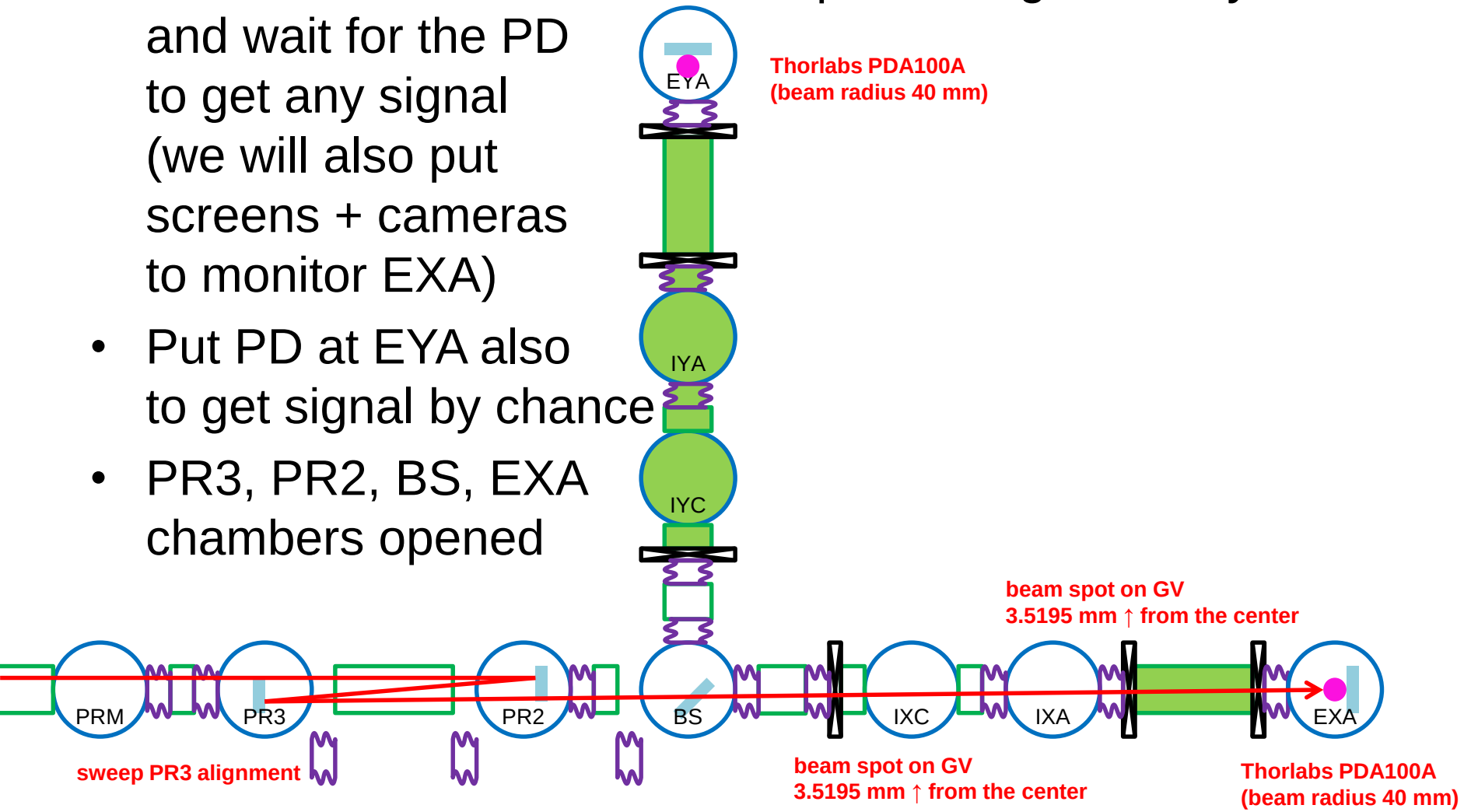
BS rough alignment (Mar 4)

- Peel BS first contact
- Roughly align BS using viewport on Yarm GV
- PR3, PR2, BS, IXA chambers opened



Pointing to X Arm (Mar 4-7)

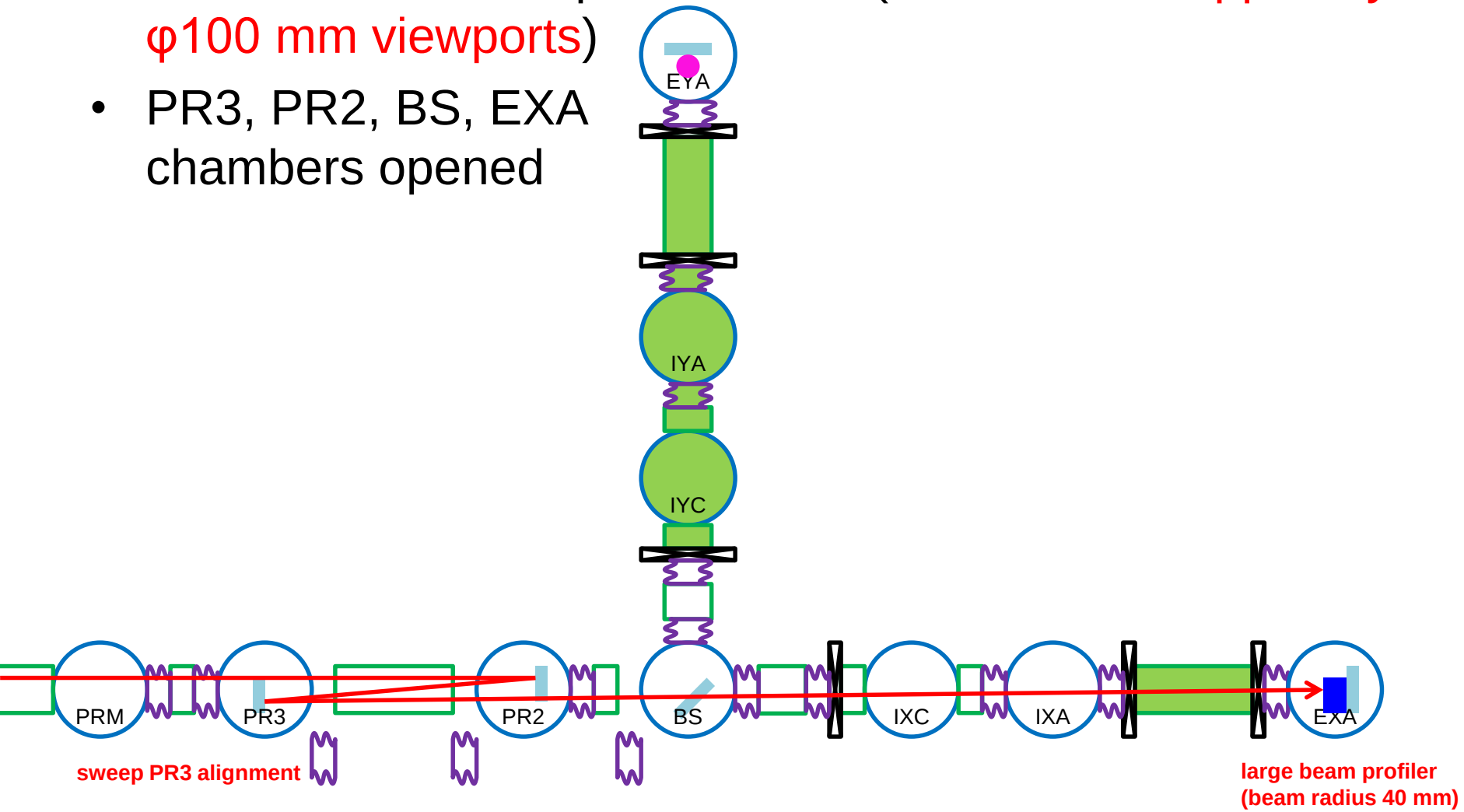
- Put PD in EXA chamber, sweep PR3 alignment by OSEMs, and wait for the PD to get any signal (we will also put screens + cameras to monitor EXA)
- Put PD at EYA also to get signal by chance
- PR3, PR2, BS, EXA chambers opened



- If no success, go to plan B

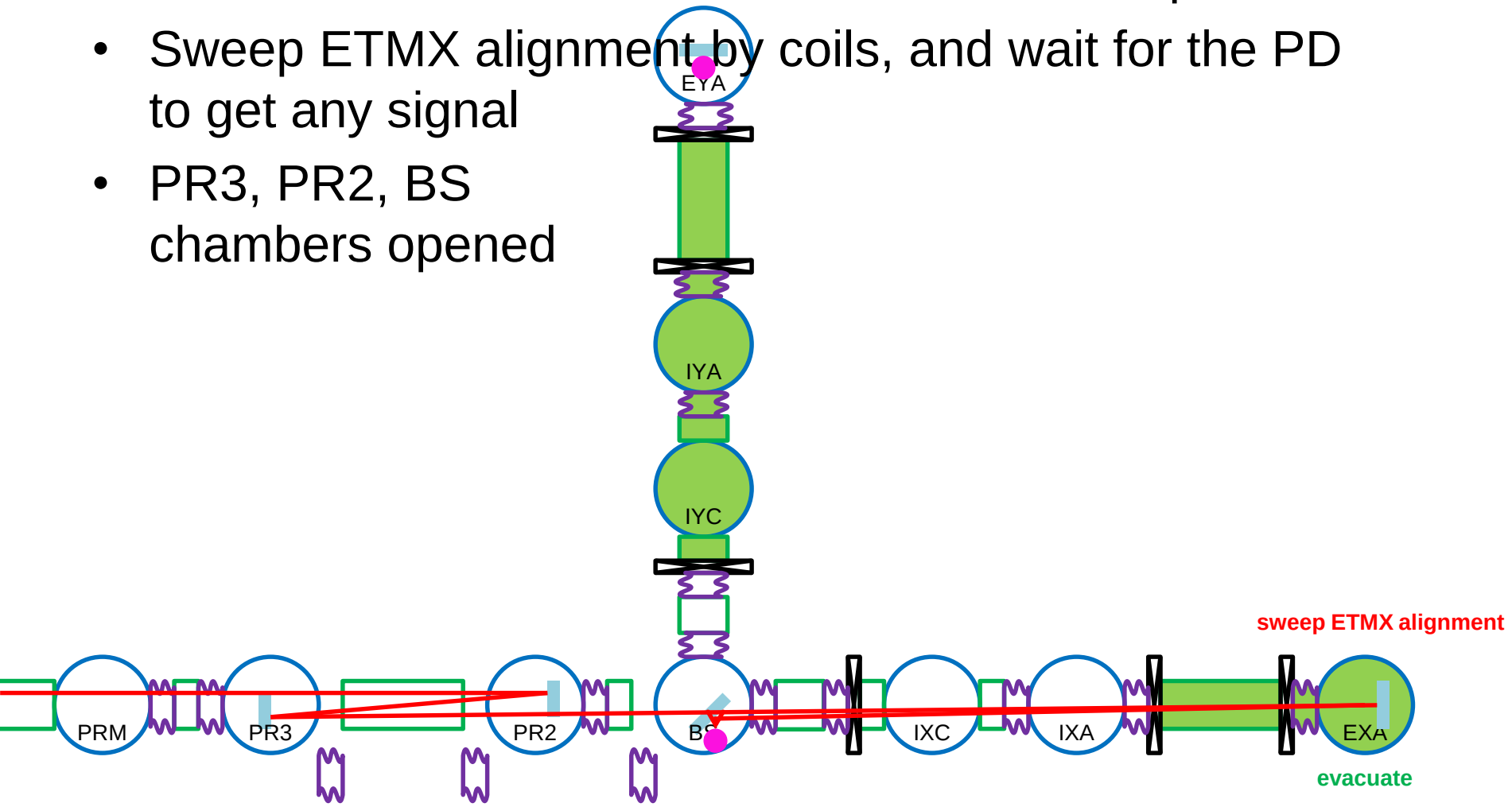
Beam Profiling at EXA (Mar 7)

- Measure the beam profile at IXA (this beam is clipped by φ100 mm viewports)
- PR3, PR2, BS, EXA chambers opened



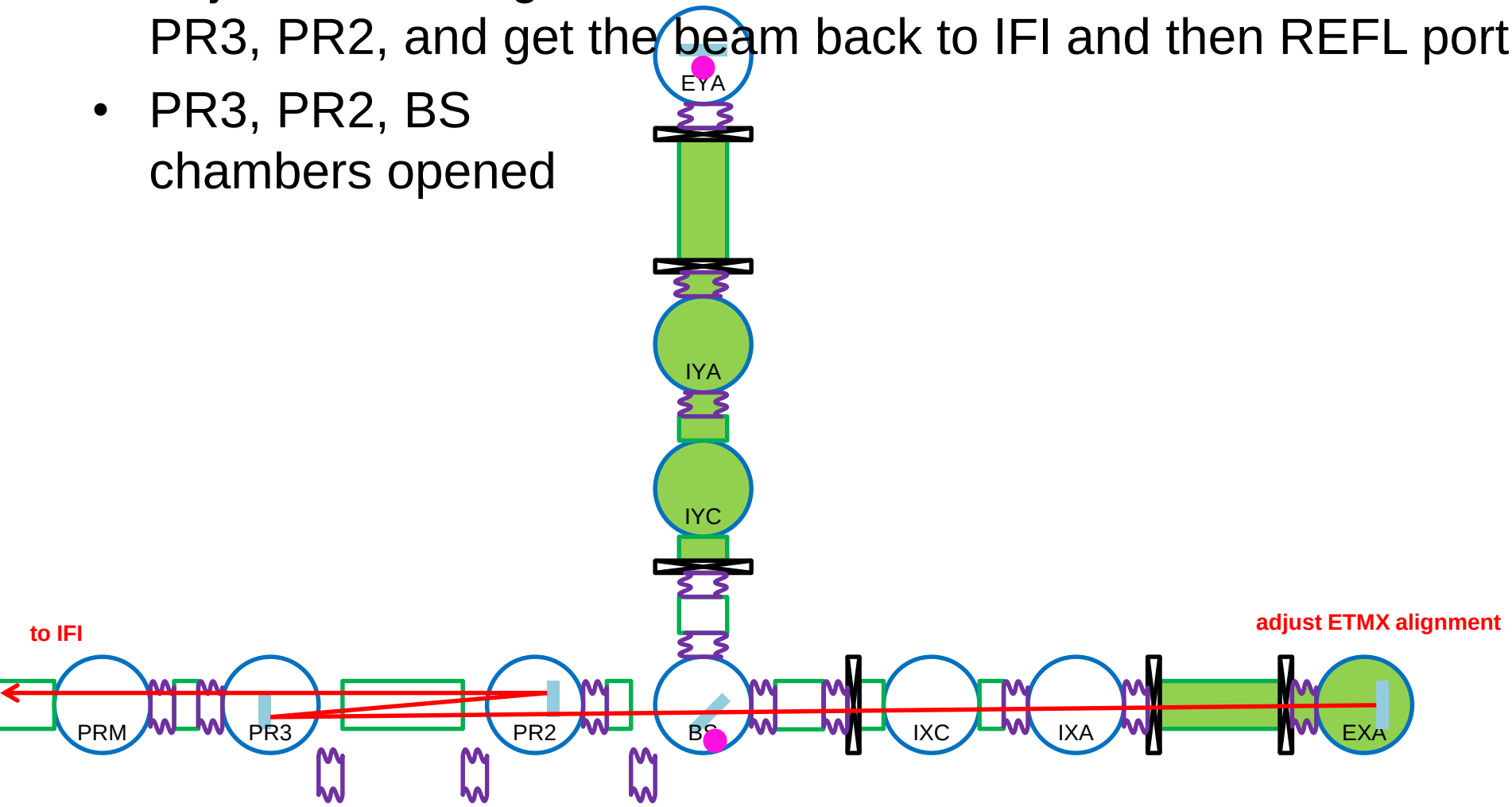
Pointing Back from X Arm (Mar 8)

- Peel ETMX first contact and evacuate EXA if possible
- Sweep ETMX alignment by coils, and wait for the PD to get any signal
- PR3, PR2, BS chambers opened



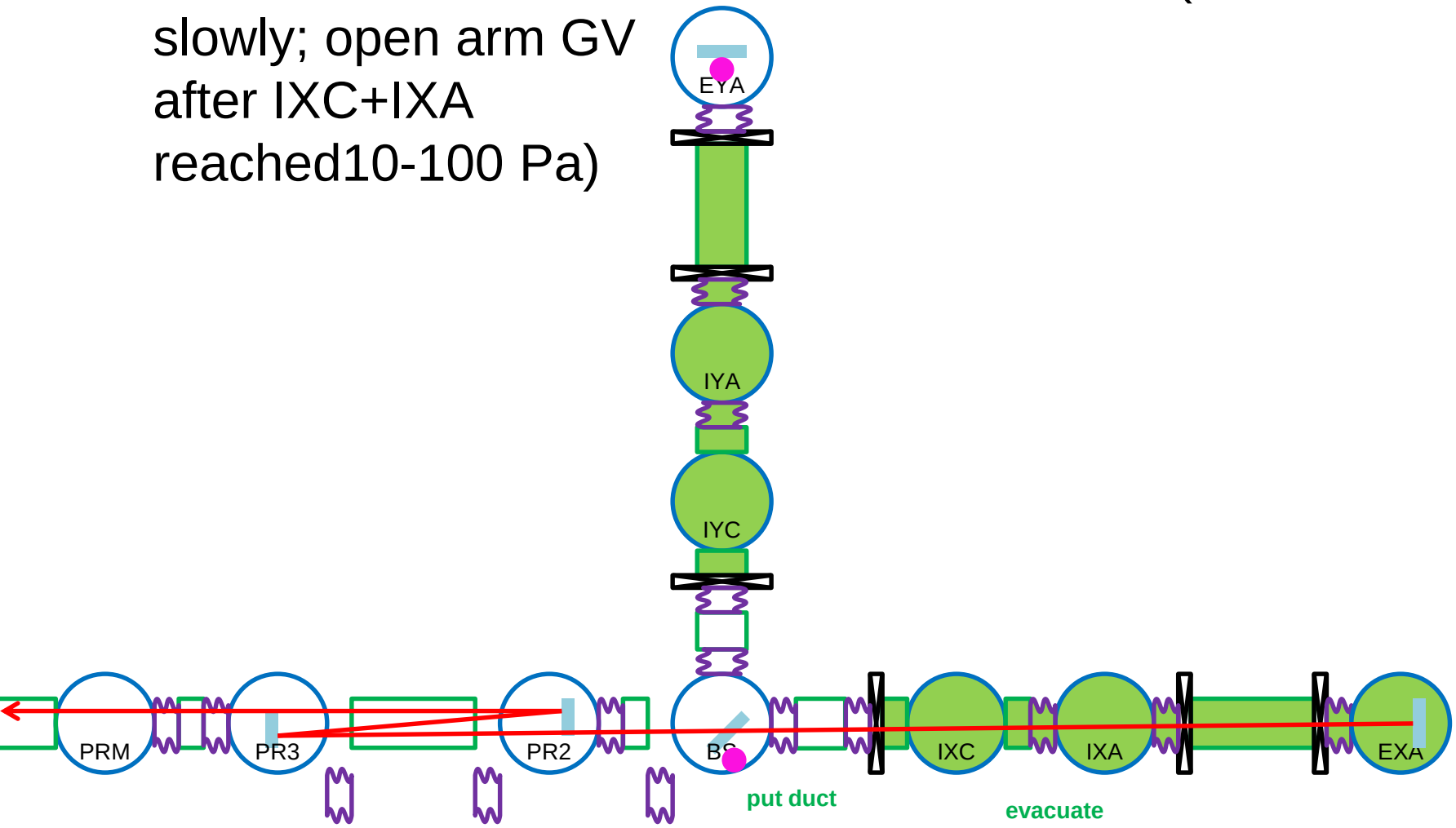
Back to IFI (Mar 8)

- Adjust ETMX alignment to center the reflected beam on BS, PR3, PR2, and get the beam back to IFI and then REFL port
- PR3, PR2, BS chambers opened



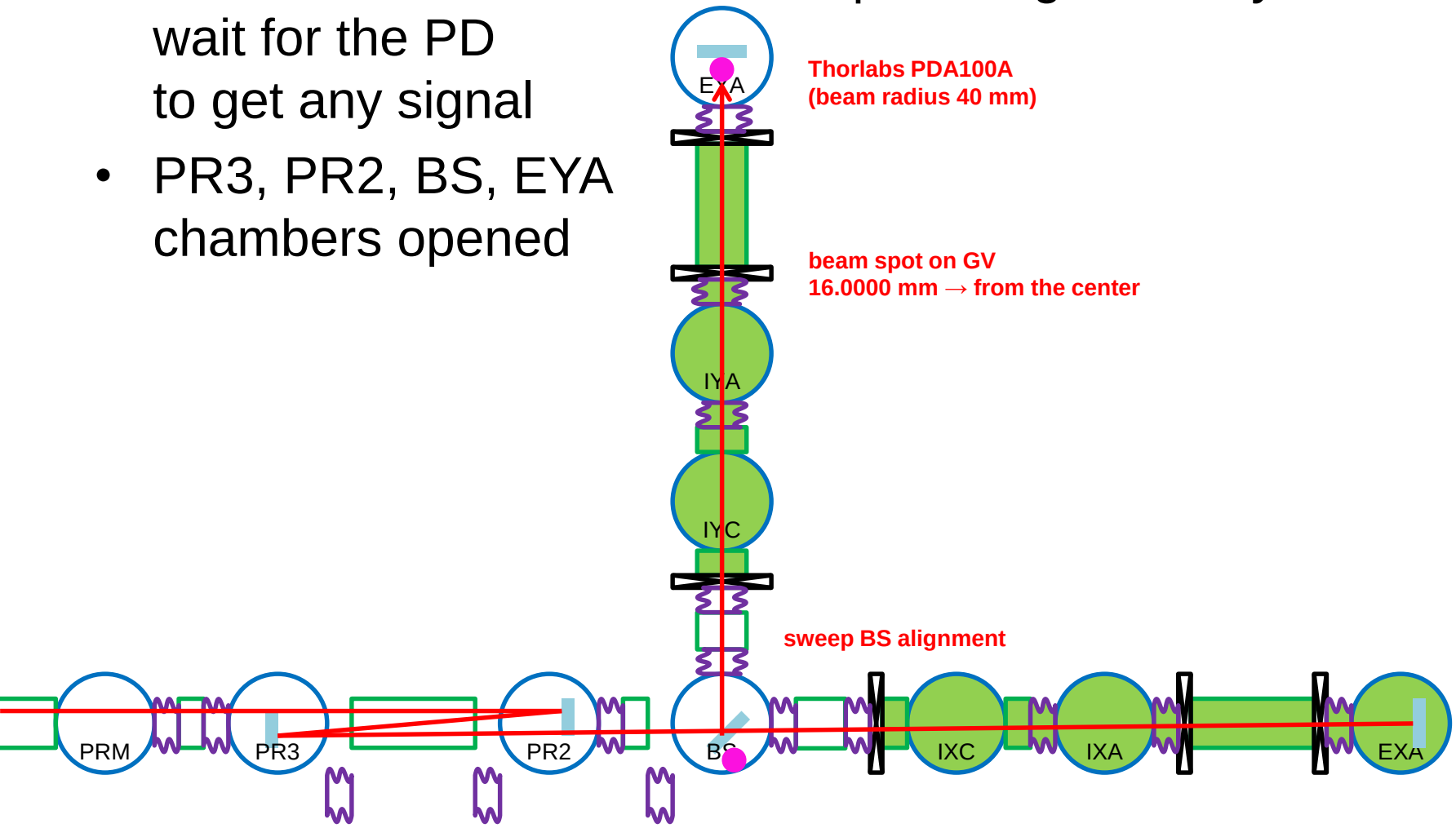
Close X arm (Mar 9)

- Put X arm bellows, and evacuate IXC + IXA (evacuate slowly; open arm GV after IXC+IXA reached10-100 Pa)



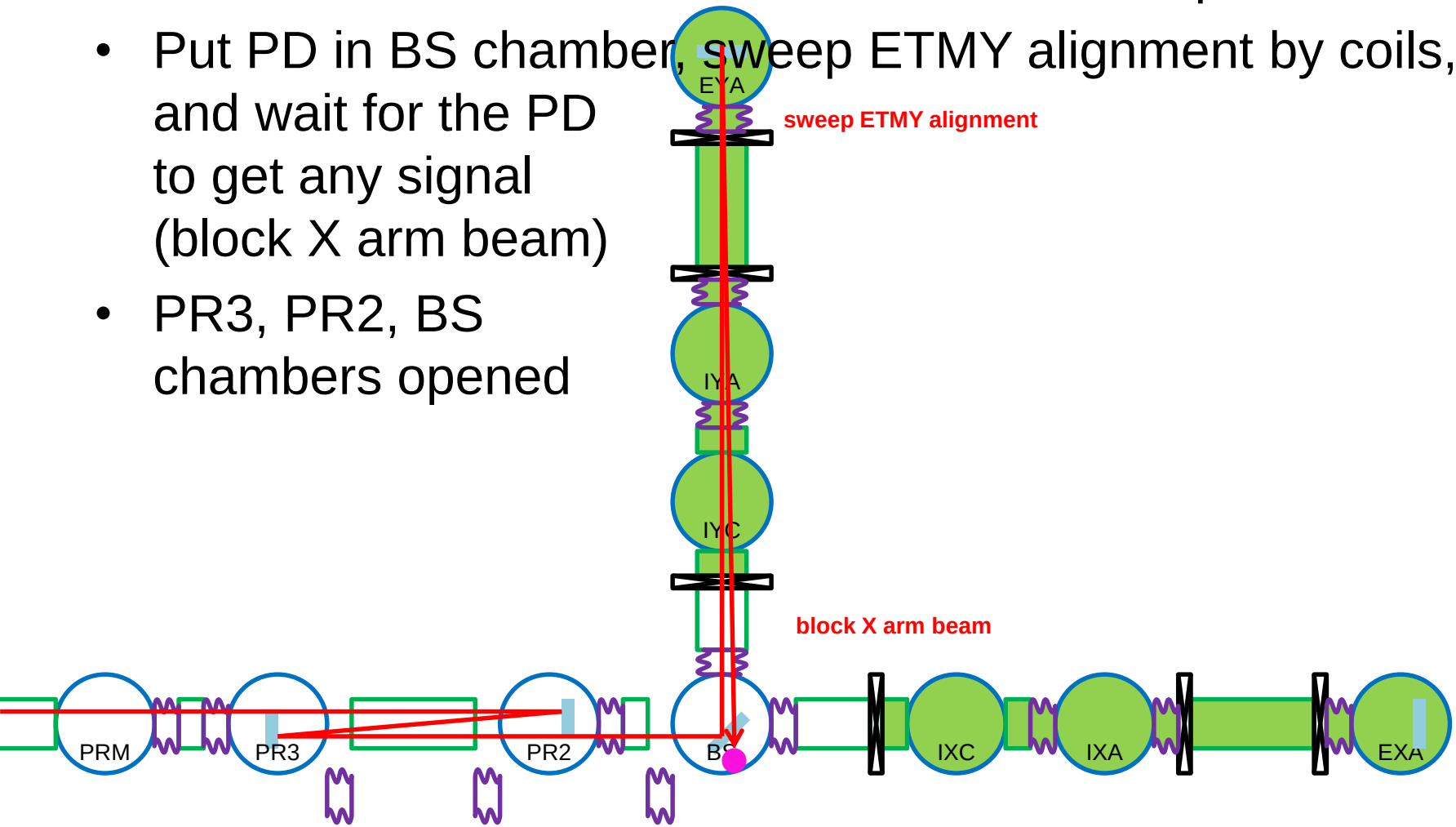
Pointing to Y arm (Mar 9-10)

- Put PD in EYA chamber, sweep BS alignment by coils, and wait for the PD to get any signal
- PR3, PR2, BS, EYA chambers opened



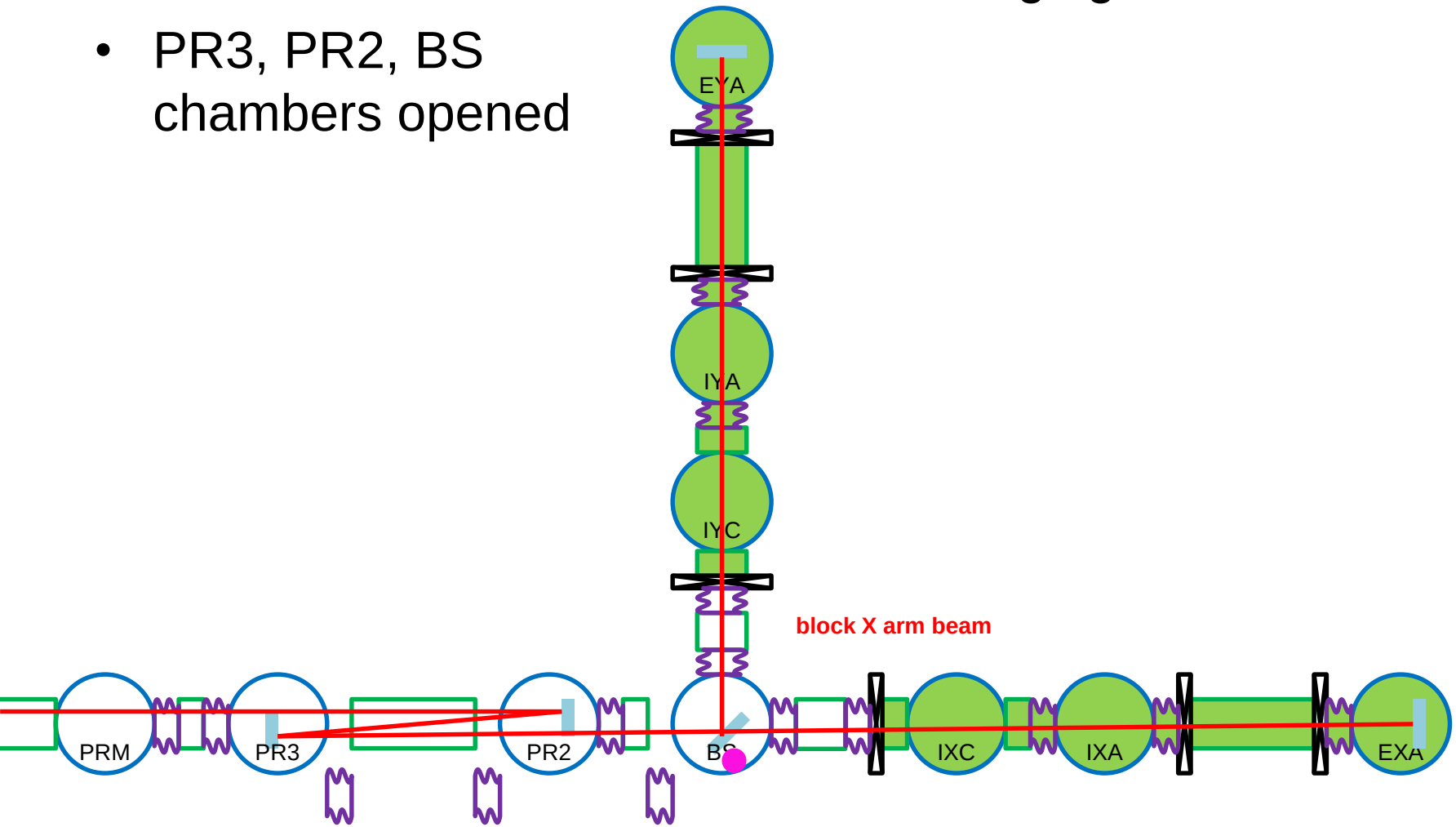
Pointing Back from Y arm (Mar 11)

- Peel ETMY first contact and evacuate EYA if possible
- Put PD in BS chamber, sweep ETMY alignment by coils, and wait for the PD to get any signal (block X arm beam)
- PR3, PR2, BS chambers opened



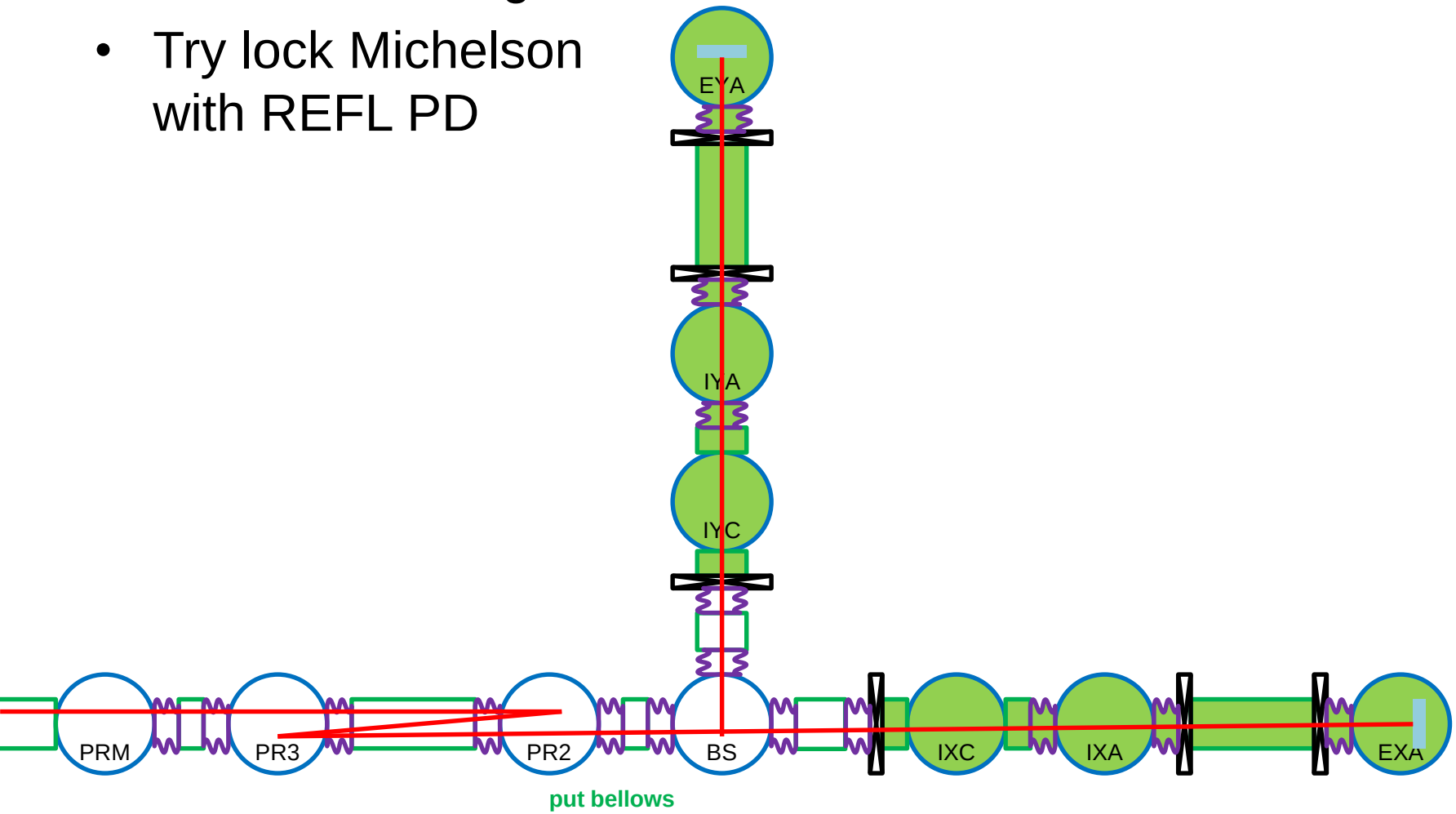
Get Fringe at REFL/AS (Mar 11)

- Unblock X arm beam and confirm fringing at REFL/AS
- PR3, PR2, BS chambers opened



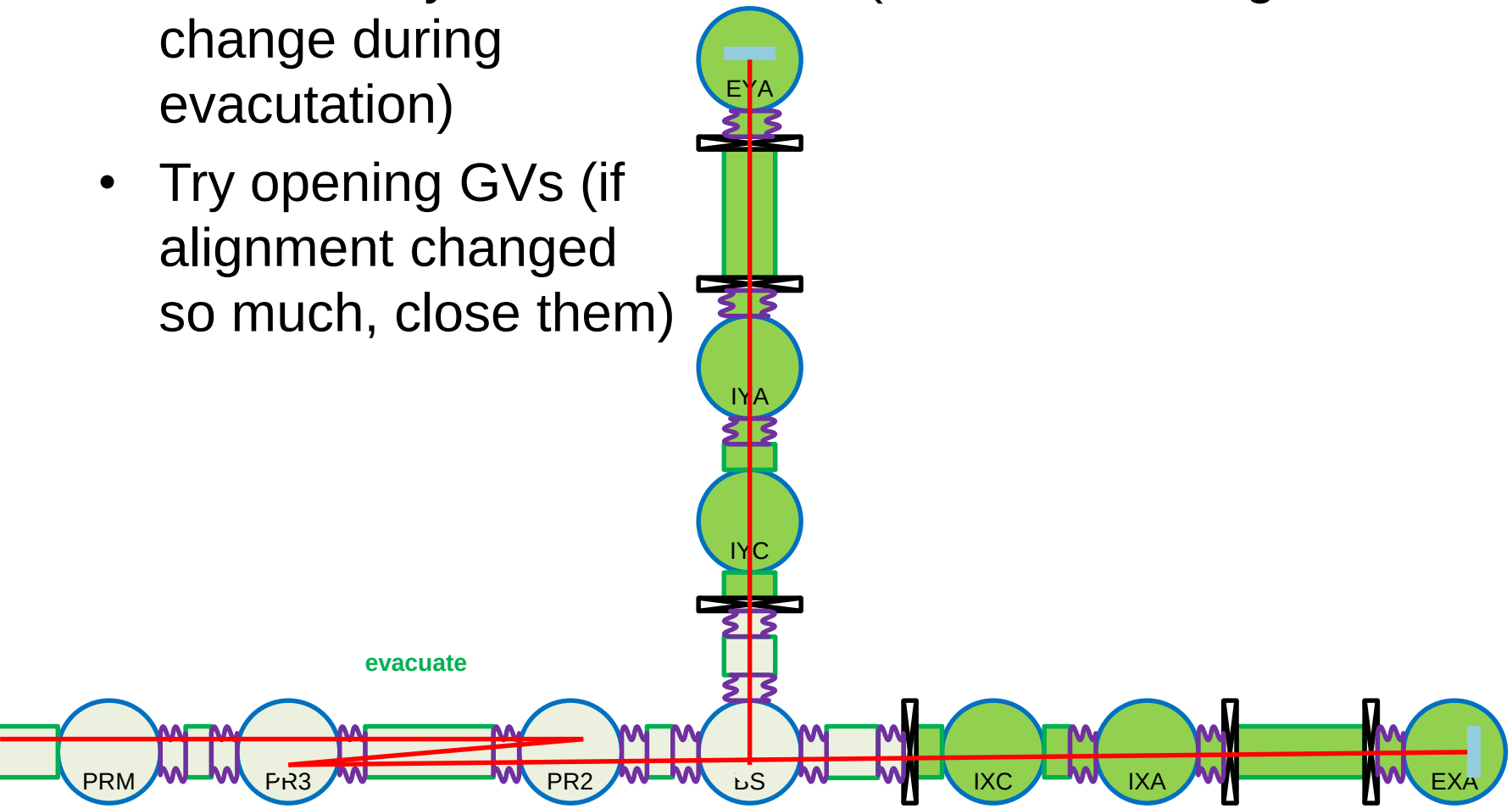
Close Everything (Mar 12-13)

- Close remaining bellows
- Try lock Michelson with REFL PD



Lock Michelson (Mar 14)

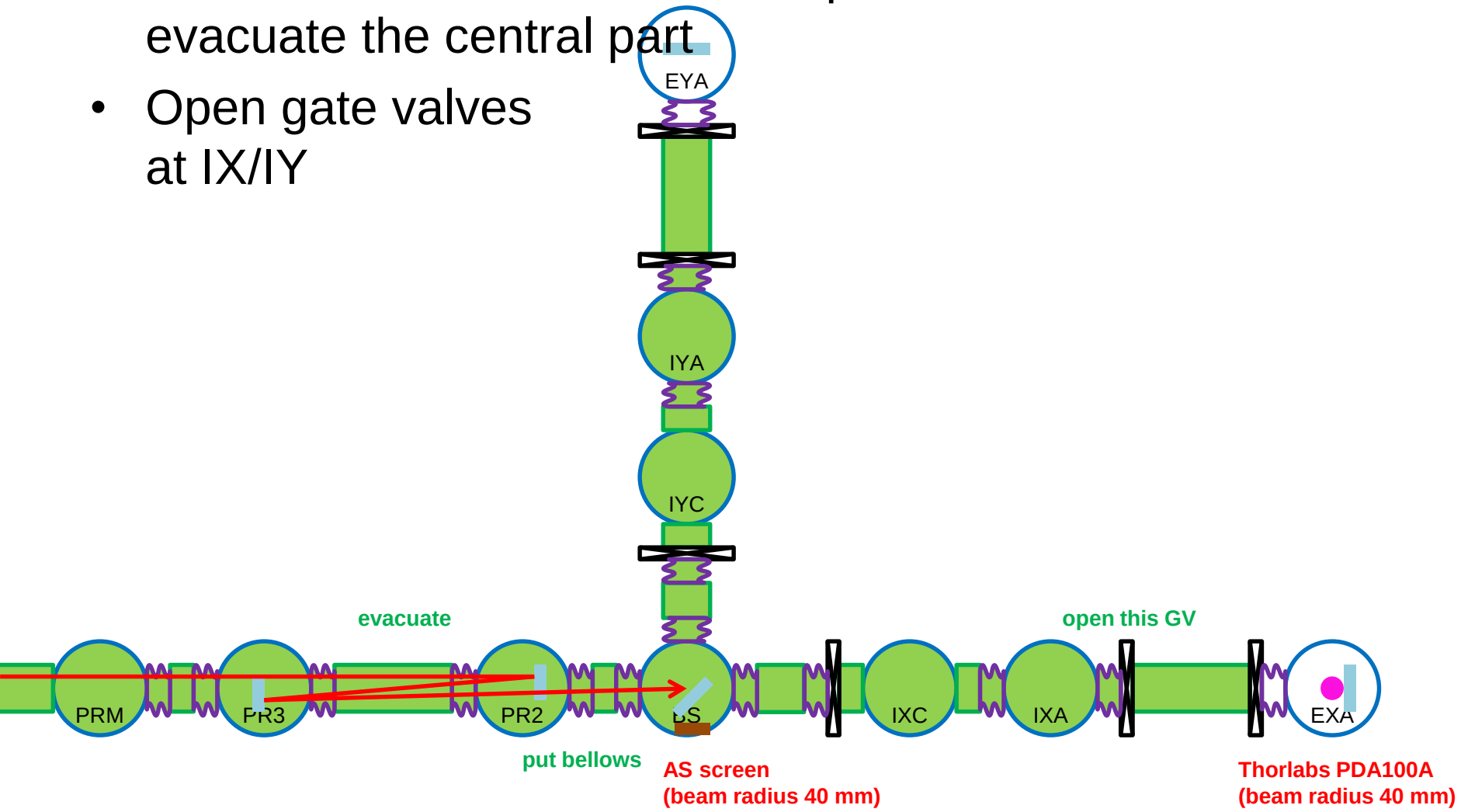
- If locked, try start evacuation (check beam alignment change during evacutation)
- Try opening GVs (if alignment changed so much, close them)



Plan B
(if we don’t see the beam at EX)

Evacuate Central Part (Mar 8)

- Put AS screen in BS chamber, put all the bellows, and evacuate the central part
- Open gate valves at IX/IY



All the rest

- Pointing to X arm (Mar 9)
- Back to IFI from X arm (Mar 10)
- Pointing to Y arm (Mar 11)
- Back to IFI from Y arm, and get fringing (Mar 12)
- Evacuate EXA and EYA (Mar 13)
- Lock Michelson (Mar 14)

- We skip beam profiling at EXA
- Use cameras/screens/irises(?) after evacuation of the central part